

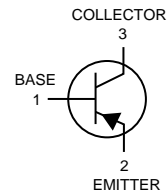
General Purpose Transistor

PNP Silicon

Lead free product

Halogen-free type

MMBT3906WGH



MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|------------------------------|------------------|-------|-----------------|
| Collector-Emitter Voltage | V _{CEO} | -40 | V _{dc} |
| Collector-Base Voltage | V _{CBO} | -40 | V _{dc} |
| Emitter-Base Voltage | V _{EBO} | -5.0 | V _{dc} |
| Collector Current-Continuous | I _C | -200 | mAdc |

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 |

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

| Characteristic | Symbol | Min. | Max. | Unit |
|----------------|--------|------|------|------|
|----------------|--------|------|------|------|

OFF CHARACTERISTICS

| | | | | |
|--|----------------------|------|-----|-----------------|
| Collector-Emitter Breakdowe Voltage ⁽³⁾ (I _C =1.0mAdc, I _B =0) | V _{(BR)CEO} | -40 | - | V _{dc} |
| Collector-Base Breakdowe Voltage (I _C = -10 uAdc, I _E =0) | V _{(BR)CBO} | -40 | - | V _{dc} |
| Emitter-Base Breakdowe Voltage (I _E = -10 uAdc, I _C =0) | V _{(BR)EBO} | -5.0 | - | V _{dc} |
| Base Cutoff Current (V _{CE} = -30 Vdc, V _{EB} = -3.0 Vdc) | I _{BL} | - | -50 | nAdc |
| Collector Cutoff Current (V _{CE} = -30 Vdc, V _{EB} = -3.0 Vdc) | I _{CEX} | - | -50 | nAdc |

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

| Characteristic | Symbol | Min. | Max. | Unit |
|----------------|--------|------|------|------|
|----------------|--------|------|------|------|

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%.

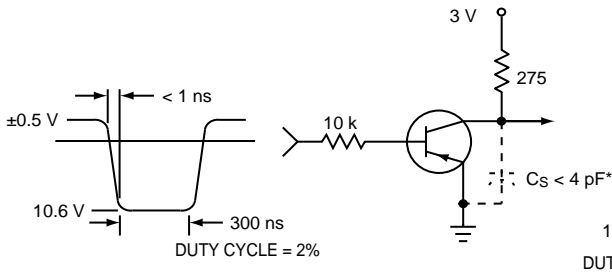


Figure 1. Delay and Rise Time Equivalent Test Circuit

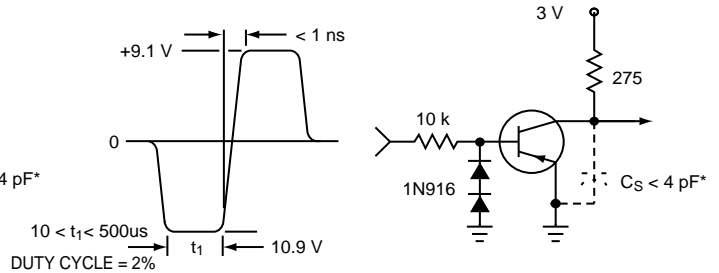


Figure 2. Storage and Fall Time Equivalent Test Circuit

* Total shunt capacitance of test jig and connectors

TYPICAL TRANSIENT CHARACTERISTICS

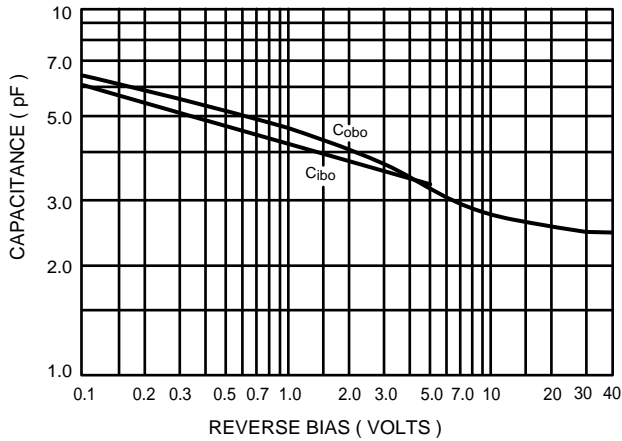


Figure 3. Capacitance

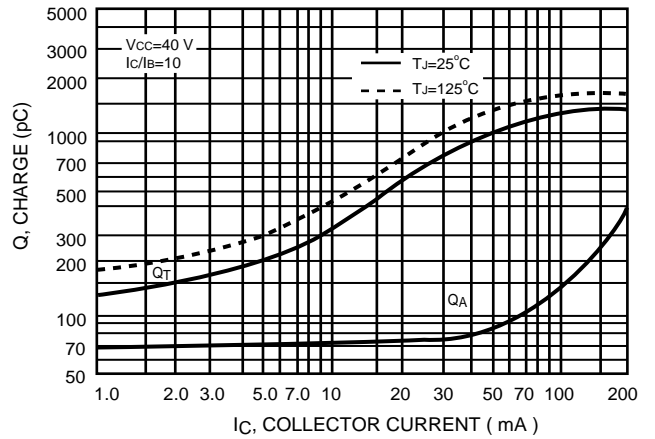


Figure 4. Charge Data

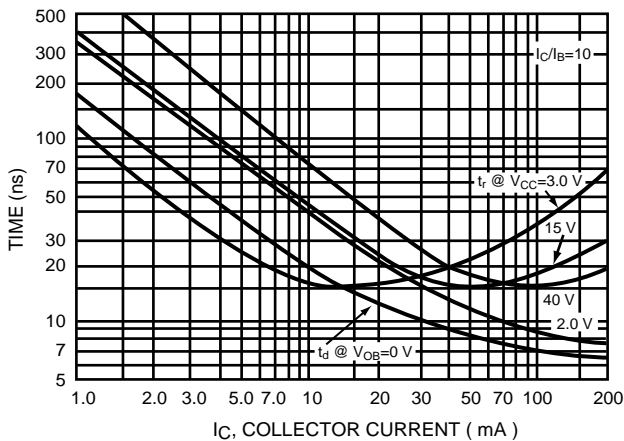


Figure 5. Turn-On Time

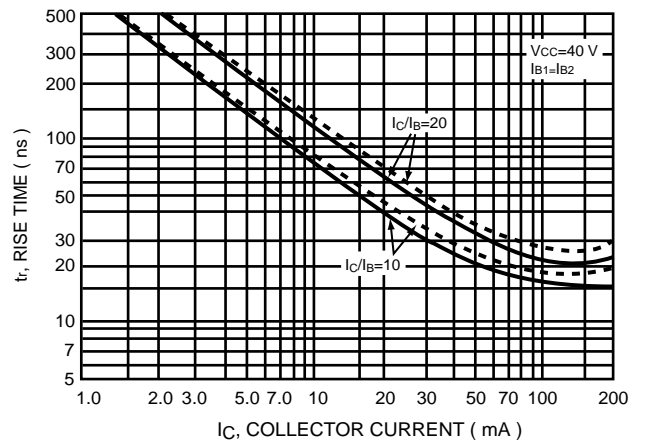


Figure 6. Fall Time

TYPICAL TRANSIENT CHARACTERISTICS
NOISE FIGURE VARIATIONS

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

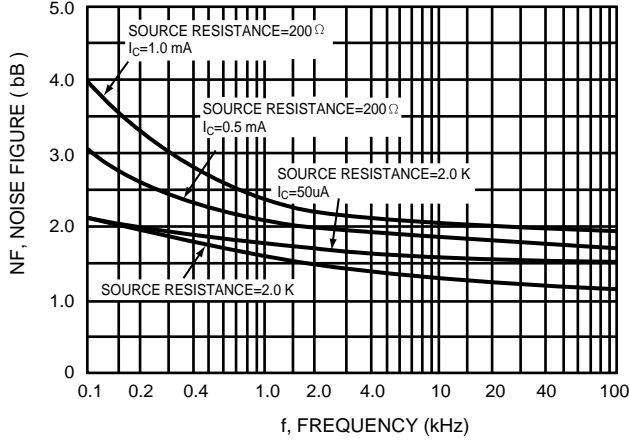


Figure 7.

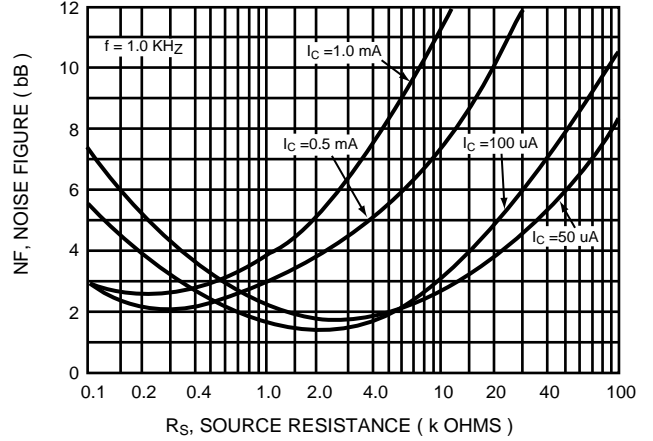


Figure 8.

h PARAMETERS

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

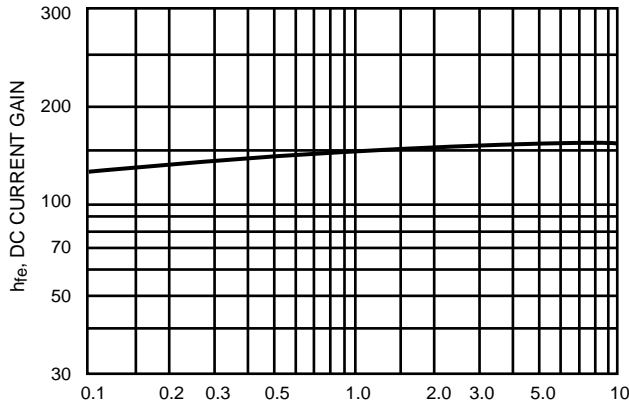


Figure 9. Current Gain

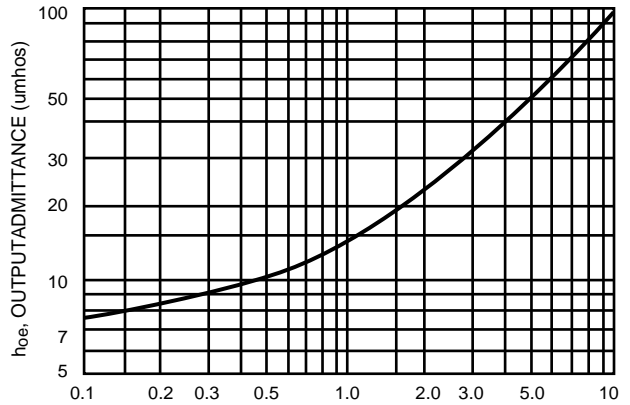


Figure 10. Output Admittance

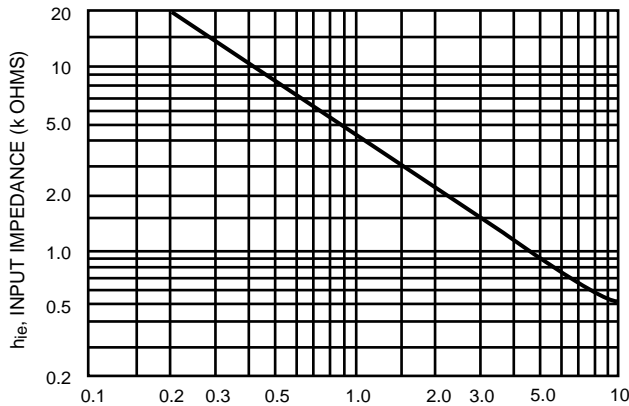


Figure 11. Input Impedance

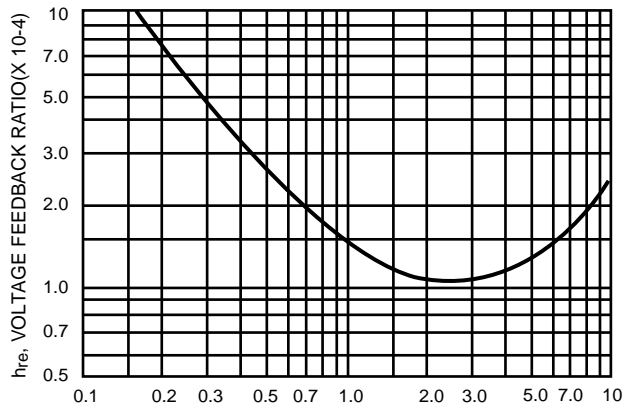


Figure 12. Voltage Feedback Ratio

TYPICAL STATIC CHARACTERISTICS

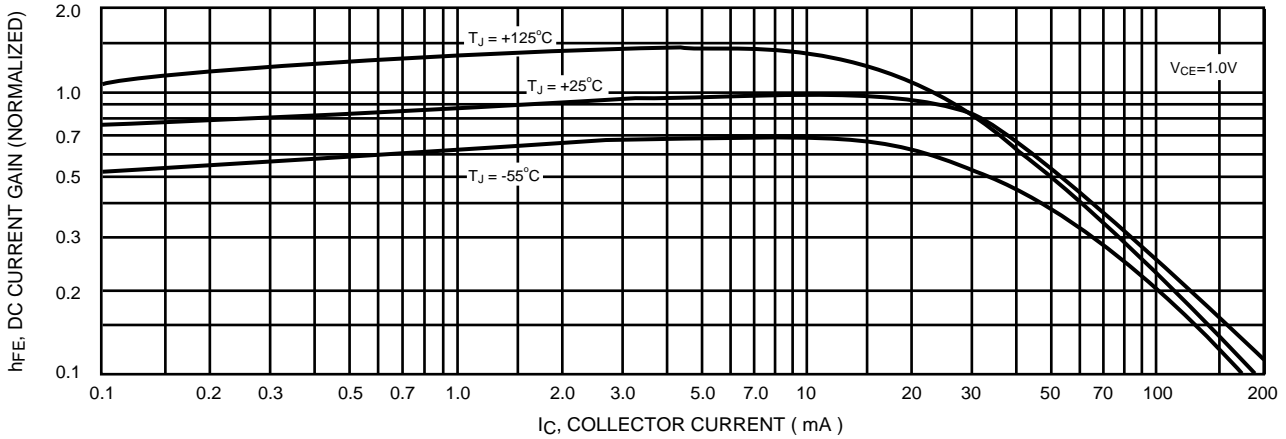


Figure 13. DC Current Gain

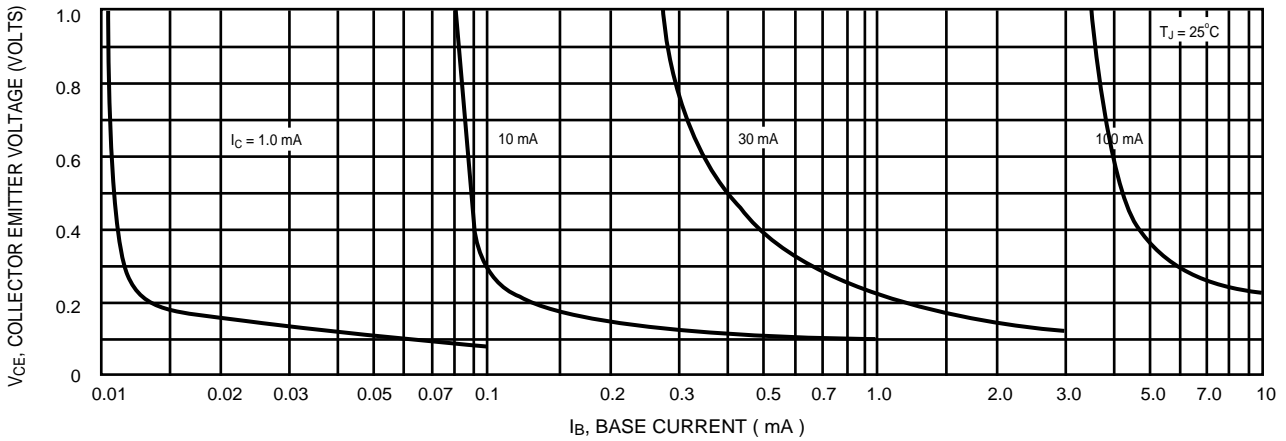


Figure 14. Collector Saturation Region

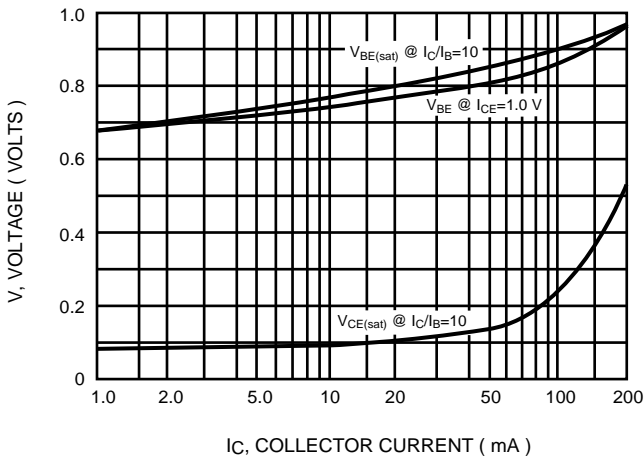


Figure 17. " ON " Voltage

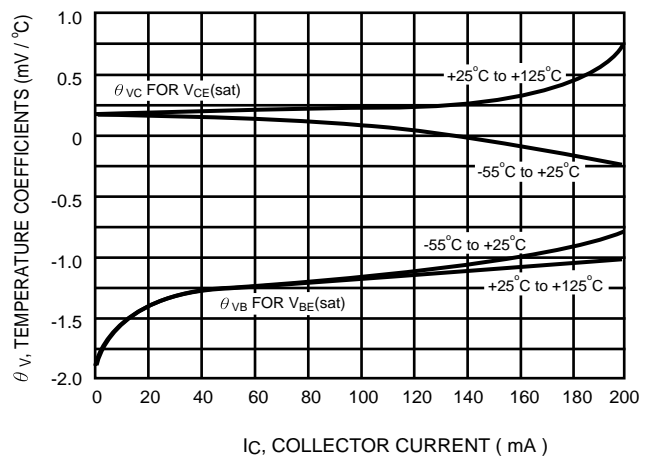


Figure 16. Temperature Coefficients