

# DATA SHEET

## **BUX84; BUX85** Silicon diffused power transistors

Product specification  
Supersedes data of February 1996  
File under Discrete Semiconductors, SC06

1997 Aug 13

# Silicon diffused power transistors

# BUX84; BUX85

## DESCRIPTION

High-voltage, high-speed, glass-passivated NPN power transistor in a TO-220AB package.

## APPLICATIONS

- Converters
- Inverters
- Switching regulators
- Motor control systems
- Switching applications.

## PINNING

PIN	DESCRIPTION
1	base
2	collector; connected to mounting base
3	emitter

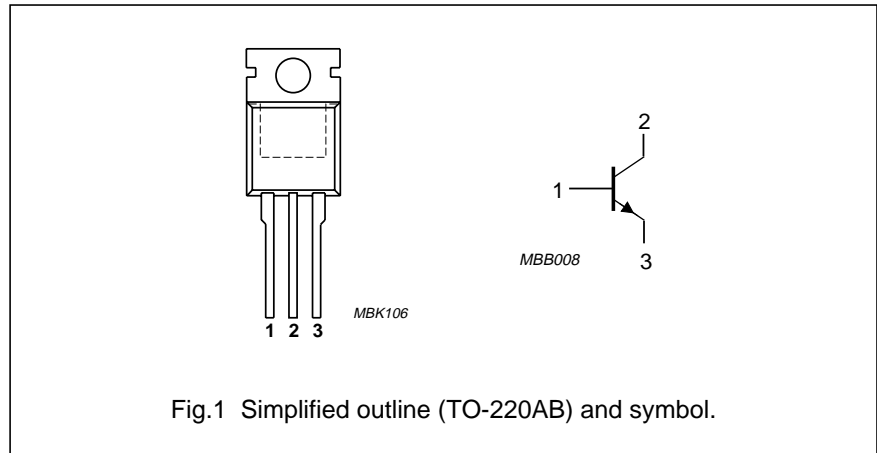


Fig.1 Simplified outline (TO-220AB) and symbol.

## QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
$V_{CESM}$	collector-emitter peak voltage	$V_{BE} = 0$	-	800	V
	BUX84			1000	V
$V_{CEO}$	collector-emitter voltage	open base	-	400	V
	BUX84			450	V
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 1\text{ A}; I_B = 200\text{ mA};$ see Fig.7	-	1	V
$I_C$	collector current (DC)	see Figs 4 and 5	-	2	A
$I_{CM}$	collector current (peak value)	see Figs 4 and 5	-	3	A
$P_{tot}$	total power dissipation	$T_{mb} \leq 25\text{ }^\circ\text{C};$ see Fig.8	-	40	W
$t_f$	fall time	resistive load; see Fig.11	0.4	-	$\mu\text{s}$

## THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	VALUE	UNIT
$R_{th\ j-mb}$	thermal resistance from junction to mounting base	2.5	K/W
$R_{th\ j-a}$	thermal resistance from junction to ambient in free air	70	K/W

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**LIMITING VALUES**

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{CESM}$	collector-emitter peak voltage	$V_{BE} = 0$			
	BUX84		–	800	V
	BUX85	–	1000	V	
$V_{CEO}$	collector-emitter voltage	open base			
	BUX84		–	400	V
	BUX85	–	450	V	
$I_C$	collector current (DC)	see Figs 4 and 5	–	2	A
$I_{CM}$	collector current (peak value)	$t_p = 2$ ms; see Figs 4 and 5	–	3	A
$I_B$	base current (DC)		–	0.75	A
$I_{BM}$	base current (peak value)		–	1	A
$I_{BM}$	base current (reversed; peak value)	turn-off current	–	–1	A
$P_{tot}$	total power dissipation	$T_{mb} \leq 25$ °C; see Fig.8	–	40	W
$T_{stg}$	storage temperature		–65	+150	°C
$T_j$	junction temperature		–	150	°C

**CHARACTERISTICS** $T_j = 25$  °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{CEOsust}$	collector-emitter sustaining voltage	$I_C = 100$ mA; $I_{Boff} = 0$ ; $L = 25$ mH; see Figs 2 and 3				
	BUX84		400	–	–	V
	BUX85	450	–	–	V	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 0.3$ A; $I_B = 30$ mA; see Fig.7	–	–	0.8	V
		$I_C = 1$ A; $I_B = 200$ mA; see Fig.7	–	–	1	V
$V_{BEsat}$	base-emitter saturation voltage	$I_C = 1$ A; $I_B = 200$ mA; see Fig.9	–	–	1.1	V
$I_{CES}$	collector-emitter cut-off current	$V_{CEM} = V_{CEMSmax}$ ; $V_{BE} = 0$ ; note 1	–	–	200	µA
		$V_{CEM} = V_{CEMSmax}$ ; $V_{BE} = 0$ ; $T_j = 125$ °C; note 1	–	–	1.5	mA
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = 5$ V; $I_C = 0$	–	–	1	mA
$h_{FE}$	DC current gain	$V_{CE} = 5$ V; $I_C = 5$ A; see Fig.10	15	–	–	
		$V_{CE} = 5$ V; $I_C = 100$ mA; see Fig.10	20	50	100	
$f_T$	transition frequency	$V_{CE} = 10$ V; $I_C = 200$ mA; $f = 1$ MHz	–	20	–	MHz

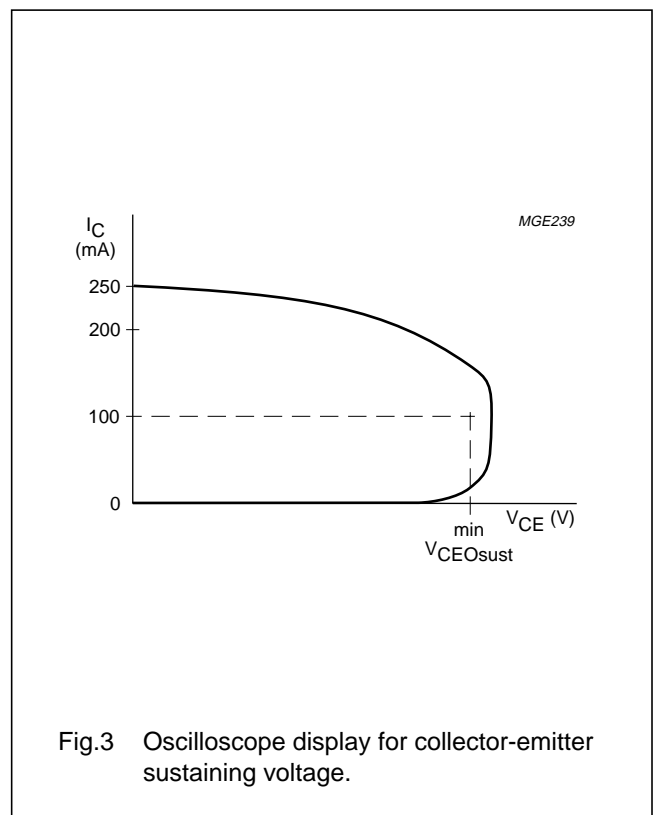
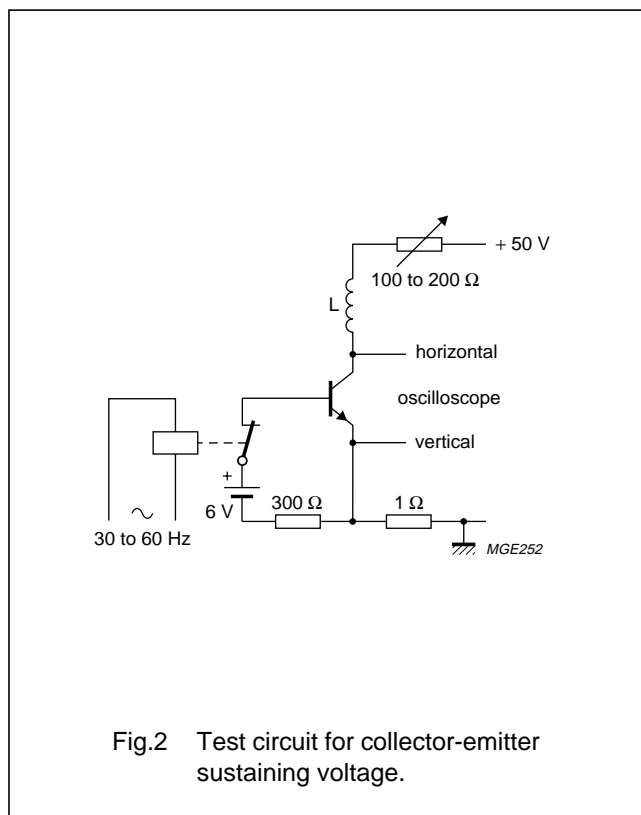
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SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Switching times in horizontal deflection circuit (see Fig.11)</b>						
$t_{on}$	turn-on time	$I_{Con} = 1\text{ A}; I_{Bon} = 200\text{ mA}; I_{Boff} = -400\text{ mA}; V_{CC} = 250\text{ V}$	–	0.2	0.5	$\mu\text{s}$
$t_f$	fall time	$I_{Con} = 1\text{ A}; I_{Bon} = 200\text{ mA}; I_{Boff} = -400\text{ mA}; V_{CC} = 250\text{ V}$	–	0.4	–	$\mu\text{s}$
		$I_{Con} = 1\text{ A}; I_{Bon} = 200\text{ mA}; I_{Boff} = -400\text{ mA}; V_{CC} = 250\text{ V}; T_{mb} = 95\text{ }^\circ\text{C}$	–	–	1.4	$\mu\text{s}$
$t_s$	storage time	$I_{Con} = 1\text{ A}; I_{Bon} = 200\text{ mA}; I_{Boff} = -400\text{ mA}; V_{CC} = 250\text{ V}$	–	2	3.5	$\mu\text{s}$

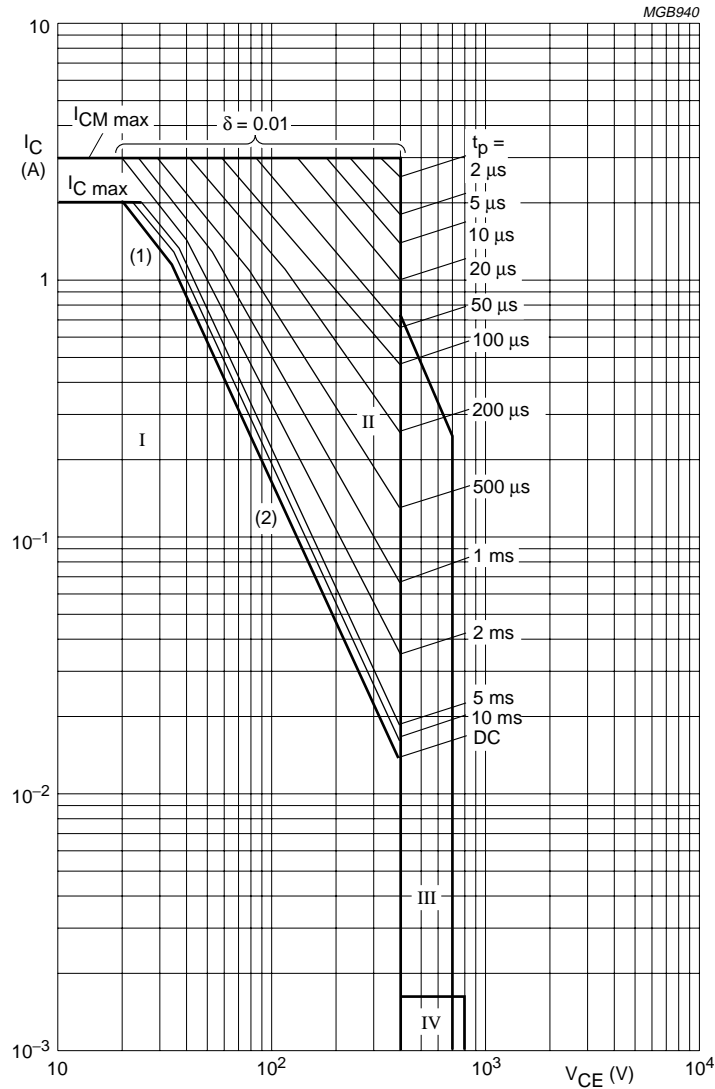
**Note**

1. Measured with a half-sinewave voltage (curve tracer).



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**BUX84.**

$T_{mb} \leq 50 \text{ }^\circ\text{C}$ .

I - Region of permissible DC operation.

II - Permissible extension for repetitive pulse operation.

III - Area of permissible operation during turn-in in single transistor converters, provided  $R_{BE} \leq 100 \Omega$  and  $t_p \leq 0.6 \mu s$ .

IV - Repetitive pulse operation in this region is permissible provided  $V_{BE} \leq 0$  and  $t_p \leq 2 \text{ ms}$ .

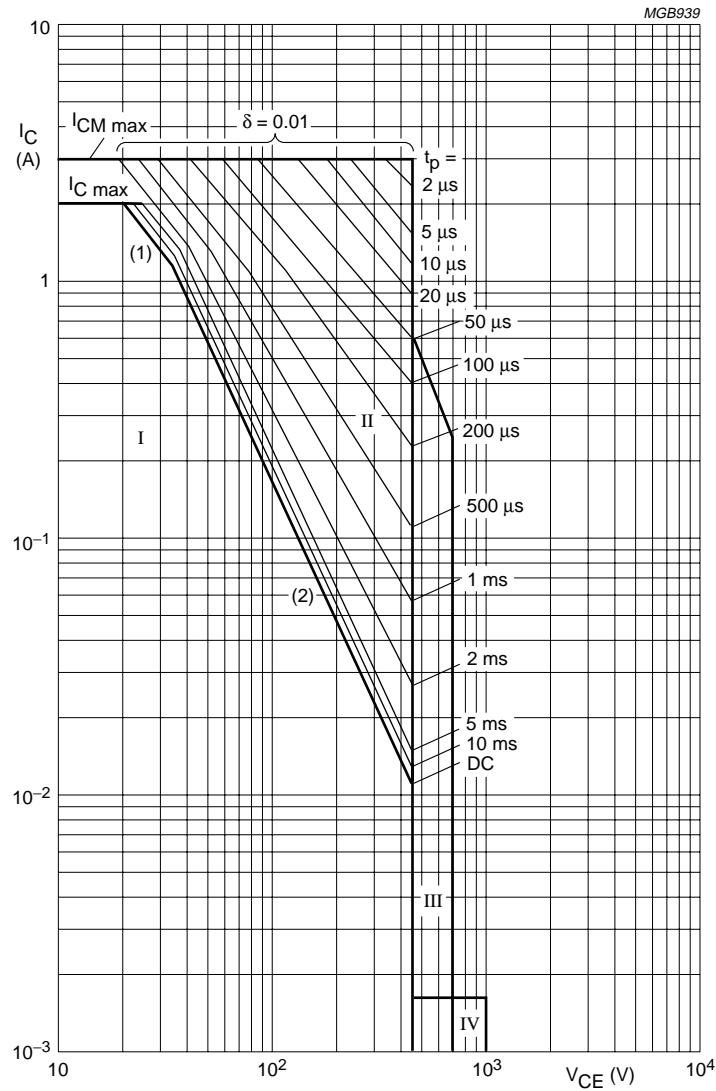
(1)  $P_{tot \max}$  and  $P_{tot \text{ peak max}}$  lines.

(2) Second breakdown limits.

Fig.4 Forward bias SOAR.

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**BUX85.**

$T_{mb} \leq 50 \text{ }^\circ\text{C}.$

I - Region of permissible DC operation.

II - Permissible extension for repetitive pulse operation.

III - Area of permissible operation during turn-on in single transistor converters, provided  $R_{BE} \leq 100 \text{ } \Omega$  and  $t_p \leq 0.6 \text{ } \mu\text{s}.$

IV - Repetitive pulse operation in this region is permissible provided  $V_{BE} \leq 0$  and  $t_p \leq 2 \text{ ms}.$

(1)  $P_{tot \text{ max}}$  and  $P_{tot \text{ peak max}}$  lines.

(2) Second breakdown limits.

Fig.5 Forward bias SOAR.

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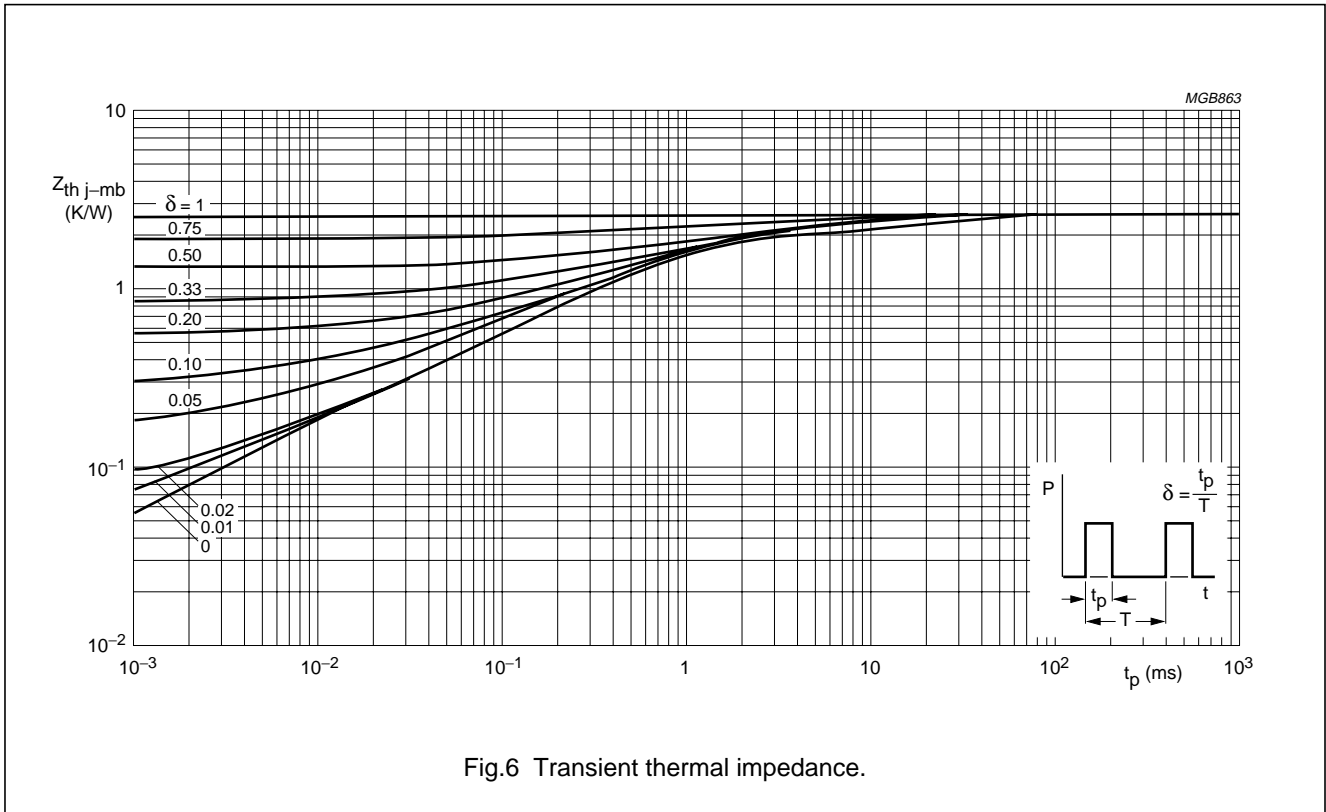


Fig.6 Transient thermal impedance.

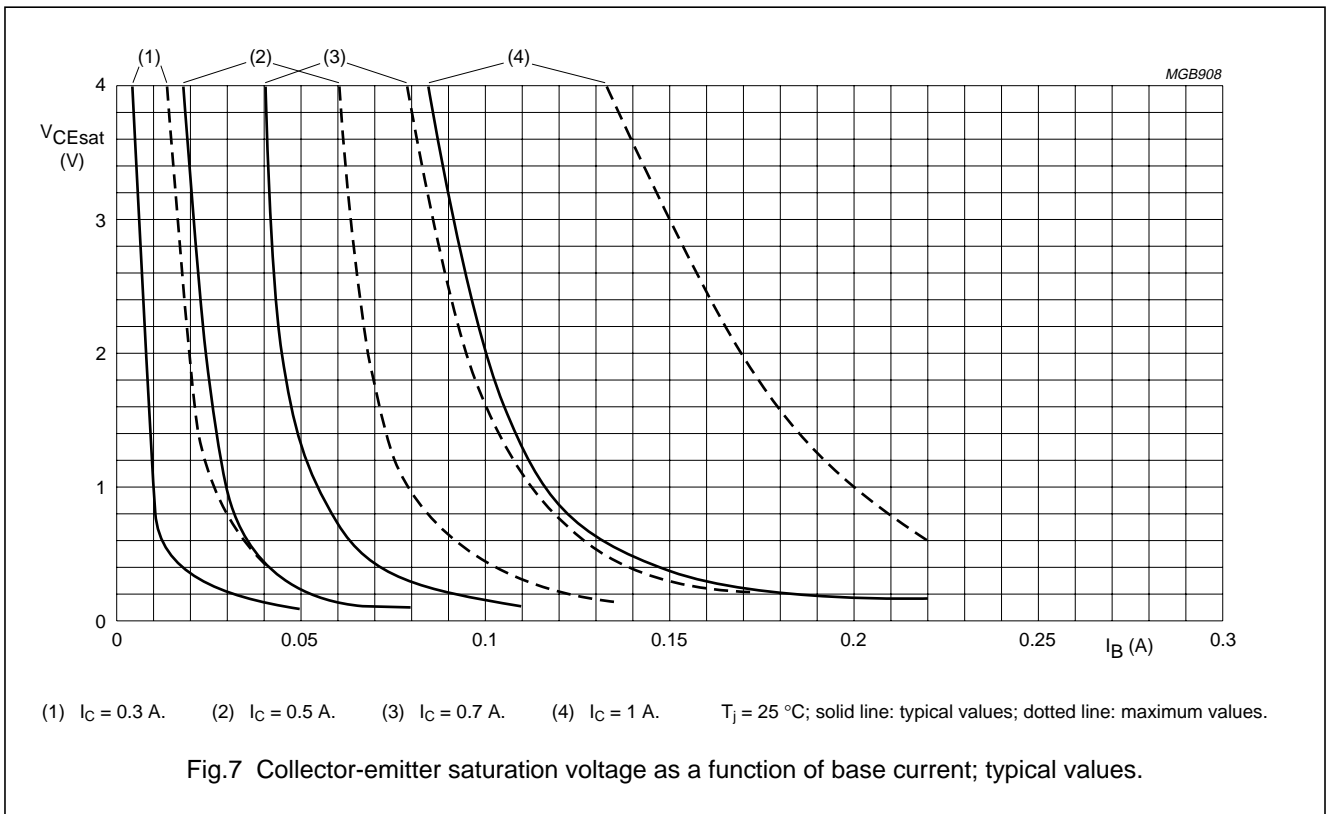
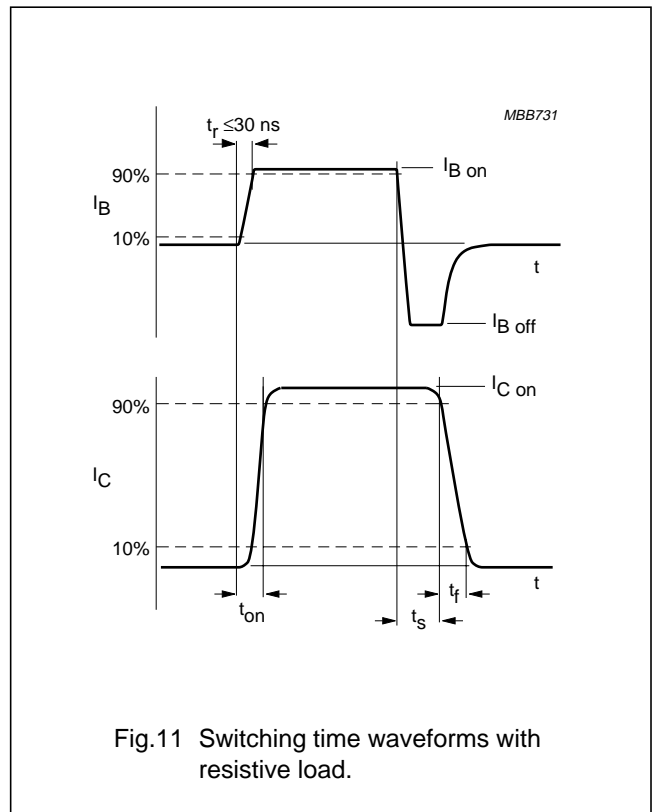
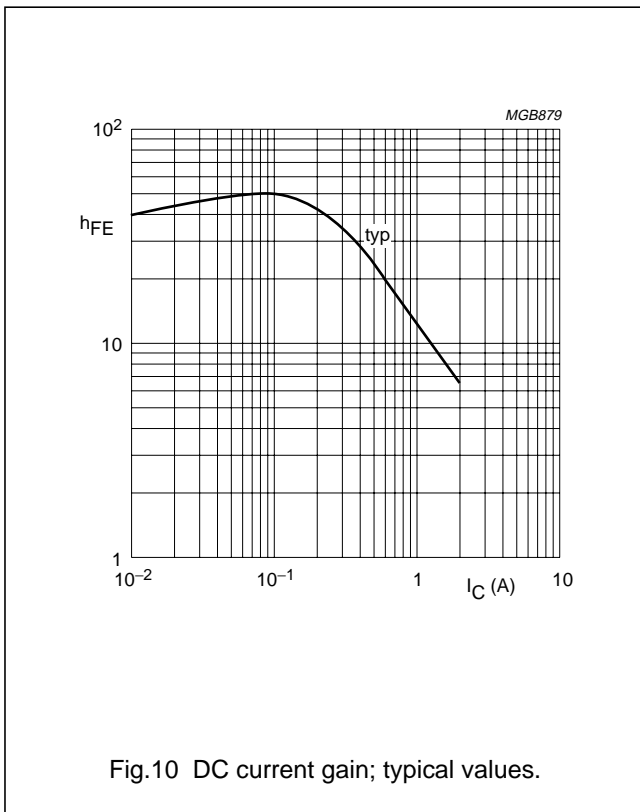
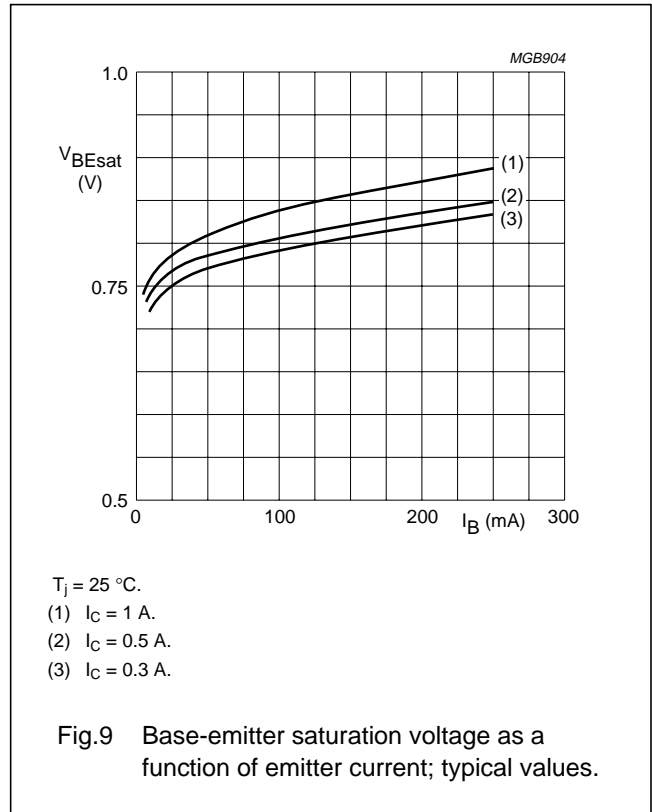
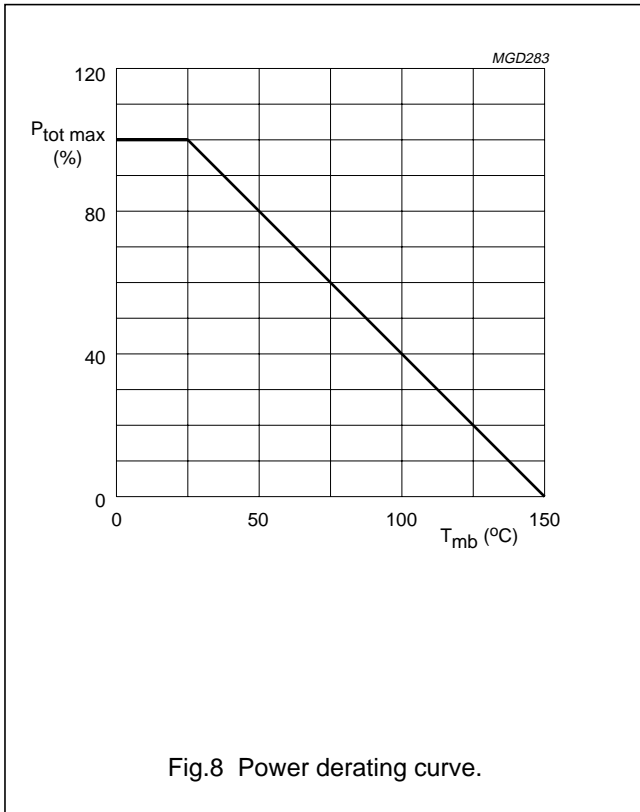


Fig.7 Collector-emitter saturation voltage as a function of base current; typical values.

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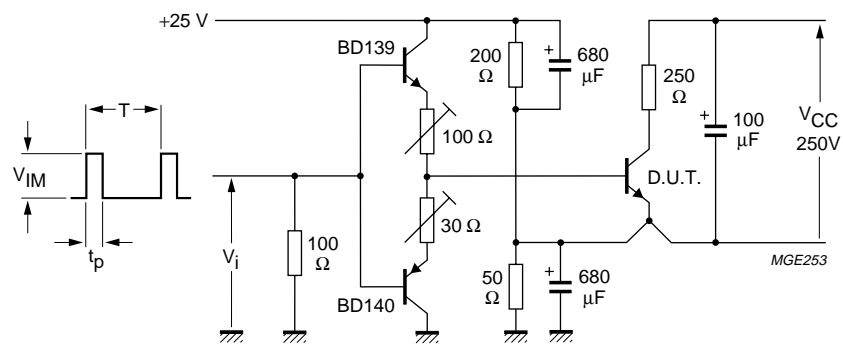
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$t_p = 20 \mu s$ ;  $T = 2 ms$ ;  $V_{IM} = 15 V$ .

Fig.12 Test circuit resistive load.

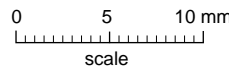
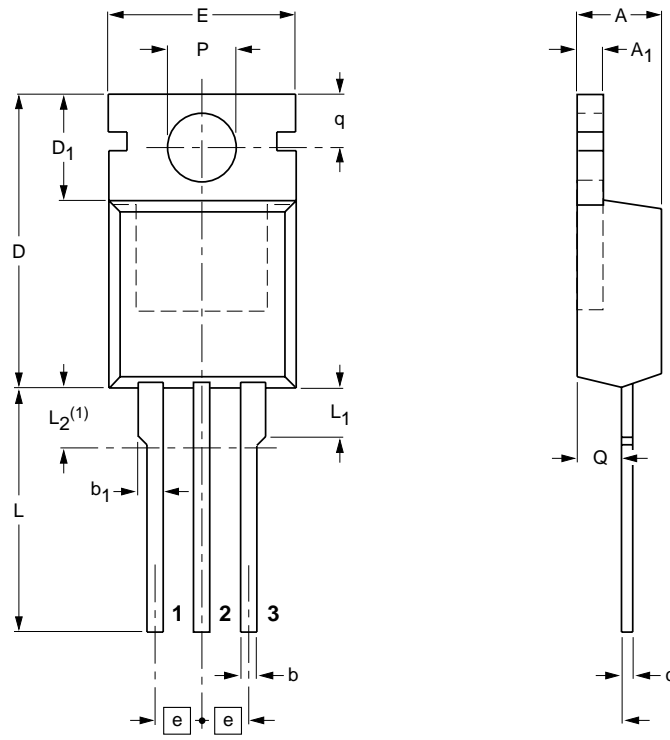
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PACKAGE OUTLINE

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

SOT78



DIMENSIONS (mm are the original dimensions)

UNIT	A	A <sub>1</sub>	b	b <sub>1</sub>	c	D	D <sub>1</sub>	E	e	L	L <sub>1</sub>	L <sub>2</sub> <sup>(1)</sup> max.	P	q	Q
mm	4.5 4.1	1.39 1.27	0.9 0.7	1.3 1.0	0.7 0.4	15.8 15.2	6.4 5.9	10.3 9.7	2.54	15.0 13.5	3.30 2.79	3.0	3.8 3.6	3.0 2.7	2.6 2.2

Note

1. Terminals in this zone are not tinned.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT78		TO-220				97-06-11

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**DEFINITIONS**

<b>Data sheet status</b>	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
<b>Limiting values</b>	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
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