FAIRCHILD SEMICONDUCTOR®

May 2004

ISL9R860P2, ISL9R860S2, ISL9R860S3ST

8A, 600V Stealth™ Diode

General Description

The ISL9R860P2, ISL9R860S2 and ISL9R860S3S are Stealth™ diodes optimized for low loss performance in high frequency hard switched applications. The Stealth™ family exhibits low reverse recovery current (I_{RRM}) 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_{RRM} and short t_a 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.

Formerly developmental type TA49409.

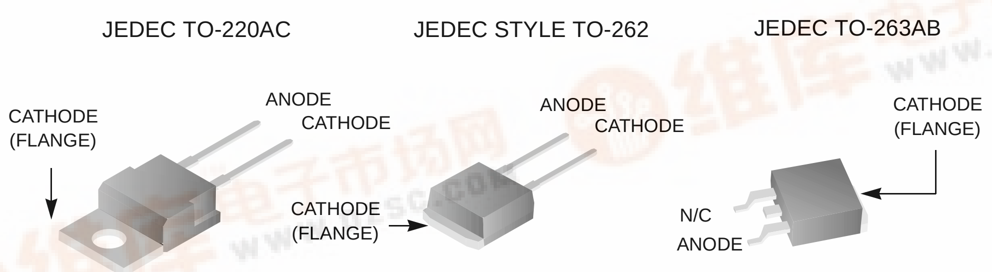
Features

- Soft Recovery . . . . t_b / t_a > 2.5
- Fast Recovery . . . . t_{rr} < 25ns
- Operating Temperature . . . . 175^{o}C
- Reverse Voltage. 600V
- Avalanche Energy Rated

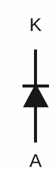
Applications

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

Package



Symbol



Device Maximum Ratings T_C= 25°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 = 147^{o}C)	8	A
I_{FRM}	Repetitive Peak Surge Current (20kHz Square Wave)	16	A
I_{FSM}	Nonrepetitive Peak Surge Current (Halfwave 1 Phase 60Hz)	100	A
P_D	Power Dissipation	85	W
E_{AVL}	Avalanche Energy (1A, 40mH)	20	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 (1.6mm) from Case for 10s Package Body for 10s, See Techbrief TB334	 300 260	 °C °C

CAUTION: Stresses above those listed in “Absolute 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	Tape Width	Quantity
R860P2	ISL9R860P2	TO-220AC	-	-
R860S2	ISL9R860S2	TO-262	-	-
R860S3S	ISL9R860S3ST	TO-263AB	24mm	800

Electrical Characteristics T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units

Off State Characteristics

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units
I_R	Instantaneous Reverse Current	V_R = 600V	T_C = 25°C	-	-	100	µA
			T_C = 125°C	-	-	1.0	mA

On State Characteristics

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units
V_F	Instantaneous Forward Voltage	I_F = 8A	T_C = 25°C	-	2.0	2.4	V
			T_C = 125°C	-	1.6	2.0	V

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
C_J	Junction Capacitance	V_R = 10V, I_F = 0A	-	30	-	pF

Switching Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
t_{rr}	Reverse Recovery Time	I_F = 1A, dI_F/dt = 100A/µs, V_R = 30V	-	18	25	ns
		I_F = 8A, dI_F/dt = 100A/µs, V_R = 30V	-	21	30	ns
t_{rr}	Reverse Recovery Time	I_F = 8A, dI_F/dt = 200A/µs, V_R = 390V, T_C = 25°C	-	28	-	ns
I_{RRM}	Maximum Reverse Recovery Current		-	3.2	-	A
Q_{RR}	Reverse Recovery Charge		-	50	-	nC
t_{rr}	Reverse Recovery Time	I_F = 8A, dI_F/dt = 200A/µs, V_R = 390V, T_C = 125°C	-	77	-	ns
S	Softness Factor (t_b/t_a)		-	3.7	-	
I_{RRM}	Maximum Reverse Recovery Current		-	3.4	-	A
Q_{RR}	Reverse Recovery Charge		-	150	-	nC
t_{rr}	Reverse Recovery Time	I_F = 8A, dI_F/dt = 600A/µs, V_R = 390V, T_C = 125°C	-	53	-	ns
S	Softness Factor (t_b/t_a)		-	2.5	-	
I_{RRM}	Maximum Reverse Recovery Current		-	6.5	-	A
Q_{RR}	Reverse Recovery Charge			195	-	nC
dI_M/dt	Maximum di/dt during t_b		-	500	-	A/µs

Thermal Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$R_{\theta JC}$	Thermal Resistance Junction to Case		-	-	1.75	°C/W
$R_{\theta JA}$	Thermal Resistance Junction to Ambient	TO-220	-	-	62	°C/W
$R_{\theta JA}$	Thermal Resistance Junction to Ambient	TO-262	-	-	62	°C/W
$R_{\theta JA}$	Thermal Resistance Junction to Ambient	TO-263			62	°C/W

Typical Performance Curves

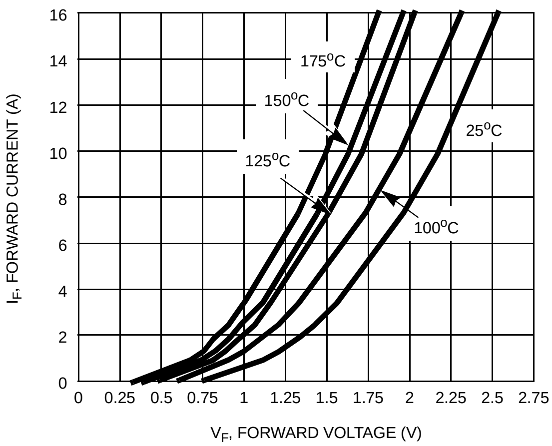


Figure 1. Forward Current vs Forward Voltage

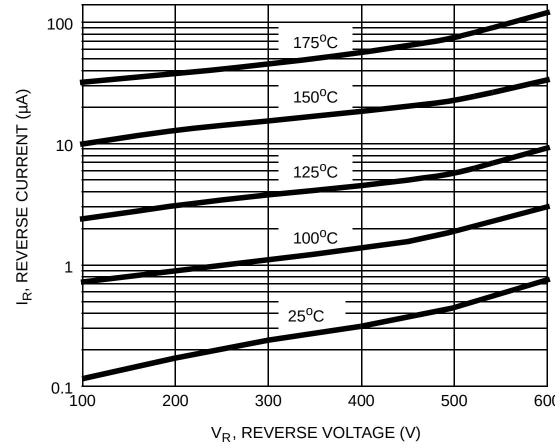


Figure 2. Reverse Current vs Reverse Voltage

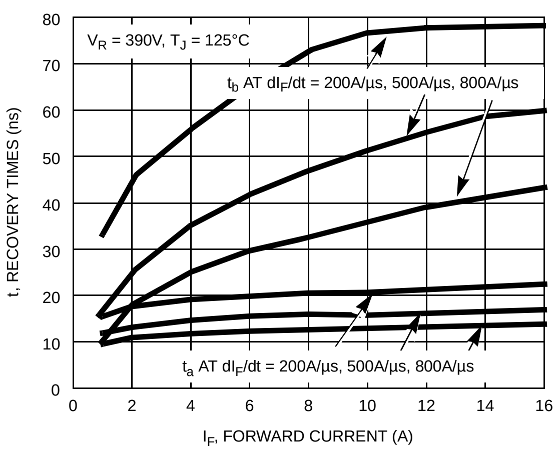


Figure 3. t_a and t_b Curves vs Forward Current

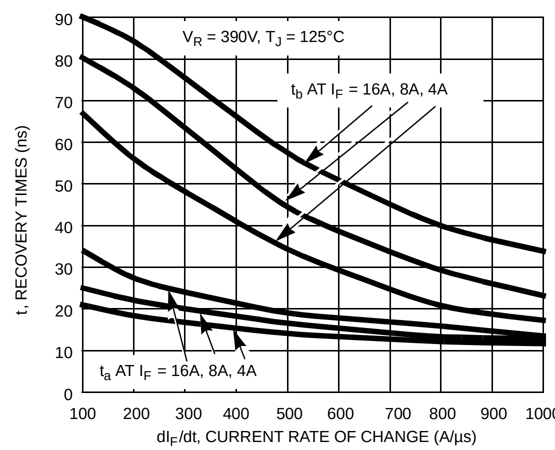


Figure 4. t_a and t_b Curves vs dI_F/dt

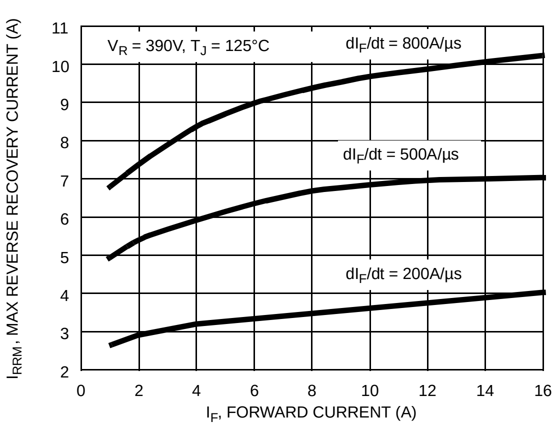


Figure 5. Maximum Reverse Recovery Current vs Forward Current

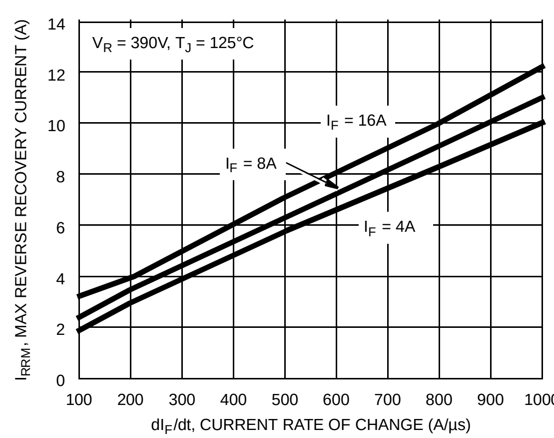


Figure 6. Maximum Reverse Recovery Current vs dI_F/dt

Typical Performance Curves (Continued)

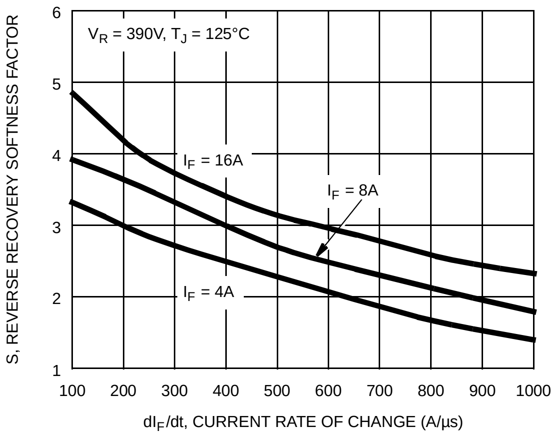


Figure 7. Reverse Recovery Softness Factor vs dI_F/dt

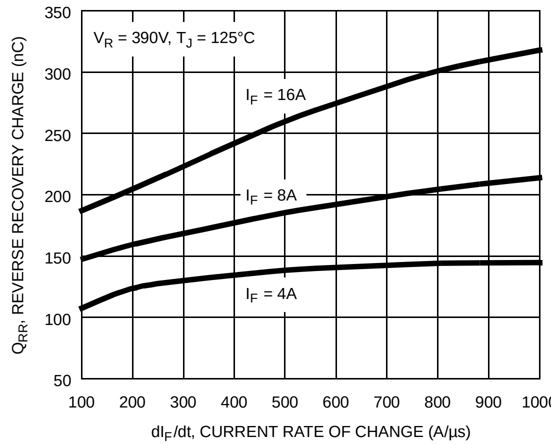


Figure 8. Reverse Recovery Charge vs dI_F/dt

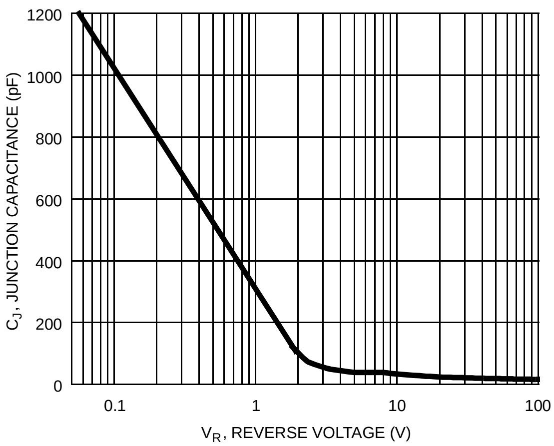


Figure 9. Junction Capacitance vs Reverse Voltage

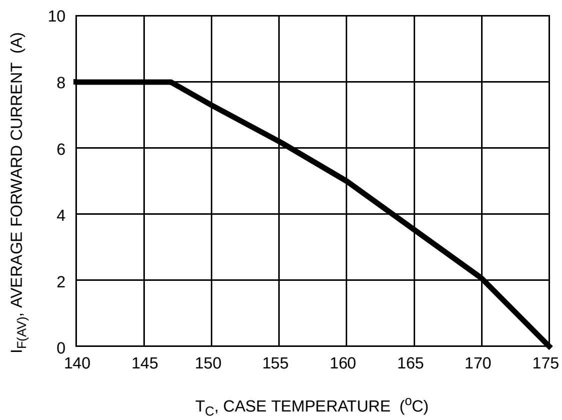


Figure 10. DC Current Derating Curve

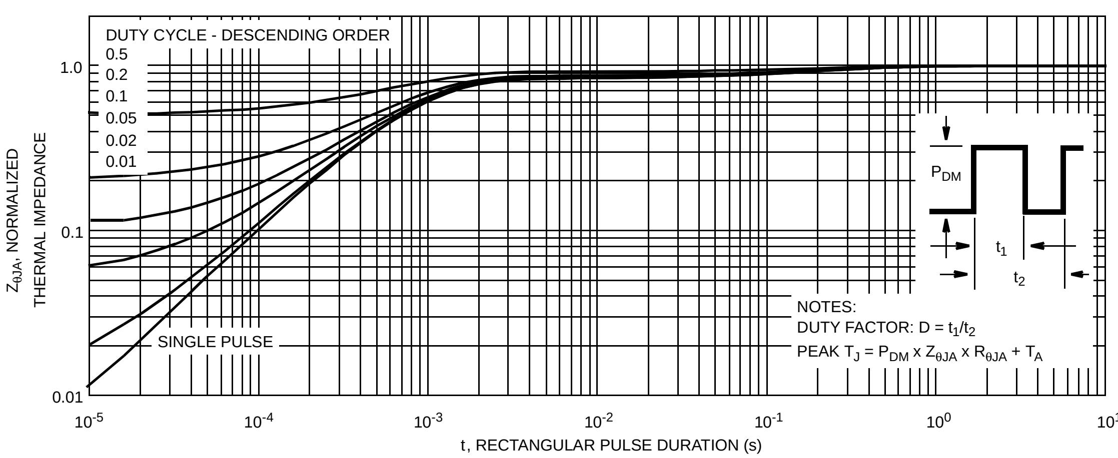


Figure 11. Normalized Maximum Transient Thermal Impedance

Test Circuits and Waveforms

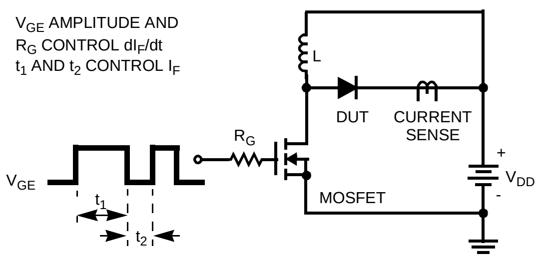


Figure 12. t_{rr} Test Circuit

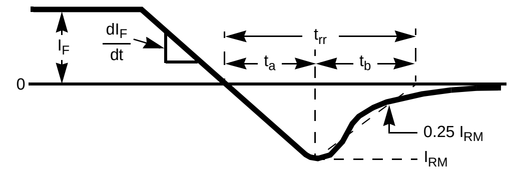


Figure 13. t_{rr} Waveforms and Definitions

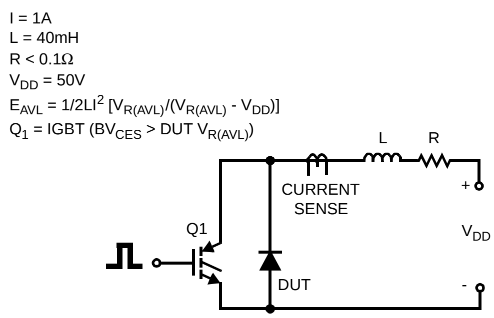


Figure 14. Avalanche Energy Test Circuit

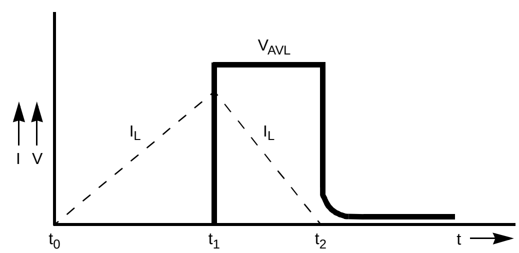


Figure 15. Avalanche Current and Voltage Waveforms

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