

DATA SHEET

BUW13W; BUW13AW Silicon diffused power transistors

Product specification
File under Discrete Semiconductors, SC06

1997 Aug 13

Silicon diffused power transistors

BUW13W; BUW13AW

DESCRIPTION

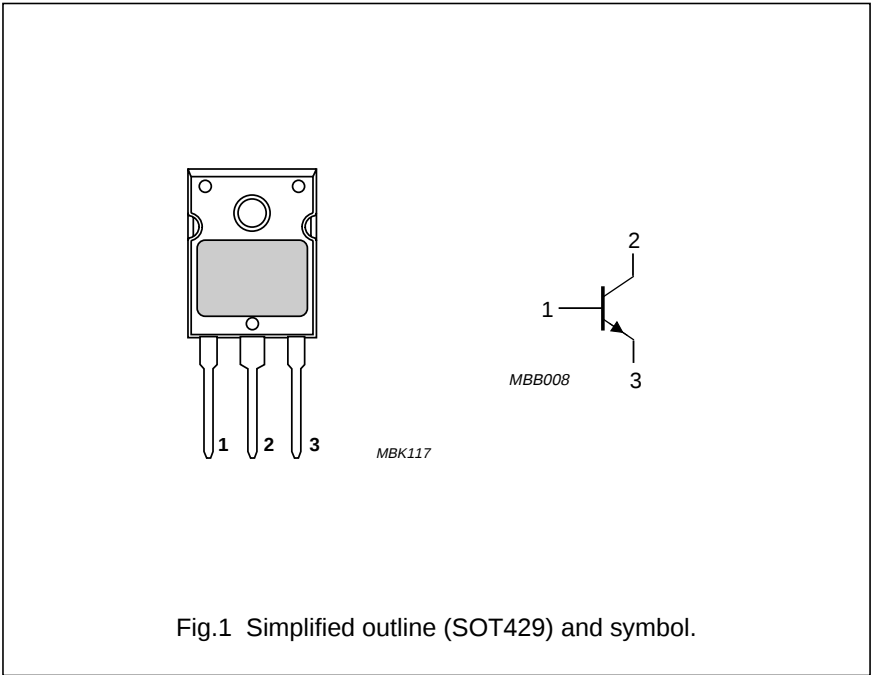
High-voltage, high-speed, glass-passivated NPN power transistor in a SOT429 package.

APPLICATIONS

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

PINNING

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



QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MAX.	UNIT
V_{CESM}	collector-emitter peak voltage BUW13W BUW13AW	$V_{BE} = 0$	850 1000	V V
V_{CEO}	collector-emitter voltage BUW13W BUW13AW	open base	400 450	V V
V_{CEsat}	collector-emitter saturation voltage	see Figs 7 and 9	1.5	V
I_C	collector current (DC)	see Figs 2 and 4	15	A
I_{CM}	collector current (peak value)	see Fig 2	30	A
P_{tot}	total power dissipation	$T_{mb} \leq 25\text{ }^{\circ}\text{C}$; see Fig.3	175	W
t_f	fall time	resistive load; see Figs 11 and 12	0.8	μs

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	VALUE	UNIT
$R_{th\ j-mb}$	thermal resistance from junction to mounting base	0.7	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 BUW13W BUW13AW	$V_{BE} = 0$	–	850	V
			–	1000	V
V_{CEO}	collector-emitter voltage BUW13W BUW13AW	open base	–	400	V
			–	450	V
I_C	collector current (DC)	see Figs 2 and 4	–	15	A
I_{CM}	collector current (peak value)	$t_p < 2$ ms; see Fig 2	–	30	A
I_B	base current (DC)		–	6	A
I_{BM}	base current (peak value)	$t_p < 2$ ms	–	9	A
P_{tot}	total power dissipation	$T_{mb} \leq 25$ °C; see Fig.3	–	175	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 BUW13W BUW13AW	$I_C = 100$ mA; $I_{Boff} = 0$; $L = 25$ mH; see Figs 5 and 6	400	–	–	V
			450	–	–	V
V_{CEsat}	collector-emitter saturation voltage BUW13W BUW13AW	$I_C = 10$ A; $I_B = 2$ A; see Figs 7 and 9	–	–	1.5	V
		$I_C = 8$ A; $I_B = 1.6$ A; see Figs 7 and 9	–	–	1.5	V
V_{BEsat}	base-emitter saturation voltage BUW13W BUW13AW	$I_C = 10$ A; $I_B = 2$ A; see Fig.7	–	–	1.6	V
		$I_C = 8$ A; $I_B = 1.6$ A; see Fig.7	–	–	1.6	V
I_{CES}	collector-emitter cut-off current	$V_{CE} = V_{CESMmax}$; $V_{BE} = 0$; note 1	–	–	1	mA
		$V_{CE} = V_{CESMmax}$; $V_{BE} = 0$; $T_j = 125$ °C; note 1	–	–	4	mA
I_{EBO}	emitter-base cut-off current	$V_{EB} = 9$ V; $I_C = 0$	–	–	10	mA
h_{FE}	DC current gain	$V_{CE} = 5$ V; $I_C = 20$ mA; see Fig.10	10	18	35	
		$V_{CE} = 5$ V; $I_C = 1.5$ A; see Fig.10	10	20	35	

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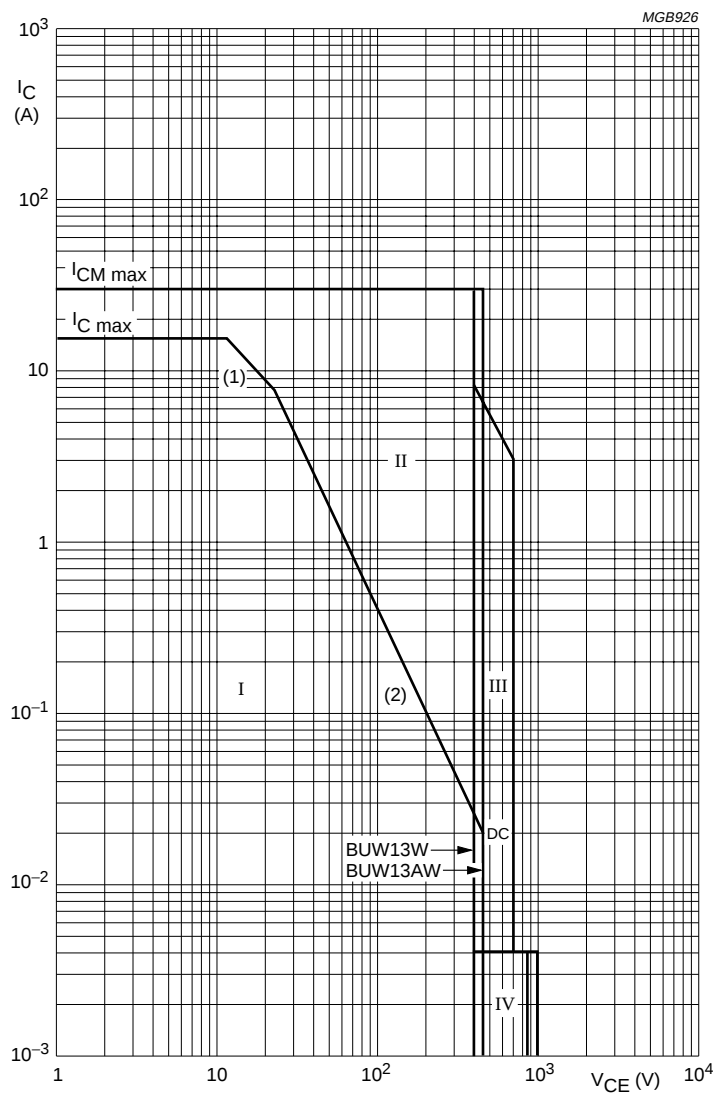
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Switching times resistive load (see Figs 11 and 12)						
t _{on}	turn-on time BUW13W BUW13AW	I _{Con} = 10 A; I _{Bon} = -I _{Boff} = 2 A	–	–	1	µs
		I _{Con} = 8 A; I _{Bon} = -I _{Boff} = 1.6 A	–	–	1	µs
t _s	storage time BUW13W BUW13AW	I _{Con} = 10 A; I _{Bon} = -I _{Boff} = 2 A	–	–	4	µs
		I _{Con} = 8 A; I _{Bon} = -I _{Boff} = 1.6 A	–	–	4	µs
t _f	fall time BUW13W BUW13AW	I _{Con} = 10 A; I _{Bon} = -I _{Boff} = 2 A	–	–	0.8	µs
		I _{Con} = 8 A; I _{Bon} = -I _{Boff} = 1.6 A	–	–	0.8	µs
Switching times inductive load (see Figs 13 and 14)						
t _s	storage time BUW13W BUW13AW	I _{Con} = 10 A; I _B = 2 A	–	2.3	3	µs
		I _{Con} = 10 A; I _B = 2 A; T _j = 100 °C	–	2.5	3.2	µs
		I _{Con} = 8 A; I _B = 1.6 A	–	2.3	3	µs
		I _{Con} = 8 A; I _B = 1.6 A; T _j = 100 °C	–	2.5	3.2	µs
t _f	fall time BUW13W BUW13AW	I _{Con} = 10 A; I _B = 2 A	–	80	150	ns
		I _{Con} = 10 A; I _B = 2 A; T _j = 100 °C	–	140	300	ns
		I _{Con} = 8 A; I _B = 1.6 A	–	80	150	ns
		I _{Con} = 8 A; I _B = 1.6 A; T _j = 100 °C	–	140	300	ns

Note

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

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$T_{mb} \leq 25^\circ\text{C}$.

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 $R_{BE} \leq 100 \Omega$ and $t_p \leq 0.6 \mu\text{s}$.

IV - Repetitive pulse operation in this region is permissible provided $V_{BE} \leq 0$ and $t_p \leq 5 \text{ ms}$.

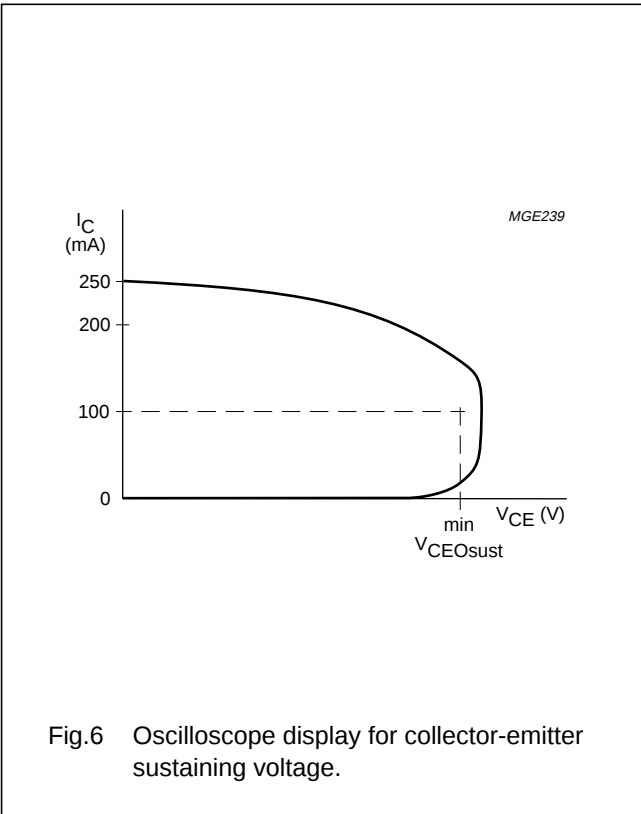
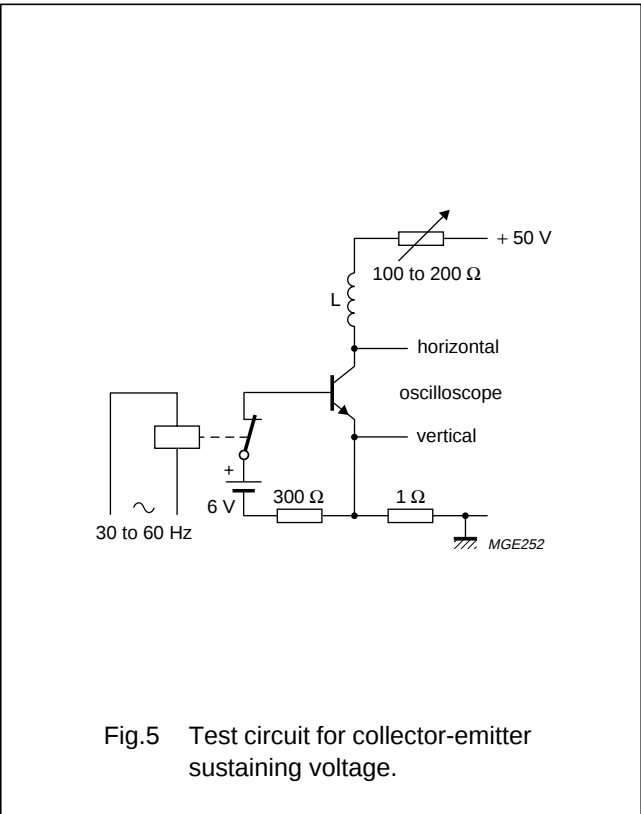
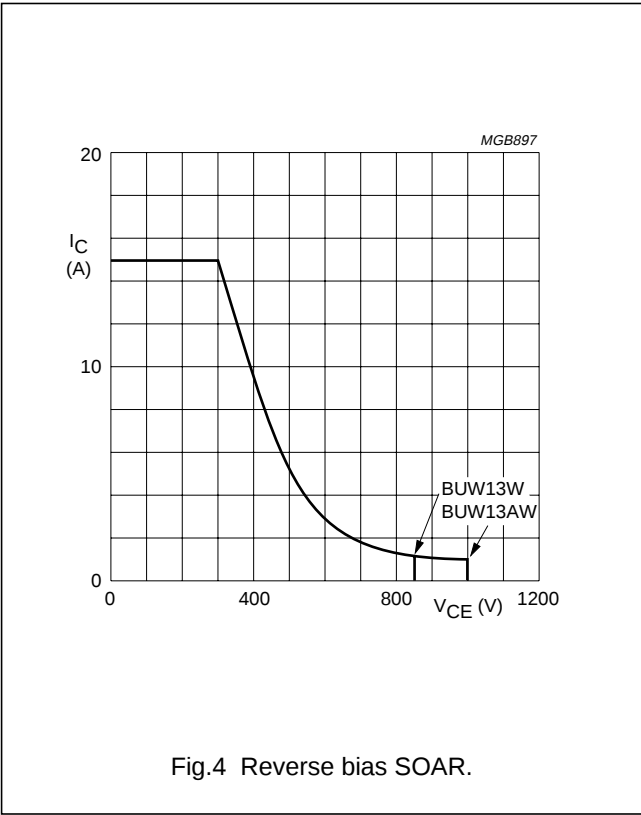
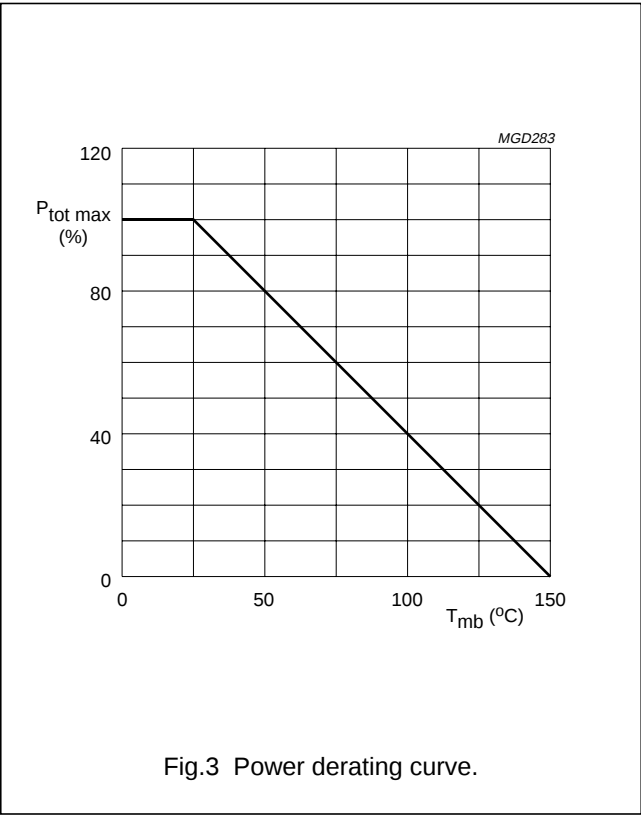
(1) $P_{tot max}$ line.

(2) Second breakdown limits.

Fig.2 Forward bias SOAR.

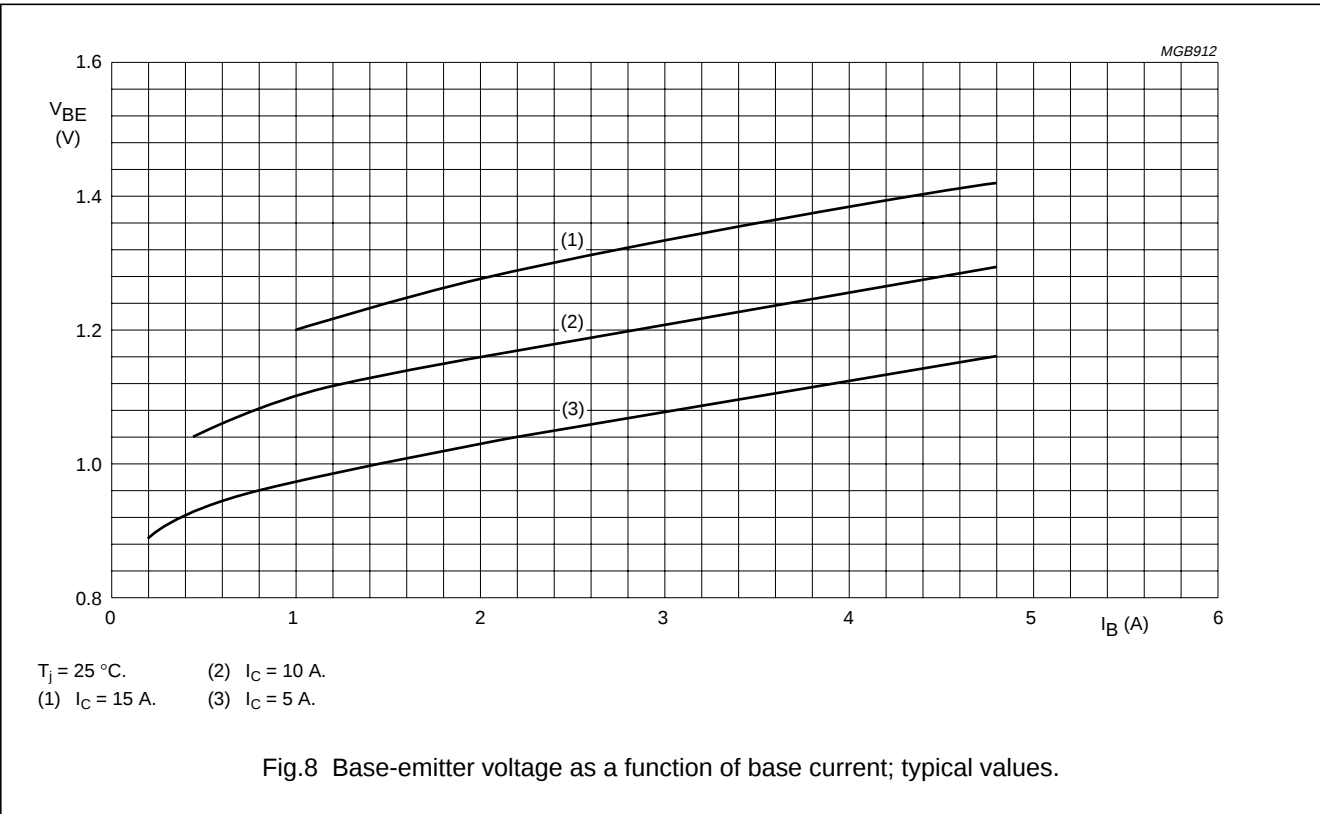
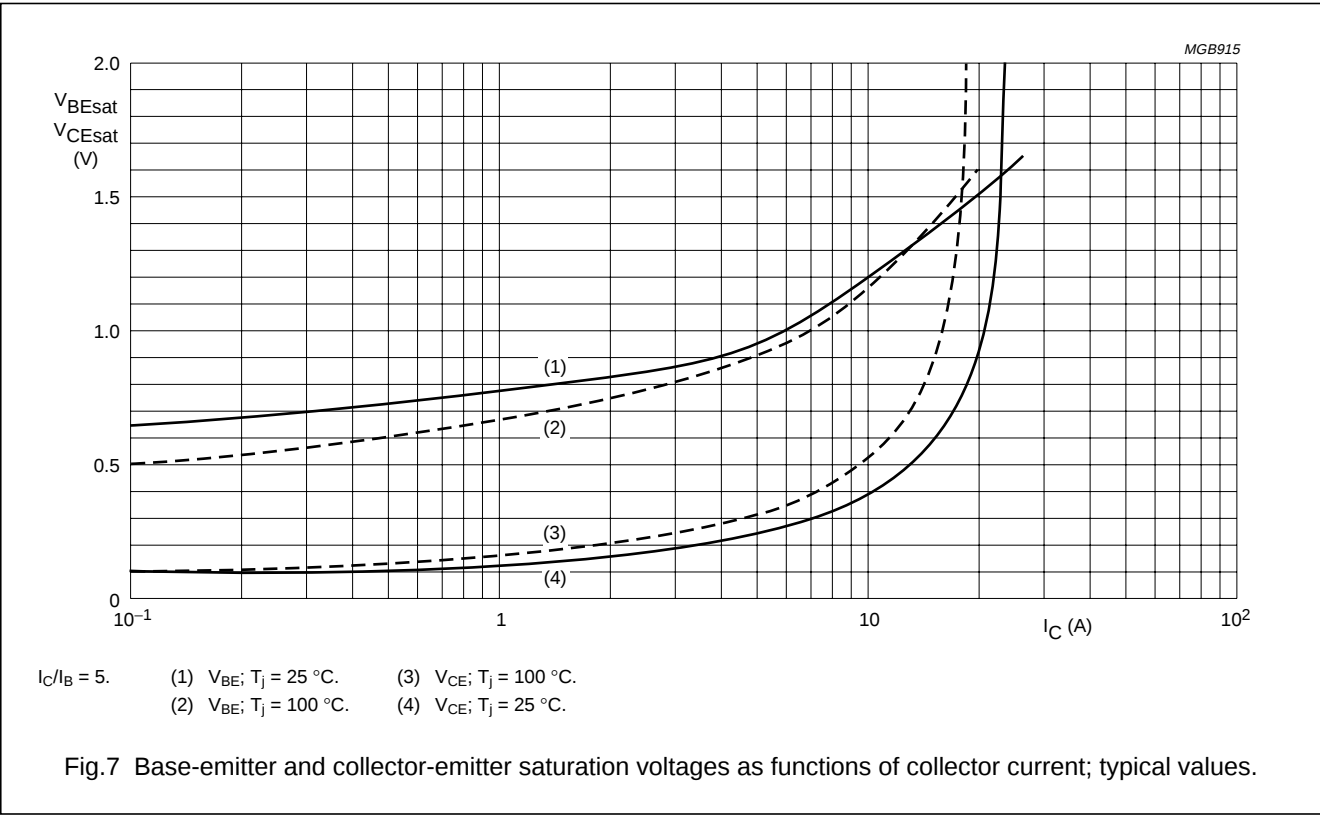
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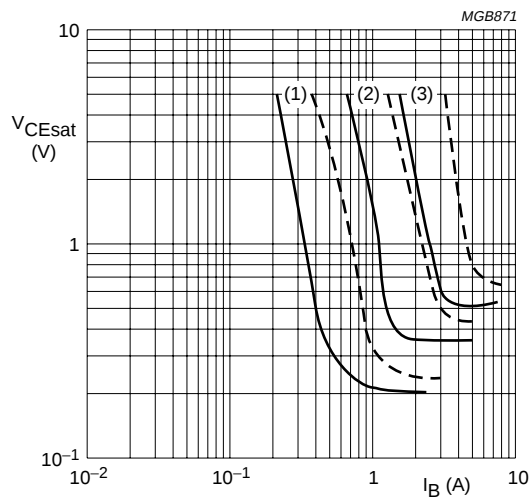
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(1) $I_C = 5$ A.
(2) $I_C = 10$ A.
(3) $I_C = 15$ A.
 $T_j = 25^\circ\text{C}$; solid line: typical values; dotted line: maximum values.

Fig.9 Collector-emitter saturation voltage as a function of base current.

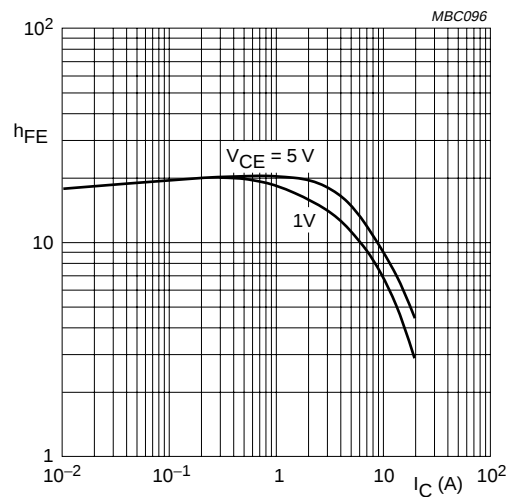
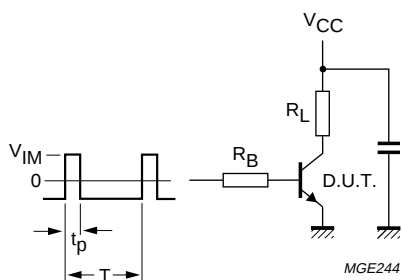


Fig.10 DC current gain; typical values.



$V_{CC} = 250$ V; $t_p = 20$ μs ; $V_{IM} = -6$ to $+8$ V; $t_p/T = 0.01$.
The values of R_B and R_L are selected in accordance with I_{Con} and I_{Bon} requirements.

Fig.11 Test circuit resistive load.

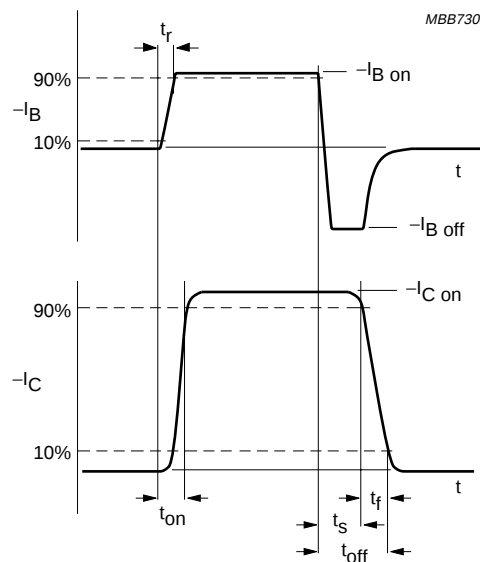
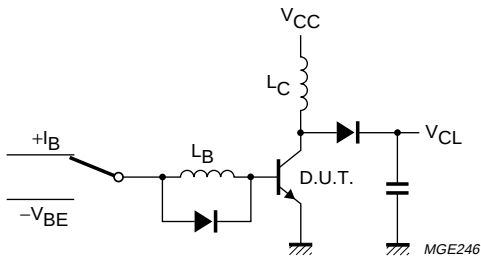


Fig.12 Switching time waveforms with resistive load.

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$V_{CL} = 300\text{ V}$; $V_{CC} = 30\text{ V}$; $V_{BE} = -5\text{ V}$; $L_B = 1\text{ }\mu\text{H}$; $L_C = 200\text{ }\mu\text{H}$.

Fig.13 Test circuit inductive load.

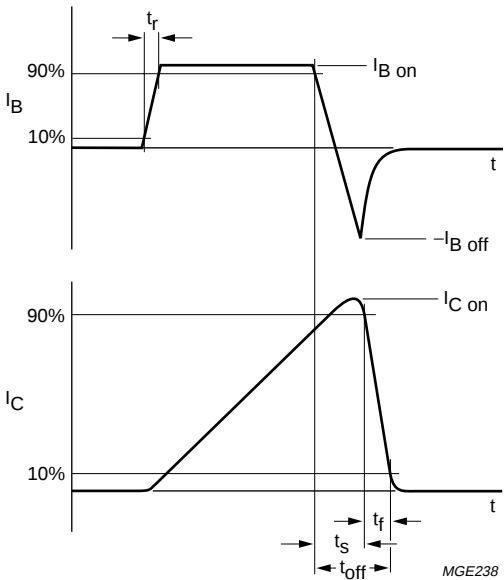


Fig.14 Switching time waveforms with inductive load.

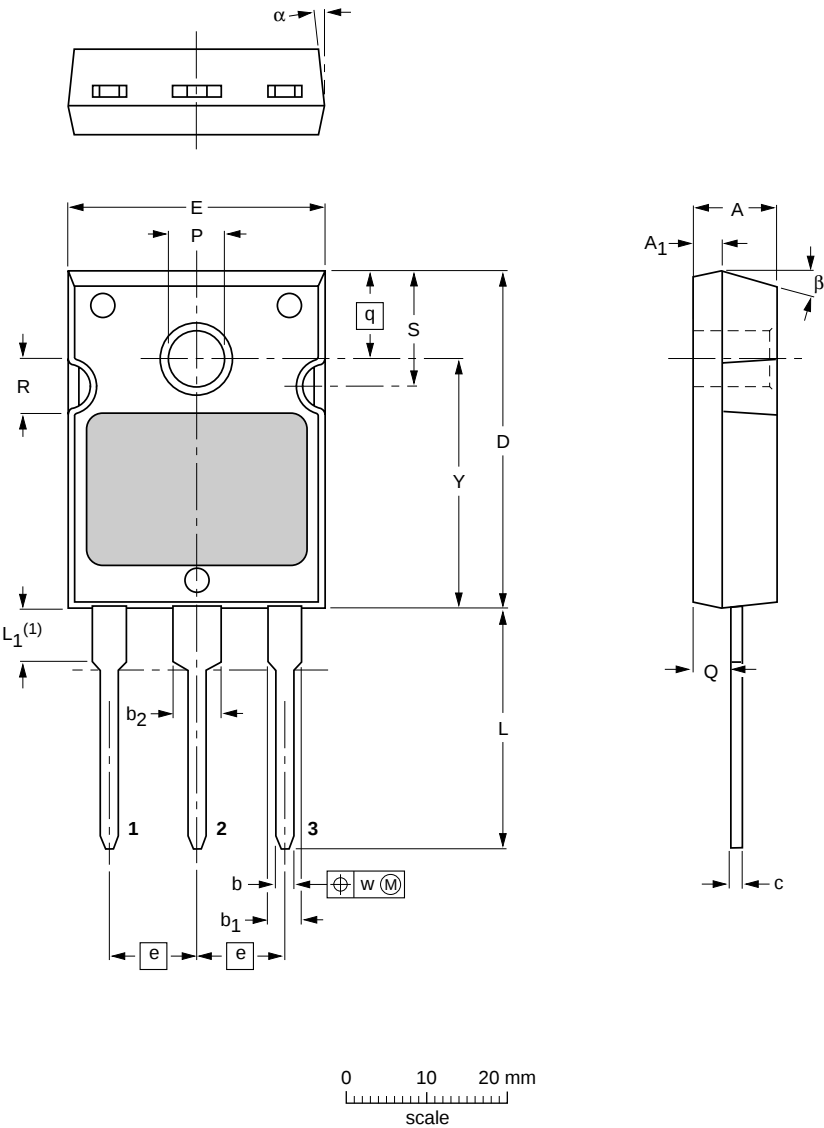
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PACKAGE OUTLINE

Plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-247

SOT429

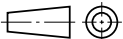


DIMENSIONS (mm are the original dimensions)

UNIT	A	A ₁	b	b ₁	b ₂	c	D	E	e	L	L ₁	P	Q	q	R	S	w	Y	α	β
mm	5.3 4.7	1.9 1.7	1.2 0.9	2.2 1.8	3.2 2.8	0.9 0.6	21 20	16 15	5.45	16 15	4.0 3.6	3.7 3.3	2.6 2.4	5.3	3.5 3.3	7.5 7.1	0.4	15.7 15.3	6° 4°	17° 13°

Note

1. Terminals are uncontrolled within zone L₁.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT429		TO-247				97-06-11

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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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