

# NSM80101MT1G

## NPN Transistor with Dual Series Switching Diode

### Features

- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

### Typical Applications

- LCD Control Board
- High Speed Switching
- High Voltage Switching

### MAXIMUM RATINGS – PNP TRANSISTOR

Rating	Symbol	Value	Unit
Collector – Emitter Voltage	$V_{CEO}$	80	Vdc
Collector – Base Voltage	$V_{CBO}$	80	Vdc
Emitter – Base Voltage	$V_{EBO}$	6.0	Vdc
Collector Current – Continuous	$I_C$	500	mAdc

### MAXIMUM RATINGS – SWITCHING DIODE

Rating	Symbol	Value	Unit
Reverse Voltage	$V_R$	100	V
Forward Current	$I_F$	200	mA
Non-Repetitive Peak Forward Current (Square Wave, $T_J = 25^\circ\text{C}$ prior to surge) $t < 1 \text{ sec}$ $t = 1 \mu\text{sec}$	$I_{FSM}$	1.0 20	A
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-55 to +150	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

### ESD RATINGS

Rating	Class	Value
Electrostatic Discharge	HBM MM	3A M4

### THERMAL CHARACTERISTICS

Rating	Symbol	Max	Unit
Total Device Dissipation FR-5 Board, (Note 1) @ $T_A = 25^\circ\text{C}$ Derate above 25°C	$P_D$	400	mW mW/°C
Thermal Resistance from Junction-to-Ambient (Note 1)	$R_{\theta JA}$	313	°C/W
Total Device Dissipation FR-5 Board (Note 2) $T_A = 25^\circ\text{C}$ Derate above 25°C	$P_D$	270	mW mW/°C
Thermal Resistance, Junction-to-Ambient (Note 2)	$R_{\theta JA}$	463	°C/W
Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 to +150	°C

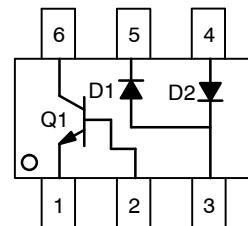
- FR-5 = 650 mm<sup>2</sup> pad, 2.0 oz Cu.
- FR-5 = 10 mm<sup>2</sup> pad, 2.0 oz Cu.



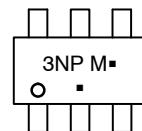
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## NPN Transistor with Dual Series Switching Diode



### MARKING DIAGRAM



3NP = 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 <sup>†</sup>
NSM80101MT1G	SC-74 (Pb-Free)	3000 / Tape & Reel

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

# NSM80101MT1G

## Q1: NPN TRANSISTOR ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
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### OFF CHARACTERISTICS

Collector – Emitter Breakdown Voltage (Note 3) ( $I_C = 1.0 \text{ mA}$ , $I_B = 0$ )	$V_{(\text{BR})\text{CEO}}$	80	–	V
Emitter – Base Breakdown Voltage ( $I_E = 100 \mu\text{A}$ , $I_C = 0$ )	$V_{(\text{BR})\text{EBO}}$	6.0	–	V
Collector Cutoff Current ( $V_{\text{CE}} = 60 \text{ V}$ , $I_B = 0$ )	$I_{\text{CES}}$	–	0.1	$\mu\text{A}$
Collector Cutoff Current ( $V_{\text{CB}} = 80 \text{ V}$ , $I_E = 0$ )	$I_{\text{CBO}}$	–	0.1	$\mu\text{A}$

### ON CHARACTERISTICS (Note 3)

DC Current Gain ( $I_C = 10 \text{ mA}$ , $V_{\text{CE}} = 1.0 \text{ V}$ )	$h_{\text{FE}}$	120	–	–
Collector – Emitter Saturation Voltage ( $I_C = 100 \text{ mA}$ , $I_B = 10 \text{ mA}$ )	$V_{\text{CE}(\text{sat})}$	–	0.3	V
Base – Emitter Saturation Voltage ( $I_C = 10 \text{ mA}$ , $V_{\text{CE}} = 5.0 \text{ Vdc}$ )	$V_{\text{BE}(\text{sat})}$	–	1.2	V

### SMALL-SIGNAL CHARACTERISTICS

Current – Gain – Bandwidth Product ( $I_C = 10 \text{ mA}$ , $V_{\text{CE}} = 5.0 \text{ V}$ , $f = 100 \text{ MHz}$ )	$f_T$	150	–	MHz
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3. Pulse Test: Pulse Width  $\leq 300 \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

## D1, D2: SWITCHING DIODE ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
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### OFF CHARACTERISTICS

Reverse Breakdown Voltage	$V_{(\text{BR})}$	75	–	V
Reverse Voltage Leakage Current ( $V_R = 75 \text{ V}$ ) ( $V_R = 20 \text{ V}$ , $T_J = 150^\circ\text{C}$ ) ( $V_R = 75 \text{ V}$ , $T_J = 150^\circ\text{C}$ )	$I_R$	– – –	1.0 30 100	$\mu\text{A}$
Diode Capacitance ( $V_R = 0 \text{ V}$ , $f = 1.0 \text{ MHz}$ )	$C_D$	–	2.0	pF
Forward Voltage ( $I_F = 1.0 \text{ mA}$ ) ( $I_F = 10 \text{ mA}$ ) ( $I_F = 50 \text{ mA}$ ) ( $I_F = 150 \text{ mA}$ )	$V_F$	– – – –	715 855 1000 1250	mV
Reverse Recovery Time ( $I_F = I_R = 10 \text{ mA}$ , $i_{\text{R}(\text{REC})} = 1.0 \text{ mA}$ , $R_L = 100 \Omega$ )	$t_{\text{rr}}$	–	6.0	ns
Forward Recovery Voltage ( $I_F = 10 \text{ mA}$ , $t_r = 20 \text{ ns}$ )	$V_{\text{FR}}$	–	1.75	V

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

## TYPICAL CHARACTERISTICS

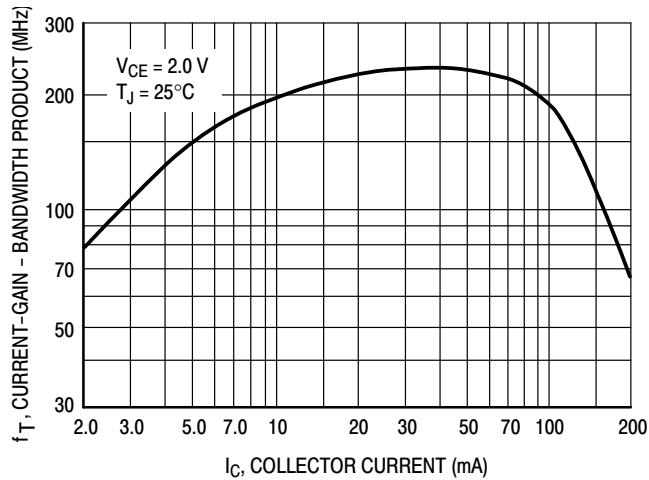


Figure 1. Current-Gain — Bandwidth Product

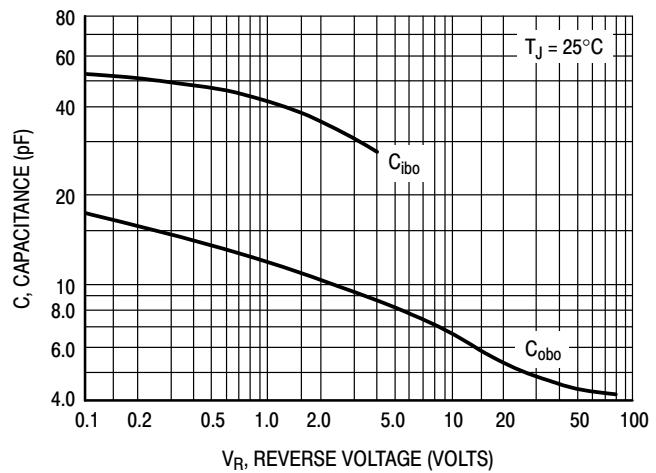


Figure 2. Capacitance

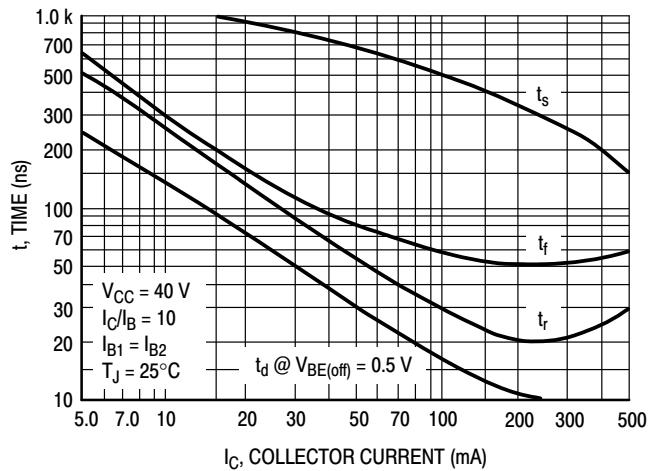


Figure 3. Switching Time

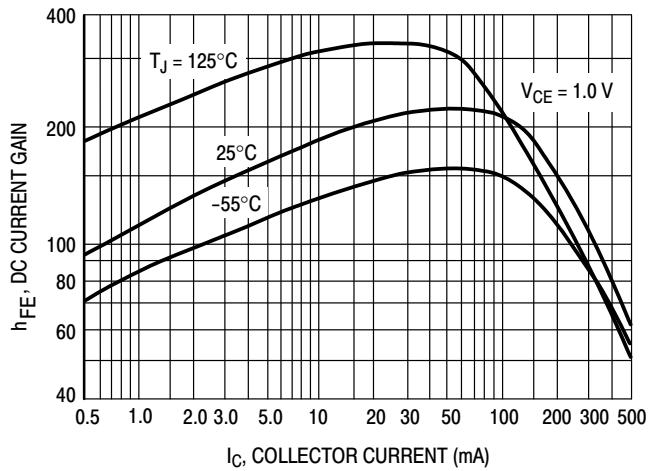


Figure 4. DC Current Gain

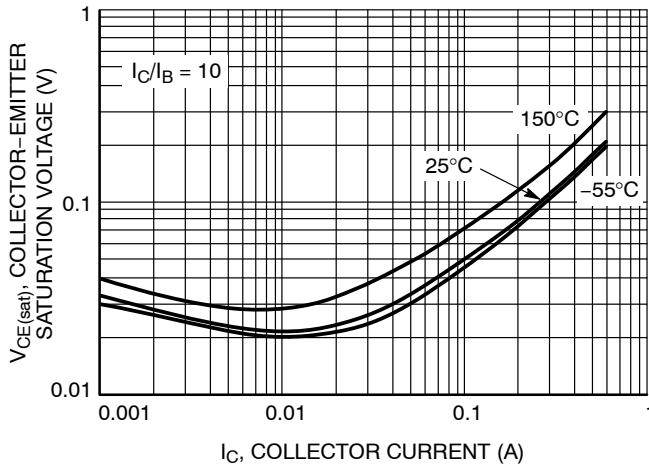


Figure 5. Collector Emitter Saturation Voltage vs. Collector Current

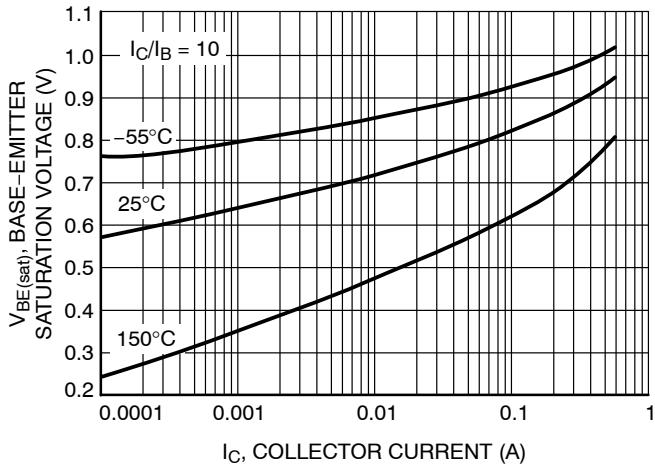
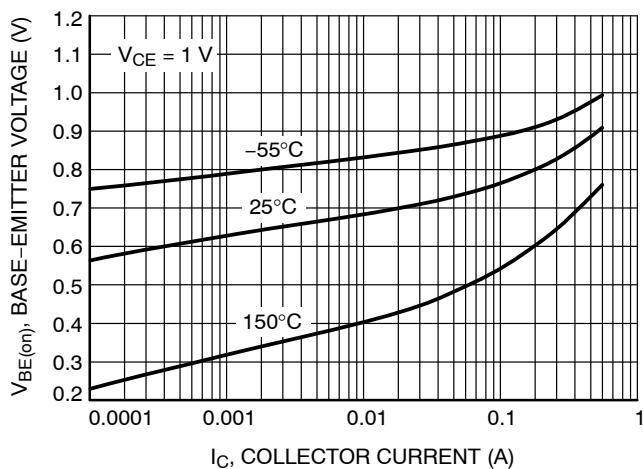
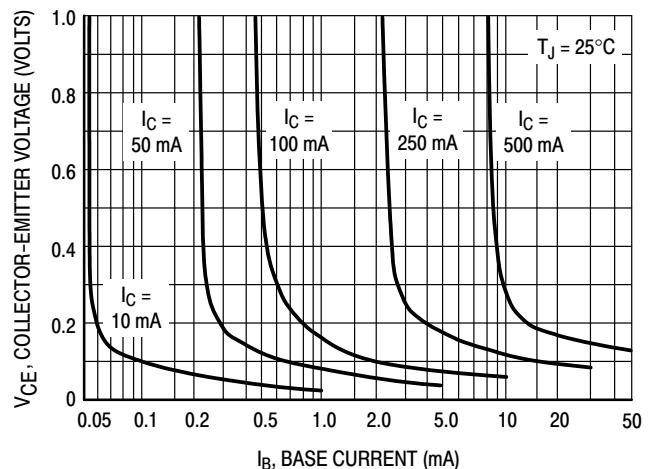


Figure 6. Base Emitter Saturation Voltage vs. Collector Current

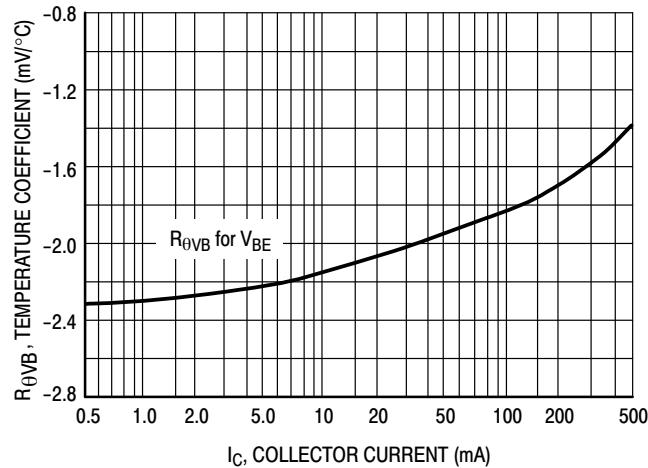
**TYPICAL CHARACTERISTICS**



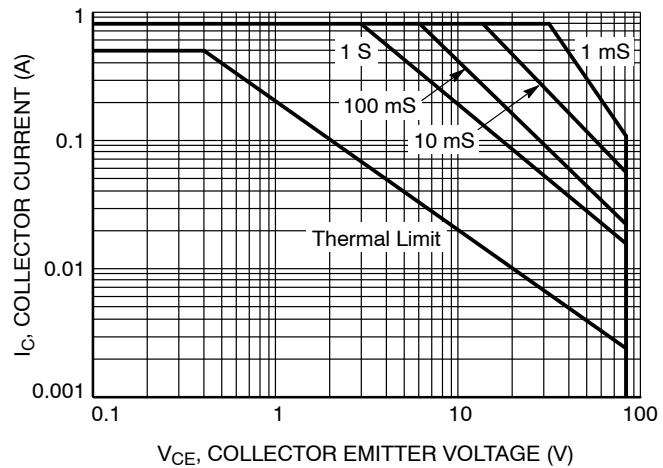
**Figure 7. Base Emitter Voltage vs. Collector Current**



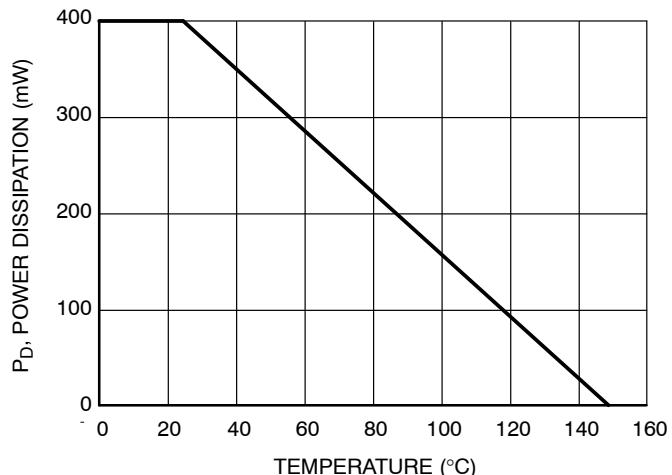
**Figure 8. Collector Saturation Region**



**Figure 9. Base-Emitter Temperature Coefficient**

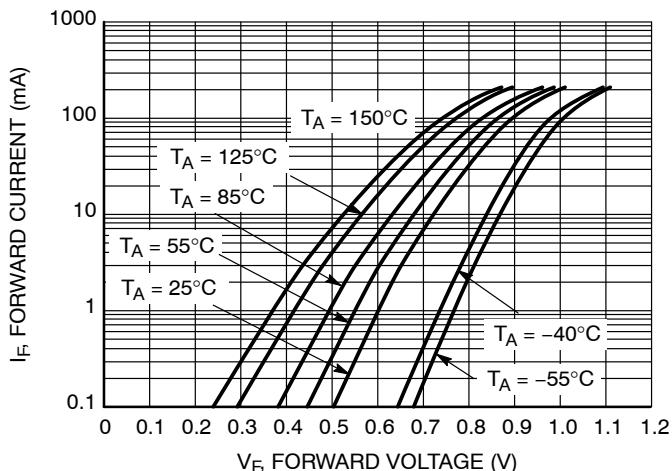


**Figure 10. Safe Operating Area**

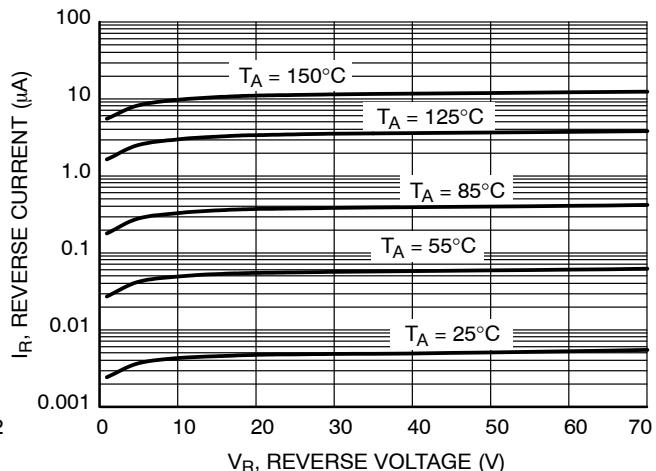


**Figure 11. Operating Temperature Derating**

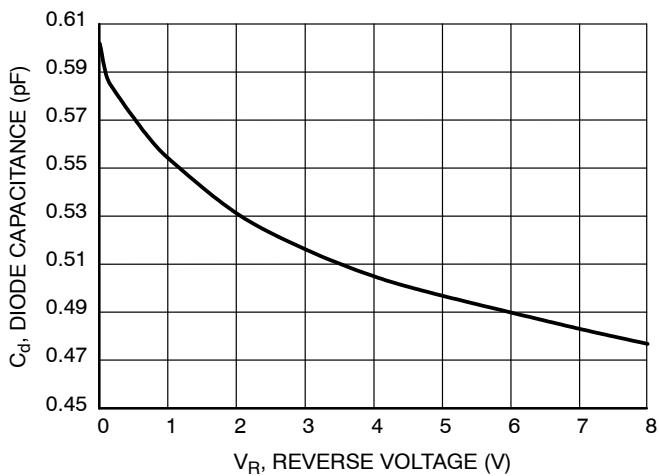
**TYPICAL CHARACTERISTICS**



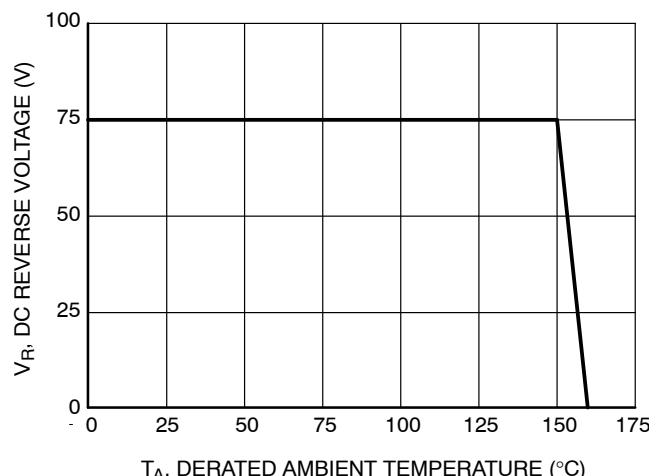
**Figure 12. Forward Voltage**



**Figure 13. Leakage Current**



**Figure 14. Capacitance**



**Figure 15. Diode Power Dissipation Curve**

**MECHANICAL CASE OUTLINE**  
PACKAGE DIMENSIONS

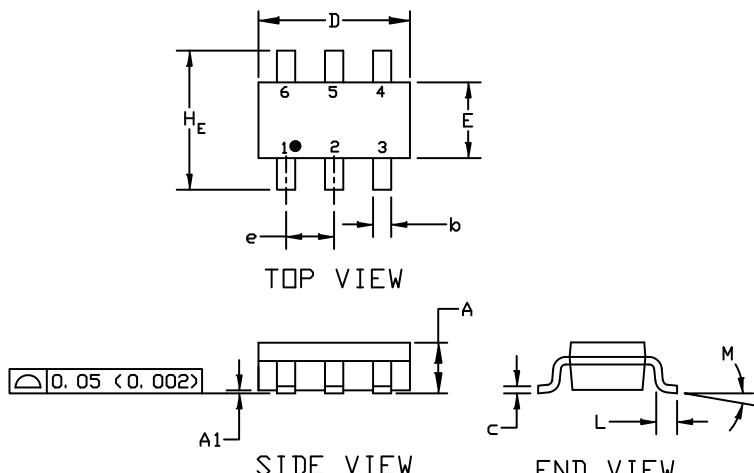
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SCALE 2:1

**SC-74**  
CASE 318F  
ISSUE P

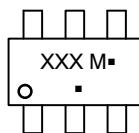
DATE 07 OCT 2021



**NOTES:**  
 1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994  
 2. CONTROLLING DIMENSION: INCHES  
 3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.

DIM	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.90	1.00	1.10	0.035	0.039	0.043
A1	0.01	0.06	0.10	0.001	0.002	0.004
b	0.25	0.37	0.50	0.010	0.015	0.020
c	0.10	0.18	0.26	0.004	0.007	0.010
D	2.90	3.00	3.10	0.114	0.118	0.122
E	1.30	1.50	1.70	0.051	0.059	0.067
e	0.85	0.95	1.05	0.034	0.037	0.041
H <sub>E</sub>	2.50	2.75	3.00	0.099	0.108	0.118
L	0.20	0.40	0.60	0.008	0.016	0.024
M	0°	---	10°	0°	---	10°

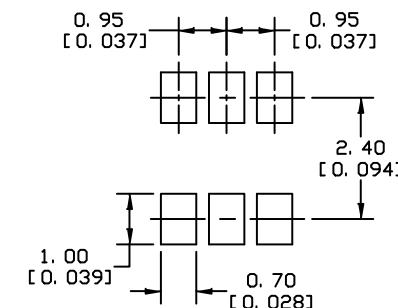
**GENERIC  
MARKING DIAGRAM\***



XXX = Specific Device Code  
 M = Date Code  
 ■ = Pb-Free Package

(Note: Microdot may be in either location)

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "■", may or may not be present. Some products may not follow the Generic Marking.



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

**SOLDERING FOOTPRINT**

STYLE 1:	STYLE 2:	STYLE 3:	STYLE 4:	STYLE 5:	STYLE 6:
PIN 1. CATHODE	PIN 1. NO CONNECTION	PIN 1. Emitter 1	PIN 1. Collector 2	PIN 1. CHANNEL 1	PIN 1. CATHODE
2. ANODE	2. COLLECTOR	2. BASE 1	2. Emitter 1/Emitter 2	2. ANODE	2. ANODE
3. CATHODE	3. Emitter	3. COLLECTOR 2	3. COLLECTOR 1	3. CHANNEL 2	3. CATHODE
4. CATHODE	4. NO CONNECTION	4. Emitter 2	4. Emitter 3	4. CHANNEL 3	4. CATHODE
5. ANODE	5. COLLECTOR	5. BASE 2	5. BASE 1/BASE 2/Collector 3	5. CATHODE	5. CATHODE
6. CATHODE	6. BASE	6. COLLECTOR 1	6. BASE 3	6. CHANNEL 4	6. CATHODE

STYLE 7:	STYLE 8:	STYLE 9:	STYLE 10:	STYLE 11:
PIN 1. SOURCE 1	PIN 1. Emitter 1	PIN 1. Emitter 2	PIN 1. ANODE/CATHODE	PIN 1. Emitter
2. GATE 1	2. BASE 2	2. BASE 2	2. BASE	2. BASE
3. DRAIN 2	3. COLLECTOR 2	3. COLLECTOR 1	3. Emitter	3. ANODE/CATHODE
4. SOURCE 2	4. Emitter 2	4. Emitter 1	4. COLLECTOR	4. ANODE
5. GATE 2	5. BASE 1	5. BASE 1	5. ANODE	5. CATHODE
6. DRAIN 1	6. COLLECTOR 1	6. COLLECTOR 2	6. CATHODE	6. COLLECTOR

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