March 2004

ISL9R18120G2 / ISL9R18120P2 / ISL9R18120S3S

18A, 1200V Stealth™ Diode

General Description

The ISL9R18120G2, ISL9R18120P2 and ISL9R18120S3S are Stealth™ diodes optimized for low loss performance in high frequency hard switched applications. The Stealth™ family exhibits low reverse recovery current (I_{RM(REC)}) 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 $I_{RM(REC)}$ 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 $^{\rm TM}$ diode with a 1200V NPT IGBT to provide the most efficient and highest power density design at lower cost

Features

•	Soft Recovery $t_b / t_a > 5.0$
•	Fast Recovery t_{rr} < 45ns
•	Operating Temperature
•	Reverse Voltage

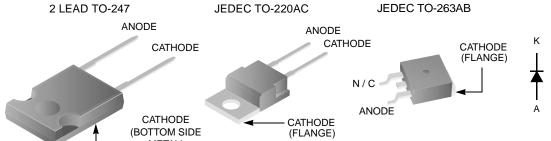
Applications

· Switch Mode Power Supplies

· Avalanche Energy Rated

- · 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}	Repetitive Peak Reverse Voltage	1200	V
V _{RWM}	Working Peak Reverse Voltage	1200	V
V _R	DC Blocking Voltage	1200	V
I _{F(AV)}	Average Rectified Forward Current (T _C = 92°C)	18	Α
I _{FRM}	Repetitive Peak Surge Current (20kHz Square Wave)	36	Α
I _{FSM}	Nonrepetitive Peak Surge Current (Halfwave 1 Phase 60Hz)	200	Α
P _D	Power Dissipation	125	W
E _{AVL}	Avalanche Energy (1A, 40mH)	20	mJ
T _J , T _{STG}	Operating and Storage Temperature Range	-55 to 150	°C
TL	Maximum Temperature for Soldering		
T_{PKG}	Leads at 0.063in (1.6mm) from Case for 10s	300	°C
	Package Body for 10s, See Application Note AN-7528	260	°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
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	Device Marking	Device	Package	Tape Width	Quantity
	R18120G2	ISL9R18120G2	TO-247	N/A	30
•	R18120P2	ISL9R18120P2	TO-220AC	N/A	50
	R18120S3	ISL9R18120S3S	TO-263AB	24mm	800

Symbol	Parameter	Test 0	Conditions	Min	Тур	Max	Units
Off State	Characteristics						
I _R	Instantaneous Reverse Current	V _R = 1200V	$T_C = 25^{\circ}C$	-	-	100	μΑ
			T _C = 125°C	-	-	1.0	mA
On State	Characteristics						
V _F	Instantaneous Forward Voltage	I _F = 18A	T _C = 25°C	-	2.7	3.3	V
			T _C = 125°C	-	2.5	3.1	V
	Characteristics	T				1	
СЈ	Junction Capacitance	$V_R = 10V, I_F = 0$	A	-	69	-	pF
Switchin	g Characteristics						
t _{rr}	Reverse Recovery Time	$\begin{array}{c} I_F = 1\text{A}, \ dI_F/dt = 100\text{A}/\mu\text{s}, \ V_R = 30\text{V} \\ I_F = 18\text{A}, \ dI_F/dt = 100\text{A}/\mu\text{s}, \ V_R = 30\text{V} \\ \hline I_F = 18\text{A}, \\ \hline Current & dI_F/dt = 200\text{A}/\mu\text{s}, \\ V_R = 780\text{V}, \ T_C = 25^{\circ}\text{C} \end{array}$		-	38	45	ns
				-	60	70	ns
t _{rr}	Reverse Recovery Time			-	300	-	ns
I _{RM(REC)}	Maximum Reverse Recovery Current			-	6.5	-	Α
Q_{RR}	Reverse Recovered Charge			-	950	-	nC
t _{rr}	Reverse Recovery Time	I _F = 18A,		-	400	-	ns
S	Softness Factor (t _b /t _a)	$dI_F/dt = 200A/\mu s$,	-	7.0	-	-
I _{RM(REC)}	Maximum Reverse Recovery Current	$V_R = 780V,$ $T_C = 125^{\circ}C$		-	8.0	-	Α
Q_{RR}	Reverse Recovered Charge	10 - 120 0		-	2.0	-	μC
t _{rr}	Reverse Recovery Time	$I_F = 18A,$ $dI_F/dt = 1000A/\mu s,$ $V_R = 780V,$ $T_C = 125^{\circ}C$		-	235	-	ns
S	Softness Factor (t _b /t _a)			-	5.2	-	-
I _{RM(REC)}	Maximum Reverse Recovery Current			-	22	-	Α
Q _{RR}	Reverse Recovered Charge			-	2.1	-	μC
dl _M /dt	Maximum di/dt during t _h			-	370		A/µs

$R_{\theta JC}$	Thermal Resistance Junction to Case	TO-247, TO-220, TO-263	-	-	1.0	°C/W
$R_{\theta JA}$	Thermal Resistance Junction to Ambient	TO-247	-	-	30	°C/W
$R_{\theta JA}$	Thermal Resistance Junction to Ambient	TO-220, TO-263	-	-	62	°C/W

Typical Performance Curves

Figure 1. Forward Current vs Forward Voltage

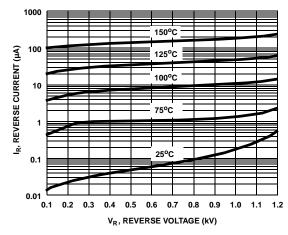


Figure 2. Reverse Current vs Reverse Voltage

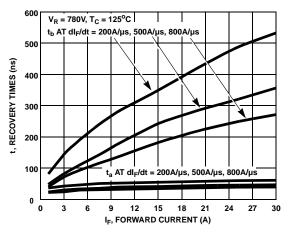


Figure 3. t_a and t_b Curves vs Forward Current

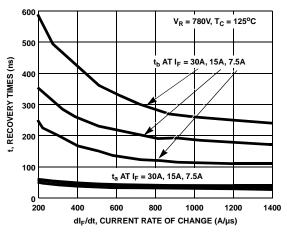


Figure 4. t_a and t_b Curves vs dl_F/dt

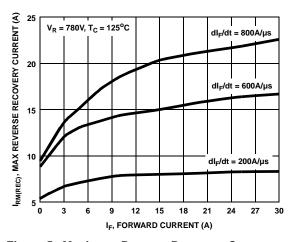


Figure 5. Maximum Reverse Recovery Current vs Forward Current

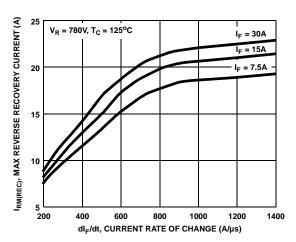
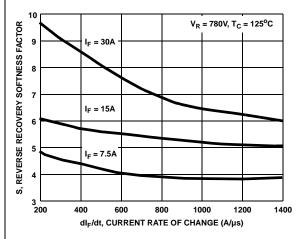


Figure 6. Maximum Reverse Recovery Current vs dl_F/dt

Typical Performance Curves (Continued)



V_R = 780V, T_C = 125°C

I_F = 30A

I_F = 30A

I_F = 15A

I_F = 7.5A

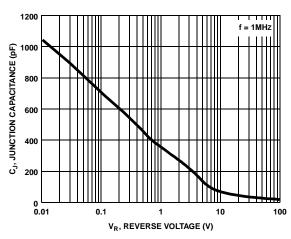
I_F = 7.5A

I_F = 7.5A

I_F = 7.5A

Figure 7. Reverse Recovery Softness Factor vs $\mathrm{dI_F/dt}$

Figure 8. Reverse Recovered Charge vs $\mathrm{dI}_{\mathrm{F}}/\mathrm{dt}$



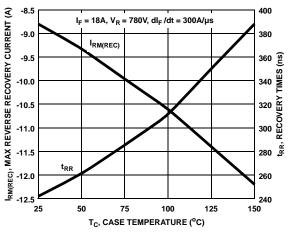


Figure 9. Junction Capacitance vs Reverse Voltage

Figure 10. Reverse Recovery Current and Times vs Case Temperature

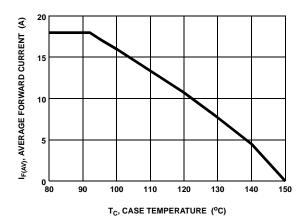


Figure 11. DC Current Derating Curve

Typical Performance Curves (Continued)

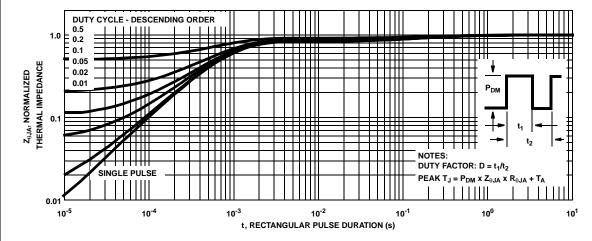
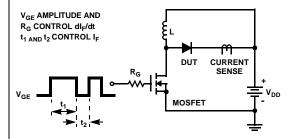


Figure 12. Normalized Maximum Transient Thermal Impedance

Test Circuit and Waveforms



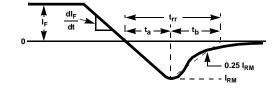
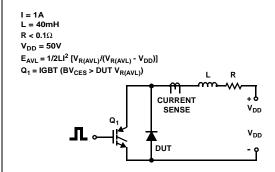


Figure 13. t_{rr} Test Circuit

Figure 14. t_{rr} Waveforms and Definitions



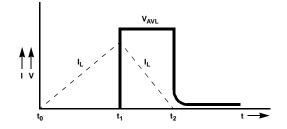


Figure 15. Avalanche Energy Test Circuit

Figure 16. Avalanche Current and Voltage Waveforms

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CoolFET™	FPS™	MicroFET™	PowerTrench®	SuperSOT™-6
CROSSVOLT™	FRFET™	MicroPak™	QFET®	SuperSOT™-8
DOME™	GlobalOptoisolator™	MICROWIRE™	QS^{TM}	SyncFET™
EcoSPARK™	GTO™ .	MSX TM	QT Optoelectronics™	TinyLogic [®]
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EnSigna™	I ² C TM	OCX^{TM}	RapidConfigure™	TruTranslation™
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