MBT3906DW1T1

Dual General Purpose Transistor

The MBT3906DW1T1 device is a spin−off of our popular SOT−23/SOT−323 three−leaded device. It is designed for general purpose amplifier applications and is housed in the SOT−363 six−leaded surface mount package. By putting two discrete devices in one package, this device is ideal for low−power surface mount applications where board space is at a premium.

Features

- h_{FE}, 100−300
- Low $V_{CE(sat)}$, $\leq$ 0.4 V
- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- Available in 8 mm, 7−inch/3,000 Unit Tape and Reel
- Pb−Free Package is Available

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
Electrostatic Discharge	ESD	HBM>16000, MM>2000	V

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.

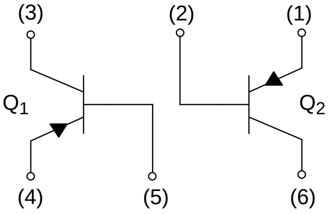
THERMAL CHARACTERISTICS

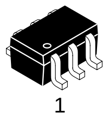
Characteristic	Symbol	Max	Unit
Total Package Dissipation (Note 1) T_A = 25°C	P_D	150	mW
Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$	833	°C/W
Junction and Storage Temperature Range	T_J, T_{stg}	−55 to +150	°C

1. Device mounted on FR4 glass epoxy printed circuit board using the minimum recommended footprint.

ON Semiconductor®

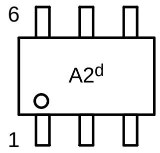
http://onsemi.com





SOT−363/SC−88
CASE 419B
STYLE 1

MARKING DIAGRAM



A2 = Device Code
d = Date Code

ORDERING INFORMATION

Device	Package	Shipping†
MBT3906DW1T1	SOT−363	3000 Units/Reel
MBT3906DW1T1G	SOT−363 (Pb−Free)	3000 Units/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.

January, 2005 − Rev. 1

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector−Emitter Breakdown Voltage (Note 2)	$V_{(BR)CEO}$	−40	−	Vdc
Collector−Base Breakdown Voltage	$V_{(BR)CBO}$	−40	−	Vdc
Emitter−Base Breakdown Voltage	$V_{(BR)EBO}$	−5.0	−	Vdc
Base Cutoff Current	I_{BL}	−	−50	nAdc
Collector Cutoff Current	I_{CEX}	−	−50	nAdc
ON CHARACTERISTICS (Note 2)				
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	f_T	250	−	MHz
Output Capacitance	C_{obo}	−	4.5	pF
Input Capacitance	C_{ibo}	−	10.0	pF

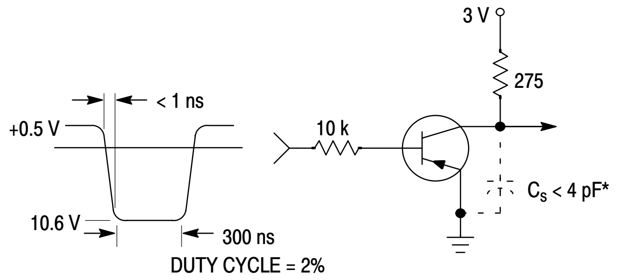
2. Pulse Test: Pulse Width ≤ 300 μs; Duty Cycle ≤ 2.0%.

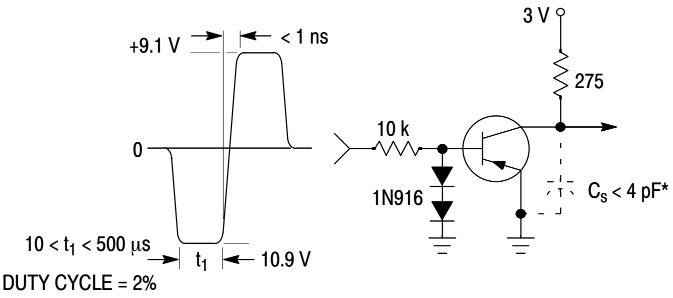
ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted) (Continued)

Characteristic	Symbol	Min	Max	Unit
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

		Symbol	Min	Max	Unit
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	





* Total shunt capacitance of test jig and connectors

Figure 1. Delay and Rise Time Equivalent Test Circuit

Figure 2. Storage and Fall Time Equivalent Test Circuit

TYPICAL TRANSIENT CHARACTERISTICS

—— T_J = 25°C
– – T_J = 125°C

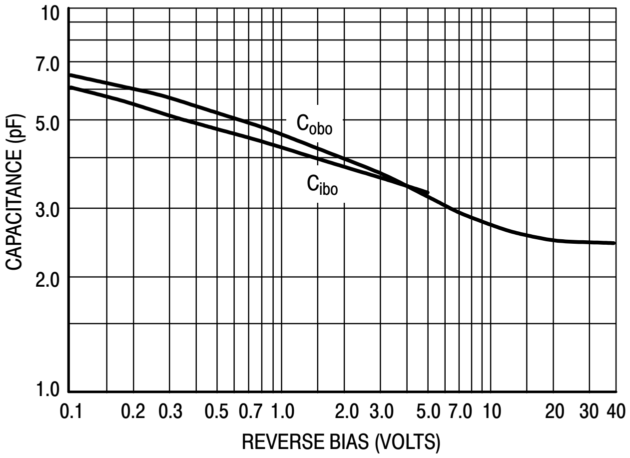


Figure 3. Capacitance

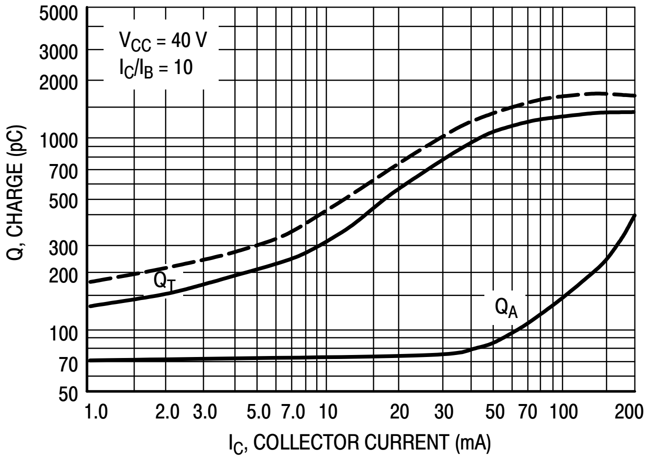


Figure 4. Charge Data

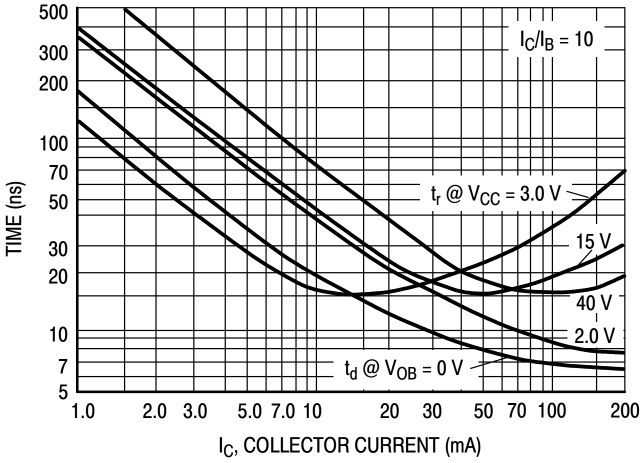


Figure 5. Turn−On Time

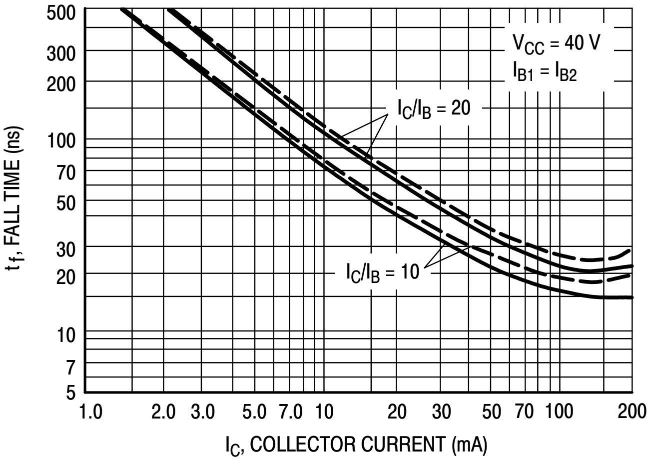


Figure 6. Fall Time

TYPICAL AUDIO SMALL−SIGNAL CHARACTERISTICS
NOISE FIGURE VARIATIONS

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

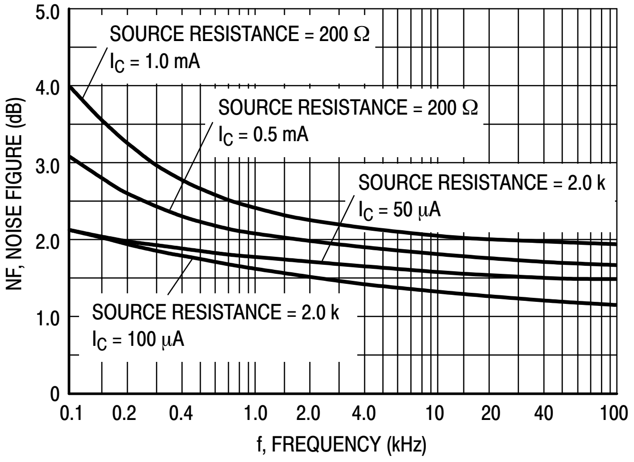


Figure 7.

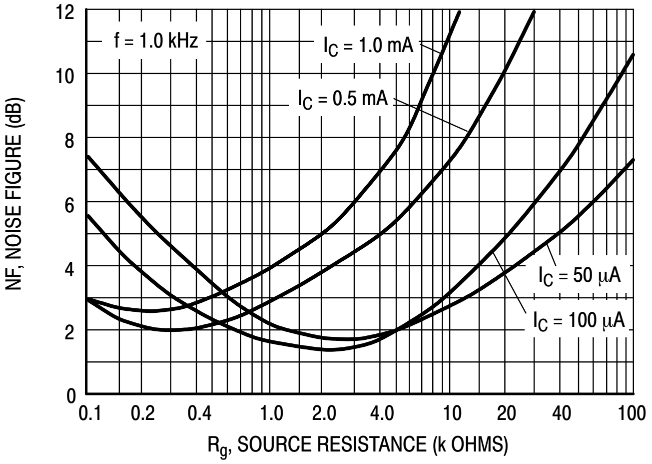


Figure 8.

h PARAMETERS

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

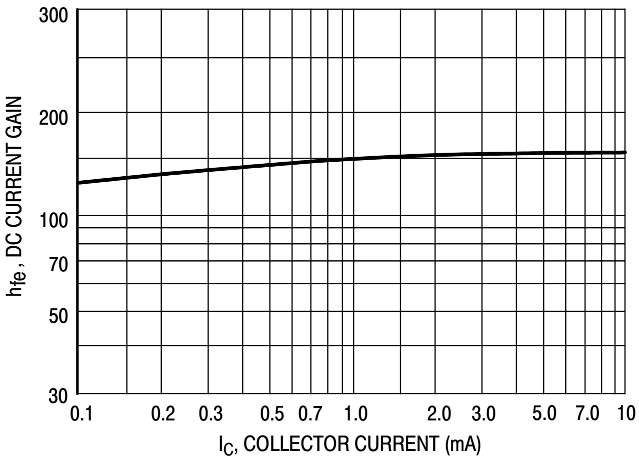


Figure 9. Current Gain

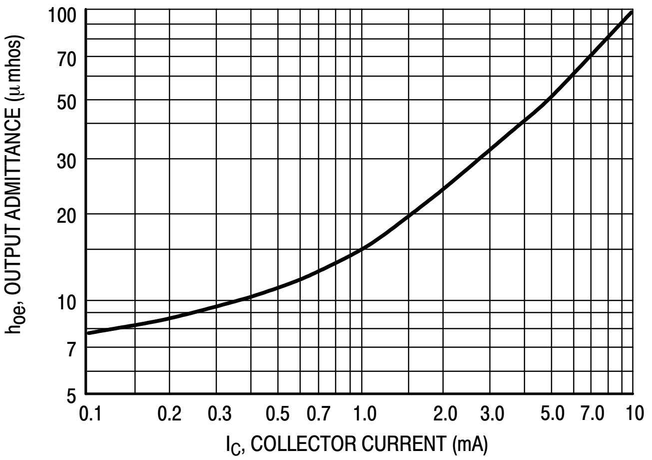


Figure 10. Output Admittance

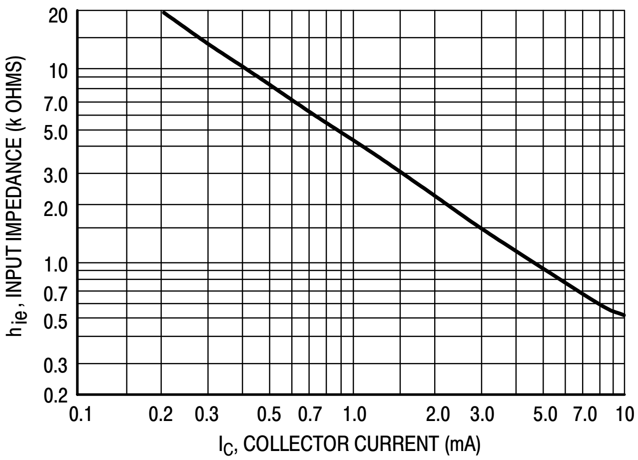


Figure 11. Input Impedance

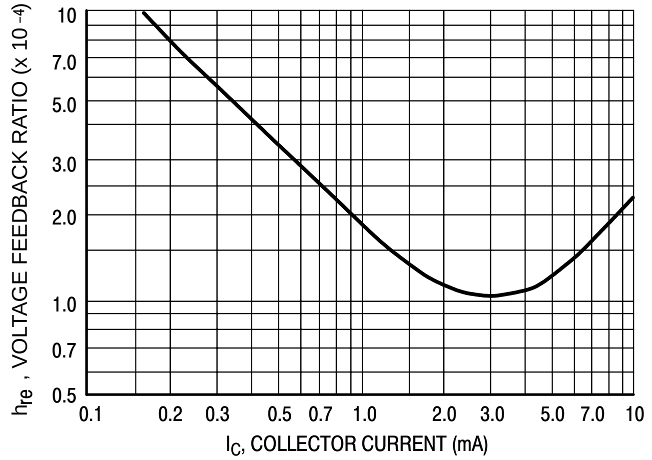


Figure 12. Voltage Feedback Ratio

TYPICAL STATIC CHARACTERISTICS

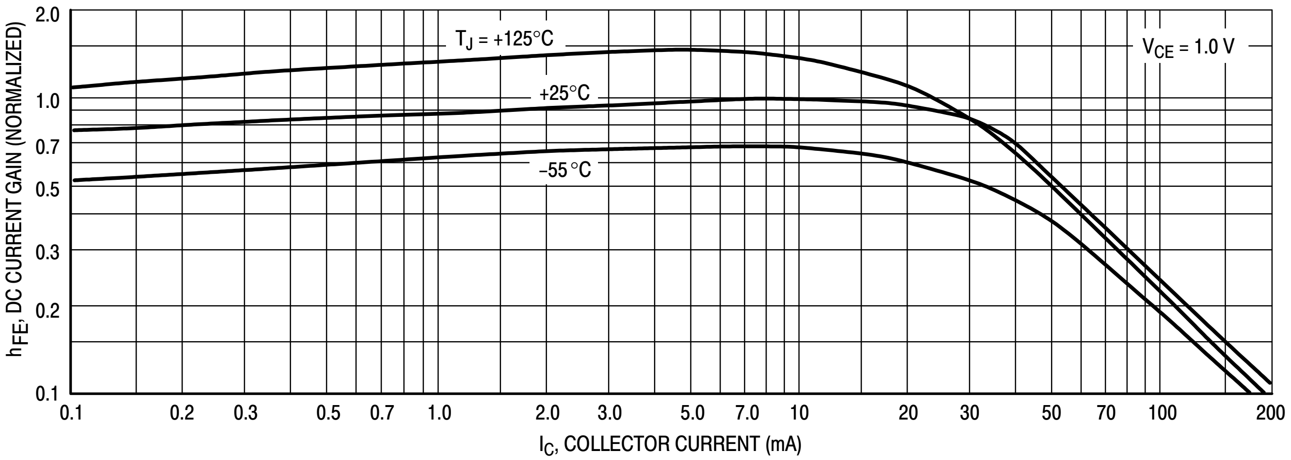


Figure 13. DC Current Gain

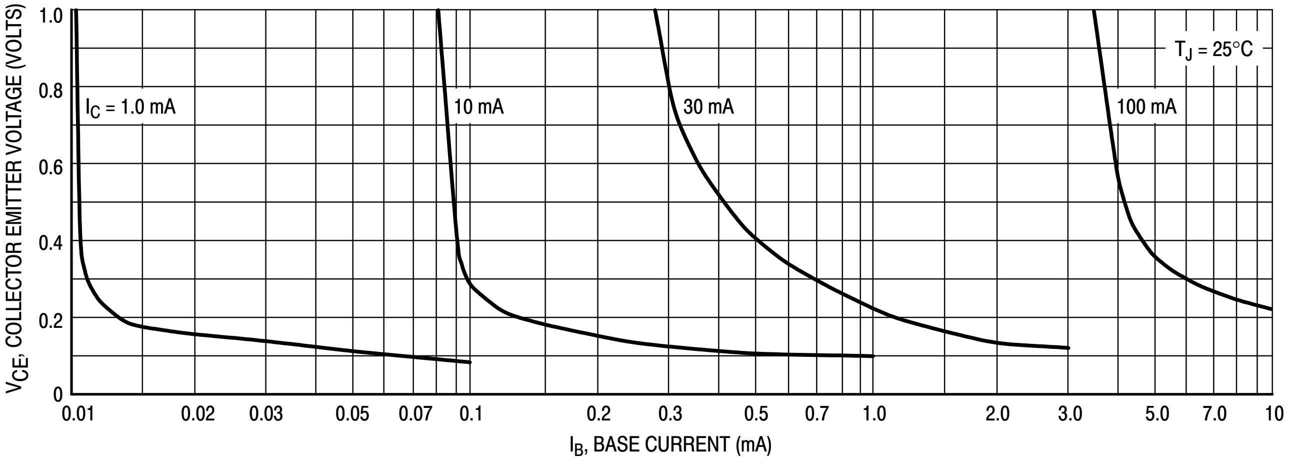


Figure 14. Collector Saturation Region

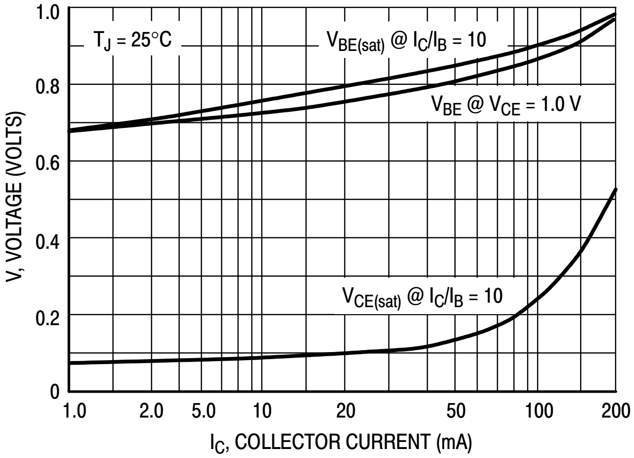


Figure 15. “ON” Voltages

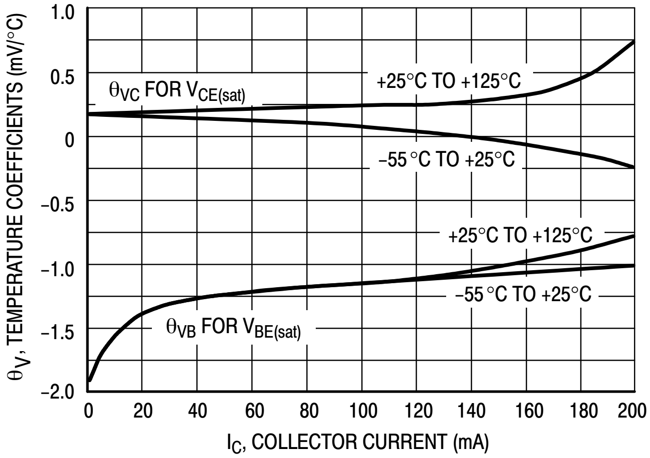
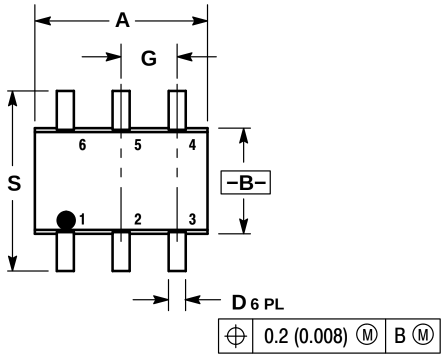


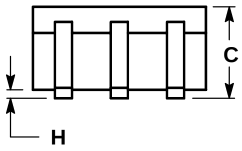
Figure 16. Temperature Coefficients

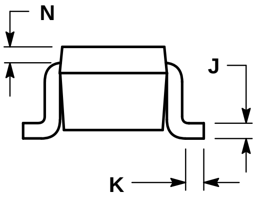
PACKAGE DIMENSIONS

SOT−363/SC−88

CASE 419B−02
ISSUE U





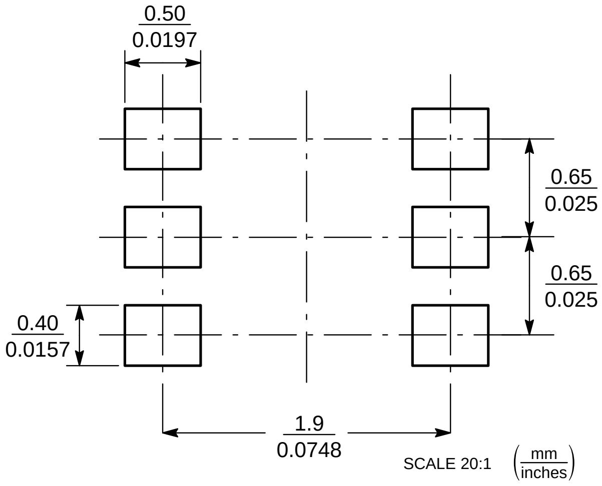


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419B−01 OBSOLETE, NEW STANDARD 419B−02.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.071	0.087	1.80	2.20
B	0.045	0.053	1.15	1.35
C	0.031	0.043	0.80	1.10
D	0.004	0.012	0.10	0.30
G	0.026 BSC		0.65 BSC	
H	−−−	0.004	−−−	0.10
J	0.004	0.010	0.10	0.25
K	0.004	0.012	0.10	0.30
N	0.008 REF		0.20 REF	
S	0.079	0.087	2.00	2.20

STYLE 1:
PIN 1. EMITTER 2
2. BASE 2
3. COLLECTOR 1
4. EMITTER 1
5. BASE 1
6. COLLECTOR 2

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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