

DATA SHEET

BUW12F; BUW12AF Silicon diffused power transistors

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

1997 Aug 14

Silicon diffused power transistors

BUW12F; BUW12AF

DESCRIPTION

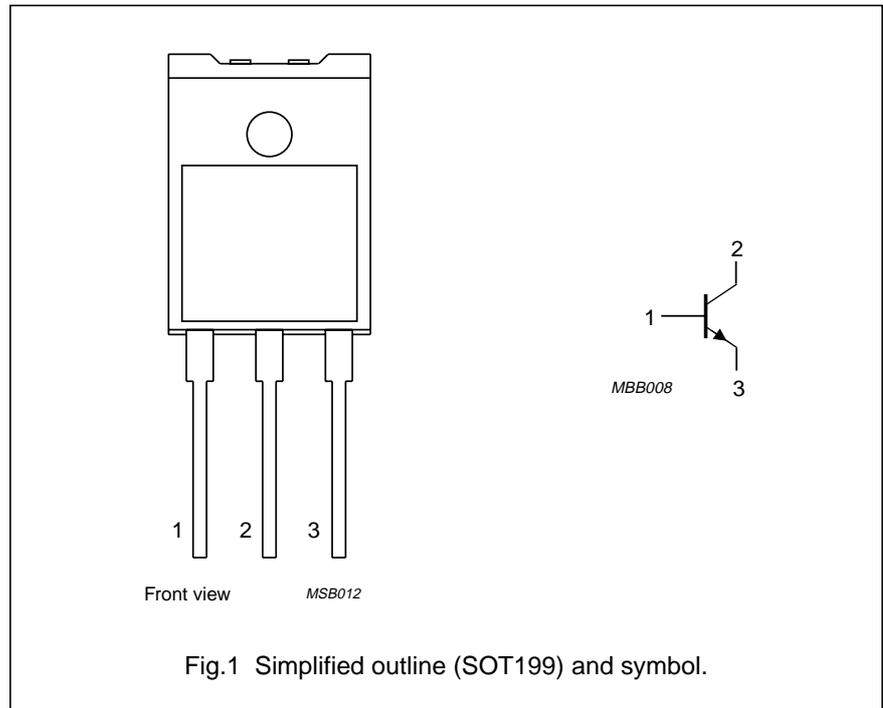
High-voltage, high-speed, glass-passivated NPN power transistor in a SOT199 package.

APPLICATIONS

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

PINNING

PIN	DESCRIPTION
1	base
2	collector
3	emitter
mb	mounting base; electrically isolated



QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MAX.	UNIT
V_{CESM}	collector-emitter peak voltage	$V_{BE} = 0$	850 1000	V V
	BUW12F			
V_{CEO}	collector-emitter voltage	open base	400 450	V V
	BUW12F			
V_{CEsat}	collector-emitter saturation voltage	see Figs 6 and 10	1.5	V
	BUW12AF			
I_{Csat}	collector saturation current		6 5	A A
	BUW12F			
I_C	collector current (DC)	see Figs 2 and 5	8	A
	BUW12AF			
I_{CM}	collector current (peak value)	see Fig 2	20	A
P_{tot}	total power dissipation	$T_h \leq 25\text{ }^\circ\text{C}$; see Fig.4	34	W
t_f	fall time	resistive load; see Figs 12 and 13	0.8	μs

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THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j-h}$	thermal resistance from junction to external heatsink	note 1	3.7	K/W
		note 2	2.8	K/W
$R_{th\ j-a}$	thermal resistance from junction to ambient		35	K/W

Notes

1. Mounted **without** heatsink compound and 30 ± 5 N force on centre of package.
2. Mounted **with** heatsink compound and 30 ± 5 N force on centre of package.

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CESM}	collector-emitter peak voltage BUW12F BUW12AF	$V_{BE} = 0$	–	850	V
			–	1000	V
V_{CEO}	collector-emitter voltage BUW12F BUW12AF	open base	–	400	V
			–	450	V
I_{Csat}	collector saturation current BUW12F BUW12AF	$V_{CE} = 1.5$ V	–	6	A
			–	5	A
I_C	collector current (DC)	see Figs 2 and 5	–	8	A
I_{CM}	collector current (peak value)	see Fig 2	–	20	A
I_B	base current (DC)		–	4	A
I_{BM}	base current (peak value)		–	6	A
P_{tot}	total power dissipation	$T_h \leq 25$ °C; see Fig.4; note 1	–	34	W
		$T_h \leq 25$ °C; see Fig.4; note 2	–	45	W
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature		–	150	°C

Notes

1. Mounted **without** heatsink compound and 30 ± 5 N force on centre of package.
2. Mounted **with** heatsink compound and 30 ± 5 N force on centre of package.

ISOLATION CHARACTERISTICS

SYMBOL	PARAMETER	MAX.	UNIT
V_{isolM}	isolation voltage from all terminals to external heatsink (peak value)	1500	V
C_{isol}	isolation capacitance from collector to external heatsink	21	pF

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CHARACTERISTICS

$T_j = 25\text{ °C}$ unless otherwise specified.

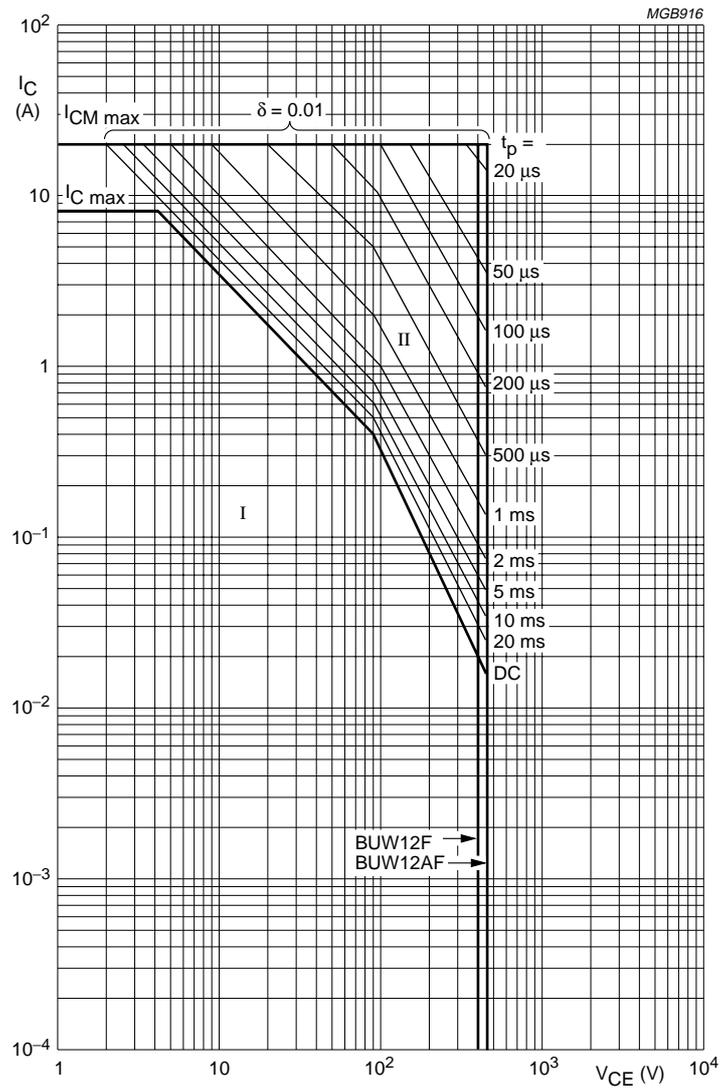
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{CEOsust}$	collector-emitter sustaining voltage BUW12F BUW12AF	$I_C = 100\text{ mA}$; $I_{Boff} = 0$; $L = 25\text{ mH}$; see Figs 8 and 9	400	–	–	V
			450	–	–	V
V_{CEsat}	collector-emitter saturation voltage BUW12F BUW12AF	$I_C = 6\text{ A}$; $I_B = 1.2\text{ A}$; see Figs 6 and 10	–	–	1.5	V
		$I_C = 5\text{ A}$; $I_B = 1\text{ A}$; see Figs 6 and 10	–	–	1.5	V
V_{BEsat}	base-emitter saturation voltage BUW12F BUW12AF	$I_C = 6\text{ A}$; $I_B = 1.2\text{ A}$; see Fig.6	–	–	1.5	V
		$I_C = 5\text{ A}$; $I_B = 1\text{ A}$; see Fig.6	–	–	1.5	V
I_{CES}	collector-emitter cut-off current	$V_{CE} = V_{CESMmax}$; $V_{BE} = 0$; note 1	–	–	1	mA
		$V_{CE} = V_{CESMmax}$; $V_{BE} = 0$; $T_j = 125\text{ °C}$; note 1	–	–	3	mA
I_{EBO}	emitter-base cut-off current	$V_{EB} = 9\text{ V}$; $I_C = 0$	–	–	10	mA
h_{FE}	DC current gain	$V_{CE} = 5\text{ V}$; $I_C = 10\text{ mA}$; see Fig.11	10	18	35	
		$V_{CE} = 5\text{ V}$; $I_C = 1\text{ A}$; see Fig.11	10	20	35	
Switching times resistive load (see Figs 12 and 13)						
t_{on}	turn-on time BUW12F BUW12AF	$I_{Con} = 6\text{ A}$; $I_{Bon} = I_{Boff} = 1.2\text{ A}$	–	–	1	μs
		$I_{Con} = 5\text{ A}$; $I_{Bon} = I_{Boff} = 1\text{ A}$	–	–	1	μs
t_s	storage time BUW12F BUW12AF	$I_{Con} = 6\text{ A}$; $I_{Bon} = I_{Boff} = 1.2\text{ A}$	–	–	4	μs
		$I_{Con} = 5\text{ A}$; $I_{Bon} = I_{Boff} = 1\text{ A}$	–	–	4	μs
t_f	fall time BUW12F BUW12AF	$I_{Con} = 6\text{ A}$; $I_{Bon} = I_{Boff} = 1.2\text{ A}$	–	–	0.8	μs
		$I_{Con} = 5\text{ A}$; $I_{Bon} = I_{Boff} = 1\text{ A}$	–	–	0.8	μs
Switching times inductive load (see Figs 14 and 15)						
t_s	storage time BUW12F BUW12AF	$I_{Con} = 6\text{ A}$; $I_B = 1.2\text{ A}$; $V_{CL} = 250\text{ V}$; $T_c = 100\text{ °C}$	–	1.9	2.5	μs
		$I_{Con} = 5\text{ A}$; $I_B = 1\text{ A}$; $V_{CL} = 300\text{ V}$; $T_c = 100\text{ °C}$	–	1.9	2.5	μs
t_f	fall time BUW12F BUW12AF	$I_{Con} = 6\text{ A}$; $I_B = 1.2\text{ A}$; $V_{CL} = 250\text{ V}$; $T_c = 100\text{ °C}$	–	200	300	ns
		$I_{Con} = 5\text{ A}$; $I_B = 1\text{ A}$; $V_{CL} = 300\text{ V}$; $T_c = 100\text{ °C}$	–	200	300	ns

Note

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

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Mounted **without** heatsink compound and 30 ± 5 N force on centre of package.

$T_{mb} < 25$ °C.

I - Region of permissible DC operation.

II - Permissible extension for repetitive pulse operation.

Fig.2 Forward bias SOAR.

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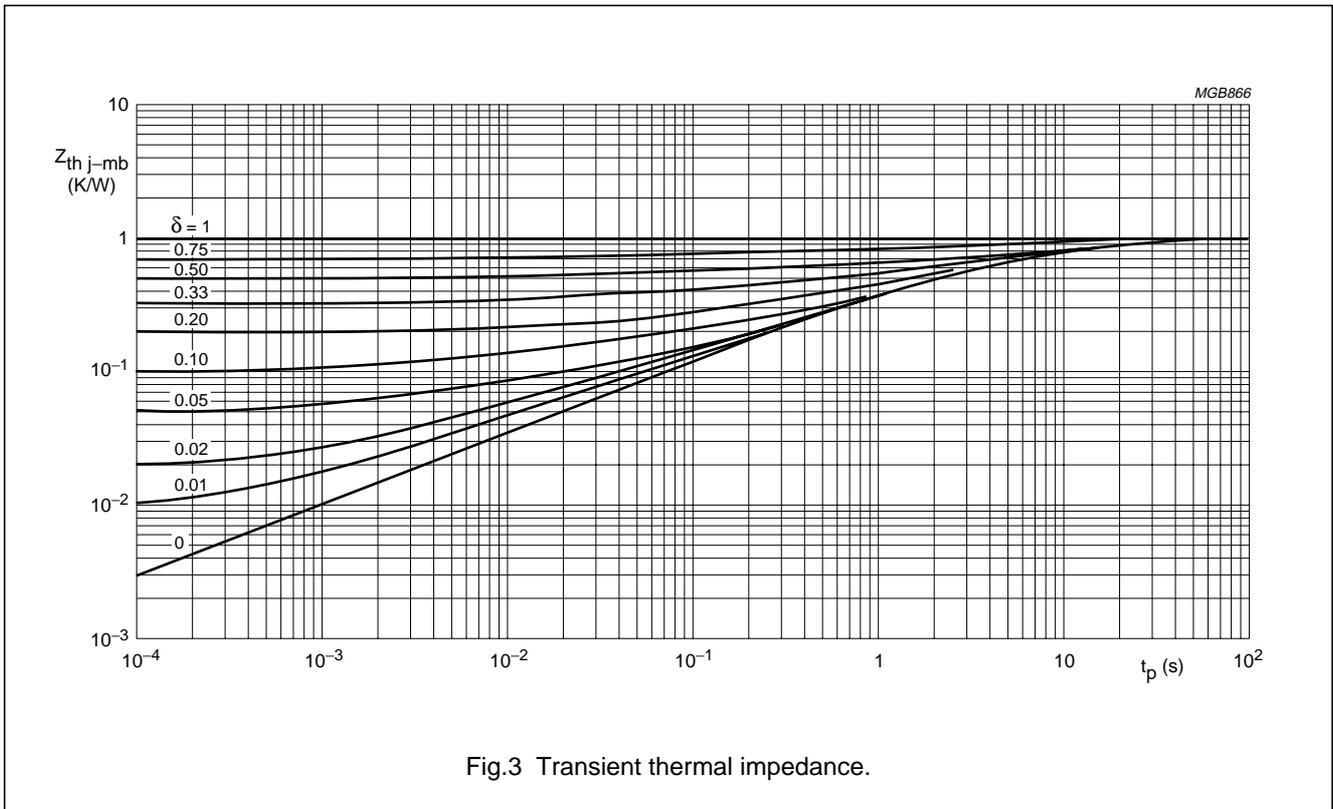


Fig.3 Transient thermal impedance.

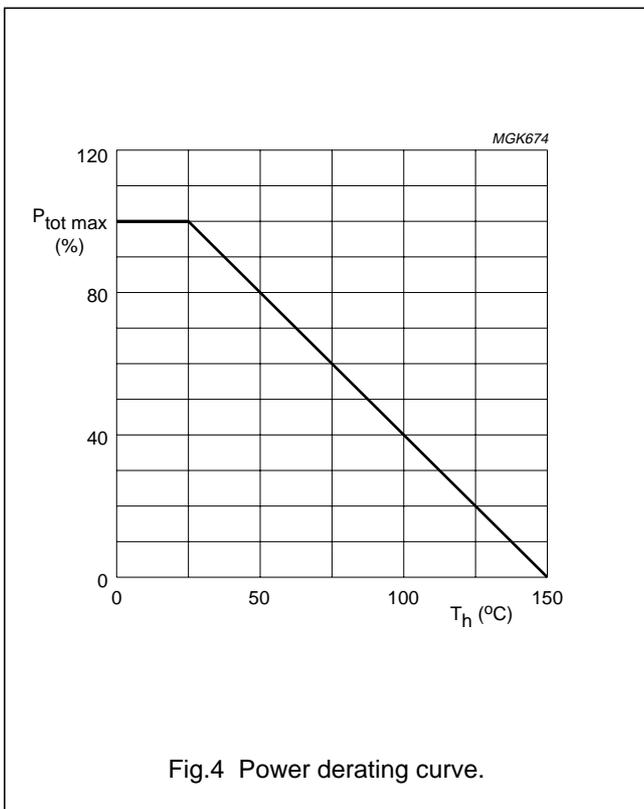
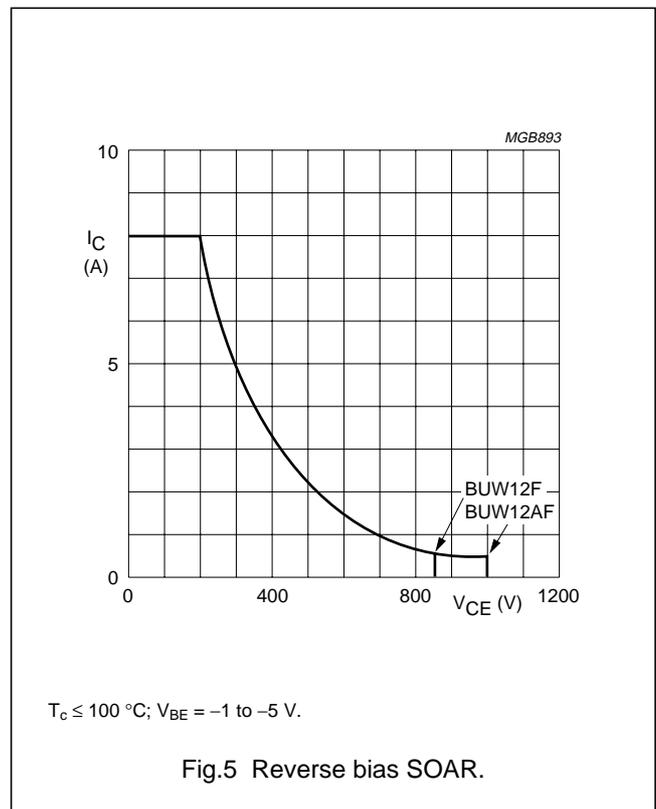


Fig.4 Power derating curve.

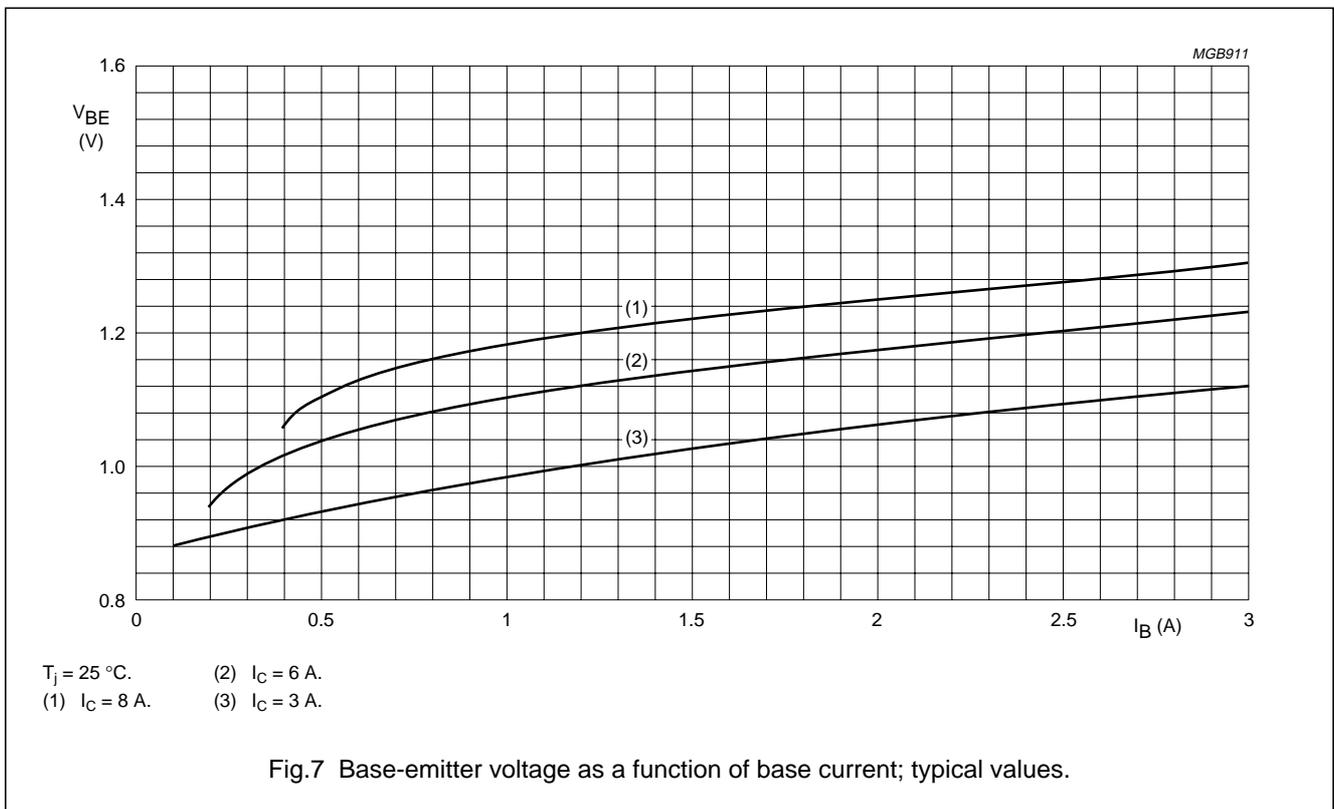
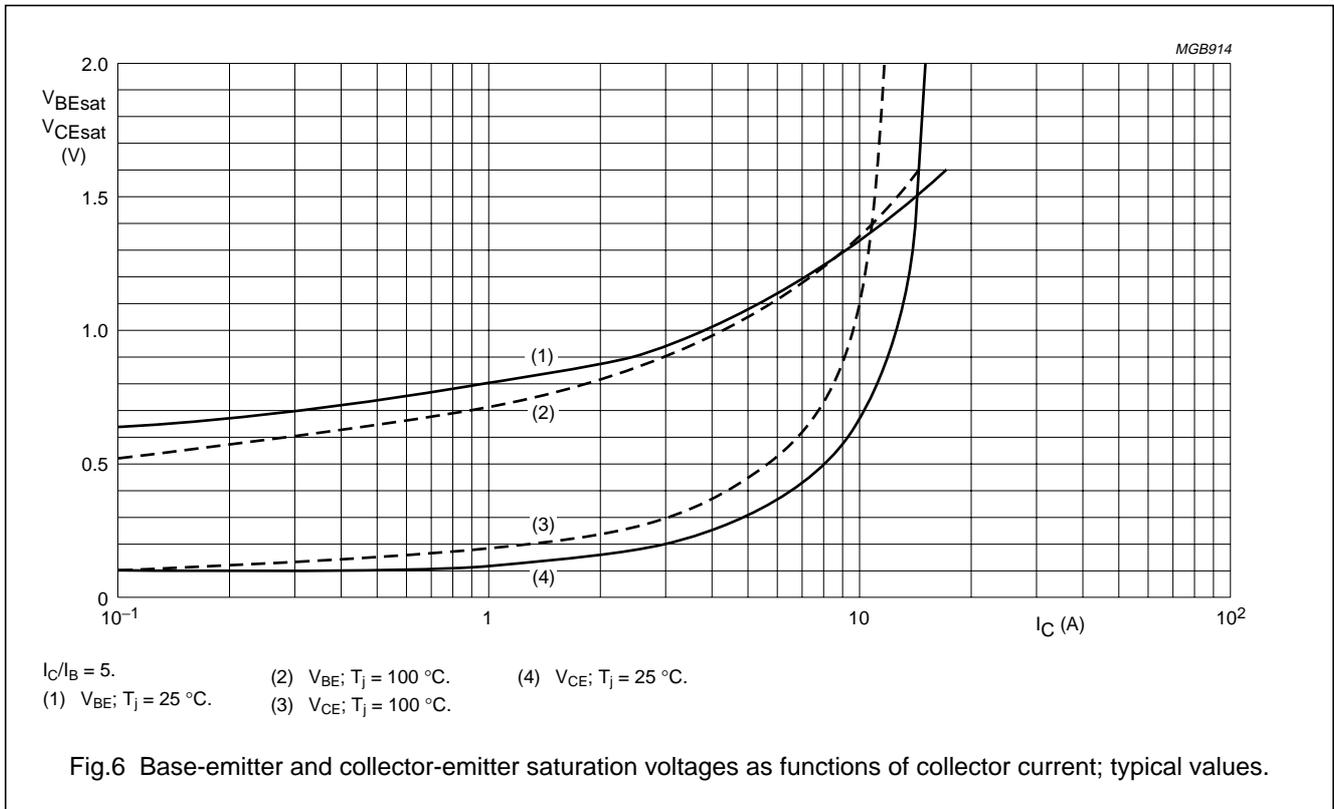


$T_c \leq 100$ °C; $V_{BE} = -1$ to -5 V.

Fig.5 Reverse bias SOAR.

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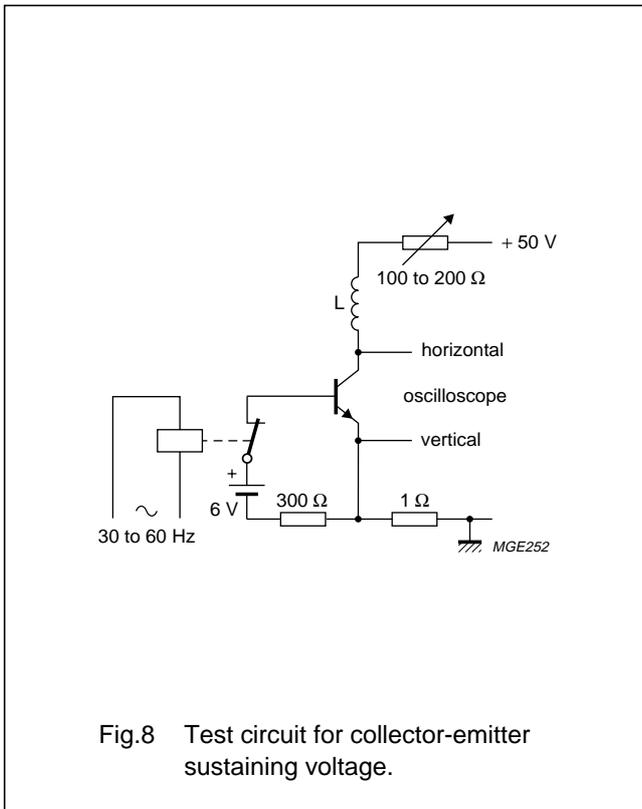


Fig.8 Test circuit for collector-emitter sustaining voltage.

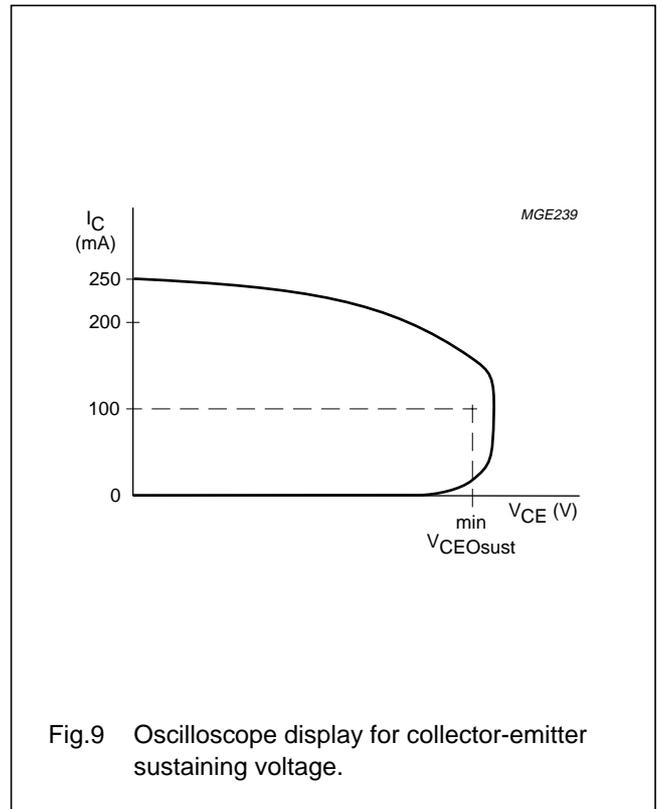
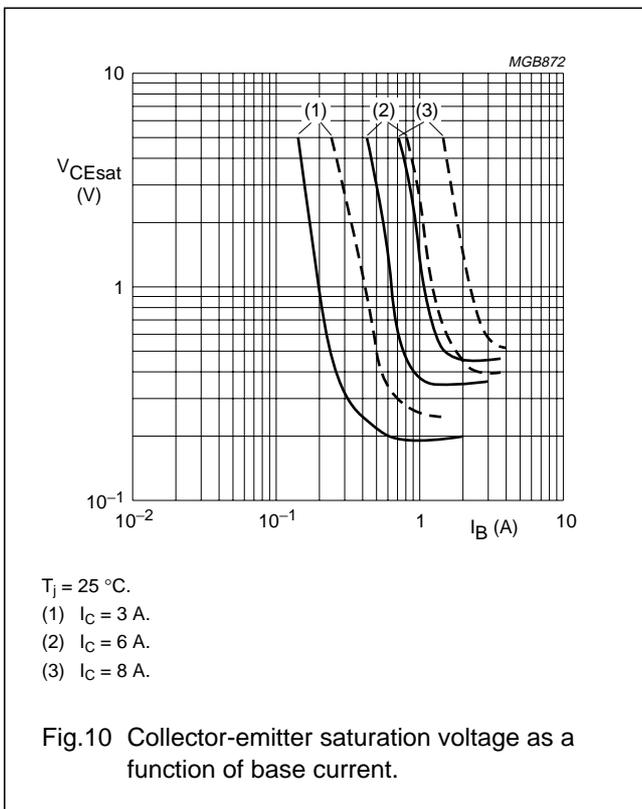
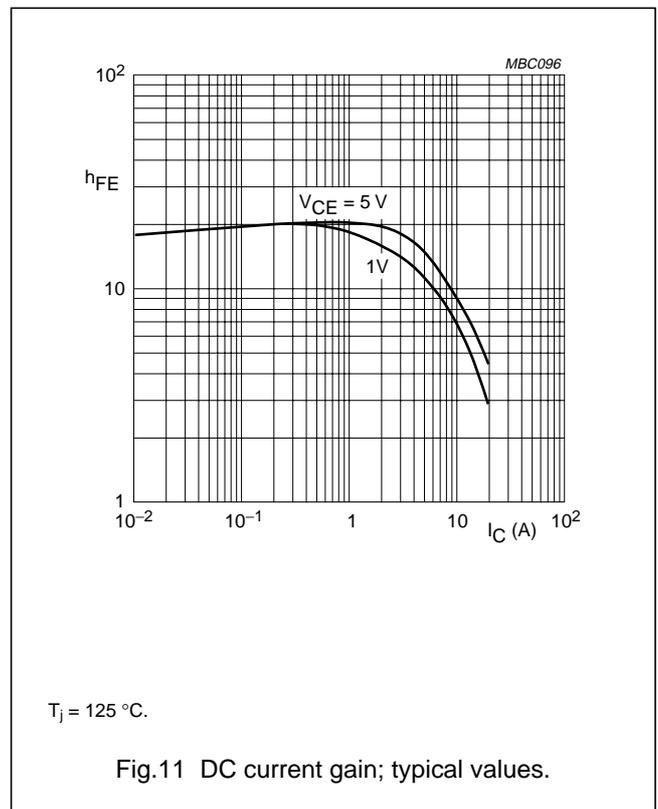


Fig.9 Oscilloscope display for collector-emitter sustaining voltage.



$T_j = 25\text{ }^\circ\text{C}$.
 (1) $I_C = 3\text{ A}$.
 (2) $I_C = 6\text{ A}$.
 (3) $I_C = 8\text{ A}$.

Fig.10 Collector-emitter saturation voltage as a function of base current.

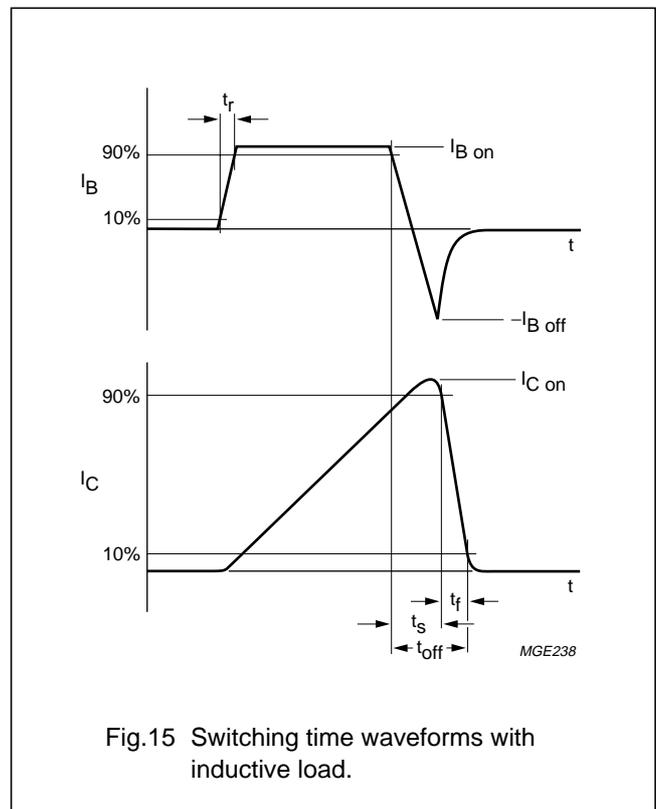
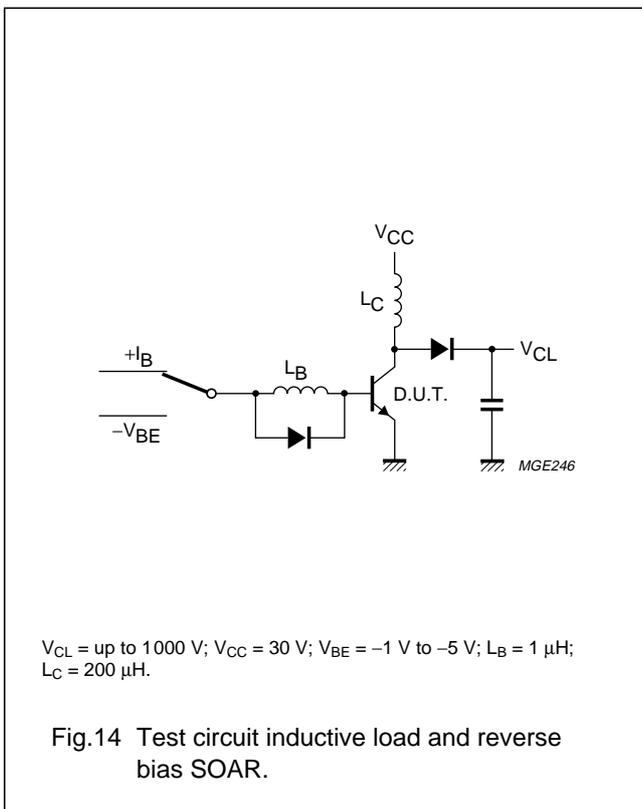
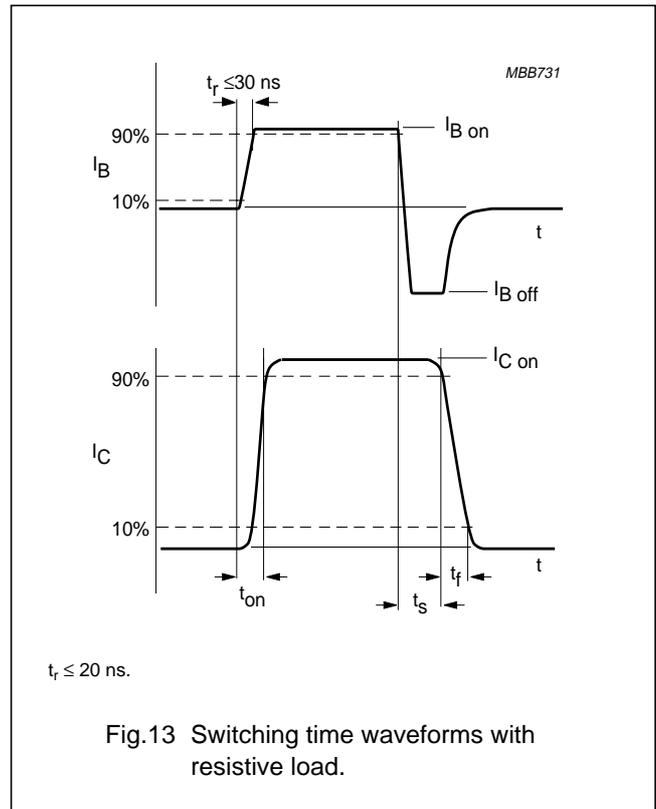
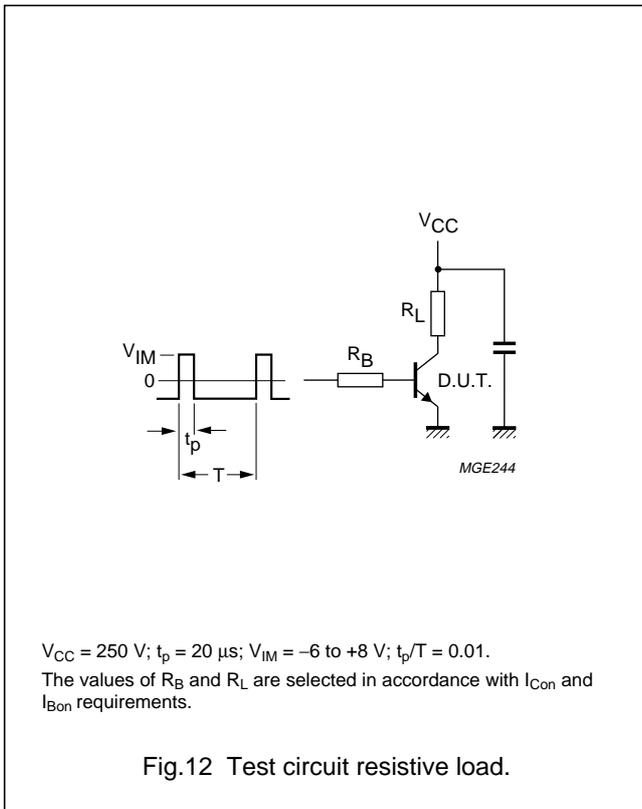


$T_j = 125\text{ }^\circ\text{C}$.

Fig.11 DC current gain; typical values.

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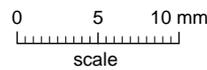
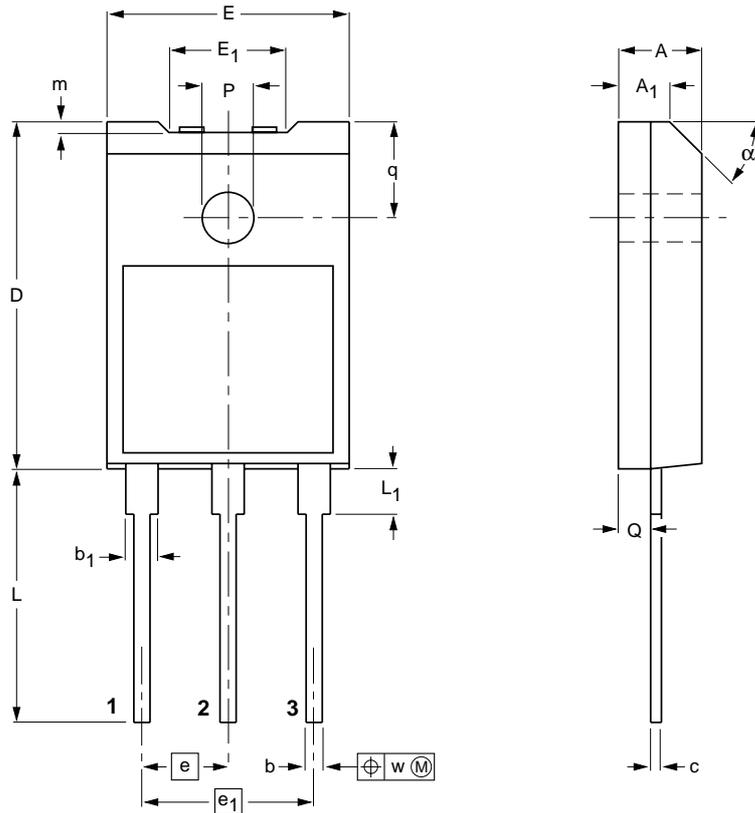
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PACKAGE OUTLINE

Plastic single-ended package; heatsink mounted; 1 mounting hole; 3 leads (in-line)

SOT199



DIMENSIONS (mm are the original dimensions)

UNIT	A	A ₁	b	b ₁	c	D	E	E ₁	e	e ₁	L	L ₁ ⁽¹⁾	m	P	Q	q	w	α
mm	5.2 4.8	3.4 3.0	1.2 1.0	2.1 1.9	0.6 0.5	21.5 20.5	15.3 14.7	7.8 6.8	5.45	10.9	16.5 15.7	3.7 3.3	0.8 0.6	3.3 3.1	2.1 1.9	6.2 5.8	0.4	45°

Note

1. Terminals in this zone are not tinned.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT199						97-06-27

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DEFINITIONS

Data sheet status	
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.
Limiting values	
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.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

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