

MJF31C (NPN), MJF32C (PNP)

Preferred Device

Complementary Silicon Plastic Power Transistors for Isolated Package Applications

Designed for use in general purpose amplifier and switching applications.

Features

- Collector–Emitter Saturation Voltage –
 $V_{CE(sat)} = 1.2 \text{ Vdc (Max) @ } I_C = 3.0 \text{ Adc}$
- Collector–Emitter Sustaining Voltage –
 $V_{CEO(sus)} = 100 \text{ Vdc (Min)}$
- High Current Gain – Bandwidth Product
 $f_T = 3.0 \text{ MHz (Min) @ } I_C = 500 \text{ mA}$
- UL Recognized, File #E69369, to 3500 V_{RMS} Isolation
- 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} | 5.0 | Vdc |
| Collector Current Unclamped Inductive Load Energy (Note 1) | I_C | 3.0 5.0 | Adc |
| | | – Continuous | |
| | | – Peak | |
| Base Current | I_B | 1.0 | Adc |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C | P_D | 28 0.22 | W W/ $^\circ\text{C}$ |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 2.0 0.016 | W W/ $^\circ\text{C}$ |
| Unclamped Inductive Load Energy (Note 1) | E | 32 | mJ |
| 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–Ambient | $R_{\theta JC}$ | 62.5 | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction–to–Case | $R_{\theta JC}$ | 4.46 | $^\circ\text{C/W}$ |

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. $I_C = 1.8 \text{ A}$, $L = 20 \text{ mH}$, $P.R.F. = 10 \text{ Hz}$, $V_{CC} = 10 \text{ V}$, $R_{BE} = 100 \Omega$.

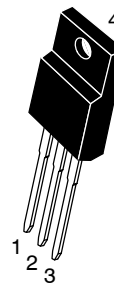
*For additional information on our Pb–Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



ON Semiconductor®

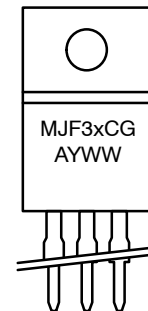
<http://onsemi.com>

3.0 AMPERE POWER TRANSISTORS COMPLEMENTARY SILICON 100 VOLTS, 28 WATTS



TO-220 FULLPAK
CASE 221D
STYLE 2

MARKING DIAGRAM



x = 1 or 2
G = Pb–Free Package
A = Assembly Location
Y = Year
WW = Work Week

ORDERING INFORMATION

| Device | Package | Shipping |
|---------|-----------------------------|---------------|
| MJF31C | TO–220 FULLPAK | 50 Units/Rail |
| MJF31CG | TO–220 FULLPAK (Pb–Free) | 50 Units/Rail |
| MJF32C | TO–220 FULLPAK | 50 Units/Rail |
| MJF32CG | TO–220 FULLPAK (Pb–Free) | 50 Units/Rail |

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

MJF31C (NPN), MJF32C (PNP)

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

| Characteristic | Symbol | Min | Max | Unit |
|--|----------------|----------|---------|-----------------|
| OFF CHARACTERISTICS | | | | |
| Collector-Emitter Sustaining Voltage (Note 2) ($I_C = 30\text{ mAdc}$, $I_B = 0$) | $V_{CEO(sus)}$ | 100 | - | Vdc |
| Collector Cutoff Current ($I_C = 3.0\text{ Adc}$, $V_{CE} = 4.0\text{ Vdc}$) | I_{CEO} | - | 0.3 | mAdc |
| Collector Cutoff Current | I_{CES} | - | 200 | μAdc |
| Emitter Cutoff Current ($V_{BE} = 5.0\text{ Vdc}$, $I_C = 0$) | I_{EBO} | - | 1.0 | mAdc |
| ON CHARACTERISTICS (Note 2) | | | | |
| DC Current Gain ($I_C = 1.0\text{ Adc}$, $V_{CE} = 4.0\text{ Vdc}$) ($I_C = 3.0\text{ Adc}$, $V_{CE} = 4.0\text{ Vdc}$) | h_{FE} | 25 10 | - 50 | - |
| Collector-Emitter Saturation Voltage ($I_C = 3.0\text{ Adc}$, $I_B = 375\text{ mAdc}$) | $V_{CE(sat)}$ | - | 1.2 | Vdc |
| Base-Emitter On Voltage ($I_C = 3.0\text{ Adc}$, $V_{CE} = 4.0\text{ Vdc}$) | $V_{BE(on)}$ | - | 1.8 | Vdc |
| DYNAMIC CHARACTERISTICS | | | | |
| Current-Gain - Bandwidth Product ($I_C = 500\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$, $f_{test} = 1.0\text{ MHz}$) | f_T | 3.0 | - | MHz |
| Small-Signal Current Gain ($I_C = 0.5\text{ Adc}$, $V_{CE} = 10\text{ Vdc}$, $f = 1.0\text{ kHz}$) | h_{fe} | 20 | - | - |

2. Pulse Test: Pulse Width $\leq 300\ \mu\text{s}$, Duty Cycle $\leq 2.0\%$.

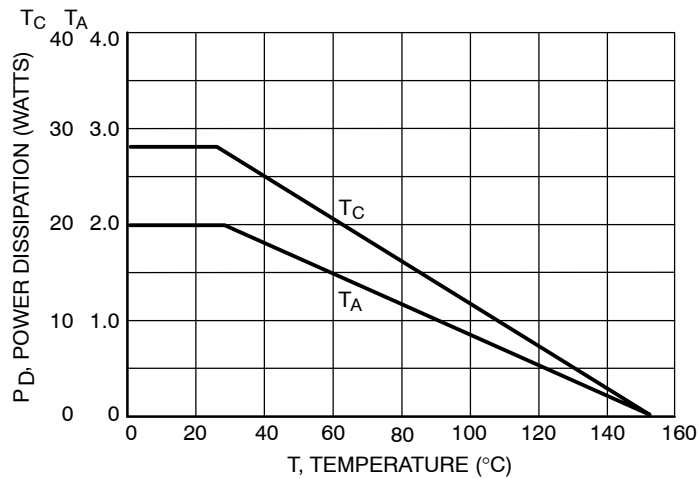


Figure 1. Power Derating

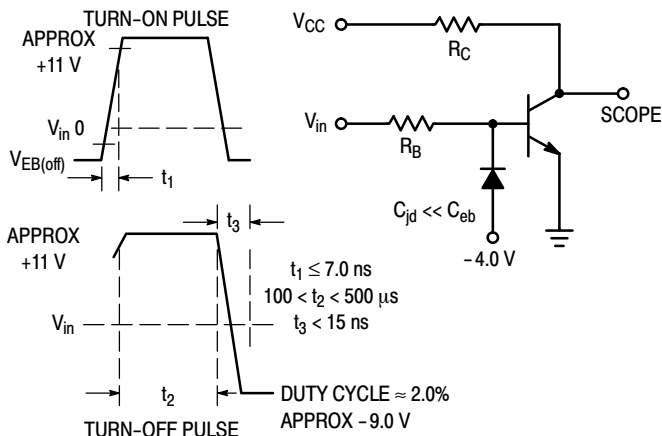


Figure 2. Switching Time Equivalent Circuit

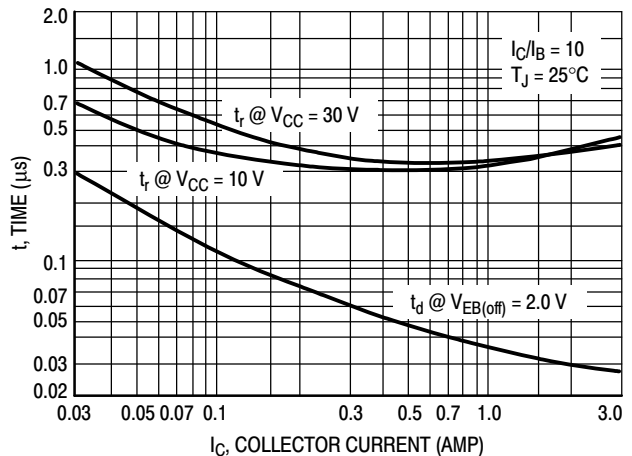


Figure 3. Turn-On Time

MJF31C (NPN), MJF32C (PNP)

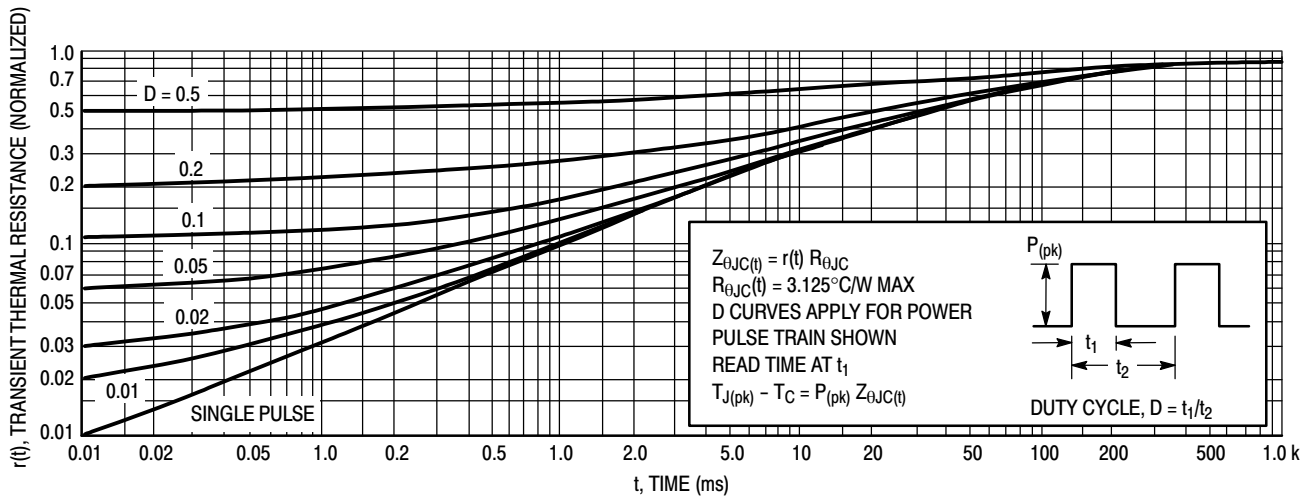


Figure 4. Thermal Response

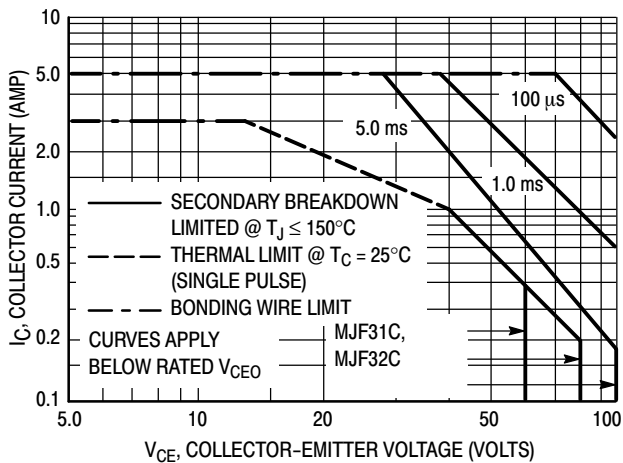


Figure 5. Active Region Safe Operating Area

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 5 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 $T_{J(pk)} \leq 150^\circ\text{C}$. $T_{J(pk)}$ 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.

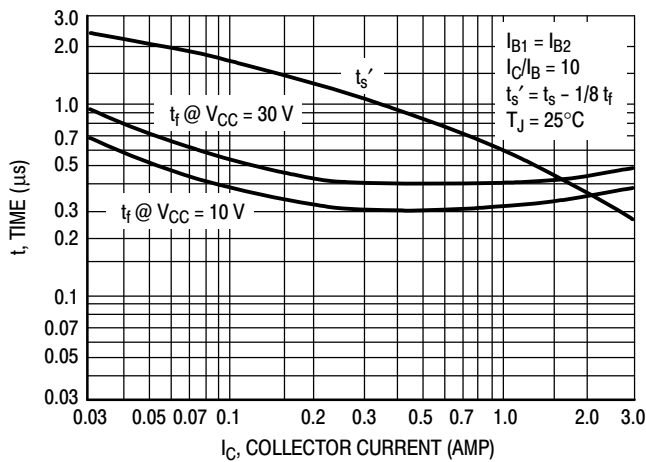


Figure 6. Turn-Off Time

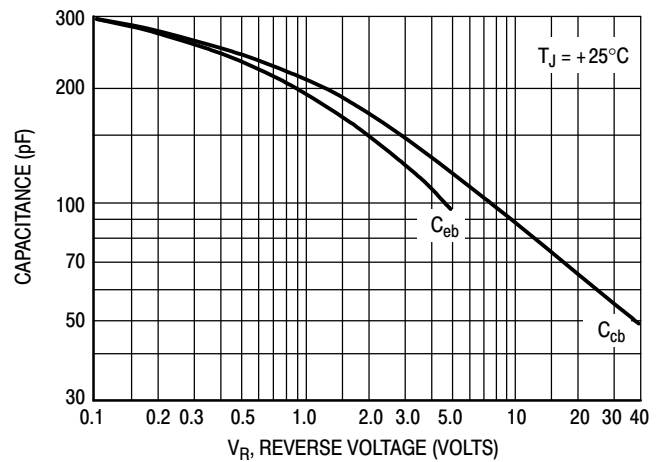


Figure 7. Capacitance

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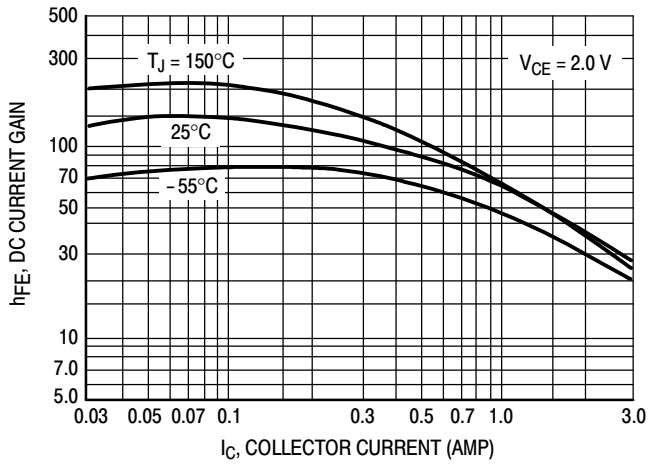


Figure 8. DC Current Gain

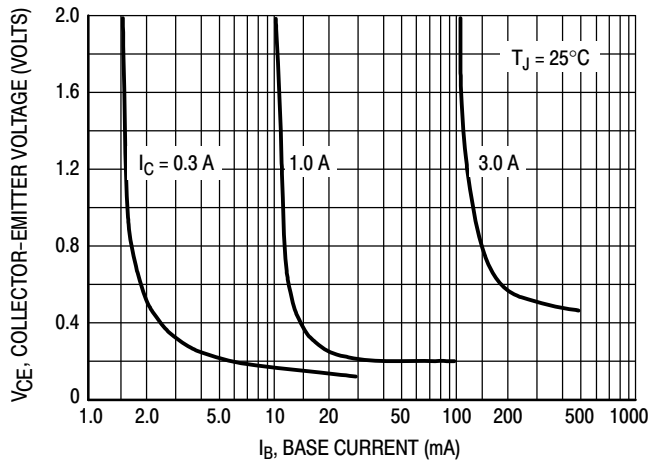


Figure 9. Collector Saturation Region

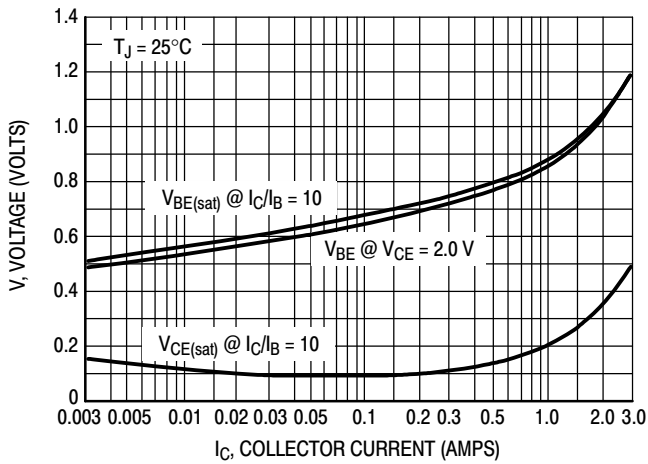


Figure 10. "On" Voltages

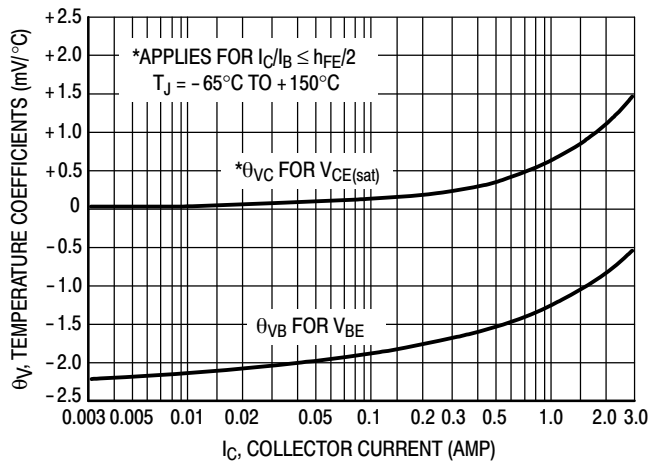


Figure 11. Temperature Coefficients

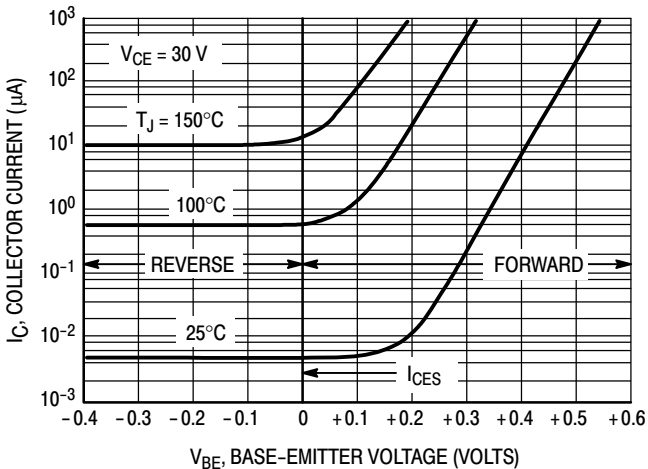


Figure 12. Collector Cut-Off Region

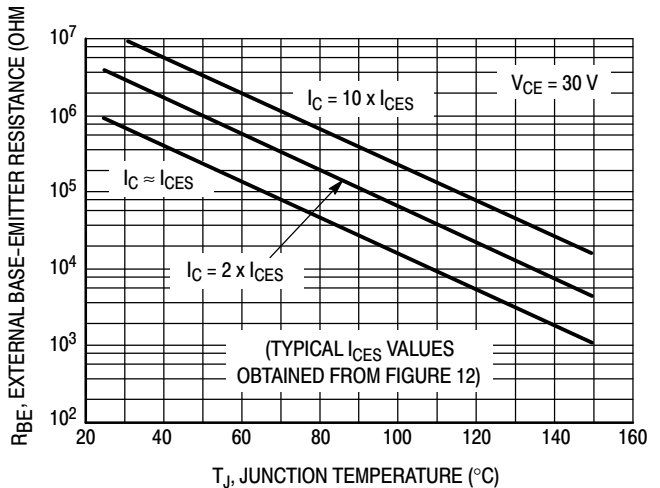
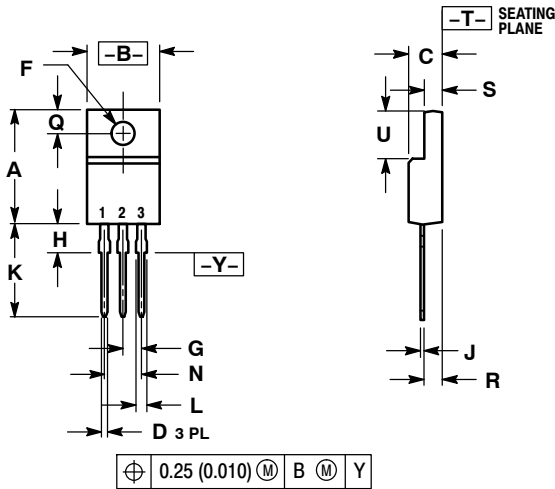


Figure 13. Effects of Base-Emitter Resistance

MJF31C (NPN), MJF32C (PNP)

PACKAGE DIMENSIONS

TO-220 FULLPAK
CASE 221D-03
ISSUE J




NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH
3. 221D-01 THRU 221D-02 OBSOLETE, NEW STANDARD 221D-03.

| DIM | INCHES | | MILLIMETERS | |
|-----|-----------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.617 | 0.635 | 15.67 | 16.12 |
| B | 0.392 | 0.419 | 9.96 | 10.63 |
| C | 0.177 | 0.193 | 4.50 | 4.90 |
| D | 0.024 | 0.039 | 0.60 | 1.00 |
| F | 0.116 | 0.129 | 2.95 | 3.28 |
| G | 0.100 BSC | | 2.54 BSC | |
| H | 0.118 | 0.135 | 3.00 | 3.43 |
| J | 0.018 | 0.025 | 0.45 | 0.63 |
| K | 0.503 | 0.541 | 12.78 | 13.73 |
| L | 0.048 | 0.058 | 1.23 | 1.47 |
| N | 0.200 BSC | | 5.08 BSC | |
| Q | 0.122 | 0.138 | 3.10 | 3.50 |
| R | 0.099 | 0.117 | 2.51 | 2.96 |
| S | 0.092 | 0.113 | 2.34 | 2.87 |
| U | 0.239 | 0.271 | 6.06 | 6.88 |

STYLE 2:

- PIN 1. BASE
2. COLLECTOR
3. EMITTER

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