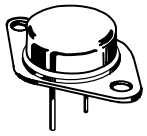
Darlington Complementary Silicon Power Transistors

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

- High DC Current Gain @ I_C = 10 Adc –
  h_{FE} = 2400 (Typ) – 2N6284
  = 4000 (Typ) – 2N6287
- Collector–Emitter Sustaining Voltage –
  $V_{CEO(sus)}$ = 100 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 for specific Pb–free orderable part numbers, or contact your local ON Semiconductor sales office or representative.**

NPN
2N6283
2N6284
PNP
2N6286
2N6287

DARLINGTON
20 AMPERE
COMPLEMENTARY
SILICON
POWER TRANSISTORS
100 VOLTS
160 WATTS



CASE 1–07
TO–204AA
(TO–3)

***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°C Derate above 25°C	P_D	160 0.915		Watts 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	$R_{\theta JC}$	1.09	°C/W

*Indicates JEDEC Registered Data.

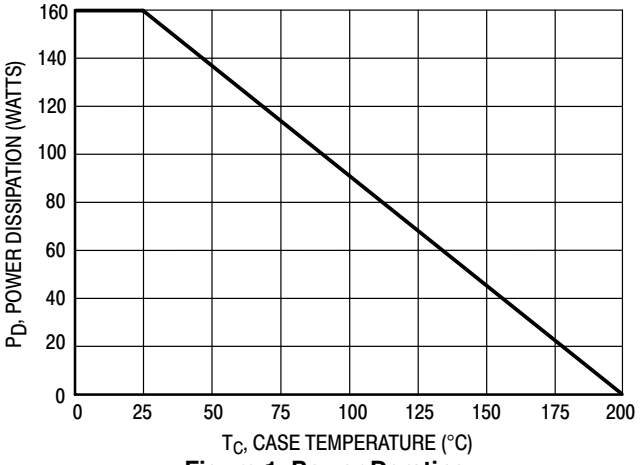


Figure 1. Power Derating

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March, 2006 – Rev. 2
Publication Order Number:
2N6284/D

***ELECTRICAL CHARACTERISTICS** (T_C = 25°C unless otherwise noted)

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

*Indicates JEDEC Registered Data.

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

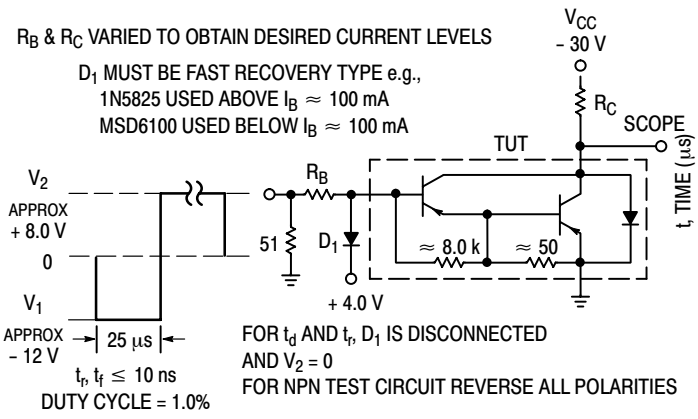


Figure 2. Switching Times Test Circuit

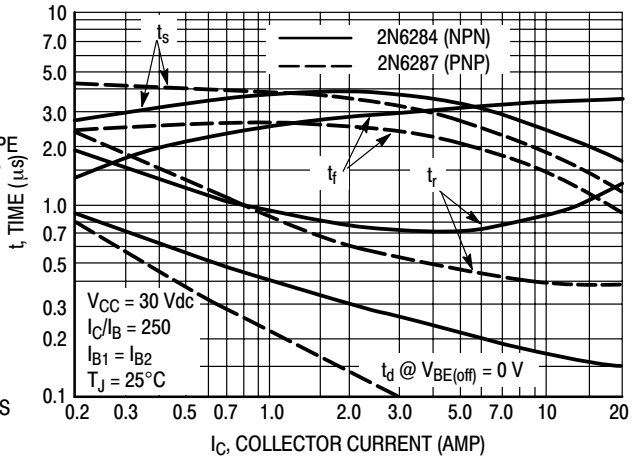


Figure 3. Switching Times

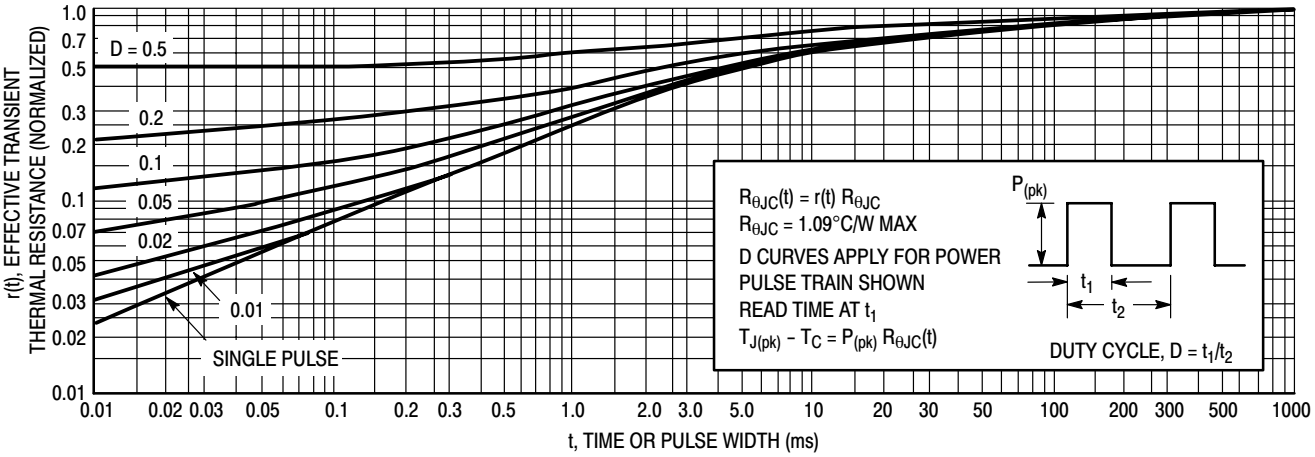


Figure 4. Thermal Response

ACTIVE−REGION SAFE OPERATING AREA

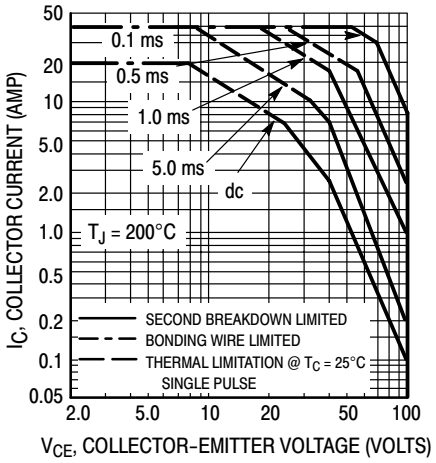


Figure 5. 2N6284, 2N6287

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°C; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)}$ < 200°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.

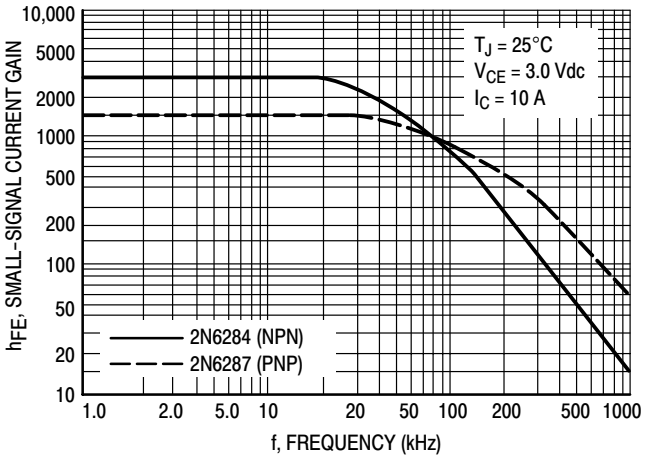


Figure 6. Small−Signal Current Gain

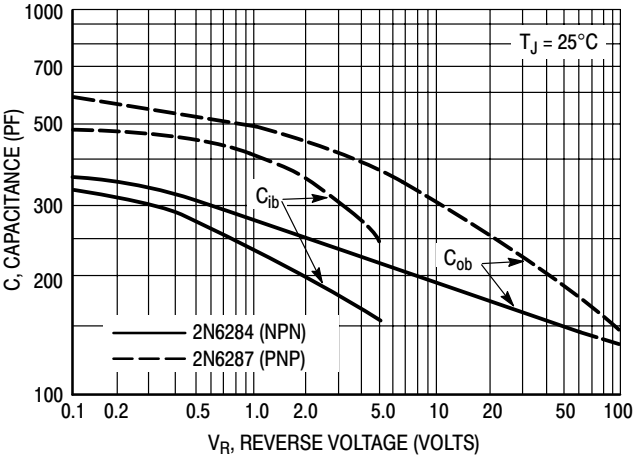
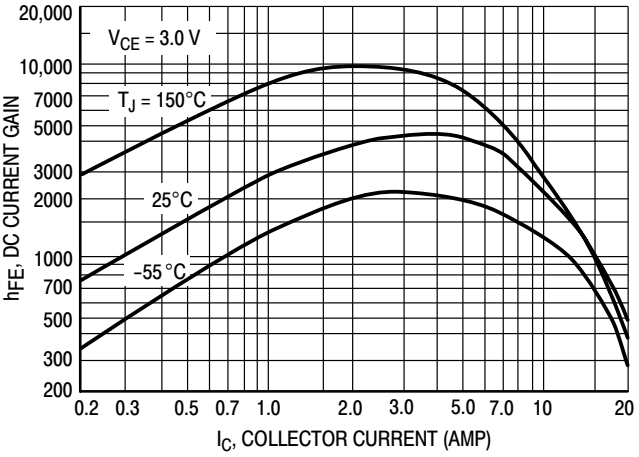


Figure 7. Capacitance

NPN
2N6284



PNP
2N6287

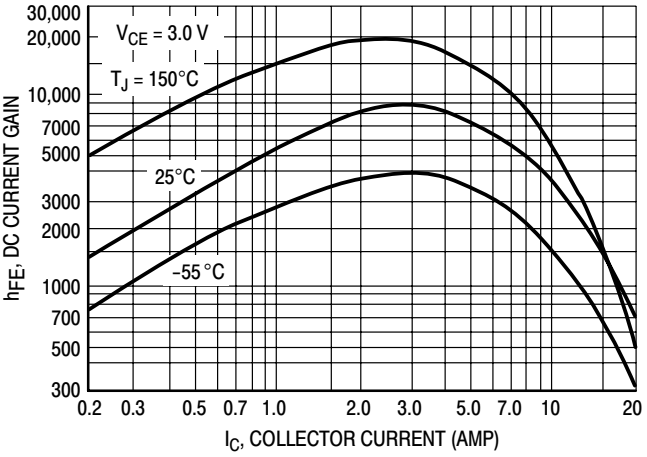
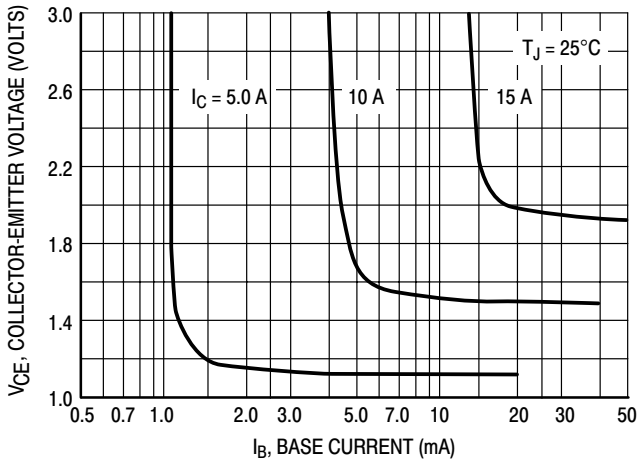


Figure 8. DC Current Gain



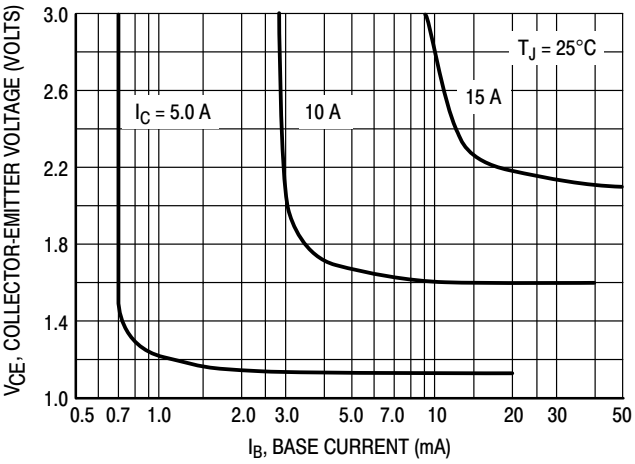
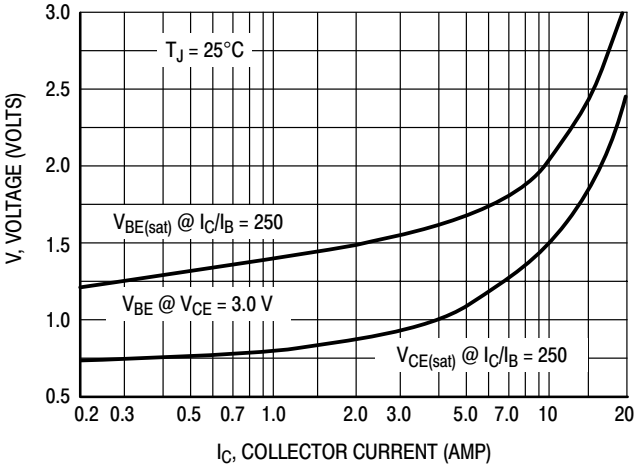


Figure 9. Collector Saturation Region



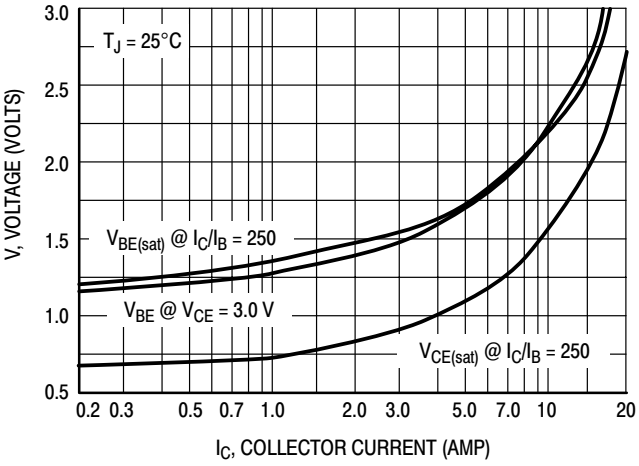


Figure 10. “On” Voltages

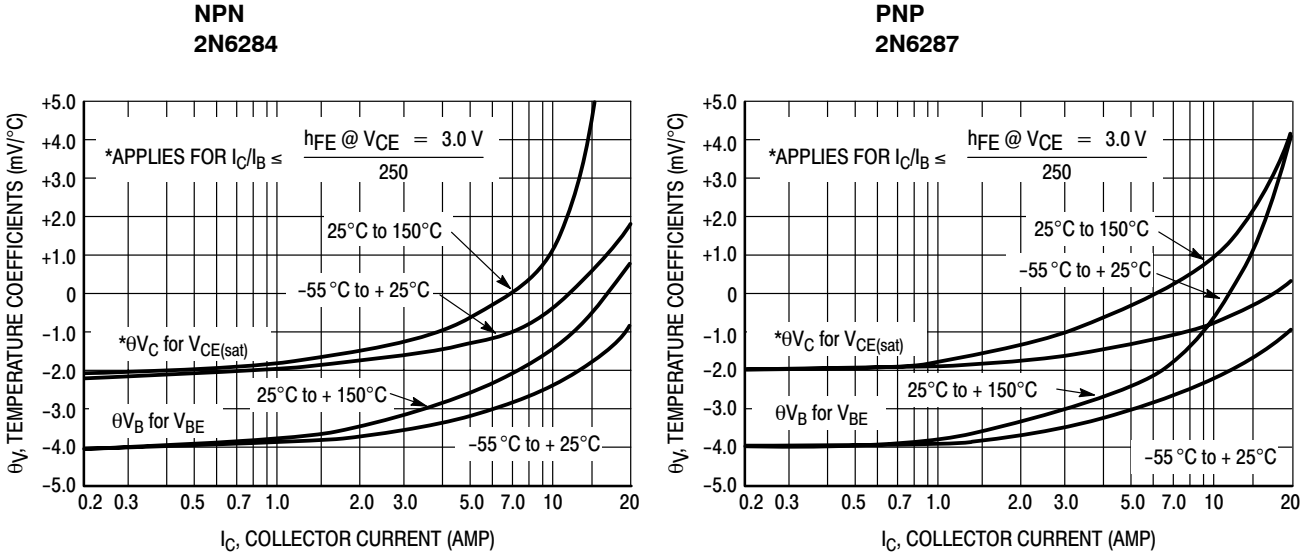


Figure 11. Temperature Coefficients

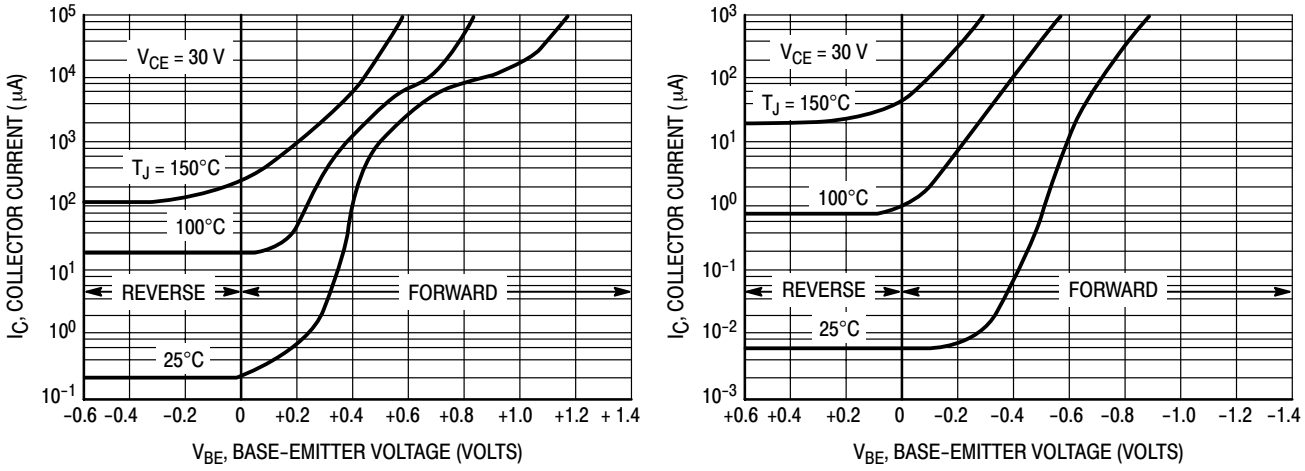


Figure 12. Collector Cut−Off Region

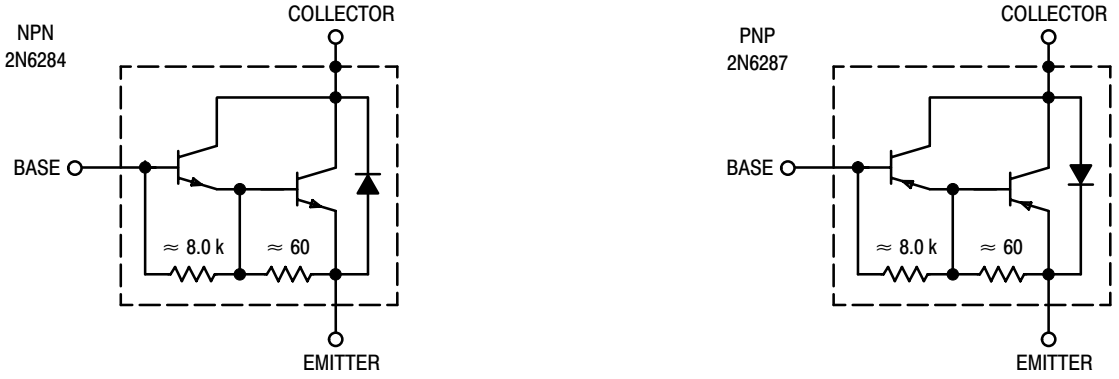
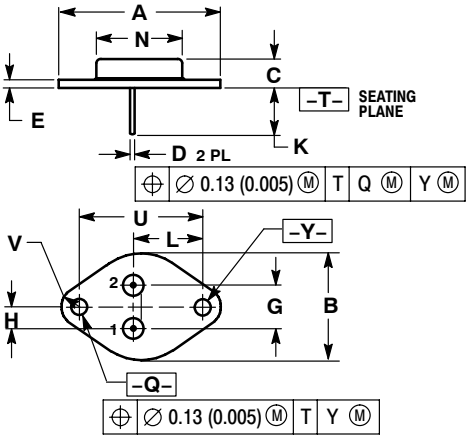


Figure 13. Darlington Schematic

PACKAGE DIMENSIONS

CASE 1−07
TO−204AA (TO−3)
ISSUE Z



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. ALL RULES AND NOTES ASSOCIATED WITH REFERENCED TO−204AA OUTLINE SHALL APPLY.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	1.550 REF		39.37 REF	
B	---	1.050	---	26.67
C	0.250	0.335	6.35	8.51
D	0.038	0.043	0.97	1.09
E	0.055	0.070	1.40	1.77
G	0.430 BSC		10.92 BSC	
H	0.215 BSC		5.46 BSC	
K	0.440	0.480	11.18	12.19
L	0.665 BSC		16.89 BSC	
N	---	0.830	---	21.08
Q	0.151	0.165	3.84	4.19
U	1.187 BSC		30.15 BSC	
V	0.131	0.188	3.33	4.77

STYLE 1:
PIN 1. BASE
2. EMITTER
CASE: COLLECTOR

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