

# ESD Suppressor: TVM-G Series



## SMD Type ESD Suppressor

### Feature

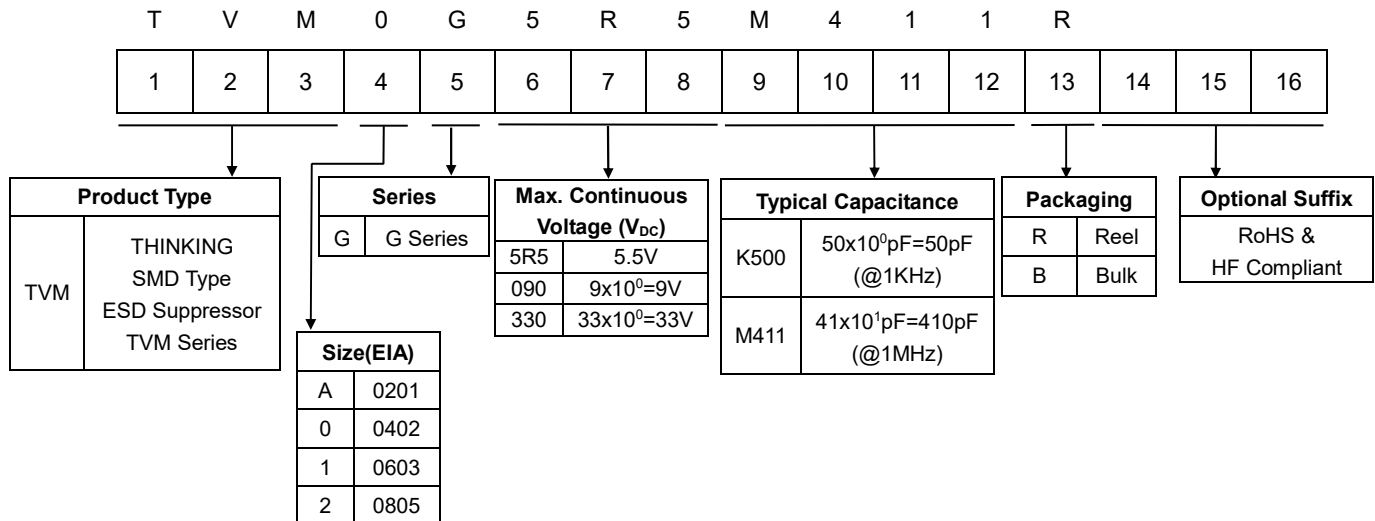
1. RoHS & Halogen Free (HF) compliant
2. Low clamping voltage
3. EIA size: 0201, 0402, 0603, 0805
4. Operating voltage: 5.5Vdc ~ 30Vdc
5. Bidirectional and symmetrical V/I characteristics
6. Multilayer ceramic construction technology
7. Rate for IEC61000-4-2 ESD level 4 test
8. Variable capacitance
9. Operating temperature range: -40°C ~ +85°C  
Storage temperature range: -40°C ~ +125°C



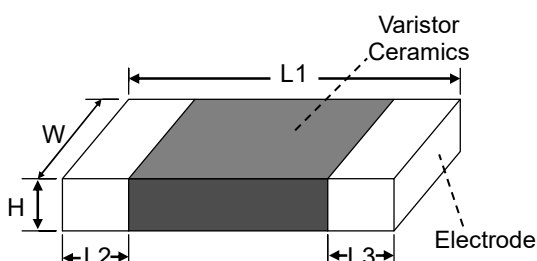
### Recommended Applications

1. Cellular phones
2. I/O port for mother board
3. LCD module
4. Data line (e.g. USB)
5. PDA
6. Bluetooth headset

### Part Number Code



### Structure and Dimensions



(Unit: mm)

Series	Size (EIA)	L1	W	Hmax.	L2 and L3
TVMA	0201	0.60± 0.05	0.30± 0.05	0.35	0.15±0.05
TVM0	0402	1.00± 0.15	0.50± 0.10	0.60	0.20±0.10
TVM1	0603	1.60±0.15	0.80±0.15	0.95	0.35±0.15
TVM2	0805	2.00±0.20	1.25±0.20	1.00	0.40±0.20

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### Electrical Characteristics

Part No.	EIA Size	Max. Continuous Voltage	Varistor Voltage (@ 1mA DC)	Max. Clamping Voltage (8/20 $\mu$ s)		Max. Surge Current (8/20 $\mu$ s)	Max. Energy (10/1000 $\mu$ s)	Typical Capacitance @1MHz
		V <sub>DC</sub>	V <sub>1mA</sub>	V <sub>p</sub>	I <sub>p</sub>	I <sub>max</sub>	W <sub>max</sub>	C <sub>p</sub>
		(V)	(V)	(V)	(A)	(A)	(J)	(pF)
TVMAG5R5M330R	0201	5.5	12.7~17.3	40	1	1	0.01	33
TVMAG5R5M470R	0201	5.5	12.7~17.3	36	1	1	0.01	47
TVMAG5R5M470*G	0201	5.5	12.7~17.3	36	1	1	0.01	47
TVM0G5R5M100R	0402	5.5	8.8~13.2	35	1	1	0.01	10
TVM0G5R5M220R	0402	5.5	8.8~13.2	33	1	1	0.01	22
TVM0G5R5M330R	0402	5.5	8.8~13.2	31	1	4	0.02	33
TVM0G5R5M400R	0402	5.5	8.8~13.2	30	1	4	0.02	40
TVM0G5R5M900R	0402	5.5	8.8~13.2	30	1	10	0.05	90
TVM0G5R5M261R	0402	5.5	8.8~13.2	25	1	20	0.05	260
TVM0G5R5M411R	0402	5.5	8.8~13.2	25	1	20	0.05	410
TVM1G5R5M100R	0603	5.5	8.8~13.2	35	1	1	0.01	10
TVM1G5R5M220R	0603	5.5	8.8~13.2	34	1	2	0.02	22
TVM1G5R5M761R	0603	5.5	8.0~12.0	25	1	30	0.1	760
TVM2G5R5M991R	0805	5.5	8.0~12.0	25	1	40	0.1	990
TVM0G090M220R	0402	9	11~16	38	1	2	0.02	22
TVM0G090M400R	0402	9	11~16	35	1	4	0.02	40
TVM0G090M141R	0402	9	11~16	30	1	20	0.05	140
TVM0G090M201R	0402	9	11~16	30	1	20	0.05	200
TVM1G090M220R	0603	9	11~16	40	1	2	0.02	22
TVM2G090M521R	0805	9	11~16	29	1	40	0.1	520
TVM0G140M400R	0402	14	15.9~21.5	42	1	4	0.02	40
TVM0G140M900R	0402	14	15.9~21.5	38	1	20	0.05	90
TVM0G140M151R	0402	14	15.9~21.5	38	1	20	0.05	150
TVM1G140M181R	0603	14	15.9~21.5	37	1	30	0.1	180
TVM2G140M321R	0805	14	15.9~20.3	34	1	40	0.1	320
TVM2G140M561R	0805	14	15.9~20.3	32	1	120	0.3	560
TVM0G150M470R	0402	15	21.6~32.4	47	1	4	0.06	47
TVMAG180M030R	0201	18	46~75	135	1	1	0.01	3
TVM0G180M030R	0402	18	46~75	135	1	1	0.01	3
TVM0G180M120R	0402	18	22~28	55	1	2	0.03	12

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TVM0G180M300R	0402	18	22~28	52	1	4	0.05	30
TVM0G180M500R	0402	18	22~28	50	1	20	0.05	50

### ■ Electrical Characteristics

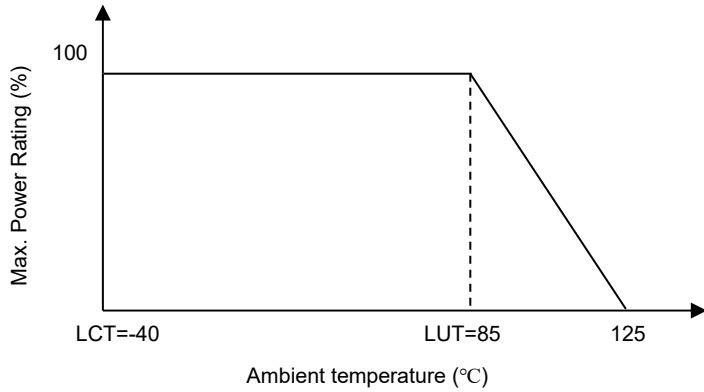
Part No.	EIA Size	Max. Continuous Voltage	Varistor Voltage (@ 1mA DC)	Max. Clamping Voltage (8/20 $\mu$ s)		Max. Surge Current (8/20 $\mu$ s)	Max. Energy (10/1000 $\mu$ s)	Typical Capacitance @1MHz
		V <sub>DC</sub>	V <sub>1mA</sub>	V <sub>p</sub>	I <sub>p</sub>	I <sub>max</sub>	W <sub>max</sub>	C <sub>p</sub>
		(V)	(V)	(V)	(A)	(A)	(J)	(pF)
TVM1G180M030R	0603	18	46~75	135	1	1	0.01	3
TVM1G180M120R	0603	18	22~28	55	1	2	0.03	12
TVM1G180M121R	0603	18	22~28	50	1	30	0.1	120
TVM2G180M291R	0805	18	22~28	44	1	40	0.1	290
TVM2G180M521R	0805	18	22~28	44	1	120	0.3	520
TVM1G260M111R	0603	26	31~38	60	1	30	0.1	110
TVM2G260M141R	0805	26	29.5~38.5	60	1	40	0.1	140
TVM2G260M221R	0805	26	29.5~38.5	60	1	100	0.3	220
TVM1G300M900R	0603	30	37~46	74	1	30	0.1	90
TVM2G300M900R	0805	30	37~46	72	1	30	0.1	90
TVM0G420M030R	0402	42	46~75	135	1	1	0.01	3

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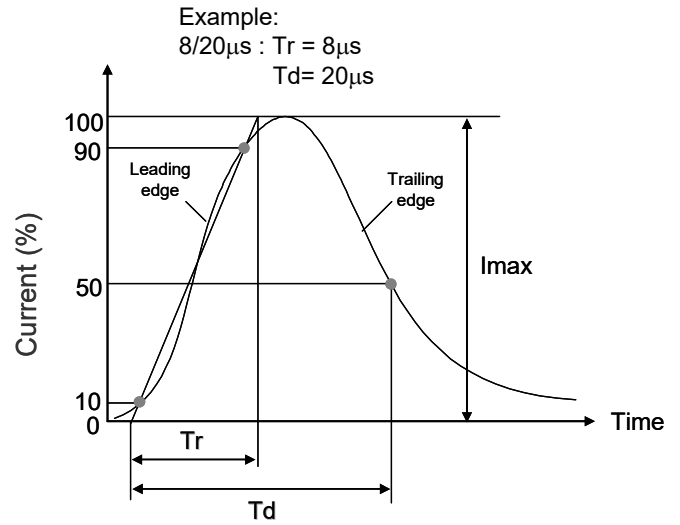


## SMD Type ESD Suppressor

### Power Derating Curve

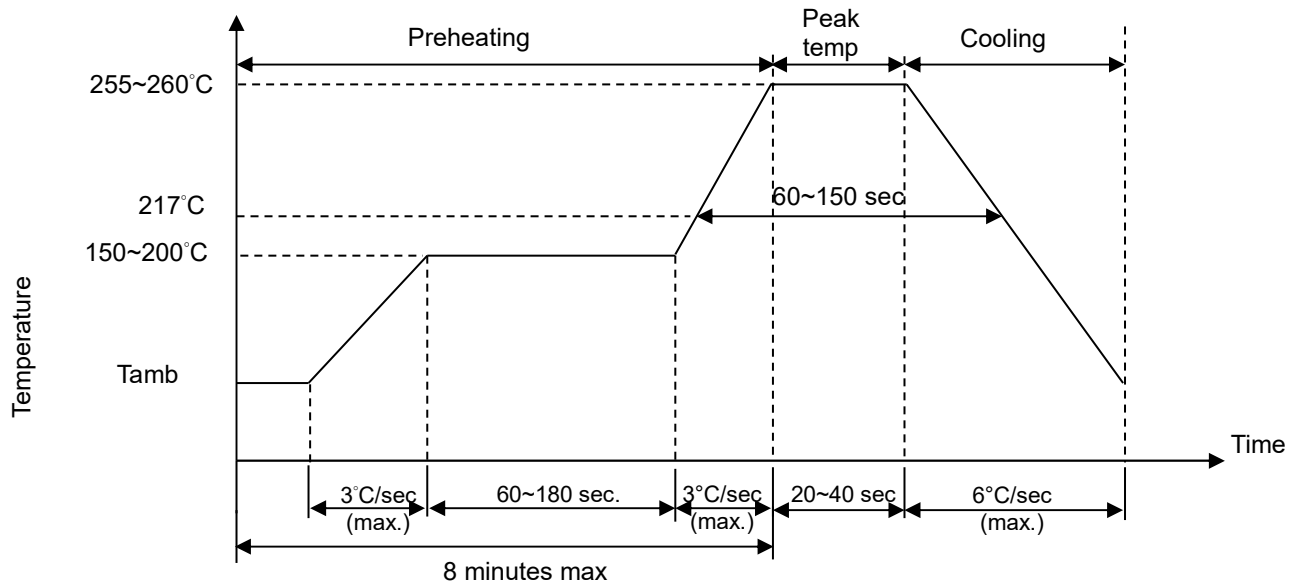


### Surge Current Standard Waveform



### Soldering Recommendation

#### IR-reflow Soldering Profile



#### Reworking Conditions with Soldering Iron

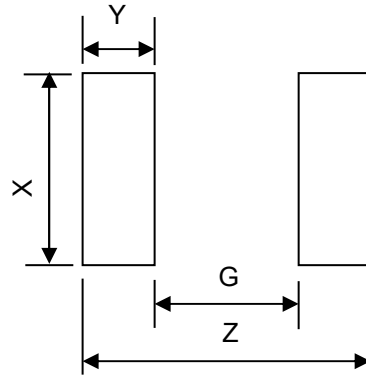
Item	Conditions
Temperature of Soldering Iron-tip	360°C (max.)
Soldering Time	3 sec (max.)
Diameter of Soldering Iron-tip	Φ3 mm (max.)
Caution: Do not touch the component surface with soldering iron directly to prevent component damage.	

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## SMD Type ESD Suppressor

### ■ Recommended Soldering Pad Dimensions



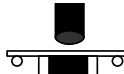
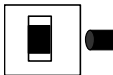
Size	Z (mm)	G (mm)	X (mm)	Y (mm)
0201	0.7	0.2	0.3	0.25
0402	1.4	0.4	0.5	0.5
0603	2.8	0.8	1.0	1.0
0805	3.4	1.0	1.4	1.2

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## SMD Type ESD Suppressor

### ■ Reliability

Item	Standard	Test conditions / Methods	Specifications															
Bending Strength	IEC 60068-2-21	Warp: 2mm ; Speed<0.5mm/sec Duration: 10 sec on PCB 	$ \Delta V_{1mA}/V_{1mA}  \leq 5\%$ No visible damage															
Adhesion	IEC 60068-2-21	Speed < 0.5mm/sec on PCB 	$W \geq 0.5Kgf$ the terminal electrode shall be break off not the chip element															
Damp Heat Load, Steady State	IEC 60068-2-78	40±2°C 90~95% RH 500±24hrs at V <sub>dc</sub>	$ \Delta V_{1mA}/V_{1mA}  \leq 10\%$ No visible damage															
High Temp. Storage	IEC 60068-2-2	125±2°C x 1000±24 hrs	$ \Delta V_{1mA}/V_{1mA}  \leq 5\%$ No visible damage															
Rapid Change of Temperature	IEC 60068-2-14	The conditions shown below shall be repeated 5 cycles on PCB <table border="1" data-bbox="512 891 1190 1055"> <thead> <tr> <th>Step</th> <th>Temperature (°C)</th> <th>Period (minutes)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-40±3</td> <td>30±3</td> </tr> <tr> <td>2</td> <td>Room temperature</td> <td>≤3</td> </tr> <tr> <td>3</td> <td>125±2</td> <td>30±3</td> </tr> <tr> <td>4</td> <td>Room temperature</td> <td>≤3</td> </tr> </tbody> </table>	Step	Temperature (°C)	Period (minutes)	1	-40±3	30±3	2	Room temperature	≤3	3	125±2	30±3	4	Room temperature	≤3	$ \Delta V_{1mA}/V_{1mA}  \leq 5\%$ No visible damage
Step	Temperature (°C)	Period (minutes)																
1	-40±3	30±3																
2	Room temperature	≤3																
3	125±2	30±3																
4	Room temperature	≤3																
High Temp. Load	MIL-STD-202 Method 108	85±2 °C 1000±24 hrs at V <sub>DC</sub>	$ \Delta V_{1mA}/V_{1mA}  \leq 5\%$ No visible damage															
Low Temp. Load	IEC 60068-2-1	-40±5 °C 1000±24 hrs at V <sub>DC</sub>	$ \Delta V_{1mA}/V_{1mA}  \leq 5\%$ No visible damage															
Max. Energy	IEC 61051-1	10/1000µs Waveform, W <sub>max</sub> , 1 surge current	$ \Delta V_{1mA}/V_{1mA}  \leq 10\%$ No visible damage															
Max. Surge Current	IEC 61051-1	8/20µs Waveform, I <sub>max</sub> , 1 surge current	$ \Delta V_{1mA}/V_{1mA}  \leq 10\%$ No visible damage															
Vibration	IEC 60068-2-6	Frequency range: 10~55Hz Amplitude: 0.75mm or 98m/s <sup>2</sup> Direction: 3 mutually perpendicular directions, 2 hrs each	$ \Delta V_{1mA}/V_{1mA}  \leq 5\%$ No visible damage															
Varistor Voltage Temp. Coefficient	Specification standard	Measure V <sub>1mA</sub> at -40°C, 25°C, 125°C	$ T_c  \leq 0.05\%/^{\circ}C$															
Climatic Sequence	IEC 61051-1	a. 125°C x 16 hrs b. 1st cycle: 55°C 93%RH x 24 hrs c. -40°C x 2 hrs d. 5 cycles: 55°C 93%RH x 24 hrs/cycle	$ \Delta V_{1mA}/V_{1mA}  \leq 10\%$ No visible damage															
Solderability	IEC 60068-2-58	245 ± 5 °C, 3 ± 0.3 sec	At least 95% of terminal electrode is covered by new solder															
Resistance to Soldering Heat	IEC 60068-2-58	260±5°C, 10±1 sec	$ \Delta V_{1mA}/V_{1mA}  \leq 5\%$ No visible damage															
Electrostatic Discharge (ESD)	IEC 61000-4-2	Contact discharge test voltage: 8KV Polarity: Positive/Negative Number of test pulse: 10/10 times Discharge network: 150pF, 330Ω Operating temperature: 15~35°C Operating humidity: 25~75 RH	1. CP ≤ 2pF $ \Delta V_{1mA}/V_{1mA}  \leq 30\%$ 2. CP > 2pF $ \Delta V_{1mA}/V_{1mA}  \leq 10\%$ No visible damage															

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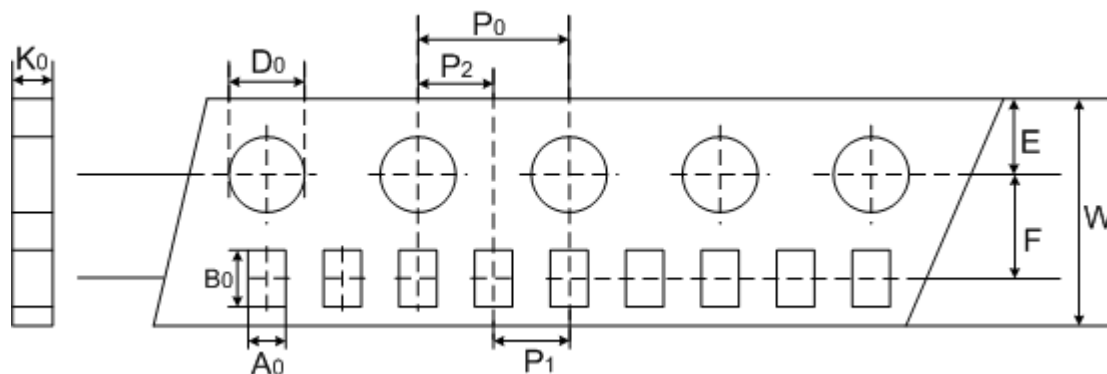


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### ■ Packaging

#### ● Taping Specification

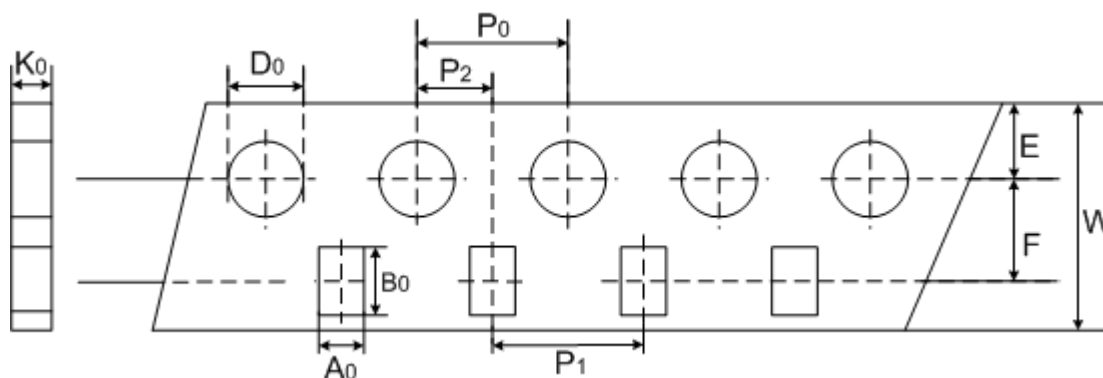
For 0201 & 0402 Series



(Unit: mm)

Index Size	$A_0$ $\pm 0.05$	$B_0$ $\pm 0.12$	$W$ $\pm 0.2$	$E$ $\pm 0.1$	$F$ $\pm 0.05$	$P_1$ $\pm 0.1$	$P_2$ $\pm 0.05$	$P_0$ $\pm 0.1$	$D_0$ $\pm 0.1$	$K_0$ $\pm 0.1$
0201	0.38	0.68	8	1.75	3.5	2	2	4	1.55	0.38
0402	0.62	1.12	8	1.75	3.5	2	2	4	1.55	0.60

For 0603 & 0805 Series



(Unit: mm)

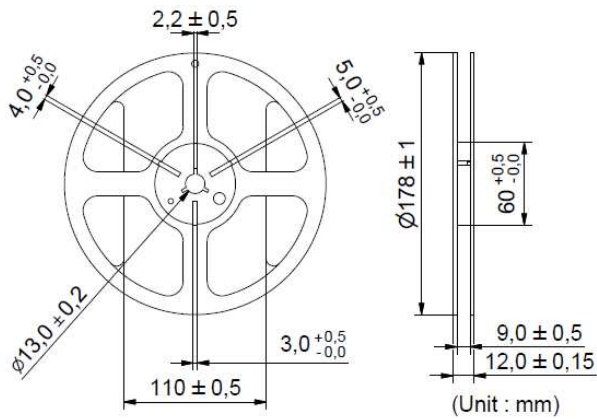
Index Size	$A_0$ $\pm 0.2$	$B_0$ $\pm 0.2$	$W$ $\pm 0.2$	$E$ $\pm 0.1$	$F$ $\pm 0.05$	$P_1$ $\pm 0.1$	$P_2$ $\pm 0.05$	$P_0$ $\pm 0.1$	$D_0$ $\pm 0.1$	$K_0$ $\pm 0.1$
0603	1.1	1.9	8	1.75	3.5	4	2	4	1.55	0.95
0805	1.5	2.3	8	1.75	3.5	4	2	4	1.55	1.0

# ESD Suppressor: TVM-G Series



## SMD Type ESD Suppressor

- Quantity



Size (EIA)	Quantity (pcs/reel)
0201	15,000
0402	10,000
0603	4,000
0805	3,500

### ■ Warehouse Storage Conditions of Products

- Storage Conditions:
  1. Storage Temperature: -10°C ~ +40°C
  2. Relative Humidity: ≤ 75%RH
  3. Keep away from corrosive atmosphere and sunlight.
- Period of Storage: 1 year