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FAIRCHILD SEMICONDUCTOR®

November 2013

# ISL9K1560G3

## 30 A, 600 V STEALTH™ Dual Diode

### Features

- Stealth Recovery $t_{rr}$ = 29.4 ns (@ $I_F$ = 15 A)
- Max Forward Voltage, $V_F$ = 2.2 V (@ $T_C$ = 25°C)
- 600 V Reverse Voltage and High Reliability
- Avalanche Energy Rated
- RoHS Compliant

### Applications

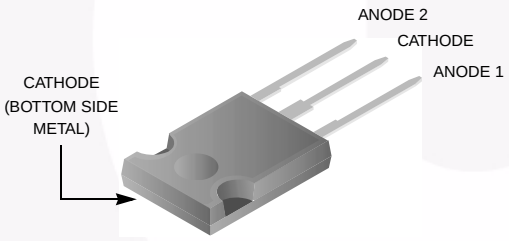
- Switch Mode Power Supplies
- Hard Switched PFC Boost Diode
- UPS Free Wheeling Diode
- Motor Drive FWD
- SMPS FWD
- Snubber Diode

### Description

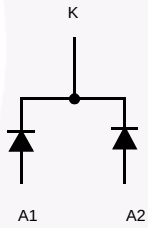
The ISL9K1560G3 is a STEALTH™ dual diode optimized for low loss performance in high frequency hard switched applications. The STEALTH™ family exhibits low reverse recovery current ($I_{RR}$) and exceptionally soft recovery under typical operating conditions. This device is intended for use as a free 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.

### Package

JEDEC STYLE TO-247




### Symbol




### Device Maximum Ratings (per leg) $T_C$ = 25°C unless otherwise noted

| Symbol | Parameter | Rating | Unit |
|---|---|---|---|
| $V_{RRM}$ | Repetitive Peak 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 ($T_C$ = 145°C)<br>Total Device Current (Both Legs) | 15<br>30 | A<br>A |
| $I_{FRM}$ | Repetitive Peak Surge Current (20kHz Square Wave) | 30 | A |
| $I_{FSM}$ | Nonrepetitive Peak Surge Current (Halfwave 1 Phase 60Hz) | 200 | A |
| $P_D$ | Power Dissipation | 150 | W |
| $E_{AVL}$ | Avalanche Energy (1A, 40mH) | 20 | mJ |
| $T_J$, $T_{STG}$ | Operating and Storage Temperature Range | -55 to 175 | °C |
| $T_L$<br>$T_{PKG}$ | Maximum Temperature for Soldering<br>Leads at 0.063in (1.6mm) from Case for 10s<br>Package Body for 10s, See Techbrief TB334 | 300<br>260 | °C<br>°C |

CAUTION: Stresses above those listed in "Device Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

## Package Marking and Ordering Information

| Device Marking | Device | Package | Packing Methode | Tape Width | Quantity |
|---|---|---|---|---|---|
| K1560G3 | ISL9K1560G3 | TO-247-3L | Tube | N/A | 30 |

## Electrical Characteristics (per leg) $T_C$ = 25°C unless otherwise noted

| Symbol | Parameter | Test 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 | $I_F$ = 15 A | $T_C$ = 25°C | - | 1.8 | 2.2 | V |
| | | | $T_C$ = 125°C | - | 1.65 | 2.0 | V |
| **Dynamic Characteristics** | | | | | | | |
| $C_J$ | Junction Capacitance | $V_R$ = 10 V, $I_F$ = 0 A | | - | 62 | - | pF |
| **Switching Characteristics** | | | | | | | |
| $t_{rr}$ | Reverse Recovery Time | $I_F$ = 1 A, dI/dt = 100 A/µs, $V_R$ = 30 V | | - | 25 | 30 | ns |
| | | $I_F$ = 15 A, dI/dt = 100 A/µs, $V_R$ = 30 V | | - | 35 | 40 | ns |
| $t_{rr}$ | Reverse Recovery Time | $I_F$ = 15 A, $dI_F/dt$ = 200 A/µs, $V_R$ = 390 V, $T_C$ = 25°C | | - | 29.4 | - | ns |
| $I_{rr}$ | Reverse Recovery Current | | | - | 3.5 | - | A |
| $Q_{rr}$ | Reverse Recovered Charge | | | - | 57 | - | nC |
| $t_{rr}$ | Reverse Recovery Time | $I_F$ = 15 A, $dI_F/dt$ = 200 A/µs, $V_R$ = 390 V, $T_C$ = 125°C | | - | 90 | - | ns |
| S | Softness Factor ($t_b/t_a$) | | | - | 2.0 | - | |
| $I_{rr}$ | Reverse Recovery Current | | | - | 5.0 | - | A |
| $Q_{rr}$ | Reverse Recovered Charge | | | - | 275 | - | nC |
| $t_{rr}$ | Reverse Recovery Time | $I_F$ = 15 A, $dI_F/dt$ = 800 A/µs, $V_R$ = 390 V, $T_C$ = 125°C | | - | 52 | - | ns |
| S | Softness Factor ($t_b/t_a$) | | | - | 1.36 | - | |
| $I_{rr}$ | 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 | | | - | - | 1.0 | °C/W |
| $R_{\theta JA}$ | Thermal Resistance Junction to Ambient | TO-247 | | - | - | 30 | °C/W |

## Typical Performance Curves

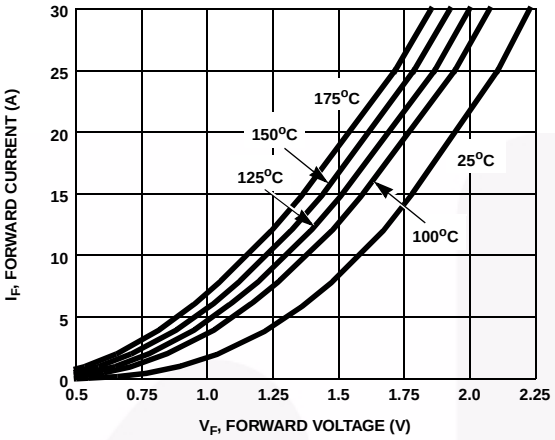



**Figure 1. Forward Current vs Forward Voltage**

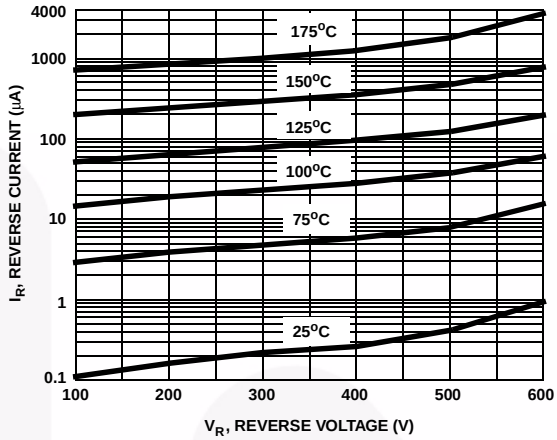



**Figure 2. Reverse Current vs Reverse Voltage**

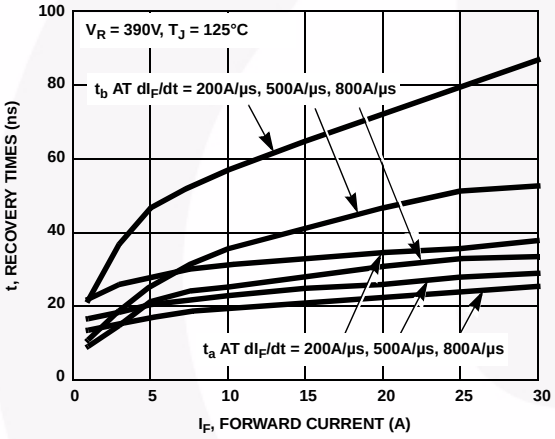



**Figure 3. $t_a$ and $t_b$ Curves vs Forward Current**

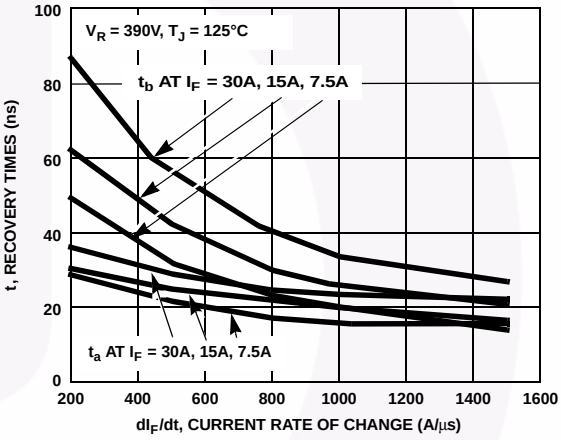



**Figure 4. $t_a$ and $t_b$ Curves vs $dI_F/dt$**

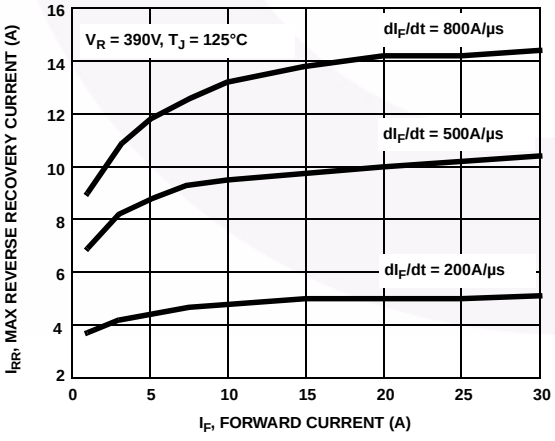



**Figure 5. Maximum Reverse Recovery Current vs Forward Current**

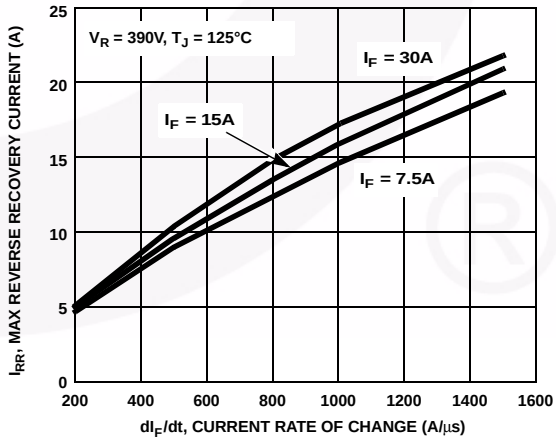



**Figure 6. Maximum Reverse Recovery Current vs $dI_F/dt$**

## Typical Performance Curves (Continued)

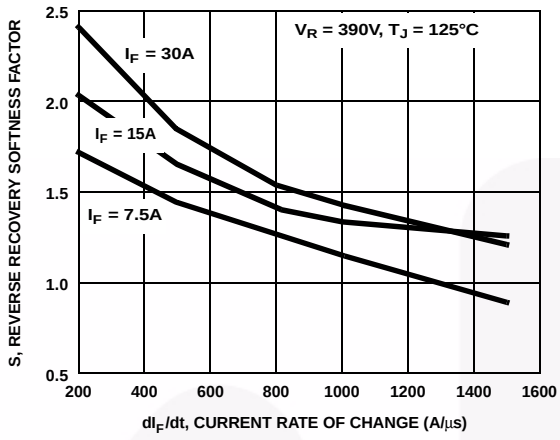



**Figure 7. Reverse Recovery Softness Factor vs $dI_F/dt$**

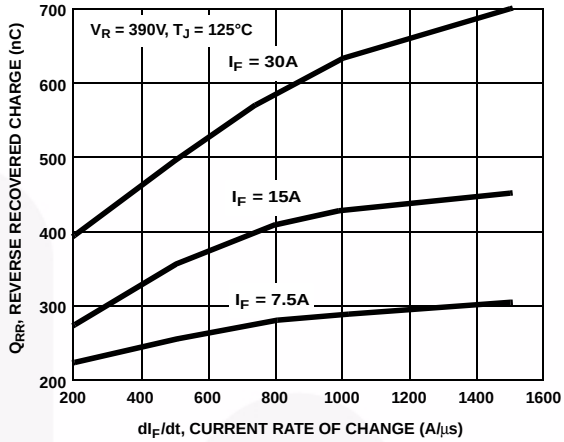



**Figure 8. Reverse Recovered Charge vs $dI_F/dt$**

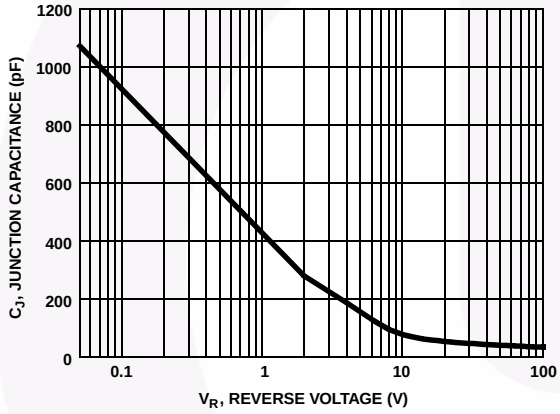



**Figure 9. Junction Capacitance vs Reverse Voltage**

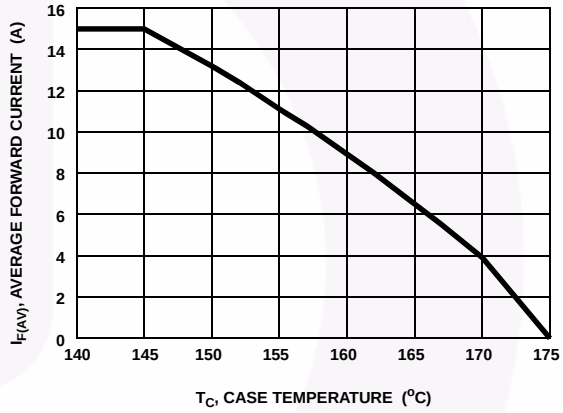



**Figure 10. DC Current Derating Curve**

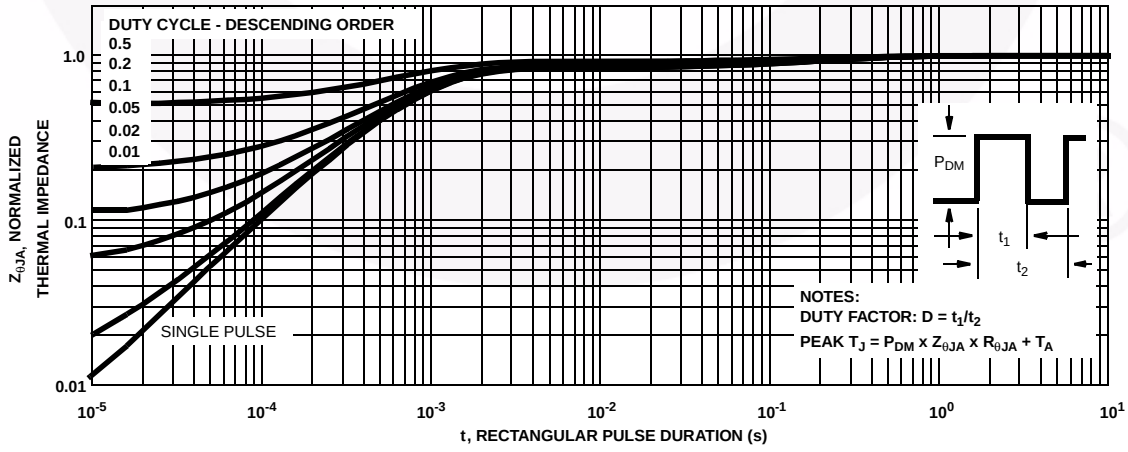



**Figure 11. Normalized Maximum Transient Thermal Impedance**

## Test Circuit and Waveforms

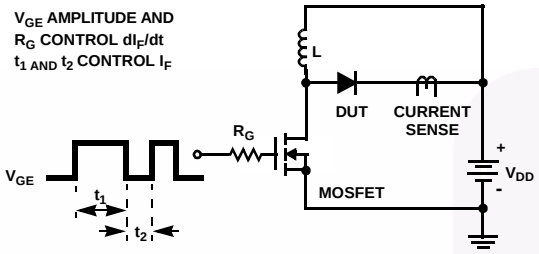



**Figure 12. $t_{rr}$ Test Circuit**

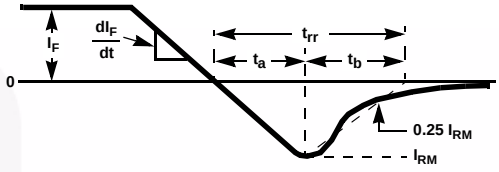



**Figure 13. $t_{rr}$ Waveforms and Definitions**

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

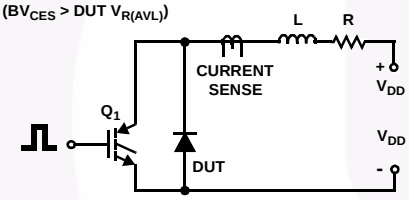



**Figure 14. Avalanche Energy Test Circuit**

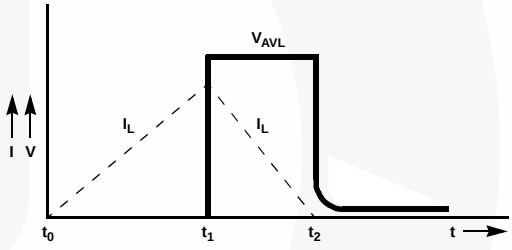
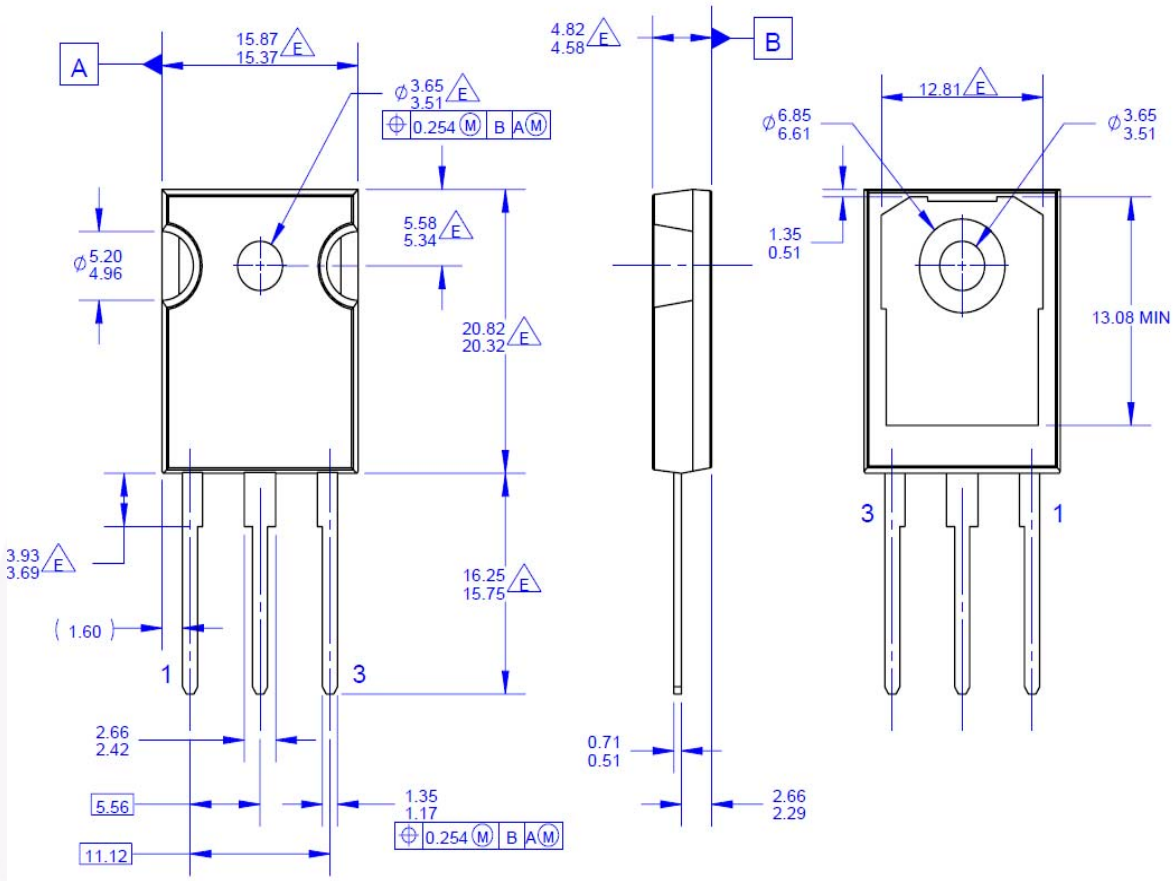



**Figure 15. Avalanche Current and Voltage Waveforms**

# TO247-3L

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F. DRAWING FILENAME: MKT-TO247A03_REV03

**Figure 16. TO-247,Molded, 3LD, Jedec Option AB**

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Rev. I66

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