4A, 600V Stealth™ Diode

The ISL9R460P2 is a Stealth™ diode 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.

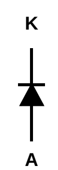
Formerly developmental type TA49408.

Ordering Information

PART NUMBER	PACKAGE	BRAND
ISL9R460P2	TO-220AC	R460P2

NOTE: When ordering, use the entire part number.

Symbol



Features

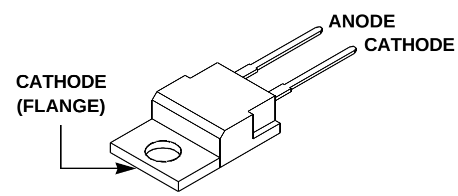
- Soft Recovery . . . . t_b / t_a > 3
- Fast Recovery . . . . t_{rr} < 20ns
- Operating Temperature . . . . 175°C
- Reverse Voltage 600V
- Avalanche Energy Rated

Applications

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

Packaging

JEDEC TO-220AC



Absolute Maximum Ratings T_C = 25°C, Unless Otherwise Specified

SYMBOL	PARAMETER	ISL9R460P2	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	4	A
I_{FRM}	Repetitive Peak Surge Current (20kHz Square Wave)	8	A
I_{FSM}	Nonrepetitive Peak Surge Current (Halfwave 1 Phase 60Hz)	50	A
P_D	Power Dissipation	58	W
E_{AVL}	Avalanche Energy (1A, 20mH)	10	mJ
T_J, T_{STG}	Operating and Storage Temperature	-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
THERMAL SPECIFICATIONS			
$R_{\theta JC}$	Thermal Resistance Junction to Case	2.6	°C/W
$R_{\theta JA}$	Thermal Resistance Junction to Ambient	62	°C/W

NOTES:

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.*

Electrical Specifications $T_C = 25^oC$, Unless Otherwise Specified

SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNITS
V_F	$I_F = 4A$	-	2.0	2.4	V
	$I_F = 4A$, $T_C = 125^oC$	-	1.6	2.0	V
I_R	$V_R = 600V$	-	-	100	µA
	$V_R = 600V$, $T_C = 125^oC$	-	-	1.0	mA
t_{rr}	$I_F = 1A$, $dI_F/dt = 100A/µs$, $V_R = 30V$	-	17	20	ns
	$I_F = 4A$, $dI_F/dt = 100A/µs$, $V_R = 30V$	-	19	22	ns
t_{rr}	$I_F = 4A$, $dI_F/dt = 200A/µs$, $V_R = 390V$, $T_C = 25^oC$	-	17	-	ns
I_{RRM}		-	2.6	-	A
Q_{RR}		-	22	-	nC
t_{rr}	$I_F = 4A$, $dI_F/dt = 200A/µs$, $V_R = 390V$, $T_C = 125^oC$	-	77	-	ns
S		-	4.2	-	
I_{RRM}		-	2.8	-	A
Q_{RR}		-	100	-	nC
t_{rr}	$I_F = 4A$, $dI_F/dt = 400A/µs$, $V_R = 390V$, $T_C = 125^oC$	-	54	-	ns
S		-	3.5	-	
I_{RRM}		-	4.3	-	A
Q_{RR}		-	110	-	nC
dI_M/dt		-	500	-	A/µs
C_J	$V_R = 10V$, $I_F = 0A$	-	19	-	pF

DEFINITIONS

V_F = Instantaneous forward voltage (pw = 300µs, D = 2%)
pw = pulse width.
D = Duty cycle
I_R = Instantaneous reverse current.
t_{rr} = Reverse recovery time ($t_a + t_b$).
S = Softness factor (t_b / t_a).
I_{RRM} = Maximum reverse recovery current.
Q_{RR} = Reverse recovery charge.
dI_M/dt = Maximum di/dt during t_b.
C_J = Junction Capacitance.

Typical Performance Curves

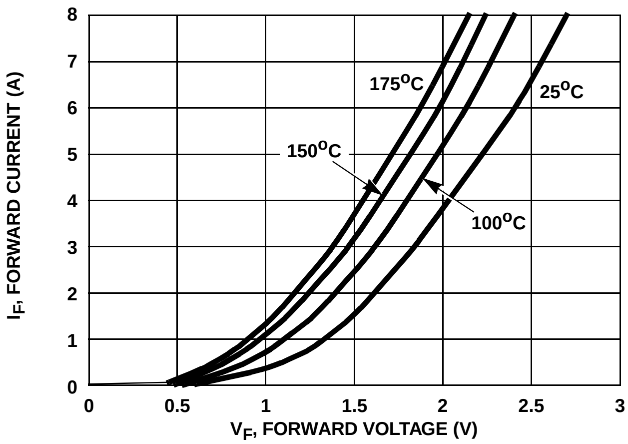


FIGURE 1. FORWARD CURRENT vs FORWARD VOLTAGE

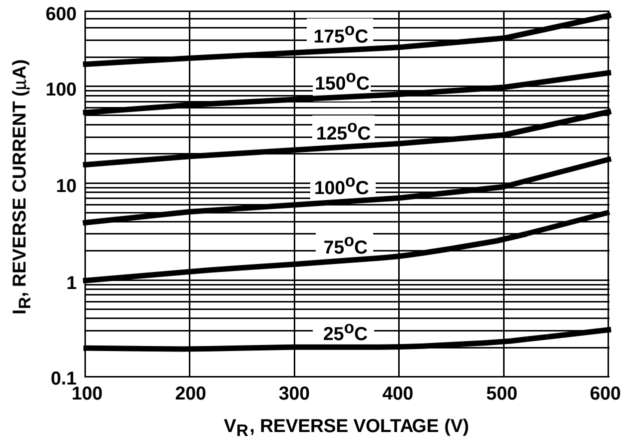


FIGURE 2. REVERSE CURRENT vs REVERSE VOLTAGE

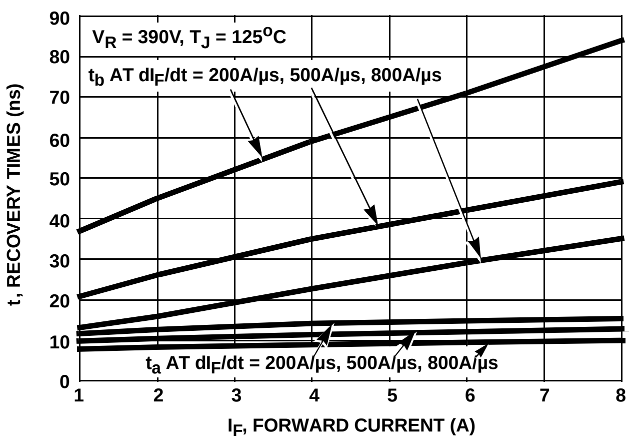


FIGURE 3. t_a AND t_b CURVES vs FORWARD CURRENT

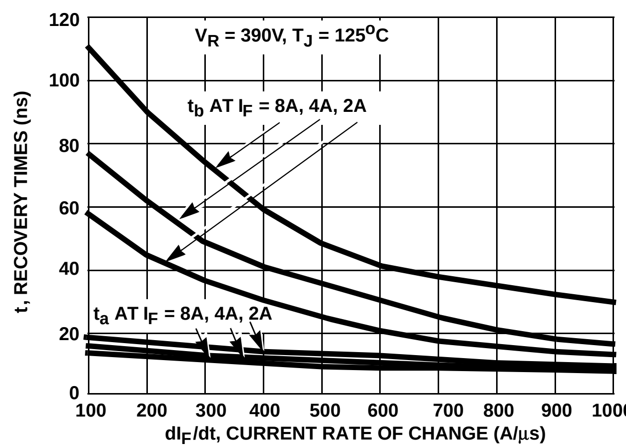


FIGURE 4. t_a AND t_b CURVES vs dI_F/dt

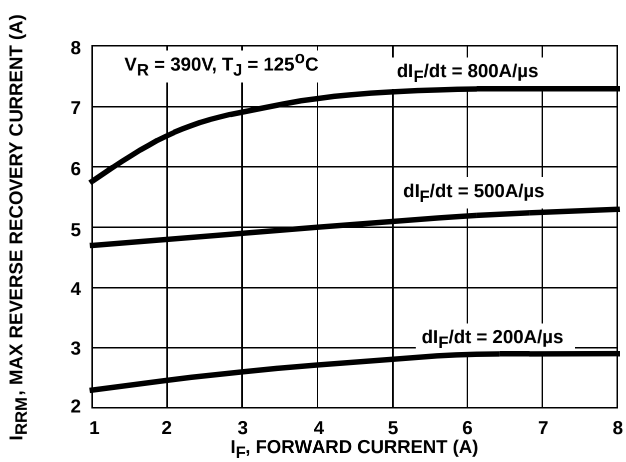


FIGURE 5. MAXIMUM REVERSE RECOVERY CURRENT vs FORWARD CURRENT

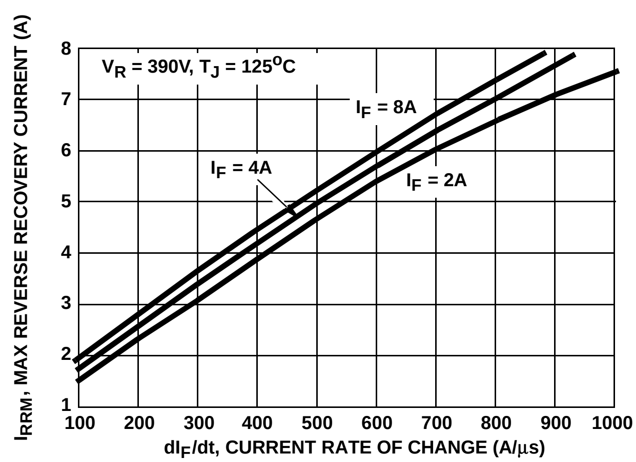


FIGURE 6. MAXIMUM REVERSE RECOVERY CURRENT vs dI_F/dt

Typical Performance Curves (Continued)

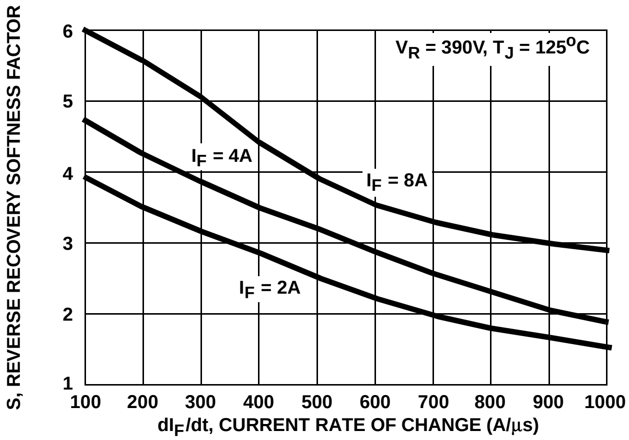


FIGURE 7. REVERSE RECOVERY SOFTNESS FACTOR vs dI$_F$/dt

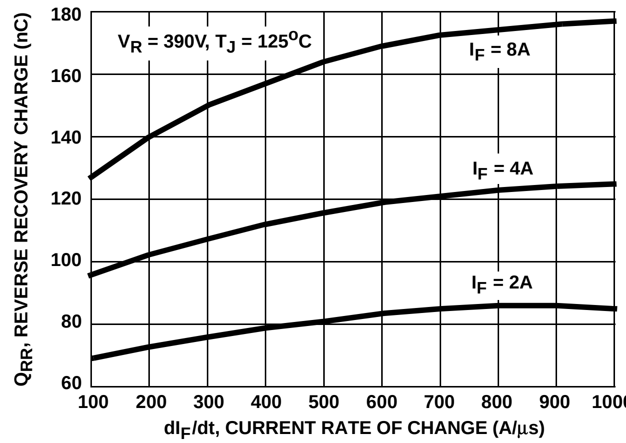


FIGURE 8. REVERSE RECOVERY CHARGE vs dI$_F$/dt

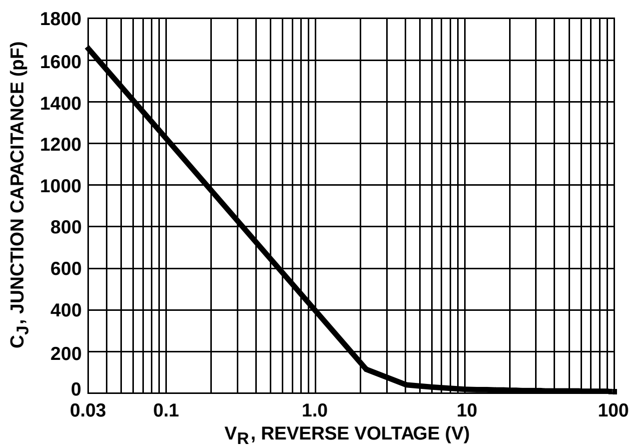


FIGURE 9. JUNCTION CAPACITANCE vs REVERSE VOLTAGE

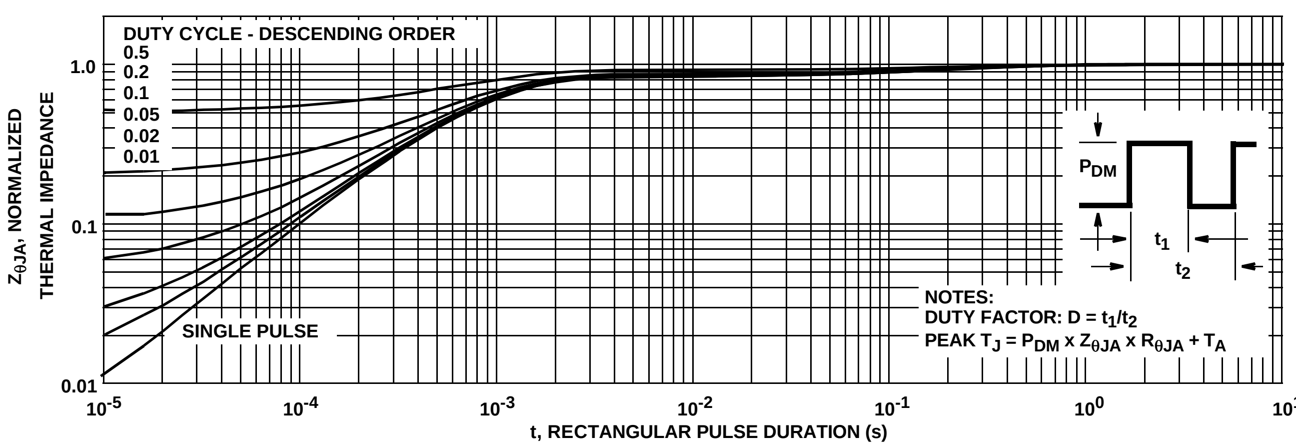


FIGURE 10. NORMALIZED MAXIMUM TRANSIENT THERMAL IMPEDANCE

Test Circuits and Waveforms

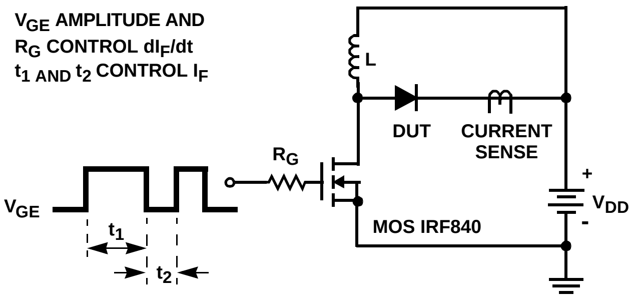


FIGURE 11. t_{rr} TEST CIRCUIT

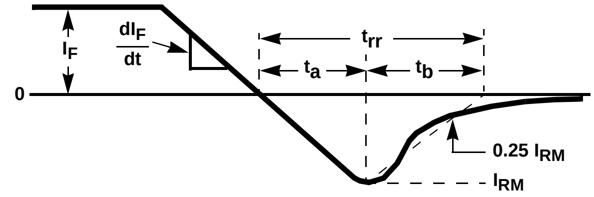


FIGURE 12. t_{rr} WAVEFORMS AND DEFINITIONS

I = 1A
L = 20mH
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 $V_{R(AVL)}$)

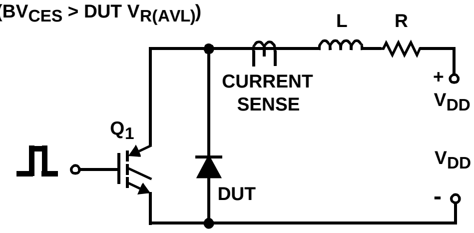


FIGURE 13. AVALANCHE ENERGY TEST CIRCUIT

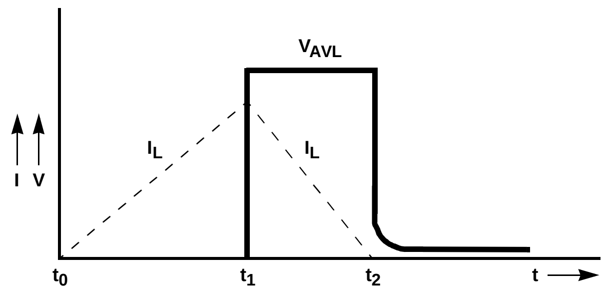
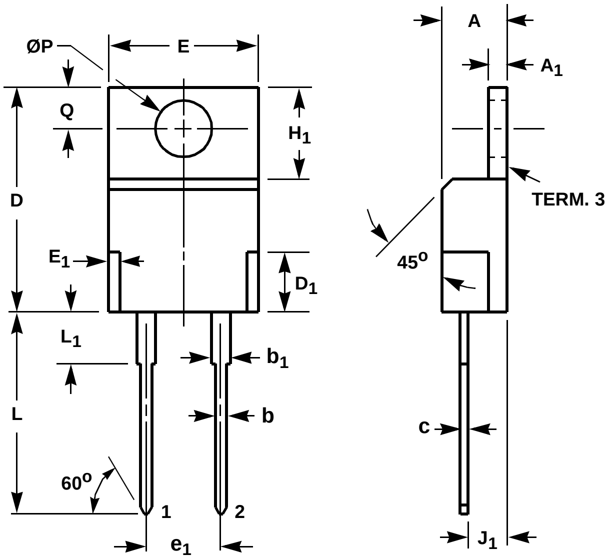


FIGURE 14. AVALANCHE CURRENT AND VOLTAGE WAVEFORMS

TO-220AC

2 LEAD JEDEC TO-220AC PLASTIC PACKAGE (FOR RECTIFIERS ONLY)



SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN	MAX	MIN	MAX	
A	0.170	0.180	4.32	4.57	-
A_1	0.048	0.052	1.22	1.32	-
b	0.030	0.034	0.77	0.86	3, 4
b_1	0.045	0.055	1.15	1.39	2, 3
c	0.014	0.019	0.36	0.48	2, 3, 4
D	0.590	0.610	14.99	15.49	-
D_1	-	0.160	-	4.06	-
E	0.395	0.410	10.04	10.41	-
E_1	-	0.030	-	0.76	-
e_1	0.200 BSC		5.08 BSC		5
H_1	0.235	0.255	5.97	6.47	-
J_1	0.100	0.110	2.54	2.79	6
L	0.530	0.550	13.47	13.97	-
L_1	0.130	0.150	3.31	3.81	2
ØP	0.149	0.153	3.79	3.88	-
Q	0.102	0.112	2.60	2.84	-

NOTES:

1. These dimensions are within allowable dimensions of Rev. J of JEDEC TO-220AC outline dated 3-24-87.
2. Lead dimension and finish uncontrolled in L_1.
3. Lead dimension (without solder).
4. Add typically 0.002 inches (0.05mm) for solder coating.
5. Position of lead to be measured 0.250 inches (6.35mm) from bottom of dimension D.
6. Position of lead to be measured 0.100 inches (2.54mm) from bottom of dimension D.
7. Controlling dimension: Inch.
8. Revision 3 dated 7-97.

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