



ACT108-600E

AC Thyristor power switch

20 August 2014

Product data sheet

1. General description

AC Thyristor power switch in a SOT54 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

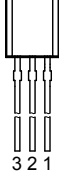
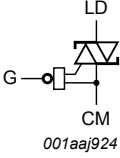
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DRM}	repetitive peak off-state voltage		-	-	600	V
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{\text{J}(\text{init})} = 25\text{ }^{\circ}\text{C}$; $t_{\text{p}} = 20\text{ ms}$; Fig. 2 ; Fig. 3	-	-	13	A
T_{J}	junction temperature		-	-	125	$^{\circ}\text{C}$
$I_{\text{T(RMS)}}$	RMS on-state current	full sine wave; $T_{\text{lead}} \leq 71\text{ }^{\circ}\text{C}$; Fig. 1	-	-	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. 4	-	-	2.5	kV
Static characteristics						
I_{GT}	gate trigger current	$V_{\text{D}} = 12\text{ V}$; $I_{\text{T}} = 100\text{ mA}$; LD+ G-; $T_{\text{J}} = 25\text{ }^{\circ}\text{C}$; Fig. 6	1	-	10	mA



Symbol	Parameter	Conditions	Min	Typ	Max	Unit
		$V_D = 12\text{ V}$; $I_T = 100\text{ mA}$; LD- G-; $T_j = 25\text{ }^\circ\text{C}$; Fig. 6	1	-	10	mA
V_{CL}	clamping voltage	$I_{CL} = 0.1\text{ mA}$; $t_p = 1\text{ ms}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 12	650	-	-	V
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 402\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; gate open circuit; Fig. 9	2000	-	-	V/ μs
dI_{com}/dt	rate of change of commutating current	$V_D = 400\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; $I_{T(RMS)} = 0.8\text{ A}$; $dV_{com}/dt = 20\text{ V}/\mu\text{s}$; (snubberless condition); gate open circuit; Fig. 10 ; Fig. 11	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>001aa/924</p>
2	G	gate		
3	LD	load		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
ACT108-600E	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		-	600	V
$I_{\text{T(RMS)}}$	RMS on-state current	full sine wave; $T_{\text{lead}} \leq 71\text{ }^{\circ}\text{C}$; Fig. 1	-	0.8	A
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. 2 ; Fig. 3	-	13	A
		full sine wave; $T_{\text{j(init)}} = 25\text{ }^{\circ}\text{C}$; $t_{\text{p}} = 16.7\text{ ms}$	-	14.3	A
I_{t}^2	I_{t} for fusing	$t_{\text{p}} = 10\text{ ms}$; SIN	-	0.32	A^2s
$\text{d}I_{\text{T}}/\text{d}t$	rate of rise of on-state current	$I_{\text{T}} = 1\text{ A}$; $I_{\text{G}} = 20\text{ mA}$; $\text{d}I_{\text{G}}/\text{d}t = 0.2\text{ A}/\mu\text{s}$	-	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
$P_{\text{G(AV)}}$	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	$T_{\text{j}} = 25\text{ }^{\circ}\text{C}$; non-repetitive, off-state; ten pulses on each voltage polarity; 20s or more between successive pulses;; Fig. 4	-	2.5	kV

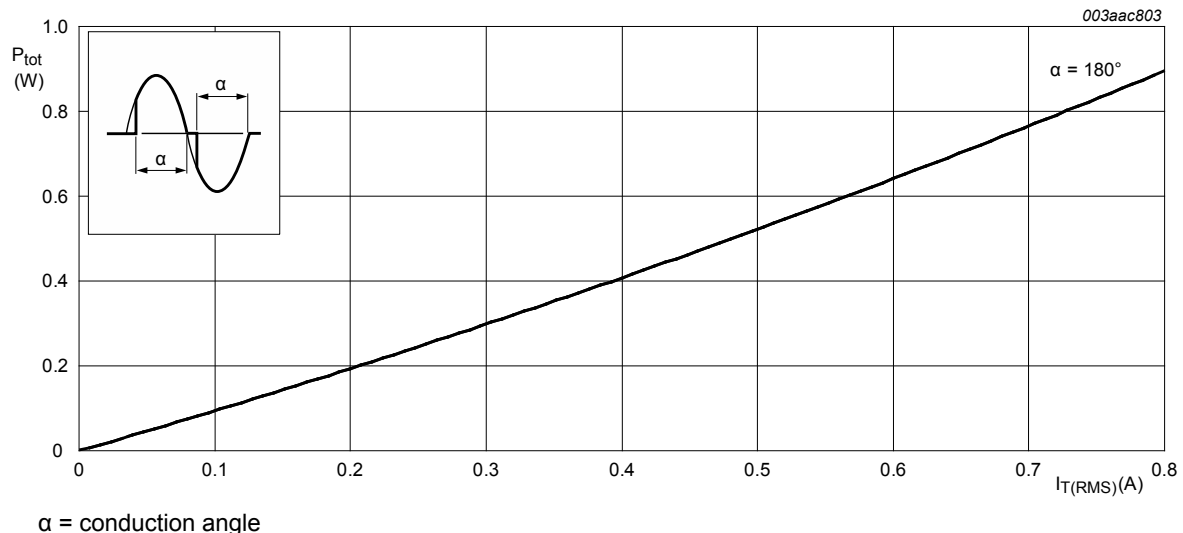


Fig. 1. Total power dissipation as a function of RMS on-state current; maximum values

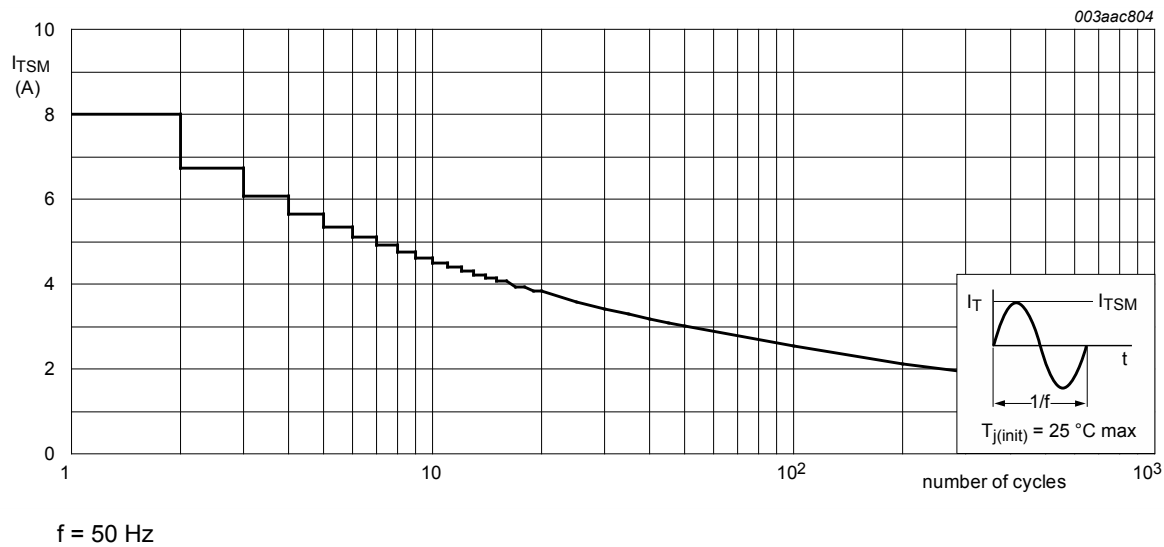


Fig. 2. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

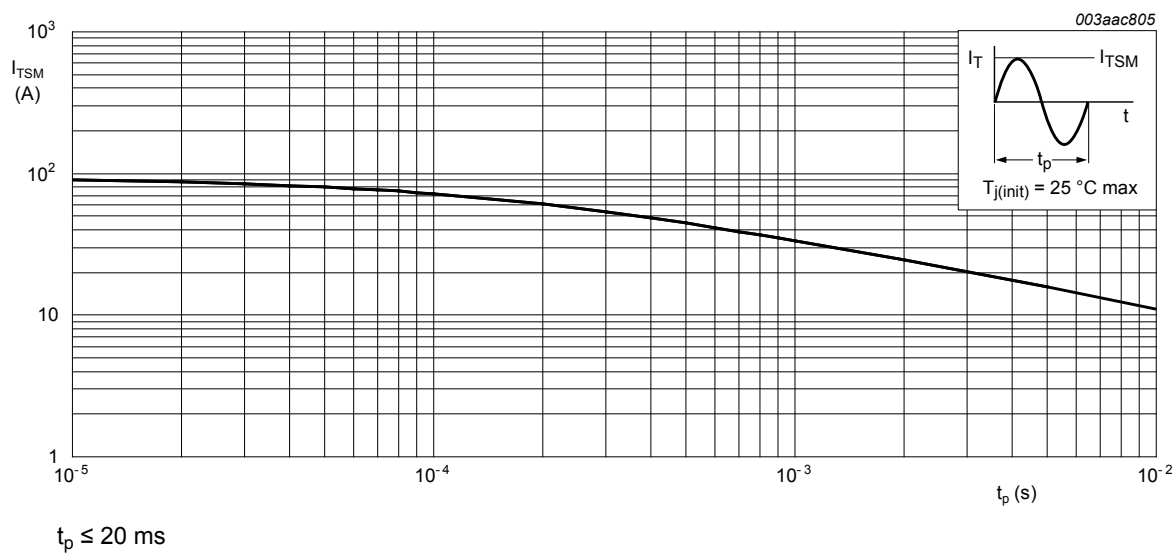


Fig. 3. Non-repetitive peak on-state current as a function of pulse width; maximum values

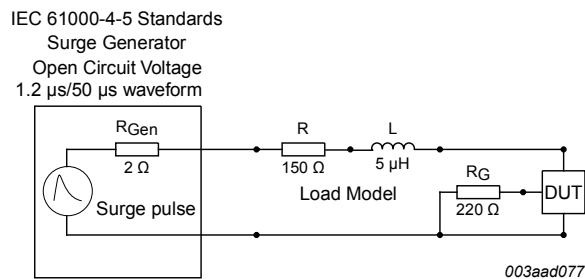
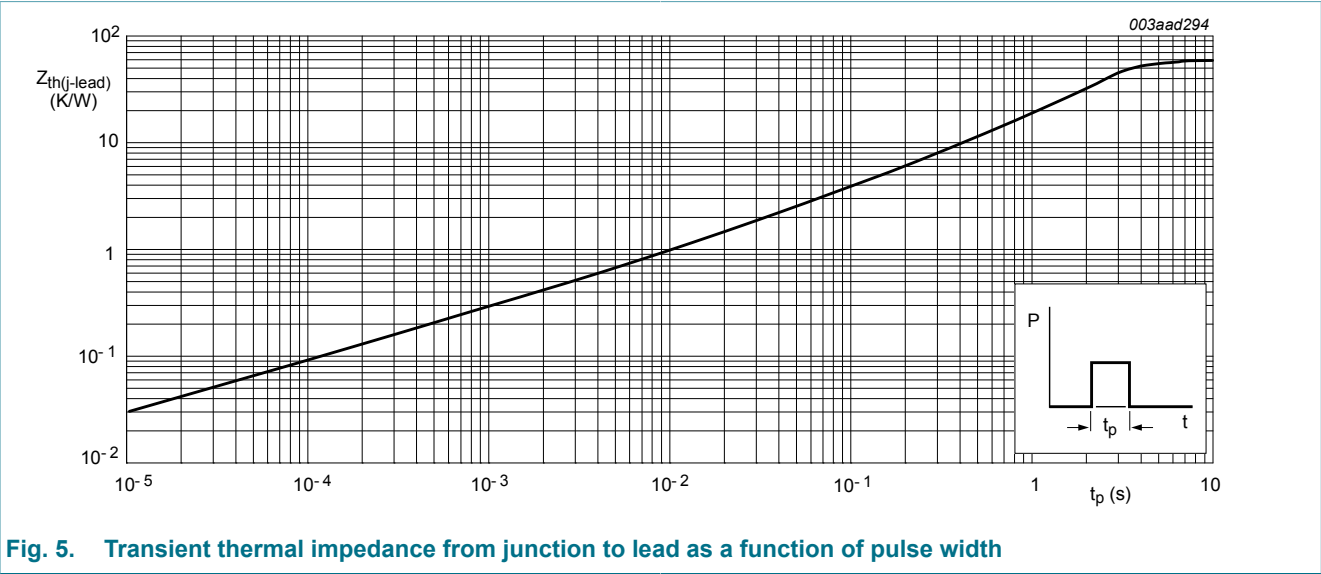


Fig. 4. Test circuit for inductive and resistive loads with conditions equivalent to IEC 61000-4-5

8. Thermal characteristics

Table 5. Thermal characteristics

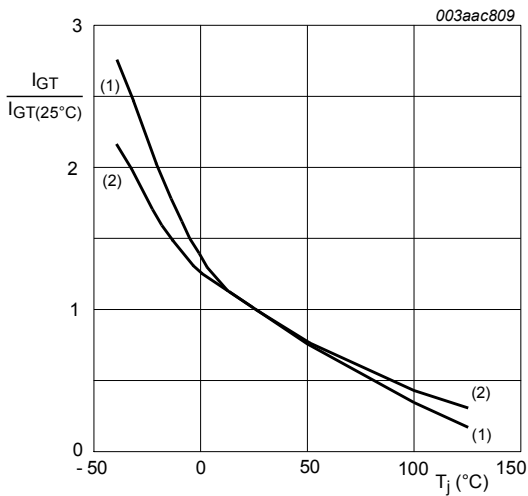
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-lead)}$	thermal resistance from junction to lead	full cycle with heatsink compound; Fig. 5	-	-	60	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	full cycle; printed-circuit board mounted; lead length 4 mm	-	150	-	K/W



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-; $T_j = 25\text{ }^\circ\text{C}$; Fig. 6	1	-	10	mA
		$V_D = 12\text{ V}$; $I_T = 100\text{ mA}$; LD- G-; $T_j = 25\text{ }^\circ\text{C}$; Fig. 6	1	-	10	mA
I_L	latching current	$V_D = 12\text{ V}$; $I_G = 100\text{ mA}$; LD+ G-; $T_j = 25\text{ }^\circ\text{C}$; Fig. 7	-	-	25	mA
		$V_D = 12\text{ V}$; $I_G = 100\text{ mA}$; LD- G-; $T_j = 25\text{ }^\circ\text{C}$; Fig. 7	-	-	20	mA
I_H	holding current	$V_D = 12\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 7	-	-	20	mA
V_T	on-state voltage	$I_T = 1.1\text{ A}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 8	-	-	1.3	V
V_{GT}	gate trigger voltage	$V_D = 400\text{ V}$; $I_T = 100\text{ mA}$; $T_j = 125\text{ }^\circ\text{C}$	0.15	-	-	V
		$V_D = 12\text{ V}$; $I_T = 100\text{ mA}$; $T_j = 25\text{ }^\circ\text{C}$	-	-	1	V
I_D	off-state current	$V_D = 600\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$	-	-	2	μA
		$V_D = 600\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$	-	-	0.2	mA
V_{CL}	clamping voltage	$I_{CL} = 0.1\text{ mA}$; $t_p = 1\text{ ms}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 12	650	-	-	V
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 402\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; gate open circuit; Fig. 9	2000	-	-	V/ μs
dI_{com}/dt	rate of change of commutating current	$V_D = 400\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; $I_{T(RMS)} = 0.8\text{ A}$; $dV_{com}/dt = 20\text{ V}/\mu\text{s}$; (snubberless condition); gate open circuit; Fig. 10 ; Fig. 11	0.5	-	-	A/ms



(1) LD+ G-
(2) LD- G-

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

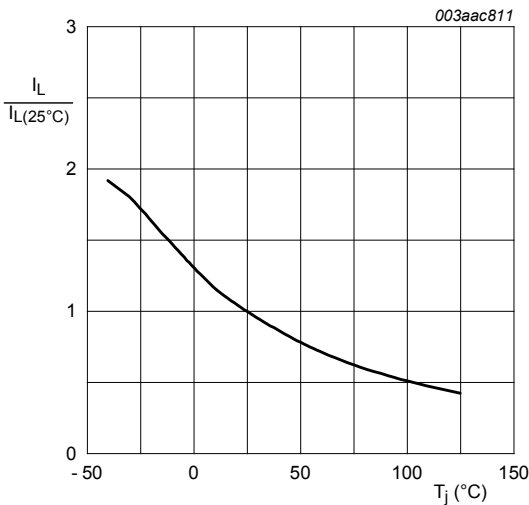
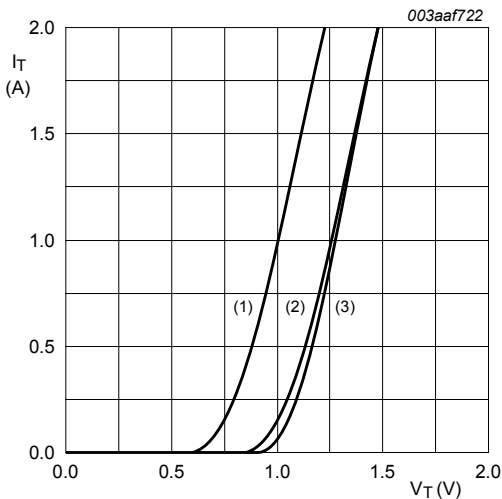
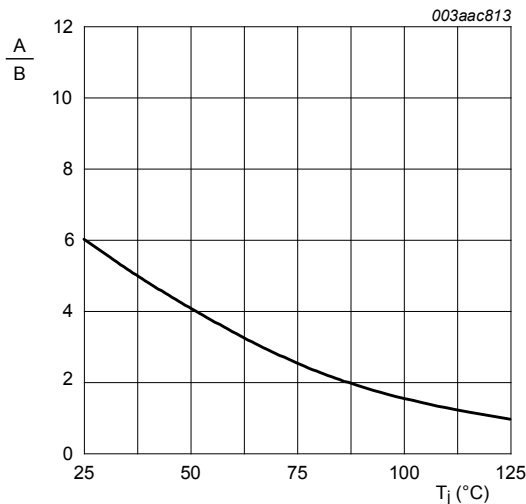


Fig. 7. Normalized latching current as a function of junction temperature



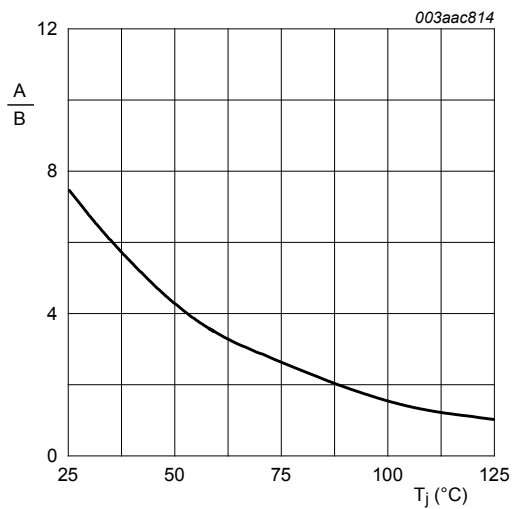
$V_o = 0.758 \text{ V}$; $R_s = 0.263 \text{ }\Omega$
(1) $T_j = 125^{\circ}\text{C}$; typical values
(2) $T_j = 125^{\circ}\text{C}$; maximum values
(3) $T_j = 25^{\circ}\text{C}$; maximum values

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



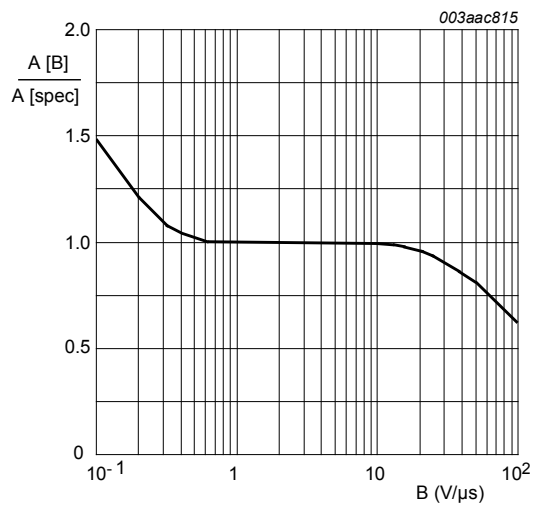
$A = dV_D/dt$ at condition $T_j^{\circ}\text{C}$
 $B = dV_D/dt$ at condition $T_j [125]^{\circ}\text{C}$

Fig. 9. 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. 10. 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 20 ms

Fig. 11. Normalized critical rate of change of commutating current as a function of critical rate of change of commutating voltage; minimum values

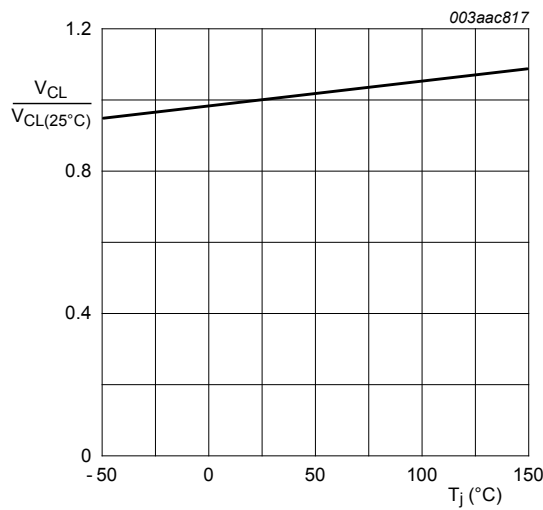


Fig. 12. Normalized clamping voltage (upper limit) as a function of junction temperature; minimum values

10. Package outline

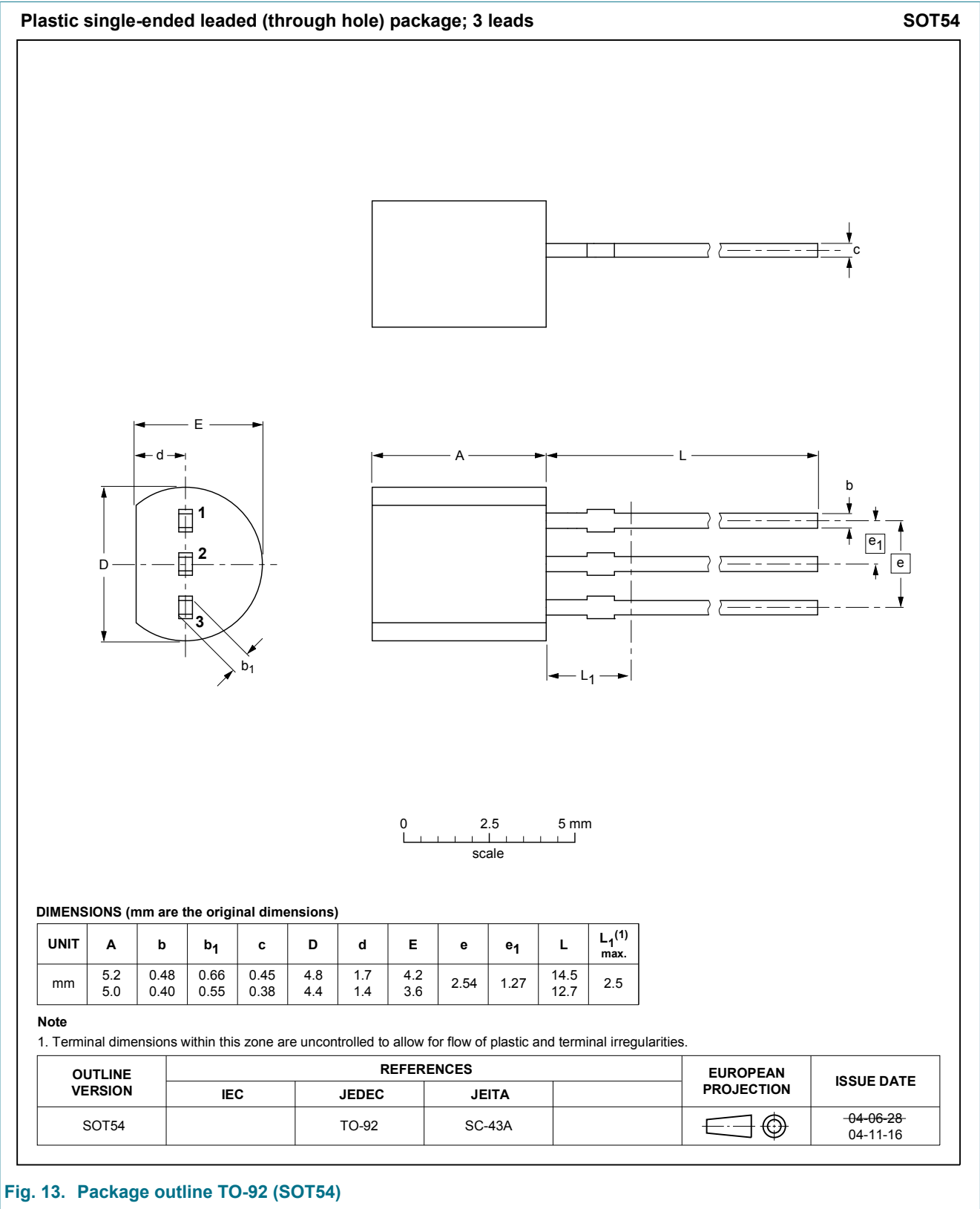


Fig. 13. Package outline TO-92 (SOT54)

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.
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