

## Complementary Power Transistors

### DPAK For Surface Mount Applications

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

- Lead Formed for Surface Mount Application in Plastic Sleeves (No Suffix)
- Straight Lead Version in Plastic Sleeves ("–1" Suffix)
- Lead Formed Version in 16 mm Tape and Reel for Surface Mount ("T4" Suffix)
- Electrically Similar to Popular D44H/D45H Series
- Low Collector Emitter Saturation Voltage —  $V_{CE(sat)} = 1.0$  Volt Max @ 8.0 Amperes
- Fast Switching Speeds
- Complementary Pairs Simplifies Designs

#### MAXIMUM RATINGS

| Rating   | Symbol         | D44H11 or D45H11 | Unit                         |
|--|----------------|------------------|------------------------------|
| Collector–Emitter Voltage  | $V_{CEO}$      | 80               | Vdc                          |
| Emitter–Base Voltage   | $V_{EB}$       | 5                | Vdc                          |
| Collector Current — Continuous<br>Peak   | $I_C$          | 8<br>16          | Adc                          |
| Total Power Dissipation<br>@ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$     | $P_D$          | 20<br>0.16       | Watts<br>W/ $^\circ\text{C}$ |
| Total Power Dissipation (1)<br>@ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 1.75<br>0.014    | Watts<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        | $R_{\theta JC}$ | 6.25 | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction to Ambient (1) | $R_{\theta JA}$ | 71.4 | $^\circ\text{C/W}$ |
| Lead Temperature for Soldering              | $T_L$           | 260  | $^\circ\text{C}$   |

(1) These ratings are applicable when surface mounted on the minimum pad size recommended.

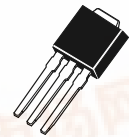
**NPN**  
**MJD44H11\***  
**PNP**  
**MJD45H11\***

\*Motorola Preferred Device

**SILICON**  
**POWER TRANSISTORS**  
**8 AMPERES**  
**80 VOLTS**  
**20 WATTS**

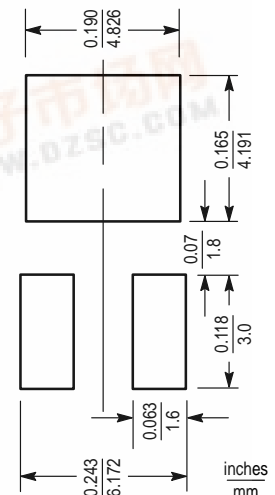


CASE 369A–13



CASE 369–07

#### MINIMUM PAD SIZES RECOMMENDED FOR SURFACE MOUNTED APPLICATIONS



## MJD44H11 MJD45H11

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

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

#### OFF CHARACTERISTICS

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

#### ON CHARACTERISTICS

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

#### DYNAMIC CHARACTERISTICS

|   |                      |          |        |            |        |               |
|---|----------------------|----------|--------|------------|--------|---------------|
| Collector Capacitance<br>( $V_{CB} = 10\text{ Vdc}$ , $f_{test} = 1\text{ MHz}$ )                     | MJD44H11<br>MJD45H11 | $C_{cb}$ | —<br>— | 130<br>230 | —<br>— | $\mu\text{F}$ |
| Gain Bandwidth Product<br>( $I_C = 0.5\text{ Adc}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 20\text{ MHz}$ ) | MJD44H11<br>MJD45H11 | $f_T$    | —<br>— | 50<br>40   | —<br>— | MHz           |

#### SWITCHING TIMES

|   |                      |             |        |            |        |    |
|---|----------------------|-------------|--------|------------|--------|----|
| Delay and Rise Times<br>( $I_C = 5\text{ Adc}$ , $I_{B1} = 0.5\text{ Adc}$ )  | MJD44H11<br>MJD45H11 | $t_d + t_r$ | —<br>— | 300<br>135 | —<br>— | ns |
| Storage Time<br>( $I_C = 5\text{ Adc}$ , $I_{B1} = I_{B2} = 0.5\text{ Adc}$ ) | MJD44H11<br>MJD45H11 | $t_s$       | —<br>— | 500<br>500 | —<br>— | ns |
| Fall Time<br>( $I_C = 5\text{ Adc}$ , $I_{B1} = I_{B2} = 0.5\text{ Adc}$ )    | MJD44H11<br>MJD45H11 | $t_f$       | —<br>— | 140<br>100 | —<br>— | ns |

## MJD44H11 MJD45H11

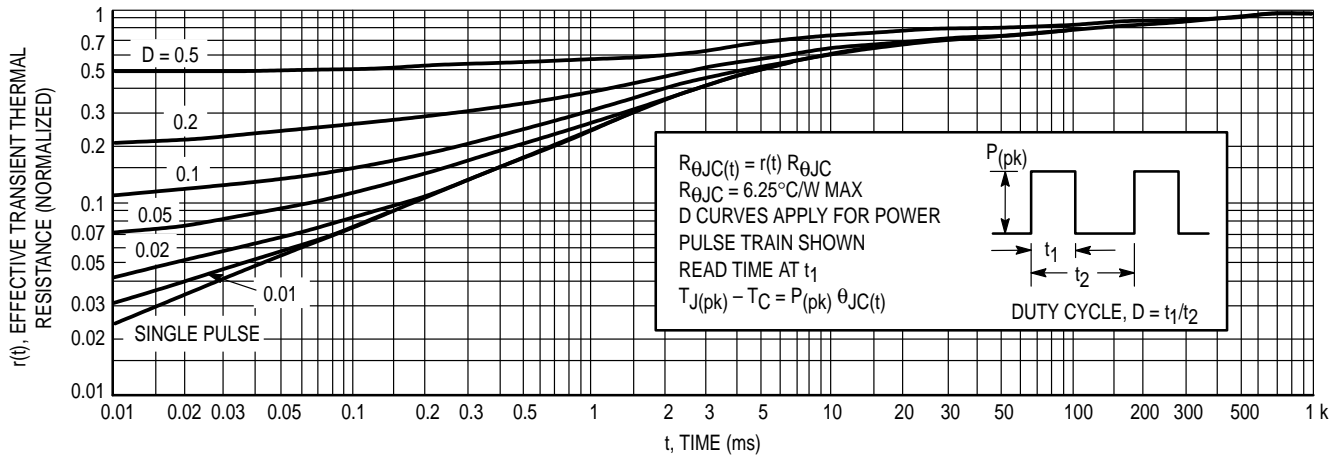


Figure 1. Thermal Response

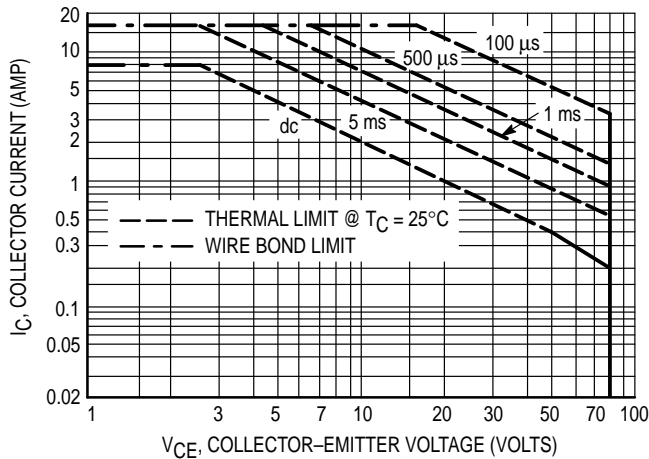


Figure 2. Maximum Forward Bias Safe Operating Area

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 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.

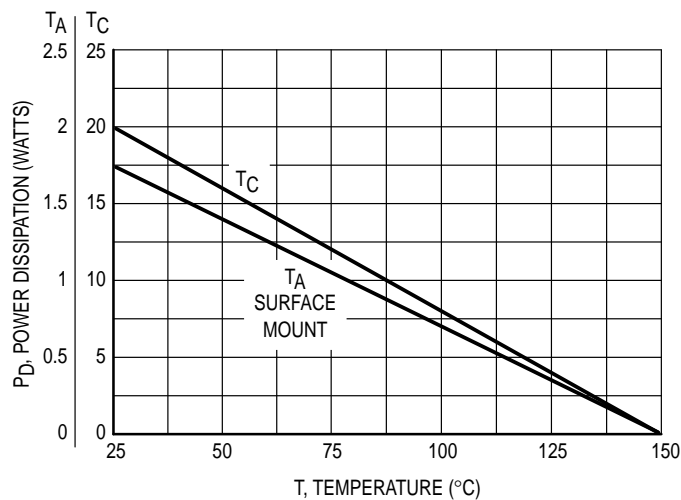
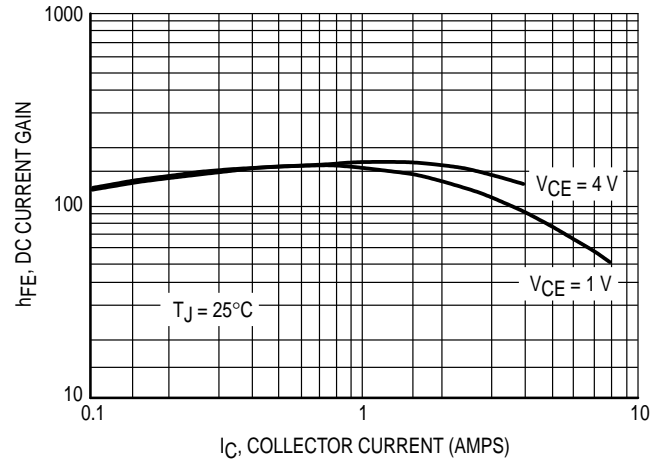
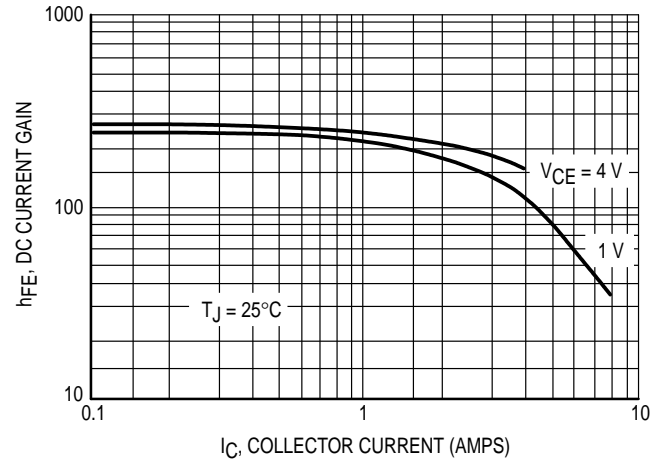


Figure 3. Power Derating

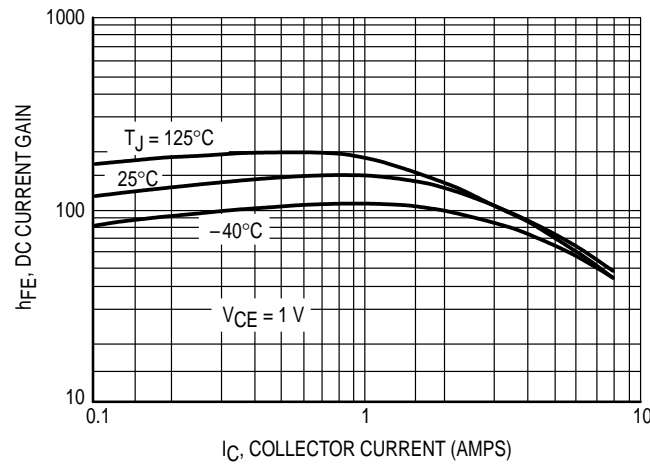
**MJD44H11 MJD45H11**



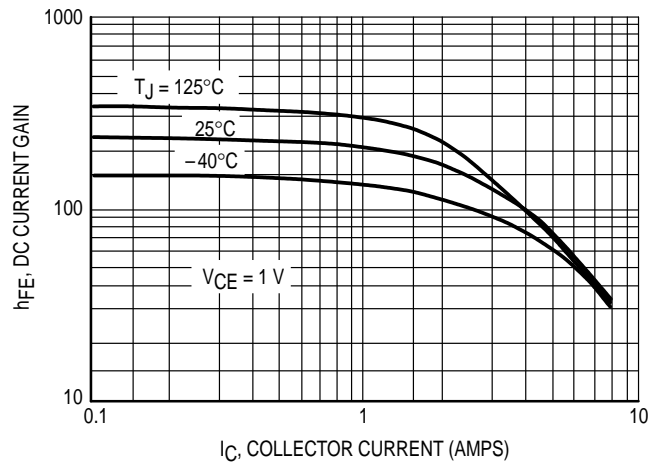
**Figure 4. MJD44H11 DC Current Gain**



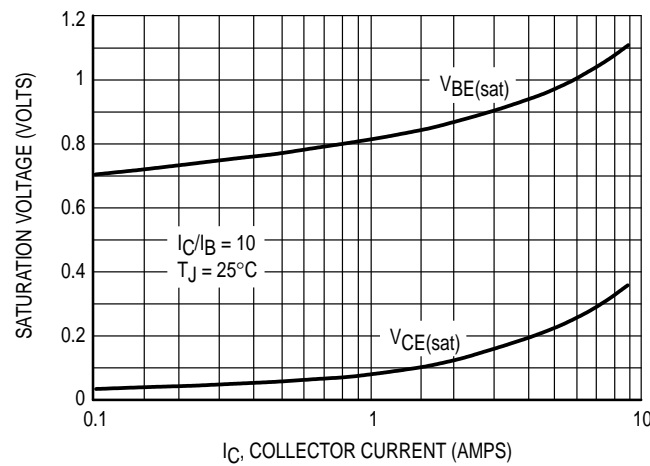
**Figure 5. MJD45H11 DC Current Gain**



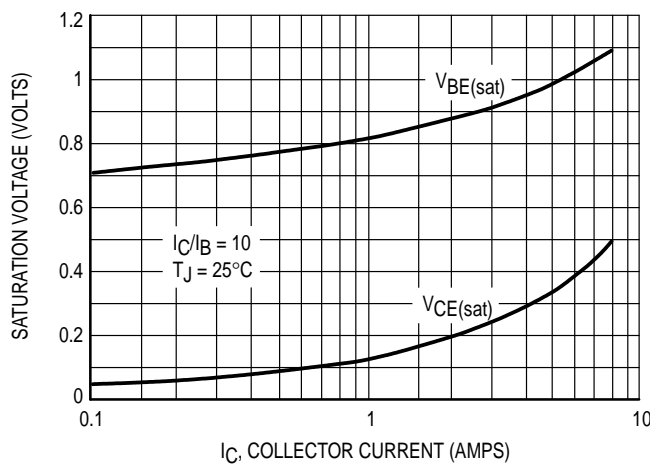
**Figure 6. MJD44H11 Current Gain versus Temperature**



**Figure 7. MJD45H11 Current Gain versus Temperature**



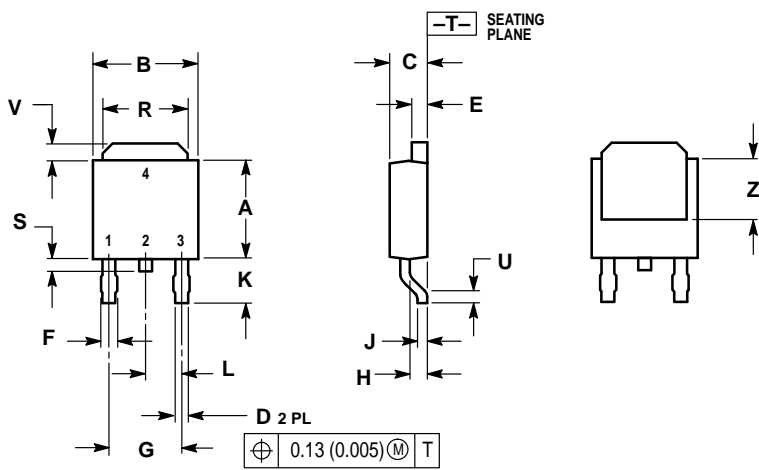
**Figure 8. MJD44H11 On-Voltages**



**Figure 9. MJD45H11 On-Voltages**

MJD44H11 MJD45H11

PACKAGE DIMENSIONS

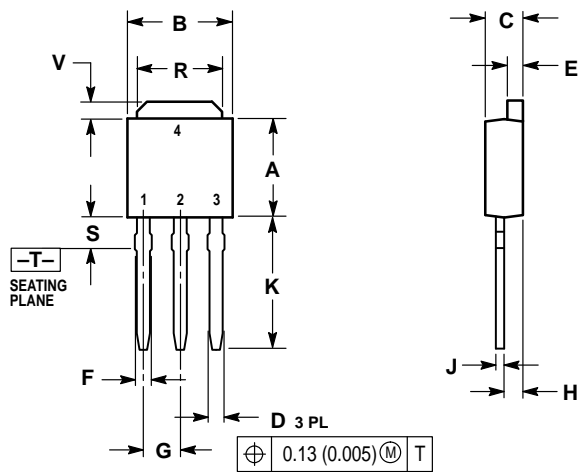


NOTES:  
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.  
2. CONTROLLING DIMENSION: INCH.

| DIM | INCHES    |       | MILLIMETERS |      |
|-----|-----------|-------|-------------|------|
|     | MIN       | MAX   | MIN         | MAX  |
| A   | 0.235     | 0.250 | 5.97        | 6.35 |
| 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   | 0.033     | 0.040 | 0.84        | 1.01 |
| F   | 0.037     | 0.047 | 0.94        | 1.19 |
| 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   | 0.175     | 0.215 | 4.45        | 5.46 |
| S   | 0.020     | 0.050 | 0.51        | 1.27 |
| U   | 0.020     | —     | 0.51        | —    |
| V   | 0.030     | 0.050 | 0.77        | 1.27 |
| Z   | 0.138     | —     | 3.51        | —    |

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

CASE 369A-13  
ISSUE W




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

| DIM | INCHES    |       | MILLIMETERS |      |
|-----|-----------|-------|-------------|------|
|     | MIN       | MAX   | MIN         | MAX  |
| A   | 0.235     | 0.250 | 5.97        | 6.35 |
| 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   | 0.033     | 0.040 | 0.84        | 1.01 |
| F   | 0.037     | 0.047 | 0.94        | 1.19 |
| G   | 0.090 BSC |       | 2.29 BSC    |      |
| H   | 0.034     | 0.040 | 0.87        | 1.01 |
| J   | 0.018     | 0.023 | 0.46        | 0.58 |
| K   | 0.350     | 0.380 | 8.89        | 9.65 |
| R   | 0.175     | 0.215 | 4.45        | 5.46 |
| S   | 0.050     | 0.090 | 1.27        | 2.28 |
| V   | 0.030     | 0.050 | 0.77        | 1.27 |

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

CASE 369-07  
ISSUE K

## MJD44H11 MJD45H11

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