

# High Voltage Transistors

## NPN Silicon

### MMBT5550L, MMBT5551L

#### Features

- S and NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

#### MAXIMUM RATINGS

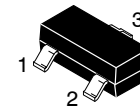
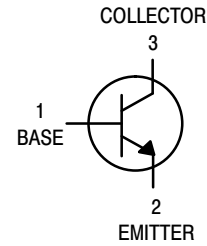
Rating	Symbol	Value	Unit
Collector – Emitter Voltage MMBT5550 MMBT5551	$V_{CEO}$	140 160	Vdc
Collector – Base Voltage MMBT5550 MMBT5551	$V_{CBO}$	160 180	Vdc
Emitter – Base Voltage	$V_{EBO}$	6.0	Vdc
Collector Current – Continuous	$I_C$	600	mA dc
Electrostatic Discharge Human Body Model Machine Model	ESD	> 8000 > 400	V

#### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation FR-5 Board (Note 1) @ $T_A = 25^\circ\text{C}$ Derate Above $25^\circ\text{C}$	$P_D$	225 1.8	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	556	$^\circ\text{C/W}$
Total Device Dissipation Alumina Substrate (Note 2) @ $T_A = 25^\circ\text{C}$ Derate Above $25^\circ\text{C}$	$P_D$	300 2.4	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	417	$^\circ\text{C/W}$
Junction and Storage Temperature	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$

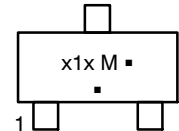
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

- FR-5 =  $1.0 \times 0.75 \times 0.062$  in.
- Alumina =  $0.4 \times 0.3 \times 0.024$  in. 99.5% alumina.



SOT-23 (TO-236)  
CASE 318  
STYLE 6

#### MARKING DIAGRAM



x1x = Device Code  
M1F = MMBT5550LT  
G1 = MMBT5551LT  
M = Date Code\*  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

\*Date Code orientation and/or overbar may vary depending upon manufacturing location.

#### ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
MMBT5550LT1G, NSVMMBT5550LT1G	SOT-23 (Pb-Free)	3,000 / Tape & Reel
MMBT5550LT3G	SOT-23 (Pb-Free)	10,000 / Tape & Reel
MMBT5551LT1G	SOT-23 (Pb-Free)	3,000 / Tape & Reel
SMMBT5551LT1G	SOT-23 (Pb-Free)	3,000 / Tape & Reel
MMBT5551LT3G	SOT-23 (Pb-Free)	10,000 / Tape & Reel
SMMBT5551LT3G	SOT-23 (Pb-Free)	10,000 / 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 Specifications Brochure, BRD8011/D.

# MMBT5550L, MMBT5551L

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

Characteristic		Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Collector – Emitter Breakdown Voltage (Note 3) ( $I_C = 1.0\text{ mA}$ , $I_E = 0$ )	MMBT5550 MMBT5551	$V_{(BR)CEO}$	140 160	– –	Vdc
Collector – Base Breakdown Voltage ( $I_C = 100\text{ }\mu\text{A}$ , $I_E = 0$ )	MMBT5550 MMBT5551	$V_{(BR)CBO}$	160 180	– –	Vdc
Emitter – Base Breakdown Voltage ( $I_E = 10\text{ }\mu\text{A}$ , $I_C = 0$ )		$V_{(BR)EBO}$	6.0	–	Vdc
Collector Cutoff Current ( $V_{CB} = 100\text{ Vdc}$ , $I_E = 0$ ) ( $V_{CB} = 120\text{ Vdc}$ , $I_E = 0$ ) ( $V_{CB} = 100\text{ Vdc}$ , $I_E = 0$ , $T_A = 100^\circ\text{C}$ ) ( $V_{CB} = 120\text{ Vdc}$ , $I_E = 0$ , $T_A = 100^\circ\text{C}$ )	MMBT5550 MMBT5551 MMBT5550 MMBT5551	$I_{CBO}$	– – – –	100 50 100 50	nAdc $\mu\text{Adc}$
Emitter Cutoff Current ( $V_{EB} = 4.0\text{ Vdc}$ , $I_C = 0$ )		$I_{EBO}$	–	50	nAdc
<b>ON CHARACTERISTICS</b>					
DC Current Gain ( $I_C = 1.0\text{ mA}$ , $V_{CE} = 5.0\text{ Vdc}$ )  ( $I_C = 10\text{ mA}$ , $V_{CE} = 5.0\text{ Vdc}$ )  ( $I_C = 50\text{ mA}$ , $V_{CE} = 5.0\text{ Vdc}$ )	MMBT5550 MMBT5551 MMBT5550 MMBT5551 MMBT5550 MMBT5551	$h_{FE}$	60 80 60 80 20 30	– – 250 250 – –	–
Collector – Emitter Saturation Voltage ( $I_C = 10\text{ mA}$ , $I_B = 1.0\text{ mA}$ ) ( $I_C = 50\text{ mA}$ , $I_B = 5.0\text{ mA}$ )	Both Types MMBT5550 MMBT5551	$V_{CE(sat)}$	– – –	0.15 0.25 0.20	Vdc
Base – Emitter Saturation Voltage ( $I_C = 10\text{ mA}$ , $I_B = 1.0\text{ mA}$ ) ( $I_C = 50\text{ mA}$ , $I_B = 5.0\text{ mA}$ )	Both Types MMBT5550 MMBT5551	$V_{BE(sat)}$	– – –	1.0 1.2 1.0	Vdc
Collector Emitter Cut-off ( $V_{CB} = 10\text{ V}$ ) ( $V_{CB} = 75\text{ V}$ )	Both Types	$I_{CES}$	– –	50 100	nA

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.

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

# MMBT5550L, MMBT5551L

## TYPICAL CHARACTERISTICS

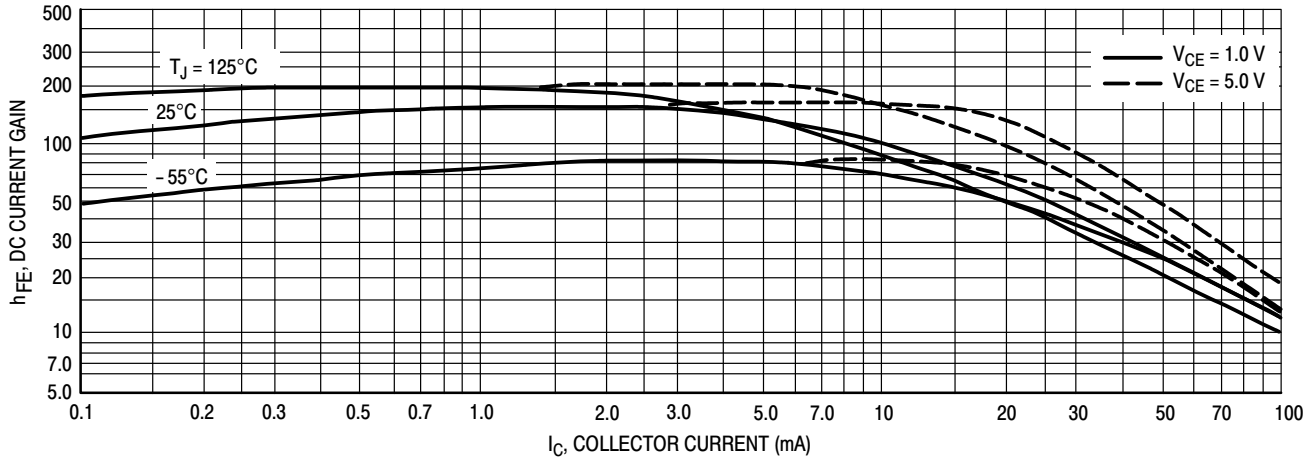


Figure 1. DC Current Gain

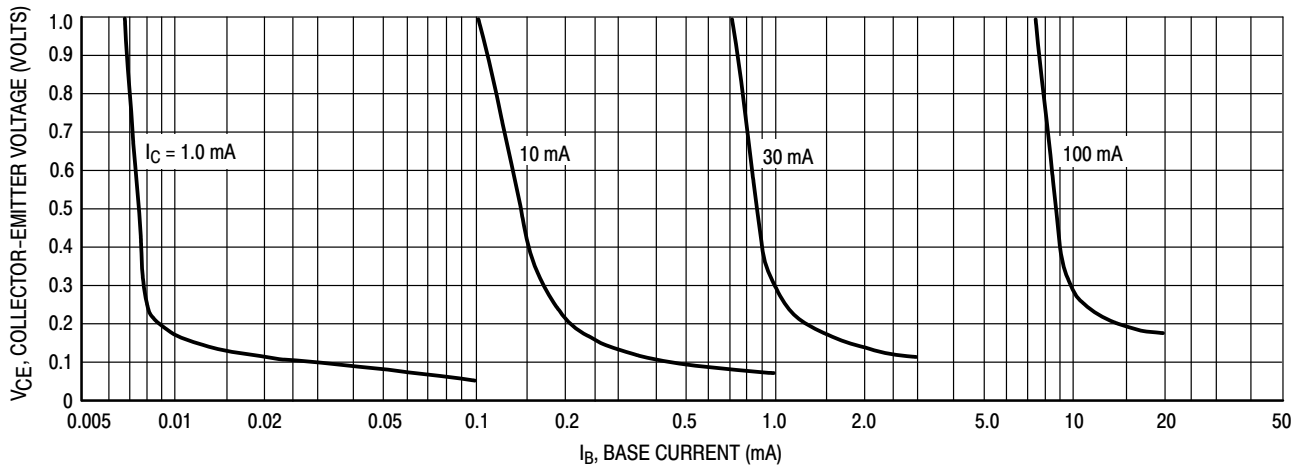


Figure 2. Collector Saturation Region

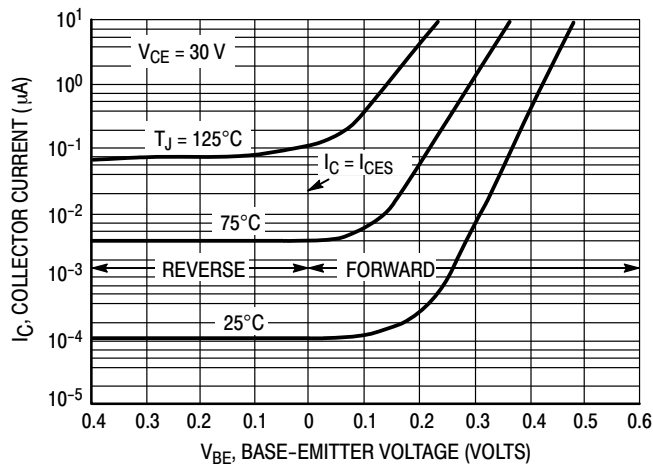


Figure 3. Collector Cut-Off Region

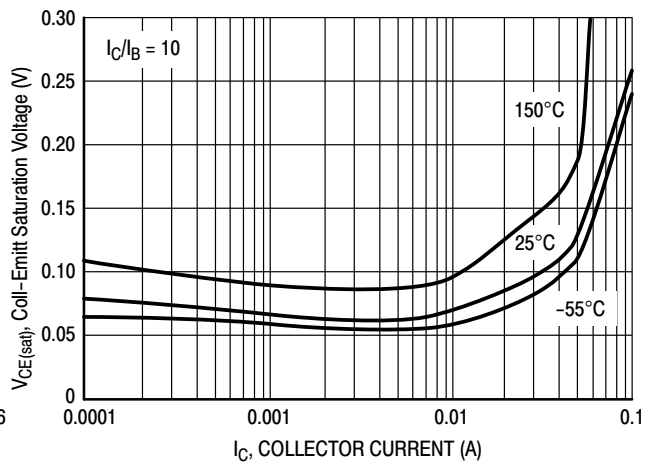


Figure 4.  $V_{CE(sat)}$

# MMBT5550L, MMBT5551L

## TYPICAL CHARACTERISTICS

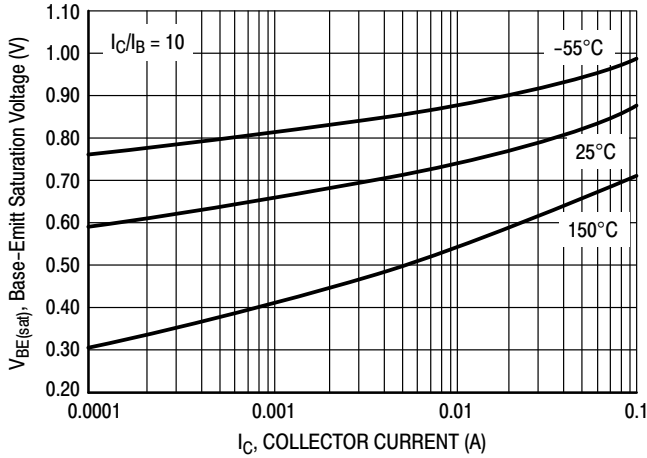


Figure 5.  $V_{BE(sat)}$

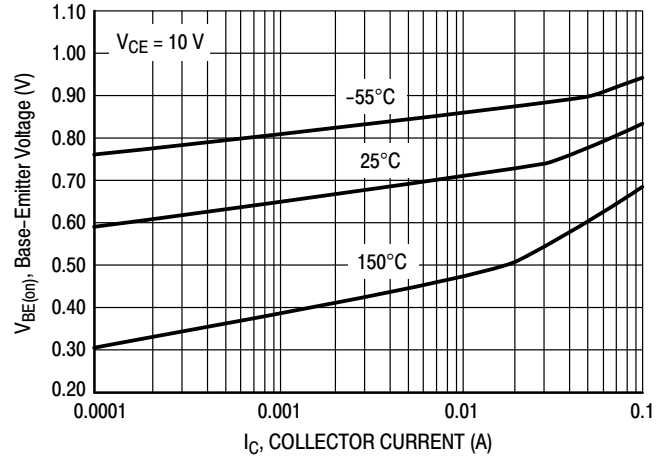


Figure 6.  $V_{BE(on)}$

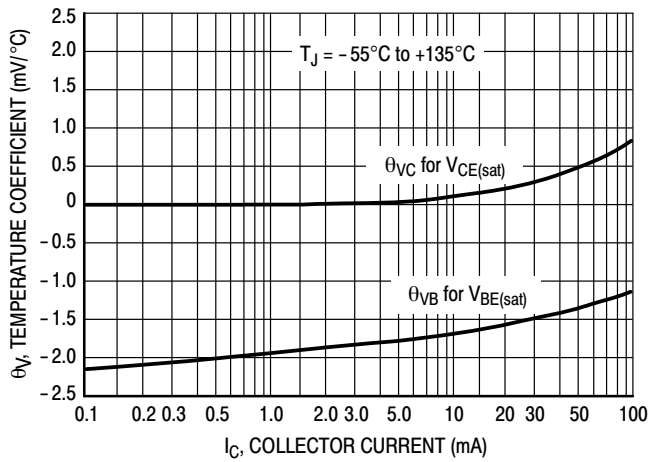


Figure 7. Temperature Coefficients

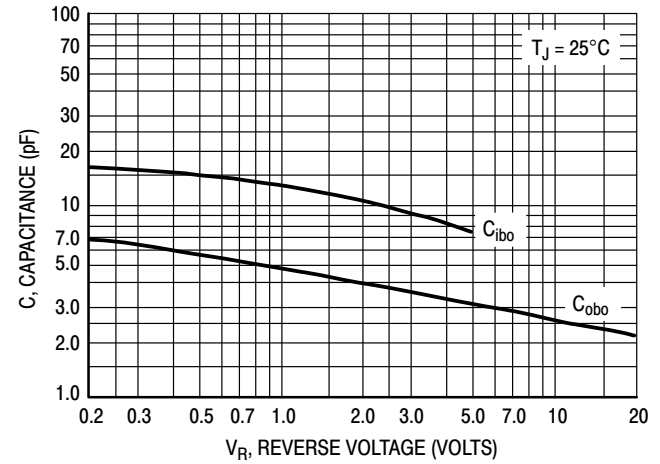
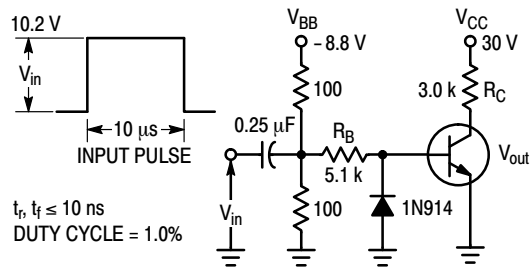


Figure 8. Capacitances



Values Shown are for  $I_C$  @ 10 mA

Figure 9. Switching Time Test Circuit

# MMBT5550L, MMBT5551L

## TYPICAL CHARACTERISTICS

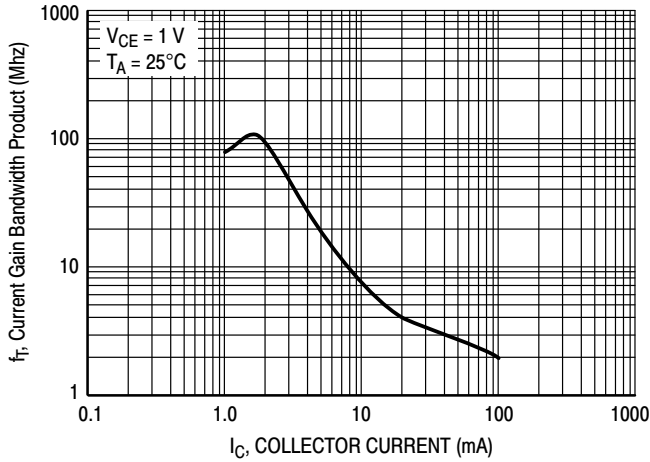


Figure 10. Current Gain Bandwidth Product

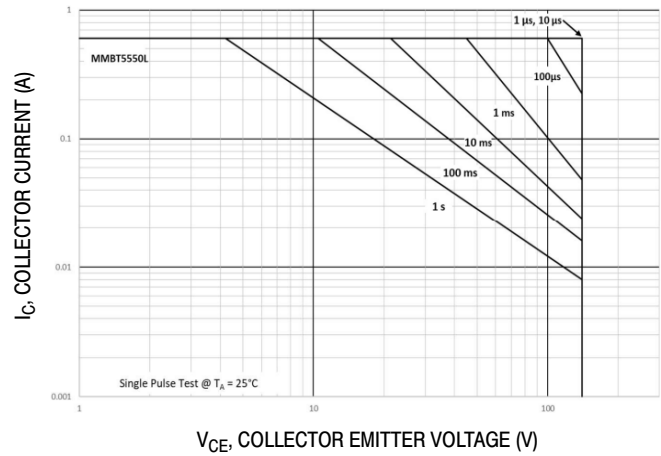


Figure 11. Safe Operating Area

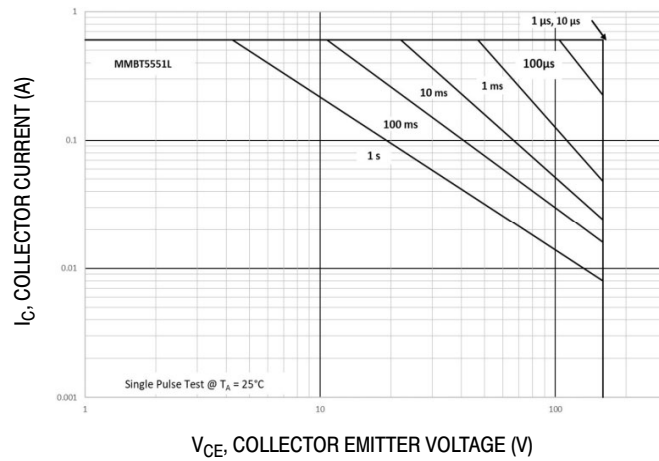


Figure 12. Safe Operating Area

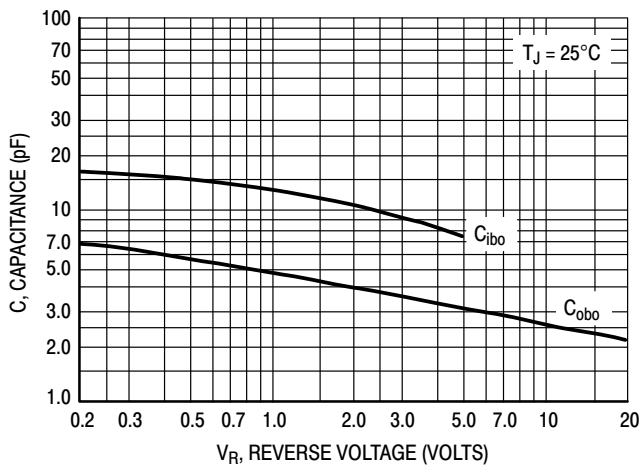


Figure 13. Capacitances

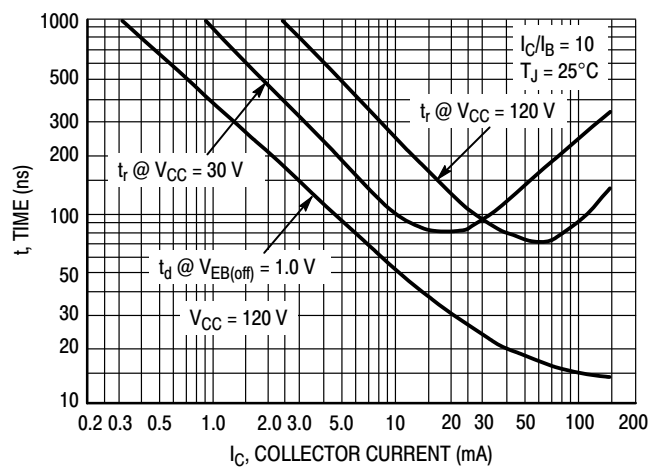
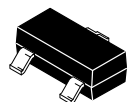


Figure 14. Turn-On Time

# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



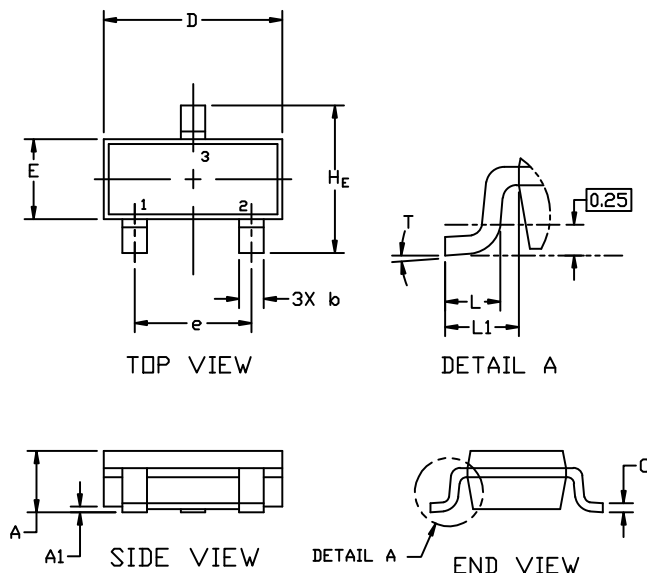
SCALE 4:1

## SOT-23 (TO-236)

CASE 318

ISSUE AT

DATE 01 MAR 2023

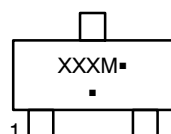


### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M,1994.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

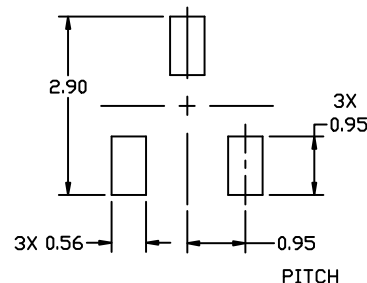
DIM	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.89	1.00	1.11	0.035	0.039	0.044
A1	0.01	0.06	0.10	0.000	0.002	0.004
b	0.37	0.44	0.50	0.015	0.017	0.020
c	0.08	0.14	0.20	0.003	0.006	0.008
D	2.80	2.90	3.04	0.110	0.114	0.120
E	1.20	1.30	1.40	0.047	0.051	0.055
e	1.78	1.90	2.04	0.070	0.075	0.080
L	0.30	0.43	0.55	0.012	0.017	0.022
L1	0.35	0.54	0.69	0.014	0.021	0.027
H <sub>E</sub>	2.10	2.40	2.64	0.083	0.094	0.104
T	0°	---	10°	0°	---	10°

### GENERIC MARKING DIAGRAM\*



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

\*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.



### RECOMMENDED MOUNTING 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.

## STYLES ON PAGE 2

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# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS



### SOT-23 (TO-236) CASE 318 ISSUE AT

DATE 01 MAR 2023

STYLE 1 THRU 5: CANCELLED	STYLE 6: PIN 1. BASE 2. EMITTER 3. COLLECTOR	STYLE 7: PIN 1. EMITTER 2. BASE 3. COLLECTOR	STYLE 8: PIN 1. ANODE 2. NO CONNECTION 3. CATHODE		
STYLE 9: PIN 1. ANODE 2. ANODE 3. CATHODE	STYLE 10: PIN 1. DRAIN 2. SOURCE 3. GATE	STYLE 11: PIN 1. ANODE 2. CATHODE 3. CATHODE-ANODE	STYLE 12: PIN 1. CATHODE 2. CATHODE 3. ANODE	STYLE 13: PIN 1. SOURCE 2. DRAIN 3. GATE	STYLE 14: PIN 1. CATHODE 2. GATE 3. ANODE
STYLE 15: PIN 1. GATE 2. CATHODE 3. ANODE	STYLE 16: PIN 1. ANODE 2. CATHODE 3. CATHODE	STYLE 17: PIN 1. NO CONNECTION 2. ANODE 3. CATHODE	STYLE 18: PIN 1. NO CONNECTION 2. CATHODE 3. ANODE	STYLE 19: PIN 1. CATHODE 2. ANODE 3. CATHODE-ANODE	STYLE 20: PIN 1. CATHODE 2. ANODE 3. GATE
STYLE 21: PIN 1. GATE 2. SOURCE 3. DRAIN	STYLE 22: PIN 1. RETURN 2. OUTPUT 3. INPUT	STYLE 23: PIN 1. ANODE 2. ANODE 3. CATHODE	STYLE 24: PIN 1. GATE 2. DRAIN 3. SOURCE	STYLE 25: PIN 1. ANODE 2. CATHODE 3. GATE	STYLE 26: PIN 1. CATHODE 2. ANODE 3. NO CONNECTION
STYLE 27: PIN 1. CATHODE 2. CATHODE 3. CATHODE	STYLE 28: PIN 1. ANODE 2. ANODE 3. ANODE				

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