

NPN SILICON POWER DARLINGTON TRANSISTORS

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

FEATURES:

- * Collector-Emitter Sustaining Voltage-

$V_{CEO(SUS)} = 300 \text{ V (Min) - TIP150}$
 $= 350 \text{ V (Min) - TIP151}$
 $= 400 \text{ V (Min) - TIP152}$

- * Collector-Emitter Saturation Voltage

$V_{CE(sat)} = 2.0 \text{ V (Max.) @ } I_C = 5.0 \text{ A}$

- * Reverse-Base SOA — 300 V to 400 V at 7 A

NPN

TIP150

TIP151

TIP152

7 AMPERE

DARLINGTON

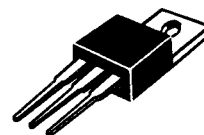
POWER TRANSISTORS

300-400 VOLTS

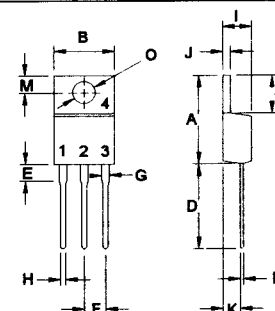
80 WATTS

MAXIMUM RATINGS

Characteristic	Symbol	TIP150	TIP151	TIP152	Unit
Collector-Emitter Voltage	V_{CEO}	300	350	400	V
Collector-Base Voltage	V_{CBO}	300	350	400	V
Emitter-Base Voltage	V_{EBO}	8.0			V
Collector Current-Continuous -Peak	I_C I_{CM}	7.0 10			A
Base Current	I_B	1.5			A
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	80 0.64			W W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{STG}	- 65 to +150			$^\circ\text{C}$



TO-220

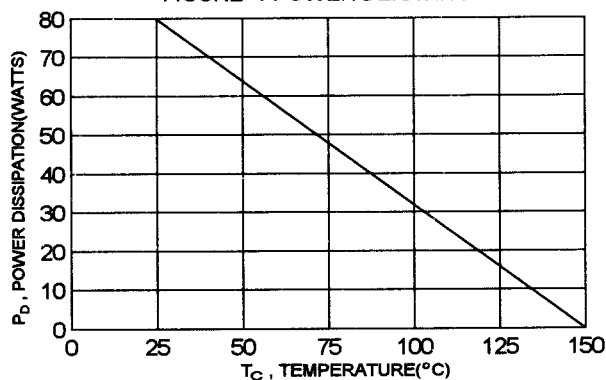


PIN 1.BASE
2.COLLECTOR
3.EMITTER
4.COLLECTOR(CASE)

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance Junction to Case	$R_{\theta jc}$	1.56	$^\circ\text{C/W}$

FIGURE -1 POWER DERATING



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

Characteristic	Symbol	Min	Max	Unit
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OFF CHARACTERISTICS

Collector - Emitter Breakdown Voltage (1) ($I_C = 10\text{ mA}$, $I_B = 0$)	TIP150 TIP151 TIP152	$V_{(BR)CEO}$	300 350 400	V
Collector - Base Breakdown Voltage (1) ($I_C = 1.0\text{ mA}$, $I_B = 0$)	TIP150 TIP151 TIP152	$V_{(BR)CBO}$	300 350 400	V
Collector Cutoff Current ($V_{CE} = 300\text{ V}$, $I_B = 0$) ($V_{CE} = 350\text{ V}$, $I_B = 0$) ($V_{CE} = 400\text{ V}$, $I_B = 0$)	TIP150 TIP151 TIP152	I_{CEO}	250 250 250	μA
Emitter Cutoff Current ($V_{EB} = 8.0\text{ V}$, $I_C = 0$)		I_{EBO}	15	mA

ON CHARACTERISTICS (1)

DC Current Gain ($I_C = 2.5\text{ A}$, $V_{CE} = 5.0\text{ V}$) ($I_C = 5.0\text{ A}$, $V_{CE} = 5.0\text{ V}$) ($I_C = 7.0\text{ A}$, $V_{CE} = 5.0\text{ V}$)	h_{FE}	150 50 15		
Collector-Emitter Saturation Voltage ($I_C = 1.0\text{ A}$, $I_B = 10\text{ mA}$) ($I_C = 2.0\text{ A}$, $I_B = 100\text{ mA}$) ($I_C = 5.0\text{ A}$, $I_B = 250\text{ mA}$)	$V_{CE(sat)}$		1.5 1.5 2.0	V
Base-Emitter Saturation Voltage ($I_C = 2.0\text{ A}$, $I_B = 100\text{ mA}$) ($I_C = 5.0\text{ A}$, $I_B = 250\text{ mA}$)	$V_{BE(sat)}$		2.2 2.3	V
Diode Forward Voltage ($I_F = 7.0\text{ A}$)	V_F		3.5	V

DYNAMIC CHARACTERISTICS

Small-Signal Current Gain ($I_C = 0.5\text{ A}$, $V_{CE} = 5.0\text{ V}$, $f = 1.0\text{ KHz}$)	h_{fe}	200		
Output Capacitance ($V_{CB} = 10\text{ V}$, $I_E = 0$, $f = 1.0\text{ MHz}$)	C_{ob}		150	pF

SWITCHING CHARACTERISTICS

Delay Time	$V_{CC} = 250\text{ V}$, $I_C = 5.0\text{ A}$ $I_{B1} = -I_{B2} = 250\text{ mA}$, $t_p = 20\mu\text{s}$, Duty Cycle $\leq 2.0\%$	t_d	30(typ)		ns
Rise Time		t_r	180(typ)		ns
Storage Time		t_s	3.5(typ)		μs
Fall Time		t_f	1.6(typ)		μs

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

FIG-2 DC CURRENT GAIN

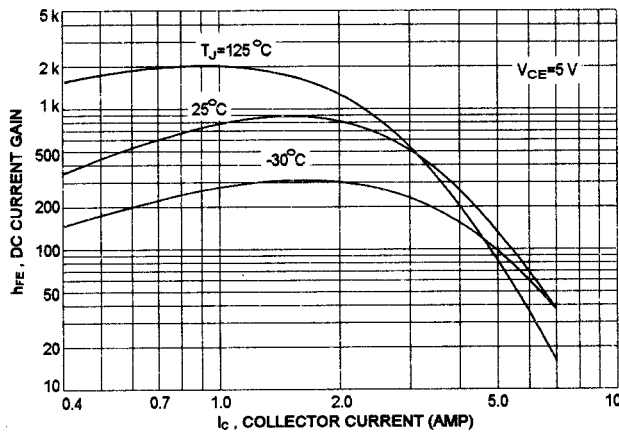


FIG-3 BASE-EMITTER VOLTAGE

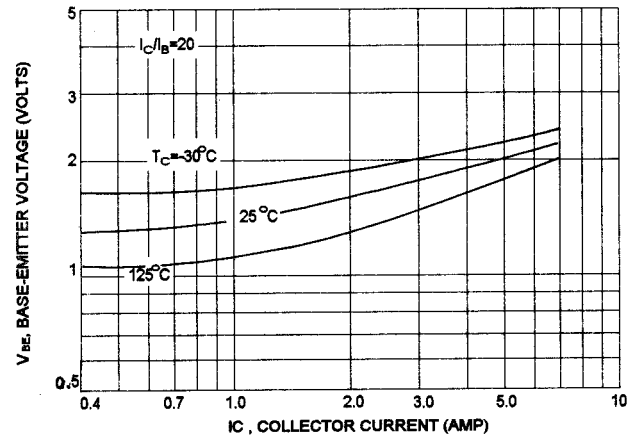


FIG-4 COLLECTOR-EMITTER SATURATION VOLTAGE

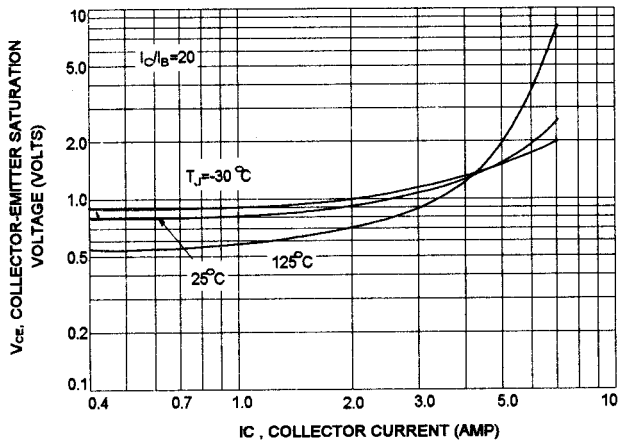


FIG-5 REVERSE BIASE SAFE OPERATING AREA

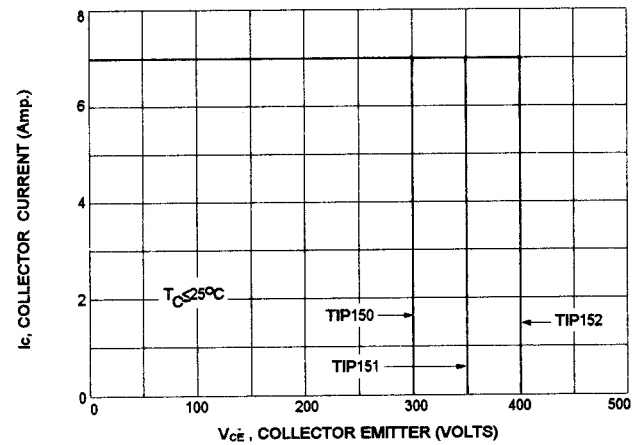
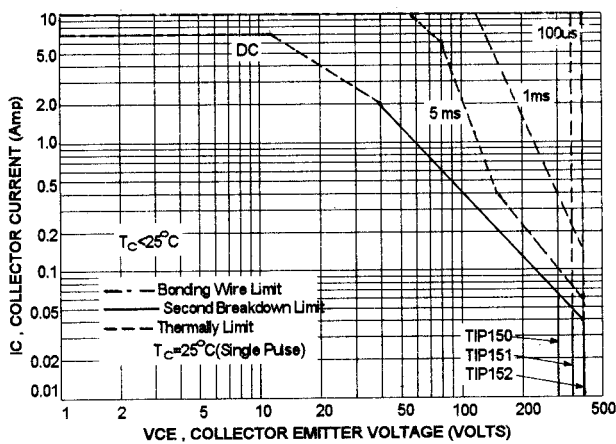


FIG-6 ACTIVE REGION SAFE OPERATING AREA



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 curve 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.