

MUN5235DW1, NSBC123JDXV6, NSBC123JDP6

Dual NPN Bias Resistor Transistors R1 = 2.2 kΩ, R2 = 47 kΩ

NPN Transistors with Monolithic Bias Resistor Network

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 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)} | 5 | 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† |
|----------------------------------|---------|----------------------|
| MUN5235DW1T1G, SMUN5235DW1T1G | SOT-363 | 3,000 / Tape & Reel |
| SMUN5235DW1T3G | SOT-363 | 10,000 / Tape & Reel |
| NSBC123JDXV6T1G | SOT-563 | 4,000 / Tape & Reel |
| NSBC123JDXV6T5G | SOT-563 | 8,000 / Tape & Reel |
| NSBC123JDP6T5G | SOT-963 | 8,000 / Tape & Reel |

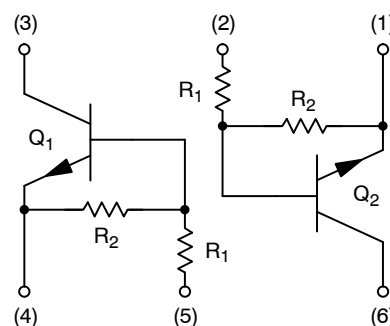
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.



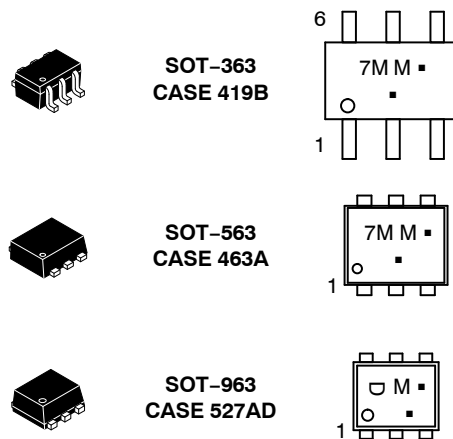
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PIN CONNECTIONS



MARKING DIAGRAMS



7M/D = 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.

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THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---|--|---------------------------------------|--------------------------------|
| MUN5235DW1 (SOT-363) ONE JUNCTION HEATED | | | |
| Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above 25°C | (Note 1) (Note 2) (Note 1) (Note 2) | P_D 187 256 1.5 2.0 | mW mW/ $^\circ\text{C}$ |
| Thermal Resistance, Junction to Ambient | (Note 1) (Note 2) | $R_{\theta JA}$ 670 490 | $^\circ\text{C/W}$ |
| MUN5235DW1 (SOT-363) BOTH JUNCTION HEATED (Note 3) | | | |
| Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above 25°C | (Note 1) (Note 2) (Note 1) (Note 2) | P_D 250 385 2.0 3.0 | mW mW/ $^\circ\text{C}$ |
| Thermal Resistance, Junction to Ambient | (Note 1) (Note 2) | $R_{\theta JA}$ 493 325 | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction to Lead | (Note 1) (Note 2) | $R_{\theta JL}$ 188 208 | $^\circ\text{C/W}$ |
| Junction and Storage Temperature Range | T_J, T_{stg} | -55 to +150 | $^\circ\text{C}$ |
| NSBC123JDXV6 (SOT-563) ONE JUNCTION HEATED | | | |
| Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above 25°C | (Note 1) (Note 1) | P_D 357 2.9 | mW mW/ $^\circ\text{C}$ |
| Thermal Resistance, Junction to Ambient | (Note 1) | $R_{\theta JA}$ 350 | $^\circ\text{C/W}$ |
| NSBC123JDXV6 (SOT-563) BOTH JUNCTION HEATED (Note 3) | | | |
| Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above 25°C | (Note 1) (Note 1) | P_D 500 4.0 | mW mW/ $^\circ\text{C}$ |
| Thermal Resistance, Junction to Ambient | (Note 1) | $R_{\theta JA}$ 250 | $^\circ\text{C/W}$ |
| Junction and Storage Temperature Range | T_J, T_{stg} | -55 to +150 | $^\circ\text{C}$ |
| NSBC123JDP6 (SOT-963) ONE JUNCTION HEATED | | | |
| Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above 25°C | (Note 4) (Note 5) (Note 4) (Note 5) | P_D 231 269 1.9 2.2 | MW mW/ $^\circ\text{C}$ |
| Thermal Resistance, Junction to Ambient | (Note 4) (Note 5) | $R_{\theta JA}$ 540 464 | $^\circ\text{C/W}$ |
| NSBC123JDP6 (SOT-963) BOTH JUNCTION HEATED (Note 3) | | | |
| Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above 25°C | (Note 4) (Note 5) (Note 4) (Note 5) | P_D 339 408 2.7 3.3 | MW mW/ $^\circ\text{C}$ |
| Thermal Resistance, Junction to Ambient | (Note 4) (Note 5) | $R_{\theta JA}$ 369 306 | $^\circ\text{C/W}$ |
| Junction and Storage Temperature Range | T_J, T_{stg} | -55 to +150 | $^\circ\text{C}$ |

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.
4. FR-4 @ 100 mm², 1 oz. copper traces, still air.
5. FR-4 @ 500 mm², 1 oz. copper traces, still air.

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ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, common for Q_1 and Q_2 , unless otherwise noted)

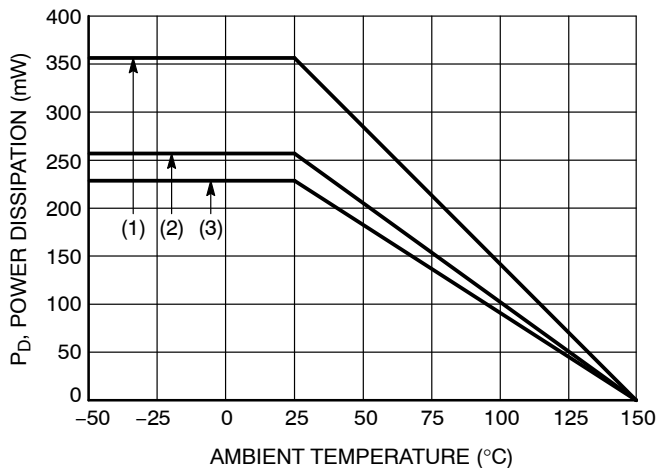
| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---------------|-----|-----|-----|------|
| OFF CHARACTERISTICS | | | | | |
| Collector-Base Cutoff Current ($V_{CB} = 50\text{ V}$, $I_E = 0$) | I_{CBO} | - | - | 100 | nAdc |
| Collector-Emitter Cutoff Current ($V_{CE} = 50\text{ V}$, $I_B = 0$) | I_{CEO} | - | - | 500 | nAdc |
| Emitter-Base Cutoff Current ($V_{EB} = 6.0\text{ V}$, $I_C = 0$) | I_{EBO} | - | - | 0.2 | mAdc |
| Collector-Base Breakdown Voltage ($I_C = 10\ \mu\text{A}$, $I_E = 0$) | $V_{(BR)CBO}$ | 50 | - | - | Vdc |
| Collector-Emitter Breakdown Voltage (Note 6) ($I_C = 2.0\text{ mA}$, $I_B = 0$) | $V_{(BR)CEO}$ | 50 | - | - | Vdc |

ON CHARACTERISTICS

| | | | | | |
|---|---------------|-------|-------|-------|------------|
| DC Current Gain (Note 6) ($I_C = 5.0\text{ mA}$, $V_{CE} = 10\text{ V}$) | h_{FE} | 80 | 140 | - | |
| Collector-Emitter Saturation Voltage (Note 6) ($I_C = 10\text{ mA}$, $I_B = 1.0\text{ mA}$) | $V_{CE(sat)}$ | - | - | 0.25 | V |
| Input Voltage (Off) ($V_{CE} = 5.0\text{ V}$, $I_C = 100\ \mu\text{A}$) | $V_{i(off)}$ | - | 0.6 | - | Vdc |
| Input Voltage (On) ($V_{CE} = 0.2\text{ V}$, $I_C = 5.0\text{ mA}$) | $V_{i(on)}$ | - | 0.8 | - | Vdc |
| Output Voltage (On) ($V_{CC} = 5.0\text{ V}$, $V_B = 2.5\text{ V}$, $R_L = 1.0\text{ k}\Omega$) | V_{OL} | - | - | 0.2 | Vdc |
| Output Voltage (Off) ($V_{CC} = 5.0\text{ V}$, $V_B = 0.5\text{ V}$, $R_L = 1.0\text{ k}\Omega$) | V_{OH} | 4.9 | - | - | Vdc |
| Input Resistor | R1 | 1.5 | 2.2 | 2.9 | k Ω |
| Resistor Ratio | R_1/R_2 | 0.038 | 0.047 | 0.056 | |

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.

6. Pulsed Condition: Pulse Width = 300 ms, Duty Cycle \leq 2%.



- (1) SOT-363; 1.0 × 1.0 Inch Pad
- (2) SOT-563; Minimum Pad
- (3) SOT-963; 100 mm², 1 oz. Copper Trace

Figure 1. Derating Curve

MUN5235DW1, NSBC123JDXV6, NSBC123JDP6

TYPICAL CHARACTERISTICS
MUN5235DW1, NSBC123JDXV6

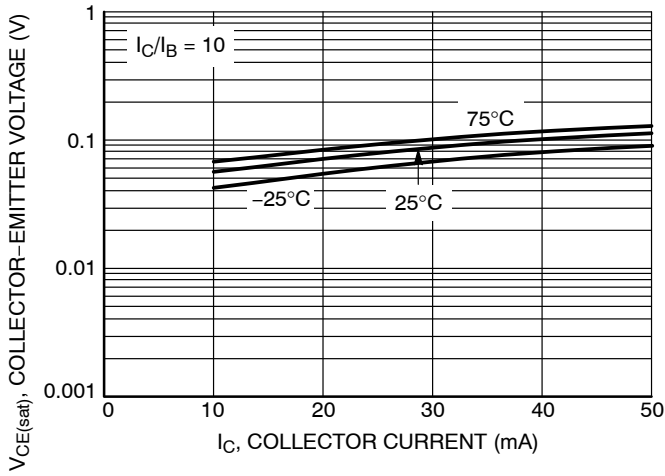


Figure 2. $V_{CE(sat)}$ vs. I_C

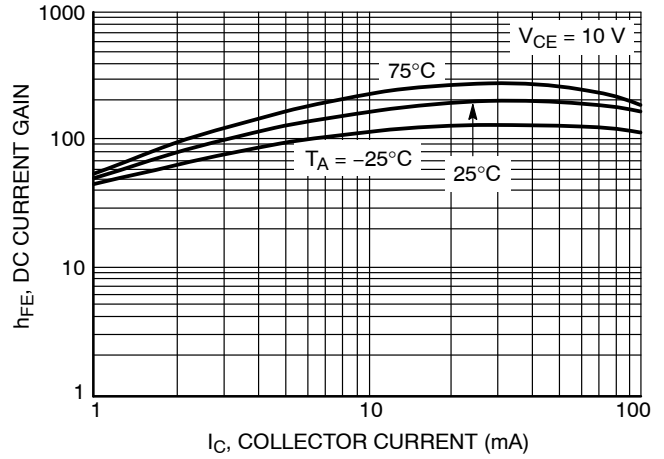


Figure 3. DC Current Gain

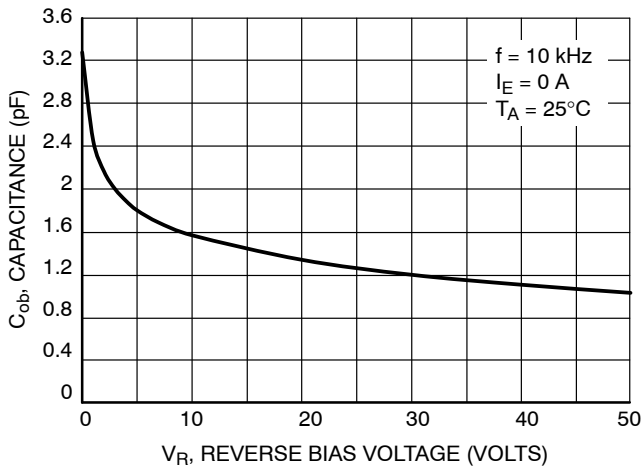


Figure 4. Output Capacitance

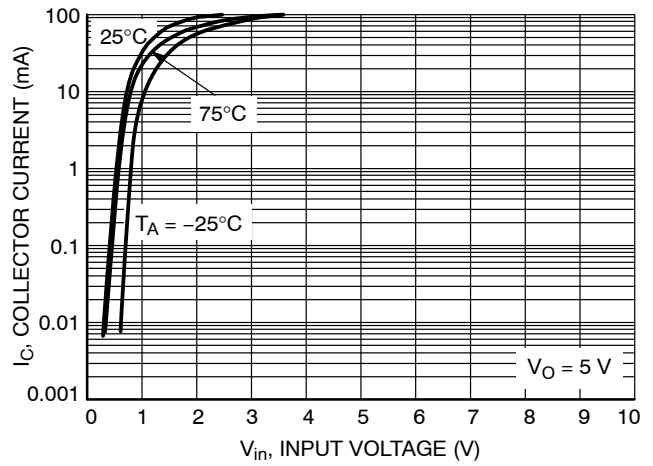


Figure 5. Output Current vs. Input Voltage

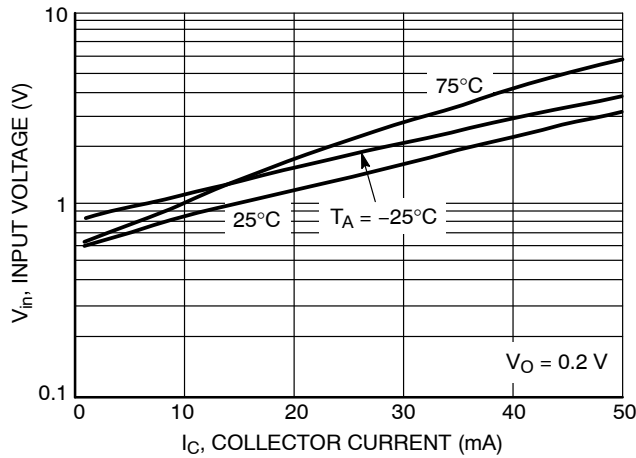


Figure 6. Input Voltage vs. Output Current

TYPICAL CHARACTERISTICS
NSBC123JDP6

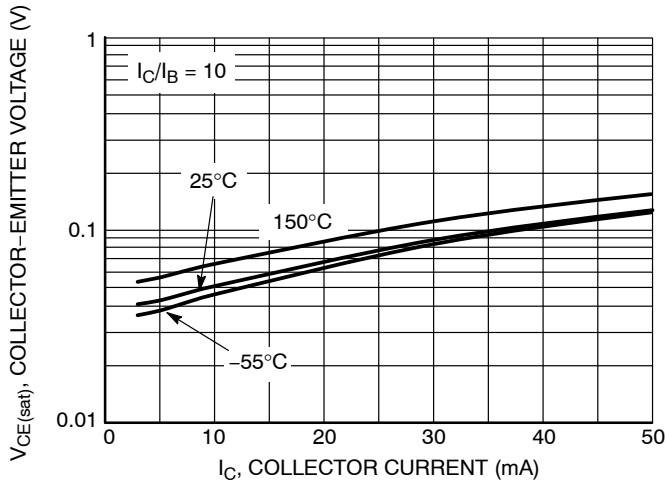


Figure 7. $V_{CE(sat)}$ vs. I_C

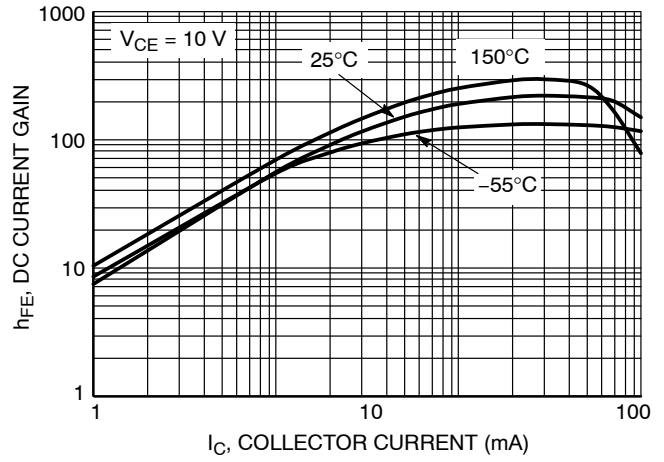


Figure 8. DC Current Gain

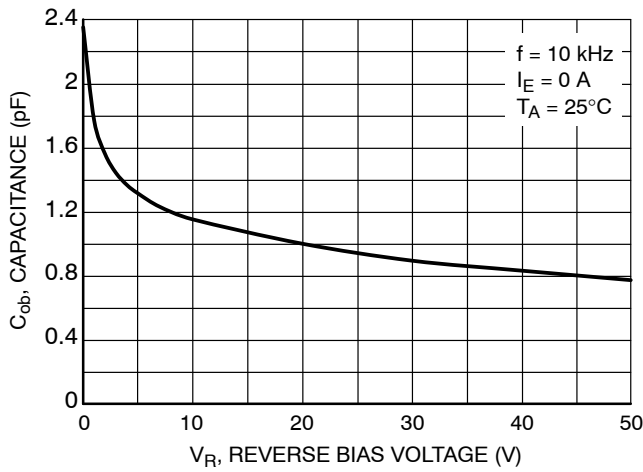


Figure 9. Output Capacitance

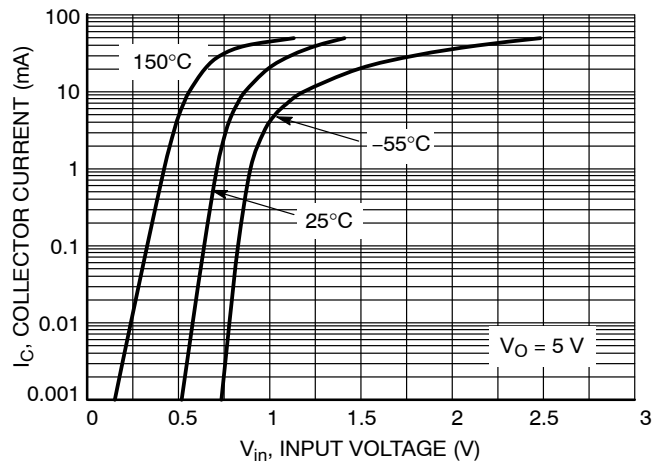


Figure 10. Output Current vs. Input Voltage

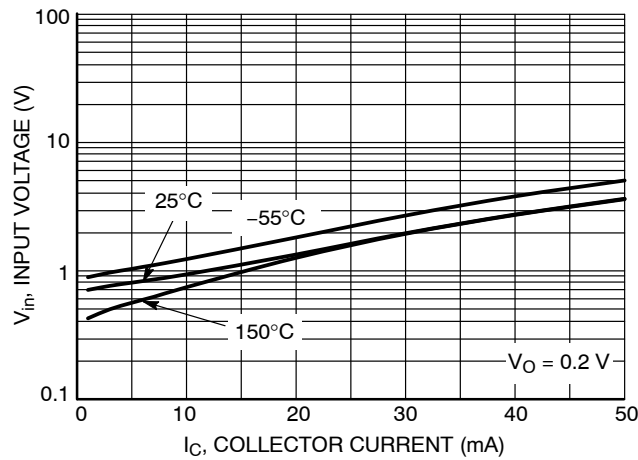
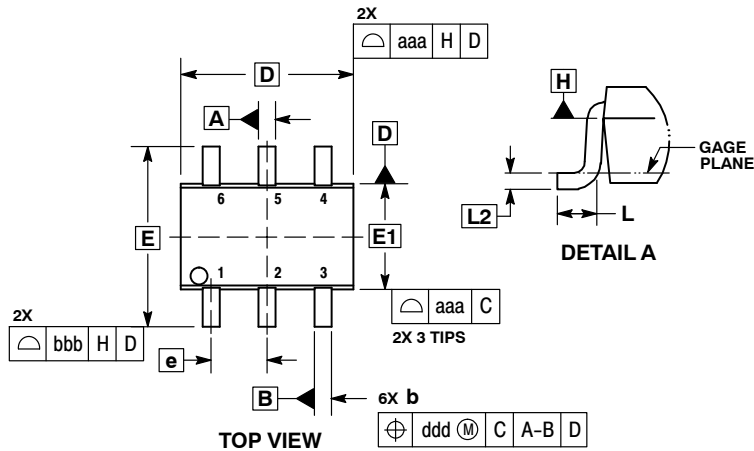


Figure 11. Input Voltage vs. Output Current

MUN5235DW1, NSBC123JDXV6, NSBC123JDP6

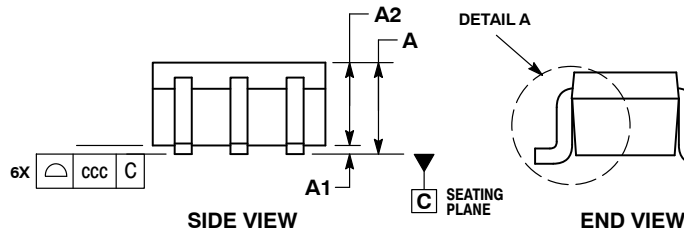
PACKAGE DIMENSIONS

SC-88/SC70-6/SOT-363
CASE 419B-02
ISSUE Y

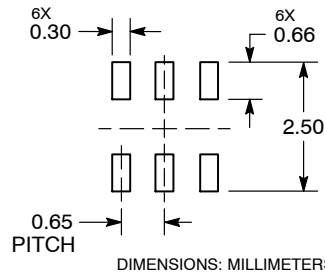


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
 2. CONTROLLING DIMENSION: MILLIMETERS.
 3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.20 PER END.
 4. DIMENSIONS D AND E1 AT THE OUTERMOST EXTREMES 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.

| DIM | MILLIMETERS | | | INCHES | | |
|-----|-------------|------|------|-----------|-------|-------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | --- | --- | 1.10 | --- | --- | 0.043 |
| A1 | 0.00 | --- | 0.10 | 0.000 | --- | 0.004 |
| A2 | 0.70 | 0.90 | 1.00 | 0.027 | 0.035 | 0.039 |
| b | 0.15 | 0.20 | 0.25 | 0.006 | 0.008 | 0.010 |
| C | 0.08 | 0.15 | 0.22 | 0.003 | 0.006 | 0.009 |
| D | 1.80 | 2.00 | 2.20 | 0.070 | 0.078 | 0.086 |
| E | 2.00 | 2.10 | 2.20 | 0.078 | 0.082 | 0.086 |
| E1 | 1.15 | 1.25 | 1.35 | 0.045 | 0.049 | 0.053 |
| e | 0.65 BSC | | | 0.026 BSC | | |
| L | 0.26 | 0.36 | 0.46 | 0.010 | 0.014 | 0.018 |
| L2 | 0.15 BSC | | | 0.006 BSC | | |
| aaa | 0.15 | | | 0.006 | | |
| bbb | 0.30 | | | 0.012 | | |
| ccc | 0.10 | | | 0.004 | | |
| ddd | 0.10 | | | 0.004 | | |



RECOMMENDED SOLDERING FOOTPRINT*

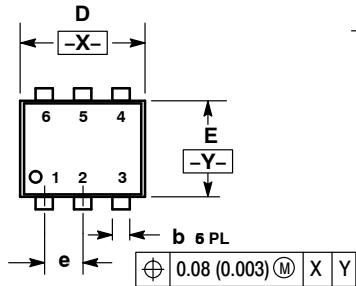


*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

MUN5235DW1, NSBC123JDXV6, NSBC123JDP6

PACKAGE DIMENSIONS

SOT-563, 6 LEAD
CASE 463A
ISSUE F

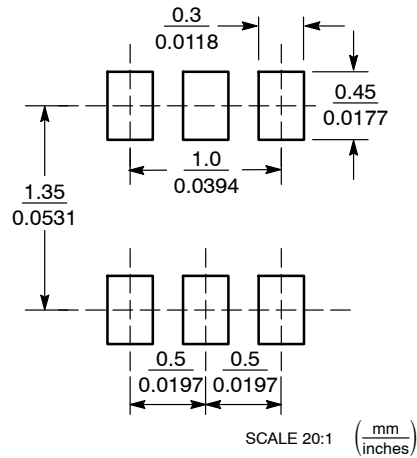


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.

| DIM | MILLIMETERS | | | INCHES | | |
|----------------|-------------|------|------|----------|-------|-------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 0.50 | 0.55 | 0.60 | 0.020 | 0.021 | 0.023 |
| b | 0.17 | 0.22 | 0.27 | 0.007 | 0.009 | 0.011 |
| C | 0.08 | 0.12 | 0.18 | 0.003 | 0.005 | 0.007 |
| D | 1.50 | 1.60 | 1.70 | 0.059 | 0.062 | 0.066 |
| E | 1.10 | 1.20 | 1.30 | 0.043 | 0.047 | 0.051 |
| e | 0.5 BSC | | | 0.02 BSC | | |
| L | 0.10 | 0.20 | 0.30 | 0.004 | 0.008 | 0.012 |
| H _E | 1.50 | 1.60 | 1.70 | 0.059 | 0.062 | 0.066 |

SOLDERING FOOTPRINT*

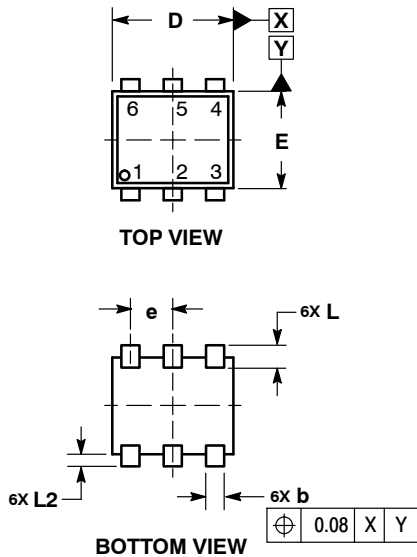


*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

MUN5235DW1, NSBC123JDXV6, NSBC123JDP6

PACKAGE DIMENSIONS

SOT-963 CASE 527AD ISSUE E

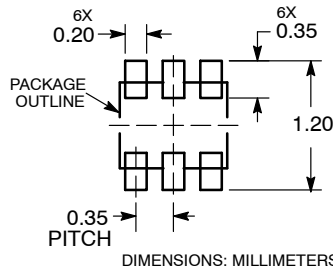


NOTES:

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

| DIM | MILLIMETERS | | |
|----------------|-------------|------|------|
| | MIN | NOM | MAX |
| A | 0.34 | 0.37 | 0.40 |
| b | 0.10 | 0.15 | 0.20 |
| C | 0.07 | 0.12 | 0.17 |
| D | 0.95 | 1.00 | 1.05 |
| E | 0.75 | 0.80 | 0.85 |
| e | 0.35 BSC | | |
| H _E | 0.95 | 1.00 | 1.05 |
| L | 0.19 REF | | |
| L2 | 0.05 | 0.10 | 0.15 |

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.

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