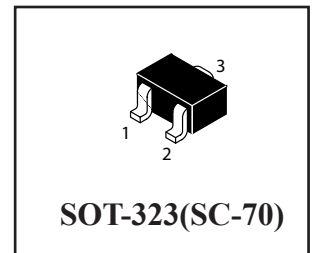
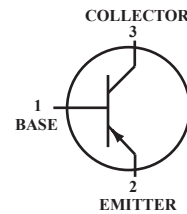


### General Purpose Transistor PNP Silicon

 Lead(Pb)-Free



### Maximum Ratings

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	$V_{CEO}$	-40	Vdc
Collector-Base Voltage	$V_{CBO}$	-40	Vdc
Emitter-Base Voltage	$V_{EBO}$	-5.0	Vdc
Collector Current-Continuous	$I_C$	-200	mAdc

### Thermal Characteristics

Characteristics	Symbol	Max	Unit
Total Device Dissipation $T_A=25^\circ\text{C}$	$P_D$	150	mW
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	833	$^\circ\text{C}/\text{W}$
Junction and Storage, Temperature	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$

### Device Marking

MMBT3906W=2A

### Electrical Characteristics ( $T_A=25^\circ\text{C}$ Unless Otherwise noted)

Characteristics	Symbol	Min	Max	Unit
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### Off Characteristics

Collector-Emitter Breakdown Voltage <sup>(2)</sup> ( $I_C=-1.0\text{mAdc}, I_B=0$ )	$V_{(BR)CEO}$	-40	-	Vdc
Collector-Base Breakdown Voltage ( $I_C=-10\ \mu\text{Adc}, I_E=0$ )	$V_{(BR)CBO}$	-40	-	Vdc
Emitter-Base Breakdown Voltage ( $I_E=-10\ \mu\text{Adc}, I_C=0$ )	$V_{(BR)EBO}$	-5.0	-	Vdc
Base Cutoff Current ( $V_{CE}=-30\ \text{Vdc}, V_{EB}=-3.0\ \text{Vdc}$ )	$I_{BL}$	-	-50	nAdc
Collector Cutoff Current ( $V_{CE}=-30\ \text{Vdc}, V_{EB}=-3.0\ \text{Vdc}$ )	$I_{CEX}$	-	-50	nAdc

1. Device mounted FR4 glass epoxy printed circuit board suing the minimun recommended footprint.

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

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

Characteristics	Symbol	Min	Max	Unit
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### On Characteristics (2)

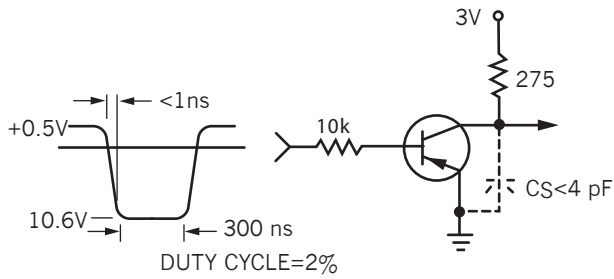
DC Current Gain ( $I_C = -0.1\text{ mAdc}$ , $V_{CE} = -1.0\text{ Vdc}$ ) ( $I_C = -1.0\text{ mAdc}$ , $V_{CE} = -1.0\text{ Vdc}$ ) ( $I_C = -10\text{ mAdc}$ , $V_{CE} = -1.0\text{ Vdc}$ ) ( $I_C = -50\text{ mAdc}$ , $V_{CE} = -1.0\text{ Vdc}$ ) ( $I_C = -100\text{ mAdc}$ , $V_{CE} = -1.0\text{ Vdc}$ )	$H_{FE}$	60 80 100 60 30	. . 300 . .	-
Collector-Emitter Saturation Voltage (2) ( $I_C = -10\text{ mAdc}$ , $I_B = -1.0\text{ mAdc}$ ) ( $I_C = -50\text{ mAdc}$ , $I_B = -5.0\text{ mAdc}$ )	$V_{CE(sat)}$	. .	-0.25 -0.4	Vdc
Base-Emitter Saturation Voltage (2) ( $I_C = -10\text{ mAdc}$ , $I_B = -1.0\text{ mAdc}$ ) ( $I_C = -50\text{ mAdc}$ , $I_B = -5.0\text{ mAdc}$ )	$V_{BE(sat)}$	-0.65 .	-0.85 -0.95	Vdc

### Small-signal Characteristics

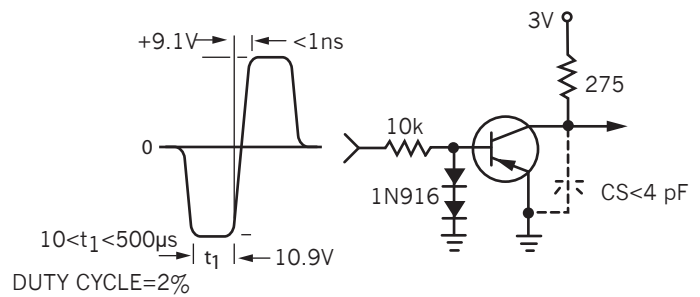
Current-Gain-Bandwidth Product ( $I_C = -10\text{ mAdc}$ , $V_{CE} = -20\text{ Vdc}$ , $f = 100\text{ MHz}$ )	$f_T$	250	-	MHz
Output Capacitance ( $V_{CB} = -5.0\text{ Vdc}$ , $I_E = 0$ , $f = 1.0\text{ MHz}$ )	$C_{obo}$	-	4.5	pF
Input Capacitance ( $V_{EB} = -0.5\text{ Vdc}$ , $I_C = 0$ , $f = 1.0\text{ MHz}$ )	$C_{ibo}$	-	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 ( $V_{CE} = -5.0\text{ Vdc}$ , $I_C = -100\text{ }\mu\text{A}$ , $R_S = 1.0\text{ k ohms}$ , $f = 1.0\text{ kHz}$ )	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	



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

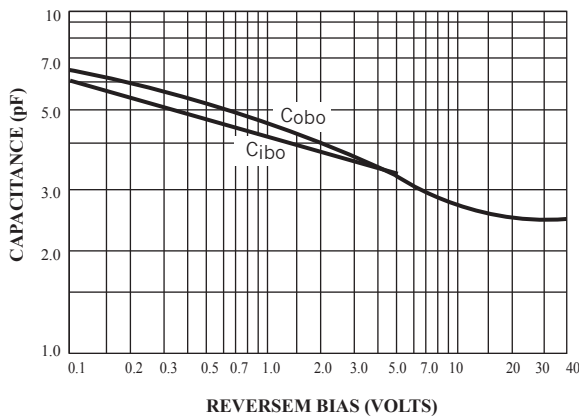


**Figure 2. Storage and Fall Time Equivalent Test Circuit**

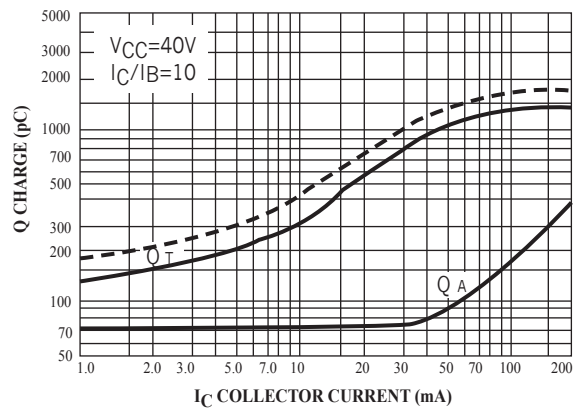
\*Total shunt capacitance of test jig and connectors

## TYPICAL TRANSIENT CHARACTERISTICS

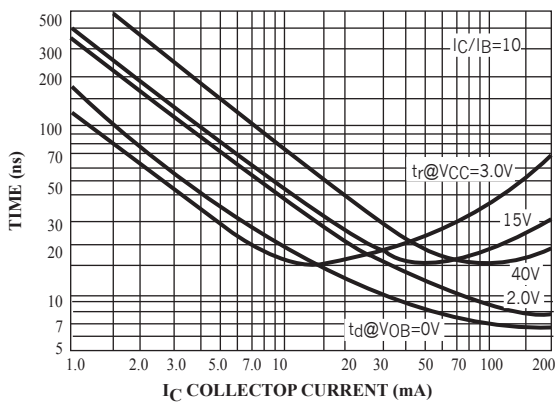
——  $T_J=25^\circ\text{C}$     - - - -  $T_J=125^\circ\text{C}$



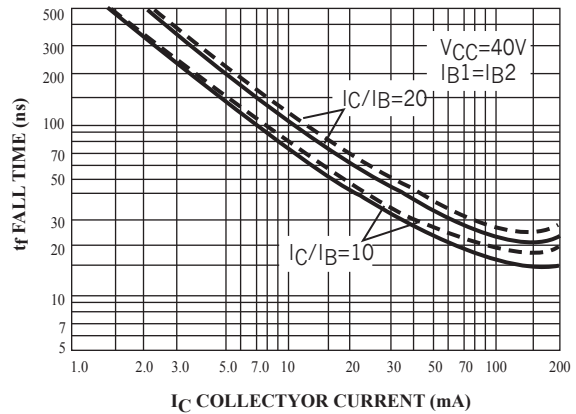
**Figure 3. Capacitance**



**Figure 4. Charge Data**



**Figure 5. Turn-On Time**



**Figure 6. Fall Time**

## TYPICAL AUDIO SMALL-SIGNAL CHARACTERISTICS NOISE FIGURE VARIATIONS

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

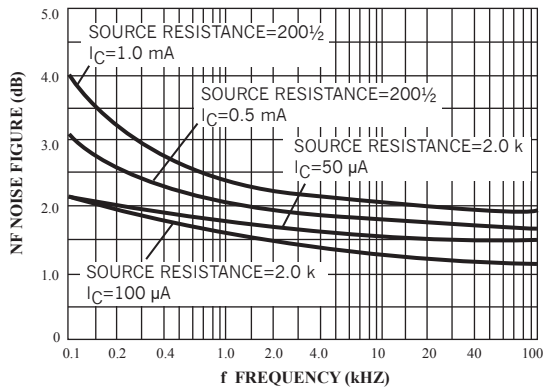


Figure 7.

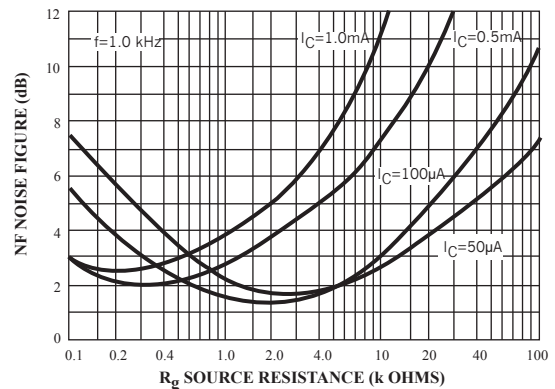


Figure 8.

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

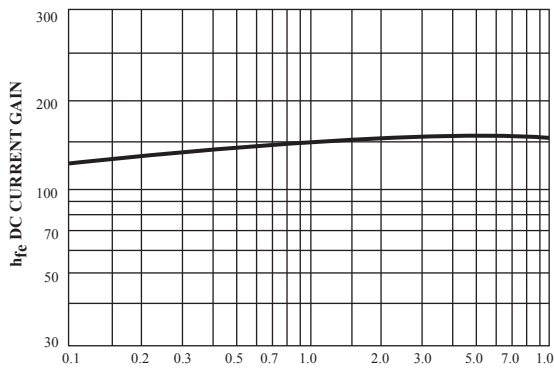


Figure 9. Current Gain

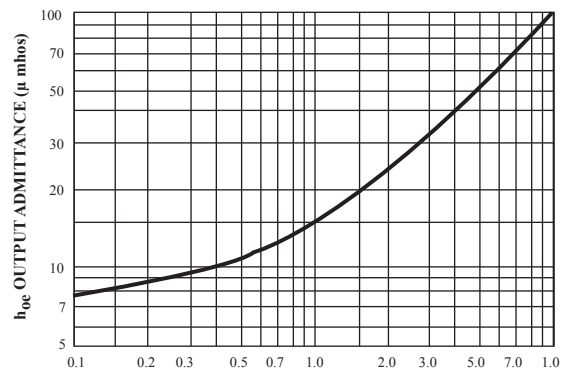


Figure 10. Input Impedance

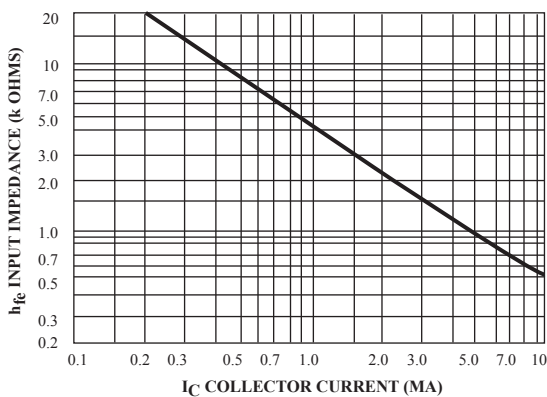


Figure .11 Input Impedance

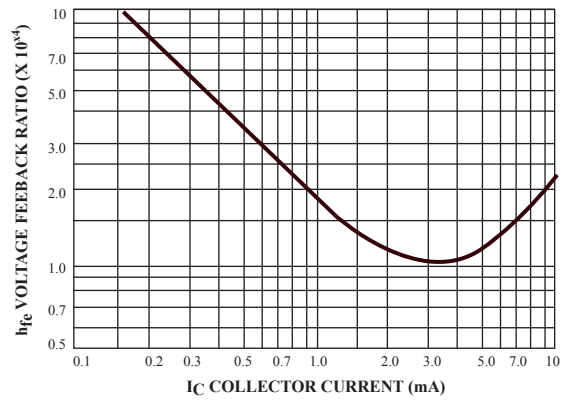


Figure 12. Votage Feedback Ratio

## TYPICAL STATIC CHARACTERISTICS

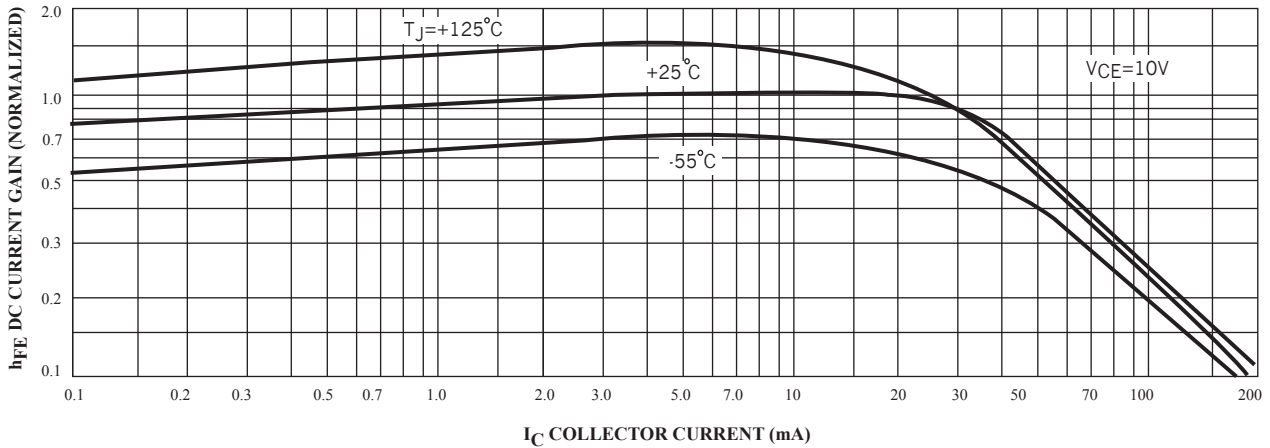


Figure 13. DC Current Gain

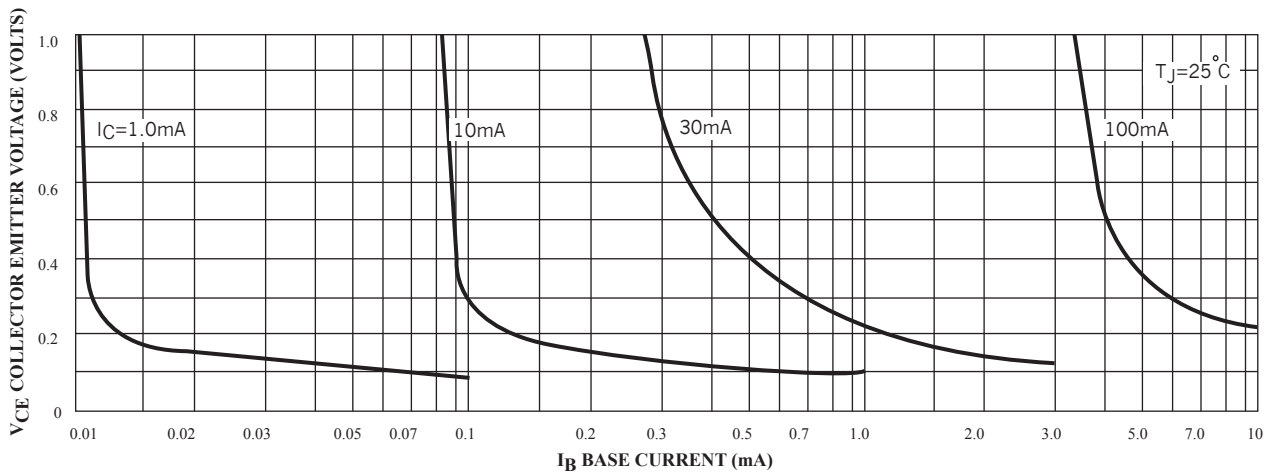


Figure 14. Collector Saturation Region

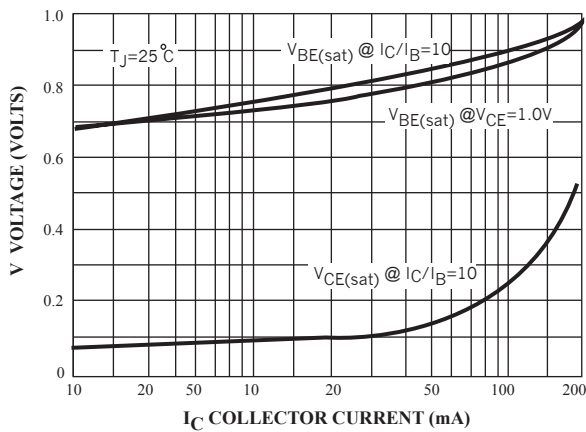


Figure 15. "ON" Voltages

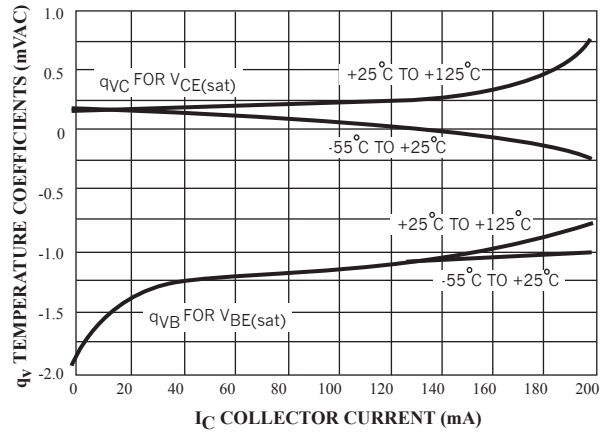
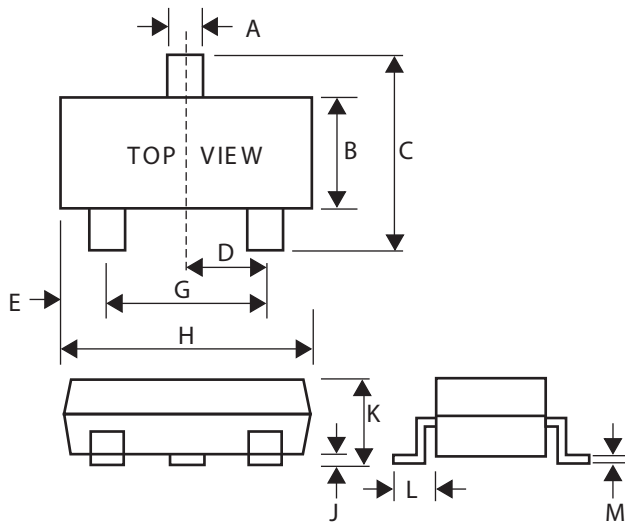


Figure 16. Temperature Coefficients

**SOT-323 Outline Demensions**

Unit:mm



<b>SOT-323</b>		
<b>Dim</b>	<b>Min</b>	<b>Max</b>
<b>A</b>	0.30	0.40
<b>B</b>	1.15	1.35
<b>C</b>	2.00	2.40
<b>D</b>	-	0.65
<b>E</b>	0.30	0.40
<b>G</b>	1.20	1.40
<b>H</b>	1.80	2.20
<b>J</b>	0.00	0.10
<b>K</b>	0.80	1.00
<b>L</b>	0.42	0.53
<b>M</b>	0.10	0.25