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December 2014

# ISL9R1560P2\_F085

## 15A, 600V Stealth Rectifier

### Features

- High Speed Switching (  $t_{rr}=30\text{ns(Typ.)}$  @  $I_F=15\text{A}$  )
- Low Forward Voltage(  $V_F=2.2\text{V(Max.)}$  @  $I_F=15\text{A}$  )
- Avalanche Energy Rated
- AEC-Q101 Qualified

### Applications

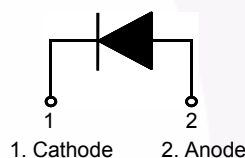
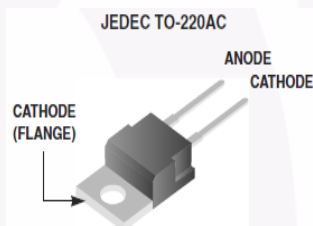
- Automotive DCDC Converter
- Automotive On Board Charger
- Switching Power Supply
- Power Switching Circuits

### Max Ratings (600V, 15A)

The ISL9R1560P2\_F085 is a Stealth™ diode with soft recovery characteristics ( $t_{rr} < 30\text{ns}$ ). It has a low forward-voltage drop and is of silicon nitride passivated, ion-implanted, epitaxial construction.

This device is intended for use as a freewheel/clamping diode in various automotive switching power supplies and other power switching applications. Its low stored charge as well as Stealth™ and soft recovery characteristics minimize ringing and electrical noise while reduce the overall power loss.

### Pin Assignments



### Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted

| Symbol         | Parameter                                                    | Ratings      | Units            |
|----------------|--------------------------------------------------------------|--------------|------------------|
| $V_{RRM}$      | 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 @ $T_C = 25^\circ\text{C}$ | 15           | A                |
| $I_{FSM}$      | Non-repetitive Peak Surge Current (Halfwave 1 Phase 50Hz)    | 45           | A                |
| $E_{AVL}$      | Avalanche Energy (1A, 40mH)                                  | 20           | mJ               |
| $T_J, T_{STG}$ | Operating Junction and Storage Temperature                   | - 55 to +175 | $^\circ\text{C}$ |

### Thermal Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted

| Symbol          | Parameter                                       | Max  | Units              |
|-----------------|-------------------------------------------------|------|--------------------|
| $R_{\theta JC}$ | Maximum Thermal Resistance, Junction to Case    | 0.93 | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | Maximum Thermal Resistance, Junction to Ambient | 62   | $^\circ\text{C/W}$ |

### Package Marking and Ordering Information

| Device Marking | Device           | Package  | Tube | Quantity |
|----------------|------------------|----------|------|----------|
| ISL9R1560P2    | ISL9R1560P2_F085 | TO-220AC | -    | 50       |

# Electrical Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted

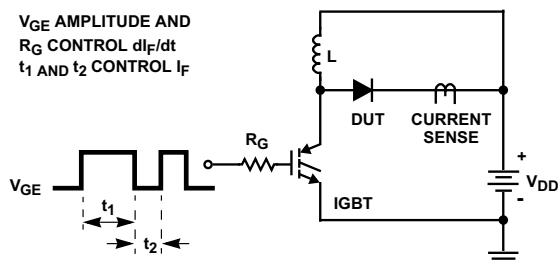
| Symbol     | Parameter                     | Conditions                                                                   | Min.                      | Typ. | Max  | Units              |
|------------|-------------------------------|------------------------------------------------------------------------------|---------------------------|------|------|--------------------|
| $I_R$      | Instantaneous Reverse Current | $V_R = 600\text{V}$                                                          | $T_C = 25^\circ\text{C}$  | -    | -    | 100 $\mu\text{A}$  |
|            |                               |                                                                              | $T_C = 175^\circ\text{C}$ | -    | -    | 1000 $\mu\text{A}$ |
| $V_{FM}^1$ | Instantaneous Forward Voltage | $I_F = 15\text{A}$                                                           | $T_C = 25^\circ\text{C}$  | -    | 1.65 | 2.2 V              |
|            |                               |                                                                              | $T_C = 175^\circ\text{C}$ | -    | 1.24 | 1.7 V              |
| $t_{rr}^2$ | Reverse Recovery Time         | $I_F = 1\text{A}$ , $di/dt = 200\text{A}/\mu\text{s}$ , $V_R = 390\text{V}$  | $T_C = 25^\circ\text{C}$  | -    | 22   | 30 ns              |
|            |                               | $I_F = 15\text{A}$ , $di/dt = 200\text{A}/\mu\text{s}$ , $V_R = 390\text{V}$ | $T_C = 25^\circ\text{C}$  | -    | 30   | ns                 |
|            |                               |                                                                              | $T_C = 175^\circ\text{C}$ | -    | 127  | ns                 |
| $t_a$      | Reverse Recovery Time         | $I_F = 15\text{A}$ , $di/dt = 200\text{A}/\mu\text{s}$ , $V_R = 390\text{V}$ | $T_C = 25^\circ\text{C}$  | -    | 17   | ns                 |
| $t_b$      | Reverse Recovery Time         |                                                                              |                           | -    | 13   | ns                 |
| $Q_{rr}$   | Reverse Recovery Charge       |                                                                              |                           | -    | 48   | nC                 |

## Notes:

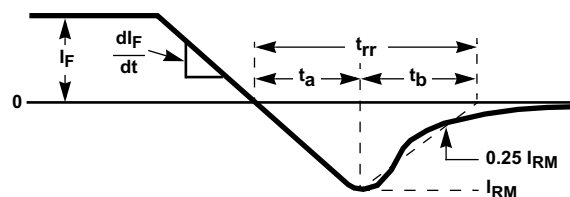
1. Pulse : Test Pulse width =  $300\mu\text{s}$ , Duty Cycle = 2%
2. Guaranteed by design

## Test Circuit and Waveforms

### $t_{rr}$ Test Circuit

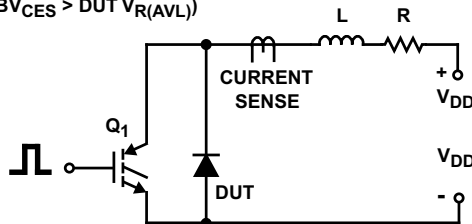


### $t_{rr}$ Waveforms and Definitions

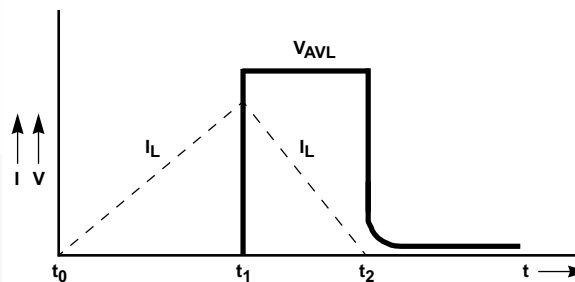


### Avalanche Energy Test Circuit

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



### Avalanche Current and Voltage Waveforms



## Typical Performance Characteristics

Figure 1. Typical Forward Voltage Drop vs. Forward Current

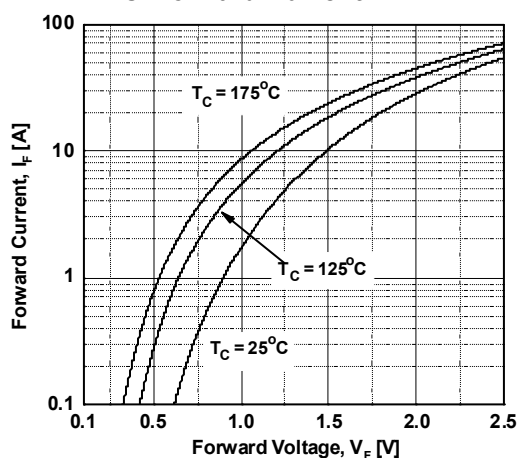


Figure 2. Typical Reverse Current vs. Reverse Voltage

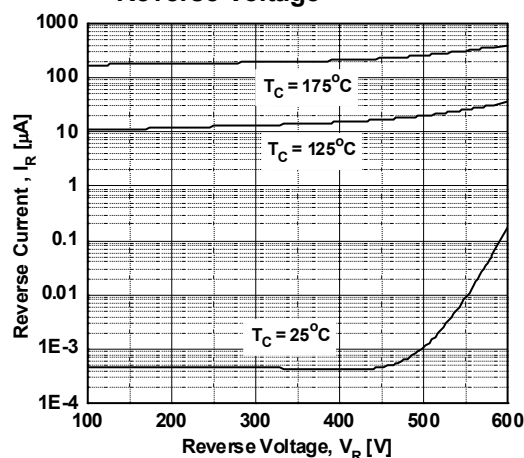


Figure 3. Typical Junction Capacitance

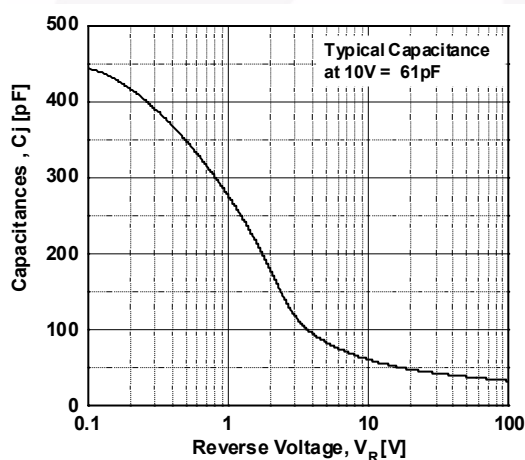


Figure 4. Typical Reverse Recovery Time vs. di/dt

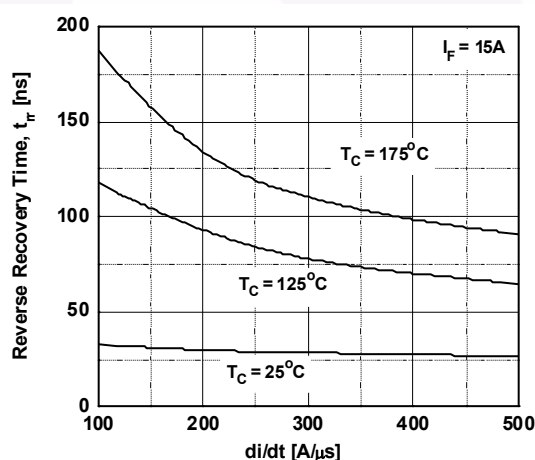


Figure 5. Typical Reverse Recovery Current vs. di/dt

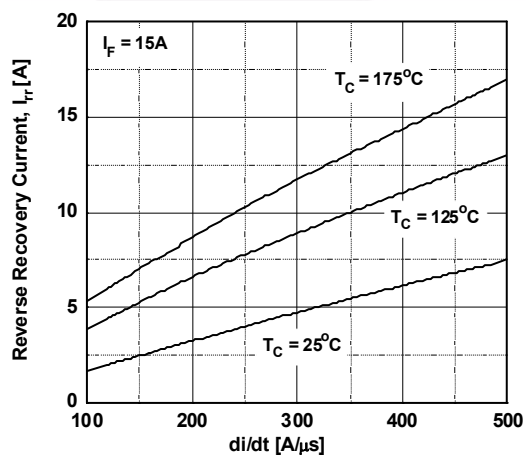
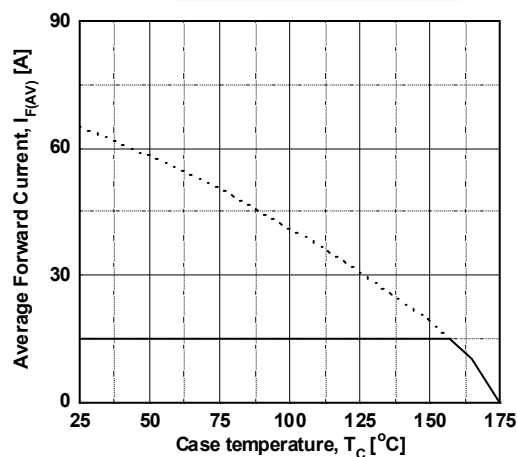


Figure 6. Forward Current Derating Curve



# Typical Performance Characteristics (Continued)

Figure 7. Reverse Recovery Charge

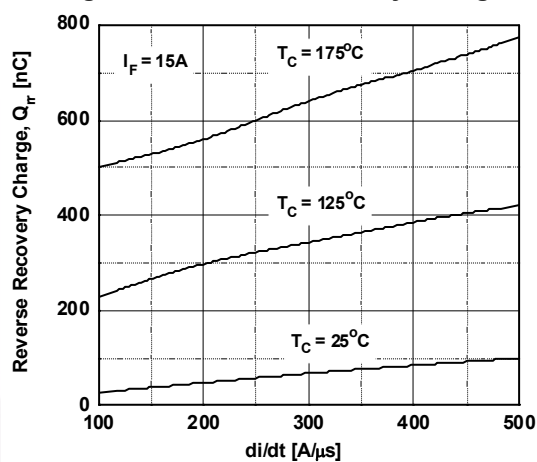
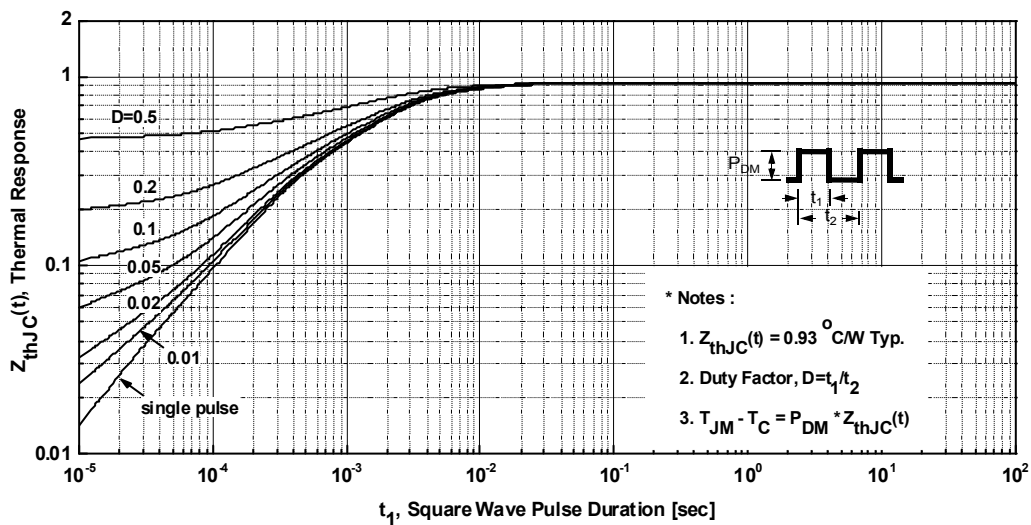
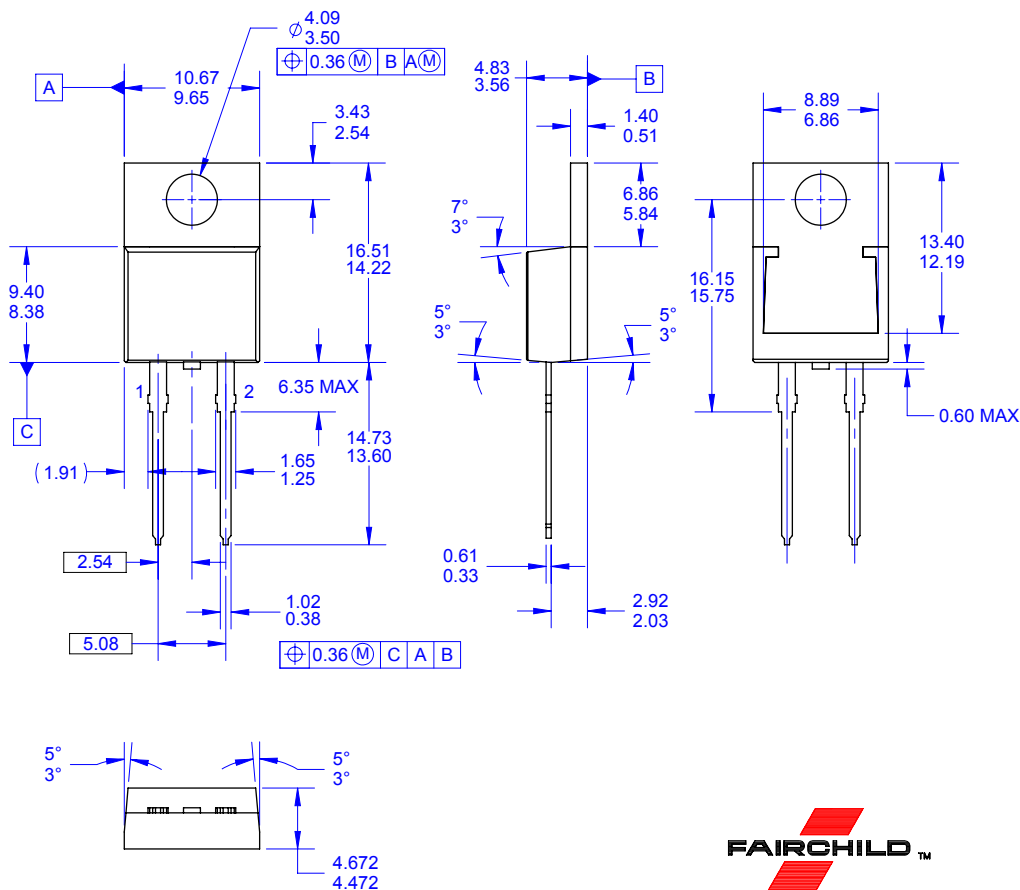


Figure 8. Transient Thermal Response Curve



# Mechanical Dimensions

## TO-220-2L



### NOTES:

- PACKAGE REFERENCE: JEDEC TO220,ISSUE K, VARIATION AC,DATED APRIL 2002.
- ALL DIMENSIONS ARE IN MILLIMETERS.
- DIMENSION AND TOLERANCE AS PER ASME Y14.5-2009.
- DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
- DRAWING FILE NAME: TO220A02REV04.

Dimensions in Millimeters



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