

# TIP147



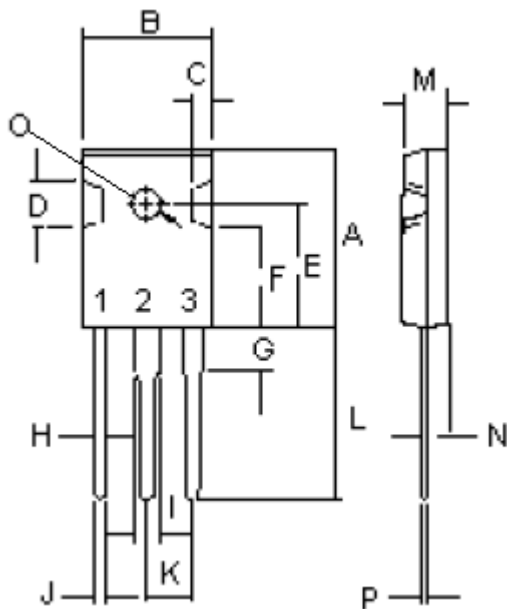
## Darlington Transistors



### Features:

- Designed for general-purpose amplifier and low speed switching applications
- Collector - emitter sustaining voltage :  $V_{CEO(sus)} = 100\text{ V}$  (Minimum)
- Collector-Emitter saturation voltage :  $V_{CE(sat)} = 2\text{ V}$  (Maximum) at  $I_C = 5\text{ A}$
- Monolithic construction with built-in base-emitter shunt resistor

TO-247 (3P)



Dimensions	Minimum	Maximum
A	20.63	22.38
B	15.38	16.2
C	1.9	2.7
D	5.1	6.1
E	14.81	15.22
F	11.72	12.84
G	4.2	4.5
H	1.82	2.46
I	2.92	3.23
J	0.89	1.53
K	5.26	5.66
L	18.5	21.5
M	4.68	5.36
N	2.4	2.8
O	3.25	3.65
P	0.55	0.7

Dimensions : Millimetres

**PNP**  
**TIP147**  
**10 Amperes**  
**Darlington**  
**Complementary Silicon**  
**Power Transistors**  
**60 - 100 Volts**  
**125 Watts**

### Maximum Ratings

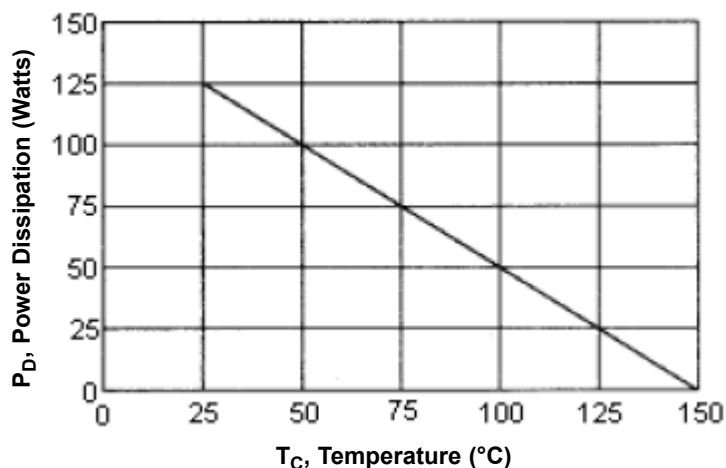
Characteristic	Symbol	TIP147	Unit
Collector - emitter voltage	$V_{CEO}$	100	V
Collector - base voltage	$V_{CBO}$	100	
Emitter - base voltage	$V_{EBO}$	5	
Collector current - continuous - peak	$I_C$ $I_{CM}$	10 15	A
Base current	$I_B$	0.5	
Total power dissipation at $T_c = 25^\circ\text{C}$ derate above $25^\circ\text{C}$	$P_D$	125 1	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	Maximum	Unit
Thermal resistance junction to case	$R_{\theta jc}$	1	$^\circ\text{C/W}$



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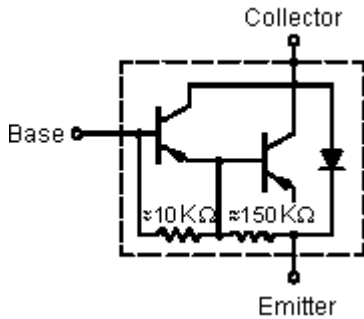
### Electrical Characteristics ( $T_C = 25^\circ\text{C}$ Unless Otherwise Specified)

Characteristic	Symbol	Minimum	Maximum	Unit	
OFF Characteristics					
Collector - emitter sustaining voltage (1) (I <sub>C</sub> = 30 mA, I <sub>B</sub> = 0)	V <sub>CEO (SUS)</sub>	100	-	V	
Collector cut off current (V <sub>CE</sub> = 50 V, I <sub>B</sub> = 0)	I <sub>CEO</sub>	-	2	mA	
Collector cut off current (V <sub>CB</sub> = 100 V, I <sub>E</sub> = 0)	I <sub>CBO</sub>	-	1		
Emitter cut off current (V <sub>EB</sub> = 5 V, I <sub>C</sub> = 0)	I <sub>EBO</sub>	-	2		
ON Characteristics (1)					
DC current gain (I <sub>C</sub> = 5 A, V <sub>CE</sub> = 4 V) (I <sub>C</sub> = 10 A, V <sub>CE</sub> = 4 V)	h <sub>FE</sub>	1,000 500	-	-	
Collector - emitter saturation voltage (I <sub>C</sub> = 5 A, I <sub>B</sub> = 10 mA) (I <sub>C</sub> = 10 A, I <sub>B</sub> = 40 mA)	V <sub>CE (sat)</sub>	-	2 3	V	
Base - emitter saturation voltage (I <sub>C</sub> = 10 A, I <sub>B</sub> = 40 mA)	V <sub>BE (sat)</sub>	-	3.5		
Base - emitter on voltage (I <sub>C</sub> = 10 A, V <sub>CE</sub> = 4 V)	V <sub>BE (on)</sub>	-	3		
Switching Characteristics					
Delay Time	V <sub>CC</sub> = 30 V, I <sub>C</sub> = 5 A I <sub>B1</sub> = -I <sub>B2</sub> = 20 mA t <sub>p</sub> = 20 μs, Duty cycle ≤ 2%	td	0.15 (Typical)	-	μs
Rise Time		tr	0.55 (Typical)	-	
Storage Time		ts	2.5 (Typical)	-	
Fall Time		tf		-	

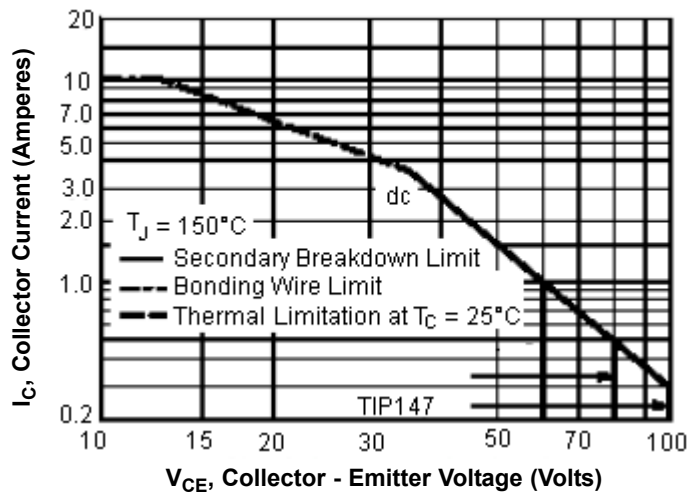
(1) Pulse Test : Pulse width = 300  $\mu\text{s}$ , duty cycle  $\leq 2\%$

## Darlington Transistors

### Internal Schematic Diagram



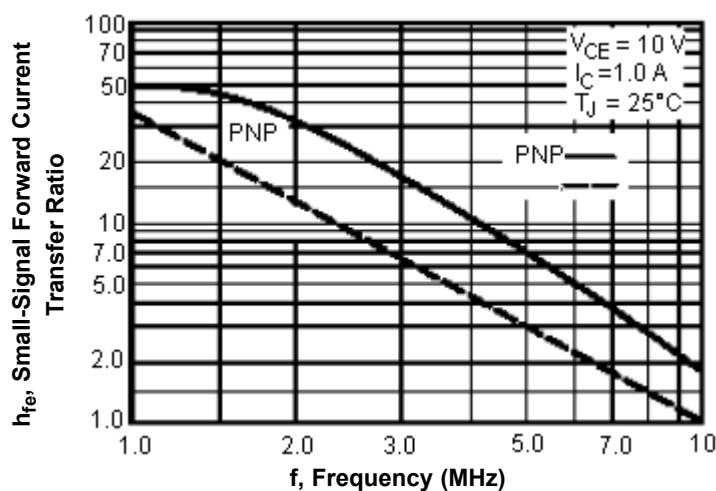
### Active Region Safe Operating Area (SOA)



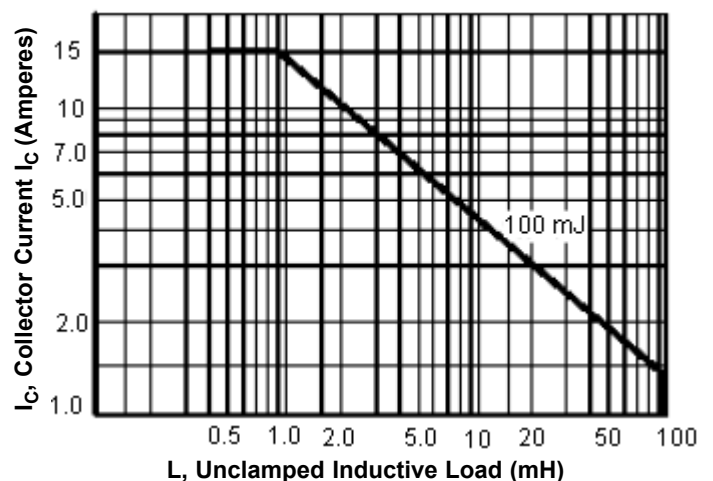
There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown safe operating area curves indicate  $I_C$ - $V_{CE}$  limits of the transistor that must be observed for reliable operation i.e., the transistor must not be subjected to greater dissipation than curves indicate

The data of SOA curve is base on  $T_J (PK) = 150^\circ\text{C}$ ;  $T_C$  is variable depending on conditions. At high case temperatures, thermal limitation will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

### Small-Signal Common-Emitter Forward Current Transfer Ratio

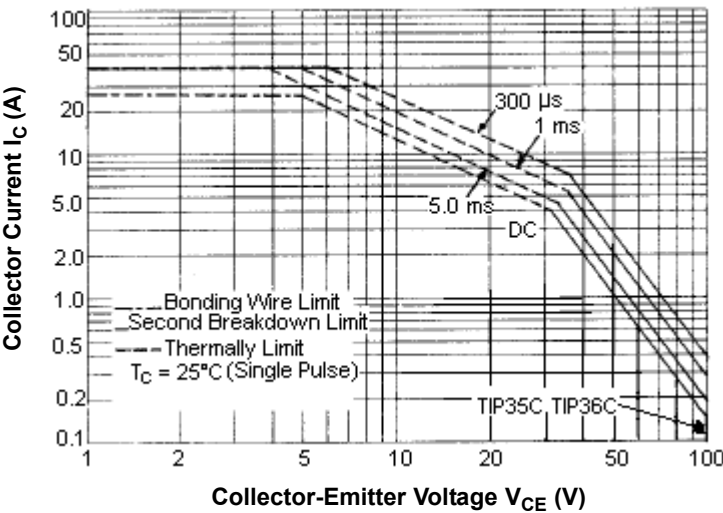


### Unclamped Inductive Load



Darlington Transistors

Safe Operating Area



There are two limitations 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 the curves indicate. The data of Figure - 6 is based on  $T_C = 25^\circ\text{C}$ ;  $T_{J(pk)}$  is variable depending on power level. Second breakdown pulse limits are valid for duty cycle to 10% but must be derated when  $T_C \geq 25^\circ\text{C}$ , second breakdown limitations do not derate the same as thermal limitation.

Specification Table

Description	$I_{C(av)}$ Maximum (A)	$V_{CEO}$ Maximum (V)	$h_{FE}$ Minimum at $I_C = 15\text{ A}$	$P_{tot}$ at $25^\circ\text{C}$ (W)	Package	Type	Part Number
Complementary Power Transistor	25	100	15	125	TO-247	NPN	TIP35C
Complementary Power Transistor	25	100	15	125	TO-247	PNP	TIP36C

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