

1. General description

Planar passivated Silicon Controlled Rectifier (SCR) in TO220 plastic package intended for use in applications requiring very high inrush current capability, high thermal cycling performance 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

3. Applications

- Protection circuit in Power Supplies for Consumer / Industrial / Medical Equipment
- Capacitive Discharge Ignition (CDI)
- Crowbar protection
- Inrush protection
- Motor control
- Voltage regulation

4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Values	Unit
Absolute maximum rating				
V_{DRM}	repetitive peak off-state voltage		600	V
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_{mb} \leq 135\text{ °C}$; Fig. 1 ; Fig. 2 ; Fig. 3	20	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	230	A
		half sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 8.3\text{ ms}$	253	A
T_j	junction temperature		150	°C

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
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	-	5	32	mA
I_H	holding current	$V_D = 12\text{ V}$; $T_j = 25\text{ °C}$; Fig. 9	-	-	40	mA
V_T	on-state voltage	$I_T = 32\text{ A}$; $T_j = 25\text{ °C}$; Fig. 10	-	1.2	1.5	V
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 402\text{ V}$; $T_j = 150\text{ °C}$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; gate open circuit	1000	-	-	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	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
TYN20-600T	TO220	TYN20-600TQ	Tube	50	TO220E (E)	26-Apr-2019
					SOT78 (d)	13-Jun-2008

7. Marking

Table 4. Marking codes

Type number	Marking codes	
	Assembly factory: E	Assembly factory: d
TYN20-600T	TYN20 600T PJExxxx xx	TYN20 600T PJdxxxx xx

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		600	V
V_{RRM}	repetitive peak reverse voltage		600	V
$I_{T(AV)}$	average on-state current	half sine wave; $T_{mb} \leq 135\text{ °C}$	12.7	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_{mb} \leq 135\text{ °C}$; Fig. 1 ; Fig. 2 ; Fig. 3	20	A
I_{TSM}	non-repetitive peak on-state current	half sine wave; $T_{j(\text{init})} = 25\text{ °C}$; $t_p = 10\text{ ms}$; Fig. 4 ; Fig. 5	230	A
		half sine wave; $T_{j(\text{init})} = 25\text{ °C}$; $t_p = 8.3\text{ ms}$	253	A
I^2t	I^2t for fusing	$t_p = 10\text{ms}$; sine wave	265	A^2s
di_T/dt	rate of rise of on-state current	$I_G = 70\text{mA}$	150	$A/\mu s$
I_{GM}	peak gate current		5	A
V_{RGM}	peak reverse gate voltage		5	V
P_{GM}	peak gate power		20	W
$P_{G(AV)}$	average gate power	over any 20 ms period	1	W
T_{stg}	storage temperature		-40 to 150	$^{\circ}\text{C}$
T_j	junction temperature		150	$^{\circ}\text{C}$

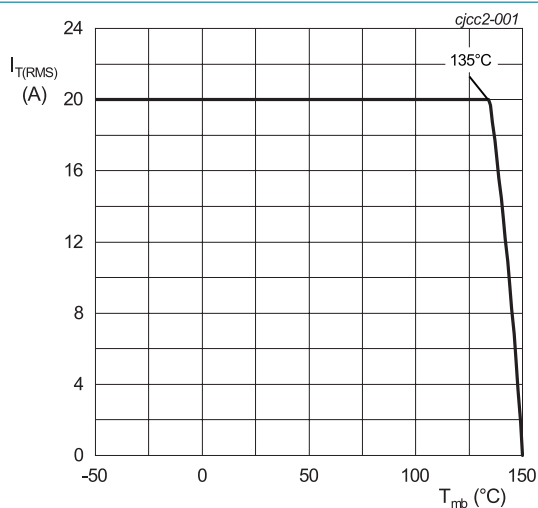


Fig. 1. RMS on-state current as a function of mounting base temperature; maximum values

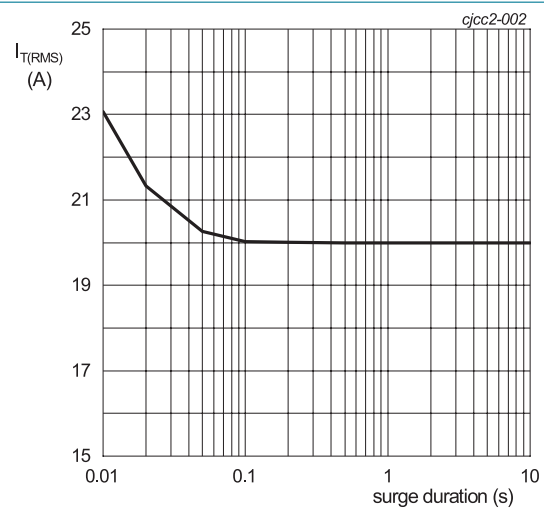
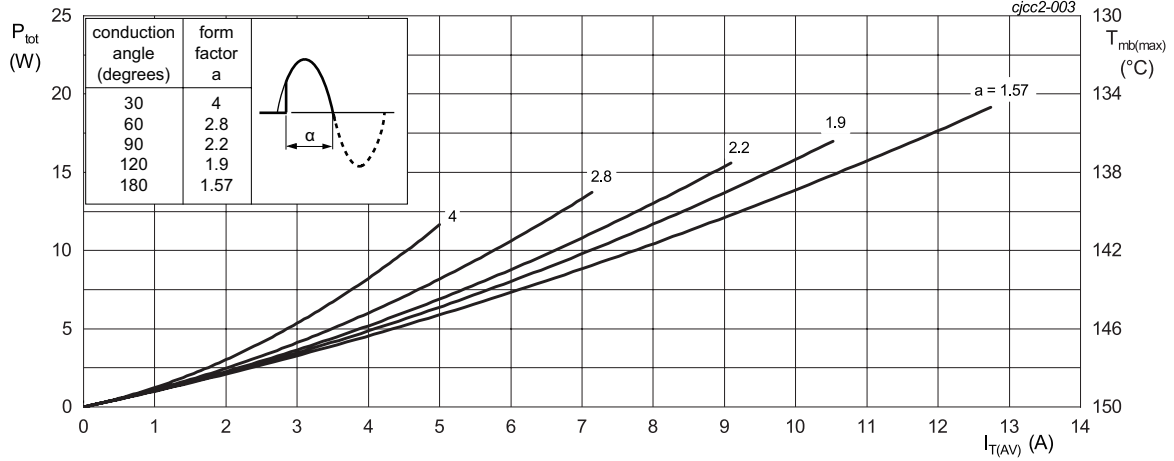
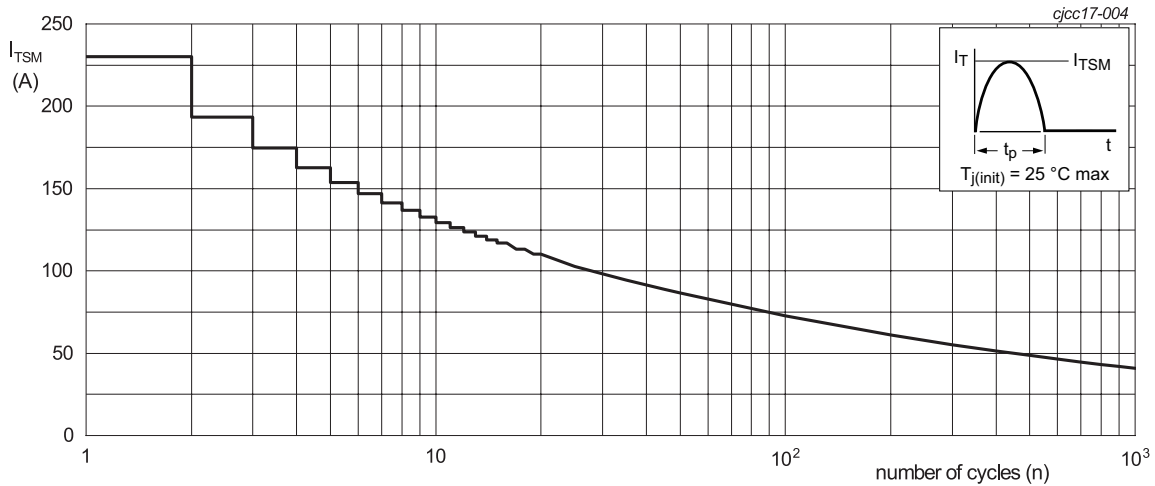


Fig. 2. RMS on-state current as a function of surge duration; maximum values
 $f = 50\text{ Hz}$; $T_{mb} = 135\text{ °C}$



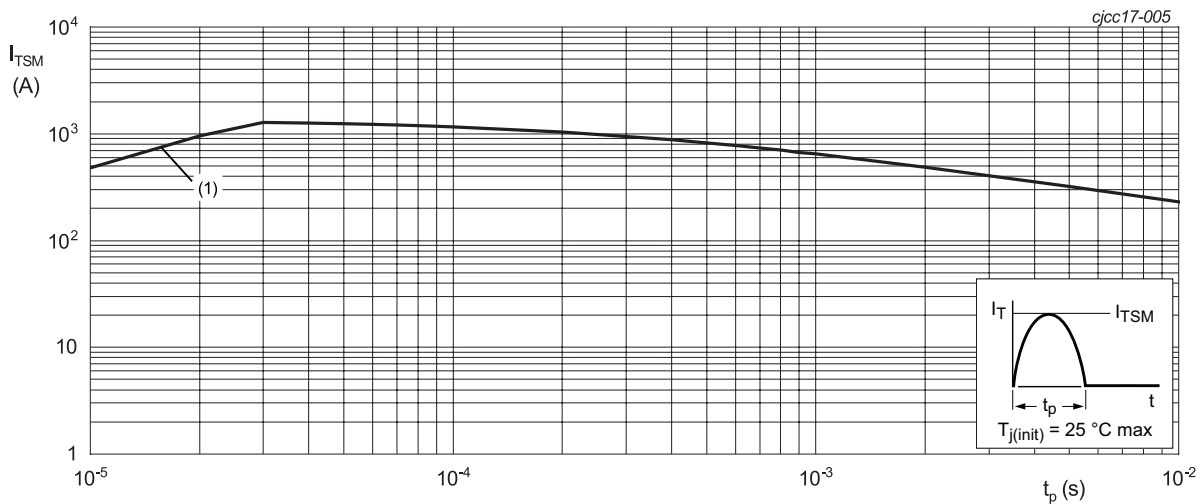
α = conduction angle
 a = form factor = $I_{T(RMS)} / I_{T(AV)}$

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



f = 50 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 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	-	-	0.8	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air	-	60	-	K/W

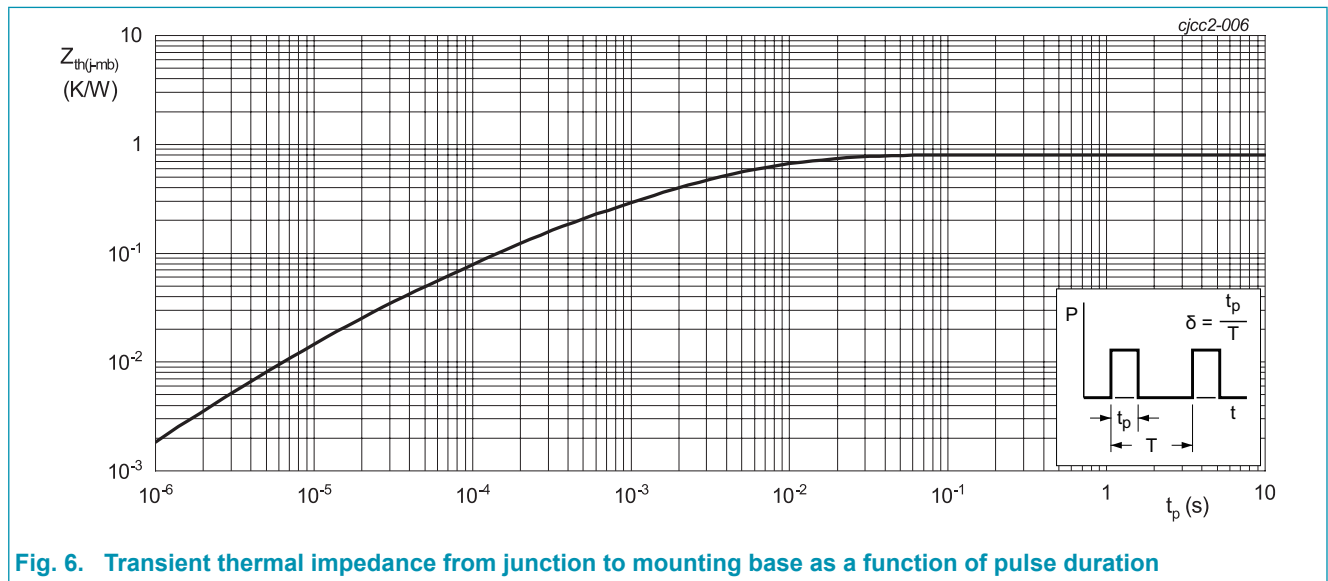


Fig. 6. Transient thermal impedance from junction to mounting base as a function of pulse duration

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I_{GT}	gate trigger current	$V_D = 12\text{ V}; I_T = 0.1\text{ A}; T_j = 25\text{ }^\circ\text{C}$; Fig. 7	-	5	32	mA
I_L	latching current	$V_D = 12\text{ V}; I_T = 0.1\text{ A}; T_j = 25\text{ }^\circ\text{C}$; Fig. 8	-	-	60	mA
I_H	holding current	$V_D = 12\text{ V}; T_j = 25\text{ }^\circ\text{C}$; Fig. 9	-	-	40	mA
V_T	on-state voltage	$I_T = 32\text{ A}; T_j = 25\text{ }^\circ\text{C}$; Fig. 10	-	1.2	1.5	V
V_{GT}	gate trigger voltage	$V_D = 12\text{ V}; I_T = 0.1\text{ A}; T_j = 25\text{ }^\circ\text{C}$; Fig. 11	-	0.7	1	V
		$V_D = 400\text{ V}; I_T = 0.1\text{ A}; T_j = 150\text{ }^\circ\text{C}$	0.2	0.4	-	V
I_D	off-state current	$V_D = 600\text{ V}; T_j = 150\text{ }^\circ\text{C}$	-	-	1	mA
I_R	reverse current	$V_D = 600\text{ V}; T_j = 150\text{ }^\circ\text{C}$	-	-	1	mA
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 402\text{ V}; T_j = 150\text{ }^\circ\text{C}$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; gate open circuit	1000	-	-	V/ μs
t_{gt}	gate-controlled turn-on time	$I_{TM} = 20\text{ A}; V_D = 600\text{ V}; I_G = 100\text{ mA}$; $(dI_G/dt)_M = 5\text{ A}/\mu\text{s}$; $T_j = 25\text{ }^\circ\text{C}$	-	2	-	μs
t_q	commutated turn-off time	$V_{DM} = 402\text{ V}; T_j = 150\text{ }^\circ\text{C}$; $I_{TM} = 20\text{ A}$; $V_R = 25\text{ V}$; $dV_D/dt = 50\text{ V}/\mu\text{s}$; $(dI_T/dt)_M = 30\text{ A}/\mu\text{s}$; $R_{GK(ext)} = 100\text{ }\Omega$; ($V_{DM} = 67\%$ of V_{DRM})	-	70	-	μs

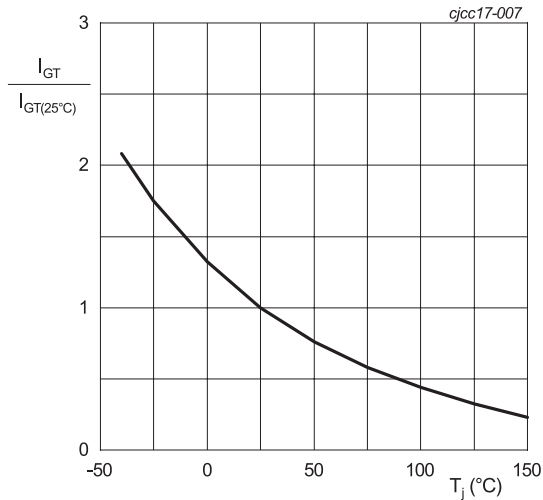


Fig. 7. Normalized gate trigger current as a function of junction temperature

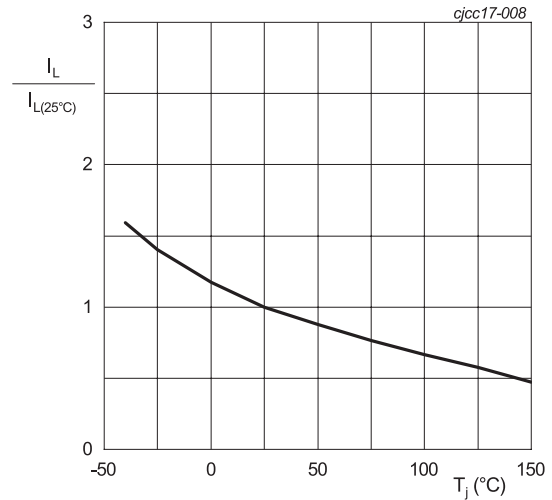


Fig. 8. Normalized latching current as a function of junction temperature

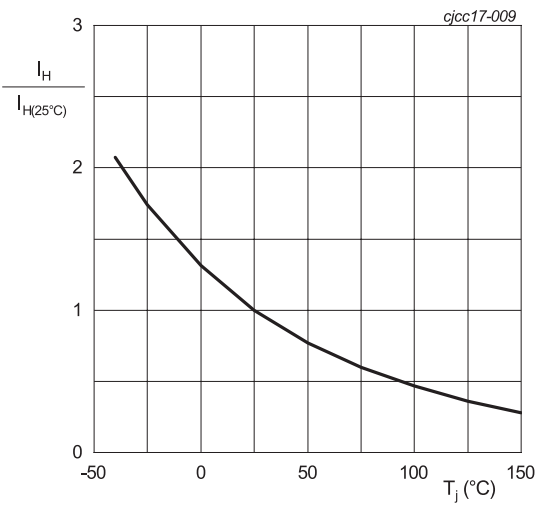
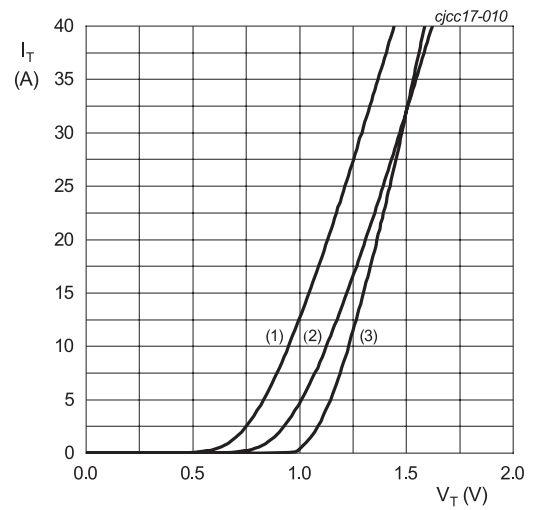


Fig. 9. Normalized holding current as a function of junction temperature



$V_o = 0.969 \text{ V}; R_s = 0.0170 \Omega$
 (1) $T_j = 150^\circ\text{C}$; typical values
 (2) $T_j = 150^\circ\text{C}$; maximum values
 (3) $T_j = 25^\circ\text{C}$; maximum values

Fig. 10. On-state current as a function of on-state voltage

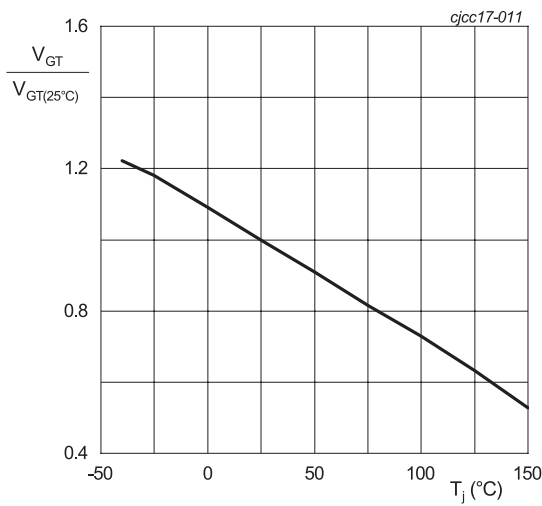
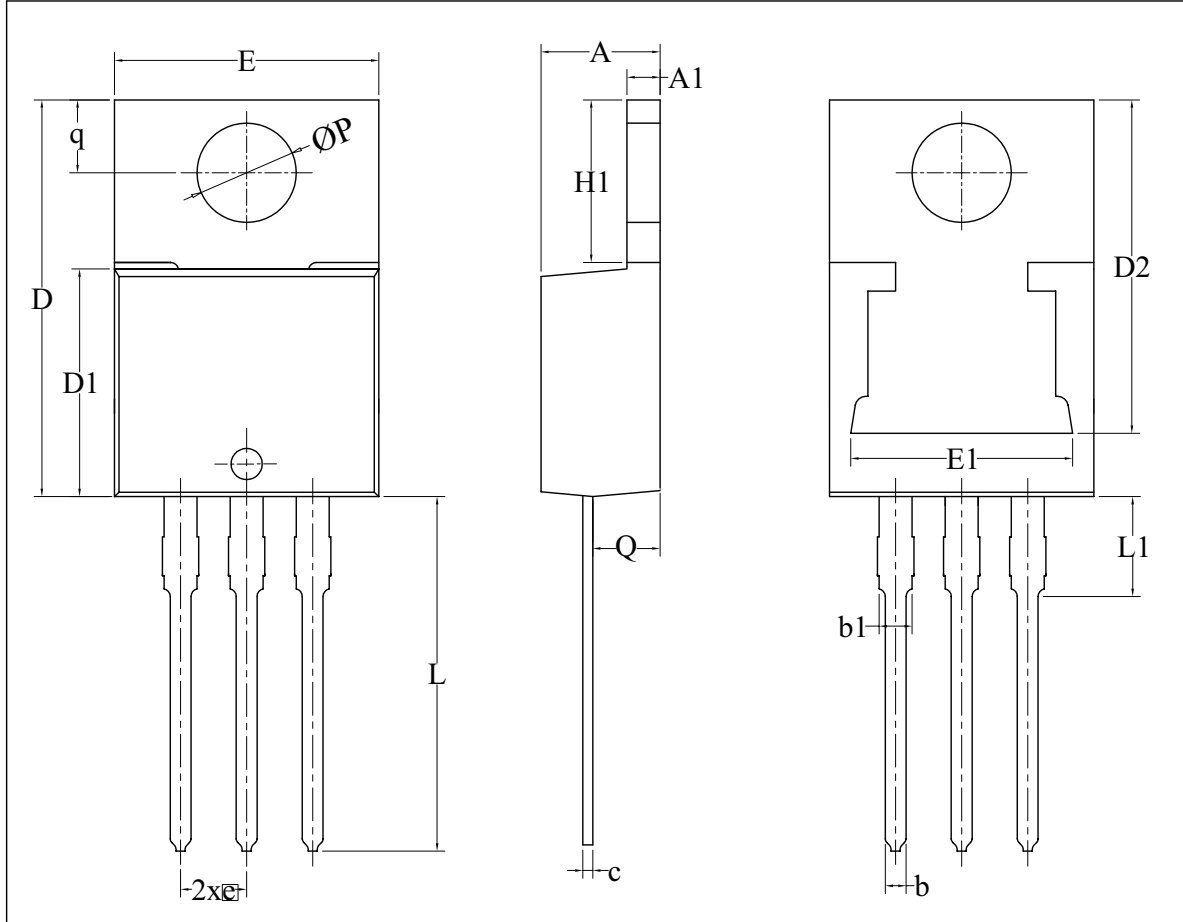


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

11. Package outline

Assembly factory: E

Plastic single-ended package; heatsink mounted; 1 mounting hole; 3 leads TO-220AB TO220

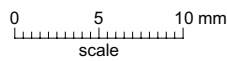
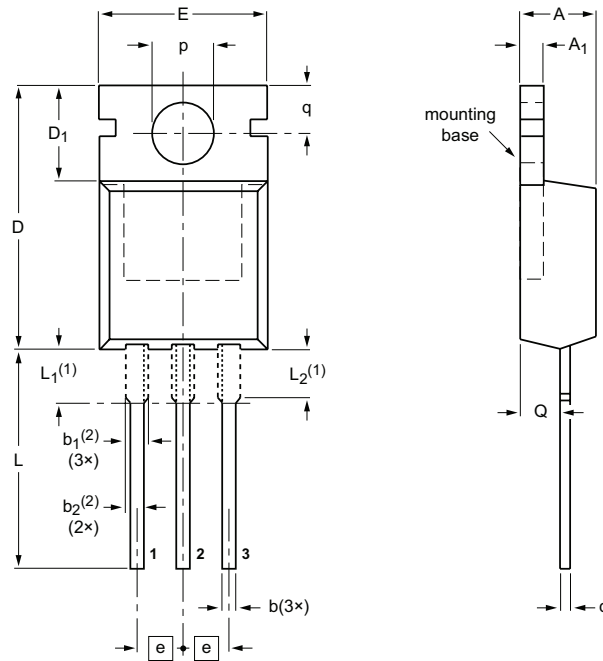


Unit	A	A1	b	b1	c	D	D1	D2	E	E1	e	H1	L	L1	P	Q	q
MM	min	4.35	1.14	0.69	1.20	0.36	14.95	8.50	12.20	10.00	8.25	6.00	13.00	3.40	3.70	2.40	2.60
	max	4.75	1.40	1.01	1.45	0.61	15.55	9.02	12.88	10.40	8.89	2.54 (BSC)	6.40	14.00	3.80	3.95	2.80

Assembly factory: d

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

SOT78



DIMENSIONS (mm are the original dimensions)

UNIT	A	A ₁	b	b ₁ (²)	b ₂ (²)	c	D	D ₁	E	e	L	L ₁ (¹)	L ₂ (¹) max.	p	q	Q
mm	4.7 4.1	1.40 1.25	0.9 0.6	1.6 1.0	1.3 1.0	0.7 0.4	16.0 15.2	6.6 5.9	10.3 9.7	2.54	15.0 12.8	3.30 2.79	3.0	3.8 3.5	3.0 2.7	2.6 2.2

Notes

1. Lead shoulder designs may vary.
2. Dimension includes excess dambar.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT78		3-lead TO-220AB	SC-46			08-04-23 08-06-13

12. 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.

- [1] Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
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