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℃ to +85℃.

APPLICATIONS

Automotive

Portable Equipment

Sample-and-Hold Circuits

Data-Acquisition Systems

Battery-Powered Systems

Audio and Video Signal Routing

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 = 50Ω, f = 1MHz)**
- **Low Off-Leakage Current: 1nA (TYP) at +25℃**
- **Low On-Leakage Current: 1nA (TYP) at +25℃**
- **Low Distortion: 0.7% (R_L = 600Ω, f = 20Hz to 20kHz)**
- **-40℃ to +85℃ Operating Temperature Range**
- **Available in Green SOIC-16, SSOP-16, TSSOP-16 and TQFN-3×3-16L Packages**

PACKAGE/ORDERING INFORMATION

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

MARKING INFORMATION

NOTE: XXXXX = Date Code and Vendor Code.

SOIC-16/SSOP-16/TSSOP-16/TQFN-3×3-16L

<u>X X X X X</u>
        — Vendor Code
      — Date Code - Week
   — Date Code - Year
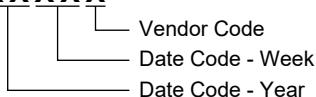
Green (RoHS & HSF): SG Micro Corp defines "Green" to mean Pb-Free (RoHS compatible) and free of halogen substances. If you have additional comments or questions, please contact your SGMICRO representative directly.

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, X_, Y_
(Pulsed at 1ms, 10% duty cycle) .... ±40mA
Junction Temperature .... +150℃
Storage Temperature Range .... -65℃ to +150℃
Lead Temperature (Soldering, 10s) .... +260℃
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℃ to +85℃

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

(TOP VIEW)

SOIC-16/SSOP-16/TSSOP-16

(TOP VIEW)

TQFN-3×3-16L
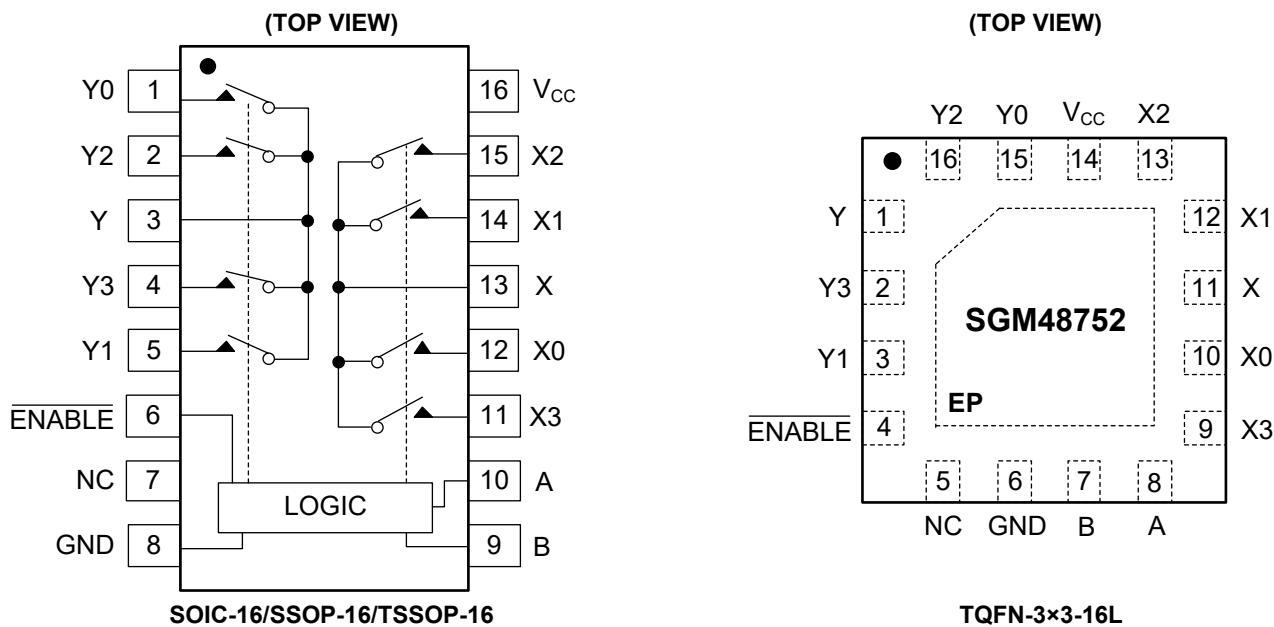
PIN DESCRIPTION

PIN		NAME	FUNCTION
SOIC-16/SSOP-16/TSSOP-16	TQFN-3×3-16L		
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	$\overline{\text{ENABLE}}$	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_{CC}	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

$\overline{\text{ENABLE}}$ 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_{CC} = 5.0V, Full = -40℃ to +85℃, typical values are at T_A = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Analog Switch							
Analog Signal Range	$V_{X\_}$, $V_{Y\_}$, V_X, V_Y		Full	GND		V_{CC}	V
On-Resistance	R_{ON}	V_{CC} = 5.0V, I_X, I_Y = 1mA	+25℃		48	58	Ω
			Full			67	
On-Resistance Match Between Channels	ΔR_{ON}	V_{CC} = 5.0V, I_X, I_Y = 1mA	+25℃		1.5	5	Ω
			Full			5.3	
On-Resistance Flatness	$R_{FLAT(ON)}$	V_{CC} = 5.0V, I_X = 1mA	+25℃		17	25	Ω
			Full			28	
X_, Y_ Off Leakage Current	$I_{X\_(OFF)}$, $I_{Y\_(OFF)}$	V_{CC} = 5.0V, $V_{X\_}$, $V_{Y\_}$ = 1V, 4.5V, V_X, V_Y = 4.5V, 1V	+25℃		1	1000	nA
X, Y Off Leakage Current	$I_{X(OFF)}$, $I_{Y(OFF)}$	V_{CC} = 5.0V, $V_{X\_}$, $V_{Y\_}$ = 1V, 4.5V, V_X, V_Y = 4.5V, 1V	+25℃		1	1000	nA
X, Y On Leakage Current	$I_{X(ON)}$, $I_{Y(ON)}$	V_{CC} = 5.0V, V_X, V_Y = 4.5V, 1V	+25℃		1	1000	nA
Digital I/O							
Logic Input Logic Threshold High	V_{AH}, V_{BH}, $V_{\overline{ENABLE}}$		+25℃	1.7			V
Logic Input Logic Threshold Low	V_{AL}, V_{BL}, $V_{\overline{ENABLE}}$		+25℃			0.5	V
Input-Current High	I_{AH}, I_{BH}, $I_{\overline{ENABLE}}$	V_A, V_B, $V_{\overline{ENABLE}}$ = V_{CC}	+25℃		1	1000	nA
Input-Current Low	I_{AL}, I_{BL}, $I_{\overline{ENABLE}}$	V_A, V_B, $V_{\overline{ENABLE}}$ = 0V	+25℃		1	1000	nA
Dynamic Characteristics							
Address Transition Time	t_{TRANS}	$V_{X\_}$, $V_{Y\_}$ = 3V/0V, R_L = 300Ω, C_L = 35pF, Test Circuit 1	+25℃		85		ns
$\overline{ENABLE}$ Turn-On Time	t_{ON}	$V_{X\_}$, $V_{Y\_}$ = 3V, R_L = 300Ω, C_L = 35pF, Test Circuit 2	+25℃		60		ns
$\overline{ENABLE}$ Turn-Off Time	t_{OFF}	$V_{X\_}$, $V_{Y\_}$ = 3V, R_L = 300Ω, C_L = 35pF, Test Circuit 2	+25℃		70		ns
Internal A, B Rise Time	t_R		+25℃		45		ns
Internal A, B Fall Time	t_F		+25℃		50		ns
Break-Before-Make Time Delay	t_D	$V_{X\_}$, $V_{Y\_}$ = 3V, R_L = 300Ω, C_L = 35pF, Test Circuit 3	+25℃		50		ns
Charge Injection	Q	R_S = 0Ω, C_L = 1nF, Test Circuit 4	+25℃		3		pC
Off-Isolation	O_{ISO}	R_L = 50Ω, f = 1MHz, Test Circuit 5	+25℃		-83		dB
Channel-to-Channel Crosstalk	X_{TALK}	f = 1MHz, Test Circuit 5	+25℃		-110		dB
Input Off-Capacitance	$C_{X\_(OFF)}$, $C_{Y\_(OFF)}$	f = 1MHz, Test Circuit 6	+25℃		5		pF
Output Off-Capacitance	$C_{X(OFF)}$, $C_{Y(OFF)}$	f = 1MHz, Test Circuit 6	+25℃		9		pF
Output On-Capacitance	$C_{X(ON)}$, $C_{Y(ON)}$	f = 1MHz, Test Circuit 6	+25℃		13		pF
-3dB Bandwidth	BW	R_L = 50Ω	+25℃		180		MHz
Total Harmonic Distortion	THD	R_L = 600Ω, $5V_{P-P}$, f = 20Hz to 20kHz	+25℃		0.7		%
Power Supply							
Power Supply Range	V_{CC}		Full	2.5		5.5	V
Power Supply Current	I_{CC}	V_A, V_B, $V_{\overline{ENABLE}}$ = V_{CC} or 0	+25℃		0.001	6	μA

ELECTRICAL CHARACTERISTICS (continued)

(V_{CC} = 3.3V, Full = -40℃ to +85℃, typical values are at T_A = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Analog Switch							
Analog Signal Range	$V_{X\_}$, $V_{Y\_}$, V_X, V_Y		Full	GND		V_{CC}	V
On-Resistance	R_{ON}	I_X, I_Y = 1mA	+25℃		80	110	Ω
			Full			116	
X_, Y_ Off Leakage Current	$I_{X\_(OFF)}$, $I_{Y\_(OFF)}$	$V_{X\_}$, $V_{Y\_}$ = 1V, 3V, V_X, V_Y = 3V, 1V	+25℃		1	1000	nA
X, Y Off Leakage Current	$I_{X(OFF)}$, $I_{Y(OFF)}$	$V_{X\_}$, $V_{Y\_}$ = 1V, 3V, V_X, V_Y = 3V, 1V	+25℃		1	1000	nA
X, Y On Leakage Current	$I_{X(ON)}$, $I_{Y(ON)}$	V_X, V_Y = 3V, 1V	+25℃		1	1000	nA
Digital I/O							
Logic Input Logic Threshold High	V_{AH}, V_{BH}, $V_{\overline{ENABLE}}$		+25℃	1.7			V
Logic Input Logic Threshold Low	V_{AL}, V_{BL}, $V_{\overline{ENABLE}}$		+25℃			0.5	V
Input-Current High	I_{AH}, I_{BH}, $I_{\overline{ENABLE}}$	V_A, V_B, $V_{\overline{ENABLE}}$ = V_{CC}	+25℃		1	1000	nA
Input-Current Low	I_{AL}, I_{BL}, $I_{\overline{ENABLE}}$	V_A, V_B, $V_{\overline{ENABLE}}$ = 0V	+25℃		1	1000	nA
Dynamic Characteristics							
Address Transition Time	t_{TRANS}	$V_{X\_}$, $V_{Y\_}$ = 3V/0V, R_L = 300Ω, C_L = 35pF, Test Circuit 1	+25℃		150		ns
$\overline{ENABLE}$ Turn-On Time	t_{ON}	$V_{X\_}$, $V_{Y\_}$ = 3V, R_L = 300Ω, C_L = 35pF, Test Circuit 2	+25℃		110		ns
$\overline{ENABLE}$ Turn-Off Time	t_{OFF}	$V_{X\_}$, $V_{Y\_}$ = 3V, R_L = 300Ω, C_L = 35pF, Test Circuit 2	+25℃		100		ns
Internal A, B Rise Time	t_R		+25℃		80		ns
Internal A, B Fall Time	t_F		+25℃		85		ns
Break-Before-Make Time Delay	t_D	$V_{X\_}$, $V_{Y\_}$ = 3V, R_L = 300Ω, C_L = 35pF, Test Circuit 3	+25℃		80		ns
-3dB Bandwidth	BW	R_L = 50Ω	+25℃		180		MHz
Charge Injection	Q	R_S = 0Ω, C = 1nF, V_S = 2.5V, Test Circuit 4	+25℃		3		pC
Power Supply							
Power Supply Current	I_{CC}	V_A, V_B, $V_{\overline{ENABLE}}$ = V_{CC} or 0	+25℃		0.001	3	μA

TYPICAL PERFORMANCE CHARACTERISTICS

V_{CC} = 5.0V, unless otherwise noted.

On-Resistance vs. Input Voltage

T_A = +85℃

T_A = +25℃

T_A = -40℃

On-Resistance (Ω)

Input Voltage (V)

Off-Isolation vs. Frequency

Off-Isolation (dB)

Frequency (MHz)
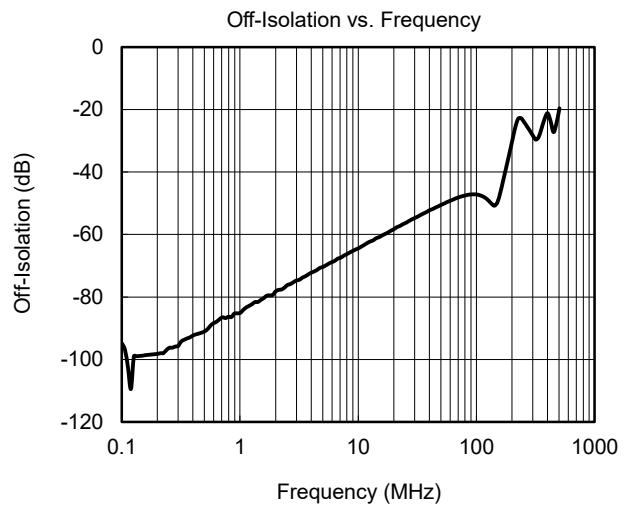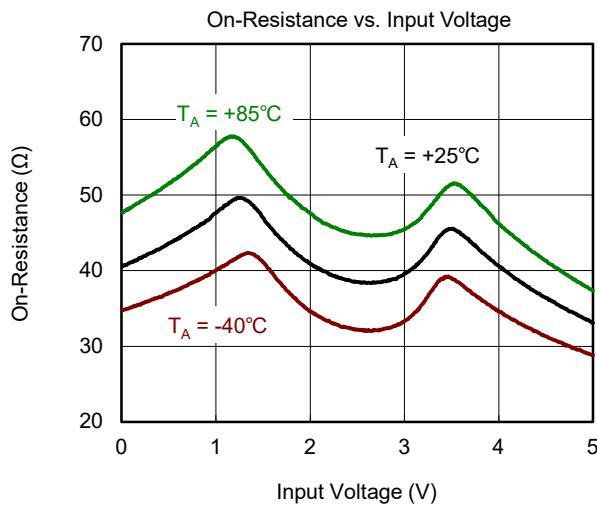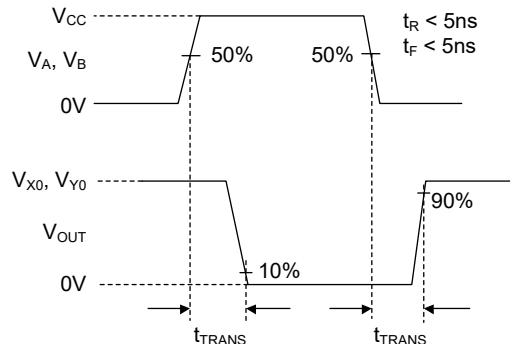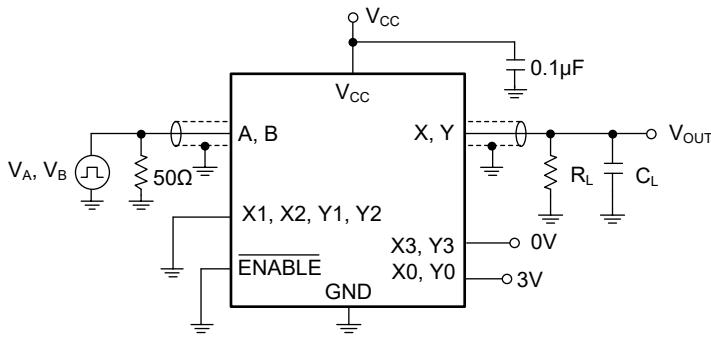
# TEST CIRCUITS

Test Circuit 1. Address Transition Times (t_TRANS)
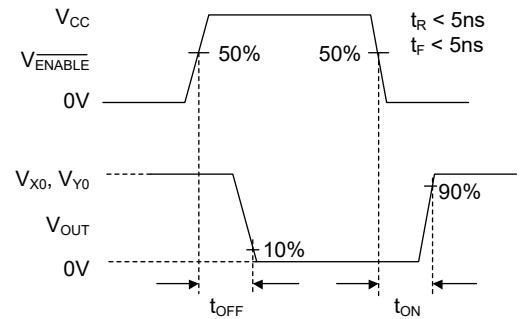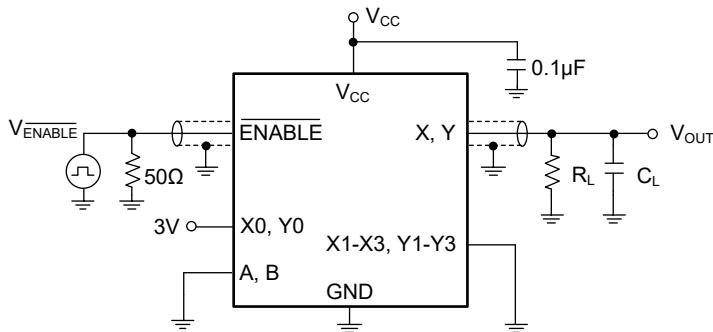
Test Circuit 2. Switching Times (t_ON, t_OFF)
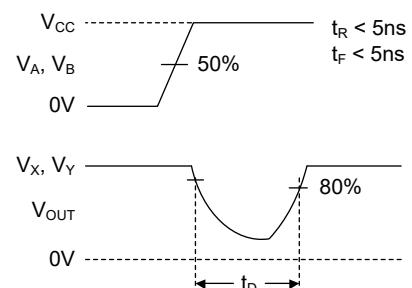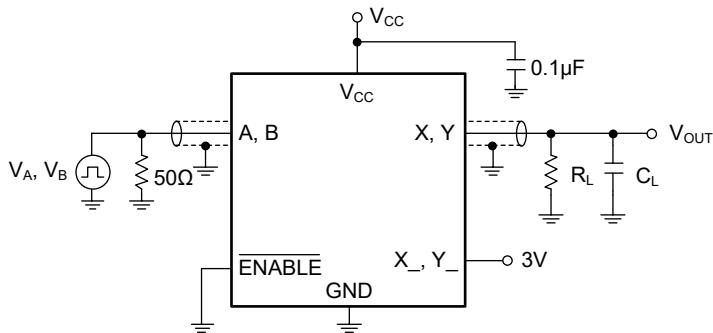
**Test Circuit 3. Break-Before-Make Time Delay (t_D)**

TEST CIRCUITS (continued)
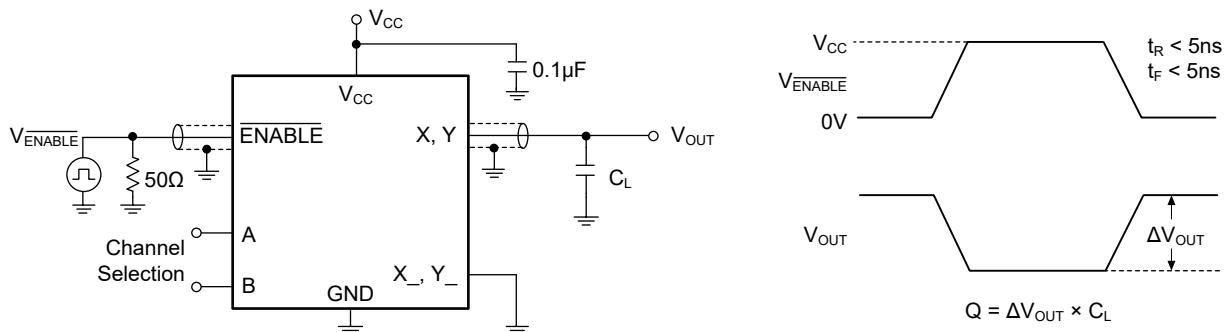
Test Circuit 4. Charge Injection (Q)
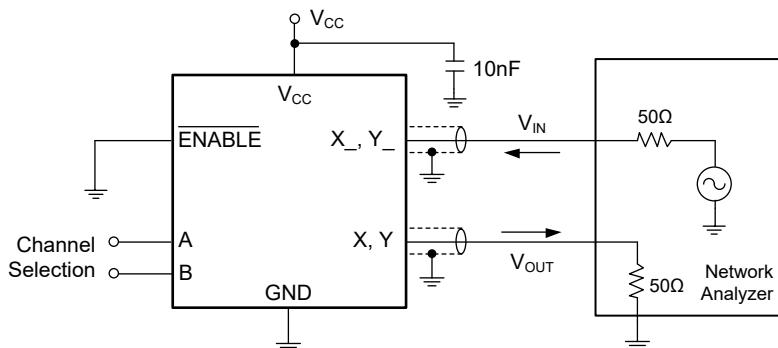
Off-Isolation = 20log (V_{OUT}/V_{IN}) (Measured between X and "OFF" X_ Terminal on Each Switch)

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

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

Test Circuit 5. Off-Isolation, On Loss and Crosstalk
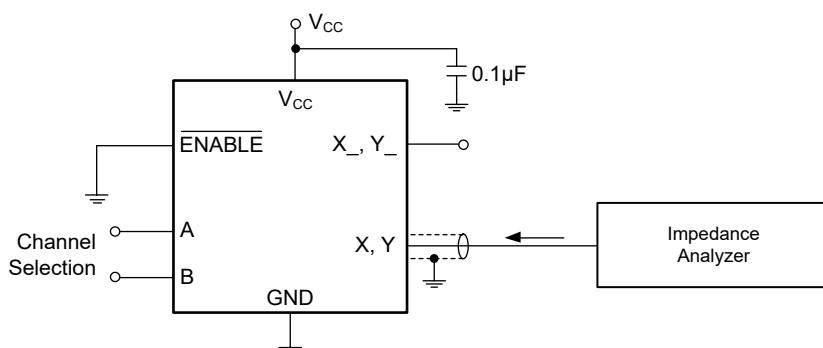
Test Circuit 6. Capacitance

REVISION HISTORY

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

## PACKAGE OUTLINE DIMENSIONS

SOIC-16
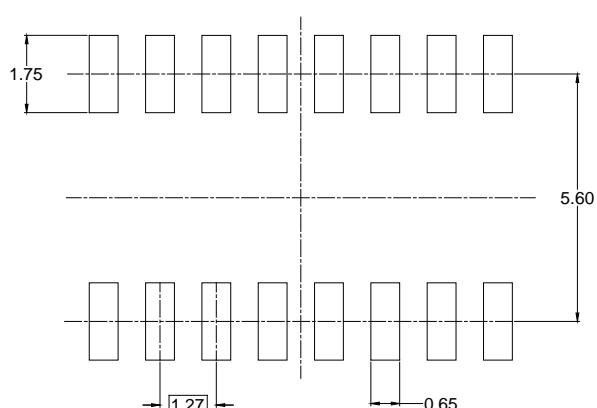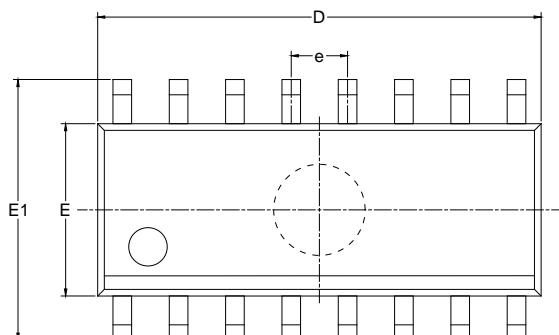
RECOMMENDED LAND PATTERN (Unit: mm)
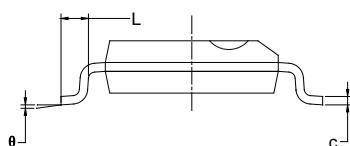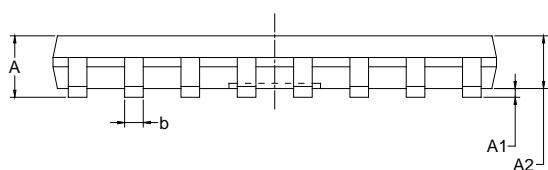
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	9.800	10.200	0.386	0.402
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.27 BSC		0.050 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
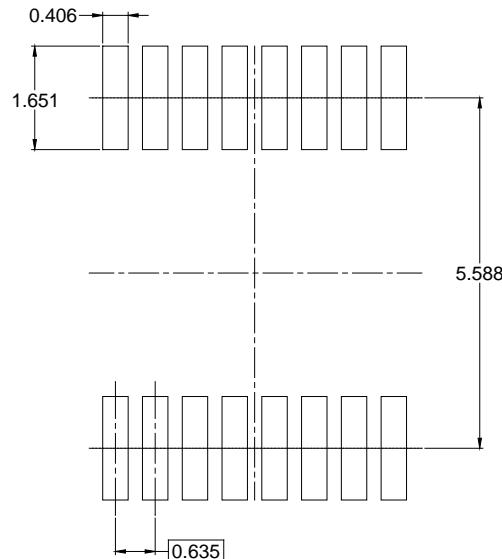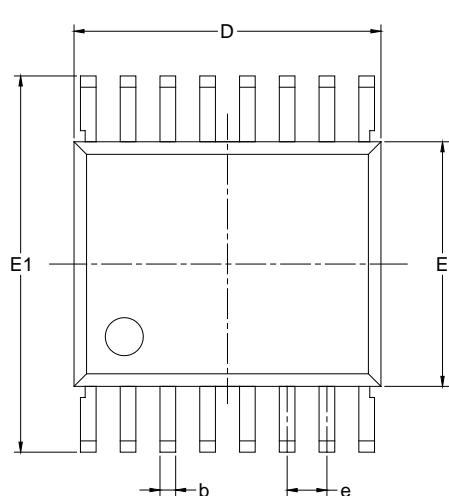
RECOMMENDED LAND PATTERN (Unit: mm)
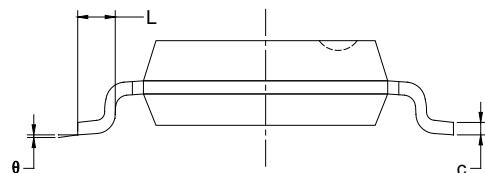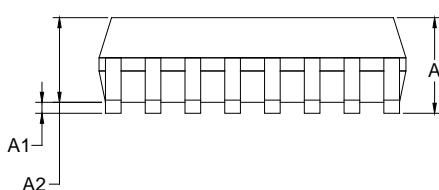
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	**MAX**	**MIN**	**MAX**
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.200	0.300	0.008	0.012
c	0.170	0.250	0.007	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	0.635 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 mode flash or protrusion.
2. This drawing is subject to change without notice.

PACKAGE OUTLINE DIMENSIONS

TSSOP-16
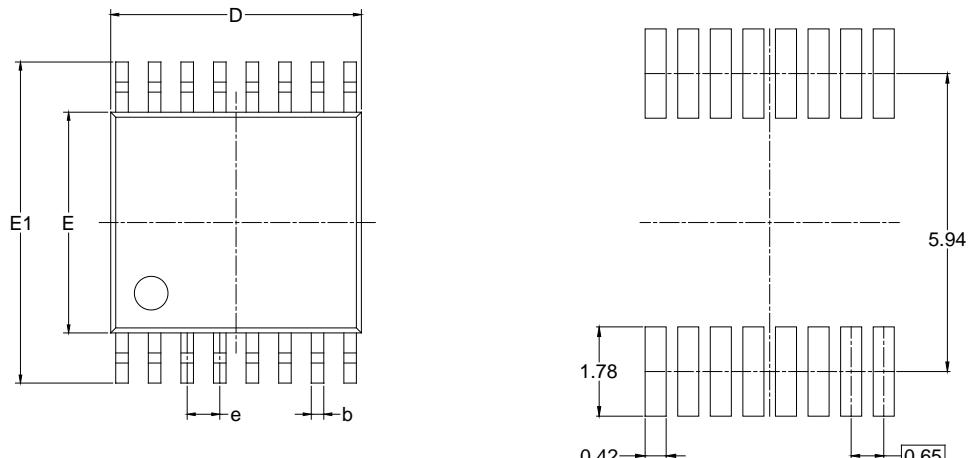
RECOMMENDED LAND PATTERN (Unit: mm)
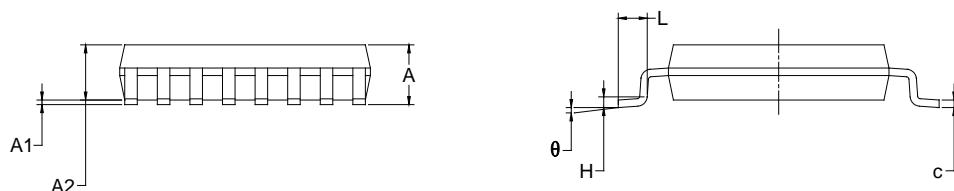
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A		1.200		0.047
A1	0.050	0.150	0.002	0.006
A2	0.800	1.050	0.031	0.041
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
D	4.860	5.100	0.191	0.201
E	4.300	4.500	0.169	0.177
E1	6.200	6.600	0.244	0.260
e	0.650 BSC		0.026 BSC	
L	0.500	0.700	0.02	0.028
H	0.25 TYP		0.01 TYP	
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 OUTLINE DIMENSIONS

TQFN-3×3-16L

TOP VIEW

BOTTOM VIEW

SIDE VIEW

RECOMMENDED LAND PATTERN (Unit: mm)
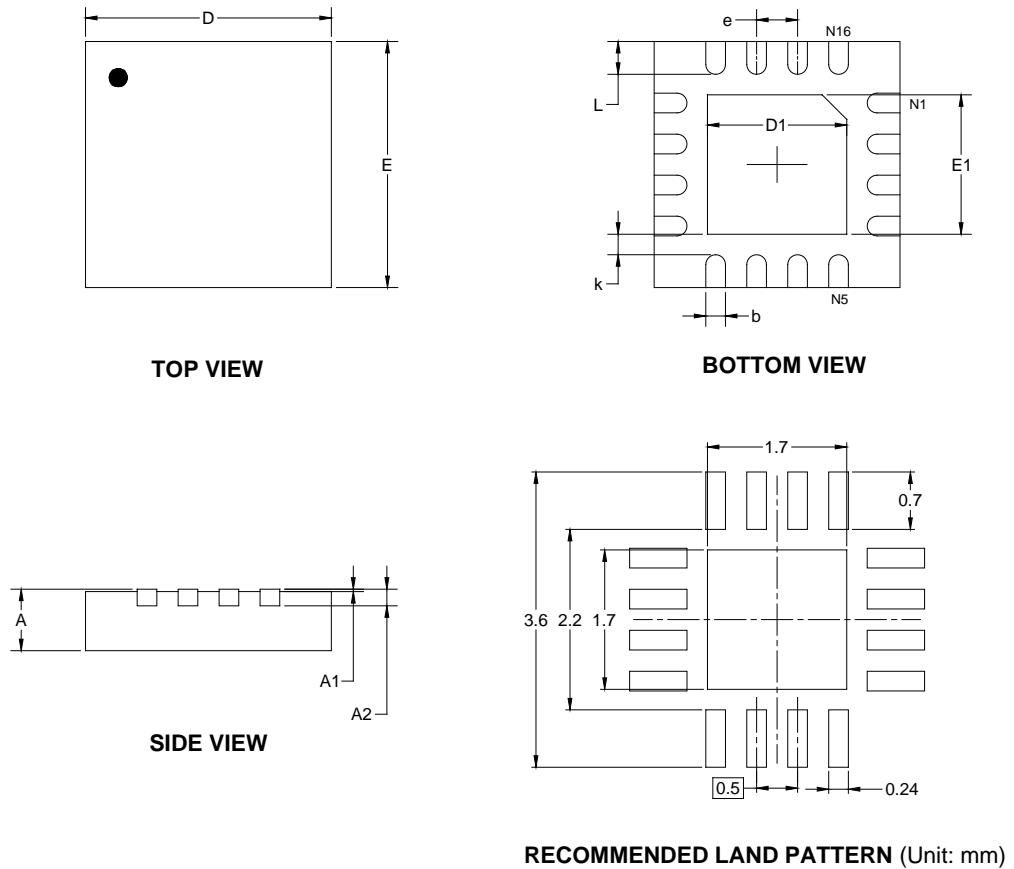
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203 REF		0.008 REF	
D	2.900	3.100	0.114	0.122
D1	1.600	1.800	0.063	0.071
E	2.900	3.100	0.114	0.122
E1	1.600	1.800	0.063	0.071
k	0.200 MIN		0.008 MIN	
b	0.180	0.300	0.007	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.

TAPE AND REEL INFORMATION

REEL DIMENSIONS
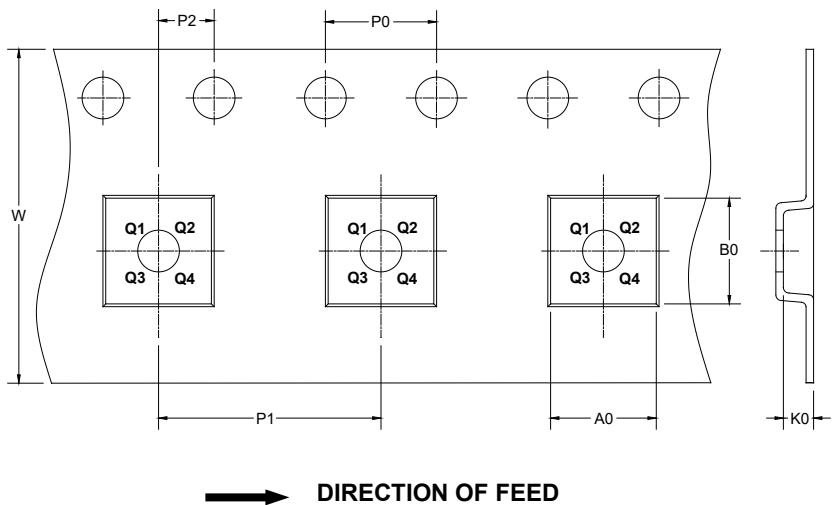
Reel Diameter

Reel Width (W1)

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-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

DD0001

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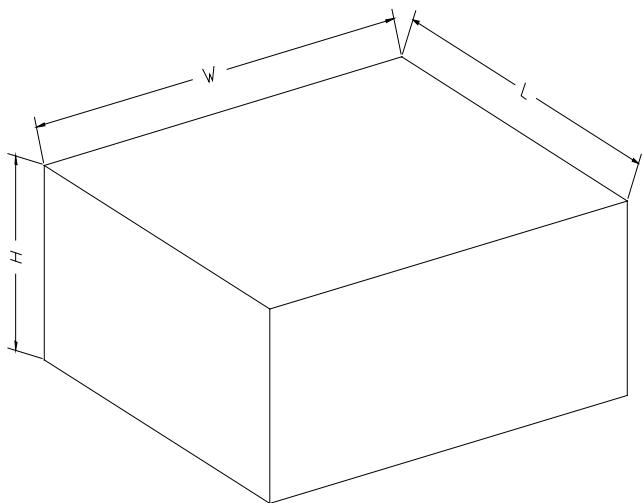
NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF CARTON BOX

Reel Type	Length (mm)	Width (mm)	Height (mm)	Pizza/Carton	
13″	386	280	370	5	DD0002