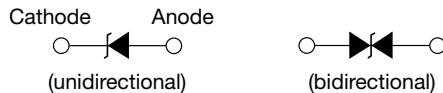


# Surface-Mount TRANSZORB<sup>®</sup> Transient Voltage Suppressors


**SMA (DO-214AC)**

**LINKS TO ADDITIONAL RESOURCES**


PRIMARY CHARACTERISTICS	
$V_{WM}$ (unidirectional)	5.8 V to 459 V
$V_{WM}$ (bidirectional)	5.8 V to 185 V
$V_{BR}$ (unidirectional)	6.8 V to 540 V
$V_{BR}$ (bidirectional)	6.8 V to 220 V
$P_{PPM}$	400 W, 300 W
$P_D$	3.3 W
$I_{FSM}$ (uni-directional only)	40 A
$T_J$ max.	150 °C
Polarity	Unidirectional, bidirectional
Package	SMA (DO-214AC)

**DEVICES FOR BIDIRECTION APPLICATIONS**

For bidirectional devices use CA suffix (e.g. P4SMA10CA).  
Electrical characteristics apply in both directions.

**FEATURES**

- Low profile package
- Ideal for automated placement
- Glass passivated chip junction
- Available in unidirectional and bidirectional
- 400 W peak pulse power capability with a 10/1000  $\mu$ s waveform, repetitive rate (duty cycle): 0.01 % (300 W above 91 V)
- Excellent clamping capability
- Very fast response time
- Low incremental surge resistance
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- AEC-Q101 qualified available
  - Automotive ordering code: P/NHE3 or P/NHM3
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**TYPICAL APPLICATIONS**

Use in sensitive electronics protection against voltage transients induced by inductive load switching and lighting on ICs, MOSFET, signal lines of sensor units for consumer, computer, industrial, and telecommunication.

**MECHANICAL DATA**

**Case:** SMA (DO-214AC)

Molding compound meets UL 94 V-0 flammability rating  
Base P/N-E3 - RoHS-compliant, commercial grade  
Base P/N-M3 - halogen-free, RoHS-compliant, commercial grade

Base P/NHE3\_X - RoHS-compliant and AEC-Q101 qualified  
Base P/NHM3\_X - halogen-free, RoHS-compliant, and AEC-Q101 qualified

("\_X" denotes revision code e.g. A, B, ...)

**Terminals:** matte tin plated leads, solderable per J-STD-002 and JESD 22-B102  
E3, M3, HE3, and HM3 suffix meets JESD 201 class 2 whisker test

**Polarity:** for unidirectional types the band denotes cathode end, no marking on bidirectional types

MAXIMUM RATINGS ( $T_A = 25$ °C unless otherwise noted)			
PARAMETER	SYMBOL	VALUE	UNIT
Peak power dissipation with a 10/1000 $\mu$ s waveform <sup>(1)(2)</sup> (fig. 1)	$P_{PPM}$	400	W
Peak pulse current with a 10/1000 $\mu$ s waveform <sup>(1)</sup> (fig. 3)	$I_{PPM}$	See next table	A
Power dissipation on infinite heatsink at $T_A = 50$ °C	$P_D$	3.3	W
Peak forward surge current 8.3 ms single half sine-wave unidirectional only <sup>(2)</sup>	$I_{FSM}$	40	A
Operating junction and storage temperature range	$T_J, T_{STG}$	-65 to +150	°C

**Notes**

<sup>(1)</sup> Non-repetitive current pulse, per fig. 3 and derated above  $T_A = 25$  °C per fig. 2. Rating is 300 W above 91 V

<sup>(2)</sup> Mounted on 0.2" x 0.2" (5.0 mm x 5.0 mm) copper pads to each terminal



ELECTRICAL CHARACTERISTICS (T <sub>A</sub> = 25 °C unless otherwise noted)										
PART NUMBER	DEVICE MARKING CODE		BREAKDOWN VOLTAGE V <sub>BR</sub> AT I <sub>T</sub> <sup>(1)</sup> (V)		TEST CURRENT I <sub>T</sub> (mA)	STAND-OFF VOLTAGE V <sub>WM</sub> (V)	MAXIMUM REVERSE LEAKAGE AT V <sub>WM</sub> I <sub>D</sub> <sup>(4)</sup> (µA)	MAXIMUM PEAK PULSE CURRENT I <sub>PPM</sub> <sup>(2)</sup> (A)	MAXIMUM CLAMPING VOLTAGE AT I <sub>PPM</sub> V <sub>C</sub> (V)	MAXIMUM TEMPERATURE COEFFICIENT OF V <sub>BR</sub> (%/°C)
	UNI	BI	MIN.	MAX.						
(+)P4SMA6.8A	6V8A	6V8C	6.45	7.14	10	5.80	1000	38.1	10.5	0.057
(+)P4SMA7.5A	7V5A	7V5C	7.13	7.88	10	6.40	500	35.4	11.3	0.061
(+)P4SMA8.2A	8V2A	8V2C	7.79	8.61	10	7.02	200	33.1	12.1	0.065
(+)P4SMA9.1A	9V1A	9V1C	8.65	9.55	1.0	7.78	50	29.9	13.4	0.068
(+)P4SMA10A	10A	10C	9.5	10.5	1.0	8.55	10	27.6	14.5	0.073
(+)P4SMA11A	11A	11C	10.5	11.6	1.0	9.40	5.0	25.6	15.6	0.075
(+)P4SMA12A	12A	12C	11.4	12.6	1.0	10.2	1.0	24.0	16.7	0.078
(+)P4SMA13A	13A	13C	12.4	13.7	1.0	11.1	1.0	22.0	18.2	0.081
(+)P4SMA15A	15A	15C	14.3	15.8	1.0	12.8	1.0	18.9	21.2	0.084
(+)P4SMA16A	16A	16C	15.2	16.8	1.0	13.6	1.0	17.8	22.5	0.086
(+)P4SMA18A	18A	18C	17.1	18.9	1.0	15.3	1.0	15.9	25.2	0.089
(+)P4SMA20A	20A	20C	19.0	21.0	1.0	17.1	1.0	14.4	27.7	0.090
(+)P4SMA22A	22A	22C	20.9	23.1	1.0	18.8	1.0	13.1	30.6	0.092
(+)P4SMA24A	24A	24C	22.8	25.2	1.0	20.5	1.0	12.0	33.2	0.094
(+)P4SMA27A	27A	27C	25.7	28.4	1.0	23.1	1.0	10.7	37.5	0.096
(+)P4SMA30A	30A	30C	28.5	31.5	1.0	25.6	1.0	9.7	41.4	0.097
(+)P4SMA33A	33A	33C	31.4	34.7	1.0	28.2	1.0	8.8	45.7	0.098
(+)P4SMA36A	36A	36C	34.2	37.8	1.0	30.8	1.0	8.0	49.9	0.099
(+)P4SMA39A	39A	39C	37.1	41.0	1.0	33.3	1.0	7.4	53.9	0.100
(+)P4SMA43A	43A	43C	40.9	45.2	1.0	36.8	1.0	6.7	59.3	0.101
(+)P4SMA47A	47A	47C	44.7	49.4	1.0	40.2	1.0	6.2	64.8	0.101
(+)P4SMA51A	51A	51C	48.5	53.6	1.0	43.6	1.0	5.7	70.1	0.102
(+)P4SMA56A	56A	56C	53.2	58.8	1.0	47.8	1.0	5.2	77.0	0.103
(+)P4SMA62A	62A	62C	58.9	65.1	1.0	53.0	1.0	4.7	85.0	0.104
(+)P4SMA68A	68A	68C	64.6	71.4	1.0	58.1	1.0	4.3	92.0	0.104
(+)P4SMA75A	75A	75C	71.3	78.8	1.0	64.1	1.0	3.9	104	0.105
(+)P4SMA82A	82A	82C	77.9	86.1	1.0	70.1	1.0	3.5	113	0.105
(+)P4SMA91A	91A	91C	86.5	95.5	1.0	77.8	1.0	3.2	125	0.106
(+)P4SMA100A	100A	100C	95.0	105	1.0	85.5	1.0	2.2	137	0.106
(+)P4SMA110A	110A	110C	105	116	1.0	94.0	1.0	2.0	152	0.107
(+)P4SMA120A	120A	120C	114	126	1.0	102	1.0	1.8	165	0.107
(+)P4SMA130A	130A	130C	124	137	1.0	111	1.0	1.7	179	0.107
(+)P4SMA150A	150A	150C	143	158	1.0	128	1.0	1.4	207	0.108
(+)P4SMA160A	160A	160C	152	168	1.0	136	1.0	1.4	219	0.108
(+)P4SMA170A	170A	170C	162	179	1.0	145	1.0	1.3	234	0.108
(+)P4SMA180A	180A	180C	171	189	1.0	154	1.0	1.2	246	0.108
(+)P4SMA200A	200A	200C	190	210	1.0	171	1.0	1.1	274	0.108
(+)P4SMA220A	220A	220C	209	231	1.0	185	1.0	0.91	328	0.108
P4SMA250A	250A	-	237	263	1.0	214	1.0	0.87	344	0.110
P4SMA300A	300A	-	285	315	1.0	256	1.0	0.73	414	0.110
P4SMA350A	350A	-	333	368	1.0	300	1.0	0.62	482	0.110
P4SMA400A	400A	-	380	420	1.0	342	1.0	0.55	548	0.110
P4SMA440A	440A	-	418	462	1.0	376	1.0	0.50	602	0.110
P4SMA480A	480A	-	456	504	1.0	408	1.0	0.46	658	0.110
P4SMA510A	510A	-	485	535	1.0	434	1.0	0.43	698	0.110
P4SMA540A	540A	-	513	567	1.0	459	1.0	0.41	740	0.110

Notes

- (1) Pulse test: t<sub>p</sub> ≤ 50 ms
- (2) Surge current waveform per fig. 3 and derate per fig. 2
- (3) All terms and symbols are consistent with ANSI/IEEE CA62.35
- (4) For bidirectional types with V<sub>R</sub> of 10 V and less, the I<sub>D</sub> limit is doubled
- (5) V<sub>F</sub> = 3.5 V at I<sub>F</sub> = 25 A (unidirectional only)
- (6) Underwriters Laboratory Recognition for the classification of protectors (QVQG2) under the UL standard for safety 497B and file number E136766 for both unidirectional and bidirectional device

**THERMAL CHARACTERISTICS** ( $T_A = 25\text{ °C}$  unless otherwise noted)

PARAMETER	SYMBOL	VALUE	UNIT
Typical thermal resistance, junction to ambient air <sup>(1)</sup>	$R_{\theta JA}$	120	°C/ W
Typical thermal resistance, junction to lead	$R_{\theta JL}$	30	

**Note**

<sup>(1)</sup> Mounted on minimum recommended pad layout

**ORDERING INFORMATION** (Example)

PREFERRED P/N	UNIT WEIGHT (g)	VOLTAGE RANGE (V)		PACKAGE CODE	BASE QUANTITY	DELIVERY MODE
		UNI -	BI -			
P4SMA6.8A-E3/61	0.064	6.8 to 220	6.8 to 220	61	1800	7" diameter plastic tape and reel
P4SMA6.8A-M3/61	0.064	6.8 to 540	6.8 to 220	61	1800	7" diameter plastic tape and reel
P4SMA6.8A-E3/5A	0.064	6.8 to 220	6.8 to 220	5A	7500	13" diameter plastic tape and reel
P4SMA6.8A-M3/5A	0.064	6.8 to 540	6.8 to 220	5A	7500	13" diameter plastic tape and reel
P4SMA6.8AHE3_A/H <sup>(1)</sup>	0.064	6.8 to 220	6.8 to 220	H	1800	7" diameter plastic tape and reel
P4SMA6.8AHM3_A/H <sup>(1)</sup>						
P4SMA6.8AHE3_A/I <sup>(1)</sup>	0.064	6.8 to 220	6.8 to 220	I	7500	13" diameter plastic tape and reel
P4SMA6.8AHM3_A/I <sup>(1)</sup>						
P4SMA250AHM3_B/H <sup>(2)</sup>	0.064	250 to 540	-	H	1800	7" diameter plastic tape and reel
P4SMA250AHM3_B/I <sup>(2)</sup>	0.064	250 to 540	-	I	7500	13" diameter plastic tape and reel

**Notes**

<sup>(1)</sup> \_A is available for P4SMA6.8(C)A to P4SMA220(C)A, AEC-Q101 qualified

<sup>(2)</sup> \_B is available for P4SMA250A to P4SMA540A, AEC-Q101 qualified

## RATINGS AND CHARACTERISTICS CURVES ( $T_A = 25\text{ }^\circ\text{C}$ unless otherwise noted)

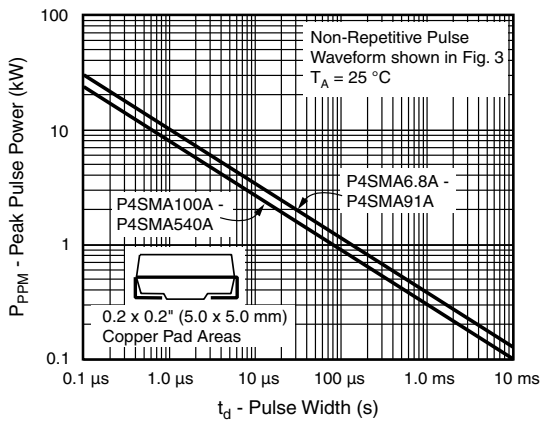


Fig. 1 - Peak Pulse Power Rating Curve

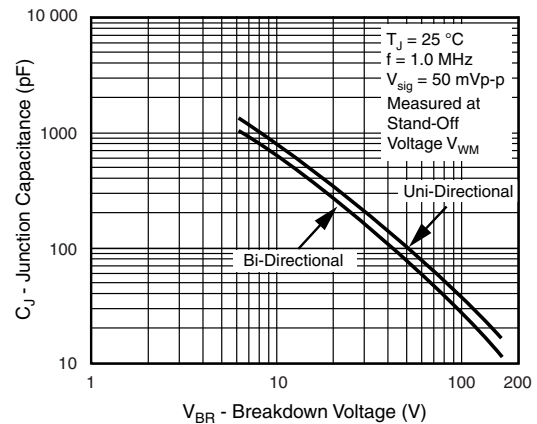


Fig. 4 - Typical Junction Capacitance

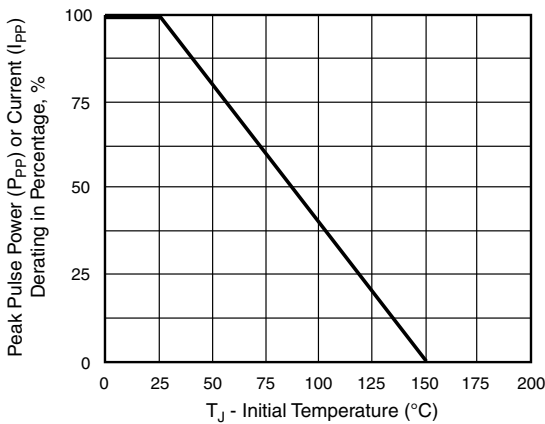


Fig. 2 - Pulse Power or Current vs. Initial Junction Temperature

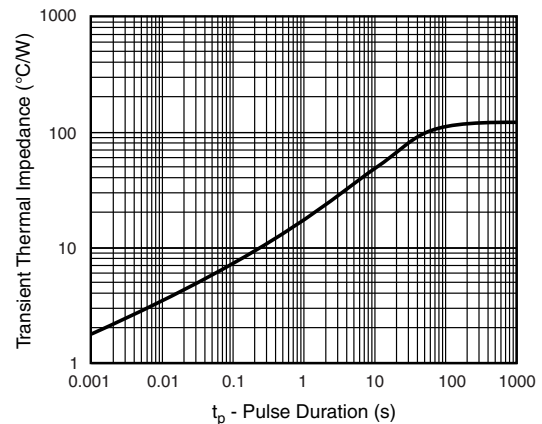


Fig. 5 - Typical Transient Thermal Impedance

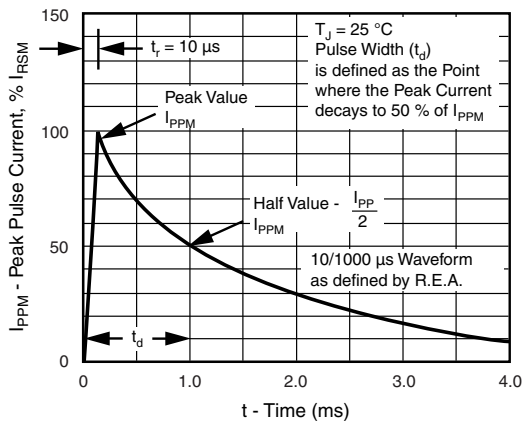


Fig. 3 - Pulse Waveform

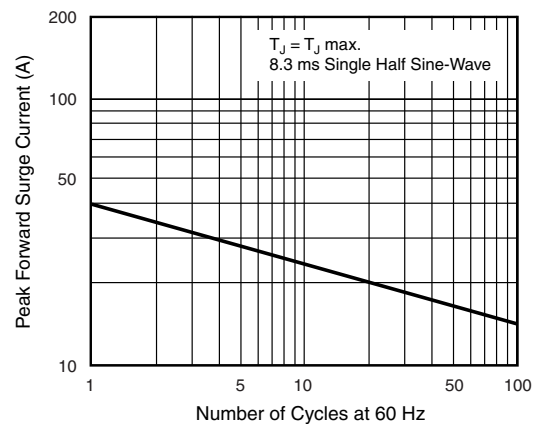
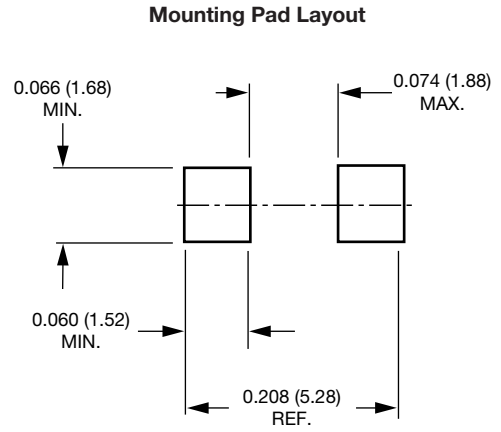
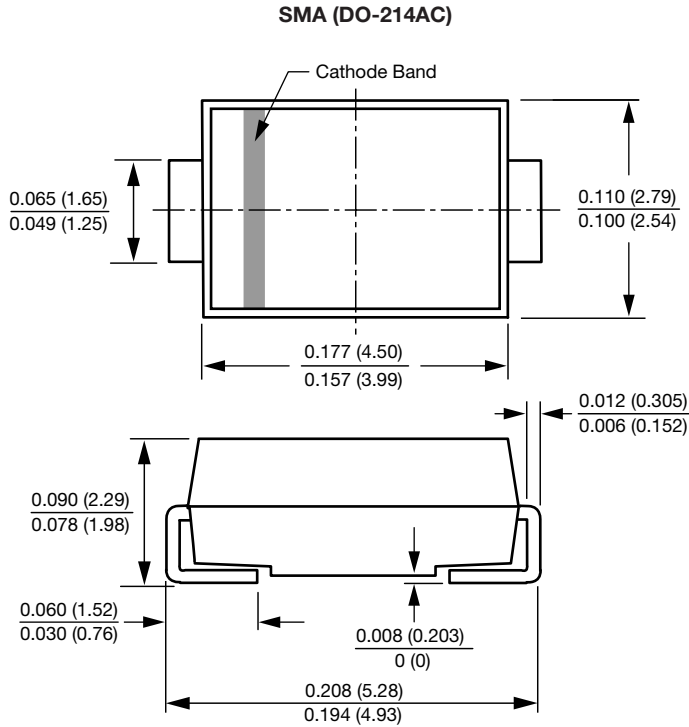


Fig. 6 - Maximum Non-Repetitive Forward Surge Current Uni-Directional Use Only



### PACKAGE OUTLINE DIMENSIONS in inches (millimeters)





## Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.