

Rochester Electronics Manufactured Components

Rochester branded components are manufactured using either die/wafers purchased from the original suppliers or Rochester wafers recreated from the original IP. All recreations are done with the approval of the OCM.

Parts are tested using original factory test programs or Rochester developed test solutions to guarantee product meets or exceed the OCM data sheet.

Quality Overview

- ISO-9001
- AS9120 certification
- Qualified Manufacturers List (QML) MIL-PRF-35835
 - Class Q Military
 - Class V Space Level
- Qualified Suppliers List of Distributors (QSLD)
 - Rochester is a critical supplier to DLA and meets all industry and DLA standards.

Rochester Electronics, LLC is committed to supplying products that satisfy customer expectations for quality and are equal to those originally supplied by industry manufacturers.

The original manufacturer's datasheet accompanying this document reflects the performance and specifications of the Rochester manufactured version of this device. Rochester Electronics guarantees the performance of its semiconductor products to the original OEM specifications. 'Typical' values are for reference purposes only. Certain minimum or maximum ratings may be based on product characterization, design, simulation, or sample testing.

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 ($T_A = 25^\circ\text{C}$)

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

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.

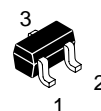
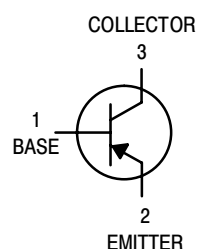
- FR-4 @ Minimum Pad
- FR-4 @ 1.0×1.0 Inch Pad



ON Semiconductor®

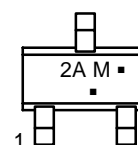
<http://onsemi.com>

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.

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector–Emitter Breakdown Voltage (Note 3) ($I_C = -1.0\text{ mA}$, $I_B = 0$)	$V_{(BR)CEO}$	-40	–	Vdc
Collector–Base Breakdown Voltage ($I_C = -10\text{ }\mu\text{A}$, $I_E = 0$)	$V_{(BR)CBO}$	-40	–	Vdc
Emitter–Base Breakdown Voltage ($I_E = -10\text{ }\mu\text{A}$, $I_C = 0$)	$V_{(BR)EBO}$	-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

ON CHARACTERISTICS (Note 3)

DC Current Gain ($I_C = -0.1\text{ mA}$, $V_{CE} = -1.0\text{ Vdc}$) ($I_C = -1.0\text{ mA}$, $V_{CE} = -1.0\text{ Vdc}$) ($I_C = -10\text{ mA}$, $V_{CE} = -1.0\text{ Vdc}$) ($I_C = -50\text{ mA}$, $V_{CE} = -1.0\text{ Vdc}$) ($I_C = -100\text{ mA}$, $V_{CE} = -1.0\text{ Vdc}$)	h_{FE}	60 80 100 60 30	– – 300 – –	–
Collector–Emitter Saturation Voltage ($I_C = -10\text{ mA}$, $I_B = -1.0\text{ mA}$) ($I_C = -50\text{ mA}$, $I_B = -5.0\text{ mA}$)	$V_{CE(sat)}$	– –	-0.25 -0.4	Vdc
Base–Emitter Saturation Voltage ($I_C = -10\text{ mA}$, $I_B = -1.0\text{ mA}$) ($I_C = -50\text{ mA}$, $I_B = -5.0\text{ mA}$)	$V_{BE(sat)}$	-0.65 –	-0.85 -0.95	Vdc

SMALL–SIGNAL CHARACTERISTICS

Current–Gain – Bandwidth Product ($I_C = -10\text{ mA}$, $V_{CE} = -20\text{ Vdc}$, $f = 100\text{ MHz}$)	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 ¹ ($V_{EB} = -0.5\text{ Vdc}$, $I_C = 0$, $f = 1.0\text{ MHz}$)	C_{ibo}	–	10.0	pF
Input Impedance ($V_{CE} = -10\text{ Vdc}$, $I_C = -1.0\text{ mA}$, $f = 1.0\text{ kHz}$)	h_{ie}	2.0	12	k Ω
Voltage Feedback Ratio ($V_{CE} = -10\text{ Vdc}$, $I_C = -1.0\text{ mA}$, $f = 1.0\text{ kHz}$)	h_{re}	0.1	10	$\times 10^{-4}$
Small–Signal Current Gain ($V_{CE} = -10\text{ Vdc}$, $I_C = -1.0\text{ mA}$, $f = 1.0\text{ kHz}$)	h_{fe}	100	400	–
Output Admittance ($V_{CE} = -10\text{ Vdc}$, $I_C = -1.0\text{ mA}$, $f = 1.0\text{ kHz}$)	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	($V_{CC} = -3.0\text{ Vdc}$, $V_{BE} = 0.5\text{ Vdc}$)	t_d	–	35	ns
Rise Time	($I_C = -10\text{ mA}$, $I_{B1} = -1.0\text{ mA}$)	t_r	–	35	
Storage Time	($V_{CC} = -3.0\text{ Vdc}$, $I_C = -10\text{ mA}$)	t_s	–	225	ns
Fall Time	($I_{B1} = I_{B2} = -1.0\text{ mA}$)	t_f	–	75	

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

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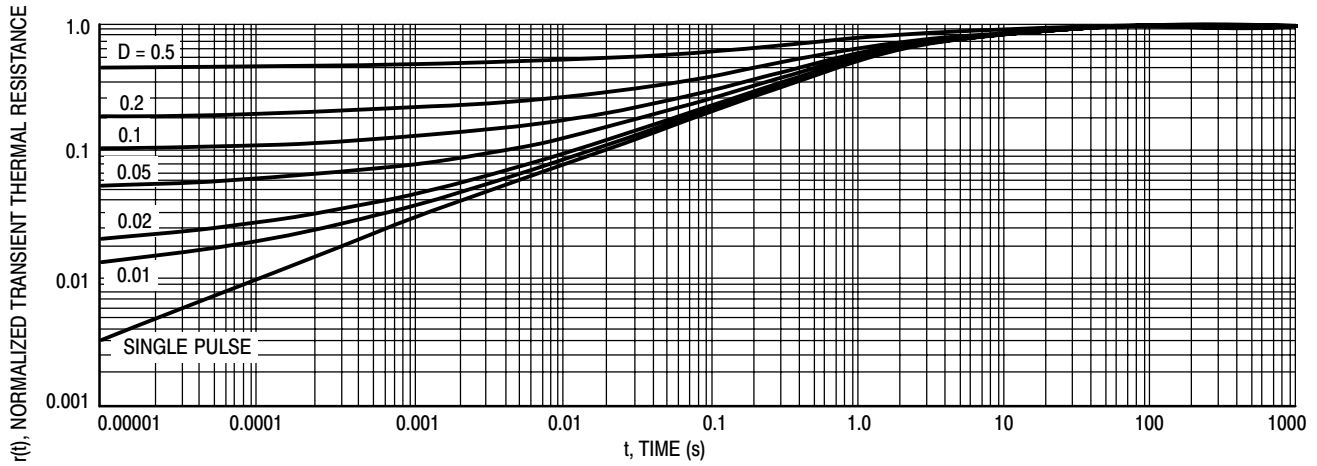


Figure 1. Normalized Thermal Response

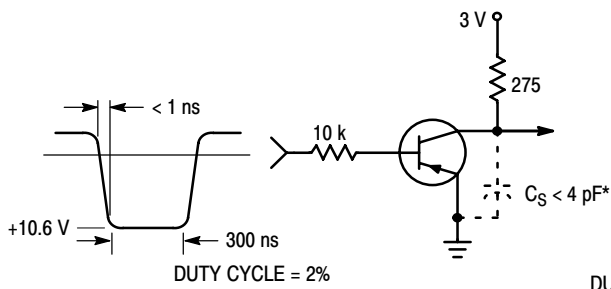


Figure 2. Delay and Rise Time Equivalent Test Circuit

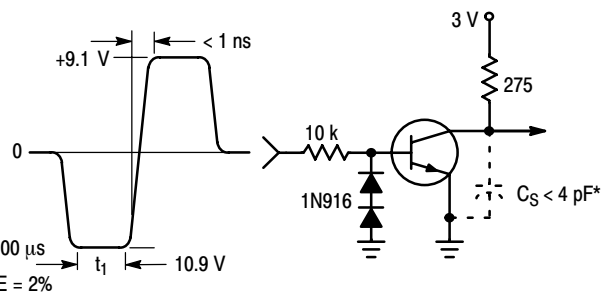


Figure 3. Storage and Fall Time Equivalent Test Circuit

TYPICAL TRANSIENT CHARACTERISTICS

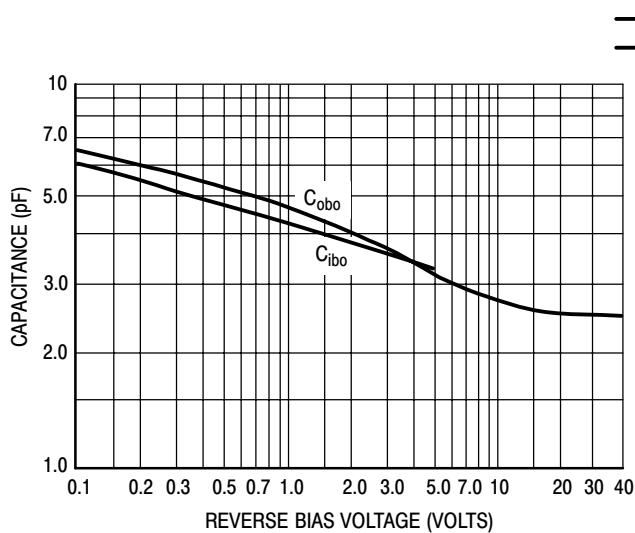


Figure 4. Capacitance

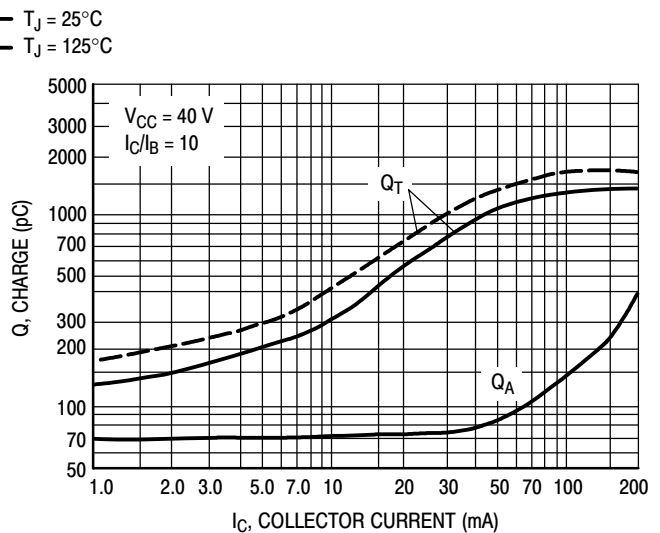


Figure 5. Charge Data

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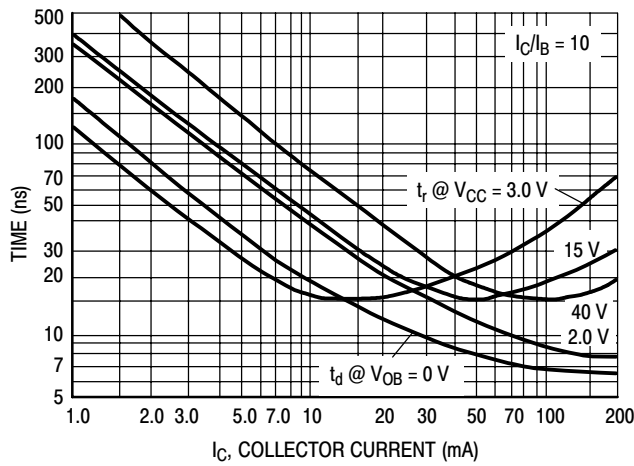


Figure 6. Turn-On Time

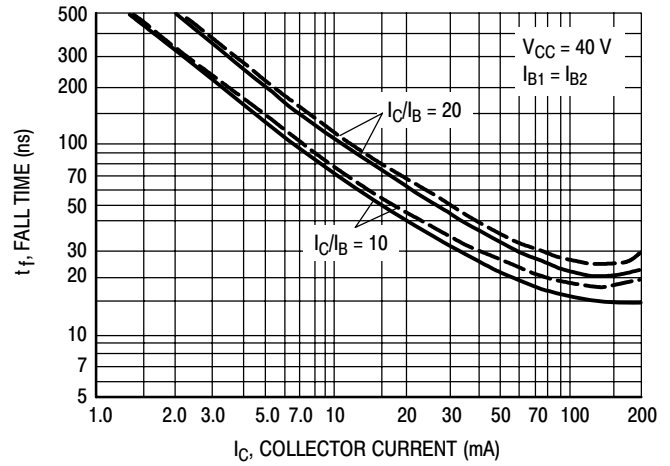


Figure 7. Fall Time

TYPICAL AUDIO SMALL-SIGNAL CHARACTERISTICS NOISE FIGURE VARIATIONS

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

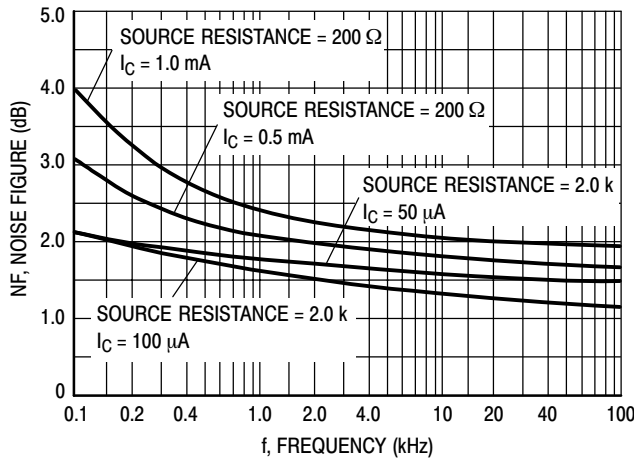


Figure 8.

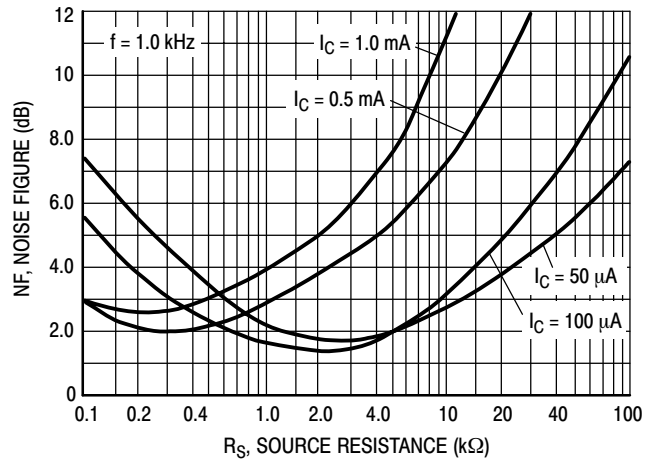


Figure 9.

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h PARAMETERS

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

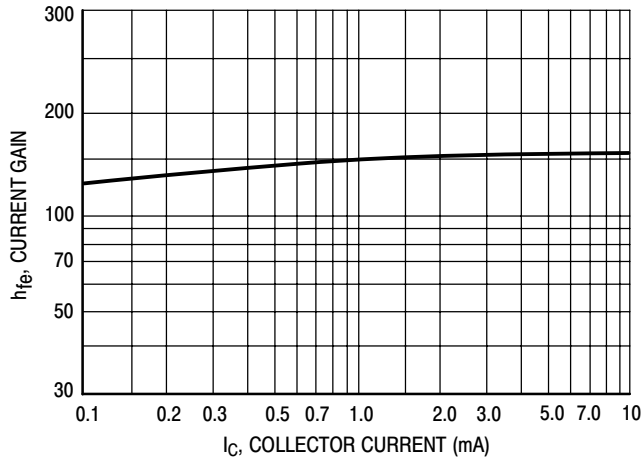


Figure 10. Current Gain

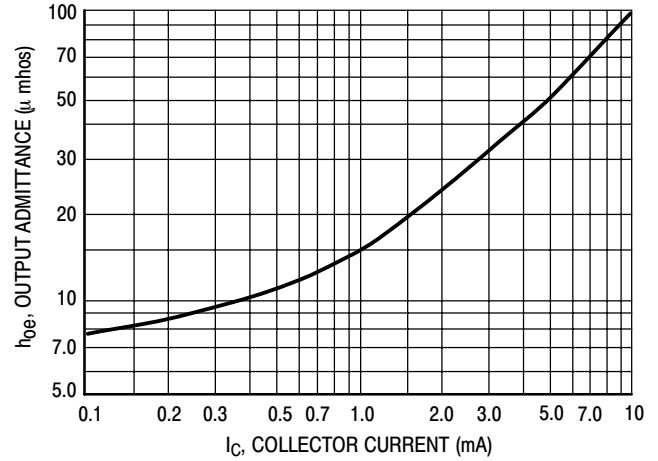


Figure 11. Output Admittance

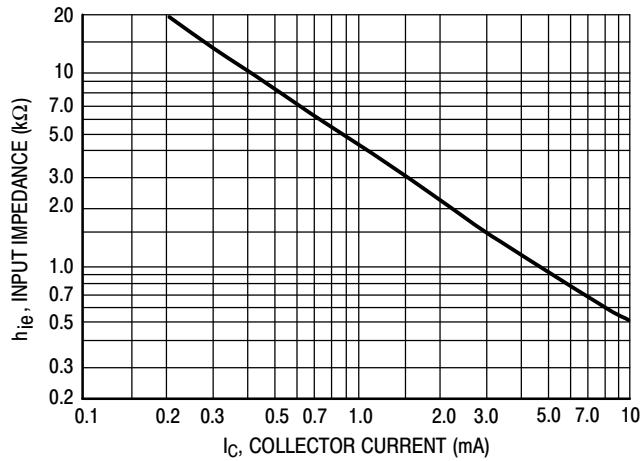


Figure 12. Input Impedance

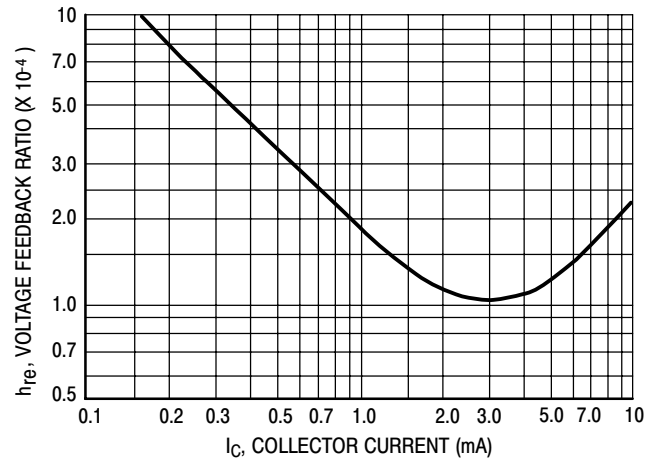


Figure 13. Voltage Feedback Ratio

STATIC CHARACTERISTICS

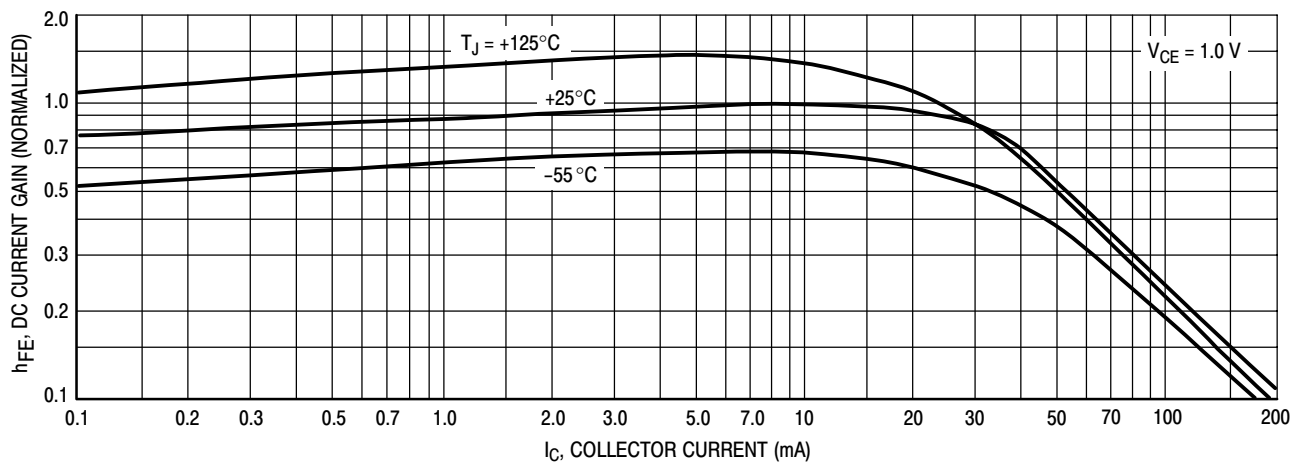


Figure 14. DC Current Gain

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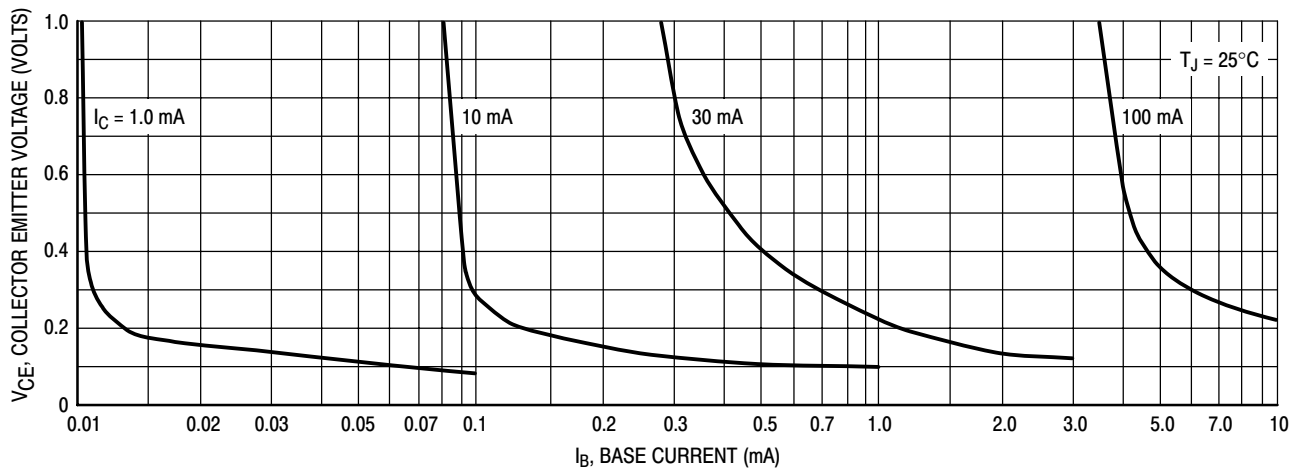


Figure 15. Collector Saturation Region

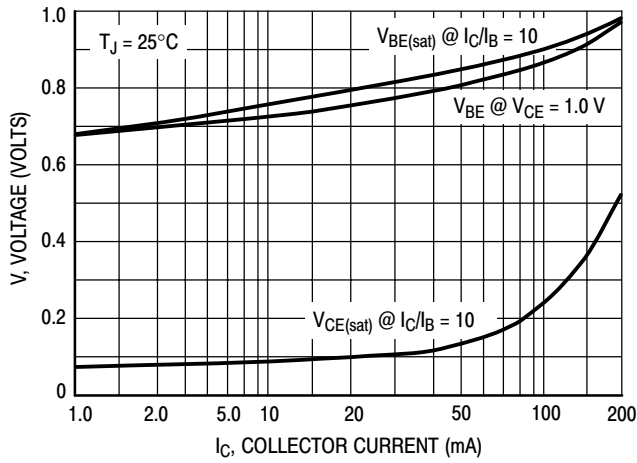


Figure 16. "ON" Voltages

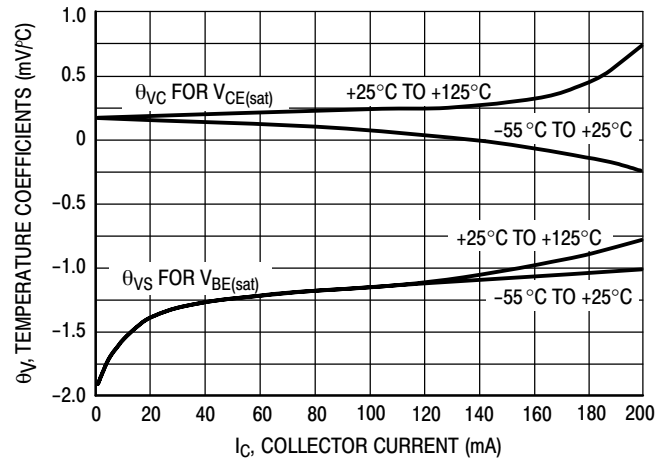
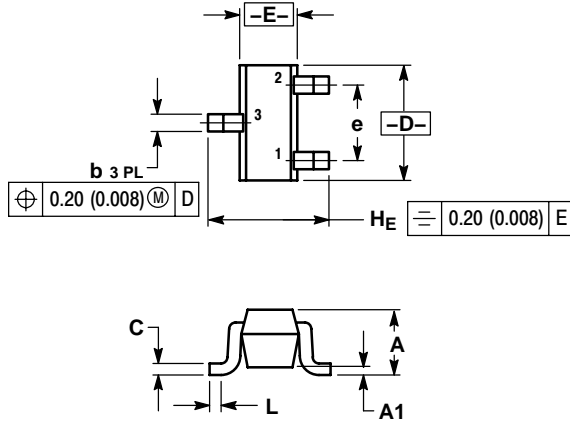


Figure 17. Temperature Coefficients

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PACKAGE DIMENSIONS

SC-75/SOT-416
CASE 463-01
ISSUE F

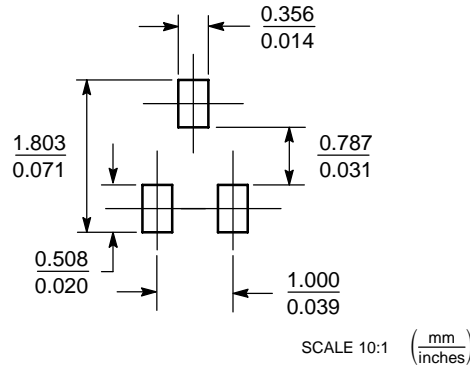


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.


DIM	MILLIMETERS			INCHES		
	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*



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

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