

May 2024

ISL9R860P2, ISL9R860S3ST 8 A, 600 V, STEALTH™ Diode

Features

- Stealth Recovery trr = 28 ns (@ IF = 8 A)
- Max Forward Voltage, VF = 2.4 V (@ TC = 25°C)
- 600 V Reverse Voltage and High Reliability
- · Avalanche Energy Rated
- RoHS Compliant

Applications

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

Description

The ISL9R860P2, ISL9R860S3ST 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 STEALT, H™ diode with an SMPS IGBT to provide the most efficient and highest power density design at lower cost.

JEDEC TO 220AC-2L JEDEC TO 263AB(D²-PAK) CATHODE (FLANGE) N/C ANODE N/C ANODE

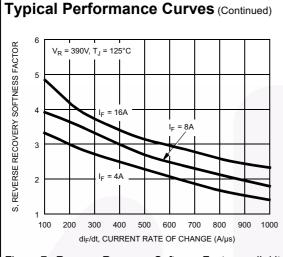
Device Maximum Ratings Tc= 25°C unless otherwise noted

Symbol	Parameter	Ratings	Unit	
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°C)	8	Α	
I _{FRM}	Repetitive Peak Surge Current (20kHz Square Wave)	16	Α	
I _{FSM}	Nonrepetitive Peak Surge Current (Halfwave 1 Phase 60Hz)	100	Α	
P _D	Power Dissipation	85	W	
E _{AVL}	Avalanche Energy (1 A, 40 mH)	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	300 260	°C °C	
	Package Body for 10s, See Techbrief TB334			

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.

Part Number Top Mark		Package	Packing Method		Reel Siz	е Тар	e Wid	lth	Quantity	
ISL9R860P2 R860P2 TO-220AC-2L		Tube N/		N/A		N/A		50		
ISL9R860S3ST R860S3S TO-263AB(D ² -PAK		TO-263AB(D ² -PAK	() Reel 13" I		13" Dia	24mm			800	
Electric	al C	haracteri	Stics T _C = 25°C u	nless otherwise	noted				•	
Symbol		Parar			Condition	s	Min	Тур	Max	Unit
Off State	Cha	racteristics								
		nstantaneous Reverse Current		V _R = 600 V T _C	T _C =	: 25°C		T -	100	μΑ
				· R · SSS ·		: 125°C	-	-	1.0	mA
On State	Cha	racteristics								
			and Maltage	L = 0.A	- I - -	25°0		20	2.4	1 07
V _F Inst		nstantaneous Forwa	ard Voltage	I _F = 8 A		: 25°C : 125°C		2.0	2.4	
					'C-	123 0		1.0	2.0	V
Dynamic	Cha	racteristics							1	
CJ	Junc	tion Capacitanc	е	$V_R = 10 \text{ V}, I_F = 0$) A	\Box		30	-	pF
Switchin	a Ch	aracteristic	e				2			
	-	erse Recovery T		$I_F = 1 \text{ A, } di_F/dt =$	100 4/11	- V - 20 V		18	25	ns
t _{rr}	IXEVE	rise Necovery 1	iiiie	$I_F = 8 \text{ A, di}_F/\text{dt} =$			6	21	30	ns
t _{rr}	Reve	erse Recovery T	ime	$I_F = 8 \text{ A}$	100 Α.μ.	s, v _R = 30 v		28	-	ns
Irr	 	Reverse Recovery Current Reverse Recovery Charge Reverse Recovery Time Softness Factor (1-/t _a)		di _F /dt = 200 A/µs, V _R = 390 V, T _C = 25°C			10	3.2	-	Α
Q _{rr}	+						()	50	-	nC
t _{rr}	Reve			I _F = 8 A,		-	77	-	ns	
S	Softn			di _F /dt = 200 A/μs,	-	3.7	-			
I _{rr}	Reverse Reovery Current		$V_{R} = 390 \text{ V},$	-0	. ' '	-	3.4	-	Α	
Q _{rr}	Reve	rse Recovery C	harge	T _C = 125°C I _F = 8 A, di _F /dt = 600 A/μs,		-	150	-	nC	
t _{rr}	Reve	erse Recovery T	ime			-	53	-	ns	
S	Softn	ess Factor (t _b /t _a	<u>, </u>			-	2.5	-		
In	Reve	Reverse Recovery Current		$V_R = 390 \text{ V},$ $T_C = 125^{\circ}\text{C}$		İ	-	6.5	-	Α
Q _{rr}	Reve	rse Recovery C	harge	10 = 125°C		İ		195	-	nC
dl _M /dt	Maximum di/dt during t _l		1		-	500	-	A/µs		
Thormal	Cha	racteristics	1,GV					•		
			Junction to Case					Ι.	1.75	°C/W
R _{9JC}				TO-220			-		62	
$R_{\theta JA}$	1	^	Junction to Ambient				-	-		°C/W
$R_{\theta JA}$	men	mai Resistance	Junction to Ambient	TO-263					62	°C/W

Typical Performance Curves 175°C 150°C REVERSE CURRENT (µA) FORWARD CURRENT (A) 12 10 125°C 8 100°C 100°C 6 2 0.5 0.75 1.25 1.5 1.75 VR, REVERSE VOLTAGE (V) V_F, FORWARD VOLTAGE (V) Figure 2. Reverse Current vs Reverse Voltage Figure 1. Forward Current vs Forward Voltage V_R = 390V, T_J = 125°C V_R = 390V, T_J = 125°C $t_b AT d_{F}/dt = 200A/\mu s, 500A/\mu s, 800A/\mu s$ 60 t, RECOVERY TIMES (ns) 40 30 30 20 10 $t_a AT di_F/dt = 200A/\mu s$, 500A/ μs , 800A/ μs 300 400 500 600 700 800 900 1000 di_F/dt, CURRENT RATE OF CHANGE (A/µs) I_F, FORWARD CURRENT (A) Figure 3. t_a and t_b Curves vs Forward Current Figure 4. t_a and t_b Curves vs di_F/dt V_R = 390V, T_J = 125°C V_R = 390V, T_J = 125°C $di_E/dt = 800A/\mu s$ CURRENT (A) 10 MAX REVERSE RECOVERY CURRENT 12 10 8 $di_F/dt = 500A/\mu s$ MAX REVERSE RECOVERY 7 6 6 5 $di_F/dt = 200A/\mu s$ 0 16 I_F, FORWARD CURRENT (A) di_F/dt, CURRENT RATE OF CHANGE (A/μs) Figure 5. Maximum Reverse Recovery Current Figure 6. Maximum Reverse Recovery Current vs Forward Current vs di_F/dt

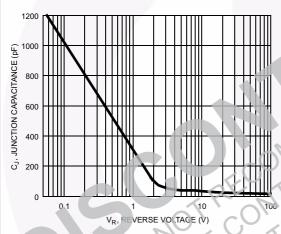


V_R = 390V, T_J = 125°C

V_R = 390V, T_J = 1

Figure 7. Reverse Recovery Softness Factor vs di_F/dt

Figure 8. Reverse Recovery Charge vs di_F/dt



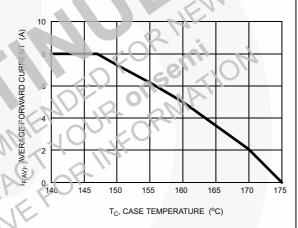


Figure 9. Junction Capacitance vs Reverse Voltage

Figure 10. DC Current Derating Curve

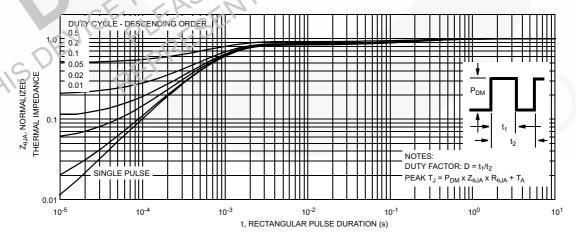
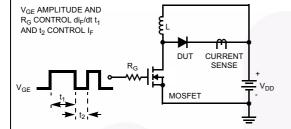


Figure 11. Normalized Maximum Transient Thermal Impedance

Test Circuits and Waveforms



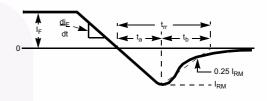
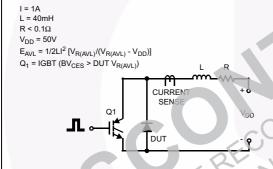


Figure 12. t_{rr} Test Circuit

Figure 13. t_{rr} Waveforms and Definitions



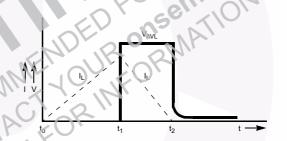


Figure 14. Avalanche Energy Test Circuit

Figure 15. Avalanche Current and Voltage Waveforms

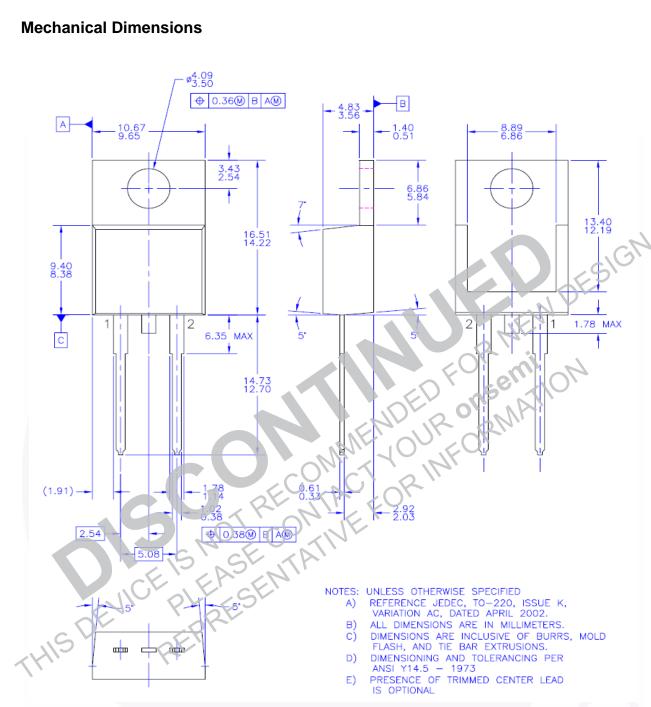


Figure 16. TO-220 2L - 2LD,TO220,JEDEC TO-220 VARIATION AC

Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of Fairchild's worldwide terms and conditions, specifically the warranty therein, which covers Fairchild products.

Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings:

http://www.fairchildsemi.com/package/packageDetails.html?id=PN TT220-0B2.

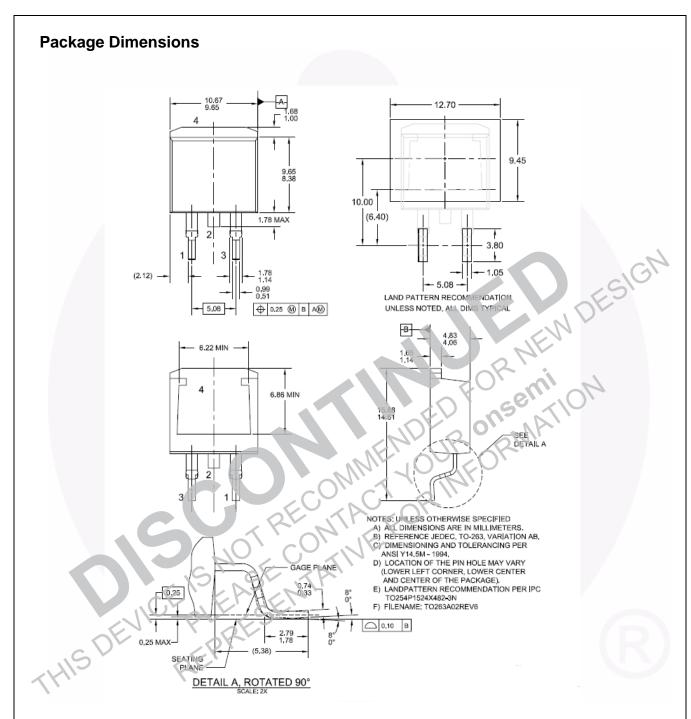


Figure 17. TO-263 2L (D2PAK) - 2LD,TO263, SURFACE MOUNT

Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of Fairchild's worldwide terms and conditions, specifically the warranty therein, which covers Fairchild products.

Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings:

http://www.fairchildsemi.com/package/packageDetails.html?id=PN_TT263-002.





TRADEMARKS

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

AccuPower™ AX-CAF BitSiC™ Build it Now™ CorePLUS™ CorePOWER™

 $\begin{array}{c} CROSSVOLT^{\text{\tiny TM}} \\ CTL^{\text{\tiny TM}} \end{array}$ Current Transfer Logic™ DEUXPEED® Dual Cool™

EcoSPARK® EfficentMax™ **ESBC™**

Fairchild[®] Fairchild Semiconductor® FACT Quiet Series™

FACT[®] FAST® FastvCore™ FETBench™ **FPS™**

F-PFSTM FRFET®

Global Power ResourceSM GreenBridge™

Green FPS™ Green FPS™ e-Series™

G*max*™ GTO™ IntelliMAX™ ISOPLANAR™

Marking Small Speakers Sound Louder

MegaBuck™ MICROCOUPLER™ MicroFET^T MicroPak™ MicroPak2™ MillerDrive™ MotionMax™ mWSaver[®] OptoHiT™ OPTOLOGIC®

OPTOPLANAR®

® PowerTrench® PowerXS™ Programmable Active Droop™

QFĔT® QSTM

Quiet Series™ RapidConfigure™

Saving our world, 1mW/W/kW at a time™

SignalWise™ SmartMax™ SMART START™

Solutions for Your Success™

STEALTH™ SuperFET® SuperSOT™-3 SuperSOT™-6 SuperSOT™ SupreMOS® SyncFE1

Sync-Lock™ SYSTEM ®' **TinyBoost** TinyBuck® TinyCalc™ TinyLogic[®] TINYOPTO™ TinyPower™ TinyPWM™ TinyWire™ TranSiC™ TriFault Detect™ TRUECURRENT®* μSerD

W

Ultra FRFET™ UniFET VCX™ VisualMax™ VoltagePlus™ XST

*Trademarks of System General Corporation, used under license by Fairchild Semiconductor

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS

LIFE SUPPORT POLICY
FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

- Life support devices or systems are devices or systems which (a) are intended for surgical implant into the body or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user
- A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or

ANTI-COUNTERFEITING POLICY

ANTI-COUNTER: ETTING POLICY

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, www.Fairchildsemi.com, under Sales Support.

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufactures of semiconductor products are experiencing counterfeiting of their

parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed application, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handing and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address and warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

PRODUCT STATUS DEFINITIONS Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.



ON Semiconductor and are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor nessure any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, a

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor 19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada Email: orderlit@onsemi.com N. American Technical Support: 800-282-9855 Toll Free USA/Canada

Europe, Middle East and Africa Technical Support: Phone: 421 33 790 2910 Japan Customer Focus Center Phone: 81-3-5817-1050 ON Semiconductor Website: www.onsemi.com

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative