



## ZXFV201, ZXFV202, ZXFV203, ZXFV204

### QUAD, SINGLE, TRIPLE, AND DUAL VIDEO AMPLIFIERS

#### Description

The ZXFV201, ZXFV202, ZXFV203 and ZXFV204 are quad, single, triple and dual, respectively, high speed amplifiers designed for video and other high-speed applications.

Their low differential gain and phase performance make them ideal for video amplifier buffer applications.

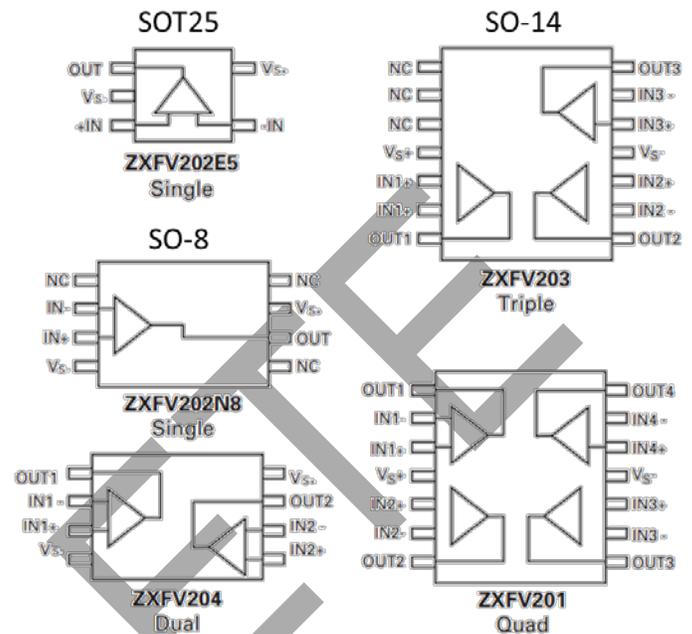
The quad allows one IC to drive RGBS format component video signals, while the triple provides RGB component video buffer/driver. The dual amplifier is a mainstay of the video market providing two channels in the space of 1 single in SO8. The small size of the ZXFV202 in SOT23 allows it to be placed where needed for position/size critical applications.

Together with high output drive and slew rate capability, they bring high performance to video applications.

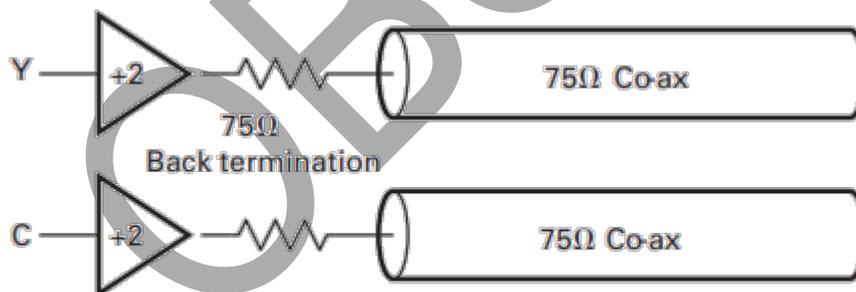
#### Features

- High speed
- Gain of 1 - 3dB bandwidth 210MHz
- Slew rate 380V/ $\mu$ s
- Good video
- 25 MHz 0.1dB bandwidth
- Differential gain 0.04%
- Differential phase 0.04°
- 40mA output current @ 3V Output
- Characterized up to 300pF load
- $\pm$ 5 Volt supply operation
- Supply current 7.5mA per amplifier

#### Pin Assignments



#### Typical Applications Circuit



**Dual amplifier S - video driver**

**Absolute Maximum Ratings** (over operating free-air temperature (unless otherwise stated <sup>(a)</sup>)

Supply voltage ( $V_{S+}$ to $V_{S-}$ )	-0.5V to +11V
Input voltage ( $V_{IN-}$ , $V_{IN+}$ ) <sup>(b)</sup>	$V_{S-} - 0.5V$ to $V_{S+} + 0.5V$
Differential input voltage ( $V_{ID}$ )	$\pm 3V$
Inverting input current ( $I_{IN-}$ ) <sup>(c)</sup>	$\pm 5mA$
Output current (continuous, $T_J < 110^\circ C$ )	$\pm 60mA$
Internal power dissipation	See power dissipation derating table
Storage temperature range	$-65^\circ C$ to $+150^\circ C$
Operating ambient junction temperature ( $T_{JMAX}$ )	$150^\circ C$

**NOTES:**

- (a) Stresses above those listed under Absolute maximum ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.
- (b) During power-up and power-down, these voltage ratings require that signals be applied only when the power supply is connected.
- (c) At high closed loop gains and low gain setting resistors care must be taken if large input signals are applied to the device which cause the output stage to saturate for extended periods of time.

**Power derating table**

Package	Theta-ja	Power rating at 25°C
SOT23-5	195°C/W	0.64W
S08	168°C/W	0.74W
S014	120°C/W	1.04W

**Recommended Operating Conditions** (@ $T_A = +25^\circ C$ , unless otherwise specified.)

Parameter		Min.	Max.	Unit
$V_{S\pm}$	Dual supply voltage range	$\pm 4.75$	$\pm 5.25$	V
$V_{CMR}$	Common mode input voltage range	-3	+3	V
$T_A$	Ambient temperature range	-40	85	°C

**Recommended resistor values**
 $V_{S\pm} = 5V$ ,  $C_L = 10pF$ 

$G_{CL}$	$R_F$	$R_G$	Peaking
1	680	n/c	2 dB
	820		0
	1000		-2dB
2	430	430	2dB
	470	470	1.5dB
	560	560	0

**Electrical Characteristics** (@  $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

**DC electrical characteristics ( $\pm 5\text{V}$  power supplies,  $T_{\text{amb}} = 25^\circ\text{C}$  unless otherwise stated.  $R_f = 1\text{k}\Omega$ ,  $R_L = 150\Omega$ ,  $C_L \leq 10\text{pF}$ )**

Parameter	Conditions	Test	Min.	Typ.	Max.	Unit
Supply voltage $V_+$ operating range			4.75	5	5.25	V
Supply voltage $V_-$ operating range			-5.25	-5	-4.75	V
Supply current/per channel		P	5.0	7.5	10	mA
Input common mode voltage range		P		$\pm 3$		V
Input offset voltage		P		1	10	mV
Output offset voltage		P		2	20	mV
Input bias current, non-inverting input		P		5	10	$\mu\text{A}$
Input resistance		P	1.5	2	6.5	$\text{M}\Omega$
Output voltage swing	$I_{\text{OUT}} = 40\text{mA}$	P		$\pm 3$		V
Output drive current	$V_{\text{IN}} = 3\text{V}$	P	40			mA
Positive PSRR	$\Delta V_+ = \pm 0.25$	P	49	57		dB
Negative PSRR	$\Delta V_- = \pm 0.25$	P	49	57		dB

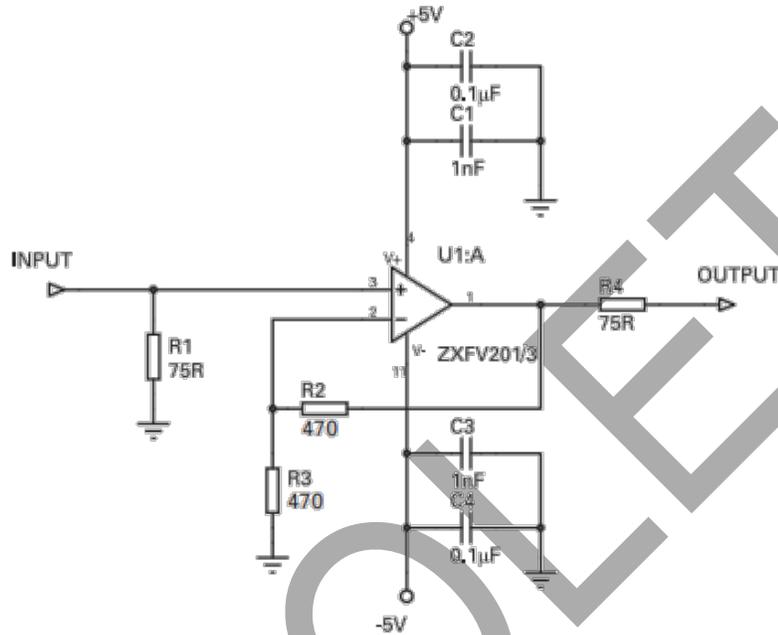
Test - P = production tested. C = characterized

**AC electrical characteristics ( $\pm 5\text{V}$ ,  $R_f = 470\Omega$ ,  $G = 2$ ,  $C_L = 10\text{pF}$ ,  $T_A = 25^\circ\text{C}$ , unless otherwise stated)**

Parameter	Conditions	Min	Typ	Max	Unit
BW <sub>-3</sub> Bandwidth, -3dB	$V_{\text{OUT}} = 0.2V_{\text{PP}}$ $G = +2$ , $R_f = 470\Omega$		210		MHz
	$V_{\text{OUT}} = 0.2V_{\text{PP}}$ $G = +1$ , $R_f = 820\Omega$		210		
BW <sub>0.1</sub> Bandwidth, $\pm 0.1\text{dB}$	$V_{\text{OUT}} = 0.2V_{\text{PP}}$		30		MHz
SR Slew Rate	$V_{\text{OUT}} = 2V_{\text{PP}}$ $G = +2$ , $R_f = 470\Omega$		600		V/ $\mu\text{s}$
	$V_{\text{OUT}} = 2V_{\text{PP}}$ $G = +1$ , $R_f = 820\Omega$		380		
$t_r$ Rise time	$V_{\text{OUT}} = \pm 1\text{V}$ , 10% - 90%		5.8		ns
$t_f$ Fall time			4.6		
$t_p$ Propagation delay			2.6		
dG Differential phase, NTSC	NTSC/PAL, $280\text{mV}_{\text{PP}}$		0.04		%
dP Differential phase, NTSC	DC = -1.428V to +1.428 V		0.04°		

## Applications Information

A typical circuit application is shown in Figure 1. This is suitable for 75Ω transmission line connections at both the input and the output and is useful for distribution of wide-band signals such as video via cables. The 75Ω reverse terminating resistor R4 gives the correct matching condition to a terminated video cable. The amplifier load is then 150Ω in parallel with the local feedback network.



**Figure 1 Typical video signal application circuit, gain = 2 (overall gain = 1 for 75Ω load)**

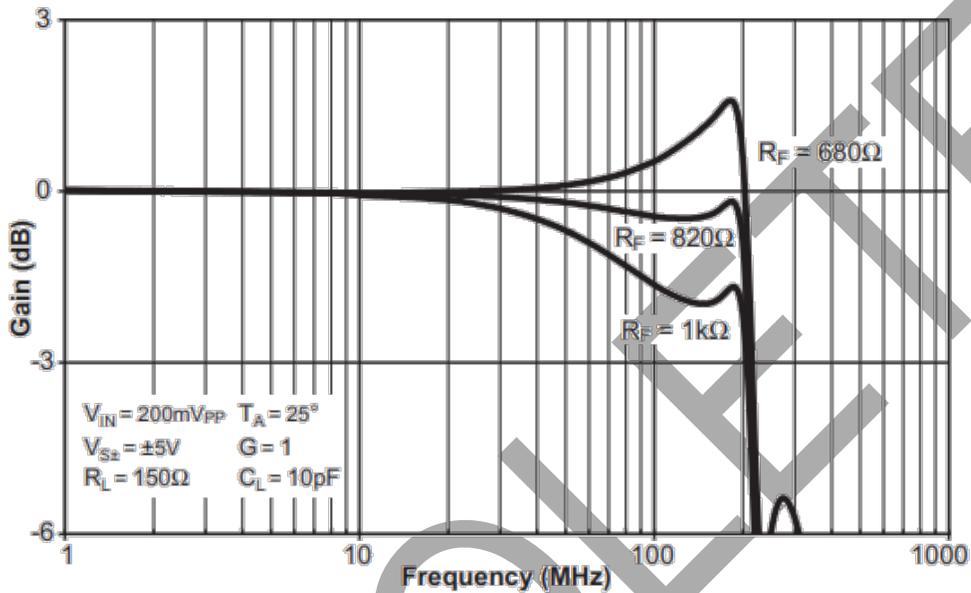
The wide bandwidth of this device necessitates some care in the layout of the printed circuit. A continuous ground plane is required under the device and its signal connection paths, to provide the shortest possible ground return paths for signals and power supply filtering. A double-sided or multi-layer PCB construction is required, with plated-through via holes providing closely spaced low-inductance connections from some components to the continuous ground plane.

For the power supply filtering, low inductance surface mount capacitors are normally required. It has been found that very good RF decoupling is provided on each supply using a 1000pF NPO size 0805 or smaller ceramic surface mount capacitor, closest to the device pin, with an adjacent 0.1μF X7R capacitor. Other configurations are possible and it may be found that a single 0.01μF X7R capacitor on each supply gives good results. However this should be supported by larger decoupling capacitors elsewhere on the printed circuit board. Values of 1 to 10μF are recommended, particularly where the voltage regulators are located more than a few inches from the device. These larger capacitors are recommended to be solid tantalum electrolytic or ceramic types.

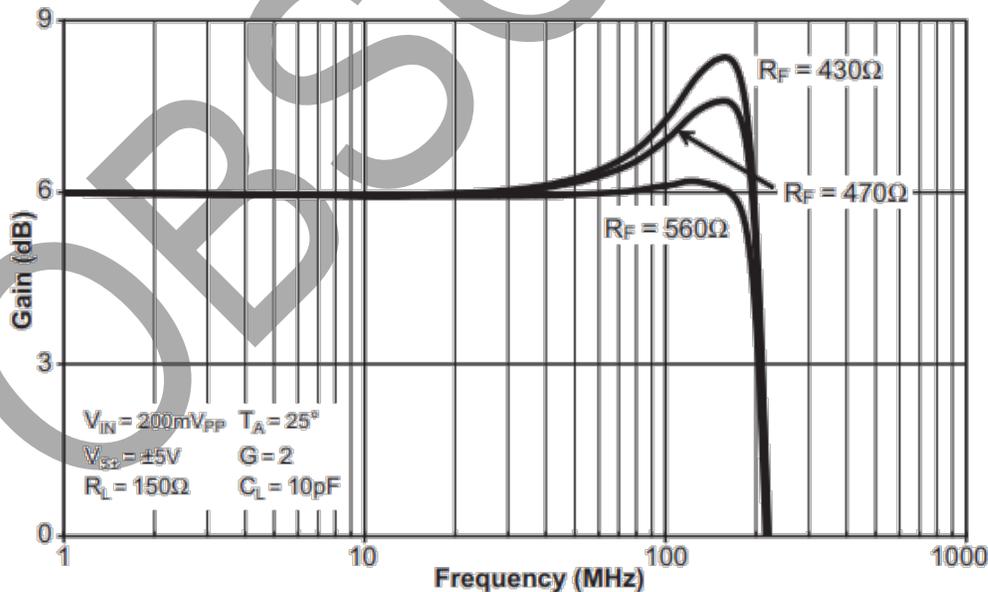
Note particularly that the inverting input of this current feedback type of amplifier is sensitive to small amounts of capacitance to ground which occur as part of the practical circuit board layout. This capacitance affects bandwidth, frequency response peaking and pulse overshoot. Therefore to minimize this capacitance, the feedback components R2 and R3 of Figure 1 should be positioned as close as possible to the inverting input connection.

**Applications Information (cont.)**

The frequency response and pulse response will vary according to particular values of resistors and layout capacitance. The response can be tailored for the application to some extent by choice of the value of feedback resistor. Figures 2 and 3 show the small signal unity gain and gain of 2 frequency responses.



**Figure 2 Unity gain small signal bandwidth**

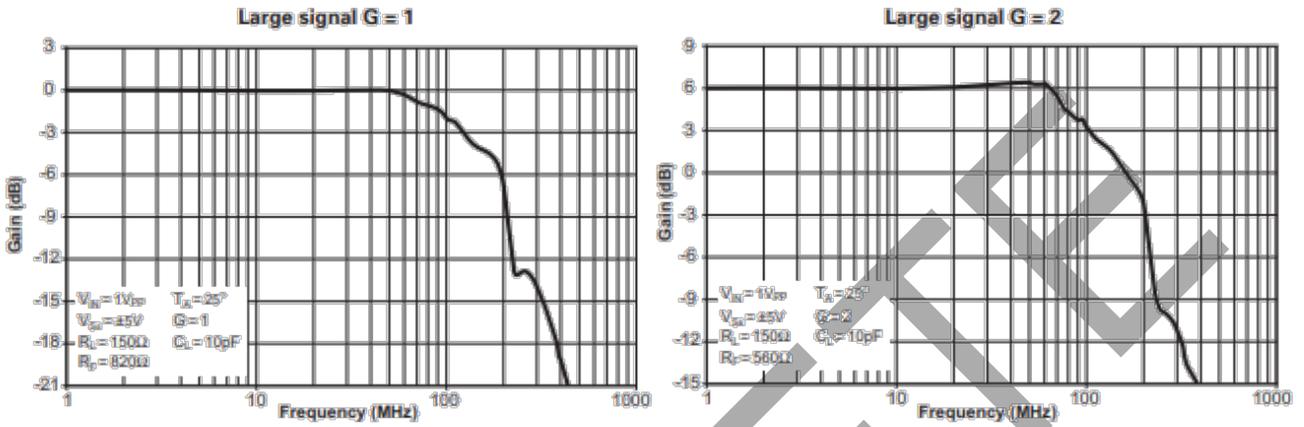


**Figure 3 Gain of 2 small signal bandwidth**

OBSOLETE - PART DISCONTINUED

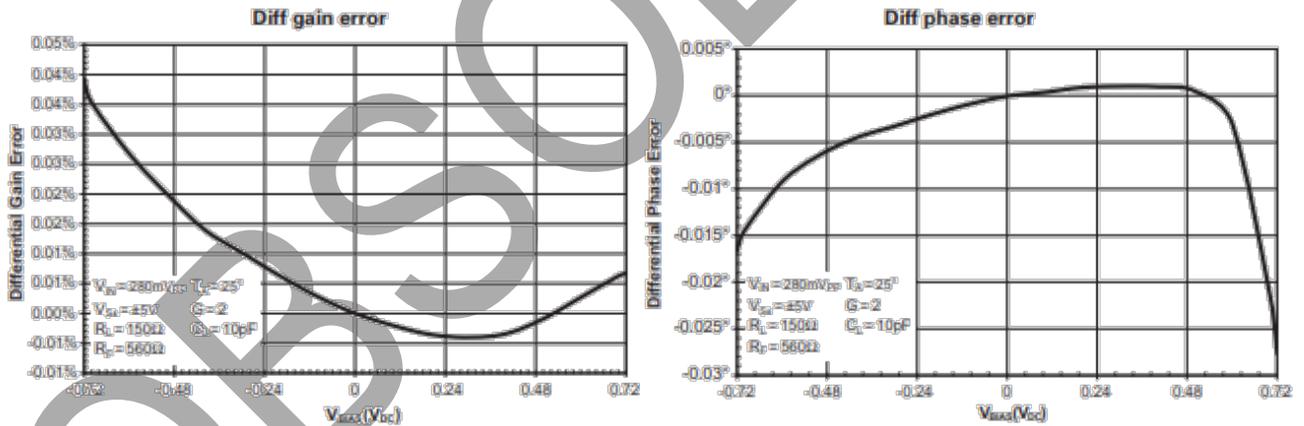
**Applications Information (cont.)**

Figures 4 and 5 show the large signal unity gain of 2 frequency responses.



**Figures 4 and 5 Large signal unity gain of 2 frequency response**

The ZXFV20x family are primarily video amplifiers; Figures 6 and 7 show the NTSC/PAL differential gain and phase errors at a gain of 2.



**Figures 6 and 7 NTSC/PAL differential gain and phase errors at a gain of 2**

OBSOLETE - PART DISCONTINUED

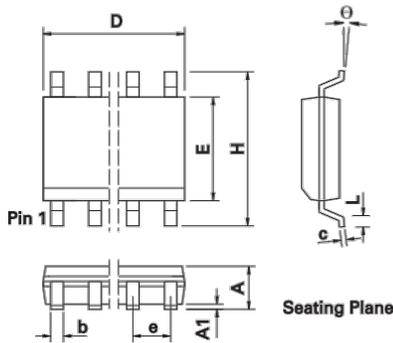
OBSOLETE - PART DISCONTINUED

### Ordering Information

Part Number	Description	Status	Part Mark	Tape and reel	
				Size (inches)	Quantity
ZXFV202E5TA	Single	Obsolete	V202	7	3,000
ZXFV202E5TD	Single	Obsolete	V202	7	500
ZXFV202N8TA	Single	Obsolete	ZXFV202	7	500
ZXFV204N8TA	Dual	Obsolete	ZXFV204	7	500
ZXFV204N8TC	Dual	Obsolete	ZXFV204	13	2,500
ZXFV203N14TA	Triple	Obsolete	ZXFV203	7	500
ZXFV203N14TC	Triple	Obsolete	ZXFV203	13	2,500
ZXFV201N14TA	Quad	Obsolete	ZXFV201	7	500
ZXFV201N14TC	Quad	Obsolete	ZXFV201	13	2,500

### Package Outline Dimensions

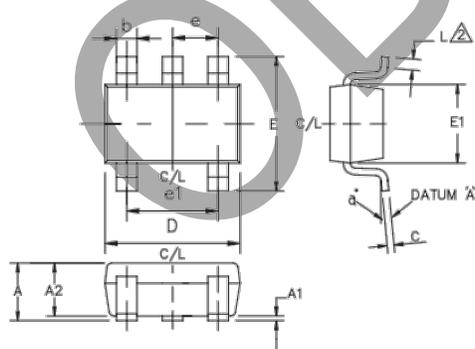
#### Package details - SO8, SO14



Dim.	Inches		Millimeters		Dim.	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.053	0.069	1.35	1.75	L	0.016	0.050	0.40	1.27
A1	0.004	0.010	0.10	0.25	e	0.050 BSC		1.27 BSC	
D (8 pin)	0.189	0.197	4.80	5.00	b	0.013	0.020	0.33	0.51
D (14 pin)	0.337	0.344	8.55	8.75	c	0.008	0.010	0.19	0.25
H	0.228	0.244	5.80	6.20	θ	0°	8°	0°	8°
E	0.150	0.157	3.80	4.00	h	0.010	0.020	0.25	0.50

Note: Controlling dimensions are in inches. Approximate dimensions are provided in millimeters

#### SOT25



DIM	MILLIMETRES		INCHES	
	MIN	MAX	MIN	MAX
A	0.90	1.45	0.0354	0.0570
A1	0.00	0.15	0.00	0.0059
A2	0.90	1.30	0.0354	0.0511
b	0.20	0.50	0.0078	0.0196
C	0.09	0.26	0.0035	0.0102
D	2.70	3.10	0.1062	0.1220
E	2.20	3.20	0.0866	0.1181
E1	1.30	1.80	0.0511	0.0708
L	0.10	0.60	0.0039	0.0236
e	0.95	REF	0.0374	REF
e1	1.90	REF	0.0748	REF
α	0°	30°	0°	30°

#### NOTE

- 1 ALL DIMENSIONS ARE IN MILLIMETRES .
- 2 FOOT LENGTH MEASURED REFERENCE TO FLAT FOOT SURFACE PARALLEL TO DATUM 'A' .
- 3 PACKAGE OUTLINE EXCLUSIVE OF MOLD FLASH AND METAL BURR.
- 4 COMPLY TO EIAJ SC74A.

**IMPORTANT NOTICE**

DIODES INCORPORATED MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARDS TO THIS DOCUMENT, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION).

Diodes Incorporated and its subsidiaries reserve the right to make modifications, enhancements, improvements, corrections or other changes without further notice to this document and any product described herein. Diodes Incorporated does not assume any liability arising out of the application or use of this document or any product described herein; neither does Diodes Incorporated convey any license under its patent or trademark rights, nor the rights of others. Any Customer or user of this document or products described herein in such applications shall assume all risks of such use and will agree to hold Diodes Incorporated and all the companies whose products are represented on Diodes Incorporated website, harmless against all damages.

Diodes Incorporated does not warrant or accept any liability whatsoever in respect of any products purchased through unauthorized sales channel. Should Customers purchase or use Diodes Incorporated products for any unintended or unauthorized application, Customers shall indemnify and hold Diodes Incorporated and its representatives harmless against all claims, damages, expenses, and attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized application.

Products described herein may be covered by one or more United States, international or foreign patents pending. Product names and markings noted herein may also be covered by one or more United States, international or foreign trademarks.

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 Incorporated.

**LIFE SUPPORT**

Diodes Incorporated products are specifically not authorized for use as critical components in life support devices or systems without the express written approval of the Chief Executive Officer of Diodes Incorporated. As used herein:

A. Life support devices or systems are devices or systems which:

1. are intended to implant into the body, or
2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.

B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

Customers represent that they have all necessary expertise in the safety and regulatory ramifications of their life support devices or systems, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of Diodes Incorporated products in such safety-critical, life support devices or systems, notwithstanding any devices- or systems-related information or support that may be provided by Diodes Incorporated. Further, Customers must fully indemnify Diodes Incorporated and its representatives against any damages arising out of the use of Diodes Incorporated products in such safety-critical, life support devices or systems.

Copyright © 2020, Diodes Incorporated

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