

## Thyristor Surge Suppressors

### P0060~P3500LA\_B\_C Serise

#### Description

The P0060~P3500LA\_B\_C Series are designed to protect baseband equipment such as modems, line cards, CPE and DSL from damaging overvoltage transients. The series provides a cost-effective through-hole solution that enables equipment to comply with global regulatory standards.



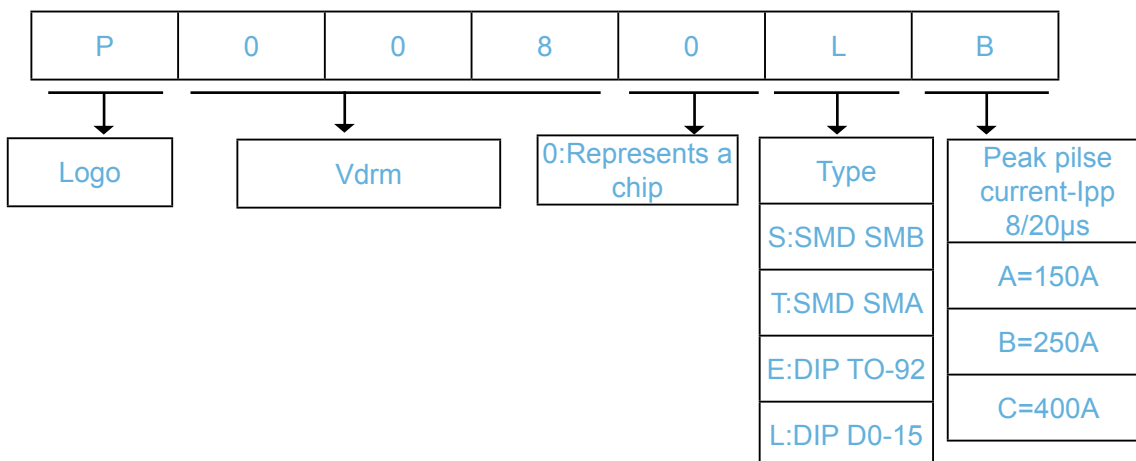
#### Features and Benefits

- Low voltagr overshoot
- Low on-state voltage
- Does not degrade with use
- Fails short circuit when surged in excess of ratings
- Low Capacitance

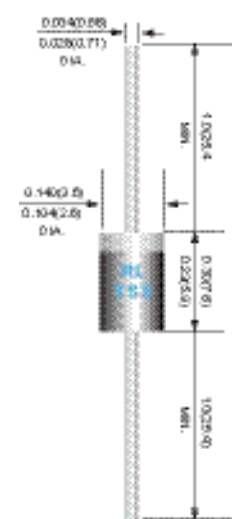
#### Applicable Global Standards

- TIA-968-A
- ITU K.20/21 Enhanced level\*
- ITU K.20/21 Basic Level
- GR 1089 Inter building\*
- GR 1089 Inter building
- IEC 6100-4-5
- YD/T 1082
- YD/T 993
- YD/T 950

#### Product Name



## Electrical Characteristics (@ TA = 25 °C Unless Otherwise Noted)

Type Number	V <sub>DRM</sub>	I <sub>DRM</sub>	V <sub>BO</sub>	I <sub>H</sub>	I <sub>S</sub>	I <sub>T</sub>	V <sub>T</sub>	C <sub>J</sub>		Package Dimensions inch(mm)
	V	μA	V	MA	MA	A	V	pF <sub>Min</sub>	pF <sub>Max</sub>	
P0080LA	6	5	25	50	800	2.2	4	25	150	 <p>DO-204AC/DO-15</p>
P0080LB	6	5	25	50	800	2.2	4	25	150	
P0080LC	6	5	25	50	800	2.2	4	35	260	
P0300LA	25	5	40	50	800	2.2	4	15	140	
P0300LB	25	5	40	50	800	2.2	4	15	140	
P0300LC	25	5	40	50	800	2.2	4	25	250	
P0640LA	58	5	77	150	800	2.2	4	40	60	
P0640LB	58	5	77	150	800	2.2	4	40	60	
P0640LC	58	5	77	150	800	2.2	4	55	155	
P0720LA	65	5	88	150	800	2.2	4	35	60	
P0720LB	65	5	88	150	800	2.2	4	35	75	
P0720LC	65	5	88	150	800	2.2	4	50	150	
P0900LA	75	5	98	150	800	2.2	4	35	55	
P0900LB	75	5	98	150	800	2.2	4	35	70	
P0900LC	75	5	98	150	800	2.2	4	45	140	
P1100LA	90	5	130	150	800	2.2	4	30	50	
P1100LB	90	5	130	150	800	2.2	4	30	70	
P1100LC	90	5	130	150	800	2.2	4	45	115	
P1300LA	120	5	160	150	800	2.2	4	25	45	
P1300LB	120	5	160	150	800	2.2	4	25	60	
P1300LC	120	5	160	150	800	2.2	4	40	105	
P1500LA	140	5	180	150	800	2.2	4	25	40	
P1500LB	140	5	180	150	800	2.2	4	25	55	
P1500LC	140	5	180	150	800	2.2	4	35	95	
P1800LA	170	5	220	150	800	2.2	4	25	35	
P1800LB	170	5	220	150	800	2.2	4	25	50	
P1800LC	170	5	220	150	800	2.2	4	35	90	
P2300LA	190	5	260	150	800	2.2	4	25	35	
P2300LB	190	5	260	150	800	2.2	4	25	50	
P2300LC	190	5	260	150	800	2.2	4	30	80	
P2600LA	220	5	300	150	800	2.2	4	20	35	
P2600LB	220	5	300	150	800	2.2	4	20	45	
P2600LC	220	5	300	150	800	2.2	4	30	80	
P3100LA	275	5	350	150	800	2.2	4	20	35	
P3100LB	275	5	350	150	800	2.2	4	20	45	
P3100LC	275	5	350	150	800	2.2	4	30	70	
P3500LA	320	5	400	150	800	2.2	4	20	35	
P3500LB	320	5	400	150	800	2.2	4	20	40	
P3500LC	320	5	400	150	800	2.2	4	25	65	

Notes:  
 - Absolute maximum ratings measured at TA= 25°C (unless otherwise noted).  
 - Devices are bi-directional.

SERIES	Peak Pulse Current-Ipp(A)				
	2/10μs	8/20μs	10/160μs	10/560μs	10/1000μs
A	200	150	100	60	50
B	250	250	150	100	80
C	500	400	200	120	100

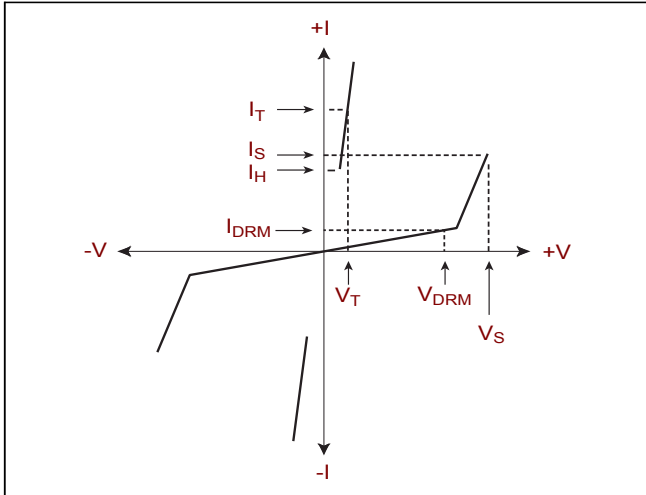
## Surge Ratings

Series	$I_{PP}$									$I_{TSM}$ 50/60 Hz	di/dt
	$0.2 \times 310^1$ $0.5 \times 700^2$	$2 \times 10^1$ $2 \times 10^2$	$8 \times 20^1$ $1.2 \times 50^2$	$10 \times 160^1$ $10 \times 160^2$	$10 \times 560^1$ $10 \times 560^2$	$5 \times 320^1$ $9 \times 720^2$	$10 \times 360^1$ $10 \times 360^2$	$10 \times 1000^1$ $10 \times 1000^2$	$5 \times 310^1$ $10 \times 700^2$		
	A min	A min	A min	A min	A min	A min	A min	A min	A min		
A	20	150	150	90	50	75	75	45	75	20	500
B	25	250	250	150	100	100	125	80	100	25	500
C	50	500	400	200	150	200	175	100	200	30	500

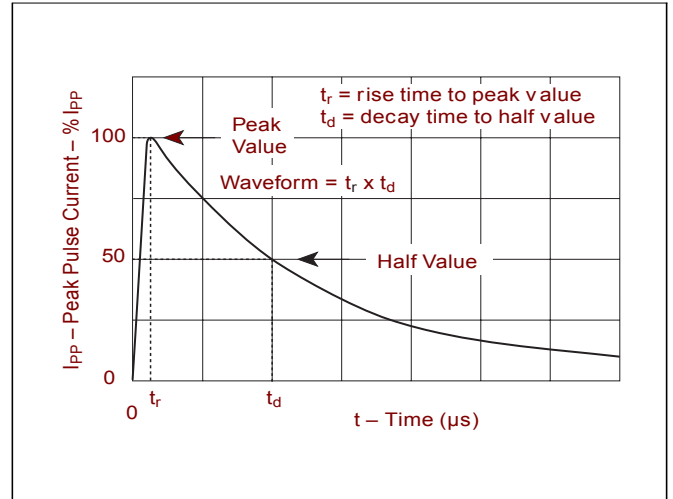
Notes:

1 Current waveform in  $\mu s$   
2 Voltage waveform in  $\mu s$

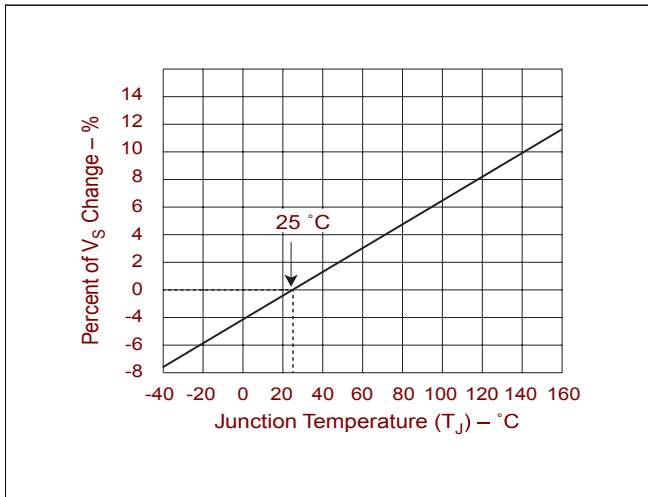
- Peak pulse current rating ( $I_{PP}$ ) is repetitive and guaranteed for the life of the product.  
-  $I_{PP}$  ratings applicable over temperature range of  $-40^\circ C$  to  $+85^\circ C$   
- The device must initially be in thermal equilibrium with  $-40^\circ C \leq T_J \leq +150^\circ C$



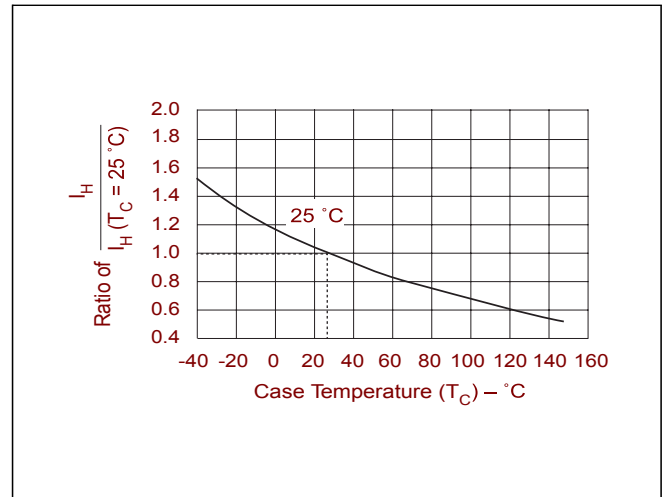
V-I Characteristics



$t_r \times t_d$  Pulse Wave-form

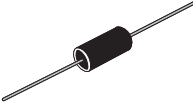


Normalized  $V_S$  Change versus Junction Temperature



Normalized DC Holding Current versus Case Temperature

## Thermal Considerations

Package	Symbol	Parameter	Value	Unit
DO-15 	$T_J$	Operating Junction Temperature Range	-40 to +150	°C
	$T_S$	Storage Temperature Range	-65 to +150	°C
	$R_{\theta JA}$	Thermal Resistance: Junction to Ambient	60	°C/W

## Soldering Parameters

Reflow Condition		Pb-Free assembly (see Fig. 1)
Pre Heat	- Temperature Min ( $T_{s(min)}$ )	+150°C
	- Temperature Max ( $T_{s(max)}$ )	+200°C
	- Time (Min to Max) ( $t_s$ )	60-180 secs.
Average ramp up rate (Liquidus Temp ( $T_L$ ) to peak)		3°C/sec. Max.
$T_{s(max)}$ to $T_L$ - Ramp-up Rate		3°C/sec. Max.
Reflow	- Temperature ( $T_L$ ) (Liquidus)	+217°C
	- Temperature ( $t_L$ )	60-150 secs.
Peak Temp ( $T_p$ )		+260(+0/-5)°C
Time within 5°C of actual Peak Temp ( $t_p$ )		30 secs. Max.
Ramp-down Rate		6°C/sec. Max.
Time 25°C to Peak Temp ( $T$ )		8 min. Max.

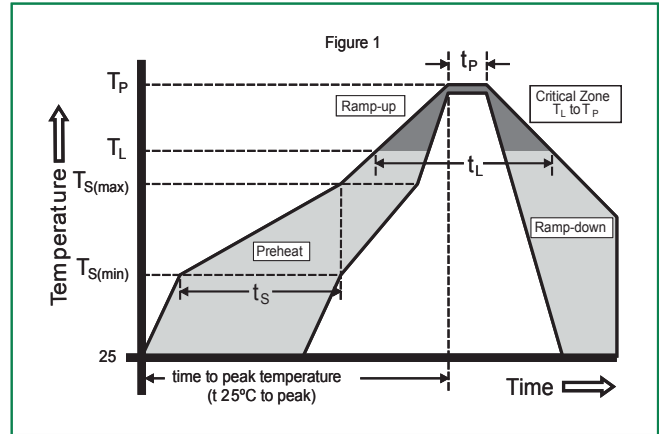
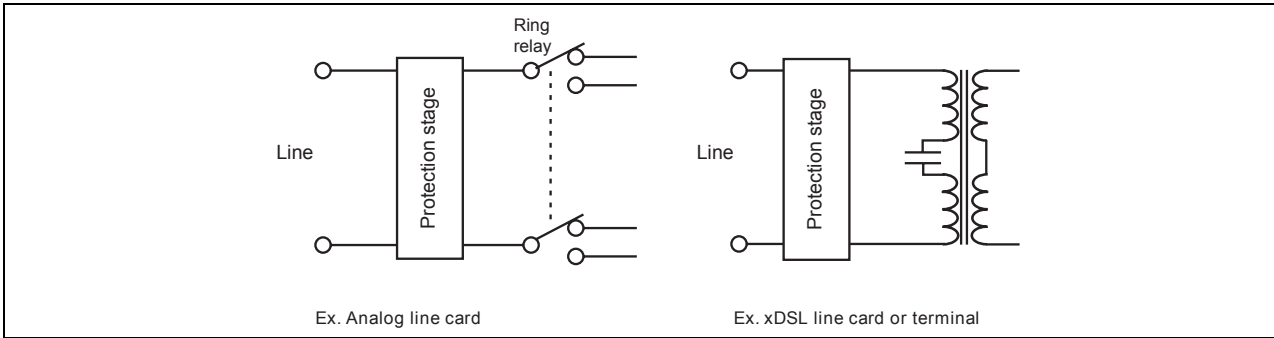


Figure 1.E examples of protection stages for line cards



In such a stage, parallel function is assumed by one or several Trisil, and is used to protect against short duration surge (lightning). During this kind of surges the Trisil limits the voltage across the device to be protected at its break over value and then fires. The fuse assumes the series function, and is used to protect the module against long duration or very high current mains disturbances (50/60Hz). It acts by safe circuit opening. Lightning surge and mains disturbance surges are defined by standards like GR1089, FCC part 68, ITU-T K20.

Figure 2. Typical circuits

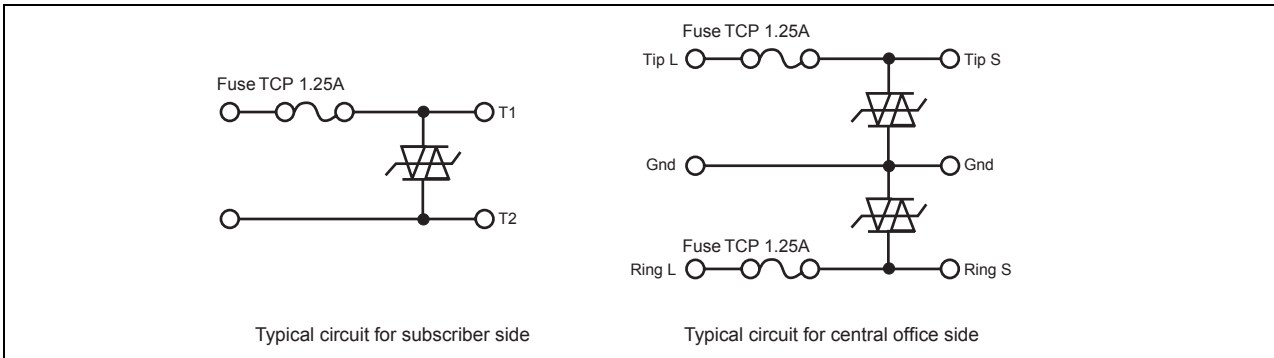


Figure 3.T test circuit 1 for Dynamic  $I_{BO}$  and  $V_{BO}$  parameters

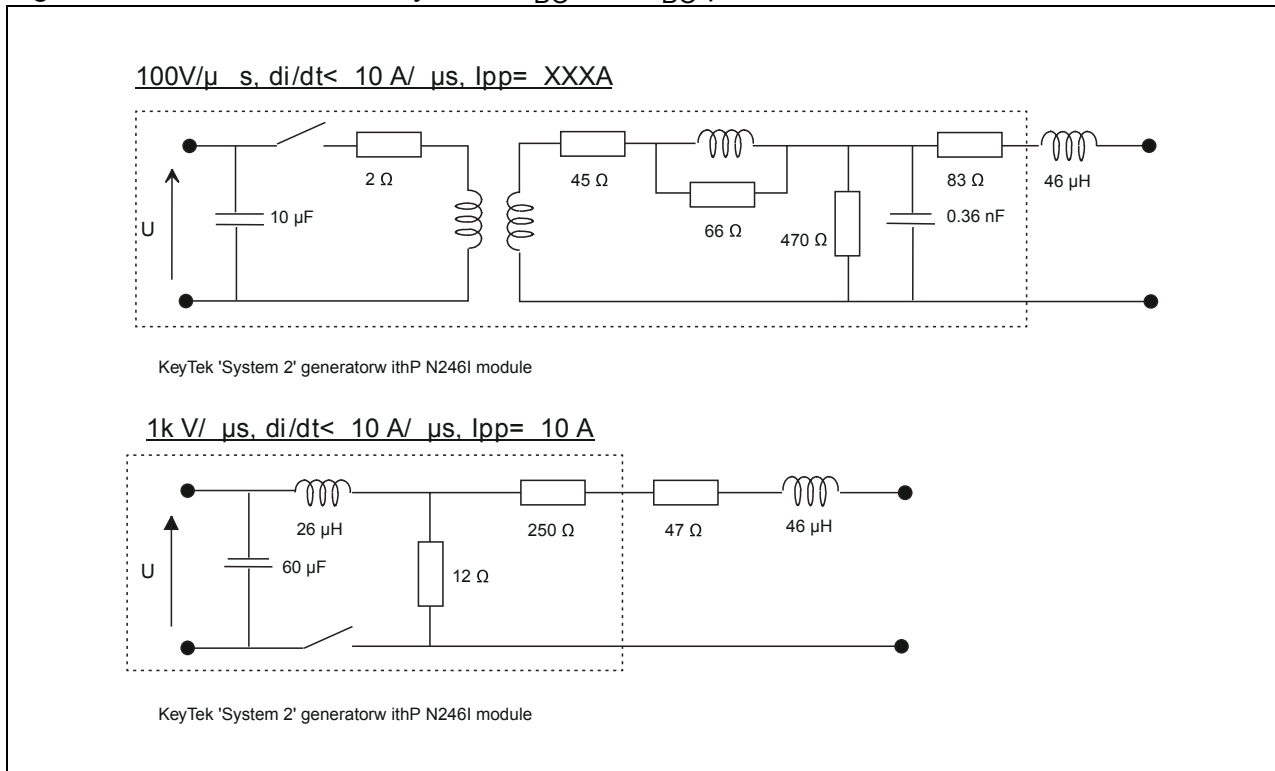


Figure 5. Test circuit 3 for dynamic  $I_H$  parameter

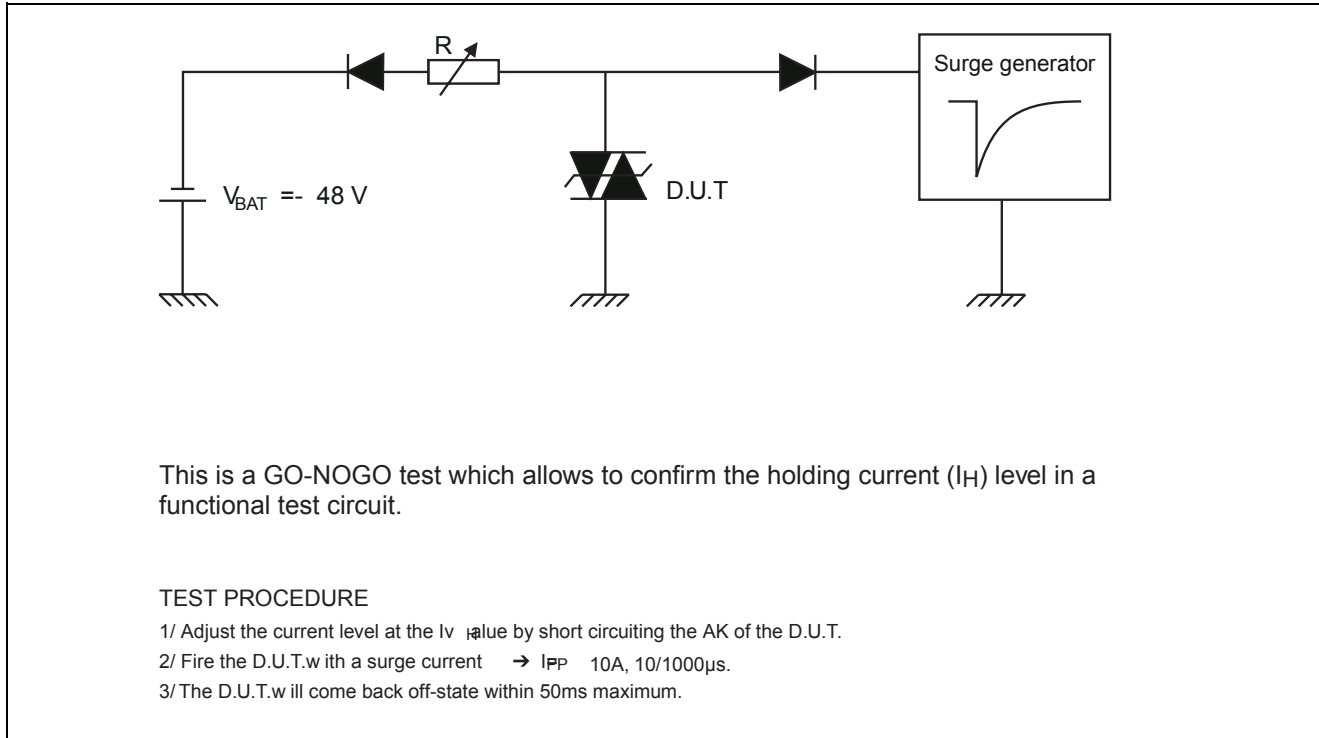
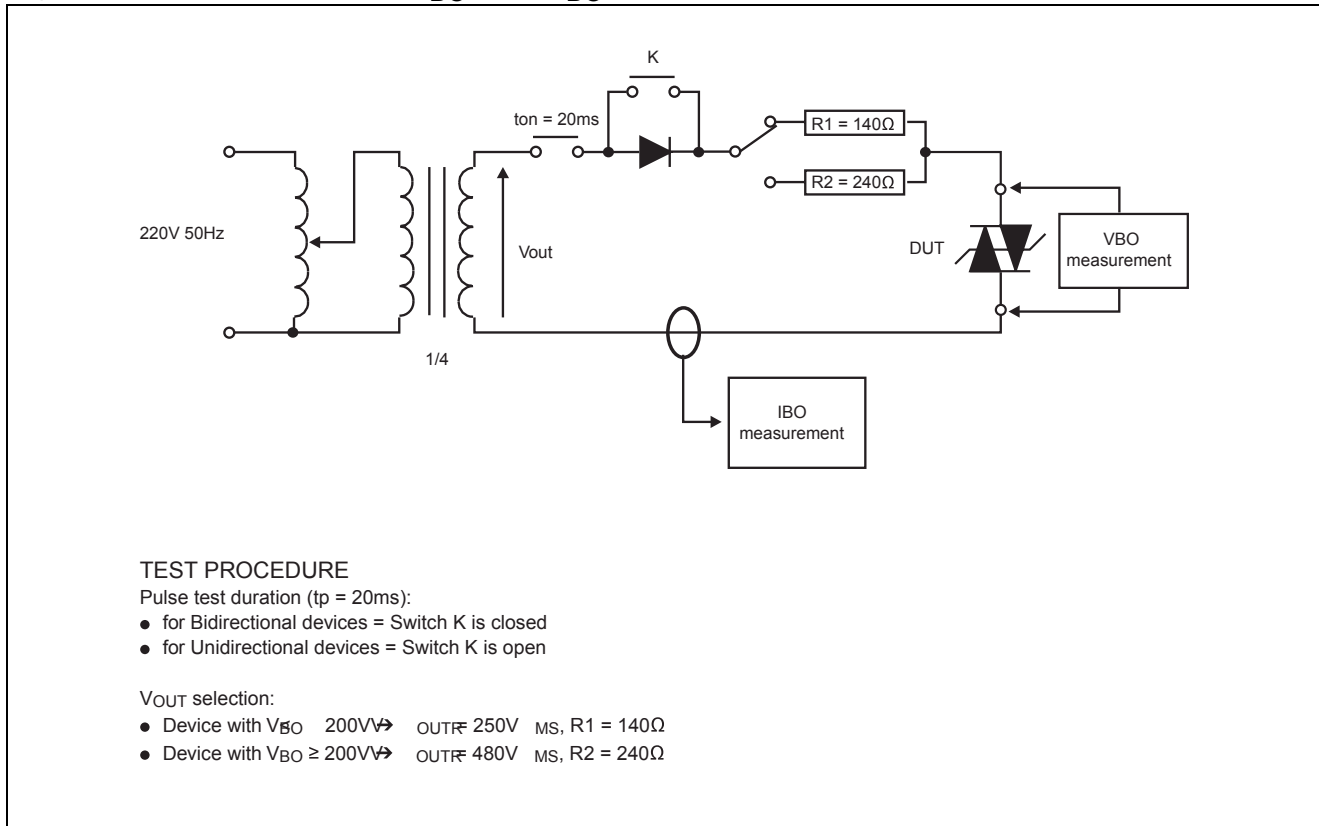


Figure 4. Test circuit 2 for  $I_{BO}$  and  $V_{BO}$  parameters



## Physical Specifications

Lead Material	Copper Alloy
Terminal Finish	100% Matte-Tin Plated
Body Material	UL recognized epoxy meeting flammability classification 94V-0

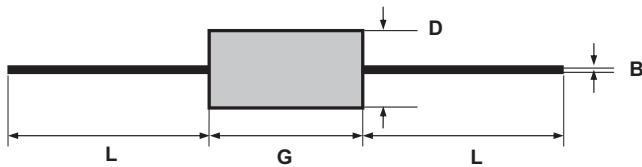
## Packing Options

Package Type	Description	Quantity	Added Suffix	Industry Standard
G	DO-15 Axial Tape & Reel	2000	RP	EIA-RS-296-D

## Environmental Specifications

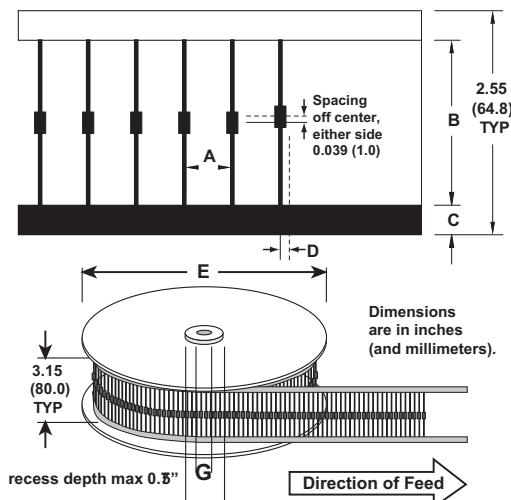
High Temp Voltage Blocking	80% Rated $V_{DRM}$ ( $V_{AC}$ Peak) +125°C or +150°C, 504 or 1008 hrs. MIL-STD-750 (Method 1040) JEDEC, JESD22-A-101
Temp Cycling	-65°C to +150°C, 15 min. dwell, 10 up to 100 cycles. MIL-STD-750 (Method 1051) EIA/JEDEC, JESD22-A-104
Biased Temp & Humidity	52 $V_{DC}$ (+85°C) 85%RH, 504 up to 1008 hrs. EIA/JEDEC, JESD22-A-101
High Temp Storage	+150°C 1008 hrs. MIL-STD-750 (Method 1031) JEDEC, JESD22-A-101
Low Temp Storage	-65°C, 1008 hrs.
Thermal Shock	0°C to +100°C, 5 min. dwell, 10 sec. transfer, 10 cycles. MIL-STD-750 (Method 1056) JEDEC, JESD22-A-106
Autoclave (Pressure Cooker Test)	+121°C, 100%RH, 2atm, 24 up to 168 hrs. EIA/JEDEC, JESD22-A-102
Resistance to Solder Heat	+260°C, 30 secs. MIL-STD-750 (Method 2031)
Moisture Sensitivity Level	85%RH, +85°C, 168 hrs., 3 reflow cycles (+260°C Peak). JEDEC-J-STD-020, Level 1

## Dimensions — DO-15



Dimension	Inches		Millimeters	
	MIN	MAX	MIN	MAX
B	0.028	0.034	0.711	0.864
D	0.12	0.14	3.048	3.556
G	0.235	0.27	5.969	6.858
L	1		25.4	

## Tape and Reel Specification — DO-15



Symbols	Description	Inches	MM
A	Component Spacing (lead to lead)	0.200 ± 0.020"	5.08 ± 0.508
B	Inner Tape Pitch	2.062 ± 0.059"	52.37 ± 1.498
C	Tape Width	0.250"	6.35
D	Max. Off Alignment	0.048"	1.219
E	Reel Dimension	13"	330.2
F	Max. Hub Recess	3"	76.19
G	Max. Abor Hole	0.68"	17.27

RUILONG.YUAN CO.,LTD  
Tel: +86- 0755-82908296  
Fax: +86- 0755-82908002

Email: [jack@ruilon.com](mailto:jack@ruilon.com)  
Website: <http://www.ruilon.com>

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