



# SGM5018

## 4.5Ω, High Speed, Low Voltage Quad, SPDT Analog Switch

### GENERAL DESCRIPTION

The SGM5018 is a quad, SPDT (single-pole/double-throw), TTL/CMOS compatible analog switch. It operates from a 1.8V to 5.5V single power supply.

The SGM5018 features high-speed, low on-resistance, low voltage and high bandwidth. The high performances make it very suitable for multiple applications, such as portable equipment, audio and video signal routing, etc. Low power consumption is also one of the important reasons that make it a good choice.

The SGM5018 is available in a Green TSSOP-16 package. It operates over an ambient temperature range of -40°C to +85°C.

### FEATURES

- **Single Supply Voltage Range: 1.8V to 5.5V**
- **-3dB Bandwidth: 300MHz**
- **Low On-Resistance: 4.5Ω (TYP)**
- **Low On-Resistance Flatness**
- **High Off-Isolation: -70dB at 1MHz**
- **Low Crosstalk: -90dB at 1MHz**
- **Fast Switching Times:**
  - $t_{ON}$ : 31.5ns
  - $t_{OFF}$ : 30ns
- **Rail-to-Rail Input and Output Operation**
- **Low Power Consumption**
- **TTL/CMOS Compatible**
- **-40°C to +85°C Operating Temperature Range**
- **Available in a Green TSSOP-16 Package**

### APPLICATIONS

Cellular Phones  
Portable Equipment  
Computer Peripherals  
Sample-and-Hold Circuits  
Personal Digital Assistants  
USB 1.1 Signal Switching Circuits  
Battery-Powered Systems  
Audio and Video Signal Routing

**PACKAGE/ORDERING INFORMATION**

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM5018	TSSOP-16	-40°C to +85°C	SGM5018YTS/TR	SGM5018 YTS 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**

V<sub>+</sub> to GND ..... -0.3V to 6V  
 Analog, Digital Voltage Range <sup>(1)</sup> ..... -0.3V to (V<sub>+</sub>) + 0.3V  
 Continuous Current NO, NC, or COM ..... ±100mA  
 Junction Temperature ..... +150°C  
 Storage Temperature Range ..... -65°C to +150°C  
 Lead Temperature (Soldering, 10s) ..... +260°C  
 ESD Susceptibility  
 HBM ..... 4000V  
 MM ..... 400V

NOTE:

1. Signals on NC, NO, or COM or IN<sub>x</sub> exceeding V<sub>+</sub> will be clamped by internal diodes. Limit forward diode current to maximum current ratings.

**RECOMMENDED OPERATING CONDITIONS**

Operating Temperature Range ..... -40°C to +85°C

**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.

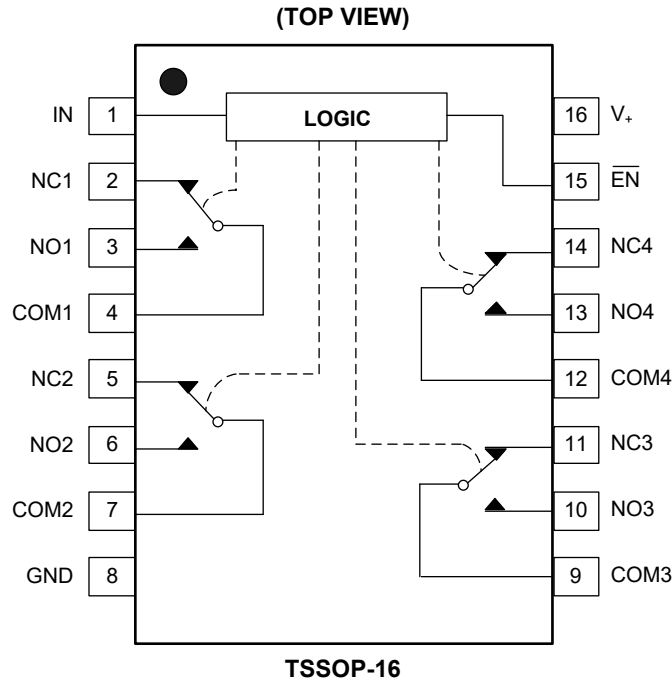
**ESD SENSITIVITY CAUTION**

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.

**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.

PIN CONFIGURATION



PIN DESCRIPTION

PIN	NAME	FUNCTION
16	V <sub>+</sub>	Positive Power Supply.
8	GND	Ground.
1	IN	Digital Control Input Pin to Connect the COM Pins to the NO or NC Pins.
15	$\overline{EN}$	Digital Enable Control. Normally connect to GND. Drive to logic high to set all switches off.
4, 7, 9, 12	COM <sub>x</sub>	Common Pins.
3, 6, 10, 13	NO <sub>x</sub>	Normally Open Pins.
2, 5, 11, 14	NC <sub>x</sub>	Normally Closed Pins

NOTE: NO<sub>x</sub>, NC<sub>x</sub> and COM<sub>x</sub> pins may be an input or output.

FUNCTION TABLE

$\overline{EN}$	IN	NO	NC
L	L	OFF	ON
L	H	ON	OFF
H	√	All Switches Open	

NOTE: √ = Don't Care.

## ELECTRICAL CHARACTERISTICS

( $V_+ = 4.5V$  to  $5.5V$ ,  $GND = 0V$ ,  $V_{IH} = 1.6V$ ,  $V_{IL} = 0.5V$ , Full =  $-40^\circ C$  to  $+85^\circ C$ . Typical values are at  $V_+ = 5V$ ,  $T_A = +25^\circ C$ , unless otherwise noted.)

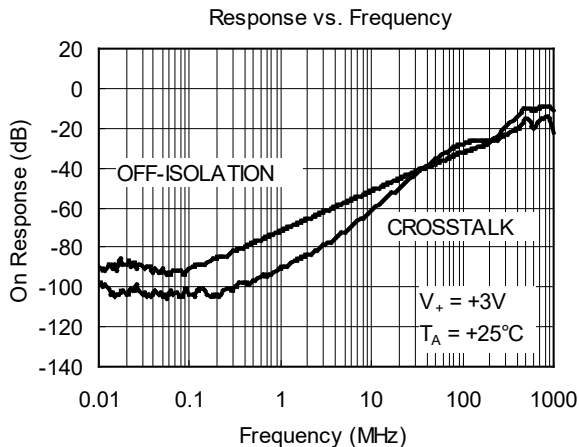
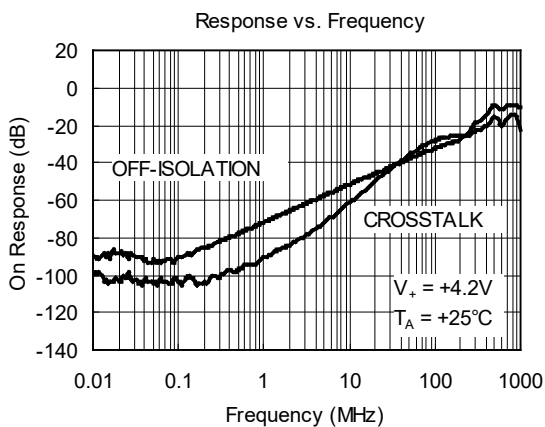
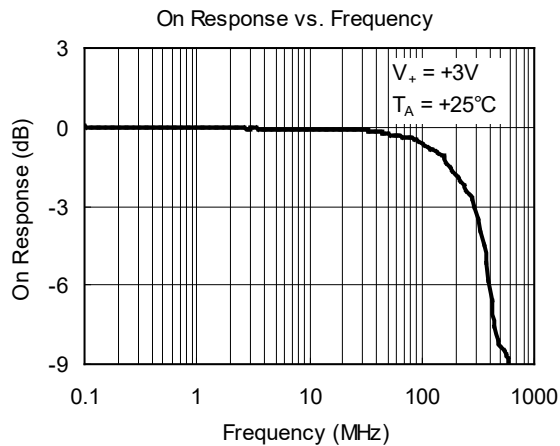
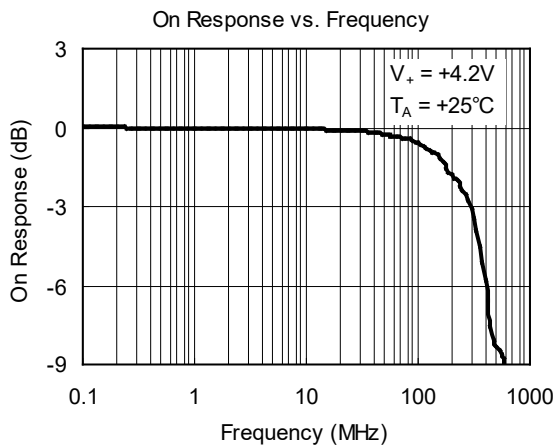
PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
<b>ANALOG SWITCH</b>							
Analog Signal Range	$V_{NO}, V_{NC}, V_{COM}$		Full	0		$V_+$	V
On-Resistance	$R_{ON}$	$V_+ = 4.5V, V_{NO}$ or $V_{NC} = 1.2V,$ $I_{COM} = -100mA$ , Test Circuit 1	$+25^\circ C$		4.5	7	$\Omega$
			Full			8	$\Omega$
On-Resistance Match Between Channels	$\Delta R_{ON}$	$V_+ = 4.5V, V_{NO}$ or $V_{NC} = 1.2V,$ $I_{COM} = -100mA$ , Test Circuit 1	$+25^\circ C$		0.8	3.6	$\Omega$
			Full			4.2	$\Omega$
On-Resistance Flatness	$R_{FLAT(ON)}$	$V_+ = 4.5V, V_{NO}$ or $V_{NC} = 1.2V, 4.5V,$ $I_{COM} = -100mA$ , Test Circuit 1	$+25^\circ C$		3	3.7	$\Omega$
			Full			4.5	$\Omega$
Source Off Leakage Current	$I_{NC(OFF)}, I_{NO(OFF)}$	$V_+ = 5.5V, V_{NO}$ or $V_{NC} = 3.3V/0.3V,$ $V_{COM} = 0.3V/3.3V$	Full			1	$\mu A$
Channel On Leakage Current	$I_{NC(ON)}, I_{NO(ON)},$ $I_{COM(ON)}$	$V_+ = 5.5V, V_{COM} = 0.3V/3.3V,$ $V_{NO}$ or $V_{NC} = 0.3V/3.3V$ , or floating	Full			1	$\mu A$
<b>DIGITAL INPUTS</b>							
Input High Voltage	$V_{INH}$		Full	1.6			V
Input Low Voltage	$V_{INL}$		Full			0.5	V
Input Leakage Current	$I_{IN}$	$V_+ = 5.5V, V_{IN} = 0V$ or $5.5V$	Full			1	$\mu A$
<b>DYNAMIC CHARACTERISTICS</b>							
Turn-On Time	$t_{ON}$	$V_{NO}$ or $V_{NC} = 2V, C_L = 35pF, R_L = 300\Omega,$ Test Circuit 2	$+25^\circ C$		40		ns
Turn-Off Time	$t_{OFF}$		$+25^\circ C$		30		ns
Charge Injection Select Input to Common I/O	Q	$V_G = GND, R_G = 0\Omega, Q = C_L \times V_{OUT}, C_L = 1nF,$ Test Circuit 3	$+25^\circ C$		20		pC
Break-Before-Make Time Delay	$t_D$	$V_{NO}$ or $V_{NC} = 3V, R_L = 300\Omega, C_L = 35pF,$ Test Circuit 4	$+25^\circ C$		18		ns
Off Isolation	$O_{ISO}$	$R_L = 50\Omega, f = 10MHz, V_{BIAS} = 350mV,$ Signal = 0dBm, Test Circuit 5	1MHz	$+25^\circ C$		-70	dB
			10MHz	$+25^\circ C$		-50	dB
Channel-to-Channel Crosstalk	$X_{TALK}$	$R_L = 50\Omega, f = 10MHz, V_{BIAS} = 350mV,$ Signal = 0dBm, Test Circuit 6	1MHz	$+25^\circ C$		-90	dB
			10MHz	$+25^\circ C$		-60	dB
-3dB Bandwidth	BW	$R_L = 50\Omega, \text{Signal} = 0dBm, V_{BIAS} = 350mV,$ Test Circuit 7	$+25^\circ C$		300		MHz
Channel On Capacitance	$C_{ON}$		$+25^\circ C$		42		pF
<b>POWER REQUIREMENTS</b>							
Power Supply Range	$V_+$		Full	1.8		5.5	V
Power Supply Current	$I_+$	$V_+ = 5.5V, V_{IN} = 0V$ or $V_+$	Full			1	$\mu A$

**ELECTRICAL CHARACTERISTICS (continued)**

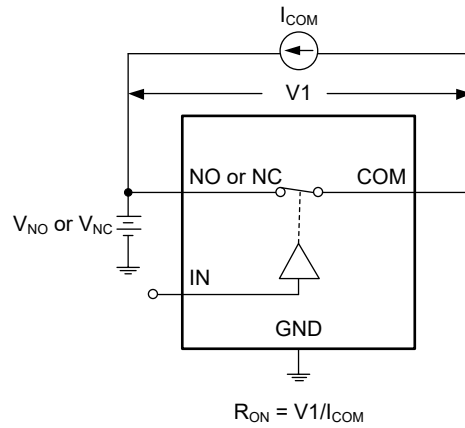
( $V_+ = 2.7V$  to  $3.6V$ ,  $V_{IH} = 1.6V$ ,  $V_{IL} = 0.4V$ , Full =  $-40^\circ C$  to  $+85^\circ C$ . Typical values are at  $V_+ = 3V$ ,  $T_A = +25^\circ C$ , unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
<b>ANALOG SWITCH</b>							
Analog Signal Range	$V_{NO}, V_{NC}, V_{COM}$		Full	0		$V_+$	V
On-Resistance	$R_{ON}$	$V_+ = 2.7V$ , $V_{NO}$ or $V_{NC} = 1.2V$ , $I_{COM} = -100mA$ , Test Circuit 1	$+25^\circ C$		11	15.5	$\Omega$
			Full			18.5	$\Omega$
On-Resistance Match Between Channels	$\Delta R_{ON}$	$V_+ = 2.7V$ , $V_{NO}$ or $V_{NC} = 1.2V$ , $I_{COM} = -100mA$ , Test Circuit 1	$+25^\circ C$		1.6	4	$\Omega$
			Full			4.6	$\Omega$
On-Resistance Flatness	$R_{FLAT(ON)}$	$V_+ = 2.7V$ , $V_{NO}$ or $V_{NC} = 1.2V, 4.5V$ , $I_{COM} = -100mA$ , Test Circuit 1	$+25^\circ C$		7	9.4	$\Omega$
			Full			13	$\Omega$
Source Off Leakage Current	$I_{NC(OFF)}, I_{NO(OFF)}$	$V_+ = 3.6V$ , $V_{NO}$ or $V_{NC} = 3.3V/0.3V$ , $V_{COM} = 0.3V/3.3V$	Full			1	$\mu A$
Channel On Leakage Current	$I_{NC(ON)}, I_{NO(ON)},$ $I_{COM(ON)}$	$V_+ = 3.6V$ , $V_{COM} = 0.3V/3.3V$ , $V_{NO}$ or $V_{NC} = 0.3V/3.3V$ , or floating	Full			1	$\mu A$
<b>DIGITAL INPUTS</b>							
Input High Voltage	$V_{INH}$		Full	1.5			V
Input Low Voltage	$V_{INL}$		Full			0.4	V
Input Leakage Current	$I_{IN}$	$V_+ = 5.5V$ , $V_{IN} = 0V$ or $3.6V$	Full			1	$\mu A$
<b>DYNAMIC CHARACTERISTICS</b>							
Turn-On Time	$t_{ON}$	$V_{NO}$ or $V_{NC} = 2V$ , $C_L = 35pF$ , $R_L = 300\Omega$ , Test Circuit 2	$+25^\circ C$		48		ns
Turn-Off Time	$t_{OFF}$		$+25^\circ C$		45		ns
Charge Injection Select Input to Common I/O	Q	$V_G = GND$ , $R_G = 0\Omega$ , $Q = C_L \times V_{OUT}$ , $C_L = 1nF$ , Test Circuit 3	$+25^\circ C$		20		pC
Break-Before-Make Time Delay	$t_D$	$V_{NO}$ or $V_{NC} = 2V$ , $R_L = 300\Omega$ , $C_L = 35pF$ , Test Circuit 4	$+25^\circ C$		20		ns
Off Isolation	$O_{ISO}$	$R_L = 50\Omega$ , $f = 10MHz$ , $V_{BIAS} = 350mV$ , Signal = 0dBm, Test Circuit 5	1MHz	$+25^\circ C$		-70	dB
			10MHz	$+25^\circ C$		-50	dB
Channel-to-Channel Crosstalk	$X_{TALK}$	$R_L = 50\Omega$ , $f = 10MHz$ , $V_{BIAS} = 350mV$ , Signal = 0dBm, Test Circuit 6	1MHz	$+25^\circ C$		-90	dB
			10MHz	$+25^\circ C$		-60	dB
-3dB Bandwidth	BW	$R_L = 50\Omega$ , Signal = 0dBm, $V_{BIAS} = 350mV$ , Test Circuit 7	$+25^\circ C$		300		MHz
Channel On Capacitance	$C_{ON}$		$+25^\circ C$		42		pF

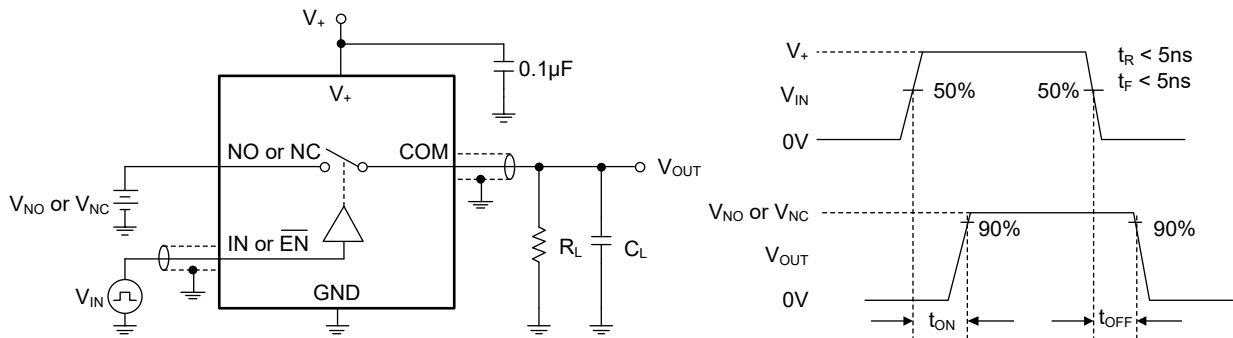
TYPICAL PERFORMANCE CHARACTERISTICS



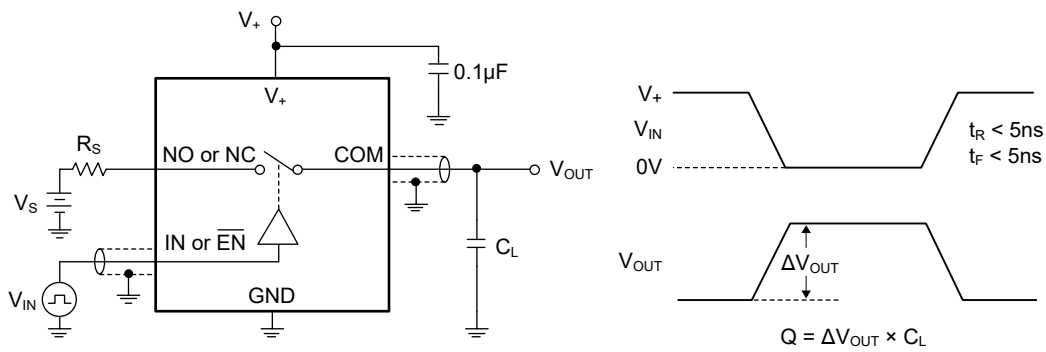
TEST CIRCUITS



Test Circuit 1. On-Resistance

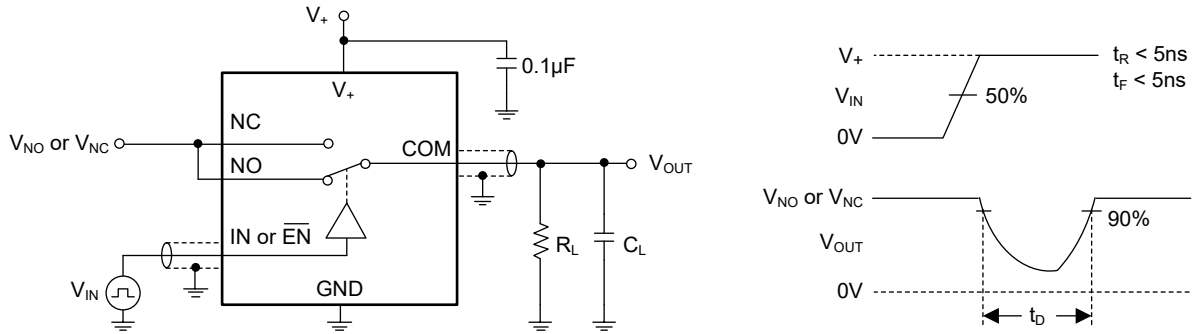


Test Circuit 2. Switching Times

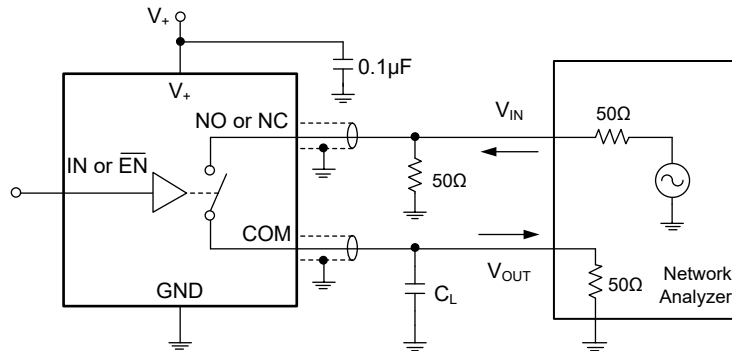


Test Circuit 3. Charge Injection

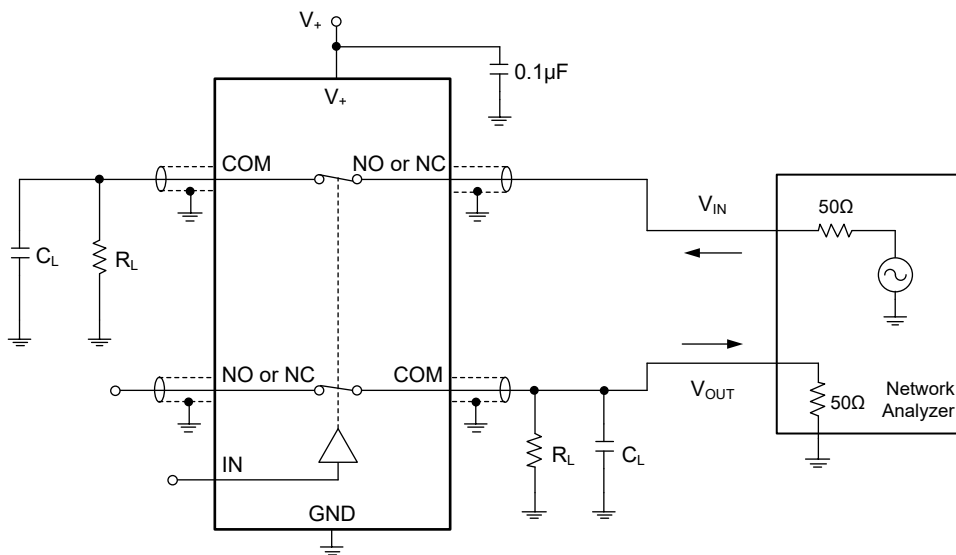
TEST CIRCUITS (continued)



Test Circuit 4. Break-Before-Make Time Delay,  $t_b$



Test Circuit 5. Off Isolation

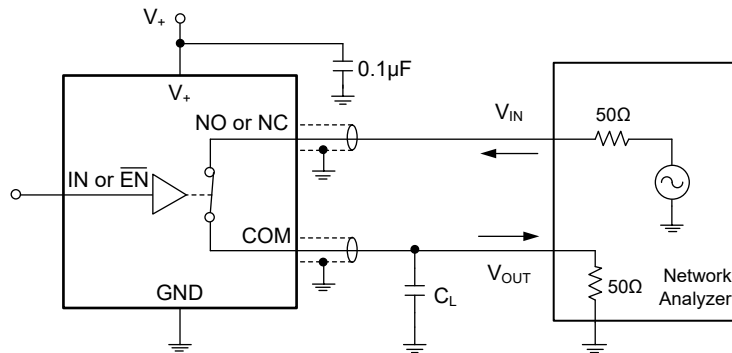


$$\text{Channel-to-Channel Crosstalk} = -20 \log (V_{NO} \text{ or } V_{NC}/V_{OUT})$$

Test Circuit 6. Channel-to-Channel Crosstalk



TEST CIRCUITS (continued)



Test Circuit 7. -3dB Bandwidth

REVISION HISTORY

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

JANUARY 2013 – REV.A.3 to REV.A.4

Added Recommended Land Pattern Information.....	9
Added Tape and Reel Information section.....	10, 11

MAY 2011 – REV.A.2 to REV.A.3

Updated Package Outline Dimensions .....	9
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DECEMBER 2008 – REV.A.1 to REV.A.2

Changes to Absolute Maximum Ratings section.....	2
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MAY 2008 – REV.A to REV.A.1

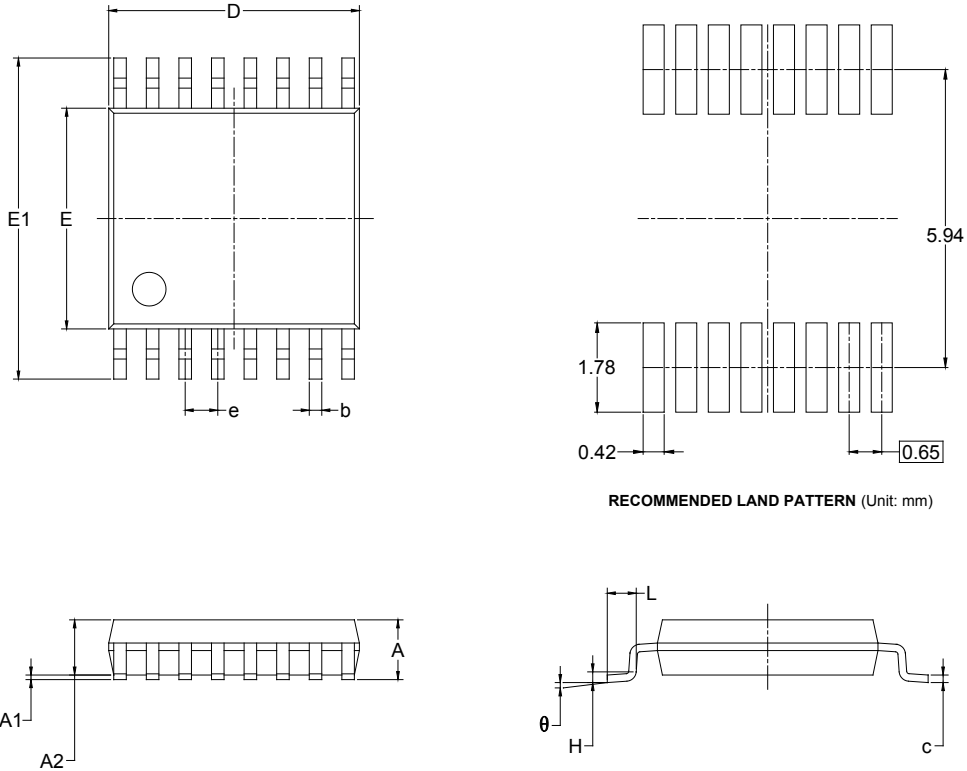
Changed Electrical Characteristics section .....	3, 4
Changed Test Circuits section .....	5, 6

Changes from Original (JANUARY 2008) to REV.A

Changed from product preview to production data .....	All
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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	
$\theta$	1°	7°	1°	7°

# 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
TSSOP-16	13"	12.4	6.90	5.60	1.20	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

DD0002