

# Complementary Silicon Power Transistors

## MJF3055 (NPN), MJF2955 (PNP)

Specifically designed for general purpose amplifier and switching applications.

### Features

- Isolated Overmold Package (1500 Volts RMS Min)
- Electrically Similar to the Popular MJE3055T and MJE2955T
- Collector-Emitter Sustaining Voltage –  $V_{CEO(sus)}$  90 V
- 10 Amperes Rated Collector Current
- No Isolating Washers Required
- Reduced System Cost
- UL Recognized, File #E69369, to 3500  $V_{RMS}$  Isolation
- Epoxy Meets UL 94 V-0 at 0.125 in
- ESD Ratings: Machine Model, C; > 400 V  
Human Body Model, 3B; > 8000 V
- Pb-Free Packages are Available\*

### MAXIMUM RATINGS

| Rating                                                                                                           | Symbol         | Value          | Unit                     |
|------------------------------------------------------------------------------------------------------------------|----------------|----------------|--------------------------|
| Collector-Emitter Sustaining Voltage                                                                             | $V_{CEO(sus)}$ | 90             | Vdc                      |
| Collector-Emitter Breakdown Voltage                                                                              | $V_{CES}$      | 90             | Vdc                      |
| Base-Emitter Voltage                                                                                             | $V_{EBO}$      | 5.0            | Vdc                      |
| Collector Current – Continuous                                                                                   | $I_C$          | 10             | Adc                      |
| Base Current – Continuous                                                                                        | $I_B$          | 6.0            | Adc                      |
| RMS Isolation Voltage (Note 3)<br>( $t = 0.3$ sec, R.H. $\leq 30\%$ , $T_A = 25^\circ\text{C}$ )<br>Per Figure 5 | $V_{ISOL}$     | 4500           | $V_{RMS}$                |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$ (Note 2)<br>Derate above $25^\circ\text{C}$                   | $P_D$          | 30<br>0.25     | W<br>W/ $^\circ\text{C}$ |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$                            | $P_D$          | 2.0<br>0.016   | W<br>W/ $^\circ\text{C}$ |
| Operating and Storage Temperature Range                                                                          | $T_J, T_{stg}$ | -55 to<br>+150 | $^\circ\text{C}$         |

### THERMAL CHARACTERISTICS

| Characteristic                                   | Symbol          | Max  | Unit               |
|--------------------------------------------------|-----------------|------|--------------------|
| Thermal Resistance, Junction-to-Case<br>(Note 2) | $R_{\theta JC}$ | 4.0  | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction-to-Ambient          | $R_{\theta JA}$ | 62.5 | $^\circ\text{C/W}$ |
| Lead Temperature for Soldering Purposes          | $T_L$           | 260  | $^\circ\text{C}$   |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

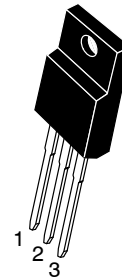
- Pulse Test: Pulse Width = 5.0 ms, Duty Cycle  $\leq 10\%$ .
- Measurement made with thermocouple contacting the bottom insulated surface (in a location beneath the die), the devices mounted on a heatsink with thermal grease and a mounting torque of  $\geq 6$  in. lbs.
- Proper strike and creepage distance must be provided.

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

## COMPLEMENTARY SILICON POWER TRANSISTORS

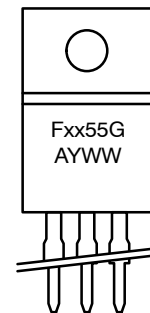
### 10 AMPERES

### 90 VOLTS, 30 WATTS



TO-220 FULLPACK  
CASE 221D  
STYLE 2

### MARKING DIAGRAM



Fxx55 = Specific Device Code  
xx = 29 or 30  
G = Pb-Free Package  
A = Assembly Location  
Y = Year  
WW = Work Week

### ORDERING INFORMATION

| Device   | Package                      | Shipping      |
|----------|------------------------------|---------------|
| MJF2955  | TO-220 FULLPACK              | 50 Units/Rail |
| MJF2955G | TO-220 FULLPACK<br>(Pb-Free) | 50 Units/Rail |
| MJF3055  | TO-220 FULLPACK              | 50 Units/Rail |
| MJF3055G | TO-220 FULLPACK<br>(Pb-Free) | 50 Units/Rail |

## MJF3055 (NPN), MJF2955 (PNP)

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

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

#### OFF CHARACTERISTICS (Note 4)

|                                                                                    |               |    |     |                    |
|------------------------------------------------------------------------------------|---------------|----|-----|--------------------|
| Collector-Emitter Sustaining Voltage<br>( $I_C = 200\text{ mA}_{dc}$ , $I_B = 0$ ) | $V_{CE(sus)}$ | 90 | –   | Vdc                |
| Collector Cutoff Current<br>( $V_{CE} = 90\text{ Vdc}$ , $V_{BE} = 0$ )            | $I_{CES}$     | –  | 1.0 | $\mu\text{A}_{dc}$ |
| Collector Cutoff Current<br>( $V_{CE} = 90\text{ Vdc}$ , $I_E = 0$ )               | $I_{CBO}$     | –  | 1.0 | $\mu\text{A}_{dc}$ |
| Emitter-Base Leakage<br>( $V_{EB} = 5.0\text{ Vdc}$ , $I_C = 0$ )                  | $I_{EBO}$     | –  | 1.0 | $\mu\text{A}_{dc}$ |

#### ON CHARACTERISTICS (Note 4)

|                                                                                                                                                   |               |           |            |     |
|---------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------|------------|-----|
| DC Current Gain<br>( $I_{CE} = 4.0\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ )<br>( $I_{CE} = 10\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ )          | $h_{FE}$      | 20<br>5.0 | 100<br>–   | –   |
| Collector-Emitter Saturation Voltage<br>( $I_C = 4.0\text{ Adc}$ , $I_B = 0.4\text{ Adc}$ )<br>( $I_C = 10\text{ Adc}$ , $I_B = 3.3\text{ Adc}$ ) | $V_{CE(sat)}$ | –<br>–    | 1.0<br>2.5 | Vdc |
| Base-Emitter On Voltage<br>( $I_C = 4.0\text{ Adc}$ , $V_{BE} = 4.0\text{ Vdc}$ )                                                                 | $V_{BE(on)}$  | –         | 1.5        | Vdc |

#### DYNAMIC CHARACTERISTICS

|                                                                                                                       |       |     |   |     |
|-----------------------------------------------------------------------------------------------------------------------|-------|-----|---|-----|
| Current-Gain-Bandwidth Product<br>( $V_{CE} = 10\text{ Vdc}$ , $I_C = 0.5\text{ Adc}$ , $f_{test} = 500\text{ kHz}$ ) | $f_T$ | 2.0 | – | MHz |
|-----------------------------------------------------------------------------------------------------------------------|-------|-----|---|-----|

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

4. Pulse Test: Pulse Width = 5.0 ms, Duty Cycle  $\leq 10\%$ .

## MJF3055 (NPN), MJF2955 (PNP)

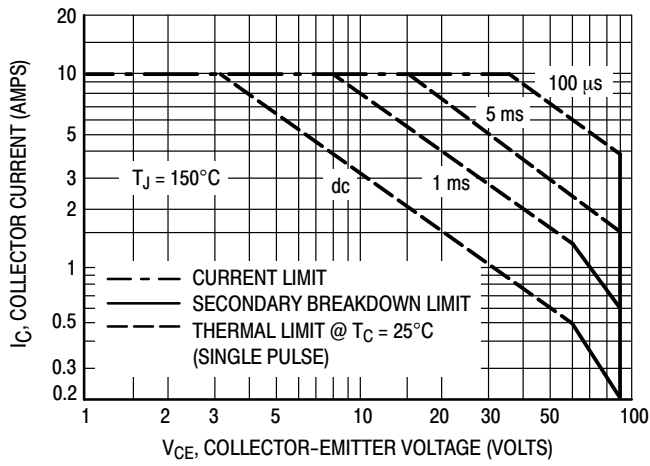


Figure 1. Maximum Forward Bias Safe Operating Area

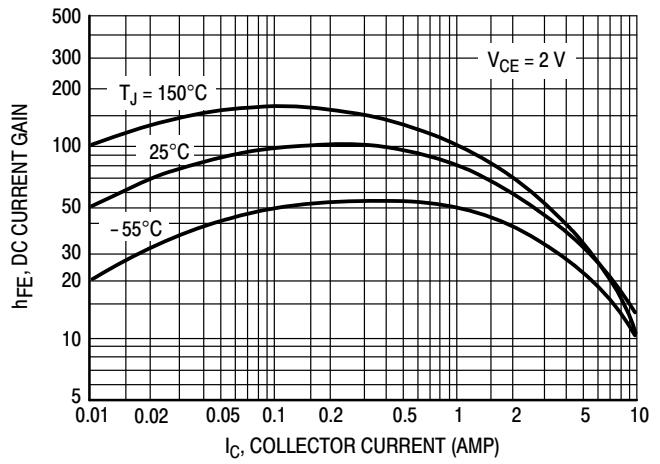


Figure 2. DC Current Gain

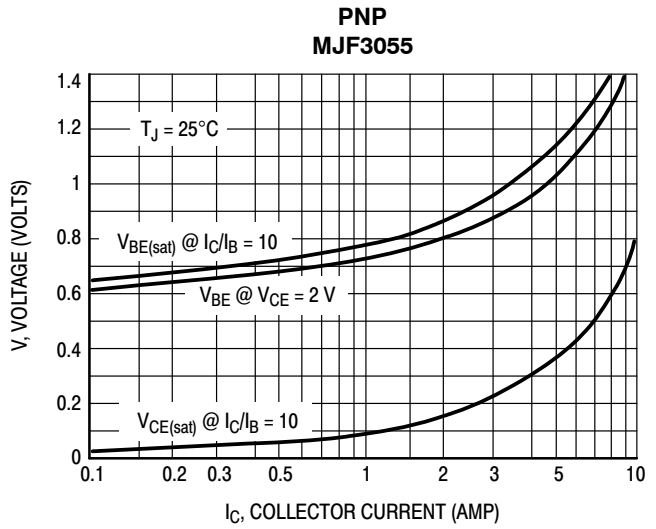
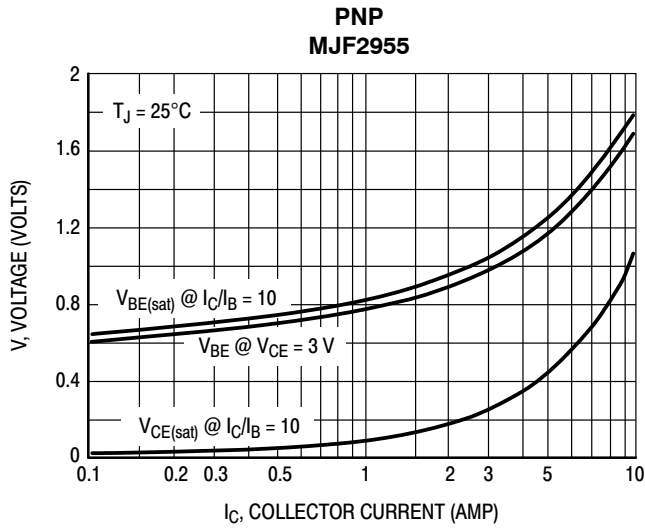


Figure 3. "On" Voltages

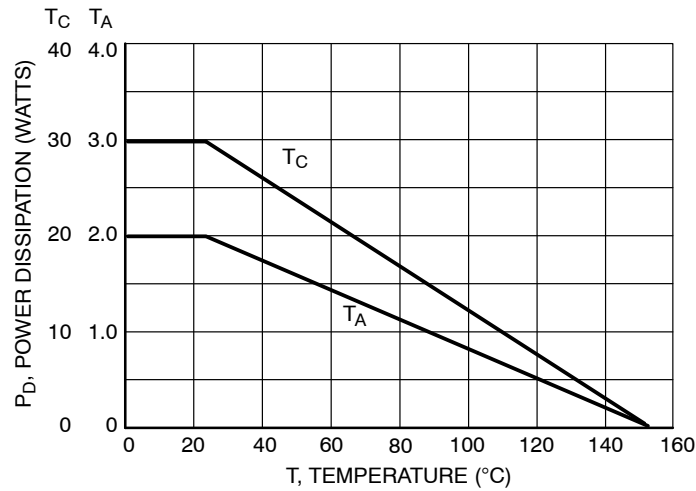


Figure 4. Power Derating

## MJF3055 (NPN), MJF2955 (PNP)

### TEST CONDITIONS FOR ISOLATION TESTS\*

#### FULLY ISOLATED PACKAGE

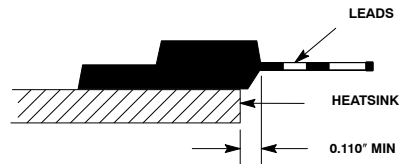


Figure 5. Mounting Position

\*Measurement made between leads and heatsink with all leads shorted together.

### MOUNTING INFORMATION

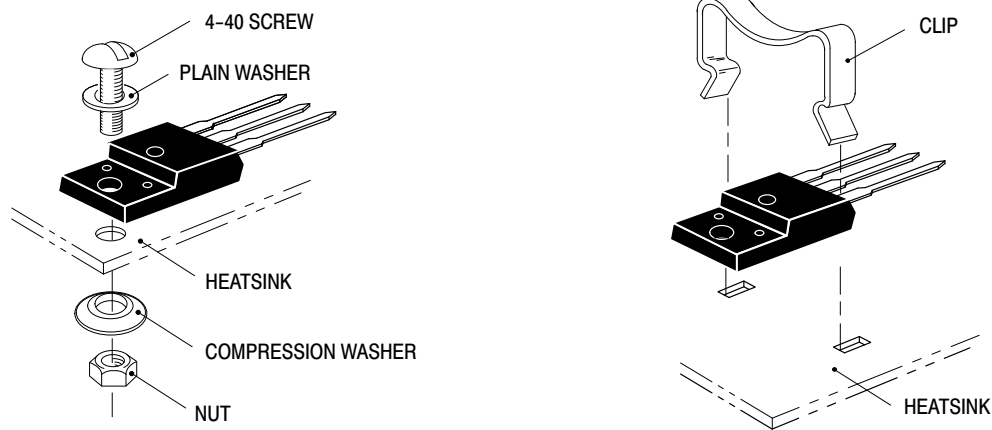


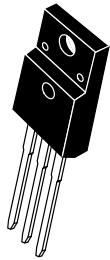
Figure 6. Typical Mounting Techniques\*

Laboratory tests on a limited number of samples indicate, when using the screw and compression washer mounting technique, a screw torque of 6 to 8 in · lbs is sufficient to provide maximum power dissipation capability. The compression washer helps to maintain a constant pressure on the package over time and during large temperature excursions.

Destructive laboratory tests show that using a hex head 4-40 screw, without washers, and applying a torque in excess of 20 in · lbs will cause the plastic to crack around the mounting hole, resulting in a loss of isolation capability.

Additional tests on slotted 4-40 screws indicate that the screw slot fails between 15 to 20 in · lbs without adversely affecting the package. However, in order to positively ensure the package integrity of the fully isolated device, **onsemi** does not recommend exceeding 10 in · lbs of mounting torque under any mounting conditions.

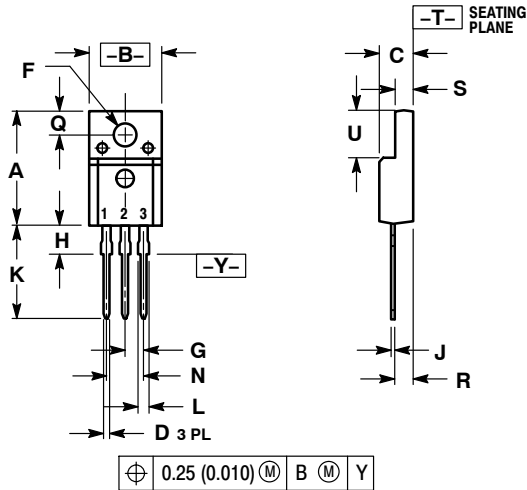
\*\*For more information about mounting power semiconductors see Application Note AN1040.



SCALE 1:1

TO-220 FULLPAK  
CASE 221D-03  
ISSUE K

DATE 27 FEB 2009



- 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.

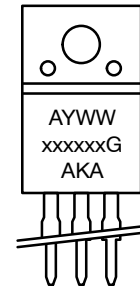
| DIM | INCHES    |       | MILLIMETERS |       |
|-----|-----------|-------|-------------|-------|
|     | MIN       | MAX   | MIN         | MAX   |
| A   | 0.617     | 0.635 | 15.67       | 16.12 |
| B   | 0.392     | 0.419 | 9.96        | 10.63 |
| C   | 0.177     | 0.193 | 4.50        | 4.90  |
| 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  |

MARKING  
DIAGRAMS

- STYLE 1:  
PIN 1. GATE  
2. DRAIN  
3. SOURCE
- STYLE 2:  
PIN 1. BASE  
2. COLLECTOR  
3. EMITTER
- STYLE 3:  
PIN 1. ANODE  
2. CATHODE  
3. ANODE
- STYLE 4:  
PIN 1. CATHODE  
2. ANODE  
3. CATHODE
- STYLE 5:  
PIN 1. CATHODE  
2. ANODE  
3. GATE
- STYLE 6:  
PIN 1. MT 1  
2. MT 2  
3. GATE



Bipolar



Rectifier

xxxxxx = Specific Device Code  
G = Pb-Free Package  
A = Assembly Location  
Y = Year  
WW = Work Week

A = Assembly Location  
Y = Year  
WW = Work Week  
xxxxxx = Device Code  
G = Pb-Free Package  
AKA = Polarity Designator

|                  |                |                                                                                                                                                                                     |
|------------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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