

**PI49FCT32802/PI49FCT32803**

**1:5/1:7 3.3V CMOS Clock Drivers**

**Features**

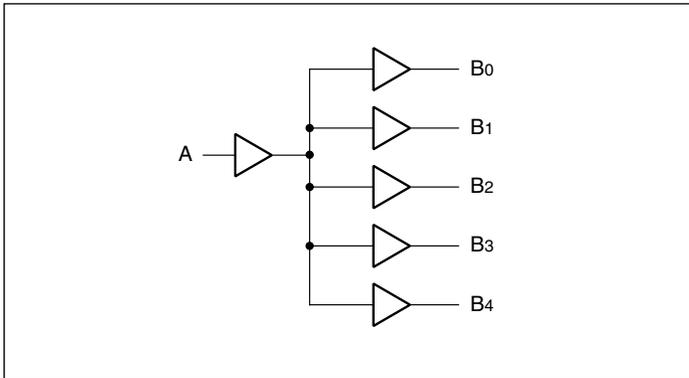
- Low skew: < 200ps
  - Fast switching frequency >133 MHz
  - Fast output rise/fall time < 1.5ns
  - Low propagation delay < 2.5ns
  - Low input capacitance < 6.0pF
  - 5V Tolerant input
  - Rail-to-Rail CMOS outputs
  - Industrial Temperature: -40°C to +85°C
  - 3.3V ±10% operation
  - Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)
  - Halogen and Antimony Free. “Green” Device (Note 3)
  - For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please [contact us](https://www.diodes.com/quality/product-definitions/) or your local Diodes representative.
- <https://www.diodes.com/quality/product-definitions/>
- Packages (Pb-free & Green available):
    - 16-pin 150-mil wide QSOP (Q)
    - 16-pin 173-mil wide TSSOP (L)

**Description**

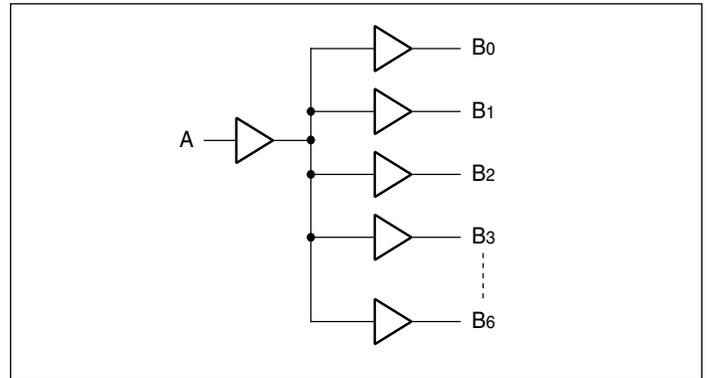
The PI49FCT3280x is a 3.3V very low-skew clock buffer from a single low-capacitance input that produces five outputs on PI49FCT32802 and seven outputs on PI49FCT32803. Excellent output signals to power and ground ratio minimize power and ground noise, and also improves output performance.

The PI49FCT3280x integrates series damping resistors on all outputs.

**Block Diagram (PI49FCT32802)**



**Block Diagram (PI49FCT32803)**

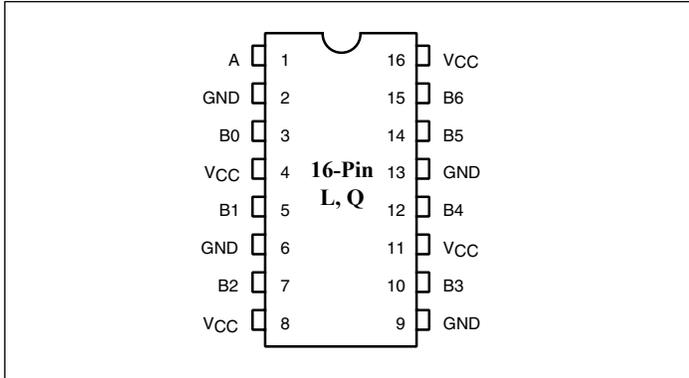


**Notes:**

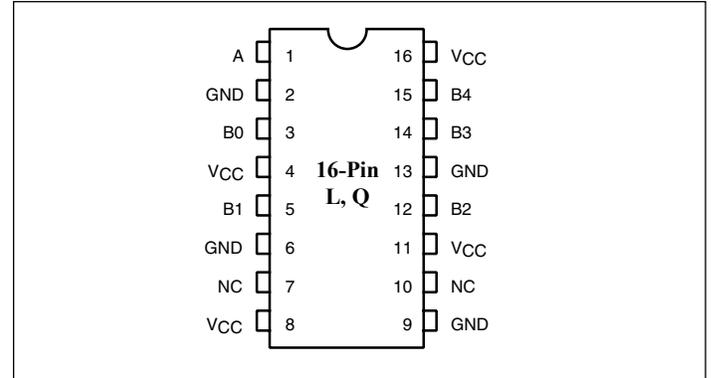
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated’s definitions of Halogen- and Antimony-free, “Green” and Lead-free.
3. Halogen- and Antimony-free “Green” products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

**PI49FCT32802/PI49FCT32803**

**Pin Configuration (PI49FCT32802)**



**Pin Configuration (PI49FCT32803)**



**Pin Description**

Pin Name		Description
PI49FCT32802	PI49FCT32803	
A	A	Input
B0-B4	B0-B6	Outputs
GND	GND	Ground
VCC	VCC	Power

## Maximum Ratings

(Above which the useful life may be impaired. For user guidelines, not tested.)

Storage Temperature .....	-55°C to +150°C
Supply Voltage to Ground Potential.....	-0.5V to +5.5V
DC Input Voltage .....	-0.5V to +5.5V
DC Output Current.....	120mA
Power Dissipation .....	0.5W
Latch up .....	200mA
ESD Protection (Input) .....	2000V min (HBM)
Junction Temperature .....	125°C Max

**Note:**

Stresses greater than those listed under MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

## DC Electrical Characteristics (Over the Operating Range)

Symbol	Description	Test Conditions <sup>(1)</sup>	Min.	Typ.	Max.	Units	
V <sub>OH</sub>	Output HIGH voltage	V <sub>CC</sub> =3V, V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> = -8mA	2.4	3	-	V
V <sub>OL</sub>	Output LOW voltage	V <sub>CC</sub> =3V, V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 12mA	-	0.4	0.5	
V <sub>IH</sub>	Input HIGH voltage	Guaranteed Logic HIGH Level (Input Pins)		2	-	5.5	
V <sub>IL</sub>	Input LOW voltage	Guaranteed Logic LOW Level (Input Pins)		-0.5	-	0.8	
I <sub>IH</sub>	Input HIGH current	V <sub>CC</sub> = 3.6V	V <sub>IN</sub> = 3.6V	-	-	1	μA
I <sub>IL</sub>	Input LOW current	V <sub>CC</sub> = 3.6V	V <sub>IN</sub> = 0V	-	-	-1	
V <sub>IK</sub>	Clamp diode voltage	V <sub>CC</sub> = Min., I <sub>IN</sub> = -18mA		-	-0.7	-1.2	V
I <sub>OH</sub>	Output HIGH current	V <sub>CC</sub> = 3.3V, V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> , V <sub>OUT</sub> = 1.5V <sup>(5)</sup>		-25	-45	-80	mA
I <sub>OL</sub>	Output LOW current	V <sub>CC</sub> = 3.3V, V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> , V <sub>OUT</sub> = 1.5V <sup>(5)</sup>		25	45	90	
I <sub>OS</sub>	Short circuit current <sup>(5)</sup>	V <sub>CC</sub> = Max., V <sub>OUT</sub> = GND <sup>(5)</sup>		-50	-100	-180	
V <sub>H</sub>	Input Hysteresis			-	150	-	mV
R <sub>S</sub>	Series Resistor				22		Ω

**Notes:**

1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at V<sub>CC</sub> = 3.3V, +25°C ambient and maximum loading.
3. V<sub>OH</sub> = V<sub>CC</sub> - 0.6V at rated current.
4. This parameter is determined by device characterization but is not production tested.
5. Not more than one output should be shorted at one time. Duration of the test should not exceed one second.

**Power Supply Characteristics**

Parameters	Description	Test Conditions <sup>(1)</sup>		Min.	Typ <sup>(2)</sup>	Max.	Units
$I_{CC}$	Quiescent Power Supply Current	$V_{CC} = \text{Max.}$	$V_{IN} = \text{GND}$ or $V_{CC}$	—	0.1	30	$\mu\text{A}$
$\Delta I_{CC}$	Supply Current per Inputs @ TTL HIGH	$V_{CC} = \text{Max.}$	$V_{IN} = V_{CC} - 0.6\text{V}^{(3)}$	—	47	300	
$I_{CCD}$	Supply Current per Input per MHz <sup>(4)</sup>	$V_{CC} = \text{Max.},$ Outputs Open Per Output Toggling 50% Duty Cycle	$V_{IN} = V_{CC}$	—			mA/
			$V_{IN} = \text{GND}$		0.08	0.16	MHz

**Notes:**

- For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device.
- Typical values are at  $V_{CC} = 3.3\text{V}$ ,  $+25^\circ\text{C}$  ambient.
- Per TTL driven input ( $V_{IN} = V_{CC} - 0.6\text{V}$ ); all other inputs at  $V_{CC}$  or  $\text{GND}$ .
- This parameter is not directly testable, but is derived for use in Total Power Supply Calculations.
- Values for these conditions are examples of the  $I_C$  formula. These limits are guaranteed but not tested.

**Capacitance** ( $T_A = 25^\circ\text{C}$ ,  $f = 1\text{ MHz}$ )

Parameters <sup>(1)</sup>	Description	Test Conditions	Typ	Max.	Units
$C_{IN}$	Input Capacitance	$V_{IN} = 0\text{V}$	3.0	4	$\text{pF}$
$C_{OUT}$	Output Capacitance	$V_{OUT} = 0\text{V}$		6	

**Notes:**

- This parameter is determined by device characterization but is not production tested.

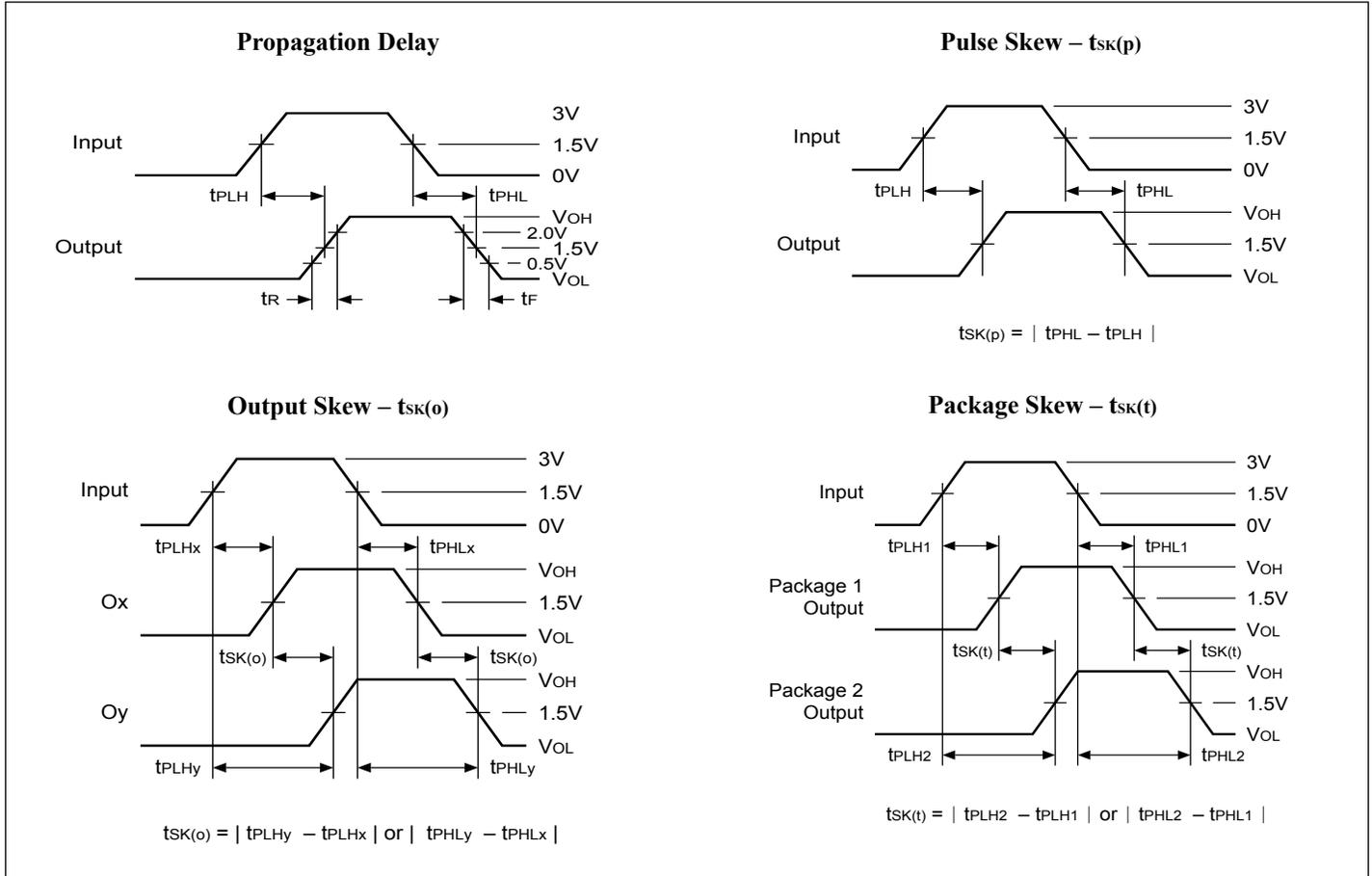
**Maximum Switching Characteristics** (Over operating range)

Symbol	Description	Condition	Max.	Units
$t_{PLH}$ $t_{PHL}$	Propagation Delay A to Bn <sup>(3)</sup>	$CL = 15\text{pF}$	2.5	ns
$t_{R/tF}$	Rise/Fall Time <sup>(2)</sup>	$0.8\text{V} - 2.0\text{V}$	1.5	
$t_{SK(p)}$	Pulse Skew (same pkg) <sup>(1,2)</sup>	$CL = 15\text{pF}$	0.35	
$t_{SK(o)}$	Output Skew (same pkg.) <sup>(1,2)</sup>		0.2	
$t_{SK(t)}$	Output Skew (different pkg.) <sup>(1,2)</sup>		0.55	
$F_{IN}$	Input Frequency <sup>(1,2)</sup>		133	MHz

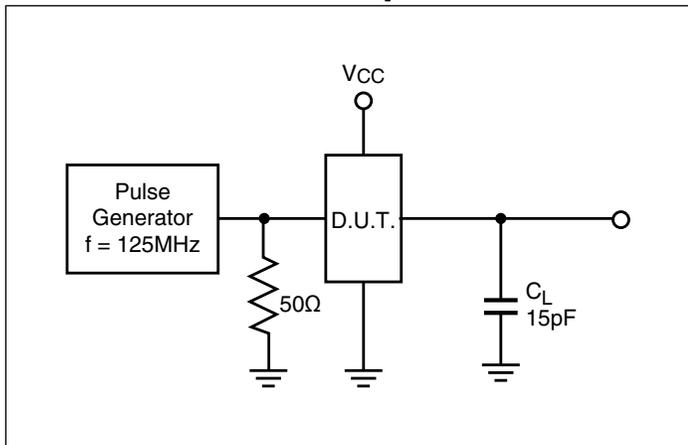
**Notes:**

- Other loading condition is described on page 4, "Test Circuits for All Outputs."
- These parameters are guaranteed by design.
- Minimum propagation delay of 1.5ns is guaranteed by design.

**Switching Waveforms**



**Tests Circuits for All Outputs**



**PI49FCT32802/PI49FCT32803**

**Part Marking**

**PI49FCT32802**

**Q Package**

PI49FCT  
32802QE  
○ YWXX

YW: 2 Letter Datecode per MA1251  
1st X: Assembly Code  
2nd X: Fab Code

**L Package**

PI49FCT  
32802LE  
○ YYWWXX

YY: Year  
WW: Workweek  
1st X: Assembly Code  
2nd X: Fab Code

**PI49FCT32803**

**Q Package**

PI49FCT  
32803QE  
○ YYWWXX

YY: Year  
WW: Workweek  
1st X: Assembly Code  
2nd X: Fab Code  
Date Code per MA-1251

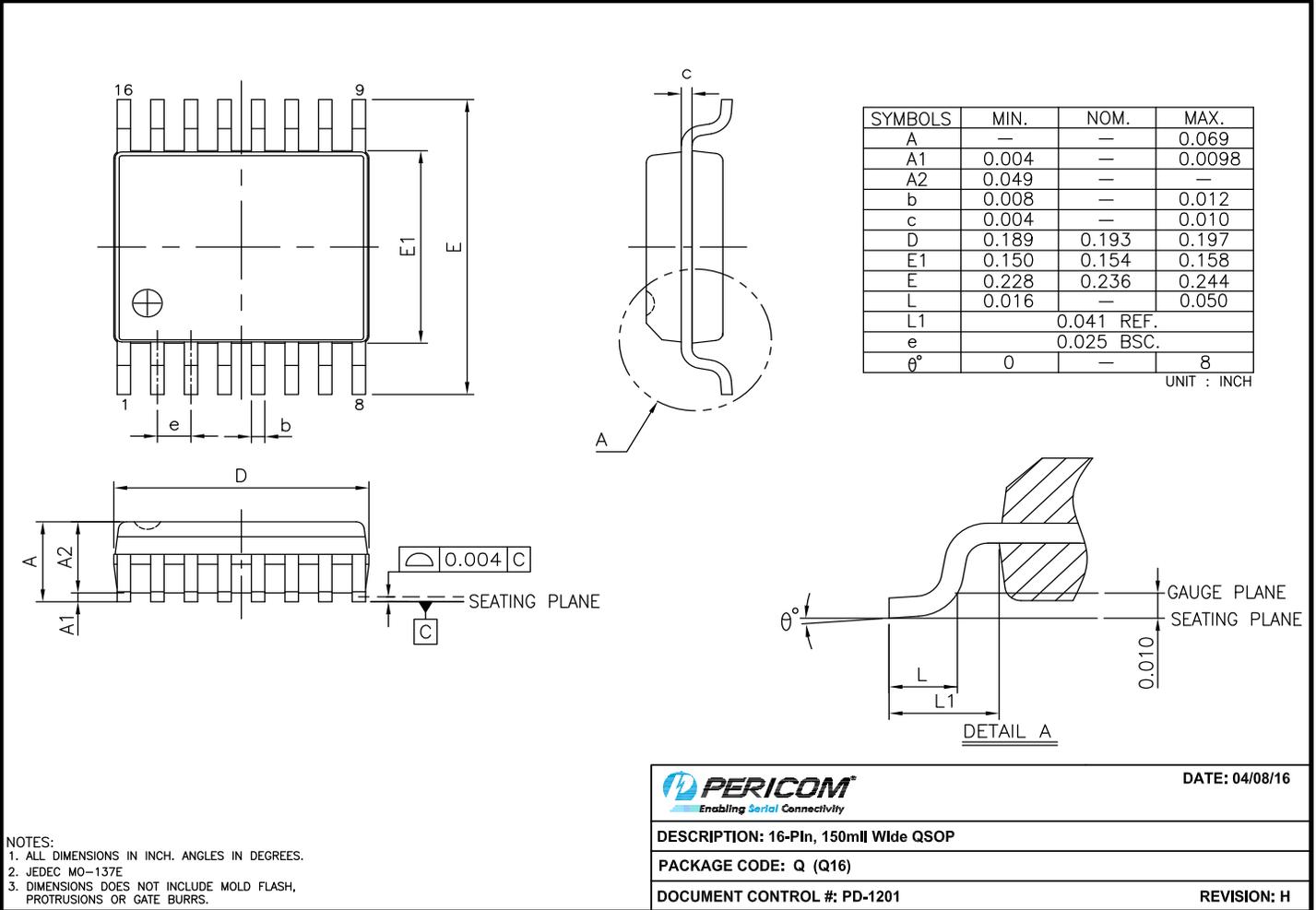
**L Package**

PI49FCT  
32803LE  
○ YYWWXX

YY: Year  
WW: Workweek  
1st X: Assembly Code  
2nd X: Fab Code

**PI49FCT32802/PI49FCT32803**

**Packaging Mechanical: 16-QSOP (Q)**



16-0056

**Packaging Mechanical: 16-TSSOP (L)**

SYMBOLS	MIN.	NOM.	MAX.
A	—	—	1.20
A1	0.05	—	0.15
A2	0.80	1.00	1.05
b	0.19	—	0.30
c	0.09	—	0.20
D	4.90	5.00	5.10
E1	4.30	4.40	4.50
E	6.20	6.40	6.60
e	0.65 BSC		
L1	1.00 REF		
L	0.45	0.60	0.75
S	0.20	—	—
$\theta$	0°	—	8°

**NOTES:**  
 1. ALL DIMENSIONS IN MILLIMETERS. ANGLES IN DEGREES.  
 2. JEDEC MO-153F  
 3. DIMENSIONS DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.

16-0061

		DATE: 03/24/16
DESCRIPTION: 16-Pin, 173mil Wide TSSOP		
PACKAGE CODE: L (L16)		
DOCUMENT CONTROL #: PD-1310		REVISION: G

For latest package info.

please check: <http://www.diodes.com/design/support/packaging/pericom-packaging/packaging-mechanicals-and-thermal-characteristics/>

**Ordering Information**

Ordering Number	Package Code	Package Description
PI49FCT32802QEX	Q	16-Pin, 150mil Wide (QSOP)
PI49FCT32803QEX	Q	16-Pin, 150mil Wide (QSOP)
PI49FCT32802LEX	L	16-Pin, 173mil Wide (TSSOP)
PI49FCT32803LEX	L	16-Pin, 173mil Wide (TSSOP)

**Notes:**

1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See <https://www.diodes.com/quality/lead-free/> 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.
4. E = Pb-free and Green
5. X suffix = Tape/Reel

**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.

Copyright © 2021 Diodes Incorporated

[www.diodes.com](http://www.diodes.com)