ACT102H-600D

AC Thyristor power switch

Rev. 1 — 23 December 2010 Product data sheet

1. Product profile

1.1 General description

An AC Thyristor power switch with very high noise immunity and over-voltage protection configured for negative gate triggering in a SOT96-1 (SO8) small surface-mountable plastic package

1.2 Features and benefits

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

1.3 Applications

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

1.4 Quick reference data

Table 1. Quick reference data

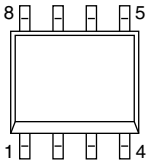
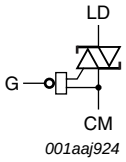
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DRM}	repetitive peak off-state voltage		-	-	600	V
I_{GT}	gate trigger current	V_D = 12 V; I_T = 100 mA; LD+ G-; T_j = 25 °C; see Figure 7	0.5	-	5	mA
		V_D = 12 V; I_T = 100 mA; LD- G-; T_j = 25 °C; see Figure 7	0.5	-	5	mA
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{amb} \leq 100$ °C; see Figure 3; see Figure 1	-	-	0.2	A
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 402 V; T_j = 125 °C; gate open circuit; exponential waveform; see Figure 11	300	-	-	V/µs

Table 1. Quick reference data *...continued*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CL}	clamping voltage	I_{CL} = 100 µA; t_p = 1 ms; $T_j \leq 125$ °C; see Figure 14	650	-	-	V
V_{PP}	peak pulse voltage	$T_j \leq 25$ °C; non-repetitive, off-state; see Figure 2	-	-	2	kV
V_T	on-state voltage	I_T = 0.3 A; see Figure 10	-	-	1.2	V

2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	n.c.	not connected		
2	LD	Load		
3	n.c.	not connected		
4	n.c.	not connected		
5	G	Gate		
6	CM	Common		
7	CM	Common		
8	n.c.	not connected		

SOT96-1 (SO8)

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
ACT102H-600D	SO8	plastic small outline package; 8 leads; body width 3.9 mm	SOT96-1

4. 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
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{amb} \leq 100$ °C; see Figure 3; see Figure 1	-	0.2	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(init)} = 25$ °C; $t_p = 16.7$ ms	-	8.8	A
		full sine wave; $T_{j(init)} = 25$ °C; $t_p = 20$ ms; see Figure 4; see Figure 5	-	8	A
I^2t	I^2t for fusing	$t_p = 10$ ms; sine-wave pulse	-	0.32	A^2s
dI_T/dt	rate of rise of on-state current	$I_T = 1$ A; $I_G = 20$ mA; $dI_G/dt = 0.2$ A/µs	-	50	A/µs
I_{GM}	peak gate current	t = 20 µs	-	1	A
V_{GM}	peak gate voltage	positive applied gate voltage	-	15	V
P_{GM}	peak gate power		-	2	W
$P_{G(AV)}$	average gate power	over any 20 ms period	-	0.1	W
T_{stg}	storage temperature		-40	150	°C
T_j	junction temperature		-	125	°C
V_{PP}	peak pulse voltage	$T_j \leq 25$ °C; non-repetitive, off-state; see Figure 2	-	2	kV

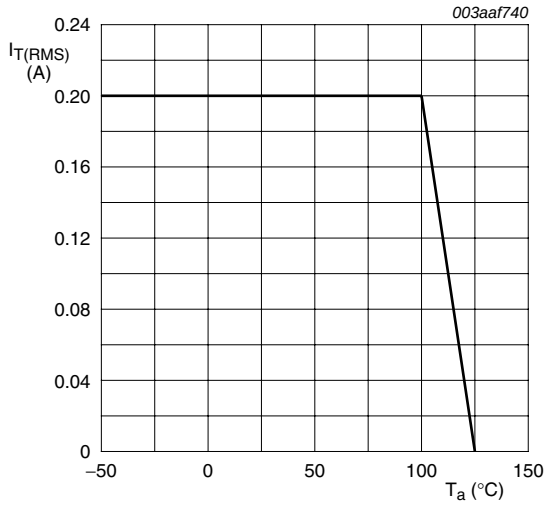


Fig 1. RMS on-state current as a function of solder point temperature; maximum values

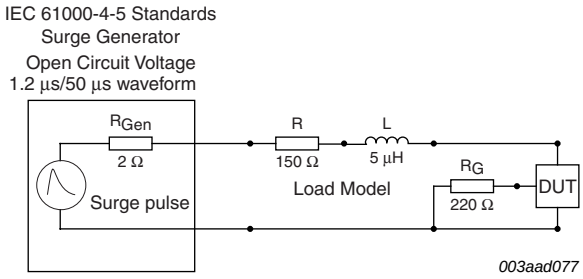
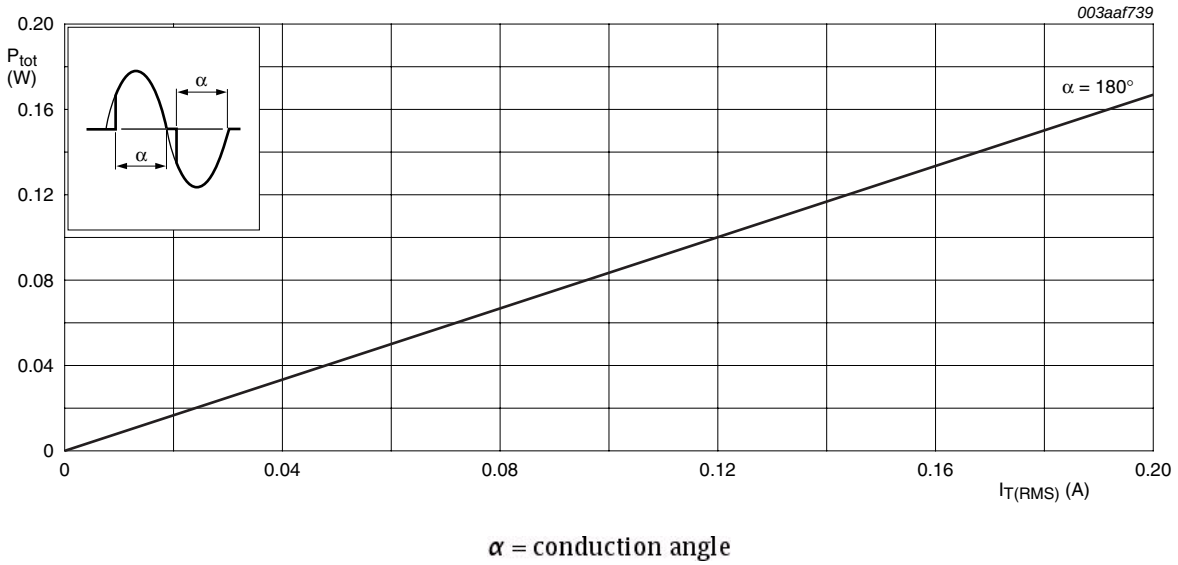
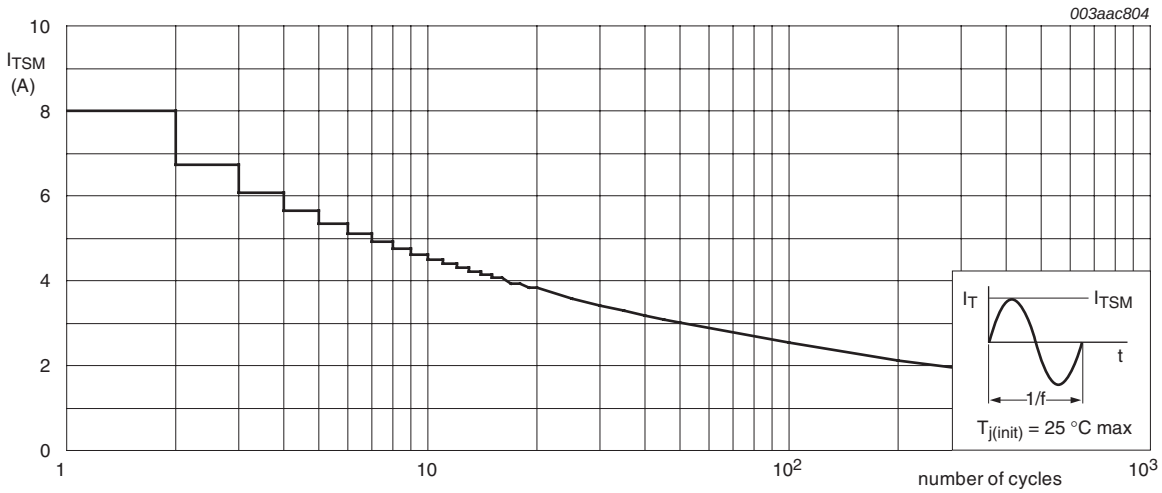


Fig 2. Test circuit for inductive and resistive loads with conditions equivalent to IEC 61000-4-5



α = conduction angle

Fig 3. Total power dissipation as a function of RMS 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

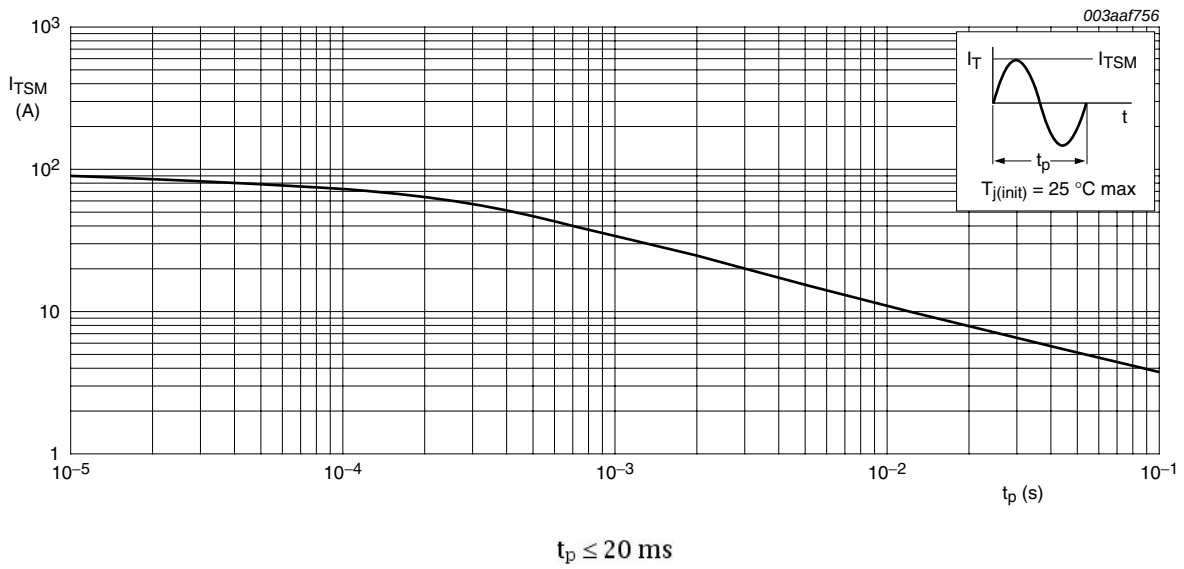


Fig 5. Non-repetitive peak on-state current as a function of pulse width; maximum values

5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	full cycle; see Figure 6	-	150	-	K/W

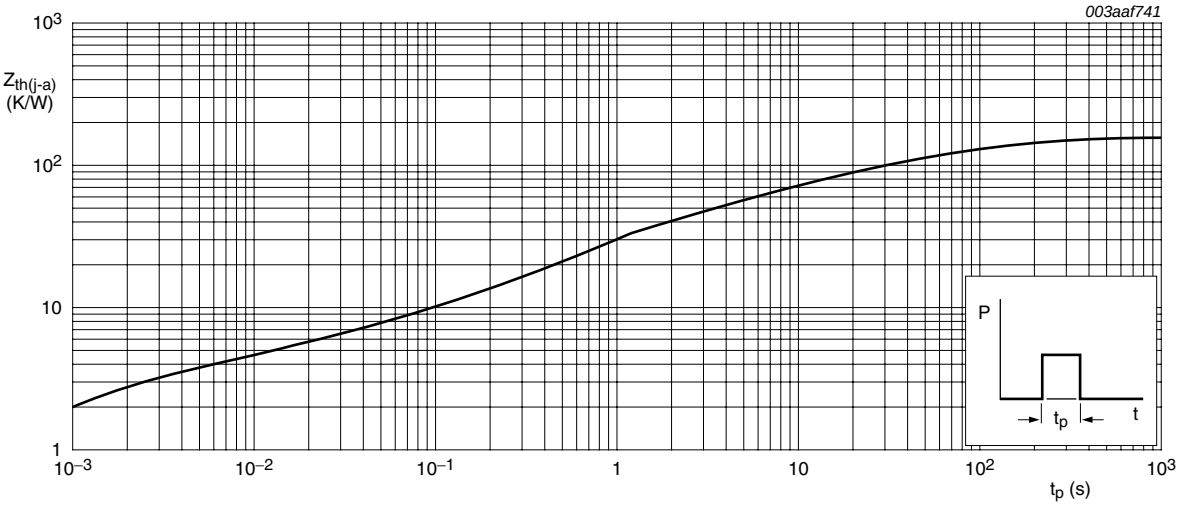
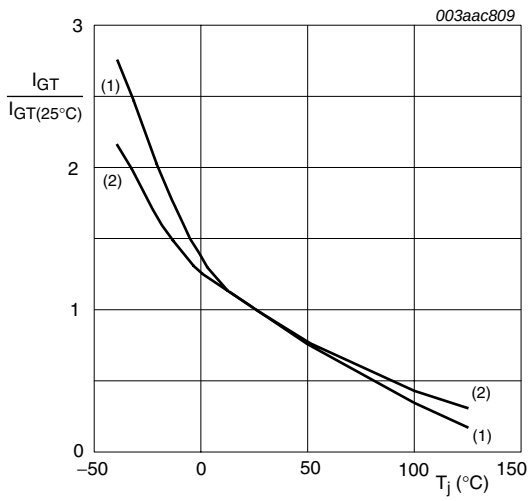


Fig 6. Transient thermal impedance from junction to lead as a function of pulse width

6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{GT}	gate trigger current	V_D = 12 V; I_T = 100 mA; LD+ G-; T_j = 25 °C; see Figure 7	0.5	-	5	mA
		V_D = 12 V; I_T = 100 mA; LD- G-; T_j = 25 °C; see Figure 7	0.5	-	5	mA
I_L	latching current	V_D = 12 V; I_G = 12 mA; T_j = 25 °C; see Figure 8	-	-	25	mA
I_H	holding current	V_D = 12 V; T_j = 25 °C; see Figure 9	-	-	20	mA
V_T	on-state voltage	I_T = 0.3 A; see Figure 10	-	-	1.2	V
V_{GT}	gate trigger voltage	V_D = 12 V; I_T = 100 mA; T_j = 25 °C	-	-	0.9	V
		V_D = 12 V; I_T = 100 mA; T_j ≤ 125 °C	0.15	-	-	V
I_D	off-state current	V_D = 600 V; T_j ≤ 125 °C	-	-	0.2	mA
		V_D = 600 V; T_j ≤ 25 °C	-	-	2	µA
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 402 V; T_j = 125 °C; gate open circuit; exponential waveform; see Figure 11	300	-	-	V/µs
dI_{com}/dt	rate of change of commutating current	V_D = 400 V; T_j = 125 °C; $I_{T(RMS)}$ = 1 A; dV_{com}/dt = 15 V/µs; gate open circuit; see Figure 12; see Figure 13	0.15	-	-	A/ms
V_{CL}	clamping voltage	I_{CL} = 100 µA; t_p = 1 ms; T_j ≤ 125 °C; see Figure 14	650	-	-	V



(1) LD+ G-

(2) LD- G-

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

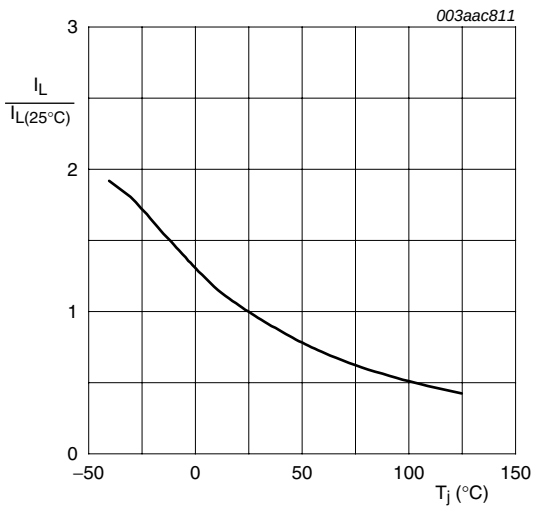


Fig 8. Normalized latching current as a function of junction temperature

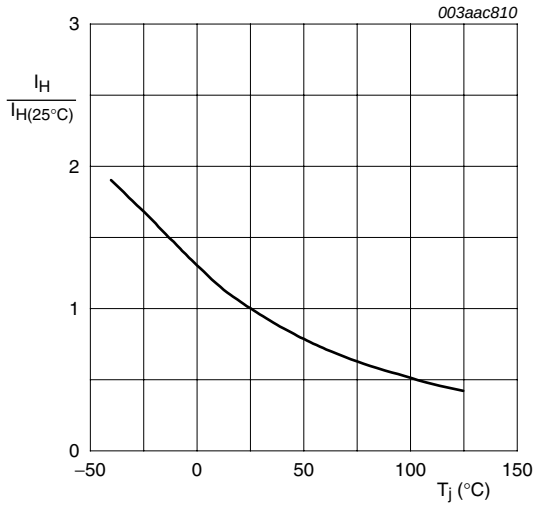
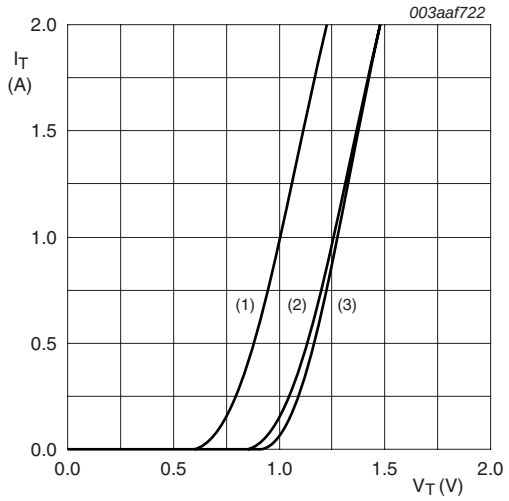
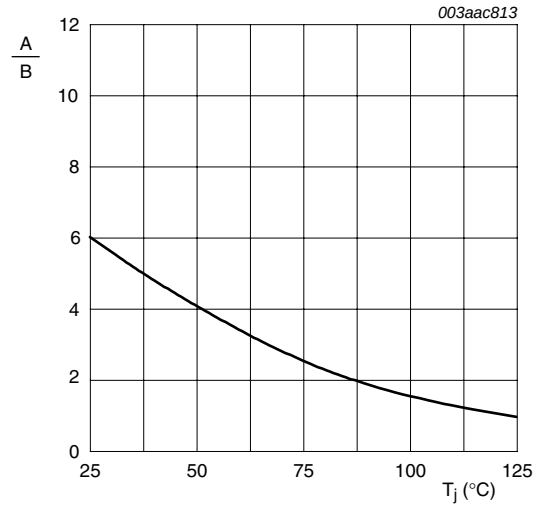


Fig 9. Normalized holding current as a function of junction temperature



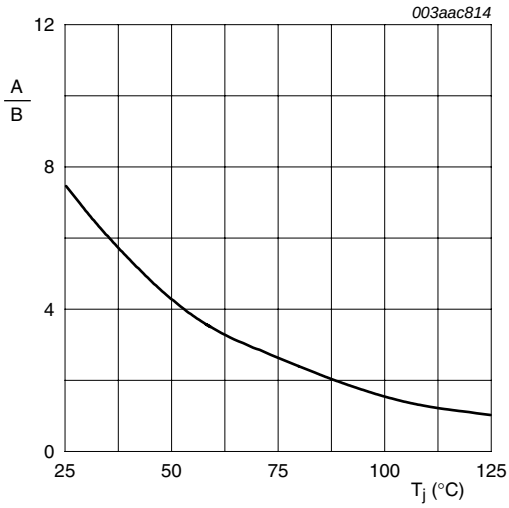
$V_o = 0.758\,V$
$R_s = 0.263\,\Omega$
(1) $T_j = 125\,°C$; typical values
(2) $T_j = 125\,°C$; maximum values
(3) $T_j = 25\,°C$; maximum values

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



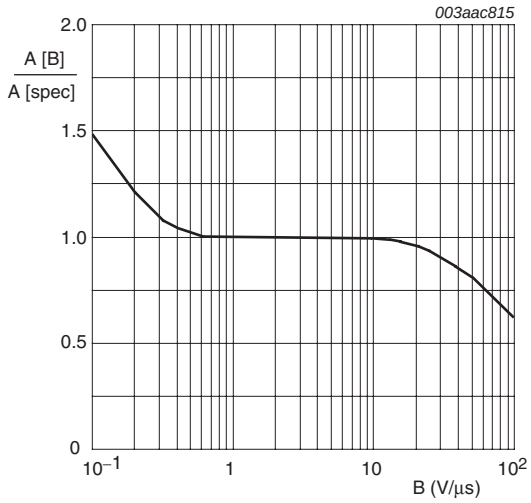
A is dV_D/dt at condition T_j °C
B is dV_D/dt at condition T_j 125 °C

Fig 11. 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 12. 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 13. Normalized critical rate of change of commutating current as a function of critical rate of change of commutating voltage; minimum values

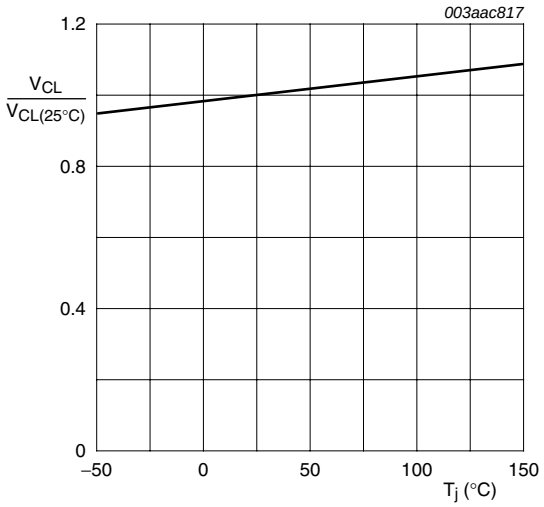
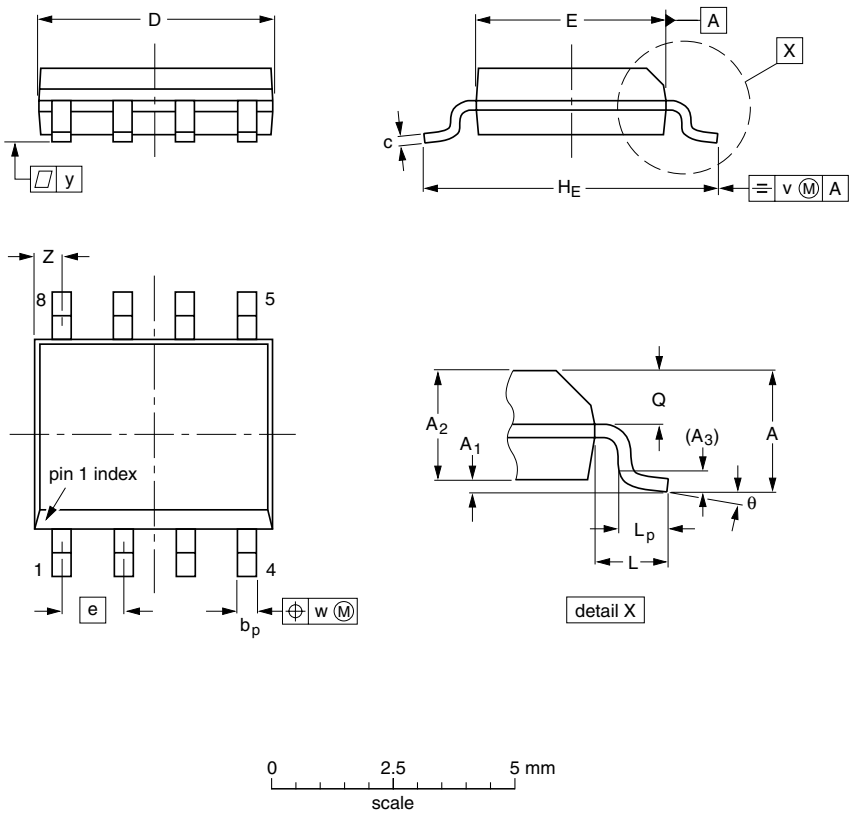


Fig 14. Normalized clamping voltage (upper limit) as a function of junction temperature; minimum values

7. Package outline

SO8: plastic small outline package; 8 leads; body width 3.9 mm **SOT96-1**



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(2)}$	e	H_E	L	L_p	Q	v	w	y	$Z^{(1)}$	θ
mm	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	5.0 4.8	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8^o 0^o
inches	0.069	0.010 0.004	0.057 0.049	0.01	0.019 0.014	0.0100 0.0075	0.20 0.19	0.16 0.15	0.05	0.244 0.228	0.041	0.039 0.016	0.028 0.024	0.01	0.01	0.004	0.028 0.012	

Notes

1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.
2. Plastic or metal protrusions of 0.25 mm (0.01 inch) maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT96-1	076E03	MS-012				~~99-12-27~~ 03-02-18

Fig 15. Package outline SOT96-1 (SO8)

8. Soldering

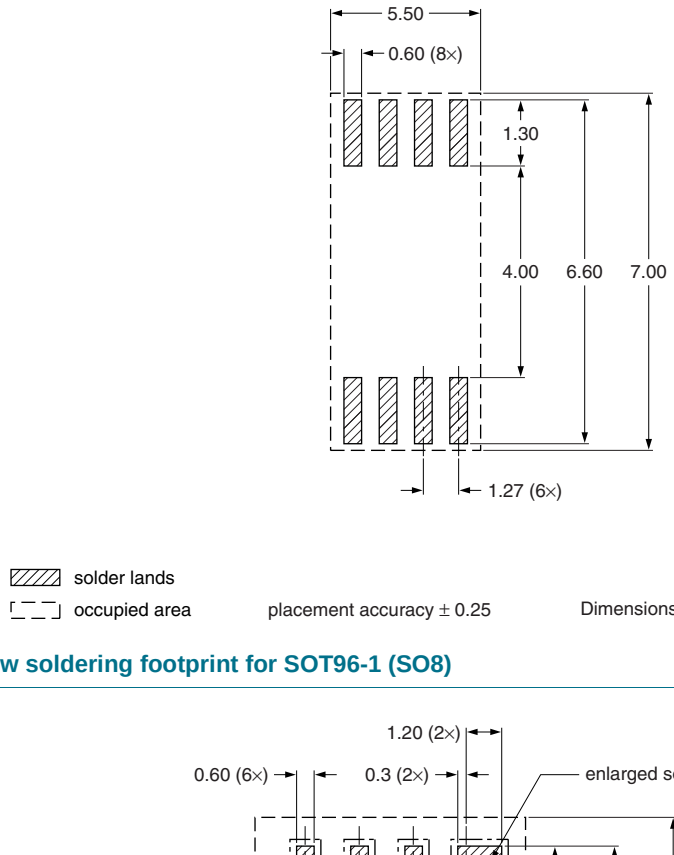


Fig 16. Reflow soldering footprint for SOT96-1 (SO8)

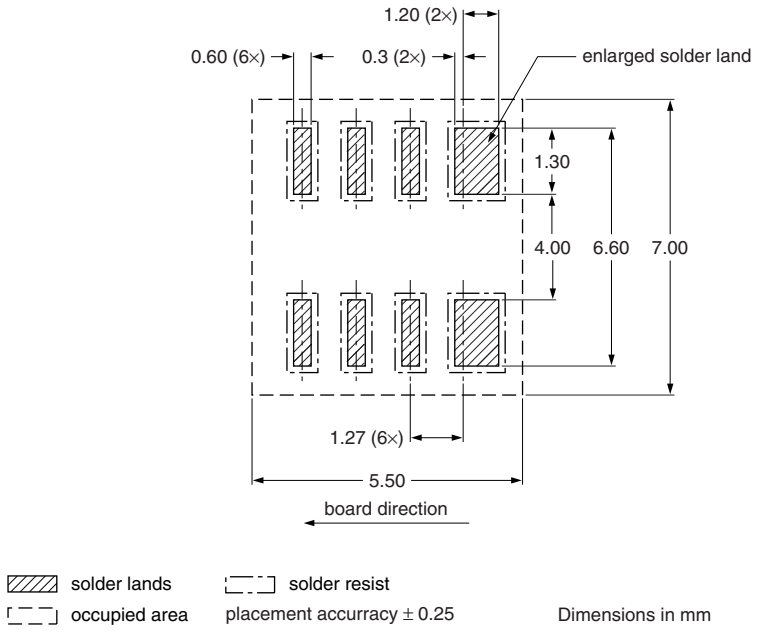


Fig 17. Wave soldering footprint for SOT96-1 (SO8)

9. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
ACT102H-600D v.1	20101223	Product data sheet	-	-

10. Legal information

10.1 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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12. Contents

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