General Purpose Transistor (PNP)

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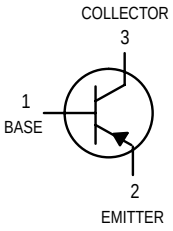
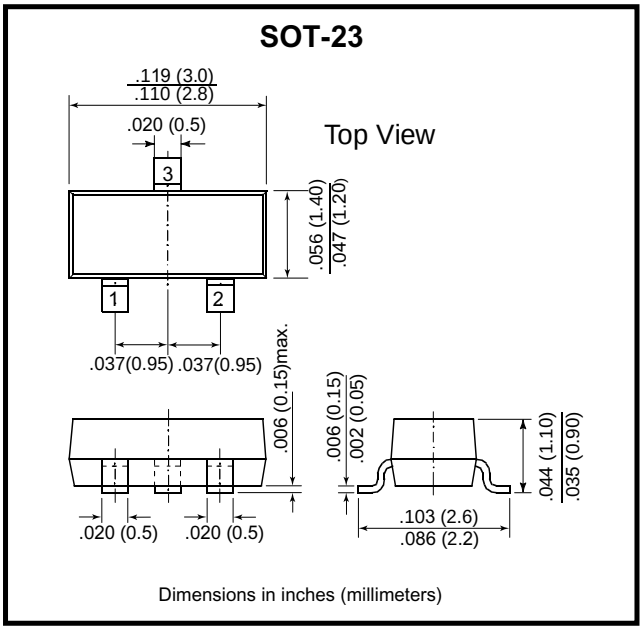
MMBT3906

PNP Silicon Type

Features

- Epitaxial Planar Die Construction
- Complementary NPN Type Available (MMBT3904)
- Ideal for Medium Power Amplification and Switching





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°C Derate above 25°C	P_D	225 1.8	mW mW/°C
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	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	$R_{\theta JA}$	417	°C/W
Junction and Storage Temperature	T_J, T_{stg}	–55 to +150	°C

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

OFF CHARACTERISTICS	Symbol	Min	Max	Unit
Collector–Emitter Breakdown Voltage(3) (I_C = –1.0 mAdc, I_B = 0)	$V_{(BR)CEO}$	–40	—	Vdc
Collector–Base Breakdown Voltage (I_C = –10 μAdc, I_E = 0)	$V_{(BR)CBO}$	–40	—	Vdc
Emitter–Base Breakdown Voltage (I_E = –10 μAdc, I_C = 0)	$V_{(BR)EBO}$	–5.0	—	Vdc
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

1. FR–5 = 1.0 × 0.75 × 0.062 in.
2. Alumina = 0.4 × 0.3 × 0.024 in. 99.5% alumina.
3. Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

REM : Thermal Clad is a trademark of the Bergquist Company.

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

ON CHARACTERISTICS(3)	Symbol	Min	Max	Unit
DC Current Gain	H_{FE}			—
(I_C = –0.1 mAdc, V_{CE} = –1.0 Vdc)		60	—	
(I_C = –1.0 mAdc, V_{CE} = –1.0 Vdc)		80	—	
(I_C = –10 mAdc, V_{CE} = –1.0 Vdc)		100	300	
(I_C = –50 mAdc, V_{CE} = –1.0 Vdc)		60	—	
(I_C = –100 mAdc, V_{CE} = –1.0 Vdc)		30	—	
Collector–Emitter Saturation Voltage	$V_{CE(sat)}$			Vdc
(I_C = –10 mAdc, I_B = –1.0 mAdc)		—	–0.25	
(I_C = –50 mAdc, I_B = –5.0 mAdc)		—	–0.4	
Base–Emitter Saturation Voltage	$V_{BE(sat)}$			Vdc
(I_C = –10 mAdc, I_B = –1.0 mAdc)		–0.65	–0.85	
(I_C = –50 mAdc, I_B = –5.0 mAdc)		—	–0.95	

SMALL–SIGNAL CHARACTERISTICS

Current–Gain — Bandwidth Product (I_C = –10 mAdc, V_{CE} = –20 Vdc, f = 100 MHz)	f_T	250	—	MHz
Output Capacitance (V_{CB} = –5.0 Vdc, I_E = 0, f = 1.0 MHz)	C_{obo}	—	4.5	pF
Input Capacitance (V_{EB} = –0.5 Vdc, I_C = 0, f = 1.0 MHz)	C_{ibo}	—	10	pF
Input Impedance (I_C = –1.0 mAdc, V_{CE} = –10 Vdc, f = 1.0 kHz)	h_{ie}	2.0	12	kΩ
Voltage Feedback Ratio (I_C = –1.0 mAdc, V_{CE} = –10 Vdc, f = 1.0 kHz)	h_{re}	0.1	10	X 10^{-4}
Small–Signal Current Gain (I_C = –1.0 mAdc, V_{CE} = –10 Vdc, f = 1.0 kHz)	h_{fe}	100	400	—
Output Admittance (I_C = –1.0 mAdc, V_{CE} = –10 Vdc, f = 1.0 kHz)	h_{oe}	3.0	60	μmhos
Noise Figure (I_C = –100 μAdc, V_{CE} = –5.0 Vdc, R_S = 1.0 kΩ, f = 1.0 kHz)	NF	—	4.0	dB

SWITCHING CHARACTERISTICS

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

3.Pulse Test: Pulse Width ı 300 ıs, Duty Cycle ı 2.0%.

Rating and Characteristic Curves (MMBT3906)

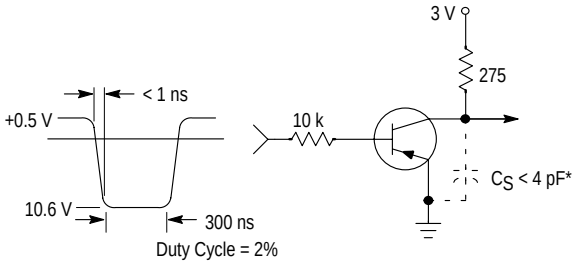


Figure 1. Delay and Rise Time Equivalent Test Circuit

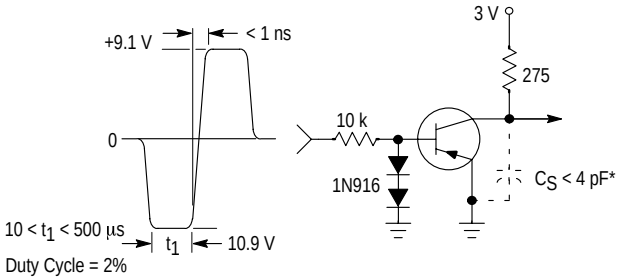


Figure 2. Storage and Fall Time Equivalent Test Circuit

* Total shunt capacitance of test jig and connectors

TYPICAL TRANSIENT CHARACTERISTICS

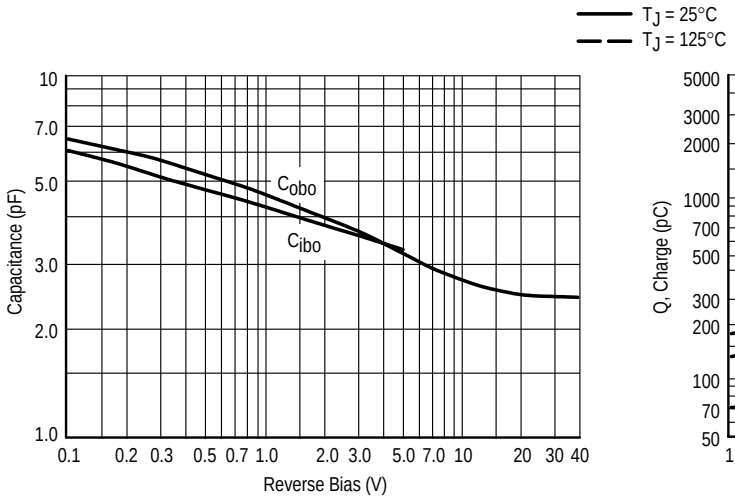


Figure 3. Capacitance

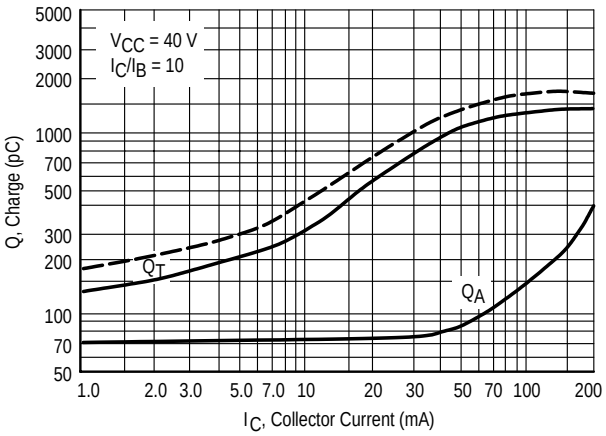


Figure 4. Charge Data

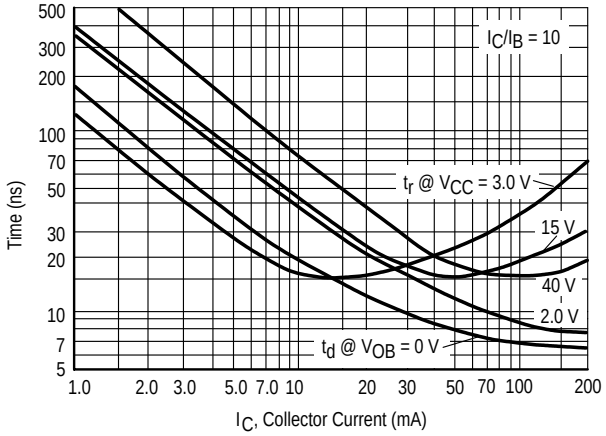


Figure 5. Turn – On Time

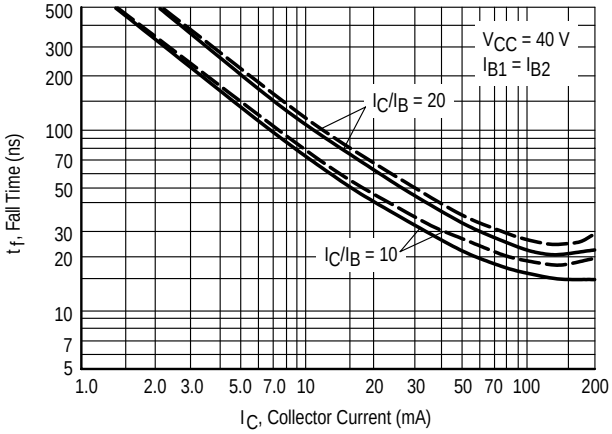


Figure 6. Fall Time

Rating and Characteristic Curves (MMBT3906)

TYPICAL AUDIO SMALL–SIGNAL CHARACTERISTICS
NOISE FIGURE VARIATIONS

(V_{CE} = –5.0 Vdc, T_A = 25°C, Bandwidth = 1.0 Hz)

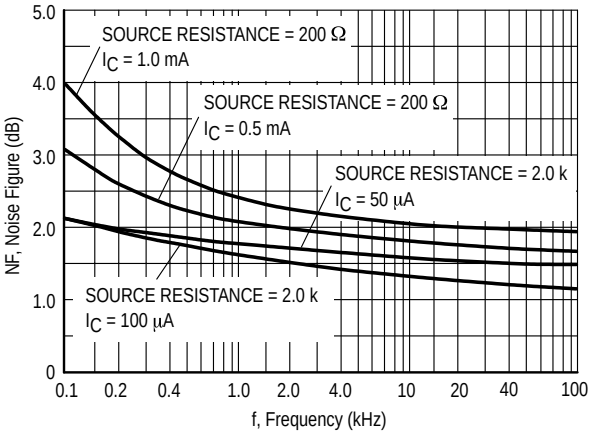


Figure 7.

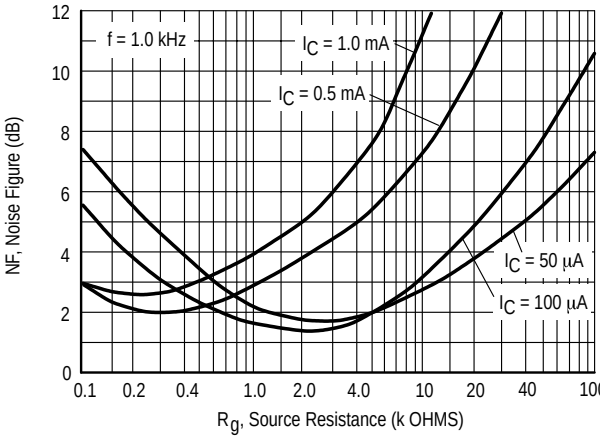


Figure 8.

h PARAMETERS

(V_{CE} = –10 Vdc, f = 1.0 kHz, T_A = 25°C)

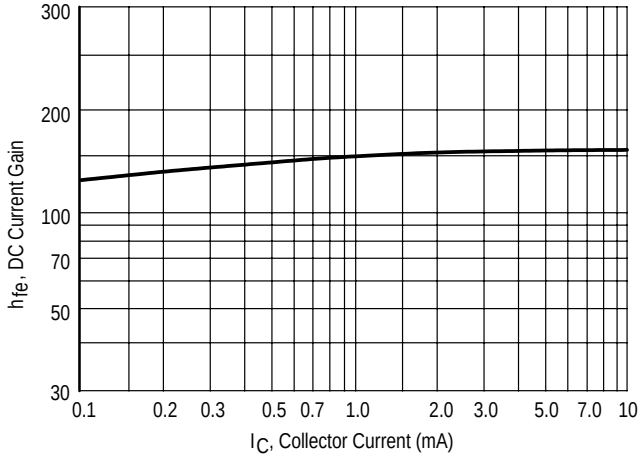


Figure 9. Current Gain

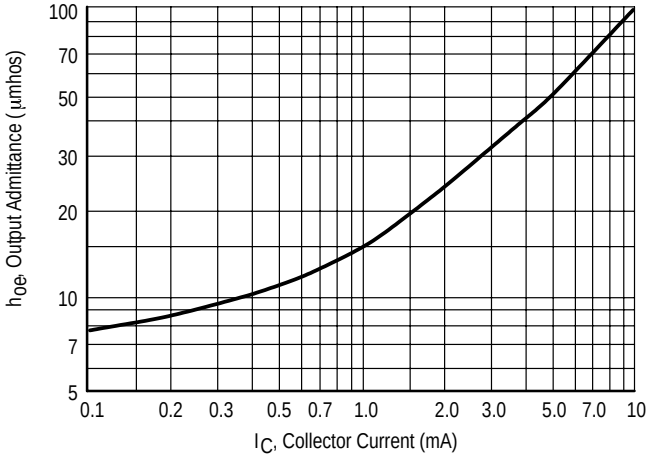


Figure 10. Output Admittance

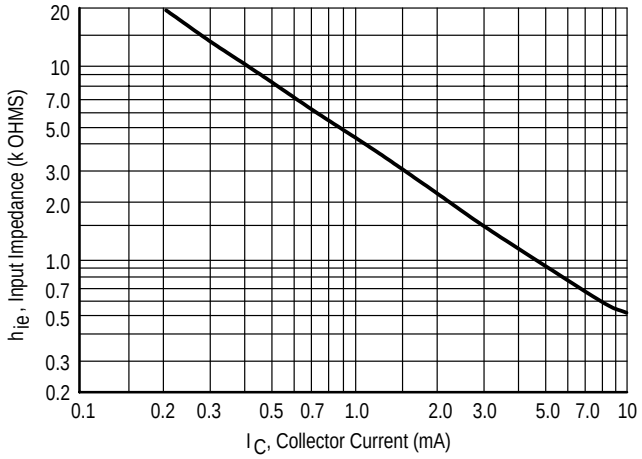


Figure 11. Input Impedance

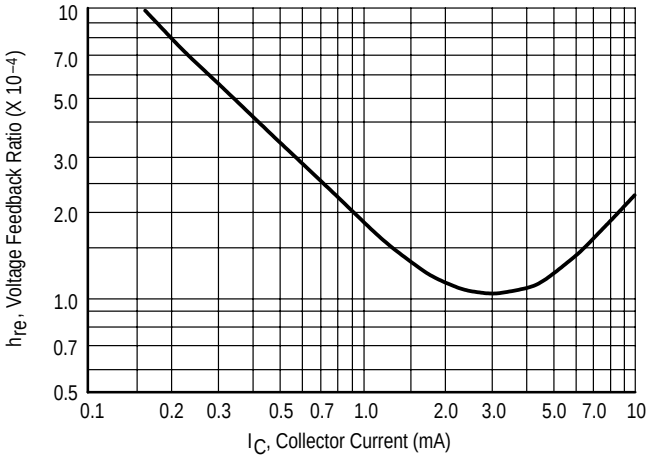


Figure 12. Voltage Feedback Ratio

Rating and Characteristic Curves (MMBT3906)

TYPICAL STATIC CHARACTERISTICS

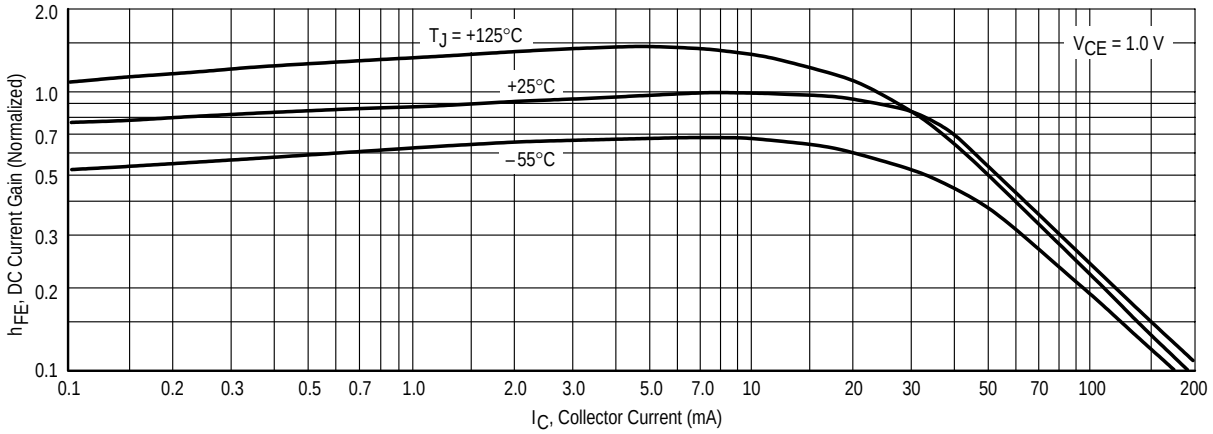


Figure 13. DC Current Gain

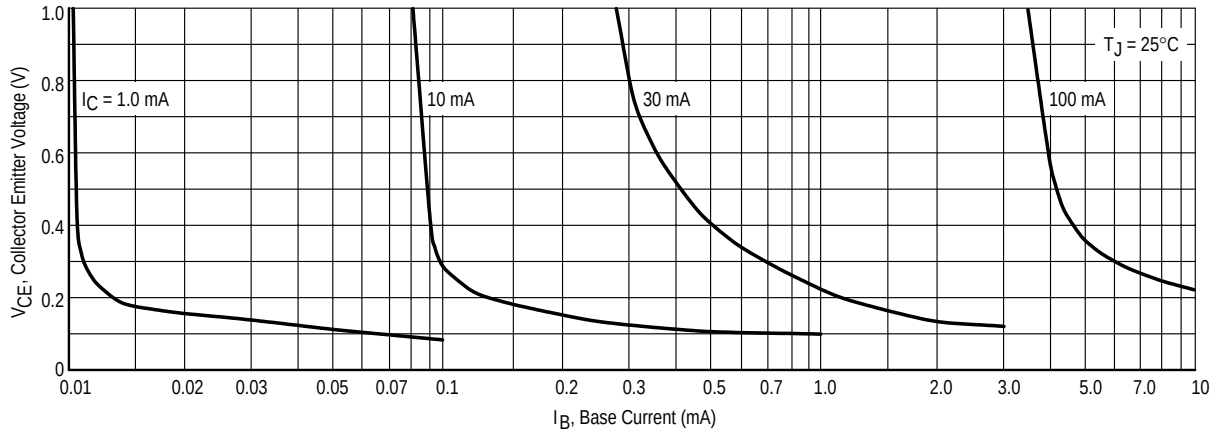


Figure 14. Collector Saturation Region

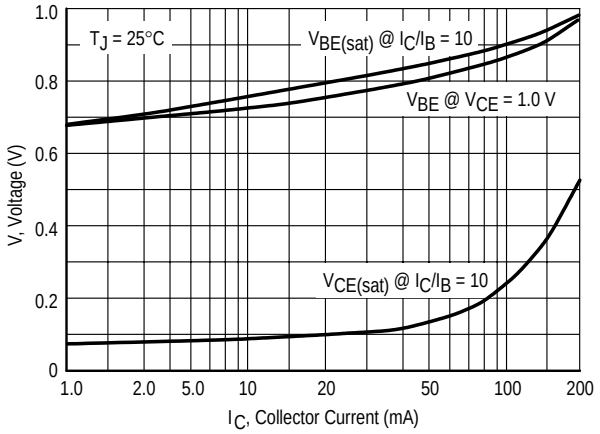


Figure 15. "ON" Voltages

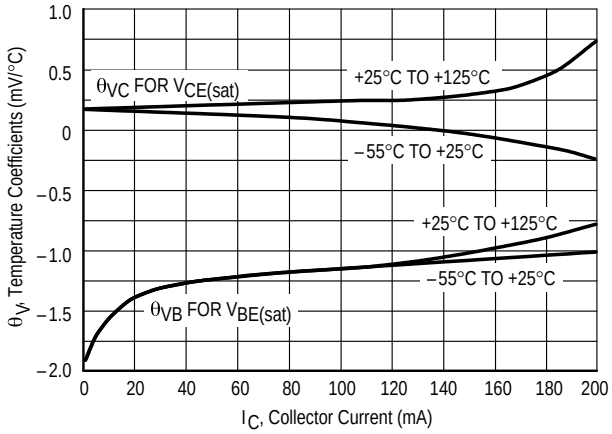


Figure 16. Temperature Coefficients