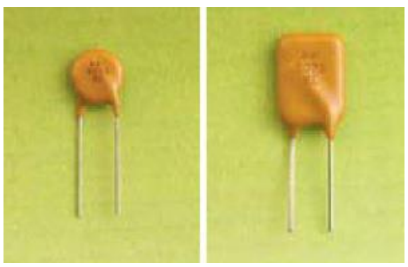
Radial Leaded PTC

0ZRE Series

HF Pb 0ZRE Series — RoHS Compliant



UK CA CE TÜV cULus

AEC-Q Compliant

Product Features

- Continuous Use at voltages up to 240V AC/DC, Low Hold Current, 265V AC/DC Max Interrupt voltage
- Full compliance with EU Directive 2011/65/EU and amending directive 2015/863
- AEC-Q Compliant
- Meets Bel automotive qualification*
  - * - Largely based on internal AEC-Q test plan

Operating (Hold Current) Range

50mA - 2A

Temperature Range

-40°C to 85°C

Maximum Operating Voltage

240V AC/DC

Maximum Interrupt Voltage

265V AC/DC

Agency Approval

TUV (Std. EN60738-1-1, Cert. R50102173)
UL Recognized Component (Std. UL1434, File E305051)

LEAD FREE = Pb
HALOGEN FREE = HF

Electrical Characteristics (23°C)

	Part Number (Bulk)	Hold Current	Trip Current	Rated Voltage	Max Current	Typical Power	Max Time to Trip		Resistance Tolerance		Agency Approvals	
							Current	Time	Rmin	R1max	cULus	TÜV
		I_H, A	I_T, A	V_{max}, V_{dc}/V_{ac}	I_{max}, A	P_d, W	A	Sec	Ohms	Ohms		
A	0ZRE0005FF1C	0.05	0.12	240	1.5	0.7	0.25	15.0	18.5	65.00	Y	Y
B	0ZRE0008FF1C	0.08	0.19	240	1.5	0.8	0.40	15.0	7.40	26.00	Y	Y
C	0ZRE0012FF1C	0.12	0.30	240	2.0	1.0	0.60	15.0	3.00	12.00	Y	Y
D	0ZRE0016FF1C	0.16	0.37	240	2.0	1.4	0.80	15.0	2.50	7.80	Y	Y
E	0ZRE0025FF1E	0.25	0.56	240	6.0	1.5	1.25	18.5	1.30	3.80	Y	Y
F	0ZRE0033FF1A	0.33	0.74	240	6.0	1.7	1.65	21.0	0.83	2.60	Y	Y
G	0ZRE0040FF1A	0.40	0.90	240	7.0	2.0	2.00	24.0	0.60	1.90	Y	Y
H	0ZRE0055FF1A	0.55	1.25	240	7.0	3.4	2.75	26.0	0.45	1.45	Y	Y
I	0ZRE0075FF1A	0.75	1.50	240	7.5	2.6	3.75	18.0	0.32	0.84	Y	Y
J	0ZRE0100FF1A	1.00	2.00	240	10.0	2.9	5.00	21.0	0.22	0.58	Y	Y
K	0ZRE0125FF1A	1.25	2.50	240	12.5	3.3	6.25	23.0	0.17	0.44	Y	Y
L	0ZRE0150FF1A	1.50	3.00	240	15.0	3.7	7.50	23.0	0.12	0.32	Y	Y
M	0ZRE0200FF1A	2.00	4.00	240	20.0	4.5	10.00	28.0	0.09	0.22	Y	Y

IH Hold Current- The maximum current at which the device will not trip in still air at 23°C.
IT Trip current- The minimum current at which the device will trip in still air at 23°C.
Vmax Maximum voltage device can withstand at its rated current without suffering damage.
Imax Maximum fault current device can withstand at rated voltage (Vmax) without damage.
Pd Typical power dissipated by device when in tripped state in 23°C still air environment.
Rmin Minimum device resistance at 23°C in initial un-soldered state.
R1max Maximum device resistance at 23°C, 1 hour after initial device trip, or after being soldered to PCB in end application

Specifications subject to change without notice

PTC’s – Basic Theory of Operation / “Tripped” Resistance Explanation

A Bel PTC consists of a block of polymeric material containing conductive carbon granules which is sandwiched between two conductive metal plates. When this polymer block reaches approximately 125C, either due to current passing through it via conductive chains of carbon particles or due to an external heat source; it swells volumetrically. This expansion breaks apart a majority of the chains of carbon granules that run randomly between the two conductive plates. This behavior results in a sharp increase in resistance across the two plates which all but eliminates current flow through the device, allowing just enough residual current flow to maintain the block’s internal temperature at 125C. Once this “tripped” state current is cut off, the polymer brick cools and shrinks to its original size, thereby allowing its broken carbon chains to reestablish themselves and permit the part to return to its low resistance state. Once cooled to room ambient, the PTC will once again exhibit a resistance less than its “R1max” rating.

At currents below the device IHOLD rating, AND at temperatures below 100C, the PTC maintains a resistance value below its R1 MAX rating.

The catalog data for each device specifies a "Typical Power" value. This is the power required to exactly match the heat lost by the tripped device to its ambient surroundings at 23C. By Ohm's Law, power can be stated as: $W = E^2/R$. Thus the approximate resistance of a “Tripped” PTC can be determined by: $R = E^2/W$, where "E" is the voltage appearing across the PTC (usually the supply's open circuit voltage), and "W" is the Typical Power value for the particular PTC.

Since the PPTC acts to maintain a constant internal temperature, its apparent resistance will change based upon applied voltage and, to a lesser degree, ambient conditions. Consider the following example....

A PTC with a Typical Power of 1 watt protecting a circuit using a 60V supply will demonstrate an apparent, tripped resistance "R" of:

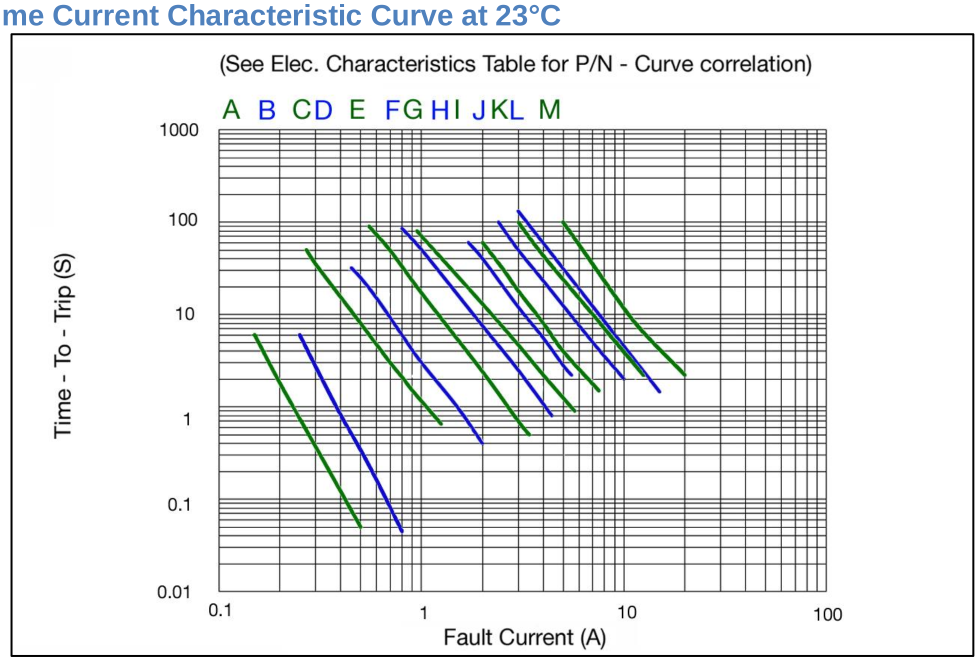
$R = 60^2/1 = 3,600$ ohms

This same tripped device when used to protect a 12V circuit would now present an apparent resistance of:

$R = 12^2/1 = 144$ ohms

The value for Typical Power is "typical" because any physical factors that affect heat loss (such as ambient temperature or air convection) will somewhat alter the level of power that the PTC needs to maintain its internal temperature. In short, PTCs do not exhibit a constant, quantifiable tripped resistance value.

Average Time Current Characteristic Curve at 23°C



The Average Time Current Characteristic Curve and Temperature Rerating Curve are affected by a number of variables and these curves are provided for guidance only.

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Physical Specifications

Lead material:
   Matte tin plated copper, size / diameter as shown in Drawings and Table under Product Dimensions.
Soldering charactcristics
   MIL-STD-202, Method 208H.
Insulating coating
   Flame retardant epoxy, meets UL-94-V-0 requirements.

PTC Marking

"bel" or "b", , IH code and "RE .

Product Dimensions

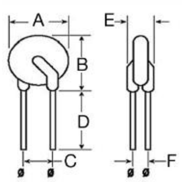


Fig.1

Lead Size : 24AWG
Φ0.51 mm Diameter

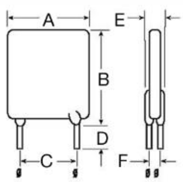


Fig.2

Lead Size : 22AWG
Φ0.65 mm Diameter

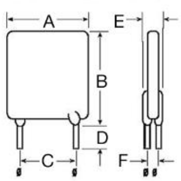


Fig.3

Lead Size : 20AWG
Φ0.81 mm Diameter

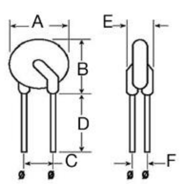


Fig.4

Lead Size : 20AWG
Φ0.81 mm Diameter

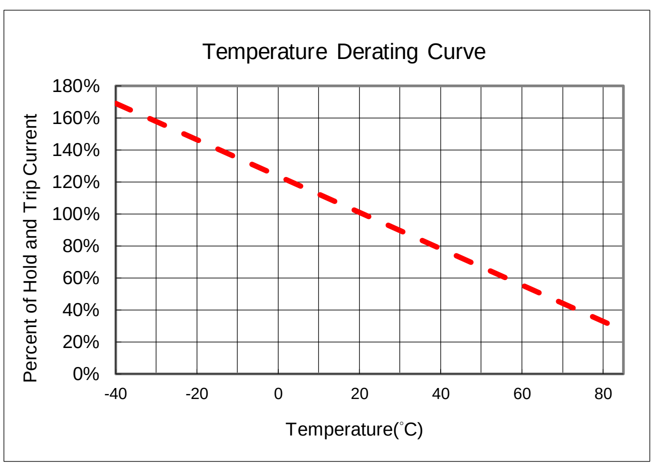
All dimensions in mm.

Part Number	Fig.	A	B	C	D	E	F
		Max	Max	Typical	Min	Max	Typical
0ZRE0005FF - 0ZRE0012FF	1	8.3	10.7	5.1	7.6	3.8	1.6
0ZRE0016FF	1	9.9	12.5	5.1	7.6	3.8	1.6
0ZRE0025FF	2	9.6	17.4	5.1	7.6	3.8	1.8
0ZRE0033FF	2	11.4	16.5	5.1	7.6	3.8	1.8
0ZRE0040FF	2	11.5	19.5	5.1	7.6	3.8	1.8
0ZRE0055FF	3	14.0	21.7	5.1	7.6	4.1	1.9
0ZRE0075FF	3	11.5	23.4	5.1	7.6	4.8	1.9
0ZRE0100FF	4	18.7	24.4	10.2	7.6	5.1	1.9
0ZRE0125FF	4	21.2	27.4	10.2	7.6	5.3	1.9
0ZRE0150FF	4	23.4	30.9	10.2	7.6	5.3	1.9
0ZRE0200FF	3	24.9	33.8	10.2	7.6	6.1	1.9

Temperature Derating Table

	Temperature Derating									
I Hold Value	**-40**	**-20**	**0**	**23**	**30**	**40**	**50**	**60**	**70**	**85**
0ZRE	167%	146%	124%	100%	92%	79%	67%	55%	43%	25%

Thermal Derating Curve



Cautionary Notes

1. Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
2. These Polymer PTC (PPTC) devices are intended for protection against occasional overcurrent/overtemperature fault conditions and may not be suitable for use in applications where repeated and/or prolonged fault conditions are anticipated.
3. Avoid contact of PTC device with chemical solvent. Prolonged contact may adversely impact the PTC performance.
4. These PTC devices may not be suitable for use in circuits with a large inductance, as the PTC trip can generate circuit voltage spikes above the PTC rated voltage.
5. These devices may be used in both DC and AC circuits provided that peak-to-peak line voltage when carrying AC does not exceed the PTC's Vmax rating. As PTCs are essentially thermal devices, the RMS value of AC current carried by a PTC will produce tripping parameters and times-to-trip similar to those of a DC voltage of the same magnitude.
6. If potting is mandated, avoid rigid potting compounds as they will encase the PTC and prevent it from volumetrically expanding to properly respond to a trip event.

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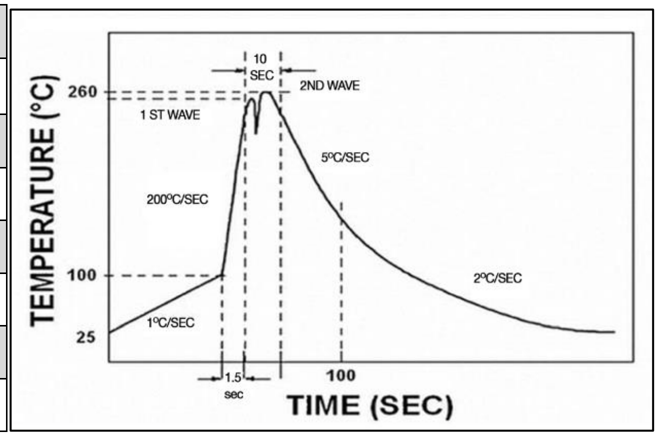
Environmental Specifications

Temperature cycling	JESD22 Method JA-104
Biased humidity	MIL-STD-202 Method 103
Operational life	MIL-STD-202 Method 108
Terminal strength	AEC-Q200-004
Resistance to solvents	MIL-STD-202 Method 215
Mechanical shock	MIL-STD-202 Method 213
Vibration	MIL-STD-202 Method 204
Resistance to soldering heat	MIL-STD-202 Method 210
Thermal shock	MIL-STD-202 Method 107
Solderability	ANSI/J-STD-002

Soldering Parameters

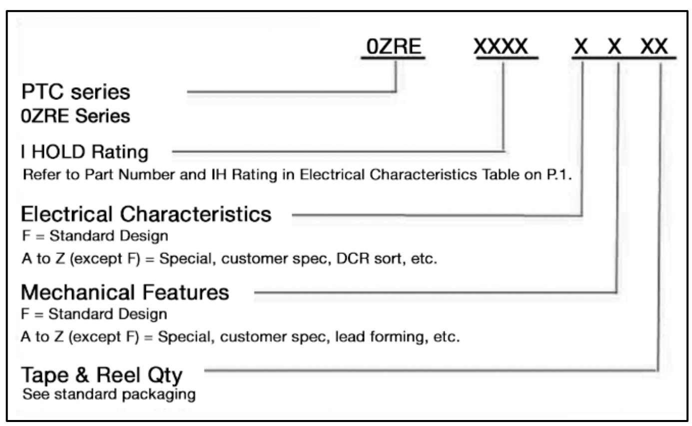
Lead-free Wave Soldering Profile	
Wave Solder Parameter	
Average ramp-up rate	200°C / second
Heating rate during preheat	typical 1 - 2°C / second Max 4°C / second
Final preheat temperature	within 125°C of soldering temperature
Peak temperature Tp	260°C
Time within +0°C / -5°C of actual peak temperature	10 seconds
Ramp-down rate	5°C / second max.



Standard Packaging

Part Number	Bulk		Reel/Tape	
	Pcs/Box	P/N Code	Pcs/Reel	P/N Code
0ZRE0005FF - 0ZRE0016FF	2000	1C	2000	2C
0ZRE0025FF	3000	1E	1500	2B
0ZRE0033FF - 0ZRE0040FF	1000	1A	1500	2B
0ZRE0055FF	1000	1A	1000	2A
0ZRE0075FF	1000	1A	2000	2C
0ZRE0100FF - 0ZRE0200FF	1000	1A	N/A	N/A

P/N Explanation and Ordering Information



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Bel:

0ZRE0005FF1C 0ZRE0055FF2A 0ZRE0040FF2B 0ZRE0016FF2C 0ZRE0033FF1A 0ZRE0008FF1C
0ZRE0025FF2B 0ZRE0040FF1A 0ZRE0005FF2C 0ZRE0025FF1E 0ZRE0055FF1A 0ZRE0012FF1C
0ZRE0016FF1C 0ZRE0033FF2B 0ZRE0008FF2C 0ZRE0012FF2C 0ZRE0125FF1A 0ZRE0100FF1A
0ZRE0200FF1A 0ZRE0150FF1A 0ZRE0075FF1A