

1. General description

AC Thyristor power switch in a TO252(DPAK) surface-mountable plastic package with self-protective capabilities against low and high energy transients.

2. Features and benefits

- Common terminal on mounting base allows multiple ACTs on shared cooling pad
- Exclusive negative gate triggering
- Full cycle AC conduction
- High voltage capability
- 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 high noise immunity

3. Applications

- Fan motor circuits
- Pump motor circuits
- Lower-power highly inductive, resistive and safety loads
- Contactors, circuit breakers, valves, dispensers and door locks

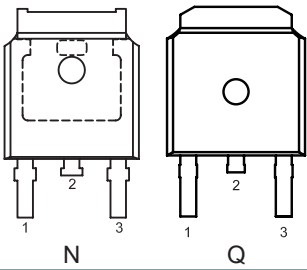
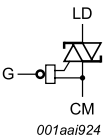
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Notes	Values			Unit
Absolute maximum rating							
V _{DRM}	repetitive peak off-state voltage			800			V
I _{T(RMS)}	RMS on-state current	full sine wave; T _{mb} ≤ 141 °C; Fig. 1 ; Fig. 2 ; Fig. 3		2			A
I _{TSM}	non-repetitive peak on-state current	full sine wave; T _{j(init)} = 25 °C; t _p = 20 ms; Fig. 4 ; Fig. 5		20			A
		full sine wave; T _{j(init)} = 25 °C; t _p = 16.7 ms		22			A
T _j	operating junction temperature			-40 to 150			°C
V _{PP}	peak pulse voltage	T _j = 25 °C; non-repetitive, off-state; Fig. 6		2.5			kV
Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
I _{GT}	gate trigger current	V _D = 12 V; I _T = 0.1 A; LD+ G-; T _j = 25 °C; Fig. 8		-	-	10	mA
		V _D = 12 V; I _T = 0.1 A; LD- G-; T _j = 25 °C; Fig. 8		-	-	10	mA
I _H	holding current	V _D = 12 V; T _j = 25 °C; Fig. 10		-	-	45	mA
V _T	on-state voltage	I _T = 2 A; T _j = 25 °C; Fig. 11		-	-	1.45	V
V _{Cl}	clamping voltage	I _{Cl} = 0.1 mA; t _n = 1 ms		850	-	-	V

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	LD	load		
2	CM	common		
3	G	gate		
mb	CM	mounting base; common		

6. Ordering information

Table 3. Ordering information

Type number	Package Name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
ACT120S-800ET	SOT223	ACT120S-800ETJ	Reel	2500	TO252N	04-Nov-2016
					TO252Q	05-Mar-2025

7. Marking

Table 4. Marking codes

Type number	Marking codes	
	Assembly factory: N	Assembly factory: Q
ACT120S-800ET	ACT120S 800ET PJNxxxx xx	ACT120S 800ET PJQxxxx xx

8. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions	Notes	Max	Unit
V_{DRM}	repetitive peak off-state voltage			800	V
$I_{\text{T(RMS)}}$	RMS on-state current	full sine wave; $T_{\text{mb}} \leq 141\text{ }^{\circ}\text{C}$; Fig 1 ; Fig 2 ; Fig 3		2	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 4 ; Fig 5		20	A
		full sine wave; $T_{\text{j(init)}} = 25\text{ }^{\circ}\text{C}$; $t_{\text{p}} = 16.7\text{ ms}$		22	A
I^2t	I^2t for fusing	$t_{\text{p}} = 10\text{ ms}$; SIN		2.6	A^2s
di_{T}/dt	rate of rise of on-state current	$I_{\text{G}} = 20\text{ mA}$		100	$\text{A}/\mu\text{s}$
I_{GM}	peak gate current	$t = 20\text{ }\mu\text{s}$		1	A
V_{GM}	peak gate voltage	$t = 20\text{ }\mu\text{s}$		15	V
P_{GM}	peak gate power			0.1	W
T_{stg}	storage temperature			-40 to 150	$^{\circ}\text{C}$
T_{j}	operating junction temperature			-40 to 150	$^{\circ}\text{C}$
V_{PP}	peak pulse voltage	$T_{\text{j}} = 25\text{ }^{\circ}\text{C}$; non-repetitive, off-state; Fig. 6		2.5	kV

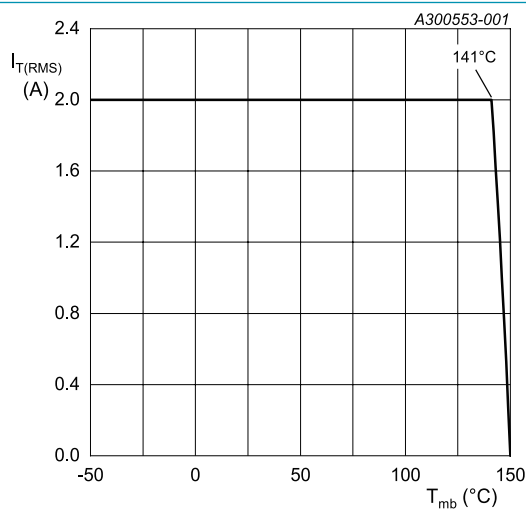
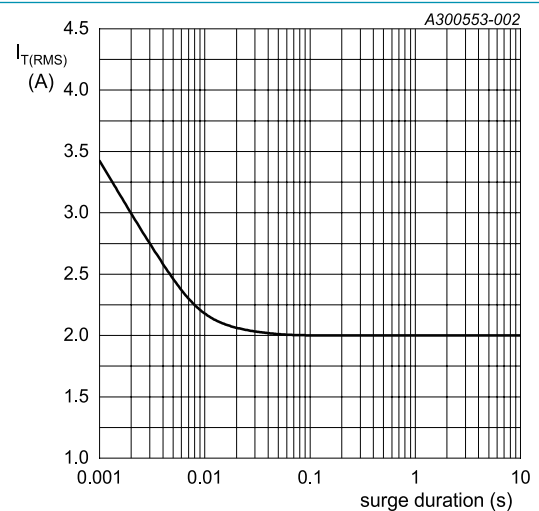


Fig. 1. RMS on-state current as a function of mounting base temperature; maximum values



$f = 50\text{ Hz}$; $T_{\text{mb}} = 141\text{ }^{\circ}\text{C}$

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

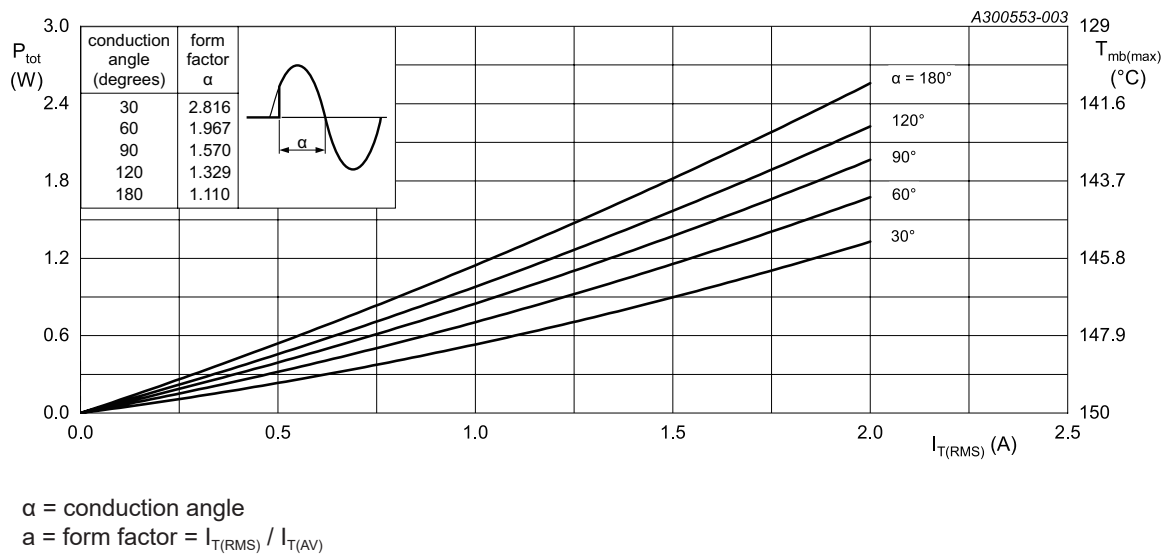


Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values

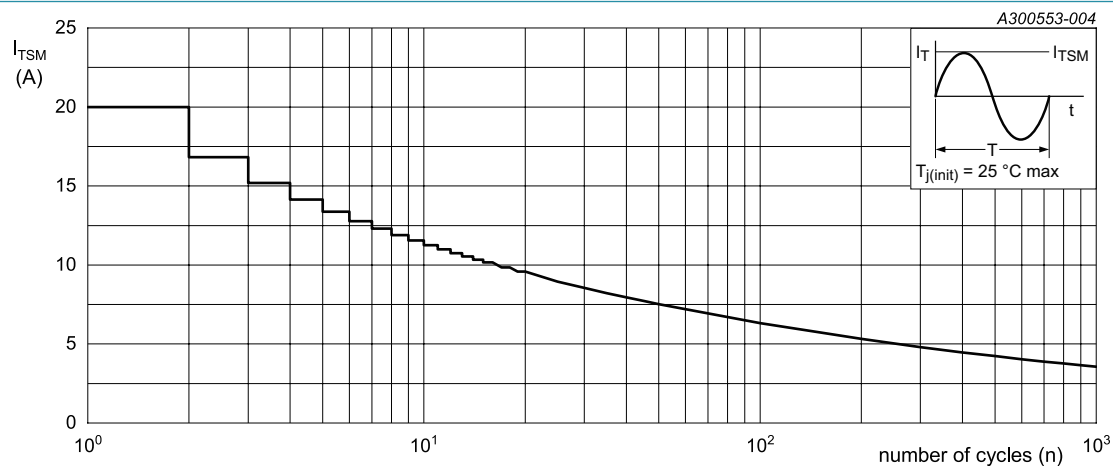


Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

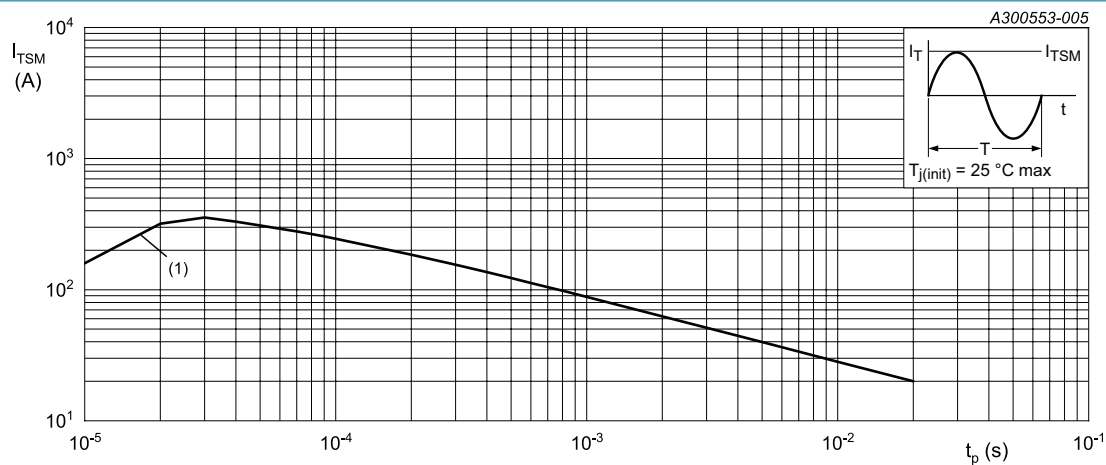
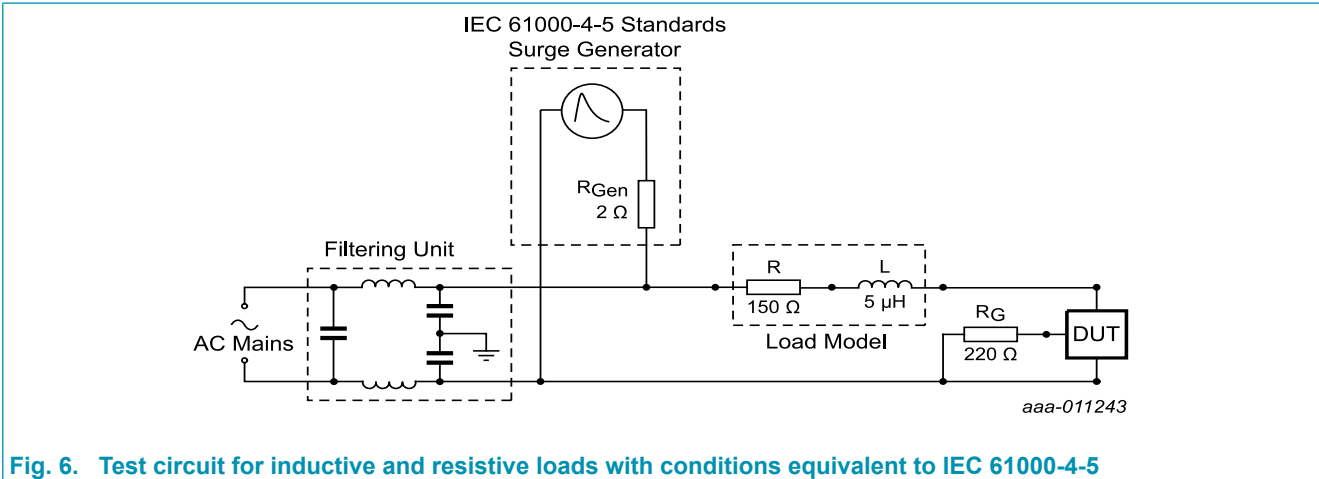


Fig. 5. Non-repetitive peak on-state current as a function of pulse width; maximum values



9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	full cycle; Fig. 7		-	-	3.5	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air; printed circuit board (FR4) mounted		-	50	-	K/W

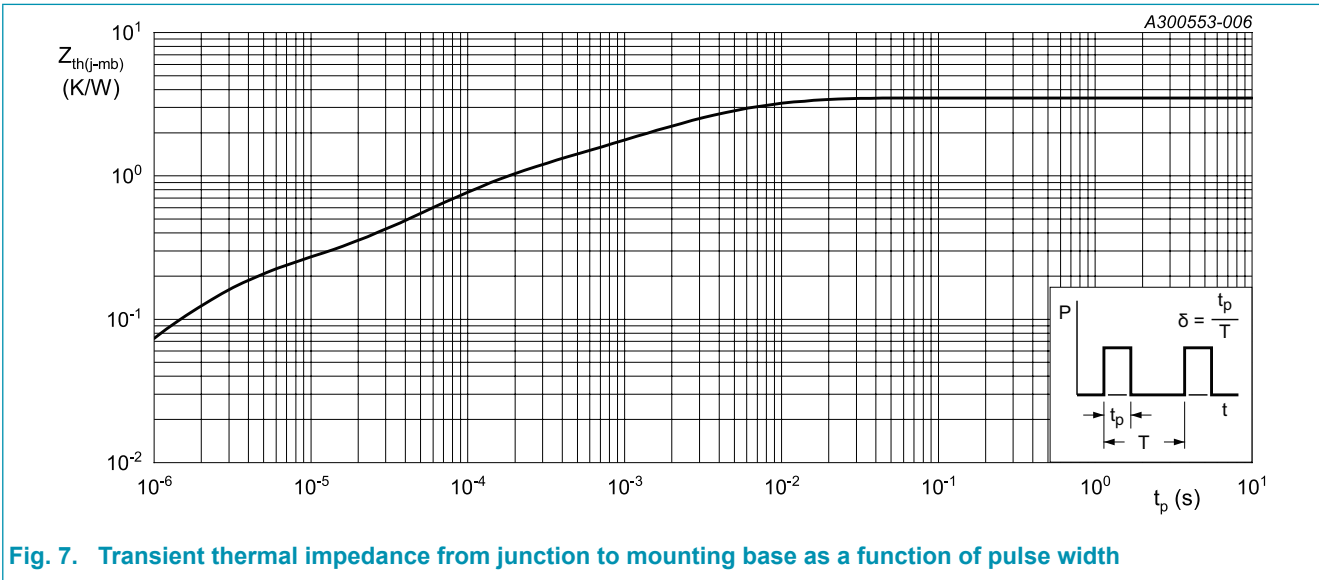
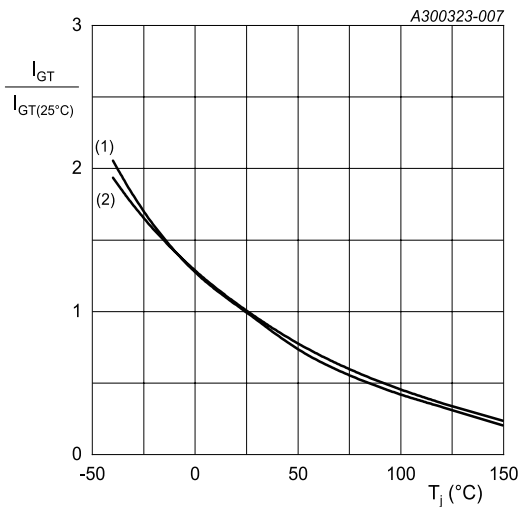


Fig. 7. Transient thermal impedance from junction to mounting base as a function of pulse width

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
I_{GT}	gate trigger current	$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; LD+ G-; $T_J = 25\text{ }^\circ\text{C}$; Fig. 8		-	-	10	mA
		$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; LD- G-; $T_J = 25\text{ }^\circ\text{C}$; Fig. 8		-	-	10	mA
I_L	latching current	$V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; LD+ G-; $T_J = 25\text{ }^\circ\text{C}$; Fig. 9		-	-	65	mA
		$V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; LD- G-; $T_J = 25\text{ }^\circ\text{C}$; Fig. 9		-	-	65	mA
I_H	holding current	$V_D = 12\text{ V}$; $T_J = 25\text{ }^\circ\text{C}$; Fig. 10		-	-	45	mA
V_T	on-state voltage	$I_T = 2\text{ A}$; $T_J = 25\text{ }^\circ\text{C}$; Fig. 11		-	-	1.45	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. 12		-	-	1	V
		$V_D = 400\text{ V}$; $I_T = 0.1\text{ A}$; $T_J = 125\text{ }^\circ\text{C}$		0.15	-	-	V
I_D	off-state current	$V_D = 800\text{ V}$; $T_J = 25\text{ }^\circ\text{C}$		-	-	10	μA
		$V_D = 800\text{ V}$; $T_J = 125\text{ }^\circ\text{C}$		-	-	0.5	mA
		$V_D = 800\text{ V}$; $T_J = 150\text{ }^\circ\text{C}$		-	-	2	mA
V_{CL}	clamping voltage	$I_{CL} = 0.1\text{ mA}$; $t_p = 1\text{ ms}$		850	-	-	V
Dynamic characteristics							
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 536\text{ V}$; $T_J = 125\text{ }^\circ\text{C}$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; gate open circuit		1000	-	-	V/ μs
dI_{com}/dt	rate of change of commutating current	$V_D = 400\text{ V}$; $T_J = 125\text{ }^\circ\text{C}$; $I_{T(RMS)} = 1.5\text{ A}$; $dV_{com}/dt = 20\text{ V}/\mu\text{s}$; (snubberless condition); gate open circuit		0.5	-	-	A/ms



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

Fig. 8. Normalized gate trigger current as a function of junction temperature

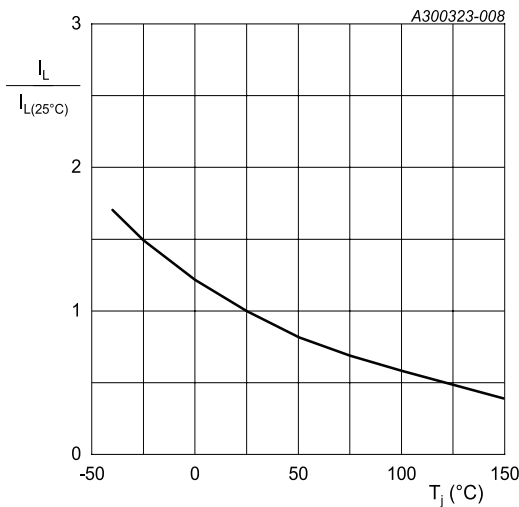


Fig. 9. Normalized latching current as a function of junction temperature

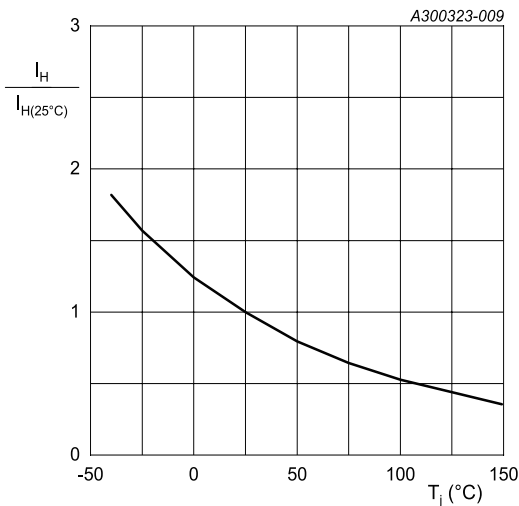
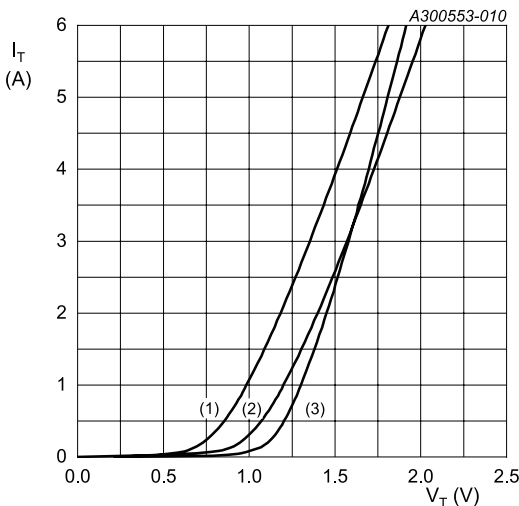


Fig. 10. Normalized holding current as a function of junction temperature



$V_o = 1.126 \text{ V}$; $R_s = 0.1325 \Omega$
(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. 11. On-state current as a function of on-state voltage

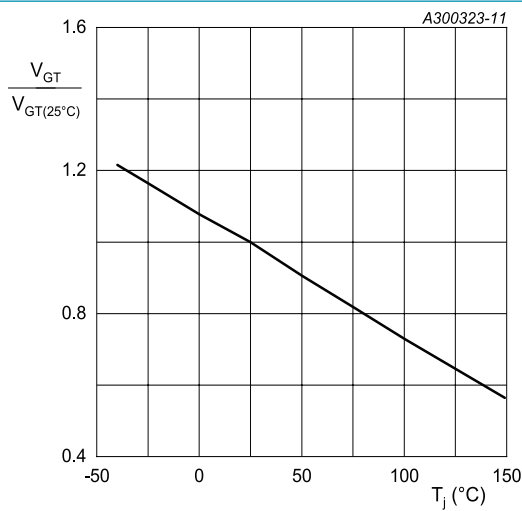


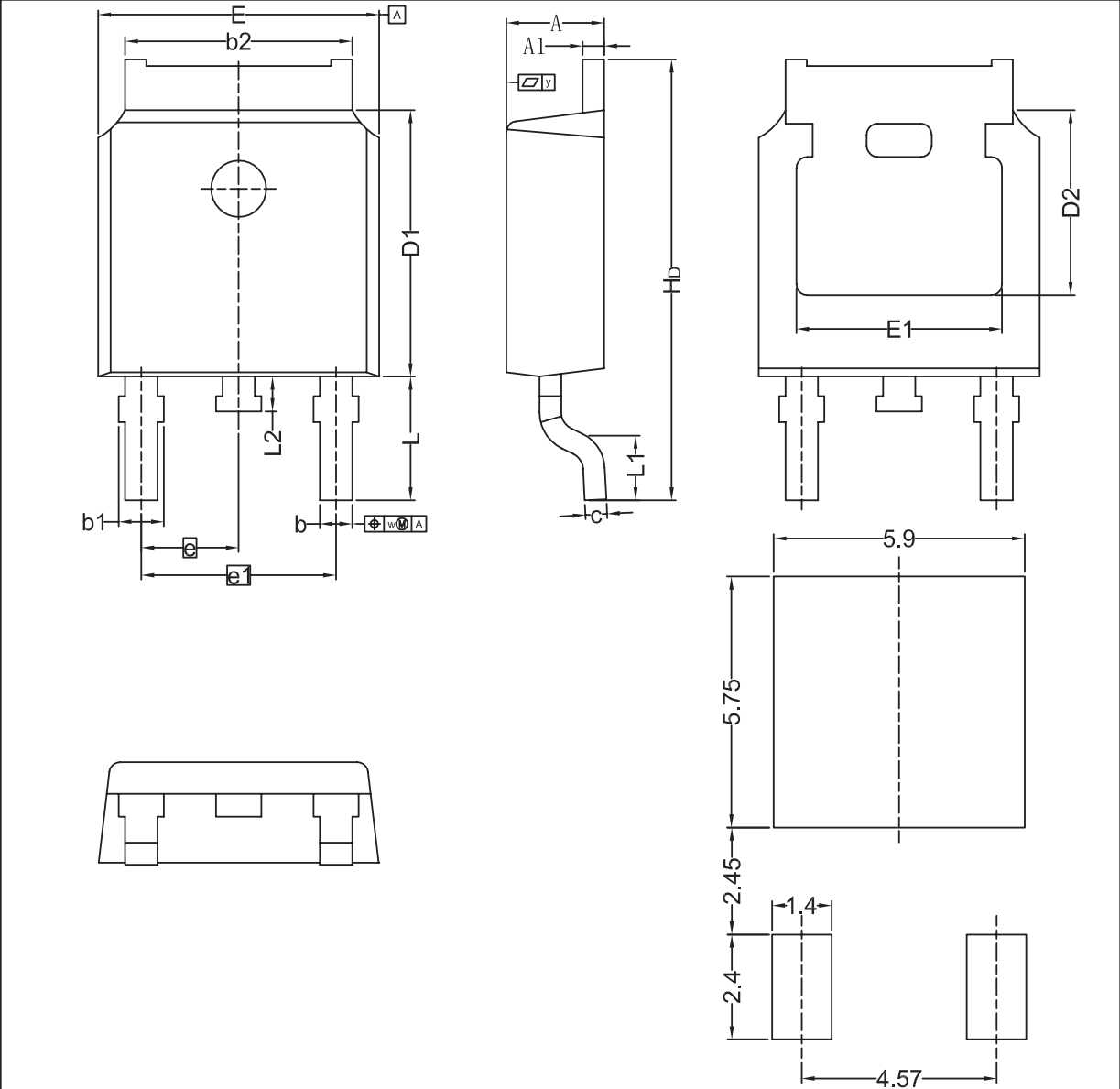
Fig. 12. Normalized gate trigger voltage as a function of junction temperature

11. Package outline

Assembly factory: N

Plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped)

TO252



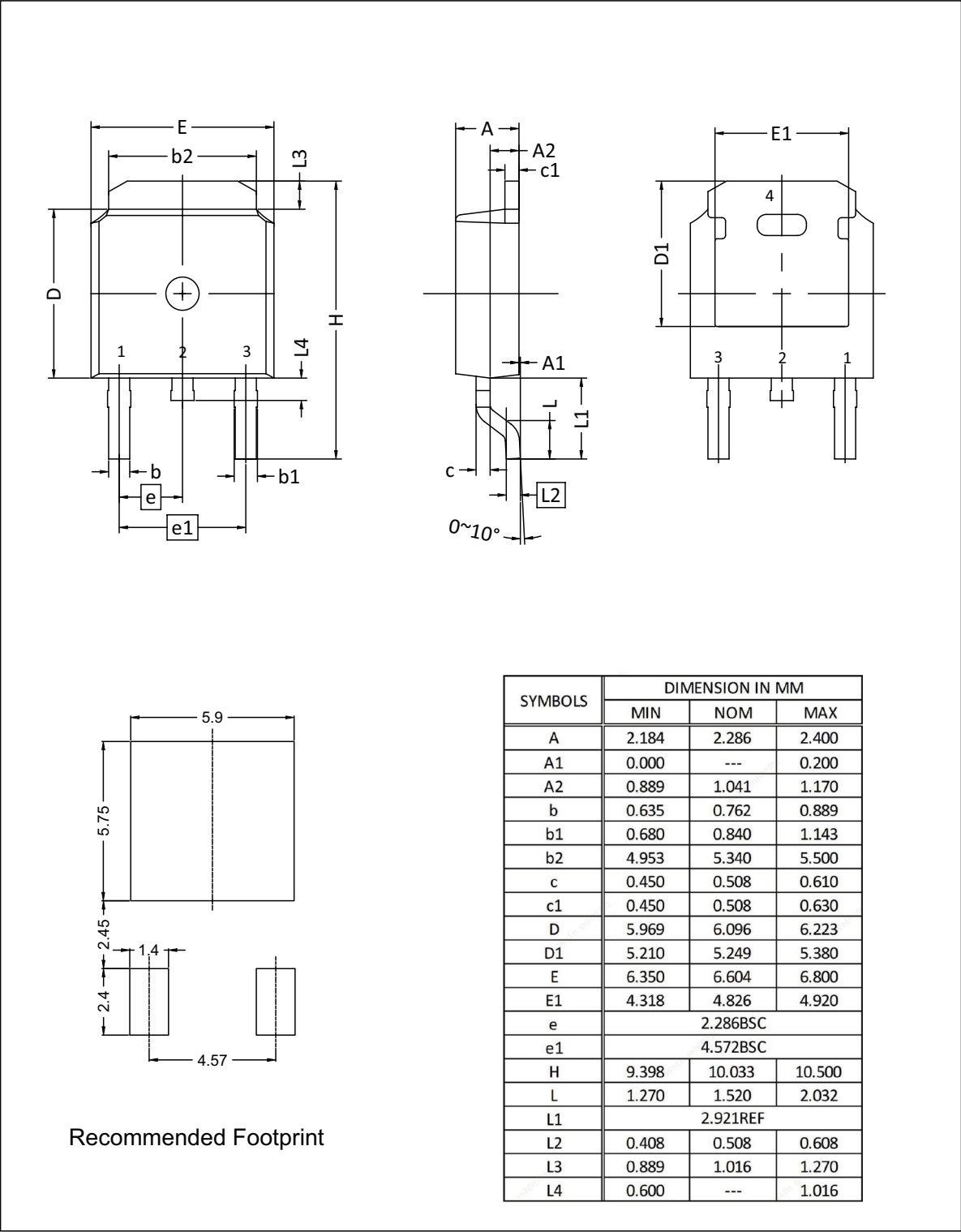
Recommended Footprint

Unit	A	A1	b	b1	b2	c	D1	D2	E	E1	e	e1	H _D	L	L1	L2	w	y
min	2.22	0.46	0.71	0.72	5.00	0.20	5.98	4.00	6.47	4.45	2.285	4.57	9.60	2.90 (Ref.)	0.50	0.50	0.20	
mm nom																		
max	2.38	0.93	0.89	1.10	5.46	0.56	6.22	---	6.73	---			10.40		---	0.90		0.20

Assembly factory: Q

Plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped)

TO252



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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- [2] The term 'short data sheet' is explained in section "Definitions".
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13. Contents

1. General description..... 1

2. Features and benefits 1

3. Applications 1

4. Quick reference data 1

5. Pinning information..... 2

6. Ordering information..... 2

7. Marking..... 2

8. Limiting values 3

9. Thermal characteristics 5

10. Characteristics..... 6

11. Package outline 9

12. Legal information 11

13. Contents 13

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