ISL9R460PF2

4 A, 600 V, STEALTH™ Diode

ON Semiconductor®

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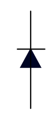
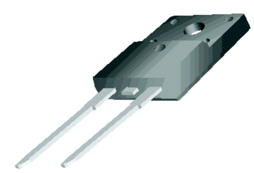




TO−220, 2−Lead
CASE 221AS

Description

The ISL9R460PF2 is a STEALTH diode optimized for low loss performance in high frequency hard switched applications. The STEALTH family exhibits low reverse recovery current (I_{RR}) and exceptionally soft recovery under typical operating conditions. This device is intended for use as a free wheeling or boost diode in power supplies and other power switching applications. The low I_{RR} and short ta phase reduce loss in switching transistors. The soft recovery minimizes ringing, expanding the range of conditions under which the diode may be operated without the use of additional snubber circuitry. Consider using the STEALTH diode with an SMPS IGBT to provide the most efficient and highest power density design at lower cost.

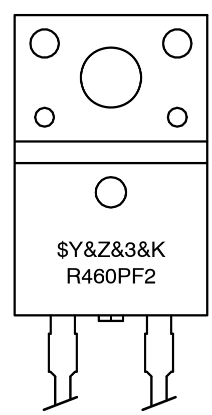
Features

- Ultrafast Recovery, t_{RR} = 17 ns (@ I_F = 4 A)
- Max Forward Voltage, V_F = 2.4 V (@ T_C = 25°C)
- 600 V Reverse Voltage and High Reliability
- Avalanche Energy Rated
- This Device is Pb−Free and is RoHS Compliant

Applications

- SMPS
- Hard Switched PFC Boost Diode
- UPS Free Wheeling Diode
- Motor Drive FWD
- SMPS FWD
- Snubber Diode

MARKING DIAGRAM



$Y	= ON Semiconductor Logo
&Z&3	= Data Code (Year & Week)
&K	= Lot
R460PF2	= Specific Device Code

ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

DEVICE MAXIMUM RATINGS T_C = 25°C unless otherwise noted

Symbol	Parameter	Rating	Unit
V_{RRM}	Peak Repetitive Reverse Voltage	600	V
V_{RWM}	Working Peak Reverse Voltage	600	V
V_R	DC Blocking Voltage	600	V
$I_{F(AV)}$	Average Rectified Forward Current (T_C = 108°C)	4	A
I_{FRM}	Repetitive Peak Surge Current (20 kHz Square Wave)	8	A
I_{FSM}	Nonrepetitive Peak Surge Current (Halfwave 1 Phase 60 Hz)	50	A
P_D	Power Dissipation	22	W
E_{AVL}	Avalanche Energy (0.5 A, 80 mH)	10	mJ
T_J, T_{STG}	Operating and Storage Temperature Range	−55 to 175	°C
T_L T_{PKG}	Maximum Temperature for Soldering Leads at 0.063in (1.6 mm) from Case for 10s Package Body for 10s, See Techbrief TB334	300 260	°C °C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

PACKAGE MARKING AND ORDERING INFORMATION

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
ISL9R460PF2	R460PF2	TO−220F−2L	Tube	N/A	N/A	50

ELECTRICAL CHARACTERISTICS T_C = 25°C unless otherwise noted

Parameter		Conditions		Min	Typ	Max	Unit
OFF STATE CHARACTERISTICS							
I_R	Instantaneous Reverse Current	V_R = 600 V	T_C = 25°C	–	–	100	μA
			T_C = 125°C	–	–	1.0	mA
ON STATE CHARACTERISTICS							
V_F	Instantaneous Forward Voltage	I_F = 4 A	T_C = 25°C	–	2.0	2.4	V
			T_C = 125°C	–	1.6	2.0	V
DYNAMIC CHARACTERISTICS							
C_J	Junction Capacitance	V_R = 10 V, I_F = 0 A		–	19	–	pF
SWITCHING CHARACTERISTICS							
t_{RR}	Reverse Recovery Time	I_F = 1 A, di_F/dt = 100 A/μs, V_R = 30 V		–	17	20	ns
		I_F = 4 A, dI_F/dt = 100 A/μs, V_R = 30 V		–	19	22	ns
t_{RR}	Reverse Recovery Time	I_F = 4 A, di_F/dt = 200 A/μs, V_R = 390 V, T_C = 25°C		–	17	–	ns
I_{RR}	Reverse Recovery Current			–	2.6	–	A
Q_{RR}	Reverse Recovered Charge			–	22	–	nC
t_{RR}	Reverse Recovery Time	I_F = 4 A, di_F/dt = 200 A/μs, V_R = 390 V, T_C = 125°C		–	77	–	ns
S	Softness Factor (t_b/t_a)			–	4.2	–	
I_{RR}	Reverse Recovery Current			–	2.8	–	A
Q_{RR}	Reverse Recovered Charge			–	100	–	nC

ELECTRICAL CHARACTERISTICS T_C = 25°C unless otherwise noted (continued)

Parameter		Conditions	Min	Typ	Max	Unit
SWITCHING CHARACTERISTICS						
t_{RR}	Reverse Recovery Time	I_F = 4 A, di_F/dt = 400 A/μs, V_R = 390 V, T_C = 125°C	–	54	–	ns
S	Softness Factor (t_b/t_a)		–	3.5	–	
I_{RR}	Reverse Recovery Current		–	4.3	–	A
Q_{RR}	Reverse Recovered Charge			110	–	nC
dI_M/dt	Maximum di/dt during t_b		–	500	–	A/μs
THERMAL CHARACTERISTICS						
$R_{\theta JC}$	Thermal Resistance Junction to Case		–	–	5.7	°C/W
$R_{\theta JA}$	Thermal Resistance Junction to Ambient	TO−220F	–	–	70	°C/W

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

TYPICAL PERFORMANCE CURVES

T_C = 25°C unless otherwise noted

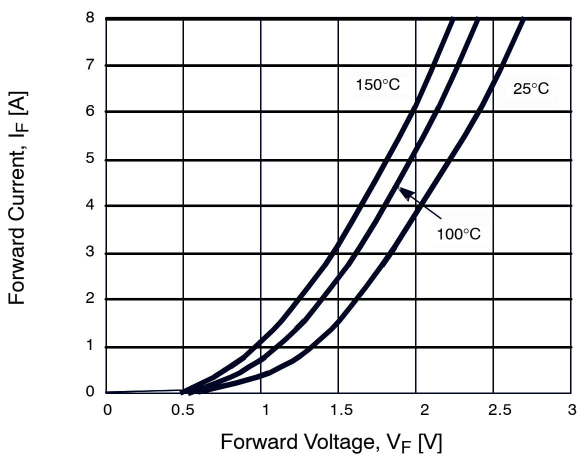


Figure 1. Forward Current vs Forward Voltage

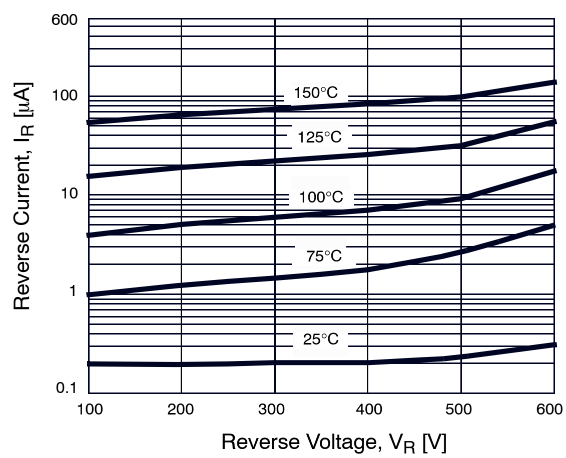


Figure 2. Reverse Current vs Reverse Voltage

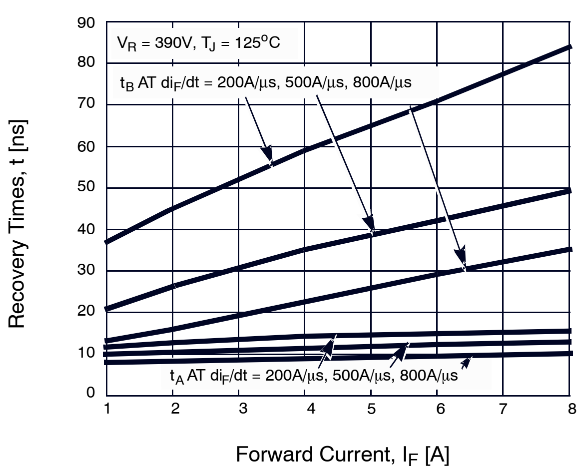


Figure 3. t_A and t_B Curves vs Forward Current

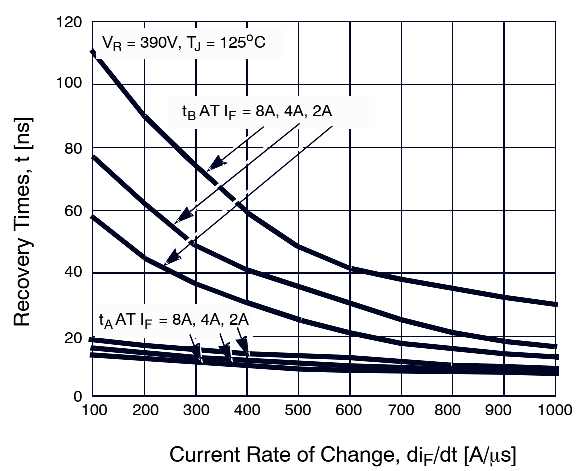


Figure 4. t_A and t_B Curves vs di_F/dt

TYPICAL PERFORMANCE CURVES (continued)

T_C = 25°C unless otherwise noted

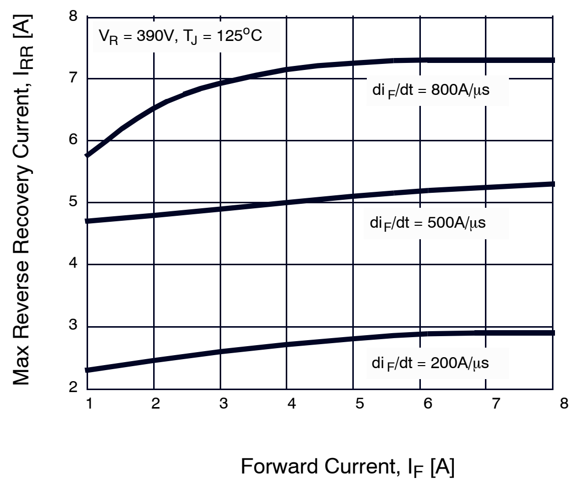


Figure 5. Maximum Reverse Recovery Current vs Forward Current

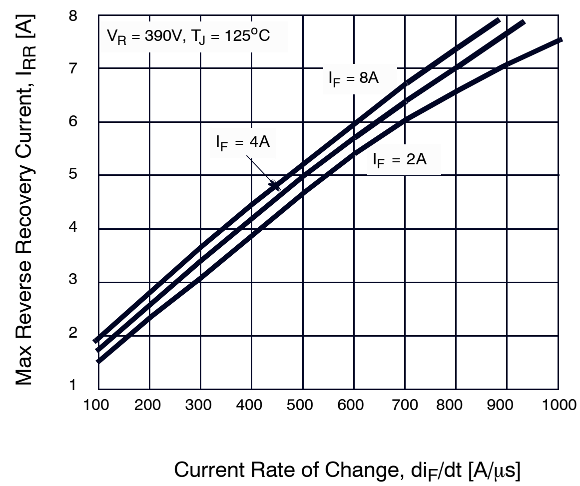


Figure 6. Maximum Reverse Recovery Current vs di_F/dt

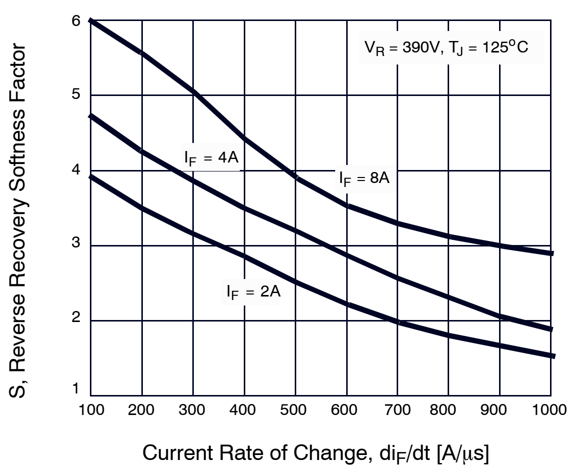


Figure 7. Reverse Recovery Softness vs di_F/dt

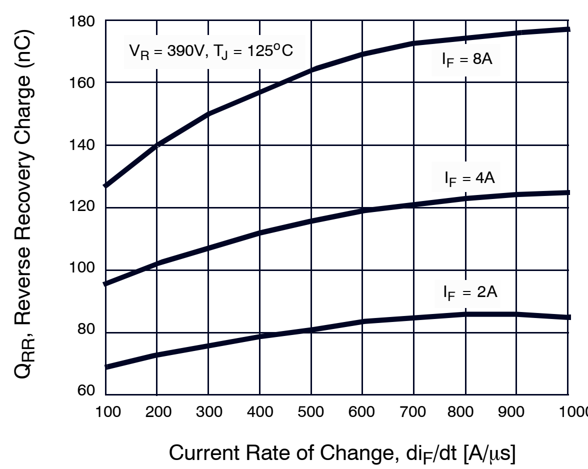


Figure 8. Reverse Recovery Charge vs di_F/dt

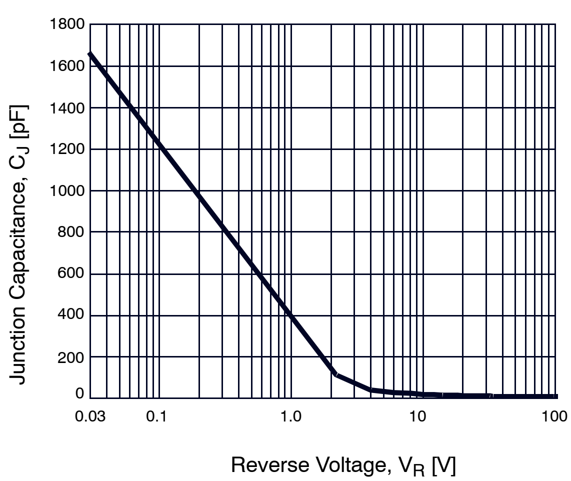


Figure 9. Junction Capacitance vs Reverse Voltage

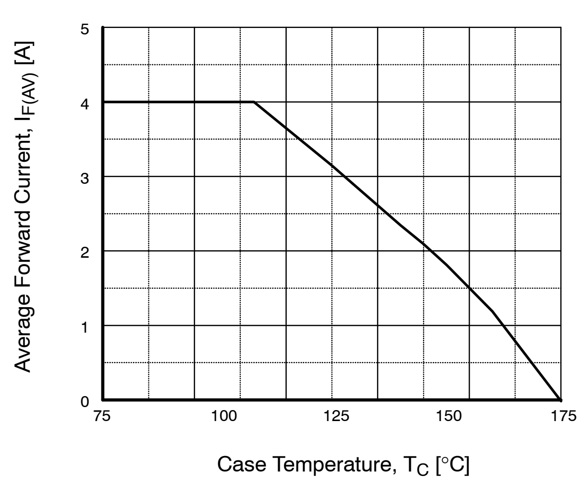


Figure 10. DC Current Derating Curve

TYPICAL PERFORMANCE CURVES (continued)

T_C = 25°C unless otherwise noted

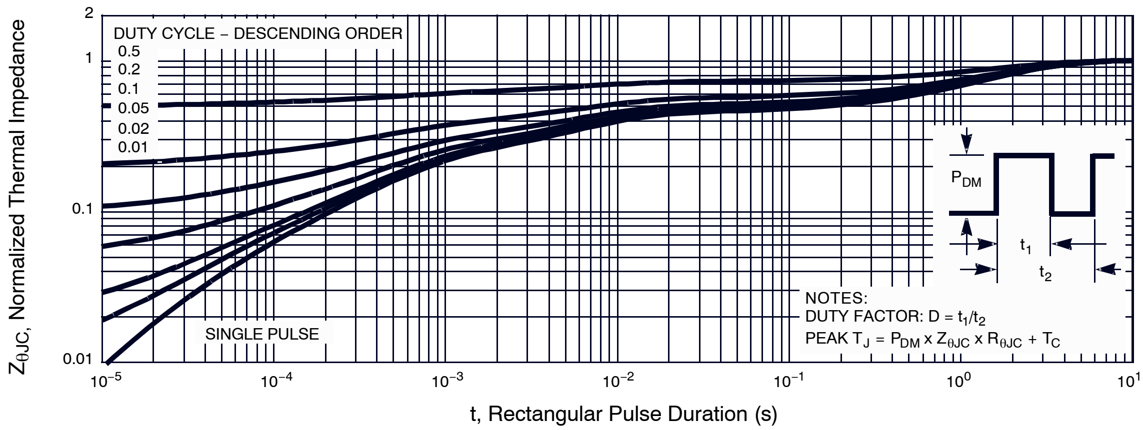


Figure 11. Normalized Maximum Transient Thermal Impedance

TEST CIRCUIT AND WAVEFORMS

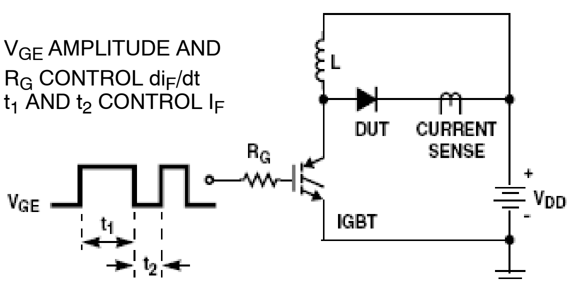


Figure 12. It$_{RR}$ Test Circuit

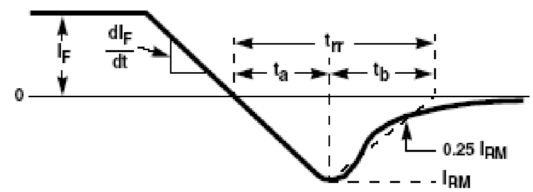


Figure 13. t$_{RR}$ Waveforms and Definitions

I = 0.5 A
L = 80 mH
R < 0.1 Ω
V_{DD} = 200 V
$E_{AVL} = 1/2LI^2[V_{R(AVL)} / (V_{R(AVL)} - V_{DD})]$
Q_1 = IGBT (B_{VCES} > DUT $V_{R(AVL)}$)

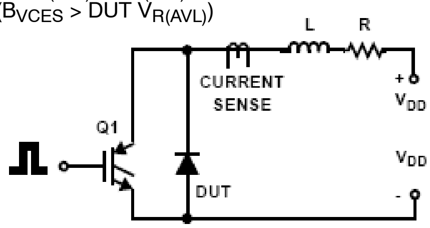


Figure 14. Avalanche Energy Test Circuit

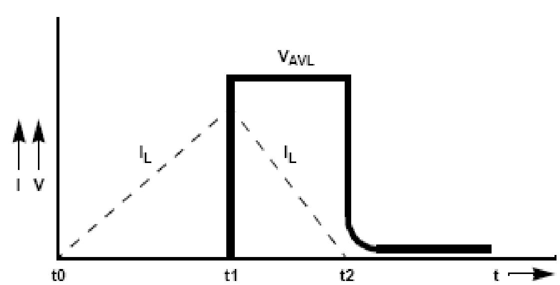


Figure 15. Avalanche Current and Voltage Waveforms

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TO−220 Fullpack, 2−Lead / TO−220F−2FS
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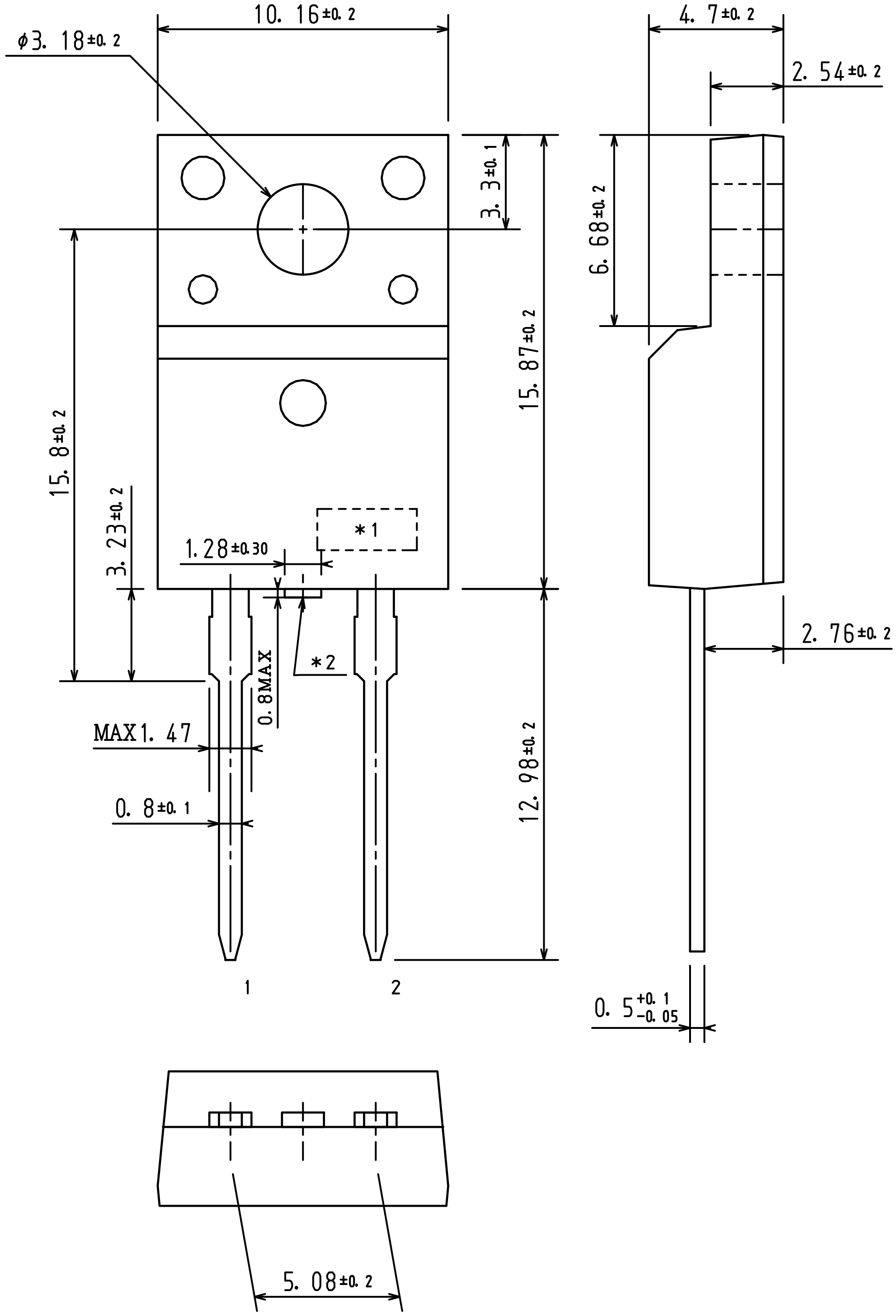

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PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Email Requests to: orderlit@onsemi.com

ON Semiconductor 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