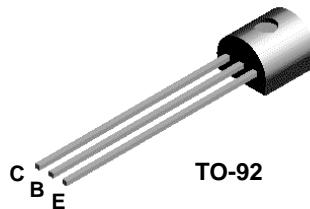
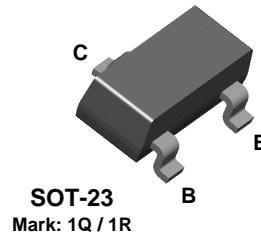




2N5088 2N5089



MMBT5088 MMBT5089



NPN General Purpose Amplifier

This device is designed for low noise, high gain, general purpose amplifier applications at collector currents from 1 μ A to 50 mA.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	2N5088 2N5089	30 25
			V
V_{CBO}	Collector-Base Voltage	2N5088 2N5089	35 30
			V
V_{EBO}	Emitter-Base Voltage	4.5	V
I_C	Collector Current - Continuous	100	mA
T_J , T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:

- 1) These ratings are based on a maximum junction temperature of 150 degrees C.
- 2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max		Units
		2N5088 2N5089	*MMBT5088 *MMBT5089	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	350 2.8	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3		°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	357	°C/W

*Device mounted on FR-4 PCB 1.6" X 1.6" X 0.06."

NPN General Purpose Amplifier

(continued)

Electrical Characteristics

TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
V _{(BR)CEO}	Collector-Emitter Breakdown Voltage*	I _C = 1.0 mA, I _B = 0	5088 5089	30 25	V V
V _{(BR)CBO}	Collector-Base Breakdown Voltage	I _C = 100 µA, I _E = 0	5088 5089	35 30	V V
I _{CBO}	Collector Cutoff Current	V _{CB} = 20 V, I _E = 0 V _{CB} = 15 V, I _E = 0	5088 5089	50 50	nA nA
I _{EBO}	Emitter Cutoff Current	V _{EB} = 3.0 V, I _C = 0 V _{EB} = 4.5 V, I _C = 0		50 100	nA nA
ON CHARACTERISTICS					
h _{FE}	DC Current Gain	I _C = 100 µA, V _{CE} = 5.0 V	5088 5089	300 400	900 1200
		I _C = 1.0 mA, V _{CE} = 5.0 V	5088 5089	350 450	
		I _C = 10 mA, V _{CE} = 5.0 V*	5088 5089	300 400	
V _{CE(sat)}	Collector-Emitter Saturation Voltage	I _C = 10 mA, I _B = 1.0 mA		0.5	V
V _{BE(on)}	Base-Emitter On Voltage	I _C = 10 mA, V _{CE} = 5.0 V		0.8	V
SMALL SIGNAL CHARACTERISTICS					
f _T	Current Gain - Bandwidth Product	I _C = 500 µA, V _{CE} = 5.0 mA, f = 20 MHz		50	MHz
C _{cb}	Collector-Base Capacitance	V _{CB} = 5.0 V, I _E = 0, f = 100 kHz		4.0	pF
C _{eb}	Emitter-Base Capacitance	V _{BE} = 0.5 V, I _C = 0, f = 100 kHz		10	pF
h _{fe}	Small-Signal Current Gain	I _C = 1.0 mA, V _{CE} = 5.0 V, f = 1.0 kHz	5088 5089	350 450	1400 1800
NF	Noise Figure	I _C = 100 µA, V _{CE} = 5.0 V, R _S = 10 kΩ, f = 10 Hz to 15.7 kHz	5088 5089	3.0 2.0	dB dB

*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

Spice Model

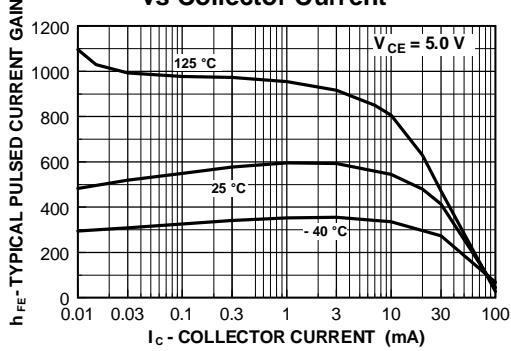
NPN (Is=5.911f Xti=3 Eg=1.11 Vaf=62.37 Bf=1.122K Ne=1.394 Ise=5.911f Ikf=14.92m Xtb=1.5 Br=1.271 Nc=2
 Isc=0 Ikr=0 Rc=1.61 Cjc=4.017p Mjc=.3174 Vjc=.75 Fc=.5 Cje=4.973p Mje=.4146 Vje=.75 Tr=4.673n Tf=821.7p
 Itf=.35 Vtf=4 Xtf=7 Rb=10)

NPN General Purpose Amplifier

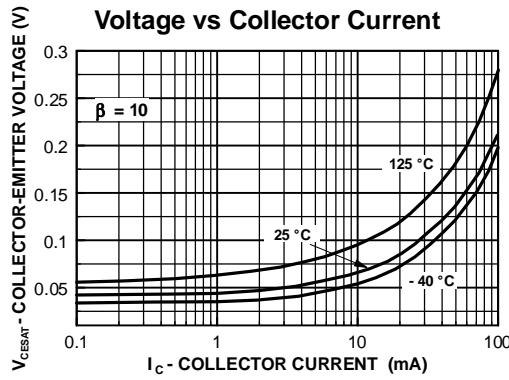
(continued)

Typical Characteristics

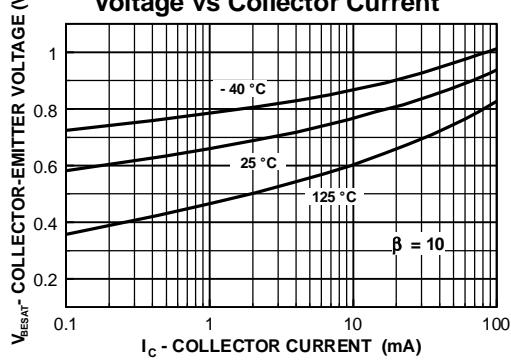
**Typical Pulsed Current Gain
vs Collector Current**



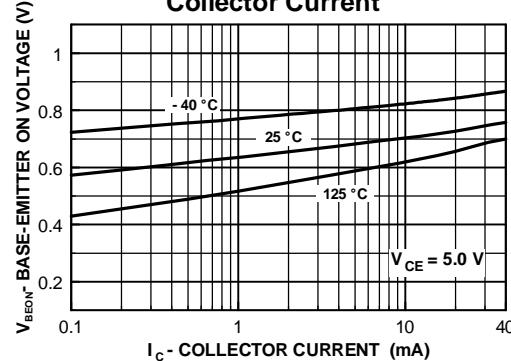
**Collector-Emitter Saturation
Voltage vs Collector Current**



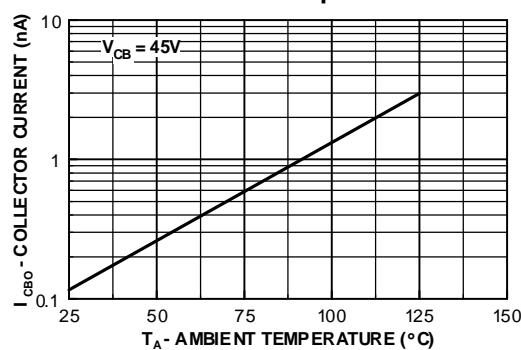
**Base-Emitter Saturation
Voltage vs Collector Current**



**Base-Emitter ON Voltage vs
Collector Current**



**Collector-Cutoff Current
vs Ambient Temperature**

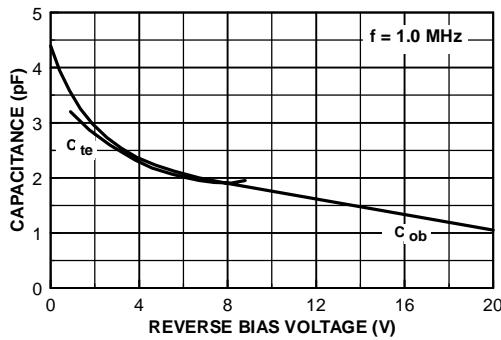


NPN General Purpose Amplifier

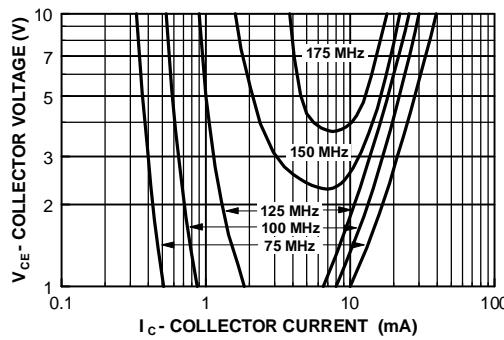
(continued)

Typical Characteristics (continued)

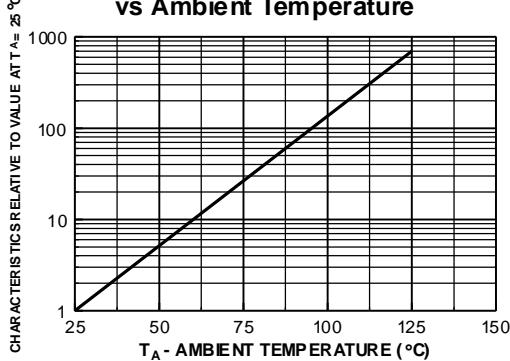
Input and Output Capacitance vs Reverse Bias Voltage



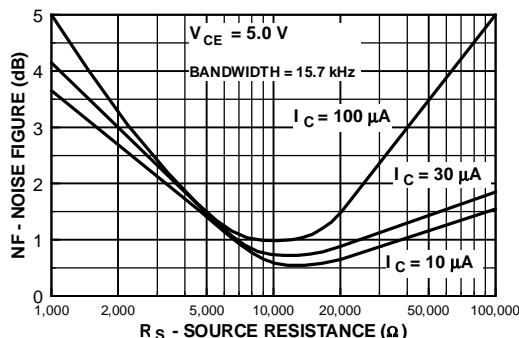
Contours of Constant Gain Bandwidth Product (f_T)



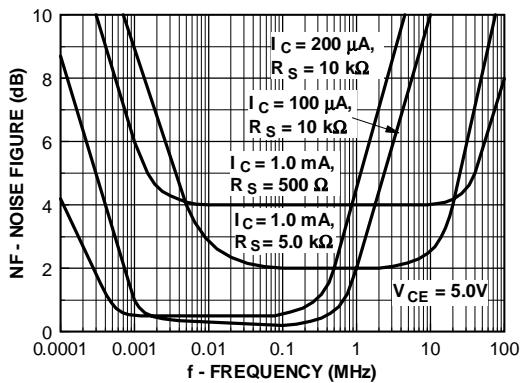
Normalized Collector-Cutoff Current vs Ambient Temperature



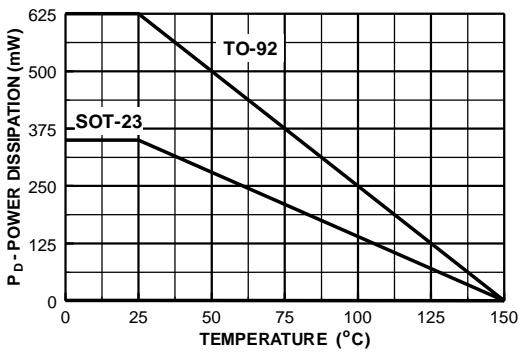
Wideband Noise Frequency vs Source Resistance



Noise Figure vs Frequency



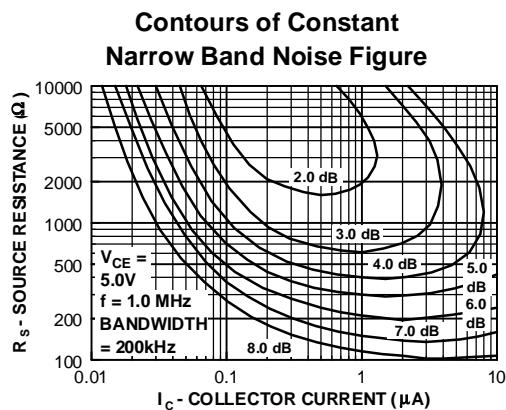
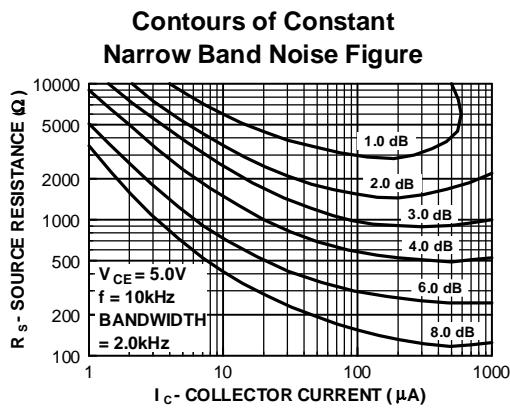
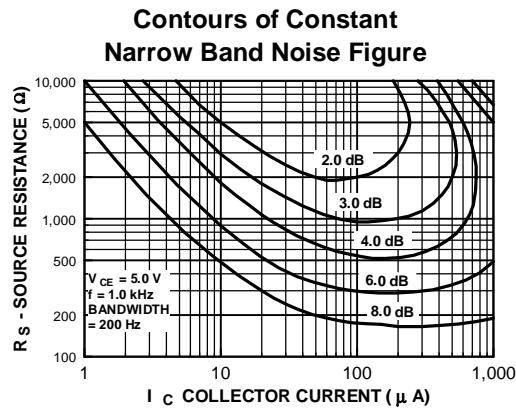
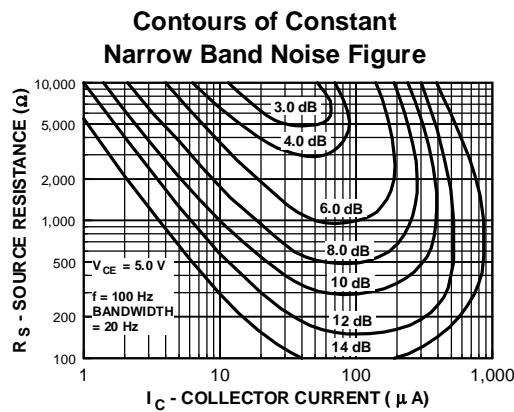
Power Dissipation vs Ambient Temperature

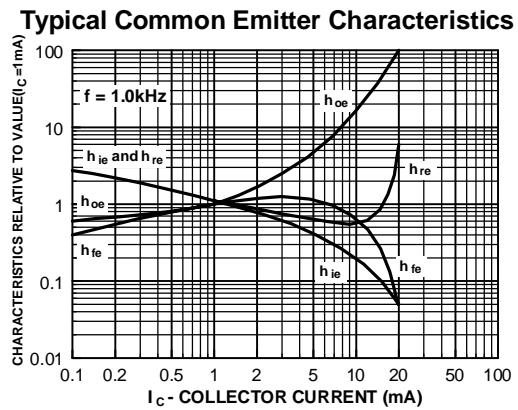
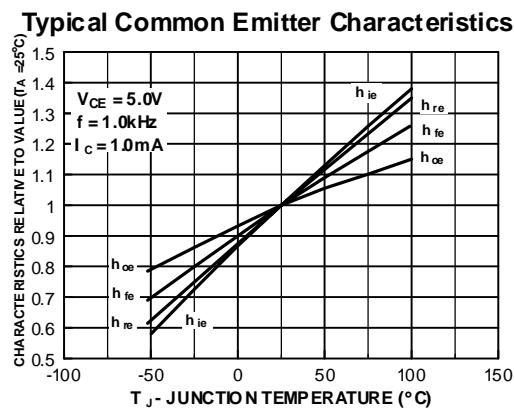
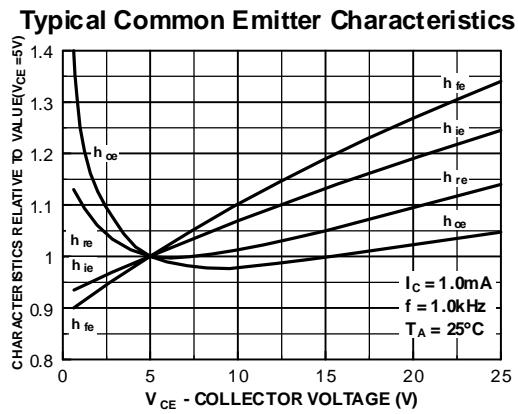


NPN General Purpose Amplifier

(continued)

Typical Characteristics (continued)



NPN General Purpose Amplifier
(continued)**Typical Common Emitter Characteristics** ($f = 1.0 \text{ kHz}$)

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EnSigna™	OPTOLOGIC™	SMART START™	
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