

NTD30N02

Power MOSFET 30 Amps, 24 Volts

N-Channel DPAK

Designed for low voltage, high speed switching applications in power supplies, converters and power motor controls and bridge circuits.

Features

- Pb-Free Packages are Available

Typical Applications

- Power Supplies
- Converters
- Power Motor Controls
- Bridge Circuits

MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	Value	Unit
Drain-to-Source Voltage	V_{DS}	24	Vdc
Gate-to-Source Voltage – Continuous	V_{GS}	± 20	Vdc
Drain Current			Adc
– Continuous @ $T_A = 25^\circ\text{C}$	I_D	30	
– Single Pulse ($t_p \leq 10 \mu\text{s}$)	I_{DM}	100	Apk
Total Power Dissipation @ $T_A = 25^\circ\text{C}$	P_D	75	W
Operating and Storage Temperature Range	T_J, T_{stg}	-55 to 150	$^\circ\text{C}$
Single Pulse Drain-to-Source Avalanche Energy – Starting $T_J = 25^\circ\text{C}$ ($V_{DD} = 24 \text{ Vdc}$, $V_{GS} = 10 \text{ Vdc}$, $L = 1.0 \text{ mH}$, $I_L(pk) = 10 \text{ A}$, $R_G = 25 \Omega$)	E_{AS}	50	mJ
Thermal Resistance			$^\circ\text{C/W}$
– Junction-to-Case	$R_{\theta JC}$	1.65	
– Junction-to-Ambient (Note 1)	$R_{\theta JA}$	67	
– Junction-to-Ambient (Note 2)	$R_{\theta JA}$	120	
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	T_L	260	$^\circ\text{C}$

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. When surface mounted to an FR4 board using 1 in. pad size, (Cu Area 1.127 sq in).
2. When surface mounted to an FR4 board using minimum recommended pad size, (Cu Area 0.412 sq in).

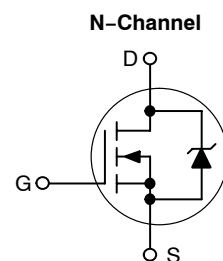


ON Semiconductor®

<http://onsemi.com>

**30 AMPERES
24 VOLTS**

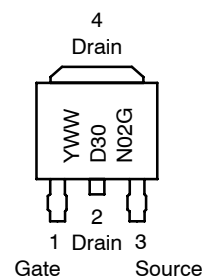
$R_{DS(on)} = 11.2 \text{ m}\Omega$ (Typ.)



MARKING DIAGRAM



**DPAK
CASE 369C
STYLE 2**



D30N02 = Device Code
Y = Year
WW = Work Week
G = Pb-Free Device

ORDERING INFORMATION

Device	Package	Shipping†
NTD30N02	DPAK	75 Units/Rail
NTD30N02G	DPAK (Pb-Free)	75 Units/Rail
NTD30N02T4	DPAK	2500 Tape & Reel
NTD30N02T4G	DPAK (Pb-Free)	2500 Tape & Reel

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

NTD30N02

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Drain-to-Source Breakdown Voltage (Note 3) (V _{GS} = 0 Vdc, I _D = 250 μAdc)	V _{(BR)DSS}	24	26.5	–	Vdc
Temperature Coefficient (Positive)		–	25.5	–	mV/°C
Zero Gate Voltage Drain Current (V _{DS} = 20 Vdc, V _{GS} = 0 Vdc) (V _{DS} = 24 Vdc, V _{GS} = 0 Vdc) (V _{DS} = 20 Vdc, V _{GS} = 0 Vdc, T _J = 125°C)	I _{DSS}	–	–	0.8 1.0 10	μAdc
Gate-Body Leakage Current (V _{GS} = ±20 Vdc, V _{DS} = 0 Vdc)	I _{GSS}	–	–	±100	nAdc

ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage (Note 3) (V _{DS} = V _{GS} , I _D = 250 μAdc)	V _{GS(th)}	1.0	2.1	3.0	Vdc
Threshold Temperature Coefficient (Negative)		–	–4.1	–	mV/°C
Static Drain-to-Source On-Resistance (Note 3) (V _{GS} = 10 Vdc, I _D = 30 Adc) (V _{GS} = 10 Vdc, I _D = 20 Adc) (V _{GS} = 4.5 Vdc, I _D = 15 Adc)	R _{DS(on)}	–	– 11.2 20	14.5 14.5 24	mΩ
Forward Transconductance (Note 3) (V _{DS} = 10 Vdc, I _D = 15 Adc)	g _{FS}	–	20	–	mhos

DYNAMIC CHARACTERISTICS

Input Capacitance	(V _{DS} = 20 Vdc, V _{GS} = 0 Vdc, f = 1.0 MHz)	C _{iss}	–	1000	–	pF
Output Capacitance		C _{oss}	–	425	–	
Transfer Capacitance		C _{rss}	–	175	–	

SWITCHING CHARACTERISTICS (Note 4)

Turn-On Delay Time	(V _{DD} = 20 Vdc, I _D = 30 Adc, V _{GS} = 10 Vdc, R _G = 2.5 Ω)	t _{d(on)}	–	7.0	15	ns
Rise Time		t _r	–	28	55	
Turn-Off Delay Time		t _{d(off)}	–	22	35	
Fall Time		t _f	–	12	20	
Turn-On Delay Time	(V _{DD} = 20 Vdc, I _D = 15 Adc, V _{GS} = 4.5 Vdc, R _G = 2.5 Ω)	t _{d(on)}	–	12.5	–	ns
Rise Time		t _r	–	115	–	
Turn-Off Delay Time		t _{d(off)}	–	15	–	
Fall Time		t _f	–	17	–	
Gate Charge	(V _{DS} = 20 Vdc, I _D = 30 Adc, V _{GS} = 4.5 Vdc) (Note 3)	Q _T	–	14.4	20	nC
		Q ₁	–	4.0	–	
		Q ₂	–	8.5	–	

SOURCE-DrAIN DIODE CHARACTERISTICS

Forward On-Voltage	(I _S = 15 Adc, V _{GS} = 0 Vdc) (I _S = 30 Adc, V _{GS} = 0 Vdc) (Note 3) (I _S = 15 Adc, V _{GS} = 0 Vdc, T _J = 125°C)	V _{SD}	– – –	0.95 1.10 0.80	1.2 – –	Vdc
Reverse Recovery Time	(I _S = 30 Adc, V _{GS} = 0 Vdc, dI _S /dt = 100 A/μs) (Note 3)	t _{rr}	–	30	–	ns
		t _a	–	14.5	–	
		t _b	–	15.5	–	
Reverse Recovery Stored Charge		Q _{RR}	–	0.013	–	μC

3. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

4. Switching characteristics are independent of operating junction temperatures.

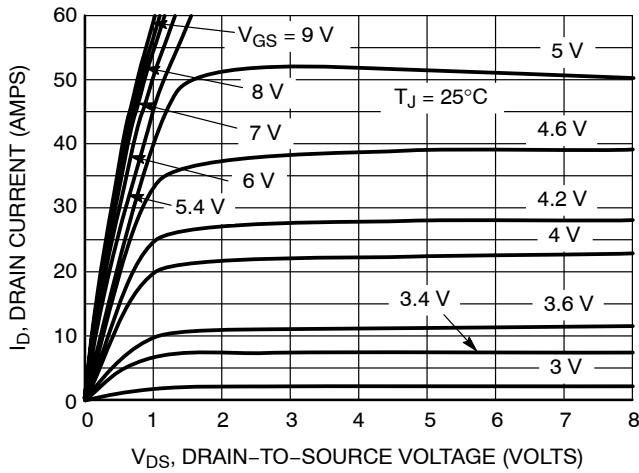


Figure 1. On-Region Characteristics

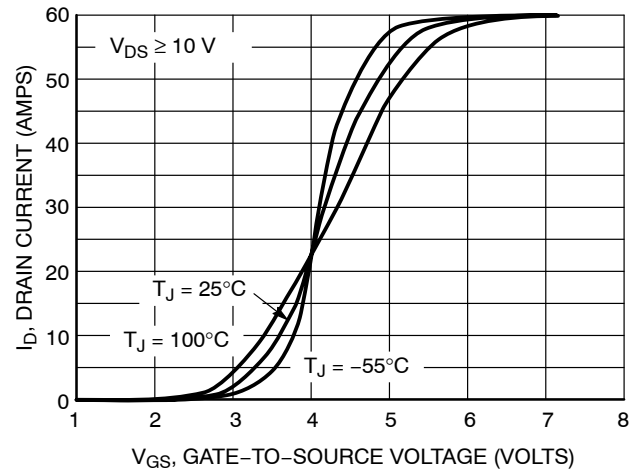


Figure 2. Transfer Characteristics

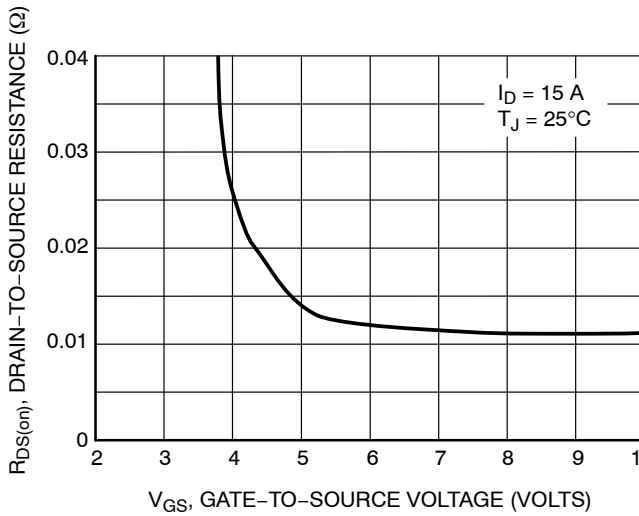


Figure 3. On-Resistance versus Gate-to-Source Voltage

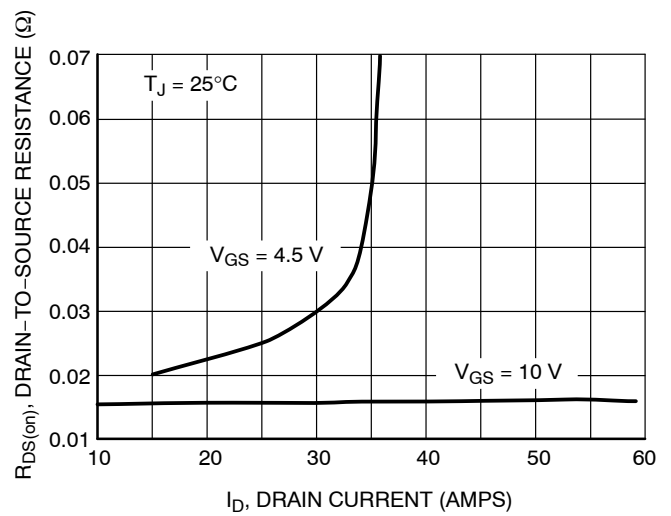


Figure 4. On-Resistance versus Drain Current and Gate Voltage

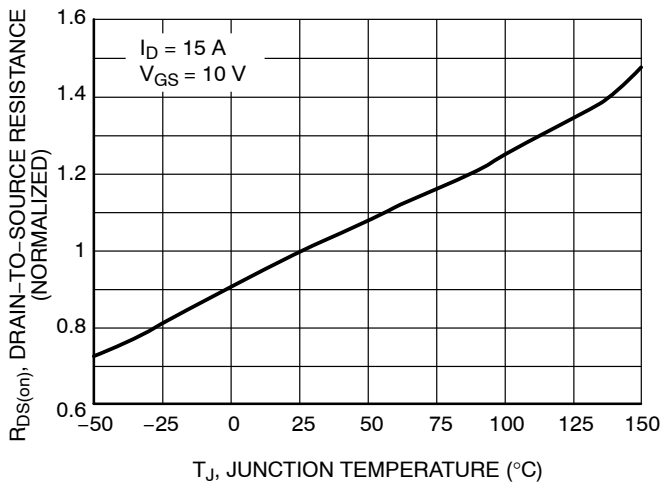


Figure 5. On-Resistance Variation with Temperature

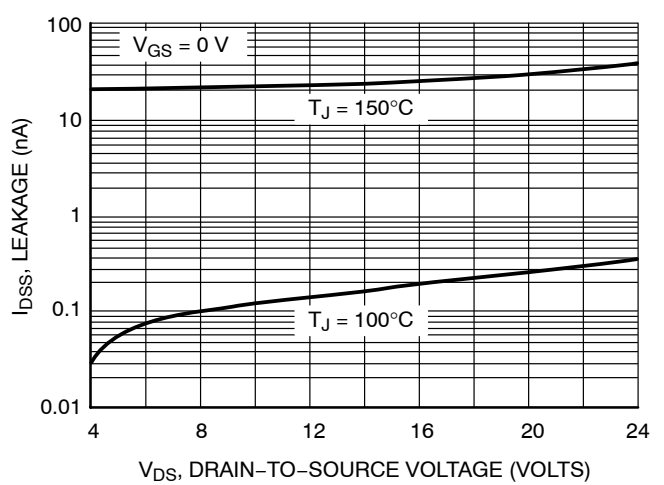


Figure 6. Drain-to-Source Leakage Current versus Voltage

NTD30N02

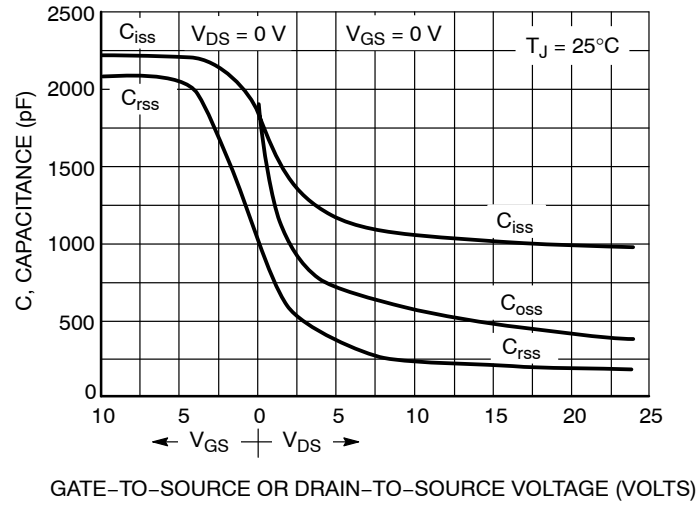


Figure 7. Capacitance Variation

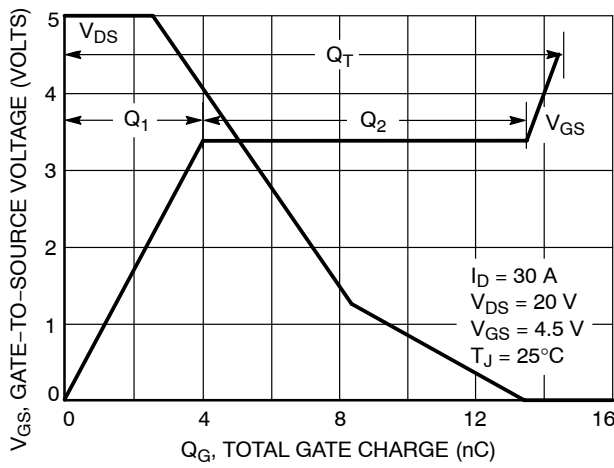


Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

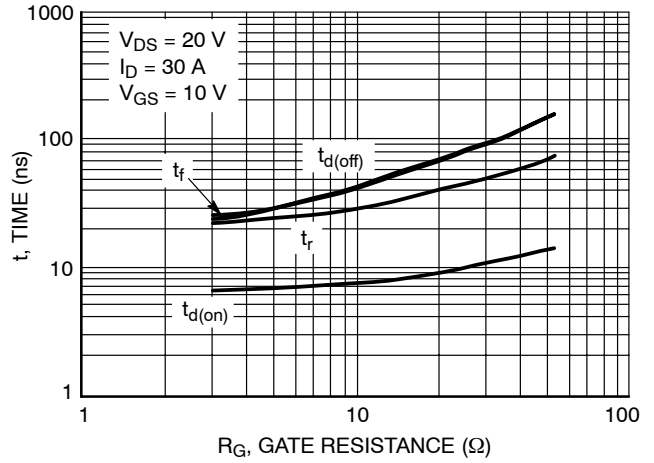


Figure 9. Resistive Switching Time Variation versus Gate Resistance

DRAIN-TO-SOURCE DIODE CHARACTERISTICS

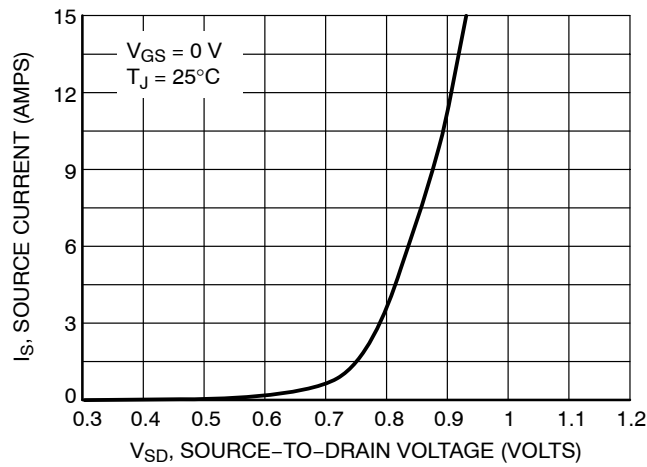
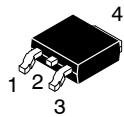


Figure 10. Diode Forward Voltage versus Current

MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

ON Semiconductor®

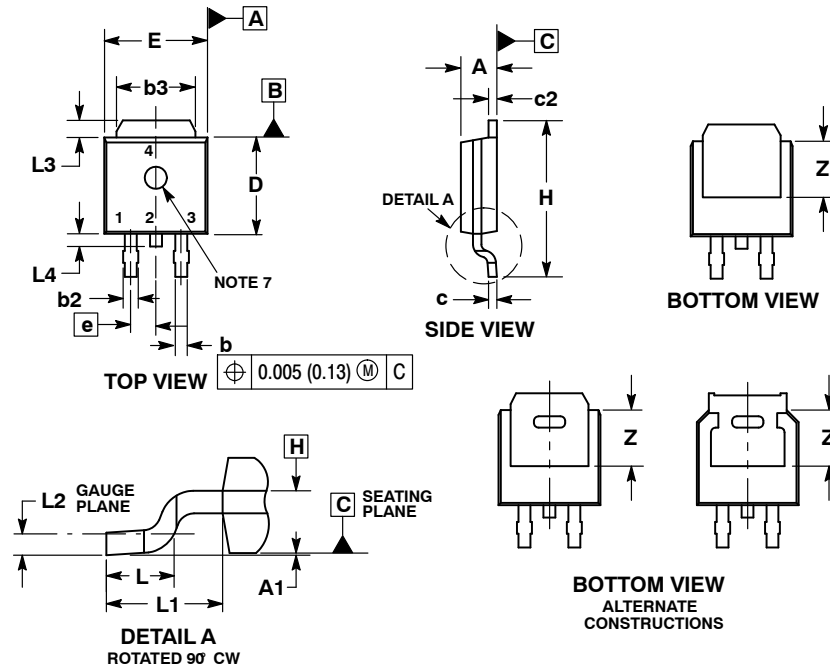
ON



SCALE 1:1

DPAK (SINGLE GAUGE) CASE 369C ISSUE F

DATE 21 JUL 2015

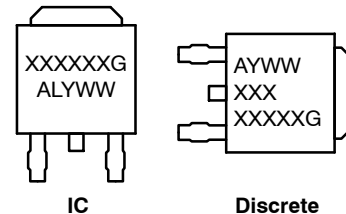


NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
3. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS b3, L3 and Z.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.006 INCHES PER SIDE.
5. DIMENSIONS D AND E ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
6. DATUMS A AND B ARE DETERMINED AT DATUM PLANE H.
7. OPTIONAL MOLD FEATURE.

DIM	MIN	MAX	MIN	MAX
A	0.086	0.094	2.18	2.38
A1	0.000	0.005	0.00	0.13
b	0.025	0.035	0.63	0.89
b2	0.028	0.045	0.72	1.14
b3	0.180	0.215	4.57	5.46
c	0.018	0.024	0.46	0.61
c2	0.018	0.024	0.46	0.61
D	0.235	0.245	5.97	6.22
E	0.250	0.265	6.35	6.73
e	0.090 BSC		2.29 BSC	
H	0.370	0.410	9.40	10.41
L	0.055	0.070	1.40	1.78
L1	0.114 REF		2.90 REF	
L2	0.020 BSC		0.51 BSC	
L3	0.035	0.050	0.89	1.27
L4	---	0.040	---	1.01
Z	0.155	---	3.93	---

GENERIC MARKING DIAGRAM*

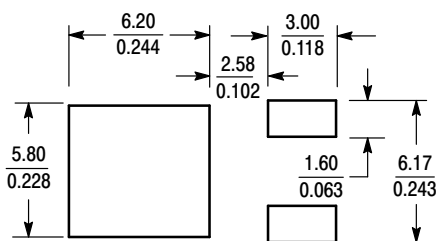


XXXXXX = Device Code
A = Assembly Location
L = Wafer Lot
Y = Year
WW = Work Week
G = Pb-Free Package

*This information is generic. Please refer to device data sheet for actual part marking.

- STYLE 1:**
PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR
- STYLE 2:**
PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN
- STYLE 3:**
PIN 1. ANODE
2. CATHODE
3. ANODE
4. CATHODE
- STYLE 4:**
PIN 1. CATHODE
2. ANODE
3. GATE
4. ANODE
- STYLE 5:**
PIN 1. GATE
2. ANODE
3. CATHODE
4. ANODE
- STYLE 6:**
PIN 1. MT1
2. MT2
3. GATE
4. MT2
- STYLE 7:**
PIN 1. GATE
2. COLLECTOR
3. EMITTER
4. COLLECTOR
- STYLE 8:**
PIN 1. N/C
2. CATHODE
3. ANODE
4. CATHODE
- STYLE 9:**
PIN 1. ANODE
2. CATHODE
3. RESISTOR ADJUST
4. CATHODE
- STYLE 10:**
PIN 1. CATHODE
2. ANODE
3. CATHODE
4. ANODE

SOLDERING FOOTPRINT*



SCALE 3:1 (mm inches)

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

DOCUMENT NUMBER:	98AON10527D	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	DPAK (SINGLE GAUGE)	PAGE 1 OF 1

ON Semiconductor and ON are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor 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. ON Semiconductor 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. **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.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

Email Requests to: orderlit@onsemi.com

onsemi Website: www.onsemi.com

TECHNICAL SUPPORT

North American Technical Support:

Voice Mail: 1 800-282-9855 Toll Free USA/Canada

Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support:

Phone: 00421 33 790 2910

For additional information, please contact your local Sales Representative