

## Low-Power Headset Detection IC in Miniaturized Package

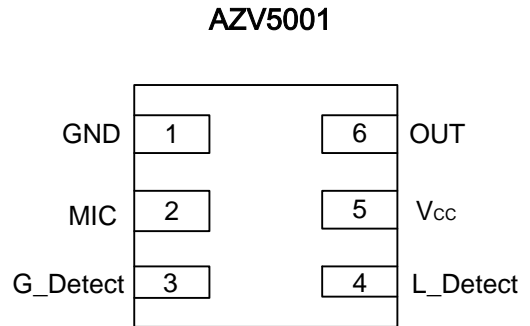
### Description

The AZV5001 is a low-power and cost-effective headset detection IC containing a comparator with internal hysteresis, OR gate, and N-channel integrated MOSFET, designed to detect the insertion of a headset with a microphone.

Pull-up resistors for the detection pins are internalized; a built-in resistor divider provides the reference voltage for detecting the left audio channel. The logic low output of the OR gate indicates the headset is connected properly.

The AZV5001 is available in a miniaturized DFN1210-6 package, which helps reduce the space needed on PCB boards.

### Pin Assignments



**Top View  
(DFN1210-6)**

**Figure 1**

### Features

- Low Supply Current: 7.5µA(typical) @ V<sub>CC</sub> = 1.8V
- Supply Voltage Range: 1.6~5.0V
- Comparator, OR Gate, N-Channel MOSFET Integrated
- Open Drain Output for MIC Pin
- DFN1210-6: 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)**

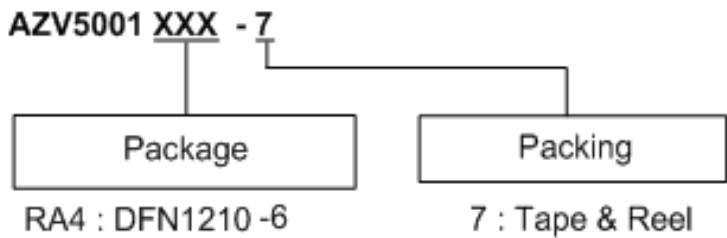
Notes:

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](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.

### Applications

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

**Ordering Information**

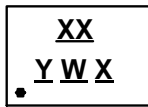


| Part Number  | Package Code | Packaging    | 7" Tape and Reel  |                    |
|--------------|--------------|--------------|-------------------|--------------------|
|              |              |              | Quantity          | Part Number Suffix |
| AZV5001RA4-7 | RA4          | X2-DFN1210-6 | 5,000/Tape & Reel | -7                 |

**Marking Information**

(1) DFN1210-6

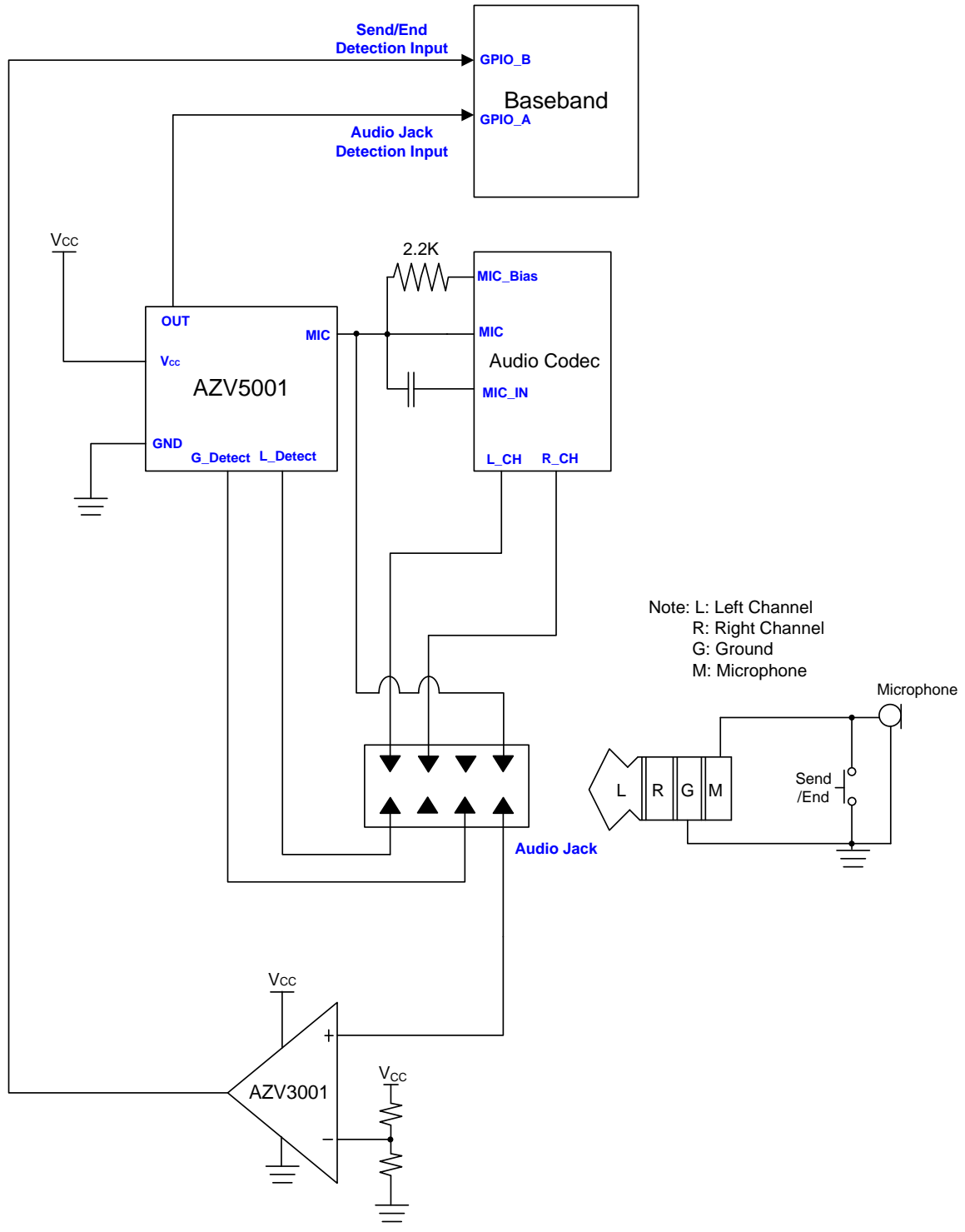
(Top View)



- 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

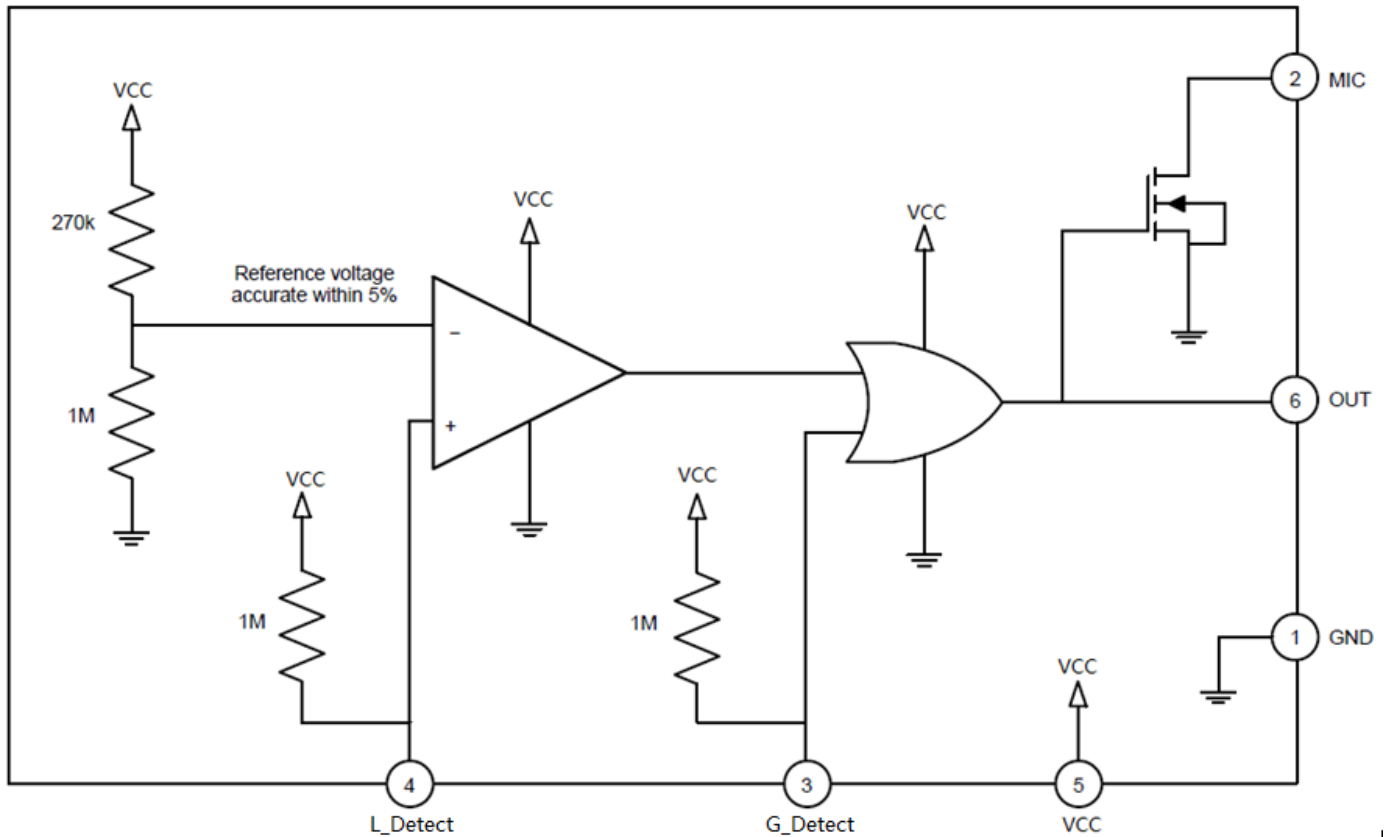
| Part Number  | Package      | Identification Code |
|--------------|--------------|---------------------|
| AZV5001RA4-7 | X2-DFN1210-6 | XE                  |

**Typical Applications Circuit**



**Figure 2**

**Functional Block Diagram**



**Figure 3**

**Pin Descriptions**

| AZV5001  |            |  |
|----------|------------|--|
| Pin Name | Pin Number | Function   |
| GND      | 1          | Negative power supply pin; this pin is connected to the system ground  |
| MIC      | 2          | MIC output pin with open drain output type; When the headset is asserted, then MIC is pulled up to the MIC bias voltage with a pull-up resistor. When the headset is not asserted, then MIC is pulled low. |
| G_Detect | 3          | Ground detection pin   |
| L_Detect | 4          | Left channel detection pin   |
| Vcc      | 5          | Positive Power Supply Pin, which pin is connected with system power supply. A minimum 0.1µF decoupling capacitor is recommended as close as possible to this Vcc pin.                                      |
| OUT      | 6          | OUT is a logic output that indicates whether the headset has been properly connected. OUT will be logic low only when G_detect and L_detect are low.<br>Table 3.   |

## Output Logic

| Inputs   |          | Outputs |                      | Headset      |
|----------|----------|---------|----------------------|--------------|
| L_Detect | G_Detect | OUT     | MIC                  | -            |
| 0        | 0        | 0       | 1 (External Pull-Up) | Detected     |
| 0        | 1        | 1       | 0                    | Not Detected |
| 1        | 0        | 1       | 0                    | Not Detected |
| 1        | 1        | 1       | 0                    | Not Detected |

## Absolute Maximum Ratings (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Symbol                | Parameter                        | Conditions | Min   | Max                  | Unit |
|-----------------------|----------------------------------|------------|-------|----------------------|------|
| V <sub>CC</sub>       | Supply Voltage                   | -          | 0     | 5.5                  | V    |
| V <sub>MIC</sub>      | MIC Pin Supply Voltage Range     | -          | 0     | 5.5                  | V    |
| I <sub>MIC</sub>      | Maximum MIC Pin Current          | -          | -     | 2                    | mA   |
| V <sub>G_Detect</sub> | G_Detect Pin Input Voltage Range | -          | -0.1  | V <sub>CC</sub> +0.1 | V    |
| V <sub>L_Detect</sub> | L_Detect Pin Input Voltage Range | -          | -0.1  | V <sub>CC</sub> +0.1 | V    |
| T <sub>j(max)</sub>   | Maximum Junction Temperature     | -          | -     | +150                 | °C   |
| T <sub>STG</sub>      | Storage Temperature              | -          | -65   | +150                 | °C   |
| ESD                   | HBM                              | -          | 4,000 |                      | V    |
| I <sub>Latch-up</sub> | Latch-Up Current                 | -          | 200   |                      | mA   |
| P <sub>TOT</sub>      | Total Power Dissipation          | -          | -     | TBD                  | mW   |

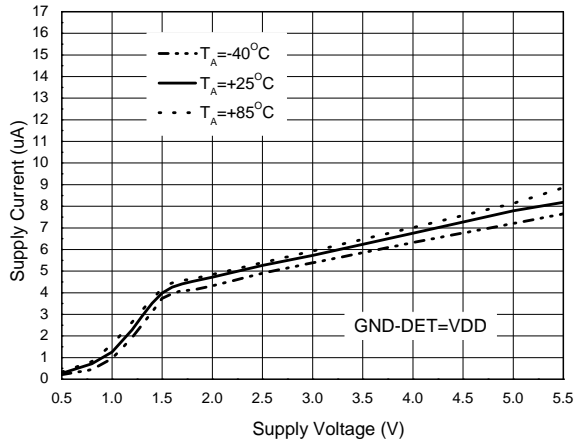
## Recommended Operating Conditions (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Symbol           | Parameter                                   | Min | Max | Unit |
|------------------|---|-----|-----|------|
| V <sub>CC</sub>  | Supply Voltage                              | 1.6 | 5.0 | V    |
| V <sub>MIC</sub> | MIC Pin Supply Voltage Range                | 1.6 | 5.0 | V    |
| V <sub>IN</sub>  | Input Voltage of L_Detect and G_Detect pins | 0   | 5.0 | V    |
| Δt/ΔV            | Input Transient Rise or Fall Rate           | 0   | 10  | ns/V |
| T <sub>A</sub>   | Ambient Operating Temperature Range         | -40 | +85 | °C   |

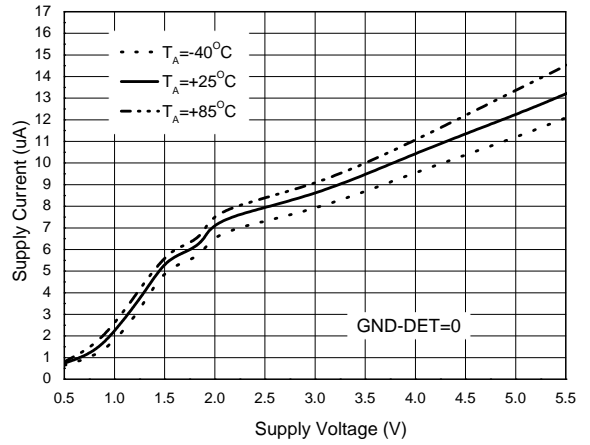
**Electrical Characteristics** (@ $T_A=+25^{\circ}\text{C}$ ,  $V_{CC}=1.8\text{V}$ ,  $V_{CM}=0.5V_{CC}$ , unless otherwise specified.)

| Symbol                                   | Parameter                        | Conditions   | +25°C |     |      | Units         |
|--|----------------------------------|--|-------|-----|------|---------------|
|  |                                  |  | Min   | Typ | Max  |               |
| $I_{CC}$                                 | Supply Current                   | $V_{G\_Detect} = 1.8\text{V or } 0\text{V}$  | -     | 7.5 | 12   | $\mu\text{A}$ |
| <b>Input Characteristics of L_Detect</b> |                                  |  |       |     |      |               |
| $V_{IH}$                                 | Input Logic High                 | $V_{CC} = 1.8\text{V}$   | 1.5   | -   | -    | V             |
| $V_{IL}$                                 | Input Logic Low                  | $V_{CC} = 1.8\text{V}$   | -     | -   | 1.33 | V             |
| $t_{pLH}, t_{pHL}$                       | Propagation Delay                | $C_{out} = 15\text{pF}, G\_Detect = 0\text{V},$<br>$L\_Detect = 1.31\sim 1.52\text{V}$ | -     | 480 | -    | ns            |
| $C_{IN}$                                 | Input Capacitance                | $f = 1\text{MHz}$  | -     | 3   | -    | pF            |
| $I_{IH}$                                 | Low Voltage Input Leakage        | $V_{L\_Detect} = 0\text{V}$  | -     | 1.8 | -    | $\mu\text{A}$ |
| $I_{IL}$                                 | High Voltage Input Leakage       | $V_{L\_Detect} = 1.8\text{V}$  | -     | 0.5 | -    | nA            |
| <b>Input Characteristics of G_Detect</b> |                                  |  |       |     |      |               |
| $V_{IH}$                                 | Input Logic High                 | $V_{CC} = 1.8\text{V}$   | 1.17  | -   | -    | V             |
| $V_{IL}$                                 | Input Logic Low                  | $V_{CC} = 1.8\text{V}$   | -     | -   | 0.63 | V             |
| $t_{pLH}, t_{pHL}$                       | Propagation Delay                | $C_{out} = 15\text{pF}, L\_Detect = 0\text{V},$<br>$G\_Detect = 0\sim 1.8\text{V}$     | -     | 10  | -    | ns            |
| $C_{IN}$                                 | Input Capacitance                | $f = 1\text{MHz}$  | -     | 3   | -    | pF            |
| $I_{IH}$                                 | Low Voltage Input Leakage        | $V_{L\_Detect} = 0\text{V}$  | -     | 1.8 | -    | $\mu\text{A}$ |
| $I_{IL}$                                 | High Voltage Input Leakage       | $V_{L\_Detect} = 1.8\text{V}$  | -     | 0.5 | -    | nA            |
| <b>Output Characteristics of OUT</b>     |                                  |  |       |     |      |               |
| $V_{OH}$                                 | Output Logic High                | $V_{CC} = 1.8\text{V}, I_{OH} = -0.1\text{mA}$   | 1.7   | -   | -    | V             |
| $V_{OL}$                                 | Output Logic Low                 | $V_{CC} = 1.8\text{V}, I_{OH} = 0.1\text{mA}$  | -     | -   | 0.1  | V             |
| $T_{rise}$                               | Rise Time                        | $C_{OUT} = 15\text{pF}, R_L = 1\text{M}\Omega$   | -     | 7   | -    | ns            |
| $T_{fall}$                               | Fall Time                        | $C_{OUT} = 15\text{pF}, R_L = 1\text{M}\Omega$   | -     | 4   | -    | ns            |
| <b>Characteristics of MIC Pin</b>        |                                  |  |       |     |      |               |
| $R_{DS(on)}$                             | Drain-Source On Resistor of NMOS | $V_{CC} = 1.8\text{V}, I_{MIC} = 1\text{mA}$   | -     | 0.9 | 1.4  | $\Omega$      |

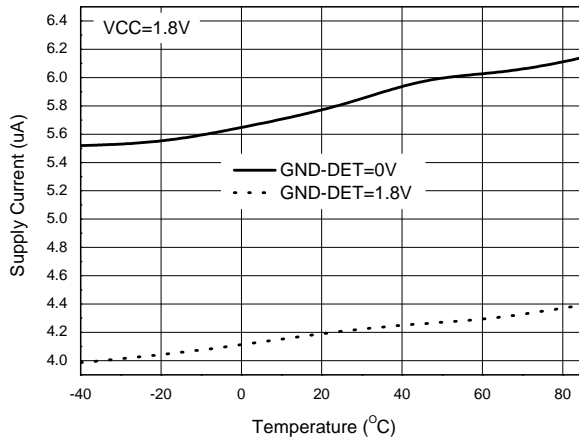
**Performance Characteristics**



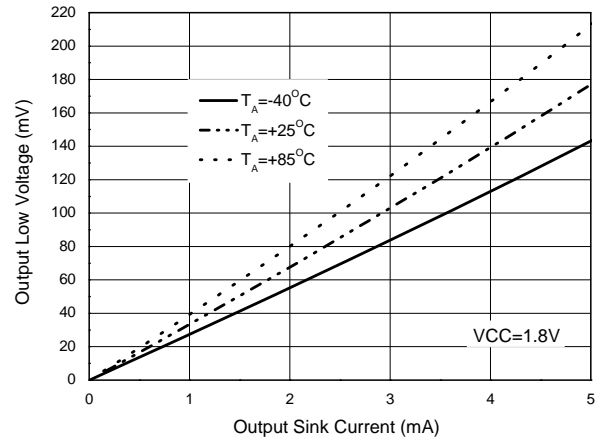
**Supply Current vs. Supply Voltage**



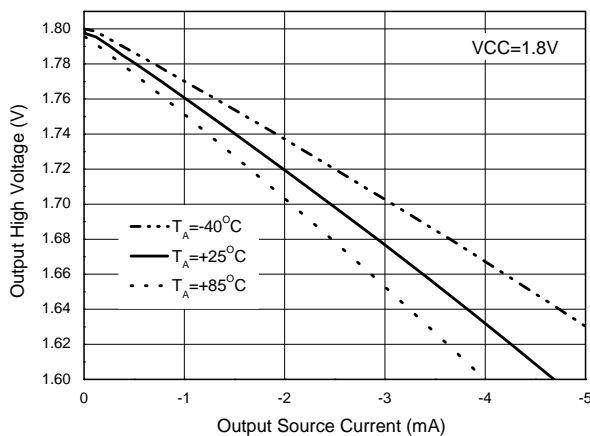
**Supply Current vs. Supply Voltage**



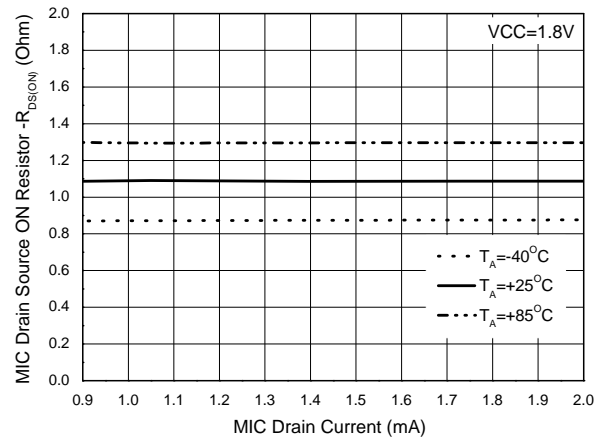
**Supply Current vs. Temperature**



**Output Low Voltage Characteristics**

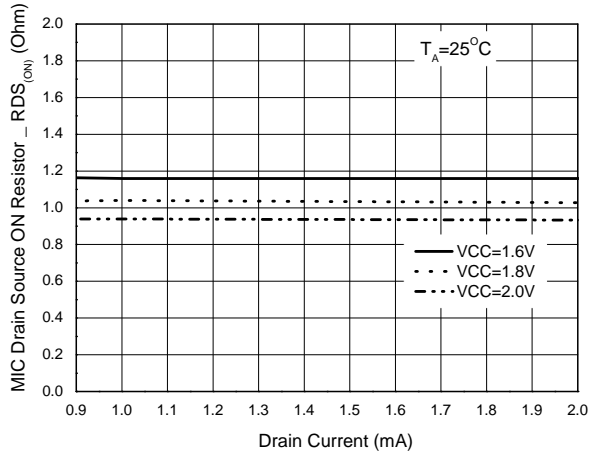


**Output High-Voltage Characteristics**

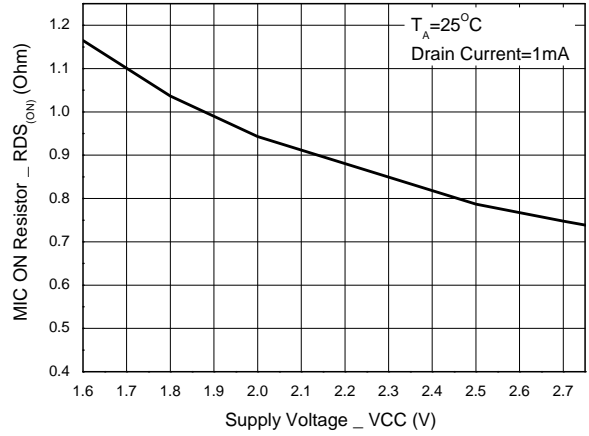


**MIC ON Resistor vs. Drain Current**

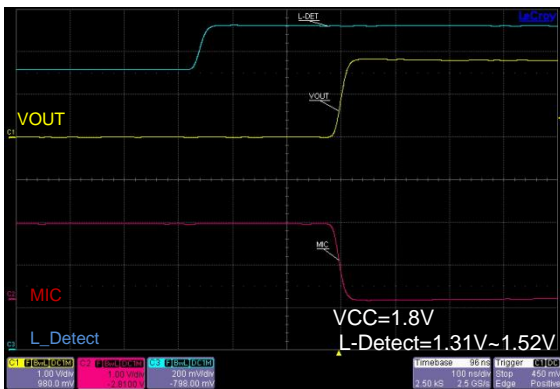
**Performance Characteristics** (continued)



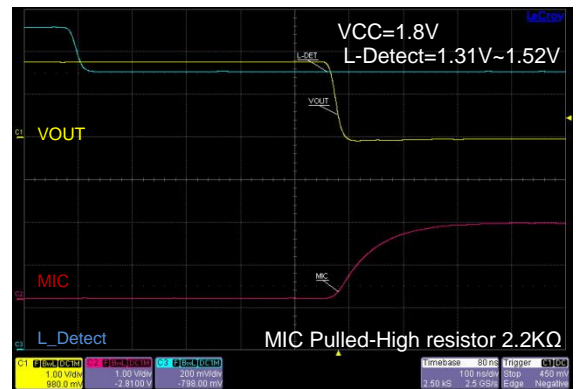
**MIC ON Resistor vs. Drain Current**



**MIC ON Resistor vs. Supply Voltage**



**L-DET TO VOUT, MIC Response**



**L-DET TO VOUT, MIC Response**



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## Application Information

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### Supply Voltage

The AZV5001 device is guaranteed to operate at supply voltage ultra low to 1.6V. For better performance, a power supply decoupling capacitor is necessary, a minimum 0.1 $\mu$ F decoupling capacitor should be placed as close as possible to the V<sub>CC</sub> pin.

### Audio Jack Detection

The AZV5001 is designed to simplify the detection of stereo audio connector with a microphone contact. When the headset is not connected, the internal pull-up resistors on L\_Detect and G\_Detect pull those pins high. When the headset is connected to the switched audio jack, the headset ground and left audio channel trigger L\_Detect and G\_Detect to logic low.

The AZV5001 can work with either the CITA or OMTP standard. In order to support both standards simultaneously, a cross point switch and additional circuitry is necessary to detect and swap the ground and microphone pins.

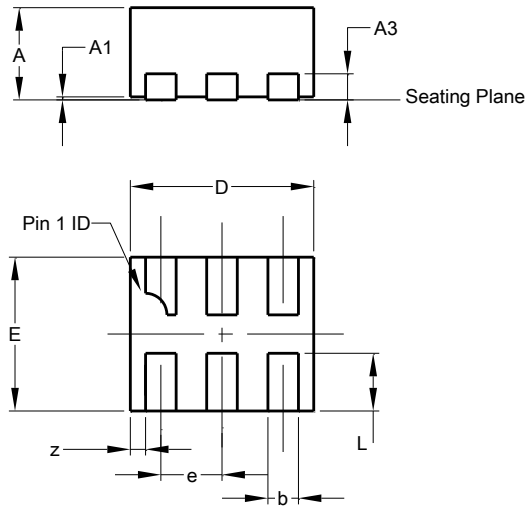
### MIC Pin Biasing

The AZV5001 typical application circuit in Figure 2 shows the recommended 2.2K $\Omega$  pull-up resistor to the MIC bias voltage under supply voltage 1.8V condition. While the headset is not detected, the internal NMOS transistor is enabled to mute the MIC signal. If the MIC sink current is 1mA under system application, the MIC pin is pulled near 1mV when the headset is not present. The internal NMOS transistor is optimized to sink up to 2mA of current, allowing some flexibility in the selection of the pull-up resistor and MIC bias voltage.

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

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

**X2-DFN1210-6**

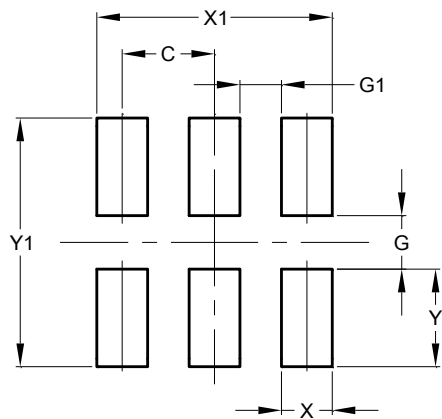


| X2-DFN1210-6         |       |       |       |
|----------------------|-------|-------|-------|
| Dim                  | Min   | Max   | Typ   |
| A                    | -     | 0.40  | -     |
| A1                   | 0.00  | 0.05  | 0.03  |
| A3                   | -     | -     | 0.13  |
| b                    | 0.15  | 0.25  | 0.20  |
| D                    | 1.15  | 1.275 | 1.20  |
| E                    | 0.95  | 1.075 | 1.00  |
| e                    | -     | -     | 0.40  |
| L                    | 0.325 | 0.425 | 0.375 |
| z                    | -     | -     | 0.100 |
| All Dimensions in mm |       |       |       |

**Suggested Pad Layout**

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

**X2-DFN1210-6**



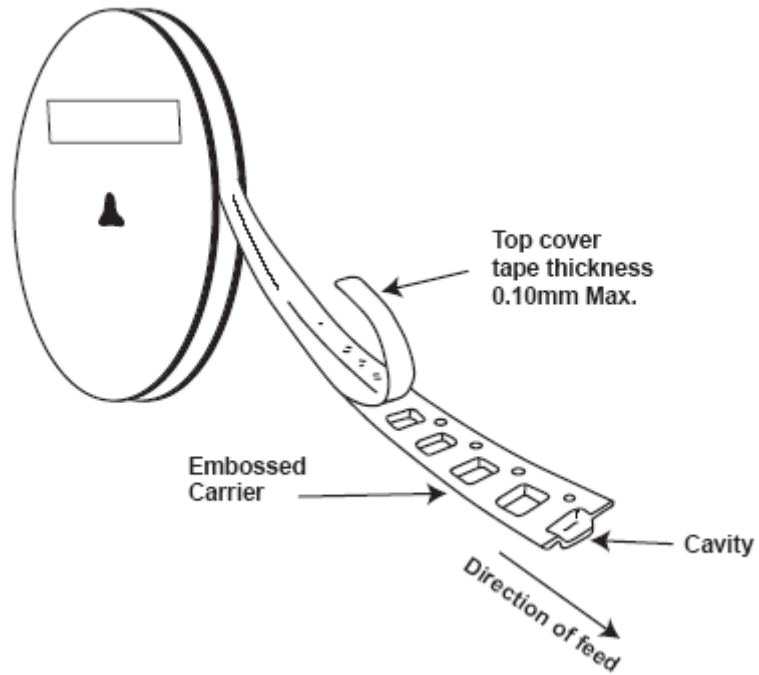
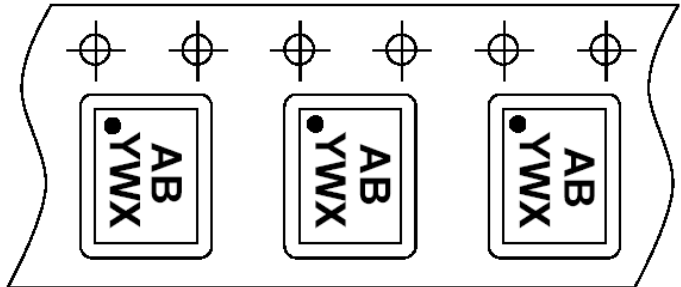
| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 0.400         |
| G          | 0.230         |
| G1         | 0.180         |
| X          | 0.220         |
| X1         | 1.020         |
| Y          | 0.420         |
| Y1         | 1.070         |

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**Taping Orientation** (Note 4)

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**X2-DFN1210-6**



Note: 4. The taping orientation of the other package type can be found on our website at <http://www.diodes.com/datasheets/ap02007.pdf>.

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**Телефон:** +7 812 627 14 35

**Электронная почта:** [sales@st-electron.ru](mailto:sales@st-electron.ru)

**Адрес:** 198099, Санкт-Петербург,  
Промышленная ул, дом № 19, литера Н,  
помещение 100-Н Офис 331