Description

The AZ1084 is a series of low dropout positive voltage regulators with a maximum dropout of 1.5V at 5A of load current.

The series features on-chip thermal limiting which provides protection against any combination of overload and ambient temperatures that would create excessive junction temperatures. It also includes a trimmed band-gap reference and a current limiting circuit.

The AZ1084 is available in 1.5V, 1.8V, 2.5V, 3.3V and 5.0V versions. The fixed versions integrate the adjust resistors. It is also available in an adjustable version which can set the output voltage with two external resistors.

The AZ1084 series is available in standard packages of TO263, TO-263-2, TO-220-3, TO-252-2 (3), TO-252-2 (4) and TO-252-2 (5).

Features

- Low Dropout Voltage: 1.3V Typical at 5A
- Current Limiting and Thermal Protection
- Output Current: 5A
- Current Limit: 6.5A
- Operating Junction Temperature Range: 0 to +125°C
- Line Regulation (Adj Version): 0.015% (Typical)
- Load Regulation (Adj Version): 0.1% (Typical)
- Lead-Free Packages: TO263, TO-263-2, TO-220-3, TO-252-2 (3), TO-252-2 (4), TO-252-2 (5)
  - **Totally Lead-Free; RoHS Compliant (Notes 1 & 2)**
- Lead-Free Packages, Available in "Green" Molding Compound: TO263, TO-263-2, TO-220-3, TO-252-2 (3), TO-252-2 (4), TO-252-2 (5)
  - **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
  - **Halogen and Antimony Free. "Green" Device (Note 3)**

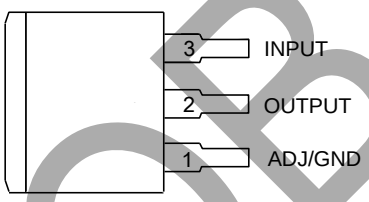
Applications

- High Efficiency Linear Regulators
- Battery Chargers
- Post Regulation for Switching Supply
- Microprocessor Supply
- Desktop PCs, RISC and Embedded Processors' Supply

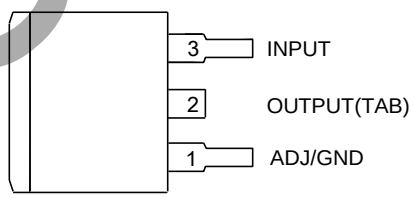
Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
2. See http://www.diodes.com/quality/lead_free.html for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

Pin Assignments

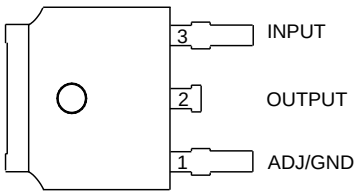
S Package
(TO263)



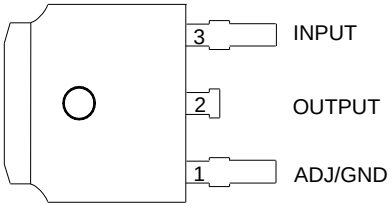
S2 Package
(TO-263-2)



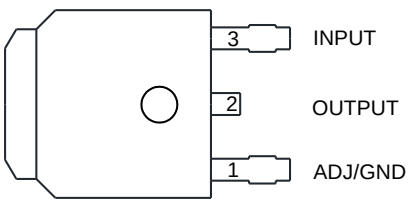
D Package
(TO-252-2 (3) (Option 1))



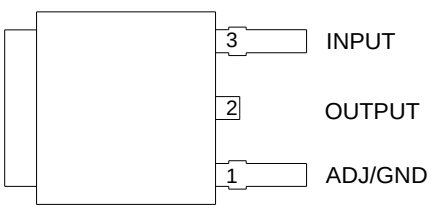
(TO-252-2 (3) (Option 2))



D Packages
(TO-252-2 (4))

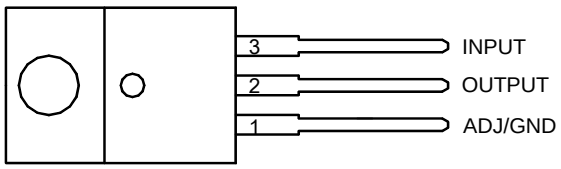


(TO-252-2 (5))

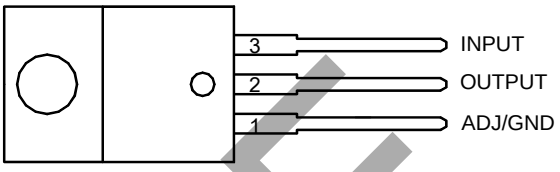


Pin Assignments (Cont.)

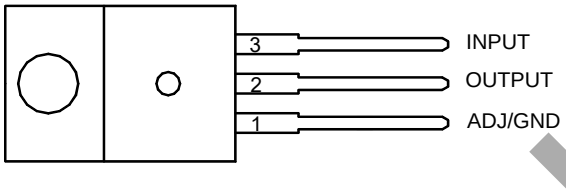
T Package
(TO-220-3 (Option 1))



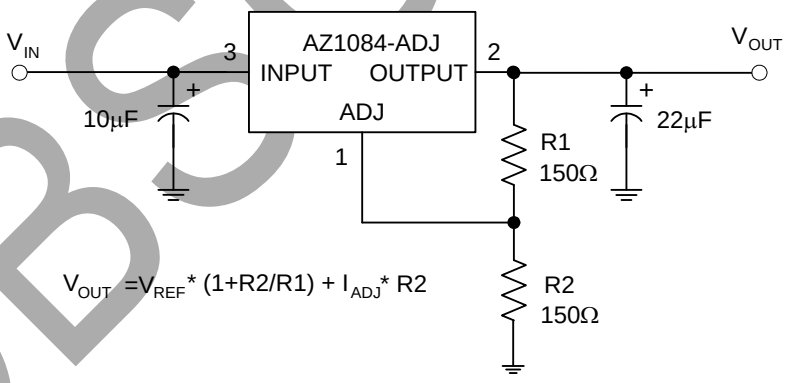
T Package
(TO-220-3 (Option 2))

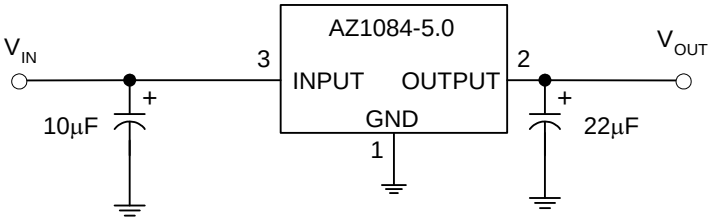


T Package
(TO-220-3 (Option 3))

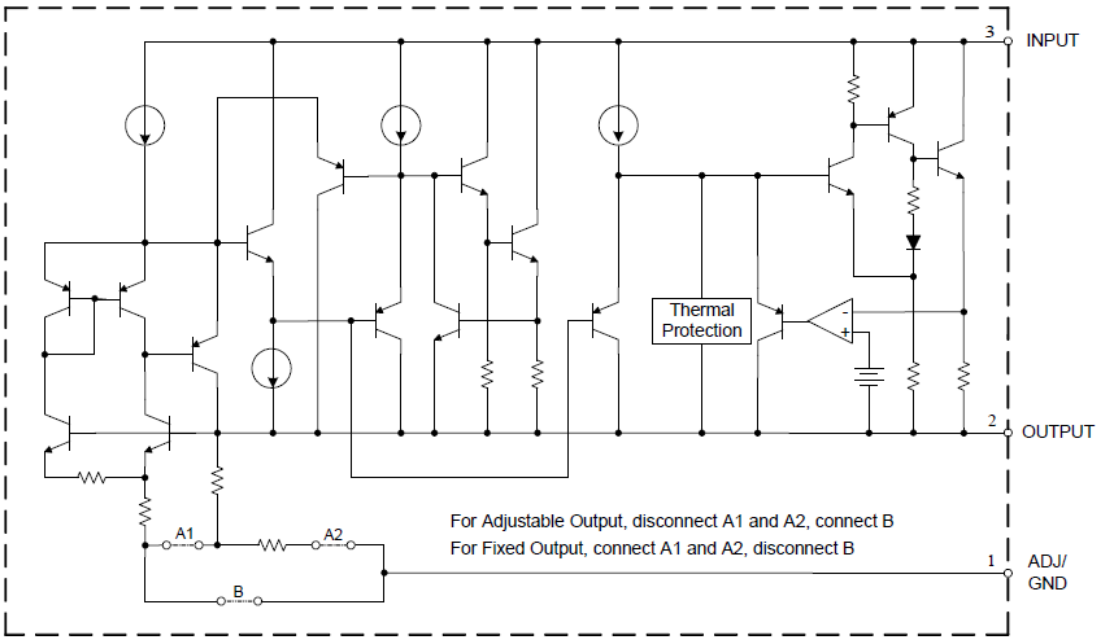


Typical Applications Circuit





Functional Block Diagram



Absolute Maximum Ratings (Note 4)

Symbol	Parameter	Rating		Unit
T_J	Operating Junction Temperature	+150		°C
T_{STG}	Storage Temperature Range	-65 to +150		°C
T_{LEAD}	Lead Temperature (Soldering, 10 sec.)	+260		°C
θ_{JA}	Thermal Resistance (Note 5)	TO-263-2	60	°C/W
		TO263	60	
		TO-220-3	60	
		TO-252-2 (3)/TO-252-2 (4)/TO-252-2 (5)	100	
ESD	ESD (Human Body Model)	2000		V
ESD	ESD (Machine Model)	400		V

Notes 4. Stresses greater than those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “Recommended Operating Conditions” is not implied. Exposure to “Absolute Maximum Ratings” for extended periods may affect device reliability.

5. Absolute maximum ratings indicate limits beyond which damage to the component may occur. Electrical specifications do not apply when operating the device outside of its operating ratings. The maximum allowable power dissipation is a function of the maximum junction temperature, $T_{J(max)}$, the junction-to-ambient thermal resistance, θ_{JA}, and the ambient temperature, T_A. The maximum allowable power dissipation at any ambient temperature is calculated using: $P_{D(max)}=(T_{J(max)} - T_A)/\theta_{JA}$. Exceeding the maximum allowable power dissipation will result in excessive die temperature, and the regulator will go into thermal shutdown.

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
V_{IN}	Input Voltage	–	12	V
T_J	Operating Junction Temperature Range	0	+125	ºC

Electrical Characteristics (Typicals and limits appearing in normal type apply for T_J = +25°C. Limits appearing in **Boldface** type apply over the entire operating junction temperature range.)

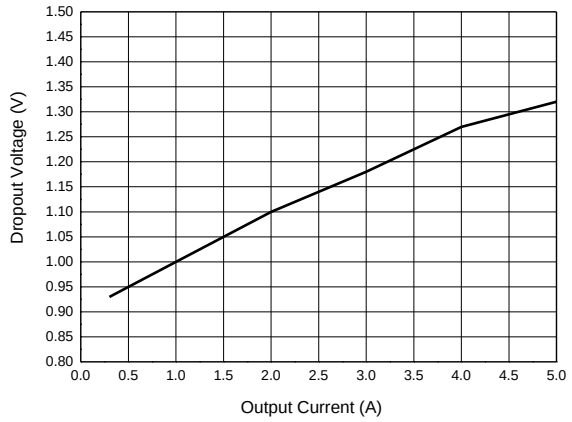
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{REF}	Reference Voltage	AZ1084-ADJ, I_{OUT} = 10mA, V_{IN}-V_{OUT} = 3V, 10mA ≤ I_{OUT} ≤ 5A, 1.5V ≤ V_{IN}-V_{OUT} ≤ 5V	1.238 **1.225**	1.250 **1.250**	1.262 **1.270**	V
V_{OUT}	Output Voltage	AZ1084-1.5, I_{OUT} = 0mA, V_{IN} = 4.5V, 10mA ≤ I_{OUT} ≤ 5A, 3.0V ≤ V_{IN} ≤ 6V	1.485 **1.47**	1.5 **1.5**	1.515 **1.53**	V
		AZ1084-1.8, I_{OUT} = 0mA, V_{IN} = 4.8V, 10mA ≤ I_{OUT} ≤ 5A, 3.3V ≤ V_{IN} ≤ 6V	1.782 **1.764**	1.8 **1.8**	1.818 **1.836**	V
		AZ1084-2.5, I_{OUT} = 0mA, V_{IN} = 5.5V 10mA ≤ I_{OUT} ≤ 5A, 4.0V ≤ V_{IN} ≤ 7V	2.475 **2.45**	2.5 **2.5**	2.525 **2.55**	V
		AZ1084-3.3, I_{OUT} = 0mA, V_{IN} = 6.3V, 10mA ≤ I_{OUT} ≤ 5A, 4.8V ≤ V_{IN} ≤ 8V	3.267 **3.234**	3.3 **3.3**	3.333 **3.366**	V
		AZ1084-5.0, I_{OUT} = 0mA, V_{IN} = 8V, 10mA ≤ I_{OUT} ≤ 5A, 6.5V ≤ V_{IN} ≤ 10V	4.95 **4.9**	5 **5**	5.05 **5.1**	V
ΔV_{OUT}	Line Regulation	AZ1084-ADJ, I_{OUT} = 10mA, 2.85V ≤ V_{IN} ≤ 10V	–	0.015 **0.035**	0.2 **0.2**	%
		AZ1084-1.5, I_{OUT} = 10mA, 3.0V ≤ V_{IN} ≤ 10V	–	0.5 **1**	6 **6**	mV
		AZ1084-1.8, I_{OUT} = 10mA, 3.3V ≤ V_{IN} ≤ 10V	–	0.5 **1**	6 **6**	mV
		AZ1084-2.5, I_{OUT} = 10mA, 4.0V ≤ V_{IN} ≤ 10V	–	0.5 **1**	6 **6**	mV
		AZ1084-3.3, I_{OUT} = 10mA, 4.8V ≤ V_{IN} ≤ 10V	–	0.5 **1**	6 **6**	mV
		AZ1084-5.0, I_{OUT} = 10mA, 6.5V ≤ V_{IN} ≤ 10V	–	0.5 **1**	10 **10**	mV
ΔV_{OUT}	Load Regulation	AZ1084-ADJ, 0mA ≤ I_{OUT} ≤ 5A, V_{IN}-V_{OUT} = 3V	–	0.1 **0.2**	0.3 **0.4**	%
		AZ1084-1.5, 0mA ≤ I_{OUT} ≤ 5A, V_{IN}-V_{OUT} = 3V	–	3 **7**	15 **20**	mV
		AZ1084-1.8, 0mA ≤ I_{OUT} ≤ 5A, V_{IN}-V_{OUT} = 3V	–	3 **7**	15 **20**	mV
		AZ1084-2.5, 0mA ≤ I_{OUT} ≤ 5A, V_{IN}-V_{OUT} = 3V	–	3 **7**	15 **20**	mV
		AZ1084-3.3, 0mA ≤ I_{OUT} ≤ 5A, V_{IN}-V_{OUT} = 3V	–	3 **7**	15 **20**	mV
		AZ1084-5.0, 0mA ≤ I_{OUT} ≤ 5A, V_{IN}-V_{OUT} = 3V	–	5 **10**	20 **35**	mV

Electrical Characteristics (Cont. Typicals and limits appearing in normal type apply for T_J = +25°C. Limits appearing in **Boldface** type apply over the entire operating junction temperature range.)

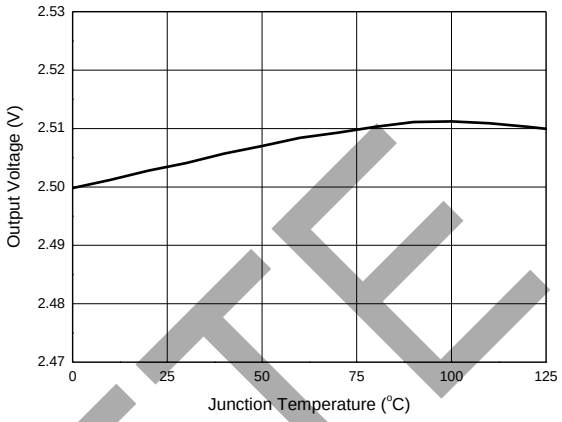
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DROP}	Dropout Voltage	I_{OUT} = 5A, ΔV_{REF}, ΔV_{OUT} = 1%	–	**1.3**	**1.5**	V
θ_{JC}	Thermal Resistance	TO-220-3	–	4.15	–	°C/W
		TO-252-2 (3)/TO-252-2 (4)/TO-252-2 (5)	–	7.36	–	
		TO263	–	4.15	–	
		TO-263-2	–	4.15	–	
I_{LIMIT}	Current Limit	V_{IN}-V_{OUT} = 3V	5.5	6.5	–	A
I_{LOAD} (MIN)	Minimum Load Current	V_{IN} = 10V (AZ1084-ADJ)	–	**3**	**10**	mA
I_Q	Quiescent Current	V_{IN} = 10V (AZ1084)	–	**5**	**10**	mA
PSRR	Ripple Rejection	f_{RIPPLE} = 120Hz, C_{OUT} = 25µF Tantalum, I_{OUT} = 5A, V_{IN}-V_{OUT} = 3V	**60**	**72**	–	dB
I_{ADJ}	Adjust Pin Current	V_{IN} = 4.25V, I_{OUT} = 10mA	–	55	**120**	µA
ΔI_{ADJ}	Adjust Pin Current Change	10mA ≤ I_{OUT} ≤ 5A, 1.5V ≤ (V_{IN}-V_{OUT}) ≤ 4.5V	–	**0.2**	**5**	µA
–	Temperature Stability	I_{OUT} = 10mA, V_{IN}-V_{OUT} = 1.5	–	**0.5**	–	%
–	Long Term Stability	T_A = 125°C, 1000Hrs	–	0.5	–	%
–	RMS Noise (% of V_{OUT})	10Hz ≤ f ≤ 10kHz	–	0.003	–	%

Typical Performance Characteristics

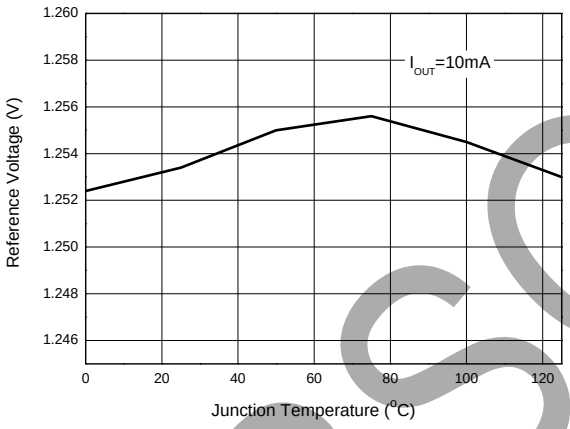
Dropout Voltage vs. Output Current



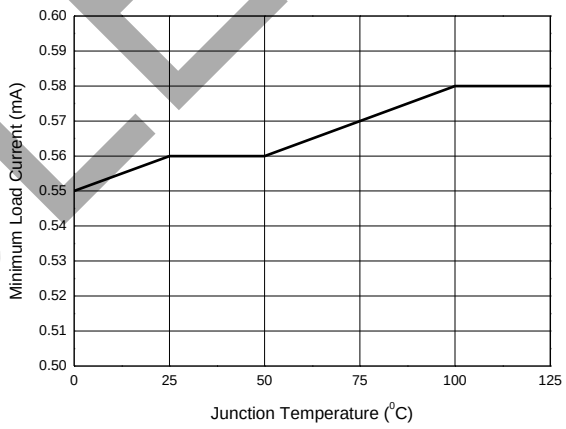
Output Voltage vs. Junction Temperature



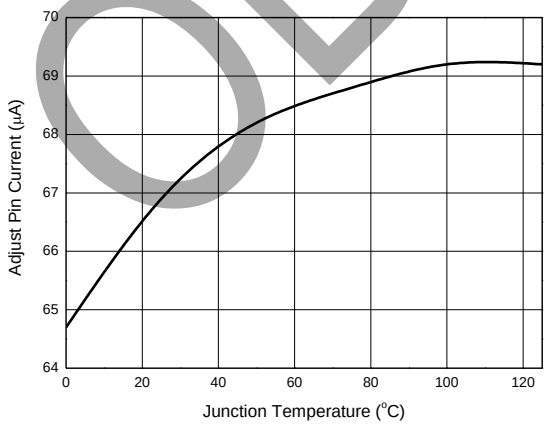
Reference Voltage vs. Junction Temperature



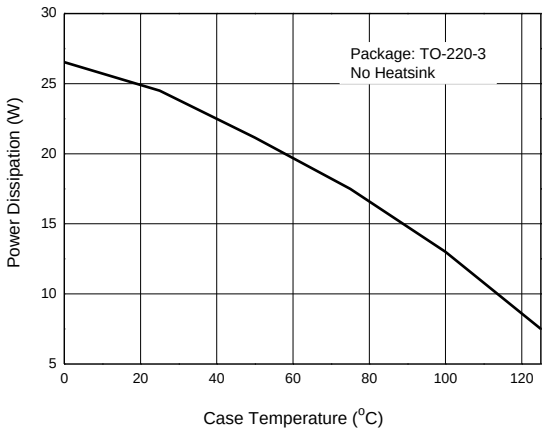
Minimum Load Current vs. Junction Temperature



Adjust Pin Current vs. Junction Temperature

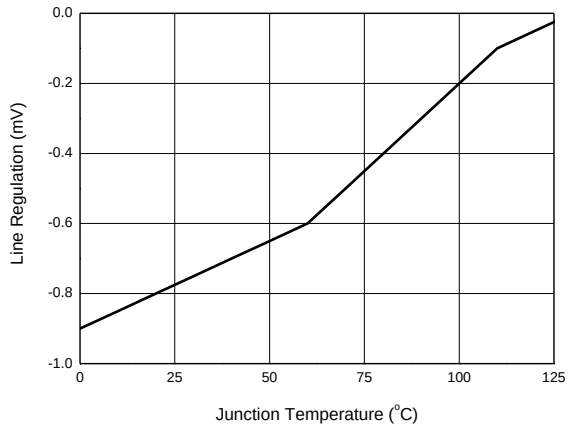


Power Dissipation vs. Case Temperature

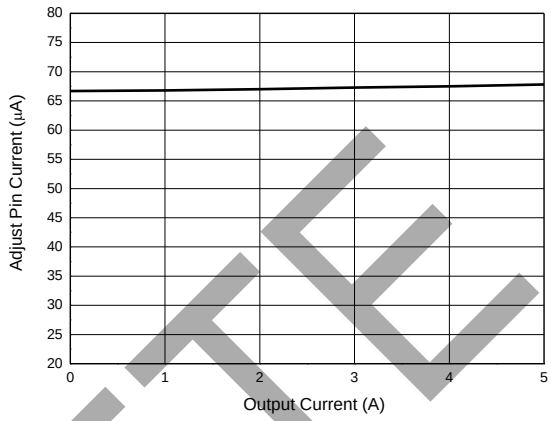


Performance Characteristics (Cont.)

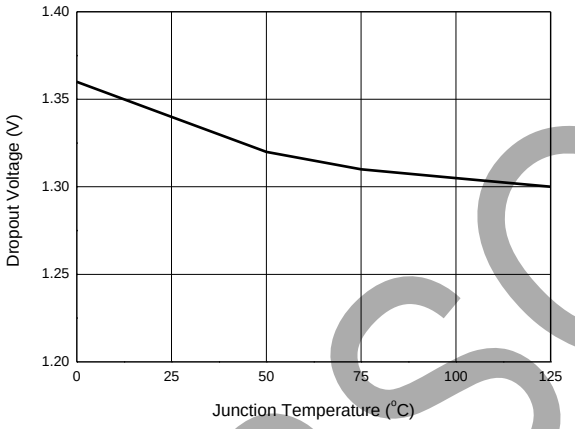
Line Regulation vs. Junction Temperature



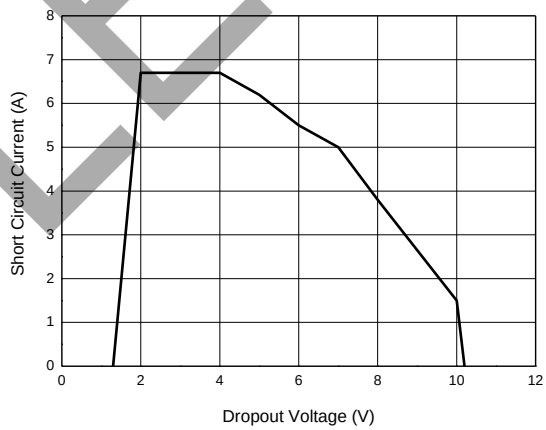
Adjust Pin Current vs. Output Current



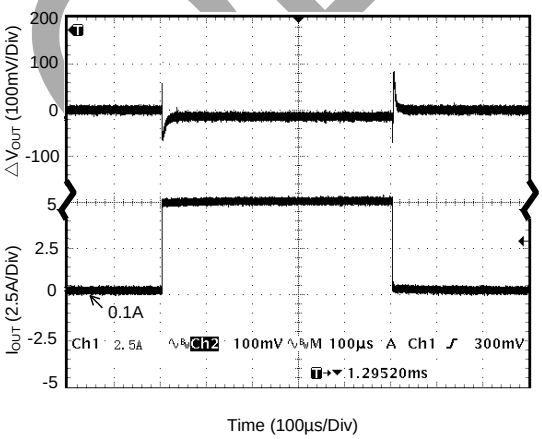
Dropout Voltage vs. Junction Temperature



Short Circuit Current vs. Dropout Voltage

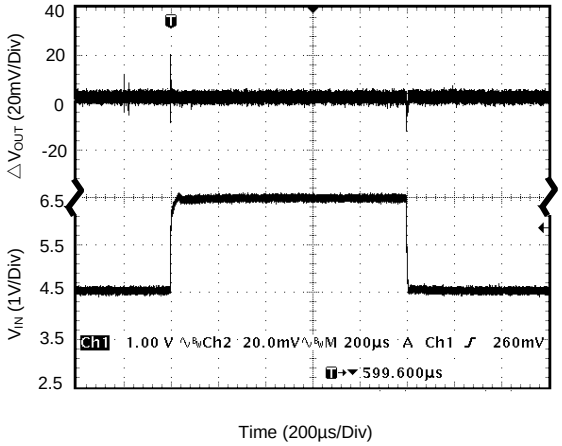


Load Transient Response
(Conditions: V_{IN} = 5.5V, V_{OUT} = 2.5V, I_{OUT} = 10mA to 5A C_{IN} = 10µF, C_{OUT} = 10µF)



Time (100µs/Div)

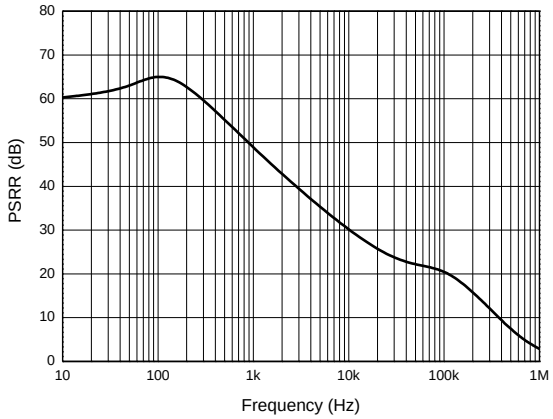
Line Transient Response
(Conditions: V_{IN} = 4.5V to 6.5V, V_{OUT} = 2.5V, I_{OUT} = 200mA, C_{OUT} = 10µF)



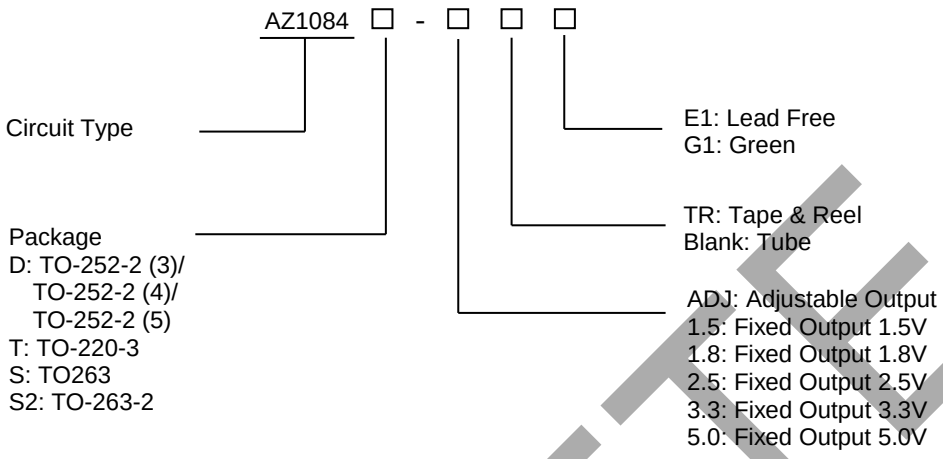
Time (200µs/Div)

Performance Characteristics (Cont.)

PSRR vs. Frequency



Ordering Information



Package	Temperature Range	Part Number		Marking ID		Packing Type
		Lead Free	Green	Lead Free	Green	
TO-252-2 (3) /TO-252-2 (4) /TO-252-2 (5)	0 to +125°C	AZ1084D-ADJTRE1	AZ1084D-ADJTRG1	AZ1084D-ADJE1	AZ1084D-ADJG1	Tape & Reel
		AZ1084D-1.5TRE1	AZ1084D-1.5TRG1	AZ1084D-1.5E1	AZ1084D-1.5G1	Tape & Reel
		AZ1084D-1.8TRE1	AZ1084D-1.8TRG1	AZ1084D-1.8E1	AZ1084D-1.8G1	Tape & Reel
		AZ1084D-2.5TRE1	AZ1084D-2.5TRG1	AZ1084D-2.5E1	AZ1084D-2.5G1	Tape & Reel
		AZ1084D-3.3TRE1	AZ1084D-3.3TRG1	AZ1084D-3.3E1	AZ1084D-3.3G1	Tape & Reel
		AZ1084D-5.0TRE1	AZ1084D-5.0TRG1	AZ1084D-5.0E1	AZ1084D-5.0G1	Tape & Reel
TO-220-3	0 to +125°C	AZ1084T-ADJE1	AZ1084T-ADJG1	AZ1084T-ADJE1	AZ1084T-ADJG1	Tube
		AZ1084T-1.5E1	AZ1084T-1.5G1	AZ1084T-1.5E1	AZ1084T-1.5G1	Tube
		AZ1084T-1.8E1	AZ1084T-1.8G1	AZ1084T-1.8E1	AZ1084T-1.8G1	Tube
		AZ1084T-2.5E1	AZ1084T-2.5G1	AZ1084T-2.5E1	AZ1084T-2.5G1	Tube
		AZ1084T-3.3E1	AZ1084T-3.3G1	AZ1084T-3.3E1	AZ1084T-3.3G1	Tube
		AZ1084T-5.0E1	AZ1084T-5.0G1	AZ1084T-5.0E1	AZ1084T-5.0G1	Tube

Lead-Free

Lead-free Green

Ordering Information (Cont.)

Package	Temperature Range	Part Number		Marking ID		Packing Type
		Lead Free	Green	Lead Free	Green	
TO263	0 to +125°C	AZ1084S-ADJTRE1	AZ1084S-ADJTRG1	AZ1084S-ADJE1	AZ1084S-ADJG1	Tape & Reel
		AZ1084S-1.5TRE1	AZ1084S-1.5TRG1	AZ1084S-1.5E1	AZ1084S-1.5G1	Tape & Reel
		AZ1084S-1.8TRE1	AZ1084S-1.8TRG1	AZ1084S-1.8E1	AZ1084S-1.8G1	Tape & Reel
		AZ1084S-2.5TRE1	AZ1084S-2.5TRG1	AZ1084S-2.5E1	AZ1084S-2.5G1	Tape & Reel
		AZ1084S-3.3TRE1	AZ1084S-3.3TRG1	AZ1084S-3.3E1	AZ1084S-3.3G1	Tape & Reel
		AZ1084S-5.0TRE1	AZ1084S-5.0TRG1	AZ1084S-5.0E1	AZ1084S-5.0G1	Tape & Reel
TO-263-2	0 to +125°C	AZ1084S2-ADJTRE1	AZ1084S2-ADJTRG1	AZ1084S2-ADJE1	AZ1084S2-ADJG1	Tape & Reel
		AZ1084S2-1.5TRE1	AZ1084S2-1.5TRG1	AZ1084S2-1.5E1	AZ1084S2-1.5G1	Tape & Reel
		AZ1084S2-1.8TRE1	AZ1084S2-1.8TRG1	AZ1084S2-1.8E1	AZ1084S2-1.8G1	Tape & Reel
		AZ1084S2-2.5TRE1	AZ1084S2-2.5TRG1	AZ1084S2-2.5E1	AZ1084S2-2.5G1	Tape & Reel
		AZ1084S2-3.3TRE1	AZ1084S2-3.3TRG1	AZ1084S2-3.3E1	AZ1084S2-3.3G1	Tape & Reel
		AZ1084S2-5.0TRE1	AZ1084S2-5.0TRG1	AZ1084S2-5.0E1	AZ1084S2-5.0G1	Tape & Reel

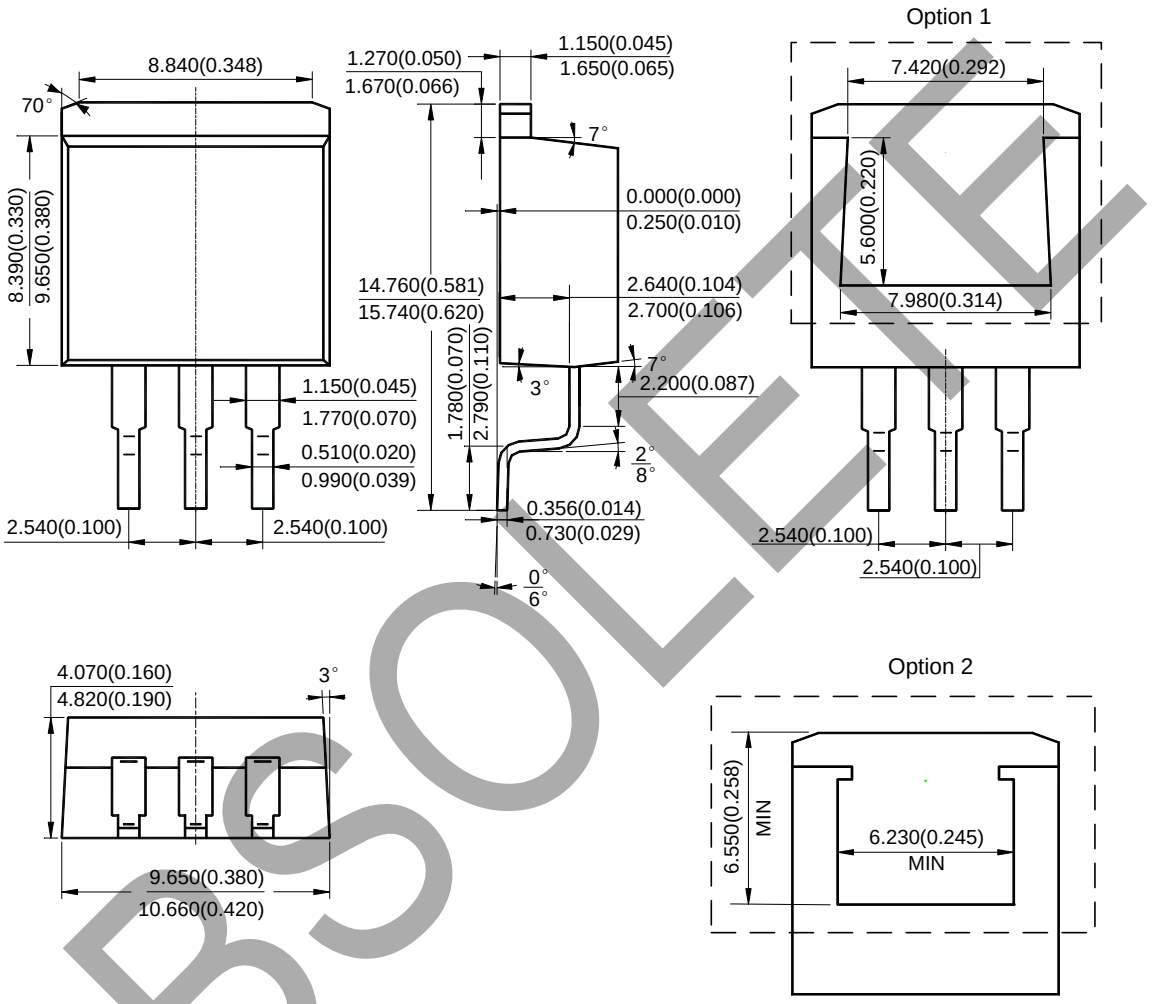
Lead-Free

Lead-free Green

BCD Semiconductor's Pb-free products, as designated with "E1" suffix in the part number, are RoHS compliant. Products with "G1" suffix are available in green packages.

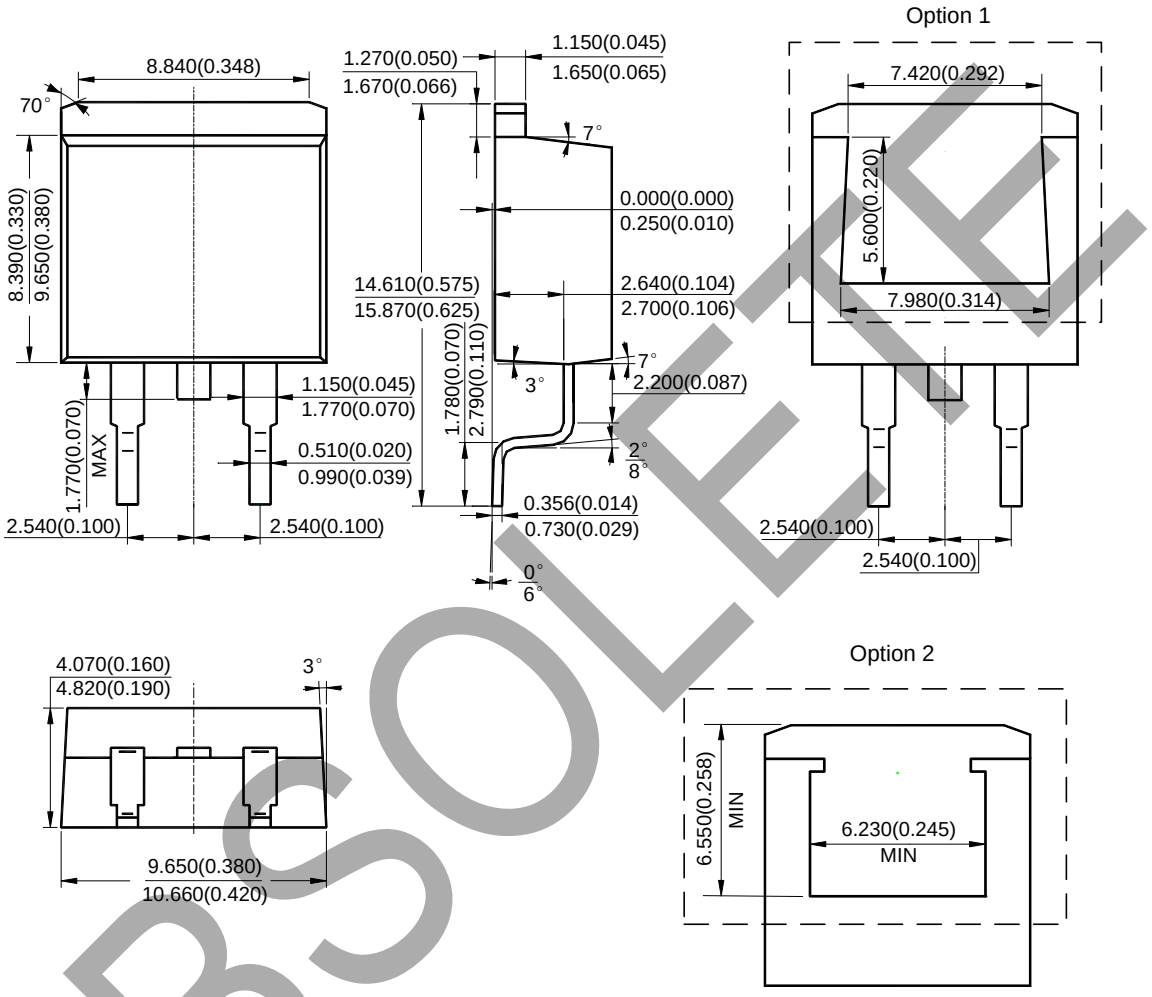
Package Outline Dimensions (All dimensions in mm(inch).)

TO263



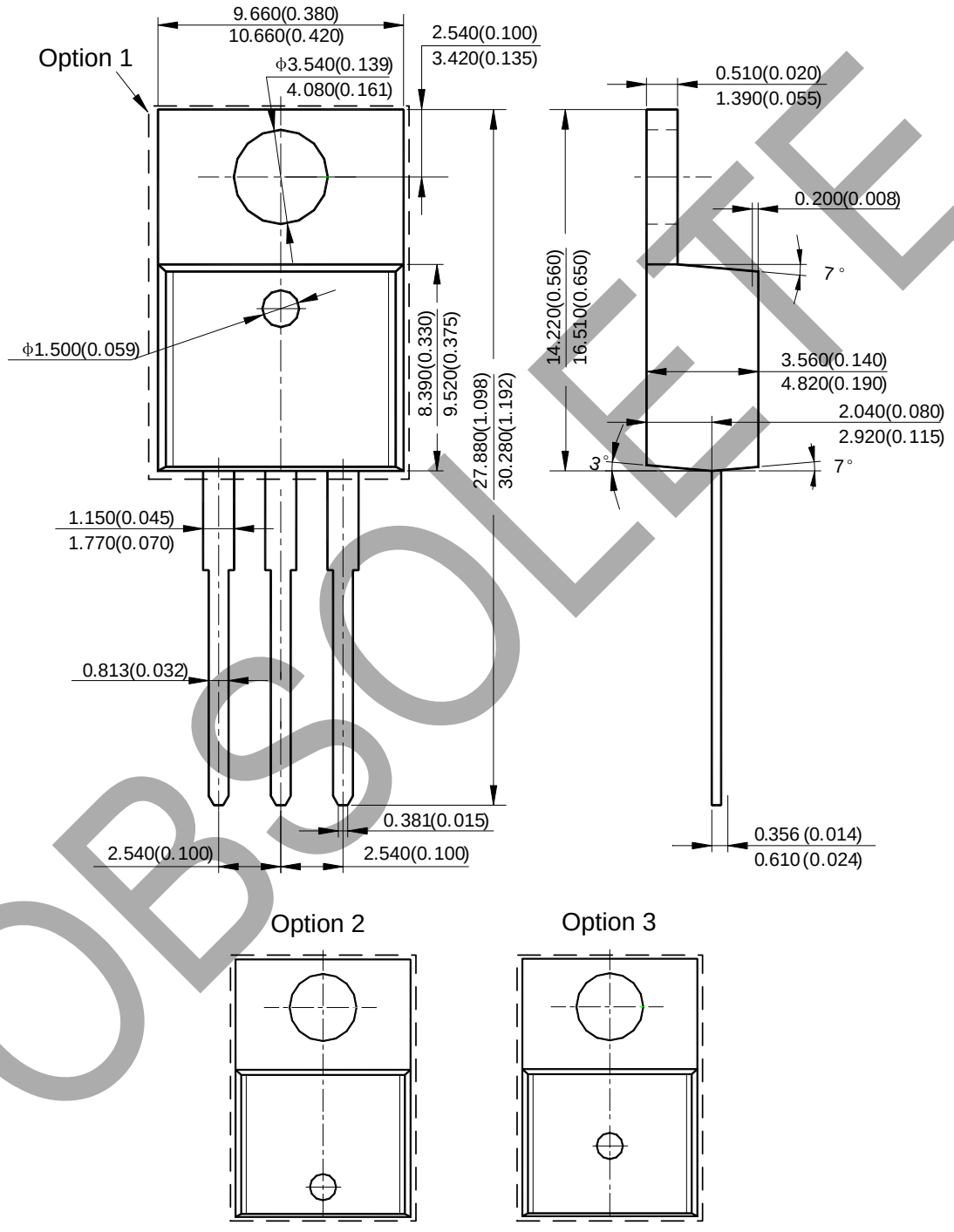
Package Outline Dimensions (Cont. All dimensions in mm(inch).)

TO-263-2



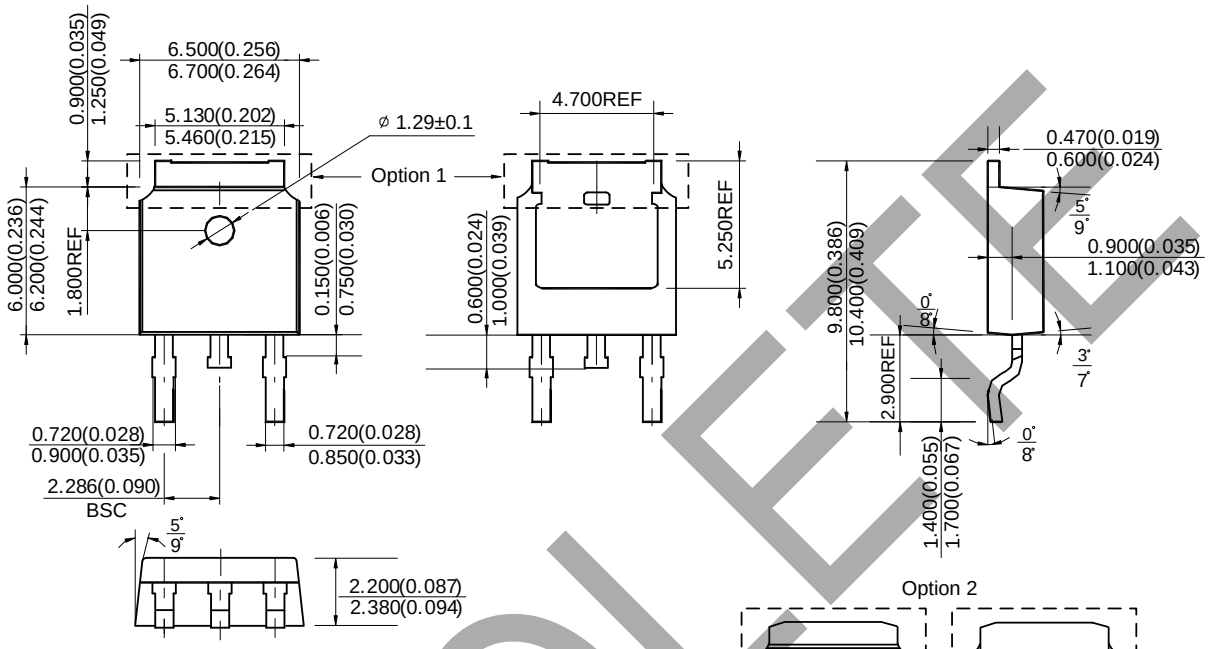
Package Outline Dimensions (Cont. All dimensions in mm(inch).)

TO-220-3



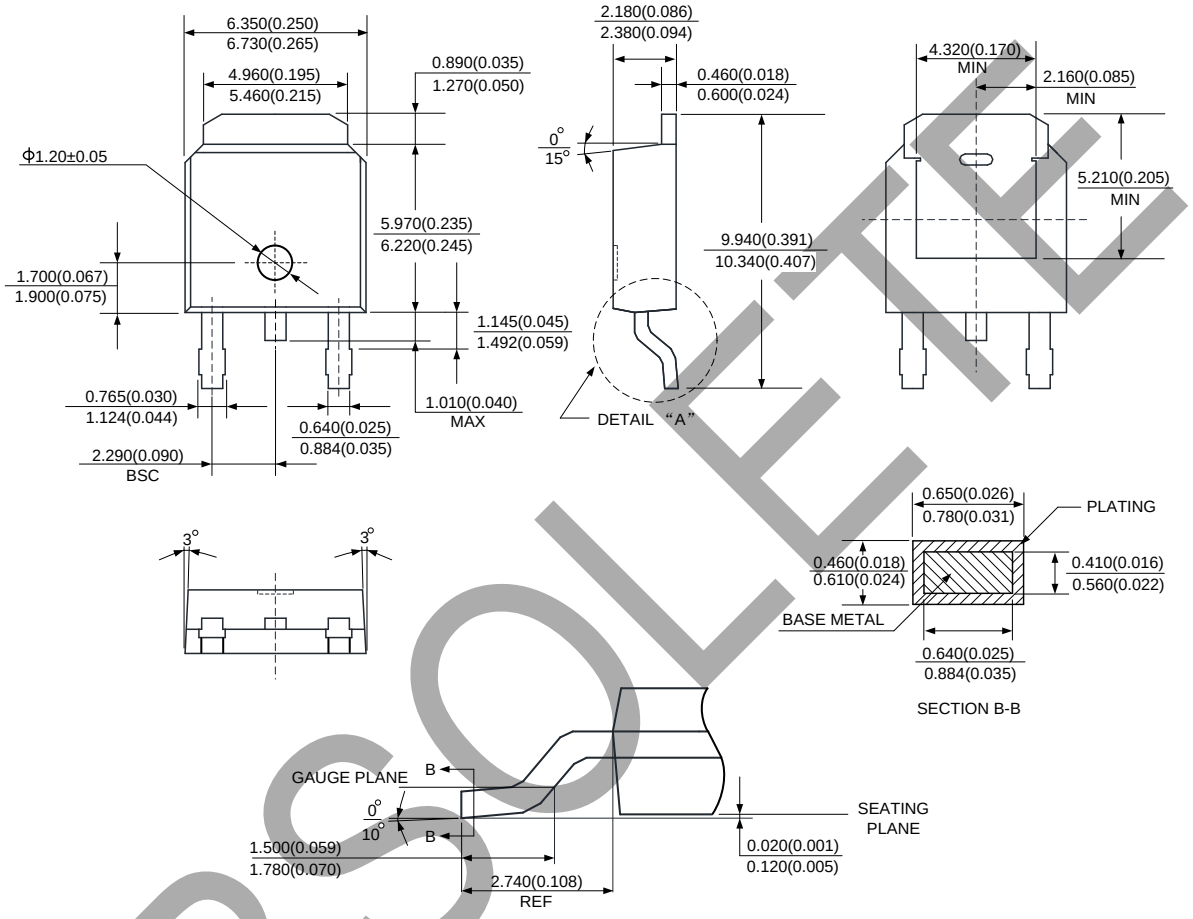
Package Outline Dimensions (Cont. All dimensions in mm(inch).)

TO-252-2 (3)



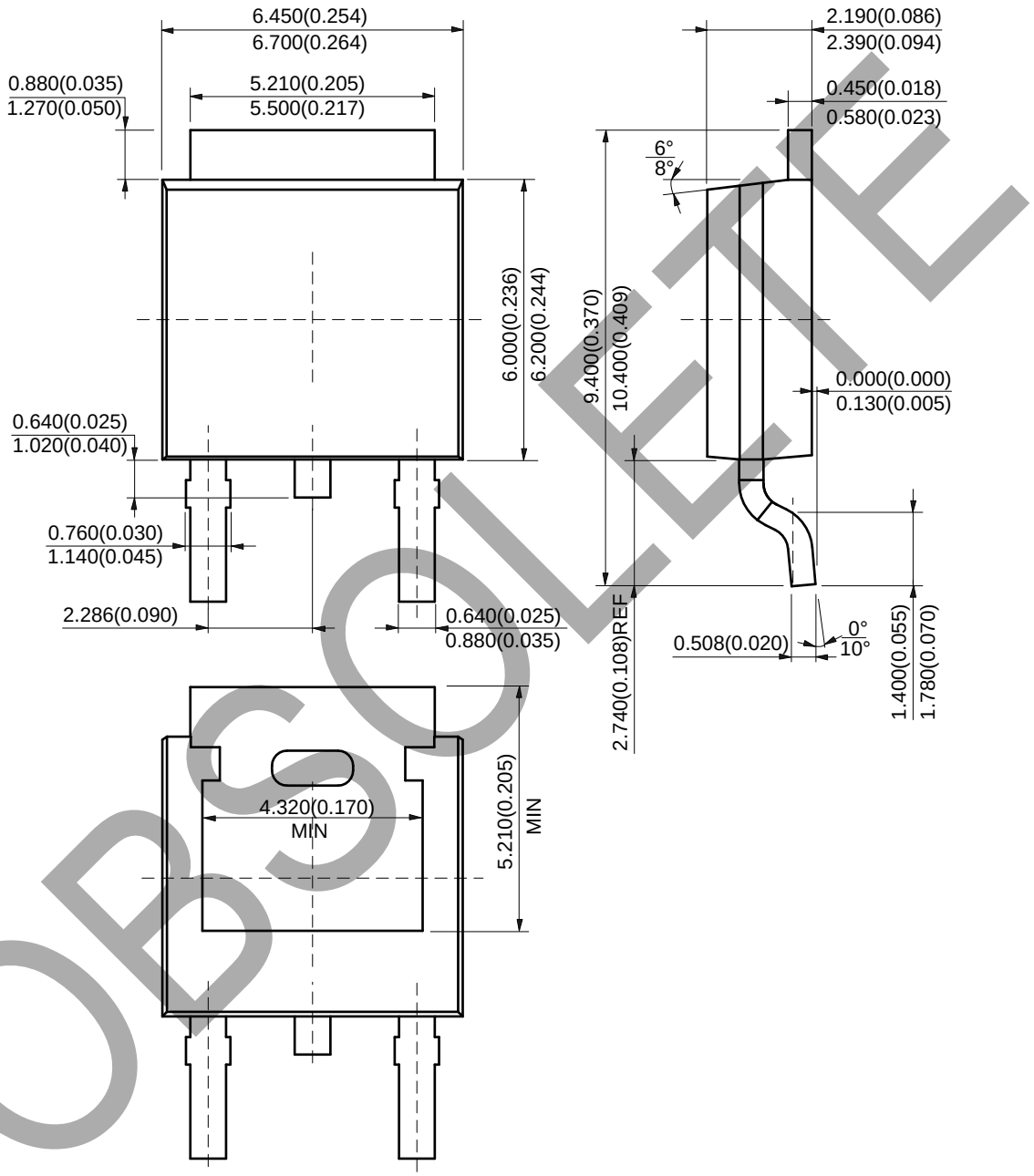
Package Outline Dimensions (Cont. All dimensions in mm(inch).)

TO-252-2 (4)



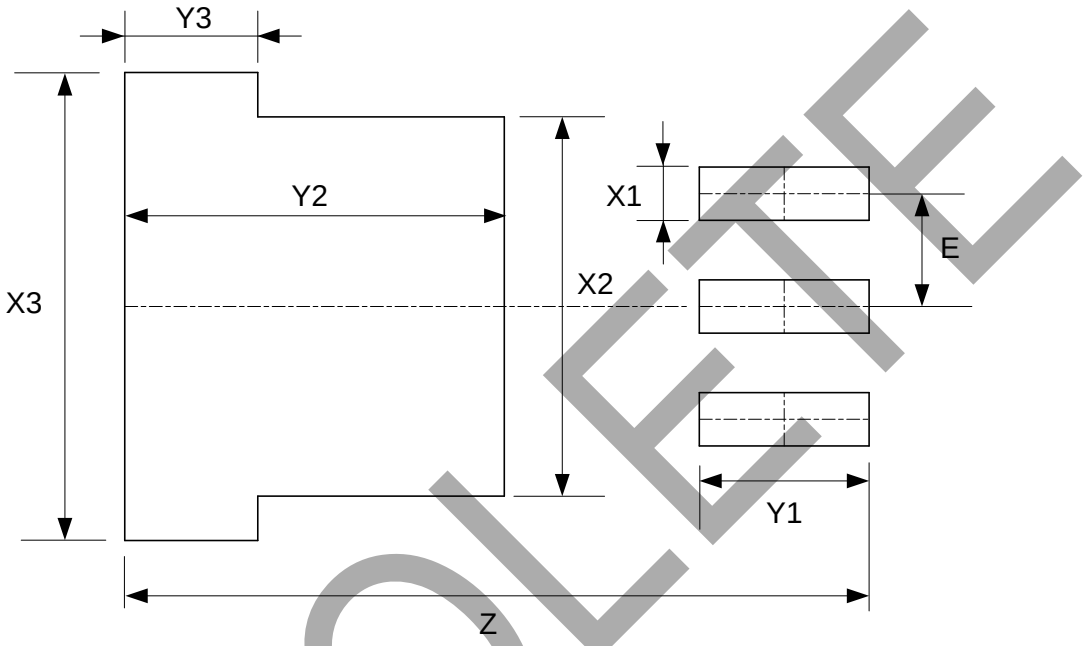
Package Outline Dimensions (Cont. All dimensions in mm(inch).)

TO-252-2 (5)



Suggested Pad Layout

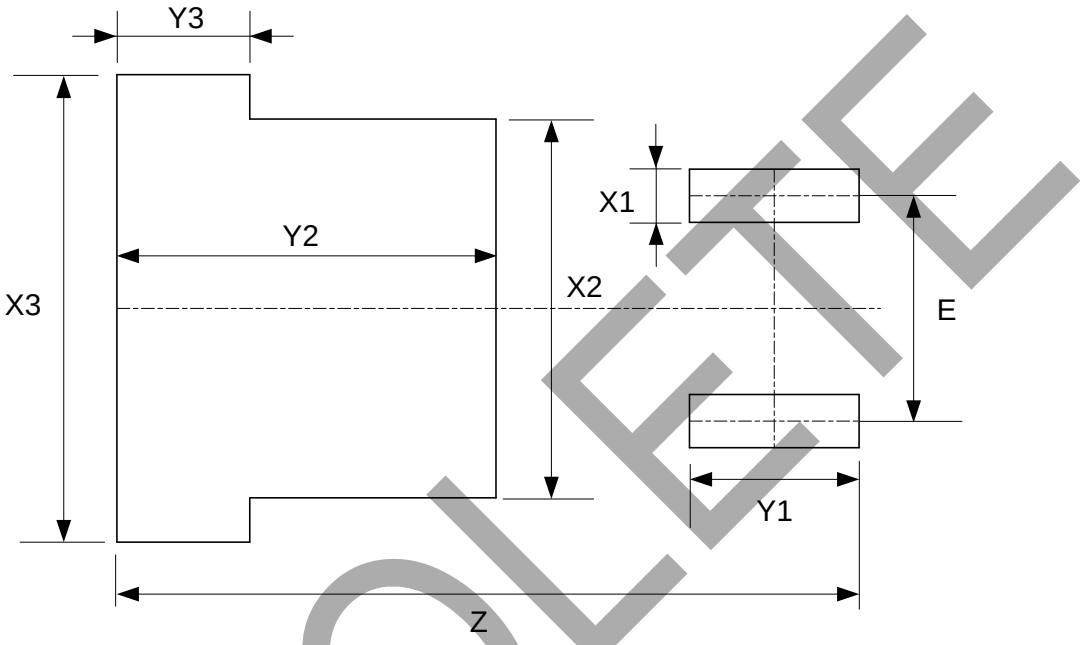
TO263



Dimensions	Z (mm)/(inch)	X1 (mm)/(inch)	X2 (mm)/(inch)	X3 (mm)/(inch)
Value	16.760/0.660	1.200/0.047	8.540/0.336	10.540/0.415
Dimensions	Y1 (mm)/(inch)	Y2 (mm)/(inch)	Y3 (mm)/(inch)	E (mm)/(inch)
Value	3.830/0.151	8.560/0.337	3.000/0.118	2.540/0.100

Suggested Pad Layout (Cont.)

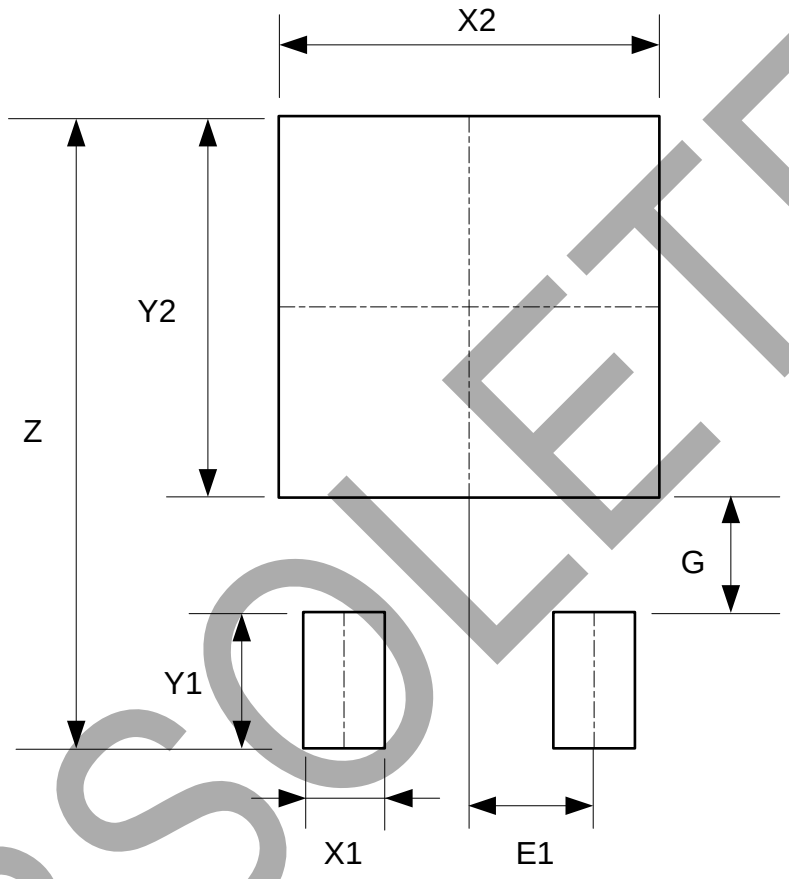
TO-263-2



Dimensions	Z (mm)/(inch)	X1 (mm)/(inch)	X2 (mm)/(inch)	X3 (mm)/(inch)
Value	16.760/0.660	1.200/0.047	8.540/0.336	10.540/0.415
Dimensions	Y1 (mm)/(inch)	Y2 (mm)/(inch)	Y3 (mm)/(inch)	E (mm)/(inch)
Value	3.830/0.151	8.560/0.337	3.000/0.118	5.080/0.200

Suggested Pad Layout (Cont.)

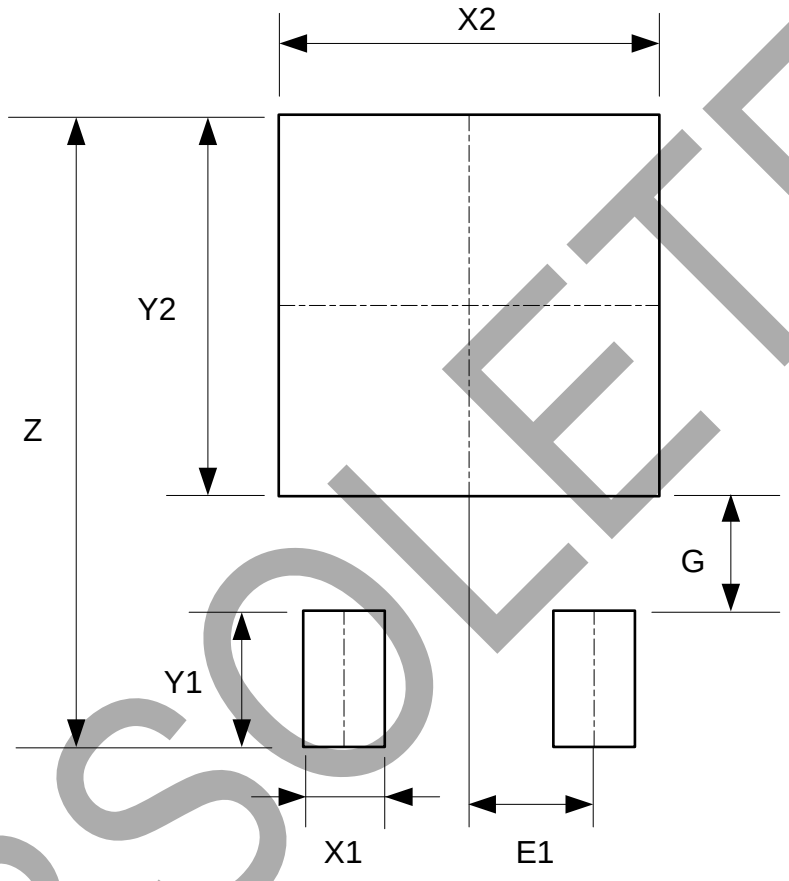
TO-252-2 (3)



Dimensions	Z (mm)/(inch)	X1 (mm)/(inch)	X2=Y2 (mm)/(inch)	Y1 (mm)/(inch)	G (mm)/(inch)	E1 (mm)/(inch)
Value	11.600/0.457	1.500/0.059	7.000/0.276	2.500/0.098	2.100/0.083	2.300/0.091

Suggested Pad Layout (Cont.)

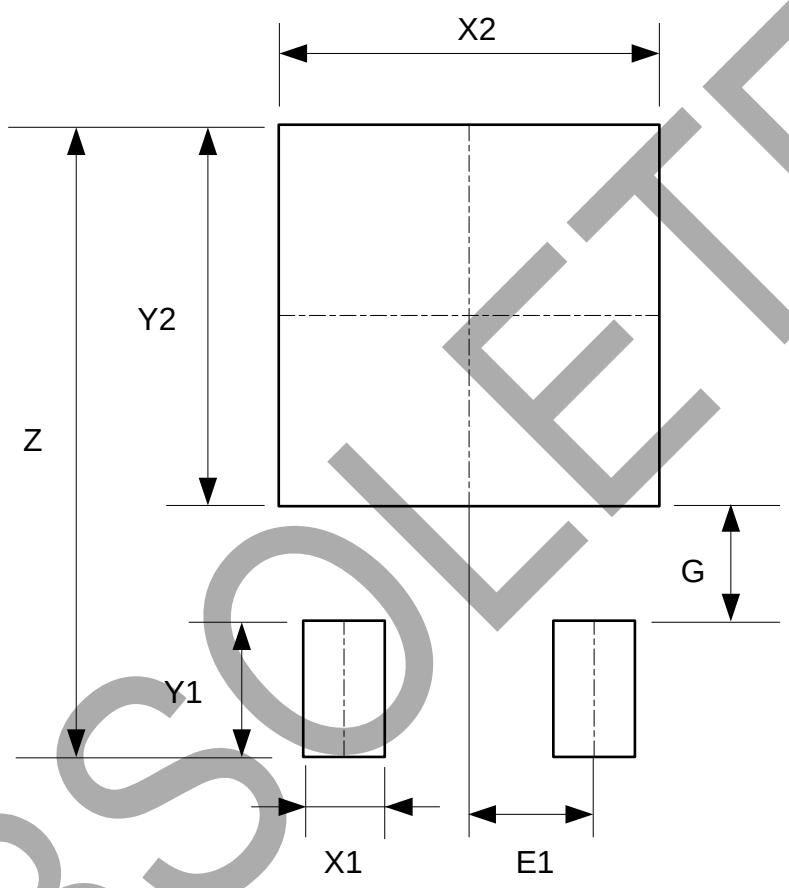
TO-252-2 (4)



Dimensions	Z (mm)/(inch)	X1 (mm)/(inch)	X2=Y2 (mm)/(inch)	Y1 (mm)/(inch)	G (mm)/(inch)	E1 (mm)/(inch)
Value	11.600/0.457	1.500/0.059	7.000/0.276	2.500/0.098	2.100/0.083	2.300/0.091

Suggested Pad Layout (Cont.)

TO-252-2 (5)



Dimensions	Z (mm)/(inch)	X1 (mm)/(inch)	X2=Y2 (mm)/(inch)	Y1 (mm)/(inch)	G (mm)/(inch)	E1 (mm)/(inch)
Value	11.600/0.457	1.500/0.059	7.000/0.276	2.500/0.098	2.100/0.083	2.300/0.091

IMPORTANT NOTICE

1. DIODES INCORPORATED AND ITS SUBSIDIARIES ("DIODES") MAKE NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARDS TO ANY INFORMATION CONTAINED IN THIS DOCUMENT, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION).

2. The Information contained herein is for informational purpose only and is provided only to illustrate the operation of Diodes products described herein and application examples. Diodes does not assume any liability arising out of the application or use of this document or any product described herein. This document is intended for skilled and technically trained engineering customers and users who design with Diodes products. Diodes products may be used to facilitate safety-related applications; however, in all instances customers and users are responsible for (a) selecting the appropriate Diodes products for their applications, (b) evaluating the suitability of the Diodes products for their intended applications, (c) ensuring their applications, which incorporate Diodes products, comply the applicable legal and regulatory requirements as well as safety and functional-safety related standards, and (d) ensuring they design with appropriate safeguards (including testing, validation, quality control techniques, redundancy, malfunction prevention, and appropriate treatment for aging degradation) to minimize the risks associated with their applications.

3. Diodes assumes no liability for any application-related information, support, assistance or feedback that may be provided by Diodes from time to time. Any customer or user of this document or products described herein will assume all risks and liabilities associated with such use, and will hold Diodes and all companies whose products are represented herein or on Diodes' websites, harmless against all damages and liabilities.

4. Products described herein may be covered by one or more United States, international or foreign patents and pending patent applications. Product names and markings noted herein may also be covered by one or more United States, international or foreign trademarks and trademark applications. Diodes does not convey any license under any of its intellectual property rights or the rights of any third parties (including third parties whose products and services may be described in this document or on Diodes' website) under this document.

5. Diodes products are provided subject to Diodes' Standard Terms and Conditions of Sale (https://www.diodes.com/about/company/terms-and-conditions/terms-and-conditions-of-sales/) or other applicable terms. This document does not alter or expand the applicable warranties provided by Diodes. Diodes does not warrant or accept any liability whatsoever in respect of any products purchased through unauthorized sales channel.

6. Diodes products and technology may not be used for or incorporated into any products or systems whose manufacture, use or sale is prohibited under any applicable laws and regulations. Should customers or users use Diodes products in contravention of any applicable laws or regulations, or for any unintended or unauthorized application, customers and users will (a) be solely responsible for any damages, losses or penalties arising in connection therewith or as a result thereof, and (b) indemnify and hold Diodes and its representatives and agents harmless against any and all claims, damages, expenses, and attorney fees arising out of, directly or indirectly, any claim relating to any noncompliance with the applicable laws and regulations, as well as any unintended or unauthorized application.

7. While efforts have been made to ensure the information contained in this document is accurate, complete and current, it may contain technical inaccuracies, omissions and typographical errors. Diodes does not warrant that information contained in this document is error-free and Diodes is under no obligation to update or otherwise correct this information. Notwithstanding the foregoing, Diodes reserves the right to make modifications, enhancements, improvements, corrections or other changes without further notice to this document and any product described herein. This document is written in English but may be translated into multiple languages for reference. Only the English version of this document is the final and determinative format released by Diodes.

8. Any unauthorized copying, modification, distribution, transmission, display or other use of this document (or any portion hereof) is prohibited. Diodes assumes no responsibility for any losses incurred by the customers or users or any third parties arising from any such unauthorized use.

www.diodes.com