

1. General description

Planar passivated SCR with sensitive gate in surface mountable plastic package and through-hole package. This SCR is designed to be interfaced directly to microcontrollers, logic integrated circuits and other low power gate trigger circuits.

2. Features and benefits

- On-state RMS current, 1.25 A
- Repetitive peak off-state voltage, 1250 V
- High surge current capability
- Direct triggering from low power drivers and logic ICs
- Planar passivated for voltage ruggedness and reliability
- Surface mountable package (SOT223)
- Through-hole package (TO92)

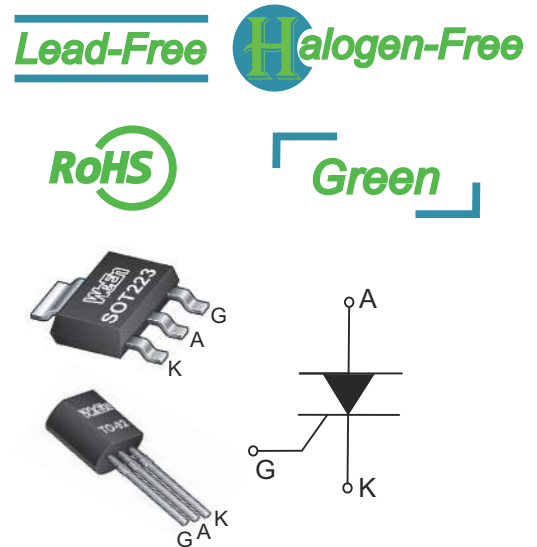
3. Applications

- GFCI (Ground Fault Circuit Interrupter)
- AFCI (Arc Fault Circuit Interrupter)
- RCD (Residual Current Device)
- RCBO (Residual Current circuit Breaker with Overload protection)
- AFDD (Arc Fault Detection Device)

4. Quick reference data

Table 1. Quick reference data

Symbol	Values	Unit
V_{DRM}, V_{RRM}	1250	V
$I_{T(RMS)}$	1.25	A
I_{GT}	≤ 90	μA
T_j	125	$^{\circ}C$



5. Characteristics

Table 2. Limiting values
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Values	Unit
V_{DRM}	repetitive peak off-state voltage	$R_{GK} = 1 \text{ k}\Omega$; $T_{j(\text{init})} = 25 \text{ }^\circ\text{C}$	1250	V
V_{RRM}	repetitive peak reverse voltage	$R_{GK} = 1 \text{ k}\Omega$; $T_{j(\text{init})} = 25 \text{ }^\circ\text{C}$	1250	V
$I_{T(AV)}$	average on-state current	half sine wave $T_{\text{lead}} \leq 83 \text{ }^\circ\text{C}$ TO92 $T_c \leq 110 \text{ }^\circ\text{C}$ SOT223	0.8	A
$I_{T(RMS)}$	RMS on-state current	half sine wave $T_{\text{lead}} \leq 83 \text{ }^\circ\text{C}$ TO92 $T_c \leq 110 \text{ }^\circ\text{C}$ SOT223	1.25	A
I_{TSM}	non-repetitive peak on-state current	half sine wave; $T_{j(\text{init})} = 25 \text{ }^\circ\text{C}$; $t_p = 10 \text{ ms}$ half sine wave; $T_{j(\text{init})} = 25 \text{ }^\circ\text{C}$; $t_p = 8.3 \text{ ms}$	20 22	A A
I^2t	I^2t for fusing	$t_p = 10 \text{ ms}$; sine-wave pulse	2	A^2s
di_T/dt	rate of rise of on-state current	$I_G = 0.2 \text{ mA}$	100	$\text{A}/\mu\text{s}$
I_{GM}	peak gate current		1.2	A
P_{GM}	peak gate power		2	W
$P_{G(AV)}$	average gate power	over any 20 ms period	0.2	W
T_{stg}	storage temperature		-40 to 150	$^\circ\text{C}$
T_j	junction temperature		-40 to 125	$^\circ\text{C}$

Table 3. Electrical Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I_{GT}	gate trigger current	$V_D = 12 \text{ V}$; $R_L = 100 \text{ }\Omega$; $T_j = 25 \text{ }^\circ\text{C}$	10	-	90	μA
V_{GT}	gate trigger voltage	$V_D = 12 \text{ V}$; $R_L = 100 \text{ }\Omega$; $T_j = 25 \text{ }^\circ\text{C}$	-	0.6	0.8	V
		$V_D = 800 \text{ V}$; $I_T = 0.1 \text{ A}$; $T_j = 125 \text{ }^\circ\text{C}$	0.25	0.4	-	V
V_{RG}	gate reverse voltage	$I_{RG} = 2 \text{ mA}$	10	-	-	V
I_L	latching current	$I_T = 0.1 \text{ A}$; $R_{GK} = 1 \text{ k}\Omega$; $T_j = 25 \text{ }^\circ\text{C}$	-	-	6	mA
I_H	holding current	$V_D = 12 \text{ V}$; $R_{GK} = 1 \text{ k}\Omega$; $T_j = 25 \text{ }^\circ\text{C}$	-	-	5	mA
V_T	on-state voltage	$I_T = 1.25 \text{ A}$; $T_j = 25 \text{ }^\circ\text{C}$	-	-	1.3	V
I_D	off-state current	$V_D = V_{DRM} / V_{RRM}$; $R_{GK} = 1 \text{ k}\Omega$				$T_j = 25 \text{ }^\circ\text{C}$
I_R	reverse current					$T_j = 125 \text{ }^\circ\text{C}$
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 838 \text{ V}$; $T_j = 125 \text{ }^\circ\text{C}$; $R_{GK} = 1 \text{ k}\Omega$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform	200	-	-	$\text{V}/\mu\text{s}$

Table 4. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
R_{th}	thermal resistance	junction to lead	TO92	-	-	40	K/W
		junction to case	SOT223	-	-	14	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	TO92	-	130	-	K/W
			SOT223	-	120	-	K/W

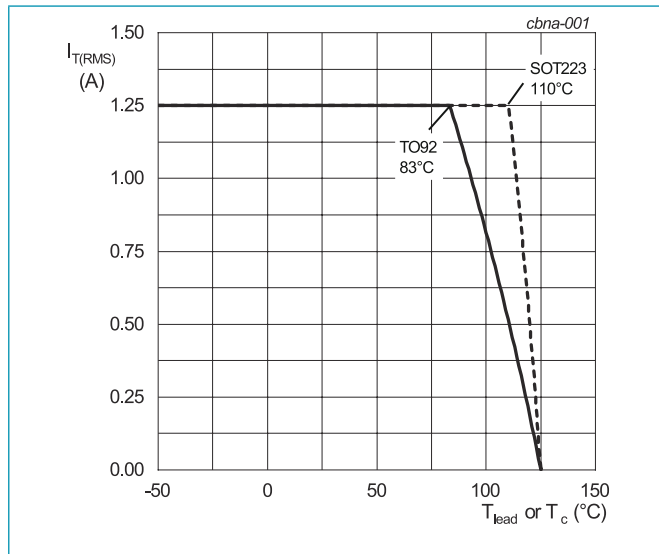


Fig. 1. RMS on-state current as a function of case temperature; maximum values (TO92 / SOT223)

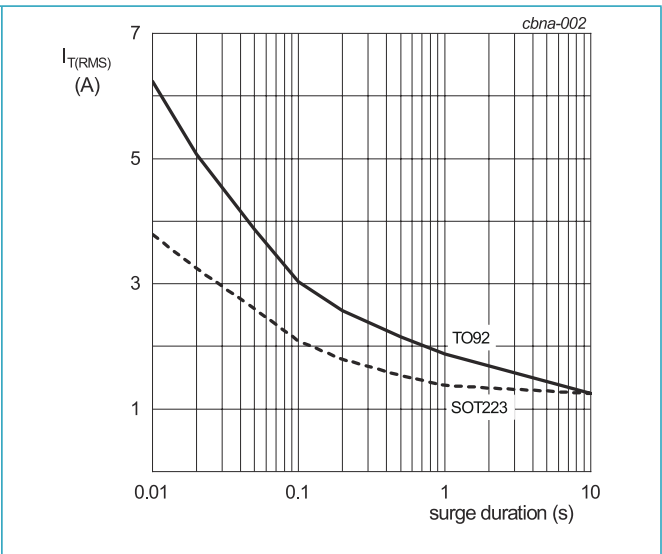


Fig. 2. RMS on-state current as a function of surge duration; maximum values (TO92 / SOT223)
 $f = 50 \text{ Hz}; T_{lead} = 83 \text{ °C} / T_c = 110 \text{ °C}$

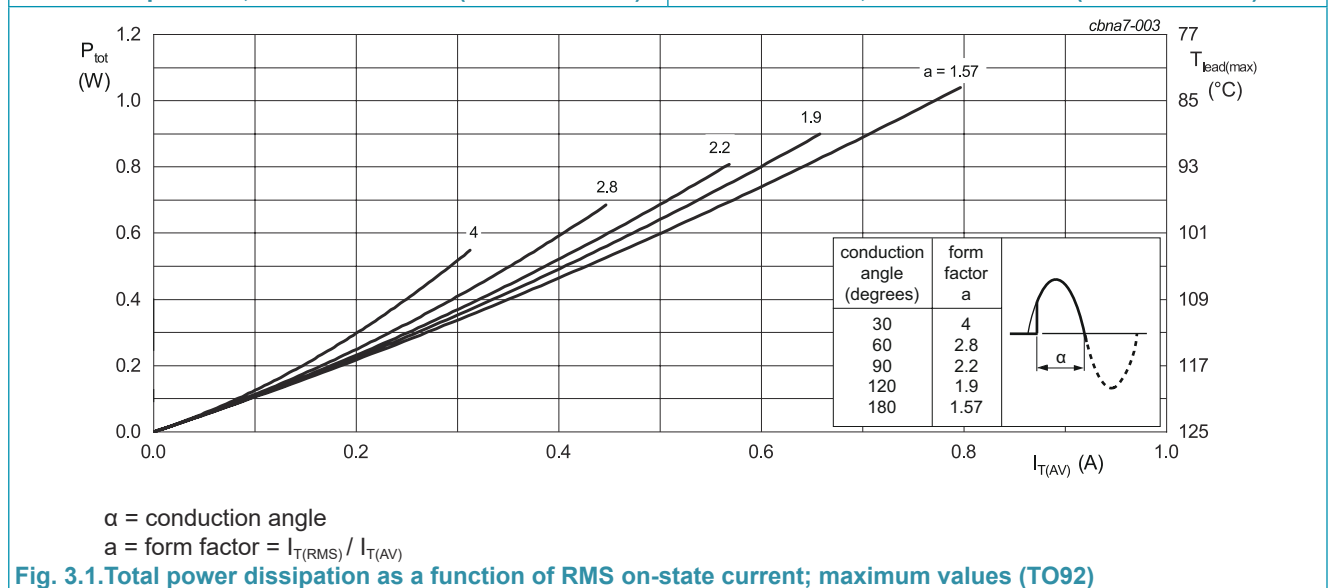
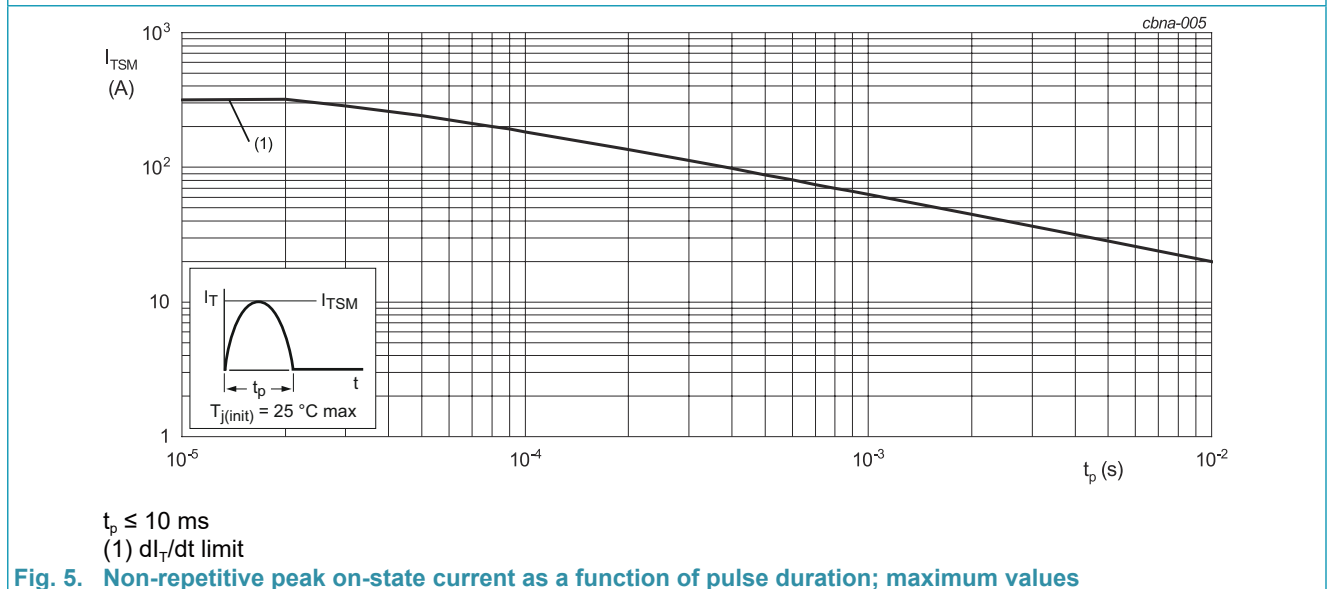
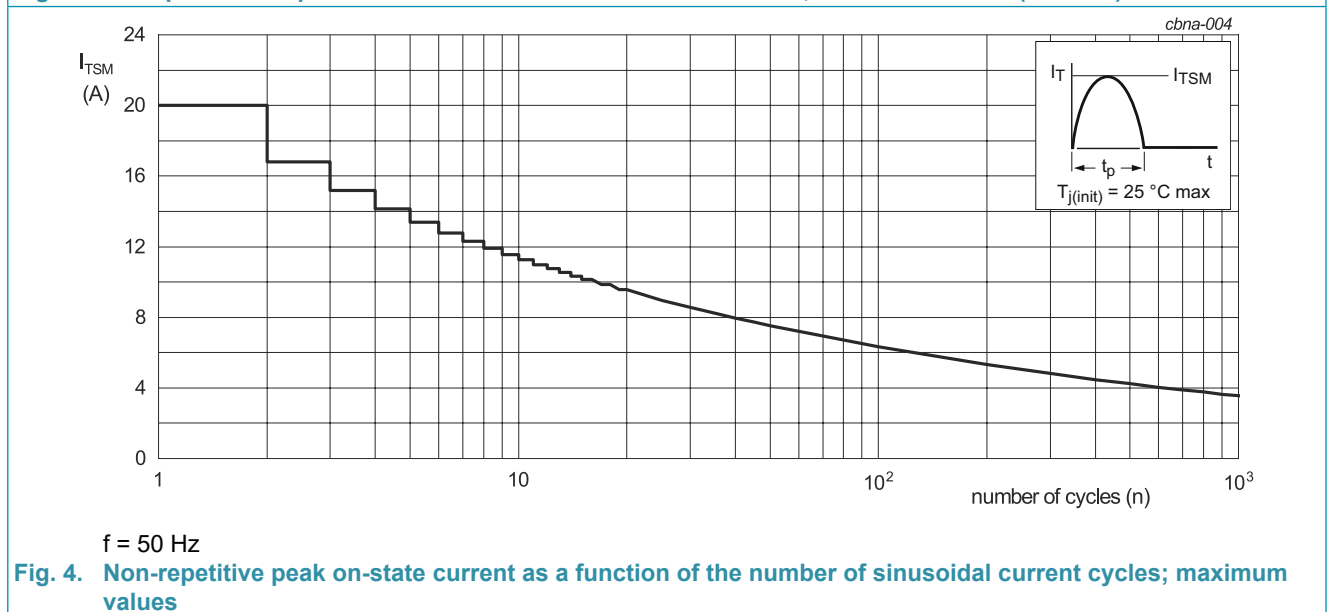
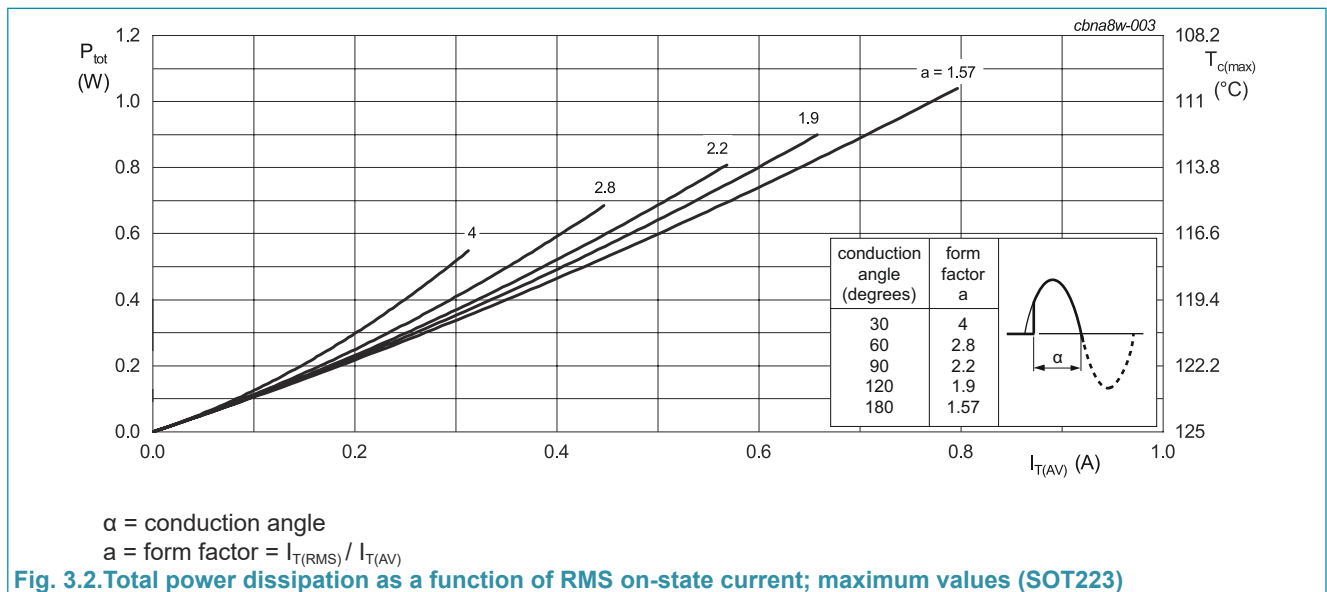


Fig. 3.1. Total power dissipation as a function of RMS on-state current; maximum values (TO92)



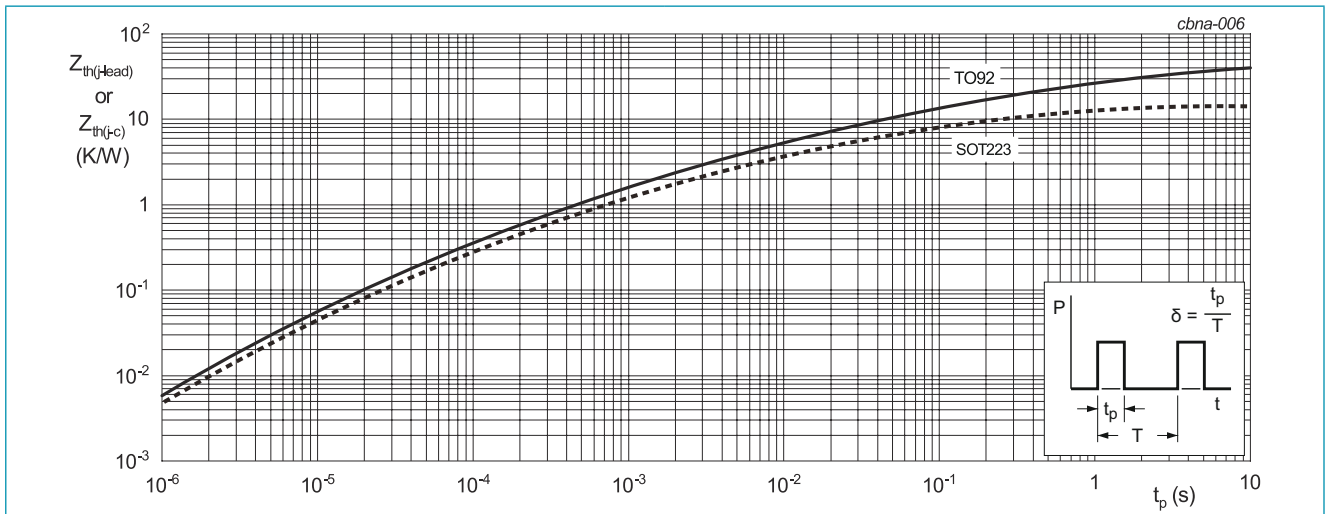


Fig. 6. Transient thermal impedance from junction to lead/case as a function of pulse duration (TO92 / SOT223)

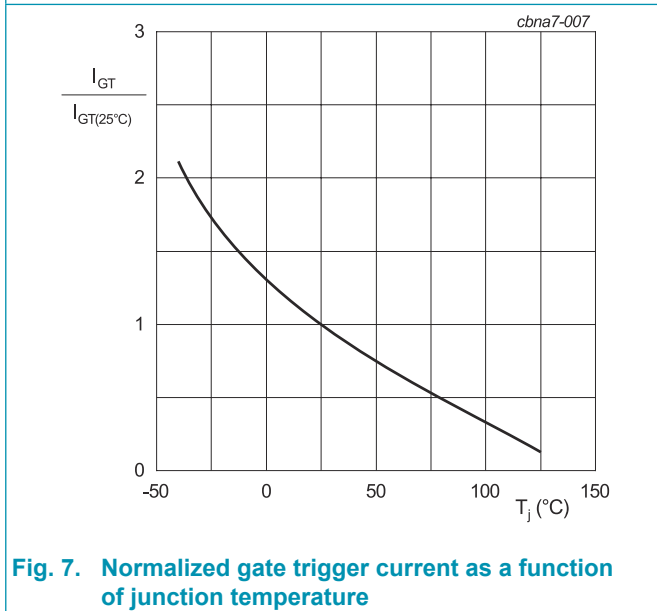


Fig. 7. Normalized gate trigger current as a function of junction temperature

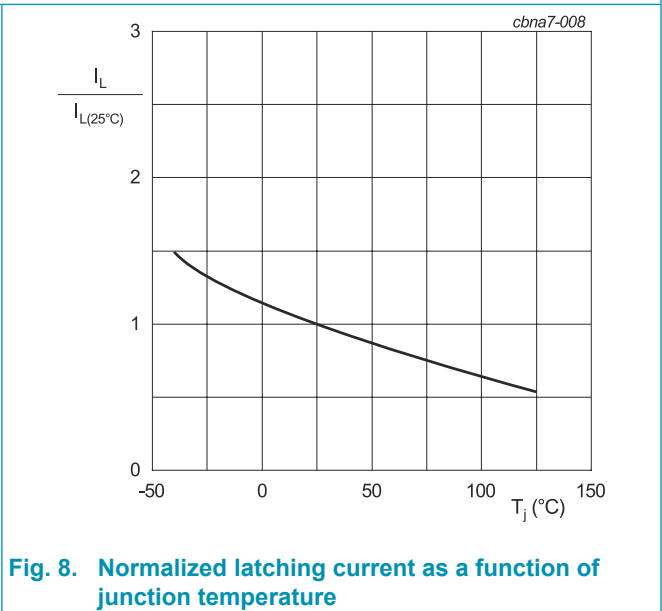


Fig. 8. Normalized latching current as a function of junction temperature

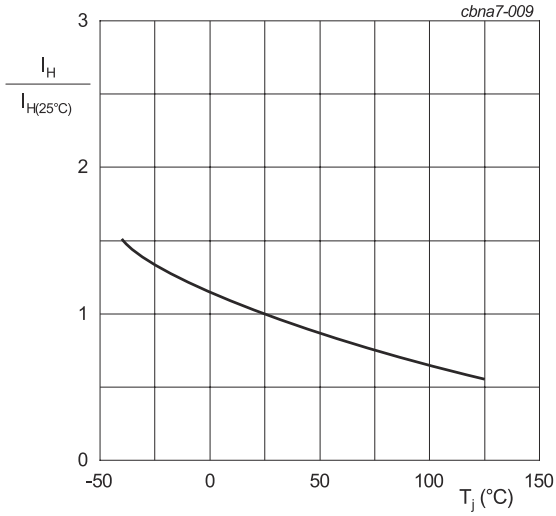


Fig. 9. Normalized holding current as a function of junction temperature

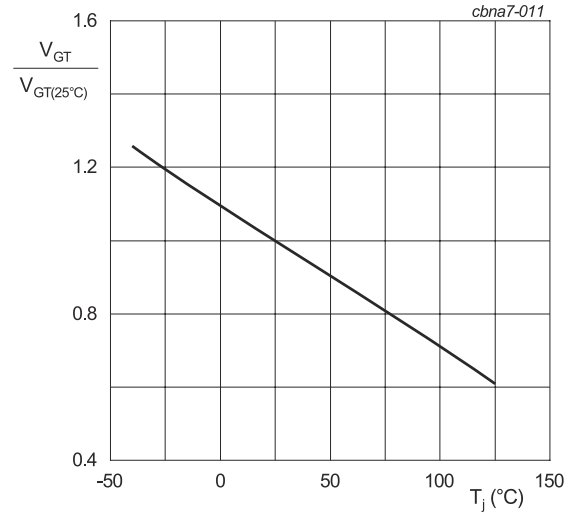
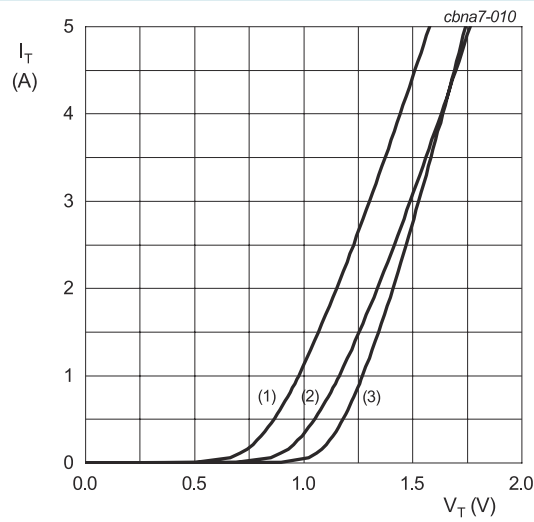


Fig. 10. Normalized gate trigger voltage as a function of junction temperature



$V_o = 1.016 \text{ V}; R_s = 0.1479 \ \Omega$

- (1) $T_j = 150 \text{ }^\circ\text{C}$; typical values
- (2) $T_j = 150 \text{ }^\circ\text{C}$; maximum values
- (3) $T_j = 25 \text{ }^\circ\text{C}$; maximum values

Fig. 11. On-state current as a function of on-state voltage

6. Ordering information

Table 5. Ordering information

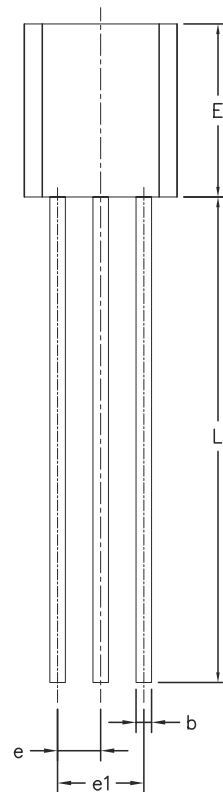
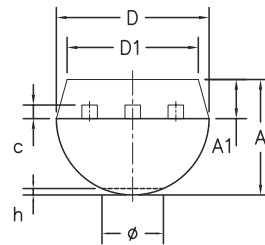
Type number	Package Name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
WCR03-12M	TO92	WCR03-12MEP	Bulk	1000	TO92L	02-Nov-2019
WCR03-12WM	SOT223	WCR03-12WMX	Reel	1000	SOT223	16-Mar-2006

7. Marking

Table 6. Marking codes

Type number	Marking codes
WCR03-12M	WCR03M
WCR03-12WM	WCR03-12M

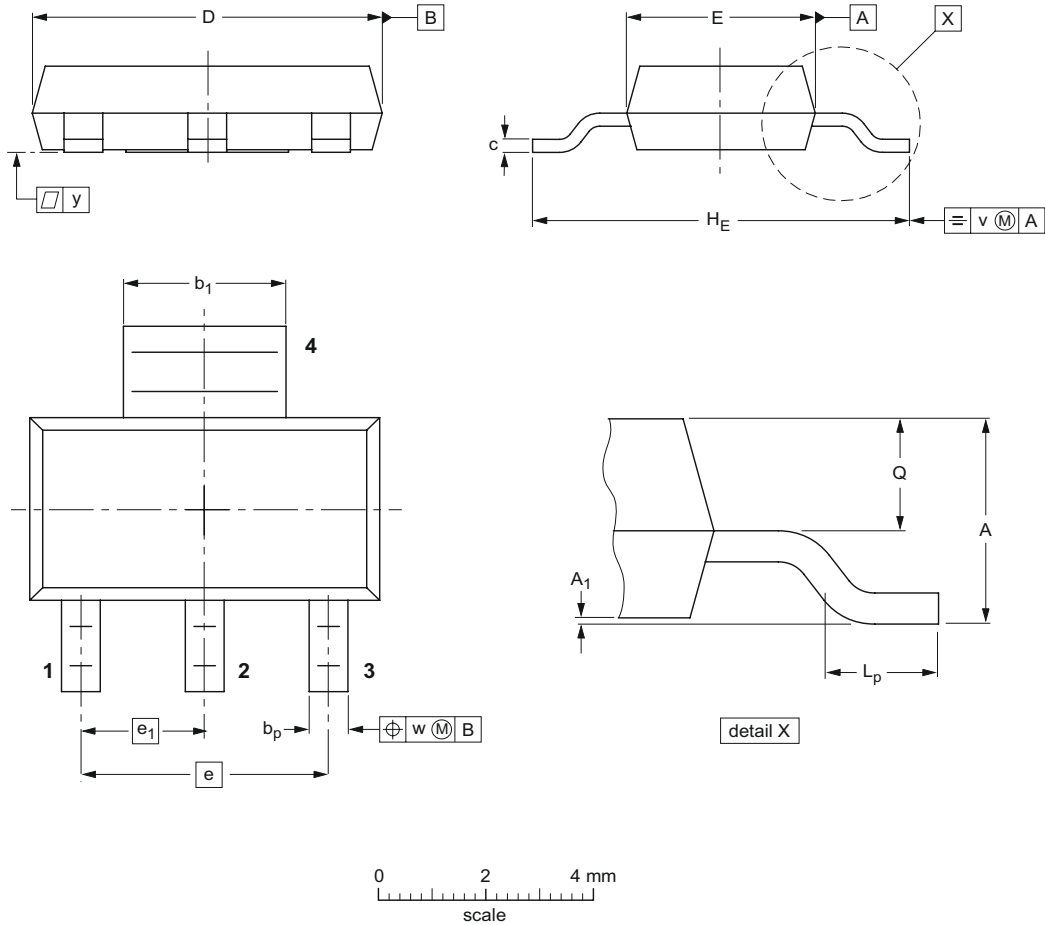
8. Package outline



UNIT	A	A1	b	c	D	D1	E	e	e1	L	h	ϕ
mm	3.30	1.10	0.36	0.28	4.30	3.43	4.30	1.27	2.54	14.10	0.00	1.60
	3.70	1.40	0.56	0.51	4.70		4.70					

Plastic surface-mounted package with increased heatsink; 4 leads

SOT223



DIMENSIONS (mm are the original dimensions)

UNIT	A	A ₁	b _p	b ₁	c	D	E	e	e ₁	H _E	L _p	Q	v	w	y
mm	1.8	0.10	0.80	3.1	0.32	6.7	3.7	4.6	2.3	7.3	1.1	0.95	0.2	0.1	0.1
	1.5	0.01	0.60	2.9	0.22	6.3	3.3			6.7	0.7	0.85			

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT223			SC-73			04-11-10 06-03-16

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Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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- [2] The term 'short data sheet' is explained in section "Definitions".
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10. Contents

1. General description.....	1
2. Features and benefits	1
3. Applications	1
4. Quick reference data	1
5. Characteristics.....	2
6. Ordering information.....	7
7. Marking.....	7
8. Package outline	8
9. Legal information	10
10. Contents	12

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