PTC THERMISTOR

Positive Temperature Coefficient Resistor

Http://www.hiel.co.kr

CHRONOLOGY

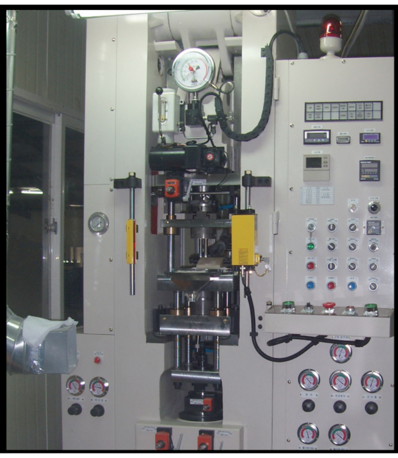
2000's

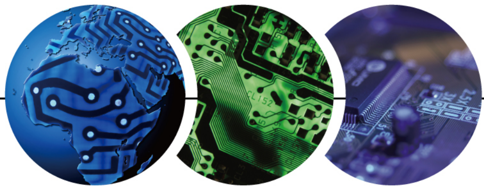
2015	• Selected as "Venture business" by SBC
	• Selected as "Global excellent enterprise" by Jeonbuk
2014	• Selected as "The leading company of the strategic industry " in Jeonbuk
	• Established Hiel's second factory
	• Selected as "Inno-Biz" by SMBA
2011	• Selected as "Export promising firm" by Jeonbuk SME Export center
2010	• Acquired a Patent for Pb Free Ceramic composite of PTC Thermistor and PTC Thermistor manufactured by the composites
	• Awarded "1 Million Dollars Exporter Tower" by The Korea International Trade Association
	• Selected as "New Exporter 300" by The Korea International Trade Association
2006	• Acquired certification of ISO 14001
2005	• Selected as Export oriented business (Jeonbuk SMBA)
2004	• Selected as parts material expertise company (Ministry of Industry and Resource)
2003	• Renamed to Hiel Co., Ltd.
2002	• Selected as Clean Workplace (Ministry of Labor)
	• Selected as "Inno-Biz" by SMBA
2001	• Attained approval of PTC THERMISTOR UL (FILE NO. E213419)
	• Acquired certification of VARISTOR VDE
2000	• Selected as Promising SME in Jeollabukdo
	• Awarded Prime minister prize in good SME in the 2nd National SME Rally

1990's

1999	• Established Corporate affiliated Laboratory
	• Awarded prize of Minister of Industry (Management and productivity improvement of venture business)
	• Selected as Export promising Firm by Small and Medium Business Corporation
1998	• Acquired certification of ISO 9001
	• Selected as Venture Enterprise designated by SMBA
	• Acquired certification of VARISTOR UL (FILE NO. E188093)
1996	• Performed technology development for PTC Thermistors Heater
1995	• Acquired certification of VARISTOR UL 1449 (FILE NO 182771)
	• Acquired certification of VARISTOR CSA (FILE NO LR 103860-1)
	• Selected as Promising Small & Medium Sized Company
1994	• Established Samyang Electronic Ceramics Co., Ltd
	• Varistors and PTC Thermistor produced

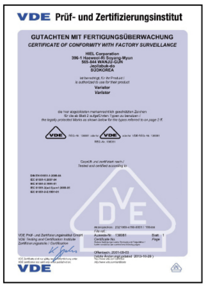
Be a partner with HIEL CORPORATION, and your products will be stronger!

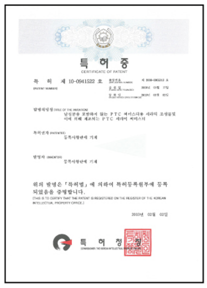



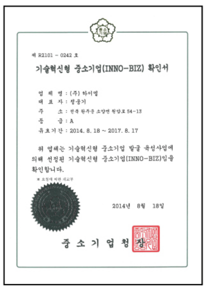



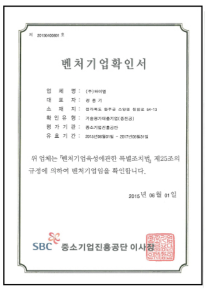
Certificate

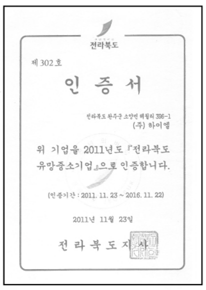


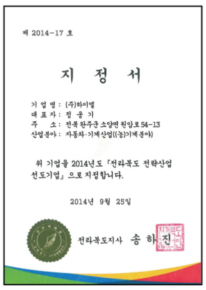


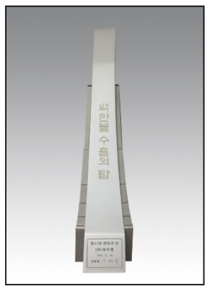




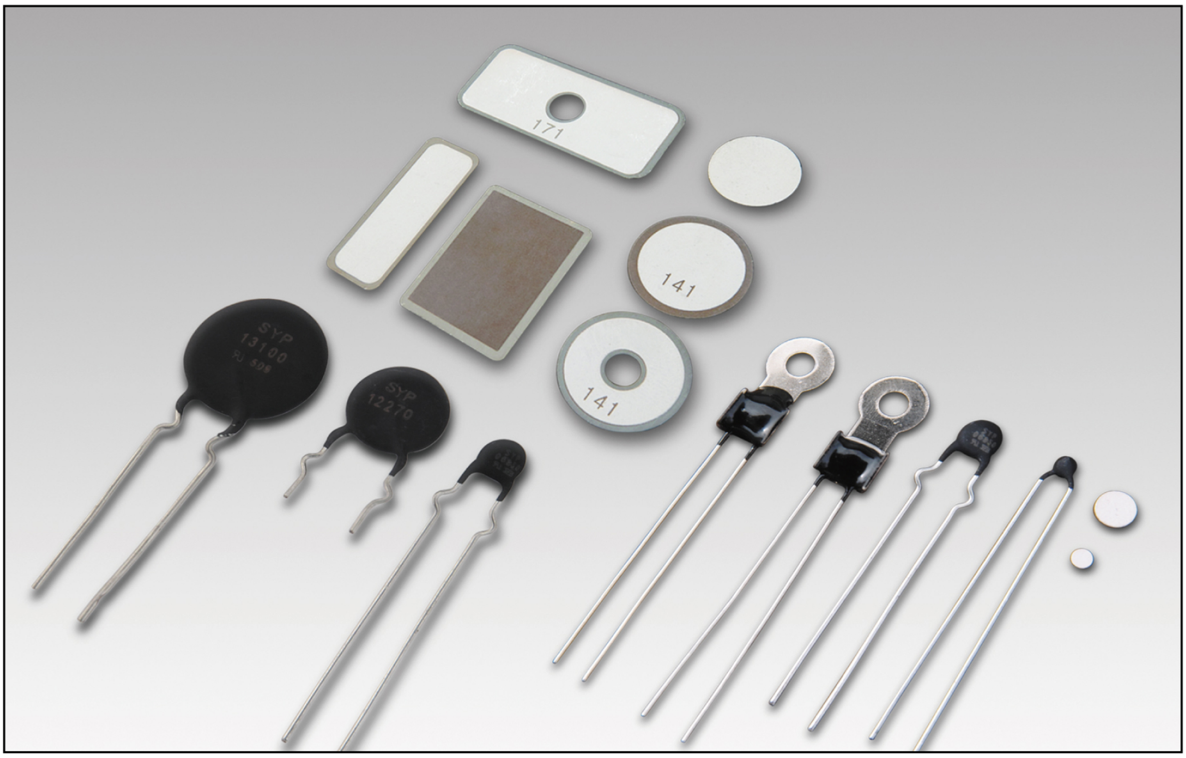








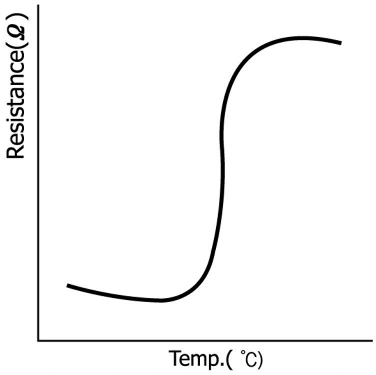
PTC THERMISTOR



I. Definition

A PTC thermistor is a thermally sensitive semiconducting resistor. Its resistance value rises sharply with increasing temperature after a defined temperature (reference temperature) has been exceeded. The very high positive temperature coefficient(PTC) has given the PTC thermistor its name.

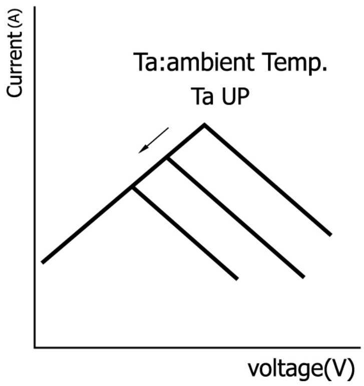
1. Resistance Temperature Characteristic



(Relation Resistance-Temp)

- Resistance temperature characteristic of PTC Thermistor shows that logarithm of resistance is proportional to temperature.
- Some abruptly increase the resistance at the gradient of 15 to 60%/℃ when reaching the abruptresistance change temperature, while others indicate relatively gradual resistance temperature gradient.
- Resistance rises abruptly from a certain temperature. The abrupt resistance change temperature ranges from 30 to 320℃.

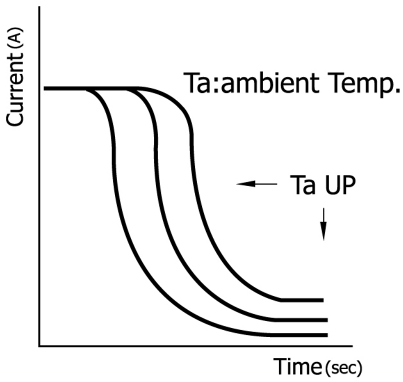
2. Voltage-Current Characteristic (Static characteristic)

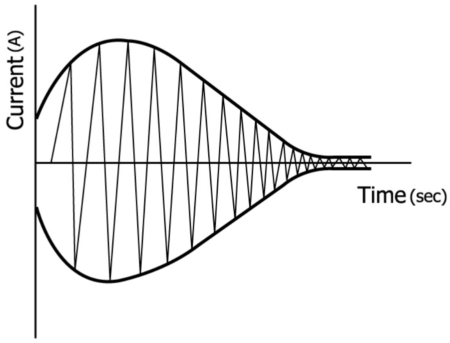


(Relation Current - Voltage)

- PTC Thermistor shows a self-heating function when voltage is applied. When operating point exceeds the maximum current point, the current becomes constant and PTC Thermistor itself automatically regulates temperature.
- This provides PTC Thermistor PTC Thermistor with a wide range of applications as a constant temperature heating element.
- When operating point is below the maximum current point, PTC Thermistor shows over current limiting function.

3. Current-time Characteristic (Dynamic Characteristic)



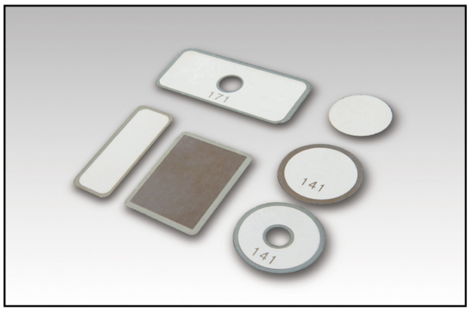


(Relation Current - Time)

- When more than a given voltage is applied to PTC Thermistor, large current flows in the instant of voltage application,due to low resistance.
- However, with the lapse of time, resistance value increases and the current decreases by PTC Thermistor's self-heating function.
- The insertion of fixed resistance in series or in parallel will change PTC Thermistor's characteristic.

Ⅱ. Products & Application

1. PTC THERMISTOR ▸ Heating Elements

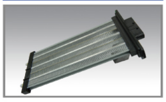


Advantages

- Self-Regulating Heating
- High-Reliability
- Stability
- Permanently Available

Applications

Cabin Air Heater

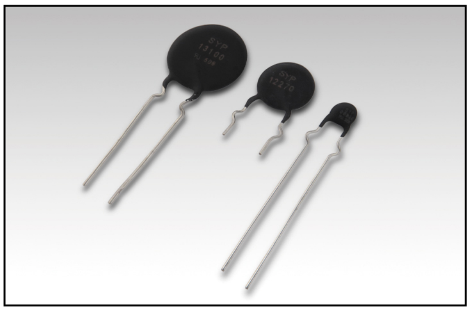


Diesel Fuel heater

Hair Iron

Vaporizer

2. PTC THERMISTOR ▸ Over Current Protection



Advantages

- Inrush Current Limiter
- Circuit Protection
- Quick Response Time
- Self-Recovery

Applications

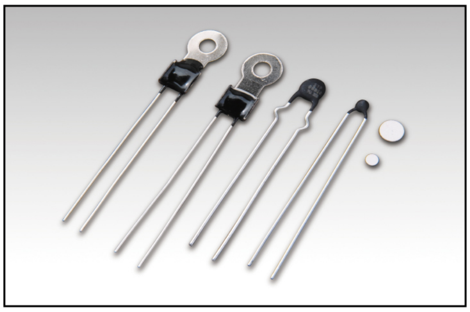
Washing Machine

Microwave Oven

TV

Air Conditioner

3. PTC THERMISTOR ▸ Over Temperature Protection



Advantages

- Small Size
- Quick Response Time
- Accurate and Automatic
- Temperature Management

Applications

PC Monitor

PC SMPS

Adaptor

LED Light

Ⅲ. Type Designation

1. Element Type Designation Code

H	P	H	E	1	4	0	2	0	S	D	1	6	0	0	A	1	5	A
H	P	H	E	1	7	3	7	2	S	B	2	4	1	8	Z	2	0	A
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

Code
Hiel
PTC

Applications	
H	Heater

Type	
E	Elenment (Lapping)
J	Elenment

Curie Temp.	
08	80℃
12	120℃
14	140℃
17	170℃

Resistance	
020	2
100	10
251	250
372	3,700

Tolorance of Resistance	
S	Special
L	± 10 %
M	± 20 %
J	± 25 %

Shape	
D	Disk-Type
B	Bar-Type
R	Ring-Type

Dimension (mm) (First _ Length)	
16	16 mm
24	24 mm
30	30 mm

Dimension (mm) (Second_Width)	
0	0 mm
18	18 mm
06	6 mm

Electrode	
Z	Ag/Zn
A	Ag/Zn+Ag
N	Ni/Cr+Ag

Thickness	
15	1.5 mm
20	2.0 mm

Classification	
A	Normal

2. Wire Type Designation Code

H	P	S	R	0	9	8	5	0	J	D	0	4	0	0	S	2	5	A
H	P	G	R	1	2	2	7	0	M	D	1	0	0	0	B	T	P	A
H	P	G	R	1	3	1	0	0	M	D	1	4	0	0	E	T	P	A
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

Code
Hiel
PTC

Applications	
G	Over Current Protecion
S	Over Temperature Protecion

Type	
R	Resin(Silicon) type
S	Soldering type

Curie Temp.	
08	80℃
10	100℃
12	120℃
13	130℃

Resistance	
020	2
100	10
270	27
251	250
152	1,500

Tolorance of Resistance	
S	Special
L	± 10 %
M	± 20 %
J	± 25 %

Shape	
D	Disk-Type
B	Bar-Type

Dimension (mm) (First_Diameter)	
08	08 mm
10	10 mm
14	14 mm

Dimension (mm) (Second_Point)	
00	0 mm
R1	0.1 mm
R4	0.4 mm

Forming Type	
E	IN - Kink
S	Straight
B	Out - Kink
Y	Y - Kink

Forming Type & Length	
T P	Taping
25	Lead 25mm

Classification	
A	Normal

Ⅳ. Packing

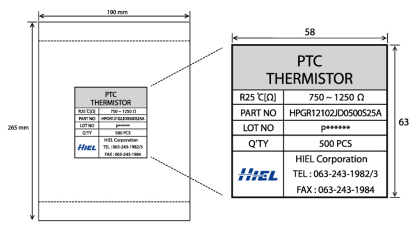
1. Bulk Packing Specifications

Unit [pcs]

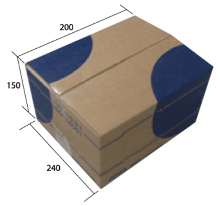
Wire length	Part No.	Vinyl bag	Inner box	Outer box
4 ~ 10 mm	D 04 ~ 05 series	1,000	10,000	20,000
	D 06 ~ 08 series	1,000	10,000	20,000
	D 10 ~ 12 series	500	2,500	5,000
	D 14 series	200	2,000	4,000
	D 20 series	100	1,000	2,000
11 ~ 25 mm	D 04~ 05 series	500	5,000	10,000
	D 06~ 08 series	500	5,000	10,000
	D 10 series	200	2,000	4,000
	D 14 series	100	2,000	4,000
	D 20 series	100	1,000	2,000

Unit [mm]

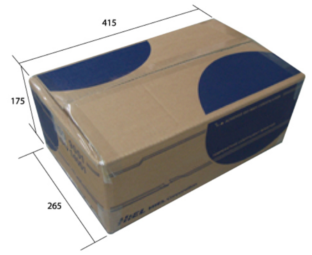
Vinyl bag (Label)



Inner box



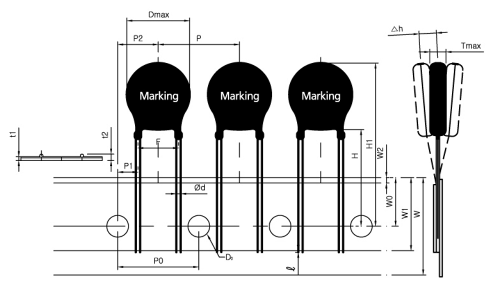
Outer box



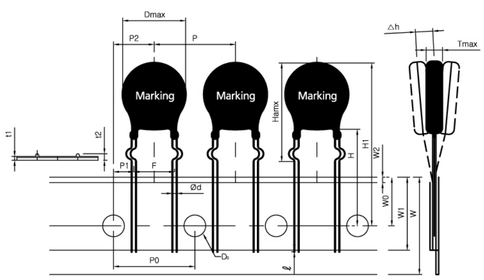
2. Tape & Reel Specifications

Unit [mm]

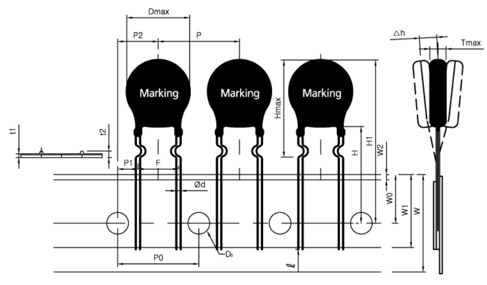
Straight-kink leads



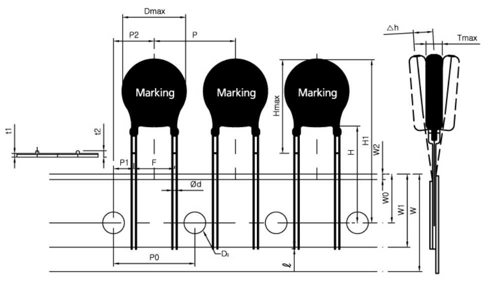
Out-kink leads



In-kink leads



Y-kink leads



3. Tape & Reel Packing Specifications

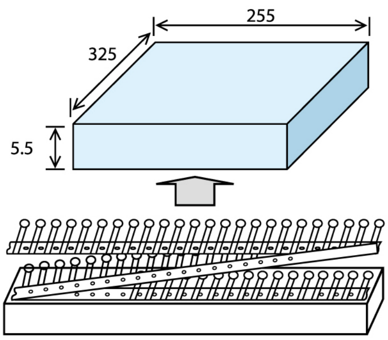
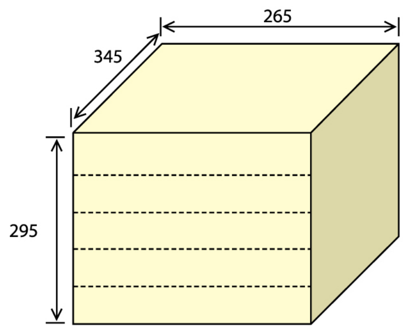
Unit [mm]

Symbol	Description		Φ04~05 series	Φ 06~08 series	Φ 10 series		Φ 14 series
P	Pitch of Component		12.7 ± 1.0	12.7 ± 1.0	12.7 ± 1.0	15.0 ± 1.0	25.4 ± 1.0
P0	Feed Hole Pitch		12.7 ± 0.3	12.7 ± 0.3	12.7 ± 0.3	15.0 ± 0.3	12.7 ± 0.3
P1	Feed Hole Center to Pitch		3.85 ± 0.7	3.85 ± 0.7	3.85 ± 0.7	3.75 ± 0.7	8.55 ± 0.7
P2	Hole Center to Component Center		6.35 ± 1.0	6.35 ± 1.0	6.35 ± 1.0	7.50 ± 1.0	12.7 ± 1.0
Δh	Component Alignment		Max. 2.0	Max. 2.0	Max. 2.0	Max. 2.0	Max. 2.0
W	Tape Width		18.25 ± 0.75	18.25 ± 0.75	18.25 ± 0.75	18.25 ± 0.75	18.25 ± 0.75
W0	Hole Position		9.125 ± 0.5	9.125 ± 0.5	9.125 ± 0.5	9.125 ± 0.5	9.125 ± 0.5
W1	Hold Down Tape Width		Min. 11.0	Min. 11.0	Min. 11.0	Min. 11.0	Min. 11.0
W2	Hold Down Tape Position		Max. 3.0	Max. 3.0	Max. 3.0	Max. 3.0	Max. 3.0
H	Height From Tape Center To Component Base		18.0 ± 1.0	18.0 ± 1.0	18.0 ± 1.0	18.0 ± 1.0	18.0 ± 1.0
H1	Component Height (Kink)	Straight	Max. 29.0	Max. 32.0	Max. 36.0	Max. 36.0	Max. 40.0
		Out	Max. 29.0	Max. 32.0	Max. 36.0	Max. 36.0	Max. 40.0
		In	Max. 29.0	Max. 32.0	Max. 36.0	Max. 36.0	Max. 40.0
		Y	Max. 29.0	Max. 32.0	Max. 36.0	Max. 36.0	Max. 40.0
D0	Feed Hole Diameter		4.0 ± 0.2	4.0 ± 0.2	4.0 ± 0.2	4.0 ± 0.2	4.0 ± 0.2
t	Tatal Tape Thickness		0.7 ± 0.2	0.7 ± 0.2	0.7 ± 0.2	0.7 ± 0.2	0.7 ± 0.2

Unit [pcs]

Part No.	Inner Box	Outer Box
D 04 ~ 05 series	1,000	5,000
D 07 ~ 08 series	1,000	5,000
D 10 ~ 12series	800	4,000
D 14 series	500	2,500

Unit [mm]

Inner Box	Outer Box
	

PTC thermistors for overcurrent protection

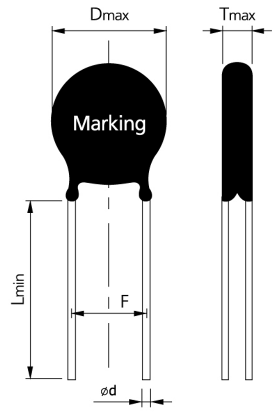
Leaded disks, coated, 100V to 220V

Application

- Overcurrent protection
- Short circuit protection

Features

- Marking : manufacturer's logo,T_b,R_{25}



Symbols and terms

Symbol	Term
R_{25}	Resistance at 25℃
R_b	Resistance at switching temperature
T_b	Switching temperature
V_R	Rated voltage
V_{max}	Maximum operating voltage
V_w	Withstanding voltage
I_{res}	Residual current
I_{max}	Maximum current
I_t	Tripping current
I_{nt}	maximum non-tripping current
T_s	Switching time

Dimensions

[mm]

Dim.	Dmax	Tmax	L (**)	F	d
D04	5.5	5.0	4 ~ 22	5.0	0.6
D05	6.5	5.0		5.0	0.6
D06	7.5	5.0		5.0	0.6
D07	8.5	5.0		5.0	0.6
D08	9.5	5.0		5.0	0.6
D10	13	5.5		5.0~7.0	0.6~0.8
D14	17	7		7.5~10.0	0.8

Specification

	Part No. "#" : UL (E213419)	T_b [℃]	R_{25} [ ]	V_R [V]	V_{max} [V]	V_W [V/3min]	T_s [Max. sec]	I_{res} [mA]	I_{max} [A]	I_{nt} [mA]	I_t [mA]
	HPGR06151JD0500	60	150 ± 25%	220	265	400	1.0	3.5 ± 30%	0.4	20	40
	HPGR08151JD0400	80	150 ± 25%	220	265	400	3.0	5.0 ± 30%	0.2	23	46
	HPGR08800JD0500	80	80 ± 25%	220	265	400	5.0	6.0 ± 30%	0.2	35	70
	HPGR08122JD0500	80	1,200 ± 25%	220	265	400	2.0	3.5 ± 30%	0.1	10	20
#	HPGR10151JD0400	100	150 ± 25%	220	265	400	4.0	5.8 ± 30%	0.2	36	72
#	HPGR10251JD0400	100	250 ± 25%	220	265	400	4.0	5.3 ± 30%	0.2	21	42
#	HPGR10501JD0400	100	500 ± 25%	220	265	400	4.0	5.0 ± 30%	0.2	19	38
#	HPGR10801JD0400	100	800 ± 25%	220	265	400	3.0	4.8 ± 30%	0.2	14	28
#	HPGR10102JD0400	100	1,000 ± 25%	220	265	400	3.0	4.7 ± 30%	0.2	13	26
#	HPGR10152JD0400	100	1,500 ± 25%	220	265	400	3.0	4.5 ± 30%	0.2	11	22
#	HPGR10381JD0500	100	380 ± 25%	220	265	400	3.0	5.5 ± 30%	0.2	24	48
	HPGR10501JD0500	100	500 ± 25%	220	265	400	2.0	5.1 ± 30%	0.2	20	40
	HPGR10102JD0500	100	1,000 ± 25%	220	265	400	3.0	4.8 ± 30%	0.1	13	26
#	HPGR10270JD1000	100	27 ± 25%	220	265	400	2.5	9.0 ± 30%	1.2	110	220
#	HPGR10330JD1000	100	33 ± 25%	220	265	400	2.5	8.8 ± 30%	1.2	105	210
#	HPGR10390JD1000	100	39 ± 25%	220	265	400	2.5	8.7 ± 30%	1.0	95	190
#	HPGR10450JD1000	100	45 ± 25%	220	265	400	2.0	8.5 ± 30%	1.0	90	180
#	HPGR10650JD1000	100	65 ± 25%	220	265	400	2.0	8.3 ± 30%	1.0	85	170
	HPGR12501JD0400	120	500 ± 25%	220	265	400	2.0	5.2 ± 30%	0.2	25	50
	HPGR12102JD0400	120	1,000 ± 25%	220	265	400	3.0	4.8 ± 30%	0.1	17	34
	HPGR12251JD0500	120	250 ± 25%	200	265	400	4.0	6.0 ± 30%	0.2	35	70
	HPGR12102JD0500	120	1,000 ± 25%	220	265	400	3.0	5.0 ± 30%	0.1	20	40
	HPGR12152JD0500	120	1,500 ± 25%	220	265	400	2.0	4.5 ± 30%	0.1	16	32

	Part No. "#" : UL (E213419)	T_b [℃]	R_{25} [ ]	V_R [V]	V_{max} [V]	V_W [V/3min]	T_s [Max. sec]	I_{res} [mA]	I_{max} [A]	I_{nt} [mA]	I_t [mA]
#	HPGR12270MD0800	120	27 ±20%	220	265	400	2.5	9.0 ± 30%	1.0	110	220
#	HPGR12330MD0800	120	33 ±20%	220	265	400	2.5	8.7 ± 30%	1.0	105	210
#	HPGR12390MD0800	120	39 ±20%	220	265	400	2.5	8.5 ± 30%	1.0	95	190
#	HPGR12450MD0800	120	45 ±20%	220	265	400	2.5	8.5 ± 30%	1.0	90	180
#	HPGR12650MD0800	120	65 ±20%	220	265	400	3.0	8.3 ± 30%	1.0	85	170
#	HPGR12270MD1000	120	27 ±20%	220	265	400	3.0	10.0 ± 30%	1.2	120	240
#	HPGR12330MD1000	120	33 ±20%	220	265	400	3.0	10.0 ± 30%	1.2	115	230
#	HPGR12390MD1000	120	39 ±20%	220	265	400	3.0	10.0 ± 30%	1.2	105	210
#	HPGR12450MD1000	120	45 ±20%	220	265	400	3.0	9.5 ± 30%	1.0	100	200
#	HPGR12650MD1000	120	65 ±20%	220	265	400	3.0	9.0 ± 30%	1.0	95	190
	HPGR12351JD1000	120	350 ±25%	220	265	400	3.0	8.0 ± 30%	0.4	45	90
	HPGR12060MD1400	120	6.8 ±20%	100	125	180	30.0	25.0 ± 30%	1.4	280	560
	HPGR13101MD0400	135	100 ±20%	220	265	400	6.5	7.7 ± 30%	0.2	75	150
	HPGR13121MD0500	135	120 ±20%	220	265	400	6.0	7.1 ± 30%	0.2	70	140
	HPGR13501MD0500	135	500 ±20%	220	265	400	3.0	6.0 ± 30%	0.2	40	80
	HPGR13102MD0500	135	1,000 ±20%	220	265	400	3.0	5.3 ± 30%	0.1	23	46
	HPGR13100MD1400	135	10 ±20%	220	265	400	5.0	16.0 ± 30%	2.2	260	520
	HPGR13220JD1400	135	22 ±25%	220	265	400	5.0	13.0 ± 30%	1.5	220	440

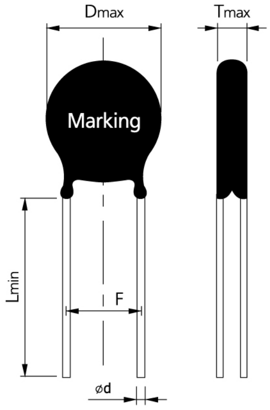
Leaded disks, coated, 12V to 65V

■ Application

- Overcurrent protection
- Short circuit protection

■ Features

- Low resistance
- Marking : manufacturer'slogo, T_b,R_{25}



■ Symbols and terms

R_{25}	Resistance at 25℃
R_b	Resistance at switching temperature
T_b	Switching temperature
V_R	Rated voltage
V_{max}	Maximum operating voltage
V_W	Withstanding voltage
I_{res}	Residual current
I_{max}	Maximum current
I_t	Tripping current
I_{nt}	maximum non-tripping current
T_s	Switching time

■ Dimensions [mm]

Dim.	Dmax	Tmax	L (**)	F	d
D04	5.5	5.0		5.0	0.6
D05	6.5	5.0		5.0	0.6
D06	7.5	5.0	4	5.0	0.6
D07	8.5	5.0	~	5.0	0.6
D08	9.5	5.0	22	5.0	0.6
D10	13	5.5		5.0~7.0	0.6~0.8
D14	17	7		7.5~10.0	0.8

■ Specification

Part No. "#" : UL (E213419)	T_b [℃]	R_{25} [ ]	V_R [V]	V_{max} [V]	V_W [V/3min]	T_s [sec]	I_{res} [mA]	I_{max} [A]	I_{nt} [mA]	I_t [mA]
HPGR08060JD0600	80	6 ± 25%	24	30	50	3.0	32.0 ± 30%	1.0	160	320
HPGR08100MD0600	80	10 ± 20%	63	80	100	2.0	14.5 ± 30%	1.0	90	180
HPGR10120JD0700	100	12 ± 25%	63	80	100	3.0	13.0 ± 30%	1.0	120	240
HPGR12200MD0500	120	20 ± 20%	12	20	100	4.0	45.0 ± 30%	-	110	220

PTC thermistors for limit temperature sensors

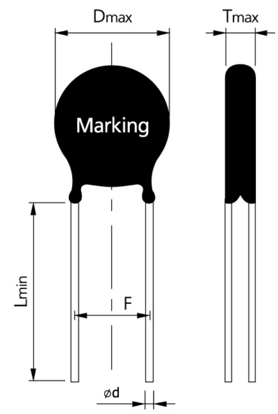
Limit temperature sensors, Leaded disks, coated

Application

- Limit temperature monitoring

Features

- Marking : manufacturer's logo,T_b,R_{25}



Symbols and terms

R_{25}	Resistance at 25℃
R_b	Resistance at switching temperature
T_b	Switching temperature
T_{NF}	Nominal functioning temperature
V_R	Rated voltage
V_{max}	Maximum operating voltage
V_w	Withstanding voltage

`XX`	2 Series	4 Series
Dmax	Max. 4.5	Max. 5.5
Tmax	Max. 3.5	Max. 3.5
F	3.5±1.0	5.0±1.0
d	0.5±0.1	
L (**)	Min. 4.0 ~ 22.0	

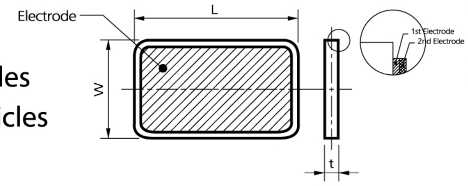
Specification

	Part No. *"#" : UL (E213419)*	T_b	R_{25}	V_R	V_{max}	V_W	T_{NF}	T_{NF}-10℃		T_{NF}+10℃		T_{NF}+ ℃	
		[℃]	[ ]	[V]	[V]	[V/3min]	[℃]	[℃]	[Max.]	[℃]	[Min.]	[℃]	[Min.]
	HPSR06850JD0200	60	85 ± 25%	16	30	50	70	60	550	80	550	-	
	HPSR07850JD0200	70	85 ± 25%	16	30	50	90	80	550	100	550	-	
	HPSR08850JD0200	80	85 ± 25%	16	30	50	100	90	570	110	570	115	1,000
	HPSR09850JD0200	90	85 ± 25%	16	30	50	105	95	550	115	1,330	130	20,000
	HPSR10850JD0200	100	85 ± 20%	16	30	50	110	100	550	120	1,330	-	
	HPSR12850JD0200	120	85 ± 25%	16	30	50	130	120	550	140	1,330	155	20,000
#	HPSR06850JD0400	60	85 ± 25%	16	30	50	70	60	550	80	550	-	
#	HPSR07850JD0400	70	85 ± 25%	16	30	50	90	80	550	100	550	-	
#	HPSR08850JD0400	80	85 ± 25%	16	30	50	100	90	570	110	570	115	1,000
#	HPSR09850JD0400	90	85 ± 25%	16	30	50	105	95	550	115	1,330	130	20,000
#	HPSR10850JD0400	100	85 ± 25%	16	30	50	110	100	550	120	1,330	-	
#	HPSR12850JD0400	120	85 ± 25%	16	30	50	130	120	550	140	1,330	155	20,000
	HPSR12102JD0400	120	1,000 ± 25%	220	265	350	130	120	10,000	140	40,000	155	1,000K
	HPSR06201SDxx00	60	200 ± 50%	16	30	50	75	65	1,500	85	1,500	-	
	HPSR07201SDxx00	70	200 ± 50%	16	30	50	85	75	1,500	95	1,500	-	
	HPSR08201SDxx00	80	200 ± 50%	16	30	50	95	85	1,500	105	1,500		
	HPSR09201SDxx00	90	200 ± 50%	16	30	50	105	95	1,500	115	1,500		
	HPSR10201SDxx00	100	200 ± 50%	16	30	50	115	105	1,500	125	1,500		

PTC thermistors as heating elements

Metallized rectangular disks

- Automotive applications
  - Diesel fuel preheaters
  - Cabin air heaters of diesel vehicles
  - Cabin air heaters of electric vehicles



Symbols and terms

R_{25}	Resistance at 25℃
R_b	Resistance at switching temp.
T_b	Switching temperature
T_{sf}	Final surface temperature
V_R	Rated voltage
V_{max}	Maximum operating voltage
V_w	Withstanding voltage
I_{inp}	Peak inrush current
I_{res}	Residual current
I_{max}	Maximum current

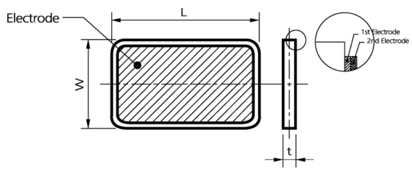
Part No.	T_b	R_{25}	L	W	Electrode		t	V_R	V_{max}	V_W	I_{inp}	I_{res}	T_{sf}
"#" : UL (E213419)	[℃]	[ ]	[mm]	[mm]	1st	2nd	[mm]	[V]	[V]	[V/3min]	[Max. A]	[mA]	[℃]
HPHE15010SB6012A25A	150	0.85 ± 30%	60.0 ± 1.0	12.0 ± 0.5	Ag/Zn	Ag	2.50 ± 0.1	12.0	13.5	30	20.0	700 ± 30%	153 ± 10
HPHE15010MB2721A14A	150	1.00 ± 20%	26.5 ± 0.5	21.0 ± 0.3	Ag/Zn	Ag	1.35 ± 0.1	12.0	13.5	30	20.0	690 ± 30%	153 ± 10
HPHE15010SB3608A20A	150	1.00 ± 20%	35.5 ± 0.6	7.8 ± 0.2	Ag/Zn	Ag	2.00 ± 0.1	12.0	13.5	30	15.0	700 ± 30%	150 ± 10
HPHE15010SB4808A20A	150	1.30 ± 20%	48.0 ± 1.0	8.0 ± 0.3	Ag/Zn	Ag	2.00 ± 0.1	12.0	24.0	30	10.0	750 ± 30%	150 ± 10
HPHE15020SB2812A16A	150	1.65 ± 20%	28.0 ± 0.5	12.0 ± 0.3	Ag/Zn	Ag	1.65 ± 0.1	13.5	28.0	30	12.0	600 ± 30%	152 ± 10
HPHE15020SB3415A24A	150	1.90 ± 20%	34.0 ± 0.5	15.0 ± 0.3	Ag/Zn	Ag	2.40 ± 0.1	12.0	24.0	30	10.0	720 ± 30%	150 ± 10
HPHE15030SB3415A24A	150	3.13 ± 20%	34.0 ± 0.5	15.0 ± 0.3	Ag/Zn	Ag	2.40 ± 0.1	24.0	36.0	50	15.0	400 ± 30%	145 ± 10
HPHE15050SB3608A20A	150	5.00 ± 20%	35.5 ± 0.6	7.8 ± 0.2	Ag/Zn	Ag	2.00 ± 0.1	24.0	30.0	50	9.5	320 ± 30%	150 ± 10
HPHE15201SB3608A20A	150	200 ± 50%	35.5 ± 0.6	7.8 ± 0.2	Ag/Zn	Ag	2.00 ± 0.1	120	150	250	3.0	70 ± 30%	150 ± 10
HPHE16070SB4808A20A	160	6.50 ± 20%	48.0 ± 1.0	8.0 ± 0.3	Ag/Zn	Ag	2.00 ± 0.1	24.0	32.0	50	8.5	420 ± 30%	153 ± 10
HPHE17010SB3415A24A	170	1.70 ± 20%	34.0 ± 0.5	15.0 ± 0.3	Ag/Zn	Ag	2.40 ± 0.1	12.0	24.0	30	10.5	950 ± 30%	170 ± 10
HPHE17020SB3006A10A	170	2.35 ± 20%	30.0 ± 1.0	5.8 ± 0.3	Ag/Zn	Ag	1.00 ± 0.1	12.0	24.0	100	8.0	670 ± 30%	180 ± 10
HPHN17030SB3606N10A	170	3.20 ± 20%	36.2 ± 0.3	5.7 ± 0.2	Ni	Ag	1.00 ± 0.1	12.0	13.5	30	8.0	750 ± 30%	170 ± 10
HPHE17372SB2418Z20A	170	3,750 ± 50%	24.0 ± 0.5	18.0 ± 0.3	Ag/Zn	-	2.00 ± 0.1	350	480	700	2.0	37 ± 30%	170 ± 10
HPHN18020SB3212N11A	180	2.10 ± 20%	32.0 ± 0.3	12.0 ± 0.2	Ni	Ag	2.00 ± 0.1	12.0	24.0	50	10.0	800 ± 30%	182 ± 10
HPHE18030SB3006A10A	180	3.00 ± 20%	30.0 ± 1.0	5.8 ± 0.3	Ag/Zn	Ag	1.00 ± 0.1	12.0	24.0	50	8.0	850 ± 30%	180 ± 10
HPHN18030SB3005N11A	180	3.50 ± 30%	30.0 ± 0.3	5.0 ± 0.2	Ni	Ag	1.10 ± 0.1	12.0	24.0	50	8.0	800 ± 30%	180 ± 10
HPHN18040SB1512N11A	180	4.35 ± 30%	15.0 ± 0.3	12.0 ± 0.2	Ni	Ag	1.10 ± 0.1	12.0	24.0	50	8.0	750 ± 30%	175 ± 10
HPHN18070SB3212N11A	180	7.00 ± 20%	32.0 ± 0.3	12.0 ± 0.2	Ni	Ag	1.10 ± 0.1	24.0	30.0	50	8.0	440 ± 30%	180 ± 10
HPHN18120SB3212N11A	180	12.00 ± 20%	32.0 ± 0.3	12.0 ± 0.2	Ni	Ag	1.10 ± 0.1	24.0	30.0	50	8.0	410 ± 30%	180 ± 10
HPHN18180SB3212N11A	180	20.00 ± 20%	32.0 ± 0 3	12.0 ± 0.2	Ni	Ag	1.10 ± 0.1	24.0	28.0	50	5.0	400 ± 30%	180 ± 10

PTC thermistors as heating elements

Metallized rectangular disks (12V to 30V)

■ Home Appliances

- Curling irons, Hot rollers, Straighteners for hair
- Heaters for medical appliances
- USB heaters



■ Symbols and terms

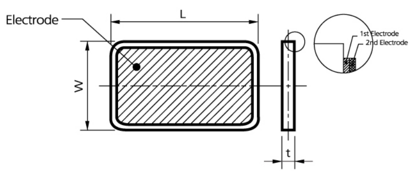
R_{25}	Resistance at 25℃
R_b	Resistance at switching temp.
T_b	Switching temperature
T_{sf}	Final surface temperature
V_R	Rated voltage
V_{max}	Maximum operating voltage
V_W	Withstanding voltage
I_{inp}	Peak inrush current
I_{res}	Residual current
I_{max}	Maximum current

Part No.	T_b	R_{25}	L	W	Electrode		t	V_R	V_{max}	V_W	I_{inp}	I_{res}	T_{Sf}
"#" : UL (E213419)	[℃]	[ ]	[mm]	[mm]	1st	2nd	[mm]	[V]	[V]	[V/3min]	[Max. A]	[mA]	[℃]
HPHE20200SB1806A14A	200	20.0 ± 50%	18.0 ± 0.5	6.0 ± 0.3	Ag/Zn	Ag	1.40 ± 0.1	12.0	15.0	50	3.0	370 ± 30%	180 ± 10
HPHE21010SB2515A09A	210	0.80 ± 20%	25.0 ± 0.5	15.0 ± 0.3	Ag/Zn	Ag	0.85 ± 0.1	12.0	13.5	30	30.0	1,300 ± 30%	237 ± 10
HPHE21200SB1806A14A	210	20.0 ± 50%	18.0 ± 0.5	6.0 ± 0.3	Ag/Zn	Ag	1.40 ± 0.1	12.0	15.0	50	3.0	400 ± 30%	190 ± 10
HPHE22200SB1806A14A	220	20.0 ± 50%	18.0 ± 0.5	6.0 ± 0.3	Ag/Zn	Ag	1.40 ± 0.1	12.0	15.0	50	3.0	410 ± 30%	200 ± 10
HPHE23200SB1806A14A	230	20.0 ± 50%	18.0 ± 0.5	6.0 ± 0.3	Ag/Zn	Ag	1.40 ± 0.1	12.0	15.0	50	3.0	430 ± 30%	215 ± 10
HPHE24200SB1806A14A	240	20.0 ± 50%	18.0 ± 0.5	6.0 ± 0.3	Ag/Zn	Ag	1.40 ± 0.1	12.0	15.0	50	3.0	460 ± 30%	220 ± 10
HPHE25200SB1806A14A	250	20.0 ± 50%	18.0 ± 0.5	6.0 ± 0.3	Ag/Zn	Ag	1.40 ± 0.1	12.0	15.0	50	3.0	470 ± 30%	230 ± 10
HPHE26200SB1806A14A	260	20.0 ± 50%	18.0 ± 0.5	6.0 ± 0.3	Ag/Zn	Ag	1.40 ± 0.1	12.0	15.0	50	3.0	480 ± 30%	235 ± 10
HPHE27200SB1806A14A	270	20.0 ± 50%	18.0 ± 0.5	6.0 ± 0.3	Ag/Zn	Ag	1.40 ± 0.1	12.0	15.0	50	3.0	500 ± 30%	245 ± 10

Metallized rectangular disks (100V to 220V)

■ Home Appliances

- Steam cleaners, Humidifiers
- Glue guns, Electrical fan heaters
- Food waste dryers



■ Symbols and terms

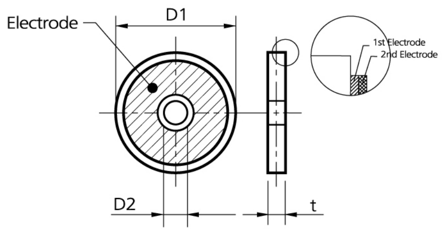
R_{25}	Resistance at 25℃
R_b	Resistance at switching temp.
T_b	Switching temperature
T_{sf}	Final surface temperature
V_R	Rated voltage
V_{max}	Maximum operating voltage
V_W	Withstanding voltage
I_{inp}	Peak inrush current
I_{res}	Residual current
I_{max}	Maximum current

	Part No.	T_b	R_{25}	L	W	Electrode		t	V_R	V_{max}	V_W	I_{inp}	I_{res}	T_{Sf}
	"#" : UL (E213419)	[℃]	[ ]	[mm]	[mm]	1st	2nd	[mm]	[V]	[V]	[V/3min]	[Max. A]	[mA]	[℃]
	HPHE14202SB2810Z14A	135	2,150 ±70%	27.8 ± 0.5	10.0 ± 0.5	Ag/Zn	-	1.4 ± 0.1	220	265	400	2.0	22 ±30%	136 ± 10
	HPHE15202SB3806Z30A	150	2,150 ±70%	38.0 ± 1.0	6.2 ± 0.3	Ag/Zn	-	3.0 ± 0.1	220	265	400	2.0	23 ±30%	150 ± 10
	HPHE15252SB2115Z22A	150	2,500 ±40%	20.5 ± 0.5	14.7 ± 0.3	Ag/Zn	-	2.2 ± 0.1	220	265	400	2.0	25 ±30%	145 ± 10
	HPHE16202SB2810Z14A	160	2,250 ±60%	27.8 ± 0.5	10.5 ± 0.5	Ag/Zn	-	1.4 ± 0.1	220	265	400	2.5	25 ±30%	155 ± 10
	HPHN18202SB1003N20A	180	2,150 ±70%	10.0 ± 0.3	2.8 ± 0.2	Ni	Ag	2.0 ± 0.1	220	265	400	1.5	15 ±30%	153 ± 10
	HPHE18352SB2515Z22A	180	3,750 ±50%	25.0 ± 0.5	15.0 ± 0.3	Ag/Zn	-	2.2 ± 0.1	220	265	450	2.0	28 ±30%	175 ± 10
	HPHE20651SB2515Z22A	200	650 ±50%	25.0 ± 0.5	15.0 ± 0.3	Ag/Zn	-	2.2 ± 0.1	110	140	400	2.0	55 ±30%	200 ± 10
	HPHE20202SB3806Z30A	200	2,150 ±70%	38.0 ± 1.0	6.2 ± 0.3	Ag/Zn	-	3.0 ± 0.1	220	265	400	2.0	27 ±30%	190 ± 10
#	HPHE23202SB2115Z22A	230	2,000 ±50%	20.5 ± 0.5	14.7 ± 0.3	Ag/Zn	-	2.2 ± 0.1	220	265	450	2.0	43 ±30%	215 ± 10
#	HPHE24202SB2409A22A	240	2,150 ±70%	24.0 ± 0.5	9.0 ± 0.3	Ag/Zn	Ag	2.2 ± 0.1	220	265	400	2.0	40 ±30%	220 ± 10
	HPHE25202SB2515A22A	250	2,000 ±50%	25.0 ± 0.5	15.0 ± 0.3	Ag/Zn	Ag	2.2 ± 0.1	220	265	400	3.0	45 ±30%	235 ± 10
#	HPHE25202SB2409A22A	250	2,150 ±70%	24.0 ± 0.5	9.0 ± 3.0	Ag/Zn	Ag	2.2 ± 0.1	220	265	400	3.0	40 ±30%	235 ± 10
#	HPHE25202SB3005A22A	250	2,150 ±70%	30.0 ± 2.0	5.0 ± 0.3	Ag/Zn	Ag	2.2 ± 0.1	220	265	400	2.0	35 ±30%	235 ± 10
	HPHE26202SB2515Z22A	260	2,000 ±50%	25.0 ± 0.5	15.0 ± 0.3	Ag/Zn	-	2.2 ± 0.1	220	265	400	2.0	45 ±30%	245 ± 10
#	HPHE28202SB2810Z14A	280	2,250 ±60%	27.8 ± 0.5	10.5 ± 0.5	Ag/Zn	-	1.4 ± 0.1	110	140	250	2.0	150 ±30%	265 ± 10
#	HPHE28202SB3806A22A	280	2,250 ±60%	38.0 ± 1.0	6.2 ± 0.3	Ag/Zn	Ag	2.2 ± 0.1	220	265	350	3.5	45 ±30%	260 ± 10

PTC thermistors as heating elements

Metallized ring disks

- **Automotive applications**
  - Diesel fuel preheaters
  - Cabin air heaters



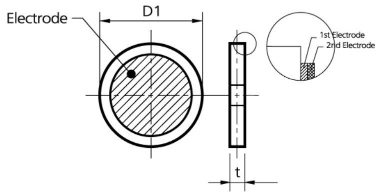
■ Symbols and terms

R_{25}	Resistance at 25℃
R_b	Resistance at switching temp.
T_b	Switching temperature
T_{sf}	Final surface temperature
V_R	Rated voltage
V_{max}	Maximum operating voltage
V_w	Withstanding voltage
I_{inp}	Peak inrush current
I_{res}	Residual current
I_{max}	Maximum current

Part No.	T_b	R_{25}	D1	D2	Electrode		t	V_R	V_{max}	V_W	I_{inp}	I_{res}	T_{Sf}
"#" : UL (E213419)	[℃]	[ ]	[mm]	[mm]	1st	2nd	[mm]	[V]	[V]	[V/3min]	[Max. A]	[mA]	[℃]
HPHE13180SR16R5A16A	135	17.6 ±20%	16.5 ±0.3	4.5 ±0.1	Ag/Zn	Ag	1.65 ±0.1	28.6	34.0	50	6.0	230 ±30%	135 ±10
HPHE14010SR16R5A16A	145	1.70 ±20%	16.5 ±0.3	4.5 ±0.1	Ag/Zn	Ag	1.65 ±0.1	12.0	13.5	30	10.0	600 ±30%	145 ±10
HPHE14020SR16R5A16A	145	2.27 ±20%	16.5 ±0.3	4.5 ±0.1	Ag/Zn	Ag	1.65 ±0.1	12.0	24.0	30	10.0	550 ±30%	145 ±10
HPHE14030SR16R5A16A	145	2.73 ±20%	16.5 ±0.3	4.5 ±0.1	Ag/Zn	Ag	1.65 ±0.1	12.0	24.0	30	7.0	500 ±30%	145 ±10
HPHE14040SR16R5A16A	145	4.10 ±20%	16.5 ±0.3	4.5 ±0.1	Ag/Zn	Ag	1.65 ±0.1	24.0	28.6	50	9.0	330 ±30%	145 ±10
HPHE14070SR1600A15A	140	7.50 ±20%	16.0 ±0.3	4.5 ±0.1	Ag/Zn	Ag	1.55 ±0.1	24.0	28.6	50	7.0	300 ±30%	145 ±10
HPHE14100SR1400A12A	145	10.00 ±20%	14.0 ±0.3	4.5 ±0.1	Ag/Zn	Ag	1.20 ±0.1	28.6	40.0	50	5.5	330 ±30%	145 ±10
HPHE14140SR1400A12A	145	14.40 ±20%	14.0 ±0.3	4.5 ±0.1	Ag/Zn	Ag	1.20 ±0.1	28.6	40.0	50	5.0	300 ±30%	145 ±10
HPHJ15020SR2200A20A	150	1.73 ±20%	22.0 ±0.3	4.7 ±0.2	Ag/Zn	Ag	2.00 ±0.1	12.0	13.5	30	9.0	650 ±30%	150 ±10
HPHE15020SR1400A16A	150	1.90 ±20%	14.0 ±0.3	4.5 ±0.1	Ag/Zn	Ag	1.60 ±0.1	12.0	13.5	30	10.0	600 ±30%	150 ±10
HPHE15030SR16R5A16A	150	2.97 ±20%	16.5 ±0.3	4.5 ±0.1	Ag/Zn	Ag	1.65 ±0.1	13.0	24.0	30	8.0	600 ±30%	145 ±10
HPHE16050SR16R5A16A	160	4.60 ±20%	16.5 ±0.3	4.5 ±0.1	Ag/Zn	Ag	1.65 ±0.1	24.0	32.0	50	10.0	380 ±30%	150 ±10
HPHE17010SR16R5A16A	170	1.50 ±20%	16.5 ±0.3	4.5 ±0.1	Ag/Zn	Ag	1.65 ±0.1	12.0	24.0	30	10.0	700 ±30%	165 ±10

Metallized round disks

- **Automotive applications**
  - Diesel fuel preheaters
  - Cabin air heaters



■ Symbols and terms

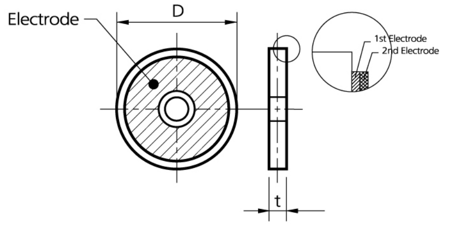
R_{25}	Resistance at 25℃
R_b	Resistance at switching temp.
T_b	Switching temperature
T_{sf}	Final surface temperature
V_R	Rated voltage
V_{max}	Maximum operating voltage
V_w	Withstanding voltage
I_{inp}	Peak inrush current
I_{res}	Residual current
I_{max}	Maximum current

Part No.	T_b	R_{25}	D1	D2	Electrode		t	V_R	V_{max}	V_W	I_{inp}	I_{res}	T_{Sf}
"#" : UL (E213419)	[℃]	[ ]	[mm]	[mm]	1st	2nd	[mm]	[V]	[V]	[V/3min]	[Max. A]	[mA]	[℃]
HPHE05551SR17R2Z27A	50	550 ±50%	17.2±0.3	4.7 ± 0.2	Ag/Zn	-	2.65±0.2	100	125	400	1.5	10 ±30%	50 ±10
HPHE07551SR17R2Z27A	70	550 ±50%	17.2±0.3	4.7 ± 0.2	Ag/Zn	-	2.65±0.2	100	125	400	1.5	12 ±30%	70 ±10
HPHE08551SR17R2Z27A	80	550 ±50%	17.2±0.3	4.7 ± 0.2	Ag/Zn	-	2.65±0.2	100	125	400	1.5	13 ±30%	80 ±10
HPHJ09100SR05R6A10A	90	10.0 ±20%	5.56±0.2	2.3 ± 0.1	Ag/Zn	Ag	1.00±0.1	6.0	8.0	50	1.5	250±30%	-

PTC thermistors as heating elements

Metallized ring disks

- Automotive applications
  - Diesel fuel preheaters
  - Cabin air heaters



Symbols and terms

R_{25}	Resistance at 25℃
R_b	Resistance at switching temp.
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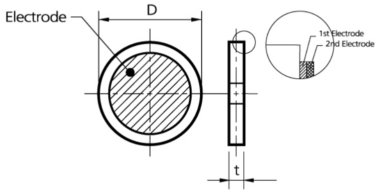
T_{sf}	Final surface temperature
V_R	Rated voltage
V_{max}	Maximum operating voltage
V_w	Withstanding voltage
I_{inp}	Peak inrush current
I_{res}	Residual current
I_{max}	Maximum current

Part No.	T_b	R_{25}	D	Electrode		t	V_R	V_{max}	V_W	I_{inp}	I_{res}	T_{sf}
"#" : UL (E213419)	[℃]	[ ]	[mm]	1st	2nd	[mm]	[V]	[V]	[V/3min]	[Max. A]	[mA]	[℃]
HPHJ14010SD1200A15A	145	1.55 ±20%	12.0 ±0.3	Ag/Zn	Ag	1.53 ±0.1	13.5	28.0	30	10.0	600 ±30%	145 ±10
HPHE14020SD1600A15A	140	2.00 ±20%	16.0 ±0.5	Ag/Zn	Ag	1.55 ±0.1	12.0	13.5	30	8.5	550 ±30%	145 ±10
HPHJ14030SD1200A15A	140	3.00 ±20%	12.0 ±0.3	Ag/Zn	Ag	1.50 ±0.1	12.0	13.5	30	6.0	600 ±30%	140 ±10
HPHE14070SD1600A15A	140	7.00 ±20%	16.0 ±0.5	Ag/Zn	Ag	1.55 ±0.1	24.0	28.6	50	6.0	280 ±30%	140 ±10
HPHJ15020SD12R2A14A	150	2.10 ±20%	12.2 ±0.3	Ag/Zn	Ag	1.40 ±0.1	13.5	28.0	30	7.8	560 ±30%	150 ±10
HPHJ16020SD1200A16A	165	2.00 ±20%	12.0 ±0.3	Ag/Zn	Ag	1.58 ±0.1	13.5	28.0	30	10.0	700 ±30%	162 ±10
HPHE22090SD12R4A12A	220	9.0 ±30%	12.4 ±0.3	Ag/Zn	Ag	1.15 ±0.1	12.0	13.5	30	4.0	100 ±30%	205 ±10

Metallized round disks

- Home Appliances
  - Insecticide and perfume vaporizers
  - Heaters for medical applications
    ex. hyperthermia therapy, hot massage etc
  - Bimetal heaters



Symbols and terms

R_{25}	Resistance at 25℃
R_b	Resistance at switching temp.
T_b	Switching temperature
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V_{max}	Maximum operating voltage
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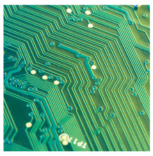
I_{inp}	Peak inrush current
I_{res}	Residual current
I_{max}	Maximum current

Part No.	T_b	R_{25}	D	Electrode		t	V_R	V_{max}	V_W	I_{inp}	I_{res}	T_{sf}
"#" : UL (E213419)	[℃]	[ ]	[mm]	1st	2nd	[mm]	[V]	[V]	[V/3min]	[Max. A]	[mA]	[℃]
HPHE06010SD2000A08A	60	1.75 ±20%	20.0 ±0.5	Ag/Zn	Ag	0.80 ±0.1	3.3	6	15	2.0	600 ±30%	-
HPHJ09150SD02R1A03A	90	12.5 ±20%	2.1 ±0.1	Ag/Zn	Ag	0.28 ±0.02	12	15	30	-	-	-
HPHJ09102SD0800A30A	90	1,000 ±40%	8.0 ±0.3	Ag/Zn	Ag	3.00 ±0.1	100	140	700	0.4	-	-
HPHJ10501SD1200A25A	100	500 ±60%	12.0 ±0.3	Ag/Zn	Ag	2.50 ±0.1	100	125	400	2.0	25 ±30%	100 ±10
HPHJ10501SD1700A25A	100	500 ±60%	17.0 ±0.3	Ag/Zn	Ag	2.50 ±0.1	100	125	400	2.0	28 ±30%	100 ±10
HPHJ10142SD1200A21A	100	1,000 ±40%	12.0 ±0.3	Ag/Zn	Ag	2.10 ±0.1	200	265	400	2.0	38 ±30%	105 ±10
HPHJ13851SD0600A15A	135	850 ±40%	6.0 ±0.2	Ag/Zn	Ag	1.50 ±0.1	250	265	600	2.0	35 ±30%	127 ±10
HPHJ14202SD1000A23A	135	2,000 ±50%	10.0 ±0.3	Ag/Zn	Ag	2.30 ±0.1	220	265	600	1.5	15 ±30%	135 ±10
HPHJ15202SD1000A23A	150	2,000 ±50%	10.0 ±0.3	Ag/Zn	Ag	2.30 ±0.1	220	265	500	1.5	18 ±30%	145 ±10
HPHJ17102SD0800A30A	175	1,000 ±50%	8.0 ±0.3	Ag/Zn	Ag	3.00 ±0.1	100	140	700	0.7	-	-
HPHJ18400SD1300A20A	180	40.00 ±30%	12.8 ±0.3	Ag/Zn	Ag	2.00 ±0.2	24	30	100	3.0	350 ±30%	160 ±10
HPHJ18202SD0800A30A	180	2,000 ±50%	8.0 ±0.3	Ag/Zn	Ag	3.00 ±0.1	220	265	400	2.0	15 ±30%	170 ±10
HPHJ19101SD1300A20A	190	100 ±20%	12.8 ±0.3	Ag/Zn	Ag	2.00 ±0.2	30	35	100	2.0	350 ±30%	180 ±10
HPHJ22202SD1000Z21A	220	2,000 ±50%	10.0 ±0.3	Ag/Zn	-	2.10 ±0.1	220	265	400	1.5	22 ±30%	200 ±10
HPHJ23680SD1300A20A	230	68.0 ±30%	13.0 ±0.3	Ag/Zn	Ag	2.00 ±0.1	30	35	100	3.0	370 ±30%	215 ±10
HPHJ23202SD0800A30A	230	2,000 ±50%	8.0 ±0.3	Ag/Zn	Ag	3.00 ±0.1	220	265	400	1.5	22 ±30%	205 ±10
HPHJ23202SD1100A29A	230	2,000 ±50%	11.1 ±0.3	Ag/Zn	Ag	2.90 ±0.1	220	265	400	2.0	30 ±30%	215 ±10



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