

Darlington Transistor TO-3



Description

Designed for use as output devices in complementary general purpose amplifier applications.

Features:

- High gain darlington performance
- High DC current gain $h_{FE} = 1,000$ (Minimum) at $I_C = 20A$
- Monolithic construction with built-in base-emitter shunt resistor

Maximum Ratings

Characteristic	Symbol	MJ11016	Unit
Collector-Emitter Voltage	V_{CEO}	120	
Collector-Base Voltage	V_{CBO}	120	V
Emitter-Base Voltage	V_{EBO}	5	
Collector Current -Continuous -Peak	I_C I_{CM}	30 50	A
Base Current	I_B	1	
Total Power Dissipation @ $T_C = 25^\circ C$ Derate above $25^\circ C$	P_D	200 1.15	W W/ $^\circ C$
Operating and Storage Junction Temperature Range	T_J, T_{STG}	-65 to +200	$^\circ C$

Thermal Characteristics

Characteristic	Symbol	Maximum	Unit
Thermal Resistance Junction to Case	$R_{\theta jc}$	0.87	$^\circ C/W$

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Electrical Characteristics (TC = 25°C unless otherwise noted)

Characteristic	Symbol	Minimum	Maximum	Unit
Off Characteristics				
Collector-Emitter Sustaining Voltage (1) ($I_C = 100\text{mA}$, $I_B = 0$)	$V_{EO(sus)}$	120	-	V
Collector Cutoff Current ($V_{CE} = 50\text{V}$, $I_B = 0$)	I_{CEO}	-	1	mA
Collector-Emitter Leakage Current ($V_{CE} = 120\text{V}$, $R_{BE} = 1\text{k}\Omega$)	I_{CER}	-	1	
($V_{CE} = 120\text{V}$, $R_{BE} = 1\text{k}\Omega$, $T_C = 125^\circ\text{C}$)			5	
Emitter Cutoff Current ($V_{EB} = 5\text{V}$, $I_C = 0$)	I_{EBO}	-	5	

On Characteristics (1)

DC Current Gain ($I_C = 20\text{A}$, $V_{CE} = 5\text{V}$) ($I_C = 30\text{A}$, $V_{CE} = 5\text{V}$)	h_{FE}	1,000 200	-	-
Collector-Emitter Saturation Voltage ($I_C = 20\text{A}$, $I_B = 200\text{mA}$) ($I_C = 30\text{A}$, $I_B = 300\text{mA}$)	$V_{CE(sat)}$	-	3 4	V
Base-Emitter Saturation Voltage ($I_C = 20\text{A}$, $I_B = 200\text{mA}$) ($I_C = 30\text{A}$, $I_B = 300\text{mA}$)	$V_{BE(sat)}$	-	3.5 5	

Dynamic Characteristics

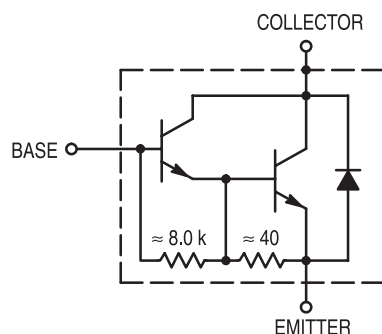
Small-Signal Current Gain ($I_C = 10\text{A}$, $V_{CE} = 3\text{V}$, $f = 1\text{MHz}$)	$ h_{fe} $	4	-	-
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(1) Pulse Test : Pulse Width = 300 μs , Duty Cycle 2%.

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

Internal Schematic Diagram

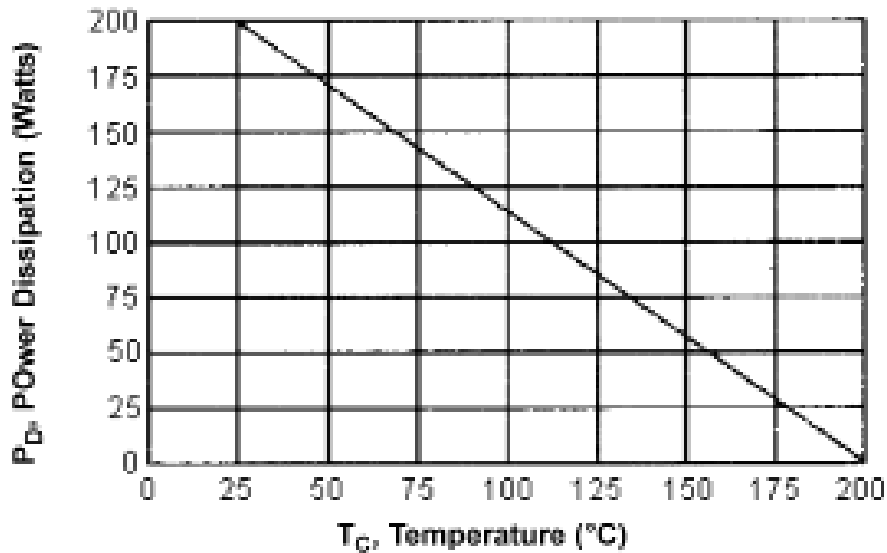
NPN
MJ11016



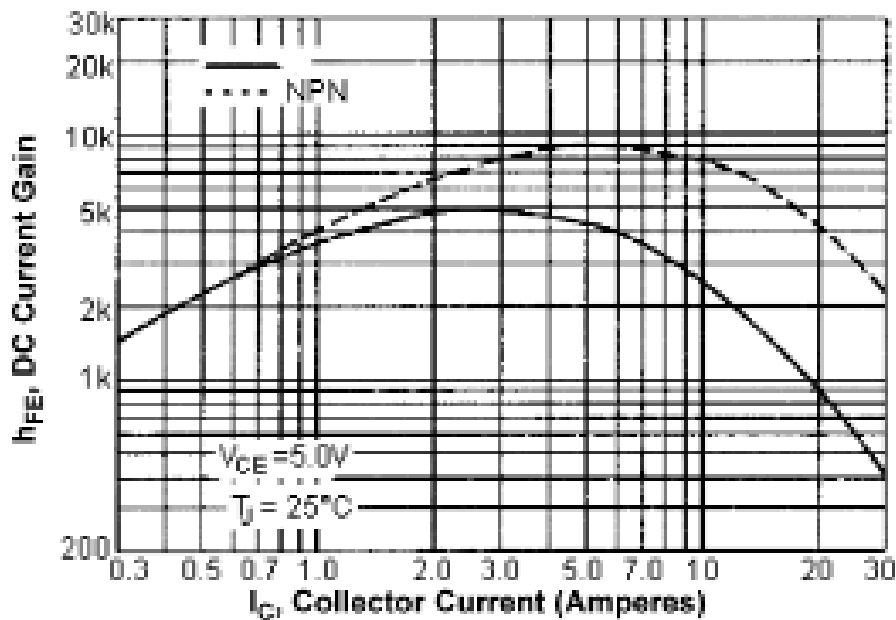
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Power Derating



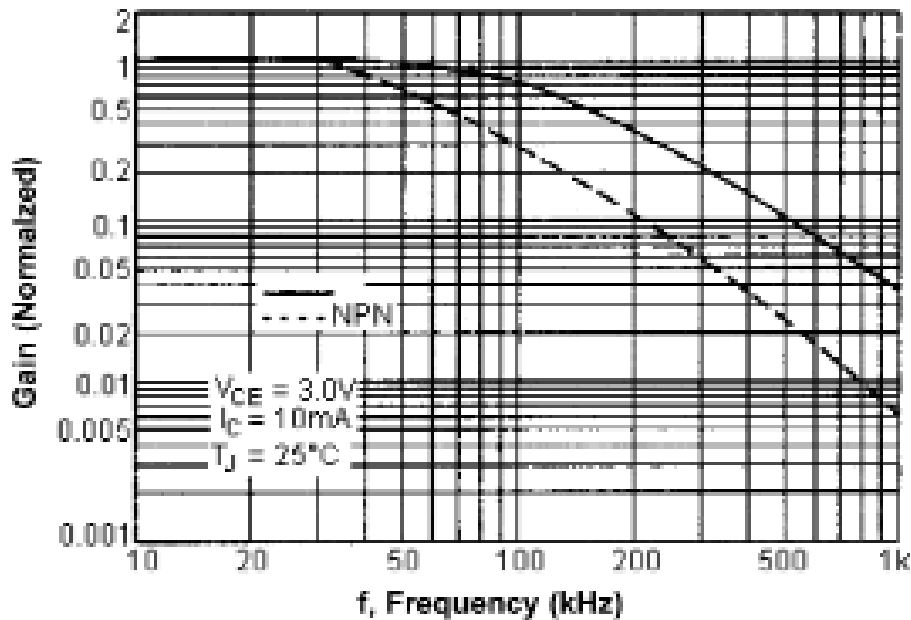
DC Current Gain



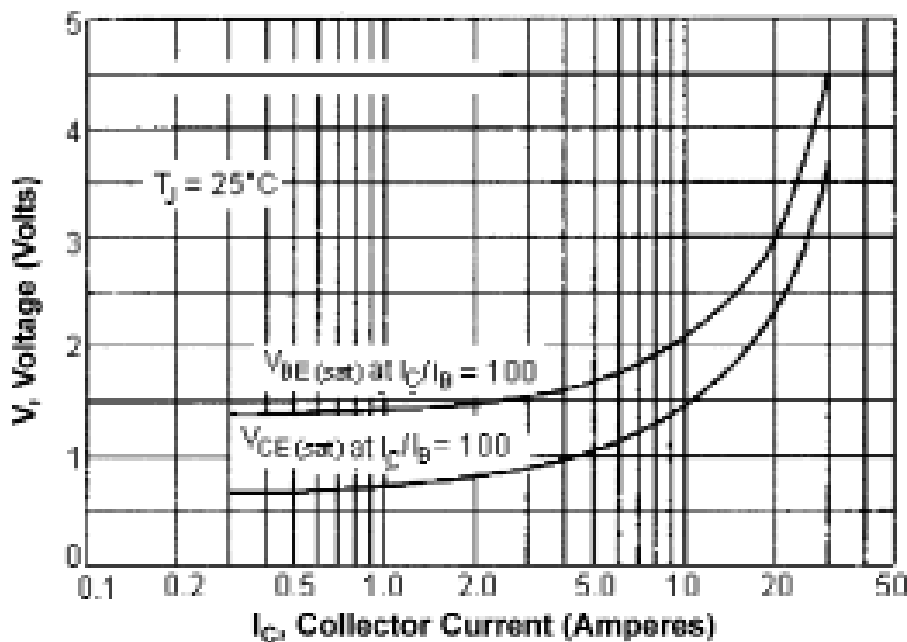
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Small-Signal Current Gain



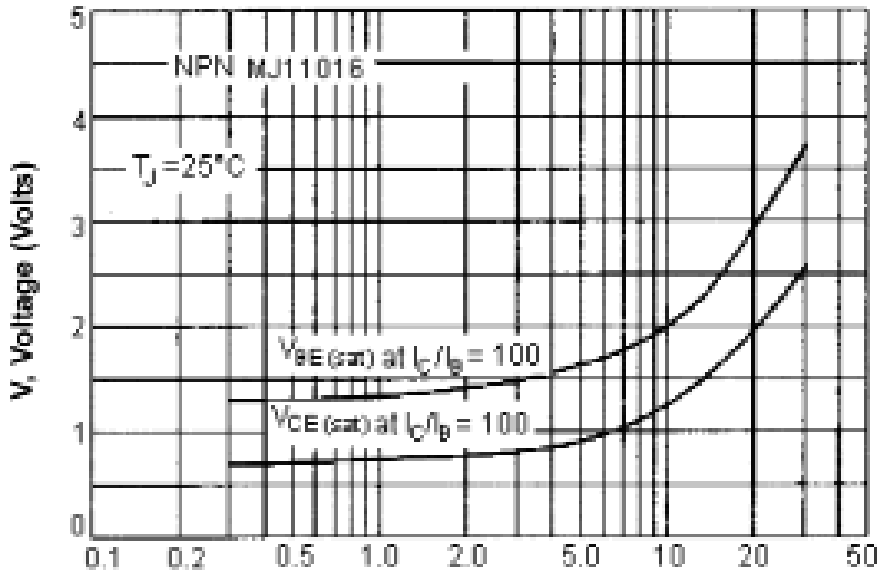
"ON" Voltages



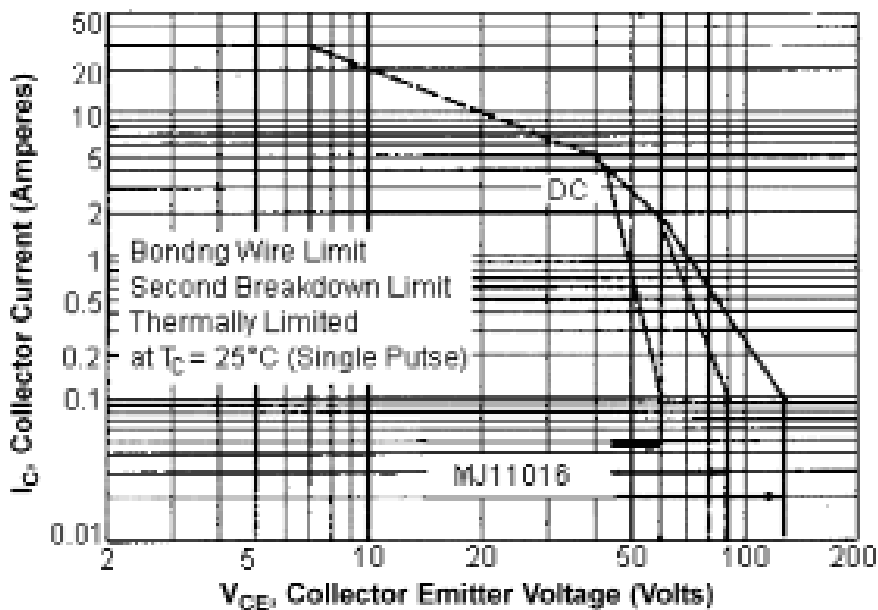
Darlington Transistor T0-3



“ON” Voltages



Active-Region Safe Operating Area (SOA)

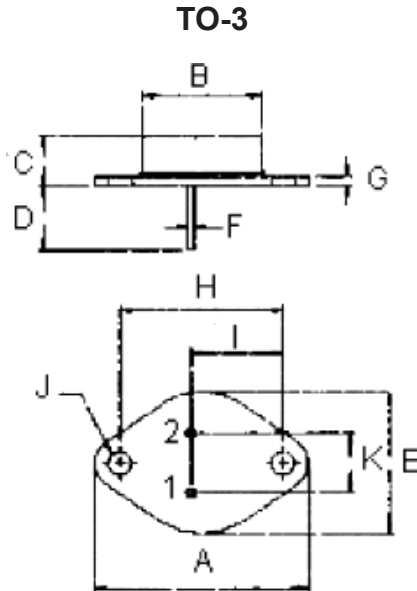


There are two limitation on the power handling ability of a transistor: average junction temperature and second breakdown safe operating area curves indicate I_C - V_{CE} limits of the transistor that must be observed for reliable operation i.e., the transistor must not be subjected to greater dissipation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

The data of SOA curve is base on $T_{J(PK)} = 200^\circ\text{C}$; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(PK)} \leq 200^\circ\text{C}$. At high case temperatures, thermal limitation will reduce the power that can be handled to values less than the limitations imposed by second breakdown.



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Dimensions	Minimum	Maximum
A	38.75	39.96
B	19.28	22.23
C	7.96	9.28
D	11.18	12.19
E	25.2	26.67
F	0.92	1.09
G	1.38	1.62
H	29.9	30.4
I	16.64	17.3
J	3.88	4.36
K	10.67	11.18

- Pin 1. Base
- 2. Emitter
- 3. Collector (Case)

Part Number Table

Description	Part Number
Darlington Transistor, TO-3	MJ11016

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