MMBT4403

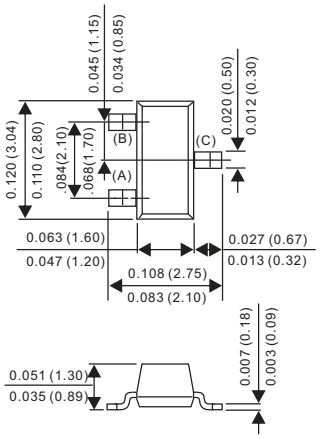
600mA Silicon PNP Epitaxial Planar Transistor

Features

- Epitaxial plana chip construction
- Ideal for medium power application and switching
- Capable of 225mW power dissipation.
- Lead-free parts for green partner, exceeds environmental standards of MIL-STD-19500 /228
- Suffix "-H" indicates Halogen-free part, ex.MMBT4403-H.

Package outline

SOT-23



Dimensions in inches and (millimeters)

Mechanical data

- Epoxy:UL94-V0 rated flame retardant
- Case : Molded plastic, SOT-23
- Terminals : Solder plated, solderable per MIL-STD-750, Method 2026
- Mounting Position : Any

Maximum ratings (AT T_A=25°C unless otherwise noted)

PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Collector-Base voltage		V_{CBO}			-40	V
Collector-Emitter voltage		V_{CEO}			-40	V
Emitter-Base voltage		V_{EBO}			-5.0	V
Collector current		I_C			-600	mA
Total device dissipation FR-5 board (1)	T_A = 25°C	P_D			225	mW
	Derate above 25°C	P_D			1.8	mW/°C
Thermal resistance(1)	Junction to ambient	$R_{\theta JA}$			556	°C/W
Total device dissipation alumina substrate(2)	T_A = 25°C	P_D			300	mW
	Derate above 25°C	P_D			2.4	mW/°C
Thermal resistance(2)	Junction to ambient	$R_{\theta JA}$			417	°C/W
Operating junction temperature range		T_J	-55		+150	°C
Storage temperature range		T_{STG}	-55		+150	°C

1.FR-5 = 1.0 X 0.75 X0.062 in.
2.Alumina = 0.4 X 0.3 X 0.024 in. 99.5% alumina.

MMBT4403

600mA Silicon PNP Epitaxial Planar Transistor

Characteristics (AT T_A=25°C unless otherwise noted)

Off characteristics

PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Collector-Base breakdown voltage	I_c = -0.1mA, I_E = 0	$V_{(BR)CBO}$	-40			V
Collector-Emitter breakdown voltage(3)	I_c = -1.0mA, I_B = 0	$V_{(BR)CEO}$	-40			V
Emitter-Base breakdown voltage	I_E = -0.1mA, I_C = 0	$V_{(BR)EBO}$	-5.0			V
Base cutoff current	V_{CE} = -35Vdc, V_{EB} = -0.4 Vdc	I_{BL}			-0.1	μA
Collector cutoff current	V_{CE} = -35Vdc, V_{EB} = -0.4Vdc	I_{CEX}			-0.1	

On characteristics(3)

PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
DC current gain	I_c = -0.1mA, V_{CE} = -1.0V	h_{FE}	30			-
	I_c = -1.0mA, V_{CE} = -1.0V		60			
	I_c = -10mA, V_{CE} = -1.0V		100		300	
	I_c = -150mA, V_{CE} = -1.0V		100			
	I_c = -500mA, V_{CE} = -2.0V		20			
Collector-Emitter saturation voltage(3)	I_c = 150mA, I_B = 15mA	$V_{CE(sat)}$			-0.4	Vdc
	I_c = 500mA, I_B = 50mA				-0.75	
Base-Emitter saturation voltage(3)	I_c = 150mA, I_B = 15mA	$V_{BE(sat)}$	0.75		-0.95	Vdc
	I_c = 500mA, I_B = 50mA				-1.30	

3.Pulse test : pukse width ≤ 300uS, duty cycle ≤ 2.0%.

Small-signal characteristics

PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Current-gain-bandwidth product(4)	I_C = -20mA, V_{CE} = -10V, f = 100MHz	f_T	200			MHz
Output capacitance	V_{CB} = -10V, I_E = 0, f = 1.0MHz	C_{obo}			8.5	pF
Input capacitance	V_{EB} = -0.5V, I_C = 0, f = 1.0MHz	C_{ibo}			30	pF
Input impedance	V_{CE} = -10V, I_C = -1.0mA, f = 1.0KHz	h_{ie}	1.5		15	kohms
Voltage feeback radio	V_{CE} = -10V, I_C = 1.0mA, f = 1.0KHz	h_{re}	0.1		8.0	X 10^{-4}
Small-signal current gain	V_{CE} = -10V, I_C = -1.0mA, f = 1.0KHz	h_{fe}	60		500	-
Output admittance	V_{CE} = -10V, I_C = -1.0mA, f = 1.0KHz	h_{oe}	1.0		100	μmhos

4.f_T is defined as the frequency at which h_{fe} extrapolates to unity.

Switching characteristics

PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Delay time	V_{CC} = -30V, V_{BE} = -2.0V_{dc}, I_C = -150mA, I_{B1} = -15mA	td			15	ns
Rise time		tr			20	
Storage time	V_{CC} = -30V, I_C =-150mA, I_{B1} = I_{B2} = -15mA	ts			225	
Fall time		tf			30	

MMBT4403

600mA Silicon PNP Epitaxial Planar Transistor

Switching time equivalent test circuits

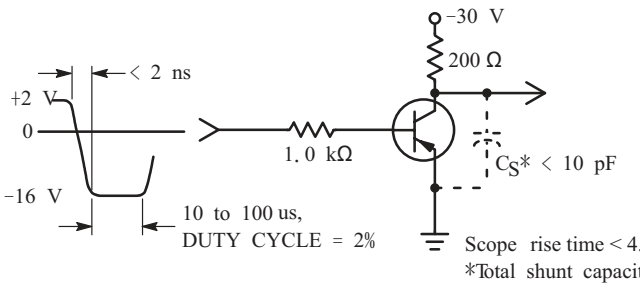


Figure 1. Turn-On Time

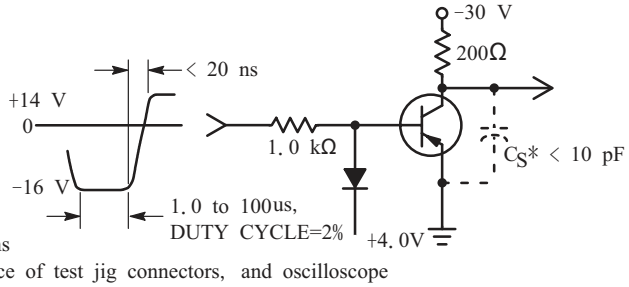


Figure 2. Turn-Off Time

Scope rise time < 4.0 ns
*Total shunt capacitance of test jig connectors, and oscilloscope

TRANSIENTCHARACTERISTICS

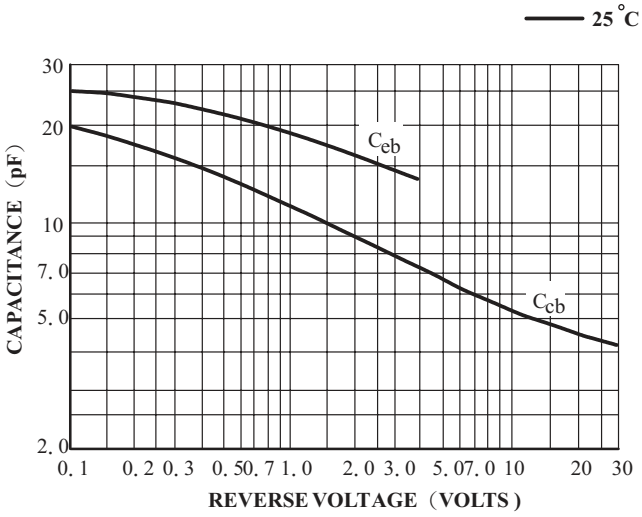


Figure 3. Capacitances

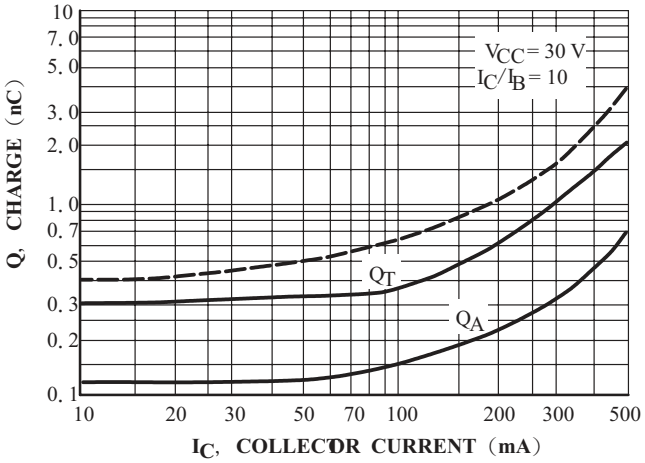


Figure 4. Charge Data

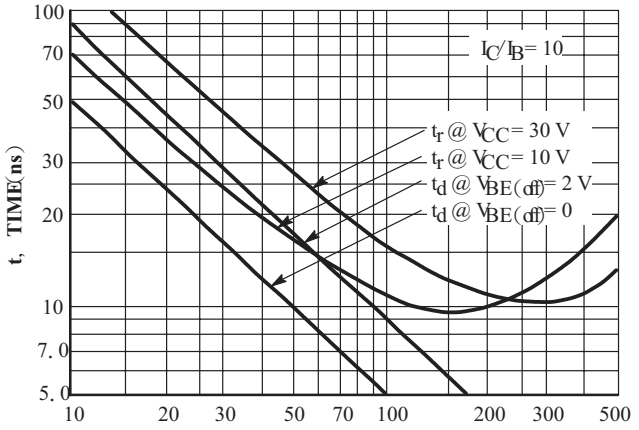


Figure 5. Turn-On Time

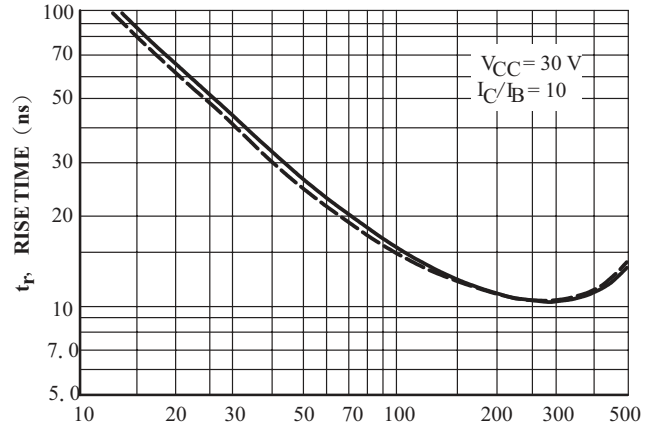


Figure 6. Rise Time

MMBT4403

600mA Silicon PNP Epitaxial Planar Transistor

Rating and characteristic curves

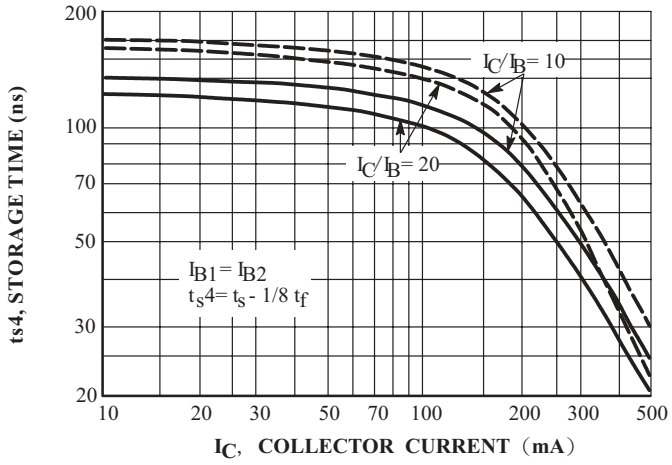


Figure 7. Storage Time

h PARAMETERS
VCE = ±10 Vdc, f = 1.0 kHz, TA = 25°C
This group of graphs illustrates the relationship between hfe 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 FMBT4403 lines, and the same units were used to develop the correspondingly±numbered curves on each graph.

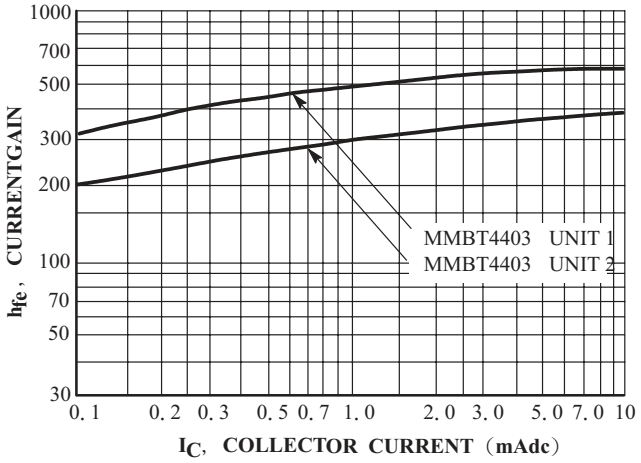


Figure 10. Current Gain

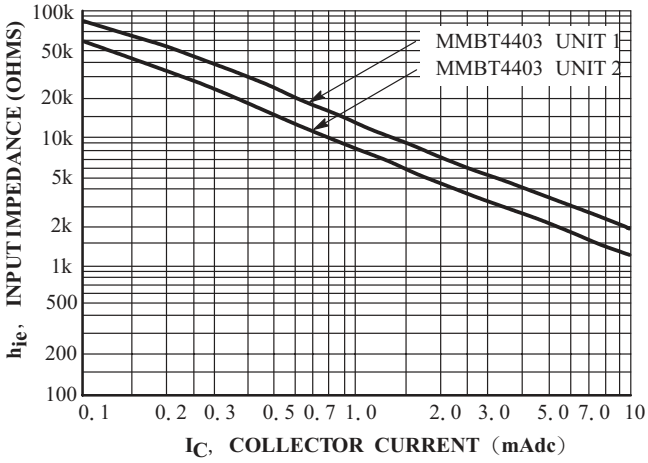


Figure 11. Input Impedance

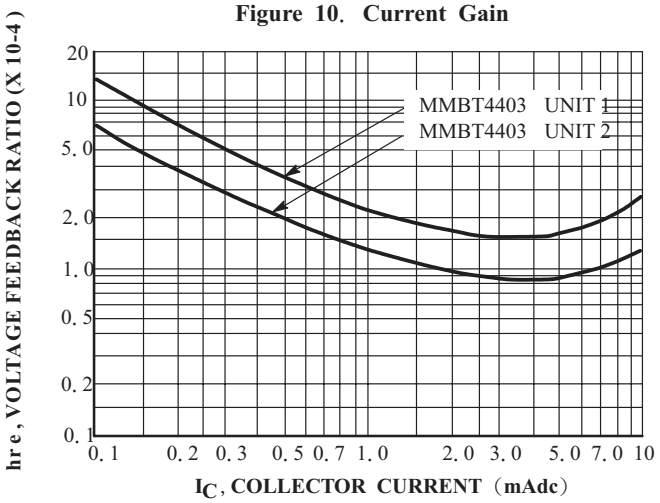


Figure 12. Voltage Feedback Ratio

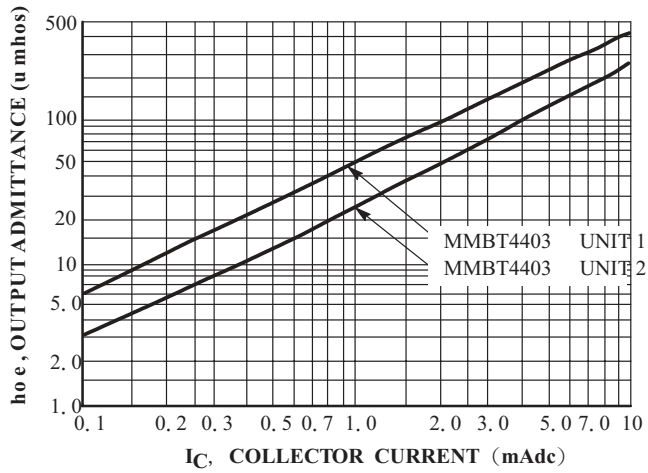


Figure 13. Output Admittance

MMBT4403

600mA Silicon PNP Epitaxial Planar Transistor

Rating and characteristic curves

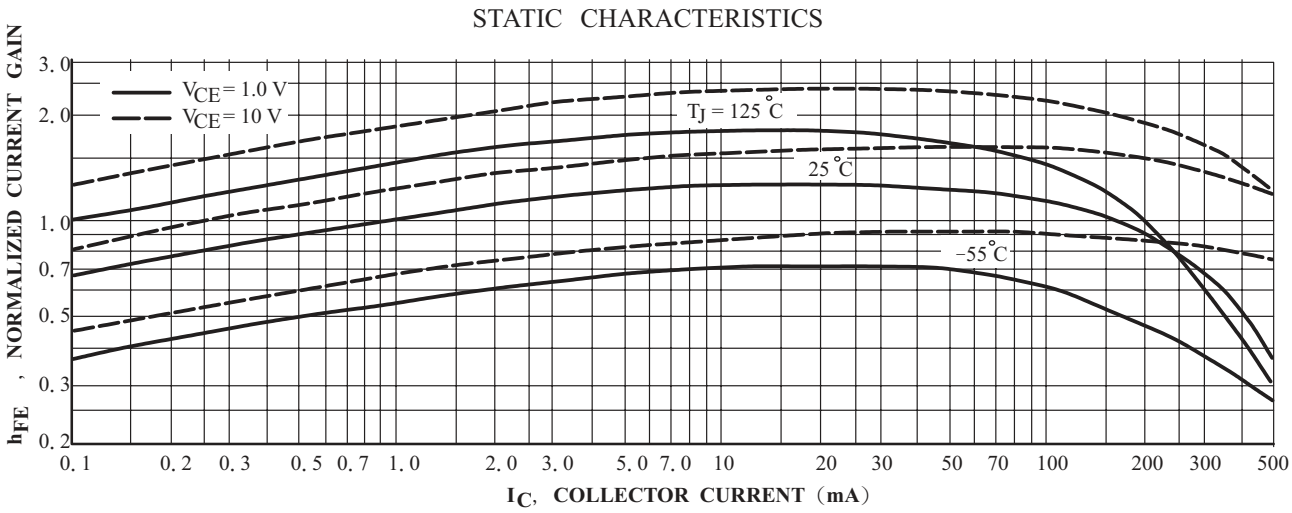


Figure 14. DC Current Gain

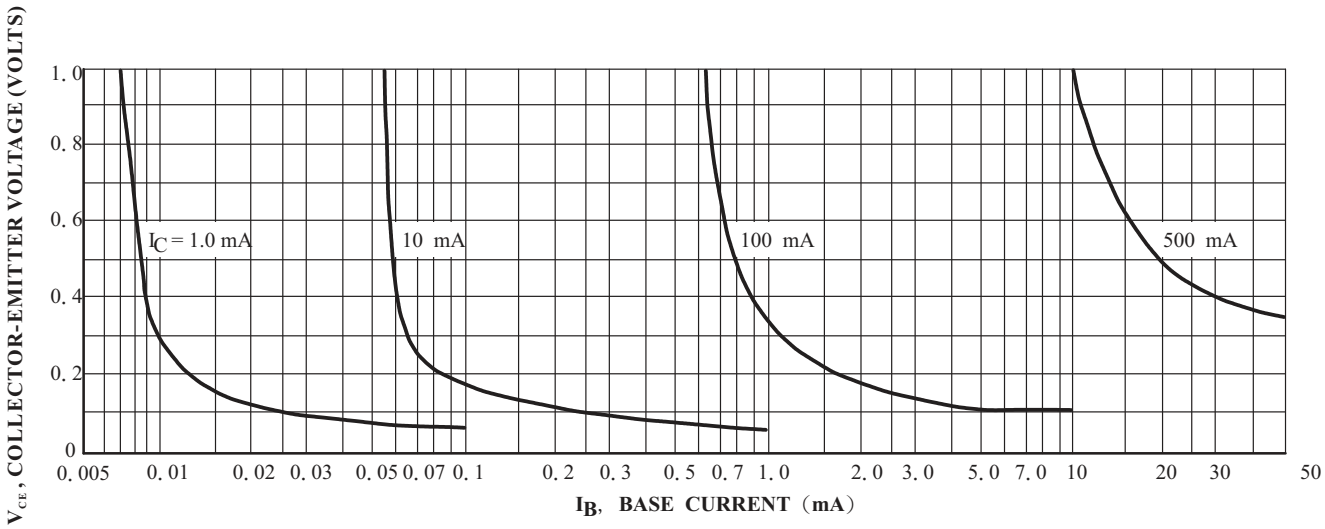


Figure 15. Collector Saturation Region

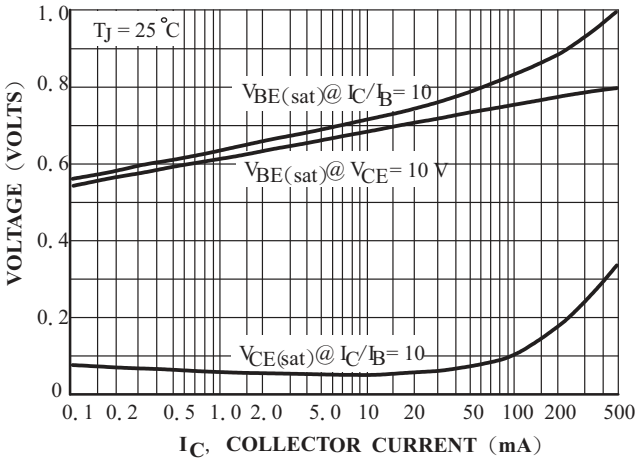


Figure 16. "On" Voltages

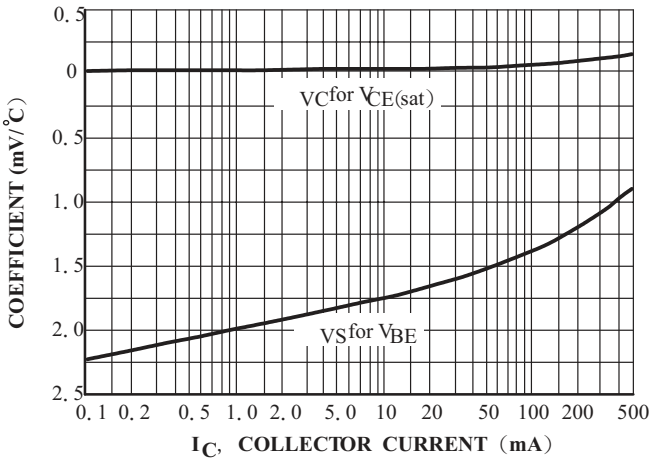
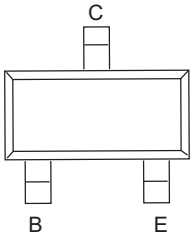
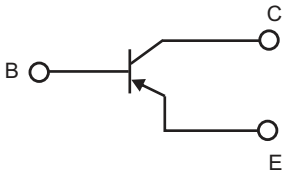


Figure 17. Temperature Coefficients

MMBT4403

600mA Silicon PNP Epitaxial Planar Transistor

Pinning information

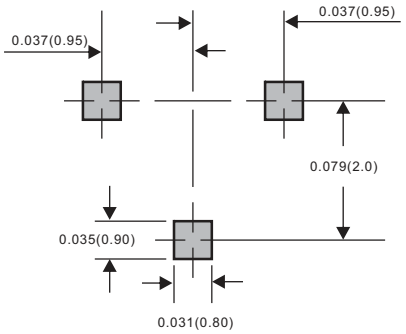
Pin	Simplified outline	Symbol
PinB Base PinC Collector PinE Emitter		

Marking

Type number	Marking code
MMBT4403	2T

Suggested solder pad layout

SOT-23



Dimensions in inches and (millimeters)