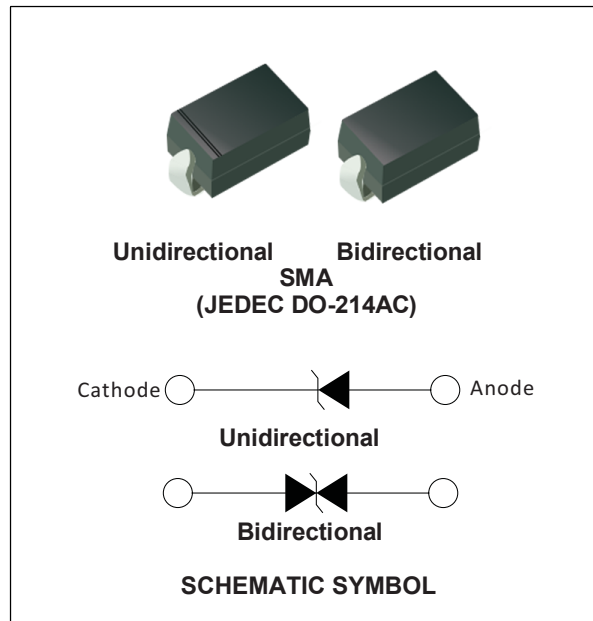


Datasheet – production data

### Features

- Peak pulse power:
  - 400 W (10/1000  $\mu$ s)
- Stand off voltage range: from 5 V to 440 V
- Unidirectional and bidirectional types
- Low leakage current:
  - 0.2  $\mu$ A at 25 °C
  - 1  $\mu$ A at 85 °C
- Operating  $T_{j\max}$ : 150 °C
- JEDEC registered package outline
- Resin meets UL 94, V0
- shipping 2000/Tape&Reel



### Complies with the following standards

- ISO 10605, C = 150 pF, R = 330  $\Omega$ :
  - 30 kV (air discharge)
  - 30 kV (contact discharge)
- ISO 10605, C = 330 pF, R = 330  $\Omega$ :
  - 30 kV (air discharge)
  - 30 kV (contact discharge)
- ISO 7637-2<sup>(a)</sup>
  - Pulse 1:  $V_S = -100$  V
  - Pulse 2a:  $V_S = +50$  V
  - Pulse 3a:  $V_S = -150$  V
  - Pulse 3b:  $V_S = +100$  V

### Description

The SMA04J series has been designed to protect sensitive automotive circuits against surges defined in ISO 7637-2 and against electrostatic discharges according to ISO 10605.

The planar technology makes this device compatible with high-end circuits where low leakage current and high junction temperature are required to provide reliability and stability over time. SMA04J are packaged in SMA (SMA footprint in accordance with IPC 7531 standard).

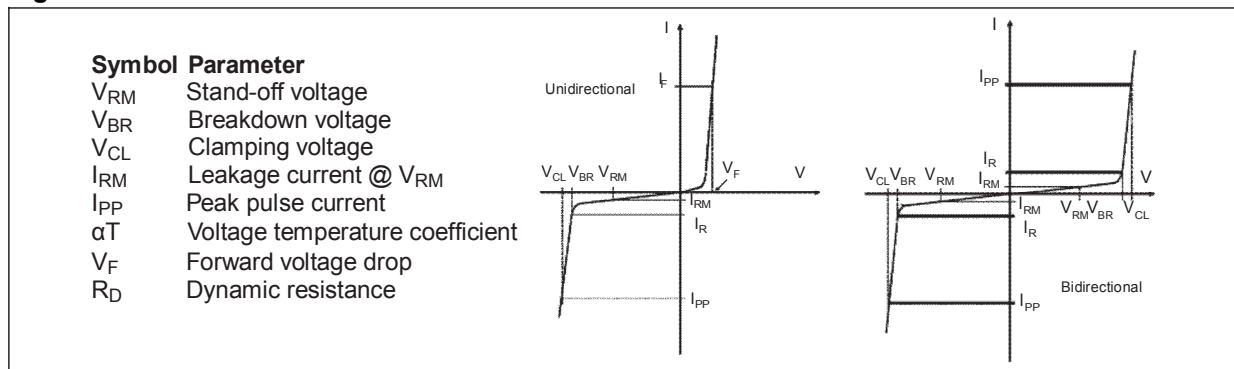
# 1 Characteristics

**Table 1. Absolute maximum ratings ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )**

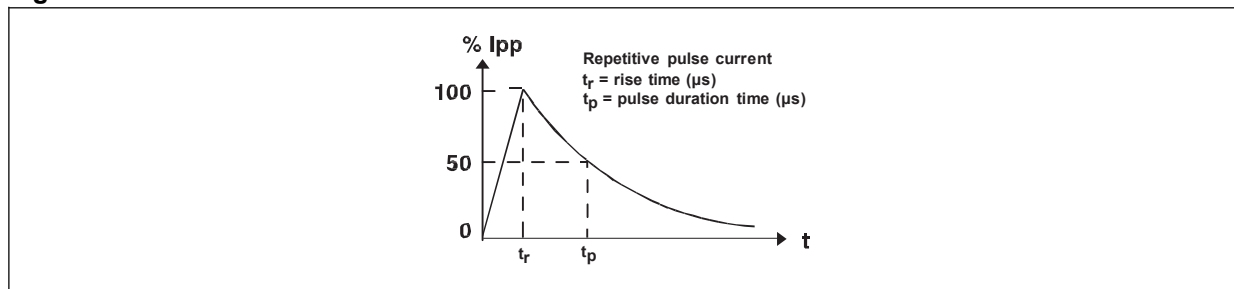
Symbol	Parameter		Value	Unit
$V_{PP}$	Peak pulse voltage	ISO 10605 (C = 330 pF, R = 330 $\Omega$ ):		
		Contact discharge	30	kV
		Air discharge	30	
		ISO 10605 (C = 150 pF, R = 330 $\Omega$ ):		
Contact discharge	30			
	Air discharge	30		
$P_{PP}$	Peak pulse power dissipation <sup>(1)</sup>	$T_j$ initial = $T_{amb}$	400	W
$T_j$	Operating junction temperature range		-40 to 150	$^{\circ}\text{C}$
$T_{stg}$	Storage temperature range		-65 to 150	
$T_L$	Maximum lead temperature for soldering during 10 s.		260	

1. For a surge greater than the maximum values, the diode will fail in short-circuit.

**Figure 1. Electrical characteristics - definitions**



**Figure 2. Pulse definition for electrical characteristics**



**Table 2. Electrical characteristics, parameter values ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )**

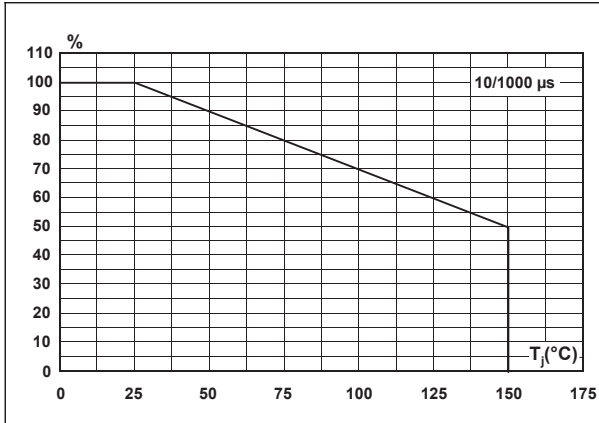
Part Number (Unidirectional)		Part Number (Bidirectional)		Reverse Stand-off Voltage	Breakdown Voltage Min.@IT	Breakdown Voltage Max.@IT	Test Current	Maximum Clamping Voltage @IPP	Peak Pulse Current	Reverse Leakage @VRWM
Mode	Marking	Mode	Marking	VRWM(V)	VBR (V)	VBR (B)	IT(mA)	VC(V)	IPP(A)	IR(uA)
SMA04J05V	AE	SMA04J05B	WE	5.0	6.40	7.00	10	9.2	43.5	800
SMA04J06V	AG	SMA04J06B	WG	6.0	6.67	7.37	10	10.3	38.8	800
SMA04J6V5V	AK	SMA04J6V5B	WK	6.5	7.22	7.98	10	11.2	35.7	500
SMA04J07V	AM	SMA04J07B	WM	7.0	7.78	8.60	10	12.0	33.3	200
SMA04J7V5V	AP	SMA04J7V5B	WP	7.5	8.33	9.21	1	12.9	31.0	100
SMA04J08V	AR	SMA04J08B	WR	8.0	8.89	9.83	1	13.6	29.4	50
SMA04J8V5V	AT	SMA04J8V5B	WT	8.5	9.44	10.40	1	14.4	27.8	20
SMA04J09V	AV	SMA04J09B	WV	9.0	10.00	11.10	1	15.4	26.0	10
SMA04J10V	AX	SMA04J10B	WX	10.0	11.10	12.30	1	17.0	23.5	5
SMA04J11V	AZ	SMA04J11B	WZ	11.0	12.20	13.50	1	18.2	22.0	1
SMA04J12V	BE	SMA04J12B	XE	12.0	13.30	14.70	1	19.9	20.1	1
SMA04J13V	BG	SMA04J13B	XG	13.0	14.40	15.90	1	21.5	18.6	1
SMA04J14V	BK	SMA04J14B	XK	14.0	15.60	17.20	1	23.2	17.2	1
SMA04J15V	BM	SMA04J15B	XM	15.0	16.70	18.50	1	24.4	16.4	1
SMA04J16V	BP	SMA04J16B	XP	16.0	17.80	19.70	1	26.0	15.4	1
SMA04J17V	BR	SMA04J17B	XR	17.0	18.90	20.90	1	27.6	14.5	1
SMA04J18V	BT	SMA04J18B	XT	18.0	20.00	22.10	1	29.2	13.7	1
SMA04J20V	BV	SMA04J20B	XV	20.0	22.20	24.50	1	32.4	12.3	1
SMA04J22V	BX	SMA04J22B	XX	22.0	24.40	26.90	1	35.5	11.3	1
SMA04J24V	BZ	SMA04J24B	XZ	24.0	26.70	29.50	1	38.9	10.3	1
SMA04J26V	CE	SMA04J26B	YE	26.0	28.90	31.90	1	42.1	9.5	1
SMA04J28V	CG	SMA04J28B	YG	28.0	31.10	34.40	1	45.4	8.8	1
SMA04J30V	CK	SMA04J30B	YK	30.0	33.30	36.80	1	48.4	8.3	1
SMA04J33V	CM	SMA04J33B	YM	33.0	36.70	40.60	1	53.3	7.5	1
SMA04J36V	CP	SMA04J36B	YP	36.0	40.00	44.20	1	58.1	6.9	1
SMA04J40V	CR	SMA04J40B	YR	40.0	44.40	49.10	1	64.5	6.2	1
SMA04J43V	CT	SMA04J43B	YT	43.0	47.80	52.80	1	69.4	5.8	1
SMA04J45V	CV	SMA04J45B	YV	45.0	50.00	55.30	1	72.7	5.5	1
SMA04J48V	CX	SMA04J48B	YX	48.0	53.30	58.90	1	77.4	5.2	1
SMA04J51V	CZ	SMA04J51B	YZ	51.0	56.70	62.70	1	82.4	4.9	1
SMA04J54V	RE	SMA04J54B	ZE	54.0	60.00	66.30	1	87.1	4.6	1

Part Number (Unidirectional)		Part Number (Bidirectional)		Reverse Stand-off Voltage	Breakdown Voltage Min.@IT	Breakdown Voltage Max.@IT	Test Current	Maximum Clamping Voltage @IPP	Peak Pulse Current	Reverse Leakage @VRWM
Mode	Marking	Mode	Marking	VRWM(V)	VBR (V)	VBR (B)	IT(mA)	VC (V)	IPP(A)	IR(uA)
SMA04J58V	R G	SMA04J58B	Z G	58	64.40	71.20	1	93.6	4.3	1
SMA04J60V	R K	SMA04J60B	Z K	60	66.70	73.70	1	96.8	4.1	1
SMA04J64V	R M	SMA04J64B	Z M	64	71.10	78.60	1	103.0	3.9	1
SMA04J70V	R P	SMA04J70B	Z P	70	77.80	86.00	1	113.0	3.5	1
SMA04J75V	R R	SMA04J75B	Z R	75	83.30	92.10	1	121.0	3.3	1
SMA04J78V	R T	SMA04J78B	Z T	78	86.70	95.80	1	126.0	3.2	1
SMA04J85V	R V	SMA04J85B	Z V	85	94.40	104.00	1	137.0	2.9	1
SMA04J90V	R X	SMA04J90B	Z X	90	100.00	111.00	1	146.0	2.7	1
SMA04J100V	R Z	SMA04J100B	Z Z	100	111.00	123.00	1	162.0	2.5	1
SMA04J110V	S E	SMA04J110B	V E	110	122.00	135.00	1	177.0	2.3	1
SMA04J120V	S G	SMA04J120B	V G	120	133.00	147.00	1	193.0	2.1	1
SMA04J130V	S K	SMA04J130B	V K	130	144.00	159.00	1	209.0	1.9	1
SMA04J150V	S M	SMA04J150B	V M	150	167.00	185.00	1	243.0	1.6	1
SMA04J160V	S P	SMA04J160B	V P	160	178.00	197.00	1	259.0	1.5	1
SMA04J170V	S R	SMA04J170B	V R	170	189.00	209.00	1	275.0	1.5	1
SMA04J180V	S T	SMA04J180B	V T	180	201.00	222.00	1	292.0	1.4	1
SMA04J200V	S V	SMA04J200B	V V	200	224.00	247.00	1	324.0	1.2	1
SMA04J220V	S X	SMA04J220B	V X	220	246.00	272.00	1	356.0	1.1	1
SMA04J250V	S Z	SMA04J250B	V Z	250	279.00	309.00	1	405.0	1.0	1
SMA04J300V	T E	SMA04J300B	U E	300	335.00	371.00	1	486.0	0.8	1
SMA04J350V	T G	SMA04J350B	U G	350	391.00	432.00	1	567.0	0.7	1
SMA04J400V	T K	SMA04J400B	U K	400	447.00	494.00	1	648.0	0.6	1
SMA04J440V	T M	SMA04J440B	U M	440	492.00	543.00	1	713.0	0.6	1

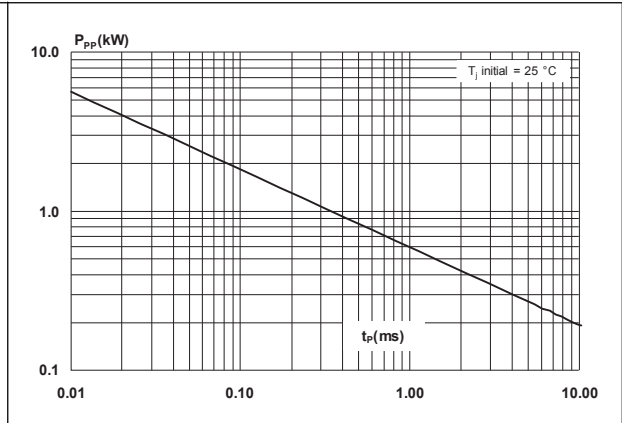
### Notes:

- Pulse test:  $t_p < 50$  ms
- To calculate maximum clamping voltage at another surge level, use the following formula:  
 $V_{CLmax} = V_{CL} - R_D \times (I_{PP} - I_{PPappli})$  where  $I_{PPappli}$  is the surge current in the application.
- To calculate  $V_{BR}$  or  $V_{CL}$  versus junction temperature, use the following formulas:  
 $V_{BR} @ T_J = V_{BR} @ 25^\circ C \times (1 + \alpha T \times (T_J - 25))$   
 $V_{CL} @ T_J = V_{CL} @ 25^\circ C \times (1 + \alpha T \times (T_J - 25))$
- Surge capability given for both directions for unidirectional and bidirectional types.

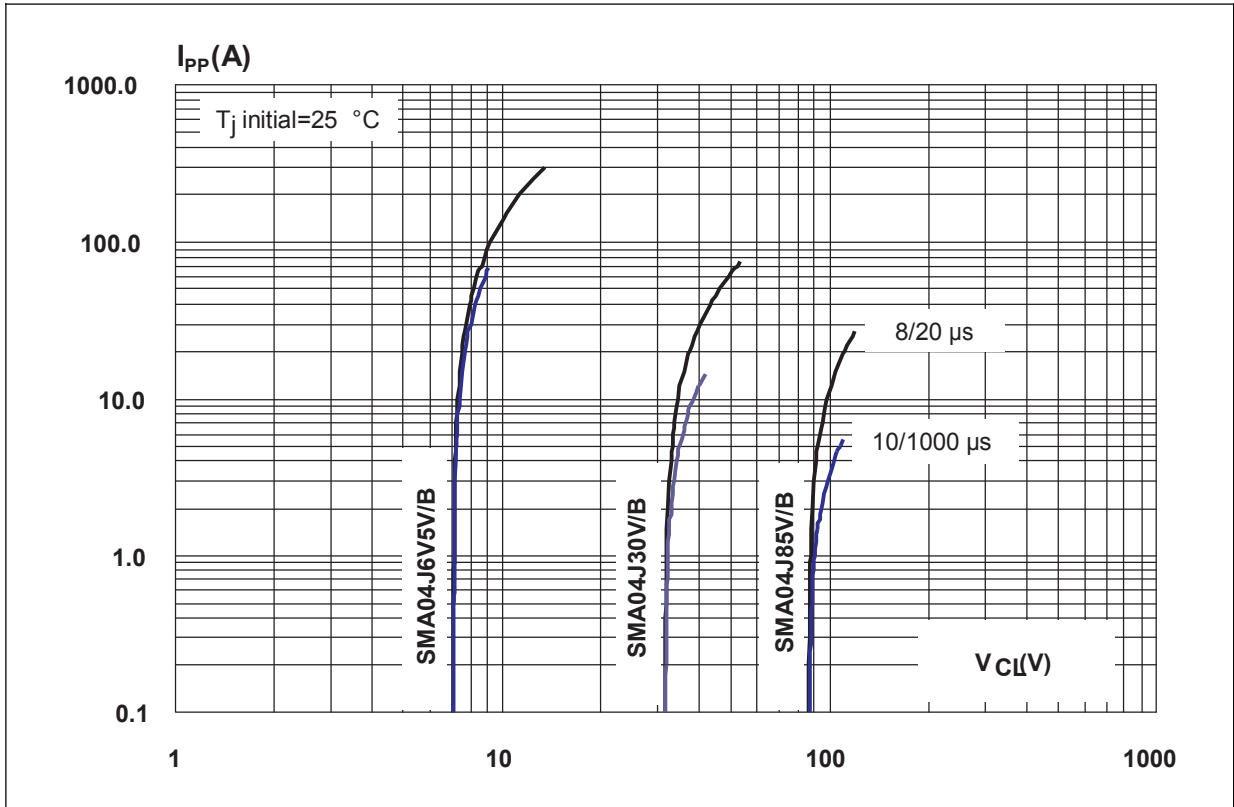
**Figure 3. Relative variation of peak power versus initial junction temperature**



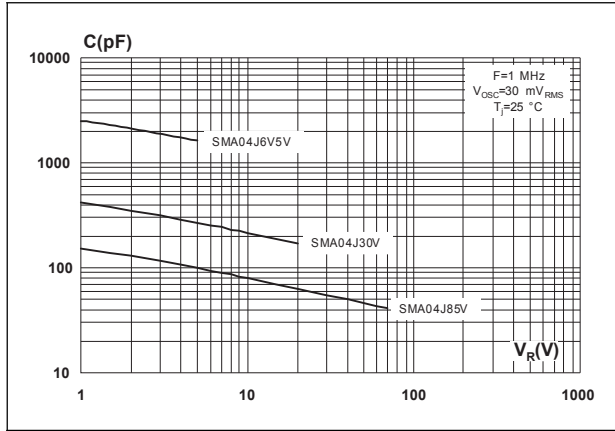
**Figure 4. Peak pulse power versus exponential pulse duration**



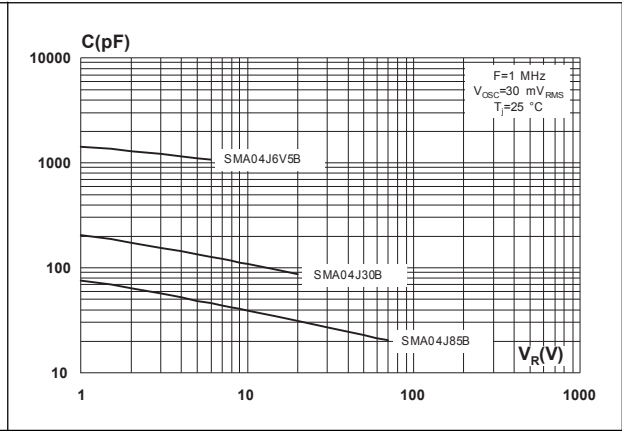
**Figure 5. Clamping voltage versus peak pulse current exponential waveform (maximum values)**



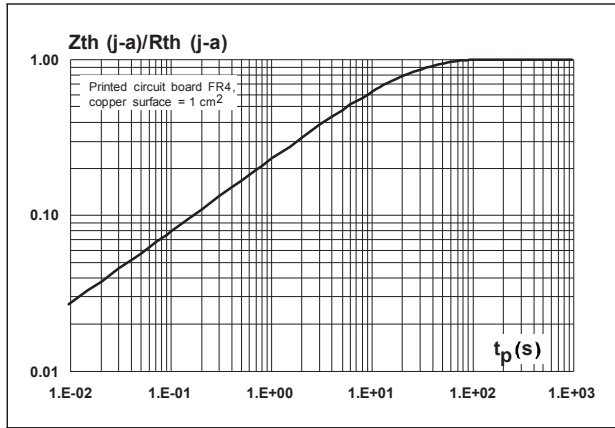
**Figure 6 . Junction capacitance versus reverse applied voltage for unidirectional types (typical values)**



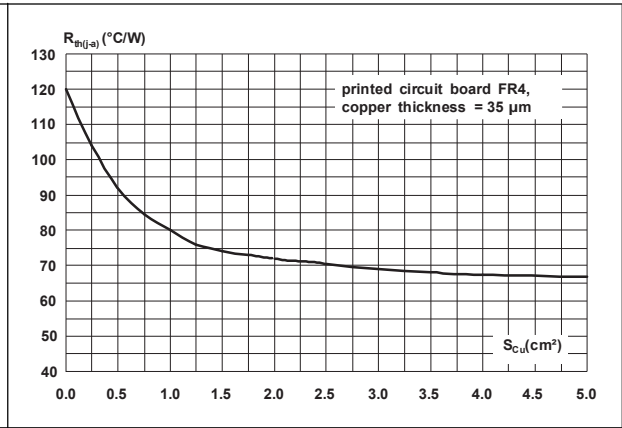
**Figure 7. Junction capacitance versus reverse applied voltage for bidirectional types (typical values)**



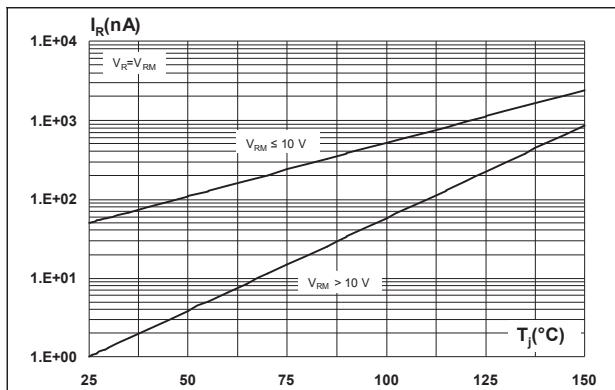
**Figure 8. Relative variation of thermal impedance, junction to ambient, versus pulse duration**



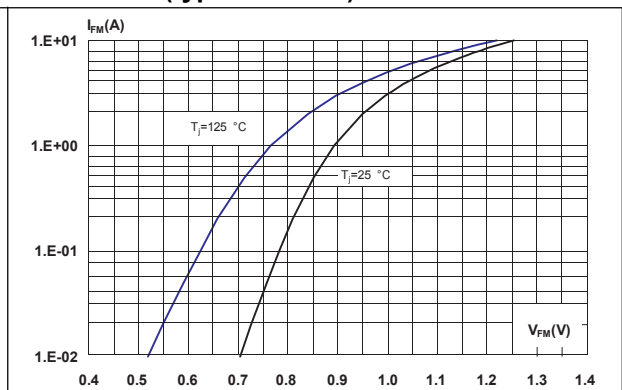
**Figure 9. Thermal resistance junction to ambient versus copper surface under each lead**



**Figure 10. Leakage current versus junction temperature (typical values)**



**Figure 11. Peak forward voltage drop versus peak forward current (typical values)**

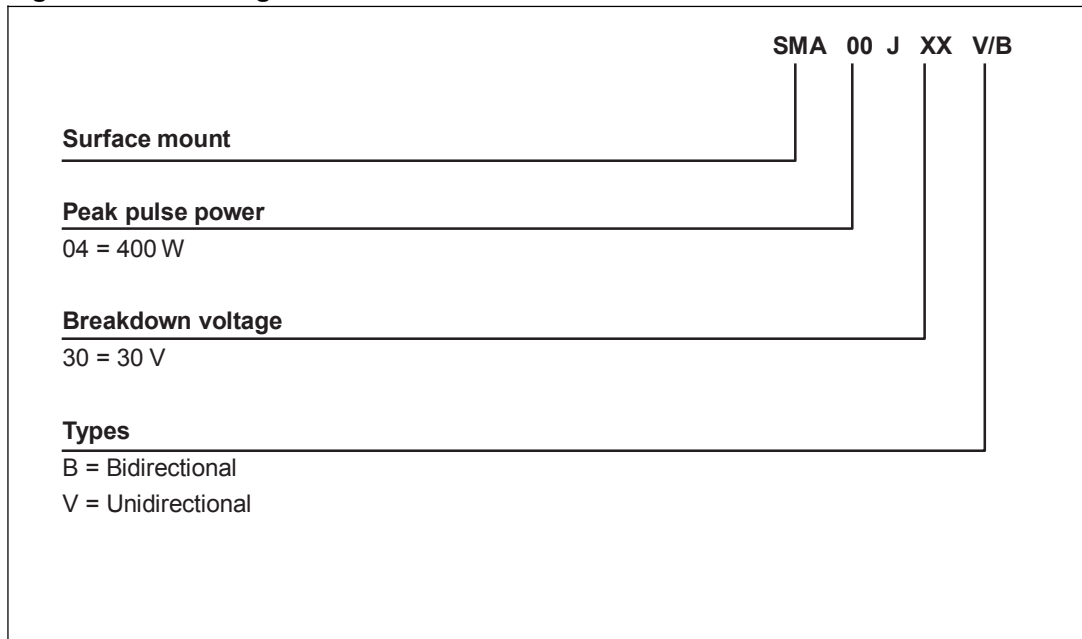


## 2 Application and design guidelines

More information is available in the ASIM Application note AN2689 “Protection of automotive electronics from electrical hazards, guidelines for design and component selection”.

## 3 Ordering information scheme

Figure 16. Ordering information scheme



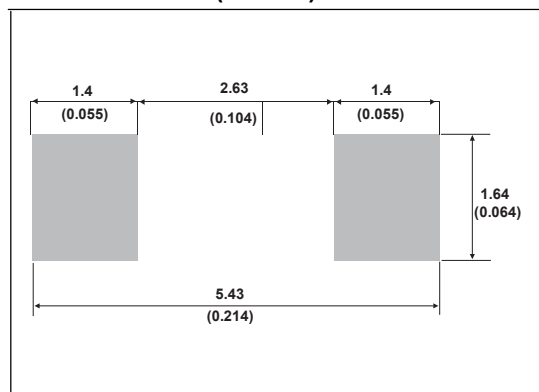
## 4 Packaging information

- Case: JEDEC DO-214AC molded plastic over planar junction
- Terminals: solder plated, solderable as per MIL-STD-750, Method 2026
- Polarity: for unidirectional types the band indicates cathode
- Flammability: epoxy meets UL 94, V0
- RoHS package

**Table 3. SMA dimensions**

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A1	1.90	2.45	0.075	0.094
A2	0.05	0.20	0.002	0.008
b	1.25	1.65	0.049	0.065
c	0.15	0.40	0.006	0.016
D	2.25	2.90	0.089	0.114
E	4.80	5.35	0.189	0.211
E1	3.95	4.60	0.156	0.181
L	0.75	1.50	0.030	0.059

**Figure 17. SMA footprint dimensions in mm (inches)**



1. Marking layout can vary according to assembly location.