BT169D

SCR

5 September 2018 Product data sheet

1. General description

Planar passivated Silicon Controlled Rectifier with sensitive gate in a SOT54 (TO-92) plastic package. This SCR is designed to be interfaced directly to microcontrollers, logic ICs and other low power gate trigger circuits.

2. Features and benefits

- Planar passivated for voltage ruggedness and reliability
- Sensitive gate
- Direct triggering from low power gate circuits and logic ICs

3. Applications

- Ignition circuits
- Lighting ballasts
- Protection circuits
- Switched Mode Power Supplies

4. Quick reference data

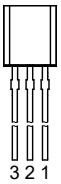
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{RRM}	repetitive peak reverse voltage			-	-	400	V
$I_{T(AV)}$	average on-state current	half sine wave; $T_{lead} \leq 83$ °C; Fig. 1		-	-	0.5	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_{lead} \leq 83$ °C; Fig. 2; Fig. 3		-	-	0.8	A
I_{TSM}	non-repetitive peak on-state current	half sine wave; $T_{j(init)} = 25$ °C; $t_p = 10$ ms; Fig. 4; Fig. 5		-	-	8	A
		half sine wave; $T_{j(init)} = 25$ °C; $t_p = 8.3$ ms		-	-	9	A
T_j	junction temperature			-	-	125	°C
Static characteristics							
I_{GT}	gate trigger current	$V_D = 12$ V; $I_T = 10$ mA; $T_j = 25$ °C; Fig. 7		-	50	200	µA
Dynamic characteristics							
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 268$ V; $T_j = 125$ °C; $R_{GK} = 1$ kΩ; exponential waveform; Fig. 12		500	800	-	V/µs

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
		V_{DM} = 268 V; T_j = 125 °C; exponential waveform; gate open circuit; Fig. 12		-	25	-	V/µs

5. Pinning information

Table 2. Pinning information

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

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BT169D	TO-92	plastic single-ended leaded (through hole) package; 3 leads	SOT54

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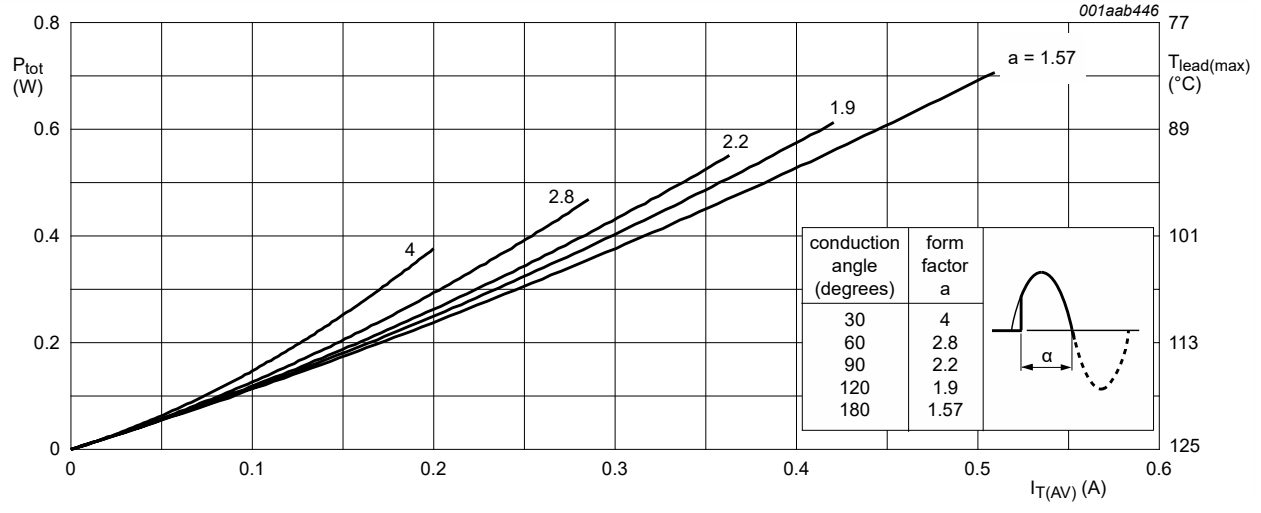
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7. Limiting values

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			-	400	V
V_{RRM}	repetitive peak reverse voltage			-	400	V
$I_{T(AV)}$	average on-state current	half sine wave; $T_{lead} \leq$ 83 °C; Fig. 1		-	0.5	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_{lead} \leq$ 83 °C; Fig. 2; Fig. 3		-	0.8	A
I_{TSM}	non-repetitive peak on-state current	half sine wave; $T_{j(init)}$ = 25 °C; t_p = 10 ms; Fig. 4; Fig. 5		-	8	A
		half sine wave; $T_{j(init)}$ = 25 °C; t_p = 8.3 ms		-	9	A
I^2t	I^2t for fusing	t_p = 10 ms; SIN		-	0.32	A²s
dI_T/dt	rate of rise of on-state current	I_T = 2 A; I_G = 10 mA; dI_G/dt = 100 mA/µs		-	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			-	125	°C



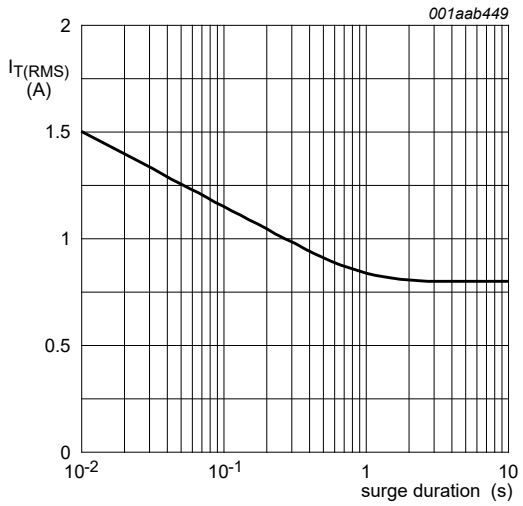
α = conduction angle

a = form factor = $I_{T(RMS)}$ / $I_{T(AV)}$

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

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f = 50 Hz; T_{lead} = 83 °C

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

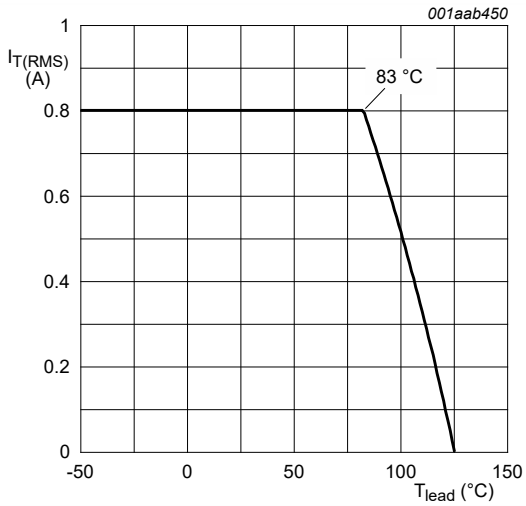
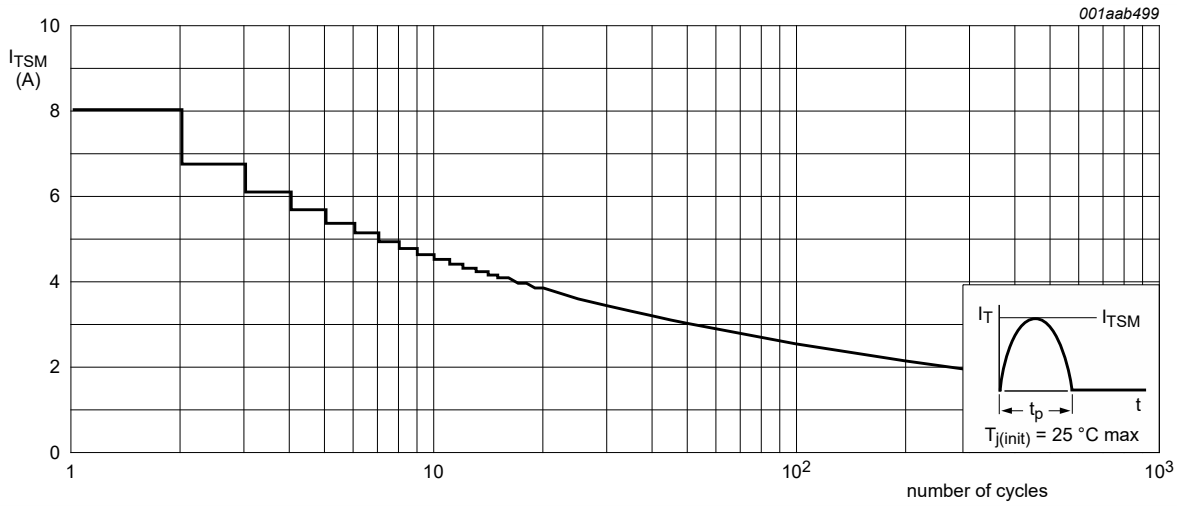


Fig. 3. RMS on-state current as a function of lead temperature; maximum values



f = 50 Hz

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

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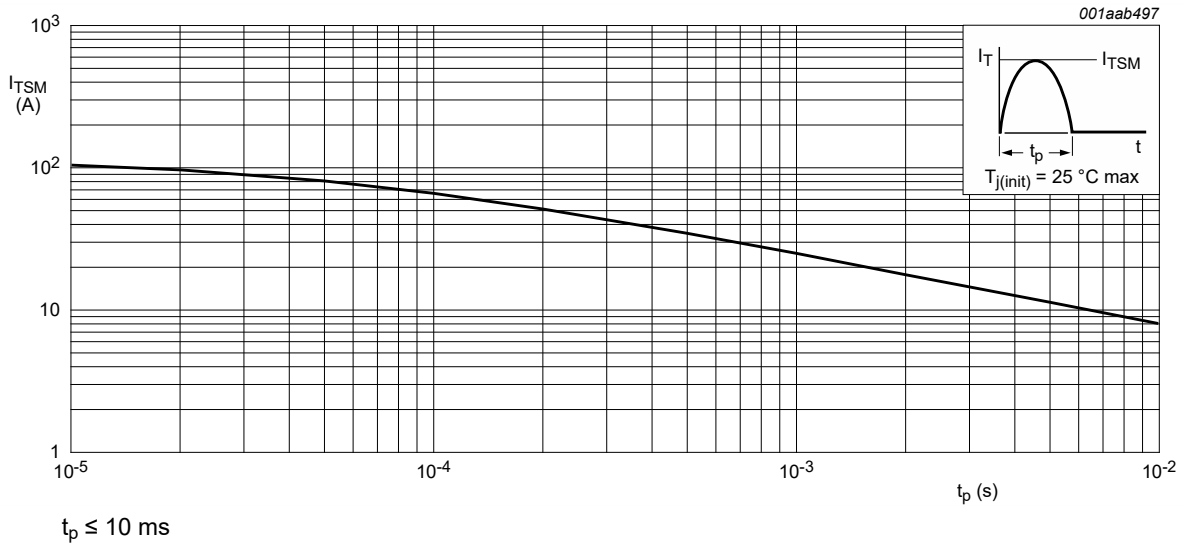


Fig. 5. Non-repetitive peak on-state current as a function of pulse width for sinusoidal currents; maximum values

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8. Thermal characteristics

Table 5. Thermal characteristics

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

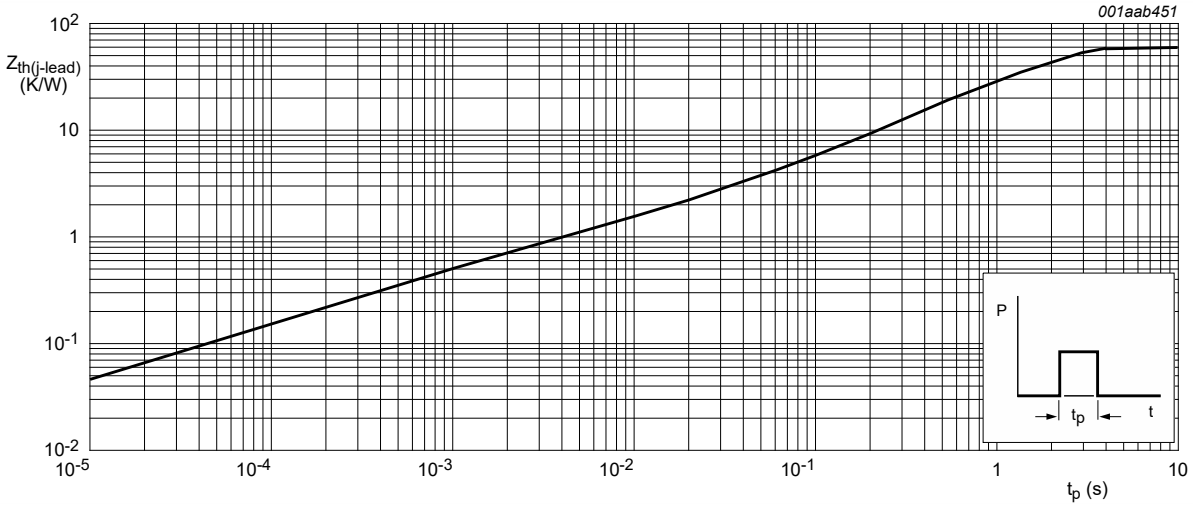


Fig. 6. Transient thermal impedance from junction to lead as a function of pulse width

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9. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
I_{GT}	gate trigger current	V_D = 12 V; I_T = 10 mA; T_j = 25 °C; Fig. 7		-	50	200	µA
I_L	latching current	V_D = 12 V; I_G = 0.5 mA; T_j = 25 °C; Fig. 8		-	2	6	mA
I_H	holding current	V_D = 12 V; T_j = 25 °C; Fig. 9		-	2	5	mA
V_T	on-state voltage	I_T = 1.2 A; T_j = 25 °C; Fig. 10		-	1.25	1.7	V
V_{GT}	gate trigger voltage	V_D = 12 V; I_T = 10 mA; T_j = 25 °C; Fig. 11		-	0.5	0.8	V
		V_D = 400 V; I_T = 10 mA; T_j = 125 °C; Fig. 11		0.2	0.3	-	V
I_D	off-state current	V_D = 400 V; T_j = 125 °C		-	0.05	0.1	mA
I_R	reverse current	V_R = 400 V; T_j = 125 °C		-	0.05	0.1	mA
Dynamic characteristics							
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 268 V; T_j = 125 °C; R_{GK} = 1 kΩ; exponential waveform; Fig. 12		500	800	-	V/µs
		V_{DM} = 268 V; T_j = 125 °C; exponential waveform; gate open circuit; Fig. 12		-	25	-	V/µs
t_{gt}	gate-controlled turn-on time	I_{TM} = 2 A; V_D = 400 V; I_G = 10 mA; dI_G/dt = 0.1 A/µs; T_j = 25 °C		-	2	-	µs
t_q	commutated turn-off time	V_{DM} = 268 V; T_j = 125 °C; I_{TM} = 1.6 A; V_R = 35 V; $(dI_T/dt)_M$ = 30 A/µs; dV_D/dt = 2 V/µs; $R_{GK(ext)}$ = 1 kΩ		-	100	-	µs

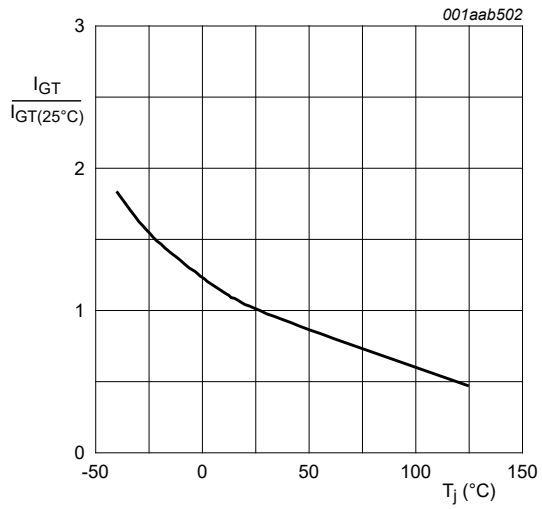
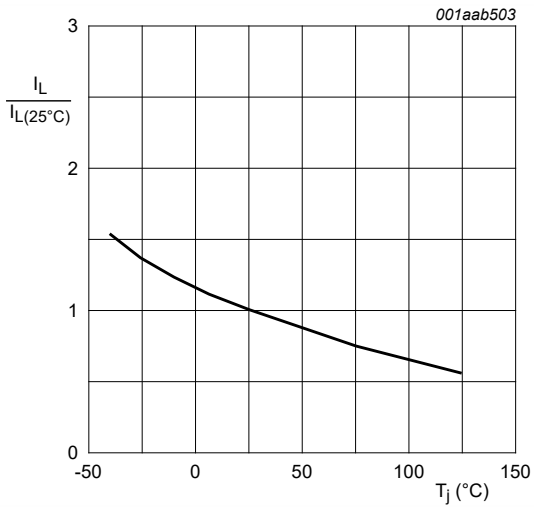


Fig. 7. Normalized gate trigger current as a function of junction temperature

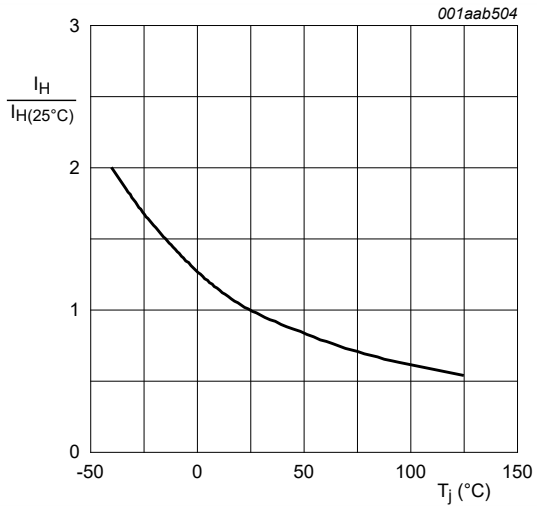


R_{GK} = 1 kΩ

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

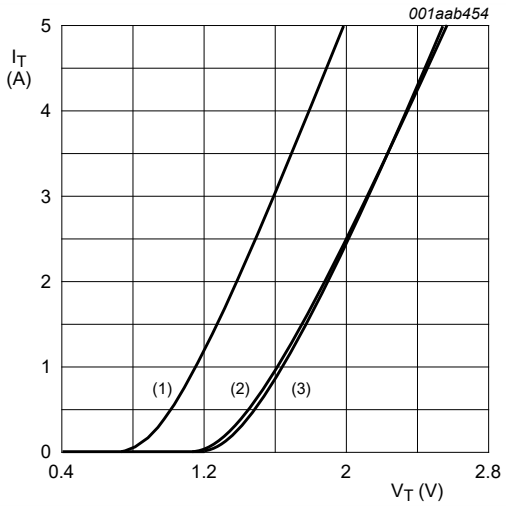
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R_{GK} = 1 kΩ

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



V_o = 1.067 V; R_s = 0.187 Ω
(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

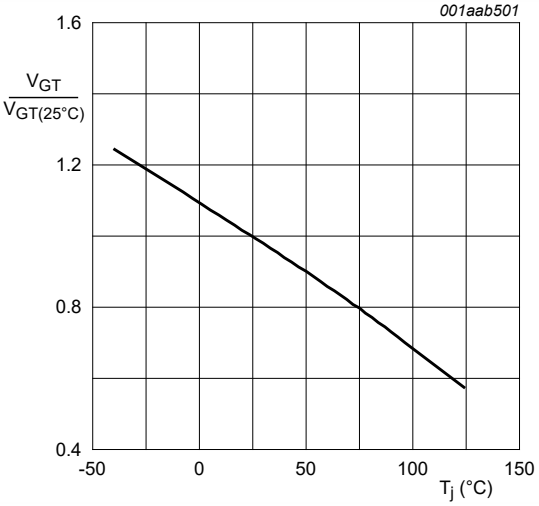
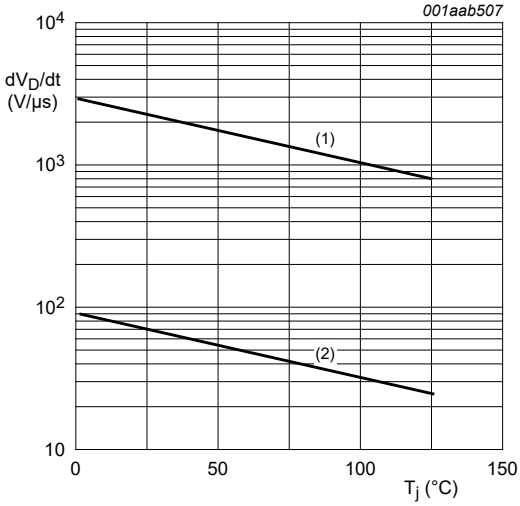


Fig. 11. Normalized gate trigger voltage as a function of junction temperature



(1) R_{GK} = 1 kΩ
(2) gate open circuit

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

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10. Package outline

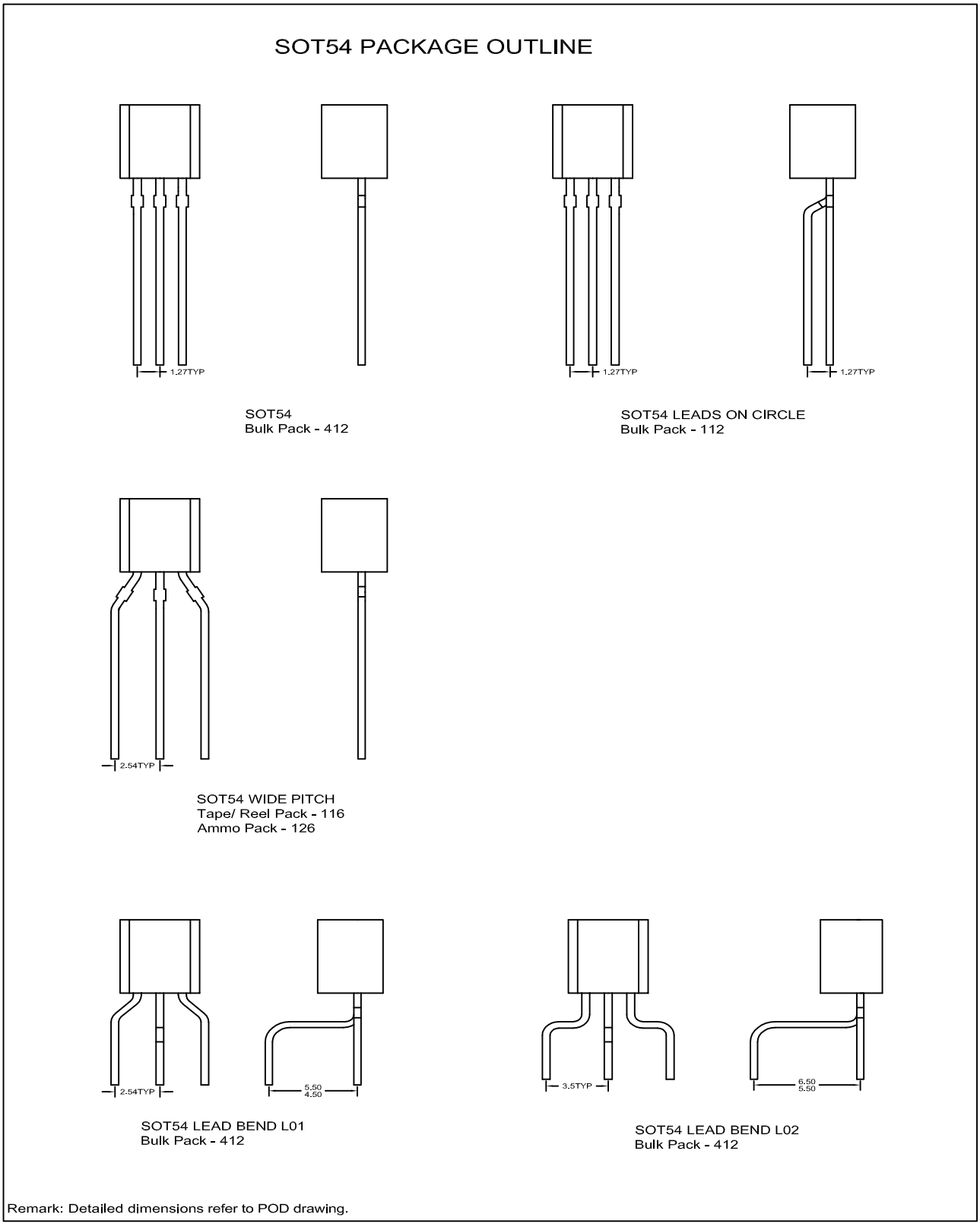


Fig. 13. Package outline TO-92 (SOT54)

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Document status [1][2]	Product status [3]	Definition
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12. 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. Limiting values....3
8. Thermal characteristics....6
9. Characteristics....7
10. Package outline....9
11. Legal information....10

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Date of release: 5 September 2018