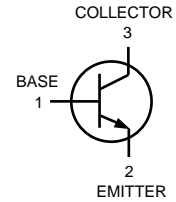
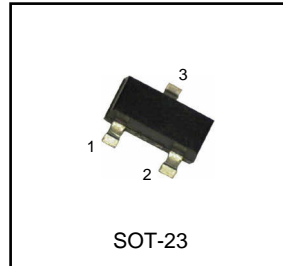


General Purpose Transistor

NPN Silicon

MMBT3906



MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V _{CEO}	-40	V _d c
Collector-Base Voltage	V _{CBO}	-40	V _d c
Emitter-Base Voltage	V _{EBO}	-5.0	V _d c
Collector Current-Continuous	I _C	-200	mA _d c

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max.	Unit
Total Device Dissipation FR-5 Board ⁽¹⁾ T _A =25°C Derate above 25°C	P _D	225 1.8	mW mW / °C
Thermal Resistance Junction to Ambient	R _{θJA}	556	°C / W
Total Device Dissipation Alumina Substrate, ⁽²⁾ T _A =25°C Derate above 25°C	P _D	300 2.4	mW mW / °C
Thermal Resistance Junction to Ambient	R _{θJA}	417	°C / W
Junction and Storage Temperature	T _J , T _{STG}	-55 to +150	°C

DEVICE MARKING

MMBT3906=2A

ELECTRICAL CHARACTERISTICS (T_A=25°C unless otherwise noted)

Characteristic	Symbol	Min.	Max.	Unit
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OFF CHARACTERISTICS

Collector-Emitter Breakdowe Voltage ⁽³⁾ (I _C =1.0mA _d c, I _B =0)	V _{(BR)CEO}	-40	-	V _d c
Collector-Base Breakdowe Voltage (I _C = -10 uA _d c, I _E =0)	V _{(BR)CBO}	-40	-	V _d c
Emitter-Base Breakdowe Voltage (I _E = -10 uA _d c, I _C =0)	V _{(BR)EBO}	-5.0	-	V _d c
Base Cutoff Current (V _{CE} = -30 V _d c, V _{EB} = -3.0 V _d c)	I _{BL}	-	-50	nA _d c
Collector Cutoff Current (V _{CE} = -30 V _d c, V _{EB} = -3.0 V _d c)	I _{CEX}	-	-50	nA _d c

ELECTRICAL CHARACTERISTICS (TA=25°C unless otherwise noted) (Continued)

Characteristic	Symbol	Min.	Max.	Unit
ON CHARACTERISTICS⁽³⁾				
DC Current Gain (IC= -0.1 mA _{dc} , VCE= -1.0 V _{dc}) (IC= -1.0 mA _{dc} , VCE= -1.0 V _{dc}) (IC= -10 mA _{dc} , VCE= -1.0 V _{dc}) (IC= -50 mA _{dc} , VCE= -1.0 V _{dc}) (IC= -100 mA _{dc} , VCE= -1.0 V _{dc})	HFE	60 80 100 60 30	- - 300 - -	-
Collector-Emitter Saturation Voltage ⁽³⁾ (IC= -10 mA _{dc} , IB= -1.0 mA _{dc}) (IC= -50 mA _{dc} , IB= -5.0 mA _{dc})	VCE(sat)	- -	-0.25 -0.4	V _{dc}
Base-Emitter Saturation Voltage ⁽³⁾ (IC= -10 mA _{dc} , IB= -1.0 mA _{dc}) (IC= -50 mA _{dc} , IB= -5.0 mA _{dc})	VBE(sat)	-0.65 -	-0.85 -0.95	V _{dc}

SMALL-SIGNAL CHARACTERISTIC

Current-Gain-Bandwidth Product (IC= -10 mA _{dc} , VCE= -20 V _{dc} , f=100 MHz)	fT	250	-	MHz
Output Capacitance (VCB= -5.0 V _{dc} , IE=0, f=1.0 MHz)	Cobo	-	4.5	pF
Input Capacitance (VEB= -0.5 V _{dc} , IC=0, f=1.0 MHz)	Cibo	-	10	pF
Input Impedance (VCE= -10 V _{dc} , IC= -1.0 mA _{dc} , f=1.0 kHz)	hie	2.0	12	k ohms
Voltage Feedback Ratio (VCE= -10 V _{dc} , IC= -1.0 mA _{dc} , f=1.0 kHz)	hre	0.1	10	X 10 ⁻⁴
Small-Signal Current Gain (VCE= -10 V _{dc} , IC= -1.0 mA _{dc} , f=1.0 kHz)	hfe	100	400	-
Output Admittance (VCE= -10 V _{dc} , IC= -1.0 mA _{dc} , f=1.0 kHz)	hoe	3.0	60	u mhos
Noise Figure (VCE= -5.0 V _{dc} , IC= -100 uA _{dc} , RS=1.0 k ohm, f=1.0 kHz)	NF	-	4.0	dB

SWITCHING CHARACTERISTICS

Delay Time	(VCC= -3.0 V _{dc} , VBE= -0.5 V _{dc} , IC= -10 mA _{dc} , IB1= -1.0 mA _{dc})	td	-	35	nS
Rise Time		tr	-	35	
Storage Time	(VCC= -3.0 V _{dc} , IC= -10 mA _{dc} , IB1=IB2= -1.0 mA _{dc})	ts	-	225	nS
Fall Time		tf	-	75	

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

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

(3) Pulse Test : Pulse Width ≤ 300uS, Duty Cycle ≤ 2.0%.

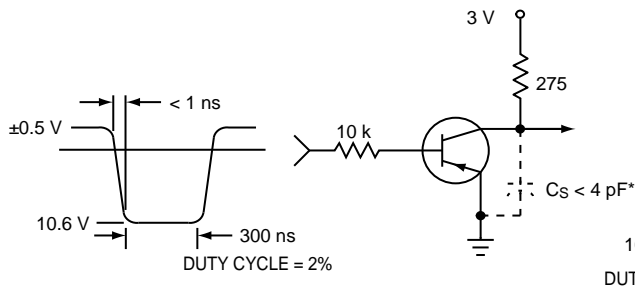


Figure 1. Delay and Rise Time Equivalent Test Circuit

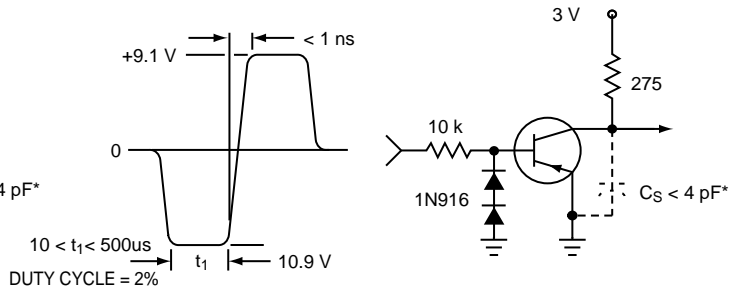


Figure 2. Storage and Fall Time Equivalent Test Circuit

* Total shunt capacitance of test jig and connectors

TYPICAL TRANSIENT CHARACTERISTICS

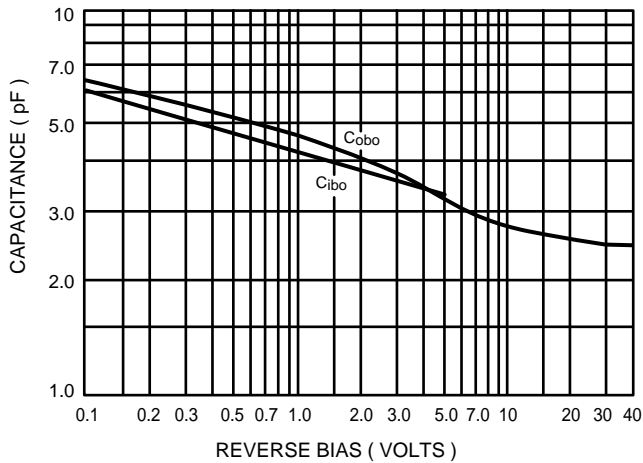


Figure 3. Capacitance

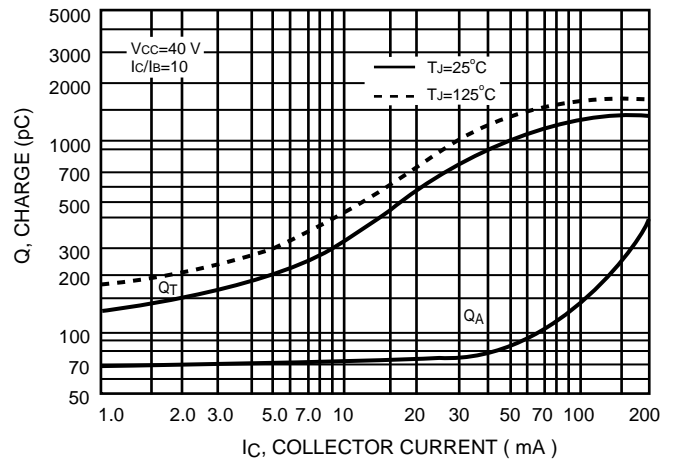


Figure 4. Charge Data

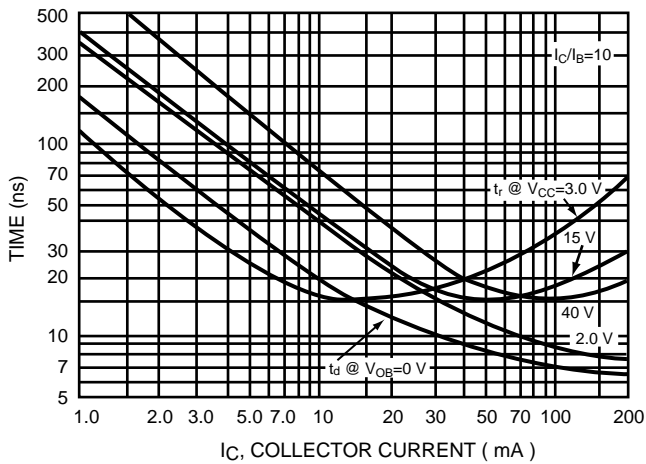


Figure 5. Turn-On Time

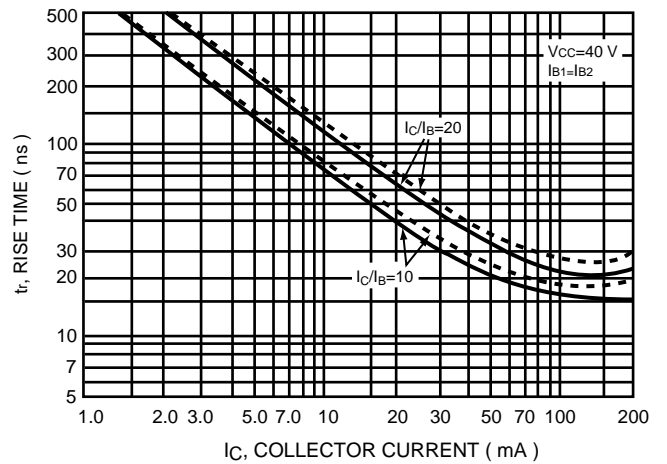


Figure 6. Fall Time

**TYPICAL TRANSIENT CHARACTERISTICS
NOISE FIGURE VARIATIONS**

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

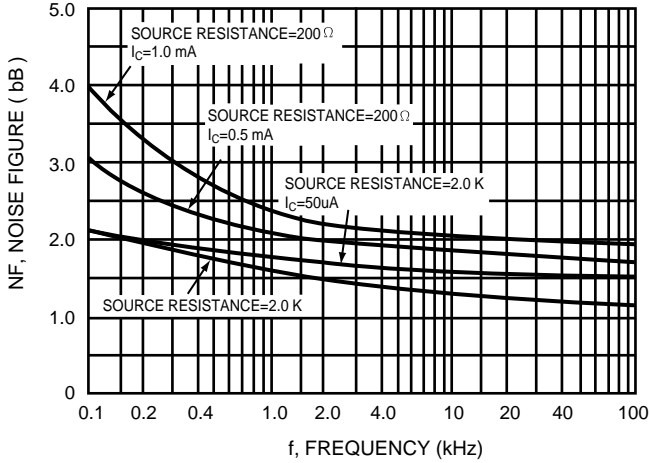


Figure 7.

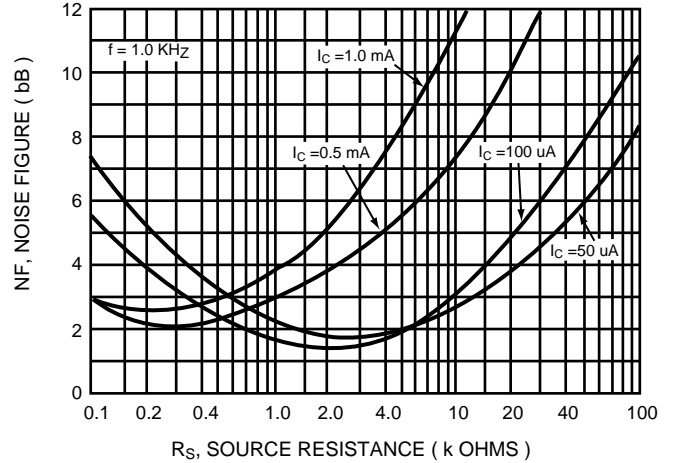
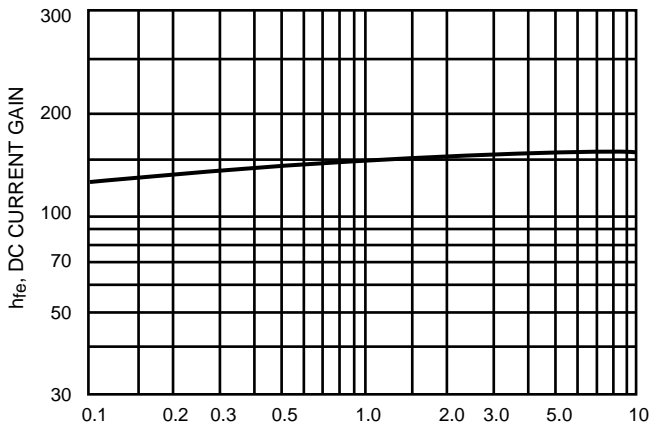


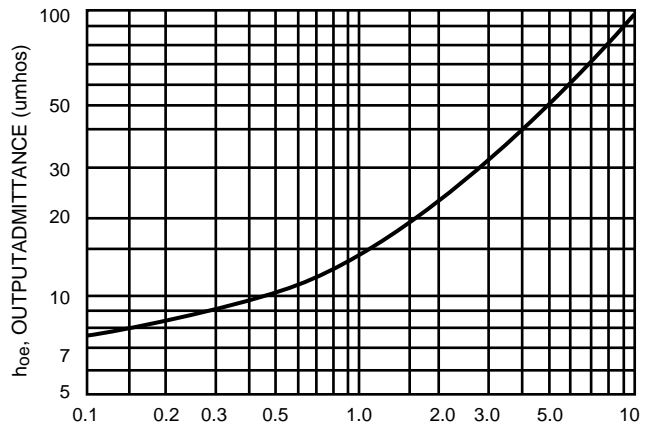
Figure 8.

h PARAMETERS

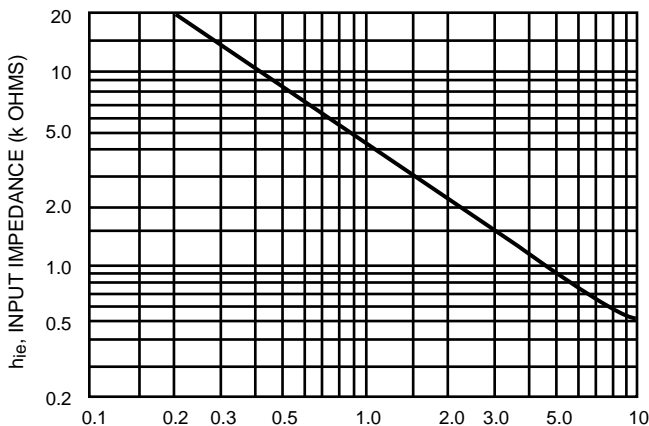
($V_{CE} = -10V_{dc}$, $f = 1.0\text{ kHz}$, $T_A = 25^\circ C$)



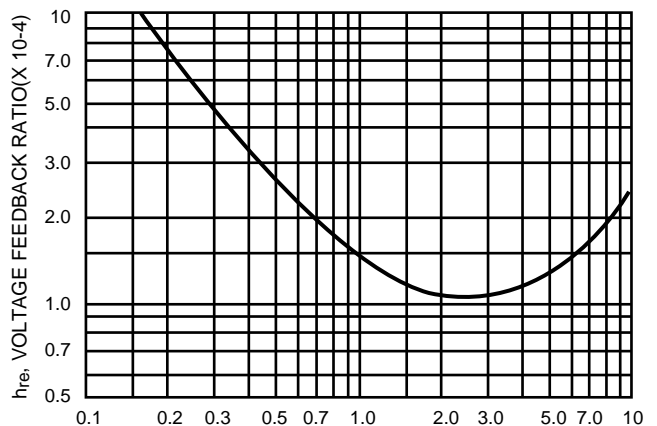
I_C , COLLECTOR CURRENT (mA)
Figure 9. Current Gain



I_C , COLLECTOR CURRENT (mA)
Figure 10. Output Admittance



I_C , COLLECTOR CURRENT (mA)
Figure 11. Input Impedance



I_C , COLLECTOR CURRENT (mA)
Figure 12. Voltage Feedback Ratio

TYPICAL STATIC CHARACTERISTICS

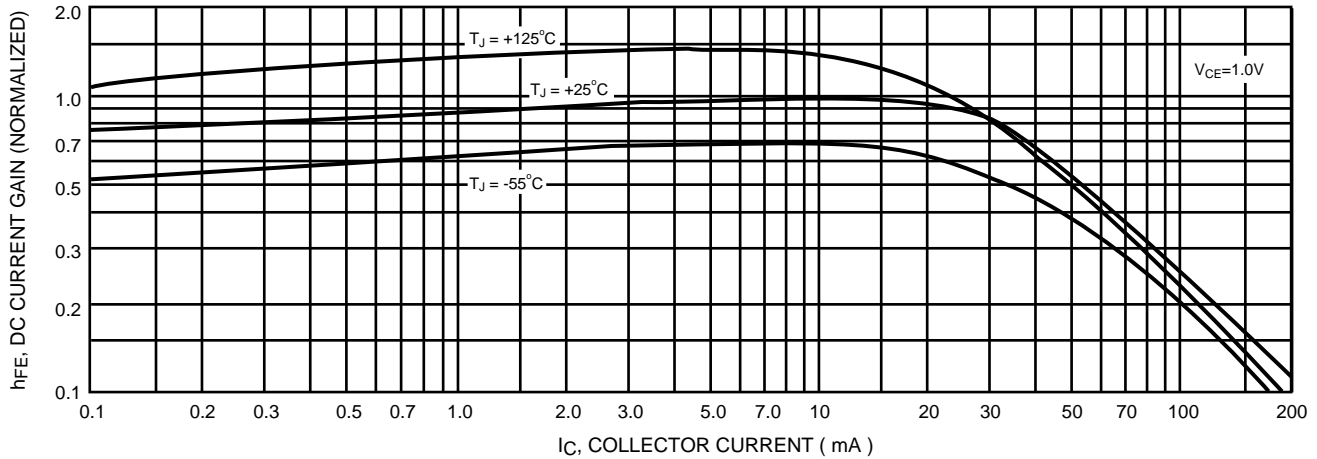


Figure 13. DC Current Gain

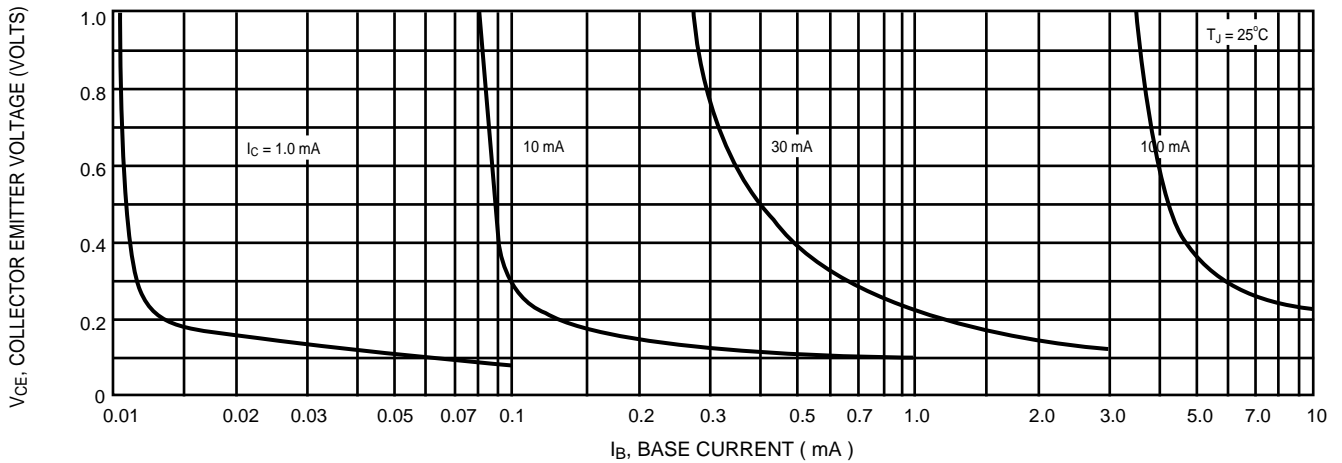


Figure 14. Collector Saturation Region

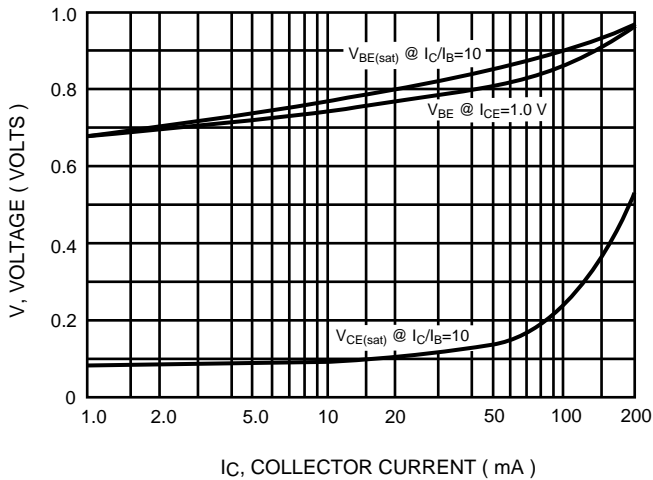


Figure 17. " ON " Voltage

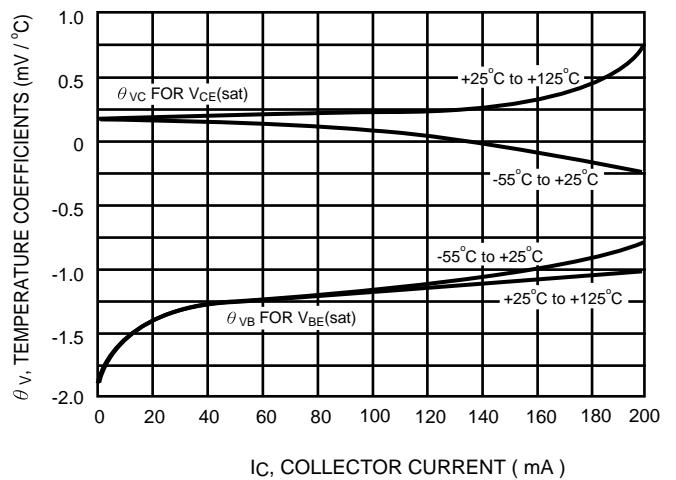


Figure 16. Temperature Coefficients