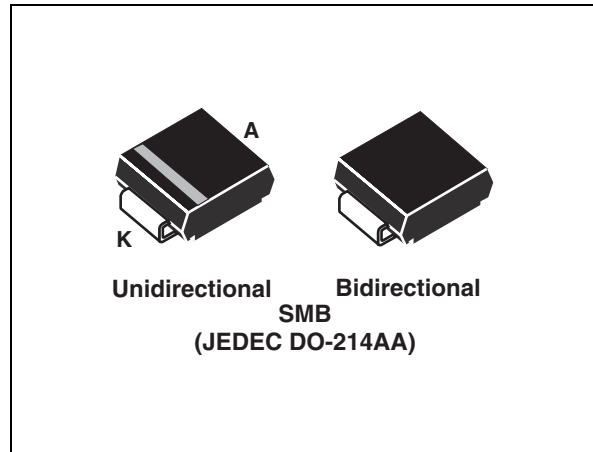


Automotive 600 W Transil™**Features**

- peak pulse power:
 - 600 W (10/1000 μ s)
 - 4 kW (8/20 μ s)
- stand-off voltage range: from 6.4 V to 58 V
- unidirectional and bidirectional types
- low leakage current:
 - 0.2 μ A at 25 °C
 - 1 μ A at 85 °C
- operating $T_{j\max}$: 150 °C
- high power capability at $T_{j\max}$:
 - 515 W (10/1000 μ s)
- JEDEC registered package outline
- resin meets UL 94, V0
- ECOPACK®2 compliant components
- AEC-Q101 qualified

Complies with the following standards

- IEC 61000-4-2 level 4:
 - 15 kV (air discharge)
 - 8 kV (contact discharge)
- ISO 10605, C = 330 pF, R = 330 Ω :
 - 15 kV (air discharge)
 - 8 kV (contact discharge)
- ISO 7637-2 (for pulse 1 and 2a, applicable only to parts with stand-off voltage (V_{RM}) lower than the average battery voltage: 13.5 V):
 - 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 SM6TY Transil series has been designed to protect sensitive automotive circuits against surges defined in ISO 7637-2 and against electrostatic discharges according to IEC 61000-4-2 and 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. SM6TY are packaged in SMB (SMB footprint in accordance with IPC 7531 standard).

TM: Transil is a trademark of STMicroelectronics

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 Ω)		
		Contact discharge	30	kV
		Air discharge	30	
		IEC 61000-4-2		
	Contact discharge	30		
	Air discharge	30		
P_{PP}	Peak pulse power dissipation ⁽¹⁾	T_j initial = T_{amb}	600	W
T_j	Operating junction temperature range		-55 to 150	
T_{stg}	Storage temperature range		-65 to 150	$^\circ\text{C}$
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.

Table 2. Thermal resistance

Symbol	Parameter	Value	Unit
$R_{th(j-l)}$	Junction to leads	20	$^\circ\text{C/W}$
$R_{th(j-a)}$	Junction to ambient on printed circuit on recommended pad layout	100	$^\circ\text{C/W}$

Figure 1. Electrical characteristics - definitions

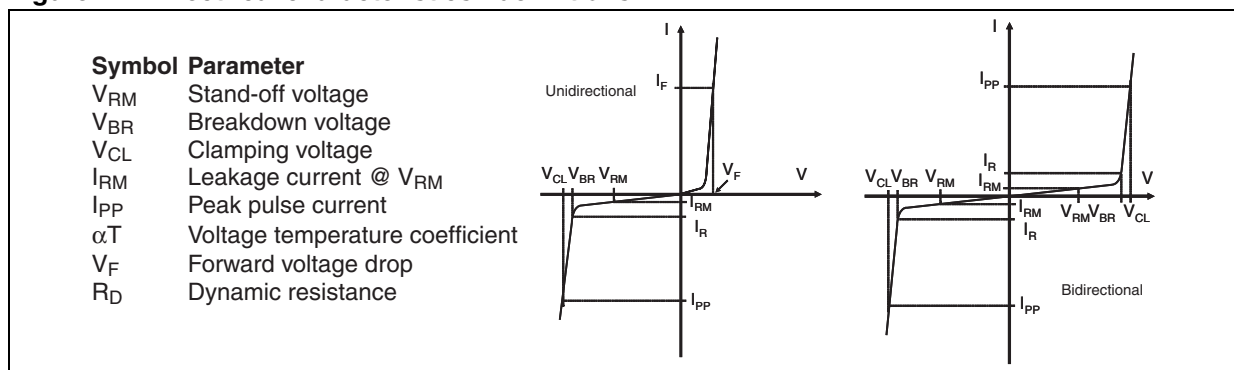


Figure 2. Pulse definition for electrical characteristics

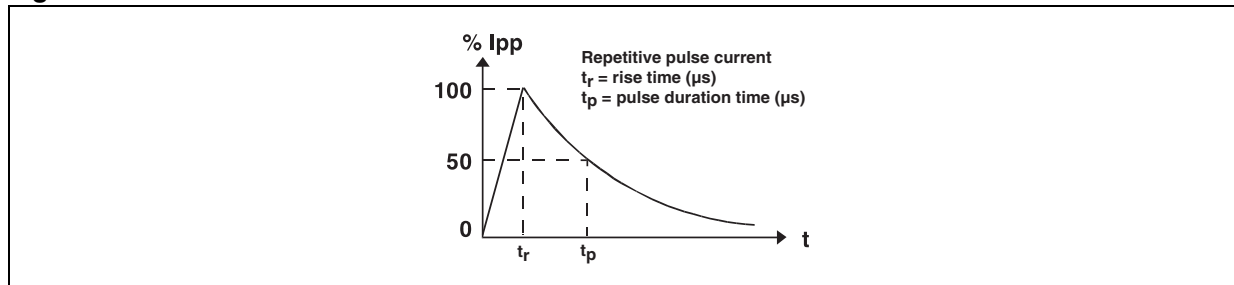


Table 3. Electrical characteristics, typical values unless otherwise stated ($T_{amb} = 25\text{ }^{\circ}\text{C}$)

Order code	$I_{RM} \text{ max}@V_{RM}$			$V_{BR} @I_R^{(1)}$			$V_{CL} @I_{PP}$ 10/1000 μs		$R_D^{(2)}$ 10/1000 μs	$V_{CL} @I_{PP}$ 8/20 μs		$R_D^{(2)}$ 8/20 μs	αT
	25 $^{\circ}\text{C}$	85 $^{\circ}\text{C}$		min.	typ.		max.			max.			max.
	μA		V	V		mA	V ⁽³⁾	A ⁽⁴⁾	Ω	V ⁽³⁾	A ⁽⁴⁾	Ω	10-4/ $^{\circ}\text{C}$
SM6T7V5AY	20	50	6.4	7.13	7.5	10	11.3	53	0.065	14.5	276	0.024	6.1
SM6T18AY/CAY	0.2	1	15.3	17.1	18	1	25.2	24	0.263	32.5	123	0.111	8.8
SM6T22AY/CAY	0.2	1	18.8	20.9	22	1	30.6	20	0.375	39.3	102	0.159	9.2
SM6T24AY/CAY	0.2	1	20.5	22.8	24	1	33.2	18	0.444	42.8	93	0.189	9.4
SM6T27AY/CAY	0.2	1	23.1	25.7	27	1	37.5	16	0.569	48.3	83	0.240	9.6
SM6T30AY/CAY	0.2	1	25.6	28.5	30	1	41.5	14.5	0.690	53.5	75	0.293	9.7
SM6T33AY/CAY	0.2	1	28.2	31.4	33	1	45.7	13.1	0.840	59.0	68	0.357	9.8
SM6T36AY/CAY	0.2	1	30.8	34.2	36	1	49.9	12	1.01	64.3	62	0.427	9.9
SM6T39AY/CAY	0.2	1	33.3	37.1	39	1	53.9	11.1	1.16	69.7	57	0.504	10.0
SM6T42CAY	0.2	1	36	40	42.1	1	58.1	10.3	1.35	76	52	0.611	10.0
SM6T47AY/CAY	0.2	1	40	44.4	46.7	1	64.5	9.7	1.59	84	48	0.728	10.1
SM6T68AY/CAY	0.2	1	58.1	64.6	68	1	92	6.5	3.17	121	33	1.503	10.4

1. Pulse test : $t_p < 50\text{ ms}$
2. 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.
3. To calculate V_{BR} or V_{CL} versus junction temperature, use the following formulas:
 $V_{BR} @ T_J = V_{BR} @ 25^{\circ}\text{C} \times (1 + \alpha T \times (T_J - 25))$
 $V_{CL} @ T_J = V_{CL} @ 25^{\circ}\text{C} \times (1 + \alpha T \times (T_J - 25))$
4. Surge capability given for both directions for unidirectional and bidirectional types.

Figure 3. Peak power dissipation versus initial junction temperature (typical values)

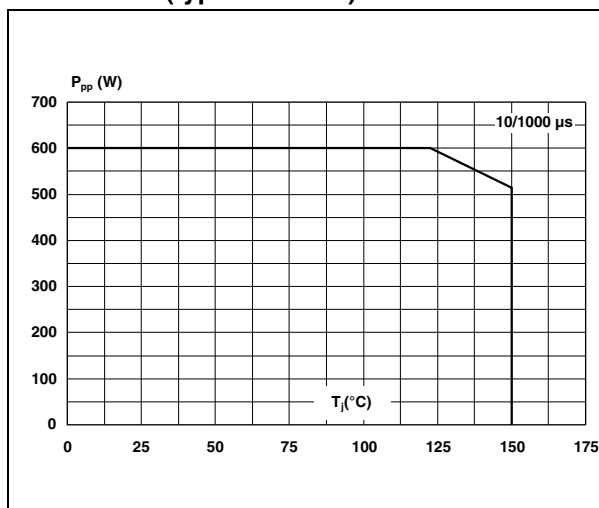


Figure 4. Peak pulse power versus exponential pulse duration

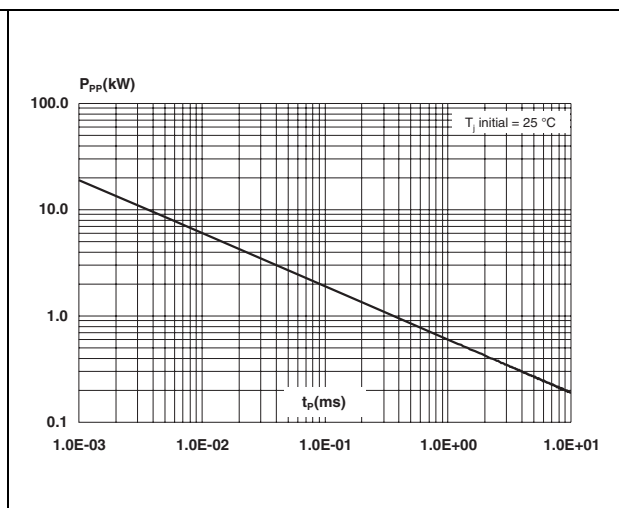


Figure 5. Clamping voltage versus peak pulse current exponential waveform (maximum values)

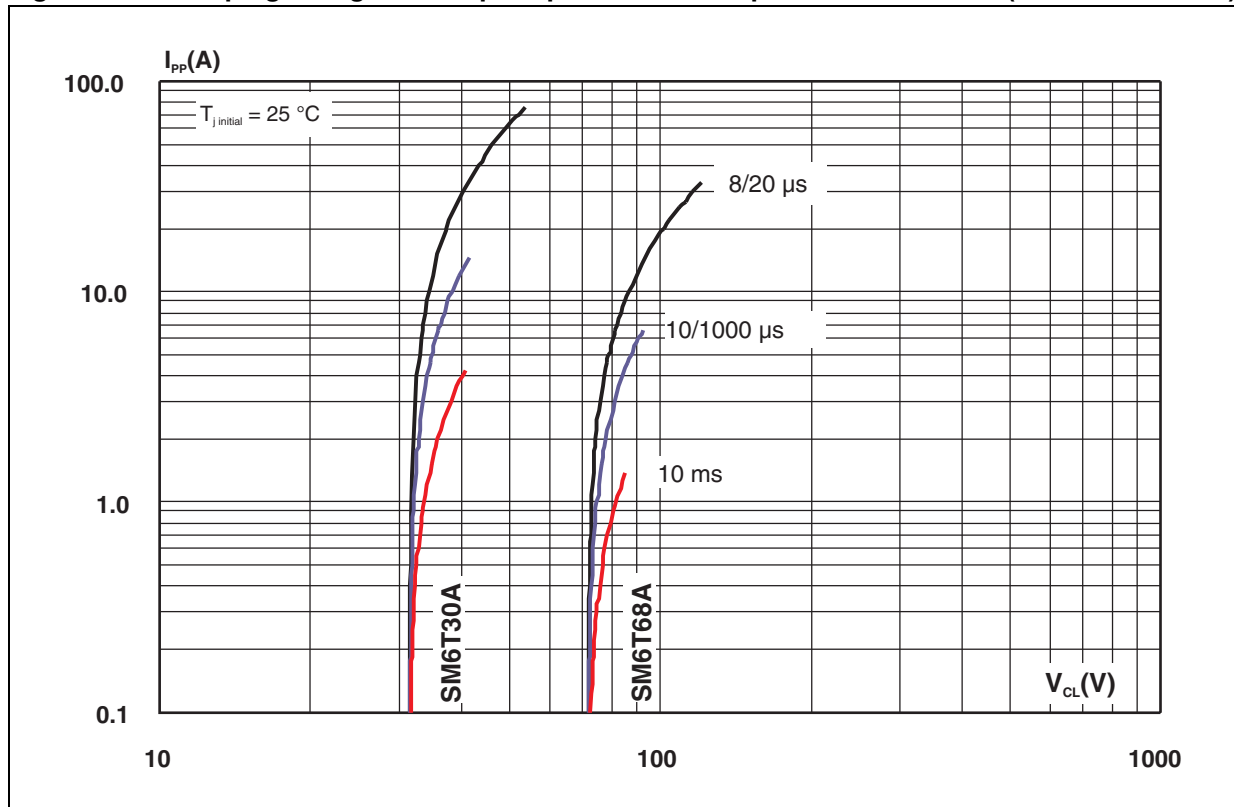


Figure 6. ISO 7637-2 pulse 1 response ($V_S = -100$ V)

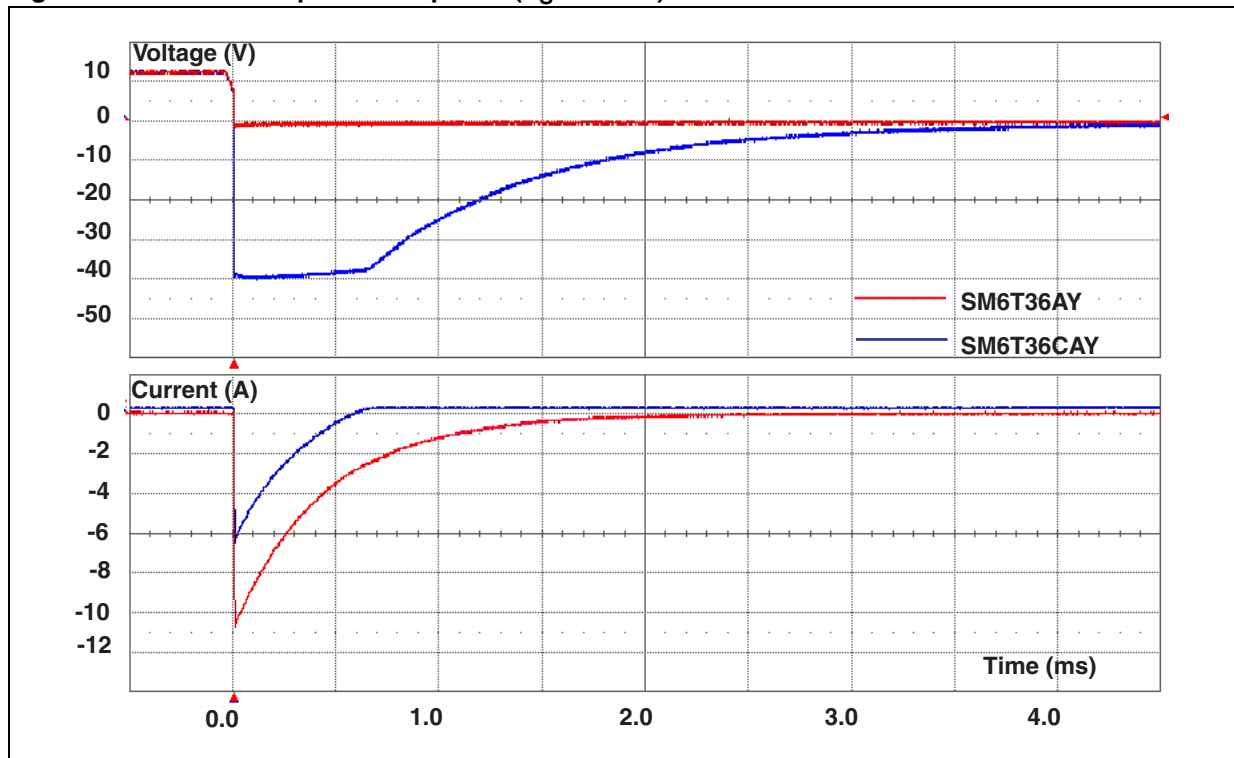


Figure 7. ISO 7637-2 pulse 2a response ($V_S = 50\text{ V}$)

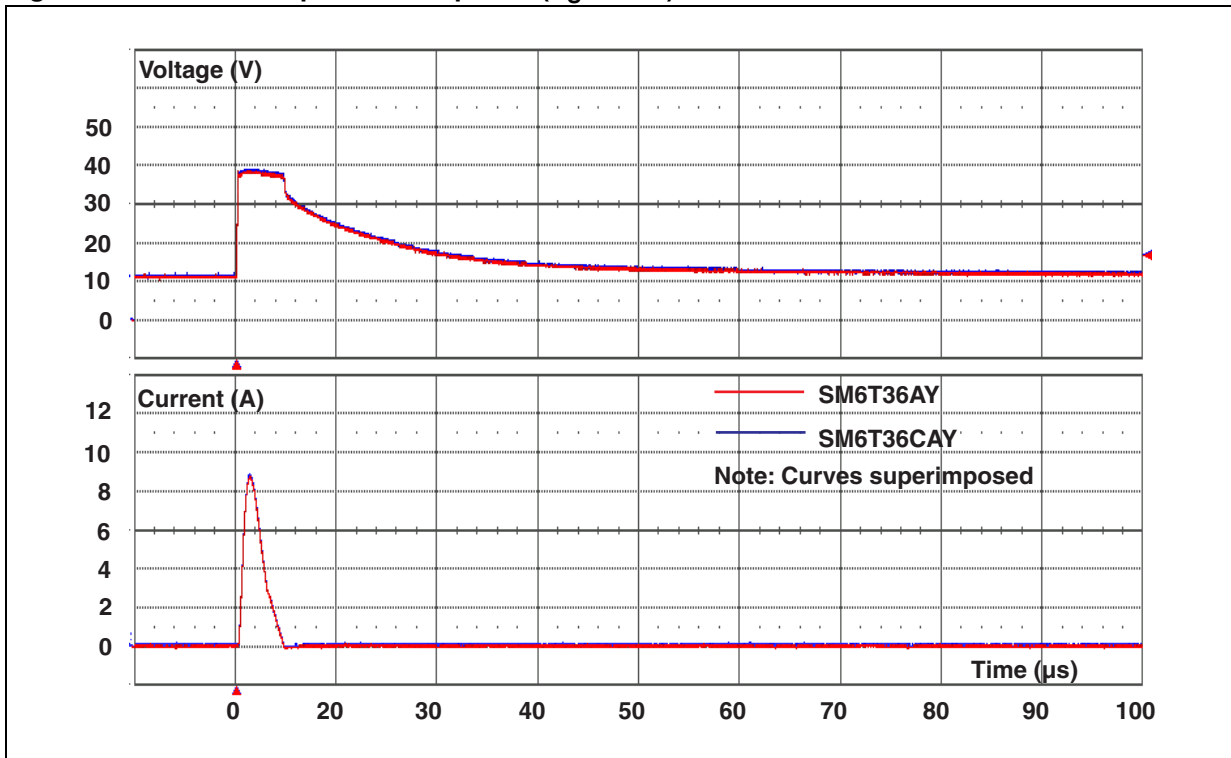


Figure 8. ISO 7637-2 pulse 3a response ($V_S = -150\text{ V}$)

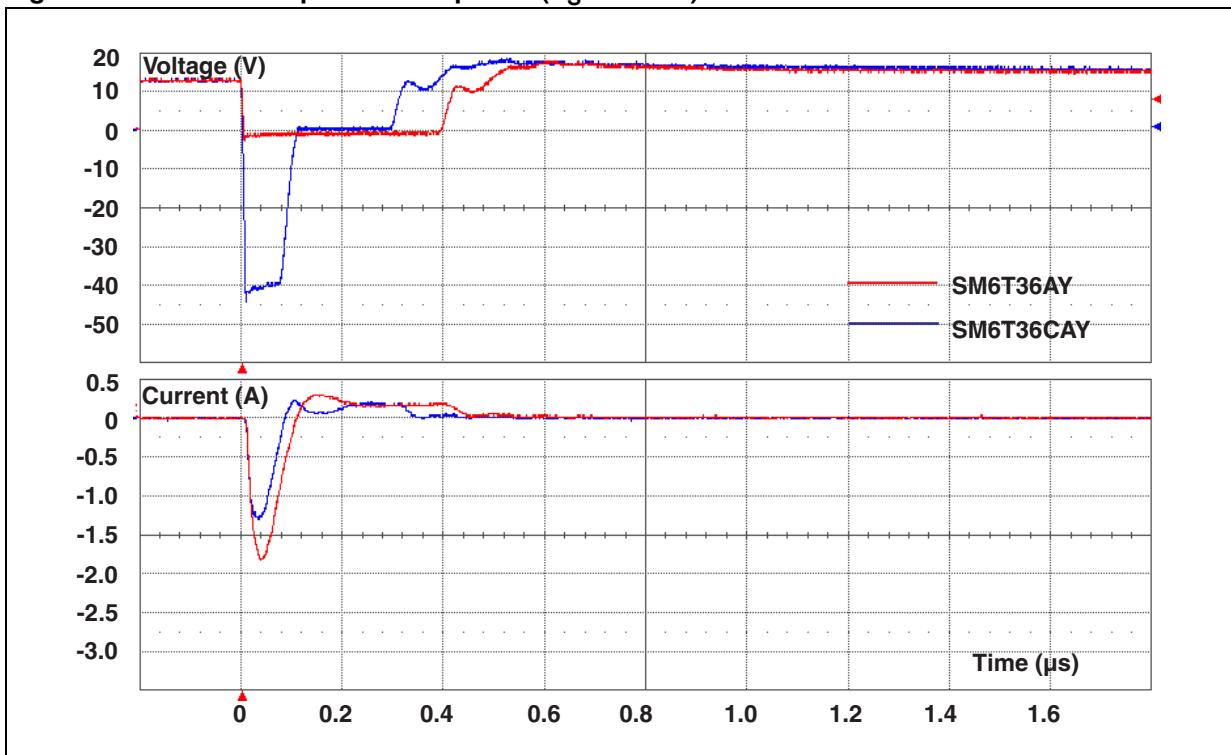
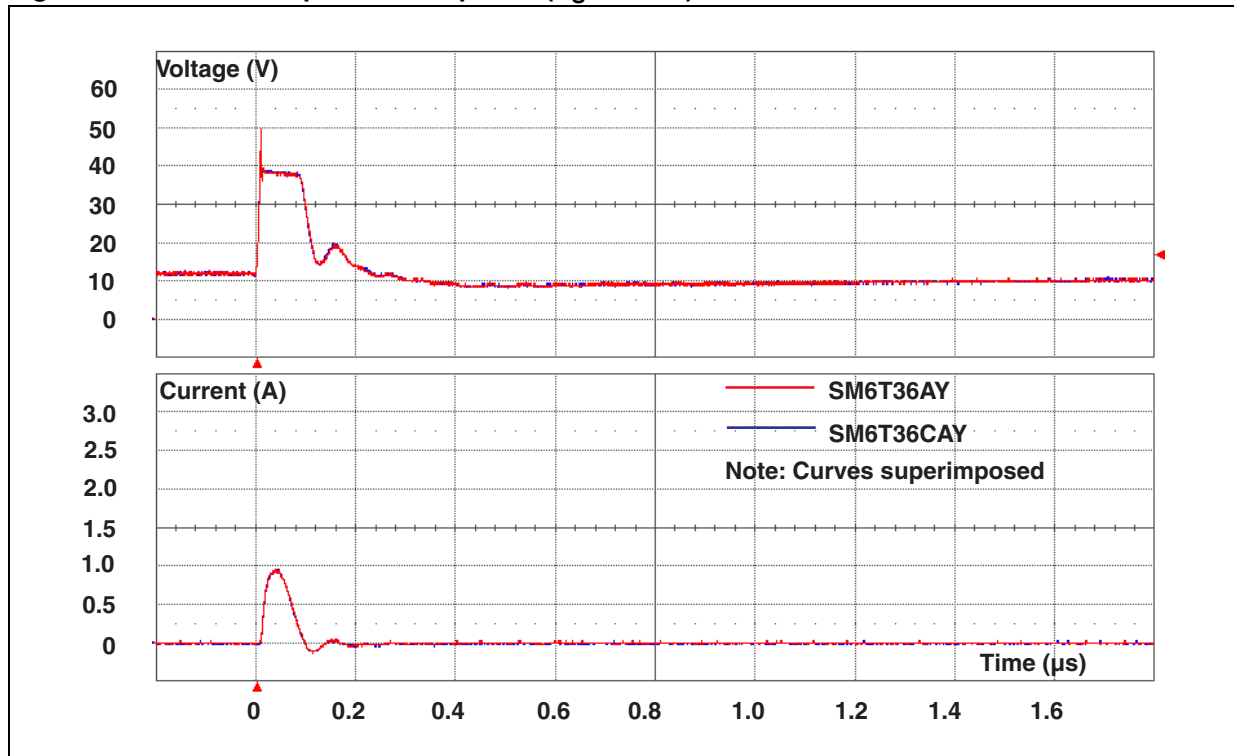


Figure 9. ISO 7637-2 pulse 3b response ($V_S = 100\text{ V}$)



Note: ISO7637-2 pulses responses are not applicable for products with a stand off voltage lower than the average battery voltage (13.5 V).

Figure 10. Junction capacitance versus reverse applied voltage for unidirectional types (typical values)

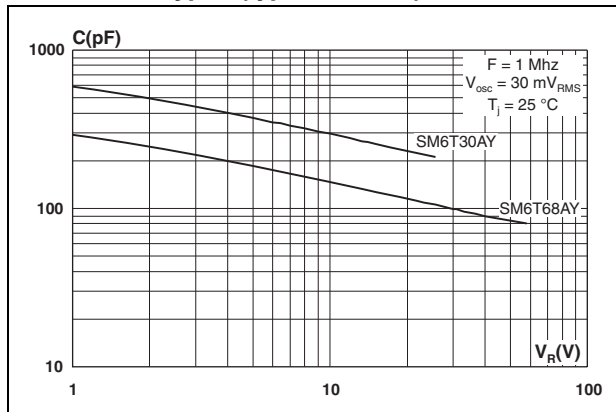


Figure 11. Junction capacitance versus reverse applied voltage for bidirectional types (typical values)

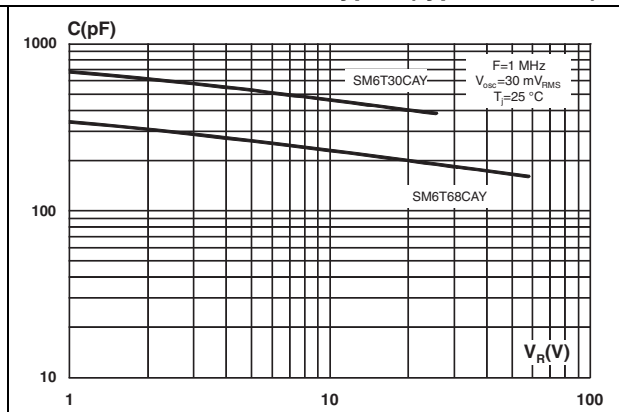


Figure 12. Relative variation of thermal impedance, junction to ambient, versus pulse duration

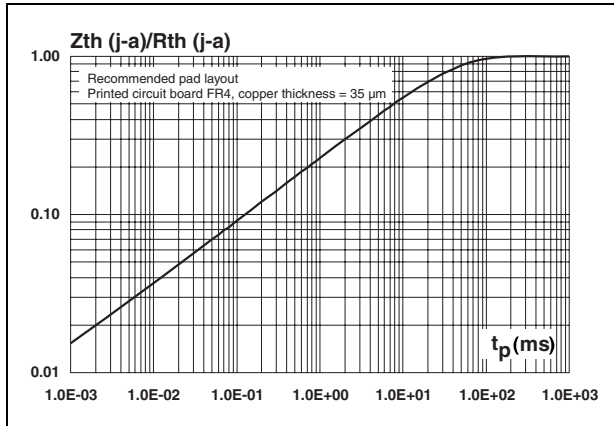


Figure 13. Thermal resistance junction to ambient versus copper surface under each lead

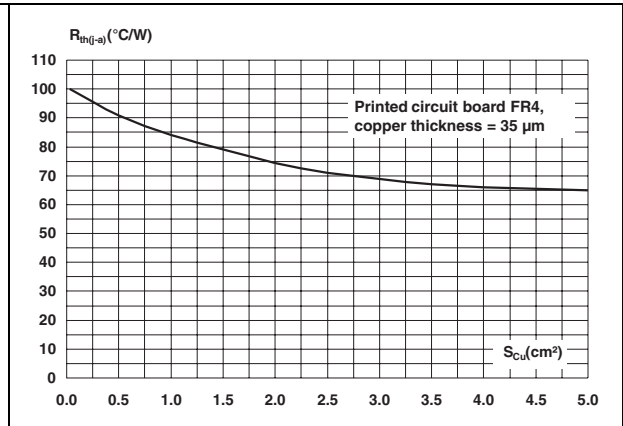


Figure 14. Leakage current versus junction temperature (typical values)

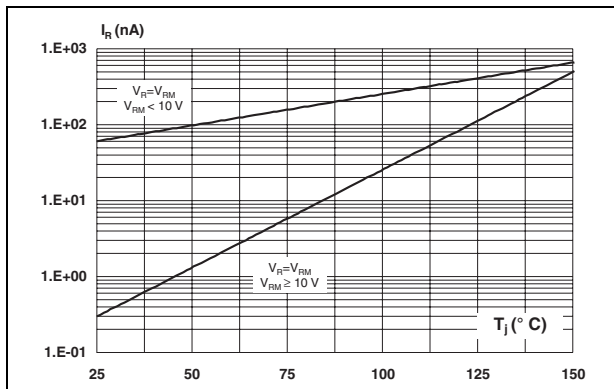
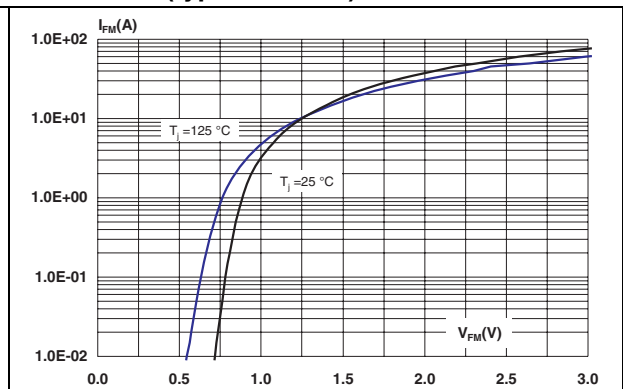


Figure 15. Peak forward voltage drop versus peak forward current (typical values)

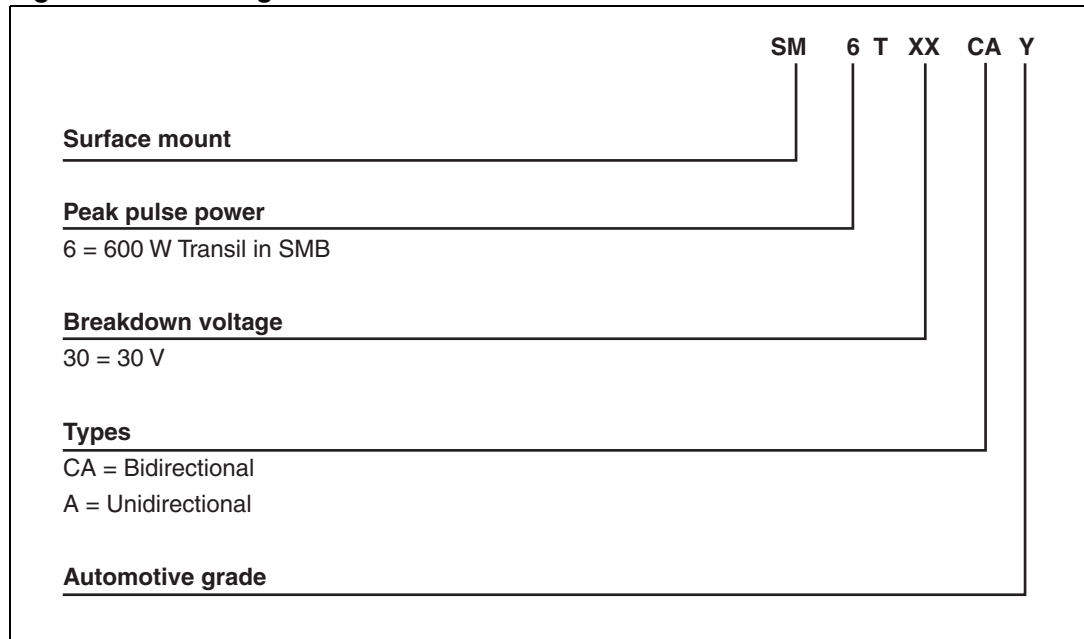


2 Application and design guidelines

More information is available in the ST 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

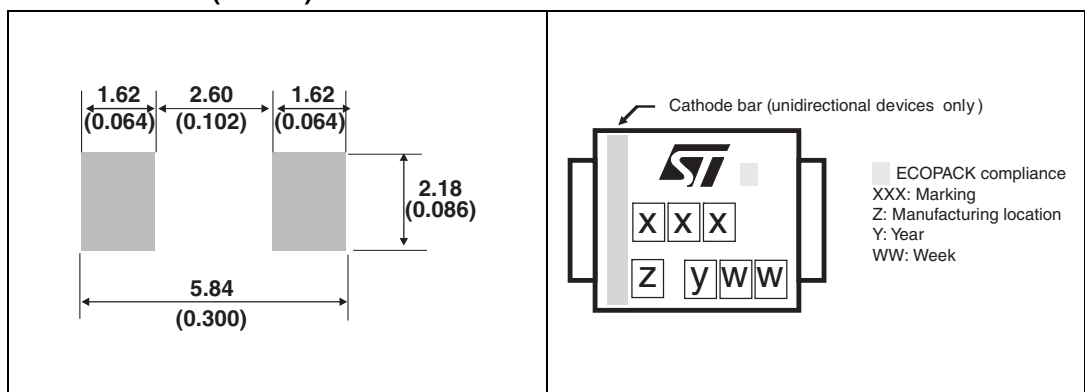
- Case: JEDEC DO-214AA molded plastic over planar junction
- Terminals: solder plated, solderable as per MIL-STD-750, Method 2026
- Polarity: for unidirectional types the band indicates cathode
- Flammability: epoxy meets UL 94, V0
- RoHS package

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK® is an ST trademark.

Table 4. SMB dimensions

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A1	1.90	2.45	0.075	0.096
A2	0.05	0.20	0.002	0.008
b	1.95	2.20	0.077	0.087
c	0.15	0.40	0.006	0.016
D	3.30	3.95	0.130	0.156
E	5.10	5.60	0.201	0.220
E1	4.05	4.60	0.159	0.181
L	0.75	1.50	0.030	0.059

Figure 17. SMB footprint dimensions in mm (inches) **Figure 18. Marking layout⁽¹⁾**



1. Marking layout can vary according to assembly location.

Table 5. Marking

Order code	Marking	Order code	Marking
SM6T7V5AY	DGY		
SM6T18AY	EEY	SM6T18CAY	MEY
SM6T22AY	EKY	SM6T22CAY	MKY
SM6T24AY	EMY	SM6T24CAY	MMY
SM6T27AY	EPY	SM6T27CAY	MPY
SM6T30AY	ERY	SM6T30CAY	MRY
SM6T33AY	ETY	SM6T33CAY	MTY
SM6T36AY	EVY	SM6T36CAY	MVY
SM6T39AY	EXY	SM6T39CAY	MXY
		SM6T42CAY	NAY
SM6T47AY	FAY	SM6T47CAY	NBY
SM6T68AY	FQY	SM6T68CAY	NQY

5 Ordering information

Table 6. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
SM6TxxxAy/CAy ⁽¹⁾	See Table 5 on page 10	SMB	0.11 g	2500	Tape and reel

1. Where xxx is nominal value of V_{BR} and A or CA indicates unidirectional or bidirectional version. See [Table 3](#) for list of available devices and their order codes

6 Revision history

Table 7. Document revision history

Date	Revision	Changes
15-Sep-2010	1	Initial release.

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