Silicon diffused power transistors — BUW12F; BUW12AF

High-voltage, high-speed, glass-passivated npn power transistor in a SOT199 envelope intended for use in converters, inverters, switching regulators, motor control systems, etc.

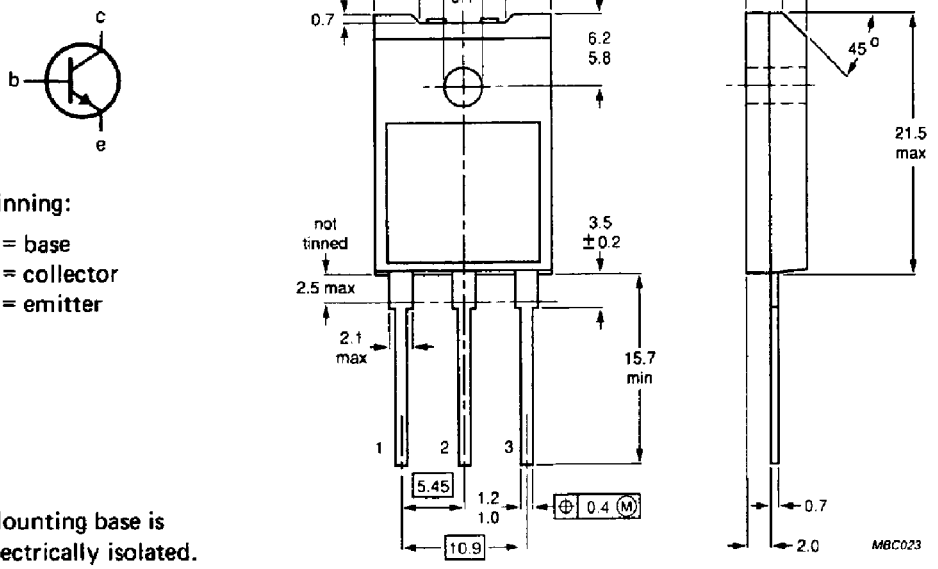
QUICK REFERENCE DATA

			BUW12F	BUW12AF	
Collector-emitter voltage					
peak value; V_{BE} = 0	V_{CESM}	max.	850	1000	V
open base	V_{CEO}	max.	400	450	V
Collector-emitter saturation voltage	V_{CEsat}	max.	1.5	1.5	V
Collector current					
saturation	I_{Csat}	max.	6.0	5.0	A
DC	I_C	max.	8.0		A
peak value	I_{CM}	max.	20		A
Total power dissipation					
up to T_{mb} = 25 °C	P_{tot}	max.	34		W
Fall time	t_f	max.	0.8		μs

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT199.



Pinning:

1 = base
2 = collector
3 = emitter

Mounting base is electrically isolated.

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RATINGS

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

			BUW12F	BUW12AF	
Collector-emitter voltage					
peak value; V_{BE} = 0	V_{CESM}	max.	850	1000	V
open base	V_{CEO}	max.	400	450	V
Collector current					
saturation	I_{Csat}		6.0	5.0	A
DC	I_C	max.	8.0		A
peak value	I_{CM}	max.	20		A
Base current					
DC	I_B	max.	4.0		A
peak value	I_{BM}	max.	6.0		A
Total power dissipation					
up to T_h = 25 °C (note 1)	P_{tot}	max.	34		W
Total power dissipation					
up to T_h = 25 °C (note 2)	P_{tot}	max.	45		W
Storage temperature range	T_{stg}		−65 to + 150		°C
Junction temperature	T_j	max.	150		°C

THERMAL RESISTANCE

From junction to external heatsink (note 1)	$R_{th\ j\text{-}h}$	=	3.7	K/W
From junction to external heatsink (note 2)	$R_{th\ j\text{-}h}$	=	2.8	K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	35	K/W

ISOLATION

Isolation voltage from all terminals to external heatsink (peak value)	V_{isol}	max.	1500	V
Isolation capacitance from collector to external heatsink	C_{isol}	max.	21	pF

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off currents (note 3)				
$V_{CE} = V_{CESMmax}$; V_{BE} = 0	I_{CES}	max.	1.0	mA
$V_{CE} = V_{CESMmax}$; V_{BE} = 0; T_j = 125 °C	I_{CES}	max.	3.0	mA
Emitter cut-off current				
V_{EB} = 9 V; I_C = 0	I_{EBO}	max.	10	mA

Notes

1. Mounted without heatsink compound and 30 ± 5 newtons pressure on centre of envelope.
2. Mounted with heatsink compound and 30 ± 5 newtons pressure on centre of envelope.
3. Measured with a half-sinewave voltage (curve tracer).

			BUW12F	BUW12AF
Saturation voltages				
I_C = 6 A; I_B = 1.2 A	V_{CEsat}	max.	1.5	– V
	V_{BEsat}	max.	1.5	– V
I_C = 5 A; I_B = 1.0 A	V_{CEsat}	max.	–	1.5 V
	V_{BEsat}	max.	–	1.5 V
Collector-emitter sustaining voltage (Figs 2 and 3)				
I_C = 100 mA; $I_{B\ off}$ = 0; L = 25 mH	$V_{CEOsust}$	min.	400	450 V
Collector saturation current				
V_{CE} = 1.5 V	I_{Csat}	max.	6.0	5.0 A
DC current gain				
I_C = 10 mA; V_{CE} = 5 V	h_{FE}	min.	10	
	h_{FE}	typ.	18	
	h_{FE}	max.	35	
I_C = 1 A; V_{CE} = 5 V	h_{FE}	min.	10	
	h_{FE}	typ.	20	
	h_{FE}	max.	35	
Switching times resistive load (Figs 4 and 5)				
$I_{C\ on}$ = 6 A; $I_{B\ on}$ = $I_{B\ off}$ = 1.2 A				
Turn-on time	t_{on}	max.	1.0	– µs
Turn-off; storage time	t_s	max.	4.0	– µs
fall time	t_f	max.	0.8	– µs
$I_{C\ on}$ = 5 A; $I_{B\ on}$ = $I_{B\ off}$ = 1 A				
Turn-on time	t_{on}	max.	–	1.0 µs
Turn-off; storage time	t_s	max.	–	4.0 µs
fall time	t_f	max.	–	0.8 µs
Switching times inductive load (Figs 6 and 7)				
$I_{C\ on}$ = 6 A; I_B = 1.2 A; V_{CL} = 250 V; T_c = 100 °C				
Turn-off; storage time	t_s	typ.	1.9	– µs
	t_s	max.	2.5	– µs
fall time	t_f	typ.	200	– ns
	t_f	max.	300	– ns
$I_{C\ on}$ = 5 A; I_B = 1 A; V_{CL} = 300 V; T_c = 100 °C				
Turn-off; storage time	t_s	typ.	–	1.9 µs
	t_s	max.	–	2.5 µs
fall time	t_f	typ.	–	200 ns
	t_f	max.	–	300 ns

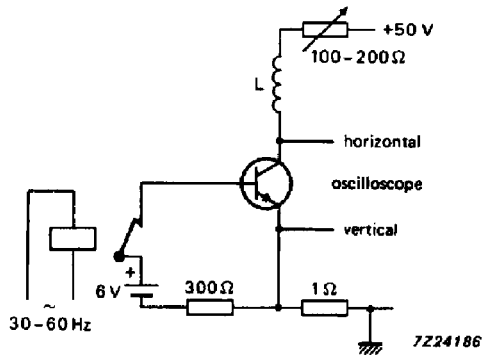


Fig. 2 Test circuit for $V_{CEOsust}$.

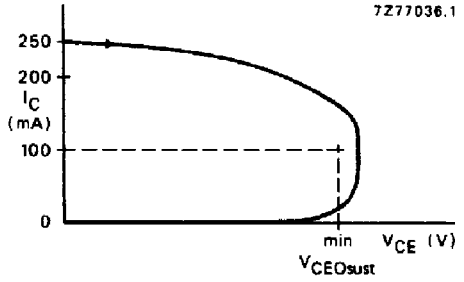


Fig. 3 Oscilloscope display for sustaining voltage.

V_{CC} = 250 V
t_p = 20 μs
V_{IM} = −6 to + 8 V
$\frac{t_p}{T}$ = 0.01

The values of R_B and R_L are selected in accordance with $I_{C\,on}$ and I_B requirements

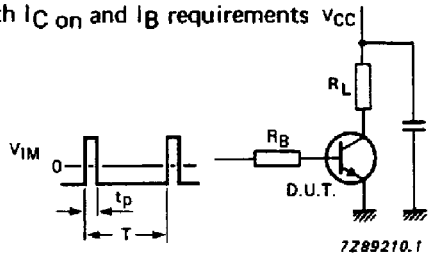


Fig. 4 Test circuit resistive load.

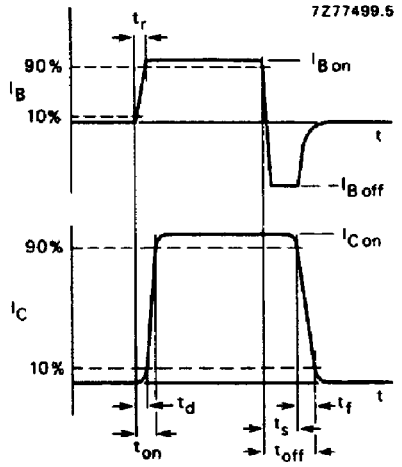


Fig. 5 Switching waveforms with resistive load; $t_f \leqslant 20$ ns.

V_{CL} = up to 1000 V
V_{CC} = 30 V
$-V_{BE}$ = 1 V to 5 V
L_B = 1.0 μH
L_C = 200 μH

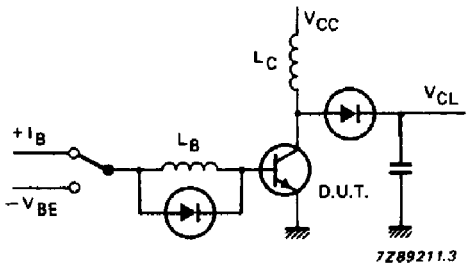


Fig. 6 Test circuit inductive load and reverse bias SOAR.

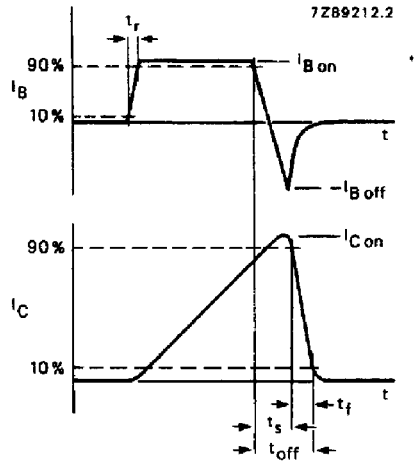
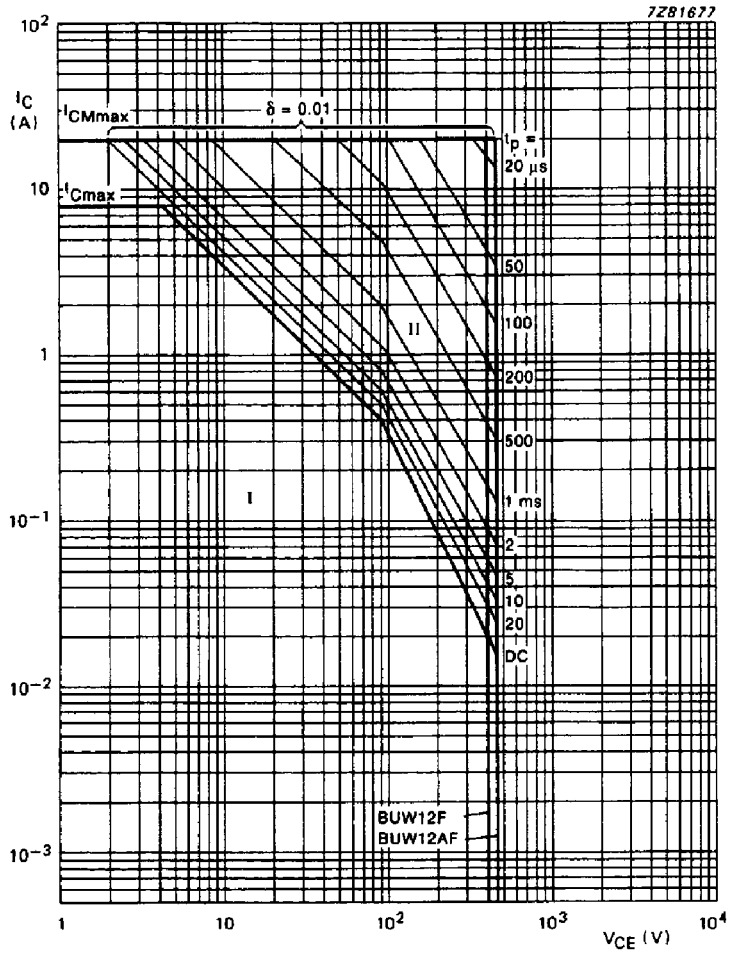


Fig. 7 Switching times waveforms with inductive load.



Mounted without heatsink compound and 30 ± 5 newtons pressure on the centre of the envelope.

I Region of permissible DC operation.
II Permissible extension for repetitive pulse operation.

Fig. 8 Safe operating area at $T_{mb} < 25$ °C.

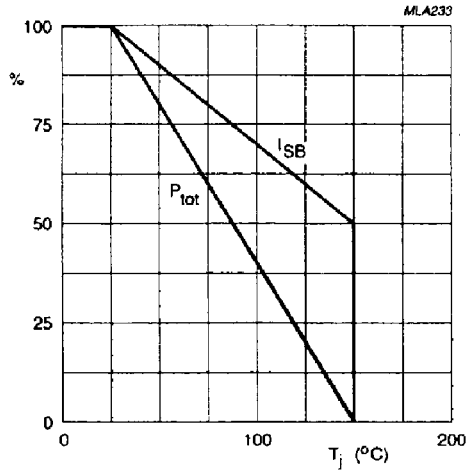


Fig. 9 Total power dissipation and second breakdown current curve.

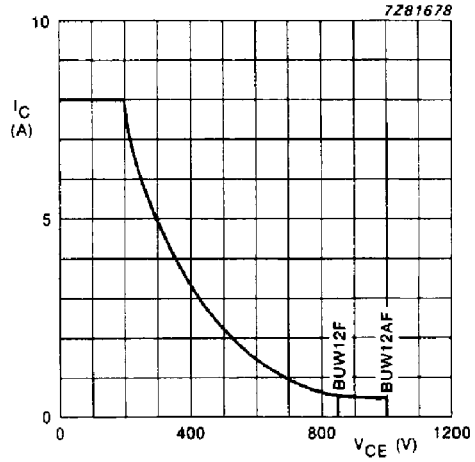


Fig. 10 RB SOAR; $T_c \leqslant 100$ °C; $V_{BE} = -1$ V to -5 V.

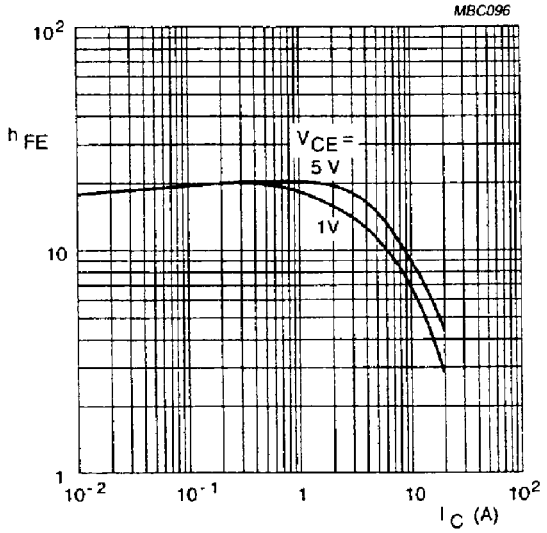


Fig. 11 Typical values DC current gain; T_j = 125 °C.

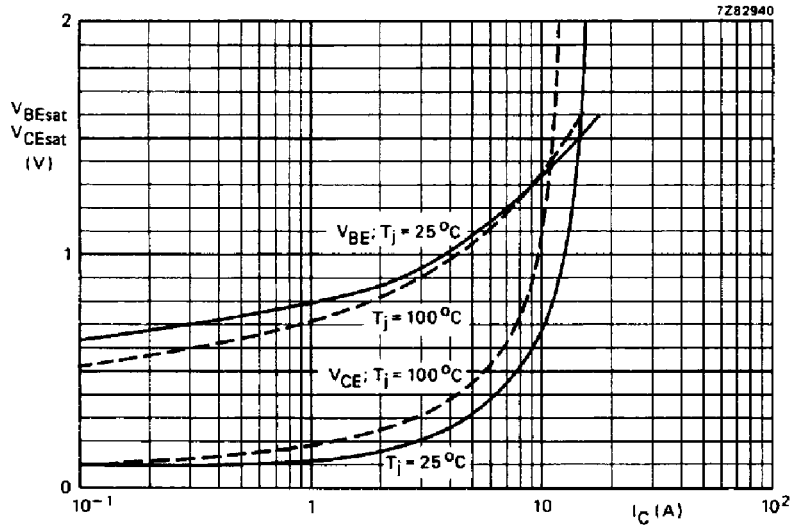


Fig. 12 Typical values base and collector voltages at $I_C/I_B = 5$.

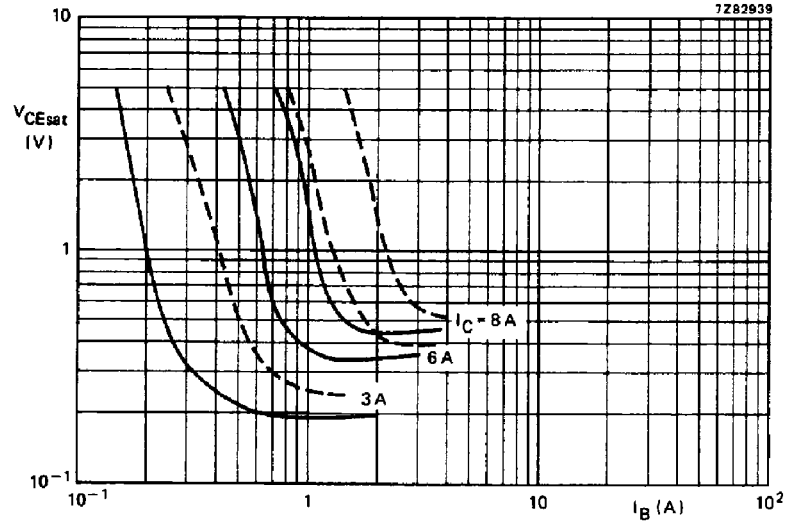


Fig. 13 Typical (——) and maximum (— — —) values saturation voltage; T_j = 25 °C.

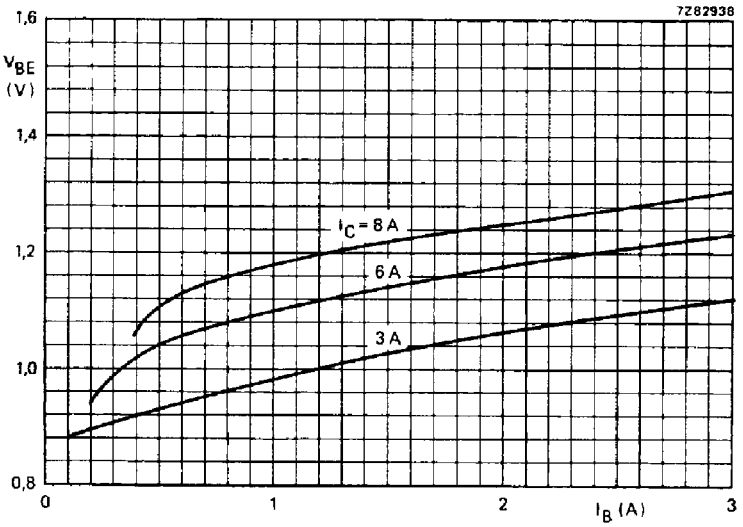


Fig. 14 Typical values base-emitter voltage at T_j = 25 °C.

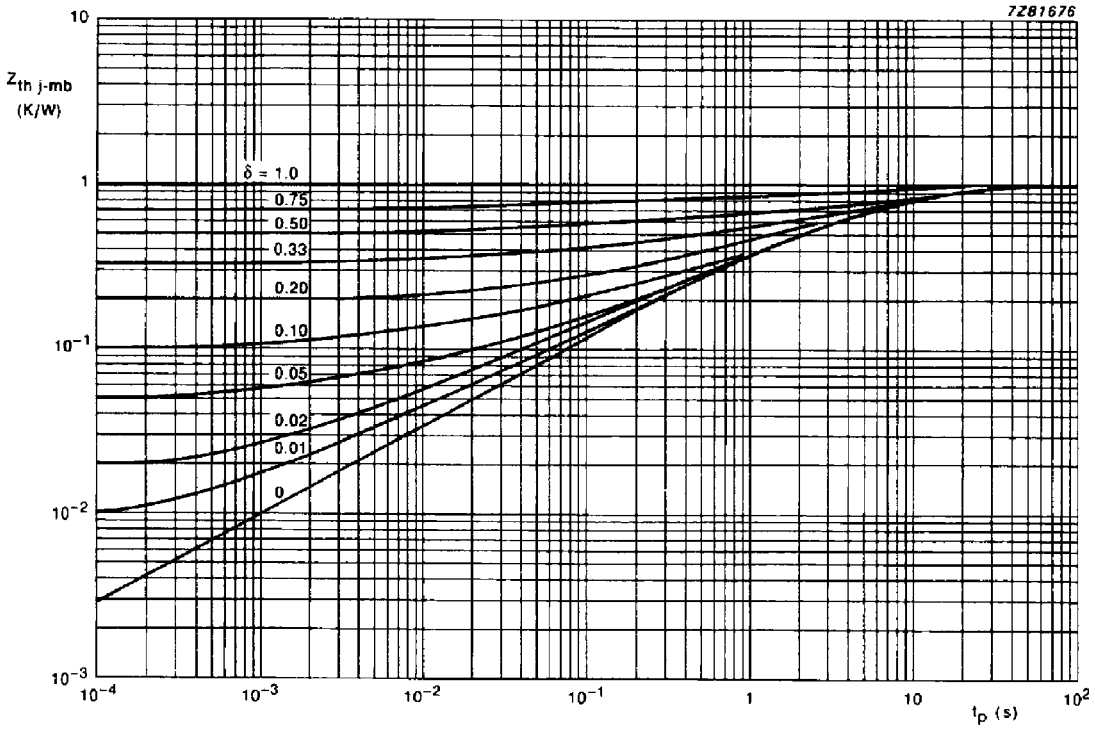


Fig. 15 Normalized thermal response at pulse power conditions.