Silicon diffused power transistors BUW13; BUW13A

High-voltage, high-speed, glass-passivated npn power transistors in a SOT93 envelope, intended for use in converters, inverters, switching regulators, motor control systems etc.

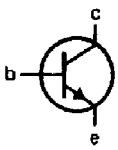
QUICK REFERENCE DATA

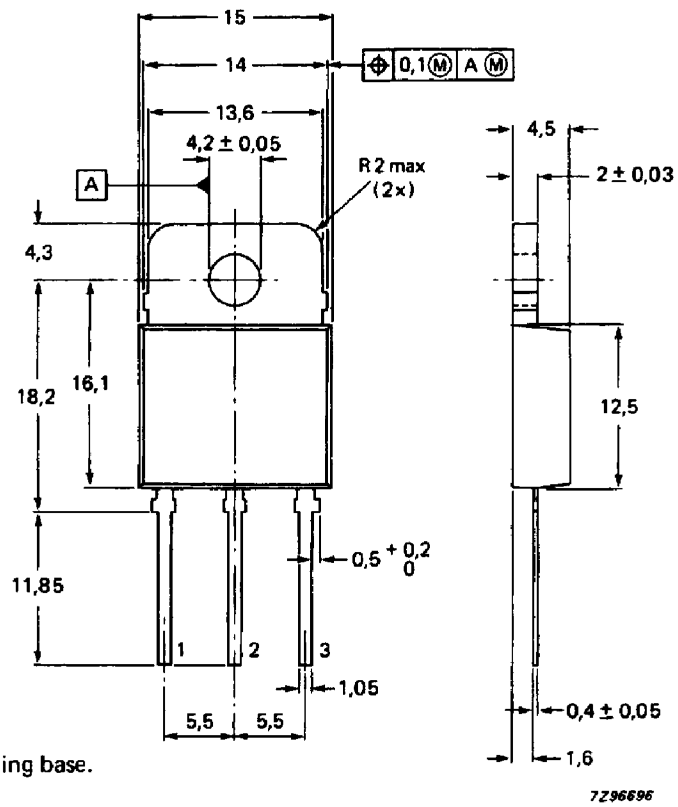
			BUW13	BUW13A	
Collector-emitter voltage (peak value; V_{BE} = 0)	V_{CESM}	max.	850	1000	V
Collector-emitter voltage (open base)	V_{CEO}	max.	400	450	V
Collector-emitter saturation voltage	V_{CEsat}	max.	1.5		V
Collector current (DC)	I_C	max.	15		A
Collector current (peak value)	I_{CM}	max.	30		A
Total power dissipation up to T_{mb} = 25 °C	P_{tot}	max.	175		W
Fall time	t_f	max.	0.8		µs

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT93.





Pinning:
1 = base
2 = collector
3 = emitter

Collector connected to mounting base.

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RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

			BUW13	BUW13A	
Collector-emitter voltage (peak value, $V_{BE} = 0$)	V_{CESM}	max.	850	1000	V
Collector-emitter voltage (open base)	V_{CEO}	max.	400	450	V
Collector current (DC)	I_C	max.	15		A
Collector current (peak value); $t_p < 2$ ms	I_{CM}	max.	30		A
Base current (DC)	I_B	max.	6		A
Base current (peak value); $t_p < 2$ ms	I_{BM}	max.	9		A
Total power dissipation up to $T_{mb} = 25$ °C	P_{tot}	max.	175		W
Storage temperature range	T_{stg}		−65 to +150		°C
Junction temperature	T_j	max.	150		°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\,j\text{-}mb}$	=	0,7	K/W

CHARACTERISTICS

$T_j = 25$ °C unless otherwise specified

Collector cut-off current*				
$V_{CE} = V_{CESMmax}$; $V_{BE} = 0$	I_{CES}	max.	1	mA
$V_{CE} = V_{CESMmax}$; $V_{BE} = 0$; $T_j = 125$ °C	I_{CES}	max.	4	mA
Emitter cut-off current				
$I_C = 0$; $V_{EB} = 9$ V	I_{EBO}	max.	10	mA

			BUW13	BUW13A	
Saturation voltages					
$I_C = 10$ A; $I_B = 2$ A	V_{CEsat}	max.	1,5	–	V
	V_{BEsat}	max.	1,6	–	V
$I_C = 8$ A; $I_B = 1,6$ A	V_{CEsat}	max.	–	1,5	V
	V_{BEsat}	max.	–	1,6	V
DC current gain					
$I_C = 20$ mA; $V_{CE} = 5$ V	h_{FE}	min.	10		
	h_{FE}	typ.	18		
	h_{FE}	max.	35		
$I_C = 1.5$ A; $V_{CE} = 5$ V	h_{FE}	min.	10		
	h_{FE}	typ.	20		
	h_{FE}	max.	35		
Collector-emitter sustaining voltage					
$I_C = 100$ mA; $I_{Boff} = 0$; $L = 25$ mH	$V_{CEOsust}$	min.	400	450	V

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

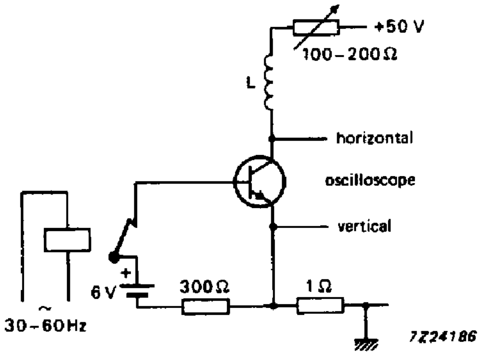


Fig. 2 Test circuit for $V_{CEOsust}$.

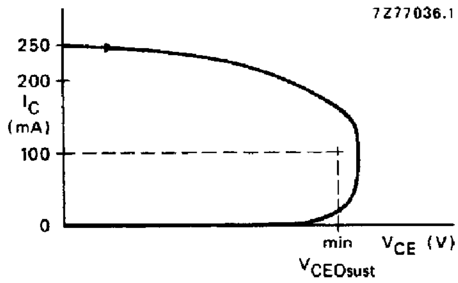
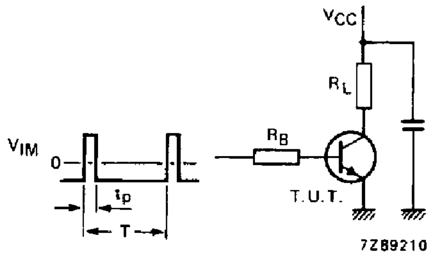


Fig. 3 Oscilloscope display for sustaining voltage.

			BUW13	BUW13A	
Switching times resistive load (Figs 4 and 5)					
I_{Con} = 10 A; I_{Bon} = $-I_{Boff}$ = 2 A					
Turn-on time	t_{on}	max.	1	–	μs
Turn-off: Storage time	t_s	max.	4	–	μs
Fall time	t_f	max.	0,8	–	μs
I_{Con} = 8 A; I_{Bon} = $-I_{Boff}$ = 1,6 A					
Turn-on time	t_{on}	max.	–	1	μs
Turn-off: Storage time	t_s	max.	–	4	μs
Fall time	t_f	max.	–	0,8	μs
Switching times inductive load (Figs 6 and 7)					
I_{Con} = 10 A; I_B = 2 A					
Turn-off: Storage time	t_s	typ.	2,3	–	μs
		max.	3,0	–	μs
Fall time	t_f	typ.	80	–	ns
		max.	150	–	ns
I_{Con} = 10 A; I_B = 2 A; T_j = 100 °C					
Turn-off: Storage time	t_s	typ.	2,5	–	μs
		max.	3,2	–	μs
Fall time	t_f	typ.	140	–	ns
		max.	300	–	ns
Switching times inductive load (Figs 6 and 7)					
I_{Con} = 8 A; I_B = 1,6 A					
Turn-off: Storage time	t_s	typ.	–	2,3	μs
		max.	–	3,0	μs
Fall time	t_f	typ.	–	80	ns
		max.	–	150	ns
I_{Con} = 8 A; I_B = 1,6 A; T_j = 100 °C					
Turn-off: Storage time	t_s	typ.	–	2,5	μs
		max.	–	3,2	μs
Fall time	t_f	typ.	–	140	ns
		max.	–	300	ns



V_{CC} = 250 V
V_{IM} = −6 to + 8 V
t_p = 20 μs
$\frac{t_p}{T}$ = 0,01
The values of R_B and R_L are selected in accordance with I_{Con} and I_B requirements.

Fig. 4 Test circuit resistive load.

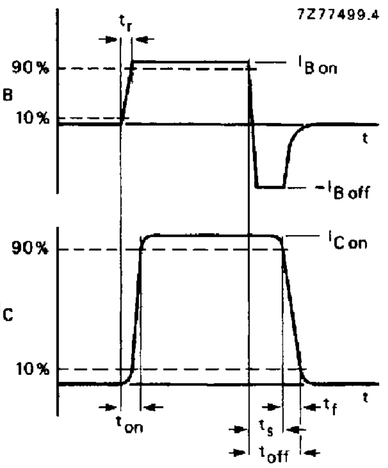


Fig. 5 Switching times waveforms with resistive load.

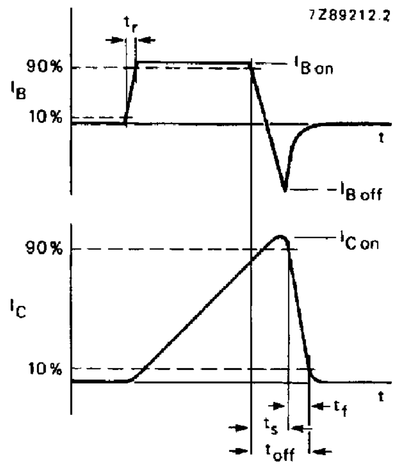
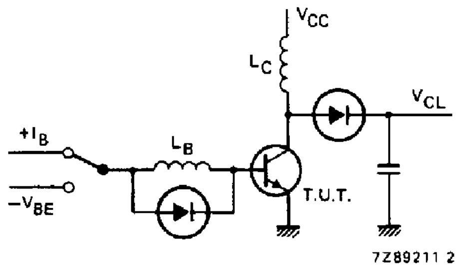
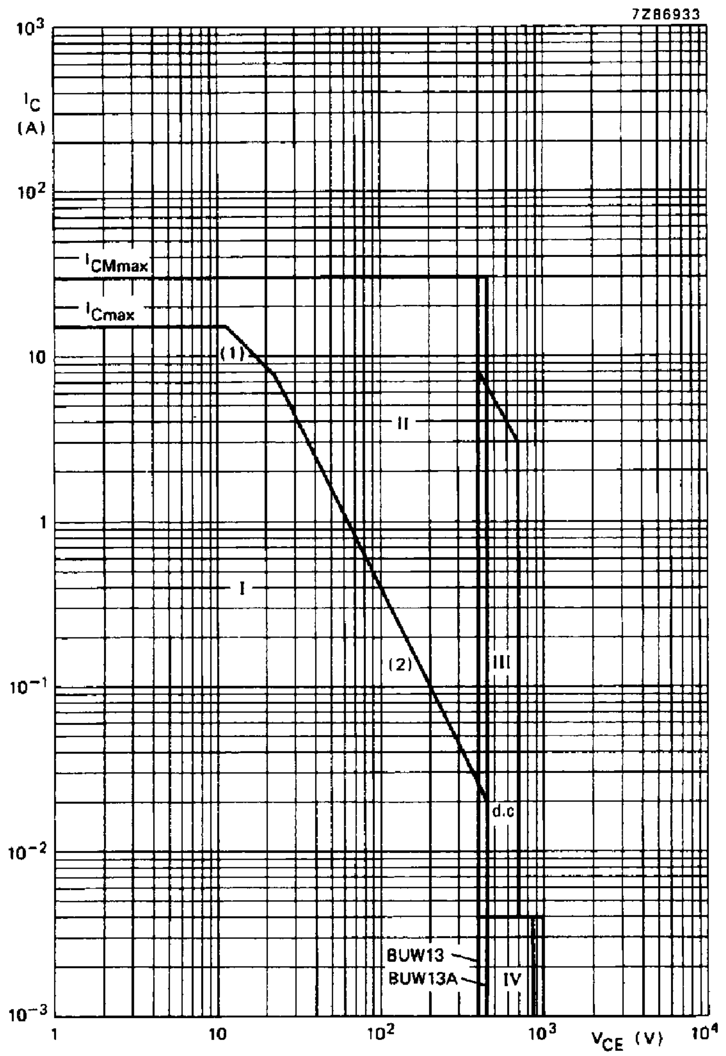


Fig. 6 Switching times waveforms with inductive load.



V_{CL} = 300 V
V_{CC} = 30 V
$-V_{BE}$ = 5 V
L_B = 1 μH
L_C = 200 μH

Fig. 7 Test circuit inductive load.



(1) $P_{tot\ max}$ line.
(2) Second-breakdown limits.

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 $R_{BE} \leqslant 100\ \Omega$ and $t_p \leqslant 0{,}6\ \mu s$.
IV Repetitive pulse operation in this region is permissible provided $V_{BE} \leqslant 0$ and $t_p \leqslant 5$ ms.

Fig. 8 Safe operating area at $T_{mb} \leqslant 25\ ^oC$.

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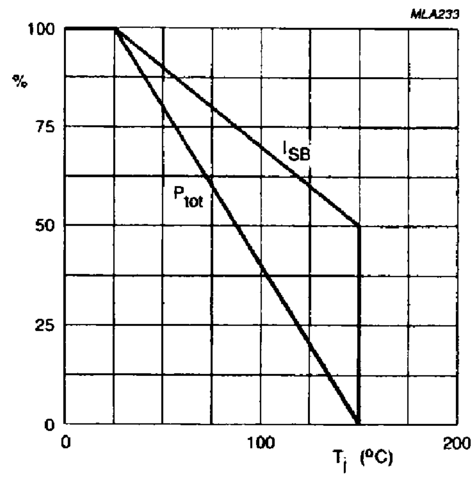

Fig. 9 Total power dissipation and second breakdown current curve.

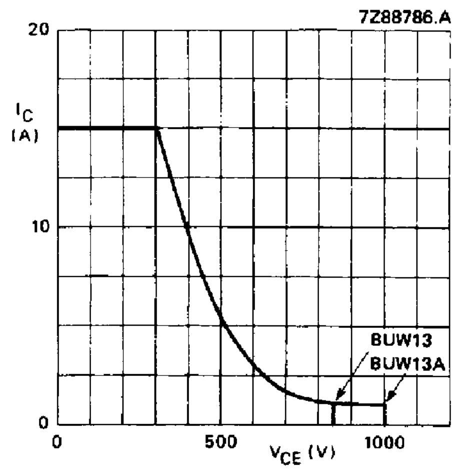

Fig. 10 Reverse bias SOAR.

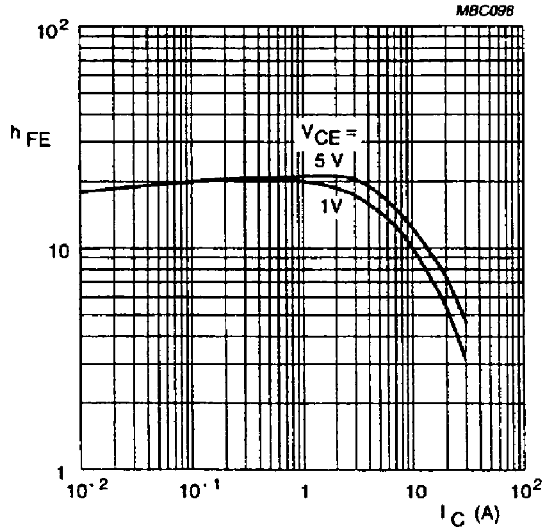

Fig.11 Typical values DC current gain.

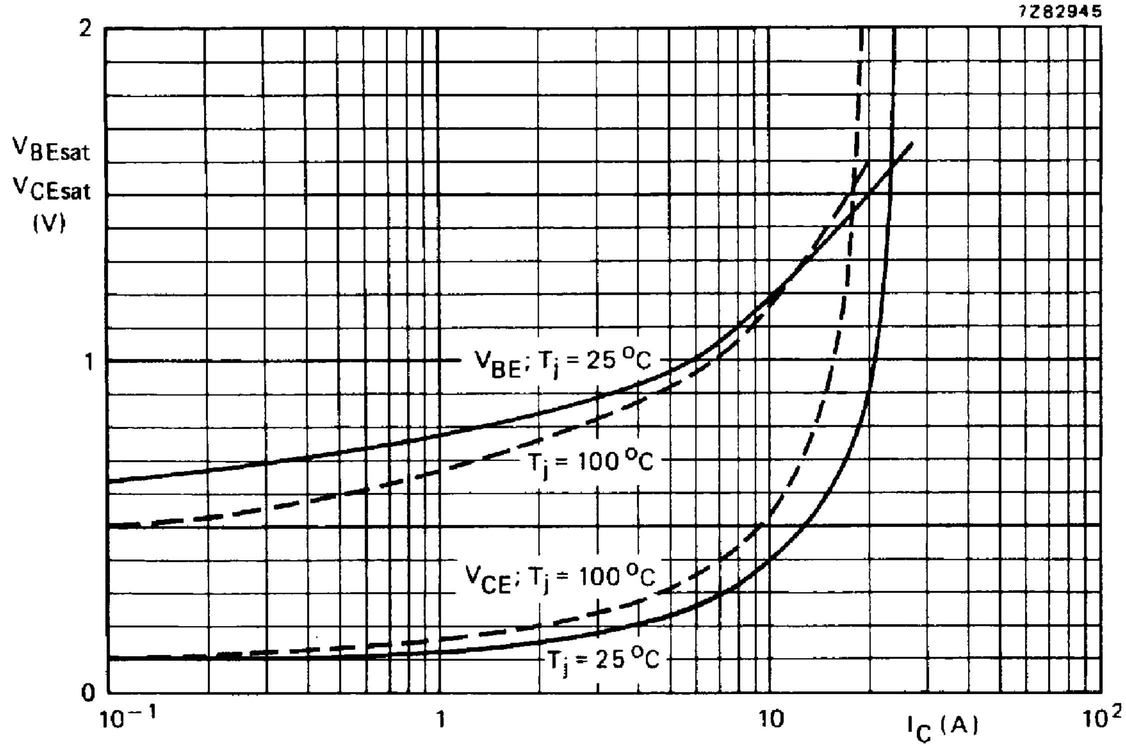

Fig. 12 Typical values base and collector voltage at I_C/I_B = 5.

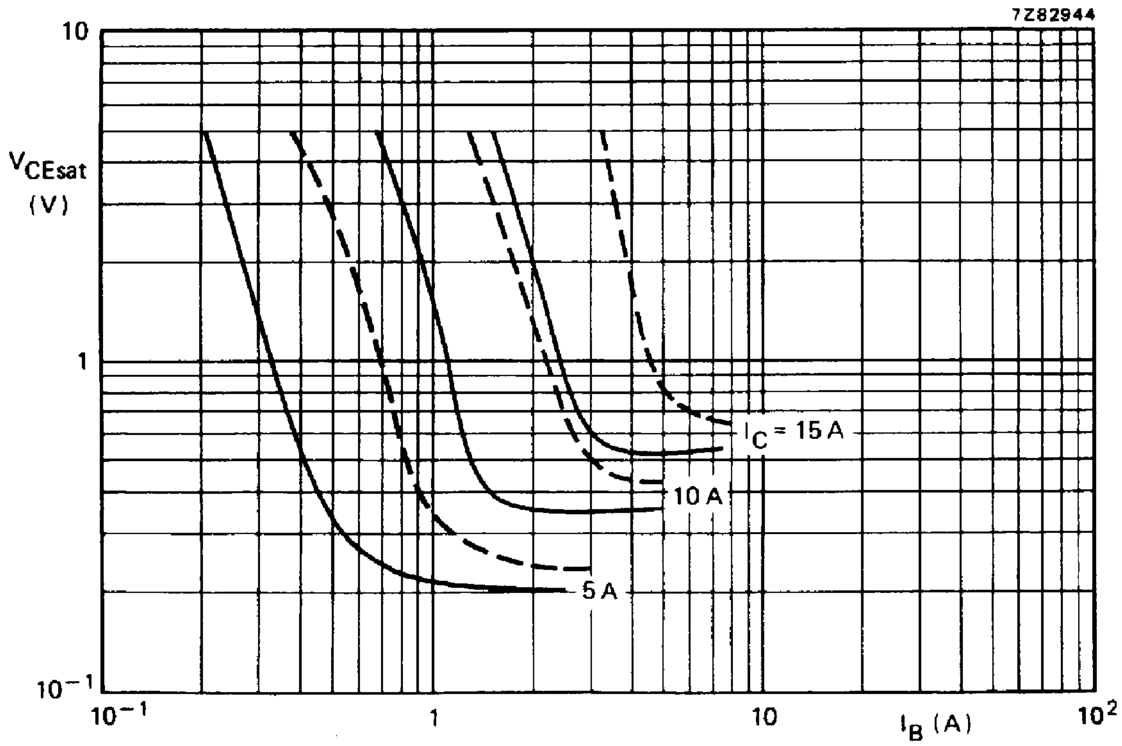

Fig. 13 Typical (——) and maximum (– – –) values saturation voltage. T_j = 25 °C.

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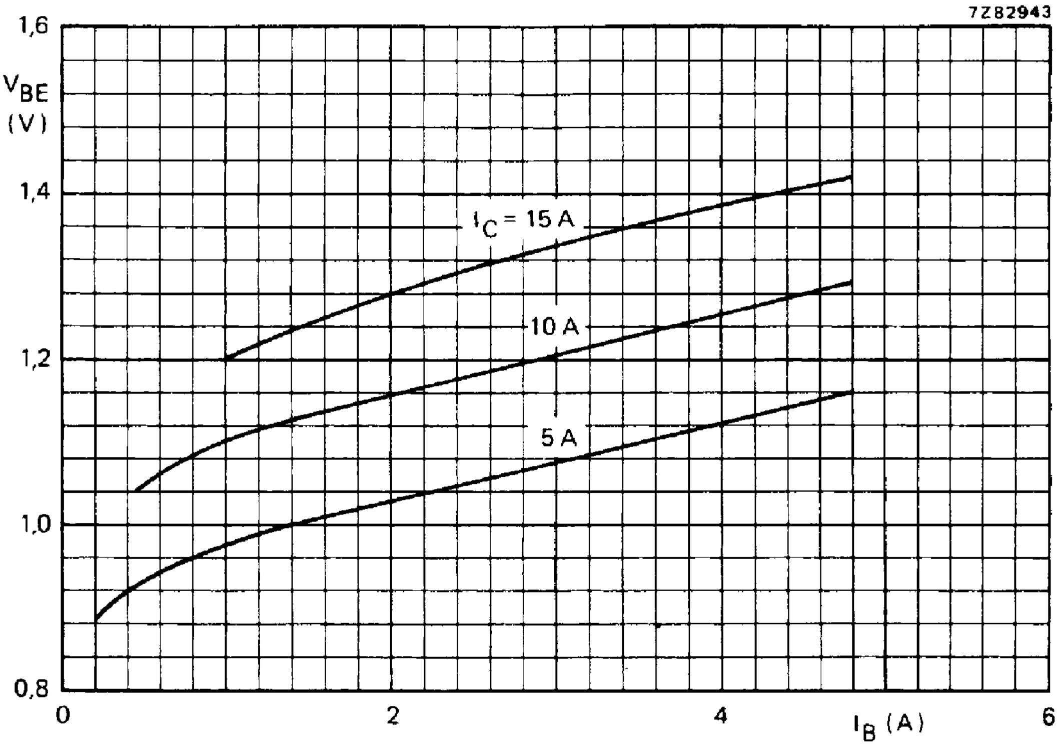

Fig. 14 Typical values base-emitter voltage at T_j = 25 °C.