

# 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 Peak	$I_C$	8 16	Adc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	20 0.16	Watts W/ $^\circ\text{C}$
Total Power Dissipation (1) @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	1.75 0.014	Watts W/ $^\circ\text{C}$
Operating and Storage Junction 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.

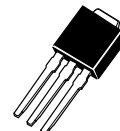
**NPN**  
**MJD44H11\***  
**PNP**  
**MJD45H11\***

\*Motorola Preferred Device

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

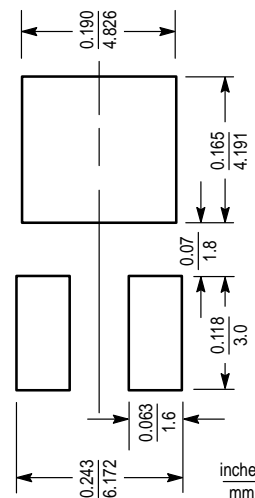


CASE 369A–13



CASE 369–07

### MINIMUM PAD SIZES RECOMMENDED FOR SURFACE MOUNTED APPLICATIONS



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

REV 2

**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 (I <sub>C</sub> = 30 mA, I <sub>B</sub> = 0)	V <sub>CEO(sus)</sub>	80	—	—	Vdc
Collector Cutoff Current (V <sub>CE</sub> = Rated V <sub>CEO</sub> , V <sub>BE</sub> = 0)	I <sub>CES</sub>	—	—	10	μA
Emitter Cutoff Current (V <sub>EB</sub> = 5 Vdc)	I <sub>EBO</sub>	—	—	50	μA
ON CHARACTERISTICS					
Collector–Emitter Saturation Voltage (I <sub>C</sub> = 8 Adc, I <sub>B</sub> = 0.4 Adc)	V <sub>CE(sat)</sub>	—	—	1	Vdc
Base–Emitter Saturation Voltage (I <sub>C</sub> = 8 Adc, I <sub>B</sub> = 0.8 Adc)	V <sub>BE(sat)</sub>	—	—	1.5	Vdc
DC Current Gain (V <sub>CE</sub> = 1 Vdc, I <sub>C</sub> = 2 Adc)	h <sub>FE</sub>	60	—	—	—
DC Current Gain (V <sub>CE</sub> = 1 Vdc, I <sub>C</sub> = 4 Adc)		40	—	—	
DYNAMIC CHARACTERISTICS					
Collector Capacitance (V <sub>CB</sub> = 10 Vdc, f <sub>test</sub> = 1 MHz)	C <sub>cb</sub>	—	130	—	pF
MJD44H11 MJD45H11		—	230	—	
Gain Bandwidth Product (I <sub>C</sub> = 0.5 Adc, V <sub>CE</sub> = 10 Vdc, f = 20 MHz)	f <sub>T</sub>	—	50	—	MHz
MJD44H11 MJD45H11		—	40	—	
SWITCHING TIMES					
Delay and Rise Times (I <sub>C</sub> = 5 Adc, I <sub>B1</sub> = 0.5 Adc)	t <sub>d</sub> + t <sub>r</sub>	—	300	—	ns
MJD44H11 MJD45H11		—	135	—	
Storage Time (I <sub>C</sub> = 5 Adc, I <sub>B1</sub> = I <sub>B2</sub> = 0.5 Adc)	t <sub>s</sub>	—	500	—	ns
MJD44H11 MJD45H11		—	500	—	
Fall Time (I <sub>C</sub> = 5 Adc, I <sub>B1</sub> = I <sub>B2</sub> = 0.5 Adc)	t <sub>f</sub>	—	140	—	ns
MJD44H11 MJD45H11		—	100	—	

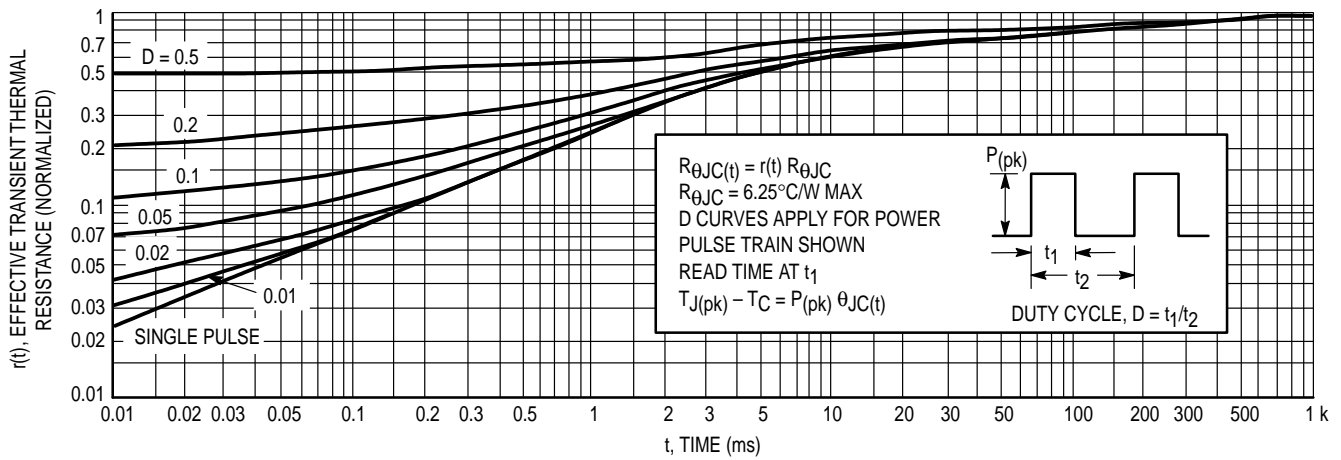


Figure 1. Thermal Response

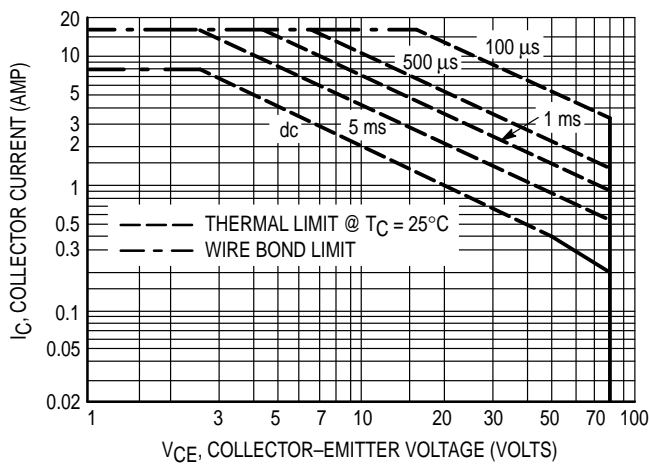


Figure 2. Maximum Forward Bias Safe Operating Area

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.

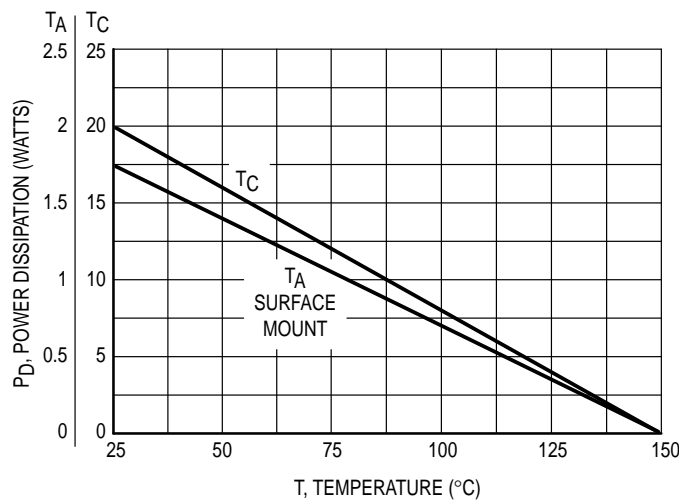


Figure 3. Power Derating

## MJD44H11 MJD45H11

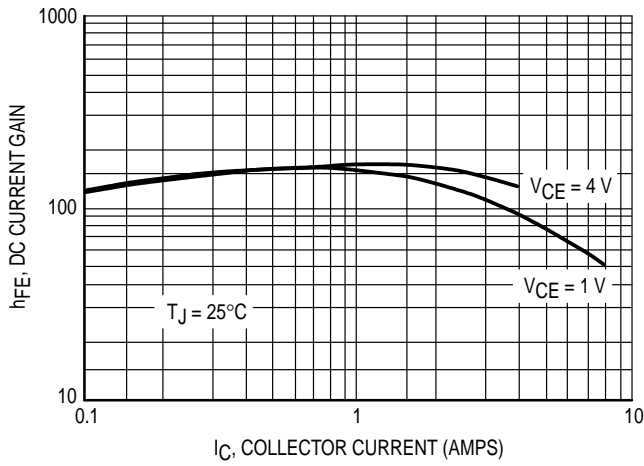


Figure 4. MJD44H11 DC Current Gain

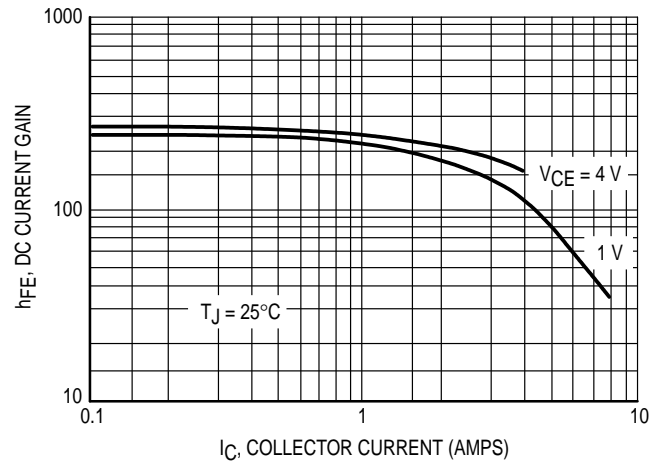


Figure 5. MJD45H11 DC Current Gain

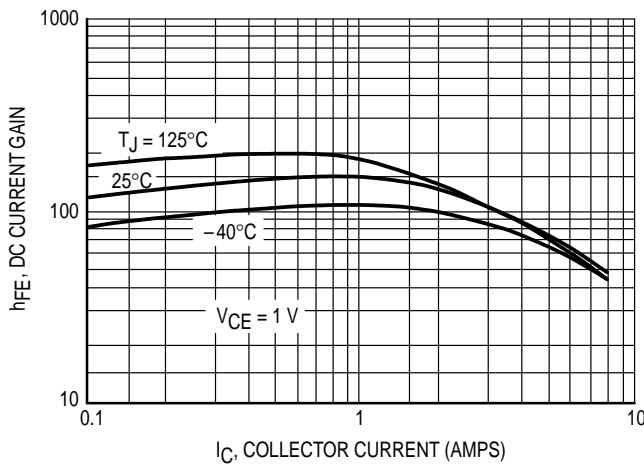


Figure 6. MJD44H11 Current Gain versus Temperature

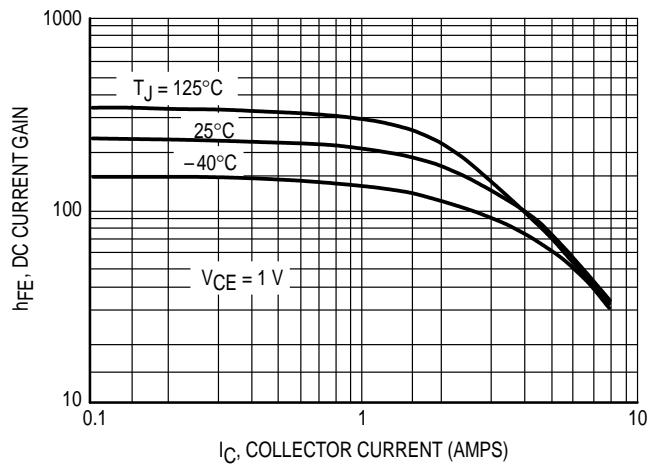


Figure 7. MJD45H11 Current Gain versus Temperature

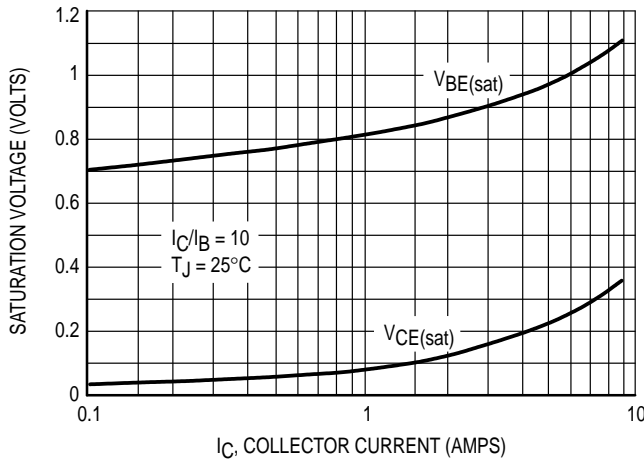


Figure 8. MJD44H11 On-Voltages

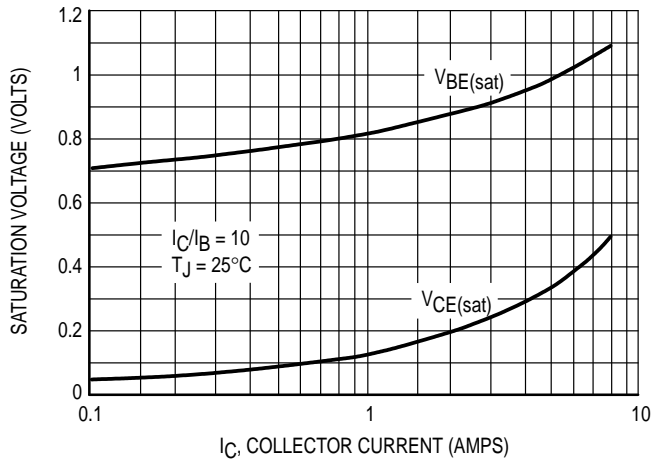
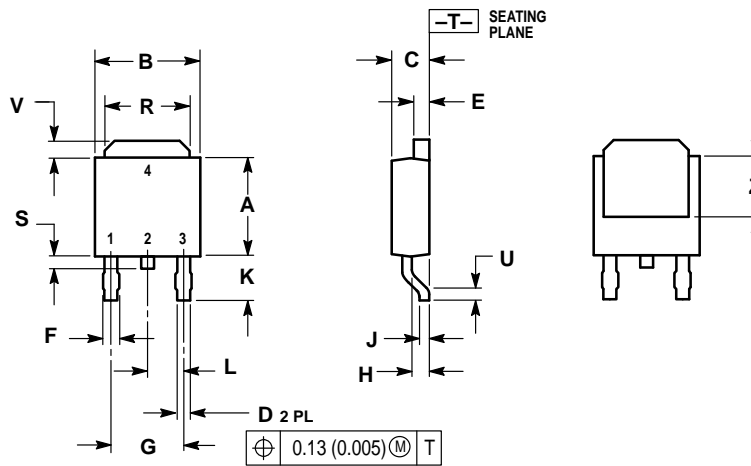


Figure 9. MJD45H11 On-Voltages

## PACKAGE DIMENSIONS



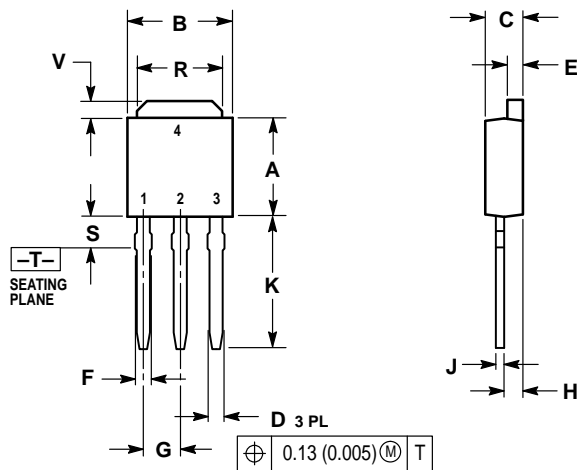
## NOTES:

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

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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
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3. EMITTER
4. COLLECTOR

CASE 369-07  
ISSUE K

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**MOTOROLA**



**MJD44H11/D**

