



ACT108-800E

AC Thyristor power switch

13 March 2014

Product data sheet

1. General description

AC Thyristor power switch in a SOT54 (TO-92) plastic package with self-protective capabilities against low and high energy transients.

2. Features and benefits

- Exclusive negative gate triggering
- Full cycle AC conduction
- Remote gate separates the gate driver from the effects of the load current
- Safe clamping of low energy over-voltage transients
- High voltage capability
- Self-protective turn-on during high energy voltage transients
- Very high noise immunity

3. Applications

- Fan motor circuits
- Pump motor circuits
- Lower-power highly inductive, resistive and safety loads

4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DRM}	repetitive peak off-state voltage		-	-	800	V
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{\text{j(Init)}} = 25\text{ }^{\circ}\text{C}$; $t_{\text{p}} = 20\text{ ms}$; Fig. 4 ; Fig. 5	-	-	13	A
T_{j}	junction temperature		-	-	125	$^{\circ}\text{C}$
$I_{\text{T(RMS)}}$	RMS on-state current	full sine wave; $T_{\text{lead}} \leq 75\text{ }^{\circ}\text{C}$; Fig. 1 ; Fig. 2 ; Fig. 3	-	-	0.8	A
V_{PP}	peak pulse voltage	$T_{\text{j}} = 25\text{ }^{\circ}\text{C}$; non-repetitive, off-state; ten pulses on each voltage polarity; 20s or more between successive pulses; Fig. 6	-	-	2.5	kV



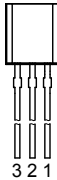
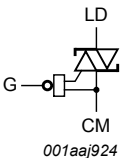
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Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I _{GT}	gate trigger current	V _D = 12 V; I _T = 100 mA; LD+ G-; T _j = 25 °C; Fig. 8	1	-	10	mA
		V _D = 12 V; I _T = 100 mA; LD- G-; T _j = 25 °C; Fig. 8	1	-	10	mA
V _{CL}	clamping voltage	I _{CL} = 0.1 mA; t _p = 1 ms; T _j = 25 °C	850	-	-	V
Dynamic characteristics						
dV _D /dt	rate of rise of off-state voltage	V _{DM} = 536 V; T _j = 125 °C; (V _{DM} = 67% of V _{DRM}); exponential waveform; gate open circuit; Fig. 13	500	-	-	V/μs
di _{com} /dt	rate of change of commutating current	V _D = 400 V; T _j = 125 °C; I _{T(RMS)} = 0.8 A; dV _{com} /dt = 20 V/μs; (snubberless condition); gate open circuit; Fig. 14 ; Fig. 15	0.5	-	-	A/ms

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	CM	common	 <p>TO-92 (SOT54)</p>	 <p>001aaJ924</p>
2	G	gate		
3	LD	load		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
ACT108-800E	TO-92	plastic single-ended leaded (through hole) package; 3 leads	SOT54

7. Limiting values

Table 4. 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		-	800	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{lead} \leq 75\text{ }^{\circ}\text{C}$; Fig. 1 ; Fig. 2 ; Fig. 3	-	0.8	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(init)} = 25\text{ }^{\circ}\text{C}$; $t_p = 20\text{ ms}$; Fig. 4 ; Fig. 5	-	13	A
		full sine wave; $T_{j(init)} = 25\text{ }^{\circ}\text{C}$; $t_p = 16.7\text{ ms}$	-	14.3	A
I^2t	I^2t for fusing	$t_p = 10\text{ ms}$; sine-wave pulse	-	0.84	A^2s
di_T/dt	rate of rise of on-state current	$I_T = 1\text{ A}$; $I_G = 20\text{ mA}$; $di_G/dt = 0.2\text{ A}/\mu\text{s}$	-	100	$\text{A}/\mu\text{s}$
I_{GM}	peak gate current	$t = 20\text{ }\mu\text{s}$	-	1	A
V_{GM}	peak gate voltage	positive applied gate voltage	-	15	V
$P_{G(AV)}$	average gate power	over any 20 ms period	-	0.1	W
T_{stg}	storage temperature		-40	150	$^{\circ}\text{C}$
T_j	junction temperature		-	125	$^{\circ}\text{C}$
V_{PP}	peak pulse voltage	$T_j = 25\text{ }^{\circ}\text{C}$; non-repetitive, off-state; ten pulses on each voltage polarity; 20s or more between successive pulses; Fig. 6	-	2.5	kV

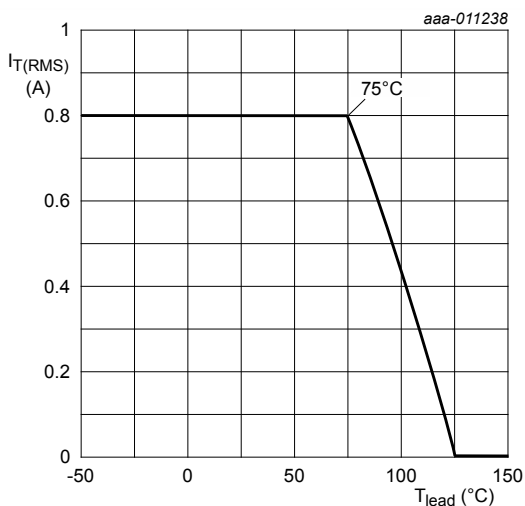
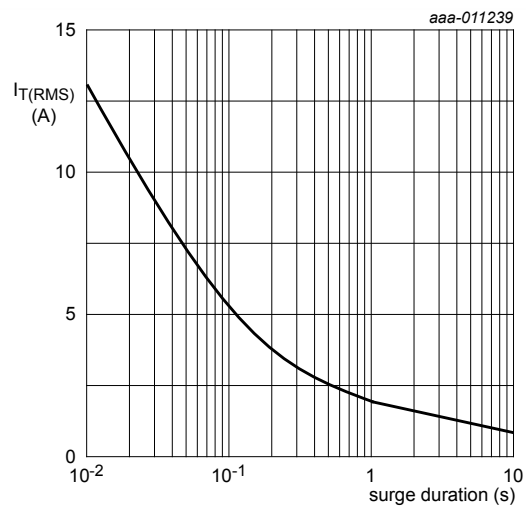


Fig. 1. RMS on-state current as a function of lead temperature; maximum values



$f = 50\text{ Hz}$; $T_{lead} = 75\text{ }^{\circ}\text{C}$

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

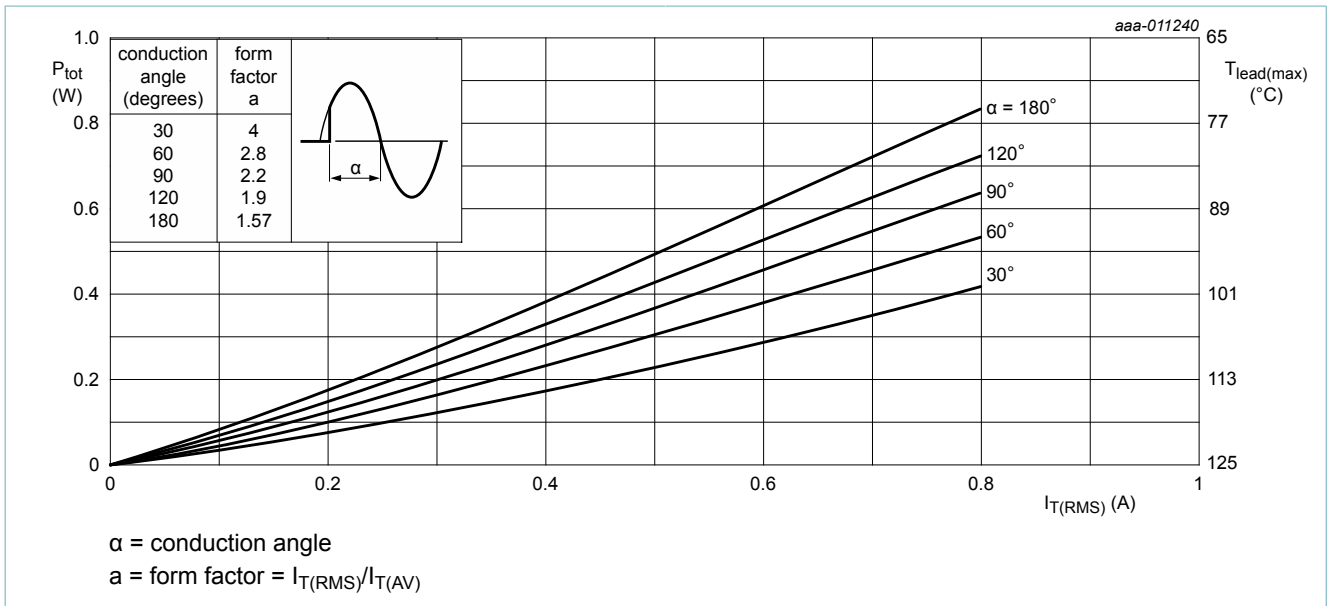


Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values

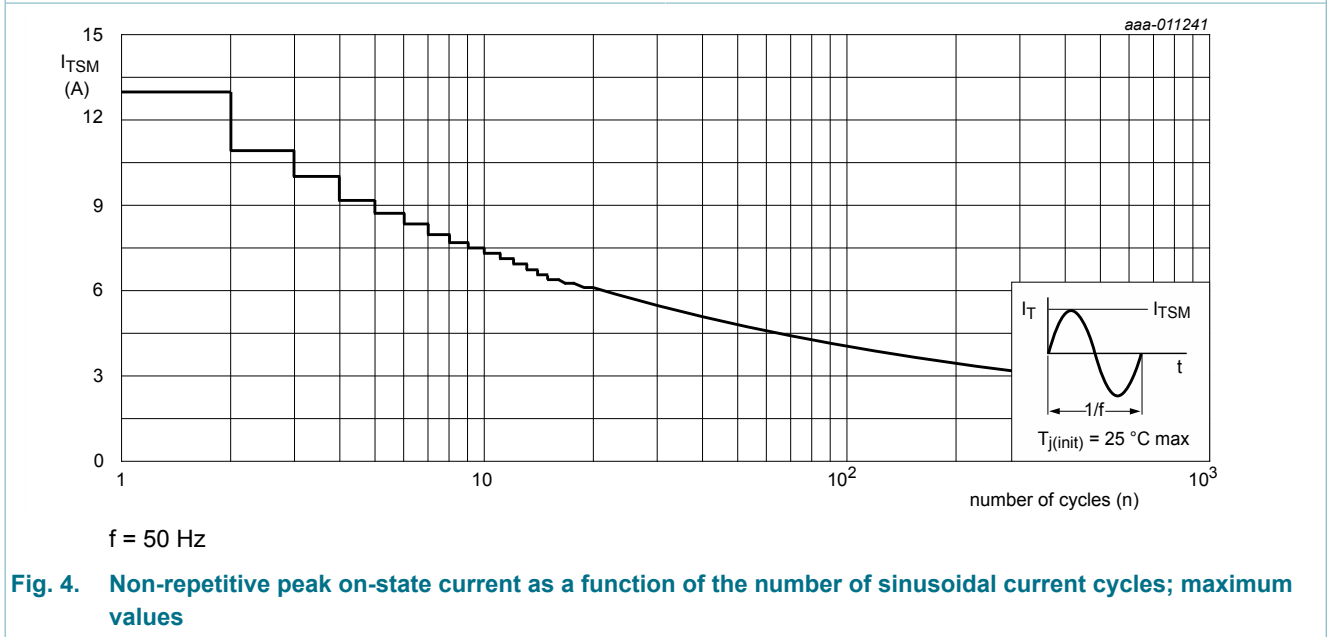
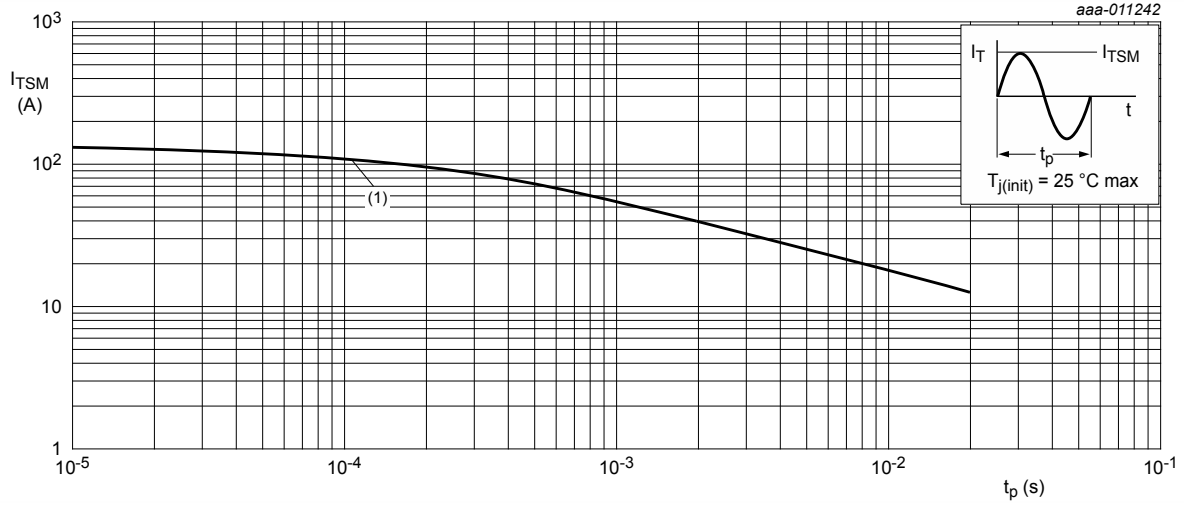


Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



$t_p \leq 20\text{ ms}$
 (1) dI_T/dt limit

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

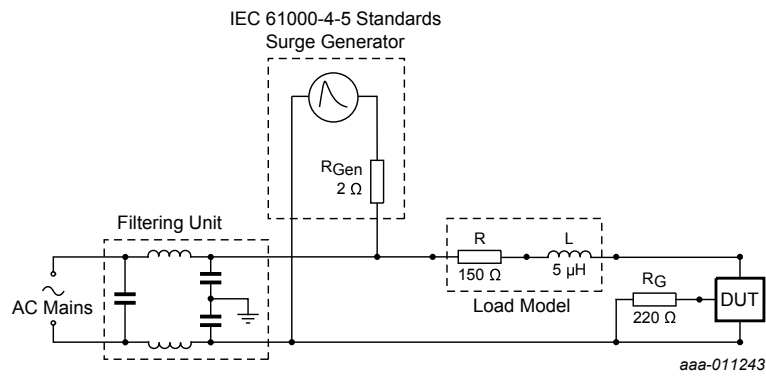


Fig. 6. Test circuit for inductive and resistive loads with conditions equivalent to IEC 61000-4-5

8. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-lead)}$	thermal resistance from junction to lead	full cycle with heatsink compound; Fig. 7	-	-	60	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	full cycle; printed-circuit board mounted; lead length 4 mm	-	150	-	K/W

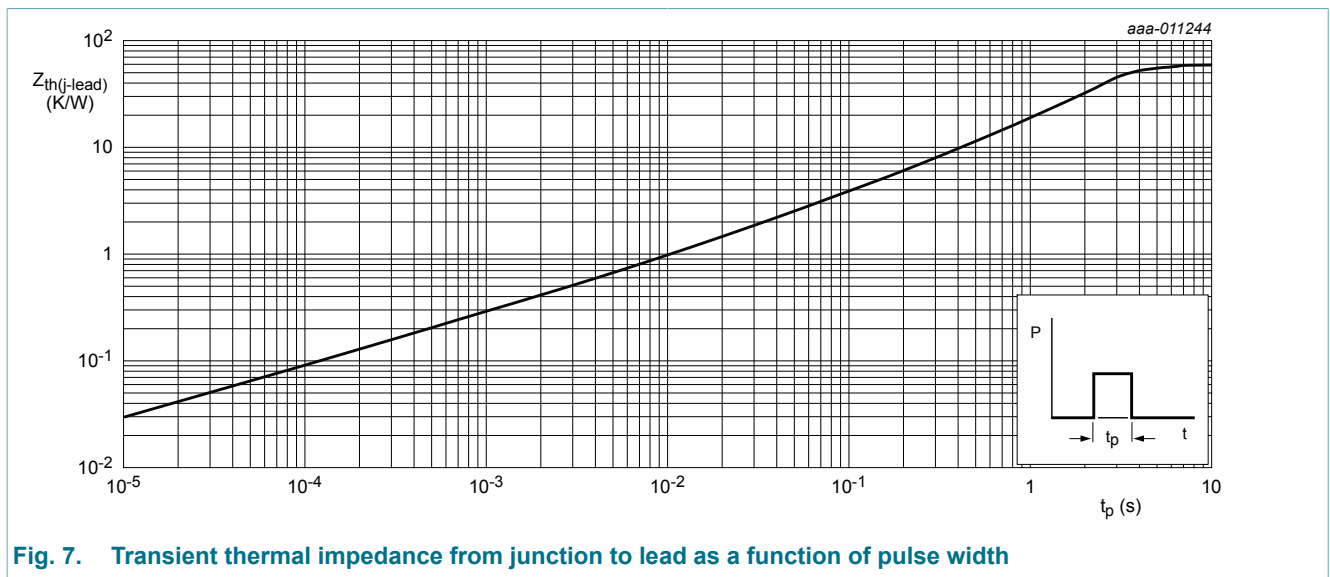
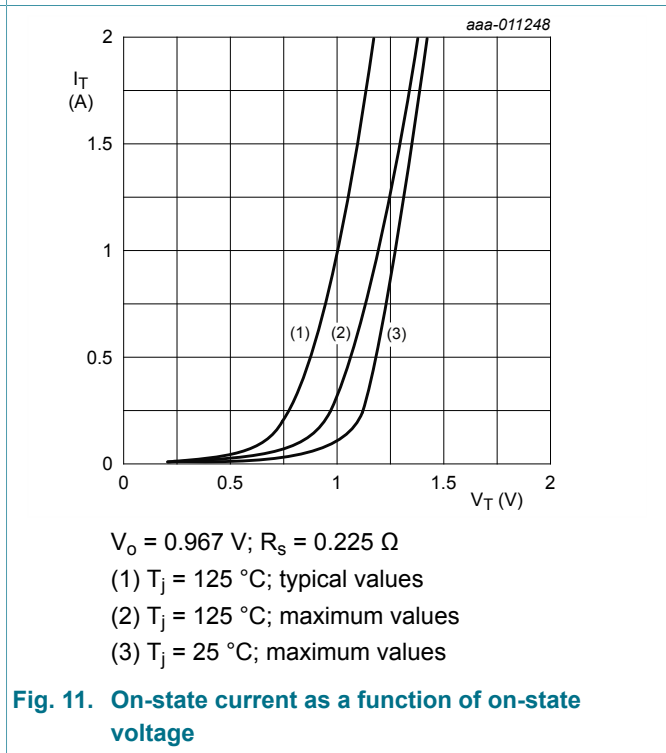
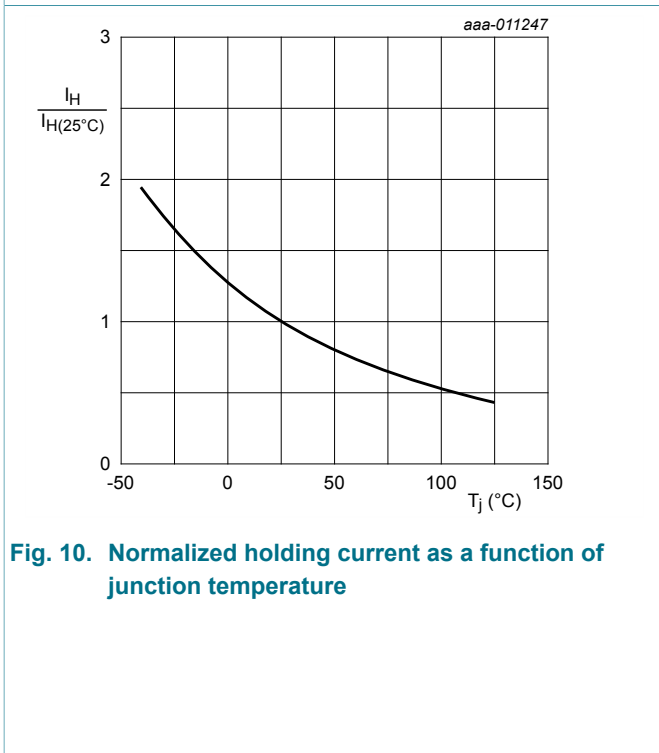
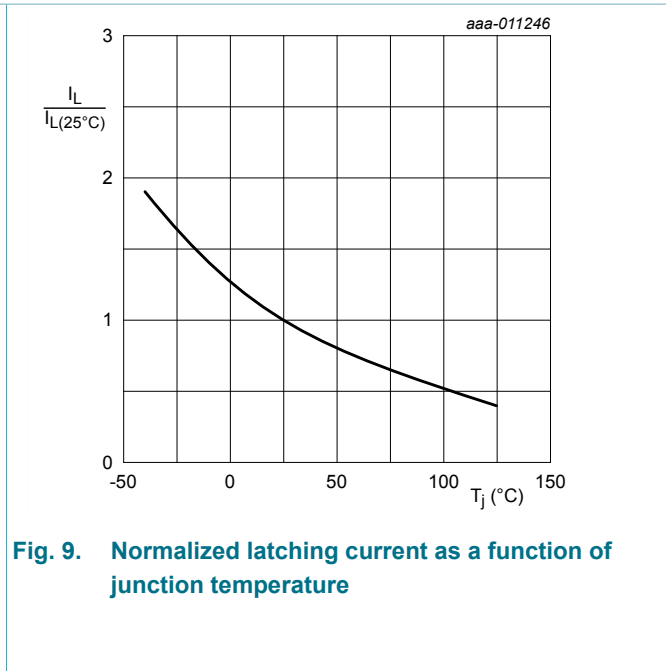
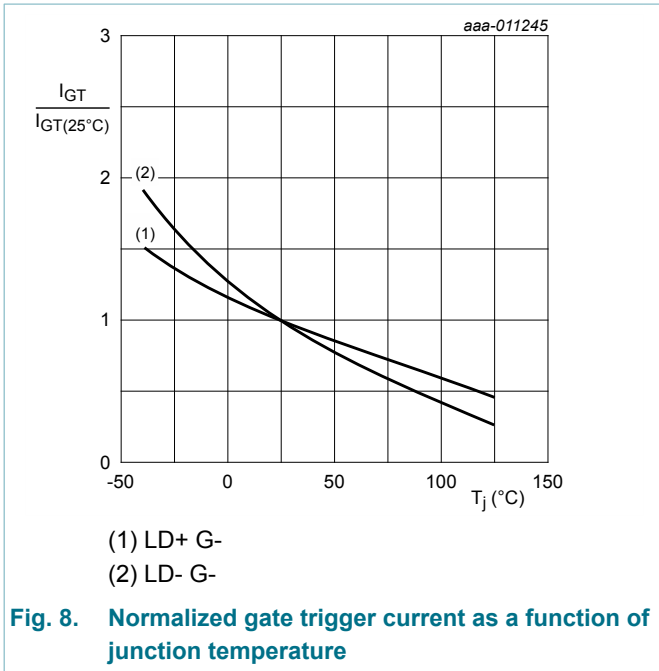


Fig. 7. Transient thermal impedance from junction to lead as a function of pulse width

9. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I_{GT}	gate trigger current	$V_D = 12\text{ V}$; $I_T = 100\text{ mA}$; LD+ G-; $T_j = 25\text{ °C}$; Fig. 8	1	-	10	mA
		$V_D = 12\text{ V}$; $I_T = 100\text{ mA}$; LD- G-; $T_j = 25\text{ °C}$; Fig. 8	1	-	10	mA
I_L	latching current	$V_D = 12\text{ V}$; $I_G = 100\text{ mA}$; LD+ G-; $T_j = 25\text{ °C}$; Fig. 9	-	-	25	mA
		$V_D = 12\text{ V}$; $I_G = 100\text{ mA}$; LD- G-; $T_j = 25\text{ °C}$; Fig. 9	-	-	20	mA
I_H	holding current	$V_D = 12\text{ V}$; $T_j = 25\text{ °C}$; Fig. 10	-	-	20	mA
V_T	on-state voltage	$I_T = 1.1\text{ A}$; $T_j = 25\text{ °C}$; Fig. 11	-	-	1.3	V
V_{GT}	gate trigger voltage	$V_D = 12\text{ V}$; $I_T = 100\text{ mA}$; $T_j = 25\text{ °C}$; Fig. 12	-	-	1	V
		$V_D = 400\text{ V}$; $I_T = 100\text{ mA}$; $T_j = 125\text{ °C}$; Fig. 12	0.15	-	-	V
I_D	off-state current	$V_D = 800\text{ V}$; $T_j = 25\text{ °C}$	-	-	2	μA
		$V_D = 800\text{ V}$; $T_j = 125\text{ °C}$	-	-	0.2	mA
V_{CL}	clamping voltage	$I_{CL} = 0.1\text{ mA}$; $t_p = 1\text{ ms}$; $T_j = 25\text{ °C}$	850	-	-	V
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 536\text{ V}$; $T_j = 125\text{ °C}$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; gate open circuit; Fig. 13	500	-	-	V/ μs
dI_{com}/dt	rate of change of commutating current	$V_D = 400\text{ V}$; $T_j = 125\text{ °C}$; $I_{T(RMS)} = 0.8\text{ A}$; $dV_{com}/dt = 20\text{ V}/\mu\text{s}$; (snubberless condition); gate open circuit; Fig. 14 ; Fig. 15	0.5	-	-	A/ms



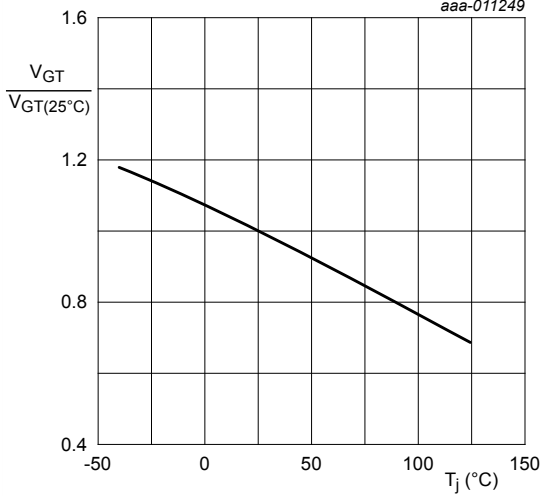
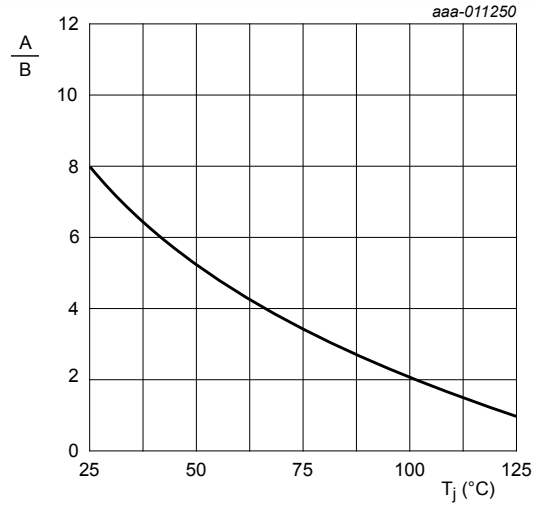
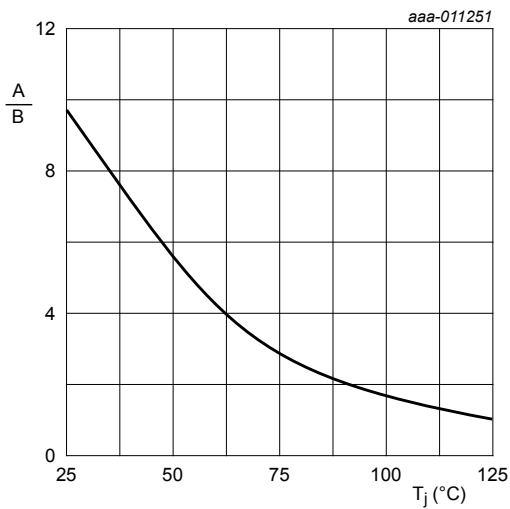


Fig. 12. Normalized gate trigger voltage as a function of junction temperature



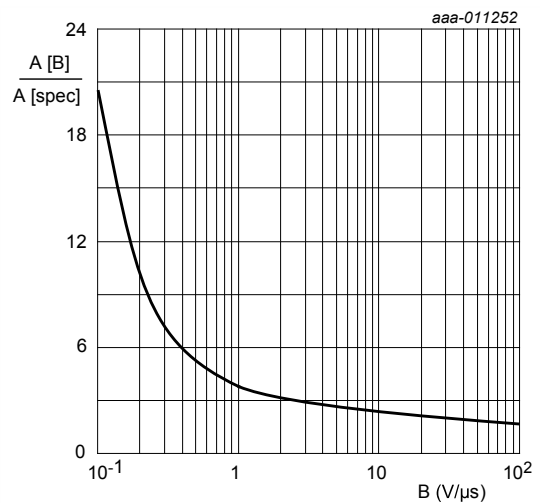
A is dV_D/dt at condition T_j °C
 B is dV_D/dt at condition T_j 125 °C

Fig. 13. Normalized rate of rise of off-state voltage as a function of junction temperature



A is dI_{com}/dt at condition T_j °C
 B is dI_{com}/dt at condition T_j 125 °C
 $V_D = 400$ V

Fig. 14. Normalized critical rate of rise of commutating current as a function of junction temperature



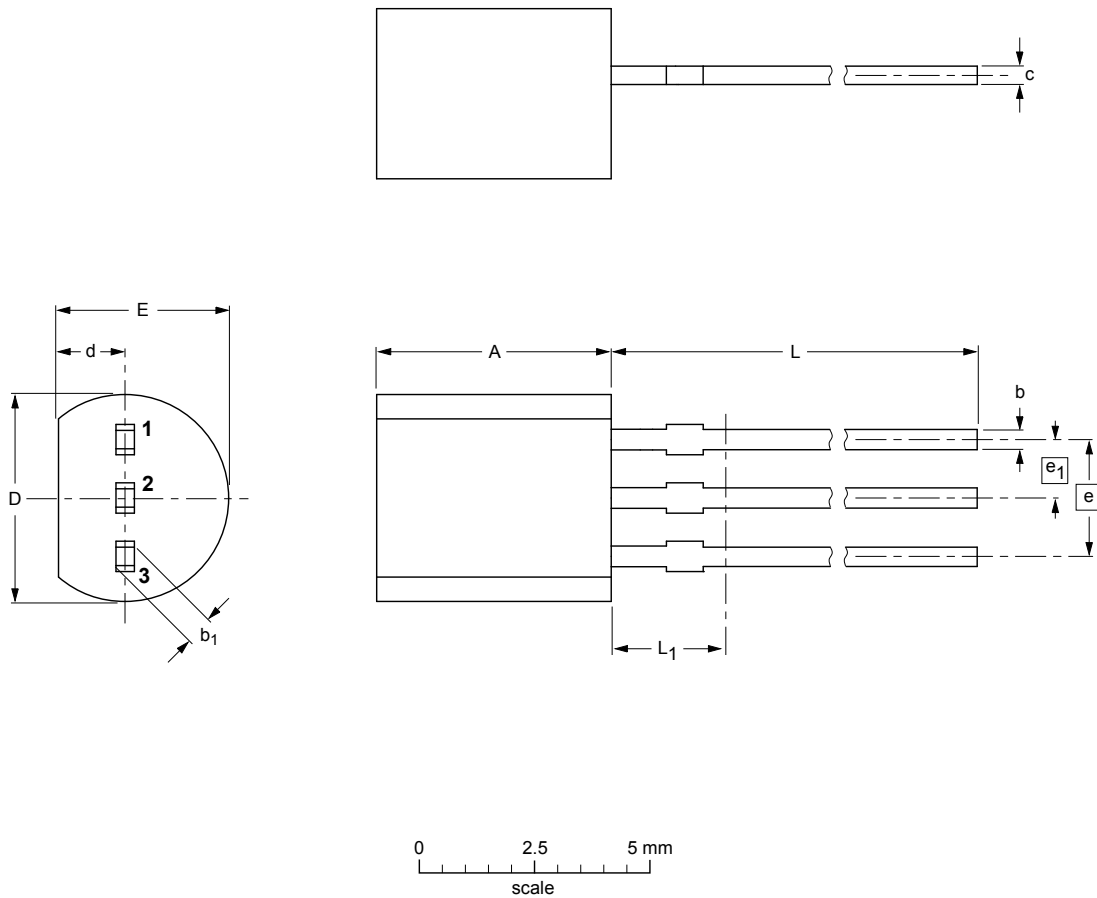
A[B] is dI_{com}/dt at condition B, dV_{com}/dt
 A[spec] is the specified data sheet value of dI_{com}/dt
 turn-off time < 20 ms

Fig. 15. Normalized critical rate of change of commutating current as a function of critical rate of change of commutating voltage; minimum values

10. Package outline

Plastic single-ended leaded (through hole) package; 3 leads

SOT54



DIMENSIONS (mm are the original dimensions)

UNIT	A	b	b ₁	c	D	d	E	e	e ₁	L	L ₁ ⁽¹⁾ max.
mm	5.2 5.0	0.48 0.40	0.66 0.55	0.45 0.38	4.8 4.4	1.7 1.4	4.2 3.6	2.54	1.27	14.5 12.7	2.5

Note

1. Terminal dimensions within this zone are uncontrolled to allow for flow of plastic and terminal irregularities.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT54		TO-92	SC-43A			-04-06-28- 04-11-16

Fig. 16. Package outline TO-92 (SOT54)

11. Legal information

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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.
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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