

DATA SHEET FOR VARISTOR

Part No.	HEL 7D471K
Class	K Series
Approvals	UL File No. E324904
	CSA File No. 215101
	VDE File No. 40037512
	CQC File No. CQC04001010845(5D Series)
	CQC File No. CQC04001010847(7D Series)
	CQC File No. CQC04001010846(10D Series)
	CQC File No. CQC04001010844(14D Series)
	CQC File No. CQC04001010848(20D Series)
Note: Ref. to the corresponding safety certifications for various specifications of varistor series,pls see page 10.	

Customer:			Supplier: HONG ZHI ELECTRONICS CO.,LTD.		
APPROVAL			APPROVAL		
Approval			Approval	Edit	Date

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HEL Product---How to order

HEL	7	D	4 7 1	KJ	E	M2.5	P
Hongzhi Logo	Normal disc diameter	Series D: Disk Series S: Square Series	Varistor Voltage The last digit represent the number of 0 180=18V 201=200V 182=1800V	Product-level K: Coventional Version KJ: Enhanced Version KH: Super Enhanced Version KX: Customized Version	Operating temperature Blank: -40°C...+85°C E: -40°C...+105°C T: -40°C...+125°C F: -40°C...+130°C	Lead Shape / Length Blank/S: Bulk Straight I: Cutting Straight L: Cutting Bending Y: Y-Forming C: Out Forming D: Inward Bending M: Flat Type Pls see the below	Packaging Blank: bulk packing P: Tape & box packing

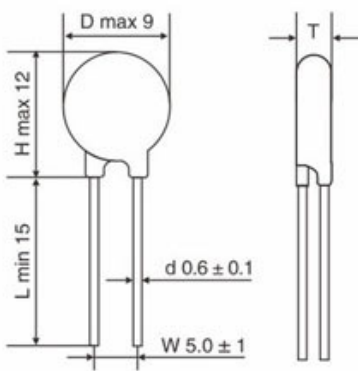
Outline Drawings

Bulk Straight (S Type)	Cutting Straight (I Type)	Cutting Bending (L Type)	Inward Bending (D Type)
Y-Forming (Y Type)	Out Forming (C Type)	Flat Type (M Type)	

Dimension & Electrical Characteristics

1. Dimension

Unit: mm

Product Shape	Series	Varistor Voltage	Tmax
	7D	18V~39V	3.9
		47V~68V	4.4
		82V~150V	3.9
		180V~270V	4.3
		330V~390V	4.9
		430V~560V	5.7
		620V~780V	6.5
		820V	6.8

Note: If the lead type is non-straight, such as out forming (c type), then usually the $H_{max} = 14mm$

2. Electrical Characteristics

Part No.	Varistor Voltage	Maximum Allowable Voltage		Maximum Clamping Voltage	Withstanding Surge Current		Rated Wattage	Energy	Typical Capacitance
	V_{1mA} (V)	AC (V)	DC (V)	V_{10A} (V)	I_{max} (8/20 μs) (A)	I_n (15 times) (8/20 μs) (A)	(W)	(10/1000 μs) (J)	1kHz (PF)
HEL 7D471K	470 (423~517)	300	385	775	1200	500	0.25	31	90

Surge current impact level

Product Level		K Coventional Version		KJ Enhanced Version		KH Super Enhanced Version		KX Customized Version
Part No.	VImA (V)	Withstanding Surge Current (Imax) (A)	Impulse Current 15 times 8/20 μ s (A)	Withstanding Surge Current (Imax) (A)	Impulse Current 15 times 8/20 μ s (A)	Withstanding Surge Current (Imax) (A)	Impulse Voltage 40 times 1.2/50 μ s (V)	Super High Energy
5D	82~750	400	150	800	250	800	1000	1 Example 14D instead of 20D 2 Example HEL14D561KX reach 6kV/3kA 100 times
7D	82~820	1200	500	1750	1000	1750	2000	
10D	82~1800	2500	1500	3500	1500	3500	4000	
14D	82~1800	4500	3000	6000	3000	6000	6000	
20D	82~1800	6500	3000	10000	5000	10000	10000	
5D	18~68	100	—	250	150	—	—	
7D	18~68	250	—	500	250	—	—	
10D	18~68	500	—	1000	500	—	—	
14D	18~68	1000	—	2000	1000	—	—	
20D	18~68	2000	—	3000	1000	—	—	
In accordance with International and National Standards		IEC61051-1 GB/T10193 IEC61051-2 GB/T10194 IEC61051-2-2 GB/T10195 CSA-C22.2 UL1449		Include the left column, and add the following: IEC60950-1:2005/Annex Q GB4943.1-2011 GB8898-2011 UL1449		Include the left column, and add the following: IEC61000-4-5 GB/T17626.5 IEC61643-331 GB/T18802.331		

Remark: the Impluse voltage testing standards(1.2/50 μ s) with 40 times are only applicable to the products which with the varistor voltage more than 430V.

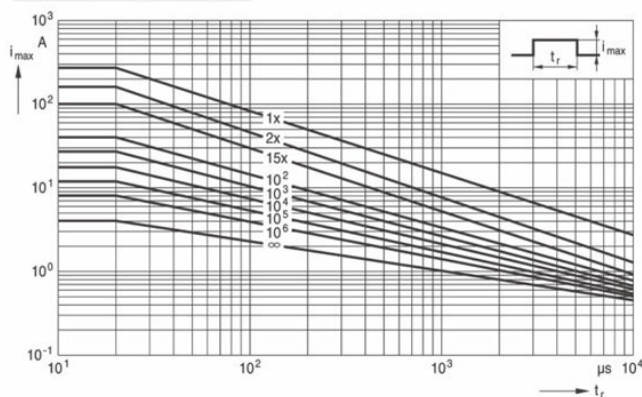
Derating curves & V/I characteristics

Derating curves

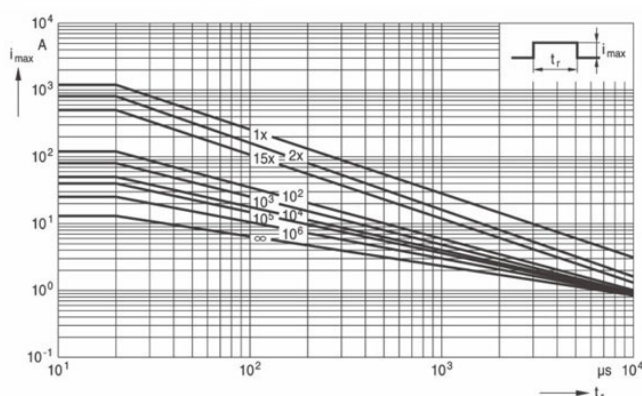
The horizontal axis is the impulse time that is the width of the surge waveform, the vertical axis is the peak value of the impulse current, and the number on the line is the number of impulses.

Maximum surge current $i_{max} = f(t_r, \text{pulse train})$

HEL 7D180~680K



HEL 7D820~751K

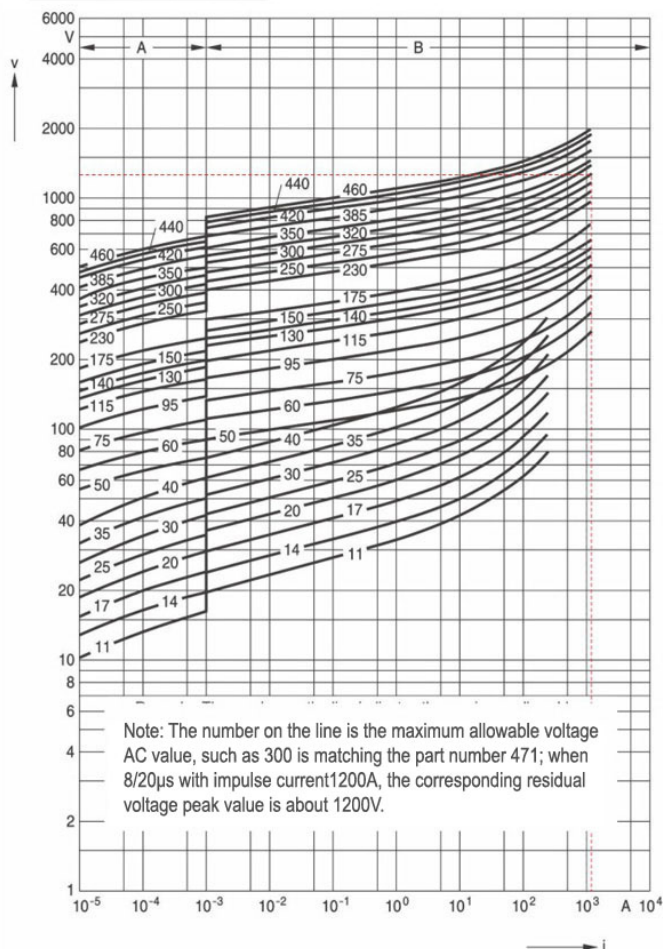


V/I characteristics

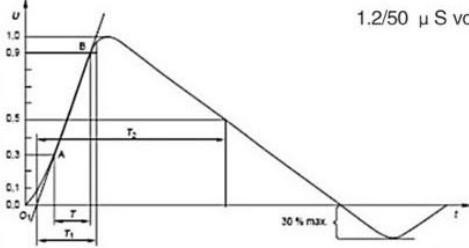
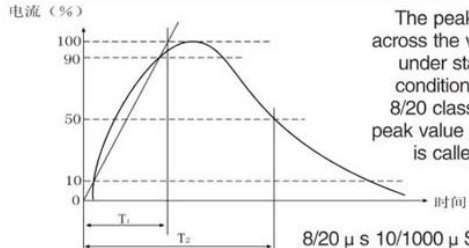
A = Leakage current,

B = Protection level for worst-case varistor tolerances

HEL 7D180~751K

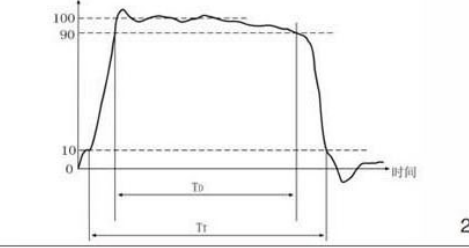


1.1 HEL VARISTOR TECHNICAL TERM

Item	Standard Terminology	Test equipment	Requirements
Varistor Voltage	The voltage between two terminals with the standard test conditions* and the specified measuring current 1mA DC applied is called varistor voltage. Similar to the knee-point voltage. With V_{1mA} said.	MYZ-5H type varistor three parameter tester	The allowable tolerance on varistor voltage is: K: $\pm 10\%$ L: $\pm 15\%$.
Leakage Current	Current passing through the varistor at the maximum allowable DC voltage and the standard test conditions*, called leakage current	MYZ-5H type varistor three parameter tester	Leakage current within the specified rating(μA).
Maximum allowable AC Voltage	Maximum a.c. r.m.s voltage of a substantially sinusoidal waveform which can be applied to the component is called Maximum allowable voltage.	Maximum Continuous AC Voltage 0.63 multiple varistor voltage	Actual continuous AC voltage 0.45 multiple varistor voltage.
composite waveform of Pulse Current (Open circuit having pulse shape of 1.2/50 μS for voltage and short circuit having 8/20 μS for current) 6KV/3KA	 1.2/50 μS voltage wave form	Maximum Continuous AC Voltage 0.63 multiple varistor voltage	After pulsing with stipulated times no appearance damage Clamping voltage change rate is $\leq \pm 10\%$
Clamping Voltage	 The peak voltage developed across the varistor terminations under standard atmospheric conditions, when passing an 8/20 class current pulse. The peak value of two terminations is called clamping voltage. 8/20 μs 10/1000 μS current wave form	8/20 μS $T_1=8\mu S \pm 10\%$ $T_2=20\mu S \pm 10\%$ 10/1000 μS $T_1=10^{+100}_{-10} \mu S$ $T_2=1000 \pm 20\% \mu S$ Impulse generator Storage oscilloscope	Clamping voltage less than the rated value, all specifications' peak current and clamping voltage see struction.

*Standard test condition Temperature: 15°C–35°C; Relative humidity: 45%–75%; Air pressure: 86 Pa–106kPa .

1.2 HEL VARISTOR TECHNICAL TERM

Item	Standard Terminology	Test equipment	Requirements
Pulse currents	The maximum energy within the varistor voltage change of $\pm 10\%$ when one impulse of 2000μS rectangular wave or 10/1000 μS surge pulse current is applied. Energy (J)=$K \cdot I_p \cdot V_c \cdot 10^{-6}$ For the 2000 μS, $K=2000$; For the 10/1000 μS, $K=1391$; I_p–Peak value of current when 2000 μS or 10/1000 μS wave form V_c–Peak value of voltage when the current of 2000 μS or 10/1000 μS developed across the varistor Current  2ms Rectangle wave	2000 μS rectangular wave: $T_D=2000 \pm 10\% \mu S$ $T_T \leq 3000 \mu S$ Impulse generator Storage oscilloscope MYZ-5H type varistor three parameter tester	After applied the maximum impact energy in this instruction: no appearance damage; varistor voltage change rate $\leq \pm 10\%$
Withstanding surge current	The maximum peak current within the varistor voltage change of $\pm 10\%$ with the standard impulse current (8/20 μS) applied one time.	Impulse generator Storage oscilloscope MYZ-5H type varistor three parameter tester	After applied the maximum pulse current in this instruction: varistor voltage change rate $\leq \pm 10\%$
Varistor voltage Temperature Coefficient	The varistor voltage change rate of varistor at temperature from 25 °C to 85 °C showed as $\%/^{\circ}C$. $\frac{V_{1mA}(85^{\circ}C) - V_{1mA}(25^{\circ}C)}{V_{1mA}(25^{\circ}C)} \times \frac{1}{60} \times 100\%$	THS-A5P-150 constant temperature humidity chamber Varistor tester	$\leq -0.05 \%/^{\circ}C$.
Rated wattage	The maximum allowable power dissipation under the ambient temperature of 25°C $\pm 1^{\circ}C$		The rated wattage of all specifications see instruction.
Capacitance	Typical capacitance measured at less than 1Vrms and frequency of 1kHz	CY 2646A capacity tester	Capacitance for reference only, all specifications' capacitance see instruction.

2 HEL VARISTOR TECHNOLOGICAL & MECHANICAL CHARACTERISTICS

Item	Standard Terminology	Test equipment	Requirements
Solderability	Dipping the varistor's terminals to a soldering bath at temperature $265^{\circ}\text{C} \pm 5^{\circ}\text{C}$ for 2 ± 0.5 seconds, visual observation.	Solder machine	Above 90% of the terminals shall be covered with solder uniformly.
Resistance to Soldering heat	After each lead shall be dipped into a solder bath having a temperature $350^{\circ}\text{C} \pm 10^{\circ}\text{C}$, to a point $2.0-0.5\text{mm}$ from the body of the unit. Using shielding Board($t=1.5 \pm 0.2\text{mm}$), be held there for $5 \pm 0.5\text{s}$, and stored at room temperature and humidity for 1 to 2 hours, then measure the varistor voltage	Solder machine	Varistor voltage change rate $\leq \pm 5\%$.
Solvent resistance of marking	Solvent: alcohol Rubbing material: cotton wool Gently wipe the marking twice in one direction, thereafter, visual examination.	Cotton wool Alcohol lamp	Legible marking.
Component Solvent resistance	Solvent: $70 \pm 5\%$ and F113+ $30 \pm 5\%$ strong third mellow mixture, Solvent temperature: $23 \pm 5^{\circ}\text{C}$, $5 \pm 0.5\text{Min}$. Recovery: 4 hours. Thereafter, visual examination and measure the varistor.	MYZ-5H type varistor three parameter tester	No visible damage Legible marking Varistor voltage change rate $\leq \pm 5\%$.
Robustness of Terminations	After gradually applying the force specified below and keeping the unit fixed for ten seconds. Lead diameter(mm): $0.6/0.8/1.0$ Force(N): $10/10/20$ Bending the other terminal for 90° , recovery and reverse 90° . Visual examination, measure varistor voltage.	MYZ-5H type varistor three parameter tester	No visible damage Varistor voltage change rate $\leq \pm 5\%$.
Vibration	Fixing the varistor at vibrating table: Acceleration: 98 m/s^2 Frequency: $10\text{Hz}-55\text{Hz}$ Amplitude: 0.75mm Total duration: 6 hours Thereafter, visual examination and measure varistor voltage and leakage current.	Vibrating table	No visible damage. Varistor voltage change rate $\leq \pm 5\%$. Leakage current within the rated value.
Shock(or bump)	Fixing the varistor at collision sets: Acceleration: 490 m/s^2 Number of bump: 4000 ± 10 times, Thereafter, visual examination and measure varistor voltage and leakage current.	Collision sets	No visible damage. Varistor voltage change rate $\leq \pm 5\%$. Leakage current within the rated value.

3.1 HEL VARISTORS SECURITY AND ENVIRONMENTAL TEST

Item	Standard Terminology	Test equipment	Requirements																															
Flame retardant	Impose the required flame on the side of varistor after fixed the varistor, 15s per cycle for 3 cycles.	Alcohol Lamp	Self-extinguishing within 15s for first and second cycles, self-extinguishing within 30s for 3rd cycle.																															
Virtual total duration of a pulse current	The varistor voltage shall be measured after the 8/20uS impulse listed below is applied 10,000 times Continuously with the interval of 10s at room temperature and lay for 1 to 2 hours. <table><tr><td rowspan="2">5D</td><td>18v-68v</td><td>5A</td><td rowspan="2">14D</td><td>18v-68v</td><td>75A</td></tr><tr><td>82v-680v</td><td>20A</td><td>82v-1800v</td><td>150A</td></tr><tr><td rowspan="2">7D</td><td>18v-68v</td><td>15A</td><td rowspan="2">20D</td><td>18v-68v</td><td>100A</td></tr><tr><td>82v-820v</td><td>50A</td><td>82v-1800v</td><td>200A</td></tr><tr><td rowspan="2">10D</td><td>18v-68v</td><td>50A</td><td></td><td></td><td></td></tr><tr><td>82v-1800v</td><td>100A</td><td></td><td></td><td></td></tr></table>	5D	18v-68v	5A	14D	18v-68v	75A	82v-680v	20A	82v-1800v	150A	7D	18v-68v	15A	20D	18v-68v	100A	82v-820v	50A	82v-1800v	200A	10D	18v-68v	50A				82v-1800v	100A				Impulse generator MYZ-5H type varistor three parameter tester	No damage Varistor voltage change rate ≤ ± 10%.
5D	18v-68v		5A	14D		18v-68v	75A																											
	82v-680v	20A	82v-1800v		150A																													
7D	18v-68v	15A	20D	18v-68v	100A																													
	82v-820v	50A		82v-1800v	200A																													
10D	18v-68v	50A																																
	82v-1800v	100A																																
Rapid change of temperature	Condition the specimen to each temperature from step 1 to step 4 in this order for the period shown in the table of specifications. The change of Varistor voltage and mechanical damage shall be examined within 1hour to 24 hours <table><tr><th>Step</th><th>Temperature</th><th>Period</th><th>Step</th><th>Temperature</th><th>Period</th></tr><tr><td>1</td><td>-40 ± 3℃</td><td>30 Min</td><td>3</td><td>UCT ± 2℃</td><td>30 Min</td></tr><tr><td>2</td><td>Room Temp.</td><td><3 Min</td><td>4</td><td>Room Temp.</td><td><3 Min</td></tr></table> 5 Cycles	Step	Temperature	Period	Step	Temperature	Period	1	-40 ± 3℃	30 Min	3	UCT ± 2℃	30 Min	2	Room Temp.	<3 Min	4	Room Temp.	<3 Min	HLA type High-Low temperature chamber MYZ-5H type varistor three parameter tester	No damage Legible marking Varistor voltage change rate ≤ ± 5%.													
Step	Temperature	Period	Step	Temperature	Period																													
1	-40 ± 3℃	30 Min	3	UCT ± 2℃	30 Min																													
2	Room Temp.	<3 Min	4	Room Temp.	<3 Min																													

3.2 HEL VARISTORS SECURITY AND ENVIRONMENTAL TEST

Item	Standard Terminology	Test equipment	Requirements
Cold resistance	The varistor shall be subjected to $-40^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for 1000 hours and then stored at room temperature for 1 hour to 4 hours, measure the varistor voltage and leakage current.	THS-A5P-150 Constant temperature humidity chamber MYZ-5H type varistor three parameter tester	No damage. Varistor voltage change rate $\leq \pm 5\%$. Leakage current within the rated value.
Damp Heat/ Humidity	The varistor shall be subjected to $40^{\circ}\text{C} \pm 2^{\circ}\text{C}$, 90 to 95% RH for 21 days and then stored at room temperature for 1 to 4 hours, measure the varistor voltage and leakage current within the rated value.	THS-A5P-150 Constant temperature humidity chamber MYZ-5H type varistor three parameter tester	No damage. Varistor voltage change rate $\leq \pm 10\%$.
Damp heat load/ humidity load	The varistor shall be subjected to $40^{\circ}\text{C} \pm 2^{\circ}\text{C}$, 90 to 95% RH and 10% Maximum allowable DC voltage for 21 days and then stored at room temperature for 1 to 4 hours, measure the varistor voltage and leakage current within the rated value.	THS-A5P-150 Constant temperature humidity chamber ADCS ac/dc life testing machine MYZ-5H type varistor three parameter tester	No damage. Varistor voltage change rate $\leq \pm 10\%$.
High temperature aging	Place the varistor in the upper category temperature environment for 1000 hours, and continuously apply the maximum allowable voltage corresponding to the temperature. After taking out, place it at normal temperature for more than 1 hour and within 4 hours to measure the varistor voltage and limit voltage	101-IIA drum wind oven ADCS ac/dc life testing machine MYZ-5H type varistor three parameter tester	No damage. Varistor voltage change rate $\leq \pm 10\%$ Limiting voltage change rate $\leq \pm 20\%$.
Category temperature range	Dry heat: $\text{UCT} \pm 2^{\circ}\text{C}$, 16hours; (UCT=Upper category temperature) Damp heat, cyclic: IEC68-2-30 Test Db, 55°C , One cycle 24 hours; Cold: $-40^{\circ}\text{C} \pm 3^{\circ}\text{C}$, 2 hours; (Low air pressure test not applicable) Damp heat, cyclic: IEC68-2-30 Test Db, remaining cycles. Then stored at room temperature for 1 to 24 hour, measure the varistor voltage	HLA high-low temperature circulation chamber MYZ-5H type varistor three parameter tester	No damage Legible marking Varistor voltage change rate $\leq \pm 5\%$.

Safety regulation certification and Corresponding models

PART NO.	5D	7D	10D	14D	20D							
180												
220												
270												
330												
390												
470												
560												
680												
820												
101												
121												
151												
181												
201												
221												
241												
271												
301												
331												
361												
391												
431												
471												
511												
561												
621												
681												
751												
781												
821												
911												
951												
102												
112												
152												
182												

Remark: CQC (GB/T10193,GB/T10194) ;
 UL1449 (VZCA2/UL,VZCA8/C-UL) , 105℃,125℃,130℃;
 VDE (IEC61051-1, -2, -2-2) ;
 CSA (C22.2 No.269.5-17) ;
 Q₁ = CQC (GB4943.1,GB8898) ;
 Q₂ = VDE (IEC60950-1 Annex.Q) ;

The above certification specifications may be changed. If necessary,
 please obtain the latest version from the Quality Control Department in time.

Packaging methods and storage conditions

1. Taping Packaging Method

(1) Plug-in taping packaging method

Carton size: 540mm×350mm×300mm

Series	Varistor Voltage	Taping Packaging Quantity	
		QTY (k) /Carton	QTY (k) /Inner Box
5D	180~511K	18	1.5
	561K~681K	12	1
7D	180~511K	18	1.5
	561K~821K	12	1
10D	180~471K	12	1
		6	0.5
	511K~112K	6	0.5
14D	180~681K	4	0.5
	751K~182K	3.2	0.4
20D	180~301K	4	0.5
	331K~122K	2	0.25

Note:The inner box packing is the smallest package

(2) Flat foot taping packaging

Carton size: 355mm×350mm×365mm

Series	Taping Packaging Quantity		
	QTY (k) /Carton	Reel QTY/Carton	QTY (k) /Reel
7D	12	12	1
10D	4.5	9	0.5
14D	3.5	7	0.5

Note:The Reel packing is the smallest package

2. Bulk Packing

Carton size: 435mm×280mm×200mm

Series	Varistor Voltage	Regular lead length		Short cutting lead length	
		QTY (k)/Carton	QTY (k)/Inner Box	QTY (k)/Carton	QTY (k)/Inner Box
5D	180~471K	24	4	25	5
	511K~681K	18	3	25	5
7D	180~561K	18	3	25	5
	621K~821K	12	2	25	5
10D	180~681K	9	1.5	12	2
	751K~112K	6	1	12	2
14D	180~681K	6	1	6	1
	751K~182K	3	0.5	6	1
20D	180~751K	3	0.5	3	0.5
	821K~182K	1.5	0.25	3	0.5

Note: The inner box packing is the smallest package

3. storage conditions

Storage conditions

temperature: -40℃~+125℃

humidity: < 65%RH

Recommended storage conditions

temperature: -10℃~+45℃

humidity: < 55%RH

Plug-in Tape Packing

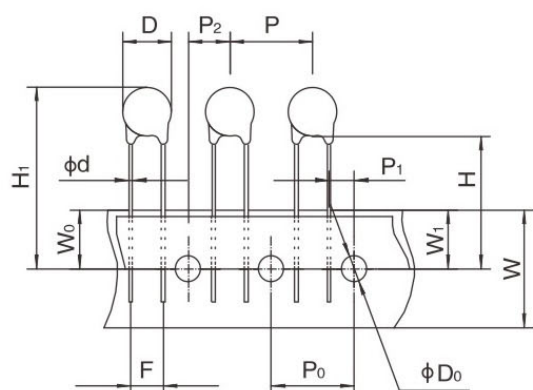


Chart 1

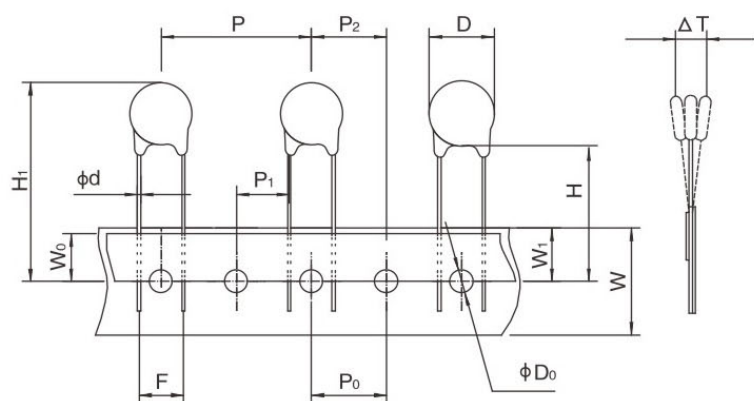
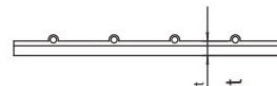
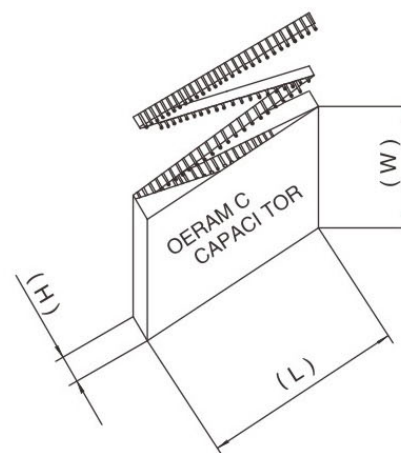


Chart 2



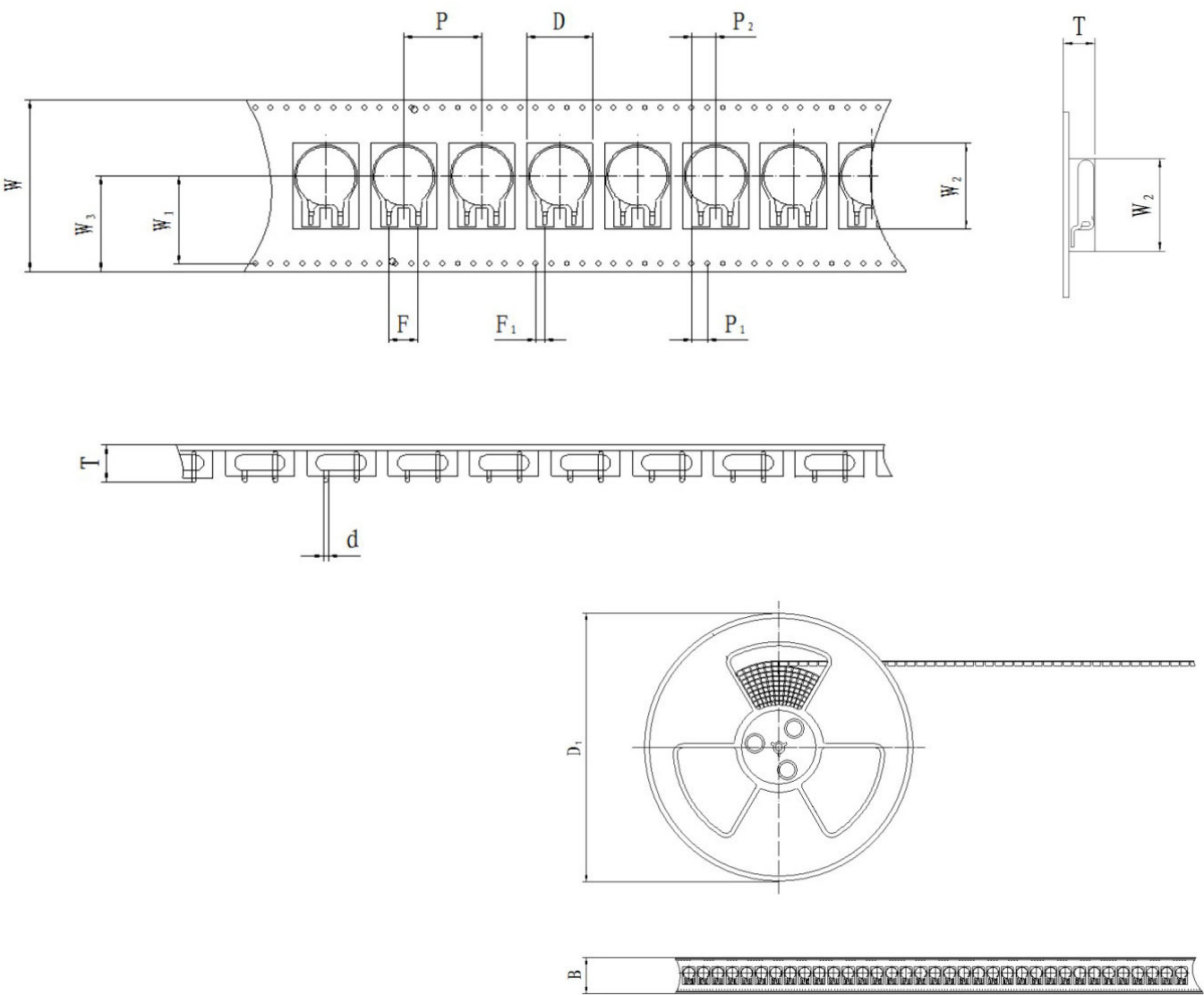
Inner Box Size: 340max (L) * 260max (W) * 420max (H)

Carton Size: 540max (L) * 350max (W) * 300max (H)

Unit : mm

Symbol	5D	7D		10D	14D		20D	
$P \pm 1$	12.7	12.7	15	25.4	25.4	30	25.4	30
$P_0 \pm 1$	12.7	12.7	15	12.7	12.7	15	12.7	15
$P_1 \pm 0.7$	3.85	3.85	5	8.95	8.95	11.25	7.7	10.0
$P_2 \pm 1.3$	6.35	6.35	7.5	12.7	12.7	15	12.7	15
$H \pm 1.0$	20	20	20	20	21	21	22	22
H_{1max}	29.0	32.0	32.0	36.0	40.0	40.0	48.0	48.0
$W \pm 1.0$	18	18	18	18	18	18	18	18
W_{0max}	10.0	10.0	10.0	8.0	8.0	8.0	8.0	8.0
$W_1 \pm 0.5$	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
$\Phi D_0 \pm 0.3$	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
D_{max}	7.5	9.0	9.0	13.5	17.0	17.0	23.0	23.0
$\Phi d \pm 0.1$	$\Phi 0.58$	$\Phi 0.58$	$\Phi 0.58$	$\Phi 0.78$	$\Phi 0.78$	$\Phi 0.78$	$\Phi 0.97$	$\Phi 0.97$
$\Delta T \pm 2.0$	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
$t \pm 0.2$	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
$F \pm 1.0$	5.0	5.0	5.0	7.5	7.5	7.5	10.0	10.0
Corresponding drawings	Chart 1			Chart 2				

Flat Knitting Tape Packing



Unit : mm

Dimension Part No.	$P \pm 1$	$P1 \pm 1$	$P2 \pm 1$	$W \pm 1$	$W1 \pm 1$	$W2 \pm 1$	$W3 \pm 1$	$F \pm 1$	$F1 \pm 0.5$	$D \pm 1$	$D1$	$B \pm 1$	$T \pm 1$	$d \pm 0.2$
7D471K	12	4	6	24	14.25	17	16	6.5	3.5	9.5	330	30	6	0.6
10D471K	16	4	6	32	18.25	20	20	7.5	3.5	12	330	38	6.5	0.8
14D471KJ	20	4	6	44	22.5	22	24.5	7.5	2.25	17	330	50	6.5	0.8