Panasonic
INDUSTRY

Your Committed Enabler

Devices & Solutions Catalogue

Capacitors, Inductors, Resistors, Circuit Protection,
Sensor Solutions & Thermal Solutions

IN Your Future

EMPOWERING EFFICIENCY, STABILITY AND SUSTAINABILITY:

PASSIVE COMPONENTS FROM PANASONIC INDUSTRY

Efficiency, stability, and sustainability are the cornerstones of modern electronics, and Panasonic Industry's portfolio of passive component capacitors can be the secret ingredient to achieving all three. Our passive component technology is proven billions of times over, operating with the utmost precision, optimizing performance, and extending the lifespan of electronic devices. Many of our products contribute to sustainability through their long lifespan and compact sizes, enabling space-saving and application miniaturization.

They often provide an alternative to conventional parts that rely on conflict materials. From household appliances to advanced communication technology, from automotive applications to industrial devices, Panasonic Industry's capacitors, inductors, resistors, thermal management materials, and other components play a vital role in shaping a more connected, energy-efficient, and sustainable world.

PANASONIC INDUSTRY AND SUSTAINABILITY

PRODUCT COMPLIANCE

The Panasonic Group is well aware of the various restrictions imposed by European, national and international legislation. The main concern in Europe is currently compliance with the directives and regulations listed below. The list does not claim to be comprehensive.

ELV (Directive 2000/53/EC)
RoHS (Directive 2011/65/EC, 2015/863/EC)
WEEE (Directive 2012/19/EU)
REACH (Regulation 1907/2006/EC)
POP (Regulation 2019/1021/EC)

In addition to legislative requirements, Panasonic Group has set its own, more stringent targets for products and procurement. Within our green procurement activity, we require and support our own factories and suppliers to establish an environmental management system and to expedite resource recycling, water & biodiversity conservation and reduction of greenhouse gas emissions. We also request our suppliers to comply with 'Panasonic Chemical Substance Management Rank Guideline for Products' which limits the use of certain chemical substances, ensuring compliance with applicable legislations, and reduces their environmental impact.
For more details and information, please visit our Green Procurement page.

Go to Webseite

Decarbonization in supply chains

Decarbonize our entire supply chain, in addition to our own business operations. Achieve net-zero CO_2 emissions for our company by 2030 and strive to reduce overall CO_2 emissions to net-zero by 2050.

- **100% renewable energy by 2030**
- **Improvement of energy use efficiency by production process innovation**
- **Collaboration with partners, nations and local governments**
- **Collaboration with suppliers**

Decarbonization through Products and Services

Contribution to the decarbonization of society through our technology and solutions that significantly reduce the CO_2 emissions for customers who use our devices and materials.

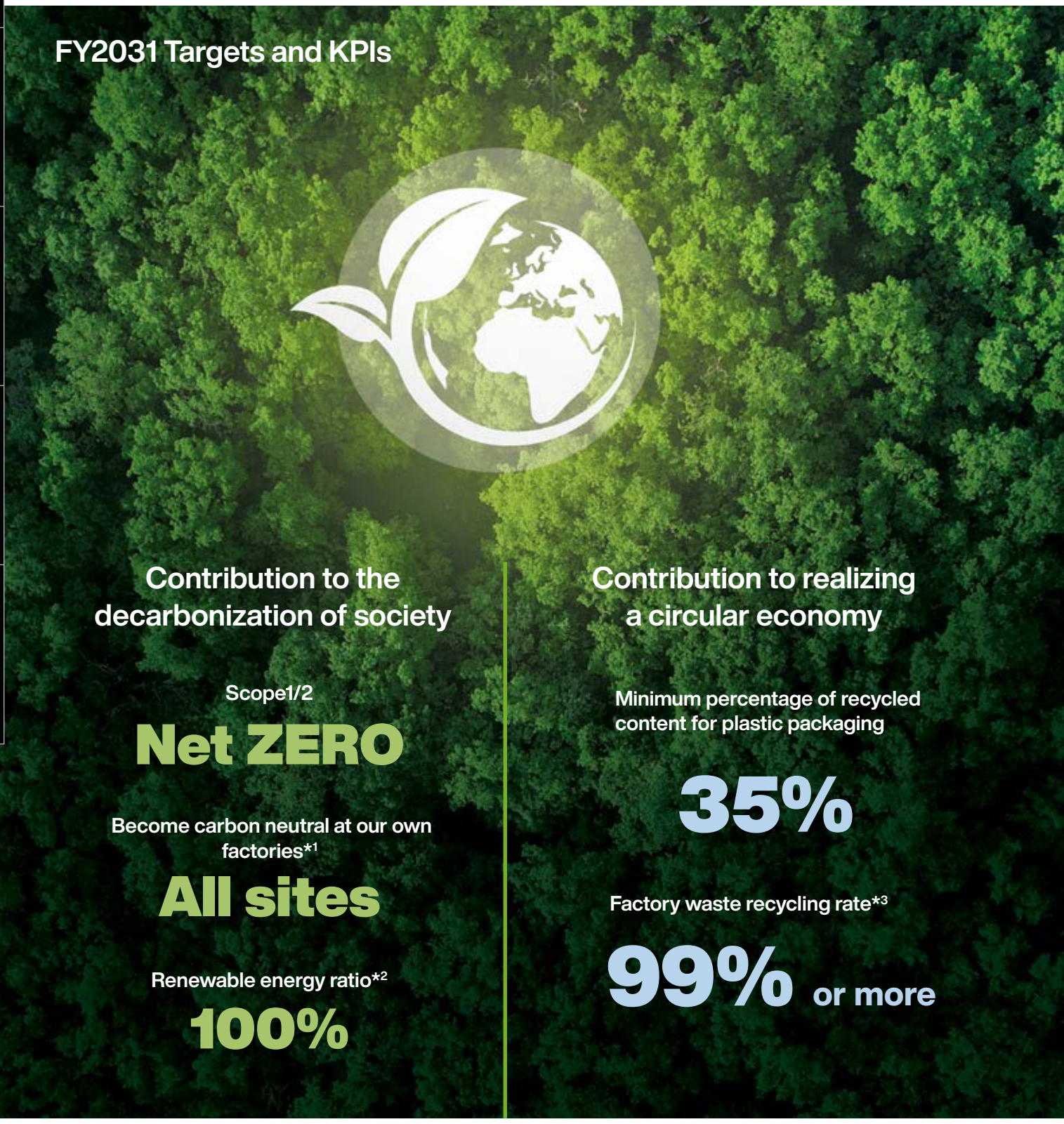
- **Increasing avoided amounts of CO_2 emissions through the evolution of environmental performance of our products**
- **Fair and transparent information disclosure to stakeholders**
- **Contribution to decarbonization by R&D and business development**

Contribution to Realizing a Circular Economy

Contribution to realizing a circular economy by improving resource use efficiency in the entire product life cycle and maximizing product lifetime.

- **Initiatives to ensure efficient use of resources across our entire value chains**
  - **Upstream (procurement, design, and development)**
  - **Midstream (production)**
  - **Downstream (collection)**
- **Contribution to realizing a circular economy by R&D and business development**

PANASONIC INDUSTRY AND SUSTAINABILITY



FY2031 Targets and KPIs

Contribution to the decarbonization of society

Scope1/2

Net ZERO

Become carbon neutral at our own factories*1

All sites

Renewable energy ratio*2

100%

Contribution to realizing a circular economy

Minimum percentage of recycled content for plastic packaging

35%

Factory waste recycling rate*3

99% or more

*1 Factories that have achieved virtually zero CO_2 emissions by conserving energy, introducing renewable energy, and using credits.
*2 Percentage of electricity, fuel, etc. used by Panasonic Energy that is derived from renewable energy sources (includes certificates, credits, and other externally procured items).
*3 Factory waste recycling rate = Amount of resources recycled / Amount of landfill.

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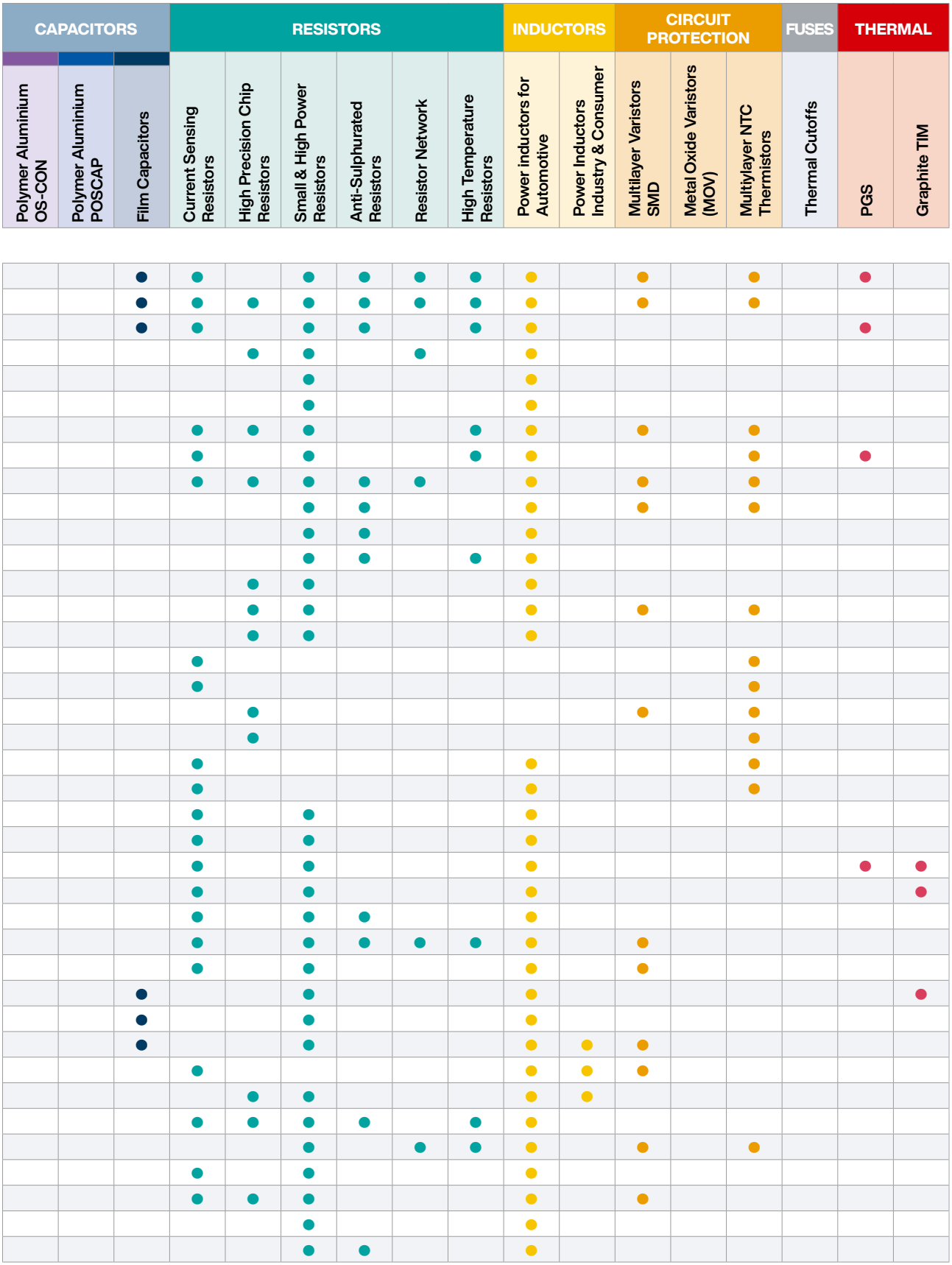
APPLICATION MATRIX

			SENSORS		CAPACITORS		
			IR Thermophile Array Sensor – Grid-EYE	6DoF inertial Sensor	Aluminium Electrolytic Capacitors	Polymer-Aluminium SP-Cap	Hybrid Capacitors
AUTOMOTIVE							
Electrification	**Power Electronics**	Inverter			●		●
		DC/DC Converter			●		●
		Charger (AC/DC, Bidirectional)			●		●
		Electric Power Steering			●		●
		E- Pumps / E-Compressors			●		●
		E-Fans			●		●
	Battery Management	Battery Module			●		●
	On Board Charger	On Board Charger			●		
Chassis & Safety Systems	**Active & Passive Safety**	Brake Systems, ABS, ESP		●	●		●
		Airbags, Restraint Systems		●	●		
		Remote Keyless Entry (RKE)					●
		TCU		●	●		●
	ADAS	Camera System		●	●		●
		Radar System		●	●		●
		LIDAR		●	●		●
		Adaptive Cruise Control		●	●		
		Lane Departure Warning		●	●		
		Park Assist		●	●		
		V2X Connectivity		●	●		
		Automatic Emergency Braking		●	●		
	Headlight	LED		●	●		●
		Xenon		●	●		
		Laser		●	●		
Interior & HMI	**Instrumentation & HMI**	Displays			●		●
		Head-Up Displays		●	●		●
		Steering Wheel			●		●
		HVAC	●		●		●
		ICP (Integrated Control Panel)			●		
	Infotainment & Connectivity	Radio & Multimedia		●	●		
		Connectivity, Telematics, eCall		●	●		●
		Electric Toll Collection (ETC)			●		
	Body & Security	Access & Door Control	●		●		●
		Seat Comfort			●		●
		Tire Pressure Monitoring Systems (TPMS)			●		
		Energy Management			●		●
		Antenna Modules			●		
		Driver Monitoring with Camera	●		●		●
		Car Alarm			●		
		Black Box		●	●		


CAPACITORS
RESISTORS
INDUCTORS
CIRCUIT PROTECTION
FUSES
THERMAL
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Polymer Aluminium POSCAP
Film Capacitors
Current Sensing Resistors
High Precision Chip Resistors
Small & High Power Resistors
Anti-Sulphurated Resistors
Resistor Network
High Temperature Resistors
Power inductors for Automotive
Power Inductors Industry & Consumer
Multilayer Varistors SMD
Metal Oxide Varistors (MOV)
Multilayer NTC Thermistors
Thermal Cutoffs
PGS
Graphite TIM

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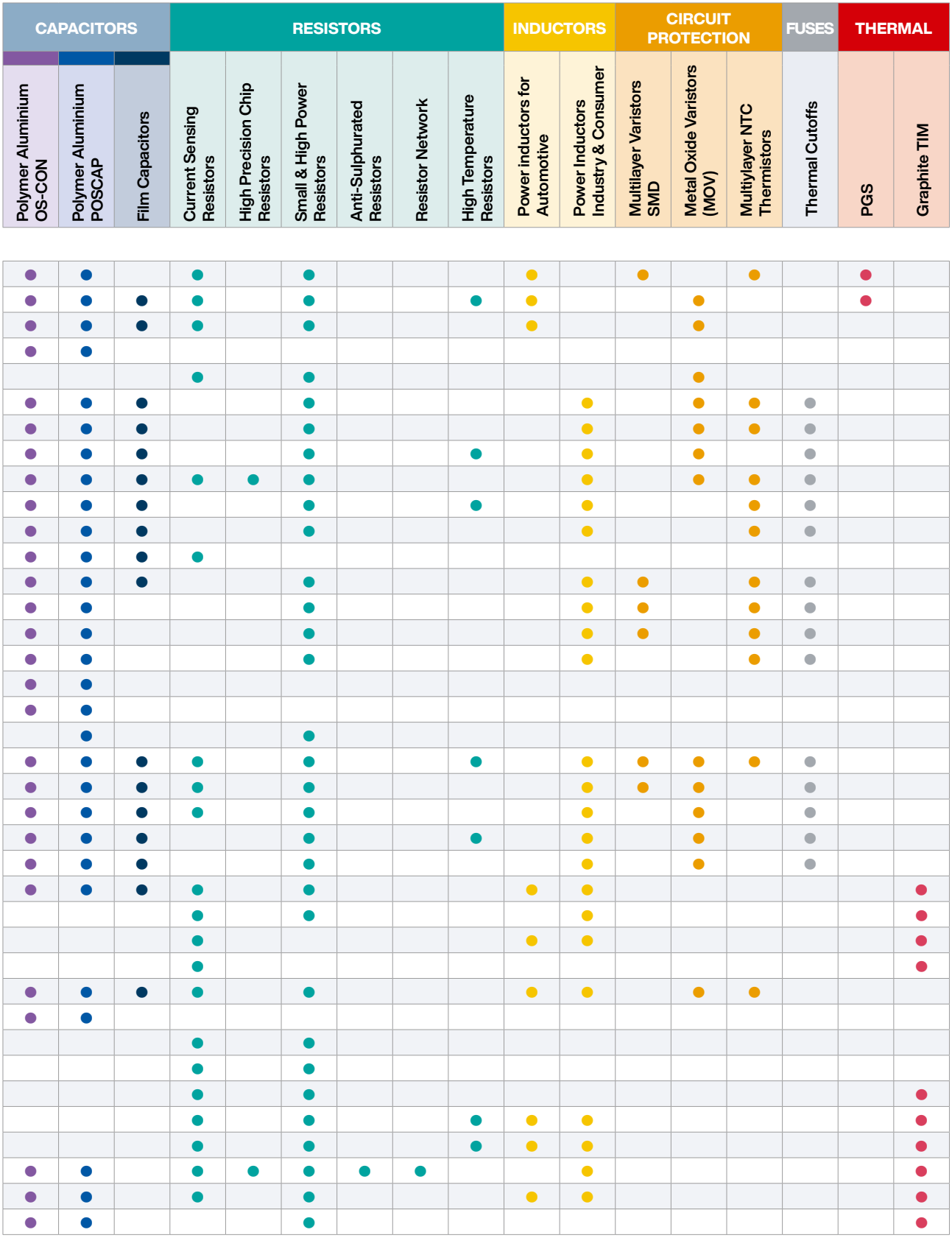
HOME							
Mobility	**E-Bike**	E-Bike		●	●	●	●
	Charging Station	Charging Station			●	●	●
	Avionic / Space	Air Taxis / Drones		●			
		Manual Drone					
		Flight Control Systems		●			
Appliance	**Home Appliance**	Coffee Machine	●			●	
		Fridge-Freezers	●			●	
		Oven, Microwaves	●			●	●
		Vacuum & Robot Cleaner	●	●	●	●	●
		Dryer	●		●	●	●
		Laundry & Irons	●			●	
		HQ Audio System (Amplifier)			●	●	●
	Personal, Health Care & Toys	Men's Grooming	●			●	
		Beauty Products	●			●	
		Oral Care	●			●	
		Toys	●			●	
		USB PD (Power Delivery)				●	●
		VR Google				●	
		Power Bank				●	
	PowerTools	Drilling			●	●	●
		Screwdriver			●	●	●
		Jig Saw			●	●	●
		Garden Tools			●	●	●
		Sealing Gun			●	●	●
Lighting	**Lighting**	Emergency Lighting	●			●	
		Streetlamps					
		LED Controller					
		LED Driver					●
Internet of Things	**Smart Home**	Control of Lighting, Heating, Shutter	●		●	●	●
		Digital Signage			●	●	●
Smart Agriculture	**Horticulture**	Horticulture Lighting	●				
		Humidity Sensors					
Smart Home	**Energy Management**	Smart Thermostats	●				
		Heat Pump					
	Cooling	HVAC	●				
	Smart Meter	Smart Meter			●	●	●
	Security Camera	Security Camera				●	●
	LCD Display	LCD Display			●	●	●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INFRASTRUCTURE							
Mobility	**Train**	Inverter					●
		Train Control System		●			
	Electric Cars	Private Wall Boxes					
		Commercial DC/DC Charger					
Information	**Data Server, Server, AI**	Power Supply			●	●	●
		FPGA				●	
		Smart NIC				●	
		Wi-Fi 6/6E/7				●	
		eSSD					
Communication	**Smartphones**	Battery and Power Management					
		Displays					
		Peripherals					
	Tablet PC	Tablet PC			●	●	●
	Satellite Constellation	Satellite Constellation				●	
INDUSTRIAL							
Manufacturing	**Advanced robotic**	Automated Equipment		●			
		Robots & Cooling Fan		●	●	●	●
		Embedded (Industrial PC)			●	●	●
		Service Robots	●	●			
		Manufacturing Robots	●				
		Collaborative/Cobots		●			
		Industrial PCs					
		Logic Controller (PLC)			●	●	●
	Industry 4.0	M2M Communication					
		PLC					
		Safety Systems					
	Motor	Motor Drive					
		Motor (Gate Driver)			●	●	●
Energy	**Renewable energy**	Generation					
		Storage					
		Distribution					
		Inverter					
	Measurement	Smart Meter					
	Power systems	Power Supply					
		Power Management					
		UPS					

CAPACITORS			RESISTORS						INDUCTORS		CIRCUIT PROTECTION			FUSES	THERMAL	
Polymer Aluminium OS-CON	Polymer Aluminium POSCAP	Film Capacitors	Current Sensing Resistors	High Precision Chip Resistors	Small & High Power Resistors	Anti-Sulphurated Resistors	Resistor Network	High Temperature Resistors	Power inductors for Automotive	Power Inductors Industry & Consumer	Multilayer Varistors SMD	Metal Oxide Varistors (MOV)	Multilayer NTC Thermistors	Thermal Cutoffs	PGS	Graphite TIM
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HEALTHCARE							
Healthcare	**Wearables**	Sleep Monitor	●				
		Fitness Tracker					
	Medical devices	Point of Care Diagnostic					
	Home, Personal MHC Tracking	Scale					
		Thermometer	●				
		Blood Pressure					
		Blood Sugar					
	Sports Activities	Fitness Machine	●				

CAPACITORS			RESISTORS						INDUCTORS		CIRCUIT PROTECTION			FUSES	THERMAL	
Polymer Aluminium OS-CON	Polymer Aluminium POSCAP	Film Capacitors	Current Sensing Resistors	High Precision Chip Resistors	Small & High Power Resistors	Anti-Sulphurated Resistors	Resistor Network	High Temperature Resistors	Power inductors for Automotive	Power Inductors Industry & Consumer	Multilayer Varistors SMD	Metal Oxide Varistors (MOV)	Multilayer NTC Thermistors	Thermal Cutoffs	PGS	Graphite TIM
			●	●					●	●				●		
			●	●					●	●				●		
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PANASONIC FOCUS 8

ALUMINIUM ELECTROLYTIC CAPACITORS

Go to Products →

- Number 1 Low ESR manufacturer 6.3V - 450V
- Long lifetime up to 10,000 hours
- Larger capacitance in smaller case size

POLYMER ALUMINIUM CAPACITORS: OS-CON

Go to Products →

- Leading manufacturer of Polymer Aluminium technology
- OS-CON: Highest ripple current (up to 7.5A) / voltage (2.5V to 100V) / longest lifetime (20,000h @105°C)

POLYMER ALUMINIUM CAPACITORS: SP-Cap

Go to Products →

- SP-Cap: Ultra-low ESR (down to 3mΩ) / voltage (2V to 6.3V) / high temperature (up to 135°C)

HYBRID CAPACITORS

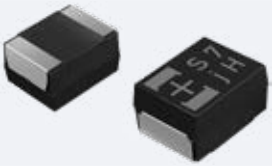
Go to Products →

- Technology leader of Hybrid Capacitor
- High ripple current (up to 6.1A) / voltage (25V to 80V) / large capacitance (up to 1,000µF)
- High temperature (up to 150°C)

POLYMER TANTALUM CAPACITORS: POSCAP

Go to Products →

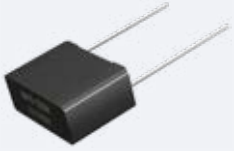
- Leading manufacturer of Polymer Tantalum technology
- Low ESR (down to 5mΩ) / voltage (up to 35V) /large capacitance (up to 1,500µF)
- Smaller size footprint available - B & D case sizes



FILM CAPACITORS

Go to Products →

- 600VDC to 1300VDC
- Higher ripple current in smaller case size
- Semi-custom solution available



POWER INDUCTORS

Go to Products

- Metal composite technology
- High vibration resistance (up to 50G) / high temperature resistance (up to 180°C)
- Wide range of products from 5x5 to 15x15 mm case size (pin to pin compatibility)

SMD RESISTORS

Go to Products

High Power & Shunt (Thick Film)

- Up to 2W, down to 5mΩ
- Wide - and double-sided terminals solutions
- Anti-Pulse / Anti-Surge
- High temperature up to 175°C, with derating at 105°C
- High voltage (up to 500V) available

High Precision (Thin Film)

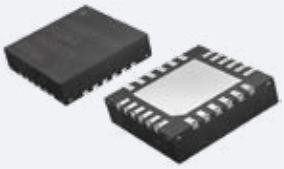
- Down to ±5ppm / K and 0.05% tolerance
- High reliability and low drift

SENSORS

Go to Products

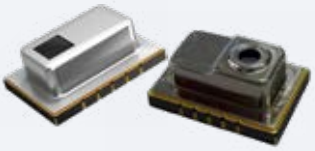
6 Degree of Freedom Sensor (6in1 Sensor)

- Safety motion detection by 3D acceleration and 3D Gyro
- High temperature resistance up to 125°C
- Life-long robustness against vibration

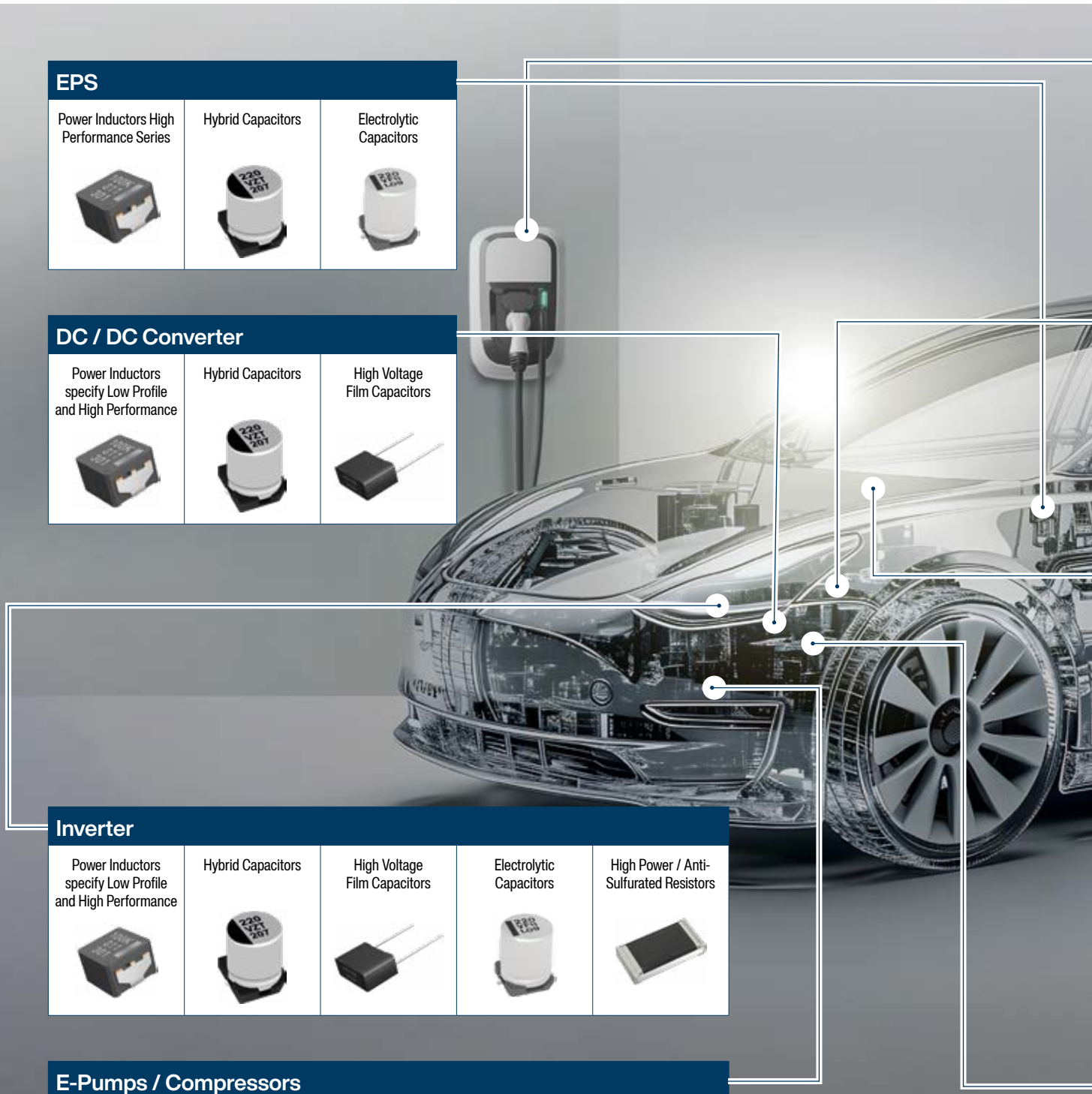


Grid-EYE Sensor

- Wide Angle 64-pixel
- Digital output I2C interface
- People tracking & counting



AUTOMOTIVE APPLICATION GUIDE



EPS

Power Inductors High Performance Series	Hybrid Capacitors	Electrolytic Capacitors

DC / DC Converter

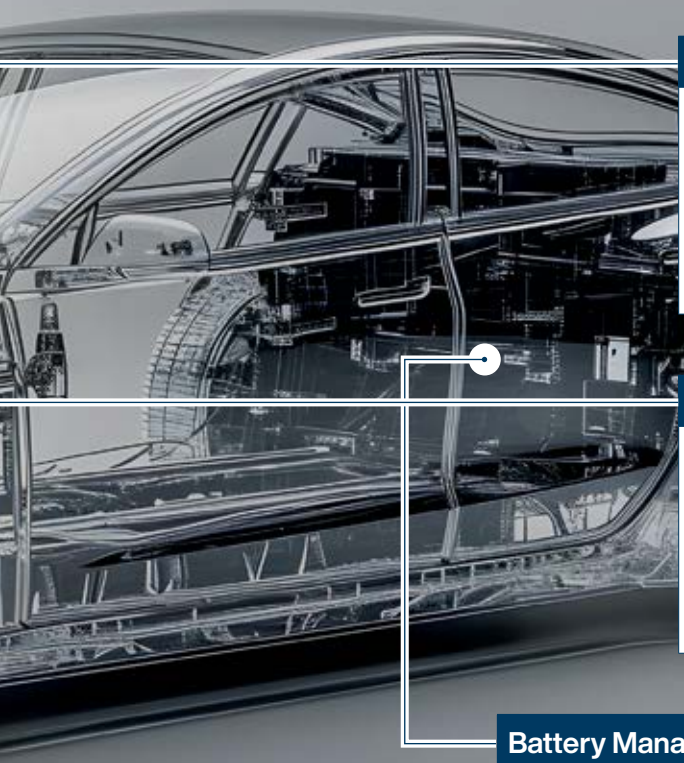
Power Inductors specify Low Profile and High Performance	Hybrid Capacitors	High Voltage Film Capacitors

Inverter

Power Inductors specify Low Profile and High Performance	Hybrid Capacitors	High Voltage Film Capacitors	Electrolytic Capacitors	High Power / Anti-Sulfurated Resistors

E-Pumps / Compressors

Power Inductors LP / High Performance / High Vibration Proof	Hybrid Capacitors	High Voltage Film Capacitors	Electrolytic Capacitors	High Temperature / Thin Film Resistors
				



Charging Wall Box

Power Inductors Low Profile Series	Hybrid Capacitors	High Voltage Film Capacitors	Electrolytic Capacitors	Current Sense / High Power Resistors
				

On Board Charger

Power Inductors High Performance / Large Current Series	Hybrid Capacitors	High Voltage Film Capacitors	High Power / Current Sense Resistors
			

ADAS

Power Inductors LP Series	Hybrid Capacitors	Electrolytic Capacitors	Thin Film Resistors
			

Battery Management System

Power Inductors Low Profile (LP) / High Performance (HP) Series	Hybrid Capacitors	High Voltage Film Capacitors	Electrolytic Capacitors	Thin Film / Current Sense Resistors
				

Actuator

Power Inductors LP / High Performance / High Vibration Proof	Hybrid Capacitors	High Voltage Film Capacitors	Electrolytic Capacitors	Current Sense / Thin Film Resistors
				

CAPACITORS

DIVERSE SOLUTIONS FOR EVERY APPLICATION

Panasonic offers an extensive range of capacitor solutions, ensuring there is an option for every application. Our capacitors feature long lifetimes, AEC-Q200 compliance, high moisture resistance, anti-vibration capabilities, and extremely small case sizes that save board space, contributing to sustainability by enabling more efficient designs. Panasonic capacitors redefine quality and performance with their industry-leading polymer capacitors and film capacitors with fail-safe metallization technology.
As a leading supplier of capacitor technology, Panasonic provides a broad spectrum of MLCC alternative solutions, including SP-Cap™, POSCAP™, OS-CON™, polymer hybrid, and film capacitors, all ready to replace MLCCs.


Electrolytic Capacitors
High temperature 135°C
Up to 10,000h
Low ESR
Film Capacitors
Up to 125°C
Up to 30Arms
High humidity resistance
POSCAP
Small case size
Low ESR ≥ 5 mΩ
Up to 1,500µF
SP-Cap
Ultra-low ESR ≥ 3mΩ
Up to 10.2Arms max
Low ESL
Polymer Capacitors
OS-CON
Highest ripple (7.5 Arms)
Up to 20,000h
Wide voltage rating: 2V - 100V
Hybrid
Up to 1,000µF
Highest ripple (6.1 Arms)
Up to 150°C
IOT

ALUMINIUM ELECTROLYTIC CAPACITORS

Wide variety of SMD and THT aluminium electrolytic capacitors in the industry. Low ESR, long life, large capacity and reliable supply.

Aluminium Electrolytic Capacitors

- High ripple current / low ESR
- High temperature: up to 135°C
- Lifetime: up to 10,000 hours
- Size range: Ø 4 - 18mm (H 5 – 40mm)
- Capacitance range: 1 – 22,000µF
- Rated voltage range: 4 - 450V
- Ripple current range: 7 - 4,000mArms
- Anti-vibration type available ≥ Ø6mm
- AEC-Q200 qualified
- Halogen-free type available

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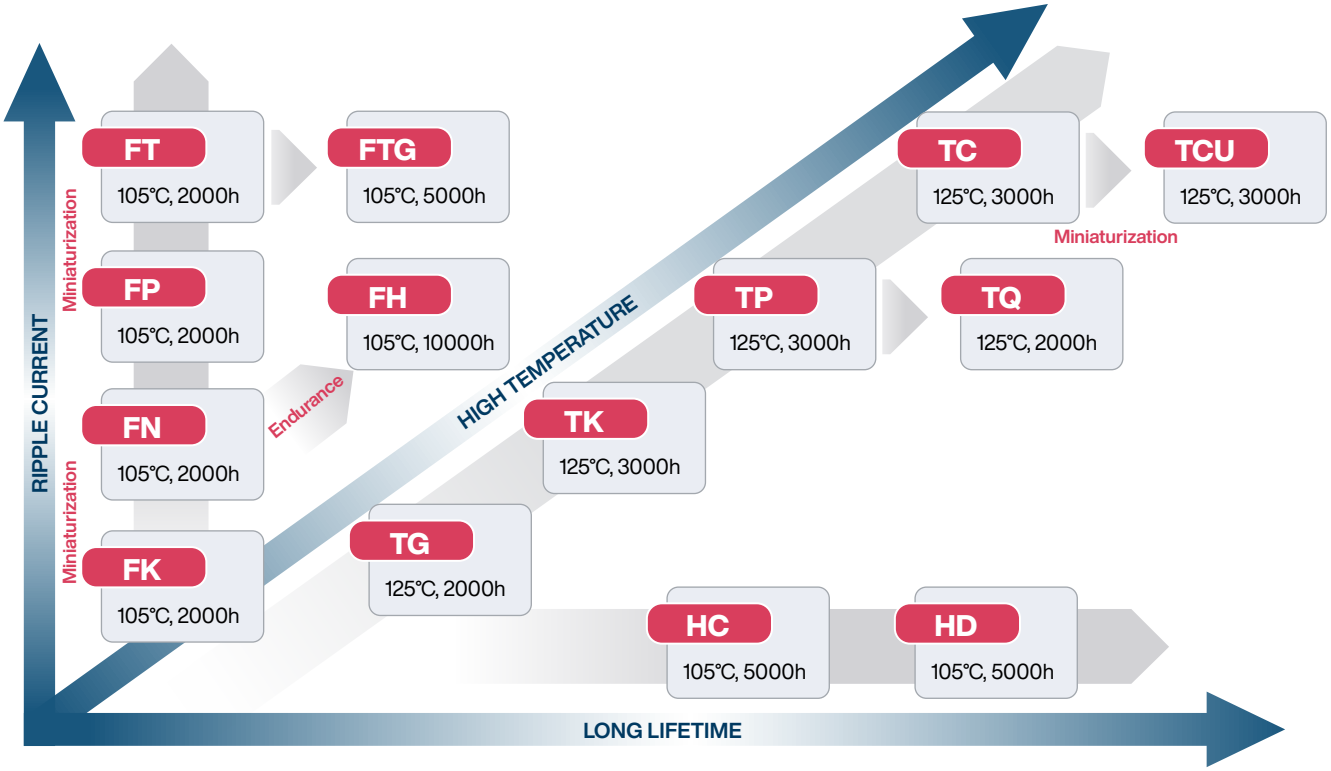
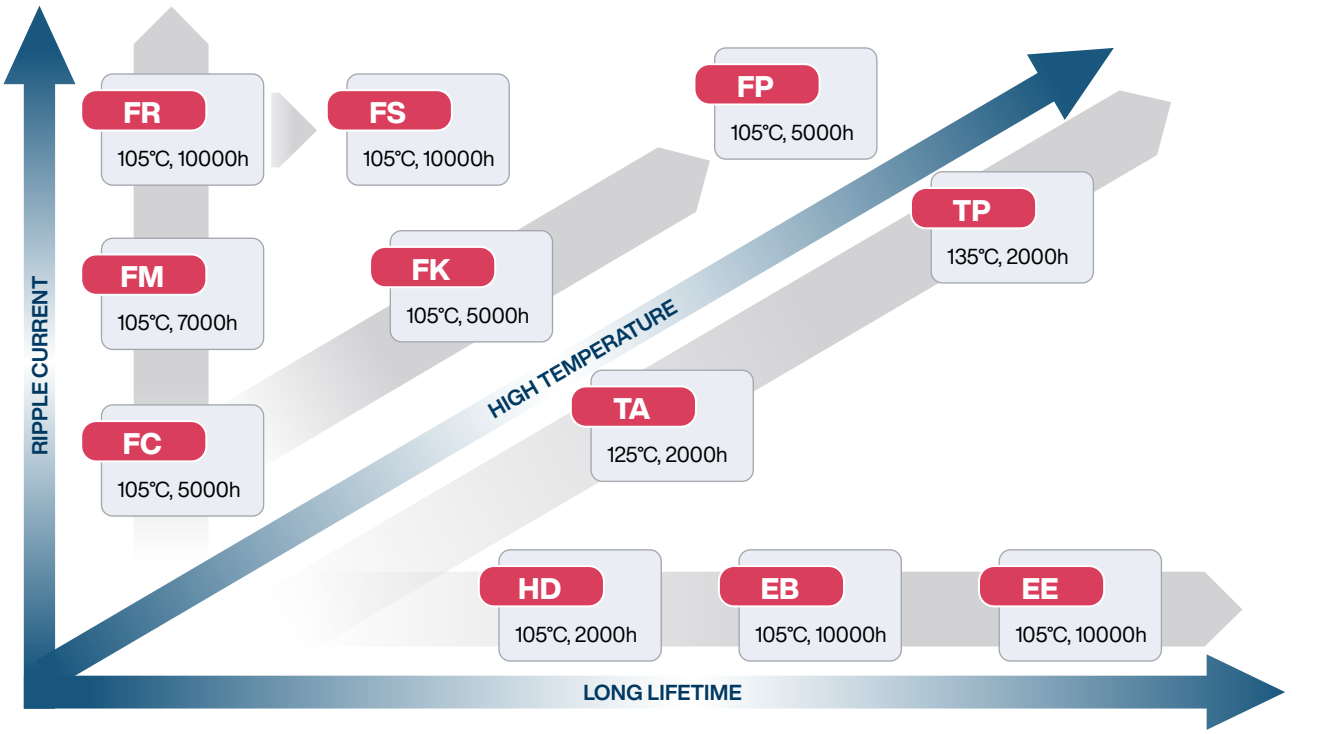
SERIES OVERVIEW

SMD Electrolytic Capacitors



THT Electrolytic Capacitors



ELECTROLYTIC CAPACITORS SMD SERIES OVERVIEW

Type	Series	Part No.	Features				Category temperature range (°C)	Rated voltage range (V)	Capacitance range (µF)	ESR (Ω)	Ripple Current (mA rms)	Tan (δ)	Impedance (Ω)	Size [ØxL] (mm)
			Endurance	Low ESR	Miniaturization	Long life								
TCU	TCU (High temp. reflow)	EEETC-----U-	125°C 3000 h		•		- 40 to 125	10 to 35	220 to 680	0.15 to 0.20	410 to 750	0.16 to 0.30	-	8x10.2 to 10x10.2
TC	TC (High temp. reflow)	EEETC	125°C 2000 to 3000h				- 40 to 125	10 to 35	47 to 470	0.15 to 0.45	300 to 750	0.16 to 0.30	-	6.3x7.7 to 10x10.2
TQ	TQ (High temp. reflow)	EEETQ-----A-	125°C 2000 h	•	•		- 40 to 125	35	47 to 100	0.3	197	0,16	-	6.3x7.7
TP	TP (High temp. reflow)	EEEFP-----A-	125°C 2000 to 3000 h	•			- 40 to 125	10 to 35	47 to 470	0.15 to 0.45	197 to 500	0.16 to 0.30	-	6.3x7.7 to 10x10.2
	TP [Medium size] (High temp. reflow)	EEETP	125°C 3000 to 4000 h	•			- 55 to 125	25 to 80	390 to 3300	0.032 to 0.1	1900 to 3250	0.12 to 0.22	-	16x16.5 to 18x21.5
TK	TK	EEETK	125°C 3000 h	•		•	- 40 to 125	10 to 35	47 to 470	0.2 to 0.3	197 to 270	0.16 to 0.30	-	8x10.2 to 10x10.2
	TK [Medium size] (High temp. reflow)	EEETK-----A-	125°C 2000 h	•			- 40 to 125	10 to 100	47 to 4700	0.075 to 0.42	250 to 1300	0.10 to 0.38	-	12.5x13.5 to 18x16.5
TG	TG	EEE/VTG	125°C 1000 to 2000 h				- 40 to 125	10 to 100	10 to 4700	0.075 to 2.20	70 to 1300	0.10 to 0.36	-	8x6.2 to 18x16.5
FH	FH [HF] (High temp. reflow)	EEEFH------L	105°C 7000 to 10000 h			•	- 55 to 105	6.3 to 100	10 to 680	0.15 to 1.30	130 to 850	0.10 to 0.32	-	6.3x7.7 to 10x10.2
FKS	FKS (Standard/High temp. reflow)	EEEFK-----S-	105°C 2000 h		•		- 55 to 105	6.3 to 100	10 to 1800	0.08 to 1.52	90 to 850	0.07 to 0.26	-	4x5.8 to 10x10.2
	FKS [HF] (Standard/High temp. reflow)	EEEFK-----SL	105°C 2000 h		•		- 55 to 105	6.3 to 100	27 to 1800	0.08 to 1.30	165 to 850	0.07 to 0.26	-	6.3x5.8 to 10x10.2
	FKS [Medium size] (High temp. reflow)	EEEFK-----S-	105°C 5000 h		•	•	- 55 to 105	6.3 to 35	750 to 13000	-	1100 to 2640	0.12 to 0.50	0.025 to 0.06	12.5x13.5 to 18x21.5
FN	FN (Standard/High temp. reflow)	EEEFN	105°C 2000 h	•	•		- 55 to 105	6.3 to 100	10 to 1800	0.08 to 3.5	60 to 850	0.07 to 0.26	-	4x5.8 to 10x10.2
	FN [HF] (Standard/High temp. reflow)	EEEFN------L	105°C 2000 h	•	•		- 55 to 105	6.3 to 100	10 to 1800	0.08 to 2.4	60 to 850	0.07 to 0.26	-	6.3x5.8 to 10x10.2
FT	FT (High temp. reflow)	EEEFT	105°C 2000 to 5000 h		•	•	- 55 to 105	6.3 to 50	10 to 2200	0.06 to 2.30	85 to 1190	0.10 to 0.28	-	4x5.8 to 10x10.2
	FT [HF] (High temp. reflow)	EEEFT-----AL	105°C 2000 h		•		- 55 to 105	6.3 to 50	47 to 2200	0.06 to 0.68	300 to 1190	0.10 to 0.28	-	6.3x5.8 to 10x10.2
FP	FP (High temp. reflow)	EEEFP-----A-	105°C 2000 h	•			- 55 to 105	6.3 to 50	10 to 1800	0.06 to 0.85	160 to 1190	0.10 to 0.26	-	4x5.8 to 10x10.2
	FP [HF] (High temp. reflow)	EEEFP-----AL	105°C 2000 h	•			- 55 to 105	6.3 to 50	33 to 1800	0.06 to 0.26	300 to 1190	0.10 to 0.26	-	6.3x5.8 to 10x10.2
FK	FK	EEE/VFK	105°C 2000 to 5000 h	•	•	•	- 55 to 105	6.3 to 100	3.3 to 6800	-	90 to 2060	0.07 to 0.36	0.033 to 3.00	4x5.8 to 18x16.5
	FK [HF]	EEEFK------L	105°C 2000 to 5000 h	•	•	•	- 55 to 105	6.3 to 100	4.7 to 1500	-	40 to 850	0.07 to 0.26	0.08 to 3.00	6.3x5.8 to 10x10.2
	FK (High temp. reflow)	EEEFK-----A-	105°C 2000 h	•	•		- 55 to 105	6.3 to 35	4.7 to 1500	-	90 to 850	0.12 to 0.26	0.08 to 1.35	4x5.8 to 10x10.2
	FK [HF] (High temp. reflow)	EEEFK-----AL	105°C 2000 h	•	•		- 55 to 105	6.3 to 35	33 to 1500	-	240 to 850	0.12 to 0.26	0.08 to 0.36	6.3x5.8 to 10x10.2
	FK [Medium size] (High temp. reflow)	EEEFK-----A-	105°C 5000 h	•	•	•	- 55 to 105	6.3 to 100	47 to 6800	-	500 to 2060	0.07 to 0.36	0.033 to 0.32	12.5x13.5 to 18x16.5
FC	FC	EEEFC	105°C 1000 h	•			- 40 to 105	6.3 to 50	1 to 1500	-	30 to 670	0.12 to 0.26	0.15 to 5.00	4x5.4 to 10x10.2
	FC (High temp. reflow)	EEEFC-----A-	105°C 1000 h	•			- 40 to 105	6.3 to 35	1 to 1500	-	60 to 670	0.12 to 0.26	0.15 to 3.00	4x5.4 to 10x10.2
HA	HA	EEEHA	105°C 1000 h				- 40 to 105	6.3 to 100	1 to 1500	-	10 to 480	0.12 to 0.35	-	4x5.4 to 10x10.2
	HA (High temp. reflow)	EEEHA-----A-	105°C 1000 h				- 40 to 105	6.3 to 50	1 to 1500	-	10 to 480	0.12 to 0.40	-	4x5.4 to 10x10.2

Type	Series	Part No.	Features				Category temperature range (°C)	Rated voltage range (V)	Capacitance range (µF)	ESR (Ω)	Ripple Current (mA rms)	Tan (δ)	Impedance (Ω)	Size [ØxL] (mm)
			Endurance	Low ESR	Miniaturization	Long life								
HB	HB	EEEHB	105°C 2000h				- 40 to 105	4 to 50	1 to 470	-	10 to 270	0.12 to 0.50	-	4x5.8 to 10x10.2
	HB (High temp. reflow)	EEEHB-----A-	105°C 2000h				- 40 to 105	6.3 to 50	1 to 1500	-	10 to 340	0.12 to 0.50	-	4x5.8 to 10x10.2
HC	HC	EEEHC	105°C 3000 to 5000h			•	- 40 to 105	6.3 to 50	1 to 1000	-	15 to 340	0.12 to 0.50	-	4x5.8 to 10x10.2
HD	HD (High temp. reflow)	EEEHD-----A-	105°C 5000h			•	- 40 to 105	6.3 to 100	1 to 1000	-	7 to 340	0.12 to 0.50	0.8 to 12.0	4x5.8 to 10x10.2
	HD [Medium size] (High temp. reflow)	EEEHD	105°C 5000h			•	- 55 to 105	6.3 to 35	680 to 7500	-	580 to 1540	0.16 to 0.40	-	12.5x13.5 to 18x16.5
S	S	EEE--A	85°C 2000h				- 40 to 85	4 to 100	1 to 1500	-	10 to 750	0.12 to 0.52	-	4x5.4 to 10x10.2
	S (High temp. reflow)	EEE--A	85°C 1000 to 2000h				- 40 to 85	6.3 to 50	1 to 1500	-	10 to 750	0.12 to 0.50	-	4x5.4 to 10x10.2

Vibration-proof product (30G guaranteed) is available upon request (≧Ø6mm)
* Ripple current temperature **depends on series**
*Impedance (100 kHz / +20°C)
*tan δ (120 Hz / +20°C)
ESR (100 kHz / +20°C)
HF, halogen-free

Part number system electrolytic capacitors SMD

EEE — Product classification 3 figures

EEE - Standard EEV - FK, TG Series with ØD 12.5mm

FK — Series 2 figures

1E — Voltage code 1 to 2 figures

R. voltage (V)	Code
4	0G
6.3	0J (J)
10	1A (A)
16	1C (C)
25	1E (E)
35	1V (V)
50	1H (H)
63	1J
80	1K (K)
100	2A
160	2C
200	2D
250	2E
350	2V
400	2G
450	2W

101 — Capacitance code 3 figures

Cap. (µF)	Code
1	10
2.2	2R2
82	820
100	101
6800	682

X — Size / Special code 0 to 2 figure

ØD x L (mm)	Code
4 to x 5.4	-
4 to 6.3x5.4 (Miniaturization)	W
4 (High temp.reflow)	A
4 to 6 (Min., High temp. reflow)	WA
4 to 5.8 (Miniaturization)	U
4 (Min., High temp. reflow)	UA
6.3 x 7.7	X
6.3x7.7 (High temp.reflow)	XA
FKS series: 6.3x7.7	XS
S, HB series: 4 to 6.3x5.4 L	S
FKS series: Other sizes	S
Bi-poler (Except: HB series)	N
FK, FT: 5000h	G

P — Taping / Option code 1 figure

ØD x L (mm)	Code
4, 5	R
6.3 to 10(x 10.2)	P
10(x 13.5) to x 12.5	Q
16, 18	M
Vibration-proof	V
Halogen-free	L

ELECTROLYTIC CAPACITOR THT SERIES OVERVIEW

Series	Part No.	Features					Category temperature range (°C)	Rated voltage range (V)	ESR (Ω)	Capacitance range (µF)	Ripple Current (mA rms)	Tan (δ)	LC (µA)	Impedance (Ω)	Size [ØxL] (mm)
		Endurance	AEC-Q200	High Voltage	High ripple current	Low Impe-dance									
FS-A	EEU-FS EEA-FS	Low Impedance Miniaturization 105°C 5000h to 10000h				•	- 40 to 105	6.3 to 100	-	27 to 10000	175 to 3820	0.08 to 0.22	13.5 to 992	0.012 to 0.510	5x11 to 16x25
FP-A	EEUFP	High ripple current Large capacitance 105°C 4000h to 5000h	•		•		- 55 to 105	25 to 35	0.030 to 0.068	510 to 2000	2500 to 4000	0.12 to 0.14	170 to 500	0.030 to 0.068	10x16 to 12.5x25
FR-A	EEU/A-FR	Low Impedance 105°C 5000h to 10000h				•	- 40 to 105	6.3 to 100	-	4.7 to 8200	175 to 3820	0.08 to 0.22	3 to 896	0.012 to 0.620	5x11 to 16x25
FM-A	EEU/A-FM	Low Impedance 105°C 4000h to 7000h				•	- 40 to 105	6.3 to 50	-	22 to 6800	280 to 3820	0.10 to 0.22	9.5 to 675	0.012 to 0.300	5x11 to 16x25
FK-A	EEUFK	Low impedance 105°C 4000h to 5000h	•			•	- 55 to 105	6.3 to 35	-	180 to 12000	630 to 3010	0.12 to 0.22	42.8 to 1175	0.016 to 0.090	8x11.5 to 18x25
FC-A	EEU/AFC	Low impedance 105°C 1000h to 5000h	•			•	- 55 to 105	6.3 to 100	-	2.2 to 15000	45 to 3735	0.07 to 0.22	3 to 1400	0.014 to 2	4x7 to 18x40
EE-A	EEU/A-EE	High ripple current 105°C 8000h to 10000h		•	•		- 25 to 105	160 to 450	-	10 to 330	330 to 2280	0.15 to 0.24	221.2 to 2122	-	5x11 to 18x25 and 16x31.5
ED-A	EEU/A-ED	High ripple current (at high frequency) 105°C 8000h to 10000h		•	•		- 25 to 105	160 to 450	-	10 to 330	300 to 2400	0.15 to 0.24	220 to 3970	-	5x11 to 18x25 and 16x31.5
EB-A	EEU/A-EB	Long life 105°C 5000h to 10000h		•			- 40 to 105 (10 V - 63 V) - 25 to 105 (160 V - 450V)	10 to 450	-	2.2 to 3300	15 to 1690	0.12 to 0.34	3 to 3178	-	5x11 to 18x25 and 16x31.5
TP-A	EEUTP	High ripple 135°C 1000h to 2000h	•		•		- 40 to 135	25 to 35	-	100 to 5100	580 to 3480	0.12 to 0.14	35 to 1275	16 to 190	8x16 to 18x31.5
TA-A	EEUTA	Heat cycle: 1000 cycle Sleeve: Polyester 125°C 2000h	•				- 40 to 125	10 to 63	-	2.2 to 4700	180 to 3310	0.09 to 0.2	5 to 825	0.017 to 0.95	8x11.5 to 18x35.5
HD-A	EEU/A-HD	1 Size Miniaturized Product of Current NHG 105°C 2000h	•				- 55 to 105	10 to 50	-	2.2 to 22000	18 to 2400	0.12 to 0.66	3 to 2500	-	5x11 to 18x35.5
NHG-A	ECA--HG	105°C standard 105°C 1000h to 2000h	•	•			- 55 to 105 (6.3 V - 100 V) - 25 to 105 (160 V - 450 V)	6.3 to 450	-	1 to 22000	18 to 2350	0.08 to 0.7	3 to 3178	-	5x11 to 18x35.5
GA-A	EEU/A-GA	7mm height 105°C 1000h					- 55 to 105	10 to 50	-	1.5 to 220	15 to 160	0.1 to 0.22	3 to 18	-	4x7 to 8x7
GA-A (Bi-polar)	ECA--EN	105°C standard Bi-polar 105°C 2000h					- 40 to 105	6.3 to 50	-	1.5 to 330	18 to 250	0.15 to 0.3	6.3 to 153	-	5x11 to 10x20
M-A	ECA--M	85°C standard 85°C 2000h		•			- 40 to 85 (6.3 V - 100 V) - 25 to 85 (160 V - 450 V)	6.3 to 450	-	1 to 22000	20 to 1900	0.16 to 0.7	3 to 4522	-	5x11 to 18x40
SU-A (Bi-polar)	ECEA--N	85°C Bi-polar standard Bi-polar 85°C 2000h					- 40 to 85	6.3 to 50	-	2.2 to 6800	18 to 1450	0.15 to 0.4	6.3 to 1653	-	5x11 to 18x35.5

ELECTROLYTIC CAPACITORS THT SERIES OVERVIEW

Series	Part No.	Features					Category temperature range (°C)	Rated voltage range (V)	ESR (Ω)	Capacitance range (µF)	Ripple Current (mA rms)	Tan (δ)	LC (µA)	Impedance (Ω)	Size [ØxL] (mm)
		Endurance	AEC-Q200	High Voltage	High ripple current	Low Impe-dance									
KA-A	ECEA--KA	7mm height 85°C 1000 h					- 40 to 85	4 to 50	-	2.2 to 470	28 to 140	0.10 to 0.35	3 to 22	-	4x7 to 8x7
KA-A (Bi-polar)	ECEA--KN	7mm height Bi-polar 85°C 1000 h					- 40 to 85	4 to 50	-	2.2 to 100	12 to 65	0.12 to 0.35	10 to 27.5	-	4x7 to 6.3x7
KS-A	ECEA--KS	5mm height 85°C 1000 h					- 40 to 85	4 to 50	-	2.2 to 330	16 to 130	0.10 to 0.35	3 to 26.4	-	4x5 to 8x5
KS-A (Bi-polar)	ECEA--SN	5mm height Bi-polar 85°C 1000 h					- 40 to 85	6.3 to 50	-	2.2 to 47	12 to 46	0.20 to 0.24	3 to 17.6	-	4x5 to 6.3x5

* Ripple current temperature **depends on series**
* Impedance (100 kHz / +20°C)
* Tan δ (120 Hz / +20°C)
* ESR (100 kHz / +20°C)

Part number system Lytic Capacitor THT Type 1
FC-A, FK-A, FM-A, FR-A, FS-A, FP-A, EB-A, ED-A, EE-A, TA-A, TP-A, HD-A, GA-A

EEU	FC	0J	272	☐ + B
Product classification 3 figures	Series code 2 figures	Voltage code 2 figures	Capacitance code 3 figures	Suffix+Taping of forming of terminal code 0 to 2 figures

R. voltage (V)	Code
6.3	0J
10	1A
16	1C
25	1E
35	1V
50	1H
63	1J
100	2A
160	2C
200	2D
250	2E
350	2V
400	2G
450	2W

Cap. (µF)	Code
6.8	6R8
10	100
330	331
8200	822
10000	103

Taping of forming of terminal code
Blank: Straight E: Lead forming B: Taping (Pitch 5.0, 7.5mm) H: Taping (Pitch 2.5mm)

Go to Webseite

Please check the catalog/ datasheet for details.

OVERVIEW OF POLYMER CAPACITORS

Hybrid
High Voltage

OS-CON
High Ripple Current

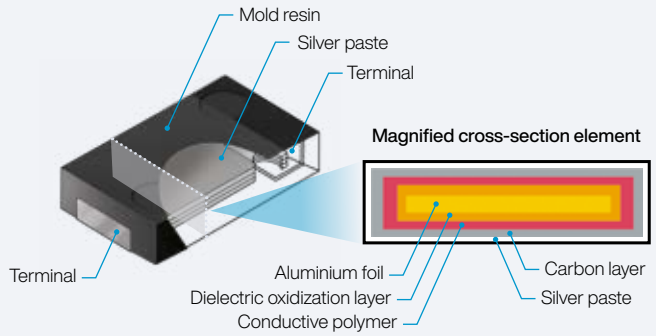
SP-Cap
Super Low ESR

POSCAP
Small Case Size

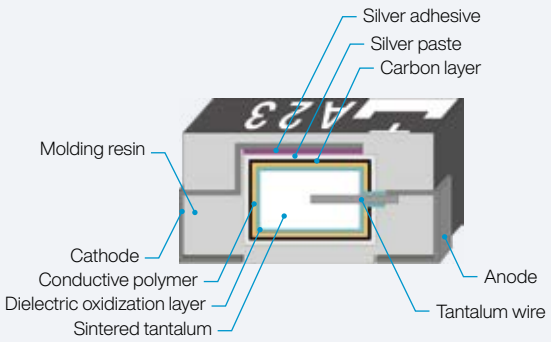
Conductive polymer capacitor of Panasonic			
SP-Cap	**POSCAP**	**OS-CON**	**Hybrid**
Conductive Polymer Aluminium Electrolytic Capacitors (Stack Type)	Conductive Polymer Tantalum Solid Capacitors (Sintered Type)	Conductive Polymer Aluminium Solid Capacitors (Wound Type)	Conductive Polymer Hybrid Aluminium Electrolytic Capacitors (Wound Type)
Super low ESR Low profile High Reliability	Low ESR Small size Large capacitance	Highest ripple High voltage Longest lifetime	Low ESR High ripple & large capacitance High reliability

Basic Structure

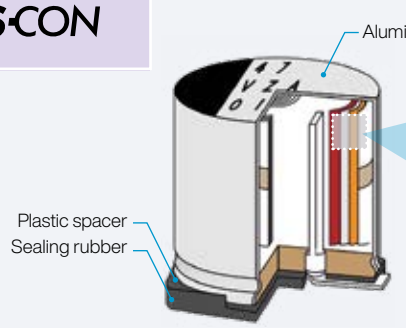
SP-Cap



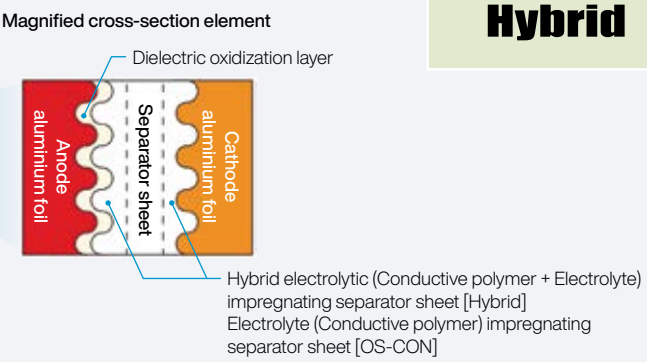
POSCAP



OS-CON



Hybrid



Features

		POLYMER							
	Lytic	Hybrid		SP-Cap & POSCAP		OS-CON		MLCC	MnO2 Tantalum
Ripple Current	medium	high	✓	high	✓	high	✓	high	medium
ESR	medium	low	✓	low	✓	low	✓	low	medium
Voltage Derating	no	no	✓	no	✓	no	✓	not specified	yes
DC Bias Characteristic	stable	stable	✓	stable	✓	stable	✓	decrease	stable
Frequency Characteristic	decrease	stable	✓	stable	✓	stable	✓	stable	decrease
Temperature Characteristic	less stable	stable	✓	stable	✓	stable	✓	decrease	stable
Estimated Lifetime	limited	long	✓	long	✓	long	✓	long	long
Initial Leakage Current	low	low	✓	low	✓	medium		low	low
e.g.: Input, 28V line, 100kHz → capacitor requirements: 35V, 22uF, 2Arms ripple	2pcs Ø10x10.2mm	1pc Ø5x5.8mm		1pc 7.3x4.3x1.9mm		1pc Ø5x5.9mm		4pcs 6.1x5.3mm	4pcs 7.3x4.3x4.3mm
									

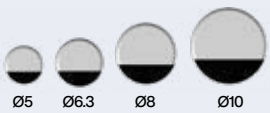
CONDUCTIVE POLYMER HYBRID ALUMINIUM ELECTROLYTIC CAPACITORS

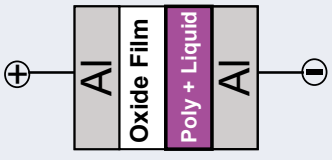
Panasonic as a leader of Hybrid capacitor technology achieves low ESR, high withstand voltage, largest capacitance, highest ripple current and high reliability through the use of the „hybrid electrolyte“ consisting of conductive polymer and electrolytic liquid.

Hybrid

Hybrid Aluminium Capacitor

Hybrid capacitors have mixed characteristics of electrolytic capacitors & OS-CON.



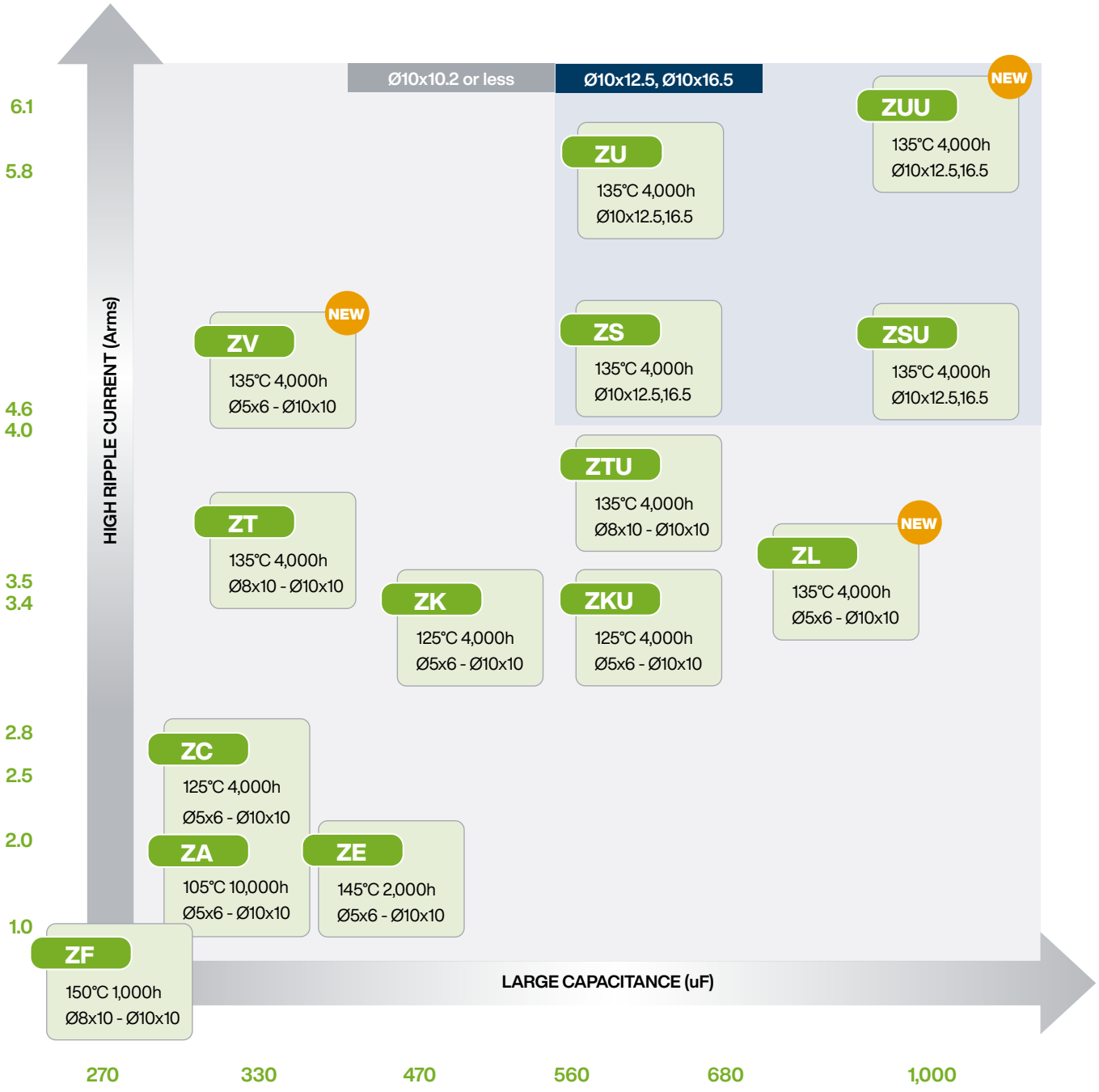


- Low ESR
- Low leakage current: 0.01CVuA
- High voltage 80V/47µF (10x10.2L) lineup
- Good temperature characteristics
- AEC-Q200 qualified

- Size: Ø5-10mm / H5.8mm - 16.8mm
- ESR: 8 - 120mΩ
- Capacitance: 10 to 1000µF
- Rated Voltage: 25 to 80V
- Ripple current range: up to 6100mA
- Anti vibration type available ≥ Ø 6mm

Go to Webseite

SERIES OVERVIEW



Anti-Vibration - SMD Hybrid & Lytic Capacitors

Anti-Vibration Versions Available

Features:

- Excellent Anti-Vibration Performance withstands 30G
- Available for all SMD Hybrid & Lytic Capacitor series with ≥ Ø 6mm

HYBRID CAPACITOR SMD SERIES OVERVIEW

Series	Part No.	Features						Category temperature range (°C)	Rated voltage range (V)	ESR (mΩ)	Capacitance range (µF)	Ripple Current (mA rms)	Tan (δ)	Size code	Size (mm)	
		Endurance	Small size	Large cap.	High ripple	High temp.	Long life								Ø D	L
ZA	EEHZA---	105°C 10000 h	•					-55 to 105	25 to 50	80 to 120	10 to 33	750 - 900	0.10 to 0.14	C	5.0	5.8
									25 to 63	50 to 120	10 to 56	1000 - 1300	0.08 to 0.14	D	6.3	5.8
										30 to 80	22 to 100	1500 - 2000	0.08 to 0.14	D8	6.3	7.7
									25 to 80	27 to 45	22 to 220	1500 - 2000	0.08 to 0.14	F	8.0	10.2
										20 to 36	33 to 330	1700 - 2500	0.08 to 0.14	G	10.0	10.2
ZC	EEHZC---	125°C 4000 h	•				•	-55 to 125	25 to 50	80 to 120	10 to 33	500 - 550	0.10 to 0.14	C	5.0	5.8
									25 to 63	50 to 120	10 to 56	700 - 900	0.08 to 0.14	D	6.3	5.8
										30 to 80	22 to 100	900 - 1400	0.08 to 0.14	D8	6.3	7.7
									25 to 80	27 to 45	22 to 220	1050 - 1900	0.08 to 0.14	F	8.0	10.2
										20 to 36	33 to 330	1360 - 2900	0.08 to 0.14	G	10.0	10.2
ZK	EEHZK---	125°C 4000 h	•	•	•		•	-55 to 125	25 to 35	80 to 100	33 to 47	750 - 850	0.12 to 0.14	C	5.0	5.8
										50 to 60	56 to 82	1200 - 1300	0.12 to 0.14	D	6.3	5.8
										30 to 35	100 to 150	1700 - 1800	0.12 to 0.14	D8	6.3	7.7
										27	180 to 270	2000	0.12 to 0.14	F	8.0	10.2
										20	330 to 470	2800	0.12 to 0.14	G	10.0	10.2
ZKU	EEHZK--U-	125°C 4000 h	•	•	•		•	-55 to 125	25 to 35	80 to 100	39 to 56	750 - 850	0.12 to 0.14	C	5.0	5.8
										50 to 60	68 to 100	1200 - 1300	0.12 to 0.14	D	6.3	5.8
										30 to 35	120 to 180	1700 - 1800	0.12 to 0.14	D8	6.3	7.7
										27	220 to 330	2000	0.12 to 0.14	F	8.0	10.2
										20	390 to 560	2800	0.12 to 0.14	G	10.0	10.2
NEW ZL	EEHZL--	125°C 4000 h 135°C 4000 h	•	•	•		•	-55 to 135	25 to 35	58 to 60	47 to 82	900 - 1000	0.12 to 0.14	C	5.0	5.8
										38 to 40	82 to 150	1400 - 1500	0.12 to 0.14	D	6.3	5.8
										24 to 26	150 to 220	1900 - 2000	0.12 to 0.14	D8	6.3	7.7
										18 to 20	270 to 470	2900 - 3000	0.12 to 0.14	F	8.0	10.2
										14 to 16	470 to 680	3300 - 3400	0.12 to 0.14	G	10.0	10.2
ZT	EEHZT---	125°C 4000 h 135°C 4000 h		•	•		•	-55 to 125	25 to 63	22 to 32	33 to 220	2400 - 2900	0.08 to 0.14	F	8.0	10.2
										16 to 25	56 to 330	2800 - 3500	0.08 to 0.14	G	10.0	10.2
ZTU	EEHZT--U-	125°C 4000 h 135°C 4000 h		•	•		•	-55 to 135	25 to 35	22	220 to 330	2900	0.12 to 0.14	F	8.0	10.2
										16	390 to 560	3500	0.12 to 0.14	G	10.0	10.2
NEW ZV	EEHZV---	125°C 4000 h 135°C 4000 h			•		•	-55 to 135	25 to 63	16 -22	33 - 220	3300 - 3900	0.08 to 0.14	F	8.0	10.2
										12-16	56 - 330	4000 - 4600	0.08 to 0.14	G	10.0	10.2
ZS	EEHZS---	125°C 4000 h 135°C 4000 h		•	•		•	-55 to 135	25 to 63	14 to 19	100 to 470	3000 - 3500	0.08 to 0.14	G12	10.0	12.5
										11 to 15	150 to 560	3500 - 4000	0.08 to 0.14	G16	10.0	16.5
ZSU	EEHZS--U-	125°C 4000 h 135°C 4000 h		•	•		•	-55 to 125	25 to 63	14 to 19	120 to 680	3000 - 3500	0.08 to 0.14	G12	10.0	12.5
										11 to 15	180 to 1000	3500 - 4000	0.08 to 0.14	G16	10.0	16.5
ZU	EEHZU---	135°C 4000 h 125°C 4000 h		•	•		•	-55 to 135	25 to 63	10 to 12	100 to 470	4600 - 5000	0.08 to 0.14	G12	10.0	12.5
										8 to 10	150 to 560	5200 - 5800	0.08 to 0.14	G16	10.0	16.5
NEW ZUU	EEHZU--U-	125°C 4000 h 135°C 4000 h		•	•		•	-55 to 135	25 to 63	10 to 12	120 to 680	4800 - 5300	0.08 to 0.14	G12	10.0	12.5
										8 to 10	180 to 1000	5500 - 6100	0.08 to 0.14	G16	10.0	16.5
ZE	EEHZE---	145°C 2000 h 135°C 4000 h				•	•	-55 to 145	25 to 63	27 to 40	33 to 220	1100 - 1600	0.08 to 0.14	F	8.0	10.2
										20 to 30	56 to 330	1400 - 2000	0.08 to 0.14	G	10.0	10.2
ZF	EEHZF---	150°C 1000 h				•	•	-55 to 150	25 to 63	27 to 40	33 to 150	650 - 800	0.08 to 0.14	F	8.0	10.2
										20 to 30	56 to 270	840 - 1000	0.08 to 0.14	G	10.0	10.2

* Vibration-proof product (30G guaranteed) is available upon request. (≧ Ø6mm)
* Ripple current temperature **depends on series**
* ESR (100 kHz / +20°C)
* Tan δ (120 Hz / +20°C)

HYBRID CAPACITOR THT SERIES OVERVIEW

Series	Part No.	Features					Category temperature range (°C)	Rated voltage range (V)	ESR (mΩ)	Capacitance range (µF)	Ripple Current (mA rms)	Tan (δ)	Size code	Size (mm)	
		Endurance	Large cap.	High ripple	High temp.	Long life								Ø D	L
ZA-A	EEHAZA----	105°C 10000 h					-55 to 105	25 to 80	27 to 45	22 to 220	1550 to 2300	0.08 to 0.14	F	8.0	9.5
									20 to 36	33 to 330	1700 to 2500	0.08 to 0.15	G	10.0	9.5
ZC-A	EEHAZC----	125°C 4000 h				•	-55 to 125	25 to 80	27 to 45	22 to 220	1050 to 1900	0.08 to 0.14	F	8.0	9.5
									20 to 36	33 to 330	1360 to 2900	0.08 to 0.15	G	10.0	9.5
ZK-A	EEHAZK----	125°C 4000 h	•	•		•	-55 to 125	25 to 35	27	180 to 270	2000	0.12 to 0.14	F	8.0	9.5
									20	330 to 470	2800	0.12 to 0.14	G	10.0	9.5
ZKU-A	EEHAZK--UB	125°C 4000 h	•	•		•	-55 to 125	25 to 35	27	220 to 330	2000	0.12 to 0.14	F	8.0	9.5
									20	390 to 560	2800	0.12 to 0.14	G	10.0	9.5
ZT-A	EEHAZT----	125°C 4000 h	•	•		•	-55 to 125	25 to 63	22 to 32	33 to 220	2400 to 2900	0.08 to 0.14	F	8.0	9.5
									16 to 25	56 to 330	2800 to 3500	0.08 to 0.14	G	10.0	9.5
ZS-A	EEHAZS----	125°C 4000 h 135°C 4000 h	•	•		•	-55 to 135	25 to 63	14 to 19	100 to 470	3000 to 3500	0.08 to 0.14	G12	10.0	11.7
									11 to 15	150 to 560	3500 to 4000	0.08 to 0.14	G16	10.0	15.7
ZSU-A	EEHAZS--UB	125°C 4000 h	•	•		•	-55 to 125	25 to 63	14 to 19	120 to 680	3000 to 3500	0.08 to 0.14	G12	10.0	11.7
									11 to 15	180 to 1000	3500 to 4000	0.08 to 0.14	G16	10.0	15.7
ZE-A	EEHAZE----	145°C 2000 h 135°C 4000 h			•	•	-55 to 145	25 to 63	27 to 40	33 to 220	1100 to 1600	0.08 to 0.14	F	8.0	9.5
									20 to 30	56 to 330	1400 to 2000	0.08 to 0.14	G	10.0	9.5
ZF-A	EEHAZF----	150°C 1000 h			•	•	-55 to 150	25 to 63	27 to 40	33 to 150	650 to 800	0.08 to 0.14	F	8.0	9.5
									20 to 30	56 to 270	840 to 1000	0.08 to 0.14	G	10.0	9.5

* Ripple current temperature **depends on series**
* ESR (100 kHz / +20°C)
* Tan δ (120 Hz / +20°C)

Part number system Hybrid capacitor SMD

EEH	ZC	1E	101	X	*	P
Product classification 3 figures	Series 2 figures	Voltage code 1 to 2 figures	Capacitance code 3 figures	Size code 0 to 1 figure	Special code 0 to 1 figure	Taping code 1 figure

R. voltage (V)	Code
25	1E
35	1V
50	1H
63	1J
80	1K

Cap. (µF)	Code
22	220
680	681
1000	102

ØD x L	Code
6.3 x 7.7 (D8) *only D8 is marked with X	X

Dia ØD	Code
Miniaturization Product	U

Tape width (mm)	Code
12	R
16 - 24	P
Vibration-proof	V

Part number system Hybrid capacitor THT

EEHA	ZC	1E	151	*	B
Product classification 4 figures	Series 2 figures	Voltage code 1 to 2 figures	Capacitance code 3 figures	Special Code* 0 to 1 figure	Taping code 1 figure

R. voltage (V)	Code
25	1E
35	1V
50	1H
63	1J
80	1K

Cap. (µF)	Code
82	820
470	471
1000	102

Dia ØD	Code
Miniaturization Product	U

Lead space (mm)	Code
3.5, 5.0	B

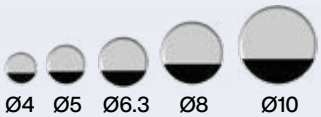
OS-CON

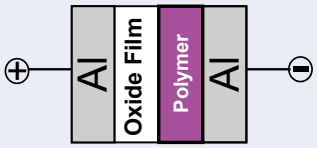
OS-CON, an aluminium solid capacitor with high conductive polymer, achieves low ESR, has excellent noise reduction capability and frequency characteristics, and long life and stability at low temperatures.

OS-CON

Conductive polymer aluminium solid capacitors

OS-CON is a capacitor using polymer + aluminium





- Low ESR
- High ripple current: up to 7.5 Arms
- Longest lifetime: up to 20,000h at 105°C
- ESR range: 5 - 260mΩ
- Capacitance range: 3.3 to 2700µF
- Rated Voltage: 2 to 100V

Go to Webseite

SERIES OVERVIEW

OS-CON SMD

HIGH RELIABILITY

SVPT
105°C 20,000h
Size: 6.3x6.4~10x12.6mm
Cap.: Up to 1500μF
ESR: Down to 10mΩ
Ripple Current: Up to 5.4A
Voltage: 2.5~50V

SVT
125°C 2,000h
Size: 6.3x6.4~10x12.6mm
Cap.: Up to 2700μF
ESR: Down to 10mΩ
Ripple Current: Up to 5.4A
Voltage: 2.5~50V

SVPD
125°C 2,000h / 85°C 85%
Size: 6.3x6.4~10x12.6mm
Cap.: up to 82μF
ESR: Down to 28mΩ
Ripple Current: Up to 3.8A
Voltage: 10~24V

LOW ESR

Ultra Low ESR

SVPE — High Ripple Current (max. 6.1A)
105°C 2,000h
Size: 5.0x5.9~10x12.6mm
Cap.: Up to 1200μF
ESR: Down to 8mΩ
Ripple Current: Up to 6.1A
Voltage: 2~16V

SVPG — High Ripple Current (max. 7.5A), NEW
105°C 5,000h
Size: 5.0x4.4~6.3x9.9mm
Cap.: Up to 1200μF
ESR: Down to 6.5mΩ
Ripple Current: Up to 7.5A
Voltage: 16~25V

SVPA
105°C 2,000h
Size: 5.0x5.9~10x7.9mm
Cap.: Up to 820μF
ESR: Down to 19mΩ
Ripple Current: Up to 4.24A
Voltage: 2.5~20V

SVPC
105°C 2,000h
Size: 5.0x5.9~10x12.6mm
Cap.: Up to 2700μF
ESR: Down to 9mΩ
Ripple Current: Up to 5.38A
Voltage: 2.5~16V

HIGH VOLTAGE

SVPF
105°C 5,000h
Size: 5.0x5.9~10x12.6mm
Cap.: Up to 1000μF
ESR: Down to 12mΩ
Ripple Current: Up to 5.4A
Voltage: 16~50V

SVF
125°C 1,000h
Size: 5.0x5.9~10x12.6mm
Cap.: Up to 1000μF
ESR: Down to 12mΩ
Ripple Current: Up to 5.4A
Voltage: 16~50V

SVPK — Small Size
125°C 1,000h
Size: 5.0x5.9~10x12.6mm
Cap.: Up to 1200μF
ESR: Down to 12mΩ
Ripple Current: Up to 5.4A
Voltage: 12~80V

SXV — Up to 100V, NEW
125°C 1,000h
Size: 8.0x6.9~10x12.6mm
Cap.: Up to 120μF
ESR: Down to 25mΩ
Ripple Current: Up to 3.28A
Voltage: 63~100V

LOW COST

SVP
105°C 2,000h
Size: 4.0x5.5~10x12.6mm
Cap.: Up to 1500μF
ESR: Down to 12mΩ
Ripple Current: Up to 5.44A
Voltage: 2.5~20V

SVPS
105°C 5,000h
Size: 4.0x5.5~10x7.9mm
Cap.: Up to 680μF
ESR: Down to 20mΩ
Ripple Current: Up to 4.13A
Voltage: 4~25V

SVQP
125°C 1,000h
Size: 6.3x5.9~8.0x6.9mm
Cap.: Up to 220μF
ESR: Down to 35mΩ
Ripple Current: Up to 2.56A
Voltage: 4~20V

OS-CON THT

HIGH VOLTAGE

SEPF
105°C 5,000h
Size: 6.3x5.5~10x13.0mm
Cap.: Up to 1000μF
ESR: Down to 12mΩ
Ripple Current: Up to 5.4A
Voltage: 16~35V

SEF
125°C 1,000h
Size: 6.3x6.0~10x13.0mm
Cap.: Up to 1000μF
ESR: Down to 12mΩ
Ripple Current: Up to 5.4A
Voltage: 16~35V

SEQP
125° 1,000h/105°C 5000h
Size: 6.3x6.0~10x13.0mm
Cap.: Up to 1200μF
ESR: Down to 12mΩ
Ripple Current: Up to 5.44A
Voltage: 4~32V

SEK — Up to 50V
125°C 1,000h
Size: 6.3x6.0~10x13.0mm
Cap.: Up to 470μF
ESR: Down to 14mΩ
Ripple Current: Up to 5A
Voltage: 25~50V

SXE — Up to 100V, NEW
125°C 1,000h
Size: 8.0x7.0~10x13.0mm
Cap.: Up to 120μF
ESR: Down to 25mΩ
Ripple Current: Up to 3.28A
Voltage: 63~100V

SUPER LOW ESR

SEPC
105°C 5,000h
Size: 5.0x9.0~10x13.0mm
Cap.: Up to 2700μF
ESR: Down to 5mΩ
Ripple Current: Up to 7.2A
Voltage: 2.5~16V

SEPG
105°C 5,000h
Size: 6.3x8.9~8.0x8.9mm
Cap.: Up to 560μF
ESR: Down to 8mΩ
Ripple Current: Up to 6.1A
Voltage: 16V

LOW COST

SEP
105°C 3,000h
Size: 6.3x6.0~10x13.0mm
Cap.: Up to 1500μF
ESR: Down to 12mΩ
Ripple Current: Up to 5.44A
Voltage: 2.5~20V

OS-CON SMD SERIES OVERVIEW

Series	Features					Category temperature range (°C)	Rated voltage range (V)	ESR (mΩ)	Capacitance range (µF)	Allowable Ripple Current (mA rms)	Tan (δ)	LC (µA)	Size code	Size (mm)	
	Endurance	Large cap.	Low ESR	High voltage	High reliability									Ø D	L
SVT	125°C 2000 h	•	•	•	•	-55 to 125	2.5 to 16	15 to 24	100 to 680	780 to 1100	0.12	300 to 850	C65	6.3	6.4
						-55 to 125	2.5 to 50	20 to 35	18 to 680	850 to 1060	0.12	180 to 864	E7	8.0	6.9
						-55 to 125	2.5 to 50	10 to 25	39 to 1500	1200 to 1620	0.12	390 to 1792	E12	8.0	11.9
						-55 to 125	2.5 to 50	12 to 20	68 to 2700	1350 to 1700	0.12	680 to 3200	F12	10.0	12.6
SVPT	105°C 20000 h	•	•	•	•	-55 to 105	2.5 to 16	15 to 24	100 to 680	2490 to 3500	0.12	300 to 415	C65	6.3	6.4
						-55 to 105	2.5 to 50	20 to 35	18 to 680	2700 to 3370	0.12	180 to 864	E7	8.0	6.9
						-55 to 105	2.5 to 50	10 to 25	39 to 1500	3800 to 5150	0.12	390 to 1792	E12	8.0	11.9
						-55 to 105	2.5 to 50	12 to 20	68 to 2700	4300 to 5400	0.12	680 to 3200	F12	10.0	12.6
SVF	125°C 1000 h	•		•	•	-55 to 125	16 to 25	27 to 40	27 to 82	770 to 940	0.12	135 to 262	B6	5.0	5.9
						-55 to 125	16 to 50	22 to 40	10 to 180	790 to 1040	0.12	100 to 576	C6	6.3	5.9
						-55 to 125	16 to 50	22 to 35	18 to 270	850 to 1040	0.12	180 to 864	E7	8.0	6.9
						-55 to 125	16 to 50	14 to 25	39 to 560	1200 to 1560	0.12	390 to 1792	E12	8.0	11.9
						-55 to 125	16	16	1000	1350	0.12	3200	F10	10.0	10.0
						-55 to 125	16 to 50	12 to 20	68 to 1000	1350 to 1700	0.12	680 to 3200	F12	10.0	12.6
SVPK	125°C 1000 h	•		•	•	-55 to 125	16 to 50	27 to 80	10 to 100	550 to 940	0.12	100 to 320	B6	5.0	5.9
						-55 to 125	16 to 50	22 to 35	22 to 220	820 to 1040	0.12	220 to 704	C6	6.3	5.9
						-55 to 125	16 to 50	22 to 35	33 to 330	850 to 1040	0.12	330 to 1056	E7	8.0	6.9
						-55 to 125	16 to 50	14 to 25	68 to 680	1200 to 1560	0.12	680 to 2176	E12	8.0	11.9
						-55 to 125	16 to 50	12 to 20	120 to 1200	1350 to 1700	0.12	1200 to 3840	F12	10.0	12.6
NEW SXV	125°C 1000 h			•	•	-55 to 125	63 to 100	60	6.8 to 18	340	0.12	34 to 56	E7	8.0	6.9
						-55 to 125	63 to 100	50 to 60	15 to 39	630 to 690	0.12	75 to 122	F8	10.0	7.9
						-55 to 125	63 to 100	25 to 40	15 to 68	730 to 930	0.12	75 to 214	E12	8.0	11.9
						-55 to 125	63 to 100	25 to 30	18 to 120	940 to 1030	0.12	90 to 378	F12	10.0	12.6
NEW SVPG	105°C 5000 h		•		•	-55 to 105	16 to 25	25 to 30	15 to 47	2800 to 3200	0.12	75 to 150	B45	5.0	4.4
						-55 to 105	16	15	100	4000	0.12	150	B6	5.0	5.9
						-55 to 105	16 to 25	14 to 18	82 to 220	3750 to 4100	0.12	410 to 704	C6	6.3	5.9
						-55 to 105	16 to 25	10 to 15	120 to 270	3900 to 5080	0.12	600 to 864	C8	6.3	7.9
						-55 to 105	16 to 25	8 to 13	150 to 270	4200 to 5800	0.12	750 to 864	C10	6.3	9.9
						-55 to 105	16	6.5	330	7500	0.12	1056	C10L	6.3	10.4
						-55 to 105	16 to 25	16 to 18	120 to 330	3750 to 4100	0.12	600 to 1056	E7	8.0	6.9
						-55 to 105	16	10	560	5200	0.12	1792	E10	8.0	10.0
						-55 to 105	16 to 25	8 to 12	270 to 680	5350 to 6500	0.12	1350 to 2176	E12	8.0	11.9
						-55 to 105	16	9	820	5700	0.12	2624	F10	10.0	10.0
						-55 to 105	16 to 25	7 to 10	470 to 1200	5900 to 7000	0.12	2350 to 3840	F12	10.0	12.6
SVPF	105°C 5000 h	•		•	•	-55 to 105	16 to 25	27 to 40	27 to 82	2450 to 3000	0.12	135 to 262	B6	5.0	5.9
						-55 to 105	16 to 50	22 to 40	10 to 180	2500 to 3300	0.12	100 to 576	C6	6.3	5.9
						-55 to 105	16 to 50	22 to 35	18 to 270	2700 to 3300	0.12	180 to 864	E7	8.0	6.9
						-55 to 105	16	18	560	3900	0.12	1792	E10	8.0	10.0
						-55 to 105	16 to 50	14 to 25	39 to 560	3800 to 4950	0.12	390 to 1792	E12	8.0	11.9
						-55 to 105	16	16	1000	4300	0.12	3200	F10	10.0	10.0
						-55 to 105	16 to 50	12 to 20	68 to 1000	4300 to 5400	0.12	680 to 3200	F12	10.0	12.6
SVPA	105°C 2000 h		•			-55 to 105	2.5 to 20	30 to 40	10 to 82	2450 to 3000	0.12	135 to 262	B6	5.0	5.9
						-55 to 105	2.5 to 20	20 to 35	22 to 180	2500 to 3300	0.12	100 to 576	C6	6.3	5.9
						-55 to 105	2.5 to 20	20 to 33	47 to 330	2700 to 3300	0.12	180 to 864	E7	8.0	6.9
						-55 to 105	2.5 to 16	19 to 29	180 to 820	3430 to 4240	0.12	500 to 660	F8	10.0	7.9

Series	Features					Category temperature range (°C)	Rated voltage range (V)	ESR (mΩ)	Capacitance range (µF)	Allowable RIpple Current (mA rms)	Tan (δ)	LC (µA)	Size code	Size (mm)	
	Endurance	Large cap.	Low ESR	High voltage	High reliability									Ø D	L
SVPB	105°C 1000 h					-55 to 105	2.5 to 20	40 to 45	15 to 120	1670 to 2000	0.12	120 to 224	C5	6.3	4.9
						-55 to 105	20	35	22	2000	0.12	88	C55	6.3	5.4
SVPC	105°C 2000 h	•	•			-55 to 105	2.5 to 16	19 to 35	39 to 180	1820 to 2800	0.12	300	B6	5.0	5.9
						-55 to 105	2.5 to 16	15 to 30	68 to 560	2200 to 3500	0.12	300 to 415	C6	6.3	5.9
						-55 to 105	2.5 to 16	19 to 27	120 to 680	2900 to 3370	0.12	491 to 660	E7	8.0	6.9
						-55 to 105	2.5 to 16	9 to 16	270 to 1500	4070 to 5380	0.12	500 to 1200	E12	8.0	11.9
						-55 to 105	2.5	12	2700	5070	0.15	1350	F12	10.0	12.6
SVPD	125°C 2000 h High voltage 85°C 85% RH			•	•	-55 to 125	10 to 25	45 to 65	10 to 56	474 to 538	0.10 to 0.12	50 to 112	C6	6.3	5.9
						-55 to 125	16 to 35	40 to 70	8.2 to 82	400 to 670	0.10 to 0.12	57 to 262	E7	8.0	6.9
						-55 to 125	25 to 35	45 to 60	18 to 39	550 to 664	0.10 to 0.12	126 to 195	F8	10.0	7.9
						-55 to 125	25 to 35	30 to 50	22 to 47	700 to 943	0.12	154 to 235	E12	8.0	11.9
						-55 to 125	25 to 35	28 to 30	47 to 82	1150 to 1202	0.12	329 to 410	F12	10.0	12.6
SVPE	105°C 2000 h	•	•			-55 to 105	2.5 to 6.3	10 to 15	150 to 390	3150 to 3860	0.12	500 to 700	B6	5.0	5.9
						-55 to 105	2.5 to 10	10 to 20	220 to 820	2700 to 3900	0.12	500 to 1220	C6	6.3	5.9
						-55 to 105	2.0 to 16	8 to 11	180 to 1200	4460 to 5230	0.12	500 to 576	C10	6.3	9.9
						-55 to 105	16	10	470	6100	0.12	1504	F12	10.0	12.6
SVPS	105°C 5000 h				•	-55 to 105	4.0 to 10	200 to 220	10 to 33	700 to 740	0.10 to 0.15	50 to 75	A5	4.0	5.4
						-55 to 105	4.0 to 16	30 to 90	22 to 68	1060 to 1970	0.10 to 0.12	165 to 300	B6	5.0	5.9
						-55 to 105	4.0 to 20	22 to 60	22 to 150	1450 to 2570	0.10 to 0.12	88 to 300	C6	6.3	5.9
						-55 to 105	4.0 to 25	22 to 60	10 to 270	1500 to 3220	0.10 to 0.12	125 to 500	E7	8.0	6.9
						-55 to 105	4.0 to 16	20 to 35	100 to 680	2670 to 4130	0.12	320 to 660	F8	10.0	7.9
SVQP	125°C 1000 h				•	-55 to 105	4.0 to 20	40 to 60	22 to 150	459 to 572	0.10 to 0.12	220 to 315	C6	6.3	5.9
						-55 to 105	6.3 to 20	35 to 45	47 to 220	598 to 810	0.12	470 to 750	E7	8.0	6.9
SVP	105°C 2000 h					-55 to 105	4.0 to 16	200 to 260	3.3 to 33	660 to 740	0.07 to 0.15	23.5 to 75	A5	4.0	5.4
						-55 to 105	4.0 to 20	60 to 120	10 to 68	1020 to 1400	0.10 to 0.12	78 to 176	B6	5.0	5.9
						-55 to 105	2.5 to 20	23 to 60	22 to 220	1450 to 2780	0.10 to 0.12	88 to 151	C6	6.3	5.9
						-55 to 105	4.0 to 20	35 to 45	33 to 330	1890 to 2560	0.12	132 to 300	E7	8.0	6.9
						-55 to 105	4.0 to 20	25 to 40	56 to 680	2400 to 3700	0.12	224 to 660	F8	10.0	7.9
						-55 to 105	2.5 to 20	13 to 24	100 to 680	3320 to 4520	0.15	340 to 660	E12	8.0	11.9
						-55 to 105	2.5 to 20	12 to 20	150 to 1500	4320 to 5440	0.15 to 0.18	600 to 960	F12	10.0	12.6

* Ripple current temperature **depends on series**
* ESR (100 kHz / +20°C)
* Tan δ (120 Hz / +20°C)

Part Number explanation OS-CON SMD type

16	SVP	3R3	M
Rated voltage	Series	Rated capacitance	Capacitance tolerance

R. voltage (V)	Code
2.0	2
2.5	2R5
35	35
100	100

R. capacitance (µF)	Code
4.7	4R7
10	10
470	470
1500	1500

Cap. tolerance	Code
±20%	M

OS-CON THT SERIES OVERVIEW

Series	Features						Category temperature range (°C)	Rated voltage range (V)	ESR (mΩ)	Capacitance range (µF)	Allowable Ripple Current (mA rms)	Tan (δ)	LC	Size code	Size (mm)	
	Endurance	Small size/Low profile	Large cap.	Low ESR	High voltage	Long life/High reliability									Ø D	L
SEF	125°C 1000 h		•		•	•	-55 to 125	16 to 35	22 to 35	22 to 180	820 to 1040	0.12	154 to 576	C6	6.3	5.9
							-55 to 125	16 to 35	22 to 30	39 to 270	880 to 1040	0.10 to 0.12	273 to 864	E7	8.0	6.9
							-55 to 125	16 to 35	14 to 20	82 to 560	1260 to 1560	0.12	574 to 1792	E12	8.0	11.9
							-55 to 125	16 to 5	12 to 18	120 to 1000	1390 to 1700	0.12	800 to 3200	F13	10.0	12.9
SEK	125°C 1000 h		•		•	•	-55 to 125	25 to 50	25 to 35	22 to 82	820 to 960	0.12	220 to 410	C6	6.3	5.9
							-55 to 125	25 to 50	24 to 35	33 to 120	850 to 1010	0.12	330 to 600	E7	8.0	6.9
							-55 to 125	25 to 50	16 to 25	68 to 270	1200 to 1470	0.12	680 to 1350	E12	8.0	11.9
							-55 to 125	25 to 50	14 to 20	120 to 470	1350 to 1590	0.12	1200 to 2350	F13	10.0	12.9
SEPG	105°C 5000 h			•		•	-55 to 105	16	12	150	4500	0.12	480	B9	5.0	8.9
							-55 to 105	16	10	270	5040	0.12	864	C9	6.3	8.9
							-55 to 105	16	8	270	5800	0.12	864	C10	6.3	9.9
							-55 to 105	16	8	470	5400	0.12	1504	E9	8.0	8.9
							-55 to 105	16	8	560	6100	0.12	1792	E13	10.0	12.9
NEW SXE	125°C 1000 h				•	•	-55 to 125	63 to 100	60	6.8 to 18	340	0.12	34 to 56	E7	8.0	6.9
							-55 to 125	63 to 100	50 to 60	15 to 39	630 to 690	0.12	75 to 122	F8	8.0	7.9
							-55 to 125	63 to 100	25 to 40	15 to 68	730 to 930	0.12	75 to 214	E12	8.0	11.9
							-55 to 125	63 to 100	25 to 30	18 to 120	940 to 1030	0.12	90 to 378	F13	10.0	12.9
SEPF	105°C 5000 h	•	•		•	•	-55 to 105	16 to 32	30 to 35	22 to 150	2400 to 2590	0.12	140 to 480	C55	6.3	5.4
							-55 to 105	16 to 35	22 to 35	22 to 180	2600 to 3300	0.12	154 to 576	C6	6.3	5.9
							-55 to 105	16 to 35	22 to 30	39 to 270	2800 to 3300	0.12	273 to 864	E7	8.0	6.9
							-55 to 105	16 to 35	14 to 20	82 to 560	4000 to 4950	0.12	574 to 1792	E12	8.0	11.9
							-55 to 105	16 to 35	12 to 18	120 to 1000	4400 to 5400	0.12	840 to 3200	F13	10.0	12.9
SEPC	105°C 5000 h	•	•	•		•	-55 to 105	2.5	7	100 to 560	4180	0.1	500	B9	5.0	8.9
							-55 to 105	6.3	18	220	2980	0.12	280	C55	6.3	5.4
							-55 to 105	2.5 to 16	10 to 24	100 to 560	2490 to 3900	0.10 to 0.12	320 to 500	C6	6.3	5.9
							-55 to 105	2.5 to 16	7 to 10	100 to 820	4680 to 5600	0.1	500 to 705	C9	6.3	8.9
							-55 to 105	2.5 to 16	8 to 22	150 to 1000	3220 to 5300	0.10 to 0.12	500 to 1260	E7	8.0	6.9
							-55 to 105	2.5 to 16	5 to 10	180 to 1000	4700 to 7200	0.1	280 to 864	E9	8.0	8.9
							-55 to 105	16	11 to 16	180 to 270	4360 to 5000	0.1	576 to 684	E12	8.0	11.9
							-55 to 105	2.5 to 6.3	7 to 8	470 to 820	5700 to 6100	0.1	500 to 592	E13	8.0	12.9
							-55 to 105	2.5 to 16	7 to 10	470 to 2700	5560 to 6640	0.1	656 to 1890	F13	10.0	12.9
SEQP	125°C 1000 h 105°C 5000 h				•	•	-55 to 125	4.0 to 20	40 to 60	22 to 150	458 to 572	0.10 to 0.12	220 to 312	C6	6.3	5.9
							-55 to 125	4.0 to 32	35 to 100	6.8 to 330	440 to 810	0.10 to 0.12	44 to 660	E7	8.0	6.9
							-55 to 125	4.0 to 32	25 to 80	15 to 680	560 to 1170	0.10 to 0.12	96 to 544	F8	10.0	7.9
							-55 to 125	4.0 to 32	13 to 50	18 to 560	790 to 1430	0.12 to 0.15	115 to 660	E12	8.0	11.9
							-55 to 125	4.0 to 20	12 to 20	150 to 1200	1367 to 1721	0.15 to 0.18	600 to 960	F13	10.0	12.9

Series	Features						Category temperature range (°C)	Rated voltage range (V)	ESR (mΩ)	Capacitance range (µF)	Allowable Ripple Current (mA rms)	Tan (δ)	LC	Size code	Size (mm)	
	Endurance	Small size/Low profile	Large cap.	Low ESR	High voltage	Long life/High reliability									Ø D	L
SEP	105°C 3000 h				•	•	-55 to 105	4.0 to 20	40 to 60	22 to 150	1450 to 1810	0.10 to 0.12	200 to 312	C6	6.3	5.9
							-55 to 105	4.0 to 20	35 to 45	33 to 330	1890 to 2560	0.12	330 to 660	E7	8.0	6.9
							-55 to 105	4.0 to 20	25 to 40	56 to 680	2400 to 3700	0.12	224 to 544	F8	10.0	7.9
							-55 to 105	2.5 to 20	13 to 24	100 to 680	3320 to 4520	0.15	340 to 660	E12	8.0	11.9
							-55 to 105	2.5 to 20	12 to 20	150 to 1500	4320 to 5440	0.15 to 0.18	600 to 960	F13	10.0	12.9

* Ripple current temperature **depends on series**
*ESR (100 kHz / +20°C)
* Tan δ (120 Hz / +20°C)

Part Number explanation OS-CON THT type

16 — Rated voltage

R. voltage (V)	Code
2.5	2R5
4.0	4
32	32
100	100

SEPC — Series

470 — Rated capacitance

R. capacitance (µF)	Code
6.8	6R8
10	10
470	470
1000	1000

M — Capacitance tolerance

Cap. tolerance	Code
±20%	M

T — Taping or forming of terminal code

Taping products and lead terminal cutting products indicate process code. Regular lead products don't have code.

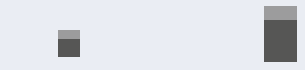
POSCAP

POSCAP, utilizing sintered tantalum as an anode and conductive polymer, offers thin, small, low ESR, superior high frequency characteristics, high reliability and heat resistance which enables the capacitors to be best candidates for digital / high frequency applications.

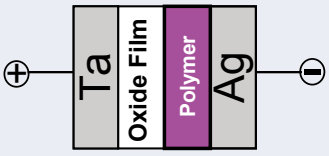
POSCAP

Conductive polymer tantalum solid capacitors

POSCAP is a solid capacitor using polymer + Tantalum



3.5 x 2.8mm (B) 7.3 x 4.3mm (D)



- Small size: 3.5 x 2.8mm
- Large capacitance / size
- Low ESR / high ripple current
- Excellent noise-absorbent characteristics
- Alternative of solid tantalum MnO2 Capacitor
- Low profile: down to 1.1mm
- ESR range: 5mΩ to 200mΩ
- Cap. range: 10µF to 1500µF
- Rated voltage: 2V to 35V
- Ripple current range: upto 6.1A

Go to Webseite

SERIES OVERVIEW

LOW PROFILE

TPC
Size: D
V.DC/µF: 10/68 & 10/100
ESR (mΩ): 45 to 100mΩ
Ripple (A r.m.s): 1.9 max

LOW ESR

TPE
Size: D, B
V.DC/µF: 2.5/1500 to 10/330
ESR (mΩ): 7 to 70mΩ
Ripple (A r.m.s): 4.4 max

TPF
Size: D
V.DC/µF: 2/330 to 10/150
ESR (mΩ): 5 to 35mΩ
Ripple (A r.m.s): 6.1 max

TPSF
Size: B
V.DC/µF: 2/270 to 2.5/270
ESR (mΩ): 6 to 9mΩ
Ripple (A r.m.s): 3.2 max

TPS
Size: B
V.DC/µF: 2.5/330 to 6.3/150
ESR (mΩ): 30mΩ
Ripple (A r.m.s): 1.4 max

TPB
Size: D, B
V.DC/µF: 4/330 to 10/330
ESR (mΩ): 35 to 70mΩ
Ripple (A r.m.s): 3.0 max

HIGH TEMPERATURE

125°C Guaranteed

TC
Size: D, B
V.DC/µF: 2.5/330 to 10/330
ESR (mΩ): 5 to 25mΩ
Ripple (A r.m.s): 6.1 max

HIGH RELIABILITY

85°C85%RHGuaranteed

TA
Size: D, B
V.DC/µF: 2.5/680 to 10/220
ESR (mΩ): 9 to 70mΩ
Ripple (A r.m.s): 3.9 max

TV
Size: D
V.DC/µF: 6.3/150 to 10/150
ESR (mΩ): 25mΩ
Ripple (A r.m.s): 2.4 max

HIGH ENERGY DENSITY

TQC NEW
Size: D, B
V.DC/µF: 16/220 to 35/15
ESR (mΩ): 40 to 400mΩ
Ripple (A r.m.s): 1.8 max

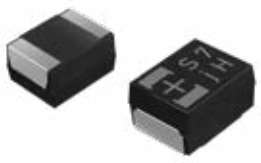
TQS NEW
Size: D
V.DC/µF: 35/47 to 35/68
ESR (mΩ): 100mΩ
Ripple (A r.m.s): 1.2 max

TQT
Size: D
V.DC/µF: 35/56
ESR (mΩ): 100mΩ
Ripple (A r.m.s): 1.2 max

HIGH VOLTAGE HIGH TEMPERATURE

125°C Guaranteed

TDC NEW
Size: D, B
V.DC/µF: 16/220 to 25/100
ESR (mΩ): 50 to 100mΩ
Ripple (A r.m.s): 1.8 max



B case size
L x W (mm): 3.5x2.8

D case size
L x W (mm): 7.3x4.3

POSCAP SERIES OVERVIEW

Series	Features								Category temp. range (°C)	Rated voltage range (V)	ESR (mΩ)	Capacitance range (µF)	Ripple Current (mA rms)	Tan (δ)	LC	Size code	Size (mm)		
	Endurance	Small size/ Low profile	Large cap.	Low ESR	Reliabi-lity	High voltage	Guaran-teed at 125°C	3 times reflow solde-ring									L	W	H
TPG	Small Size Low profile Large Capaci-tance 85°C 1000 h	•	•						-55 to 105	10 to 12.5	35 to 70	33 to 47	1000	0,1	41.3 to 47	B1G	3.5	2.8	1.1
TPS	105°C 2000 h	•	•						-55 to 105	2.5 to 6.3	30 to 35	150 to 330	1250 to 1400	0.1	55 to 94.5	B1S	3.5	2.8	1.1
TPSF	105°C 2000 h	•	•	•					-55 to 105	2.0 to 2.5	6 to 9	270	2400 to 3200	0.08	108 to 135	B2S	3.5	2.8	1.9
TPE	B size: 105°C 1000 h D size: 105°C 2000 h			•					-55 to 105	2.0 to 10	9 to 70	47 to 470	950 to 2300	0.08 to 0.10	40 to 188	B2	3.5	2.8	1.9
									-55 to 105	6.3	35	470	1700	0.1	296,1	D15E	7.3	4.3	1.4
									-55 to 105	2.5 to 10	7 to 45	68 to 470	1750 to 4400	0.1	55 to 207.9	D2E	7.3	4.3	1.8
									-55 to 105	2.5 to 10	9 to 40	150 to 680	1850 to 3900	0.1	132 to 220	D3L	7.3	4.3	2.8
									-55 to 105	2.5 to 10	10 to 40	330 to 1500	2350 to 4400	0.1 to 0.15	207.9 to 428.4	D4	7.3	4.3	3.8
TPF	105°C 2000 h		•	•					-55 to 105	2.0	6	220 to 330	1750 to 4400	0.1	55 to 207.9	D2E	7.3	4.3	1.8
									-55 to 105	2.5 to 10	5 to 25	150 to 680	1850 to 3900	0.1	138.6 to 220	D3L	7.3	4.3	2.8
									-55 to 105	2.5 to 6.3	5 to 35	470 to 1000	2350 to 4400	0.1 to 0.15	207.9 to 428.4	D4	7.3	4.3	3.8
TQT	105°C 2000 h		•			•		•	-55 to 105	35	100	56	1200	0.1	196	D15S	7.3	4.3	1.4
NEW TQS	105°C 2000 h	•				•		•	-55 to 105	35	100	47	1200	0.1	164,5	D15S	7.3	4.3	1.4
												68	1200	0.1	238	D2S	7.3	4.3	1.9
NEW TQC	105°C 2000 h					•		• (only specific PNs)	-55 to 105	16 to 35	90 to 400	3.9 to 47	500 to 1100	0.1 to 0.15	25 to 225.6	B2	3.5	2.8	1.9
									-55 to 105	16	40	33	1800	0,1	52,8	D12	7.3	4.3	1.15
									-55 to 105	16 to 25	55 to 70	22 to 47	1400 to 1500	0,1	55 to 94.5	D15	7.3	4.3	1.4
									-55 to 105	16 to 35	40 to 150	10 to 150	900 to 1800	0.1 to 0.15	35 to 240	D2	7.3	4.3	1.9
									-55 to 105	16 to 25	50 to 70	68 to 220	1400 to 1800	0,1	170 to 352	D3L	7.3	4.3	2.8
TA	105°C 2000 h				•				-55 to 105	4.0 to 10	70	47 to 100	1100	0.08	29.6 to 47	B2	3.5	2.8	1.9
									-55 to 105	2.5 to 10	9 to 25	68 to 470	2400 to 3900	0.1	55 to 138.6	D2E	7.3	4.3	1.8
									-55 to 105	2.5 to 10	15 to 25	150 to 680	2400 to 3100	0.1	150 to 220	D3L	7.3	4.3	2.8
TV	Guaranteed at 125°C 1000h				•		•		-55 to 125	6.3 to 10	25	68 to 150	2400	0.1	68 to 94.5	D2E	7.3	4.3	1.8
									-55 to 125	10	25	150	2400	0.1	150	D3L	7.3	4.3	2.8
TPB	Standard B size: 105°C 1000 h D size: 105°C 2000 h								-55 to 105	4.0 to 10	70	33 to 68	1100	0.8	20.7 to 47	B2	3.5	2.8	1.9
									-55 to 105	4.0 to 10	40 to 55	150 to 330	1700 to 2000	0.1	132 to 220	D3L	7.3	4.3	2.8
									-55 to 105	6.3 to 10	35 to 40	220 to 470	2800 to 3300	0.1 to 0.15	207.9 to 330	D4	7.3	4.3	3.8
TC	Guaranteed at 125°C 1000h						•		-55 to 125	2.5	9	330	3200	0.08	165	B2	3.5	2.8	1.9
									-55 to 125	4.0 to 6.3	15 to 25	100 to 330	2400 to 3100	0.1 to 0.15	60 to 138.6	D2E	7.3	4.3	1.8
									-55 to 125	2.5 to 10	5 to 25	150 to 680	2400 to 4600	0.1	132 to 220	D3L	7.3	4.3	2.8
										2.5 to 10	5 to 25	330 to 1000	3000 to 6100	0.1 to 0.15	170 to 428.4	D4	7.3	4.3	3.8

Series	Features								Category temp. range (°C)	Rated voltage range (V)	ESR (mΩ)	Capacitance range (µF)	Ripple Current (mA rms)	Tan (δ)	LC	Size code	Size (mm)		
	Endurance	Small size/ Low profile	Large cap.	Low ESR	Reliability	High voltage	Guaranteed at 125°C	3 times reflow soldering									L	W	H
NEW TDC	Guaranteed at 125°C 1000 h					•	•	• (only specific PNs)	-55 to 125	16 to 25	90 to 100	15 to 33	900 to 1000	0.1	112 to 158.4	B2	3.5	2.8	1.9
									-55 to 125	16	50	100	1800	0.1	160	D2	7.3	4.3	1.9
									-55 to 125	16 to 25	50 to 70	68 to 150	1400 to 1800	0.1	170 to 250	D3L	7.3	4.3	2.8
TPC	D size: 105°C 2000 h	•							-55 to 105	6.3 to 10	45 to 100	68 to 330	1100 to 1900	0.1	63 to 207.9	D2	7.3	4.3	1.9

* Ripple current temperature **depends on series**
* ESR (100 kHz / +20°C)
*Tan δ (120 Hz / +20°C)

Part Number explanation POSCAP

2R5 — Rated voltage 1 to 3 figures

R. voltage (V)	Code
2.5	2R5 or E
4.0	4
16.0	16 or 1C
20.0	20

TPB — Series name 3 to 4 figures

330 — Rated cap. 2 to 4 figures

R. capacitance (µF)	Code
8.2	8R2
10	10
680	680
1000	1000

M — Cap. tolerance 1 figure

Cap. tolerance	Code
±20%	M

L — Special code 0 to 4 figures

SP-Cap

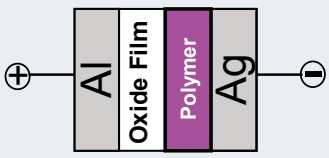
SP-Cap, a chip-shaped aluminium electrolytic capacitor with polymer as its electrolyte, provides low ESR, low ESL, long life span, small size, low profile, and high temperature stability.

SP-Cap

SP-Cap - conductive polymer aluminium electrolytic capacitors

SP-Cap is a solid capacitor using polymer + Aluminium

7.3 x 4.3mm (D)



- Super low ESR: 3mOhm min
- High ripple current
- Long lifetime at high temperature: 5500h @ 135°C
- Alternative of solid tantalum MnO2 Capacitor
- MLCC Ceramic Capacitor Replacement
- Low profile: down to 1mm
- ESR range: 3mΩ to 40mΩ
- Cap. range: 8.2µF to 820µF
- Rated Voltage range: 2V to 6.3V

Go to Webseite

SERIES OVERVIEW

TWO-TERMINAL SERIES

D case size
7.3 x 4.3mm

CX
Standard
Size: 7.3 x 4.3 x 1.9mm
Voltage: 2 to 6.3V
Cap.: 100 to 560µF
ESR: 12 to 15mΩ

Low profile

CT
Low Profile
Size: 7.3 x 4.3 x 1.4mm
Voltage: 4 to 6.3V
Cap.: 100 to 180µF
ESR: 15mΩ

Low profile

CS
Low Profile
Size: 7.3 x 4.3 x 1.1mm
Voltage: 4 to 6.3V
Cap.: 68 to 120µF
ESR: 15mΩ

CY / SY
Guaranteed at 85°C
Size: 7.3 x 4.3 x 2.8mm
Voltage: 4 to 6.8V
Cap.: 330 to 470µF
ESR: 9 to 15mΩ

SX
Low ESR
Size: 7.3 x 4.3 x 1.9mm
Voltage: 2 to 6.3V
Cap.: 82 to 560µF
ESR: 4.5 to 9 mΩ

Super Low ESR

GX
Super Low ESR
High Ripple Current
Size: 7.3 x 4.3 x 1.9mm
Voltage: 2 to 2.5V
Cap.: 330 to 560µF
ESR: 3mΩ

Large capacitance

GY
Size: 7.3 x 4.3 x 2.8mm
Voltage: 2 to 2.5V
Cap.: 680 to 820µF
ESR: 3mΩ

Low profile

ST
Low ESR
Low Profile
Size: 7.3 x 4.3 x 1.4mm
Voltage: 2 to 2.5V
Cap.: 270 to 330µF
ESR: 6mΩ

Low profile

SS
Low Profile
Low ESR
Size: 7.3 x 4.3 x 1.1mm
Voltage: 2 to 2.5V
Cap.: 180 to 220µF
ESR: 6mΩ

Low profile

SR
Standard
Size: 7.3 x 4.3 x 1.0mm
Voltage: 2 to 6.3V
Cap.: 68 to 220µF
ESR: 4.5 to 9mΩ

THREE-TERMINAL SERIES

D case size
7.3 x 4.3mm

LX
Low ESR
Low Profile
Size: 7.3 x 4.3 x 1.9mm
Voltage: 2 to 2.5V
Cap.: 330 to 560µF
ESR: 4.5 to 6mΩ

Super Low ESR

GX-L
Super low ESR
High Ripple Current
Size: 7.3 x 4.3 x 1.9mm
Voltage: 2 to 2.5V
Cap.: 470 to 560µF
ESR: 3mΩ

Low profile

LT
Low ESR
Low Profile
Low ESL
Size: 7.3 x 4.3 x 1.4mm
Voltage: 2 to 2.5V
Cap.: 270 to 330µF
ESR: 6mΩ

Low profile

LS
Low ESR
Low Profile
Low ESL
Size: 7.3 x 4.3 x 1.1mm
Voltage: 2 to 2.5V
Cap.: 180 to 220µF
ESR: 6mΩ

Low profile

LR
Low ESR
Low Profile
Low ESL
Size: 7.3 x 4.3 x 1.0mm
Voltage: 2 to 6.3V
Cap.: 68 to 220µF
ESR: 4.5 to 9mΩ

Benefits of 3 -Terminal Construction?
Low ESL for DC/DC Output capacitor to support larger current & higher switching frequency.
ESL: 0.5 nH (Typ.) @500 MHz.

HIGH TEMPERATURE GUARANTEED SERIES

Long Lifetime & Gurantee High temperature

HX
1000Hours at 125°C
Size: 7.3 x 4.3 x 1.9mm
Voltage: 2 to 25V
Cap.: 15 to 470µF
ESR: 4.5 to 40mΩ

JX
3000Hours at 125°C
Size: 7.3 x 4.3 x 1.9mm
Voltage: 2 to 6.3V
Cap.: 120 to 470µF
ESR: 3 to 15mΩ

Larger capacitance

JZ NEW
3000Hours at 125°C
Large Capacitance
Size: 7.3 x 4.3 x 2.2mm
Voltage: 2V
Cap.: 560µF
ESR: 3 to 9mΩ

KX
5500Hours at 125°C
Size: 7.3 x 4.3 x 1.9mm
Voltage: 4 to 6.3V
Cap.: 120 to 470µF
ESR: 3 to 15mΩ

Larger capacitance

KZ NEW
5500Hours at 125°C
Large Capacitance
Size: 7.3 x 4.3 x 2.2mm
Voltage: 2V
Cap.: 560µF
ESR: 3 to 9mΩ

TX NEW
5500Hours at 135°C
Size: 7.3 x 4.3 x 1.9mm
Voltage: 2 to 6.3V
Cap.: 120 to 470µF
ESR: 3 to 15mΩ

Larger capacitance

TZ NEW
5500Hours at 135°C
Large Capacitance
Size: 7.3 x 4.3 x 2.2mm
Voltage: 2V
Cap.: 560µF
ESR: 3 to 9mΩ

Recommend for AI servers, switches, routers, and base stations

SP-Cap SERIES OVERVIEW

Series	Part No.	Features								Category temperature range (°C)	Rated voltage range (V)	ESR (mΩ)	Capacitance range (µF)	Ripple Current (mA rms)	Size (mm)		
		Endurance	Low profile	Low ESR	Low ESL	Large cap.	High temp.	Long life	High voltage						L	W	H
JX	EEFJX---	125°C 3000 h		•			•	•		-55 to 125	2 to 6.3	3 to 15	120 to 470	5100 to 10200	7.3	4.3	1.9
KX	EEFKX---	125°C 5500 h		•			•	•		-55 to 125	2 to 6.3	3 to 15	120 to 470	5100 to 10200	7.3	4.3	1.9
NEW TX	EEFTX---	135°C 5500 h		•			•	•		-55 to 135	2 to 6.3	3 to 15	120 to 470	5100 to 10200	7.3	4.3	1.9
NEW JZ	EEFJZ---	125°C 3000 h		•		•	•	•		-55 to 125	2	3 to 9	560	6300 to 10200	7.3	4.3	2.2
NEW KZ	EEFKZ---	125°C 5500 h		•		•	•	•		-55 to 125	2	3 to 9	560	6300 to 10200	7.3	4.3	2.2
NEW TZ	EEFTZ---	135°C 5500 h		•		•	•	•		-55 to 135	2	3 to 9	560	6300 to 10200	7.3	4.3	2.2
CX	EEFCX---	105°C 2000 h							•	-55 to 105	2 to 6.3	12 to 15	100 to 560	5100 to 5600	7.3	4.3	1.9
CT	EEFCT---	105°C 2000 h	•						•	-55 to 105	4 to 6.3	15	100 to 180	5100	7.3	4.3	1.4
CS	EEFCS---	105°C 2000 h	•						•	-55 to 105	4 to 6.3	15	68 to 120	5100	7.3	4.3	1.1
SX	EEFSX---	105°C 2000 h		•						-55 to 105	2 to 6.3	4.5 to 9	82 to 560	6300 to 8500	7.3	4.3	1.9
GX	EEFGX---	105°C 2000 h		•						-55 to 105	2, 2.5	3	330 to 560	10200	7.3	4.3	1.9
LX	EEFLX---	105°C 2000 h		•	•					-55 to 105	2, 2.5	4.5 to 6	330 to 560	7500 to 8500	7.3	4.3	1.9
ST	EEFST---	105°C 2000 h	•	•						-55 to 105	2, 2.5	6	270 to 330	7500	7.3	4.3	1.4
LT	EEFLT---	105°C 2000 h	•	•	•					-55 to 105	2, 2.5	6	270 to 330	7500	7.3	4.3	1.4
SS	EEFSS---	105°C 2000 h	•	•						-55 to 105	2, 2.5	6	180 to 220	7500	7.3	4.3	1.1
LS	EEFLS---	105°C 2000 h	•	•	•					-55 to 105	2, 2.5	6	180 to 220	7500	7.3	4.3	1.1
SR	EEFSR---	105°C 2000 h	•	•						-55 to 105	2 to 6.3	4.5 to 9	68 to 220	6300 to 8500	7.3	4.3	1.0 max.
LR	EEFLR---	105°C 2000 h	•	•	•					-55 to 105	2 to 6.3	4.5 to 9	68 to 220	6300 to 8500	7.3	4.3	1.0 max.
GY	EEFGY---	105°C 2000 h		•		•				-55 to 105	2, 2.5	3	680 to 820	10200	7.3	4.3	2.8
CY	ECGCY---	85°C 2000 h				•				-55 to 85	4, 6.3	15	330 to 470	5100	7.3	4.3	2.8
SY	ECGSY---	85°C 2000 h		•		•				-55 to 85	4, 6.3	9	330 to 470	6300	7.3	4.3	2.8
HX	EEFHX---	125°C 1000 h					•		•	-55 to 125	2 to 2.5	4.5 to 15	330 to 470	5100 to 8500	7.3	4.3	1.9

* Ripple current temperature **depends on series**
* ESR (100 kHz / +20°C)
* Tan δ (120 Hz / +20°C)

Part Number explanation SP-Cap

EEF	CX	0E	471	R
Product classification 3 figures	**Series 2 figures**	**Voltage code 2 figures**	**Capacitance code 3 figures**	**Special code 1 to 2 figures**

Series	Product classification
CY, SY Series	ECG
Rest of series	EEF

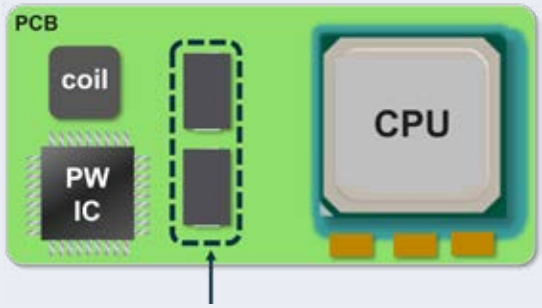
Voltage (V)	Code
2	0D
2.5	0E
4	0G
6.3	0J

Cap. (µF)	Code
68	680
100	101

SP-Cap High Reliability Series (JX/KX/TX)

Choose the right polymer capacitor to enhance your design efficiency at higher temperatures and ensure it is maintenance-free for a longer duration.
The trends of constant high load applications such as AI servers, switches, routers and base stations are currently putting further demands on passive components to provide long-term endurance and excellent reliability. In response to this trend, Panasonic is providing components that are suitable for applications with constant high loads. The Panasonic SP-Cap JX/KX/TX series is responsible for meeting this need.

Consumer Application



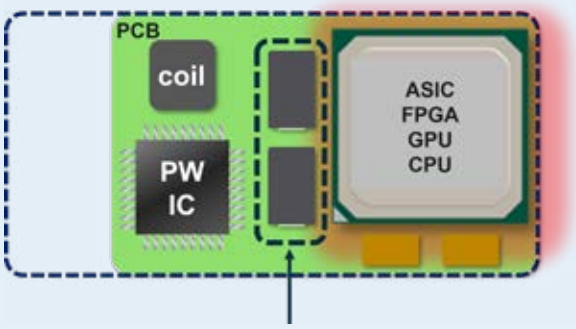
Capacitors garantee up to 105°C is enough for general case around processors required low power

Standard SP-Cap for power circuit guarantee **105°C**

NEW

Infrastructure Application: Constant High Load Application

(such as AI servers, switches, routers, Accelerator and base station)



Application Requirements

- Processor power rise up
- Small PCB, temperature increasing around processor
- Longer lifetime

High Reliability SP-Cap Capacitors are required
SP-Cap **JX/KX/TX** series guarantee **125°C & 135°C**

	High Reliability Products		
Series	**JX series**	**KX series**	**TX series**
Endurance spec.	125°C 3,000hours	125°C 5,500hours	135°C 5,500hours
Damp heat spec.	85°C85%RH 1000hours		
Size	7.3 x 4.3 x 1.9mm		
Voltage / Capacitance	2V/330µF to 6.3V/120µF		
ESR	3 to 15mΩ		

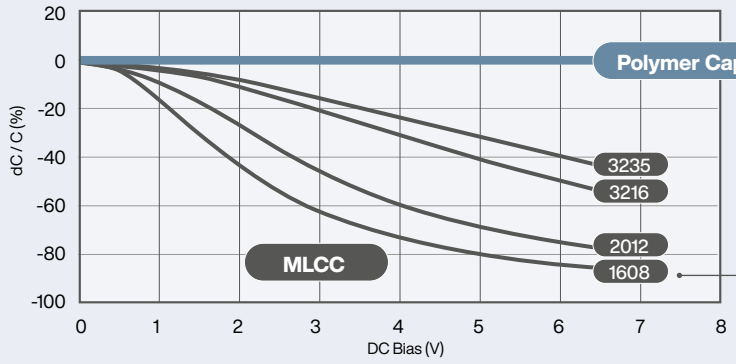
- For high temperature & long lifetime application
- For application with MLCC X7R/X7S grade
- For moisture proof application required 85°C85%RH damp heat spec

Why use polymer capacitors?

Polymer Cap with Material and Mechanical Advantage over MLCC

Reliable & Easy to Use

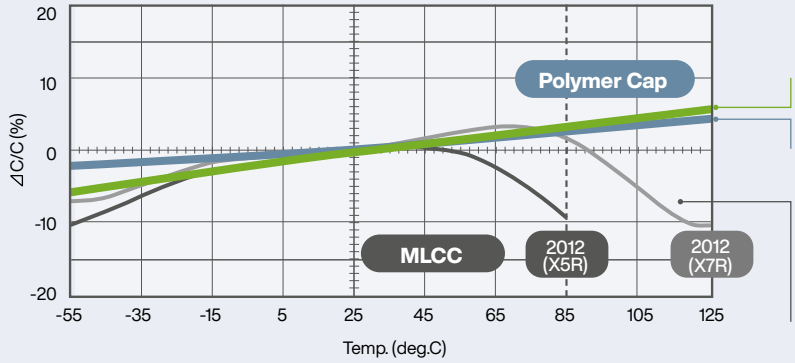
DC biased Characteristic



Hybrid
POSCAP
SP-Cap
OS-CON

Capacitance Down due to material property

Temperature Characteristic



Hybrid
POSCAP SP-Cap OS-CON

Capacitance Down due to material property

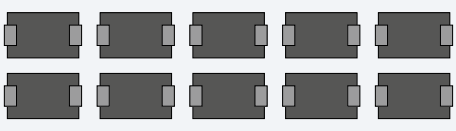
Save cost/ pcs

DC/DC 12V output capacitor

MLCC

(25V22μF X5R) x **10pcs.**

22μFx20%x10pcs=**44μF**



Save cost/pcs

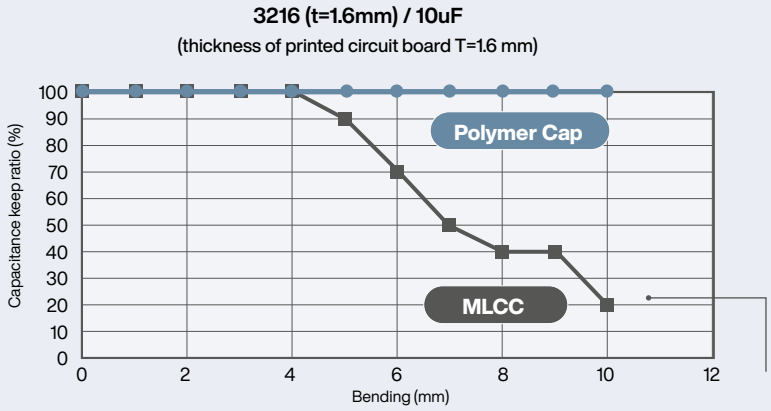
POSCAP

(20V47μF) x **1pcs.**

20TQC47MYF

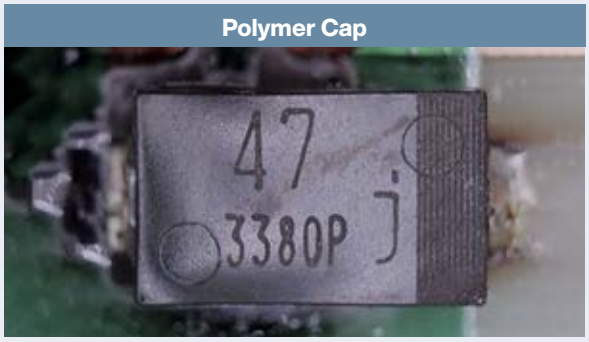
47μFx1pc= **47μF**

Bending Test



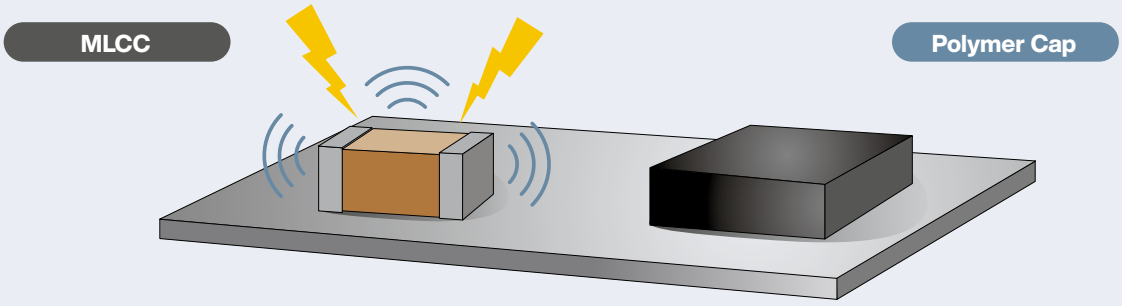
Capacitance Down due to crack

Short-circuit Test



PCB burned due to continuous short-current

Voltage Application Test



MLCC beeps due to material and mechanical property

FILM CAPACITORS

Panasonic provides a broad range of film capacitors from polypropylene plastic film capacitors with high accuracy capacitance, low loss, and large current features to polyester, polyethylene naphthalate, and polyphenylene sulphide plastic film capacitors with high voltage, small size and large capacitance features, which are suitable for various applications including electronic equipment, AC motor, automotive and industrial infrastructure.

Film Capacitors

A wide range of products with high reliability, high current resistance, high humidity resistance, and enhanced safety characteristics to optimize your solution.

- High voltage: up to 1300VDC
- High ripple current: up to 29.3 Arms
- High Capacitance: up to 110uF
- Wide range of size
- High Temperature guarantee up to 110°C

Go to Webseite

SERIES OVERVIEW

METALIZED POLYPROPYLENE FILM CAPACITOR

Electric Equipment

ECWF(A)
Normal
Volt: 250-630VDC
Cap.: 0.1-6.8uF
-40~105℃

ECWFD
Miniaturization
Volt: 450-630VDC
Cap.: 0.01-4.7uF
-40~105℃

ECWF(L)
High Current
Volt: 400-630VDC
Cap.: 0.1-10uF
110℃

ECWFE
Box Type
Volt: 450-630VDC
Cap.: 0.01-4.7uF
-40~105℃

Automotive (AEC-Q200)

ECWFG
Small Capacitance
Volt: 600-1100VDC
Cap.: 1-12uF
-40~110℃ (125℃)

EZPV
Large Capacitance
Volt: 600-1100DC
Cap.: 3-110uF
-40~105℃

High Voltage/Frequency

ECWH(C)
Specialized for IH
Volt: 630-3000VDC
Cap.: 0.0024-0.33uF
110℃

TMF
Customized
AC/DC
Cap.: Customized
-25~85℃

Industrial/Infrastructure

EZPE
Normal DC Link
Volt: 500-1300VDC
Cap.: 10-110uF
-40~85℃

EZPV
High Ripple/
Humidity resistance
Volt: 600-1100V
Cap.: 1-110uF
-40~105℃

EZPE
Low Height
Volt: 450-630VDC
Cap.: 10-66uF
-40~85℃

EZPQ
AC Filter
Volt: 250-600VAC
Cap.: 1-36uF
-40~105℃

METALIZED PET FILM CAPACITOR

Electric Equipment

ECQE(B)
Miniaturization
Volt: 250VDC
Cap.: 0.1-4.7uF
-40~105℃

ECQE(F)
Normal
Volt: 100-1250V
Cap.: 0.001-10uF
-40~105℃

ECQE(T)
High Humidity
Resistance
Volt: 250-630VDC
Cap.: 0.01-10uF
-40~105℃

AUTOMOTIVE & INDUSTRIAL FILM CAPACITORS

Top features

- Temperature up to 125°C
- Lead time = 8 weeks*
- Ripple current up to 30Arms
- AEC-Q200

Panasonic Series	Voltage range	Capacitance	Ripple Current	Max. Temperature
ECWFG	600VDC - 1100VDC	1µF - 12µF	Up to 10 A	125°C
EZPV	600VDC – 1100VDC	3µF - 110µF	Up to 30 A	105°C
ECWFE	450VDC – 600VDC	0.1µF - 4.7µF	Up to 6 A	105°C
EZPE	450VDC – 1300VDC	10µF - 110µF	Up to 18.5 A	105°C
EZPQ	250VAC – 600VAC	1 µF - 12µF	Up to 18 A	105°C

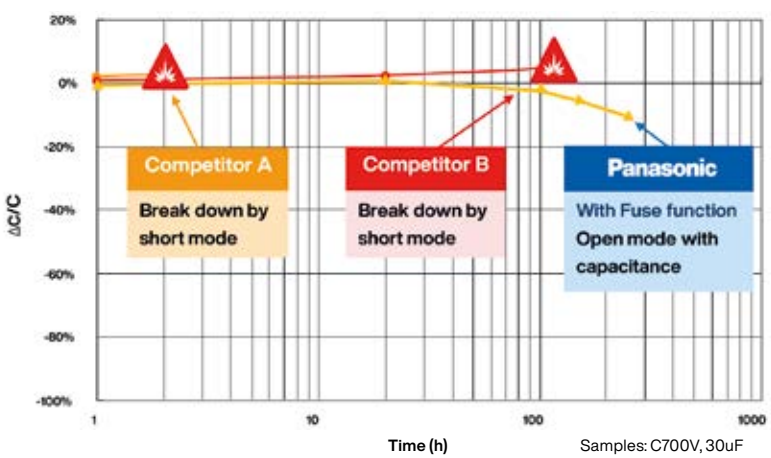
Design registrable Unique Technical Feature Price Competitive New Product Introduction

Why Panasonic?

1. High Durability

Panasonic film capacitors are more reliable and have better durability. They exhibit open-circuit failure and protect your circuit boards against fire.

Life test with high temperature (115°C) and high voltage (900VDC)

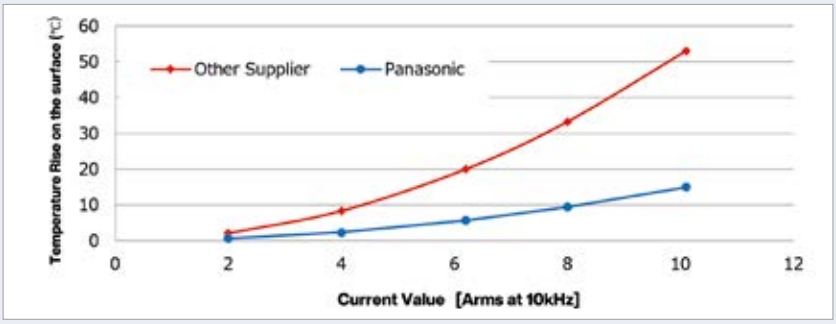


Samples: C700V, 30uF

2. High current resistance

Panasonic Film Capacitors use high quality film and case material which helps us achieve a lower temperature rise upon application of high currents.

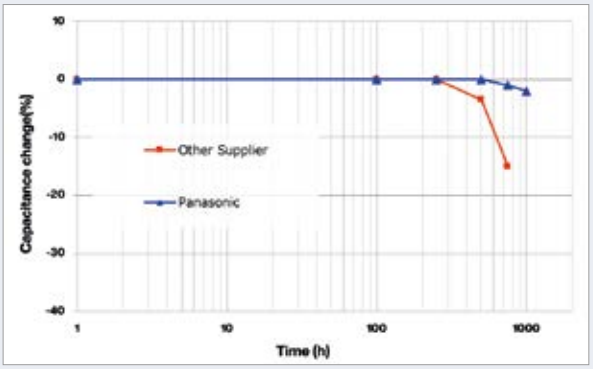
Ripple current vs Temperature rise Test



3. High-humidity resistance

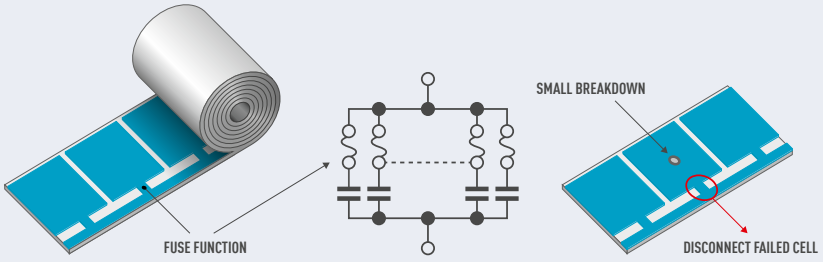
The special vacuum-controlled sealing technology of Panasonic enables its film capacitors to perform exceptionally in high humidity conditions: 85°C / 85% / 1,000h.

Humidity resistance Load Test 85°C 85%



4. High safety (Self-healing with additional fuse function)

The fuse function enhances the safety of the film capacitor by localizing any high voltage fault on the film (Open Circuit Fault). To know more about this feature, please contact Panasonic!



Panasonic original IN-HOUSE metallization process

Safety mechanism

FILM CAPACITOR SERIES OVERVIEW

Film capacitor

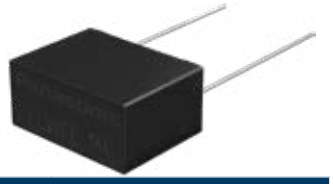
Dielectric Material & Structure		Series	Operating temp.*	Rated Voltage	Rated Capacitance	Ripple Current Range (If data available)	ESR Range (If data available)
Stacked metallized film chip capacitor	Stacked metallized PPS film chip capacitor	ECHU(X)	-55°C to +125°C	[DC] 16 V, 50 V	0.00010 µF - 0.22 µF	-	-
		ECHU(C)	-55°C to +105°C	[DC] 100 V	0.010 µF - 0.22 µF	-	-
Metallized type	Metallized polyester film capacitor	ECQE(F)	-40°C to +105°C	[DC] 100 V - 1250 V [AC] 125 V, 250 V	0.0033 µF - 10 µF	-	-
		ECQE(B)	-40°C to +105°C	[DC] 250 V [AC] 125 V	0.010 µF - 4.7 µF	-	-
		ECQE(T)	-40°C to +105°C	[DC] 250 V - 630 V [AC] 125 V, 250 V	0.010 µF - 10 µF	-	-
	Metallized polypropylene film capacitor	ECWF(L)	-40°C to +105°C	[DC] 400 V, 630 V	0.010 µF - 2.4 µF	-	-
		ECWF(A)	-40°C to +105°C	[DC] 250 V - 630 V	0.10 µF - 6.8 µF	-	-
		ECWFD	-40°C to +110°C	[DC] 450 V	0.1 µF - 4.7 µF	-	-
			-40°C to +105°C	[DC] 630 V	0.01 µF - 4.7 µF	-	-
		ECWFE	-40°C to +105°C	[DC] 450 V, 630 V	0.10 µF - 4.7 µF	-	-
		ECWH(V)	-40°C to +105°C	[DC] 1000 V - 2000 V	0.0010 µF - 0.10 µF	-	-
		ECWH(A)	-40°C to +105°C	[DC] 800 V, 1600 V	0.0010 µF - 0.047 µF	-	-
		ECWH(C)	-40°C to +105°C (+85°C)	[DC] 630 V - 3000 V	0.0024 µF - 0.33 µF	-	-
		TMF	-25°C to +85°C	(Smoothing circuit) [AC] 150 V - 220 V [DC] 350 V - 630 V (Resonance circuit) [AC] 300 V - 2300 V [DC] 500 V - 1200 V	(Smoothing circuit) 1 µF - 10 µF (Resonance circuit) 0.01 µF - 4.0 µF	Individual design	Individual design

Case Size range L	Case Size range W	Case Size range H	Pitch 1 Size Range	Pitch 2 Size Range	Structure, Feature	Application
1.6 - 6.0	0.8 - 4.1	0.7 - 2.8	-	-	● Non-inductive, Stacked ● Tight C-Tol. ● Reflow soldering	● High density mounting
4.8 - 7.1	3.3 - 6.3	1.4 - 4.8	-	-	● Non-inductive, Stacked ● Tight C-Tol. ● Reflow soldering	● High density mounting ● Resonance circuit for LCD B/L inverter unit
10.3 - 31.0	4.3 - 19.5	7.4 - 29.0	7.5 - 27.5	-	● Epoxy resin coating ● Wide capacitance range	● General purpose ● Noise suppressor
7.9 - 25.8	4.2 - 11.9	7.1 - 21.0	5.0 - 22.5	-	● Epoxy resin coating ● Miniaturization of ECQE(F) type	● General purpose ● Noise suppressor
10.8 - 31.5	4.3 - 19.5	7.4 - 29.0	7.5 - 27.5	-	● Epoxy resin coating ● Excellent moisture resistance	● Electric circuit of high humidity equipment
12.5 - 28.0	5.2 - 17.6	8.0 - 24.8	10.0 - 25.0	-	● Epoxy resin coating ● Low D.F ● Excellent moisture resistance	● High frequency high current circuit
13.0 - 26.3	5.0 - 17.8	10.4 - 23.5	15.0 - 22.5	-	● High safety (with safety function) ● Miniaturization of ECWF(L) type ● Low D.F	● Active filtering circuit ● High frequency high current circuit
12.6 - 25.3	4.5 - 11.7	11.2 - 16.4	10.0 - 22.5	-	● High safety (with safety function) ● Epoxy resin coating ● Low D.F ● Miniaturization of ECWF(A) type	● Active filtering circuit ● High frequency high current circuit
12.6 - 25.3	4.4 - 18.3	11.0 - 23.9	15.0 - 22.5	-	-	-
13.0 - 31.0	5.0 - 16.0	10.5 - 25.5	10.0 - 27.5	-	● High safety (with safety function) ● Box type ● Low D.F	● Active filtering circuit ● High frequency high current circuit
18.0 - 28.0	6.0 - 16.0	12.5 - 24.5	15.0 - 25.0	-	● Epoxy resin coating ● Low D.F ● Small in size	● High frequency high current circuit
15.4 - 20.6	5.2 - 13.4	9.1 - 19.2	12.5 - 17.5	-	● Epoxy resin coating ● Low D.F ● Miniaturization of ECWH(V) type	● General resonance circuit
20.7 - 25.8	6.1 - 14.9	13.5 - 21.9	17.5 - 22.5	-	● Epoxy resin coating ● Low D.F	● General resonance circuit ● Microwave oven ● IH resonance circuit
Individual design	Individual design	Individual design	Individual design	Individual design	● Wide voltage range up to 2300 V[AC] ● High frequency and high current capability ● Low loss/Low ESR ● Long lifetime / High reliability ● Flame retardant	● General resonance and smoothing circuits for IH and Industry

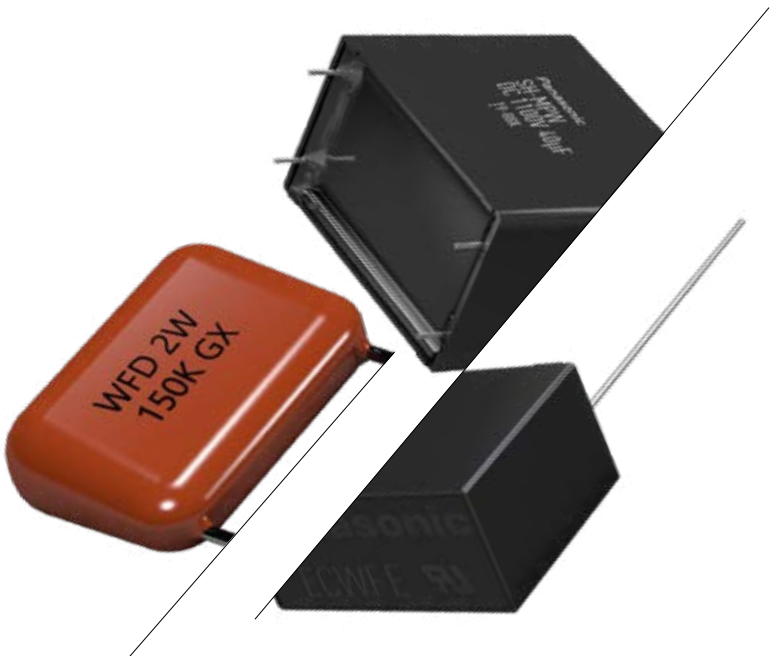
FILM CAPACITOR SERIES OVERVIEW

Film capacitor

Dielectric Material & Structure		Series	Operating temp.*	Rated Voltage	Rated Capacitance	Ripple Current Range (If data available)	ESR Range (If data available)
	Film capacitor for AC motor	PMF Automotive, Industrial and Infrastructure Use	-25°C to +70°C	[AC] 150 V - 500 V	0.5 µF - 65 µF	-	-
	Metallized polyester Film capacitor for noise suppression of automobile	ECQE	-40°C to +130°C	[DC] 250 V	0.47 µF, 2.2 µF, 4.7 µF	-	-
	Metallized polypropylene film capacitors	ECWFG	-40°C to +110°C	[DC] 600 V - 1100 V	1.0 µF - 12.0 µF	3.3 - 10.1	4.4 - 36.5
		EZPE	-40°C to +85°C	[DC] 500 V - 1300 V	10 µF - 110 µF	5.0 - 18.5	4.1 - 22.0
		EZPE (Low profile type)	-40°C to +85°C	[DC] 450 V - 630 V	10 µF - 66 µF	3.0 - 15.0	5.0 - 22.0
		EZPQ	-40°C to +85°C	[AC] 250 V	12 µF - 36 µF	-	-
			-40°C to +105°C	[AC] 330 V, 380 V, 600 V	1 µF - 35 µF	2.1 - 17.9	3.8 - 71.6
		EZPV	-40°C to +105°C	[DC] 600 V -1100 V	3 µF - 110 µF	4.0 - 29.3	3.6 - 30.8



Case Size range L	Case Size range W	Case Size range H	Pitch 1 Size Range	Pitch 2 Size Range	Structure, Feature	Application
39.5 - 50.0	14.0 - 48.5	16.2 - 36.0	36.0 - 46.0	-	● High safety (with safety function) ● High reliability, safety standard approval ● Small size, lightness, and low loss	● Motor and small compressor (for running)
-	-	-	-	-	● Excellent water-proof and corrosion-proof properties ● Guaranteed operation temperature of 130°C max.	● Noise suppressor for automobile
27.0 - 31.5	9.5 - 18.5	17.0 - 32.5	22.5 - 27.5	-	● AEC-Q200 compliant ● High safety (with safety function) ● Excellent moisture resistance ● High thermal shock resistance	● xEV charging circuit ● DC/DC, AC/DC converter (smoothing, PFC)
41.5 - 57.5	20.0 - 35.0	42.0 - 56.0	37.5 - 52.5	10.2 - 20.3	● High safety (with safety function) ● Long product life, High reliability ● Low loss, Low ESR ● Flame retardant	● DC filtering ● DC link circuit
32.5 - 41.5	24.5 - 90.0	19.5 - 24.0	27.5 - 37.5	20.3 - 37.5	● High safety (with safety function) ● Long product life, High reliability, High moisture resistance ● Low loss, Low ESR ● Flame retardant	● Solar inverters, Micro inverters ● Wind power generation ● Industrial power supplies ● Inverter circuit in appliances (Air Conditioners etc.)
48.5 - 57.5	22.0 - 35.0	36.0 - 56.0	45.6 - 52.5	-	● High safety (with safety function) ● Long product life, High reliability ● Low loss, Low ESR ● Flame retardant ● High moisture resistance	● AC Filter ● Solar inverters ● UPS ● Industrial power supplies ● Inverter circuit in appliances
41.5 - 57.5	15.0 - 45.0	29.0 - 64.5	37.5 - 52.5	10.2 - 20.3		
31.5 - 57.5	15.0 - 43.0	29.0 - 64.5	27.5 - 52.5	10.2 - 20.3	● High Safety (with safety function) ● Long product life, High reliability ● Low loss, Low ESR ● Flame retardant (Case and sealing resin) ● AEC-Q200 compliant (For automotive Part No.)	● For DC filtering ● DC link circuit ● Solar inverters ● Wind power generation ● Industrial power supplies ● Inverter circuit in appliances ● On board charger



FILM CAPACITORS BOX TYPE OVERVIEW

ECWFG Series (Automotive)

ECWFG | Explanation of part number

1 2	3 4 5	6 7	8 9 10	11	12
E C	W F G				
Product code	Dielectric & construction	Rated voltage	Capacitance	Cap. Tol.	Suffix 2

Rated voltage

Code	R. voltage (DC)
60	600 V
2J	630 V
70	700 V
80	800 V
1B	1100 V

Cap. Tol.

R. volt. code	Code	Cap. Tol.
2J, 70	J	±5%
	K	±10%
60, 80, 1B	J	±5%

Suffix 2

Code	Lead form
Blank	Straight
A	Cut lead

Series	Part Number	Voltage	Capacitance (uF)	L	W	H	Pitch	ESR (mΩ)	Ripple Current (Arms)
ECWFG	ECWFG60	600V	2.0 - 2.2	31.5	8	17	27.5	23.1 - 25.3	3.4 - 3.6
			2.7 - 3.5		9.5	18		14.9 - 19.0	4.1 - 4.7
			3.9 - 4.0		10.5	21		13.1 - 13.4	5.0 - 5.1
			4.7 - 6.8		12	24.5		7.9 - 11.2	5.6 - 6.8
			7.0 - 10.0		13.5	28.5		5.5 - 7.7	6.9 - 8.4
			12		17.5	32.5		4.6	10.0
	ECWFG2J	630V	1	27	10.5	19	22.5	12.9	4.7
			1.5		12	21		8.9	6.3
			2.2		15.5	24		6.2	8.1
			3		17.5	26.5		4.7	9.8
			1	31.5	9.5	18	27.5	20.8	4.0
			1.5		10.5	21		13.9	5.2
			2.2		12	24.5		9.5	6.5
			3		13.5	28.5		7.8	6.9
			4.7		17.5	32.5		4.4	10.1
	ECWFG70	700V	1	31.5	9.5	18	27.5	20.8	4.0
			1.5		10.5	21		13.9	5.2
			2.0 - 2.2		12	24.5		9.5 - 10.4	6.2 - 6.5
			3		13.5	28.5		6.9	7.8
			3.9 - 4.7		17.5	32.5		4.4 - 6.3	9.1 - 10.1
	ECWFG80	800V	2.0 -2.2	31.5	10.5	21	27.5	16.5 - 18.0	4.2 - 4.5
			2.7 - 3.3		12	24.5		11.3 - 13.6	5.0 - 5.6
			3.5 - 4.7		13.5	28.5		8.2 - 10.7	5.8 - 6.8
			5.0 - 6.0		16	29.5		6.5 - 7.7	7.1 - 7.8
			6.8 - 8.0		17.5	32.5		5.0 - 5.8	8.3 - 9.1
	ECWFG1B	1100V	1	31.5	10.5	21	27.5	36.5	3.3
			1.5 - 2.0		12	24.5		18.7 - 24.1	4.1 - 4.8
			2.2		13.5	28.5		17.1	5.1
			3.0 - 3.3		16	29.5		11.5 - 12.7	6.3 - 6.7
			4		18.5	32.5		9.6	7.5
			4.7 - 5.0		18.5	35		7.7 - 8.2	8.3 - 8.6

EZPV Series (Automotive)

EZPV | Explanation of part number

1 2 3	4	5 6	7 8 9	10	11	12
E Z P	V				T	
Product code	Dielectric & construction	Rated voltage	Capacitance	Pin type	Case type	Suffix

Rated voltage

Code	R. voltage (DC)
60	600 V
70	700 V
80	800 V
1A	1000 V
1B	1100 V

Pin type

Code	Pin type
L	2 pin type
M	4 pin type

Suffix

Code	Suffix
A	27.5mm pitch (for industrial & infrastructure)
B	37.5mm pitch (for industrial & infrastructure)
C	52.5mm pitch (for industrial & infrastructure)
U	27.5mm pitch (for automotive)
T	37.5mm pitch (for automotive)
S	52.5mm pitch (for automotive)

Working Temperature −40°C to +110°C
* Also available as a 2 pin Part number

Series	Part Number	Voltage	Capacitance (uF)	L	W	H	Pitch P1	Ripple Current	ESR
EZPV	EZPV60	600V	10.0 - 12.0	41	15	29	37.5	8.6 - 9.2	14.3 - 16.9
			15		17	34.5		10	12.8
			20.0 - 25.0		22	36		11.9 - 13.8	8.6 - 10.4
			30.0 - 35.0		26	40.5		15.6 - 17.2	7.1 - 8.2
			40	41.5	27.5	42		18.7	6.5
			45.0 - 55.0	41	30	50.5		20.1 - 22.0	6.2 - 4.5
			60.0 - 65.0	41.5	30	56		22.5 - 23	3.6 - 4.1
			70	42	38	52.5		23.4	3.6
			75		38	57		23.8	4.1
			40.0 -50.0	57	25	40	52.5	16.9 - 19.1	6.8 - 8.4
			55.0 - 85.0	57.5	30	51		19.1 - 25.3	4.6 - 6.8
			80-85	41	43	58		24.3 -24.7	3.7 - 3.9
			90.0 -95.0	57.5	35	50		26.0 -26.8	4.7 - 5.2
			100	57	40	51.5		27.5	5.1
			110	57.5	35	56		28.9	4.8
	EZPV70	700V	9.0 - 12.0*	31	20.5	41.5	27.5	12.3 - 14.2	9.9 - 12.6
			13.0 -14.0*		26	41		14.7 - 15.3	8.7 - 9.2
			18*		22	53.5		17.3	7.8
			8.0 -10.0	41	17	34.5	37.5	8.2 - 9.5	13.9 -17.1
			12.0 -15.0		22	36		10.7 - 13.0	10.2 - 12.5
			20		26	40.5		15.8	8.7
			25 - 30		30	50.5		18.3 - 20.6	7.1 - 8.7
			35	41.5	30	56		22.7	5.5
			40	42	38	52.5		24.6	5.1
			45		38	57		26.4	4.5
			50	41	43	58		28.2	4.8
			25	57	25	40	52.5	14.4	11.6
			30-50	57.5	30	51		14.4 - 24.5	6.8 - 11.6
			55		35	50		26.2	6.3
			60		35	56		27.8	6.2
			65		35	64.5		29.3	6.2

FILM CAPACITORS BOX TYPE OVERVIEW

EZPV Series (Automotive)

Series	Part Number	Voltage	Capacitance (uF)	L	W	H	Pitch P1	Ripple Current	ESR
EZPV	EZPV80	800V	9.0 - 12.0*	31	20,5	41,5	27,5	12.3 - 14.2	9.9 - 12.6
			13 - 14*		26	41		14.7 - 15.3	8.7 - 9.2
			18*		22	53,5		17,3	7,8
			8.0 - 10.0	41	17	34,5	37,5	8.2 - 9.5	13.9 -17.1
			12.0 -15.0		22	36		10.7 - 13.0	10.2 - 12.5
			20		26	40,5		15,8	10,2
			25 - 30		30	50,5		18.3 - 20.6	7.1 - 8.7
			35	41,5	30	56		22,7	5,5
			40	42	38	52,5		24,6	5,1
			45		38	57		26,4	4,5
			50	41	43	58		28,2	4,8
			25	57	25	40	52,5	14,4	11,6
			30.0 - 50.0	57,5	30	51		16.8 - 24.5	6.8 - 11.6
			55		35	50		26,2	6,3
			60		35	56		27,8	6,2
			65		35	64,5		29,3	6,2
	EZPV1A	1000V	3.0 - 4.0	41	15	29	37,5	4.4 - 5.5	23.5 - 30.8
			4.7 - 6		17	34,5		6.2 - 7.3	17.5 - 21.7
			7.0 - 9.0		22	36		8.5 - 10.4	12.4 - 15.5
			10	41,5	23,5	43,5		11,2	12,7
			12	41	26	40,5		12,8	10,4
			15 - 18		30	50,5		15.0 - 16.9	8.5 - 10.4
			20	41,5	30	56		18,1	7,2
			25	42	38	52,5		20,9	5,9
			30	41	43	58		23,4	5,7
			15	57	25	40	52,5	10,6	13,7
			20-25	57,5	35,5	45,5		12.2 - 13.6	9.1 -11.2
			30		35	50		14,9	9,9
			35.0 -40.0		35	56		16.1 - 17.2	7.8 - 9.2
	EZPV1B	1100V	3.0 - 4.0	41	15	29	37,5	4.4 - 5.5	23.5 - 30.8
			4.7 - 6		17	34,5		6.2 - 7.3	17.5 - 21.7
			7.0 - 9.0		22	36		8.5 - 10.4	12.4 -15.5
			10	41,5	23,5	43,5		11,2	12,7
			12	41	26	40,5		12,8	10,4
			15.0 - 18.0		30	50,5		15.0 -16.9	8.5 - 10.4
			20	41,5	30	56		18,1	7,2
			25	42	38	52,5		20,9	5,9
			30	41	43	58		23,4	5,7
			15	57	25	40	52,5	10,6	13,7
			20.0 - 25.0	57,5	35,5	45,5		12.2 - 13.6	9.1 - 11.2
			30		35	50		14,9	9,9
			35 - 40		35	56		17,2	7,8

EZPQ Series

EZPQ | Explanation of part number

1 2 3	4	5 6	7 8 9	10	11	12
E Z P	Q				T	
Product code	Dielectric & construction	Rated voltage	Capacitance	Pin type	Case type	Suffix

Code	R. voltage (DC)
25	250 V
33	330 V
38	380 V
60	600 V

Code	Pin type
L	2 pin type
M	4 pin type

Working Temperature −40°C to +110°C
* Also available as a 2 pin Part number

Series	Part Number	Voltage	Capacitance (uF)	L	W	H	Pitch P1	Ripple Current	ESR
EZPQ	EZPQ25	250	12	48.5	22	36	45.6		
			22	57.5	30	45	52.5		
			36	57.5	35	56			
	EZPQ33	330	3.0 - 4.5	41.5	17	34.4	37.5	5.0 - 6.8	15.9 - 23
			4.7 - 6.0		22	36		6.8 - 8.0	13.5 - 16.2
			6.8 - 8.0		26	40.5		8.6 - 9.5	11.3 - 12.6
			9		26.5	41.5		10.3	10.6
			10		30	50.5		10.4	10.9
			10		35.5	50.5		12.1	8.1
			12		30	50.5		11.5	10
			14.0 - 15.0		35.5	50.5		11.5 - 14.4	7.0 - 7.1
			20		43	58		17.9	5.9
			10.0 - 12.0		30	50.5		10.4 - 11.5	10 - 10.9
			14 - 15	42.5	35.5	50.5		14.4 - 14.9	7.0 - 7.1
			20	41.5	43	58		17.9	5.9
	EZPQ38	380	1.0 - 2.5	41.5	15	29	37.5	2.1 - 4.1	29.2 - 71.6
			3.0 - 3.5		17	34.5		4.8 - 5.4	20.9 - 24.4
			4.5 - 5.0		22	36		6.5 - 7.1	15.1 - 16.7
			5.5 - 7.0		26	40.5		7.4 - 8.7	12.2 -14.4
			7.5 - 8.0		26.5	41.5		9.1 - 10	11.8 -11.9
			8*		27.5	42		9.2	11.9
			8.5 - 10*		30	50.5		9.5 - 12.7	8 - 11.7
			12*		30	56		12.7	8
			15*		38	57.5		14.6	7.1
			10	57.5	25	40	52.5	7.1	13.3
			11.0 - 18.0		30	51		7.6 - 10.8	8.1 - 12.2
			20		35	50		11.7	7.5
			22		25	56		11.9	7.5
			24		35	64.5		12.2	7.6
			30 - 33		45	62		15	6.2

FILM CAPACITORS BOX TYPE OVERVIEW

Series	Part Number	Voltage	Capacitance (uF)	L	W	H	Pitch P1	Ripple Current	ESR
EZPQ	EZPQ60	600	1	41.5	15	29	37.5	6.5	13.7
			1.5		17	34.5		7.9	11.2
			2.2		26	40.5		9.6	8.8
			3.3		27.5	42		11.8	5.7
			4.7	42.5	35.5	50.5		11.8	5.7
			4.7 - 7.0	57.5	30	51	52.5	10.6 - 13.0	5.6 - 7.0
			10		35	64.5		15.5	4.6
			12		45	62		17	3.9

ECWFE Series

ECWFE | Explanation of part number

■ Standard

1 2	3 4 5	6 7	8 9 10	11	12
E C	W F E				T
Product code	Dielectric & construction	Rated voltage	Capacitance	Cap. Tol.	Suffix

Rated voltage	
Code	R. voltage (DC)
2W	450 V
2J	630 V

Cap. Tol.	
Code	Pin type
J	±5%
K	±10%

Suffix	
Code	Lead form
Blank	Straight
A	Cut lead

■ Special lead space product

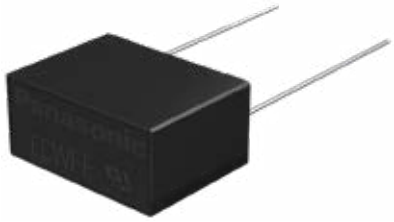
1 2	3 4 5	6 7	8 9 10	11	12
E C	W F E				T
Product code	Dielectric & construction	Rated voltage	Capacitance	Cap. Tol.	Suffix

Rated voltage	
Code	R. voltage (DC)
2W	450 V
2J	630 V

Cap. Tol.	
Code	Pin type
P	±5%
Q	±10%

Suffix	
Code	Lead form
1, 5, 8	Straight
A, D, L	Cut lead

Series	Part Number	Voltage	Capacitance (uF)	L	W	H	Pitch P1
ECWFE	ECWFE2W	450	0.1 - 0.15	13	5	10.5	10
			0.22 - 0.33		6	12	
			0.47		7	12.5	
			0.1 - 0.33	17.5	5	10.5	15
			0.47		6	11.5	
			0.68 - 1		7	12.5	
			1.5 - 2.2		10	15.5	
			3.3	26	10	17	22.5
			4.7		12	19	
			1.5	31	9	19	27.5
			2.2		11	21	
			3.3		13	23	
			4.7		15.5	25.5	



Series	Part Number	Voltage	Capacitance (uF)	L	W	H	Pitch P1
ECWFE	ECWFE2J	630	0.10 - 0.15	13	5	10.5	10
			0.22 - 0.33		6	12	
			0.47		7	12.5	
			0.10 - 0.33	17.5	5	10.5	15
			0.47		6	11.5	
			0.68 - 1.0		7	12.5	
			1.5 - 2.2		10	15.5	
			3.3	26	10	17	27.5
			4.7		12	19	
			1.5	31	9	19	
			2.2		11	21	
			3.3		13	23	
			4.7		15.5	25.5	

ECWFD Series

ECWFD | Explanation of part number

1 2	3 4 5	6 7	8 9 10	11	12
E C	W F G				
Product code	Dielectric & construction	Rated voltage	Capacitance	Cap. Tol.	Suffix

Rated voltage	
Code	R. voltage (DC)
2W	450 V
2J	630 V

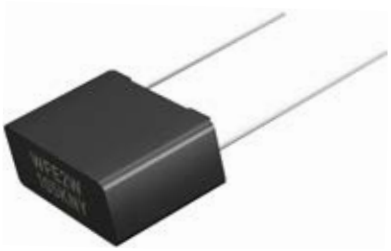
Cap. Tol.	
Code	Cap. Tol.
J	±5%
K	±10%

Suffix	
Code	Lead form
Blank	Straight
B	Crimped lead
Q	Crimped lead
C	Cut lead
3	Crimped taping (Ammo)
4	Odd size taping

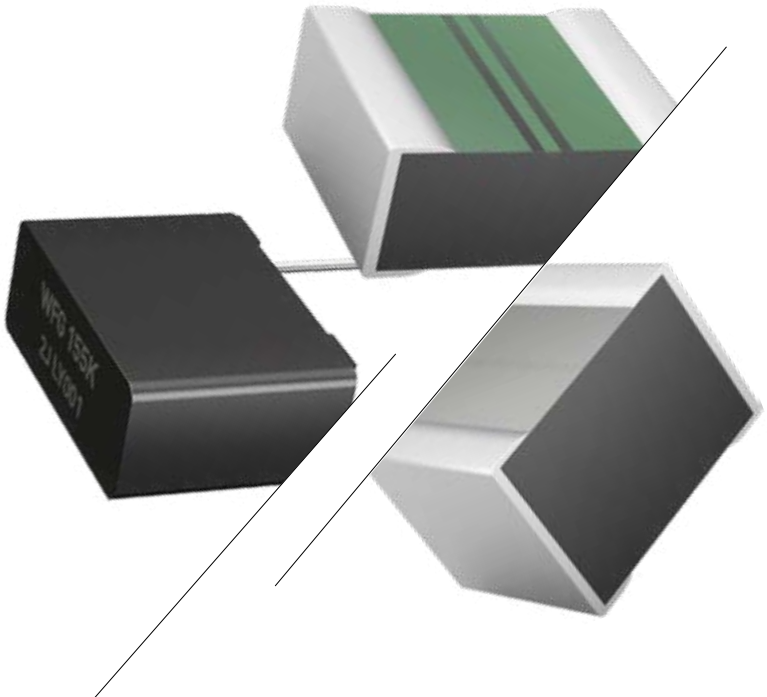
* certain PNs have crimped lead type. Please check catalogue for exact dimensions.

FILM CAPACITORS BOX TYPE OVERVIEW

Series	Part Number	Voltage (VDC)	Capacitance (uF)	L	W	H	Pitch P1
ECWFD	ECWFD2W*	450	0.1	12.6	4.5	13.9	7.5
			0.12 - 0.15		4.6	14	
			0.18		4.8	14.3	
			0.22		5	14.6	
			0.27		5.3	15	
			0.33		5.6	15.4	
			0.39		6	15.7	
			0.47		6.5	11.2	10
			0.68		7.7	12.4	7.5
			1		9.2	13.9	
			0.47	17.5	5.8	9	15
			0.56		6.2	9.4	
			0.68		6.7	9.9	
			0.82		7.2	10.4	
			1		7.8	11	
			1.2		8.5	11.6	
			1.5		9.3	12.5	
			1.8		10.1	13.3	
			2.2		11.1	14.3	
ECWFD	ECWFD2W*	450	2.7	25.3	9	13.7	22.5
			3.3		9.8	14.6	
			3.9		10.7	15.4	
			4.7		11.7	16.4	
	ECWFD2J*	630	0.01	12.6	4.9	8	7.5
			0.012		5.2	8.2	
			0.015		5.6	8.6	
			0.018		5.9	9	
			0.022		6.4	9.4	
			0.027		6.9	9.9	
			0.33		7.5	10.5	
			0.039		8	11	
			0.047		4.4	12.8	
			0.056		4.7	13.1	
			0.068		5	13.4	
			0.082		5.4	13.7	
			0.1		5.8	14.2	
			0.12		6.2	14.6	
			0.15		6.8	15.2	
			0.18		7.4	15.7	
			0.22		8.1	16.4	



Series	Part Number	Voltage (VDC)	Capacitance (uF)	L	W	H	Pitch P1
ECWFD	ECWFD2J*	630	0.27	17.8	6	11	7.5
			0.33		6.6	11.5	
			0.39		7.1	12	
			0.47		7.8	12.7	
			0.56		8.4	13.3	
			0.68		9.3	14.2	
			0.82		10.2	15.1	
			1		11.2	16.1	
			1	25.3	8.4	13.5	22.5
			1.2		9.2	14.3	
			1.5		10.3	15.5	
			1.8		11.2	16.5	
			2.2		12.4	17.7	
			2.7		13.8	19.2	
			3.3		15.3	20.7	
			3.9		16.6	22.1	
			4.7		18.3	23.9	

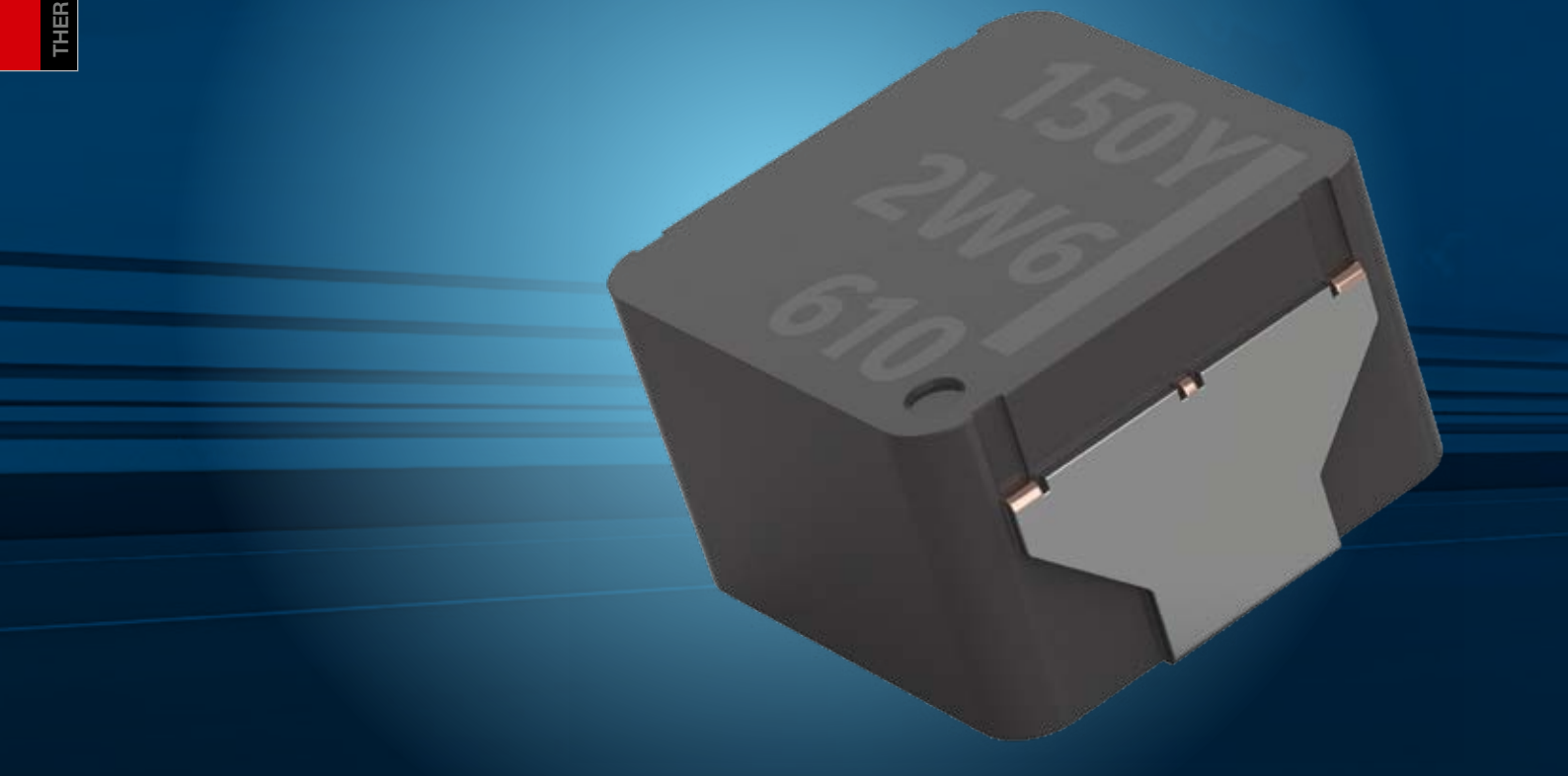


INDUCTORS

METAL POWER INDUCTORS FOR THE AUTOMOTIVE AND EVERY OTHER MARKET

Panasonic's power inductors are designed to meet the demands of various applications, offering exceptional performance and reliability. Our extensive range of inductive products includes SMD and metal composite power inductors, all of which are AEC-Q200 automotive compliant, ensuring they meet the rigorous standards of the automotive industry.

Whether you are looking for solutions for the automotive market, industrial applications, or consumer electronics, Panasonic has the right inductive products to meet your needs. Our power inductors are engineered for high efficiency and durability, making them ideal for enhancing the performance and longevity of electronic devices across multiple sectors. With Panasonic's power inductors, you can ensure reliable power management and superior performance in your automotive, industrial, and consumer applications, contributing to the development of more efficient and sustainable technologies.



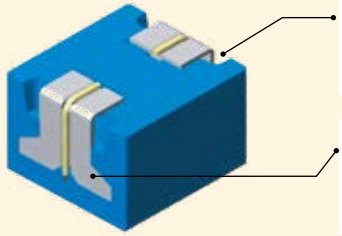
ETQP POWER INDUCTORS

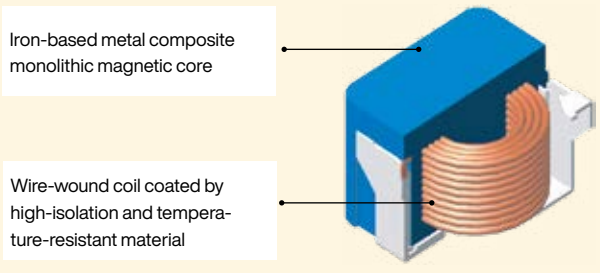
Metal Composite Technology for Automotive Applications.
Panasonic ETQP series are metal-composite power inductors made up of a coil of wire wound inside a magnetic core made of a metal alloy with high magnetic permeability.

Metal composite design
Features and Benefits

High quality design guarantees:

- High current capability
- None-hard saturation vs bias current
- No temperature degradation
- Long lifetime stability
- Size reduction
- Reduced power loss inside the core





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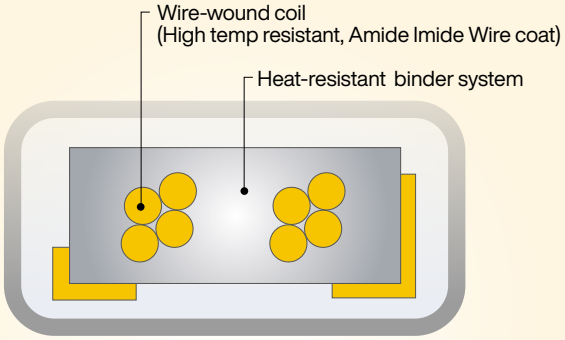
METAL COMPOSITE CORE TYPE ADVANTAGES

All ETQP series inductors withstand up to 180°C for a short time

- Amide imide wire coating material over 200°C heat resistance
- High temperature resistant binder in core material over 200°C heat resistance
- Metal core material over 500°C Curie temperature
- No adhesive used, monolithic moulding technology
- Highly resistant to heat cycles



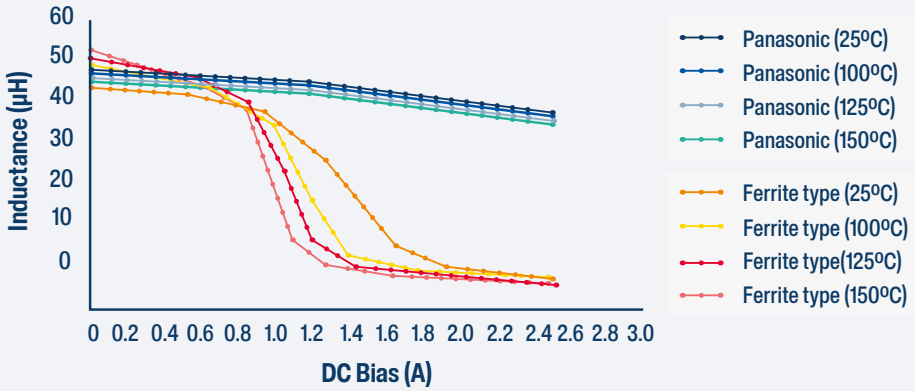
Power Inductor cross-section

None-hard saturation characteristics

Stable inductance value over lifetime even at high currents and high temperatures.
Metal composite core inductors have a higher saturation current capability compared to ferrite core inductors.
This is due to a core made of a metal alloy with a high magnetic permeability.

- AEC-Q200 compliant
- Up to 180°C and 30G vibration resistance
- Fully magnetic shielded structure for excellent EMC behaviour
- High currents up to 103A
- Variety of core sizes from 5x5 to 15x15mm
- 0ppm from the market thanks to a well monitored manufacturing process

Inductance Trend Over DC Bias Current and Temperature



No temp. derating

POWER INDUCTORS SERIES OVERVIEW

Multi-Source LP / LE

- High reliability
- Low cost
- L: 0.33 to 100µH

High Performance

- Excellent saturation characteristics
- Isat up to 56.7A, vibration proof up to 30G
- L: 0.33 to 100µH

AEC-Q200 Compliant

High Vibration Resistant

- From 30 to 50G vibration proof
- No adhesives required
- L: 0.68 to 47µH

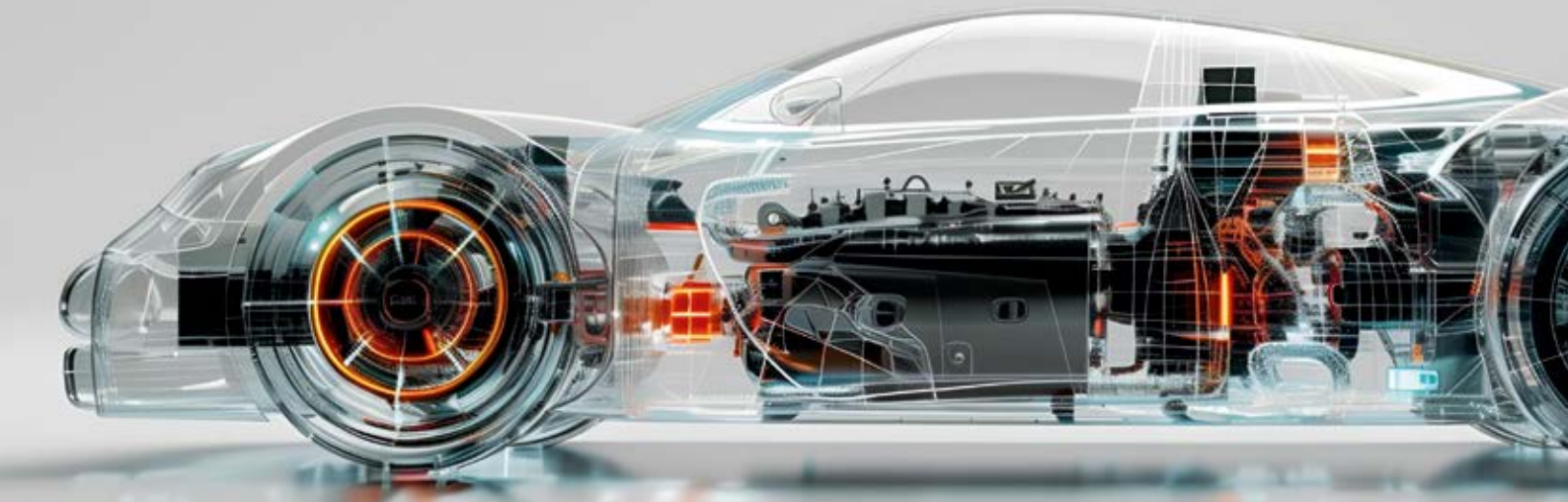
Large Current

- Saturation current up to 100A
- 30 G vibration proof for harsh environments
- L: 0.33 to 4.7µH

CASE SIZE	ETQP Series	Part Number	Height (mm)	Inductance Range (uH)	Vibration Resistance	Temperature range	Sat Rated Current (A)
5x5mm	LP	ETQP3M***KVP	3	0.33 -10	30G	-55°C to +155°C	4.2 - 21.8
	High Performance	ETQP3M***YFP	3	2.2, 3.3	10G	-40°C to +150°C	8.6, 10.9
		ETQP4M***YFP	4	4.6, 22			3.1, 7.7
6x6mm	LP	ETQP3M***KVN	3	0.68 - 33	30G	-55°C to +155°C	3 - 20.2
	High Performance	ETQP3M***YFN	3	0.68 - 1.5	10G	-40°C to +150°C	16 - 24
		ETQP4M***YFN	4.5	2.2 - 47			3.8 - 14.4
7.5x7mm	High Performance	ETQP5M***YFM	5.4	3.3 - 68	10 G	-40°C to +150°C	3.9 - 14.4
		ETQP5M101YGM	5	95			3.1
8.5x8mm	LP	ETQP4M***KVK	4	0.68 - 33	10 G	-55°C to +155°C	4.7 - 29
	High Performance	ETQP5M***YFK	5.4	2.5 - 10		-40°C to +150°C	5.4 - 20.1
		ETQP5M101YGK	5	100			3
	High Vibration	ETQP5M2R5YSK	5.4	2.45	50 G		21.7
10.7x10mm	LP	ETQP4M***KVC	4	1 - 100	10 G	-55°C to +155°C	3.5 - 34.6
	High Performance	ETQP5M***YFC	5.4	1.5 - 66		-40°C to +150°C	4.9 - 35.1
		ETQP5M***YGC	5	3.3 - 97			3 - 23.4
10.9x10mm	High Performance	ETQP5M***YLC	5	0.33 - 2	10 G	-40°C to +150°C	31.3 - 56.7
		ETQP6M***YLC	6	1.5 - 14	10 G		11.2 - 32
	High Vibration	ETQP5M***YSC	5	0.68 - 47	50 G		29.8 - 40
		ETQP6M2R5YSC	6	2.5	50 G		23.7
12.6 x 13.2mm	Large Current	ETQP8M***JFA	8	0.68 - 4.7	30 G	-40°C to +160°C	24.7 - 56.9
15.6 x 17.2mm		ETQPAM***JFW	10.5	0.33 - 0.68			71 -103

EXAMPLES OF AUTOMOTIVE APPLICATIONS

Engine ECU	Autonomous Driving	Electric Power Steering (EPS)	Transmission ECU
Battery Management System (BMS)	E-Compressors	Navigation System	Battery ECU
Panel / HUD	Electrical Pump	Camera	Cooling Fan

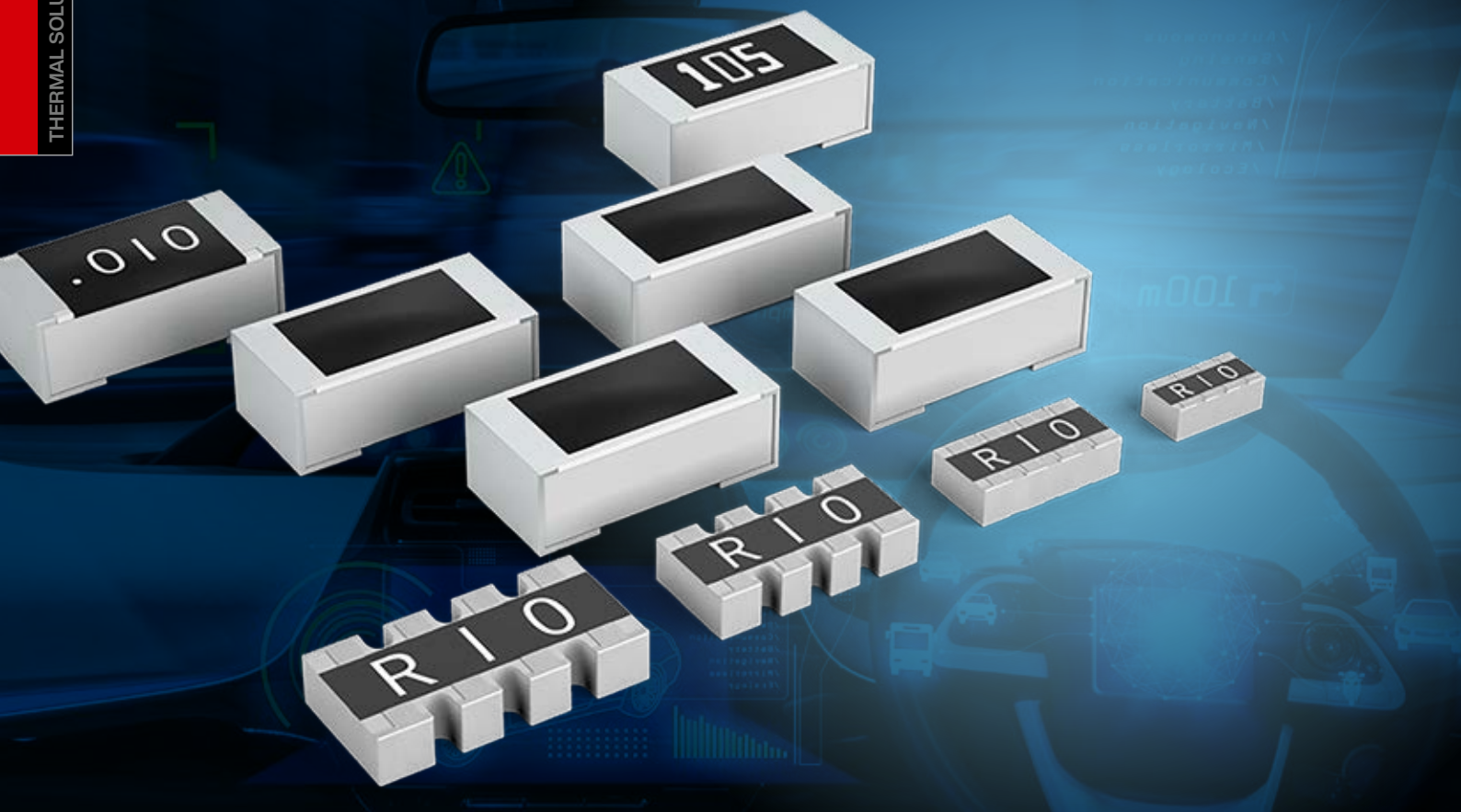


Radar	ADAS	Lidar	Fan Motor Driver
Domain Controller	Gateway	Monitor	LED Headlamp
On Board Charger (OBC)	48V/EV Inverter	Zone Controller	Door Motor Controller

RESISTORS

DECADES OF EXPERTISE AND INNOVATION

With over 90 years of experience in resistor manufacturing, Panasonic offers a comprehensive portfolio of high-performance resistors to meet market demand. Panasonic resistors boast a wide range of features and specifications, from conventional thick film chip resistors to specialized types.
Our portfolio includes high power thick film and shunt, which allow for component miniaturization and cost savings, high precision thin film, with high reliability and low drift, special resistors for anti-sulphurated and high temperature applications and chip resistor arrays ranging from 0201 to 2512 case sizes.



High Voltage

ERJPM8
- Pulse-proof
- Up to 500V @10MΩ
- 0.66W in 1206

ERA8P
- Up to 500V @1MΩ
- Low tolerance (0.1%)
- Low TCR (15ppm/K)

High Precision

ERA*V/K
- High power rating (e.g. 0.25W in 0805)
- ESD-proof
- High voltage (200V in 1206)

ERA*A
- High reliability (ΔR<0.1% after 15 years)

Current Sensing

ERJ*BW/CW/LW
- Up to 1W (1206)
- R ≥ 5mΩ
- Low tolerance (0.5%)

ERJA/B/D
- Wide terminal
- Up to 2W (1020)
- R ≥ 10mΩ
- Low TCR (100ppm/K)

High Power

ERJT
- Pulse-proof: Pmax>100W @1msec (1210)

ERJP
- High power: e.g. 0.5W (0805)
- Surge-proof

ERJH
- High power: e.g. 0.5W (0805) @105°C
- Tmax=175°C

ERJUP
- Anti-sulphurated
- High power: e.g. 0.66W (1206)
- Anti-surge

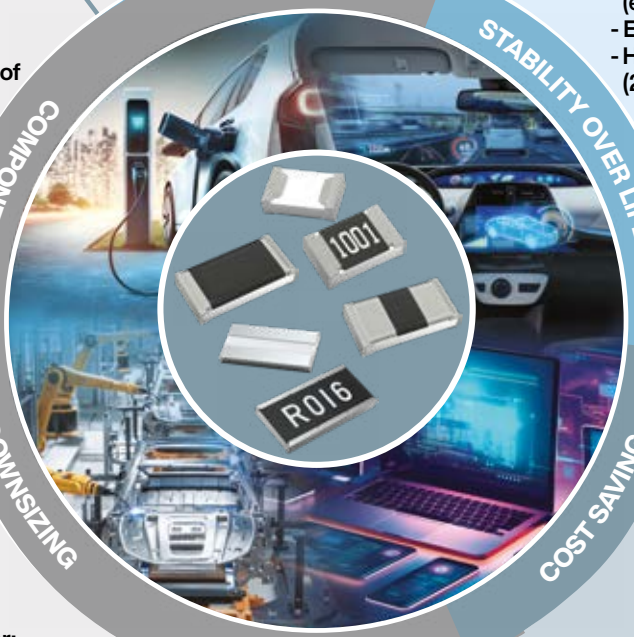
Environmental Resistant

ERJS
- Sulphuration-proof
- Au-based electrode

COMPONENT SAVING AND DOWNSIZING

STABILITY OVER LIFETIME

COST SAVING



RESISTORS

Resistors are key components found in all electronic devices.

Panasonic resistors are designed to maintain high performance even when used extensively in diverse environments. High precision resistors **ERA*A** and **ERA*V/K/P** offer high accuracy and high reliability, ensuring high stability over lifetime.
Small & high power chip resistors are conceived for component saving and downsizing, following the miniaturization trend we are experiencing nowadays in electronics, especially in the automotive sector.
The high power and anti-surge series (**ERJP, ERJT**), can achieve more than double the power rating, anti-pulse, and anti-surge performance compared to standard chip resistors.
When operating in tough environments, **ERJH** parts present excellent heat resistance and thermal shock stability and are ideal for applications around power devices. **ERJ*U/S** series present excellent sulfurization resistance and can be safely employed in outdoor applications for industrial equipments, automobiles, base stations, etc.
In applications requiring high voltage rating, **ERJPM8** and **ERA8P** can be employed.
To guarantee cost savings in current sensing applications, Panasonic proposes thick film technology versus metal plate shunt resistors (up to 14 A current). Double-sided structures **ERJ*BW/CW/LW** resistors and wide terminal shunts **ERJA/B/D** enable ultra-low resistance values at maximum power ratings.

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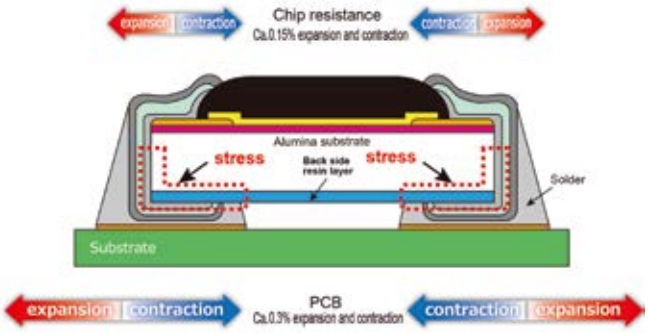
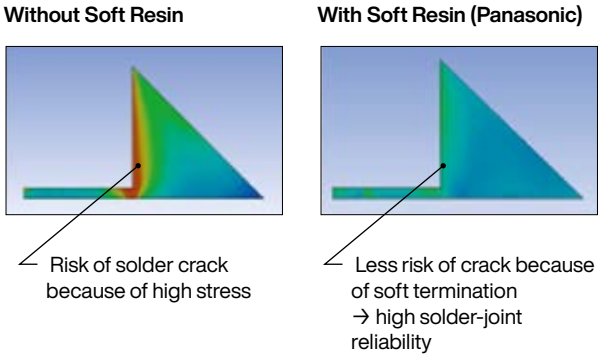
SOFT TERMINATION STRUCTURE

High solder joint reliability

One of the most common failure modes of conventional chip resistors is solder joint cracking. This phenomenon occurs especially during thermal cycling and can be attributed to the difference in CTE (Coefficient of Thermal Expansion) between PCB and resistor. When referring to an FR4 PCB as an example, this presents a CTE value of about 15 ppm/K, which is approximately two times the CTE of the resistor alumina substrate (equal to ~7.6 ppm/K). The different expansion and contraction ratio of PCB and resistor during thermal cycling induces a high stress at solder joint level, resulting in solder joint cracks and consequent disconnection of the resistor from the circuit.

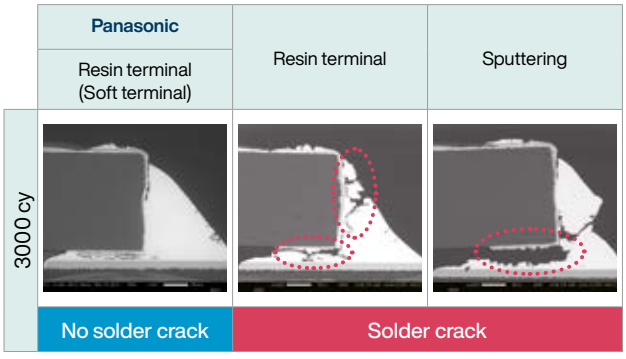
To avoid this issue, Panasonic has developed a patented technology called Soft Termination Technology, which consists in the use of a soft resin in the connection between the alumina substrate and the outer electrode. This resin provides enough flexibility between these two elements to lighten the stress at solder fillet level during thermal contraction and expansion.

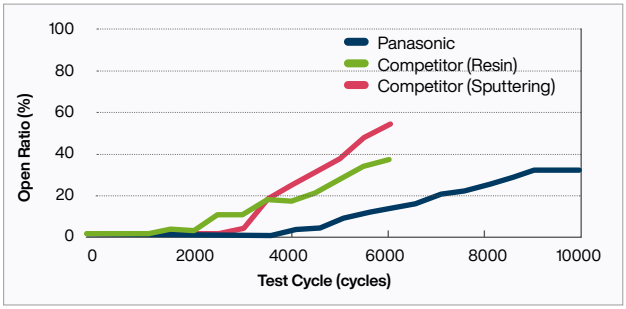




Due to the lower stress experienced at solder level, as opposed to sputtering or hard resin, cracks do not occur or occur much later in the chip's lifetime, thus decreasing the risk of failure or quality issues and improving system reliability during thermal cycles.

This technology, developed by Panasonic Industry, is used in every ERJ chip resistor manufactured by the Panasonic group. A case size higher than 0201 makes our components robust and reliable, even in harsh temperature conditions.





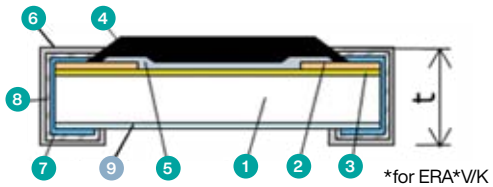
HIGH PRECISION CHIP RESISTORS

High stability and reliability

Panasonic's high reliability ERA*A thin film chip resistors are extremely well suited for automotive, transportation and measurement industries.
Their outstanding reliability is achieved by using a newly developed and high reliable metal thin film technology in conjunction with a moisture resistant (anti-oxidation) overcoat and an operating temperature of up to 155°C.
This structure enables them to reach one of the highest reliabilities in the market, with resistance drifts lower than 0.1% even under high temperature (155°C, 1000h) and high humidity (85°C/85%RH, 1000h) conditions.

The high stability and reliability type ERA*V/K series presents an improved anti-sulphurated performance and the highest level of ESD resistance by preventing concentration and reducing electric field strength.
Their structure is made of an edge-sputtering electrode, ensuring anti-sulfur performance, a smoother alumina surface which prevents charge concentration achieving the highest level of ESD resistance, and a backside resin layer that ensures improved robustness under temperature cycles.

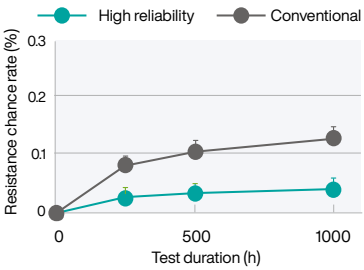
Structure (cross-section)



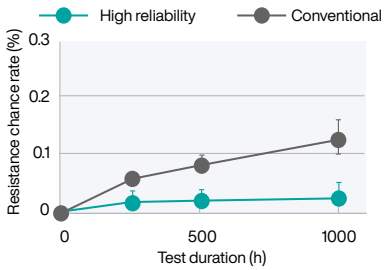
1. Aluminium substrate
2. Inner electrode (Cu)
3. Resistive element
4. Overcoating
5. Inorganic protective coating
6. Sn plating
7. Middle electrode
8. Ni plating
9. Absorbable layer*

Features & benefits

High Reliability:
85°C / 85% RH, 1000 h → ΔR<±0,1%

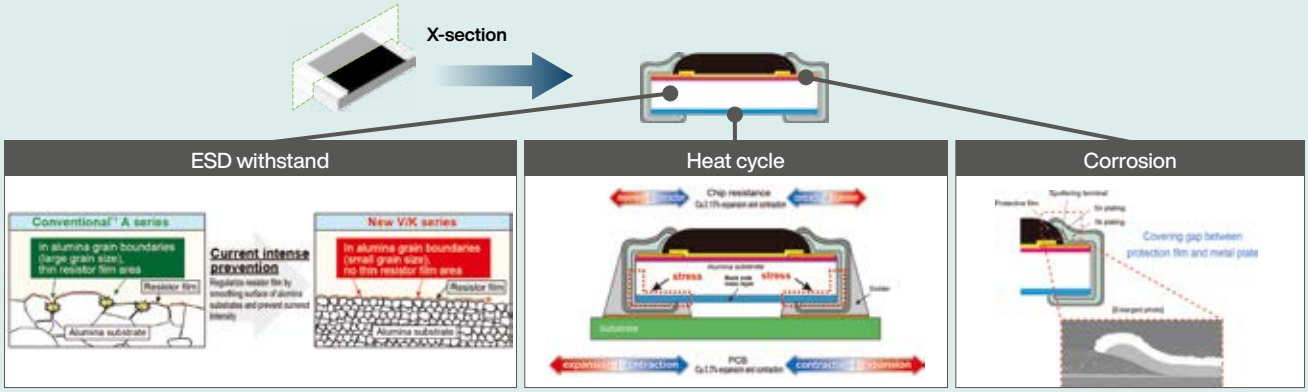


High Heat Resistance:
155°C, 1000 h → ΔR<±0,1%



- Temperature range: -55°C to +155°C. 100% rated power up to 85°C
- High voltage type ERA8P available: up to 500V @1MΩ
- Correspond to: AEC-Q200
- ESD-proof (HBM>2kV) & anti-sulphuration specifications for ERA*V series

ERA*V structure and features



HIGH POWER CHIP RESISTORS

Downsizing and component savings

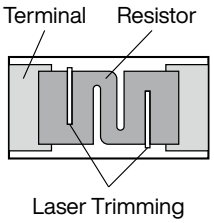
The increasing complexity of electronic circuitry has led to an increased demand in higher power devices across different industries nowadays.
Panasonic offers a wide portfolio of high-power resistors, that can handle high power loads while maintaining compact sizes. These resistors lead to advantages both in terms of cost reduction, manufacturing equipment simplification and design space-saving, but also to manufacturing equipment simplification and overall cost reduction.

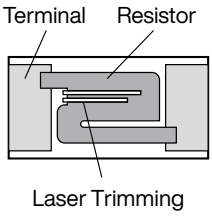
Power \ Size	0402	0603	0805	1206 / 0612	1210	2010 / 1020
2W						ERJB1/D1
1W				ERJB2/D2		
0.66W				ERJP08 / ERJUP8		ERJ12(0.75W)
0.5W			ERJHP6* / ERJP06 / ERJUP6		ERJP14	
0.33W					ERJ14	
0.25W		ERJPA3 / ERJUP3		ERJ8ENF		
0.2W	ERJPA2	ERJH3Q				
0.125W		ERJH3G	ERJ6ENF			
0.1W	ERJ2RKF / ERJH2G*	ERJ3EKF				

Higher Power in Smaller Size

Standard | Wide terminal (ERJB/D series) | High-Power (ERJP series) | Anti-Surge (ERJPA series) | Anti-Sulphurated (ERJUP series) | High temperature (ERJH series)

ANTI-SURGE TYPE Structure



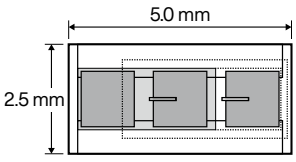


Features & benefits

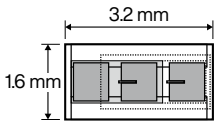
- Downsizing and high power load component and cost saving
- High pulse characteristics
- High voltage characteristics
- Excellent heat dissipation

WIDE TERMINAL Structure

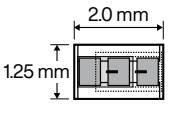
ERJB1, D1 (Size 1020)



ERJB2, D2 (Size 0612)



ERJB3 (Size 0508)



CURRENT SENSING CHIP RESISTORS

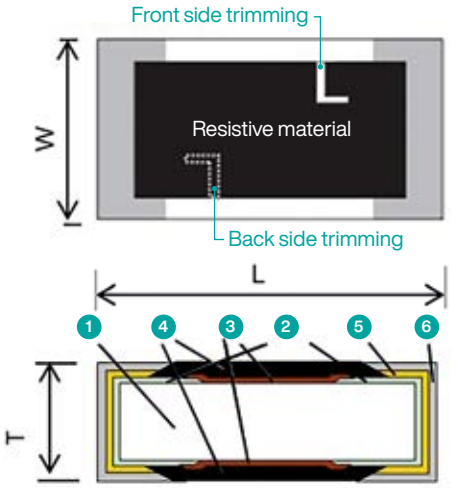
Current sensing resistors are designed with low resistances range to minimize heat and losses generated by higher current consumption in electronic devices.
The heat generation of a resistor depends on losses (I^2R). Therefore, heat generation can be reduced by lowering the resistance value.
The main parameters influencing the resistance value are: material resistivity (ρ), component length (L) and cross-sectional area (S): $R = \rho^* L / S$.

By improving the materials used in the resistance element and electrode and by optimizing the component structure, Panasonic develops current sensing chip resistors with low resistance and low temperature coefficient. To meet market demand, a wide range of current sensing resistors is available in different case sizes (0402 to 2512) and with several resistance values and utilizing different technologies.

Low ohmic chip resistors

The **ERJ*BW/CW** series can achieve low resistance values in small cases thanks to their double-sided structure. The structure uses a resistance film on both sides of a substrate and forming a rectangual shape to achieve a lower resistance. The presence of two resistive elements in parallel in a single chip gives them high power and overload characteristics.

Structure & dimensions



1. Aluminium substrate
2. Electrode (Inner)
3. Resistive element
4. Protective coating
5. Electrode (Middle)
6. Electrode (Outer)

Unit: mm

	L	W	T
ERJ2LW	1.00	0.50	0.40
ERJ2BW	1.00	0.50	0.35
ERJ3LW	1.60	0.80	0.55
ERJ3BW			
ERJ6LW	2.00	1.25	0.70
ERJ6BW	2.00	1.25	0.65
ERJ6CW	2.05	1.30	0.65
ERJ8BW	3.20	1.60	0.65
ERJ8CW			

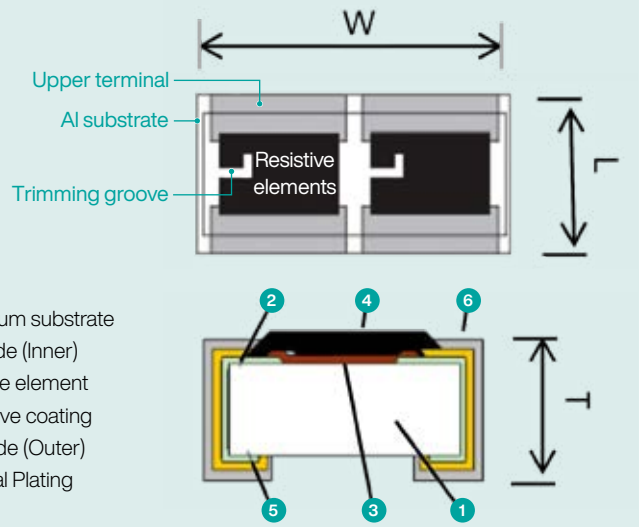
Features

- Wide range of resistance values starting from 5mΩ
- Large power dissipation capability
- Low TCR (±75ppm) available - ERJ6CW, ERJ8CW series

Wide terminal chip resistors

The **ERJB/D** series present excellent heat dissipation characteristics thanks to their wide terminal construction, while guaranteeing accurate current measurement thanks to their low temperature coefficient. Their high power and accuracy make them a valuable replacement solution for metal shunt resistors.

Structure & dimensions



1. Aluminium substrate
2. Electrode (Inner)
3. Resistive element
4. Protective coating
5. Electrode (Outer)
6. Terminal Plating

Unit: mm

	L	W	T
ERJA1	3.20	6.40	0.55
ERJB1	2.50	5.00	0.55
ERJD1	2.50	5.00	0.60
ERJB2 (R<10mΩ)	1.60	3.20	0.65
ERJB2 (R≥10mΩ)	1.60	3.20	0.55
ERJD2	1.60	3.20	0.65
ERJB3	1.25	2.00	0.50

Features

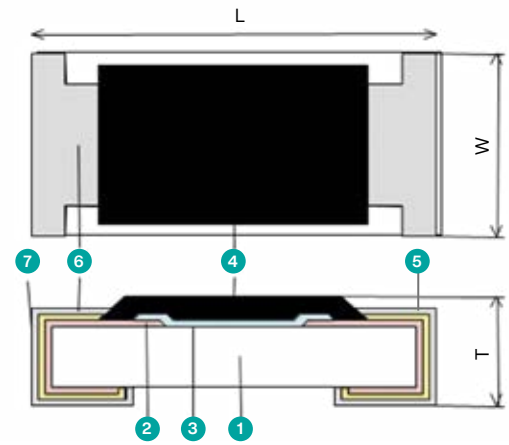
- High solder-joint reliability through a wide terminal structure yielding a reduction in solder-joint cracks
- Excellent heat dissipation characteristics through wide terminals & separated resistor structure which yields small & high-power characteristics

CHIP RESISTORS FOR TOUGH ENVIRONMENTS

High temperature chip resistors

Beside the high-power specification, the **ERJH** series enables electronic circuit designs to meet the demanding requirements of high temperature applications. Thanks to the use of a high-temperature resin coat, these resistors can be employed in environments reaching up to 175°C, while guaranteeing 100% rated power up to 105°C. Furthermore, the combination between resin coating and soft termination in the outer terminals, guarantees improved solder-joint reliability.

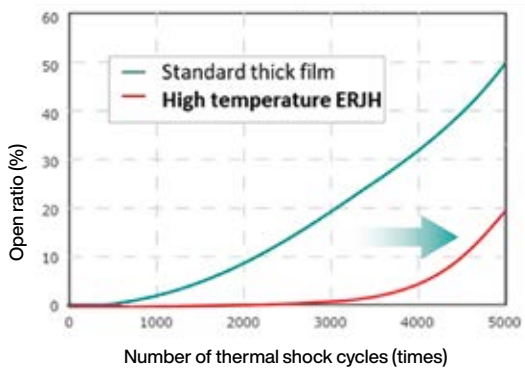
Structure



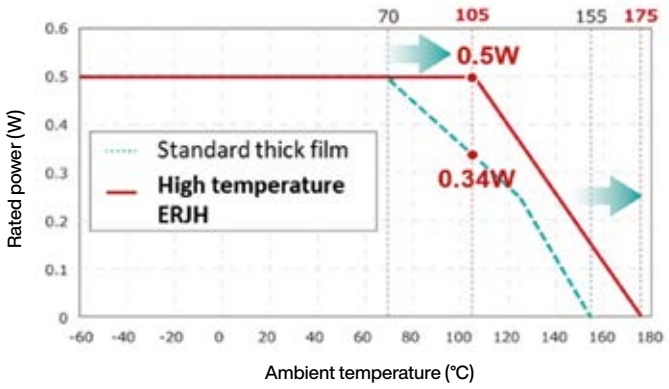
1. Aluminium substrate
2. Inner electrode
3. Resistive element
4. Protective coating
5. Middle Electrode
6. Outer Electrode
7. Outer Electrode (Ni/Si)

Open ratio in thermal shock test

Test conditions: -55°C/+175°C, 0603 size



Load reduction curve (0805 size)



Features

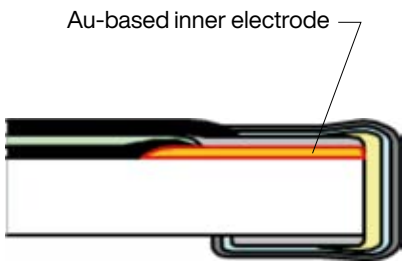
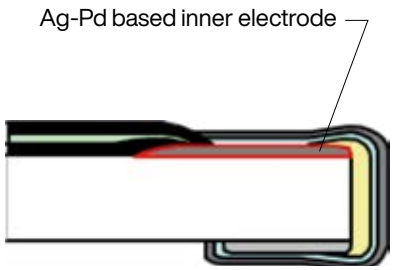
- Extended temperature range: -55 to 175°C
- 100% rated load up to 105°C
- Improvement of solder crack resistance

Anti-sulphurated chip resistors

Today oil contains considerable amounts of sulphur to improve lubrication. As a result, any circuitry mounted near the thermal engine must be protected to avoid sulphuration reactions.

Panasonic anti-sulphurated series guarantee sulphuration inhibition using gold (**ERJS** series) or silver with high concentration of palladium (**ERJU** series) as inner electrode material.

Structure

	ERJS series	ERJU series
Structure		
Sulphur-proof performance	**Excellent** **Theoretically no sulphur corrosion**	**Good** **Survives more than 12000h at sulphide oil immersion test**

Features

- High corrosion resistance – electrode disconnections caused by sulphuration and chlorination are avoided using Au/AgPd electrodes.
- High Reliability – especially in hazardous environments containing sulphur and chlorine.

SMD RESISTORS SERIES OVERVIEW

High precision chip resistors

	Appearance	Type	Case Size	Power Rating(W)	Resistance Range (Ω)	Resistance Tolerance (%)	T.C.R (ppm/°C)	Features
High precision chip resistors	Thin Film - High Stability and Reliability 0402 0603 0805 1206	ERA2V	0402	0.1	47 ~ 100k	± 0.1	± 25	• High Power: To realize higher power rating, Limiting element voltage, and maximum overload voltage than current products • High reliability: Stable at high temperature and humidity (85°C 85%RH rated load, Category temperature range: -55°C to +155°C) • High accuracy: Low resistance tolerance and temperature coefficient of resistance • High performance: Low current noise, excellent linearity • Anti-ESD: Original structure for high ESD performance (AEC-Q200-002 HBM Class 1c and above) • Anti-sulphurated: Original structure for sulphurated performance
					1k ~ 47k	± 0.1	± 15	
						± 0.1	± 10	
						± 0.05		
		ERA3V	0603	0.125	47 ~ 100k	± 0.1	± 25	
					1k ~ 100k	± 0.1	± 15	
						± 0.1	± 10	
						± 0.05		
		ERA3K	0603	0.125	102k ~ 240k	± 0.1	± 25	
		ERA6V	0805	0.25	47 ~ 100k	± 0.1	± 25	
					1k ~ 100k	± 0.1	± 15	
						± 0.1	± 10	
						± 0.05		
		ERA6K	0805	0.25	102k ~ 750k	± 0.1	± 25	
		ERA8V	1206	0.25	47 ~ 100k	± 0.1	± 25	
					1k ~ 100k		± 15	
					1k ~ 100k		± 10	
						± 0.05		
		ERA8K	1206	0.25	102k ~ 1M	± 0.1	± 25	
							± 15	
					102k ~ 160k		± 10	
						± 0.05		
	Thin Film - High Reliability 0201 0402 0603 0805 1206	ERA1A	0201	0.05	100 ~ 10k	± 0.1	± 25	• High reliability: Stable at high temperature and humidity (85°C 85%RH rated load, Category temperature range: -55°C to +155°C) • High accuracy: Low resistance tolerance and Temperature Coefficient of Resistance • High performance: Low current noise, excellent linearity • Reference standard: IEC 60115-8, JIS C 5201-8, JEITA RC-2133C
						± 0.25		
					100 ~ 10k	± 0.25	± 10	
						± 0.1		
					1k ~ 10k	± 0.05		
		ERA2A	0402	0.063	10 ~ 46.4	± 0.5	± 100	
					47 ~ 100k	± 0.5	± 25	
						± 0.25		
						± 0.1		
					200 ~ 47k	± 0.25	± 15	
						± 0.1		
					200 ~ 47k	± 0.25	± 10	
						± 0.1		
		ERA3A	0603	0.1	10 ~ 46.4	± 0.5	± 50	
					47 ~ 330k	± 0.5	± 25	
						± 0.25		
						± 0.1		
					470 ~ 100k	± 0.25	± 15	
						± 0.1		
					1k ~ 100k	± 0.25	± 10	
						± 0.1		
						± 0.05		

High precision chip resistors

	Appearance	Type	Case Size	Power Rating(W)	Resistance Range (Ω)	Resistance Tolerance (%)	T.C.R (ppm/°C)	Features
High precision chip resistors	Thin Film - High Reliability 0201 0402 0603 0805 1206	ERA6A	0805	0.125	10 ~ 46.4	± 0.5	± 50	• High reliability: Stable at high temperature and humidity (85°C 85%RH rated load, Category temperature range: -55°C to +155°C) • High accuracy: Low resistance tolerance and Temperature Coefficient of Resistance • High performance: Low current noise, excellent linearity • Reference standard: IEC 60115-8, JIS C 5201-8, JEITA RC-2133C
					47 ~ 1M	± 0.5	± 25	
						± 0.25		
						± 0.1		
					470 ~ 100k	± 0.25	± 15	
						± 0.1		
					1k ~ 100k	± 0.25	± 10	
						± 0.1		
						± 0.05		
		ERA8A	1206	0.25	10 ~ 46.4	± 0.5	± 50	
					47 ~ 1M	± 0.5	± 25	
						± 0.25		
						± 0.1		
					470 ~ 100k	± 0.25	± 15	
						± 0.1		
					1k ~ 100k	± 0.25	± 10	
						± 0.1		
						± 0.05		
	Thin Film - High Voltage 1206	ERA8P	1206	0.25	160 k ~ 1M	± 0.1	± 25 ; ± 15	• High voltage: Achieves high limiting element voltage with original design concept (500V @1MΩ) • High reliability: Stable at high temperature and humidity (85°C 85%RH rated load, Category temperature range: -55°C to +155°C) • High accuracy: Low resistance tolerance and Temperature Coefficient of Resistance • High performance: Low current noise, excellent linearity • Anti-ESD: Original structure for high ESD performance (AEC-Q200-002 HBM Guarantee at 4 kV) • Anti-sulphurated: Original structure for sulphurated performance
	Thick Film 0603 0805	ERJPB3	0603	0.2	200 ~ 100k	± 0.1 ; ± 0.5	± 50	• Achieve the resistance tolerance ±0.1% with high reliability metal glaze thick film resistor • Guarantee the Temperature Coefficient of Resistance ±50×10^-6 /K in high resistance range up to 1 MΩ • High power: 0.20 W & 0.25 W
		ERJPB6	0805	0.25	200 ~ 1M	± 0.1 ; ± 0.5	± 50	

SMD RESISTORS SERIES OVERVIEW

Current sensing chip resistors

	Appearance	Type	Case Size	Power Rating (W)	Resistance Range (Ω)	Resistance Tolerance (%)	T.C.R (ppm/°C)	Features
Current sensing chip resistors	Thick Film - Low Resistance 0402 0603 0805 1206 1210 1812 2010 2512	ERJ2LW	0402	0.2	10m	± 1, ± 2, ± 5	0 ~ +500	• Current sensing resistor • Small size and lightweight • Both low resistance & high precision thanks to original thick-film resistive element & special electrode structure • Suitable for both reflow and flow soldering • High-power characteristics thanks to a double-sided resistive element structure that aims to suppress temperature rising: ERJ2LW, 3LW, 6LW, 2BW, 3BW, 6BW, 8BW, 6CW,8CW • Low TCR: ±75×10^-6/K(ERJ6CW, ERJ8CW) • Low resistance value: Thick-film resistors available from 5 mΩ (ERJ3LW, 6LW)
		ERJ3LW	0603	0.25	5m	± 1, ± 2, ± 5	0 ~ +700	
					10m	± 1, ± 2, ± 5	0 ~ +300	
		ERJ6LW	0805	0.5	5, 6, 7, 8, 9 m	± 1, ± 2, ± 5	0 ~ +300	
		ERJ2BW	0402	0.25	47m ~ 100m	± 1, ± 2, ± 5	0 ~ +300	
		ERJ3BW	0603	0.33	20m ~ 100m	± 1, ± 2, ± 5	20 mΩ ≤ R < 39 mΩ: 0 ~ +250 39 mΩ ≤ R ≤ 100 mΩ: 0 ~ +150	
		ERJ6BW	0805	0.5	10m ~ 100m	± 1, ± 2, ± 5	10 mΩ ≤ R < 15 mΩ: 0 ~ +300 15 mΩ ≤ R ≤ 100 mΩ: 0 ~ +200	
		ERJ8BW	1206	1	10m ~ 100m	± 1, ± 2, ± 5	"10 mΩ ≤ R < 20 mΩ: 0 ~ +200 20 mΩ ≤ R < 47 mΩ: 0 ~ +150 47 mΩ ≤ R ≤ 100 mΩ: 0 ~ +100"	
		ERJ6CW	0805	0.5	10m ~ 30m	± 0.5, ± 1 ± 2, ± 5	± 75	
		ERJ8CW	1206	1	10m ~ 50m	± 1, ± 2, ± 5	± 75	
		ERJ2BS	0402	0.166	0.1 ~ 0.2	± 1, ± 2, ± 5	0.1Ω ≤ R < 0.22Ω: 0 ~ +300 0.22Ω ≤ R ≤ 1Ω: 0 ~ +250	
		ERJ2BQ	0402		0.22 ~ 1			
		ERJ3BS	0603	0.25	0.1 ~ 0.2	± 1, ± 2, ± 5	0.1Ω ≤ R < 0.22Ω: 0 ~ +300 0.22Ω ≤ R < 1Ω: 0 ~ +300 1Ω Ω ≤ R ≤ 9.1 Ω: ± 200	
		ERJ3BQ	0603		0.22 ~ 0.91			
					1 ~ 9.1			
		ERJ6DS	0805	0.5	0.1 ~ 0.2	± 0.5, ± 1 ± 2, ± 5	0.1Ω ≤ R < 0.22Ω: 0 ~ +150 0.22Ω ≤ R < 1Ω: 0 ~ +100 1Ω Ω ≤ R ≤ 9.1 Ω: ± 100	
		ERJ6DQ	0805		0.22 ~ 9.1			
		ERJ6BS	0805	0.33	0.1 ~ 0.2	± 1, ± 2, ± 5	0.1Ω ≤ R < 0.22Ω: 0 ~ +250 0.22Ω ≤ R < 1Ω: 0 ~ +250 1Ω Ω ≤ R ≤ 9.1 Ω: ± 200	
		ERJ6BQ	0805		0.22 ~ 0.91			
					1 ~ 9.1			
		ERJ8BS	1206	0.5	0.1 ~ 0.2	± 1, ± 2, ± 5	0.1Ω ≤ R < 0.22Ω: 0 ~ +250 0.22Ω ≤ R < 1Ω: 0 ~ +250 1Ω Ω ≤ R ≤ 9.1 Ω: ± 200	
		ERJ8BQ	1206		0.22 ~ 0.91			
					1 ~ 9.1			
		ERJ14BS	1210	0.5	0.1 ~ 0.2	± 1, ± 2, ± 5	0.1Ω ≤ R < 0.22Ω: 0 ~ +200 0.22Ω ≤ R < 1Ω: 0 ~ +200 1Ω Ω ≤ R ≤ 9.1 Ω: ± 100	
		ERJ14BQ	1210		0.22 ~ 0.91			
					1 ~ 9.1			
		ERJ3RS	0603	0.1	0.1 ~ 0.2	± 1, ± 2, ± 5	0.1Ω ≤ R < 0.22Ω: 0 ~ +300 0.22Ω ≤ R < 1Ω: 0 ~ +300 1Ω Ω ≤ R ≤ 9.1 Ω: ± 200	
		ERJ3RQ	0603		0.22 ~ 0.91	± 1, ± 2, ± 5		
					1 ~ 9.1			
		ERJ6RS	0805	0.125	0.1 ~ 0.2	± 1, ± 2, ± 5	0.1Ω ≤ R < 0.22Ω: 0 ~ +250 0.22Ω ≤ R < 1Ω: 0 ~ +250 1Ω Ω ≤ R ≤ 9.1 Ω: ± 200	
		ERJ6RQ	0805		0.22 ~ 0.91			
					1 ~ 9.1			
		ERJ8RS	1206	0.25	0.1 ~ 0.2	± 1, ± 2, ± 5	0.1Ω ≤ R < 0.22Ω: 0 ~ +250 0.22Ω ≤ R < 1Ω: 0 ~ +250 1Ω Ω ≤ R ≤ 9.1 Ω: ± 200	
		ERJ8RQ	1206		0.22 ~ 0.91			
					1 ~ 9.1			
		ERJ14RS	1210	0.25	0.1 ~ 0.2	± 1, ± 2, ± 5	0.1Ω ≤ R < 0.22Ω: 0 ~ +200 0.22Ω ≤ R < 1Ω: 0 ~ +200 1Ω Ω ≤ R ≤ 9.1 Ω: ± 100	
		ERJ14RQ	1210		0.22 ~ 0.91			
					1 ~ 9.1			

Current sensing chip resistors

	Appearance	Type	Case Size	Power Rating (W)	Resistance Range (Ω)	Resistance Tolerance (%)	T.C.R (ppm/°C)	Features
Current sensing chip resistors	Thick Film - Low Resistance 0402 0603 0805 1206 1210 1812 2010 2512	ERJ12RS	1812	0.5	0.1 ~ 0.2	± 1, ± 2, ± 5	0.1Ω ≤ R < 0.22Ω: 0 ~ +200 0.22Ω ≤ R < 1Ω: 0 ~ +200 1Ω Ω ≤ R ≤ 9.1 Ω: ± 100	• Current sensing resistor • Small size and lightweight • Both low resistance & high precision thanks to original thick-film resistive element & special electrode structure • Suitable for both reflow and flow soldering • High-power characteristics thanks to a double-sided resistive element structure that aims to suppress temperature rising: ERJ2LW, 3LW, 6LW, 2BW, 3BW, 6BW, 8BW, 6CW,8CW • Low TCR: ±75×10^-6/K(ERJ6CW, ERJ8CW) • Low resistance value: Thick-film resistors available from 5 mΩ (ERJ3LW, 6LW)
		ERJ12RQ	1812	0.5	0.22 ~ 0.91			
					1 ~ 9.1			
		ERJ12ZS	2010	0.5	0.1 ~ 0.2		0.1Ω ≤ R < 0.22Ω: 0 ~ +200 0.22Ω ≤ R < 1Ω: 0 ~ +200 1Ω Ω ≤ R ≤ 9.1 Ω: ± 100	
		ERJ12ZQ	2010	0.5	0.22 ~ 0.91			
					1 ~ 9.1			
		ERJ1TRS	2512	1	0.1 ~ 0.2	± 1, ± 2, ± 5	0.1Ω ≤ R < 0.22Ω: 0 ~ +200 0.22Ω ≤ R < 1Ω: 0 ~ +200 1Ω Ω ≤ R ≤ 9.1 Ω: ± 100	
		ERJ1TRQ	2512		0.22 ~ 0.91			
					1 ~ 9.1			
		ERJL03	0603	0.2	47m ~100m	± 1, ± 5	± 200	
		ERJL06	0805	0.25	47m ~100m		± 100	
		ERJL08	1206	0.33	47m ~100m		± 100	
		ERJL14	1210	0.33	20m ~100m		R < 47mΩ: ±300 R ≥ 47mΩ: ± 100	
		ERJL12	1812	0.5	20m ~100m			
		ERJL1D	2010	0.5	40m ~100m			
	Thick Film - High Power - Wide Terminal 0508 0612 1020 1225	ERJA1	1225	1.33	100m ~ 10k	± 1	±100	• High solder-joint reliability due to wide terminal construction • Excellent heat dissipation characteristics thanks to wide terminal construction
					10m ~ 10k	± 2, ± 5	10mΩ≤R<100mΩ: ±350 100mΩ≤R≤10kΩ: ±200	
		ERJB1	1020	2 (R≤10Ω)	10m ~ 10	± 1	±1% : 10mΩ ≤ R < 22mΩ: 0 ~ +350 22mΩ ≤ R < 47mΩ: 0 ~ +200 47mΩ ≤ R < 100mΩ: 0 ~ +150 100mΩ ≤ R ≤ 10kΩ: ±100 ±2%, ±5% : 10mΩ ≤ R < 22mΩ: 0 ~ +350 22mΩ ≤ R < 100mΩ: 0 ~ +200 100mΩ ≤ R ≤ 10kΩ: ±200	
						± 2, ± 5		
				1 (R>10Ω)	11 ~ 10k	± 1		
						± 2, ± 5		
		ERJB2	0612	1.5 (R≤1kΩ)	10m ~ 1k	± 1	±1% : 10mΩ ≤ R < 22mΩ: 0 ~ +300 22mΩ ≤ R < 47mΩ: 0 ~ +200 47mΩ ≤ R < 100mΩ: 0 ~ +150 100mΩ ≤ R ≤ 220mΩ: 0 ~ +100 220mΩ ≤ R ≤ 1MΩ: ±100 ±2%, ±5% : 5mΩ ≤ R < 22mΩ: 0 ~ +300 22mΩ ≤ R < 47mΩ: 0 ~ +200 47mΩ ≤ R < 100mΩ: 0 ~ +150 100mΩ ≤ R < 220mΩ: 0 ~ +200 220mΩ ≤ R ≤ 1MΩ: ±200	
						± 2, ± 5		
				0.75 (R>1kΩ)	1.1k ~ 1M	± 1		
						± 2, ± 5		
				1 (R≤10Ω)	10m ~ 10	± 1		
						± 2		
					5, 6, 7, 8, 9,10m ~ 10	± 5		
				0.75 (R>10Ω)	11 ~ 1M (E24)	± 1		
						± 2, ± 5		
		ERJB3	0508	1	20m ~ 10	± 1	±1% : 20mΩ ≤ R < 47mΩ: 0 ~ +300 47mΩ ≤ R < 1Ω: 0 ~ +200 1Ω≤R≤10Ω: ±100 ±2%, ±5 % : 20mΩ ≤ R < 47mΩ: 0 ~ +300 47mΩ ≤ R < 1Ω: 0 ~ +200 1Ω ≤ R ≤ 10Ω: ±200	
						± 2, ± 5		
				0.5 (R≤1Ω)	20m ~ 1	± 1		
						± 2, ± 5		
				0.33 (R>1Ω)	1.1 ~ 10	± 1		
						± 2, ± 5		

SMD RESISTORS SERIES OVERVIEW

Current sensing chip resistors

	Appearance	Type	Case Size	Power Rating (W)	Resistance Range (Ω)	Resistance Tolerance (%)	T.C.R (ppm/°C)	Features
Current sensing chip resistors	**Thick Film - Low TCR & High Power - Wide Terminal** **0612** **1020**	ERJD1	1020	2	10m ~ 200m	±1, ±5	±100	• Achieved High power and low TCR (±100×10-6/K) using wide terminal electrode structure and original material • Suitable for small size/high power current detection (Low TCR enables high accuracy of current detection) • High solder-joint reliability by wide terminal construction • Excellent heat dissipation characteristics by wide terminal construction
		ERJD2	0612	1	10m ~ 200m	±1, ±5	±100	

High power chip resistors

	Appearance	Type	Case Size	Power Rating (W)	Resistance Range (Ω)	Resistance Tolerance (%)	T.C.R (ppm/°C)	Features
Small & high-power chip resistors	**Thick Film - Anti-Surge** **0402** **0603** **0805** **1206** **1210**	ERJPA2	0402	0.2	10 ~ 1 M	±0.5, ±1	±0.5, ±1: ±100 ±5: ±200 R<10Ω: -100 ~ +600	• ESD surge characteristics superior to standard metal film resistors • High reliability: Metal glaze thick film resistive element and three layers of electrodes • Suitable for both reflow and flow soldering • High power • High precision, High voltage, High resistance value (ERJPM8): Limiting element voltage 500 V, Resistance tolerance ±1%, TCR ±100 (x 10^-6 / K)
					1 ~ 1 M	±5		
				0.25	10 ~ 1 M	±0.5, ±1		
					1 ~ 1 M	±5		
		ERJPA3	0603	0.25	10 ~ 1 M	±0.5, ±1	±0.5, ±1: ±100 ±5: ±200	
					1 ~ 1.5 M	±5		
				0.33	10 ~ 1 M	±0.5, ±1		
					1 ~ 1.5 M	±5		
		ERJP03	0603	0.2	10 ~ 1 M	±0.5	±150	
						±1	R < 10Ω: -150 ~ +400 10Ω ≤ R: ±200	
					1 ~ 1 M	±5		
		ERJP06	0805	0.5	10 ~ 1 M	±0.5, ±1	R < 33Ω: ±300 33Ω≤R: ±100	
					1 ~ 3.3 M	±5	R < 10Ω: -100 ~ +600 10Ω ≤ R < 33Ω: ±300 33Ω ≤ R: ±200	
		ERJP08	1206	0.66	10 ~ 1 M	±0.5, ±1	±100	
					1 ~ 10 M	±5	R<10Ω: -100 ~ +600 10Ω≤R: ±200	
		ERJPM8	1206	0.66	1.02 M ~ 10 M	±1	±100	
		ERJP14	1210	0.5	10 ~ 1 M	±0.5, ±1	±100	
					1 ~ 1 M	±5	R < 10Ω: -100 ~ +600 10Ω ≤ R: ±200	
	Thick Film - Anti-Pulse **0805** **1206** **1210**	ERJT06	0805	0.25	1 ~ 1 M	±5	R<10 Ω: -100 ~ +600 10 Ω≤R<33 Ω: ±300 33 Ω≤R: ±200	• Anti-Pulse characteristics • High pulse characteristics achieved by the optimized trimming specifications (ERJT06, T08, T14) • Further high pulse characteristics achieved by trimming-less specifications (ERJT14L) • High reliability: Metal glaze thick film resistive element and three layers of electrodes • Suitable for both reflow and flow soldering • High power
		ERJT08	1206	0.33	1 ~ 1 M	±5	R<10 Ω: -100 ~ +600 10 Ω≤R: ±200	
		ERJT14	1210	0.5	1 ~ 1 M	±5	R<10 Ω: -100 ~ +600 10 Ω≤R: ±200	
		ERJT14L	1210	0.5	1 ~ 1 M	±10; ±20	R<10 Ω: -100 ~ +600 10 Ω≤R: ±200	

Environmental resistant chip resistors

	Appearance	Type	Case Size	Power Rating (W)	Resistance Range (Ω)	Resistance Tolerance (%)	T.C.R (ppm/°C)	Features
High temperature thick film chip resistors	High Temperature 0402 0603 0805	ERJH2G	0402	0.1	1 ~ 300 k	± 5	R < 10Ω: -100 ~ +600 10Ω ≤ R: ±200	● High reliability: Metal glaze thick film resistive element and high temperature of electrodes structure ● Achieve maximum category temperature 175°C and rated category temperature 105°C ● Suitable for both reflow and flow soldering
		ERJH2C	0402	0.1	1 ~ 9.76	± 1	-100 ~ +600	
		ERJH2R	0402	0.1	10 ~ 300 k	± 0.5 ; ± 1	± 100	
		ERJH3G	0603	0.125	1 ~ 300 k	± 5	R < 10Ω: -100 ~ +600 10Ω ≤ R: ±200	
		ERJH3E	0603	0.125	10 ~ 300 k	± 0.5 ; ± 1	± 100	
		ERJH3Q	0603	0.25	1 ~ 9.76	± 0.5 ; ± 1	± 200	
					1 ~ 9.1	± 5		
		ERJHP6	0805	0.5	10 ~ 300 k	± 0.5	R < 33Ω: ±300 33Ω≤R: ±100	
					1 ~ 300 k	± 1	R < 10Ω: -100 ~ +600 10Ω ≤ R <33Ω: ±300 33Ω≤R: ±100	
					1 ~ 300 k	± 5	R < 10Ω: -100 ~ +600 10Ω ≤ R <33Ω: ±300 33Ω≤R: ±100	
Anti-sulphurated chip resistors	Thick Film - Au-based / Ag-based 01005 0201 0402 0603 0805 1206 1210 1812 2010 2512	ERJU0X	01005	0.031	10 ~ 1 M	±1	R<10 Ω: -100 ~ +600 10 Ω≤R<100 Ω: ±300	● High resistance to sulphurisation achieved by adopting an Au-based inner electrode (Series ERJS) and Ag-Pd-based inner electrode (Series ERJU) ● High reliability: Metal glaze thick film resistive element and three layers of electrodes ● Suitable for both reflow and flow soldering ● Low resistance type: ERJU6S, U6Q series: 0.1 Ω to 1 Ω
					1 ~ 1 M	±5	100 Ω≤R: ±200	
		ERJU01	0201	0.05	10 ~ 1 M	±1	R<10 Ω: -100 ~ +600 10 Ω to 1 MΩ: ±200 1 MΩ<R: -400 ~ +150	
					1 ~ 1 M	±5		
		ERJS02 ERJU02	0402	0.1	1 ~ 3.3 M	±0.5 ; ±1		
					1 ~ 10M	±5		
		ERJS03 ERJU03	0603	0.1	1 ~ 1 M	±0.5 ; ±1	R<10 Ω: -100 ~ +600 10 Ω ~ 1 MΩ: ±200 (± 5%) 10 Ω ~ 1MΩ: ±100 (±0.5%, ±1%) 1MΩ < R: -400 ~ +150	
					1 ~ 10 M	±5		
		ERJS06 ERJU06	0805	0.125	1 ~ 1 M	±0.5 ; ±1		
					1 ~ 10 M	±5		
		ERJS08 ERJU08	1206	0.25	1 ~ 1 M	±0.5 ; ±1		
					1 ~ 10 M	±5		
		ERJS14 ERJU14	1210	0.5	1 ~ 1 M	±0.5 ; ±1		
					1 ~ 10 M	±5		
		ERJS12 ERJU12	1812	0.75	1 ~ 1 M	±0.5 ; ±1		
					1 ~ 10 M	±5		
		ERJS1D ERJU1D	2010	0.75	1 ~ 1 M	±0.5 ; ±1		
					1 ~ 10 M	±5		
		ERJS1T ERJU1T	2512	1	1 ~ 1 M	±0.5 ; ±1		
					1 ~ 10 M	±5		
		ERJU6S	0805	0.25	0.1 ~ 0.2	±1, ±2, ±5	0 ~ 150	
		ERJU6Q			0.22 ~ 1			
	Thick Film - Precision 0402 0603 0805	ERJU2R	0402	0.1	100 ~ 100 k	±0.5	±50	● High resistance to sulphurisation achieved by adopting an Ag-Pd-based inner electrode ● High precision: Resistance tolerance: ±0.5%, TCR: ±50 ×10^-6/K ● High reliability: Metal glaze thick film resistive element and three layers of electrodes. ● Suitable for both reflow and flow soldering
		ERJU3R	0603	0.1	100 ~ 100 k	±0.5		
		ERJU6R	0805	0.125	100 ~ 100 k	±0.5		

SMD RESISTORS SERIES OVERVIEW

Environmental resistant chip resistors

	Appearance	Type	Case Size	Power Rating (W)	Resistance Range (Ω)	Resistance Tolerance (%)	T.C.R (ppm/°C)	Features
Anti-sulphurated chip resistors	Thick Film - Anti-Surge 0603 0805 1206	ERJUP3	0603	0.25	10 ~ 1 M	±0.5, ±1	±100	• High resistance to sulfurization achieved by adopting anti-Sulfurated electrode material (Ag-Pd-based inner electrode) and structure • ESD surge characteristics superior to standard metal film resistors • High reliability: Metal glaze thick film resistive element and three layers of electrodes • Suitable for both reflow and flow soldering • High power 0.25 W, 0.50 W 0.66 W
					1 ~ 1.5 M	±5	±200	
		ERJUP6	0805	0.5	10 ~ 1 M	±0.5, ±1	±100	
					1 ~ 3.3 M	±5	R<10 Ω: -100 ~ +600 10 Ω≤R: ±200	
		ERJUP8	1206	0.66	10 ~ 1 M	±0.5, ±1	±100	
					1 ~ 10 M	±5	R<10 Ω: -100 ~ +600 10 Ω≤R: ±200	
	Thick Film - Wide Terminal 1020	ERJC1	1020	2	10 m ~ 1	±1	10 mΩ ≤ R < 22 mΩ: 0 ~ +350 22 mΩ ≤ R < 47 mΩ: 0 ~ +200 47 mΩ ≤ R < 100 mΩ: 0 ~ +150 100 mΩ ≤ R ≤ 1 Ω: ±100	• High resistance to sulphurisation achieved by adopting anti-Sulphurated electrode material • (Ag-Pd-based inner electrode) and structure (covered electrode) • High solder-joint reliability by wide terminal construction • Excellent heat dissipation characteristics by wide terminal construction
						±5	10 mΩ ≤ R < 22 mΩ: 0 ~ +350 22 mΩ ≤ R < 100 mΩ: 0 ~ +200 100 mΩ ≤ R ≤ 1 Ω: ±200	

General purpose chip resistors

	Appearance	Type	Case Size	Power Rating (W)	Resistance Range (Ω)	Resistance Tolerance (%)	T.C.R (ppm/°C)	Features
General Purpose Chip Resistors	Thick Film - Precision 01005 0201 0402 0603 0805 1206 1210 1812 2010 2512	ERJ1RH	0201	0.05	1 k ~ 1 M	±0.5	±50	• Small size and lightweight • High reliability: Metal glaze thick film resistive element and three layers of electrodes • Compatible with placement machines: Taping packaging available • Suitable for both reflow and flow soldering • Low resistance tolerance: ERJXG, 1G, 2R, 3E, 6E, 8E, 14, 12, 1T series: ±1% ERJ1R, 2R, 3R, 6R series: ±0.5%
		ERJ2RH	0402	0.063	100 ~ 100 k	±0.5	±50	
		ERJ2RK	0402	0.063	10 ~ 97.6 102 k ~ 1 M	±0.5	±100	
		ERJ3RB	0603	0.1	100 ~ 100 k	±0.5	±50	
		ERJ3RE	0603	0.1	10 ~ 97.6 102 k ~ 1 M	±0.5	±100	
		ERJ6RB	0805	0.1	100 ~ 100 k	±0.5	±50	
		ERJ6RE	0805	0.1	10 ~ 97.6 102 k ~ 1 M	±0.5	±100	
		ERJXGN	01005	0.031	10 ~ 1 M	±1	R < 100 Ω: ±300 100 Ω ≤ R: ±200	
		ERJ1GN	0201	0.05	10 ~ 1 M	±1	±200	
		ERJ1GJ	0201	0.05	10 ~ 1 M	±1	±200	
		ERJ2RC	0402	0.1	1 ~ 9.76	±1	-100 ~ +600	
		ERJ2RK	0402	0.1	10 ~ 1 M	±1	±100	
		ERJ3EK	0603	0.1	10 ~ 1 M	±1	±100	
		ERJ6EN	0805	0.125	10 ~ 2.2 M	±1	±100	
		ERJ8EN	1206	0.25	10 ~2.2M	±1	±100	
		ERJ14N	1210	0.5	10 ~ 1 M	±1	±100	
		ERJ12N	1812	0.75	10 ~ 1 M	±1	±100	
		ERJ12S	2010	0.75	10 ~ 1 M	±1	±100	
		ERJ1TN	2512	1	10 ~ 1 M	±1	±100	

	Appearance	Type	Case Size	Power Rating (W)	Resistance Range (Ω)	Resistance Tolerance (%)	T.C.R (ppm/°C)	Features
General Purpose Chip Resistors	Thick Film 01005 0201 0402 0603 0805 1206 1210 1812 2010 2512	ERJXG	01005	0.031	1 ~ 1 M	±5	R<10Ω: -100 ~ +600 10Ω ~ 100Ω: ±300 100Ω≤R: ±200	• Small size and lightweight • High reliability: Metal glaze thick film resistive element and three layers of electrodes • Compatible with placement machines: Taping packaging available • Suitable for both reflow and flow soldering
		ERJ1GN	0201	0.05	1 ~ 10 M	±5	R < 10Ω: -100 ~ +600 10Ω ~ 1MΩ: ±200 1MΩ < R: -400 ~ +150	
		ERJ1GJ	0201	0.05	1 ~ 10 M	±5		
		ERJ2G	0402	0.1	1 ~ 10 M	±5		
		ERJ3G	0603	0.1	1 ~ 10 M	±5		
		ERJ6G	0805	0.125	1 ~ 10 M	±5		
		ERJ8G	1206	0.25	1 ~ 10 M	±5	R < 10Ω: -100 ~ +600 10Ω ~ 1MΩ: ±200 1MΩ < R: -400 ~ +150	
		ERJ14	1210	0.5	1 ~ 10 M	±5		
		ERJ12	1812	0.75	1 ~ 10 M	±5		
		ERJ12Z	2010	0.75	1 ~ 10 M	±5		
		ERJ1T	2512	1	1 ~ 1 M	±5		

Resistors network

	Appearance	Type	Case Size	Power Rating (W)	Resistance Range (Ω)	Resistance Tolerance (%)	T.C.R (ppm/°C)	Features
Resistors network	Chip Resistors Networks 1206 1608 2512 1506	EXBD	1206	0.05 / element	47 ~ 1 M	±5	±200	• High density placing for digital signal circuits • Bussed 8 or 15 resistors for pull up/down circuits • Available direct placing on the bus line by means of half pitch spacing without through-holes on PWB
		EXBE	1608	0.063 / element	47 ~ 1 M	±5	±200	
		EXBA	2512	0.063 / element	47 ~ 1 M	±5	±200	
		EXBQ	1506	0.025 / element	100 ~ 470 k	±5	±200	
	Chip Resistors Array 0201 x 2 0201 x 4 0402 x 2 0402 x 4 0602 x 8 0603 x 2 0603 x 4 0402 x 4 0603 x 2 0805 x 4	EXB14V	0201 x 2	0.031 / element	10 ~ 1 M	±5	R<10 Ω: -200 ~ +600 10 Ω ~ 1 MΩ: ±200	• High density • Improvement of placement efficiency • Placement efficiency of chip resistor array is two, four or eight times of the flat type chip resistor
		EXB18V	0201 x 4	0.031 / element	10 ~ 1 M	±5		
		EXB24V	0402 x 2	0.063 / element	1 ~ 1 M	±5		
		EXB28V	0402 x 4	0.063 / element	1 ~ 1 M	±5		
		EXB2HV	0602 x 8	0.063 / element	10 ~ 1 M	±5		
		EXB34V	0603 x 2	0.063 / element	1 ~ 1 M	±5		
		EXB38V	0603 x 4	0.063 / element	1 ~ 1 M	±5		
		EXBN8V	0402 x 4	0.031 / element	10 ~ 1 M	±5		
		EXBV4V	0603 x 2	0.063 / element	10 ~ 1 M	±5		
		EXBV8V	0603 x 4	0.063 / element	10 ~ 1 M	±5		
		EXBS8V	0805 x 4	0.1 / element	10 ~ 1 M	±5		
	Anti-sulphurated Array 0201 x 2 0201 x 4 0402 x 2 0402 x 4 0602 x 8 0603 x 2 0603 x 4	EXBU14	0201 x 2	0.031 / element	10 ~ 1 M	±5	R < 10 Ω: -200 ~ +600 10 Ω ~ 1 MΩ: ±200	• High resistance to sulphurisation achieved by adopting an Ag-Pd-based inner electrode • High density • Improvement of placement efficiency • Placement efficiency of chip resistor array is two, four or eight times of the flat type chip resistor
		EXBU18	0201 x 4	0.031 / element	10 ~ 1 M	±5		
		EXBU24	0402 x 2	0.063 / element	1 ~ 1 M	±5		
		EXBU28	0402 x 4	0.063 / element	1 ~ 1 M	±5		
		EXBU2H	0602 x 8	0.063 / element	10 ~ 1 M	±5		
		EXBU34	0603 x 2	0.063 / element	1 ~ 1 M	±5		
		EXBU38	0603 x 4	0.063 / element	1 ~ 1 M	±5		

EXPLANATION OF PART NUMBERS

High precision chip resistors

High Precision Thin Film - High Stability Type

1 2 3	4 5	6	7	8 9 10 11	12
E R A	3 A	A	B	1 0 5 1	V
Product code	Size, Power rating	Temperature Coefficient	Resistance Tolerance	Resistance value	Packaging methods
Thin film chip resistors				For E24 value, the first two digits are significant figures of resistance and the third one denotes number of zeros following. Example: 102→1 kΩ For E96 values, the first three digits are significant figures of resistance and the fourth one denotes number of zeros following. Example: 1051 → 1.05 kΩ	

Code	Inch	Power rating
1A	0201	0.05 W
2A	0402	0.063 W
3A	0603	0.1 W
6A	0805	0.125 W
8A	1206	0.25 W

Code	T.C.R
R	±10×10⁻⁶/K
P	±15×10⁻⁶/K
E	±25×10⁻⁶/K
H	±50×10⁻⁶/K
K	±100×10⁻⁶/K

Code	Tolerance
W	±0.05%
B	±0.1%
C	±0.25%
D	±0.5%

Code	Packaging	Type
C	Pressed carrier taping 2mm pitch, 15,000 pcs	ERA1A
X	Pressed carrier taping 2mm pitch, 10,000 pcs	ERA2A
V	Punched carrier taping 4mm pitch, 5,000 pcs	ERA3A, ERA6A, ERA8A

High Precision Thin Film - High Stability and Reliability Type

1 2 3	4 5	6	7	8 9 10 11	12
E R A	8 V	E	B	1 0 5 1	V
Product code	Size, Power rating	Temperature Coefficient	Resistance Tolerance	Resistance value	Packaging methods
Thin film chip resistors				The first digits are significant figures of resistance and the last one denotes number of zeros following. Examples: 1051 → 1.05 kΩ, 102 → 1 kΩ	

Code	Inch	Power rating
2V	0402	0.1W
3V	0603	0.125 W
3K		
6V	0805	0.25 W
6K		
8V	1206	0.25W
8K		

Code	T.C.R
R	±10×10⁻⁶/K
P	±15×10⁻⁶/K
E	±25×10⁻⁶/K
H	±50×10⁻⁶/K
K	±100×10⁻⁶/K

Code	Tolerance
W	±0.05%
B	±0.1%
C	±0.25%
D	±0.5%

Code	Packaging	Type
X	Pressed carrier taping 2mm pitch, 10,000 pcs	ERA2V
V	Punched carrier taping 4mm pitch, 5,000 pcs	ERA3V, ERA3K ERA6V, ERA6K ERA8V, ERA8K

High Precision Thin Film - High Voltage

1 2 3	4 5	6	7	8 9 10 11	12
E R A	8 P	E	B	1 6 9 3	V
Product code	Size, Power rating	Temperature Coefficient	Resistance Tolerance	Resistance value	Packaging methods
Thin film chip resistors				The first three digits are significant figures of resistance and the last one denotes number of zeros following. Example: 1693 → 169 kΩ	

Code	Inch	Power rating
8P	1206	0.25W

Code	T.C.R
P	±15×10⁻⁶/K
E	±25×10⁻⁶/K

Code	Tolerance
B	±0.1%

Code	Packaging	Type
V	Punched carrier taping 4mm pitch, 5,000 pcs	ERA8P

High precision thick film

1 2 3	4 5 6	7	8 9 10 11	12
E R J	P B 6	B	1 0 0 2	V
Product code	Size, Power rating	Resistance Tolerance	Resistance value	Packaging methods
Thick film chip resistors			The first three digits are significant figures of resistance and the fourth one denotes number of zeros following. Example: 5110 → 511 Ω	

Code	Inch	Power rating
PB3	0603	0.20W
PB6	0805	0.25W

Code	Tolerance
B	±0.1%
D	±0.5%

Code	Packaging	Type
V	Punched carrier taping 4mm pitch, 5,000 pcs	ERJPB3 ERJPB6

Current sensing chip resistors

Thick Film - Low Resistance - Double sided Type

1 2 3	4 5 6	7	8 9 10 11	12
E R J	2 B W	G	R 0 4 7	X
Product code	**Size, Power rating**	**Resistance tolerance**	**Resistance value**	**Packaging methods**
Thick film chip resistors			Shown by 4 digits or letters. Examples: R005: 0.005 Ω → 5 mΩ R047: 0.047 Ω → 47 mΩ	

Size, Power rating

Code	Inch	Power rating
2LW	0402	0.20W
3LW	0603	0.25W
6LW	0805	0.5W
2BW	0402	0.25W
3BW	0603	0.33W
6BW	0805	0.5W
8BW	1206	1W
6CW	0805	0.5W
8CW	1206	1W

Resistance tolerance

Code	Tolerance
D	±0.5%
F	±1%
G	±2%
J	±5%

Packaging methods

Code	Packaging	Type
X	Pressed carrier taping 2mm pitch, 10,000 pcs	ERJ2LW ERJ2BW
V	Punched carrier taping 4mm pitch, 5,000 pcs	ERJ3LW ERJ6LW ERJ3BW ERJ6BW ERJ8BW ERJ6CW ERJ8CW

Thick Film - High Power Type / Standard Type

1 2 3	4 5	6	7	8 9 10	11
E R J	8 R	Q	F	R 2 2	V
Product code	**Size, Power rating**	**Resistance value region**	**Resistance Tolerance**	**Resistance value**	**Packaging methods**
Thick film chip resistors				Shown by 3 digits or letters. Only when it is D (E24,E96) or F (E96), shown by 4 digits or letters. Examples: R22 →0.22Ω, R102→ 0.102Ω	

Size, Power rating

Code	Inch	Power rating
2B	0402	0.166W
3B	0603	0.25W
3R	0603	0.1W
6D	0805	0.5W
6B	0805	0.33W
6R	0805	0.125W
8B	1206	0.5W
8R	1206	0.25W
14B	1210	0.5W
14R	1210	0.25W
12R	1812	0.5W
12Z	2010	0.5W
1TR	2512	1W

Resistance value region

Code	Resistance value
S	0.1Ω to 0.2Ω
Q	0.22Ω to 9.1Ω

Resistance Tolerance

Code	Tolerance
D	±0.5%
F	±1%
G	±2%
J	±5%

Packaging methods

Code	Packaging	Type
X	Pressed carrier taping 2mm pitch, 10,000 pcs.	ERJ2B
V	Punched carrier taping 4mm pitch, 5,000 pcs.	ERJ3B/3R ERJ6D/6B/ERJ6R ERJ8B/8R
U	Embossed carrier taping 4mm pitch, 5,000 pcs.	ERJ14B/14R ERJ12R, ERJ12Z
	Embossed Carrier Taping 4mm pitch, 4,000 pcs.	ERJ1TR

Thick Film - Low TCR Type

1 2 3	4 5 6	7	8	9 10 11	12
E R J	L 0 3	U	F	5 0 M	V
Product code	**Size, Power rating**	**Resistance value region**	**Resistance Tolerance**	**Resistance value**	**Packaging methods**
Thick film chip resistors				Shown by 3 digits or letters. Example: 50M → 50mΩ, 10C→ 100mΩ	

Size, Power rating

Code	Inch	Power rating
L03	0603	0.2W
L06	0805	0,25W
L08	1206	0.33W
L14	1210	0.33W
L12	1812	0.5W
L1D	2010	0.5W

Resistance value region

Code	Resistance value
K	Standard (20 mΩ, 22 mΩ, 33 mΩ, 39 mΩ, 47 mΩ, 50 mΩ, 100 mΩ)
U	20mΩ to 100mΩ

Resistance Tolerance

Code	Tolerance
F	±1%
J	±5%

Packaging methods

Code	Packaging	Type
V	Punched carrier taping 4mm pitch, 5,000 pcs	ERJL03/ERJL06/ ERJL08
U	Embossed carrier taping 4mm pitch, 5,000 pcs.	ERJL14, ERJL12, ERJL1D

* L03, L06, L08: 47 mΩ to 100 mΩ
L1D: 40 mΩ to 100 mΩ

EXPLANATION OF PART NUMBERS

Current sensing chip resistors

High power Chip Resistors - Wide Terminal Type

1 2 3	4 5	6	7	8 9 10	11
E R J	A 1	A	J	1 0 2	U
Product code	Size, Power rating	Resistance value region	Resistance Tolerance	Resistance value	Packaging methods
Thick film chip resistors				Shown by three digits or letters. Only when it is impossible, shown by four digits or letters. Examples: 102 → 1.0kΩ, R01 → 0.01 Ω = 10mΩ, 4R7 → 4.7Ω, R015 → 0.015Ω = 15mΩ	

Size, Power rating

Code	Inch	Power rating
A1	1225	1.33W
B1	1020	2W (1W; R>10Ω)
B2	0612	1W (0.75W; R>10Ω)
B3	0508	0.5W (0.33W; R>1Ω)

Resistance value region

Code	Resistance value
A	10Ω ≤ R
B	0.22Ω ≤ R < 10Ω
C	0.01Ω ≤ R < 0.22Ω
D	0.005Ω ≤ R < 0.01Ω

Resistance Tolerance

Code	Tolerance
F	±1%
G	±2%
J	±5%

Packaging methods

Code	Packaging	Type
V	Punched carrier taping 4mm pitch, 5,000 pcs	ERJB2, ERJB3
U	Embossed carrier taping 4mm pitch, 5,000 pcs.	ERJB1
	Embossed carrier taping 4mm pitch, 4,000 pcs.	ERJA1

Low TCR High Power Chip Resistors - Wide Terminal Type

1 2 3	4 5 6	7	8 9 10 11	12
E R J	D 1 D	J	R 0 1 0	U
Product code	Size, Power rating, R range	Resistance Tolerance	Resistance value	Packaging methods
Thick film chip resistors			Shown by four letters. Example: R010 → 0.001 Ω = 10mΩ	

Size, Power rating, R range

Code	Inch	Power rating	Resistance value region
D1C	1020	2W	22 mΩ ≤R≤ 200 MΩ
D1D			0 mΩ ≤R≤ 20 mΩ
D2C	0612	1W	33 mΩ ≤R≤ 200 mΩ
D2D			10 mΩ ≤R≤ 30 mΩ

Resistance Tolerance

Code	Tolerance
F	±1%
J	±5%

Packaging methods

Code	Packaging	Type
V	Embossed carrier taping 4mm pitch, 5,000 pcs.	ERJD1
U	Punched carrier taping 4mm pitch, 5,000 pcs.	ERJD2

Anti-Sulphurated High Power Chip Resistors - Wide Terminal Type

1 2 3	4 5	6	7	8 9 10	11
E R J	C 1	C	F	R 1 0	U
Product code	Size, Power rating	Resistance value region	Resistance Tolerance	Resistance value	Packaging methods
Thick film chip resistors				Shown by 3 digits or letters. Only when it is impossible, shown by 4 digits or letters. Examples: R01: 0.01 Ω →10 mΩ, R015: 0.015 Ω→15 mΩ	

Size, Power rating

Code	Inch	Power rating
C1	1020	2W

Resistance value region

Code	Resistance value
B	220 mΩ ≤R≤ 1 Ω
C	10 mΩ ≤R< 220 mΩ

Resistance Tolerance

Code	Tolerance
F	±1%
J	±5%

Packaging methods

Code	Packaging	Type
U	Embossed carrier taping 4mm pitch, 5,000 pcs.	ERJC1

High power chip resistors

Anti-Surge Thick Film

1 2 3	4 5 6	7	8 9 10 11	12
E R J	P 0 6	D	1 0 0 2	V
Product code	Size, Power rating	Resistance Tolerance	Resistance value	Packaging methods
Thick film chip resistors			The first two or three digits are significant figures of resistance and the third or fourth one denotes number of zeros following. Three-digit type (±5%), Four-digit type (±1%, ±0.5%) Example: 222 → 2.2 KΩ 10R0 → 10 Ω 1002 → 10 KΩ	

Size, Power rating

Code	Inch	Power rating
PA2	0402	0.20W
P03	0603	0.20W
PA3		0.25W
P06	0805	0.50W
P08	1206	0.66W
PM8		
P14	1210	0.50W

Resistance Tolerance

Code	Tolerance
D	±0.5%
F	±1%
J	±5%

Packaging methods

Code	Packaging	Type
X	Punched carrier taping 2mm pitch, 10,000 pcs	ERJPA2
V	Punched carrier taping 4mm pitch, 5,000 pcs.	ERJP03 ERJPA3 ERJP06 ERJP08 ERJPM8
U	Embossed carrier taping 4mm pitch, 5,000 pcs.	ERJP14

Anti-Pulse Thick Film

1 2 3	4 5 6	7	8 9 10	11
E R J	T 0 6	J	1 0 0	V
Product code	Size, Power rating	Resistance Tolerance	Resistance value	Packaging methods
Thick film chip resistors			The first two digits are significant figures of resistance and the third one denotes number of zeros following. Examples: 222 → 2.2kΩ	

Size, Power rating

Code	Inch	Power rating
T06	0805	0.25W
T08	1206	0.33W
T14	1210	0.5W

Resistance Tolerance

Code	Tolerance
J	±5%

Packaging methods

Code	Packaging	Type
V	Punched carrier taping 4mm pitch, 5,000 pcs.	ERJT06 ERJT08
U	Embossed carrier taping 4mm pitch, 5,000 pcs.	ERJT14

Anti-Pulse Thick Film

1 2 3	4 5 6	7	8	9 10 11	12
E R J	T 1 4	L	M	1 0 0	U
Product code	Size, Power rating	Product specifications	Resistance Tolerance	Resistance value	Packaging methods
Thick film chip resistors				The first two digits are significant figures of resistance and the third one denotes number of zeros following. Example: 222 → 2.2 kΩ	

Size, Power rating

Code	Inch	Power rating
T14	1210	0.5W

Product specifications

Code	Specification
L	Trimming-less

Resistance Tolerance

Code	Tolerance
K	±10%
M	±20%

Packaging methods

Code	Packaging	Type
U	Embossed carrier taping 4mm pitch, 5,000 pcs	ERJT14L

EXPLANATION OF PART NUMBERS

Environmental resistant chip resistors

High Temperature Thick Film

1 2 3	4 5 6	7	8 9 10 11	12
E R J	H 2 R	D	1 0 0 2	X

1 2 3 — Product code

Product code
Thick film chip resistors

4 5 6 — Size, Power rating

Code	Inch	Power rating
H2G	0402	0.1W
H2C	0402	0.1W
H2R	0402	0.1W
H3G	0603	0.125W
H3E	0603	0.125W
H3Q	0603	0.25W
HP6	0805	0.5W

Jumper

Code	Inch	Rated current
H2G	0402	1A
H3G	0603	1A
H6G	0805	2A

7 — Resistance Tolerance

Code	Tolerance
D	±0.5%
F	±1%
J	±5%
0	Jumper

8 9 10 11 — Resistance value

The first two or three digits are significant figures of resistance and the third or fourth one denotes number of zeros following.
Three-digit type (±5%),
Four-digit type (±1%, ±0.5%)

Examples:
222 → 2.2 kΩ,
1002 → 10 kΩ,
4R7 → 4.7 Ω
Jumper is expressed by R00.

12 — Packaging methods

Code	Packaging	Type
X	Punched carrier taping 2mm pitch, 10,000 pcs	ERJH2G ERJH2C ERJH2R
V	Punched carrier taping 4mm pitch, 5,000 pcs.	ERJH3G ERJH3E ERJH3Q ERJHP6 ERJH6G

Anti-Sulphurated Thick Film

1 2 3	4 5 6	7	8 9 10 11	12
E R J	S 0 6	D	1 0 0 2	V

1 2 3 — Product code

Product code
Thick film chip resistors

4 5 6 — Size, Power rating

Code	Inch	Power rating
U0X	01005	0.031W
U01	0201	0.05W
S02 U02	0402	0.1W
S03 U03	0603	0.1W
S06 U06	0805	0.125W
S08 U08	1206	0.25W
S14 U14	1210	0.5W
S12 U12	1812	0.75W
S1D U1D	2010	0.75W
S1T U1T	2512	1W

7 — Resistance Tolerance

Code	Tolerance
D	±0.5%
F	±1%
J	±5%
0	Jumper

8 9 10 11 — Resistance value

The first two or three digits are significant figures of resistance and the third or fourth one denotes number of zeros following.
Three-digit type (±5%),
four-digit type (±0.5%, ±1%)

Example:
222 → 2.2 kΩ, 1002 → 10 kΩ
Jumper is expressed by R00.

12 — Packaging methods

Code	Packaging	Type
Y	Pressed carrier taping 2mm pitch, 20,000 pcs	ERJU0X
C	Pressed carrier taping 2mm pitch, 15,000 pcs	ERJU01
X	Punched carrier taping 2mm pitch, 10,000 pcs	ERJS02 ERJU02
V	Punched carrier taping 4mm pitch, 5,000 pcs.	ERJS03, ERJU03 ERJS06, ERJU06 ERJS08, ERJU08
U	Embossed carrier taping 4mm pitch, 5,000 pcs	ERJS14, ERJU14 ERJS12, ERJU12 ERJS1D, ERJU1D
	Embossed carrier taping 4mm pitch, 4,000 pcs	ERJS1T ERJU1T

Anti-Sulphurated Thick Film

1 2 3	4 5	6	7	8 9 10	11
E R J	U 6	S	J	R 2 0	V

1 2 3 — Product code

Product code
Thick film chip resistors

4 5 — Size, Power rating

Code	Inch	Power rating
U6	0805	0.25W

6 — Resistance value region

Inch	Resistance value region
S	0.1Ω≤R≤0.2Ω
Q	0.22Ω≤R≤1Ω

7 — Resistance Tolerance

Code	Tolerance
F	±1%
G	±2%
J	±5%

8 9 10 — Resistance value

Shown by three digits or letters.
Example:
R20: 0.20 Ω=200 mΩ
1R0: 1.0 Ω=1000 mΩ

11 — Packaging methods

Code	Packaging	Type
V	Punched carrier taping 4mm pitch, 5,000 pcs	ERJU6S ERJU6Q

Anti-sulphurated Thick Film (Precision Type)

1 2 3	4 5 6	7	8 9 10 11	12
E R J	U 3 R	D	1 0 0 2	V
Product code	Size, Power rating	Resistance Tolerance	Resistance value	Packaging methods
Thick film chip resistors			The first three digits are significant figures of resistance and the fourth one denotes number of zeros following. Example: 1002 → 10 kΩ	

Size, Power rating

Code	Inch	Power rating
U2R	0402	0.1 W
U3R	0603	0.1 W
U6R	0805	0.125 W

Resistance Tolerance

Code	Tolerance
D	±0.5%

Packaging methods

Code	Packaging	Type
X	Punched carrier taping 2mm pitch, 10,000 pcs	ERJU2R
V	Punched carrier taping 4mm pitch, 5,000 pcs	ERJU3R ERJU6R

Anti-sulphurated Thick Film (Anti-Surge Type)

1 2 3	4 5 6	7	8 9 10 11	12
E R J	U P 6	D	1 0 0 2	V
Product code	Size, Power rating	Resistance Tolerance	Resistance value	Packaging methods
Thick film chip resistors			The first two or three digits are significant figures of resistance and the third or fourth one denotes number of zeros following. Three-digit type (±5%), four-digit type (±0.5%, ±1%) Example: 222 → 2.2 kΩ, 1002 → 10 kΩ Jumper is expressed by R00.	

Size, Power rating

Code	Inch	Power rating
UP3	0603	0.25W
UP6	0805	0.5W
UP8	1206	0.66W

Resistance Tolerance

Code	Tolerance
D	±0.5%
F	±1%
J	±5%

Packaging methods

Code	Packaging	Type
V	Punched carrier taping 4mm pitch, 5,000 pcs.	ERJUP3 ERJUP6 ERJUP8

General purpose chip resistors

Thick Film

1 2 3	4 5 6	7	8	9 10 11	12
E R J	8 E N	Y	J	1 0 2	V
Product code	Size, Power rating	Marking	Resistance Tolerance	Resistance Value	Packaging methods
Thick film chip resistors				The first two digits are significant figures of resistance and the third one denotes number of zeros following. Jumper is expressed by R00. Example: 222 → 2.2 kΩ, 4R7 → 4.7 Ω	

Size, Power rating

Code	Inch	Power rating
XGN	01005	0.031W
1GN	0201	0.05W
1GJ		
2GE	0402	0.1W
3GE	0603	0.1W
8EN	1206	0.25W
14	1210	0.5W
12	1812	0.75W
12Z	2010	0.75W
1T	2512	1 W

Marking

Code	Marking
Y	Value marking on black side
*Nil	No marking

Resistance Tolerance

Code	Tolerance
J	±5%
0	Jumper

Packaging methods

Code	Packaging	Type
Y	Pressed carrier taping W8P2, 20,000 pcs	ERJXGN
U	Embossed carrier taping W4P1, 40,000 pcs	
C	Pressed carrier taping 2mm pitch, 15,000 pc	ERJ1GN ERJ1GJ
X	Punched carrier taping 2mm pitch, 10,000 pcs	ERJ2GE
V	Punched carrier taping 4mm pitch, 5,000 pcs	ERJ3GE ERJ6GE ERJ8GE
U	Embossed carrier taping 4mm pitch, 5,000 pcs	ERJ14 ERJ12 ERJ12Z
	Embossed carrier taping 4mm pitch, 4,000 pcs	ERJ1T

Precision Thick Film

1 2 3	4 5	6	6	8 9 10 11	12
E R J	3 R	B	D	1 0 0 2	V
Product code	Size, Power rating	T.C.R., Marking	Resistance Tolerance	Resistance value	Packaging methods
Thick film chip resistors				The first three digits are significant figures of resistance and the last one denotes number of zeros following. Example: 1002 → 10 KΩ	

Size, Power rating

Code	Inch	Power rating
1R	0201	0.05W
2R	0402	0.063W
3R	0603	0.1W
6R	0805	0.1W

T.C.R., Marking

Code	T.C.R.
H	±50 × 10^{-6}/K (1R, 2R)
B	±50 × 10^{-6}/K (3R, 6R)
K	±100 × 10^{-6}/K (2R)
E	±100 × 10^{-6}/K (3R, 6R)

Resistance Tolerance

Code	Tolerance
D	±0.5%

Packaging methods

Code	Packaging	Type
C	Pressed carrier taping 2mm pitch, 15,000 pc	ERJ1R
X	Punched carrier taping 2mm pitch, 10,000 pcs	ERJ2R
V	Punched carrier taping 4mm pitch, 5,000 pcs	ERJ3R ERJ6R

EXPLANATION OF PART NUMBERS

General purpose chip resistors

Precision Thick Film

1 2 3	4 5 6	7	8 9 10 11	12
E R J	6 E N	F	1 0 0 2	V
Product code	Size, Power rating	Resistance Tolerance	Resistance value	Packaging methods

Product code

Thick film chip resistors

Size, Power rating

Code	Inch	Power rating
XGN	01005	0.031W
1GN	0201	0.05W
1GJ		
2RC	0402	0.1W
2RK	0402	0.1W
3EK	0603	0.1W
6EN	0805	0.125W
8EN	1206	0.25 W
14N	1210	0.5W
12N	1812	0.75W
12S	2010	0.75W
1TN	2512	1W

Resistance Tolerance

Code	Tolerance
F	±1%

Resistance value

The first three digits are significant figures of resistance and the last one denotes number of zeros following.
Decimal point is expressed by „R".
Example: 1002 → 10 kΩ

Packaging methods

Code	Packaging	Type
Y	Pressed carrier taping W8P2, 20,000 pcs	ERJXGN
U	Embossed carrier taping W4P1, 40,000 pcs	
C	Pressed carrier taping 2mm pitch, 15,000 pc	ERJ1GN ERJ1GJ
X	Punched carrier taping 2mm pitch, 10,000 pcs	ERJ2RC ERJ2RK
V	Punched carrier taping 4mm pitch, 5,000 pcs	ERJ3EK ERJ6EN ERJ8EN
U	Embossed carrier taping 4mm pitch, 5,000 pcs	ERJ14N ERJ12N ERJ12S
	Embossed carrier taping 4mm pitch, 4,000 pcs	ERJ1TN

Resistors array

Chip Resistors Network

1 2 3	4	5 6	7	8 9 10	11	12
E X B	E	1 0	C	1 0 3	J	
Product code	Dimension code of chip resistor network	Nb of terminals	Circuit configuration	Resistance value	Resistance tolerance	Suffix for special requirements

Product code

Thick Film Resistor Network

Dimension code of chip resistor network

Code	Inch	Dimensions (mm)
D	1206	3.2×1.6
E	1608	4.0×2.1
A	2512	6.4×3.1
Q	1506	3.8×1.6

Nb of terminals

10 Terminals (EXBD, EXBE, EXBA)

16 Terminals (EXBQ)

Circuit configuration

Code	Common terminal position
C	Center common circuit (EXBD, EXBE)
P	Diagonal common circuit (Terminal 5 and Terminal 10) (EXBA)
P	One side common circuit (Terminal 16) (EXBQ)
E	Diagonal common circuit (Terminal 1 and Terminal 6) (EXBA)

Resistance value

The first two digits are significant figures of resistance value and the third one denotes the number of zeros following.

Resistance tolerance

Code	Tolerance
J	±5%

Suffix for special requirements

Chip Resistors Array

1 2 3	4 5	6	7 8 9	10	11
E X B	V 8	V	4 7 2	J	V

Product code

Product code
Thick Film Chip Resistor Network

Dimension code of chip resistor network

Code	Inch	Construction
14	0201×2	Convex terminal
18	0201×4	Flat terminal
24	0402x2	Convex terminal
28	0402x4	Convex terminal
2H	0602x8	Convex terminal
34	0603x2	Convex terminal
38	0603x4	Convex terminal
N8	0402x4	Concave terminal
V4	0603x2	Concave terminal
V8	0603x4	Concave terminal
S8	0805x4	Concave terminal

Schematics

Code	Schematics
V	Isolated type

Resistance value

The first two digits are significant figures of resistance value and the third one denotes the number of zeros following. Jumper is expressed by R00.
(Ex.) 222 → 2.2 k

Resistance Tolerance

Code	Tolerance
J	±5%
0	Jumper

Packaging methods

Code	Packaging	Type
Nil	Embossed carrier taping 4mm pitch, 2,500 pcs	EXBS8V
X	Punched carrier taping 2mm pitch, 10,000 pcs	EXB14V EXB18V EXB24V EXB28V EXBN8V
V	Punched carrier taping 4mm pitch, 5,000 pcs	EXB2HV EXB34V EXB38V EXBV4V EXBV8V

Anti-Sulphurated Chip Resistors Array

1 2 3	4 5 6	7 8 9	10	11
E X B	U 2 8	4 7 2	J	X

Product code

Product code
Thick Film Chip Resistor Network

Dimension code of chip resistor network

Code	Inch	Construction
U14	0201x2	Convex terminal
U18	0201x4	Flat terminal
U24	0402x2	Convex Terminal
U28	0402x4	Convex Terminal
U2H	0602x8	Convex Terminal
U34	0603x2	Convex Terminal
U38	0603x4	Convex Terminal

Resistance value

The first two digits are significant figures of resistance value and the third one denotes the number of zeros following.
Jumper is expressed by R00.
(Ex.) 222 → 2.2 kΩ

Resistance Tolerance

Code	Tolerance
J	±5%
0	Jumper

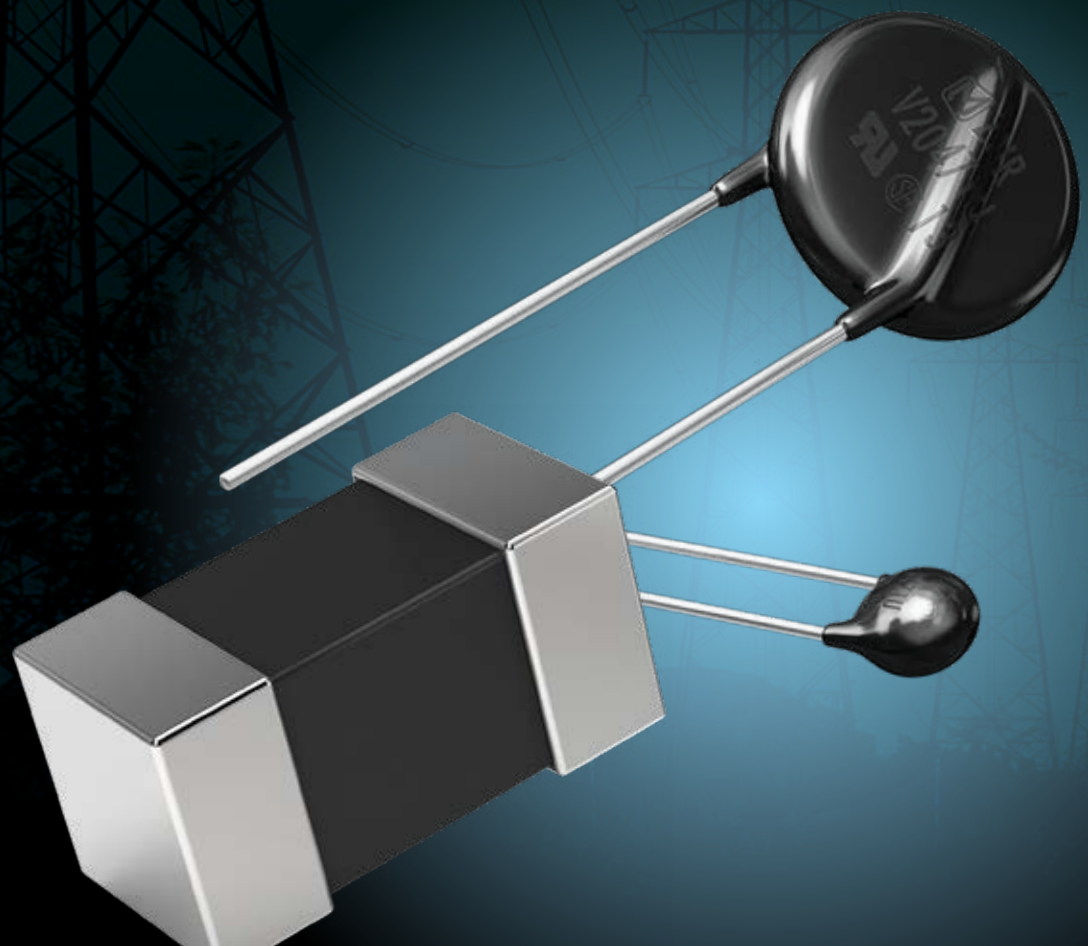
Packaging methods

Code	Packaging	Type
X	Punched carrier taping 2mm pitch, 10,000 pcs	EXBU14 EXBU18 EXBU24 EXBU28
V	Punched carrier taping 4mm pitch, 5,000 pcs	EXBU2H EXBU34 EXBU38

CIRCUIT PROTECTION

ESSENTIALS FOR RELIABLE CIRCUIT SAFETY AND PERFORMANCE

Panasonic Industry offers a comprehensive range of circuit protection components designed to ensure the safety and reliability of modern electronic devices. Our lineup includes ESD protection filters, ESD suppressors, NTC thermistors, common mode filters, and microchip fuses, each serving a critical role in preventing electrical malfunctions. ESD filters and suppressors protect sensitive components from electrostatic discharge, while NTC thermistors regulate current flow during temperature changes. Common mode filters reduce electromagnetic interference, and microchip fuses provide overcurrent protection. Together, these components are essential for safeguarding electrical circuits against damage, ensuring long-term performance and durability.



MULTILAYER CHIP VARISTORS (MLCV)

Automotive grade

With our years of experience from product know-how and core technology to manufacturing, multilayer varistors are one of our impeccable products which we are proud to offer to the automotive industry for general usage.
We have 3 special targeted applications in our lineups, the EZJZ/P-M series for automotive, the EZJZ/P series for ESD pulse (for DC voltage lines / low and high speed signal lines), and the EZJS series for general ESD pulse applications.

Go to Webseite

EZJZ-M, EZJP-M SERIES

- Excellent ESD suppression due to original advanced material technology
- Large electrostatic resistance that meets IEC61000-4-2, ISO10605 requirements
- Capable of replacing 2 Zener diodes and 1 capacitor thanks to having no polarity (bipolar)
- Great solderability thanks to lead-free plating terminal electrodes
- multilayer structure Wide range of products available, meeting various needs
- AEC-Q200 compliant
- RoHS compliant

Explanation of part numbers

1 2 3	4	5	6	7 8 9	10	11
E Z J	P	0	V	2 7 0	E	M
Product code	Code / Series	Code / Dimensions (mm) (inch)	Code / Packaging style	Nominal varistor voltage	Code / Capacitance / Code / Capacitance	Automotive grade

Code	Series
Z	EZJZ
P	EZJP

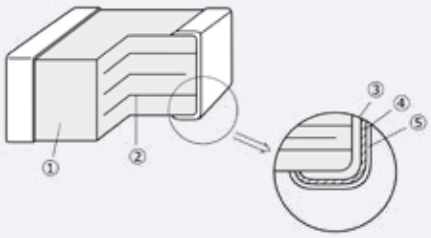
Code	Dimensions (mm) (inch)
0	1005 (0402)
1	1608 (0603)
2	2012 (0805)

Code	Packaging style
V	0402, 0603 Punched carrier taping
Y	0805 Embossed carrier tape

The first and second digits denote the first 2 numbers of the varistor voltage and the third digit indicates the number of zeros following.
The decimal point denotes in R.

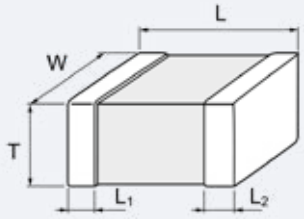
Code	Capacitance	Code	Capacitance
B	10 pF	F	68 pF
R	20 pF	G	100 pF
D	27 pF	H	150 pF
E	47 pF	J	220 pF
W	56 pF	K	330 pF

Construction



No.	Name	
1	Zinc oxide-based ceramics	
2	Internal electrode	
3	Terminal electrode	Substrate electrode
4		Intermediate electrode
5		External electrode

Dimensions in mm (not to scale)



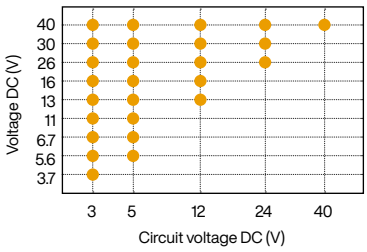
Size code	Size (inch)	L	W	T	L_1 L_2
0	0402	1.00 ± 0.05	0.50 ± 0.05	0.50 ± 0.05	0.2 ± 0.1
1	0603	1.6 ± 0.1	0.8 ± 0.1	0.8 ± 0.1	0.3 ± 0.2
2	0805	2.0 ± 0.2	1.25 ± 0.2	1.25 ± 0.2	0.5 ± 0.25

EZJZ-M, EZJP-M SERIES

Features

A wide variety of products is available thanks to the multilayer construction, which allows for a wide range of usages such as application to DC voltage lines and signal lines.

- Varistor voltage:
  12 to 100 V (at 1 mA)
- Capacitance:
  10 to 220 pF max. (at 1 MHz)



Recommended applications

- Engine ECU
- Various body ECU
- Communication line, such as CAN, LIN
- Audio, navigation
- LED light
- Control SW

Ratings and characteristics

Size (inch)	Part no.	Maximum allowable voltage DC (V)	Nominal varistor voltage at 1 mA (V)	Capacitance (pF)		Maximum peak current at 8/20 µs, 2 times (A)	Maximum ESD	
				at 1 MHz	at 1 kHz		IEC61000-4-2 150 pF / 330 Ω	ISO10605 330 pF / 2 kΩ
0402	EZJP0V120JM	7.5	12	220 max. [150 typ.]	175 typ.	10	Contact discharge 8 kV	Contact discharge 25 kV
	EZJP0V180HM	11	18	150 max. [120 typ.]	140 typ.	10		
	EZJP0V220HM	13	22	150 max. [100 typ.]	116 typ.	10		
	EZJP0V270GM	18	27	100 max. [85 typ.]	100 typ.	10		
	EZJP0V270EM	18	27	47 max. [33 typ.]	37 typ.	4		
	EZJP0V270RM	18	27	20 max. [15 typ.]	16.5 typ.	2		
	EZJP0V270BM	18	27	10 max. [8 typ.]	10 typ.	—		
	EZJP0V330GM	25	33	100 max. [85 typ.]	100 typ.	10		
	EZJP0V420WM	30	42	56 max. [40 typ.]	45 typ.	6		
	EZJP0V650DM	40	65	27 max. [22 typ.]	33 typ.	2		
	EZJP0V101BM	30	100	10 max. [8 typ.]	10 typ.	—		
0603	EZJP1V120KM	7.5	12	330 max. [250 typ.]	290 typ.	20		
	EZJP1V180JM	11	18	220 max. [180 typ.]	210 typ.	20		
	EZJP1V220JM	13	22	220 max. [160 typ.]	185 typ.	10		
	EZJP1V270GM	18	27	100 max. [85 typ.]	100 typ.	10		
	EZJP1V270EM	18	27	47 max. [33 typ.]	37 typ.	5		
	EZJP1V270RM	18	27	20 max. [15 typ.]	16.5 typ.	2		
	EZJP1V330GM	25	33	100 max. [85 typ.]	100 typ.	10		
	EZJP1V420FM	30	42	68 max. [55 typ.]	63 typ.	8		
	EZJP1V650DM	40	65	27 max. [22 typ.]	33 typ.	2		
	EZJZ1V180JM	11	18	220 max. [180 typ.]	210 typ.	20		
	EZJZ1V220JM	13	22	220 max. [160 typ.]	185 typ.	20		
	EZJZ1V270GM	18	27	100 max. [85 typ.]	100 typ.	20		
	EZJZ1V330GM	26	33	100 max. [85 typ.]	100 typ.	20		
	EZJZ1V420FM	30	42	68 max. [55 typ.]	63 typ.	15		
	EZJZ1V650DM	40	65	27 max. [22 typ.]	33 typ.	5		
NEW 0805	EZJZ2Y390KM	31	39	330 max. [210 typ.]	250 typ.	80*1		

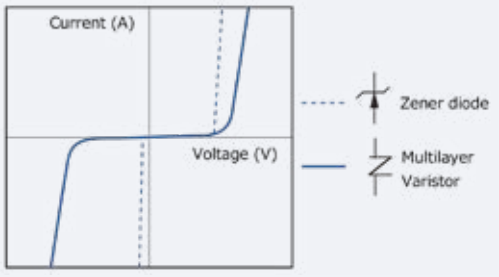
- Operating temperature range: EZJP-M series −55 to 150 °C · EZJZ-M series −55 to 125 °C

*1 Surge 1 time
* Recommend soldering method: Reflow soldering

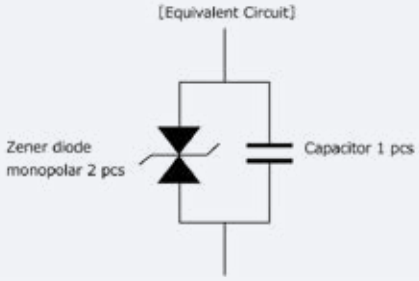
Maximum allowable voltage	Maximum DC voltage that can be applied continuously within the operating temperature range
Varistor voltage	Varistor starting voltage between terminals at DC 1 mA, also known as breakdown voltage
Maximum peak current	Maximum current that can be withstood under the standard pulse 8/20 µs, 2 times based
Maximum ESD	Maximum voltage that can be withstood under ESD

CHARACTERISTICS

Varistor characteristics and equivalent circuit

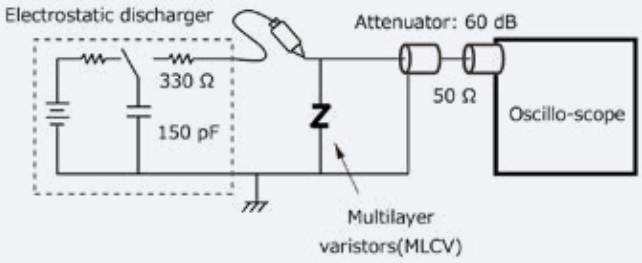


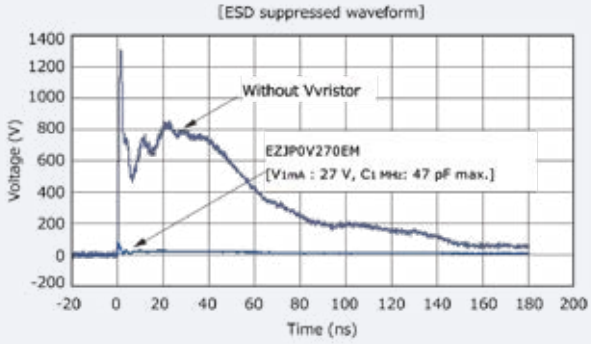
A multilayer varistor does not have an electrical polarity like Zener diodes and is equivalent to a total of 3 pieces, i.e. 2 Zener diodes and 1 capacitor.



ESD suppressive effects

Typical effects of ESD suppression
Test conditions: IEC61000-4-2* level 4 contact discharge, 8 kV



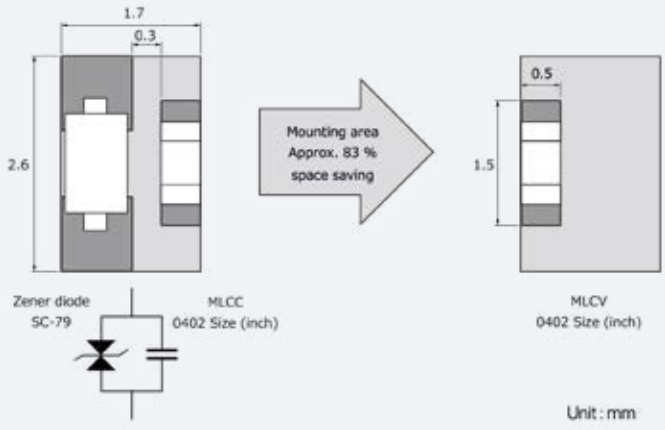


* IEC61000-4-2
International standard of the ESD testing method (HBM) for electronic equipment ability to withstand ESD generated from a human body. It sets 4 levels of severity

Severity	Level 1	Level 2	Level 3	Level 4
Contact discharge	2 kV	4 kV	6 kV	8 kV
Air discharge	2 kV	4 kV	8 kV	15 kV

Replacement of Zener diode

Replacing Zener diodes and a capacitor with a multilayer varistor reduces both mounting space and the number of components used.



PERFORMANCE AND TESTING

Performance and testing methods

Characteristics	Specifications	Testing method	
Standard test conditions		Electrical characteristics shall be measured under the following conditions. Temp.: 5 to 35 °C, relative humidity: 85 % or less	
Varistor voltage	To meet the specified value	The varistor voltage is the voltage (VC or VcmA) between both end terminals of a varistor when specified current (CmA) is applied to it. The measurement shall be made as quickly as possible to avoid heating effects.	
Maximum allowable voltage	To meet the specified value	The maximum DC voltage that can be applied continuously to a varistor.	
Capacitance	To meet the specified value	Capacitance shall be measured at the specified frequency, bias voltage 0 V, and measuring voltage 0.2 to 2.0 Vrms.	
Maximum peak current	To meet the specified value	The maximum current measured (varistor voltage tolerance is within ±10 %) when a standard impulse current of 8/20 μ seconds is applied twice with an interval of 5 minutes.	
Maximum ESD	To meet the specified value	The maximum ESD measured (while the varistor voltage is within blow ranges of its nominal value) when exposed to ESD 10 times (five times for each positive-negative polarity) based on IEC61000-4-2, ISO10605. EZJP□□□□□□M: within ±10 %, EZJZ□□□□□□M: within ±30 %	
Solder ability	To meet the specified value	The part shall be immersed into a soldering bath under the conditions below.	
		Solder	Sn-Ag-Cu
		Soldering flux	Ethanol solution of rosin (concentration approx. 25 wt%)
		Soldering temp.	230±5 °C
		Period	4±1s
		Soldering position	Immerse both terminal electrodes until they are completely into the soldering bath.
Resistance to soldering heat	ΔVc/Vc: within ±10 %	After the immersion, leave the part for 24 ±2 hours under the standard condition, then evaluate its characteristics. Soldering conditions are specified below.	
		Soldering conditions	270 °C , 3 s / 260 °C , 10 s
		Soldering position	Immerse both terminal electrodes until they are completely into the soldering bath.
Temperature cycling	ΔVc/Vc: within ±10 %	After repeating the cycles stated below for specified number of times, leave the part for 24±2 hours, then evaluate its characteristics.	

Cycle: 2000 cycles

Step	Temperature	Period
1	Max. operating temp.	30±3 min
2	Ordinary temp.	3 min max.
3	Min. operating temp.	30±3 min
4	Ordinary temp.	3 min max.

Vibration	ΔVc/Vc: within ±10 %	The varistor shall be soldered on the testing board shown
		G force: 5 G
		Vibration frequency range: 10 to 2000 Hz
		Sweet time: 20 min.
		Sweet direction: 12 cycles for 3 courses perpendicular each other
Mechanical shock	ΔVc/Vc: within ±10 %	The varistor shall be soldered on the testing board shown.
		Shock-wave formation: Half sine , 11 ms
		G force: 50 G
		Sweet direction: 6 directions of X, Y, Z, for each three times
Biased humidity	ΔVc/Vc: within ±10 %	After conducting the test under the conditions specified below, leave the part 24±2 hours, then evaluate its characteristics.
		Temp.: 85±2 °C
		Humidity: 80 to 85 % RH
		Applied voltage: Maximum allowable voltage (individually specified)
		Period: 2000 + 24/0 h
High temperature exposure (dry heat)	ΔVc/Vc: within ±10 %	After conducting the test under the conditions specified below, leave the part 24±2 hours, then evaluate its characteristics.
		Temp.: Maximum operating temperature ±3 °C (individually specified)
		Applied voltage: Maximum allowable voltage (individually specified)
		Period: 2000 + 24/0 h

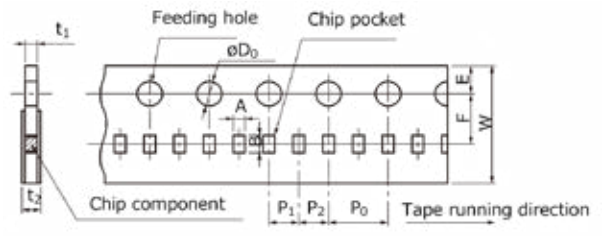
PACKAGING

Packaging methods (taping)

- Standard quantity

Series	Size code (inch size)	Thickness (mm)	Kind of taping	Pitch (mm)	Quantity (pcs/reel)
EZJZ, EZJP	0 (0402)	0.5	Punched carrier taping	2	10000
	1 (0603)	0.8	Punched carrier taping	4	4000
	2 (0805)	1.25	Embossed carrier tape	4	2000

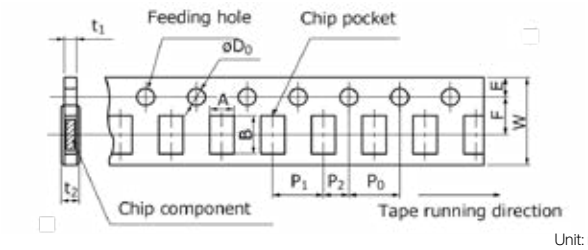
- 2mm pitch (punched carrier taping) size 0402



Unit: mm

Code	A	B	W	F	E	P_1	P_2	P_0	$øD_0$	t_1	t_2
EZJZ EZJP	0.62 ±0.05	1.12 ±0.05	8.0 ±0.2	3.50 ±0.05	1.75 ±0.10	2.00 ±0.05	2.00 ±0.05	4.0 ±0.1	1.5 +0.1 0	0.7 max.	1.0 max.

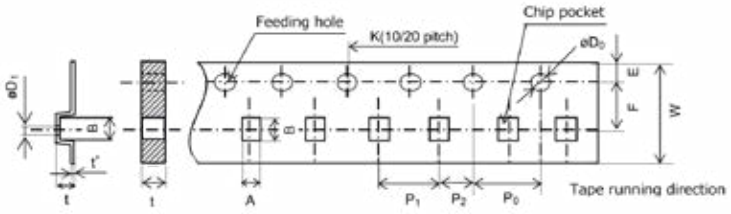
- 4mm Pitch (Punched carrier taping) Size 0603



Unit: mm

Code	A	B	W	F	E	P_1	P_2	P_0	$øD_0$	t_1	t_2
EZJZ EZJP	1.0 ±0.1	1.8 ±0.1	8.0 ±0.2	3.50 ±0.05	1.75 ±0.10	4.0 ±0.1	2.00 ±0.05	4.0 ±0.1	1.5 +0.1 0	1.1 max.	1.4 max.

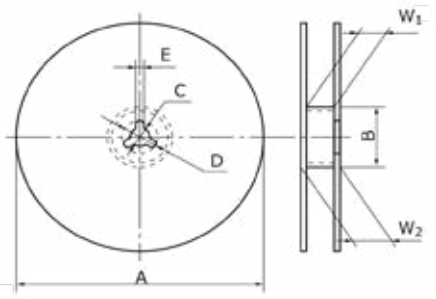
- 4mm pitch (embossed carrier tape) size 0805



Unit: mm

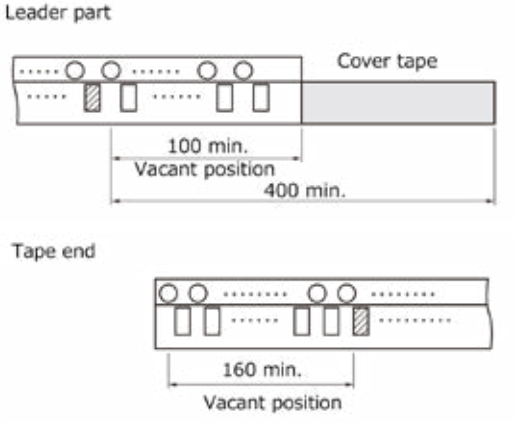
Code	A	B	W	F	E	P_1	P_2	P_0	$øD_0$	t	t'	K
EZJZ	1.45 ±0.1	2.25 ±0.1	8.0 ±0.2	3.50 ±0.05	1.75 ±0.10	4.0 ±0.1	2.00 ±0.05	4.0 ±0.1	1.5 +0.1 0	1.42 ±0.1	0.25 ±0.05	40.0 +0.15/ 10 pitch

- Reel for taping



Unit: mm

Code	A		B		C	D	E	W_1		W_2
EZJZ EZJP	ø180	0 −3	ø60.0	+1.0 0	13.0±0.5	21.0±0.8	2.0±0.5	9.0	+1.0 0	11.4±1.0



VARISTORS (ZNR SURGE ABSORBER)

D type / E-S1 series

Varistors (ZNR surge absorbers) of the E-S1 series achieve a high capability for absorbing transient overvoltages in a compact size. They are also suitable for surge protection at high temperatures.

Go to Webseite

D TYPE / E-S1 SERIES

Features

- Large withstanding surge current capability in compact sizes
- Withstanding surge current at max. 125°C
- Large “Energy handling capability” absorbing transient overvoltages in compact sizes
- Wide range of varistor voltages
- RoHS compliant

Recommended applications

- Transistor, diode, IC, thyristor or triac semiconductor protection
- Surge protection in consumer electronic equipment
- Surge protection in communication, measuring or controller electronics
- Surge protection in electronic home appliances, gas or petroleum appliances

Applicable standards

- UL1449 (VZCA2 / UL, VZCA8 / C-UL)
- VDE IEC61051-1, -2, -2-2, IEC60950-1 Annex Q, IEC62368-1 G8.2
- CQC (GB / T10193, GB / T10194, GB4943.1, GB8898)

Refer to "Standard products" and "Application note for safety standards" for the details.
As for handling precautions and minimum quantity / packing unit please see related information.

Explanation of part numbers I E-S1 series

1 2 3	4 5 6	7	8 9 10	11 12
E R Z	E	A		S 1
Product code	Code / Series	Code / Lead configuration	Nominal varistor voltage	Code / Design

Code	Series
E11	E11-S1
E14	E14-S1

Code	Lead configuration	
	Configuration	Packaging
A	Straight lead	Bulk

The first two digits are significant figures and the third one denotes the number of zeros following.

Code	Design
S1	Long lead type
SC	Lead cut type

D TYPE / E11-S1 SERIES

Reference guide to standard products

Part no.	Applicable standards		Varistor voltage at 1 mA	Maximum allowable voltage		Clamping voltage at 8/20 µs		Maximum peak current at 8/20 µs (A)		
	Type name	Approvals	(V)	ACrms (V)	DC (V)	max. (V)	Ip (A)	85 °C 1 time	125 °C 1 time	125 °C 2 times
ERZE11A201S1	E11201	○☆★◇◆	200 (185 to 225)	130	170	340	50	6000	5000	4500
ERZE11A221S1	E11221	○☆★◇◆	220 (198 to 242)	140	180	360	50	6000	5000	4500
ERZE11A241S1	E11241	○☆★◇◆	240 (216 to 264)	150	200	395	50	6000	5000	4500
ERZE11A271S1	E11271	○☆★◇◆	270 (247 to 303)	175	225	455	50	6000	5000	4500
ERZE11A331S1	E11331	○☆★◇◆	330 (297 to 363)	210	270	545	50	6000	5000	4500
ERZE11A361S1	E11361	○☆★◇◆	360 (324 to 396)	230	300	595	50	6000	5000	4500
ERZE11A391S1	E11391	○☆★◇◆	390 (351 to 429)	250	320	650	50	6000	5000	4500
ERZE11A431S1	E11431	○☆★◇◆	430 (387 to 473)	275	350	710	50	6000	5000	4500
ERZE11A471S1	E11471	○☆★◇◆	470 (423 to 517)	300	385	775	50	6000	5000	4500
ERZE11A511S1	E11511	○☆★◇◆	510 (459 to 561)	320	410	845	50	6000	5000	4500
ERZE11A561S1	E11561	○☆★◇◆	560 (504 to 616)	350	450	930	50	6000	5000	4500
ERZE11A621S1	E11621	○☆★◇◆	620 (558 to 682)	385	505	1025	50	5000	5000	4500
ERZE11A681S1	E11681	○☆★◇◆	680 (612 to 748)	420	560	1120	50	5000	5000	4500
ERZE11A751S1	E11751	○☆★◇◆	750 (675 to 825)	460	615	1240	50	5000	5000	4500
ERZE11A821S1	E11821	○☆★◇◆	820 (738 to 902)	510	670	1355	50	5000	5000	4500
ERZE11A911S1	E11911	○☆★◇◆	910 (819 to 1001)	550	745	1500	50	5000	5000	4500
ERZE11A102S1	E11102	○☆★◇◆	1000 (900 to 1100)	625	825	1650	50	5000	5000	4500
ERZE11A112S1	E11112	○☆★◇◆	1100 (990 to 1210)	680	895	1815	50	5000	5000	4500

Maximum allowable voltage and maximum peak current at 8/20 µs (A) at 125 °C

○: UL1449 (VZCA2/UL, VZC A8/C-UL) ☆: VDE (IEC61051-1, -2, -2-2) ★: VDE (IEC60950-1 Annex Q, IEC62368-1 G8.2)

◇: CQC (GB/T10193, GB/T10194) ◆: CQC (GB4943.1, GB8898)

Approval number (file no.) of safety regulations are subject to change without notice. Ask the factory for a copy of the latest file number.

Ratings and characteristics

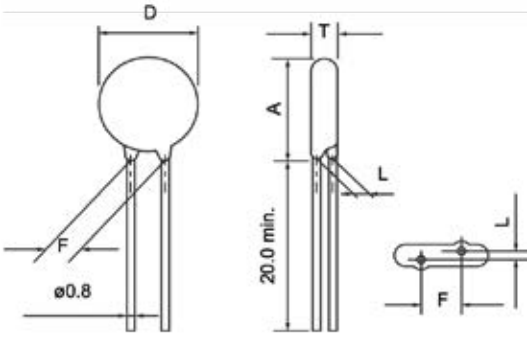
- Operating temperature range: –40 to 125 °C
- Storage temperature range: –40 to 125 °C

Part no.	Varistor voltage at 1 mA	Maximum allowable voltage		Clamping voltage (max.) *Ip	Rated power	Maximum energy		Maximum peak current at 8/20 µs			Capacitance (max.) at 1 kHz
	(V)	ACrms (V)	DC (V)	(V)	(W)	(J)	(J)	(A)	(A)	(A)	(pF)
ERZE11A201S1	200 (185 to 225)	130	170	340	0.6	70	50	6000	5000	4500	690
ERZE11A221S1	220 (198 to 242)	140	180	360	0.6	78	55	6000	5000	4500	660
ERZE11A241S1	240 (216 to 264)	150	200	395	0.6	84	60	6000	5000	4500	620
ERZE11A271S1	270 (247 to 303)	175	225	455	0.6	99	70	6000	5000	4500	580
ERZE11A331S1	330 (297 to 363)	210	270	545	0.6	115	80	6000	5000	4500	520
ERZE11A361S1	360 (324 to 396)	230	300	595	0.6	130	90	6000	5000	4500	480
ERZE11A391S1	390(351 to 429)	250	320	650	0.6	140	100	6000	5000	4500	450
ERZE11A431S1	430 (387 to 473)	275	350	710	0.6	155	110	6000	5000	4500	400
ERZE11A471S1	470 (423 to 517)	300	385	775	0.6	175	125	6000	5000	4500	360
ERZE11A511S1	510 (459 to 561)	320	410	845	0.6	190	136	6000	5000	4500	310
ERZE11A561S1	560 (504 to 616)	350	450	930	0.6	190	136	6000	5000	4500	310
ERZE11A621S1	620 (558 to 682)	385	505	1025	0.6	190	136	5000	5000	4500	300
ERZE11A681S1	680 (612 to 748)	420	560	1120	0.6	190	136	5000	5000	4500	290
ERZE11A751S1	750 (675 to 825)	460	615	1240	0.6	210	150	5000	5000	4500	280
ERZE11A821S1	820 (738 to 902)	510	670	1355	0.6	235	165	5000	5000	4500	260
ERZE11A911S1	910 (819 to 1001)	550	745	1500	0.6	255	180	5000	5000	4500	240
ERZE11A102S1	1000 (900 to 1100)	625	825	1650	0.6	280	200	5000	5000	4500	220
ERZE11A112S1	1100 (990 to 1210)	680	895	1815	0.6	310	220	5000	5000	4500	200

* Ip measuring current of clamping voltage: 50 A

Dimensions in mm (not to scale)

Part no.	D max.	T max.	F±1.0	A max.	L±1.0
ERZE11A201S1	13.0	5.2	7.5	17.0	1.9
ERZE11A221S1	13.0	5.3	7.5	17.0	2.0
ERZE11A241S1	13.0	5.4	7.5	17.0	2.1
ERZE11A271S1	13.0	5.6	7.5	17.0	2.3
ERZE11A331S1	13.0	5.9	7.5	17.0	2.6
ERZE11A361S1	13.0	6.1	7.5	17.0	2.8
ERZE11A391S1	13.0	6.2	7.5	17.0	2.9
ERZE11A431S1	13.0	6.4	7.5	17.0	3.1
ERZE11A471S1	13.0	6.6	7.5	17.0	3.3
ERZE11A511S1	13.0	6.8	7.5	17.0	3.5
ERZE11A561S1	13.0	7.2	7.5	17.0	3.8
ERZE11A621S1	14.0	7.5	7.5	18.0	4.2
ERZE11A681S1	14.0	7.8	7.5	18.0	4.5
ERZE11A751S1	14.0	8.2	7.5	18.0	4.9
ERZE11A821S1	14.0	8.5	7.5	18.0	5.2
ERZE11A911S1	14.0	9.0	7.5	18.0	5.7
ERZE11A102S1	14.0	9.5	7.5	18.0	6.2
ERZE11A112S1	14.0	10.1	7.5	18.0	6.8

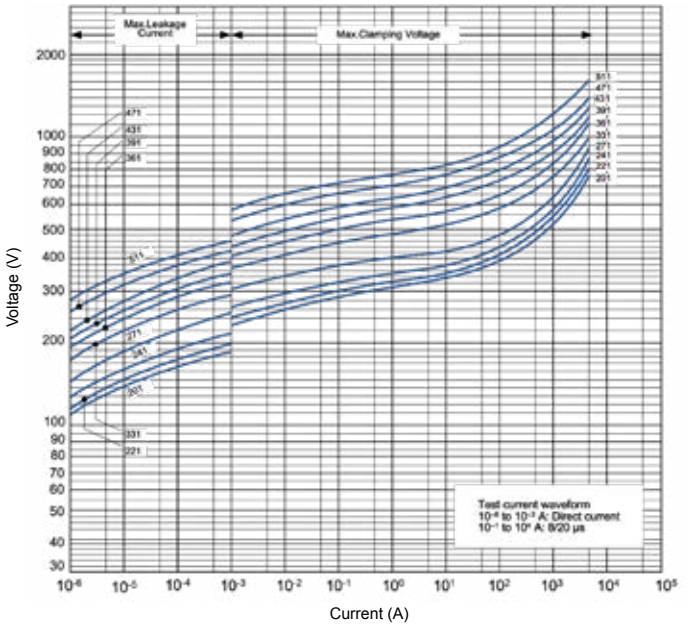


D TYPE / E11-S1 SERIES

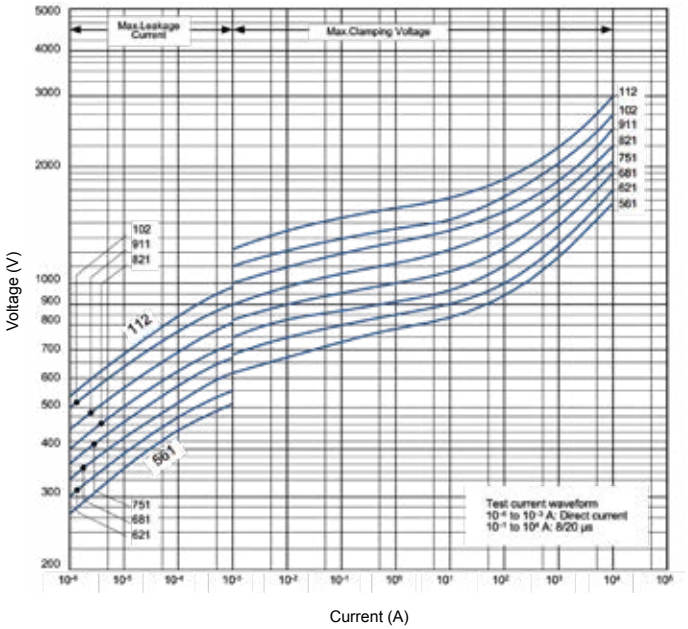
Typical characteristics

- Voltage vs. current

ERZE11A201S1 to ERZE11A511S1

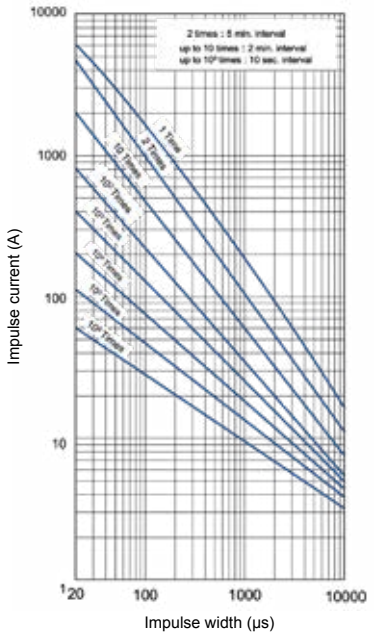


ERZE11A561S1 to ERZE11A112S1

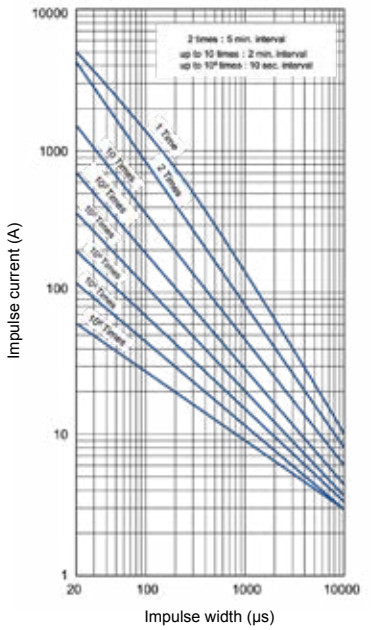


- Impulse derating
(Relation between impulse width and impulse current multiple)

ERZE11A201S1 to ERZE11A511S1



ERZE11A561S1 to ERZE11A112S1



Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

D TYPE / E14-S1 SERIES

Reference guide to standard products

Part no.	Applicable standards		Varistor voltage at 1 mA	Maximum allowable voltage		Clamping voltage at 8/20 µs		Maximum peak current at 8/20 µs (A)		
	Type name	Approvals	(V)	ACrms (V)	DC (V)	max. (V)	Ip (A)	85 °C 1 time	125 °C 1 time	125 °C 2 times
ERZE14A201S1	E14201	○☆★◇◆	200 (185 to 225)	130	170	340	100	10000	7500	6500
ERZE14A221S1	E14221	○☆★◇◆	220 (198 to 242)	140	180	360	100	10000	7500	6500
ERZE14A241S1	E14241	○☆★◇◆	240 (216 to 264)	150	200	395	100	10000	7500	6500
ERZE14A271S1	E14271	○☆★◇◆	270 (247 to 303)	175	225	455	100	10000	7500	6500
ERZE14A331S1	E14331	○☆★◇◆	330 (297 to 363)	210	270	545	100	10000	7500	6500
ERZE14A361S1	E14361	○☆★◇◆	360 (324 to 396)	230	300	595	100	10000	7500	6500
ERZE14A391S1	E14391	○☆★◇◆	390 (351 to 429)	250	320	650	100	10000	7500	6500
ERZE14A431S1	E14431	○☆★◇◆	430 (387 to 473)	275	350	710	100	10000	7500	6500
ERZE14A471S1	E14471	○☆★◇◆	470 (423 to 517)	300	385	775	100	10000	7500	6500
ERZE14A511S1	E14511	○☆★◇◆	510 (459 to 561)	320	410	845	100	10000	7500	6500
ERZE14A561S1	E14561	○☆★◇◆	560 (504 to 616)	350	450	930	100	10000	7500	6500
ERZE14A621S1	E14621	○☆★◇◆	620 (558 to 682)	385	505	1025	100	7500	7500	6500
ERZE14A681S1	E14681	○☆★◇◆	680 (612 to 748)	420	560	1120	100	7500	7500	6500
ERZE14A751S1	E14751	○☆★◇◆	750 (675 to 825)	460	615	1240	100	7500	7500	6500
ERZE14A821S1	E14821	○☆★◇◆	820 (738 to 902)	510	670	1355	100	7500	7500	6500
ERZE14A911S1	E14911	○☆★◇◆	910 (819 to 1001)	550	745	1500	100	7500	7500	6500
ERZE14A102S1	E14102	○☆★◇◆	1000 (900 to 1100)	625	825	1650	100	7500	7500	6500
ERZE14A112S1	E14112	○☆★◇◆	1100 (990 to 1210)	680	895	1815	100	7500	7500	6500

Maximum allowable voltage and maximum peak current at 8/20 µs (A) at 125 °C

○: UL1449 (VZCA2/UL, VZC A8/C-UL) ☆: VDE (IEC61051-1, -2, -2-2) ★: VDE (IEC60950-1 Annex Q, IEC62368-1 G8.2)

◇: CQC (GB/T10193, GB/T10194) ◆: CQC (GB4943.1, GB8898)

Approval number (file no.) of safety regulations are subject to change without notice. Ask the factory for a copy of the latest file number.

D TYPE / E14-S1 SERIES

Ratings and characteristics

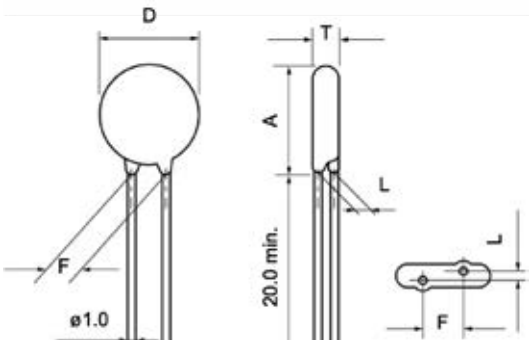
- Operating temperature range: –40 to 125 °C
- Storage temperature range: –40 to 125 °C

Part no.	Varistor voltage at 1 mA	Maximum allowable voltage		Clamping voltage (max.) *Ip	Rated power	Maximum energy		Maximum peak current at 8/20 µs			Capacitance (max.) at 1 kHz
						10/1000 µs	2 ms	85 °C 1 time	125 °C 1 time	125 °C 2 times	
	(V)	ACrms (V)	DC (V)	(V)	(W)	(J)	(J)	(A)	(A)	(A)	(pF)
ERZE14A201S1	200 (185 to 225)	130	170	340	1.0	140	100	10000	7500	6500	1300
ERZE14A221S1	220 (198 to 242)	140	180	360	1.0	155	110	10000	7500	6500	1200
ERZE14A241S1	240 (216 to 264)	150	200	395	1.0	168	120	10000	7500	6500	1100
ERZE14A271S1	270 (247 to 303)	175	225	455	1.0	190	135	10000	7500	6500	1000
ERZE14A331S1	330 (297 to 363)	210	270	545	1.0	228	160	10000	7500	6500	900
ERZE14A361S1	360 (324 to 396)	230	300	595	1.0	255	180	10000	7500	6500	900
ERZE14A391S1	390 (351 to 429)	250	320	650	1.0	275	195	10000	7500	6500	800
ERZE14A431S1	430 (387 to 473)	275	350	710	1.0	303	215	10000	7500	6500	800
ERZE14A471S1	470 (423 to 517)	300	385	775	1.0	350	250	10000	7500	6500	750
ERZE14A511S1	510 (459 to 561)	320	410	845	1.0	382	273	10000	7500	6500	700
ERZE14A561S1	560 (504 to 616)	350	450	930	1.0	382	273	10000	7500	6500	700
ERZE14A621S1	620 (558 to 682)	385	505	1025	1.0	382	273	7500	7500	6500	650
ERZE14A681S1	680 (612 to 748)	420	560	1120	1.0	382	273	7500	7500	6500	600
ERZE14A751S1	750 (675 to 825)	460	615	1240	1.0	420	300	7500	7500	6500	530
ERZE14A821S1	820 (738 to 902)	510	670	1355	1.0	460	325	7500	7500	6500	500
ERZE14A911S1	910 (819 to 1001)	550	745	1500	1.0	510	360	7500	7500	6500	400
ERZE14A102S1	1000 (900 to 1100)	625	825	1650	1.0	565	400	7500	7500	6500	400
ERZE14A112S1	1100 (990 to 1210)	680	895	1815	1.0	620	440	7500	7500	6500	350

* Ip measuring current of clamping voltage: 100 A

Dimensions in mm (not to scale)

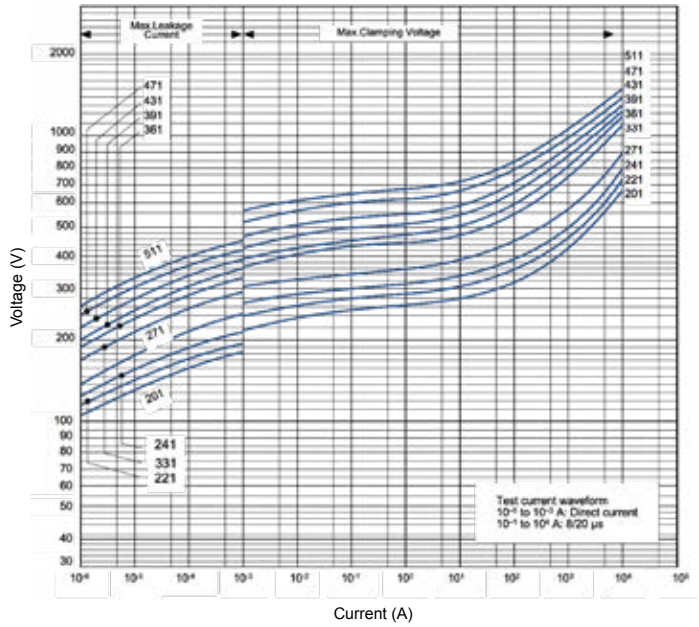
Part no.	D max.	T max.	F±1.0	A max.	L±1.0
ERZE14A201S1	16.5	5.2	10.0	20.0	2.1
ERZE14A221S1	16.5	5.3	10.0	20.0	2.2
ERZE14A241S1	16.5	5.4	10.0	20.0	2.3
ERZE14A271S1	16.5	5.6	10.0	20.0	2.5
ERZE14A331S1	16.5	5.9	10.0	20.0	2.8
ERZE14A361S1	16.5	6.1	10.0	20.0	3.0
ERZE14A391S1	16.5	6.2	10.0	20.0	3.1
ERZE14A431S1	16.5	6.4	10.0	20.0	3.3
ERZE14A471S1	16.5	6.6	10.0	20.0	3.5
ERZE14A511S1	16.5	6.8	10.0	20.0	3.7
ERZE14A561S1	16.5	7.2	10.0	20.0	4.0
ERZE14A621S1	17.5	7.5	10.0	20.5	4.4
ERZE14A681S1	17.5	7.8	10.0	20.5	4.7
ERZE14A751S1	17.5	8.2	10.0	20.5	5.1
ERZE14A821S1	17.5	8.5	10.0	20.5	5.4
ERZE14A911S1	17.5	9.0	10.0	20.5	5.9
ERZE14A102S1	17.5	9.5	10.0	20.5	6.4
ERZE14A112S1	17.5	10.1	10.0	20.5	7.2



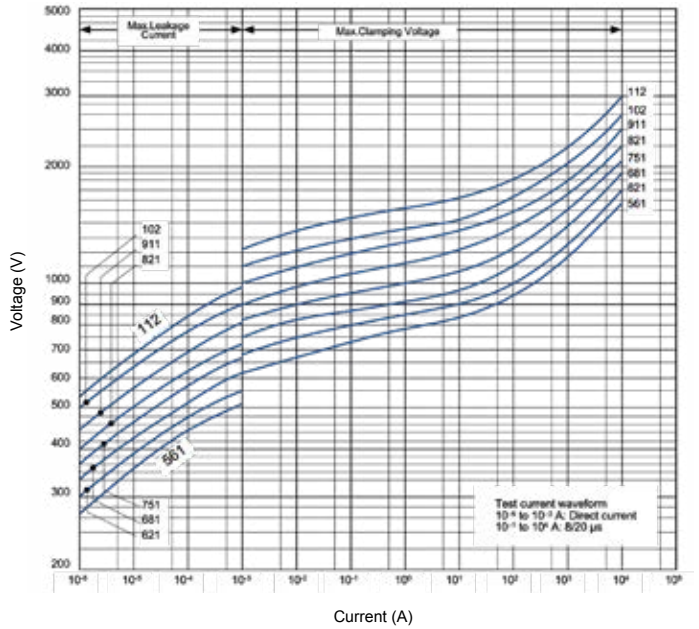
Typical characteristics

- Voltage vs. current

ERZE14A201S1 to ERZE14A511S1

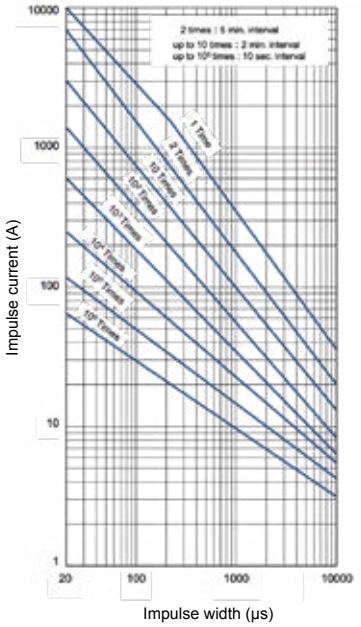


ERZE14A561S1 to ERZE14A112S1

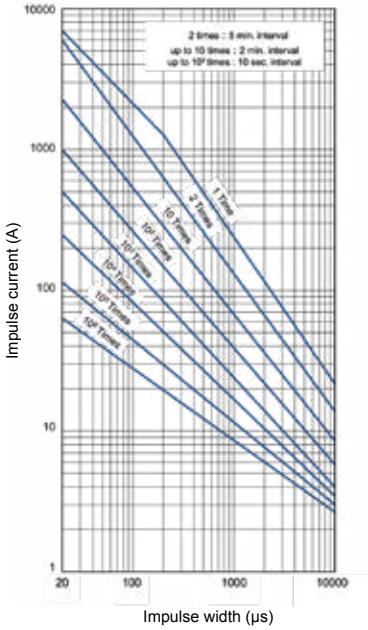


- Impulse derating
(Relation between impulse width and impulse current multiple)

ERZE14A201S1 to ERZE14A511S1



ERZE14A561S1 to ERZE14A112S1



Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

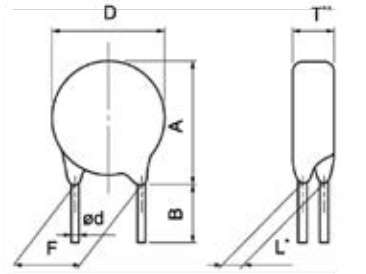
D TYPE / E-S1 SERIES (LEADS CUT TYPE)

Straight leads cut type (bulk type)

Ratings and characteristics refer to the bulk standard type

Dimensions in mm (not to scale)

Varistor voltage	E11-S1		E14-S1	
	201 to 561	621 to 112	201 to 561	621 to 112
D	13.0 max	14.0 max	16.5 max	17.5 max
A	17.0 max	18.0 max	20.0 max	20.5 max
F	7.5±1.0	7.5±1.0	10.0±1.0	10.0±1.0
ø d	0.80 $^{+0.08}_{-0.05}$	0.80 $^{+0.08}_{-0.05}$	1.0 $^{+0.1}_{-0.05}$	1.0 $^{+0.1}_{-0.05}$
B	4.0±1.0	4.0±1.0	4.0±1.0	4.0±1.0
Standard products part no.	ERZE11A□□□SC		ERZE14A□□□SC	



* Dimension "L": Conforms to each individual specification
**Dimension "T": Conforms to each individual specification

Application note for safety standards (for series E-S1)

- Approvals products lists in "Reference guide to standard products"
- UL and VDE: Registered in "Type name", it isn't registered in "Panasonic part no."
- CQC: Registered in "Panasonic part no."
- "Rated voltages" are specified for UL recognized components in list shown below

The AC rated voltage and maximum allowable voltage

Type name	Maximum allowable voltage		Rated voltage (Vrms)
	ACrms (V)	DC (V)	UL1449
E❊201	130	170	118
E❊221	140	180	127
E❊241	150	200	136
E❊271	175	225	159
E❊331	210	270	189
E❊361	230	300	209
E❊391	250	320	227
E❊431	275	350	250
E❊471	300	385	272
E❊511	320	410	291
E❊561	350	450	320
E❊621	385	505	350
E❊681	420	560	381
E❊751	460	615	418
E❊821	510	670	463
E❊911	550	745	500
E❊102	625	825	568
E❊112	680	895	600

* 11 series is 11, 14 series is 14

MULTILAYER NTC THERMISTORS

ERTJ series

Features

- Surface mount device (0201-0402-0603)
- Highly reliable multilayer / monolithic structure
- Wide temperature operating range (–40 to 125 °C)
- Environmentally-friendly lead-free
- RoHS compliant

Go to Webseite

ERTJ SERIES

Recommended applications

- Mobile phone
  - Temperature compensation for crystal oscillator
  - Temperature compensation for semiconductor devices
- Personal computer and peripheral device
  - Temperature detection for CPU and memory device
  - Temperature compensation for ink-viscosity (Inkjet printer)
- Battery pack (Secondary battery)
  - Temperature detection of battery cells
- Liquid Crystal Display
  - Temperature compensation of display contrast
  - Temperature compensation of display backlighting (CCFL)

Explanation of part numbers

1	2	3	4
E	R	T	J

Common code

Product code		Type code	
ERT	NTC thermistors	J	Chip type (SMD) Multilayer type

5
0

Size code (inch size)	
Z	0201
0	0402
1	0603

6
E

Packaging style code	
E	0201, 0402 Pressed carrier taping Punched carrier taping (Pitch: 2mm)
V	0603 Punched carrier taping (Pitch: 4mm)

7
G

B value class code	
A	2701 to 2800
G	3301 to 3400
M	3801 to 3900
P	4001 to 4100
R	4201 to 4300
S	4301 to 4400
T	4401 to 4500
V	4601 to 4700

8	9	10
1	0	3

Nominal resistance R_{25} (Ω)

The first two digits are significant figures of resistance and the third one denotes the number of zeros following them.

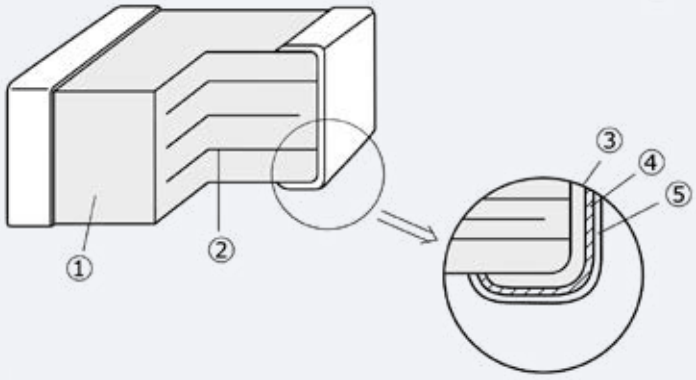
11
J

Resistance tolerance code		
F	±1%	Narrow tolerance type
G	±2%	
H	±3%	Standard type
J	±5%	

12
A

Special specification

Construction



No.	Name	
1	Semiconductive ceramics	
2	Internal electrode	
3	Terminal electrode	Substrate electrode
4		Intermediate electrode
5		External electrode

MULTILAYER NTC THERMISTORS

Ratings

Size code (inch size)	Z (0201)	0 (0402)	1 (0603)
Operating temperature range	−40 to 125 °C		
Rated maximum power dissipation*1	33 mW	66 mW	100 mW
Dissipation factor*2	approx. 1 mW / °C	approx. 2 mW / °C	approx. 3 mW / °C

*1 **Rated maximum power dissipation:** The maximum power that can be continuously applied at the rated ambient temperature.
· The maximum value of power and rated power is the same under the condition of an ambient temperature of 25 °C or less.
If the temperature exceeds 25 °C, rated power depends on the decreased power dissipation curve.
· Please see "Operating power" for details.

*2 **Dissipation factor:** The constant amount power required to raise the temperature of the thermistor 1 °C through self-heat generation under stable temperatures.
· Dissipation factor is the reference value when mounted on a glass epoxy board (1.6mmT).

Part number list of narrow tolerance type (resistance tolerance: ±2 %, ±1 %)

- 0201 inch size

Part no.	Nominal resistance at 25 °C (Ω)	Resistance tolerance	B value at 25/50 (K)	B value at 25/85 (K)
ERTJZEG103A	10 kΩ	±1 % (F) or ±2 % (G)	(3380 K)	3435 K±1%
ERTJZEP473☐	47 kΩ		4050 K±1%	(4100 K)
ERTJZEP683☐	68 kΩ		4050 K±1%	(4100 K)
ERTJZER683☐	68 kΩ		4250 K±1%	(4300 K)
ERTJZER104☐	100 kΩ		4250 K±1%	(4300 K)
ERTJZET104☐	100 kΩ		4500 K±1%	(4550 K)
ERTJZEV104☐	100 kΩ		4700 K±1%	(4750 K)

- 0402 inch size

ERTJ0EG103☐A	10 kΩ	±1 % (F) or ±2 % (G)	(3380 K)	3435 K±1%
ERTJ0EP333☐	33 kΩ		4050 K±1%	(4100 K)
ERTJ0EP473☐	47 kΩ		4050 K±1%	(4100 K)
ERTJ0EP683☐	68 kΩ		4050 K±1%	(4100 K)
ERTJ0ER104☐	100 kΩ		4250 K±1%	(4300 K)
ERTJ0ES104☐	100 kΩ		4330 K±1%	(4390 K)
ERTJ0EV104☐	100 kΩ		4700 K±1%	(4750 K)
ERTJ0EV224☐	220 kΩ		4700 K±1%	(4750 K)

- 0603 inch size

ERTJ0EG103☐A	10 kΩ	±1 % (F) or ±2 % (G)	(3380 K)	3435 K±1%
ERTJ1VS104☐A	100 kΩ		(4330 K)	4390 K±1%

☐: Resistance tolerance code

Part number list of standard type (resistance tolerance: ±5 %, ±3 %)

- 0201 inch size

Part no.	Nominal resistance at 25 °C (Ω)	Resistance tolerance	B value at 25/50 (K)	B value at 25/85 (K)
ERTJZET202☐	2.0 kΩ	±3 % (H) or ±5 % (J)	4500 K±2%	(4450 K)
ERTJZET302☐	3.0 kΩ		4500 K±2%	(4450 K)
ERTJZET472☐	4.7 kΩ		4500 K±2%	(4450 K)
ERTJZEG103☐A	10 kΩ		(3380 K)	3435 K±1%
ERTJZEP473☐	47 kΩ		4050 K±2%	(4100 K)
ERTJZEP683☐	68 kΩ		4050 K±2%	(4100 K)

ERTJZER683☐	68 kΩ	±3 %(H) or ±5 %(J)	4250 K±2 %	(4300 K)
ERTJZER104☐	100 kΩ		4250 K±2 %	(4300 K)
ERTJZET104☐	100 kΩ		4500 K±2 %	(4550 K)
ERTJZEV104☐	100 kΩ		4700 K±2 %	(4750 K)
ERTJZET154☐	150 kΩ		4500 K±2 %	(4750 K)
ERTJZET224☐	220 kΩ		4500 K±2 %	(4750 K)

☐: Resistance tolerance code

- 0402 inch size

Part no.	Nominal resistance at 25°C (Ω)	Resistance tolerance	B value at 25/50 (K)	B value at 25/85 (K)
ERTJ0EA220☐	22 Ω	±3 %(H) or ±5 %(J)	2750 K±3 %	(2700 K)
ERTJ0EA330☐	33 Ω		2750 K±3 %	(2700 K)
ERTJ0EA400☐	40 Ω		2750 K±3 %	(2700 K)
ERTJ0EA470☐	47 Ω		2750 K±3 %	(2700 K)
ERTJ0EA680☐	68 Ω		2800 K±3 %	(2750 K)
ERTJ0EA101☐	100 Ω		2800 K±3 %	(2750 K)
ERTJ0EA151☐	150 Ω		2800 K±3 %	(2750 K)
ERTJ0ET102☐	1.0 kΩ		4500 K±2 %	(4450 K)
ERTJ0ET152☐	1.5 kΩ		4500 K±2 %	(4450 K)
ERTJ0ET202☐	2.0 kΩ		4500 K±2 %	(4450 K)
ERTJ0ET222☐	2.2 kΩ		4500 K±2 %	(4450 K)
ERTJ0ET302☐	3.0 kΩ		4500 K±2 %	(4450 K)
ERTJ0ER332☐	3.3 kΩ		4250 K±2 %	(4300 K)
ERTJ0ET332☐	3.3 kΩ		4500 K±2 %	(4450 K)
ERTJ0ET472☐	4.7 kΩ		4500 K±2 %	(4450 K)
ERTJ0ER472☐	4.7 kΩ		4250 K±2 %	(4300 K)
ERTJ0ER682☐	6.8 kΩ		4250 K±2 %	(4300 K)
ERTJ0EG103☐A	10 kΩ		(3380 K)	3435 K±1%
ERTJ0EM103☐	10 kΩ		3900 K±2 %	(3970 K)
ERTJ0ER103☐	10 kΩ		4250 K±2 %	(4300 K)
ERTJ0ER153☐	15 kΩ		4250 K±2 %	(4300 K)
ERTJ0ER223☐	22 kΩ		4250 K±2 %	(4300 K)
ERTJ0EP333☐	33 kΩ		4050 K±2 %	(4100 K)
ERTJ0ER333☐	33 kΩ		4250 K±2 %	(4300 K)
ERTJ0ET333☐	33 kΩ		4500 K±2 %	(4580 K)
ERTJ0EP473☐	47 kΩ		4050 K±2 %	(4100 K)
ERTJ0ET473☐	47 kΩ		4500 K±2 %	(4550 K)
ERTJ0EV473☐	47 kΩ		4700 K±2 %	(4750 K)
ERTJ0EP683☐	68 kΩ		4050 K±2 %	(4100 K)
ERTJ0ER683☐	68 kΩ		4250 K±2 %	(4300 K)
ERTJ0EV683☐	68 kΩ		4700 K±2 %	(4750 K)
ERTJ0EP104☐	100 kΩ		4050 K±2 %	(4100 K)
ERTJ0ER104☐	100 kΩ		4250 K±2 %	(4300 K)
ERTJ0ES104☐	100 kΩ		4330 K±2 %	(4390 K)
ERTJ0ET104☐	100 kΩ		4500 K±2 %	(4580 K)
ERTJ0EV104☐	100 kΩ		4700 K±2 %	(4750 K)
ERTJ0ET154☐	150 kΩ		4500 K±2 %	(4580 K)
ERTJ0EV154☐	150 kΩ		4700 K±2 %	(4750 K)
ERTJ0EV224☐	220 kΩ		4700 K±2 %	(4750 K)
ERTJ0EV334☐	330 kΩ		4700 K±2 %	(4750 K)
ERTJ0EV474☐	470 kΩ		4700 K±2 %	(4750 K)

☐: Resistance tolerance code

ERTJ SERIES

Part number list of standard type (resistance tolerance: ±5 %, ±3 %)

- 0603 inch size

Part no.	Nominal resistance at 25 °C (Ω)	Resistance tolerance	B value at 25/50 (K)	B value at 25/85 (K)
ERTJ1VA220☐	22 Ω	±3 % (H) or ±5 % (J)	2750 K±3%	(2700 K)
ERTJ1VA330☐	33 Ω		2750 K±3%	(2700 K)
ERTJ1VA400☐	40 Ω		2800 K±3%	(2750 K)
ERTJ1VA470☐	47 Ω		2800 K±3%	(2750 K)
ERTJ1VA680☐	68 Ω		2800 K±3%	(2750 K)
ERTJ1VA101☐	100 Ω		2800 K±3%	(2750 K)
ERTJ1VT102☐	1.0 kΩ		4500 K±2%	(4450 K)
ERTJ1VT152☐	1.5 kΩ		4500 K±2%	(4450 K)
ERTJ1VT202☐	2.0 kΩ		4500 K±2%	(4450 K)
ERTJ1VT222☐	2.2 kΩ		4500 K±2%	(4450 K)
ERTJ1VT302☐	3.0 kΩ		4500 K±2%	(4450 K)
ERTJ1VT332☐	3.3 kΩ		4500 K±2%	(4450 K)
ERTJ1VR332☐	3.3 kΩ		4250 K±2%	(4300 K)
ERTJ1VR472☐	4.7 kΩ		4250 K±2%	(4300 K)
ERTJ1VT472☐	4.7 kΩ		4500 K±2%	(4450 K)
ERTJ1VR682☐	6.8 kΩ		4250 K±2%	(4300 K)
ERTJ1VG103☐A	10 kΩ		(3380 K)	3435 K±1%
ERTJ1VR103☐	10 kΩ		4250 K±2%	(4300 K)
ERTJ1VR153☐	15 kΩ		4250 K±2%	(4300 K)
ERTJ1VR223☐	22 kΩ		4250 K±2%	(4300 K)
ERTJ1VR333☐	33 kΩ		4250 K±2%	(4300 K)
ERTJ1VP473☐	47 kΩ		4100 K±2%	(4150 K)
ERTJ1VR473☐	47 kΩ		4250 K±2%	(4300 K)
ERTJ1VV473☐	47 kΩ		4700 K±2%	(4750 K)
ERTJ1VR683☐	68 kΩ		4250 K±2%	(4300 K)
ERTJ1VV683☐	68 kΩ		4700 K±2%	(4750 K)
ERTJ1VS104☐A	100 kΩ		(4330 K)	4390 K±1%
ERTJ1VV104☐	100 kΩ		4700 K±2%	(4750 K)
ERTJ1VV154☐	150 kΩ		4700 K±2%	(4750 K)
ERTJ1VT224☐	220 kΩ		4500 K±2%	(4580 K)

☐: Resistance tolerance code

Part number list of standard type (resistance tolerance: ±5 %, ±3 %)

- Temperature and resistance value (the resistance value at 25 °C is set to 1) / reference values

	ERTJ□□A to		ERTJ□□G to	ERTJ□□M to	ERTJ□□P to	ERTJ□□R to	ERTJ0ES to	ERTJ1VS to	ERTJ□□T to	ERTJ□□T to	ERTJ□□V to
$B_{25/50}$	2750 K	2800 K	(3375 K)	3900 K	4050 K	4250 K	4330 K	(4330 K)	4500 K	4500 K	4700 K
$B_{25/85}$	(2700 K)	(2750 K)	3435 K	(3970 K)	(4100 K)	(4300 K)	(4390 K)	4390 K	(4450 K)	(4580 K)	(4750 K)
T (°C)									*1	*2	
-40	13,05	13,28	20,52	32,11	33,10	43,10	45,67	45,53	63,30	47,07	59,76
-35	10,21	10,40	15,48	23,29	24,03	30,45	32,08	31,99	42,92	33,31	41,10
-30	8,061	8,214	11,79	17,08	17,63	21,76	22,80	22,74	29,50	23,80	28,61
-25	6,427	6,547	9,069	12,65	13,06	15,73	16,39	16,35	20,53	17,16	20,14
-20	5,168	5,261	7,037	9,465	9,761	11,48	11,91	11,89	14,46	12,49	14,33
-15	4,191	4,261	5,507	7,147	7,362	8,466	8,743	8,727	10,30	9,159	10,31
-10	3,424	3,476	4,344	5,444	5,599	6,300	6,479	6,469	7,407	6,772	7,482
-5	2,819	2,856	3,453	4,181	4,291	4,730	4,845	4,839	5,388	5,046	5,481
0	2,336	2,362	2,764	3,237	3,312	3,582	3,654	3,650	3,966	3,789	4,050
5	1,948	1,966	2,227	2,524	2,574	2,734	2,778	2,776	2,953	2,864	3,015
10	1,635	1,646	1,806	1,981	2,013	2,102	2,128	2,126	2,221	2,179	2,262
15	1,38	1,386	1,474	1,567	1,584	1,629	1,642	1,641	1,687	1,669	1,710
20	1,171	1,174	1,211	1,247	1,255	1,272	1,277	1,276	1,293	1,287	1,303
25	1	1	1	1	1	1	1	1	1	1	1
30	0,8585	0,8565	0,8309	0,8072	0,8016	0,7921	0,7888	0,7890	0,7799	0,7823	0,7734
35	0,7407	0,7372	0,6941	0,6556	0,6461	0,6315	0,6263	0,6266	0,6131	0,6158	0,6023
40	0,6422	0,6376	0,5828	0,5356	0,5235	0,5067	0,5004	0,5007	0,4856	0,4876	0,4721
45	0,5595	0,5541	0,4916	0,4401	0,4266	0,4090	0,4022	0,4025	0,3874	0,3884	0,3723
50	0,4899	0,4836	0,4165	0,3635	0,3496	0,3319	0,3251	0,3254	0,3111	0,3111	0,2954
55	0,4309	0,4238	0,3543	0,3018	0,2881	0,2709	0,2642	0,2645	0,2513	0,2504	0,2356
60	0,3806	0,3730	0,3027	0,2518	0,2386	0,2222	0,2158	0,2161	0,2042	0,2026	0,1889
65	0,3376	0,3295	0,2595	0,2111	0,1985	0,1832	0,1772	0,1774	0,1670	0,1648	0,1523
70	0,3008	0,2922	0,2233	0,1777	0,1659	0,1518	0,1463	0,1465	0,1377	0,1348	0,1236
75	0,2691	0,2600	0,1929	0,1504	0,1393	0,1264	0,1213	0,1215	0,1144	0,1108	0,1009
80	0,2417	0,2322	0,1672	0,1278	0,1174	0,1057	0,1011	0,1013	0,09560	0,09162	0,08284
85	0,2180	0,2081	0,1451	0,1090	0,09937	0,08873	0,08469	0,08486	0,08033	0,07609	0,06834
90	0,1974	0,1871	0,1261	0,09310	0,08442	0,07468	0,07122	0,07138	0,06782	0,06345	0,05662
95	0,1793	0,1688	0,1097	0,07980	0,07200	0,06307	0,06014	0,06028	0,05753	0,05314	0,04712
100	0,1636	0,1528	0,09563	0,06871	0,06166	0,05353	0,05099	0,05112	0,04903	0,04472	0,03939
105	0,1498	0,1387	0,08357	0,05947	0,05306	0,04568	0,04340	0,04351	0,04198	0,03784	0,03308
110	0,1377	0,1263	0,07317	0,05170	0,04587	0,03918	0,03708	0,03718	0,03609	0,03218	0,02791

*1: Apply to products with a B25/50 constant of 4500 K and a resistance value of 25 °C less than 10 kΩ

*2: Apply to products with a B25/50 constant of 4500 K and a resistance value of 25 °C of 10 kΩ or more
* Applied only to ERTJ0ET104□

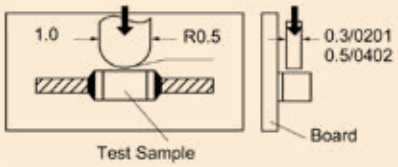
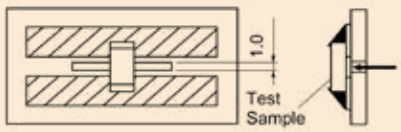
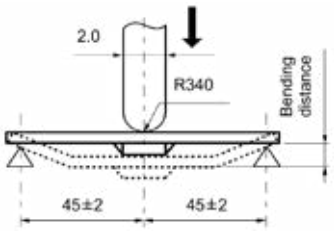
$$B_{25/50}=\frac{\ln(R_{25}/R_{50})}{1/298.15-1/323.15}$$

$$B_{25/85}=\frac{\ln(R_{25}/R_{85})}{1/298.15-1/358.15}$$

R_{25}=Resistance at 25.0±0.1°C
R_{50}=Resistance at 50.0±0.1°C
R_{85}=Resistance at 85.0±0.1°C

ERTJ SERIES

Specification and test method

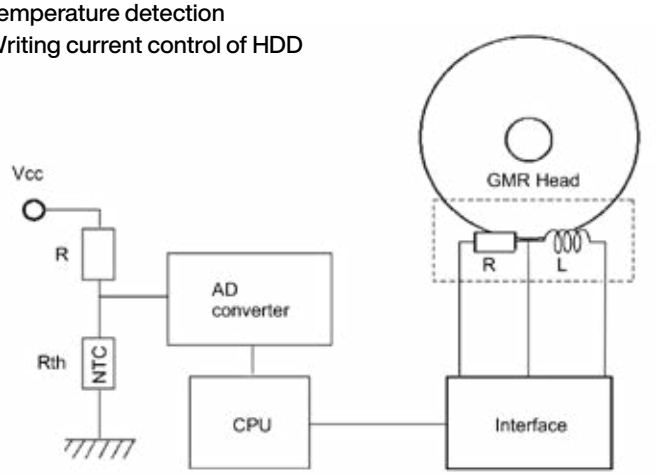
Item	Specifications	Testing method
Rated zero-power resistance (R_{25})	Within the specified tolerance.	The value is measured at a power that the influence of self-heat generation can be negligible (0.1 mW or less), at the rated ambient temperature of 25.0 ± 0.1°C.
B value	Shown in each Individual specification. Individual specification shall specify $B_{25/50}$ or $B_{25/85}$.	The zero-power resistances; R_1 and R_2 shall be measured respectively at T_1 (°C) T_2 (°C) . The B value is calculated by the following equation. $B_{T_1/T_2} = \frac{\ln(R_1) - \ln(R_2)}{1/(T_1+273.15) - 1/(T_2+273.15)}$ | | T_1 | T_2 | | $B_{25/50}$ | 25.0 ±0.1°C | 50.0 ±0.1°C | | $B_{25/85}$ | 25.0 ±0.1°C | 85.0 ±0.1°C |
Adhesion	The terminal electrode shall be free from peeling or signs of peeling.	Applied force Size 0201: 2 N · Size 0402, 0603: 5 N · Duration: 10 s Size: 0201, 0402  Size: 0603 Unit: mm 
Bending strength	There shall be no cracks and other mechanical damage. R_{25} change: within ±5 %	Bending distance: 1mm · Bending speed: 1mm/s 
Resistance to soldering heat	There shall be no cracks and other mechanical damage. **Narrow tolerance type** R_{25} change: within ±2 % B value change: within ±1% **Standard type** R_{25} change: within ±3 % B value change: within ±2 %	Soldering bath method Solder temperature: 270 ±5° C Dipping period: 3.0 ±0.5 s Preheat condition | Step | Temp (°C) | Period (s) | | 1 | 80 to 100 | 120 to 180 | | 2 | 150 to 200 | 120 to 180 |
Solderability	More than 95 % of the soldered area of both terminal electrodes shall be covered with fresh solder.	Soldering bath method Solder temperature: 230 ±5 °C Dipping period: 4 ±1 s Solder: Sn – 3.0 Ag – 0.5 Cu

Specification and test method

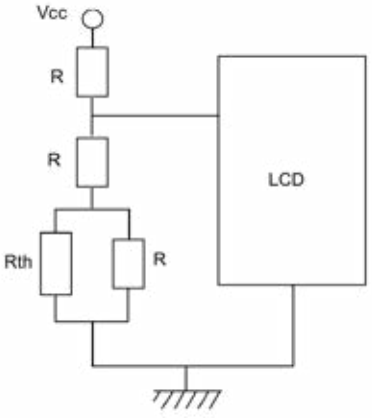
Item	Specifications	Testing method
Temperature cycling	**Narrow tolerance type** R_{25} change: within ±2% B value change: within ±1% **Standard type** R_{25} change: within ±3% B value change: within ±2%	Conditions of one cycle Step 1: −40°C, 30±3 min Step 2: Room temp., 3 min max. Step 3: 125°C, 30±3 min Step 4: Room temp., 3 min max. Number of cycles: 100 cycles
Humidity		Temperature: 85 ±2 °C Test period: 1000 +48 / 0 h Relative humidity: 85 ±5 %
Biased humidity		Temperature: 85 ±2 °C Applied power: 10 mW (D.C.) Relative humidity: 85 ±5 % Test period: 500 +48 / 0 h
Low temperature exposure		Temperature: −40 ±3 °C Test period: −40 ±3 °C
High temperature exposure		Temperature: 125 ±3 °C Test period: 1000 +48 / 0 h

Typical application

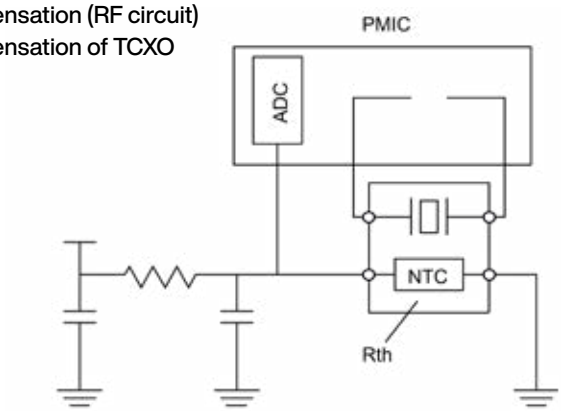
- Temperature detection
  Writing current control of HDD



- Temperature compensation (pseudo-linearisation)
  Contrast level control of LCD

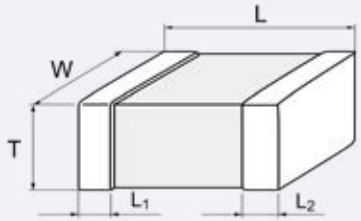


- Temperature compensation (RF circuit)
  Temperature compensation of TCXO



ERTJ SERIES

Dimensions in mm (not to scale)



Unit: mm

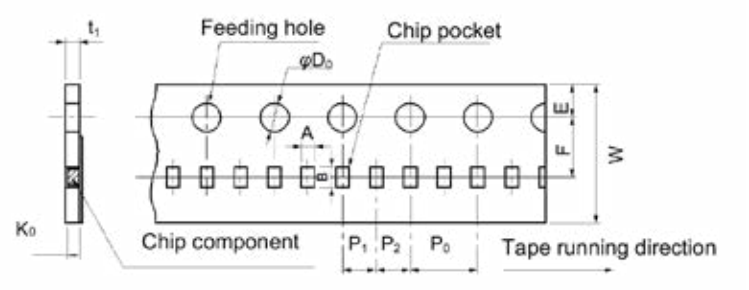
Size code	Size (inch)	L	W	T	L_1 L_2
Z	0201	0.60±0.03	0.30±0.03	0.30±0.03	0.15±0.05
0	0402	1.0±0.1	0.50±0.05	0.50±0.05	0.25±0.15
1	0603	1.60±0.15	0.8±0.1	0.8±0.1	0.3±0.2

Packaging methods (taping)

- Standard packing quantities

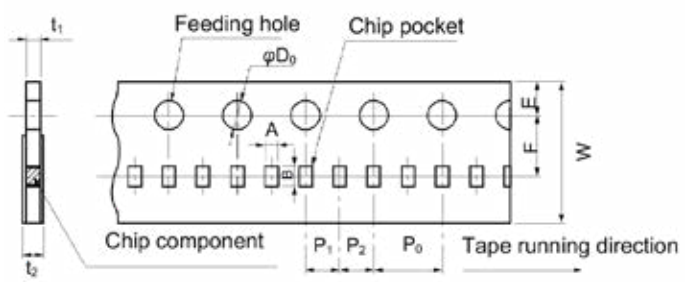
Size code (inch size)	Thickness (mm)	Kind of taping	Pitch (mm)	Quantity (pcs/reel)
Z (0201)	0.5	Pressed Carrier Taping	2	15000
0 (0402)	0.8	Punched Carrier Taping	2	10000
1 (0603)	1.25	Punched Carrier Taping	4	4000

- 2mm pitch (pressed carrier taping) size 0201



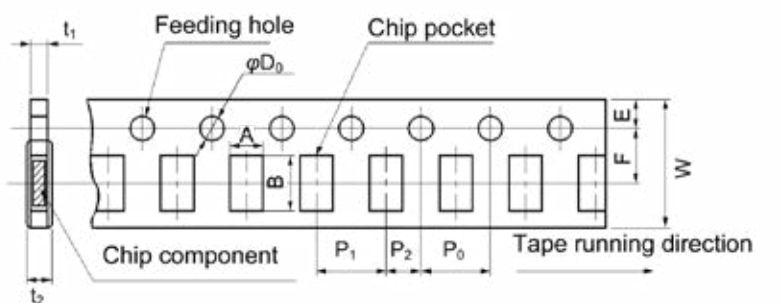
Symbol	A	B	W	F	E	P_1	P_2	P_0	$øD_0$	t_1	K_0
Unit (mm)	0.36 ±0.03	0.66 ±0.03	8.0 ±0.2	3.50 ±0.05	1.75 ±0.10	2.00 ±0.05	2.00 ±0.05	4.0 ±0.1	1.5 +0.1/0	0.55 max.	0.36 ±0.03

- 2mm pitch (punched carrier taping) size 0402



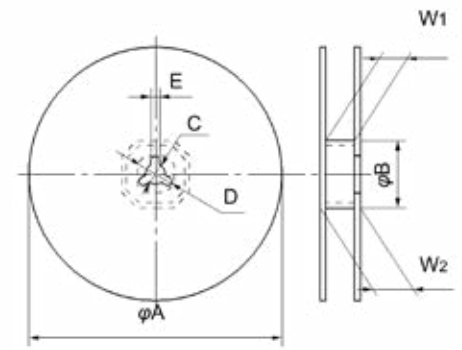
Symbol	A	B	W	F	E	P_1	P_2	P_0	$øD_0$	t_1	t_2
Unit (mm)	0.62 ±0.05	1.12 ±0.05	8.0 ±0.2	3.50 ±0.05	1.75 ±0.10	2.00 ±0.05	2.00 ±0.05	4.0 ±0.1	1.5 +0.1/0	0.7 max.	1.0 max.

- 4mm pitch (punched carrier taping) size 0603



Symbol	A	B	W	F	E	P_1	P_2	P_0	$øD_0$	t_1	t_2
Unit (mm)	1.0 ±0.1	1.8 ±0.1	8.0 ±0.2	3.50 ±0.05	1.75 ±0.10	4.0 ±0.1	2.00 ±0.05	4.0 ±0.1	1.5 +0.1/0	1.1 max.	1.4 max.

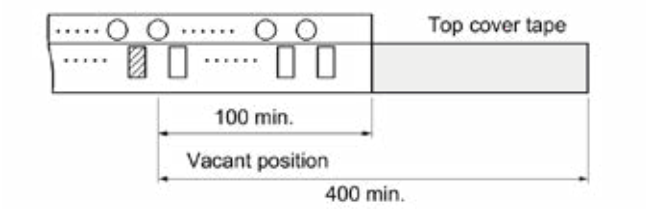
- Reel for taping



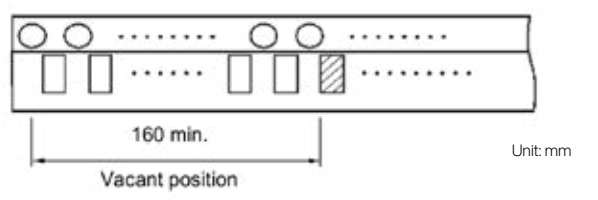
Symbol	øA	øB	C	D	E	W_1	W_2
Unit (mm)	180+0/−3	60.0+1.0/0	13.0±0.5	21.0±0.8	2.0±0.5	9.0+1.0/0	11.4±1.0

- Leader part and taped end

Leader part



Taped end



Unit: mm

Minimum quantity / packing unit

Part no. (inch size)	Minimum quantity / packing unit	Packing quantity in carton	Carton L × W × H (mm)
ERTJZ (0201)	15000	300000	250 × 200 × 200
ERTJ0 (0402)	10000	200000	250 × 200 × 200
ERTJ1 (0603)	4000	80000	250 × 200 × 200

Part no., quantity and country of origin are designated on outer packages in English.

MULTILAYER NTC THERMISTORS AUTOMOTIVE GRADE

ERTJ-M series

Features

- Surface mount device (0402·0603)
- Highly reliable multilayer / monolithic structure
- Wide temperature operating range (–40 to 150 °C)
- Environmentally-friendly lead-free
- AEC-Q200 compliant
- RoHS compliant

Go to Webseite

ERTJ-M SERIES

Recommended applications

- For car audio systems
- For ECUs
- For electric pumps and compressors
- For LED lights
- For batteries
- For temperature detection of various circuits

Explanation of part numbers I ERTJ-M series

1 2 3 4 : E R T J

Common code			
Product code		Type code	
ERT	NTC thermistors	J	Chip type (SMD) Multilayer type

5 : 0

Size code (inch size)	
0	0402
1	0603

6 : E

Packaging style code	
E	0402 Punched carrier taping (Pitch: 2mm)
V	0603 Punched carrier taping (Pitch: 4mm)

7 : G

B value class code	
A	2701 to 2800
G	3301 to 3400
M	3801 to 3900
P	4001 to 4100
R	4201 to 4300
S	4301 to 4400
T	4401 to 4500
V	4601 to 4700

8 9 10 : 1 0 3

Nominal resistance R_{25} (Ω)

The first two digits are significant figures of resistance and the third one denotes the number of zeros following them.

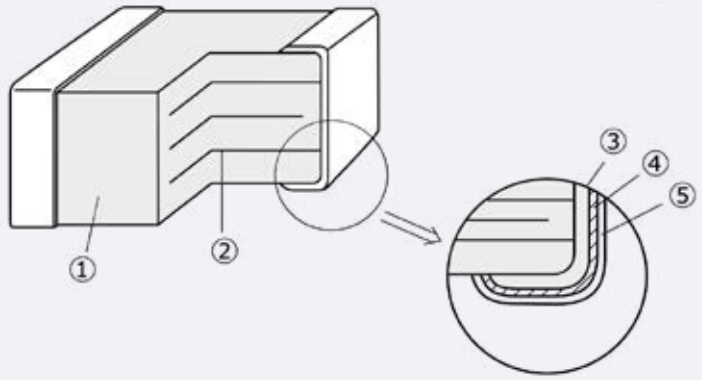
11 : F

Resistance tolerance code		
F	±1%	Narrow tolerance type
G	±2%	
H	±3%	Standard type
J	±5%	

12 : M

M	Automotive component

Construction



No.	Name	
①	Semiconductive ceramics	
②	Internal electrode	
③	Terminal electrode	Substrate electrode
④		Intermediate electrode
⑤		External electrode

ERTJ-M SERIES

Ratings

Size code (inch size)	0 (0402)	1 (0603)
Operating temperature range	−40 to 150 °C	
Rated maximum power dissipation*1	66 mW	100 mW
Dissipation factor*2	approx. 2 mW / °C	approx. 3 mW / °C

*1 **Rated maximum power dissipation:** The maximum power that can be continuously applied at the rated ambient temperature.
· The maximum value of power and rated power is the same under the condition of an ambient temperature of 25 °C or less.
If the temperature exceeds 25 °C, rated power depends on the decreased power dissipation curve.
· Please see "Operating power" for details.

*2 **Dissipation factor:** The constant amount power required to raise the temperature of the thermistor 1 °C through self-heat generation under stable temperatures.
· Dissipation factor is the reference value when mounted on a glass epoxy board (1.6mmT).

Part number list

● 0402 inch size

Part no.	Nominal resistance at 25 °C (Ω)	B value at 25/50 (K)	B value at 25/85 (K)
ERTJ0EG202GM	2 kΩ±2%	(3380 K)	3410 K±0.5%
ERTJ0EG202HM	2 kΩ±3%	(3380 K)	3410 K±0.5%
ERTJ0EG202JM	2 kΩ±5%	(3380 K)	3410 K±0.5%
ERTJ0EG103☐M	10 kΩ	3380 K±1%	3435 K±1%
ERTJ0EP473☐M	47 kΩ	4050 K±1%	(4100 K)
ERTJ0ER104☐M	100 kΩ	4250 K±1%	(4300 K)
ERTJ0ET104☐M	100 kΩ	4485 K±1%	(4550 K)
ERTJ0EV104☐M	100 kΩ	4700 K±1%	(4750 K)
ERTJ0EV474☐M	470 kΩ	4700 K±1%	(4750 K)

● 0603 inch size

Part no.	Nominal resistance at 25 °C (Ω)	B value at 25/50 (K)	B value at 25/85 (K)
ERTJ1VK102☐M	1 kΩ	3650 K±1%	(3690 K)
ERTJ1VG103☐M	10 kΩ	3380 K±1%	3435 K±1%
ERTJ1VP473☐M	47 kΩ	4100 K±1%	(4150 K)
ERTJ1VR104☐M	100 kΩ	4200 K±1%	(4250 K)
ERTJ1VV104☐M	100 kΩ	4700 K±1%	(4750 K)
ERTJ1VT224☐M	220 kΩ	4485 K±1%	(4550 K)

☐: Resistance tolerance code
(F: ±1% · G: ±2% · H: ±3% · J: ±5%)

● Temperature and resistance value (the resistance value at 25 °C is set to 1) / reference values

	ERTJ☐☐G~	ERTJ1VK~	ERTJ0EP~	ERTJ1VP~	ERTJ0ER~	ERTJ1VR~	ERTJ☐☐T~	ERTJ☐☐V~
$B_{25/50}$	(3380 K)	3650 K	4050 K	4100 K	4250 K	4200 K	4485 K	4700 K
$B_{25/85}$	3435 K	(3690 K)	(4100 K)	(4150 K)	(4300 K)	(4250 K)	(4550 K)	(4750 K)
T (°C)								
−40	20,52	25,77	33,10	34,56	42,40	40,49	46,47	59,76
−35	15,48	19,10	24,03	24,99	29,96	28,81	32,92	41,10
−30	11,79	14,29	17,63	18,26	21,42	20,72	23,55	28,61
−25	9,069	10,79	13,06	13,48	15,50	15,07	17,00	20,14
−20	7,037	8,221	9,761	10,04	11,33	11,06	12,38	14,33
−15	5,507	6,312	7,362	7,546	8,370	8,198	9,091	10,31
−10	4,344	4,883	5,599	5,720	6,244	6,129	6,729	7,482
−5	3,453	3,808	4,291	4,369	4,699	4,622	5,019	5,481
0	2,764	2,993	3,312	3,362	3,565	3,515	3,772	4,050
5	2,227	2,372	2,574	2,604	2,725	2,694	2,854	3,015
10	1,806	1,892	2,013	2,030	2,098	2,080	2,173	2,262
15	1,474	1,520	1,584	1,593	1,627	1,618	1,666	1,710
20	1,211	1,229	1,255	1,258	1,271	1,267	1,286	1,303

- Temperature and resistance value (the resistance value at 25 °C is set to 1) / reference values

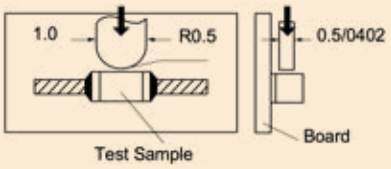
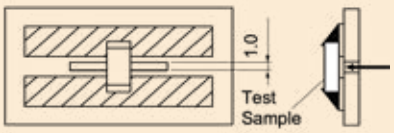
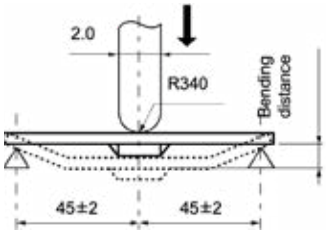
	ERTJ□□G~	ERTJ1VK~	ERTJ0EP~	ERTJ1VP~	ERTJ0ER~	ERTJ1VR~	ERTJ□□T~	ERTJ□□V~
25	1	1	1	1	1	1	1	1
30	0,8309	0,8185	0,8016	0,7994	0,7923	0,7944	0,7829	0,7734
35	0,6941	0,6738	0,6461	0,6426	0,6318	0,6350	0,6168	0,6023
40	0,5828	0,5576	0,5235	0,5194	0,5069	0,5108	0,4888	0,4721
45	0,4916	0,4639	0,4266	0,4222	0,4090	0,4132	0,3896	0,3723
50	0,4165	0,3879	0,3496	0,3451	0,3320	0,3363	0,3123	0,2954
55	0,3543	0,3258	0,2881	0,2837	0,2709	0,2752	0,2516	0,2356
60	0,3027	0,2749	0,2386	0,2344	0,2222	0,2263	0,2037	0,1889
65	0,2595	0,2330	0,1985	0,1946	0,1831	0,1871	0,1658	0,1523
70	0,2233	0,1984	0,1659	0,1623	0,1516	0,1554	0,1357	0,1236
75	0,1929	0,1696	0,1393	0,1359	0,1261	0,1297	0,1117	0,1009
80	0,1672	0,1456	0,1174	0,1143	0,1054	0,1087	0,09236	0,08284
85	0,1451	0,1255	0,09937	0,09658	0,08843	0,09153	0,07675	0,06834
90	0,1261	0,1087	0,08442	0,08189	0,07457	0,07738	0,06404	0,05662
95	0,1097	0,09440	0,07200	0,06969	0,06316	0,06567	0,05366	0,04712
100	0,09563	0,08229	0,06166	0,05957	0,05371	0,05596	0,04518	0,03939
105	0,08357	0,07195	0,05306	0,05117	0,04585	0,04786	0,03825	0,03308
110	0,07317	0,06311	0,04587	0,04415	0,03929	0,04108	0,03255	0,02791
115	0,06421	0,05552	0,03979	0,03823	0,03378	0,03539	0,02781	0,02364
120	0,0565	0,04899	0,03460	0,03319	0,02913	0,03059	0,02382	0,02009
125	0,04986	0,04336	0,03013	0,02886	0,02519	0,02652	0,02043	0,01712
130	0,04413	0,03849	0,02629	0,02513	0,02184	0,02307	0,01755	0,01464
135	0,03916	0,03426	0,02298	0,02193	0,01898	0,02013	0,01511	0,01256
140	0,03483	0,03058	0,02013	0,01918	0,01654	0,01762	0,01304	0,01080
145	0,03105	0,02736	0,01767	0,01680	0,01445	0,01546	0,01127	0,00931
150	0,02774	0,02454	0,01553	0,01476	0,01265	0,01361	0,00976	0,00806

$$B_{25/50} = \frac{\ln(R_{25}/R_{50})}{1/298.15 - 1/323.15} \qquad B_{25/85} = \frac{\ln(R_{25}/R_{85})}{1/298.15 - 1/358.15}$$

R_{25} = Resistance at 25.0±0.1 °C
R_{50} = Resistance at 50.0±0.1 °C
R_{85} = Resistance at 85.0±0.1 °C

ERTJ-M SERIES

Specification and test method

Item	Specifications	Testing method
Rated zero-power resistance (R25)	Within the specified tolerance.	The value is measured at a power that the influence of self-heat generation can be negligible (0.1 mW or less), at the rated ambient temperature of 25.0 ± 0.1°C.
B value	Shown in each Individual specification. Individual specification shall specify $B_{25/50}$ or $B_{25/85}$.	The zero-power resistances; R_1 and R_2 shall be measured respectively at T_1 (°C) T_2 (°C). The B value is calculated by the following equation: $B_{T_1/T_2} = \frac{\ln(R_1) - \ln(R_2)}{1/(T_1+273.15) - 1/(T_2+273.15)}$ | | T_1 | T_2 | | $B_{25/50}$ | 25.0 ±0.1°C | 50.0 ±0.1°C | | $B_{25/85}$ | 25.0 ±0.1°C | 85.0 ±0.1°C |
Adhesion	The terminal electrode shall be free from peeling or signs of peeling.	Applied force Size 0402, 0603: 5 N · Duration: 10 s Size: 0402  Size: 0603 Unit: mm 
Bending strength	There shall be no cracks and other mechanical damage. R25 change: within ±5 %	Bending distance: 2mm · Bending speed: 1mm/s  Unit: mm
Resistance to vibration	There shall be no cracks and other mechanical damage. R25 change: within ±2 % B value change: within ±1%	Solder samples on a testing substrate, then apply vibration to them. Acceleration: 5 G Vibrational frequency: 10 to 2000 Hz Sweep time: 20 minutes 12 cycles in three directions, which are perpendicular to each other.
Resistance to impact	There shall be no cracks and other mechanical damage. R25 change: within ±2 % B value change: within ±1%	Solder samples on a testing substrate, then apply impacts to them. Pulse waveform: Semisinusoidal wave, 11 ms Impact acceleration: 50 G Impact direction: X-X', Y-Y', Z-Z' in 6 directions, three times each

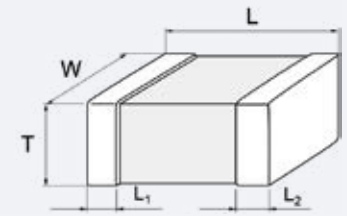
Specification and test method

Item	Specifications	Testing method
Resistance to soldering heat	There shall be no cracks and other mechanical damage. R25 change: within ±2% B value change: within ±1%	Soldering bath method Solder temperature: 260 ±5 °C · 270 ±5 °C Dipping period: 3,0 ±0.5 s · 10,0 ±0.5 s Preheat condition Step 1: 80 to 100 °C, 120 to 180 s Step 2: 150 to 200 °C, 120 to 180 s
Solderability	More than 95% of the soldered area of both terminal electrodes shall be covered with fresh solder.	Soldering bath method Solder temperature: 230 ±5 °C Dipping period: 4 ±1 s Solder: Sn-3.0 Ag-0.5Cu
Temperature cycling	R25 change: within ±2% B value change: within ±1%	Conditions of one cycle Step 1: −55 °C · 30±3 min Step 2: Room temp. · 3 min max. Step 3: 125 ±5 °C · 30 ±3 min Step 4: Room temp. · 3 min max. Number of cycles: 2000
Humidity	R25 change: within ±2% B value change: within ±1%	Temperature: 85 ±2 °C Relative humidity: 85 ±5 % Test period: 2000 +48/0 h
Biased Humidity	R25 change: within ±2% B value change: within ±1%	Temperature: 85 ±2 °C Relative humidity: 85 ±5 % Applied power: 10 mW (D.C.) Test period: 2000 +48/0 h
Low Temperature Exposure	R25 change: within ±2% B value change: within ±1%	Temperature: −40 ±3 °C Test period: 2000 +48/0 h
High Temperature Exposure 1	R25 change: within ±2% B value change: within ±1%	Temperature: 125 ±3 °C Test period: 2000 +48/0 h
High Temperature Exposure 2	R25 change: within ±3% B value change: within ±2 %	Temperature: 150 ±3 °C Test period: 1000 +48/0 h

Step	Temp (°C)	Period (s)
1	80 to 100	120 to 180
2	150 to 200	120 to 180

ERTJ-M SERIES

Dimensions in mm (not to scale)



Unit: mm

Size code	Size (inch)	L	W	T	L_1 L_2
0	0402	1.0±0.1	0.50±0.05	0.50±0.05	0.25±0.15
1	0603	1.60±0.15	0.8±0.1	0.8±0.1	0.3±0.2

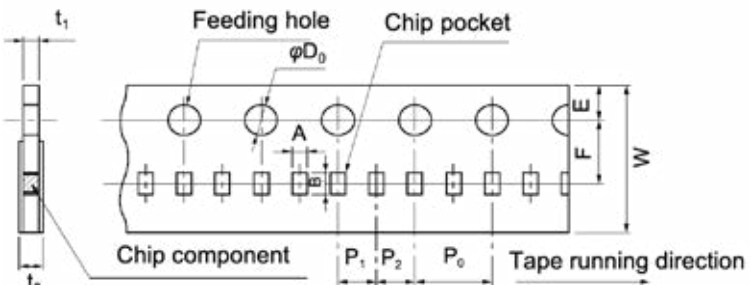
Packaging methods (taping)

- Standard packing quantities

Unit: mm

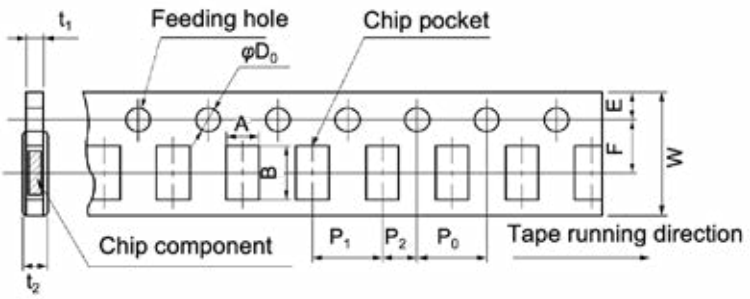
Size code	Size (inch)	Thickness (mm)	Kind of taping	Pitch (mm)	Quantity (pcs/reel)
0	0402	0.5	Punched carrier taping	2	10.000
1	0603	0,8	Punched carrier taping	4	4.000

- 2mm pitch (punched carrier taping) size 0402



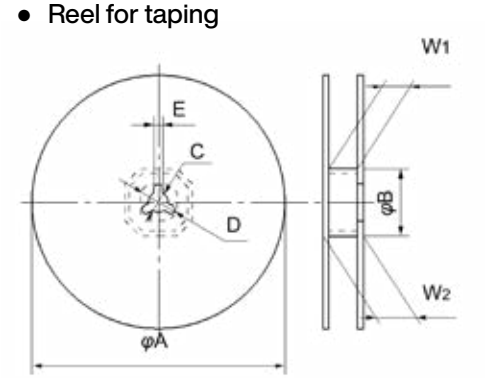
Symbol	A	B	W	F	E	P_1	P_2	P_0	$øD_0$	t_1	t_2
Unit (mm)	0.62 ±0.05	1.12 ±0.05	8.0 ±0.2	3.50 ±0.05	1.75 ±0.10	2.00 ±0.05	2.00 ±0.05	4.0 ±0.1	1.5 +0.1/0	0.7 max.	1.0 max.

- 4mm pitch (punched carrier taping) size 0603



Symbol	A	B	W	F	E	P_1	P_2	P_0	$øD_0$	t_1	t_2
Unit (mm)	1.0 ±0.1	1.8 ±0.1	8.0 ±0.2	3.50 ±0.05	1.75 ±0.10	4.0 ±0.1	2.00 ±0.05	4.0 ±0.1	1.5 +0.1/0	1.1 max.	1.4 max.

- Reel for taping

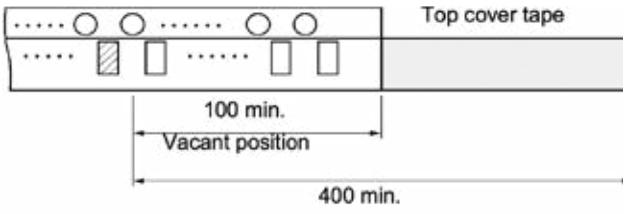


Symbol	øA	øB	C	D	E	W_1	W_2
Unit (mm)	180+0/−3	60.0+1.0/0	13.0±0.5	21.0±0.8	2.0±0.5	9.0+1.0/0	11.4±1.0

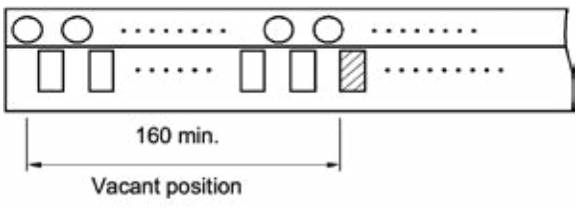
Packaging methods (taping)

- Leader part and taped end

Leader part



Taped end



Unit: mm

Minimum quantity / packing unit

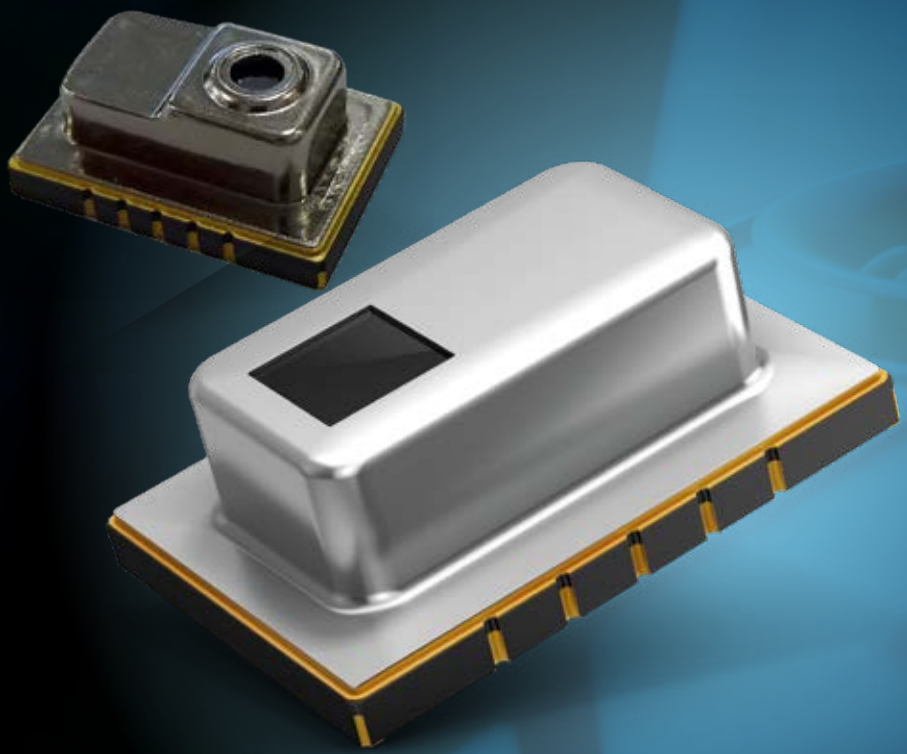
Part no. (inch size)	Minimum quantity / packing unit	Packing quantity in carton	Carton L × W × H (mm)
ERTJ0 (0402)	10.000	200.000	250 × 200 × 200
ERTJ1 (0603)	4.000	80.000	250 × 200 × 200

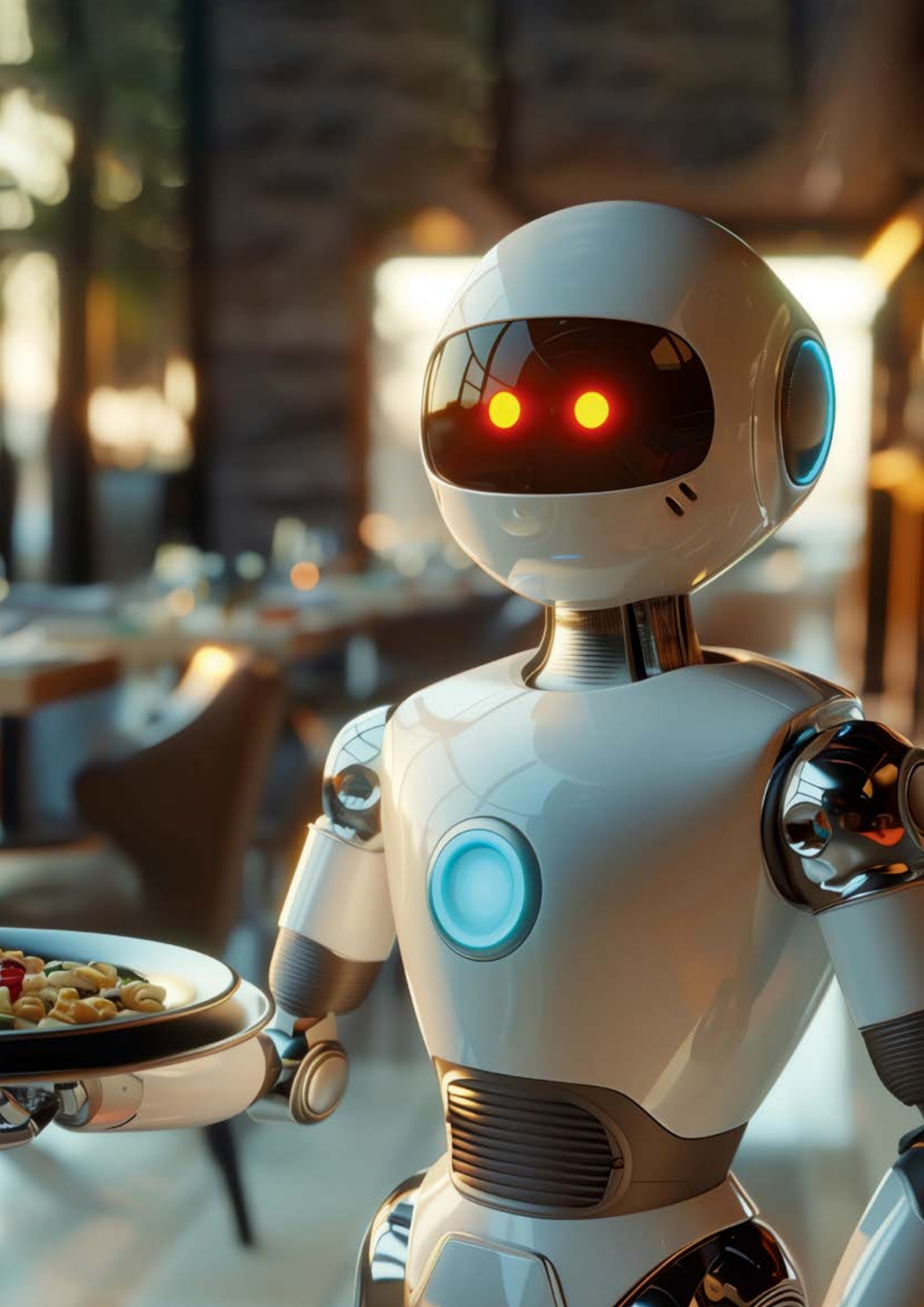
Part no., quantity and country of origin are designated on outer packages in English.

INNOVATIVE SENSOR SOLUTIONS

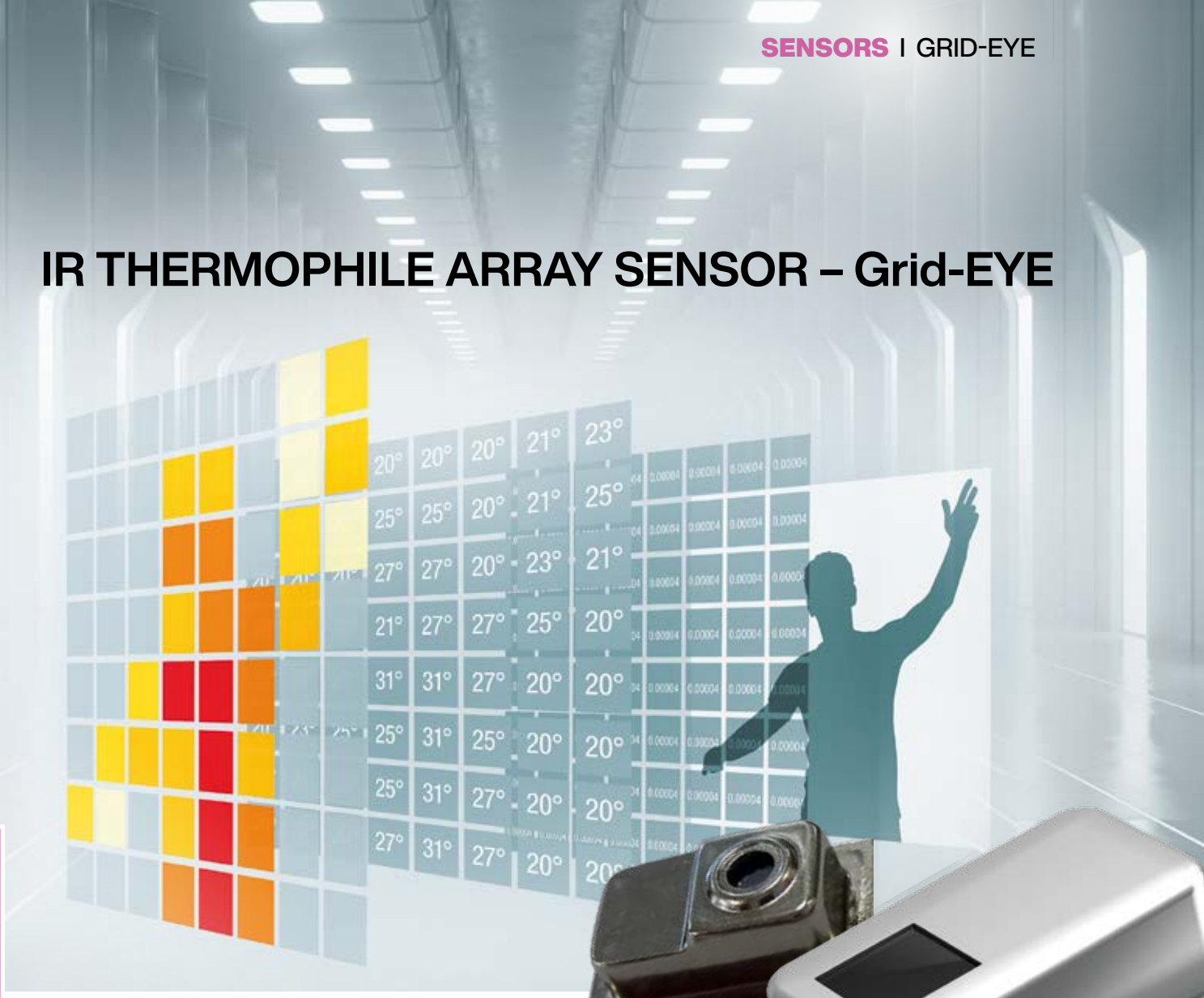
GRID EYE THERMAL SENSOR AND 6DOF INERTIAL SENSOR

Discover Panasonic's advanced sensor technology with our Grid Eye thermal SMT sensors and compact 6DoF inertial sensors.
Our Miniature Grid Eye Thermal SMT Sensors detect heat sources and measure temperature with 64 thermopile elements arranged in an 8x8 matrix, ideal for IoT applications like person-tracking. If you need a low-cost, miniature thermal sensor for smart embedded systems, the Grid Eye is the perfect choice.
The '6in1' Six DoF Inertial Sensor, measuring just 4.5 x 4.5 x 1.1mm, captures six degrees of freedom data including three axes of acceleration and gyro data. It's tailored for ADAS, autonomous driving, and mobility applications in automotive, off-highway, industrial machinery, and transportation sectors, promoting safer mobility solutions.
Explore how these innovative sensors can enhance your applications with precision and reliability.





IR THERMOPHILE ARRAY SENSOR – Grid-EYE



Thermal sensors for the next generation of smart embedded applications

Where do we offer alternatives

- Low-cost surface mount device in a very small package (11.6mm x 8mm x 4.3mm)
- Package with 64 thermopile MEMS pixels in 8x8 matrix, ASIC & integrated lens
- Digital readout of temperature data over I2C interface for simple integration
- Portfolio with multiple choices of lenses: 36°, 60° and 90° to address different use cases
- People tracking and counting algorithms for privacy-enabled detection
- New evaluation platforms with collocated Grid-EYE and camera to design machine learning based detection models

Go to Webseite

Grid-EYE: DETAILS

Grid-EYE's value proposition:

- Hot spot identification
- Moving and stationary detection
- Tracking and counting objects/people
- Area temperature measurement

3 Lens types to target different applications:

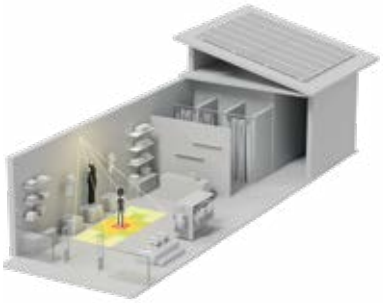
- Narrow: 36°
- Standard: 60°
- **Wide: 90°** NEW

Target applications

Hospital bed monitoring

Smart retail

Room occupancy



Personalized lighting

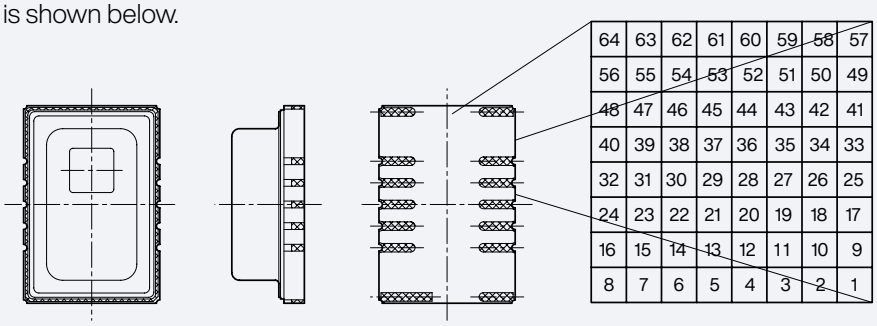
Hot-desking

Stove guards

Grid-EYE: DETAILS

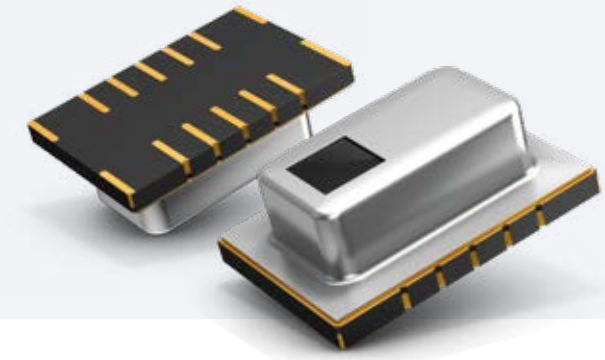
1. Pixel array

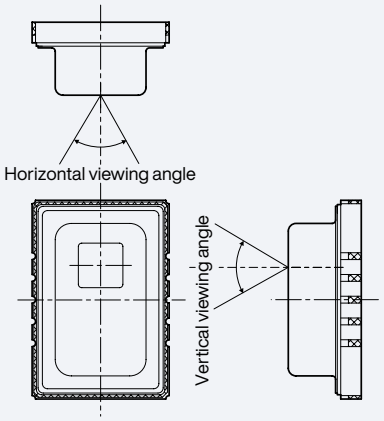
Pixel array from 1 to 64 is shown below.



2. Viewing field

Sensor viewing field (typical) is shown below.





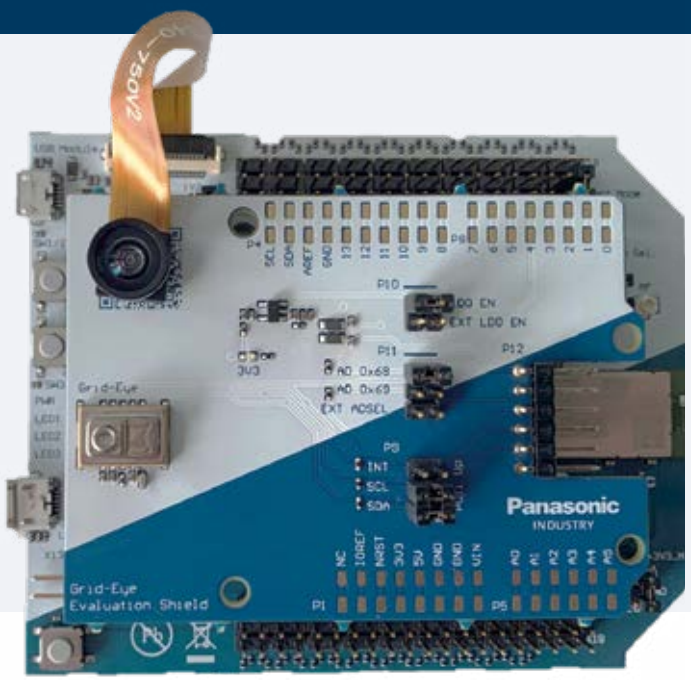
Ordering information

	Type	Field of view	Amplification factor	Operating voltage	Part number	Temperature of measured object
Grid-EYE	Narrow angle	35.6°	Low Gain	3.3V	AMG883642	-20 to 100°C
	Standard angle	60°	High Gain	3.3V	AMG8833	0 to 80°C
			Low Gain		AMG8834	-20 to 100°C
			High Gain	5V	AMG8853	0 to 80°C
			Low Gain		AMG8854	-20 to 100°C
	Wide angle*	90°	High Gain	3.3V	AMG883543	0 to 80°C
				5V	AMG885543	

* Contact Panasonic for more details

Grid-EYE: DETAILS

Evaluation platform



Grid-EYE Connectivity Kit

- Grid-EYE shield in Arduino form factor
- Embedded Wi-Fi using PAN9520 evaluation board
- Possible to interface with standard Arduino camera (not provided by Panasonic)

Simple setup for designing machine-learning models

- Camera – Grid-EYE combination to create aggregated datasets
- Possible to recover dataset over Wi-Fi channel
- Auto-annotation for people tracking & counting applications

	Wi-Fi	Grid-EYE Type	Order Code
Grid-EYE Connectivity kit (Arduino style)	PAN9520	35.6 °	ENW49D01AWKF
		60°	ENW49D01AXKF
		90°	ENW49D01AYKF

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6DOF INERTIAL SENSOR

EWTS5G HP Type

Main Features

- Balanced 6DoF accuracy with <0.01° orthogonality error
- Reduced total offset error and sensitivity error over the lifetime
- Robustness against harsh vibration and temperature
- ISO 26262 ASIL-B(D) compliant, AEC-Q100 qualified
- Complete installation flexibility for all systems

Market & Applications

- **Automotive:** Passive safety, ADAS/AD, comfort
- **Industrial:** Off-highway vehicles, AGVs, robotics
- **Mobility:** NEVs, motorbikes, trains, drones
- **Agriculture:** Agricultural robots, lawn mowers, sprayers

Specifications:	EWTS5G HP Type
Package size: 4.5 x 4.5 x 1.1mm	4.5 x 4.5 x 1.1mm
Operating temperature: -40 to +125°C	-40 to +125°C
Interface:	SPI
Total offset:	Gyroscope ±2 dps, accelerometer ± 50mg
ASIL:	ASIL-B (D)
Total sensitivity error:	Gyro±2.0%, Accel±2.0%

Go to Webseite

EWTS5G HP SERIES BASIC SPEC

Characteristics

	Size (mm)	4.5 x 4.5 x 1.1
	Operation temperature	-40°C to +125°C
	Storage temperature	-40°C to +125°C
	Operation voltage [DC]	3.3 ± 0.3V
	Current consumption	≦ 10mA
	Data interface	SPI
Gyro	Axis	X, Y, Z
	Zero point error	≦ ± 2.0dps
	Scale factor error	≦ ± 2.0%
	Full scale range	± 300dps, ± 150dps, ± 120dps, ± 60dps, ± 30dps (Selectable)
	Frequency response	10Hz, 12.5Hz, 27Hz, 30Hz, 46Hz, 60Hz (Selectable)
	Cross axis sensitivity	≦ ± 1.7%
	Output noise	≦ 0.1dps rms (LPF: 60Hz)
	Orthogonality	≦ 0.01°
Acceleration	Axis	X, Y, Z
	Zero point error	≦ ± 0.05G
	Scale factor error	≦ ± 2.0%
	Full scale range	± 16G, ± 8G, ± 2G, ± 1G (Selectable)
	Frequency response	10Hz, 46Hz, 60Hz, 250Hz, 300Hz, 400Hz (Selectable)
	Cross axis sensitivity	≦ ± 1.7%
	Output noise	≦ 0.004G rms (LPF: 60 Hz)
	Orthogonality	≦ 0.01°

Reliability test condition (AEC-Q100 compliance)	
Temperature humidity bias (THB)	85°C / 85%RH / 3.6V / 1000h
High temperature storage life (HTSL)	150°C / 1000h
High temperature operating life (HTOL)	125°C / 3.6V / 1000h
Temp cycling (TC)	-55°C to 150°C / 1000 cycle
Mechanical shock (MS)	1500G / 0.5ms / 5 times for each axis
Variable frequency vibration (VFV)	50G / 20Hz to 2kHz / 4 times for each axis

Main Features

- Variety of interfaces including CAN, Ethernet, UART, and USB.
- IMU configuration, sampling settings, and data recording functions

THERMAL SOLUTIONS

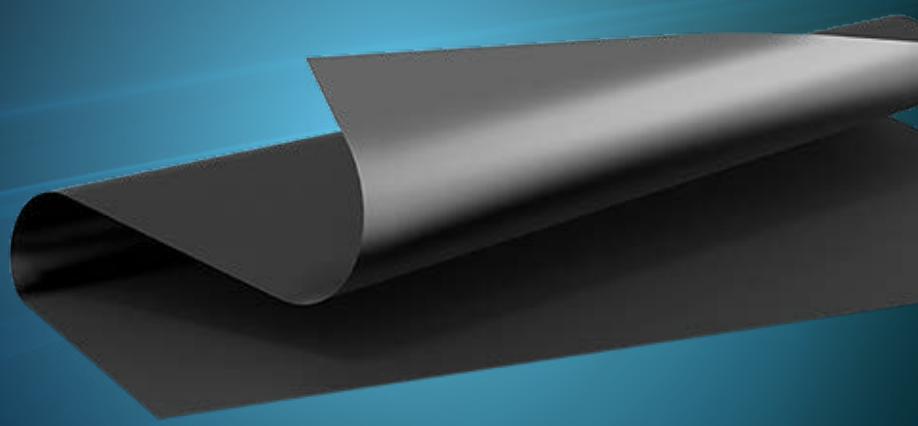
THE FUTURE OF THERMAL MANAGEMENT

In today's rapidly evolving technological landscape, effective thermal management is more crucial than ever. Devices are becoming more powerful and compact, leading to increased heat generation that can impact performance and reliability.

At Panasonic Industry, we recognize the important role that advanced thermal solutions play in optimizing the functionality and lifespan of electronic components.

Panasonic Industry offers a comprehensive range of innovative thermal management products designed to meet the diverse needs of various industries. Our portfolio includes highly efficient thermal interface materials (TIMs) and advanced graphite sheets that deliver superior thermal conductivity and reliability.

Engineered with precision and backed by rigorous testing, our thermal solutions are tailored to address the challenges posed by high-power applications. Whether you are looking to enhance the thermal performance of consumer electronics, automotive systems, industrial machinery, or renewable energy devices, Panasonic Industry has the expertise and products to help you achieve your goals.



PGS

PGS Graphite Sheets

"PGS (Pyrolytic Graphite Sheet)" is a thermal conductivity sheet which is very thin, synthetically made, has high thermal conductivity, and is made from a polymer film. It is ideal for providing thermal management / heat-sinking in limited spaces. This material is flexible and can be cut into customizable shapes.

Go to Webseite

EYG TYPE

Features

- Excellent thermal conductivity: 700 to 1000W / (m·K)
  (2 times as high as copper, 3 to 5 time as high as aluminum)
- Lightweight: Specific gravity: 0.85 to 1.00g / cm^3
- Flexible and easy to be cut or trimmed (withstands repeated bending)
- Low thermal resistance
- RoHS compliant

Recommended applications

- Semiconductor manufacturing equipment (sputtering, dry etching, steppers)
- Optical communications equipment
- TIM (Thermal Interface Material)

Explanation of part numbers I PGS only (EYGS)

1 2 3	4	5 6 7 8	9 10
E Y G	S	0 9 1 2	1 0
Product code	Style	Dimension (mm)	PGS thickness
PGS Graphite sheet	S: PGS only	0912: 90 × 115 1218: 115 × 180 1823: 180 × 230	10: 100μm 07: 70μm

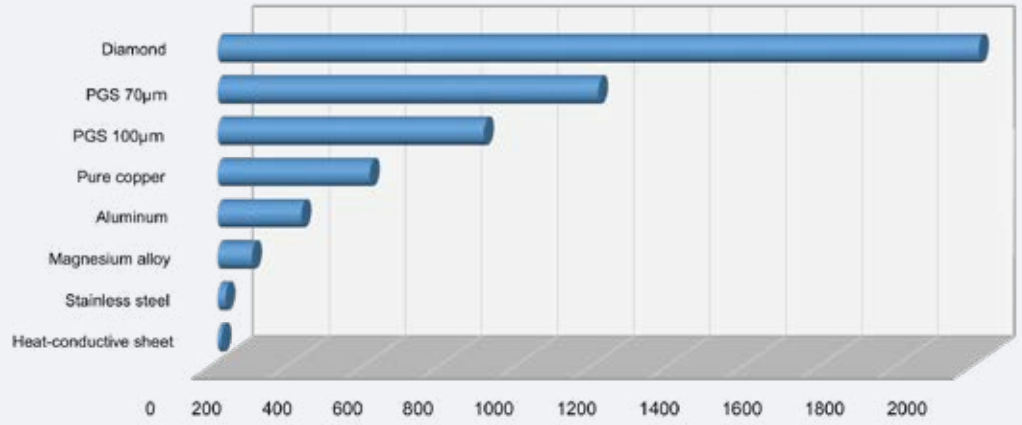
Characteristics of PGS graphite sheets

Thickness		100μm	70μm
		0.10±0.03mm	0.07±0.015mm
Density		0.85 g / cm^3	1.21 g / cm^3
Thermal conductivity a-b plane		700W / (m·K)	1000W / (m·K)
Electrical conductivity		10000 S / cm	10000 S / cm
Extensional strength		20.0 MPa	20.0 MPa
Expansion coefficient	a-b plane	9.3×10^{-7} 1 / K	9.3×10^{-7} 1 / K
	c axis	3.2×10^{-5} 1 / K	3.2×10^{-5} 1 / K
Heat resistance*1		400 ℃	
Bending (angle 180, R5)		10000 cycles	

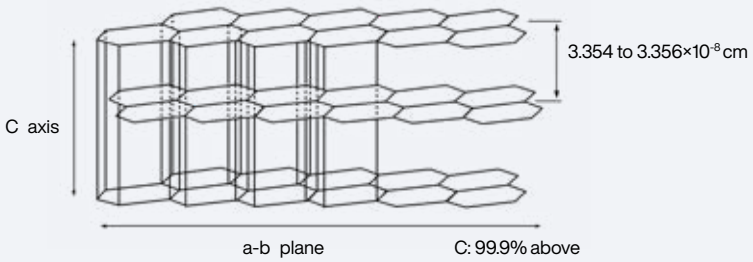
*1 Withstand temperature refers to PGS only. (Lamination material such as PET tape etc. is not included)

PGS GRAPHITE SHEETS

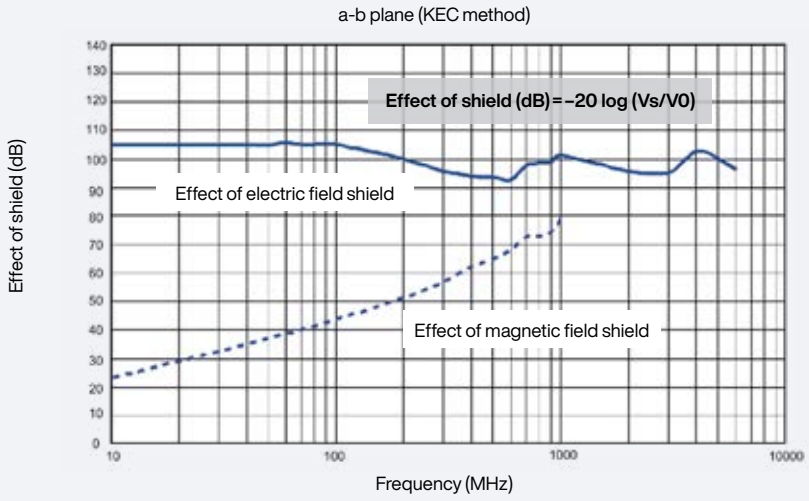
Comparison of thermal conductivity (a-b plane)



Layered structure of PGS

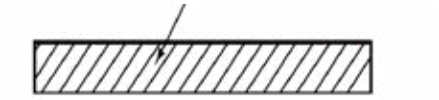


Electric field shield performance



Type / Composition example

- Standard series (PGS 100, 70μm series)

Type		PGS only
		S type
Front face		–
Rear face		–
Structure		PGS Graphite sheets 
Features		• High thermal conductivity, high flexibility • Low thermal resistance • Available up to 400 °C • Conductive material
Withstand temperature		400° C
100μm	Part no.	EYGS121810
	Thickness	100μm
70μm	Part no.	EYGS121807
	Thickness	70μm

Minimum order

Item	Type	Part no.	Size (mm)	Minimum order
PGS Graphite Sheet Only	S type 100μm	EYGS091210	90 × 115	20
		EYGS121810	115 × 180	10
		EYGS182310	180 × 230	10
	S type 70μm	EYGS091207	90 × 115	20
		EYGS121807	115 × 180	10
		EYGS182307	180 × 230	10

(1) The above-listed part number is sample part number for testing.
(2) Please contact us about your request of custom part number which will be arranged separately.
(3) Please contact us if quantity is below minimum order quantity.

GraphiteTIM (COMPRESSIBLE TYPE)

GraphiteTIM (Compressible type) is a graphite sheet that is dedicated for use as a thermal interface material. The GraphiteTIM (Compressible type) has a very high compressibility compared to a standard PGS, which makes it possible to reduce the thermal resistance while effectively dealing with gaps, warpage, and distortion of targets / substrates.

Excellent heat resistance and reliability of the GraphiteTIM help obtain a longer service life and a higher performance of various components such as power modules.

The GraphiteTIM (Compressible type) is cost-saving because it may allow you to reduce your existing processes. Since it is a sheet-type product, there is no need for a printing process as is required for grease. In short, GraphiteTIM excels as a thermal interface material because it does not have any of the problems encountered when using grease and phase change materials.

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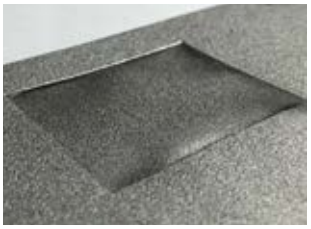
EYGS, EYGR TYPE

Features



After pressure to GraphiteTIM

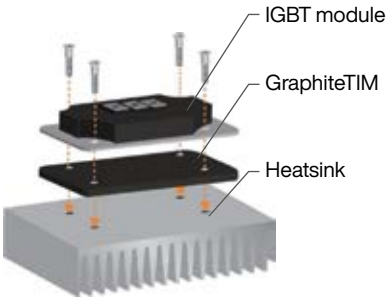
- Thermal resistance: 0.2 K·cm²/W (600kPa)
  To achieve a good thermal resistance from GraphiteTIM, adequate pressure must be applied. This helps to fill voids more effectively
- Thermal conductivity:
  X-Y direction 200 to 400W/m·K,
  Z direction (28W/m·K)
- Compressibility: 40% or more (600 kPa)
- High and long term reliability: operating temperature range −55 to 400 °C
- RoHS compliant

Recommended applications

For cooling/heat transfer of electronic devices that generate heat such as power modules.

- Inverters and converters modules
- Car-mounted camera, motor control unit, automotive LED, luminous source of laser HUD, medical equipment
- Base station, server

Install in IGBT module



Explanation of part numbers I GraphiteTIM (EYG ❋❋❋❋Z ❋❋❋)

1 2 3	4	5 6 7 8	9 10	11 12
E Y G	S	0 9 1 8	Z L	X 2
Product code	**Style**	**Dimension (mm)**	**Thickness of GraphiteTIM**	**Suffix**
PGS	S Standard type	0909 90 × 90	ZL 200μm	
Graphite sheet	R High compressible type	0918 90 × 180	ZL 250μm	
		1818 180 × 180	ZR 350μm	

* Please contact us for custom-made products

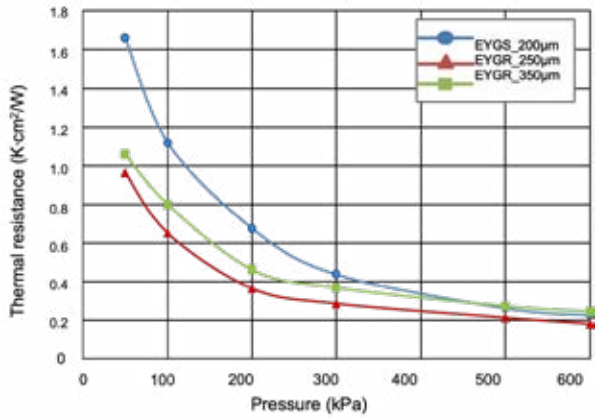
GraphiteTIM WITH LOW THERMAL RESISTANCE

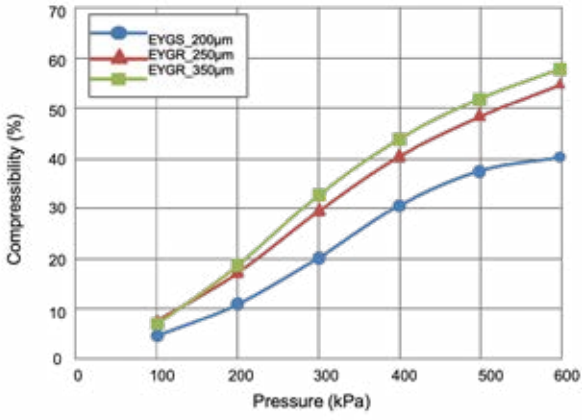
Typical characteristics

Items	Test method	Condition	Data		
Thickness (μm)			200	250	350
Thermal resistance (K·cm²/W)	TIM Tester	200kPa	0.6	0.4	0.5
Compressibility (%)	TIM Tester	600kPa	40	55	55
Thermal conductivity (W/m·K)	Laser PIT	X-Y	400	250	200
		Z	28	28	28
Flame resistance	UL-94V		V-0 equivalent		
Operating temperature range (°C)			−55 to 400		

Typical values, not guaranteed

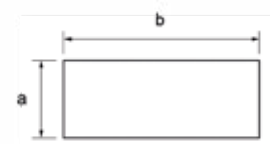
Thermal resistance and compressibility





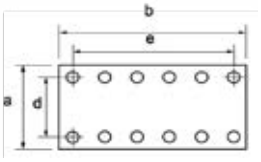
Type / Composition example

- GraphiteTIM (Compressible type) standard form

Type		Sheet only		
		S type	R type	
Process for IGBT mounting		–		
Structure	Front			
	Side			
Operating temperature range		−55 °C to 400 °C		
Thickness : c		200µm	250µm	350µm
Standard part no.	90 x 90mm	EYGS0909ZLX2	EYGR0909ZLX2	EYGR0909ZRX2
	90 x 180mm	EYGS0918ZLX2	EYGR0918ZLX2	EYGR0918ZRX2
	180 x 180mm	EYGS0918ZLX2	EYGR1818ZLX2	EYGR1818ZRX2

Part numbers listed above are all standard samples for your consideration.
Contact us for custom-made samples. We can make samples in various forms and / or dimensions other than standard samples.

- PGS in IGBT forms

Type		Sheet only		
		S type	R type	
Process for IGBT mounting		–		
Structure	Front	 This shape is an example, please contact us for details on the shape of each part no.		
	Side			
Operating temperature range		−55 °C to 400 °C		
Thickness : c		200µm	250µm	350µm

GraphiteTIM WITH LOW THERMAL RESISTANCE

Type / Composition example

No.	Standard part no. 200µm	Standard part no. 250µm	Standard part no. 300µm	a : Lateral size (mm)	b : Longitudinal size (mm)	Hole number	Hole diameter (ø mm)	d : Lateral hole pitch (mm)	e : Longitudinal hole pitch (mm)
1	EYGS1431ZLAA	EYGR1431ZLAA	EYGR1431ZRAA	140	308	12	6	126	290
2	EYGS0925ZLWA	EYGR0925ZLWA	EYGR0925ZRWA	85	246	14	6	73	234
3	EYGS1419ZLWB	EYGR1419ZLWB	EYGR1419ZRWB	136	186	8	7.5	124	171
4	EYGS0917ZLWC	EYGR0917ZLWC	EYGR0917ZRWC	85	168	10	6	73	156
5	EYGS1316ZLAC	EYGR1316ZLAC	EYGR1316ZRAC	125	163	8	6.1	110	150
6	EYGS1216ZLWD	EYGR1216ZLWD	EYGR1216ZRWD	120	160	8	6	110	150
7	EYGS1116ZLMA	EYGR1116ZLMA	EYGR1116ZRMA	108.8	158	8	6	92.75	144
8	EYGS1315ZLGA	EYGR1315ZLGA	EYGR1315ZRGA	129.5	150	8	7	118.5	137.5
9	EYGS1314ZLWE	EYGR1314ZLWE	EYGR1314ZRWE	126	136	6	7.5	114	124
10	EYGS1014ZLAD	EYGR1014ZLAD	EYGR1014ZRAD	97.8	138	4	6.8	86	127
11	EYGS0714ZLAE	EYGR0714ZLAE	EYGR0714ZRAE	70	138	4	5.7	57	128
12	EYGS0714ZLAF	EYGR0714ZLAF	EYGR0714ZRAF	69	136	4	7.2	57	124
13	EYGS1113ZLMB	EYGR1113ZLMB	EYGR1113ZRMB	106	132	4	5.7	95	121
14	EYGS1313ZLGB	EYGR1313ZLGB	EYGR1313ZRGB	128	128	4	6.7	110	110
15	EYGS0713ZLAG	EYGR0713ZLAG	EYGR0713ZRAG	66	126	4	5.7	50	116
16	EYGS0813ZLMD	EYGR0813ZLMD	EYGR0813ZRMD	71	123	2	4.7	Center	116
17	EYGS1212ZLGC	EYGR1212ZLGC	EYGR1212ZRGC	120	120	4	5.7	110	110
18	EYGS0912ZLGD	EYGR0912ZLGD	EYGR0912ZRGD	88	120	4	5.7	78	110
19	EYGS0612ZLWF	EYGR0612ZLWF	EYGR0612ZRWF	60	120	4	5.7	50	110
20	EYGS0512ZLGE	EYGR0512ZLGE	EYGR0512ZRGE	53	118	2	5.7	Center	106
21	EYGS0811ZLGH	EYGR0811ZLGH	EYGR0811ZRGH	80	113	4	5.7	70	103
22	EYGS0811ZLWG	EYGR0811ZLWG	EYGR0811ZRWG	78	108	4	6.7	62	93
23	EYGS0611ZLWH	EYGR0611ZLWH	EYGR0611ZRWH	60	106	4	6.7	48	93

No.	Standard part no. 200μm	Standard part no. 250μm	Standard part no. 300μm	a : Lateral size (mm)	b : Longitudinal size (mm)	Hole number	Hole diameter (ø mm)	d : Lateral hole pitch (mm)	e : Longitudinal hole pitch (mm)
24	EYGS0411ZLWJ	EYGR0411ZLWJ	EYGR0411ZRWJ	43	106	2	5.7	Center	93
25	EYGS0610ZLAH	EYGR0610ZLAH	EYGR0610ZRAH	59.4	104	4	6.7	48	93
26	EYGS0410ZLAJ	EYGR0410ZLAJ	EYGR0410ZRAJ	43	103	2	5.7	Center	93
27	EYGS1010ZLME	EYGR1010ZLME	EYGR1010ZRME	98	98	4	6.7	87	87
28	EYGS0409ZLGJ	EYGR0409ZLGJ	EYGR0409ZRGJ	44	93	2	6.7	Center	80
29	EYGS0509ZLGK	EYGR0509ZLGK	EYGR0509ZRGK	46	92	2	6.7	Center	80
30	EYGS0309ZLMF	EYGR0309ZLMF	EYGR0309ZRMF	32	92	2	6.7	Center	80
31	EYGS0409ZLMG	EYGR0409ZLMG	EYGR0409ZRMG	41	88	2	5.7	Center	80
32	EYGS0309ZLAK	EYGR0309ZLAK	EYGR0309ZRAK	29.5	90	2	6.6	Center	80
33	EYGS0509ZLMH	EYGR0509ZLMH	EYGR0509ZRMH	51	86	2	4.7	-	80
34	EYGS0508ZLMJ	EYGR0508ZLMJ	EYGR0508ZRMJ	46.2	83	2	4.7	-	77
35	EYGS0608ZLMK	EYGR0608ZLMK	EYGR0608ZRMK	55	78	2	4.5	Center	40
36	EYGS0607ZLGL	EYGR0607ZLGL	EYGR0607ZRGL	58	70	4	5.7	50	62
37	EYGS0507ZLML	EYGR0507ZLML	EYGR0507ZRML	45.3	66	2	4.7	-	60
38	EYGS0407ZLAL	EYGR0407ZLAL	EYGR0407ZRAL	40	66	1	7.7	Center	Center
39	EYGS0506ZLMM	EYGR0506ZLMM	EYGR0506ZRMM	48	55	1	4.5	Center	Center
40	EYGS0404ZLMP	EYGR0404ZLMP	EYGR0404ZRMP	36	38	1	4.5	Center	Center
41	EYGS1018ZLSA	EYGR1018ZLSA	EYGR1018ZRSA	104.5	183	8	7	93	171
42	EYGS1516ZLSB	EYGR1516ZLSB	EYGR1516ZRSB	148	158	8	5	137	150
43	EYGS1116ZLSC	EYGR1116ZLSC	EYGR1116ZRSC	112	158	8	5	101	150
44	EYGS0715ZLSD	EYGR0715ZLSD	EYGR0715ZRSD	67	153	4	5.6	57	143
45	EYGS0613ZLSE	EYGR0613ZLSE	EYGR0613ZRSE	61	128	4	5.6	50	116
46	EYGS0612ZLSF	EYGR0612ZLSF	EYGR0612ZRSF	63.3	124	4	5.6	50	110
47	EYGS0612ZLSG	EYGR0612ZLSG	EYGR0612ZRSG	61.5	124	4	5.6	50	110
48	EYGS1012ZLSH	EYGR1012ZLSH	EYGR1012ZRSH	104.5	121	4	6.7	93	109.5
49	EYGS0410ZLSJ	EYGR0410ZLSJ	EYGR0410ZRSJ	43	103	2	5.7	Center	93
50	EYGS0609ZLSK	EYGR0609ZLSK	EYGR0609ZRSK	61.5	91	4	5.6	50	77
51	EYGS0606ZLSL	EYGR0606ZLSL	EYGR0606ZRSL	58	62	2	5.6	44	50
52	EYGS0305ZLSM	EYGR0305ZLSM	EYGR0305ZRSM	27	51	1	4.6	Center	Center
53	EYGS0204ZLSN	EYGR0204ZLSN	EYGR0204ZRSN	24	37	1	4.6	Center	Center
54	EYGS0303ZLSP	EYGR0303ZLSP	EYGR0303ZRSP	29	32	1	4.5	Center	Center
55	EYGS0911ZLDA	EYGR0911ZLDA	EYGR0911ZRDA	92	109	4	6	78	93
56	EYGS1014ZLDB	EYGR1014ZLDB	EYGR1014ZRDB	98	138	4	6.7	86	127

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NOTES PAGE

SPOT THE DIFFERENCE QUIZ

The top illustration is correct, but the bottom one is missing some objects.

So, how many items are missing?

Take a good look and compare!

The answer is seven objects.

NOTES PAGE

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