SMF4L3.3A - SMF4L200(C)A

400W SURFACE MOUNT TRANSIENT VOLTAGE SUPPRESSOR

Product Summary (@T_A = +25°C)

$V_{BR\ (MIN)}$	$I_{PP\ (MAX)}$	$V_{C\ (MAX)}$
4.1V 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, from 0V to BV min.
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e.: parts qualified to AEC-Q100/101/104/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please refer to the related automotive grade (Q-suffix) part. A listing can be found at https://www.diodes.com/products/automotive/automotive-products/.**
- **This part is qualified to JEDEC standards (as references in AEC-Q) for High Reliability. 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 management
- Automotive applications
- 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 Lead Frame. Solderable per MIL-STD-202, Method 208 e3
- Weight:0.016 grams (Approximate)
- Polarity: Cathode band denotes Uni-directional device; No 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	
				Quantity	Carrier
SMF4Lx.x(C)A-7	DO-219AA	7	12	3000	Tape & Reel
SMF4Lxx(C)A-7	DO-219AA	7	12	3000	Tape & Reel
SMF4Lxxx(C)A-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: 8 = 2018)
W = Week Code
XX = Lot Code (ex: 0~9 and A~Z, (Skip O, I))
Bar Denotes Cathode Side

Date Code Key

Year	2018	…	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Code	8	…	0	1	2	3	4	5	6	7	8	9

Week	1-26	27-52	53
Code	A-Z	a-z	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 6) 10/1000µs	P_{PK}	400	W
Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 7)	I_{FSM}	40	A
Maximum instantaneous forward voltage at 16A for unidirectional device only (Note 8)	V_F	3	V

Thermal Characteristics

Characteristic	Symbol	Value	Unit
DC Steady-State Power Dissipation (Note 9)	P_D	1.0	W
Typical thermal resistance (Note 10)	$R_{\Theta JA}$ $R_{\Theta JL}$ $R_{\Theta JC}$	96 14 18	°C/W
Thermal Resistance, Junction to Soldering Point (Note 11)	$R_{\Theta JS}$	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 PeakReverse Voltage	Breakdown voltage VBR Volts (Note 12)			Maximum Reverse Voltage at IRSM (Clamping Voltage)	Maximum Reverse Surge Current	Maximum Reverse Leakage at VRWM (Note 13)	Device Marking code	
Uni	Bi	VRWM(Volts)	Min.	Max	@IT(mA)	VRSM(Volts)	IRSM(Amps)	IR (uA)	Uni	Bi
SMF4L3.3A	---	3.3	4.5	6.0	10	8	43.8	100	HD	--
SMF4L5.0A	SMF4L5.0CA	5	6.4	7.07	10	9.2	43.5	800	HE	TE
SMF4L6.0A	SMF4L6.0CA	6	6.67	7.37	10	10.3	38.3	800	HG	TG
SMF4L6.5A	SMF4L6.5CA	6.5	7.22	7.98	10	11.2	35.7	500	HK	TK
SMF4L7.0A	SMF4L7.0CA	7	7.78	8.6	10	12	33.3	200	HM	TM
SMF4L7.5A	SMF4L7.5CA	7.5	8.3	9.21	1	12.9	31	100	HP	TP
SMF4L8.0A	SMF4L8.0CA	8	8.89	9.83	1	13.6	29.4	50	HR	TR
SMF4L8.5A	SMF4L8.5CA	8.5	9.44	10.43	1	14.4	27.7	10	HT	TT
SMF4L9.0A	SMF4L9.0CA	9	10	11.1	1	15.4	26	5	HV	TV
SMF4L10A	SMF4L10CA	10	11.1	12.3	1	17	23.5	5	HX	TX
SMF4L11A	SMF4L11CA	11	12.2	13.5	1	18.2	22	0.5	HZ	TZ
SMF4L12A	SMF4L12CA	12	13.3	14.7	1	19.9	20.1	0.5	IE	UE
SMF4L13A	SMF4L13CA	13	14.4	15.9	1	21.5	18.6	0.5	IG	UG
SMF4L14A	SMF4L14CA	14	15.6	17.2	1	23.2	17.2	0.5	IK	UK
SMF4L15A	SMF4L15CA	15	16.7	18.5	1	24.4	16.4	0.5	IM	UM
SMF4L16A	SMF4L16CA	16	17.8	19.7	1	26	15.3	0.5	IP	UP
SMF4L17A	SMF4L17CA	17	18.9	20.9	1	27.6	14.5	0.5	IR	UR
SMF4L18A	SMF4L18CA	18	20	22.1	1	29.2	13.7	0.5	IT	UT
SMF4L20A	SMF4L20CA	20	22.2	24.5	1	32.4	12.3	0.5	IV	UV
SMF4L22A	SMF4L22CA	22	24.4	27	1	35.5	11.2	0.5	IX	UX
SMF4L24A	SMF4L24CA	24	26.7	29.5	1	38.9	10.3	0.5	IZ	UZ
SMF4L26A	SMF4L26CA	26	28.9	31.9	1	42.1	9.5	0.5	JE	VE
SMF4L28A	SMF4L28CA	28	31.1	34.4	1	45.4	8.8	0.5	JG	VG
SMF4L30A	SMF4L30CA	30	33.3	36.8	1	48.4	8.3	0.5	JK	VK

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

Type Number		Working PeakReverse Voltage	Breakdown voltage VBR Volts (Note 12)			Maximum Reverse Voltage at IRSM (Clamping Voltage)	Maximum Reverse Surge Current	Maximum Reverse Leakage at VRWM	Device Marking code	
Uni	Bi	VRWM(Volts)	Min.	Max	@IT(mA)	VRSM(Volts)	IRSM(Amps)	IR (uA)	Uni	Bi
SMF4L33A	SMF4L33CA	33	36.7	40.6	1	53.3	7.5	0.5	JM	VM
SMF4L36A	SMF4L36CA	36	40	44.2	1	58.1	6.9	0.5	JP	VP
SMF4L40A	SMF4L40CA	40	44.4	49.1	1	64.5	6.2	0.5	JR	VR
SMF4L43A	SMF4L43CA	43	47.8	52.8	1	69.4	5.7	0.5	JT	VT
SMF4L45A	SMF4L45CA	45	50	55.3	1	72.7	5.5	0.5	JV	VV
SMF4L48A	SMF4L48CA	48	53.3	58.9	1	77.4	5.2	0.5	JX	VX
SMF4L51A	SMF4L51CA	51	56.7	62.7	1	82.4	4.9	0.5	JZ	VZ
SMF4L54A	SMF4L54CA	54	60	66.3	1	87.1	4.6	0.5	RE	WE
SMF4L58A	SMF4L58CA	58	64.4	71.2	1	93.6	4.3	0.5	RG	WG
SMF4L60A	SMF4L60CA	60	66.7	73.7	1	96.8	4.1	0.5	PK	WK
SMF4L64A	SMF4L64CA	64	71.1	78.6	1	103	3.9	0.5	RM	WM
SMF4L70A	SMF4L70CA	70	77.8	86	1	113	3.5	0.5	RP	WP
SMF4L75A	SMF4L75CA	75	83.3	92.1	1	121	3.3	0.5	RR	WR
SMF4L78A	SMF4L78CA	78	86.7	95.8	1	126	3.2	0.5	RT	WT
SMF4L85A	SMF4L85CA	85	94.4	104	1	137	2.9	0.5	RV	WV
SMF4L90A	SMF4L90CA	90	100	111	1	146	2.7	0.5	RX	WX
SMF4L100A	SMF4L100CA	100	111	123	1	162	2.5	0.5	RZ	WZ
SMF4L110A	SMF4L110CA	110	122	135	1	177	2.3	0.5	SE	XE
SMF4L120A	SMF4L120CA	120	133	147	1	193	2.0	0.5	SG	XG
SMF4L130A	SMF4L130CA	130	144	159	1	209	1.9	0.5	SK	XK
SMF4L150A	SMF4L150CA	150	167	185	1	243	1.6	0.5	SM	XM
SMF4L160A	SMF4L160CA	160	178	197	1	259	1.5	0.5	SP	XP
SMF4L170A	SMF4L170CA	170	189	209	1	275	1.4	0.5	SR	XR
SMF4L188A	SMF4L188CA	188	209	231	1	328	1.2	0.5	SS	VS
SMF4L200A	SMF4L200CA	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.
13. SMF4L3.3(C)A under development

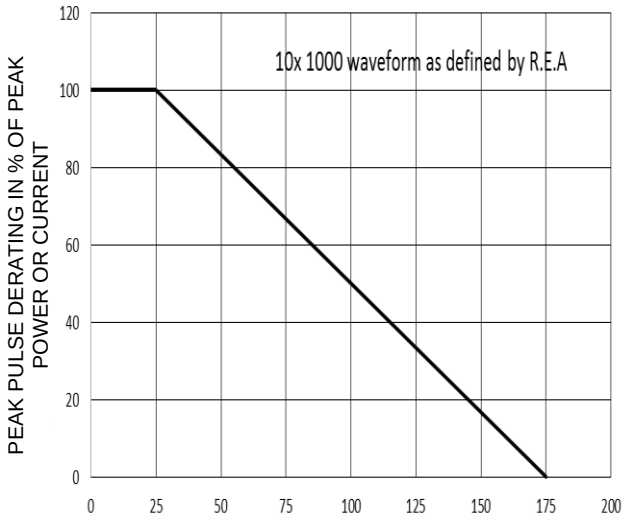


Fig. 1 Pulse Derating Curve

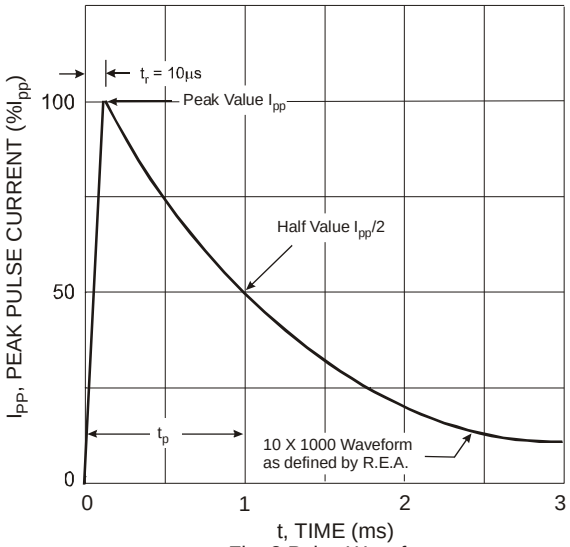


Fig. 2 Pulse Waveform

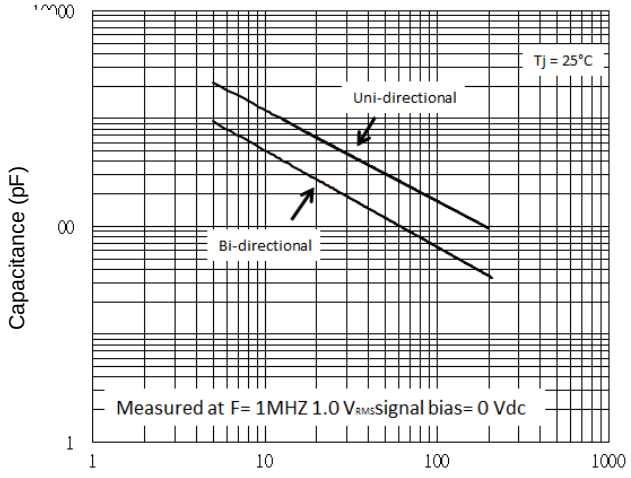


Fig.3 Typical Junction Capacitance

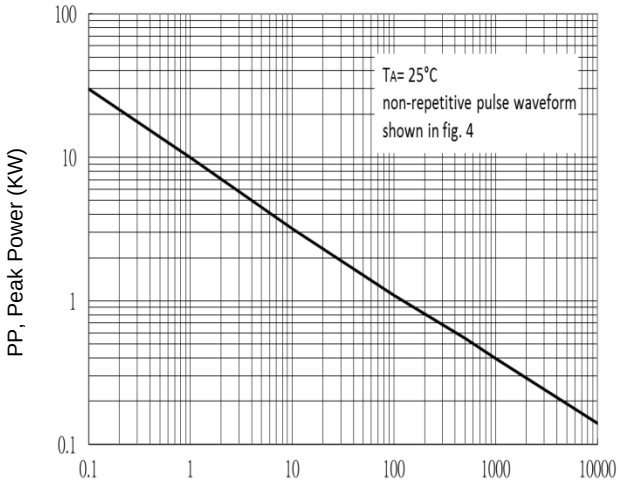
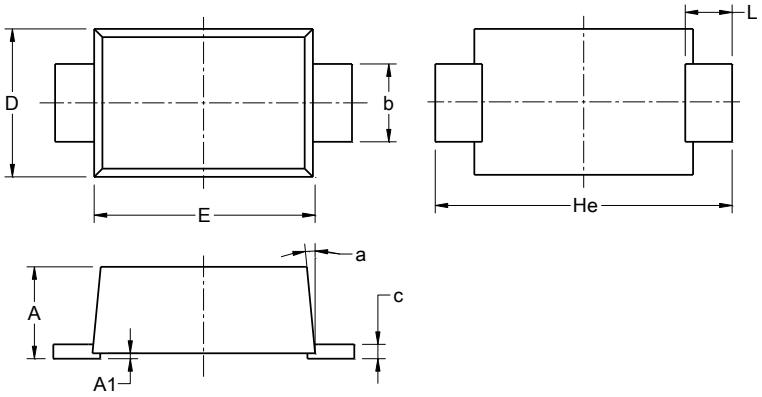


Fig.4 Pulse Rating Curve

Package Outline Dimensions

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

DO-219AA

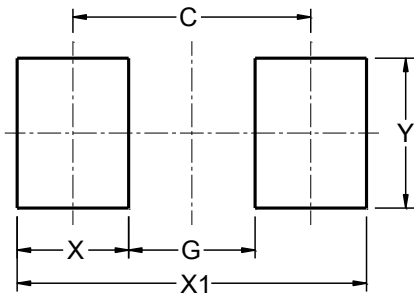


DO-219AA			
Dim	**Min**	**Max**	**Typ**
A	0.81	1.20	1.18
A1	0.03	0.10	0.07
b	0.85	1.15	1.00
c	0.05	0.30	0.15
D	1.70	2.00	1.90
E	2.70	2.90	2.80
He	3.50	3.90	3.80
L	0.45	0.75	0.60
a	0°	8°	5°
All Dimensions in mm			

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