MOSPEC

COMPLEMENTARY SILICON HIGH-POWER TRANSISTORS

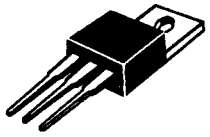
General Purpose-Amplifier and Switching Application..

FEATURES:

* Collector-Emitter Sustaining Voltage -
  $V_{CEO(sus)}$=120V (Min)- TIP31D,TIP32D
  140V (Min)- TIP31E,TIP32E
  160V (Min)- TIP31F,TIP32F
* Current Gain-Bandwidth Product-
  f_T= 3.0MHz(Min)@I_C= 1.0 A

NPN	PNP
TIP31D	TIP32D
TIP31E	TIP32E
TIP31F	TIP32F

3.0 AMPERE
COMPLEMENTARY SILICON
POWER TRANSISTORS
120-160 VOLTS
40 WATTS



TO-220

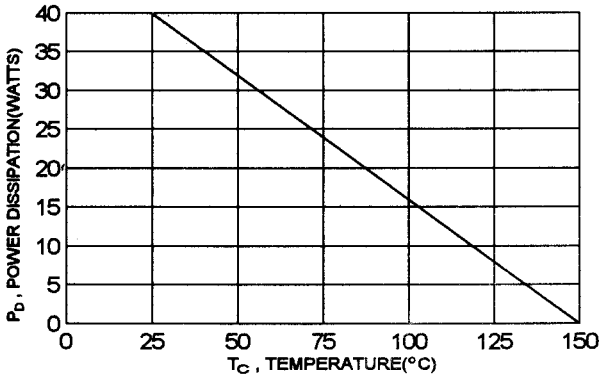
MAXIMUM RATINGS

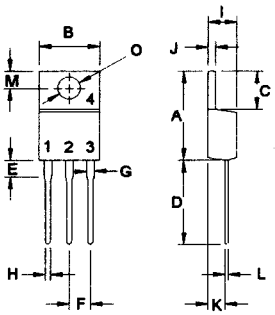
Characteristic	Symbol	TIP31D TIP32D	TIP31E TIP32E	TIP31F TIP32F	Unit
Collector-Emitter Voltage	V_{CEO}	120	140	160	V
Collector-Base Voltage	V_{CBO}	160	180	200	V
Emitter-Base Voltage	V_{EBO}	5.0			V
Collector Current - Continuous - Peak	I_C	3.0 5.0			A
Base Current	I_B	1.0			A
Total Power Dissipation@T_C = 25°C Derate above 25°C	P_D	40 0.32			W W/°C
Operating and Storage Junction Temperature Range	T_J , T_{STG}	-65 to +150			°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance Junction to Case	Rθjc	3.125	°C/W

FIGURE -1 POWER DERATING





PIN 1.BASE
2.COLLECTOR
3.EMITTER
4.COLLECTOR(CASE)

DIM	MILLIMETERS	
	MIN	MAX
A	14.68	15.31
B	9.78	10.42
C	5.01	6.52
D	13.06	14.62
E	3.57	4.07
F	2.42	3.66
G	1.12	1.36
H	0.72	0.96
I	4.22	4.98
J	1.14	1.38
K	2.20	2.97
L	0.33	0.55
M	2.48	2.98
O	3.70	3.90

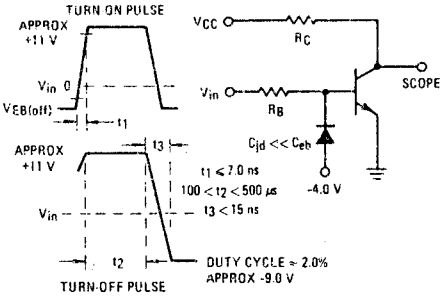
ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector -Emitter Breakdown Voltage (1) (I_C =30 mA,I_B= 0)	TIP31D,TIP32D TIP31E,TIP32E TIP31F,TIP32F	$V_{(BR)CEO}$	120 140 160		V
Collector Cutoff Current (V_{CE}= 90 V,I_B= 0)		I_{CEO}		0.3	mA
Collector Cutoff Current (V_{CE}= 160 V, V_{BE}= 0) (V_{CE}= 180 V, V_{BE}= 0) (V_{CE}= 200 V, V_{BE}= 0)	TIP31D,TIP32D TIP31E,TIP32E TIP31F,TIP32F	I_{CES}		0.2 0.2 0.2	mA
Emitter-Base Cutoff Current (V_{EB}= 5.0 V,I_C= 0)		I_{EBO}		1.0	mA
ON CHARACTERISTICS (1)					
DC Current Gain (I_C= 1.0 A, V_{CE}= 4.0 V) (I_C= 3.0 A, V_{CE}= 4.0 V)		h_{FE}	25 5.0		
Collector-Emitter Saturation Voltage (I_C =3.0 A, I_B =750 mA)		$V_{CE(sat)}$		2.5	V
Base-Emitter On Voltage (I_C= 3.0 A, V_{CE}= 4.0 V)		$V_{BE(on)}$		1.8	V
DYNAMIC CHARACTERISTICS					
Current-Gain-Bandwidth Product (I_C = 0.5 A, V_{CE} = 10 V, f = 1.0 MHz)		f_T	3.0		MHz
Small-Signal Current Gain (I_C = 0.5 A, V_{CE} = 10 V, f = 1.0 KHz)		h_{fe}	20		
SWITCHING CHARACTERISTICS					
Turn On Time	I_C= 1.0A , I_{B1}= -I_{B2}= 0.1A $V_{BE(off)}$= -4.3V, R_L= 30Ω	t_{on}		0.6	us
Off Time		t_{off}		2.8	us

(1) Puise Test: Puise width ≦ 300 us , Duty Cycle ≦ 2.0 %

(2) $f_T = |h_{fe}| \cdot f_{TEST}$

FIGURE 2 – SWITCHING TIME EQUIVALENT CIRCUIT



RB and RC VARIED TO OBTAIN DESIRED CURRENT LEVELS.

FIG-3 TURN-ON TIME

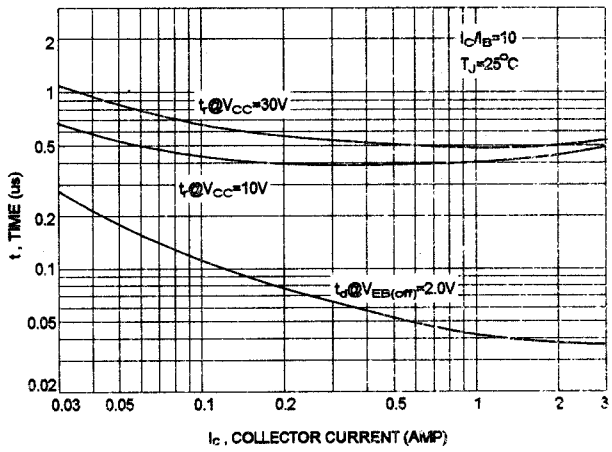


FIG-4 DC CURRENT GAIN

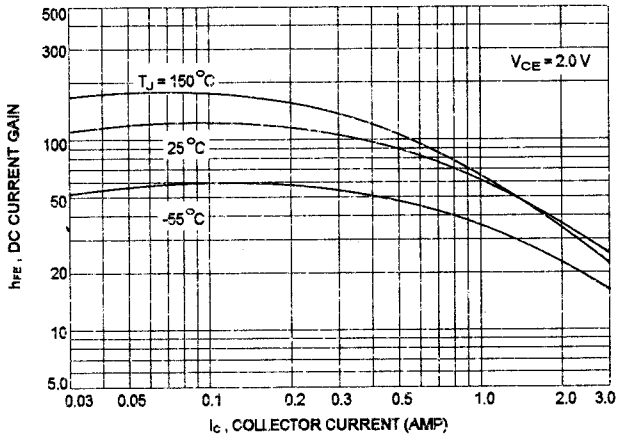


FIG-5 TURN-OFF TIME

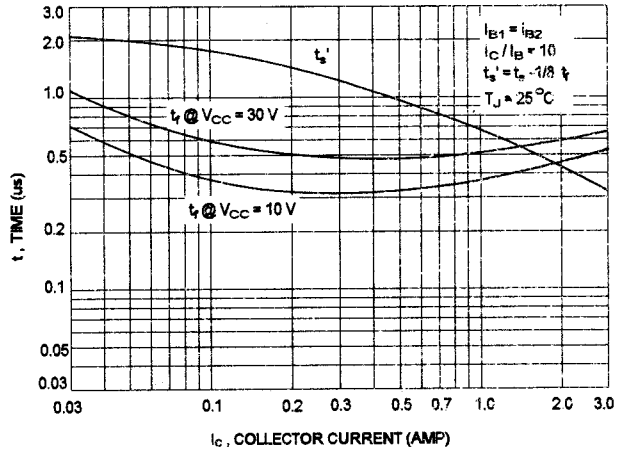
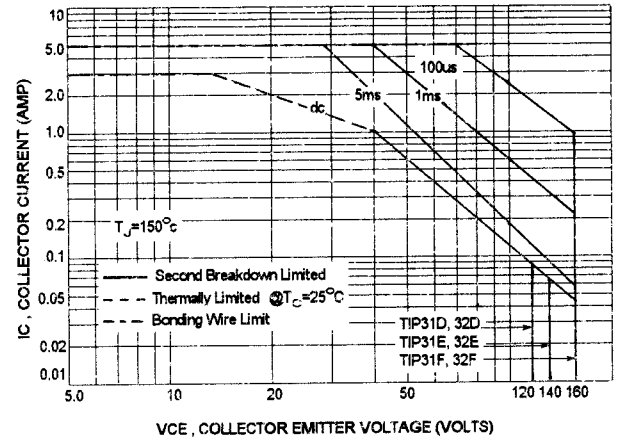


FIG-6 ACTIVE REGION SAFE OPERATING AREA



There are two limitation on the power handling ability of a transistor:average junction temperature and second breakdown safe operating area curves indicate I_C-V_{CE} limits of the transistor that must be observed for reliable operation i.e., the transistor must not be subjected to greater dissipation than curves indicate.

The data of FIG-6 curve is base on $T_{J(PK)}$=150 °C; T_C is variable depending on power level. second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(PK)} \leq$150°C,At high case temperatures,thermal limitation will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

FIG-7 COLLECTOR SATURATION REGION

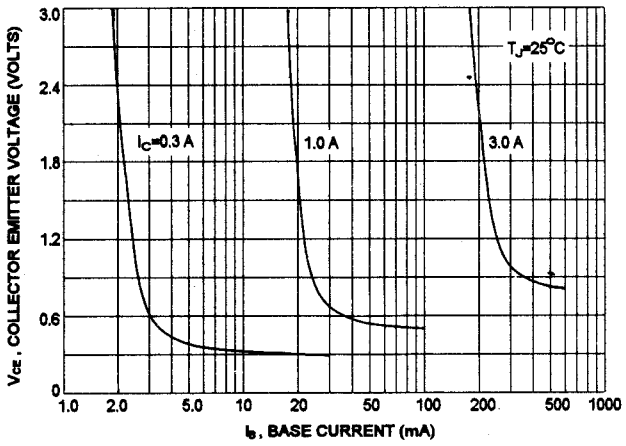


FIG-8 CAPACITANCES

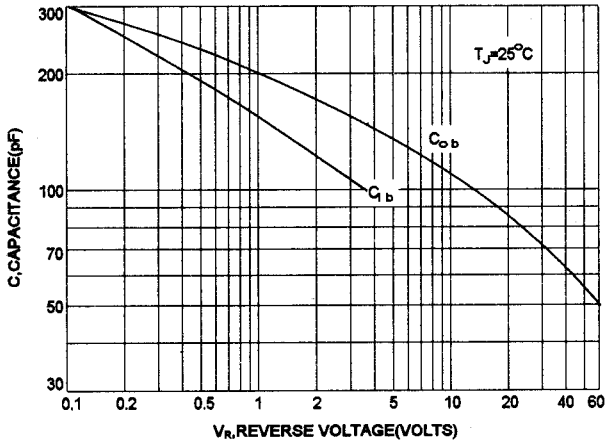


FIG-9 "ON" VOLTAGE

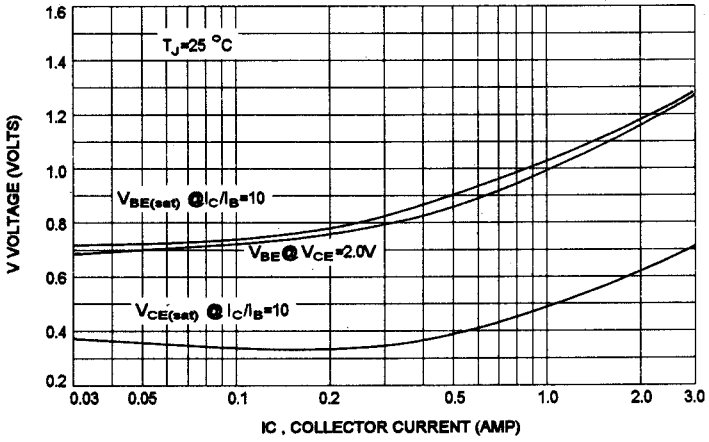


FIG-10 COLLECTOR CUT-OFF REGION