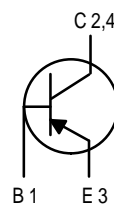


# Bipolar Power Transistors

## PNP Silicon

- Collector–Emitter Sustaining Voltage —  $V_{CEO(sus)}$   
= 30 Vdc (Min) @  $I_C = 10$  mAdc
- High DC Current Gain —  $h_{FE}$   
= 125 (Min) @  $I_C = 0.8$  Adc  
= 90 (Min) @  $I_C = 3.0$  Adc
- Low Collector–Emitter Saturation Voltage —  $V_{CE(sat)}$   
= 0.275 Vdc (Max) @  $I_C = 1.2$  Adc  
= 0.55 Vdc (Max) @  $I_C = 3.0$  Adc
- SOT–223 Surface Mount Packaging

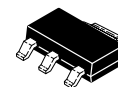


Schematic

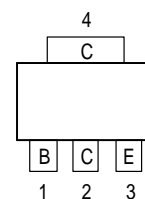
# MMJT9435

Motorola Preferred Device

**POWER BJT**  
 **$I_C = 3.0$  AMPERES**  
 **$V_{CEO} = 30$  VOLTS**  
 **$V_{CE(sat)} = 0.275$  VOLTS**



CASE 318E–04, Style 1



Top View Pinout

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

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	$V_{CEO}$	30	Vdc
Collector–Base Voltage	$V_{CB}$	45	Vdc
Emitter–Base Voltage	$V_{EB}$	$\pm 6.0$	Vdc
Base Current — Continuous	$I_B$	1.0	Adc
Collector Current — Continuous — Peak	$I_C$	3.0 5.0	Adc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$ Total $P_D$ @ $T_A = 25^\circ\text{C}$ mounted on 1" sq. (645 sq. mm) Collector pad on FR–4 bd material Total $P_D$ @ $T_A = 25^\circ\text{C}$ mounted on 0.012" sq. (7.6 sq. mm) Collector pad on FR–4 bd material	$P_D$	3.0 24 1.56 0.72	Watts mW/ $^\circ\text{C}$ Watts
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 – Junction to Ambient on 1" sq. (645 sq. mm) Collector pad on FR–4 bd material – Junction to Ambient on 0.012" sq. (7.6 sq. mm) Collector pad on FR–4 bd material	$R_{\theta JC}$ $R_{\theta JA}$ $R_{\theta JA}$	42 80 174	$^\circ\text{C}/\text{W}$
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 5 seconds	$T_L$	260	$^\circ\text{C}$

This document contains information on a new product. Specifications and information are subject to change without notice.

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

# MMJT9435

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

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Collector–Emitter Sustaining Voltage (I <sub>C</sub> = 10 mA <sub>dc</sub> , I <sub>B</sub> = 0 A <sub>dc</sub> )	V <sub>CEO(sus)</sub>	30	—	—	V <sub>dc</sub>
Emitter–Base Voltage (I <sub>E</sub> = 50 μA <sub>dc</sub> , I <sub>C</sub> = 0 A <sub>dc</sub> )	V <sub>EBO</sub>	6.0	—	—	V <sub>dc</sub>
Collector Cutoff Current (V <sub>CE</sub> = 25 V <sub>dc</sub> , R <sub>BE</sub> = 200 Ω) (V <sub>CE</sub> = 25 V <sub>dc</sub> , R <sub>BE</sub> = 200 Ω, T <sub>J</sub> = 125°C)	I <sub>CER</sub>	—	—	20 200	μA <sub>dc</sub>
Emitter Cutoff Current (V <sub>BE</sub> = 5.0 V <sub>dc</sub> )	I <sub>EBO</sub>	—	—	10	μA <sub>dc</sub>

## ON CHARACTERISTICS(1)

Collector–Emitter Saturation Voltage (I <sub>C</sub> = 0.8 A <sub>dc</sub> , I <sub>B</sub> = 20 mA <sub>dc</sub> ) (I <sub>C</sub> = 1.2 A <sub>dc</sub> , I <sub>B</sub> = 20 mA <sub>dc</sub> ) (I <sub>C</sub> = 3.0 A <sub>dc</sub> , I <sub>B</sub> = 0.3 A <sub>dc</sub> )	V <sub>CE(sat)</sub>	—	0.155	0.210 0.275 0.550	V <sub>dc</sub>
Base–Emitter Saturation Voltage (I <sub>C</sub> = 3.0 A <sub>dc</sub> , I <sub>B</sub> = 0.3 A <sub>dc</sub> )	V <sub>BE(sat)</sub>	—	—	1.25	V <sub>dc</sub>
Base–Emitter On Voltage (I <sub>C</sub> = 1.2 A <sub>dc</sub> , V <sub>CE</sub> = 4.0 V <sub>dc</sub> )	V <sub>BE(on)</sub>	—	—	1.10	V <sub>dc</sub>
DC Current Gain (I <sub>C</sub> = 0.8 A <sub>dc</sub> , V <sub>CE</sub> = 1.0 V <sub>dc</sub> ) (I <sub>C</sub> = 1.2 A <sub>dc</sub> , V <sub>CE</sub> = 1.0 V <sub>dc</sub> ) (I <sub>C</sub> = 3.0 A <sub>dc</sub> , V <sub>CE</sub> = 1.0 V <sub>dc</sub> )	h <sub>FE</sub>	125 110 90	220 — —	— — —	—

## DYNAMIC CHARACTERISTICS

Output Capacitance (V <sub>CB</sub> = 10 V <sub>dc</sub> , I <sub>E</sub> = 0 A <sub>dc</sub> , f = 1.0 MHz)	C <sub>ob</sub>	—	100	150	pF
Input Capacitance (V <sub>EB</sub> = 8.0 V <sub>dc</sub> )	C <sub>ib</sub>	—	135	—	pF
Current–Gain — Bandwidth Product(2) (I <sub>C</sub> = 500 mA, V <sub>CE</sub> = 10 V, F <sub>test</sub> = 1.0 MHz)	f <sub>T</sub>	—	110	—	MHz

(1) Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

(2) f<sub>T</sub> = |h<sub>FE</sub>| • f<sub>test</sub>

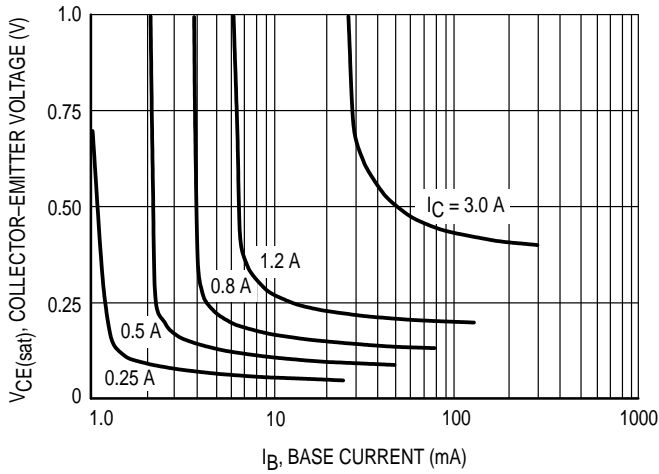


Figure 1. Collector Saturation Region

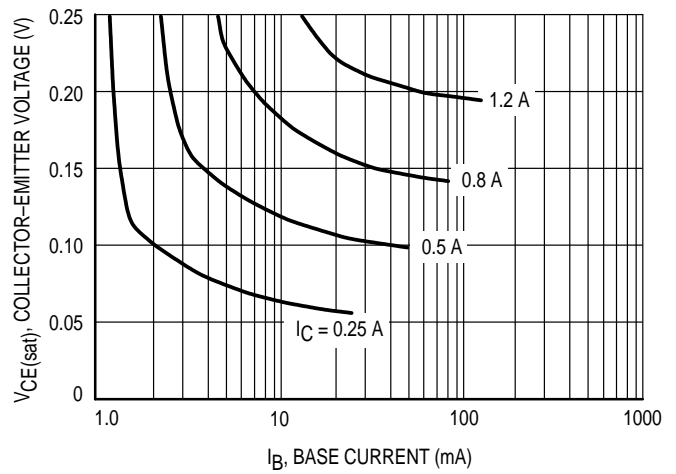


Figure 2. Collector Saturation Region

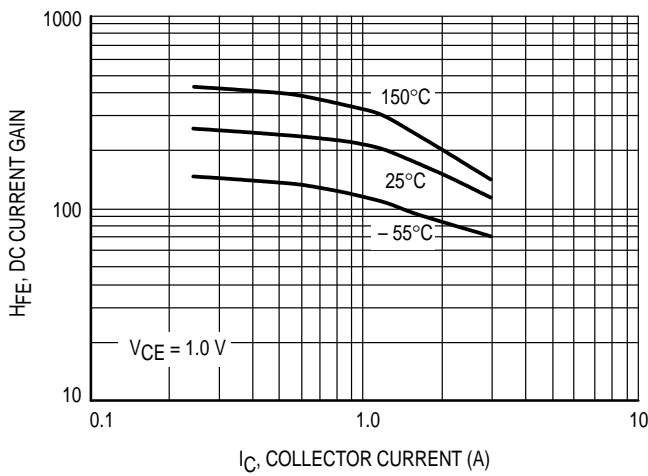


Figure 3. DC Current Gain

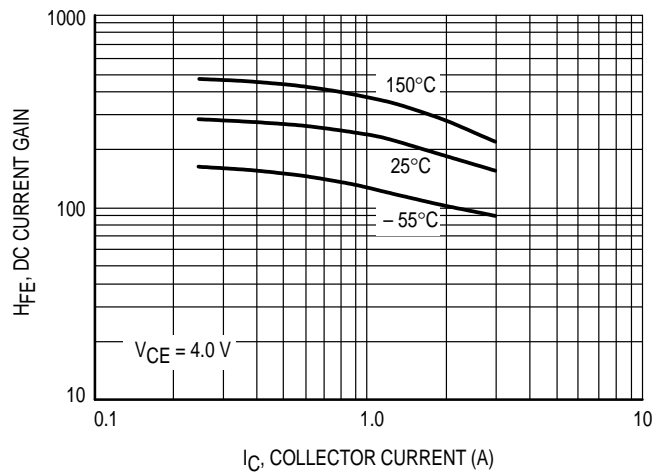


Figure 4. DC Current Gain

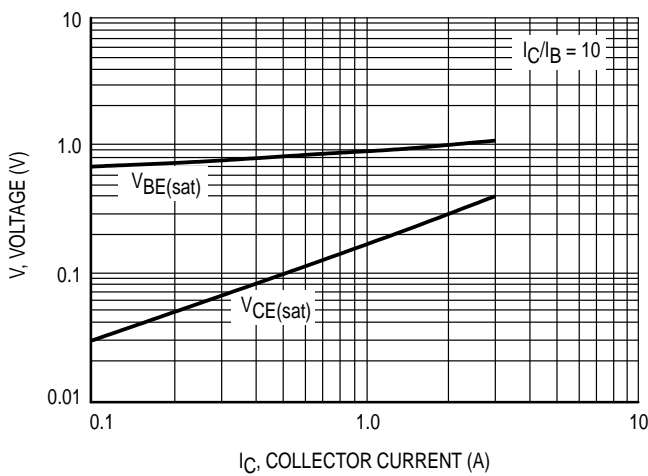


Figure 5. "On" Voltages

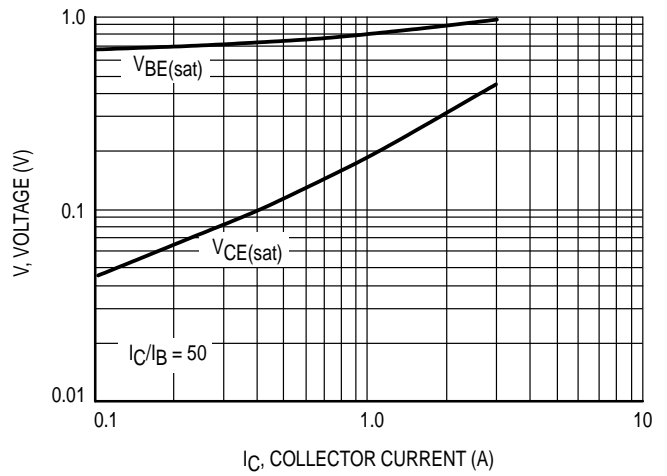
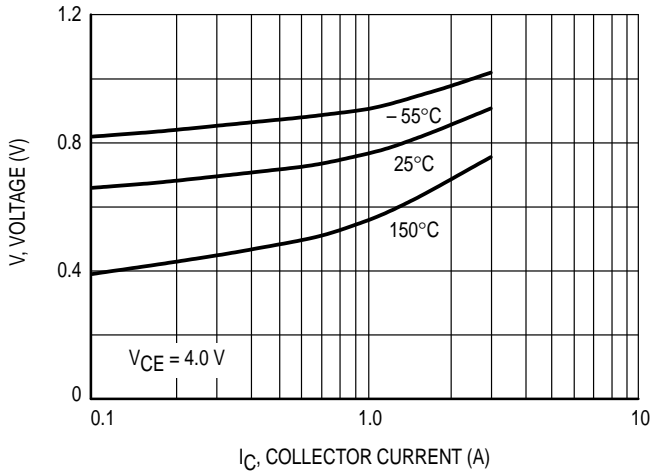
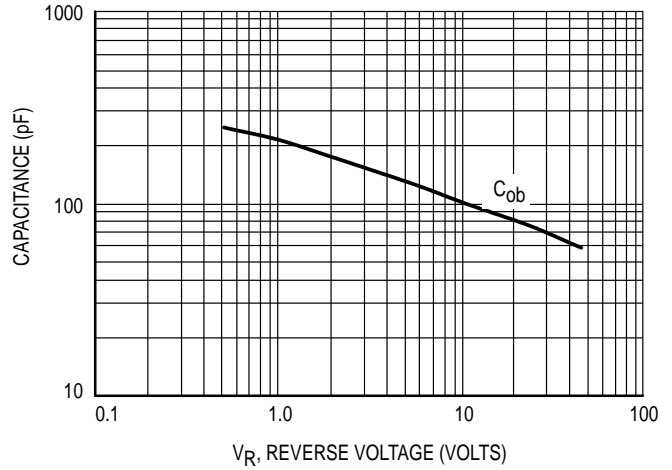


Figure 6. "On" Voltages

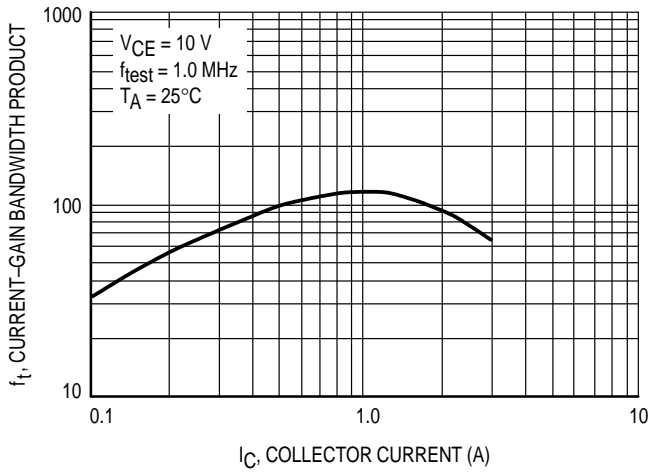
**MMJT9435**



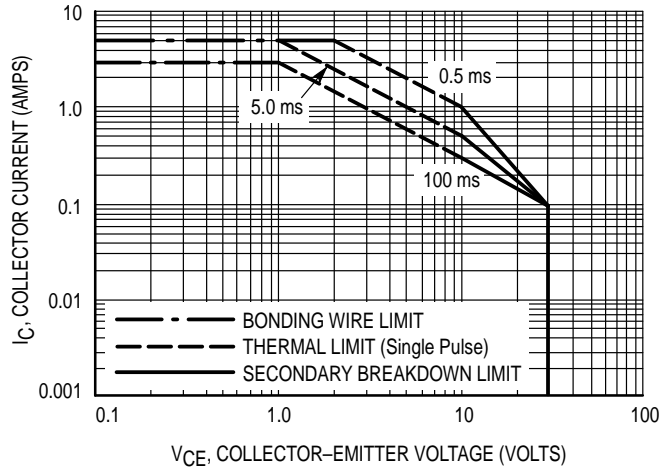
**Figure 7.  $V_{BE(on)}$  Voltage**



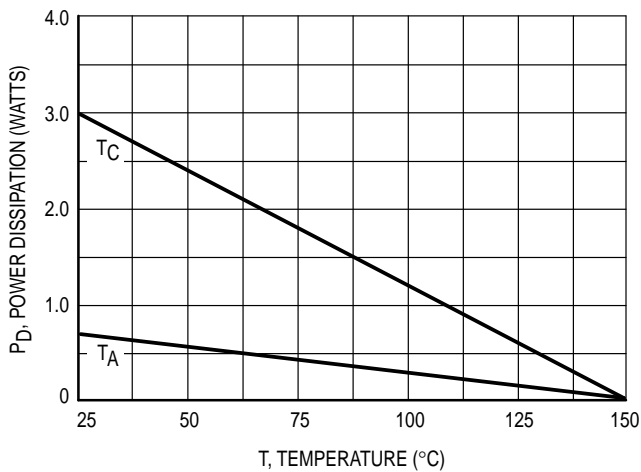
**Figure 8. Output Capacitance**



**Figure 9. Current-Gain Bandwidth Product**



**Figure 10. Active Region Safe Operating Area**



**Figure 11. Power Derating**

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 10 is based on  $T_{J(pk)} = 150^\circ\text{C}$ ;  $T_C$  is variable depending on conditions. Secondary 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 12. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by secondary breakdown.

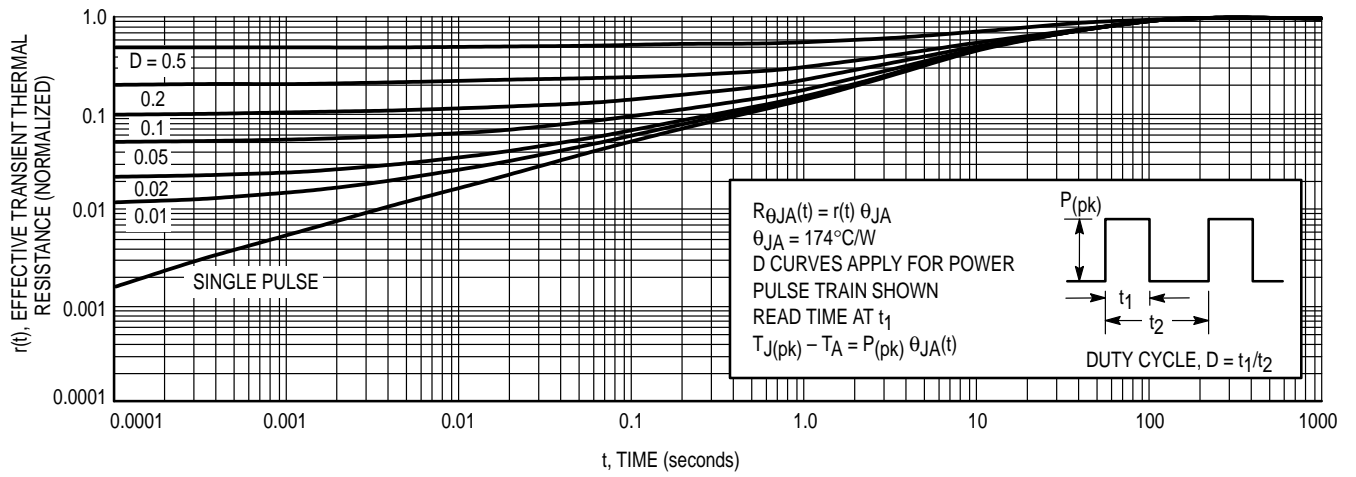
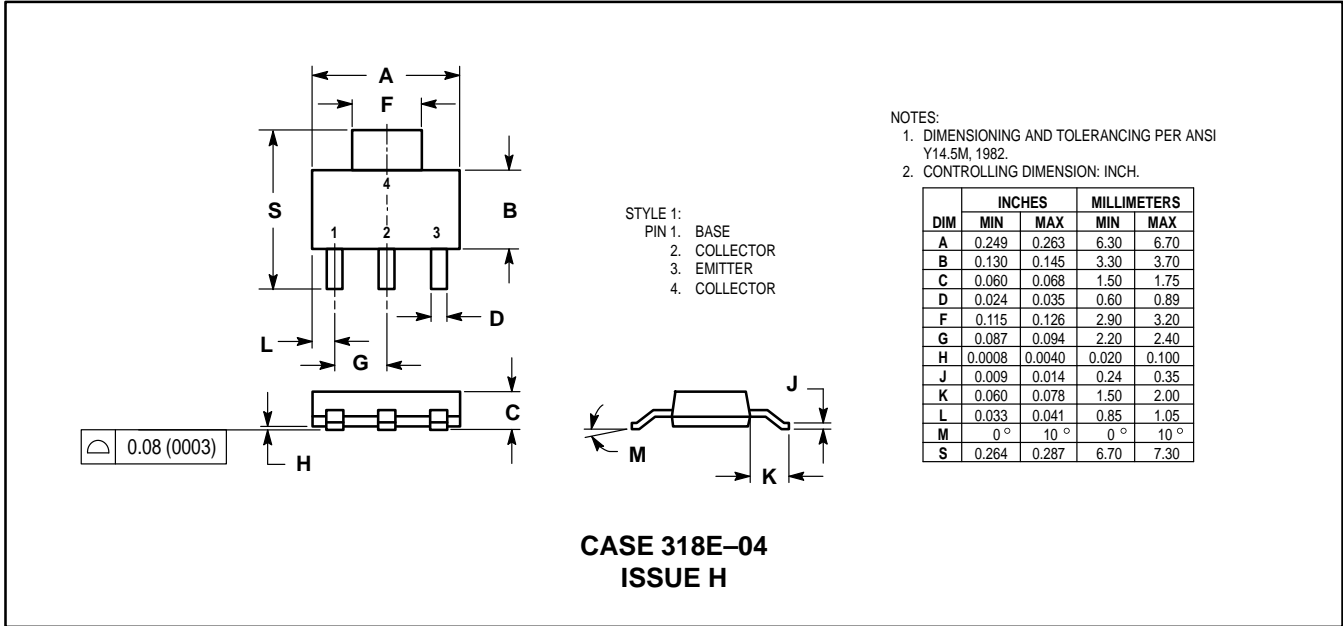


Figure 12. Thermal Response

PACKAGE DIMENSIONS



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