Darlington Transistor
TO-3

Description:

Darlington complementary silicon power transistors
Designed for general-purpose amplifier and low frequency switching applications

Features:

- High DC current gain - h_{FE} = 3,500 (typical) at I_C = 5A DC
- Collector-emitter sustaining voltage - at 100mA
  V_{CEO} (sus) = 100V DC (min.)
- Monolithic construction with built-in-base-emitter shunt resistors
- Pb-free device

Maximum Ratings

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	100	V DC
Collector-Base Voltage	V_{CB}		
Emitter-Base Voltage	V_{EB}	5	
Collector Current -Continuous -Peak	I_C	12 20	A DC
Base Current	I_B	0.2	
Total Power Dissipation at T_C = 25°C Derate above 25°C	P_D	150 0.857	W W/°C
Operating and Storage Junction Temperature Range	T_J, T_{STG}	-65 to +200	°C

Thermal Characteristics

Characteristic	Symbol	Max.	Unit
Thermal Resistance Junction to Case	$R_{\theta jc}$	1.17	°C/W

Stresses exceeding maximum ratings may damage the device. Maximum ratings are stress ratings only. Functional operation above the recommended operating conditions is not implied. Extended exposure to stresses above the recommended operating conditions may affect device reliability.

1. Indicates JEDEC registered data.

Electrical Characteristics (TC = 25°C unless otherwise noted) (Note 2)

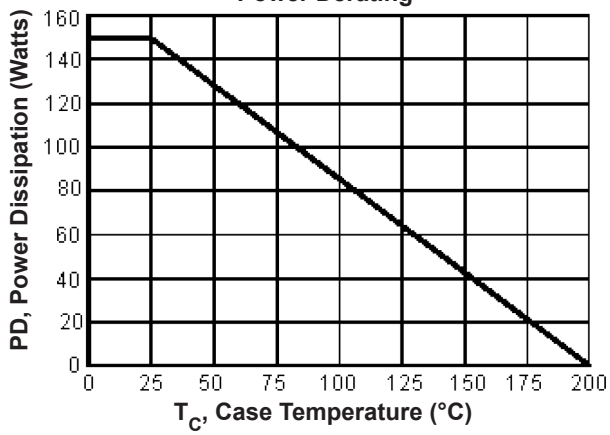
Characteristic	Symbol	Min.	Max.	Unit
Off Characteristics				
Collector-Emitter Sustaining Voltage (Note 3) (I_C = 100mA DC, I_B = 0)	$V_{CEO\ (sus)}$	100	-	V DC
Collector Cut off Current (V_{CE} = 50V DC, I_B = 0)	I_{CEO}	-	1	mA DC
Collector Cut off Current (V_{CE} = Rated V_{CEO}, $V_{BE\ (off)}$ = 1.5V DC) (V_{CE} = Rated V_{CEO}, $V_{BE\ (off)}$ = 1.5V DC, T_C = 150°C)	I_{CEX}	-	0.5 5	
Emitter Cut off Current (V_{BE} = 5V DC, I_C = 0)	I_{EBO}	-	2	
On Characteristics (Note 3)				
DC Current Gain (I_C = 6A DC, V_{CE} = 3V DC) (I_C = 12A DC, V_{CE} = 3V DC)	h_{FE}	750 100	18,000 -	-
Collector-Emitter Saturation Voltage (I_C = 6A DC, I_B = 24mA DC) (I_C = 12A DC, I_B = 120mA DC)	$V_{CE\ (sat)}$	- -	2 3	V DC
Base-Emitter Saturation Voltage (I_C = 12A DC, I_B = 120mA DC)	$V_{BE\ (sat)}$	-	4	
Base-Emitter On Voltage (I_C = 6A DC, V_{CE} = 3V DC)	$V_{BE\ (on)}$	-	2.8	
Dynamic Characteristics				
Magnitude of Common-Emitter Small-Signal Short-Circuit Forward Current Transfer Ratio (I_C = 5A DC, V_{CE} = 3V DC, f = 1MHz)	$\lvert h_{fe} \rvert$	4	-	MHz
Output Capacitance (V_{CB} = 10V DC, I_E = 0, f = 0.1MHz)	C_{ob}	-	500 300	pF
Small-Signal Current Gain (I_C = 5A DC, V_{CE} = 3V DC, f = 1kHz)	h_{fe}	300	-	-

Note:

(2) Indicates JEDEC Registered Data.

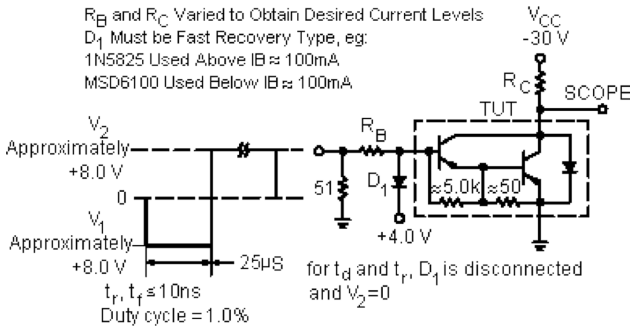
(3) Pulse test: Pulse Width = 300µs, Duty Cycle = 2%.

Power Derating



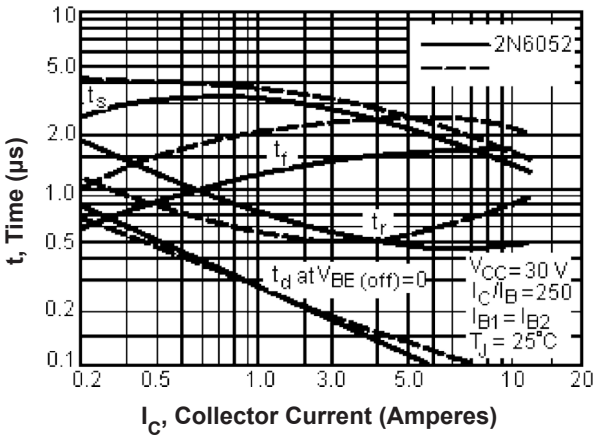
Darlington Transistor
TO-3

Switching Times Test Circuit

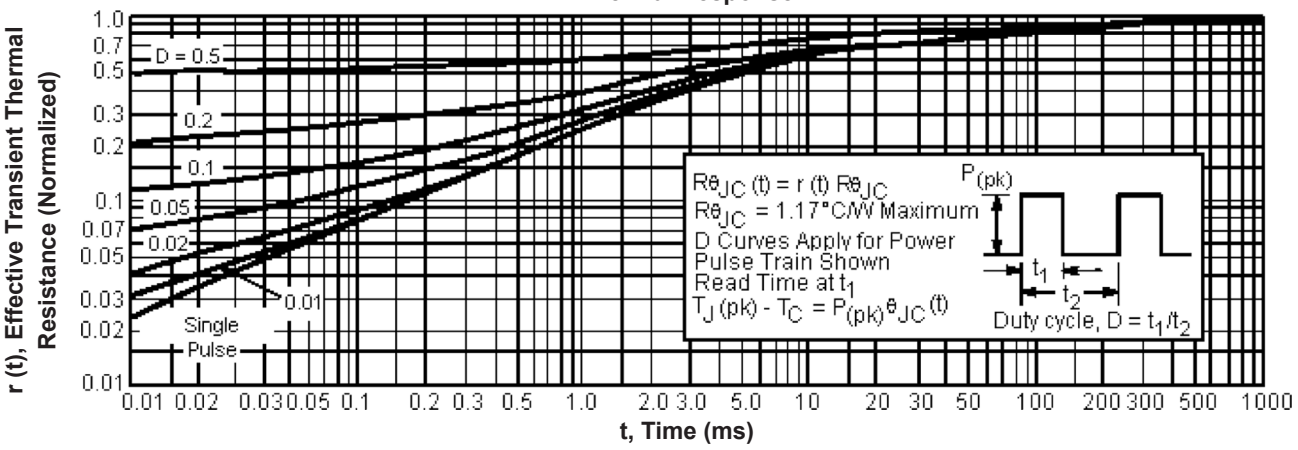


For NPN Test Circuit Reverse Diode and Voltage Polarities

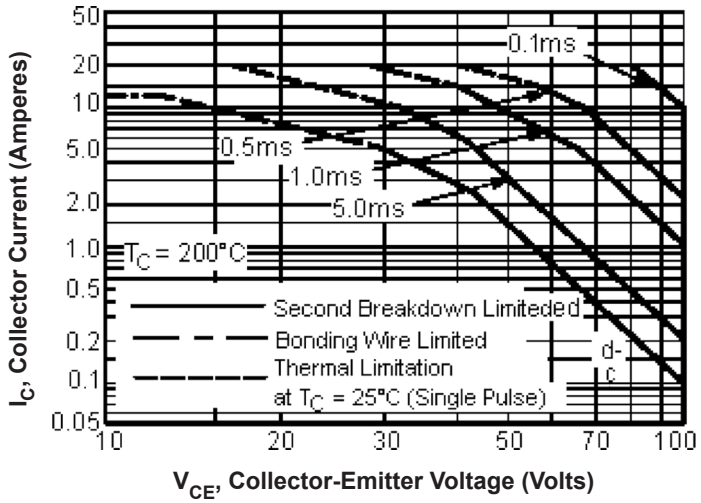
Switching Times



Thermal Response



Active-Region Safe Operating Area



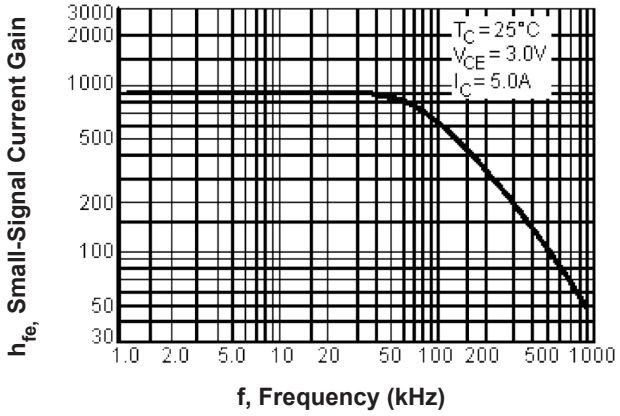
There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate $I_C - V_{CE}$ limits of the transistor that must be observed for reliable operation; i.e., the transistor must not be subjected to greater dissipation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

The data is based on $T_{J(pk)}$ = 200°C; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} \leq 200°C$; $T_{J(pk)}$ may be calculated from the data. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

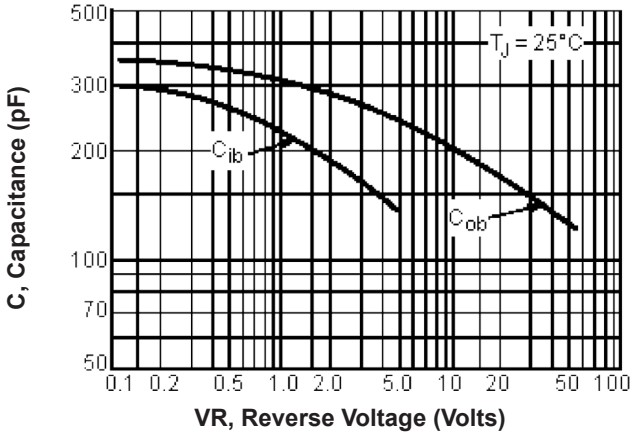
Darlington Transistor
TO-3

multicomp PRO

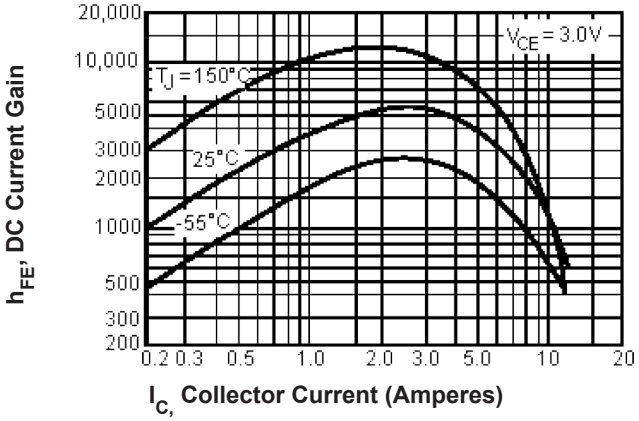
Small-Signal Current Gain



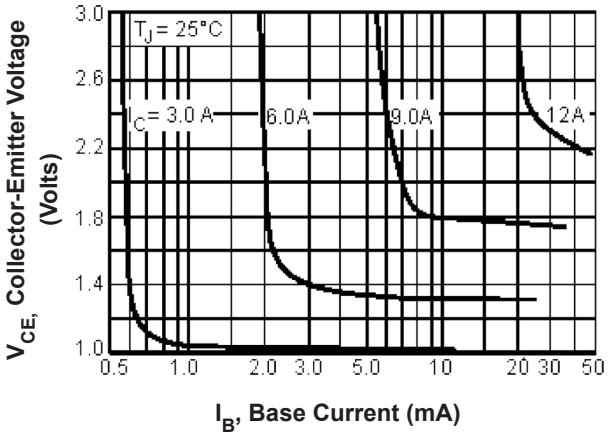
Capacitance



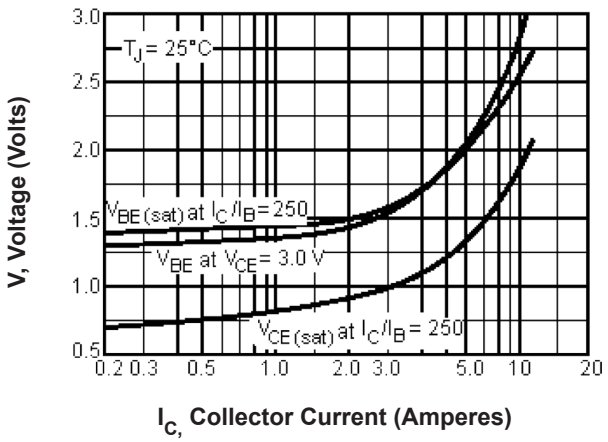
DC Current Gain



Collector Saturation Region



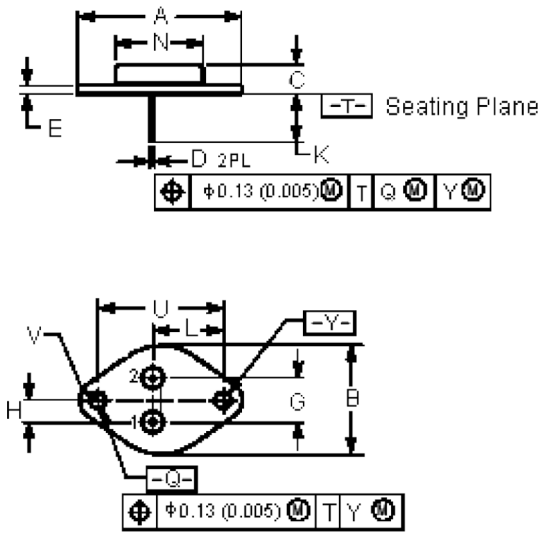
"On" Voltages



Darlington Transistor
TO-3

Dimensions

(TO-3)



Dimensions	Min.	Max.
A	1.55 (39.37) Reference	
B	-	1.05 (26.67)
C	0.25 (6.35)	0.335 (8.51)
D	0.038 (0.97)	0.043 (1.09)
E	0.055 (1.4)	0.07 (1.77)
G	0.43 (10.92) BSC	
H	0.215 (5.46) BSC	
K	0.44 (11.18)	0.48 (12.19)
L	0.665 (16.89) BSC	
N	-	0.83 (21.08)
Q	0.151 (3.84)	0.165 (4.19)
U	1.187 (30.15) BSC	
V	0.131 (3.33)	0.188 (4.77)

Dimensions : Inches (Millimetres)

Pin Configuration

Pin 1. Base
2. Emitter
Collector (Case)

Part Number Table

Description	Part Number
Darlington Transistor, TO-3	2N6052