

# 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

#### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	$V_{CEO}$	–40	Vdc
Collector–Base Voltage	$V_{CBO}$	–40	Vdc
Emitter–Base Voltage	$V_{EBO}$	–5.0	Vdc
Collector Current – Continuous	$I_C$	–600	mAdc

#### THERMAL CHARACTERISTICS

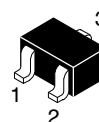
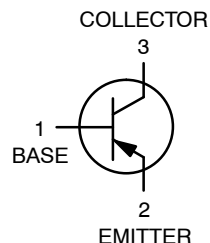
Characteristic	Symbol	Max	Unit
Total Device Dissipation FR–5 Board $T_A = 25^\circ\text{C}$	$P_D$	150	mW
Thermal Resistance, Junction–to–Ambient	$R_{\theta JA}$	833	$^\circ\text{C}/\text{W}$
Junction and Storage Temperature	$T_J, T_{stg}$	–55 to +150	$^\circ\text{C}$

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.



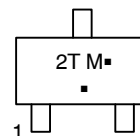
ON Semiconductor®

<http://onsemi.com>



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†
MMBT4403WT1G	SC-70 (Pb-Free)	3000 / Tape & Reel

†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<sub>A</sub> = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector-Emitter Breakdown Voltage (Note 1) (I <sub>C</sub> = -1.0 mAdc, I <sub>B</sub> = 0)	V <sub>(BR)CEO</sub>	-40	-	Vdc
Collector-Base Breakdown Voltage (I <sub>C</sub> = -0.1 mAdc, I <sub>E</sub> = 0)	V <sub>(BR)CBO</sub>	-40	-	Vdc
Emitter-Base Breakdown Voltage (I <sub>E</sub> = -0.1 mAdc, I <sub>C</sub> = 0)	V <sub>(BR)EBO</sub>	-5.0	-	Vdc
Base Cutoff Current (V <sub>CE</sub> = -35 Vdc, V <sub>EB</sub> = -0.4 Vdc)	I <sub>BEV</sub>	-	-0.1	μAdc
Collector Cutoff Current (V <sub>CE</sub> = -35 Vdc, V <sub>EB</sub> = -0.4 Vdc)	I <sub>CEX</sub>	-	-0.1	μAdc

## ON CHARACTERISTICS

DC Current Gain (I <sub>C</sub> = -0.1 mAdc, V <sub>CE</sub> = -1.0 Vdc) (I <sub>C</sub> = -1.0 mAdc, V <sub>CE</sub> = -1.0 Vdc) (I <sub>C</sub> = -10 mAdc, V <sub>CE</sub> = -1.0 Vdc) (I <sub>C</sub> = -150 mAdc, V <sub>CE</sub> = -2.0 Vdc) (Note 1) (I <sub>C</sub> = -500 mAdc, V <sub>CE</sub> = -2.0 Vdc) (Note 1)	h <sub>FE</sub>	30 60 100 100 20	- - - 300 -	-
Collector-Emitter Saturation Voltage (Note 1) (I <sub>C</sub> = -150 mAdc, I <sub>B</sub> = -15 mAdc) (I <sub>C</sub> = -500 mAdc, I <sub>B</sub> = -50 mAdc)	V <sub>CE(sat)</sub>	- -	-0.4 -0.75	Vdc
Base-Emitter Saturation Voltage (Note 1) (I <sub>C</sub> = -150 mAdc, I <sub>B</sub> = -15 mAdc) (I <sub>C</sub> = -500 mAdc, I <sub>B</sub> = -50 mAdc)	V <sub>BE(sat)</sub>	-0.75 -	-0.95 -1.3	Vdc

## SMALL-SIGNAL CHARACTERISTICS

Current-Gain - Bandwidth Product (I <sub>C</sub> = -20 mAdc, V <sub>CE</sub> = -10 Vdc, f = 100 MHz)	f <sub>T</sub>	200	-	MHz
Collector-Base Capacitance (V <sub>CB</sub> = -10 Vdc, I <sub>E</sub> = 0, f = 1.0 MHz)	C <sub>cb</sub>	-	8.5	pF
Emitter-Base Capacitance (V <sub>BE</sub> = -0.5 Vdc, I <sub>C</sub> = 0, f = 1.0 MHz)	C <sub>eb</sub>	-	30	pF
Input Impedance (I <sub>C</sub> = -1.0 mAdc, V <sub>CE</sub> = -10 Vdc, f = 1.0 kHz)	h <sub>ie</sub>	1.5	15	kΩ
Voltage Feedback Ratio (I <sub>C</sub> = -1.0 mAdc, V <sub>CE</sub> = -10 Vdc, f = 1.0 kHz)	h <sub>re</sub>	0.1	8.0	X 10 <sup>-4</sup>
Small-Signal Current Gain (I <sub>C</sub> = -1.0 mAdc, V <sub>CE</sub> = -10 Vdc, f = 1.0 kHz)	h <sub>fe</sub>	60	500	-
Output Admittance (I <sub>C</sub> = -1.0 mAdc, V <sub>CE</sub> = -10 Vdc, f = 1.0 kHz)	h <sub>oe</sub>	1.0	100	μmhos

## SWITCHING CHARACTERISTICS

Delay Time	(V <sub>CC</sub> = -30 Vdc, V <sub>EB</sub> = -2.0 Vdc, I <sub>C</sub> = -150 mAdc, I <sub>B1</sub> = -15 mAdc)	t <sub>d</sub>	-	15	ns
Rise Time		t <sub>r</sub>	-	20	
Storage Time	(V <sub>CC</sub> = -30 Vdc, I <sub>C</sub> = -150 mAdc, I <sub>B1</sub> = I <sub>B2</sub> = -15 mAdc)	t <sub>s</sub>	-	225	ns
Fall Time		t <sub>f</sub>	-	30	

1. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

## SWITCHING TIME EQUIVALENT TEST CIRCUIT

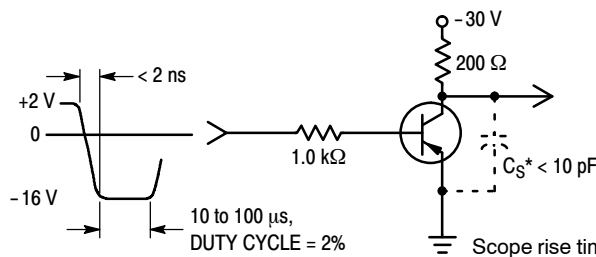


Figure 1. Turn-On Time

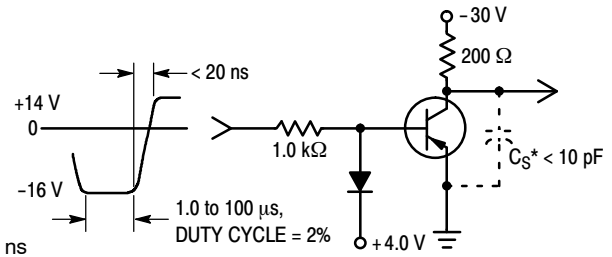


Figure 2. Turn-Off Time

# MMBT4403WT1G

## TRANSIENT CHARACTERISTICS

— 25°C    - - - 100°C

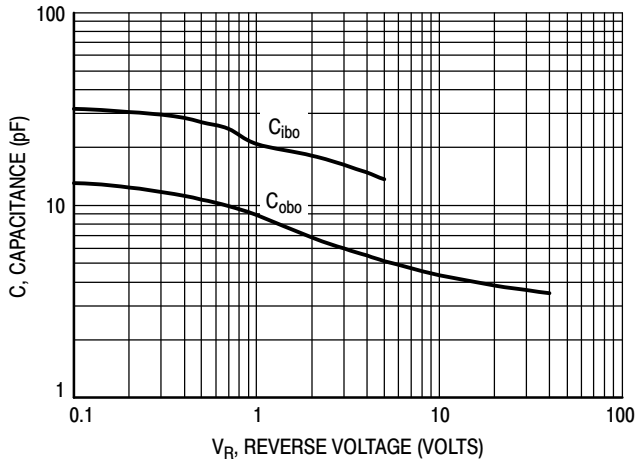


Figure 3. Capacitances

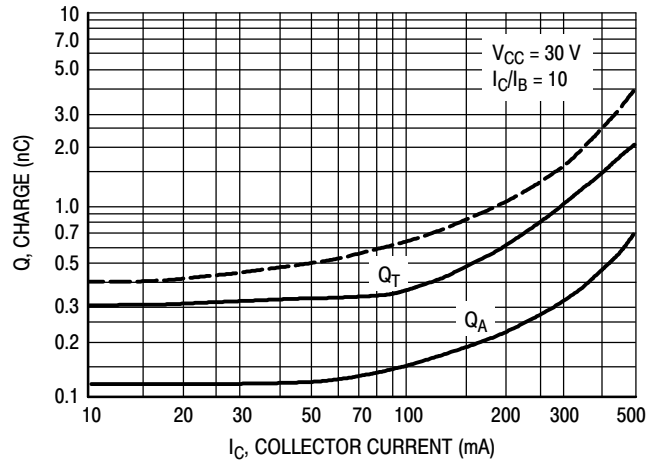


Figure 4. Charge Data

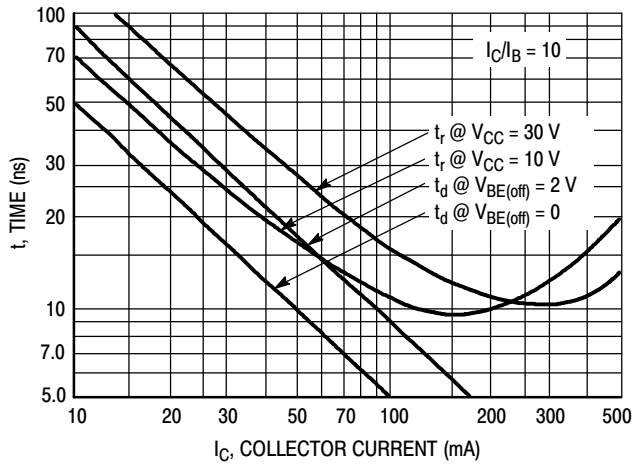


Figure 5. Turn-On Time

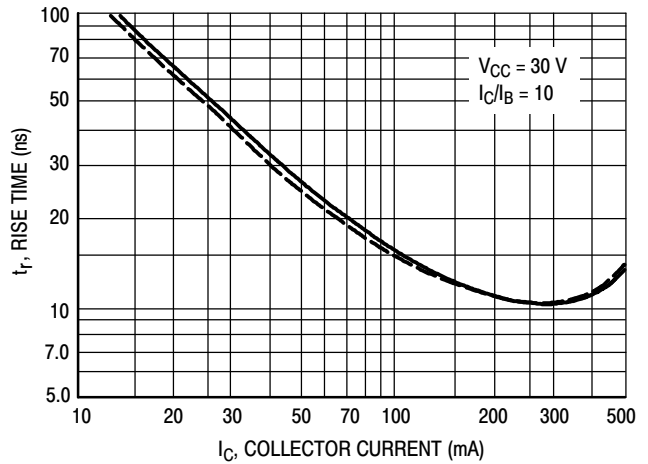


Figure 6. Rise Time

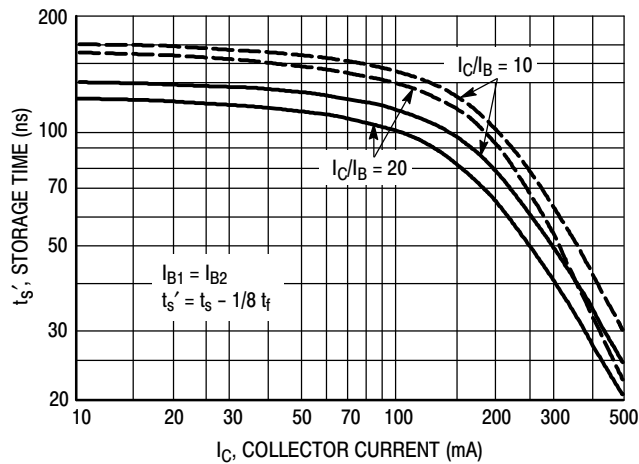


Figure 7. Storage Time

# MMBT4403WT1G

## SMALL-SIGNAL CHARACTERISTICS NOISE FIGURE

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

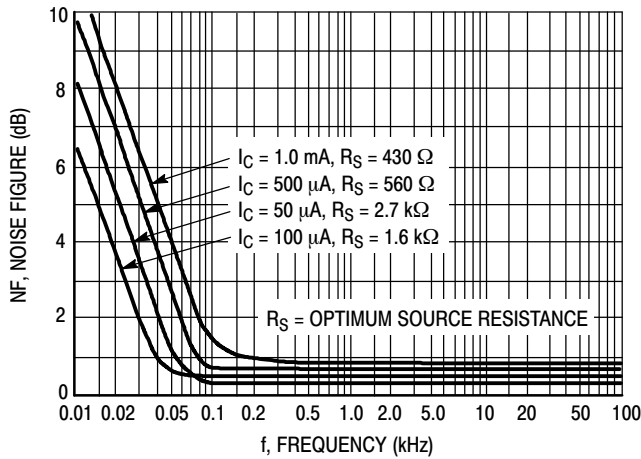


Figure 8. Frequency Effects

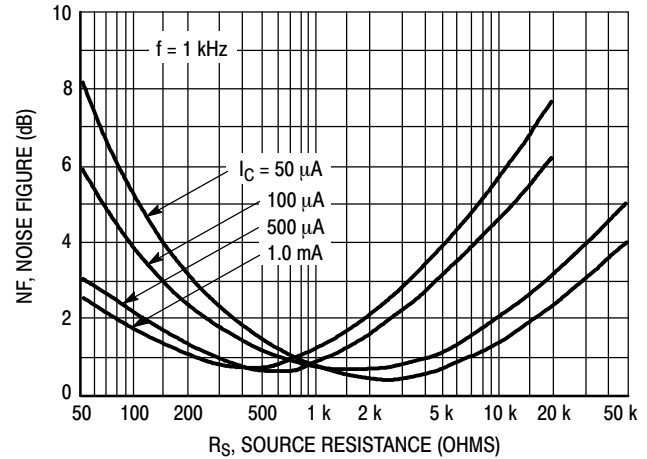


Figure 9. Source Resistance Effects

## h PARAMETERS

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

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.

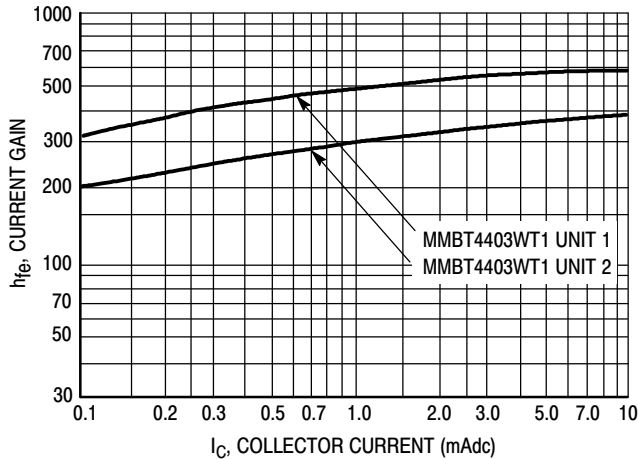


Figure 10. Current Gain

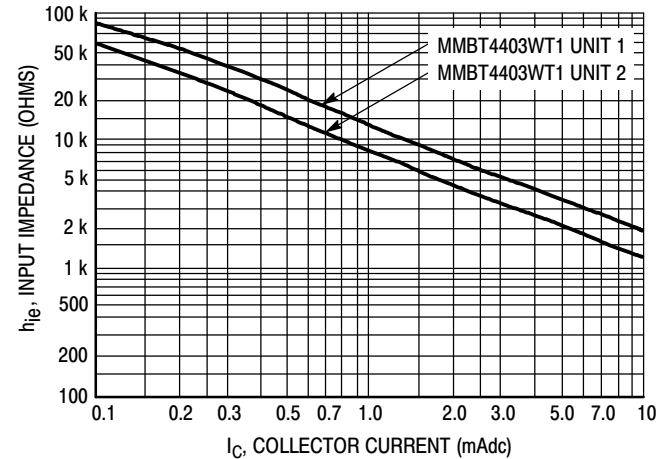


Figure 11. Input Impedance

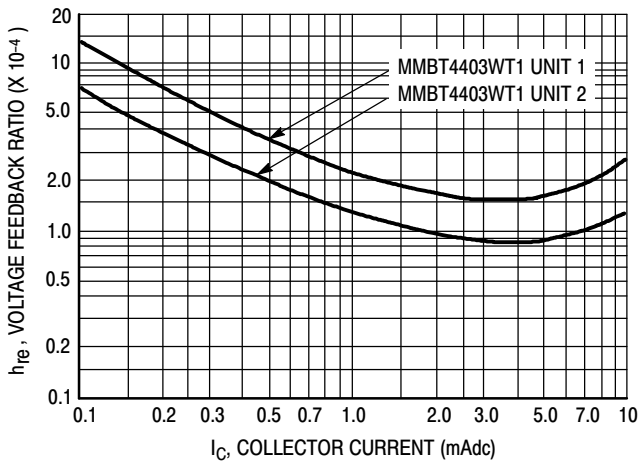


Figure 12. Voltage Feedback Ratio

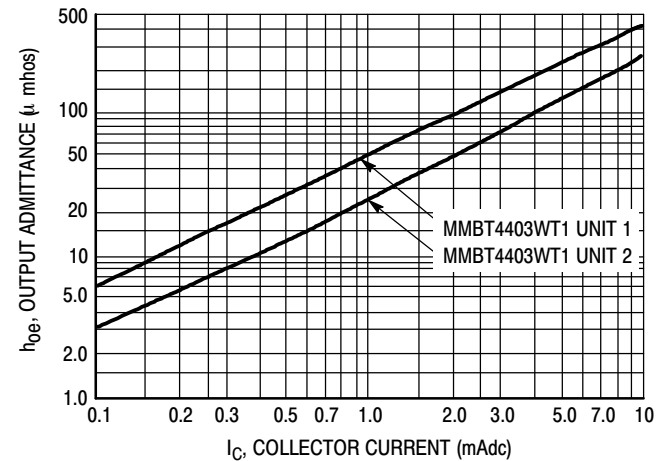
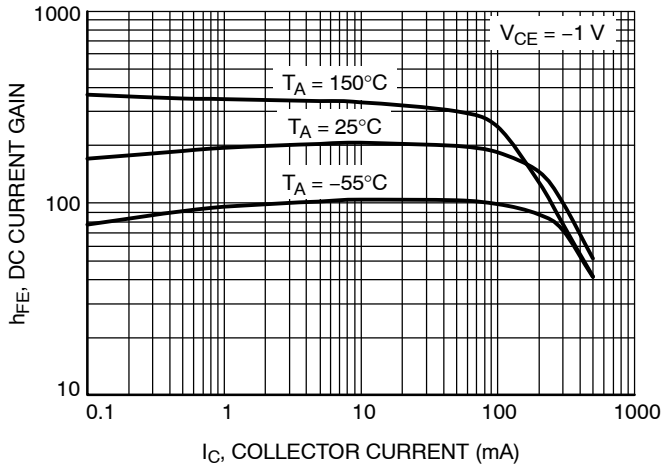


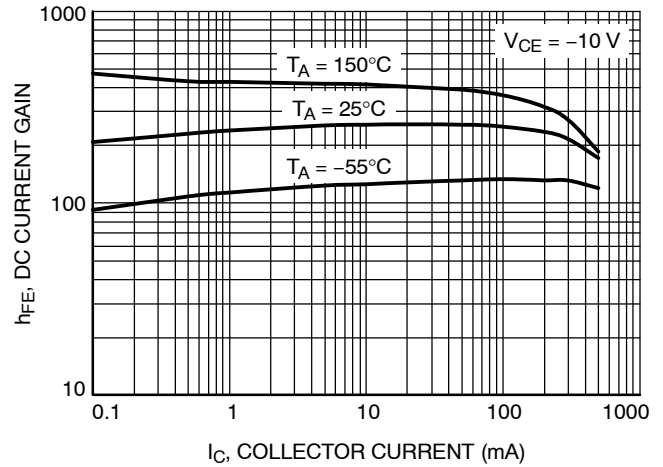
Figure 13. Output Admittance

# MMBT4403WT1G

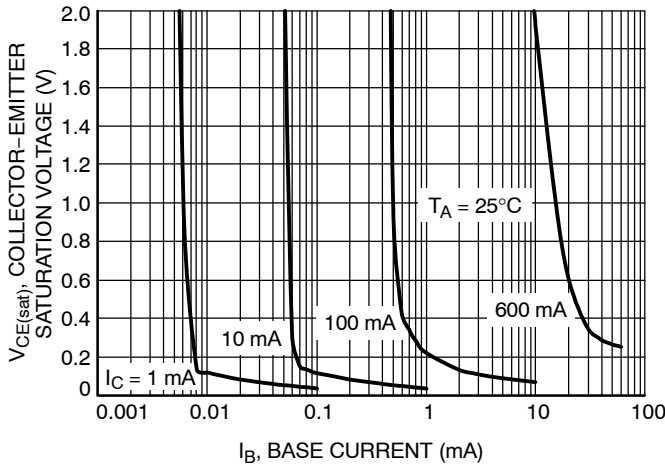
## STATIC CHARACTERISTICS



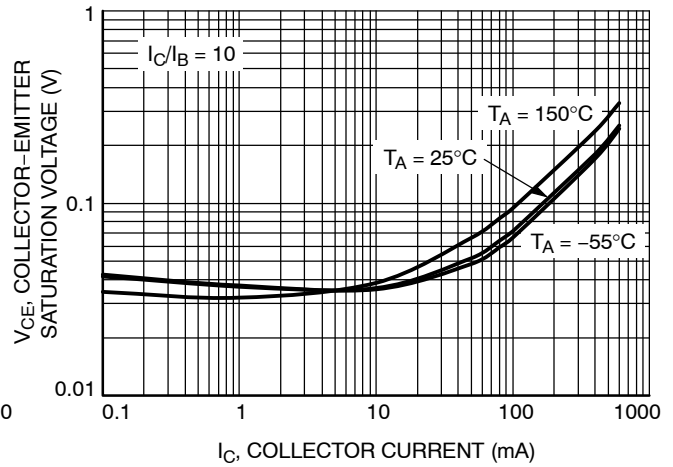
**Figure 14. DC Current Gain vs. Collector Current**



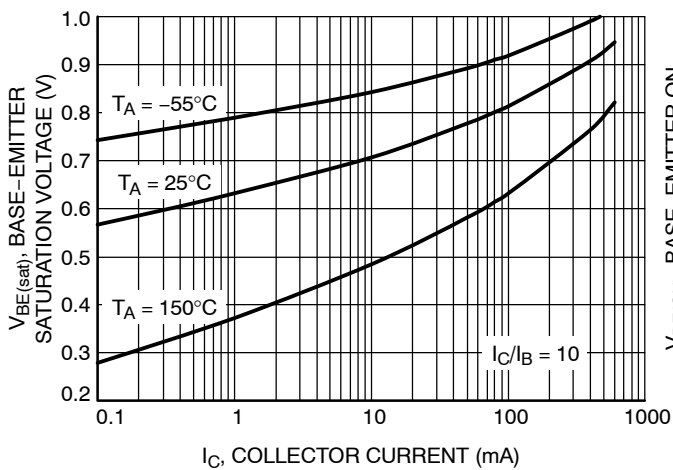
**Figure 15. DC Current Gain vs. Collector Current**



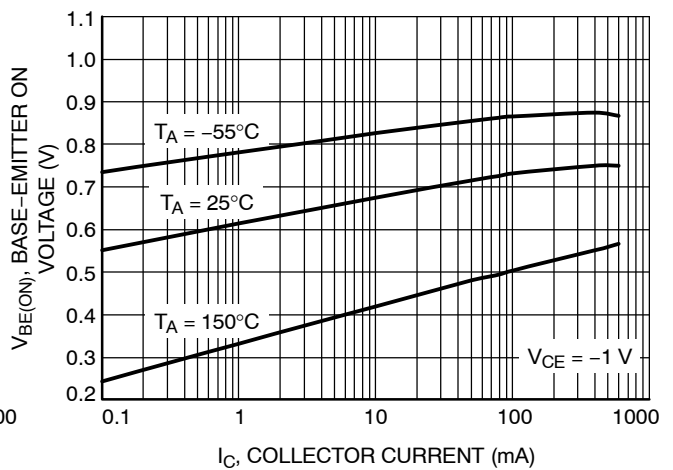
**Figure 16. Saturation Region**



**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**

# MMBT4403WT1G

## STATIC CHARACTERISTICS

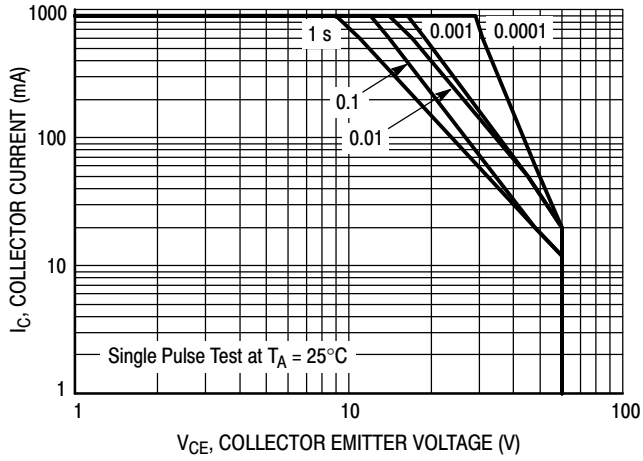


Figure 20. Safe Operating Area

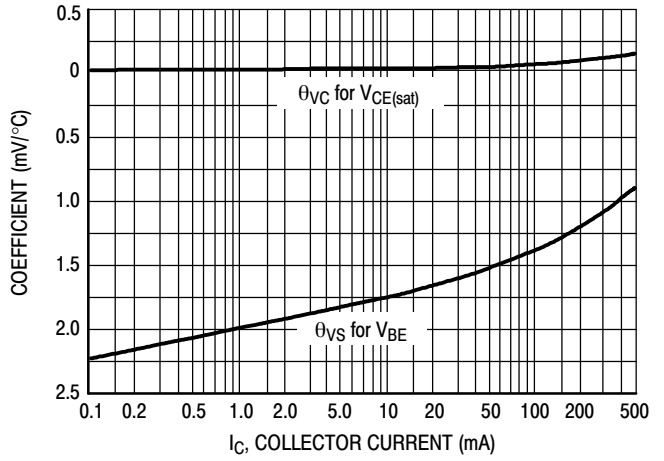
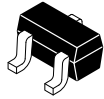


Figure 21. Temperature Coefficients

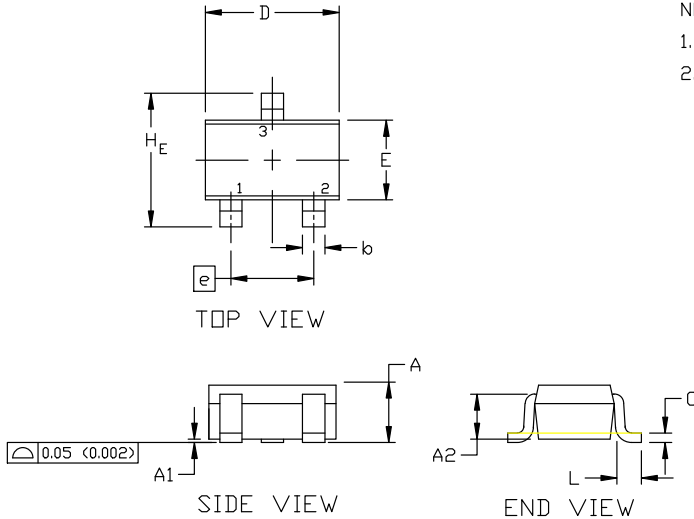
# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



SCALE 4:1

## SC-70 (SOT-323) CASE 419 ISSUE R

DATE 11 OCT 2022

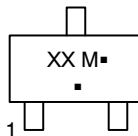


NOTES:

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

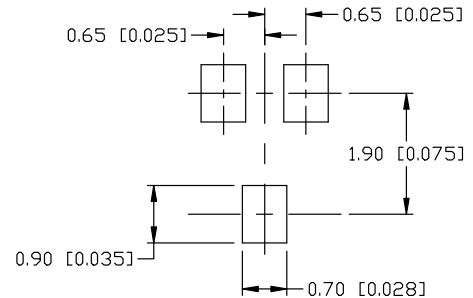
DIM	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.80	0.90	1.00	0.032	0.035	0.040
A1	0.00	0.05	0.10	0.000	0.002	0.004
A2	0.70 REF			0.028 BSC		
b	0.30	0.35	0.40	0.012	0.014	0.016
c	0.10	0.18	0.25	0.004	0.007	0.010
D	1.80	2.00	2.20	0.071	0.080	0.087
E	1.15	1.24	1.35	0.045	0.049	0.053
e	1.20	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 <sub>E</sub>	2.00	2.10	2.40	0.079	0.083	0.095

### GENERIC MARKING DIAGRAM



- XX = Specific Device Code
- M = Date Code
- = Pb-Free Package

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "■", may or may not be present. Some products may not follow the Generic Marking.



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

### SOLDERING FOOTPRINT

STYLE 1: CANCELLED	STYLE 2: PIN 1. ANODE 2. N.C. 3. CATHODE	STYLE 3: PIN 1. BASE 2. EMITTER 3. COLLECTOR	STYLE 4: PIN 1. CATHODE 2. CATHODE 3. ANODE	STYLE 5: PIN 1. ANODE 2. ANODE 3. CATHODE
STYLE 6: PIN 1. EMITTER 2. BASE 3. COLLECTOR	STYLE 7: PIN 1. BASE 2. EMITTER 3. COLLECTOR	STYLE 8: PIN 1. GATE 2. SOURCE 3. DRAIN	STYLE 9: PIN 1. ANODE 2. CATHODE 3. CATHODE-ANODE	STYLE 10: PIN 1. CATHODE 2. ANODE 3. ANODE-CATHODE
				STYLE 11: PIN 1. CATHODE 2. CATHODE 3. CATHODE

DOCUMENT NUMBER:	98ASB42819B	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	SC-70 (SOT-323)	PAGE 1 OF 1

onsemi and ONSEMI are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. onsemi does not convey any license under its patent rights nor the rights of others.

**onsemi**, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

## ADDITIONAL INFORMATION

### TECHNICAL PUBLICATIONS:

Technical Library: [www.onsemi.com/design/resources/technical-documentation](http://www.onsemi.com/design/resources/technical-documentation)  
onsemi Website: [www.onsemi.com](http://www.onsemi.com)

### ONLINE SUPPORT: [www.onsemi.com/support](http://www.onsemi.com/support)

For additional information, please contact your local Sales Representative at [www.onsemi.com/support/sales](http://www.onsemi.com/support/sales)