

COMPLEMENTARY SILICON POWER DARLINGTON TRANSISTORS

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

FEATURES:

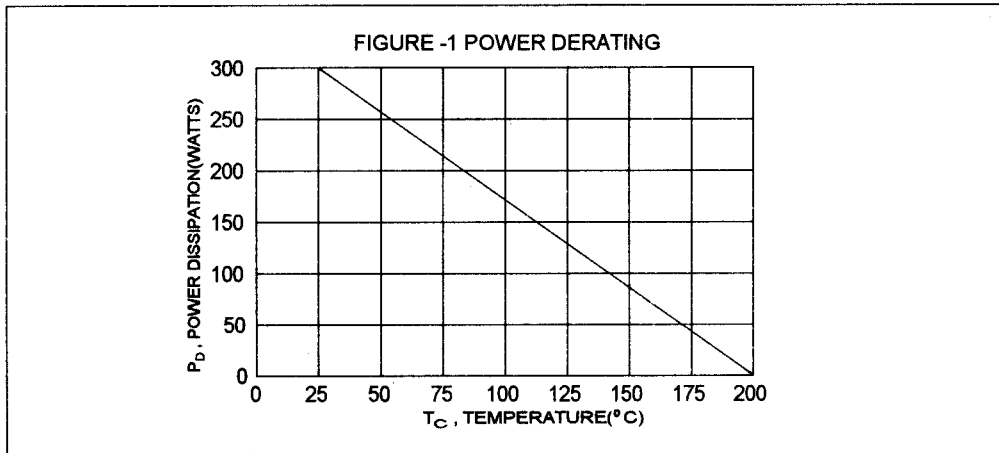
- * High Gain Darlington Performance
- * High DC Current Gain: $hFE = 1000(\text{Min}) @ I_C = 25 \text{ A}$
 $hFE = 400(\text{Min}) @ I_C = 50 \text{ A}$
- * Monolithic Construction with Built-in Base-Emitter Shunt Resistor

MAXIMUM RATINGS

| Characteristic | Symbol | MJ11028 MJ11029 | MJ11030 MJ11031 | MJ11032 MJ11033 | Unit |
|---|-------------------|--------------------|--------------------|--------------------|--------------------------------|
| Collector-Emitter Voltage | V_{CEO} | 60 | 90 | 120 | V |
| Collector-Base Voltage | V_{CBO} | 60 | 90 | 120 | V |
| Emitter-Base Voltage | V_{EBO} | 5.0 | | | V |
| Collector Current-Continuous -Peak | I_C I_{CM} | 50 100 | | | A |
| Base Current | I_B | 2.0 | | | A |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C | P_D | 300 1.71 | | | W $\text{W}/^\circ\text{C}$ |
| Operating and Storage Junction Temperature Range | T_J, T_{STG} | - 65 to +200 | | | $^\circ\text{C}$ |

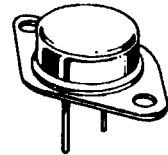
THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|-------------------------------------|-----------------|-------|---------------------------|
| Thermal Resistance Junction to Case | $R_{\theta jc}$ | 0.584 | $^\circ\text{C}/\text{W}$ |

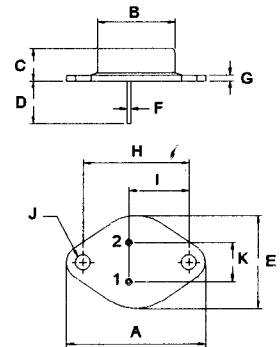


| NPN | PNP |
|---------|---------|
| MJ11028 | MJ11029 |
| MJ11030 | MJ11031 |
| MJ11032 | MJ11033 |

50 AMPERE
COMPLEMENTARY
SILICON POWER
DARLINGTON TRANSISTOR
60-120 VOLTS
300 WATTS



TO-3



PIN 1. BASE
2. EMITTER
COLLECTOR(CASE)

| DIM | MILLIMETERS | |
|-----|-------------|-------|
| | MIN | MAX |
| A | 38.75 | 39.96 |
| B | 19.28 | 22.23 |
| C | 7.96 | 9.28 |
| D | 11.18 | 12.19 |
| E | 25.20 | 26.67 |
| F | 0.92 | 1.09 |
| G | 1.38 | 1.62 |
| H | 29.90 | 30.40 |
| I | 16.64 | 17.30 |
| J | 3.88 | 4.36 |
| K | 10.67 | 11.18 |

MJ11028, MJ11030, MJ11032 NPN / MJ11029, MJ11031, MJ11033 PNP

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

| Characteristic | Symbol | Min | Max | Unit |
|---|---------------|-----|-----|------|
| Collector - Emitter Sustaining Voltage (1) ($I_c = 100\text{ mA}$, $I_B = 0$) | $V_{CE(sus)}$ | 60 | | V |
| MJ11028, MJ11029 | | 90 | | |
| MJ11030, MJ11031 MJ11032, MJ11033 | | 120 | | |
| Collector Cutoff Current ($V_{CE} = 50\text{ V}$, $I_B = 0$) | I_{CEO} | | 2.0 | mA |
| Collector-Emitter Leakage Current ($V_{CE} = 60\text{ V}$, $R_{BE} = 1\text{ k ohm}$) | I_{CER} | | 2.0 | mA |
| MJ11028, MJ11029 | | | 2.0 | |
| ($V_{CE} = 90\text{ V}$, $R_{BE} = 1\text{ k ohm}$) | | | 2.0 | |
| MJ11030, MJ11031 | | | 2.0 | |
| ($V_{CE} = 120\text{ V}$, $R_{BE} = 1\text{ k ohm}$) | | | 10 | |
| MJ11032, MJ11033 | | | 10 | |
| Emitter Cutoff Current ($V_{EB} = 5.0\text{ V}$, $I_C = 0$) | I_{EBO} | | 5.0 | mA |

ON CHARACTERISTICS (1)

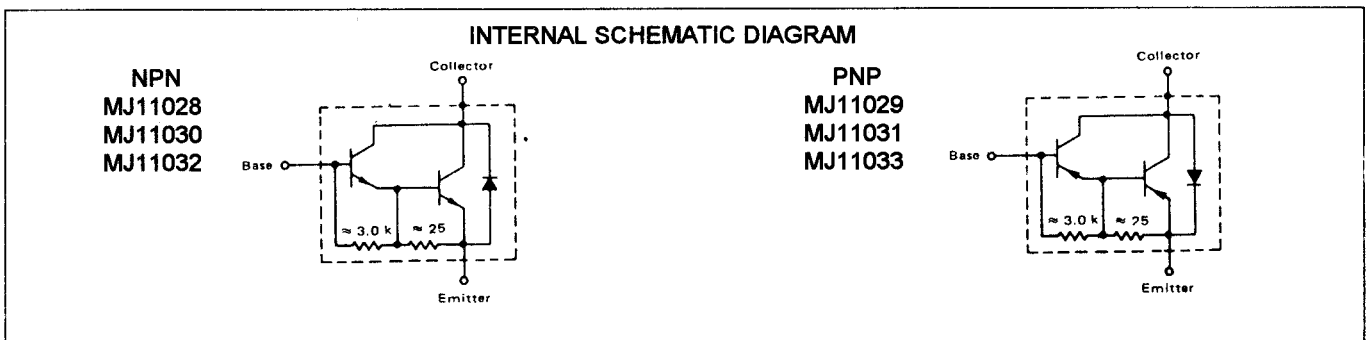
| | | | | |
|--|---------------|-------------|------------|---|
| DC Current Gain ($I_c = 25\text{ A}$, $V_{CE} = 5.0\text{ V}$) ($I_c = 50\text{ A}$, $V_{CE} = 5.0\text{ V}$) | hFE | 1000 400 | 18000 | |
| Collector-Emitter Saturation Voltage ($I_c = 25\text{ A}$, $I_B = 250\text{ mA}$) ($I_c = 50\text{ A}$, $I_B = 500\text{ mA}$) | $V_{CE(sat)}$ | | 2.5 3.5 | V |
| Base-Emitter Saturation Voltage ($I_c = 25\text{ A}$, $I_B = 200\text{ mA}$) ($I_c = 50\text{ A}$, $I_B = 300\text{ mA}$) | $V_{BE(sat)}$ | | 3.0 4.5 | V |

DYNAMIC CHARACTERISTICS

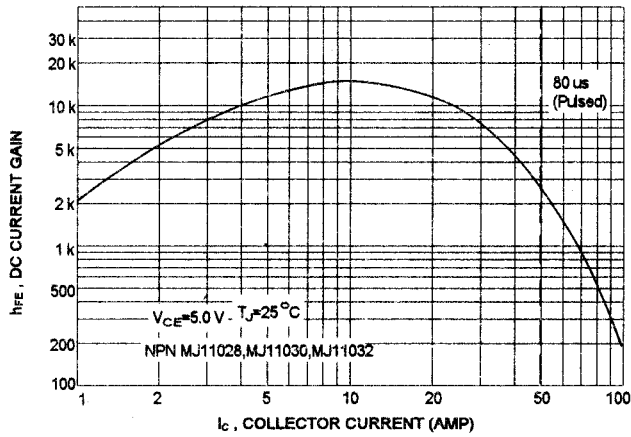
| | | | | |
|---|------------|-----|--|--|
| Small-Signal Current Gain ($I_c = 10\text{ A}$, $V_{CE} = 3.0\text{ V}$, $f = 1.0\text{ MHz}$) | $ h_{fe} $ | 4.0 | | |
|---|------------|-----|--|--|

(1) Pulse Test: Pulse width = 300 us , Duty Cycle $\leq 2.0\%$

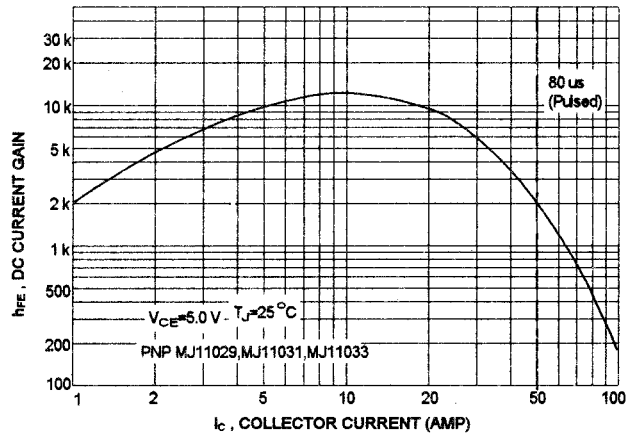
(2) $f_T = |h_{fe}| \cdot f_{test}$



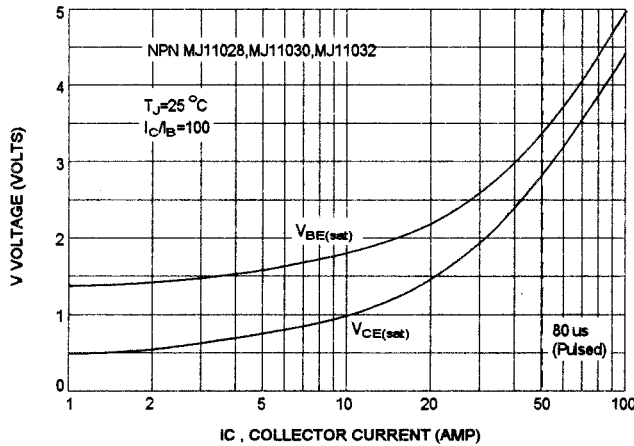
DC CURRENT GAIN



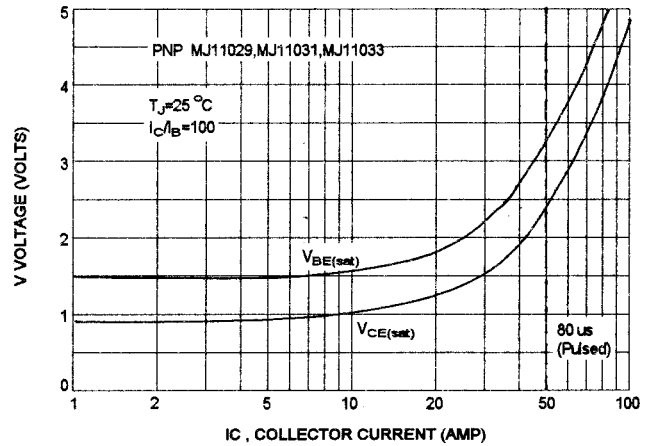
DC CURRENT GAIN



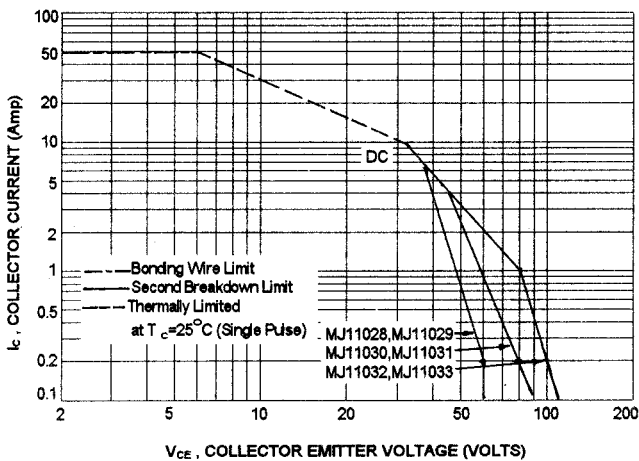
"ON" VOLTAGES



"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.