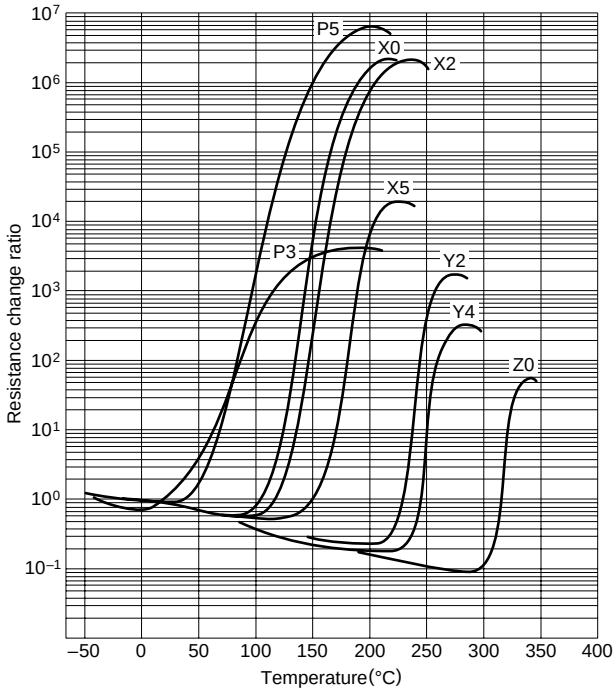
Sensors

Temperature Sensors
PTC Thermistors

PTC (Positive Temperature Coefficient) thermistors are made of an oxide semiconductor ceramic with barium titanate as the main component. The switching temperature is determined by raw material composition. Above this temperature, the resistance rises rapidly. This property of PTC thermistors make them suitable for a wide range of applications, including constant temperature heaters, current limiting elements, and temperature sensors.

FEATURES

- Switching temperatures are available in the range from +30 to +330°C, accommodating a wide variety of applications.



- Within any given size and shape, there is a wide range of available resistances at normal temperature. In the following formulas, ρ (specific resistivity at normal temperature) can have values in the range of 10Ω • m to 50kΩ • m with slight variations according to switching temperature. Resistance is calculated as follows:

Disc shape

$$R = \frac{t}{D^2} \times 12.7 \times \rho$$

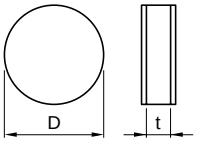
Rectangular shape

$$R = \frac{t}{L \bullet W} \times 10 \times \rho$$

R : Resistance at normal temperature(Ω)
D : PTC electrode diameter (mm)
L : PTC element length (mm)
W : PTC element width (mm)
t : PTC element thickness (mm)
ρ : Specific resistivity of PTC element's material at normal temperature (Ω • cm)

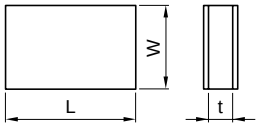
- Application of different shapes and resistances results in a wide range of rated voltages. Voltages may be AC or DC in the range of 12V to 240V.
- These thermistor elements enable contact-free circuit designs – no bimetals, relays, etc.
- Because the elements are made of ceramic material, it is possible to form units of various shapes and dimensions through the application of different molding methods.
- Various housing shapes can be produced to meet specific application requirements.

Disc type



D=ø5 to 35mm
t=1 to 5mm

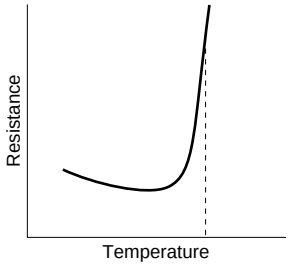
Square type



W=10 to 45mm
L=5 to 35mm
t=1 to 5mm

FOR TEMPERATURE SENSING

The rapidly increasing resistance characteristics makes use of these thermistors a convenient method for detecting specific temperatures. Such applications also benefit from good sensitivity.



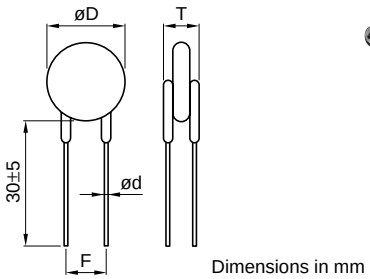
FOR CURRENT LIMITING

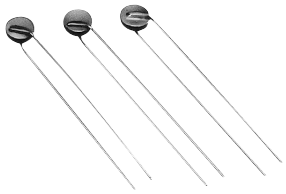
- Current attenuation characteristics can be custom-tailored by controlling a combination of parameters: switching temperature, element volume, resistance value, and load impedance.
- The operating characteristics for overcurrent protection can be based on current increase, ambient temperature increase, or a combination of both.

Sensors

Temperature Sensors
PTC Thermistors

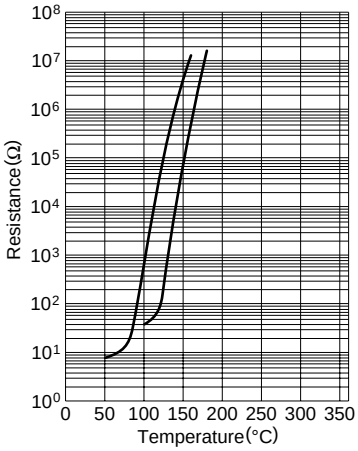
PTC THERMISTORS FOR OVERCURRENT LIMITING
SHAPES AND DIMENSIONS





Dimensions in mm

RESISTANCE vs. TEMPERATURE CHARACTERISTICS



ELECTRICAL CHARACTERISTICS

Part No.	Switching temperature Ts (°C)	Rated voltage (V)	Initial resistance R_{25}(Ω)	Current on normal condition (mA) [at 25°C]	Maximum overcurrent (A)	Dimensions(mm)			
						øD max.	T max.	F	ød
911X00C0R5MB15	100	16	0.5±20%	900	5	15	4.5	10	0.6
911X01C010MB13	100	16	1±20%	580	4	15	3.5	5	0.5
911X21D4R7MF10	120	35	4.7±20%	320	1	9.6	5	5	0.6
911X21D070MJ07	120	60	7±20%	220	1	8	4	5	0.6
911P81D100MN08	80	100	10±20%	100	0.5	9	4	5	0.5

• Coated products

Sensors

Temperature Sensors
PTC Thermistors

PTC THERMISTORS FOR MOTOR STARTING
PRODUCT IDENTIFICATION

9	12	X3	2	E	4R7	N	Q	18	B1
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)

(1) Product classification

9	PTC thermistor

(2) Applications/structures of the PTC thermistor

12	For motor starting/element incorporated case type

(3) Switching temperature Ts

X3	135°C (An approximate symbol is used for X3.)
X2	120°C

(4) Specific resistance ρ

2	less than 40 to 70 Ω • cm
3	less than 70 to 100 Ω • cm
4	less than 100 to 400 Ω • cm
5	less than 400 to 700 Ω • cm
6	less than 700 to 1000 Ω • cm

(5) Resistance temperature coefficient α

E	22%/°C
D	15%/°C

(6) Nominal initial resistance R_{25}

R means the decimal point. The second and third digits in a symbol containing no R are significant figures respectively.
The first digit means the number of zero following the significant figure.

3R3	3.3Ω
3R9	3.9Ω
4R7	4.7Ω
5R6	5.6Ω
6R8	6.8Ω
100	10Ω
150	15Ω
220	22Ω
330	33Ω
470	47Ω
680	68Ω

(7) Nominal initial resistance tolerance

N	±30%
M	±20%
X	±25%
Y	Special tolerance

(8) Maximum rated voltage Erms

Q	200V(160 to 200V)
R	240V(220 to 240V)
S	300V(250 to 300V)
T	360V(320 to 355V)
U	400V
V	500V(430 to 500V)

(9) PTC element diameter

14	ø14mm
16	ø16mm
18	ø17.5mm
20	ø20mm

(10) Case type/circuit connection method symbol

B0	Plug-in case B type/CSIR
B1	Plug-in case B type/RSIR
B2	Plug-in case B type/RSCR
B3	Plug-in case B type/CSR
C0	Plug-in case C type/CSIR
C1	Plug-in case C type/RSIR
C2	Plug-in case C type/RSCR
C3	Plug-in case C type/CSR
PS2	Two-point fixed case type (Faston® tub terminal #187)
PS2A	Two-point fixed case type (Faston® tub terminal #250)

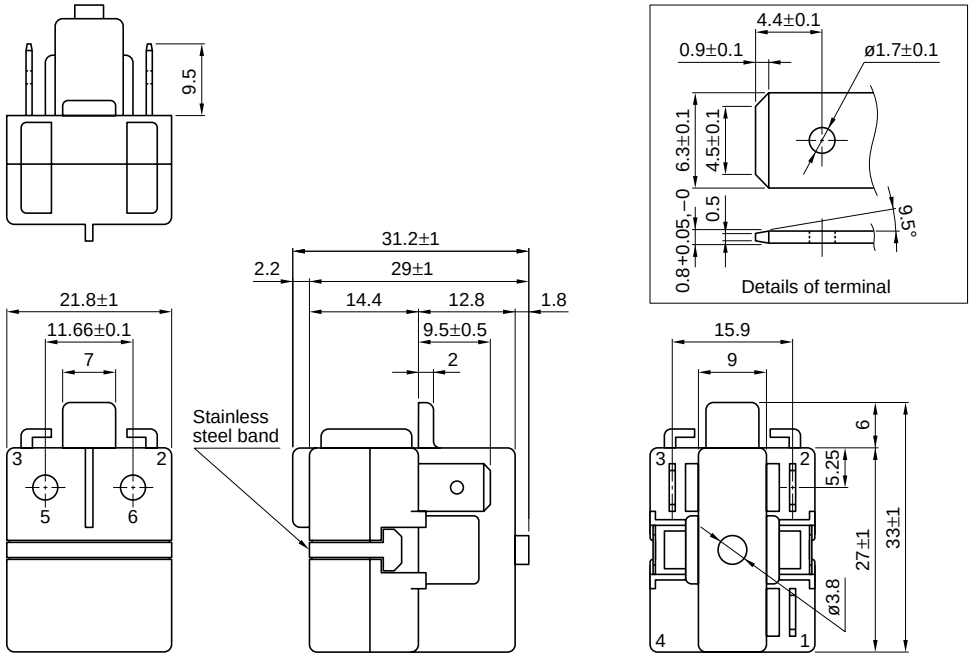
• Faston® is a registered trademark of AMP Incorporated.

Sensors

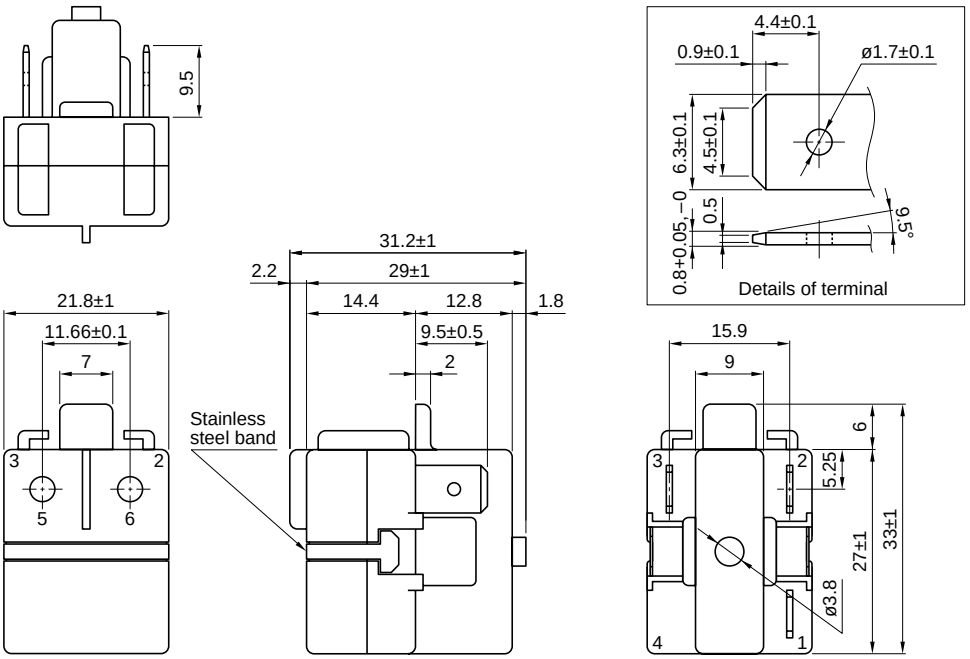
Temperature Sensors
PTC Thermistors

PTC THERMISTORS FOR MOTOR STARTING
PLUG-IN CASE, B AND C (Fail safe type) TYPES
SHAPES AND DIMENSIONS

B TYPE



C (Fail safe type) TYPE



Dimensions in mm

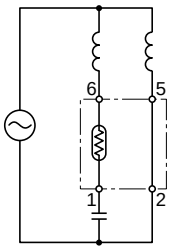
- Numbers of pin are differed from the starting style.

Sensors

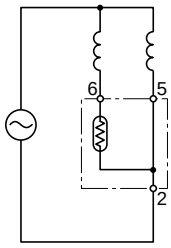
Temperature Sensors
PTC Thermistors

PTC THERMISTORS FOR MOTOR STARTING
PLUG-IN CASE, B AND C (Fail safe type) TYPES
STARTING STYLES

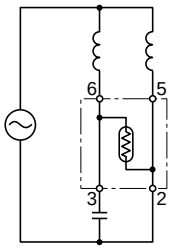
0:CSIR TYPE
Capacitor-start motor



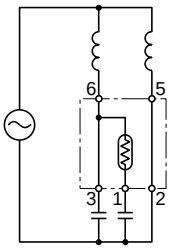
1:RSIR TYPE
Resistance-split-phase Start motor



2:RSCR TYPE
Capacitor-drive



3:CSR TYPE
Capacitor-start-drive



ELECTRICAL CHARACTERISTICS
SWITCHING TEMPERATURE Ts: 120°C(Ambient temperature 25°C)

Part No.	Initial resistance (Ω)±30%	Rated voltage Erms(V)	Withstand voltage*1 Erms(V)	Maximum rated current Irms(A)	Operating time (s)app.	Power consumption (W)max.	Resetting time (s)max.
912X22E3R3NQ20-B*2_*3	3.3	160	240	12	0.6	3.2	120
912X22E3R9NQ20-B_	3.9	160	240	12	0.6	3.2	120
912X22E4R7NQ20-B_	4.7	180	270	12	0.6	3.2	120
912X22E5R6NQ20-B_	5.6	180	270	12	0.6	3.2	120
912X23E6R8NQ20-B_	6.8	220	330	10	0.6	3.2	120
912X24E100NR20-B_	10	240	360	10	0.6	3.2	120
912X24E150NS20-B_	15	260	390	10	0.6	3.2	120
912X24E220NS20-B_	22	300	450	9	0.6	3.2	120
912X25E330NS20-B_	33	300	450	9	0.6	3.2	120
912X25E470NS20-B_	47	300	450	9	0.6	3.2	120
912X25E680NT20-B_	68	320	480	9	0.6	3.2	120
912X22E4R7NQ18-B_	4.7	170	255	12	0.4	3	100
912X22E5R6NQ18-B_	5.6	190	285	12	0.4	3	100
912X22E6R8NQ18-B_	6.8	220	330	10	0.4	3	100
912X23E100NQ18-B_	10	240	360	9	0.4	3	100
912X24E150NR18-B_	15	260	390	8	0.4	3	100
912X24E220NS18-B_	22	280	420	8	0.4	3	100
912X24E330NS18-B_	33	280	420	7	0.4	3	100
912X25E470NS18-B_	47	300	450	6	0.4	3	100
912X25E680NS18-B_	68	300	450	5	0.4	3	100

*1 Rated voltage×1.5, 1min
*2 Fail safe type:Please specify code C instead of B.
*3 Starting style code 0:CSIR/1:RSIR/2:RSCR/3:CSR

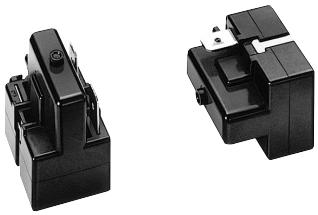
Sensors

Temperature Sensors
PTC Thermistors

PTC THERMISTORS FOR MOTOR STARTING
PLUG-IN CASE, B AND C (Fail safe type) TYPES
ELECTRICAL CHARATERISTICS
SWITCHING TEMPERATURE Ts: 135°C(Ambient temperature 25°C)

Part No.	Initial resistance (Ω)±30%	Rated voltage Erms(V)	Withstand voltage*1 Erms(V)	Maximum rated current Irms(A)	Operating time (s)app.	Power consumption (W)max.	Resetting time (s)max.
912X32E3R3NQ20-B*2_*3	3.3	160	240	12	0.7	3.5	100
912X32E3R9NQ20-B_	3.9	160	240	12	0.7	3.5	100
912X32E4R7NQ20-B_	4.7	180	270	12	0.7	3.5	100
912X32E5R6NQ20-B_	5.6	180	270	12	0.7	3.5	100
912X33E6R8NQ20-B_	6.8	200	300	10	0.7	3.5	100
912X34E100NR20-B_	10	225	340	9	0.7	3.5	100
912X34E150NS20-B_	15	250	375	8	0.7	3.5	100
912X34E220NS20-B_	22	300	450	7	0.7	3.5	100
912X35E330NT20-B_	33	355	530	6	0.7	3.5	100
912X35E470NU20-B_	47	400	600	5	0.7	3.5	100
912X36E680NV20-B_	68	430	645	4	0.7	3.5	100
912X32E4R7NQ18-B_	4.7	180	270	10	0.6	3.2	90
912X32E5R6NQ18-B_	5.6	180	270	10	0.6	3.2	90
912X32E6R8NQ18-B_	6.8	200	300	9	0.6	3.2	90
912X33E100NR18-B_	10	220	330	8	0.6	3.2	90
912X34E150NR18-B_	15	240	360	7	0.6	3.2	90
912X34E220NS18-B_	22	280	420	6	0.6	3.2	90
912X34E330NT18-B_	33	320	480	4	0.6	3.2	90
912X35E470NT18-B_	47	350	525	4	0.6	3.2	90
912X35E680NU18-B_	68	400	600	4	0.6	3.2	90
912X32E4R7NQ16-B_	4.7	160	240	10	0.5	3	80
912X32E5R6NQ16-B_	5.6	170	255	10	0.5	3	80
912X32E6R8NQ16-B_	6.8	180	270	9	0.5	3	80
912X33E100NQ16-B_	10	200	300	8	0.5	3	80
912X34E150NR16-B_	15	225	340	7	0.5	3	80
912X34E220NS16-B_	22	250	375	6	0.5	3	80
912X32E6R8NQ14-B_(*)	6.8	160	240	8	0.4	2.7	60
912X32E100NQ14-B_(*)	10	180	270	7	0.4	2.7	60
912X33E150NR14-B_(*)	15	240	340	6	0.4	2.7	60
912X34E220NR14-B_(*)	22	225	360	5	0.4	2.7	60
912X34E330NS14-B_(*)	33	250	375	4	0.4	2.7	60

*1 Rated voltage×1.5, 1min
*2 Fail safe type:Please specify code C instead of B. (*) are only for B type.
*3 Starting style code 0:CSIR/1:RSIR/2:RSCR/3:CSR



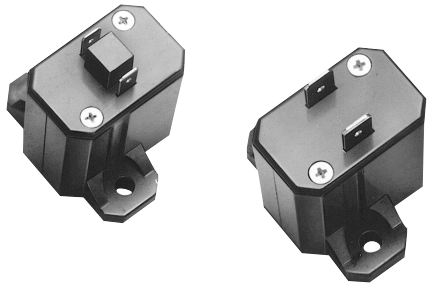
Sensors

Temperature Sensors
PTC Thermistors

PTC THERMISTORS FOR MOTOR STARTING

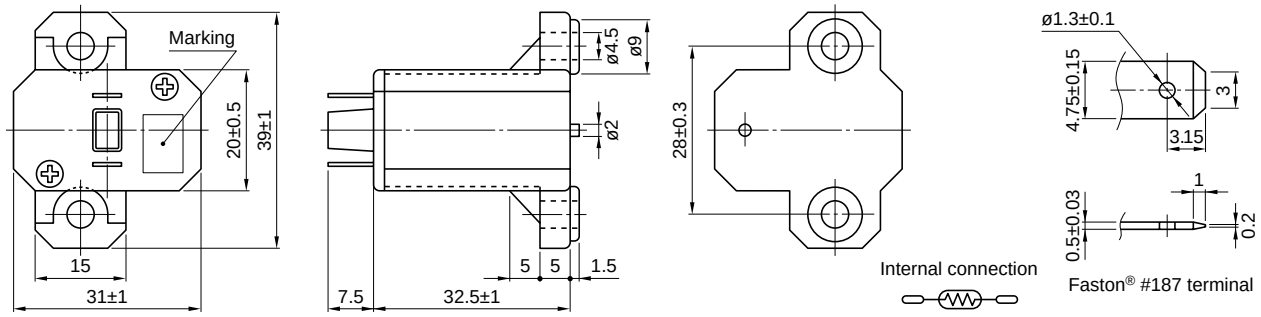
FEATURES

- These are all UL recognized products (File No. E97354)
- They are available with all element types except the ø14mm type.

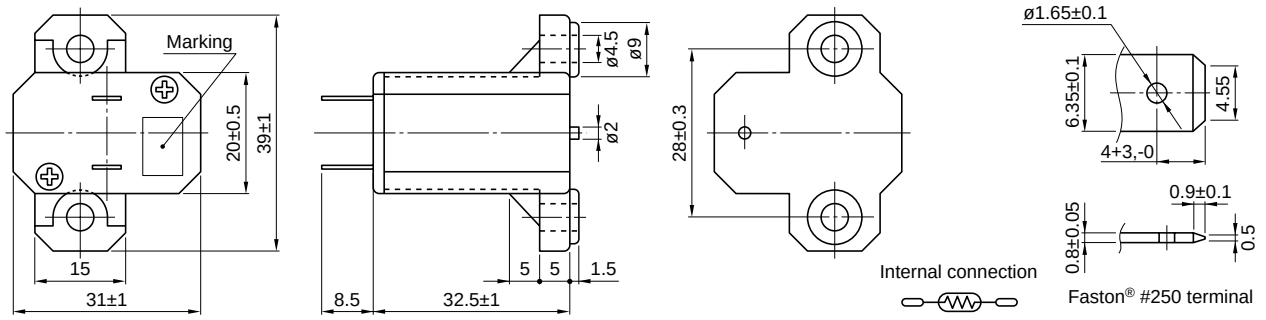


SHAPES AND DIMENSIONS

PS2

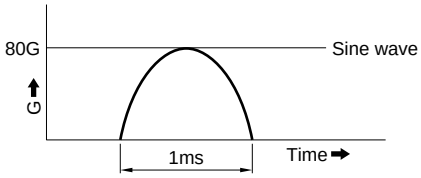


PS2A



Dimensions in mm

MECHANICAL CHARACTERISTICS

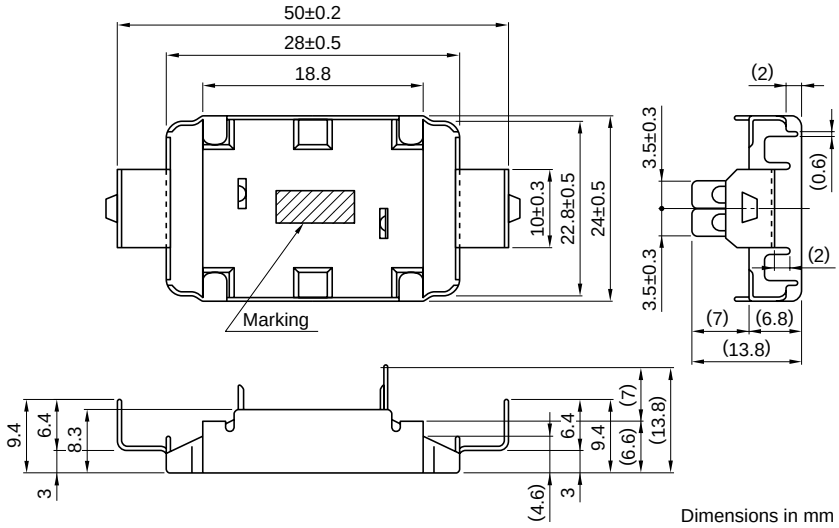
Item	Test method	Specifications
Terminal part strength	Secure the sample and add the following pulling/pushing loads to each terminal for 10s. Faston® tub terminal #187:98N (10kgf) Faston® tub terminal #250:147N (15kgf)	Appearance: There shall be no structural abnormality such as lack of terminals.
Vibration resistance	Put a sample on the board steadily secured to the test machine in normal posture, and then apply cyclic up (30s) and down (30s) vibration of 3 mm/10 to 55Hz, in X, Y, and Z direction in the same manner as shown in the previous figure for 60min respectively.	Resistance change rate: ±10% max. Appearance: There shall be no looseness, break, chipping, or cracking on each part.
Impact resistance	Secure a sample onto a mechanically strong fitting, and then apply 80G impulse (785m/s^2)* based on the below specifications upward/downward, left/right, and forward/backward respectively once (total 3 times). *1G=9.80665m/s^2 	Resistance change rate: ±10% max. Appearance: There shall be no looseness, break, chipping, or cracking on each part.

• Faston® is a registered trademark of AMP Incorporated.

Sensors

Temperature Sensors
PTC Thermistors

HEATERS FOR ELECTRONIC MOSQUITO KILLER (Example)
SHAPES AND DIMENSIONS



Dimensions in mm

Part No. 922Y17E152YR14-E

APPLICATION HEATERS FOR ELECTRONIC MOSQUITO KILLERS AND OTHER HEATERS

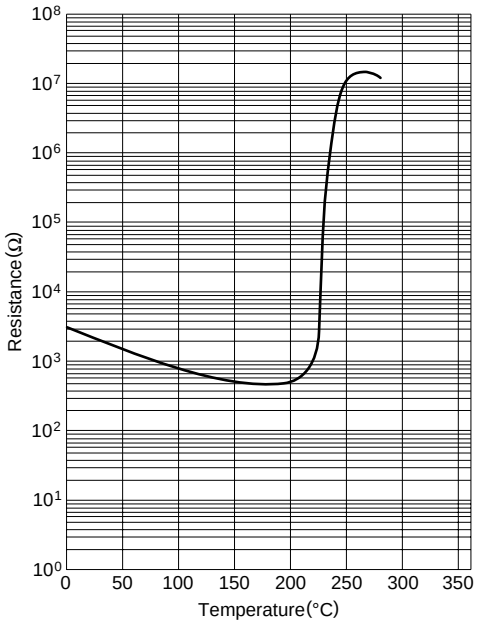
CHARACTERISTICS OF PTC THERMISTOR

Initial resistance value R_{25}	1 to 3kΩ[at 25°C]
Switching temperature	210°C

CHARACTERISTICS

Resistance	1 to 3kΩ[at 20°C]
Rated voltage Eac	100V/240V 50/60Hz
Maximum current Irms	0.6A[AC.110V], 1.5A[AC.240V]
Surface temperature	163±5°C[at 25°C, AC.100V]
Power consumption	4.5±1W
Safety standards	Electrical Appliance and Material Control Law, UL Certificated

RESISTANCE vs. TEMPERATURE CHARACTERISTICS



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