



IMPORTANT NOTICE

10 December 2015

1. Global joint venture starts operations as WeEn Semiconductors

Dear customer,

As from November 9th, 2015 NXP Semiconductors N.V. and Beijing JianGuang Asset Management Co. Ltd established Bipolar Power joint venture (JV), **WeEn Semiconductors**, which will be used in future Bipolar Power documents together with new contact details.

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Thank you for your cooperation and understanding,

WeEn Semiconductors



1. General description

High voltage, high speed, planar passivated NPN power switching transistor in a SOT54 (TO-92) plastic package.

2. Features and benefits

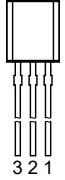
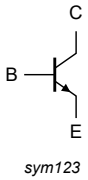
- Fast switching
- High voltage capability
- Very low switching and conduction losses

3. Applications

- Compact fluorescent lamps (CFL)
- Electronic lighting ballasts
- Inverters
- Off-line self-oscillating power supplies

4. Pinning information

Table 1. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base	 <p>TO-92 (SOT54)</p>	 <p>sym123</p>
2	C	collector		
3	E	emitter		

5. Ordering information

Table 2. Ordering information

Type number	Package		
	Name	Description	Version
PHE13003A	TO-92	plastic single-ended leaded (through hole) package; 3 leads	SOT54

6. Limiting values

Table 3. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CESM}	collector-emitter peak voltage	$V_{BE} = 0\text{ V}$	-	700	V
V_{CBO}	collector-base voltage	$I_E = 0\text{ A}$	-	700	V
V_{CEO}	collector-emitter voltage	$I_B = 0\text{ A}$	-	400	V
V_{EBO}	emitter-base voltage	$I_C = 0\text{ A}; I(\text{Emitter}) = 10\text{ mA}$	-	9	V
I_C	collector current	DC; Fig. 1	-	1	A
I_{CM}	peak collector current		-	2	A
I_B	base current	DC	-	0.5	A
I_{BM}	peak base current		-	1	A
P_{tot}	total power dissipation	$T_{lead} \leq 25\text{ °C};$ Fig. 2	-	2.1	W
T_{stg}	storage temperature		-65	150	°C
T_j	junction temperature		-	150	°C

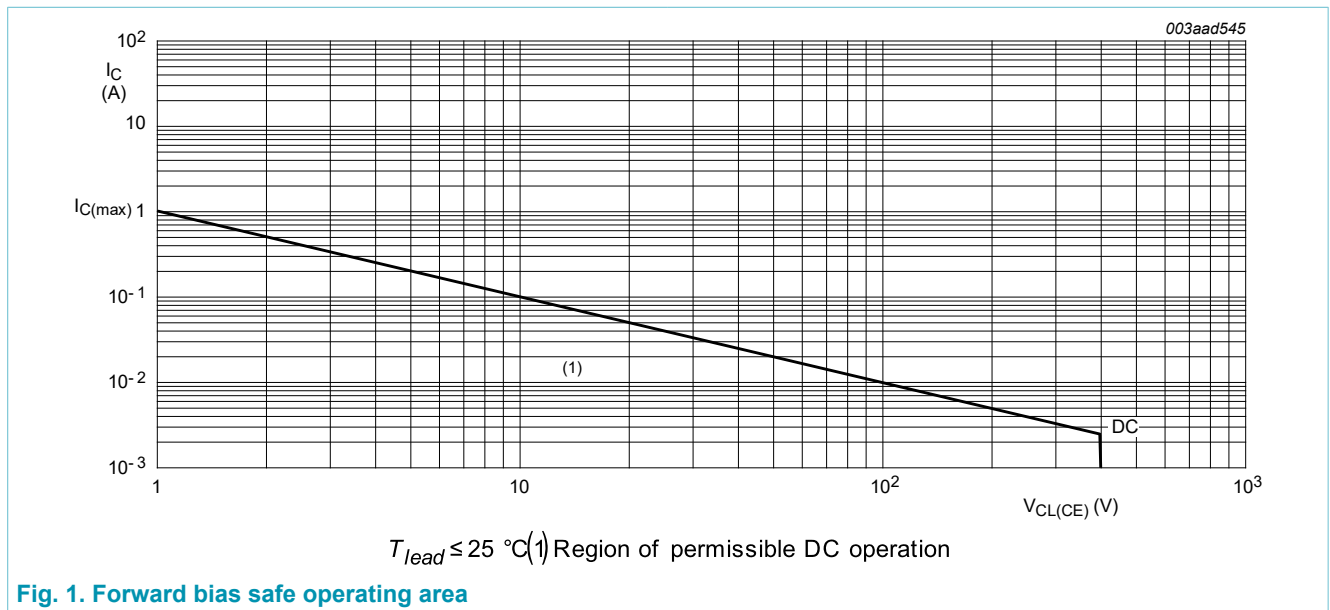
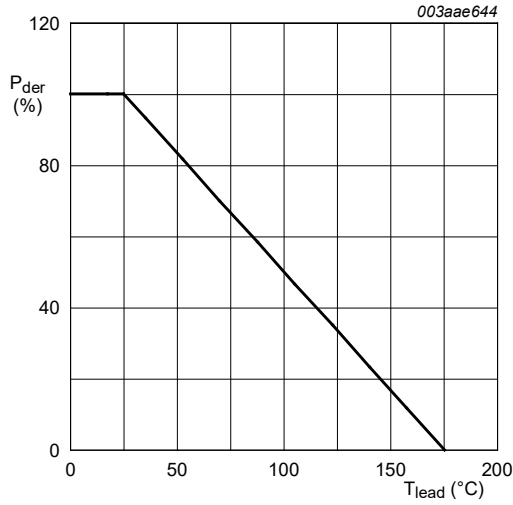


Fig. 1. Forward bias safe operating area



$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}C)}} \times 100\%$$

Fig. 2. Normalized total power dissipation as a function of lead temperature

7. Thermal characteristics

Table 4. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
R _{th(j-lead)}	thermal resistance from junction to lead	Fig. 3	-	-	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

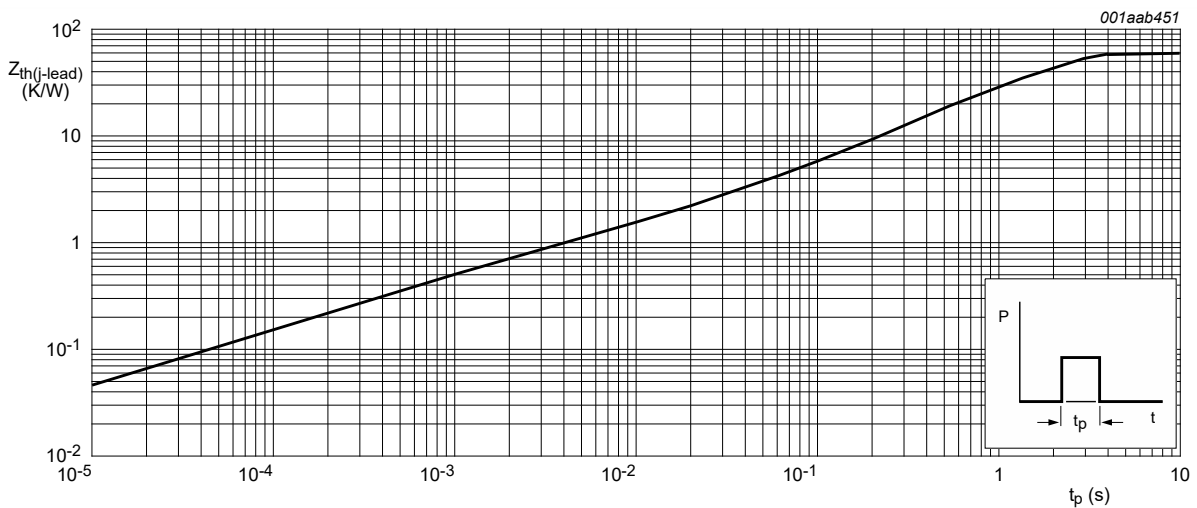


Fig. 3. Transient thermal impedance from junction to lead as a function of pulse width

8. Characteristics

Table 5. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I_{CES}	collector-emitter cut-off current (base shorted)	$V_{BE} = 0\text{ V}$; $V_{CE} = 700\text{ V}$; $T_j = 125\text{ °C}$	-	-	5	mA
I_{EBO}	emitter-base cut-off current (collector open)	$V_{EB} = 9\text{ V}$; $I_C = 0\text{ A}$; $T_{lead} = 25\text{ °C}$	-	-	1	mA
V_{CE0sus}	collector-emitter sustaining voltage (base open)	$I_B = 0\text{ A}$; $I_C = 1\text{ mA}$; $L_C = 25\text{ mH}$; $T_{lead} = 25\text{ °C}$; Fig. 4 ; Fig. 5	400	-	-	V
V_{CEsat}	collector-emitter saturation voltage	$I_C = 0.25\text{ A}$; $I_B = 50\text{ mA}$; $T_{lead} = 25\text{ °C}$; Fig. 6	-	0.2	0.5	V
		$I_C = 0.5\text{ A}$; $I_B = 125\text{ mA}$; $T_{lead} = 25\text{ °C}$; Fig. 6	-	0.3	1	V
		$I_C = 0.75\text{ A}$; $I_B = 250\text{ mA}$; $T_{lead} = 25\text{ °C}$; Fig. 6	-	0.4	1.5	V
V_{BEsat}	base-emitter saturation voltage	$I_C = 0.25\text{ A}$; $I_B = 50\text{ mA}$; $T_{lead} = 25\text{ °C}$; Fig. 7	-	-	1	V
		$I_C = 0.5\text{ A}$; $I_B = 125\text{ mA}$; $T_{lead} = 25\text{ °C}$; Fig. 7	-	-	1.2	V
h_{FE}	DC current gain	$I_C = 0.5\text{ mA}$; $V_{CE} = 2\text{ V}$; $T_{lead} = 25\text{ °C}$; Fig. 8 ; Fig. 9	12	-	-	
		$I_C = 0.4\text{ A}$; $V_{CE} = 5\text{ V}$; $T_{lead} = 25\text{ °C}$; Fig. 8 ; Fig. 9	10	-	30	
		$I_C = 0.8\text{ A}$; $V_{CE} = 5\text{ V}$; $T_{lead} = 25\text{ °C}$; Fig. 8 ; Fig. 9	5	7.5	20	
Dynamic characteristics						
t_f	fall time	$I_C = 1\text{ A}$; $I_{B0n} = 200\text{ mA}$; $V_{BB} = -5\text{ V}$; $L_B = 1\text{ }\mu\text{H}$; $T_{lead} = 25\text{ °C}$; inductive load; Fig. 10 ; Fig. 11	-	80	-	ns

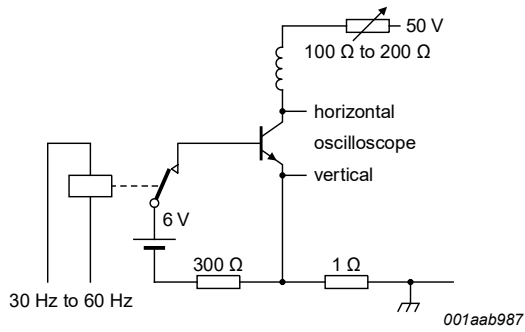


Fig. 4. Test circuit for collector-emitter sustaining voltage

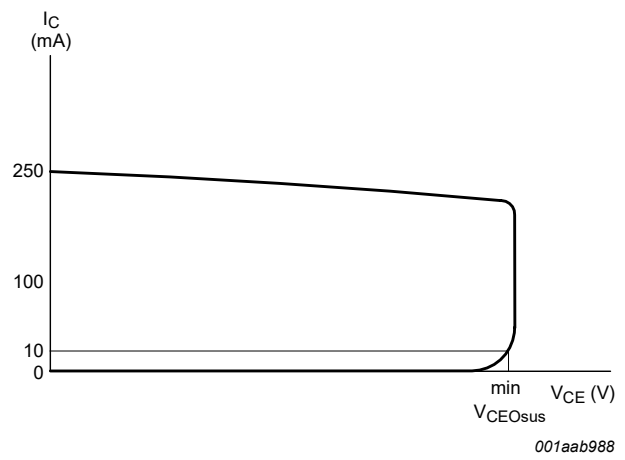


Fig. 5. Oscilloscope display for collector-emitter sustaining voltage test waveform

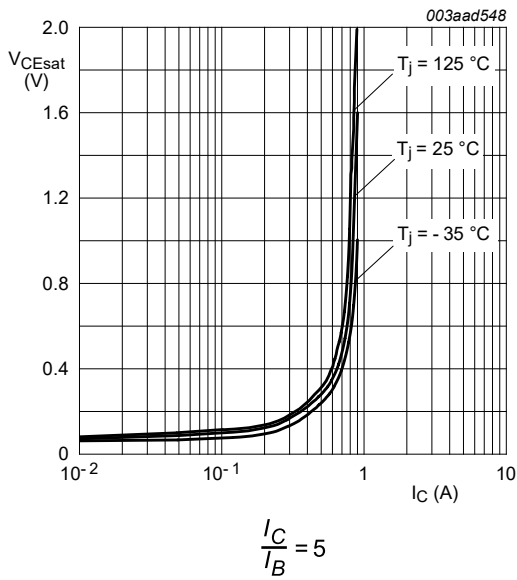


Fig. 6. Collector-emitter saturation voltage as a function of collector current; typical values

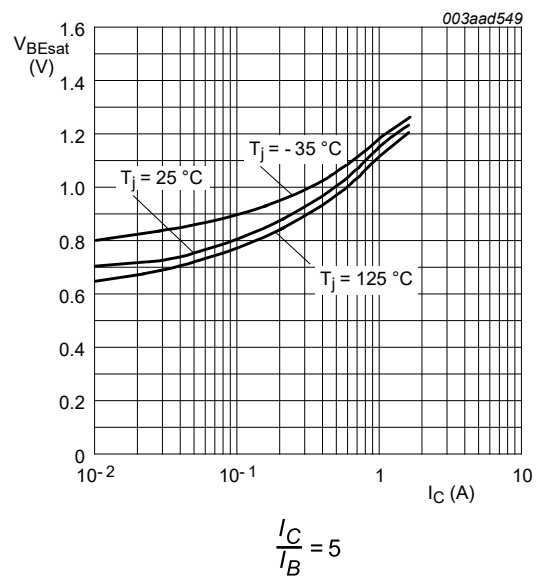
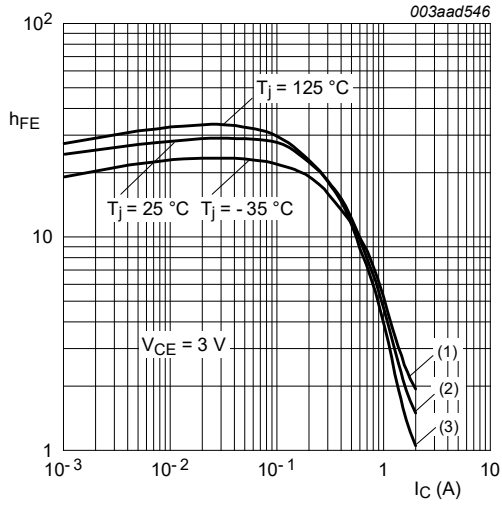
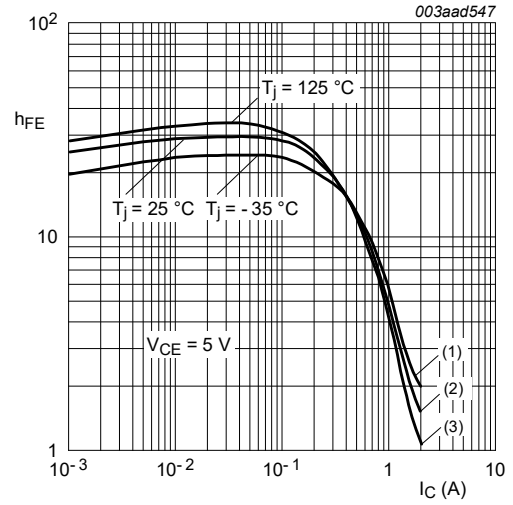


Fig. 7. Base-emitter saturation voltage as a function of collector current; typical values



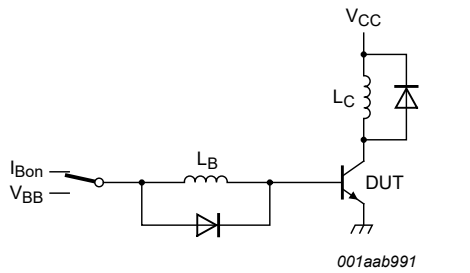
(1) $T_j = -35\text{ °C}$ (2) $T_j = 25\text{ °C}$ (3) $T_j = 125\text{ °C}$

Fig. 8. DC current gain as a function of collector current; typical values



(1) $T_j = -35\text{ °C}$ (2) $T_j = 25\text{ °C}$ (3) $T_j = 125\text{ °C}$

Fig. 9. DC current gain as a function of collector current; typical values



$V_{CC} = 300\text{ V}; V_{BB} = -5\text{ V}; L_C = 200\text{ }\mu\text{H}; L_B = 1\text{ }\mu\text{H}$

Fig. 10. Test circuit for inductive load switching

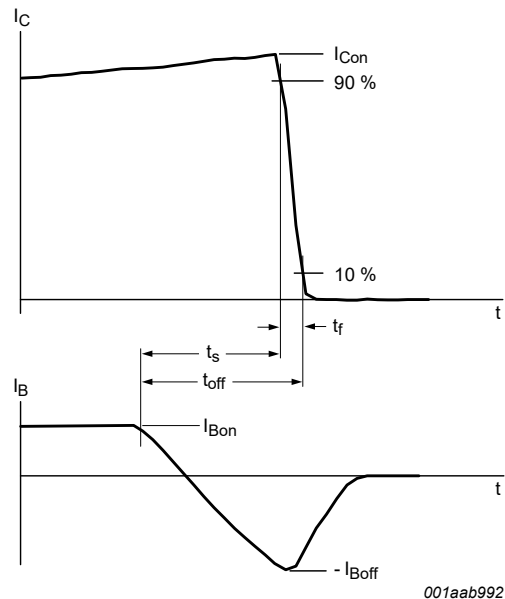


Fig. 11. Switching times waveforms for inductive load

9. Package outline

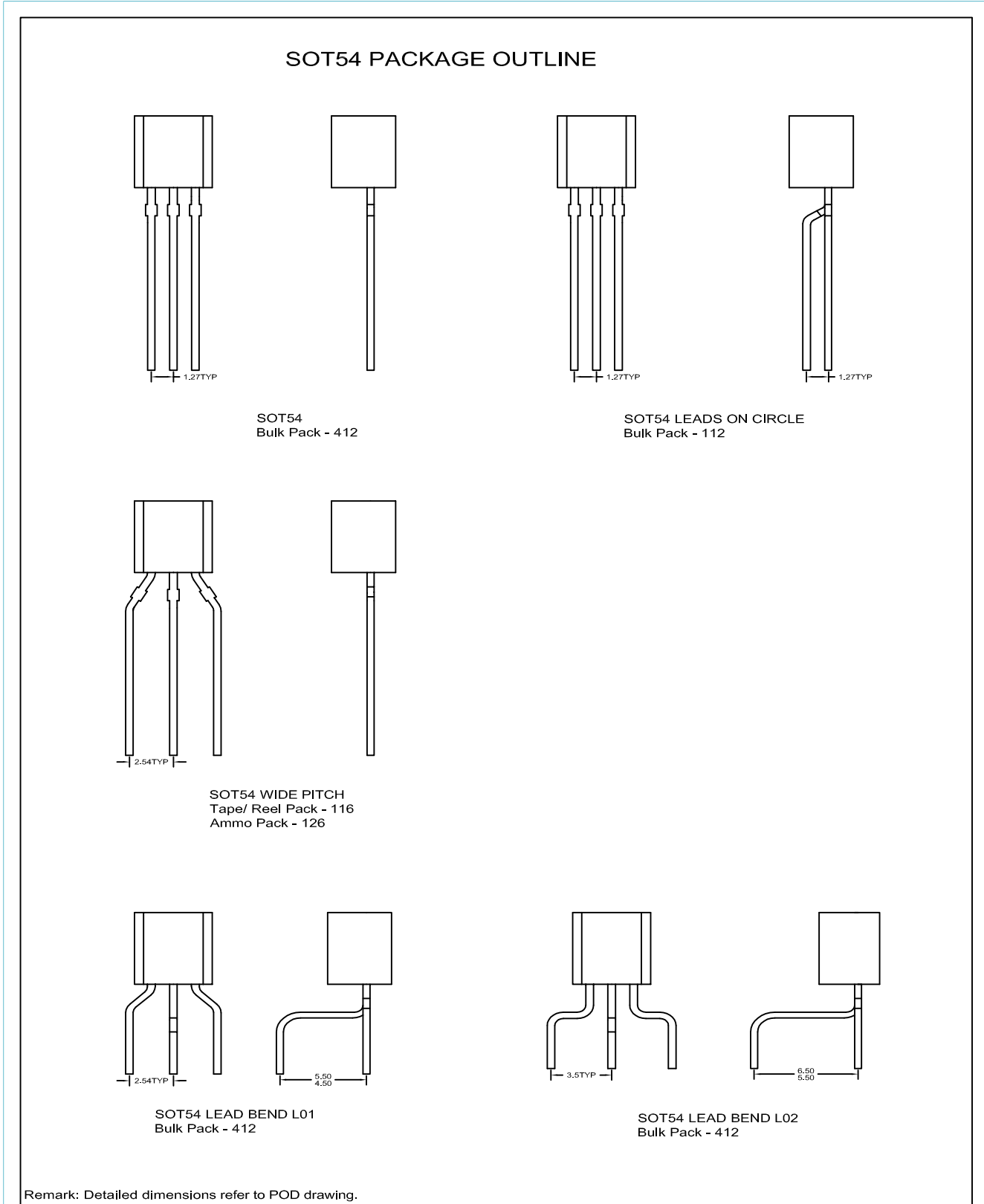


Fig. 12. Package outline TO-92 (SOT54)

10. Legal information

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

1. General description.....	1
2. Features and benefits.....	1
3. Applications.....	1
4. Pinning information.....	1
5. Ordering information.....	1
6. Limiting values.....	2
7. Thermal characteristics.....	3
8. Characteristics.....	4
9. Package outline.....	7
10. Legal information.....	8

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