SGM48754X
Quad SPST CMOS Analog Switch

GENERAL DESCRIPTION

The SGM48754X 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.

Other features include 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 SGM48754X is available in Green SOIC-14 and TSSOP-14 packages. It operates over an ambient temperature range of -40℃ to +125℃.

FEATURES

- **Single Supply Voltage Range: 2.5V to 5.5V**
- **On-Resistance: 27Ω (TYP) with 5V Supply**
- **"T" Type Switch**
- **1.8V Logic Compatible**
- **Low On-Resistance Flatness**
- **High Off-Isolation: -72dB (R_L = 50Ω, f = 1MHz)**
- **Low Off-Leakage Current: ±1μA (MAX)**
- **Low On-Leakage Current: ±1μA (MAX)**
- **Low Distortion: 0.33% (R_L = 600Ω, f = 20Hz to 20kHz)**
- **-40℃ to +125℃ 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

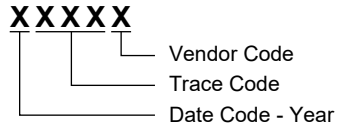
PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM48754X	SOIC-14	-40℃ to +125℃	SGM48754XS14G/TR	SGM48754XS14 XXXXX	Tape and Reel, 2500
	TSSOP-14	-40℃ to +125℃	SGM48754XTS14G/TR	SGM48754 XTS14 XXXXX	Tape and Reel, 4000

MARKING INFORMATION

NOTE: XXXXX = Date Code, Trace Code and Vendor Code.

SOIC-14/TSSOP-14



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 (1) ..... -0.3V to (V_{CC} + 0.3V)
Continuous Current into Any Terminal ..... ±20mA
Peak Current (Pulsed at 1ms, 10% duty cycle) ..... ±40mA
Junction Temperature ..... +150℃
Storage Temperature Range ..... -65℃ to +150℃
Lead Temperature (Soldering, 10s) ..... +260℃
ESD Susceptibility
HBM 4000V
CDM 1000V

NOTE:
1. Internal diodes will clamp the voltage on any signal that is lower than GND. Limit the current through the forward diode to the maximum ratings.

RECOMMENDED OPERATING CONDITIONS

Supply Voltage Range ..... 2.5V to 5.5V
Operating Temperature Range ..... -40℃ to +125℃

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.

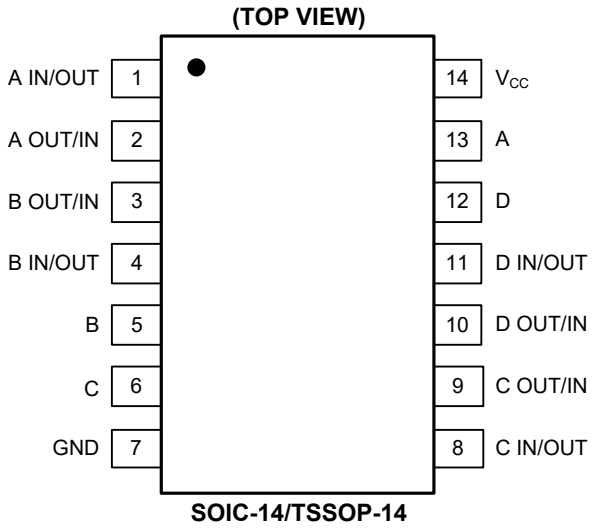
ESD SENSITIVITY CAUTION

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
1	A IN/OUT	Switch A Input/Output Pin.
2	A OUT/IN	Switch A Output/Input Pin.
3	B OUT/IN	Switch B Output/Input 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 Output/Input Pin.
10	D OUT/IN	Switch D Output/Input Pin.
11	D IN/OUT	Switch D Input/Output Pin.
12	D	Switch D Control Pin.
13	A	Switch A Control Pin.
14	V_{CC}	Positive Analog and Digital Supply Voltage Input Pin.

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

FUNCTION TABLE

SELECT INPUTS A/B/C/D	SWITCH STATUS
H	All Switches Close
L	All Switches Open

ELECTRICAL CHARACTERISTICS

(V_{CC} = 5V, Full = -40℃ to +125℃, x = A, B, C and D switch in/out or out/in, typical values are at T_A = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Analog Switch							
Analog Signal Range	$V_{X\_}$, V_X		Full	GND		V_{CC}	V
On-Resistance	R_{ON}	V_{CC} = 5V, V_I = 0V to V_{CC}, I_X = 1mA	+25℃		27	35	Ω
			Full			45	
On-Resistance Match between Channels	ΔR_{ON}	V_{CC} = 5V, V_I = 0V to V_{CC}, I_X = 1mA	+25℃		0.6	3.5	Ω
			Full			4	
On-Resistance Flatness	$R_{FLAT(ON)}$	V_{CC} = 5V, V_I = 0V to V_{CC}, I_X = 1mA	+25℃		7	12	Ω
			Full			17	
X_ Off Leakage Current	$I_{X\_(OFF)}$	V_{CC} = 5V, $V_{X\_}$ = 0V, V_X = 5V, or $V_{X\_}$ = 5V, V_X = 0V	Full		±0.01	±1	μA
X Off Leakage Current	$I_{X(OFF)}$	V_{CC} = 5V, $V_{X\_}$ = 0V, V_X = 5V, or V_X = 5V, V_X = 0V	Full		±0.01	±1	μA
On Leakage Current	I_{ON}	V_{CC} = 5V, V_X = 5V, 0V	Full		±0.01	±1	μA
Digital I/O							
Logic Input Logic Threshold High	V_{AH}, V_{BH}, V_{CH},V_{DH}		Full	1.8			V
Logic Input Logic Threshold Low	V_{AL}, V_{BL}, V_{CL}, V_{DL}		Full			0.5	V
Input-Current High	I_{AH}, I_{BH}, I_{CH}, I_{DH}	V_A, V_B, V_C, V_D = V_{CC}	Full		±0.01	±1	μA
Input-Current Low	I_{AL}, I_{BL}, I_{CL}, I_{DL}	V_A, V_B, V_C, V_D = 0V	Full		±0.01	±1	μA
Dynamic Characteristics							
Propagation Delay Time	t_{PD}	R_L = 300Ω, C_L = 35pF	Full	0.1	1	3	ns
Turn-On Time	t_{ON}	$V_{X\_}$ = 3V, R_L = 300Ω, C_L = 35pF, Test Circuit 1	Full	10	35	85	ns
Turn-Off Time	t_{OFF}	$V_{X\_}$ = 3V, R_L = 300Ω, C_L = 35pF, Test Circuit 1	Full	30	70	110	ns
Charge Injection	Q	R_S = 0Ω, C_L = 1nF, Test Circuit 2	+25℃		1.5		pC
Input Off-Capacitance	$C_{X\_(OFF)}$	$V_{X\_}$ = 0V, f = 1MHz, Test Circuit 3	+25℃		15		pF
Output Off-Capacitance	$C_{X(OFF)}$	V_X = 0V, f = 1MHz, Test Circuit 3	+25℃		12		pF
Output On-Capacitance	$C_{X(ON)}$	$V_{X\_}$ = 0V, f = 1MHz, Test Circuit 3	+25℃		18		pF
Off-Isolation	O_{ISO}	R_L = 50Ω, C_L = 30pF, f = 1MHz, Test Circuit 4	+25℃		-72		dB
-3dB Bandwidth	BW	R_L = 50Ω, C_L = 30pF, Test Circuit 5	+25℃		290		MHz
Channel-to-Channel Crosstalk	X_{TALK}	f = 1MHz, C_L = 30pF, Test Circuit 6	+25℃		-75		dB
Total Harmonic Distortion	THD	R_L = 600Ω, V_I = $5V_{P-P}$, f = 20Hz to 20kHz	+25℃		0.33		%
Power Supply							
Power Supply Range	V_{CC}		Full	2.5		5.5	V
Power Supply Current	I_{CC}	V_{CC} = 5V, V_A, V_B, V_C, V_D = V_{CC} or 0V	Full		±0.01	±1	μA

ELECTRICAL CHARACTERISTICS (continued)

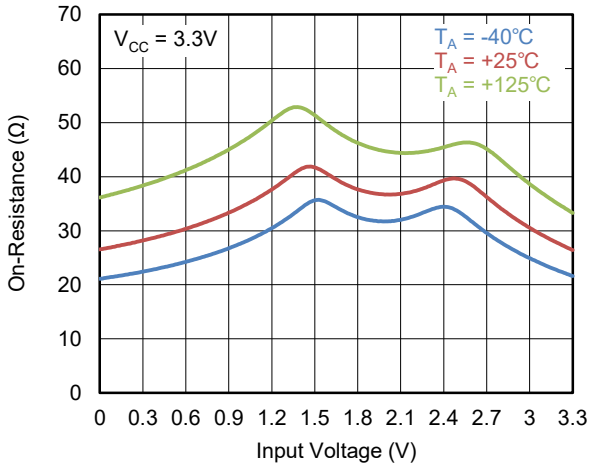
(V_{CC} = 3.3V, Full = -40℃ to +125℃, x = A, B, C and D switch in/out or out/in, typical values are at T_A = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Analog Switch							
Analog Signal Range	$V_{X\_}$, V_X		Full	GND		V_{CC}	V
On-Resistance	R_{ON}	V_{CC} = 3.3V, V_I = 0V to V_{CC}, I_X = 1mA	+25℃		43	60	Ω
			Full			72	
On-Resistance Match between Channels	ΔR_{ON}	V_{CC} = 3.3V, V_I = 0V to V_{CC}, I_X = 1mA	+25℃		0.7	3.5	Ω
			Full			4	
On-Resistance Flatness	$R_{FLAT(ON)}$	V_{CC} = 3.3V, V_I = 0V to V_{CC}, I_X = 1mA	+25℃		16	26	Ω
			Full			29	
X_ Off Leakage Current	$I_{X\_(OFF)}$	V_{CC} = 3.3V, $V_{X\_}$ = 0V, V_X = 3.3V, or $V_{X\_}$ = 3.3V, V_X = 0V	Full		±0.01	±1	μA
X Off Leakage Current	$I_{X(OFF)}$	V_{CC} = 3.3V, $V_{X\_}$ = 0V, V_X = 3.3V, or V_X = 3.3V, V_X = 0V	Full		±0.01	±1	μA
On Leakage Current	I_{ON}	V_{CC} = 3.3V, V_X = 3.3V, 0V	Full		±0.01	±1	μA
Digital I/O							
Logic Input Logic Threshold High	V_{AH}, V_{BH}, V_{CH}, V_{DH}		Full	1.7			V
Logic Input Logic Threshold Low	V_{AL}, V_{BL}, V_{CL}, V_{DL}		Full			0.4	V
Input-Current High	I_{AH}, I_{BH}, I_{CH} I_{DH}	V_A, V_B, V_C, V_D = V_{CC}	Full		±0.01	±1	μA
Input-Current Low	I_{AL}, I_{BL}, I_{CL} I_{DL}	V_A, V_B, V_C, V_D = 0V	Full		±0.01	±1	μA
Dynamic Characteristics							
Propagation Delay Time	t_{PD}	R_L = 300Ω, C_L = 35pF	Full	0.1	1.2	5	ns
Turn-On Time	t_{ON}	$V_{X\_}$ = 3V, R_L = 300Ω, C_L = 35pF, Test Circuit 1	Full	15	65	180	ns
Turn-Off Time	t_{OFF}	$V_{X\_}$ = 3V, R_L = 300Ω, C_L = 35pF, Test Circuit 1	Full	40	105	210	ns
Charge Injection	Q	R_S = 0Ω, C_L = 1nF, Test Circuit 2	+25℃		0.7		pC
-3dB Bandwidth	BW	R_L = 50Ω, C_L = 30pF, Test Circuit 5	+25℃		290		MHz
Power Supply							
Power Supply Current	I_{CC}	V_A, V_B, V_C, V_D = V_{CC} or 0V	Full		±0.01	±1	μA

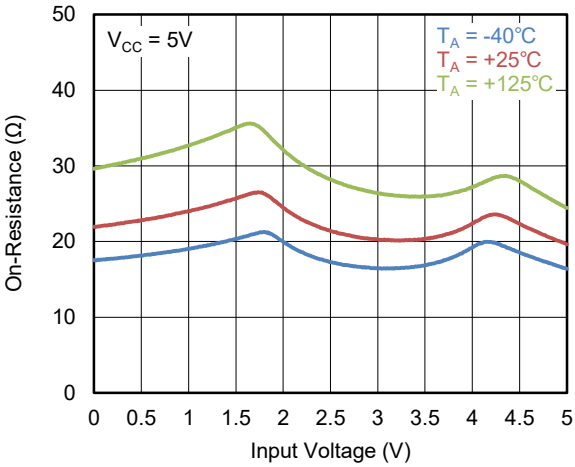
TYPICAL PERFORMANCE CHARACTERISTICS

T_A = +25℃, unless otherwise noted.

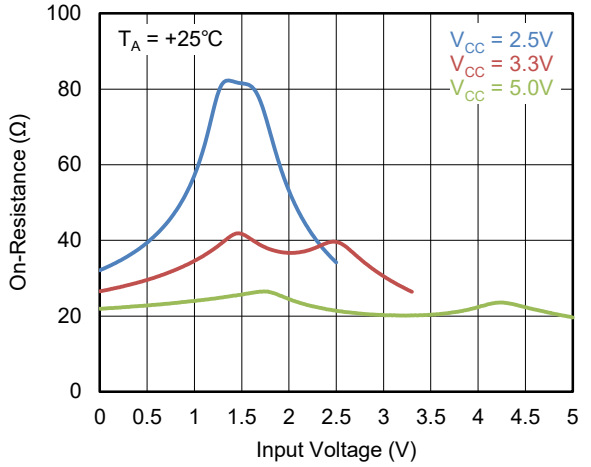
On-Resistance vs. Input Voltage



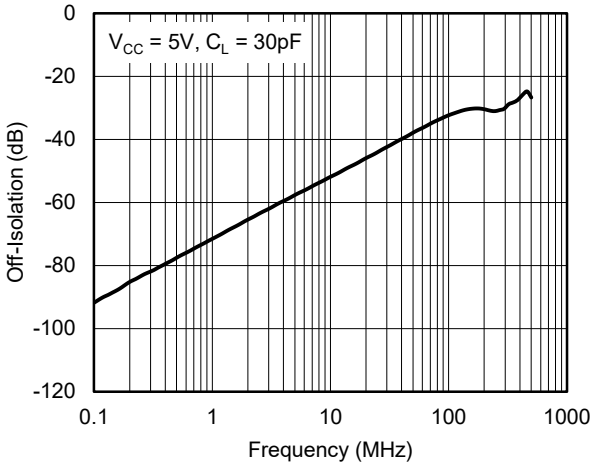
On-Resistance vs. Input Voltage



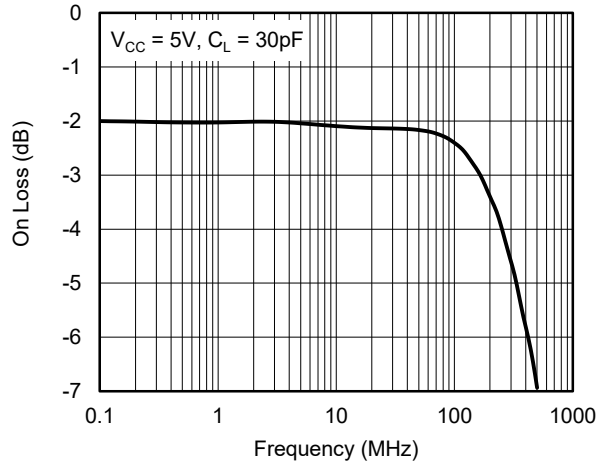
On-Resistance vs. Input Voltage



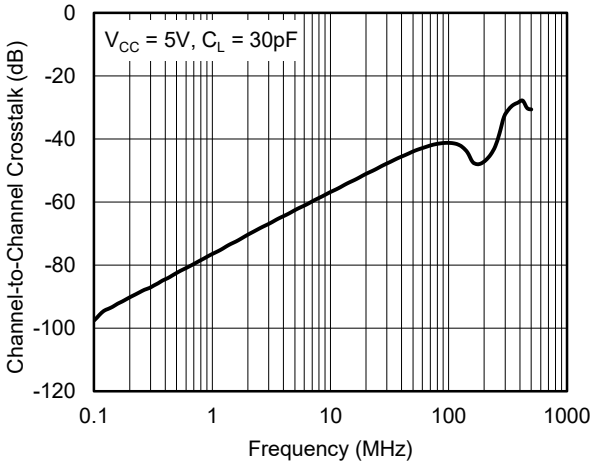
Off-Isolation vs. Frequency



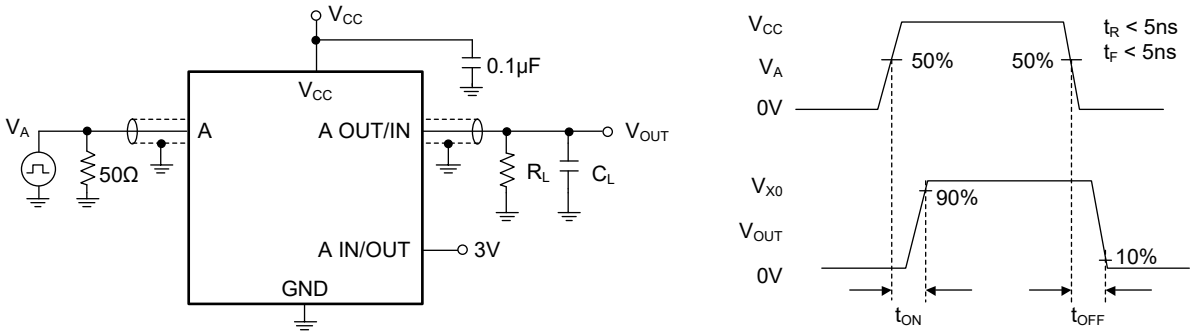
On Loss vs. Frequency



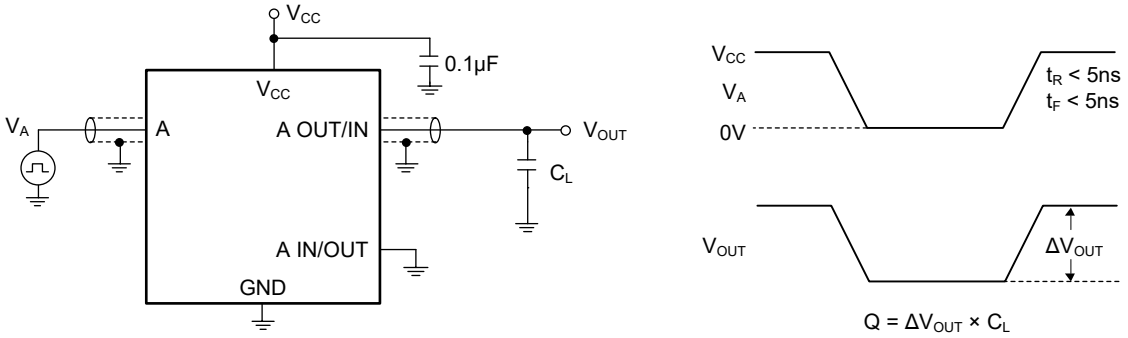
Channel-to-Channel Crosstalk vs. Frequency



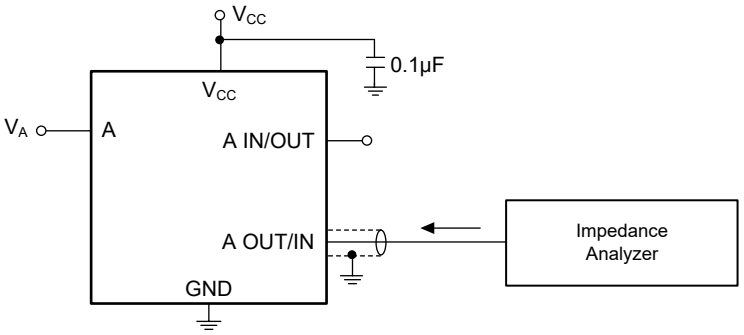
TEST CIRCUITS



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

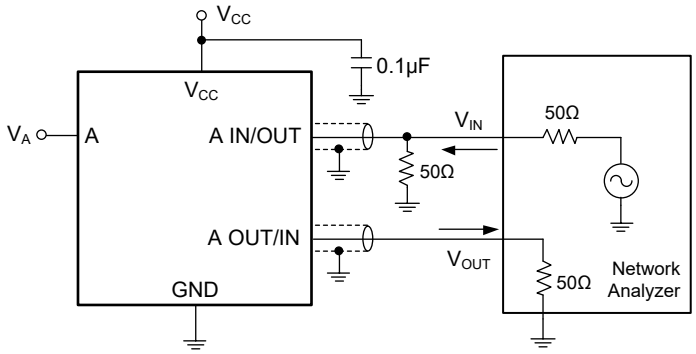


Test Circuit 2. Charge Injection (Q)



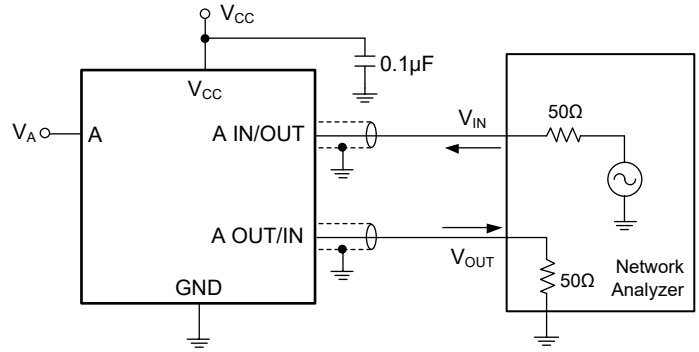
Test Circuit 3. Capacitance

TEST CIRCUITS (continued)



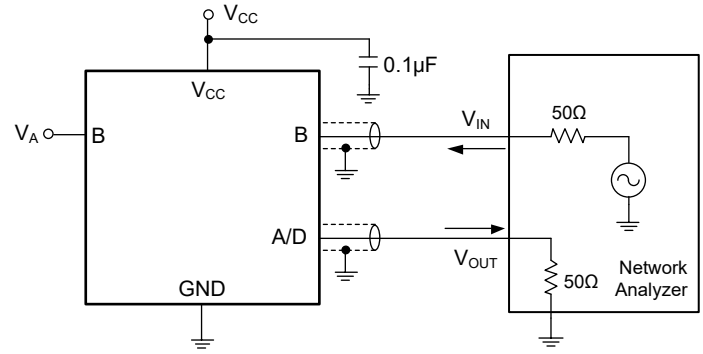
Off-Isolation = 20log(V_{OUT}/V_{IN})
Measured between A/B/C/D OUT/IN and "OFF" A/B/C/D IN/OUT Terminal on Each Switch.

Test Circuit 4. Off-Isolation



On Loss = 20log(V_{OUT}/V_{IN})
Measured between A/B/C/D OUT/IN and "ON" A/B/C/D IN/OUT Terminal on Each Switch.

Test Circuit 5. On Loss



Channel-to-Channel Crosstalk = 20log(V_{OUT}/V_{IN})
Measured from One Channel (A/B/C/D OUT/IN) to All other Channels.

Test Circuit 6. Channel-to-Channel Crosstalk

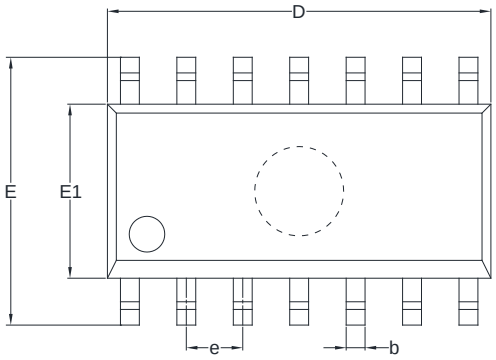
REVISION HISTORY

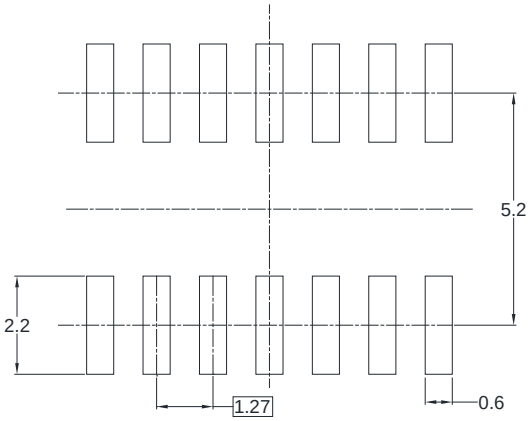
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Original (JANUARY 2024) to REV.A	Page
Changed from product preview to production data	All

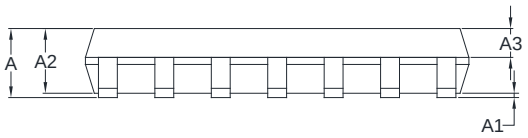
PACKAGE OUTLINE DIMENSIONS

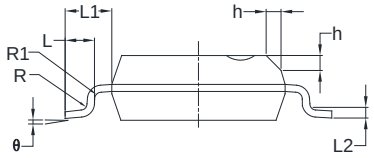
SOIC-14





RECOMMENDED LAND PATTERN (Unit: mm)



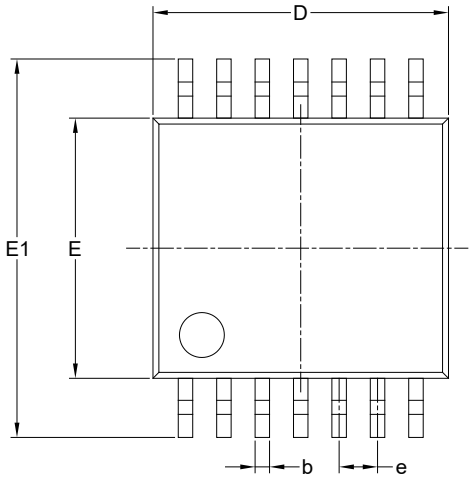


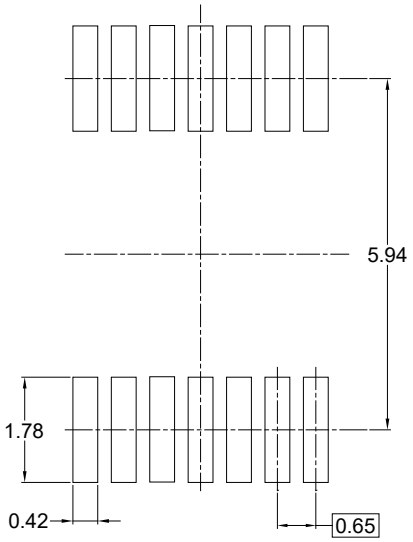
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.35	1.75	0.053	0.069
A1	0.10	0.25	0.004	0.010
A2	1.25	1.65	0.049	0.065
A3	0.55	0.75	0.022	0.030
b	0.36	0.49	0.014	0.019
D	8.53	8.73	0.336	0.344
E	5.80	6.20	0.228	0.244
E1	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
L	0.45	0.80	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.

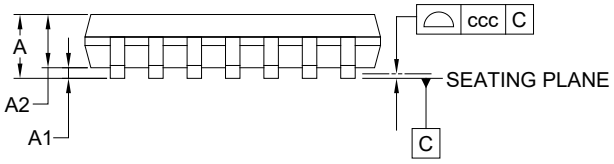
PACKAGE OUTLINE DIMENSIONS

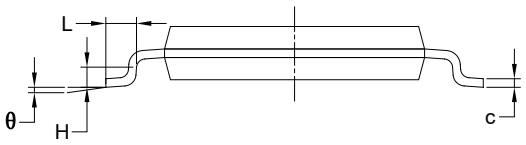
TSSOP-14





RECOMMENDED LAND PATTERN (Unit: mm)



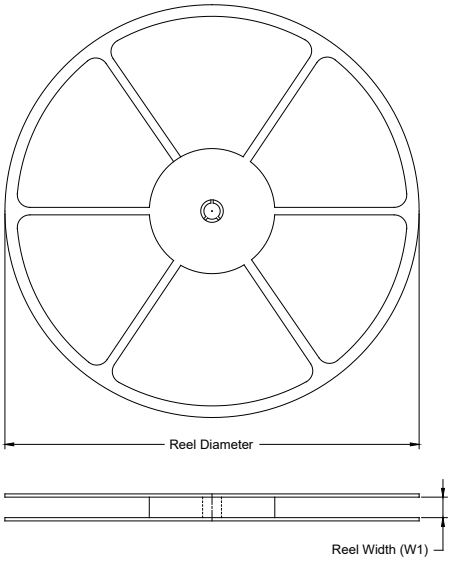


Symbol	Dimensions In Millimeters		
	MIN	MOD	MAX
A	-	-	1.200
A1	0.050	-	0.150
A2	0.800	-	1.050
b	0.190	-	0.300
c	0.090	-	0.200
D	4.860	-	5.100
E	4.300	-	4.500
E1	6.200	-	6.600
e	0.650 BSC		
L	0.450	-	0.750
H	0.250 TYP		
θ	0°	-	8°
ccc	0.100		

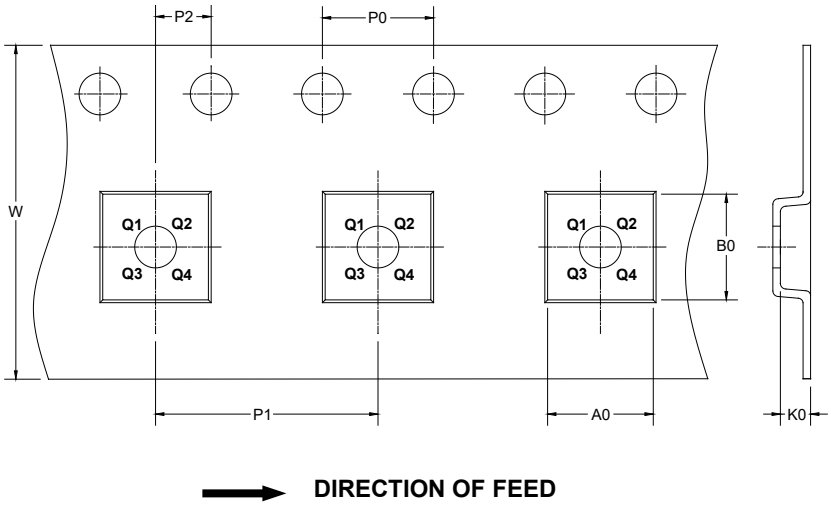
NOTES:
1. This drawing is subject to change without notice.
2. The dimensions do not include mold flashes, protrusions or gate burrs.
3. Reference JEDEC MO-153.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



DIRECTION OF FEED

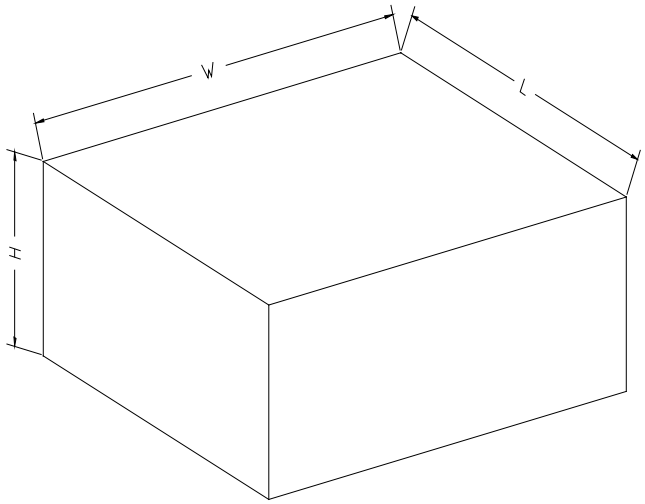
NOTE: The picture is only for reference. Please make the object as the standard.

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	6.80	5.40	1.50	4.0	8.0	2.0	12.0	Q1

DD0001

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