

# Darlington Complementary Silicon Power Transistors

... designed for general-purpose amplifier and low-frequency switching applications.

- High DC Current Gain @  $I_C = 10 \text{ Adc}$  –  
 $h_{FE} = 2400 \text{ (Typ)} - 2N6284$   
 $= 4000 \text{ (Typ)} - 2N6287$
- Collector–Emitter Sustaining Voltage –  
 $V_{CEO(sus)} = 100 \text{ Vdc (Min)}$
- Monolithic Construction with Built–In Base–Emitter Shunt Resistors
- These devices are available in Pb–free package(s). Specifications herein apply to both standard and Pb–free devices. Please see our website at [www.onsemi.com](http://www.onsemi.com) for specific Pb–free orderable part numbers, or contact your local ON Semiconductor sales office or representative.

**\*MAXIMUM RATINGS**

Rating	Symbol	2N6283 2N6286	2N6284 2N6287	Unit
Collector–Emitter Voltage	$V_{CEO}$	80	100	Vdc
Collector–Base Voltage	$V_{CB}$	80	100	Vdc
Emitter–Base Voltage	$V_{EB}$	5.0		Vdc
Collector Current – Continuous Peak	$I_C$	20 40		Adc
Base Current	$I_B$	0.5		Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	160 0.915		Watts W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	–65 to +200		$^\circ\text{C}$

**\*THERMAL CHARACTERISTICS**

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.09	$^\circ\text{C/W}$

\*Indicates JEDEC Registered Data.

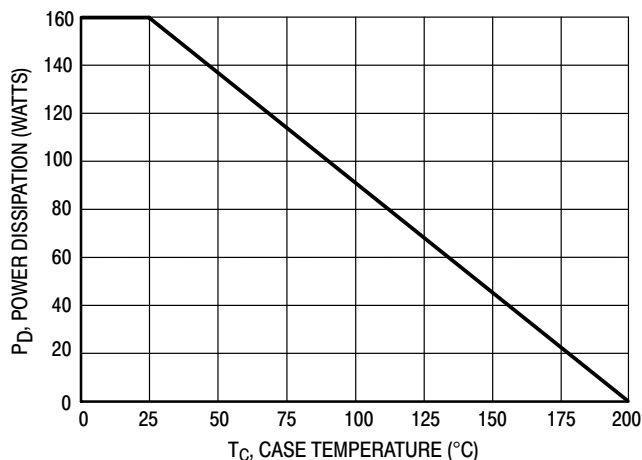


Figure 1. Power Derating

**NPN**  
**2N6283**  
  
**2N6284**  
**PNP**  
**2N6286**  
  
**2N6287**

**DARLINGTON**  
**20 AMPERE**  
**COMPLEMENTARY**  
**SILICON**  
**POWER TRANSISTORS**  
**100 VOLTS**  
**160 WATTS**

**CASE 1-07**  
**TO-204AA**  
**(TO-3)**

## 2N6283 2N6284 2N6286 2N6287

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

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector–Emitter Sustaining Voltage ( $I_C = 0.1 \text{ Adc}$ , $I_B = 0$ )  2N6283, 2N6286 2N6284, 2N6287	$V_{CE(sus)}$	<b>80</b> 100	– –	Vdc
Collector Cutoff Current ( $V_{CE} = 40 \text{ Vdc}$ , $I_B = 0$ ) ( $V_{CE} = 50 \text{ Vdc}$ , $I_B = 0$ )	$I_{CEO}$	– –	1.0 1.0	mAdc
Collector Cutoff Current ( $V_{CE} = \text{Rated } V_{CB}$ , $V_{BE(off)} = 1.5 \text{ Vdc}$ ) ( $V_{CE} = \text{Rated } V_{CB}$ , $V_{BE(off)} = 1.5 \text{ Vdc}$ , $T_C = 150^\circ\text{C}$ )	$I_{CEX}$	– –	0.5 5.0	mAdc
Emitter Cutoff Current ( $V_{BE} = 5.0 \text{ Vdc}$ , $I_C = 0$ )	$I_{EBO}$	–	2.0	mAdc
<b>ON CHARACTERISTICS (1)</b>				
DC Current Gain ( $I_C = 10 \text{ Adc}$ , $V_{CE} = 3.0 \text{ Vdc}$ ) ( $I_C = 20 \text{ Adc}$ , $V_{CE} = 3.0 \text{ Vdc}$ )	$h_{FE}$	750 100	18,000 –	–
Collector–Emitter Saturation Voltage ( $I_C = 10 \text{ Adc}$ , $I_B = 40 \text{ mAdc}$ ) ( $I_C = 20 \text{ Adc}$ , $I_B = 200 \text{ mAdc}$ )	$V_{CE(sat)}$	– –	2.0 3.0	Vdc
Base–Emitter On Voltage ( $I_C = 10 \text{ Adc}$ , $V_{CE} = 3.0 \text{ Vdc}$ )	$V_{BE(on)}$	–	2.8	Vdc
Base–Emitter Saturation Voltage ( $I_C = 20 \text{ Adc}$ , $I_B = 200 \text{ mAdc}$ )	$V_{BE(sat)}$	–	4.0	Vdc
<b>DYNAMIC CHARACTERISTICS</b>				
Magnitude of Common Emitter Small–Signal Short–Circuit Forward Current Transfer Ratio ( $I_C = 10 \text{ Adc}$ , $V_{CE} = 3.0 \text{ Vdc}$ , $f = 1.0 \text{ MHz}$ )	$ h_{fe} $	4.0	–	MHz
Output Capacitance ( $V_{CB} = 10 \text{ Vdc}$ , $I_E = 0$ , $f = 0.1 \text{ MHz}$ )  2N6283, 2N6284 2N6286, 2N6287	$C_{ob}$	– –	400 600	pF
Small–Signal Current Gain ( $I_C = 10 \text{ Adc}$ , $V_{CE} = 3.0 \text{ Vdc}$ , $f = 1.0 \text{ kHz}$ )	$h_{fe}$	300	–	–

\*Indicates JEDEC Registered Data.

(1) Pulse test: Pulse Width = 300  $\mu\text{s}$ , Duty Cycle = 2%

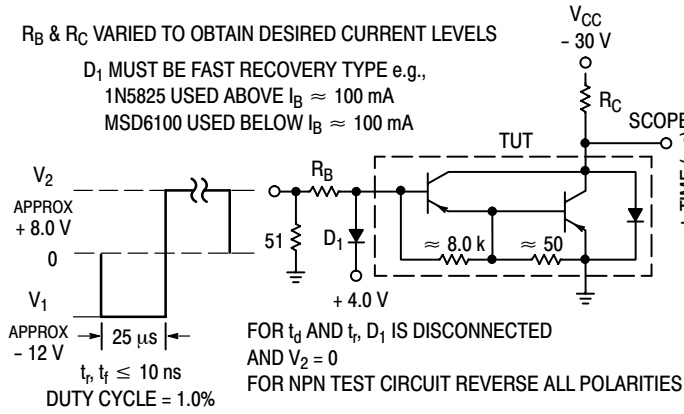


Figure 2. Switching Times Test Circuit

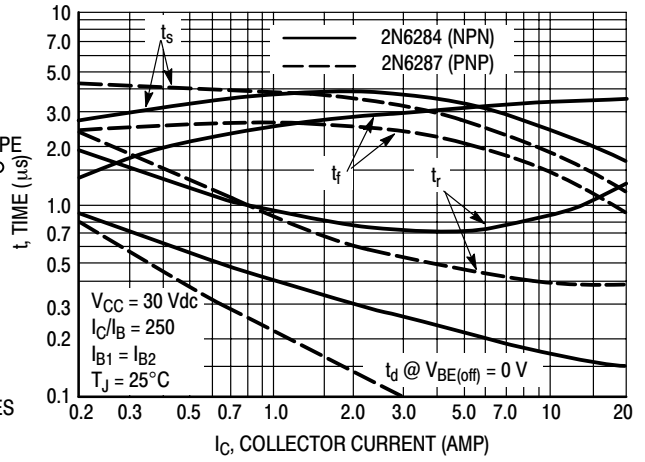


Figure 3. Switching Times

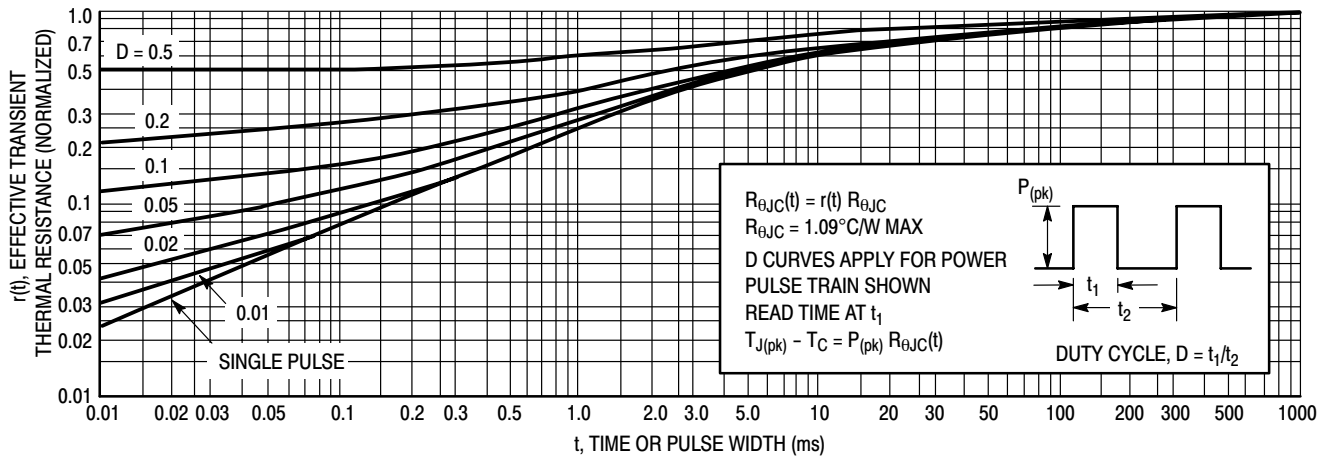


Figure 4. Thermal Response

ACTIVE-REGION SAFE OPERATING AREA

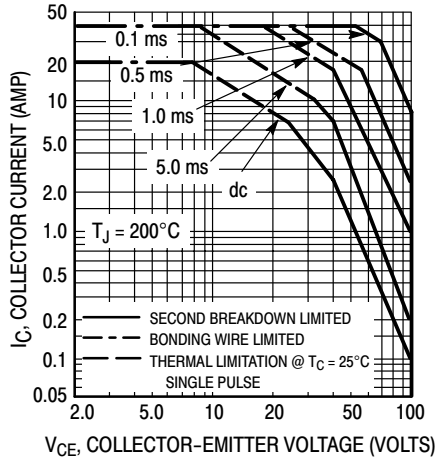


Figure 5. 2N6284, 2N6287

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 5 is based 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  $T_{J(pk)} < 200^\circ\text{C}$ .  $T_{J(pk)}$  may be calculated from the data in Figure 4. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

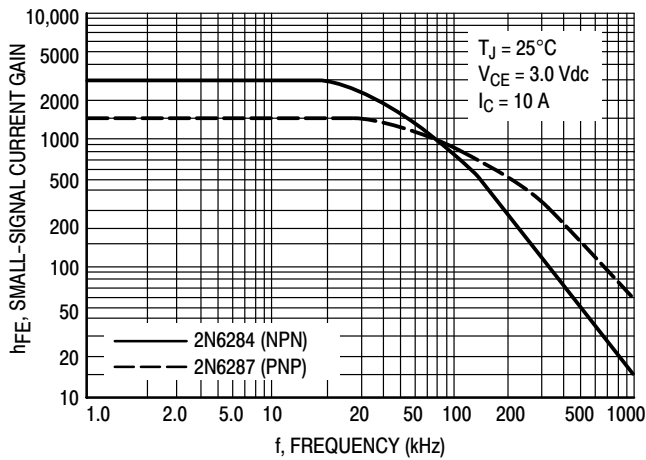


Figure 6. Small-Signal Current Gain

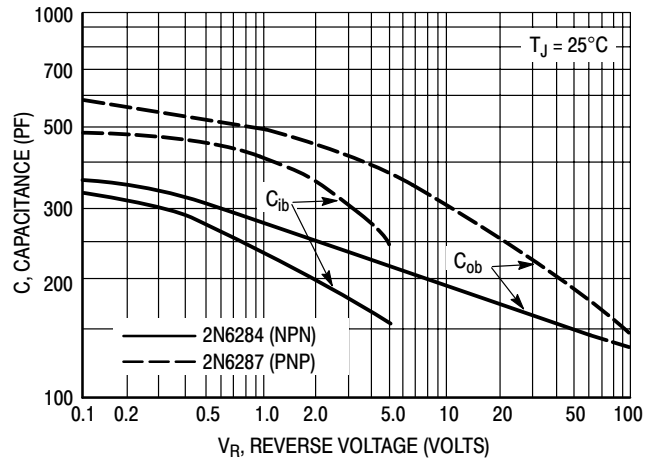
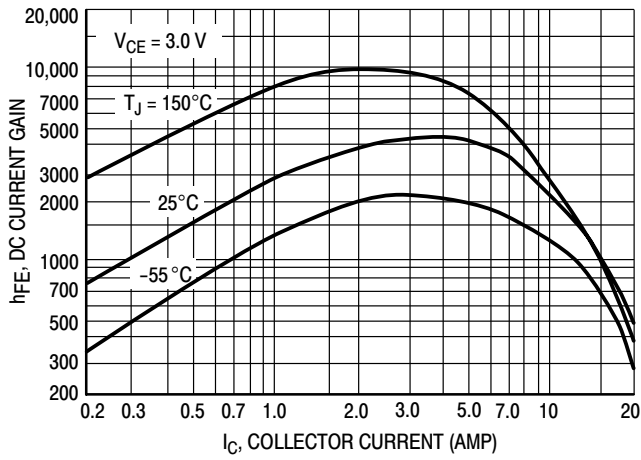


Figure 7. Capacitance

**NPN  
2N6284**



**PNP  
2N6287**

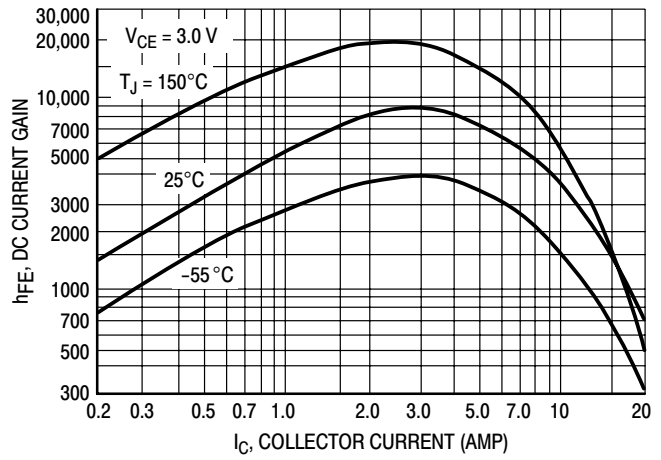


Figure 8. DC Current Gain

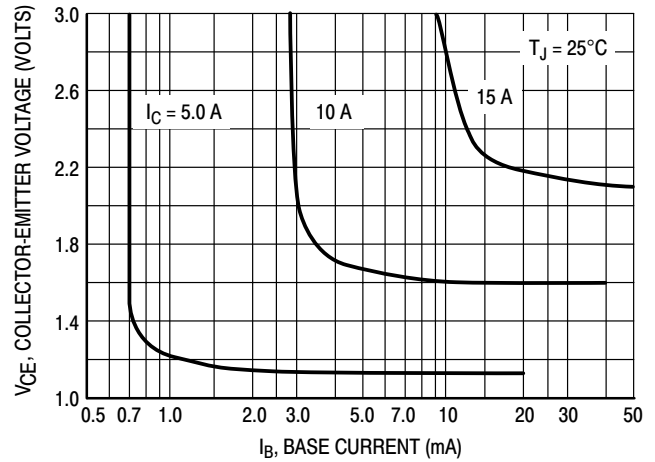
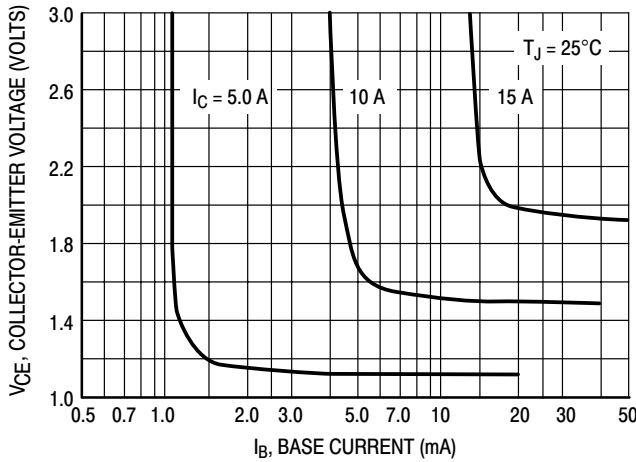


Figure 9. Collector Saturation Region

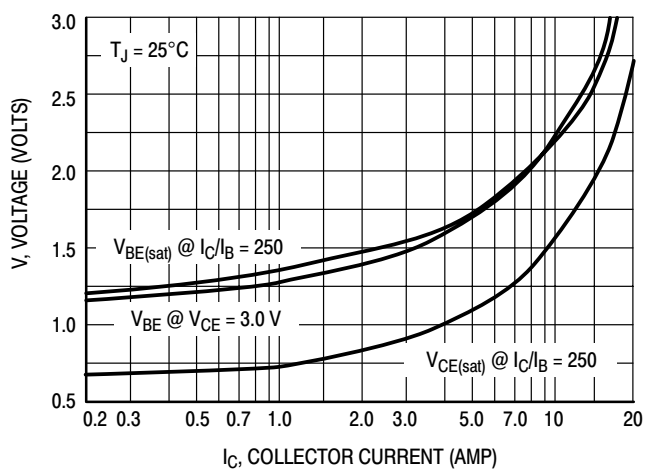
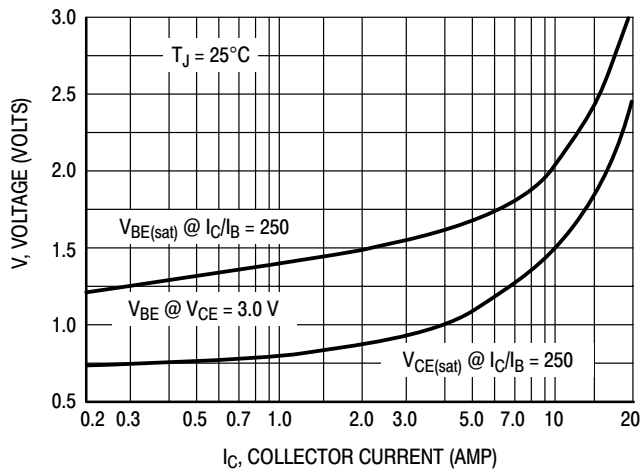


Figure 10. "On" Voltages

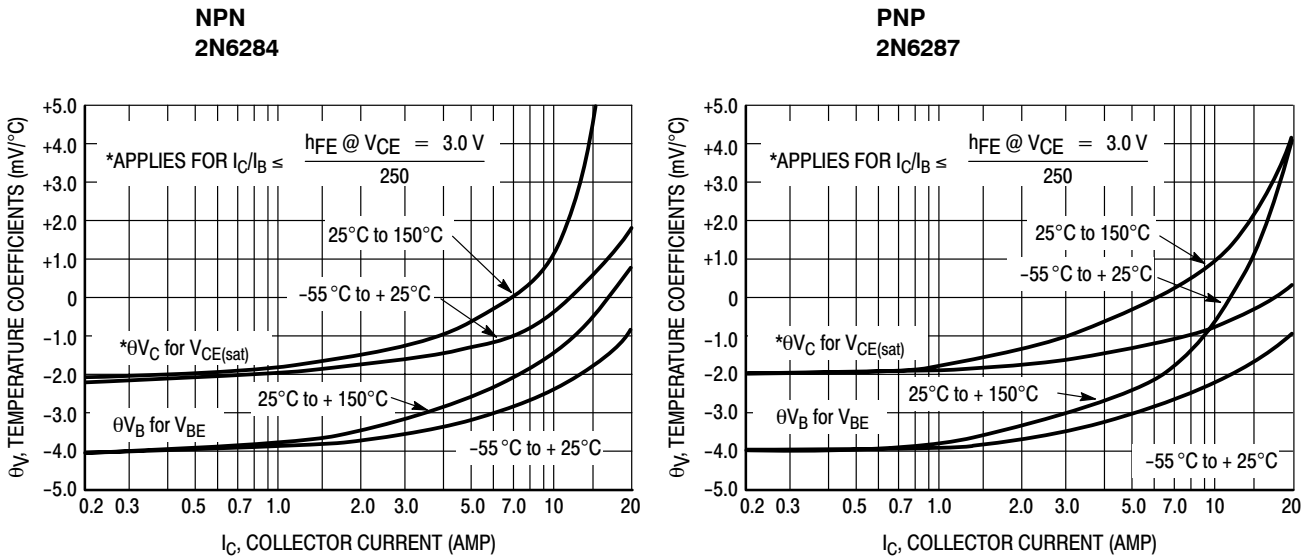


Figure 11. Temperature Coefficients

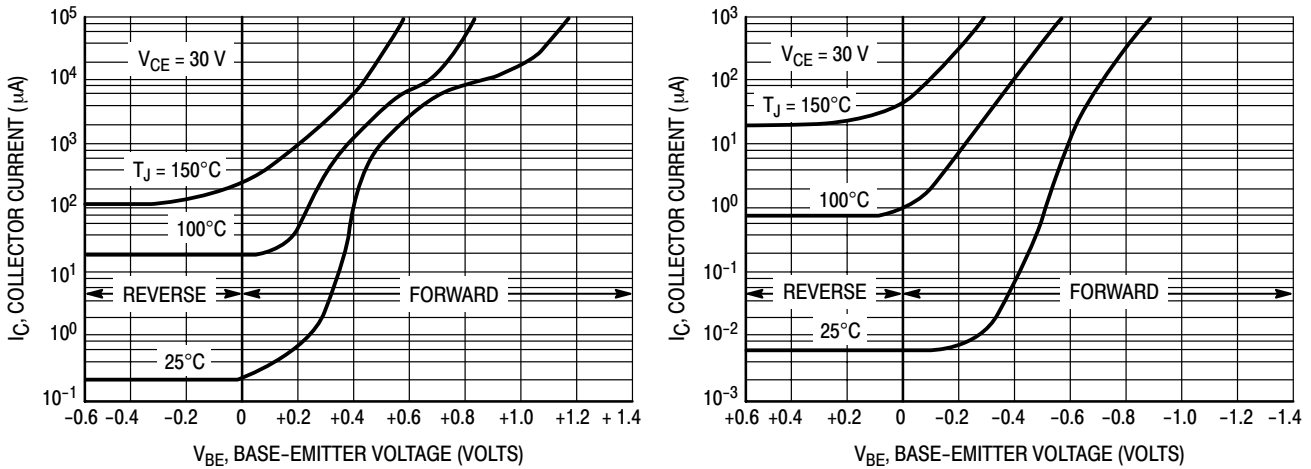


Figure 12. Collector Cut-Off Region

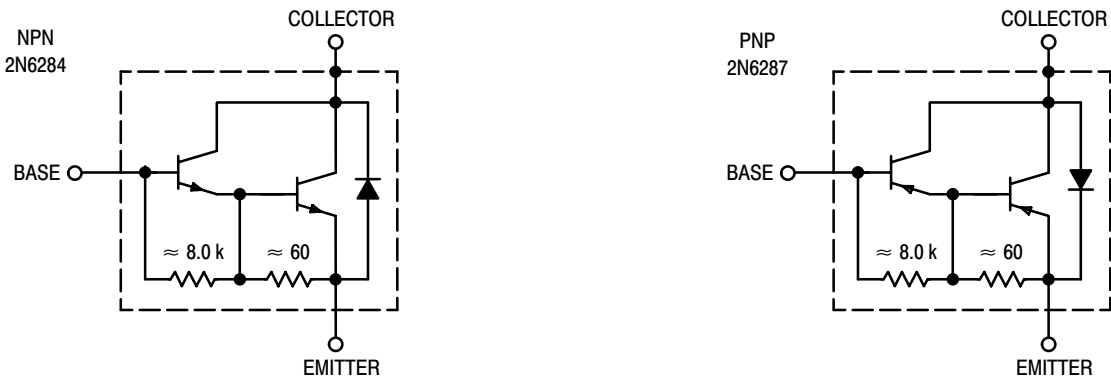


Figure 13. Darlington Schematic

