MBT2222ADW1T1G

General Purpose Transistor

NPN Silicon

Features
- Moisture Sensitivity Level: 1
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector−Emitter Voltage	V_{CEO}	40	Vdc
Collector−Base Voltage	V_{CBO}	75	Vdc
Emitter−Base Voltage	V_{EBO}	6.0	Vdc
Collector Current − Continuous	I_C	600	mAdc
Electrostatic Discharge	ESD	HBM Class 2 MM Class B	

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	T_J, T_{stg}	−55 to +150	°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Device mounted on FR4 glass epoxy printed circuit board using the minimum recommended footprint.
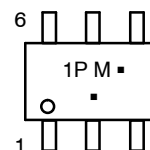
ON Semiconductor®
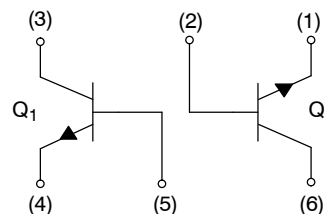
SC−88/SC70−6/SOT−363
CASE 419B
STYLE 1

MARKING DIAGRAM

1P = Specific Device Code
M = Date Code
▪ = Pb−Free Package
(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping[†]
MBT2222ADW1T1G	SOT−363 (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°C unless otherwise noted)

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector–Emitter Breakdown Voltage	(I_C = 10 mAdc, I_B = 0)	$V_{(BR)CEO}$	40	–	Vdc
Collector–Base Breakdown Voltage	(I_C = 10 μAdc, I_E = 0)	$V_{(BR)CBO}$	75	–	Vdc
Emitter–Base Breakdown Voltage,	(I_E = 10 μAdc, I_C = 0)	$V_{(BR)EBO}$	6.0	–	Vdc
Collector Cutoff Current	(V_{CE} = 60 Vdc, $V_{EB(off)}$ = 3.0 Vdc)	I_{CEX}	–	10	nAdc
Collector Cutoff Current		I_{CBO}			μAdc
	(V_{CB} = 60 Vdc, I_E = 0)		–	0.01	
	(V_{CB} = 60 Vdc, I_E = 0, T_A = 125°C)		–	10	
Emitter Cutoff Current	(V_{EB} = 3.0 Vdc, I_C = 0)	I_{EBO}	–	100	nAdc
Base Cutoff Current	(V_{CE} = 60 Vdc, $V_{EB(off)}$ = 3.0 Vdc)	I_{BL}	–	20	nAdc
ON CHARACTERISTICS					
DC Current Gain		h_{FE}			–
	(I_C = 0.1 mAdc, V_{CE} = 10 Vdc)		35	–	
	(I_C = 1.0 mAdc, V_{CE} = 10 Vdc)		50	–	
	(I_C = 10 mAdc, V_{CE} = 10 Vdc)		75	–	
	(I_C = 10 mAdc, V_{CE} = 10 Vdc, T_A = –55°C)		35	–	
	(I_C = 150 mAdc, V_{CE} = 10 Vdc) (Note 2)		100	300	
	(I_C = 150 mAdc, V_{CE} = 1.0 Vdc) (Note 2)		50	–	
	(I_C = 500 mAdc, V_{CE} = 10 Vdc) (Note 2)		40	–	
Collector–Emitter Saturation Voltage (Note 2)		$V_{CE(sat)}$			Vdc
	(I_C = 150 mAdc, I_B = 15 mAdc)		–	0.3	
	(I_C = 500 mAdc, I_B = 50 mAdc)		–	1.0	
Base–Emitter Saturation Voltage (Note 2)		$V_{BE(sat)}$			Vdc
	(I_C = 150 mAdc, I_B = 15 mAdc)		0.6	1.2	
	(I_C = 500 mAdc, I_B = 50 mAdc)		–	2.0	
SMALL–SIGNAL CHARACTERISTICS					
Current–Gain – Bandwidth Product (Note 3)		f_T	300	–	MHz
	(I_C = 20 mAdc, V_{CE} = 20 Vdc, f = 100 MHz)				
Output Capacitance	(V_{CB} = 10 Vdc, I_E = 0, f = 1.0 MHz)	C_{obo}	–	8.0	pF
Input Capacitance	(V_{EB} = 0.5 Vdc, I_C = 0, f = 1.0 MHz)	C_{ibo}	–	25	pF
Input Impedance		h_{ie}			kΩ
	(I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)		2.0	8.0	
	(I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)		0.25	1.25	
Voltage Feedback Ratio		h_{re}			X 10^{-4}
	(I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)		–	8.0	
	(I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)		–	4.0	
Small–Signal Current Gain		h_{fe}			–
	(I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)		50	300	
	(I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)		75	375	
Output Admittance		h_{oe}			μmhos
	(I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)		5.0	35	
	(I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)		25	200	
Collector Base Time Constant	(I_E = 20 mAdc, V_{CB} = 20 Vdc, f = 31.8 MHz)	rb, C_c	–	150	ps
Noise Figure	(I_C = 100 μAdc, V_{CE} = 10 Vdc, R_S = 1.0 kΩ, f = 1.0 kHz)	NF	–	4.0	dB
SWITCHING CHARACTERISTICS					
Delay Time	(V_{CC} = 30 Vdc, $V_{BE(off)}$ = – 0.5 Vdc, I_C = 150 mAdc, I_{B1} = 15 mAdc)	t_d	–	10	ns
Rise Time		t_r	–	25	
Storage Time	(V_{CC} = 30 Vdc, I_C = 150 mAdc, $I_{B1} = I_{B2}$ = 15 mAdc)	t_s	–	225	ns
Fall Time		t_f	–	60	

2. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.
3. f_T is defined as the frequency at which |h_{fe}| extrapolates to unity.

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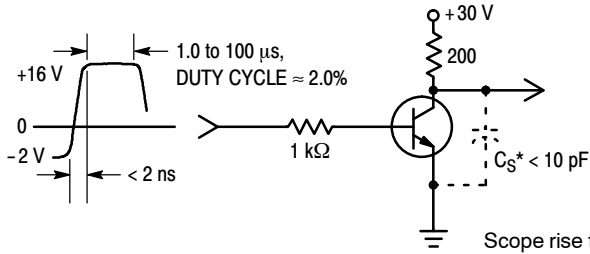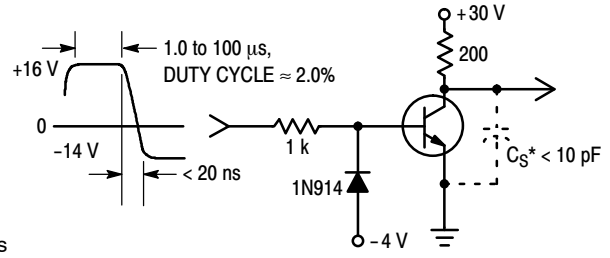## SWITCHING TIME EQUIVALENT TEST CIRCUITS

+16 V
0
−2 V
< 2 ns

1.0 to 100 μs,
DUTY CYCLE ≈ 2.0%

1 kΩ

+30 V
200

C_S^* < 10 pF

Figure 1. Turn−On Time

+16 V
0
−14 V
< 20 ns

1.0 to 100 μs,
DUTY CYCLE ≈ 2.0%

1 k
1N914
−4 V

+30 V
200

C_S^* < 10 pF

Scope rise time < 4 ns
*Total shunt capacitance of test jig, connectors, and oscilloscope.

Figure 2. Turn−Off Time

$T_J = 125°C$

25°C

−55°C

$V_{CE} = 1.0$ V
$V_{CE} = 10$ V

h_{FE}, DC CURRENT GAIN

I_C, COLLECTOR CURRENT (mA)

Figure 3. DC Current Gain

V_{CE}, COLLECTOR-EMITTER VOLTAGE (VOLTS)

$I_C = 1.0$ mA

10 mA

150 mA

500 mA

$T_J = 25°C$

I_B, BASE CURRENT (mA)
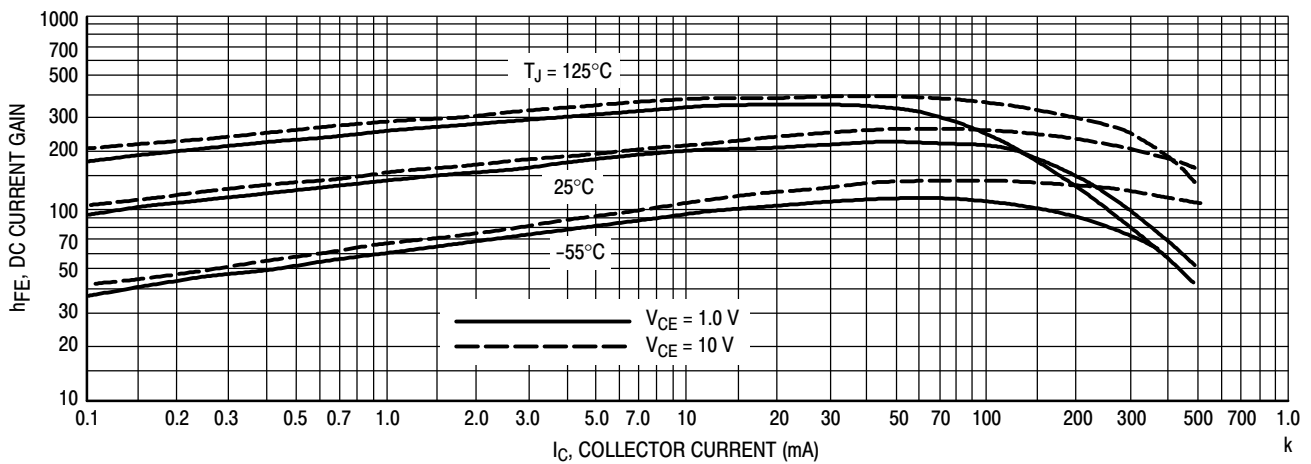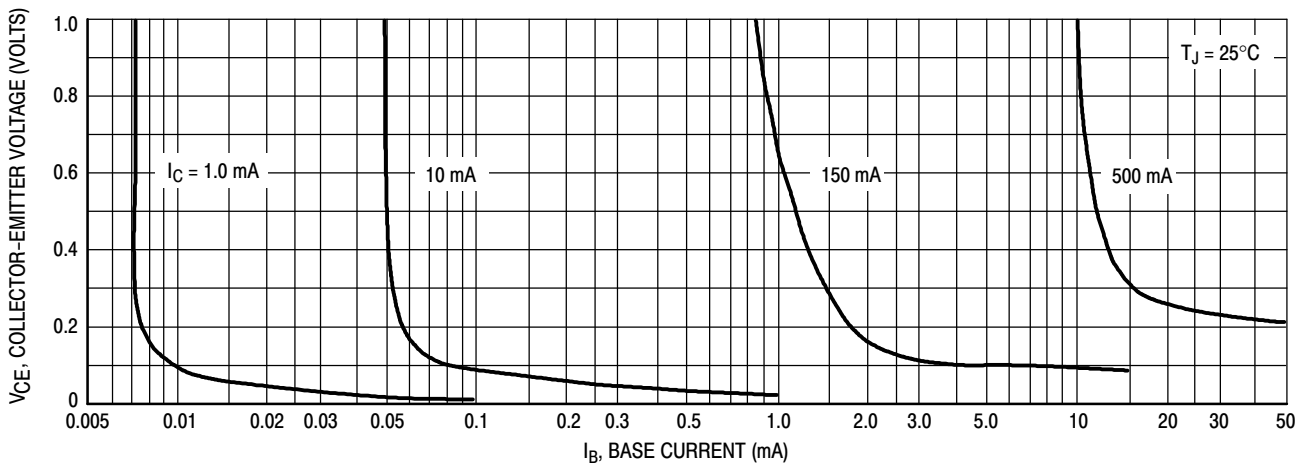
Figure 4. Collector Saturation Region
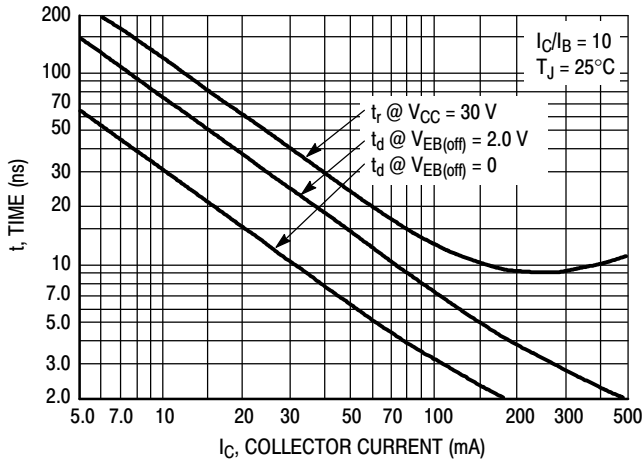
Figure 5. Turn−On Time
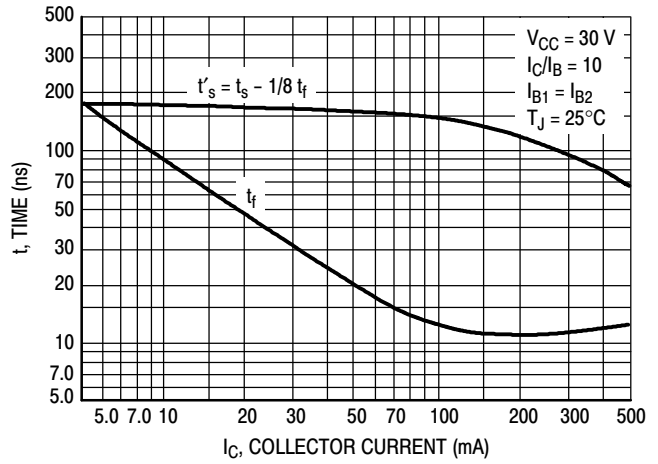
Figure 6. Turn−Off Time
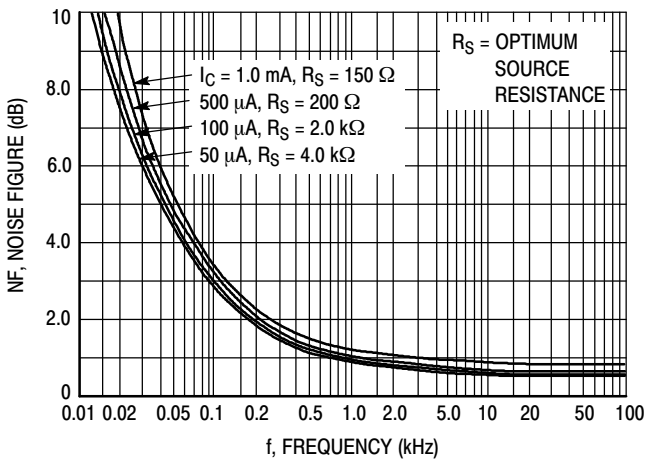
Figure 7. Frequency Effects
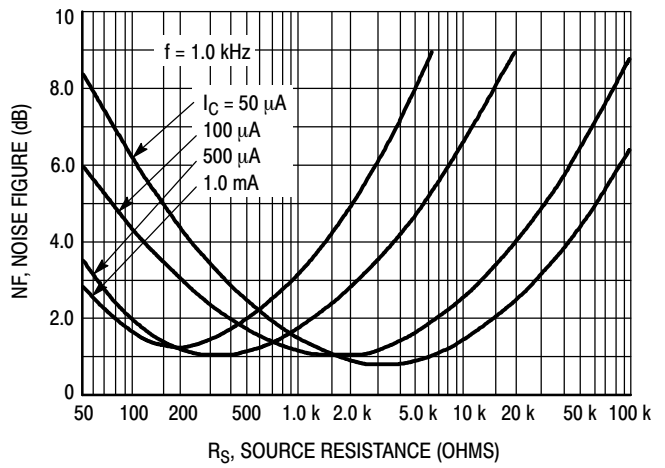
Figure 8. Source Resistance Effects
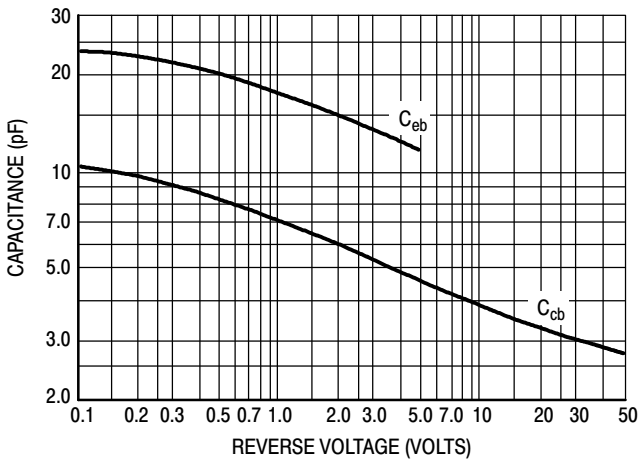
Figure 9. Capacitances
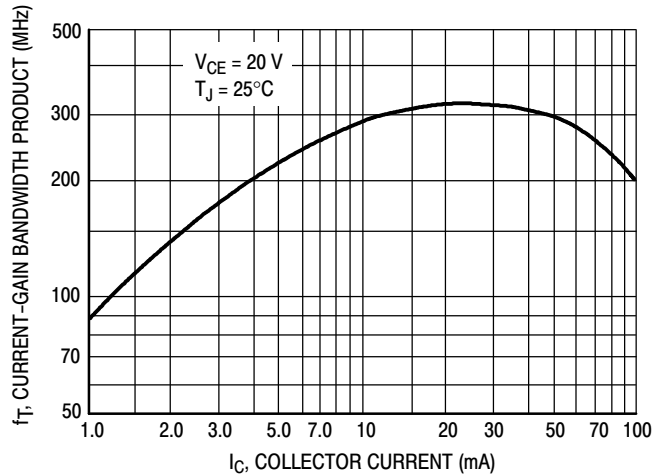
Figure 10. Current−Gain Bandwidth Product
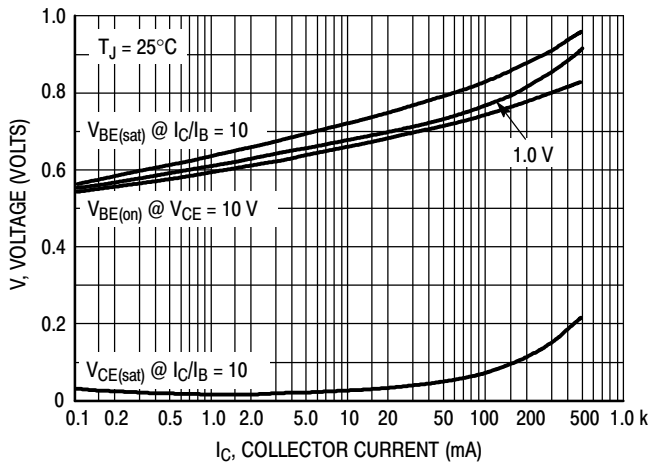
Figure 11. "On" Voltages
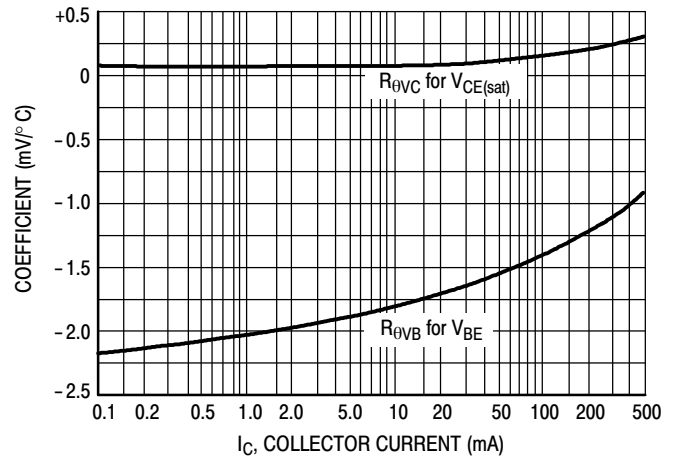
Figure 12. Temperature Coefficients

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PACKAGE DIMENSIONS

SC−88/SC70−6/SOT−363
CASE 419B−02
ISSUE W
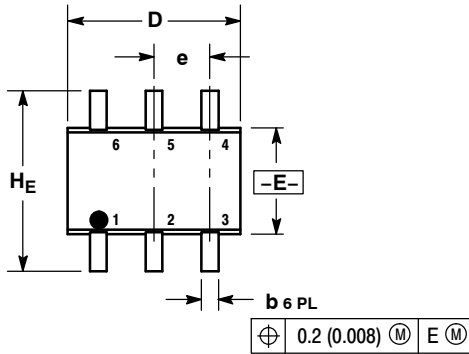
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419B−01 OBSOLETE, NEW STANDARD 419B−02.

⊕ 0.2 (0.008) Ⓜ E Ⓜ

b 6 PL

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.80	0.95	1.10	0.031	0.037	0.043
A1	0.00	0.05	0.10	0.000	0.002	0.004
A3	0.20 REF			0.008 REF		
b	0.10	0.21	0.30	0.004	0.008	0.012
C	0.10	0.14	0.25	0.004	0.005	0.010
D	1.80	2.00	2.20	0.070	0.078	0.086
E	1.15	1.25	1.35	0.045	0.049	0.053
e	0.65 BSC			0.026 BSC		
L	0.10	0.20	0.30	0.004	0.008	0.012
H$_E$	2.00	2.10	2.20	0.078	0.082	0.086
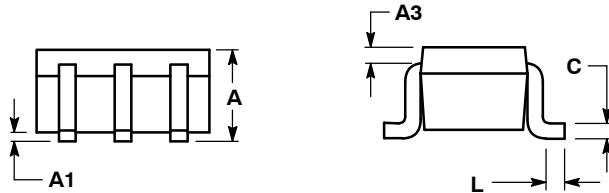
STYLE 1:
PIN 1. EMITTER 2
2. BASE 2
3. COLLECTOR 1
4. EMITTER 1
5. BASE 1
6. COLLECTOR 2

SOLDERING FOOTPRINT*

0.50 / 0.0197

0.65 / 0.025

0.65 / 0.025

0.40 / 0.0157

1.9 / 0.0748

SCALE 20:1 (mm / inches)
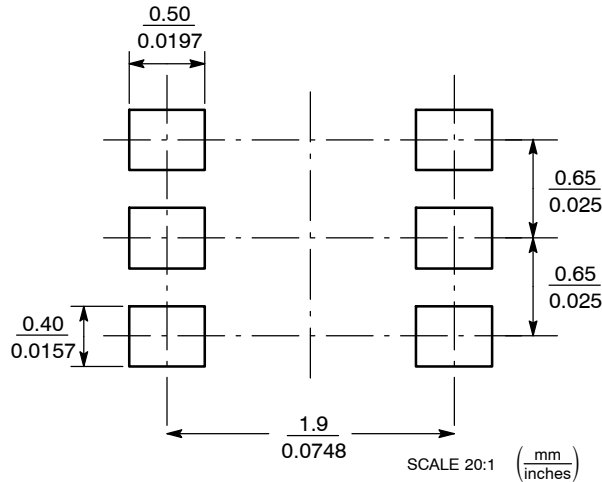
*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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