Littelfuse
Expertise Applied | Answers Delivered

Technology **Brief**

High Reliability TVS Diodes
Upscreening and Sorting Solutions

Overview

Littelfuse, global leader in circuit protection products,offers a wide portfolio of discrete TVS Diode devices ranging from 200 watt to 30kW including ultra high power AK families up to 15kA. Our dedicated design team with AS9100 certified facility provides specialized upscreening services based upon Specification MIL-PRF-19500 for robust Hi-Rel TVS Diodes that are suitable selection for applications require higher reliability performance under harsh conditions.

Features

- Specification MIL-PRF-19500 screening proceses flow
- Flexible selection on high reliablity sortings flow can be customized by requests
- Standard voltage range and power rating are offered for energy absorption capability
- Long history of use in the Avionics industry

Benefits

- Ensures high-reliability performance and low infant mortality to meet the requirements of Avionics, industrial, and medical applications.
- Provides the flexibility to address a variety of applications
- Allows for easy design-in in compliance with the RTCA/DO-160 Standard (Environmental Conditions and Test Procedures for Airborne Equipment)
- Ensures market-proven results

Customized Sorting Steps Available

- Visual Monitor in Process
- Single Wafer Lot Source
- High Temperature Storage Life
- X-Ray Inspection
- 3 Sigma & Dynamic Test
- Temperature Cycle Test
- Reflow (2X)
- Customized Vbr/Ir
- Additional Sorting
- HTRB
- H3TRB
- Labeling

Applications

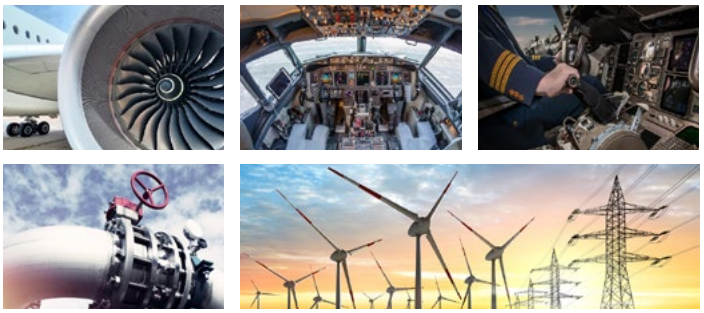
- Avionics
- Industrial Application
- Harsh Environment Application
- AC/DC Power Line Protection

DO-160 Test Results Available
(example, more data by request)

Part Number (Bi)	25C						70C						120C					
	Wave 3	Wave 4 (6.4/69us)			Wave 5a (40/120us)		Wave 3	Wave 4 (6.4/69us)			Wave 5a (40/120us)		Wave 3	Wave 4 (6.4/69us)			Wave 5a (40/120us)	
	L5	L3	L4	L5	L3	L4	L5	L3	L4	L5	L3	L4	L5	L3	L4	L5	L3	L4
	128A	60A	150A	320A	300A	750A	128A	60A	150A	320A	300A	750A	128A	60A	150A	320A	300A	750A
SMPDJ5.0CA-HR	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass
SMPDJ6.0CA-HR	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass
SMPDJ6.5CA-HR	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-
SMPDJ7.0CA-HR	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	-
SMPDJ7.5CA-HR	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	-
SMPDJ8.0CA-HR	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	-
SMPDJ8.5CA-HR	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	-
SMPDJ9.0CA-HR	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	-
SMPDJ10CA-HR	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	-
SMPDJ11CA-HR	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	-	-
SMPDJ12CA-HR	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	-	-
SMPDJ13CA-HR	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	-	-
SMPDJ14CA-HR	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	-	-
SMPDJ15CA-HR	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	-	-
SMPDJ16CA-HR	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	-	-	pass	pass	pass	-	-	-

Figure 1. Packages Overview

Figure 2. Application Examples



Available Upscreened Hi-REL TVS Series

Table 1. Series List Table

Series	100% Screen Test Sorting	Group B Test Sorting	PeakPulse Power Rating	Reverse Stand Off Voltage (V_R)	Minimum Breakdown Voltage (V_{BR})	SMD/ Axial Lead	Package	Compliance and Protection	
			(W)	(V)	(V)			DO-160 / DC Protection	MIL-STD-704
SMAJ-HR	Yes	Yes	400	6.0-45.0	6.67-50	SMD	DO-214AC	Yes	-
SMAJ-HRA	Yes	-	400	6.0-45.0	6.67-50	SMD	DO-214AC	Yes	-
SMBJ-HR	Yes	Yes	600	5.0-170	6.4-189	SMD	DO-214AA	Yes	-
SMBJ-HRA	Yes	-	600	5.0-170	6.4-189	SMD	DO-214AA	Yes	-
SMBLCE-HR	Yes	Yes	600	6.5-70.0	7.22-77.8	SMD	DO-214AA	Yes	-
SMBLCE-HRA	Yes	-	600	6.5-70.0	7.22-77.8	SMD	DO-214AA	Yes	-
SMCG-HR	Yes	Yes	1500	5.0-120	6.4-133	SMD	DO-215AB	Yes	-
SMCG-HRA	Yes	-	1500	5.0-130	6.4-144	SMD	DO-215AB	Yes	-
SMCJ-HR	Yes	Yes	1500	5.0-170	6.4-189	SMD	DO-214AB	Yes	-
SMCJ-HRA	Yes	-	1500	5.0-170	6.4-189	SMD	DO-214AB	Yes	-
SMDJ-HR	Yes	Yes	3000	5.0-170	6.4-189	SMD	DO-214AB	Yes	-
SMDJ-HRA	Yes	-	3000	5.0-170	6.4-189	SMD	DO-214AB	Yes	-
5.0SMDJxxS-HRA	Yes	-	5000	6.0-60.0	6.67-66.7	SMD	DO-214AB	Yes	-
TLP	Yes	Yes	5000	10.0-40.0	11.8-44.4	Axial Leaded	P600	Yes	Yes
TLPA	Yes	-	5000	10.0-40.0	11.8-44.4	Axial Leaded	P600	Yes	Yes
5KP-HR	Yes	Yes	5000	5.0-220	6.4-244	Axial Leaded	P600	Yes	-
5KP-HRA	Yes	-	5000	5.0-220	6.4-244	Axial Leaded	P600	Yes	-
15KPA-HR	Yes	Yes	15000	17.0-280	18.99-312.8	Axial Leaded	P600	Yes	-
15KPA-HRA	Yes	-	15000	17.0-280	18.99-312.8	Axial Leaded	P600	Yes	-
30KPA-HR	Yes	Yes	30000	28.0-345	31.28-384	Axial Leaded	P600	Yes	-
30KPA-HRA	Yes	-	30000	28.0-345	31.28-384	Axial Leaded	P600	Yes	-

Note: Hi-REL Series are also avalible for **3kA/ 6kA/10kA/15kA in AK packages**, please contact Littelfuse sales for more details.

100% Screen Process

Table 2. Screen Process Description

Description	Standard
100% Vision Inspection	MIL-STD-750: Method 2074
100% High Temperature Storage Life (168hrs)	MIL-STD-750: Method 1031
100% X-RAY inspection	MIL-STD-750: Method 2076
100% Temperature Cycle Test (-55 to150°C, 20 cycles, dwell time 15 min)	MIL-STD-750: Method 1051
100% Reflow (2X)	JEDEC J-STD-020
100% Surge Test (2X)	MIL-STD-750: Method 4066
100% HTRB 150°C Bias=V_R(80% breakdown voltage, 96hrs, and each direction at 96 hrs for Bi-directional products)	MIL-STD-750: Method 1038
Final Electrical Test(100% 3 sigma limit, 100% dynamic test and PAT limit)	MIL-STD-750: Method 4016.4021.4011

Group B Test

Table 3. Group B Test Description

Screen	Method	Condition	Requirement
Surge Test	10x1000µS Peak Pulse Waveform	Maximum Clamping Voltage (V_C) @Peak Pulse Current (I_{PP})	Sample Size 45, Perform 10x Accept 0 Failures
Burn-In (HTRB)	MIL-STD-750: Method 1038.5	Applied Voltage 100% V_R@150°C	Sample Size 45, 340 Hours (680 hours for bi-directional products, each direction 340 hours). Accept 0 Failures
Electrical Tests		I_R@V_R V($_{BR}$)@ I_T	Sample Size 45, Accept 0 Failures

Note: Please see our datasheets on website for more details.