

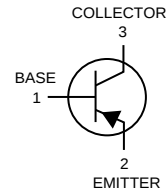
General Purpose Transistor

PNP Silicon

Lead free product

Halogen-free type

MMBT3906WGH



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

Characteristic	Symbol	Max.	Unit
Total Device Dissipation FR-5 Board ⁽¹⁾ $T_A=25^\circ\text{C}$ Derate above 25°C	P_D	225 1.8	mW mW / $^\circ\text{C}$
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	556	$^\circ\text{C} / \text{W}$
Total Device Dissipation Alumina Substrate, ⁽²⁾ $T_A=25^\circ\text{C}$ Derate above 25°C	P_D	300 2.4	mW mW / $^\circ\text{C}$
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	417	$^\circ\text{C} / \text{W}$
Junction and Storage Temperature	T_J, T_{STG}	-55 to +150	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS ($T_A=25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min.	Max.	Unit
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OFF CHARACTERISTICS

Collector-Emitter Breakdowe Voltage ⁽³⁾ ($I_C=1.0\text{mAdc}$, $I_B=0$)	$V_{(BR)CEO}$	-40	-	Vdc
Collector-Base Breakdowe Voltage ($I_C= -10\text{ uAdc}$, $I_E=0$)	$V_{(BR)CBO}$	-40	-	Vdc
Emitter-Base Breakdowe Voltage ($I_E= -10\text{ uAdc}$, $I_C=0$)	$V_{(BR)EBO}$	-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

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

Characteristic	Symbol	Min.	Max.	Unit
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ON CHARACTERISTICS⁽³⁾

DC Current Gain (IC= -0.1 mAdc, VCE= -1.0 Vdc) (IC= -1.0 mAdc, VCE= -1.0 Vdc) (IC= -10 mAdc, VCE= -1.0 Vdc) (IC= -50 mAdc, VCE= -1.0 Vdc) (IC= -100 mAdc, VCE= -1.0 Vdc)	HFE	60 80 100 60 30	- - 300 - -	-
Collector-Emitter Saturation Voltage ⁽³⁾ (IC= -10 mAdc, IB= -1.0 mAdc) (IC= -50 mAdc, IB= -5.0 mAdc)	VCE(sat)	- -	-0.25 -0.4	Vdc
Base-Emitter Saturation Voltage ⁽³⁾ (IC= -10 mAdc, IB= -1.0 mAdc) (IC= -50 mAdc, IB= -5.0 mAdc)	VBE(sat)	-0.65 -	-0.85 -0.95	Vdc

SMALL-SIGNAL CHARACTERISTIC

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

(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%.

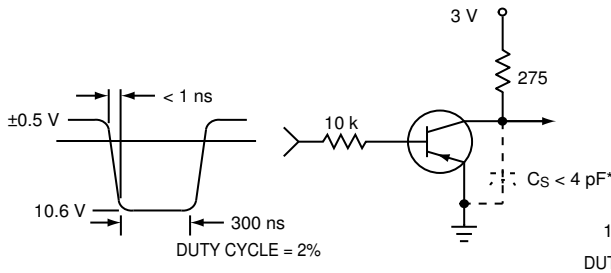


Figure 1. Delay and Rise Time
Equivalent Test Circuit

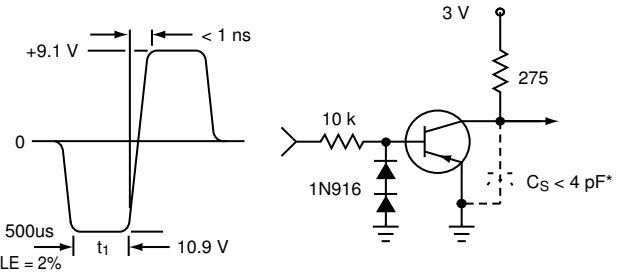


Figure 2. Storage and Fall Time
Equivalent Test Circuit

* Total shunt capacitance of test jig and connectors

TYPICAL TRANSIENT CHARACTERISTICS

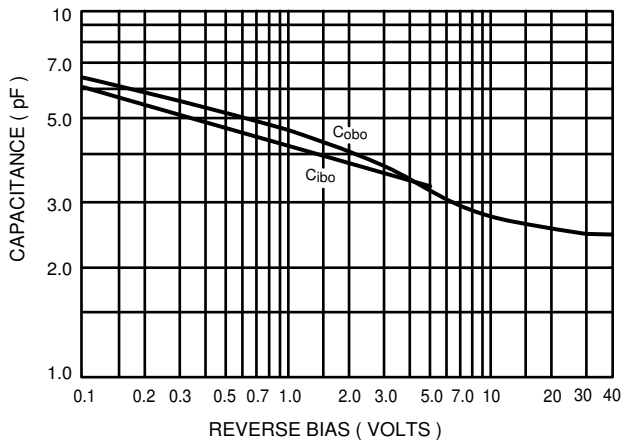


Figure 3. Capacitance

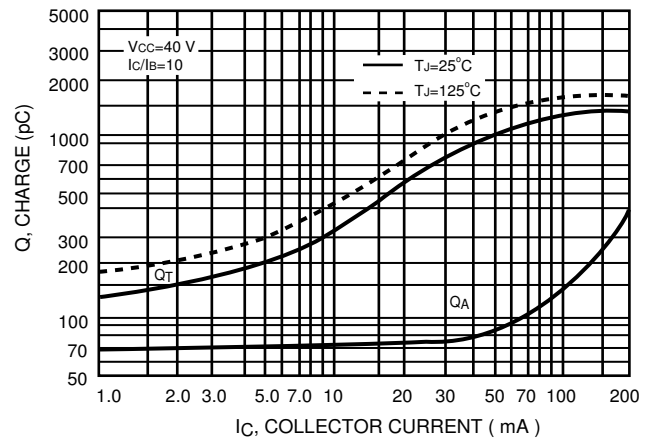


Figure 4. Charge Data

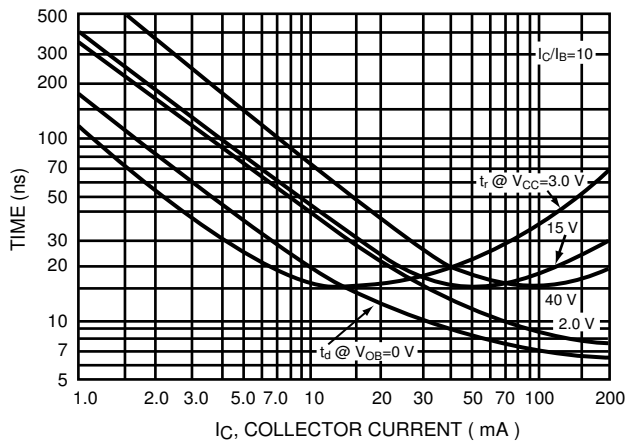


Figure 5. Turn-On Time

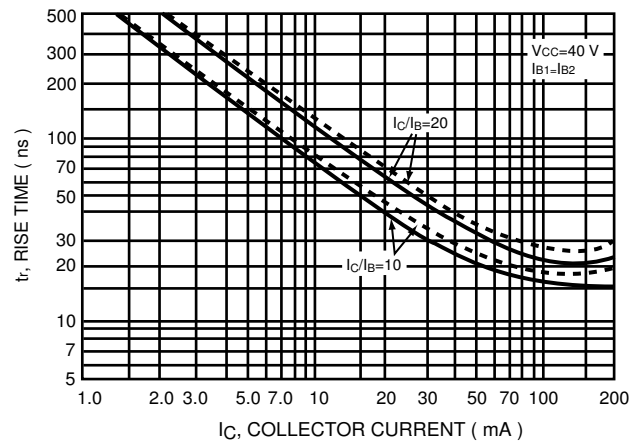


Figure 6. Fall Time

TYPICAL TRANSIENT CHARACTERISTICS
NOISE FIGURE VARIATIONS

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

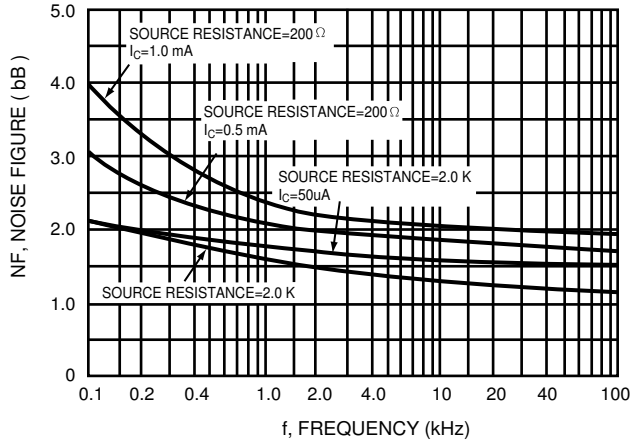


Figure 7.

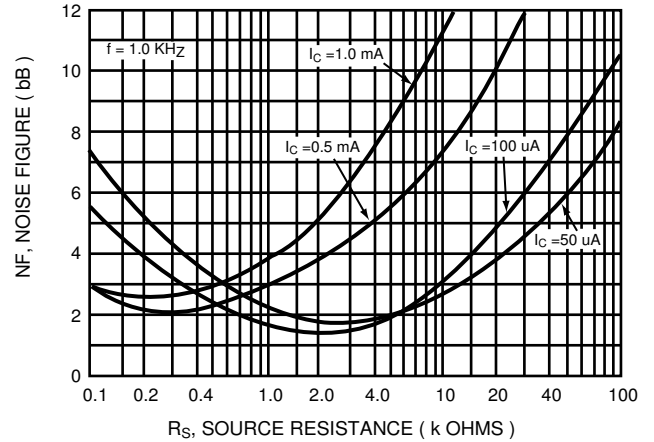


Figure 8.

h PARAMETERS

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

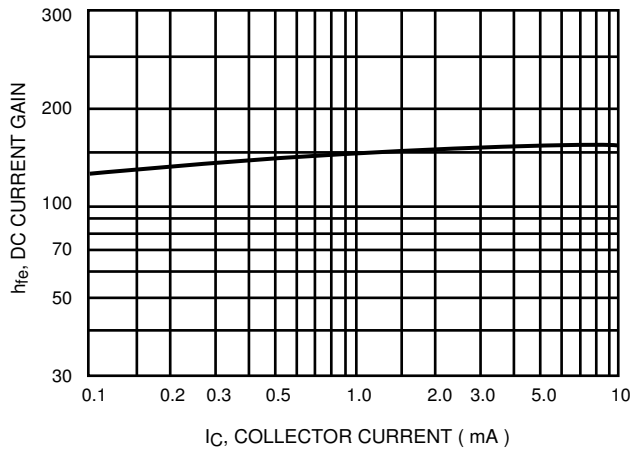


Figure 9. Current Gain

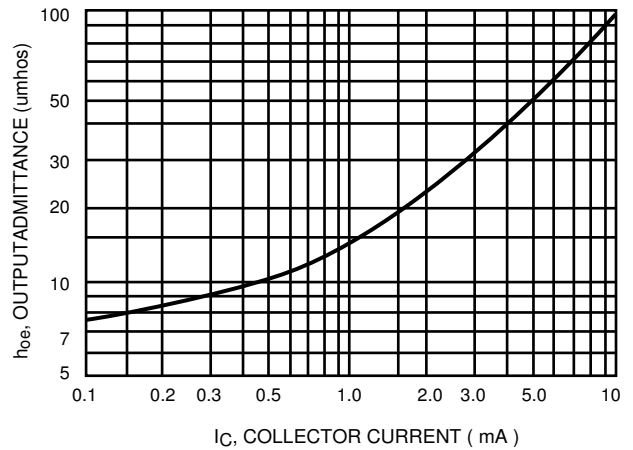


Figure 10. Output Admittance

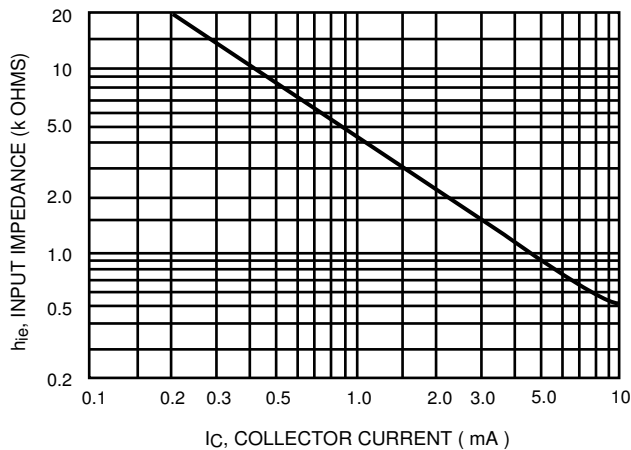


Figure 11. Input Impedance

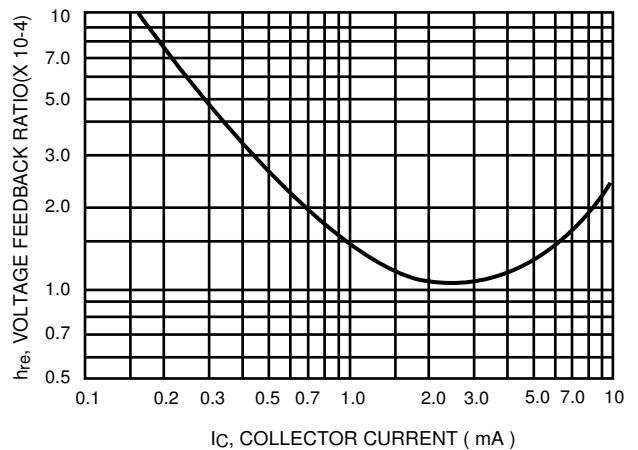


Figure 12. Voltage Feedback Ratio



TYPICAL STATIC CHARACTERISTICS

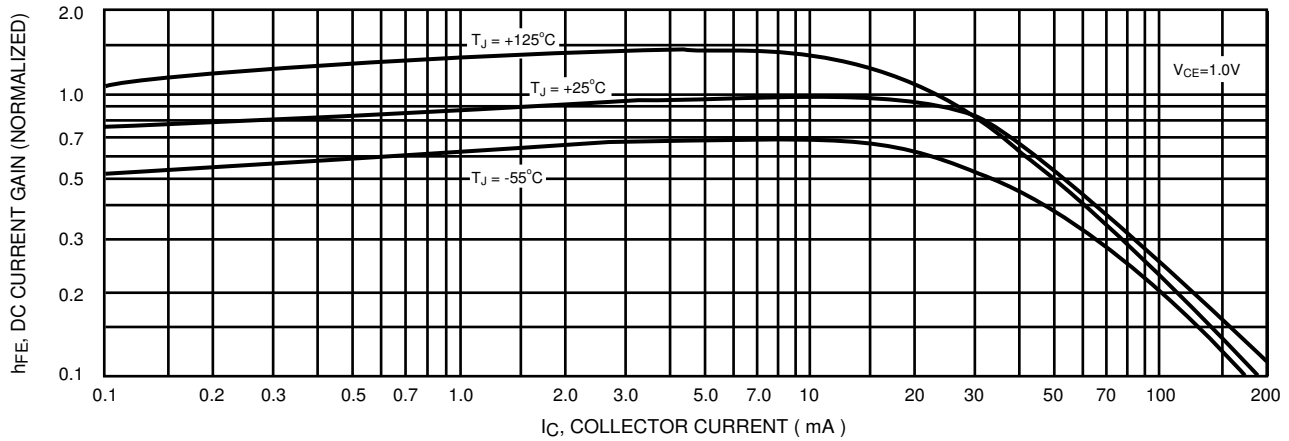


Figure 13. DC Current Gain

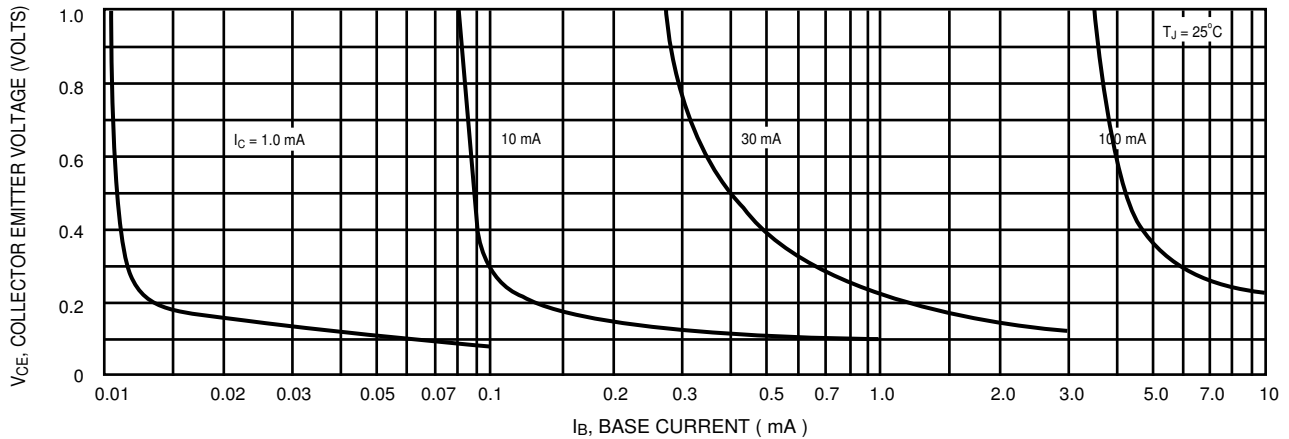


Figure 14. Collector Saturation Region

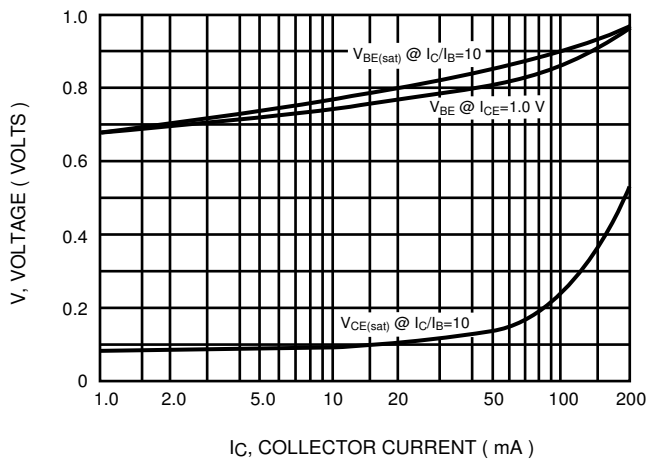


Figure 17. " ON " Voltage

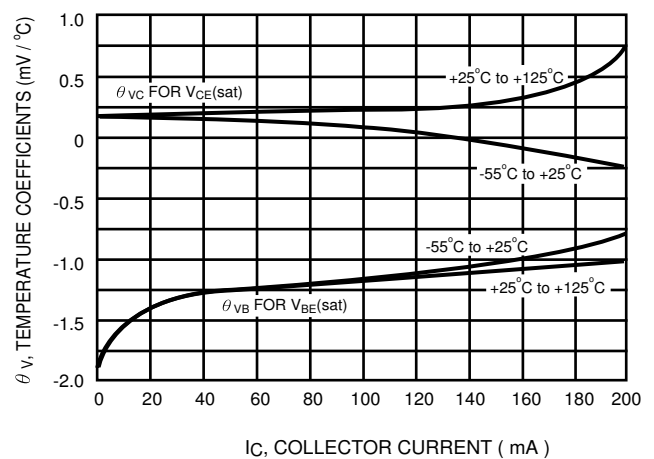


Figure 16. Temperature Coefficients

