

GENERAL DESCRIPTION

The SGM4582 is a TTL/CMOS compatible analog multiplexer which consists of two 4-channel multiplexers. It operates from +3.6V to +11V single power supply or $\pm 1.8\text{V}$ to $\pm 5.5\text{V}$ dual power supplies.

The SGM4582 features high voltage, low on-resistance and low distortion. The high performances make it very suitable for multiple applications, such as cellular phones, audio and video signal routing, etc.

TTL/CMOS logic compatibility can be guaranteed when using a single +5V or dual $\pm 5\text{V}$ power supplies because the logic thresholds of all digital inputs are between 0.8V and 2.4V.

The SGM4582 is available in Green SOIC-16, SSOP-16, TSSOP-16 and TQFN-3 $\times$ 3-16L packages. It operates over an ambient temperature range of -40°C to $+85^{\circ}\text{C}$.

FEATURES

- **Single Supply Voltage Range:** +3.6V to +11V
- **Dual-Supply Voltage Range:** $\pm 1.8\text{V}$ to $\pm 5.5\text{V}$
- **High Off-Isolation:** -66dB ($R_L = 50\Omega$, $f = 1\text{MHz}$)
- **On-Resistance:**
 - 51 Ω (MAX) with $\pm 5\text{V}$ Supplies
 - 84 Ω (MAX) with Single +5V Supply
- **Low On-Resistance Flatness**
- **Low Off-Leakage Current:** 10nA (TYP) at $+25^{\circ}\text{C}$
- **Low On-Leakage Current:** 10nA (TYP) at $+25^{\circ}\text{C}$
- **Low Crosstalk:** -100dB ($R_L = 50\Omega$, $f = 1\text{MHz}$)
- **Low Distortion:** 0.08% ($R_L = 600\Omega$, $f = 20\text{Hz}$ to 20kHz)
- **Rail-to-Rail Input and Output Operation**
- **TTL/CMOS-Logic Compatible**
- **-40°C to $+85^{\circ}\text{C}$ Operating Temperature Range**
- **Available in Green SOIC-16, SSOP-16, TSSOP-16 and TQFN-3 $\times$ 3-16L Packages**

APPLICATIONS

Automotive
Cellular Phones
Portable Equipment
Sample-and-Hold Circuits
Battery-Powered Systems
Audio and Video Signal Routing

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM4582	SOIC-16	-40°C to +85°C	SGM4582YS16G/TR	SGM4582YS16 XXXXX	Tape and Reel, 2500
	SSOP-16	-40°C to +85°C	SGM4582YQS16G/TR	SGM4582 YQS16 XXXXX	Tape and Reel, 3000
	TSSOP-16	-40°C to +85°C	SGM4582YTS16G/TR	SGM4582 YTS16 XXXXX	Tape and Reel, 3000
	TQFN-3×3-16L	-40°C to +85°C	SGM4582YTQ16G/TR	4582TQ XXXXX	Tape and Reel, 3000

NOTE: XXXXX = Date Code and Vendor Code.

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

Voltages Referenced to V_{EE}

V_{CC}	-0.3V to 13.2V
GND	-0.3V to 6V
Voltage into Any Terminal ⁽¹⁾ ($V_{EE} - 0.3V$) to ($V_{CC} + 0.3V$)	
Continuous Current into Any Terminal	±20mA
Peak Current, X_{-} (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	3000V
MM	200V

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

RECOMMENDED OPERATING CONDITIONS

Operating Temperature Range	-40°C to +85°C
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OVERSTRESS CAUTION

Stresses beyond those listed may cause permanent damage to the device. Functional operation of the device at these or any other conditions beyond those indicated in the operational section of the specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

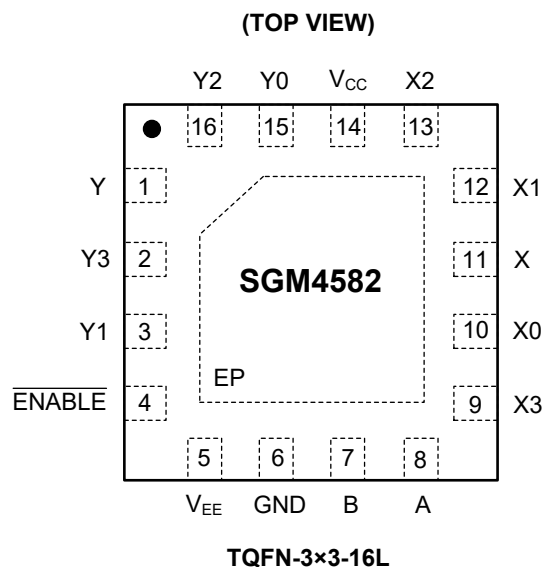
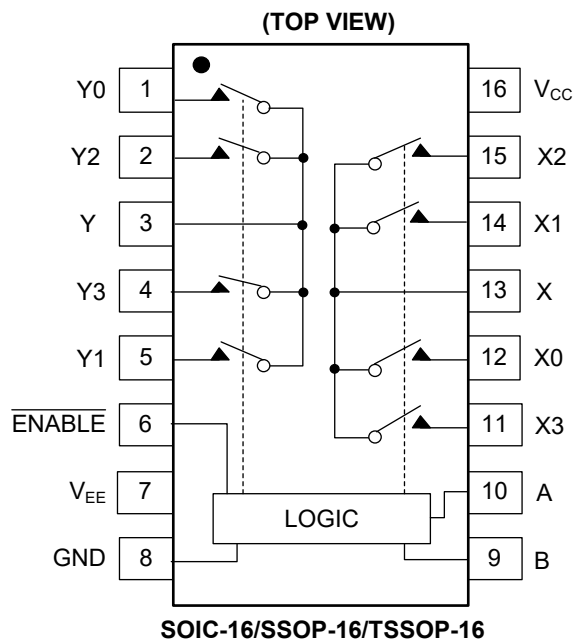
DISCLAIMER

SG Micro Corp reserves the right to make any change in circuit design, specification or other related things if necessary without notice at any time.

ESD SENSITIVITY CAUTION

This integrated circuit can be damaged by ESD if you don't pay attention to ESD protection. 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 very small parametric changes could cause the device not to meet its published specifications.

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 Pins 0-3.
3	1	Y	Analog Switch "Y" Output Pin.
6	4	ENABLE	Digital Enable Control Pin. Normally connected to GND.
7	5	V _{EE}	Negative Analog Supply Voltage Input Pin. Connect to GND for single-supply operation.
8	6	GND	Ground.
9	7	B	Digital Address "B" Input Pin.
10	8	A	Digital Address "A" Input Pin.
13	11	X	Analog Switch "X" Output Pin.
12, 14, 15, 11	10, 12, 13, 9	X0, X1, X2, X3	Analog Switch "X" Inputs Pins 0-3.
16	14	V _{CC}	Positive Analog and Digital Supply Voltage Input Pin.
—	Exposed Pad	EP	Exposed Pad. Connect exposed pad to V _{EE} Pin.

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 (Dual Supplies)(V_{CC} = 4.5V to 5.5V, V_{EE} = -4.5V to -5.5V, Full = -40°C to +85°C, typical values are at T_A = +25°C, 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	V _{EE}		V _{CC}	V
On-Resistance	R _{ON}	V _{CC} = 4.5V, V _{EE} = -4.5V, I _X , I _Y = 1mA	+25°C		36	51	Ω
			Full			62	
On-Resistance Match Between Channels	ΔR _{ON}	V _{CC} = 4.5V, V _{EE} = -4.5V, I _X , I _Y = 1mA	+25°C		3	11	Ω
			Full			12.7	
On-Resistance Flatness	R _{FLAT(ON)}	V _{CC} = 4.5V, V _{EE} = -4.5V, I _X , I _Y = 1mA	+25°C		15	25	Ω
			Full			29	
X ₋ , Y ₋ Off Leakage Current	I _{X(OFF)} , I _{Y(OFF)}	V _{CC} = 5.5V, V _{EE} = -5.5V, V _X , V _Y = ±4.5V, V _X , V _Y = m4.5V	+25°C		10		nA
X, Y Off Leakage Current	I _{X(OFF)} , I _{Y(OFF)}	V _{CC} = 5.5V, V _{EE} = -5.5V, V _X , V _Y = ±4.5V, V _X , V _Y = m4.5V	+25°C		10		nA
X, Y On Leakage Current	I _{X(ON)} , I _{Y(ON)}	V _{CC} = 5.5V, V _{EE} = -5.5V, V _X , V _Y = ±4.5V	+25°C		10		nA
DIGITAL I/O							
Logic Input Logic Threshold High	V _{AH} , V _{BH} , V _{ENABLEH}		+25°C	2.4			V
Logic Input Logic Threshold Low	V _{AL} , V _{BL} , V _{ENABLEL}		+25°C			0.8	V
Input-Current High	I _{AH} , I _{BH} , I _{ENABLEH}	V _A , V _B , V _{ENABLE} = V _{CC}	+25°C		10		nA
Input-Current Low	I _{AL} , I _{BL} , I _{ENABLEL}	V _A , V _B , V _{ENABLE} = 0V	+25°C		10		nA
DYNAMIC CHARACTERISTICS							
Address Transition Time	t _{TRANS}	V _X , V _Y = ±3V, R _L = 300Ω, C _L = 35pF, Test Circuit 1	+25°C		70		ns
ENABLE Turn-On Time	t _{ON}	V _X , V _Y = 3V, R _L = 300Ω, C _L = 35pF, Test Circuit 2	+25°C		60		ns
ENABLE Turn-Off Time	t _{OFF}	V _X , V _Y = 3V, R _L = 300Ω, C _L = 35pF, Test Circuit 2	+25°C		60		ns
Break-Before-Make Time	t _D	V _X , V _Y = 3V, R _L = 300Ω, C _L = 35pF, Test Circuit 3	+25°C		20		ns
Charge Injection	Q	R _S = 0Ω, C = 1nF, V _S = 0V, Test Circuit 4	+25°C		15		pC
Channel-to-Channel Crosstalk	V _{CT}	R _L = 50Ω, f = 1MHz, Test Circuit 5	+25°C		-100		dB
Off Isolation	V _{ISO}	R _L = 50Ω, f = 1MHz, Test Circuit 5	+25°C		-66		dB
Input Off-Capacitance	C _{X(OFF)} , C _{Y(OFF)}	f = 1MHz, Test Circuit 6	+25°C		9		pF
Output Off-Capacitance	C _{X(OFF)} , C _{Y(OFF)}	f = 1MHz, Test Circuit 6	+25°C		20		pF
Output On-Capacitance	C _{X(ON)} , C _{Y(ON)}	f = 1MHz, Test Circuit 6	+25°C		40		pF
-3dB Bandwidth	BW	R _L = 50Ω	+25°C		120		MHz
Total Harmonic Distortion	THD	R _L = 600Ω, 5V _{P-P} , f = 20Hz to 20kHz	+25°C		0.08		%
POWER SUPPLY							
Power Supply Range	V _{CC} , V _{EE}		Full	±1.8		±5.5	V
Power Supply Current	I _{CC} , I _{EE}	V _{CC} = 5.5V, V _{EE} = -5.5V, V _A , V _B , V _{ENABLE} = V _{CC} or 0	+25°C		0.01	20	μA

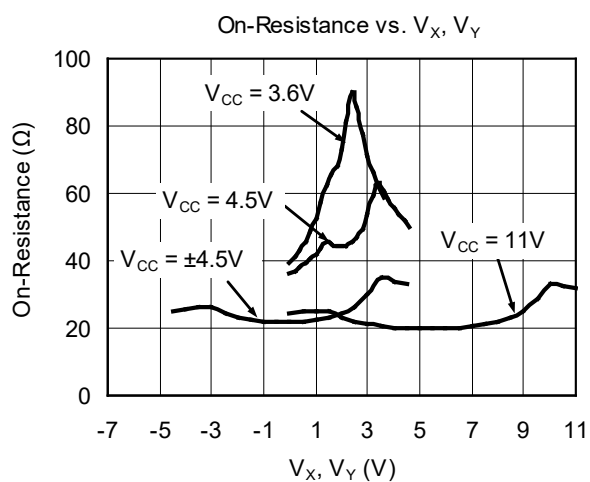
ELECTRICAL CHARACTERISTICS (Single Supply at +5V)(V_{CC} = 4.5V to 5.5V, V_{EE} = 0V, Full = -40°C to +85°C, typical values are at T_A = +25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
ANALOG SWITCH							
Analog Signal Range	V_{X-}, V_{Y-}, V_X, V_Y		Full	V _{EE}		V _{CC}	V
On-Resistance	R _{ON}	V _{CC} = 4.5V, I _X , I _Y = 1mA	+25°C		66	84	Ω
			Full			97	
On-Resistance Match Between Channels	ΔR _{ON}	V _{CC} = 4.5V, I _X , I _Y = 1mA	+25°C		3	11	Ω
			Full			14	
X ₋ , Y ₋ Off Leakage Current	I _{X(OFF)} , I _{Y(OFF)}	V _{CC} = 5.5V, V _{X-} , V _{Y-} = 1V, 4.5V, V _X , V _Y = 4.5V, 1V	+25°C		10		nA
X, Y Off Leakage Current	I _{X(OFF)} , I _{Y(OFF)}	V _{CC} = 5.5V, V _{X-} , V _{Y-} = 1V, 4.5V, V _X , V _Y = 4.5V, 1V	+25°C		10		nA
X, Y On Leakage Current	I _{X(ON)} , I _{Y(ON)}	V _{CC} = 5.5V, V _X , V _Y = 4.5V, 1V	+25°C		10		nA
DIGITAL I/O							
Logic Input Logic Threshold High	$V_{AH}, V_{BH}, V_{ENABLEH}$		+25°C	2.4			V
Logic Input Logic Threshold Low	$V_{AL}, V_{BL}, V_{ENABLEL}$		+25°C			0.8	V
Input-Current High	$I_{AH}, I_{BH}, I_{ENABLEH}$	V _A , V _B , V _{ENABLE} = V _{CC}	+25°C		10		nA
Input-Current Low	$I_{AL}, I_{BL}, I_{ENABLEL}$	V _A , V _B , V _{ENABLE} = 0V	+25°C		10		nA
DYNAMIC CHARACTERISTICS							
Address Transition Time	t _{TRANS}	V _{X-} , V _{Y-} = 3V/0V, R _L = 300Ω, C _L = 35pF, Test Circuit 1	+25°C		110		ns
ENABLE Turn-On Time	t _{ON}	V _{X-} , V _{Y-} = 3V, R _L = 300Ω, C _L = 35pF, Test Circuit 2	+25°C		85		ns
ENABLE Turn-Off Time	t _{OFF}	V _{X-} , V _{Y-} = 3V, R _L = 300Ω, C _L = 35pF, Test Circuit 2	+25°C		65		ns
Break-Before-Make Time	t _D	V _{X-} , V _{Y-} = 3V, R _L = 300Ω, C _L = 35pF, Test Circuit 3	+25°C		40		ns
-3dB Bandwidth	BW	R _L = 50Ω	+25°C		140		MHz
Charge Injection	Q	R _S = 0Ω, C = 1nF, V _S = 2.5V, Test Circuit 4	+25°C		2		pC
POWER SUPPLY							
Power Supply Range	V _{CC} , V _{EE}		Full	3.6		11	V
Power Supply Current	I _{CC} , I _{EE}	V _{CC} = 5.5V, V _A , V _B , V _{ENABLE} = V _{CC} or 0	+25°C		0.01	20	μA

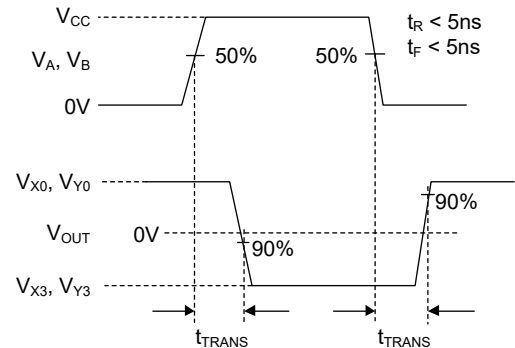
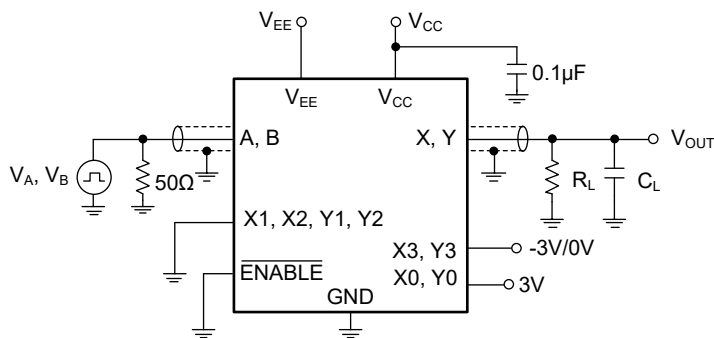
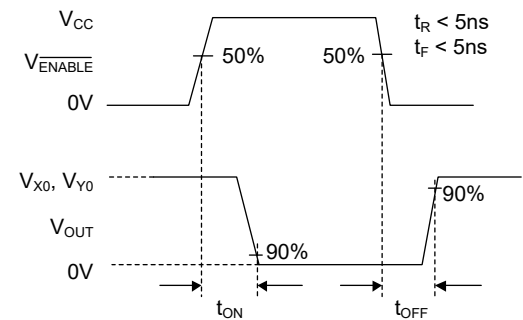
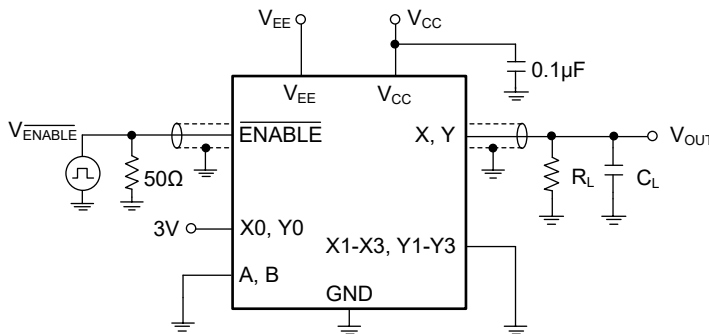
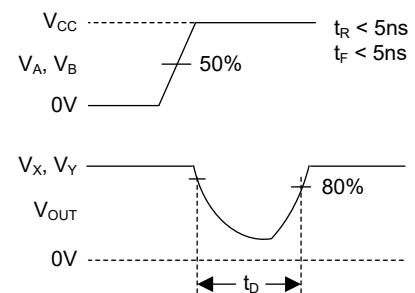
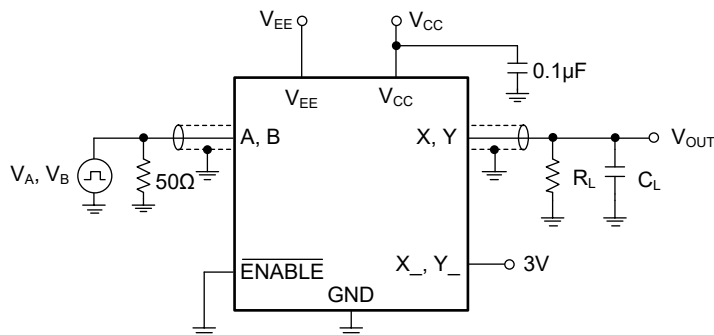
ELECTRICAL CHARACTERISTICS (Single Supply at +3.6V)(V_{CC} = 3.6V, V_{EE} = 0V, Full = -40°C to +85°C, typical values are at T_A = +25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
ANALOG SWITCH							
Analog Signal Range	V _{X-} , V _{Y-} , V _X , V _Y		Full	V _{EE}		V _{CC}	V
On-Resistance	R _{ON}	I _X , I _Y = 1mA	+25°C		100	130	Ω
			Full			140	
X ₋ , Y ₋ Off Leakage Current	I _{X(OFF)} , I _{Y(OFF)}	V _{X-} , V _{Y-} = 1V, 3V, V _X , V _Y = 3V, 1V	+25°C		10		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°C		10		nA
X, Y On Leakage Current	I _{X(ON)} , I _{Y(ON)}	V _X , V _Y = 3V, 1V	+25°C		10		nA
DIGITAL I/O							
Logic Input Logic Threshold High	V _{AH} , V _{BH} , V _{ENABLEH}		+25°C	2			V
Logic Input Logic Threshold Low	V _{AL} , V _{BL} , V _{ENABLEL}		+25°C			0.5	V
Input-Current High	I _{AH} , I _{BH} , I _{ENABLEH}	V _A , V _B , V _{ENABLE} = V _{CC}	+25°C		10		nA
Input-Current Low	I _{AL} , I _{BL} , I _{ENABLEL}	V _A , V _B , V _{ENABLE} = 0V	+25°C		10		nA
DYNAMIC CHARACTERISTICS							
Address Transition Time	t _{TRANS}	V _{X-} , V _{Y-} = 3V/0V, R _L = 300Ω, C _L = 35pF, Test Circuit 1	+25°C		170		ns
ENABLE Turn-On Time	t _{ON}	V _{X-} , V _{Y-} = 3V, R _L = 300Ω, C _L = 35pF, Test Circuit 2	+25°C		140		ns
ENABLE Turn-Off Time	t _{OFF}	V _{X-} , V _{Y-} = 3V, R _L = 300Ω, C _L = 35pF, Test Circuit 2	+25°C		80		ns
Break-Before-Make Time	t _D	V _{X-} , V _{Y-} = 3V, R _L = 300Ω, C _L = 35pF, Test Circuit 3	+25°C		70		ns
-3dB Bandwidth	BW	R _L = 50Ω	+25°C		140		MHz
Charge Injection	Q	R _S = 0Ω, C = 1nF, V _S = 2.5V, Test Circuit 4	+25°C		1		pC
POWER SUPPLY							
Power Supply Current	I _{CC} , I _{EE}	V _{CC} = 3.6V, V _A , V _B , V _{ENABLE} = V _{CC} or 0	+25°C		0.01	20	μA

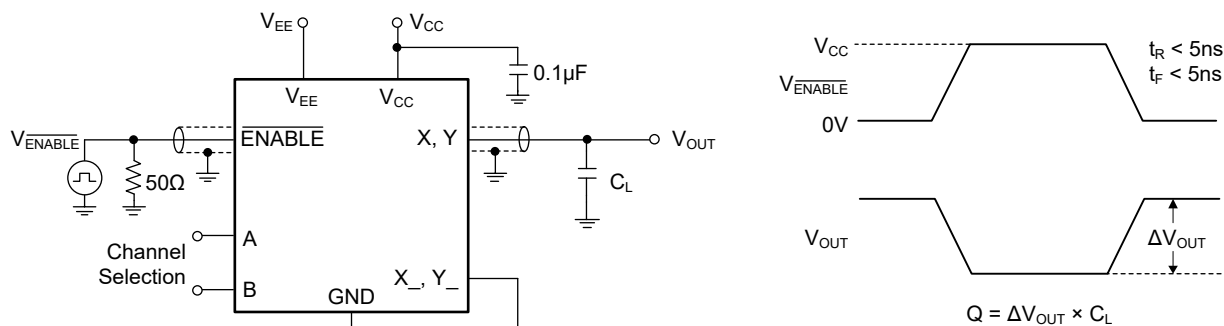
TYPICAL PERFORMANCE CHARACTERISTICS



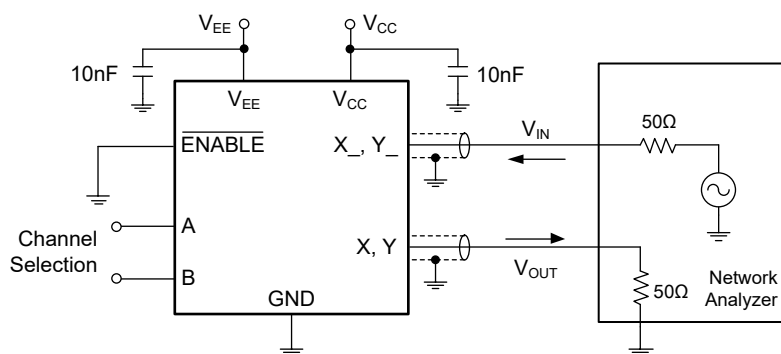
TEST CIRCUITS

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

TEST CIRCUITS (continued)



Test Circuit 4. Charge Injection (Q)

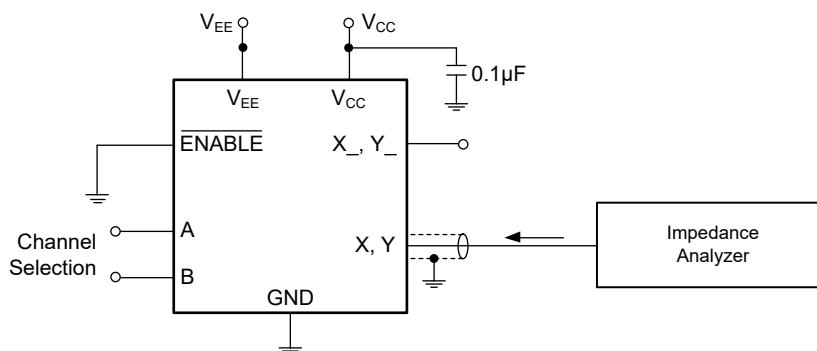


Off Isolation = $20\log(V_{OUT}/V_{IN})$ (Measured between X and "OFF" X_- Terminal on Each Switch)

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.

JANUARY 2014 – REV.A.1 to REV.A.2

ENABLE pin change to $\overline{\text{ENABLE}}$ pin	All
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JULY 2013 – REV.A to REV.A.1

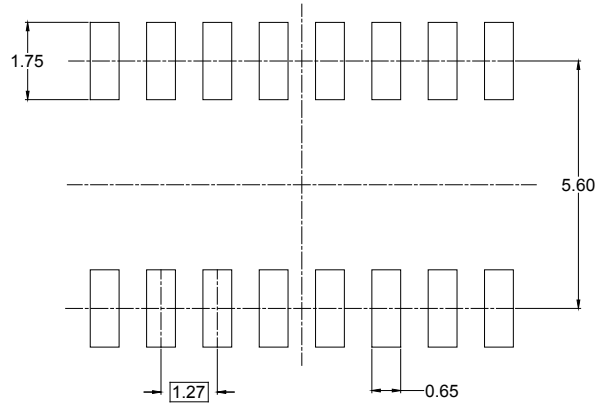
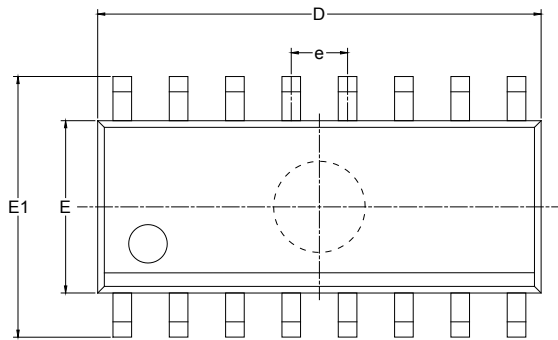
Changed Electrical Characteristics section	5, 6
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Changes from Original (AUGUST 2012) to REV.A

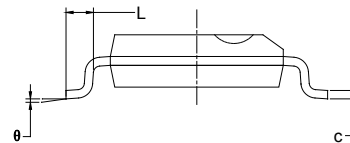
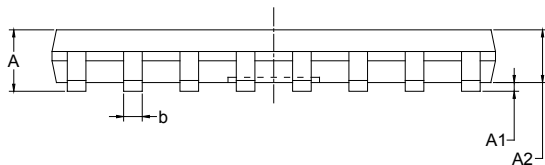
Changed from product preview to production data	All
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PACKAGE OUTLINE DIMENSIONS

SOIC-16



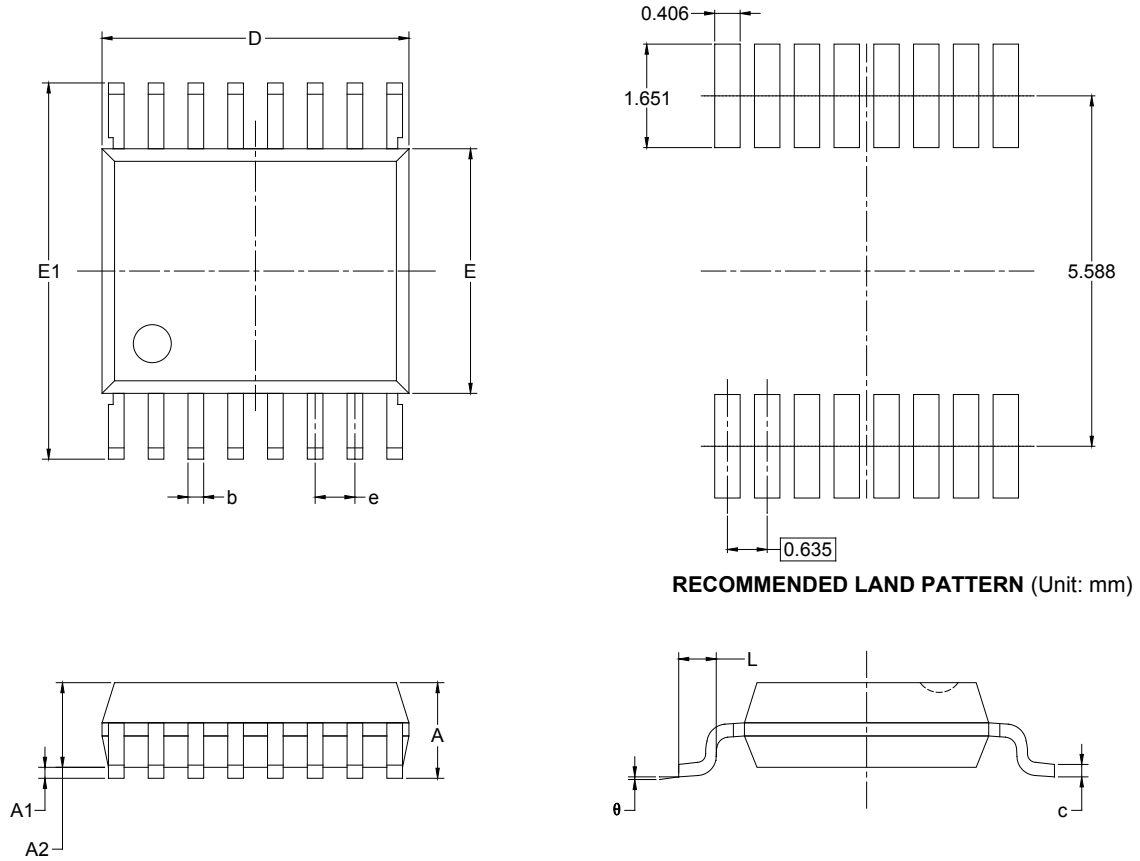
RECOMMENDED LAND PATTERN (Unit: mm)



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°

PACKAGE OUTLINE DIMENSIONS

SSOP-16

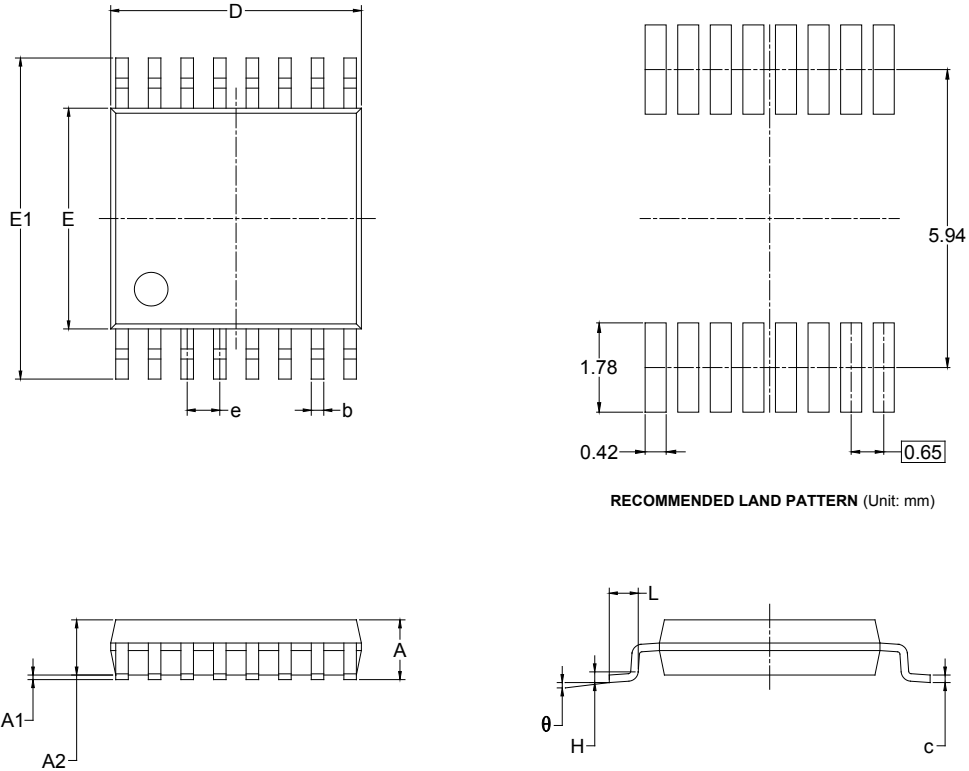


RECOMMENDED LAND PATTERN (Unit: mm)

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°

PACKAGE OUTLINE DIMENSIONS

TSSOP-16



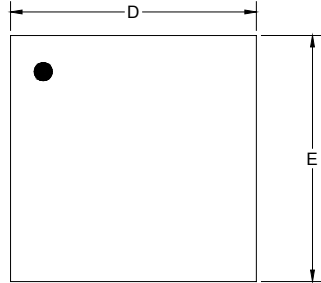
RECOMMENDED LAND PATTERN (Unit: mm)

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°

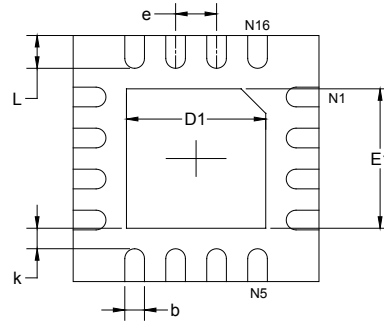
PACKAGE INFORMATION

PACKAGE OUTLINE DIMENSIONS

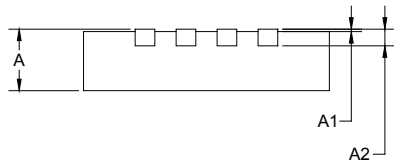
TQFN-3×3-16L



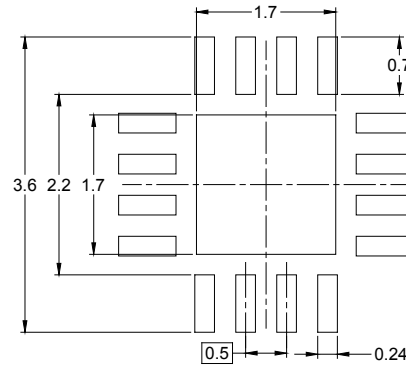
TOP VIEW



BOTTOM VIEW



SIDE VIEW



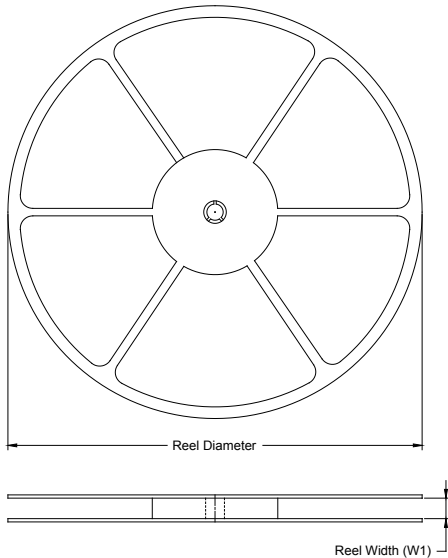
RECOMMENDED LAND PATTERN (Unit: mm)

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

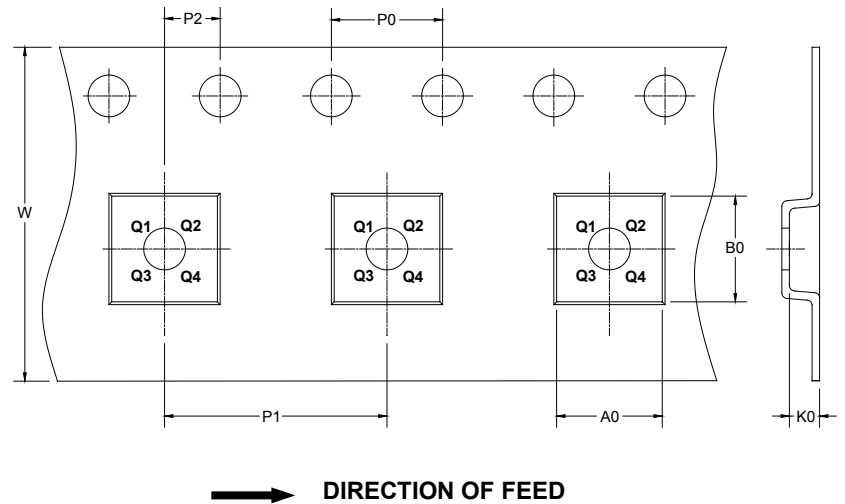
PACKAGE INFORMATION

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	1.20	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

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