

COMPLEMENTARY SILICON HIGH-POWER TRANSISTORS

General Purpose-Amplifier and Switching Application..

FEATURES:

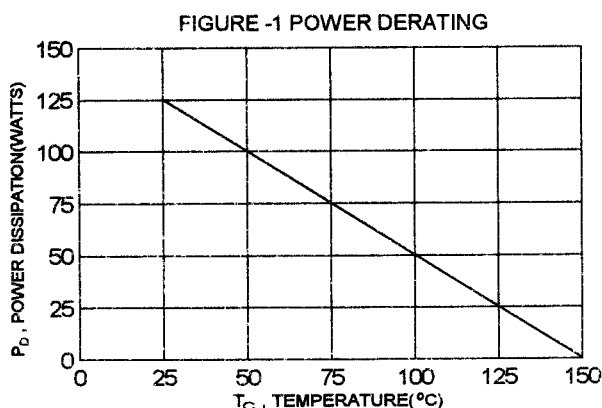
- * Collector-Emitter Sustaining Voltage -
 $V_{CE(sus)}$ = 120V (Min)- TIP35D, TIP36D
 140V (Min)- TIP35E, TIP36E
 160V (Min)- TIP35F, TIP36F
- * Current Gain-Bandwidth Product-
 $f_T = 3.0\text{MHz}(\text{Min}) @ I_C = 1\text{A}$

MAXIMUM RATINGS

Characteristic	Symbol	TIP35D TIP36D	TIP35E TIP36E	TIP35F TIP36F	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	25 40			A
Base Current	I_B	5			A
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	125 1.0			W W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{STG}	-65 to +150			$^\circ\text{C}$

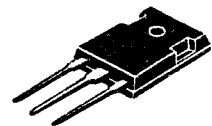
THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance Junction to Case	$R_{\theta jc}$	1.0	$^\circ\text{C/W}$

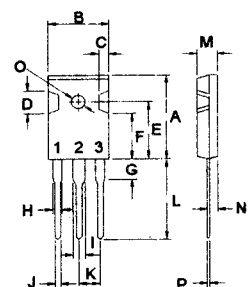


NPN PNP
TIP35D TIP36D
TIP35E TIP36E
TIP35F TIP36F

**25 AMPERE
COMPLEMENTARY SILICON
POWER TRANSISTORS
120-160 VOLTS
125 WATTS**



TO-247 (3P)



PIN 1. BASE
 2. COLLECTOR
 3. EMITTER
 4. COLLECTOR

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

TIP35D,TIP35E,TIP35F NPN / TIP36D,TIP36E,TIP36F PNP

ELECTRICAL CHARACTERISTICS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
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OFF CHARACTERISTICS

Collector -Emitter Breakdown Voltage (1) ($I_C = 30\text{ mA}$, $I_B = 0$)	TIP35D,TIP36D TIP35E,TIP36E TIP35F,TIP36F	$V_{(BR)CEO}$	120 140 160	V
Collector Cutoff Current ($V_{CE} = 90\text{ V}$, $I_B = 0$)		I_{CEO}	1.0	mA
Collector Cutoff Current ($V_{CE} = 160\text{ V}$, $V_{BE} = 0$) ($V_{CE} = 180\text{ V}$, $V_{BE} = 0$) ($V_{CE} = 200\text{ V}$, $V_{BE} = 0$)	TIP35D,TIP36D TIP35E,TIP36E TIP35F,TIP36F	I_{CES}	0.7 0.7 0.7	mA
Emitter-Base Cutoff Current ($V_{EB} = 5.0\text{ V}$, $I_C = 0$)		I_{EBO}	1.0	mA

ON CHARACTERISTICS (1)

DC Current Gain ($I_C = 1.5\text{ A}$, $V_{CE} = 4.0\text{ V}$) ($I_C = 15\text{ A}$, $V_{CE} = 4.0\text{ V}$)	h_{FE}	25 8.0		
Collector-Emitter Saturation Voltage ($I_C = 15\text{ A}$, $I_B = 3.0\text{ A}$) ($I_C = 25\text{ A}$, $I_B = 6.25\text{ A}$)	$V_{CE(sat)}$		2.5 5.0	V
Base-Emitter On Voltage ($I_C = 15\text{ A}$, $V_{CE} = 4.0\text{ V}$) ($I_C = 25\text{ A}$, $V_{CE} = 4.0\text{ V}$)	$V_{BE(on)}$		2.0 4.0	V

DYNAMIC CHARACTERISTICS

Current-Gain-Bandwidth Product ($I_C = 1.0\text{ A}$, $V_{CE} = 10\text{ V}$, $f = 1.0\text{ MHz}$)	f_T	3.0		MHz
Small-Signal Current Gain ($I_C = 1.0\text{ A}$, $V_{CE} = 4.0\text{ V}$, $f = 1.0\text{ KHz}$)	h_{fe}	12		

SWITCHING CHARACTERISTICS

Turn On Time	$I_C = 15\text{ A}$, $I_{B1} = -I_{B2} = 1.5\text{ A}$ $V_{BE(off)} = 4.15\text{ V}$, $R_L = 2\ \Omega$	t_{on}	1.2	us
Off Time		t_{off}	0.9	us

(1) Pulse Test: Pulse width $\leq 300\ \mu\text{s}$, Duty Cycle $\leq 2.0\%$

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

FIG-2 DC CURRENT GAIN

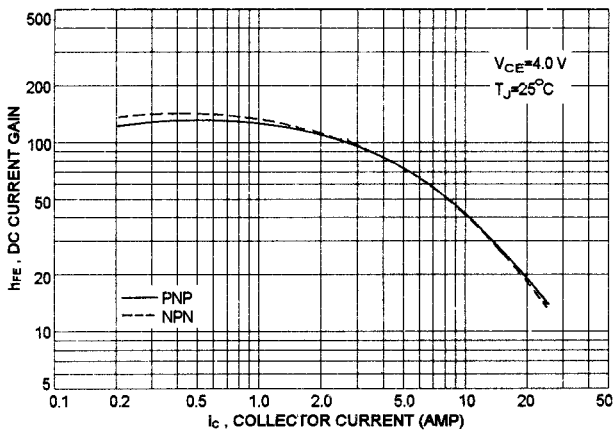


FIG-3 TURN-OFF TIME

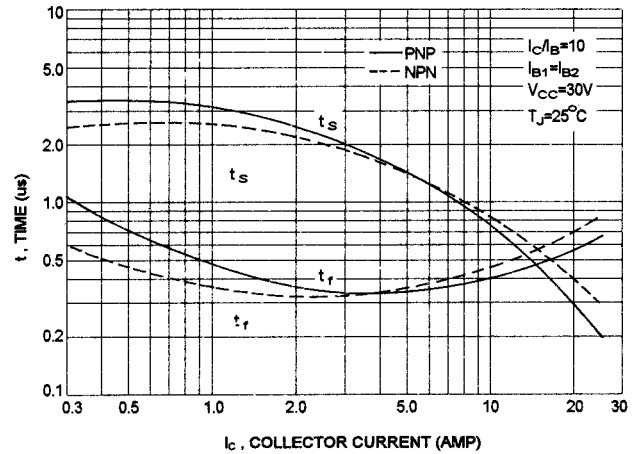


FIG-4 TURN-ON TIME

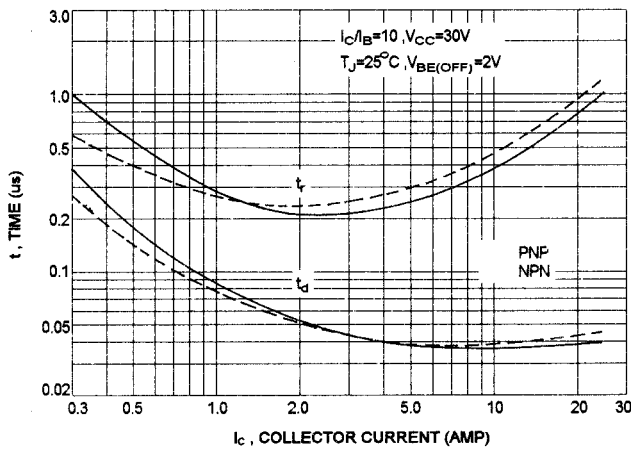


FIG-5 REVERSE BIASE SAFE OPERATING AREA

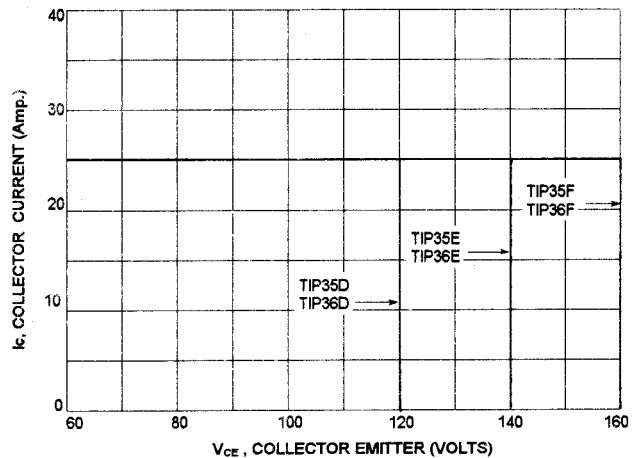
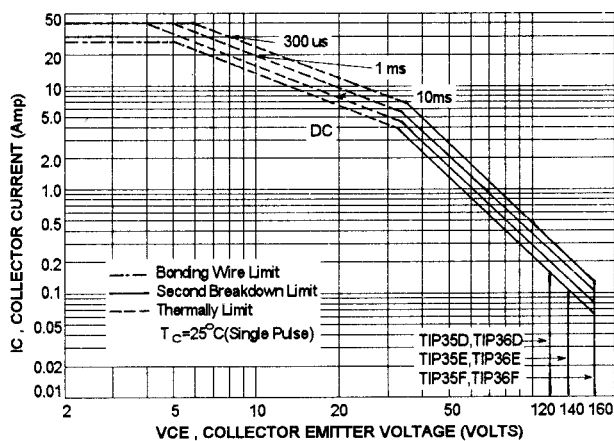


FIG-6 ACTIVE REGION SAFE OPERATING AREA



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