SILICON EPITAXIAL BASE POWER TRANSISTORS

NPN transistors in a plastic envelope intended for use in audio output stages and general amplifier and switching applications. PNP complements are TIP32 series.

QUICK REFERENCE DATA

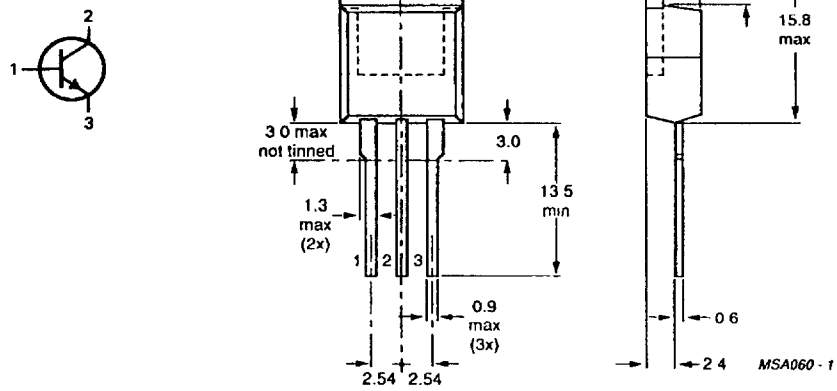
			TIP31	A	B	C	
Collector-base voltage (open emitter)	V_{CBO}	max.	80	100	120	140	V
Collector-emitter voltage (open base)	V_{CEO}	max.	40	60	80	100	V
Collector current (d.c.)	I_C	max.			3		A
Collector current (peak value)	I_{CM}	max.			5		A
Total power dissipation up to T_{mb} = 25 °C	P_{tot}	max.			40		W
Junction temperature	T_j	max.			150		°C
D.C. current gain							
I_C = 1 A; V_{CE} = 4 V	h_{FE}	>			25		
I_C = 3 A; V_{CE} = 4 V	h_{FE}				10 to 50		

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-220.

Collector connected to mounting base.



See also chapters Mounting Instructions and Accessories.

RATINGS

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

			TIP31	A	B	C	
Collector-base voltage (open emitter)	V_{CBO}	max.	80	100	120	140	V
Collector-emitter voltage (open base)	V_{CEO}	max.	40	60	80	100	V
Emitter-base voltage (open collector)	V_{EBO}	max.			5		V
Collector current (d.c.)	I_C	max.			3		A
Collector current (peak value)	I_{CM}	max.			5		A
Base current (d.c.)	I_B	max.			1		A
Total power dissipation up to T_{mb} = 25 °C	P_{tot}	max.			40		W
Storage temperature	T_{stg}				−65 to +150		°C
Junction temperature	T_j	max.			150		°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	3,12	K/W
From junction to ambient (in free air)	$R_{th\ j\text{-}a}$	=	70	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

			TIP31;A	TIP31B;C	
Collector cut-off current					
I_B = 0; V_{CE} = 30 V	I_{CEO}	<	0,1	−	mA
I_B = 0; V_{CE} = 60 V	I_{CEO}	<	−	0,1	mA
V_{BE} = 0; V_{CE} = V_{CEOmax}	I_{CES}	<	0,2		mA
Emitter cut-off current					
I_C = 0; V_{EB} = 5 V	I_{EBO}	<	0,2		mA
D.C. current gain *					
I_C = 1 A; V_{CE} = 4 V	h_{FE}	>	25		
I_C = 3 A; V_{CE} = 4 V	h_{FE}		10 to 50		
Base-emitter voltage * **					
I_C = 3 A; V_{CE} = 4 V	V_{BE}	<	1,8		V
Collector-emitter saturation voltage *					
I_C = 3 A; I_B = 0,375 A	V_{CEsat}	<	1,2		V

			TIP31	A	B	C	
Collector-emitter breakdown voltage *							
I_B = 0; I_C = 30 mA	$V_{(BR)CEO}$	>	40	60	80	100	V
Small-signal current transfer ratio							
I_C = 0,5 A; V_{CE} = 10 V; f = 1 kHz	$\lvert h_{fe}\rvert$	>			20		
I_C = 0,5 A; V_{CE} = 10 V; f = 1 MHz	$\lvert h_{fe}\rvert$	>			3		
Turn-off breakdown energy							
L = 20 mH; I_{CC} = 1,8 A	$E_{(BR)}$	>			32		mJ

* Measured under pulse conditions: $t_p \leqslant 300\ \mu s$; $\delta \leqslant 2\%$.

** V_{BE} decreases by about 2,3 mV/K with increasing temperature.

Switching times
(between 10% and 90% levels)
I_{Con} = 1 A; I_{Bon} = $-I_{Boff}$ = 0,1 A

Turn-on time	t_{on}	typ.	0,3 μs
Turn-off time	t_{off}	typ.	1 μs

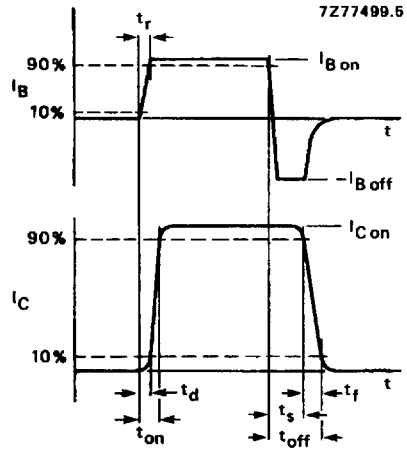
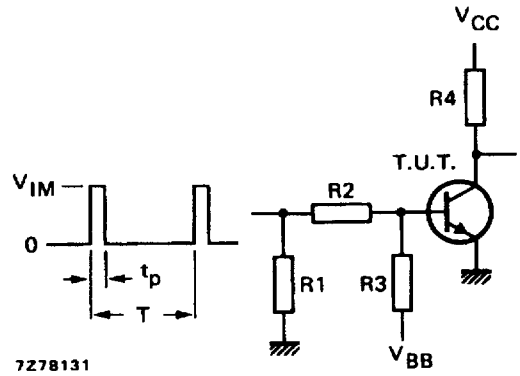


Fig. 2 Switching times waveforms.



V_{IM} = 30 V
V_{CC} = 20 V
$-V_{BB}$ = 3 V
R1 = 56 Ω
R2 = 150 Ω
R3 = 33 Ω
R4 = 20 Ω
$t_r = t_f$ = 15 ns
t_p = 20 μs
T = 500 μs

Fig. 3 Switching times test circuit.

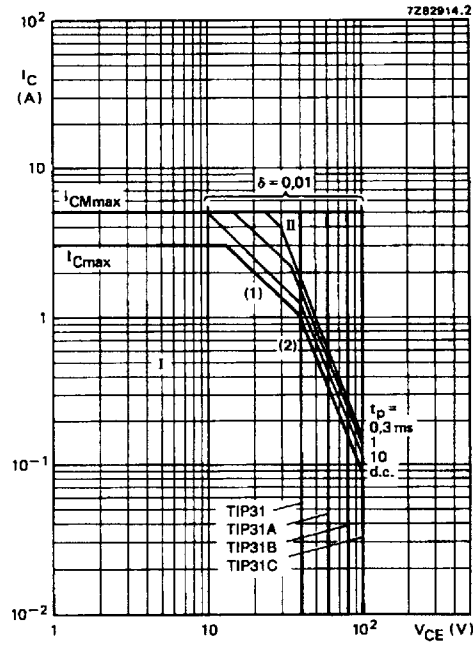


Fig. 4 Safe Operating Area; T_{mb} = 25 °C.

I Region of permissible d.c. operation.

II Permissible extension for repetitive pulse operation.

(1) $P_{tot\,max}$ and $P_{peak\,max}$ lines.

(2) Second-breakdown limits.

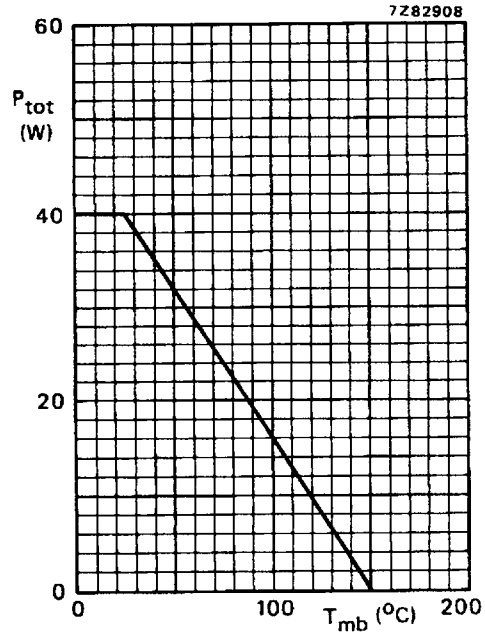


Fig. 5 Power derating curve.

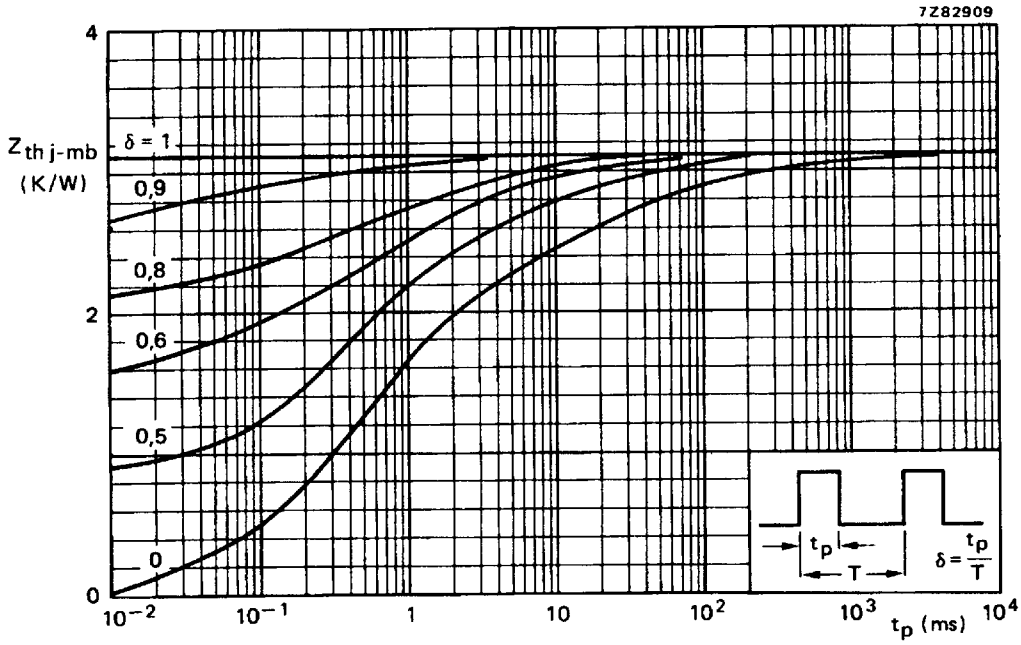


Fig. 6 Pulse power rating chart.

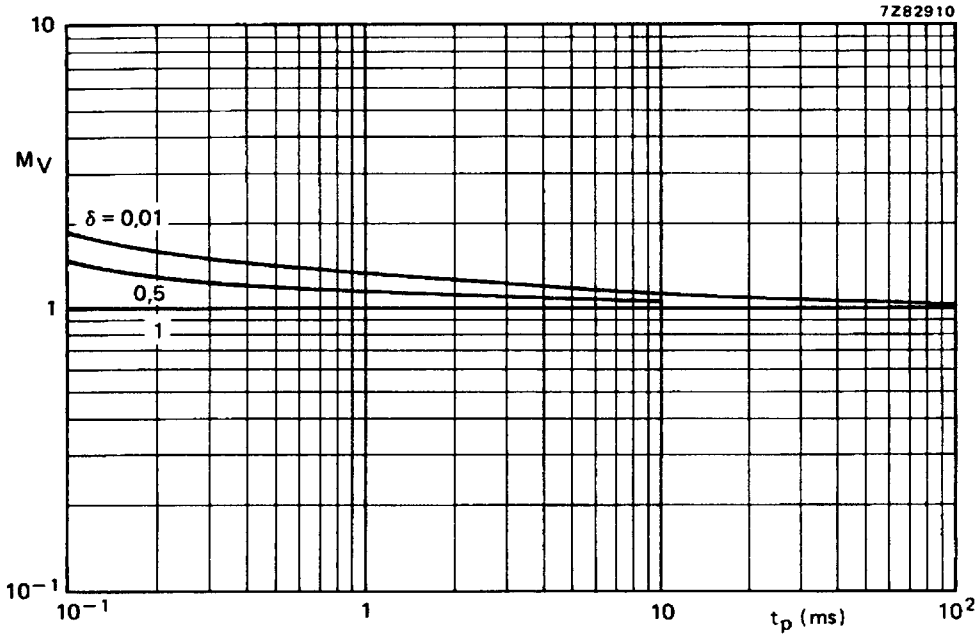


Fig. 7 S.B. voltage multiplying factor at the I_{Cmax} level.

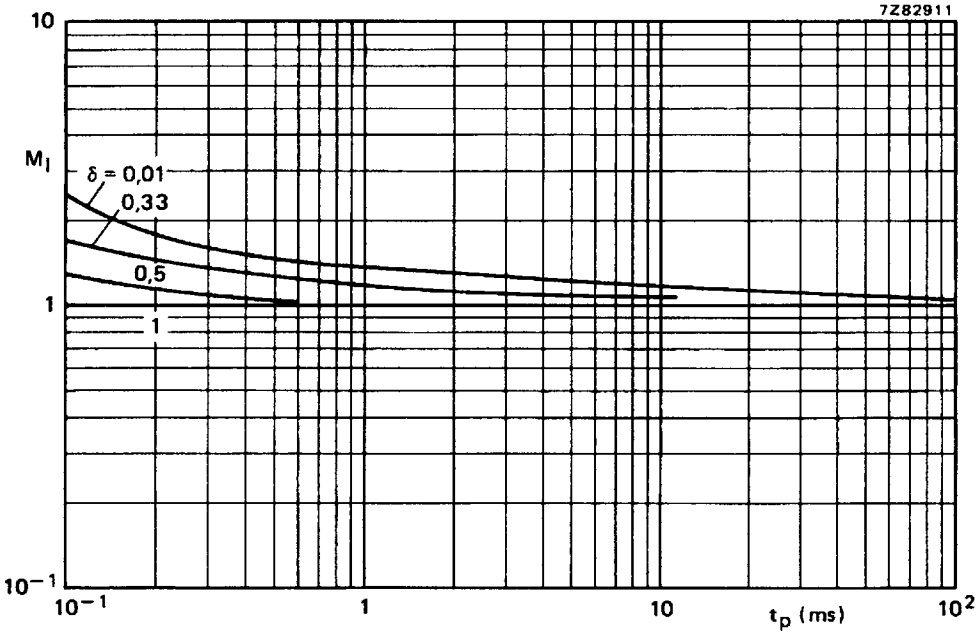


Fig. 8 S.B. current multiplying factor at the V_{CEOmax} level.

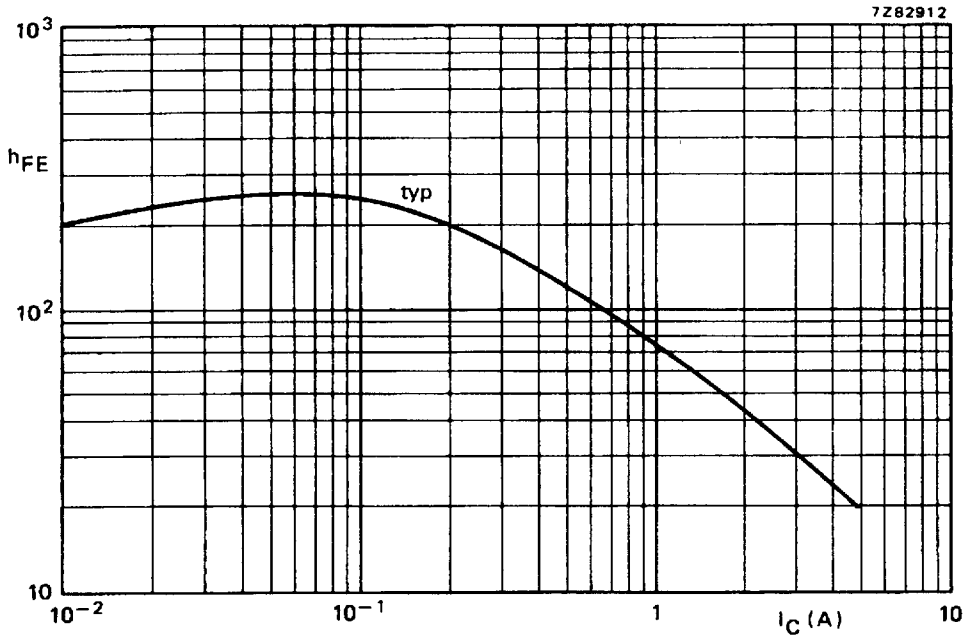


Fig. 9 Typical values d.c. current gain at V_{CE} = 4 V.