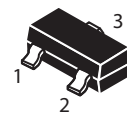
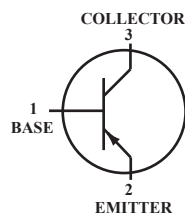


## General Purpose Transistor

### PNP Silicon

 Lead(Pb)-Free


**SOT-23**

## Maximum Ratings

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V <sub>CEO</sub>	-40	Vdc
Collector-Base Voltage	V <sub>CBO</sub>	-40	Vdc
Emitter-Base Voltage	V <sub>EBO</sub>	-5.0	Vdc
Collector Current-Continuous	I <sub>C</sub>	-200	mAdc

## Thermal Characteristics

Characteristics	Symbol	Max	Unit
Total Device Dissipation FR-5 Board <sup>(1)</sup> T <sub>A</sub> =25 °C Derate above 25 °C	P <sub>D</sub>	225	mW
Thermal Resistance, Junction to Ambient	R <sub>θJA</sub>	556	°C/W
Total Device Dissipation Alumina Substrate, <sup>(2)</sup> T <sub>A</sub> =25 °C Derate above 25 °C	P <sub>D</sub>	300	mW
Thermal Resistance, Junction to Ambient	R <sub>θJA</sub>	417	°C/W
Junction and Storage, Temperature	T <sub>J</sub> , T <sub>stg</sub>	-55 to +150	°C

## Device Marking

MMBT3906=2A

## Electrical Characteristics (T<sub>A</sub>=25 °C Unless Otherwise noted)

Characteristics	Symbol	Min	Max	Unit
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## Off Characteristics

Collector-Emitter Breakdown Voltage <sup>(3)</sup> (I <sub>C</sub> =-1.0mAdc, I <sub>B</sub> =0)	V <sub>(BR)CEO</sub>	-40	-	Vdc
Collector-Base Breakdown Voltage (I <sub>C</sub> =-10 μAdc, I <sub>E</sub> =0)	V <sub>(BR)CBO</sub>	-40	-	Vdc
Emitter-Base Breakdown Voltage (I <sub>E</sub> =-10 μAdc, I <sub>C</sub> =0)	V <sub>(BR)EBO</sub>	-5.0	-	Vdc
Base Cutoff Current (V <sub>CE</sub> =-30 Vdc, V <sub>EB</sub> =-3.0 Vdc)	I <sub>BL</sub>	-	-50	nAdc
Collector Cutoff Current (V <sub>CE</sub> =-30Vdc, V <sub>EB</sub> =-3.0Vdc)	I <sub>CEX</sub>	-	-50	nAdc

1.FR-5=1.0 x 0.75 x 0.062 in.

2.Alumina=0.4 x 0.3 x 0.024 in. 99.5% alumina.

3.Pulse Test:Pulse Width ≤ 300 μS, Duty Cycle ≤ 2.0%.

**Electrical Characteristics** ( $T_A=25^{\circ}\text{C}$  unless otherwise noted) (Continued)

Characteristics	Symbol	Min	Max	Unit
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**On Characteristics** <sup>(3)</sup>

DC Current Gain ( $I_C = -0.1 \text{ mAdc}, V_{CE} = -1.0 \text{ Vdc}$ ) ( $I_C = -1.0 \text{ mAdc}, V_{CE} = -1.0 \text{ Vdc}$ ) ( $I_C = -10 \text{ mAdc}, V_{CE} = -1.0 \text{ Vdc}$ ) ( $I_C = -50 \text{ mAdc}, V_{CE} = -1.0 \text{ Vdc}$ ) ( $I_C = -100 \text{ mAdc}, V_{CE} = -1.0 \text{ Vdc}$ )	$H_{FE}$	60 80 100 60 30	- - 300 - -	-
Collector-Emitter Saturation Voltage <sup>(3)</sup> ( $I_C = -10 \text{ mAdc}, I_B = -1.0 \text{ mAdc}$ ) ( $I_C = -50 \text{ mAdc}, I_B = -5.0 \text{ mAdc}$ )	$V_{CE(sat)}$	- -	-0.25 -0.4	Vdc
Base-Emitter Saturation Voltage <sup>(3)</sup> ( $I_C = -10 \text{ mAdc}, I_B = -1.0 \text{ mAdc}$ ) ( $I_C = -50 \text{ mAdc}, I_B = -5.0 \text{ mAdc}$ )	$V_{BE(sat)}$	-0.65 -	-0.85 -0.95	Vdc

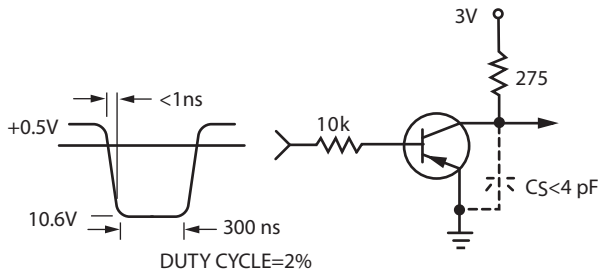
**Small-signal Characteristics**

Current-Gain-Bandwidth Product <sup>(4)</sup> ( $I_C = -10 \text{ mAdc}, V_{CE} = -20 \text{ Vdc}, f = 100 \text{ MHz}$ )	$f_T$	250	-	MHz
Output Capacitance ( $V_{CB} = -5.0 \text{ Vdc}, I_E = 0, f = 1.0 \text{ MHz}$ )	$C_{obo}$	-	4.5	pF
Input Capacitance ( $V_{EB} = -0.5 \text{ Vdc}, I_C = 0, f = 1.0 \text{ MHz}$ )	$C_{ibo}$	-	10	pF
Input Impedance ( $V_{CE} = -10 \text{ Vdc}, I_C = -1.0 \text{ mAdc}, f = 1.0 \text{ kHz}$ )	$h_{ie}$	2.0	12	k ohms
Voltage Feedback Ratio ( $V_{CE} = -10 \text{ Vdc}, I_C = 1.0 \text{ mAdc}, f = 1.0 \text{ kHz}$ )	$h_{re}$	0.1	10	$\times 10^{-4}$
Small-Signal Current Gain ( $V_{CE} = -10 \text{ Vdc}, I_C = 1.0 \text{ mAdc}, f = 1.0 \text{ kHz}$ )	$h_{fe}$	100	400	-
Output Admittance ( $V_{CE} = -10 \text{ Vdc}, I_C = 1.0 \text{ mAdc}, f = 1.0 \text{ kHz}$ )	$h_{oe}$	3.0	60	$\mu\text{mhos}$
Noise Figure ( $V_{CE} = -5.0 \text{ Vdc}, I_C = -100 \mu\text{Adc}, R_S = 1.0 \text{ k ohms}, f = 1.0 \text{ kHz}$ )	NF	-	4.0	dB

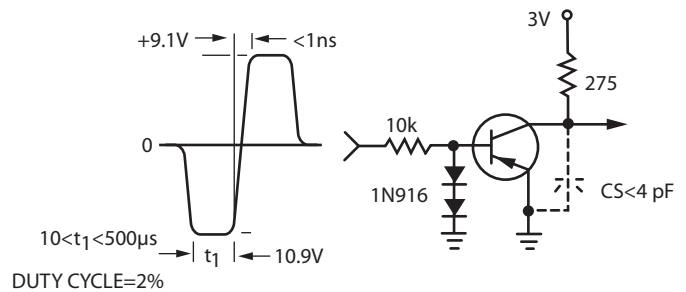
**Switching Characteristics**

Delay Time	(Vcc = -3.0 Vdc, VBE = 0.5 Vdc Ic = -10 mAdc, IB1 = -1.0 mAdc)	td	-	35	ns
Rise Time		tr	-	35	
Storage Time	(Vcc = -3.0 Vdc, Ic = -10 mAdc, IB1 = IB2 = -1.0 mAdc)	ts	-	225	ns
Fall Time		tf	-	75	

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



**FIG.1 Delay and Rise Time  
Equivalent Test Circuit**

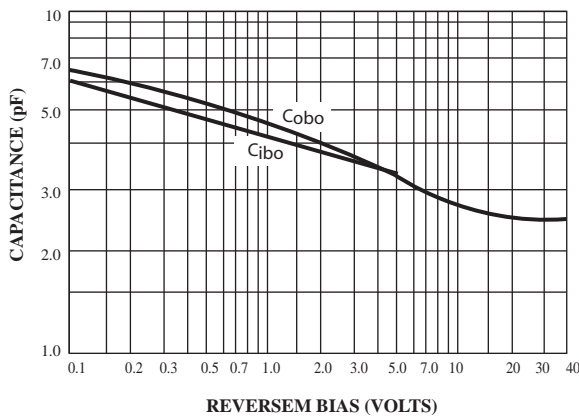


**FIG.2 Storage and Fall Time  
Equivalent Test Circuit**

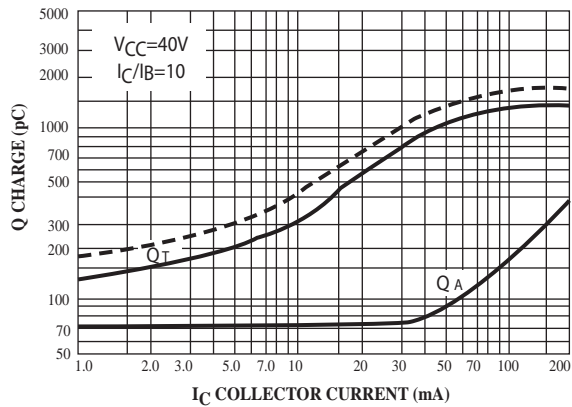
\*Total shunt capacitance of test jig and connectors

## TYPICAL TRANSIENT CHARACTERISTICS

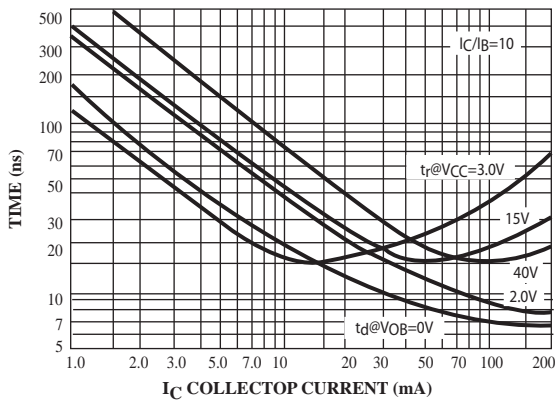
——  $T_J=25^\circ\text{C}$     - - - -  $T_J=125^\circ\text{C}$



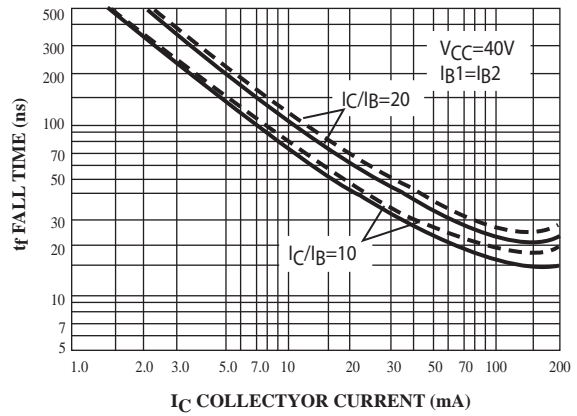
**FIG.3 Capacitance**



**FIG.4 Charge Data**



**FIG.5 Turn-On Time**



**FIG.6 Fall Time**

## TYPICAL AUDIO SMALL-SIGNAL CHARACTERISTICS NOISE FIGURE VARIATIONS

( $V_{CE} = -5.0 \text{ Vdc}$ ,  $T_A = 25^\circ\text{C}$ , Bandwidth = 1.0Hz)

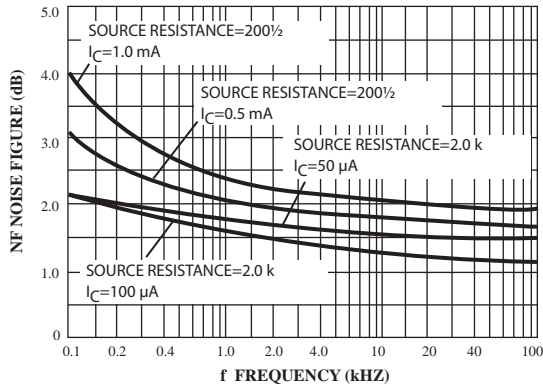


FIG.7

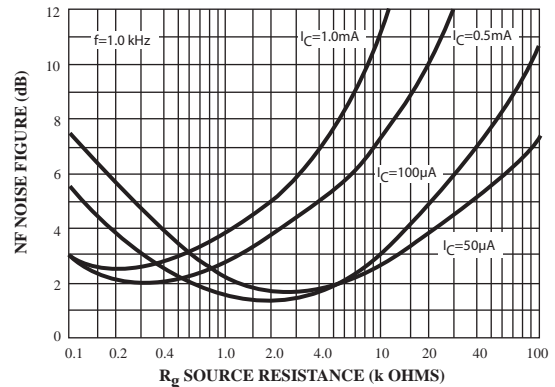


FIG.8

## h PARAMETERS

( $V_{CE} = -10 \text{ Vdc}$ ,  $f = 1.0 \text{ kHz}$ ,  $T_A = 25^\circ\text{C}$ )

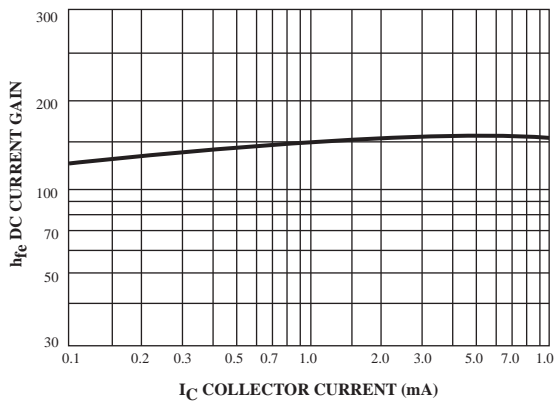


FIG.9 Current Gain

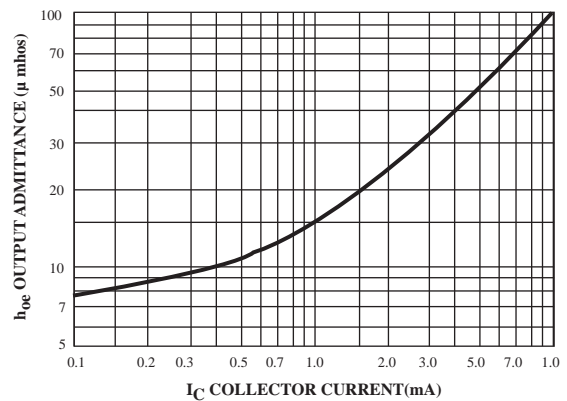


FIG.10 Input Impedance

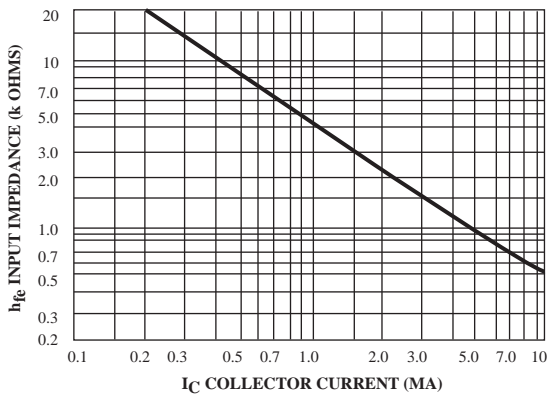


FIG.11 Input Impedance

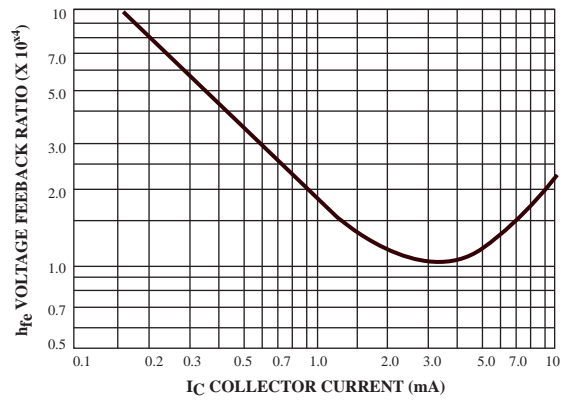
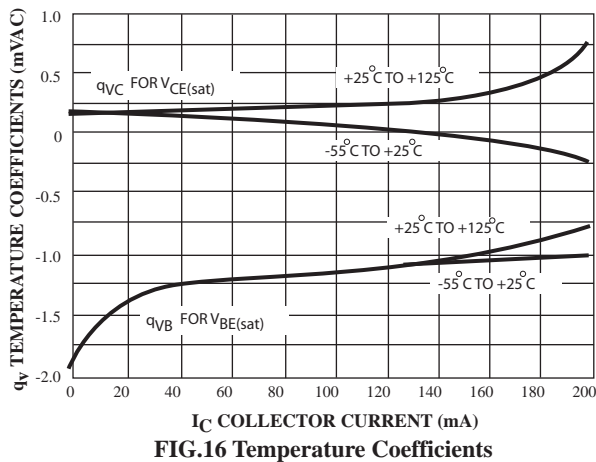
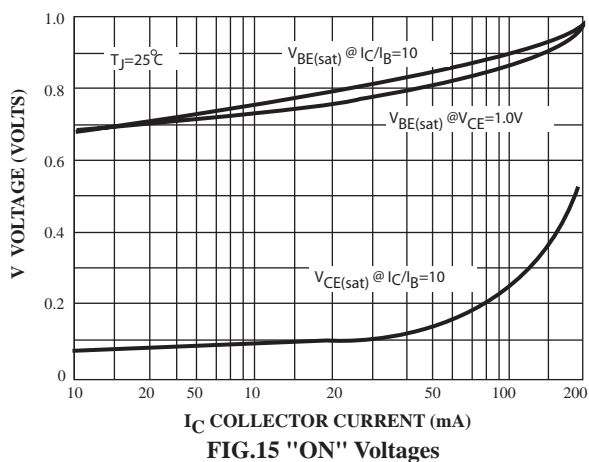
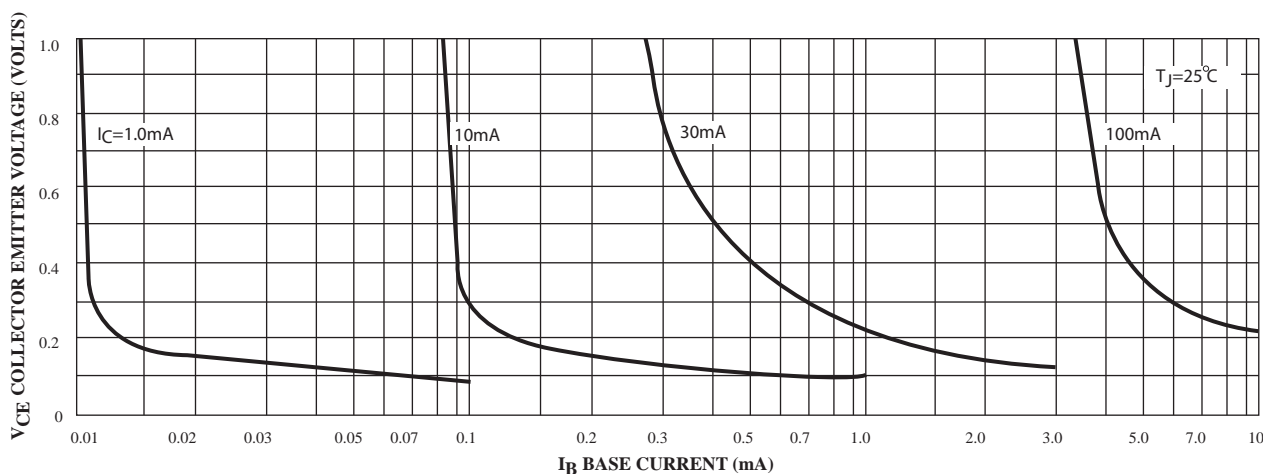
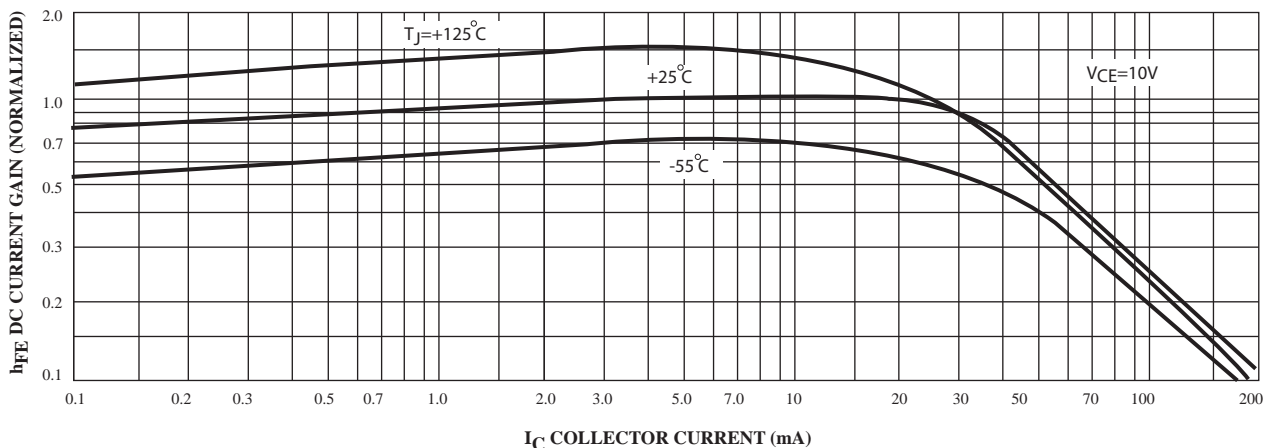


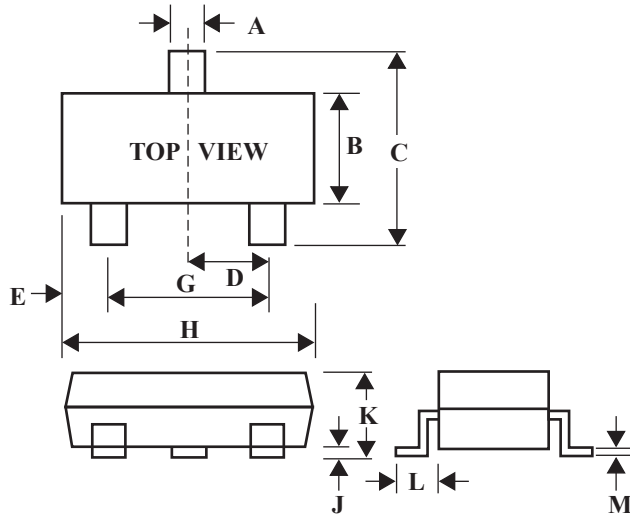
FIG.12 Voltage Feedback Ratio

## TYPICAL STATIC CHARACTERISTICS



**SOT-23 Package Outline Dimensions**

Unit:mm



Dim	Min	Max
A	0.35	0.51
B	1.19	1.40
C	2.10	3.00
D	0.85	1.05
E	0.46	1.00
G	1.70	2.10
H	2.70	3.10
J	0.01	0.13
K	0.89	1.10
L	0.30	0.61
M	0.076	0.25