

## 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

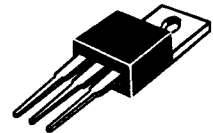
TIP151

TIP152

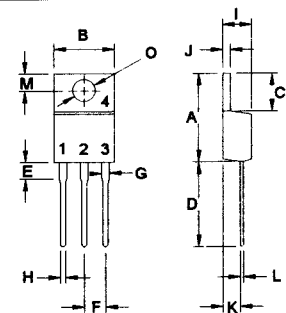
7 AMPERE  
DARLINGTON  
POWER TRANSISTORS  
300-400 VOLTS  
80 WATTS

### 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 $25^\circ\text{C}$	$P_D$	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



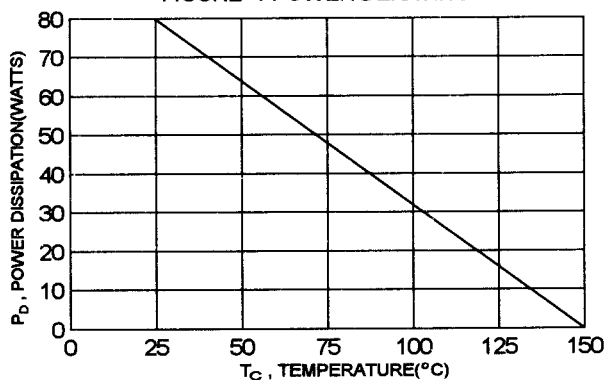
PIN 1.BASE  
2.COLLECTOR  
3.EMITTER  
4.COLLECTOR(CASE)

### THERMAL CHARACTERISTICS

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

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

FIGURE -1 POWER DERATING



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

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector - Emitter Breakdown Voltage (1) ( $I_C = 10 \text{ mA}, I_B = 0$ )	$V_{(BR)CEO}$	300 350 400		V
Collector - Base Breakdown Voltage (1) ( $I_C = 1.0 \text{ mA}, I_B = 0$ )	$V_{(BR)CBO}$	300 350 400		V
Collector Cutoff Current ( $V_{CE} = 300 \text{ V}, I_B = 0$ ) ( $V_{CE} = 350 \text{ V}, I_B = 0$ ) ( $V_{CE} = 400 \text{ V}, I_B = 0$ )	$I_{CEO}$		250 250 250	$\mu\text{A}$
Emitter Cutoff Current ( $V_{EB} = 8.0 \text{ V}, I_C = 0$ )	$I_{EBO}$		15	mA

**ON CHARACTERISTICS (1)**

DC Current Gain ( $I_C = 2.5 \text{ A}, V_{CE} = 5.0 \text{ V}$ ) ( $I_C = 5.0 \text{ A}, V_{CE} = 5.0 \text{ V}$ ) ( $I_C = 7.0 \text{ A}, V_{CE} = 5.0 \text{ V}$ )	hFE	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	$V_{CC} = 250 \text{ V}, I_C = 5.0 \text{ A}$ $I_{B1} = -I_{B2} = 250 \text{ mA}$ $t_p = 20\mu\text{s}, \text{Duty Cycle} \leq 2.0\%$	$t_d$	30(typ)		ns
Rise Time		$t_r$	180(typ)		ns
Storage Time		$t_s$	3.5(typ)		$\mu\text{s}$
Fall Time		$t_f$	1.6(typ)		$\mu\text{s}$

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

FIG-2 DC CURRENT GAIN

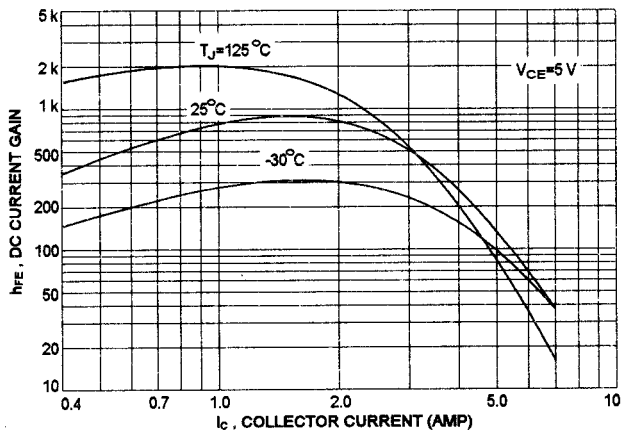


FIG-3 BASE-EMITTER VOLTAGE

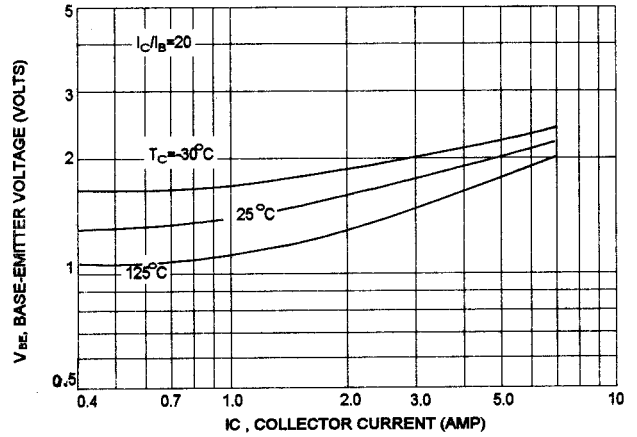


FIG-4 COLLECTOR-EMITTER SATURATION VOLTAGE

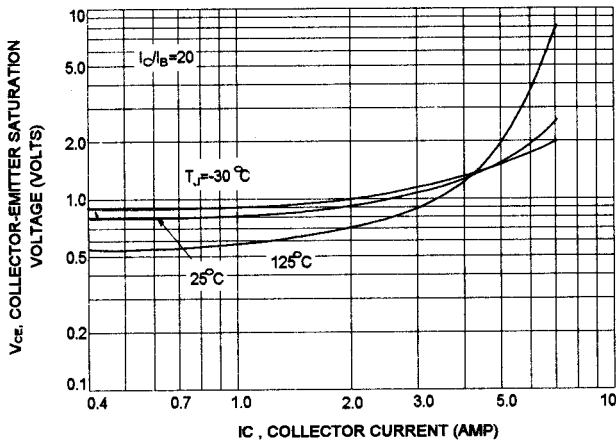


FIG-5 REVERSE BIASE SAFE OPERATING AREA

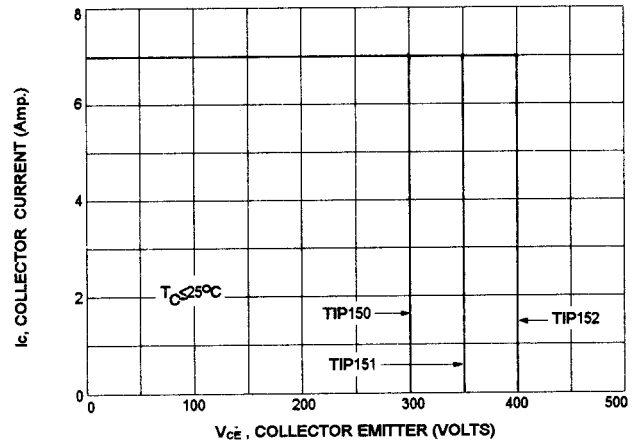
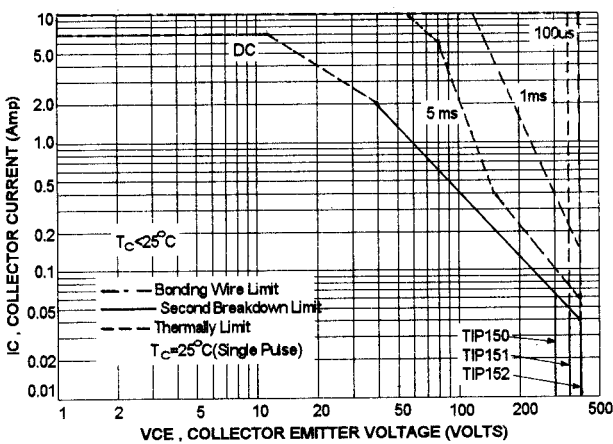


FIG-6 ACTIVE REGION SAFE OPERATING AREA



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