



Is Now Part of



ON Semiconductor®

To learn more about ON Semiconductor, please visit our website at
www.onsemi.com

ON Semiconductor and the ON Semiconductor logo 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 makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume 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, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

ISL9R1560G2, ISL9R1560P2, ISL9R1560S2, ISL9R1560S3S 15 A, 600 V, STEALTH™ Diode

Features

- Stealth Recovery $t_{rr} = 29.4 \text{ ns}$ (@ $I_F = 15 \text{ A}$)
- Max Forward Voltage, $V_F = 2.2 \text{ V}$ (@ $T_C = 25^\circ\text{C}$)
- 600 V Reverse Voltage and High Reliability
- Avalanche Energy Rated
- RoHS Compliant

Applications

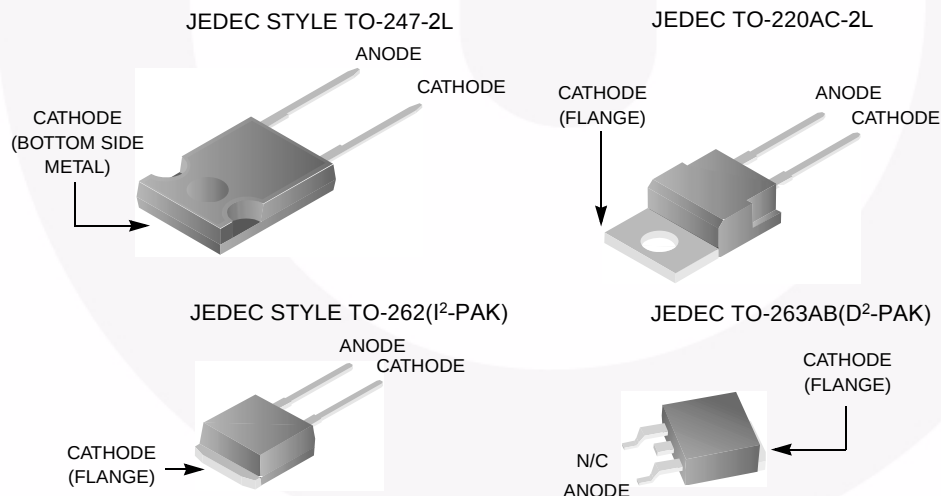
- SMPS
- Hard Switched PFC Boost Diode
- UPS Free Wheeling Diode
- Motor Drive FWD
- SMPS FWD
- Snubber Diode

Description

The ISL9R1560G2, ISL9R1560P2, ISL9R1560S2, ISL9R1560S3S 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 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.

Package

Symbol



Device Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Ratings	Unit
V_{RRM}	Repetitive Peak 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 ($T_C = 145^\circ\text{C}$)	15	A
I_{FRM}	Repetitive Peak Surge Current (20kHz Square Wave)	30	A
I_{FSM}	Nonrepetitive Peak Surge Current (Halfwave 1 Phase 60Hz)	200	A

Symbol	Parameter	Ratings	Unit
P_D	Power Dissipation	150	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	Maximum Temperature for Soldering	300	°C
T_{PKG}	Leads at 0.063in (1.6mm) from Case for 10s Package Body for 10s, See Techbrief TB334	260	°C

CAUTION: Stresses above those listed in "Device 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

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
ISL9R1560G2	ISL9R1560G2	TO-247-2L	Tube	N/A	N/A	30
ISL9R1560P2	ISL9R1560P2	TO-220AC-2L	Tube	N/A	N/A	50
ISL9R1560S2	ISL9R1560S2	TO-262(I ² -PAK)	Tube	N/A	N/A	50
ISL9R1560S3ST	ISL9R1560S3S	TO-263(D ² -PAK)	Reel	13" dia	24mm	800

Electrical Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
--------	-----------	-----------------	-----	-----	-----	------

Off State Characteristics

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

On State Characteristics

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

Dynamic Characteristics

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

Switching Characteristics

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

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance Junction to Case		-	-	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	-	-	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

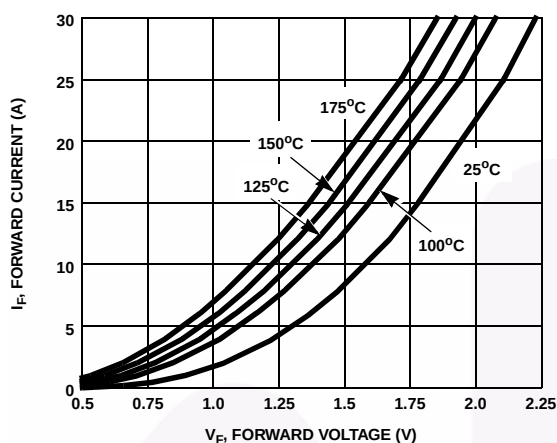


Figure 1. Forward Current vs Forward Voltage

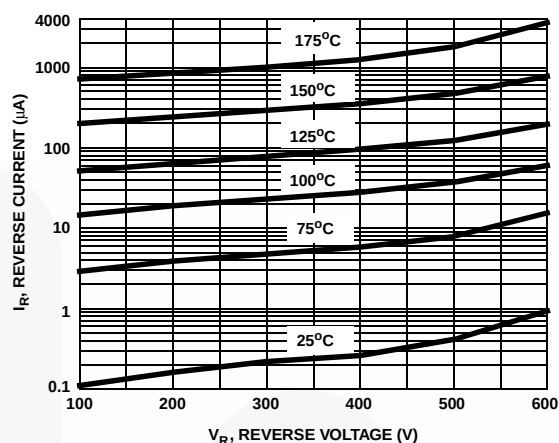


Figure 2. Reverse Current vs Reverse Voltage

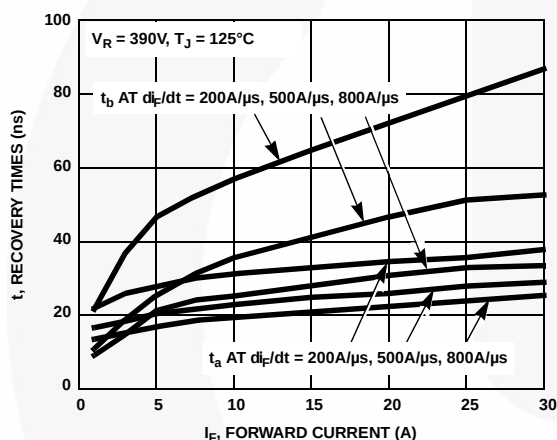


Figure 3. t_a and t_b Curves vs Forward Current

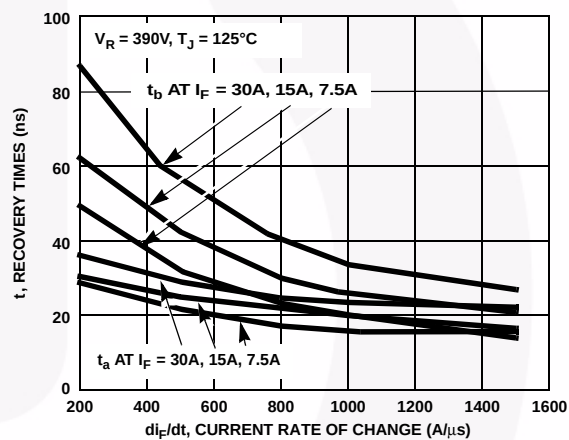


Figure 4. t_a and t_b Curves vs di_F/dt

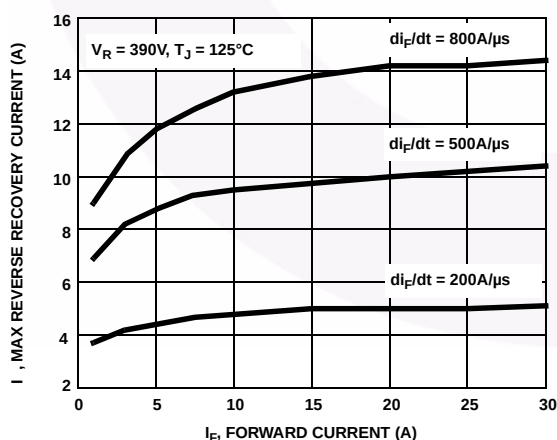


Figure 5. Maximum Reverse Recovery Current vs Forward Current

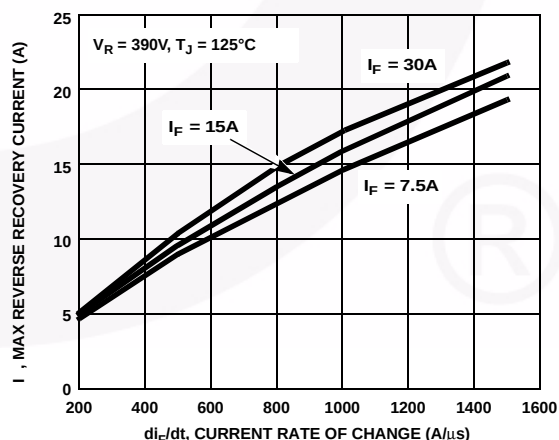


Figure 6. Maximum Reverse Recovery Current vs di_F/dt

Typical Performance Curves (Continued)

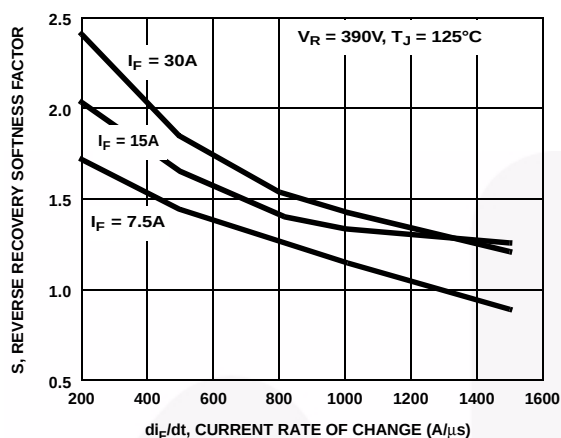


Figure 7. Reverse Recovery Softness Factor vs di_F/dt

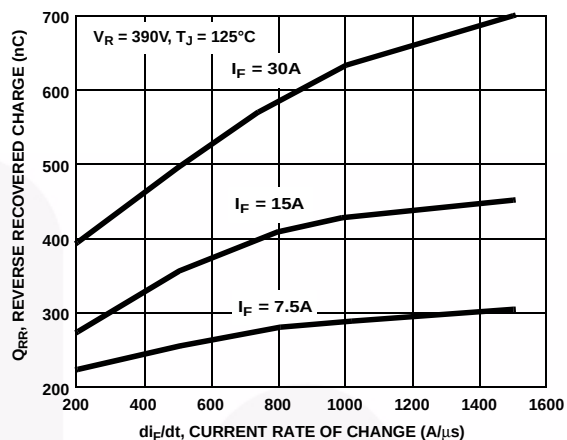


Figure 7. Reverse Recovered Charge vs di_F/dt

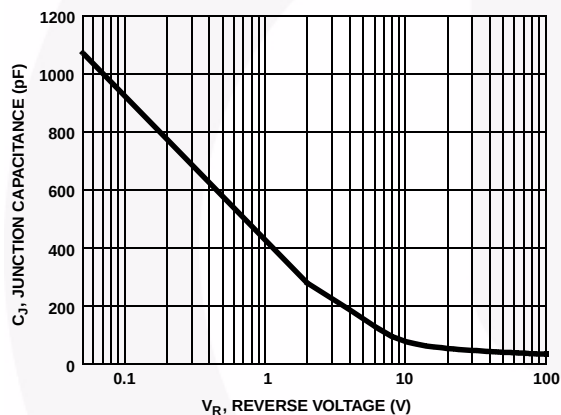


Figure 9. Junction Capacitance vs Reverse Voltage

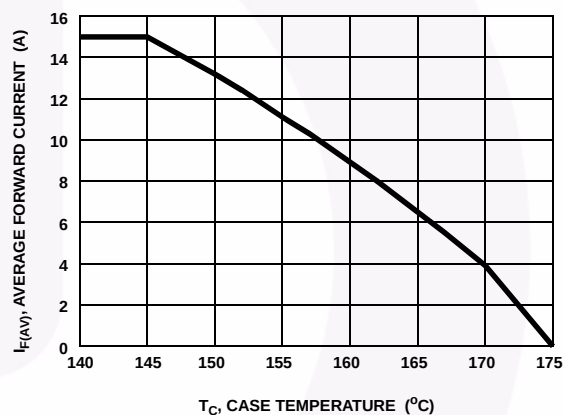


Figure 10. DC Current Derating Curve vs Case Temperature

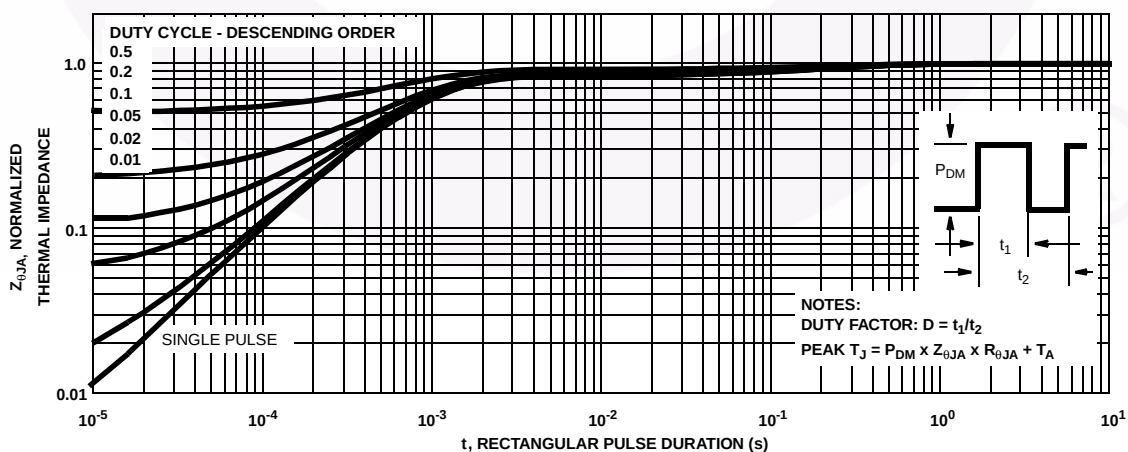


Figure 11. Normalized Maximum Transient Thermal Impedance

Test Circuit and Waveforms

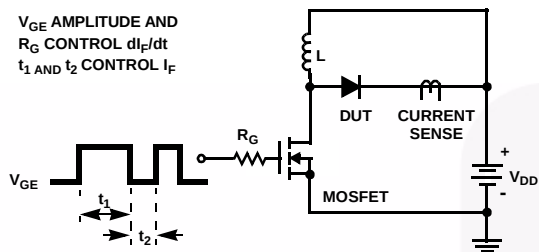


Figure 12. t_{rr} Test Circuit

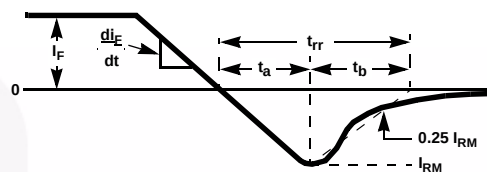


Figure 13. t_{rr} Waveforms and Definitions

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

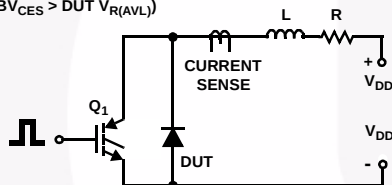


Figure 14. Avalanche Energy Test Circuit

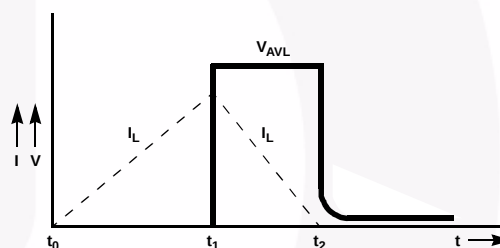
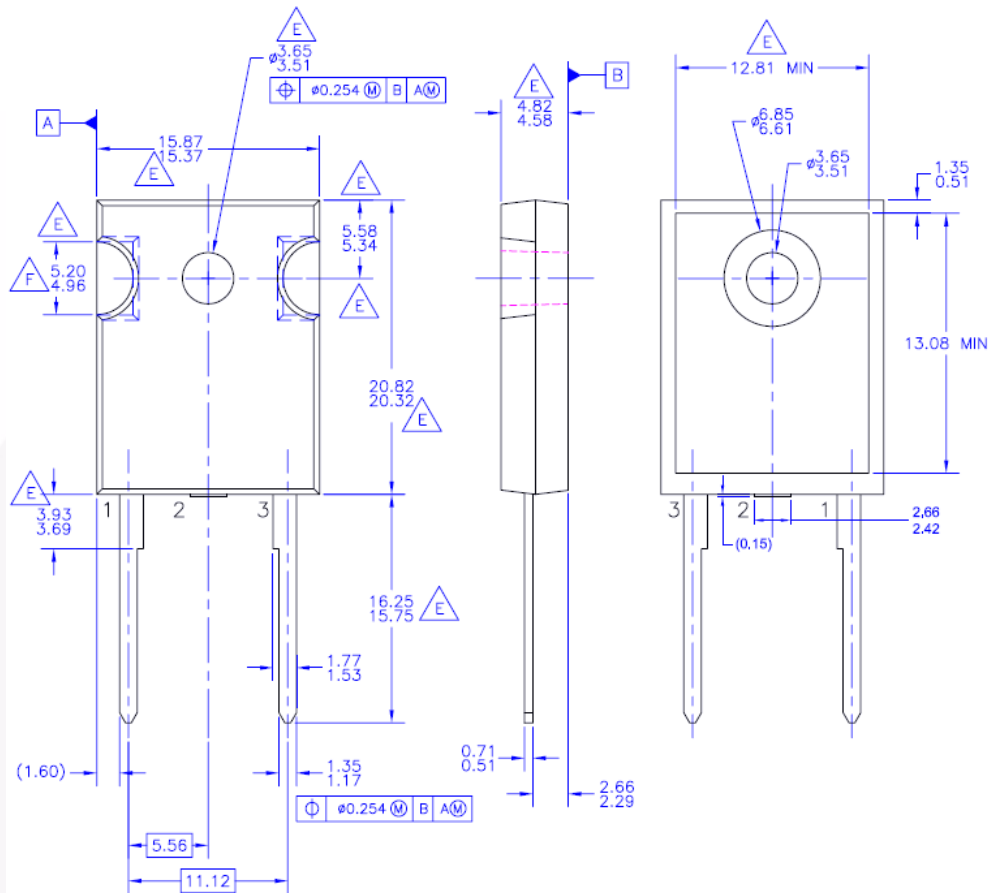


Figure 15. Avalanche Current and Voltage Waveforms

Mechanical Dimensions



- NOTES: UNLESS OTHERWISE SPECIFIED
- A. PACKAGE REFERENCE: JEDEC TO-247, ISSUE E, VARIATION AB, DATED JUNE, 2004.
 - B. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
 - C. ALL DIMENSIONS ARE IN MILLIMETERS.
 - D. DRAWING CONFORMS TO ASME Y14.5 - 1994
 - E. DOES NOT COMPLY JEDEC STANDARD VALUE
 - F. NOTCH MAY BE SQUARE
 - G. DRAWING FILENAME: MKT-TO247B02_REV02

Figure 16. TO-247 2L - TO247,MOLDED,2LD, JEDEC OPTION AB

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_TO247-002

Mechanical Dimensions

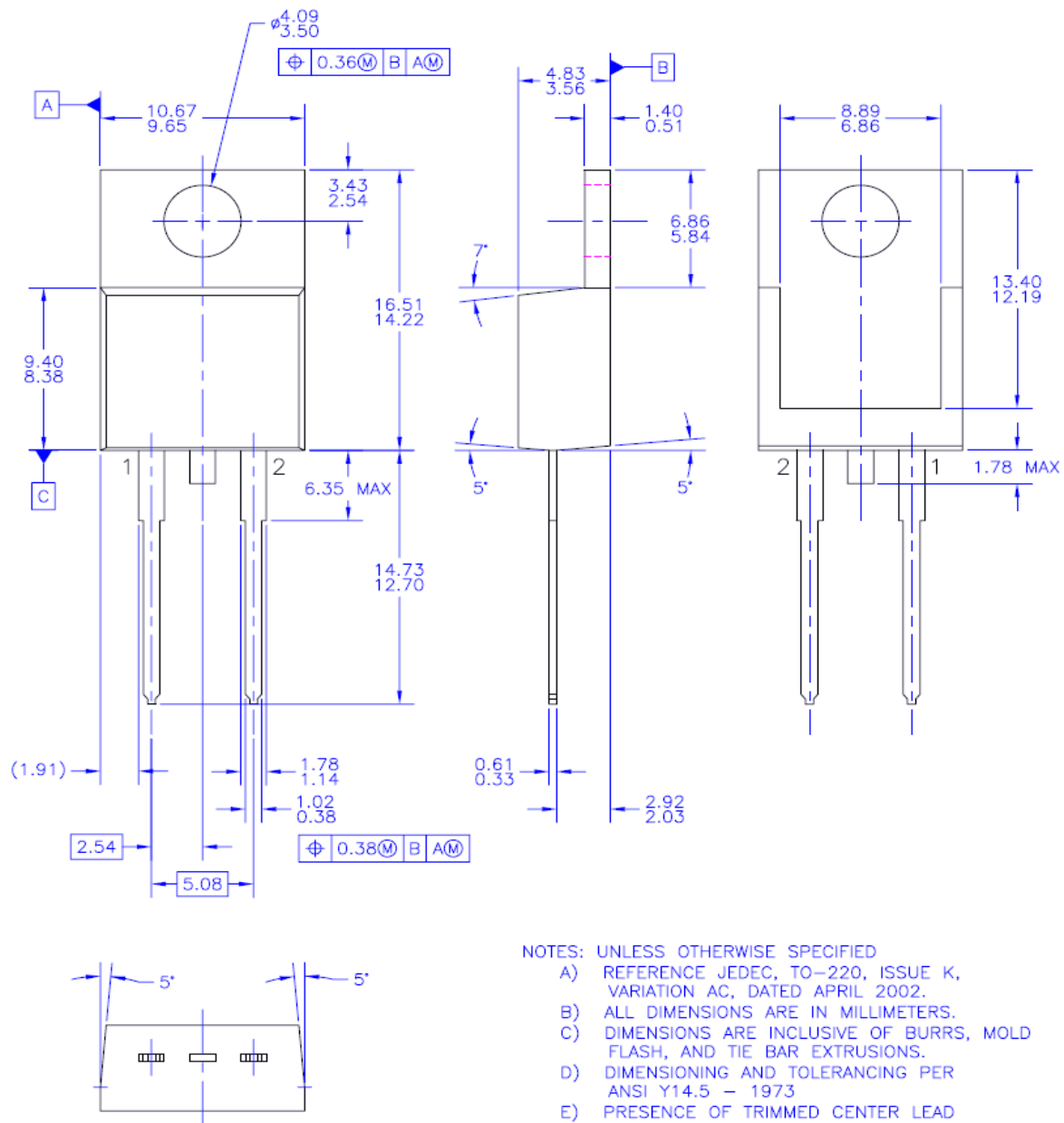


Figure 1 . TO-220 2L - 2LD, TO220, JEDEC TO-220 VARIATION AC

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

Mechanical Dimensions

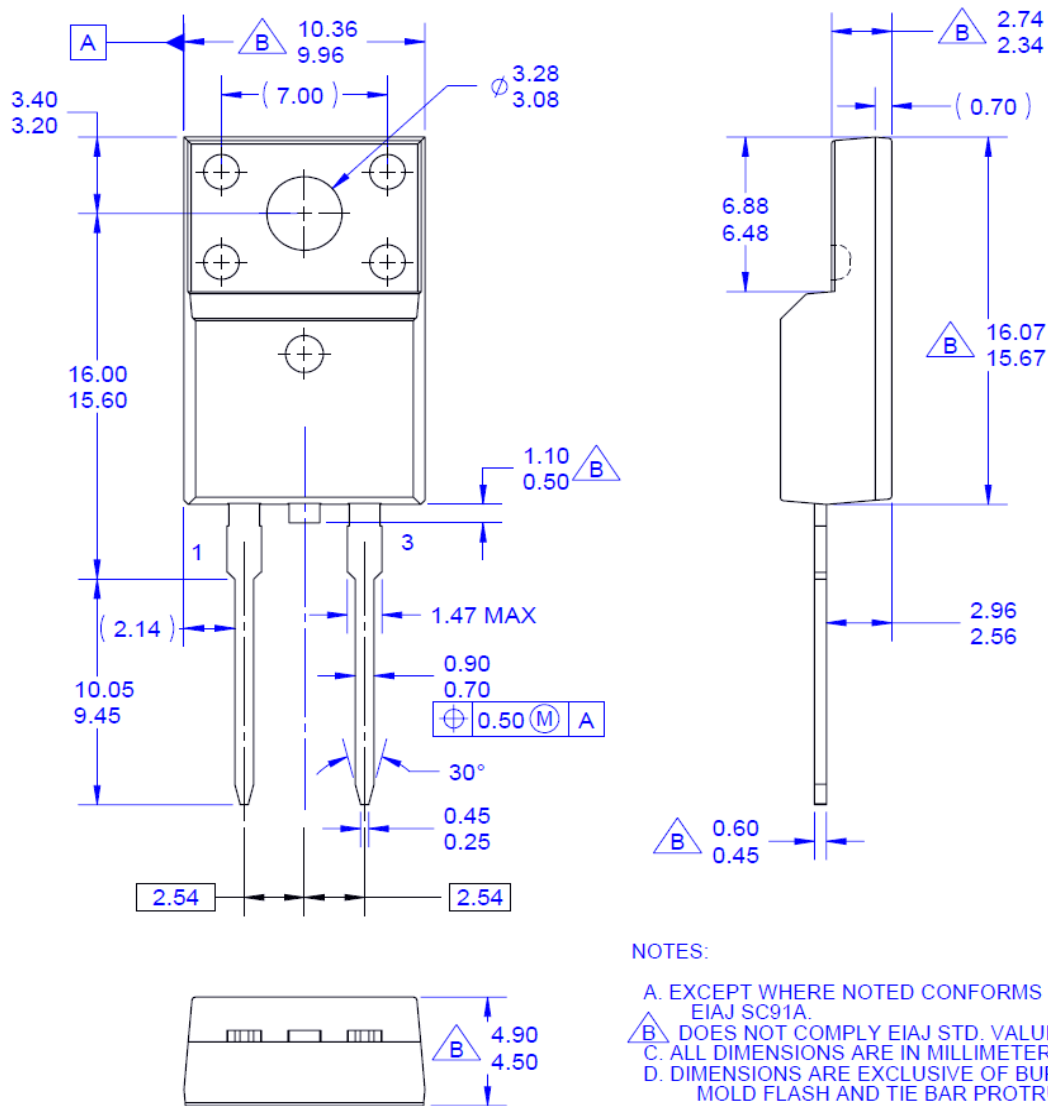


Figure 1 . TO-220F 2L - 2LD; TO220; MOLDED; FULL PACK

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_TF220-002

Me i Dimensions

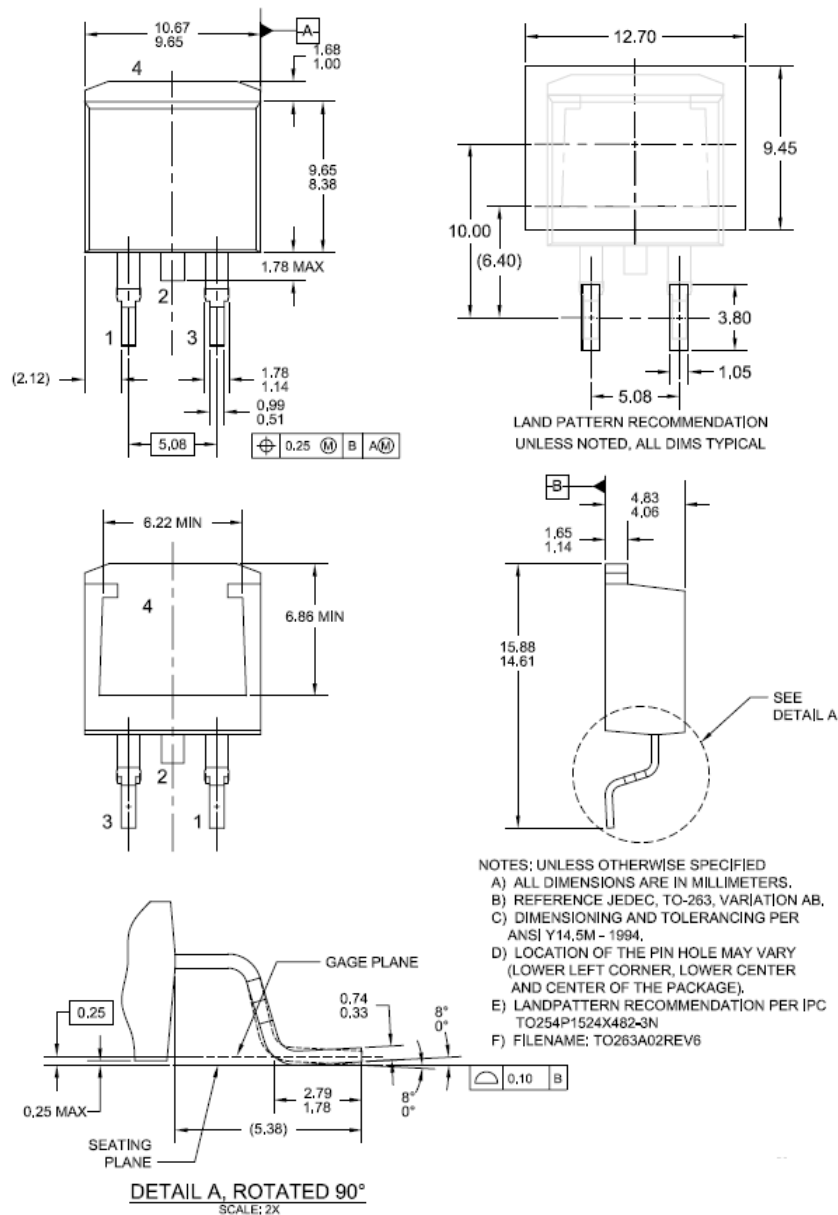


Figure 19. TO-263 2L (D2PAK) - 2LD, TO263, SURFACE MOUNT

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

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 makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume 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, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

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