STEALTH™ Diode

18 A, 1200 V

ISL9R18120G2, ISL9R18120S3S

Description

The ISL9R18120G2, ISL9R18120S3S 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.

Features

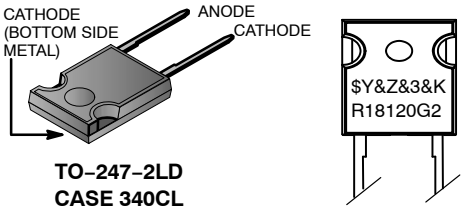
- Stealth Recovery t_{rr} = 300 ns (@ I_F = 18 A)
- Max Forward Voltage, V_F = 3.3 V (@ T_C = 25°C)
- 1200 V Reverse Voltage and High Reliability
- Avalanche Energy Rated
- These Devices are Pb−Free and are RoHS Compliant

Applications

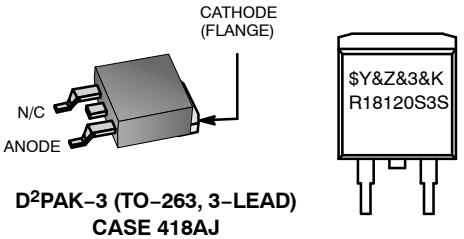
- Hard Switched PFC Boost Diode
- UPS Free Wheeling Diode
- Motor Drive FWD
- SMPS FWD
- Snubber Diode

ON Semiconductor®

www.onsemi.com



TO−247−2LD
CASE 340CL



D²PAK−3 (TO−263, 3−LEAD)
CASE 418AJ

MARKING DIAGRAM

$Y	= ON Semiconductor Logo
&Z	= Assembly Plant Code
&3	= Numeric Date Code
&K	= Lot Code
R18120G2, R18120S3S	= Specific Device Code

SYMBOL



ORDERING INFORMATION

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

© Semiconductor Components Industries, LLC, 2002

DEVICE MAXIMUM RATINGS (T_C = 25°C unless otherwise noted)

Parameter	Symbol	Ratings	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	1200	V
Working Peak Reverse Voltage	V_{RWM}	1200	V
DC Blocking Voltage	V_R	1200	V
Average Rectified Forward Current (T_C = 92°C)	$I_{F(AV)}$	18	A
Repetitive Peak Surge Current (20 kHz Square Wave)	I_{FRM}	36	A
Non−repetitive Peak Surge Current (Halfwave 1 Phase 60 Hz)	I_{FSM}	200	A
Power Dissipation	P_D	125	W
Avalanche Energy (1 A, 40 mH)	E_{AVL}	20	mJ
Operating and Storage Temperature Range	T_J, T_{STG}	−55 to +175	°C
Maximum Temperature for Soldering Leads at 0.063 in (1.6 mm) from Case for 10 s Package Body for 10 s	T_L T_{PKG}	300 260	°C °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

Device	Device Marking	Package	Packing Method	Tape Width	Quantity
ISL9R18120G2	R18120G2	TO−247−2LD	Tube	N/A	30
ISL9R18120S3ST	R18120S3S	TO−263−3LD (D^2−PAK)	Reel	24 mm	800

THERMAL CHARACTERISTICS

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Thermal Resistance Junction to Case	$R_{\theta JC}$	TO−247, TO−263	−	−	1.0	°C/W
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	TO−247	−	−	30	°C/W
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	TO−263	−	−	62	°C/W

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
Off State Characteristics							
Instantaneous Reverse Current	I_R	V_R = 1200 V	T_C = 25°C	–	–	100	μA
			T_C = 125°C	–	–	1.0	mA
On State Characteristics							
Instantaneous Forward Voltage	V_F	I_F = 18 A	T_C = 25°C	–	2.7	3.3	V
			T_C = 125°C	–	2.5	3.1	V
Dynamic Characteristics							
Junction Capacitance	C_J	V_R = 10 V, I_F = 0 A		–	69	–	pF
Switching Characteristics							
Reverse Recovery Time	t_{rr}	I_F = 1 A, dI_F/dt = 100 A/μs, V_R = 30 V		–	38	45	ns
		I_F = 18 A, dI_F/dt = 100 A/μs, V_R = 30 V		–	60	70	ns
Reverse Recovery Time	t_{rr}	I_F = 18 A, dI_F/dt = 200 A/μs, V_R = 780 V, T_C = 25°C		–	300	–	ns
Reverse Recovery Current	I_{rr}			–	6.5	–	A
Reverse Recovered Charge	Q_{rr}			–	950	–	nC
Reverse Recovery Time	t_{rr}	I_F = 18 A, dI_F/dt = 200 A/μs, V_R = 780 V, T_C = 125°C		–	400	–	ns
Softness Factor (t_b/t_a)	S			–	7.0	–	–
Reverse Recovery Current	I_{rr}			–	8.0	–	A
Reverse Recovered Charge	Q_{rr}			–	2.0	–	μC
Reverse Recovery Time	t_{rr}	I_F = 18 A, dI_F/dt = 1000 A/μs, V_R = 780 V, T_C = 125°C		–	235	–	ns
Softness Factor (t_b/t_a)	S			–	5.2	–	–
Reverse Recovery Current	I_{rr}			–	22	–	A
Reverse Recovered Charge	Q_{rr}			–	2.1	–	μC
Maximum di/dt During t_b	dI_M/dt			–	370	–	A/μs

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

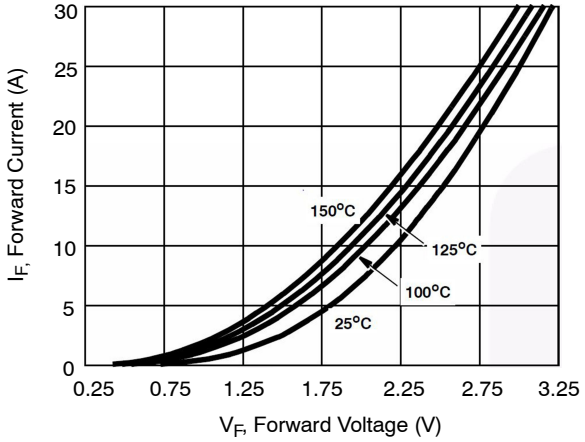


Figure 1. Forward Current vs. Forward Voltage

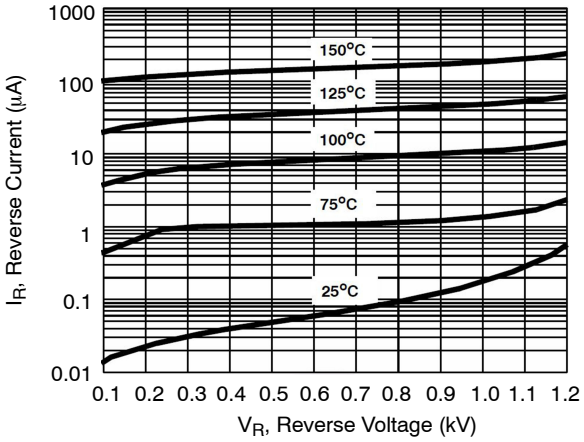


Figure 2. Reverse Current vs. Reverse Voltage

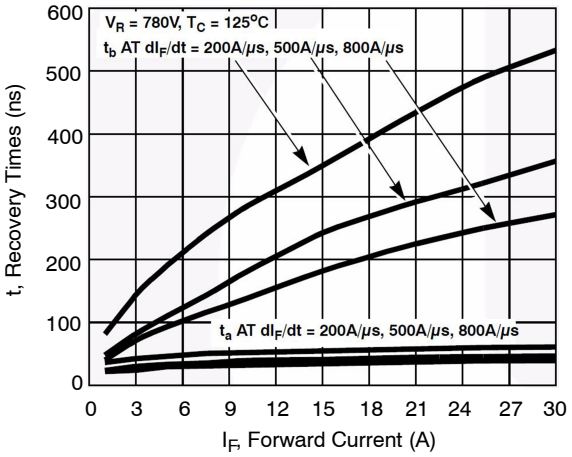


Figure 3. t_a and t_b Curves vs. Forward Current

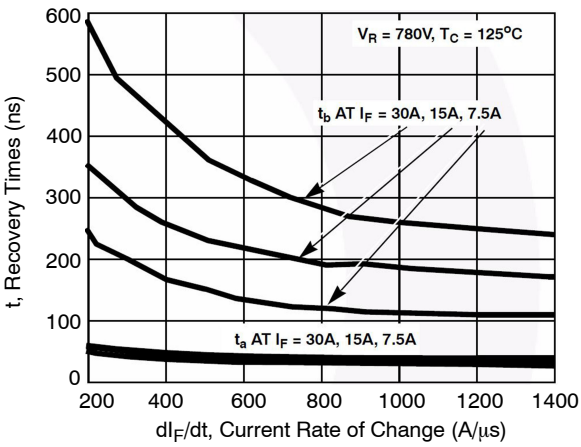


Figure 4. t_a and t_b Curves vs. dI_F/dt

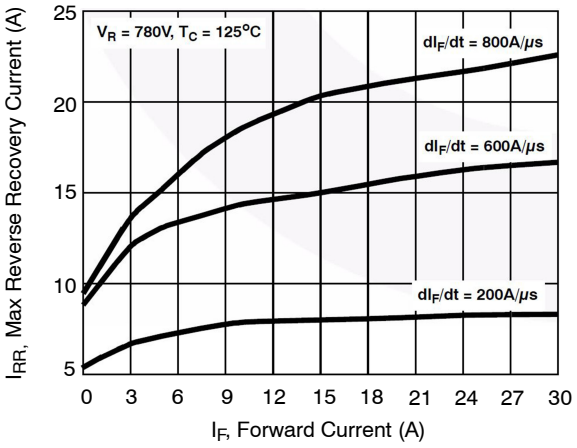


Figure 5. Maximum Reverse Recovery Current vs. Forward Current

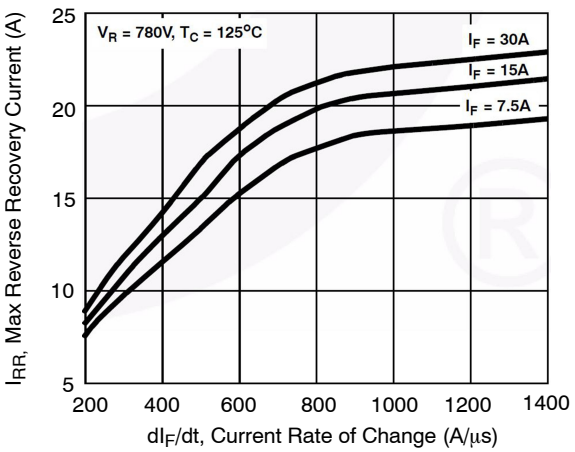


Figure 6. Maximum Reverse Recovery Current vs. dI_F/dt

TYPICAL PERFORMANCE CURVES (continued)

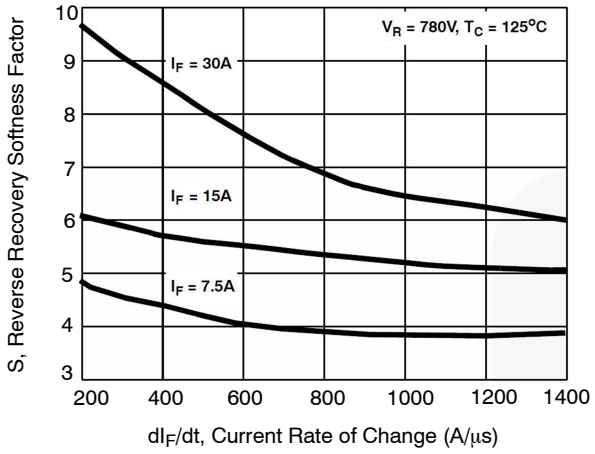


Figure 7. Reverse Recovery Softness Factor vs. dI_F/dt

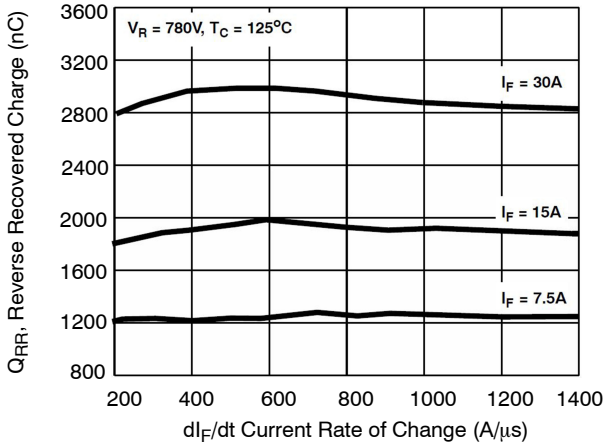


Figure 8. Reverse Recovered Charge vs. dI_F/dt

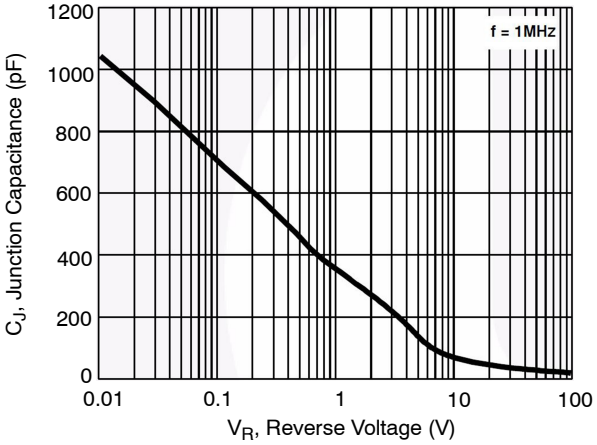


Figure 9. Junction Capacitance vs. Reverse Voltage

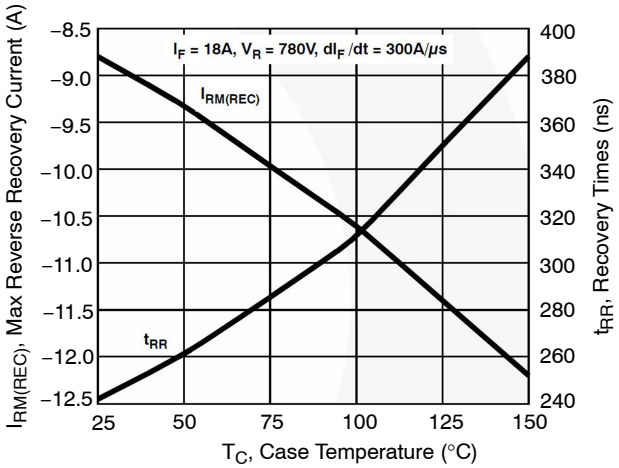


Figure 10. Reverse Recovery Current and Times vs. Case Temperature

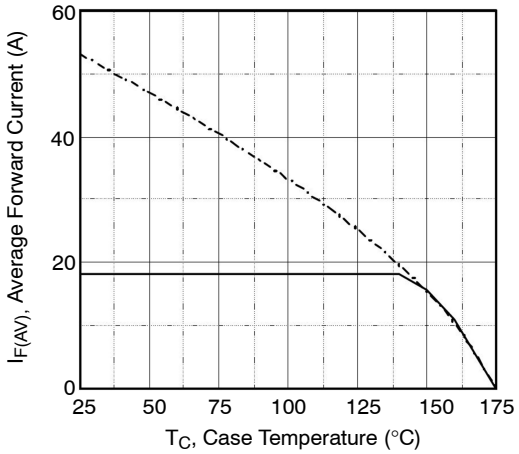


Figure 11. DC Current Derating Curve

TYPICAL PERFORMANCE CURVES (continued)

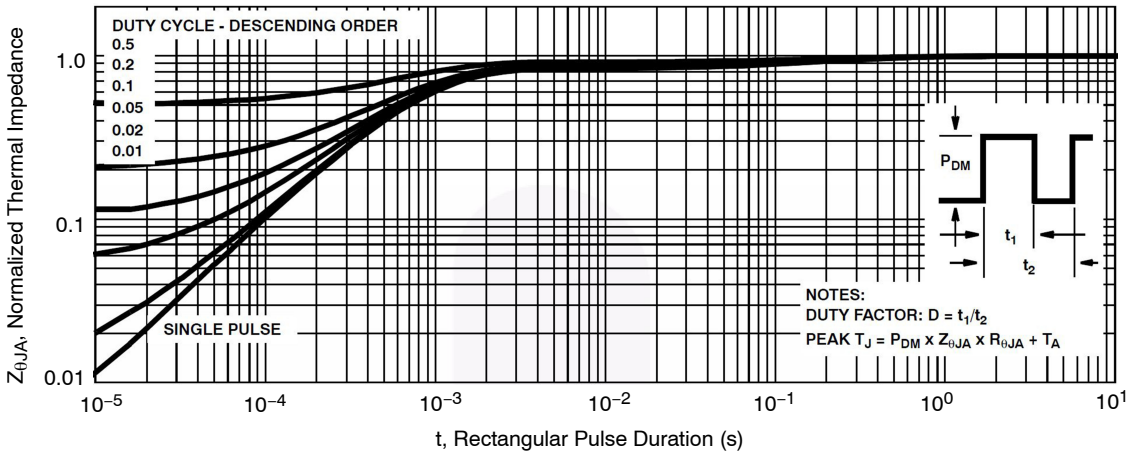


Figure 12. Normalized Maximum Transient Thermal Impedance

TEST CIRCUIT AND WAVEFORMS

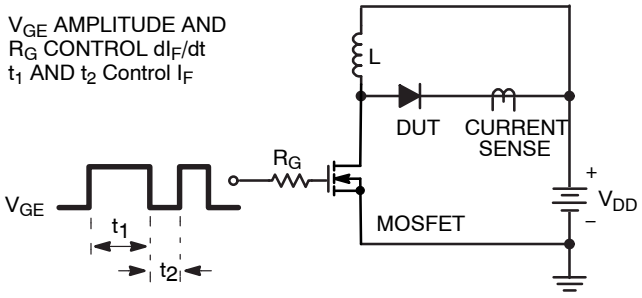


Figure 13. t_{rr} Test Circuit

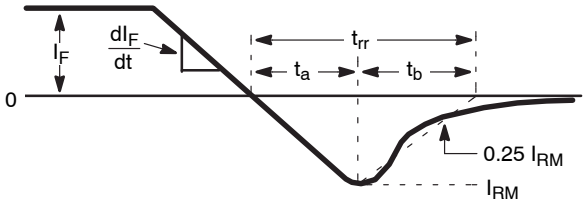


Figure 14. t_{rr} Waveforms and Definitions

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

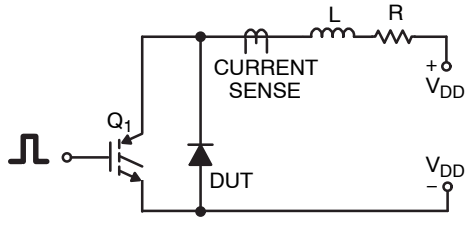


Figure 15. Avalanche Energy Test Circuit

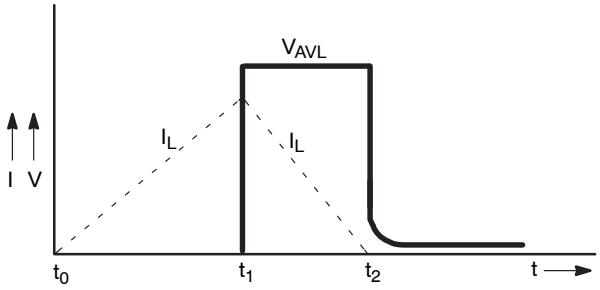


Figure 16. Avalanche Current and Voltage Waveforms

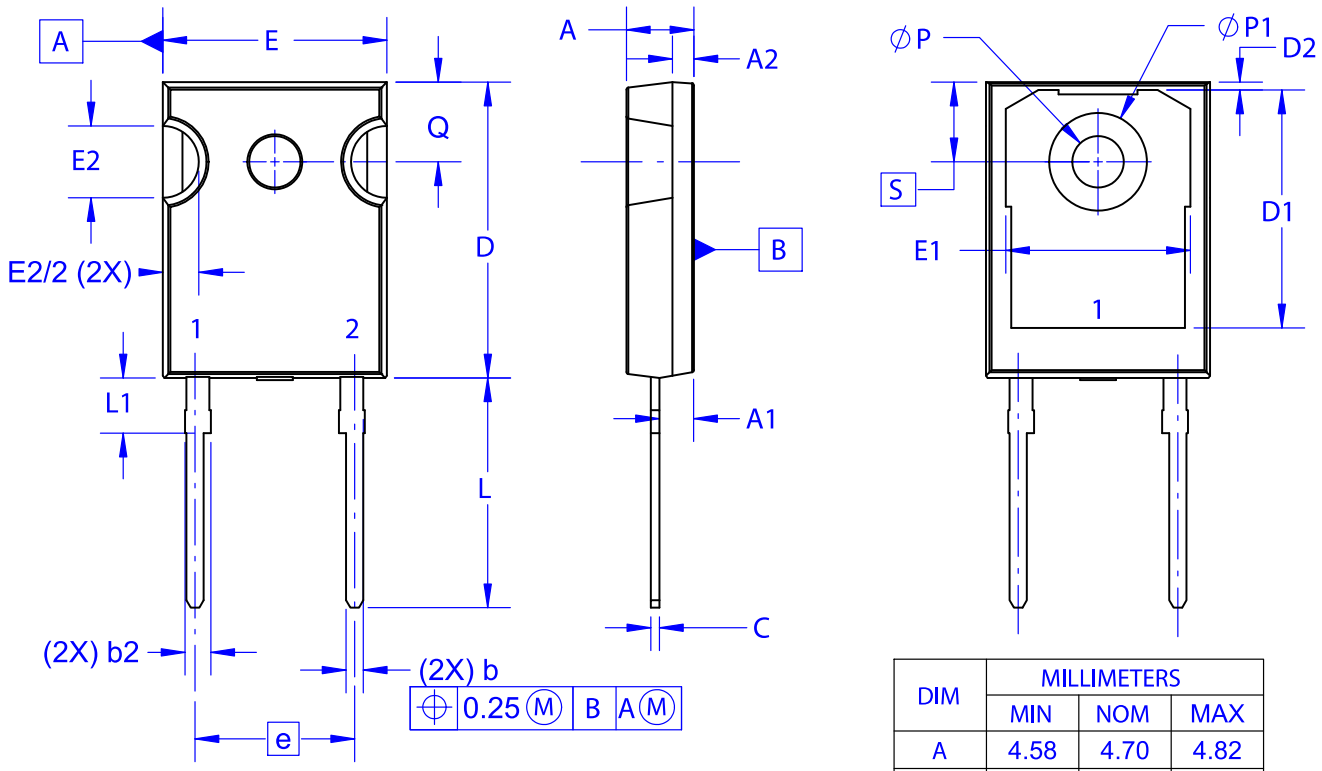
STEALTH is a trademark of Semiconductor Components Industries, LLC (SCILLC) or its subsidiaries in the United States and/or other countries.

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

ON Semiconductor®

TO−247−2LD
CASE 340CL
ISSUE A

DATE 03 DEC 2019

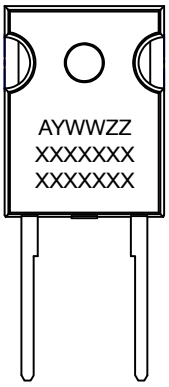


NOTES: UNLESS OTHERWISE SPECIFIED.

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.

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
ØP	3.51	3.58	3.65
ØP1	6.61	6.73	6.85
Q	5.34	5.46	5.58
S	5.34	5.46	5.58

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.

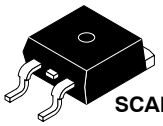
DOCUMENT NUMBER:	**98AON13850G**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped “CONTROLLED COPY” in red.
DESCRIPTION:	**TO−247−2LD**	**PAGE 1 OF 1**

ON Semiconductor and ON are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. 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. ON Semiconductor does not convey any license under its patent rights nor the rights of others.

© Semiconductor Components Industries, LLC, 2018

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

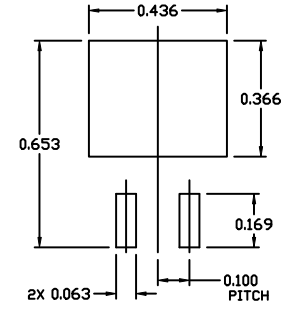
ON Semiconductor®



SCALE 1:1

D²PAK–3 (TO–263, 3–LEAD)
CASE 418AJ
ISSUE F

DATE 11 MAR 2021



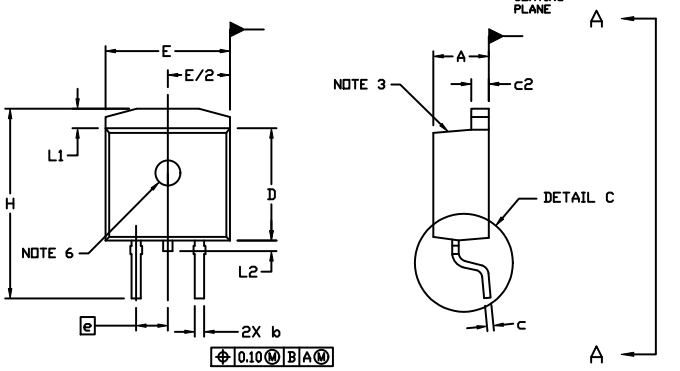
RECOMMENDED
MOUNTING FOOTPRINT

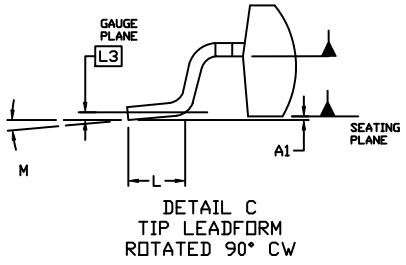
* For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

NOTES:

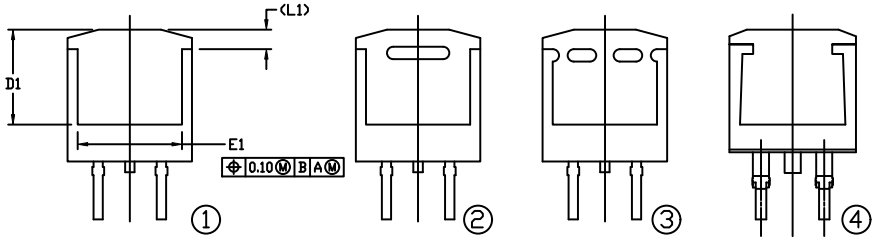
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: INCHES
3. CHAMFER OPTIONAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.005 PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY AT DATUM H.
5. THERMAL PAD CONTOUR IS OPTIONAL WITHIN DIMENSIONS E, L1, D1, AND E1.
6. OPTIONAL MOLD FEATURE.
7. ①, ② ... OPTIONAL CONSTRUCTION FEATURE CALL OUTS.

	INCHES		MILLIMETERS	
DIM	MIN.	MAX.	MIN.	MAX.
A	0.160	0.190	4.06	4.83
A1	0.000	0.010	0.00	0.25
b	0.020	0.039	0.51	0.99
c	0.012	0.029	0.30	0.74
c2	0.045	0.065	1.14	1.65
D	0.330	0.380	8.38	9.65
D1	0.260	---	6.60	---
E	0.380	0.420	9.65	10.67
E1	0.245	---	6.22	---
e	0.100 BSC		2.54 BSC	
H	0.575	0.625	14.60	15.88
L	0.070	0.110	1.78	2.79
L1	---	0.066	---	1.68
L2	---	0.070	---	1.78
L3	0.010 BSC		0.25 BSC	
M	0°	8°	0°	8°





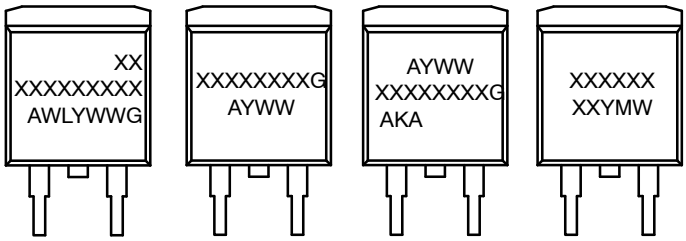
DETAIL C
TIP LEADFORM
ROTATED 90° CW



VIEW A–A

VIEW A–A
OPTIONAL CONSTRUCTIONS

GENERIC MARKING DIAGRAMS*



IC | Standard | Rectifier | SSG

XXXXXX = Specific Device Code
A = Assembly Location
WL = Wafer Lot
Y = Year
WW = Work Week
W = Week Code (SSG)
M = Month Code (SSG)
G = Pb–Free Package
AKA = Polarity Indicator

*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.

DOCUMENT NUMBER:	**98AON56370E**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped “CONTROLLED COPY” in red.
DESCRIPTION:	**D²PAK–3 (TO–263, 3–LEAD)**	**PAGE 1 OF 1**

ON Semiconductor and ON are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. 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. ON Semiconductor does not convey any license under its patent rights nor the rights of others.

© Semiconductor Components Industries, LLC, 2018

onsemi, ONSEMI , and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent−Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as−is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** 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 **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** 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. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** 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 **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** 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 **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** 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:
Email Requests to: orderlit@onsemi.com

onsemi Website: www.onsemi.com

TECHNICAL SUPPORT
North American Technical Support:
Voice Mail: 1 800−282−9855 Toll Free USA/Canada
Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support:
Phone: 00421 33 790 2910
For additional information, please contact your local Sales Representative

◊