

# NSBC144WPDP6

## Complementary Bias Resistor Transistors R1 = 47 kΩ, R2 = 22 kΩ

### NPN and PNP 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
- This Device is Pb-Free, Halogen Free/BFR Free and is RoHS Compliant

#### MAXIMUM RATINGS

(T<sub>A</sub> = 25°C both polarities Q<sub>1</sub> (PNP) & Q<sub>2</sub> (NPN), unless otherwise noted)

| Rating                         | Symbol               | Max | Unit |
|--------------------------------|----------------------|-----|------|
| Collector-Base Voltage         | V <sub>CBO</sub>     | 50  | Vdc  |
| Collector-Emitter Voltage      | V <sub>CEO</sub>     | 50  | Vdc  |
| Collector Current – Continuous | I <sub>C</sub>       | 100 | mAdc |
| Input Forward Voltage          | V <sub>IN(fwd)</sub> | 40  | Vdc  |
| Input Reverse Voltage          | V <sub>IN(rev)</sub> | 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 <sup>†</sup> |
|-----------------|---------|-----------------------|
| NSBC144WPDP6T5G | SOT-963 | 8,000/Tape & Reel     |

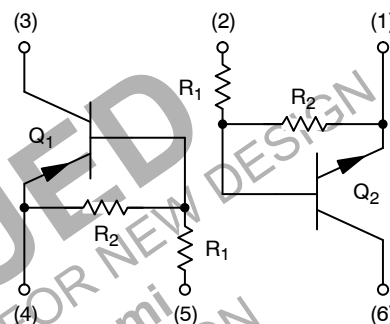
<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.



ON Semiconductor®

[www.onsemi.com](http://www.onsemi.com)

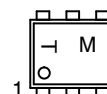
#### PIN CONNECTIONS



#### MARKING DIAGRAMS



SOT-963  
CASE 527AD



T = Specific Device Code  
M = Date Code\*

\*Date Code orientation may vary depending upon manufacturing location.

# NSBC144WPDP6

## THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|----------------|--------|-----|------|
|----------------|--------|-----|------|

### NSBC144WPDP6 (SOT-963) ONE JUNCTION HEATED

|  |                  |                          |                 |
|--|------------------|--------------------------|-----------------|
| Total Device Dissipation<br>T <sub>A</sub> = 25°C (Note 1)<br>(Note 2)<br>Derate above 25°C (Note 1)<br>(Note 2) | P <sub>D</sub>   | 231<br>269<br>1.9<br>2.2 | MW<br><br>mW/°C |
| Thermal Resistance,<br>Junction to Ambient (Note 1)<br>(Note 2)  | R <sub>θJA</sub> | 540<br>464               | °C/W            |

### NSBC144WPDP6 (SOT-963) BOTH JUNCTION HEATED (Note 3)

|  |                                   |                          |                 |
|--|-----------------------------------|--------------------------|-----------------|
| Total Device Dissipation<br>T <sub>A</sub> = 25°C (Note 1)<br>(Note 2)<br>Derate above 25°C (Note 1)<br>(Note 2) | P <sub>D</sub>                    | 339<br>408<br>2.7<br>3.3 | MW<br><br>mW/°C |
| Thermal Resistance,<br>Junction to Ambient (Note 1)<br>(Note 2)  | R <sub>θJA</sub>                  | 369<br>306               | °C/W            |
| Junction and Storage Temperature Range   | T <sub>J</sub> , T <sub>stg</sub> | -55 to +150              | °C              |

1. FR-4 @ 100 mm<sup>2</sup>, 1 oz. copper traces, still air.
2. FR-4 @ 500 mm<sup>2</sup>, 1 oz. copper traces, still air.
3. Both junction heated values assume total power is sum of two equally powered channels.

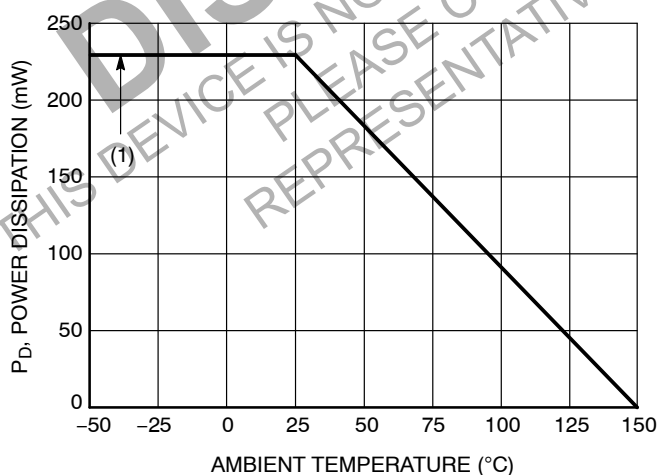
**DISCONTINUED**  
THIS DEVICE IS NOT RECOMMENDED FOR NEW DESIGN  
PLEASE CONTACT YOUR onsemi  
REPRESENTATIVE FOR INFORMATION

# NSBC144WPDP6

## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ both polarities $Q_1$ (PNP) & $Q_2$ (NPN), unless otherwise noted)

| Characteristic  | Symbol        | Min  | Typ        | Max  | Unit       |
|---|---------------|------|------------|------|------------|
| <b>OFF CHARACTERISTICS</b>  |               |      |            |      |            |
| Collector-Base Cutoff Current<br>( $V_{CB} = 50\text{ V}$ , $I_E = 0$ )   | $I_{CBO}$     | –    | –          | 100  | nAdc       |
| Collector-Emitter Cutoff Current<br>( $V_{CE} = 50\text{ V}$ , $I_B = 0$ )  | $I_{CEO}$     | –    | –          | 500  | nAdc       |
| Emitter-Base Cutoff Current<br>( $V_{EB} = 6.0\text{ V}$ , $I_C = 0$ )  | $I_{EBO}$     | –    | –          | 0.13 | mAdc       |
| Collector-Base Breakdown Voltage<br>( $I_C = 10\text{ }\mu\text{A}$ , $I_E = 0$ )   | $V_{(BR)CBO}$ | 50   | –          | –    | Vdc        |
| Collector-Emitter Breakdown Voltage (Note 4)<br>( $I_C = 2.0\text{ mA}$ , $I_B = 0$ )   | $V_{(BR)CEO}$ | 50   | –          | –    | Vdc        |
| <b>ON CHARACTERISTICS</b>   |               |      |            |      |            |
| DC Current Gain (Note 4)<br>( $I_C = 5.0\text{ mA}$ , $V_{CE} = 10\text{ V}$ )  | $h_{FE}$      | 80   | 140        | –    |            |
| Collector-Emitter Saturation Voltage (Note 4)<br>( $I_C = 10\text{ mA}$ , $I_B = 0.3\text{ mA}$ )   | $V_{CE(sat)}$ | –    | –          | 0.25 | V          |
| Input Voltage (Off)<br>( $V_{CE} = 5.0\text{ V}$ , $I_C = 100\text{ }\mu\text{A}$ ) (NPN)<br>( $V_{CE} = 5.0\text{ V}$ , $I_C = 100\text{ }\mu\text{A}$ ) (PNP) | $V_{i(off)}$  | –    | 1.7<br>1.7 | –    | Vdc        |
| Input Voltage (On)<br>( $V_{CE} = 0.2\text{ V}$ , $I_C = 3.0\text{ mA}$ ) (NPN)<br>( $V_{CE} = 0.2\text{ V}$ , $I_C = 3.0\text{ mA}$ ) (PNP)                    | $V_{i(on)}$   | –    | 2.6<br>2.7 | –    | Vdc        |
| Output Voltage (On)<br>( $V_{CC} = 5.0\text{ V}$ , $V_B = 4.0\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ )  | $V_{OL}$      | –    | –          | 0.2  | Vdc        |
| Output Voltage (Off)<br>( $V_{CC} = 5.0\text{ V}$ , $V_B = 0.5\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ )   | $V_{OH}$      | 4.9  | –          | –    | Vdc        |
| Input Resistor  | $R_1$         | 32.9 | 47         | 61.1 | k $\Omega$ |
| Resistor Ratio  | $R_1/R_2$     | 1.7  | 2.1        | 2.6  |            |

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



(1) SOT-963; 100 mm<sup>2</sup>, 1 oz. Copper Trace

Figure 1. Derating Curve

TYPICAL CHARACTERISTICS – NPN TRANSISTOR  
NSBC144WPDP6

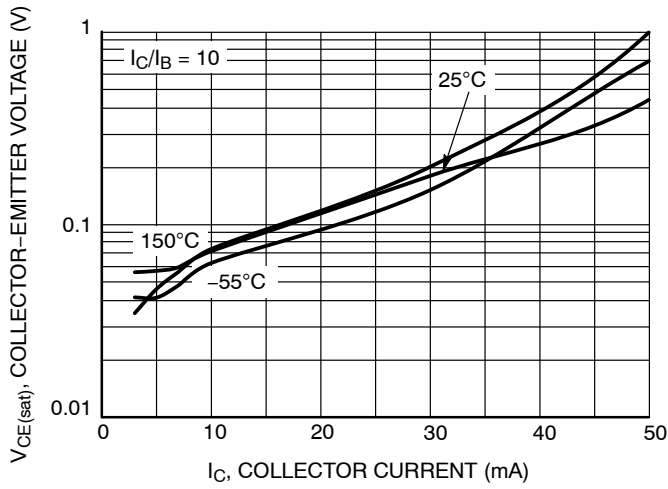


Figure 2.  $V_{CE(sat)}$  vs.  $I_C$

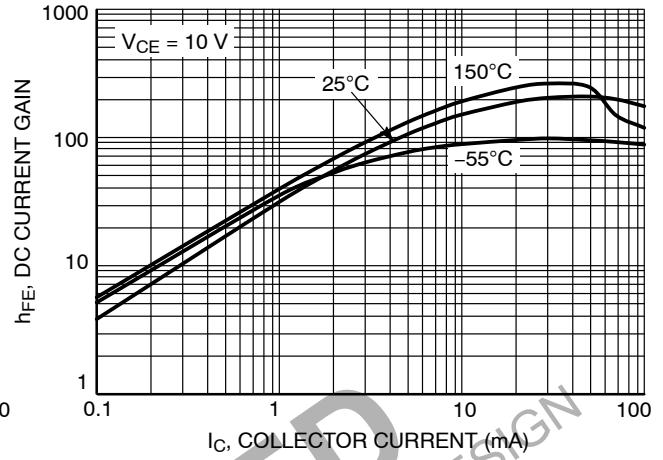


Figure 3. DC Current Gain

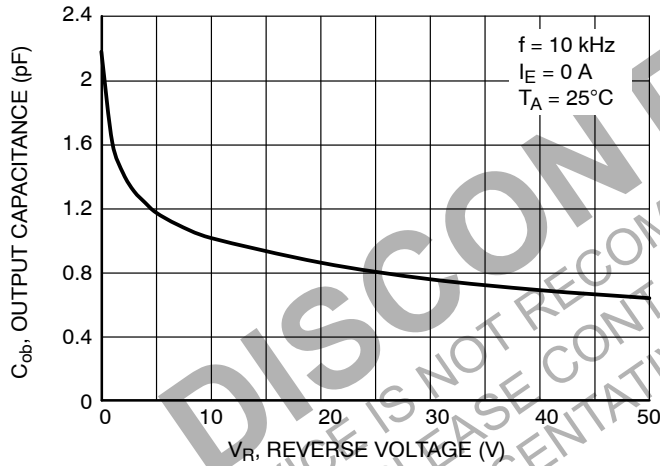


Figure 4. Output Capacitance

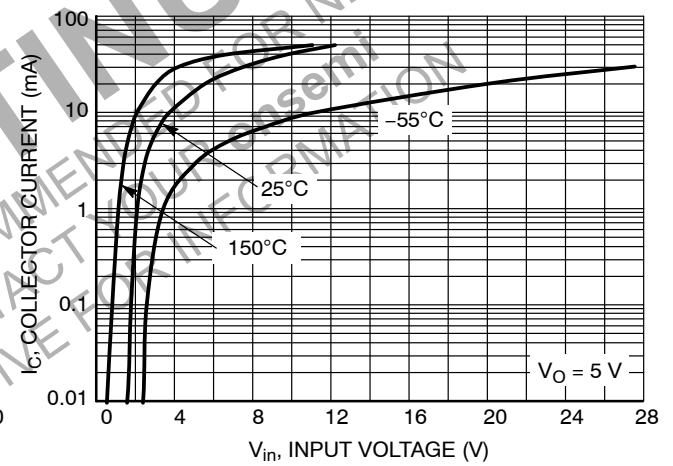


Figure 5. Output Current vs. Input Voltage

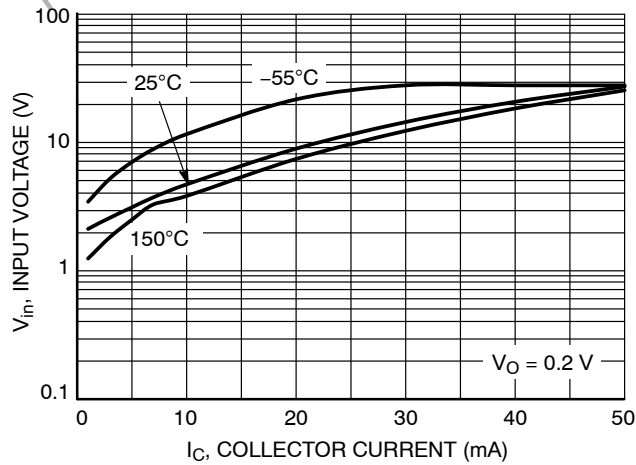


Figure 6. Input Voltage vs. Output Current

TYPICAL CHARACTERISTICS – PNP TRANSISTOR  
NSBC144WPDP6

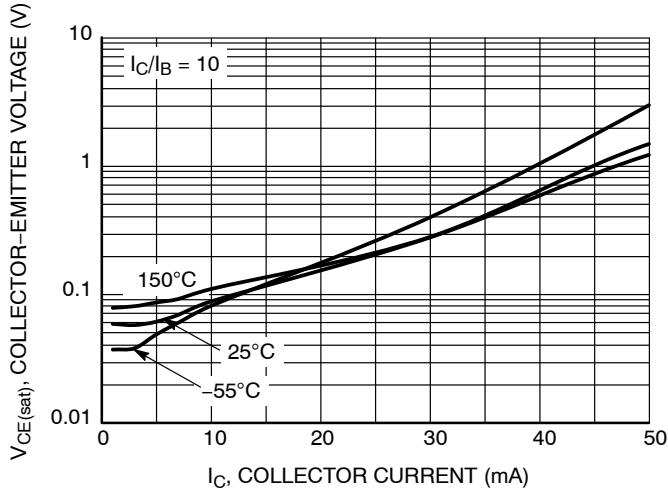


Figure 7.  $V_{CE(sat)}$  vs.  $I_C$

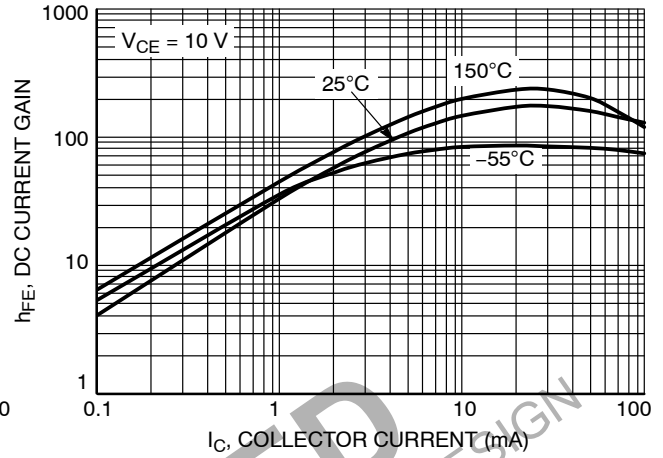


Figure 8. DC Current Gain

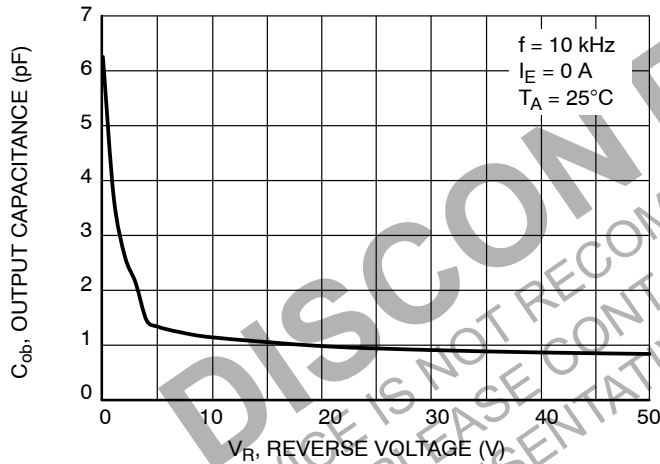


Figure 9. Output Capacitance

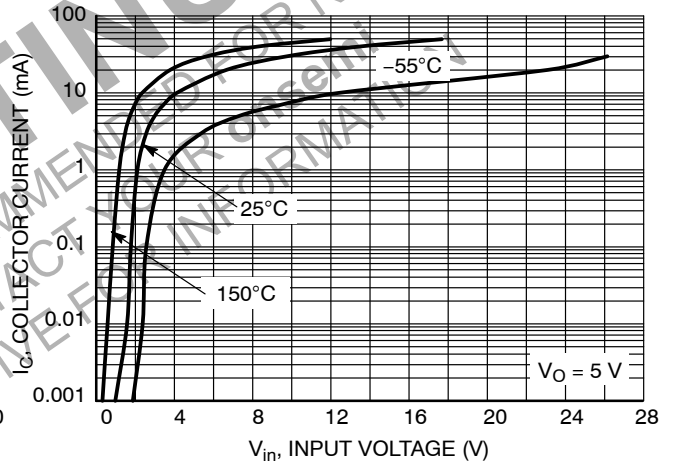


Figure 10. Output Current vs. Input Voltage

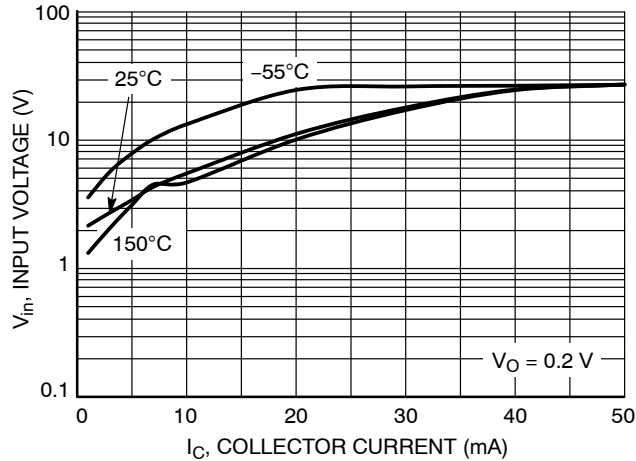
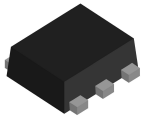


Figure 11. Input Voltage vs. Output Current

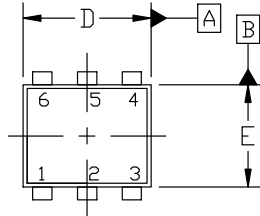


**SOT-963 1.00x1.00x0.37, 0.35P**  
**CASE 527AD**  
**ISSUE F**

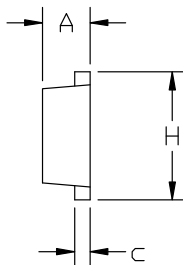
DATE 20 FEB 2024

NOTES:

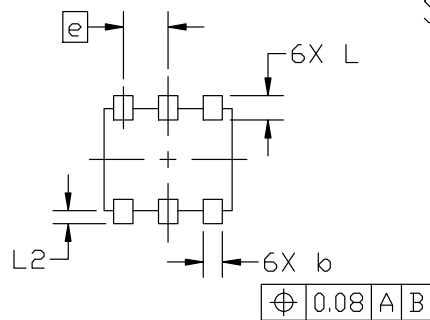
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.



TOP VIEW

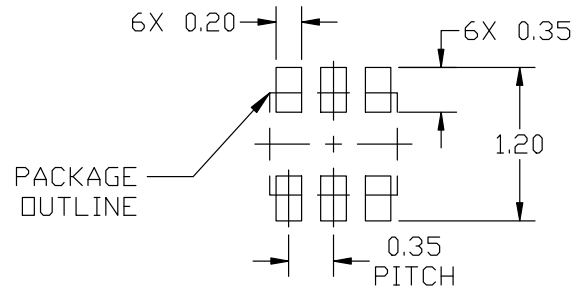


SIDE VIEW



BOTTOM VIEW

| 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   | 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.

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

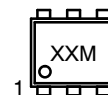
STYLE 9:

- 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

**GENERIC  
MARKING DIAGRAM\***



XX = Specific Device Code  
M = Month Code

\*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.

|                         |                                      |  |
|-------------------------|--------------------------------------|--|
| <b>DOCUMENT NUMBER:</b> | <b>98AON26456D</b>                   | Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. |
| <b>DESCRIPTION:</b>     | <b>SOT-963 1.00x1.00x0.37, 0.35P</b> | <b>PAGE 1 OF 1</b>   |

onsemi and onsemi are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. onsemi does not convey any license under its patent rights nor the rights of others.

**onsemi**, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

## ADDITIONAL INFORMATION

### TECHNICAL PUBLICATIONS:

Technical Library: [www.onsemi.com/design/resources/technical-documentation](http://www.onsemi.com/design/resources/technical-documentation)  
onsemi Website: [www.onsemi.com](http://www.onsemi.com)

### ONLINE SUPPORT: [www.onsemi.com/support](http://www.onsemi.com/support)

For additional information, please contact your local Sales Representative at  
[www.onsemi.com/support/sales](http://www.onsemi.com/support/sales)