SILICON DIFFUSED POWER TRANSISTORS

High-voltage, high-speed, glass-passivated npn power transistor in a SOT186 envelope with electrically isolated seating plane, intended for use in converters, inverters, switching regulators, motor control systems etc.

QUICK REFERENCE DATA

			BUT21BF	21CF	
Collector-emitter voltage					
peak value; $V_{BE} = 0$	V_{CESM}	max.	750	850	V
open base	V_{CEO}	max.	400	450	V
Collector-emitter saturation voltage					
$I_C = 3$ mA	V_{CEsat}	max.	1.5		V
Collector current					
saturation	I_{Csat}	max.	3.0		A
DC	I_C	max.	5.0		A
peak value	I_{CM}	max.	10		A
Total power dissipation up to $T_h = 25$ °C	P_{tot}	max.	20		W
Fall time	t_f	max.	0.7		μs

MECHANICAL DATA

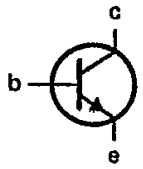
Dimensions in mm

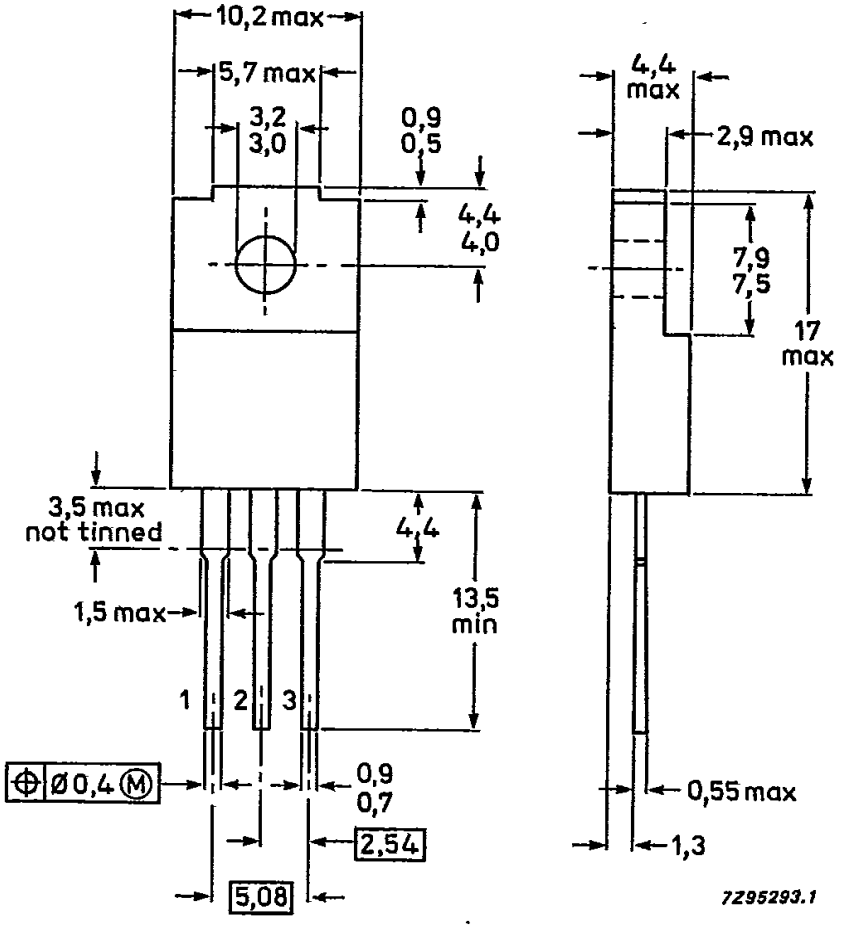
Fig.1 SOT186.

Pinning

1 = base
2 = collector
3 = emitter

Mounting base is electrically isolated from all terminals.





RATINGS

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

			BUT21BF	21CF	
Collector-emitter voltage					
peak value; $V_{BE} = 0$	V_{CESM}	max.	750	850	V
open base	V_{CEO}	max.	400	450	V
Collector current					
saturation	I_{Csat}	max.	3.0		A
DC	I_C	max.	5.0		A
peak value	I_{CM}	max.	10		A
Base current					
DC	I_B	max.	2.0		A
peak value	I_{BM}	max.	4.0		A
Total power dissipation					
up to $T_h = 25\ ^oC$	P_{tot}	max.	20		W
Storage temperature	T_{stg}		−65 to + 150		°C
Junction temperature	T_j	max.	150		°C

THERMAL RESISTANCE

From junction to internal header	$R_{th\ j\text{-}mb}$	=	1.46	K/W
From junction to external heatsink (note 1)	$R_{th\ j\text{-}h}$	=	6.46	K/W
From junction to external heatsink (note 2)	$R_{th\ j\text{-}h}$	=	3.96	K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	55	K/W

ISOLATION

Isolation voltage from all terminals to external heatsink (peak value)	V_{isol}	max.	1000	V
Isolation capacitance from collector to external heatsink	C_{isol}	typ.	12	pF

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.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

			BUT21BF	21CF	
Collector cut-off currents					
$V_{CE} = V_{CESmax}$; $V_{BE} = 0$	I_{CES}	max.	1.0		mA
Emitter cut-off current					
V_{EB} = 9 V; I_C = 0	I_{EBO}	max.	10		mA
Current gain					
I_C = 0.5 A; V_{CE} = 10 V	h_{FE}	typ.	25		
Saturation voltages					
I_C = 3 A; I_B = 0.4 A	V_{CEsat}	max.	1.5	—	V
	V_{BEsat}	max.	1.5	—	V
I_C = 3 A; I_B = 0.5 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 = 0; L = 25 mH	$V_{CEOsust}$	min.	400	450	V
Switching times resistive load (Figs 4 and 5)					
$I_{C\,on}$ = 3 A; $I_{B\,on} = I_{B\,off}$ = 0.4 A					
V_{CC} = 250 V; t_p = 20 μs; T = 2 ms					
Turn-on time	t_{on}	max.	1.0	—	μs
Turn-off					
storage time	t_s	max.	4.5	—	μs
fall time	t_f	max.	0.7	—	μs
$I_{C\,on}$ = 3 A; $I_{B\,on} = I_{B\,off}$ = 0.5 A					
Turn-on time	t_{on}	max.	—	1.0	μs
Turn-off					
storage time	t_s	max.	—	4.5	μs
fall time	t_f	max.	—	0.7	μs
Switching times inductive load (Figs 6 and 7)					
$I_{C\,on}$ = 3 A; $I_{B\,on}$ = $I_{B\,on}$ as resistive load; V_{CL} = 250 V; $-V_{BE}$ = −5 V; L_B = 1 μH; T_c = 100 °C					
Turn-off					
storage time	t_s	typ.	2.0	—	μs
	t_s	max.	2.5	—	μs
fall time	t_f	typ.	100	—	μs
	t_f	max.	250	—	μs
$I_{C\,on}$ = 3 A; $I_B = I_{B\,on}$ as resistive load; V_{CL} = 250 V; T_c = 100 °C					
Turn-off					
storage time	t_s	typ.	—	2.0	μs
	t_s	max.	—	2.5	μs
fall time	t_f	typ.	—	100	μs
	t_f	max.	—	250	μs

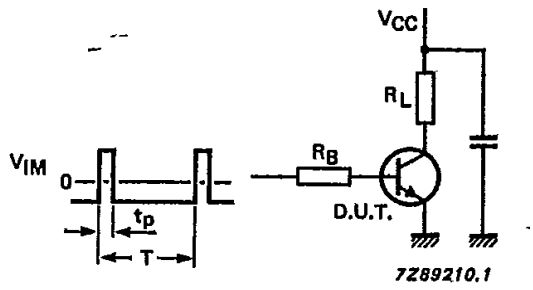


Fig.2 Test circuit for $V_{CEOsust}$.

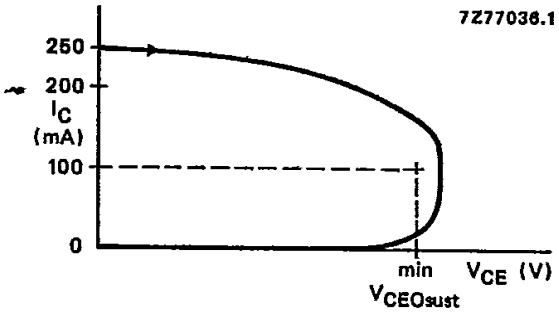


Fig.3 Oscilloscope display for sustaining voltage.

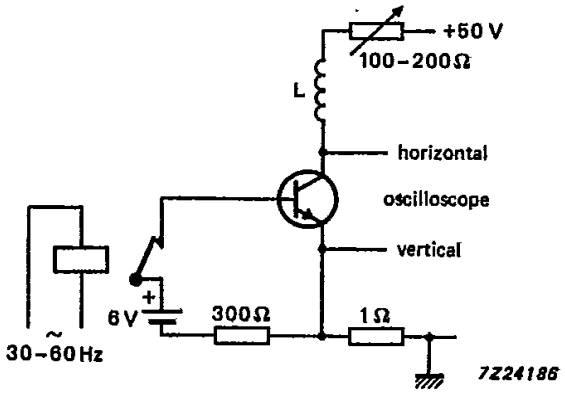


Fig.4 Test circuit resistive load.

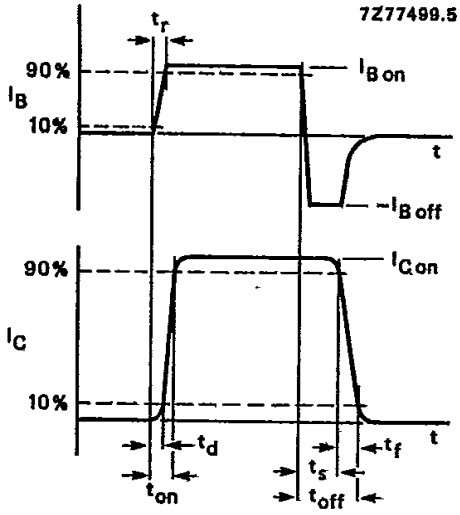


Fig.5 Switching times waveforms with resistive load; t_r max. 30 ns.

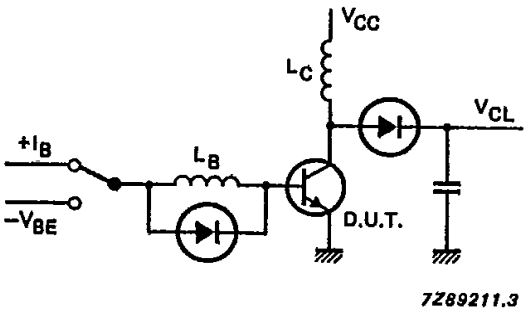


Fig.6 Test circuit inductive load.

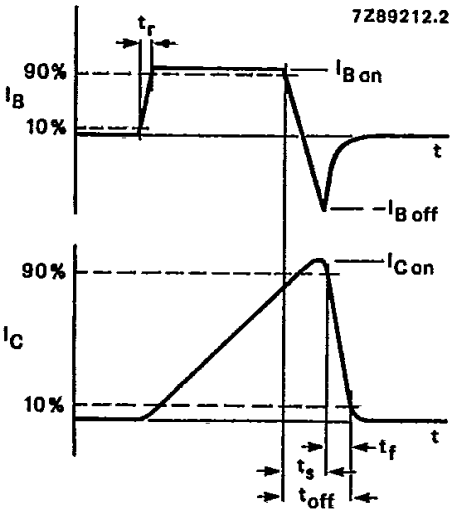
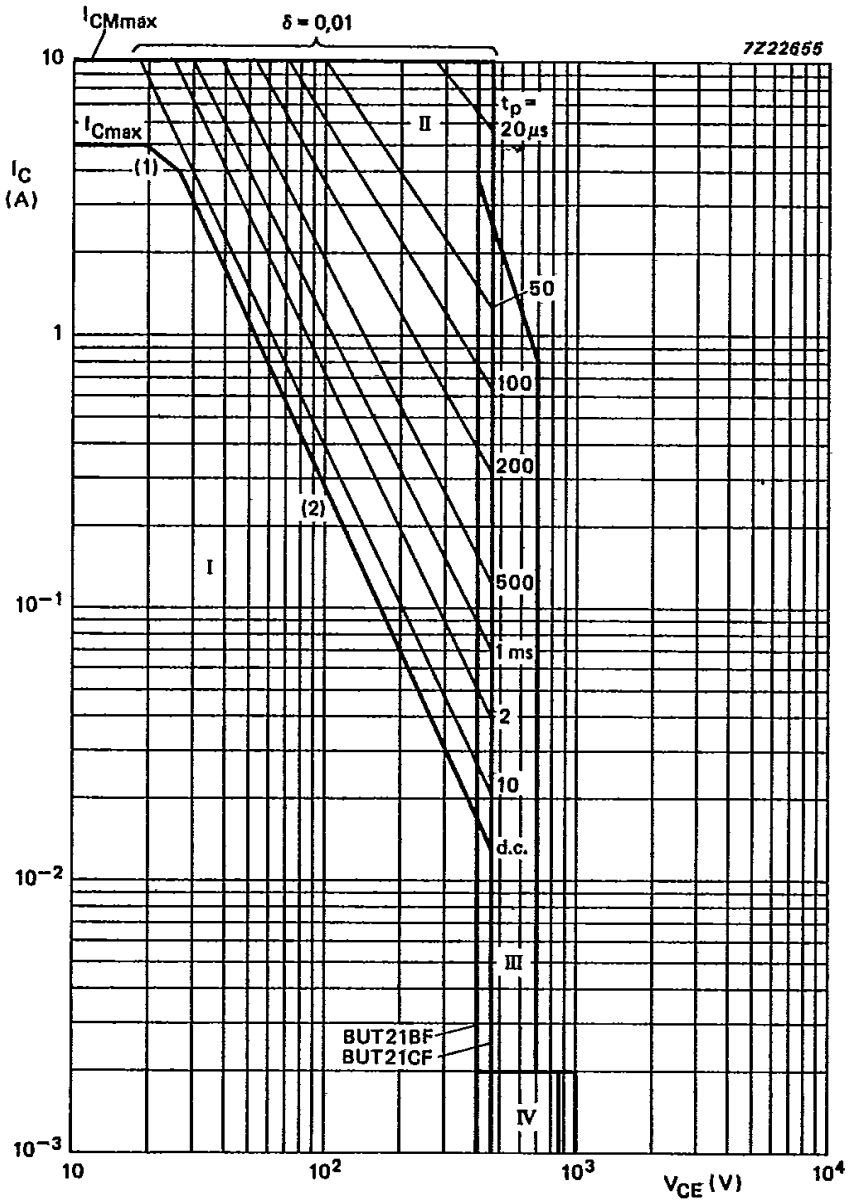


Fig.7 Switching times waveforms with inductive load.



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

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

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

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

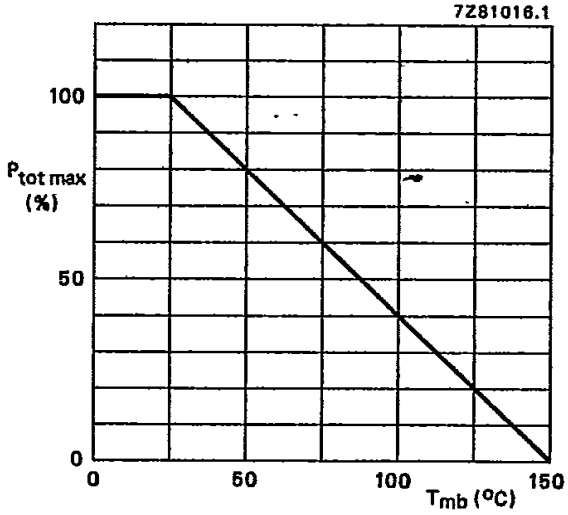


Fig.9 Power derating curve.

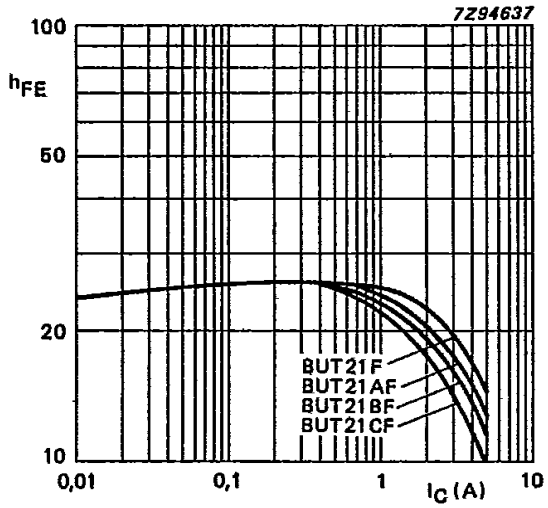


Fig.10 Typical DC current gain at V_{CE} = 5 V; T_j = 25 °C.

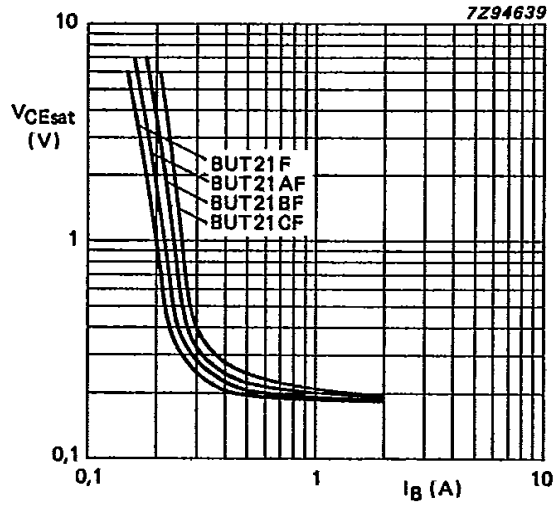


Fig.11 Collector-emitter saturation voltage as a function of base current; I_C = 3 A; T_j = 25 °C.

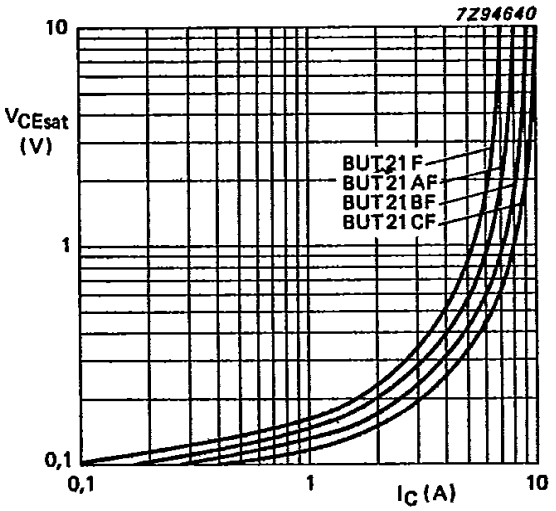


Fig.12 Collector-emitter saturation voltage as a function of collector current; I_C/I_B = 7.6 A (BUT21BF), 6.0 A (BUT21CF); T_j = 25 °C.

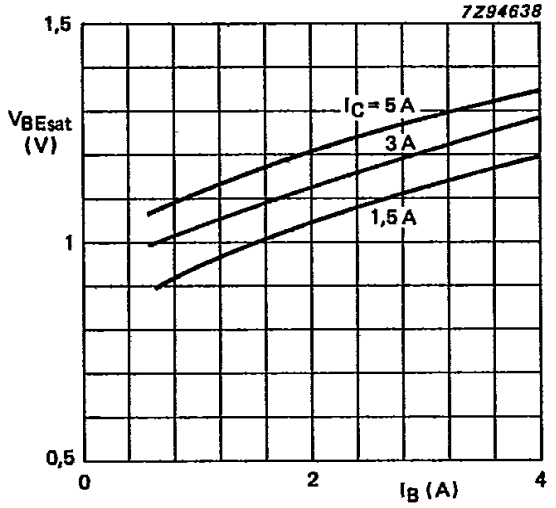


Fig.13 Base-emitter saturation voltage as a function of base current; T_j = 25 °C.