

MJD122 (NPN) MJD127 (PNP)

Preferred Device

Complementary Darlington Power Transistor

DPAK For Surface Mount Applications

Designed for general purpose amplifier and low speed switching applications.

Features

- Lead Formed for Surface Mount Applications in Plastic Sleeves
- Surface Mount Replacements for 2N6040–2N6045 Series, TIP120–TIP122 Series, and TIP125–TIP127 Series
- Monolithic Construction With Built-in Base–Emitter Shunt Resistors
- High DC Current Gain: $h_{FE} = 2500$ (Typ) @ $I_C = 4.0$ Adc
- Epoxy Meets UL 94 V–0 @ 0.125 in
- ESD Ratings: Human Body Model, 3B > 8000 V
Machine Model, C > 400 V
- Pb–Free Packages are Available

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|---|----------------|---------------|--------------------------|
| Collector–Emitter Voltage | V_{CEO} | 100 | Vdc |
| Collector–Base Voltage | V_{CB} | 100 | Vdc |
| Emitter–Base Voltage | V_{EB} | 5 | Vdc |
| Collector Current – Continuous – Peak | I_C | 8 16 | Adc |
| Base Current | I_B | 120 | mAdc |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C | P_D | 20 0.16 | W W/ $^\circ\text{C}$ |
| Total Power Dissipation (Note 1) @ $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 1.75 0.014 | W W/ $^\circ\text{C}$ |
| Operating and Storage Junction Temperature Range | T_J, T_{stg} | –65 to +150 | $^\circ\text{C}$ |

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---|-----------------|------|---------------------------|
| Thermal Resistance Junction–to–Case | $R_{\theta JC}$ | 6.25 | $^\circ\text{C}/\text{W}$ |
| Thermal Resistance Junction–to–Ambient (Note1) | $R_{\theta JA}$ | 71.4 | $^\circ\text{C}/\text{W}$ |

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

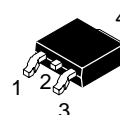
1. These ratings are applicable when surface mounted on the minimum pad sizes recommended.



ON Semiconductor®

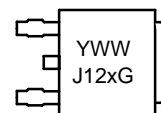
<http://onsemi.com>

**SILICON
POWER TRANSISTOR
8 AMPERES
100 VOLTS, 20 WATTS**



**DPAK
CASE 369C
STYLE 1**

MARKING DIAGRAM



Y = Year
WW = Work Week
x = 2 or 7
G = Pb–Free Package

ORDERING INFORMATION

| Device | Package | Shipping† |
|-----------|-------------------|------------------|
| MJD122 | DPAK | 75 Units/Rail |
| MJD122G | DPAK (Pb–Free) | 75 Units/Rail |
| MJD122T4 | DPAK | 2500/Tape & Reel |
| MJD122T4G | DPAK (Pb–Free) | 2500/Tape & Reel |
| MJD127 | DPAK | 75 Units/Rail |
| MJD127G | DPAK (Pb–Free) | 75 Units/Rail |
| MJD127T4 | DPAK | 2500/Tape & Reel |
| MJD127T4G | DPAK (Pb–Free) | 2500/Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

Preferred devices are recommended choices for future use and best overall value.

MJD122 (NPN)

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

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

OFF CHARACTERISTICS

| | | | | |
|--|----------------|-----|----|-----------------|
| Collector–Emitter Sustaining Voltage ($I_C = 30\text{ mAdc}$, $I_B = 0$) | $V_{CEO(sus)}$ | 100 | – | Vdc |
| Collector Cutoff Current ($V_{CE} = 50\text{ Vdc}$, $I_B = 0$) | I_{CEO} | – | 10 | μAdc |
| Collector Cutoff Current ($V_{CB} = 100\text{ Vdc}$, $I_E = 0$) | I_{CBO} | – | 10 | μAdc |
| Emitter Cutoff Current ($V_{BE} = 5\text{ Vdc}$, $I_C = 0$) | I_{EBO} | – | 2 | mAdc |

ON CHARACTERISTICS

| | | | | |
|--|---------------|-------------|-------------|-----|
| DC Current Gain ($I_C = 4\text{ Adc}$, $V_{CE} = 4\text{ Vdc}$) ($I_C = 8\text{ Adc}$, $V_{CE} = 4\text{ Vdc}$) | h_{FE} | 1000 100 | 12,000 – | – |
| Collector–Emitter Saturation Voltage ($I_C = 4\text{ Adc}$, $I_B = 16\text{ mAdc}$) ($I_C = 8\text{ Adc}$, $I_B = 80\text{ mAdc}$) | $V_{CE(sat)}$ | – – | 2 4 | Vdc |
| Base–Emitter Saturation Voltage (Note 2) ($I_C = 8\text{ Adc}$, $I_B = 80\text{ mAdc}$) | $V_{BE(sat)}$ | – | 4.5 | Vdc |
| Base–Emitter On Voltage ($I_C = 4\text{ Adc}$, $V_{CE} = 4\text{ Vdc}$) | $V_{BE(on)}$ | – | 2.8 | Vdc |

DYNAMIC CHARACTERISTICS

| | | | | |
|---|------------|--------|------------|-----|
| Current–Gain–Bandwidth Product ($I_C = 3\text{ Adc}$, $V_{CE} = 4\text{ Vdc}$, $f = 1\text{ MHz}$) | $ h_{fe} $ | 4 | – | MHz |
| Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f = 0.1\text{ MHz}$) | C_{ob} | – – | 300 200 | pF |
| Small–Signal Current Gain ($I_C = 3\text{ Adc}$, $V_{CE} = 4\text{ Vdc}$, $f = 1\text{ kHz}$) | h_{fe} | 300 | – | – |

2. Pulse Test: Pulse Width $\leq 300\ \mu\text{s}$, Duty Cycle $\leq 2\%$.

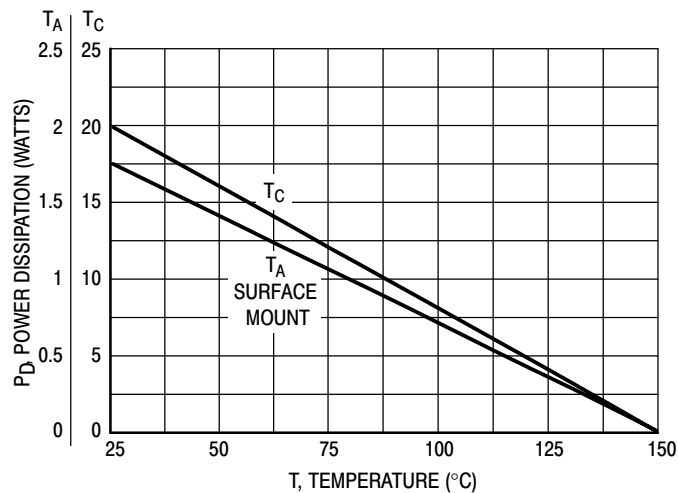


Figure 1. Power Derating

MJD122 (NPN)

TYPICAL ELECTRICAL CHARACTERISTICS

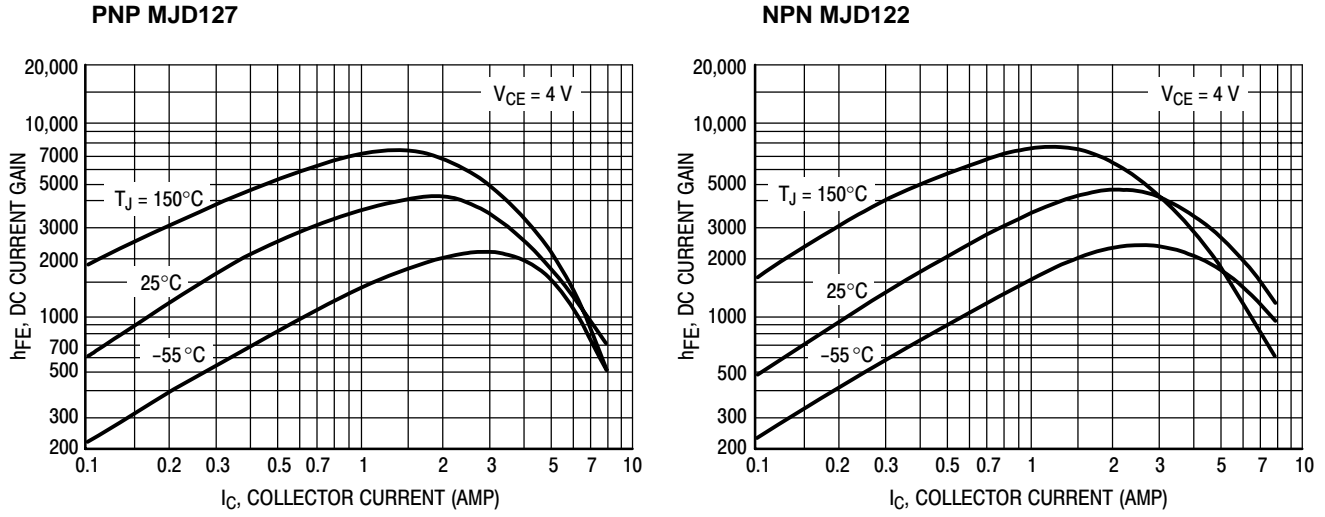


Figure 2. DC Current Gain

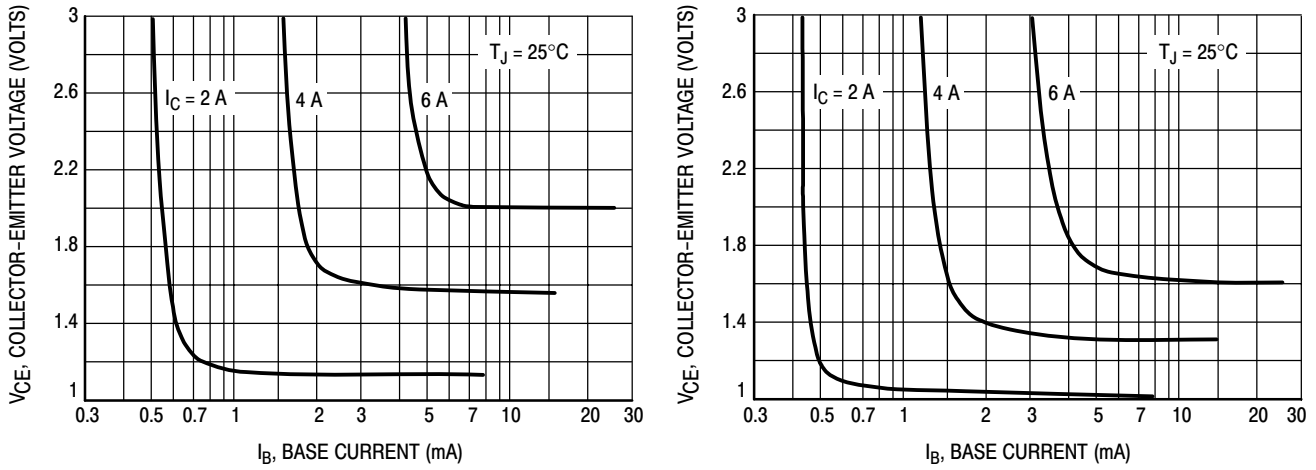


Figure 3. Collector Saturation Region

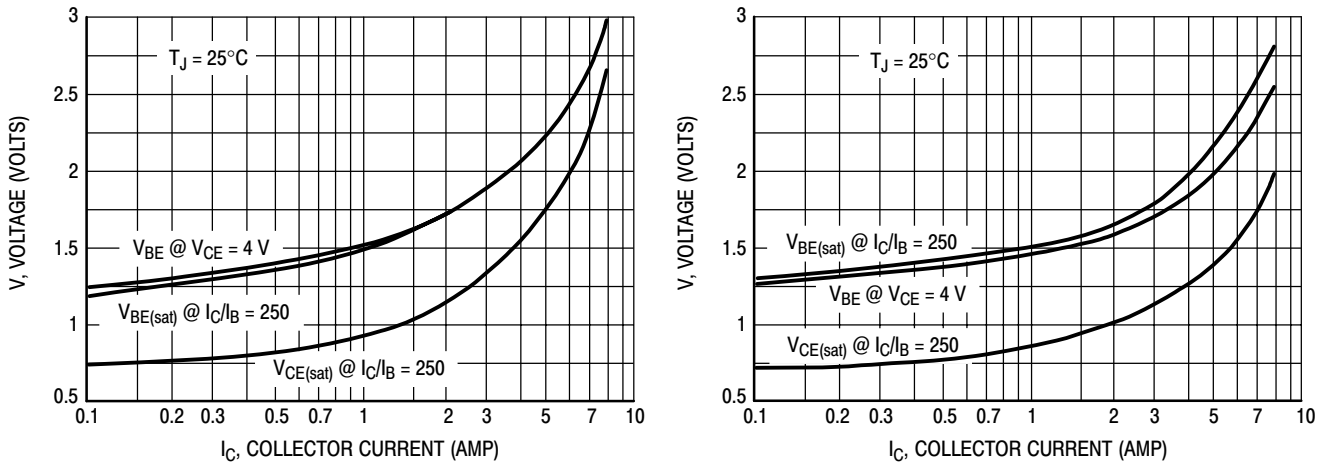


Figure 4. "On" Voltages

MJD122 (NPN)

TYPICAL ELECTRICAL CHARACTERISTICS

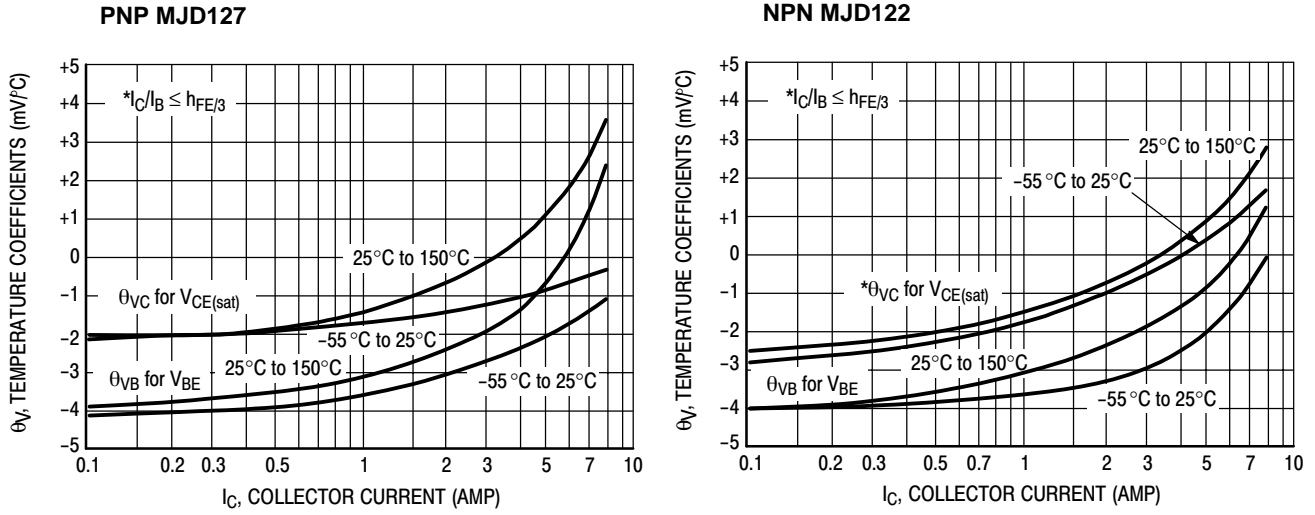


Figure 5. Temperature Coefficients

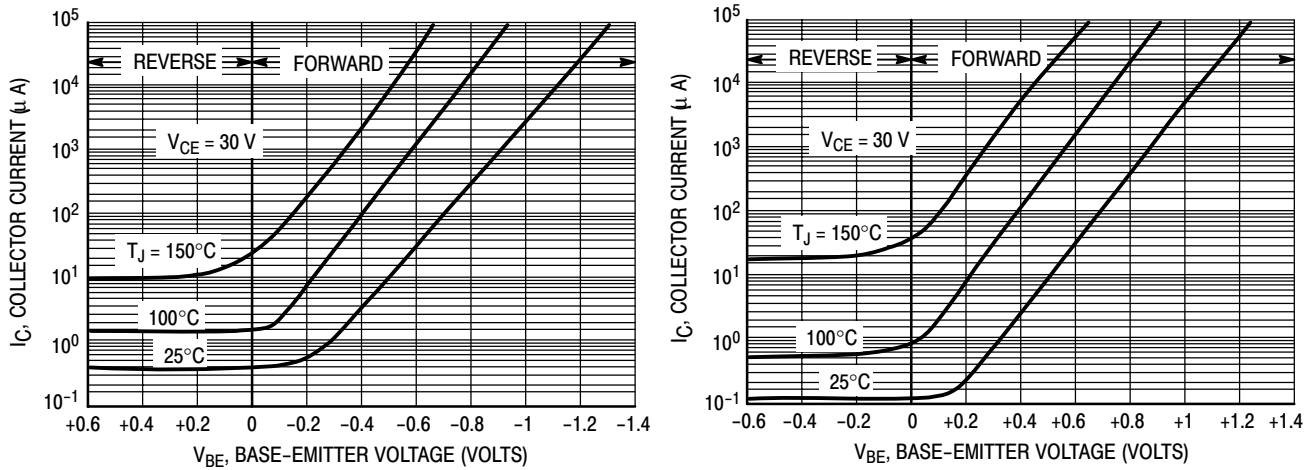


Figure 6. Collector Cut-Off Region

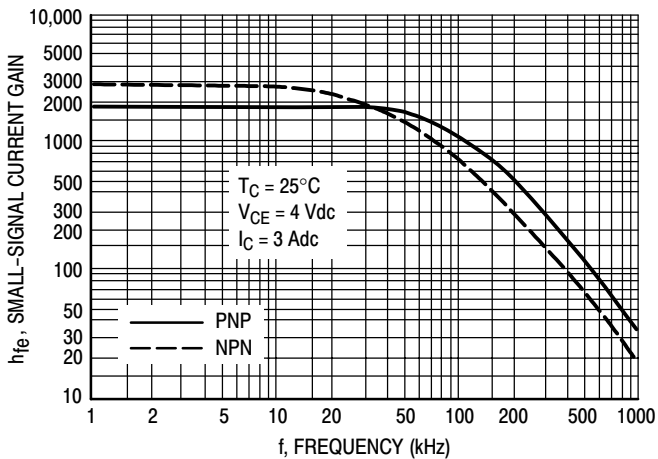


Figure 7. Small-Signal Current Gain

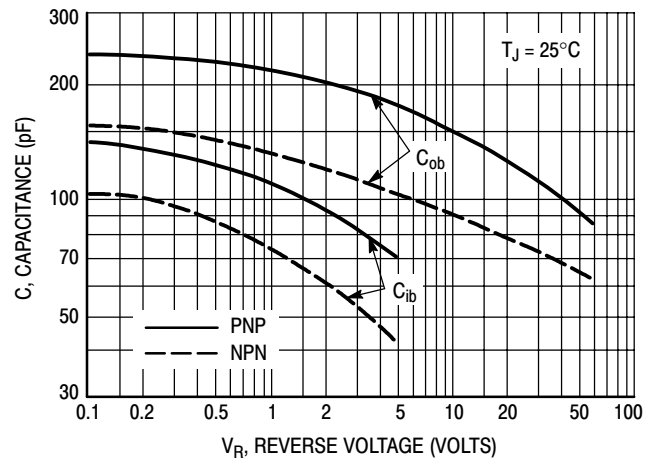


Figure 8. Capacitance

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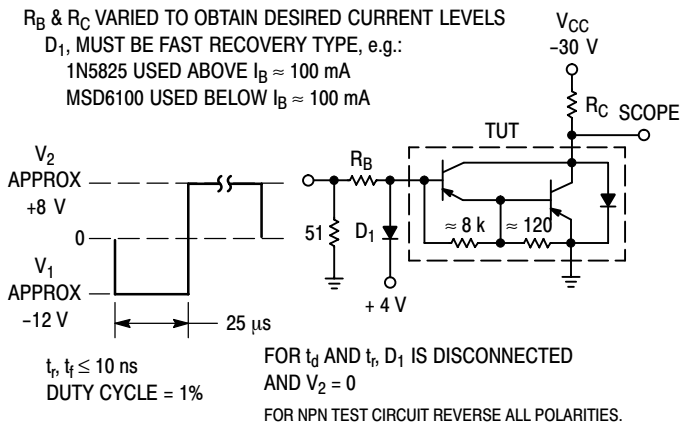


Figure 9. Switching Times Test Circuit

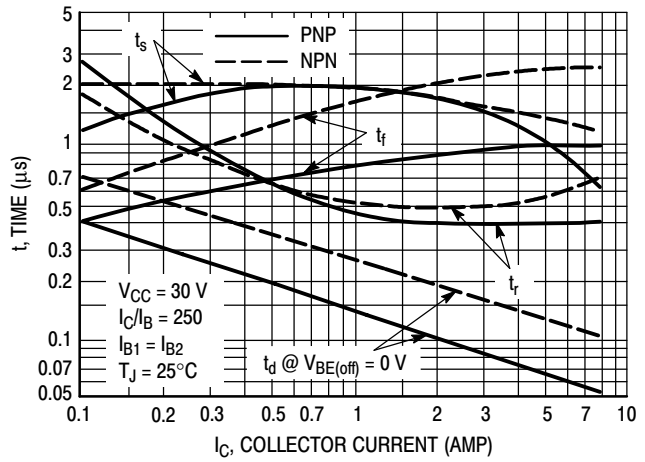


Figure 10. Switching Times

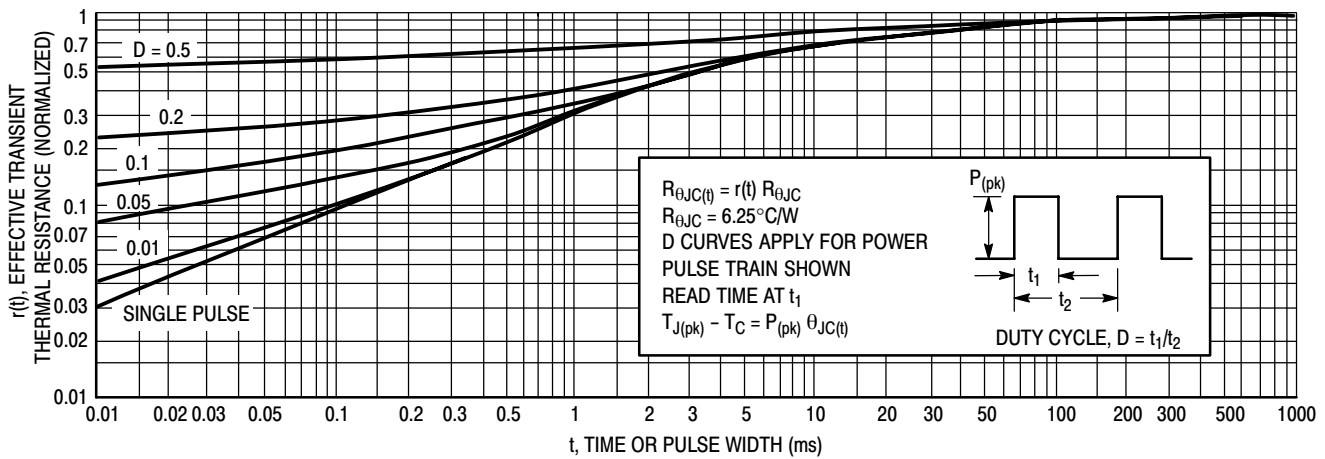


Figure 11. Thermal Response

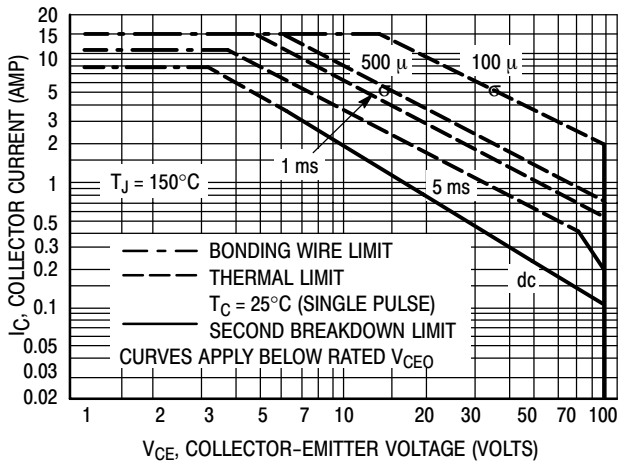


Figure 12. Maximum Forward Bias Safe Operating Area

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 12 is based on $T_{J(pk)} = 150^\circ\text{C}$; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} < 150^\circ\text{C}$. $T_{J(pk)}$ may be calculated from the data in Figure 11. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

MJD122 (NPN)

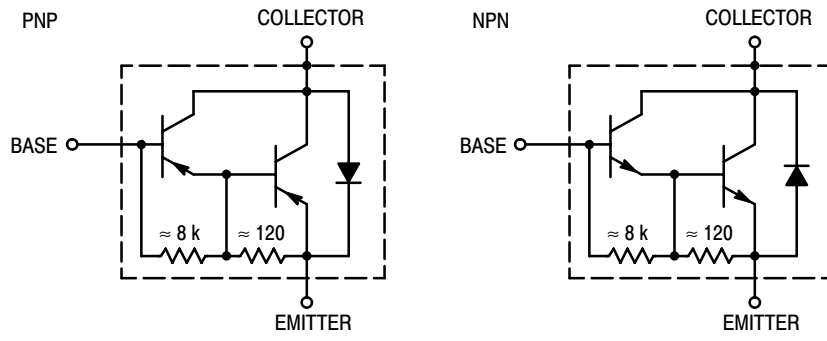
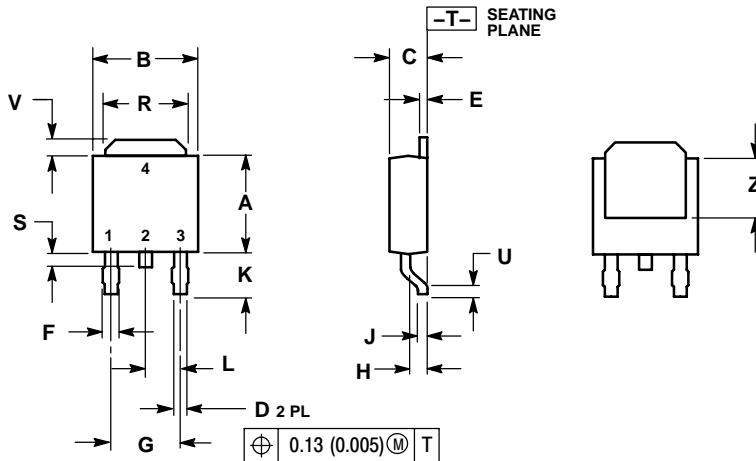


Figure 13. Darlington Schematic

MJD122 (NPN)

PACKAGE DIMENSIONS

DPAK
CASE 369C
ISSUE O



NOTES:

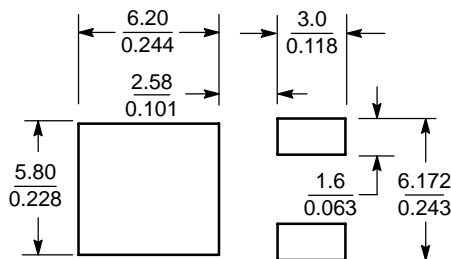
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

| DIM | INCHES | | MILLIMETERS | |
|-----|-----------|-------|-------------|------|
| | MIN | MAX | MIN | MAX |
| A | 0.235 | 0.245 | 5.97 | 6.22 |
| B | 0.250 | 0.265 | 6.35 | 6.73 |
| C | 0.086 | 0.094 | 2.19 | 2.38 |
| D | 0.027 | 0.035 | 0.69 | 0.88 |
| E | 0.018 | 0.023 | 0.46 | 0.58 |
| F | 0.037 | 0.045 | 0.94 | 1.14 |
| G | 0.180 BSC | | 4.58 BSC | |
| H | 0.034 | 0.040 | 0.87 | 1.01 |
| J | 0.018 | 0.023 | 0.46 | 0.58 |
| K | 0.102 | 0.114 | 2.60 | 2.89 |
| L | 0.090 BSC | | 2.29 BSC | |
| R | 0.180 | 0.215 | 4.57 | 5.45 |
| S | 0.025 | 0.040 | 0.63 | 1.01 |
| U | 0.020 | --- | 0.51 | --- |
| V | 0.035 | 0.050 | 0.89 | 1.27 |
| Z | 0.155 | --- | 3.93 | --- |

STYLE 1:

- PIN 1. BASE
- COLLECTOR
- EMITTER
- COLLECTOR

SOLDERING FOOTPRINT*



SCALE 3:1 (mm/inches)

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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