Dual NPN Bias Resistor Transistors
R1 = 2.2 kΩ, R2 = 2.2 kΩ

NPN Transistors with Monolithic Bias Resistor Network

MUN5231DW1, NSBC123EDXV6



SOT−363
CASE 419B



SOT−563
CASE 463A

This series of digital transistors is designed to replace a single device and its external resistor bias network. The Bias Resistor Transistor (BRT) contains a single transistor with a monolithic bias network consisting of two resistors; a series base resistor and a base-emitter resistor. The BRT eliminates these individual components by integrating them into a single device. The use of a BRT can reduce both system cost and board space.

Features

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- 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

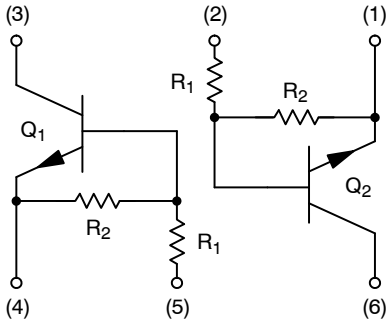
MAXIMUM RATINGS

(T_A = 25°C, common for Q_1 and Q_2, unless otherwise noted)

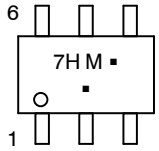
Symbol	Rating	Max	Unit
V_{CBO}	Collector-Base Voltage	50	Vdc
V_{CEO}	Collector-Emitter Voltage	50	Vdc
I_C	Collector Current − Continuous	100	mAdc
$V_{IN(fwd)}$	Input Forward Voltage	12	Vdc
$V_{IN(rev)}$	Input Reverse Voltage	10	Vdc

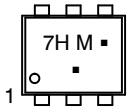
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

PIN CONNECTIONS



MARKING DIAGRAMS





7H = Specific 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

See detailed ordering, marking and shipping information in the package dimensions section on page 5 of this data sheet.

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THERMAL CHARACTERISTICS

Symbol	Characteristic	Max	Unit
MUN5231DW1 (SOT−363) ONE JUNCTION HEATED			
P_D	Total Device Dissipation T_A = 25°C (Note 1) (Note 2) Derate above 25°C (Note 1) (Note 2)	 187 256 1.5 2.0	 mW mW/°C
$R_{\theta JA}$	Thermal Resistance, (Note 1) Junction to Ambient (Note 2)	670 490	°C/W
MUN5231DW1 (SOT−363) BOTH JUNCTION HEATED (Note 3)			
P_D	Total Device Dissipation T_A = 25°C (Note 1) (Note 2) Derate above 25°C (Note 1) (Note 2)	 250 385 2.0 3.0	 mW mW/°C
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1) (Note 2)	 493 325	°C/W
$R_{\theta JL}$	Thermal Resistance, Junction to Lead (Note 1) (Note 2)	 188 208	°C/W
T_J, T_{stg}	Junction and Storage Temperature Range	−55 to +150	°C
NSBC123EDXV6 (SOT−563) ONE JUNCTION HEATED			
P_D	Total Device Dissipation T_A = 25°C (Note 1) Derate above 25°C (Note 1)	 357 2.9	 mW mW/°C
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1)	 350	°C/W
NSBC123EDXV6 (SOT−563) BOTH JUNCTION HEATED (Note 3)			
P_D	Total Device Dissipation T_A = 25°C (Note 1) Derate above 25°C (Note 1)	 500 4.0	 mW mW/°C
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1)	 250	°C/W
T_J, T_{stg}	Junction and Storage Temperature Range	−55 to +150	°C

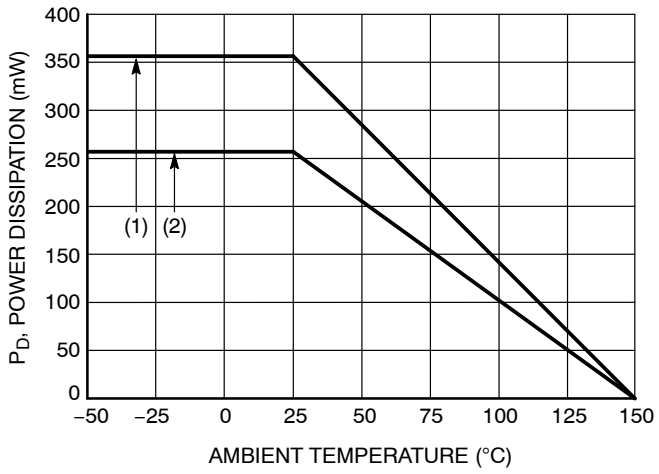
1. FR−4 @ Minimum Pad.
2. FR−4 @ 1.0 × 1.0 Inch Pad.
3. Both junction heated values assume total power is sum of two equally powered channels.

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ELECTRICAL CHARACTERISTICS (T_A = 25°C, common for Q_1 and Q_2, unless otherwise noted)

Symbol	Characteristic	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
I_{CBO}	Collector-Base Cutoff Current (V_{CB} = 50 V, I_E = 0)	–	–	100	nAdc
I_{CEO}	Collector-Emitter Cutoff Current (V_{CE} = 50 V, I_B = 0)	–	–	500	nAdc
I_{EBO}	Emitter-Base Cutoff Current (V_{EB} = 6.0 V, I_C = 0)	–	–	2.3	mAdc
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage (I_C = 10 μA, I_E = 0)	50	–	–	Vdc
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage (Note 4) (I_C = 2.0 mA, I_B = 0)	50	–	–	Vdc
ON CHARACTERISTICS					
h_{FE}	DC Current Gain (Note 4) (I_C = 5.0 mA, V_{CE} = 10 V)	8.0	15	–	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage (Note 4) (I_C = 10 mA, I_B = 5.0 mA)	–	–	0.25	V
$V_{i(off)}$	Input Voltage (Off) (V_{CE} = 5.0 V, I_C = 1.0 mA)	–	1.3	–	Vdc
$V_{i(on)}$	Input Voltage (On) (V_{CE} = 0.2 V, I_C = 20 mA)	–	1.8	–	Vdc
V_{OL}	Output Voltage (On) (V_{CC} = 5.0 V, V_B = 2.5 V, R_L = 1.0 kΩ)	–	–	0.2	Vdc
V_{OH}	Output Voltage (Off) (V_{CC} = 5.0 V, V_B = 0.25 V, R_L = 1.0 kΩ)	4.9	–	–	Vdc
R1	Input Resistor	1.5	2.2	2.9	kΩ
R_1/R_2	Resistor Ratio	0.8	1.0	1.2	

4. Pulsed Condition: Pulse Width = 300 ms, Duty Cycle ≤ 2%.



(1) SOT−363; 1.0 × 1.0 Inch Pad
(2) SOT−563; Minimum Pad

Figure 1. Derating Curve

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TYPICAL CHARACTERISTICS
MUN5231DW1, NSBC123EDXV6

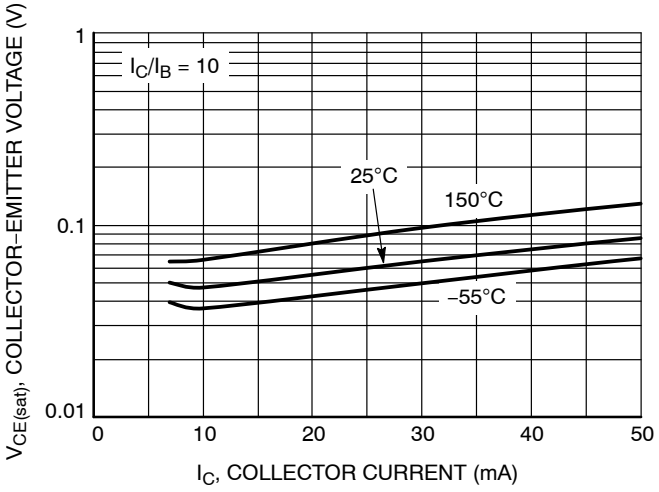


Figure 2. $V_{CE(sat)}$ vs. I_C

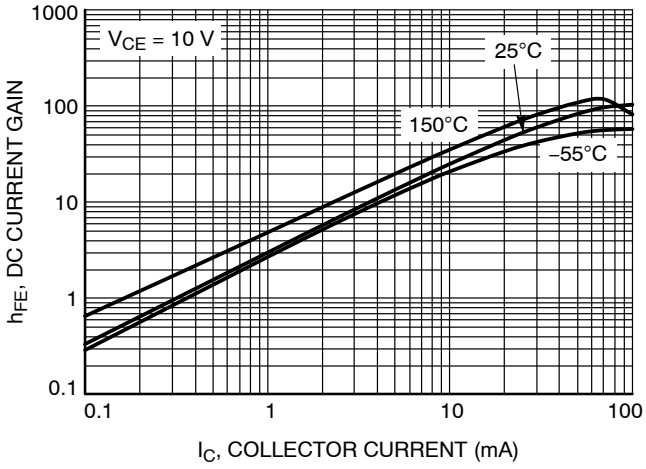


Figure 3. DC Current Gain

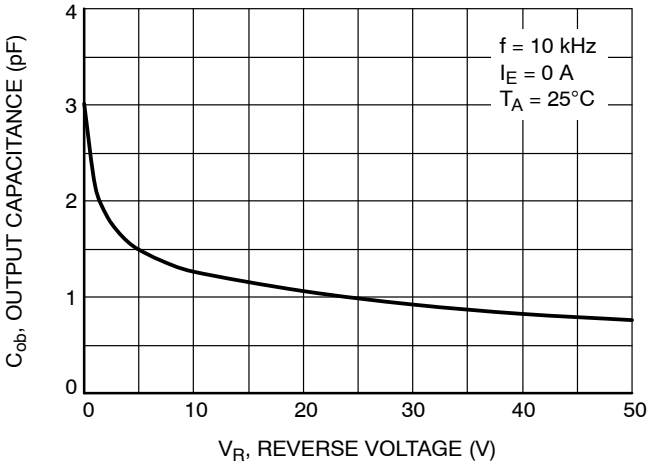


Figure 4. Output Capacitance

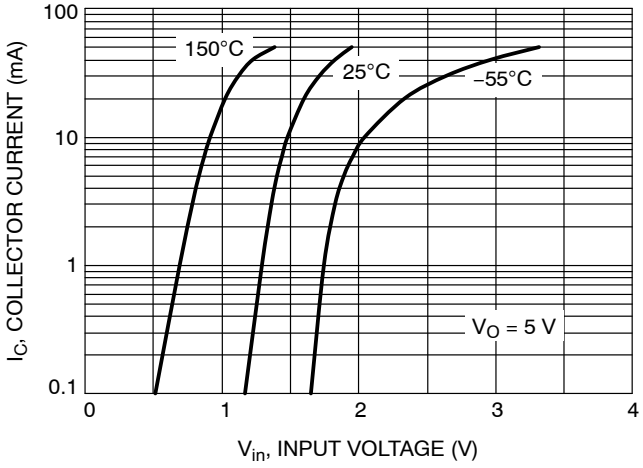


Figure 5. Output Current vs. Input Voltage

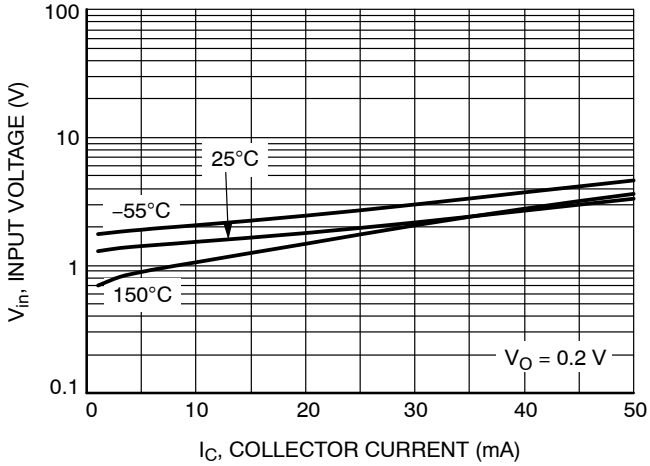


Figure 6. Input Voltage vs. Output Current

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ORDERING INFORMATION

Device	Package	Shipping†
MUN5231DW1T1G	SOT−363	3,000/Tape & Reel
SMUN5231DW1T1G	SOT−363	3,000/Tape & Reel
NSBC123EDXV6T1G	SOT−563	4,000/Tape & Reel

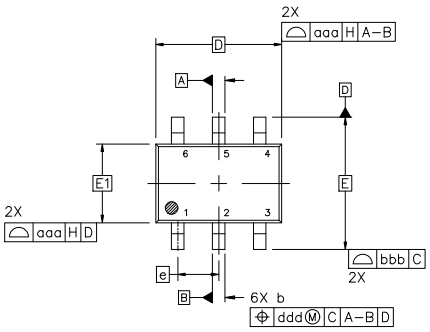
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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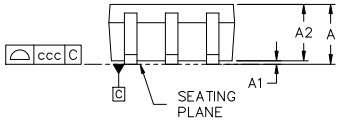


SC−88 2.00x1.25x0.90, 0.65P
CASE 419B−02
ISSUE Z

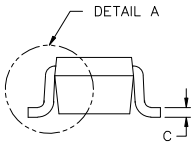
DATE 18 APR 2024



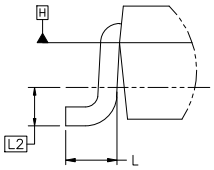
TOP VIEW



SIDE VIEW



END VIEW

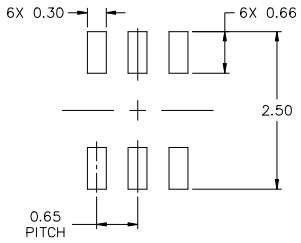


DETAIL A
SCALE 2:1

NOTES:

1. DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5−2018.
2. ALL DIMENSION ARE IN MILLIMETERS.
3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.20 PER END.
4. DIMENSIONS D AND E1 AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY AND DATUM H.
5. DATUMS A AND B ARE DETERMINED AT DATUM H.
6. DIMENSIONS b AND c APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.08 AND 0.15 FROM THE TIP.
7. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 TOTAL IN EXCESS OF DIMENSION b AT MAXIMUM MATERIAL CONDITION. THE DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OF THE FOOT.

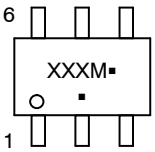
	MILLIMETERS		
DIM	MIN.	NOM.	MAX.
A	−−−	−−−	1.10
A1	0.00	−−−	0.10
A2	0.70	0.90	1.00
b	0.15	0.20	0.25
c	0.08	0.15	0.22
D	2.00 BSC		
E	2.10 BSC		
E1	1.25 BSC		
e	0.65 BSC		
L	0.26	0.36	0.46
L2	0.15 BSC		
aaa	0.15		
bbb	0.30		
ccc	0.10		
ddd	0.10		



RECOMMENDED MOUNTING FOOTPRINT*

* FOR ADDITIONAL INFORMATION ON OUR Pb−FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ONSEMI SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

GENERIC MARKING DIAGRAM*



XXX = Specific Device Code
M = Date Code*
▪ = Pb−Free Package

(Note: Microdot may be in either location)

*Date Code orientation and/or position may vary depending upon manufacturing 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.

STYLES ON PAGE 2

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SC−88 2.00x1.25x0.90, 0.65P
CASE 419B−02
ISSUE Z

DATE 18 APR 2024

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

STYLE 2:
CANCELLED

STYLE 3:
CANCELLED

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

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

STYLE 6:
PIN 1. ANODE 2
2. N/C
3. CATHODE 1
4. ANODE 1
5. N/C
6. CATHODE 2

STYLE 7:
PIN 1. SOURCE 2
2. DRAIN 2
3. GATE 1
4. SOURCE 1
5. DRAIN 1
6. GATE 2

STYLE 8:
CANCELLED

STYLE 9:
PIN 1. EMITTER 2
2. EMITTER 1
3. COLLECTOR 1
4. BASE 1
5. BASE 2
6. COLLECTOR 2

STYLE 10:
PIN 1. SOURCE 2
2. SOURCE 1
3. GATE 1
4. DRAIN 1
5. DRAIN 2
6. GATE 2

STYLE 11:
PIN 1. CATHODE 2
2. CATHODE 2
3. ANODE 1
4. CATHODE 1
5. CATHODE 1
6. ANODE 2

STYLE 12:
PIN 1. ANODE 2
2. ANODE 2
3. CATHODE 1
4. ANODE 1
5. ANODE 1
6. CATHODE 2

STYLE 13:
PIN 1. ANODE
2. N/C
3. COLLECTOR
4. EMITTER
5. BASE
6. CATHODE

STYLE 14:
PIN 1. VREF
2. GND
3. GND
4. IOUT
5. VEN
6. VCC

STYLE 15:
PIN 1. ANODE 1
2. ANODE 2
3. ANODE 3
4. CATHODE 3
5. CATHODE 2
6. CATHODE 1

STYLE 16:
PIN 1. BASE 1
2. EMITTER 2
3. COLLECTOR 2
4. BASE 2
5. EMITTER 1
6. COLLECTOR 1

STYLE 17:
PIN 1. BASE 1
2. EMITTER 1
3. COLLECTOR 2
4. BASE 2
5. EMITTER 2
6. COLLECTOR 1

STYLE 18:
PIN 1. VIN1
2. VCC
3. VOUT2
4. VIN2
5. GND
6. VOUT1

STYLE 19:
PIN 1. I OUT
2. GND
3. GND
4. V CC
5. V EN
6. V REF

STYLE 20:
PIN 1. COLLECTOR
2. COLLECTOR
3. BASE
4. EMITTER
5. COLLECTOR
6. COLLECTOR

STYLE 21:
PIN 1. ANODE 1
2. N/C
3. ANODE 2
4. CATHODE 2
5. N/C
6. CATHODE 1

STYLE 22:
PIN 1. D1 (i)
2. GND
3. D2 (i)
4. D2 (c)
5. VBUS
6. D1 (c)

STYLE 23:
PIN 1. Vn
2. CH1
3. Vp
4. N/C
5. CH2
6. N/C

STYLE 24:
PIN 1. CATHODE
2. ANODE
3. CATHODE
4. CATHODE
5. CATHODE
6. CATHODE

STYLE 25:
PIN 1. BASE 1
2. CATHODE
3. COLLECTOR 2
4. BASE 2
5. EMITTER
6. COLLECTOR 1

STYLE 26:
PIN 1. SOURCE 1
2. GATE 1
3. DRAIN 2
4. SOURCE 2
5. GATE 2
6. DRAIN 1

STYLE 27:
PIN 1. BASE 2
2. BASE 1
3. COLLECTOR 1
4. EMITTER 1
5. EMITTER 2
6. COLLECTOR 2

STYLE 28:
PIN 1. DRAIN
2. DRAIN
3. GATE
4. SOURCE
5. DRAIN
6. DRAIN

STYLE 29:
PIN 1. ANODE
2. ANODE
3. COLLECTOR
4. EMITTER
5. BASE/ANODE
6. CATHODE

STYLE 30:
PIN 1. SOURCE 1
2. DRAIN 2
3. DRAIN 2
4. SOURCE 2
5. GATE 1
6. DRAIN 1

Note: Please refer to datasheet for style callout. If style type is not called out in the datasheet refer to the device datasheet pinout or pin assignment.

DOCUMENT NUMBER:	**98ASB42985B**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.	
DESCRIPTION:	**SC−88 2.00x1.25x0.90, 0.65P**		**PAGE 2 OF 2**

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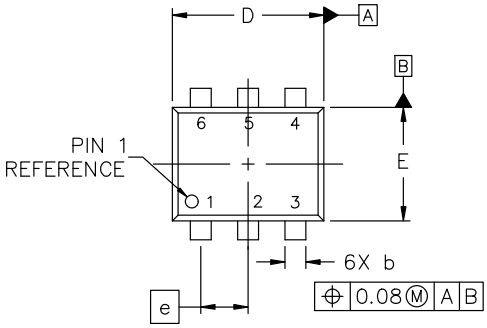
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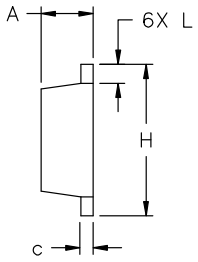
SOT−563−6 1.60x1.20x0.55, 0.50P
CASE 463A
ISSUE J

DATE 15 FEB 2024

NOTES:
1. DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5−2018.
2. ALL DIMENSION ARE IN MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.

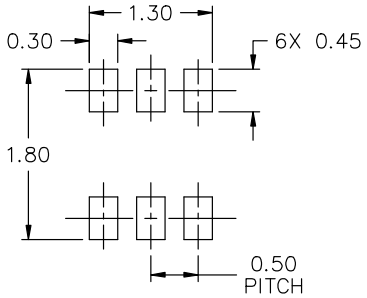


TOP VIEW



SIDE VIEW

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.50	0.55	0.60
b	0.17	0.22	0.27
c	0.08	0.13	0.18
D	1.50	1.60	1.70
E	1.10	1.20	1.30
e	0.50 BSC		
H	1.50	1.60	1.70
L	0.10	0.20	0.30



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.

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

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

STYLE 3:
PIN 1. CATHODE 1
2. CATHODE 1
3. ANODE/ANODE 2
4. CATHODE 2
5. CATHODE 2
6. ANODE/ANODE 1

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

STYLE 5:
PIN 1. CATHODE
2. CATHODE
3. ANODE
4. ANODE
5. CATHODE
6. CATHODE

STYLE 6:
PIN 1. CATHODE
2. ANODE
3. CATHODE
4. CATHODE
5. CATHODE
6. CATHODE

STYLE 7:
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3. CATHODE
4. CATHODE
5. ANODE
6. CATHODE

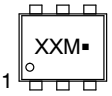
STYLE 8:
PIN 1. DRAIN
2. DRAIN
3. GATE
4. SOURCE
5. DRAIN
6. DRAIN

STYLE 9:
PIN 1. SOURCE 1
2. GATE 1
3. DRAIN 2
4. SOURCE 2
5. GATE 2
6. DRAIN 1

STYLE 10:
PIN 1. CATHODE 1
2. N/C
3. CATHODE 2
4. ANODE 2
5. N/C
6. ANODE 1

STYLE 11:
PIN 1. EMITTER 2
2. BASE 2
3. COLLECTOR 1
4. EMITTER 1
5. BASE 1
6. COLLECTOR 2

GENERIC MARKING DIAGRAM*



XX = Specific Device Code
M = Month 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.

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DESCRIPTION:	**SOT−563−6 1.60x1.20x0.55, 0.50P**		**PAGE 1 OF 1**

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