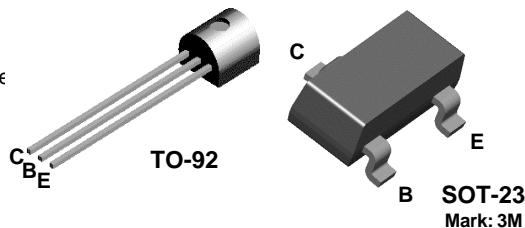


# 2N5210/MMBT5210

## NPN General Purpose Amplifier

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



### Absolute Maximum Ratings\*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
$V_{CEO}$	Collector-Emitter Voltage	50	V
$V_{CBO}$	Collector-Base Voltage	50	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
		2N5210	MMBT5210	
$P_D$	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

## NPN General Purpose Amplifier

(continued)

### Electrical Characteristics

TA = 25°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

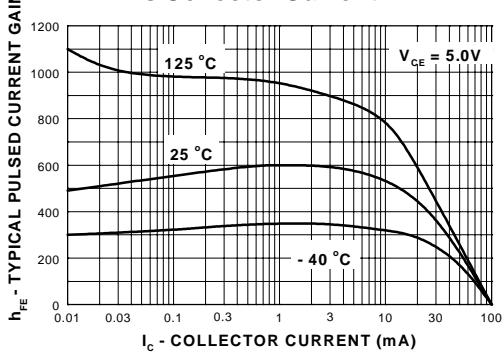
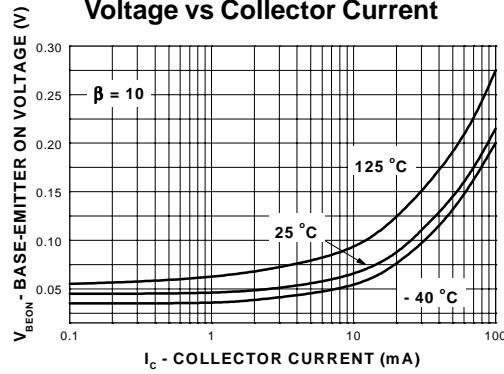
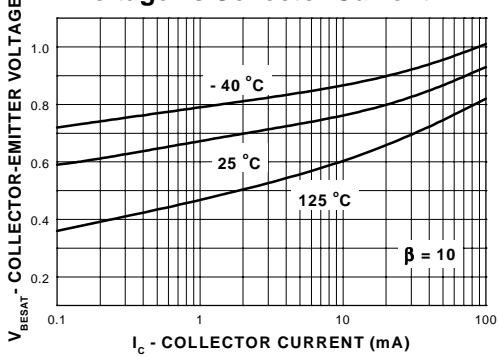
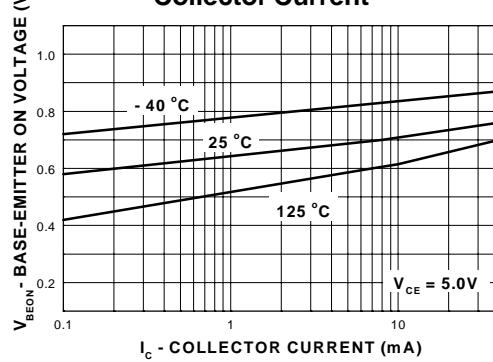
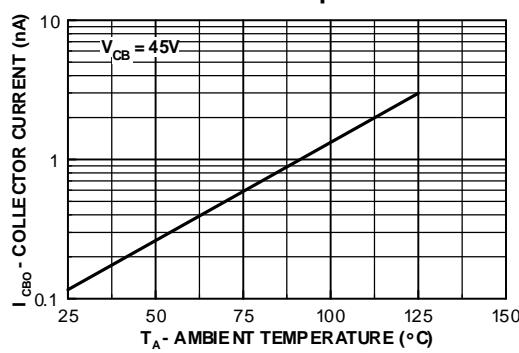
$h_{FE}$	DC Current Gain	$I_C = 100 \mu\text{A}, V_{CE} = 5.0 \text{ V}$ $I_C = 1.0 \text{ mA}, V_{CE} = 5.0 \text{ V}$ $I_C = 10 \text{ mA}, V_{CE} = 5.0 \text{ V}^*$	200 250 250	600	
$V_{CE(\text{sat})}$	Collector-Emitter Saturation Voltage	$I_C = 10 \text{ mA}, I_B = 1.0 \text{ mA}$		0.7	V
$V_{BE(\text{on})}$	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	$I_C = 500 \mu\text{A}, V_{CE} = 5.0 \text{ V},$ $f = 20 \text{ MHz}$	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	$I_C = 20 \mu\text{A}, V_{CE} = 5.0 \text{ V},$ $R_S = 22 \text{ k}\Omega, f = 10 \text{ Hz to } 15.7 \text{ kHz}$ $I_C = 20 \mu\text{A}, V_{CE} = 5.0 \text{ V},$ $R_S = 10 \text{ k}\Omega, f = 1.0 \text{ kHz}$		2.0 3.0	dB

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

## Typical Characteristics

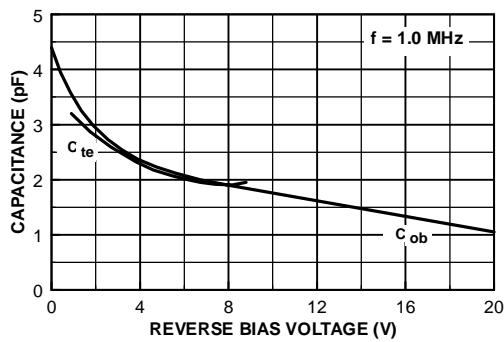
Typical Pulsed Current Gain  
vs Collector CurrentCollector-Emitter Saturation  
Voltage vs Collector CurrentBase-Emitter Saturation  
Voltage vs Collector CurrentBase-Emitter ON Voltage vs  
Collector CurrentCollector-Cutoff Current  
vs Ambient Temperature

## NPN General Purpose Amplifier

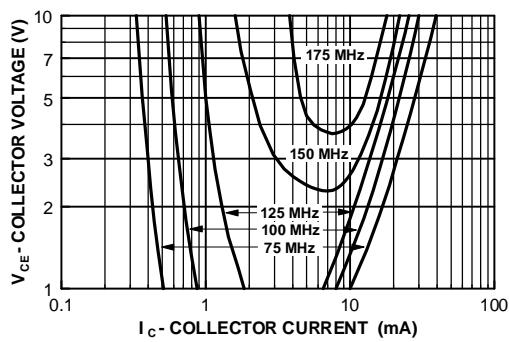
(continued)

### Typical Characteristics (continued)

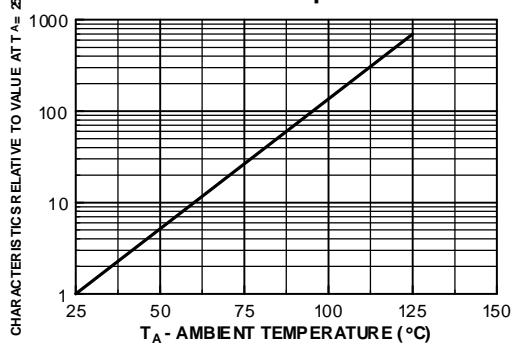
**Input and Output Capacitance vs Reverse Bias Voltage**



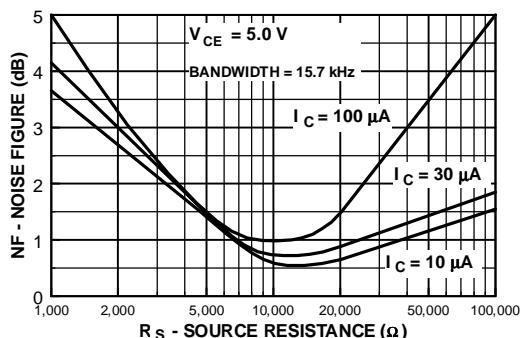
**Contours of Constant Gain Bandwidth Product ( $f_T$ )**



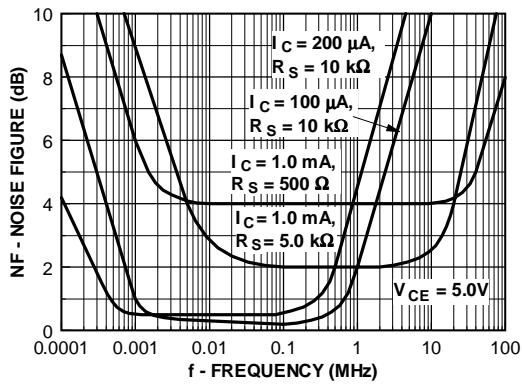
**Normalized Collector-Cutoff Current vs Ambient Temperature**



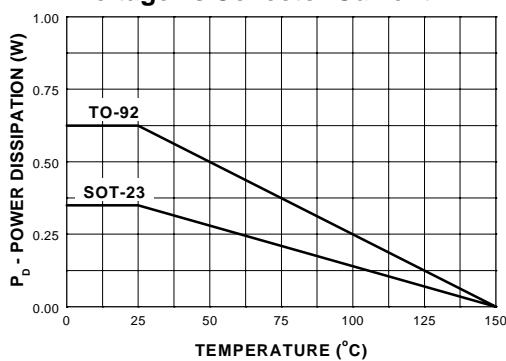
**Wideband Noise Figure vs Source Resistance**



**Noise Figure vs Frequency**



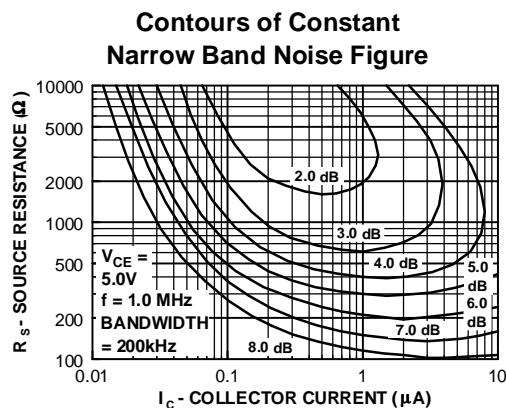
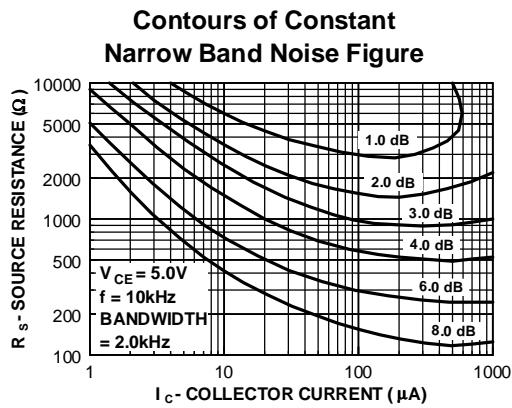
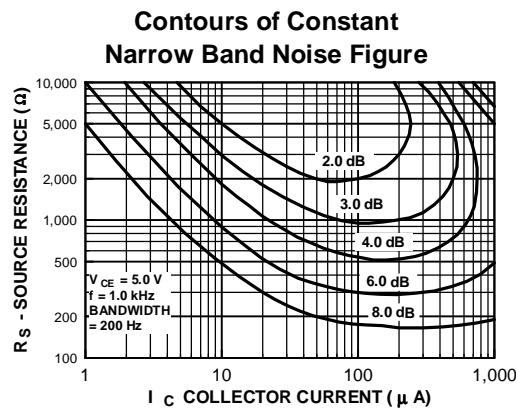
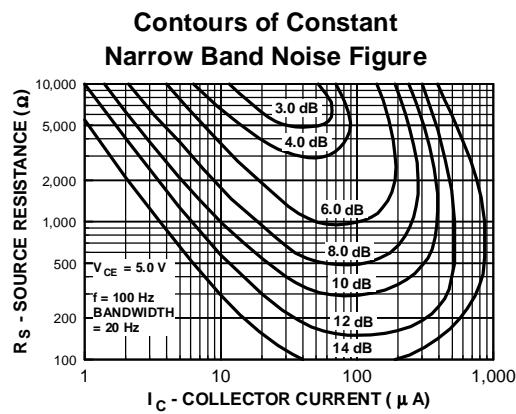
**Base-Emitter Saturation Voltage vs Collector Current**

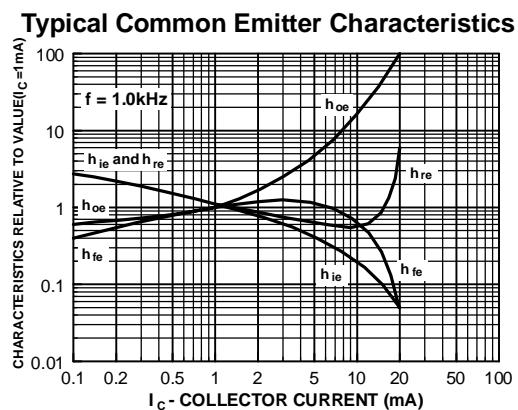
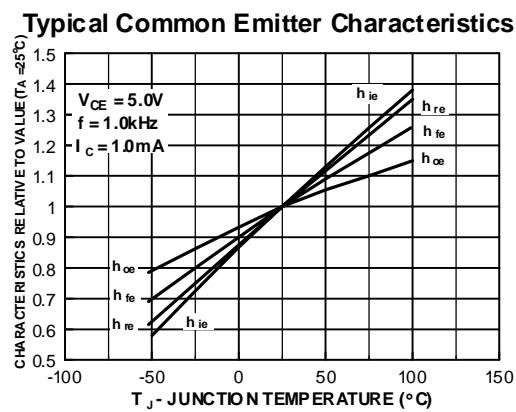
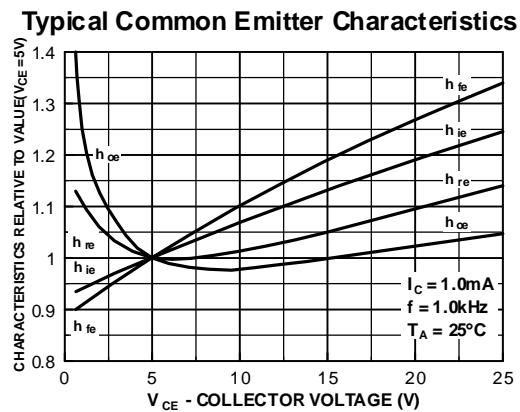


## NPN General Purpose Amplifier

(continued)

### Typical Characteristics (continued)



**NPN General Purpose Amplifier**  
(continued)**Typical Common Emitter Characteristics** (f = 1.0 kHz)

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