MAC97A8

4Q Triac

15 September 2018 Product data sheet

1. General description

Planar passivated very sensitive gate four quadrant triac in a SOT54 plastic package intended to be interfaced directly to microcontrollers, logic integrated circuits and other low power gate trigger circuits.

2. Features and benefits

- Direct interfacing to logic level ICs
- Direct interfacing to low power gate drivers and microcontrollers
- High blocking voltage capability
- Planar passivated for voltage ruggedness and reliability
- Triggering in all four quadrants
- Very sensitive gate

3. Applications

- General purpose low power phase control
- General purpose low power switching
- Solid-state relay

4. Quick reference data

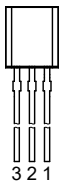
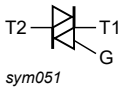
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DRM}	repetitive peak off-state voltage			-	-	600	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{lead} \leq$ 50 °C; Fig. 1; Fig. 2; Fig. 3		-	-	0.6	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		-	-	8	A
		full sine wave; $T_{j(init)}$ = 25 °C; t_p = 16.7 ms		-	-	8.8	A
T_j	junction temperature			-	-	125	°C
Static characteristics							
I_{GT}	gate trigger current	V_D = 12 V; I_T = 0.1 A; T2+ G+; T_j = 25 °C; Fig. 7		-	1	5	mA
		V_D = 12 V; I_T = 0.1 A; T2+ G-; T_j = 25 °C; Fig. 7		-	2	5	mA
		V_D = 12 V; I_T = 0.1 A; T2- G-; T_j = 25 °C; Fig. 7		-	2	5	mA

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
		V_D = 12 V; I_T = 0.1 A; T2- G+; T_j = 25 °C; Fig. 7		-	4	7	mA
I_H	holding current	V_D = 12 V; T_j = 25 °C; Fig. 9		-	1	10	mA
V_T	on-state voltage	I_T = 0.85 A; T_j = 25 °C; Fig. 10		-	1.4	1.9	V
Dynamic characteristics							
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 402 V; T_j = 110 °C; (V_{DM} = 67% of V_{DRM}); exponential waveform; gate open circuit; Fig. 12		30	45	-	V/µs
dV_{com}/dt	rate of change of commutating voltage	V_D = 600 V; T_j = 50 °C; dI_{com}/dt = 0.3 A/ms; I_T = 0.84 A; gate open circuit		-	5	-	V/µs

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	T2	main terminal 2	 **TO-92 (SOT54)**	 *sym051*
2	G	gate		
3	T1	main terminal 1		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
MAC97A8	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
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{lead} \leq 50$ °C; Fig. 1; Fig. 2; Fig. 3		-	0.6	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		-	8	A
		full sine wave; $T_{j(init)} = 25$ °C; $t_p = 16.7$ ms		-	8.8	A
I^2t	I^2t for fusing	$t_p = 10$ ms; SIN		-	0.32	A^2s
dI_T/dt	rate of rise of on-state current	$I_G = 20$ mA; T2+ G+		-	50	A/µs
		$I_G = 20$ mA; T2+ G-		-	50	A/µs
		$I_G = 20$ mA; T2- G-		-	50	A/µs
		$I_G = 20$ mA; T2- G+		-	10	A/µs
I_{GM}	peak gate current			-	1	A
P_{GM}	peak gate power			-	5	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

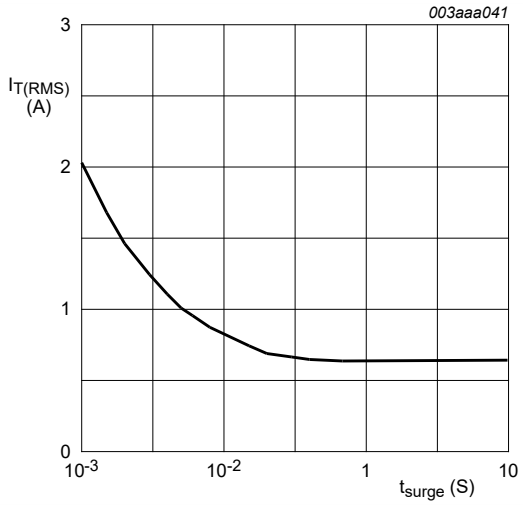


Fig. 1. RMS on-state current as a function of surge duration; maximum values

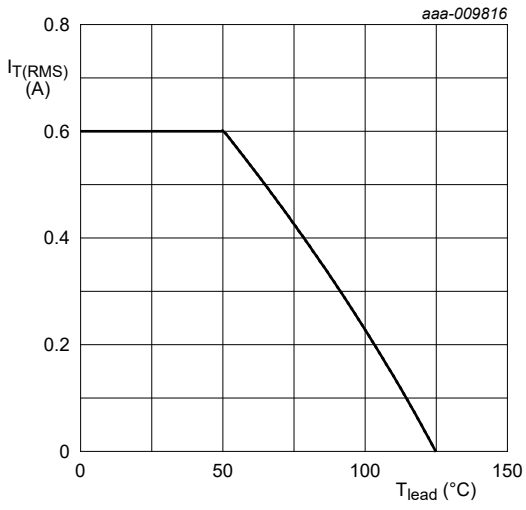
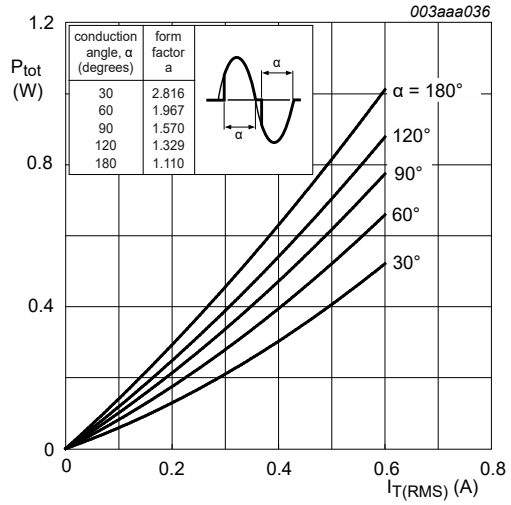
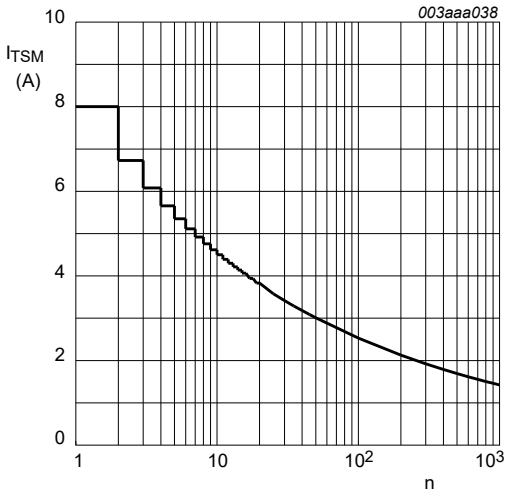


Fig. 2. RMS on-state current as a function of lead temperature; maximum values



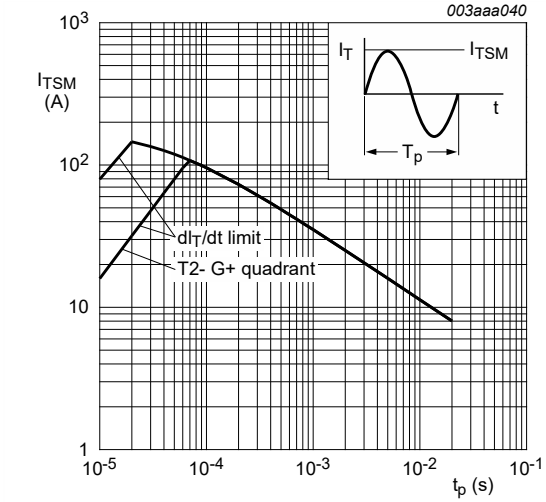
α = conduction angle
a = form factor = $I_{T(RMS)}$ / $I_{T(AV)}$

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



$t_p \leq 20$ ms

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

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	full cycle; Fig. 6		-	-	60	K/W
		half cycle		-	-	80	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

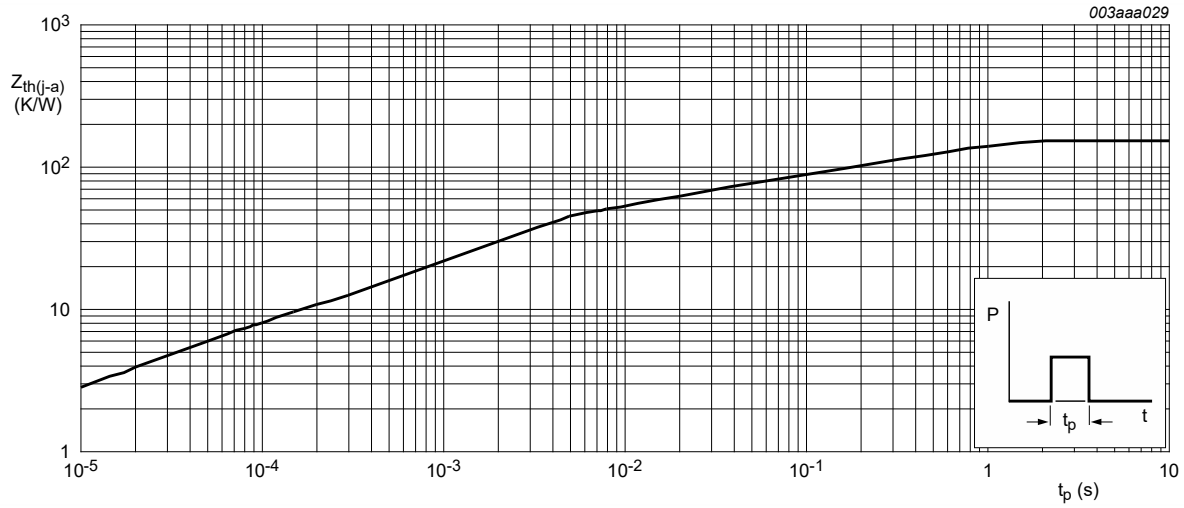
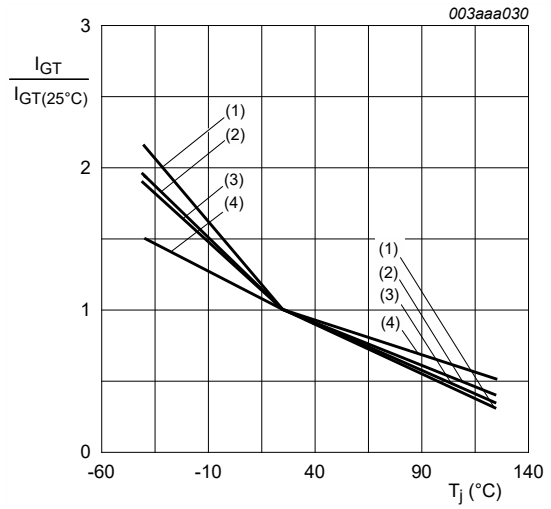


Fig. 6. Transient thermal impedance from junction to ambient as a function of pulse width

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 = 0.1 A; T2+ G+; T_j = 25 °C; Fig. 7		-	1	5	mA
		V_D = 12 V; I_T = 0.1 A; T2+ G-; T_j = 25 °C; Fig. 7		-	2	5	mA
		V_D = 12 V; I_T = 0.1 A; T2- G-; T_j = 25 °C; Fig. 7		-	2	5	mA
		V_D = 12 V; I_T = 0.1 A; T2- G+; T_j = 25 °C; Fig. 7		-	4	7	mA
I_L	latching current	V_D = 12 V; I_G = 0.1 A; T2+ G+; T_j = 25 °C; Fig. 8		-	1	10	mA
		V_D = 12 V; I_G = 0.1 A; T2+ G-; T_j = 25 °C; Fig. 8		-	5	10	mA
		V_D = 12 V; I_G = 0.1 A; T2- G-; T_j = 25 °C; Fig. 8		-	1	10	mA
		V_D = 12 V; I_G = 0.1 A; T2- G+; T_j = 25 °C; Fig. 8		-	2	10	mA
I_H	holding current	V_D = 12 V; T_j = 25 °C; Fig. 9		-	1	10	mA
V_T	on-state voltage	I_T = 0.85 A; T_j = 25 °C; Fig. 10		-	1.4	1.9	V
V_{GT}	gate trigger voltage	V_D = 12 V; I_T = 0.1 A; T_j = 25 °C; Fig. 11		-	0.9	1.5	V
		V_D = 400 V; I_T = 0.1 A; T_j = 110 °C; Fig. 11		0.1	0.7	-	V
I_D	off-state current	V_D = 600 V; T_j = 110 °C		-	3	100	µA
Dynamic characteristics							
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 402 V; T_j = 110 °C; (V_{DM} = 67% of V_{DRM}); exponential waveform; gate open circuit; Fig. 12		30	45	-	V/µs
dV_{com}/dt	rate of change of commutating voltage	V_D = 600 V; T_j = 50 °C; dI_{com}/dt = 0.3 A/ms; I_T = 0.84 A; gate open circuit		-	5	-	V/µs
t_{gt}	gate-controlled turn-on time	I_{TM} = 1 A; V_D = 600 V; I_G = 25 mA; dI_G/dt = 5 A/µs		-	2	-	µs



(1) T2- G+
(2) T2- G-
(3) T2+ G-
(4) T2+ G+

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

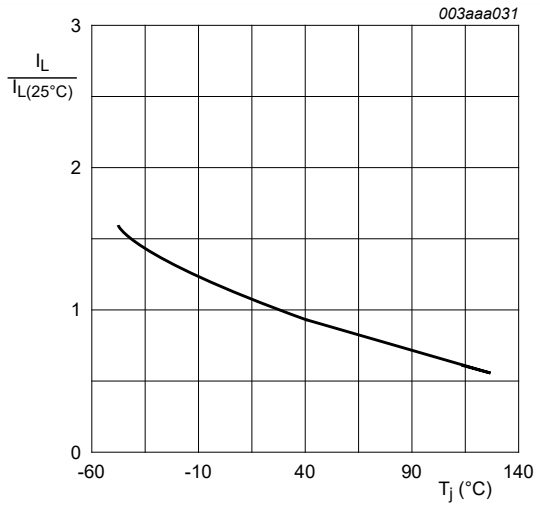


Fig. 8. Normalized latching current as a function of junction temperature

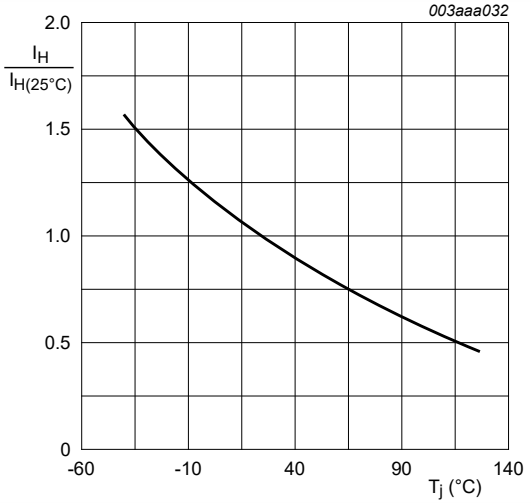
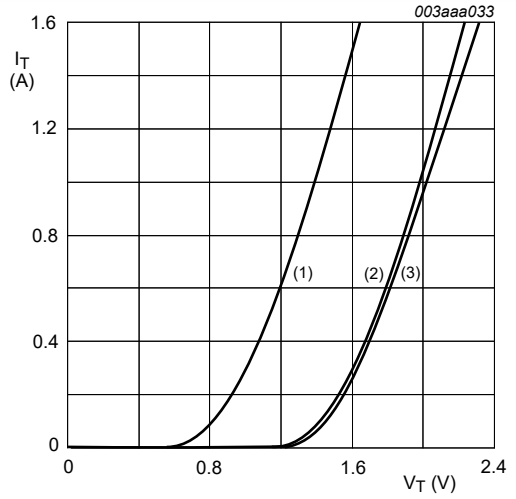


Fig. 9. Normalized holding current as a function of junction temperature



V_o = 1.45 V; R_s = 0.1875 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

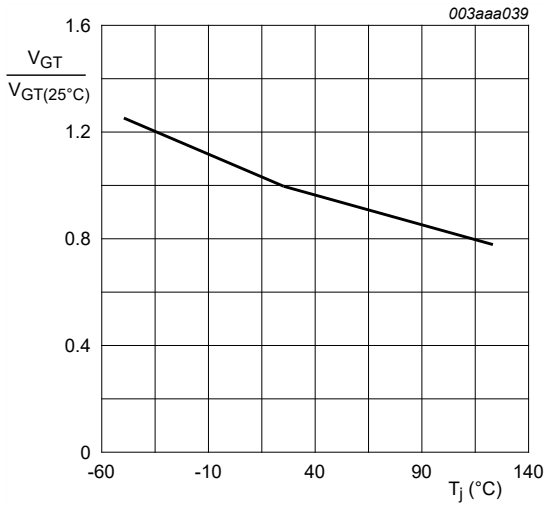


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

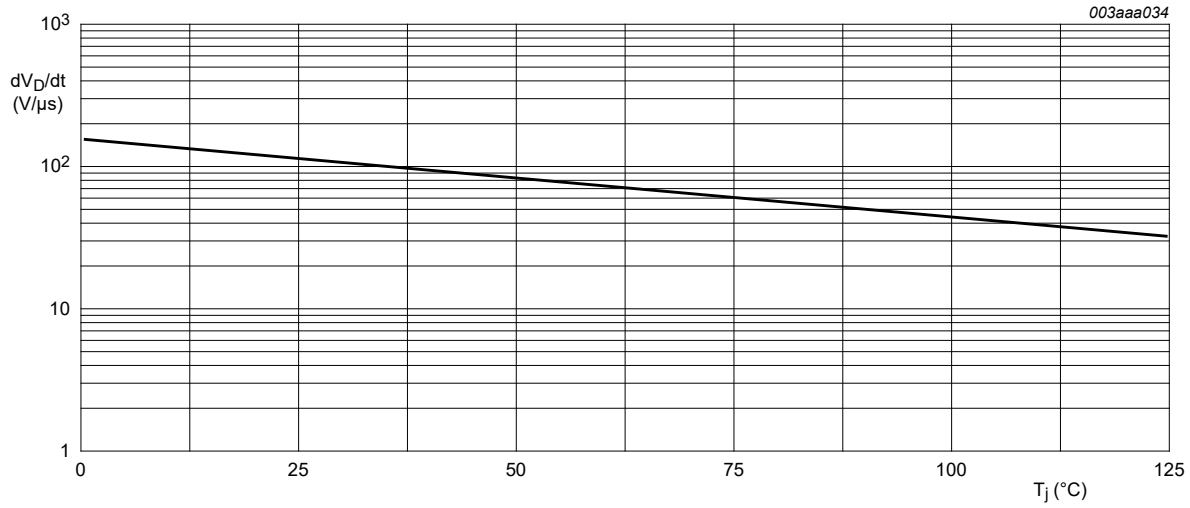


Fig. 12. Critical rate of rise of off-state voltage as a function of junction temperature; typical values

10. Package outline

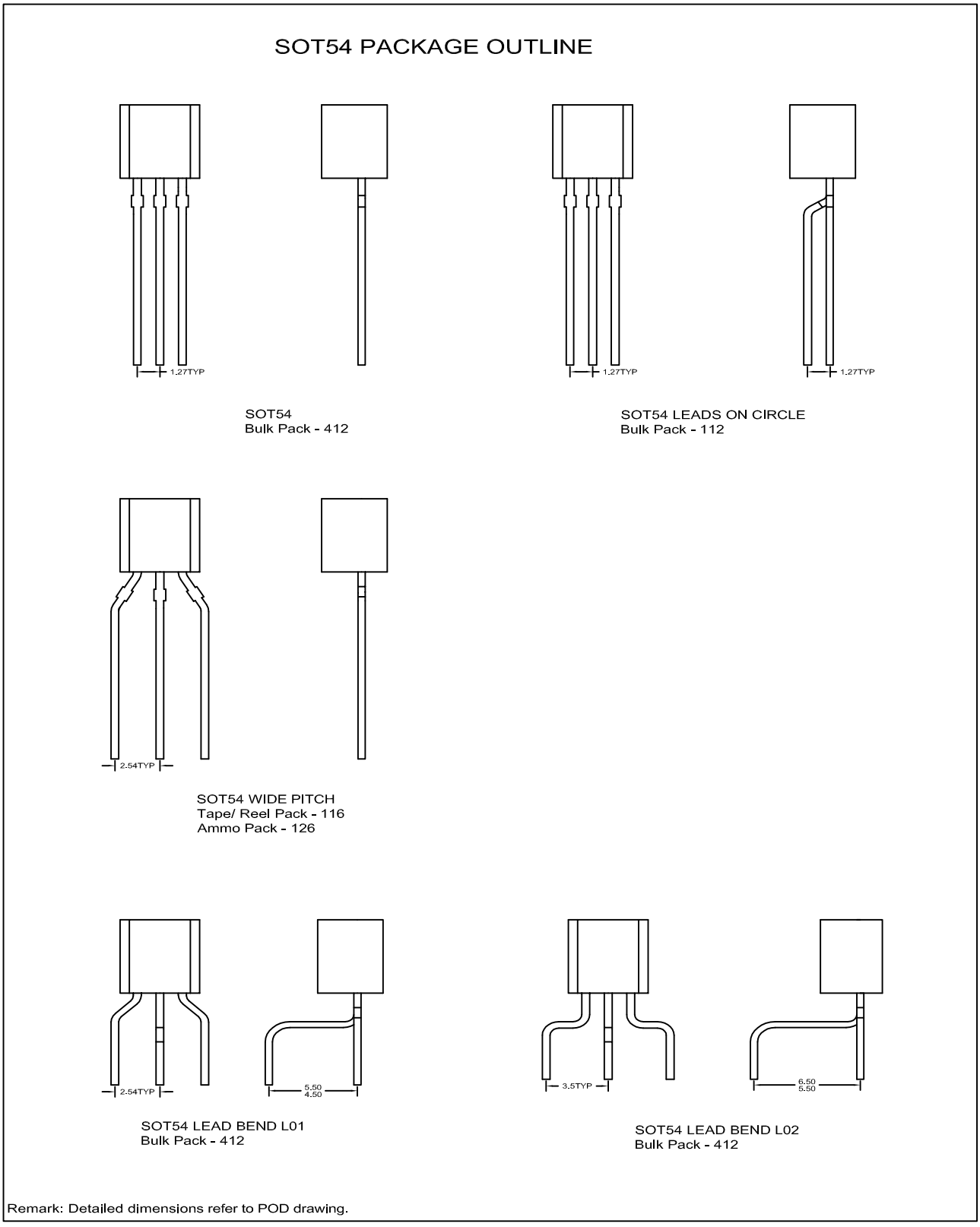


Fig. 13. Package outline TO-92 (SOT54)

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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.
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12. Contents

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Date of release: 15 September 2018

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