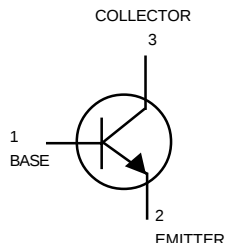
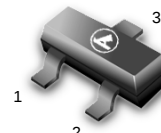


Low Noise Transistors

NPN Silicon



MMBT5088LT1
MMBT5089LT1



CASE 318-08, STYLE 6
SOT-23 (TO-236AB)

MAXIMUM RATINGS

Rating	Symbol	5088LT	15089LT1	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) $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	225 1.8	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	556	$^\circ\text{C/W}$
Total Device Dissipation Alumina Substrate, (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	$^\circ\text{C/W}$
Junction and Storage Temperature	T_J, T_{stg}	-55 to $+150$	$^\circ\text{C}$

DEVICE MARKING

MMBT5088LT1 = 1Q; MMBT5089LT1 = 1R

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

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

1. FR-5 = $1.0 \times 0.75 \times 0.062$ in.

2. Alumina = $0.4 \times 0.3 \times 0.024$ in. 99.5% alumina.

MMBT5088LT1 PNP MMBT5089LT1

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

Characteristic	Symbol	Min	Max	Unit	
ON CHARACTERISTICS					
DC Current Gain (I _C =100μAdc, V _{CE} =5.0Vdc)	h _{FE}	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 (I _C =10mAdc, I _B =1.0mAdc)	V _{CE(sat)}	—	0.5	Vdc	
Base–Emitter Saturation Voltage (I _C =10mAdc, I _B =1.0mAdc)	V _{BE(sat)}	—	0.8	Vdc	
SMALL–SIGNAL CHARACTERISTICS					
Current–Gain — Bandwidth Product (I _C = 500 μAdc, V _{CE} =5.0Vdc, f=20MHz)	f _T	50	—	MHz	
Collector–Base Capacitance (V _{CB} =5.0Vdc, I _E =0, f=1.0MHz emitter guarded)	C _{cb}	—	4.0	pF	
Emitter–Base Capacitance (V _{EB} =0.5Vdc, I _C =0, f=1.0MHz collector guarded)	C _{eb}	—	10	pF	
Small Signal Current Gain (I _C =1.0mAdc, V _{CE} =5.0Vdc, f=1.0kHz)	h _{fe}	MMBT5088	350	1400	—
		MMBT5089	450	1800	
Noise Figure (I _C =100μAdc, V _{CE} =5.0Vdc, R _S =10κΩ, f=1.0kHz)	N _F	MMBT5088	—	3.0	dB
		MMBT5089	—	2.0	

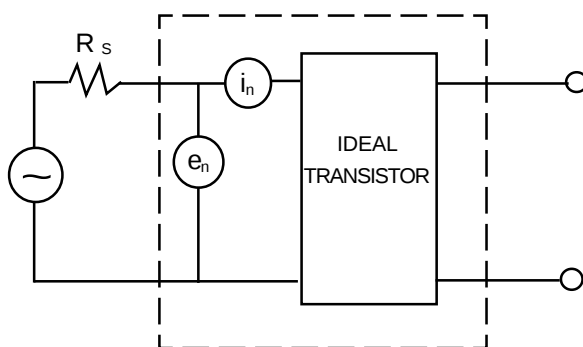


Figure 1. Transistor Noise Model

MMBT5088LT1 MMBT5089LT1

NOISE CHARACTERISTICS

($V_{CE} = 5.0 \text{ Vdc}$, $T_A = 25^\circ\text{C}$)

NOISE VOLTAGE

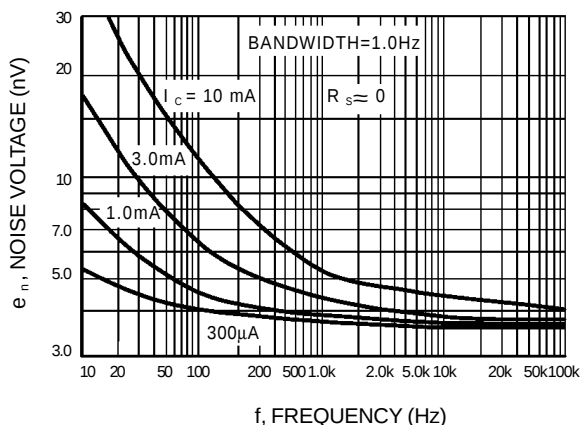


Figure 2. Effects of Frequency

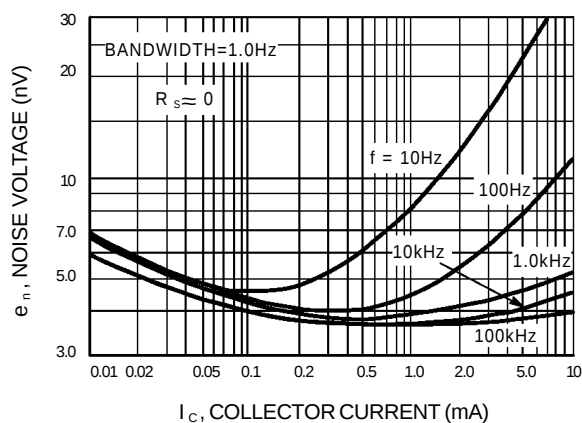


Figure 3. Effects of Collector Current

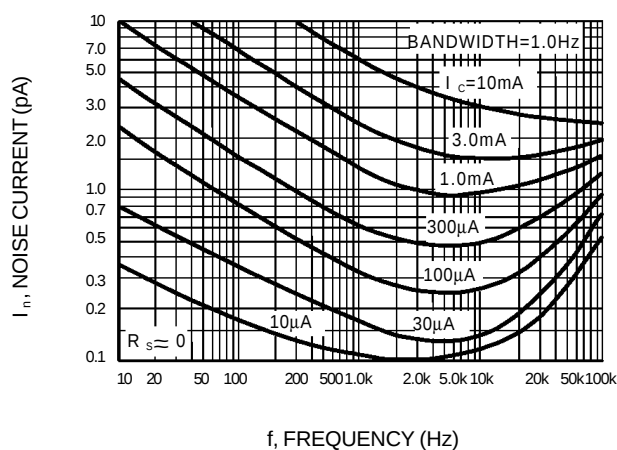


Figure 4. Noise Current

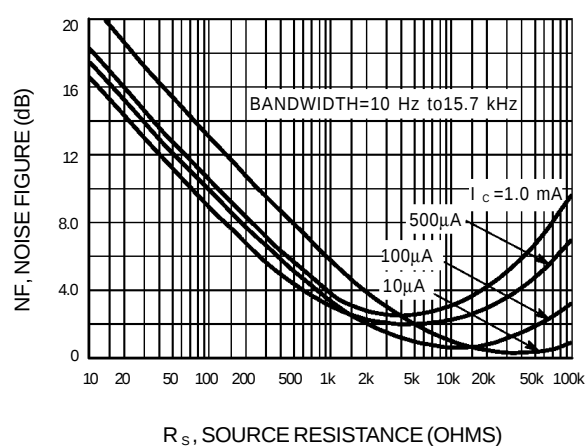


Figure 5. Wideband Noise Figure

100 Hz NOISE DATA

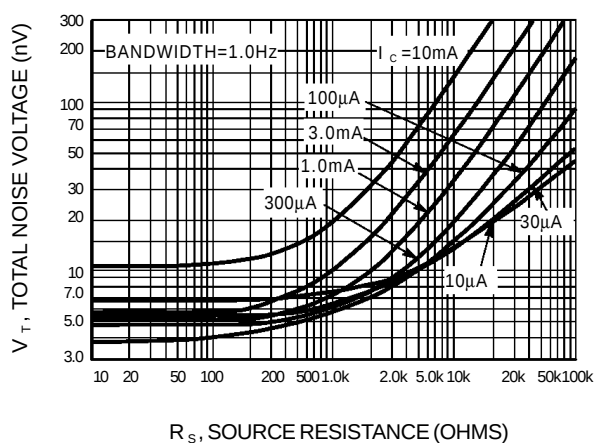


Figure 6. Total Noise Voltage

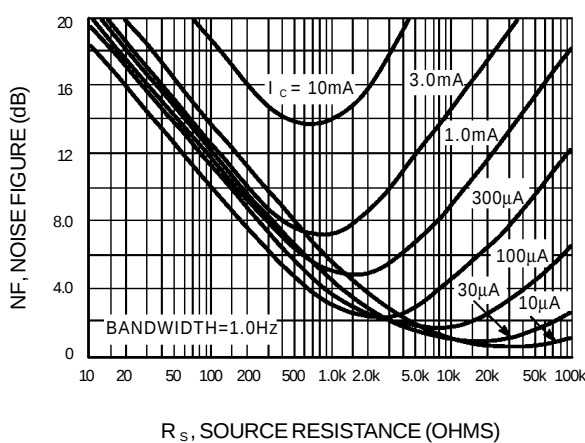


Figure 7. Noise Figure

MMBT5088LT1 MMBT5089LT1

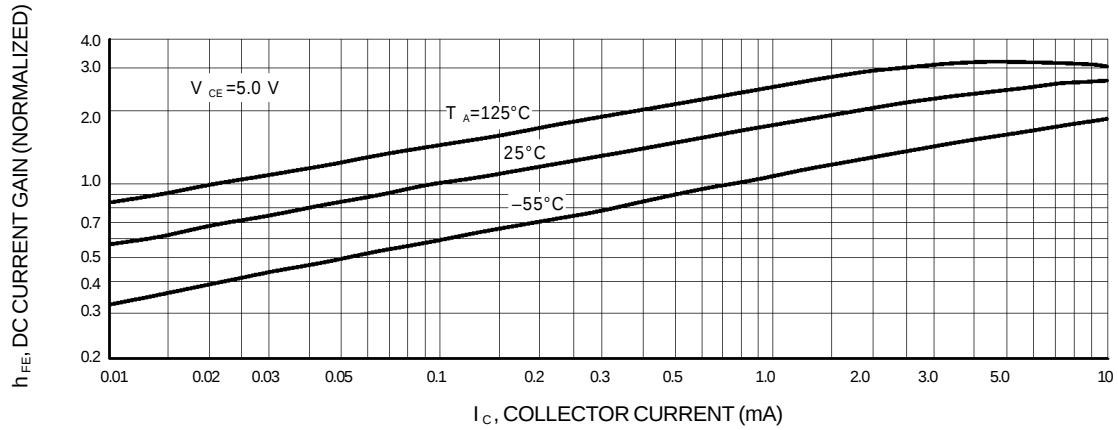


Figure 8. DC Current Gain

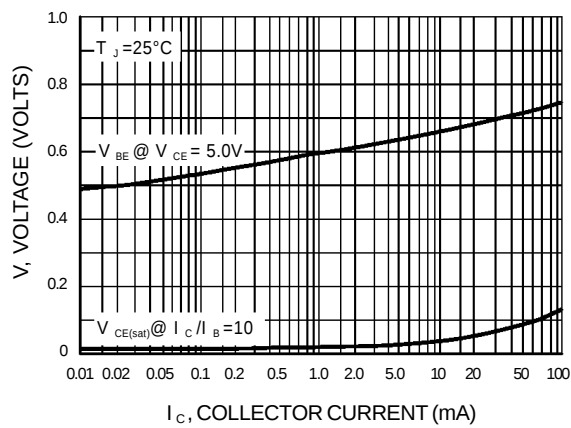


Figure 9. "On" Voltages

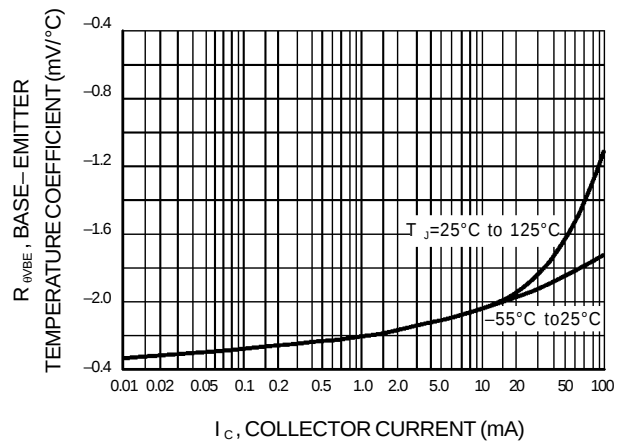


Figure 10. Temperature Coefficients

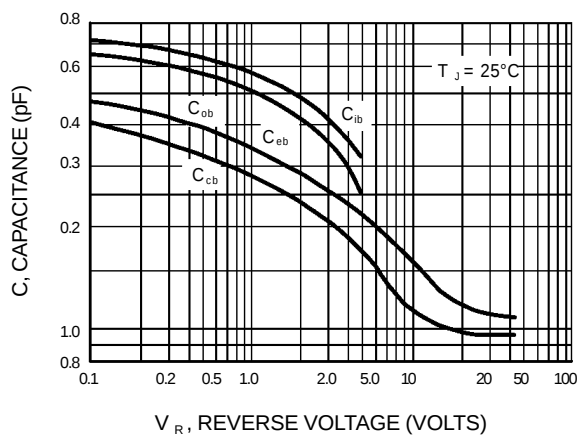


Figure 11. Capacitance

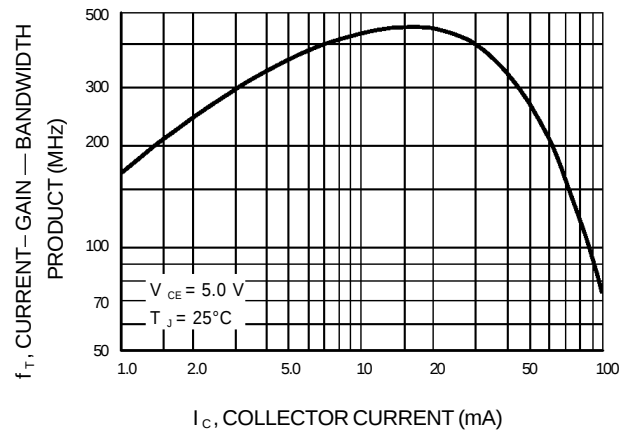


Figure 12. Current-Gain — Bandwidth Product