

# MOSPEC

## COMPLEMENTARY SILICON POWER DARLINGTON TRANSISTORS

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

### FEATURES:

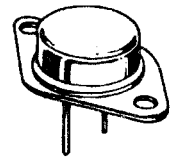
- \* High Gain Darlington Performance
- \* High DC Current Gain  $h_{FE} = 1000(\text{Min}) @ I_C = 20 \text{ A}$
- \* Monolithic Construction with Built-in Base-Emitter Shunt Resistor

| PNP     | NPN     |
|---------|---------|
| MJ11011 | MJ11012 |
| MJ11013 | MJ11014 |
| MJ11015 | MJ11016 |

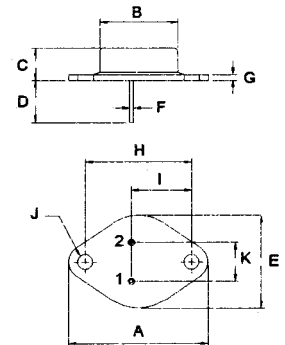
30 AMPERE  
COMPLEMENTARY  
SILICON POWER  
DARLINGTON TRANSISTOR  
60-120 VOLTS  
200 WATTS

### MAXIMUM RATINGS

| Characteristic  | Symbol            | MJ11011<br>MJ11012 | MJ11013<br>MJ11014 | MJ11015<br>MJ11016 | 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<br>-Peak   | $I_C$<br>$I_{CM}$ | 30<br>50           |                    |                    | A                        |
| Base Current  | $I_B$             | 1.0                |                    |                    | A                        |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$             | 200<br>1.15        |                    |                    | W<br>W/ $^\circ\text{C}$ |
| Operating and Storage Junction<br>Temperature Range                                   | $T_J, T_{STG}$    | - 65 to +200       |                    |                    | $^\circ\text{C}$         |



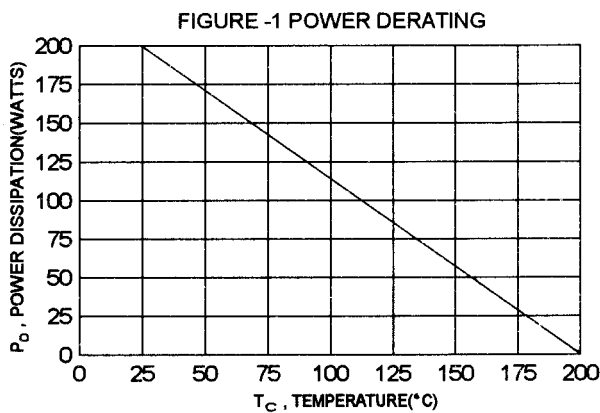
TO-3



PIN 1.BASE  
2.EMITTER  
COLLECTOR(CASE)

### THERMAL CHARACTERISTICS

| Characteristic                      | Symbol          | Max  | Unit               |
|-------------------------------------|-----------------|------|--------------------|
| Thermal Resistance Junction to Case | $R_{\theta jc}$ | 0.87 | $^\circ\text{C/W}$ |



| 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 |

MJ11011, MJ11013, MJ11015 PNP / MJ11012, MJ11014, MJ11016 NPN

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

| Characteristic | Symbol | Min | Max | Unit |
|----------------|--------|-----|-----|------|
|----------------|--------|-----|-----|------|

**OFF CHARACTERISTICS**

|   |               |                 |  |    |
|---|---------------|-----------------|--|----|
| Collector - Emitter Sustaining Voltage (1)<br>( $I_c = 100\text{ mA}$ , $I_B = 0$ )<br>MJ11011, MJ11012<br>MJ11013, MJ11014<br>MJ11015, MJ11016   | $V_{CE(sus)}$ | 60<br>90<br>120 |  | V  |
| Collector Cutoff Current<br>( $V_{CE} = 50\text{ V}$ , $I_B = 0.0$ )  | $I_{CEO}$     |                 | 1.0                                    | mA |
| Collector-Emitter Leakage Current<br>( $V_{CE} = 60\text{ V}$ , $R_{BE} = 1.0\text{ k ohm}$ ) MJ11011, MJ11012<br>( $V_{CE} = 90\text{ V}$ , $R_{BE} = 1.0\text{ k ohm}$ ) MJ11013, MJ11014<br>( $V_{CE} = 120\text{ V}$ , $R_{BE} = 1.0\text{ k ohm}$ ) MJ11015, MJ11016<br>( $V_{CE} = 60\text{ V}$ , $R_{BE} = 1.0\text{ k ohm}$ , $T_c = 125^\circ\text{C}$ ) MJ11011, MJ11012<br>( $V_{CE} = 90\text{ V}$ , $R_{BE} = 1.0\text{ k ohm}$ , $T_c = 125^\circ\text{C}$ ) MJ11013, MJ11014<br>( $V_{CE} = 120\text{ V}$ , $R_{BE} = 1.0\text{ k ohm}$ , $T_c = 125^\circ\text{C}$ ) MJ11015, MJ11016 | $I_{CER}$     |                 | 1.0<br>1.0<br>1.0<br>5.0<br>5.0<br>5.0 | mA |
| Emitter Cutoff Current<br>( $V_{EB} = 5.0\text{ V}$ , $I_C = 0$ )   | $I_{EBO}$     |                 | 5.0                                    | mA |

**ON CHARACTERISTICS (1)**

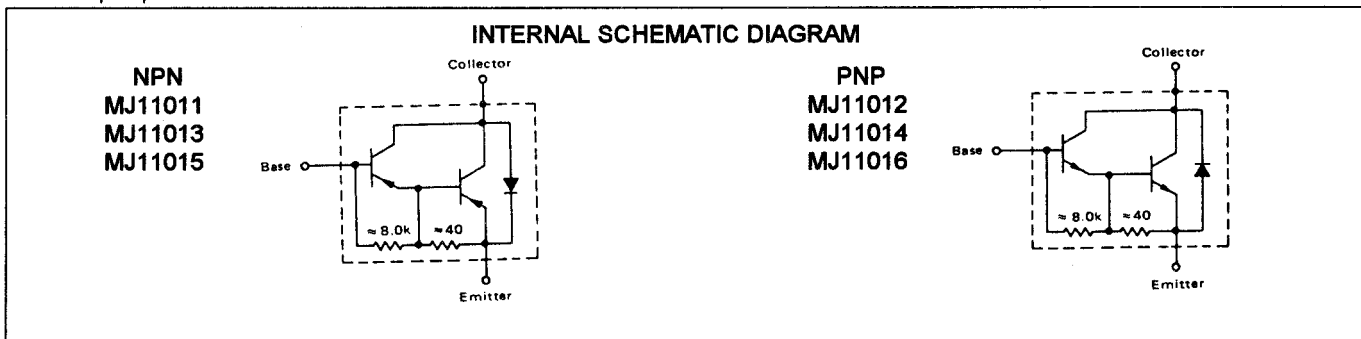
|  |               |             |            |   |
|--|---------------|-------------|------------|---|
| DC Current Gain<br>( $I_c = 20\text{ A}$ , $V_{CE} = 5.0\text{ V}$ )<br>( $I_c = 30\text{ A}$ , $V_{CE} = 5.0\text{ V}$ )                  | hFE           | 1000<br>200 |            |   |
| Collector-Emitter Saturation Voltage<br>( $I_c = 20\text{ A}$ , $I_B = 200\text{ mA}$ )<br>( $I_c = 30\text{ A}$ , $I_B = 300\text{ mA}$ ) | $V_{CE(sat)}$ |             | 3.0<br>4.0 | V |
| Base-Emitter Saturation Voltage<br>( $I_c = 20\text{ A}$ , $I_B = 200\text{ mA}$ )<br>( $I_c = 30\text{ A}$ , $I_B = 300\text{ mA}$ )      | $V_{BE(sat)}$ |             | 3.5<br>5.0 | V |

**DYNAMIC CHARACTERISTICS**

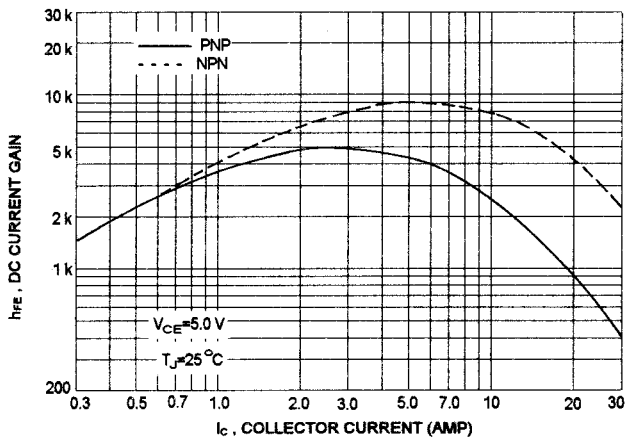
|   |            |     |  |  |
|---|------------|-----|--|--|
| Small-Signal Current Gain<br>( $I_c = 10\text{ A}$ , $V_{CE} = 3.0\text{ V}$ , $f = 1.0\text{ MHz}$ ) | $ h_{fe} $ | 4.0 |  |  |
|---|------------|-----|--|--|

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

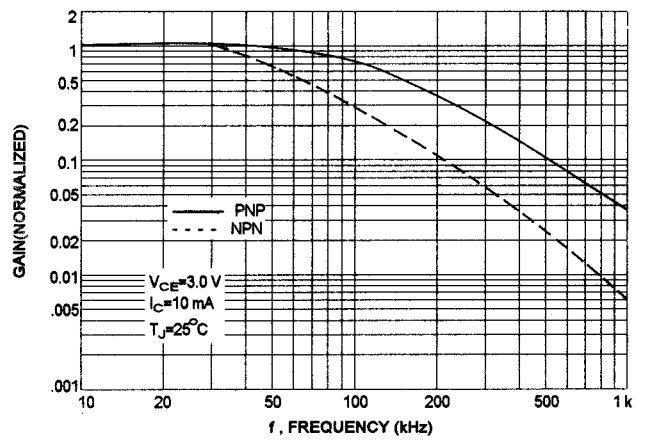
(2)  $f_T = |h_{fe}| \cdot f_{test}$



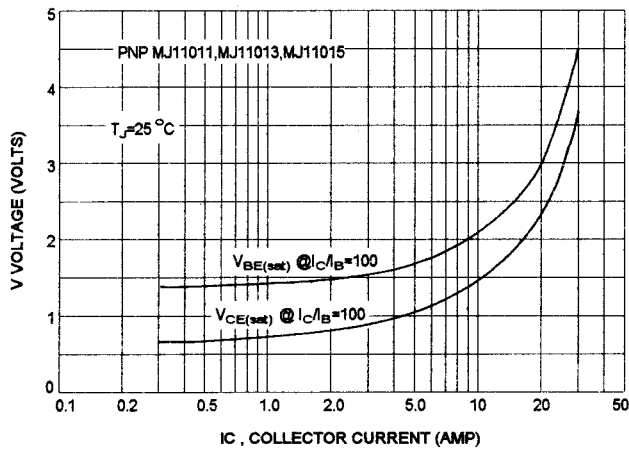
DC CURRENT GAIN



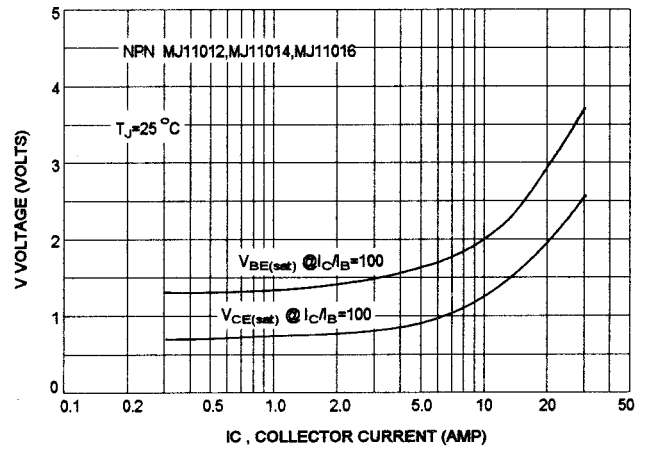
SMALL-SIGNAL CURRENT GAIN



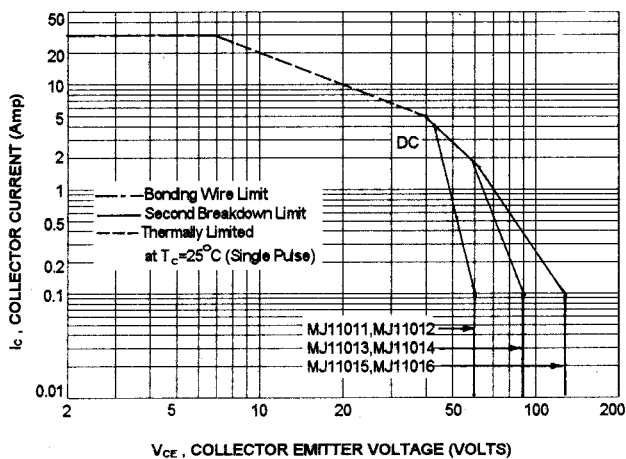
"ON" VOLTAGES



"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  $T_{J(PK)}=200^\circ C$ ;  $T_C$  is variable depending on conditions. second breakdown pulse limits are valid for duty cycles to 10% provided  $T_{J(PK)} \leq 200^\circ C$ . At high case temperatures, thermal limitation will reduce the power that can be handled to values less than the limitations imposed by second breakdown.