

# 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** ( $T_A = 25^\circ\text{C}$  unless otherwise noted, common for  $Q_1$  and  $Q_2$ , - minus sign for  $Q_1$  (PNP) omitted)

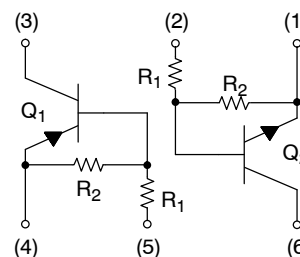
Rating	Symbol	Value	Unit
Collector-Base Voltage	$V_{CBO}$	50	Vdc
Collector-Emitter Voltage	$V_{CEO}$	50	Vdc
Collector Current	$I_C$	100	mAdc

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.



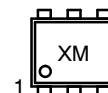
ON Semiconductor®

<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.

# NSBC114EPDP6T5G Series

## THERMAL CHARACTERISTICS

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

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. Dual heated values assume total power is sum of two equally powered channels.

## DEVICE MARKING AND RESISTOR VALUES

Device	Package	Marking (Clockwise Rotation)	R1 (k $\Omega$ )	R2 (k $\Omega$ )
NSBC114EPDP6T5G	SOT-963	L	10	10
NSBC124EPDP6T5G	SOT-963	R (90 $^\circ$ )	22	22
NSBC144EPDP6T5G	SOT-963	K (180 $^\circ$ )	47	47
NSBC114YPDP6T5G	SOT-963	Q (90 $^\circ$ )	10	47
NSBC115TPDP6T5G	SOT-963	J (180 $^\circ$ )	100	$\infty$
NSBC123TPDP6T5G	SOT-963	A (180 $^\circ$ )	2.2	$\infty$
NSBC143EPDP6T5G	SOT-963	V (90 $^\circ$ )	4.7	4.7
NSBC143ZPDP6T5G	SOT-963	Y (90 $^\circ$ )	4.7	47
NSBC144WPDP6T5G	SOT-963	T (90 $^\circ$ )	47	22
NSBC123JPDP6T5G	SOT-963	D (180 $^\circ$ )	2.2	47

# NSBC114EPDP6T5G Series

## ELECTRICAL CHARACTERISTICS

(T<sub>A</sub> = 25°C unless otherwise noted, common for Q<sub>1</sub> and Q<sub>2</sub>, – minus sign for Q<sub>1</sub> (PNP) omitted)

TCharacteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Collector-Base Cutoff Current (V <sub>CB</sub> = 50 V, I <sub>E</sub> = 0)	I <sub>CBO</sub>	–	–	100	nAdc
Collector-Emitter Cutoff Current (V <sub>CE</sub> = 50 V, I <sub>B</sub> = 0)	I <sub>CEO</sub>	–	–	500	nAdc
Emitter-Base Cutoff Current (V <sub>EB</sub> = 6.0 V, I <sub>C</sub> = 0)	I <sub>EBO</sub>	–	–	0.5	mAdc
	NSBC114EPDP6T5G	–	–	0.2	
	NSBC124EPDP6T5G	–	–	0.1	
	NSBC144EPDP6T5G	–	–	0.2	
	NSBC114YPDP6T5G	–	–	0.1	
	NSBC115TPDP6T5G	–	–	4.0	
	NSBC123TPDP6T5G	–	–	1.5	
	NSBC143EPDP6T5G	–	–	0.18	
	NSBC143ZPDP6T5G	–	–	0.13	
	NSBC144WPDP6T5G	–	–	0.2	
	NSBC123JPDP6T5G	–	–	–	
Collector-Base Breakdown Voltage (I <sub>C</sub> = 10 μA, I <sub>E</sub> = 0)	V <sub>(BR)CBO</sub>	50	–	–	Vdc
Collector-Emitter Breakdown Voltage (Note 4) (I <sub>C</sub> = 2.0 mA, I <sub>B</sub> = 0)	V <sub>(BR)CEO</sub>	50	–	–	Vdc
<b>ON CHARACTERISTICS (Note 4)</b>					
DC Current Gain (V <sub>CE</sub> = 10 V, I <sub>C</sub> = 5.0 mA)	h <sub>FE</sub>	35	60	–	
	NSBC114EPDP6T5G	60	100	–	
	NSBC124EPDP6T5G	80	140	–	
	NSBC144EPDP6T5G	80	140	–	
	NSBC114YPDP6T5G	160	350	–	
	NSBC115TPDP6T5G	160	350	–	
	NSBC123TPDP6T5G	15	30	–	
	NSBC143EPDP6T5G	80	200	–	
	NSBC143ZPDP6T5G	80	140	–	
	NSBC144WPDP6T5G	80	140	–	
	NSBC123JPDP6T5G	80	140	–	
Collector-Emitter Saturation Voltage (I <sub>C</sub> = 10 mA, I <sub>B</sub> = 0.3 mA)	V <sub>CE(sat)</sub>	–	–	0.25	Vdc
	NSBC114EPDP6T5G	–	–	0.25	
	NSBC124EPDP6T5G	–	–	0.25	
	NSBC144EPDP6T5G	–	–	0.25	
	NSBC114YPDP6T5G	–	–	0.25	
	NSBC144WPDP6T5G	–	–	0.25	
	NSBC123JPDP6T5G	–	–	0.25	
	NSBC115TPDP6T5G	–	–	0.25	
	NSBC143EPDP6T5G	–	–	0.25	
	NSBC143ZPDP6T5G	–	–	0.25	
	NSBC123TPDP6T5G	–	–	0.25	
Output Voltage (on) (V <sub>CC</sub> = 5.0 V, V <sub>B</sub> = 2.5 V, R <sub>L</sub> = 1.0 kΩ)	V <sub>OL</sub>	–	–	0.2	Vdc
	NSBC114EPDP6T5G/NSBC124EPDP6T5G	–	–	0.2	
	NSBC114YPDP6T5G/NSBC123TPDP6T5G	–	–	0.2	
	NSBC143EPDP6T5G/NSBC143ZPDP6T5G	–	–	0.2	
	NSBC123JPDP6T5G	–	–	0.2	
(V <sub>CC</sub> = 5.0 V, V <sub>B</sub> = 4.0 V, R <sub>L</sub> = 1.0 kΩ)		–	–	0.2	
	NSBC144WPDP6T5G	–	–	0.2	
(V <sub>CC</sub> = 5.0 V, V <sub>B</sub> = 3.5 V, R <sub>L</sub> = 1.0 kΩ)		–	–	0.2	
	NSBC144EPDP6T5G/NSBC115TPDP6T5G	–	–	0.2	
Output Voltage (off) (V <sub>CC</sub> = 5.0 V, V <sub>B</sub> = 0.5 V, R <sub>L</sub> = 1.0 kΩ)	V <sub>OH</sub>	4.9	–	–	Vdc
	NSBC114EPDP6T5G/NSBC124EPDP6T5G	4.9	–	–	
	NSBC144EPDP6T5G/NSBC114YPDP6T5G	4.9	–	–	
	NSBC143ZPDP6T5G/NSBC144WPDP6T5G	4.9	–	–	
	NSBC123JPDP6T5G	4.9	–	–	
(V <sub>CC</sub> = 5.0 V, V <sub>B</sub> = 0.25 V, R <sub>L</sub> = 1.0 kΩ)		4.9	–	–	
	NSBC123TPDP6T5G/NSBC115TPDP6T5G	4.9	–	–	
	NSBC143EPDP6T5G	4.9	–	–	

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

## NSBC114EPDP6T5G Series

### ELECTRICAL CHARACTERISTICS

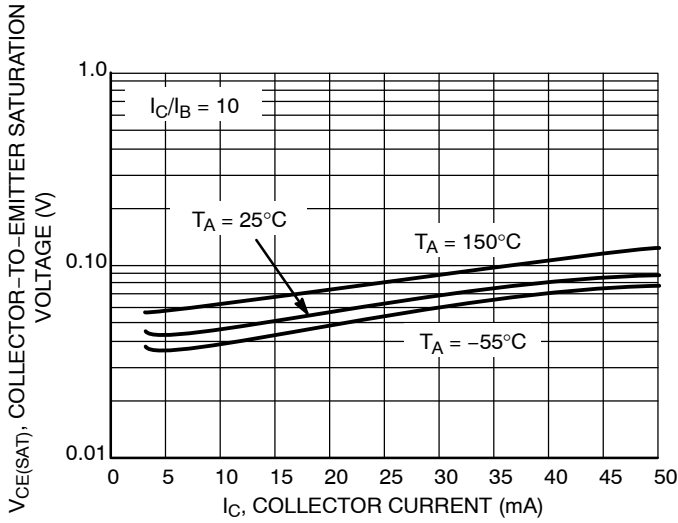
(T<sub>A</sub> = 25°C unless otherwise noted, common for Q<sub>1</sub> and Q<sub>2</sub>, – minus sign for Q<sub>1</sub> (PNP) omitted)

Characteristic	Symbol	Min	Typ	Max	Unit	
<b>ON CHARACTERISTICS</b> (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	

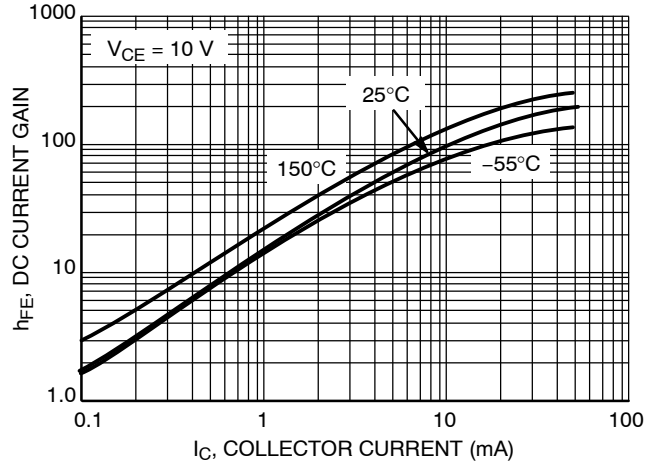
4. Pulse Test: Pulse Width < 300 μs, Duty Cycle < 2.0%

# NSBC114EPDP6T5G Series

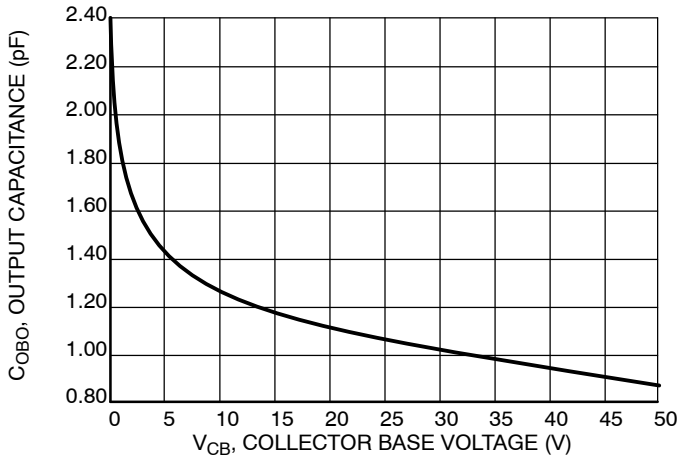
## TYPICAL ELECTRICAL CHARACTERISTICS – NSBC114EPDP6 NPN TRANSISTOR



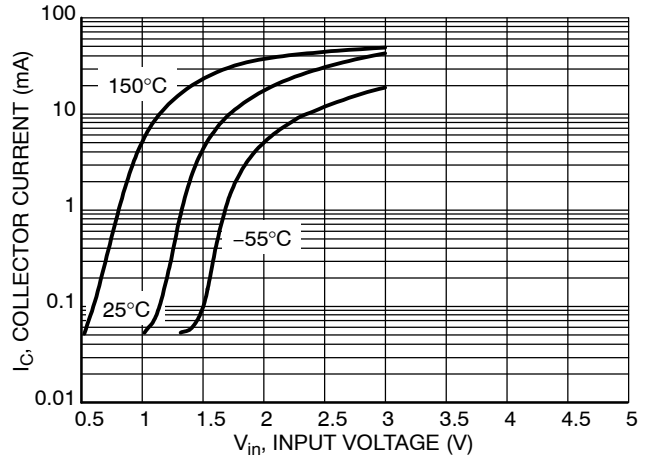
**Figure 1.  $V_{CE(sat)}$  vs.  $I_C$**



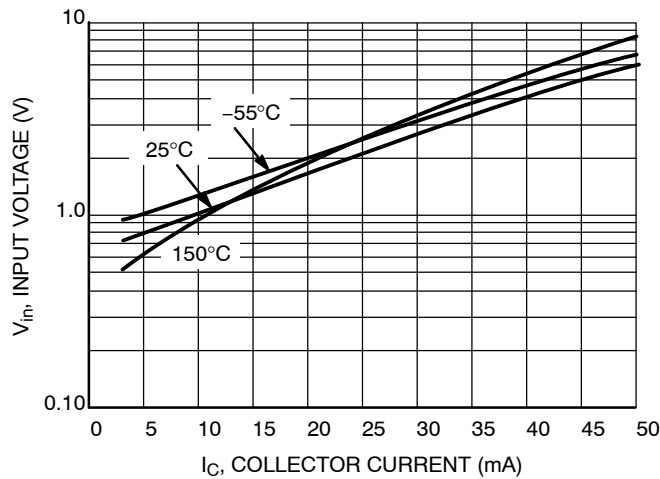
**Figure 2. DC Current Gain**



**Figure 3. Output Capacitance**



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



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

# NSBC114EPDP6T5G Series

## TYPICAL ELECTRICAL CHARACTERISTICS – NSBC114EPDP6 PNP TRANSISTOR

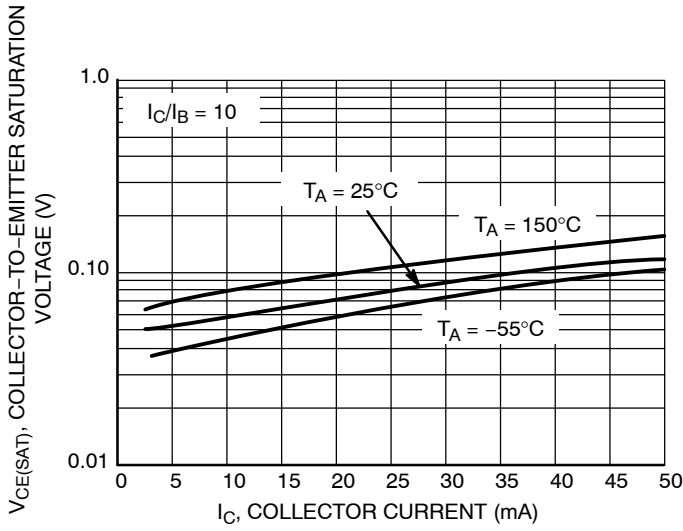


Figure 6.  $V_{CE(sat)}$  vs.  $I_C$

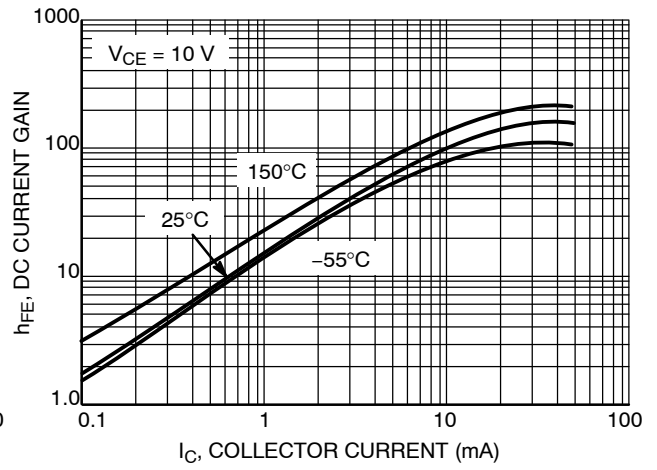


Figure 7. DC Current Gain

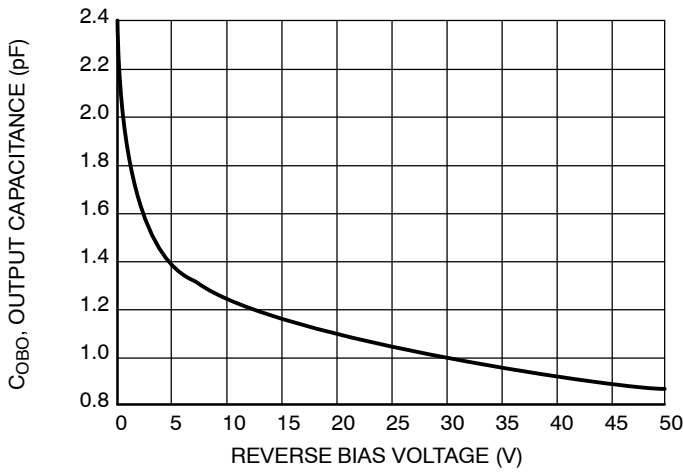


Figure 8. Output Capacitance

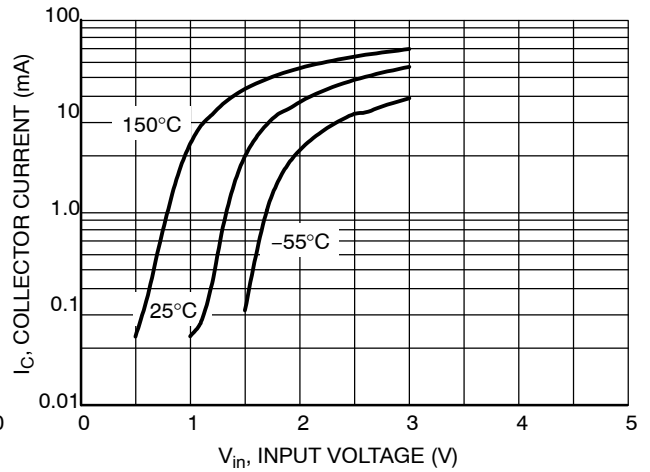


Figure 9. Output Current vs. Input Voltage

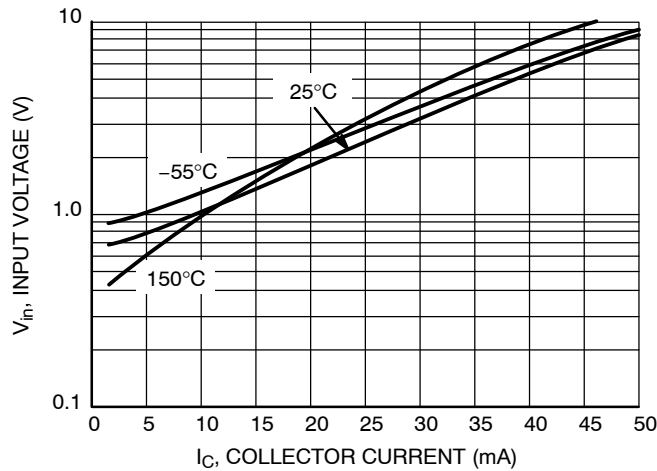
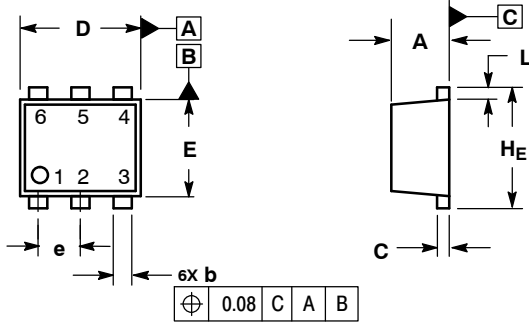


Figure 10. Input Voltage vs. Output Current

# NSBC114EPDP6T5G Series

## PACKAGE DIMENSIONS

SOT-963  
CASE 527AD-01  
ISSUE C

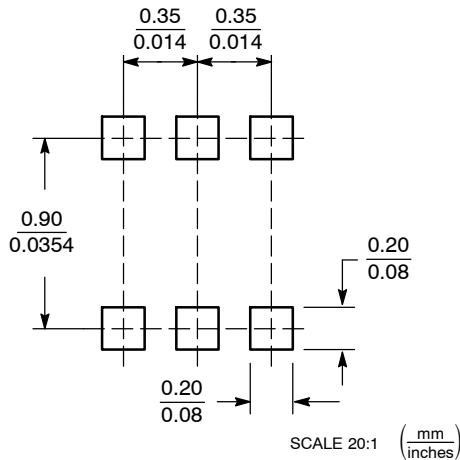


NOTES:

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.

DIM	MILLIMETERS			INCHES		
	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
HE	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.

ON Semiconductor and are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC 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. "Typical" parameters which may be provided in SCILLC 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. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC 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 SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

### PUBLICATION ORDERING INFORMATION

**LITERATURE FULFILLMENT:**  
Literature Distribution Center for ON Semiconductor  
P.O. Box 5163, Denver, Colorado 80217 USA  
**Phone:** 303-675-2175 or 800-344-3860 Toll Free USA/Canada  
**Fax:** 303-675-2176 or 800-344-3867 Toll Free USA/Canada  
**Email:** orderlit@onsemi.com

**N. American Technical Support:** 800-282-9855 Toll Free  
USA/Canada  
**Europe, Middle East and Africa Technical Support:**  
Phone: 421 33 790 2910  
**Japan Customer Focus Center**  
Phone: 81-3-5773-3850

**ON Semiconductor Website:** [www.onsemi.com](http://www.onsemi.com)

**Order Literature:** <http://www.onsemi.com/orderlit>

For additional information, please contact your local Sales Representative