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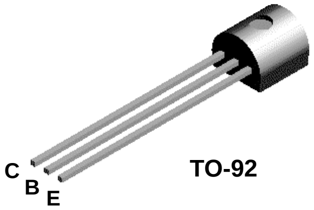
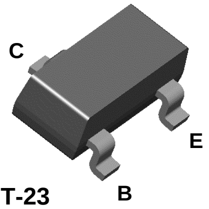
2N5088 2N5089 MMBT5088 MMBT5089



TO-92



SOT-23
Mark: 1Q / 1R

NPN General Purpose Amplifier

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

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter		Value	Units
V_{CEO}	Collector-Emitter Voltage	**2N5088**	30	V
		2N5089	25	V
V_{CBO}	Collector-Base Voltage	**2N5088**	35	V
		2N5089	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."

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Electrical Characteristics

TA = 25°C unless otherwise noted

OFF CHARACTERISTICS

Symbol	Parameter	Test Conditions	Min	Max	Units
$V_{(BR)CEO}$	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 **5088** V_{CB} = 15 V, I_E = 0 **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

Symbol	Parameter	Test Conditions	Min	Max	Units
h_{FE}	DC Current Gain	I_C = 100 μA, V_{CE} = 5.0 V **5088** **5089** I_C = 1.0 mA, V_{CE} = 5.0 V **5088** **5089** I_C = 10 mA, V_{CE} = 5.0 V* **5088** **5089**	300 400 350 450 300 400	900 1200	
$V_{CE(sat)}$	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

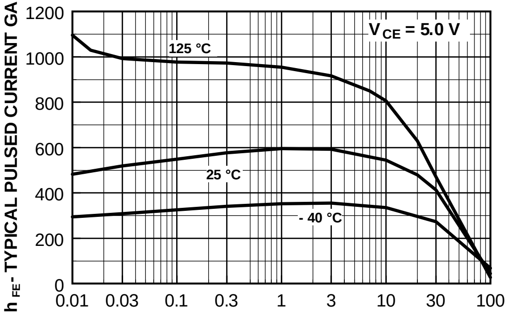
Symbol	Parameter	Test Conditions	Min	Max	Units
f_T	Current Gain - Bandwidth Product	I_C = 500 μA,V_{CE} = 5.0 mA, f = 20 MHz	50		MHz
C_{cb}	Collector-Base Capacitance	V_{CB} = 5.0 V, I_E = 0, f = 100 kHz		4.0	pF
C_{eb}	Emitter-Base Capacitance	V_{BE} = 0.5 V, I_C = 0, f = 100 kHz		10	pF
h_{fe}	Small-Signal Current Gain	I_C = 1.0 mA, V_{CE} = 5.0 V, **5088** f = 1.0 kHz **5089**	350 450	1400 1800	
NF	Noise Figure	I_C = 100 μA, V_{CE} = 5.0 V, **5088** R_S = 10 kΩ, **5089** f = 10 Hz to 15.7 kHz		3.0 2.0	dB dB

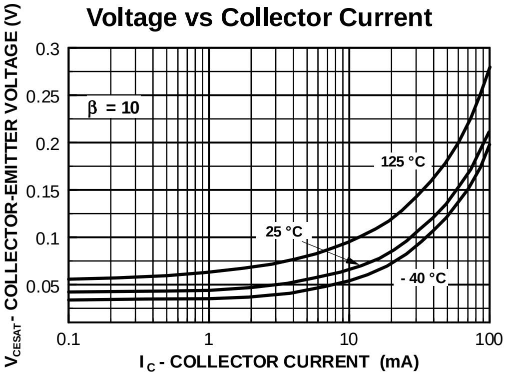
*Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%

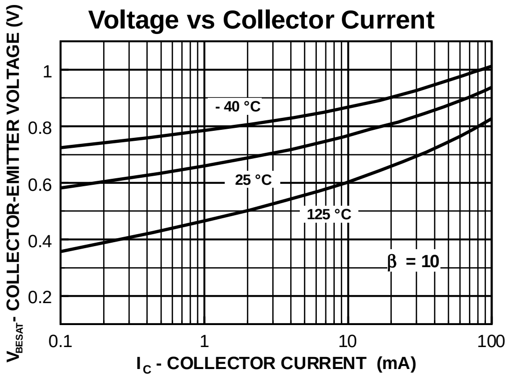
Spice Model

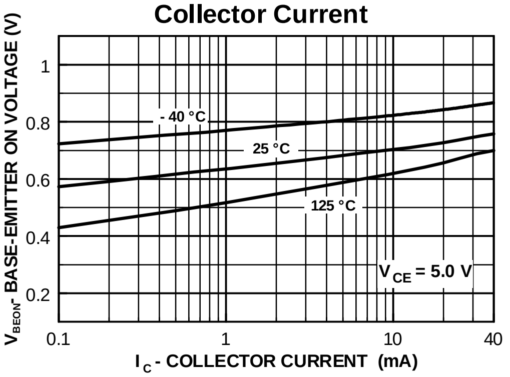
NPN (Is=5.911f Xti=3 Eg=1.11 Vaf=62.37 Bf=1.122K Ne=1.394 Ise=5.911f Ikf=14.92m Xtb=1.5 Br=1.271 Nc=2 Isc=0 Ikr=0 Rc=1.61 Cjc=4.017p Mjc=.3174 Vjc=.75 Fc=.5 Cje=4.973p Mje=.4146 Vje=.75 Tr=4.673n Tf=821.7p Itf=.35 Vtf=4 Xtf=7 Rb=10)

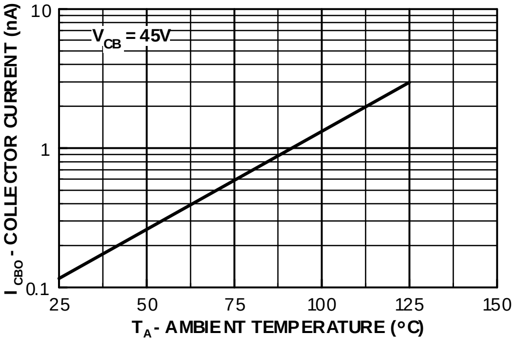
Typical Characteristics


Typical Pulsed Current Gain vs Collector Current


Collector-Emitter Saturation Voltage vs Collector Current

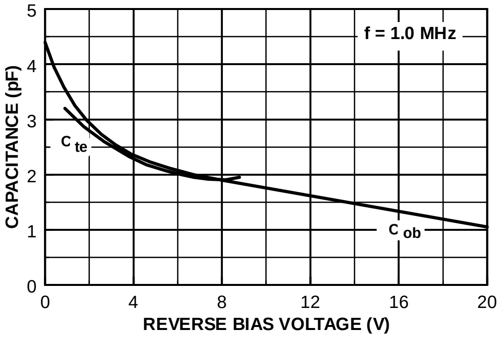

Base-Emitter Saturation Voltage vs Collector Current


Base-Emitter ON Voltage vs Collector Current

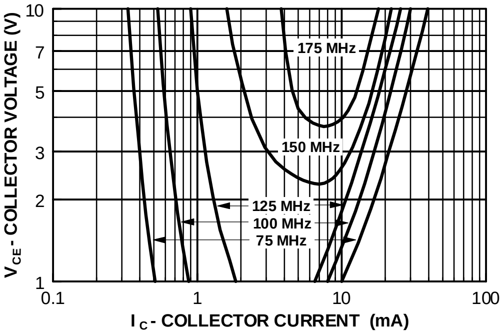

Collector-Cutoff Current vs Ambient Temperature

Typical Characteristics (continued)

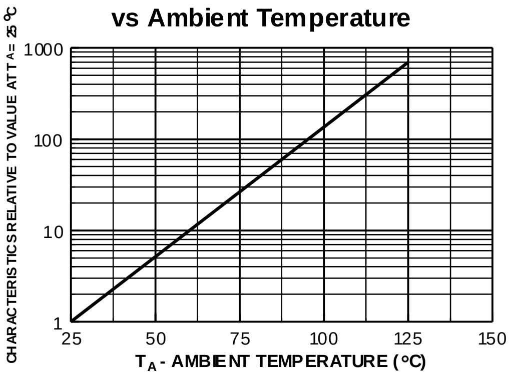
Input and Output Capacitance vs Reverse Bias Voltage



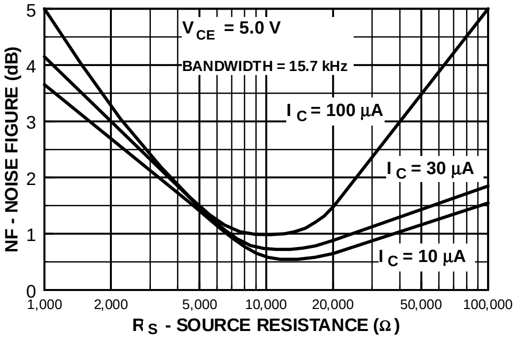
Contours of Constant Gain Bandwidth Product (f_T)



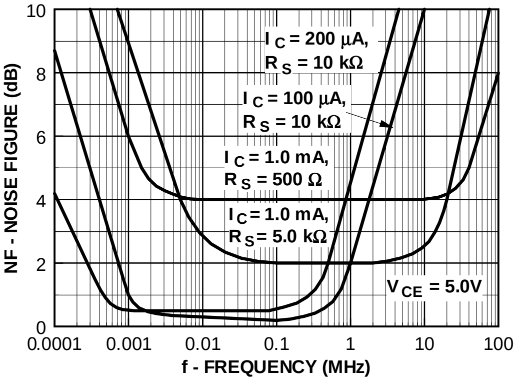
Normalized Collector-Cutoff Current vs Ambient Temperature



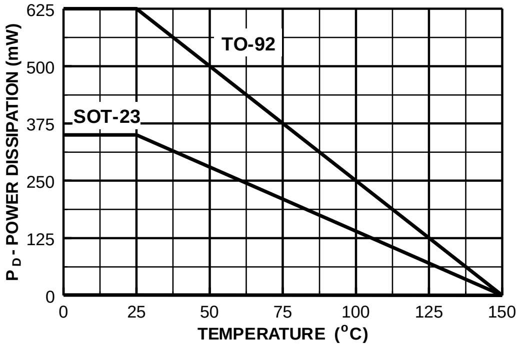
Wideband Noise Frequency vs Source Resistance



Noise Figure vs Frequency

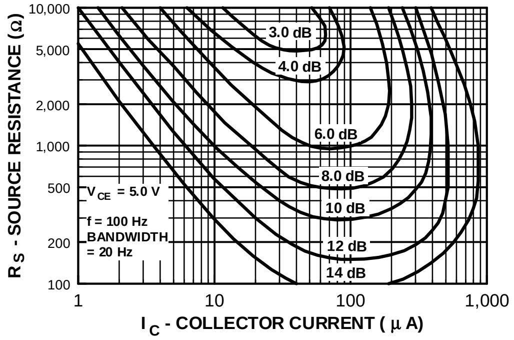


Power Dissipation vs Ambient Temperature

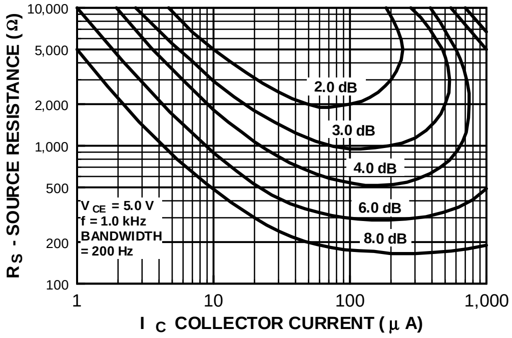


Typical Characteristics (continued)

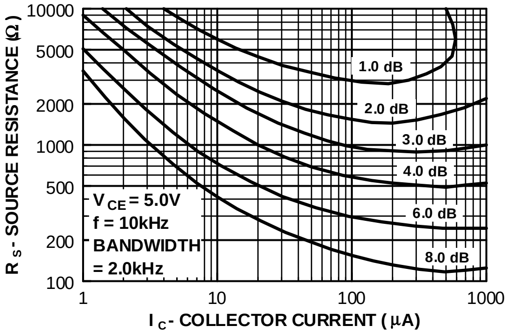
Contours of Constant Narrow Band Noise Figure



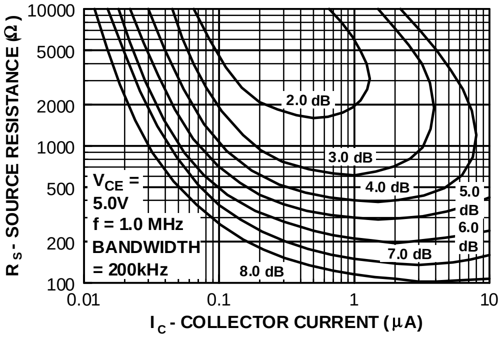
Contours of Constant Narrow Band Noise Figure



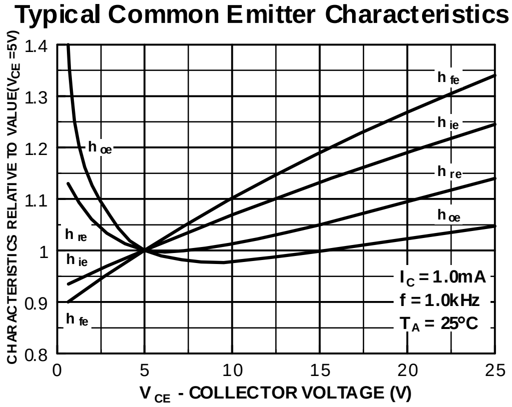
Contours of Constant Narrow Band Noise Figure

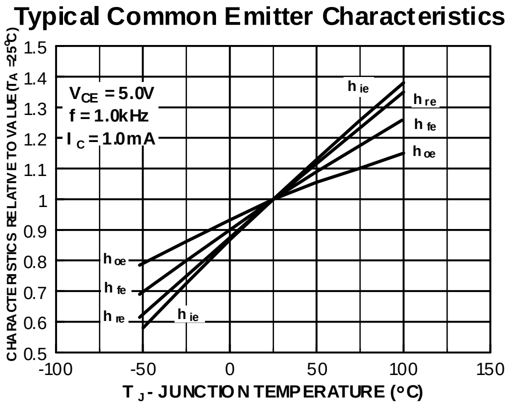


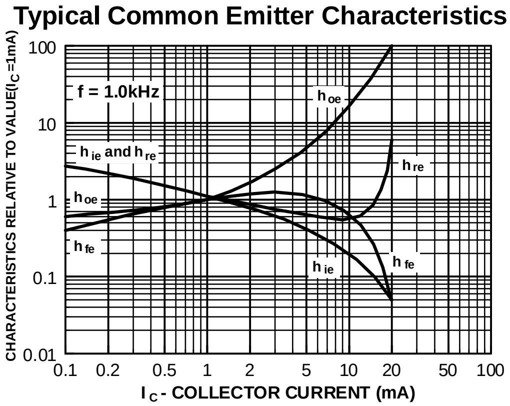
Contours of Constant Narrow Band Noise Figure



Typical Common Emitter Characteristics (f = 1.0 kHz)


Typical Common Emitter Characteristics


Typical Common Emitter Characteristics


Typical Common Emitter Characteristics

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