

# MJB44H11 (NPN), NJVMJB44H11 (NPN), MJB45H11 (PNP), NJVMJB45H11 (PNP)

## Complementary Power Transistors

### D<sup>2</sup>PAK for Surface Mount

Complementary power transistors are for general purpose power amplification and switching such as output or driver stages in applications such as switching regulators, converters and power amplifiers.

#### Features

- Low Collector–Emitter Saturation Voltage –  
 $V_{CE(sat)} = 1.0 \text{ V (Max) @ } 8.0 \text{ A}$
- Fast Switching Speeds
- Complementary Pairs Simplifies Designs
- Epoxy Meets UL 94 V–0 @ 0.125 in
- ESD Ratings: Human Body Model, 3B > 8000 V  
Machine Model, C > 400 V
- AEC–Q101 Qualified and PPAP Capable
- NJV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements
- Pb–Free Packages are Available

#### MAXIMUM RATINGS

| Rating                                                                                   | Symbol         | Value        | Unit                     |
|------------------------------------------------------------------------------------------|----------------|--------------|--------------------------|
| Collector–Emitter Voltage                                                                | $V_{CEO}$      | 80           | Vdc                      |
| Emitter–Base Voltage                                                                     | $V_{EB}$       | 5            | Vdc                      |
| Collector Current – Continuous<br>– Peak                                                 | $I_C$          | 10<br>20     | Adc                      |
| Total Power Dissipation<br>@ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 50<br>1.67   | W<br>W/ $^\circ\text{C}$ |
| Total Power Dissipation<br>@ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 2.0<br>0.016 | W<br>W/ $^\circ\text{C}$ |
| Operating and Storage Junction<br>Temperature Range                                      | $T_J, T_{stg}$ | –55 to 150   | $^\circ\text{C}$         |

#### THERMAL CHARACTERISTICS

| Characteristic                          | Symbol          | Max | Unit               |
|-----------------------------------------|-----------------|-----|--------------------|
| Thermal Resistance, Junction–to–Case    | $R_{\theta JC}$ | 2.5 | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction–to–Ambient | $R_{\theta JA}$ | 75  | $^\circ\text{C/W}$ |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

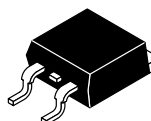


ON Semiconductor®

<http://onsemi.com>

**SILICON POWER  
TRANSISTORS  
10 AMPERES,  
80 VOLTS, 50 WATTS**

#### MARKING DIAGRAM



D<sup>2</sup>PAK  
CASE 418B  
STYLE 1



x = 4 or 5  
A = Assembly Location  
Y = Year  
WW = Work Week  
G = Pb–Free Package

#### ORDERING INFORMATION

| Device         | Package                         | Shipping†       |
|----------------|---------------------------------|-----------------|
| MJB44H11       | D <sup>2</sup> PAK              | 50 Units/Rail   |
| MJB44H11G      | D <sup>2</sup> PAK<br>(Pb–Free) | 50 Units/Rail   |
| MJB44H11T4     | D <sup>2</sup> PAK              | 800/Tape & Reel |
| MJB44H11T4G    | D <sup>2</sup> PAK<br>(Pb–Free) | 800/Tape & Reel |
| NJVMJB44H11T4G | D <sup>2</sup> PAK<br>(Pb–Free) | 800/Tape & Reel |
| MJB45H11       | D <sup>2</sup> PAK              | 50 Units/Rail   |
| MJB45H11G      | D <sup>2</sup> PAK<br>(Pb–Free) | 50 Units/Rail   |
| MJB45H11T4     | D <sup>2</sup> PAK              | 800/Tape & Reel |
| MJB45H11T4G    | D <sup>2</sup> PAK<br>(Pb–Free) | 800/Tape & Reel |
| NJVMJB45H11T4G | D <sup>2</sup> PAK<br>(Pb–Free) | 800/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.

# MJB44H11 (NPN), NJVMJB44H11 (NPN), MJB45H11 (PNP), NJVMJB45H11 (PNP)

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

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

### OFF CHARACTERISTICS

|                                                                              |                |    |   |    |               |
|------------------------------------------------------------------------------|----------------|----|---|----|---------------|
| Collector-Emitter Sustaining Voltage ( $I_C = 30\text{ mA}$ , $I_B = 0$ )    | $V_{CEO(sus)}$ | 80 | – | –  | Vdc           |
| Collector Cutoff Current ( $V_{CE} = \text{Rated } V_{CEO}$ , $V_{BE} = 0$ ) | $I_{CES}$      | –  | – | 10 | $\mu\text{A}$ |
| Emitter Cutoff Current ( $V_{EB} = 5\text{ Vdc}$ )                           | $I_{EBO}$      | –  | – | 50 | $\mu\text{A}$ |

### ON CHARACTERISTICS

|                                                                                        |               |    |   |     |     |
|----------------------------------------------------------------------------------------|---------------|----|---|-----|-----|
| Collector-Emitter Saturation Voltage ( $I_C = 8\text{ Adc}$ , $I_B = 0.4\text{ Adc}$ ) | $V_{CE(sat)}$ | –  | – | 1.0 | Vdc |
| Base-Emitter Saturation Voltage ( $I_C = 8\text{ Adc}$ , $I_B = 0.8\text{ Adc}$ )      | $V_{BE(sat)}$ | –  | – | 1.5 | Vdc |
| DC Current Gain ( $V_{CE} = 1\text{ Vdc}$ , $I_C = 2\text{ Adc}$ )                     | $h_{FE}$      | 60 | – | –   | –   |
| DC Current Gain ( $V_{CE} = 1\text{ Vdc}$ , $I_C = 4\text{ Adc}$ )                     |               | 40 | – | –   |     |

### DYNAMIC CHARACTERISTICS

|                                                                                                                                                      |          |        |            |        |     |
|------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------|------------|--------|-----|
| Collector Capacitance ( $V_{CB} = 10\text{ Vdc}$ , $f_{\text{test}} = 1\text{ MHz}$ )<br>MJB44H11, NJVMJB44H11<br>MJB45H11, NJVMJB45H11              | $C_{cb}$ | –<br>– | 130<br>230 | –<br>– | pF  |
| Gain Bandwidth Product ( $I_C = 0.5\text{ Adc}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 20\text{ MHz}$ )<br>MJB44H11, NJVMJB44H11<br>MJB45H11, NJVMJB45H11 | $f_T$    | –<br>– | 50<br>40   | –<br>– | MHz |

### SWITCHING TIMES

|                                                                                                                              |             |        |            |        |    |
|------------------------------------------------------------------------------------------------------------------------------|-------------|--------|------------|--------|----|
| Delay and Rise Times ( $I_C = 5\text{ Adc}$ , $I_{B1} = 0.5\text{ Adc}$ )<br>MJB44H11, NJVMJB44H11<br>MJB45H11, NJVMJB45H11  | $t_d + t_r$ | –<br>– | 300<br>135 | –<br>– | ns |
| Storage Time ( $I_C = 5\text{ Adc}$ , $I_{B1} = I_{B2} = 0.5\text{ Adc}$ )<br>MJB44H11, NJVMJB44H11<br>MJB45H11, NJVMJB45H11 | $t_s$       | –<br>– | 500<br>500 | –<br>– | ns |
| Fall Time ( $I_C = 5\text{ Adc}$ , $I_{B1} = I_{B2} = 0.5\text{ Adc}$ )<br>MJB44H11, NJVMJB44H11<br>MJB45H11, NJVMJB45H11    | $t_f$       | –<br>– | 140<br>100 | –<br>– | ns |

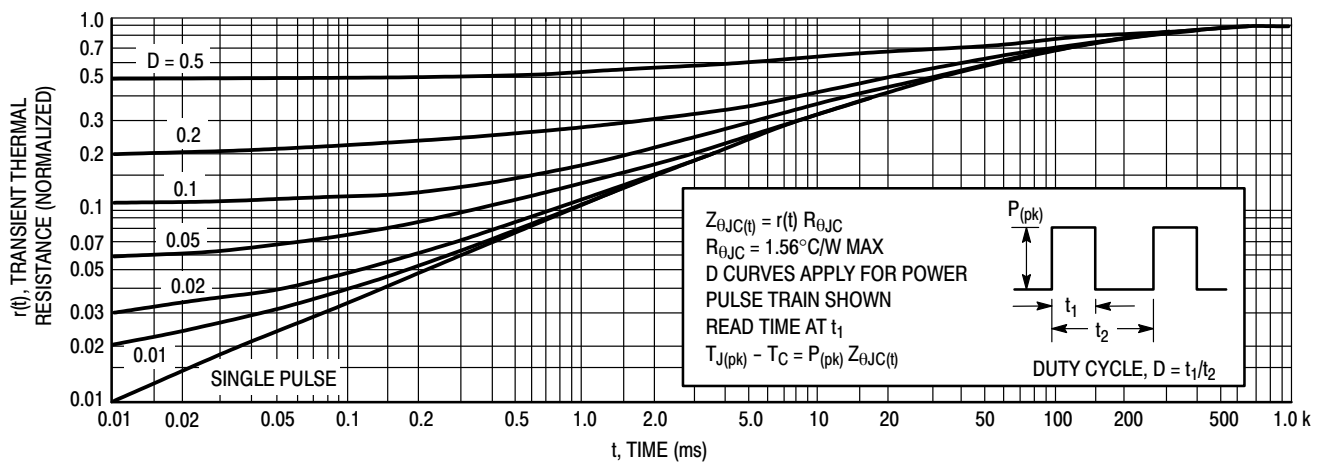
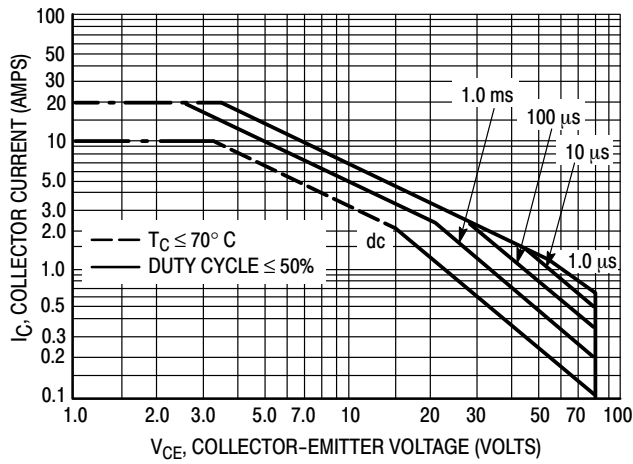


Figure 1. Thermal Response

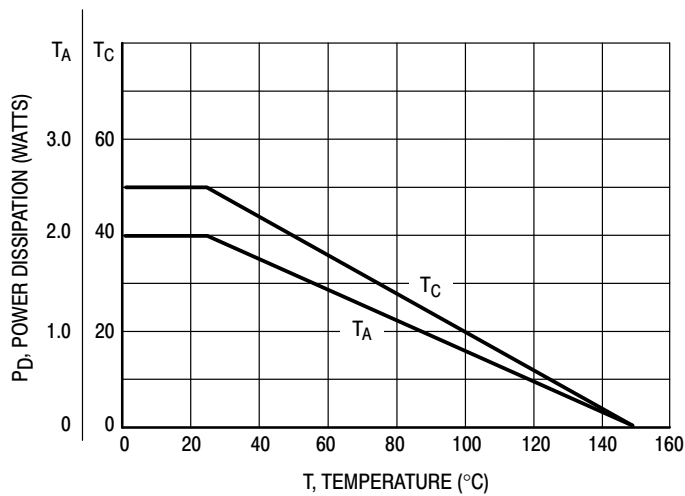
## MJB44H11 (NPN), NJVMJB44H11 (NPN), MJB45H11 (PNP), NJVMJB45H11 (PNP)



**Figure 2. Maximum Rated Forward Bias Safe Operating Area**

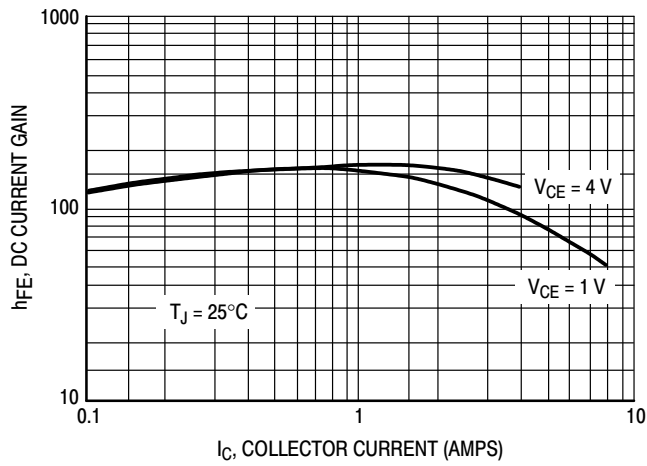
There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate  $I_C - V_{CE}$  limits of the transistor that must be observed for reliable operation; i.e., the transistor must not be subjected to greater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

The data of Figure 2 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 1. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

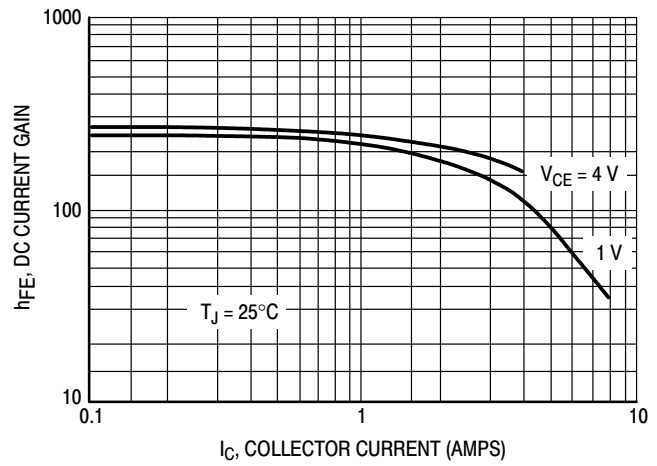


**Figure 3. Power Derating**

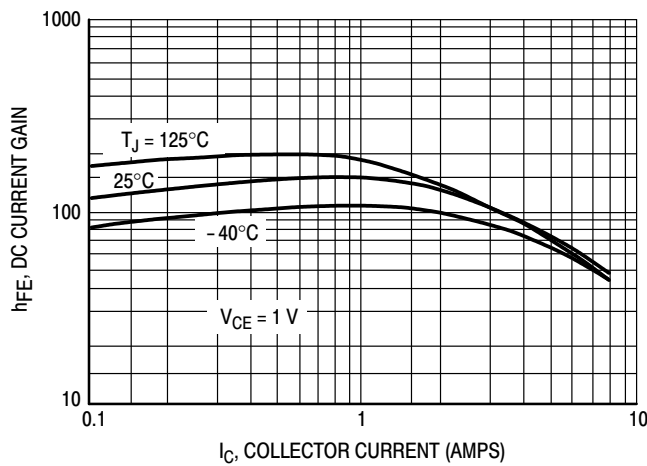
**MJB44H11 (NPN), NJVMJB44H11 (NPN), MJB45H11 (PNP), NJVMJB45H11 (PNP)**



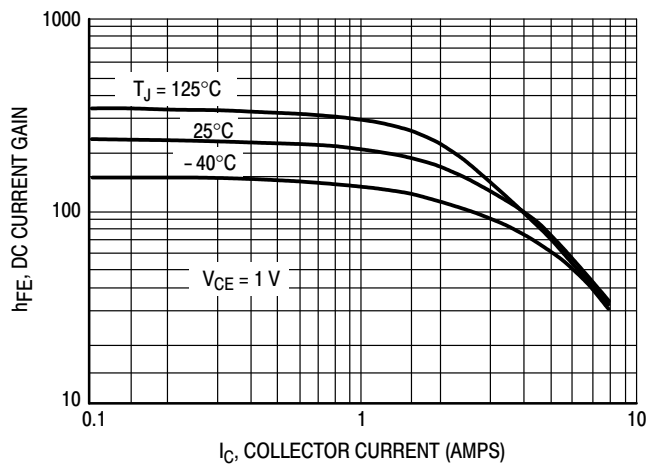
**Figure 4. MJB44H11 DC Current Gain**



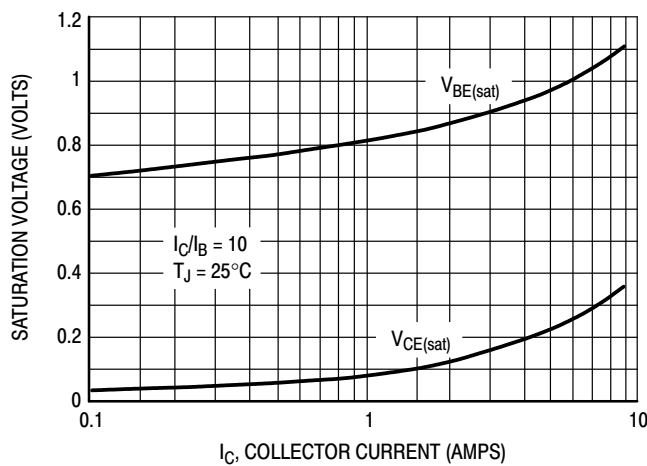
**Figure 5. MJB45H11 DC Current Gain**



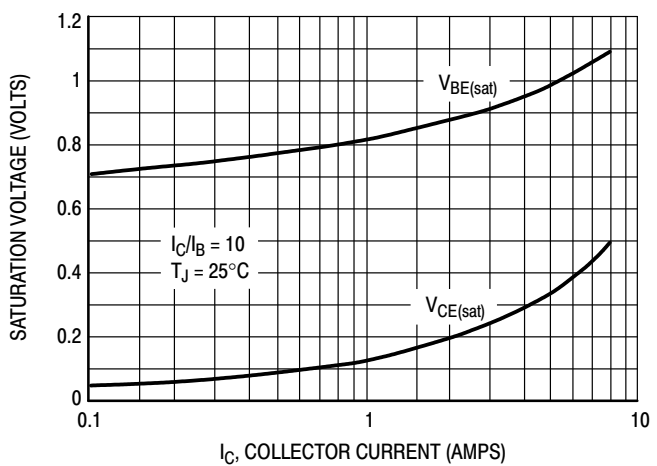
**Figure 6. MJB44H11 Current Gain versus Temperature**



**Figure 7. MJB45H11 Current Gain versus Temperature**



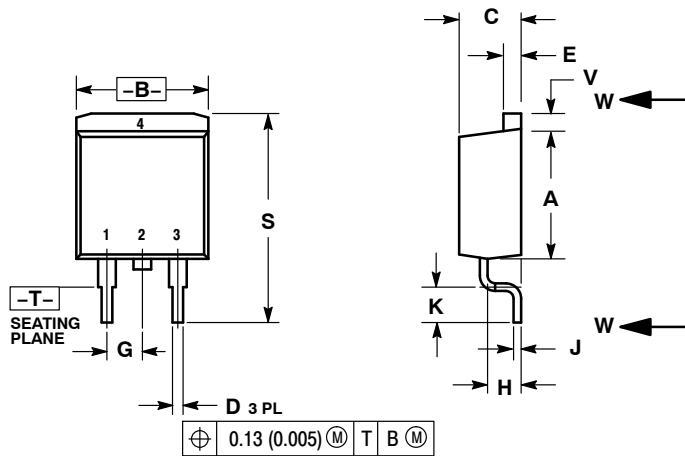
**Figure 8. MJB44H11 On-Voltages**



**Figure 9. MJB45H11 On-Voltages**

PACKAGE DIMENSIONS

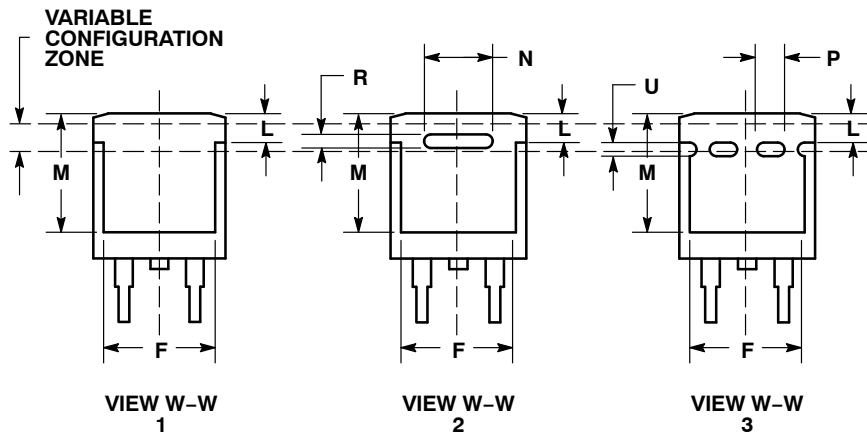
D<sup>2</sup>PAK 3  
CASE 418B-04  
ISSUE K



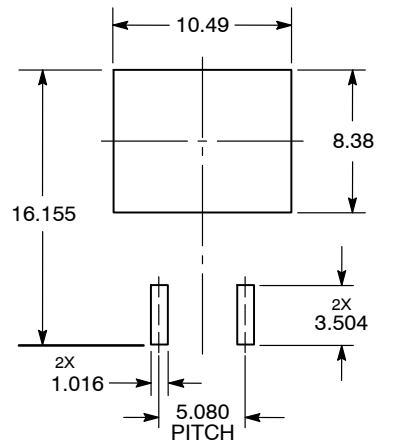
- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. 418B-01 THRU 418B-03 OBSOLETE, NEW STANDARD 418B-04.

| DIM | INCHES    |       | MILLIMETERS |       |
|-----|-----------|-------|-------------|-------|
|     | MIN       | MAX   | MIN         | MAX   |
| A   | 0.340     | 0.380 | 8.64        | 9.65  |
| B   | 0.380     | 0.405 | 9.65        | 10.29 |
| C   | 0.160     | 0.190 | 4.06        | 4.83  |
| D   | 0.020     | 0.035 | 0.51        | 0.89  |
| E   | 0.045     | 0.055 | 1.14        | 1.40  |
| F   | 0.310     | 0.350 | 7.87        | 8.89  |
| G   | 0.100 BSC |       | 2.54 BSC    |       |
| H   | 0.080     | 0.110 | 2.03        | 2.79  |
| J   | 0.018     | 0.025 | 0.46        | 0.64  |
| K   | 0.090     | 0.110 | 2.29        | 2.79  |
| L   | 0.052     | 0.072 | 1.32        | 1.83  |
| M   | 0.280     | 0.320 | 7.11        | 8.13  |
| N   | 0.197 REF |       | 5.00 REF    |       |
| P   | 0.079 REF |       | 2.00 REF    |       |
| R   | 0.039 REF |       | 0.99 REF    |       |
| S   | 0.575     | 0.625 | 14.60       | 15.88 |
| V   | 0.045     | 0.055 | 1.14        | 1.40  |

- STYLE 1:
- PIN 1. BASE
  - COLLECTOR
  - EMITTER
  - COLLECTOR



SOLDERING FOOTPRINT\*



DIMENSIONS: MILLIMETERS

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

# MJB44H11 (NPN), NJVMJB44H11 (NPN), MJB45H11 (PNP), NJVMJB45H11 (PNP)

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