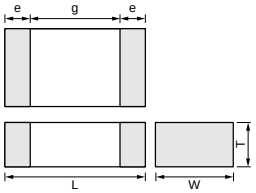
POSISTOR® for Circuit Protection

for Overheat Sensing Chip Type

This chip PTC Thermistor is reflow soldering SMD type for overheat sensing for power transistors, power diodes and power ICs in hybrid circuits.



Part Number	Dimensions (mm)				
	L	W	T	e	g
PRF15_RC	1.0±0.05	0.5±0.05	0.5±0.05	0.15 to 0.4	0.3 min.
PRF18_RB	1.6±0.15	0.8±0.15	0.8±0.15	0.1 to 0.6	-
PRF21_RA	2.0±0.2	1.25±0.2	0.9±0.2	0.2 min.	0.5 min.

■ Features

1. SMD type is helpful for miniaturizing circuits because of its small size and light weight.
2. Excellent thermal response due to small size
3. Solid-state construction provides excellent mechanical vibration and impact resistance.
4. Contactless operation provides noiseless operation.
5. Lead is not contained in the terminations.

Chip Type 0402 (1005) Size

Part Number	Sensing Temperature (at 4.7k ohm) (°C)	Maximum Voltage (V)	Resistance (at 25°C) (ohm)	Temperature Range (°C)
PRF15BC471QB1RC	105 ±5°C	32	470 ±50%	-20 to 120
PRF15BB471QB1RC	115 ±5°C	32	470 ±50%	-20 to 130
PRF15BA471QB1RC	125 ±5°C	32	470 ±50%	-20 to 140

This product is applied to reflow soldering.

Chip Type 0603 (1608) Size

Part Number	Sensing Temperature (at 4.7k ohm) (°C)	Maximum Voltage (V)	Resistance (at 25°C) (ohm)	Temperature Range (°C)
PRF18BG471QB1RB	65 ±5°C	32	470 ±50%	-20 to 80
PRF18BF471QB1RB	75 ±5°C	32	470 ±50%	-20 to 90
PRF18BE471QB1RB	85 ±5°C	32	470 ±50%	-20 to 100
PRF18BD471QB1RB	95 ±5°C	32	470 ±50%	-20 to 110
PRF18BC471QB1RB	105 ±5°C	32	470 ±50%	-20 to 120
PRF18BB471QB1RB	115 ±5°C	32	470 ±50%	-20 to 130
PRF18BA471QB1RB	125 ±5°C	32	470 ±50%	-20 to 140
PRF18AR471QB1RB	135 ±5°C	32	470 ±50%	-20 to 150
PRF18AS471QB1RB	145 ±5°C	32	470 ±50%	-20 to 160

This product is applied to reflow soldering. Please consult us for flow soldering usage.
Please contact us for UL recognized products.

Chip Type 0805 (2012) Size

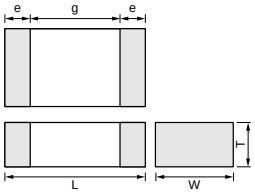
Part Number	Sensing Temperature (at 4.7k ohm) (°C)	Maximum Voltage (V)	Resistance (at 25°C) (ohm)	Temperature Range (°C)
PRF21BE471QB1RA	85 ±5°C	32	470 ±50%	-20 to 100
PRF21BD471QB1RA	95 ±5°C	32	470 ±50%	-20 to 110
PRF21BC471QB1RA	105 ±5°C	32	470 ±50%	-20 to 120
PRF21BB471QB1RA	115 ±5°C	32	470 ±50%	-20 to 130
PRF21BA471QB1RA	125 ±5°C	32	470 ±50%	-20 to 140
PRF21AR471QB1RA	135 ±5°C	32	470 ±50%	-20 to 150
PRF21AS471QB1RA	145 ±5°C	32	470 ±50%	-20 to 160

This product is applied to reflow soldering. Please consult us for flow soldering usage.
This product is recognized by UL.

POSISTOR® for Circuit Protection

for Overheat Sensing Chip Type Tight-tolerance Type

PRF18_RB1RB series is an improvement on sensing accuracy from existing PRF18_QB1RB series.



Part Number	Dimensions (mm)				
	L	W	T	e	g
PRF15_RC	1.0±0.05	0.5±0.05	0.5±0.05	0.15 to 0.4	0.3 min.
PRF18_RB	1.6±0.15	0.8±0.15	0.8±0.15	0.1 to 0.6	-
PRF21_RA	2.0±0.2	1.25±0.2	0.9±0.2	0.2 min.	0.5 min.

■ Features

1. Sensing accuracy +/-3 deg.C which is highest of PTC Thermistor and the same level as NTC at sensing point.
2. Same resistance-temperature characteristics as PRF18_QB1RB series.
   Easy to use higher accurate sensing type.
3. SMD type is helpful for miniaturizing circuits because of its small size and light weight.
4. Excellent thermal response due to small size
5. Solid-state construction provides excellent mechanical vibration and impact resistance.
6. Contactless operation provides noiseless operation.
7. Lead is not contained in the terminations.

Chip Tight Tolerance Type 0603 (1608) Size

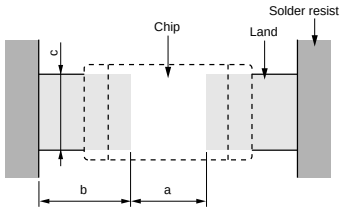
Part Number	Sensing Temperature (at 4.7k ohm) (°C)	Maximum Voltage (V)	Resistance (at 25°C) (ohm)	Temperature Range (°C)
PRF18BE471RB1RB	85 ±3°C	32	470 ±50%	-20 to 100
PRF18BD471RB1RB	95 ±3°C	32	470 ±50%	-20 to 110
PRF18BC471RB1RB	105 ±3°C	32	470 ±50%	-20 to 120
PRF18BB471RB1RB	115 ±3°C	32	470 ±50%	-20 to 130

This product is applied to reflow soldering. Please consult us for flow soldering usage.

10

for Overheat Sensing Chip Type (Reference Data)

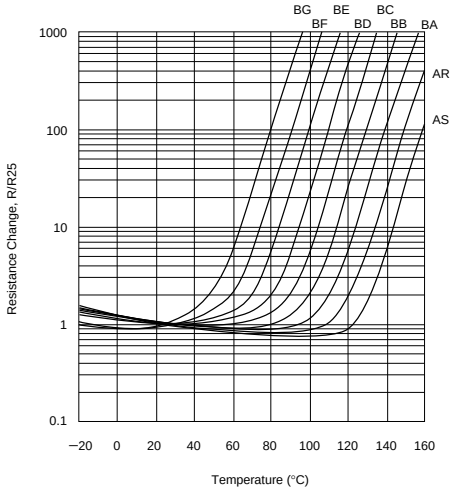
■ Standard Land Pattern Dimensions



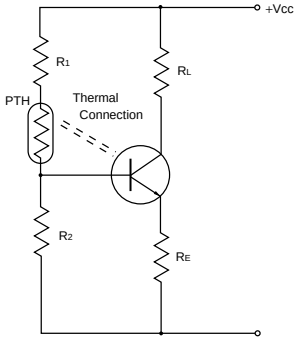
(in mm)

Part Number	Soldering Methods	Dimensions (mm)			
		Chip (L×W)	a	b	c
PRF15	Reflow Soldering	1.0×0.5	0.5	0.4-0.5	0.5
PRF18		1.6×0.8	0.6-0.8	0.6-0.7	0.6-0.8
PRF21		2.0×1.25	1.0-1.2	0.5-0.7	1.0-1.2

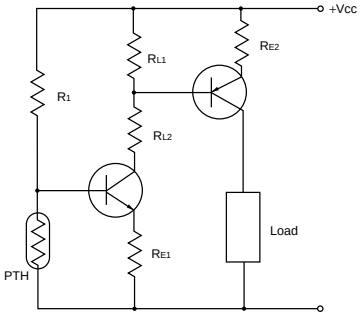
■ Resistance-Temperature Characteristics (Typical)



■ Overheat Protection Circuit



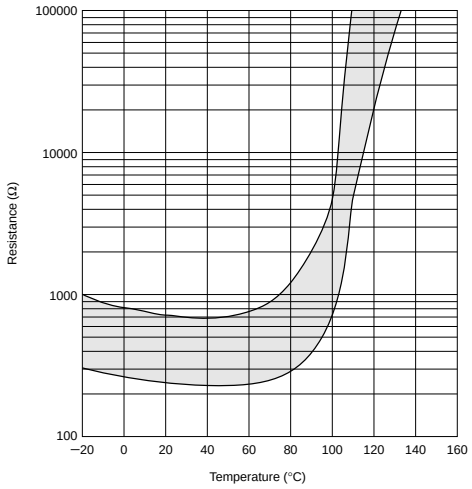
■ Temperature Sensing Circuit



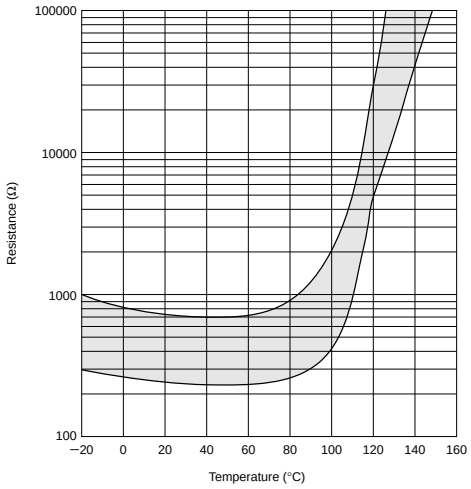
Chip Type (Ref. Only)

■ Resistance-Temperature Characteristics Range

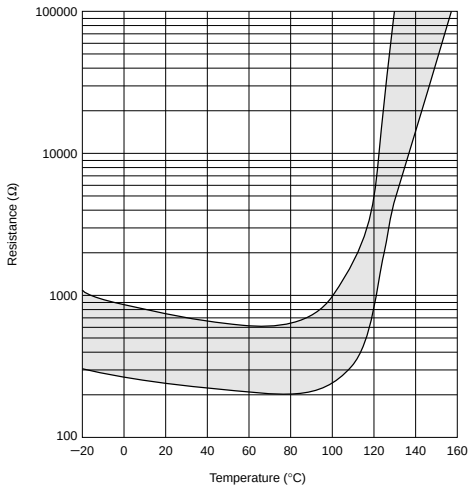
PRF15BC471QB1RC



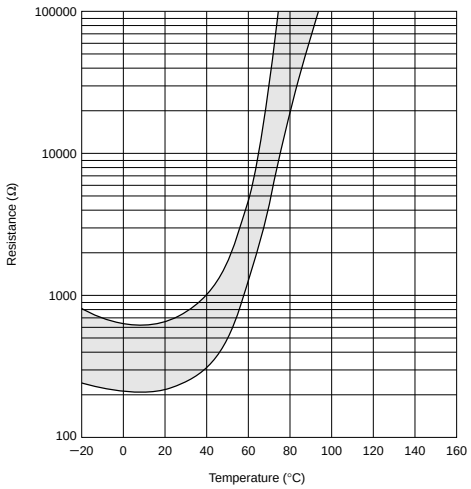
PRF15BB471QB1RC



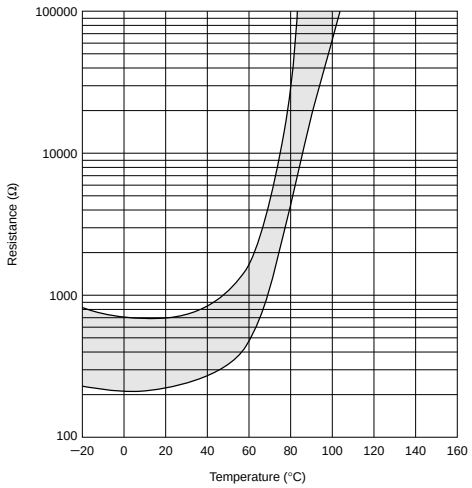
PRF15BA471QB1RC



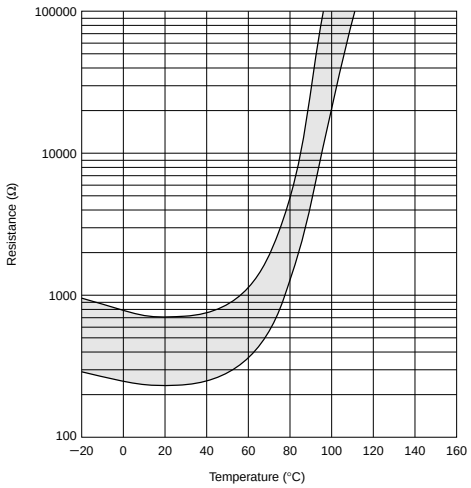
PRF18/21BG471Q Type



PRF18/21BF471Q Type



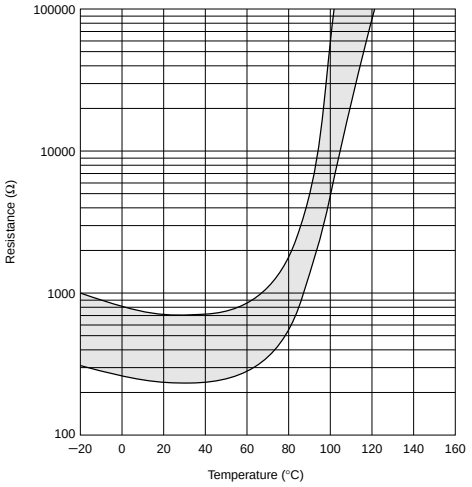
PRF18/21BE471Q Type



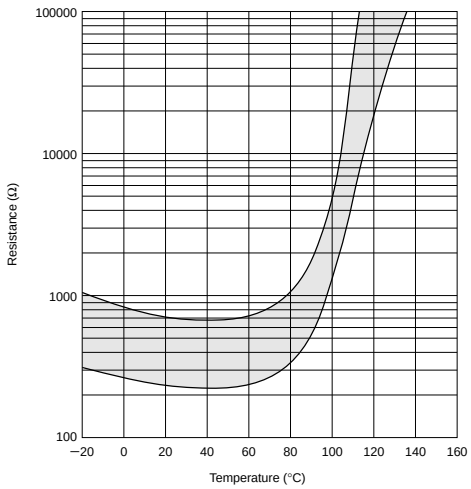
Continued from the preceding page.

■ Resistance-Temperature Characteristics Range

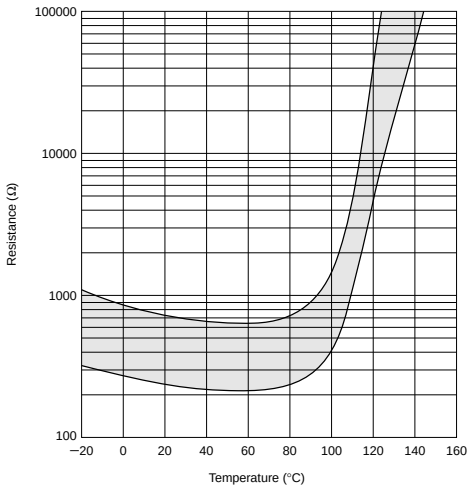
PRF18/21BD471Q Type



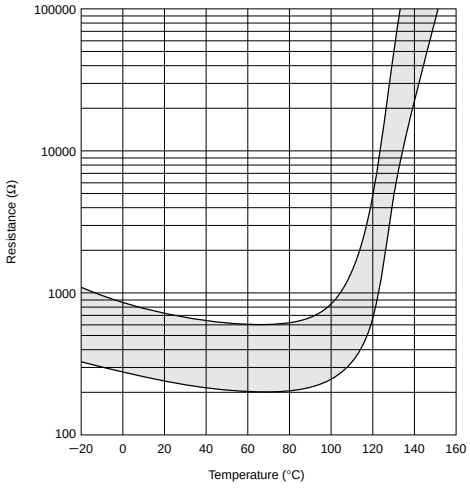
PRF18/21BC471Q Type



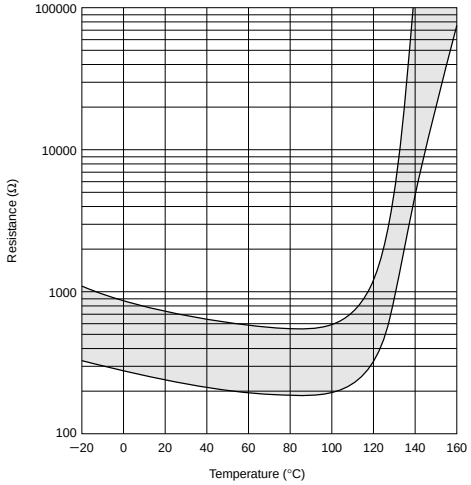
PRF18/21BB471Q Type



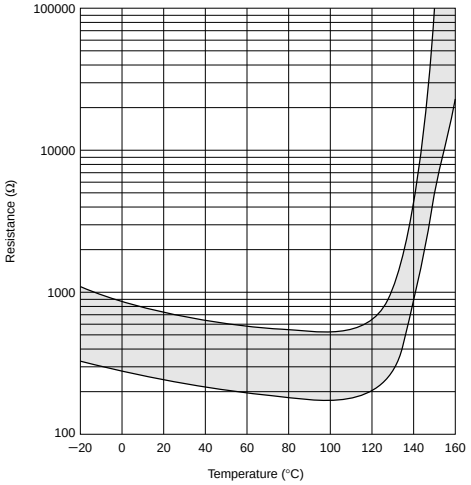
PRF18/21BA471Q Type



PRF18/21AR471Q Type



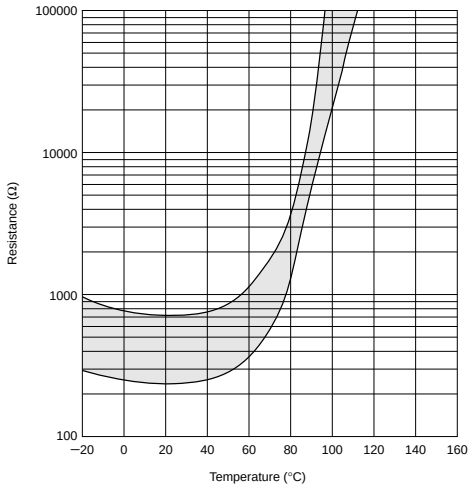
PRF18/21AS471Q Type



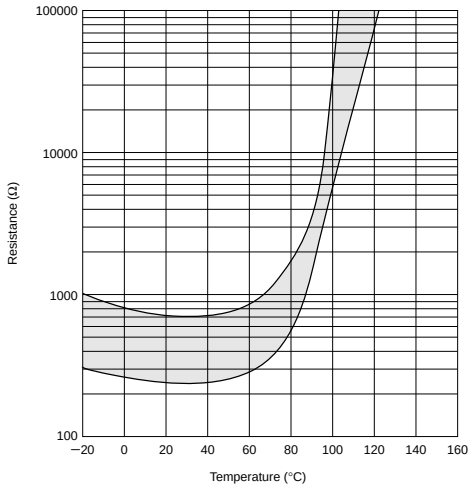
Chip Tight Tolerance Type (Ref. Only)

■ Resistance-Temperature Characteristics Range

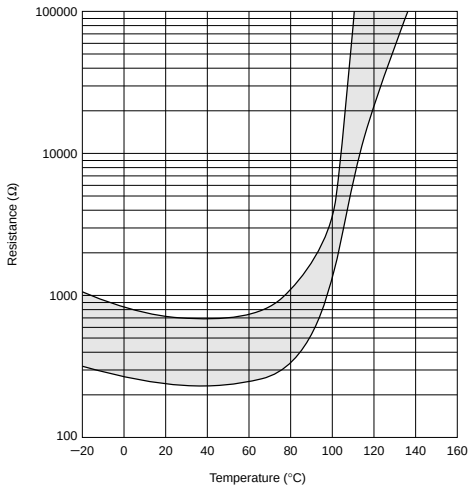
PRF18BE471RB1RB



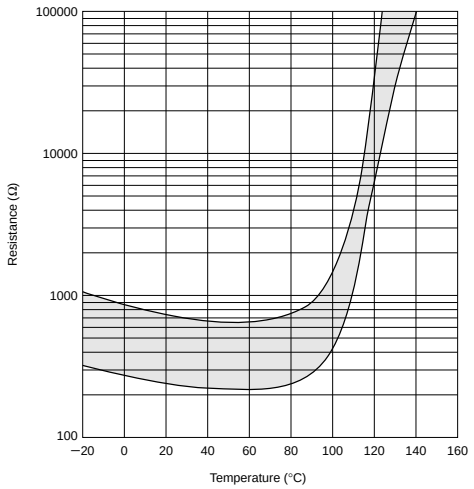
PRF18BD471RB1RB



PRF18BC471RB1RB



PRF18BB471RB1RB



Chip Type Specifications and Test Methods (PRF15 Series)

■ PRF15 Series

No.	Item	Rating Value	Method of Examination
1	Resistance Value (at 25°C)	The resistance value should be within the specified tolerance.	After applying maximum operating voltage for 3 mins. and leaving for 2 hrs. at 25°C, measured by applying voltage of less than 1.5Vdc (by a direct current of less than 10mA).
2	Vibrationability	Normal appearance Resistance change: not to exceed ±20% (*)	JIS C 5102 term 8.2 Soldered PTC to PCB Vibration: 10-55-10Hz (1 min.) Width: 1.5mm Vibrate for 2 hrs. in each of 3 mutually perpendicular planes for a total of 6 hrs.
3	Solderability	Min. 75% electrode is covered with new solder. Resistance change: not to exceed ±20% (*)	JIS C 5102 term 8.4 Solder: Sn 63%/Pb 37% (or 60/40%) Solder temp: 230±5°C Soaking time: 3±0.5 sec. Soaking position: Until a whole electrode is soaked.
4	Solder-heatability	Normal appearance Resistance change: not to exceed ±20% (*)	Solder: Sn 63%/Pb 37% (or 60/40%) Flux: Solder paste containing less than 0.2wt% of chlorine. Preheating: 150±5°C 3 mins. Peak temp.: 260±5°C 10±5 sec. (reflow) PCB: Glass Epoxy PCB (JIS C 6484)
5	Temperature Cycling	Normal appearance Resistance change: not to exceed ±20% (*)	JIS C 5102 term 9.3 Times: 5 cycles Step / Temp. (°C) / Time (min.) 1 / -20 +0, -3 / 30 2 / Room temp. / 10-15 3 / +150 +3, -0 / 30 4 / Room temp. / 10-15
6	Humidity Test	Normal appearance Resistance change: not to exceed ±20% (*)	JIS C 5102 term 9.5 40±2°C, 90-95%RH leave for 500±8 hrs.
7	High Temperature Load Test	Normal appearance Resistance change: not to exceed ±20% (*)	JIS C 5102 term 9.10 85±5°C (in air), load maximum operating voltage for 1000±12 hrs.

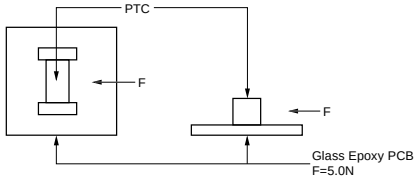
(*) Measurement resistance after the test by applying voltage of less than 1.5Vdc by a direct current of less than 10mA after product is left at 25±2°C for 2 hours.

Above mentioned soldering in "2. Vibrationability" is done following condition at our side.
- Glass-Epoxy PC board
- Standard land dimension
- Standard solder paste
- Standard solder profile

Above conditions are mentioned in Notice.

Chip Type Specifications and Test Methods (PRF18/21 Series)

■ PRF18/21 Series

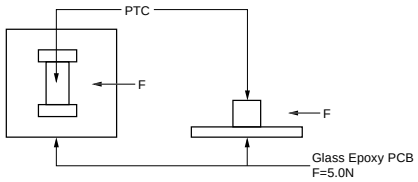
No.	Item	Rating Value	Method of Examination
1	Resistance Value (at 25°C)	The resistance value should be within the specified tolerance.	After applying maximum operating voltage for 3 mins. and leaving for 2 hrs. at 25°C, measured by applying voltage of less than 1.5Vdc (by a direct current of less than 10mA).
2	Adhesive Strength	There is no sign of electrode exfoliation	EIAJ ET-7403 term 9 Solder PTC to PCB and add a force of 5.0N in the direction shown below. 
3	Vibrationability	Normal appearance Resistance change: not to exceed ±20% (*)	JIS C 5102 term 8.2 Soldered PTC to PCB Vibration: 10-55-10Hz (1 min.) Width: 1.5mm Vibrate for 2 hrs. in each of 3 mutually perpendicular planes for a total of 6 hrs.
4	Solderability	Min. 75% electrode is covered with new solder. Resistance change: not to exceed ±20% (*)	JIS C 5102 term 8.4 Solder: Sn 63%/Pb 37% (or 60/40%) Solder temp: 230±5°C Soaking time: 3±0.5 sec. Soaking position: Until a whole electrode is soaked.
5	Solder-heatability	Normal appearance Resistance change: not to exceed ±20% (*)	Solder: Sn 63%/Pb 37% (or 60/40%) Flux: Solder paste containing less than 0.2wt% of chlorine. Preheating: 150±5°C 3 mins. Peak temp.: 260±5°C 10±5 sec. (reflow) PCB: Glass Epoxy PCB (JIS C 6484)
6	Temperature Cycling	Normal appearance Resistance change: not to exceed ±20% (*)	JIS C 5102 term 9.3 Times: 5 cycles Step / Temp. (°C) / Time (min.) 1 / -20 +0, -3 / 30 2 / Room temp. / 10-15 3 / +150 +3, -0 / 30 4 / Room temp. / 10-15
7	Humidity Test	Normal appearance Resistance change: not to exceed ±20% (*)	JIS C 5102 term 9.5 40±2°C, 90-95%RH leave for 500±8 hrs.
8	High Temperature Load Test	Normal appearance Resistance change: not to exceed ±20% (*)	JIS C 5102 term 9.10 85±5°C (in air), load maximum operating voltage for 1000±12 hrs.

(*) Measurement resistance after the test by applying voltage of less than 1.5Vdc by a direct current of less than 10mA after product is left at 25±2°C for 2 hours.

Above mentioned soldering in "2. Adhesive Strength" and "3. Vibrationability" is done following condition at our side.
- Glass-Epoxy PC board
- Standard land dimension
- Standard solder paste
- Standard solder profile

Above conditions are mentioned in Notice.

Chip Tight Tolerance Type Specifications and Test Methods

No.	Item	Rating Value	Method of Examination
1	Resistance Value (at 25°C)	The resistance value should be within the specified tolerance.	After applying maximum operating voltage for 3 mins. and leaving for 2 hrs. at 25°C, measured by applying voltage of less than 1.5Vdc. (by a direct current of less than 10mA).
2	Adhesive Strength	There is no sign of electrode exfoliation	EIAJ ET-7403 term 9 Solder PTC to PCB and add a force of 5.0N in the direction shown below. 
3	Vibrationability	Normal appearance Resistance change: not to exceed ±20% (*1)	JIS C 5102 term 8.2 Soldered PTC to PCB Vibration: 10-55-10Hz (1 min.) Width: 1.5mm Vibrate for 2 hrs. in each of 3 mutually perpendicular planes for a total of 6 hrs.
4	Solderability	Min. 75% electrode is covered with new solder. Resistance change: not to exceed ±20% (*1)	JIS C 5102 term 8.4 Solder: Sn 63%/Pb 37% (or 60/40%) Solder temp: 230±5°C Soaking time: 3±0.5 sec. Soaking position: Until a whole electrode is soaked
5	Solder-heatability	Normal appearance Resistance change: not to exceed ±20% (*1)	Solder: Sn 63%/Pb 37% (or 60/40%) Flux: Solder paste containing less than 0.2wt% of chlorine. Preheating: 150±5°C 3 mins. Peak temp.: 260±5°C 10±5 sec. (reflow) PCB: Glass Epoxy PCB (JIS C 6484)
6	Temperature Cycling	Normal appearance Resistance change: not to exceed ±20% (*1, 2)	JIS C 5102 term 9.3 Times: 5 cycles Step / Temp. (°C) / Time (min.) 1 / -20 +0, -3 / 30 2 / Room temp. / 10-15 3 / +150 +3, -0 / 30 4 / Room temp. / 10-15
7	Humidity Test	Normal appearance Resistance change: not to exceed ±20% (*1, 2)	JIS C 5102 term 9.5 40±2°C, 90-95%RH leave for 500±8 hrs.
8	High Temperature Load Test	Normal appearance Resistance change: not to exceed ±20% (*1, 2)	JIS C 5102 term 9.10 85±5°C (in air), load maximum operating voltage for 1000±12 hrs.

(*1) Measurement resistance after the test by applying voltage of less than 1.5Vdc by a direct current of less than 10mA after product is left at 25±2°C for 2 hours.
(*2) Sensing temp. change: not to exceed ±1°C

Above mentioned soldering in "2. Adhesive Strength" and "3. Vibrationability" is done following condition at our side.
- Glass-Epoxy PC board
- Standard land dimension
- Standard solder paste
- Standard solder profile

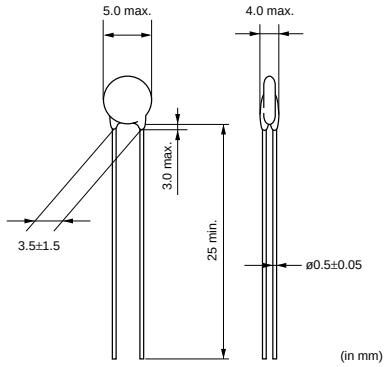
Above conditions are mentioned in Notice.

POSISTOR® for Circuit Protection

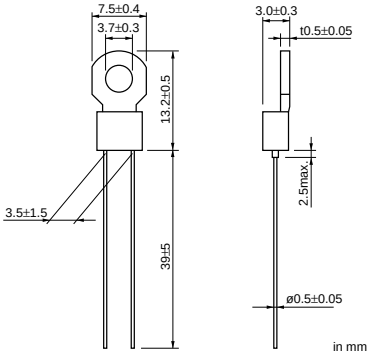
for Overheat Sensing Lead Type

PTFM type has been developed for protecting power transistors, stereo main amplifiers, etc. from overheating, and also for sensing the temperature of other components which may be overheated. The "POSISTOR" offers an excellent temperature sensing ability, exhibiting a steep change in electrical resistivity near the temperature setting. PTFL type is suitable for use as an air temperature sensor.

PTFL Series



PTFM Series



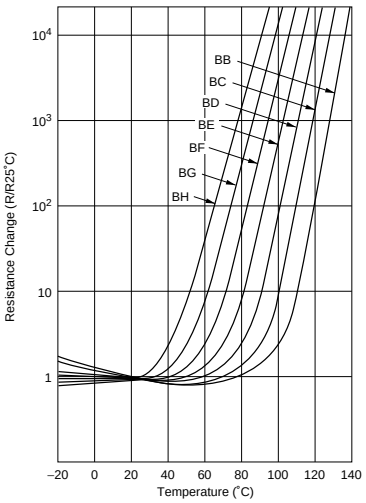
■ Features

1. PTFM type is a screw-fixing type and PTFL type is a lead type, therefore mounting is easy.
2. Compact and light design as well as excellent thermal response.
3. Solid-state construction withstands mechanical vibration and impact sufficiently.
4. Contactless operation provides a prolonged service life, yet permits noiseless operation.
5. The operating point of "POSISTOR" is set on the steepest point along the resistance-temperature characteristic curve, thus performing the overheat protective operation securely.
6. PTFM type and PTFL type have the same temperature characteristic, providing a selection depending on the mounting method.

Part Number	Max. Voltage (V)	Sensing Temp. (TS) (°C)	Resistance Value at 25°C (max.) (ohm)	Resistance Value (at Sensing Temp. -10°C) (max.)	Resistance Value (at Sensing Temp. TS°C) (min.)
PTF□04BH471Q2N34B0	16	60	100	330ohm	470ohm
PTF□04BG471Q2N34B0	16	70	100	330ohm	470ohm
PTF□04BF471Q2N34B0	16	80	100	330ohm	470ohm
PTF□04BE471Q2N34B0	16	90	100	330ohm	470ohm
PTF□04BD471Q2N34B0	16	100	100	330ohm	470ohm
PTF□04BC471Q2N34B0	16	110	100	330ohm	470ohm
PTF□04BB471Q2N34B0	16	120	100	330ohm	470ohm
PTF□04BH222Q2N34B0	16	60	330	1.5k ohm	2.2k ohm
PTF□04BG222Q2N34B0	16	70	330	1.5k ohm	2.2k ohm
PTF□04BF222Q2N34B0	16	80	330	1.5k ohm	2.2k ohm
PTF□04BE222Q2N34B0	16	90	330	1.5k ohm	2.2k ohm
PTF□04BD222Q2N34B0	16	100	330	1.5k ohm	2.2k ohm
PTF□04BC222Q2N34B0	16	110	330	1.5k ohm	2.2k ohm
PTF□04BB222Q2N34B0	16	120	330	1.5k ohm	2.2k ohm

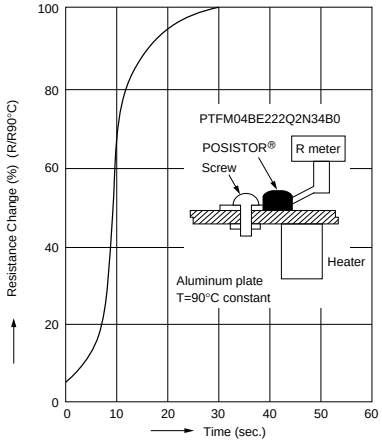
A blank is filled with type codes. (L: Lead type, M: with Lug-terminal)

■ Resistance-Temperature Characteristics



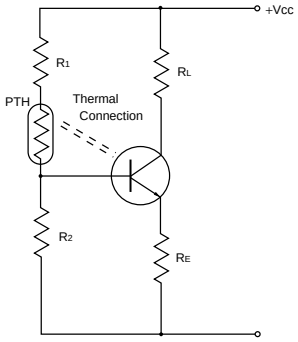
■ Example of Thermal Response Time

Operating Time of POSISTOR®

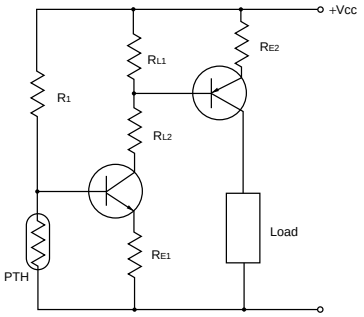


Relation between resistance change and time after POSISTOR®
PTFM04BE222Q2N34B0 is installed on the part heated at a constant temperature of 90°C (3mm thick alminum sheet) is shown in the figure below.

■ Overheat Protection Circuit

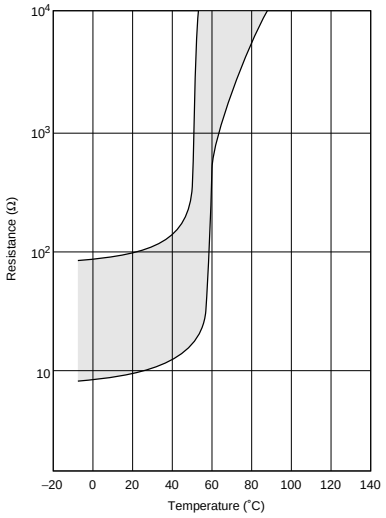


■ Overheat Sensing Circuit

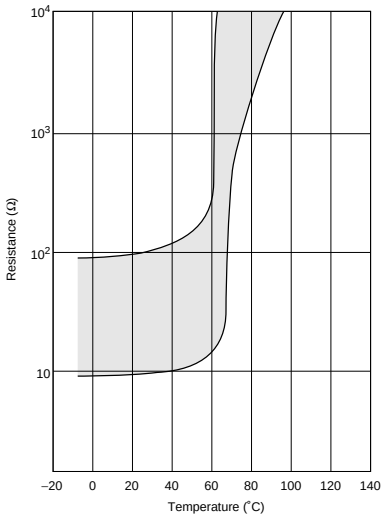


■ Resistance-Temperature Characteristics Range (Ref. Only)

PTF_04BH471Q2N34B0



PTF_04BG471Q2N34B0



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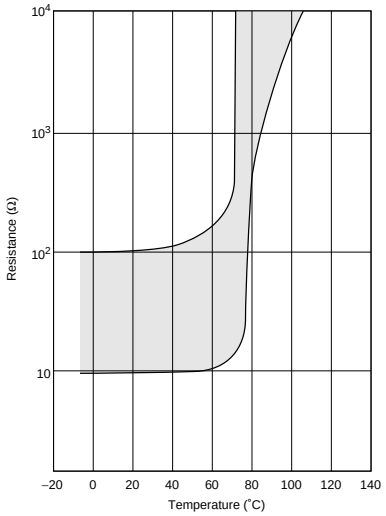
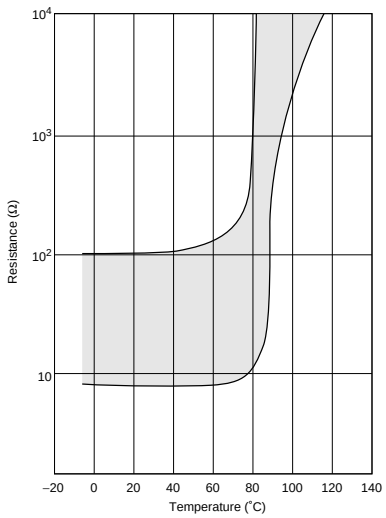
■ Resistance-Temperature Characteristics Range (Ref. Only)

PTF_04BF471Q2N34B0



PTF_04BE471Q2N34B0



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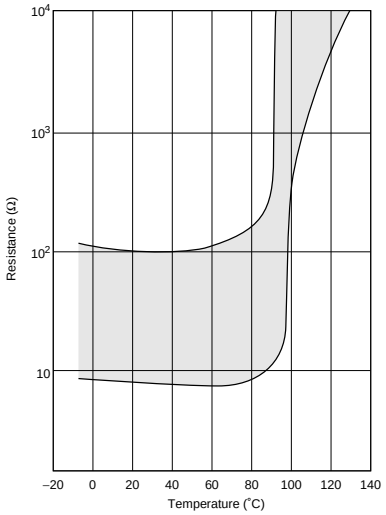

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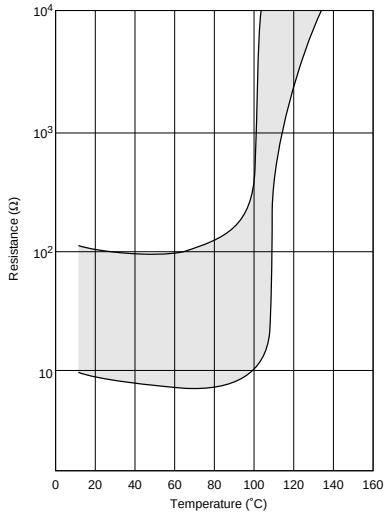

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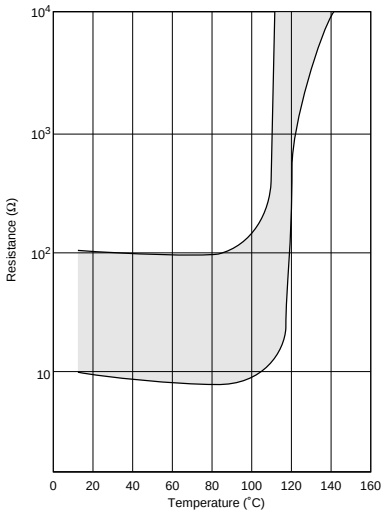

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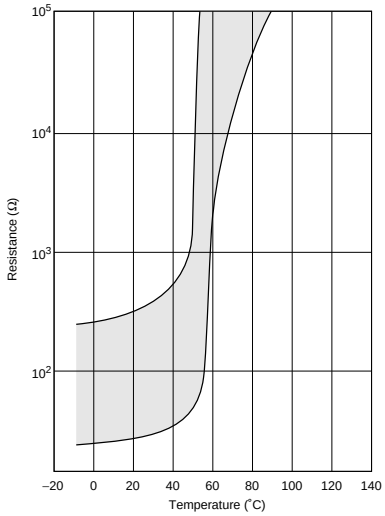

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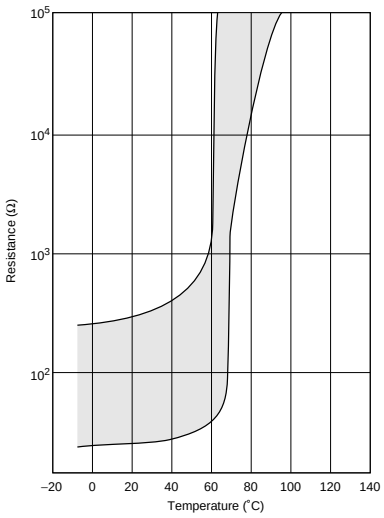
■ Resistance-Temperature Characteristics Range (Ref. Only)

PTF_04BG222Q2N34B0



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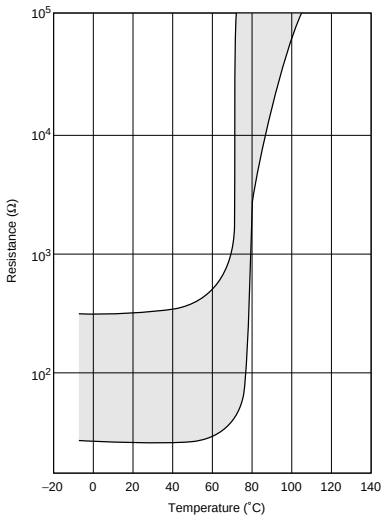
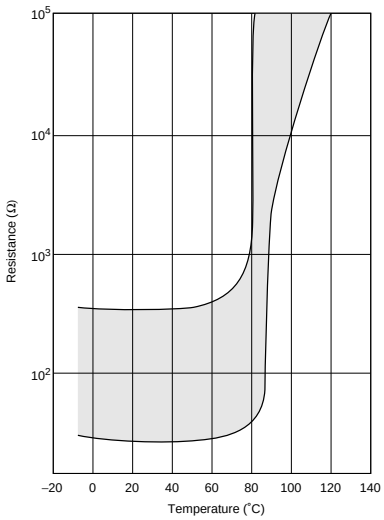
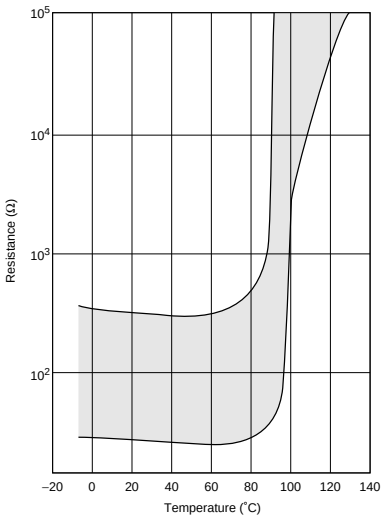


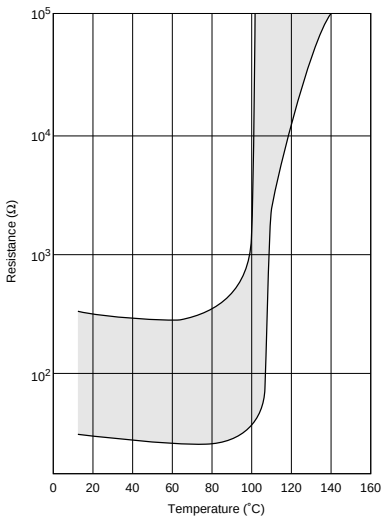
PTF_04BE222Q2N34B0



PTF_04BD222Q2N34B0



PTF_04BC222Q2N34B0



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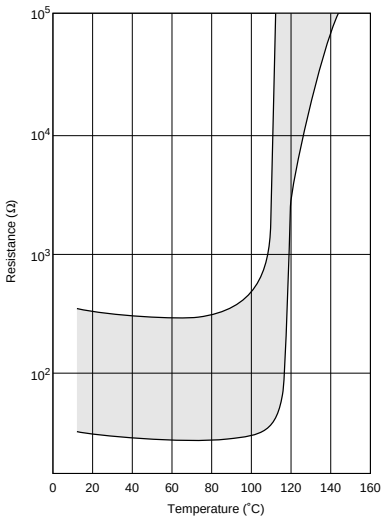
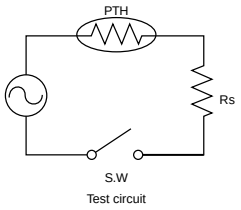


11

for Temperature Sensor Lead Type Specifications and Test Methods

No.	Item	Rating Value	Method of Examination
1	Resistance Value	Satisfies specification	Resistance value is measured by applying voltage under 1.5Vdc (by a direct current of less than 10mA) in a silicone oil vessel.
2	Withstanding Voltage	No problem	We apply AC voltage 120% that of the maximum voltage to POSISTOR® by raising voltage gradually for 180±5 seconds at 25°C. (A protective resistor is to be connected in series, and the inrush current through POSISTOR® must be limited below max. rated value.)
3	Tensile Strength of Lead Wire Terminal	No damage	The load is gradually applied to each terminal of POSISTOR® until the force of the following table in the axial-direction with fixing POSISTOR®'s body itself and this load is kept for 10 seconds. Series / Force **PTFL** / 4.90N **PTFM** / 9.80N
4	Bending Strength of Lead Wire Terminal	Lead wire does not come off	POSISTOR® is held so that it is perpendicular to the lead wire with the following load hanging in the axial direction of the lead wire. The lead wire is slowly bent toward 90° and returned; then it is slowly bent in the opposite direction and returned to original state. (Above mentioned procedure is done slowly with one cycle.) Series / Force **PTFL** / 2.45N **PTFM** / 4.90N
5	Solderability	Solder is applied around the lead wire covering 3/4 or more of the circumference without gap in the axial-direction.	The lead wire of POSISTOR® is soaked in a Isopropyl Alcohol (JIS K 8839) or ethanol (JIS K 8101) solution (about 25wt%) of colophony (JIS K 5902) for 5-10 sec. And, each lead wire is soaked in molten solder (JIS Z 3282 H60A) at 235±5°C from the bottom to a point of 2.0-2.5mm for 2±0.5 sec.
6	Terminal Durability of Soldering	ΔR/R25≦±15%	The lead wire of POSISTOR® is soaked in molten solder (JIS Z 3282 H60A) at 350±10°C from the bottom to a point of 2.0-2.5 mm for 3.5±0.5 sec. And, after the device is left at room temperature (25°C) for 24±4 hours, the resistance is measured.
7	Humidity Test	ΔR/R25≦±20%	POSISTOR® is set in an environmental chamber at 40±2°C and 90-95% humidity for 500±4 hours. And after the device is left at room temperature (25°C) for one hour, the resistance measurement is performed.
8	Load Cycle Test at High Temperature	ΔR/R25≦±20%  Test circuit	POSISTOR® is set in an environmental chamber at 85±3°C with maximum voltage applied for 1.5 hours and then is left without voltage applied for 0.5 hours. This cycle is repeated for 1000±10 hours, and after the device is left at room temperature (25°C) for one hour, the resistance measurement is performed. (A protective resistor is to be connected in series and the inrush current through POSISTOR® must be limited below max. rated value.)

⚠Caution/Notice

■ ⚠Caution (Storage and Operating Condition)

This product is designed for application in an ordinary environment (normal room temperature, humidity and atmospheric pressure). Do not use under the following conditions because all these factors can deteriorate the characteristics or cause product failure and burn-out.

1. Corrosive gas or deoxidizing gas (Chlorine gas, Hydrogen sulfide gas, Ammonia gas, Sulfuric acid gas, Nitric oxide gas, etc.)
2. Volatile or flammable gas
3. Dusty conditions
4. Under vacuum, or under high or low-pressure
5. Wet or humid conditions
6. Places with salt water, oils, chemical liquids or organic solvents
7. Strong vibrations
8. Other places where similar hazardous conditions exist

■ ⚠Caution (Other)

Be sure to provide an appropriate fail-safe function on your product to prevent secondary damage that may be caused by the abnormal function or the failure of our product.

■ Notice (Storage and Operating Condition)

To keep solderability of product from declining, following storage condition is recommended.

1. Storage condition:
   Temperature -10 to +40 degrees C
   Humidity less than 75%RH (not dewing condition)
2. Storage term:
   Use this product within 6 months after delivery by first-in and first-out stocking system.
3. Handling after unpacking:
   After unpacking, promptly reseal this product or store it in a sealed container with a drying agent.
4. Storage place:
   Do not store this product in corrosive gas (sulfuric acid, chlorine, etc.) or in direct sunlight.

■ Notice (Soldering and Mounting)

PTGL Series

When the lead of this product is soldered, pay attention as follows to avoid the decline of element characteristics or break-down of the element.

1. Use Rosin type flux or non-activated flux
2. Do not dip the body into flux.
   (flux should be coated to lead wire only for soldering.)
3. Be sure that preheating does not melt the soldering of this product.

■ Notice (Soldering and Mounting)

PTFL/PTFM Series

1. PTFM type is to be screwed beside the Power-Transistor on the radiative plate.
2. If PTFL type is to be mounted with thermal cement, the cement should not be of the Cyano Acrylate family.
3. Please bend the lead wire far from the root of the body and do not apply force to the lead wire of the product.
4. When the lead of this product is soldered, pay attention as follows to avoid the decline of element characteristics or break-down of the element.
   (1) Use Rosin type flux or non-activated flux.
   (2) Do not dip the body into flux.
   (Flux should be coated to lead wire only for soldering.)
   (3) Be sure that preheating does not melt the soldering of this product.

⚠Caution/Notice

■ Notice (Soldering and Mounting) PRG/PRF Series

1. Solder and Flux

(1) Solder Paste

Use solder paste Sn:Pb=63:37wt%.

For your reference, we are using

63Sn/37Pb RMA9086 90-3-M18,

manufactured by Alpha Metals Japan Ltd.

96.5Sn/3.0Ag/0.5Cu M705-221BM5-42-11,

manufactured by Senju Metal Industry Co., LTD for any Internal tests of this product.

(2) Flux

Use rosin-based flux. Do not use strong acidic flux (with halide content exceeding 0.2wt%).

2. Cleaning Conditions and Drying

To remove the flux after soldering, observe the following points in order to avoid deterioration of the characteristics or any change to the external electrodes quality.

(1) Cleaning Conditions

Solvent	Dipping Cleaning	Ultrasonic Cleaning
2-propanol	Less than 5 min. at room temp. or Less than 2 min. at 40˚C max.	Less than 1 min. 20W/L Frequency of several 10kHz to 100kHz.

A sufficient cleaning should be applied to remove flux completely.

(2) Drying

After cleaning, promptly dry this product.

3. Soldering Conditions

In your mounting process, observe the following points in order to avoid deterioration of the characteristics or destruction of this product. The mounting quality of this product may also be affected by the mounting conditions, shown in the points below.

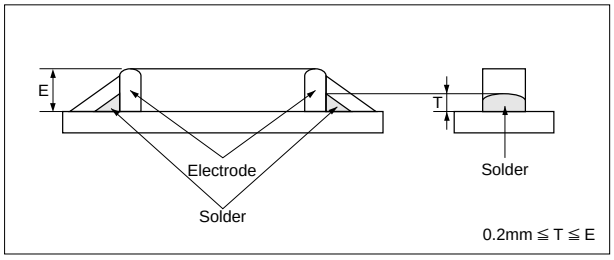
This product is for only reflow soldering. Flow soldering should not be allowed.

(1) Printing Conditions of Solder Paste

(a) Standard thickness of solder paste printing should be from 0.15 to 0.20 mm.

(b) After soldering, the solder fillet should be a height from 0.2 mm to the thickness of this product (see the figure at right).

(c) Too much solder gives too strong mechanical stress to this product. Such stress may cause cracking or other mechanical damage. Also, it can destroy the electrical performance of this product.



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⚠Caution/Notice

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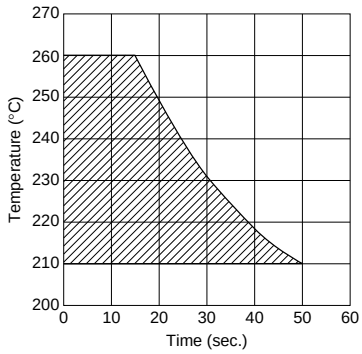
(2) Allowable Soldering Temperature and Time

(a) Solder within the temperature and time combinations, indicated by the slanted lines in the right graphs.

(b) The excessive soldering conditions may cause dissolution of metallization or deterioration of solder-wetting on the external electrode.

(c) In the event that soldering is repeated more than twice, the allowable reflow soldering time should be the accumulated soldering time.

[Allowable Reflow Soldering Temp. and Time]

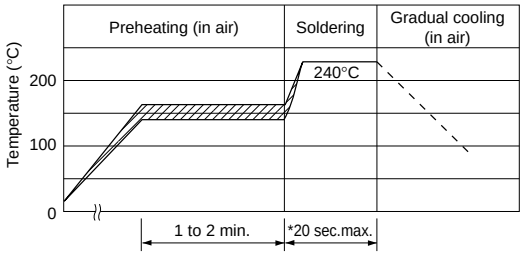


(3) Standard Temperature Profile for Soldering

(a) Insufficient preheating may cause a crack on ceramic body. Difference between preheating temperature and maximum temperature in the profile should be 100℃.

(b) Rapid cooling by dipping in solvent or by other means is not recommended.

[Reflow Soldering Condition]



Preheating: 150±10°C, 1 to 2min.
Soldering: 240°C, 20 sec. max.

*In the event that soldering is repeated more than twice the accumulated soldering time should be in the above allowable soldering time (2).

(4) There may be a risk unexpected failures (tombstone, insufficient solder-wetting, etc.) in the mounting process, caused by the mounting conditions. Please make sure that this product is correctly mounted under specified mounting conditions.

⚠Caution/Notice

■ Notice (Handling)

PTGL Series

1. Do not apply an excessive force to the lead. Otherwise, it may cause the junction between lead and element to break, or may crack the element. Therefore, holding the element side lead wire is recommended when lead wire is bent or cut.
2. This product does not have waterproof construction. Splashed water may cause failure mode such as decline of characteristics or current leak.
3. When this product is operated, temperature of some area may be over 100 to 160 degrees C. Be sure that surrounding parts and inserting material can withstand the temperature. If the surrounding part and material are kept under such condition, they may deteriorate or produce harmful gas (Chlorine gas, Hydrogen sulfide gas, Ammonia gas, Sulfuric acid gas, Nitric oxide gas, etc.). And such harmful gas may deteriorate the element.

■ Notice (Handling)

PTFL/PTFM Series

1. Do not apply an excessive force to the lead. Otherwise, it may cause the junction between lead and element to break, or may crack the element. Therefore, holding the element side lead wire is recommended when lead wire is bent or cut.
2. This product does not have waterproof construction. Splashed water may cause failure mode such as decline of characteristics or current leak.

■ Notice (Handling)

PRG/PRF Series

1. When this product is operated, temperature of some area may be over 100 to 150 degrees C. Be sure that surrounding parts and inserting material can withstand the temperature. If the surrounding part and material are kept under such condition, they may deteriorate or produce harmful gas (Chlorine gas, Hydrogen sulfide gas, Ammonia gas, Sulfuric acid gas, Nitric oxide gas, etc.). And such harmful gas may deteriorate the element.
2. Do not assemble this product with air-sealing or resin casting. Such sealing may deteriorate element.

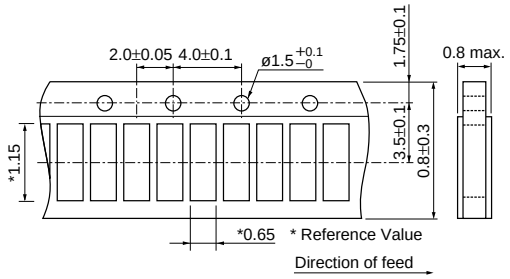
PRG/PRF Series Package

■ Minimum Quantity Guide

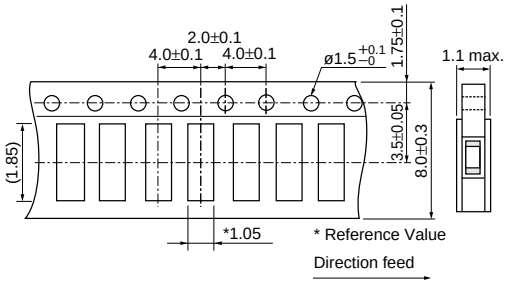
Part Number	Quantity (pcs.)	
	Paper Tape	Embossed Tape
PRF15_RC	10000	-
PR*18_RB	4000	-
PR*21_RA	-	4000
PR*21_RK	-	3000

■ Tape Dimensions

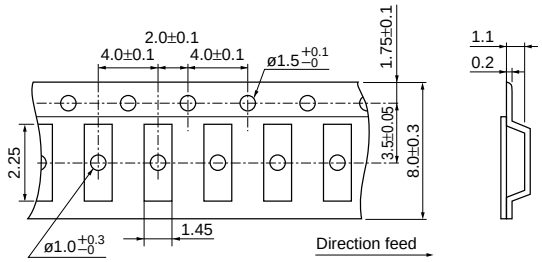
PRF15_RC Series: Paper Tape



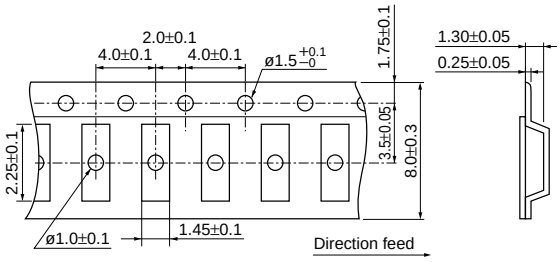
PR*18_RB Series: Paper Tape



PR*21_RA Series: Embossed Tape



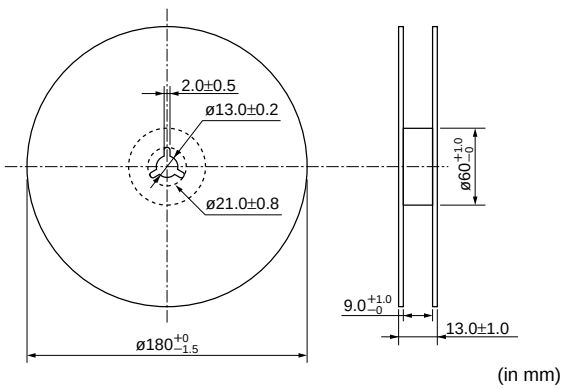
PR*21_RK Series: Embossed Tape



(in mm)

■ Reel Dimensions

Reel Dimensions



(in mm)