# AOZ6232

## 0.25Ω Low-Voltage Dual-SPDT Analog Switch

## General Description

The AOZ6232 is a 0.25Ω low-voltage Dual Single Pole Double Throw (SPDT) analog switch. The AOZ6232 operates from a single 1.65V to 3.3V supply. It features an ultra-low On Resistance of 0.25Ω at a +2.7V supply and 25°C. The AOZ6232 is designed for break-before-make operation.

## Features

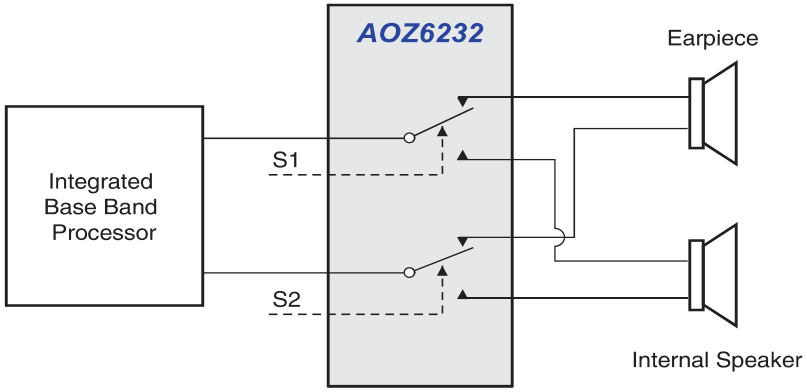
- Typical 0.25Ω On Resistance ($R_{ON}$) for +2.7V supply
- 0.15Ω maximum $R_{ON}$ flatness for +2.7V supply
- 1.6mm x 2.1mm QFN package
- Broad $V_{CC}$ operating range
- Low THD (0.02% typical for 32Ω load)
- High current handling capability (350mA continuous current under 3.0V supply)

## Applications

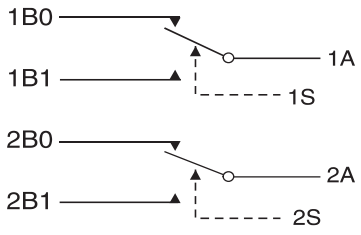
- Cell phone
- PDA
- Portable media player

Green Product

## Typical Application




## Pin Configuration

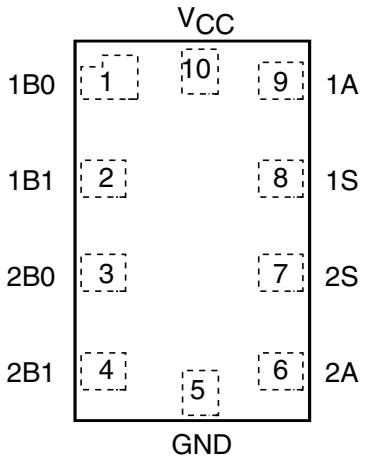


## Ordering Information

| Part Number | Ambient Temperature Range | Package | Environmental |
|---|---|---|---|
| AOZ6232QI | -40°C to +85°C | QFN-10 | RoHS Compliant<br>Green Product |

AOS Green Products use reduced levels of Halogens, and are also RoHS compliant.
Please visit www.aosmd.com/web/quality/rohs_compliant.jsp for additional information.

## Pin Configuration




**QFN-10**
**(Top Thru View)**

## Pin Description

| Pin Name | Function |
|---|---|
| 1A, 2A, 1B0, 1B1, 2B0, 2B1 | Data Ports |
| 1S, 2S | Control Input |

## Truth Table

| Logic Input | Function |
|---|---|
| 0 | B0 Connected to A |
| 1 | B1 Connected to A |

## Absolute Maximum Ratings

*Exceeding the Absolute Maximum ratings may damage the device.*

| Symbol | Parameter | Rating |
|---|---|---|
| $V_{CC}$ | Supply Voltage | -0.5V to +3.6V |
| $V_S$ | Switch Voltage(1) | -0.5 to $V_{CC}$ |
| $V_{IN}$ | Input Voltage(1) | -0.5 to $V_{CC}$ |
| $I_{IK}$ | Minimum Input Diode Current(2) | -50mA |
| $I_{SW}$ | Switch Current | 350mA |
| $I_{SWPEAK}$ | Peak Switch Current (Pulsed at 1ms duration, <10% Duty Cycle) | 500mA |
| $T_{STG}$ | Storage Temperature Range | -65°C to +150°C |
| $T_J$ | Maximum Junction Temperature | +150°C |
| $T_L$ | Lead Temperature (Soldering, 10 seconds) | +260°C |
| ESD | Human Body Model | 8000V |
| | Charged Device Model | 1000V |

## Recommend Operating Ratings

*The device is not guaranteed to operate beyond the Maximum Operating Ratings.*

| Symbol | Parameter | Rating |
|---|---|---|
| $V_{CC}$ | Supply Voltage | 1.65V to +3.3V |
| $V_{IN}$ | Control Input Voltage(3) | 0V to $V_{CC}$ |
| $V_{SW}$ | Switch Input Voltage | 0V to $V_{CC}$ |
| $T_A$ | Operating Temperature | -40°C to +85°C |

**Notes:**

1. The input and output negative voltage ratings may be exceeded if the input and output diode current ratings are observed.
2. Negative current should not exceed minimum negative value.
3. Unused inputs must be held HIGH or LOW. They may not float.

## DC Electrical Characteristics

All typical values are at 25°C unless otherwise specified.

| Symbol | Parameter | Conditions | $V_{CC}$ (V) | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|
| $V_{IH}$ | Input Voltage HIGH | | 2.7 to 3.3 | 1.7 | | | V |
| | | | 2.3 to 2.7 | 1.6 | | | |
| | | | 1.65 to 1.95 | 0.65 x $V_{CC}$ | | | |
| $V_{IL}$ | Input Voltage LOW | | 2.7 to 3.3 | | | 1.0 | V |
| | | | 2.3 to 2.7 | | | 0.9 | |
| | | | 1.65 to 1.95 | | | 0.35 x $V_{CC}$ | |
| $I_{IN}$ | Control Input Leakage | $V_{IN}$ = 0V to $V_{CC}$ | 1.65 to 3.3 | -0.5 | | 0.5 | µA |
| $I_{NO(OFF)}$, $I_{NC(OFF)}$ | Off-Leakage Current of Port $nB_0$ and $nB_1$ | nA = 0.3V, 3.0V, nB0 or nB1 = 0.3V, 3.0V or floating | 3.3 | -50 | | 50 | nA |
| | | nA = 0.3V, 2.4V, nB0 or nB1 = 0.3V, 2.4V or floating | 2.7 | -50 | | 50 | |
| | | nA = 0.3V, 1.65V, nB0 or nB1 = 0.3V, 1.65V or floating | 1.95 | -50 | | 50 | |
| $I_{A(ON)}$ | On Leakage Current of Port 1A and 2A | nA = 0.3V, 3.0V, nB0 or nB1 = 0.3V, 3.0V or floating | 3.3 | -50 | | 50 | nA |
| | | nA = 0.3V, 2.4V, nB0 or nB1 = 0.3V, 2.4V or floating | 2.7 | -50 | | 50 | |
| | | nA = 0.3V, 1.65V, nB0 or nB1 = 0.3V, 1.65V or floating | 1.95 | -50 | | 50 | |
| $R_{ON}$ | Switch On Resistance[4] See Figure 1 | $I_{OUT}$ = 100mA, nB0 or $nB_1$ = 0V, 0.7V, 2.0V, 2.7V | 2.7 | | 0.25 | 0.4 | Ω |
| | | $I_{OUT}$ = 100mA, nB0 or nB1 = 0V, 0.7V, 1.6V, 2.3V | 2.3 | | 0.30 | 0.45 | |
| | | $I_{OUT}$ = 100mA, nB0 or nB1 = 0.8V | 1.65 | | 0.50 | 0.7 | |
| $\Delta R_{ON}$ | On Resistance Matching Between Channels[5] | $I_{OUT}$ = 100mA, nB0 or nB1 = 0.7V | 2.7 | | 0.040 | 0.075 | Ω |
| | | | 2.3 | | 0.040 | 0.080 | |
| | | | 1.65 | | 0.1 | | |
| $R_{FLAT(ON)}$ | On Resistance Flatness[6] | $I_{OUT}$ = 100mA, nB0 or nB1 = 0V to $V_{CC}$ | 2.7 | | | 0.15 | Ω |
| | | | 2.3 | | | 0.2 | |
| | | | 1.65 | | 0.8 | | |
| $I_{CC}$ | Quiescent Supply Current | $V_{IN}$ = 0V or $V_{CC}$, $I_{OUT}$ = 0A | 3.3 | -500 | | 500 | nA |

**Notes:**

4. On resistance is determined by the voltage drop between A and B pins at the indicated current through the switch.
5. $\Delta R_{ON} = R_{ONmax} - R_{ONmin}$ measured at identical $V_{CC}$, temperature, and voltage.
6. Flatness is defined as the difference between the maximum and minimum value of $R_{ON}$ over the specified range of conditions.

## AC Electrical Characteristics

All typical values are at 25°C unless otherwise specified.

| Symbol | Parameter | Conditions | $V_{CC}$ (V) | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|
| $t_{ON}$ | Turn-On Time | nB0 or nB1 = 1.5V, $R_L$ = 50Ω, $C_L$ = 35 pF | 2.7 to 3.3 | | 25.0 | 50.0 | ns |
| | | | 2.3 to 2.7 | | 30.0 | 50.0 | |
| | | | 1.65 to 1.95 | | 50.0 | 60.0 | |
| $t_{OFF}$ | Turn-Off Time | nB0 or nB1 = 1.5V, $R_L$ = 50Ω, $C_L$ = 35pF | 2.7 to 3.3 | | 10.0 | 25.0 | ns |
| | | | 2.3 to 2.7 | | 20.0 | 25.0 | |
| | | | 1.65 to 1.95 | | 45.0 | 50.0 | |
| $t_{BBM}$ | Break-Before-Make Time | nB0 or nB1 = 1.5V, $R_L$ = 50Ω, $C_L$ = 35pF | 2.7 to 3.3 | 2.0 | 17.0 | | ns |
| | | | 2.3 to 2.7 | 2.0 | 15.0 | | |
| | | | 1.65 to 1.95 | 2.0 | 12.0 | | |
| Q | Charge Injection | $C_L$ = 100pF, $V_{GEN}$ = 0V, $R_{GEN}$ = 0Ω | 1.65 to 3.3 | | 9.0 | | pC |
| OIRR | Off Isolation | f = 100kHz, $R_L$ = 50Ω, $C_L$ = 5pF (Stray) | 1.65 to 3.3 | | -95 | | dB |
| Xtalk | Crosstalk | f = 100kHz, $R_L$ = 50Ω, $C_L$ = 5pF (Stray) | 1.65 to 3.3 | | -95 | | dB |
| BW | -3dB Bandwidth | $R_L$ = 50Ω | 1.65 to 3.3 | | 45.0 | | MHz |
| THD | Total Harmonic Distortion | $R_L$ = 32Ω, $V_{IN}$ = $2V_{pk-pk}$, f = 20Hz to 20kHz | 2.7 to 3.3 | | 0.024 | | % |
| | | $R_L$ = 32Ω, $V_{IN}$ = $1.5V_{pk-pk}$, f = 20Hz to 20kHz | 2.3 to 2.7 | | 0.015 | | |
| | | $R_L$ = 32Ω, $V_{IN}$ = $1.2V_{pk-pk}$, f = 20Hz to 20kHz | 1.65 to 1.95 | | 0.35 | | |

## Capacitance

| Symbol | Parameter | Conditions | $V_{CC}$ (V) | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|
| $C_{IN}$ | Control Pin Input Capacitance | f = 1MHz | 0.0 | | 4 | | pF |
| $C_{OFF}$ | B Port Off Capacitance | f = 1MHz | 3.3 | | 26 | | pF |
| $C_{ON}$ | A Port On Capacitance | f = 1MHz | 3.3 | | 150 | | pF |

## Typical Performance Characteristics

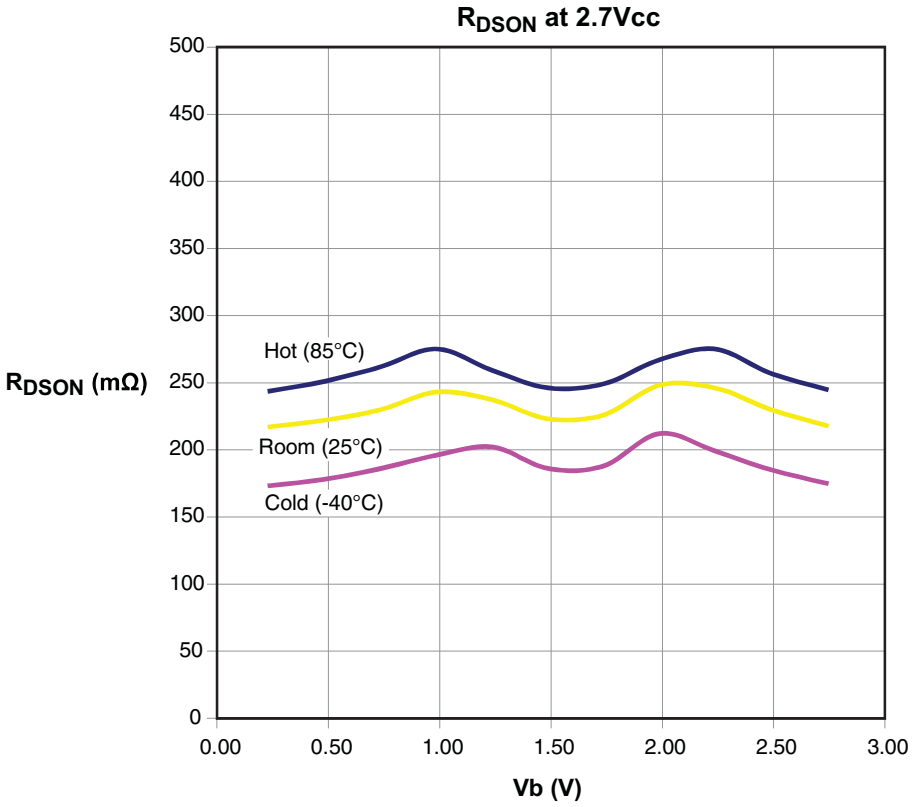
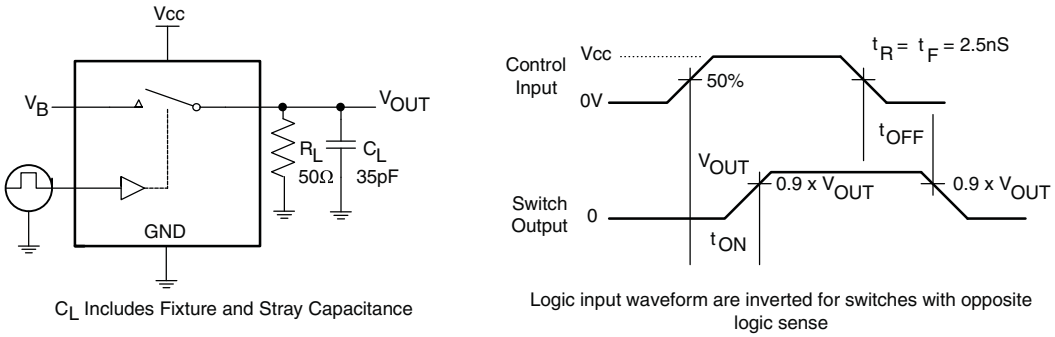



**Figure 1. Switch On Resistance**

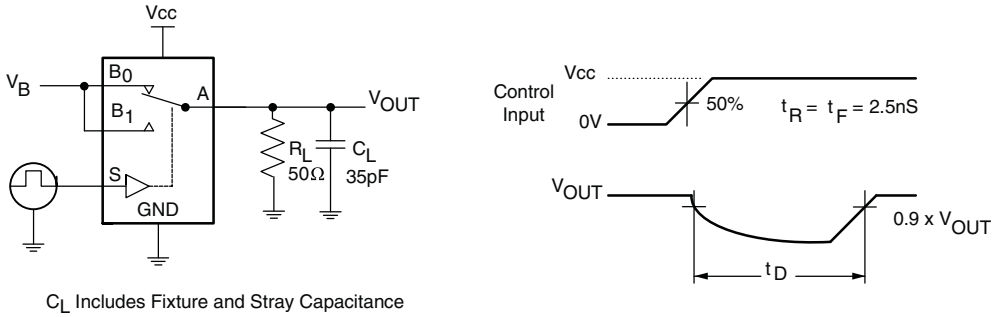
## AC Loading and Waveforms




$C_L$ Includes Fixture and Stray Capacitance

Logic input waveform are inverted for switches with opposite logic sense

**Figure 1. Turn-On/Turn-Off Timing**




$C_L$ Includes Fixture and Stray Capacitance

**Figure 2. Break-Before-Make Timing`**

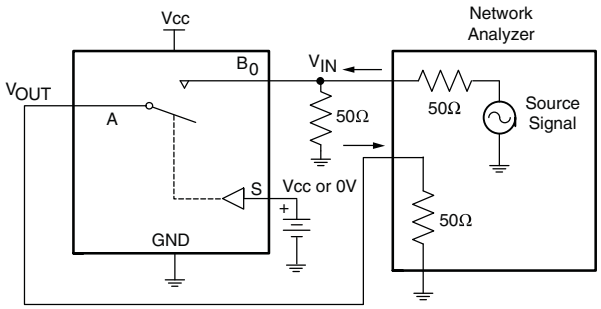



**Figure 3. Off Isolation**

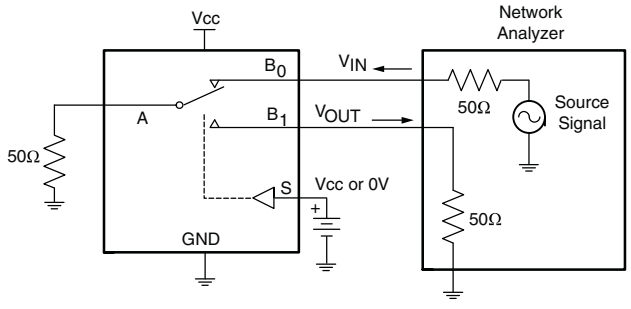



**Figure 4. Crosstalk**

## AC Loading and Waveforms (continued)

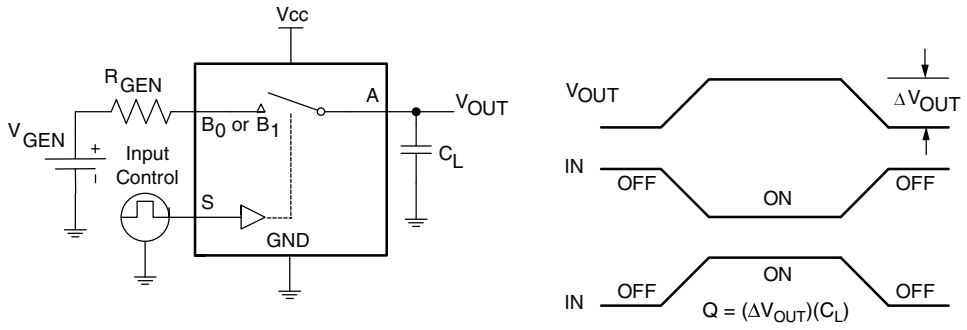



**Figure 5. Charge Injection**

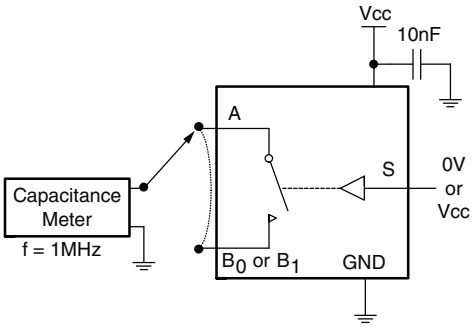



**Figure 6. ON/Off Capacitance Measurement**

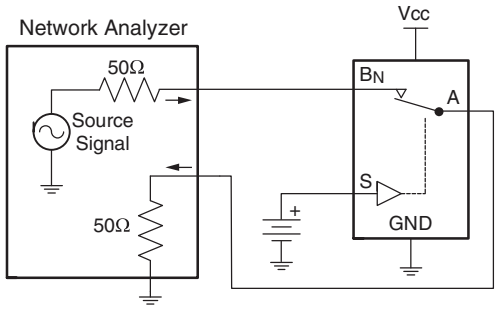



**Figure 7. Bandwidth**

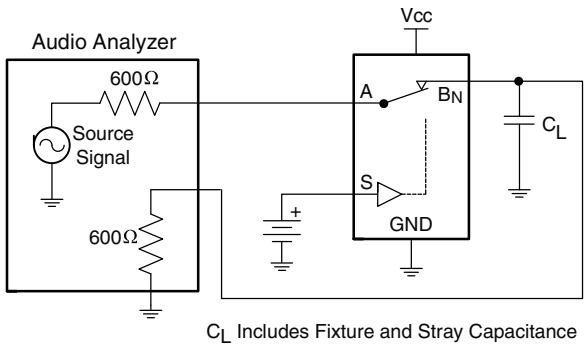
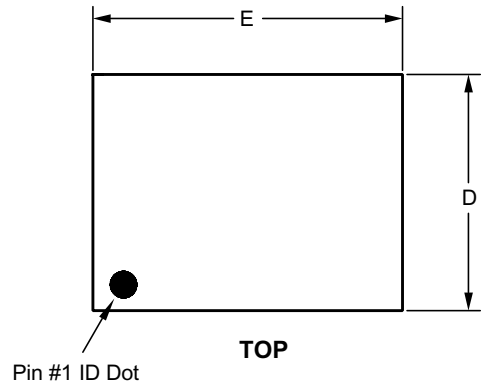
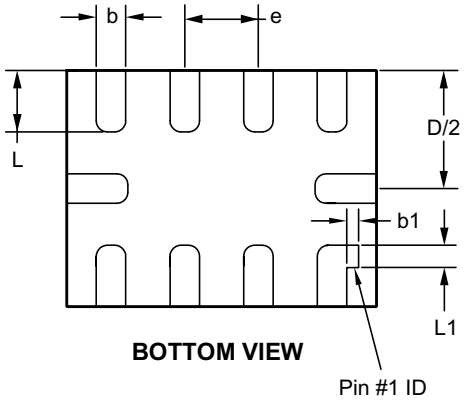
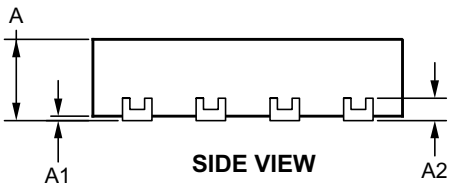


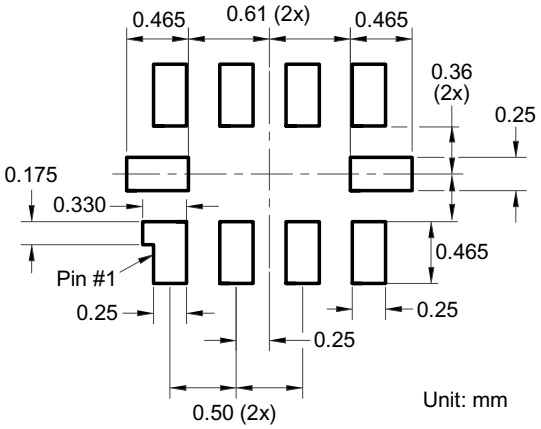

**Figure 8. Harmonic Distortion**

## Package Dimensions, QFN-10




**Dimensions in millimeters**

| Symbols | Min. | Nom. | Max. |
|---|---|---|---|
| A | 0.50 | 0.55 | 0.60 |
| A1 | 0.00 | — | 0.05 |
| A2 | | 0.152 REF. | |
| b | 0.15 | 0.20 | 0.25 |
| b1 | | 0.08 REF. | |
| D | 1.55 | 1.60 | 1.65 |
| E | 2.05 | 2.10 | 2.15 |
| e | | 0.50 BSC | |
| L | 0.365 | 0.415 | 0.465 |
| L1 | | 0.15 REF. | |

**Dimensions in inches**

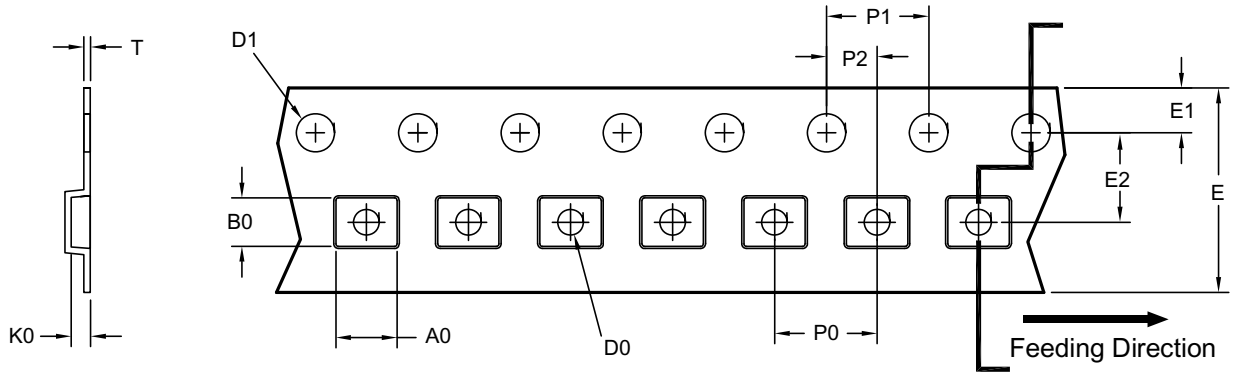
| Symbols | Min. | Nom. | Max. |
|---|---|---|---|
| A | 0.020 | 0.022 | 0.024 |
| A1 | 0.00 | — | 0.002 |
| A2 | | 0.006 REF. | |
| b | 0.006 | 0.008 | 0.010 |
| b1 | | 0.003 REF. | |
| D | 0.061 | 0.063 | 0.065 |
| E | 0.081 | 0.083 | 0.085 |
| e | | 0.020 BSC | |
| L | 0.014 | 0.016 | 0.018 |
| L1 | | 0.006 REF. | |

**Note:**

1. Controlling dimension is millimeter. Converted inch dimensions are not necessarily exact.

## Tape and Reel Dimensions, QFN-10

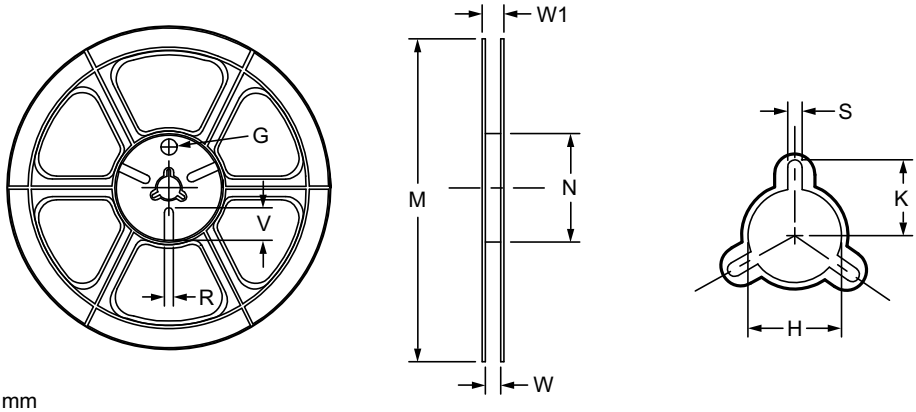
### Carrier Tape




UNIT: mm

| Package | A0 | B0 | K0 | D0 | D1 | E | E1 | E2 | P0 | P1 | P2 | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QFN 2.1 x 1.6 (8mm) | 0.76 ±0.05 | 1.21 ±0.05 | 0.53 ±0.05 | 0.50 ±0.05 | 1.5 ±0.10 | 8.00 +0.30/-0.10 | 1.75 ±0.10 | 3.50 ±0.05 | 4.00 ±0.10 | 4.00 ±0.10 | 2.00 ±0.05 | 0.254 ±0.02 |

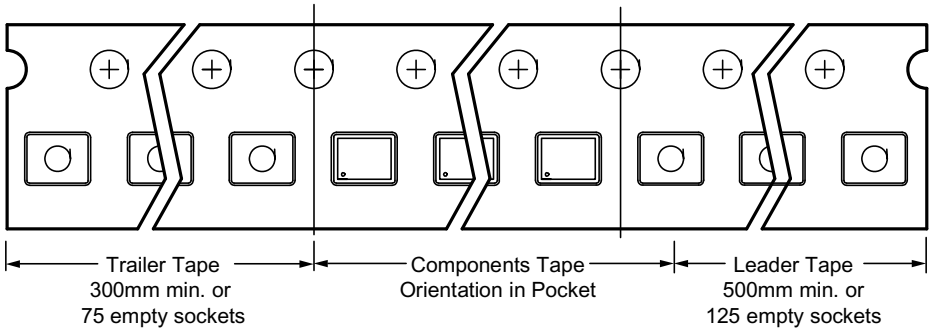
### Reel



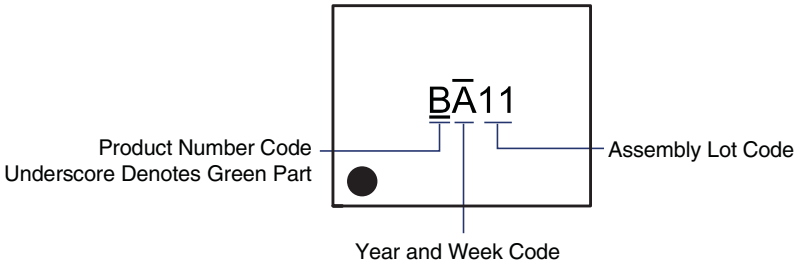

UNIT: mm

| Tape Size | Reel Size | M | N | W | W1 | H | K | S | G | R | V |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8mm | ø178 | ø178 ±0.5 | ø55 ±1 | 8.4 +1.5/0 | 14.4 Max. | ø13.0 ±0.5 | 10.1 Max. | 2.0 ±0.5 | N/A | N/A | N/A |

### Leader/Trailer and Orientation



## Chip Marking




**This datasheet contains preliminary data; supplementary data may be published at a later date.**
**Alpha & Omega Semiconductor reserves the right to make changes at any time without notice.**

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