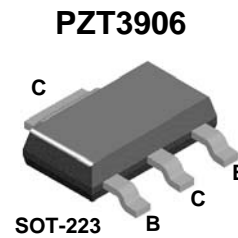
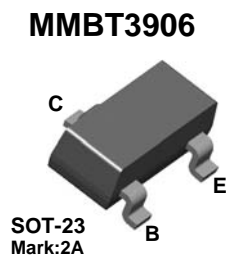


# 2N3906 / MMBT3906 / PZT3906 PNP General Purpose Amplifier

## Features

- This device is designed for general purpose amplifier and switching applications at collector currents of 10 $\mu$ A to 100 mA.



## Absolute Maximum Ratings\* $T_a = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Value	Units
$V_{CEO}$	Collector-Emitter Voltage	-40	V
$V_{CBO}$	Collector-Base Voltage	-40	V
$V_{EBO}$	Emitter-Base Voltage	-5.0	V
$I_C$	Collector Current - Continuous	-200	mA
$T_J, T_{stg}$	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$

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

### NOTES:

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

## Thermal Characteristics $T_a = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Max.			Units
		2N3906	*MMBT3906	**PZT3906	
$P_D$	Total Device Dissipation Derate above 25 $^\circ\text{C}$	625	350	1,000	mW
		5.0	2.8	8.0	mW/ $^\circ\text{C}$
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3			$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	357	125	$^\circ\text{C}/\text{W}$

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

\*\* Device mounted on FR-4 PCB 36 mm X 18 mm X 1.5 mm; mounting pad for the collector lead min. 6 cm<sup>2</sup>.

**Electrical Characteristics**  $T_a = 25^\circ\text{C}$  unless otherwise noted

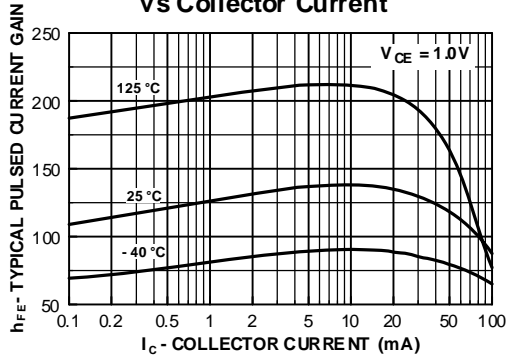
Symbol	Parameter	Test Condition	Min.	Max.	Units
<b>OFF CHARACTERISTICS</b>					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	$I_C = -1.0\text{mA}, I_B = 0$	-40		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	$I_C = -10\mu\text{A}, I_E = 0$	-40		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	$I_E = -10\mu\text{A}, I_C = 0$	-5.0		V
$I_{BL}$	Base Cutoff Current	$V_{CE} = -30\text{V}, V_{BE} = -3.0\text{V}$		-50	nA
$I_{CEX}$	Collector Cutoff Current	$V_{CE} = -30\text{V}, V_{BE} = -3.0\text{V}$		-50	nA
<b>ON CHARACTERISTICS</b>					
$h_{FE}$	DC Current Gain*	$I_C = -0.1\text{mA}, V_{CE} = -1.0\text{V}$ $I_C = -1.0\text{mA}, V_{CE} = -1.0\text{V}$ $I_C = -10\text{mA}, V_{CE} = -1.0\text{V}$ $I_C = -50\text{mA}, V_{CE} = -1.0\text{V}$ $I_C = -100\text{mA}, V_{CE} = -1.0\text{V}$	60 80 100 60 30	300	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = -10\text{mA}, I_B = -1.0\text{mA}$ $I_C = -50\text{mA}, I_B = -5.0\text{mA}$		-0.25 -0.4	V V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	$I_C = -10\text{mA}, I_B = -1.0\text{mA}$ $I_C = -50\text{mA}, I_B = -5.0\text{mA}$	-0.65	-0.85 -0.95	V V
<b>SMALL SIGNAL CHARACTERISTICS</b>					
$f_T$	Current Gain - Bandwidth Product	$I_C = -10\text{mA}, V_{CE} = -20\text{V},$ $f = 100\text{MHz}$	250		MHz
$C_{obo}$	Output Capacitance	$V_{CB} = -5.0\text{V}, I_E = 0,$ $f = 100\text{kHz}$		4.5	pF
$C_{ibo}$	Input Capacitance	$V_{EB} = -0.5\text{V}, I_C = 0,$ $f = 100\text{kHz}$		10.0	pF
NF	Noise Figure	$I_C = -100\mu\text{A}, V_{CE} = -5.0\text{V},$ $R_S = 1.0\text{k}\Omega,$ $f = 10\text{Hz to } 15.7\text{kHz}$		4.0	dB
<b>SWITCHING CHARACTERISTICS</b>					
$t_d$	Delay Time	$V_{CC} = -3.0\text{V}, V_{BE} = -0.5\text{V}$		35	ns
$t_r$	Rise Time	$I_C = -10\text{mA}, I_{B1} = -1.0\text{mA}$		35	ns
$t_s$	Storage Time	$V_{CC} = -3.0\text{V}, I_C = -10\text{mA},$		225	ns
$t_f$	Fall Time	$I_{B1} = I_{B2} = -1.0\text{mA}$		75	ns

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

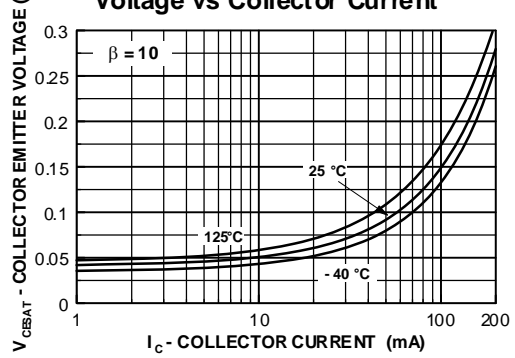
Part Number	Marking	Package	Packing Method	Pack Qty
2N3906BU	2N3906	TO-92	BULK	10000
2N3906TA	2N3906	TO-92	AMMO	2000
2N3906TAR	2N3906	TO-92	AMMO	2000
2N3906TF	2N3906	TO-92	TAPE REEL	2000
2N3906TFR	2N3906	TO-92	TAPE REEL	2000
MMBT3906	2A	SOT-23	TAPE REEL	3000
PZT3906	3906	SOT-223	TAPE REEL	2500

### Typical Performance Characteristics

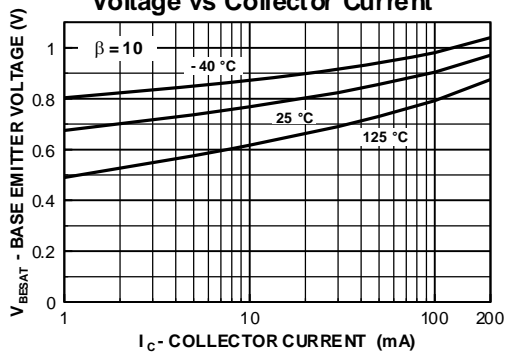
**Typical Pulsed Current Gain vs Collector Current**



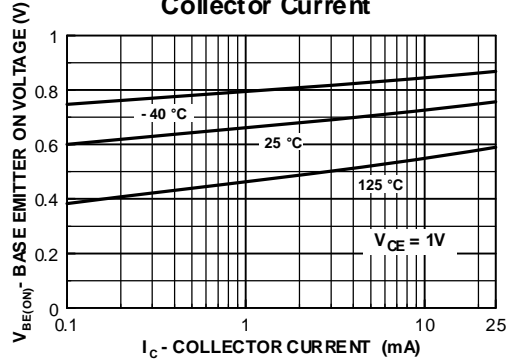
**Collector-Emitter Saturation Voltage vs Collector Current**



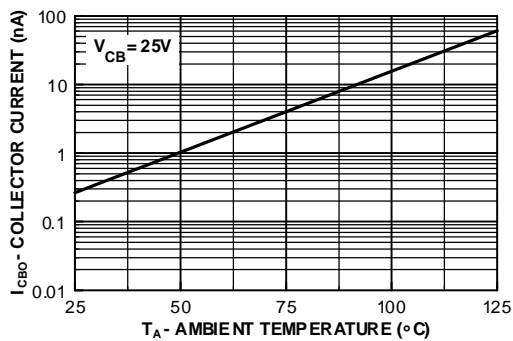
**Base-Emitter Saturation Voltage vs Collector Current**



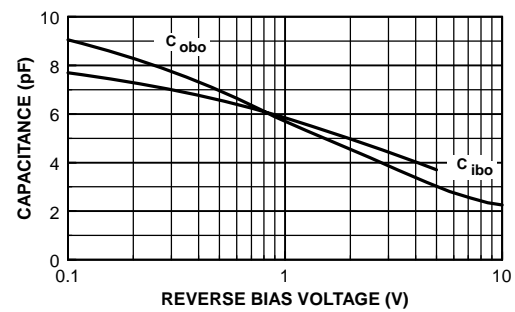
**Base Emitter ON Voltage vs Collector Current**



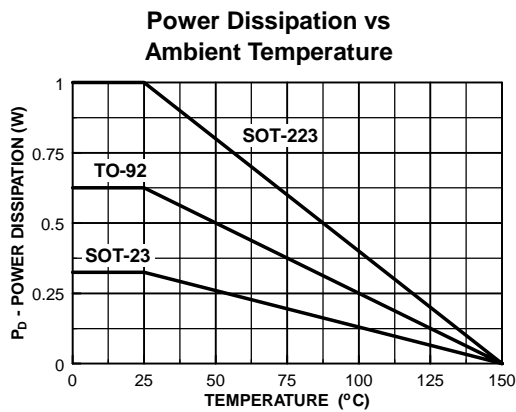
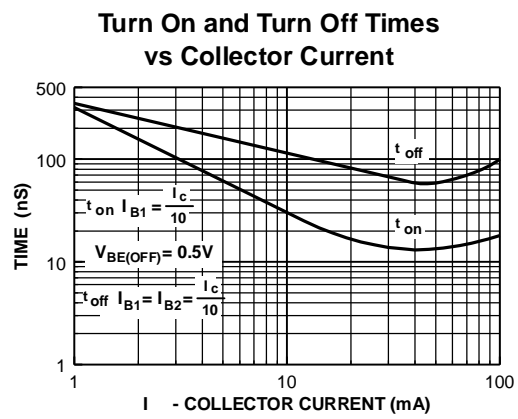
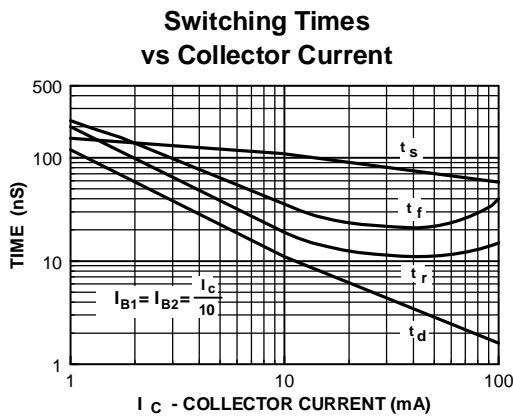
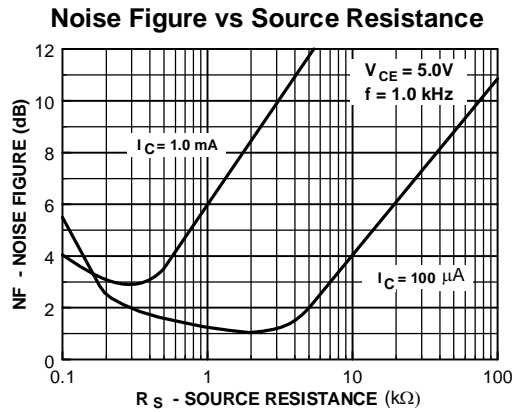
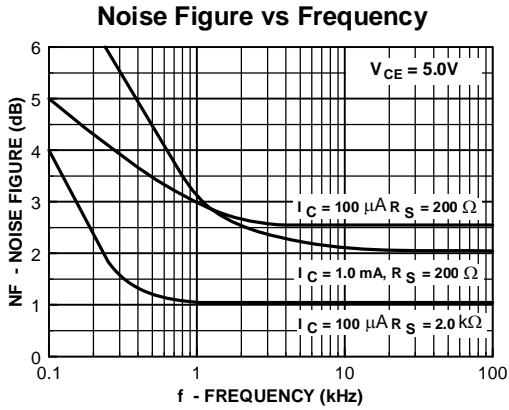
**Collector-Cutoff Current vs Ambient Temperature**



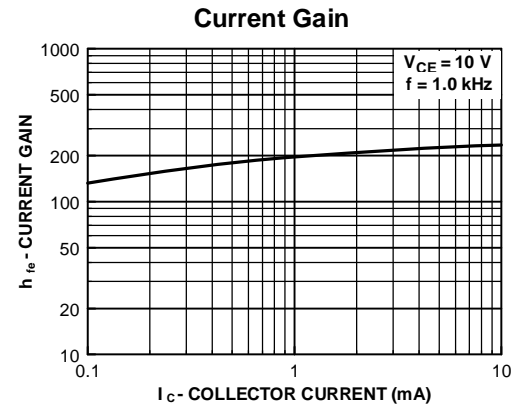
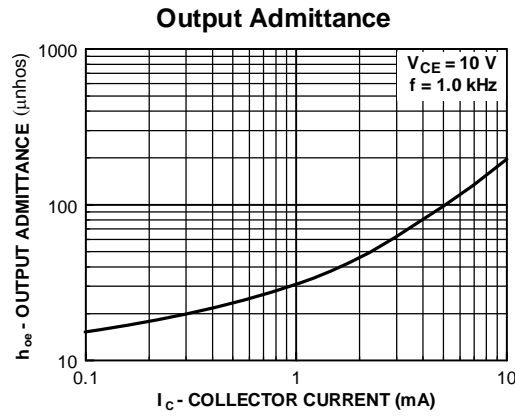
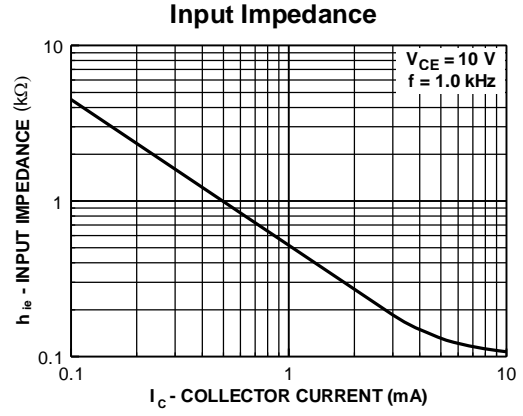
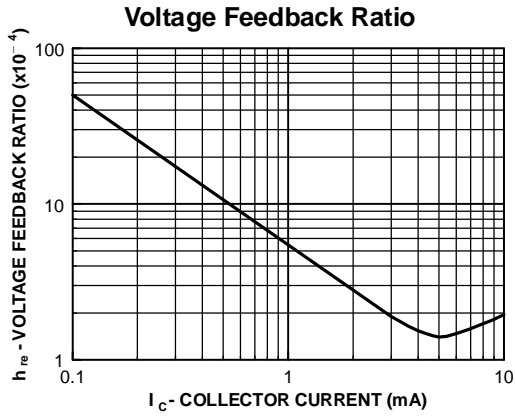
**Common-Base Open Circuit Input and Output Capacitance vs Reverse Bias Voltage**



**Typical Performance Characteristics** (continued)







Typical Performance Characteristics (continued)





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**Телефон:** +7 812 627 14 35

**Электронная почта:** [sales@st-electron.ru](mailto:sales@st-electron.ru)

**Адрес:** 198099, Санкт-Петербург,  
Промышленная ул, дом № 19, литера Н,  
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