MMBT3906TT1

General Purpose Transistors

PNP Silicon

This transistor is designed for general purpose amplifier applications. It is housed in the SOT−416/SC−75 package which is designed for low power surface mount applications.

Features

- Pb−Free Package is Available

MAXIMUM RATINGS (T_A = 25°C)

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−4 Board (Note 1) @T_A = 25°C Derated above 25°C	P_D	200 1.6	mW mW/°C
Thermal Resistance, Junction−to−Ambient (Note 1)	$R_{\theta JA}$	600	°C/W
Total Device Dissipation, FR−4 Board (Note 2) @T_A = 25°C Derated above 25°C	P_D	300 2.4	mW mW/°C
Thermal Resistance, Junction−to−Ambient (Note 2)	$R_{\theta JA}$	400	°C/W
Junction and Storage Temperature Range	T_J, T_{stg}	−55 to +150	°C

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. FR−4 @ Minimum Pad
2. FR−4 @ 1.0 × 1.0 Inch Pad

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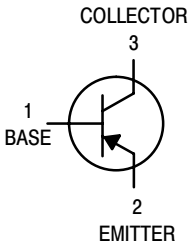
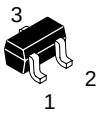
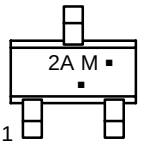
GENERAL PURPOSE AMPLIFIER TRANSISTORS SURFACE MOUNT





CASE 463
SOT−416/SC−75
STYLE 1

MARKING DIAGRAM



2A = Device Code
M = Date Code*
▪ = Pb−Free Package
(Note: Microdot may be in either location)
*Date Code orientation may vary depending upon manufacturing location.

ORDERING INFORMATION

Device	Package	Shipping†
MMBT3906TT1	SOT−416	3000 / Tape & Reel
MMBT3906TT1G	SOT−416 (Pb−Free)	3000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure. BRD8011/D.

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector−Emitter Breakdown Voltage (Note 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
ON CHARACTERISTICS (Note 3)				
DC Current Gain (I_C = −0.1 mAdc, V_{CE} = −1.0 Vdc) (I_C = −1.0 mAdc, V_{CE} = −1.0 Vdc) (I_C = −10 mAdc, V_{CE} = −1.0 Vdc) (I_C = −50 mAdc, V_{CE} = −1.0 Vdc) (I_C = −100 mAdc, V_{CE} = −1.0 Vdc)	h_{FE}	 60 80 100 60 30	 − − 300 − −	−
Collector−Emitter Saturation Voltage (I_C = −10 mAdc, I_B = −1.0 mAdc) (I_C = −50 mAdc, I_B = −5.0 mAdc)	$V_{CE(sat)}$	 − −	 −0.25 −0.4	Vdc
Base−Emitter Saturation Voltage (I_C = −10 mAdc, I_B = −1.0 mAdc) (I_C = −50 mAdc, I_B = −5.0 mAdc)	$V_{BE(sat)}$	 −0.65 −	 −0.85 −0.95	Vdc
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 Capacitance1 (V_{EB} = −0.5 Vdc, I_C = 0, f = 1.0 MHz)	C_{ibo}	−	10.0	pF
Input Impedance (V_{CE} = −10 Vdc, I_C = −1.0 mAdc, f = 1.0 kHz)	h_{ie}	2.0	12	k Ω
Voltage Feedback Ratio (V_{CE} = −10 Vdc, I_C = −1.0 mAdc, f = 1.0 kHz)	h_{re}	0.1	10	X 10^{-4}
Small−Signal Current Gain (V_{CE} = −10 Vdc, I_C = −1.0 mAdc, f = 1.0 kHz)	h_{fe}	100	400	−
Output Admittance (V_{CE} = −10 Vdc, I_C = −1.0 mAdc, f = 1.0 kHz)	h_{oe}	3.0	60	μmhos
Noise Figure (V_{CE} = −5.0 Vdc, I_C = −100 μAdc, R_S = 1.0 k Ω, f = 1.0 kHz)	NF	−	4.0	dB
SWITCHING CHARACTERISTICS				
Delay Time	(V_{CC} = −3.0 Vdc, V_{BE} = 0.5 Vdc)	t_d	−	35	ns
Rise Time	(I_C = −10 mAdc, I_{B1} = −1.0 mAdc)	t_r	−	35	
Storage Time	(V_{CC} = −3.0 Vdc, I_C = −10 mAdc)	t_s	−	225	ns
Fall Time	(I_{B1} = I_{B2} = −1.0 mAdc)	t_f	−	75	

3. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

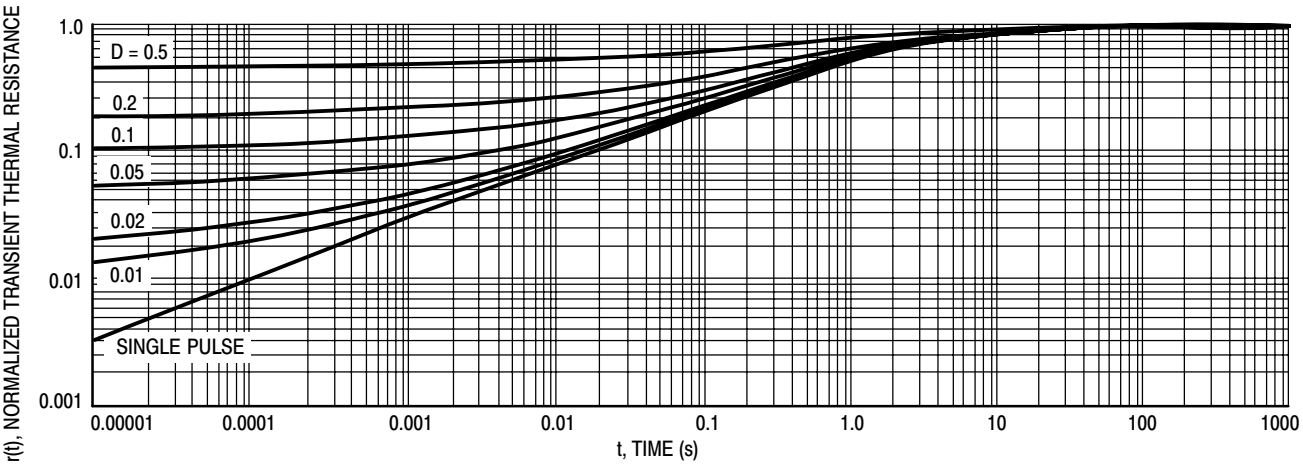
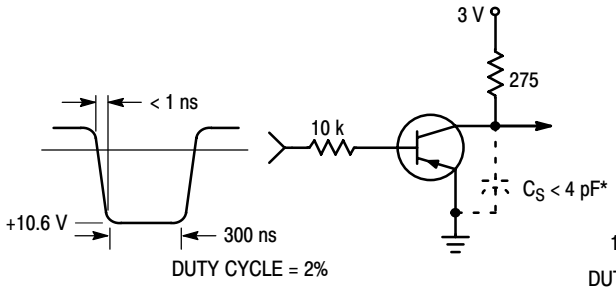
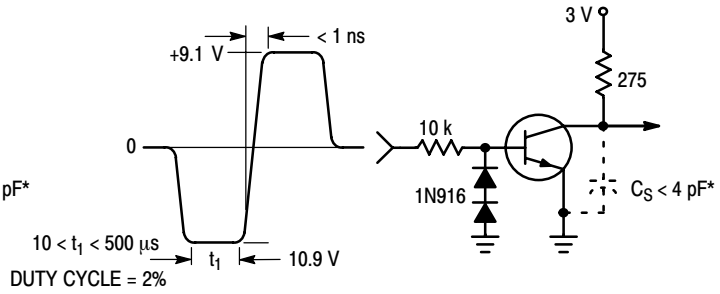


Figure 1. Normalized Thermal Response





* Total shunt capacitance of test jig and connectors

Figure 2. Delay and Rise Time Equivalent Test Circuit

Figure 3. Storage and Fall Time Equivalent Test Circuit

TYPICAL TRANSIENT CHARACTERISTICS

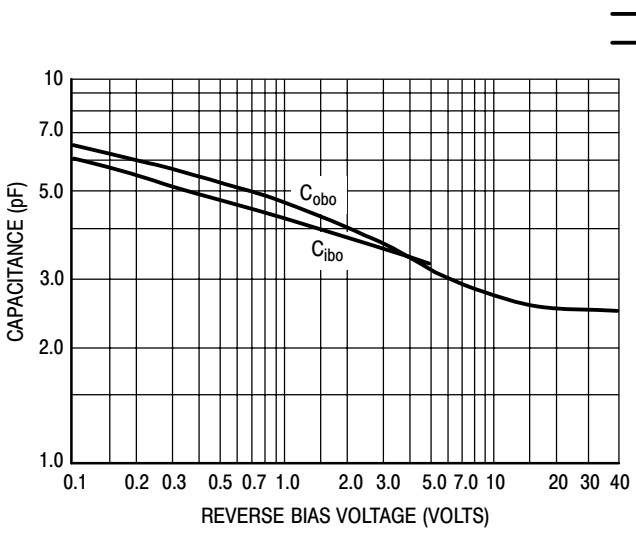


Figure 4. Capacitance

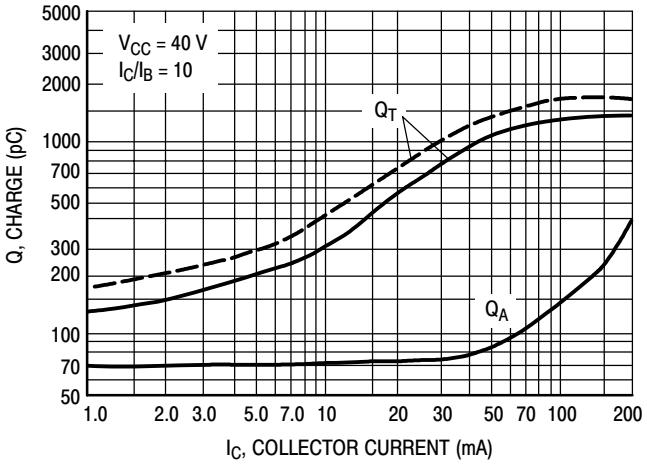


Figure 5. Charge Data

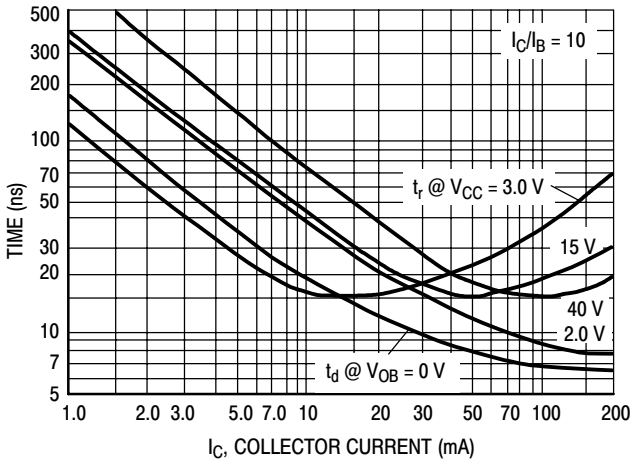


Figure 6. Turn−On Time

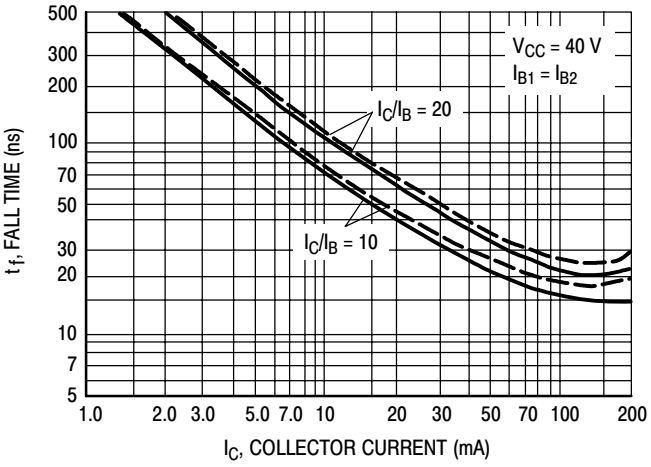


Figure 7. Fall Time

TYPICAL AUDIO SMALL−SIGNAL CHARACTERISTICS
NOISE FIGURE VARIATIONS

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

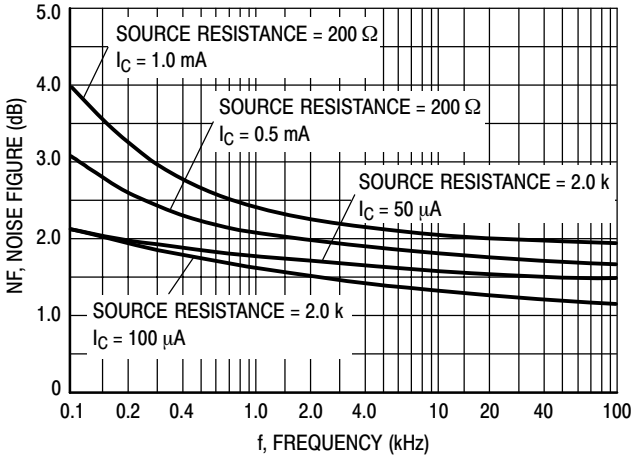


Figure 8.

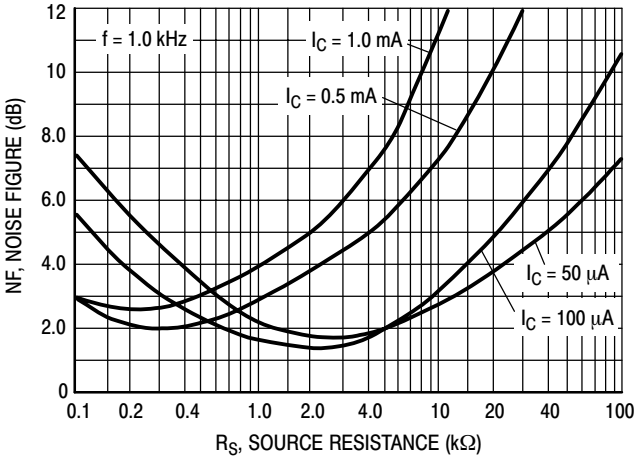


Figure 9.

h PARAMETERS

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

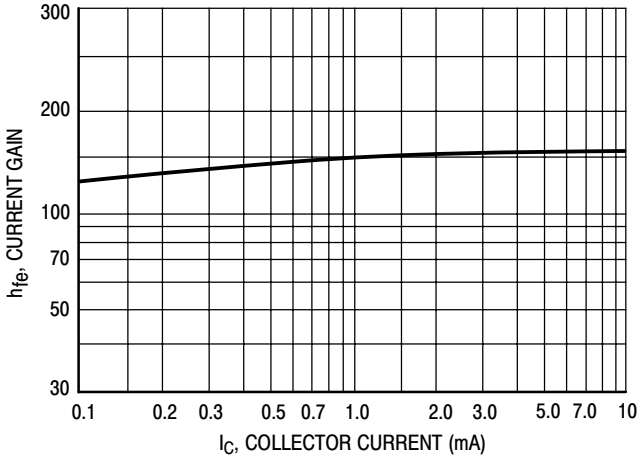


Figure 10. Current Gain

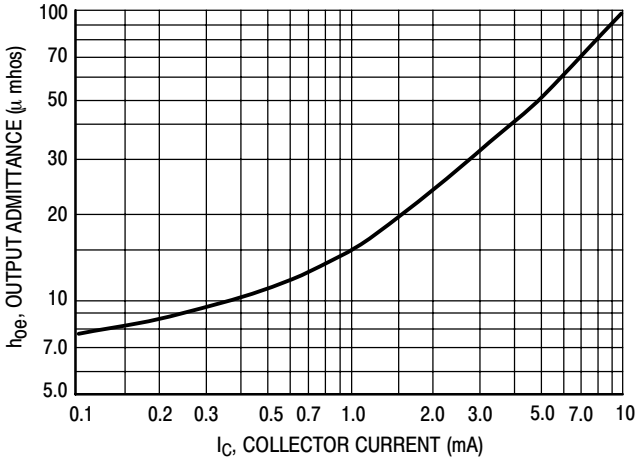


Figure 11. Output Admittance

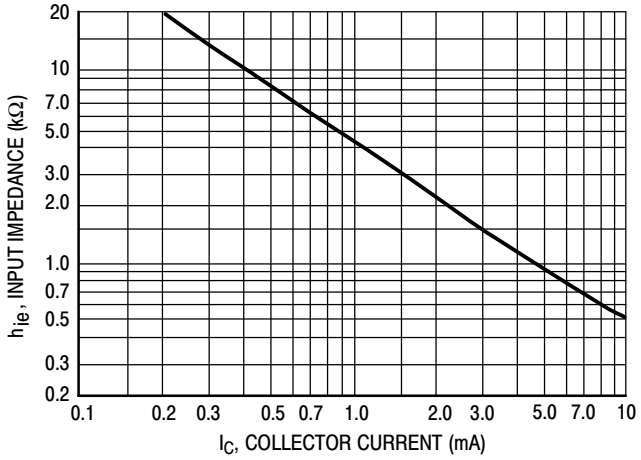


Figure 12. Input Impedance

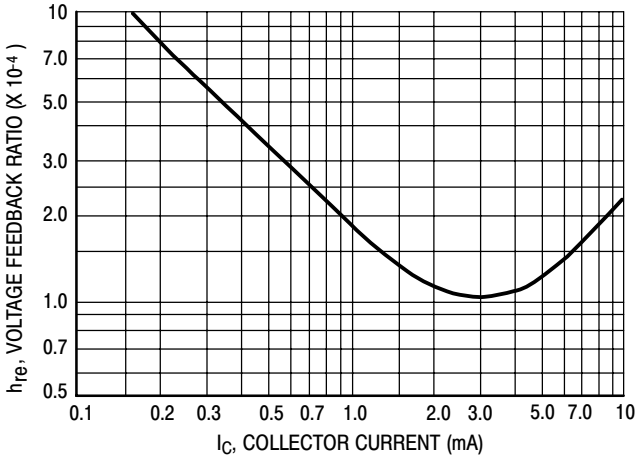


Figure 13. Voltage Feedback Ratio

STATIC CHARACTERISTICS

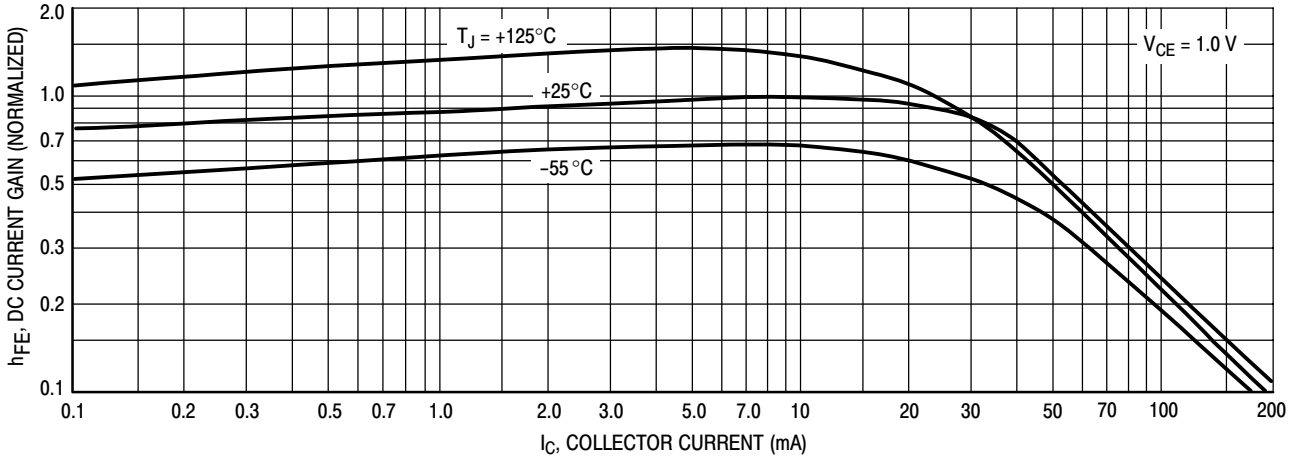


Figure 14. DC Current Gain

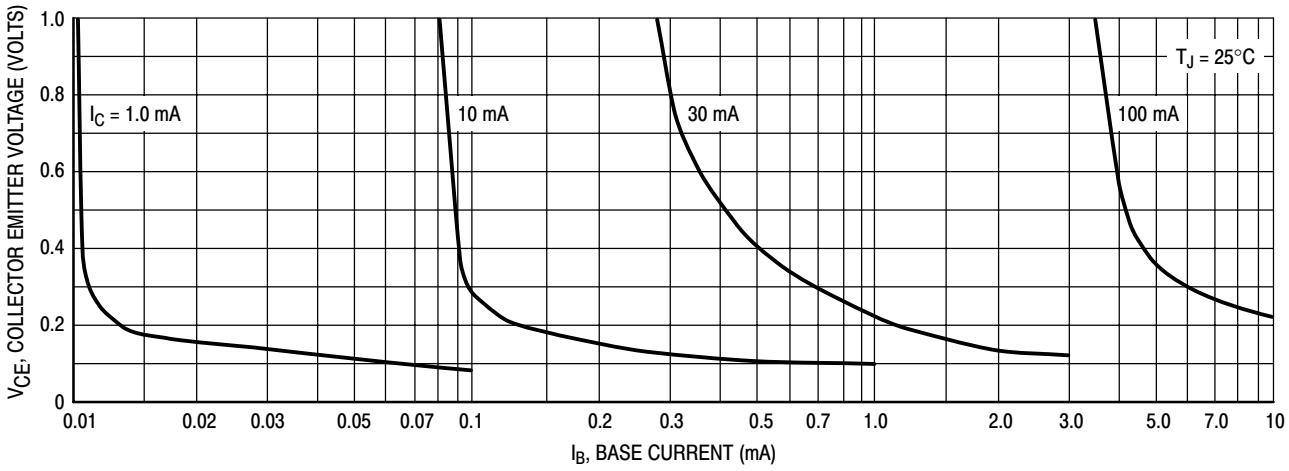


Figure 15. Collector Saturation Region

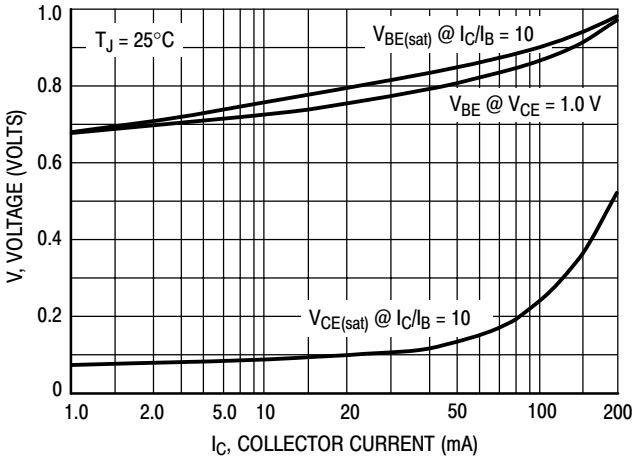


Figure 16. “ON” Voltages

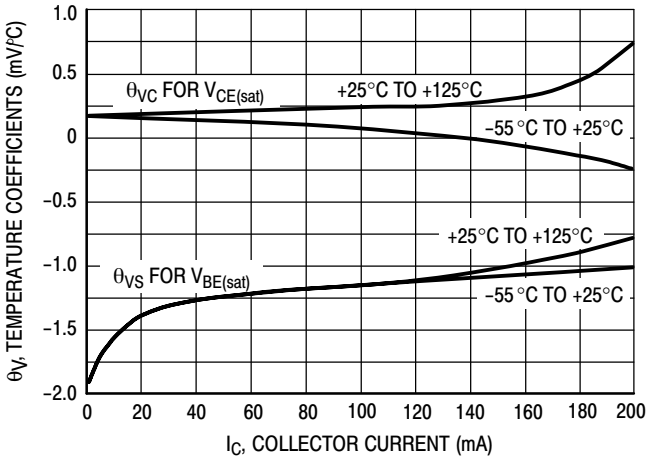
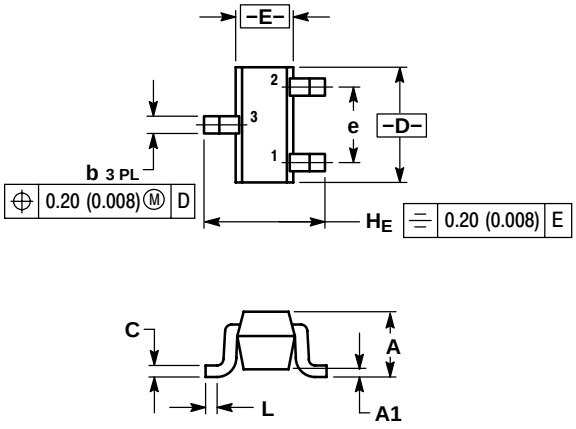


Figure 17. Temperature Coefficients

MMBT3906TT1

PACKAGE DIMENSIONS

SC−75/SOT−416
CASE 463−01
ISSUE F

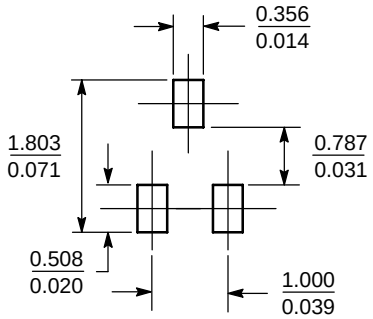


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	0.70	0.80	0.90	0.027	0.031	0.035
A1	0.00	0.05	0.10	0.000	0.002	0.004
b	0.15	0.20	0.30	0.006	0.008	0.012
C	0.10	0.15	0.25	0.004	0.006	0.010
D	1.55	1.60	1.65	0.059	0.063	0.067
E	0.70	0.80	0.90	0.027	0.031	0.035
e	1.00 BSC			0.04 BSC		
L	0.10	0.15	0.20	0.004	0.006	0.008
H_E	1.50	1.60	1.70	0.061	0.063	0.065

STYLE 1:
PIN 1. BASE
2. EMITTER
3. COLLECTOR

SOLDERING FOOTPRINT*



SCALE 10:1 $\left(\frac{\text{mm}}{\text{inches}}\right)$

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PUBLICATION ORDERING INFORMATION

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