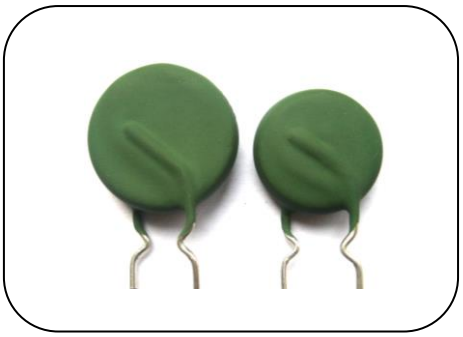
Ceramic PTC Thermistor: PPL Series
Dip Type for Inrush Current Limiter

■ Features



1. RoHS compliant
2. Leaded type
3. Voltage rating: $270V_{ac}$~$500V_{ac}$
4. Resistance range:10~1000Ω
5. Stable over a long time
6. Operating temperature range:
   -20 ~ +85°C ($V=V_{max}$)
   -40 ~ +125°C (V=0)
7. Agency recognition:
   UL/cUL File No. E138827

■ Recommended Applications

1. Air conditioner
2. Server
3. LED lamp
4. Switch power supply

■ Part Number Code

P	P	L	1	6	5	0	0	M	A	2	B	7	Y		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Product Code

PP	THINKING Ceramic PTC Thermistor PP Series

Series

L	Leaded Type

Dimensions

11	ϕ11mm
16	ϕ16mm
20	ϕ20mm

Resistance (R_{25})

250	25Ω
500	50Ω
101	100Ω
102	1000Ω

Tolerance of R_{25}

M	±20%
H	±25%
N	±30%
Y	Special

Curie Temperature

P8	80℃
A0	100℃
A2	120℃
A4	140℃

Max. Voltage

A4	140 V
B7	270 V
C8	380 V
E0	500 V

Packaging

Y	Bulk
X	Ammo Box Pitch 12.7mm
V	Ammo Box Pitch 15mm
W	Taping & Reel Pitch 12.7mm
U	Taping & Reel Pitch 15mm

Internal Control Code

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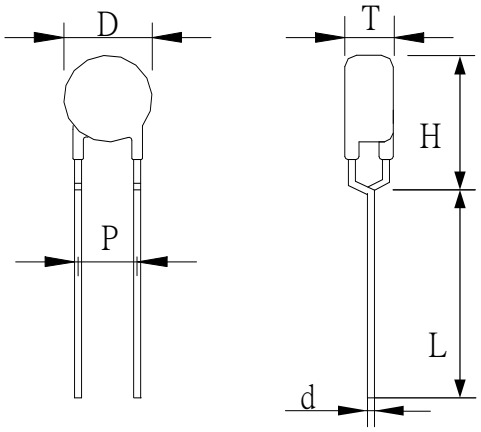
■ Structure and Dimensions

- **Structure**



- **Dimensions**

(Unit: mm)

Part No.	D		T		H	d	P	L
	min	max	min	max	max	±0.02	±1.0	Min.
PPL123R8□A4A1	10.5	13.0	3.0	5.0	17.5	0.6	5	25
PPL09160□A2B2	8.5	11.0	3.0	5.0	14.5	0.6	5	25
PPL19100□A1B7	19.0	21.5	6.5	10.7	25.5	1.0	10	25
PPL16270□A2B7	15.5	18.0	5.0	7.5	21.5	1.0	10	25
PPL16350□A2B7	15.5	18.0	5.0	7.5	21.5	1.0	10	25
PPL16500□A2B7	15.5	18.0	5.0	7.5	21.5	1.0	10	25
PPL16800□A2B7	15.5	18.0	5.0	7.5	21.5	1.0	10	25
PPL19150□A2B7	19.0	21.5	6.5	10.7	25.5	1.0	10	25
PPL20400□A2B7	19.0	22.0	6.0	10.0	25.5	0.8	7.5	25
PPL20600□A2B7	19	22.0	6.5	10.7	25.5	1.0	10	25
PPL20330□A3B7	19.5	22.0	6.5	10.7	25.5	1.0	10	25
PPL20470□A3B7	19.5	22.0	6.5	10.7	25.5	0.8	7.5	25
PPL06121□A3B8	5.0	8.0	3.0	6.0	13.8	0.5	5	25
PPL11250□A2C8	10.5	13.0	4.0	6.5	17.0	0.6	5	25
PPL11500□A2C8	10.5	13.0	5.0	7.5	17.0	0.6	5	25
PPL11800□A2C8	10.5	13.0	5.0	7.5	17.0	0.6	5	25
PPL19500□A0C8	19.0	21.5	6.5	10.7	25.5	1.0	10	25
PPL11121□A2C8	10.5	13.0	5.0	7.5	17.0	0.6	5	25
PPL11151□A2C8	10.5	13.0	5.0	7.5	17.0	0.6	5	25
PPL16101□A2C8	15.5	18.0	5.0	7.5	21.5	1.0	10	25
PPL11201□A2D2	10.5	13.0	5.0	7.5	17.0	0.6	5	25
PPL16151□A2D2	15.5	18.0	5.0	7.5	21.5	1.0	10	25
PPL14121□A3D4	12.5	15.0	5.0	7.5	19.5	0.8	5	25
PPL14560□A3D4	12.5	15.0	5.0	7.5	19.5	0.8	5	25
PPL19102□A0D8	19.0	21.5	6.5	10.7	25.5	1.0	10	25
PPL16251□A2E0	15.5	18.0	5.0	7.5	21.5	1.0	10	25
PPL11501□A2E0	10.5	13.0	5.0	7.5	17.0	0.6	5	25

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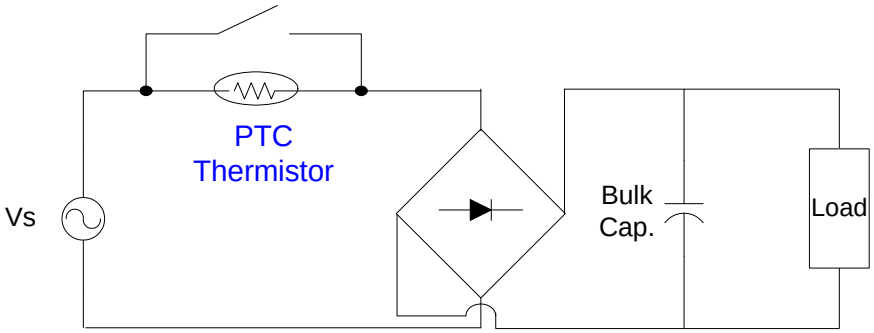
■ Characteristics

Part No.	Max. Voltage	Zero-power Resistance at 25℃	Curie Temperature	Thermal Capacity	Max. Non-operating Energy at 60℃	Safety Approvals
	Vmax (Vac)	R_{25} (Ω)	Tc (℃)	Cth(J/K)	E_{Non60}(J)	UL/cUL
PPL123R8□A4A1	140	3.8	140	0.8	41	√
PPL09160□A2B2	220	16	120	0.4	16.8	√
PPL19100□A1B7	270	10	110	3.5	123	√
PPL16270□A2B7	270	27	120	2.3	97	√
PPL16350□A2B7	270	35	120	2.3	97	√
PPL16500□A2B7	270	50	120	2.3	97	√
PPL16800□A2B7	270	80	120	2.3	97	√
PPL19150□A2B7	270	15	120	3.5	147	√
PPL20400□A2B7	270	40	120	3.2	134	√
PPL20600□A2B7	270	60	120	3.8	160	√
PPL20330□A3B7	270	33	130	3.8	186	√
PPL20470□A3B7	280	47	130	3.8	186	√
PPL06121□A3B8	280	120	130	0.12	5	√
PPL11250□A2C8	380	25	115	1.0	39	√
PPL11500□A2C8	380	50	115	1.4	54	√
PPL11800□A2C8	380	80	115	1.4	54	√
PPL19500□A0C8	380	50	100	3.5	98	√
PPL11121□A2C8	380	120	115	1.4	54	√
PPL11151□A2C8	380	150	115	1.4	54	√
PPL16101□A2C8	380	100	120	2.3	97	√
PPL11201□A2D2	420	200	120	1.4	59	√
PPL16151□A2D2	420	150	120	2.3	97	√
PPL14121□A3D4	440	120	130	2.1	103	√
PPL14560□A3D4	440	56	130	2.1	103	√
PPL19102□A0D8	480	1000	100	3.8	106	√
PPL16251□A2E0	500	250	120	2.3	97	√
PPL11501□A2E0	500	500	115	1.4	54	√

Note: □ is the tolerance of R_{25}

■ Application and Selection

● Typical application circuit:



● Selection

Select charging capacitor according to the following formula.

$$C < \frac{0.7x(Tc-Ta)xCthx10^6}{0.5xV^2} \quad \text{(Unit: uF)}$$

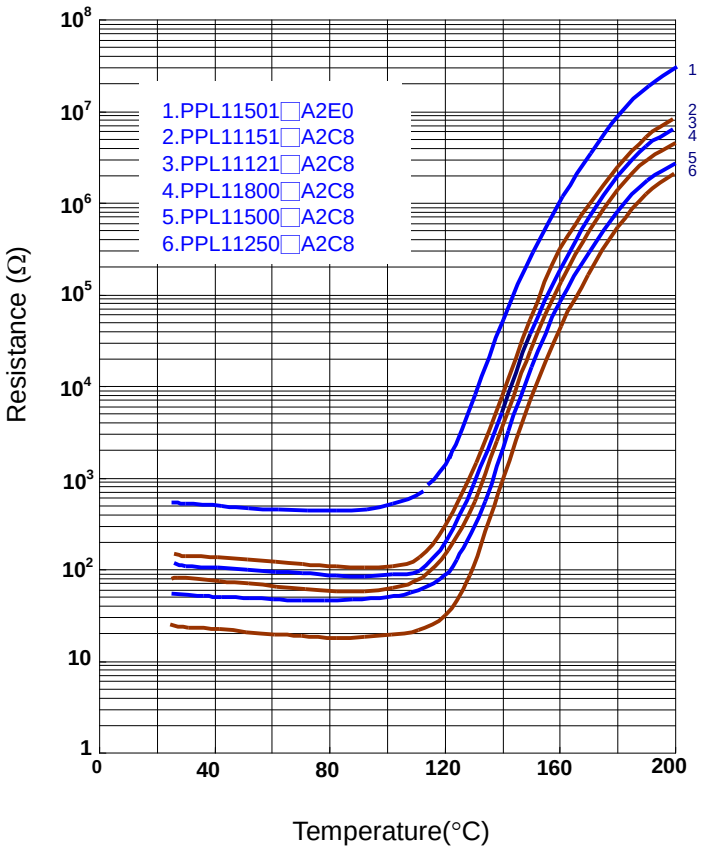
C: Bulk Cap.
Tc: Curie temperature of PTC
V: Voltage of capacitor charging (V=1.414xVs)

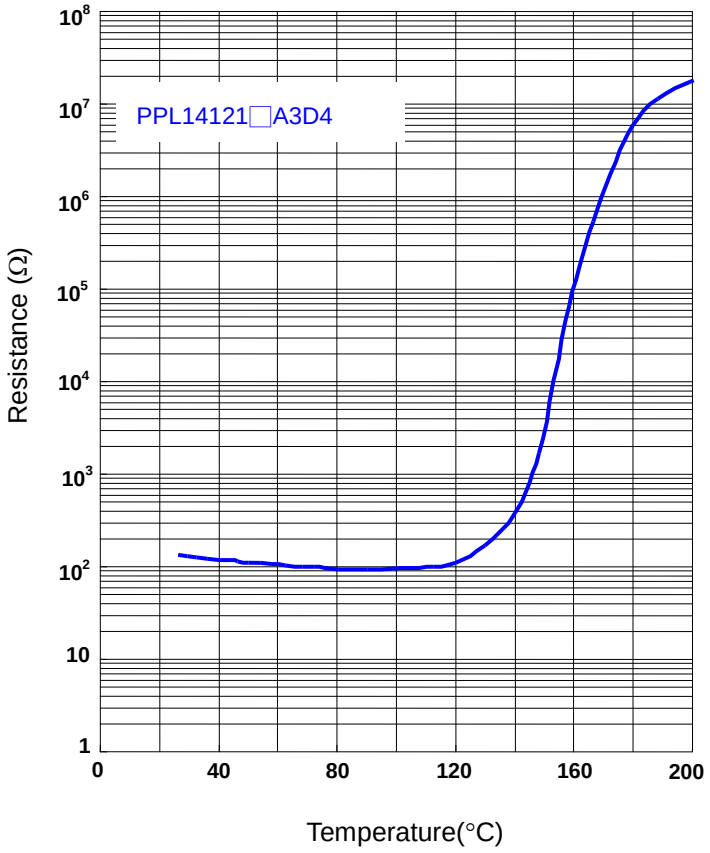
0.7: Safety factor
Ta: Ambient temperature

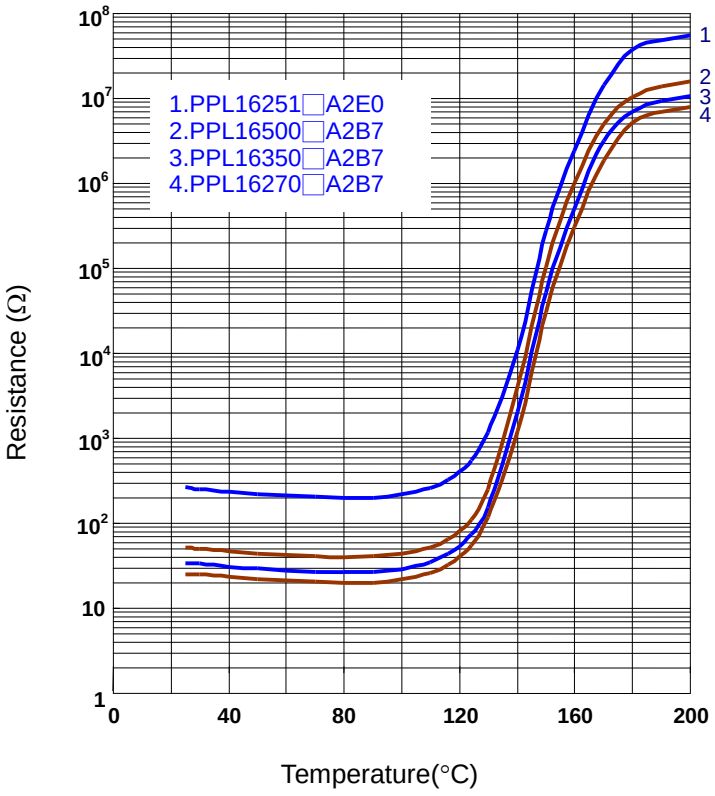
$$E_{Non60}=0.7x(Tc-Ta)xCth$$

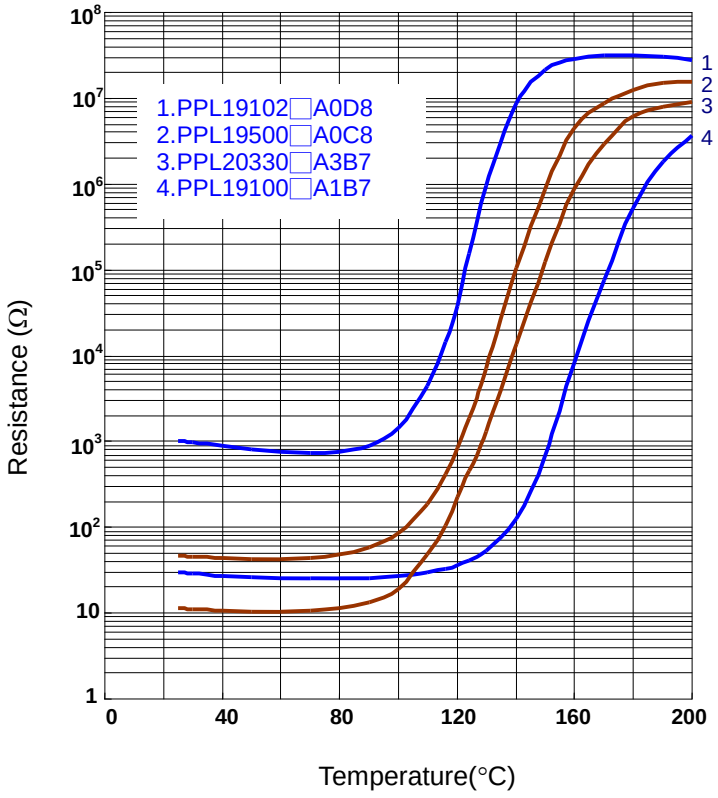
E_{Non60}: Max Non-operating Energy at 60℃ (Ta= 60)

■ R-T Characteristic Curve (Typical)



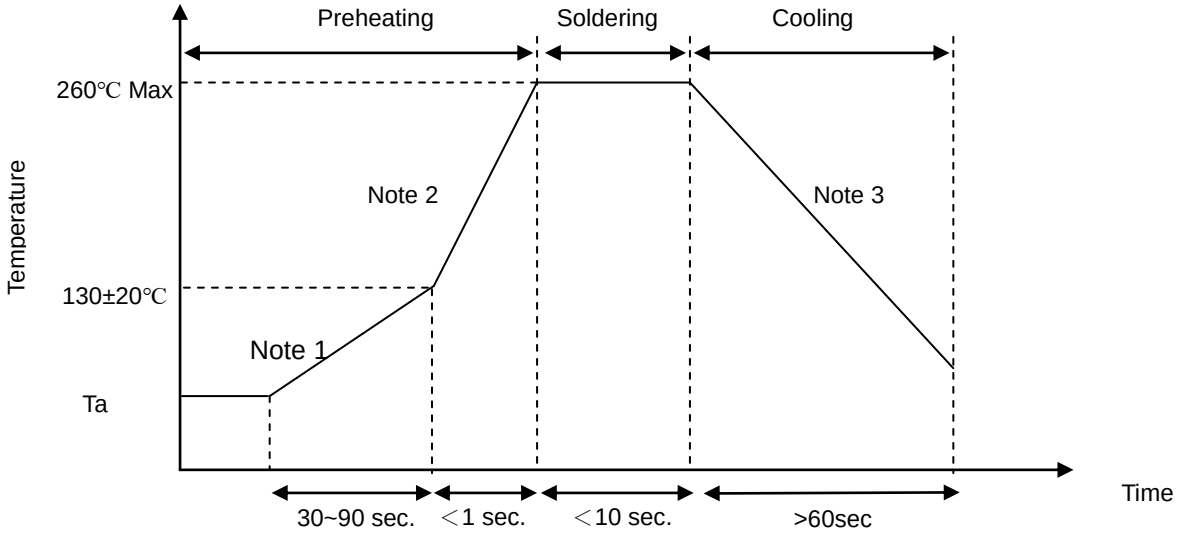






■ Soldering Recommendation

● Wave Flow Soldering Profile



Note

1: (1~3℃)/sec

2: Approx. 200℃/sec

3: 5℃/sec. (Max)

■ Recommended Reworking Conditions with Soldering Iron

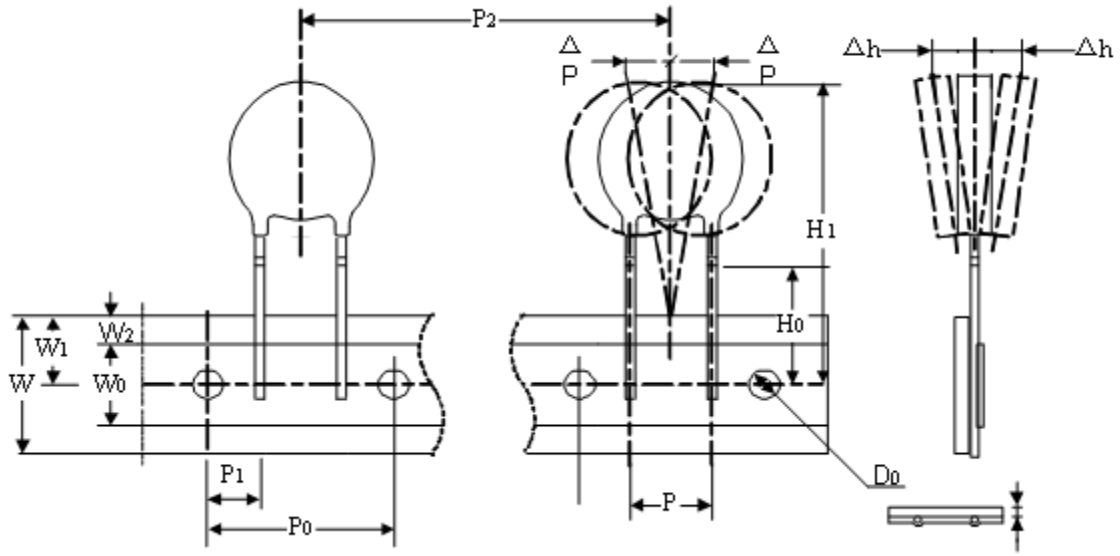
Item	Conditions
Temperature of Soldering Iron-tip	360℃ (max.)
Soldering Time	3 sec (max.)
Distance from Thermistor	2 mm (min.)

■ Reliability Test

<table>
<tr><th>Item</th><th>Standard</th><th>Test Conditions and Methods</th><th>Specifications</th></tr>
<tr><td>Robustness of Terminations</td><td>IEC 60738-1</td><td>Gradually apply the specified force and keep the unit fixed for 10±1 sec.
Terminal diameter (mm) / Force T(N)
0.35<d≦0.5 : 5.0
0.5<d≦0.8 : 10.0
0.8<d≦1.25 : 20.0</td><td>｜△R_{25}/R_{25}｜≦20%
No visible damage</td></tr>
<tr><td>Solderability</td><td>IEC 60738-1</td><td>245±3℃, 2±0.5 sec</td><td>At least 95% of terminal electrode is covered by new solder</td></tr>
<tr><td>Resistance to Soldering Heat</td><td>IEC 60738-1</td><td>260±3℃, 10±1 sec</td><td>｜△R_{25}/R_{25}｜≦20%
No visible damage</td></tr>
<tr><td>Vibration</td><td>IEC 60738-1</td><td>Frequency range:10~55Hz
Amplitude: 0.75mm or 98m/s^2
Direction: 3 mutually perpendicular directions
Duration: 6hrs (3x2 hrs)</td><td>｜△R_{25}/R_{25}｜≦20%
No visible damage</td></tr>
<tr><td>Shock</td><td>IEC 60738-1</td><td>Wave: half-sine
⊿V: 1.0m/s
Acceleration: 50 m/s^2
Pulse time: 30ms</td><td>｜△R_{25}/R_{25}｜≦20%
No visible damage</td></tr>
<tr><td>Rapid Change of Temperature</td><td>IEC 60738-1</td><td>The thermal shock conditions shown below shall be repeated 5 cycles.
<table>
<tr><th>Step</th><th>Temperature (℃)</th><th>Period (minutes)</th></tr>
<tr><td>1</td><td>-40 ± 5</td><td>30 ± 3</td></tr>
<tr><td>2</td><td>Room temperature</td><td>5 ± 3</td></tr>
<tr><td>3</td><td>85 ± 5</td><td>30 ± 3</td></tr>
<tr><td>4</td><td>Room temperature</td><td>5 ± 3</td></tr>
</table></td><td>｜△R_{25}/R_{25}｜≦20%
No visible damage</td></tr>
<tr><td>Climatic Sequence</td><td>IEC 60738-1</td><td>Dry heat: 125 ℃ for 16 hrs
Damp heat first cycle: 40℃, 95% R.H ,cycle time: 24 hrs
Cold: -40℃ for 2 hrs
Damp heat (cyclic), remaining cycles: 5 cycles
Test according to IEC60068-2-30</td><td>｜△R_{25}/R_{25}｜≦20%
No visible damage</td></tr>
<tr><td>Damp Heat, Steady State</td><td>IEC 60738-1</td><td>40±2℃, 90~95% RH, 1000±2hrs</td><td>｜△R_{25}/R_{25}｜≦20%
No visible damage</td></tr>
<tr><td>Endurance at Maximum Operating Temperature and Maximum Voltage</td><td>IEC 60738-1</td><td>85℃, V_{max} , 1000±2hrs</td><td>｜△R_{25}/R_{25}｜≦20%
No visible damage</td></tr>
<tr><td>Endurance Test for Charging of Capacitor</td><td>Specification Standard</td><td>Operating cycles at Vmax, 100,000 cycles
(charging of capacitor)</td><td>｜△R_{25}/R_{25}｜≦20%
No visible damage</td></tr>
</table>

■ Packaging

■ Taping Specification



(Unit: mm)

■ Parameter List

Index	Parameter	Nominal dimensions		Tolerance
P	Lead spacing	5		±1
P_0	Sprocket hole pitch	12.7	15	±0.3
P_1	Ordinate to adjacent component lead	3.85	5	±1
P_2	Device pitch	12.7 (D≦10)	15.0 (D≦10)	±1
		25.4 (D >10)	30.0 (D >10)	
H_0	Abscissa to plane (kinked lead)	16	16	±0.5
H_1	Abscissa to top	33.5(D=11) 36.0(D=14)		Max.
W	Carrier tape width	18	18	±1
W_0	Hold-down tape width	12	12	±1.5
W_1	Sprocket hole position	9	9	±1
W_2	Top distance between tape edges	3	3	Max.
△P	Body tape plane deviation	1	1	Max.
△h	Body lateral deviation	2	2	Max.
D_0	Sprocket hole diameter	4	4	±0.2
t	Tape thickness	0.6	0.6	±0.2

Note: D is the PTC disc diameter.

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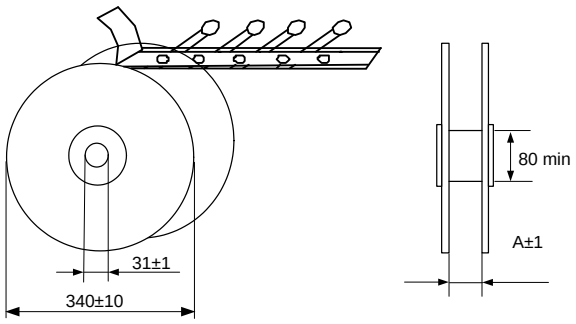
■ Quantity

● Bulk Packing

Disc Size (mm)	Quantity (pcs/bag)
10<Φ<20	100
Φ≧20	50

● Reel Packing

Disc Size (mm)	Quantity (pcs/reel)
07＜Φ≦12	750
12＜Φ≦16	500
Φ＞16	250

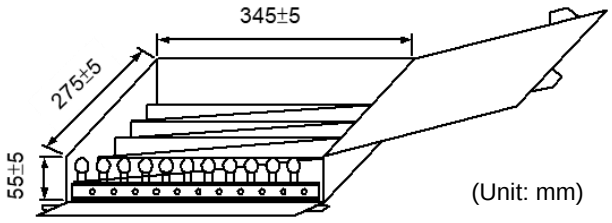


(Unit: mm)

Disc Size	Φ＜16	Φ≧16
A	46	55

● Ammo Packing

Disc Size (mm)	Quantity (pcs/box)
07＜Φ≦12	750
12＜Φ≦16	500
Φ＞16	250



(Unit: mm)

■ Warehouse Storage Conditions of Products

● Storage Conditions:

1. Storage Temperature: -10℃~ +40℃
2. Relative Humidity: ≦75%RH
3. Keep away from corrosive atmosphere and sunlight.

● Period of Storage: 1 year

■ Usage

Please keep products away from the conditions mentioned below to avoid their characteristic deterioration and failure.

1. Corrosive gas or deoxidizing gas (Cl_2, H_2S, NH_3, SOx, NOx etc.)
2. Place in a vacuum or put pressure
3. Salt water, oil, solvent and chemical liquid
4. Flammable gas
5. Place in splashed water, or high humidity and dewing place
6. Other places similar to any conditions mentioned above