# Dual PNP Bias Resistor Transistors
# R1 = 2.2 kΩ, R2 = 2.2 kΩ

## PNP Transistors with Monolithic Bias Resistor Network

# MUN5131DW1, NSBA123EDXV6

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

- S and NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

### MAXIMUM RATINGS

($T_A$ = 25°C, common for Q1 and Q2, unless otherwise noted)

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

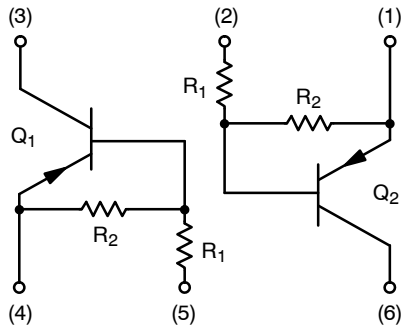
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

### ORDERING INFORMATION

| Device | Package | Shipping† |
|---|---|---|
| MUN5131DW1T1G, SMUN5131DW1T1G | SOT−363 | 3,000 / Tape & Reel |
| NSBA123EDXV6T1G | SOT−563 | 4,000 / Tape & Reel |

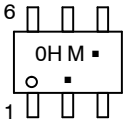
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

### PIN CONNECTIONS



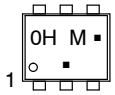

### MARKING DIAGRAMS






SOT−363
CASE 419B






SOT−563
CASE 463A

0H = Specific Device Code
M = Date Code*
▪ = Pb−Free Package

(Note: Microdot may be in either location)

*Date Code orientation may vary depending up-on manufacturing location.

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## THERMAL CHARACTERISTICS

| Characteristic | | Symbol | Max | Unit |
|---|---|---|---|---|
| **MUN5131DW1 (SOT−363) One Junction Heated** | | | | |
| Total Device Dissipation<br>$T_A$ = 25°C<br><br>Derate above 25°C | <br>(Note 1)<br>(Note 2)<br>(Note 1)<br>(Note 2) | $P_D$ | <br>187<br>256<br>1.5<br>2.0 | <br>mW<br><br>mW/°C |
| Thermal Resistance,<br>Junction to Ambient | (Note 1)<br>(Note 2) | $R_{\theta JA}$ | 670<br>490 | °C/W |
| **MUN5131DW1 (SOT−363) Both Junction Heated** (Note 3) | | | | |
| Total Device Dissipation<br>$T_A$ = 25°C<br><br>Derate above 25°C | <br>(Note 1)<br>(Note 2)<br>(Note 1)<br>(Note 2) | $P_D$ | <br>250<br>385<br>2.0<br>3.0 | <br>mW<br><br>mW/°C |
| Thermal Resistance,<br>Junction to Ambient | (Note 1)<br>(Note 2) | $R_{\theta JA}$ | 493<br>325 | °C/W |
| Thermal Resistance,<br>Junction to Lead | (Note 1)<br>(Note 2) | $R_{\theta JL}$ | 188<br>208 | °C/W |
| Junction and Storage Temperature Range | | $T_J$, $T_{stg}$ | −55 to +150 | °C |
| **NSBA123EDXV6 (SOT−563) One Junction Heated** | | | | |
| Total Device Dissipation<br>$T_A$ = 25°C<br>Derate above 25°C | <br>(Note 1)<br>(Note 1) | $P_D$ | <br>357<br>2.9 | <br>mW<br>mW/°C |
| Thermal Resistance,<br>Junction to Ambient | <br>(Note 1) | $R_{\theta JA}$ | <br>350 | °C/W |
| **NSBA123EDXV6 (SOT−563) Both Junction Heated** (Note 3) | | | | |
| Total Device Dissipation<br>$T_A$ = 25°C<br>Derate above 25°C | <br>(Note 1)<br>(Note 1) | $P_D$ | <br>500<br>4.0 | <br>mW<br>mW/°C |
| Thermal Resistance,<br>Junction to Ambient | <br>(Note 1) | $R_{\theta JA}$ | <br>250 | °C/W |
| Junction and Storage Temperature Range | | $T_J$, $T_{stg}$ | −55 to +150 | °C |

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

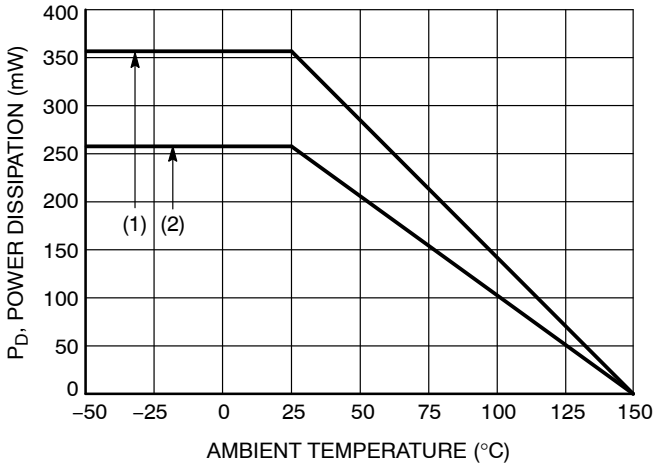


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**ELECTRICAL CHARACTERISTICS** ($T_A$ = 25°C, common for $Q_1$ and $Q_2$, unless otherwise noted)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | |
| Collector−Base Cutoff Current ($V_{CB}$ = 50 V, $I_E$ = 0) | $I_{CBO}$ | – | – | 100 | nAdc |
| Collector−Emitter Cutoff Current ($V_{CE}$ = 50 V, $I_B$ = 0) | $I_{CEO}$ | – | – | 500 | nAdc |
| Emitter−Base Cutoff Current ($V_{EB}$ = 6.0 V, $I_C$ = 0) | $I_{EBO}$ | – | – | 2.3 | mAdc |
| Collector−Base Breakdown Voltage ($I_C$ = 10 μA, $I_E$ = 0) | $V_{(BR)CBO}$ | 50 | – | – | Vdc |
| Collector−Emitter Breakdown Voltage (Note 4) ($I_C$ = 2.0 mA, $I_B$ = 0) | $V_{(BR)CEO}$ | 50 | – | – | Vdc |
| **ON CHARACTERISTICS** | | | | | |
| DC Current Gain (Note 4) ($I_C$ = 5.0 mA, $V_{CE}$ = 10 V) | $h_{FE}$ | 8.0 | 15 | – | |
| Collector−Emitter Saturation Voltage (Note 4) ($I_C$ = 10 mA, $I_B$ = 5.0 mA) | $V_{CE(sat)}$ | – | – | 0.25 | Vdc |
| Input Voltage (off) ($V_{CE}$ = 5.0 V, $I_C$ = 1.0 mA) | $V_{i(off)}$ | – | 1.2 | – | Vdc |
| Input Voltage (on) ($V_{CE}$ = 0.2 V, $I_C$ = 20 mA) | $V_{i(on)}$ | – | 1.9 | – | Vdc |
| Output Voltage (on) ($V_{CC}$ = 5.0 V, $V_B$ = 2.5 V, $R_L$ = 1.0 kΩ) | $V_{OL}$ | – | – | 0.2 | Vdc |
| Output Voltage (off) ($V_{CC}$ = 5.0 V, $V_B$ = 0.25 V, $R_L$ = 1.0 kΩ) | $V_{OH}$ | 4.9 | – | – | Vdc |
| Input Resistor | R1 | 1.5 | 2.2 | 2.9 | kΩ |
| Resistor Ratio | $R_1/R_2$ | 0.8 | 1.0 | 1.2 | |

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




(1) SOT−363; 1.0 x 1.0 inch Pad
(2) SOT−563; Minimum Pad

**Figure 1. Derating Curve**



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## TYPICAL CHARACTERISTICS
## MUN5131DW1, NSBA123EDXV6

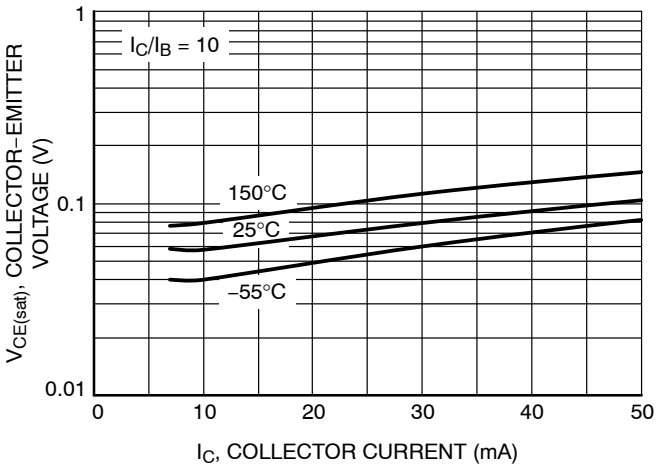



**Figure 2. $V_{CE(sat)}$ vs. $I_C$**

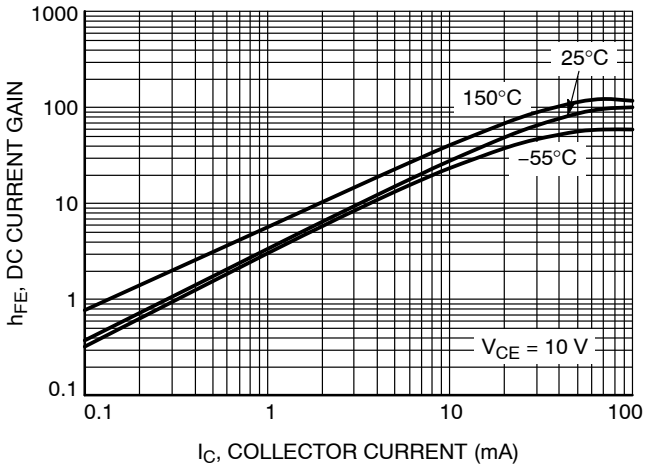



**Figure 3. DC Current Gain**

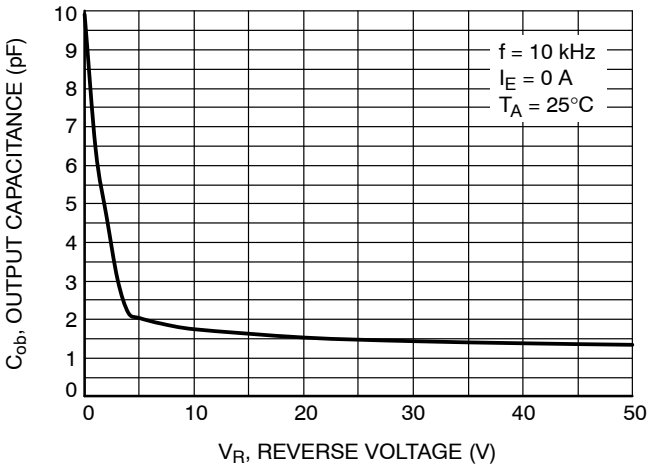



**Figure 4. Output Capacitance**

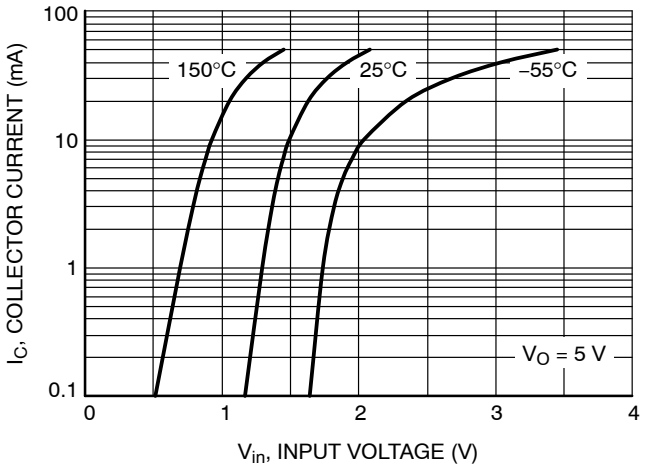



**Figure 5. Output Current vs. Input Voltage**

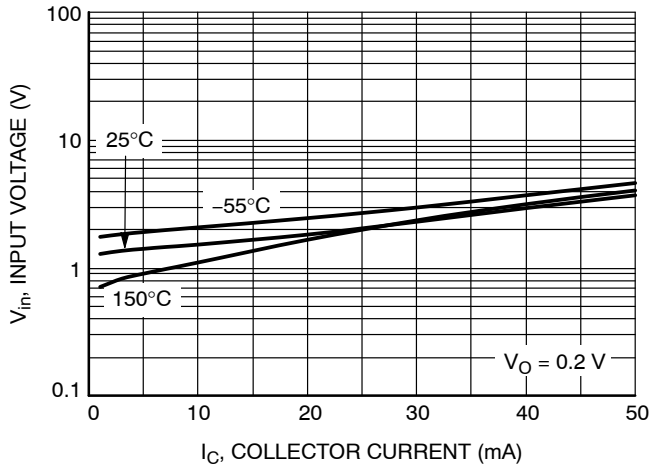



**Figure 6. Input Voltage vs. Output Current**

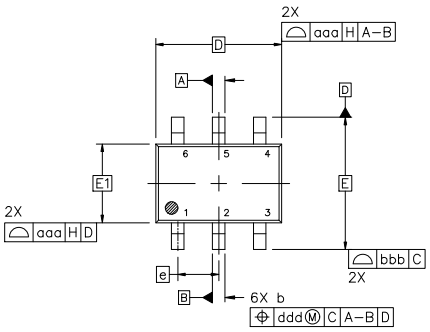


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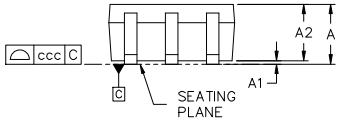


**SC−88 2.00x1.25x0.90, 0.65P**
CASE 419B−02
ISSUE Z

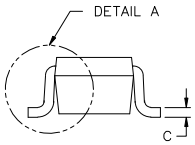
DATE 18 APR 2024



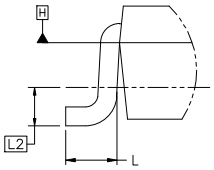

TOP VIEW




SIDE VIEW




END VIEW

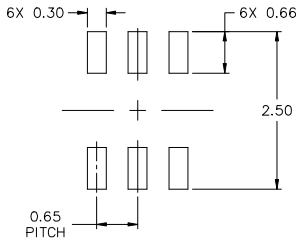



DETAIL A
SCALE 2:1

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.

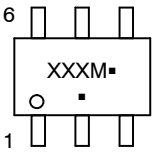
| | MILLIMETERS | | |
|---|---|---|---|
| DIM | MIN. | NOM. | MAX. |
| A | −−− | −−− | 1.10 |
| A1 | 0.00 | −−− | 0.10 |
| A2 | 0.70 | 0.90 | 1.00 |
| b | 0.15 | 0.20 | 0.25 |
| c | 0.08 | 0.15 | 0.22 |
| D | 2.00 BSC | | |
| E | 2.10 BSC | | |
| E1 | 1.25 BSC | | |
| e | 0.65 BSC | | |
| L | 0.26 | 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

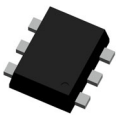
STYLE 30:
PIN 1. SOURCE 1
2. DRAIN 2
3. DRAIN 2
4. SOURCE 2
5. GATE 1
6. DRAIN 1

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.

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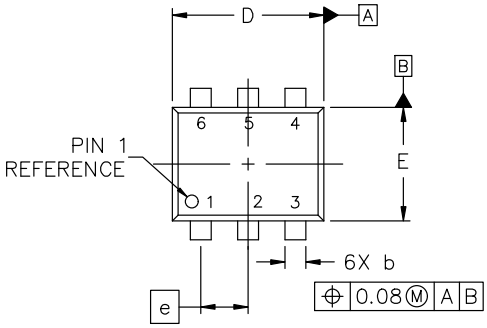
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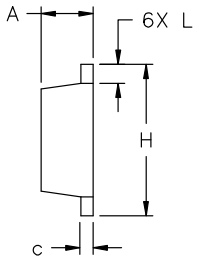
**SOT−563−6 1.60x1.20x0.55, 0.50P**
CASE 463A
ISSUE J

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.

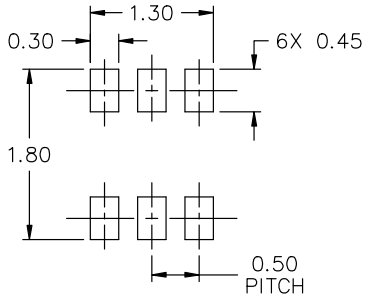


TOP VIEW



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*

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

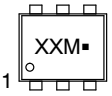
STYLE 8:
PIN 1. DRAIN
2. DRAIN
3. GATE
4. SOURCE
5. DRAIN
6. DRAIN

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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