FAIRCHILD SEMICONDUCTOR®

November 2013

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

Features

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

Applications

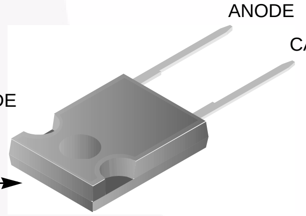
- SMPS
- Hard Switched PFC Boost Diode
- UPS Free Wheeling Diode
- Motor Drive FWD
- SMPS FWD
- Snubber Diode

Description

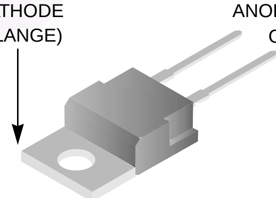
The ISL9R1560G2, ISL9R1560P2, ISL9R1560S2, ISL9R1560S3S is a STEALTH™ diode optimized for low loss performance in high frequency hard switched applications. The STEALTH™ family exhibits low reverse recovery current (I_{rr}) and exceptionally soft recovery under typical operating conditions. This device 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 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 STEALTH™ diode with an SMPS IGBT to provide the most efficient and highest power density design at lower cost.

Package

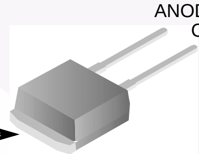
JEDEC STYLE TO-247-2L



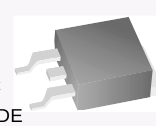
JEDEC TO-220AC-2L



JEDEC STYLE TO-262(I^2-PAK)



JEDEC TO-263AB(D^2-PAK)



Symbol

Device Maximum Ratings T_C = 25°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°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

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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 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 "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(I²-PAK)	Tube	N/A	N/A	50
ISL9R1560S3ST	ISL9R1560S3S	TO-263(D²-PAK)	Reel	13" dia	24mm	800

Electrical Characteristics T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions		Min	Typ	Max	Unit
Off State Characteristics							
I_R	Instantaneous Reverse Current	V_R = 600 V	T_C = 25°C	-	-	100	µA
			T_C = 125°C	-	-	1.0	mA
On State Characteristics							
V_F	Instantaneous Forward Voltage	I_F = 15 A	T_C = 25°C	-	1.8	2.2	V
			T_C = 125°C	-	1.65	2.0	V
Dynamic Characteristics							
C_J	Junction Capacitance	V_R = 10 V, I_F = 0 A		-	62	-	pF
Switching Characteristics							
t_{rr}	Reverse Recovery Time	I_F = 1 A, di_F/dt = 100 A/µs, V_R = 30 V		-	25	30	ns
		I_F=15 A, di_F/dt = 100 A/µs, V_R = 30 V		-	35	40	ns
t_{rr}	Reverse Recovery Time	I_F = 15 A, di_F/dt = 200 A/µs, V_R = 390 V, T_C = 25°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 A, di_F/dt = 200 A/µs, V_R = 390 V, T_C = 125°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 A, di_F/dt = 800 A/µs, V_R = 390 V, T_C = 125°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

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Typical Performance Curves

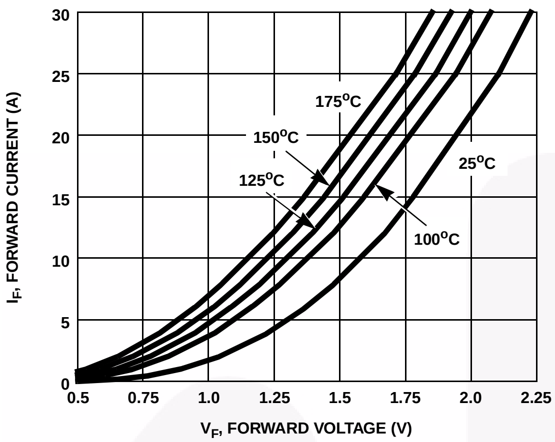

Figure 1. Forward Current vs Forward Voltage

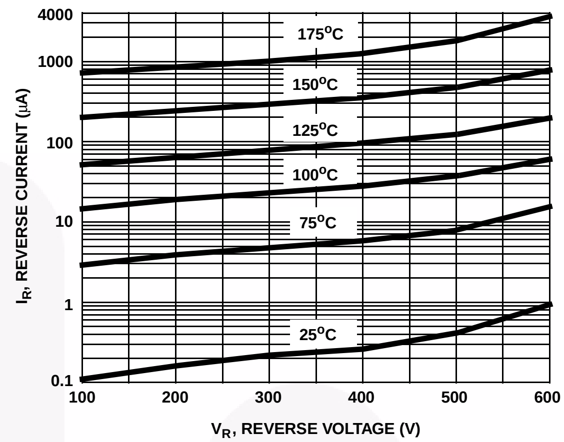

Figure 2. Reverse Current vs Reverse Voltage

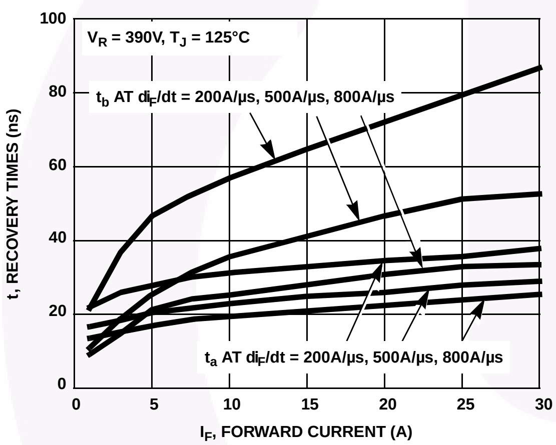

Figure 3. t_a and t_b Curves vs Forward Current

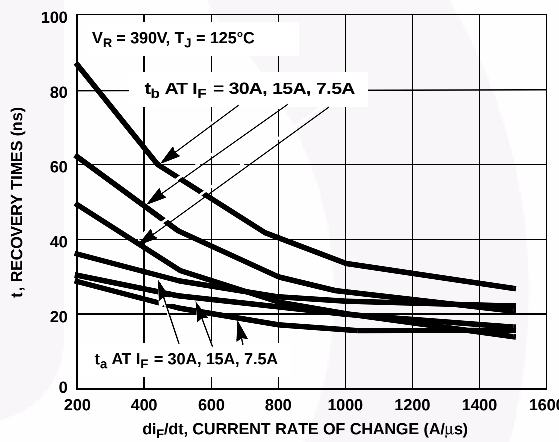

Figure 4. t_a and t_b Curves vs di_F/dt

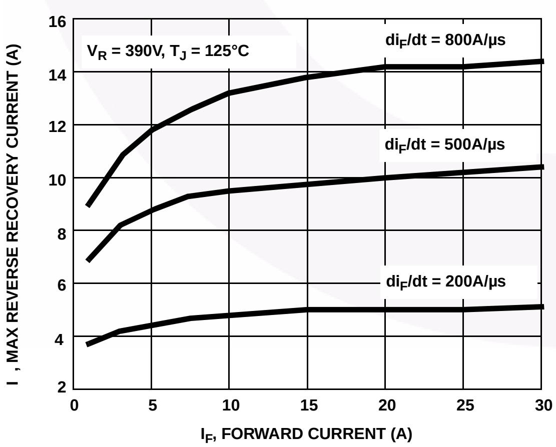

Figure 5. Maximum Reverse Recovery Current vs Forward Current

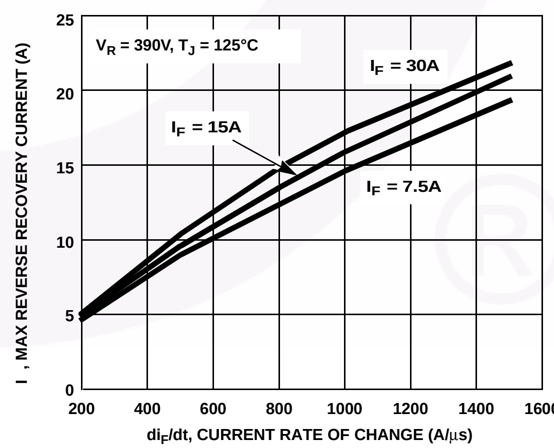

Figure 6. Maximum Reverse Recovery Current vs di_F/dt

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Typical Performance Curves (Continued)

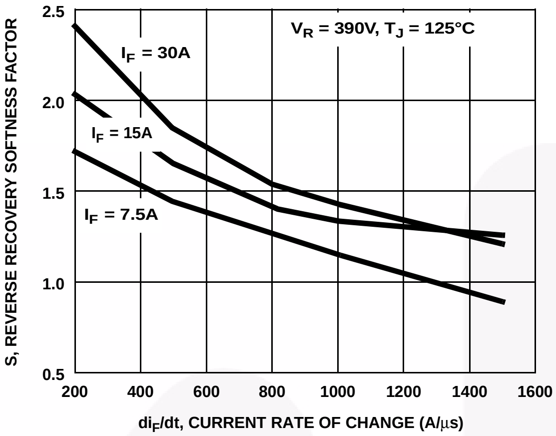

Figure 7. Reverse Recovery Softness Factor vs di_F/dt

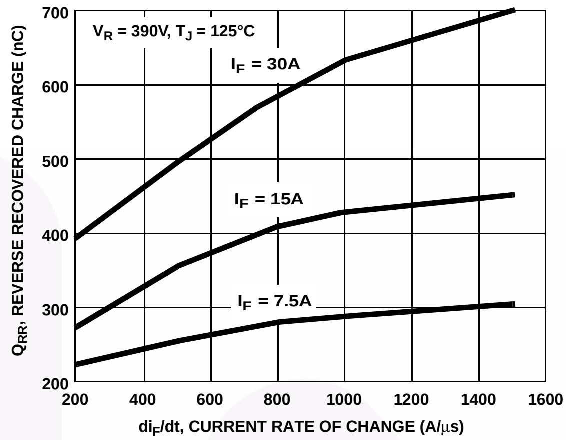

Figure 7. Reverse Recovered e di d

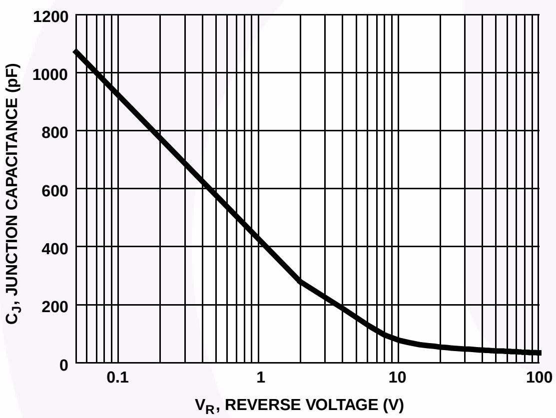

Figure 9. Junction Capacitance vs Reverse Voltage

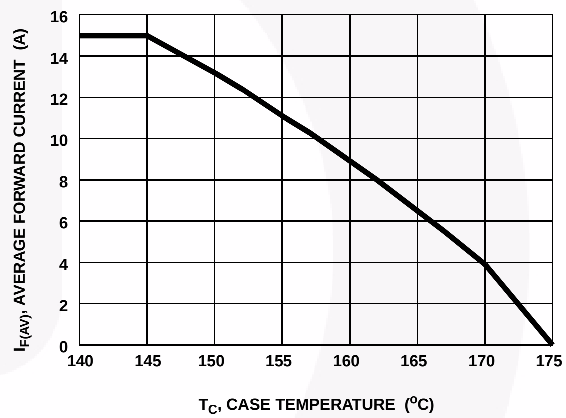

Figure 10. DC Current Derating Curve

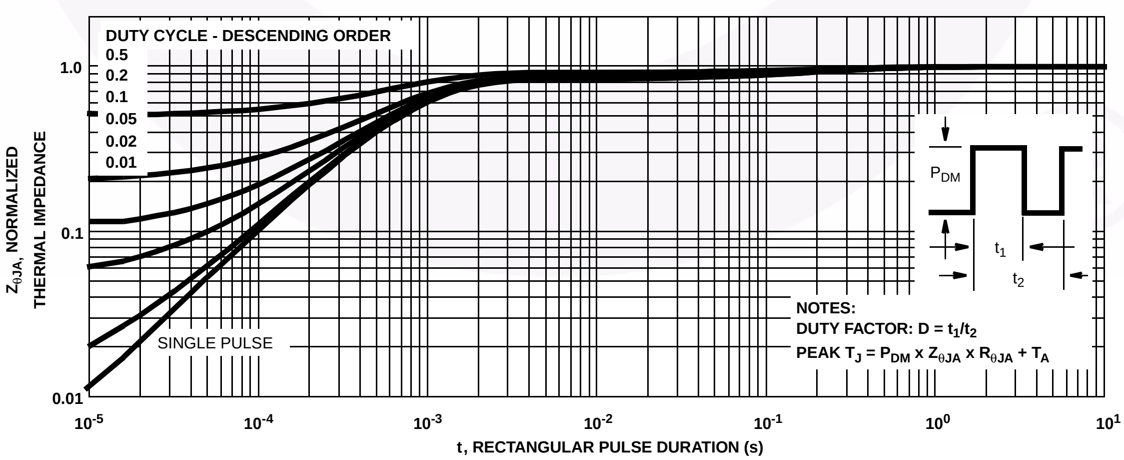

Figure 11. Normalized Maximum Transient Thermal Impedance

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Test Circuit and Waveforms

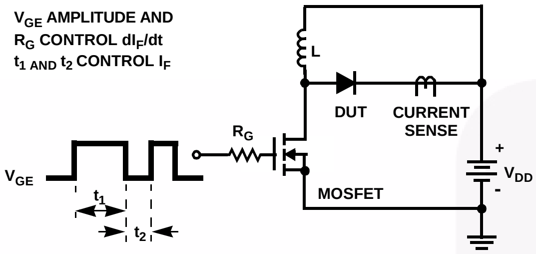

Figure 12. t_{rr} Test Circuit

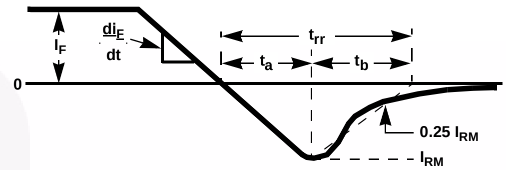

Figure 13. t_{rr} Waveforms and Definitions

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

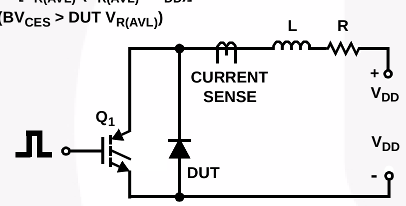

Figure 14. Avalanche Energy Test Circuit

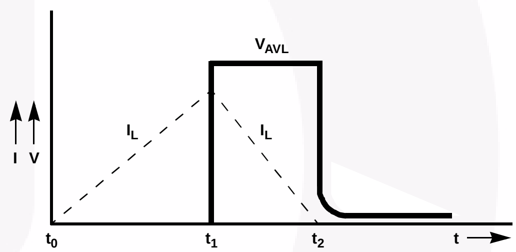

Figure 15. Avalanche Current and Voltage Waveforms

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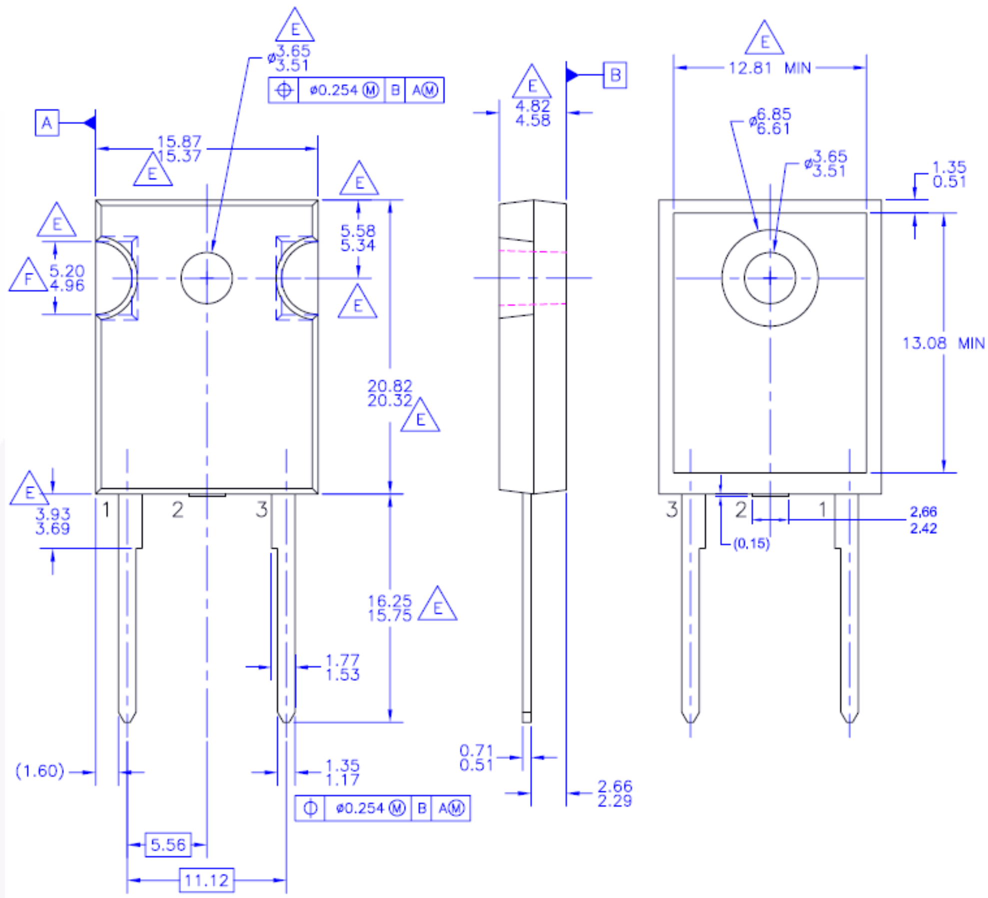
Mechanical Dimensions



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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

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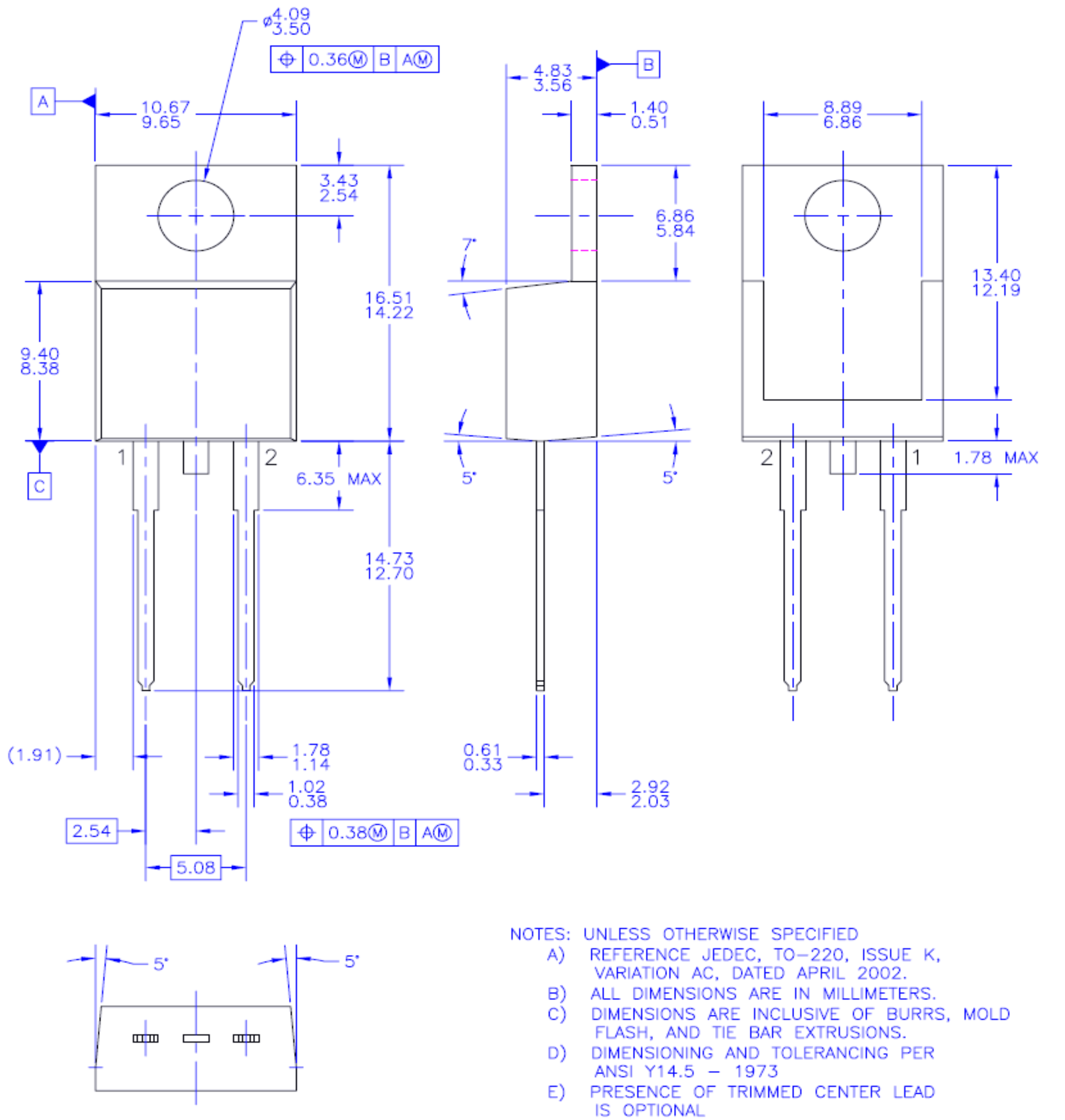

Figure 1 . TO-220 2L - 2LD,TO220,JEDEC TO-220 VARIATION AC

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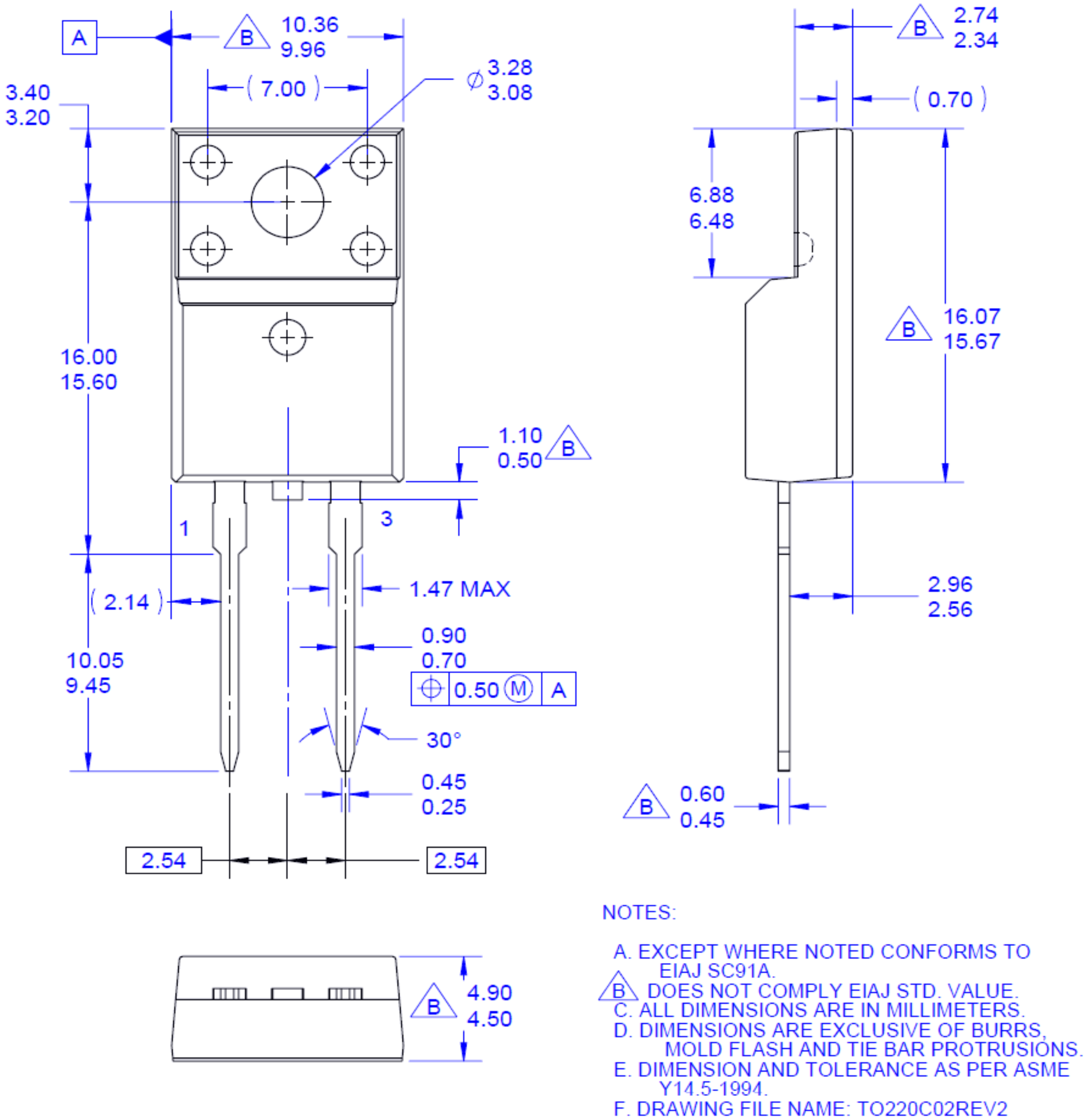

Figure 1 . TO-220F 2L - 2LD; TO220; MOLDED; FULL PACK

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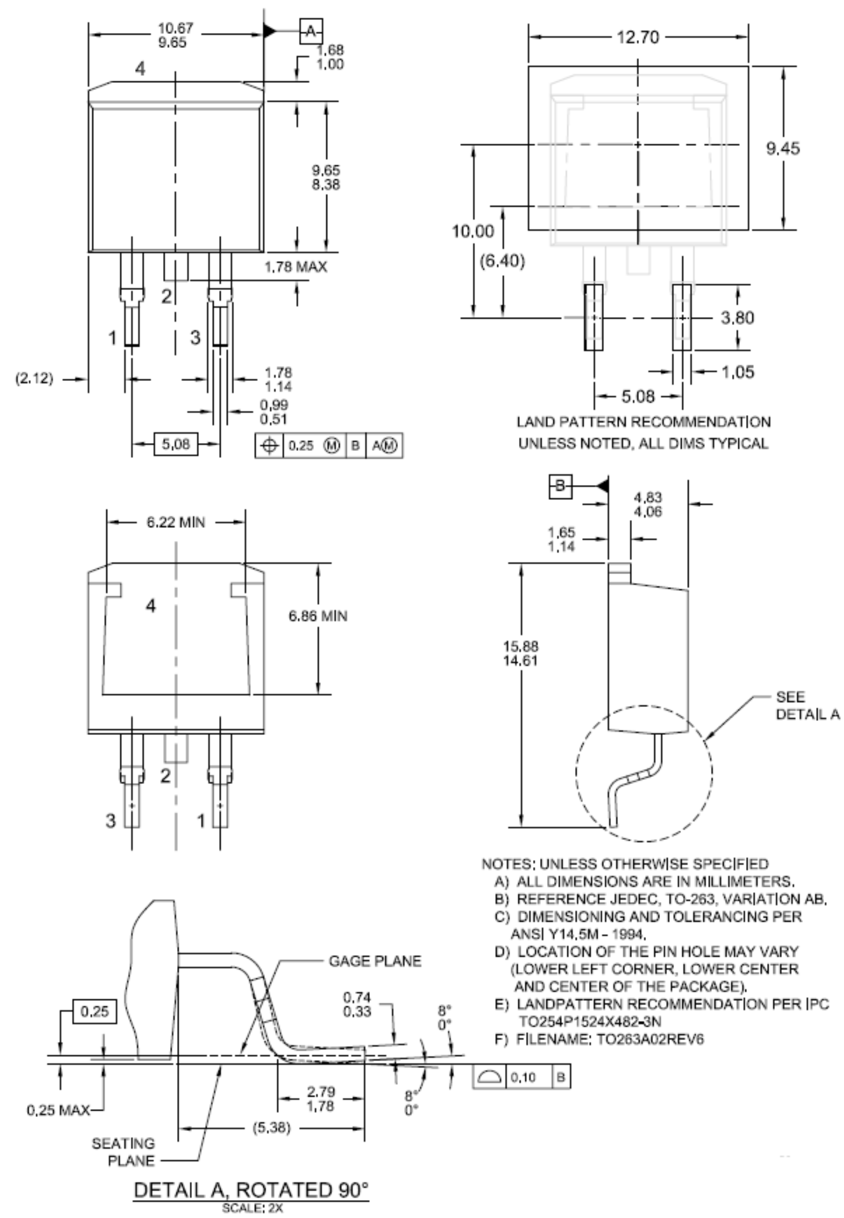

Figure 19. TO-263 2L (D2PAK) - 2LD,TO263, SURFACE MOUNT

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