SMF4L3.3AQ - SMF4L200(C)AQ

400W SURFACE-MOUNT TRANSIENT VOLTAGE SUPPRESSOR

Product Summary (@T_A = +25°C)

V_{BR} (MIN)	I_{PP} (MAX)	V_C (MAX)
4.5V to 224V	1.2A to 43.8A	8.0V to 328V

Features

- 400W Peak Pulse Power Dissipation (10µs × 1000µs Waveform)
- 5V to 200V Standoff Voltages
- Provides ESD Protection per IEC61000-4-2 Standard: Air ±30kV, Contact ±30kV
- Excellent Clamping Capability
- Fast Response Time: Typically Less Than 1.0ns for Uni-Direction, Less Than 5.0ns for Bi-Direction, Form 0 Volts to BV Min.
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **The SMF4L3.3AQ - SMF4L200(C)AQ are suitable for automotive applications requiring specific change control; these parts are AEC-Q101 qualified, PPAP capable, and manufactured in IATF 16949 certified facilities.** **https://www.diodes.com/quality/product-definitions/**

Description and Applications

This new generation TVS is designed for transient overvoltage protection. The combination of small size and high ESD surge capability makes it ideal for use in:

- Power managements
- Automotives
- Battery contacts

Mechanical Data

- Package: DO-219AA
- Package Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish Annealed over Copper Alloy Leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight:0.016 grams (Approximate)
- Polarity: Cathode Band Denotes Uni-Directional Device; None Cathode Band Denotes Bi-Directional Device

DO-219AA

Top View

Bi-Directional

Uni-Directional

Ordering Information (Note 4)

Orderable Part Number	Package	Reel Size (inches)	Tape Width (mm)	Packing	
				Qty.	Carrier
SMF4Lx.x(C)AQ-7	DO-219AA	7	12	3000	Tape & Reel
SMF4Lxx(C)AQ-7	DO-219AA	7	12	3000	Tape & Reel
SMF4Lxxx(C)AQ-7	DO-219AA	7	12	3000	Tape & Reel

Notes:
1. EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant. All applicable RoHS exemptions applied.
2. See https://www.diodes.com/quality/lead-free/ for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
4. For packaging details, go to our website at https://www.diodes.com/design/support/packaging/diodes-packaging/.

Marking Information

Bi-Directional

Uni-Directional

ZZ = Product Type Marking Code (See Electrical Characteristics Table)
YWXX = Date Code Marking
Y = Year (ex: 5 = 2025)
W = Week Code
XX = Joumal Lot Code (ex: 0~9 and A~Z, (Skip O, I))
Bar Denotes Cathode Side

Date Code Key

Year	2021	-	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Code	1	-	5	6	7	8	9	0	1	2	3	4

Week	1-26	27-52
Code	A-Z	a-z

Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Single phase, half wave, 60Hz, resistive or inductive load.
For capacitive load, derate current by 20%.

Characteristic	Symbol	Value	Unit
Peak Pulse Power Dissipation (Note 5) 10/1000µs	P_{PK}	400	W
Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 6)	I_{FSM}	40	A
Maximum Instantaneous Forward Voltage at 16A for Uni-directional Device Only (Note 7)	V_F	3	V

Thermal Characteristics

Characteristic	Symbol	Value	Unit
DC Steady-State Power Dissipation (Note 8)	P_D	1.0	W
Typical Thermal Resistance (Note 9)	$R_{\Theta JA}$ $R_{\Theta JL}$ $R_{\Theta JC}$	96 14 18	°C/W
Thermal Resistance, Junction to Soldering Point (Note 10)	$R_{\Theta JS}$	70	°C/W
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +175	°C

Notes:
5. Non-repetitive current pulse, per figure 4 and derated above T_A = +25°C, per figure 1.
6. 1/2 sine wave (or equivalent square wave), pulse width = 8.3ms, duty cycle = 4 pulses/minute maximum.
7. V_F max = 3V at I_F = 16A 300µs square wave pulse.
8. Device mounted on 1" × 1", FR-4 PCB; 2 oz. Cu pad layout.
9. Thermal resistance from junction to ambient, lead and case.
10. Theoretical $R_{\theta JS}$ calculated from the top center of the die straight down to the PCB/cathode tab solder junction.

Electrical Characteristics (T_A = +25°C, unless otherwise specified.)

Type Number		Working Peak Reverse Voltage	Breakdown Voltage V_{BR} Volts (Note 11)			Maximum Reverse Voltage at I_{RSM} (Clamping Voltage)	Maximum Reverse Surge Current	Maximum Reverse Leakage at V_{RWM} (Note 12)	Device Marking Code	
Uni	Bi	V_{RWM} (Volts)	Min	Max	@I_T (mA)	V_{RSM} (Volts)	I_{RSM} (Amps)	I_R (µA)	Uni	Bi
SMF4L3.3AQ	—	3.3	4.5	6.0	10	8	43.8	100	HD	—
SMF4L5.0AQ	SMF4L5.0CAQ	5	6.4	7.07	10	9.2	43.5	800	HE	TE
SMF4L6.0AQ	SMF4L6.0CAQ	6	6.67	7.37	10	10.3	38.3	800	HG	TG
SMF4L6.5AQ	SMF4L6.5CAQ	6.5	7.22	7.98	10	11.2	35.7	500	HK	TK
SMF4L7.0AQ	SMF4L7.0CAQ	7	7.78	8.6	10	12	33.3	200	HM	TM
SMF4L7.5AQ	SMF4L7.5CAQ	7.5	8.3	9.21	1	12.9	31	100	HP	TP
SMF4L8.0AQ	SMF4L8.0CAQ	8	8.89	9.83	1	13.6	29.4	50	HR	TR
SMF4L8.5AQ	SMF4L8.5CAQ	8.5	9.44	10.43	1	14.4	27.7	10	HT	TT
SMF4L9.0AQ	SMF4L9.0CAQ	9	10	11.1	1	15.4	26	5	HV	TV
SMF4L10AQ	SMF4L10CAQ	10	11.1	12.3	1	17	23.5	5	HX	TX
SMF4L11AQ	SMF4L11CAQ	11	12.2	13.5	1	18.2	22	0.5	HZ	TZ
SMF4L12AQ	SMF4L12CAQ	12	13.3	14.7	1	19.9	20.1	0.5	IE	UE
SMF4L13AQ	SMF4L13CAQ	13	14.4	15.9	1	21.5	18.6	0.5	IG	UG
SMF4L14AQ	SMF4L14CAQ	14	15.6	17.2	1	23.2	17.2	0.5	IK	UK
SMF4L15AQ	SMF4L15CAQ	15	16.7	18.5	1	24.4	16.4	0.5	IM	UM
SMF4L16AQ	SMF4L16CAQ	16	17.8	19.7	1	26	15.3	0.5	IP	UP
SMF4L17AQ	SMF4L17CAQ	17	18.9	20.9	1	27.6	14.5	0.5	IR	UR
SMF4L18AQ	SMF4L18CAQ	18	20	22.1	1	29.2	13.7	0.5	IT	UT
SMF4L20AQ	SMF4L20CAQ	20	22.2	24.5	1	32.4	12.3	0.5	IV	UV
SMF4L22AQ	SMF4L22CAQ	22	24.4	27	1	35.5	11.2	0.5	IX	UX
SMF4L24AQ	SMF4L24CAQ	24	26.7	29.5	1	38.9	10.3	0.5	IZ	UZ
SMF4L26AQ	SMF4L26CAQ	26	28.9	31.9	1	42.1	9.5	0.5	JE	VE
SMF4L28AQ	SMF4L28CAQ	28	31.1	34.4	1	45.4	8.8	0.5	JG	VG
SMF4L30AQ	SMF4L30CAQ	30	33.3	36.8	1	48.4	8.3	0.5	JK	VK
SMF4L33AQ	SMF4L33CAQ	33	36.7	40.6	1	53.3	7.5	0.5	JM	VM

Notes: 11. V_{BR} measured at pulse test current I_T with $t_P \leq 5.0$ms at T_A = +25°C.
12. The I_R limit is double for Bi-directional devices.

Electrical Characteristics (@T_A = +25°C, unless otherwise specified.) (continued)

Type Number		Working Peak Reverse Voltage	Breakdown Voltage V_{BR} Volts (Note 11)			Maximum Reverse Voltage at I_{RSM} (Clamping Voltage)	Maximum Reverse Surge Current	Maximum Reverse Leakage at V_{RWM} (Note 12)	Device Marking Code	
Uni	Bi	V_{RWM} (Volts)	Min	Max	@I_T (mA)	V_{RSM} (Volts)	I_{RSM} (Amps)	I_R (µA)	Uni	Bi
SMF4L36AQ	SMF4L36CAQ	36	40	44.2	1	58.1	6.9	0.5	JP	VP
SMF4L40AQ	SMF4L40CAQ	40	44.4	49.1	1	64.5	6.2	0.5	JR	VR
SMF4L43AQ	SMF4L43CAQ	43	47.8	52.8	1	69.4	5.7	0.5	JT	VT
SMF4L45AQ	SMF4L45CAQ	45	50	55.3	1	72.7	5.5	0.5	JV	VV
SMF4L48AQ	SMF4L48CAQ	48	53.3	58.9	1	77.4	5.2	0.5	JX	VX
SMF4L51AQ	SMF4L51CAQ	51	56.7	62.7	1	82.4	4.9	0.5	JZ	VZ
SMF4L54AQ	SMF4L54CAQ	54	60	66.3	1	87.1	4.6	0.5	RE	WE
SMF4L58AQ	SMF4L58CAQ	58	64.4	71.2	1	93.6	4.3	0.5	RG	WG
SMF4L60AQ	SMF4L60CAQ	60	66.7	73.7	1	96.8	4.1	0.5	PK	WK
SMF4L64AQ	SMF4L64CAQ	64	71.1	78.6	1	103	3.9	0.5	RM	WM
SMF4L70AQ	SMF4L70CAQ	70	77.8	86	1	113	3.5	0.5	RP	WP
SMF4L75AQ	SMF4L75CAQ	75	83.3	92.1	1	121	3.3	0.5	RR	WR
SMF4L78AQ	SMF4L78CAQ	78	86.7	95.8	1	126	3.2	0.5	RT	WT
SMF4L85AQ	SMF4L85CAQ	85	94.4	104	1	137	2.9	0.5	RV	WV
SMF4L90AQ	SMF4L90CAQ	90	100	111	1	146	2.7	0.5	RX	WX
SMF4L100AQ	SMF4L100CAQ	100	111	123	1	162	2.5	0.5	RZ	WZ
SMF4L110AQ	SMF4L110CAQ	110	122	135	1	177	2.3	0.5	SE	XE
SMF4L120AQ	SMF4L120CAQ	120	133	147	1	193	2.0	0.5	SG	XG
SMF4L130AQ	SMF4L130CAQ	130	144	159	1	209	1.9	0.5	SK	XK
SMF4L150AQ	SMF4L150CAQ	150	167	185	1	243	1.6	0.5	SM	XM
SMF4L160AQ	SMF4L160CAQ	160	178	197	1	259	1.5	0.5	SP	XP
SMF4L170AQ	SMF4L170CAQ	170	189	209	1	275	1.4	0.5	SR	XR
SMF4L188AQ	SMF4L188CAQ	188	209	231	1	328	1.2	0.5	SS	VS
SMF4L200AQ	SMF4L200CAQ	200	224	248	1	324	1.2	0.5	ST	YT

Notes: 11. V_{BR} measured at pulse test current I_T with $t_P \leq 5.0$ms at T_A = +25°C.
12. The I_R limit is double for Bi-directional devices.

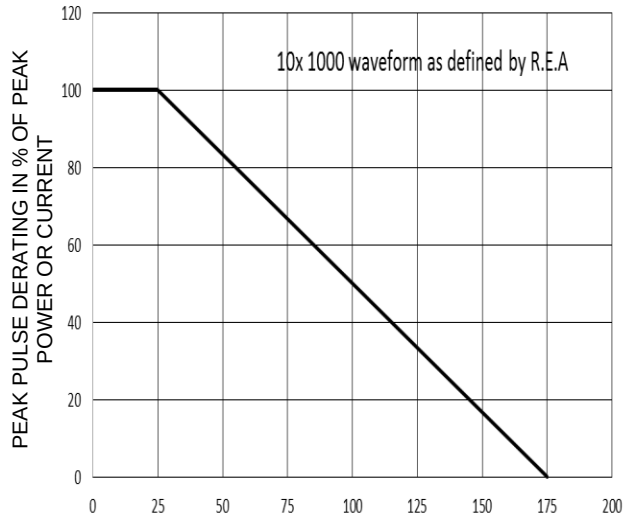


Fig. 1 Pulse Derating Curve

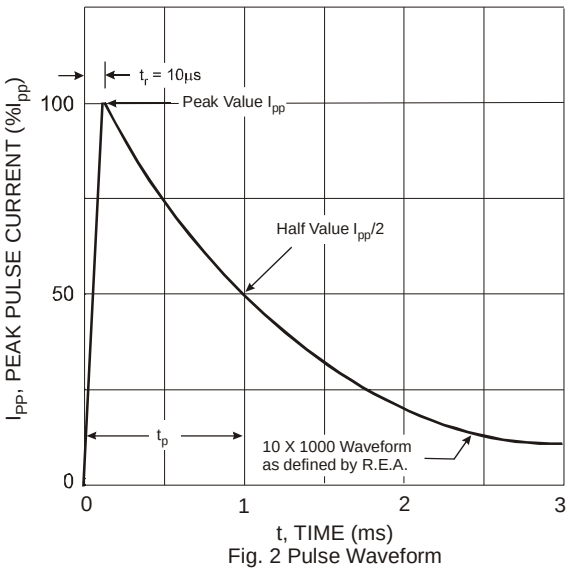


Fig. 2 Pulse Waveform

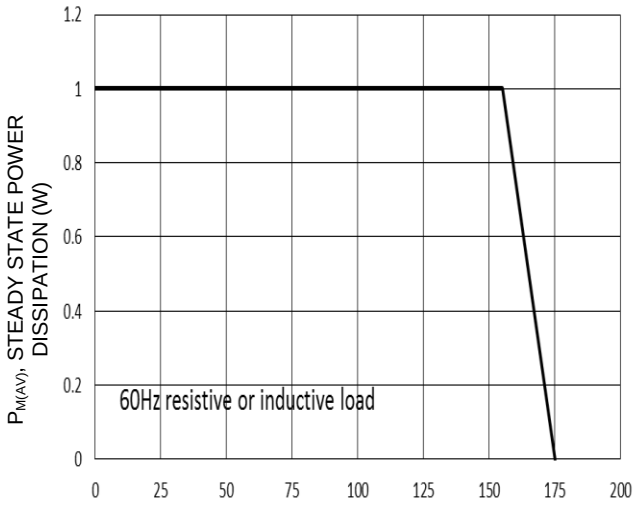


Fig. 3 Steady State Power Derating Curve

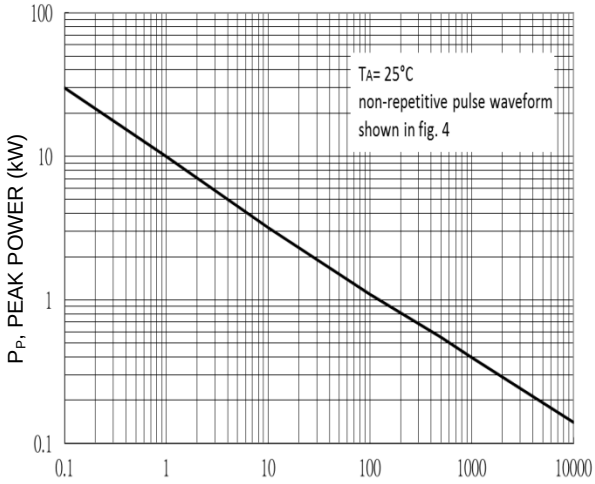


Fig. 4 Pulse Rating Curve

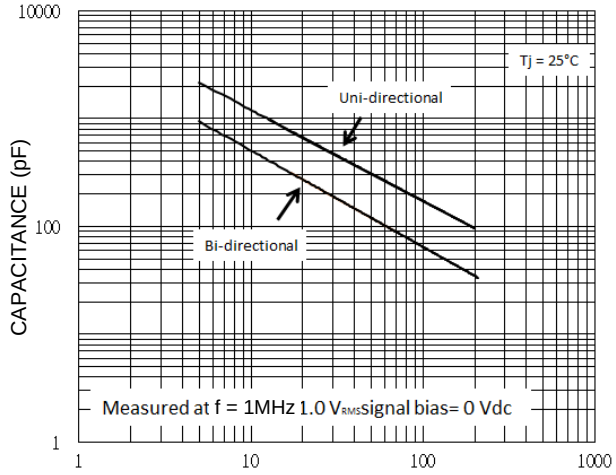
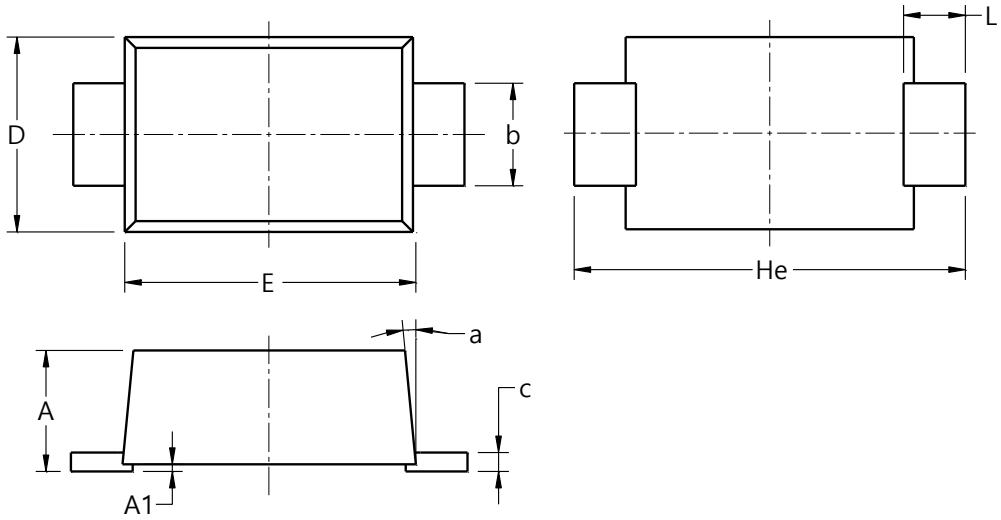


Fig.5 Typical Junction Capacitance

Package Outline Dimensions

Please see http://www.diodes.com/package-outlines.html for the latest version.

DO-219AA

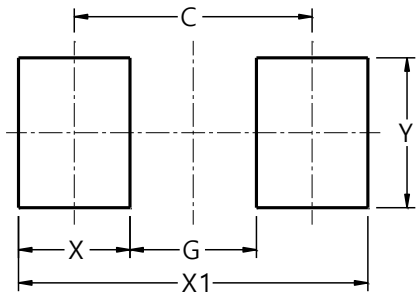


DO-219AA			
Dim	**Min**	**Max**	**Typ**
A	0.81	1.20	1.18
A1	0.03	0.10	0.07
b	0.85	1.15	1.00
c	0.05	0.30	0.15
D	1.70	2.00	1.90
E	2.70	2.90	2.80
He	3.50	3.90	3.80
L	0.45	0.75	0.60
a	0°	8°	5°
All Dimensions in mm			

Suggested Pad Layout

Please see http://www.diodes.com/package-outlines.html for the latest version.

DO-219AA



Dimensions	Value (in mm)
C	2.86
G	1.52
X	1.34
X1	4.20
Y	1.80

IMPORTANT NOTICE

1. DIODES INCORPORATED (Diodes) AND ITS SUBSIDIARIES MAKE NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARDS TO ANY INFORMATION CONTAINED IN THIS DOCUMENT, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION).

2. The Information contained herein is for informational purpose only and is provided only to illustrate the operation of Diodes' products described herein and application examples. Diodes does not assume any liability arising out of the application or use of this document or any product described herein. This document is intended for skilled and technically trained engineering customers and users who design with Diodes' products. Diodes' products may be used to facilitate safety-related applications; however, in all instances customers and users are responsible for (a) selecting the appropriate Diodes products for their applications, (b) evaluating the suitability of Diodes' products for their intended applications, (c) ensuring their applications, which incorporate Diodes' products, comply the applicable legal and regulatory requirements as well as safety and functional-safety related standards, and (d) ensuring they design with appropriate safeguards (including testing, validation, quality control techniques, redundancy, malfunction prevention, and appropriate treatment for aging degradation) to minimize the risks associated with their applications.

3. Diodes assumes no liability for any application-related information, support, assistance or feedback that may be provided by Diodes from time to time. Any customer or user of this document or products described herein will assume all risks and liabilities associated with such use, and will hold Diodes and all companies whose products are represented herein or on Diodes' websites, harmless against all damages and liabilities.

4. Products described herein may be covered by one or more United States, international or foreign patents and pending patent applications. Product names and markings noted herein may also be covered by one or more United States, international or foreign trademarks and trademark applications. Diodes does not convey any license under any of its intellectual property rights or the rights of any third parties (including third parties whose products and services may be described in this document or on Diodes' website) under this document.

5. Diodes' products are provided subject to Diodes' Standard Terms and Conditions of Sale (https://www.diodes.com/about/company/terms-and-conditions/terms-and-conditions-of-sales/) or other applicable terms. This document does not alter or expand the applicable warranties provided by Diodes. Diodes does not warrant or accept any liability whatsoever in respect of any products purchased through unauthorized sales channel.

6. Diodes' products and technology may not be used for or incorporated into any products or systems whose manufacture, use or sale is prohibited under any applicable laws and regulations. Should customers or users use Diodes' products in contravention of any applicable laws or regulations, or for any unintended or unauthorized application, customers and users will (a) be solely responsible for any damages, losses or penalties arising in connection therewith or as a result thereof, and (b) indemnify and hold Diodes and its representatives and agents harmless against any and all claims, damages, expenses, and attorney fees arising out of, directly or indirectly, any claim relating to any noncompliance with the applicable laws and regulations, as well as any unintended or unauthorized application.

7. While efforts have been made to ensure the information contained in this document is accurate, complete and current, it may contain technical inaccuracies, omissions and typographical errors. Diodes does not warrant that information contained in this document is error-free and Diodes is under no obligation to update or otherwise correct this information. Notwithstanding the foregoing, Diodes reserves the right to make modifications, enhancements, improvements, corrections or other changes without further notice to this document and any product described herein. This document is written in English but may be translated into multiple languages for reference. Only the English version of this document is the final and determinative format released by Diodes.

8. Any unauthorized copying, modification, distribution, transmission, display or other use of this document (or any portion hereof) is prohibited. Diodes assumes no responsibility for any losses incurred by the customers or users or any third parties arising from any such unauthorized use.

9. This Notice may be periodically updated with the most recent version available at https://www.diodes.com/about/company/terms-and-conditions/important-notice

www.diodes.com