BUJ105AD

Silicon diffused power transistor

Rev. 4 — 13 July 2018 **Product data sheet**

1. Product profile

1.1 General description

High-voltage, high-speed planar-passivated NPN power switching transistor in a SOT428 (D-PAK) surface mounted package.

1.2 Features and benefits

- Low thermal resistance
- Fast switching

1.3 Applications

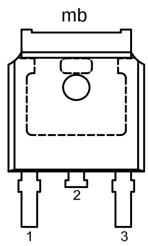
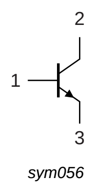
- Electronic lighting ballast
- Inverters
- DC-to-DC converters
- Motor control systems

1.4 Quick reference data

- $V_{CESM} \leq 700$ V
- $P_{tot} \leq 80$ W
- $I_C \leq 8$ A
- $h_{FEsat} = 11$ (typ)

2. Pinning information

Table 1. Pinning

Pin	Description	Simplified outline	Symbol
1	base	 DPAK (SOT428)	
2	collector [1]		
3	emitter		
mb	mounting base; connected to collector		

[1] It is not possible to make a connection to pin 2 of the SOT428 (D-PAK) package.

3. Ordering information

Table 2. Ordering information

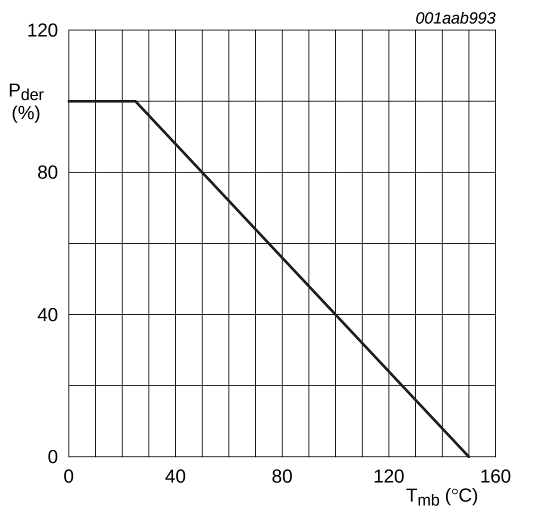
Type number	Package		
	Name	Description	Version
BUJ105AD	D-PAK	plastic single-ended surface mounted package; 3 leads (one lead cropped)	SOT428

4. Limiting values

Table 3. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CESM}	peak collector-emitter voltage	V_{BE} = 0 V	-	700	V
V_{CEO}	collector-emitter voltage	open base	-	400	V
V_{CBO}	collector-base voltage	open emitter	-	700	V
I_C	collector current (DC)		-	8	A
I_{CM}	peak collector current		-	16	A
I_B	base current (DC)		-	4	A
I_{BM}	peak base current		-	8	A
P_{tot}	total power dissipation	T_{mb} = ≤ 25 °C; see Figure 1	-	80	W
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature		-	150	°C



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

Fig 1. Normalized total power dissipation as a function of mounting base temperature

5. Thermal characteristics

Table 4. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	see Figure 2		-	-	1.56	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient		[1]	-	75	-	K/W

[1] Device mounted on a printed-circuit board; minimum footprint

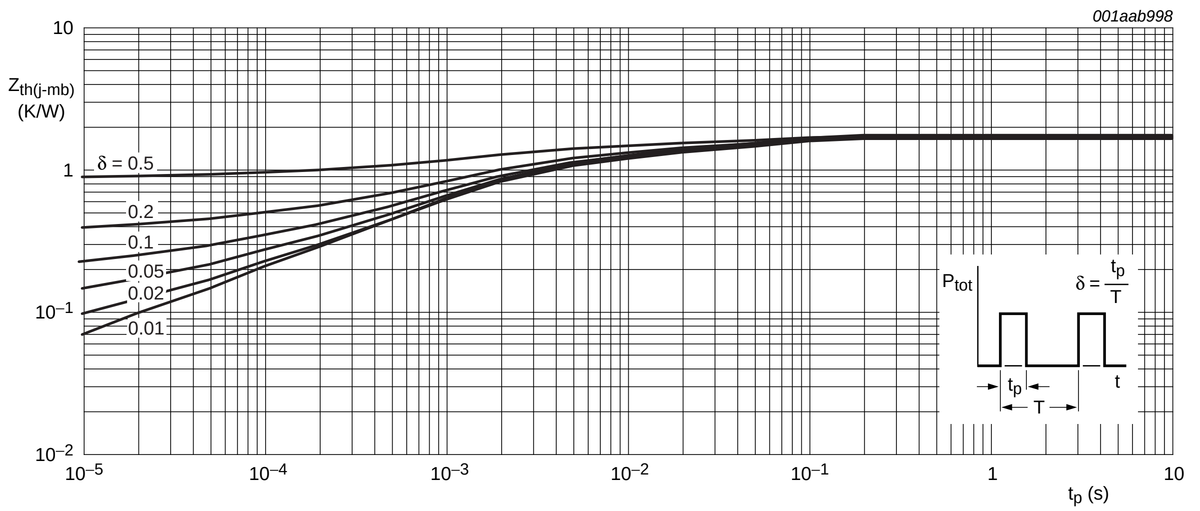


Fig 2. Transient thermal impedance from junction to mounting base as a function of pulse duration

6. Characteristics

Table 5. Characteristics
T_{mb} = 25 °C; unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
I_{CES}	collector-emitter cut-off current	V_{BE} = 0 V; V_{CE} = $V_{CESMmax}$	[1]	-	-	0.2	mA
		V_{BE} = 0 V; V_{CE} = $V_{CESMmax}$; T_j = 125 °C	[1]	-	-	0.5	mA
I_{CBO}	collector-base cut-off current	V_{BE} = 0 V; V_{CE} = $V_{CESMmax}$	[1]	-	-	0.2	mA
I_{CEO}	collector-emitter cut-off current	V_{CEO} = $V_{CEOMmax}$ = 400 V	[1]	-	-	0.1	mA
I_{EBO}	emitter-base cut-off current	V_{EB} = 9 V; I_C = 0 A		-	-	1	mA
V_{CEOsus}	collector-emitter sustaining voltage	I_B = 0 A; I_C = 10 mA; L = 25 mH; see Figure 3 and 4		400	-	-	V
V_{CEsat}	collector-emitter saturation voltage	I_C = 4.0 A; I_B = 0.8 A; see Figure 11		-	0.3	1.0	V
V_{BEsat}	base-emitter saturation voltage	I_C = 4.0 A; I_B = 0.8 A; see Figure 12		-	1.0	1.5	V
h_{FE}	DC current gain	I_C = 1 mA; V_{CE} = 5 V		10	14	34	
		I_C = 500 mA; V_{CE} = 5 V; see Figure 10		13	23	36	
h_{FEsat}	DC saturation current gain	I_C = 4.0 A; V_{CE} = 5 V		8	11	15	

Table 5. Characteristics *...continued*

T_{mb} = 25 °C; unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Dynamic characteristics						
Switching times (resistive load); see Figure 5 and 6						
t_{on}	turn-on time	I_{Con} = 5 A; I_{Bon} = $-I_{Boff}$ = 1 A; R_L = 75 Ω	-	0.65	1	μs
t_{stg}	storage time		-	1.8	2.5	μs
t_f	fall time		-	0.3	0.5	μs
Switching times (inductive load); see Figure 7 and 8						
t_{stg}	storage time	I_{Con} = 5 A; I_{Bon} = 1 A; L_B = 1 μH; V_{BB} = −5 V	-	1.2	1.7	μs
t_f	fall time		-	20	50	ns
Switching times (inductive load); see Figure 7 and 8						
t_{stg}	storage time	I_{Con} = 5 A; I_{Bon} = 1 A; L_B = 1 μH; V_{BB} = −5 V; T_j = 100 °C	-	1.4	1.9	μs
t_f	fall time		-	25	100	ns

[1] Measured with half sine-wave voltage (curve tracer).

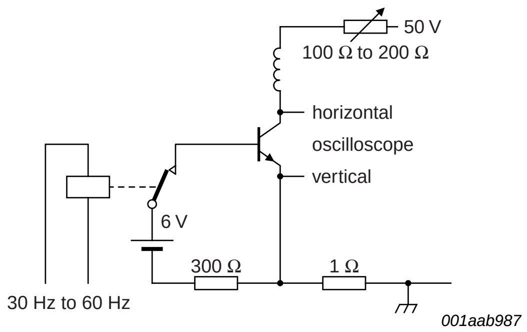


Fig 3. Test circuit for collector-emitter sustaining voltage

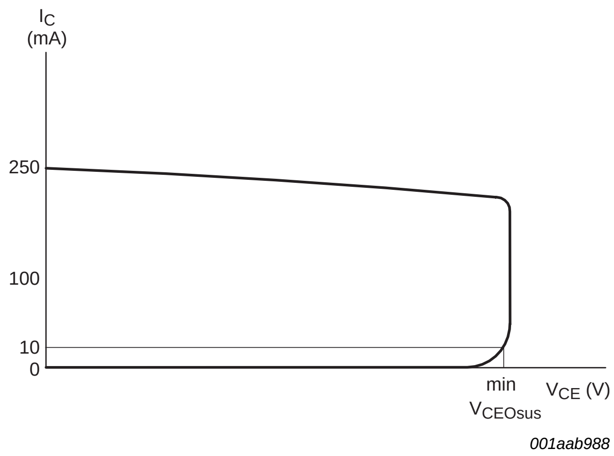
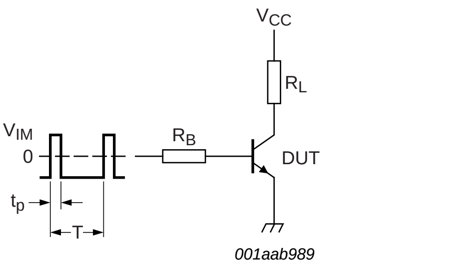


Fig 4. Oscilloscope display for collector-emitter sustaining voltage test waveform



V_{IM} = −6 V to +8 V; V_{CC} = 250 V; t_p = 20 μs;
$\delta = t_p/T$ = 0.01.

R_B and R_L calculated from I_{Con} and I_{Bon} requirements.

Fig 5. Test circuit for resistive load switching

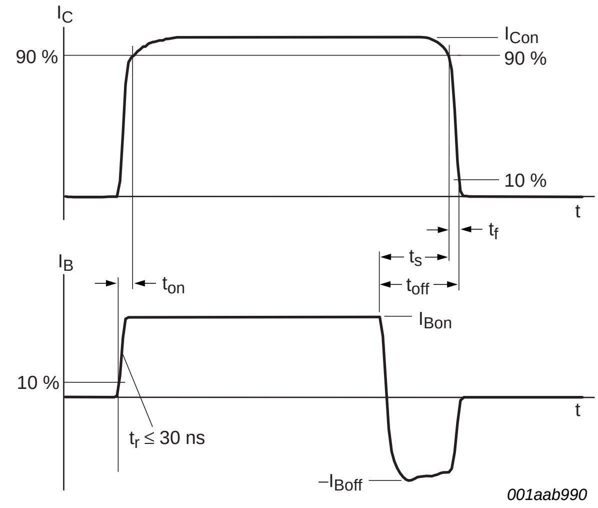
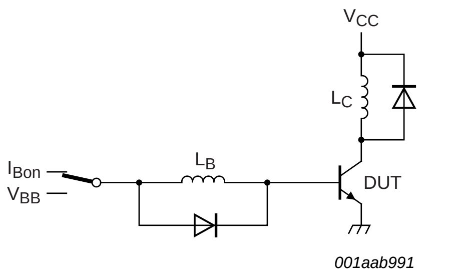


Fig 6. Switching times waveforms for resistive load



V_{CC} = 300 V; V_{BB} = −5 V; L_C = 200 μH; L_B = 1 μH.

Fig 7. Test circuit for inductive load switching

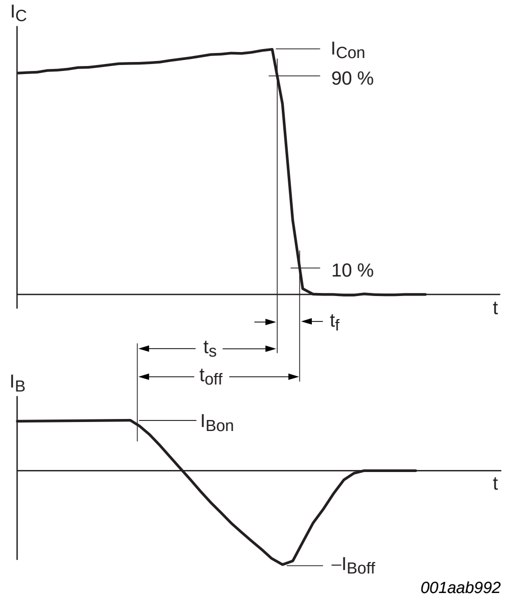


Fig 8. Switching times waveforms for inductive load

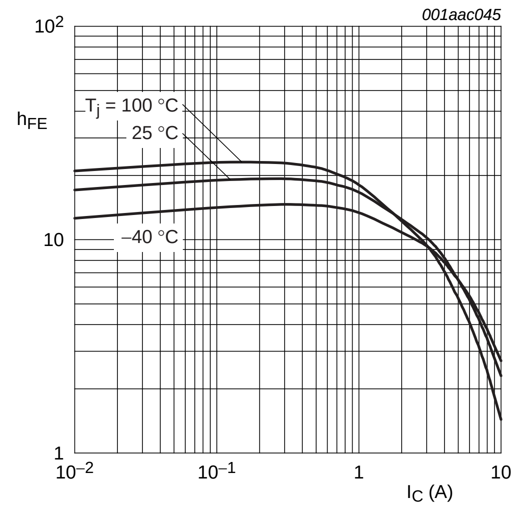


Fig 9. DC current gain as a function of collector current; typical values at V_{CE} = 1 V

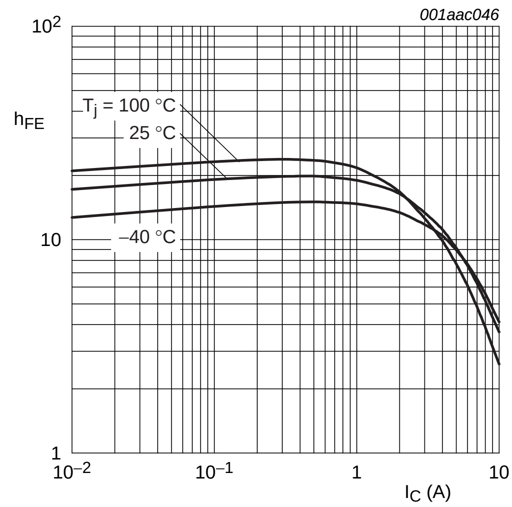
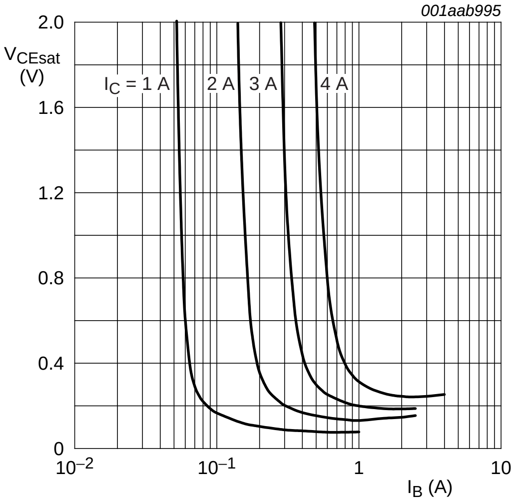
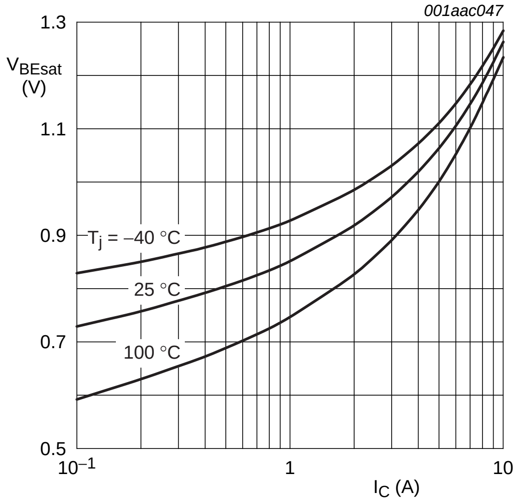


Fig 10. DC current gain as a function of collector current; typical values at V_{CE} = 5 V



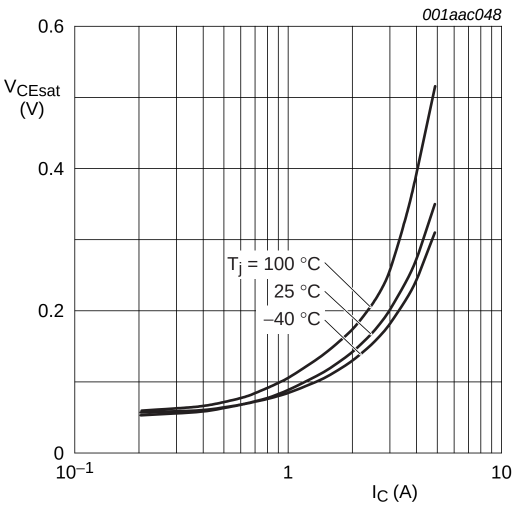
T_j = 25 °C.

Fig 11. Collector-emitter saturation voltage as a function of base current; typical values



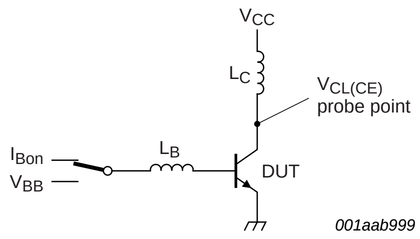
I_C/I_B = 4.

Fig 12. Base-emitter saturation voltage as a function of collector current; typical values



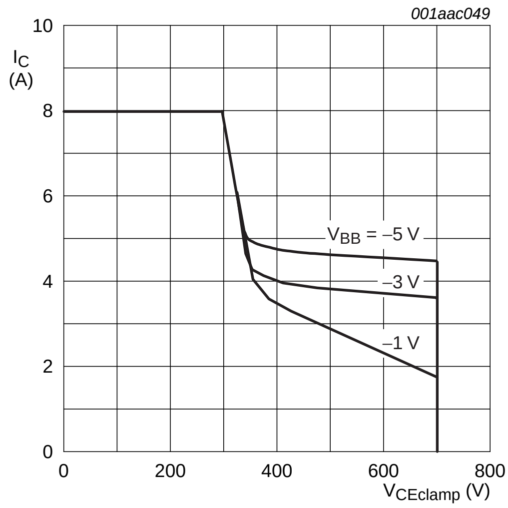
$I_C/I_B = 4$.

Fig 13. Collector-emitter saturation voltage as a function of collector current; typical values



$V_{CEclamp} < 700$ V; $V_{CC} = 150$ V; $V_{BB} = -5$ V, -3 V and -1 V; $L_B = 1$ μH; $L_C = 200$ μH.

Fig 14. Test circuit for reverse bias safe operating area



$T_j < T_{j(max)}$.

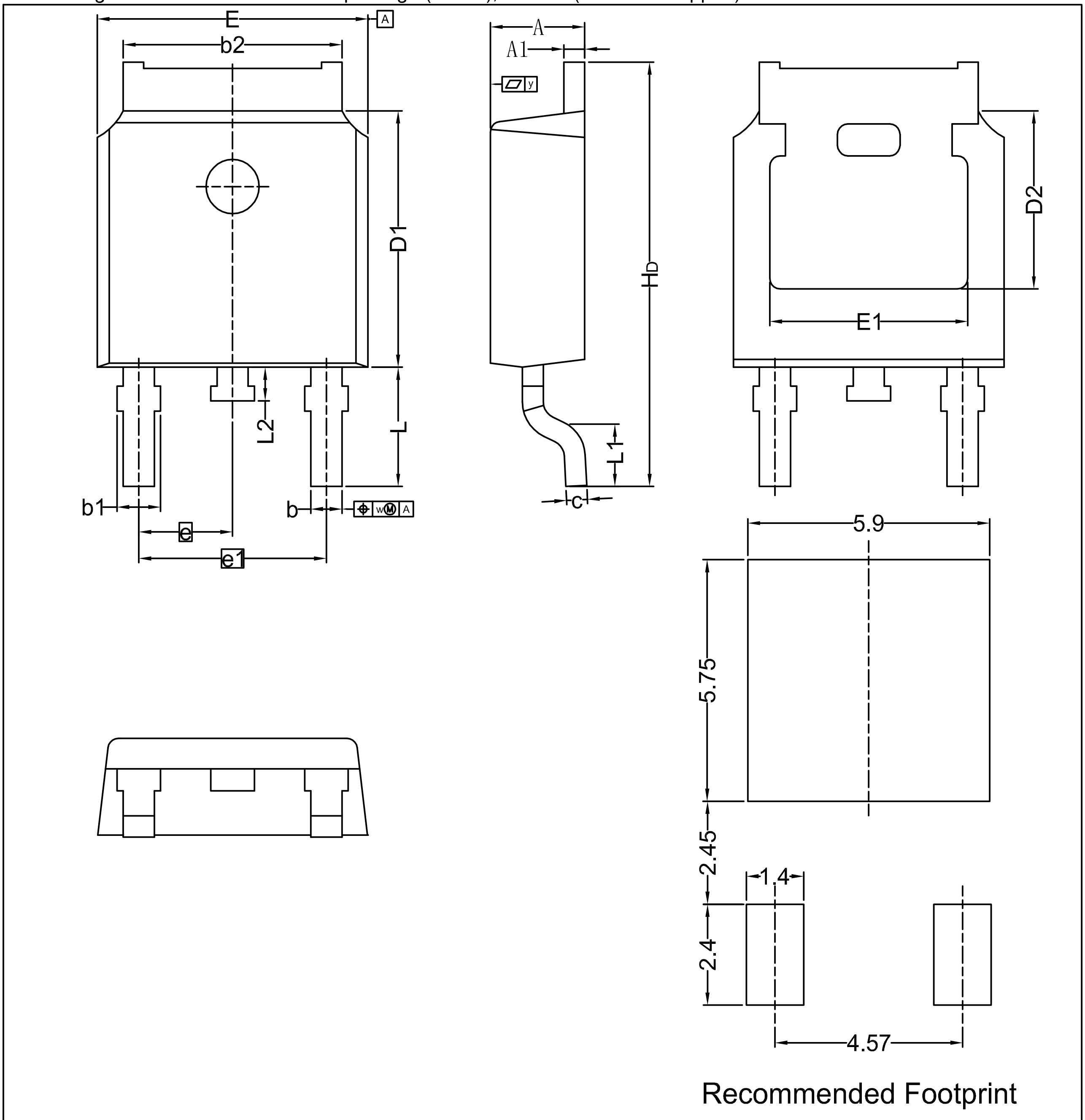
Fig 15. Reverse bias safe operating area

7. Package information

Epoxy meets requirements of UL94 V-0 at ⅛ inch.

8. Package outline

Plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped) TO252



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

Fig. 15. Package outline DPAK (SOT428)

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Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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