Single/Dual Channel Low Voltage Push-Pull Output Comparators

Description

AZV3001 and AZV3002 are single and dual channel comparators developed for new generation low-power comparator family for battery-powered devices and systems requiring low voltage operation.

The supply current each comparator typically consumes is 6µA to extend battery life. It is guaranteed to operate at a low voltage of 1.6V and is fully operational up to 5.5V. These features make the AZV3001 and AZV3002 convenient for use in 1.8V, 3.0V and 5.0V systems and perfectly suitable for battery-powered devices from its low-power characteristics.

The AZV3001 and AZV3002 have complementary push-pull output stage comprised of P- and N-Channel MOSFET for each comparator capable of driving rail-to-rail output swing.

The whole family is packaged in miniaturized packaging to reduce the space needed on PCB boards. The AZV3001 is available in X2-DFN1410-6, and the AZV3002 is available in U-FLGA1616-8.

Features

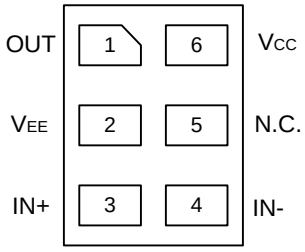
- Low Supply Current: 6µA (typical)
- Wide Supply Voltage Range: 1.6~5.5V
- Rail to Rail Input/Output Performance
- Push-Pull Output Structure
- Propagation Delay: 0.8µs (typical)
- Low Input Bias Current: 1pA (typical)
- No Phase Inversion with Overdrive Input Signals
- Internal HysteresisX2-DFN1410-6, U-FLGA1616-8: Available in "Green" Molding Compound (No Br. Sb.)
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

Applications

- Mobile Phones
- Pad
- Battery Powered Devices
- Alarm and Security Systems

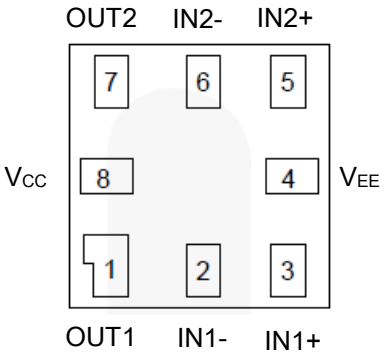
Pin Assignments

AZV3001



Top View
(X2-DFN1410-6)

AZV3002



Top View
(U-FLGA1616-8)

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.

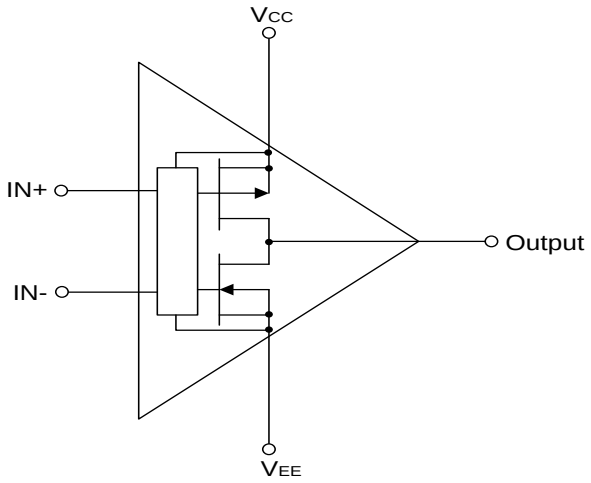
Pin Descriptions

AZV3001		
Pin Name	**Pin Number**	**Function**
V_{CC}	6	Supply Voltage
V_{EE}	2	Supply Voltage
IN+	3	Non-Inverting Input
IN-	4	Inverting Input
OUT	1	Comparator Output
N.C.	5	No Connection

***: Package Variant Under Plan**

AZV3002		
Pin Name	**Pin Number**	**Function**
V_{CC}	8	Supply Voltage
V_{EE}	4	Supply Voltage
IN1+	3	Non-Inverting Input of Comparator 1
IN1-	2	Inverting Input of Comparator 1
OUT1	1	Comparator 1 Output
IN2+	5	Non-Inverting Input of Comparator 2
IN2-	6	Inverting Input of Comparator 2
OUT2	7	Comparator 2 Output

Functional Block Diagram



Single Channel Comparator

Absolute Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	Supply Voltage	-	-	6	V
V_I	Input Voltage	IN-, IN+ inputs	-0.3	V_{CC}+0.3	V
$t_{SC(O)}$	Output Short-Circuit Time	-	-	Indefinite	s
$T_{j(max)}$	Maximum Junction Temperature	-	-	150	°C
T_{STG}	Storage Temperature	-	-65	150	°C
P_{TOT}	Total Power Dissipation	Tamb = -40°C~85°C	-	-	mW

DC Electrical Characteristics (V_{CC}=1.6V to 5.5V, V_{EE}=0V; V_{CM}=0.5V_{CC} unless otherwise specified.)

			+25°C			-40°C to +85°C		
Symbol	**Parameter**	**Conditions**	**Min**	**Typ**	**Max**	**Min**	**Max**	**Units**
V_{HYST}	Hysteresis Voltage	-	6	9	13	-	-	mV
		V_{CC}=1.3V		20	-	-	-	mV
$V_{I(offset)}$	Offset Input Voltage	-	-30	0.5	+30	-30	+30	mV
		V_{CC}=1.3V	-	3	-	-	-	mV
V_{OH}	High-Level Output Voltage	I_O = -0.5mA; V_{CC} = 1.3V	-	1.24	-	-	-	V
		I_O = -0.5mA; V_{CC} = 1.6V	-	1.55	-	1.35	-	V
		I_O = -3mA; V_{CC} = 3.0V	-	2.85	-	2.7	-	V
		I_O = -5mA; V_{CC} = 5.5V	-	5.33	-	5.2	-	V
V_{OL}	Low-Level Output Voltage	I_O = -0.5mA; V_{CC} = 1.3V	-	0.05	-	-	-	V
		I_O = -0.5mA; V_{CC} = 1.6V	-	0.04	-	-	0.25	V
		I_O = -3mA; V_{CC} = 3.0V	-	0.14	-	-	0.3	V
		I_O = -5mA; V_{CC} = 5.5V	-	0.2	-	-	0.3	V
V_{CM}	Common-Mode Voltage	V_{CC} = 1.3V to 5.5V	-	V_{EE} to V_{CC}	-	-	-	V
I_{OS}	Output Short-Circuit Current	V_{CC} = 5.5V; V_O = V_{EE} or V_{CC}	-	68	-	-	-	mA
CMRR	Common-Mode Rejection Ratio	ΔV_{CM} = V_{CC}	-	70	-	-	-	dB
PSRR	Power Supply Rejection Ratio	ΔV_{CC} = 1.95V	45	80	-	-	-	dB
I_{IB}	Input Bias Current	-	-	1	-	-	-	pA
I_{CC}	Supply Current (Single Comparator)	-	-	6	-	-	9	µA

AC Electrical Characteristics (V_{CC}=1.6V to 5.5V, V_{EE}=0V; V_{CM}=0.5V_{CC} unless otherwise specified.)

Symbol	**Parameter**	**Conditions**	**Min**	**Typ**	**Max**	**Unit**
t_{pd}	Propagation Delay	20mV Overdrive; C_L=15pF	—	0.8	—	µs
t_{THL}	High to Low Output Transition Time	V_{CC}=5.5V; C_L-50pF	—	10	—	ns
t_{TLH}	Low to High Output Transition Time	V_{CC}=5.5V; C_L=50pF	—	10	—	ns

Performance Characteristics

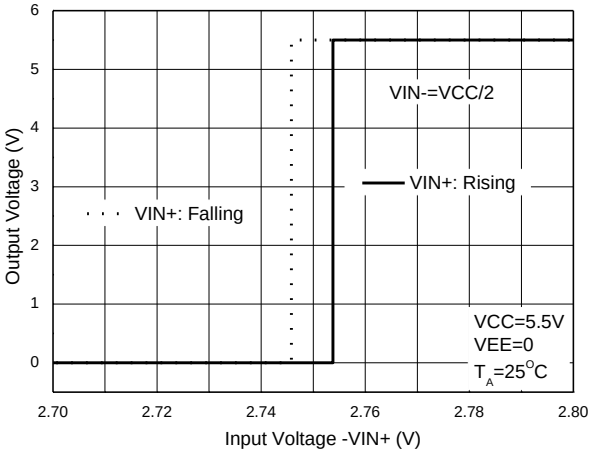


Figure 1 Input Hysteresis Voltage

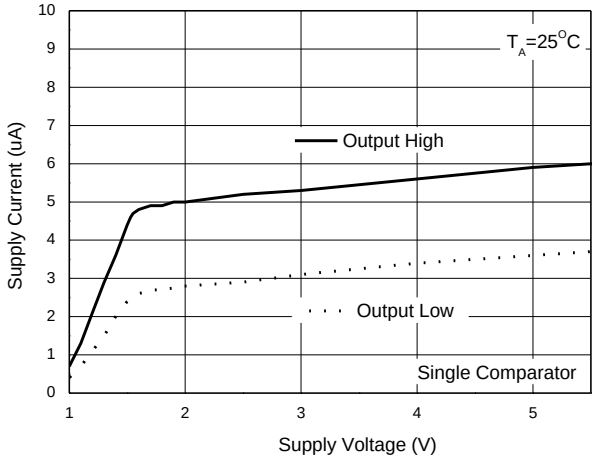


Figure 2 Supply Current vs. Supply Voltage

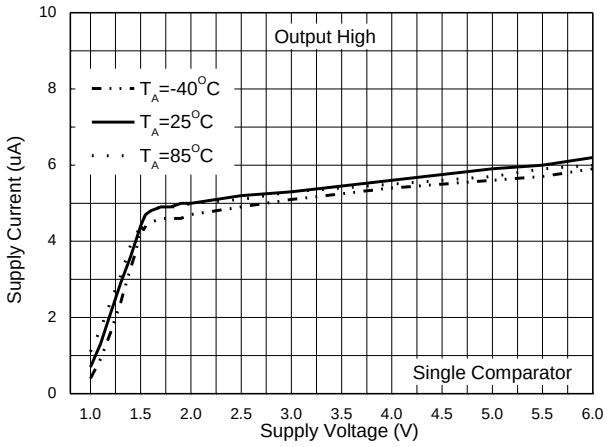


Figure 3 Supply Current vs. Supply Voltage

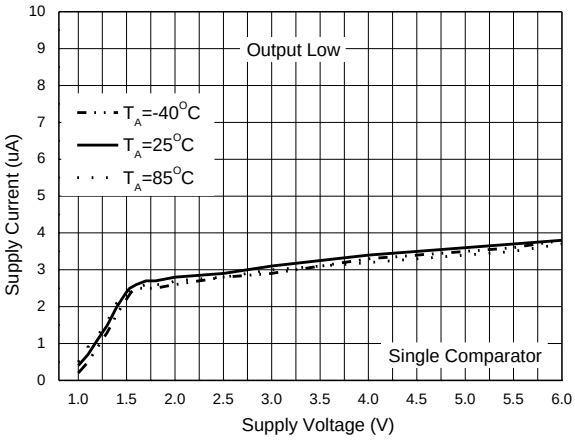


Figure 4 Supply Current vs. Supply Voltage

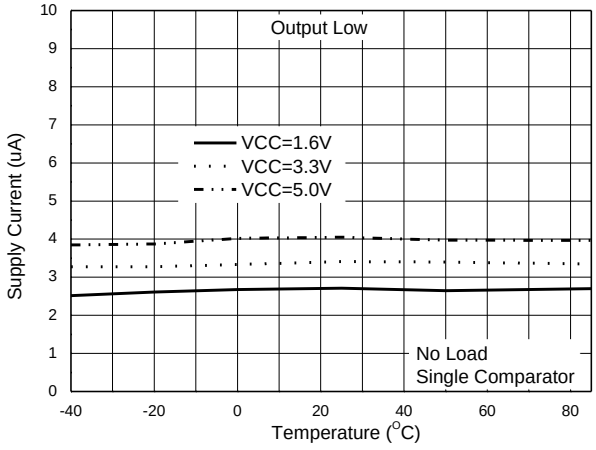


Figure 5 Supply Current vs. Temperature

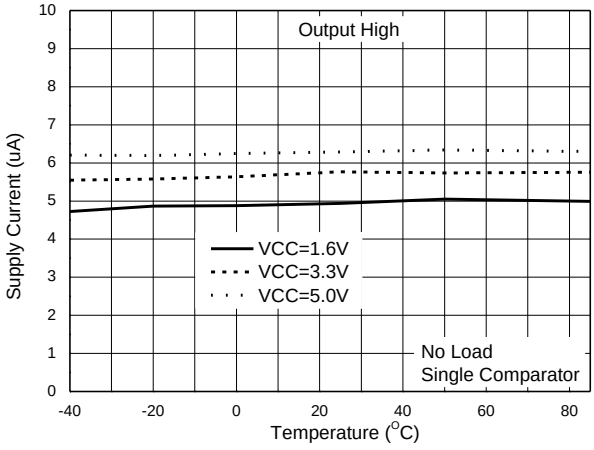


Figure 6 Supply Current vs. Temperature

Performance Characteristics (Cont.)

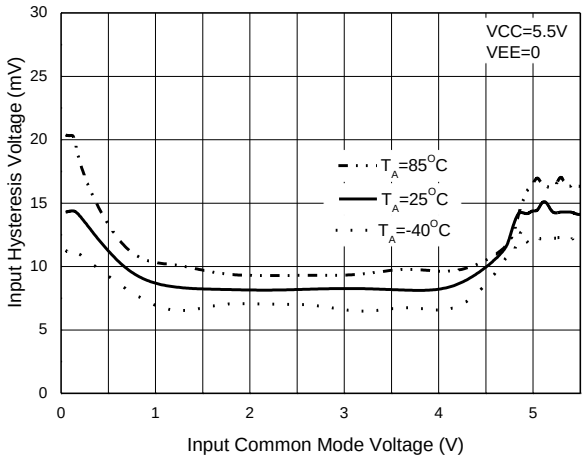


Figure 7 Input Hysteresis Voltage

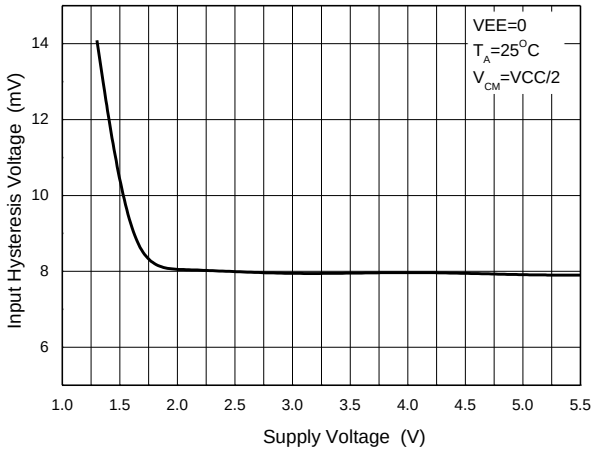


Figure 8 Input Hysteresis Voltage

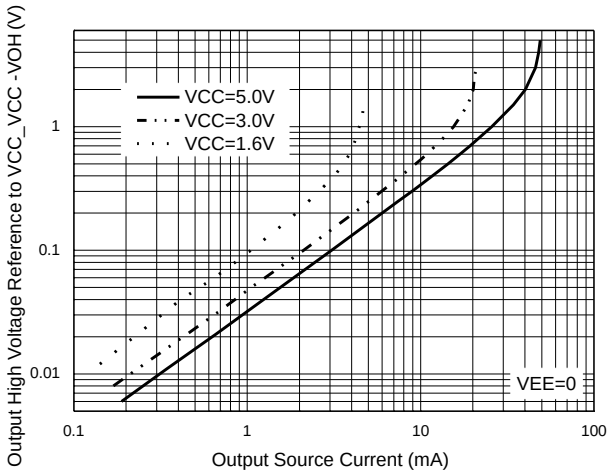


Figure 9 Output Voltage vs. Output Source Current

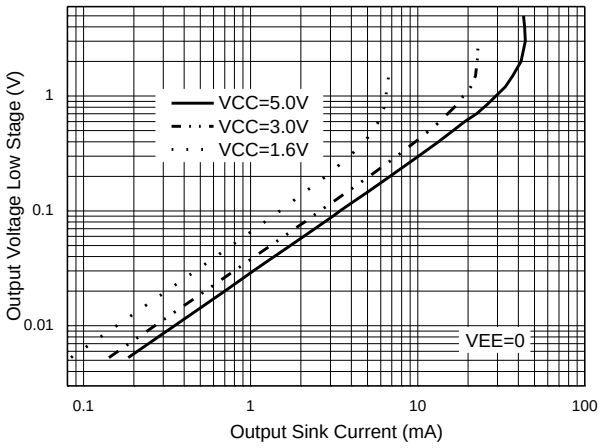


Figure 10 Output Voltage vs. Output Sink Current

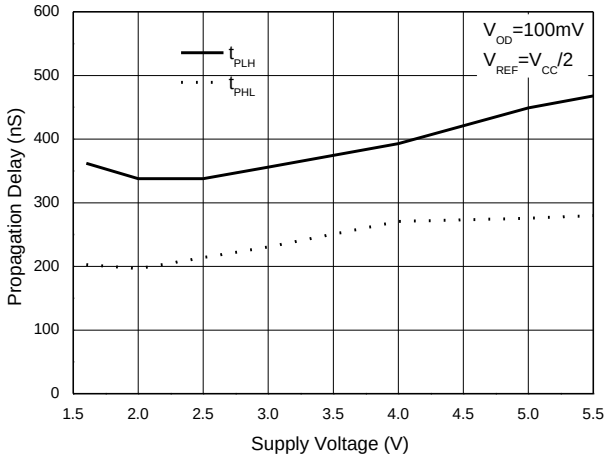


Figure 11 Propagation Delay vs. Supply Voltage

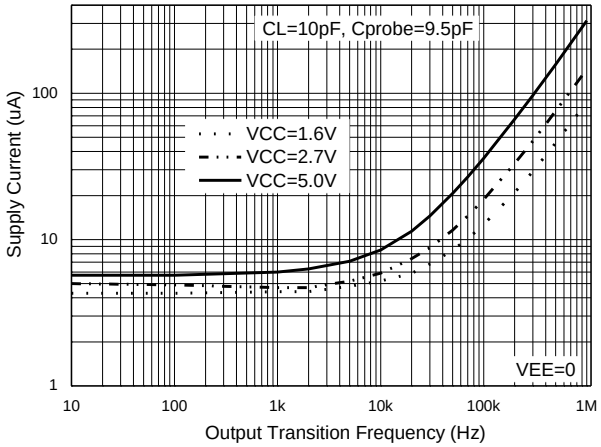


Figure 12 Supply Current vs. Transition Frequency

Application Information

Description

The AZV3001/2 are single and dual low voltage, low power comparators. These devices are designed for rail-to-rail input and output application. The AZV3001 device consumes only 6µA supply current while achieving a typical propagation delay 0.8µS under 20mV input overdrive condition. These family comparators are guaranteed to operate at low supply voltage 1.6V to 5.5V.

The AZV3001 /2 series have a typical internal hysteresis of 9.0mV. This allows for greater noise immunity and clean output switching.

The Output Stage

The AZV3001 and AZV3002 feature a push-pull output, which have a complementary P- and N-Channel output stage. When the output switches, there is a direct patch between V_{CC} and V_{EE}, causing increased output sinking or sourcing current during the transition. Following the transition the output current decreases and supply current returns to 6µA, thus maintaining low power consumption.

Many comparators consume orders of magnitude more current during switching than during steady-state operation. However, with this family of comparators, the supply current change during an output transition is extremely small. The graph of Supply Current vs. Output Transition Frequency shows the minimal supply current increase as the output switching frequency approaches 1KHz. In battery-powered applications, this characteristic results in a substantial increase in battery life.

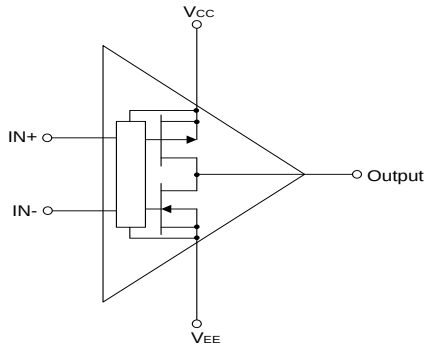


Figure 13 AZV3001/2 Complementary Output Configuration

Internal Input Hysteresis Voltage (V_{HYST})

Many comparators oscillate in the linear region of operation because of noise or undesired parasitic feedback. This tends to occur when the voltage on one input is equal to very close to the voltage on the other input. The AZV3001/2 have internal 9mV (Typ.) hysteresis to counter parasitic effects and noise.

The hysteresis in a comparator creates two trip points: one for the rising input voltage (V_{HYST+}) and one for the falling input voltage (V_{HYST-}). The difference between the trip points is the hysteresis (V_{HYST}). When the comparator's input voltage are equal, the hysteresis effectively causes one comparator input to move quickly past the other, thus taking the input out of the region where oscillation occurs. Figure 1 illustrates the case in which V_{IN-} has a fixed voltage applied, and V_{IN+} is varied. If the inputs were reversed, the figure would be the same, except with an inverted output.

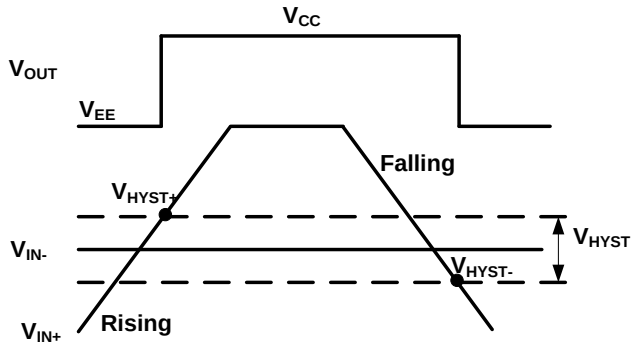


Figure 14 AZV3001 / 2 Internal Input Hysteresis Voltage

Application Information (Cont.)

External Hysteresis Application

The AZV3001 and AZV3002 have a hysteresis transfer curve that is a function of the following three components:

V_{TH}: the actual set voltage or threshold trip voltage

V_{OS}: the internal offset voltage between VIN+ and VIN-. This voltage is added to VTH to formal the actual trip point at which the comparator must respond in order to change output states.

V_{HYST}: internal hysteresis (or trip window) that is designed to produce comparator sensitivity to noise.

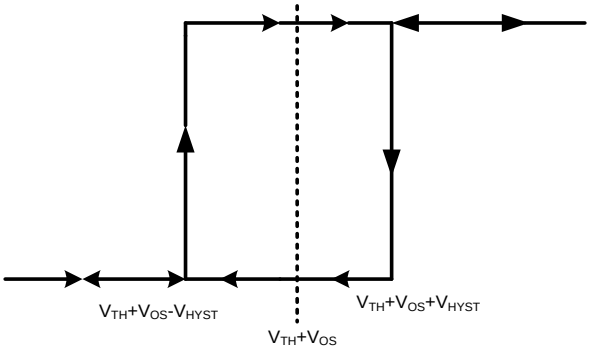


Figure 15 AZV3001 Hysteresis Transfer Curve

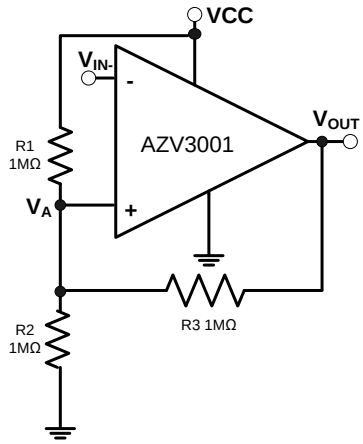


Figure 16. Inverting Comparator With Hysteresis

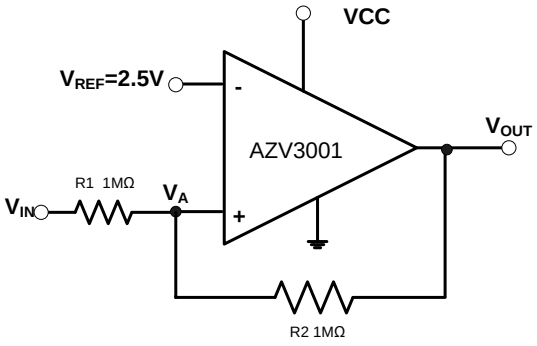


Figure 17. Non-Inverting Comparator With Hysteresis

No Phase Inversion

AZV3001 and AZV3002 are rail-to-rail input comparator, with the input common-mode voltage range reaching to the supply rails for both positive and negative supplies. The AZV3001 and AZV3002 are designed to prevent phase inversion when the input pins exceed the supply voltage. Figure 18 shows the AZV3001/2 response when input voltages exceed the supply, resulting in no phase inversion.

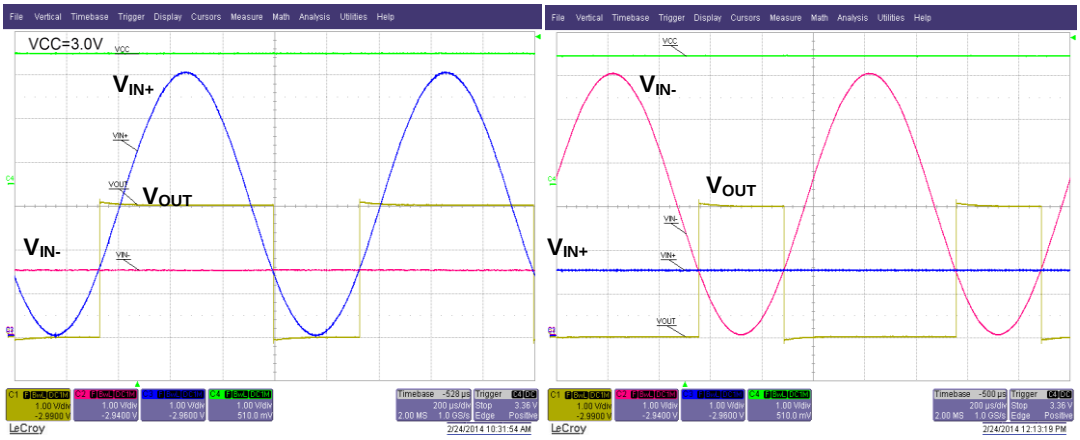
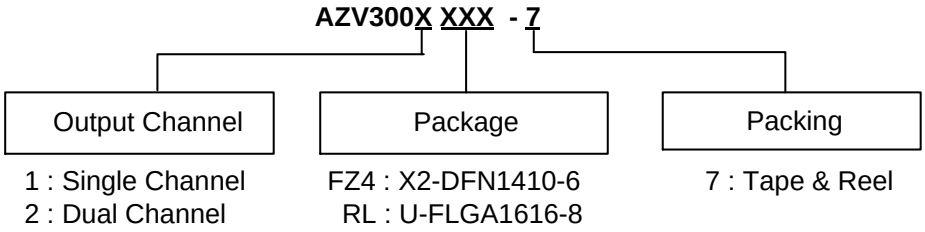


Figure 18 Comparator Response to Input Voltage –No Phase Inversion

Ordering Information



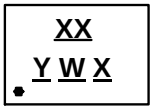
Part Number	Package Code	Packaging	7" Tape and Reel		Remark
			Quantity	Part Number Suffix	
AZV3001FZ4-7	FZ4	X2-DFN1410-6	5,000/Tape & Reel	-7	Available
AZV3002RL-7	RL	U-FLGA1616-8	3,000/Tape & Reel	-7	Under Qualification

Note: 4. Pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at http://www.diodes.com/datasheets/ap02001.pdf.

Marking Information

(1) X2-X2-DFN1410-6

(Top View)

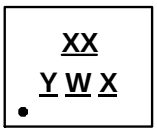


XX : Identification Code
Y : Year : 0~9
W : Week : A~Z : 1~26 week;
a~z : 27~52 week; z represents 52 and 53 week
X : Internal Code

Part Number	Package	Identification Code
AZV3001FZ4	X2-DFN1410-6	YA

(2) U-FLGA1616-8

(Top View)

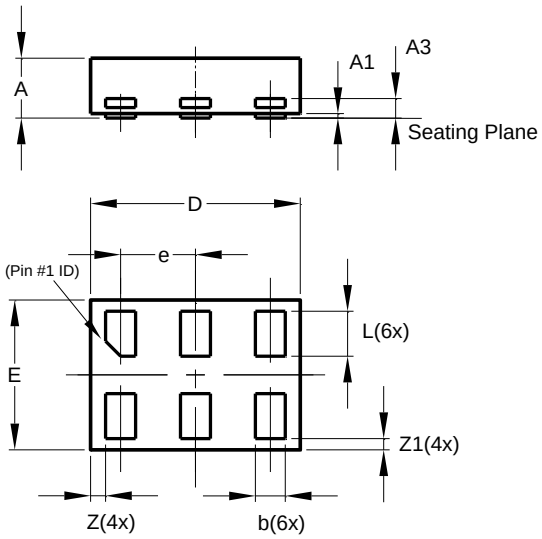


XX : Identification Code
Y : Year : 0~9
W : Week : A~Z : 1~26 week;
a~z : 27~52 week; z represents 52 and 53 week
X : Internal Code

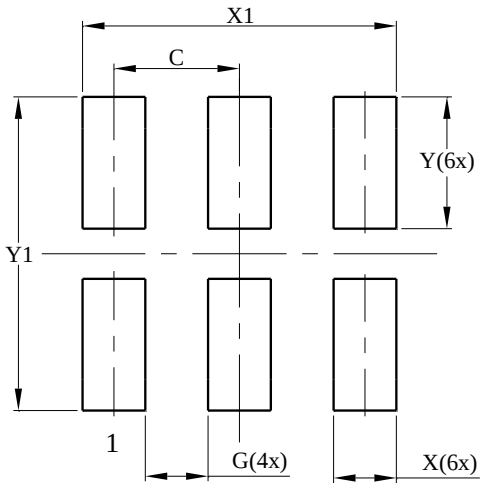
Part Number	Package	Identification Code
AZV3002RL	U-FLGA1616-8	XD

Package Outline Dimensions & Suggested Pad Layout (All dimensions in mm.)

Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for the latest version.

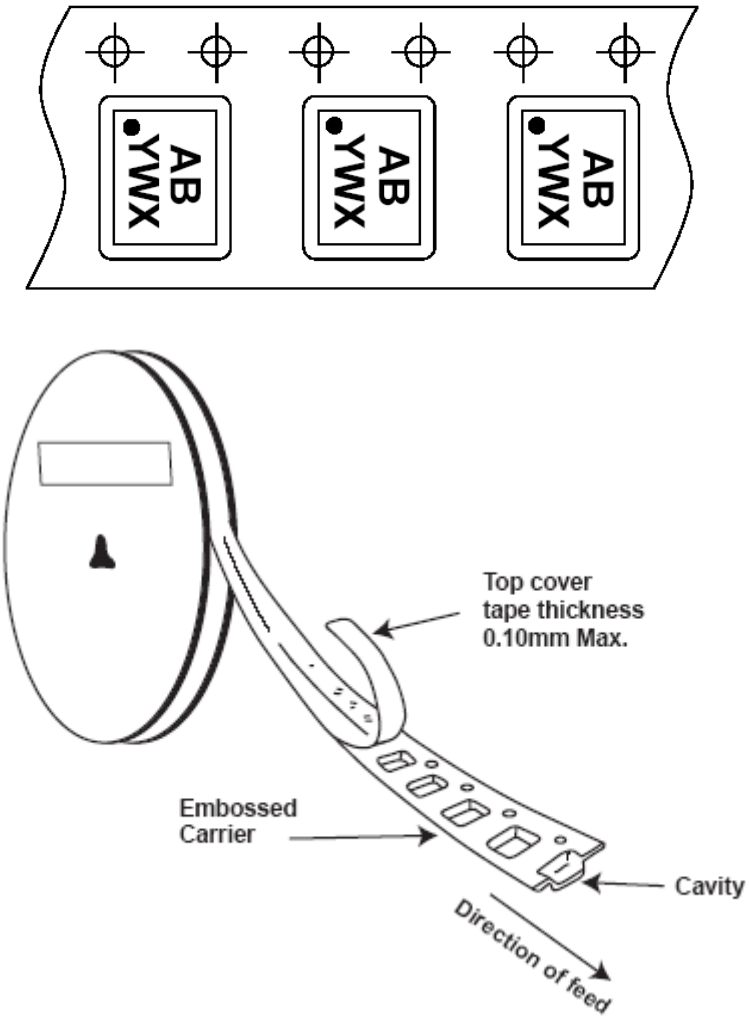


X2-DFN1410-6			
Dim	**Min**	**Max**	**Typ**
A	—	0.40	0.39
A1	0.00	0.05	0.02
A3	—	—	0.13
b	0.15	0.25	0.20
D	1.35	1.45	1.40
E	0.95	1.05	1.00
e	—	—	0.50
L	0.25	0.35	0.30
Z	—	—	0.10
Z1	0.045	0.105	0.075
All Dimensions in mm			



Dimensions	Value (in mm)
C	0.500
G	0.250
X	0.250
X1	1.250
Y	0.525
Y1	1.250

Taping Orientation (Note 5)



Note: 5. The taping orientation of the other package type can be found on our website at http://www.diodes.com/datasheets/ap02007.pdf.

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.

www.diodes.com

AMEYA360
Components Supply Platform

Authorized Distribution Brand :

Website :

Welcome to visit www.ameya360.com

Contact Us :

- ### Address :

  401 Building No.5, JiuGe Business Center, Lane 2301, Yishan Rd
  Minhang District, Shanghai , China

- ### Sales :

  Direct +86 (21) 6401-6692

  Email amall@ameya360.com

  QQ 800077892

  Skype ameyasales1 ameyasales2

- ### Customer Service :

  Email service@ameya360.com

- ### Partnership :

  Tel +86 (21) 64016692-8333

  Email mkt@ameya360.com