

# STEALTH™ Dual Diode

## 30 A, 600 V

### ISL9K1560G3

#### 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.

#### 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
- This Device is Pb-Free and is RoHS Compliant

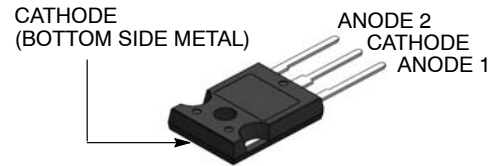
#### Applications

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



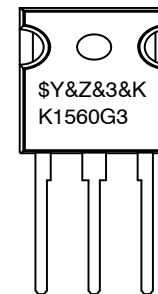
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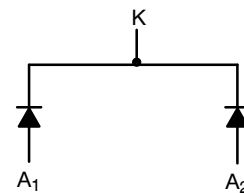


TO-247-3LD  
CASE 340CK

#### MARKING DIAGRAM



\$Y	= ON Semiconductor Logo
&Z	= Assembly Plant Code
&3	= Numeric Date Code
&K	= Lot Code
K1560G3	= Specific Device Code



#### ORDERING INFORMATION

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

# ISL9K1560G3

## DEVICE MAXIMUM RATINGS (per leg) ( $T_C = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Ratings	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 ( $T_C = 145^\circ\text{C}$ ) Total Device Current (Both Legs)	$I_{F(AV)}$	15 30	A 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	$P_D$	150	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 10 s Package Body for 10 s, See Techbrief TB334	$T_L$ $T_{PKG}$	300 260	$^\circ\text{C}$ $^\circ\text{C}$

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.

## PACKAGE MARKING AND ORDERING INFORMATION

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

## THERMAL CHARACTERISTICS

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Thermal Resistance Junction to Case	$R_{\theta JC}$		-	-	1.0	$^\circ\text{C}/\text{W}$
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	TO-247	-	-	30	$^\circ\text{C}/\text{W}$

# ISL9K1560G3

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
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### OFF STATE CHARACTERISTICS

Instantaneous Reverse Current	$I_R$	$V_R = 600\text{ V}$	$T_C = 25^\circ\text{C}$	-	-	100	$\mu\text{A}$
			$T_C = 125^\circ\text{C}$	-	-	1.0	$\text{mA}$

### ON STATE CHARACTERISTICS

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

### DYNAMIC CHARACTERISTICS

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

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

# ISL9K1560G3

## TYPICAL PERFORMANCE CURVES

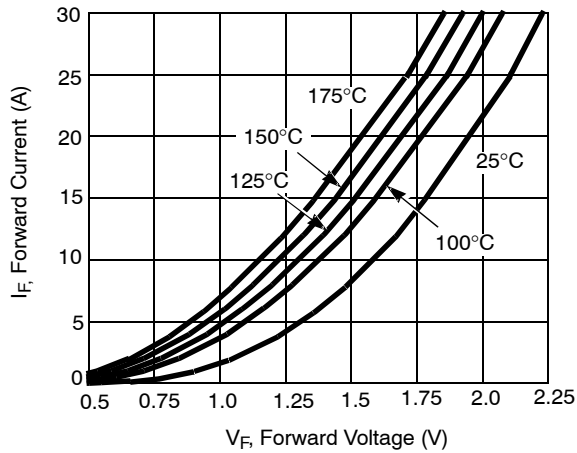


Figure 1. Forward Current vs. Forward Voltage

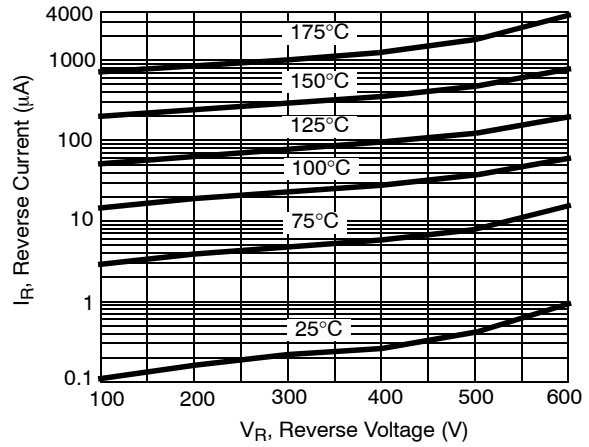


Figure 2. Reverse Current vs. Reverse Voltage

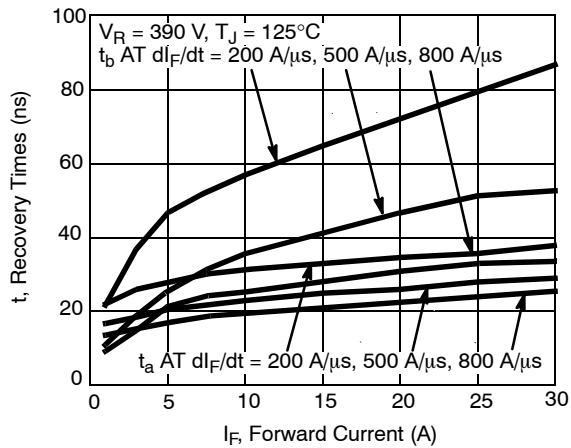


Figure 3.  $t_a$  and  $t_b$  Curves vs. Forward Current

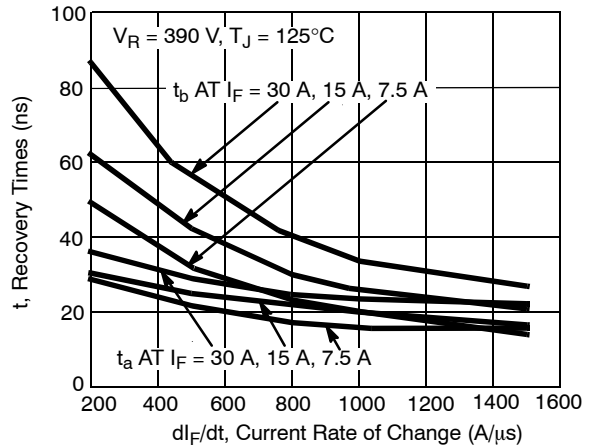


Figure 4.  $t_a$  and  $t_b$  Curves vs.  $dI_F/dt$

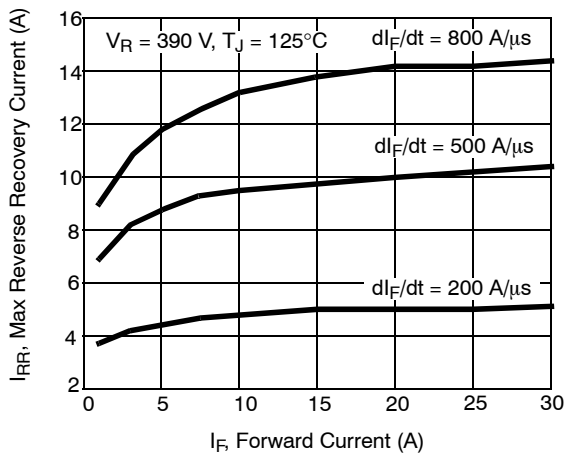


Figure 5. Maximum Reverse Recovery Current vs. Forward Current

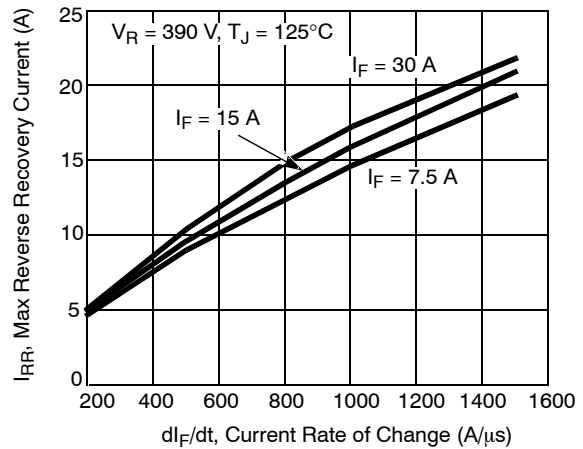
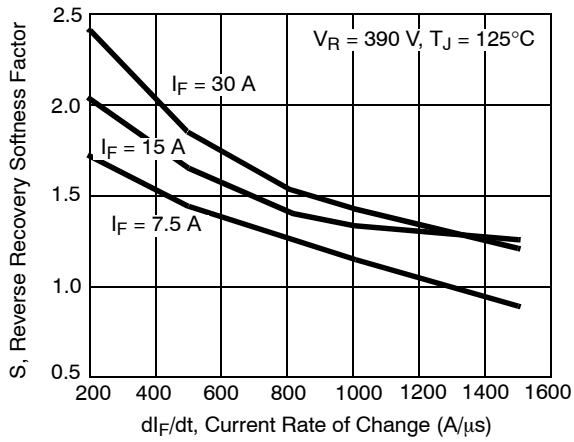


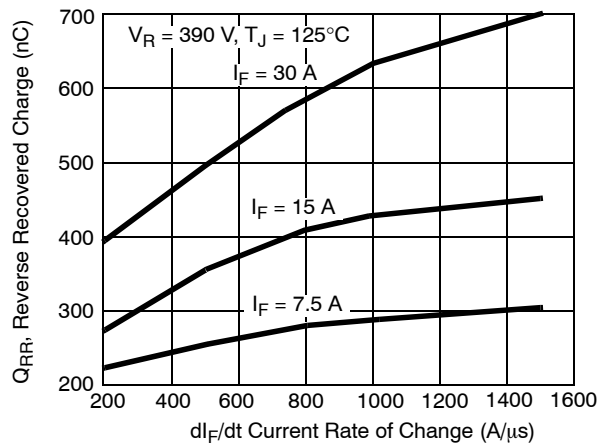
Figure 6. Maximum Reverse Recovery Current vs.  $dI_F/dt$

# ISL9K1560G3

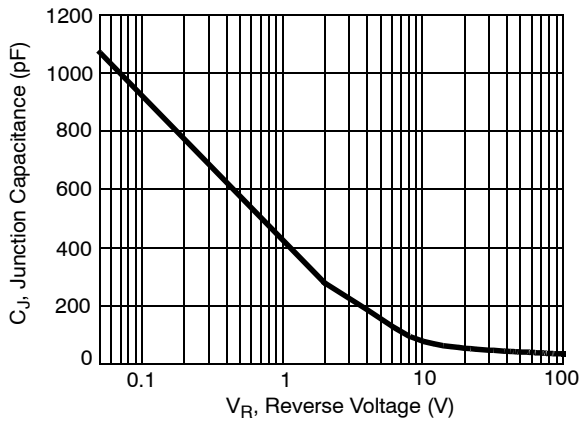
## TYPICAL PERFORMANCE CURVES (continued)



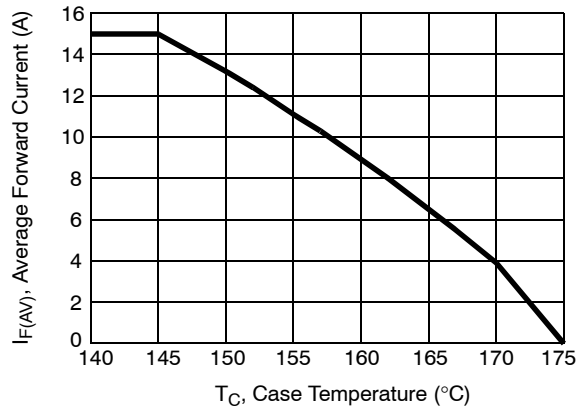
**Figure 7. Reverse Recovery Softness Factor vs.  $di_F/dt$**



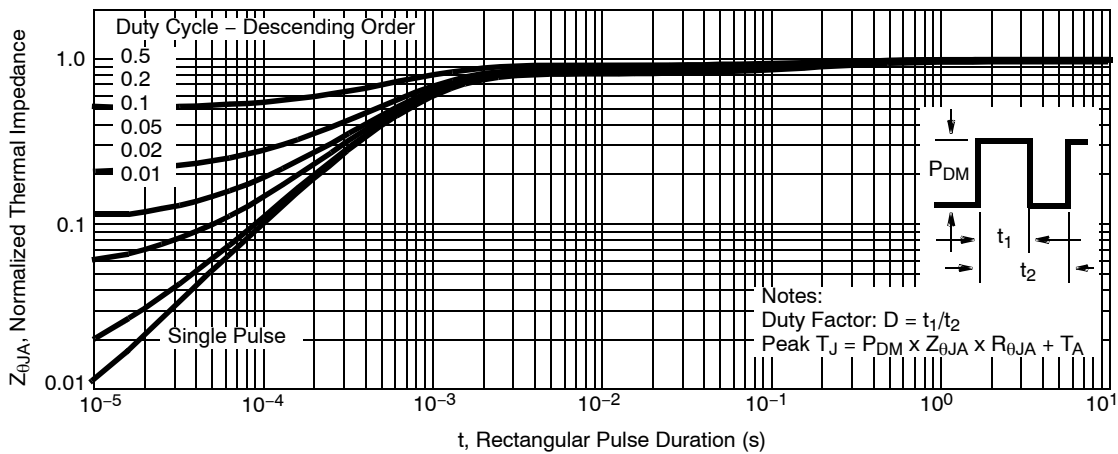
**Figure 8. Reverse Recovered Charge vs.  $di_F/dt$**



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



**Figure 10. DC Current Derating Curve**



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

# ISL9K1560G3

## TEST CIRCUIT AND WAVEFORMS

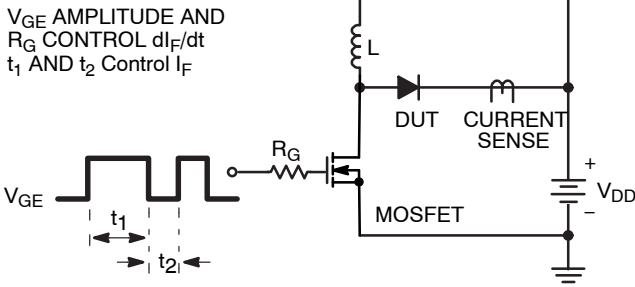


Figure 12.  $t_{rr}$  Test Circuit

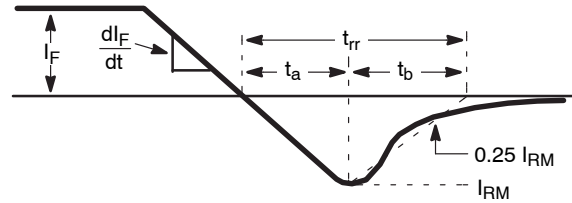


Figure 13.  $t_{rr}$  Waveforms and Definitions

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

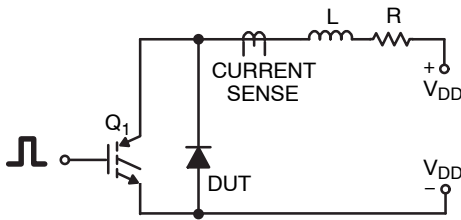


Figure 14. Avalanche Energy Test Circuit

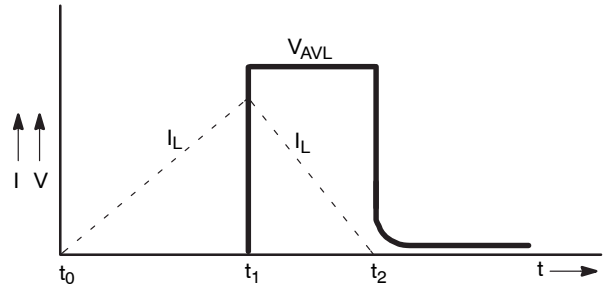


Figure 15. Avalanche Current and Voltage Waveforms

**TO-247-3LD SHORT LEAD**  
**CASE 340CK**  
**ISSUE A**

DATE 31 JAN 2019



NOTES: UNLESS OTHERWISE SPECIFIED.

- A. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- B. ALL DIMENSIONS ARE IN MILLIMETERS.
- C. DRAWING CONFORMS TO ASME Y14.5 - 2009.
- D. DIMENSION A1 TO BE MEASURED IN THE REGION DEFINED BY L1.
- E. LEAD FINISH IS UNCONTROLLED IN THE REGION DEFINED BY L1.

**GENERIC MARKING DIAGRAM\***



- XXXX = Specific Device Code
- A = Assembly Location
- Y = Year
- WW = Work Week
- ZZ = Assembly Lot Code

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	4.58	4.70	4.82
A1	2.20	2.40	2.60
A2	1.40	1.50	1.60
b	1.17	1.26	1.35
b2	1.53	1.65	1.77
b4	2.42	2.54	2.66
c	0.51	0.61	0.71
D	20.32	20.57	20.82
D1	13.08	~	~
D2	0.51	0.93	1.35
E	15.37	15.62	15.87
E1	12.81	~	~
E2	4.96	5.08	5.20
e	~	5.56	~
L	15.75	16.00	16.25
L1	3.69	3.81	3.93
$\phi P$	3.51	3.58	3.65
$\phi P1$	6.60	6.80	7.00
Q	5.34	5.46	5.58
S	5.34	5.46	5.58

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