BUJ302A

NPN power transistor

9 October 2018 **Product data sheet**

1. General description

High voltage, high speed planar passivated NPN power switching transistor in a SOT78 (TO-220AB) plastic package.

2. Features and benefits

- Fast switching
- Low thermal resistance
- Very high voltage capability
- Very low switching and conduction losses

3. Applications

- DC-to-DC converters
- High frequency electronic lighting ballasts
- Inverters
- Motor control systems

4. Quick reference data

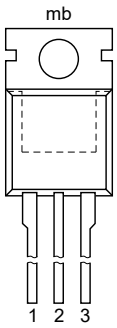
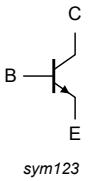
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_{CM}	peak collector current	Fig. 1; Fig. 2; Fig. 3		-	-	8	A
P_{tot}	total power dissipation	$T_{mb} \leq 25$ °C; Fig. 4		-	-	80	W
V_{CESM}	collector-emitter peak voltage	$V_{BE} = 0$ V		-	-	1050	V
Static characteristics							
h_{FE}	DC current gain	$I_C = 0.1$ A; $V_{CE} = 5$ V; $T_{mb} = 25$ °C; Fig. 11	[1]	48	66	100	
		$I_C = 0.8$ A; $V_{CE} = 3$ V; $T_{mb} = 25$ °C; Fig. 12	[1]	25	42	50	

[1] Pulse test: pulse duration ≤ 300 µs, duty cycle ≤ 2 %

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base	 TO-220AB (SOT78)	
2	C	collector		
3	E	emitter		
mb	C	mounting base; connected to collector		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BUJ302A	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

7. Limiting values

Table 4. 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 V		-	1050	V
V_{CEO}	collector-emitter voltage	I_B = 0 A		-	400	V
V_{EBO}	emitter-base voltage	I_C = 0 A; I_E = 2 A; t_p < 10 ms		-	24	V
I_C	collector current	Fig. 1; Fig. 2; Fig. 3		-	4	A
I_{CM}	peak collector current			-	8	A
I_B	base current			-	2	A
I_{BM}	peak base current			-	4	A
P_{tot}	total power dissipation	T_{mb} ≤ 25 °C; Fig. 4		-	80	W
T_{stg}	storage temperature			-65	150	°C
T_j	junction temperature			-	150	°C

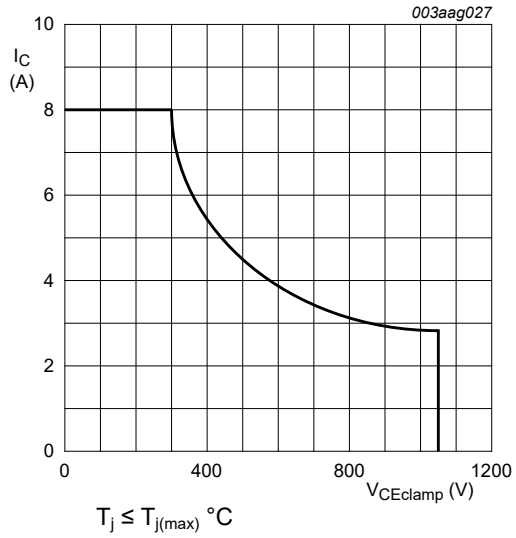
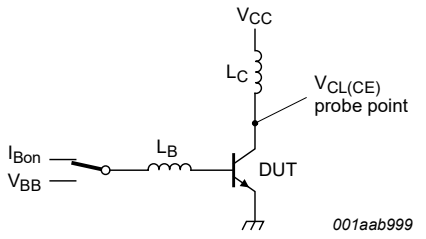
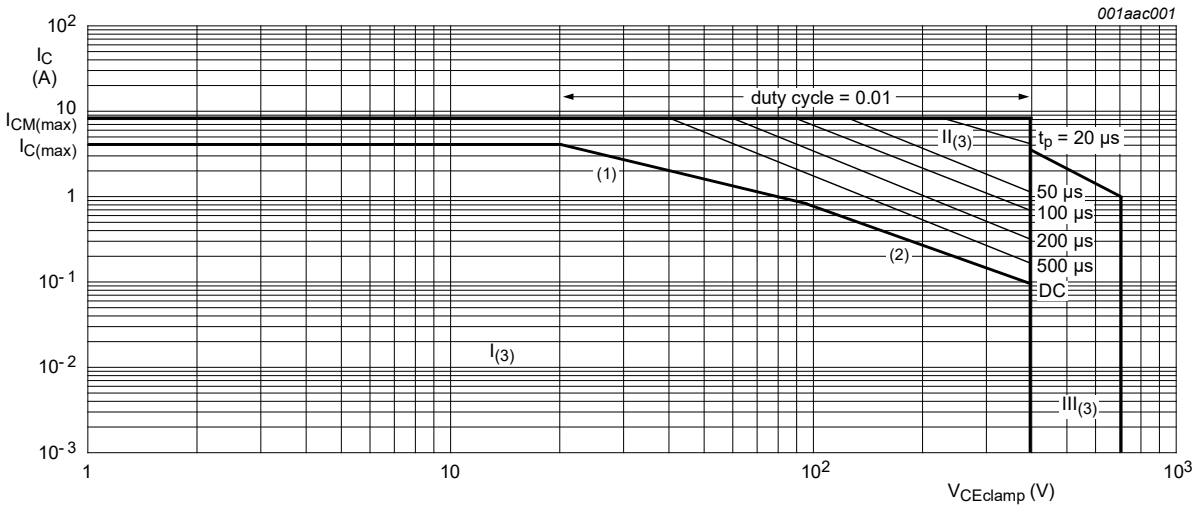


Fig. 1. Reverse bias safe operating area



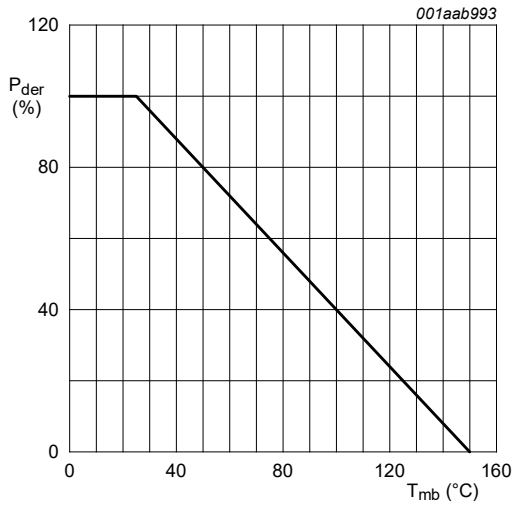
$V_{CL(CE)} \leq 1000$ V; V_{CC} = 150 V; V_{BB} = - 5 V; L_B = 1 µH; L_C = 200 µH

Fig. 2. Test circuit for reverse bias safe operating area



1) P_{tot} maximum and P_{tot} peak maximum lines
2) Second breakdown limits
3) I = Region of permissable DC operation
   II = Extension for repetitive pulse operation
   III = Extension during turn-on in single transistor converters provided that $R_{BE} \leq 100\ \Omega$ and $t_p \leq 0.6\ \mu s$

Fig. 3. Forward bias safe operating area for $T_{mb} \leq 25\ °C$



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

Fig. 4. Normalized total power dissipation as a function of mounting base temperature

8. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j\text{-}mb)}$	thermal resistance from junction to mounting base	Fig. 5		-	-	1.56	K/W
$R_{th(j\text{-}a)}$	thermal resistance from junction to ambient free air	in free air		-	60	-	K/W

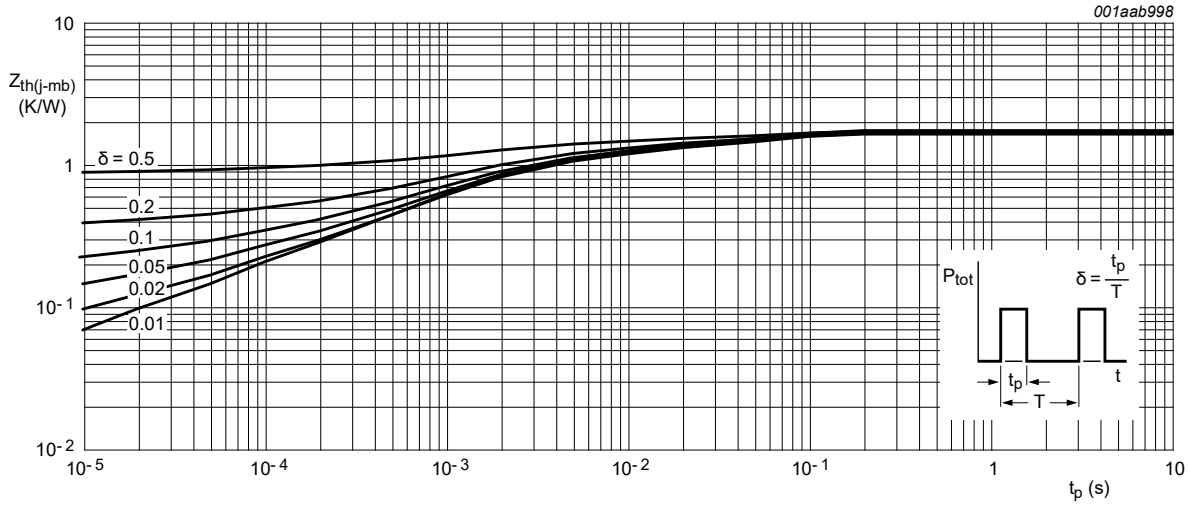


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse width

9. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
I_{CES}	collector-emitter cut-off current (base shorted)	V_{BE} = 0 V; V_{CE} = 1050 V; T_{mb} = 25 °C		-	0.2	10	µA
I_{CEO}	collector-emitter cut-off current (base open)	V_{CE} = 400 V; I_B = 0 A; T_{mb} = 25 °C		-	10	250	mA
$V_{(BR)EBO}$	emitter-base breakdown voltage (collector open)	I_B = 1 mA; I_C = 0 A; T_{mb} = 25 °C		15	19	-	V
V_{CEOsus}	collector-emitter sustaining voltage (base open)	I_B = 0 A; I_C = 10 mA; L_C = 25 mH; T_{mb} = 25 °C; Fig. 6; Fig. 7	[1]	400	470	-	V
V_{CEsat}	collector-emitter saturation voltage	I_C = 1 A; I_B = 0.2 A; T_{mb} = 25 °C; Fig. 8; Fig. 9	[1]	-	0.15	0.5	V
		I_C = 3.5 A; I_B = 1 A; T_{mb} = 25 °C; Fig. 8; Fig. 9	[1]	-	0.6	1.5	V
V_{BEsat}	base-emitter saturation voltage	I_C = 3.5 A; I_B = 1 A; T_{mb} = 25 °C; Fig. 10	[1]	-	1.1	1.5	V
h_{FE}	DC current gain	I_C = 0.1 A; V_{CE} = 5 V; T_{mb} = 25 °C; Fig. 11	[1]	48	66	100	
		I_C = 0.8 A; V_{CE} = 3 V; T_{mb} = 25 °C; Fig. 12	[1]	25	42	50	
Dynamic characteristics							
t_s	storage time	I_C = 2.5 A; I_{Bon} = 0.5 A; I_{Boff} = -0.5 A; R_L = 60 Ω; V_{BB} = -5 V; T_{mb} = 25 °C; resistive load; t_p = 300 µs; Fig. 13; Fig. 14		-	-	3.5	µs
t_f	fall time			-	-	500	ns

[1] Pulse test: pulse duration ≤ 300 µs, duty cycle ≤ 2 %

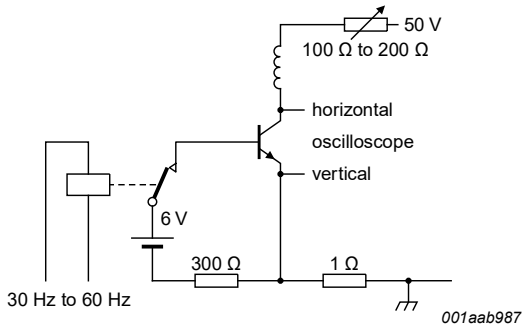


Fig. 6. Test circuit for collector-emitter sustaining voltage

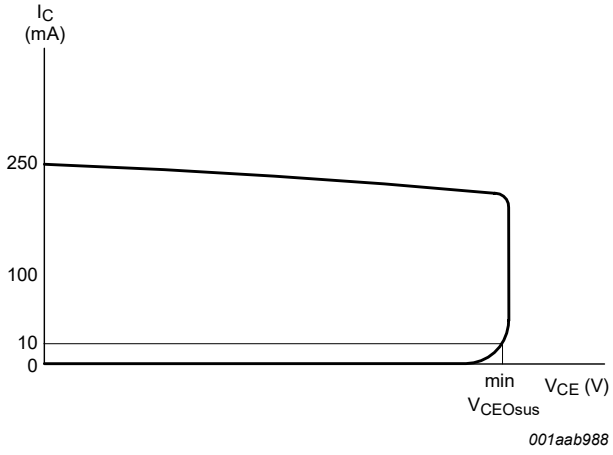


Fig. 7. Oscilloscope display for collector-emitter sustaining voltage test waveform

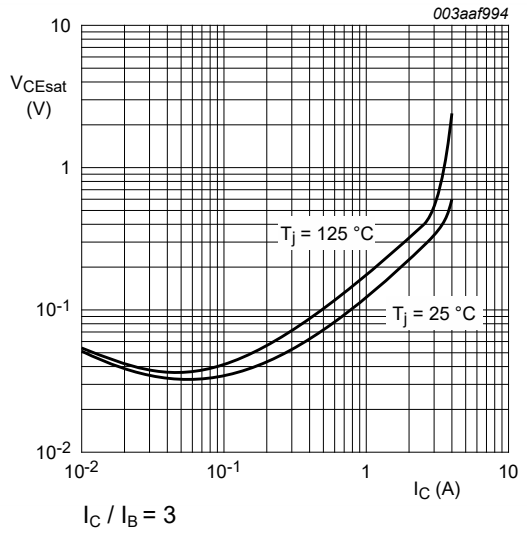


Fig. 8. Collector-emitter saturation voltage as a function of collector current; typical values

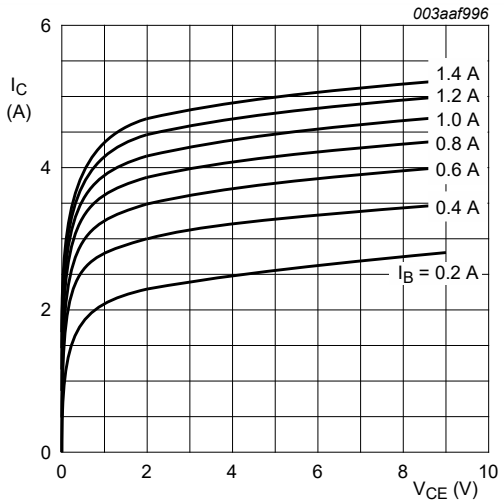


Fig. 9. Collector current as a function of collector-emitter voltage; typical values

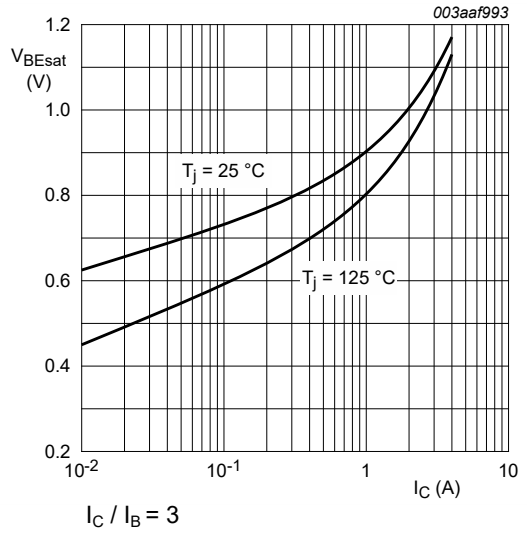


Fig. 10. Base-emitter saturation voltage as a function of collector current; typical values

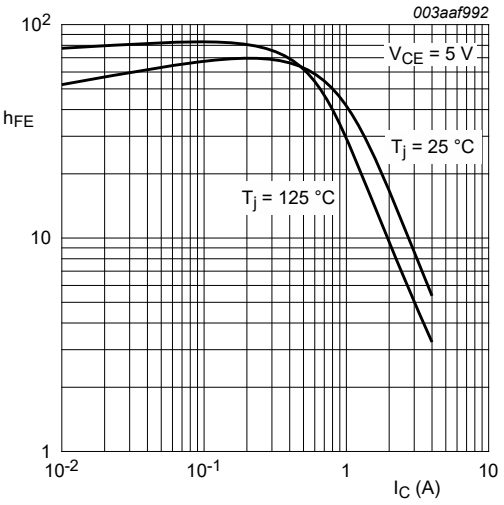


Fig. 11. DC current gain as a function of collector current; typical values

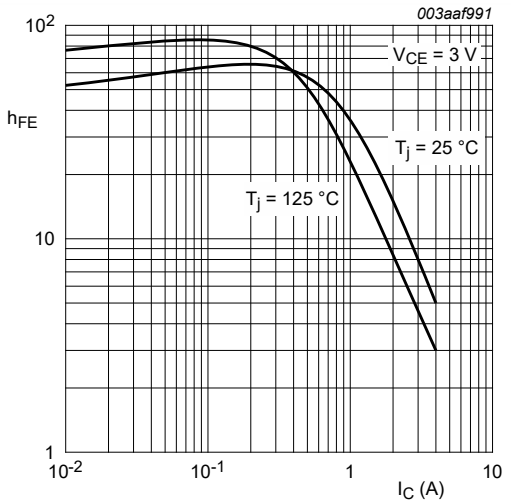
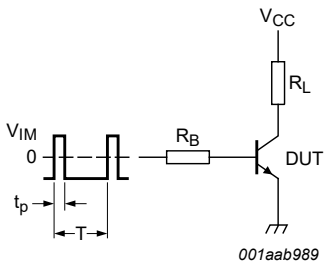


Fig. 12. DC current gain as a function of collector current; typical values



V_{IM}= - 6 to + 8 V; V_{CC} = 250 V; t_p = 20 us; δ = t_p/T = 0.01

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

Fig. 13. Test circuit for resistive load switching

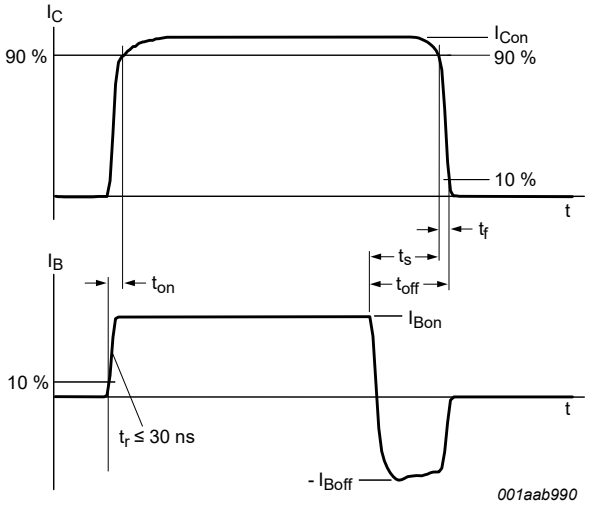
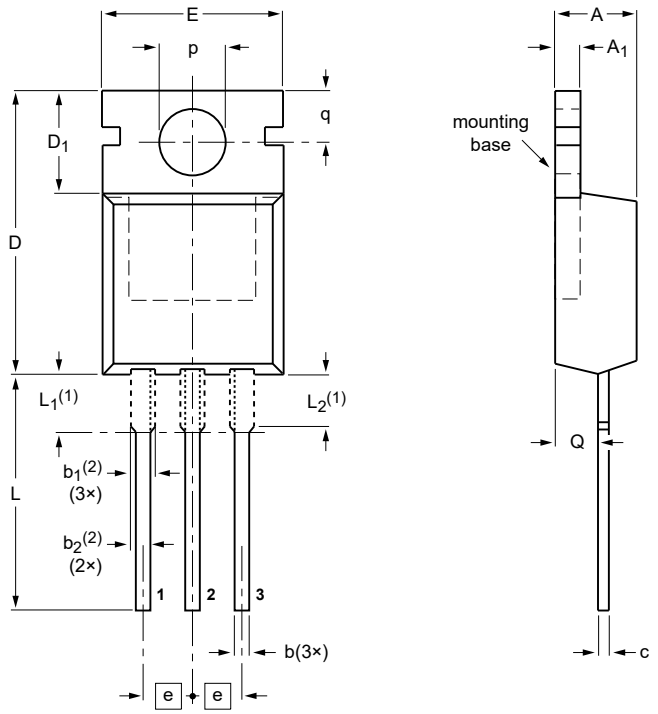


Fig. 14. Switching times waveforms for resistive load

10. Package outline

Plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB **SOT78**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b	b_1(2)	b_2(2)	c	D	D_1	E	e	L	L_1(1)	L_2(1) max.	p	q	Q
mm	4.7 4.1	1.40 1.25	0.9 0.6	1.6 1.0	1.3 1.0	0.7 0.4	16.0 15.2	6.6 5.9	10.3 9.7	2.54	15.0 12.8	3.30 2.79	3.0	3.8 3.5	3.0 2.7	2.6 2.2

Notes

1. Lead shoulder designs may vary.
2. Dimension includes excess dambar.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT78		3-lead TO-220AB	SC-46			~~08-04-23~~ 08-06-13

Fig. 15. Package outline TO-220AB (SOT78)

11. 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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