

1 Characteristics

Table 1. Absolute maximum ratings

Symbol	Parameters			Value	Unit
I _{T(RMS)}	RMS on-state current (full sine wave)	SOT-223	T _{tab} = 90 °C	1	A
		TO-92	T _L = 50 °C		
		SMBflat-3L	T _{tab} = 107 °C		
I _{TSM}	Non repetitive surge peak on-state current (full cycle, T _j initial = 25 °C)	F = 50 Hz	t _p = 20 ms	8	A
		F = 60 Hz	t _p = 16.7 ms	8.5	
I ² t	I ² t value for fusing	t _p = 10 ms		0.35	A ² s
di/dt	Critical rate of rise of on-state current I _G = 2 x I _{GT} , t _r ≤ 100 ns	F = 120 Hz	T _j = 125 °C	20	A/μs
I _{GM}	Peak gate current	t _p = 20 μs	T _j = 125 °C	1	A
P _{G(AV)}	Average gate power dissipation		T _j = 125 °C	1	W
T _{stg}	Storage junction temperature range			-40 to +150	°C
T _j	Operating junction temperature range			-40 to +125	°C

Table 2. Electrical characteristics ($T_j = 25\text{ °C}$, unless otherwise specified)

Symbol	Parameters	Quadrant		Value				Unit
				Z01				
				03	07	09	10	
I _{GT} ⁽¹⁾	V _D = 12 V, R _L = 30 Ω	I - II - III	Max.	3	5	10	25	mA
		IV		5	7	10	25	
V _{GT}		All	Max.	1.3				V
V _{GD}	V _D = V _{DRM} , R _L = 3.3 kΩ, T _j = 125 °C	All	Min.	0.2				V
I _H ⁽²⁾	I _T = 50 mA		Max.	7	10	10	25	mA
I _L	I _G = 1.2 I _{GT}	I - III - IV	Max.	7	10	15	25	mA
		II	Max.	15	20	25	50	
dV/dt ⁽²⁾	V _D = 67 % V _{DRM} gate open, T _j = 110 °C		Min.	10	20	50	100	V/μs
(dV/dt) _c ⁽²⁾	(dI/dt) _c = 0.44 A/ms, T _j = 110 °C		Min.	0.5	1	2	5	V/μs

1. Minimum I_{GT} is guaranteed at 5 % of I_{GT} max.

2. For both polarities of A2 referenced to A1

Table 3. Static electrical characteristics

Symbol	Test conditions	T_j		Value	Unit
$V_T^{(1)}$	$I_{TM} = 1.4 \text{ A}$, $t_p = 380 \mu\text{s}$	25 °C	Max.	1.60	V
$V_{TO}^{(1)}$	Threshold on-state voltage	125 °C	Max.	0.95	V
R_d	Dynamic resistance	125 °C	Max.	400	mΩ
I_{DRM} I_{RRM}	$V_{DRM} = V_{RRM}$	25 °C	Max.	5	μA
		125 °C		0.5	mA

1. For both polarities of A2 referenced to A1

Table 4. Thermal resistance

Symbol	Parameters		Max. value	Unit
$R_{th(j-t)}$	Max. junction to tab (AC)	SOT-223	25	°C/W
		SMBflat-3L	14	
$R_{th(j-l)}$	Max. junction to lead (AC)	TO-92	60	
$R_{th(j-a)}$	Junction to ambient ($S^{(1)} = 5 \text{ cm}^2$)	SOT-223	60	
		SMBflat-3L	75	
	Junction to ambient	TO-92	150	

1. Copper surface under tab.

1.1 Characteristics (curves)

Figure 1. Maximum power dissipation versus on-state RMS current (full cycle)

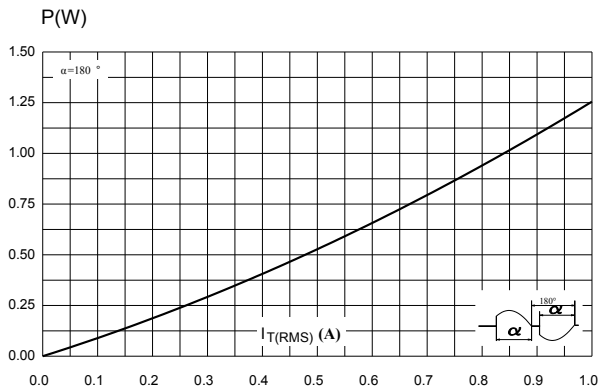


Figure 2. RMS on-state current versus lead (TO-92) or tab (SOT-223, SMBflat-3L) temperature (full cycle)

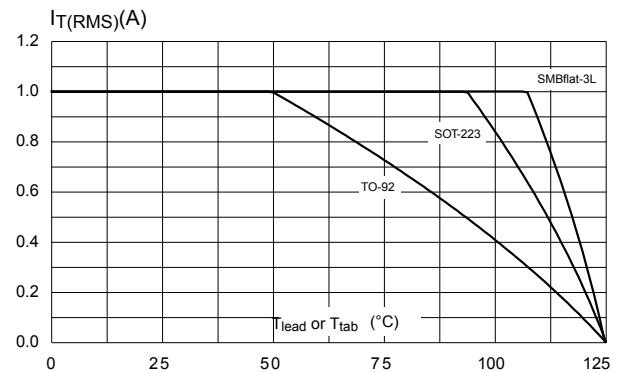


Figure 3. On-state rms current versus ambient temperature (free air convection full cycle)

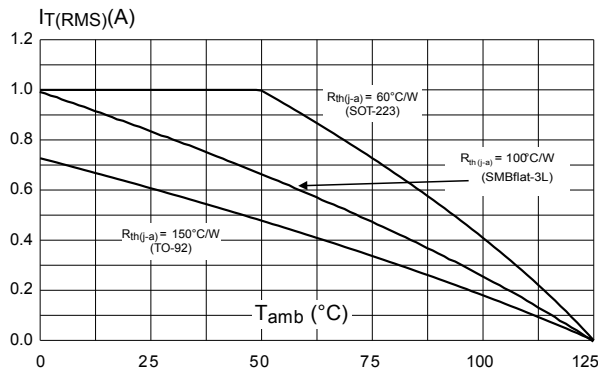


Figure 4. Relative variation of thermal impedance versus pulse duration ($Z_{th(j-a)}$)

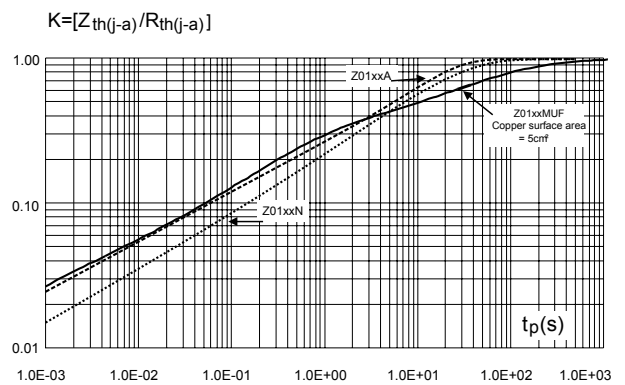


Figure 5. Relative variation of holding current and latching current versus junction temperature (typ. values)

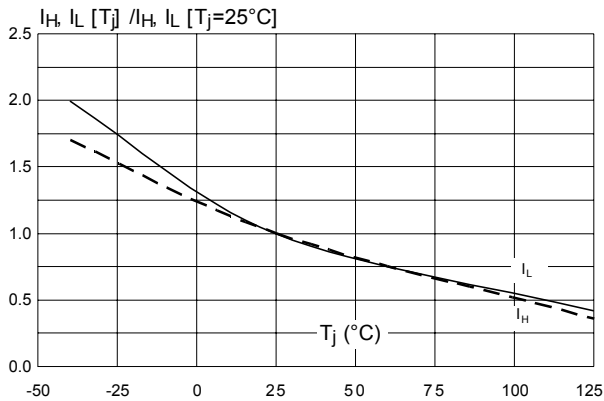


Figure 6. Relative variation of gate trigger current (I_{GT}) and voltage (V_{GT}) versus junction temperature

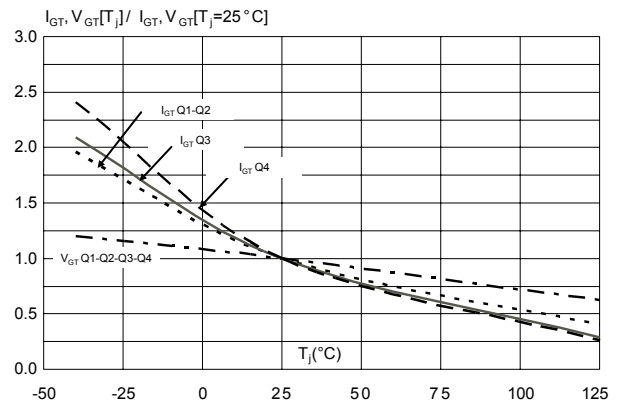


Figure 7. Surge peak on-state current versus number of cycles

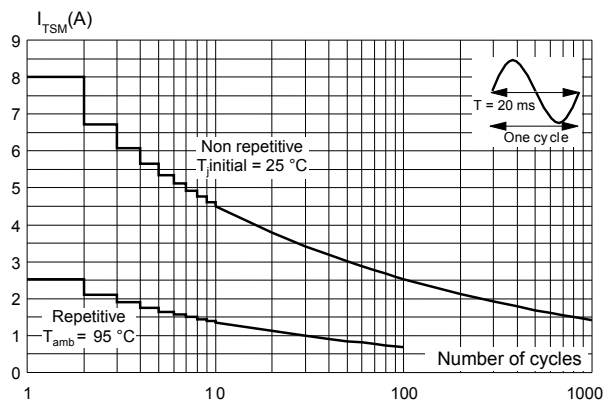


Figure 8. Non-repetitive surge peak on-state current and corresponding value of I^2t sinusoidal pulse width

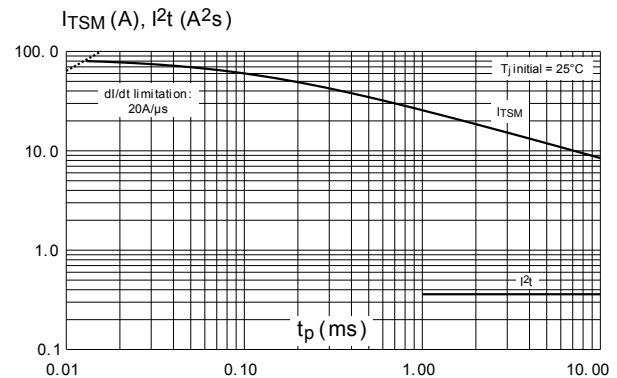


Figure 9. On-state characteristics (maximum values) ($I_{TM} = f(V_{TM})$)

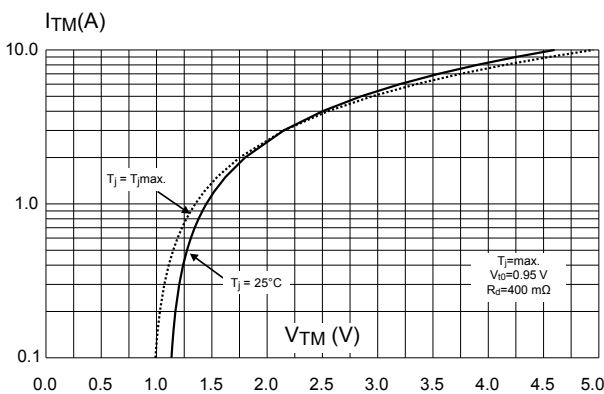


Figure 10. Relative variation of critical rate of decrease of main current (dI/dt) versus junction temperature

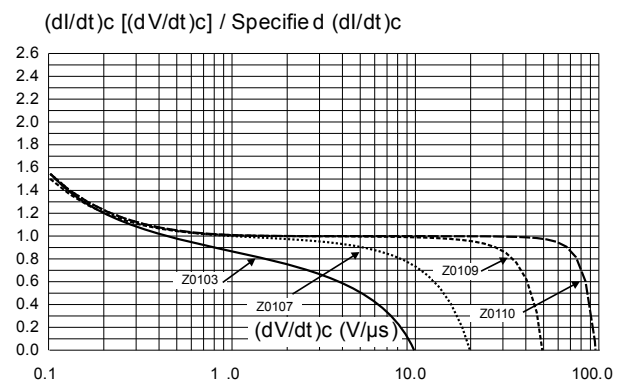


Figure 11. Relative variation of critical rate of decrease of main current (dl/dt)_c versus junction temperature

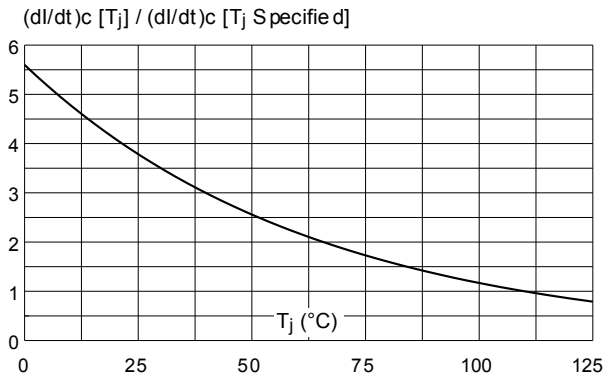


Figure 12. SOT-223 and SMBflat-3L thermal resistance junction to ambient versus copper surface under case

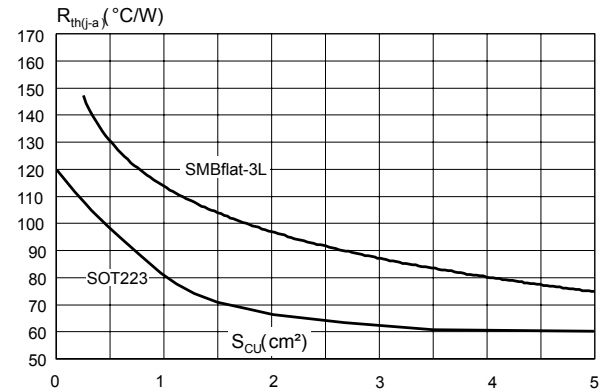
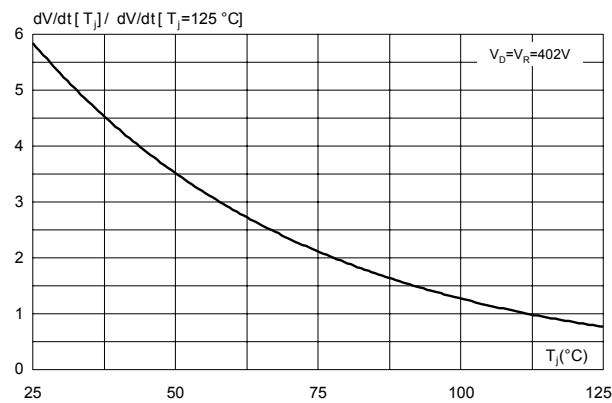


Figure 13. Relative variation of static dV/dt immunity versus junction temperature (gate open)



2 Package information

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.

2.1 SOT-223 package information

- Epoxy meets UL94, V0
- Lead free plating + halogen-free molding resin

Figure 14. SOT-223 package outline

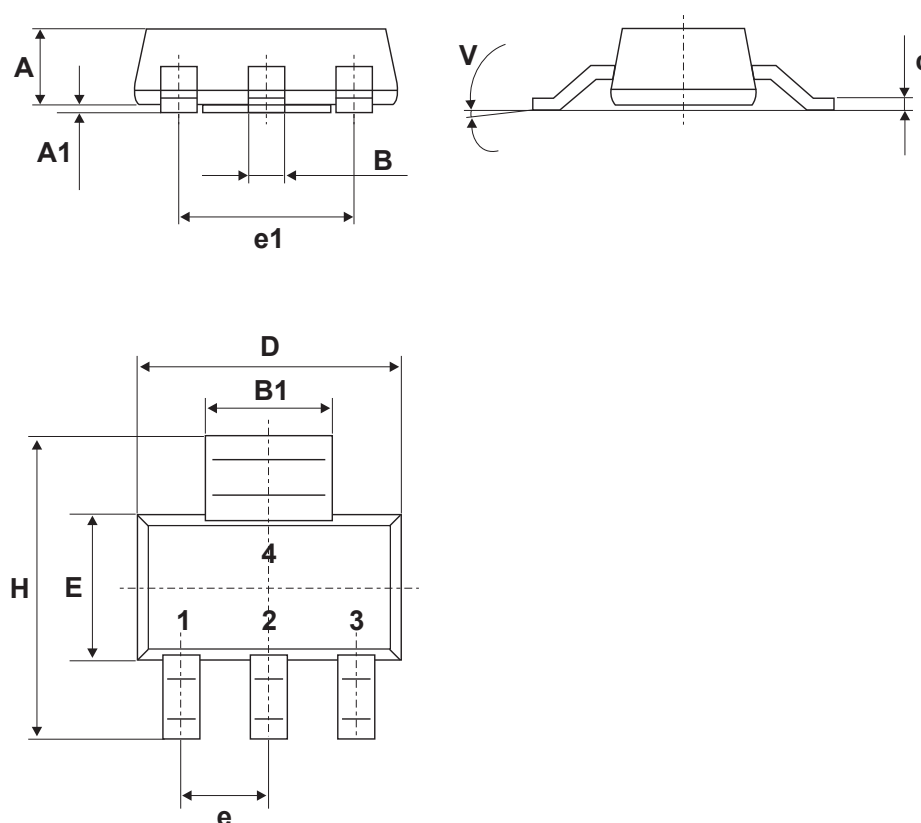
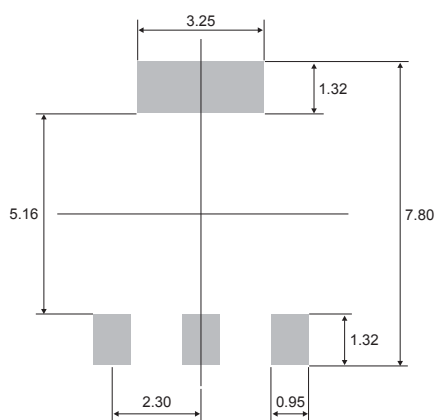


Table 5. SOT-223 package mechanical data

Ref.	Dimensions					
	Millimeters			Inches ⁽¹⁾		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.80			0.0709
A1		0.02	0.10		0.0008	0.0039
B	0.60	0.70	0.85	0.024	0.0276	0.0335
B1	2.90	3.00	3.15	0.114	0.1181	0.1240
c	0.24	0.26	0.35	0.009	0.0102	0.0138
D	6.30	6.50	6.70	0.248	0.2559	0.2638
e		2.3			0.0906	
e1		4.6			0.1811	
E	3.30	3.50	3.70	0.130	0.1378	0.1457
H	6.70	7.00	7.30	0.264	0.2756	0.2874
V	10° max.					

1. Inches only for reference

Figure 15. SOT-223 footprint (dimensions in mm)


2.2 TO-92 package information

- Epoxy meets UL94, V0
- Lead free plating + halogen-free molding resin

Figure 16. TO-92 package outline

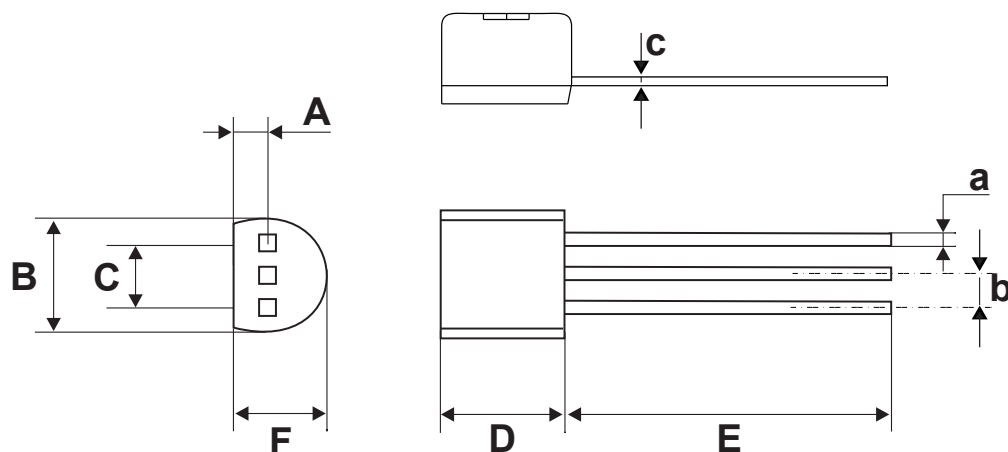


Table 6. TO-92 package mechanical data

Ref.	Dimensions					
	Millimeters			Inches ⁽¹⁾		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A		1.35			0.0531	
B			4.70			0.1850
C		2.54			0.1000	
D	4.40			0.1732		
E	12.70			0.5000		
F			3.70			0.1457
a			0.50			0.0197
b		1.27			0.500	
c			0.48			0.0189

1. Inches dimensions given for information

2.3 SMBflat-3L package information

- Epoxy meets UL94, V0
- Lead-free package

Figure 17. SMBflat-3L package outline

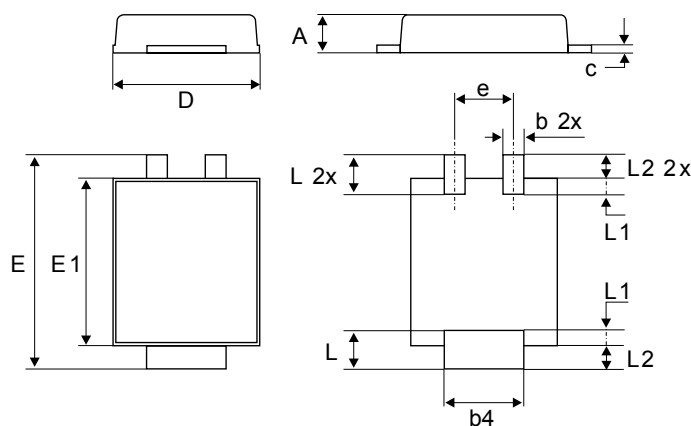


Table 7. SMBflat-3L mechanical data

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.90		1.10	0.035		0.044
b	0.35		0.65	0.014		0.026
b4	1.95		2.20	0.070		0.087
c	0.15		0.40	0.005		0.016
D	3.30		3.95	0.129		0.156
E	5.10		5.60	0.200		0.221
E1	4.05		4.60	0.159		0.182
L	0.75		1.50	0.029		0.060
L1		0.40			0.016	
L2		0.60			0.024	
e		1.60			0.063	

Figure 18. Footprint recommendations, dimensions in mm (inches)

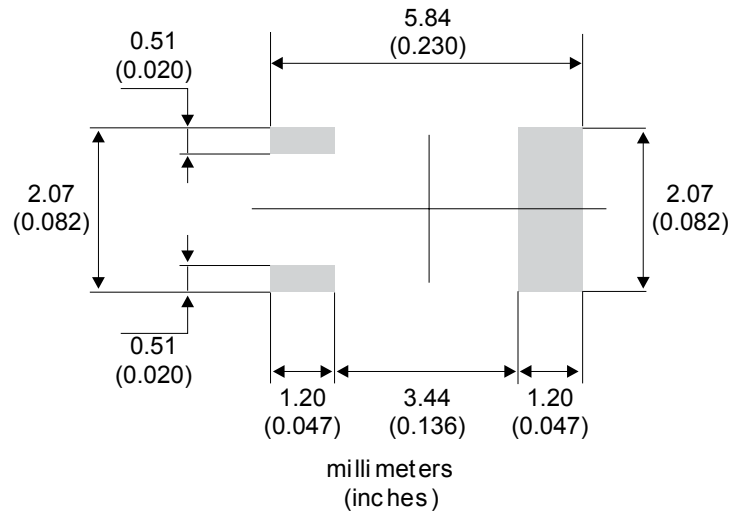
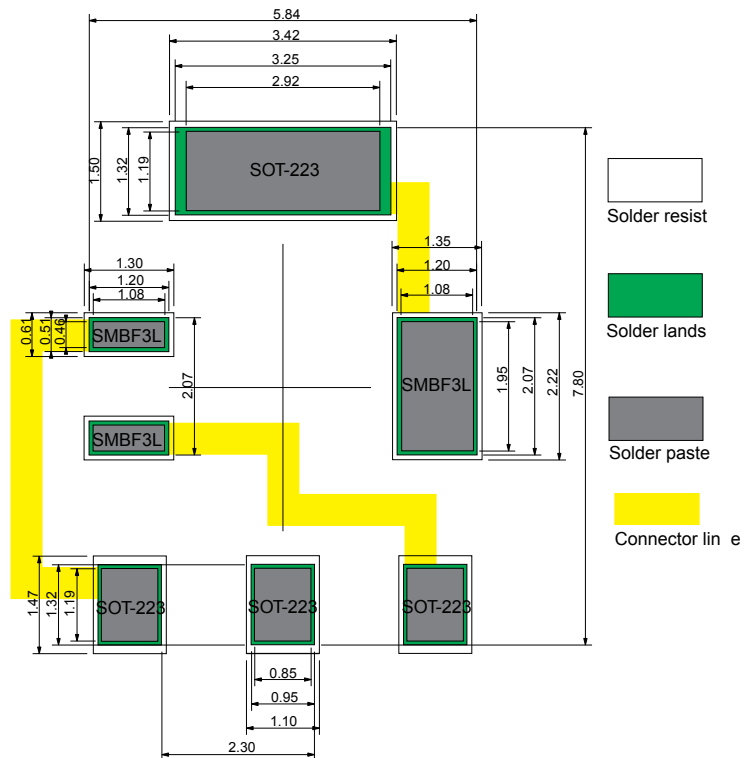
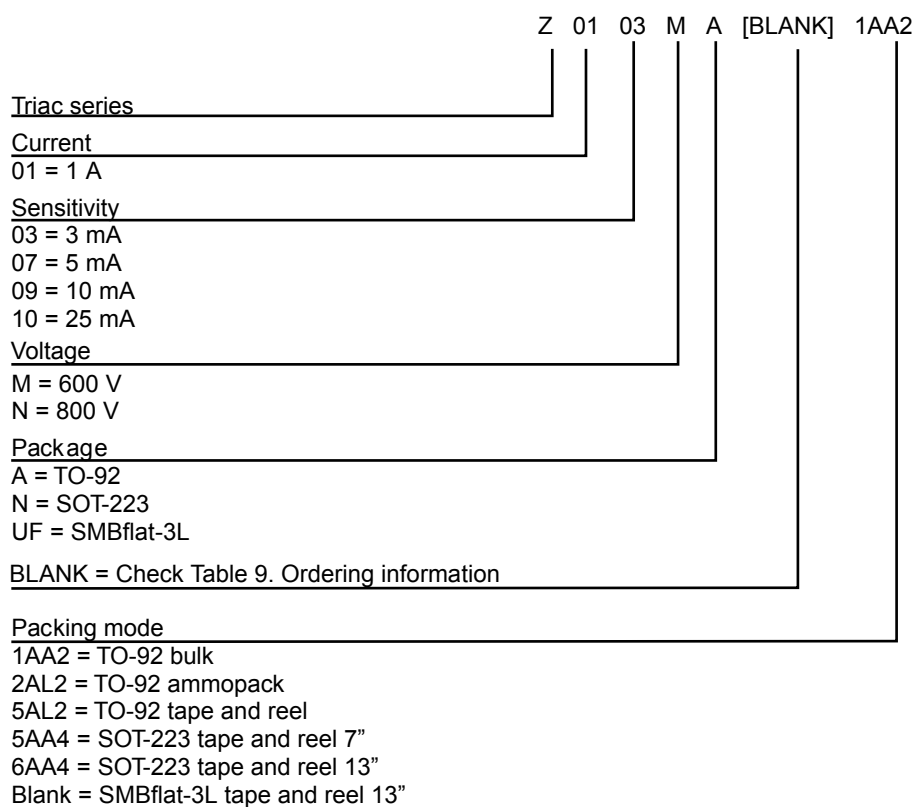


Figure 19. Footprint and connectors for SOT-223 or SMBflat-3L (dimensions in mm)



3 Ordering information

Figure 20. Ordering information scheme



3.1 Product selector

Table 8. Product selector

Part Number		Sensitivity	Type	Package
600	800			
Z0103MA	Z0103NA	3 mA	Standard	TO-92
Z0103MN	Z0103NN			SOT-223
Z0107MA	Z0107NA	5 mA		TO-92
Z0107MN	Z0107NN			SOT-223
Z0109MA	Z0109NA	10 mA		TO-92
Z0109MN	Z0109NN			SOT-223
Z0110MA	Z0110NA	25 mA		TO-92
Z0110MN	Z0110NN			SOT-223
Z0103MUF		3 mA		SMBflat-3L
Z0107MUF		5 mA		
Z0109MUF		10 mA		

3.2 Ordering information

Table 9. Ordering information

Order code ⁽¹⁾	Marking ⁽¹⁾	Package	Weight	Base qty.	Delivery mode
Z01xxyA 1AA2	Z01xxyA	TO-92	0.2 g	2500	Bulk
Z01xxyA 2AL2				2000	Ammopack
Z01xxyA 5AL2				2000	Tape and reel
Z0103yN 5AA4	Z3y	SOT-223	0.12 g	1000	
Z0103MN 6AA4	Z3M			4000	
Z0107yN 5AA4	Z7y			1000	
Z0107MN 6AA4	Z7M			4000	
Z0109yN 5AA4	Z9y			1000	
Z0109NN6AA4	Z9N			4000	
Z0103MUF	Z3M	SMBflat-3L	46.78 mg	5000	
Z0107MUF	Z7M			5000	
Z0109MUF	Z9M			5000	

1. xx = sensitive, y = voltage, and check [Figure 20. Ordering information scheme](#).

Revision history

Table 10. Document revision history

Date	Revision	Changes
Oct-2001	4	Last update.
10-Feb-2005	5	Package: TO-92 tape and reel delivery mode 5AL2 added.
09-May-2005	6	Table 4 on page 2: typo. mistake corrected 1. (dV/dt)c instead of (dI/dt)c 2. V/μs unit instead of A/ms
21-Apr-2006	7	Reformatted to current standard. Table 2 on page 2: Typo corrected. Values for IGT split into two separate rows.
10-Oct-2010	8	Table 2: modified test conditions for (dV/dt)c. Changed “ambient” to “lead or tab” in Figure 2.
20-Oct-2010	9	Package: SOT-223 13” tape and reel added = 6AA4.
14-Dec-2010	10	Added package SMBflat-3L. Updated dimensions in Table 6. Updated Figure 3 and Figure 12. Updated Table 5: Product Selector.
02-May-2019	11	Updated Table 9. Ordering information . Minor text changed.

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