

ON Semiconductor

Is Now

onsemi™

To learn more about onsemi™, please visit our website at
www.onsemi.com

onsemi and **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** product/patent coverage may be accessed at 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. Other names and brands may be claimed as the property of others.

MPF4392, MPF4393

JFET Switching Transistors

N-Channel – Depletion

Features

- Pb-Free Packages are Available*

MAXIMUM RATINGS

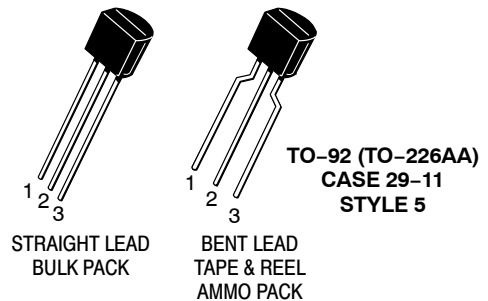
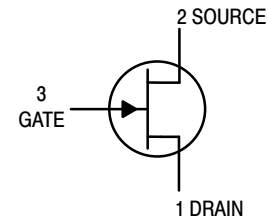
Rating	Symbol	Value	Unit
Drain – Source Voltage	V_{DS}	30	Vdc
Drain – Gate Voltage	V_{DG}	30	Vdc
Gate – Source Voltage	V_{GS}	30	Vdc
Forward Gate Current	$I_{G(f)}$	50	mAdc
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	350 2.8	mW mW/ $^\circ\text{C}$
Operating and Storage Channel Temperature Range	$T_{channel}$, T_{stg}	-65 to +150	$^\circ\text{C}$

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.

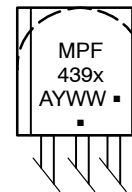


ON Semiconductor®

<http://onsemi.com>



MARKING DIAGRAM



MPF439x = Device Code
x = 2 or 3

A = Assembly Location

Y = Year

WW = Work Week

▪ = Pb-Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping†
MPF4392	TO-92	1000 Units / Bulk
MPF4392G	TO-92 (Pb-Free)	1000 Units / Bulk
MPF4393	TO-92	1000 Units / Bulk
MPF4393G	TO-92 (Pb-Free)	1000 Units / Bulk
MPF4393RLRP	TO-92	1000 / Ammo Box
MPF4393RLRPG	TO-92 (Pb-Free)	1000 / Ammo Box

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

MPF4392, MPF4393

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Gate-Source Breakdown Voltage (I _G = -1.0 μAdc, V _{DS} = 0)	V _{(BR)GSS}	30	-	-	Vdc
Gate Reverse Current (V _{GS} = -15 Vdc, V _{DS} = 0) (V _{GS} = -15 Vdc, V _{DS} = 0, T _A = 100°C)	I _{GSS}	-	-	1.0 0.2	nAdc μAdc
Drain-Cutoff Current (V _{DS} = 15 Vdc, V _{GS} = -12 Vdc) (V _{DS} = 15 Vdc, V _{GS} = -12 Vdc, T _A = 100°C)	I _{D(off)}	-	-	1.0 1.0	nAdc μAdc
Gate-Source Voltage (V _{DS} = 15 Vdc, I _D = 10 nAdc)	V _{GS}	-2.0 -0.5	-	-5.0 -3.0	Vdc

ON CHARACTERISTICS

Zero-Gate-Voltage Drain Current (Note 1) (V _{DS} = 15 Vdc, V _{GS} = 0)	MPF4392 MPF4393	I _{DSS}	25 5.0	- -	75 30	mAdc
Drain-Source On-Voltage (I _D = 6.0 mAdc, V _{GS} = 0) (I _D = 3.0 mAdc, V _{GS} = 0)	MPF4392 MPF4393	V _{DS(on)}	- -	- -	0.4 0.4	Vdc
Static Drain-Source On Resistance (I _D = 1.0 mAdc, V _{GS} = 0)	MPF4392 MPF4393	r _{DS(on)}	- -	- -	60 100	Ω

SMALL-SIGNAL CHARACTERISTICS

Forward Transfer Admittance (V _{DS} = 15 Vdc, I _D = 25 mAdc, f = 1.0 kHz) (V _{DS} = 15 Vdc, I _D = 5.0 mAdc, f = 1.0 kHz)	MPF4392 MPF4393	y _{fs}	- -	17 12	- -	mmhos
Drain-Source "ON" Resistance (V _{GS} = 0, I _D = 0, f = 1.0 kHz)	MPF4392 MPF4393	r _{ds(on)}	- -	- -	60 100	Ω
Input Capacitance (V _{GS} = 15 Vdc, V _{DS} = 0, f = 1.0 MHz)		C _{iss}	-	6.0	10	pF
Reverse Transfer Capacitance (V _{GS} = 12 Vdc, V _{DS} = 0, f = 1.0 MHz) (V _{DS} = 15 Vdc, I _D = 10 mAdc, f = 1.0 MHz)		C _{rss}	- -	2.5 3.2	3.5 -	pF

SWITCHING CHARACTERISTICS

Rise Time (See Figure 2) (I _{D(on)} = 6.0 mAdc) (I _{D(on)} = 3.0 mAdc)	MPF4392 MPF4393	t _r	- -	2.0 2.5	5.0 5.0	ns
Fall Time (See Figure 4) (V _{GS(off)} = 7.0 Vdc) (V _{GS(off)} = 5.0 Vdc)	MPF4392 MPF4393	t _f	- -	15 29	20 35	ns
Turn-On Time (See Figures 1 and 2) (I _{D(on)} = 6.0 mAdc) (I _{D(on)} = 3.0 mAdc)	MPF4392 MPF4393	t _{on}	- -	4.0 6.5	15 15	ns
Turn-Off Time (See Figures 3 and 4) (V _{GS(off)} = 7.0 Vdc) (V _{GS(off)} = 5.0 Vdc)	MPF4392 MPF4393	t _{off}	- -	20 37	35 55	ns

1. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 3.0%.

MPF4392, MPF4393

TYPICAL SWITCHING CHARACTERISTICS

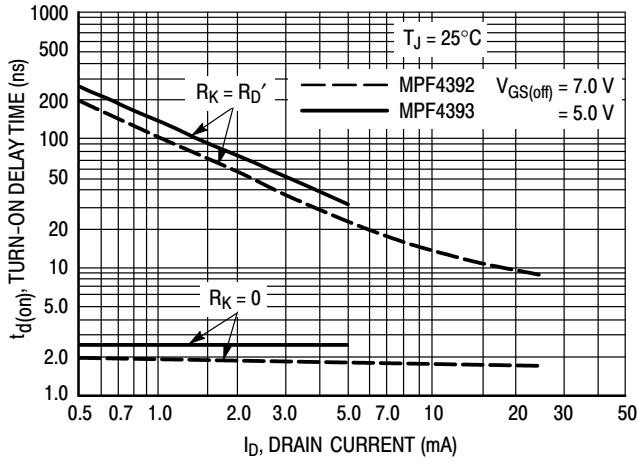


Figure 1. Turn-On Delay Time

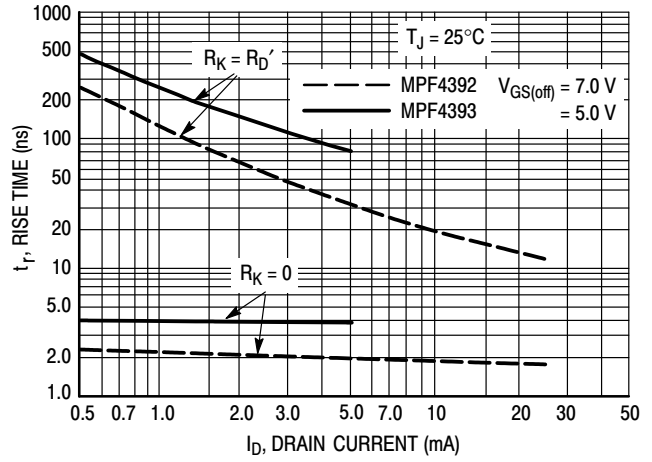


Figure 2. Rise Time

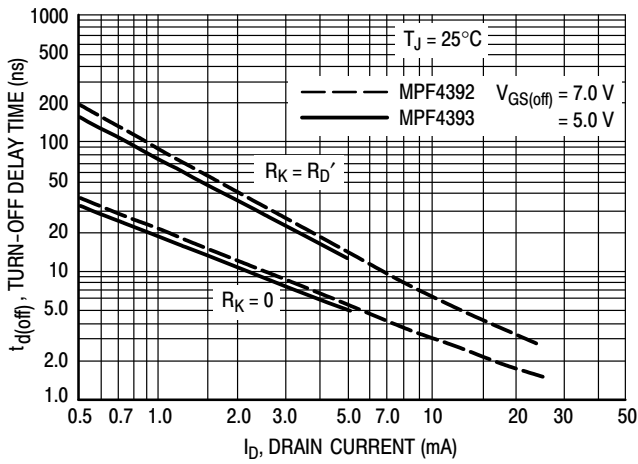


Figure 3. Turn-Off Delay Time

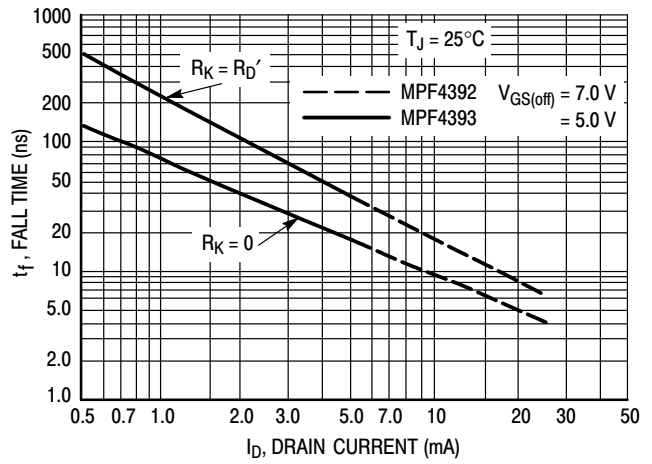


Figure 4. Fall Time

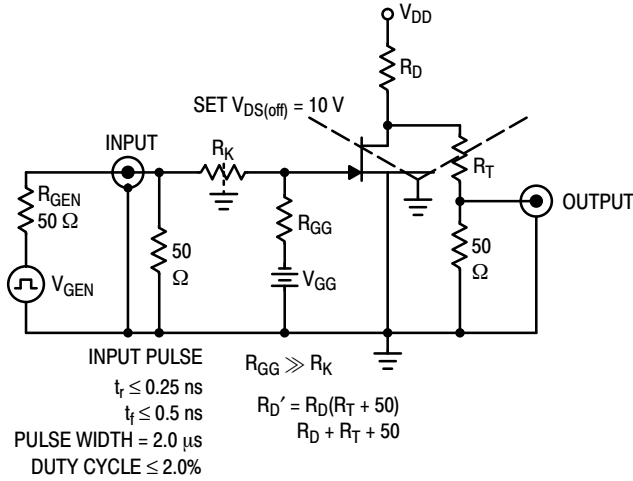


Figure 5. Switching Time Test Circuit

NOTE 1

The switching characteristics shown above were measured using a test circuit similar to Figure 5. At the beginning of the switching interval, the gate voltage is at Gate Supply Voltage ($-V_{GG}$). The Drain-Source Voltage (V_{DS}) is slightly lower than Drain Supply Voltage (V_{DD}) due to the voltage divider. Thus Reverse Transfer Capacitance (C_{rss}) or Gate-Drain Capacitance (C_{gd}) is charged to $V_{GG} + V_{DS}$.

During the turn-on interval, Gate-Source Capacitance (C_{gs}) discharges through the series combination of R_{GEN} and R_K . C_{gd} must discharge to $V_{DS(on)}$ through R_G and R_K in series with the parallel combination of effective load impedance (R'_D) and Drain-Source Resistance (r_{ds}). During the turn-off, this charge flow is reversed.

Predicting turn-on time is somewhat difficult as the channel resistance r_{ds} is a function of the gate-source voltage. While C_{gs} discharges, V_{GS} approaches zero and r_{ds} decreases. Since C_{gd} discharges through r_{ds} , turn-on time is non-linear. During turn-off, the situation is reversed with r_{ds} increasing as C_{gd} charges.

The above switching curves show two impedance conditions: 1) R_K is equal to R'_D which simulates the switching behavior of cascaded stages where the driving source impedance is normally the load impedance of the previous stage, and 2) $R_K = 0$ (low impedance) the driving source impedance is that of the generator.

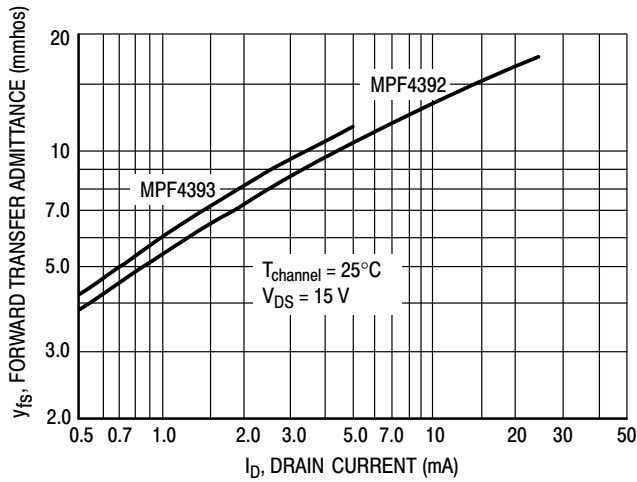


Figure 6. Typical Forward Transfer Admittance

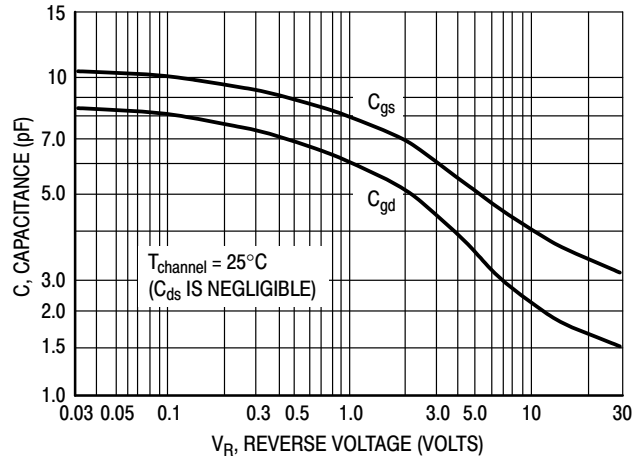


Figure 7. Typical Capacitance

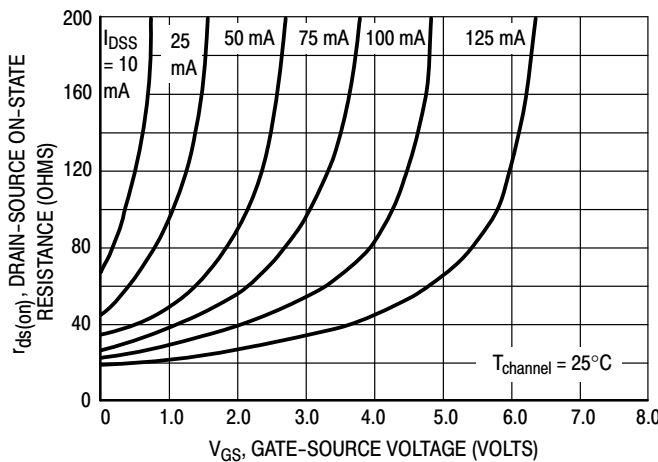


Figure 8. Effect of Gate-Source Voltage On Drain-Source Resistance

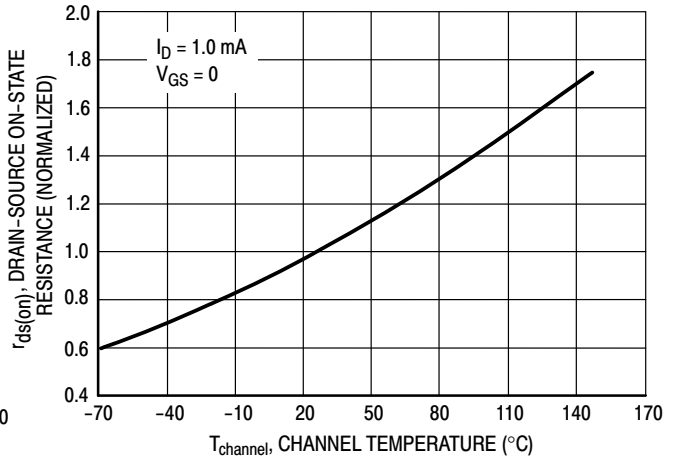


Figure 9. Effect of Temperature On Drain-Source On-State Resistance

MPF4392, MPF4393

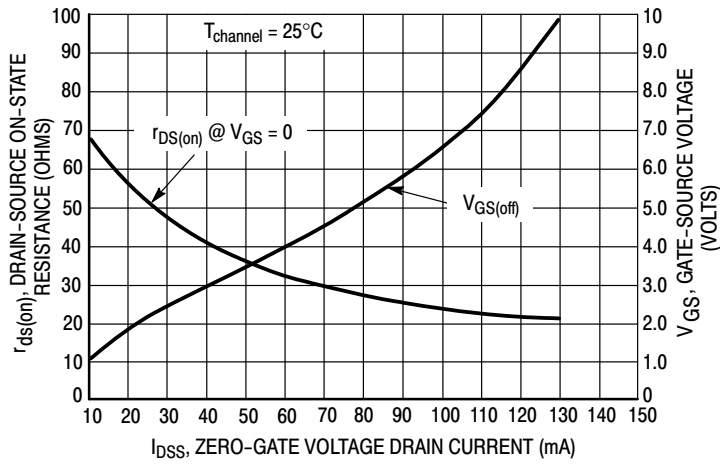


Figure 10. Effect of I_{DSS} On Drain-Source Resistance and Gate-Source Voltage

NOTE 2

The Zero-Gate-Voltage Drain Current (I_{DSS}), is the principle determinant of other J-FET characteristics. Figure 10 shows the relationship of Gate-Source Off Voltage ($V_{GS(off)}$) and Drain-Source On Resistance ($r_{ds(on)}$) to I_{DSS} . Most of the devices will be within $\pm 10\%$ of the values shown in Figure 10. This data will be useful in predicting the characteristic variations for a given part number.

For example:

Unknown

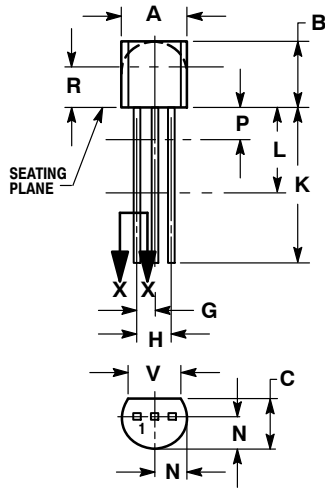
$r_{ds(on)}$ and V_{GS} range for an MPF4392

The electrical characteristics table indicates that an MPF4392 has an I_{DSS} range of 25 to 75 mA. Figure 10 shows $r_{ds(on)} = 52 \Omega$ for $I_{DSS} = 25$ mA and 30Ω for $I_{DSS} = 75$ mA. The corresponding V_{GS} values are 2.2 V and 4.8 V.

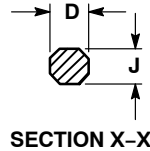
MPF4392, MPF4393

PACKAGE DIMENSIONS

TO-92 (TO-226)
CASE 29-11
ISSUE AM



STRAIGHT LEAD
BULK PACK



SECTION X-X

NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.175	0.205	4.45	5.20
B	0.170	0.210	4.32	5.33
C	0.125	0.165	3.18	4.19
D	0.016	0.021	0.407	0.533
G	0.045	0.055	1.15	1.39
H	0.095	0.105	2.42	2.66
J	0.015	0.020	0.39	0.50
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	0.115	---	2.93	---
V	0.135	---	3.43	---

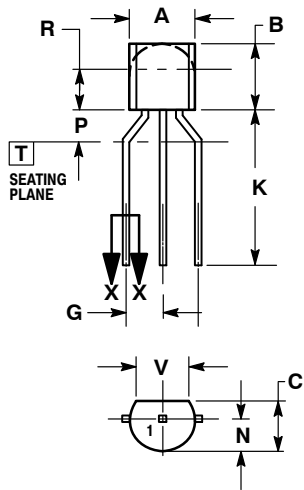
STYLE 5:

- PIN 1. DRAIN
- SOURCE
- GATE

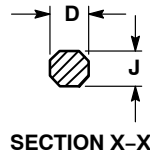
NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

DIM	MILLIMETERS	
	MIN	MAX
A	4.45	5.20
B	4.32	5.33
C	3.18	4.19
D	0.40	0.54
G	2.40	2.80
J	0.39	0.50
K	12.70	---
N	2.04	2.66
P	1.50	4.00
R	2.93	---
V	3.43	---



BENT LEAD
TAPE & REEL
AMMO PACK



SECTION X-X

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: 81-3-5817-1050

ON Semiconductor Website: www.onsemi.com
Order Literature: <http://www.onsemi.com/orderlit>

For additional information, please contact your local Sales Representative