

## 带自动方向感应和 $\pm 5\text{kV}$ ESD保护的2位双向电压电平转换器

**UM3302H CSP8 1.90  $\times$  0.90**

**UM3302M8 MSOP8**

### 描述

UM3302是一款带ESD保护的电平转换器，提供允许数据在多压系统中传输所需的电平转换。这个2通道同相转换器使用两个独立的可配置电源轨。A端口设计用于跟踪 $V_{CCA}$ 。 $V_{CCA}$ 支持从1.2V到3.6V范围内的任意电源电压。B端口设计用于跟踪 $V_{CCB}$ 。 $V_{CCB}$ 支持从1.65V到5.5V范围内的任意电源电压。这使得该器件可在1.2V、1.5V、1.8V、2.5V、3.3V和5V电压节点之间任意进行通用低压双向转换。所有I/O端口都具有自动感应功能，因此无需方向控制引脚，非常适合在低电压ASIC/PLD和较高电压系统间的数据传输。

UM3302在整个指定的工作电压范围内能保证以20Mbps的数据速率工作。在特定电压域内，更高的数据速率可达100Mbps。

当输出使能端(OE)输入为低电平时，所有输出都被置于高阻态。UM3302旨在由 $V_{CCA}$ 为OE输入电路供电。为确保在上电或掉电期间均处于高阻抗状态，必须将OE通过下拉电阻接地，驱动器的拉电流能力决定该电阻的最小值。

UM3302H是一款双通道电平转换器，采用CSP8 1.90 $\times$ 1.90凸点封装，而UM3302M8采用MSOP8封装

### 应用

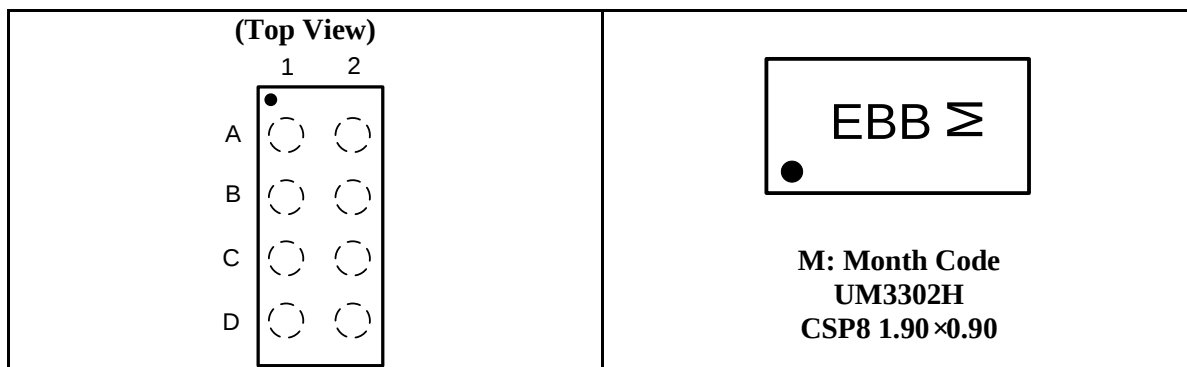
- 低电压ASIC电平转换
- 手机卡
- 便携式POS设备
- 便携式通信设备
- 低成本串行接口
- 蜂窝电话
- GPS
- 电信设备

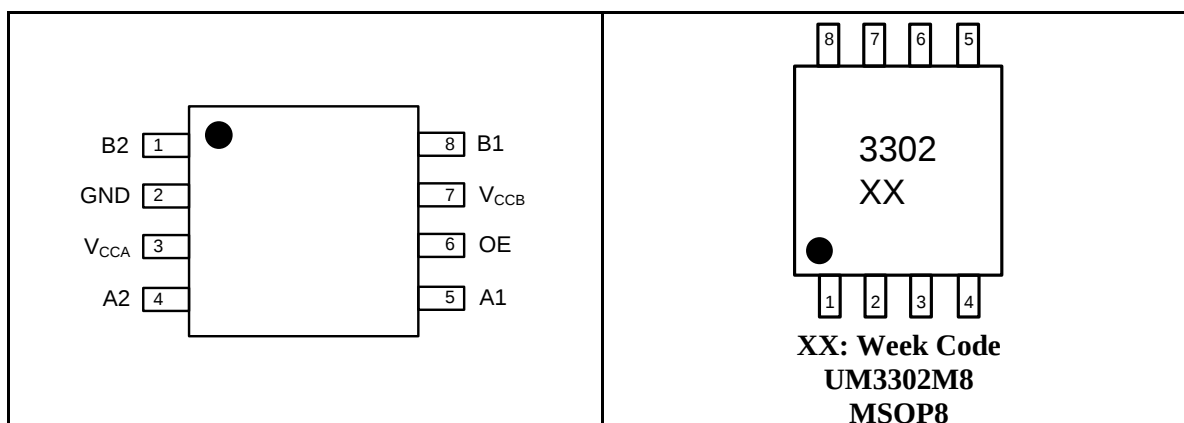
### 特性

- A端口输入电压范围为1.2V至3.6V  
B端口输入电压范围为1.65V至5.5V  
( $V_{CCA} \leq V_{CCB}$ )
- $V_{CC}$ 隔离特性--如果任何一个 $V_{CC}$ 输入在接地(GND)上，所有输出呈高阻态
- 以 $V_{CCA}$ 为基准的输出使能(OE)输入电路
- 低功耗
- 闩锁性能(Latch-Up)超过100mA
- B端口提供 $\pm 5\text{kV}$  ESD保护

### 引脚配置

### 顶部视图





## Ball Mapping for UM3302H

|   | 1                | 2                |
|---|------------------|------------------|
| A | B2               | B1               |
| B | GND              | V <sub>CCB</sub> |
| C | V <sub>CCA</sub> | OE               |
| D | A2               | A1               |

Transparent Top View

## Pin Description

| Pin No  |          | Pin Name         | Function                                                                                                |
|---------|----------|------------------|---------------------------------------------------------------------------------------------------------|
| UM3302H | UM3302M8 |                  |                                                                                                         |
| A1      | 1        | B2               | Input/Output B. Referenced to V <sub>CCB</sub>                                                          |
| B1      | 2        | GND              | Ground                                                                                                  |
| C1      | 3        | V <sub>CCA</sub> | A-Port Supply Voltage.<br>1.2V ≤ V <sub>CCA</sub> ≤ 3.6V and V <sub>CCA</sub> ≤ V <sub>CCB</sub>        |
| D1      | 4        | A2               | Input/Output A. Referenced to V <sub>CCA</sub>                                                          |
| D2      | 5        | A1               | Input/Output A. Referenced to V <sub>CCA</sub>                                                          |
| C2      | 6        | OE               | 3-State Output Enable. Pull OE low to place all outputs in 3-state mode. Referenced to V <sub>CCA</sub> |
| B2      | 7        | V <sub>CCB</sub> | B-Port Supply Voltage. 1.65V ≤ V <sub>CCB</sub> ≤ 5.5V                                                  |
| A2      | 8        | B1               | Input/Output B. Referenced to V <sub>CCB</sub>                                                          |

## Ordering Information

| Part Number | Packaging Type   | Marking Code | Shipping Qty                  |
|-------------|------------------|--------------|-------------------------------|
| UM3302H     | CSP8 1.90 × 0.90 | EBB          | 3000pcs/7Inch<br>Tape & Reel  |
| UM3302M8    | MSOP8            | 3302         | 4000pcs/13Inch<br>Tape & Reel |

## Absolute Maximum Ratings (Note 1)

Over operating free-air temperature range (unless otherwise noted)

| Symbol    | Parameter                                                                             | Value        | Unit                      |
|-----------|---------------------------------------------------------------------------------------|--------------|---------------------------|
| $V_{CCA}$ | Supply Voltage Range                                                                  | -0.5 to +4.5 | V                         |
| $V_{CCB}$ | Supply Voltage Range                                                                  | -0.5 to +6.5 | V                         |
| $V_I$     | Input Voltage Range (Note 2)                                                          | A Port       | -0.5 to +4.5              |
|           |                                                                                       | B Port       | -0.5 to +6.5              |
| $V_O$     | Voltage Range Applied to Any Output in the High-Impedance or Power-Off State (Note 2) | A Port       | -0.5 to +4.5              |
|           |                                                                                       | B Port       | -0.5 to +6.5              |
| $V_O$     | Voltage Range Applied to Any Output in the High or Low State (Note 2, 3)              | A Port       | -0.5 to ( $V_{CCA}+0.5$ ) |
|           |                                                                                       | B Port       | -0.5 to ( $V_{CCB}+0.5$ ) |
| $I_{IK}$  | Input Clamp Current                                                                   | $V_I < 0$    | -50                       |
| $I_{OK}$  | Output Clamp Current                                                                  | $V_O < 0$    | -50                       |
| $I_O$     | Continuous Output Current                                                             |              | $\pm 50$                  |
|           | Continuous Current through $V_{CCA}$ , $V_{CCB}$ , or GND                             |              | $\pm 100$                 |
| $T_{OP}$  | Operating Temperature Range                                                           |              | -40 to +85                |
| $T_{STG}$ | Storage Temperature Range                                                             |              | -65 to +150               |

Note 1: Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

Note 2: The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.

Note 3: The value of  $V_{CCA}$  and  $V_{CCB}$  are provided in the recommended operating conditions table.

## Recommended Operating Conditions (Note 1, 2)

| Symbol              | Parameter                                                                    | $V_{CCA}$     | $V_{CCB}$    | Min            | Max                             | Unit                  |
|---------------------|------------------------------------------------------------------------------|---------------|--------------|----------------|---------------------------------|-----------------------|
| $V_{CCA}$           | Supply Voltage                                                               |               |              | 1.2            | 3.6                             | V                     |
| $V_{CCB}$           |                                                                              |               |              | 1.65           | 5.5                             | V                     |
| $V_{IH}$            | High Level Input Voltage                                                     | Data Inputs   | 1.2V to 3.6V | 1.65V to 5.5V  | $V_{CCI} \times 0.65^{(Note3)}$ | $V_{CCI}$             |
|                     |                                                                              | OE Input      | 1.2V to 3.6V | 1.65V to 5.5V  | $V_{CCA} \times 0.65$           | 5.5                   |
| $V_{IL}$            | Low Level Input Voltage                                                      | Data Inputs   | 1.2V to 3.6V | 1.65V to 5.5V  | 0                               | $V_{CCI} \times 0.35$ |
|                     |                                                                              | OE Input      | 1.2V to 3.6V | 1.65V to 5.5V  | 0                               | $V_{CCA} \times 0.35$ |
| $V_O$               | Voltage Range Applied to Any Output in the High-Impedance or Power Off State | A Port        | 1.2V to 3.6V | 1.65V to 5.5V  | 0                               | 3.6                   |
|                     |                                                                              | B Port        |              |                | 0                               | 5.5                   |
| $\Delta t/\Delta V$ | Input Transition Rise or Fall Time                                           | A-Port Inputs | 1.2V to 3.6V | 1.65V to 5.5V  | 40                              | ns/V                  |
|                     |                                                                              | B-Port Inputs | 1.2V to 3.6V | 1.65V to 1.95V | 40                              |                       |
|                     |                                                                              |               |              | 4.5V to 5.5V   | 30                              |                       |

Note 1. The A and B sides of an unused data I/O pair must be held in the same state, i.e., both at  $V_{CCI}$  or both at GND.

Note 2.  $V_{CCA}$  must be less than or equal to  $V_{CCB}$  and must not exceed 3.6 V.

Note 3.  $V_{CCI}$  is the supply voltage associated with the input port.

## Electrical Characteristics (Note 1, 2)

Over recommended operating free-air temperature range (unless otherwise noted)

| Parameter                          |             | Test Conditions                                                    | V <sub>CCA</sub> | V <sub>CCB</sub> | T <sub>A</sub> =25 °C |     | -40 °C to 85 °C       |     | Unit |
|------------------------------------|-------------|--------------------------------------------------------------------|------------------|------------------|-----------------------|-----|-----------------------|-----|------|
|                                    |             |                                                                    |                  |                  | Min                   | Max | Min                   | Max |      |
| V <sub>OHA</sub>                   |             | I <sub>OH</sub> =-20μA                                             | 1.2V             |                  | 1.1                   |     |                       |     | V    |
|                                    |             |                                                                    | 1.4V to 3.6V     |                  |                       |     | V <sub>CCA</sub> -0.4 |     |      |
| V <sub>OLA</sub>                   |             | I <sub>OL</sub> =20μA                                              | 1.2V             |                  | 0.9                   |     |                       |     | V    |
|                                    |             |                                                                    | 1.4V to 3.6V     |                  |                       |     |                       | 0.4 |      |
| V <sub>OHB</sub>                   |             | I <sub>OH</sub> =-20μA                                             |                  | 1.65V to 5.5V    |                       |     | V <sub>CCB</sub> -0.4 |     | V    |
| V <sub>OLB</sub>                   |             | I <sub>OL</sub> =20μA                                              |                  | 1.65V to 5.5V    |                       |     |                       | 0.4 | V    |
| I <sub>I</sub>                     | OE          | V <sub>I</sub> =V <sub>CCI</sub> or GND                            | 1.2V to 3.6V     | 1.65V to 5.5V    |                       | ±1  |                       | ±2  | μA   |
| I <sub>off</sub>                   | A Port      | V <sub>I</sub> or V <sub>O</sub> =0 to 3.6V                        | 0V               | 0V to 5.5V       |                       | ±1  |                       | ±2  | μA   |
|                                    | B Port      | V <sub>I</sub> or V <sub>O</sub> =0 to 5.5V                        | 0V to 3.6V       | 0V               |                       | ±1  |                       | ±2  |      |
| I <sub>OZ</sub>                    | A or B Port | OE=GND                                                             | 1.2V to 3.6V     | 1.65V to 5.5V    |                       | ±1  |                       | ±2  | μA   |
| I <sub>CCA</sub>                   |             | V <sub>I</sub> =V <sub>CCI</sub> or GND, I <sub>O</sub> =0         | 1.2V             | 1.65V to 5.5V    | 0.06                  |     |                       |     | μA   |
|                                    |             |                                                                    | 1.4V to 3.6V     | 1.65V to 5.5V    |                       |     |                       | 3   |      |
|                                    |             |                                                                    | 3.6V             | 0V               |                       |     |                       | 2   |      |
|                                    |             |                                                                    | 0V               | 5.5V             |                       |     |                       | -2  |      |
| I <sub>CCB</sub>                   |             | V <sub>I</sub> =V <sub>CCI</sub> or GND, I <sub>O</sub> =0         | 1.2V             | 1.65V to 5.5V    | 3.4                   |     |                       |     | μA   |
|                                    |             |                                                                    | 1.4V to 3.6V     | 1.65V to 5.5V    |                       |     |                       | 5   |      |
|                                    |             |                                                                    | 3.6V             | 0V               |                       |     |                       | -2  |      |
|                                    |             |                                                                    | 0V               | 5.5V             |                       |     |                       | 2   |      |
| I <sub>CCA</sub> +I <sub>CCB</sub> |             | V <sub>I</sub> =V <sub>CCI</sub> or GND, I <sub>O</sub> =0         | 1.2V             | 1.65V to 5.5V    | 3.5                   |     |                       |     | μA   |
|                                    |             |                                                                    | 1.4V to 3.6V     | 1.65V to 5.5V    |                       |     |                       | 8   |      |
| I <sub>CCZA</sub>                  |             | V <sub>I</sub> =V <sub>CCI</sub> or GND, I <sub>O</sub> =0, OE=GND | 1.2V             | 1.65V to 5.5V    | 0.05                  |     |                       |     | μA   |
|                                    |             |                                                                    | 1.4V to 3.6V     | 1.65V to 5.5V    |                       |     |                       | 3   |      |
| I <sub>CCZB</sub>                  |             | V <sub>I</sub> =V <sub>CCI</sub> or GND, I <sub>O</sub> =0, OE=GND | 1.2V             | 1.65V to 5.5V    | 3.3                   |     |                       |     | μA   |
|                                    |             |                                                                    | 1.4V to 3.6V     | 1.65V to 5.5V    |                       |     |                       | 5   |      |
| C <sub>i</sub>                     | OE          |                                                                    | 1.2V to 3.6V     | 1.65V to 5.5V    | 2.5                   |     |                       | 3   | pF   |
| C <sub>iO</sub>                    | A Port      |                                                                    | 1.2V to 3.6V     | 1.65V to 5.5V    | 5                     |     |                       | 6   | pF   |
|                                    | B Port      |                                                                    |                  |                  | 11                    |     |                       | 14  |      |

Note 1. V<sub>CCI</sub> is the supply voltage associated with the input port.

Note 2. V<sub>CCO</sub> is the supply voltage associated with the output port.

## Switching Characteristics

$T_A = +25^\circ\text{C}$ ,  $V_{CCA} = 1.2\text{V}$

| Parameter        | From<br>(Input)           | To<br>(Output) | $V_{CCB} = 1.8\text{V}$ | $V_{CCB} = 2.5\text{V}$ | $V_{CCB} = 3.3\text{V}$ | $V_{CCB} = 5\text{V}$ | Unit          |
|------------------|---------------------------|----------------|-------------------------|-------------------------|-------------------------|-----------------------|---------------|
|                  |                           |                | Typ                     | Typ                     | Typ                     | Typ                   |               |
| $t_{pd}$         | A                         | B              | 7                       | 6                       | 5.3                     | 5.5                   | ns            |
|                  | B                         | A              | 7.5                     | 6.5                     | 6                       | 6                     |               |
| $t_{en}$         | OE                        | A              | 1                       | 1                       | 1                       | 1                     | $\mu\text{s}$ |
|                  |                           | B              | 1                       | 1                       | 1                       | 1                     |               |
| $t_{dis}$        | OE                        | A              | 18                      | 16                      | 14                      | 14                    | ns            |
|                  |                           | B              | 19                      | 17                      | 15                      | 15                    |               |
| $t_{rA}, t_{fA}$ | A Port Rise and Fall Time |                | 5                       | 5                       | 5                       | 5                     | ns            |
| $t_{rB}, t_{fB}$ | B Port Rise and Fall Time |                | 2.5                     | 1.5                     | 1.2                     | 1                     | ns            |
| $t_{SK(O)}$      | Channel-to-Channel        |                | 0.5                     | 0.5                     | 0.5                     | 1.5                   | ns            |
| Max Data Rate    |                           |                | 20                      | 20                      | 20                      | 20                    | Mbps          |

## Switching Characteristics

Over recommended operating free-air temperature range,  $V_{CCA} = 1.5\text{V} \pm 0.1\text{V}$  (unless otherwise noted)

| Parameter        | From<br>(Input)           | To<br>(Output) | $V_{CCB} = 1.8\text{V} \pm 0.15\text{V}$ |     | $V_{CCB} = 2.5\text{V} \pm 0.2\text{V}$ |     | $V_{CCB} = 3.3\text{V} \pm 0.3\text{V}$ |     | $V_{CCB} = 5\text{V} \pm 0.5\text{V}$ |     | Unit          |
|------------------|---------------------------|----------------|------------------------------------------|-----|-----------------------------------------|-----|-----------------------------------------|-----|---------------------------------------|-----|---------------|
|                  |                           |                | Min                                      | Max | Min                                     | Max | Min                                     | Max | Min                                   | Max |               |
| $t_{pd}$         | A                         | B              | 2                                        | 15  | 1.2                                     | 11  | 1.1                                     | 10  | 1                                     | 10  | ns            |
|                  | B                         | A              | 1                                        | 15  | 0.9                                     | 12  | 0.5                                     | 12  | 0.3                                   | 13  |               |
| $t_{en}$         | OE                        | A              |                                          | 1   |                                         | 1   |                                         | 1   |                                       | 1   | $\mu\text{s}$ |
|                  |                           | B              |                                          | 1   |                                         | 1   |                                         | 1   |                                       | 1   |               |
| $t_{dis}$        | OE                        | A              | 6                                        | 30  | 5.5                                     | 28  | 5.5                                     | 25  | 5.5                                   | 23  | ns            |
|                  |                           | B              | 5.5                                      | 30  | 5                                       | 25  | 5                                       | 20  | 5                                     | 20  |               |
| $t_{rA}, t_{fA}$ | A Port Rise and Fall Time |                | 1.5                                      | 5.0 | 1.5                                     | 5.0 | 1.5                                     | 5.0 | 1.5                                   | 5.0 | ns            |
| $t_{rB}, t_{fB}$ | B Port Rise and Fall Time |                | 0.9                                      | 4.5 | 0.6                                     | 3.5 | 0.5                                     | 3   | 0.4                                   | 2.5 | ns            |
| $t_{SK(O)}$      | Channel-to-Channel        |                |                                          | 0.5 |                                         | 0.5 |                                         | 0.5 |                                       | 0.5 | ns            |
| Max Data Rate    |                           |                | 40                                       |     | 40                                      |     | 40                                      |     | 40                                    |     | Mbps          |

## Switching Characteristics

Over recommended operating free-air temperature range,  $V_{CCA}=1.8V \pm 0.15V$  (unless otherwise noted)

| Parameter        | From (Input)              | To (Output) | $V_{CCB}=1.8V \pm 0.15V$ |     | $V_{CCB}=2.5V \pm 0.2V$ |     | $V_{CCB}=3.3V \pm 0.3V$ |      | $V_{CCB}=5V \pm 0.5V$ |      | Unit    |
|------------------|---------------------------|-------------|--------------------------|-----|-------------------------|-----|-------------------------|------|-----------------------|------|---------|
|                  |                           |             | Min                      | Max | Min                     | Max | Min                     | Max  | Min                   | Max  |         |
| $t_{pd}$         | A                         | B           | 1.6                      | 10  | 1.4                     | 9   | 1.3                     | 7    | 1.2                   | 6.5  | ns      |
|                  | B                         | A           | 1.5                      | 12  | 1.3                     | 8.5 | 1                       | 8    | 0.9                   | 8    |         |
| $t_{en}$         | OE                        | A           |                          | 1   |                         | 1   |                         | 1    |                       | 1    | $\mu s$ |
|                  |                           | B           |                          | 1   |                         | 1   |                         | 1    |                       | 1    |         |
| $t_{dis}$        | OE                        | A           | 6                        | 34  | 5.5                     | 23  | 5                       | 20   | 5                     | 17.6 | ns      |
|                  |                           | B           | 5.5                      | 33  | 4.5                     | 22  | 4.2                     | 16.8 | 4.4                   | 16.3 |         |
| $t_{rA}, t_{fA}$ | A Port Rise and Fall Time |             | 1                        | 4.2 | 1.1                     | 4.0 | 1.1                     | 4.0  | 1.1                   | 4.0  | ns      |
| $t_{rB}, t_{fB}$ | B Port Rise and Fall Time |             | 0.9                      | 4   | 0.6                     | 3.2 | 0.5                     | 2.8  | 0.4                   | 2.8  | ns      |
| $t_{SK(O)}$      | Channel-to-Channel        |             |                          | 0.5 |                         | 0.5 |                         | 0.5  |                       | 0.5  | ns      |
| Max Data Rate    |                           |             | 60                       |     | 60                      |     | 60                      |      | 60                    |      | Mbps    |

## Switching Characteristics

Over recommended operating free-air temperature range,  $V_{CCA}=2.5V \pm 0.2V$  (unless otherwise noted)

| Parameter        | From (Input)              | To (Output) | $V_{CCB}=2.5V \pm 0.2V$ |     | $V_{CCB}=3.3V \pm 0.3V$ |      | $V_{CCB}=5V \pm 0.5V$ |      | Unit    |
|------------------|---------------------------|-------------|-------------------------|-----|-------------------------|------|-----------------------|------|---------|
|                  |                           |             | Min                     | Max | Min                     | Max  | Min                   | Max  |         |
| $t_{pd}$         | A                         | B           | 1.1                     | 6.5 | 1                       | 5.2  | 0.9                   | 5    | ns      |
|                  | B                         | A           | 1.2                     | 6.6 | 1.1                     | 5.1  | 0.9                   | 4.4  |         |
| $t_{en}$         | OE                        | A           |                         | 1   |                         | 1    |                       | 1    | $\mu s$ |
|                  |                           | B           |                         | 1   |                         | 1    |                       | 1    |         |
| $t_{dis}$        | OE                        | A           | 5.0                     | 23  | 4.6                     | 15.2 | 4.6                   | 13   | ns      |
|                  |                           | B           | 4.4                     | 22  | 3.8                     | 16   | 3.9                   | 13.3 |         |
| $t_{rA}, t_{fA}$ | A Port Rise and Fall Time |             | 0.8                     | 3   | 0.8                     | 3    | 0.8                   | 3    | ns      |
| $t_{rB}, t_{fB}$ | B Port Rise and Fall Time |             | 0.7                     | 2.7 | 0.5                     | 2.8  | 0.4                   | 2.7  | ns      |
| $t_{SK(O)}$      | Channel-to-Channel        |             |                         | 0.5 |                         | 0.5  |                       | 0.5  | ns      |
| Max Data Rate    |                           |             | 100                     |     | 100                     |      | 100                   |      | Mbps    |

## Switching Characteristics

Over recommended operating free-air temperature range,  $V_{CCA}=3.3V\pm0.3V$  (unless otherwise noted)

| Parameter        | From<br>(Input)           | To<br>(Output) | $V_{CCB}=3.3V\pm0.3V$ |     | $V_{CCB}=5V\pm0.5V$ |      | Unit    |
|------------------|---------------------------|----------------|-----------------------|-----|---------------------|------|---------|
|                  |                           |                | Min                   | Max | Min                 | Max  |         |
| $t_{pd}$         | A                         | B              | 0.9                   | 5   | 0.8                 | 4    | ns      |
|                  | B                         | A              | 1                     | 5.1 | 0.9                 | 4    |         |
| $t_{en}$         | OE                        | A              |                       | 1   |                     | 1    | $\mu s$ |
|                  |                           | B              |                       | 1   |                     | 1    |         |
| $t_{dis}$        | OE                        | A              | 5                     | 15  | 4                   | 13   | ns      |
|                  |                           | B              | 4                     | 16  | 3.4                 | 13.8 |         |
| $t_{rA}, t_{fA}$ | A Port Rise and Fall Time |                | 0.7                   | 2.5 | 0.7                 | 2.5  | ns      |
| $t_{rB}, t_{fB}$ | B Port Rise and Fall Time |                | 0.5                   | 2.1 | 0.4                 | 2.8  | ns      |
| $t_{SK(O)}$      | Channel-to-Channel        |                |                       | 0.5 |                     | 0.5  | ns      |
| Max Data Rate    |                           |                | 100                   |     | 100                 |      | Mbps    |

## Operating Characteristics

$T_A=+25^\circ C$

| Parameter        |                               | Test Conditions                                                                               | V <sub>CCB</sub> |      |      |      |      |      |            | Unit |
|------------------|-------------------------------|-----------------------------------------------------------------------------------------------|------------------|------|------|------|------|------|------------|------|
|                  |                               |                                                                                               | 5V               | 1.8V | 1.8V | 1.8V | 2.5V | 5V   | 3.3V to 5V |      |
|                  |                               |                                                                                               | V <sub>CCA</sub> |      |      |      |      |      |            |      |
|                  |                               |                                                                                               | 1.2V             | 1.2V | 1.5V | 1.8V | 2.5V | 2.5V | 3.3V       |      |
|                  |                               |                                                                                               | Typ              | Typ  | Typ  | Typ  | Typ  | Typ  | Typ        |      |
| C <sub>pdA</sub> | A-Port Input<br>B-Port Output | C <sub>L</sub> =0,<br>f=10MHz,<br>t <sub>r</sub> =t <sub>f</sub> =1ns,<br>OE=V <sub>CCA</sub> | 9                | 10   | 10   | 10   | 10   | 10   | pF         |      |
|                  | B-Port Input<br>A-Port Output |                                                                                               | 12               | 11   | 11   | 11   | 11   | 11   |            |      |
| C <sub>pdB</sub> | A-Port Input<br>B-Port Output |                                                                                               | 35               | 28   | 28   | 29   | 3.0  | 30   |            | 30   |
|                  | B-Port Input<br>A-Port Output |                                                                                               | 27               | 19   | 19   | 19   | 20   | 21   |            | 23   |
| C <sub>pdA</sub> | A-Port Input<br>B-Port Output | C <sub>L</sub> =0,<br>f=10MHz,<br>t <sub>r</sub> =t <sub>f</sub> =1ns,<br>OE=GND              | 0.01             | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | pF         |      |
|                  | B-Port Input<br>A-Port Output |                                                                                               | 0.01             | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |            | 0.01 |
| C <sub>pdB</sub> | A-Port Input<br>B-Port Output |                                                                                               | 0.01             | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |            | 0.03 |
|                  | B-Port Input<br>A-Port Output |                                                                                               | 0.01             | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |            | 0.05 |

## Applications Information

UM3302 ESD protected level translator provides level shifting necessary to allow data transfer in a multi-voltage system. Externally applied voltages,  $V_{CCA}$  and  $V_{CCB}$  set the logic levels on either side of device. A high voltage signal present on  $V_{CCA}$  side of the device appears as a high voltage logic signal on the  $V_{CCB}$  side of the device, and vice-versa.

## Block Diagram

The UM3302 (block diagram see Figure 1) does not require a direction-control signal to control the direction of data flow from A to B or from B to A. In a dc state, the output drivers of the UM3302 can maintain a high or low, but are designed to be weak, so that they can be overdriven by an external driver when data on the bus starts flowing to the opposite direction.

The output one shot detects rising or falling edges on the A or B ports. During a rising edge, the one shot turns on the PMOS transistors (T1, T3) for a short duration, which speeds up the low-to-high transition. Similarly, during a falling edge, the one shot turns on the NMOS transistors (T2, T4) for a short duration, which speeds up the high-to-low transition.

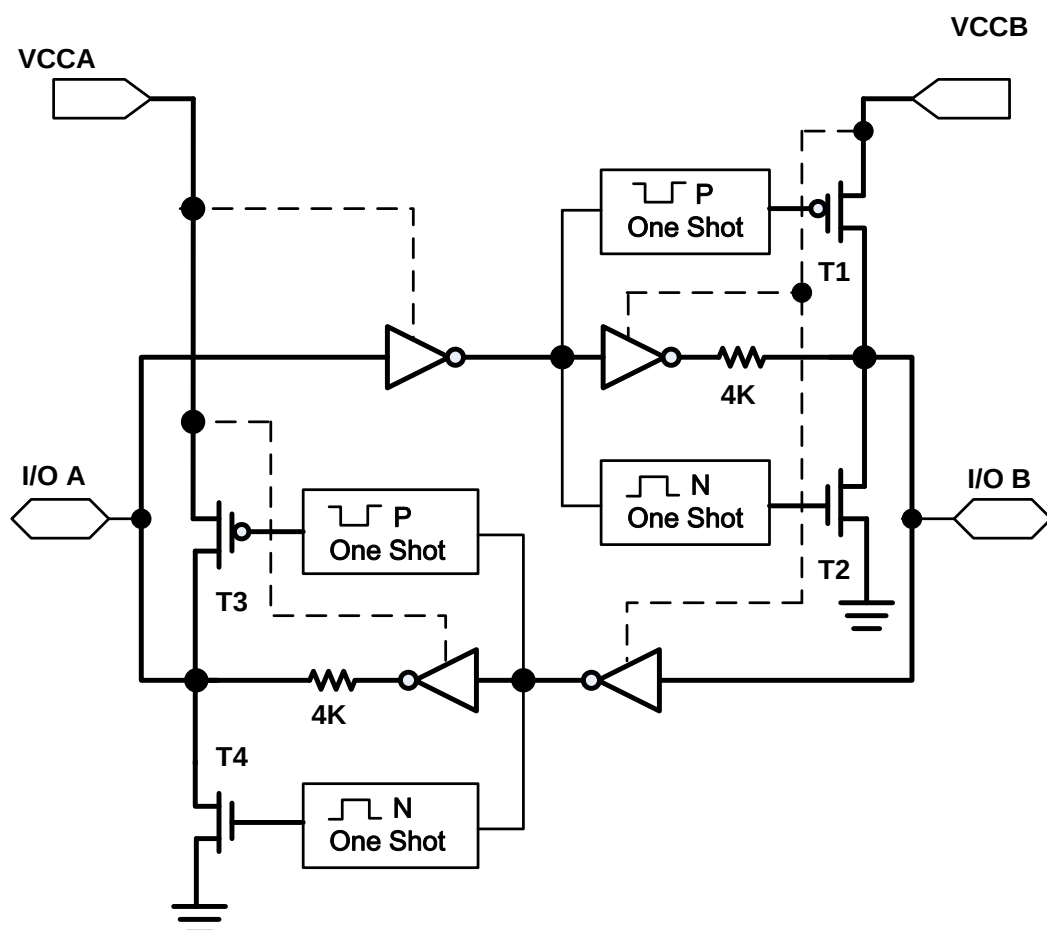
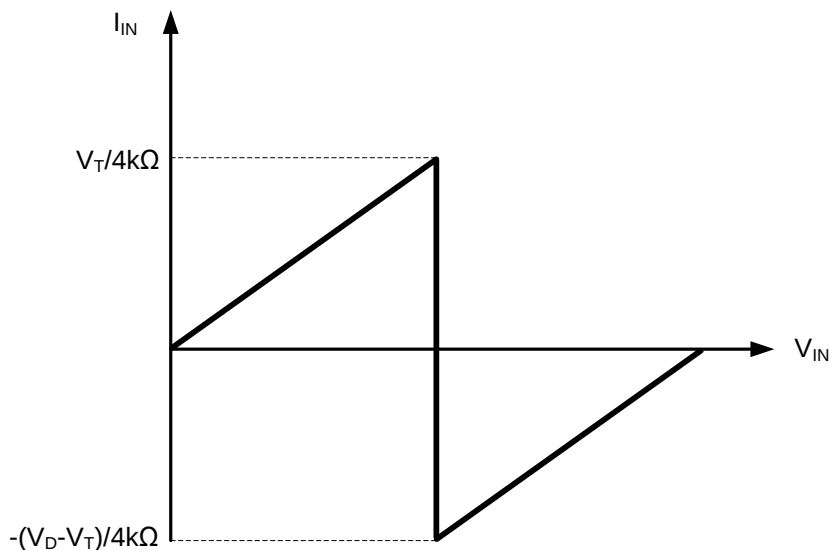


Figure 1 Block Diagram of UM3302 I/O Cell

## Input Driver Requirements

Typical  $I_{IN}$  vs.  $V_{IN}$  characteristics of the UM3302 are shown in Figure 2. For proper operation, the device driving the data I/Os of the UM3302 must have drive strength of at least  $\pm 2\text{mA}$ .



- A:  $V_T$  is the input threshold voltage of the UM3302 (typical  $V_{CCI}/2$ ).  
 B:  $V_D$  is the supply voltage of the external driver.

**Figure 2 Typical  $I_{IN}$  vs.  $V_{IN}$  Curve**

## Power Up

During operation, ensure that  $V_{CCA} \leq V_{CCB}$  at all times. During power-up sequencing,  $V_{CCA} \geq V_{CCB}$  does not damage the device, so any power supply can be ramped up first. The UM3302 has circuitry that disables all output ports when either  $V_{CC}$  is switched off ( $V_{CCA/B} = 0\text{ V}$ ).

## Enable and Disable

The UM3302 has an OE input that is used to disable the device by setting OE=low, which places all I/Os in the high-impedance (Hi-Z) state. The disable time ( $t_{dis}$ ) indicates the delay between when OE goes low and when the outputs actually get disabled (Hi-Z). The enable time ( $t_{en}$ ) indicates the amount of time the user must allow for the one-shot circuitry to become operational after OE is taken high.

## Pull-up or Pull-down Resistors on I/O Lines

The UM3302 is designed to drive capacitive loads of up to 50pF. The output drivers of the UM3302H have low dc drive strength. If pull-up or pull-down resistors are connected externally to the data I/Os, their values must be kept higher than 50kΩ to ensure that they do not contend with the output drivers of the UM3302.

For the same reason, the UM3302 should not be used in applications such as I<sup>2</sup>C or 1-Wire where an open-drain driver is connected on the bidirectional data I/O.

## Typical Operating Circuit

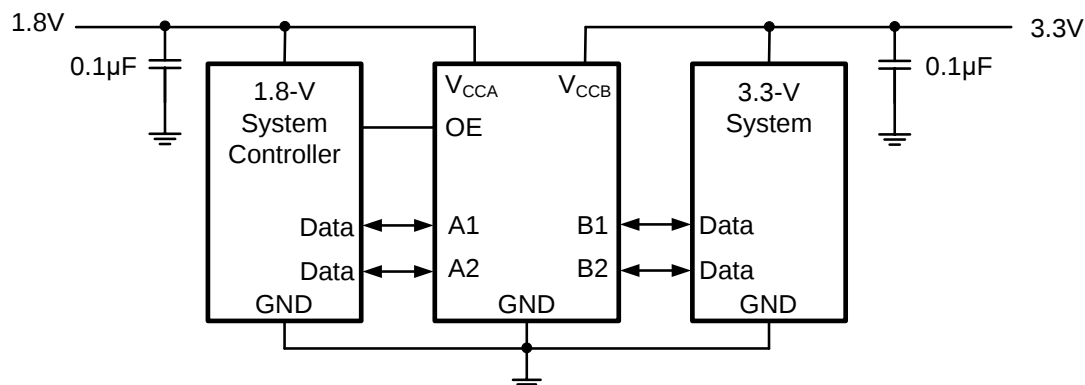
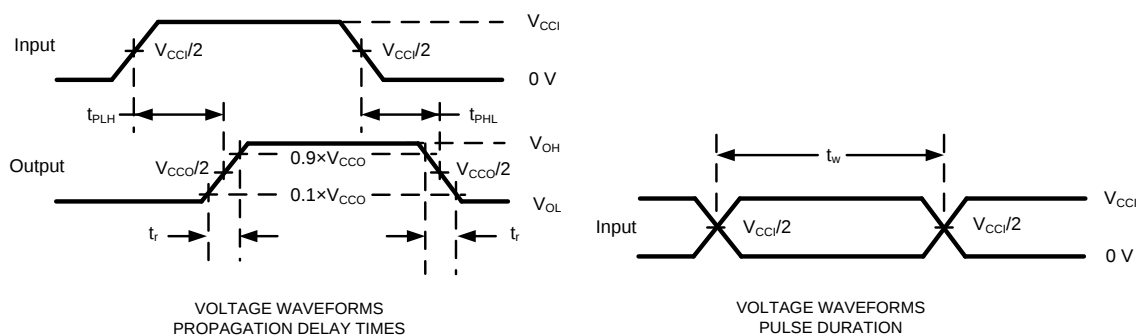
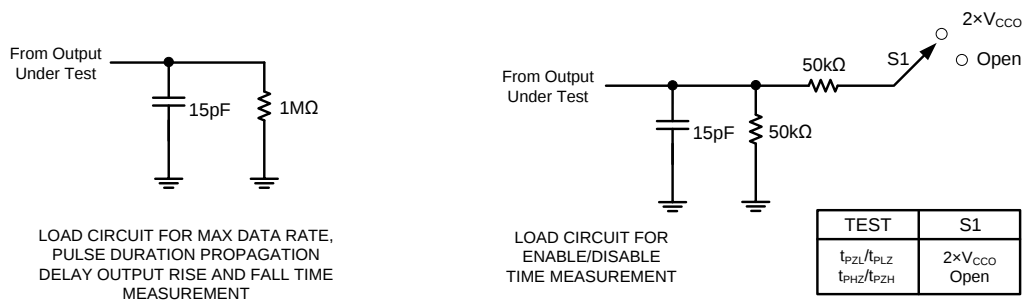


Figure 3 Typical Operating Circuit

## Test Circuits



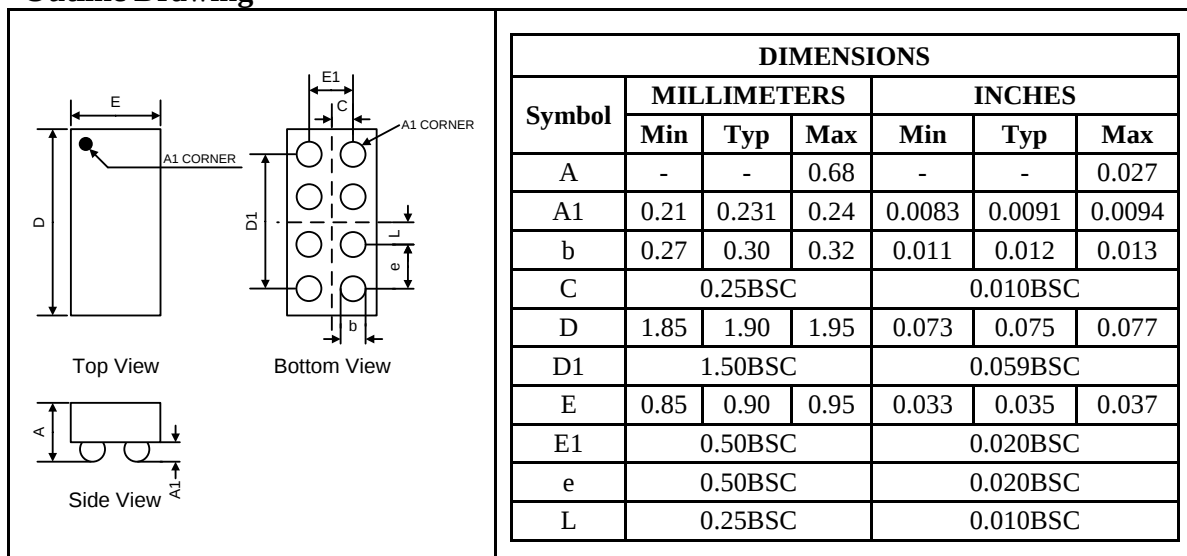
- A.  $C_L$  includes probe and jig capacitance.  
 B. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 10\text{MHz}$ ,  $Z_o = 50\Omega$ ,  $dv/dt \geq 1\text{V/ns}$ .  
 C. The outputs are measured one at a time, with one transition per measurement.  
 D.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .  
 E.  $V_{CCI}$  is the  $V_{CC}$  associated with the input port.  
 F.  $V_{CCO}$  is the  $V_{CC}$  associated with the output port.  
 G. All parameters and waveforms are not applicable to all devices.

Figure 4 Load Circuits and Voltage Waveforms

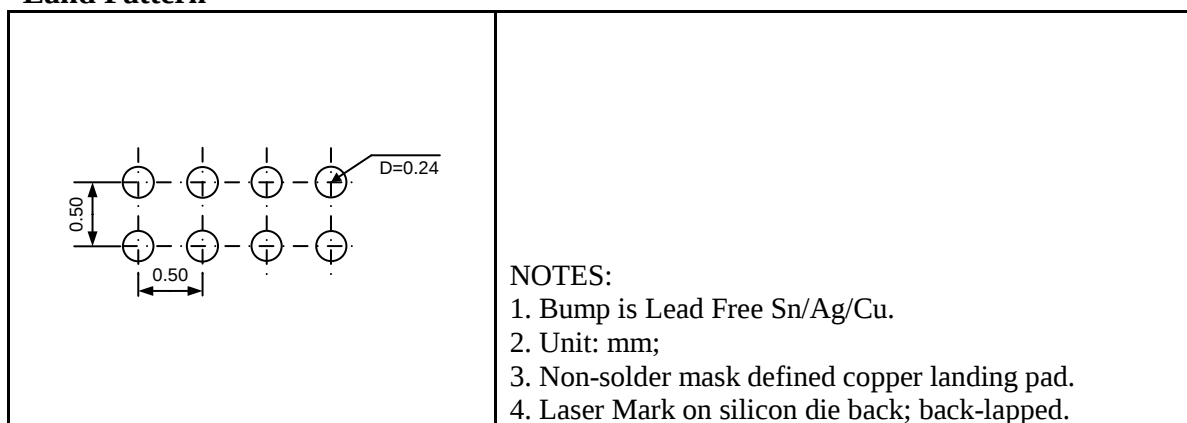
## Package Information

### UM3302H: CSP8 1.90 × 0.90

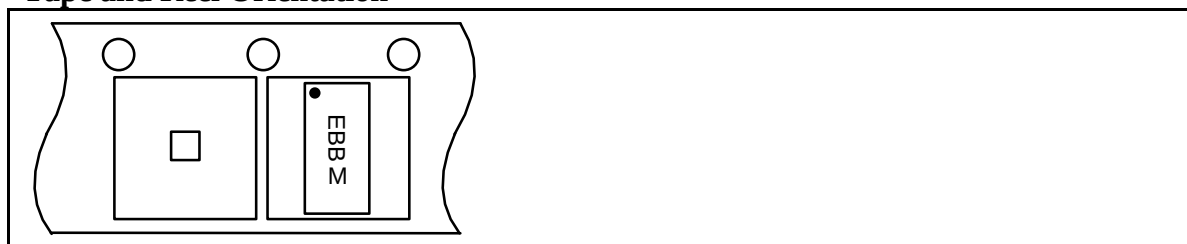
#### Outline Drawing



#### Land Pattern

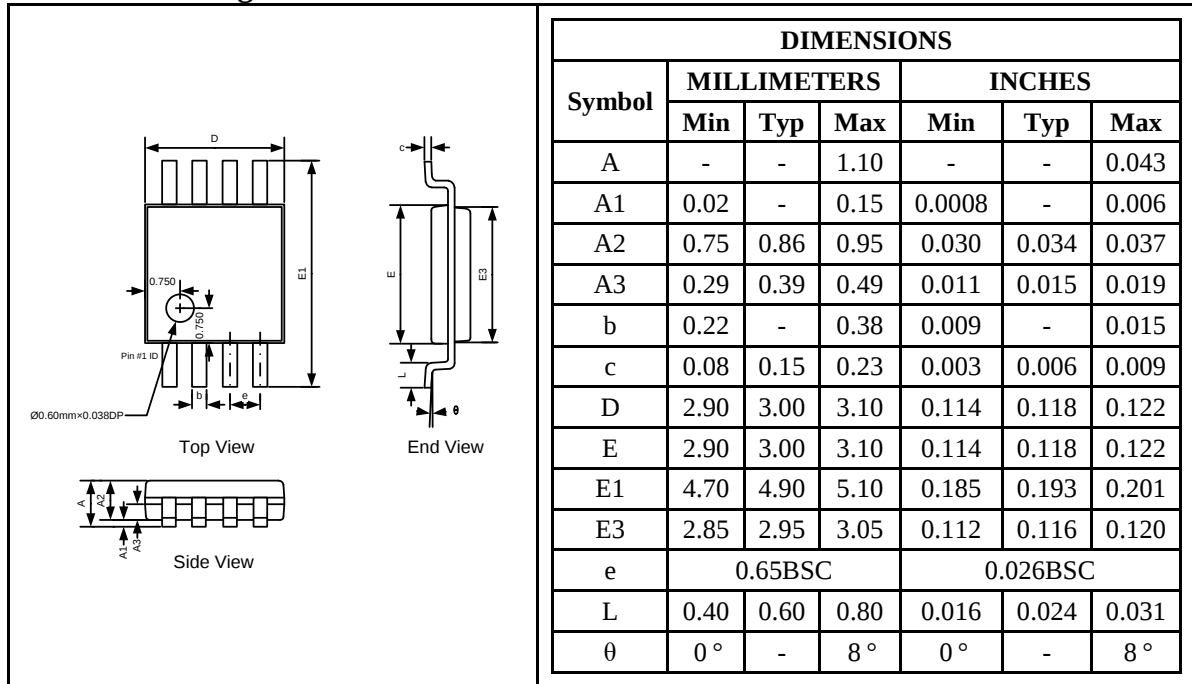


#### Tape and Reel Orientation

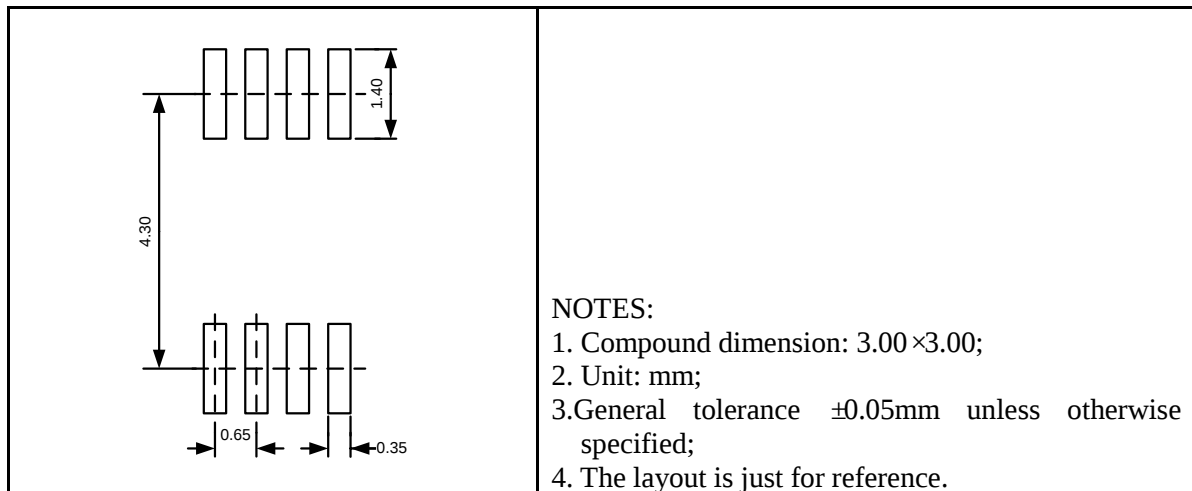


## UM3302M8: MSOP8

### Outline Drawing



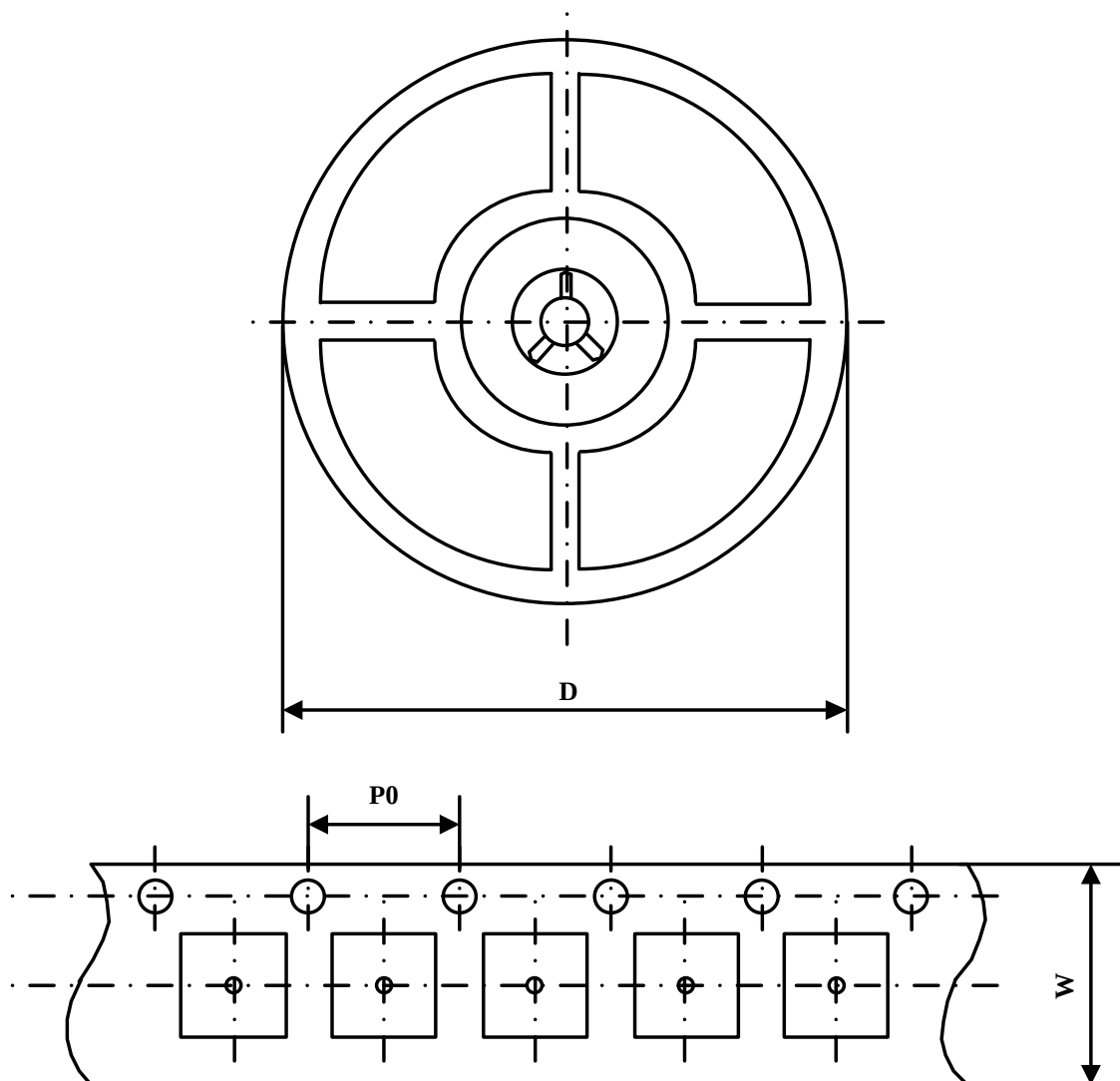
### Land Pattern



### Tape and Reel Orientation



## Packing Information



| Part Number | Package Type   | Carrier Width(W) | Pitch(P0) | Reel Size(D) |
|-------------|----------------|------------------|-----------|--------------|
| UM3302H     | CSP8 1.90×0.90 | 8 mm             | 4 mm      | 180 mm       |
| UM3302M8    | MSOP8          | 12 mm            | 4 mm      | 330 mm       |

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