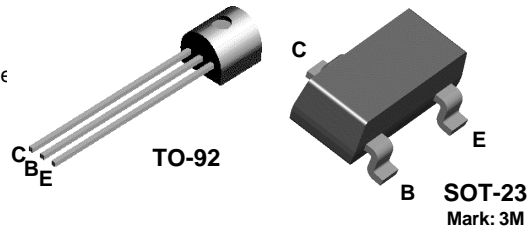


# 2N5210/MMBT5210

## 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 <sub>CEO</sub>	Collector-Emitter Voltage	50	V
V <sub>CBO</sub>	Collector-Base Voltage	50	V
V <sub>EBO</sub>	Emitter-Base Voltage	4.5	V
I <sub>C</sub>	Collector Current - Continuous	100	mA
T <sub>J</sub> , T <sub>stg</sub>	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
		2N5210	MMBT5210	
P <sub>D</sub>	Total Device Dissipation	625	350	mW
	Derate above 25°C	5.0	2.8	mW/°C
R <sub>θJC</sub>	Thermal Resistance, Junction to Case	83.3		°C/W
R <sub>θJA</sub>	Thermal Resistance, Junction to Ambient	200	357	°C/W

# NPN General Purpose Amplifier

(continued)

## Electrical Characteristics

$T_A = 25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
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### OFF CHARACTERISTICS

$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	$I_C = 1.0\text{ mA}, I_B = 0$	50		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	$I_C = 0.1\text{ mA}, I_E = 0$	50		V
$I_{CBO}$	Collector Cutoff Current	$V_{CB} = 35\text{ V}, I_E = 0$		50	nA
$I_{EBO}$	Emitter Cutoff Current	$V_{EB} = 3.0\text{ V}, I_C = 0$		50	nA

### ON CHARACTERISTICS

$h_{FE}$	DC Current Gain	$I_C = 100\text{ }\mu\text{A}, V_{CE} = 5.0\text{ V}$ $I_C = 1.0\text{ mA}, V_{CE} = 5.0\text{ V}$ $I_C = 10\text{ mA}, V_{CE} = 5.0\text{ V}^*$	200 250 250	600	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 10\text{ mA}, I_B = 1.0\text{ mA}$		0.7	V
$V_{BE(on)}$	Base-Emitter On Voltage	$I_C = 1.0\text{ mA}, V_{CE} = 5.0\text{ V}$		0.85	V

### SMALL SIGNAL CHARACTERISTICS

$f_T$	Current Gain - Bandwidth Product	$I_C = 500\text{ }\mu\text{A}, V_{CE} = 5.0\text{ V},$ $f = 20\text{ MHz}$	30		MHz
$C_{cb}$	Collector-Base Capacitance	$V_{CB} = 5.0\text{ V}, I_E = 0, f = 100\text{ kHz}$		4.0	pF
$h_{fe}$	Small-Signal Current Gain	$I_C = 1.0\text{ mA}, V_{CE} = 5.0\text{ V},$ $f = 1.0\text{ kHz}$	250	900	
NF	Noise Figure	$I_C = 20\text{ }\mu\text{A}, V_{CE} = 5.0\text{ V},$ $R_S = 22\text{ k}\Omega, f = 10\text{ Hz to }15.7\text{ kHz}$ $I_C = 20\text{ }\mu\text{A}, V_{CE} = 5.0\text{ V},$ $R_S = 10\text{ k}\Omega, f = 1.0\text{ kHz}$		2.0 3.0	dB dB

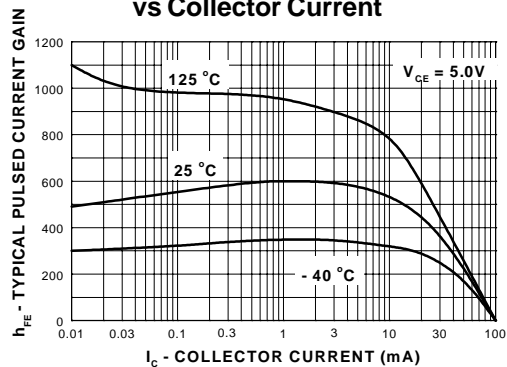
\*Pulse Test: Pulse Width  $\leq 300\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$

# NPN General Purpose Amplifier

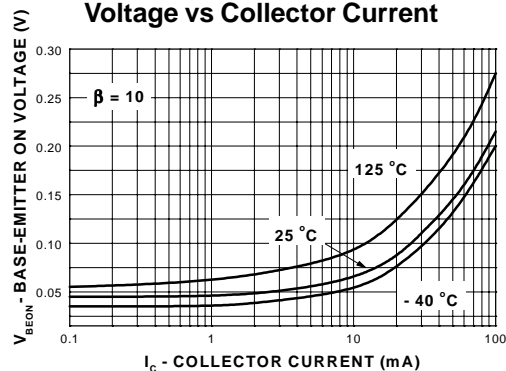
(continued)

## Typical Characteristics

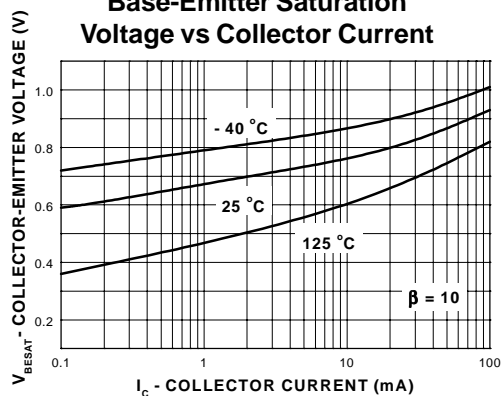
Typical Pulsed Current Gain vs Collector Current



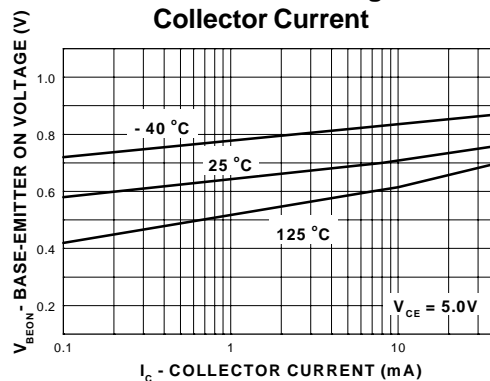
Collector-Emitter Saturation Voltage vs Collector Current



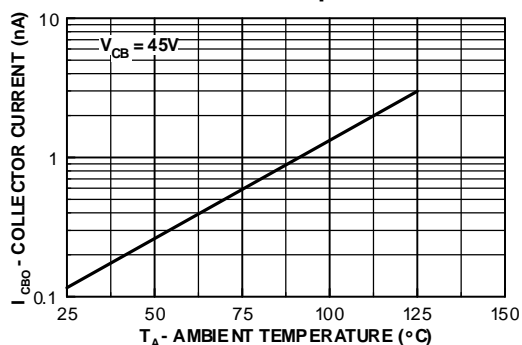
Base-Emitter Saturation Voltage vs Collector Current



Base-Emitter ON Voltage vs Collector Current



Collector-Cutoff Current vs Ambient Temperature

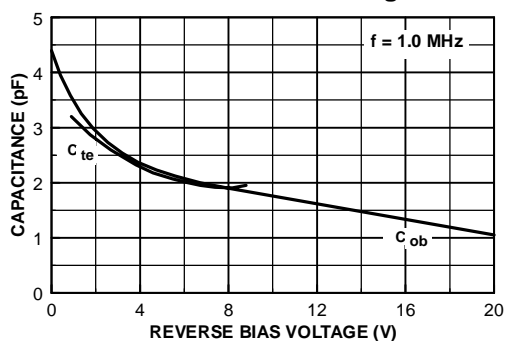


# NPN General Purpose Amplifier

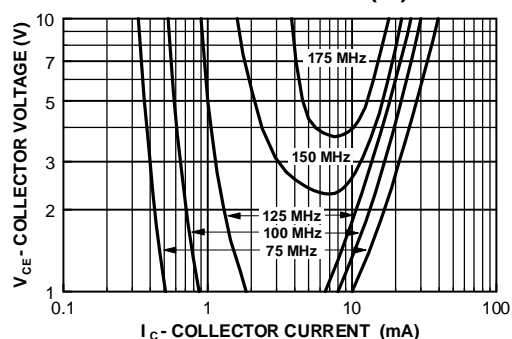
(continued)

## Typical Characteristics (continued)

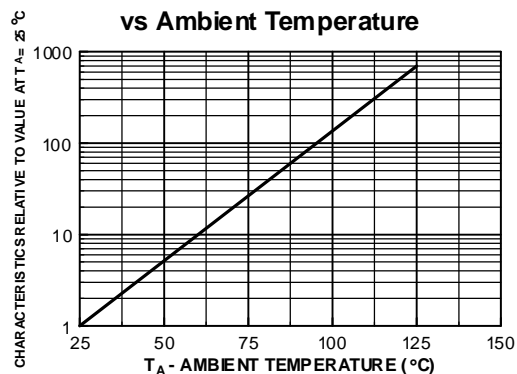
Input and Output Capacitance  
vs Reverse Bias Voltage



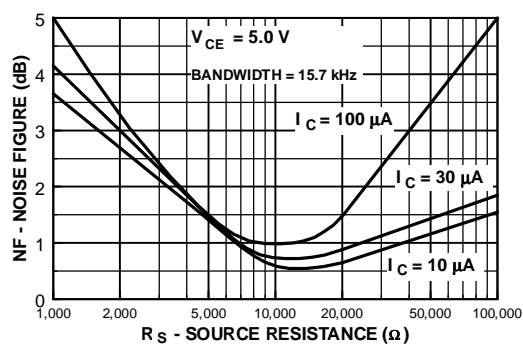
Contours of Constant Gain  
Bandwidth Product ( $f_T$ )



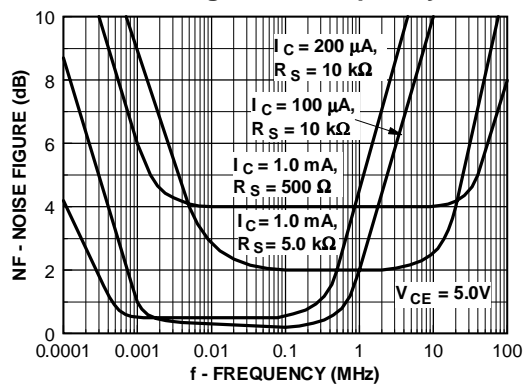
Normalized Collector-Cutoff Current  
vs Ambient Temperature



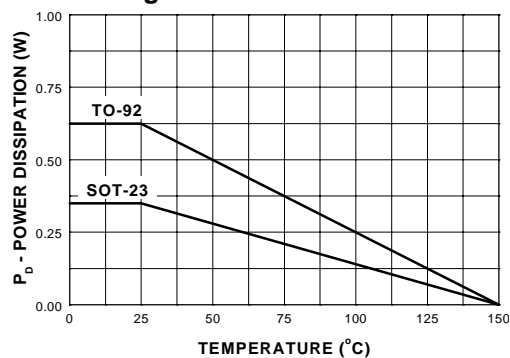
Wideband Noise Frequency  
vs Source Resistance



Noise Figure vs Frequency



Base-Emitter Saturation  
Voltage vs Collector Current

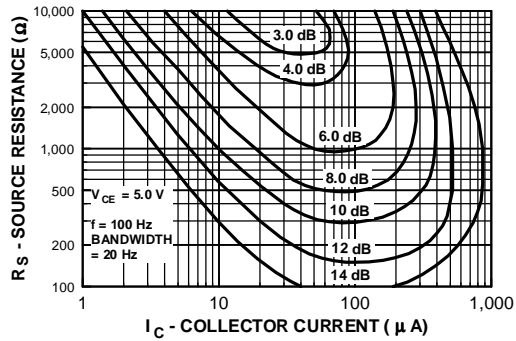


# NPN General Purpose Amplifier (continued)

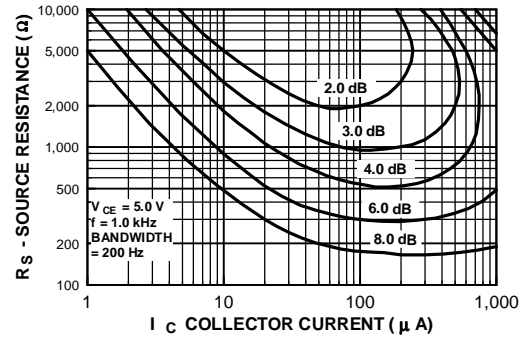
2N5210/MMBT5210

## Typical Characteristics (continued)

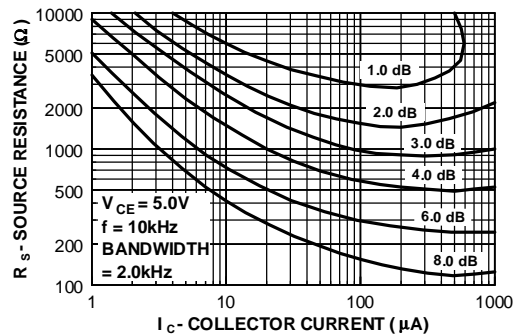
Contours of Constant  
Narrow Band Noise Figure



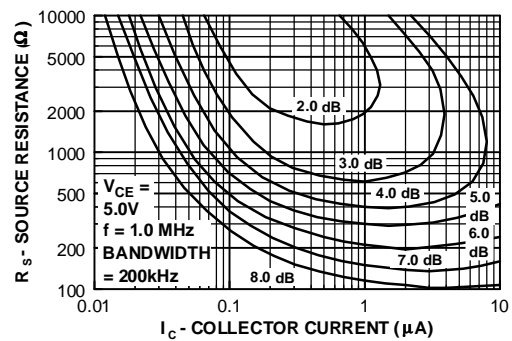
Contours of Constant  
Narrow Band Noise Figure



Contours of Constant  
Narrow Band Noise Figure



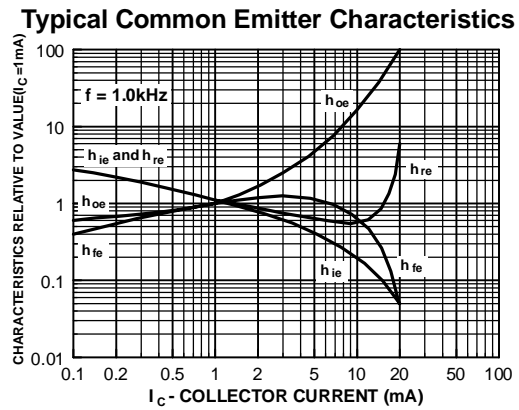
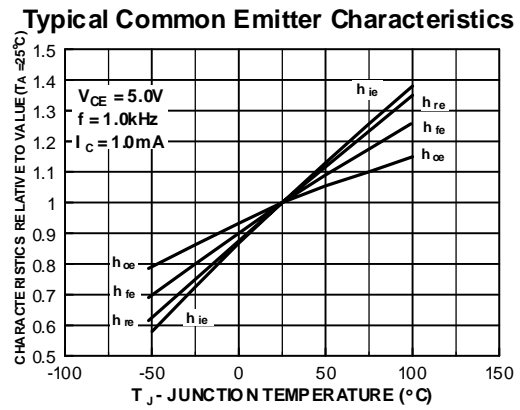
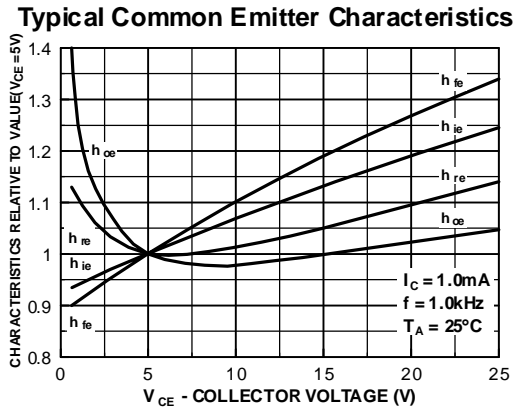
Contours of Constant  
Narrow Band Noise Figure



# NPN General Purpose Amplifier (continued)

2N5210/MMBT5210

## Typical Common Emitter Characteristics (f = 1.0 kHz)



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