

# MJL3281A (NPN) MJL1302A (PNP)

Preferred Devices

## Complementary Bipolar Power Transistors

### Features

- Exceptional Safe Operating Area
- NPN/PNP Gain Matching within 10% from 50 mA to 5 A
- Excellent Gain Linearity
- High BVCEO
- High Frequency
- Pb-Free Packages are Available

### Benefits

- Reliable Performance at Higher Powers
- Symmetrical Characteristics in Complementary Configurations
- Accurate Reproduction of Input Signal
- Greater Dynamic Range
- High Amplifier Bandwidth

### Applications

- High-End Consumer Audio Products
  - ♦ Home Amplifiers
  - ♦ Home Receivers
- Professional Audio Amplifiers
  - ♦ Theater and Stadium Sound Systems
  - ♦ Public Address Systems (PAs)

### MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

| Rating                                                                                | Symbol         | Value           | Unit                         |
|---------------------------------------------------------------------------------------|----------------|-----------------|------------------------------|
| Collector-Emitter Voltage                                                             | $V_{CEO}$      | 260             | Vdc                          |
| Collector-Base Voltage                                                                | $V_{CBO}$      | 260             | Vdc                          |
| Emitter-Base Voltage                                                                  | $V_{EBO}$      | 5.0             | Vdc                          |
| Collector-Emitter Voltage – 1.5 V                                                     | $V_{CEX}$      | 260             | Vdc                          |
| Collector Current – Continuous<br>– Peak (Note 1)                                     | $I_C$          | 15<br>25        | Adc                          |
| Base Current – Continuous                                                             | $I_B$          | 1.5             | Adc                          |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$<br>Derate Above $25^\circ\text{C}$ | $P_D$          | 200<br>1.43     | Watts<br>W/ $^\circ\text{C}$ |
| Operating and Storage Junction<br>Temperature Range                                   | $T_J, T_{stg}$ | – 65 to<br>+150 | $^\circ\text{C}$             |

### THERMAL CHARACTERISTICS

| Characteristic                       | Symbol          | Max   | Unit               |
|--------------------------------------|-----------------|-------|--------------------|
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 0.625 | $^\circ\text{C/W}$ |

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. Pulse Test: Pulse Width = 5 ms, Duty Cycle < 10%.

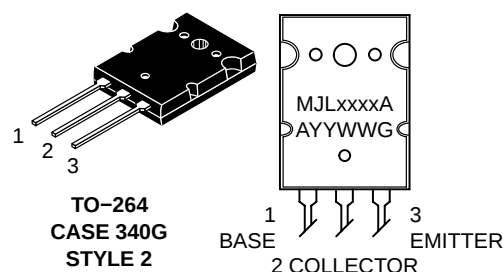


ON Semiconductor®

<http://onsemi.com>

**15 AMPERES  
COMPLEMENTARY  
SILICON POWER  
TRANSISTORS  
260 VOLTS  
200 WATTS**

### MARKING DIAGRAM



xxxx = 3281 or 1302  
A = Location Code  
YY = Year  
WW = Work Week  
G = Pb-Free Package

### ORDERING INFORMATION

| Device    | Package             | Shipping      |
|-----------|---------------------|---------------|
| MJL3281A  | TO-264              | 25 Units/Rail |
| MJL3281AG | TO-264<br>(Pb-Free) | 25 Units/Rail |
| MJL1302A  | TO-264              | 25 Units/Rail |
| MJL1302AG | TO-264<br>(Pb-Free) | 25 Units/Rail |

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

# MJL3281A (NPN) MJL1302A (PNP)

## ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

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

### OFF CHARACTERISTICS

|                                                                                         |                       |     |    |      |
|-----------------------------------------------------------------------------------------|-----------------------|-----|----|------|
| Collector–Emitter Sustaining Voltage<br>(I <sub>C</sub> = 100 mAdc, I <sub>B</sub> = 0) | V <sub>CEO(sus)</sub> | 260 | –  | Vdc  |
| Collector Cutoff Current<br>(V <sub>CB</sub> = 260 Vdc, I <sub>E</sub> = 0)             | I <sub>CBO</sub>      | –   | 50 | μAdc |
| Emitter Cutoff Current<br>(V <sub>EB</sub> = 5 Vdc, I <sub>C</sub> = 0)                 | I <sub>EBO</sub>      | –   | 5  | μAdc |

### SECOND BREAKDOWN

|                                                                                                                                                                      |                  |        |        |     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|--------|--------|-----|
| Second Breakdown Collector with Base Forward Biased<br>(V <sub>CE</sub> = 50 Vdc, t = 1 s (non-repetitive))<br>(V <sub>CE</sub> = 100 Vdc, t = 1 s (non-repetitive)) | I <sub>S/b</sub> | 4<br>1 | –<br>– | Adc |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|--------|--------|-----|

### ON CHARACTERISTICS

|                                                                                                                                                                                                                                                                                             |                      |                            |                               |     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------------------|-------------------------------|-----|
| DC Current Gain<br>(I <sub>C</sub> = 500 mAdc, V <sub>CE</sub> = 5 Vdc)<br>(I <sub>C</sub> = 1 Adc, V <sub>CE</sub> = 5 Vdc)<br>(I <sub>C</sub> = 3 Adc, V <sub>CE</sub> = 5 Vdc)<br>(I <sub>C</sub> = 5 Adc, V <sub>CE</sub> = 5 Vdc)<br>(I <sub>C</sub> = 8 Adc, V <sub>CE</sub> = 5 Vdc) | h <sub>FE</sub>      | 75<br>75<br>75<br>75<br>45 | 150<br>150<br>150<br>150<br>– |     |
| Collector–Emitter Saturation Voltage<br>(I <sub>C</sub> = 10 Adc, I <sub>B</sub> = 1 Adc)                                                                                                                                                                                                   | V <sub>CE(sat)</sub> | –                          | 3                             | Vdc |

### DYNAMIC CHARACTERISTICS

|                                                                                                                  |                 |    |     |     |
|------------------------------------------------------------------------------------------------------------------|-----------------|----|-----|-----|
| Current–Gain – Bandwidth Product<br>(I <sub>C</sub> = 1 Adc, V <sub>CE</sub> = 5 Vdc, f <sub>test</sub> = 1 MHz) | f <sub>T</sub>  | 30 | –   | MHz |
| Output Capacitance<br>(V <sub>CB</sub> = 10 Vdc, I <sub>E</sub> = 0, f <sub>test</sub> = 1 MHz)                  | C <sub>ob</sub> | –  | 600 | pF  |

# MJL3281A (NPN) MJL1302A (PNP)

## TYPICAL CHARACTERISTICS

PNP MJL1302A

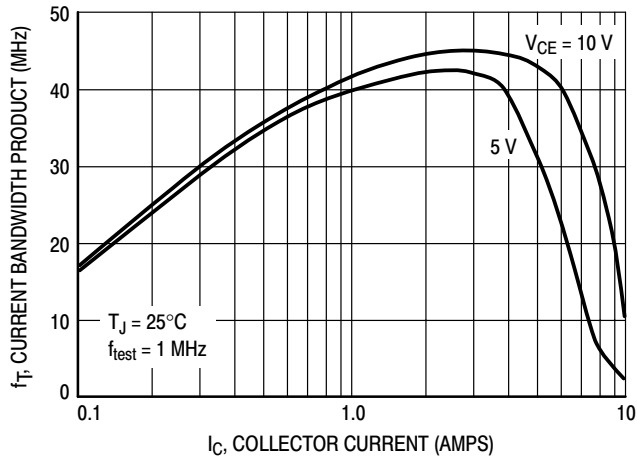


Figure 1. Typical Current Gain Bandwidth Product

NPN MJL3281A

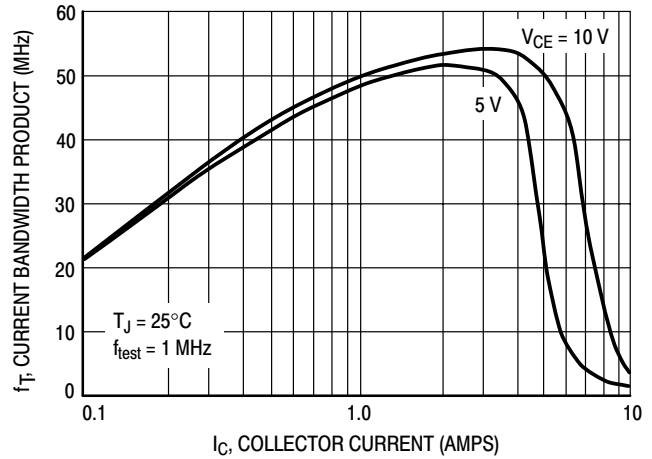


Figure 2. Typical Current Gain Bandwidth Product

PNP MJL1302A

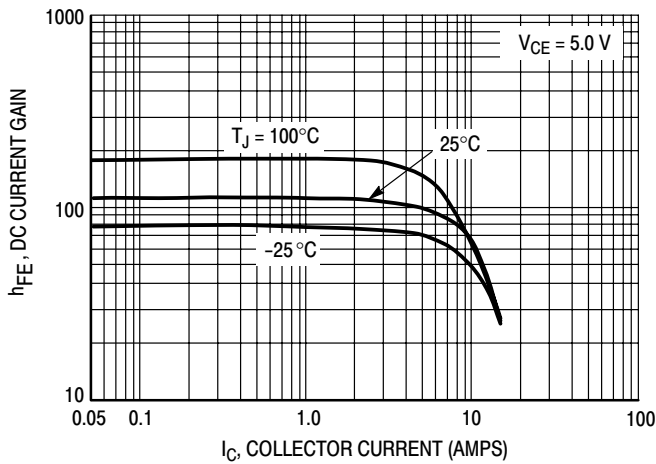


Figure 3. DC Current Gain

NPN MJL3281A

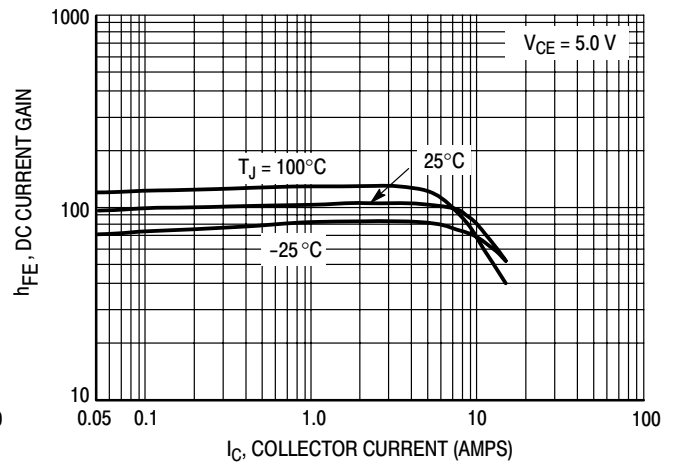


Figure 4. DC Current Gain

PNP MJL1302A

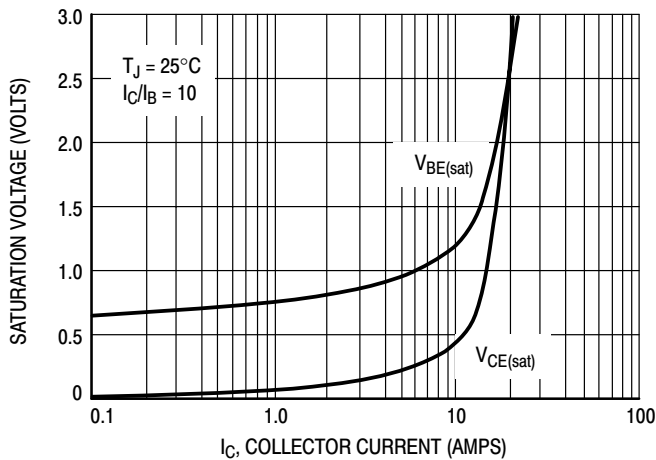


Figure 5. Typical Saturation Voltages

NPN MJL3281A

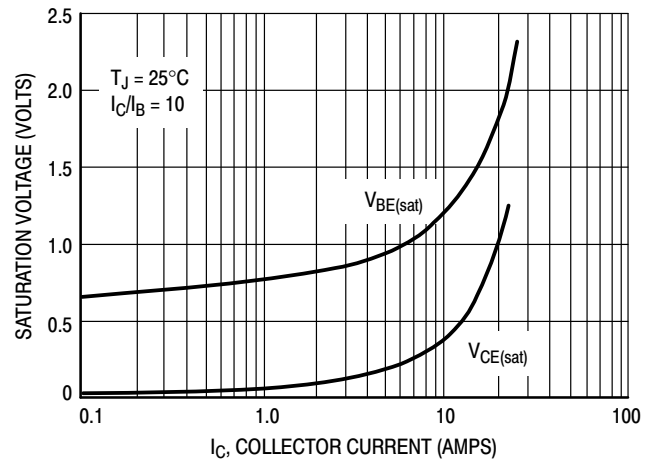


Figure 6. Typical Saturation Voltages

# MJL3281A (NPN) MJL1302A (PNP)

## TYPICAL CHARACTERISTICS

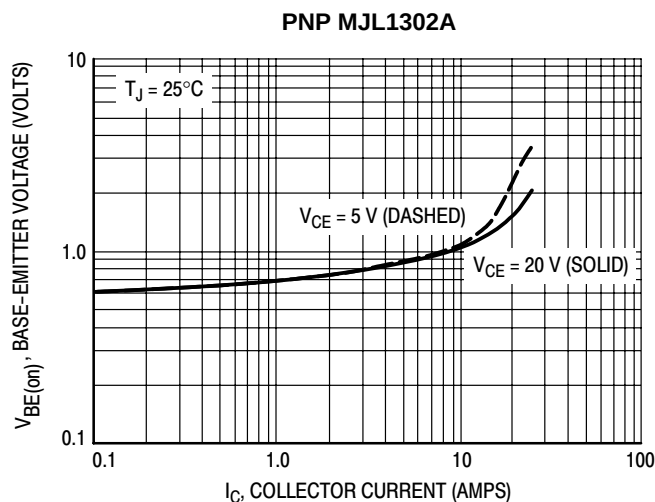


Figure 7. Typical Base-Emitter Voltage

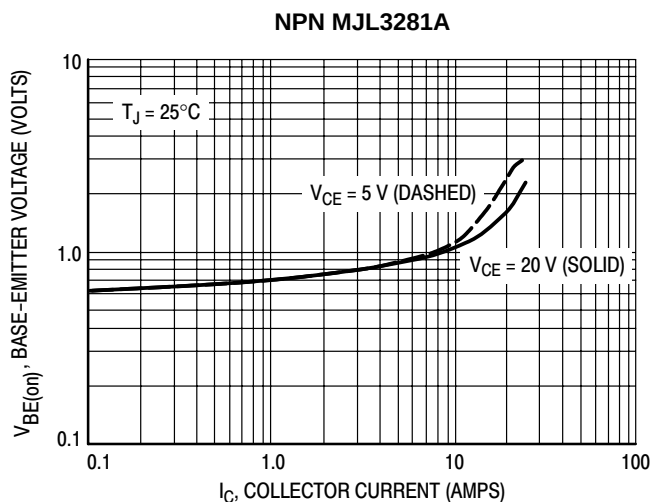


Figure 8. Typical Base-Emitter Voltage

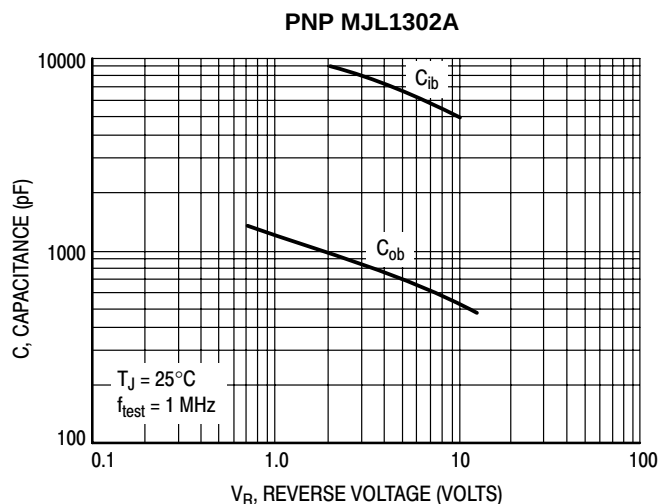


Figure 9. MJL1302A Typical Capacitance

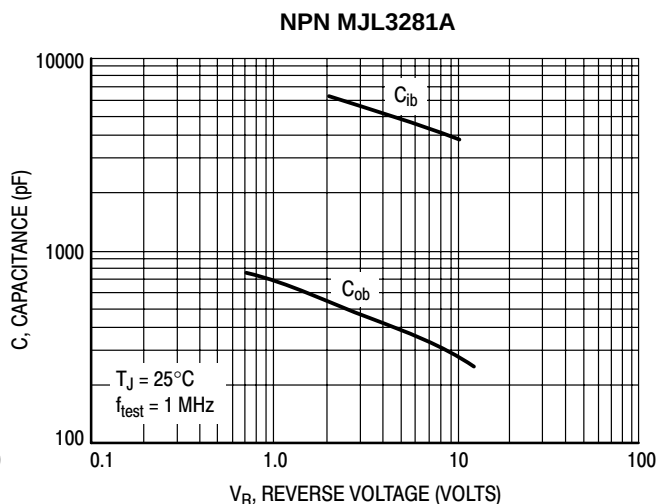


Figure 10. MJL3281A Typical Capacitance

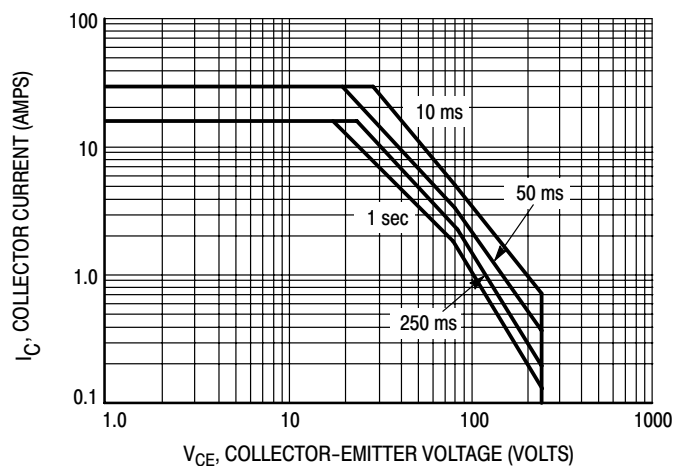


Figure 11. Active Region Safe Operating Area

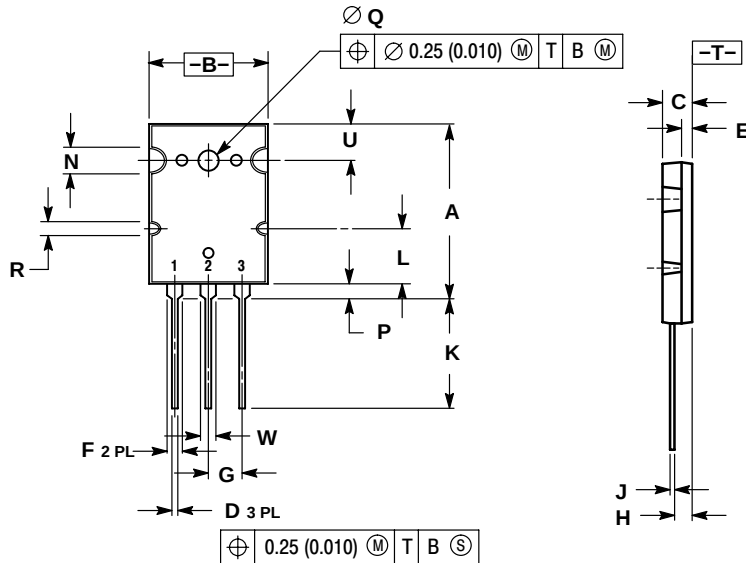
There are two limitations on the power handling ability of a transistor; average junction temperature and secondary breakdown. Safe operating area curves indicate  $I_C - V_{CE}$  limits of the transistor that must be observed for reliable operation; i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figure 11 is based on  $T_{J(pk)} = 150^\circ\text{C}$ ;  $T_C$  is variable depending on conditions. At high case temperatures, thermal limitations will reduce the power than can be handled to values less than the limitations imposed by second breakdown.

# MJL3281A (NPN) MJL1302A (PNP)

## PACKAGE DIMENSIONS

TO-3PBL (TO-264)  
CASE 340G-02  
ISSUE J



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

| DIM | MILLIMETERS |      | INCHES    |       |
|-----|-------------|------|-----------|-------|
|     | MIN         | MAX  | MIN       | MAX   |
| A   | 28.0        | 29.0 | 1.102     | 1.142 |
| B   | 19.3        | 20.3 | 0.760     | 0.800 |
| C   | 4.7         | 5.3  | 0.185     | 0.209 |
| D   | 0.93        | 1.48 | 0.037     | 0.058 |
| E   | 1.9         | 2.1  | 0.075     | 0.083 |
| F   | 2.2         | 2.4  | 0.087     | 0.102 |
| G   | 5.45 BSC    |      | 0.215 BSC |       |
| H   | 2.6         | 3.0  | 0.102     | 0.118 |
| J   | 0.43        | 0.78 | 0.017     | 0.031 |
| K   | 17.6        | 18.8 | 0.693     | 0.740 |
| L   | 11.2 REF    |      | 0.411 REF |       |
| N   | 4.35 REF    |      | 0.172 REF |       |
| P   | 2.2         | 2.6  | 0.087     | 0.102 |
| Q   | 3.1         | 3.5  | 0.122     | 0.137 |
| R   | 2.25 REF    |      | 0.089 REF |       |
| U   | 6.3 REF     |      | 0.248 REF |       |
| W   | 2.8         | 3.2  | 0.110     | 0.125 |

STYLE 2:  
PIN 1. BASE  
2. COLLECTOR  
3. EMITTER

\*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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