



SGM4717

4.5Ω, 300MHz Bandwidth, Dual, SPDT Analog Switch

GENERAL DESCRIPTION

The SGM4717 is a bidirectional, dual, SPDT (single-pole/double-throw), TTL/CMOS compatible analog switch. It operates from a 1.8V to 5.5V single power supply.

The SGM4717 features low on-resistance, high bandwidth and fast switching times. The high performances make it very suitable for multiple applications, such as portable equipment, audio and video signal routing, etc. In addition, the SGM4717 can be used as a dual 2-to-1 multiplexer because it has two normally open and two normally close switches. Low power consumption is also one of the important reasons that make it a good choice.

The SGM4717 is available in Green MSOP-10 and WLCSP-2.0×1.5-10B packages. It operates over an ambient temperature range of -40°C to +85°C.

FEATURES

- **Supply Voltage Range: 1.8V to 5.5V**
- **High Bandwidth: 300MHz**
- **Low On-Resistance: 4.5Ω (TYP) at 5V**
- **Fast Switching Times at $V_+ = 5V$:**
 - t_{ON} : 26ns (TYP)
 - t_{OFF} : 20ns (TYP)
- **High Off-Isolation: -57dB at 10MHz**
- **Low Crosstalk: -99dB at 10MHz**
- **TTL/CMOS Compatible**
- **Break-Before-Make Switching**
- **Rail-to-Rail Input and Output Operation**
- **-40°C to +85°C Operating Temperature Range**
- **Available in Green WLCSP-2.0×1.5-10B and MSOP-10 Packages**

APPLICATIONS

Cellular Phones
Computer Peripherals
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
SGM4717	WLCSP-2.0x1.5-10B	-40°C to +85°C	SGM4717YG/TR	XXXXX 4717YG	Tape and Reel, 3000
	MSOP-10	-40°C to +85°C	SGM4717YMS/TR	SGM4717 YMS 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+, IN to GND..... -0.3V to 6V
 Analog, Digital Voltage Range ⁽¹⁾.....-0.3V to (V+) + 0.3V
 Continuous Current NO, NC, or COM..... ±50mA
 Peak Current NO, NC, or COM..... ±80mA
 Junction Temperature.....+150°C
 Storage Temperature Range.....-65°C to +150°C
 Lead Temperature (Soldering, 10s).....+260°C
 ESD Susceptibility
 HBM.....2000V

NOTE:

1. Signals on NC, NO, or COM or IN exceeding V+ 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.

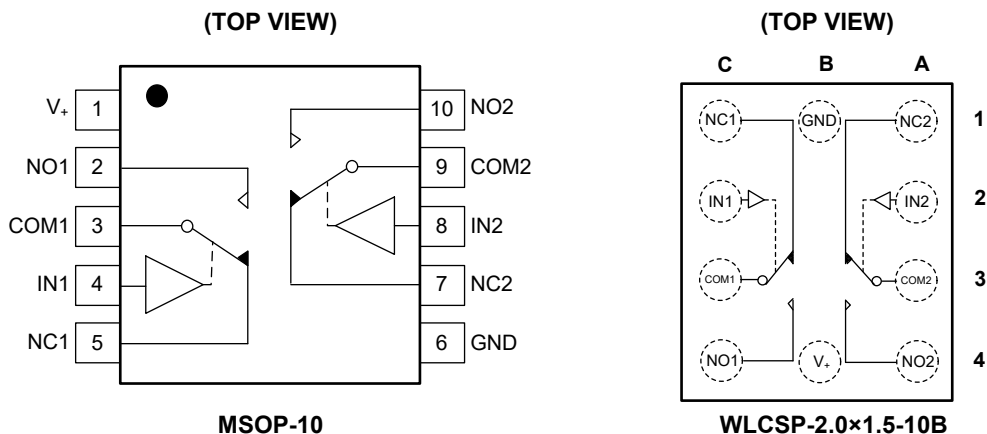
ESD SENSITIVITY CAUTION

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 CONFIGURATIONS



PIN DESCRIPTION

PIN		NAME	FUNCTION
MSOP-10	WLCSP-2.0x1.5-10B		
1	B4	V+	Positive Power Supply.
6	B1	GND	Ground.
4, 8	C2, A2	IN1, IN2	Digital Control Input Pins to Connect the COM Pins to the NO or NC Pins.
3, 9	C3, A3	COM1, COM2	Common Pins.
2, 10	C4, A4	NO1, NO2	Normally Open Pins.
5, 7	C1, A1	NC1, NC2	Normally Closed Pins.

NOTE: NO, NC and COM pins may be an input or output.

FUNCTION TABLE

LOGIC	NO	NC
0	OFF	ON
1	ON	OFF

NOTE: Switches shown for logic "0" input.

ELECTRICAL CHARACTERISTICS

(V₊ = 4.5V to 5.5V, V_{IH} = 2V, V_{IL} = 0.8V, Full = -40°C to +85°C. Typical values are at V₊ = 5V, T_A = +25°C, unless otherwise noted.)

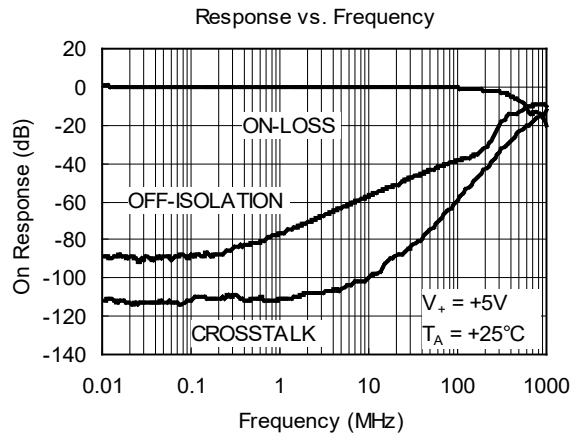
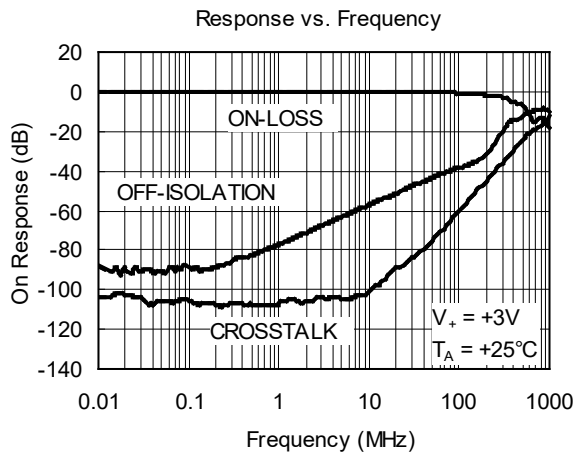
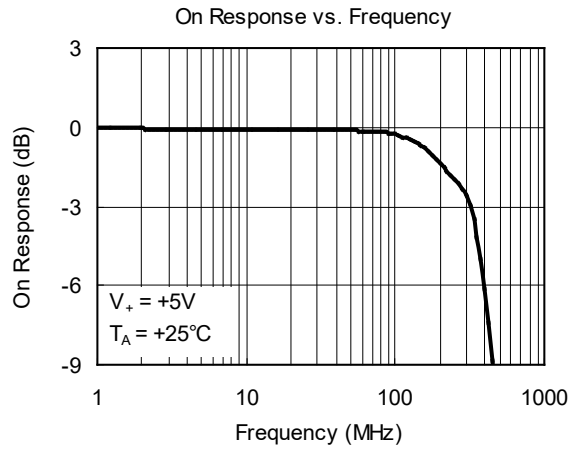
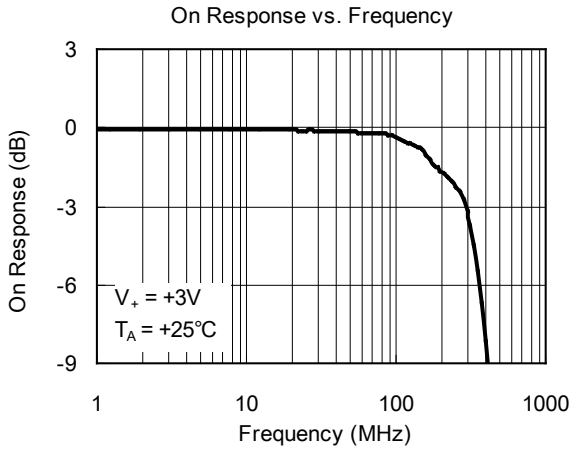
PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
ANALOG SWITCH							
Analog Signal Range	V _{NO} , V _{NC} , V _{COM}		Full	0		V ₊	V
On-Resistance	R _{ON}	V ₊ = 4.5V, V _{NO} or V _{NC} = 3.5V, I _{COM} = -10mA, Test Circuit 1	+25°C		4.5	8	Ω
			Full			8.5	Ω
On-Resistance Match Between Channels	ΔR _{ON}	V ₊ = 4.5V, V _{NO} or V _{NC} = 3.5V, I _{COM} = -10mA, Test Circuit 1	+25°C		0.15	0.3	Ω
			Full			0.4	Ω
On-Resistance Flatness	R _{FLAT(ON)}	V ₊ = 4.5V, V _{NO} or V _{NC} = 1V, 2V, 3.5V, I _{COM} = -10mA, Test Circuit 1	+25°C		2.3	3.3	Ω
			Full			3.7	Ω
Source Off Leakage Current	I _{NC(OFF)} , I _{NO(OFF)}	V ₊ = 5.5V, V _{NO} or V _{NC} = 1V, 4.5V, V _{COM} = 4.5V, 1.0V	Full			1	μA
Channel On Leakage Current	I _{NC(ON)} , I _{NO(ON)} , I _{COM(ON)}	V ₊ = 5.5V, V _{COM} = 1.0V, 4.5V, V _{NO} or V _{NC} = 1V, 4.5V, or floating	Full			1	μA
DIGITAL INPUTS							
Input High Voltage	V _{INH}		Full	1.5			V
Input Low Voltage	V _{INL}		Full			0.6	V
Input Leakage Current	I _{IN}	V ₊ = 5.5V, V _{IN} = 0V or 5.5V	Full			1	μA
DYNAMIC CHARACTERISTICS							
Turn-On Time	t _{ON}	V _{NO} or V _{NC} = 3V, V _{IH} = 1.5V, V _{IL} = 0V, R _L = 300Ω, C _L = 35pF, Test Circuit 2	+25°C		26		ns
Turn-Off Time	t _{OFF}	V _{NO} or V _{NC} = 3V, V _{IH} = 1.5V, V _{IL} = 0V, R _L = 300Ω, C _L = 35pF, Test Circuit 2	+25°C		20		ns
Break-Before-Make Time Delay	t _D	V _{NO1} or V _{NC1} = V _{NO2} or V _{NC2} = 3V, R _L = 300Ω, C _L = 35pF, Test Circuit 3	+25°C		4		ns
Skew	t _{SKEW}	R _S = 39Ω, C _L = 50pF, Test Circuit 4	+25°C		5.8		ns
Off Isolation	O _{ISO}	R _L = 50Ω, C _L = 5pF, Signal = 0dBm, Test Circuit 5	f = 10MHz	+25°C		-57	dB
			f = 1MHz	+25°C		-76	dB
Channel-to-Channel Crosstalk	X _{TALK}	R _L = 50Ω, C _L = 5pF, Test Circuit 6	f = 10MHz	+25°C		-99	dB
			f = 1MHz	+25°C		-110	dB
-3dB Bandwidth	BW	Signal = 0dBm, R _L = 50Ω, C _L = 5pF, Test Circuit 7	+25°C		300		MHz
Source Off Capacitance	C _{NC(OFF)} , C _{NO(OFF)}	f = 1MHz	+25°C		5.5		pF
Channel On Capacitance	C _{NC(ON)} , C _{NO(ON)} , C _{COM(ON)}	f = 1MHz	+25°C		15.5		pF
POWER REQUIREMENTS							
Power Supply Range	V ₊		Full	1.8		5.5	V
Power Supply Current	I ₊	V ₊ = 5.5V, V _{IN} = 0V or V ₊	Full			5	μA

ELECTRICAL CHARACTERISTICS (continued)

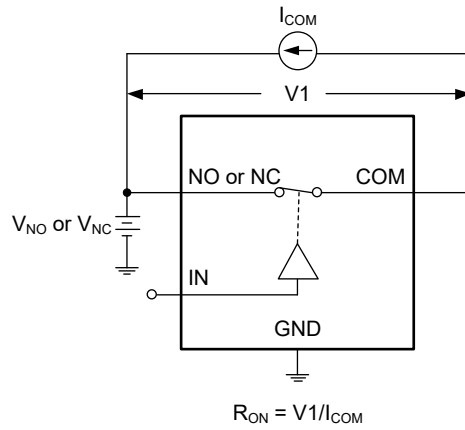
($V_+ = 2.7V$ to $3.6V$, $V_{IH} = 1.4V$, $V_{IL} = 0.5V$, Full = $-40^\circ C$ to $+85^\circ C$. Typical values are at $V_+ = 3V$, $T_A = +25^\circ C$, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
ANALOG SWITCH							
Analog Signal Range	V_{NO}, V_{NC}, V_{COM}		Full	0		V_+	V
On-Resistance	R_{ON}	$V_+ = 2.7V, V_{NO}$ or $V_{NC} = 1.5V,$ $I_{COM} = -10mA$, Test Circuit 1	$+25^\circ C$		7	10	Ω
			Full			10.5	Ω
On-Resistance Match Between Channels	ΔR_{ON}	$V_+ = 2.7V, V_{NO}$ or $V_{NC} = 1.5V,$ $I_{COM} = -10mA$, Test Circuit 1	$+25^\circ C$		0.15	0.3	Ω
			Full			0.4	Ω
On-Resistance Flatness	$R_{FLAT(ON)}$	$V_+ = 2.7V, V_{NO}$ or $V_{NC} = 1V, 1.5V, 2V,$ $I_{COM} = -10mA$, Test Circuit 1	$+25^\circ C$		3	4	Ω
			Full			4.3	Ω
Source Off Leakage Current	$I_{NC(OFF)}, I_{NO(OFF)}$	$V_+ = 3.6V, V_{NO}$ or $V_{NC} = 0.3V, 3.3V,$ $V_{COM} = 3.3V, 0.3V$	Full			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	Full			1	μA
DIGITAL INPUTS							
Input High Voltage	V_{INH}		Full	1			V
Input Low Voltage	V_{INL}		Full			0.5	V
Input Leakage Current	I_{IN}	$V_+ = 5.5V, V_{IN} = 0V$ or $3.6V$	Full			1	μA
DYNAMIC CHARACTERISTICS							
Turn-On Time	t_{ON}	V_{NO} or $V_{NC} = 1.5V, V_{IH} = 1.5V, V_{IL} = 0V,$ $R_L = 300\Omega, C_L = 35pF$, Test Circuit 2	$+25^\circ C$		23		ns
Turn-Off Time	t_{OFF}	V_{NO} or $V_{NC} = 1.5V, V_{IH} = 1.5V, V_{IL} = 0V,$ $R_L = 300\Omega, C_L = 35pF$, Test Circuit 2	$+25^\circ C$		22		ns
Break-Before-Make Time Delay	t_D	V_{NO1} or $V_{NC1} = V_{NO2}$ or $V_{NC2} = 3V,$ $R_L = 300\Omega, C_L = 35pF$, Test Circuit 3	$+25^\circ C$		4		ns
Skew	t_{SKEW}	$R_S = 39\Omega, C_L = 50pF$, Test Circuit 4	$+25^\circ C$		5		ns
Off Isolation	O_{ISO}	$R_L = 50\Omega, C_L = 5pF,$ Signal = 0dBm, Test Circuit 5	f = 10MHz	$+25^\circ C$		-57	dB
			f = 1MHz	$+25^\circ C$		-76	dB
Channel-to-Channel Crosstalk	X_{TALK}	$R_L = 50\Omega, C_L = 5pF,$ Test Circuit 6	f = 10MHz	$+25^\circ C$		-98	dB
			f = 1MHz	$+25^\circ C$		-103	dB
-3dB Bandwidth	BW	Signal = 0dBm, $R_L = 50\Omega, C_L = 5pF,$ Test Circuit 7	$+25^\circ C$		300		MHz
Source Off Capacitance	$C_{NC(OFF)}, C_{NO(OFF)}$	f = 1MHz	$+25^\circ C$		5.5		pF
Channel On Capacitance	$C_{NC(ON)}, C_{NO(ON)},$ $C_{COM(ON)}$	f = 1MHz	$+25^\circ C$		15.5		pF
POWER REQUIREMENTS							
Power Supply Range	V_+		Full	1.8		5.5	V
Power Supply Current	I_+	$V_+ = 5.5V, V_{IN} = 0V$ or V_+	Full			5	μA

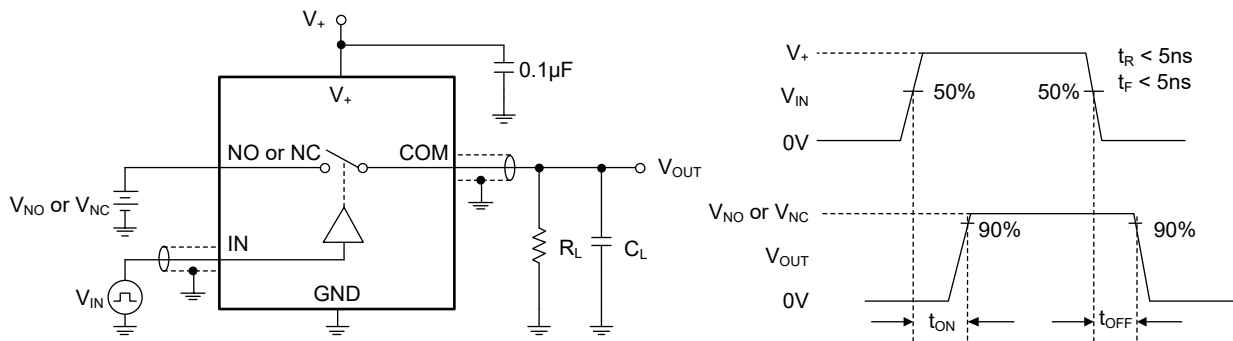
TYPICAL PERFORMANCE CHARACTERISTICS



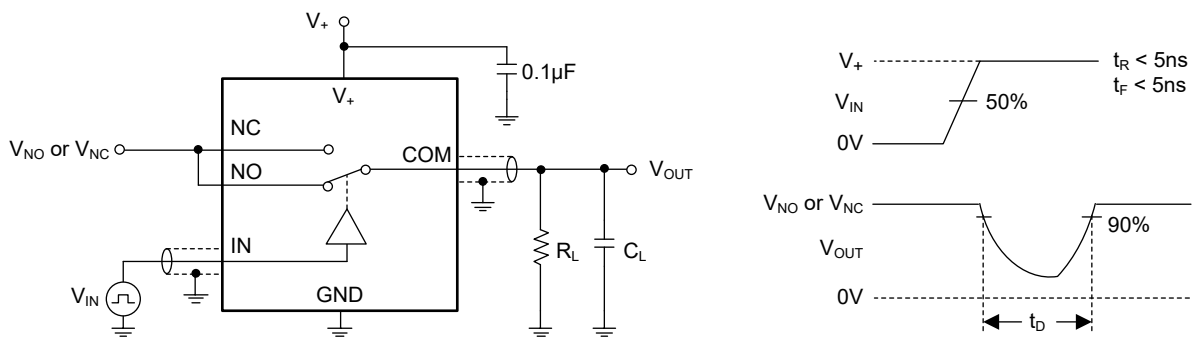
TEST CIRCUITS



Test Circuit 1. On-Resistance

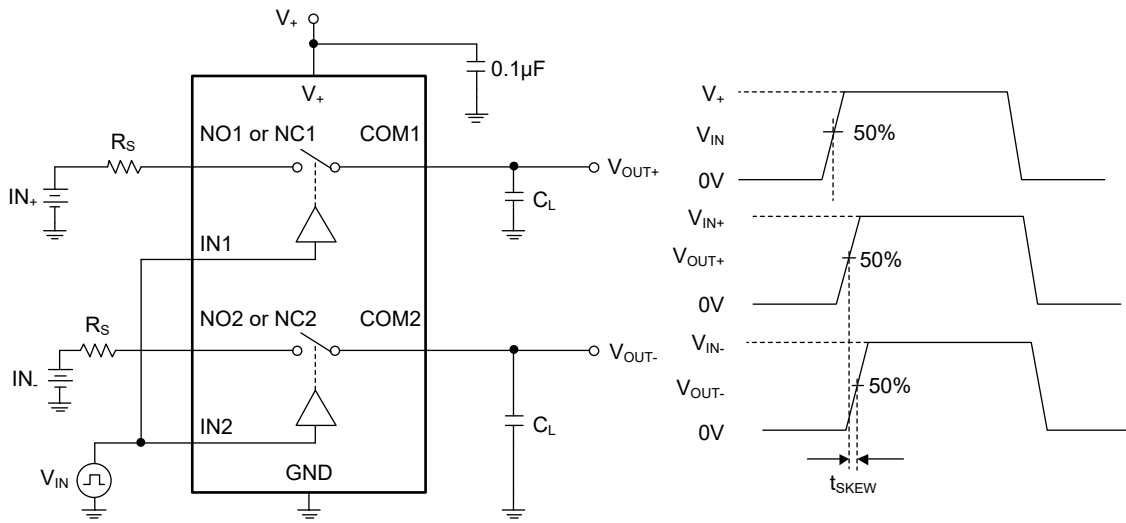


Test Circuit 2. Switching Times

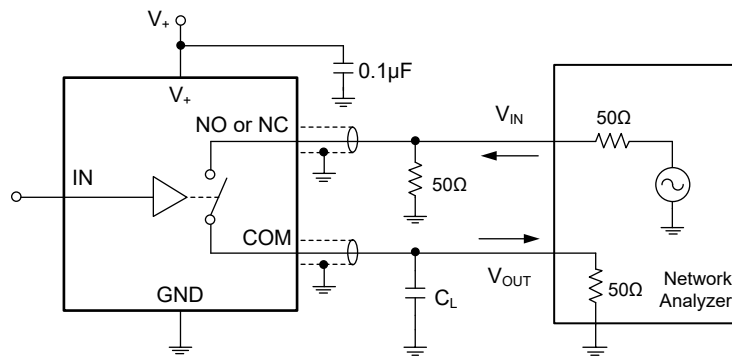


Test Circuit 3. Break-Before-Make Time Delay, t_D

TEST CIRCUITS (continued)

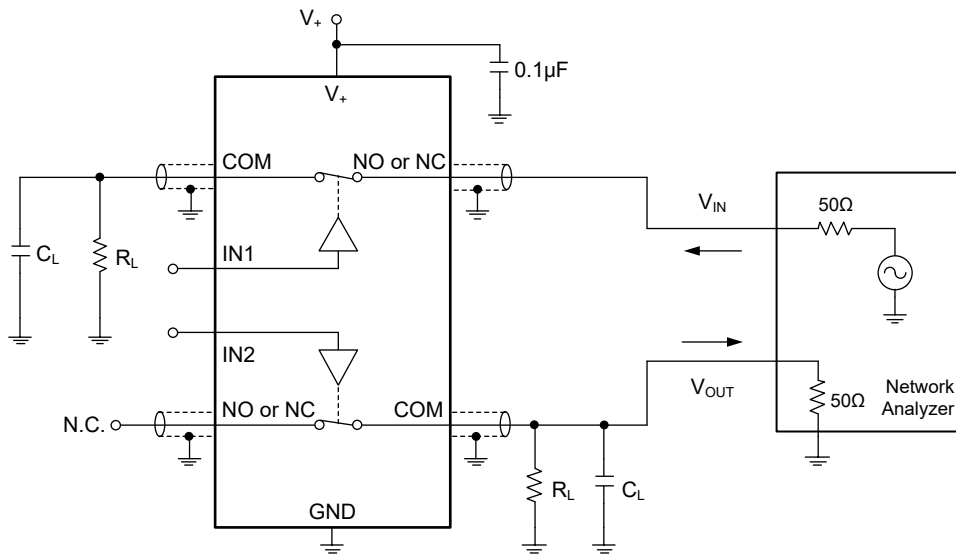


Test Circuit 4. Output Signal Skew



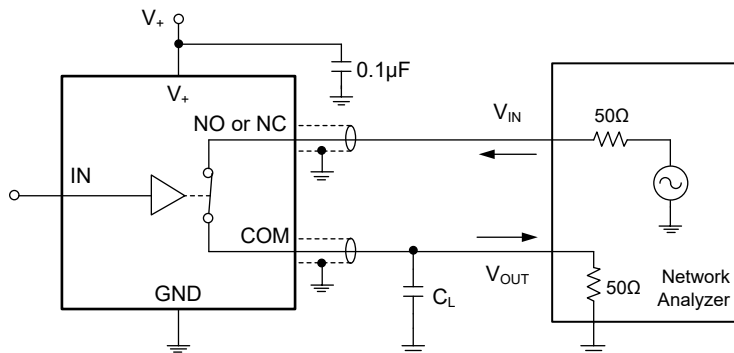
Test Circuit 5. Off Isolation

TEST CIRCUITS (continued)



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

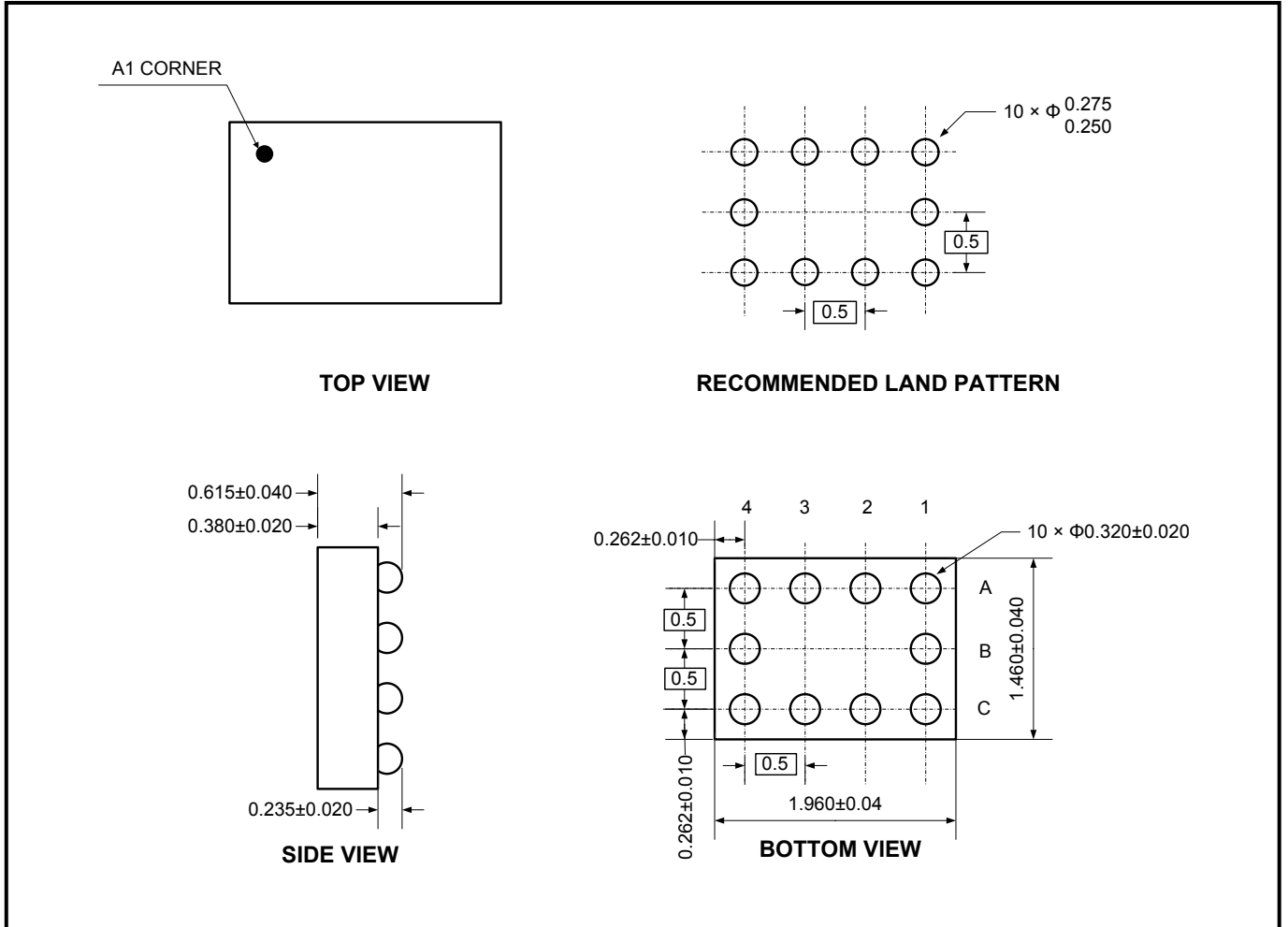
Test Circuit 6. Channel-to-Channel Crosstalk



Test Circuit 7. -3dB Bandwidth

PACKAGE OUTLINE DIMENSIONS

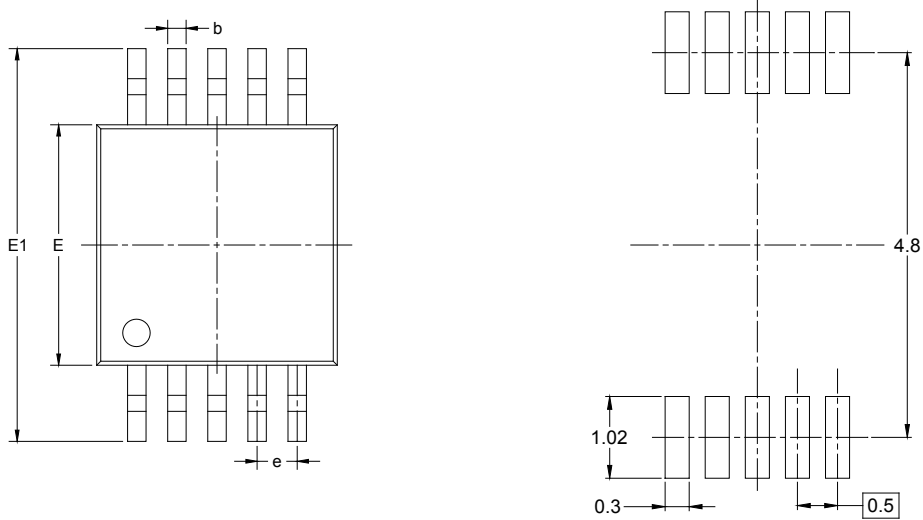
WLCSP-2.0x1.5-10B



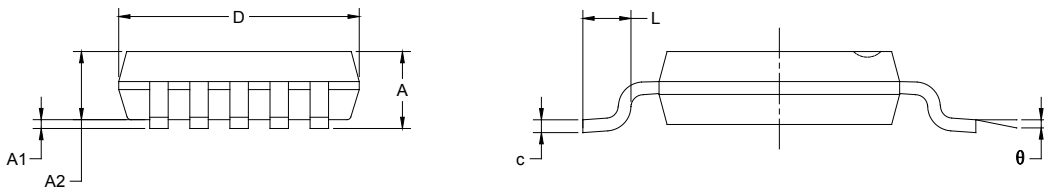
NOTE: All linear dimensions are in millimeters.

PACKAGE OUTLINE DIMENSIONS

MSOP-10



RECOMMENDED LAND PATTERN (Unit: mm)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.180	0.280	0.007	0.011
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
e	0.500 BSC		0.020 BSC	
L	0.400	0.800	0.016	0.031
θ	0°	6°	0°	6°

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
WLCSP-2.0×1.5-10B	7"	9.2	1.70	2.20	0.90	4.0	4.0	2.0	8.0	Q2
MSOP-10	13"	12.4	5.20	3.30	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
7" (Option)	368	227	224	8
7"	442	410	224	18
13"	386	280	370	5

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