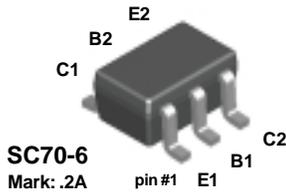
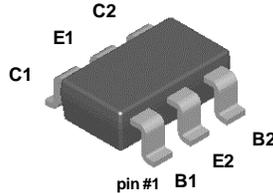


## FFB3906



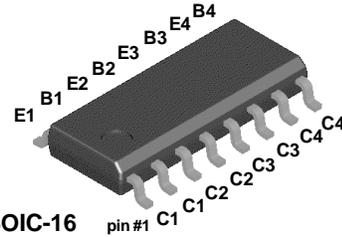
**SC70-6**  
Mark: .2A

## FMB3906



**SuperSOT™-6**  
Mark: .2A

## MMPQ3906



**SOIC-16**  
Mark: MMPQ3906

NOTE: The pinouts are symmetrical; pin 1 and pin 4 are interchangeable. Units inside the carrier can be of either orientation and will not affect the functionality of the device.

## PNP Multi-Chip General Purpose Amplifier

This device is designed for general purpose amplifier and switching applications at collector currents of 10  $\mu$ A to 100 mA. Sourced from Process 66.

### Absolute Maximum Ratings\*

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

Symbol	Parameter	Value	Units
$V_{CE0}$	Collector-Emitter Voltage	40	V
$V_{CB0}$	Collector-Base Voltage	40	V
$V_{EB0}$	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:

- 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

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

Symbol	Characteristic	Max			Units
		FFB3904	FMB3904	MMPQ3904	
$P_D$	Total Device Dissipation	300	700	1,000	mW
	Derate above 25 $^\circ\text{C}$	2.4	5.6	8.0	mW/ $^\circ\text{C}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	415	180		$^\circ\text{C}/\text{W}$
	Effective 4 Die			125	$^\circ\text{C}/\text{W}$
	Each Die			240	$^\circ\text{C}/\text{W}$

# PNP Multi-Chip General Purpose Amplifier

(continued)

## Electrical Characteristics

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

Symbol	Parameter	Test Conditions	Min	Typ	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

## ON CHARACTERISTICS

$h_{FE}$	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

## SMALL SIGNAL CHARACTERISTICS

$f_T$	Current Gain - Bandwidth Product	$I_C = 10\text{ mA}, V_{CE} = 20\text{ V},$ $f = 100\text{ MHz}$		450		MHz
$C_{obo}$	Output Capacitance	$V_{CB} = 5.0\text{ V}, I_E = 0,$ $f = 100\text{ kHz}$		3.0		pF
$C_{ibo}$	Input Capacitance	$V_{EB} = 0.5\text{ V}, I_C = 0,$ $f = 100\text{ kHz}$		8.0		pF
NF	Noise Figure (except MMPQ3906)	$I_C = 100\ \mu\text{A}, V_{CE} = 5.0\text{ V},$ $R_S = 1.0\text{ k}\Omega, f = 10\text{ Hz to } 15.7\text{ kHz}$		2.5		dB

## SWITCHING CHARACTERISTICS

$t_d$	Delay Time	$V_{CC} = 3.0\text{ V}, V_{BE} = 0.5\text{ V},$		15		ns
$t_r$	Rise Time	$I_C = 10\text{ mA}, I_{B1} = 1.0\text{ mA}$		20		ns
$t_s$	Storage Time	$V_{CC} = 3.0\text{ V}, I_C = 10\text{ mA}$		110		ns
$t_f$	Fall Time	$I_{B1} = I_{B2} = 1.0\text{ mA}$		40		ns

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

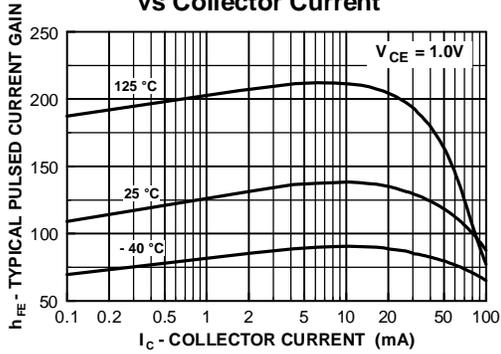
## Spice Model

PNP (Is=1.41f Xti=3 Eg=1.11 Vaf=18.7 Bf=180.7 Ne=1.5 Ise=0 Ikf=80m Xtb=1.5 Br=4.977 Nc=2 Isc=0 Ikr=0 Rc=2.5 Cjc=9.728p Mjc=.5776 Vjc=.75 Fc=.5 Cje=8.063p Mje=.3677 Vje=.75 Tr=33.42n Tf=179.3p ltf=.4 Vtf=4 Xtf=6 Rb=10)

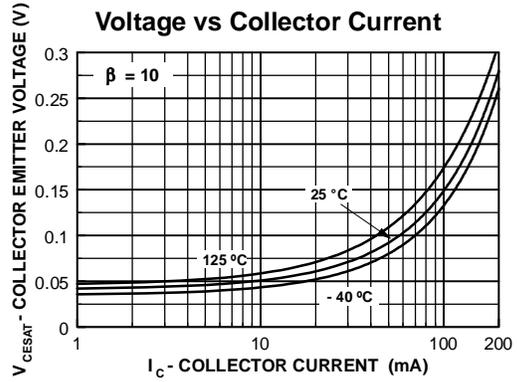
FFB3906 / FMB3906 / MMPQ3906

Typical Characteristics

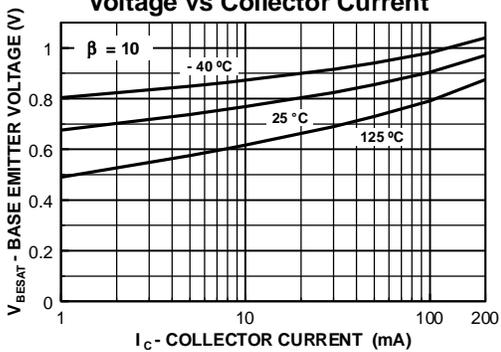
Typical Pulsed Current Gain vs Collector Current



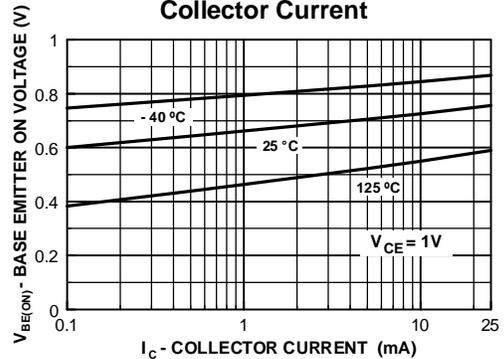
Collector-Emitter Saturation Voltage vs Collector Current



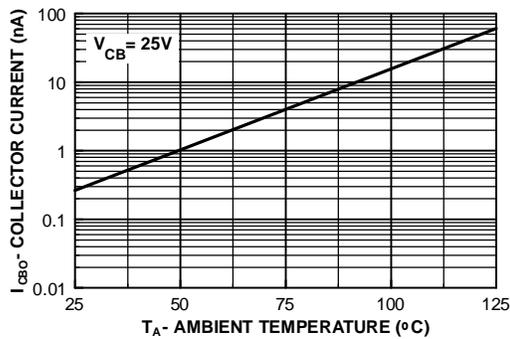
Base-Emitter Saturation Voltage vs Collector Current



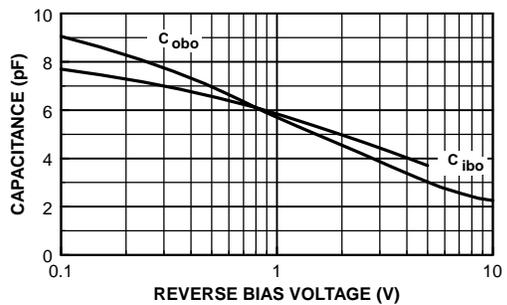
Base Emitter ON Voltage vs Collector Current



Collector-Cutoff Current vs Ambient Temperature



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



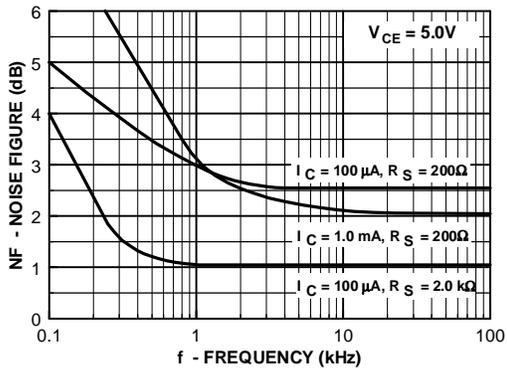
# PNP Multi-Chip General Purpose Amplifier

(continued)

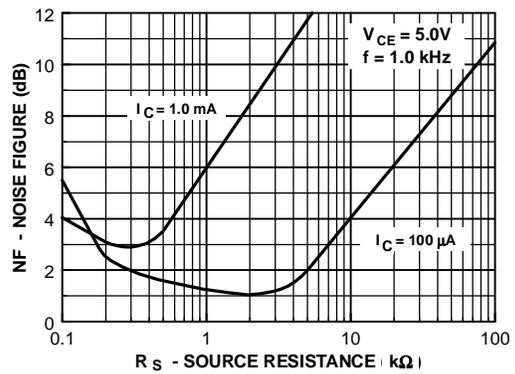
FFB3906 / FMB3906 / MMPQ3906

## Typical Characteristics (continued)

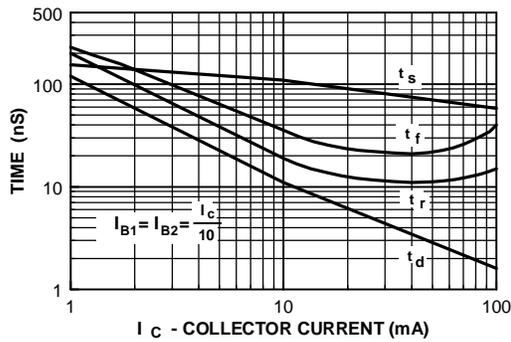
### Noise Figure vs Frequency



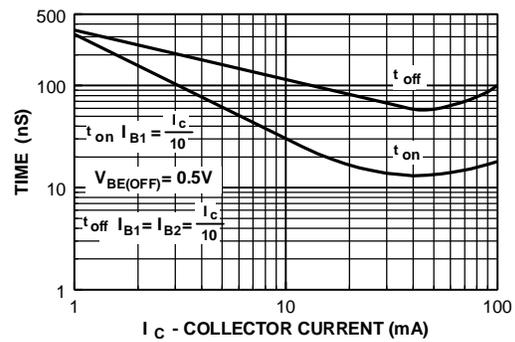
### Noise Figure vs Source Resistance



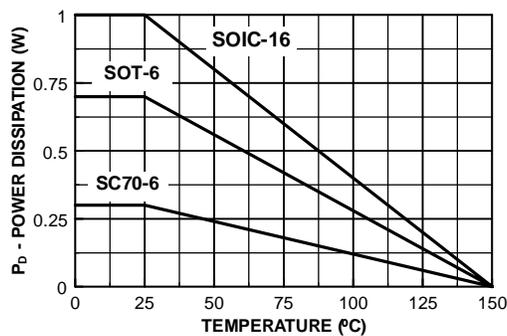
### Switching Times vs Collector Current



### Turn On and Turn Off Times vs Collector Current



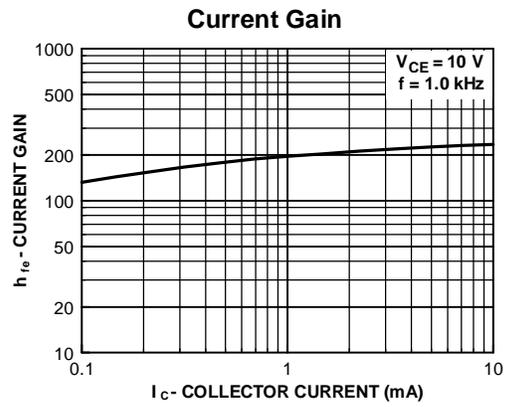
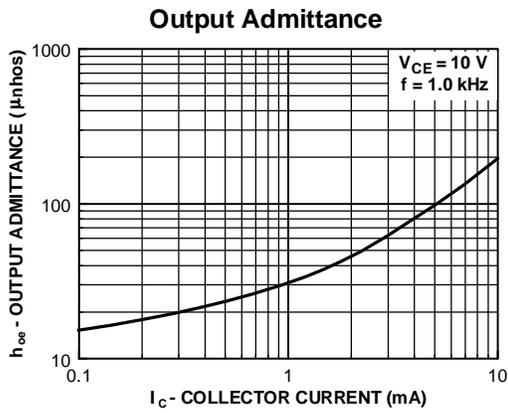
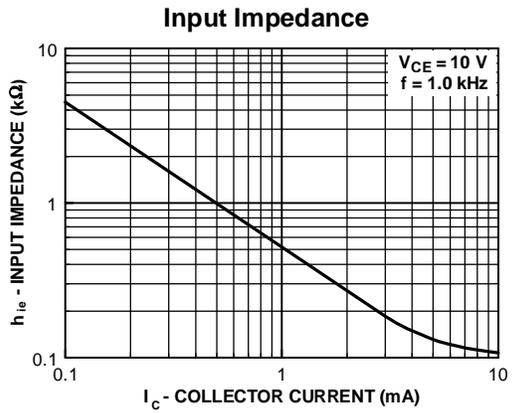
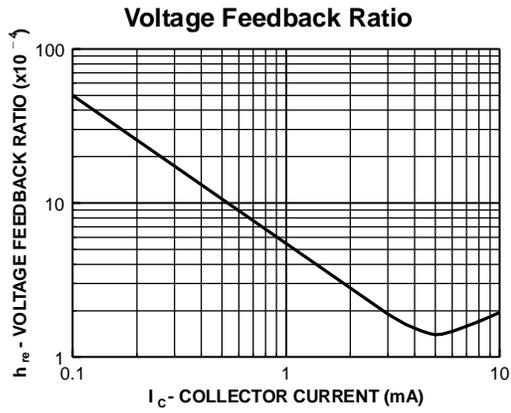
### Power Dissipation vs Ambient Temperature



PNP Multi-Chip General Purpose Amplifier  
(continued)

FFB3906 / FMB3906 / MMPQ3906

Typical Characteristics (continued)



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