

### GENERAL DESCRIPTION

The SGM48752 is a CMOS analog multiplexer which consists of two 4-channel multiplexers. It operates from 2.5V to 5.5V single power supply and all digital inputs support 1.8V logic control.

The SGM48752 features low voltage, low on-resistance and low off-leakage current. The high performances make it very suitable for multiple applications, such as cellular phones, audio and video signal routing, etc.

The SGM48752 is available in Green SOIC-16, SSOP-16, TSSOP-16 and TQFN-3×3-16L packages. It operates over an ambient temperature range of -40°C to +85°C.

### FEATURES

- **Single Supply Voltage Range: 2.5V to 5.5V**
- **On-Resistance: 48Ω (TYP) with 5V Supply**
- **Internal A, B Rise Time: 45ns (TYP),  $V_{CC} = 5V$**
- **Internal A, B Fall Time: 50ns (TYP),  $V_{CC} = 5V$**
- **1.8V Logic Compatible**
- **Low On-Resistance Flatness**
- **Low Crosstalk: -110dB ( $f = 1MHz$ )**
- **High Off-Isolation: -83dB ( $R_L = 50\Omega$ ,  $f = 1MHz$ )**
- **Low Off-Leakage Current: 1nA (TYP) at +25°C**
- **Low On-Leakage Current: 1nA (TYP) at +25°C**
- **Low Distortion: 0.7% ( $R_L = 600\Omega$ ,  $f = 20Hz$  to 20kHz)**
- **-40°C to +85°C Operating Temperature Range**
- **Available in Green SOIC-16, SSOP-16, TSSOP-16 and TQFN-3×3-16L Packages**

### APPLICATIONS

Automotive

Portable Equipment

Sample-and-Hold Circuits

Data-Acquisition Systems

Battery-Powered Systems

Audio and Video Signal Routing

## PACKAGE/ORDERING INFORMATION

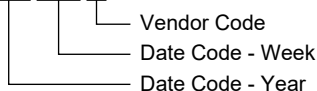
| MODEL    | PACKAGE DESCRIPTION | SPECIFIED TEMPERATURE RANGE | ORDERING NUMBER   | PACKAGE MARKING            | PACKING OPTION      |
|----------|---------------------|-----------------------------|-------------------|----------------------------|---------------------|
| SGM48752 | SOIC-16             | -40°C to +85°C              | SGM48752YS16G/TR  | SGM48752YS16<br>XXXXX      | Tape and Reel, 2500 |
|          | SSOP-16             | -40°C to +85°C              | SGM48752YQS16G/TR | SGM48752<br>YQS16<br>XXXXX | Tape and Reel, 3000 |
|          | TSSOP-16            | -40°C to +85°C              | SGM48752YTS16G/TR | SGM48752<br>YTS16<br>XXXXX | Tape and Reel, 4000 |
|          | TQFN-3×3-16L        | -40°C to +85°C              | SGM48752YTQ16G/TR | 48752TQ<br>XXXXX           | Tape and Reel, 4000 |

## MARKING INFORMATION

NOTE: XXXXX = Date Code and Vendor Code.

SOIC-16/SSOP-16/TSSOP-16/TQFN-3×3-16L

XXXXX



Green (RoHS & HSF): SG Micro Corp defines "Green" to mean Pb-Free (RoHS compatible) and free of halogen substances. If you have additional comments or questions, please contact your SGMICRO representative directly.

## ABSOLUTE MAXIMUM RATINGS

|                                                                          |                              |
|--------------------------------------------------------------------------|------------------------------|
| $V_{CC}$ to GND .....                                                    | -0.3V to 6V                  |
| Voltage into Any Terminal <sup>(1)</sup> .....                           | -0.3V to ( $V_{CC} + 0.3V$ ) |
| Continuous Current into Any Terminal .....                               | $\pm 20mA$                   |
| Peak Current, $X_{-}$ , $Y_{-}$<br>(Pulsed at 1ms, 10% duty cycle) ..... | $\pm 40mA$                   |
| Junction Temperature .....                                               | +150°C                       |
| Storage Temperature Range .....                                          | -65°C to +150°C              |
| Lead Temperature (Soldering, 10s) .....                                  | +260°C                       |
| ESD Susceptibility                                                       |                              |
| HBM .....                                                                | 3000V                        |
| MM .....                                                                 | 200V                         |

NOTE:

1. Voltages exceeding  $V_{CC}$  or GND on any signal terminal are clamped by internal diodes. Limit forward-diode current to maximum current rating.

## RECOMMENDED OPERATING CONDITIONS

|                                   |                |
|-----------------------------------|----------------|
| Supply Voltage Range .....        | 2.5V to 5.5V   |
| Operating Temperature Range ..... | -40°C to +85°C |

## OVERSTRESS CAUTION

Stresses beyond those listed in Absolute Maximum Ratings may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect reliability. Functional operation of the device at any conditions beyond those indicated in the Recommended Operating Conditions section is not implied.

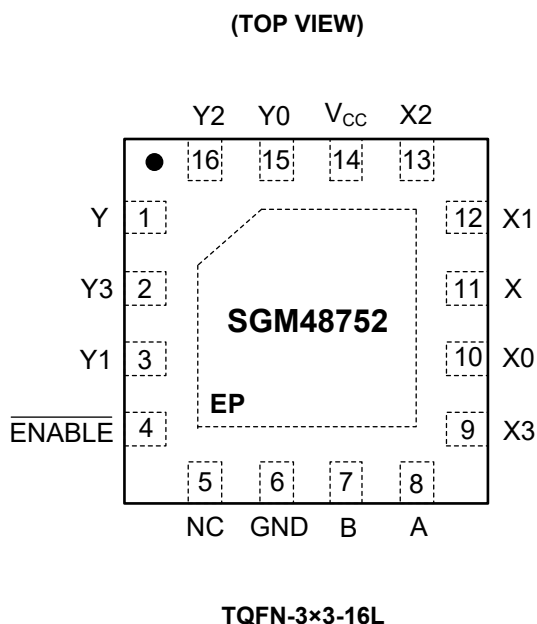
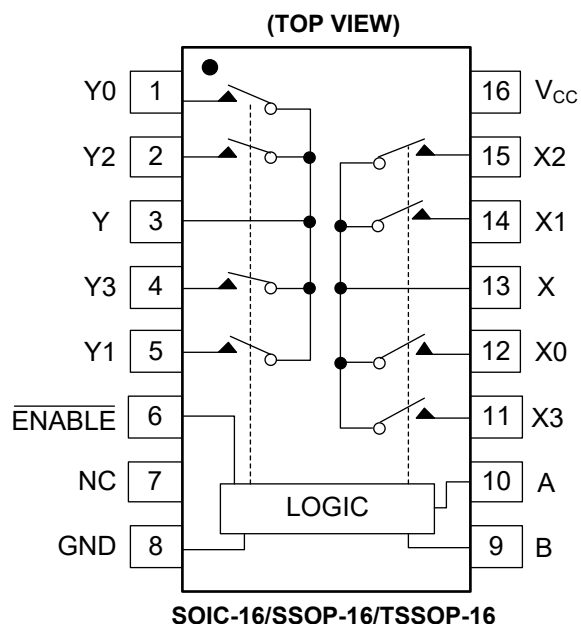
## ESD SENSITIVITY CAUTION

This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because even small parametric changes could cause the device not to meet the published specifications.

## DISCLAIMER

SG Micro Corp reserves the right to make any change in circuit design, or specifications without prior notice.

## PIN CONFIGURATIONS



## PIN DESCRIPTION

| PIN                      |               | NAME            | FUNCTION                                               |
|--------------------------|---------------|-----------------|--------------------------------------------------------|
| SOIC-16/SSOP-16/TSSOP-16 | TQFN-3x3-16L  |                 |                                                        |
| 1, 5, 2, 4               | 15, 3, 16, 2  | Y0, Y1, Y2, Y3  | Analog Switch "Y" Inputs 0-3.                          |
| 3                        | 1             | Y               | Analog Switch "Y" Output Pin.                          |
| 6                        | 4             | ENABLE          | Digital Enable Control Pin. Normally connected to GND. |
| 7                        | 5             | NC              | No Connect.                                            |
| 8                        | 6             | GND             | Ground. Connect to digital ground.                     |
| 9                        | 7             | B               | Digital Address "B" Input Pin.                         |
| 10                       | 8             | A               | Digital Address "A" Input Pin.                         |
| 12, 14, 15, 11           | 10, 12, 13, 9 | X0, X1, X2, X3  | Analog Switch "X" Inputs 0-3.                          |
| 13                       | 11            | X               | Analog Switch "X" Output Pin.                          |
| 16                       | 14            | V <sub>CC</sub> | Positive Analog and Digital Supply Voltage Input Pin.  |
| —                        | Exposed Pad   | EP              | Exposed Pad. Connect exposed pad to GND.               |

## NOTE:

Any input terminal can be used as an output terminal, and any output terminal can also be used as an input terminal. Signal transmission in both directions is equally well.

## FUNCTION TABLE

| ENABLE INPUT | SELECT INPUTS |   | ON SWITCHES       |
|--------------|---------------|---|-------------------|
|              | B             | A |                   |
| H            | X             | X | All Switches Open |
| L            | L             | L | X-X0, Y-Y0        |
| L            | L             | H | X-X1, Y-Y1        |
| L            | H             | L | X-X2, Y-Y2        |
| L            | H             | H | X-X3, Y-Y3        |

X = Don't care.

## ELECTRICAL CHARACTERISTICS

(V<sub>CC</sub> = 5.0V, Full = -40°C to +85°C, typical values are at T<sub>A</sub> = +25°C, unless otherwise noted.)

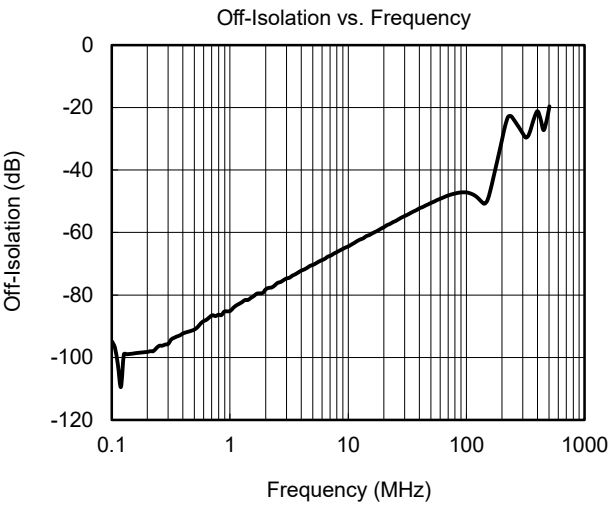
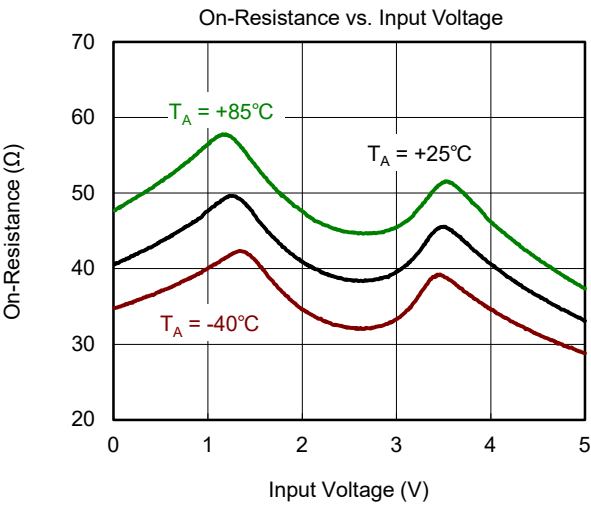
| PARAMETER                                           | SYMBOL                                                               | CONDITIONS                                                                                                     | TEMP  | MIN | TYP   | MAX             | UNITS |
|-----------------------------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|-------|-----|-------|-----------------|-------|
| <b>Analog Switch</b>                                |                                                                      |                                                                                                                |       |     |       |                 |       |
| Analog Signal Range                                 | V <sub>X</sub> , V <sub>Y</sub> ,<br>V <sub>X</sub> , V <sub>Y</sub> |                                                                                                                | Full  | GND |       | V <sub>CC</sub> | V     |
| On-Resistance                                       | R <sub>ON</sub>                                                      | V <sub>CC</sub> = 5.0V, I <sub>X</sub> , I <sub>Y</sub> = 1mA                                                  | +25°C |     | 48    | 58              | Ω     |
|                                                     |                                                                      |                                                                                                                | Full  |     |       | 67              |       |
| On-Resistance Match<br>Between Channels             | ΔR <sub>ON</sub>                                                     | V <sub>CC</sub> = 5.0V, I <sub>X</sub> , I <sub>Y</sub> = 1mA                                                  | +25°C |     | 1.5   | 5               | Ω     |
|                                                     |                                                                      |                                                                                                                | Full  |     |       | 5.3             |       |
| On-Resistance Flatness                              | R <sub>FLAT(ON)</sub>                                                | V <sub>CC</sub> = 5.0V, I <sub>X</sub> = 1mA                                                                   | +25°C |     | 17    | 25              | Ω     |
|                                                     |                                                                      |                                                                                                                | Full  |     |       | 28              |       |
| X <sub>-</sub> , Y <sub>-</sub> Off Leakage Current | I <sub>X(OFF)</sub> , I <sub>Y(OFF)</sub>                            | V <sub>CC</sub> = 5.0V, V <sub>X</sub> , V <sub>Y</sub> = 1V, 4.5V, V <sub>X</sub> , V <sub>Y</sub> = 4.5V, 1V | +25°C |     | 1     | 1000            | nA    |
| X, Y Off Leakage Current                            | I <sub>X(OFF)</sub> , I <sub>Y(OFF)</sub>                            | V <sub>CC</sub> = 5.0V, V <sub>X</sub> , V <sub>Y</sub> = 1V, 4.5V, V <sub>X</sub> , V <sub>Y</sub> = 4.5V, 1V | +25°C |     | 1     | 1000            | nA    |
| X, Y On Leakage Current                             | I <sub>X(ON)</sub> , I <sub>Y(ON)</sub>                              | V <sub>CC</sub> = 5.0V, V <sub>X</sub> , V <sub>Y</sub> = 4.5V, 1V                                             | +25°C |     | 1     | 1000            | nA    |
| <b>Digital I/O</b>                                  |                                                                      |                                                                                                                |       |     |       |                 |       |
| Logic Input Logic Threshold<br>High                 | V <sub>AH</sub> , V <sub>BH</sub> ,<br>V <sub>ENABLE</sub>           |                                                                                                                | +25°C | 1.7 |       |                 | V     |
| Logic Input Logic Threshold<br>Low                  | V <sub>AL</sub> , V <sub>BL</sub> ,<br>V <sub>ENABLE</sub>           |                                                                                                                | +25°C |     |       | 0.5             | V     |
| Input-Current High                                  | I <sub>AH</sub> , I <sub>BH</sub> ,<br>I <sub>ENABLE</sub>           | V <sub>A</sub> , V <sub>B</sub> , V <sub>ENABLE</sub> = V <sub>CC</sub>                                        | +25°C |     | 1     | 1000            | nA    |
| Input-Current Low                                   | I <sub>AL</sub> , I <sub>BL</sub> ,<br>I <sub>ENABLE</sub>           | V <sub>A</sub> , V <sub>B</sub> , V <sub>ENABLE</sub> = 0V                                                     | +25°C |     | 1     | 1000            | nA    |
| <b>Dynamic Characteristics</b>                      |                                                                      |                                                                                                                |       |     |       |                 |       |
| Address Transition Time                             | t <sub>TRANS</sub>                                                   | V <sub>X</sub> , V <sub>Y</sub> = 3V/0V, R <sub>L</sub> = 300Ω, C <sub>L</sub> = 35pF,<br>Test Circuit 1       | +25°C |     | 85    |                 | ns    |
| ENABLE Turn-On Time                                 | t <sub>ON</sub>                                                      | V <sub>X</sub> , V <sub>Y</sub> = 3V, R <sub>L</sub> = 300Ω, C <sub>L</sub> = 35pF, Test Circuit 2             | +25°C |     | 60    |                 | ns    |
| ENABLE Turn-Off Time                                | t <sub>OFF</sub>                                                     | V <sub>X</sub> , V <sub>Y</sub> = 3V, R <sub>L</sub> = 300Ω, C <sub>L</sub> = 35pF, Test Circuit 2             | +25°C |     | 70    |                 | ns    |
| Internal A, B Rise Time                             | t <sub>R</sub>                                                       |                                                                                                                | +25°C |     | 45    |                 | ns    |
| Internal A, B Fall Time                             | t <sub>F</sub>                                                       |                                                                                                                | +25°C |     | 50    |                 | ns    |
| Break-Before-Make Time<br>Delay                     | t <sub>D</sub>                                                       | V <sub>X</sub> , V <sub>Y</sub> = 3V, R <sub>L</sub> = 300Ω, C <sub>L</sub> = 35pF, Test Circuit 3             | +25°C |     | 50    |                 | ns    |
| Charge Injection                                    | Q                                                                    | R <sub>S</sub> = 0Ω, C <sub>L</sub> = 1nF, Test Circuit 4                                                      | +25°C |     | 3     |                 | pC    |
| Off-Isolation                                       | O <sub>ISO</sub>                                                     | R <sub>L</sub> = 50Ω, f = 1MHz, Test Circuit 5                                                                 | +25°C |     | -83   |                 | dB    |
| Channel-to-Channel Crosstalk                        | X <sub>TALK</sub>                                                    | f = 1MHz, Test Circuit 5                                                                                       | +25°C |     | -110  |                 | dB    |
| Input Off-Capacitance                               | C <sub>X(OFF)</sub> ,<br>C <sub>Y(OFF)</sub>                         | f = 1MHz, Test Circuit 6                                                                                       | +25°C |     | 5     |                 | pF    |
| Output Off-Capacitance                              | C <sub>X(OFF)</sub> ,<br>C <sub>Y(OFF)</sub>                         | f = 1MHz, Test Circuit 6                                                                                       | +25°C |     | 9     |                 | pF    |
| Output On-Capacitance                               | C <sub>X(ON)</sub> , C <sub>Y(ON)</sub>                              | f = 1MHz, Test Circuit 6                                                                                       | +25°C |     | 13    |                 | pF    |
| -3dB Bandwidth                                      | BW                                                                   | R <sub>L</sub> = 50Ω                                                                                           | +25°C |     | 180   |                 | MHz   |
| Total Harmonic Distortion                           | THD                                                                  | R <sub>L</sub> = 600Ω, 5V <sub>P-P</sub> , f = 20Hz to 20kHz                                                   | +25°C |     | 0.7   |                 | %     |
| <b>Power Supply</b>                                 |                                                                      |                                                                                                                |       |     |       |                 |       |
| Power Supply Range                                  | V <sub>CC</sub>                                                      |                                                                                                                | Full  | 2.5 |       | 5.5             | V     |
| Power Supply Current                                | I <sub>CC</sub>                                                      | V <sub>A</sub> , V <sub>B</sub> , V <sub>ENABLE</sub> = V <sub>CC</sub> or 0                                   | +25°C |     | 0.001 | 6               | μA    |

**ELECTRICAL CHARACTERISTICS (continued)**(V<sub>CC</sub> = 3.3V, Full = -40°C to +85°C, typical values are at T<sub>A</sub> = +25°C, unless otherwise noted.)

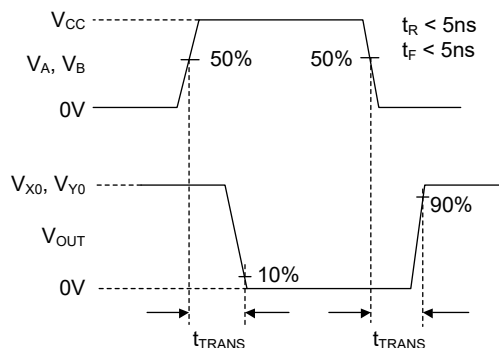
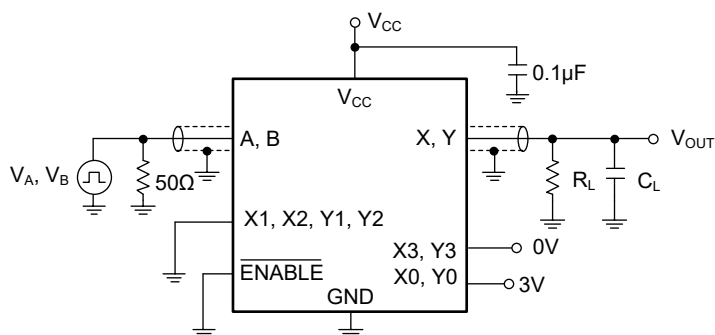
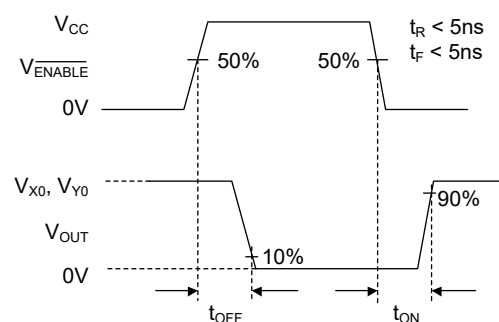
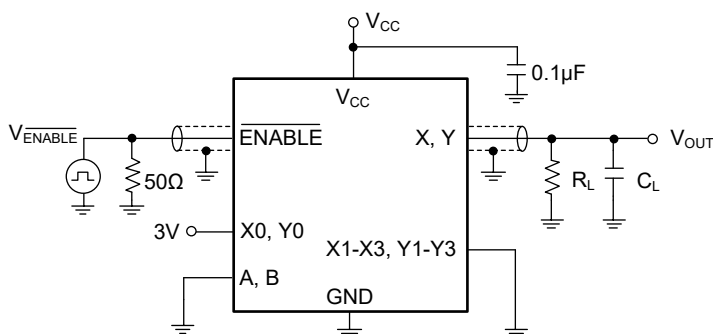
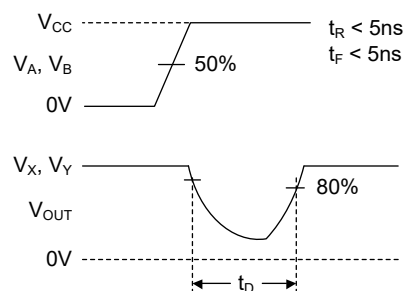
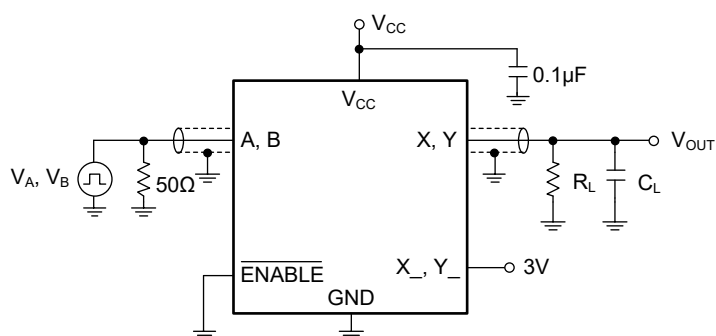
| PARAMETER                                           | SYMBOL                           | CONDITIONS                                                                                              | TEMP  | MIN | TYP   | MAX             | UNITS |
|-----------------------------------------------------|----------------------------------|---------------------------------------------------------------------------------------------------------|-------|-----|-------|-----------------|-------|
| <b>Analog Switch</b>                                |                                  |                                                                                                         |       |     |       |                 |       |
| Analog Signal Range                                 | $V_{X-}, V_{Y-}, V_{X+}, V_{Y+}$ |                                                                                                         | Full  | GND |       | V <sub>CC</sub> | V     |
| On-Resistance                                       | R <sub>ON</sub>                  | I <sub>X</sub> , I <sub>Y</sub> = 1mA                                                                   | +25°C |     | 80    | 110             | Ω     |
|                                                     |                                  |                                                                                                         | Full  |     |       | 116             |       |
| X <sub>-</sub> , Y <sub>-</sub> Off Leakage Current | $I_{X(OFF)}, I_{Y(OFF)}$         | V <sub>X-</sub> , V <sub>Y-</sub> = 1V, 3V, V <sub>X+</sub> , V <sub>Y+</sub> = 3V, 1V                  | +25°C |     | 1     | 1000            | nA    |
| X, Y Off Leakage Current                            | $I_{X(OFF)}, I_{Y(OFF)}$         | V <sub>X-</sub> , V <sub>Y-</sub> = 1V, 3V, V <sub>X+</sub> , V <sub>Y+</sub> = 3V, 1V                  | +25°C |     | 1     | 1000            | nA    |
| X, Y On Leakage Current                             | $I_{X(ON)}, I_{Y(ON)}$           | V <sub>X</sub> , V <sub>Y</sub> = 3V, 1V                                                                | +25°C |     | 1     | 1000            | nA    |
| <b>Digital I/O</b>                                  |                                  |                                                                                                         |       |     |       |                 |       |
| Logic Input Logic Threshold High                    | $V_{AH}, V_{BH}, V_{ENABLE}$     |                                                                                                         | +25°C | 1.7 |       |                 | V     |
| Logic Input Logic Threshold Low                     | $V_{AL}, V_{BL}, V_{ENABLE}$     |                                                                                                         | +25°C |     |       | 0.5             | V     |
| Input-Current High                                  | $I_{AH}, I_{BH}, I_{ENABLE}$     | V <sub>A</sub> , V <sub>B</sub> , V <sub>ENABLE</sub> = V <sub>CC</sub>                                 | +25°C |     | 1     | 1000            | nA    |
| Input-Current Low                                   | $I_{AL}, I_{BL}, I_{ENABLE}$     | V <sub>A</sub> , V <sub>B</sub> , V <sub>ENABLE</sub> = 0V                                              | +25°C |     | 1     | 1000            | nA    |
| <b>Dynamic Characteristics</b>                      |                                  |                                                                                                         |       |     |       |                 |       |
| Address Transition Time                             | t <sub>TRANS</sub>               | V <sub>X-</sub> , V <sub>Y-</sub> = 3V/0V, R <sub>L</sub> = 300Ω, C <sub>L</sub> = 35pF, Test Circuit 1 | +25°C |     | 150   |                 | ns    |
| ENABLE Turn-On Time                                 | t <sub>ON</sub>                  | V <sub>X-</sub> , V <sub>Y-</sub> = 3V, R <sub>L</sub> = 300Ω, C <sub>L</sub> = 35pF, Test Circuit 2    | +25°C |     | 110   |                 | ns    |
| ENABLE Turn-Off Time                                | t <sub>OFF</sub>                 | V <sub>X-</sub> , V <sub>Y-</sub> = 3V, R <sub>L</sub> = 300Ω, C <sub>L</sub> = 35pF, Test Circuit 2    | +25°C |     | 100   |                 | ns    |
| Internal A, B Rise Time                             | t <sub>R</sub>                   |                                                                                                         | +25°C |     | 80    |                 | ns    |
| Internal A, B Fall Time                             | t <sub>F</sub>                   |                                                                                                         | +25°C |     | 85    |                 | ns    |
| Break-Before-Make Time Delay                        | t <sub>D</sub>                   | V <sub>X-</sub> , V <sub>Y-</sub> = 3V, R <sub>L</sub> = 300Ω, C <sub>L</sub> = 35pF, Test Circuit 3    | +25°C |     | 80    |                 | ns    |
| -3dB Bandwidth                                      | BW                               | R <sub>L</sub> = 50Ω                                                                                    | +25°C |     | 180   |                 | MHz   |
| Charge Injection                                    | Q                                | R <sub>S</sub> = 0Ω, C = 1nF, V <sub>S</sub> = 2.5V, Test Circuit 4                                     | +25°C |     | 3     |                 | pC    |
| <b>Power Supply</b>                                 |                                  |                                                                                                         |       |     |       |                 |       |
| Power Supply Current                                | I <sub>CC</sub>                  | V <sub>A</sub> , V <sub>B</sub> , V <sub>ENABLE</sub> = V <sub>CC</sub> or 0                            | +25°C |     | 0.001 | 3               | μA    |

TYPICAL PERFORMANCE CHARACTERISTICS

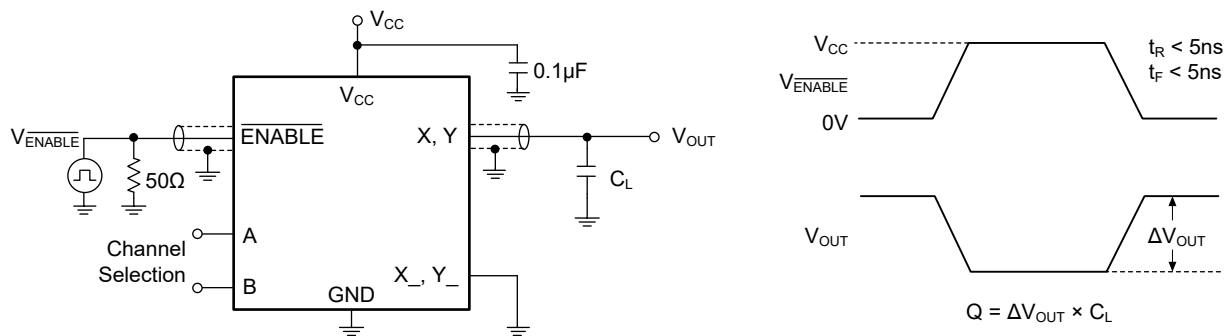
V<sub>CC</sub> = 5.0V, unless otherwise noted.



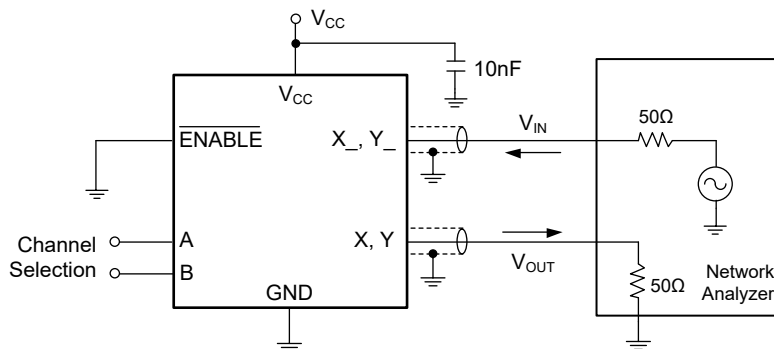
## TEST CIRCUITS

Test Circuit 1. Address Transition Times ( $t_{TRANS}$ )Test Circuit 2. Switching Times ( $t_{ON}$ ,  $t_{OFF}$ )Test Circuit 3. Break-Before-Make Time Delay ( $t_D$ )

## TEST CIRCUITS (continued)



Test Circuit 4. Charge Injection (Q)

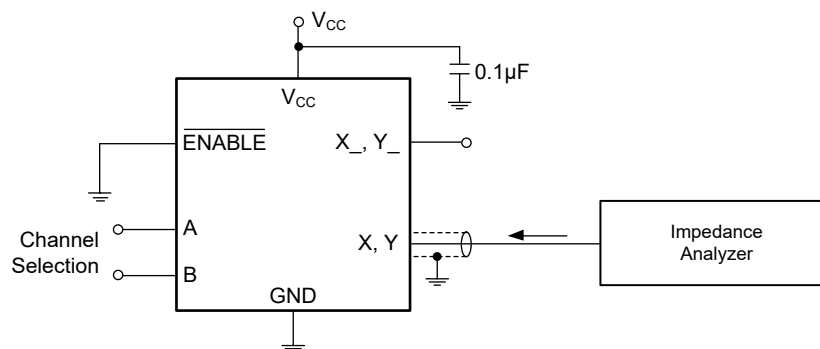


Off-Isolation =  $20\log(V_{OUT}/V_{IN})$  (Measured between X and "OFF"  $X_-$  Terminal on Each Switch)

On Loss =  $20\log(V_{OUT}/V_{IN})$  (Measured between X and "ON"  $X_-$  Terminal on Each Switch)

Channel-to-Channel Crosstalk =  $20\log(V_{OUT}/V_{IN})$  (Measured from One Channel (X, Y) to All other Channels)

Test Circuit 5. Off-Isolation, On Loss and Crosstalk



Test Circuit 6. Capacitance

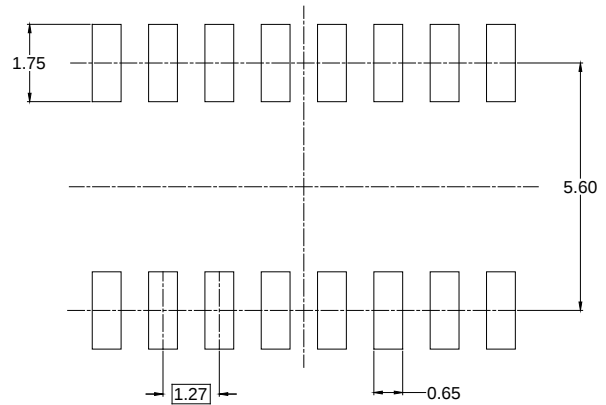
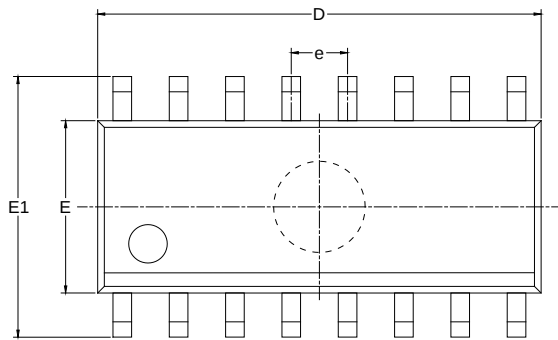
## REVISION HISTORY

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

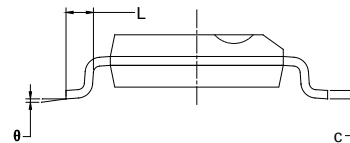
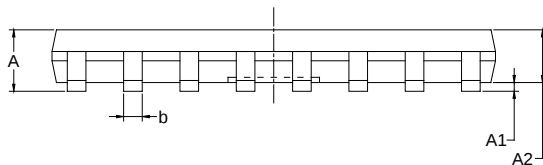
| <b>AUGUST 2022 – REV.A.2 to REV.A.3</b>               | <b>Page</b> |
|-------------------------------------------------------|-------------|
| Updated Test Circuits section .....                   | 8           |
| <b>DECEMBER 2014 – REV.A.1 to REV.A.2</b>             | <b>Page</b> |
| Added Packages: SSOP-16 & TQFN-3×3-16L .....          | All         |
| <b>NOVEMBER 2014 – REV.A to REV.A.1</b>               | <b>Page</b> |
| Updated Electrical Characteristics section .....      | 4, 5        |
| <b>Changes from Original (NOVEMBER 2014) to REV.A</b> | <b>Page</b> |
| Changed from product preview to production data ..... | All         |

## PACKAGE OUTLINE DIMENSIONS

### SOIC-16



RECOMMENDED LAND PATTERN (Unit: mm)



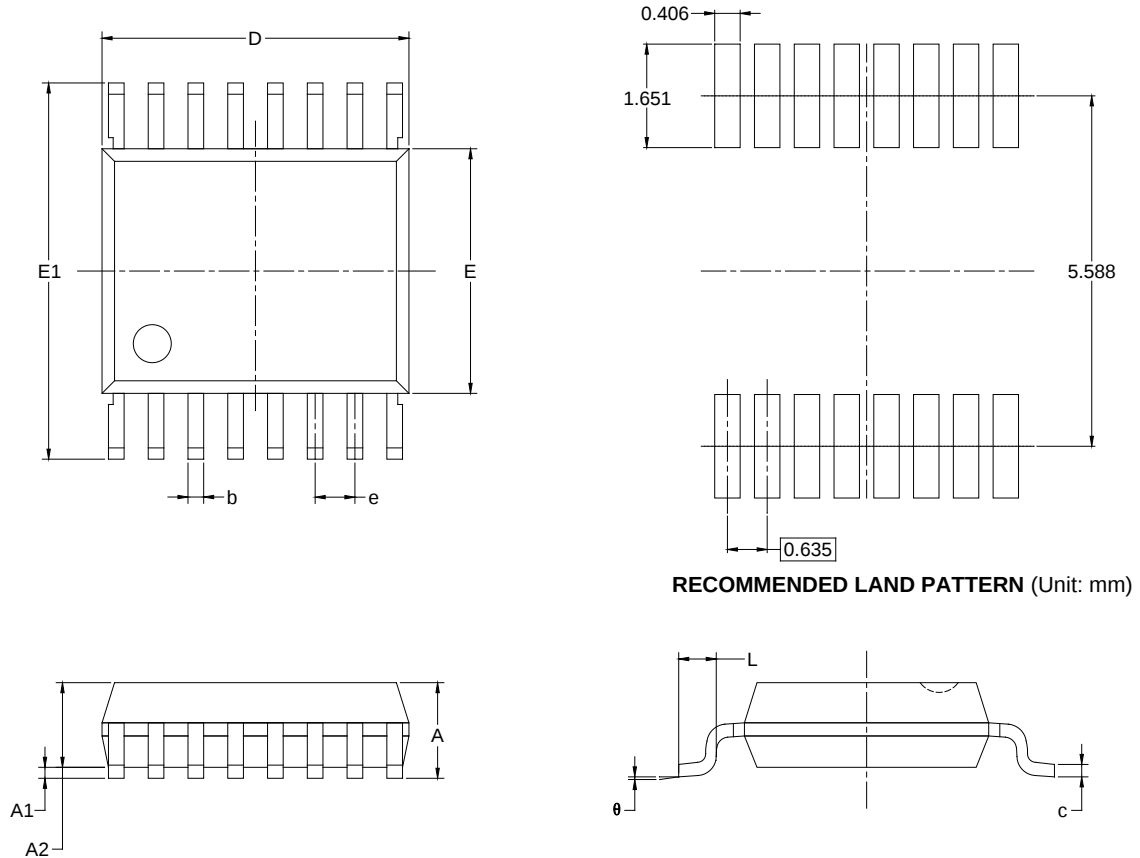
| Symbol | Dimensions<br>In Millimeters |        | Dimensions<br>In Inches |       |
|--------|------------------------------|--------|-------------------------|-------|
|        | MIN                          | MAX    | MIN                     | MAX   |
| A      | 1.350                        | 1.750  | 0.053                   | 0.069 |
| A1     | 0.100                        | 0.250  | 0.004                   | 0.010 |
| A2     | 1.350                        | 1.550  | 0.053                   | 0.061 |
| b      | 0.330                        | 0.510  | 0.013                   | 0.020 |
| c      | 0.170                        | 0.250  | 0.006                   | 0.010 |
| D      | 9.800                        | 10.200 | 0.386                   | 0.402 |
| E      | 3.800                        | 4.000  | 0.150                   | 0.157 |
| E1     | 5.800                        | 6.200  | 0.228                   | 0.244 |
| e      | 1.27 BSC                     |        | 0.050 BSC               |       |
| L      | 0.400                        | 1.270  | 0.016                   | 0.050 |
| θ      | 0°                           | 8°     | 0°                      | 8°    |

#### NOTES:

1. Body dimensions do not include mode flash or protrusion.
2. This drawing is subject to change without notice.

## PACKAGE OUTLINE DIMENSIONS

### SSOP-16



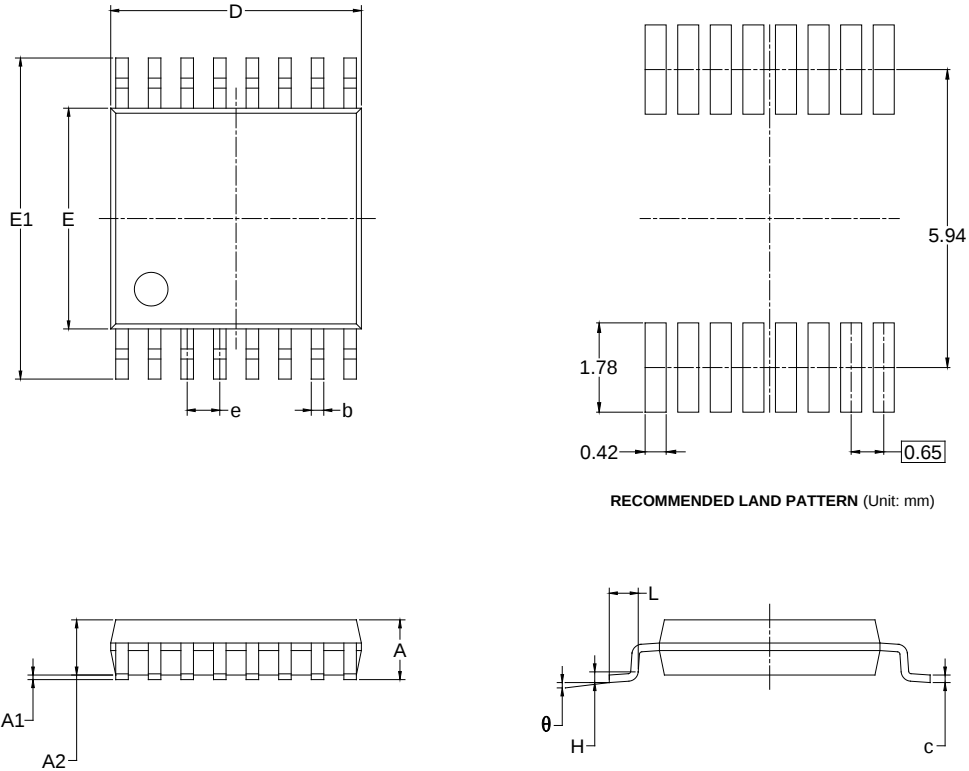
| Symbol | Dimensions<br>In Millimeters |       | Dimensions<br>In Inches |       |
|--------|------------------------------|-------|-------------------------|-------|
|        | MIN                          | MAX   | MIN                     | MAX   |
| A      | 1.350                        | 1.750 | 0.053                   | 0.069 |
| A1     | 0.100                        | 0.250 | 0.004                   | 0.010 |
| A2     | 1.350                        | 1.550 | 0.053                   | 0.061 |
| b      | 0.200                        | 0.300 | 0.008                   | 0.012 |
| c      | 0.170                        | 0.250 | 0.007                   | 0.010 |
| D      | 4.700                        | 5.100 | 0.185                   | 0.200 |
| E      | 3.800                        | 4.000 | 0.150                   | 0.157 |
| E1     | 5.800                        | 6.200 | 0.228                   | 0.244 |
| e      | 0.635 BSC                    |       | 0.025 BSC               |       |
| L      | 0.400                        | 1.270 | 0.016                   | 0.050 |
| θ      | 0°                           | 8°    | 0°                      | 8°    |

#### NOTES:

1. Body dimensions do not include mold flash or protrusion.
2. This drawing is subject to change without notice.

## PACKAGE OUTLINE DIMENSIONS

### TSSOP-16



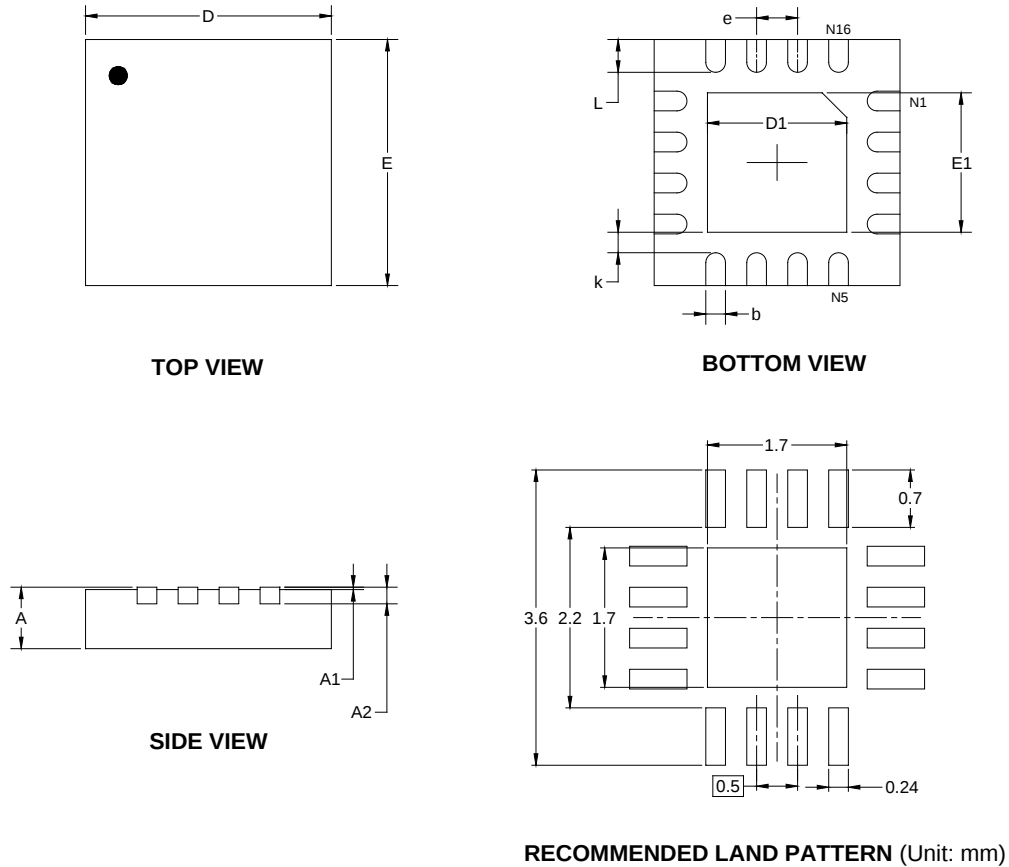
| Symbol   | Dimensions<br>In Millimeters |       | Dimensions<br>In Inches |       |
|----------|------------------------------|-------|-------------------------|-------|
|          | MIN                          | MAX   | MIN                     | MAX   |
| A        |                              | 1.200 |                         | 0.047 |
| A1       | 0.050                        | 0.150 | 0.002                   | 0.006 |
| A2       | 0.800                        | 1.050 | 0.031                   | 0.041 |
| b        | 0.190                        | 0.300 | 0.007                   | 0.012 |
| c        | 0.090                        | 0.200 | 0.004                   | 0.008 |
| D        | 4.860                        | 5.100 | 0.191                   | 0.201 |
| E        | 4.300                        | 4.500 | 0.169                   | 0.177 |
| E1       | 6.200                        | 6.600 | 0.244                   | 0.260 |
| e        | 0.650 BSC                    |       | 0.026 BSC               |       |
| L        | 0.500                        | 0.700 | 0.02                    | 0.028 |
| H        | 0.25 TYP                     |       | 0.01 TYP                |       |
| $\theta$ | 1°                           | 7°    | 1°                      | 7°    |

#### NOTES:

1. Body dimensions do not include mode flash or protrusion.
2. This drawing is subject to change without notice.

## PACKAGE OUTLINE DIMENSIONS

### TQFN-3×3-16L



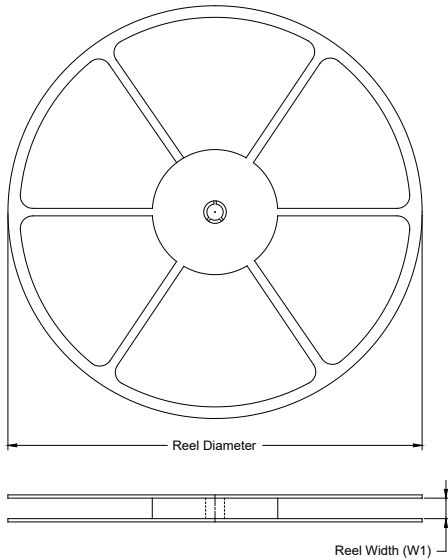
| Symbol | Dimensions<br>In Millimeters |       | Dimensions<br>In Inches |       |
|--------|------------------------------|-------|-------------------------|-------|
|        | MIN                          | MAX   | MIN                     | MAX   |
| A      | 0.700                        | 0.800 | 0.028                   | 0.031 |
| A1     | 0.000                        | 0.050 | 0.000                   | 0.002 |
| A2     | 0.203 REF                    |       | 0.008 REF               |       |
| D      | 2.900                        | 3.100 | 0.114                   | 0.122 |
| D1     | 1.600                        | 1.800 | 0.063                   | 0.071 |
| E      | 2.900                        | 3.100 | 0.114                   | 0.122 |
| E1     | 1.600                        | 1.800 | 0.063                   | 0.071 |
| k      | 0.200 MIN                    |       | 0.008 MIN               |       |
| b      | 0.180                        | 0.300 | 0.007                   | 0.012 |
| e      | 0.500 TYP                    |       | 0.020 TYP               |       |
| L      | 0.300                        | 0.500 | 0.012                   | 0.020 |

NOTE: This drawing is subject to change without notice.

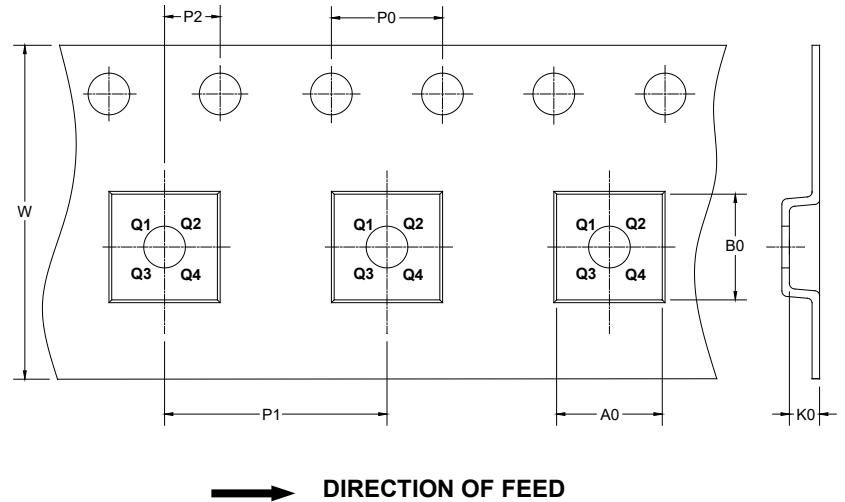
# PACKAGE INFORMATION

## TAPE AND REEL INFORMATION

### REEL DIMENSIONS



### TAPE DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

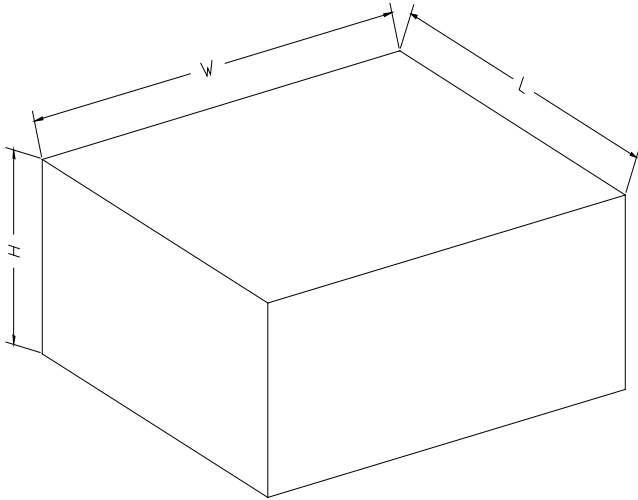
### KEY PARAMETER LIST OF TAPE AND REEL

| Package Type | Reel Diameter | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P0 (mm) | P1 (mm) | P2 (mm) | W (mm) | Pin1 Quadrant |
|--------------|---------------|--------------------|---------|---------|---------|---------|---------|---------|--------|---------------|
| SOIC-16      | 13"           | 16.4               | 6.50    | 10.30   | 2.10    | 4.0     | 8.0     | 2.0     | 16.0   | Q1            |
| SSOP-16      | 13"           | 12.4               | 6.40    | 5.40    | 2.10    | 4.0     | 8.0     | 2.0     | 12.0   | Q1            |
| TSSOP-16     | 13"           | 12.4               | 6.90    | 5.60    | 1.50    | 4.0     | 8.0     | 2.0     | 12.0   | Q1            |
| TQFN-3×3-16L | 13"           | 12.4               | 3.35    | 3.35    | 1.13    | 4.0     | 8.0     | 2.0     | 12.0   | Q1            |

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## PACKAGE INFORMATION

### CARTON BOX DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

### KEY PARAMETER LIST OF CARTON BOX

| Reel Type | Length (mm) | Width (mm) | Height (mm) | Pizza/Carton |
|-----------|-------------|------------|-------------|--------------|
| 13"       | 386         | 280        | 370         | 5            |

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