MOSPEC

COMPLEMENTARY SILICON HIGH-POWER TRANSISTORS

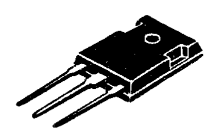
General Purpose-Amplifier and Switching Application..

FEATURES:

* Collector-Emitter Sustaining Voltage -
  $V_{CEO(sus)}$=120V (Min)- TIP33D,TIP34D
  140V (Min)- TIP33E,TIP34E
  160V (Min)- TIP33F,TIP34F
* Current Gain-Bandwidth Product-
  f_T= 3.0MHz(Min)@I_C=0.5 A

NPN	PNP
TIP33D	TIP34D
TIP33E	TIP34E
TIP33F	TIP34F

10 AMPERE
COMPLEMENTARY SILICON
POWER TRANSISTORS
120-160 VOLTS
80 WATTS



TO-247 (3P)

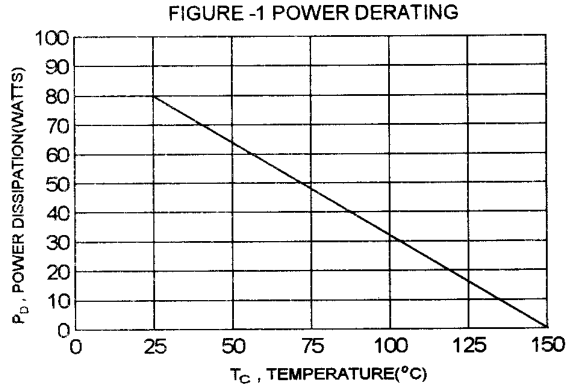
MAXIMUM RATINGS

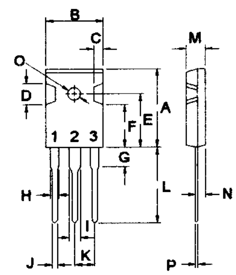
Characteristic	Symbol	TIP33D TIP34D	TIP33E TIP34E	TIP33F TIP34F	Unit
Collector-Emitter Voltage	V_{CEO}	120	140	160	V
Collector-Base Voltage	V_{CBO}	160	180	200	V
Emitter-Base Voltage	V_{EBO}	5			V
Collector Current - Continuous - Peak	I_C	10 15			A
Base Current	I_B	3			A
Total Power Dissipation@T_C = 25°C Derate above 25°C	P_D	80 0.64			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	$R\theta jc$	1.56	°C/W

FIGURE -1 POWER DERATING





PIN 1.BASE
2.COLLECTOR
3.EMITTER

DIM	MILLIMETERS	
	MIN	MAX
A	20.63	22.38
B	15.38	16.20
C	1.90	2.70
D	5.10	6.10
E	14.81	15.22
F	11.72	12.84
G	4.20	4.50
H	1.82	2.46
I	2.92	3.23
J	0.89	1.53
K	5.26	5.66
L	18.50	21.50
M	4.76	5.24
O	3.25	3.65

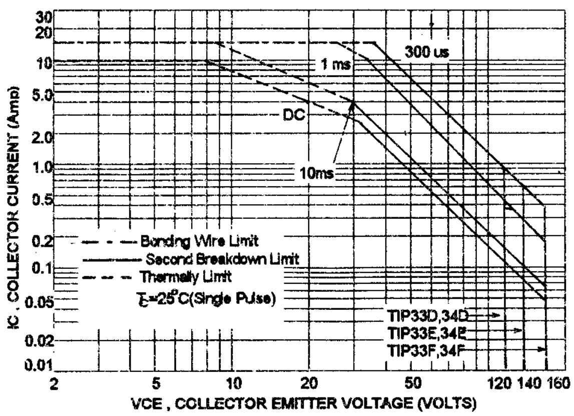
ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector -Emitter Breakdown Voltage (1) (I_C =30 mA, I_B= 0)	TIP33D,TIP34D TIP33E,TIP34E TIP33F,TIP34F	$V_{(BR)CEO}$	120 140 160		V
Collector Cutoff Current (V_{CE}= 90 V, I_B= 0)		I_{CEO}		0.7	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)	TIP33D,TIP34D TIP33E,TIP34E TIP33F,TIP34F	I_{CES}		0.4 0.4 0.4	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}= 4.0V) (I_C= 3.0 A, V_{CE}= 4.0V)		h_{FE}	40 20		
Collector-Emitter Saturation Voltage (I_C =3.0 A, I_B =0.3 A) (I_C =10 A, I_B =3.3 A)		$V_{CE(sat)}$		1.0 4.0	V
Base-Emitter On Voltage (I_C= 3.0 A, V_{CE}= 4.0 V) (I_C= 10 A, V_{CE}= 4.0 V)		$V_{BE(on)}$		1.6 3.0	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}	12		

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

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

FIG-2 ACTIVE- REGION SAFE OPERATING AREA

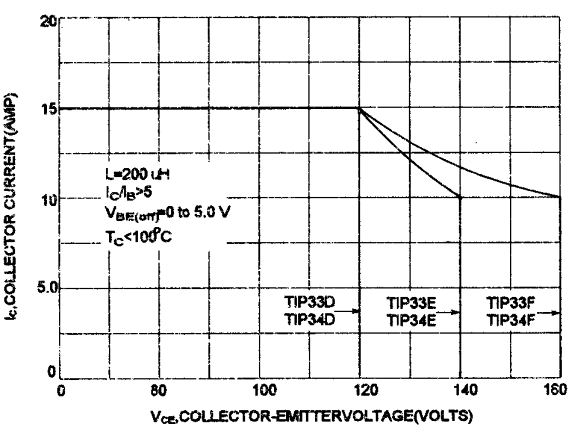


FORWARD BIAS

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-2 is base on T_C=25 °C;$T_{J(PK)}$ is variable depending on power level.Second breakdown pulse limi -ts are valid for duty cycles to 10% but must be derated when $T_C \geq 25$°C, second breakdown limitations do not derate the same as thermal limitations.

FIG-3 REVERSE BIAS SAFE OPERATING AREA



REVERSE BIAS

For inductive loads,high voltage and high current must be sustained simultaneously during turn-off,in most cases with the base-to-emitter junction reverse biased under these conditions the collector voltage must be held to a safe level at or below a specfic value of collector current.This can be accomplished by several mean such as active clamping, RC snubbing, load line shaping, etc. the safe level for these devices is specified as Reverse Bias Safe Operating Area and represents the voltage-current condition allowable during reverse biased turn-off. This rating is verified under clamped conditions so that the device is never subjected to an avalanche mode. FIG-3 gives the RBSOA characteristics.

FIG-4 DC CURRENT GAIN