

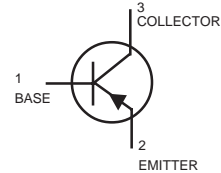
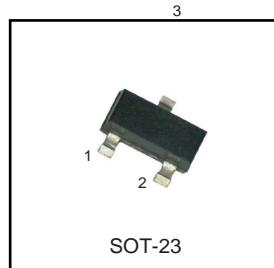
Switching Transistor

PNP Silicon

Lead free product

Halogen-free type

MMBT4403GH



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 ⁽¹⁾ TA=25°C Derate above 25°C	P _D	225 1.8	mW mW / °C
Thermal Resistance Junction to Ambient	R _{θJA}	556	°C / W
Total Device Dissipation Alumina Substrate, ⁽²⁾ TA=25°C Derate above 25°C	P _D	300 2.4	mW mW / °C
Thermal Resistance Junction to Ambient	R _{θJA}	417	°C / W
Junction and Storage Temperature	T _J ,T _{STG}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (TA=25°C unless otherwise noted)

Characteristic	Symbol	Min.	Max.	Unit
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OFF CHARACTERISTICS

Collector-Emitter Breakdowe Voltage ⁽³⁾ (I _C = -1.0mAdc, I _B =0)	V _{(BR)CEO}	-40	-	Vdc
Collector-Base Breakdowe Voltage (I _C = -0.1 mAdc, I _E =0)	V _{(BR)CBO}	-40	-	Vdc
Emitter-Base Breakdowe Voltage (I _E = -0.1 mAdc, I _C =0)	V _{(BR)EBO}	-5.0	-	Vdc
Base Cutoff Current (V _{CE} = -35 Vdc, V _{EB} = -0.4 Vdc)	I _{BEV}	-	-0.1	Adc
Collector Cutoff Current (V _{CE} = -35 Vdc, V _{EB} = -0.4 Vdc)	I _{CEx}	-	-0.1	Adc

(1) FR-5=1.0 x 0.75 x 0.062in.

(2) Alumina=0.4 x 0.3 x 0.024in. 99.5% alumina.

(3) Pulse Test : Pulse Width 300uS, Duty Cycle 2.0%.

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

Characteristic	Symbol	Min.	Max.	Unit
ON CHARACTERISTICS⁽³⁾				
DC Current Gain ($I_C=-0.1\text{ mAdc}$, $V_{CE}=-1.0\text{ Vdc}$) ($I_C=-1.0\text{ mAdc}$, $V_{CE}=-1.0\text{ Vdc}$) ($I_C=-10\text{ mAdc}$, $V_{CE}=-1.0\text{ Vdc}$) ($I_C=-150\text{ mAdc}$, $V_{CE}=-2.0\text{ Vdc}$) ⁽³⁾ ($I_C=-500\text{ mAdc}$, $V_{CE}=-2.0\text{ Vdc}$) ⁽³⁾	HFE	30 60 100 100 20	- - - 300 -	-
Collector-Emitter Saturation Voltage ⁽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 ⁽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

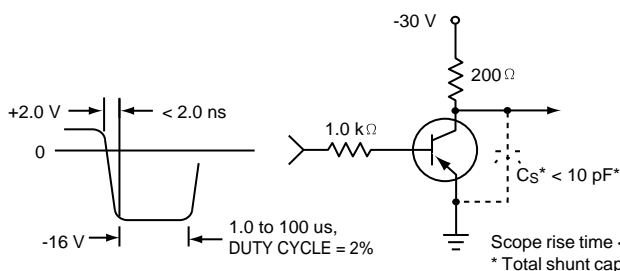
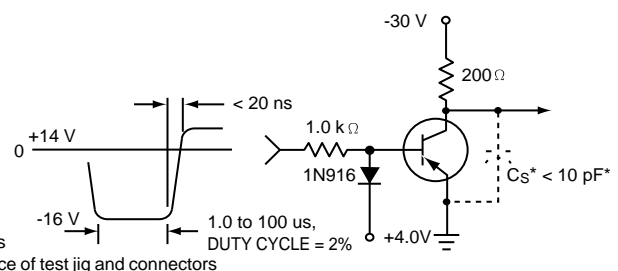
SMALL-SIGNAL CHARACTERISTIC

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

SWITCHING CHARACTERISTICS

Delay Time	($V_{CC}=-30\text{ Vdc}$, $V_{EB}=-2.0\text{ Vdc}$, $I_C=-150\text{ mAdc}$, $I_B=-15\text{ mAdc}$)	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 CIRCUITS

Figure 1. Turn-On Time

Figure 2. Turn-Off Time

TYPICAL TRANSIENT CHARACTERISTICS

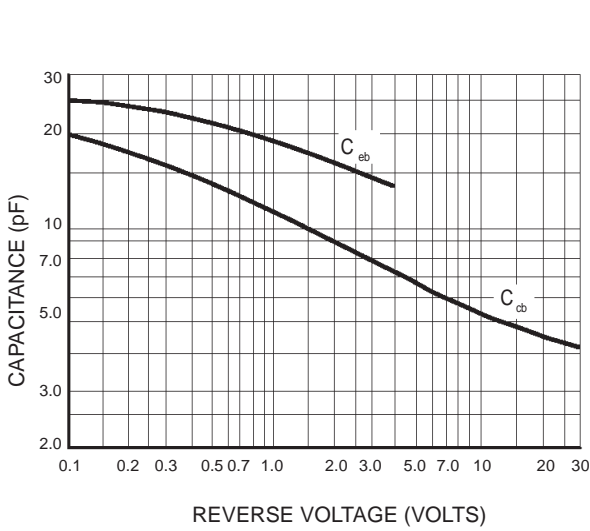


Figure 3. Capacitance

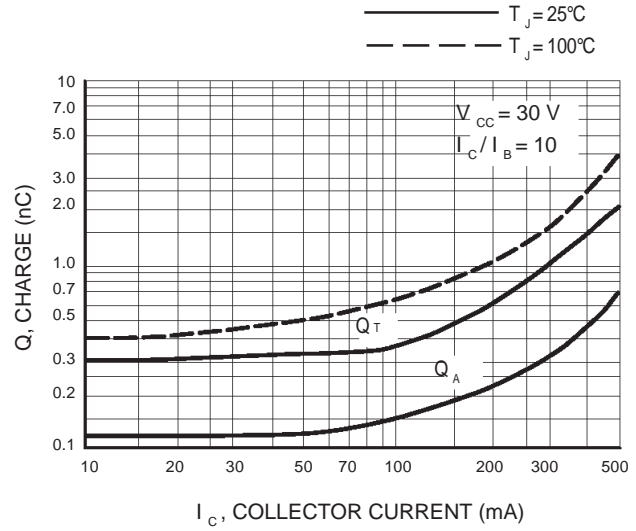


Figure 4. Charge Data

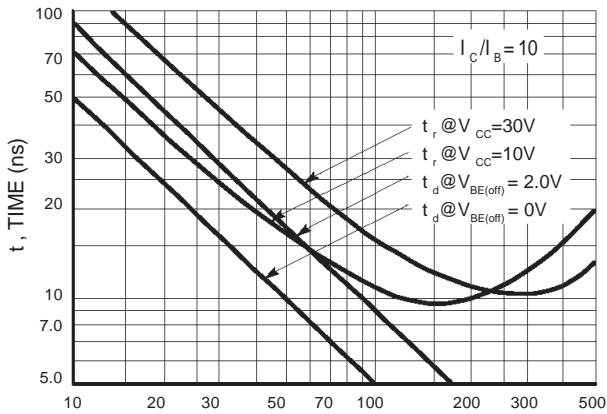


Figure 5. Turn-On Time

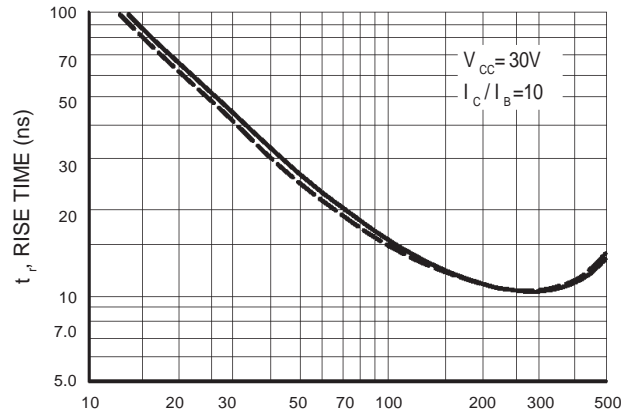


Figure 6. Rise Time

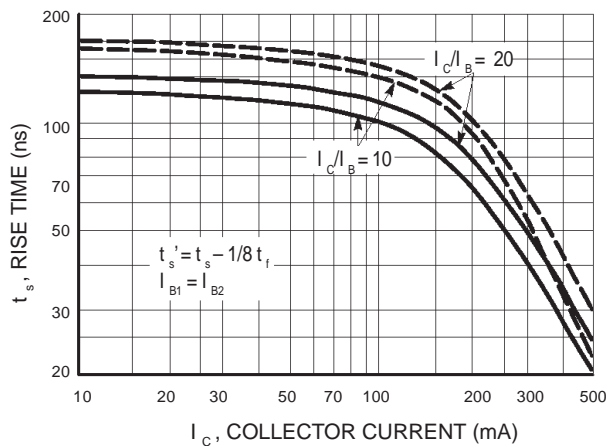


Figure 7. Storage Time

SMALL-SIGNAL CHARACTERISTICS
NOISE FIGURE

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

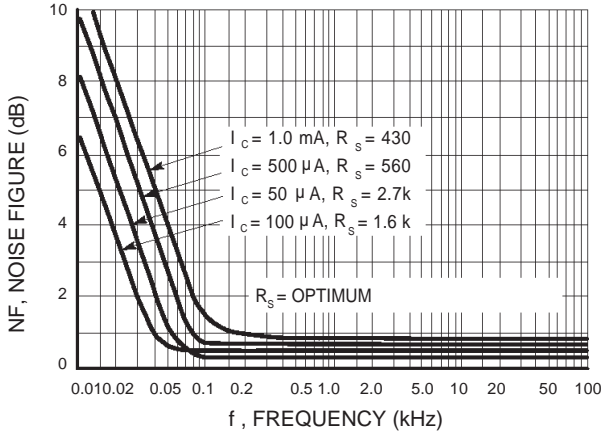


Figure 8. Frequency Effects

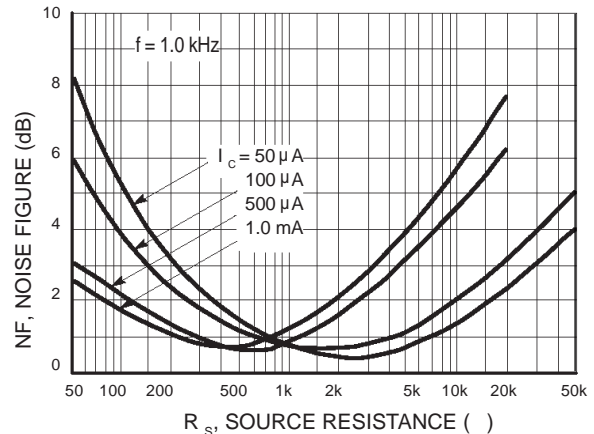


Figure 9. Source Resistance Effects

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 MMBT4401LT1 lines, and the same units were used to develop the correspondingly numbered curves on each graph.

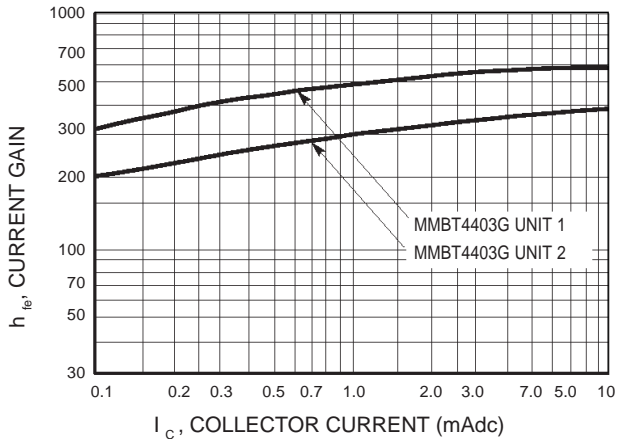


Figure 10. Current Gain

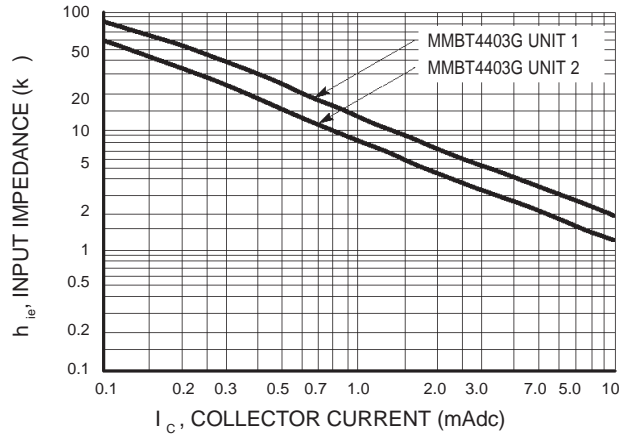


Figure 11. Input Impedance

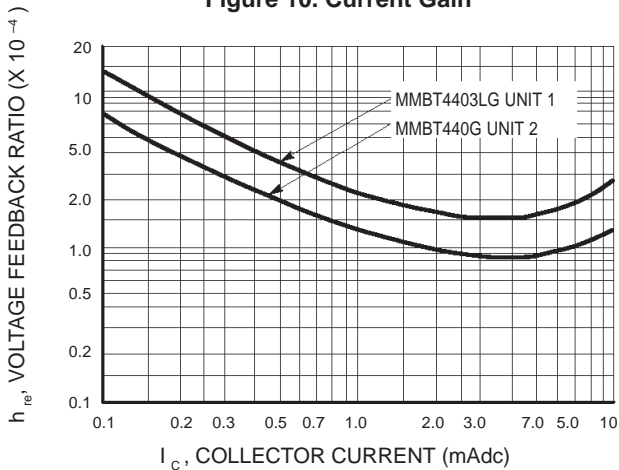


Figure 12. Voltage Feedback Ratio

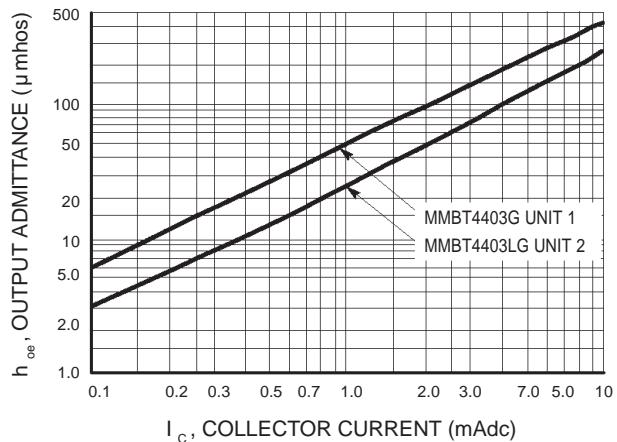


Figure 13. Output Admittance

STATIC CHARACTERISTICS

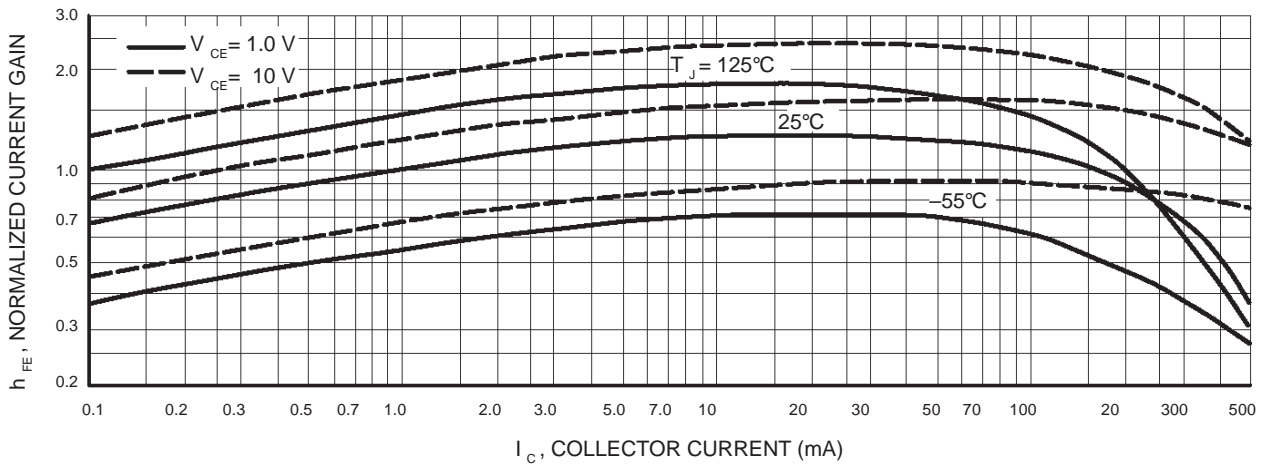


Figure 14. DC Current Gain

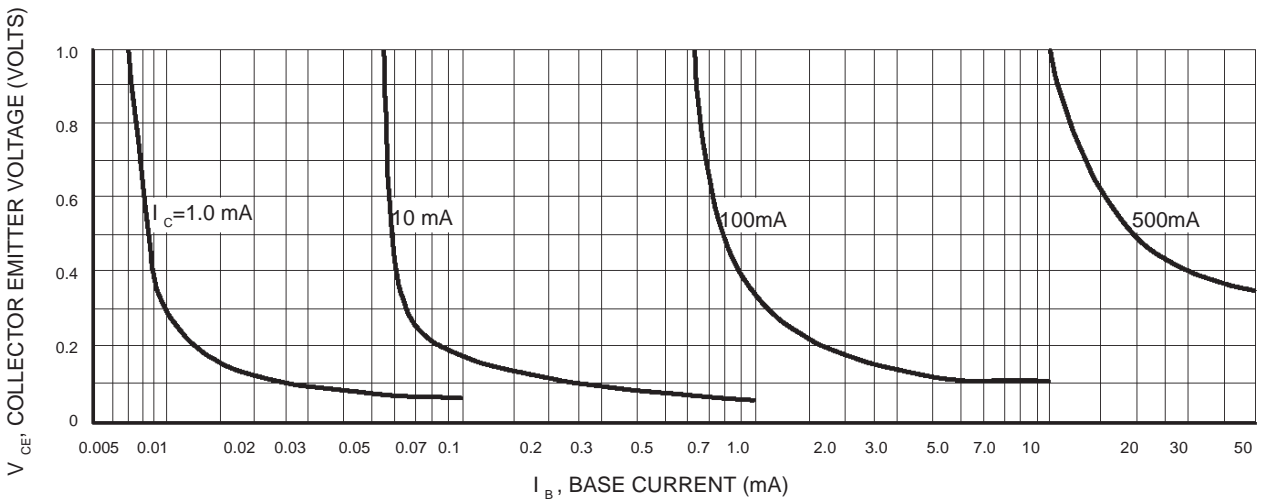


Figure 15. Collector Saturation Region

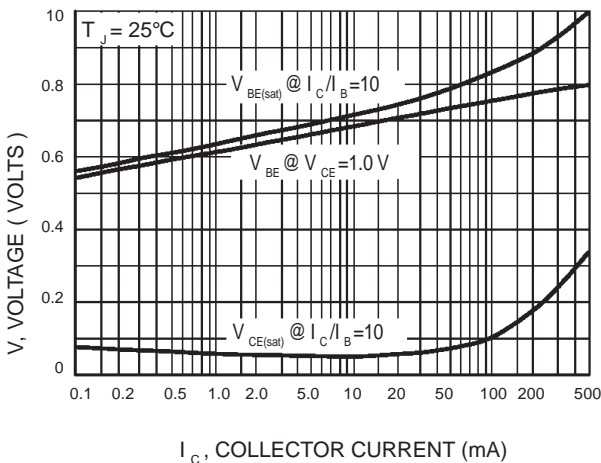


Figure 16. "On" Voltages

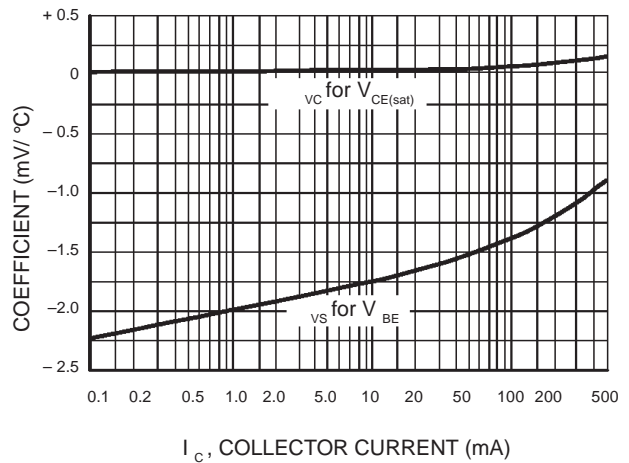


Figure 17. Temperature Coefficients