

NPN SILICON POWER DARLINGTON TRANSISTORS

...designed for use in automotive ignition, switching and motor control applications.

FEATURES:

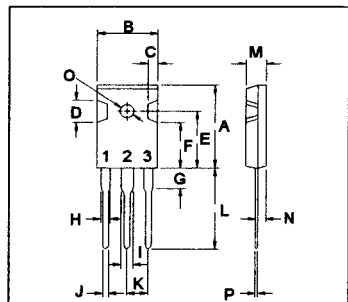
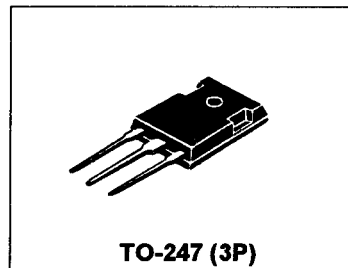
- * Collector-Emitter Sustaining Voltage-
 - $V_{CE(SUS)} = 320 \text{ V (Min) - TIP160}$
 - $= 350 \text{ V (Min) - TIP161}$
 - $= 380 \text{ V (Min) - TIP162}$
- * Collector-Emitter Saturation Voltage
 - $V_{CE(sat)} = 2.9 \text{ V (Max.) @ } I_C = 10 \text{ A}$
- * 10 A Rated Continuous Collector Current

**NPN
TIP160
TIP161
TIP162**

**10 AMPERE
DARLINGTON
POWER TRANSISTORS
320-380 VOLTS
125 WATTS**

MAXIMUM RATINGS

Characteristic	Symbol	TIP160	TIP161	TIP162	Unit
Collector-Emitter Voltage	V_{CEO}	320	350	380	V
Collector-Base Voltage	V_{CBO}	320	350	380	V
Emitter-Base Voltage	V_{EBO}	5.0			V
Collector Current-Continuous -Peak	I_C I_{CM}	10 15			A
Base Current	I_B	1.0			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			$^\circ\text{C}$



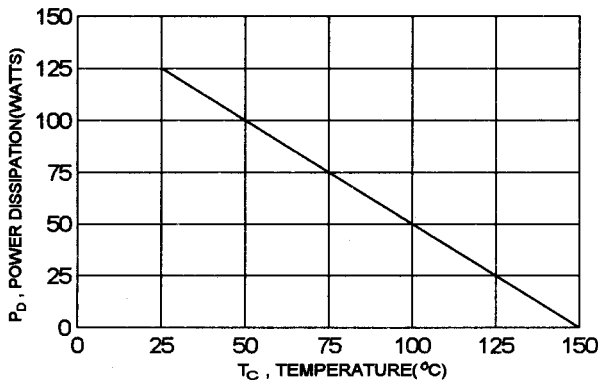
PIN 1.BASE
2.COLLECTOR
3.EMITTER

THERMAL CHARACTERISTICS

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

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	4.68	5.36
N	2.40	2.80
O	3.25	3.65
P	0.55	0.70

FIGURE -1 POWER DERATING



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

Characteristic	Symbol	Min	Max	Unit
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OFF CHARACTERISTICS

Collector Cutoff Current ($V_{CE} = 320\text{ V}, I_B = 0$) ($V_{CE} = 350\text{ V}, I_B = 0$) ($V_{CE} = 380\text{ V}, I_B = 0$)	TIP160 TIP161 TIP162	I_{CEO}	1.0 1.0 1.0	mA
Emitter Cutoff Current ($V_{EB} = 5.0\text{ V}, I_C = 0$)		I_{EBO}	100	mA

ON CHARACTERISTICS (1)

DC Current Gain ($I_C = 4.0\text{ A}, V_{CE} = 2.2\text{ V}$)	h_{FE}	200		
Collector-Emitter Saturation Voltage ($I_C = 6.5\text{ A}, I_B = 0.1\text{ A}$) ($I_C = 10\text{ A}, I_B = 1.0\text{ A}$)	$V_{CE(sat)}$		2.8 2.9	V
Base-Emitter Saturation Voltage ($I_C = 6.5\text{ A}, I_B = 0.1\text{ A}$)	$V_{BE(sat)}$		2.2	V
Diode Forward Voltage ($I_F = 10\text{ A}$)	V_F		3.5	V

SWITCHING CHARACTERISTICS

Delay Time	$V_{CC} = 33\text{ V}, I_C = 6.5\text{ A}$ $I_{B1} = -I_{B2} = 100\text{ mA}$ $t_p = 20\mu\text{s}, \text{Duty Cycle} \leq 2.0\%$	t_d	0.3(Typ)		us
Rise Time		t_r	1.5(Typ)		us
Storage Time		t_s	2.3(Typ)		us
Fall Time		t_f	2.8(Typ)		us

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

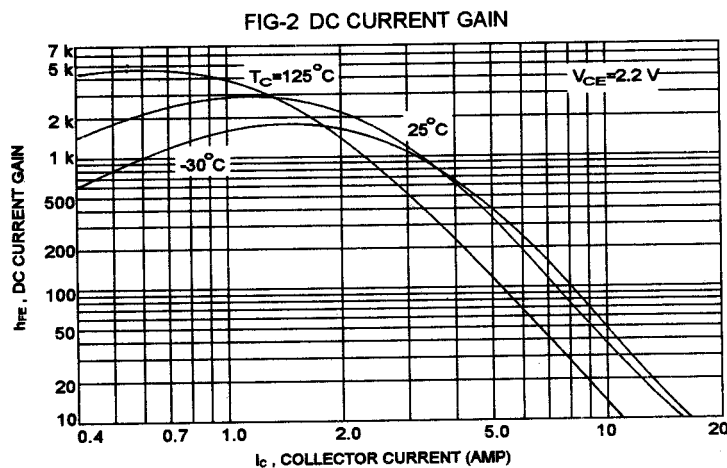


FIG-3 BASE-EMITTER VOLTAGE

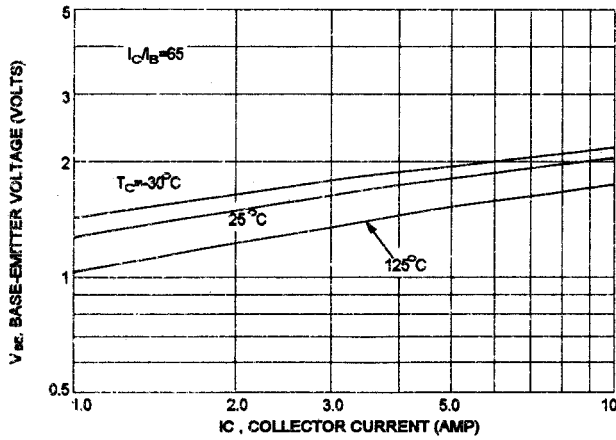


FIG-4 BASE-EMITTER VOLTAGE

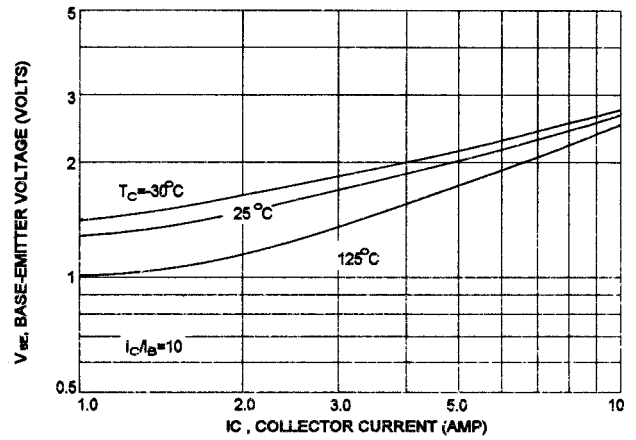


FIG-5 COLLECTOR-EMITTER SATURATION VOLTAGE

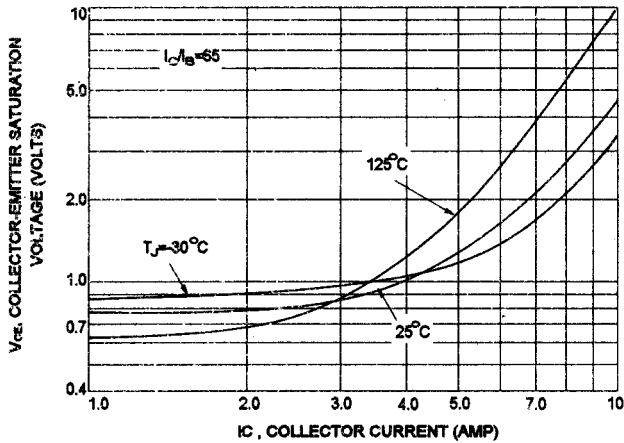


FIG-6 COLLECTOR-EMITTER SATURATION VOLTAGE

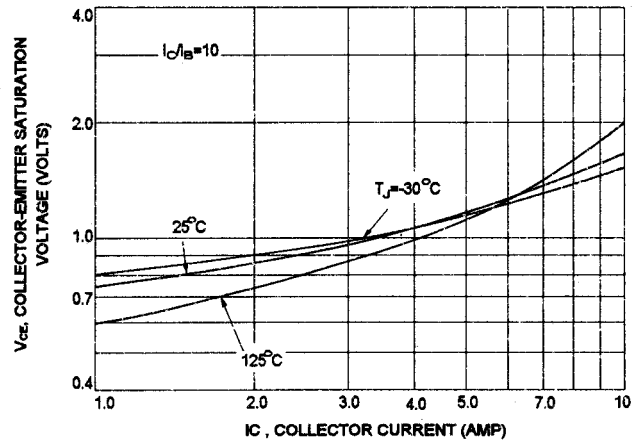
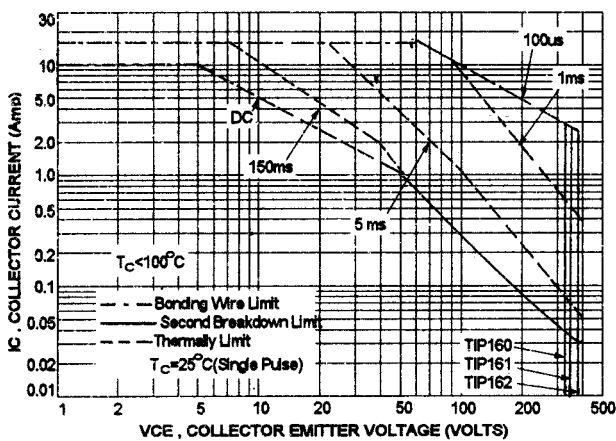


FIG-7 ACTIVE REGION SAFE OPERATING AREA



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-7 is base on $T_{J(PK)} = 150^\circ\text{C}$; T_C is variable depending on power level. second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(PK)} \leq 150^\circ\text{C}$. At high case temperatures, thermal limitation will reduce the power that can be handled to values less than the limitations imposed by second breakdown.