WCR03 Series

SCR

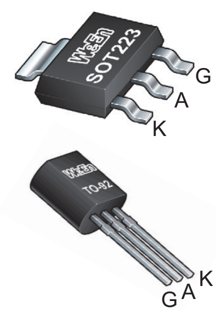
Rev.02 - 29 November 2021 Product data sheet

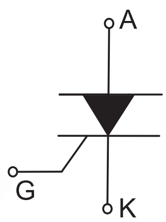
1. General description

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	°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 kΩ; $T_{j(init)}$ = 25 °C			1250	V
V_{RRM}	repetitive peak reverse voltage	R_{GK} = 1 kΩ; $T_{j(init)}$ = 25 °C			1250	V
$I_{T(AV)}$	average on-state current	half sine wave	T_{lead} ≤ 83 °C	TO92	0.8	A
			T_c ≤ 110 °C	SOT223		
$I_{T(RMS)}$	RMS on-state current	half sine wave	T_{lead} ≤ 83 °C	TO92	1.25	A
			T_c ≤ 110 °C	SOT223		
I_{TSM}	non-repetitive peak on-state current	half sine wave; $T_{j(init)}$ = 25 °C; t_p = 10 ms			20	A
		half sine wave; $T_{j(init)}$ = 25 °C; t_p = 8.3 ms			22	A
I^2t	I^2t for fusing	t_p = 10 ms; sine-wave pulse			2	A^2s
dI_T/dt	rate of rise of on-state current	I_G = 0.2 mA			100	A/μs
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	°C
T_j	junction temperature				-40 to 125	°C

Table 3. Electrical Characteristics

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

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

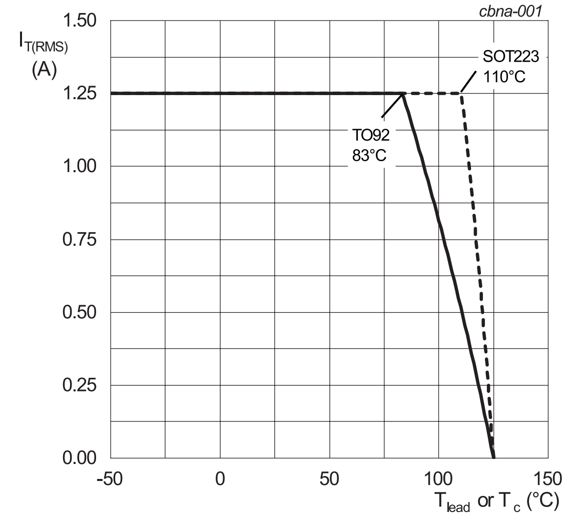
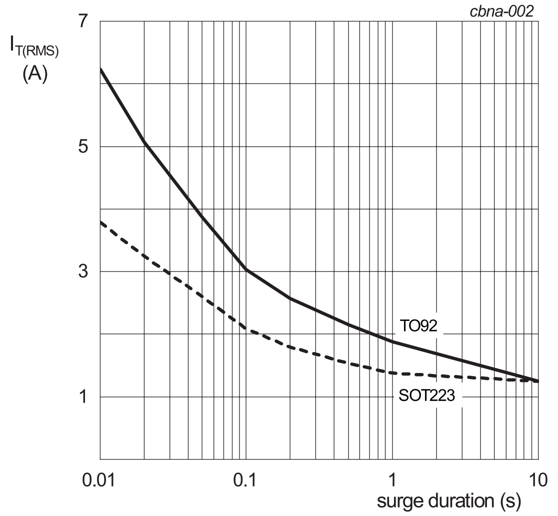
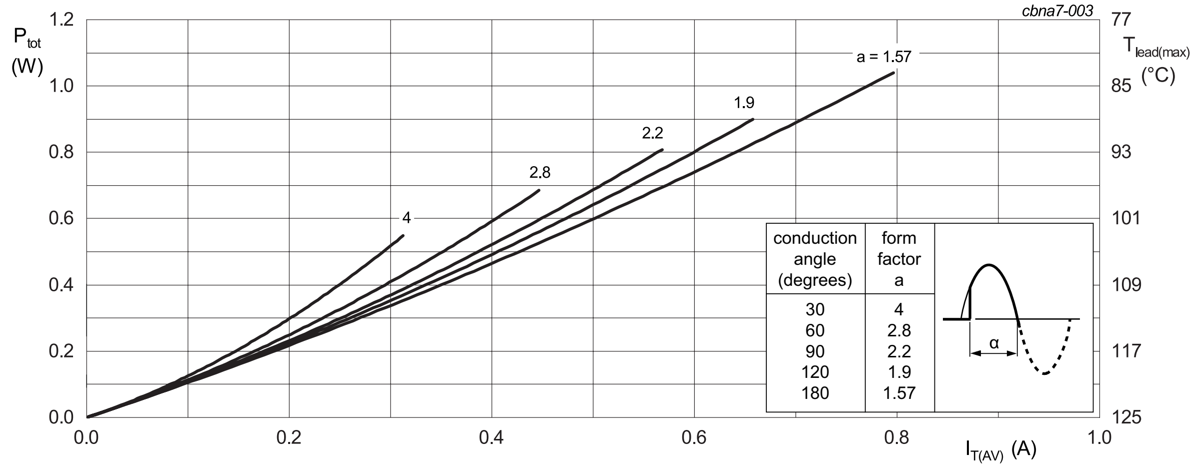


Fig. 1. RMS on-state current as a function of case temperature; maximum values (TO92 / SOT223)



f = 50 Hz; T_{lead} = 83 °C / T_c = 110 °C

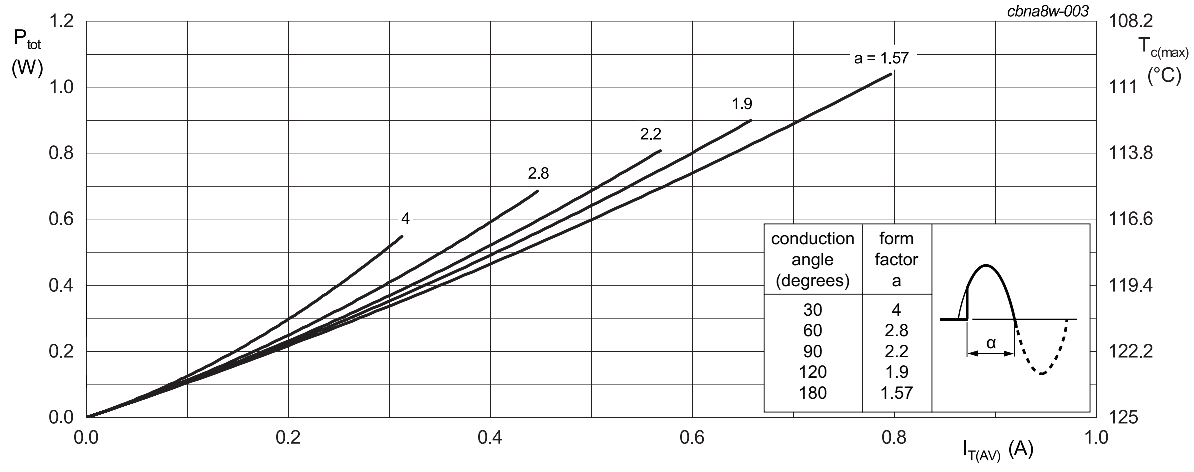
Fig. 2. RMS on-state current as a function of surge duration; maximum values (TO92 / SOT223)



α = conduction angle

a = form factor = $I_{T(RMS)} / I_{T(AV)}$

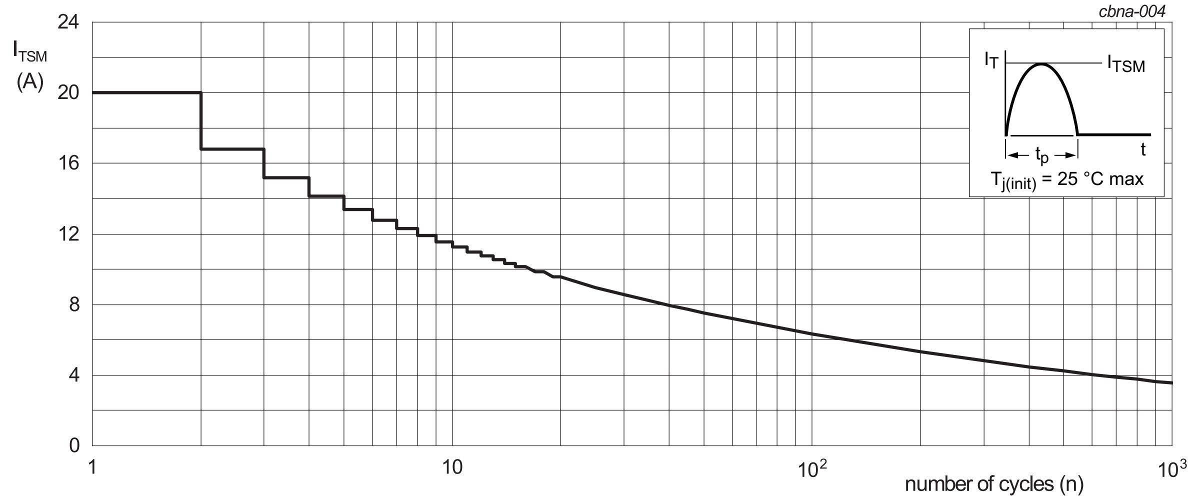
Fig. 3.1.Total power dissipation as a function of RMS on-state current; maximum values (TO92)



α = conduction angle

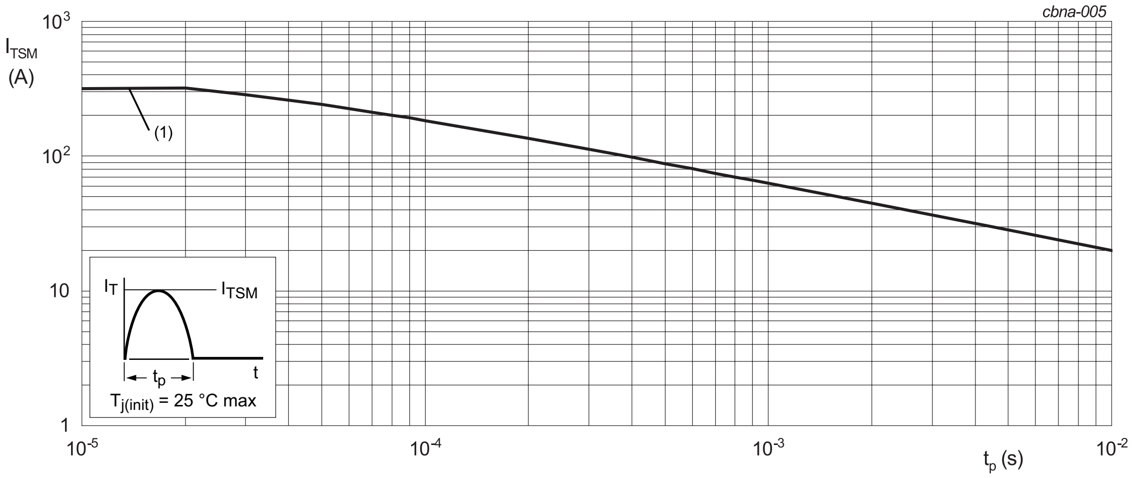
a = form factor = $I_{T(RMS)} / I_{T(AV)}$

Fig. 3.2.Total power dissipation as a function of RMS on-state current; maximum values (SOT223)



f = 50 Hz

Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



$t_p \leq 10$ ms

(1) dI_T/dt limit

Fig. 5. Non-repetitive peak on-state current as a function of pulse duration; maximum values

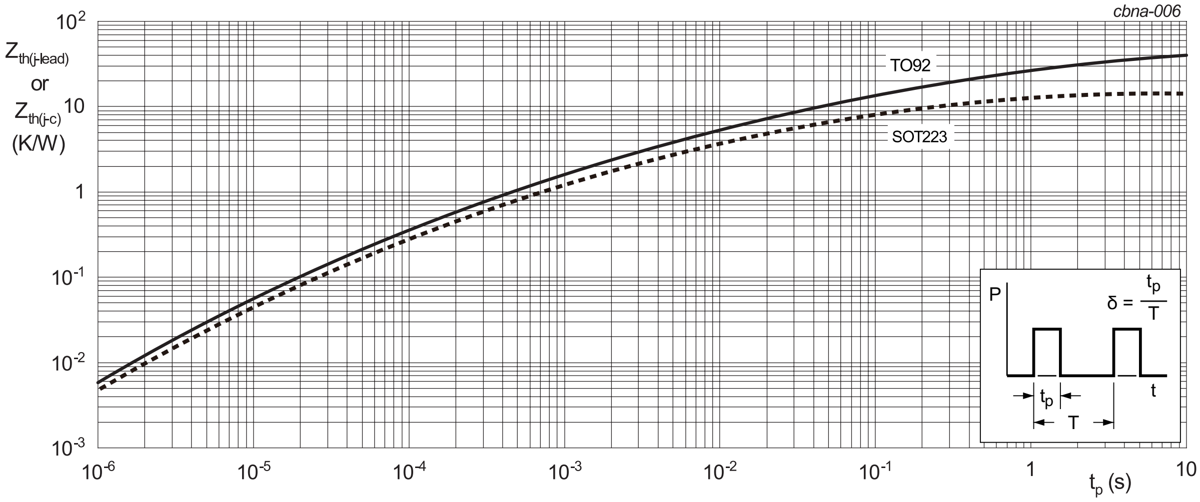


Fig. 6. Transient thermal impedance from junction to lead/case as a function of pulse duration (TO92 / SOT223)

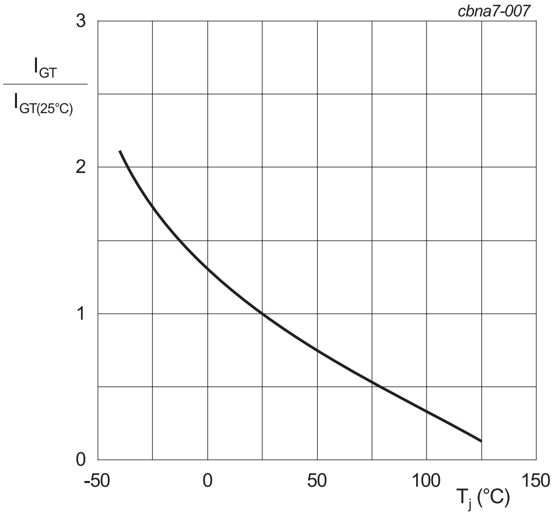


Fig. 7. Normalized gate trigger current as a function of junction temperature

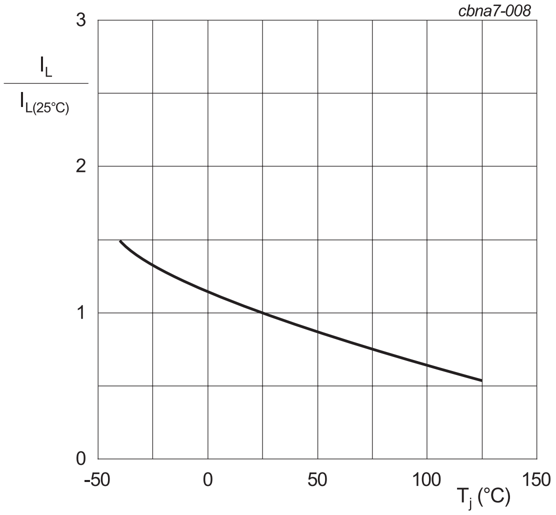


Fig. 8. Normalized latching current as a function of junction temperature

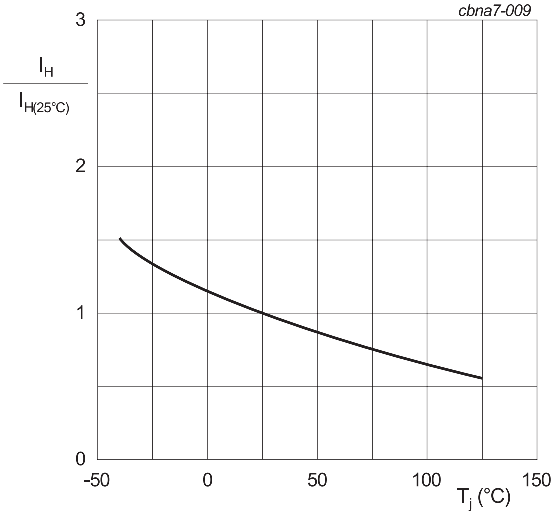


Fig. 9. Normalized holding current as a function of junction temperature

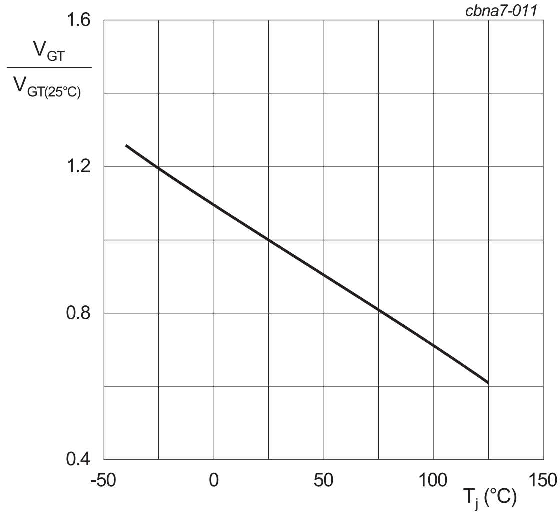
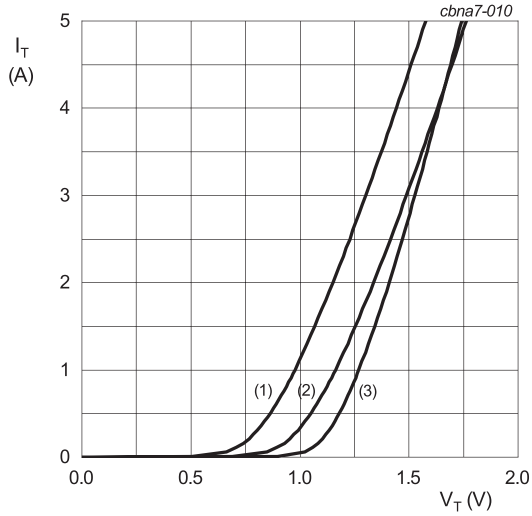


Fig. 10. Normalized gate trigger voltage as a function of junction temperature



V_o = 1.016 V; R_s = 0.1479 Ω
(1) T_j = 150 °C; typical values
(2) T_j = 150 °C; maximum values
(3) T_j = 25 °C; maximum values

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

6. Ordering information

Table 5. Ordering information

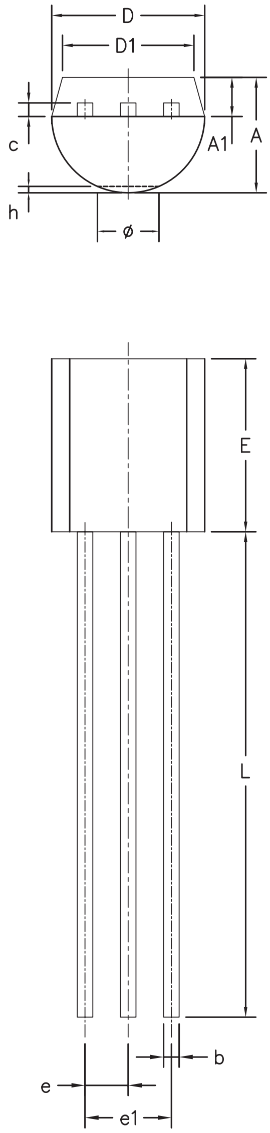
Type number	Package Name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
WCR03-12M	TO92	WCR03-12MEP	Bulk	1000	TO92L	02-Nov-2019
WCR03-12WM	SOT223	WCR03-12WMX	Reel	1000	SOT223	16-Mar-2006

7. Marking

Table 6. Marking codes

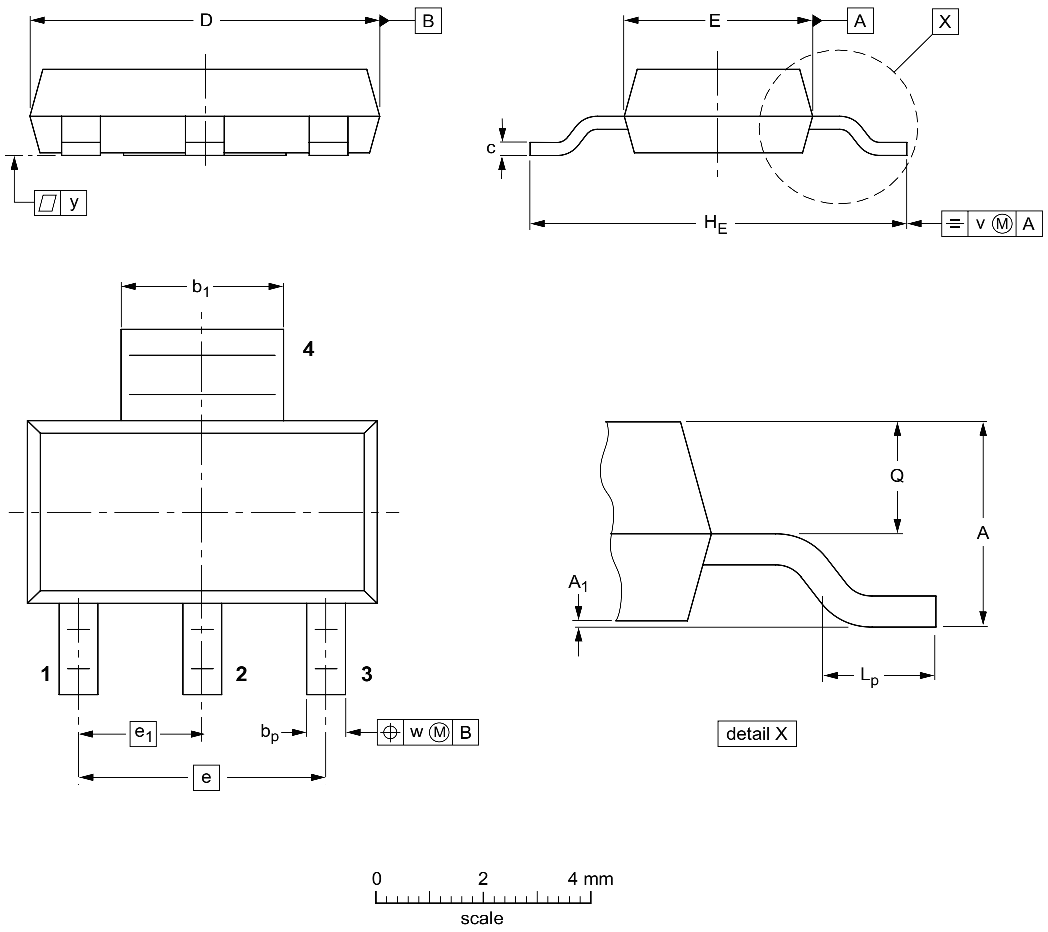
Type number	Marking codes
WCR03-12M	WCR03M
WCR03-12WM	WCR03-12M

8. Package outline



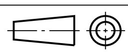
UNIT	A	A1	b	c	D	D1	E	e	e1	L	h	Ø
mm	3.30	1.10	0.36	0.28	4.30	3.43	4.30	1.27	2.54	14.10	0.00	
	3.70	1.40	0.56	0.51	4.70		4.70			14.50	0.38	1.60

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 1.5	0.10 0.01	0.80 0.60	3.1 2.9	0.32 0.22	6.7 6.3	3.7 3.3	4.6	2.3	7.3 6.7	1.1 0.7	0.95 0.85	0.2	0.1	0.1

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

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Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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Date of release: 29 November 2021

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[>>WeEn(瑞能)]