

1. General description

AC Thyristor power switch in a TO92 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
- Very high noise immunity
- Safe clamping of low energy over-voltage transients
- Self-protective turn-on during high energy voltage transients

3. Applications

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

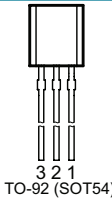
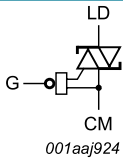
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Absolute maximum rating						
V_{DRM}	repetitive peak off-state voltage		-	-	600	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{lead} \leq 71 \text{ }^\circ\text{C}$; Fig. 1	-	-	0.8	A
Static characteristics						
I_{GT}	gate trigger current	$V_D = 12 \text{ V}$; $I_T = 0.1 \text{ A}$; LD+ G-; $T_j = 25 \text{ }^\circ\text{C}$; Fig. 6	1	-	10	mA
		$V_D = 12 \text{ V}$; $I_T = 0.1 \text{ A}$; LD- G+; $T_j = 25 \text{ }^\circ\text{C}$; Fig. 6	1	-	10	mA

5. Pinning information

Table 2. Pinning information

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

6. Ordering information

Table 3. Ordering information

Type number	Package Name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
ACT108-600E	TO92	ACT108-600E,412	Bulk	1000	SOT54	14-Nov-2013
ACT108-600E	TO92	ACT108-600E,126	Ammo	2000	SOT54 wide pitch	14-Nov-2013
ACT108-600E	TO92	ACT108-600EQP	Reel	2000	SOT54 wide pitch	14-Nov-2013

7. Marking

Table 4. Marking codes

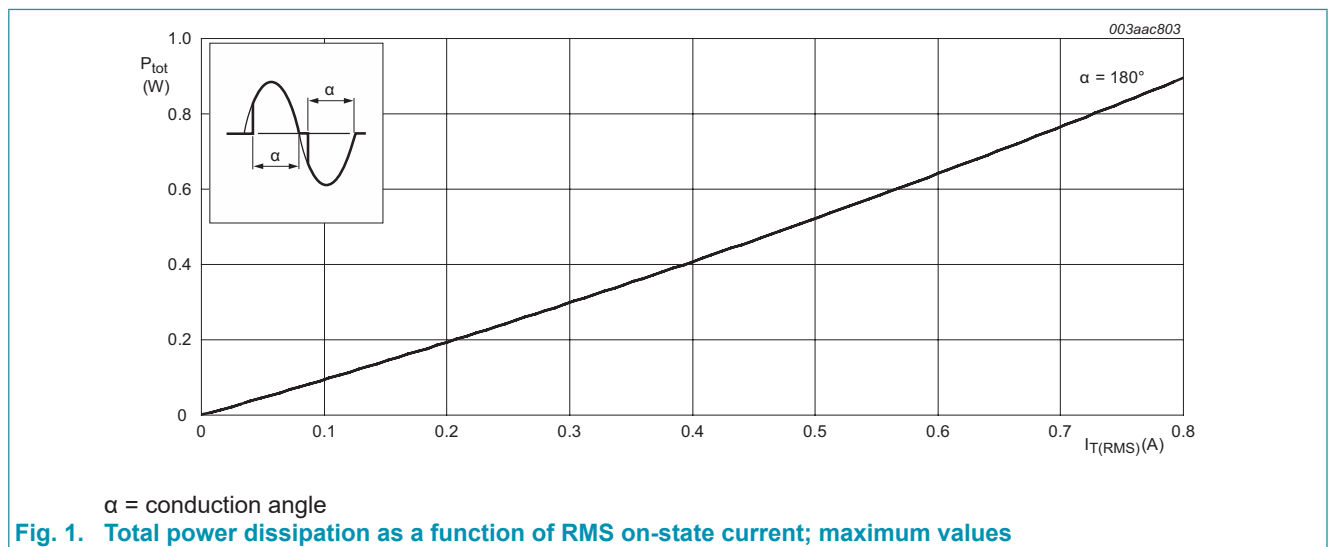
Type number	Marking codes
ACT108-600E	108-6E

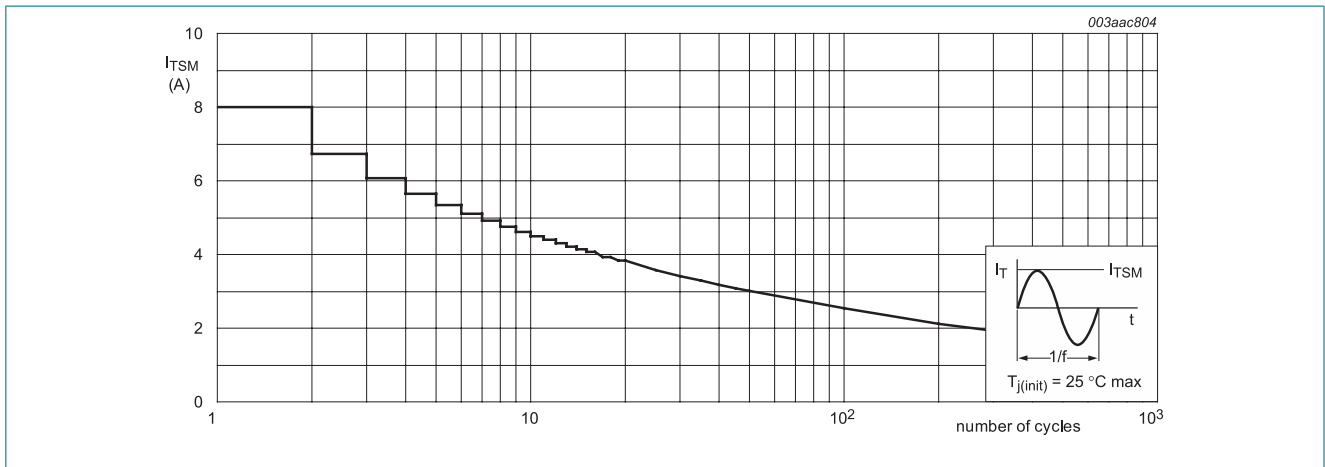
8. Limiting values

Table 5. Limiting values

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

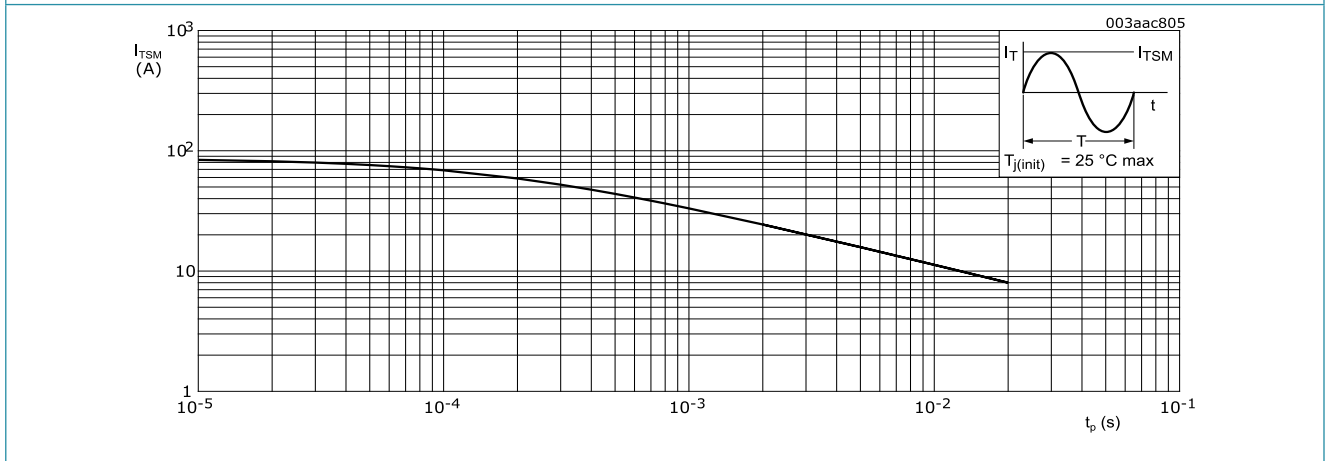
Symbol	Parameter	Conditions	Min	Max	Unit
V_{DRM}	repetitive peak off-state voltage		-	600	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{lead} \leq 71\text{ °C}$; Fig. 1	-	0.8	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 20\text{ ms}$; Fig. 2 ; Fig. 3	-	13	A
		full sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 16.7\text{ ms}$	-	14.3	A
I^2t	I^2t for fusing	$t_p = 10\text{ ms}$; sine-wave pulse	-	0.32	A^2s
di_T/dt	rate of rise of on-state current	$I_G = 20\text{ mA}$	-	100	$A/\mu s$
I_{GM}	peak gate current	$t_p = 20\text{ us}$	-	1	A
V_{GM}	peak gate voltage	positive applied gate voltage	-	15	V
$P_{G(AV)}$	average gate power	over any 20ms period	-	0.1	W
T_{stg}	storage temperature		-40	150	$^{\circ}C$
T_j	junction temperature		-	125	$^{\circ}C$
V_{PP}	peak pulse voltage	$T_j = 25\text{ °C}$; non-repetitive, off-state; ten pulses on each voltage polarity; 20s or more between successive pulses; Fig. 4	-	2.5	kV





f = 50Hz

Fig. 2. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



t_p ≤ 20ms

Fig. 3. Non-repetitive peak on-state current as a function of pulse width; maximum values

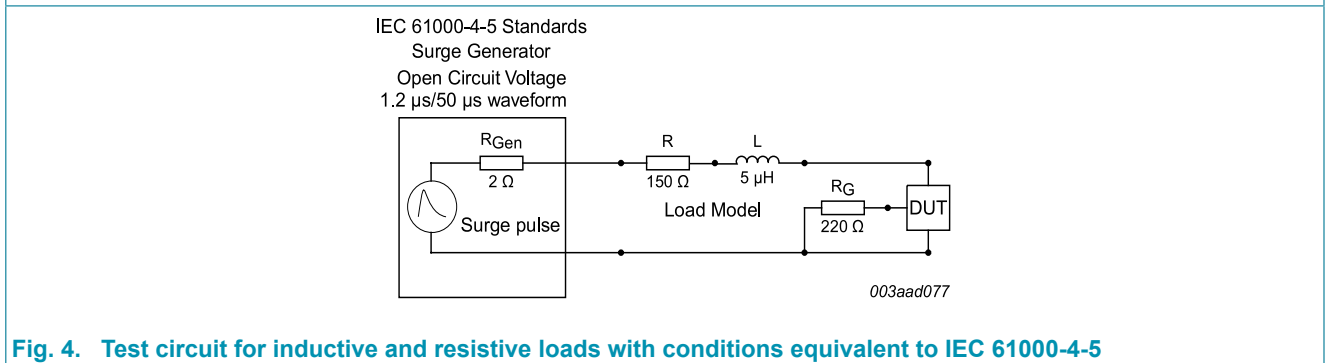


Fig. 4. Test circuit for inductive and resistive loads with conditions equivalent to IEC 61000-4-5

9. Thermal characteristics

Table 6. 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. 5	-	-	60	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	full cycle; printed-circuit board mounted; lead length 4mm	-	150	-	K/W

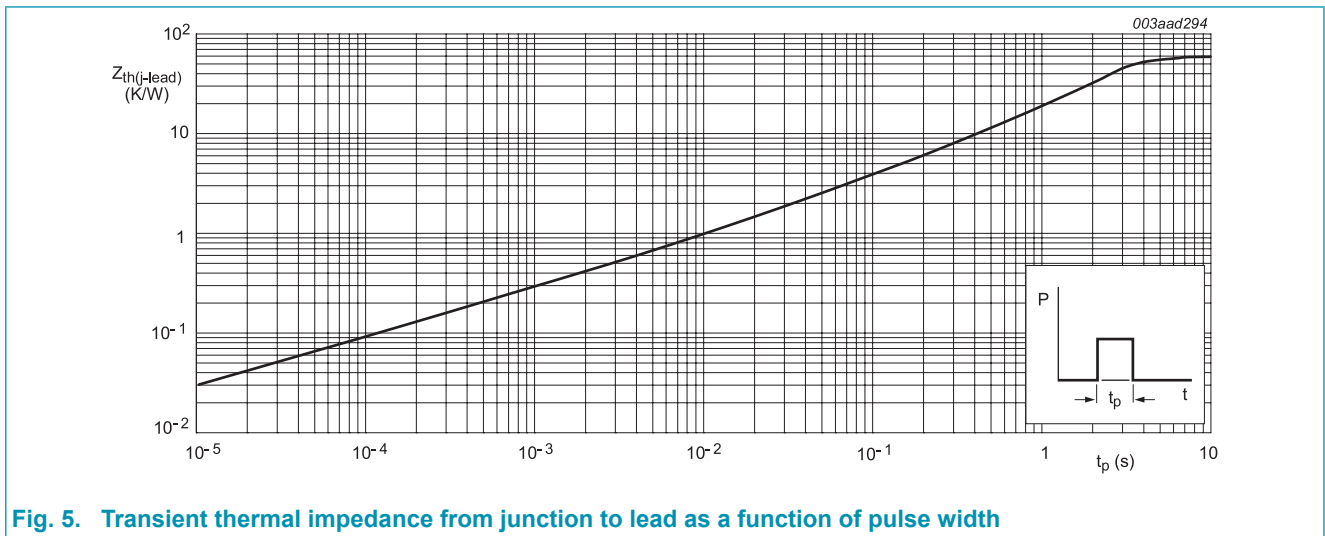


Fig. 5. Transient thermal impedance from junction to lead as a function of pulse width

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I_{GT}	gate trigger current	$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; LD+ G-; $T_J = 25\text{ °C}$; Fig. 6	1	-	10	mA
		$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; LD- G-; $T_J = 25\text{ °C}$; Fig. 6	1	-	10	mA
I_L	latching current	$V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; LD+ G-; $T_J = 25\text{ °C}$; Fig. 7	-	-	25	mA
		$V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; LD- G-; $T_J = 25\text{ °C}$; Fig. 7	-	-	20	mA
I_H	holding current	$V_D = 12\text{ V}$; $T_J = 25\text{ °C}$; Fig. 7	-	-	20	mA
V_T	on-state voltage	$I_T = 1.1\text{ A}$; $T_J = 25\text{ °C}$; Fig. 8	-	-	1.3	V
V_{GT}	gate trigger voltage	$V_D = 400\text{ V}$; $I_T = 0.1\text{ A}$; $T_J = 125\text{ °C}$;	0.15	-	-	V
		$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; $T_J = 25\text{ °C}$;	-	-	1	V
I_D	off-state current	$V_D = 600\text{ V}$; $T_J = 25\text{ °C}$	-	-	2	μA
		$V_D = 600\text{ V}$; $T_J = 125\text{ °C}$	-	-	0.2	mA
V_{CL}	clamping voltage	$I_{CL} = 0.1\text{ mA}$; $t_p = 1\text{ ms}$; $T_J = 25\text{ °C}$; Fig. 9	650	-	-	V
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 402\text{ V}$; $T_J = 125\text{ °C}$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; gate open circuit; Fig. 10	2000	-	-	V/μs
dI_{com}/dt	rate of change of commutating current	$V_D = 400\text{ V}$; $T_J = 125\text{ °C}$; $I_{T(RMS)} = 0.8\text{ A}$; $dV_{com}/dt = 20\text{ V/μs}$; (snubberless condition); gate open circuit; Fig. 11 ; Fig. 12	0.5	-	-	A/ms

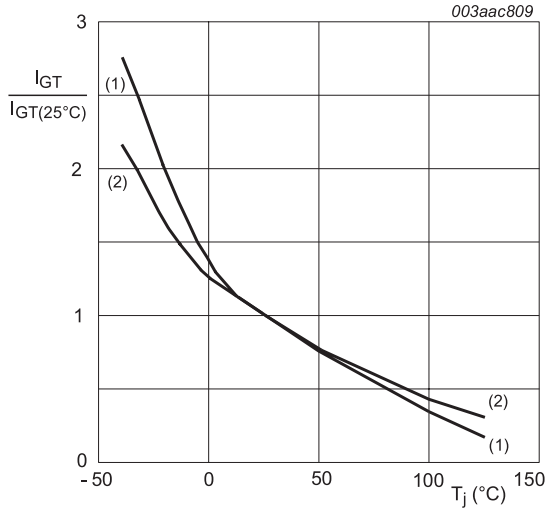


Fig. 6. Normalized gate trigger current as a function of junction temperature

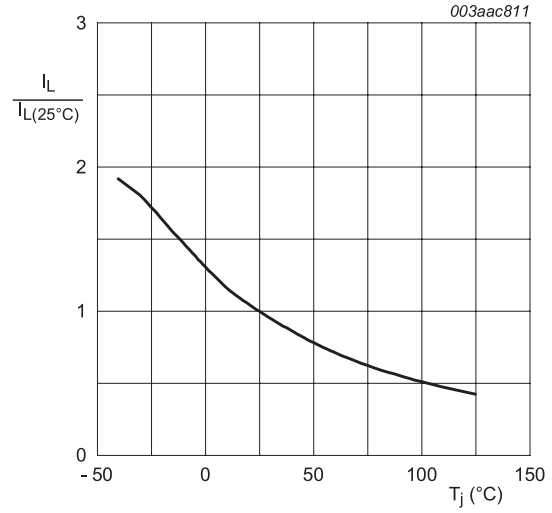
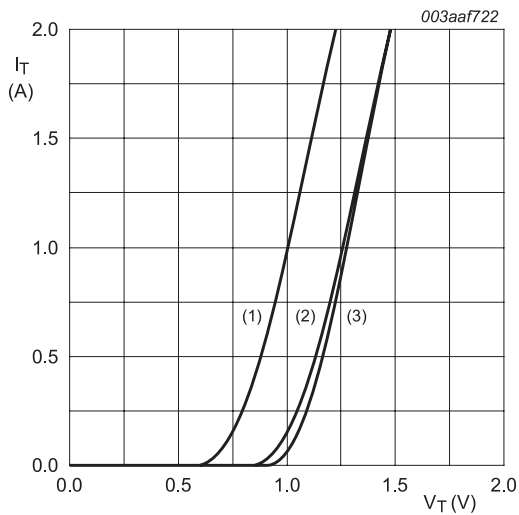


Fig. 7. Normalized latching current as a function of junction temperature



$V_o = 0.758 \text{ V}$; $R_s = 0.263 \Omega$
 (1) $T_j = 125^\circ\text{C}$; typical values
 (2) $T_j = 125^\circ\text{C}$; maximum values
 (3) $T_j = 25^\circ\text{C}$; maximum values

Fig. 8. On-state current as a function of on-state voltage

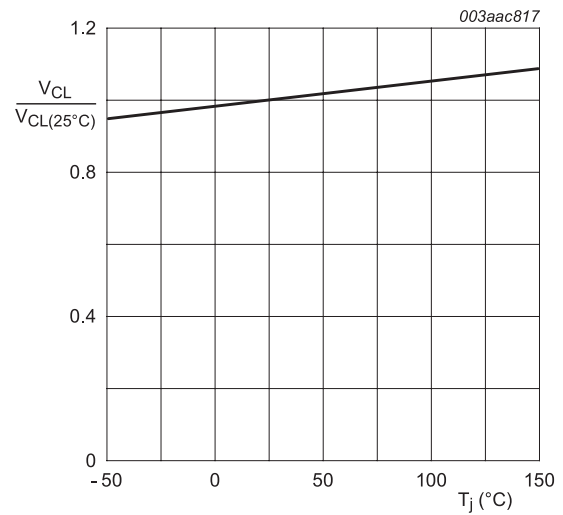
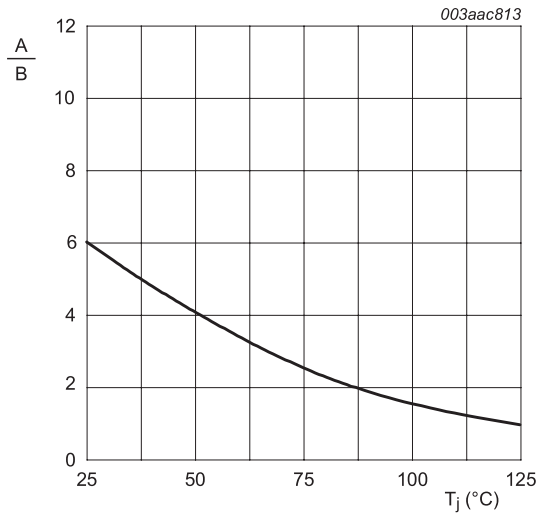
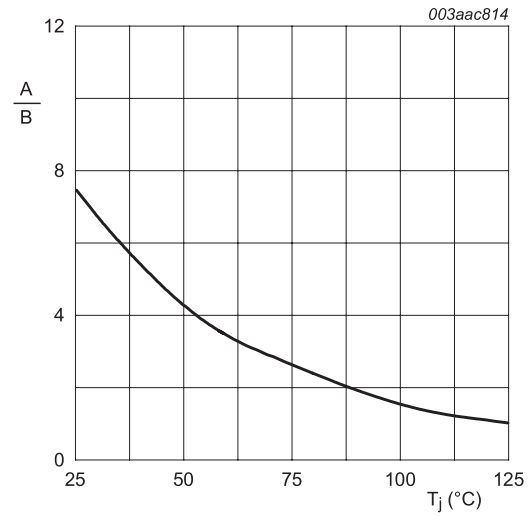


Fig. 9. Normalized clamping voltage (upper limit) as a function of junction temperature; minimum values



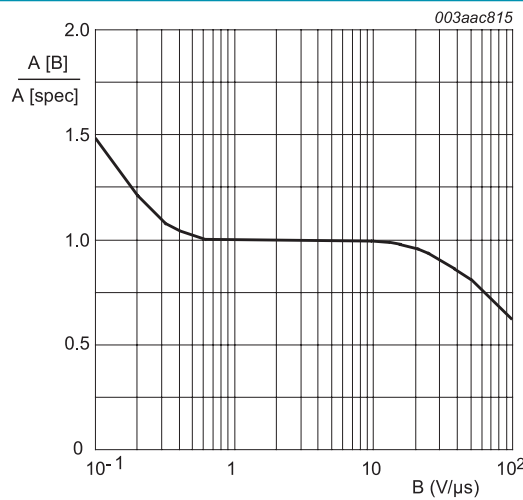
A = dV_D/dt at condition T_j °C
 B = dV_D/dt at condition T_j [125] °C

Fig. 10. Normalized rate of rise of off-state voltage as a function of junction temperature



A = di_{com}/dt at condition T_j °C
 B = di_{com}/dt at condition T_j [125] °C
 $V_D = 400$ V

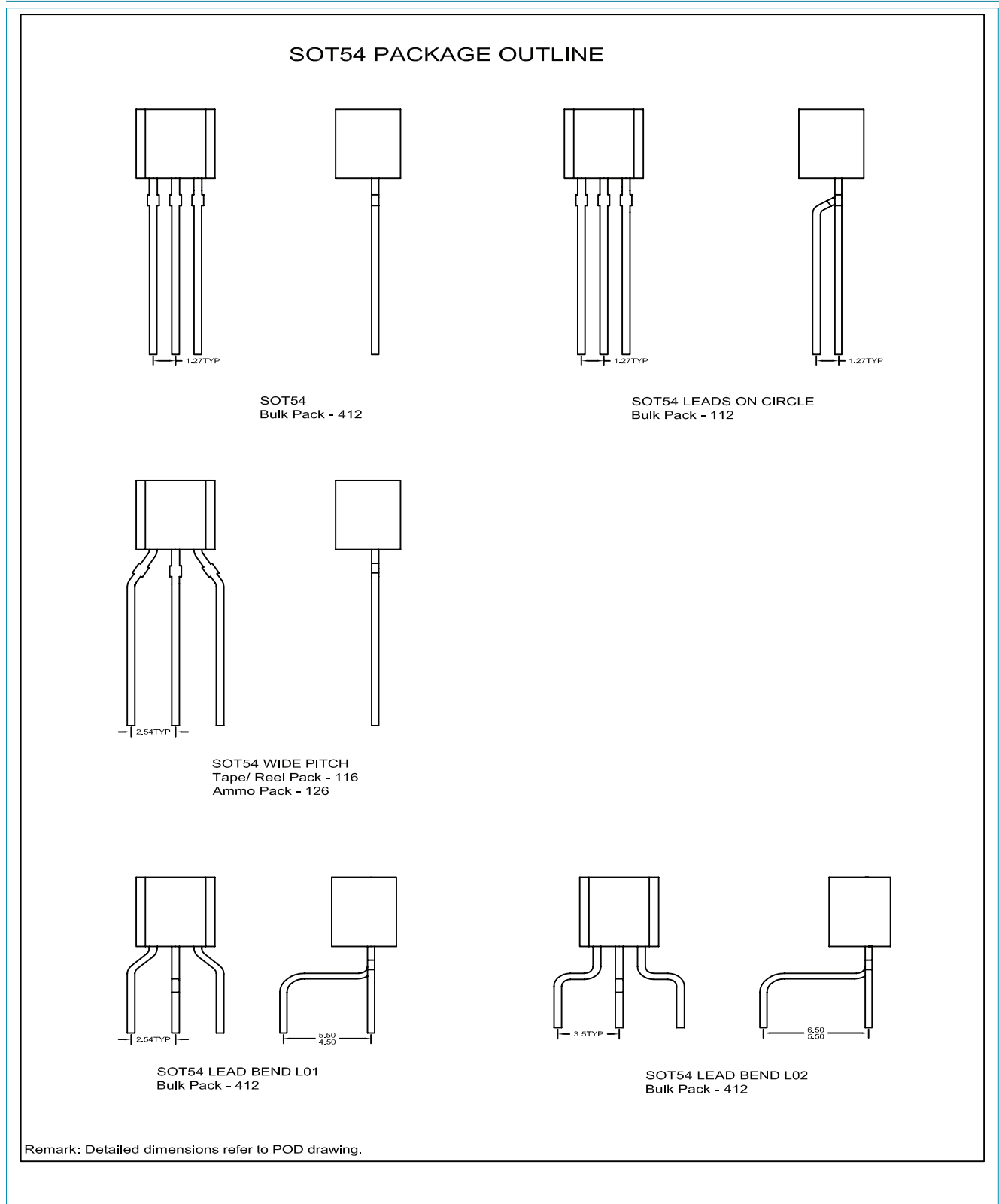
Fig. 11. Normalized critical rate of rise of commutating current as a function of junction temperature



A [B] = di_{com}/dt at condition B, dV_{com}/dt
 A [spec] is the data sheet value for di_{com}/dt
 turn-off time is less than 20ms

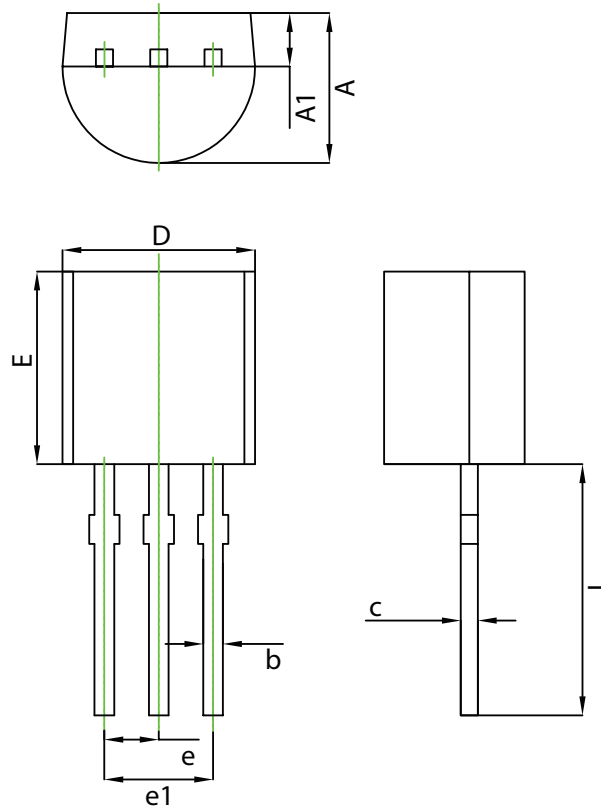
Fig. 12. Normalized critical rate of change of commutating current as a function of critical rate of change of commutating voltage; minimum values

11. Package outline



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

TO92



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.300	3.700	0.130	0.146
A1	1.100	1.400	0.043	0.055
b	0.380	0.550	0.015	0.022
c	0.360	0.510	0.014	0.020
D	4.300	4.700	0.169	0.185
E	4.300	4.700	0.169	0.185
e	1.270 TYP.		0.050 TYP.	
e1	2.440	2.640	0.096	0.104
L	14.100	14.500	0.555	0.571

12. 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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