

MMBT4403LT1

Preferred Device

Switching Transistor

PNP Silicon

Features

- Pb-Free Packages are Available

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 (Note 1) @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	225 1.8	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	556	$^\circ\text{C}/\text{W}$
Total Device Dissipation Alumina Substrate, (Note 2) @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	300 2.4	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	417	$^\circ\text{C}/\text{W}$
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.

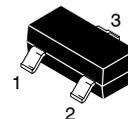
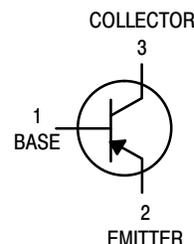
*Transient pulses must not cause the junction temperature to be exceeded.

- FR-5 = $1.0 \times 0.75 \times 0.062$ in.
- Alumina = $0.4 \times 0.3 \times 0.024$ in. 99.5% alumina.



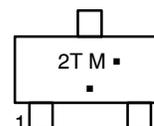
ON Semiconductor®

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SOT-23 (TO-236)
CASE 318
STYLE 6

MARKING DIAGRAM



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

(Note: Microdot may be in either location)

*Date Code orientation and/or overbar may vary depending upon manufacturing location.

ORDERING INFORMATION

Device	Package	Shipping†
MMBT4403LT1	SOT-23	3000 Tape & Reel
MMBT4403LT1G	SOT-23 (Pb-Free)	3000 Tape & Reel
MMBT4403LT3	SOT-23	10,000 Tape & Reel
MMBT4403LT3G	SOT-23 (Pb-Free)	10,000 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.

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

MMBT4403LT1

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

Characteristic	Symbol	Min	Max	Unit	
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (Note 3)	$(I_C = -1.0 \text{ mAdc}, I_B = 0)$	$V_{(BR)CEO}$	-40	-	Vdc
Collector-Base Breakdown Voltage	$(I_C = -0.1 \text{ mAdc}, I_E = 0)$	$V_{(BR)CBO}$	-40	-	Vdc
Emitter-Base Breakdown Voltage	$(I_E = -0.1 \text{ mAdc}, I_C = 0)$	$V_{(BR)EBO}$	-5.0	-	Vdc
Base Cutoff Current	$(V_{CE} = -35 \text{ Vdc}, V_{EB} = -0.4 \text{ Vdc})$	I_{BEV}	-	-0.1	μAdc
Collector Cutoff Current	$(V_{CE} = -35 \text{ Vdc}, V_{EB} = -0.4 \text{ Vdc})$	I_{CEX}	-	-0.1	μAdc

ON CHARACTERISTICS

DC Current Gain	$(I_C = -0.1 \text{ mAdc}, V_{CE} = -1.0 \text{ Vdc})$ $(I_C = -1.0 \text{ mAdc}, V_{CE} = -1.0 \text{ Vdc})$ $(I_C = -10 \text{ mAdc}, V_{CE} = -1.0 \text{ Vdc})$ $(I_C = -150 \text{ mAdc}, V_{CE} = -2.0 \text{ Vdc})$ $(I_C = -500 \text{ mAdc}, V_{CE} = -2.0 \text{ Vdc})$	h_{FE}	30 60 100 100 20	- - - 300 -	- - - - -
Collector-Emitter Saturation Voltage (Note 3)	$(I_C = -150 \text{ mAdc}, I_B = -15 \text{ mAdc})$ $(I_C = -500 \text{ mAdc}, I_B = -50 \text{ mAdc})$	$V_{CE(sat)}$	- -	-0.4 -0.75	Vdc
Base-Emitter Saturation Voltage (Note 3)	$(I_C = -150 \text{ mAdc}, I_B = -15 \text{ mAdc})$ $(I_C = -500 \text{ mAdc}, I_B = -50 \text{ mAdc})$	$V_{BE(sat)}$	-0.75 -	-0.95 -1.3	Vdc

SMALL-SIGNAL CHARACTERISTICS

Current-Gain-Bandwidth Product	$(I_C = -20 \text{ mAdc}, V_{CE} = -10 \text{ Vdc}, f = 100 \text{ MHz})$	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	$(I_C = -1.0 \text{ mAdc}, V_{CE} = -10 \text{ Vdc}, f = 1.0 \text{ kHz})$	h_{ie}	1.5	15	$k\Omega$
Voltage Feedback Ratio	$(I_C = -1.0 \text{ mAdc}, V_{CE} = -10 \text{ Vdc}, f = 1.0 \text{ kHz})$	h_{re}	0.1	8.0	$\times 10^{-4}$
Small-Signal Current Gain	$(I_C = -1.0 \text{ mAdc}, V_{CE} = -10 \text{ Vdc}, f = 1.0 \text{ kHz})$	h_{fe}	60	500	-
Output Admittance	$(I_C = -1.0 \text{ mAdc}, V_{CE} = -10 \text{ Vdc}, f = 1.0 \text{ kHz})$	h_{oe}	1.0	100	μMhos

SWITCHING CHARACTERISTICS

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

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

SWITCHING TIME EQUIVALENT TEST CIRCUIT

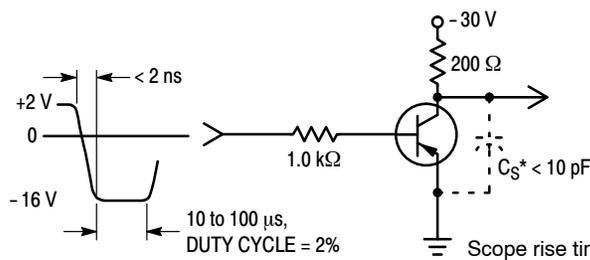


Figure 1. Turn-On Time

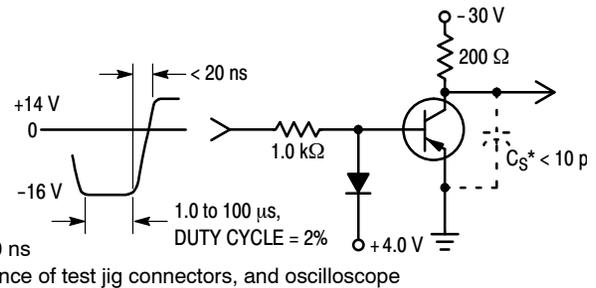


Figure 2. Turn-Off Time

MMBT4403LT1

TRANSIENT CHARACTERISTICS

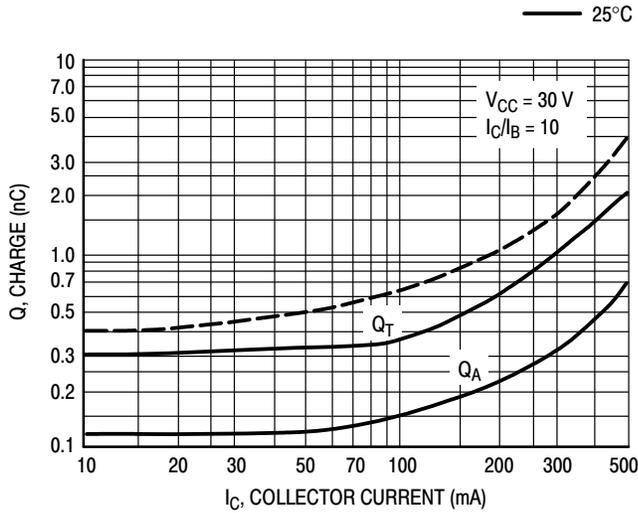


Figure 3. Charge Data

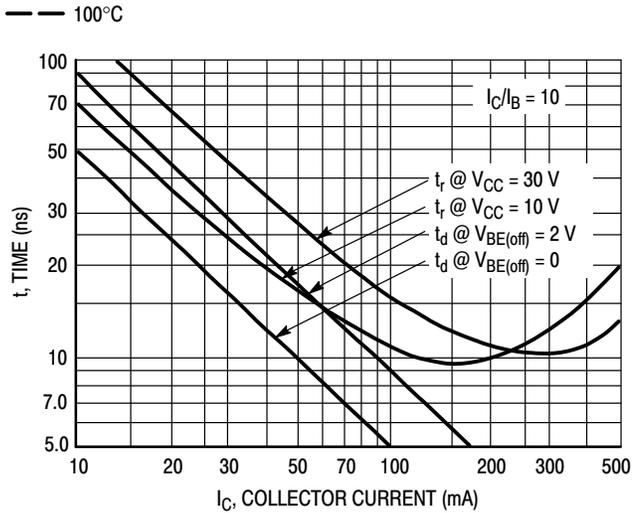


Figure 4. Turn-On Time

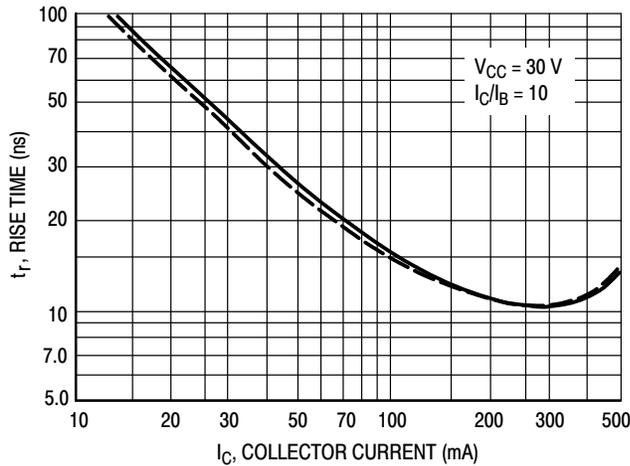


Figure 5. Rise Time

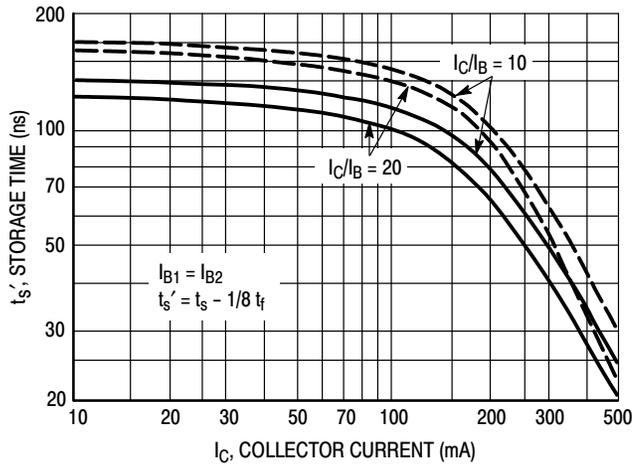


Figure 6. Storage Time

SMALL-SIGNAL CHARACTERISTICS NOISE FIGURE

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

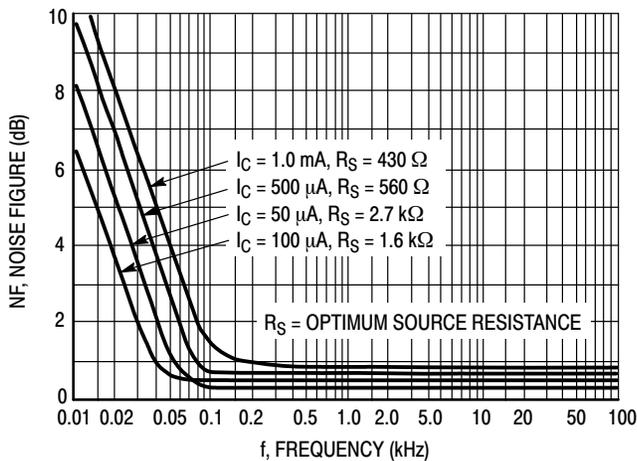


Figure 7. Frequency Effects

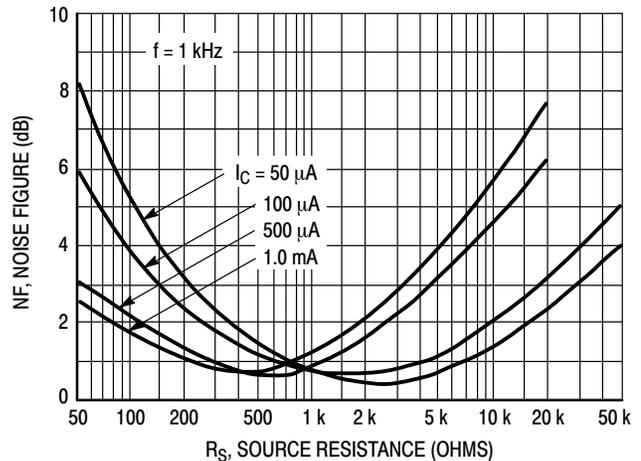


Figure 8. Source Resistance Effects

MMBT4403LT1

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 MMBT4403LT1 lines, and the same units were used to develop the correspondingly numbered curves on each graph.

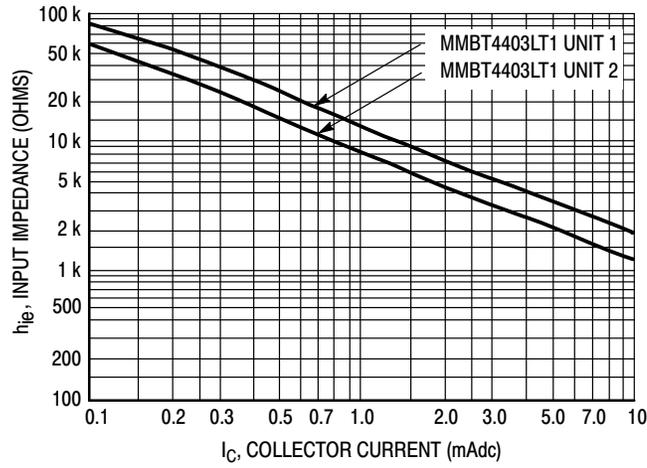


Figure 9. Input Impedance

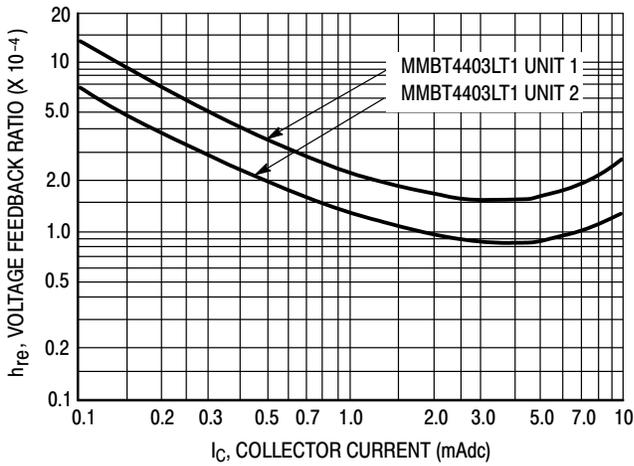


Figure 10. Voltage Feedback Ratio

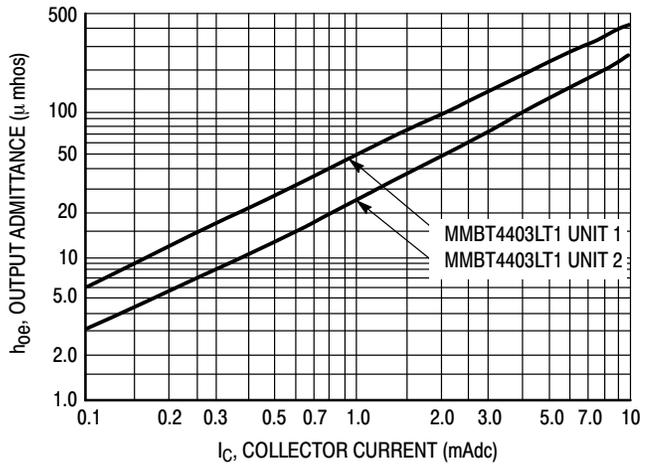


Figure 11. Output Admittance

MMBT4403LT1

STATIC CHARACTERISTICS

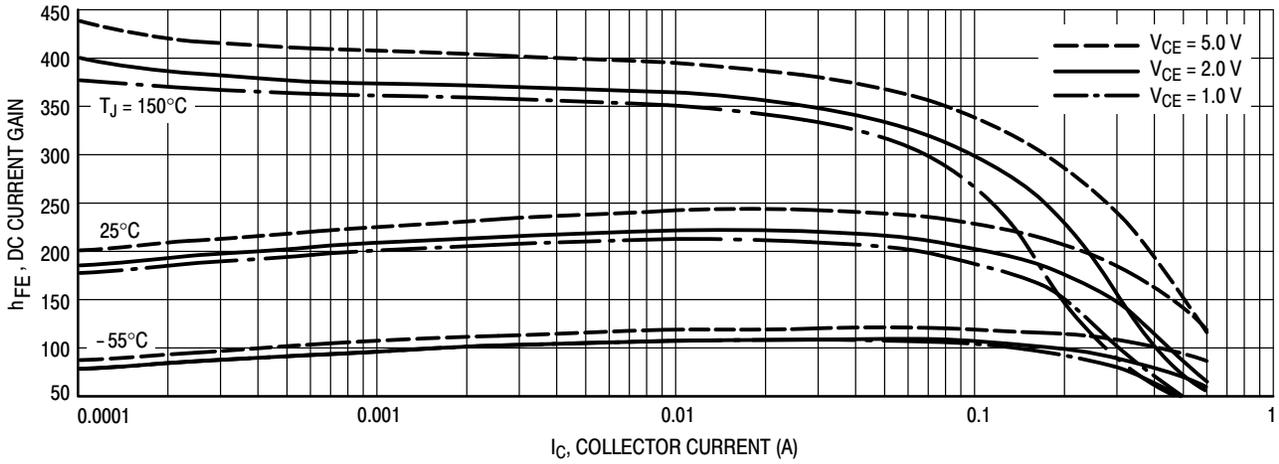


Figure 12. DC Current Gain

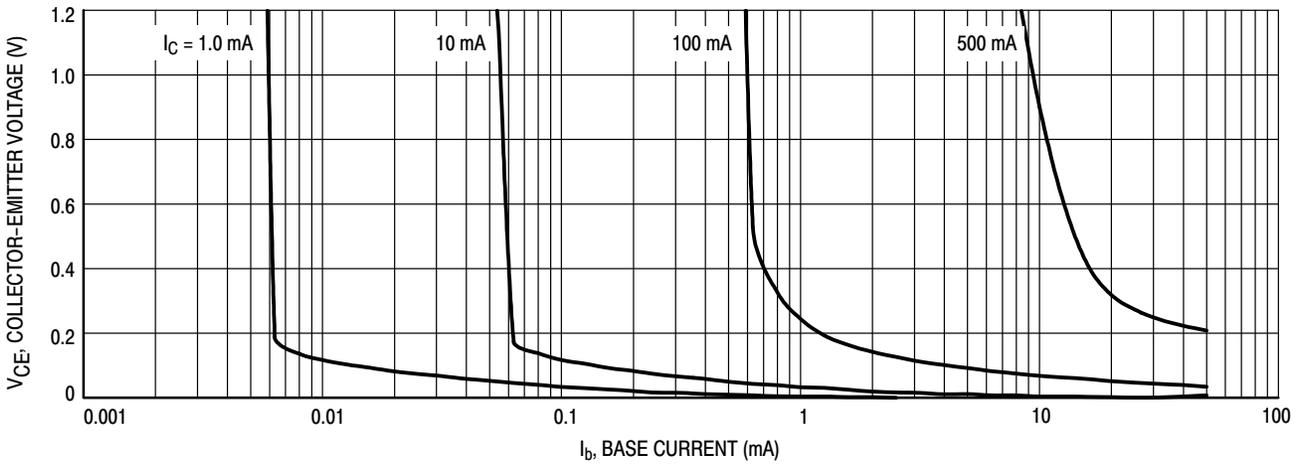


Figure 13. Collector Saturation Region

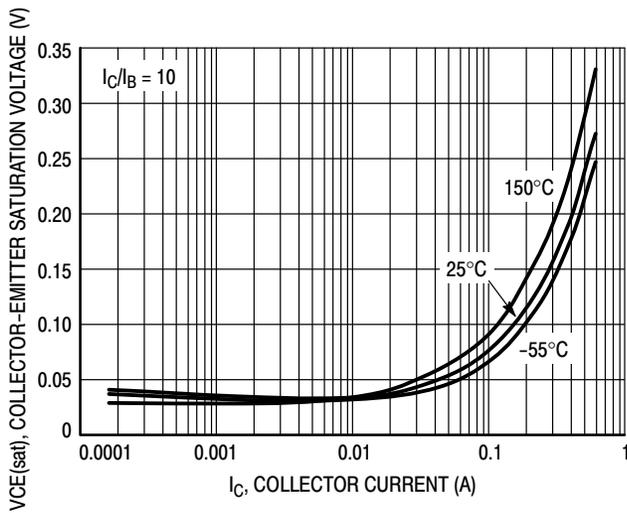


Figure 14. Collector-Emitter Saturation Voltage vs. Collector Current

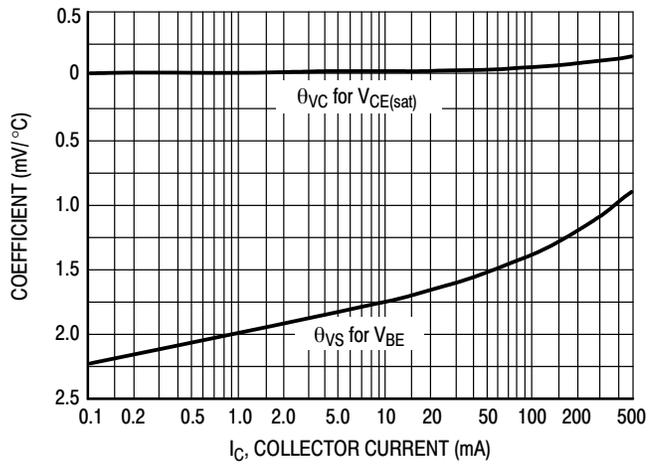


Figure 15. Temperature Coefficients

MMBT4403LT1

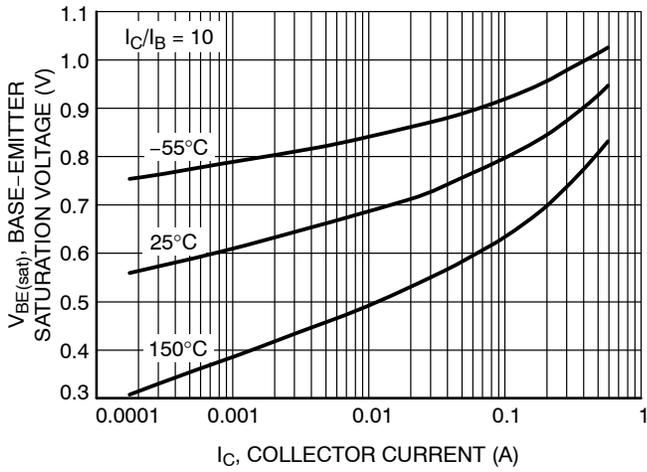


Figure 16. Base-Emitter Saturation Voltage vs. Collector Current

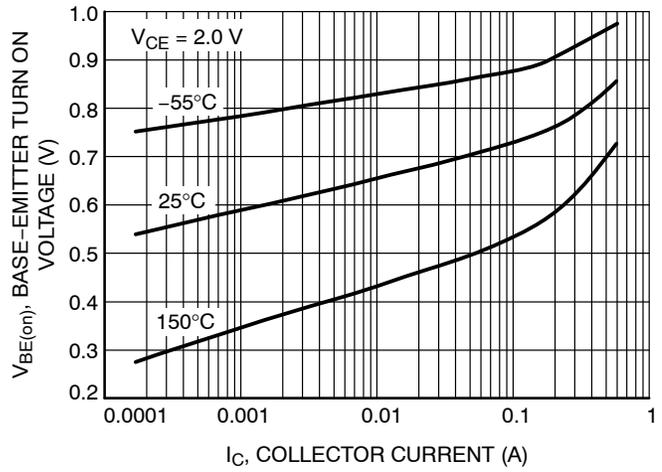


Figure 17. Base-Emitter Turn On Voltage vs. Collector Current

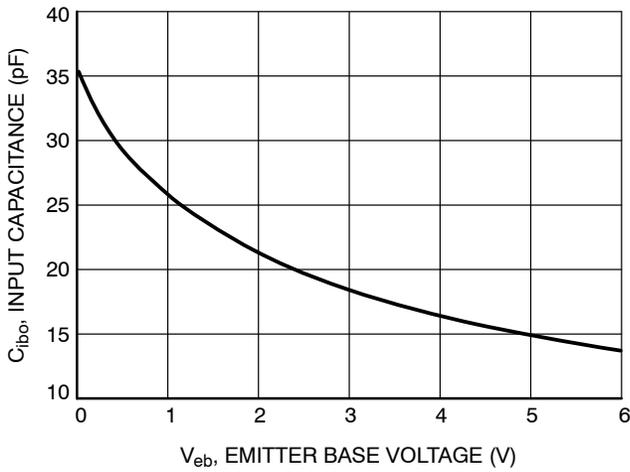


Figure 18. Input Capacitance vs. Emitter Base Voltage

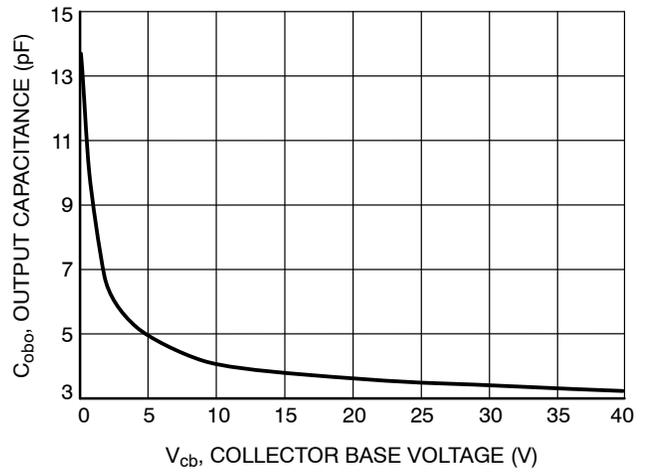
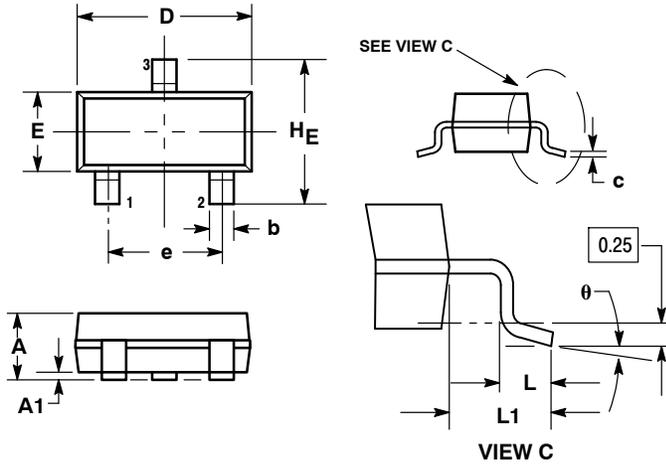


Figure 19. Output Capacitance vs. Collector Base Voltage

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PACKAGE DIMENSIONS

SOT-23 (TO-236)
CASE 318-08
ISSUE AN



NOTES:

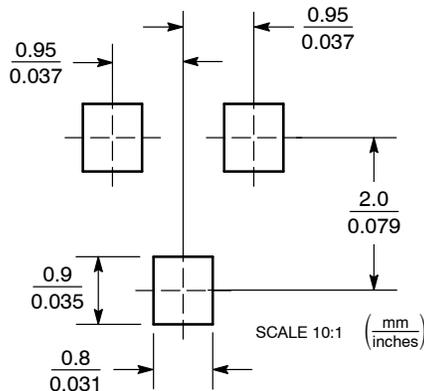
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 318-01 THRU -07 AND -09 OBSOLETE, NEW STANDARD 318-08.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.89	1.00	1.11	0.035	0.040	0.044
A1	0.01	0.06	0.10	0.001	0.002	0.004
b	0.37	0.44	0.50	0.015	0.018	0.020
c	0.09	0.13	0.18	0.003	0.005	0.007
D	2.80	2.90	3.04	0.110	0.114	0.120
E	1.20	1.30	1.40	0.047	0.051	0.055
e	1.78	1.90	2.04	0.070	0.075	0.081
L	0.10	0.20	0.30	0.004	0.008	0.012
L1	0.35	0.54	0.69	0.014	0.021	0.029
HE	2.10	2.40	2.64	0.083	0.094	0.104

STYLE 6:

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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