

# STEALTH™ Diode

30 A, 600 V

## ISL9R3060G2, ISL9R3060P2

### Description

The ISL9R3060G2, ISL9R3060P2 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.

### Features

- Stealth Recovery,  $t_{rr} = 36$  ns (@  $I_F = 30$  A)
- Max Forward Voltage,  $V_F = 2.4$  V (@  $T_C = 25^\circ\text{C}$ )
- 600 V Reverse Voltage and High Reliability
- Avalanche Energy Rated
- This Device is Pb-Free and is RoHS Compliant

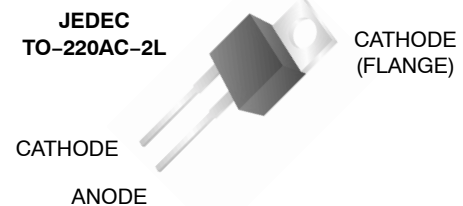
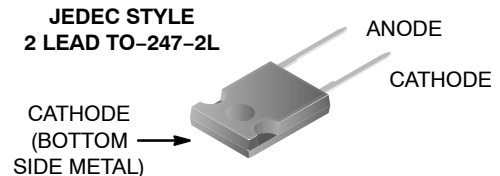
### Applications

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

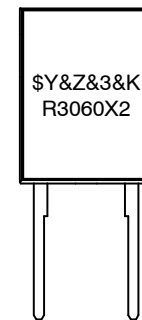


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### MARKING DIAGRAM



|         |                         |
|---------|-------------------------|
| \$Y     | = ON Semiconductor Logo |
| &Z      | = Assembly Plant Code   |
| &3      | = Numeric Date Code     |
| &K      | = Lot Code              |
| R3060X2 | = Specific Device Code  |
| X       | =G/P                    |



### ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

# ISL9R3060G2, ISL9R3060P2

## DEVICE MAXIMUM RATINGS ( $T_C = 25^\circ\text{C}$ unless otherwise noted)

| Rating  | Symbol         | Value      | Unit             |
|---|----------------|------------|------------------|
| Peak Repetitive Reverse Voltage   | $V_{RRM}$      | 600        | V                |
| Working Peak Reverse Voltage  | $V_{RWM}$      | 600        | V                |
| DC Blocking Voltage   | $V_R$          | 600        | V                |
| Average Rectified Forward Current   | $I_{F(AV)}$    | 30         | A                |
| Repetitive Peak Surge Current (20 kHz Square Wave)                              | $I_{FRM}$      | 70         | A                |
| Nonrepetitive Peak Surge Current (Halfwave, 1 Phase, 60 Hz)                     | $I_{FSM}$      | 325        | A                |
| Power Dissipation   | $P_D$          | 200        | W                |
| Avalanche Energy (1 A, 40 mH)   | $E_{AVL}$      | 20         | mJ               |
| Operating and Storage Temperature Range   | $T_J, T_{STG}$ | -55 to 175 | $^\circ\text{C}$ |
| Maximum Temperature for Soldering Leads at 0.063 in (1.6 mm) from Case for 10 s | $T_L$          | 300        | $^\circ\text{C}$ |
| Maximum Temperature for Soldering Package Body for 10 s                         | $T_{PKG}$      | 260        | $^\circ\text{C}$ |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

## PACKAGE MARKING AND ORDERING INFORMATION

| Part Number | Top Mark    | Package     | Packing Methode | Reel Size | Tape Width | Quantity |
|-------------|-------------|-------------|-----------------|-----------|------------|----------|
| R3060G2     | ISL9R3060G2 | TO-247-2L   | Tube            | N/A       | N/A        | 30       |
| R3060G2     | ISL9R3060P2 | TO-220AC-2L | Tube            | N/A       | N/A        | 50       |

## 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 | $\mu\text{A}$ |
|       |                               |                      | $T_C = 125^\circ\text{C}$ | - | - | 1   | mA            |

### ON CHARACTERISTICS

|       |                               |                     |                           |   |     |     |   |
|-------|-------------------------------|---------------------|---------------------------|---|-----|-----|---|
| $V_F$ | Instantaneous Forward Voltage | $I_F = 30\text{ A}$ | $T_C = 25^\circ\text{C}$  | - | 2.1 | 2.4 | V |
|       |                               |                     | $T_C = 125^\circ\text{C}$ | - | 1.7 | 2.1 | V |

### DYNAMIC CHARACTERISTICS

|       |                      |                                       |   |     |   |    |
|-------|----------------------|---------------------------------------|---|-----|---|----|
| $C_J$ | Junction Capacitance | $V_R = 10\text{ V}, I_F = 0\text{ A}$ | - | 120 | - | pF |
|-------|----------------------|---------------------------------------|---|-----|---|----|

### SWITCHING CHARACTERISTICS

|          |                               |   |  |     |    |    |
|----------|-------------------------------|---|--|-----|----|----|
| $T_{rr}$ | Reverse Recovery Time         | $I_F = 1\text{ A}, di_F/dt = 100\text{ A}/\mu\text{s}, V_R = 30\text{ V}$   | -  | 27  | 35 | ns |
|          |                               |   | $I_F = 30\text{ A}, di_F/dt = 100\text{ A}/\mu\text{s}, V_R = 30\text{ V}$ | -   | 36 | 45 |
| $T_{rr}$ | Reverse Recovery Time         | $I_F = 30\text{ A}$<br>$di_F/dt = 200\text{ A}/\mu\text{s}$<br>$V_R = 390\text{ V}$<br>$T_C = 25^\circ\text{C}$   | -  | 36  | -  | ns |
| $I_{RR}$ | Reverse Recovery Current      |   | -  | 2.9 | -  | A  |
| $Q_{RR}$ | Reverse Recovery Charge       | $T_C = 25^\circ\text{C}$  | -  | 55  | -  | nC |
| $T_{rr}$ | Reverse Recovery Time         | $I_F = 30\text{ A}$<br>$di_F/dt = 200\text{ A}/\mu\text{s}$<br>$V_R = 390\text{ V},$<br>$T_C = 125^\circ\text{C}$ | -  | 110 | -  | ns |
| S        | Softness Factor ( $t_p/t_a$ ) |   | -  | 1.9 | -  | -  |
| $I_{RR}$ | Reverse Recovery Current      |   | -  | 6   | -  | A  |
| $Q_{RR}$ | Reverse Recovery Charge       |   | -  | 450 | -  | nC |

## ISL9R3060G2, ISL9R3060P2

### ELECTRICAL CHARACTERISTICS ( $T_C = 25^\circ\text{C}$ unless otherwise noted) (continued)

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

#### SWITCHING CHARACTERISTICS

|           |                               |   |   |      |   |                  |
|-----------|-------------------------------|---|---|------|---|------------------|
| $T_{rr}$  | Reverse Recovery Time         | $I_F = 30\text{ A}$<br>$di_F/dt = 1000\text{ A}/\mu\text{s}$<br>$V_R = 390\text{ V}$<br>$T_C = 125^\circ\text{C}$ | – | 60   | – | ns               |
| S         | Softness Factor ( $t_b/t_a$ ) |   | – | 1.25 | – | –                |
| $I_{RR}$  | Reverse Recovery Current      |   | – | 21   | – | A                |
| $Q_{RR}$  | Reverse Recovery Charge       |   | – | 730  | – | nC               |
| $di_M/dt$ | Maximum $di/dt$ during $t_b$  |   | – | 800  | – | A/ $\mu\text{s}$ |

#### THERMAL CHARACTERISTICS

|                 |  |        |   |   |      |                           |
|-----------------|--|--------|---|---|------|---------------------------|
| $R_{\theta JC}$ | Thermal Resistance Junction to Case    |        | – | – | 0.75 | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance Junction to Ambient | TO-247 | – | – | 30   | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance Junction to Ambient | TO-220 | – | – | 62   | $^\circ\text{C}/\text{W}$ |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

TYPICAL PERFORMANCE CURVES

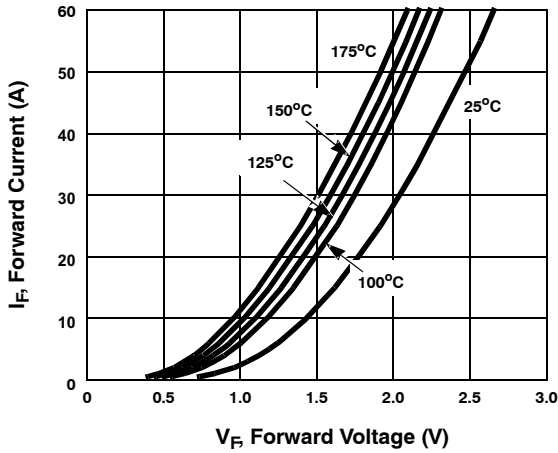


Figure 1. Forward Current vs. Forward Voltage

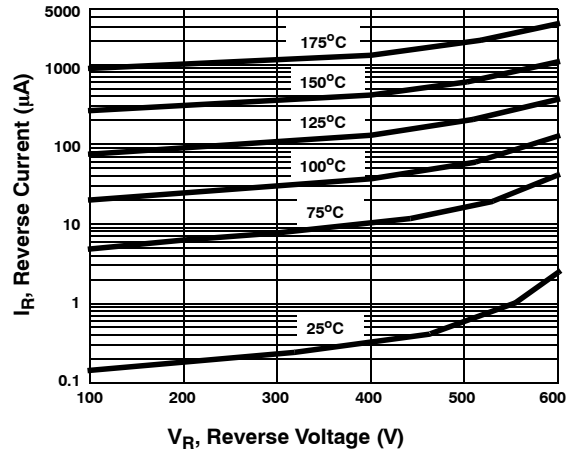


Figure 2. Reverse Current vs. Reverse Voltage

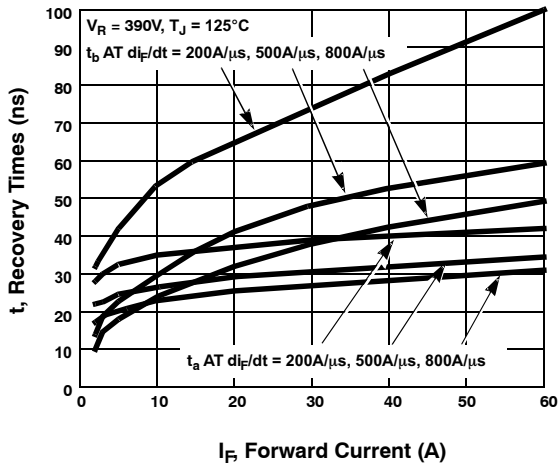


Figure 3.  $t_a$  and  $t_b$  Curves vs. Forward Current

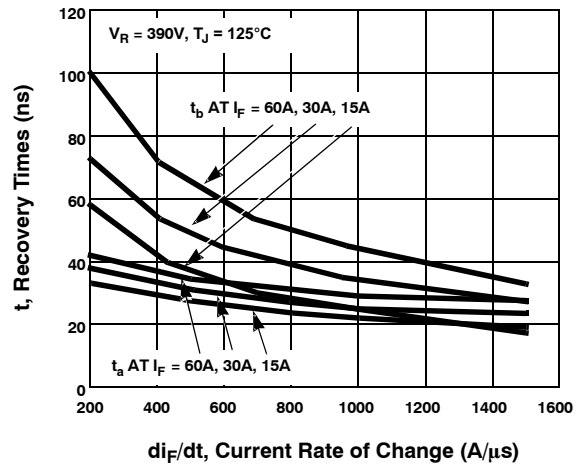


Figure 4.  $t_a$  and  $t_b$  Curves vs.  $di_F/dt$

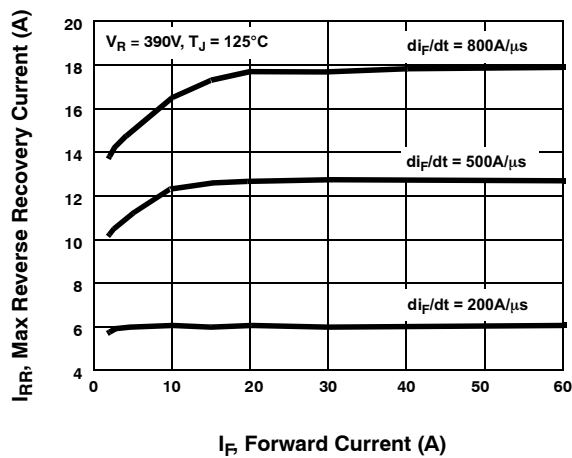


Figure 5. Maximum Reverse Recovery Current vs. Forward Current

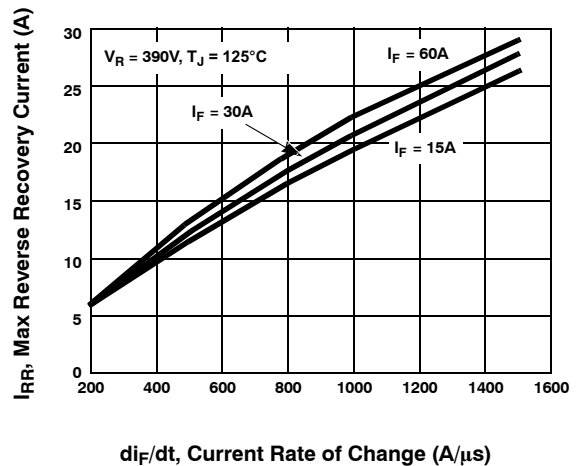


Figure 6. Maximum Reverse Recovery Current vs.  $di_F/dt$

# ISL9R3060G2, ISL9R3060P2

## TYPICAL PERFORMANCE CURVES

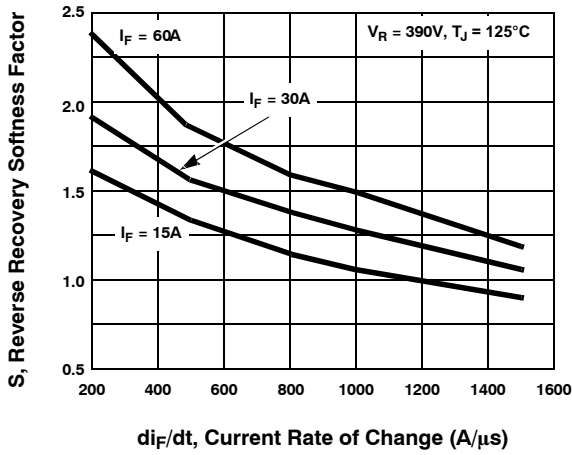


Figure 7. Reverse Recovery Softness Factor vs.  $di_F/dt$

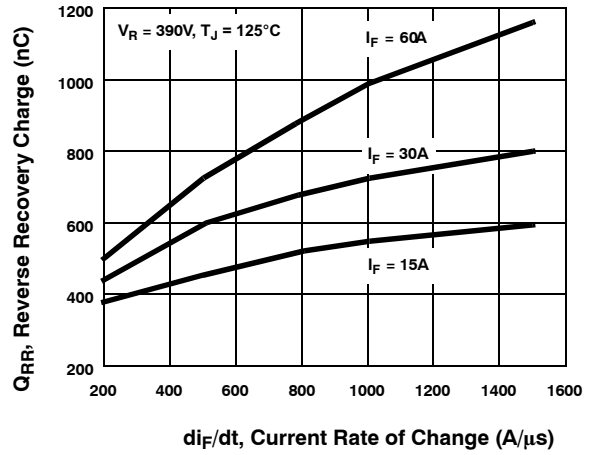


Figure 8. Reverse Recovery Charge vs.  $di_F/dt$

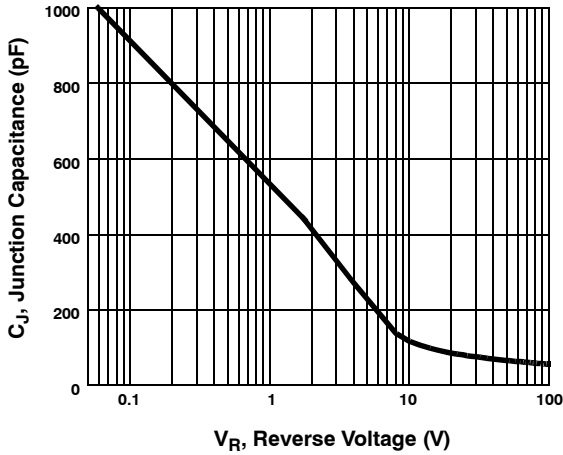


Figure 9. Junction Capacitance vs. Reverse Voltage

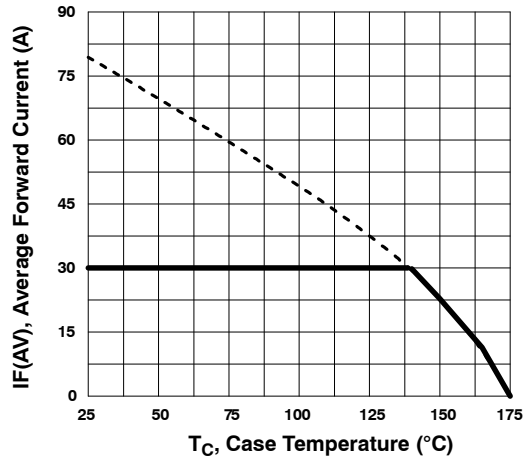


Figure 10. Forward Current Derating Curve

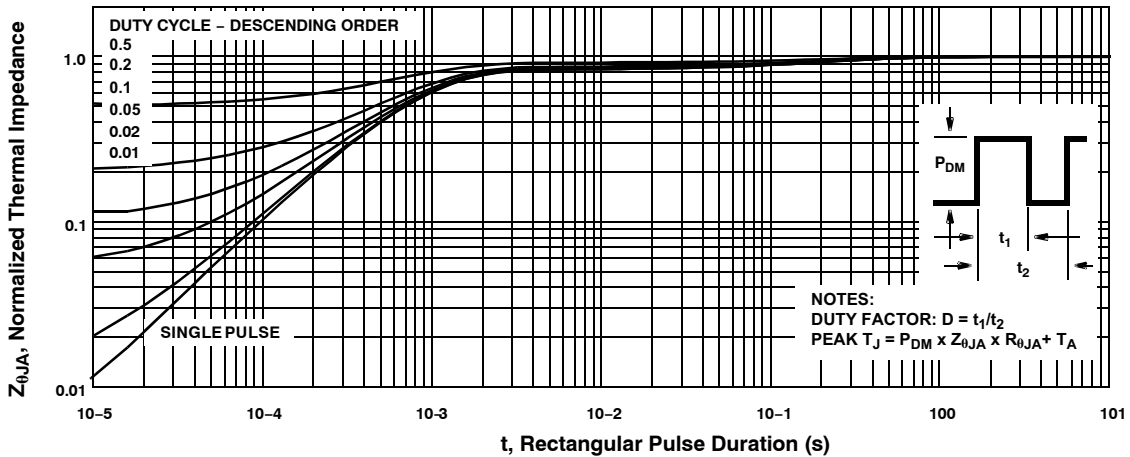


Figure 11. Normalized Maximum Transient Thermal Impedance

# ISL9R3060G2, ISL9R3060P2

## TEST CIRCUITS AND WAVEFORMS

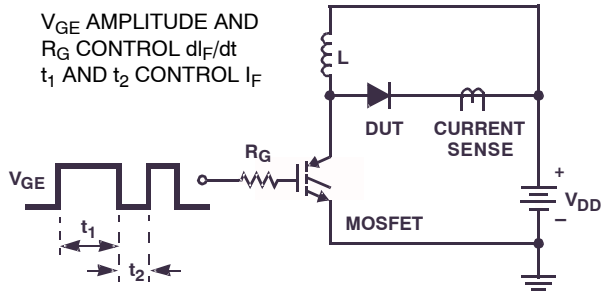


Figure 12.  $T_{rr}$  Test Circuit

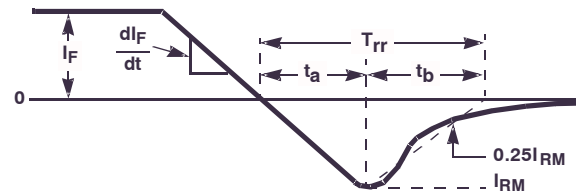


Figure 13.  $T_{rr}$  Waveforms and Definitions

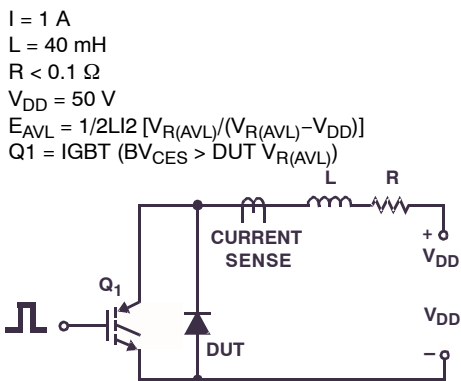


Figure 14. Avalanche Energy Test Circuit

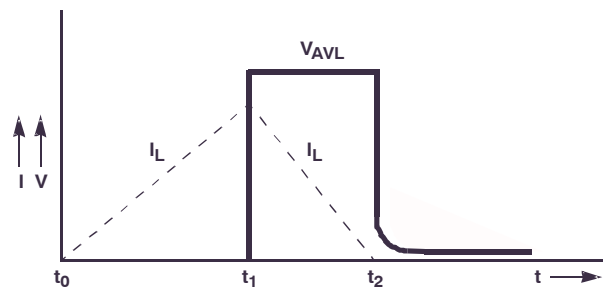


Figure 15. Avalanche Current and Voltage Waveforms

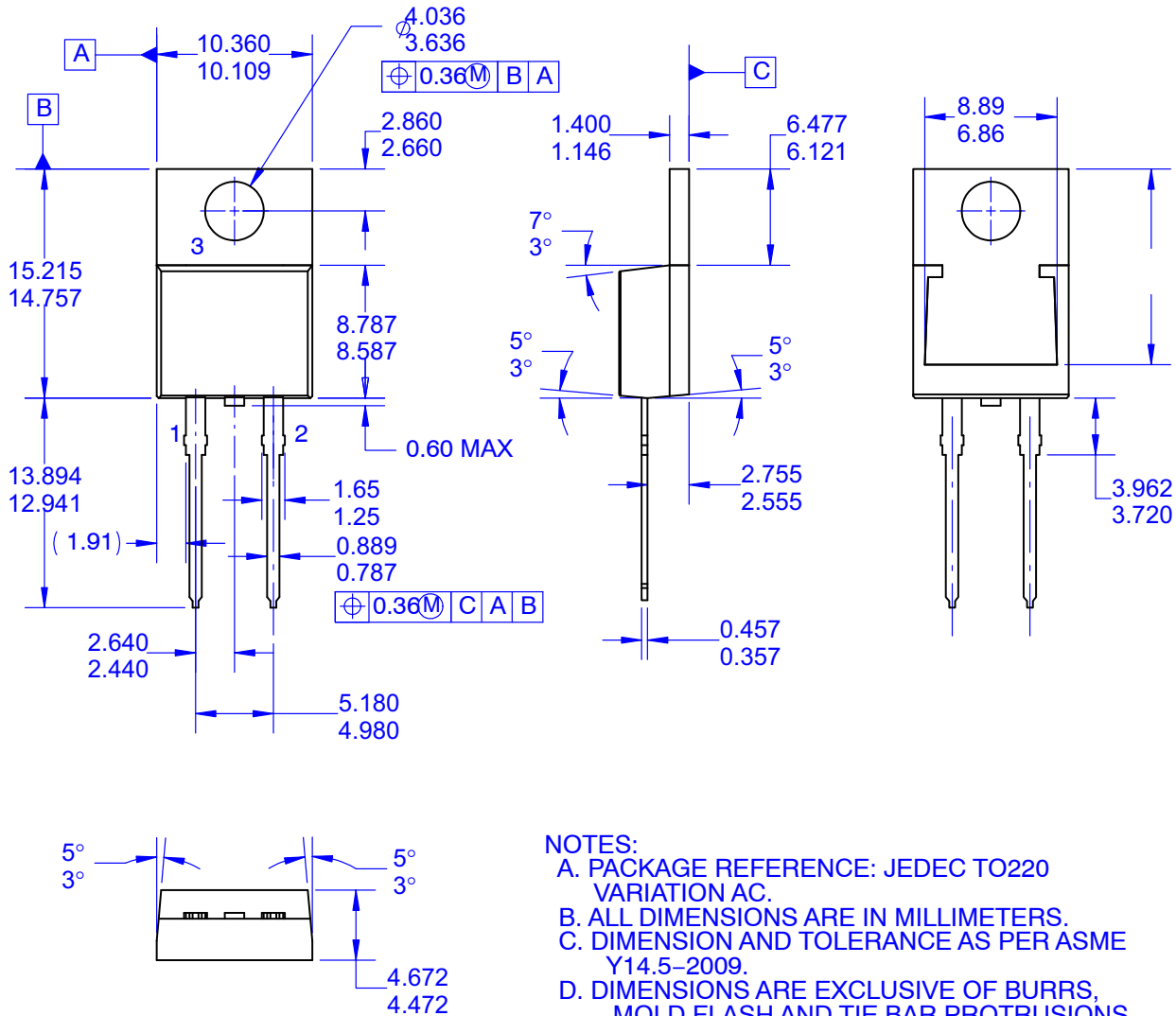
**MECHANICAL CASE OUTLINE**  
**PACKAGE DIMENSIONS**

ON Semiconductor®



TO-220-2LD  
CASE 340BA  
ISSUE O

DATE 31 AUG 2016



**NOTES:**

- A. PACKAGE REFERENCE: JEDEC TO220 VARIATION AC.
- B. ALL DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSION AND TOLERANCE AS PER ASME Y14.5-2009.
- D. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.

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# MECHANICAL CASE OUTLINE

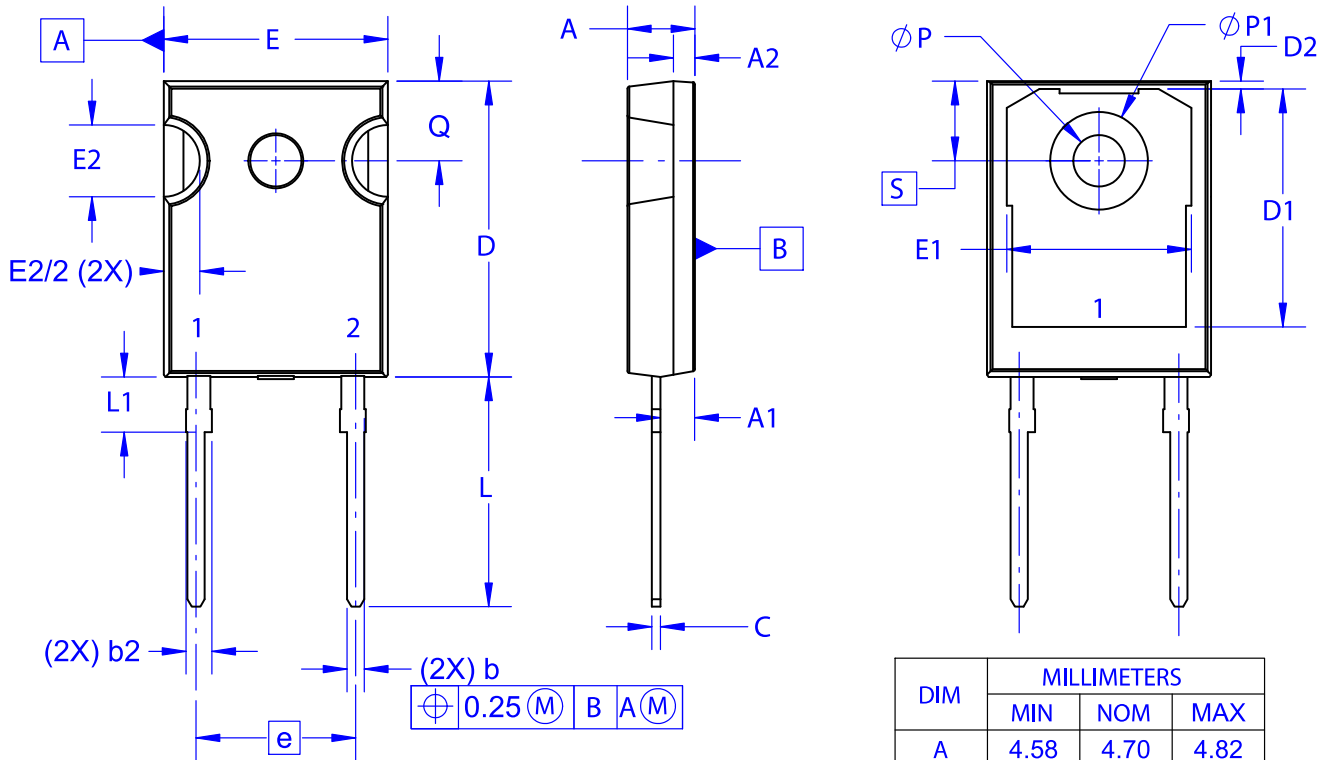
## PACKAGE DIMENSIONS

ON Semiconductor®



TO-247-2LD  
CASE 340CL  
ISSUE A

DATE 03 DEC 2019

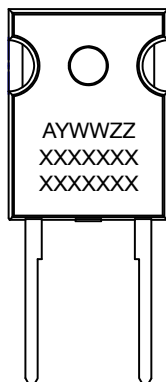


⊕ 0.25 (M) B A (M)

NOTES: UNLESS OTHERWISE SPECIFIED.

- A. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- B. ALL DIMENSIONS ARE IN MILLIMETERS.
- C. DRAWING CONFORMS TO ASME Y14.5 - 2009.
- D. DIMENSION A1 TO BE MEASURED IN THE REGION DEFINED BY L1.
- E. LEAD FINISH IS UNCONTROLLED IN THE REGION DEFINED BY L1.

### GENERIC MARKING DIAGRAM\*



XXXX = Specific Device Code  
A = Assembly Location  
Y = Year  
WW = Work Week  
ZZ = Assembly Lot Code

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

| DIM | MILLIMETERS |       |       |
|-----|-------------|-------|-------|
|     | MIN         | NOM   | MAX   |
| A   | 4.58        | 4.70  | 4.82  |
| A1  | 2.29        | 2.40  | 2.66  |
| A2  | 1.30        | 1.50  | 1.70  |
| b   | 1.17        | 1.26  | 1.35  |
| b2  | 1.53        | 1.65  | 1.77  |
| c   | 0.51        | 0.61  | 0.71  |
| D   | 20.32       | 20.57 | 20.82 |
| D1  | 16.37       | 16.57 | 16.77 |
| D2  | 0.51        | 0.93  | 1.35  |
| E   | 15.37       | 15.62 | 15.87 |
| E1  | 12.81       | ~     | ~     |
| E2  | 4.96        | 5.08  | 5.20  |
| e   | ~           | 11.12 | ~     |
| L   | 15.75       | 16.00 | 16.25 |
| L1  | 3.69        | 3.81  | 3.93  |
| ∅P  | 3.51        | 3.58  | 3.65  |
| ∅P1 | 6.61        | 6.73  | 6.85  |
| Q   | 5.34        | 5.46  | 5.58  |
| S   | 5.34        | 5.46  | 5.58  |

|                         |                    |  |
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