

# MMBT4403WT1G

## Switching Transistor

### PNP Silicon

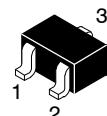
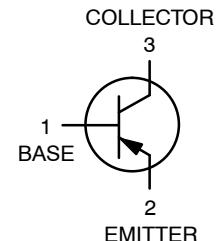
#### Features

- Moisture Sensitivity Level: 1
- ESD Rating: Human Body Model; 4 kV, Machine Model; 400 V
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant



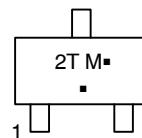
ON Semiconductor®

<http://onsemi.com>



SC-70  
CASE 419  
STYLE 3

#### MARKING DIAGRAM



2T = Specific Device Code  
M = Date Code  
- = Pb-Free Package

(Note: Microdot may be in either location)

\*Date Code orientation may vary depending upon manufacturing location.

#### ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
MMBT4403WT1G	SC-70 (Pb-Free)	3000 / Tape & Reel

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

# MMBT4403WT1G

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

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector-Emitter Breakdown Voltage (Note 1) ( $I_C = -1.0 \text{ mA}, I_B = 0$ )	$V_{(\text{BR})\text{CEO}}$	-40	-	Vdc
Collector-Base Breakdown Voltage ( $I_C = -0.1 \text{ mA}, I_E = 0$ )	$V_{(\text{BR})\text{CBO}}$	-40	-	Vdc
Emitter-Base Breakdown Voltage ( $I_E = -0.1 \text{ mA}, I_C = 0$ )	$V_{(\text{BR})\text{EBO}}$	-5.0	-	Vdc
Base Cutoff Current ( $V_{CE} = -35 \text{ Vdc}, V_{EB} = -0.4 \text{ Vdc}$ )	$I_{BEV}$	-	-0.1	$\mu\text{A}$
Collector Cutoff Current ( $V_{CE} = -35 \text{ Vdc}, V_{EB} = -0.4 \text{ Vdc}$ )	$I_{CEX}$	-	-0.1	$\mu\text{A}$

## ON CHARACTERISTICS

DC Current Gain ( $I_C = -0.1 \text{ mA}, V_{CE} = -1.0 \text{ Vdc}$ ) ( $I_C = -1.0 \text{ mA}, V_{CE} = -1.0 \text{ Vdc}$ ) ( $I_C = -10 \text{ mA}, V_{CE} = -1.0 \text{ Vdc}$ ) ( $I_C = -150 \text{ mA}, V_{CE} = -2.0 \text{ Vdc}$ ) (Note 1) ( $I_C = -500 \text{ mA}, V_{CE} = -2.0 \text{ Vdc}$ ) (Note 1)	$h_{FE}$	30 60 100 100 20	-	-
Collector-Emitter Saturation Voltage (Note 1) ( $I_C = -150 \text{ mA}, I_B = -15 \text{ mA}$ ) ( $I_C = -500 \text{ mA}, I_B = -50 \text{ mA}$ )	$V_{CE(\text{sat})}$	- -	-0.4 -0.75	Vdc
Base-Emitter Saturation Voltage (Note 1) ( $I_C = -150 \text{ mA}, I_B = -15 \text{ mA}$ ) ( $I_C = -500 \text{ mA}, I_B = -50 \text{ mA}$ )	$V_{BE(\text{sat})}$	-0.75 -	-0.95 -1.3	Vdc

## SMALL-SIGNAL CHARACTERISTICS

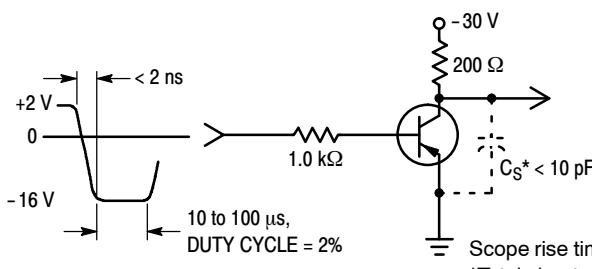
Current-Gain - Bandwidth Product ( $I_C = -20 \text{ mA}, V_{CE} = -10 \text{ Vdc}, f = 100 \text{ MHz}$ )	$f_T$	200	-	MHz
Collector-Base Capacitance ( $V_{CB} = -10 \text{ Vdc}, I_E = 0, f = 1.0 \text{ MHz}$ )	$C_{cb}$	-	8.5	pF
Emitter-Base Capacitance ( $V_{BE} = -0.5 \text{ Vdc}, I_C = 0, f = 1.0 \text{ MHz}$ )	$C_{eb}$	-	30	pF
Input Impedance ( $I_C = -1.0 \text{ mA}, V_{CE} = -10 \text{ Vdc}, f = 1.0 \text{ kHz}$ )	$h_{ie}$	1.5	15	k $\Omega$
Voltage Feedback Ratio ( $I_C = -1.0 \text{ mA}, V_{CE} = -10 \text{ Vdc}, f = 1.0 \text{ kHz}$ )	$h_{re}$	0.1	8.0	$\times 10^{-4}$
Small-Signal Current Gain ( $I_C = -1.0 \text{ mA}, V_{CE} = -10 \text{ Vdc}, f = 1.0 \text{ kHz}$ )	$h_{fe}$	60	500	-
Output Admittance ( $I_C = -1.0 \text{ mA}, V_{CE} = -10 \text{ Vdc}, f = 1.0 \text{ kHz}$ )	$h_{oe}$	1.0	100	$\mu\text{mhos}$

## SWITCHING CHARACTERISTICS

Delay Time	$(V_{CC} = -30 \text{ Vdc}, V_{EB} = -2.0 \text{ Vdc}, I_C = -150 \text{ mA}, I_{B1} = -15 \text{ mA})$	$t_d$	-	15	ns
Rise Time		$t_r$	-	20	
Storage Time	$(V_{CC} = -30 \text{ Vdc}, I_C = -150 \text{ mA}, I_{B1} = I_{B2} = -15 \text{ mA})$	$t_s$	-	225	ns
Fall Time		$t_f$	-	30	

1. Pulse Test: Pulse Width  $\leq 300 \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

## SWITCHING TIME EQUIVALENT TEST CIRCUIT



\*Total shunt capacitance of test jig connectors, and oscilloscope

Figure 1. Turn-On Time

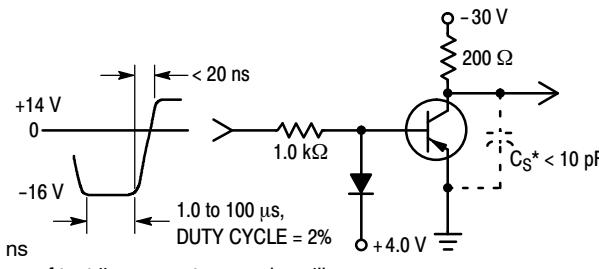


Figure 2. Turn-Off Time

## TRANSIENT CHARACTERISTICS

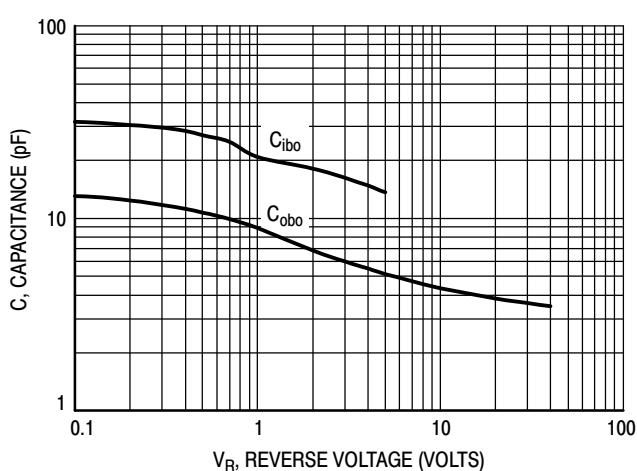


Figure 3. Capacitances

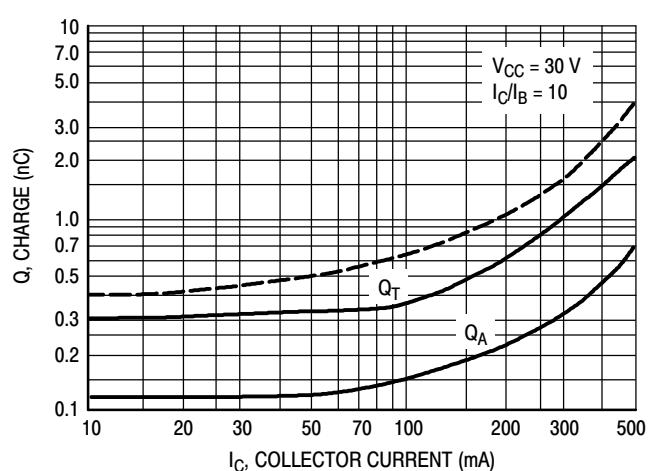


Figure 4. Charge Data

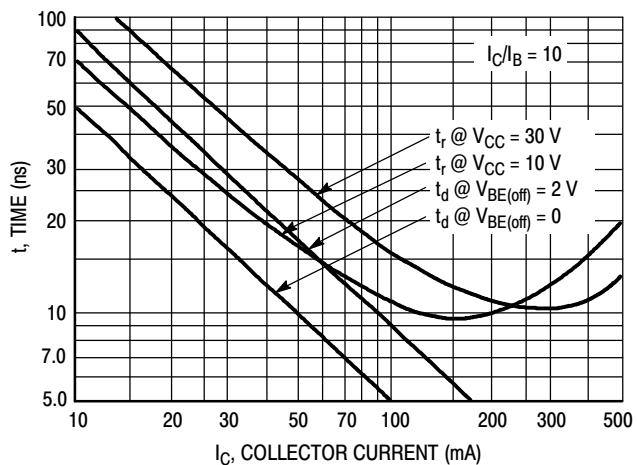


Figure 5. Turn-On Time

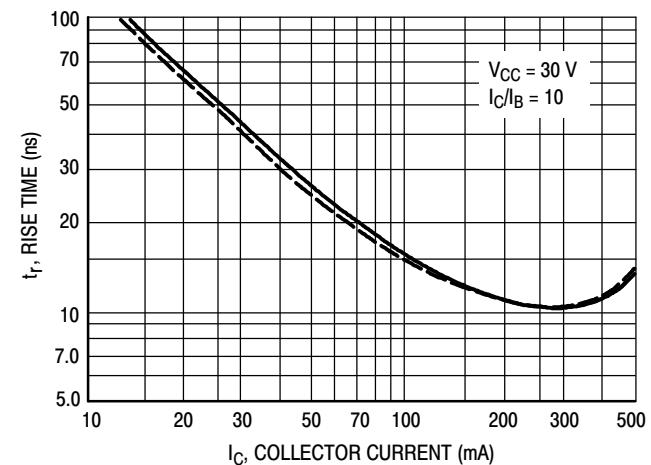


Figure 6. Rise Time

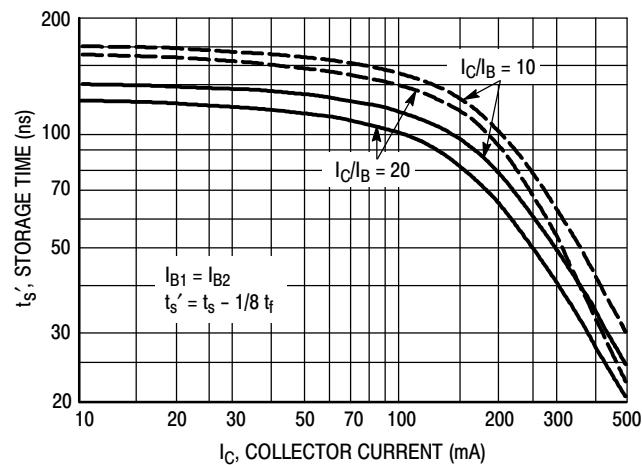


Figure 7. Storage Time

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## SMALL-SIGNAL CHARACTERISTICS NOISE FIGURE

$V_{CE} = -10$  Vdc,  $T_A = 25^\circ\text{C}$ ; Bandwidth = 1.0 Hz

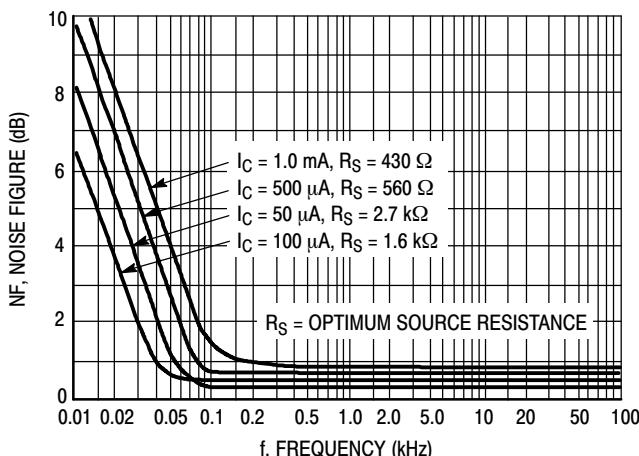


Figure 8. Frequency Effects

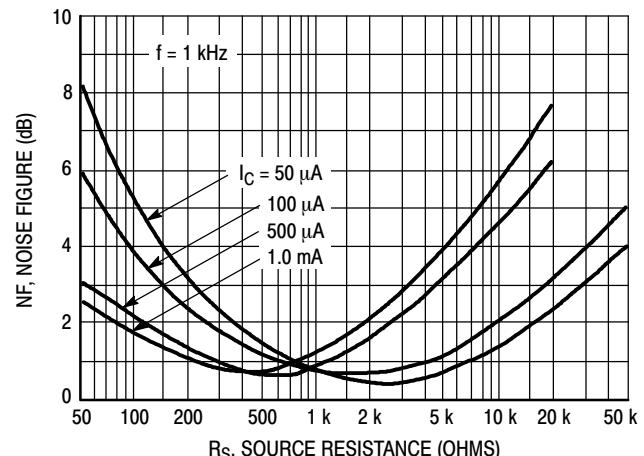


Figure 9. Source Resistance Effects

## h PARAMETERS

$V_{CE} = 10$  Vdc,  $f = 1.0$  kHz,  $T_A = 25^\circ\text{C}$

This group of graphs illustrates the relationship between  $h_{fe}$  and other "h" parameters for this series of transistors. To obtain these curves, a high-gain and a low-gain unit were selected from the MMBT4403WT1 lines, and the same units were used to develop the correspondingly numbered curves on each graph.

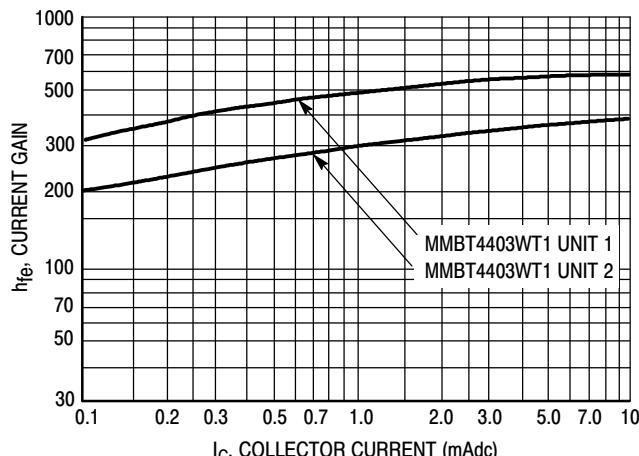


Figure 10. Current Gain

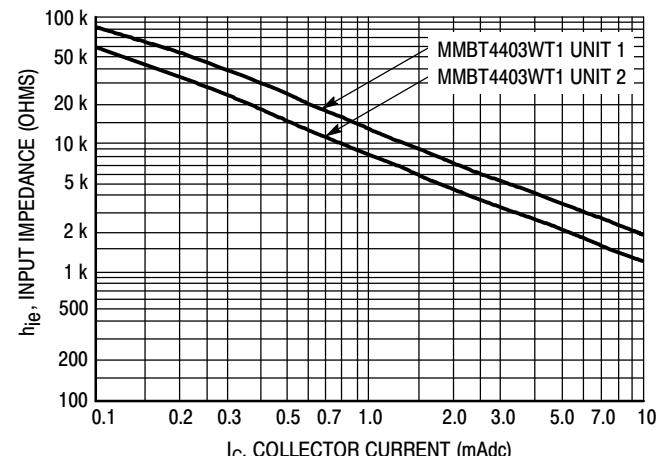


Figure 11. Input Impedance

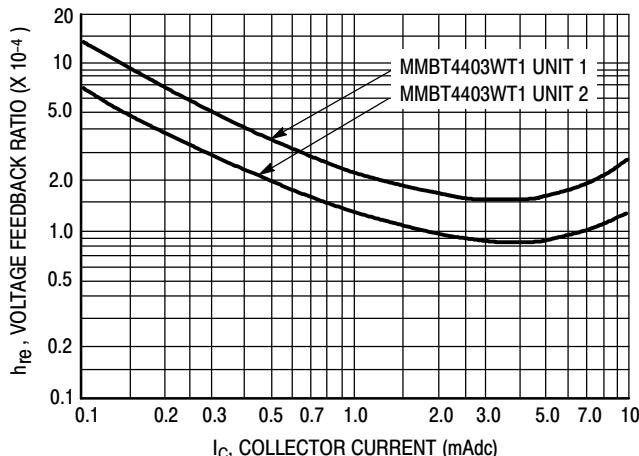


Figure 12. Voltage Feedback Ratio

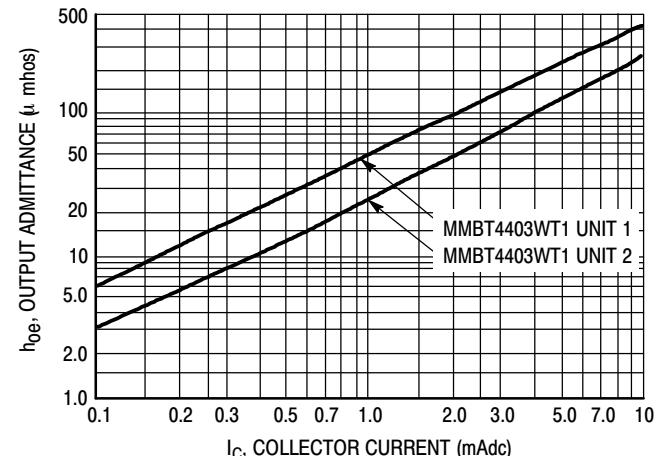


Figure 13. Output Admittance

## STATIC CHARACTERISTICS

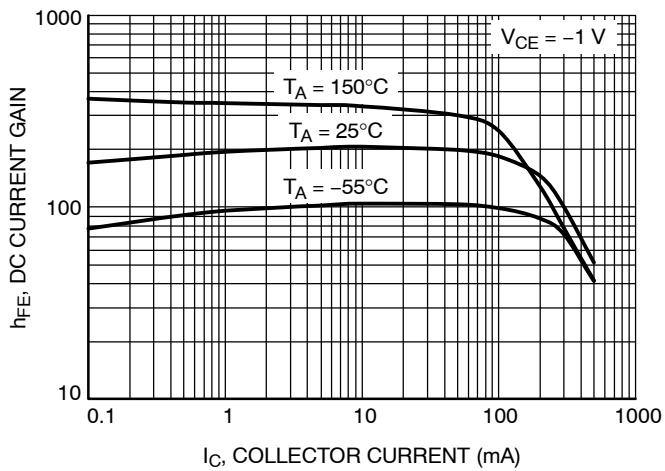


Figure 14. DC Current Gain vs. Collector Current

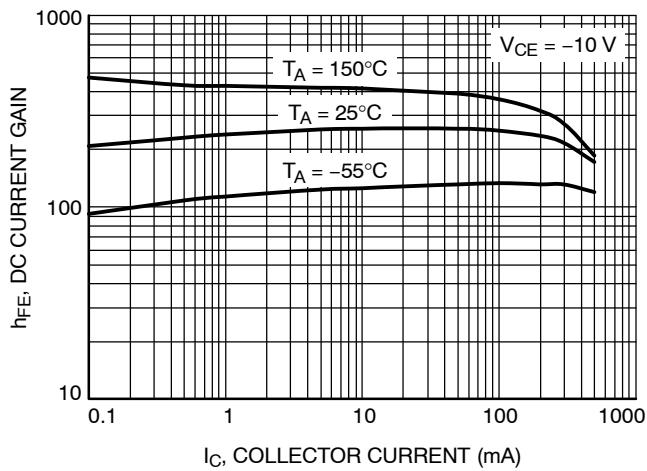


Figure 15. DC Current Gain vs. Collector Current

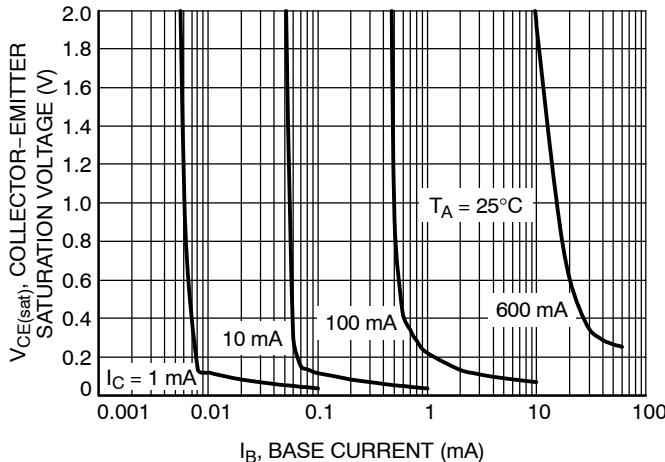


Figure 16. Saturation Region

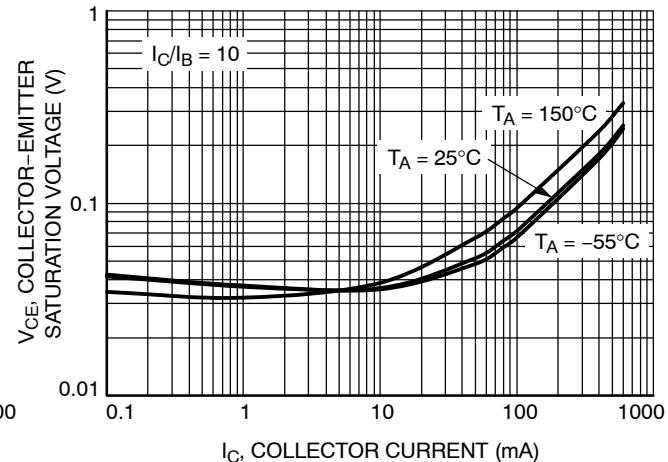


Figure 17. Collector Emitter Saturation Voltage vs. Collector Current

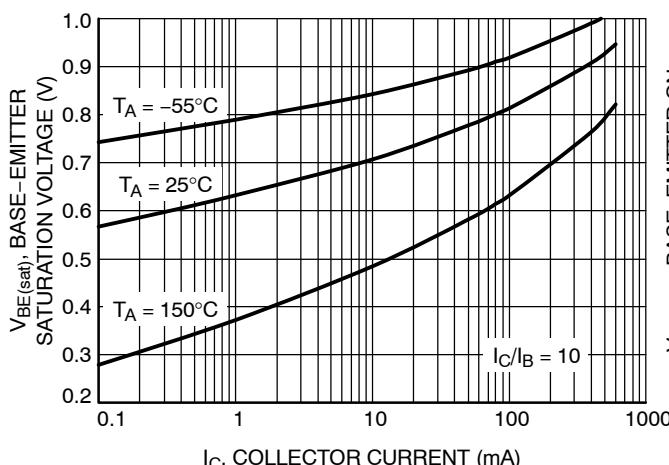


Figure 18. Base Emitter Saturation Voltage vs. Collector Current

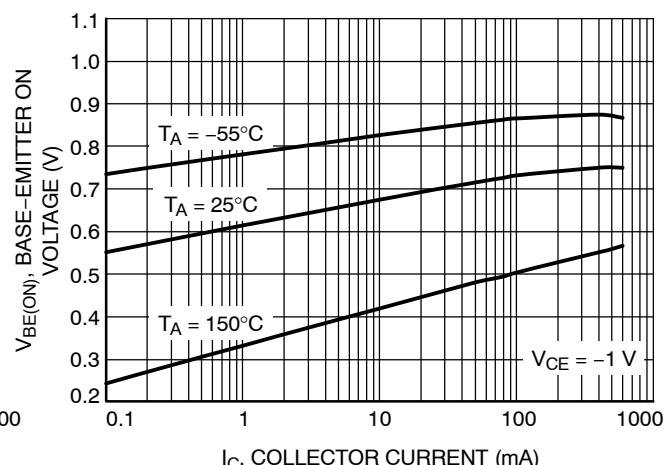


Figure 19. Base-Emitter Turn-On Voltage vs. Collector Current

STATIC CHARACTERISTICS

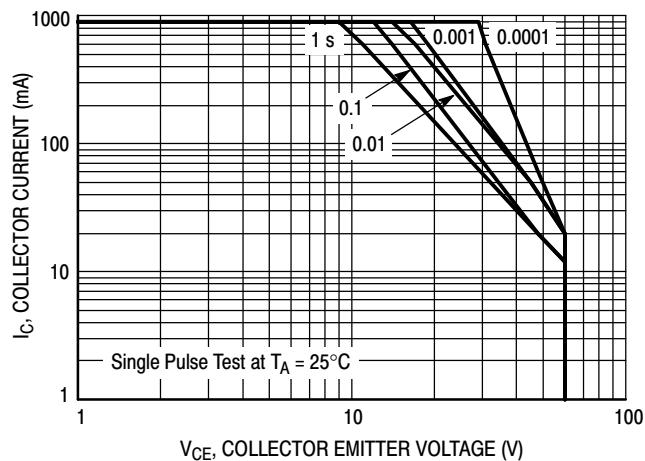


Figure 20. Safe Operating Area

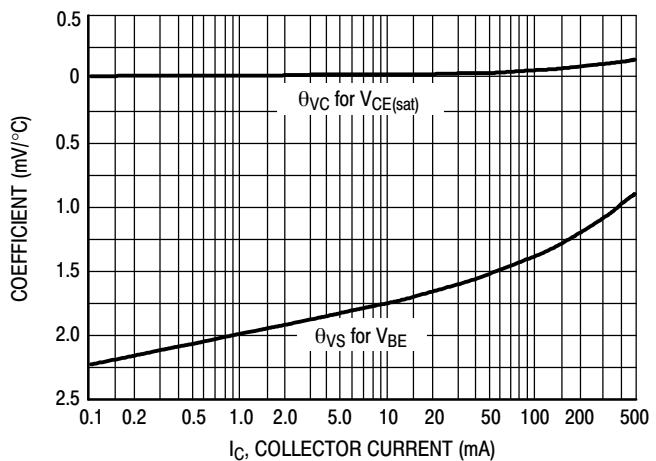


Figure 21. Temperature Coefficients

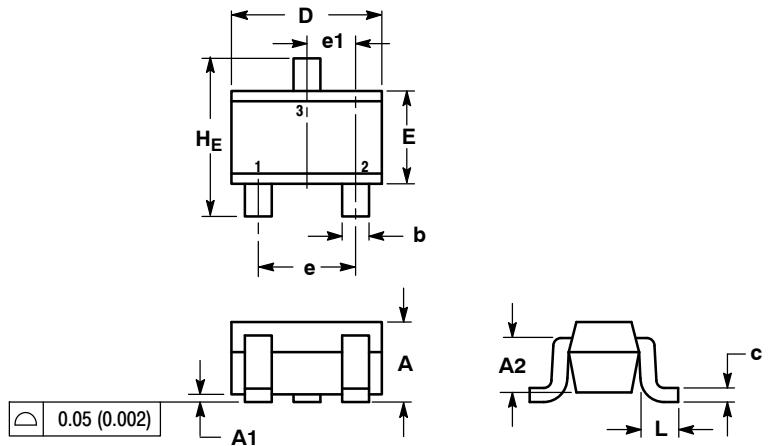
# MMBT4403WT1G

## PACKAGE DIMENSIONS

### SC-70 (SOT-323)

CASE 419-04

ISSUE N

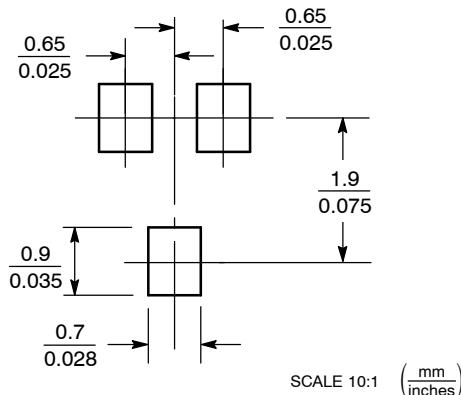


NOTES:  
 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.  
 2. CONTROLLING DIMENSION: INCH.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.80	0.90	1.00	0.032	0.035	0.040
A1	0.00	0.05	0.10	0.000	0.002	0.004
A2	0.70	REF		0.028	REF	
b	0.30	0.35	0.40	0.012	0.014	0.016
c	0.10	0.18	0.25	0.004	0.007	0.010
D	1.80	2.10	2.20	0.071	0.083	0.087
E	1.15	1.24	1.35	0.045	0.049	0.053
e	1.20	1.30	1.40	0.047	0.051	0.055
e1	0.65	BSC		0.026	BSC	
L	0.20	0.38	0.56	0.008	0.015	0.022
H_E	2.00	2.10	2.40	0.079	0.083	0.095

STYLE 3:  
 PIN 1. BASE  
 2. Emitter  
 3. Collector

### SOLDERING FOOTPRINT\*



\*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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