

# 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

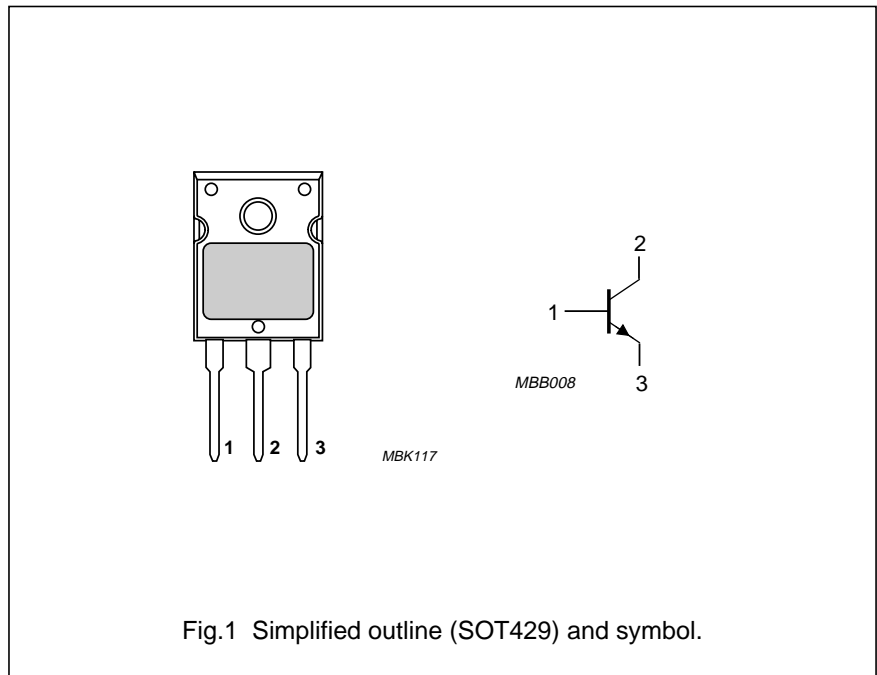


Fig.1 Simplified outline (SOT429) and symbol.

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	$\mu\text{s}$

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	$V_{BE} = 0$	–	850	V
	BUW13W			1000	V
$V_{CEO}$	collector-emitter voltage	open base	–	400	V
	BUW13W			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
$V_{CEO_{sust}}$	collector-emitter sustaining voltage	$I_C = 100$ mA; $I_{B_{off}} = 0$ ; $L = 25$ mH; see Figs 5 and 6	400	–	–	V
	BUW13W		450	–	–	V
$V_{CE_{sat}}$	collector-emitter saturation voltage	$I_C = 10$ A; $I_B = 2$ A; see Figs 7 and 9	–	–	1.5	V
	BUW13W		–	–	1.5	V
$V_{BE_{sat}}$	base-emitter saturation voltage	$I_C = 10$ A; $I_B = 2$ A; see Fig.7	–	–	1.6	V
	BUW13W		–	–	1.6	V
$I_{CES}$	collector-emitter cut-off current	$V_{CE} = V_{CESM_{max}}$ ; $V_{BE} = 0$ ; note 1	–	–	1	mA
		$V_{CE} = V_{CESM_{max}}$ ; $V_{BE} = 0$ ; $T_j = 125$ °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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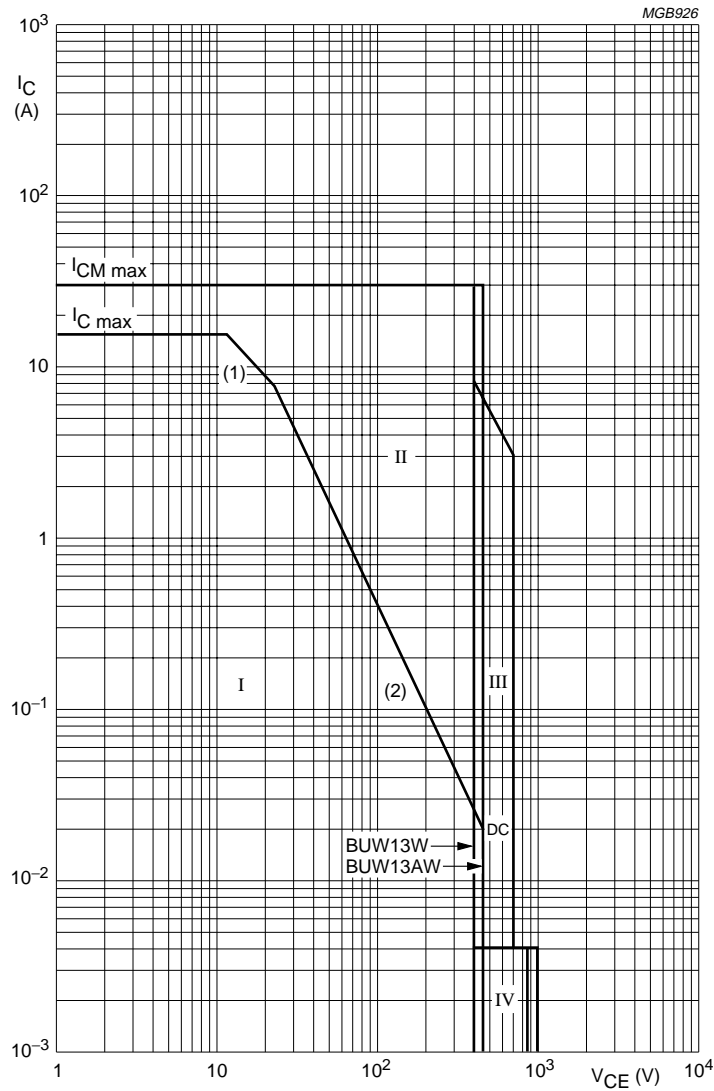
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Switching times resistive load</b> (see Figs 11 and 12)						
t <sub>on</sub>	turn-on time BUW13W BUW13AW	I <sub>Con</sub> = 10 A; I <sub>Bon</sub> = -I <sub>Boff</sub> = 2 A	-	-	1	μs
		I <sub>Con</sub> = 8 A; I <sub>Bon</sub> = -I <sub>Boff</sub> = 1.6 A	-	-	1	μs
t <sub>s</sub>	storage time BUW13W BUW13AW	I <sub>Con</sub> = 10 A; I <sub>Bon</sub> = -I <sub>Boff</sub> = 2 A	-	-	4	μs
		I <sub>Con</sub> = 8 A; I <sub>Bon</sub> = -I <sub>Boff</sub> = 1.6 A	-	-	4	μs
t <sub>f</sub>	fall time BUW13W BUW13AW	I <sub>Con</sub> = 10 A; I <sub>Bon</sub> = -I <sub>Boff</sub> = 2 A	-	-	0.8	μs
		I <sub>Con</sub> = 8 A; I <sub>Bon</sub> = -I <sub>Boff</sub> = 1.6 A	-	-	0.8	μs
<b>Switching times inductive load</b> (see Figs 13 and 14)						
t <sub>s</sub>	storage time BUW13W	I <sub>Con</sub> = 10 A; I <sub>B</sub> = 2 A	-	2.3	3	μs
		I <sub>Con</sub> = 10 A; I <sub>B</sub> = 2 A; T <sub>j</sub> = 100 °C	-	2.5	3.2	μs
	BUW13AW	I <sub>Con</sub> = 8 A; I <sub>B</sub> = 1.6 A	-	2.3	3	μs
		I <sub>Con</sub> = 8 A; I <sub>B</sub> = 1.6 A; T <sub>j</sub> = 100 °C	-	2.5	3.2	μs
t <sub>f</sub>	fall time BUW13W	I <sub>Con</sub> = 10 A; I <sub>B</sub> = 2 A	-	80	150	ns
		I <sub>Con</sub> = 10 A; I <sub>B</sub> = 2 A; T <sub>j</sub> = 100 °C	-	140	300	ns
	BUW13AW	I <sub>Con</sub> = 8 A; I <sub>B</sub> = 1.6 A	-	80	150	ns
		I <sub>Con</sub> = 8 A; I <sub>B</sub> = 1.6 A; T <sub>j</sub> = 100 °C	-	140	300	ns

**Note**

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

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

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  $t_p \leq 0.6\ \mu s$ .

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

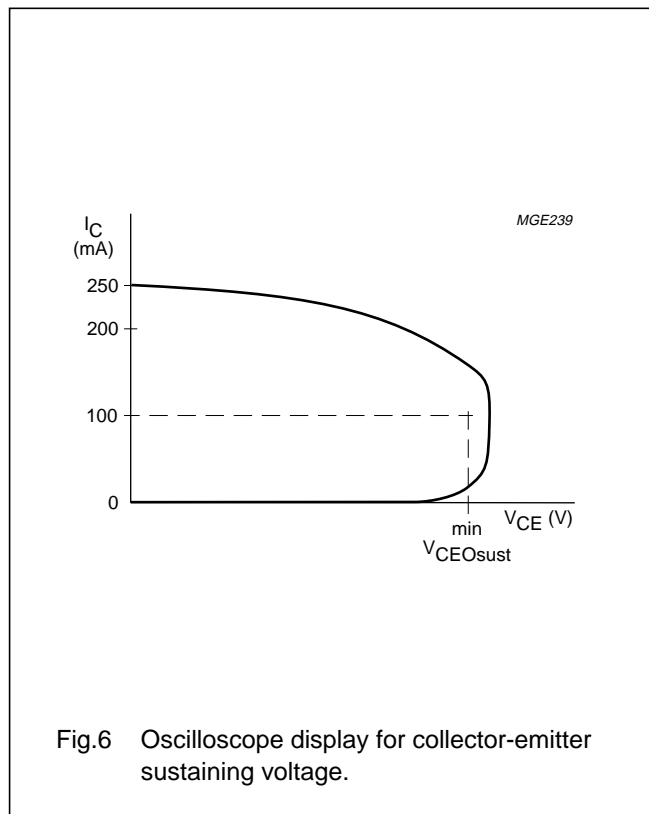
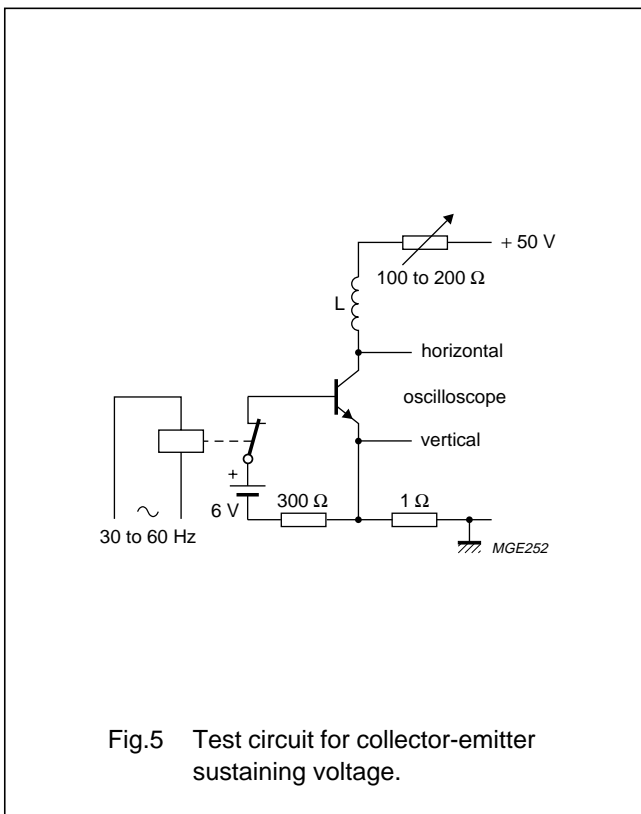
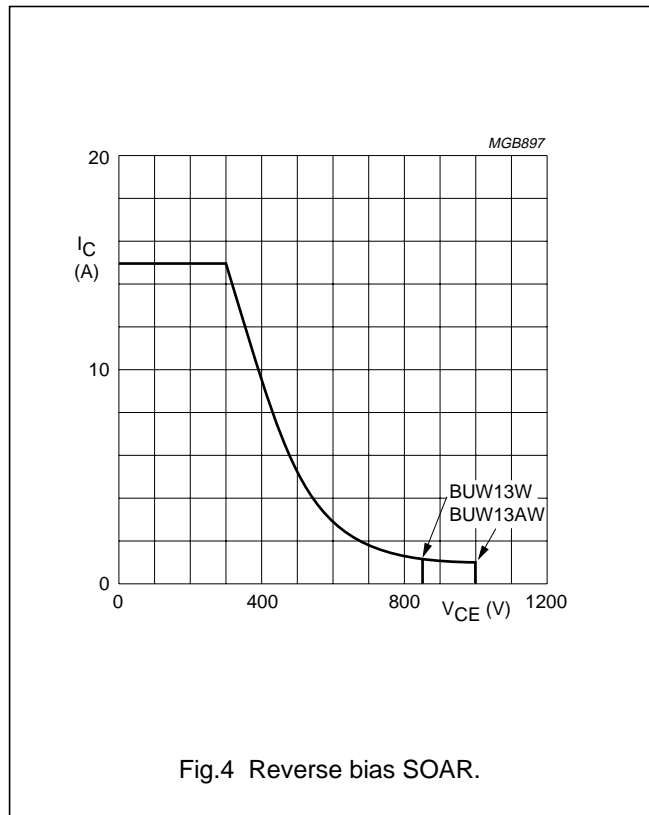
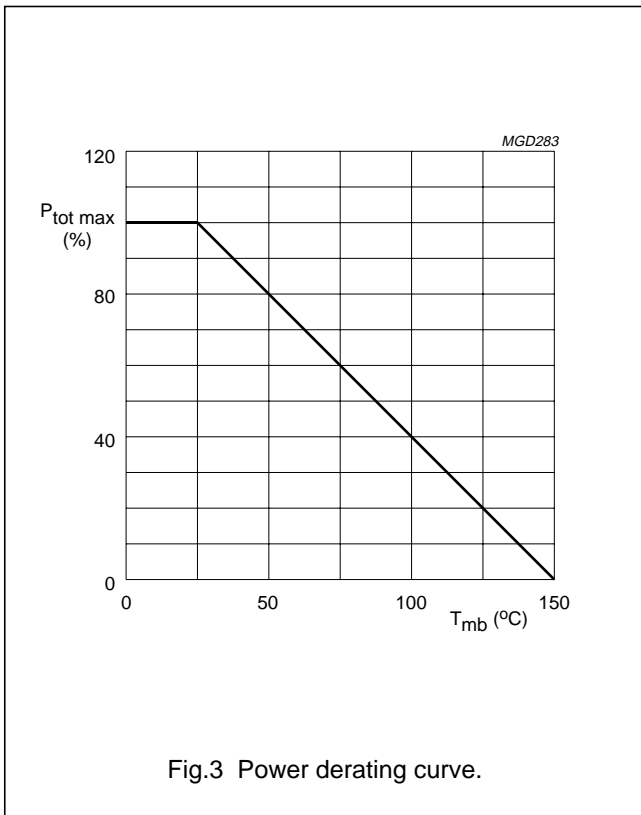
(1)  $P_{tot\ max}$  line.

(2) Second breakdown limits.

Fig.2 Forward bias SOAR.

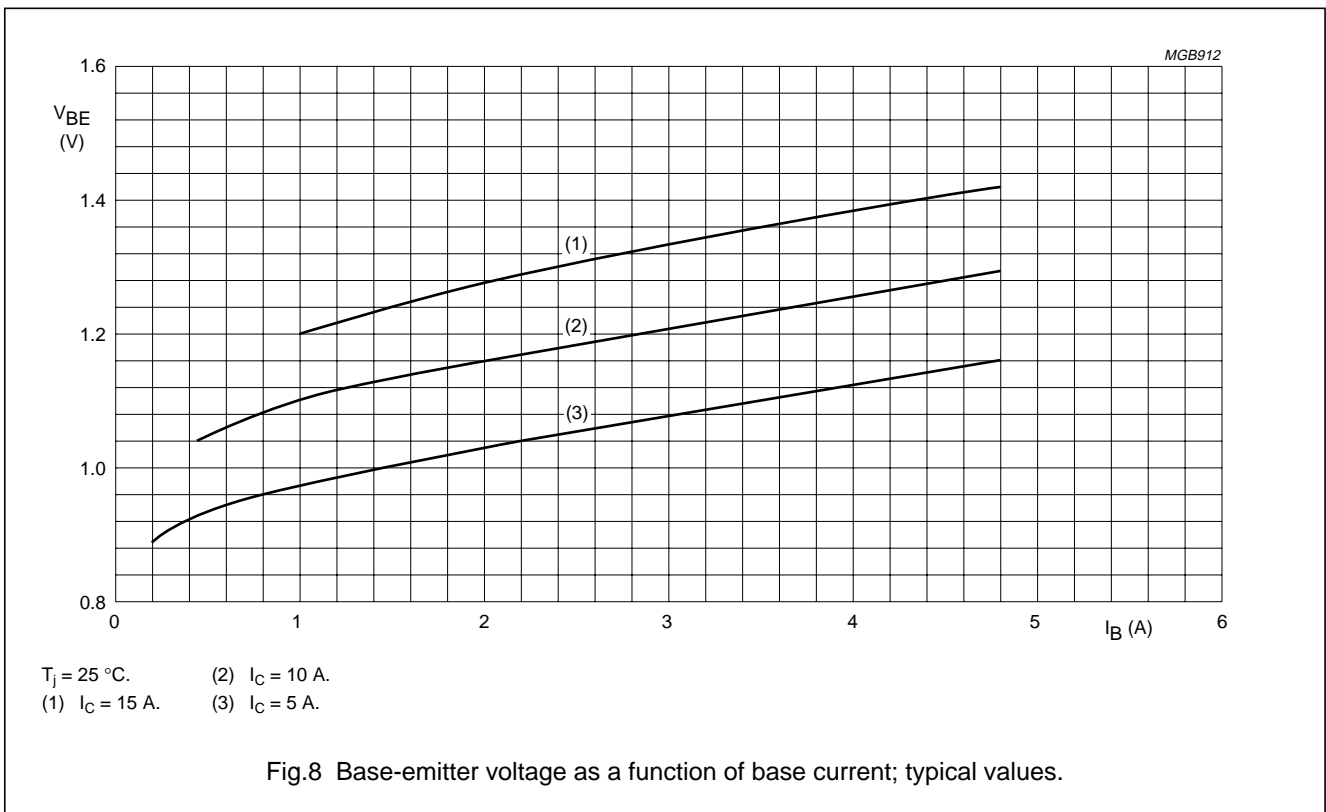
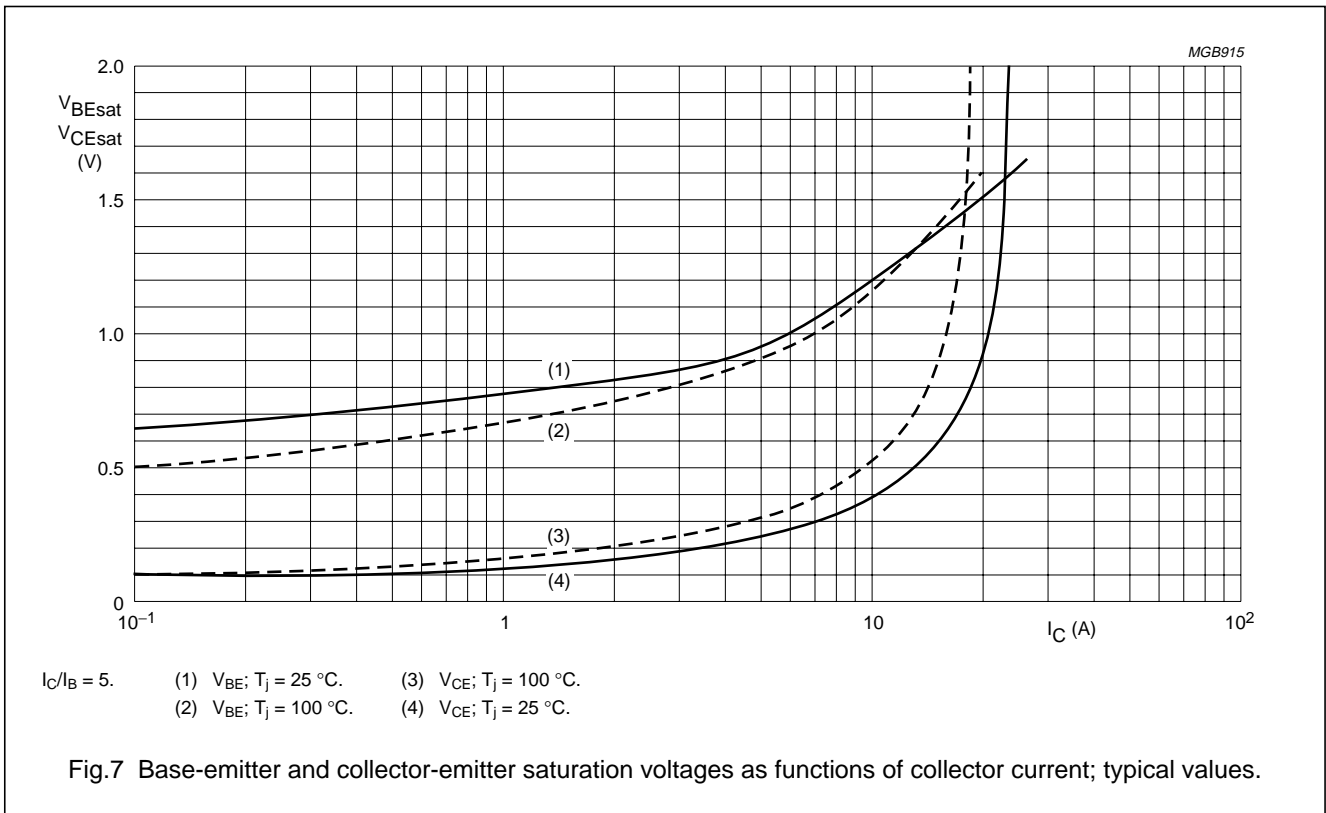
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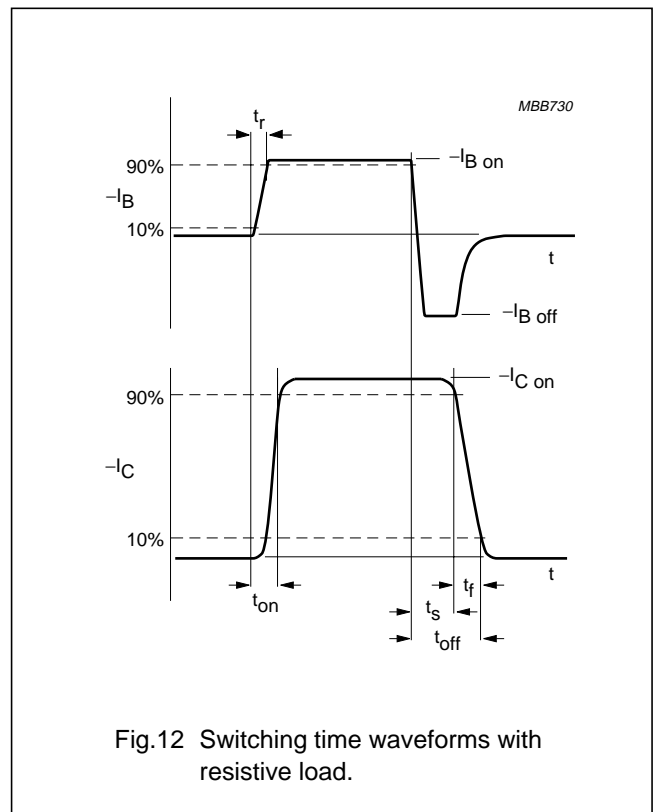
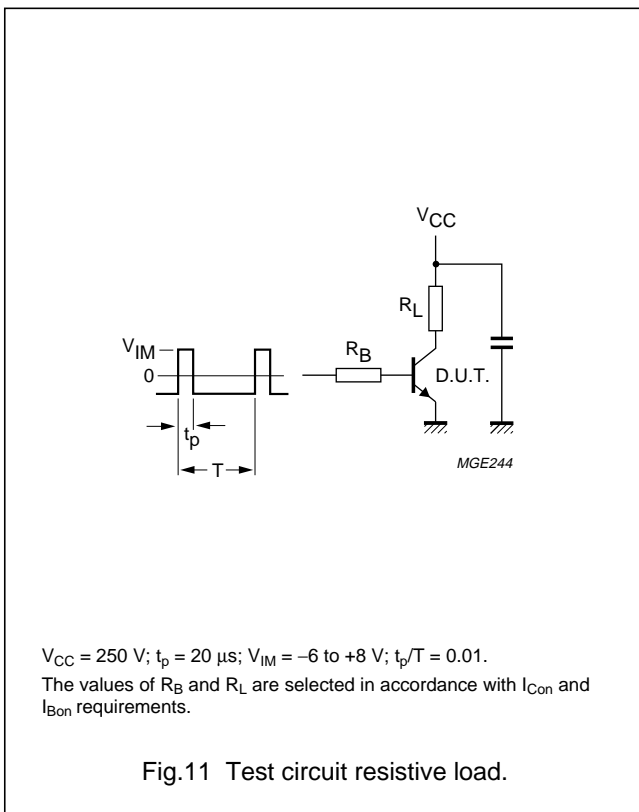
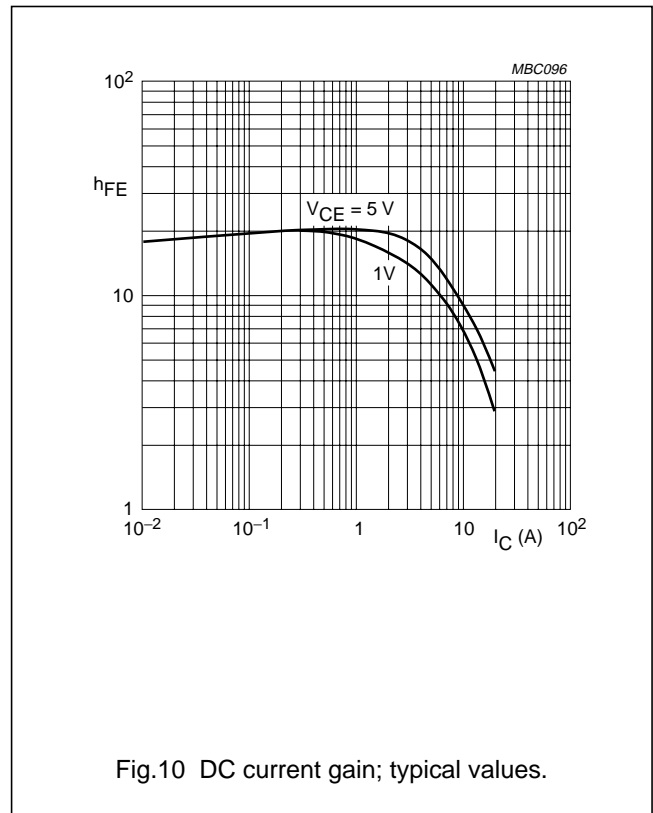
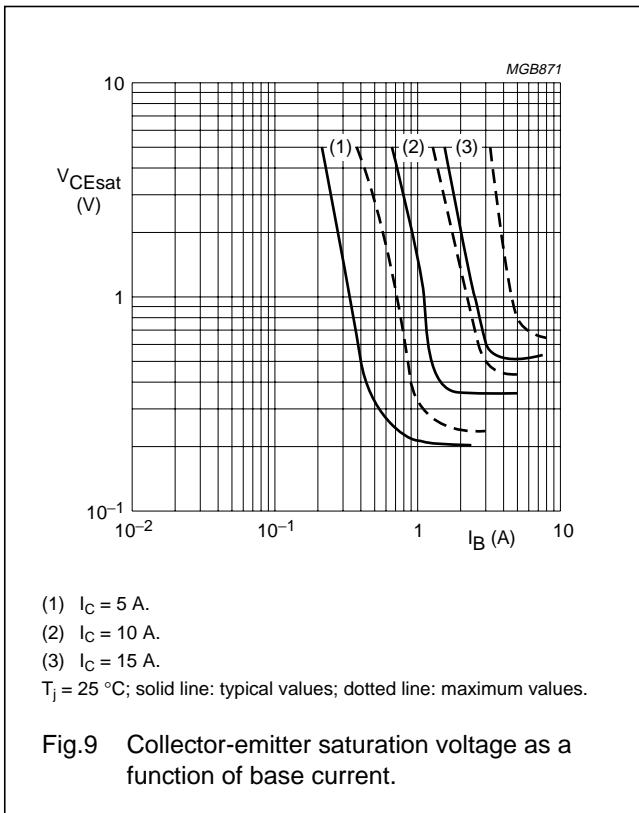
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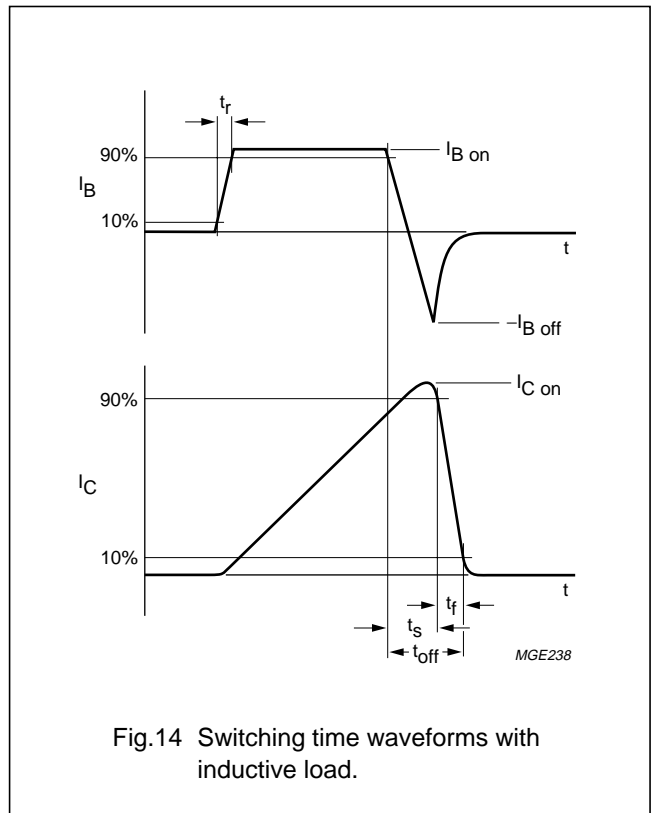
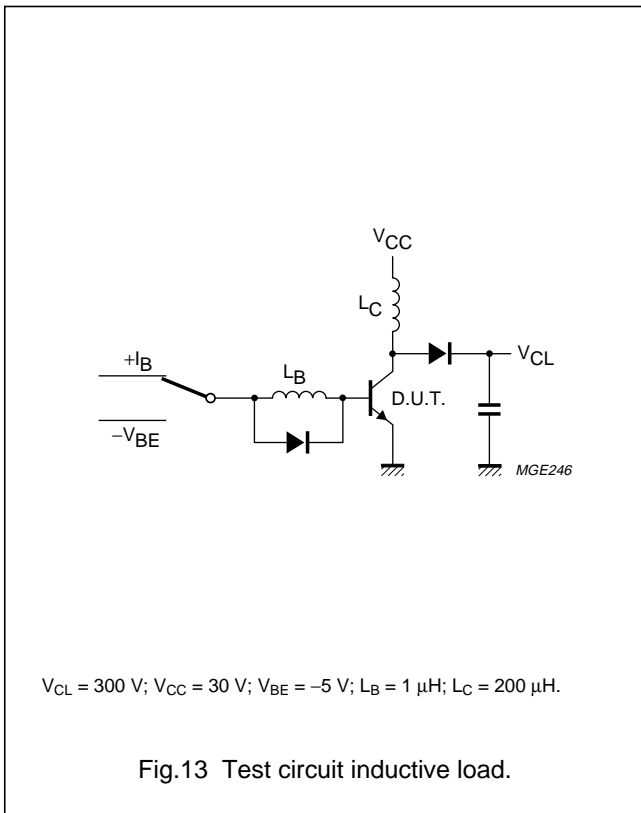
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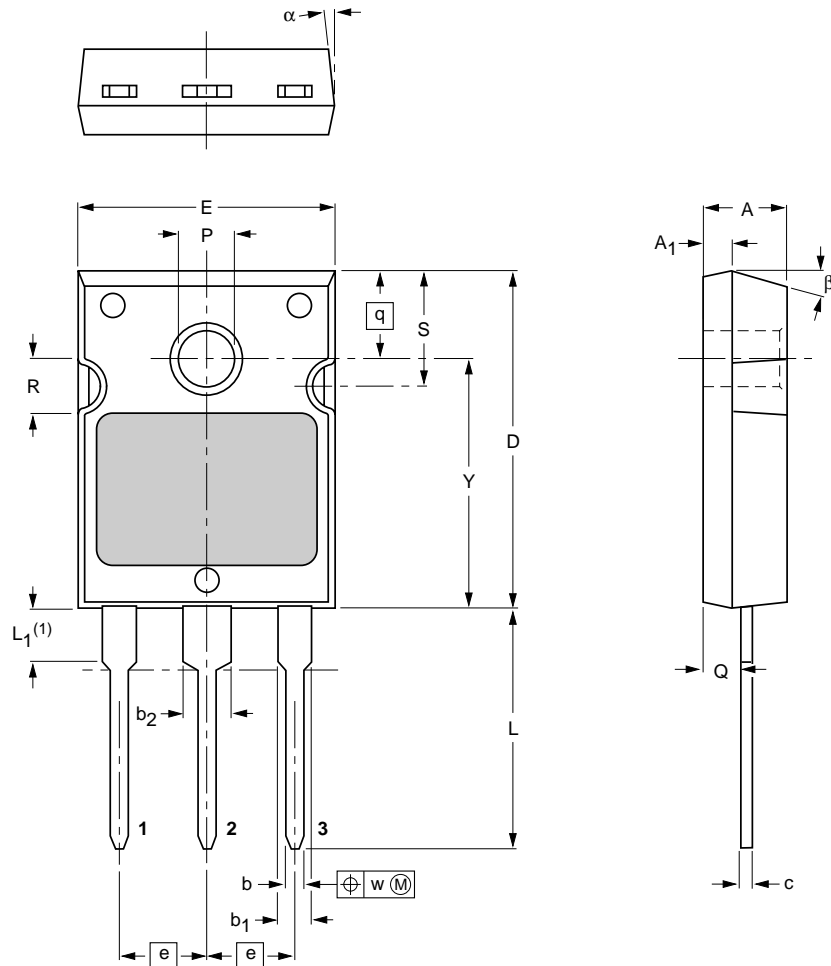
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PACKAGE OUTLINE

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

SOT429



DIMENSIONS (mm are the original dimensions)

UNIT	A	A <sub>1</sub>	b	b <sub>1</sub>	b <sub>2</sub>	c	D	E	e	L	L <sub>1</sub>	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 L<sub>1</sub>.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT429		TO-247				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.	
<b>Application information</b>	
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