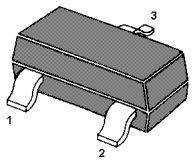
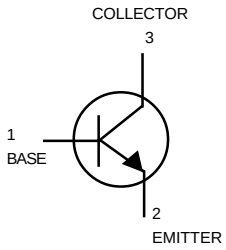
Low Noise Transistors

NPN Silicon



1.Base 2.Emitter 3.Collector
SOT-23 Plastic Package



MAXIMUM RATINGS

Rating	Symbol	5088	5089	Unit
Collector–Emitter Voltage	V_{CEO}	30	25	Vdc
Collector–Base Voltage	V_{CBO}	35	30	Vdc
Emitter–Base Voltage	V_{EBO}	4.5		Vdc
Collector Current—Continuous	I_C	50		mAdc

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation FR- 5 Board (1) T_A=25 °C	P_D	225	mW
Derate above 25 °C		1.8	mW/ °C
Thermal Resistance, 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		2.4	mW/ °C
Thermal Resistance,Junction to Ambient	$R_{\theta JA}$	417	°C/W
Junction and Storage Temperature	T_J, T_{stg}	–55 to +150	℃

DEVICE MARKING

MMBT5088 = 1Q; MMBT5089 = 1R

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

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector–Emitter Breakdown Voltage		$V_{(BR)CEO}$			Vdc
(I_C = 1.0 mAdc, I_B = 0)	MMBT5088		30	—	
	MMBT5089		25	—	
Collector–Base Breakdown Voltage		$V_{(BR)CBO}$			Vdc
(I_C = 100 µAdc, I_E = 0)	MMBT5088		35	—	
	MMBT5089		30	—	
Collector Cutoff Current		I_{CBO}			nAdc
(V_{CB} = 20 Vdc, I_E = 0)	MMBT5088		—	50	
(V_{CB} = 15 Vdc, I_E = 0)	MMBT5089		—	50	
Emitter Cutoff Current		I_{EBO}			nAdc
($V_{EB(off)}$= 3.0Vdc, I_C = 0)	MMBT5088		—	50	
($V_{EB(off)}$ = 4.5Vdc, I_C = 0)	MMBT5089		—	100	

1. FR–5 = 1.0 x 0.75 x 0.062 in.
2. Alumina = 0.4 x 0.3 x 0.024 in. 99.5% alumina.

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted) (Continued)

Characteristic		Symbol	Min	Max	Unit
ON CHARACTERISTICS					
DC Current Gain		h_{FE}			—
(I_C=100μAdc,V_{CE}=5.0Vdc)	MMBT5088		300	900	
	MMBT5089		400	1200	
(I_C=1.0mAdc,V_{CE}=5.0Vdc)	MMBT5088		350	—	
	MMBT5089		450	—	
(I_C = 10mAdc, V_{CE}=5.0Vdc)	MMBT5088		300	—	
	MMBT5089		400	—	
Collector–Emitter Saturation Voltage		$V_{CE(sat)}$			Vdc
(I_C=10mAdc,I_B=1.0mAdc)			—	0.5	
Base–Emitter Saturation Voltage		$V_{BE(sat)}$			Vdc
(I_C =10mAdc,I_B=1.0mAdc)			—	0.8	
SMALL–SIGNAL CHARACTERISTICS					
Current–Gain — Bandwidth Product		f_T			MHz
(I_C= 500 μAdc,V_{CE}=5.0Vdc,f=20MHz)			50	—	
Collector–Base Capacitance		C_{cb}			pF
(V_{CB}=5.0Vdc,I_E=0,f=1.0MHz emitter guarded)			—	4.0	
Emitter–Base Capacitance		C_{eb}			pF
(V_{EB}=0.5Vdc,I_C=0,f=1.0MHz collector guarded)			—	10	
Small Signal Current Gain		h_{fe}			—
(I_C=1.0mAdc,V_{CE}=5.0Vdc,f=1.0kHz)	MMBT5088		350	1400	
	MMBT5089		450	1800	
Noise Figure		NF			dB
(I_C=100μAdc,V_{CE}=5.0Vdc, R_S=10kΩ,f=1.0kHz)	MMBT5088		—	3.0	
	MMBT5089		—	2.0	

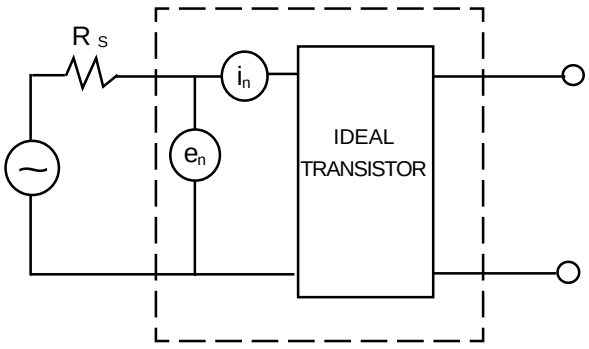
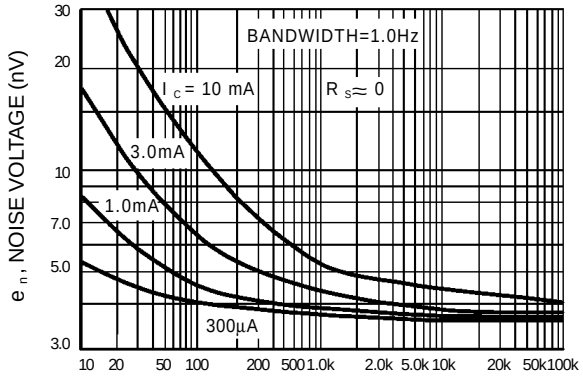


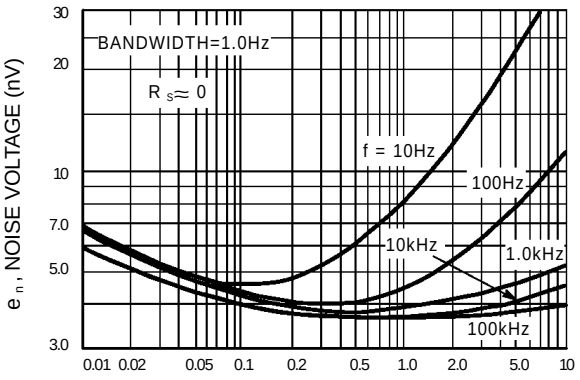
Figure 1.Transistor Noise Model

Typical Characteristics



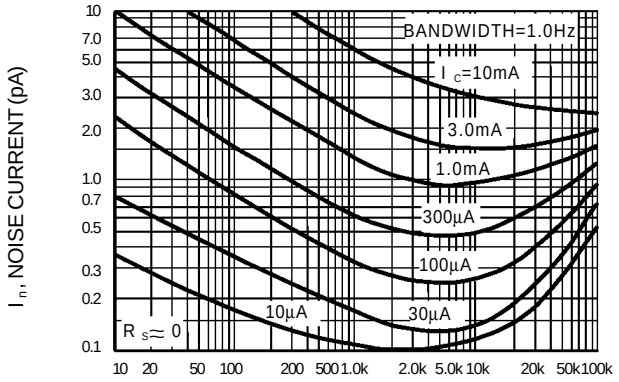
f, FREQUENCY (Hz)

Figure 2. Effects of Frequency



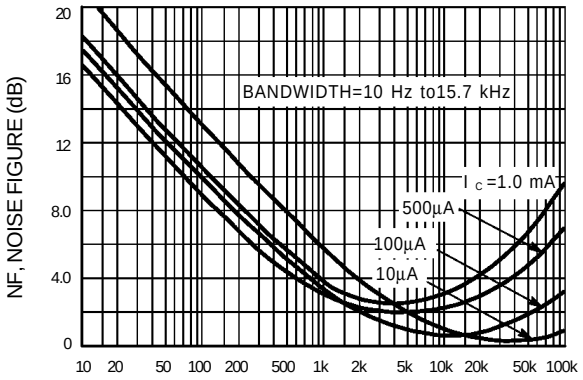
I C, COLLECTOR CURRENT (mA)

Figure 3. Effects of Collector Current



f, FREQUENCY (Hz)

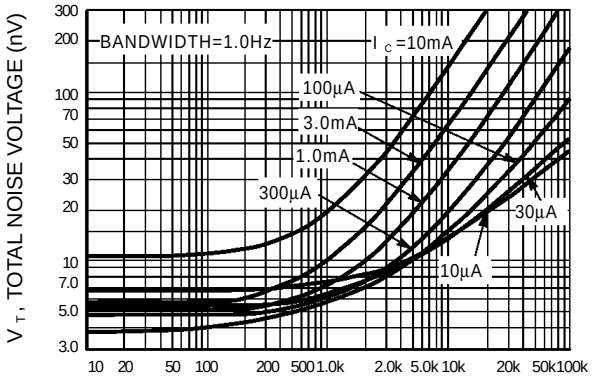
Figure 4. Noise Current



R S, SOURCE RESISTANCE (OHMS)

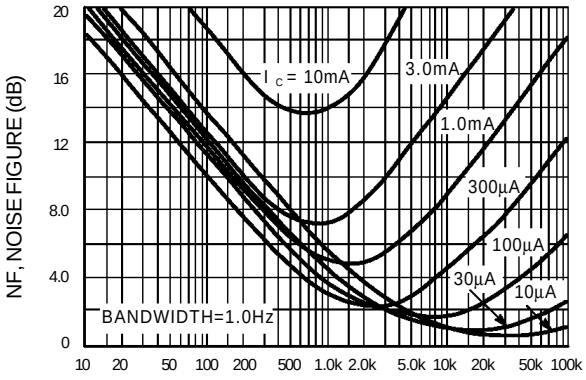
Figure 5. Wideband Noise Figure

100 Hz NOISE DATA



R S, SOURCE RESISTANCE (OHMS)

Figure 6. Total Noise Voltage



R S, SOURCE RESISTANCE (OHMS)

Figure 7. Noise Figure

Typical Characteristics

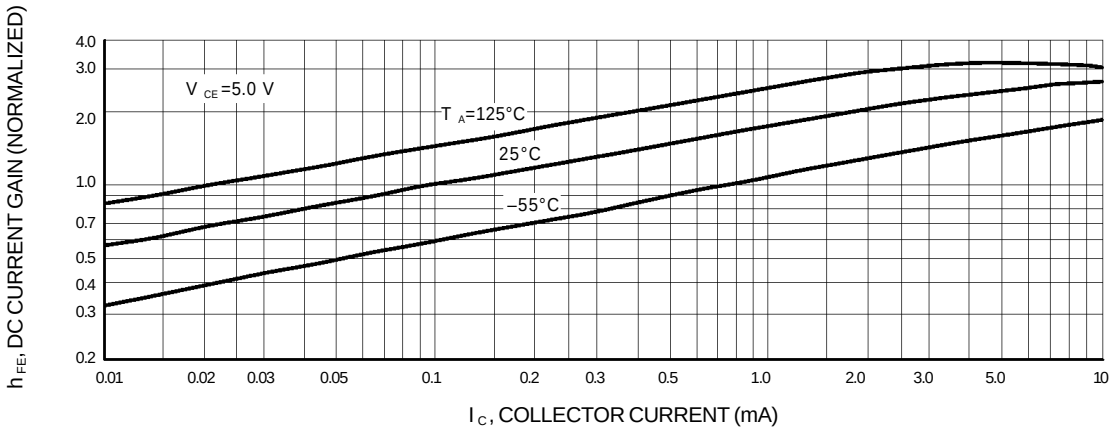


Figure 8. DC Current Gain

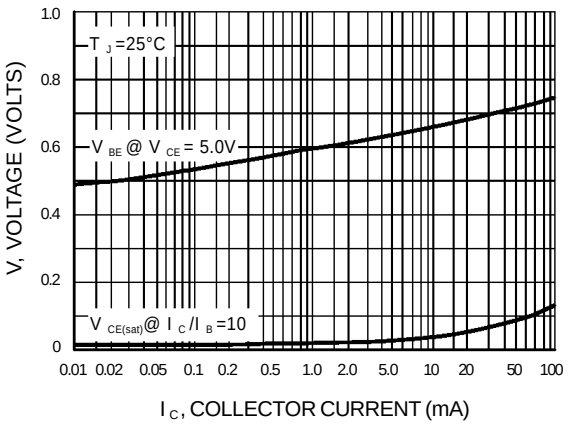


Figure 9. “On” Voltages

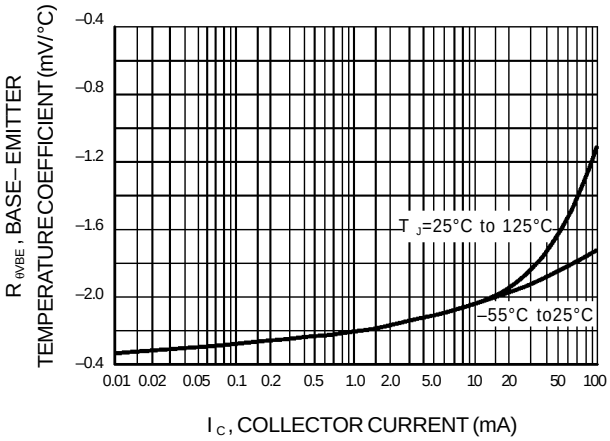


Figure 10. Temperature Coefficients

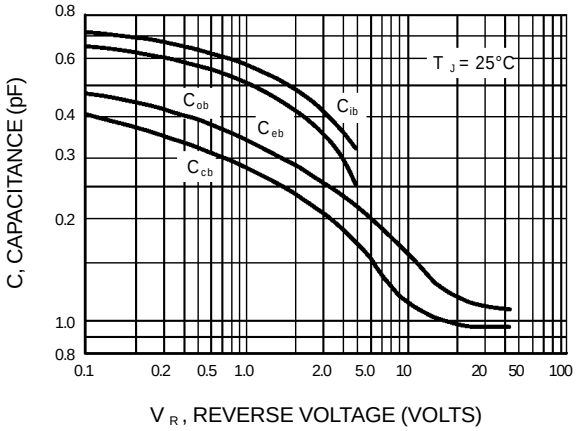


Figure 11. Capacitance

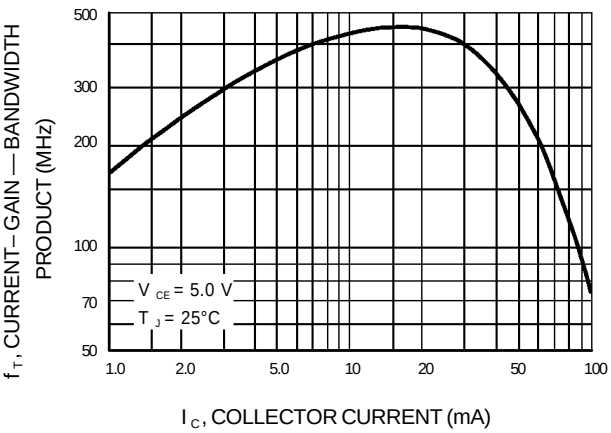


Figure 12. Current–Gain — Bandwidth Product