

### GENERAL DESCRIPTION

The SGM48754 is a quad SPST (single-pole/single-throw), CMOS analog switch. It operates from 2.5V to 5.5V single power supply and all digital inputs support 1.8V logic control.

The SGM48754 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 SGM48754 is available in Green SOIC-14 and TSSOP-14 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: 24Ω (TYP) with 5V Supply**
- **“T” Type Switch**
- **1.8V Logic Compatible**
- **Low On-Resistance Flatness**
- **High Off-Isolation: -80dB ( $R_L = 50\Omega$ ,  $f = 1\text{MHz}$ )**
- **Low Off-Leakage Current: 1nA (TYP) at +25°C**
- **Low On-Leakage Current: 1nA (TYP) at +25°C**
- **Low Distortion: 0.35% ( $R_L = 600\Omega$ ,  $f = 20\text{Hz to } 20\text{kHz}$ )**
- **-40°C to +85°C Operating Temperature Range**
- **Available in Green SOIC-14 and TSSOP-14 Packages**

### APPLICATIONS

Automotive  
Portable Equipment  
Sample-and-Hold Circuits  
Data-Acquisition Systems  
Battery-Powered Systems  
Audio and Video Signal Routing

**PACKAGE/ORDERING INFORMATION**

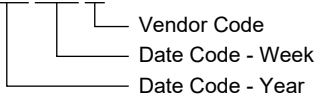
| MODEL    | PACKAGE DESCRIPTION | SPECIFIED TEMPERATURE RANGE | ORDERING NUMBER   | PACKAGE MARKING            | PACKING OPTION      |
|----------|---------------------|-----------------------------|-------------------|----------------------------|---------------------|
| SGM48754 | SOIC-14             | -40°C to +85°C              | SGM48754YS14G/TR  | SGM48754YS14<br>XXXXX      | Tape and Reel, 2500 |
|          | TSSOP-14            | -40°C to +85°C              | SGM48754YTS14G/TR | SGM48754<br>YTS14<br>XXXXX | Tape and Reel, 4000 |

**MARKING INFORMATION**

NOTE: XXXXX = Date Code and Vendor Code.

**SOIC-14/TSSOP-14**

**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 <sub>CC</sub> to GND .....                      | -0.3V to 6V                       |
| Voltage into Any Terminal <sup>(1)</sup> .....    | -0.3V to (V <sub>CC</sub> + 0.3V) |
| Continuous Current into Any Terminal.....         | ±20mA                             |
| Peak Current (Pulsed at 1ms, 10% duty cycle)..... | ±40mA                             |
| Junction Temperature.....                         | +150°C                            |
| Storage Temperature Range .....                   | -65°C to +150°C                   |
| Lead Temperature (Soldering, 10s).....            | +260°C                            |
| ESD Susceptibility                                |                                   |
| HBM.....  | 4000V                             |
| MM.....   | 300V                              |

**NOTE:**

1. Voltages exceeding V<sub>CC</sub> 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.

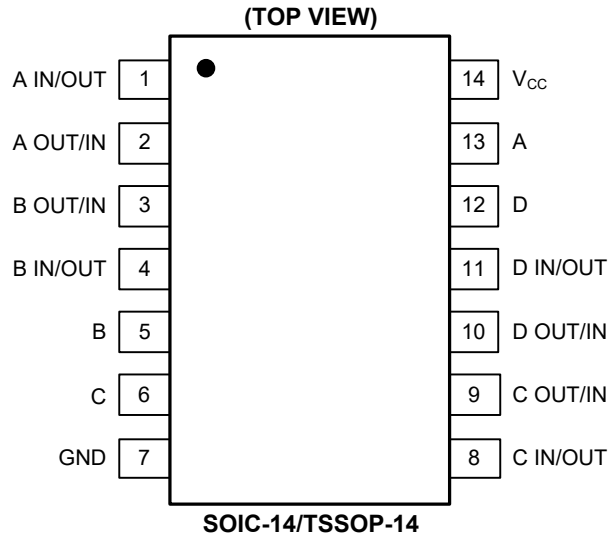
**ESD SENSITIVITY CAUTION**

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-14/TSSOP-14 |                 |   |
| 1                | A IN/OUT        | Switch A Input/Output Pin.                            |
| 2                | A OUT/IN        | Switch A Input/Output Pin.                            |
| 3                | B OUT/IN        | Switch B Input/Output Pin.                            |
| 4                | B IN/OUT        | Switch B Input/Output Pin.                            |
| 5                | B               | Switch B Control Pin.                                 |
| 6                | C               | Switch C Control Pin.                                 |
| 7                | GND             | Ground.   |
| 8                | C IN/OUT        | Switch C Input/Output Pin.                            |
| 9                | C OUT/IN        | Switch C Input/Output Pin.                            |
| 10               | D OUT/IN        | Switch D Input/Output Pin.                            |
| 11               | D IN/OUT        | Switch D Input/Output Pin.                            |
| 12               | D               | Switch D Control Pin.                                 |
| 13               | A               | Switch A Control Pin.                                 |
| 14               | V <sub>CC</sub> | Positive Analog and Digital Supply Voltage Input Pin. |

**FUNCTION TABLE**

| SELECT INPUTS | SWITCH STATUS      |
|---------------|--------------------|
| A/B/C/D       |                    |
| High          | All Switches Close |
| Low           | All Switches Open  |

**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.

## ELECTRICAL CHARACTERISTICS

( $V_{CC} = 5.0V$ , Full =  $-40^{\circ}C$  to  $+85^{\circ}C$ , x = A, B, C and D switch in/out or out/in, typical values are at  $T_A = +25^{\circ}C$ , unless otherwise noted.)

| PARAMETER                            | SYMBOL                           | CONDITIONS   | TEMP           | MIN | TYP   | MAX      | UNITS    |
|--------------------------------------|----------------------------------|--|----------------|-----|-------|----------|----------|
| <b>Analog Switch</b>                 |                                  |  |                |     |       |          |          |
| Analog Signal Range                  | $V_{X-}, V_X$                    |  | Full           | GND |       | $V_{CC}$ | V        |
| On-Resistance                        | $R_{ON}$                         | $V_{CC} = 5.0V, I_X = 1mA$   | $+25^{\circ}C$ |     | 24    | 30       | $\Omega$ |
|                                      |                                  |  | Full           |     |       | 35       |          |
| On-Resistance Match Between Channels | $\Delta R_{ON}$                  | $V_{CC} = 5.0V, I_X = 1mA$   | $+25^{\circ}C$ |     | 1     | 2.6      | $\Omega$ |
|                                      |                                  |  | Full           |     |       | 3        |          |
| On-Resistance Flatness               | $R_{FLAT(ON)}$                   | $V_{CC} = 5.0V, I_X = 1mA$   | $+25^{\circ}C$ |     | 8     | 11       | $\Omega$ |
|                                      |                                  |  | Full           |     |       | 14       |          |
| X_ Off Leakage Current               | $I_{X(OFF)}$                     | $V_{CC} = 5.0V, V_{X-} = 4.5V$ or $0V$ ,<br>$V_X = 4.5V$ or $0V$       | $+25^{\circ}C$ |     | 1     | 1000     | nA       |
| X Off Leakage Current                | $I_{X(OFF)}$                     | $V_{CC} = 5.0V, V_{X-} = 4.5V$ or $0V$ ,<br>$V_X = 4.5V$ or $0V$       | $+25^{\circ}C$ |     | 1     | 1000     | nA       |
| X On Leakage Current                 | $I_{X(ON)}$                      | $V_{CC} = 5.0V, V_X = 4.5V$ or $0V$                                    | $+25^{\circ}C$ |     | 1     | 1000     | nA       |
| <b>Digital I/O</b>                   |                                  |  |                |     |       |          |          |
| Logic Input Logic Threshold High     | $V_{AH}, V_{BH}, V_{CH}, V_{DH}$ |  | $+25^{\circ}C$ | 1.7 |       |          | V        |
| Logic Input Logic Threshold Low      | $V_{AL}, V_{BL}, V_{CL}, V_{DL}$ |  | $+25^{\circ}C$ |     |       | 0.5      | V        |
| Input-Current High                   | $I_{AH}, I_{BH}, I_{CH}, I_{DH}$ | $V_A, V_B, V_C, V_D = V_{CC}$  | $+25^{\circ}C$ |     | 1     |          | nA       |
| Input-Current Low                    | $I_{AL}, I_{BL}, I_{CL}, I_{DL}$ | $V_A, V_B, V_C, V_D = 0V$  | $+25^{\circ}C$ |     | 1     |          | nA       |
| <b>Dynamic Characteristics</b>       |                                  |  |                |     |       |          |          |
| Turn-On Time                         | $t_{ON}$                         | $V_{X-}, V_{Y-} = 3V, R_L = 300\Omega, C_L = 35pF$ ,<br>Test Circuit 1 | $+25^{\circ}C$ |     | 40    |          | ns       |
| Turn-Off Time                        | $t_{OFF}$                        | $V_{X-}, V_{Y-} = 3V, R_L = 300\Omega, C_L = 35pF$ ,<br>Test Circuit 1 | $+25^{\circ}C$ |     | 100   |          | ns       |
| Input Transition Rise or Fall Rate   | $\Delta t/\Delta V$              |  | $+25^{\circ}C$ |     |       | 20       | ns/V     |
| Charge Injection                     | Q                                | $R_S = 0\Omega, C = 1nF, V_S = 0V$ , Test Circuit 2                    | $+25^{\circ}C$ |     | 7     |          | pC       |
| Input Off-Capacitance                | $C_{X(OFF)}$                     | $V_{X-} = 0V, f = 1MHz$ , Test Circuit 3                               | $+25^{\circ}C$ |     | 9     |          | pF       |
| Output Off-Capacitance               | $C_{X(OFF)}$                     | $V_{X-} = 0V, f = 1MHz$ , Test Circuit 3                               | $+25^{\circ}C$ |     | 9     |          | pF       |
| Output On-Capacitance                | $C_{X(ON)}$                      | $V_{X-} = 0V, f = 1MHz$ , Test Circuit 3                               | $+25^{\circ}C$ |     | 18    |          | pF       |
| Off-Isolation                        | $O_{ISO}$                        | $R_L = 50\Omega, f = 1MHz$ , Test Circuit 4                            | $+25^{\circ}C$ |     | -80   |          | dB       |
| Channel-to-Channel Crosstalk         | $X_{TALK}$                       | $f = 1MHz$ , Test Circuit 4  | $+25^{\circ}C$ |     | -95   |          | dB       |
| -3dB Bandwidth                       | BW                               | $R_L = 50\Omega$   | $+25^{\circ}C$ |     | 180   |          | MHz      |
| Total Harmonic Distortion            | THD                              | $R_L = 600\Omega, 5V_{P-P}, f = 20Hz$ to $20kHz$                       | $+25^{\circ}C$ |     | 0.35  |          | %        |
| <b>Power Supply</b>                  |                                  |  |                |     |       |          |          |
| Power Supply Range                   | $V_{CC}$                         |  | Full           | 2.5 |       | 5.5      | V        |
| Power Supply Current                 | $I_{CC}$                         | $V_A, V_B, V_C, V_D = V_{CC}$ or $0$                                   | $+25^{\circ}C$ |     | 0.001 | 6        | $\mu A$  |

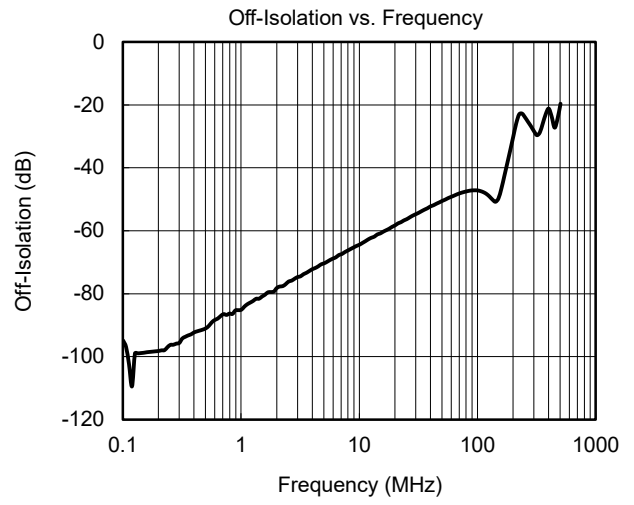
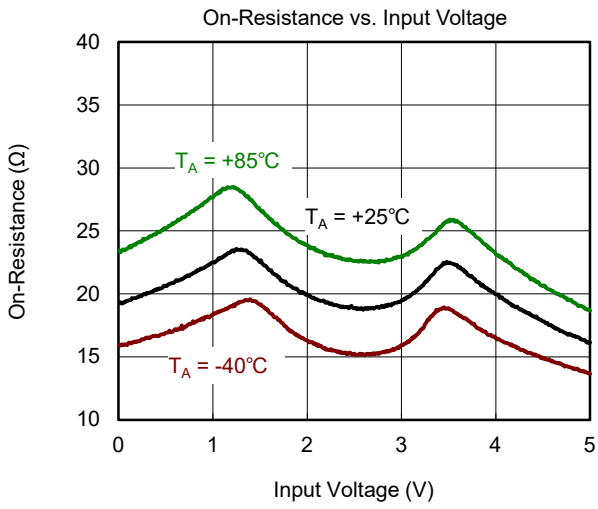
**ELECTRICAL CHARACTERISTICS (continued)**

( $V_{CC} = 3.3V$ , Full =  $-40^{\circ}C$  to  $+85^{\circ}C$ , x = A, B, C and D switch in/out or out/in, typical values are at  $T_A = +25^{\circ}C$ , unless otherwise noted.)

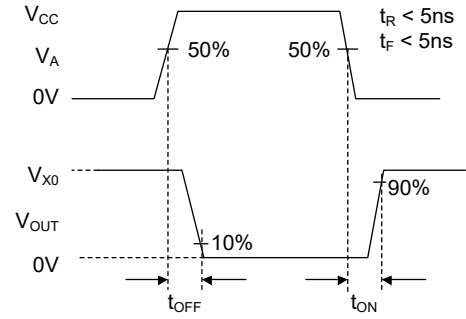
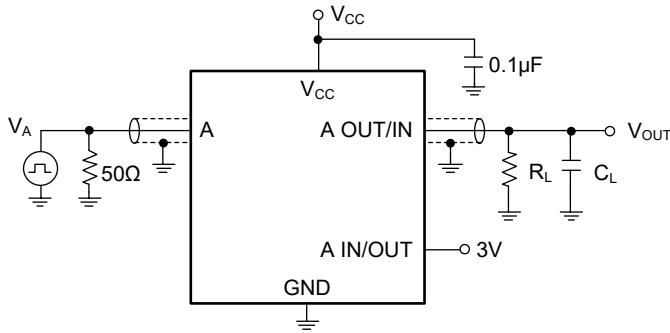
| PARAMETER                          | SYMBOL                           | CONDITIONS   | TEMP  | MIN | TYP   | MAX      | UNITS    |
|------------------------------------|----------------------------------|--|-------|-----|-------|----------|----------|
| <b>Analog Switch</b>               |                                  |  |       |     |       |          |          |
| Analog Signal Range                | $V_{X-}, V_X$                    |  | Full  | GND |       | $V_{CC}$ | V        |
| On-Resistance                      | $R_{ON}$                         | $I_X = 1mA$  | +25°C |     | 40    | 55       | $\Omega$ |
|                                    |                                  |  | Full  |     |       | 58       |          |
| Off Leakage Current                | $I_{X(OFF)}$                     | $V_{X-} = 1V, 3V, V_X = 3V, 1V$  | +25°C |     | 1     | 1000     | nA       |
| Off Leakage Current                | $I_{X(OFF)}$                     | $V_{X-} = 1V, 3V, V_X = 3V, 1V$  | +25°C |     | 1     | 1000     | nA       |
| On Leakage Current                 | $I_{X(ON)}$                      | $V_X = 3V, 1V$   | +25°C |     | 1     | 1000     | nA       |
| <b>Digital I/O</b>                 |                                  |  |       |     |       |          |          |
| Logic Input Logic Threshold High   | $V_{AH}, V_{BH}, V_{CH}, V_{DH}$ |  | +25°C | 1.7 |       |          | V        |
| Logic Input Logic Threshold Low    | $V_{AL}, V_{BL}, V_{CL}, V_{DL}$ |  | +25°C |     |       | 0.5      | V        |
| Input-Current High                 | $I_{AH}, I_{BH}, I_{CH}, I_{DH}$ | $V_A, V_B, V_C, V_D = V_{CC}$  | +25°C |     | 1     |          | nA       |
| Input-Current Low                  | $I_{AL}, I_{BL}, I_{CL}, I_{DL}$ | $V_A, V_B, V_C, V_D = 0V$  | +25°C |     | 1     |          | nA       |
| <b>Dynamic Characteristics</b>     |                                  |  |       |     |       |          |          |
| Turn-On Time                       | $t_{ON}$                         | $V_{X-}, V_{Y-} = 3V, R_L = 300\Omega, C_L = 35pF$ ,<br>Test Circuit 1 | +25°C |     | 75    |          | ns       |
| Turn-Off Time                      | $t_{OFF}$                        | $V_{X-}, V_{Y-} = 3V, R_L = 300\Omega, C_L = 35pF$ ,<br>Test Circuit 1 | +25°C |     | 125   |          | ns       |
| Input Transition Rise or Fall Rate | $\Delta t/\Delta V$              |  | +25°C |     |       | 100      | ns/V     |
| -3dB Bandwidth                     | BW                               | $R_L = 50\Omega$   | +25°C |     | 180   |          | MHz      |
| Charge Injection                   | Q                                | $R_S = 0\Omega, C = 1nF, V_S = 0V$ , Test Circuit 2                    | +25°C |     | 3.5   |          | pC       |
| <b>Power Supply</b>                |                                  |  |       |     |       |          |          |
| Power Supply Current               | $I_{CC}$                         | $V_A, V_B, V_C, V_D = V_{CC}$ or 0                                     | +25°C |     | 0.001 | 3        | $\mu A$  |

TYPICAL PERFORMANCE CHARACTERISTICS

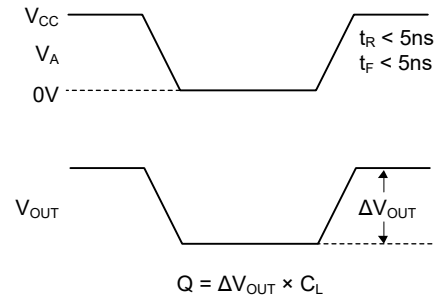
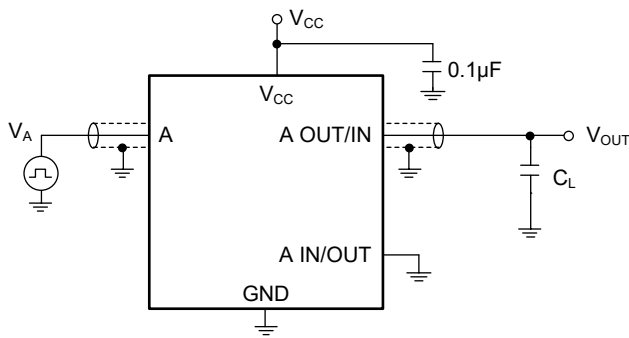
V<sub>CC</sub> = 5.0V, unless otherwise noted.



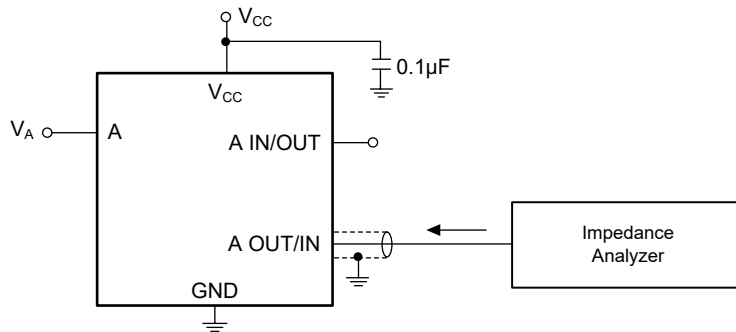
TEST CIRCUITS



Test Circuit 1. Switching Times ( $t_{ON}$ ,  $t_{OFF}$ )

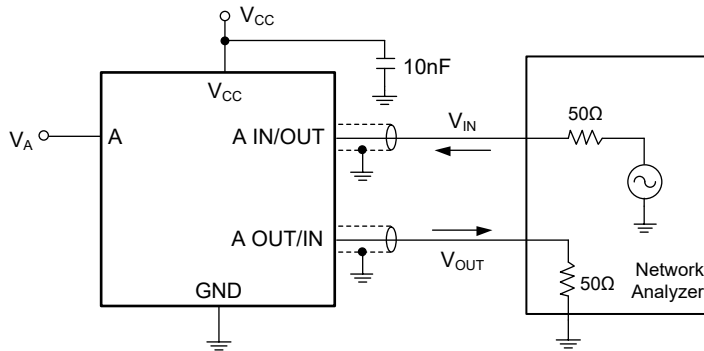


Test Circuit 2. Charge Injection ( $Q$ )



Test Circuit 3. Capacitance

TEST CIRCUITS (continued)



Off-Isolation =  $20\log(V_{OUT}/V_{IN})$  (Measured between A/B/C/D OUT/IN and "OFF" A/B/C/D IN/OUT Terminal on Each Switch)  
 On Loss =  $20\log(V_{OUT}/V_{IN})$  (Measured between A/B/C/D OUT/IN and "ON" A/B/C/D IN/OUT Terminal on Each Switch)  
 Channel-to-Channel Crosstalk =  $20\log(V_{OUT}/V_{IN})$  (Measured from One Channel ( A/B/C/D OUT/IN) to All other Channels)

Test Circuit 4. Off-Isolation, On Loss and Crosstalk

REVISION HISTORY

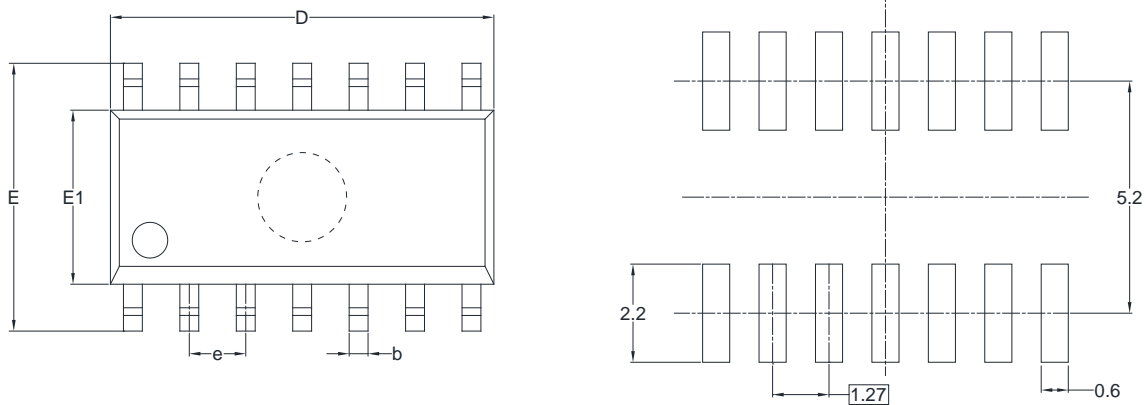
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

| AUGUST 2022 – REV.A to REV.A.1                        | Page |
|---|------|
| Updated Test Circuits section .....                   | 7    |
| <b>Changes from Original (MAY 2015) to REV.A</b>      |      |
| Changed from product preview to production data ..... | All  |

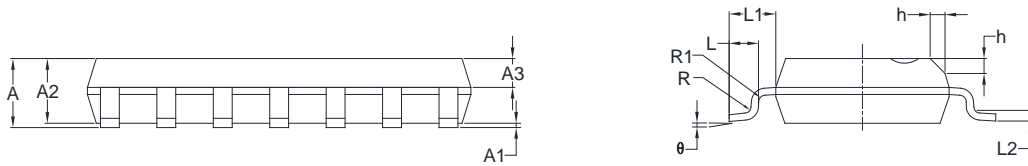


PACKAGE OUTLINE DIMENSIONS

SOIC-14



RECOMMENDED LAND PATTERN (Unit: mm)

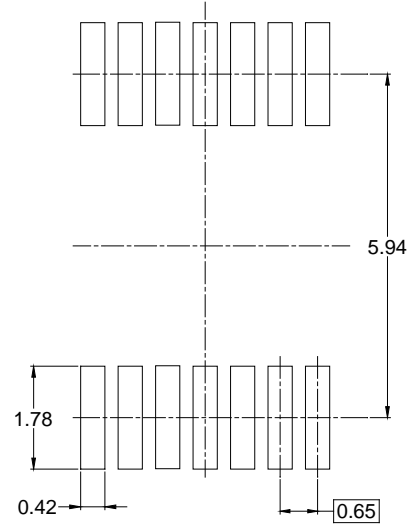
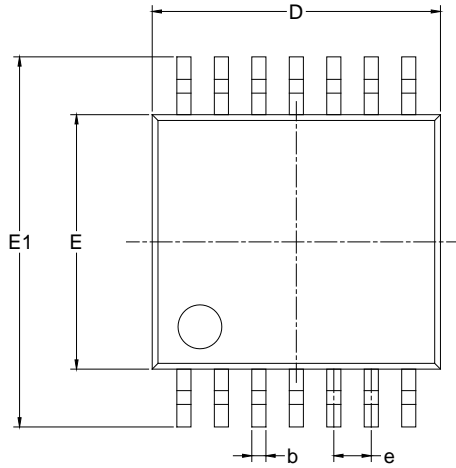


| Symbol | Dimensions<br>In Millimeters |      | Dimensions<br>In Inches |       |
|--------|------------------------------|------|-------------------------|-------|
|        | MIN                          | MAX  | MIN                     | MAX   |
| A      | 1.35                         | 1.75 | 0.053                   | 0.069 |
| A1     | 0.10                         | 0.25 | 0.004                   | 0.010 |
| A2     | 1.25                         | 1.65 | 0.049                   | 0.065 |
| A3     | 0.55                         | 0.75 | 0.022                   | 0.030 |
| b      | 0.36                         | 0.49 | 0.014                   | 0.019 |
| D      | 8.53                         | 8.73 | 0.336                   | 0.344 |
| E      | 5.80                         | 6.20 | 0.228                   | 0.244 |
| E1     | 3.80                         | 4.00 | 0.150                   | 0.157 |
| e      | 1.27 BSC                     |      | 0.050 BSC               |       |
| L      | 0.45                         | 0.80 | 0.018                   | 0.032 |
| L1     | 1.04 REF                     |      | 0.040 REF               |       |
| L2     | 0.25 BSC                     |      | 0.01 BSC                |       |
| R      | 0.07                         |      | 0.003                   |       |
| R1     | 0.07                         |      | 0.003                   |       |
| h      | 0.30                         | 0.50 | 0.012                   | 0.020 |
| θ      | 0°                           | 8°   | 0°                      | 8°    |

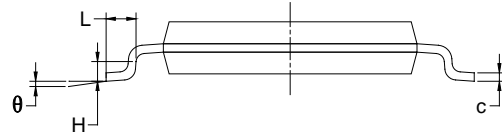
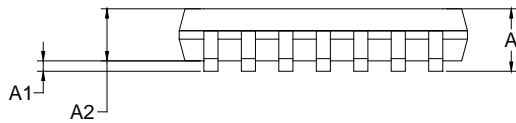
- NOTES:  
 1. Body dimensions do not include mode flash or protrusion.  
 2. This drawing is subject to change without notice.

PACKAGE OUTLINE DIMENSIONS

TSSOP-14



RECOMMENDED LAND PATTERN (Unit: mm)



| 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     | 6.250                        | 6.550 | 0.246                   | 0.258 |
| e      | 0.650 BSC                    |       | 0.026 BSC               |       |
| L      | 0.500                        | 0.700 | 0.02                    | 0.028 |
| H      | 0.25 TYP                     |       | 0.01 TYP                |       |
| θ      | 1°                           | 7°    | 1°                      | 7°    |

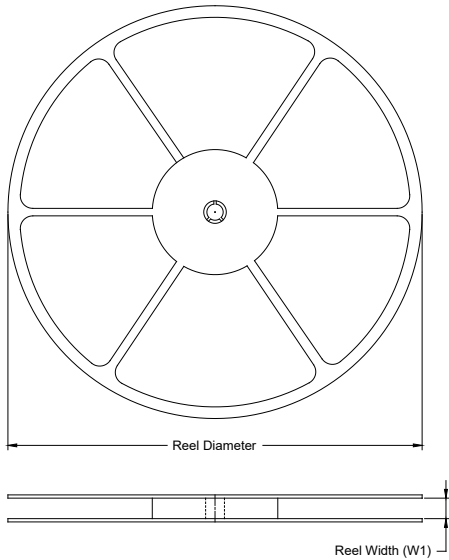
NOTES:

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

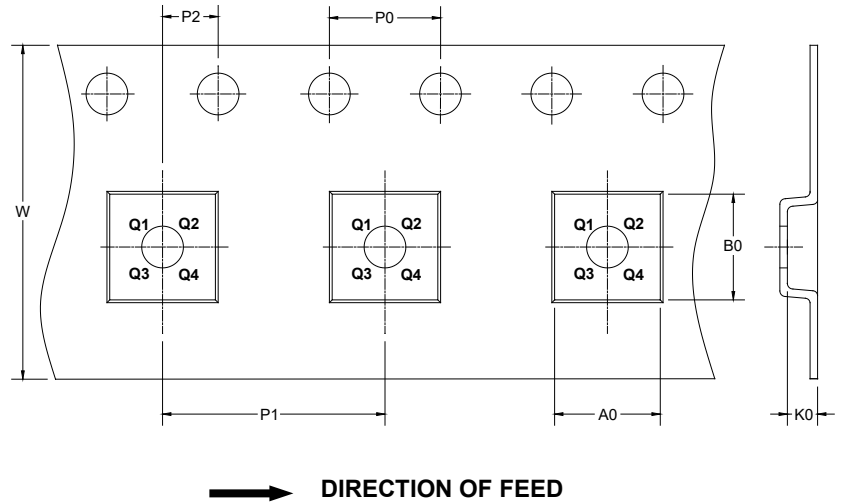
# PACKAGE INFORMATION

## TAPE AND REEL INFORMATION

### REEL DIMENSIONS



### TAPE DIMENSIONS



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

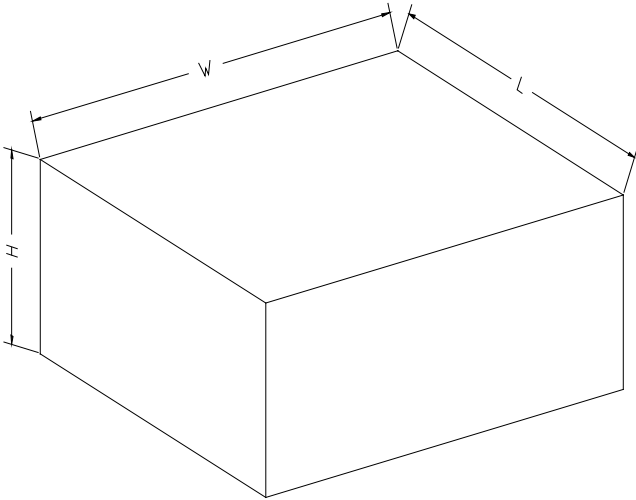
### KEY PARAMETER LIST OF TAPE AND REEL

| 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-14      | 13"           | 16.4               | 6.60    | 9.30    | 2.10    | 4.0     | 8.0     | 2.0     | 16.0   | Q1            |
| TSSOP-14     | 13"           | 12.4               | 6.95    | 5.60    | 1.50    | 4.0     | 8.0     | 2.0     | 12.0   | Q1            |

DD0001

# 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            |

DD0002