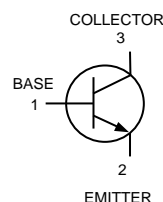
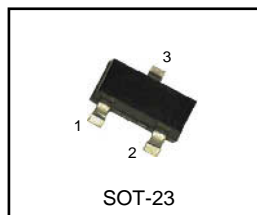


General Purpose Transistor
NPN Silicon
Halogen-free type
Lead free product

MMBT2222AGH



MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V _{CEO}	40	V _{dc}
Collector-Base Voltage	V _{CBO}	75	V _{dc}
Emitter-Base Voltage	V _{EBO}	6.0	V _{dc}
Collector Current-Continuous	I _C	600	mA _{dc}

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max.	Unit
Total Device Dissipation FR-5 Board ⁽¹⁾ T _A =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⁾ T _A =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 (T_A=25°C unless otherwise noted)

Characteristic	Symbol	Min.	Max.	Unit
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OFF CHARACTERISTICS

Collector-Emitter Breakdowe Voltage (I _C =10mA _{dc} , I _B =0)	V _{(BR)CEO}	40	-	V _{dc}
Collector-Emitter Breakdowe Voltage (I _C =10μA _{dc} , I _E =0)	V _{(BR)CBO}	75	-	V _{dc}
Emitter - Base Breakdowe Voltage (I _E =10 μA _{dc} , I _C =0)	V _{(BR)EBO}	6.0	-	V _{dc}
Collector Cutoff Current (V _{CE} =60 V _{dc} , V _{EB (off)} =3.0 V _{dc})	I _{CEX}	-	10	nA _{dc}
Collector Cutoff Current (V _{CB} =60 V _{dc} , I _E =0) (V _{CB} =60 V _{dc} , I _E =0, T _A =125°C)	I _{CBO}	- -	0.01 10	uA _{dc}
Emitter Cutoff Current (V _{EB} =3.0 V _{dc} , I _C =0)	I _{EBO}	-	100	nA _{dc}
Base Cutoff Current (V _{CE} =60 V, V _{EB (off)} =3.0 V _{dc})	I _{BL}	-	20	nA _{dc}

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

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

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

Characteristic	Symbol	Min.	Max.	Unit
ON CHARACTERISTICS⁽³⁾				
DC Current Gain ($I_C=0.1\text{ mAdc}$, $V_{CE}=10\text{ Vdc}$) ($I_C=1.0\text{ mAdc}$, $V_{CE}=10\text{ Vdc}$) ($I_C=10\text{ mAdc}$, $V_{CE}=10\text{ Vdc}$) ($I_C=10\text{ mAdc}$, $V_{CE}=10\text{ Vdc}$, $T_A=-55^{\circ}\text{C}$) ($I_C=150\text{ mAdc}$, $V_{CE}=10\text{ Vdc}$) ⁽³⁾ ($I_C=150\text{ mAdc}$, $V_{CE}=1.0\text{ Vdc}$) ⁽³⁾ ($I_C=500\text{ mAdc}$, $V_{CE}=10\text{ Vdc}$) ⁽³⁾	HFE	35 50 75 35 100 50 40	- - - - 300 - -	-
Collector-Emitter Saturation Voltage ⁽³⁾ ($I_C=150\text{ mAdc}$, $I_B=15\text{ mAdc}$) ($I_C=500\text{ mAdc}$, $I_B=50\text{ mAdc}$)	$V_{CE(sat)}$	- -	0.3 1.0	Vdc
Base-Emitter Saturation Voltage ⁽³⁾ ($I_C=150\text{ mAdc}$, $I_B=15\text{ mAdc}$) ($I_C=500\text{ mAdc}$, $I_B=50\text{ mAdc}$)	$V_{BE(sat)}$	0.6 -	1.2 2.0	Vdc

SMALL-SIGNAL CHARACTERISTIC

Current-Gain-Bandwidth Product ⁽⁴⁾ ($I_C=20\text{ mAdc}$, $V_{CE}=20\text{ Vdc}$, $f=100\text{ MHz}$)	fT	300	-	MHz
Output Capacitance ($V_{CB}=10\text{ Vdc}$, $I_E=0$, $f=1.0\text{ MHz}$)	Cobo	-	8.0	pF
Input Capacitance ($V_{EB}=0.5\text{ Vdc}$, $I_C=0$, $f=1.0\text{ MHz}$)	Cibo	-	25	pF
Input Impedance ($V_{CE}=10\text{ Vdc}$, $I_C=1.0\text{ mAdc}$, $f=1.0\text{ kHz}$) ($V_{CE}=10\text{ Vdc}$, $I_C=10\text{ mAdc}$, $f=1.0\text{ kHz}$)	hie	2.0 0.25	8.0 1.25	k ohms
Voltage Feedback Ratio ($V_{CE}=10\text{ Vdc}$, $I_C=1.0\text{ mAdc}$, $f=1.0\text{ kHz}$) ($V_{CE}=10\text{ Vdc}$, $I_C=10\text{ mAdc}$, $f=1.0\text{ kHz}$)	hre	- -	8.0 4.0	$\times 10^{-4}$
Small-Signal Current Gain ($V_{CE}=10\text{ Vdc}$, $I_C=1.0\text{ mAdc}$, $f=1.0\text{ kHz}$) ($V_{CE}=10\text{ Vdc}$, $I_C=10\text{ mAdc}$, $f=1.0\text{ kHz}$)	hfe	50 75	300 375	-
Output Admittance ($V_{CE}=10\text{ Vdc}$, $I_C=1.0\text{ mAdc}$, $f=1.0\text{ kHz}$) ($V_{CE}=10\text{ Vdc}$, $I_C=10\text{ mAdc}$, $f=1.0\text{ kHz}$)	hoe	5.0 25	35 200	u mhos
Collector Base Time Constant ($V_{CB}=10\text{ Vdc}$, $I_C=100\text{ uAdc}$, $R_s = 1.0\text{ k ohms}$, $f=1.0\text{ kHz}$)	rb, Cc	-	150	ps
Noise Figure ($V_{CE}=10\text{ Vdc}$, $I_C=100\text{ uAdc}$, $R_s=1.0\text{ k ohm}$, $f=1.0\text{ kHz}$)	NF	-	4.0	dB

SWITCHING CHARACTERISTICS

Delay Time	($V_{CC}=30\text{ Vdc}$, $V_{BE(off)} = -0.5\text{ Vdc}$, $I_C=150\text{ mAdc}$, $I_{B1} = 15\text{ mAdc}$)	td	-	10	nS
Rise Time		tr	-	25	
Storage Time	($V_{CC}=30\text{ Vdc}$, $I_C = 150\text{ mAdc}$, $I_{B1} = I_{B2} = 15\text{ mAdc}$)	ts	-	225	nS
Fall Time		tf	-	60	

(3) Pulse Test : Pulse Width $\leq 300\text{ uS}$, Duty Cycle $\leq 2.0\%$.

(2) fT is defined as the frequency at which hfe extrapolates to unity.

SWITCHING TIME EQUIVALENT TEST CIRCUITS

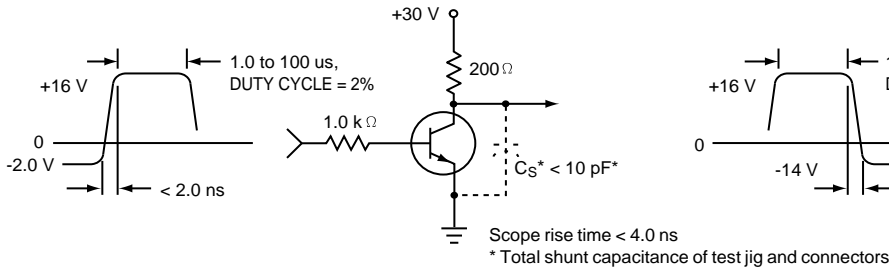


Figure 1. Turn-On Time

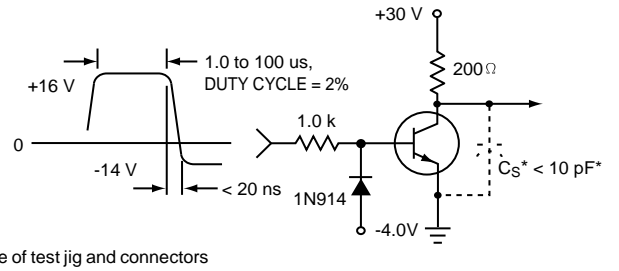


Figure 2. Turn-Off Time

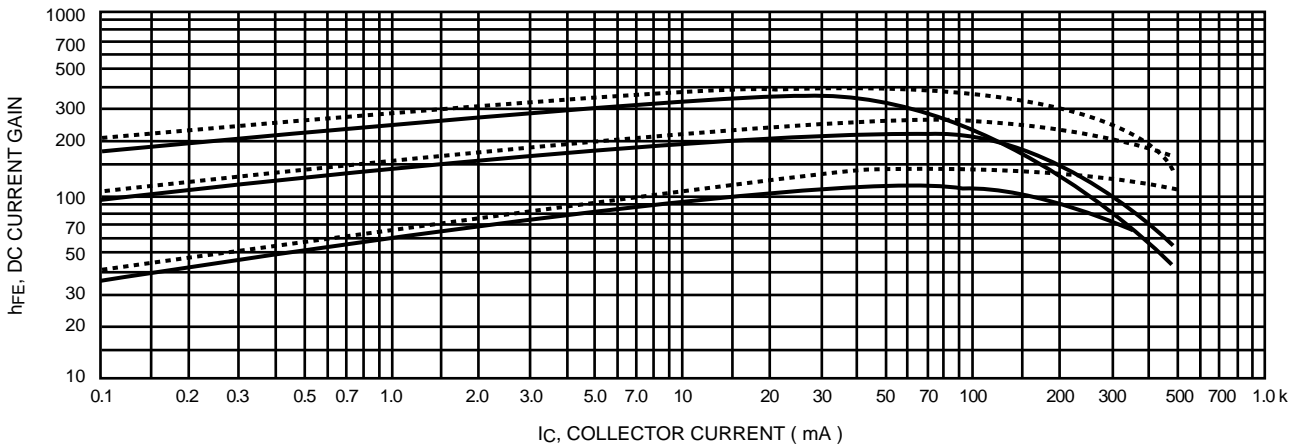


Figure 3. DC Current Gain

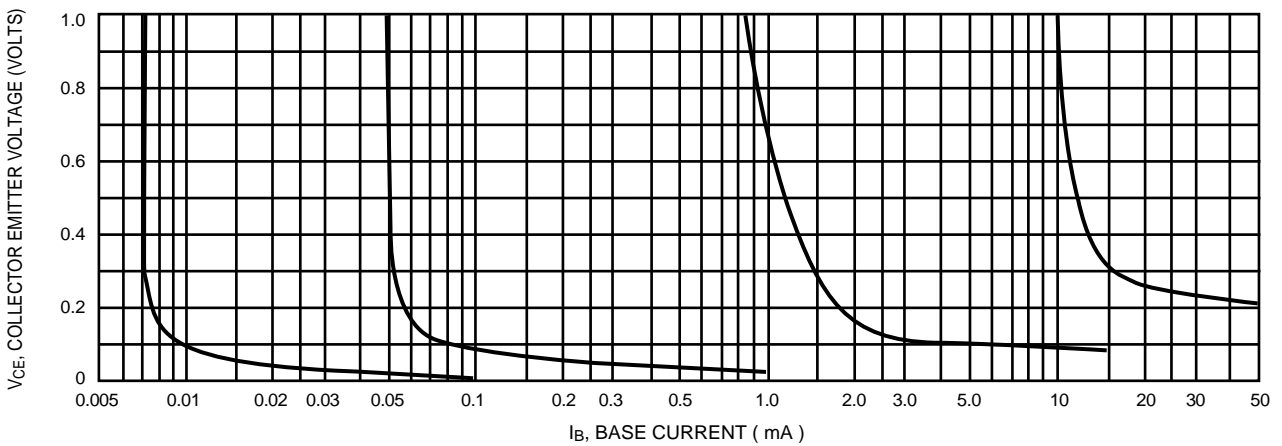
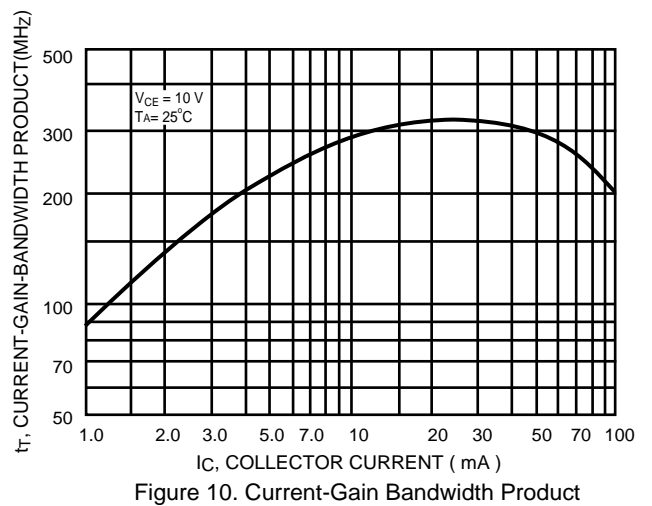
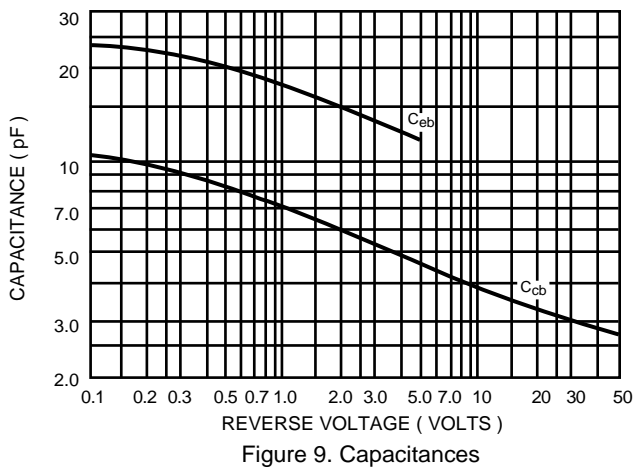
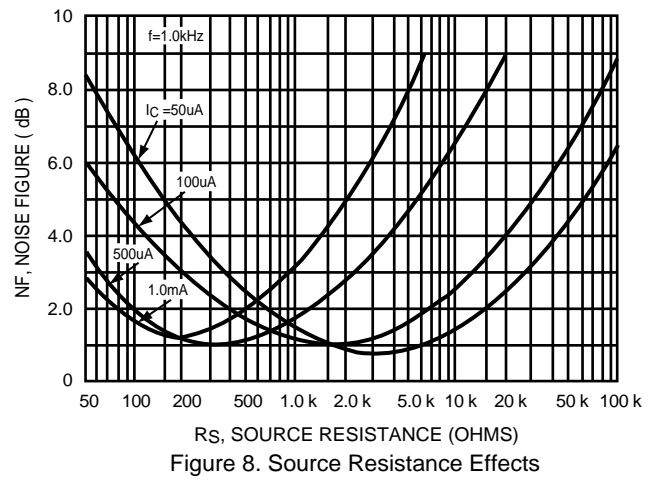
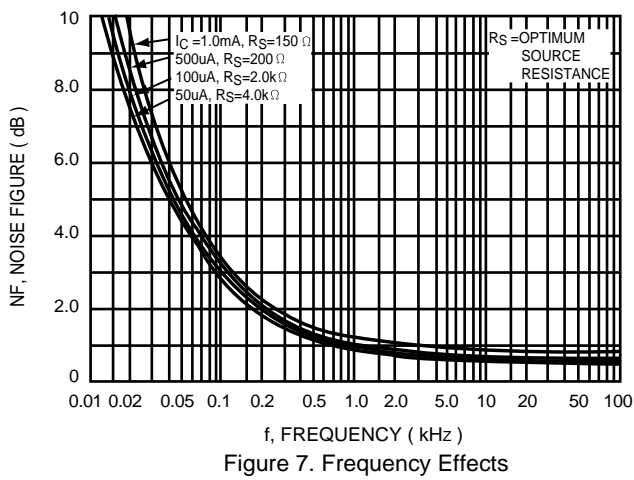
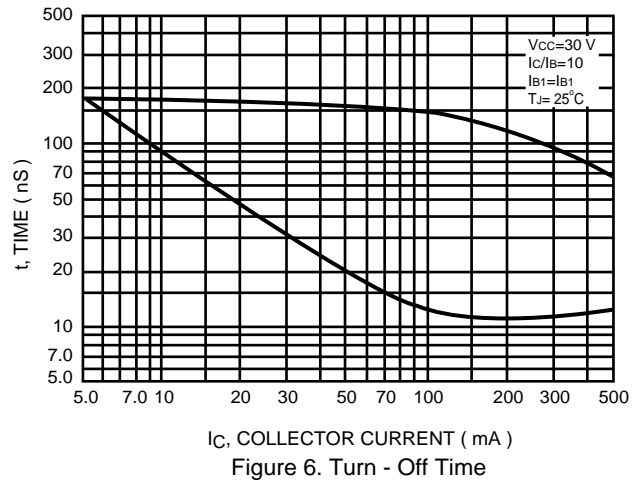
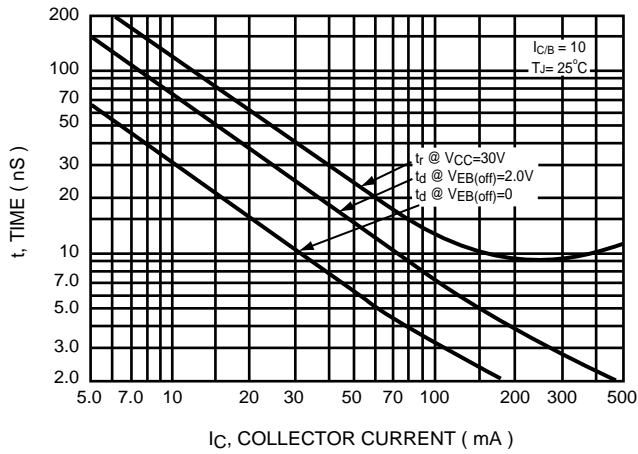


Figure 4. Collector Saturation Region



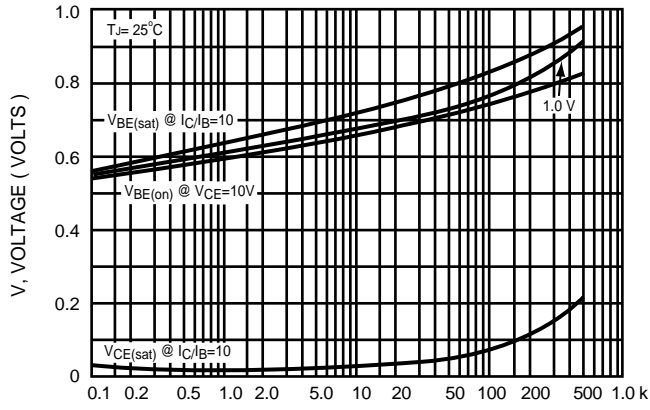


Figure 11. " On " Voltage

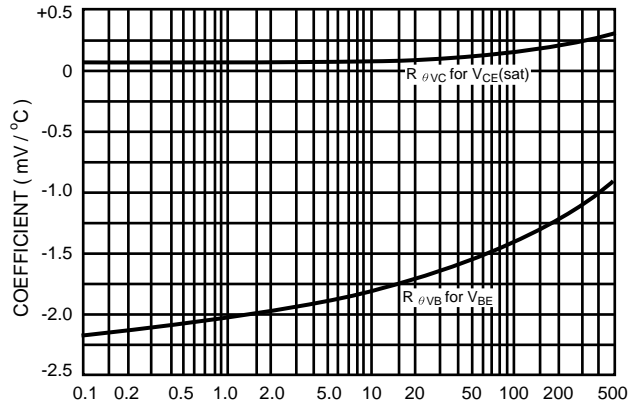


Figure 12. Temperature Coefficients