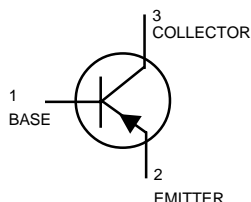


General Purpose Transistors

PNP Silicon



MMBT3906LT1



CASE 318-08, STYLE 6
SOT-23 (TO-236AB)

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	$^\circ\text{C/W}$
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	$^\circ\text{C/W}$
Junction and Storage Temperature	T_J, T_{stg}	-55 to +150	$^\circ\text{C}$

DEVICE MARKING

MMBT3906LT1 = 2A

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

Characteristic	Symbol	Min	Max	Unit
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OFF CHARACTERISTICS

Collector-Emitter Breakdown Voltage (3) ($I_C = -1.0\text{ mAdc}, I_B = 0$)	$V_{(BR)CEO}$	-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

- FR-5 = $1.0 \times 0.75 \times 0.062$ in.
- Alumina = $0.4 \times 0.3 \times 0.024$ in. 99.5% alumina.
- Pulse Width $\leq 300\ \mu\text{s}$; Duty Cycle $\leq 2.0\%$.

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

Characteristic	Symbol	Min	Max	Unit
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 ($I_C = -10\text{ mAdc}$, $I_B = -1.0\text{ mAdc}$) ($I_C = -50\text{ mAdc}$, $I_B = -5.0\text{ mAdc}$)	$V_{CE(sat)}$	— —	-0.25 -0.4	Vdc
Base–Emitter Saturation Voltage ($I_C = -10\text{ mAdc}$, $I_B = -1.0\text{ mAdc}$) ($I_C = -50\text{ mAdc}$, $I_B = -5.0\text{ mAdc}$)	$V_{BE(sat)}$	-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 Ω
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_{re}	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	μmhos
Noise Figure ($V_{CE} = -5.0\text{ Vdc}$, $I_C = -100\text{ }\mu\text{A}$, $R_S = 1.0\text{ k}\Omega$, $f = 1.0\text{ kHz}$)	NF	—	4.0	dB

SWITCHING CHARACTERISTICS

Delay Time	($V_{CC} = -3.0\text{ Vdc}$, $V_{BE} = 0.5\text{ Vdc}$, $I_C = -10\text{ mAdc}$, $I_{B1} = -1.0\text{ mAdc}$)	t_d	—	35	ns
Rise Time		t_d	—	35	
Storage Time	($V_{CC} = -3.0\text{ Vdc}$, $I_C = -10\text{ mAdc}$, $I_{B1} = I_{B2} = -1.0\text{ mAdc}$)	t_s	—	225	ns
Fall Time		t_f	—	75	

3. Pulse Test: Pulse Width $\leq 300\text{ }\mu\text{s}$; Duty Cycle $\leq 2.0\%$.

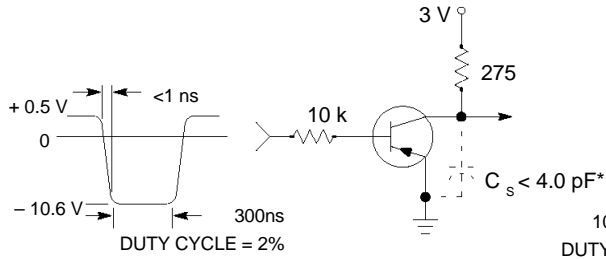


Figure 1. Delay and Rise Time Equivalent Test Circuit

*Total shunt capacitance of test jig and connectors

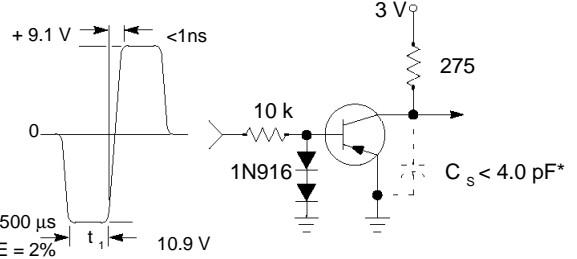


Figure 2. Storage and Fall Time Equivalent Test Circuit

TYPICAL TRANSIENT CHARACTERISTICS

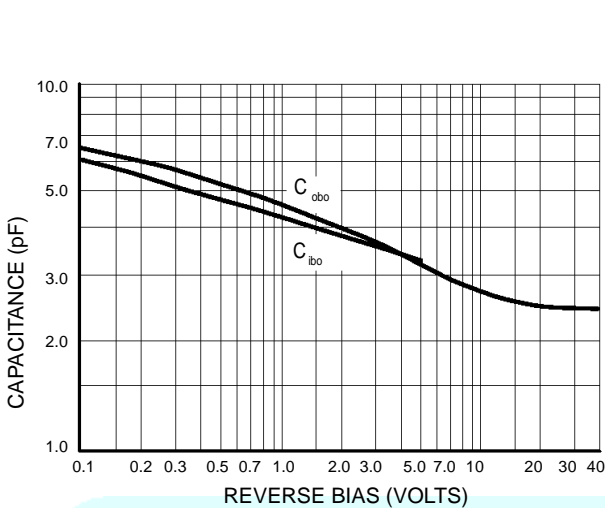


Figure 3. Capacitance

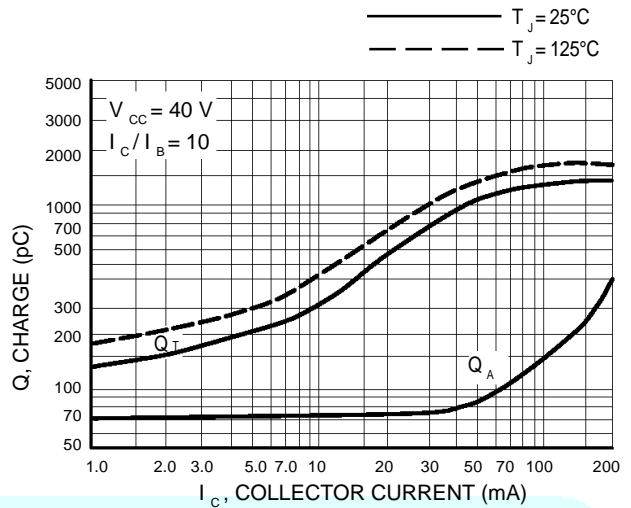


Figure 4. Charge Data

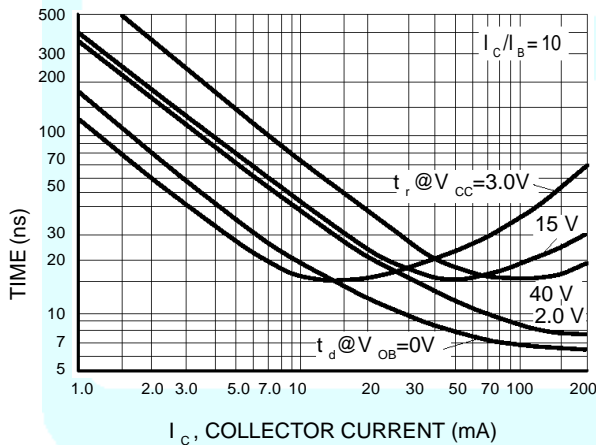


Figure 5. Turn-On Time

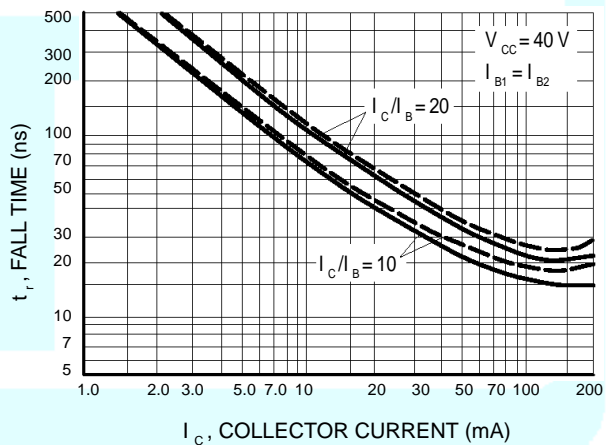
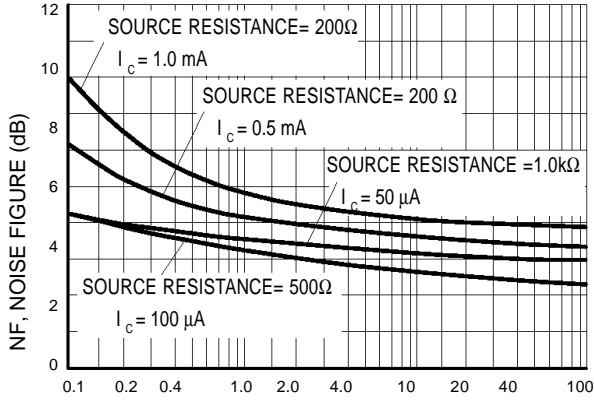


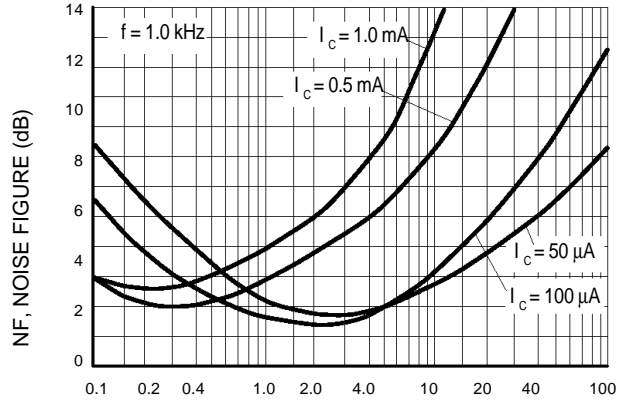
Figure 6. Fall Time

**TYPICAL AUDIO SMALL-SIGNAL CHARACTERISTICS
NOISE FIGURE VARIATIONS**

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



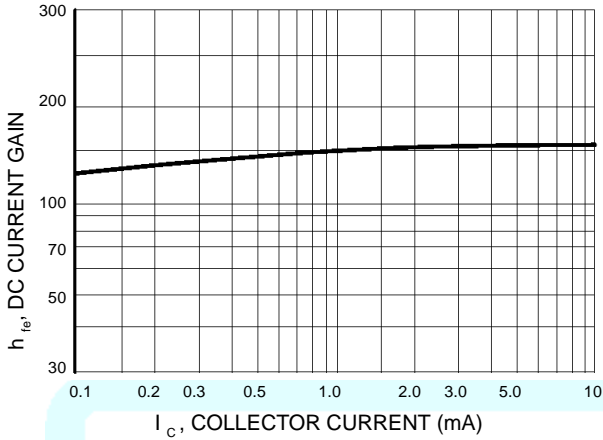
f, FREQUENCY (kHz)
Figure 7. Noise Figure



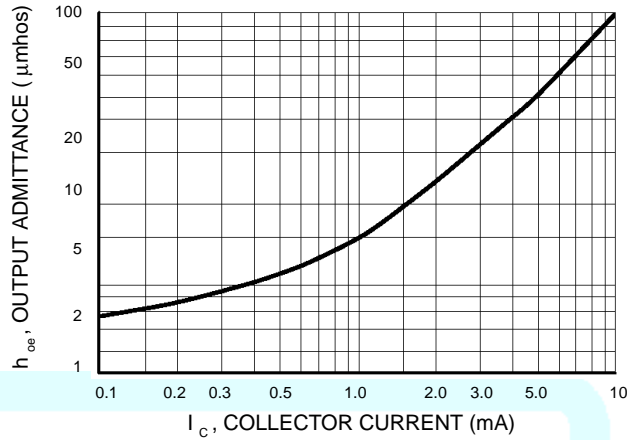
R_g , SOURCE RESISTANCE (kΩ)
Figure 8. Noise Figure

h PARAMETERS

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



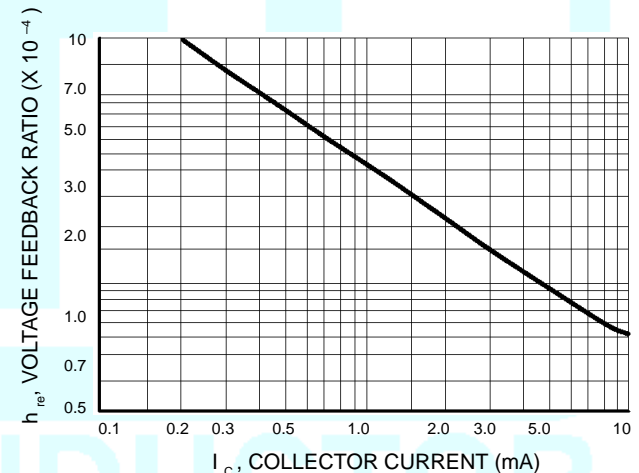
I_C , COLLECTOR CURRENT (mA)
Figure 9. Current Gain



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

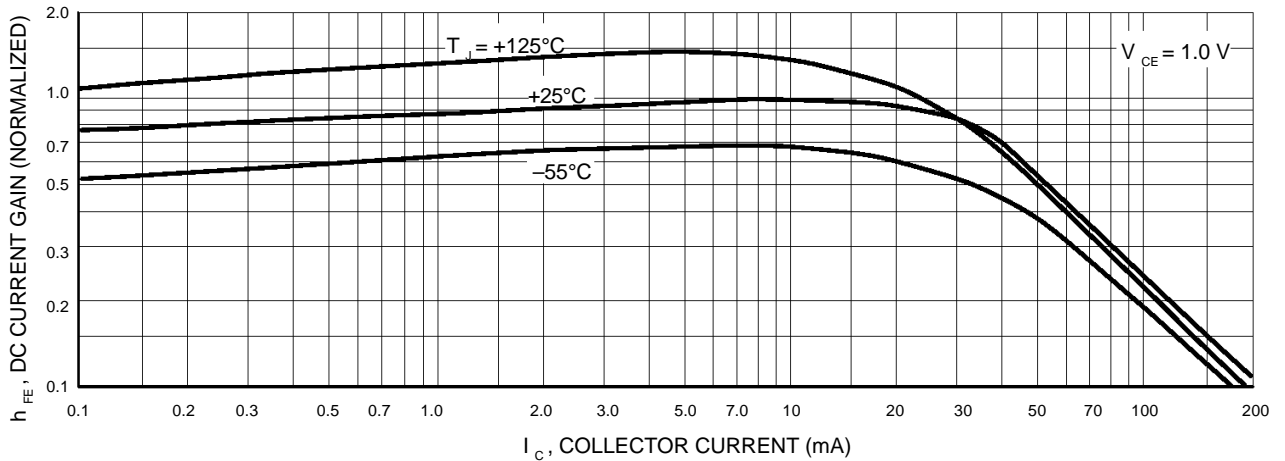


Figure 13. DC Current Gain

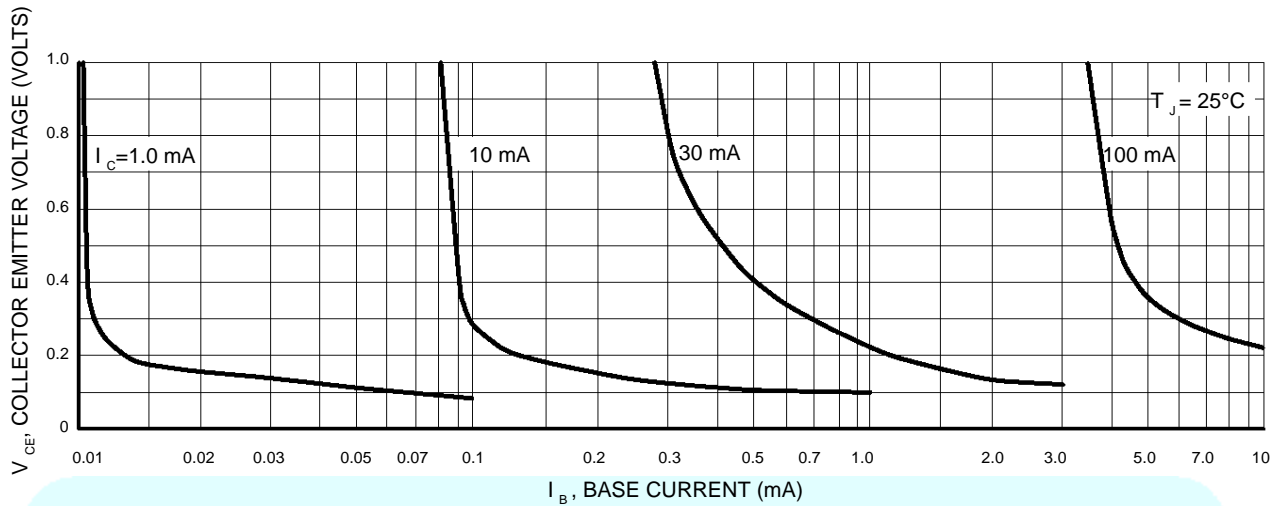


Figure 14. Collector Saturation Region

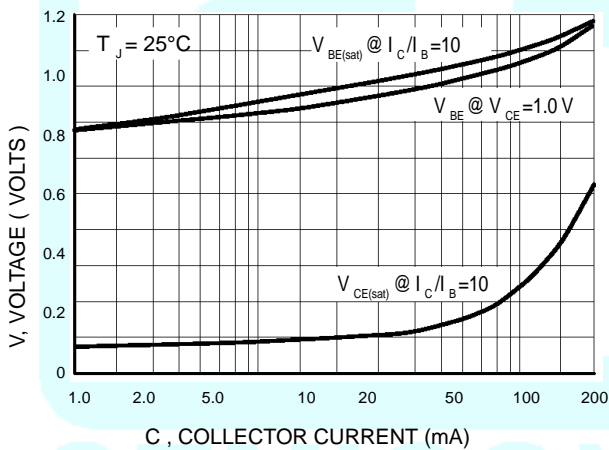


Figure 15. "ON" Voltages

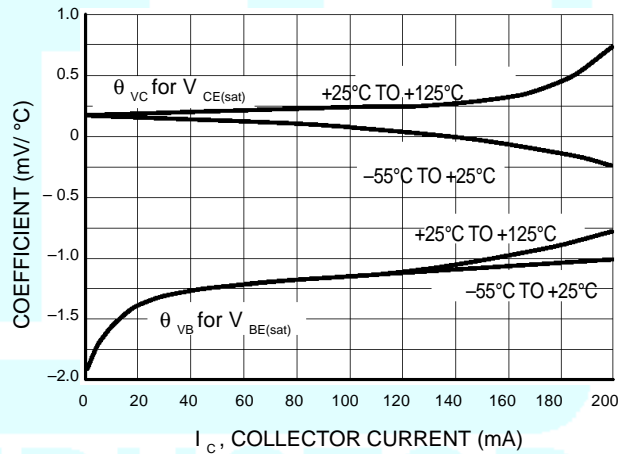


Figure 16. Temperature Coefficients