

ISL9R1560PF2

15 A, 600 V, STEALTH Diode

Description

The ISL9R1560PF2 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

- Stealth Recovery, $t_{rr} = 29.4$ ns (@ $I_F = 15$ A)
- Max. Forward Voltage, $V_F = 2.2$ V (@ $T_C = 25^\circ\text{C}$)
- 600 V Reverse Voltage and High Reliability
- Avalanche Energy Rated
- These Devices are Pb-Free and are RoHS Compliant

Applications

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

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

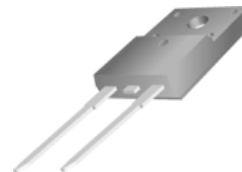
Rating	Symbol	Value	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	600	V
Working Peak Reverse Voltage	V_{RWM}	600	V
DC Blocking Voltage	V_R	600	V
Average Rectified Forward Current ($T_C = 25^\circ\text{C}$)	$I_{F(AV)}$	15	A
Repetitive Peak Surge Current (20 kHz Square Wave)	I_{FRM}	30	A
Nonrepetitive Peak Surge Current (Halfwave 1 Phase 60 Hz)	I_{FSM}	200	A
Power Dissipation	P_D	37	W
Avalanche Energy (1 A, 40 mH)	E_{AVL}	20	mJ
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to 175	$^\circ\text{C}$
Maximum Temperature for Soldering Leads at 0.063 in (1.6 mm) from Case for 10s	T_L	300	$^\circ\text{C}$

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.



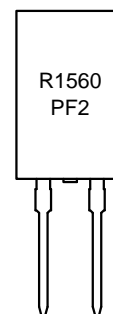
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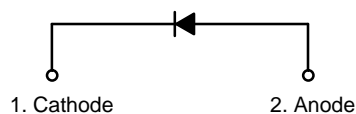


TO-220F
2 LEAD
CASE 221AS

MARKING DIAGRAM



R1560PF2 = Specific Device Marking



ORDERING INFORMATION

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

ISL9R1560PF2

PACKAGE MARKING AND ORDERING INFORMATION

Part Number	Top Marking	Package	Tape Width	Quantity
ISL9R1560PF2	R1560PF2	TO-220F-2L	N/A	50 Units

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
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OFF STATE CHARACTERISTICS

I_R	Instantaneous Reverse Current	$V_R = 600\text{ V}, T_C = 25^\circ\text{C}$	–	–	100	μA
		$V_R = 600\text{ V}, T_C = 125^\circ\text{C}$	–	–	1.0	mA

ON STATE CHARACTERISTICS

V_F	Instantaneous Forward Voltage	$I_F = 15\text{ A}, T_C = 25^\circ\text{C}$	–	1.8	2.2	V
		$I_F = 15\text{ A}, T_C = 125^\circ\text{C}$	–	1.65	2.0	V

DYNAMIC CHARACTERISTICS

C_J	Junction Capacitance	$I_F = 0\text{ A}, V_R = 10\text{ V}$	–	62	–	pF
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SWITCHING CHARACTERISTICS

t_{rr}	Reverse Recovery Time	$I_F = 1\text{ A}, di_F/dt = 100\text{ A}/\mu\text{s}, V_R = 30\text{ V}$	–	25	30	ns
		$I_F = 15\text{ A}, di_F/dt = 100\text{ A}/\mu\text{s}, V_R = 30\text{ V}$	–	35	40	ns
t_{rr}	Reverse Recovery Time	$I_F = 15\text{ A}, di_F/dt = 200\text{ A}/\mu\text{s}, V_R = 390\text{ V}, T_C = 25^\circ\text{C}$	–	29.4	–	ns
I_{rr}	Maximum Reverse Recovery Current		–	3.5	–	A
Q_{rr}	Reverse Recovered Charge		–	57	–	nC
t_{rr}	Reverse Recovery Time	$I_F = 15\text{ A}, di_F/dt = 200\text{ A}/\mu\text{s}, V_R = 390\text{ V}, T_C = 125^\circ\text{C}$	–	90	–	ns
S	Softness Factor (t_b/t_a)		–	2.0	–	
I_{rr}	Maximum Reverse Recovery Current		–	5.0	–	A
Q_{rr}	Reverse Recovered Charge		–	275	–	nC
t_{rr}	Reverse Recovery Time	$I_F = 15\text{ A}, di_F/dt = 800\text{ A}/\mu\text{s}, V_R = 390\text{ V}, T_C = 125^\circ\text{C}$	–	52	–	ns
S	Softness Factor (t_b/t_a)		–	1.36	–	
I_{rr}	Maximum Reverse Recovery Current		–	13.5	–	A
Q_{rr}	Reverse Recovered Charge		–	390	–	nC
dI_M/dt	Maximum di/dt during t_b		–	800	–	A/ μs

THERMAL CHARACTERISTICS

$R_{\theta JC}$	Thermal Resistance Junction to Case		–	–	4.1	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance Junction to Ambient	TO-247	–	–	70	$^\circ\text{C}/\text{W}$

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.

ISL9R1560PF2

TYPICAL PERFORMANCE CHARACTERISTICS

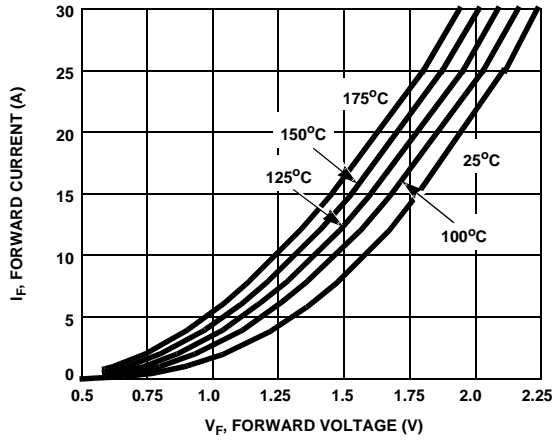


Figure 1. Forward Current vs. Forward Voltage

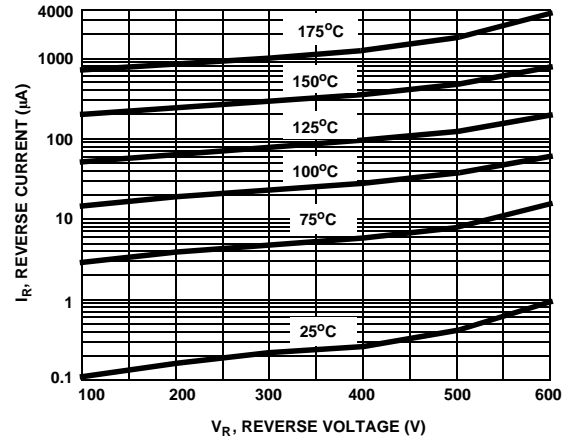


Figure 2. Reverse Current vs. Reverse Voltage

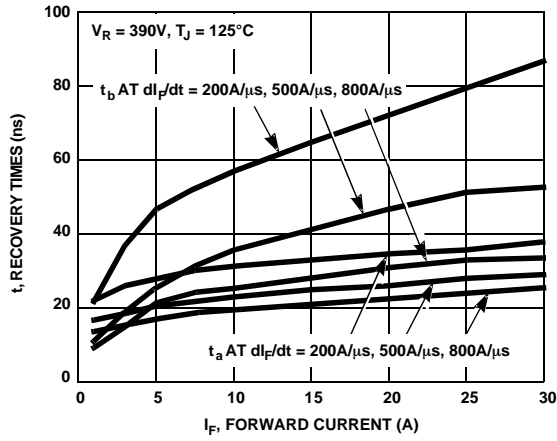


Figure 3. t_a and t_b Curves vs. Forward Current

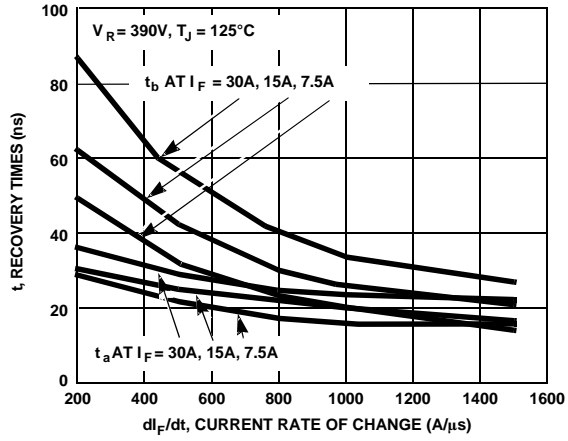


Figure 4. t_a and t_b Curves vs. di_F/dt

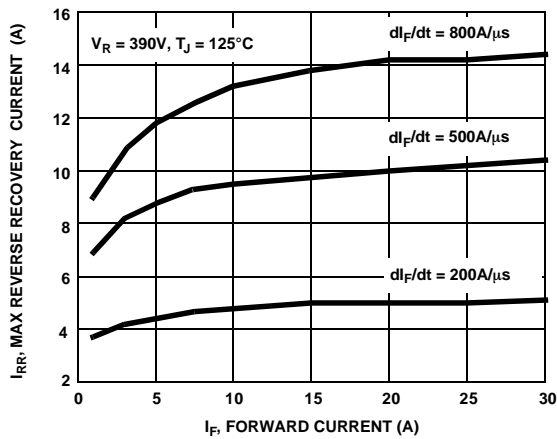


Figure 5. Maximum Reverse Recovery Current vs. Forward Current

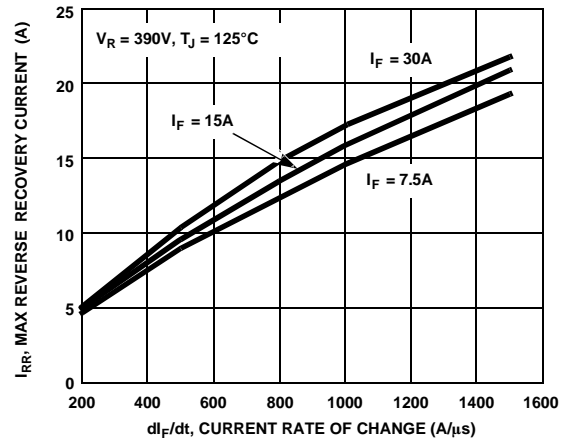


Figure 6. Maximum Reverse Recovery Current vs. di_F/dt

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TYPICAL PERFORMANCE CHARACTERISTICS

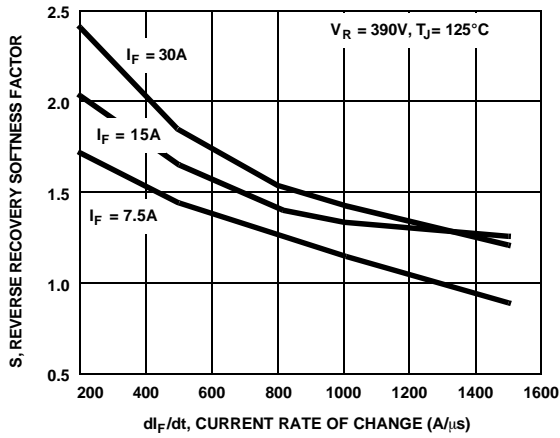


Figure 7. Reverse Recovery Softness Factor vs. di_F/dt

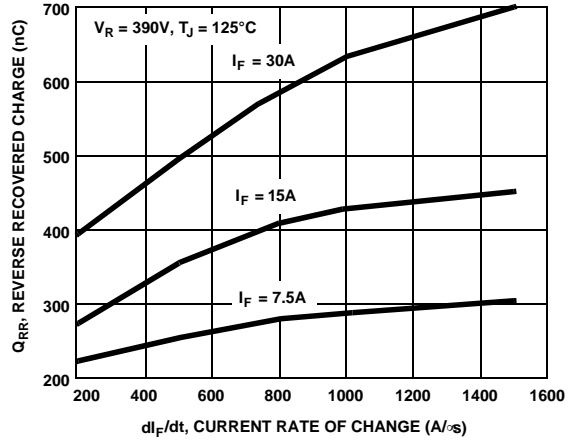


Figure 8. Reverse Recovered Charge vs. di_F/dt

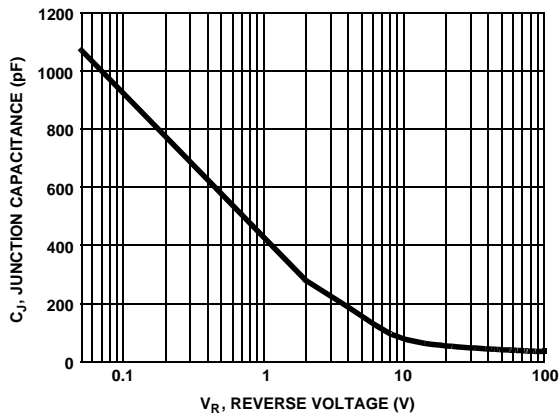


Figure 9. Junction Capacitance vs. Reverse Voltage

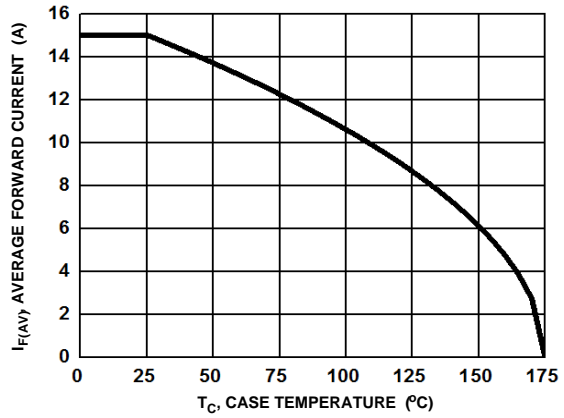


Figure 10. DC Current Derating Curve

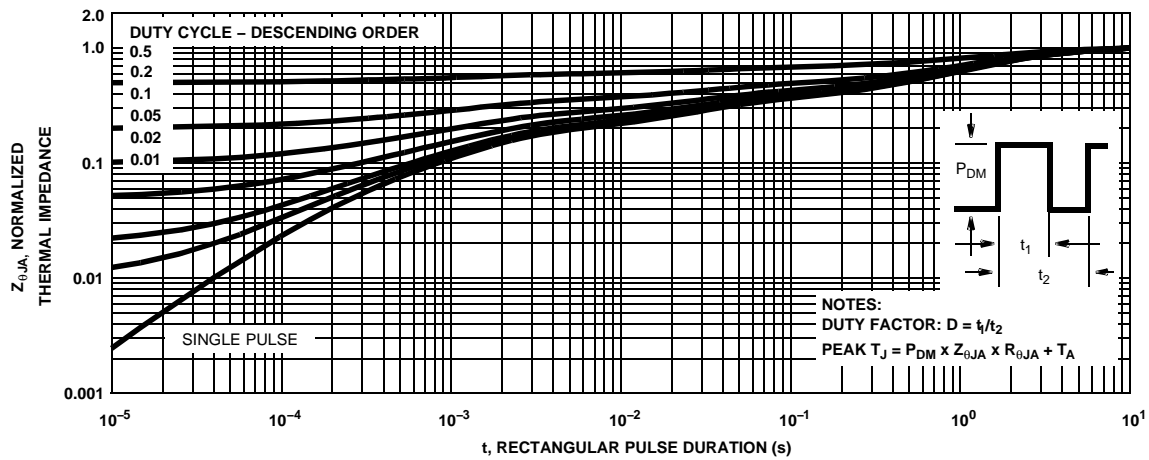


Figure 11. Normalized Maximum Transient Thermal Impedance

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TEST CIRCUIT AND WAVEFORMS

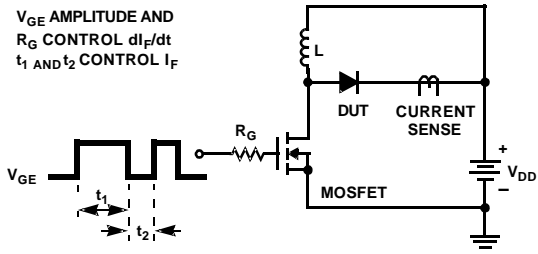


Figure 12. Test Circuit

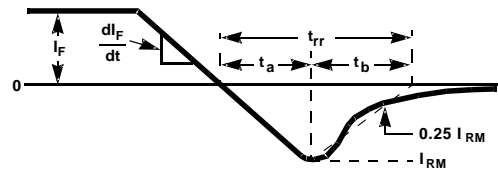


Figure 13. t_{rr} Waveforms and Definitions

$I = 1A$
 $L = 40mH$
 $R < 0.1\Omega$
 $V_{DD} = 50V$
 $E_{AVL} = 1/2LI^2[V_{R(AVL)}(V_{R(AVL)} - V_{DD})]$
 $Q_1 = IGBT (BV_{CES} > DUT V_{R(AVL)})$

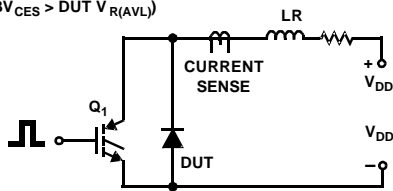


Figure 14. Avalanche Energy Test Circuit

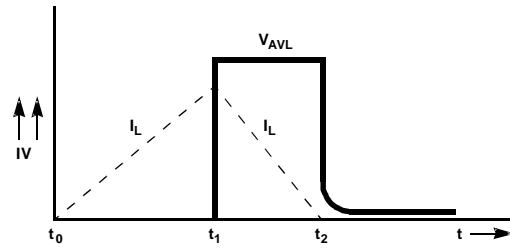


Figure 15. Avalanche Current and Voltage Waveforms

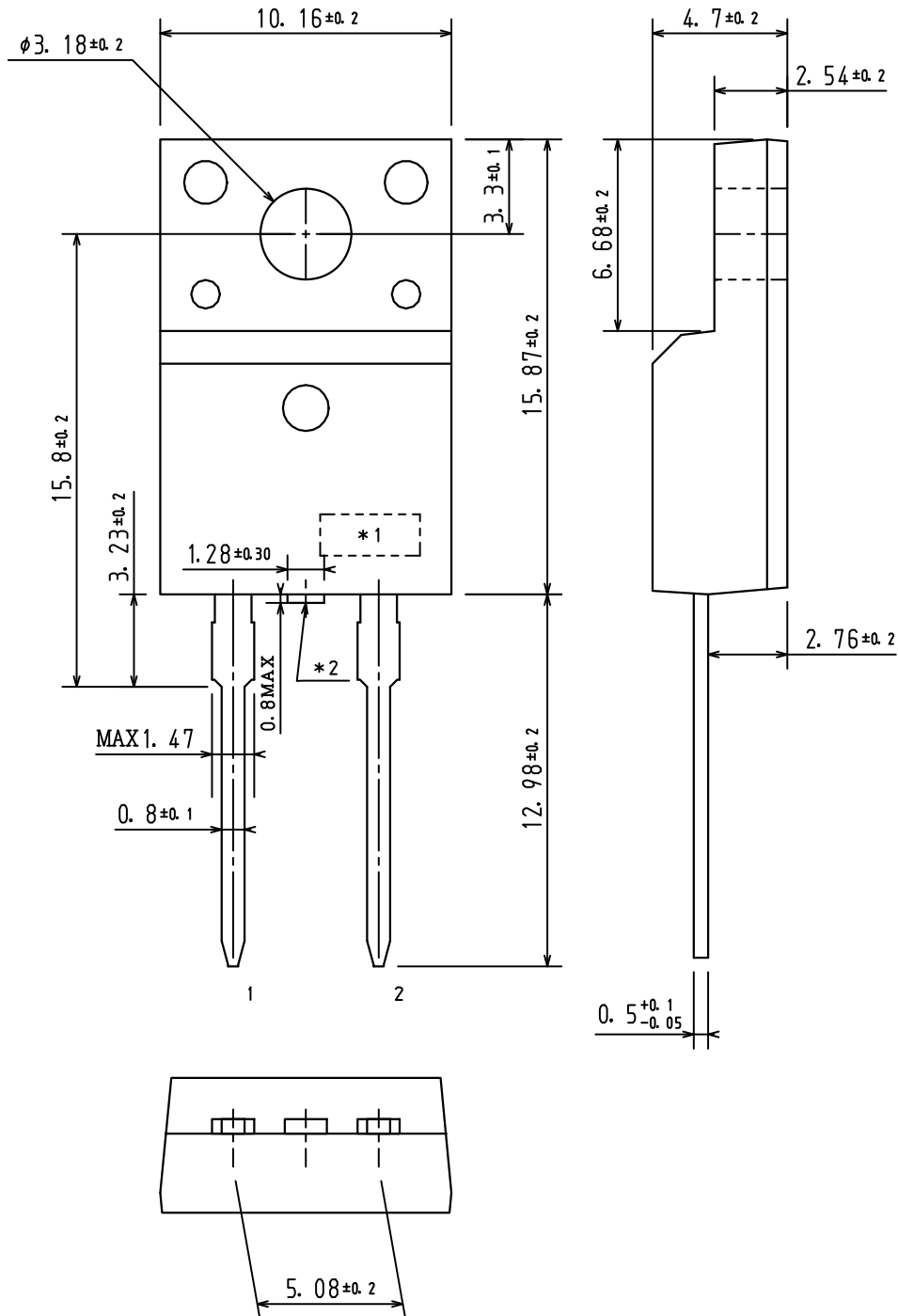
MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

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TO-220 Fullpack, 2-Lead / TO-220F-2FS
CASE 221AS
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