THE DATASHEET OF

NCR125W-125MX

NCR125W-125M

SCR

Rev.01 - 24 September 2019 Product data sheet

1. General description

Planar passivated SCR with sensitive gate in a SOT223 surface mountable plastic 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

- Sensitive gate
- High surge current capability
- High voltage capability
- Planar passivated for voltage ruggedness and reliability
- Direct triggering from low power drivers and logic ICs
- Surface mountable package

3. Applications

- Ground Fault Circuit Interrupter (GFCI)
- GFCI Socket
- Residual Current Circuit Breaker with Overcurrent Protection (RCBO)
- Arc Fault Circuit Interrupter (AFCI)

4. Quick reference data

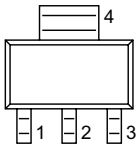
Table 1. Quick reference data

Symbol	Parameter	Conditions	Values	Unit
V_{DRM}	repetitive peak off-state voltage		1250	V
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_c \leq 111$ °C; Fig. 1; Fig. 2; Fig. 3	1.25	A
I_{TSM}	non-repetitive peak on-state current	half sine wave; $T_{j(init)} = 25$ °C; $t_p = 10$ ms; Fig 4; Fig 5	20	A
		half sine wave; $T_{j(init)} = 25$ °C; $t_p = 8.3$ ms	22	A
T_j	junction temperature		125	°C

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
I_{GT}	gate trigger current	V_D = 12 V; R_L = 140 Ω; T_j = 25 °C; Fig. 8		1	-	100	µA
I_H	holding current	V_D = 12 V; R_{GK} = 220 Ω; T_j = 25 °C; Fig. 10		-	-	10	mA
V_T	on-state voltage	I_T = 2.5 A; T_j = 25 °C; Fig. 11		-	-	1.5	V
Dynamic characteristics							
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 838 V; T_j = 125 °C; R_{GK} = 220 Ω; (V_{DM} = 67% of V_{DRM}); exponential waveform		200	-	-	V/µs

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode		
2	A	anode		
3	G	gate		
4	A	mounting base; connected to anode		

6. Ordering information

Table 3. Ordering information

Type number	Package Name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
NCR125W-125M	SOT223	NCR125W-125MX	Reel	1000	SOT223	16-Mar-2006

7. Marking

Table 4. Marking codes

Type number	Marking codes
NCR125W-125M	125-125M

8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Values	Unit
V_{DRM}	repetitive peak off-state voltage		1250	V
V_{RRM}	repetitive peak reverse voltage		1250	V
$I_{T(AV)}$	average on-state current	half sine wave; $T_c \leq 111$ °C;	0.8	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_c \leq 111$ °C; Fig. 1; Fig. 2; Fig. 3	1.25	A
I_{TSM}	non-repetitive peak on-state current	half sine wave; $T_{j(init)} = 25$ °C; $t_p = 10$ ms; Fig 4; Fig 5	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	$I_G = 0.1$ mA; f = 50 Hz; $T_j = 125$ °C	100	A/µs
	non-repetitive critical current rate of rise at break over, refer Fig. 14		200	A/µs
I_{GM}	peak gate current	$t_p = 20$ us; $T_j = 125$ °C	1.2	A
P_{GM}	peak gate power		5	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

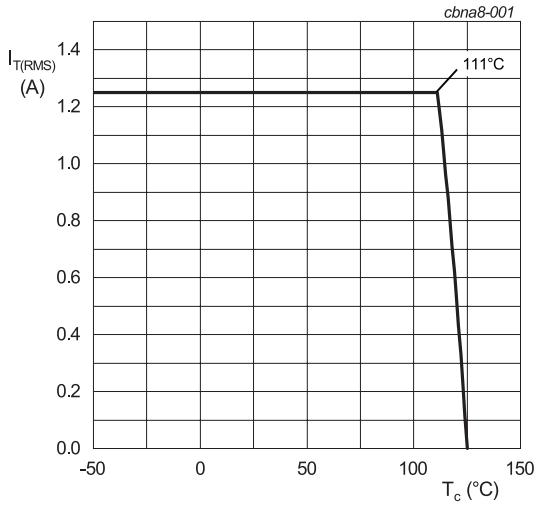
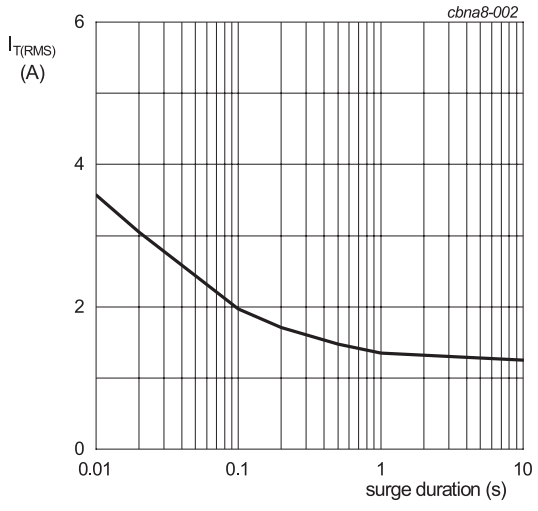
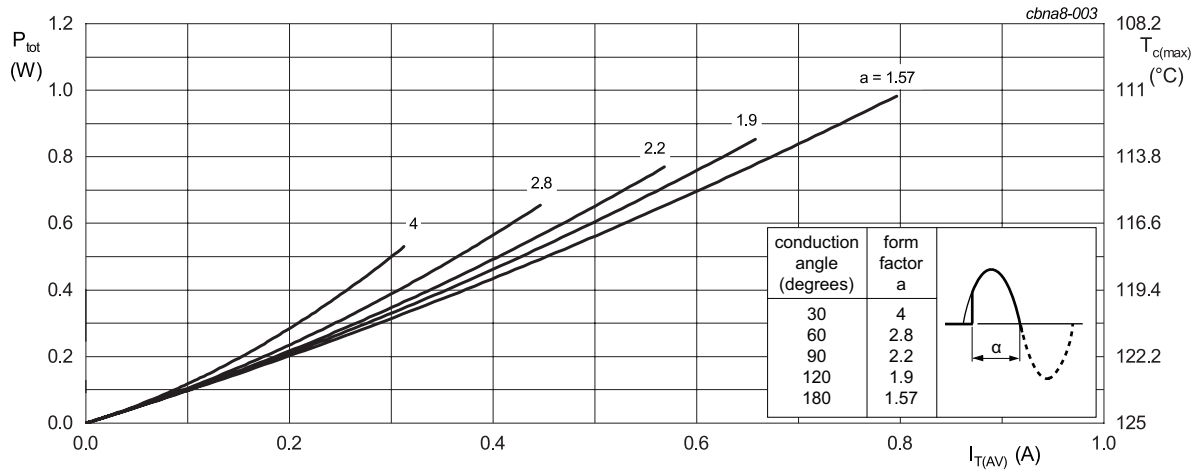


Fig. 1. RMS on-state current as a function of case temperature; maximum values



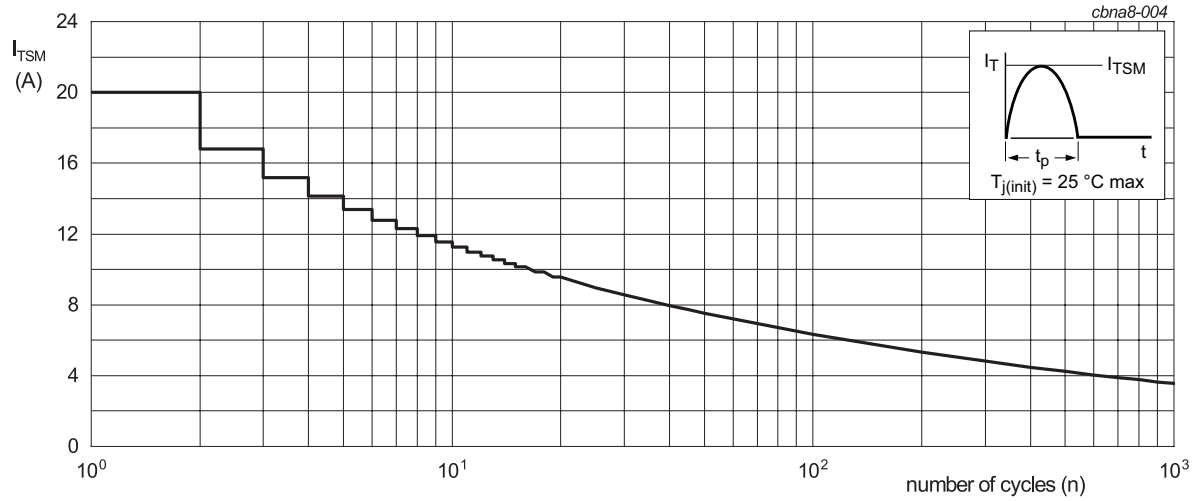
f = 50 Hz; $T_c = 111$ °C

Fig. 2. RMS on-state current as a function of surge duration; maximum values



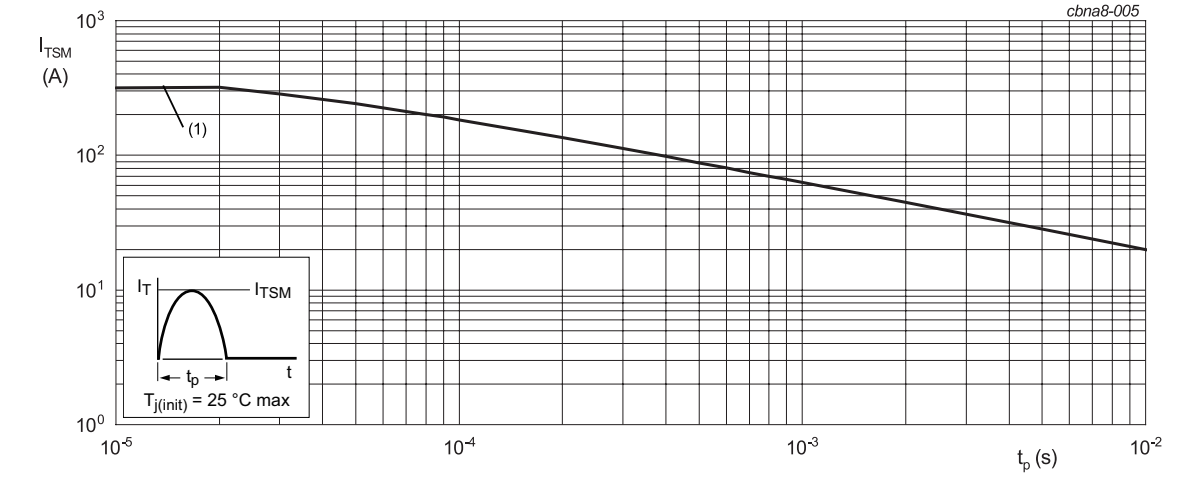
α = conduction angle
a = form factor = $I_{T(RMS)}$ / $I_{T(AV)}$

Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values



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

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-c)}$	thermal resistance from junction to case	Fig 6		-	-	14	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air; printed circuit board mounted: minimum footprint; Fig 7		-	130	-	K/W

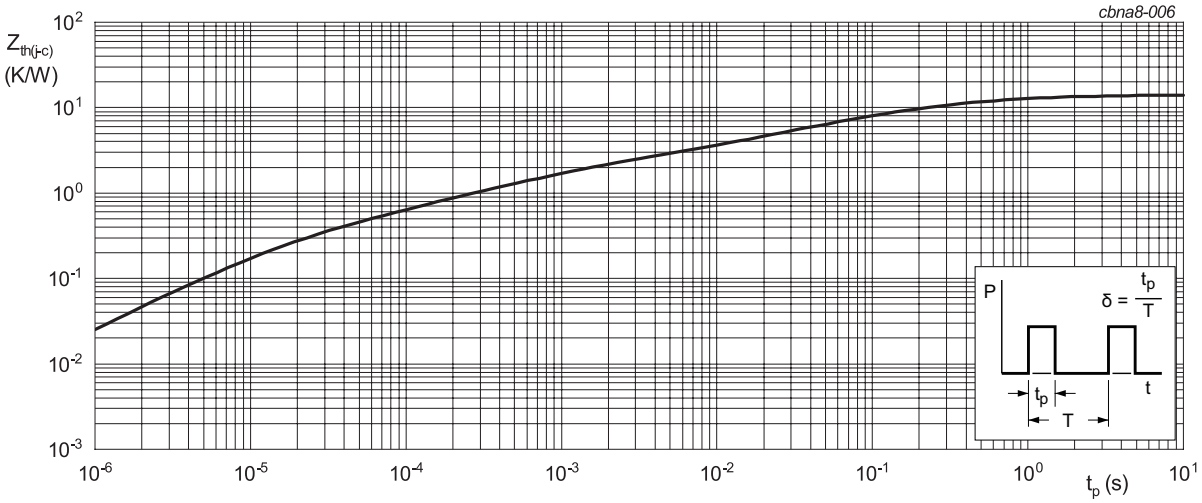
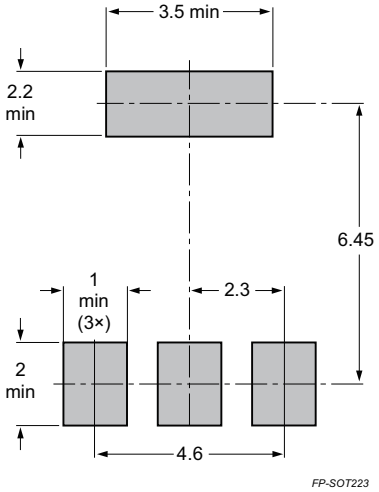


Fig. 6. Transient thermal impedance from junction to case as a function of pulse duration



All dimensions are in mm

Fig. 7. Minimum footprint SOT223

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
I_{GT}	gate trigger current	V_D = 12 V; R_L = 140 Ω; T_j = 25 °C; Fig. 8		1	-	100	µA
V_{GT}	gate trigger voltage	V_D = 12 V; R_L = 140 Ω; T_j = 25 °C; Fig. 12		-	0.6	0.8	V
V_{GD}	gate non-trigger voltage	V_D = V_{DRM}; R_L = 33 kΩ; R_{GK} = 220 Ω; T_j = 125 °C		0.1	-	-	V
V_{RG}	gate reverse voltage	I_{RG} = 2 mA; T_j = 25 °C		10	-	-	V
I_L	latching current	I_T = 0.1 A; R_{GK} = 220 Ω; T_j = 25 °C; Fig. 9		-	-	12	mA
I_H	holding current	V_D = 12 V; R_{GK} = 220 Ω; T_j = 25 °C; Fig. 10		-	-	10	mA
V_T	on-state voltage	I_T = 2.5 A; T_j = 25 °C; Fig. 11		-	-	1.5	V
I_D	off-state current	V_D = 1250 V; R_{GK} = 220 Ω; T_j = 25 °C		-	-	1	µA
		V_D = 1250 V; R_{GK} = 220 Ω; T_j = 125 °C		-	-	100	µA
I_R	reverse current	V_D = 1250 V; R_{GK} = 220 Ω; T_j = 25 °C		-	-	1	µA
		V_D = 1250 V; R_{GK} = 220 Ω; 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} = 220 Ω; (V_{DM} = 67% of V_{DRM}); exponential waveform		200	-	-	V/µs
V_O	threshold voltage	T_j = 125 °C		-	-	0.936	V
R_S	dynamic resistance	T_j = 125 °C		-	-	152	mΩ

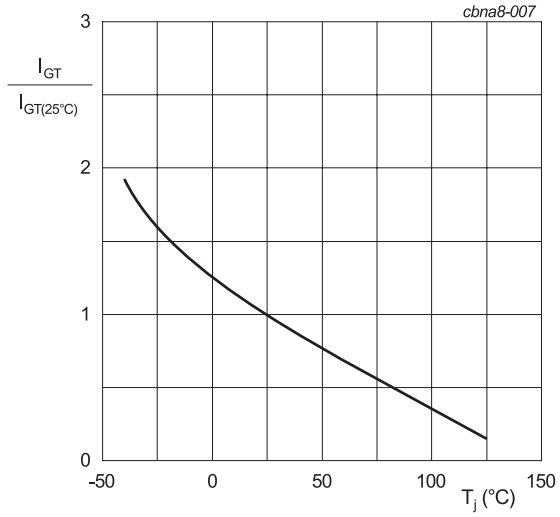


Fig. 8. Normalized gate trigger current as a function of junction temperature

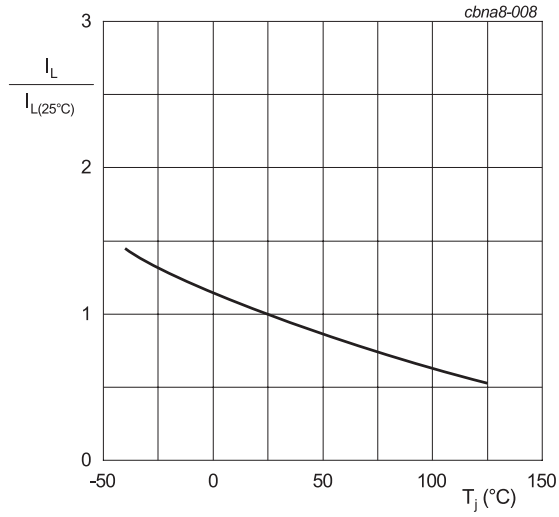


Fig. 9. Normalized latching current as a function of junction temperature

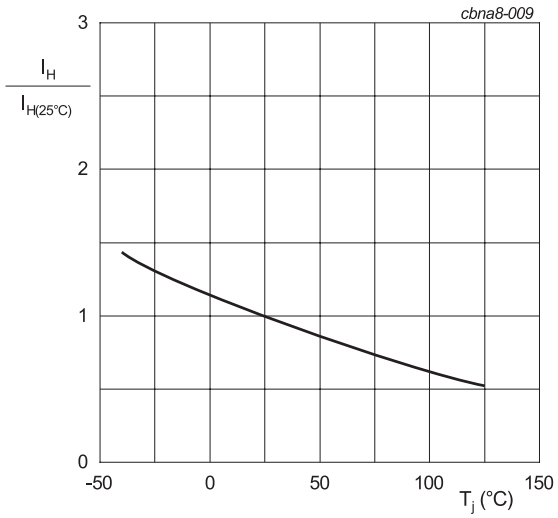
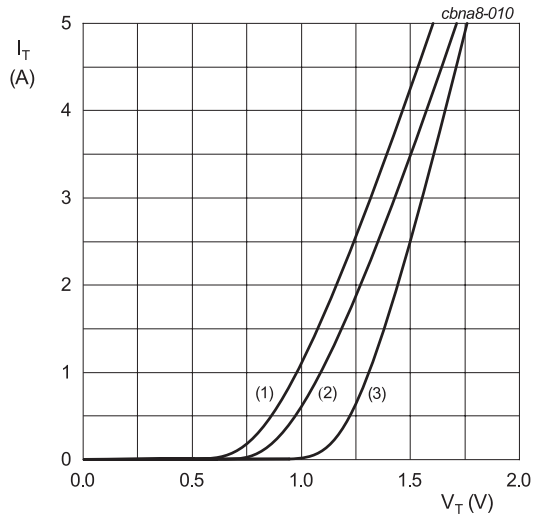


Fig. 10. Normalized holding current as a function of junction temperature



V_o = 0.936 V; R_s = 0.1520 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

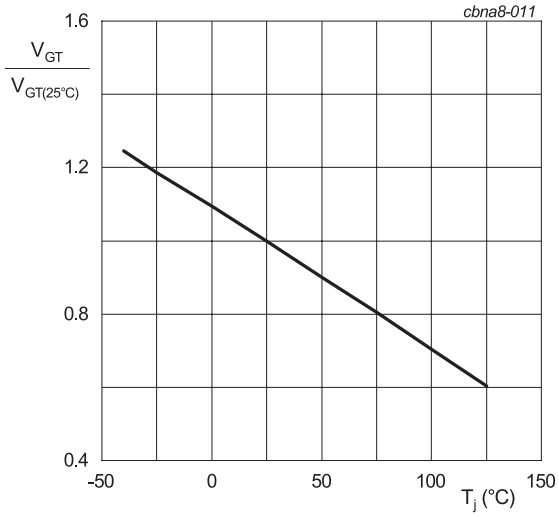


Fig. 12. Normalized gate trigger voltage as a function of junction temperature

11. AC line transient voltage ruggedness

NCR125W-125M has over voltage self-protected function, it can safely withstand AC line direct surge voltages by switching to on-state (for less than 10 ms on 50 Hz mains) to dissipate energy shocks through the load. The load limits the current through NCR125W-125M. The self-protection against over-voltage is based on an overvoltage crowbar technology. This safety feature works even with high turn-on current ramp up.

The NCR125W-125M recovers its blocking voltage capability after the direct surge and the next zero current crossing. Typical current and voltage as below according to the IEC 61000-4-5 standard conditions. Such a non-repetitive test can be done at least 10 times.

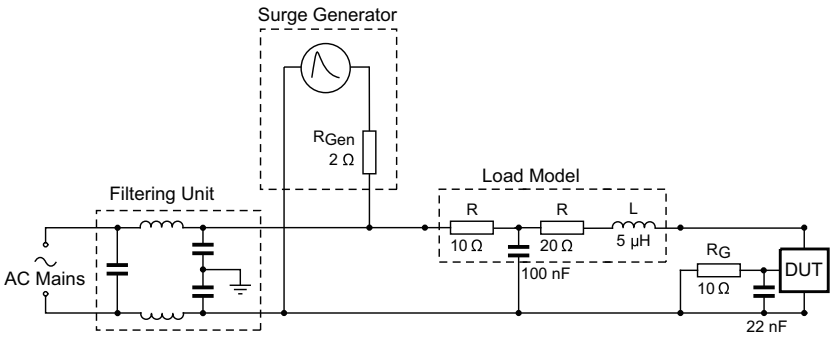


Fig. 13. Overvoltage ruggedness test circuit for IEC 61000-4-5 standards

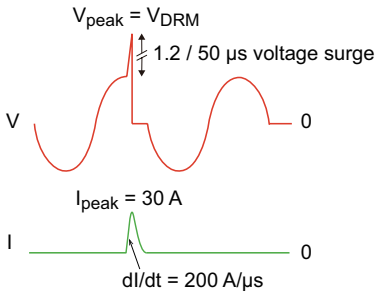
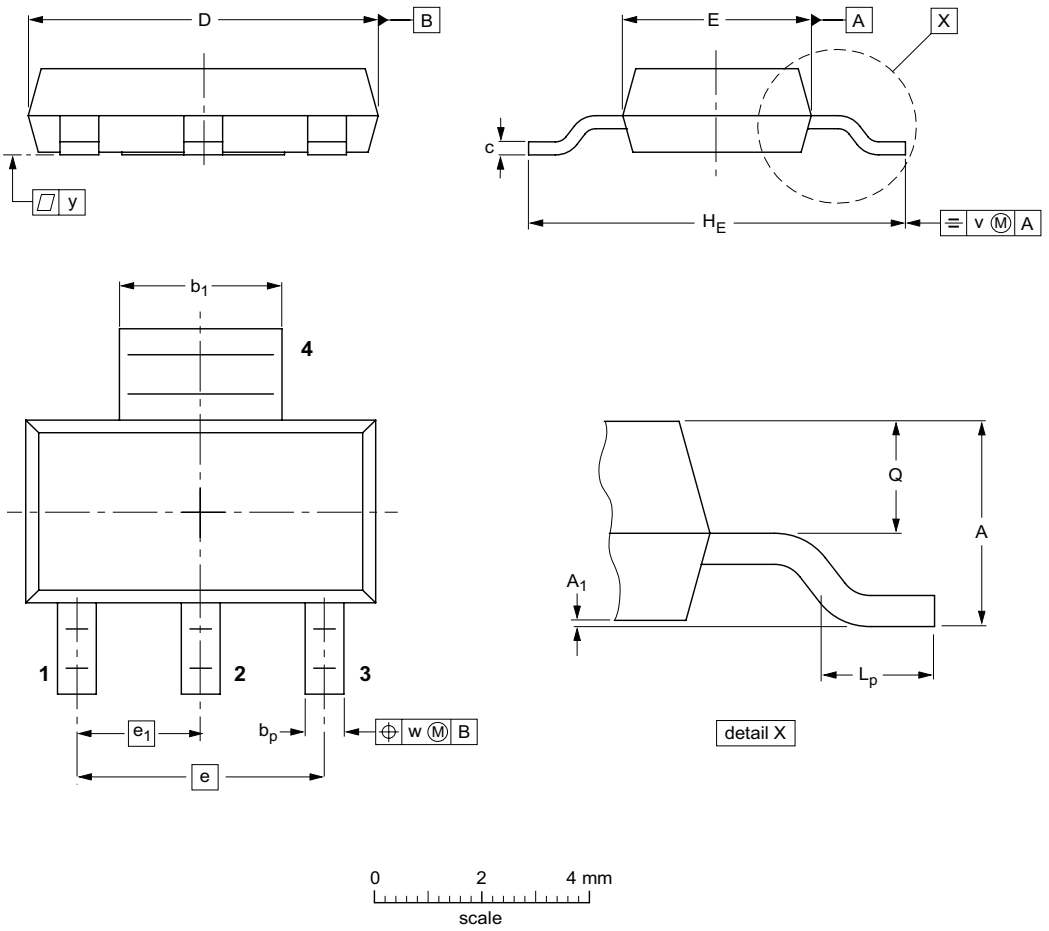


Fig. 14. Typical current and voltage waveforms across NCR125W-125M during IEC 61000-4-5 standard test

12. Package outline

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

Fig. 15. Package outline SOT223

13. Legal information

Data sheet status

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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Date of release: 24 September 2019

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