Description

AZV3001 and AZV3002 are single and dual channel comparators developed for new generation low-power comparator families 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 are 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; the AZV3002 is available in U-FLGA1616-8 and SO-8.

Features

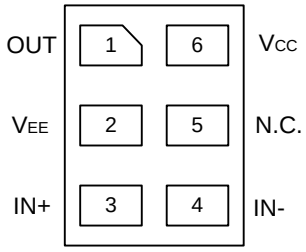
- Low Supply Current: 6µA (typical)
- Wide Supply Voltage Range: 1.6~5.5V
- Rail to Rail Input/ Output Performance
- Push-Pull Output Structure
- Propagation Delay: 0.8µs (typical)
- Low Input Bias Current: 1pA (typical)
- No Phase Inversion with Overdrive Input Signals
- Internal Hysteresis
- X2-DFN1410-6, U-FLGA1616-8 and SO-8 Package: 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
- Tablets
- Battery Powered Devices
- Alarm and Security Systems

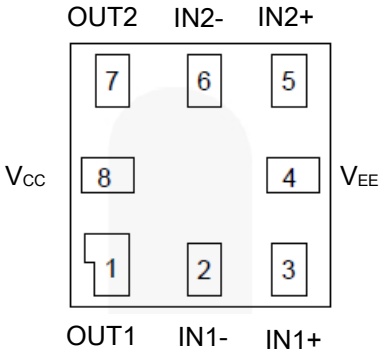
Pin Assignments

AZV3001

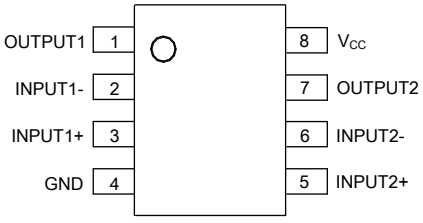


Top View
(X2-DFN1410-6)

AZV3002



Top View
(U-FLGA1616-8)



Top View
(SO-8)

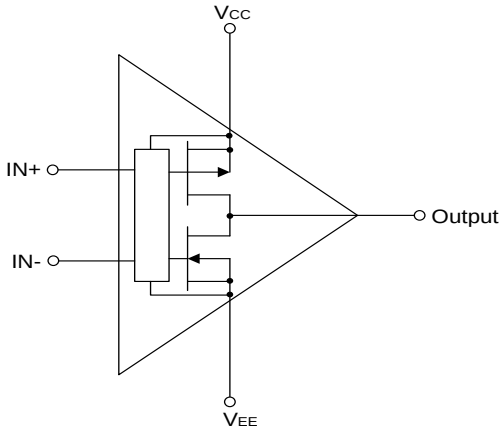
Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
2. See http://www.diodes.com/quality/lead_free.html for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "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

AZV3002			
Pin Name	**Pin Number**		**Function**
	U-FLGA1616-8	**SO-8**	
V_{CC}	8	8	Supply Voltage
V_{EE}	4	4	Supply Voltage
IN1+	3	3	Non-Inverting Input of Comparator 1
IN1-	2	2	Inverting Input of Comparator 1
OUT1	1	1	Comparator 1 Output
IN2+	5	5	Non-Inverting Input of Comparator 2
IN2-	6	6	Inverting Input of Comparator 2
OUT2	7	7	Comparator 2 Output

Functional Block Diagram



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

Symbol	Parameter		Min	Max	Unit
V_{CC}	Supply Voltage		-	6	V
V_I	Input Voltage		-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
θ_{JA}	Thermal Resistance (Junction-to-Ambient)	X2-DFN1410-6	315		°C/W
		U-FLGA1616-8	306		
		SO-8	220		
θ_{JC}	Thermal Resistance (Junction-to-Case)	X2-DFN1410-6	150		°C/W
		U-FLGA1616-8	122		
		SO-8	80		

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 – AZV3001	-	-	6	-	-	9	µA
	Supply Current – AZV3002	-	-	9			12	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

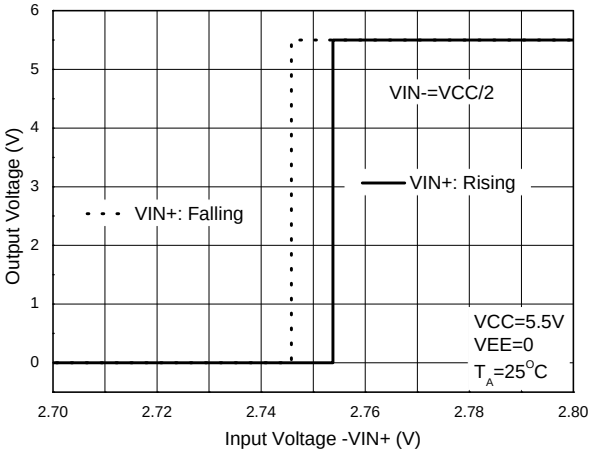


Figure 1 Input Hysteresis Voltage

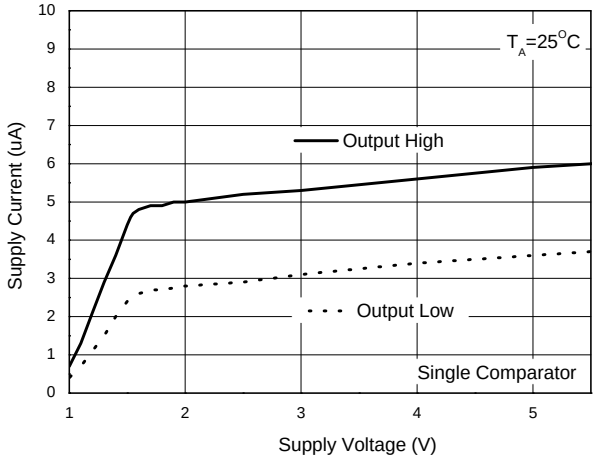


Figure 2 Supply Current vs. Supply Voltage

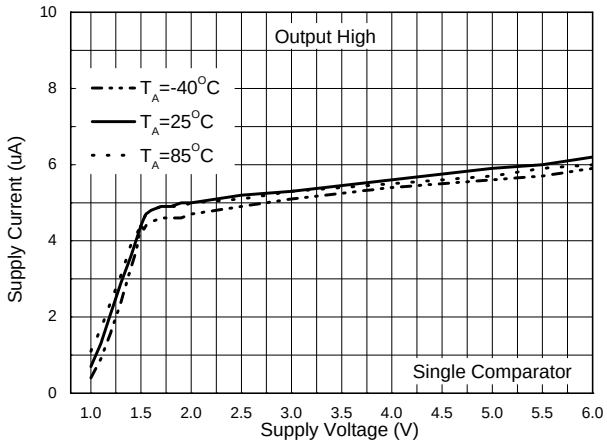


Figure 3 Supply Current vs. Supply Voltage

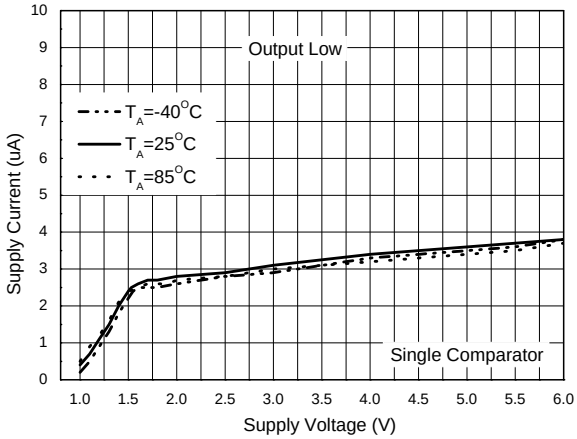


Figure 4 Supply Current vs. Supply Voltage

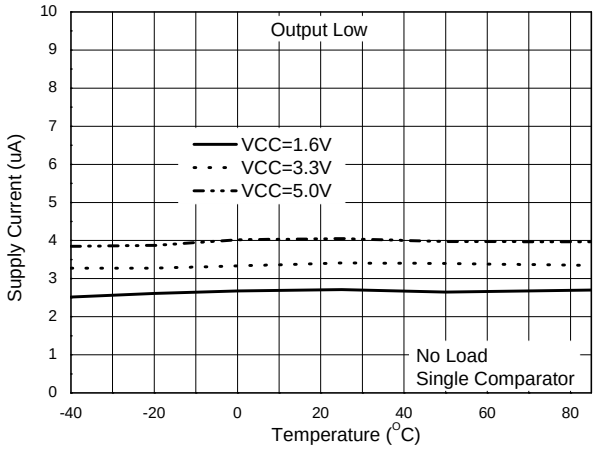


Figure 5 Supply Current vs. Temperature

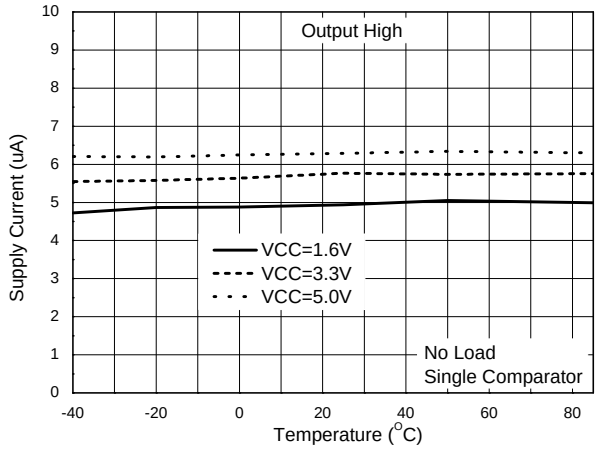


Figure 6 Supply Current vs. Temperature

Performance Characteristics (continued)

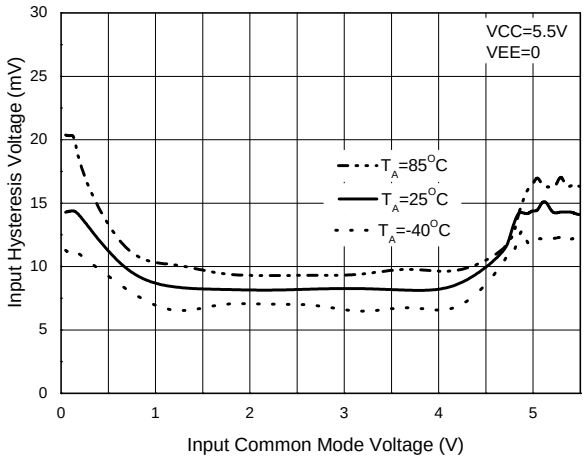


Figure 7 Input Hysteresis Voltage

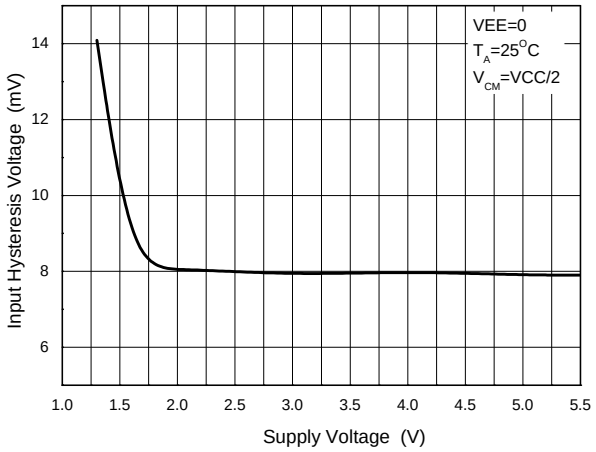


Figure 8 Input Hysteresis Voltage

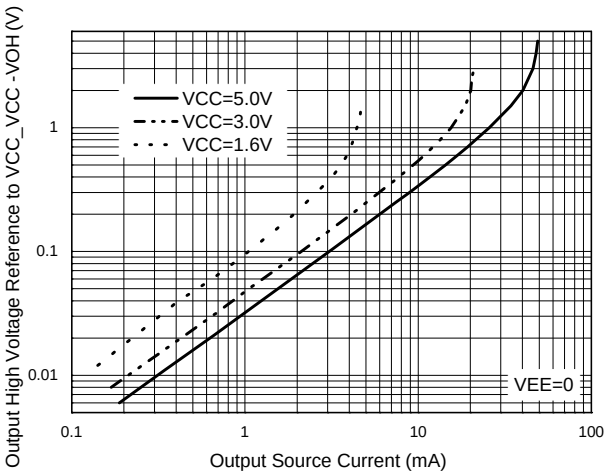


Figure 9 Output Voltage vs. Output Source Current

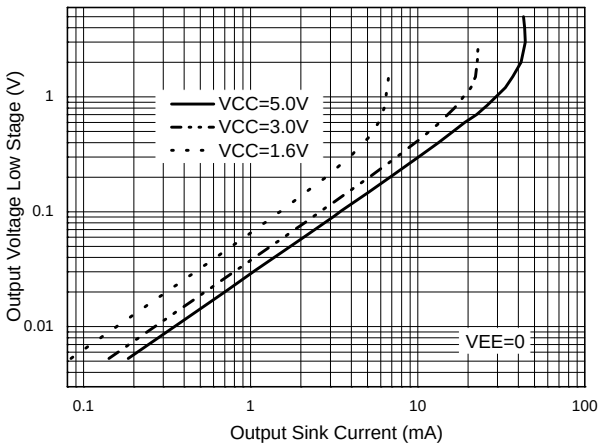


Figure 10 Output Voltage vs. Output Sink Current

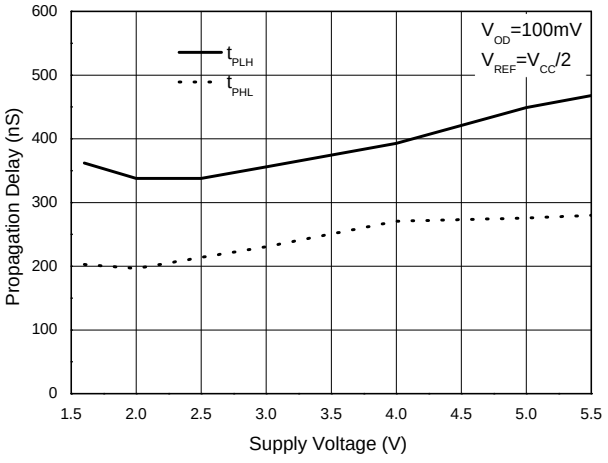


Figure 11 Propagation Delay vs. Supply Voltage

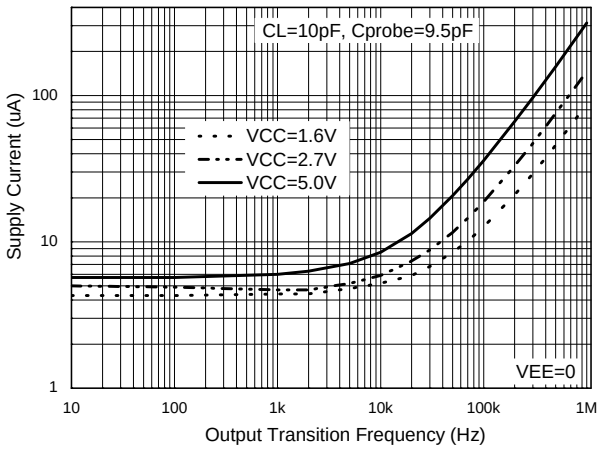


Figure 12 Supply Current vs. Transition Frequency

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 applications. 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 a low supply voltage range of 1.6V to 5.5V.

The AZV3001 /2 series has 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 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.

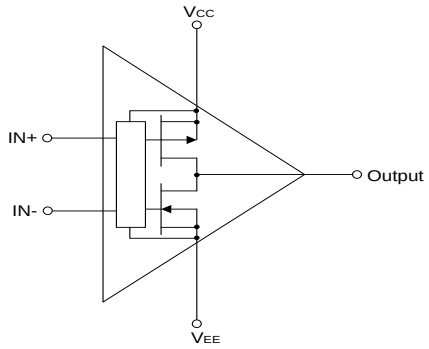


Figure 13 AZV3001/2 Complementary Output Configuration

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, or 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 voltages 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.

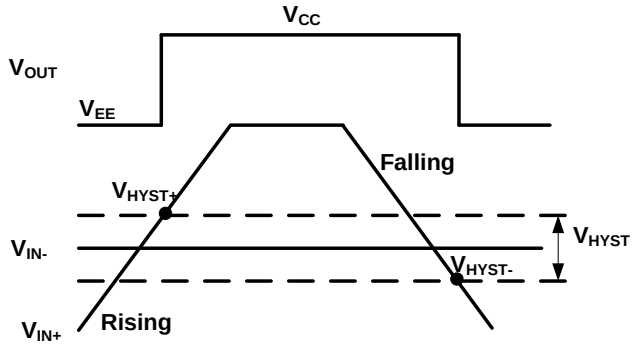


Figure 14 AZV3001 / 2 Internal Input Hysteresis Voltage

Application Information (continued)

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 form 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.

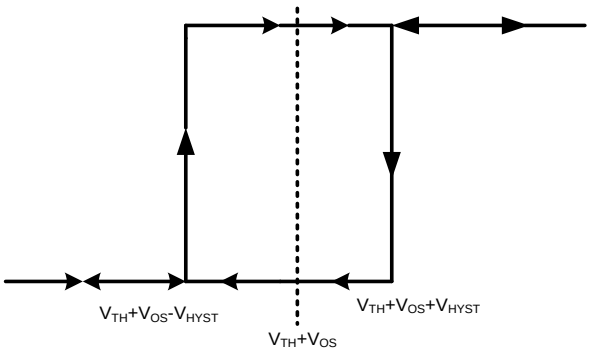


Figure 15 AZV3001 Hysteresis Transfer Curve

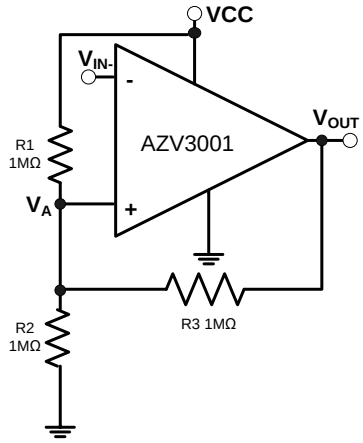


Figure 16. Inverting Comparator With Hysteresis

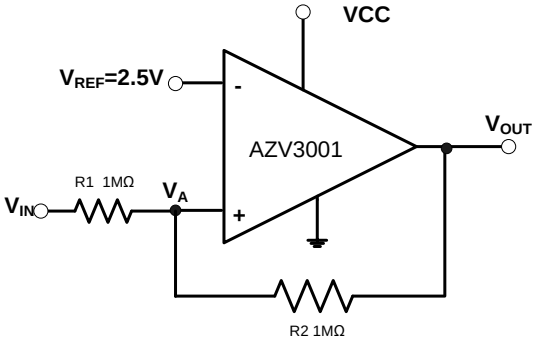


Figure 17. Non-Inverting Comparator With Hysteresis

No Phase Inversion

AZV3001 and AZV3002 are rail-to-rail input comparators, 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.

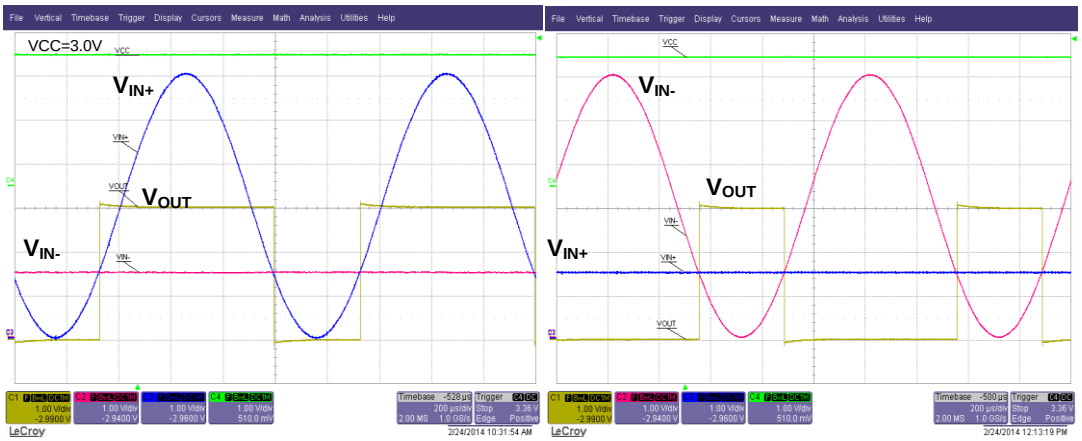


Figure 18 Comparator Response to Input Voltage –No Phase Inversion

Ordering Information

AZV300X XXX - 7

Output Channel	Package	Packing
1 : Single Channel 2 : Dual Channel	FZ4 : X2-DFN1410-6 RL : U-FLGA1616-8 S : SOP-8L	7/13 : Tape & Reel

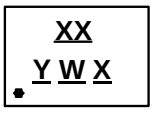
Part Number	Package Code	Packaging	7"/13" Tape and Reel	
			Quantity	Part Number Suffix
AZV3001FZ4-7	FZ4	X2-DFN1410-6	5,000/Tape & Reel	-7
AZV3002RL-7	RL	U-FLGA1616-8	3,000/Tape & Reel	-7
AZV3002S-13	S	SO-8	2500/Tape & Reel	-13

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)

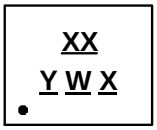


XX : Identification Code
Y : Year : 0~9
W : Week : A~Z : 1~26 week;
a~z : 27~52 week; z represents 52 and 53 week
X : Internal Code

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

(2) U-FLGA1616-8

(Top View)

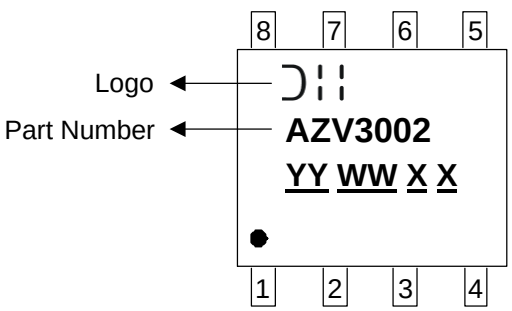


XX : Identification Code
Y : Year : 0~9
W : Week : A~Z : 1~26 week;
a~z : 27~52 week; z represents 52 and 53 week
X : Internal Code

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

(3) SO-8

(Top View)

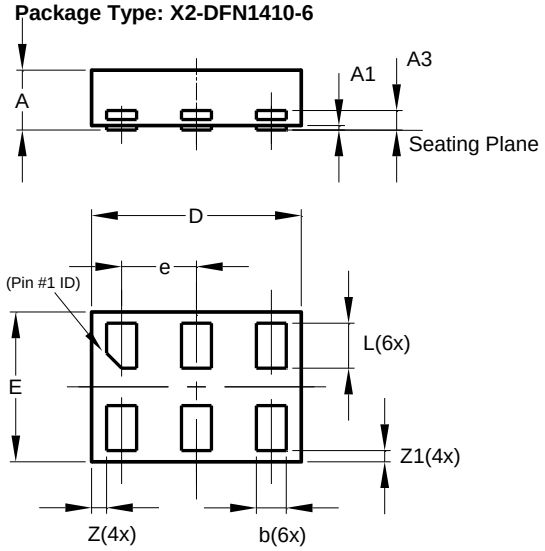


YY : Year : 14,15,16~
WW : Week : 01~52; 52 represents 52 and 53 week
X X : Internal Code

Package Outline Dimensions (All dimensions in mm.)

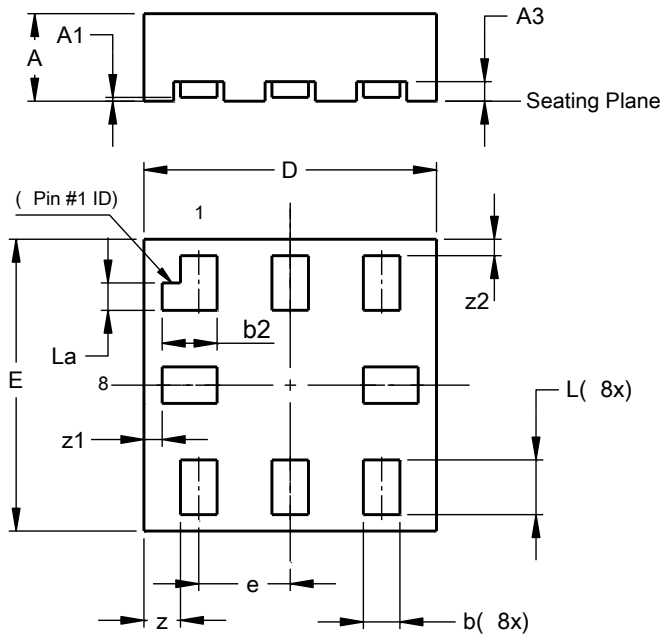
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for the latest version.

(1) Package Type: X2-DFN1410-6



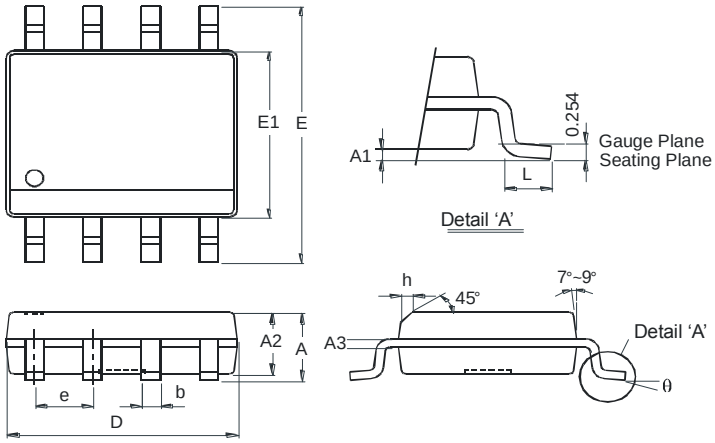
X2-DFN1410-6			
Dim	**Min**	**Max**	**Typ**
A	—	0.40	0.39
A1	0.00	0.05	0.02
A3	—	—	0.13
b	0.15	0.25	0.20
D	1.35	1.45	1.40
E	0.95	1.05	1.00
e	—	—	0.50
L	0.25	0.35	0.30
Z	—	—	0.10
Z1	0.045	0.105	0.075
All Dimensions in mm			

(2) U-FLGA1616-8



U-FLGA1616-8			
Dim	**Min**	**Max**	**Typ**
A	0.45	0.55	0.50
A1	0.00	0.05	0.02
A3	-	-	0.176
b	0.15	0.25	0.20
b2	-	-	0.30
D	1.55	1.65	1.60
E	1.55	1.65	1.60
e	0.50BSC		
L	0.25	0.35	0.30
La	-	-	0.15
z	-	-	0.20
z1	-	-	0.10
z2	-	-	0.09
All Dimensions in mm			

(3) SO-8

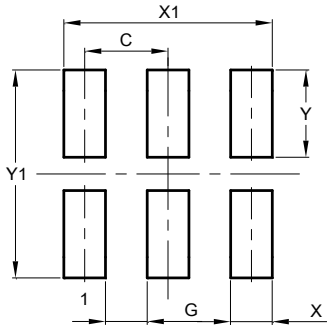


SO-8		
Dim	**Min**	**Max**
A	-	1.75
A1	0.10	0.20
A2	1.30	1.50
A3	0.15	0.25
b	0.3	0.5
D	4.85	4.95
E	5.90	6.10
E1	3.85	3.95
e	1.27 Typ	
h	-	0.35
L	0.62	0.82
θ	0°	8°
All Dimensions in mm		

Suggested Pad Layout

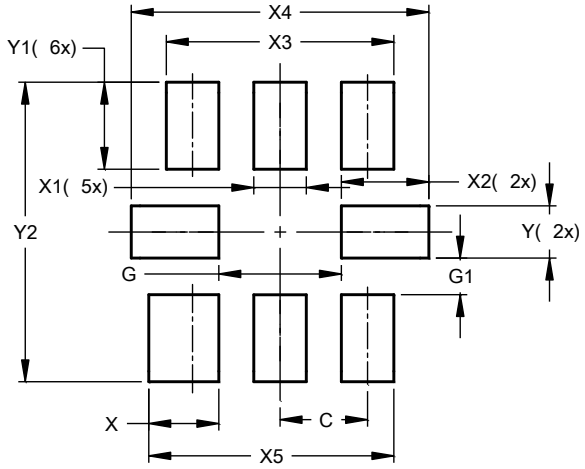
Please see AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for the latest version.

(1) Package Type: X2-DFN1410-6



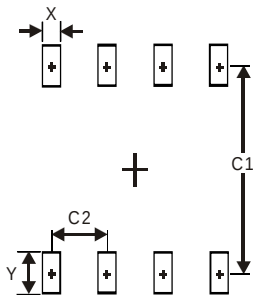
Dimensions	Value (in mm)
C	0.500
G	0.250
X	0.250
X1	1.250
Y	0.525
Y1	1.250

(2)U-FLGA1616-8



Dimensions	Value (in mm)
C	0.500
G	0.700
G1	0.210
X	0.400
X1	0.300
X2	0.500
X3	1.300
X4	1.700
X5	1.400
Y	0.300
Y1	0.500
Y2	1.720

(3)SO-8



Dimensions	Value (in mm)
X	0.60
Y	1.55
C1	5.4
C2	1.27

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- *Специальные условия для постоянных клиентов.*
- *Подбор аналогов.*
- *Поставку компонентов в любых объемах, удовлетворяющих вашим потребностям.*

- *Приемлемые сроки поставки, возможна ускоренная поставка.*
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- *Работу по проектам и поставку образцов.*
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- *Сертификаты соответствия на поставляемую продукцию (по желанию клиента).*
- *Тестирование поставляемой продукции.*
- *Поставку компонентов, требующих военную и космическую приемку.*
- *Входной контроль качества.*
- *Наличие сертификата ISO.*

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Конструкторский отдел помогает осуществить:

- *Регистрацию проекта у производителя компонентов.*
- *Техническую поддержку проекта.*
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Тел: +7 (812) 336 43 04 (многоканальный)
Email: org@lifeelectronics.ru

www.lifeelectronics.ru