

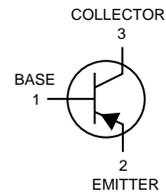
## General Purpose Transistor

**PNP Silicon**

**Lead free product**

**Halogen-free type**

**MMBT3906WGH**



### MAXIMUM RATINGS

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

### THERMAL CHARACTERISTICS

Characteristic	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 1.8	mW mW / °C
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 2.4	mW mW / °C
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

### ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C unless otherwise noted)

Characteristic	Symbol	Min.	Max.	Unit
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### OFF CHARACTERISTICS

Collector-Emitter Breakdowe Voltage <sup>(3)</sup> ( I <sub>C</sub> =1.0mAdc, I <sub>B</sub> =0 )	V <sub>(BR)CEO</sub>	-40	-	V <sub>dc</sub>
Collector-Base Breakdowe Voltage ( I <sub>C</sub> = -10 uAdc, I <sub>E</sub> =0 )	V <sub>(BR)CBO</sub>	-40	-	V <sub>dc</sub>
Emitter-Base Breakdowe Voltage ( I <sub>E</sub> = -10 uAdc, I <sub>C</sub> =0 )	V <sub>(BR)EBO</sub>	-5.0	-	V <sub>dc</sub>
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> = -30 Vdc, V <sub>EB</sub> = -3.0 Vdc )	I <sub>CEx</sub>	-	-50	nAdc

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

Characteristic	Symbol	Min.	Max.	Unit
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**ON CHARACTERISTICS<sup>(3)</sup>**

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 <sup>(3)</sup> ( 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 <sup>(3)</sup> ( 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 <sup>-4</sup>
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%.

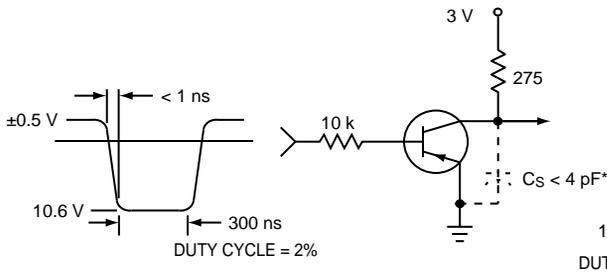


Figure 1. Delay and Rise Time Equivalent Test Circuit

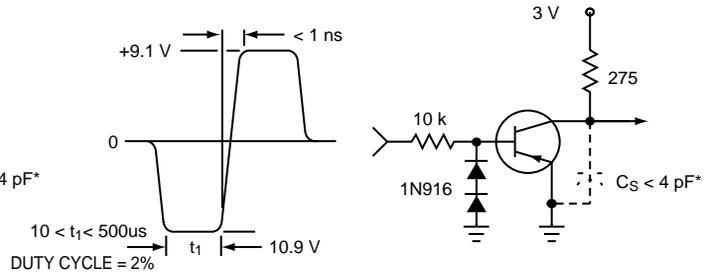


Figure 2. Storage and Fall Time Equivalent Test Circuit

\* Total shunt capacitance of test jig and connectors

TYPICAL TRANSIENT CHARACTERISTICS

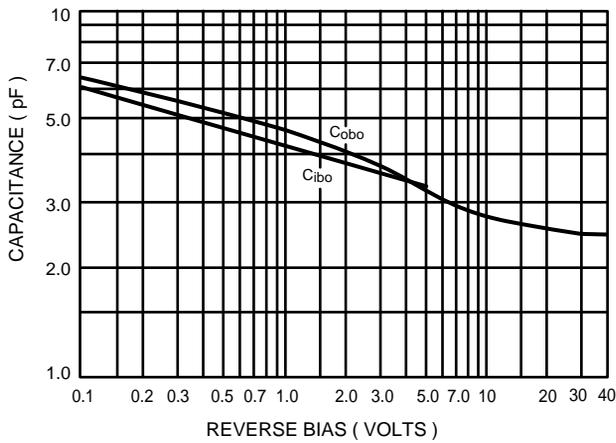


Figure 3. Capacitance

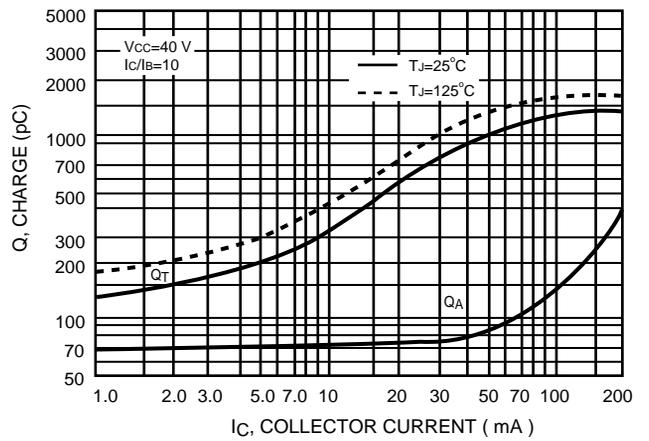


Figure 4. Charge Data

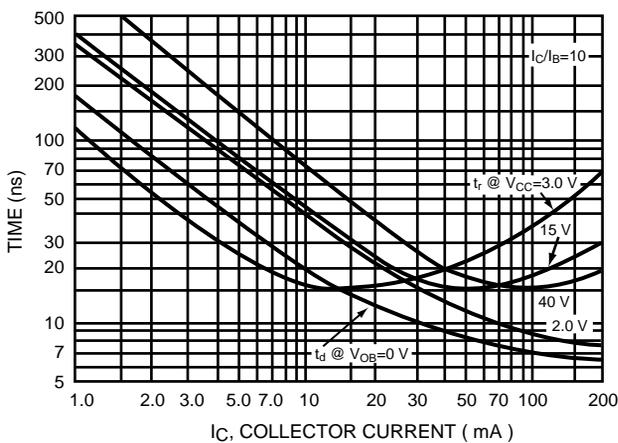


Figure 5. Turn-On Time

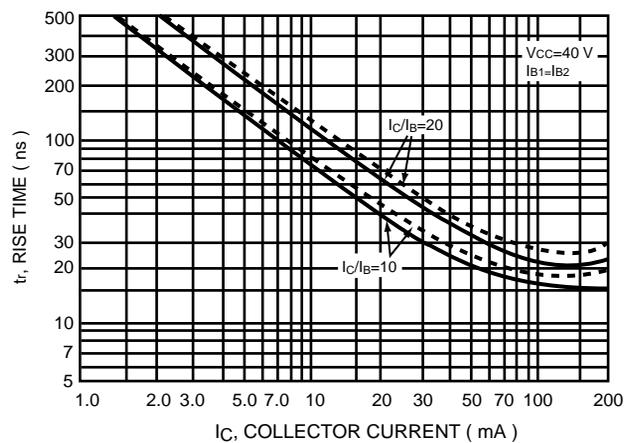


Figure 6. Fall Time

TYPICAL TRANSIENT CHARACTERISTICS  
NOISE FIGURE VARIATIONS

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

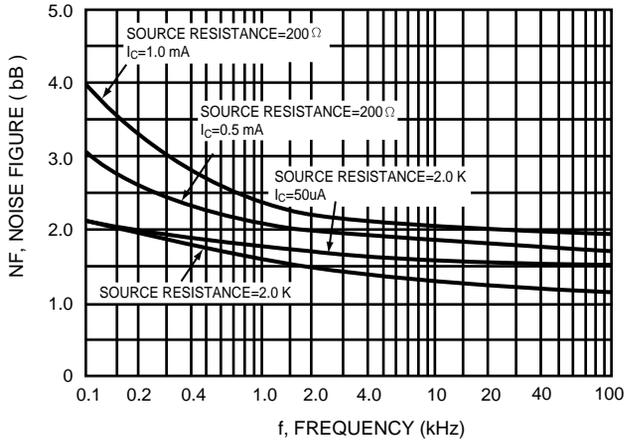


Figure 7.

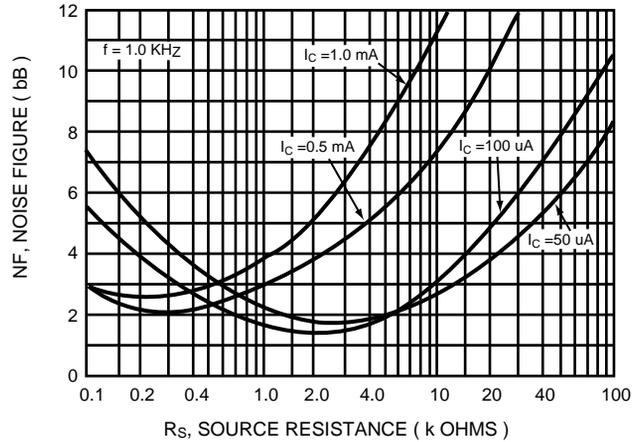


Figure 8.

h PARAMETERS

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

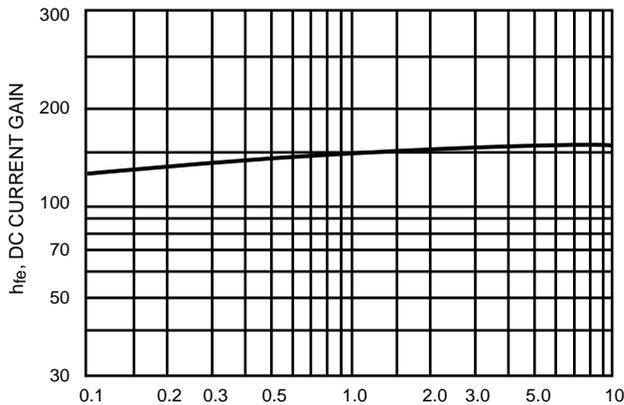


Figure 9. Current Gain

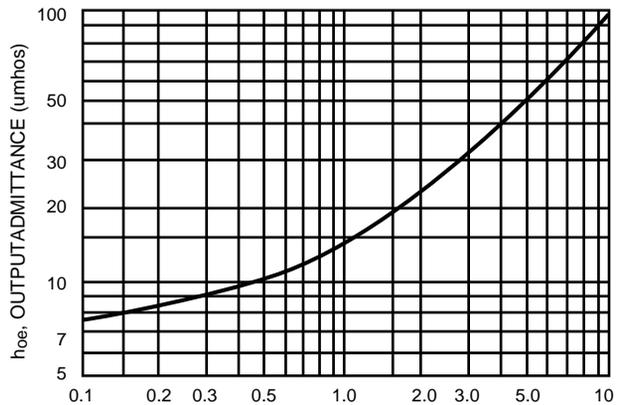


Figure 10. Output Admittance

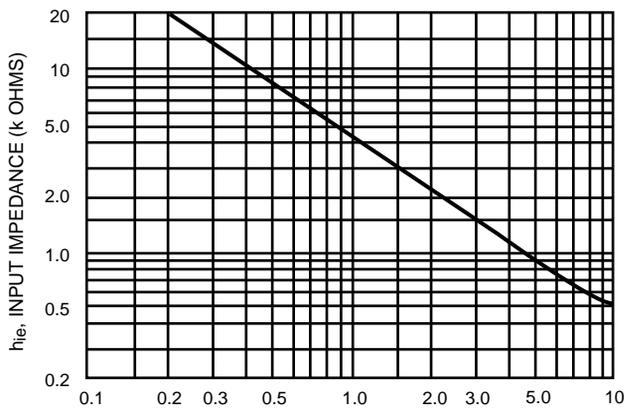


Figure 11. Input Impedance

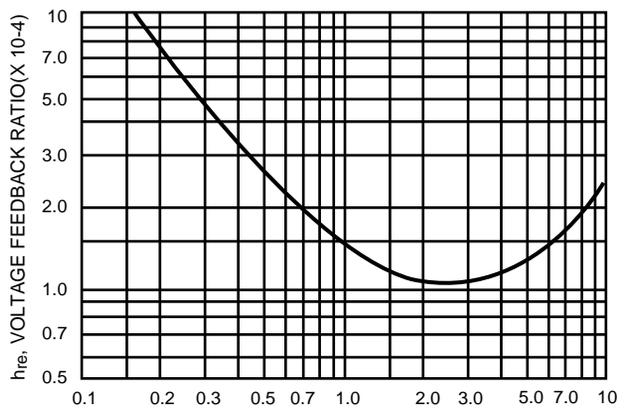


Figure 12. Voltage Feedback Ratio

TYPICAL STATIC CHARACTERISTICS

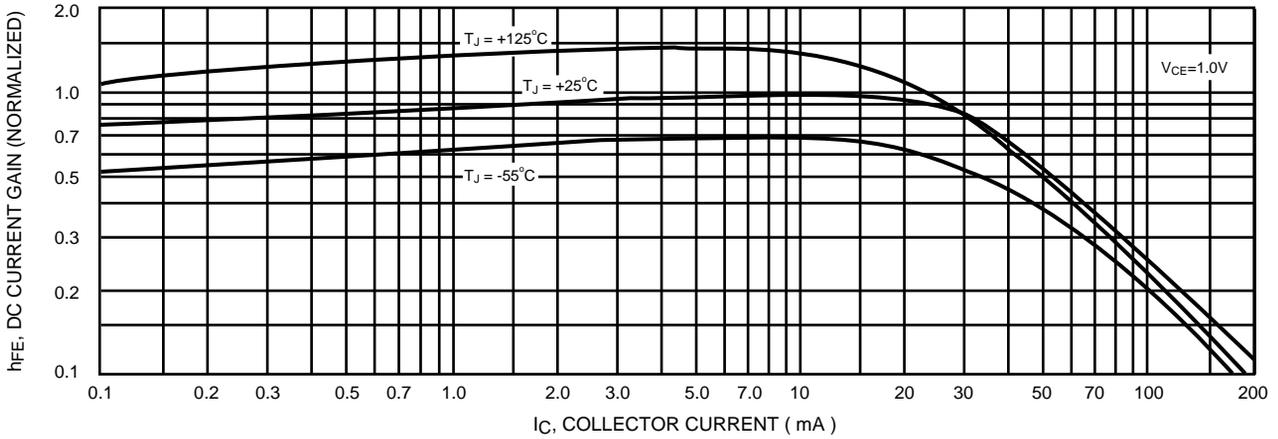


Figure 13. DC Current Gain

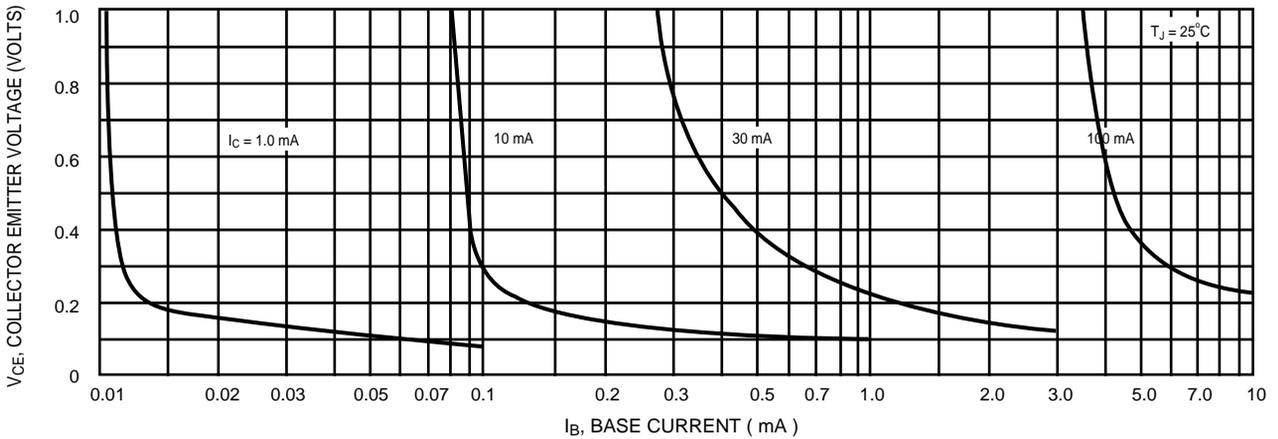


Figure 14. Collector Saturation Region

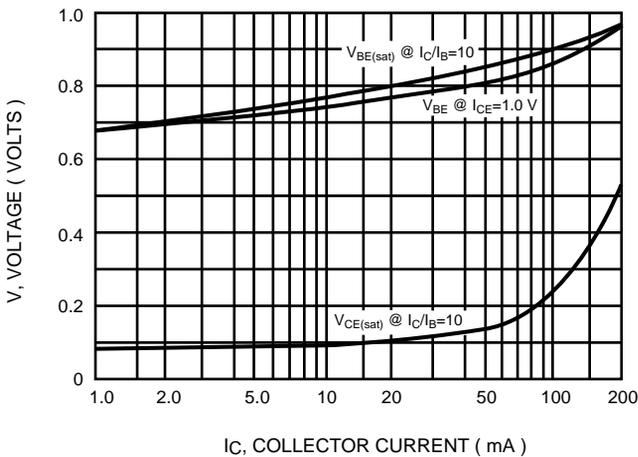


Figure 17. " ON " Voltage

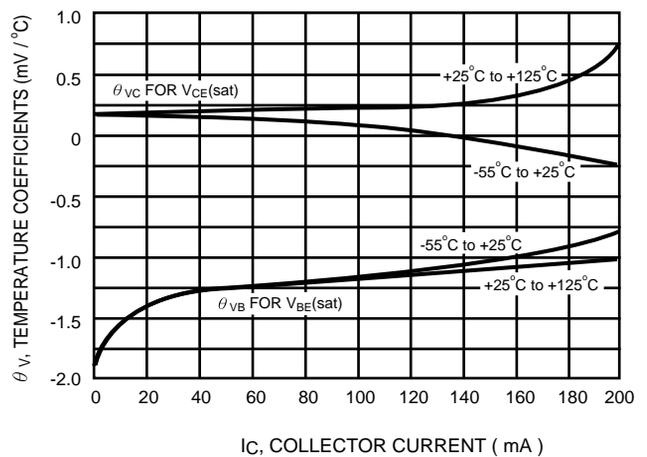


Figure 16. Temperature Coefficients