# NSBC114EPDP6T5G Series

**Preferred Devices**

# Dual Digital Transistors (BRT)

## Complementary Silicon Surface Mount Transistors with Monolithic Bias Resistor Network

The BRT (Bias Resistor Transistor) contains a single transistor with a monolithic bias network consisting of two resistors; a series base resistor and a base−emitter resistor. These digital transistors are designed to replace a single device and its external resistor bias network. The BRT eliminates these individual components by integrating them into a single device. In the NSBC114EPDP6T5G series, two complementary BRT devices are housed in the SOT−963 package which is ideal for low power surface mount applications where board space is at a premium.

### Features

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- Available in 4 mm, 8000 Units Tape and Reel
- These are Pb−Free Devices
- These are Halide−Free Devices

**MAXIMUM RATINGS** ($T_A$ = 25°C unless otherwise noted, common for $Q_1$ and $Q_2$, − minus sign for $Q_1$ (PNP) omitted)

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Collector-Base Voltage | $V_{CBO}$ | 50 | Vdc |
| Collector-Emitter Voltage | $V_{CEO}$ | 50 | Vdc |
| Collector Current | $I_C$ | 100 | mAdc |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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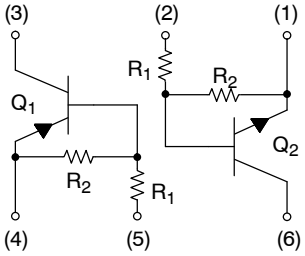
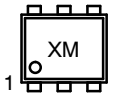
**http://onsemi.com**




**SOT−963**
**CASE 527AD**

**MARKING DIAGRAM**




X = Specific Device Code
M = Date Code
▪ = Pb−Free Package

### ORDERING INFORMATION

| Device | Package | Shipping† |
|---|---|---|
| NSBC114EPDP6T5G | SOT−963 (Pb−Free) | 8000 / 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.

### DEVICE MARKING INFORMATION

See specific marking information in the device marking table on page 2 of this data sheet.

## THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---|---|---|---|
| **SINGLE HEATED** | | | |
| Total Device Dissipation<br>$T_A$ = 25°C (Note 1)<br>Derate above 25°C | $P_D$ | <br>231<br>1.9 | <br>mW<br>mW/°C |
| Thermal Resistance (Note 1)<br>Junction-to-Ambient | $R_{\theta JA}$ | 540 | °C/W |
| Total Device Dissipation<br>$T_A$ = 25°C (Note 2)<br>Derate above 25°C | $P_D$ | <br>269<br>2.2 | <br>mW<br>mW/°C |
| Thermal Resistance (Note 2) Junction-to-Ambient | $R_{\theta JA}$ | 464 | °C/W |
| **DUAL HEATED** (Note 3) | | | |
| Total Device Dissipation<br>$T_A$ = 25°C (Note 1)<br>Derate above 25°C | $P_D$ | <br>339<br>2.7 | <br>mW<br>mW/°C |
| Thermal Resistance (Note 1)<br>Junction-to-Ambient | $R_{\theta JA}$ | 369 | °C/W |
| Total Device Dissipation<br>$T_A$ = 25°C (Note 2)<br>Derate above 25°C | $P_D$ | <br>408<br>3.3 | <br>mW<br>mW/°C |
| Thermal Resistance (Note 2) Junction-to-Ambient | $R_{\theta JA}$ | 306 | °C/W |
| Junction and Storage Temperature | $T_J$, $T_{stg}$ | −55 to +150 | °C |

1. FR−4 @ 100 $mm^2$, 1 oz. copper traces, still air.
2. FR−4 @ 500 $mm^2$, 1 oz. copper traces, still air.
3. Dual heated values assume total power is sum of two equally powered channels.

## DEVICE MARKING AND RESISTOR VALUES

| Device | Package | Marking (Clockwise Rotation) | R1 (kΩ) | R2 (kΩ) |
|---|---|---|---|---|
| NSBC114EPDP6T5G | SOT−963 | L | 10 | 10 |
| NSBC124EPDP6T5G | SOT−963 | R (90°) | 22 | 22 |
| NSBC144EPDP6T5G | SOT−963 | K (180°) | 47 | 47 |
| NSBC114YPDP6T5G | SOT−963 | Q (90°) | 10 | 47 |
| NSBC115TPDP6T5G | SOT−963 | J (180°) | 100 | ∞ |
| NSBC123TPDP6T5G | SOT−963 | A (180°) | 2.2 | ∞ |
| NSBC143EPDP6T5G | SOT−963 | V (90°) | 4.7 | 4.7 |
| NSBC143ZPDP6T5G | SOT−963 | Y (90°) | 4.7 | 47 |
| NSBC144WPDP6T5G | SOT−963 | T (90°) | 47 | 22 |
| NSBC123JPDP6T5G | SOT−963 | D (180°) | 2.2 | 47 |

## ELECTRICAL CHARACTERISTICS

($T_A$ = 25°C unless otherwise noted, common for $Q_1$ and $Q_2$, – minus sign for $Q_1$ (PNP) omitted)

| TCharacteristic | | 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 | NSBC114EPDP6T5G | $I_{EBO}$ | – | – | 0.5 | mAdc |
| ($V_{EB}$ = 6.0 V, $I_C$ = 0) | NSBC124EPDP6T5G | | – | – | 0.2 | |
| | NSBC144EPDP5T5G | | – | – | 0.1 | |
| | NSBC114YPDP6T5G | | – | – | 0.2 | |
| | NSBC115TPDP6T5G | | – | – | 0.1 | |
| | NSBC123TPDP6T5G | | – | – | 4.0 | |
| | NSBC143EPDP6T5G | | – | – | 1.5 | |
| | NSBC143ZPDP6T5G | | – | – | 0.18 | |
| | NSBC144WPDP6T5G | | – | – | 0.13 | |
| | NSBC123JPDP6T5G | | – | – | 0.2 | |
| 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** (Note 4) | | | | | | |
| DC Current Gain | NSBC114EPDP6T5G | $h_{FE}$ | 35 | 60 | – | |
| ($V_{CE}$ = 10 V, $I_C$ = 5.0 mA) | NSBC124EPDP6T5G | | 60 | 100 | – | |
| | NSBC144EPDP5T5G | | 80 | 140 | – | |
| | NSBC114YPDP6T5G | | 80 | 140 | – | |
| | NSBC115TPDP6T5G | | 160 | 350 | – | |
| | NSBC123TPDP6T5G | | 160 | 350 | – | |
| | NSBC143EPDP6T5G | | 15 | 30 | – | |
| | NSBC143ZPDP6T5G | | 80 | 200 | – | |
| | NSBC144WPDP6T5G | | 80 | 140 | – | |
| | NSBC123JPDP6T5G | | 80 | 140 | – | |
| Collector-Emitter Saturation Voltage | | $V_{CE(sat)}$ | | | | Vdc |
| ($I_C$ = 10 mA, $I_B$ = 0.3 mA) | | | | | | |
| | NSBC114EPDP6T5G | | – | – | 0.25 | |
| | NSBC124EPDP6T5G | | – | – | 0.25 | |
| | NSBC144EPDP6T5G | | – | – | 0.25 | |
| | NSBC114YPDP6T5G | | – | – | 0.25 | |
| | NSBC144WPDP6T5G | | – | – | 0.25 | |
| | NSBC123JPDP6T5G | | – | – | 0.25 | |
| ($I_C$ = 10 mA, $I_B$ = 1 mA) | NSBC115TPDP6T5G | | – | – | 0.25 | |
| | NSBC143EPDP6T5G | | – | – | 0.25 | |
| | NSBC143ZPDP6T5G | | – | – | 0.25 | |
| | NSBC123TPDP6T5G | | – | – | 0.25 | |
| Output Voltage (on) | | $V_{OL}$ | | | | Vdc |
| ($V_{CC}$ = 5.0 V, $V_B$ = 2.5 V, $R_L$ = 1.0 kΩ) | | | | | | |
| | NSBC114EPDP6T5G/NSBC124EPDP6T5G | | – | – | 0.2 | |
| | NSBC114YPDP6T5G/NSBC123TPDP6T5G | | – | – | 0.2 | |
| | NSBC143EPDP6T5G/NSBC143ZPDP6T5G | | – | – | 0.2 | |
| | NSBC123JPDP6T5G | | – | – | 0.2 | |
| ($V_{CC}$ = 5.0 V, $V_B$ = 4.0 V, $R_L$ = 1.0 kΩ) | | | | | | |
| | NSBC144WPDP6T5G | | – | – | 0.2 | |
| ($V_{CC}$ = 5.0 V, $V_B$ = 3.5 V, $R_L$ = 1.0 kΩ) | | | | | | |
| | NSBC144EPDP6T5G/NSBC115TPDP6T5G | | – | – | 0.2 | |
| Output Voltage (off) | | $V_{OH}$ | | | | Vdc |
| ($V_{CC}$ = 5.0 V, $V_B$ = 0.5 V, $R_L$ = 1.0 kΩ) | | | | | | |
| | NSBC114EPDP6T5G/NSBC124EPDP6T5G | | 4.9 | – | – | |
| | NSBC144EPDP6T5G/NSBC114YPDP6T5 | | 4.9 | – | – | |
| | NSBC143ZPDP6T5G/NSBC144WPDP6T5G | | 4.9 | – | – | |
| | NSBC123JPDP6T5G | | 4.9 | – | – | |
| ($V_{CC}$ = 5.0 V, $V_B$ = 0.25 V, $R_L$ = 1.0 kΩ) | | | | | | |
| | NSBC123TPDP6T5G/NSBC115TPDP6T5G | | 4.9 | – | – | |
| | NSBC143EPDP6T5G | | 4.9 | – | – | |

4. Pulse Test: Pulse Width < 300 μs, Duty Cycle < 2.0%

## ELECTRICAL CHARACTERISTICS

($T_A$ = 25°C unless otherwise noted, common for $Q_1$ and $Q_2$, – minus sign for $Q_1$ (PNP) omitted)

| TCharacteristic | | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **ON CHARACTERISTICS** (Note 4) | | | | | | |
| Input Resistor | NSBC114EPDP6T5G | R1 | 7.0 | 10 | 13 | kΩ |
| | NSBC124EPDP6T5G | | 15.4 | 22 | 28.6 | |
| | NSBC144EPDP5T5G | | 32.9 | 47 | 61.1 | |
| | NSBC114YPDP6T5G | | 7.0 | 10 | 13 | |
| | NSBC115TPDP6T5G | | 70 | 100 | 130 | |
| | NSBC123TPDP6T5G | | 1.54 | 2.2 | 2.86 | |
| | NSBC143EPDP6T5G | | 3.3 | 4.7 | 6.1 | |
| | NSBC143ZPDP6T5G | | 3.3 | 4.7 | 6.1 | |
| | NSBC144WPDP6T5G | | 15.4 | 47 | 28.6 | |
| | NSBC123JPDP6T5G | | 1.54 | 2.2 | 2.86 | |
| Resistor Ratio | NSBC114EPDP6T5G | R1/R2 | 0.8 | 1.0 | 1.2 | |
| | NSBC124EPDP6T5G | | 0.8 | 1.0 | 1.2 | |
| | NSBC144EPDP5T5G | | 0.8 | 1.0 | 1.2 | |
| | NSBC114YPDP6T5G | | 0.17 | 0.21 | 0.25 | |
| | NSBC115TPDP6T5G | | – | – | – | |
| | NSBC123TPDP6T5G | | – | – | – | |
| | NSBC143EPDP6T5G | | 0.8 | 1.0 | 1.2 | |
| | NSBC143ZPDP6T5G | | 0.055 | 0.1 | 0.185 | |
| | NSBC144WPDP6T5G | | 1.7 | 2.1 | 2.6 | |
| | NSBC123JPDP6T5G | | 0.038 | 0.047 | 0.056 | |

4. Pulse Test: Pulse Width < 300 μs, Duty Cycle < 2.0%

## TYPICAL ELECTRICAL CHARACTERISTICS – NSBC114EPDP6 NPN TRANSISTOR

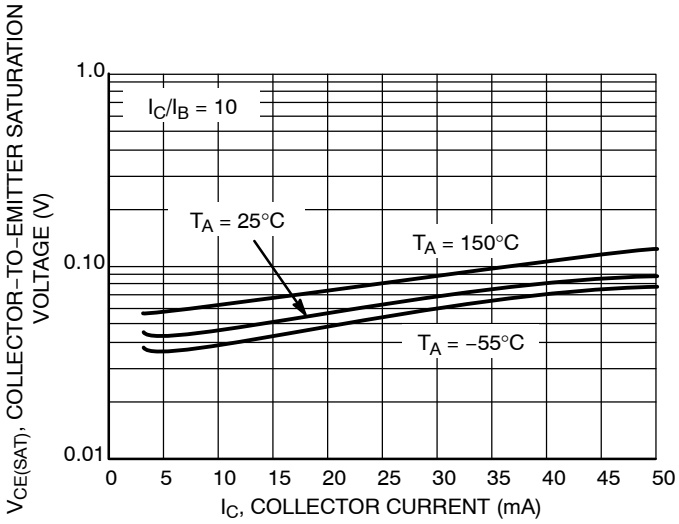



**Figure 1. $V_{CE(sat)}$ vs. $I_C$**

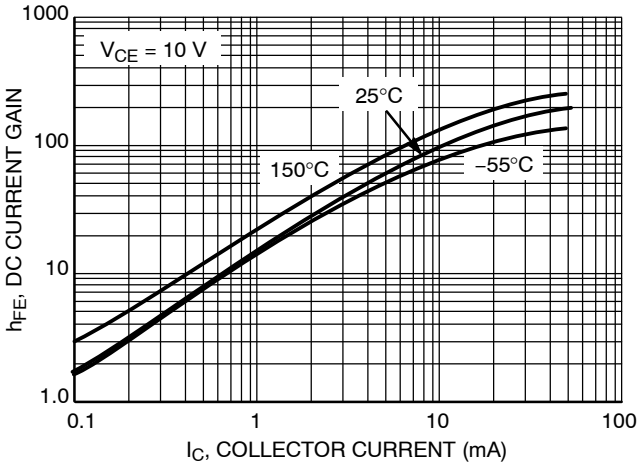



**Figure 2. DC Current Gain**

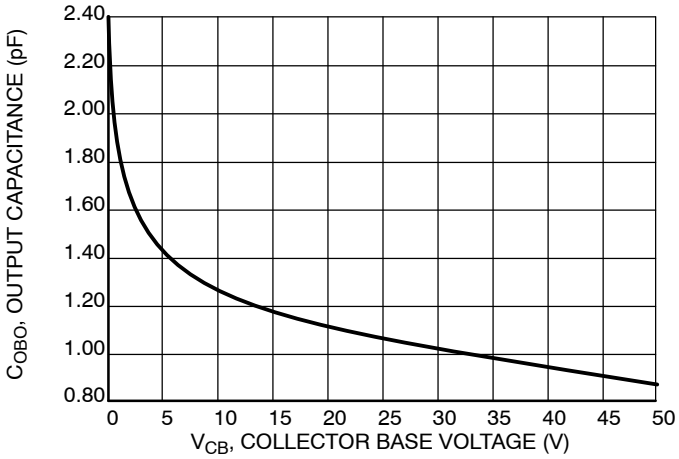



**Figure 3. Output Capacitance**

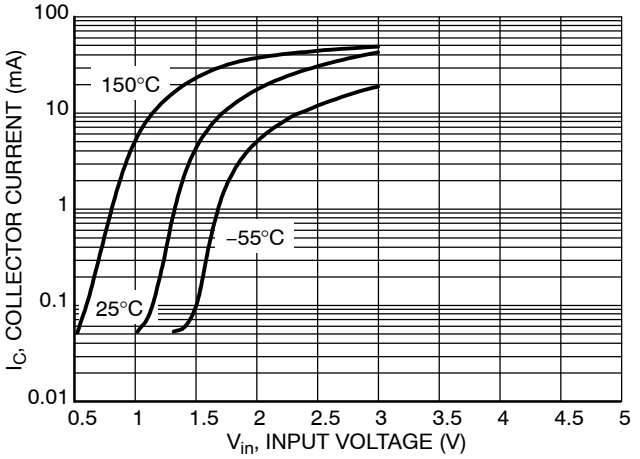



**Figure 4. Output Current vs. Input Voltage**

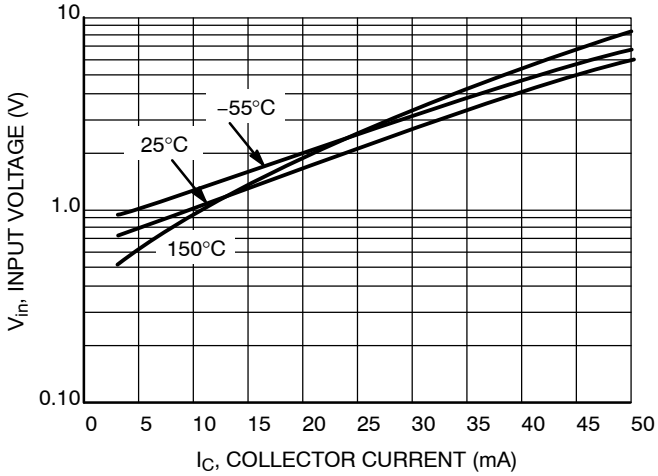



**Figure 5. Input Voltage vs. Output Current**

## TYPICAL ELECTRICAL CHARACTERISTICS – NSBC114EPDP6 PNP TRANSISTOR

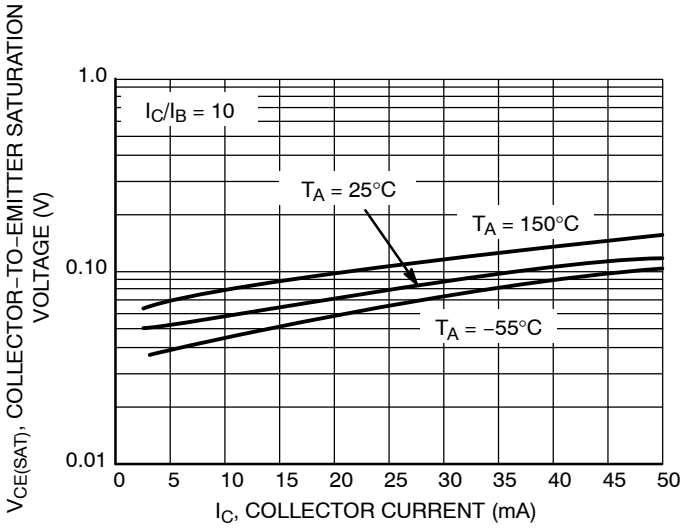



**Figure 6. $V_{CE(sat)}$ vs. $I_C$**

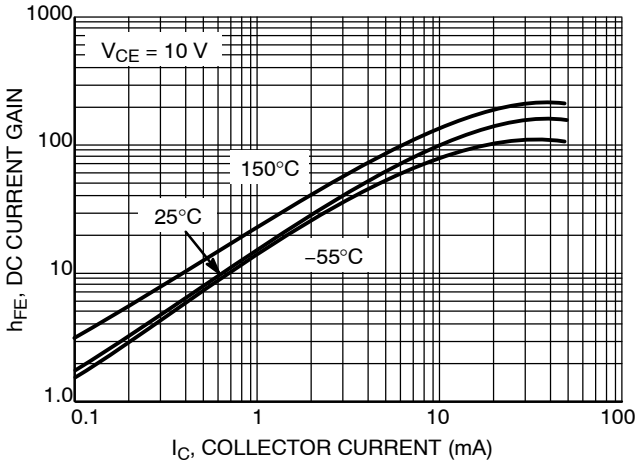



**Figure 7. DC Current Gain**

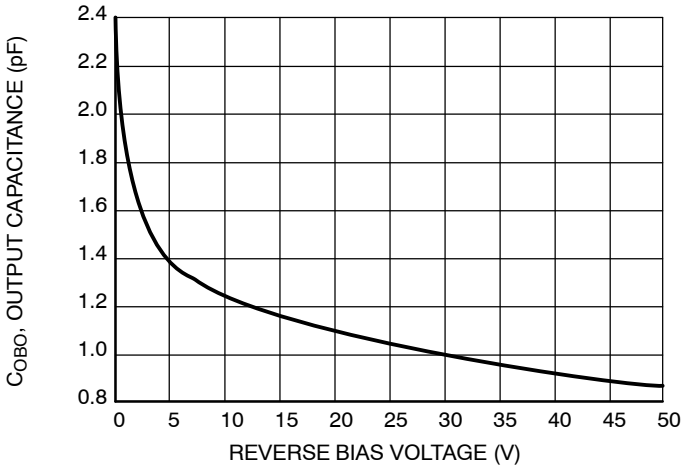



**Figure 8. Output Capacitance**

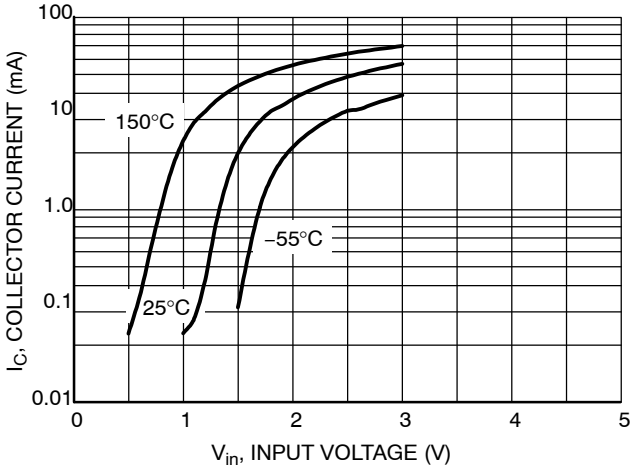



**Figure 9. Output Current vs. Input Voltage**

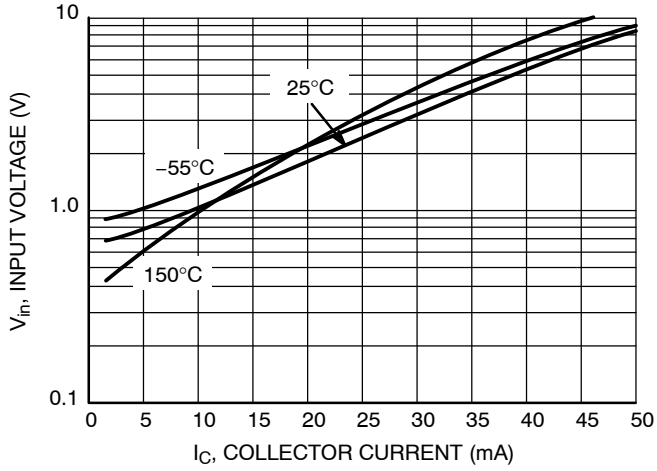
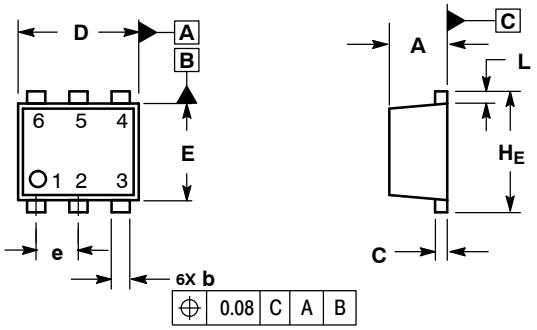



**Figure 10. Input Voltage vs. Output Current**

## PACKAGE DIMENSIONS

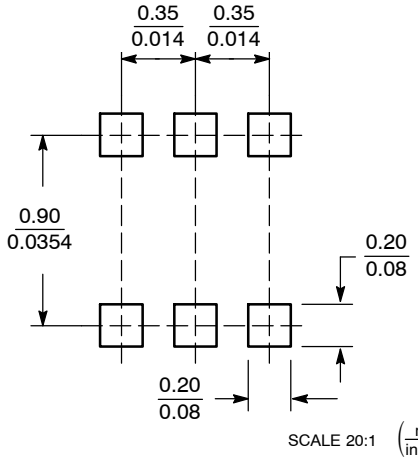
**SOT−963**
CASE 527AD−01
ISSUE C




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.

| | MILLIMETERS | | | INCHES | | |
|---|---|---|---|---|---|---|
| DIM | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 0.34 | 0.37 | 0.40 | | | |
| b | 0.10 | 0.15 | 0.20 | 0.004 | 0.006 | 0.008 |
| C | 0.07 | 0.12 | 0.17 | 0.003 | 0.005 | 0.007 |
| D | 0.95 | 1.00 | 1.05 | 0.037 | 0.039 | 0.041 |
| E | 0.75 | 0.80 | 0.85 | 0.03 | 0.032 | 0.034 |
| e | 0.35 BSC | | | 0.014 BSC | | |
| L | 0.05 | 0.10 | 0.15 | 0.002 | 0.004 | 0.006 |
| $H_E$ | 0.95 | 1.00 | 1.05 | 0.037 | 0.039 | 0.041 |

## 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.



**PUBLICATION ORDERING INFORMATION**

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