



SGM5018

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

GENERAL DESCRIPTION

The SGM5018 is a high-speed, low voltage, quad single-pole/double-throw (SPDT) CMOS analog switch that is designed to operate from a single +1.8V to +5.5V power supply.

SGM5018 features guaranteed on-resistance (4.5Ω TYP), on-resistance matching (3.6Ω MAX) between switches and guaranteed on-resistance flatness over the signal range (3Ω TYP). This ensures excellent linearity and low distortion when switching audio signals. Fast switching speed, coupled with high signal bandwidth (300MHz), also makes the parts suitable for video signal switching. CMOS process ensures ultra low power dissipation, making the parts ideally suited for portable and battery powered instruments.

SGM5018 is available in Green TSSOP-16 package.

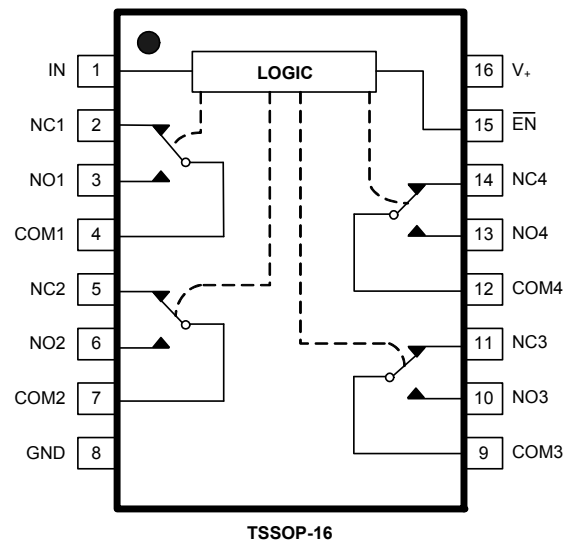
APPLICATIONS

- Battery-Powered Systems
- USB 1.1 Signal Switching Circuits
- Communication Systems
- Portable Instrumentation
- Audio and Video Switching
- Computer Peripherals
- Cell Phones
- PDA's

FEATURES

- Low Voltage Operation: 1.8V to 5.5V
- R_{ON} is Typically 4.5Ω at 5V
- Low On-Resistance Flatness
- -3dB Bandwidth: 300MHz
- Rail-to-Rail Input and Output Operation
- Typical Power Consumption (< 0.01μW)
- TTL/CMOS Compatible
- -40°C to +85°C Operating Temperature Range
- Available in Green TSSOP-16 Package

PIN CONFIGURATION (TOP VIEW)



FUNCTION TABLE

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

√ = Don't Care.

PACKAGE/ORDERING INFORMATION

MODEL	PIN-PACKAGE	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKAGE OPTION
SGM5018	TSSOP-16	-40°C to +85°C	SGM5018YTS/TR	SGM5018YTS	Tape and Reel, 3000

ABSOLUTE MAXIMUM RATINGS

V ₊ to GND.....	-0.3V to 6V	Storage Temperature Range.....	-65°C to +150°C
Analog, Digital voltage range ⁽¹⁾	-0.3V to (V ₊) + 0.3V	Lead Temperature (soldering, 10s).....	260°C
Continuous Current NO, NC, or COM.....	±100mA	ESD Susceptibility	
Operating Temperature Range.....	-40°C to +85°C	HBM.....	4000V
Junction Temperature.....	150°C	MM.....	400V

NOTES:

1. Signals on NC, NO, or COM or IN_x exceeding V₊ will be clamped by internal diodes. Limit forward diode current to maximum current ratings.
2. Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

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.

SGMICRO reserves the right to make any change in circuit design, specification or other related things if necessary without notice at any time. Please contact SGMICRO sales office to get the latest datasheet.

PIN DESCRIPTION

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

NOTE: NO_x, NC_x and COM_x terminals may be an input or output.

ELECTRICAL CHARACTERISTICS

($V_+ = +4.5V$ to $+5.5V$, $GND = 0V$, $V_{IH} = +1.6V$, $V_{IL} = +0.5V$, $T_A = -40^\circ C$ to $+85^\circ C$. Typical values are at $V_+ = +5.0V$, $T_A = +25^\circ C$, unless otherwise noted.)

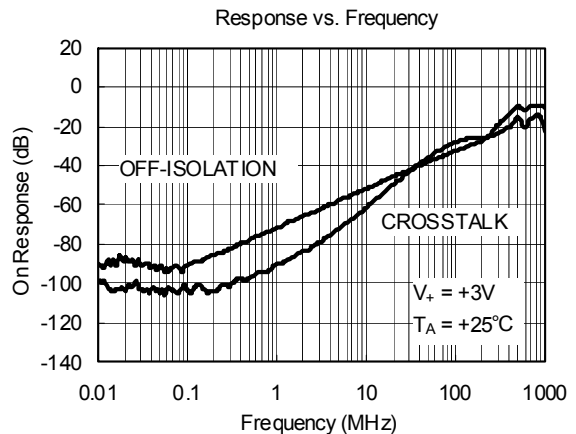
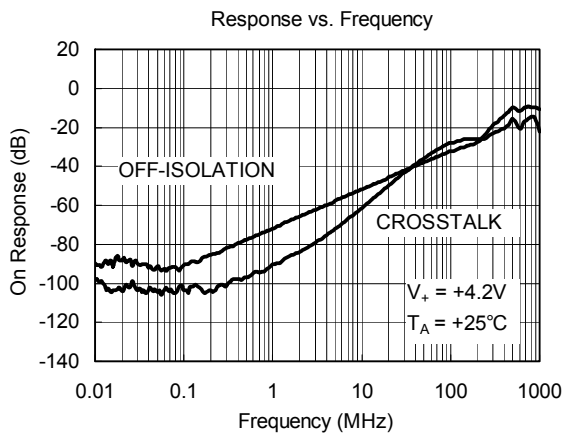
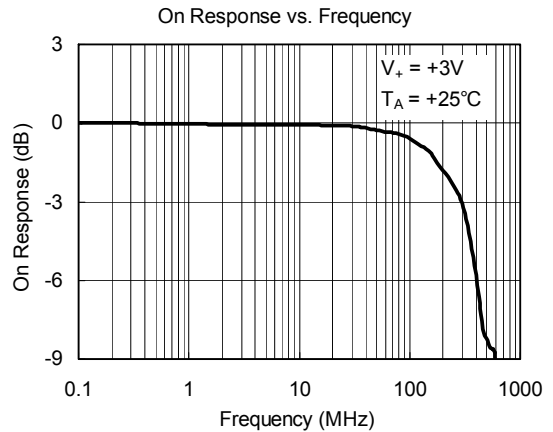
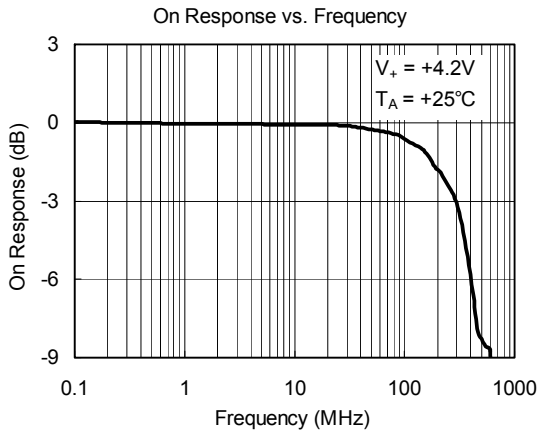
PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
ANALOG SWITCH							
Analog Signal Range	V_{NO}, V_{NC}, V_{COM}		$-40^\circ C$ to $+85^\circ C$	0		V_+	V
On-Resistance	R_{ON}	$V_+ = 4.5V, V_{NO}$ or $V_{NC} = 1.2V,$ $I_{COM} = -100mA$, Test Circuit 1	$+25^\circ C$		4.5	7	Ω
			$-40^\circ C$ to $+85^\circ C$			8	Ω
On-Resistance Match Between Channels	ΔR_{ON}	$V_+ = 4.5V, V_{NO}$ or $V_{NC} = 1.2V,$ $I_{COM} = -100mA$, Test Circuit 1	$+25^\circ C$		0.8	3.6	Ω
			$-40^\circ C$ to $+85^\circ C$			4.2	Ω
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	Ω
			$-40^\circ C$ to $+85^\circ C$			4.5	Ω
Source OFF Leakage Current	$I_{NC(OFF)}, I_{NO(OFF)}$	$V_+ = 5.5V, V_{NO}$ or $V_{NC} = 3.3V/0.3V,$ $V_{COM} = 0.3V/3.3V$	$-40^\circ C$ to $+85^\circ C$			1	μA
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	$-40^\circ C$ to $+85^\circ C$			1	μA
DIGITAL INPUTS							
Input High Voltage	V_{INH}		$-40^\circ C$ to $+85^\circ C$	1.6			V
Input Low Voltage	V_{INL}		$-40^\circ C$ to $+85^\circ C$			0.5	V
Input Leakage Current	I_{IN}	$V_+ = 5.5V, V_{IN} = 0V$ or $5.5V$	$-40^\circ C$ to $+85^\circ C$			1	μA
DYNAMIC CHARACTERISTICS							
Turn-On Time	t_{ON}	V_{NO} or $V_{NC} = 2V, C_L = 35pF,$ $R_L = 300\Omega$, Test Circuit2	$+25^\circ C$		40		ns
Turn-Off Time	t_{OFF}		$+25^\circ C$		30		ns
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 Circuit5	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 Circuit6	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 Circuit7	$+25^\circ C$		300		MHz
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 Circuit3	$+25^\circ C$		20		pC
Channel ON Capacitance	C_{ON}		$+25^\circ C$		42		pF
POWER REQUIREMENTS							
Power Supply Range	V_+		$-40^\circ C$ to $+85^\circ C$	1.8		5.5	V
Power Supply Current	I_+	$V_+ = 5.5V, V_{IN} = 0V$ or V_+	$-40^\circ C$ to $+85^\circ C$			1	μA

ELECTRICAL CHARACTERISTICS

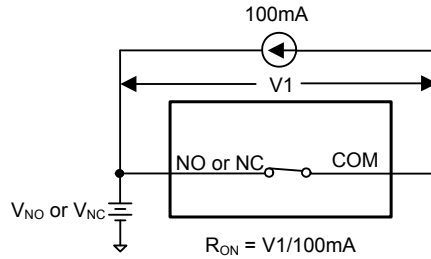
($V_+ = +2.7V$ to $+3.6V$, $V_{IH} = +1.6V$, $V_{IL} = +0.4V$, $T_A = -40^\circ C$ to $+85^\circ C$. Typical values are at $V_+ = +3.0V$, $T_A = +25^\circ C$, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
ANALOG SWITCH							
Analog Signal Range	V_{NO}, V_{NC}, V_{COM}		$-40^\circ C$ to $+85^\circ C$	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	Ω
			$-40^\circ C$ to $+85^\circ C$			18.5	Ω
On-Resistance Match Between Channels	ΔR_{ON}	$V_+ = 2.7V$, V_{NO} or $V_{NC} = 1.2V$, $I_{COM} = -100mA$, Test Circuit 1	$+25^\circ C$		1.6	4	Ω
			$-40^\circ C$ to $+85^\circ C$			4.6	Ω
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	Ω
			$-40^\circ C$ to $+85^\circ C$			13	Ω
Source OFF Leakage Current	$I_{NC(OFF)}, I_{NO(OFF)}$	$V_+ = 3.6V$, V_{NO} or $V_{NC} = 3.3V/0.3V$, $V_{COM} = 0.3V/3.3V$	$-40^\circ C$ to $+85^\circ C$			1	μA
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	$-40^\circ C$ to $+85^\circ C$			1	μA
DIGITAL INPUTS							
Input High Voltage	V_{INH}		$-40^\circ C$ to $+85^\circ C$	1.5			V
Input Low Voltage	V_{INL}		$-40^\circ C$ to $+85^\circ C$			0.4	V
Input Leakage Current	I_{IN}	$V_+ = 5.5V$, $V_{IN} = 0V$ or $3.6V$	$-40^\circ C$ to $+85^\circ C$			1	μA
DYNAMIC CHARACTERISTICS							
Turn-On Time	t_{ON}	V_{NO} or $V_{NC} = 2V$, $C_L = 35pF$, $R_L = 300\Omega$, Test Circuit2	$+25^\circ C$		48		ns
Turn-Off Time	t_{OFF}		$+25^\circ C$		45		ns
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 Circuit5	1MHz	$+25^\circ C$		-70	dB
			10MHz	$+25^\circ C$		-50	dB
Channel-to-Channel Crosstalk	X_{TALK}	$R_L = 50\Omega$, $f = 10MHz$, $V_{BIAS} = 350 mV$, Signal = 0dBm, Test Circuit6	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 Circuit7	$+25^\circ C$		300		MHz
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 Circuit3	$+25^\circ C$		20		pC
Channel ON Capacitance	C_{ON}		$+25^\circ C$		42		pF

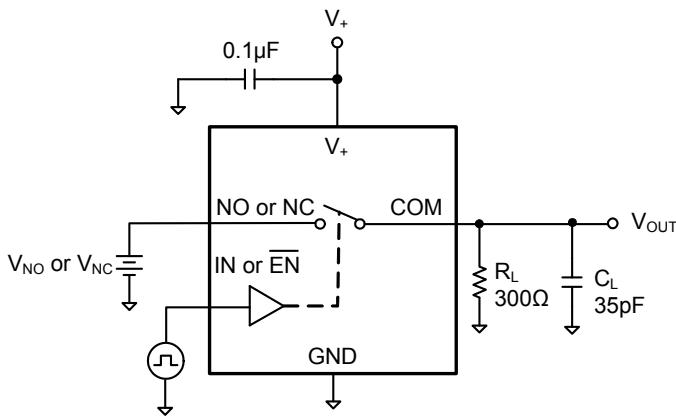
TYPICAL PERFORMANCE CHARACTERISTICS



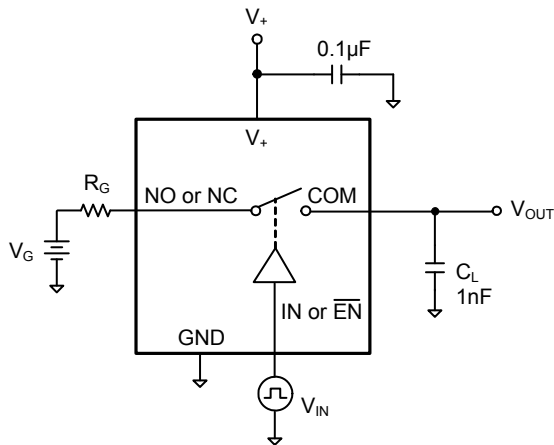
TEST CIRCUITS



Test Circuit 1. On Resistance

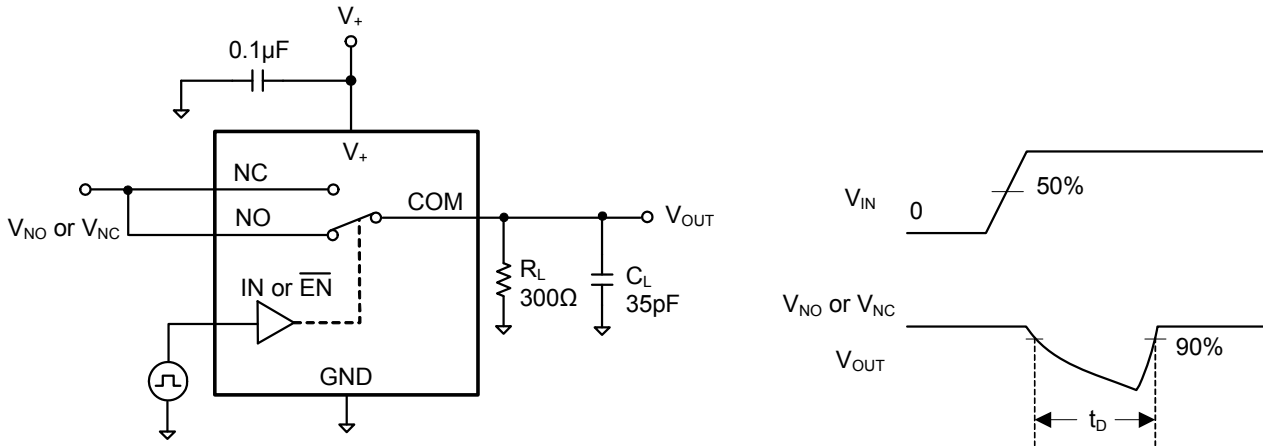


Test Circuit 2. Switching Times

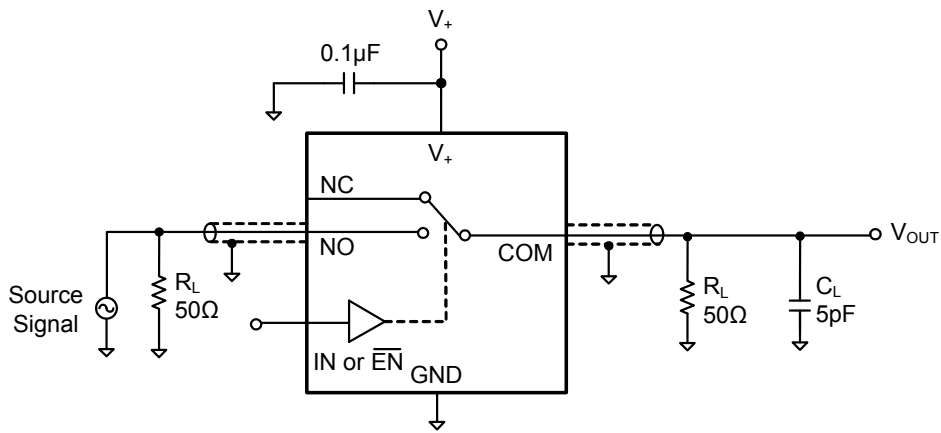


Test Circuit 3. Charge Injection

TEST CIRCUITS (Cont.)

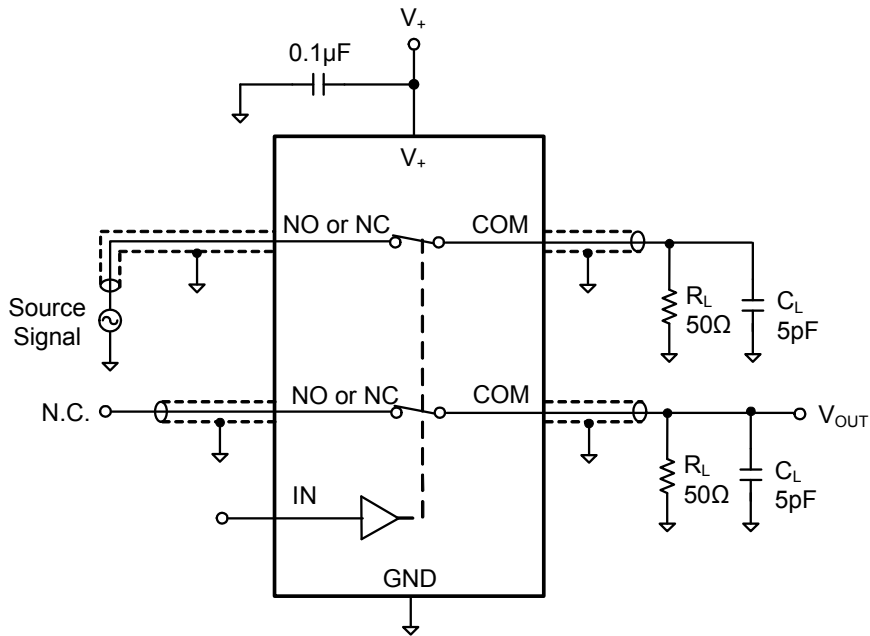


Test Circuit 4. Break-Before-Make Time Delay, t_d



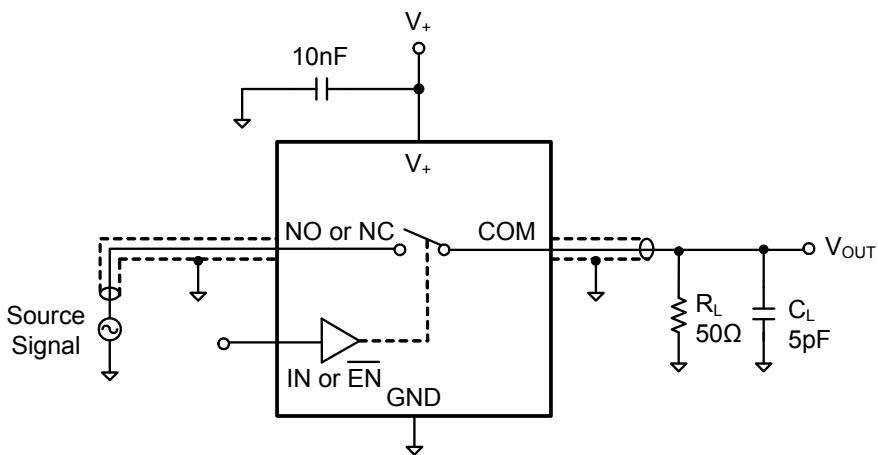
Test Circuit 5. Off Isolation

TEST CIRCUITS (Cont.)



$$\text{Channel To Channel Crosstalk} = -20 \times \log \frac{V_{\text{NO or V}_{\text{NC}}}}{V_{\text{OUT}}}$$

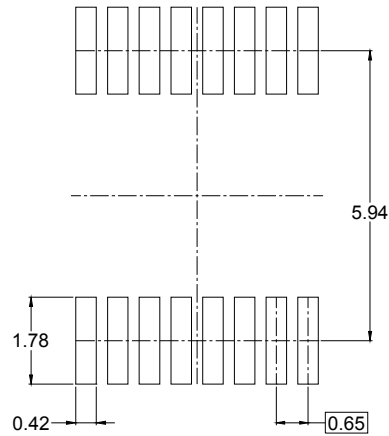
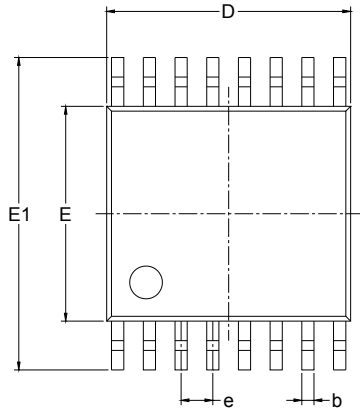
Test Circuit 6. Channel-to-Channel Crosstalk



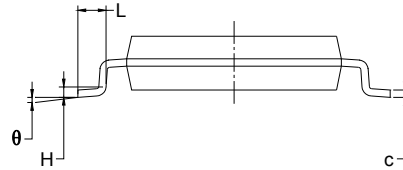
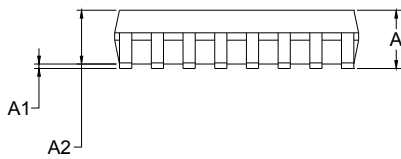
Test Circuit 7. -3dB Bandwidth

PACKAGE OUTLINE DIMENSIONS

TSSOP-16



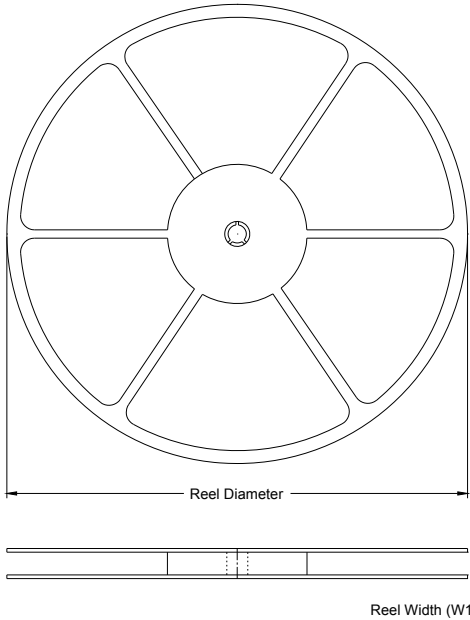
RECOMMENDED LAND PATTERN (Unit: mm)



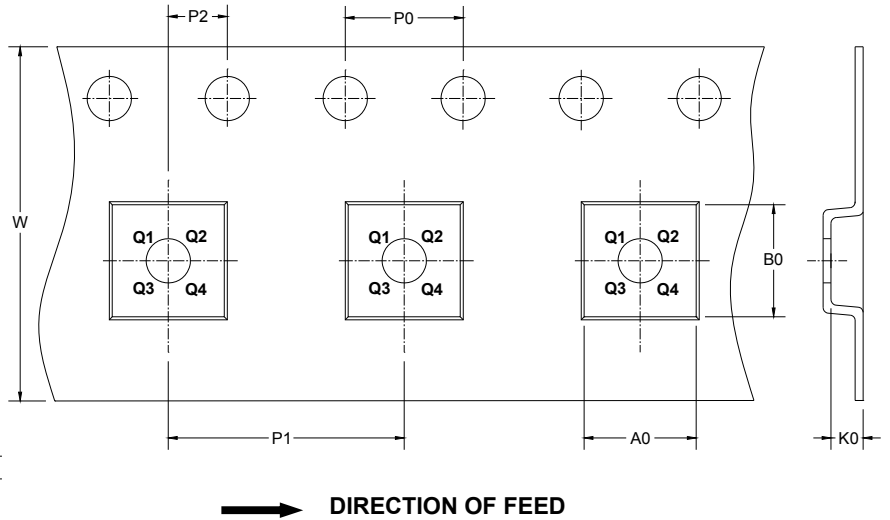
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A		1.100		0.043
A1	0.050	0.150	0.002	0.006
A2	0.800	1.000	0.031	0.039
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
D	4.900	5.100	0.193	0.201
E	4.300	4.500	0.169	0.177
E1	6.250	6.550	0.246	0.258
e	0.650 BSC		0.026 BSC	
L	0.500	0.700	0.02	0.028
H	0.25 TYP		0.01 TYP	
θ	1°	7°	1°	7°

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



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

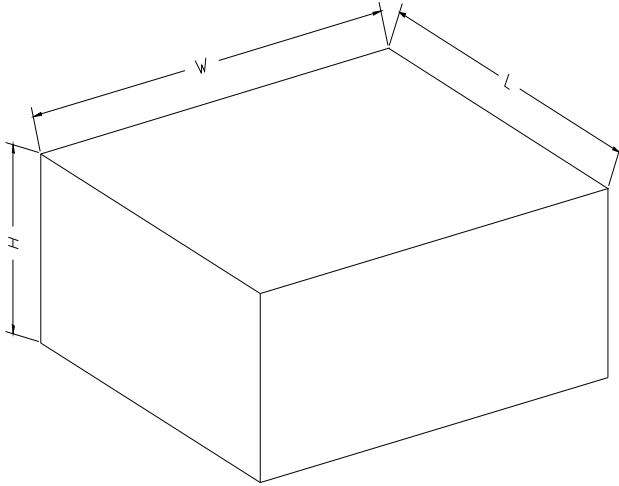
KEY PARAMETER LIST OF TAPE AND REEL

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	6.9	5.6	1.2	4.0	8.0	2.0	12.0	Q1

SGM5018

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

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