**2N6050, 2N6051, 2N6052, 2N6057, 2N6058, 2N6059**

File Number **1185**

# 12-Ampere Complementary P-N-P and N-P-N Monolithic Darlington Power Transistors

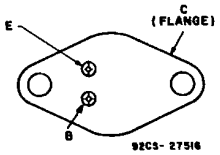
60-80-100 Volts, 150 Watts
Gain of 7000 (Typ.) at 5 A (2N6050, 2N6051, 2N6052)
Gain of 4000 (Typ.) at 5 A (2N6057, 2N6058, 2N6059)

*Features:*

- **Operates from IC without predriver**
- **Monolithic construction**
- **High voltage ratings:**

$V_{CEO}(sus)$ = 60 V Min. – 2N6050●, 2N6057
= 80 V Min. – 2N6051●, 2N6058
= 100 V Min. – 2N6052●, 2N6059

**TERMINAL DESIGNATIONS**




JEDEC TO-204AA

The RCA-2N6050, 2N6051, and 2N6052 p-n-p types and the 2N6057, 2N6058, and 2N6059 n-p-n types are complementary monolithic silicon Darlington transistors designed for general-purpose amplifier and low-speed switching applications. The high gain of these devices makes it possible for them to be driven directly from integrated circuits. These devices are supplied in the JEDEC TO-204AA hermetic steel package.

*Applications:*

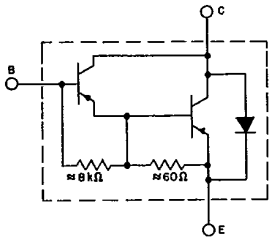
- **Power switching**
- **Hammer drivers**
- **Series and shunt regulators**
- **Audio amplifiers**

**MAXIMUM RATINGS,** *Absolute-Maximum Values:*

| | 2N6050● 2N6057 | 2N6051● 2N6058 | 2N6052● 2N6059 | |
|---|---|---|---|---|
| * $V_{CBO}$ | 60 | 80 | 100 | V |
| * $V_{CEO}(sus)$ | 60 | 80 | 100 | V |
| * $V_{EBO}$ | | 5 | | V |
| * $I_C$ | | 12 | | A |
| * $I_{CM}$ | | 20 | | A |
| * $I_B$ | | 0.2 | | A |
| * $P_T$ | | | | |
| $T_C \leq 25°C$ | | 150 | | W |
| $T_C > 25°C$ Derate linearly | | 0.857 | | W/°C |
| * $T_{stg}, T_J$ | | −65 to 200 | | °C |
| * $T_L$ At distances ≥ 1/16 in. (1.58 mm) from case for 10 s max. | | 235 | | °C |

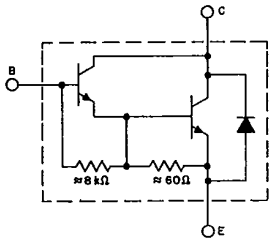
* In accordance with JEDEC registration data. ● For p-n-p devices, voltage and current values are negative.

# 2N6050, 2N6051, 2N6052, 2N6057, 2N6058, 2N6059




92CS-29129

*Fig. 1 – Schematic diagram for 2N6050, 2N6051, and 2N6052.*




92CS-29128

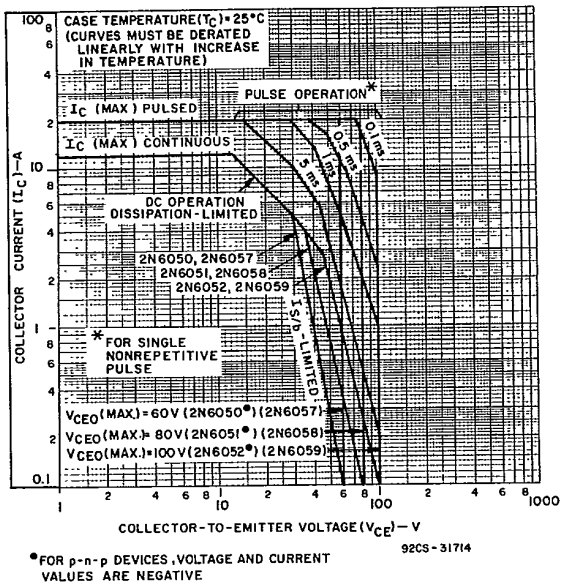
*Fig. 2 – Schematic diagram for 2N6057, 2N6058, and 2N6059.*

**ELECTRICAL CHARACTERISTICS,** *at Case Temperature ($T_C$) = 25°C Unless Otherwise Specified*

| | CHARACTERISTIC | TEST CONDITIONS | | | | LIMITS | | | | | | UNITS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | VOLTAGE V dc | | CURRENT A dc | | 2N6050● 2N6057 | | 2N6051● 2N6058 | | 2N6052● 2N6059 | | |
| | | $V_{CE}$ | $V_{BE}$ | $I_C$ | $I_B$ | MIN. | MAX. | MIN. | MAX. | MIN. | MAX. | |
| * | $I_{CEO}$ | 30 | | | 0 | – | 1 | – | – | – | – | mA |
| | | 40 | | | 0 | – | – | – | 1 | – | – | |
| | | 50 | | | 0 | – | – | – | – | – | 1 | |
| * | $I_{CEX}$ | 60 | –1.5 | | | – | 0.5 | – | – | – | – | |
| | | 80 | –1.5 | | | – | – | – | 0.5 | – | – | |
| | | 100 | –1.5 | | | – | – | – | – | – | 0.5 | |
| | $T_C$ = 150°C | 60 | –1.5 | | | – | 5 | – | – | – | – | |
| | | 80 | –1.5 | | | – | – | – | 5 | – | – | |
| | | 100 | –1.5 | | | – | – | – | – | – | 5 | |
| * | $I_{EBO}$ | | –5 | 0 | | – | 2 | – | 2 | – | 2 | mA |
| * | $V_{CEO}(sus)$ | | | 0.1[a] | 0 | 60 | – | 80 | – | 100 | – | V |
| * | $h_{FE}$ | 3 | | 12[a] | | 100 | – | 100 | – | 100 | – | |
| | | 3 | | 6[a] | | 750 | 18,000 | 750 | 18,000 | 750 | 18,000 | |
| * | $V_{CE}(sat)$ | | | 12[a] | 0.12 | – | 3 | – | 3 | – | 3 | V |
| | | | | 6[a] | 0.024 | – | 2 | – | 2 | – | 2 | |
| * | $V_{BE}$ | 3 | | 6[a] | | – | 2.8 | – | 2.8 | – | 2.8 | V |
| * | $V_{BE}(sat)$ | | | 12[a] | 0.12 | – | 4 | – | 4 | – | 4 | V |
| * | $h_{fe}$ f = 1 kHz | 3 | | 5 | | 300 | – | 300 | – | 300 | – | |
| * | $\|h_{fe}\|$ f = 1 MHz | 3 | | 5 | | 4 | – | 4 | – | 4 | – | |
| * | $C_{ob}$ $V_{CB}$ = 10 V, $I_E$ 0, f = 0.1 MHz | | | | | | | | | | | |
| | 2N6050-52 | | | | | – | 500 | – | 500 | – | 500 | pF |
| | 2N6057-59 | | | | | – | 300 | – | 300 | – | 300 | |
| | $I_{S/b}$ t = 1 s, nonrep. | 30 | | | | 5 | – | 5 | – | 5 | – | A |
| | $R_{\theta JC}$ | | | | | | 1.17 | – | 1.17 | – | 1.17 | °C/W |

[a] Pulsed: Pulse duration = 300 μs, duty factor = 1.8%.
● For p-n-p devices, voltage and current values are negative.
* In accordance with JEDEC registration data.

# 2N6050, 2N6051, 2N6052, 2N6057, 2N6058, 2N6059




•FOR p-n-p DEVICES, VOLTAGE AND CURRENT VALUES ARE NEGATIVE

*Fig. 3 — Maximum operating areas for all types.*

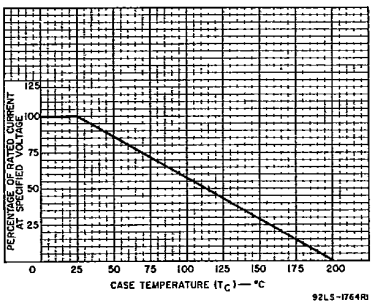



*Fig. 4 — Current derating curve for all types.*

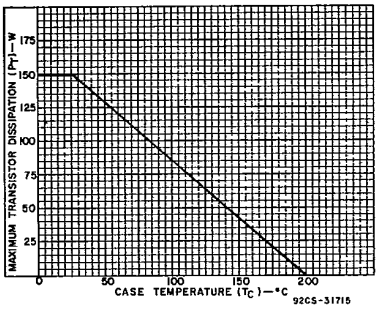



*Fig. 5 — Power derating curve for all types.*

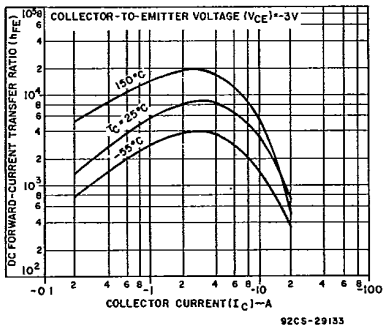



*Fig. 6 — Typical dc beta characteristics for 2N6050, 2N6051, and 2N6052.*

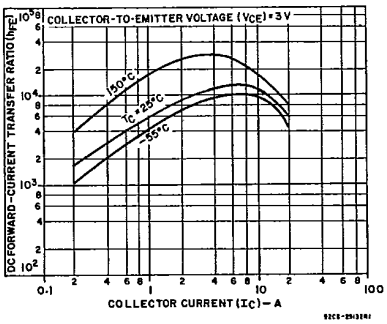



*Fig. 7 — Typical dc beta characteristics for 2N6057, 2N6058, and 2N6059.*

# 2N6050, 2N6051, 2N6052, 2N6057, 2N6058, 2N6059

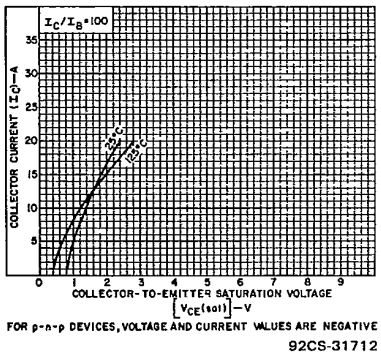



*Fig. 8 — Typical saturation characteristics for all types.*

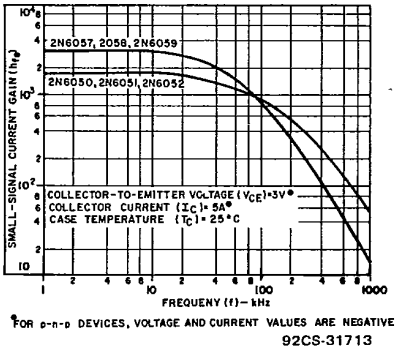



*Fig. 9 — Typical small-signal current gain for all types.*

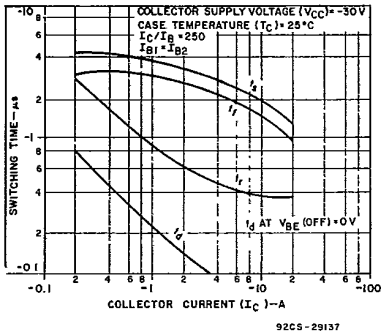



*Fig. 10 — Typical switching times for 2N6050, 2N6051, and 2N6052.*

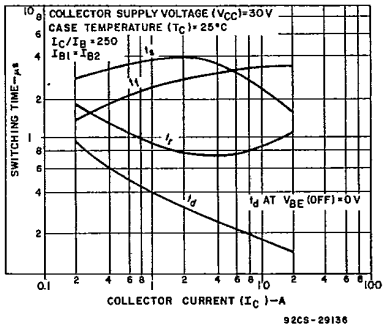



*Fig. 11 — Typical switching times for 2N6057, 2N6058, and 2N6059.*

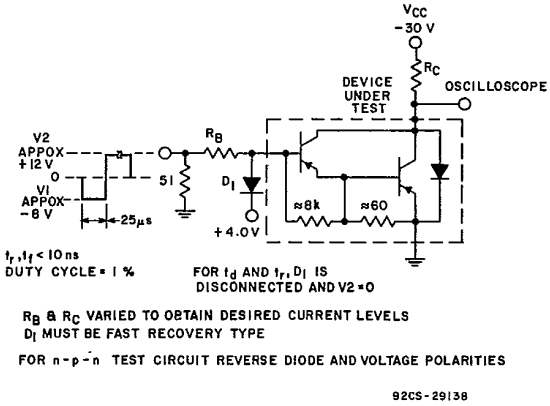



*Fig. 12 — Switching times test circuit.*