

1. General description

Planar passivated Silicon Controlled Rectifier (SCR) in a ITO220 plastic package intended for use in applications requiring good bidirectional blocking voltage and high surge current capability and high junction temperature capability ($T_{j(max)} = 150\text{ °C}$).

2. Features and benefits

- High junction operating temperature capability ($T_{j(max)} = 150\text{ °C}$)
- High bidirectional blocking voltage capability
- Very high current surge capability
- High thermal cycling performance
- Planar passivated for voltage ruggedness and reliability
- Internally insulated package
- Isolated mounting base with 2500 V_(RMS) isolation

3. Applications

- Capacitive Discharge Ignition (CDI)
- Crowbar protection
- Inrush protection
- Motor control
- Voltage regulation

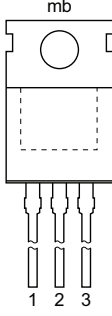
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DRM}	repetitive peak off-state voltage		-	-	650	V
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_{mb} \leq 122\text{ °C}$; Fig. 1 ; Fig. 2 ; Fig. 3	-	-	12	A
I_{TSM}	non-repetitive peak on-state current	half sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 10\text{ ms}$; Fig. 4 ; Fig. 5	-	-	120	A
		half sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 8.3\text{ ms}$	-	-	132	A
T_j	junction temperature		-	-	150	°C
Static characteristics						
I_{GT}	gate trigger current	$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; $T_j = 25\text{ °C}$; Fig. 7	1.5	-	5	mA
I_H	holding current	$V_D = 12\text{ V}$; $T_j = 25\text{ °C}$; Fig. 9	-	-	20	mA
V_T	on-state voltage	$I_T = 12\text{ A}$; $T_j = 25\text{ °C}$; Fig. 10	-	-	1.5	V
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 436\text{ V}$; $T_j = 150\text{ °C}$; $R_{GK} = 100\text{ }\Omega$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform	500	-	-	V/ μ s
		$V_{DM} = 436\text{ V}$; $T_j = 150\text{ °C}$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; gate open circuit	200	-	-	V/ μ s

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode		
2	A	anode		
3	G	gate		
mb	n.c.	mounting base; isolated		

6. Ordering information

Table 3. Ordering information

Type number	Package name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
BT151Y-650LTF	IITO220	BT151Y-650LTFQ	Tube	50	SOT78D	13-Jun-2008

7. Marking

Table 4. Marking codes

Type number	Marking codes
BT151Y-650LTF	BT151Y 650LTF

8. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
V_{DRM}	repetitive peak off-state voltage			-	650	V
V_{RRM}	repetitive peak reverse voltage			-	650	V
$I_{\text{T(AV)}}$	average on-state current	half sine wave; $T_{\text{mb}} \leq 122\text{ }^{\circ}\text{C}$;		-	7.5	A
$I_{\text{T(RMS)}}$	RMS on-state current	half sine wave; $T_{\text{mb}} \leq 122\text{ }^{\circ}\text{C}$; Fig. 1 ; Fig. 2 ; Fig. 3		-	12	A
I_{TSM}	non-repetitive peak on-state current	half sine wave; $T_{\text{j(init)}} = 25\text{ }^{\circ}\text{C}$; $t_{\text{p}} = 10\text{ ms}$; Fig. 4 ; Fig. 5		-	120	A
		half sine wave; $T_{\text{j(init)}} = 25\text{ }^{\circ}\text{C}$; $t_{\text{p}} = 8.3\text{ ms}$		-	132	A
I^2t	I^2t for fusing	$t_{\text{p}} = 10\text{ ms}$; sine wave		-	72	A^2s
di_{T}/dt	rate of rise of on-state current	$I_{\text{G}} = 10\text{ mA}$		-	150	$\text{A}/\mu\text{s}$
I_{GM}	peak gate current			-	2	A
P_{GM}	peak gate power			-	5	W
$P_{\text{G(AV)}}$	average gate power	over any 20 ms period		-	0.5	W
T_{stg}	storage temperature			-40	150	$^{\circ}\text{C}$
T_{j}	junction temperature			-	150	$^{\circ}\text{C}$

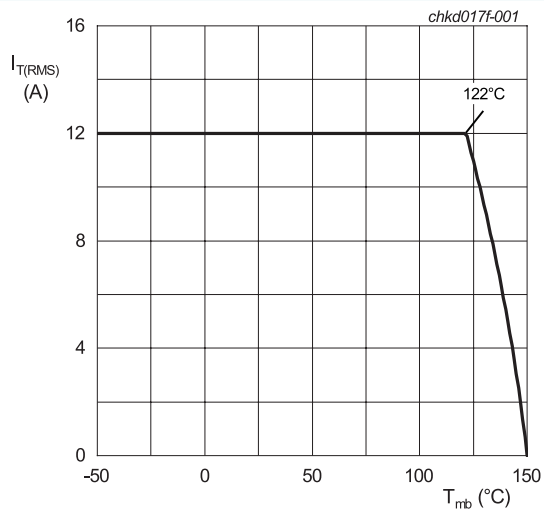


Fig. 1. RMS on-state current as a function of mounting base temperature; maximum values

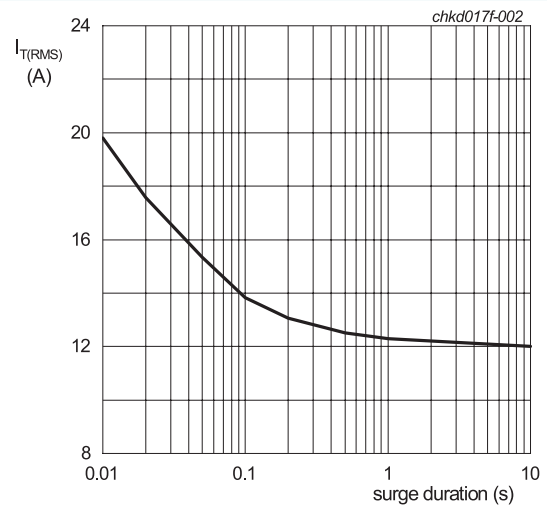
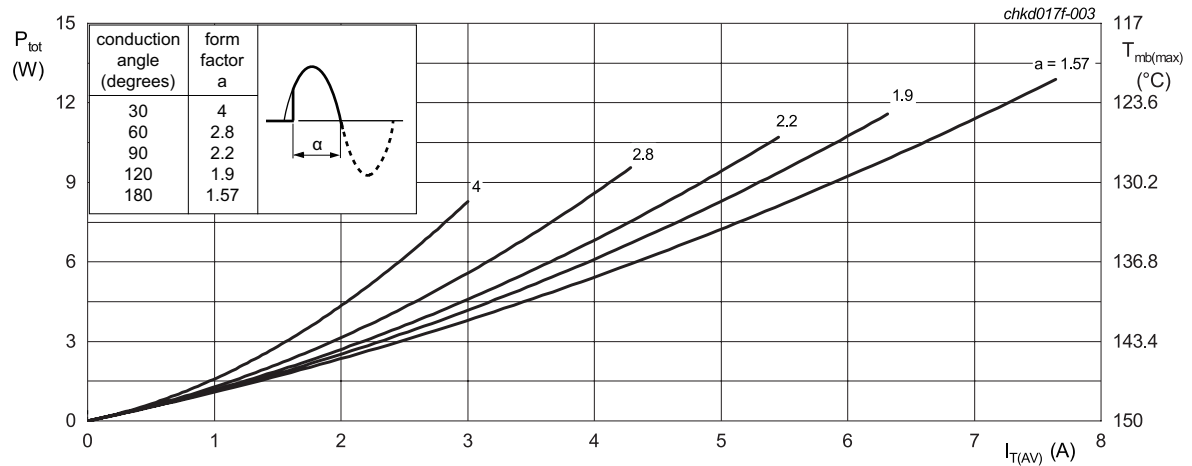
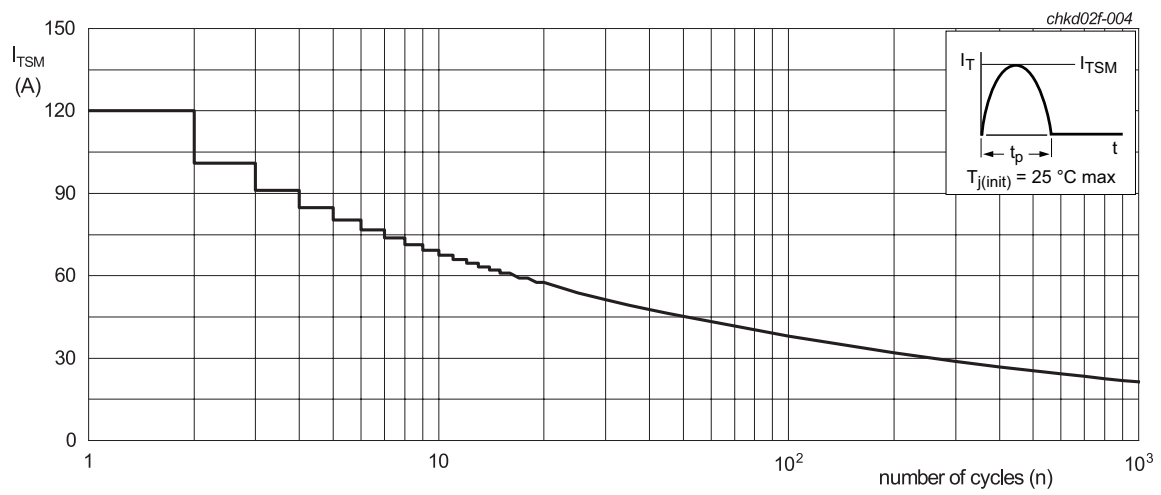


Fig. 2. RMS on-state current as a function of surge duration; maximum values



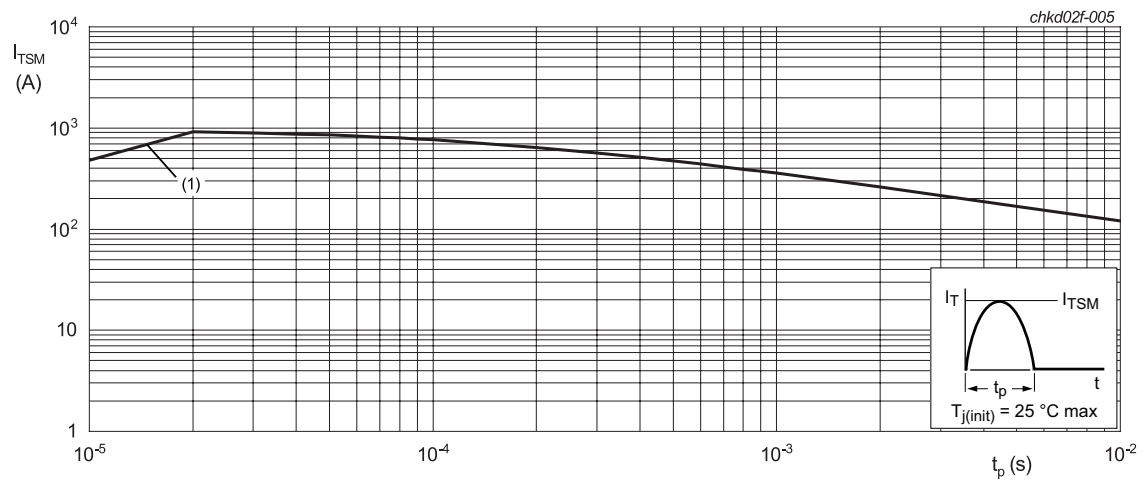
α = conduction angle
 a = form factor = $I_{T(RMS)} / I_{T(AV)}$

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



$f = 50 \text{ Hz}$

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



$t_p \leq 10 \text{ ms}$;
 (1) di_T/dt limit

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

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	Fig. 6	-	-	2.2	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air	-	60	-	K/W

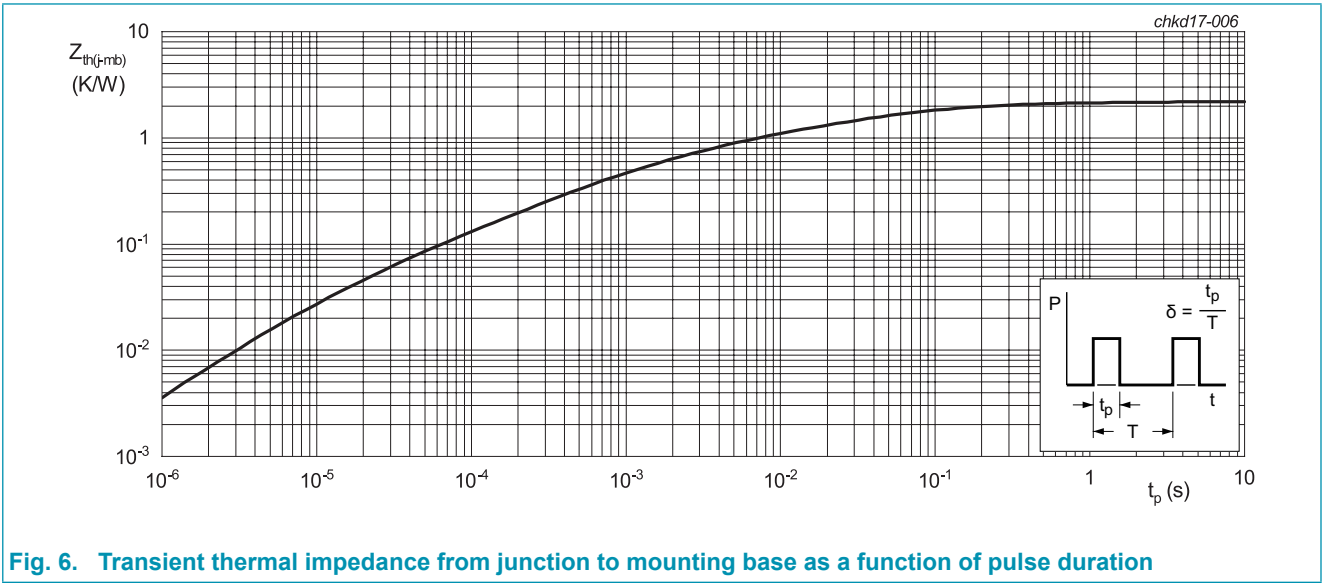


Fig. 6. Transient thermal impedance from junction to mounting base as a function of pulse duration

10. Isolation characteristics

Table 7. Isolation characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{isol(RMS)}$	RMS isolation voltage	$50\text{ Hz} \leq f \leq 60\text{ Hz}$; $RH \leq 65\%$; from all pins to external heatsink; sinusoidal waveform; clean and dust free	-	-	2500	V
C_{isol}	isolation capacitance	from cathode to external heatsink	-	10	-	pF

11. Characteristics

Table 8. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
I _{GT}	gate trigger current	V _D = 12 V; I _T = 0.1 A; T _j = 25 °C; Fig. 7		1.5	-	5	mA
I _L	latching current	V _D = 12 V; I _G = 0.1 A; T _j = 25 °C; Fig. 8		-	-	40	mA
I _H	holding current	V _D = 12 V; T _j = 25 °C; Fig. 9		-	-	20	mA
V _T	on-state voltage	I _T = 12 A; T _j = 25 °C; Fig. 10		-	-	1.5	V
V _{GT}	gate trigger voltage	V _D = 12 V; I _T = 0.1 A; T _j = 25 °C; Fig. 11		-	0.8	1	V
		V _D = 400 V; I _T = 0.1 A; T _j = 150 °C		0.25	0.45	-	V
V _{GR}	gate reverse voltage	I _{RG} = 100 mA		10	-	-	V
I _D	off-state current	V _D = 650 V; T _j = 25 °C		-	-	10	μA
		V _D = 650 V; T _j = 150 °C		-	-	2	mA
I _R	reverse current	V _D = 650 V; T _j = 25 °C		-	-	10	μA
		V _D = 650 V; T _j = 150 °C		-	-	2	mA
Dynamic characteristics							
dV _D /dt	rate of rise of off-state voltage	V _{DM} = 436 V; T _j = 150 °C; R _{GK} = 100 Ω; (V _{DM} = 67% of V _{DRM}); exponential waveform		500	-	-	V/μs
		V _{DM} = 436 V; T _j = 150 °C; (V _{DM} = 67% of V _{DRM}); exponential waveform; gate open circuit		200	-	-	V/μs
t _{gt}	gate-controlled turn-on time	I _{TM} = 12 A; V _D = 600 V; I _G = 20 mA; (dI _G /dt) _M = 5 A/μs; T _j = 25 °C			2	-	μs
t _q	commutated turn-off time	I _{TM} = 2 A; t _p = 50 μs; dV _D /dt = 5 V/μs; dI/dt = 30 A/μs			-	12	μs

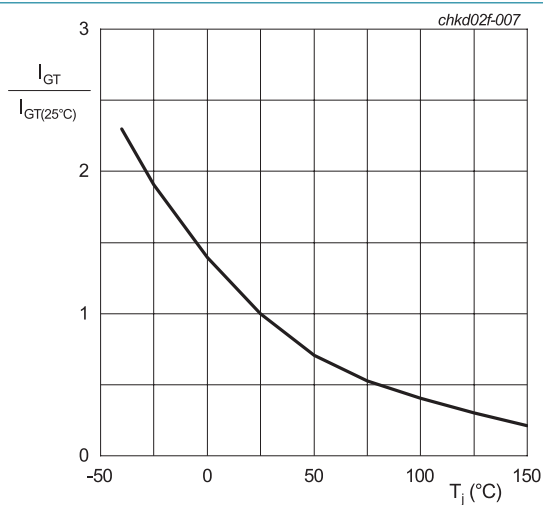


Fig. 7. Normalized gate trigger current as a function of junction temperature

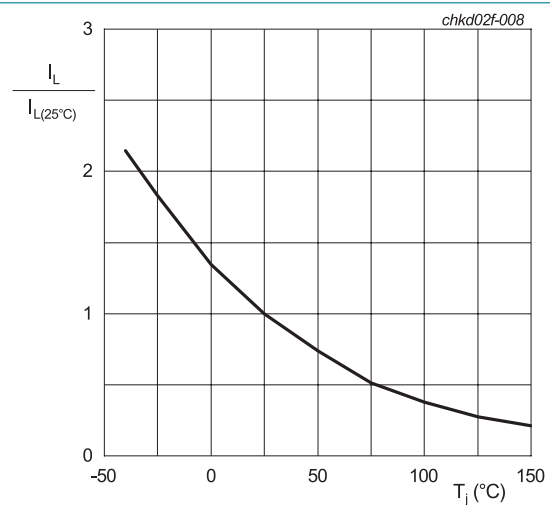


Fig. 8. Normalized latching current as a function of junction temperature

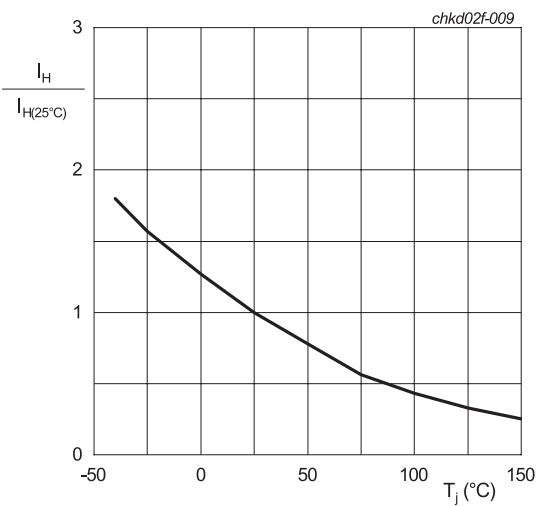
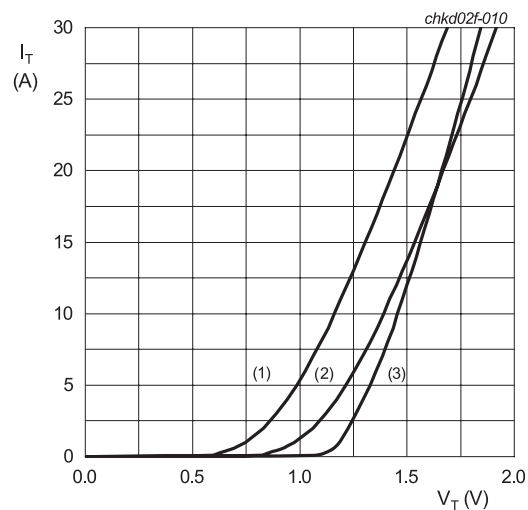


Fig. 9. Normalized holding current as a function of junction temperature



$V_o = 0.993 \text{ V}$; $R_s = 0.0368 \Omega$
(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. 10. On-state current as a function of on-state voltage

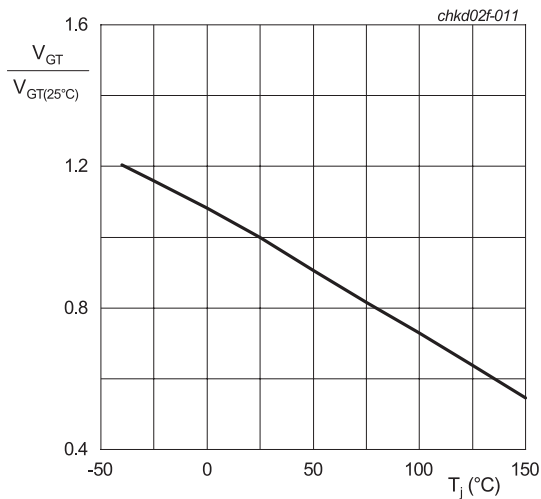
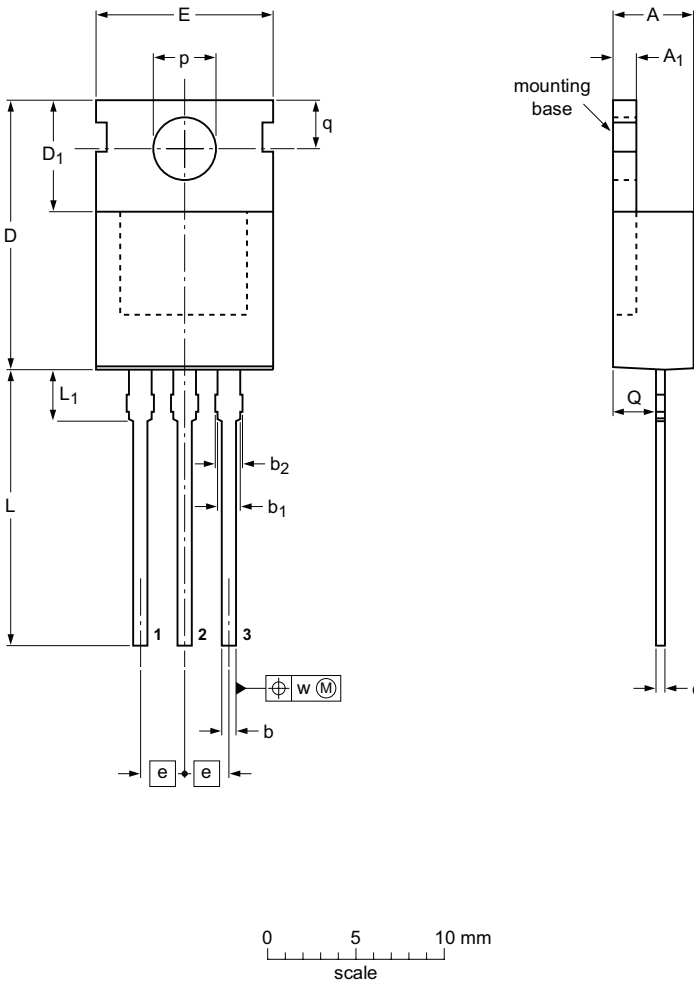


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

12. Package outline

Plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-220 SOT78D



DIMENSIONS (mm are the original dimensions)

UNIT	A	A ₁	b	b ₁	b ₂	c	D	D ₁ ref	E	e	L	L ₁ ref	p	Q	q	w
mm	4.7 4.3	1.40 1.25	0.9 0.6	1.4 1.1	1.72 1.32	0.6 0.4	16.0 15.2	6.5	10.3 9.7	2.54	14.0 12.8	3.0	3.7 3.5	2.6 2.2	3.0 2.7	0.2

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT78D		TO-220				07-04-04 07-07-10

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.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

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- [2] The term 'short data sheet' is explained in section "Definitions".
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