

1. General description

Planar passivated ultra sensitive gate Silicon Controlled Rectifier in a TO92 plastic package.

2. Features and benefits

- Planar passivated for voltage ruggedness and reliability
- Ultra sensitive gate

3. Applications

- Electronic ballasts
- Safety shut down and protection circuits
- Sensing circuits
- Smoke detectors
- Switched Mode Power Supplies

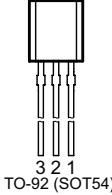

4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Absolute maximum rating						
V_{DRM}	repetitive peak offstate voltage		-	-	400	V
V_{RRM}	repetitive peak reverse voltage		-	-	400	V
$I_{T(AV)}$	average on-state current	half sine wave; $T_{lead} \leq 92\text{ °C}$; Fig. 1	-	-	0.5	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_{lead} \leq 92\text{ °C}$; Fig. 2 ; Fig. 3	-	-	0.8	A
I_{TSM}	non-repetitive peak on-state current	half sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 10\text{ ms}$; Fig. 4 ; Fig. 5	-	-	8	A
Static characteristics						
I_{GT}	gate trigger current	$V_D = 12\text{ V}$; $I_T = 10\text{ mA}$; $T_j = 25\text{ °C}$; Fig. 7	-	3	12	μA

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	A	anode	 <p>TO-92 (SOT54)</p>	 <p>sym037</p>
2	G	gate		
3	K	cathode		

6. Ordering information

Table 3. Ordering information

Type number	Package Name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
EC103D1	TO92	EC103D1,412	Bulk	1000	SOT54	14-Nov-2013
EC103D1	TO92	EC103D1,116	Reel	2000	SOT54 wide pitch	14-Nov-2013

7. Marking

Table 4. Marking codes

Type number	Marking codes
EC103D1	EC103D1

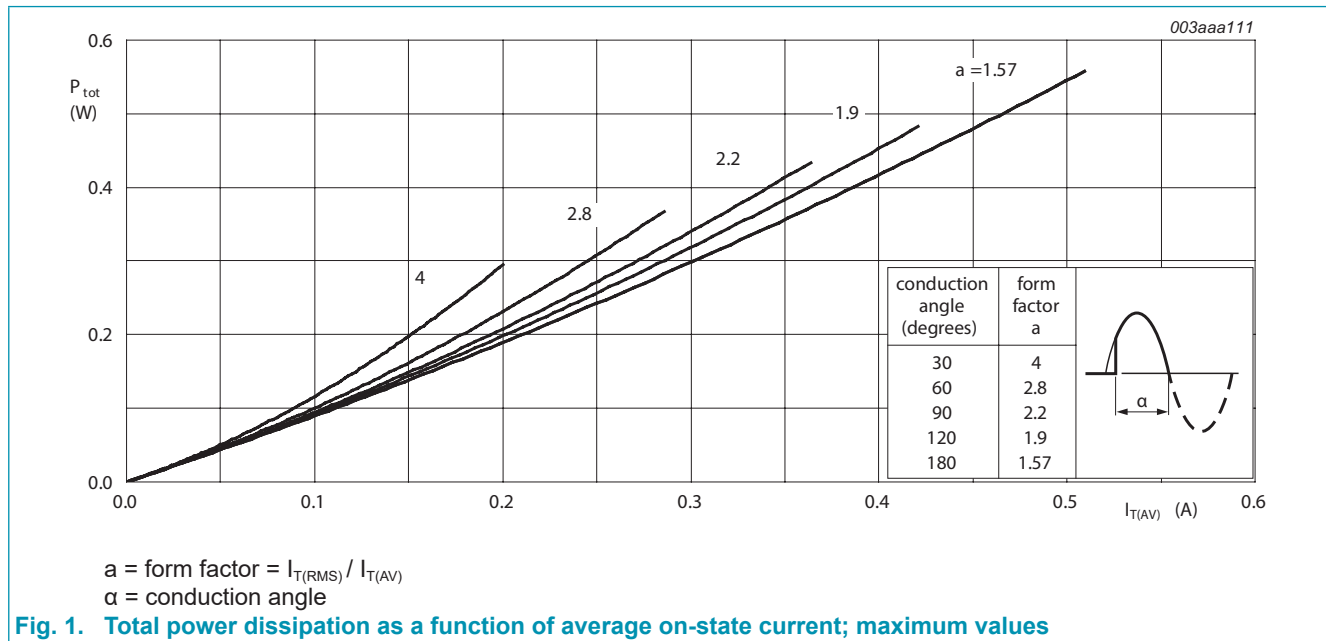
8. Limiting values

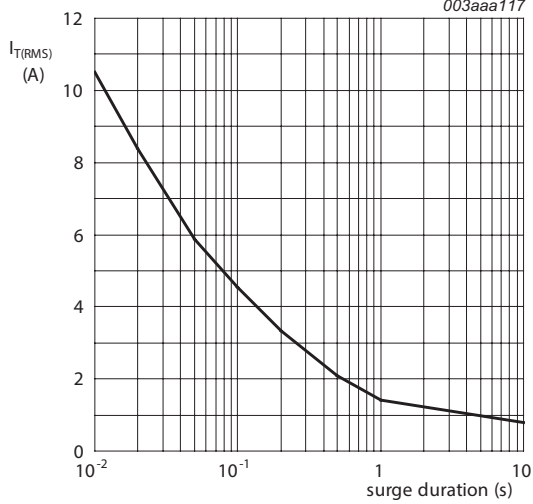
Table 5. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DRM}	repetitive peak off-state voltage		-	400	V
V_{RRM}	repetitive peak reverse voltage		-	400	V
$I_{T(AV)}$	average on-state current	half sine wave; $T_{lead} \leq 92\text{ °C}$; Fig. 1	-	0.5	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_{lead} \leq 92\text{ °C}$; Fig. 2; Fig. 3	-	0.8	A
I_{TSM}	non-repetitive peak on-state current	half sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 10\text{ ms}$; Fig. 4; Fig. 5	-	8	A
		half sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 8.3\text{ ms}$	-	9	A
I^2t	I^2t for fusing	$t_p = 10\text{ ms}$; SIN	-	0.32	A ² s
di_T/dt	rate of rise of on-state current	$I_T = 2\text{ A}$; $I_G = 10\text{ mA}$; $di_G/dt = 100\text{ mA}/\mu\text{s}$	-	50	A/ μs
I_{GM}	peak gate current		-	1	A
V_{RGM}	peak reverse gate voltage		-	5	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	[1]	-	125	°C

[1] Operation above 110°C may require the use of a gate to cathode resistor of 1kΩ or less.





$f = 50 \text{ Hz}; T_{\text{lead}} = 92 \text{ }^\circ\text{C}$

Fig. 2. RMS on-state current as a function of surge duration for sinusoidal currents

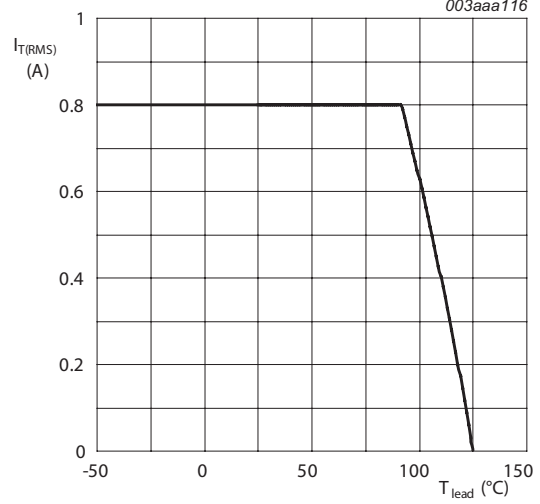
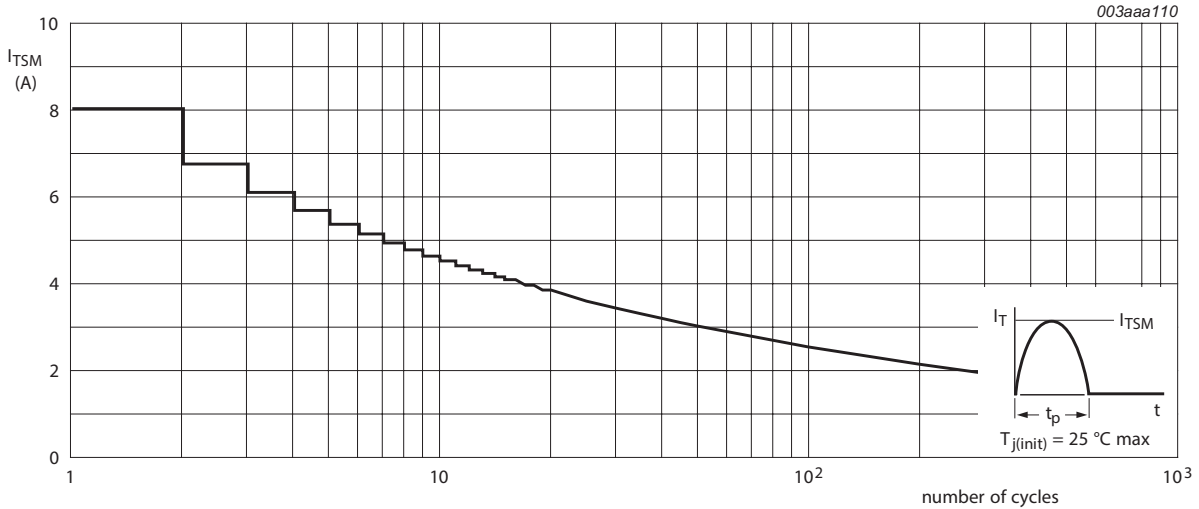
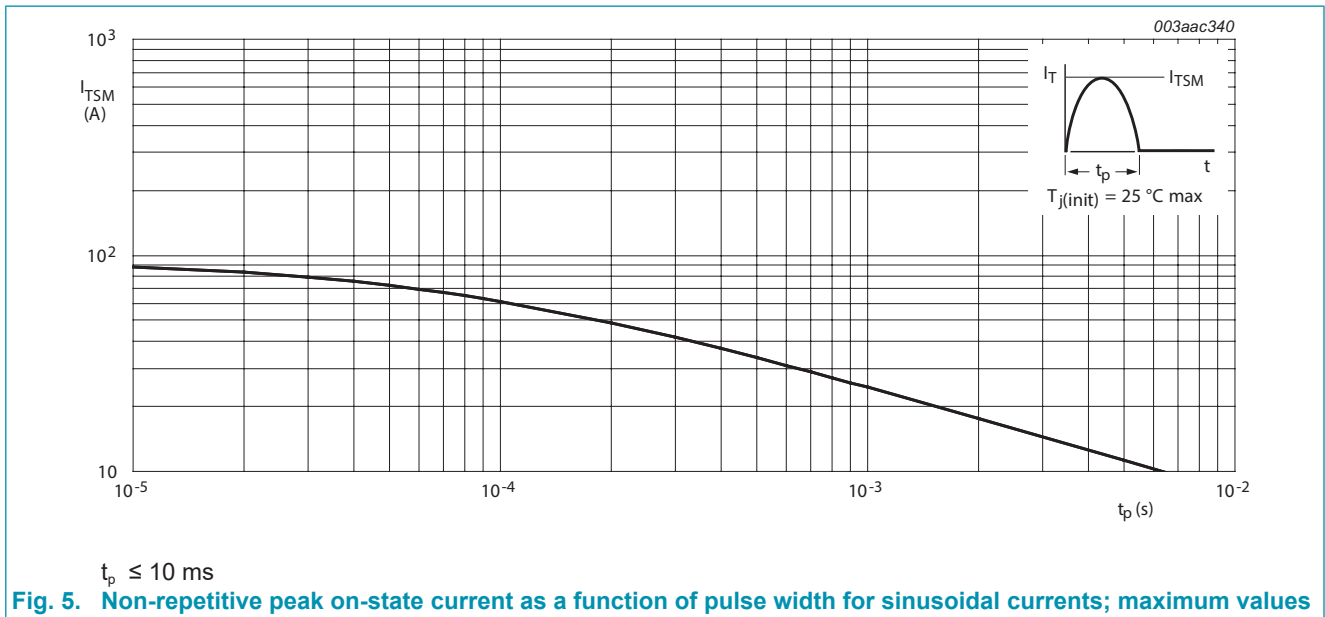


Fig. 3. RMS on-state current as a function of lead temperature; maximum values



$f = 50 \text{ Hz}$

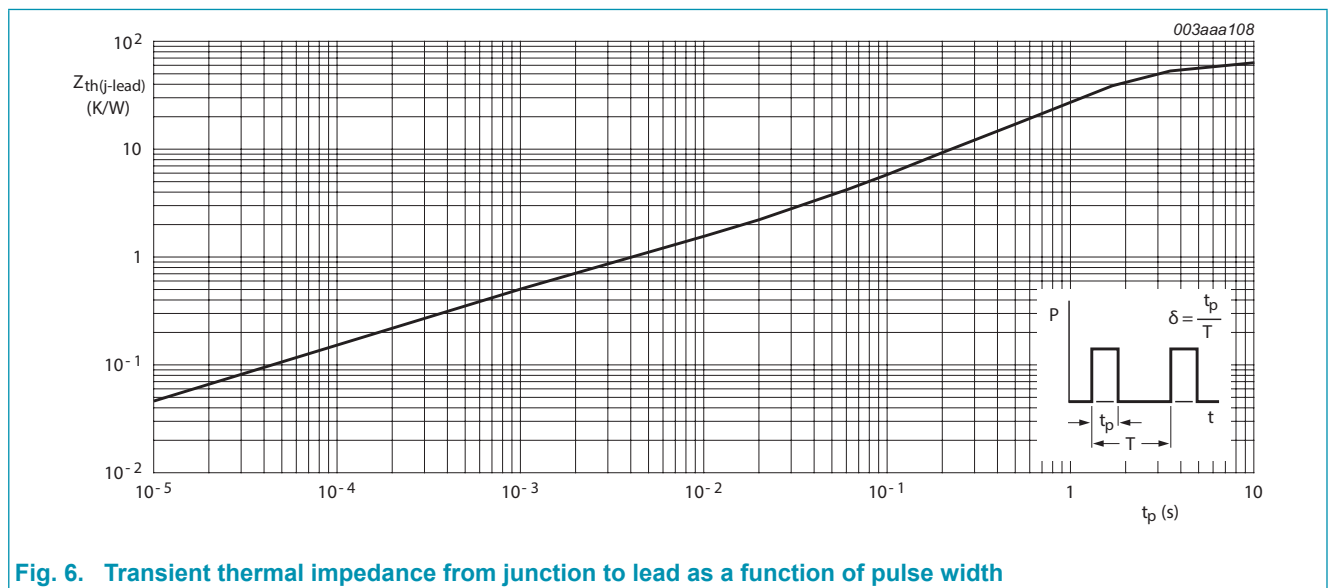
Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-lead)}$	thermal resistance from junction to lead	Fig. 6	-	-	60	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	printed circuit board mounted: lead length = 4 mm	-	150	-	K/W



10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I_{GT}	gate trigger current	$V_D = 12\text{ V}$; $I_T = 10\text{ mA}$; $T_J = 25\text{ °C}$; Fig. 7	-	3	12	μA
I_L	latching current	$V_D = 12\text{ V}$; $I_G = 0.5\text{ mA}$; $R_{GK} = 1\text{ k}\Omega$; $T_J = 25\text{ °C}$; Fig. 8	-	2	6	mA
I_H	holding current	$V_D = 12\text{ V}$; $R_{GK} = 1\text{ k}\Omega$; $T_J = 25\text{ °C}$; Fig. 9	-	2	5	mA
V_T	on-state voltage	$I_T = 1\text{ A}$; $T_J = 25\text{ °C}$; Fig. 10	-	1.2	1.35	V
V_{GT}	gate trigger voltage	$V_D = 12\text{ V}$; $I_T = 10\text{ mA}$; $T_J = 25\text{ °C}$; Fig. 11	-	0.5	0.8	V
		$V_D = 400\text{ V}$; $I_T = 10\text{ mA}$; $T_J = 125\text{ °C}$	0.2	0.3	-	V
I_D	off-state current	$V_D = 400\text{ V}$; $R_{GK} = 1\text{ k}\Omega$; $T_J = 125\text{ °C}$	-	0.05	0.1	mA
I_R	reverse current	$V_D = 400\text{ V}$; $R_{GK} = 1\text{ k}\Omega$; $T_J = 125\text{ °C}$	-	0.05	0.1	mA
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 268\text{ V}$; $T_J = 125\text{ °C}$; $R_{GK} = 1\text{ k}\Omega$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; Fig. 12	-	150	-	$\text{V}/\mu\text{s}$
t_{gt}	gate-controlled turn-on time	$I_{TM} = 2\text{ A}$; $V_D = 400\text{ V}$; $I_G = 10\text{ mA}$; $dI_G/dt = 0.1\text{ A}/\mu\text{s}$; $T_J = 25\text{ °C}$	-	2	-	μs
t_q	commutated turn-off time	$V_{DM} = 268\text{ V}$; $T_J = 125\text{ °C}$; $I_{TM} = 1.6\text{ A}$; $V_R = 35\text{ V}$; $(dI_T/dt)_M = 30\text{ A}/\mu\text{s}$; $dV_D/dt = 2\text{ V}/\mu\text{s}$; $R_{GK} = 1\text{ k}\Omega$; ($V_{DM} = 67\%$ of V_{DRM})	-	100	-	μs

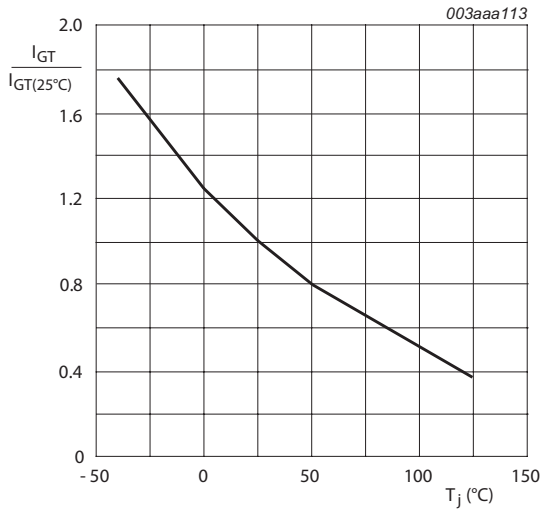
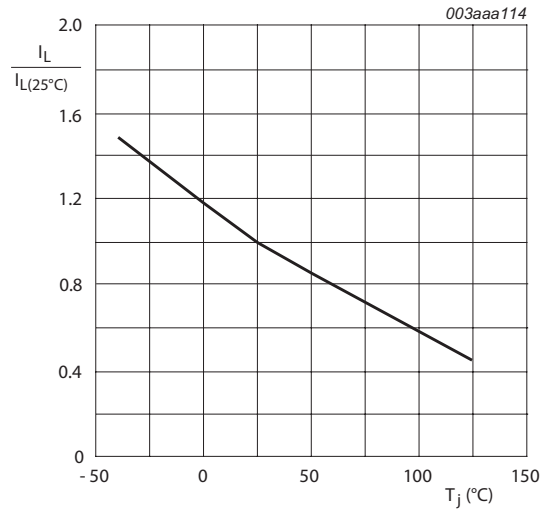
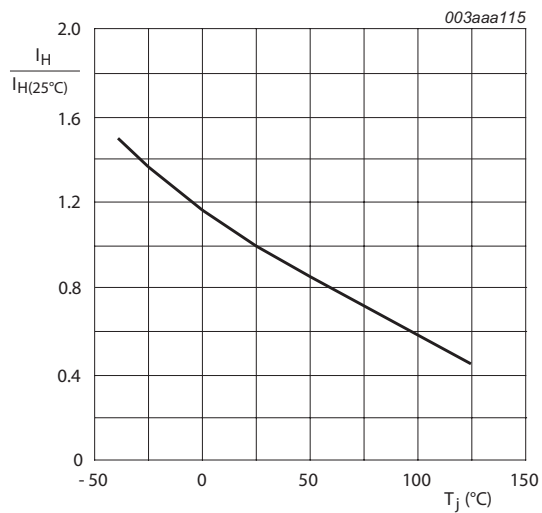


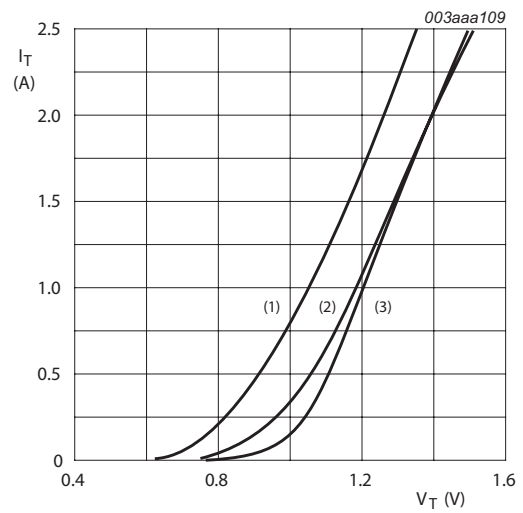
Fig. 7. Normalized gate trigger current as a function of junction temperature



$R_{GK} = 1 \text{ k}\Omega$
Fig. 8. Normalized latching current as a function of junction temperature



$R_{GK} = 1 \text{ k}\Omega$
Fig. 9. Normalized holding current as a function of junction temperature



$V_o = 0.895 \text{ V}; R_s = 0.195 \Omega$
(1) $T_j = 125 \text{ }^\circ\text{C}$; typical values
(2) $T_j = 125 \text{ }^\circ\text{C}$; maximum values
(3) $T_j = 25 \text{ }^\circ\text{C}$; maximum values
Fig. 10. On-state current as a function of on-state voltage

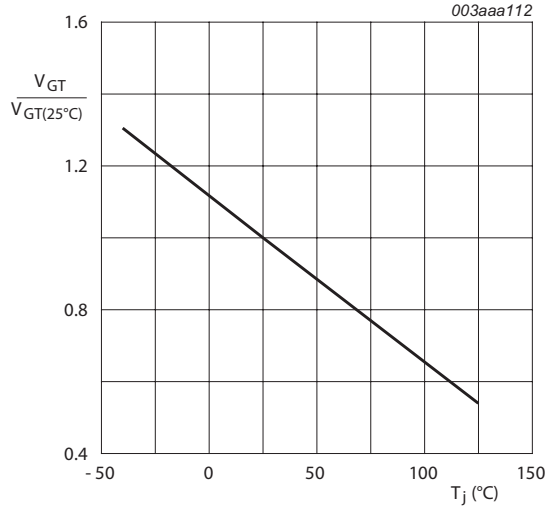
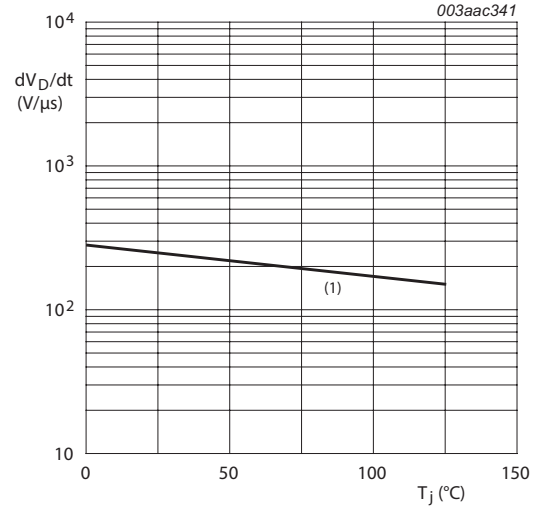


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

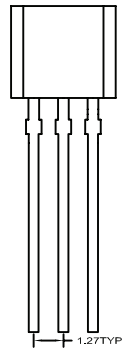


(1) $R_{GK} = 1 \text{ k}\Omega$

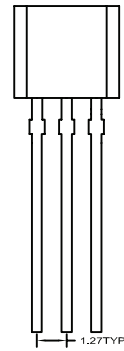
Fig. 12. Critical rate of rise of off-state voltage as a function of junction temperature; typical values

11. Package outline

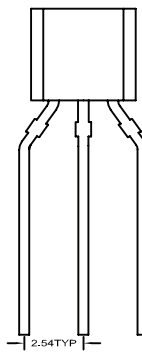
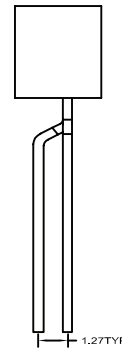
SOT54 PACKAGE OUTLINE



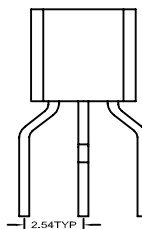
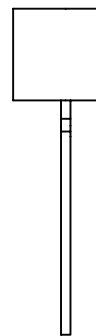
SOT54
Bulk Pack - 412



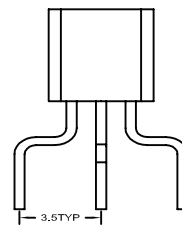
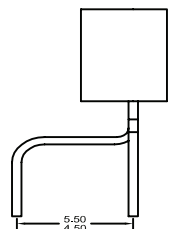
SOT54 LEADS ON CIRCLE
Bulk Pack - 112



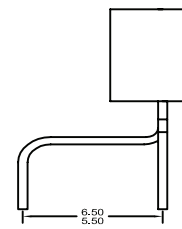
SOT54 WIDE PITCH
Tape/ Reel Pack - 116
Ammo Pack - 126



SOT54 LEAD BEND L01
Bulk Pack - 412



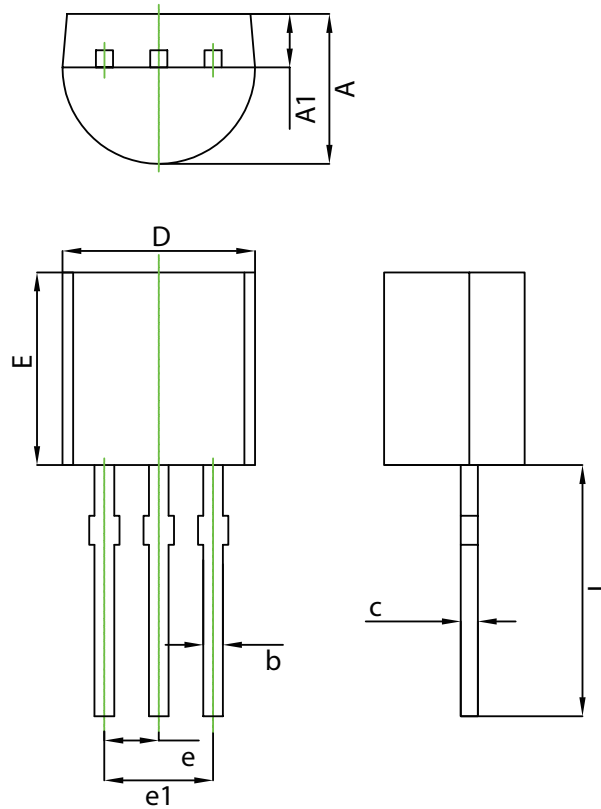
SOT54 LEAD BEND L02
Bulk Pack - 412



Remark: Detailed dimensions refer to POD drawing.

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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- [2] The term 'short data sheet' is explained in section "Definitions".
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Date of release: 01 November 2021
