



Datasheet

Gas Discharge Tube (GDT)

Series / Models	3R-5SQ(2000~3600V)
Product Code	10.13.49.XXXX
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3R-5SQ(2000~3600V)

Version History

Version	Date	Page	Description	Author
A0	2024-09-12	/	Initial draft	Xia Wu
A1	2025-06-11	Page 1,2,3,4	1. Add cover and version history 2. Update description 3. Add recommended storage conditions	Xia Wu
A2	2025-08-20	Page 5	Update dimensions of the tape	Xia Wu

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3R-5SQ(2000~3600V)

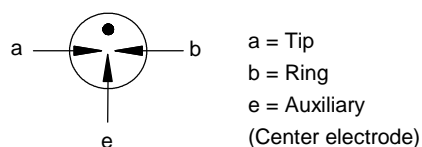
Description

Gas discharge tubes (GDTs) are generally in a high insulation resistance state, equivalent to an open circuit, which has almost no impact on the normal operation of the circuit. When transient overvoltage occurs in the circuit and the voltage amplitude exceeds the breakdown voltage of the GDT, the gas inside the GDT is ionized, causing the GDT to quickly conduct and limit the overvoltage to a lower level, thereby protecting electronic devices or circuit components connected in parallel from high voltage impact damage. After the overvoltage disappears, the GDT immediately returns to a high insulation resistance state, and the circuit resumes normal operation.

The 3R-5SQ series GDT is a high-voltage surface mount package. It is not only small in size and easy to install on various compact printed circuit boards (PCBs), but also has excellent performance. High AC withstand voltage and high insulation resistance ensure that the performance of the circuit will not suffer additional losses under normal operating conditions. The 3R-5SQ series GDT is a high-voltage (2000~3600V) component designed specifically for surge protection and high isolation applications. It is also suitable for applications where there is typically a bias voltage or signal level of several hundred volts. It can also be combined with MOVs to provide excellent protection performance for AC applications.



Electrical symbol



Features

- I Excellent response to fast rising transients
- I 8/20μs Impulse current capability: 3KA
- I Non-Radioactive
- I Ultra Low capacitance (<1.0pF)
- I Size: 8.0mm(L)*5.0mm(W)*5.0mm(H)

Applications

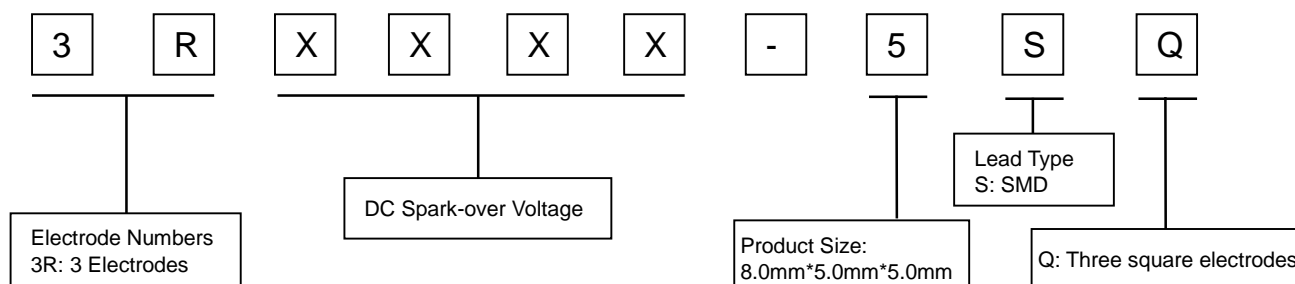
Automotive:

- I On-board chargers
- I Vehicle charging stations

Others:

- I LED lighting
- I Power supply
- I Photovoltaic
- I Air conditioning

Part Number Code



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3R-5SQ(2000~3600V)

Electrical Characteristics

Model	3R2000-5SQ	3R2500-5SQ	3R3000-5SQ	3R3600-5SQ	Units
DC Spark-over Voltage ^{1) 2)} at 100V/S					
V_{a-b}	2000±20%	2500±20%	3000±20%	3600±20%	V
V_{a-e}, V_{b-e}	800~1250	1000~1600	1200~1900	1450~2300	V
Impulse Spark-over Voltage ³⁾ at 1KV/μS					
Arrester Only	<3500	<4000	<4500	<5000	V
With auxiliary circuit ⁴⁾	<1800	<2000	<2500	<3000	V
Front of wave spark-over voltage ³⁾ at 1.2/50 μs, 6 kV					
Arrester Only	<4000	<4500	<5000	<5500	V
With auxiliary circuit ⁴⁾	<1800	<2000	<2500	<3000	V
Service life ³⁾					
Normal Impulse discharge current 8/20μs ±5 times	3	3	3	3	KA
Impulse Discharge Current 1.2/50μS, 12Ω ⁵⁾ 80 times	10	10	10	10	KV
Alternating Discharge Current 50Hz, 1S 10 times	1	1	1	1	A
Glow Voltage ³⁾ at 10mA	~300	~300	~300	~300	V
Arc Voltage ³⁾ at 1A	~35	~35	~35	~35	V
AC withstand voltage ³⁾ at 5mA, 1minute	1000	1300	1600	1900	V
Insulation Resistance ³⁾ at DC 500V	>1	>1	>1	>1	GΩ
Capacitance ³⁾ at 1MHz	<1.0	<1.0	<1.0	<1.0	pF
Weight	~0.72	~0.72	~0.72	~0.72	g
Operation temperature	-40~+125	-40~+125	-40~+125	-40~+125	°C
Recommended storage ⁶⁾					
Temperature	+5~+35	+5~+35	+5~+35	+5~+35	°C
Humidity	45~80	45~80	45~80	45~80	%
Period	≤ 2	≤ 2	≤ 2	≤ 2	years
Climatic category (IEC60068-1)	40/125/21	40/125/21	40/125/21	40/125/21	
Marking	Without				
Surface treatment	Matte-tin plated				
Moisture sensitivity level ⁷⁾	1				

¹⁾ At delivery AQL 0.65 level II, DIN ISO 2859.

²⁾ In ionized mode.

³⁾ Tip electrode (a) to ring electrode (b).

⁴⁾ See page 5.

⁵⁾ Tested at AC220V with MOVs.

⁶⁾ Specified in terms of corrosion against tin plating.

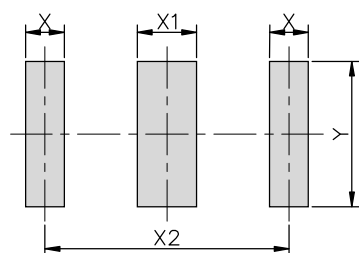
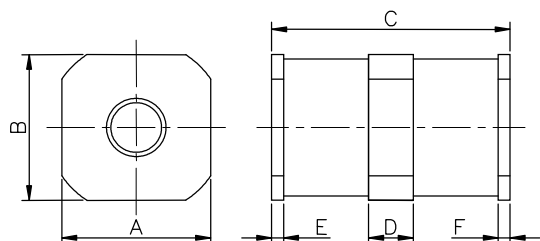
⁷⁾ Tests according to JEDEC J-STD-020.

Terms in accordance with ITU-T Rec. K.12, IEC 61643-311.

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Dimensions

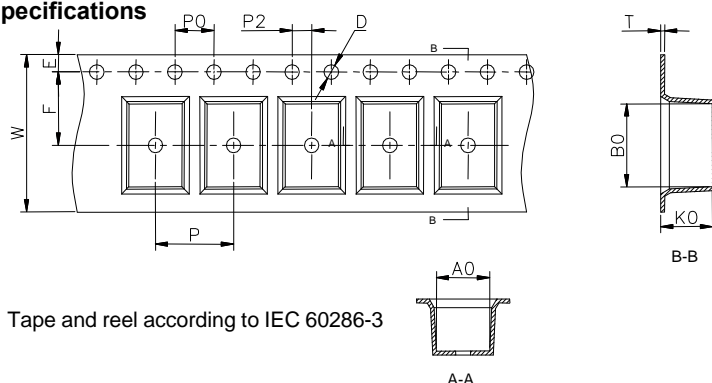


Recommended Soldering Pad Layout

Symbol	Millimeters	Inches
A	5.0±0.2	0.197±0.008
B	5.0±0.2	0.197±0.008
C	8.0±0.2	0.315±0.008
D	1.5±0.3	0.059±0.012
E	0.5±0.2	0.020±0.008
F	0.5±0.2	0.020±0.008
X	1.3	0.051
X1	2.0	0.079
X2	8.2	0.323
Y	5.0	0.197

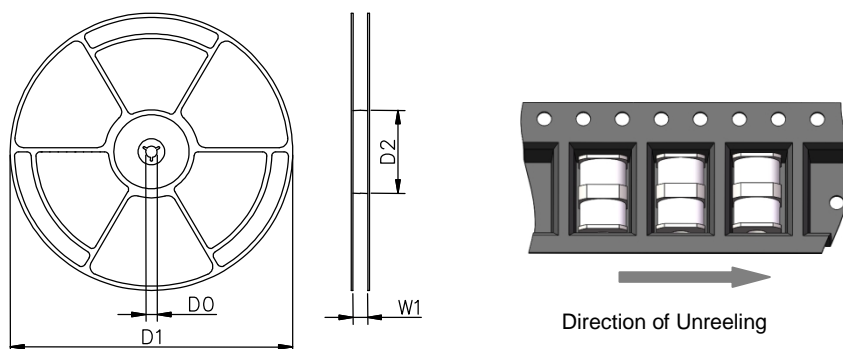
Packaging Information

Tape Specifications



Tape and reel according to IEC 60286-3

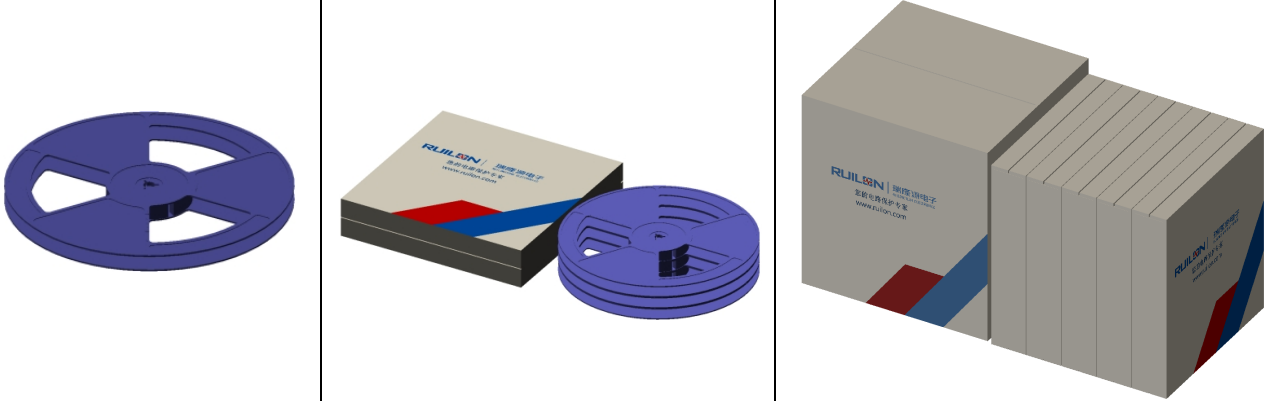
Reel Specifications



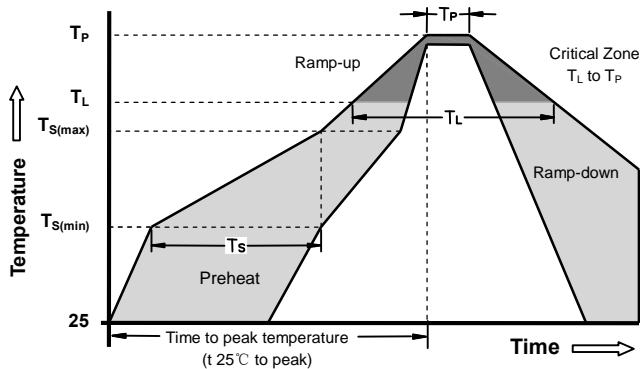
Symbol	Millimeters	Inches
W	16±0.3	0.630±0.012
A0	5.4±0.1	0.213±0.004
B0	9±0.1	0.354±0.004
K0	5.3±0.1	0.209±0.004
P	8±0.1	0.315±0.004
F	7.5±0.1	0.295±0.004
E	1.75±0.1	0.069±0.004
D	1.5+0.1/-0.0	0.059+0.004/-0.0
P0	4±0.1	0.157±0.004
P2	2±0.1	0.079±0.004
T	0.4±0.1	0.016±0.004
D0	13.3±0.15	0.524±0.006
D1	330±2	12.992±0.079
D2	100+1/-2	3.937+0.039/-0.079
W1	16.5±0.4	0.65±0.016

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	Reel	Inner Box	Carton
Size	330×20.5mm	340×333×70mm	375×353×380mm
Quantity	MPQ/MOQ: 1 reel=1,000pcs	1 Inner Box=3 reels=3,000pcs	1Carton=5 Inner boxes=15,000pcs
Photos			

Soldering Parameters - Reflow Soldering (Surface Mount Devices)



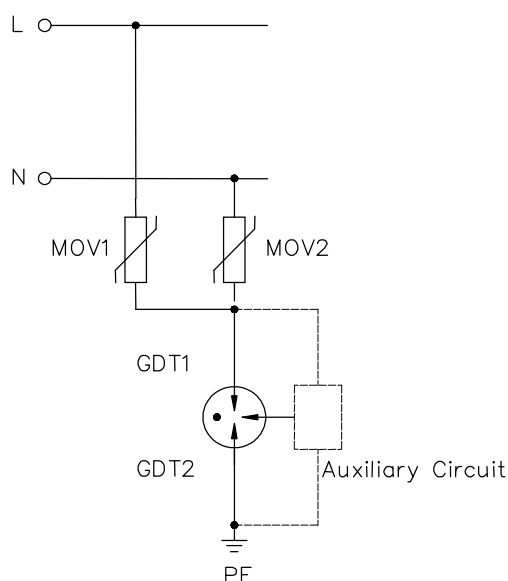
Reflow Condition		Pb - Free assembly
Pre Heat	-Temperature Min ($T_{s(min)}$)	150°C
	-Temperature Max ($T_{s(max)}$)	200°C
	- Time (min to max) (t_s)	60 -180 Seconds
Average ramp up rate (Liquids Temp T_L to peak)		3°C/second max
$T_{s(max)}$ to T_L - Ramp-up Rate		5°C/second max
Reflow	- Temperature (T_L) (Liquids)	217°C
	- Time (min to max) (t_s)	60 -150 Seconds
Peak Temperature (T_P)		260 +0/-5°C
Time within 5°C of actual peak Temperature (t_p)		10 - 30 Seconds
Ramp-down Rate		6°C/second max
Time 25°C to peak Temperature (T_P)		8 minutes Max
Do not exceed		260°C

Surface mounted components (SMD) may exhibit a temporary increase in the DC spark-over voltage after the solder reflow process. The components will recover within 24 hours. There is no quality defect nor change in protection levels during the temporary change in DC spark-over voltage.

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Application Circuit



Terms and definitions

NO.	Item	Definitions
1	Gas discharge tube(GDT)	A gap, or several gaps, in an enclosed discharge medium, other than air at atmospheric pressure, designed to protect apparatus or personnel, or both, from high transient voltages. Also referred to as "gas tube surge arrester".
2	DC Spark-over Voltage	The voltage at which the gas discharge tube sparks over with slowly increasing d.c. voltage.
3	Impulse Spark-over Voltage	The highest voltage which appears across the terminals of a gas discharge tube in the period between the application of an impulse of given wave-shape and the time when current begins to flow.
5	Arc voltage	Voltage drop across the GDT during arc current flow.
6	Glow voltage	Peak value of voltage drop across the GDT when a glow current is flowing.
7	Impulse discharge current 8/20μs	Current impulse with a nominal virtual front time of 8 μs and a nominal time to half-value of 20 μs.
8	Alternating Discharge Current	The rms value of an approximately sinusoidal alternating current passing through the gas discharge tube.
9	Insulation Resistance	Insulation resistance shall be measured from each terminal to every other terminal of the GDT. The test is performed with DC500V.
10	Capacitance	The capacitance shall be measured once at 1 MHz between all terminals unless otherwise specified.

Cautions

- I Do not operate gas discharge tubes in power supply networks, whose maximum operating voltage exceeds the minimum spark-over voltage of the gas discharge tubes.
- I Gas discharge tubes may become hot in the event of longer periods of current stress (burn risk). In the event of overload the connectors may fail or the component may be destroyed.
- I Gas discharge tubes must be handled with care and must not be dropped.
- I Do not continue to use damaged gas discharge tubes.
- I The shown SMD pad dimensions represent a safe way to mount the arrester and are a recommendation of the manufacturer. During the reflow process it must be assured that no solder material reduces the insulation distance between the pads below the arrester.
- I SMD gas discharge tubes should be soldered within 24 month after shipment.
- I The electrical characteristics described in this datasheet are only typical characteristics, and all of these characteristics have been confirmed through testing and inspection. If the customer's usage requirements are different from this or have special requirements, please contact Ruilongyuan Electronics Co., Ltd. If protection failure or circuit damage occurs as a result, our company is not responsible for it.
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