

# MPSW45, MPSW45A

## One Watt Darlington Transistors

### NPN Silicon

#### Features

- Pb-Free Packages are Available\*

#### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector - Emitter Voltage	$V_{CES}$	40 50	Vdc
Collector - Base Voltage	$V_{CBO}$	50 60	Vdc
Emitter - Base Voltage	$V_{EBO}$	12	Vdc
Collector Current - Continuous	$I_C$	1.0	Adc
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	1.0 8.0	W mW/ $^\circ\text{C}$
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	2.5 20	W mW/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$

#### THERMAL CHARACTERISTICS

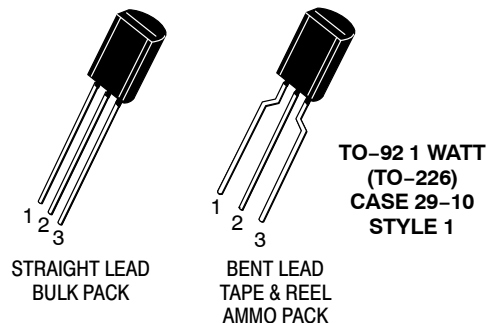
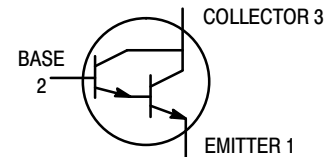
Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	125	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	50	$^\circ\text{C}/\text{W}$

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.

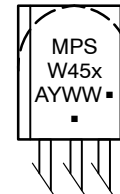


ON Semiconductor®

<http://onsemi.com>



#### MARKING DIAGRAM



MPSW45x = Device Code  
 x = 45A Devices  
 A = Assembly Location  
 Y = Year  
 WW = Work Week  
 ■ = Pb-Free Package

(Note: Microdot may be in either location)

#### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

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

# MPSW45, MPSW45A

## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Characteristic		Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Collector – Emitter Breakdown Voltage ( $I_C = 100 \mu\text{Adc}$ , $V_{BE} = 0$ )	MPSW45 MPSW45A	$V_{(BR)CES}$	40 50	– –	Vdc
Collector – Base Breakdown Voltage ( $I_C = 100 \mu\text{Adc}$ , $I_E = 0$ )	MPSW45 MPSW45A	$V_{(BR)CBO}$	50 60	– –	Vdc
Emitter – Base Breakdown Voltage ( $I_E = 10 \mu\text{Adc}$ , $I_C = 0$ )		$V_{(BR)EBO}$	12	–	Vdc
Collector Cutoff Current ( $V_{CB} = 30 \text{Vdc}$ , $I_E = 0$ ) ( $V_{CB} = 40 \text{Vdc}$ , $I_E = 0$ )	MPSW45 MPSW45A	$I_{CBO}$	– –	100 100	nAdc
Emitter Cutoff Current ( $V_{EB} = 10 \text{Vdc}$ , $I_C = 0$ )		$I_{EBO}$	–	100	nAdc

## ON CHARACTERISTICS (Note 1)

DC Current Gain ( $I_C = 200 \text{mAdc}$ , $V_{CE} = 5.0 \text{Vdc}$ ) ( $I_C = 500 \text{mAdc}$ , $V_{CE} = 5.0 \text{Vdc}$ ) ( $I_C = 1.0 \text{Adc}$ , $V_{CE} = 5.0 \text{Vdc}$ )		$h_{FE}$	25,000 15,000 4,000	150,000 – –	–
Collector – Emitter Saturation Voltage ( $I_C = 1.0 \text{Adc}$ , $I_B = 2.0 \text{mAdc}$ )		$V_{CE(sat)}$	–	1.5	Vdc
Base – Emitter Saturation Voltage ( $I_C = 1.0 \text{Adc}$ , $I_B = 2.0 \text{mAdc}$ )		$V_{BE(sat)}$	–	2.0	Vdc
Base – Emitter On Voltage ( $I_C = 1.0 \text{Adc}$ , $V_{CE} = 5.0 \text{Vdc}$ )		$V_{BE(on)}$	–	2.0	Vdc

## SMALL-SIGNAL CHARACTERISTICS

Current – Gain – Bandwidth Product ( $I_C = 200 \text{mAdc}$ , $V_{CE} = 5.0 \text{Vdc}$ , $f = 100 \text{MHz}$ )		$f_T$	100	–	MHz
Collector – Base Capacitance ( $V_{CB} = 10 \text{Vdc}$ , $I_E = 0$ , $f = 1.0 \text{MHz}$ )		$C_{cb}$	–	6.0	pF

1. Pulse Test: Pulse Width  $\leq 300 \mu\text{s}$ ; Duty Cycle  $\leq 2.0\%$ .

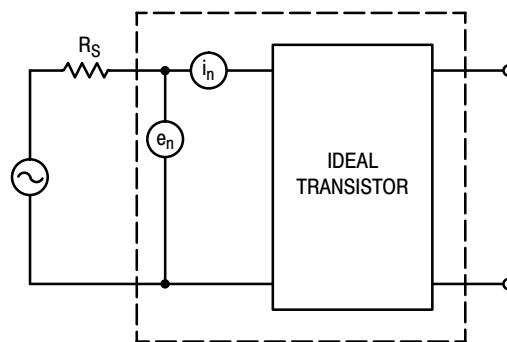


Figure 1. Transistor Noise Model

# MPSW45, MPSW45A

## NOISE CHARACTERISTICS

( $V_{CE} = 5.0 \text{ Vdc}$ ,  $T_A = 25^\circ\text{C}$ )

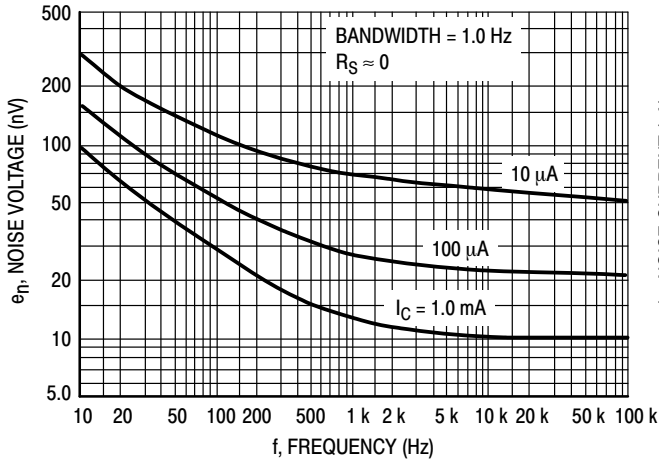


Figure 2. Noise Voltage

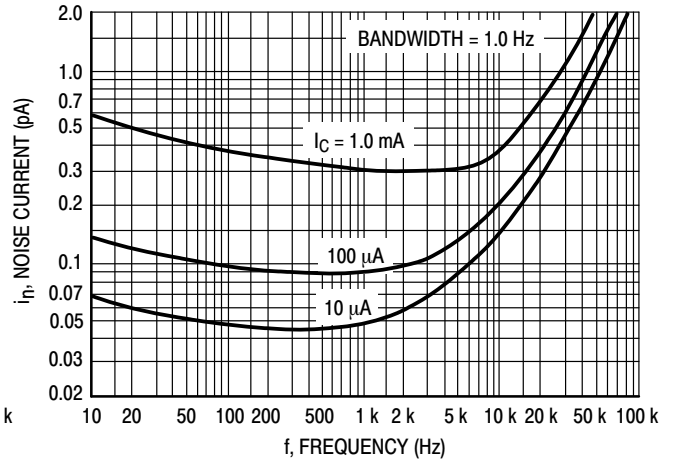


Figure 3. Noise Current

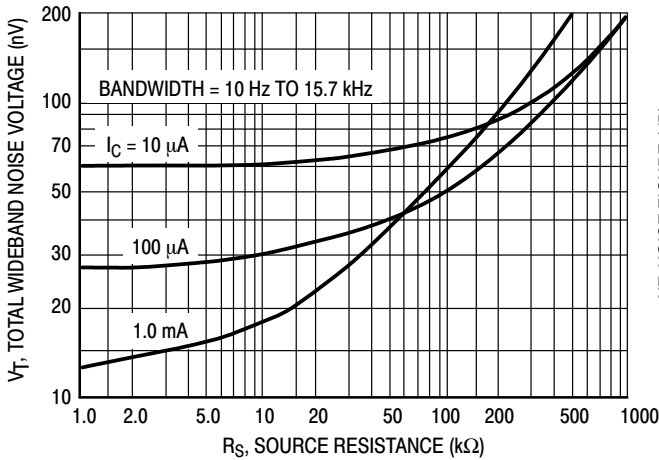


Figure 4. Total Wideband Noise Voltage

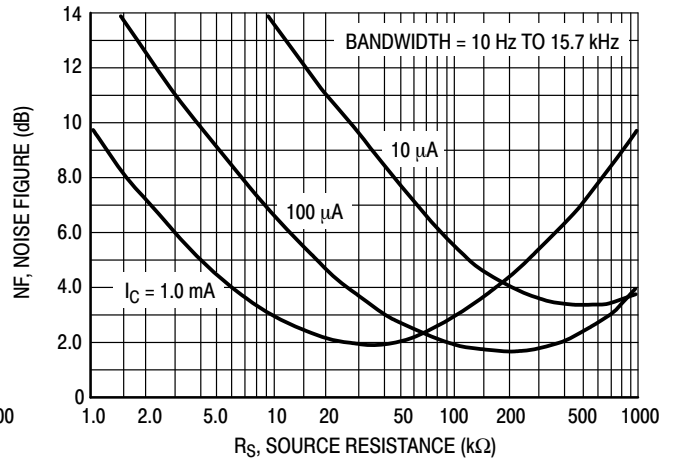


Figure 5. Wideband Noise Figure

# MPSW45, MPSW45A

## SMALL-SIGNAL CHARACTERISTICS

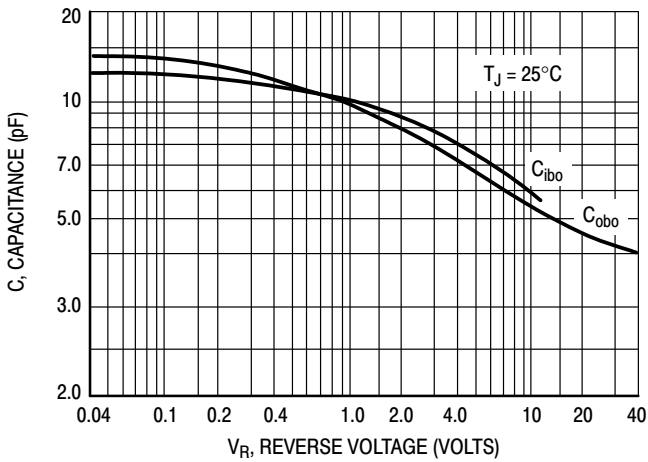


Figure 6. Capacitance

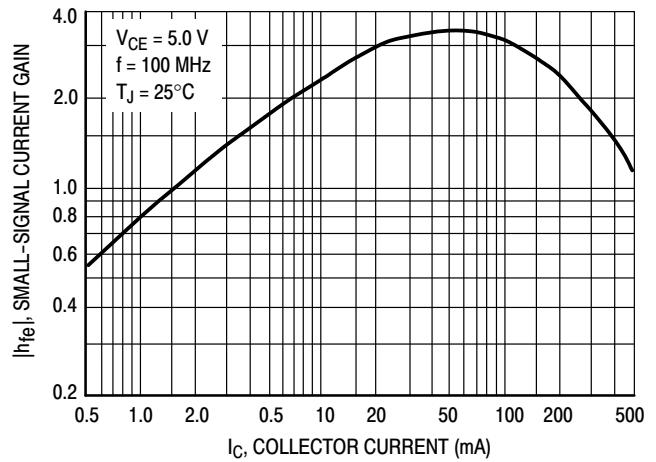


Figure 7. High Frequency Current Gain

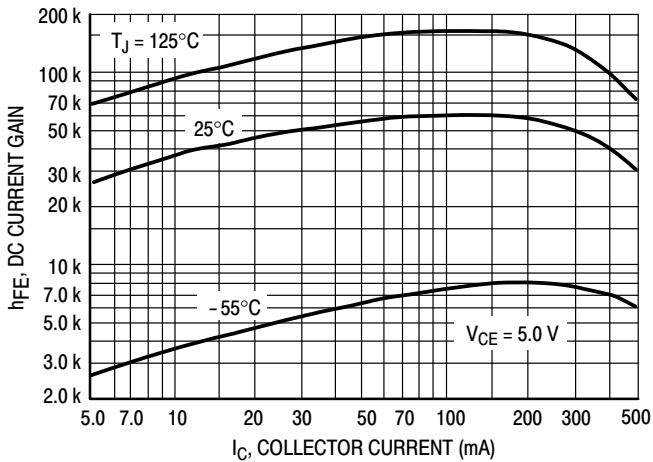


Figure 8. DC Current Gain

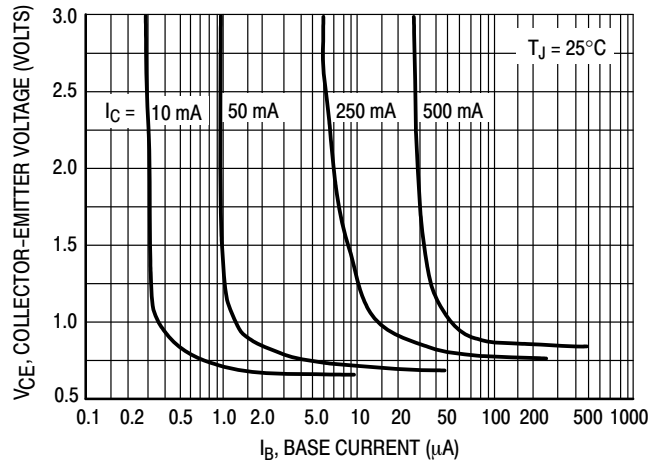


Figure 9. Collector Saturation Region

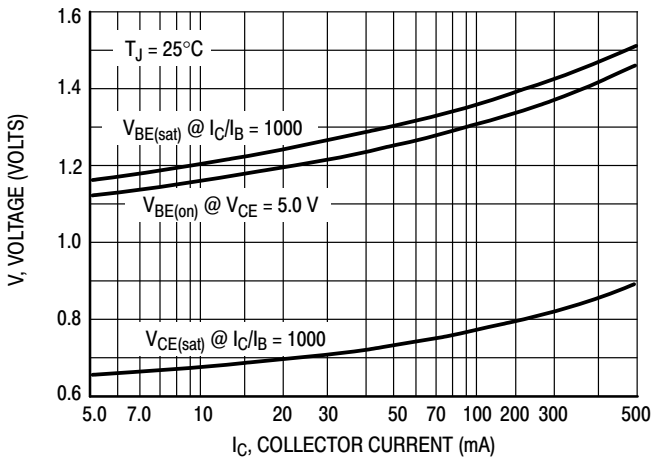


Figure 10. "On" Voltages

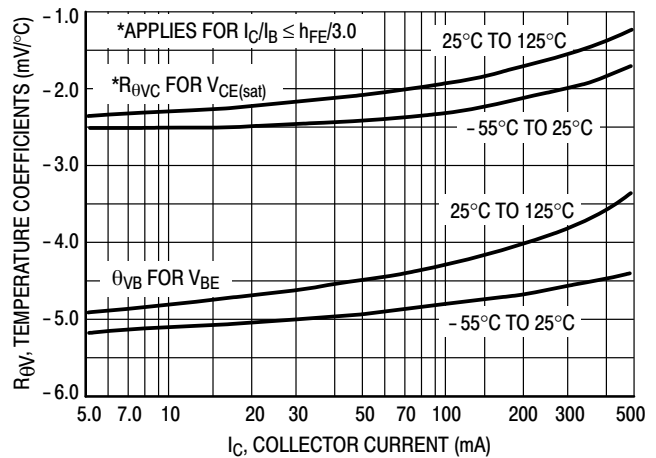


Figure 11. Temperature Coefficients

# MPSW45, MPSW45A

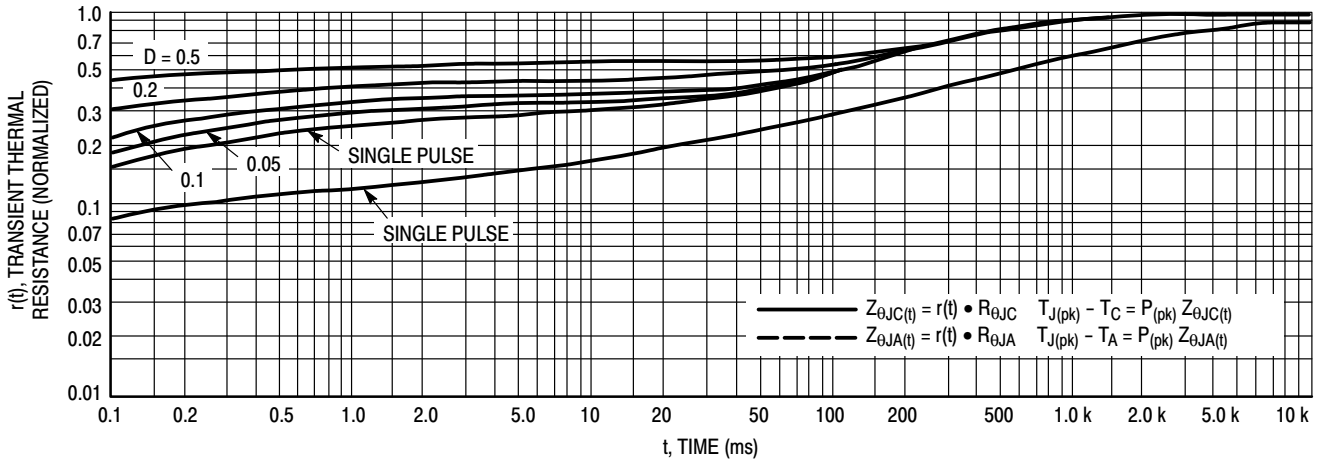


Figure 12. Thermal Response

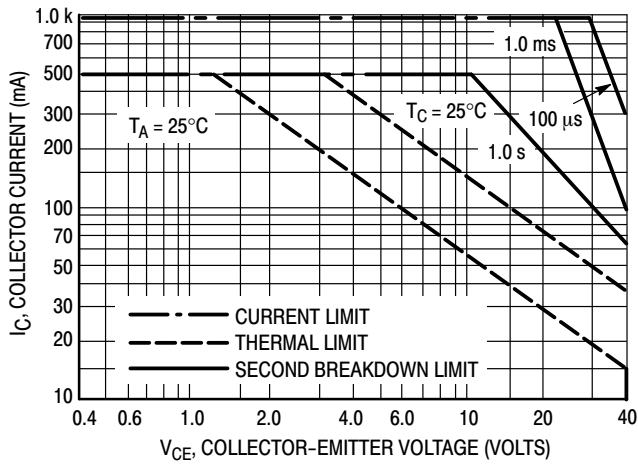
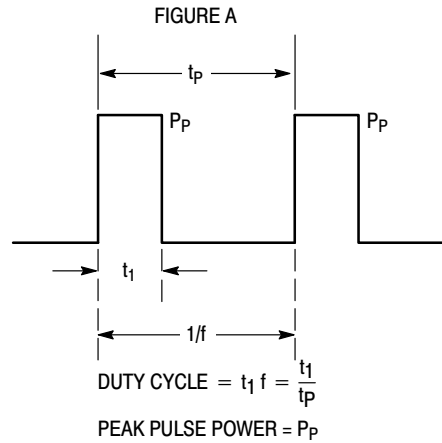


Figure 13. Active Region Safe Operating Area



Design Note: Use of Transient Thermal Resistance Data

## ORDERING INFORMATION

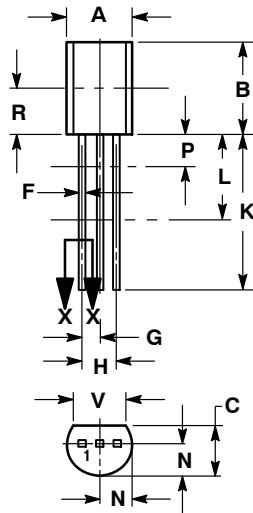
Device	Package	Shipping†
MPSW45G	TO-92 (Pb-Free)	5,000 Units / Box
MPSW45RLREG	TO-92 (Pb-Free)	2,000 / Tape & Reel
MPSW45A	TO-92	5,000 Units / Box
MPSW45AG	TO-92 (Pb-Free)	5,000 Units / Box
MPSW45ARLRA	TO-92	2,000 / Tape & Reel
MPSW45ARLRAG	TO-92 (Pb-Free)	2,000 / Tape & Reel
MPSW45AZL1	TO-92	2,000 / Ammo Pack
MPSW45AZL1G	TO-92 (Pb-Free)	2,000 / Ammo Pack

†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.

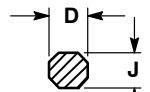
# MPSW45, MPSW45A

## PACKAGE DIMENSIONS

TO-92 (TO-226) 1 WATT  
CASE 29-10  
ISSUE O



STRAIGHT LEAD  
BULK PACK



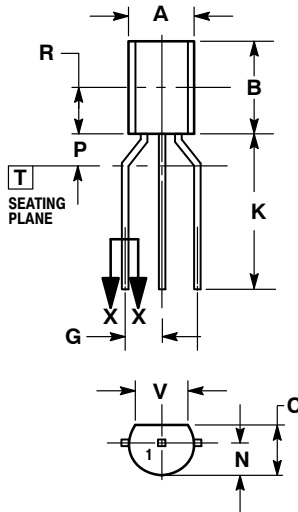
SECTION X-X

NOTES:

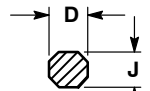
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. DIMENSION F APPLIES BETWEEN DIMENSIONS P AND L. DIMENSIONS D AND J APPLY BETWEEN DIMENSIONS L AND K MINIMUM. THE LEAD DIMENSIONS ARE UNCONTROLLED IN DIMENSION P AND BEYOND DIMENSION K MINIMUM.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.175	0.205	4.44	5.21
B	0.290	0.310	7.37	7.87
C	0.125	0.165	3.18	4.19
D	0.018	0.021	0.46	0.53
F	0.016	0.019	0.41	0.48
G	0.045	0.055	1.15	1.39
H	0.095	0.105	2.42	2.66
J	0.018	0.024	0.46	0.61
K	0.500	---	12.70	---
L	0.250	---	6.35	---
N	0.080	0.105	2.04	2.66
P	---	0.100	---	2.54
R	0.135	---	3.43	---
V	0.135	---	3.43	---

- STYLE 1:  
PIN 1. EMITTER  
2. BASE  
3. COLLECTOR



BENT LEAD  
TAPE & REEL  
AMMO PACK



SECTION X-X

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. DIMENSION F APPLIES BETWEEN DIMENSIONS P AND L. DIMENSIONS D AND J APPLY BETWEEN DIMENSIONS L AND K MINIMUM. THE LEAD DIMENSIONS ARE UNCONTROLLED IN DIMENSION P AND BEYOND DIMENSION K MINIMUM.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.175	0.205	4.44	5.21
B	0.290	0.310	7.37	7.87
C	0.125	0.165	3.18	4.19
D	0.018	0.021	0.46	0.53
G	0.094	0.102	2.40	2.80
J	0.018	0.024	0.46	0.61
K	0.500	---	12.70	---
N	0.080	0.105	2.04	2.66
P	---	0.100	---	2.54
R	0.135	---	3.43	---
V	0.135	---	3.43	---

**ON Semiconductor** and **ON** 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