SILICON EPITAXIAL POWER TRANSISTORS

NPN silicon epitaxial power transistors, each in a SOT186 envelope with an electrically insulated mounting base.

PNP complements are TIP42F, TIP42AF, TIP42BF and TIP42CF.

QUICK REFERENCE DATA

			TIP41F	AF	BF	CF	
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
DC collector current	I_C	max.			6		A
Peak collector current	I_{CM}	max.			10		A
Total power dissipation up to $T_h = 25\ ^oC$	P_{tot}	max.			32		W
Junction temperature	T_j	max.			150		^oC
DC current gain $I_C = 3$ A; $V_{CE} = 4$ V	h_{FE}	min.			15		
		max.			75		

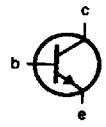
MECHANICAL DATA

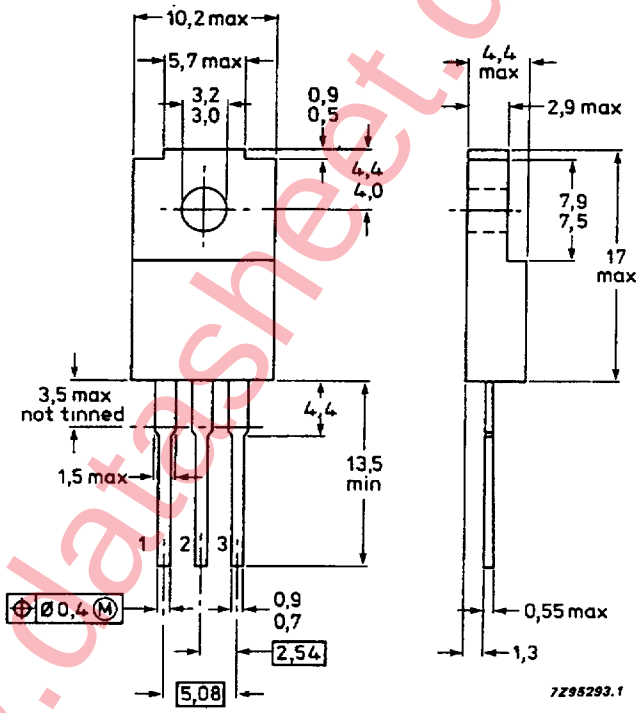
Dimensions in mm

Fig.1 SOT186.

Pinning

1 = base
2 = collector
3 = emitter





RATINGS

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

			TIP41F	AF	BF	CF	
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
DC collector current	I_C	max.		6			A
Peak collector current	I_{CM}	max.		10			A
DC base current	I_B	max.		3			A
Total power dissipation							
up to T_h = 25 °C (note 1)	P_{tot}	max.		20			W
up to T_h = 25 °C (note 2)	P_{tot}	max.		32			W
Storage temperature range	T_{stg}			−65 to + 150			°C
Junction temperature	T_j	max.		150			°C

THERMAL RESISTANCE

From junction to internal heatsink	$R_{th\,j\text{-}mb}$	=	1.6	K/W
From junction to external heatsink (note 1)	$R_{th\,j\text{-}h}$	=	6.3	K/W
From junction to external heatsink (note 2)	$R_{th\,j\text{-}h}$	=	3.9	K/W

INSULATION

Voltage allowed between all terminals and external heatsink, peak value	V_{insul}	max.	1000	V
Isolation capacitance from collector to external heatsink	C_{th}	typ.	12	pF

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

			TIP41F	AF	BF	CF	
Collector cut-off currents							
I_B = 0; V_{CE} = 30 V	I_{CEO}	max.	0.2	0.2	–	–	mA
I_B = 0; V_{CE} = 60 V	I_{CEO}	max.	–	–	0.2	0.2	mA
V_{BE} = 0; V_{CE} = V_{CEOmax}	I_{CES}	max.		0.4			mA
Emitter cut-off current							
I_C = 0; V_{EB} = 5 V	I_{EBO}	max.		0.5			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.

DC current gain (note 1)							
I_C = 0.3 A; V_{CE} = 4 V	h_{FE}	min.			30		
I_C = 3 A; V_{CE} = 4 V	h_{FE}	min.			15		
		max.			75		
Base-emitter voltage (note 2)							
I_C = 6 A; V_{CE} = 4 V	V_{BE}	max.			2		V
Collector-emitter saturation voltage (note 1)							
I_C = 6 A; I_B = 0.6 A	V_{CEsat}	max.			1.5		V
			TIP41F	AF	BF	CF	
Collector-emitter breakdown voltage (note 1)							
I_C = 30 mA; I_B = 0	$V_{(BR)CEO}$	max.	40	60	80	100	V
Small-signal current transfer ratio							
I_C = 0.5 A; V_{CE} = 10 V; f = 1 kHz	$\|h_{fe}\|$	min.			20		
Transition frequency							
I_C = 0.5 A; V_{CE} = 10 V; f = 1 kHz	f_T	min.			3		MHz
Turn-off breakdown energy with inductive load (Fig.4)							
I_{Boff} = 0; I_{CC} = 2.5 V	$E_{(BR)}$	min.			62.5		mJ
Switching times (Figs 2 and 3) (between 10% and 90% levels)							
I_{Con} = 6 A; I_{Bon} = $-I_{Boff}$ = 0.6 A							
turn-on time	t_{on}	typ.			0.6		μs
turn-off time	t_{off}	typ.			1		μs

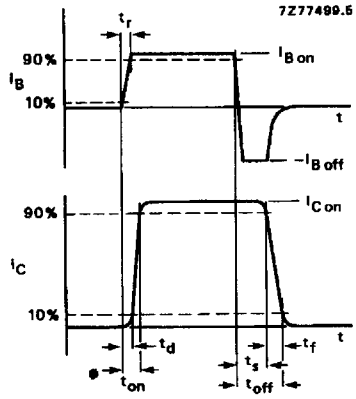
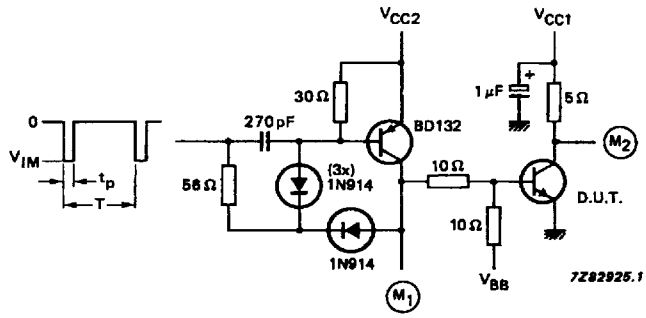


Fig.2 Switching times waveform.

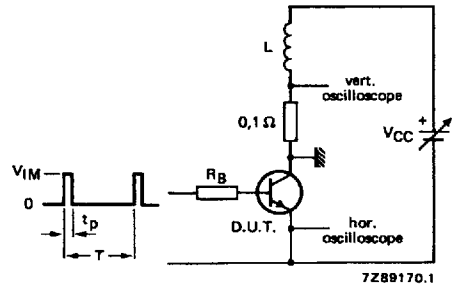
Notes

1. Measured under pulse conditions: t_p max. 300 μs; δ max. 2%.
2. V_{BE} decreases by about 2.3 mV/K with increasing temperature.



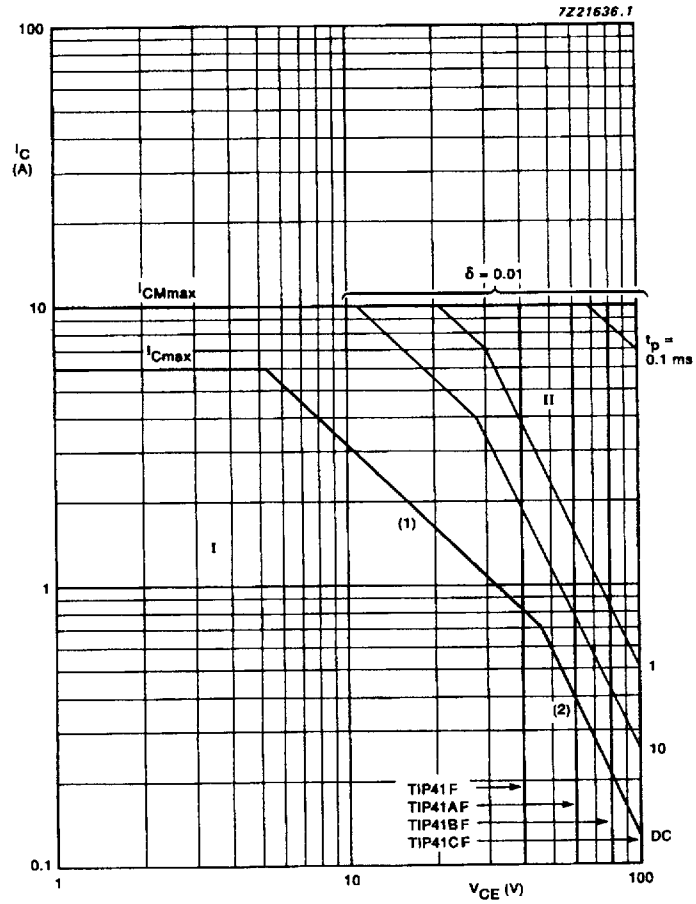
$-V_{IM}$ = 10 V
V_{CC1} = 30 V
V_{CC2} = 16 V
$-V_{BB}$ = 4 V
$t_r = t_f$ = 15 ns
t_p = 20 μs
δ max. 2%

Fig.3 Switching times test circuit.
Adjust V_{CC2} to give M_1 = 14 V.



V_{IM} = 12 V
R_B = 270 Ω
L = 20 mH
I_{CC} = 2,5 A
δ max. 1%
t_p = 1 ms

Fig.4 Test circuit for turn-off breakdown energy.



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

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

Fig.5 Safe Operating Area, T_{mb} = 25 °C.

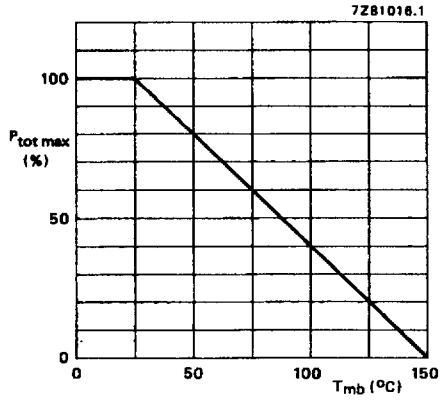


Fig.6 Total power dissipation.

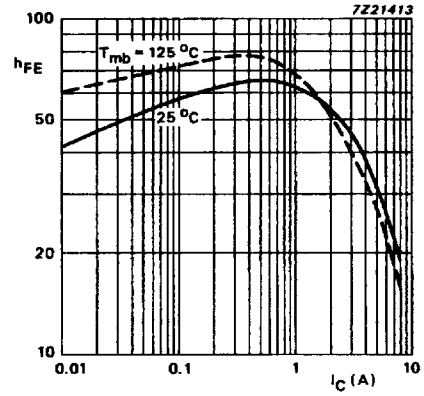


Fig.7 DC current gain; V_{CE} = 4 V; typical values.

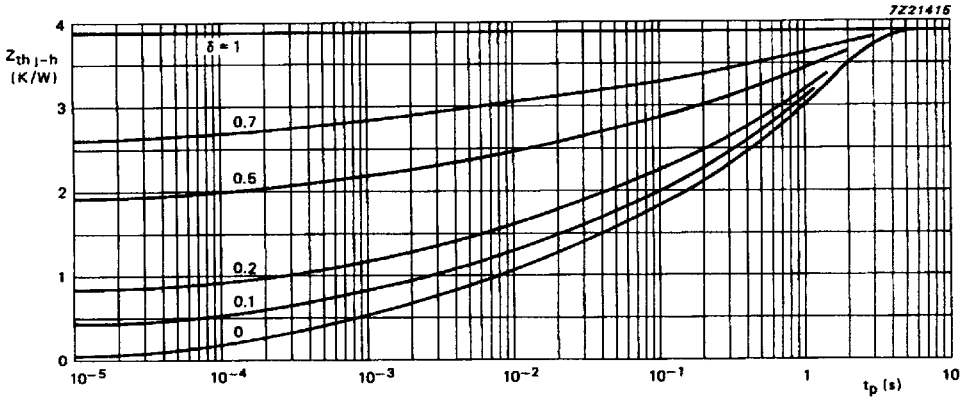


Fig.8 Pulse power rating chart.

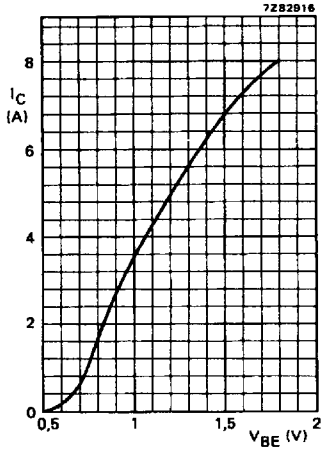


Fig.9 Typical collector current.
V_{CE} = 4 V; T_j = 25 °C.