



SGM48759

Dual Bilateral Analog Switch

GENERAL DESCRIPTION

SGM48759 is dual bilateral analog switch which is designed for 1.65V to 5.5V V_{CC} operation. The device can support up to 5.5V bidirectional signal transmission. It can be flexibly applied to digital and analog signal processing systems.

The SGM48759 is a dual channel single-pole/single-throw (SPST) switch. Each channel of SGM48759 is completely independent and can be controlled by its own enable-input control pin (C).

The SGM48759 is available in Green VSSOP-8 and MSOP-8 packages.

FEATURES

- **Supply Voltage Range: 1.65V to 5.5V**
- **Low On-Resistance: 4.5Ω (TYP) at $V_{CC} = 4.5V$**
- **With No V_{CC} Connected in the System, the Control Pins can Accept Voltages up to 5.5V**
- **Propagation Delay Time, t_{PD} : 0.7ns (TYP) at 3.3V**
- **High On-Off Output Voltage Ratio**
- **High Degree of Linearity**
- **Rail-to-Rail Input and Output Operation**
- **-40°C to +125°C Operating Temperature Range**
- **Available in Green VSSOP-8 and MSOP-8 Packages**

APPLICATIONS

Computer Peripherals
 Portable Equipment
 Sample-and-Hold Circuits

LOGIC DIAGRAM

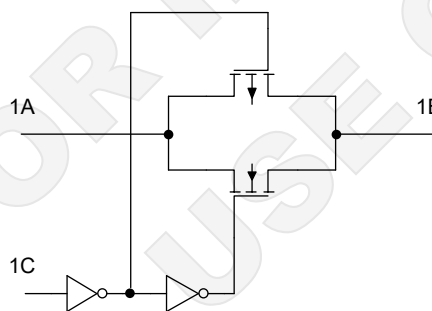


Figure 1. Logic Diagram

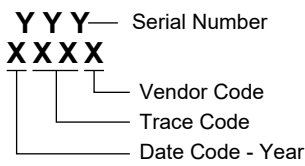
PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM48759	VSSOP-8	-40°C to +125°C	SGM48759XVS8G/TR	041 XXXX	Tape and Reel, 3000
	MSOP-8	-40°C to +125°C	SGM48759XMS8G/TR	SGM03Y XMS8 XXXXX	Tape and Reel, 4000

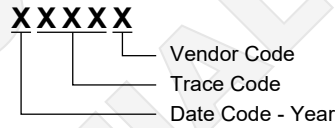
MARKING INFORMATION

NOTE: XXXX = Date Code, Trace Code and Vendor Code. XXXXX = Date Code, Trace Code and Vendor Code.

VSSOP-8



MSOP-8



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

Supply Voltage, V_{CC} ⁽¹⁾	-0.5V to 6.5V
Control Input Voltage, V_{IN} ^{(1) (2)}	-0.5V to 6.5V
Switch I/O Voltage, $V_{I/O}$ ^{(1) (2) (3)}	-0.5V to ($V_{CC} + 0.5V$)
Control Input Clamp Current, I_{IK} , $V_{IN} < 0V$	-50mA
I/O Port Diode Current, $I_{I/OK}$, $V_{I/O} < 0V$	-50mA
On-State Switch Current, I_T , $V_{I/O} = 0V$ to V_{CC}	$\pm 50mA$
Junction Temperature	+150°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (Soldering, 10s)	+260°C

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.

RECOMMENDED OPERATING CONDITIONS

Supply Voltage, V_{CC}	1.65V to 5.5V
I/O Port Voltage, $V_{I/O}$	0V to V_{CC}
Control Input Voltage, V_{IN}	0V to 5.5V
Input Transition Rise or Fall Time, $\Delta t/\Delta v$	
$V_{CC} = 1.65V$ to $1.95V$	20ns/V
$V_{CC} = 2.3V$ to $2.7V$	20ns/V
$V_{CC} = 3V$ to $3.6V$	10ns/V
$V_{CC} = 4.5V$ to $5.5V$	10ns/V
Operating Temperature Range, T_A	-40°C to +125°C

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.

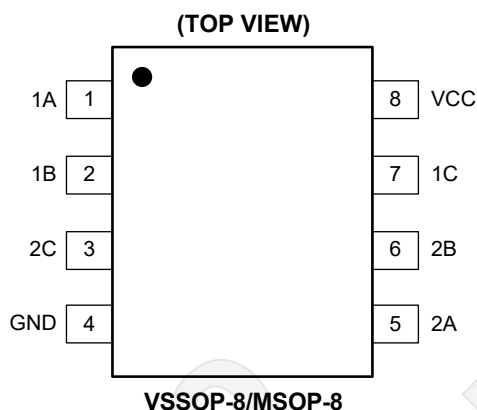
DISCLAIMER

SG Micro Corp reserves the right to make any change in circuit design, or specifications without prior notice.

NOTES:

1. All voltages reference ground, unless otherwise noted.
2. If the input and output clamp-current ratings are observed, the input and output negative voltage ratings may be exceeded.
3. The maximum value is 5.5V.

PIN CONFIGURATIONS



PIN DESCRIPTION

PIN	NAME	I/O	FUNCTION
1	1A	I/O	Analog Switch 1A Input/Output Port.
2	1B	I/O	Analog Switch 1B Input/Output Port.
3	2C	I	Control Signal Input Port of Channel 2.
4	GND	–	Ground Pin.
5	2A	I/O	Analog Switch 2A Input/Output Port.
6	2B	I/O	Analog Switch 2B Input/Output Port.
7	1C	I	Control Signal Input Port of Channel 1.
8	VCC	–	Power Supply Input Pin.

FUNCTION TABLE

CONTROL INPUT (C)	SWITCH
L	OFF
H	ON

ELECTRICAL CHARACTERISTICS

(Typical values are at T_A = +25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	V _{CC} (V)	MIN	TYP	MAX	UNITS
Control Input High Voltage	V _{INH}		4.5 to 5.5	2.9			V
			3 to 3.6	1.9			
			2.3 to 2.7	1.4			
			1.65 to 1.95	1.0			
Control Input Low Voltage	V _{INL}		4.5 to 5.5			1.8	V
			3 to 3.6			1.2	
			2.3 to 2.7			0.9	
			1.65 to 1.95			0.4 × V _{CC}	
On-Resistance	R _{ON}	V _I = 0V to V _{CC} , V _{IN} = V _{INH} , Test Circuit 2	I _S = 4mA	1.65		48	Ω
			I _S = 8mA	2.3		11	
			I _S = 24mA	3		7	
			I _S = 32mA	4.5		4.5	
On-Resistance Flatness	R _{FLAT(ON)}	V _I = 0V to V _{CC} , V _{IN} = V _{INH} , Test Circuit 2	I _S = 4mA	1.65		40	Ω
			I _S = 8mA	2.3		5.3	
			I _S = 24mA	3		2	
			I _S = 32mA	4.5		1.2	
On-Resistance Match Between Channels	ΔR _{ON}	V _I = 0V to V _{CC} , V _{IN} = V _{INH} , Test Circuit 2	I _S = 4mA	1.65		0.3	Ω
			I _S = 8mA	2.3		0.06	
			I _S = 24mA	3		0.04	
			I _S = 32mA	4.5		0.03	
Off Leakage Current	I _{S(OFF)}	V _I = V _{CC} and V _O = 0V or V _I = 0V and V _O = V _{CC} , V _{IN} = V _{INL} , Test Circuit 3	5.5		0.1		μA
On Leakage Current	I _{S(ON)}	V _I = V _{CC} or 0V, V _{IN} = V _{INH} , V _O = Open, Test Circuit 4	5.5		0.1		μA
Control Input Current	I _{IN}	V _{IN} = V _{CC} or 0V	5.5		0.1		μA
Supply Current	I _{CC}	V _{IN} = V _{CC} or 0V	5.5		0.1		μA
Supply Current Change	ΔI _{CC}	V _{IN} = V _{CC} - 0.6V	5.5		0.1		μA
Control Input Capacitance	C _{INC}	f = 1MHz	5		3		pF
Switch Input/Output Capacitance	C _{IO(OFF)}	f = 1MHz	5		6		pF
Switch Input/Output Capacitance	C _{IO(ON)}	f = 1MHz	5		13		pF

SWITCHING CHARACTERISTICS

(Typical values are at T_A = +25°C, unless otherwise noted.)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 1.8V ± 0.15V			V _{CC} = 2.5V ± 0.2V			V _{CC} = 3.3V ± 0.3V			V _{CC} = 5V ± 0.5V			UNITS
			MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
t _{PD}	A or B	B or A		0.5			0.4			0.7			0.6		ns
t _{EN}	C	A or B		6.7			3.7			3.5			2.8		ns
t _{DIS}	C	A or B		7.3			4.1			3.6			3.1		ns

ANALOG SWITCH CHARACTERISTICS

(T_A = +25°C, unless otherwise noted.)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	CONDITIONS	V _{CC} (V)	TYP	UNITS
Frequency Response (Switch On)	A or B	B or A	C _L = 20pF, R _L = 600Ω, f = sine wave, Test Circuit 5	1.65	130	MHz
				2.3	190	
				3	200	
				4.5	210	
			C _L = 5pF, R _L = 50Ω, f = sine wave, Test Circuit 5	1.65	310	
				2.3	320	
				3	330	
				4.5	340	
Crosstalk (Between Switches)	A or B	B or A	C _L = 50pF, R _L = 600Ω, f = 1MHz (sine wave), Test Circuit 6	1.65	-89	dB
				2.3	-89	
				3	-89	
				4.5	-89	
			C _L = 5pF, R _L = 50Ω, f = 1MHz (sine wave), Test Circuit 6	1.65	-110	
				2.3	-110	
				3	-110	
				4.5	-110	
Crosstalk (Control Input to Signal Output)	C	A or B	C _L = 50pF, R _L = 600Ω, f = 1MHz (square wave), Test Circuit 7	1.65	35	mV
				2.3	60	
				3	90	
				4.5	160	
Feedthrough Attenuation (Switch Off)	A or B	B or A	C _L = 50pF, R _L = 600Ω, f = 1MHz (sine wave), Test Circuit 8	1.65	-54	dB
				2.3	-54	
				3	-54	
				4.5	-54	
			C _L = 5pF, R _L = 50Ω, f = 1MHz (sine wave), Test Circuit 8	1.65	-75	
				2.3	-75	
				3	-75	
				4.5	-75	
Sine-Wave Distortion	A or B	B or A	C _L = 50pF, R _L = 10kΩ, f = 1kHz (sine wave), Test Circuit 9	1.65	0.065	%
				2.3	0.015	
				3	0.005	
				4.5	0.005	
			C _L = 50pF, R _L = 10kΩ, f = 10kHz (sine wave), Test Circuit 9	1.65	0.07	
				2.3	0.015	
				3	0.005	
				4.5	0.005	

OPERATING CHARACTERISTICS

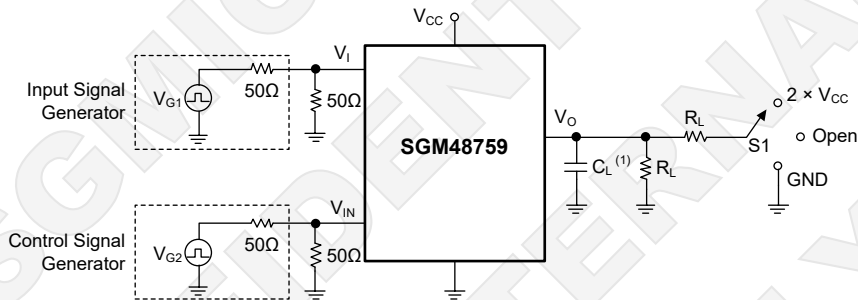
(T_A = +25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	V _{CC} = 1.8V	V _{CC} = 2.5V	V _{CC} = 3.3V	V _{CC} = 5V	UNITS
			TYP	TYP	TYP	TYP	
Power Dissipation Capacitance	C _{PD}	f = 10MHz	7	8	8.5	9	pF

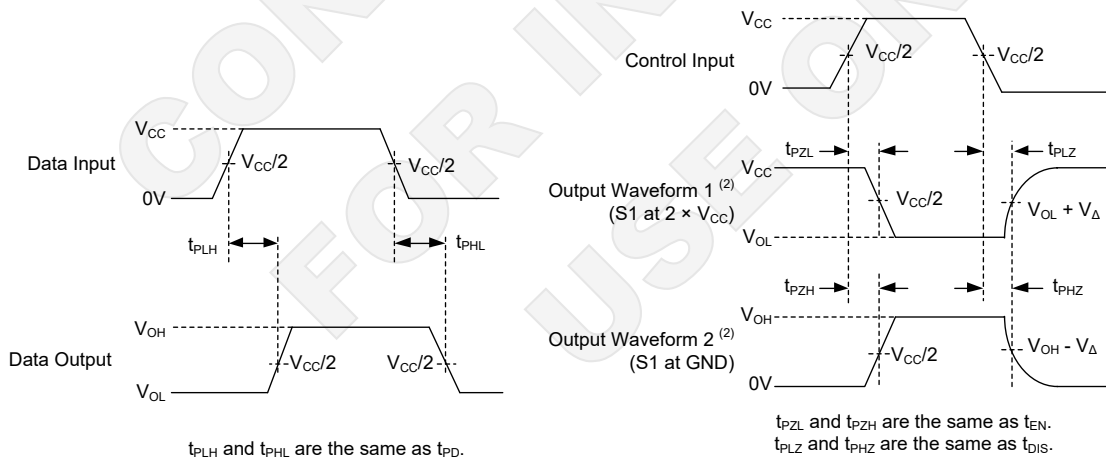
TEST CIRCUITS

Table 1. Parameter Test Information

PARAMETER	V _{CC}	S1	INPUTS		V _M	C _L	R _L	V _Δ
			V _{IN}	t _R /t _F				
t _{PLH} /t _{PHL}	1.8V ± 0.15V	Open	V _{CC}	≤ 2ns	V _{CC} /2	30pF	1kΩ	0.15V
	2.5V ± 0.2V	Open	V _{CC}	≤ 2ns	V _{CC} /2	30pF	500Ω	0.15V
	3.3V ± 0.3V	Open	V _{CC}	≤ 2.5ns	V _{CC} /2	50pF	500Ω	0.3V
	5V ± 0.5V	Open	V _{CC}	≤ 2.5ns	V _{CC} /2	50pF	500Ω	0.3V
t _{PLZ} /t _{PZL}	1.8V ± 0.15V	2 × V _{CC}	V _{CC}	≤ 2ns	V _{CC} /2	30pF	1kΩ	0.15V
	2.5V ± 0.2V	2 × V _{CC}	V _{CC}	≤ 2ns	V _{CC} /2	30pF	500Ω	0.15V
	3.3V ± 0.3V	2 × V _{CC}	V _{CC}	≤ 2.5ns	V _{CC} /2	50pF	500Ω	0.3V
	5V ± 0.5V	2 × V _{CC}	V _{CC}	≤ 2.5ns	V _{CC} /2	50pF	500Ω	0.3V
t _{PHZ} /t _{PZH}	1.8V ± 0.15V	GND	V _{CC}	≤ 2ns	V _{CC} /2	30pF	1kΩ	0.15V
	2.5V ± 0.2V	GND	V _{CC}	≤ 2ns	V _{CC} /2	30pF	500Ω	0.15V
	3.3V ± 0.3V	GND	V _{CC}	≤ 2.5ns	V _{CC} /2	50pF	500Ω	0.3V
	5V ± 0.5V	GND	V _{CC}	≤ 2.5ns	V _{CC} /2	50pF	500Ω	0.3V



Test Circuit 1. Propagation Delay Time (t_{PD}), Enable and Disable Times (t_{EN}, t_{DIS})



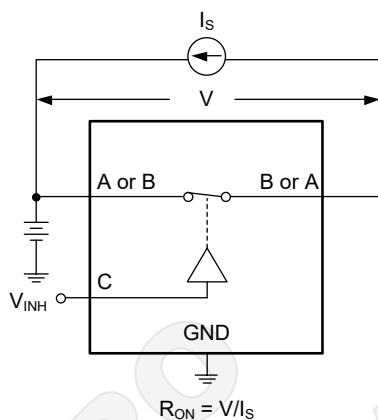
(1) Voltage Waveforms & Propagation Delay Times (t_{PD})

(2) Voltage Waveforms & Enable and Disable Times

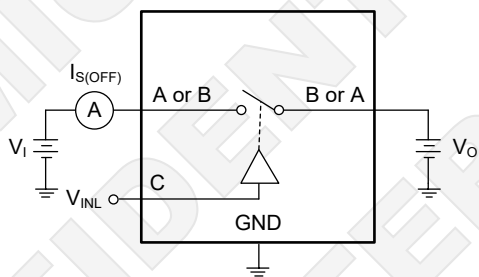
NOTES:

1. The C_L includes probe capacitance and clamp capacitance.
2. Waveform 1 indicates the output when internal conditions force the output to low, except the output port is disabled through the output control. Waveform 2 indicates the output when internal conditions force the output to high, except the output port is disabled through the output control.
3. For all input signals from signal generator equipment, the following conditions are required: PRR ≤ 10MHz, Z_O = 50Ω.
4. Only one output port is measured with one transition at a time.

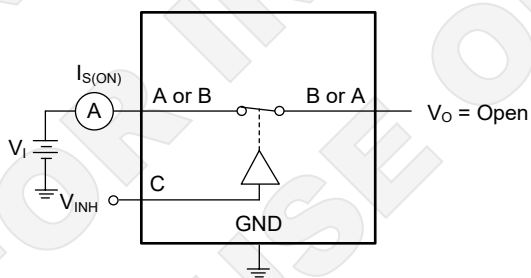
TEST CIRCUITS (continued)



Test Circuit 2. On-Resistance

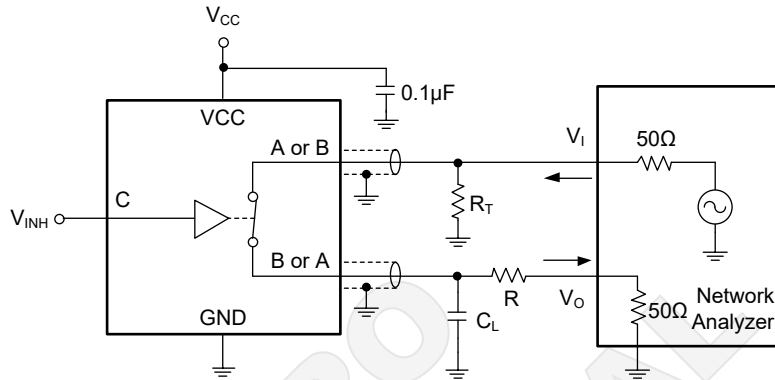


Test Circuit 3. Off Leakage Current



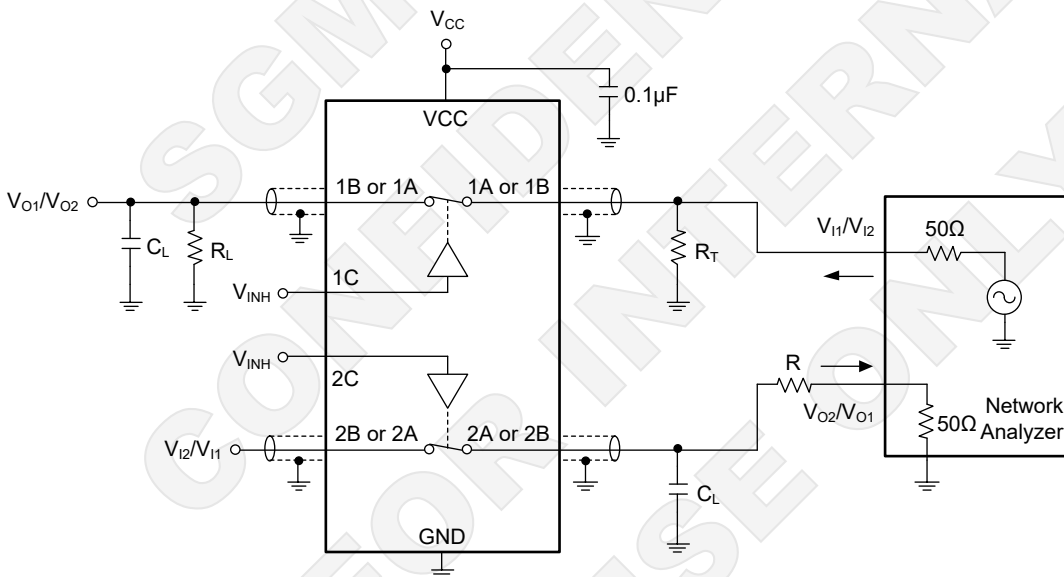
Test Circuit 4. On Leakage Current

TEST CIRCUITS (continued)



$R_L = 600\Omega$: $R = 550\Omega$, $R_T = 50\Omega$
 $R_L = 50\Omega$: $R = 0\Omega$, $R_T = \text{Open}$

Test Circuit 5. Frequency Response (Switch On)

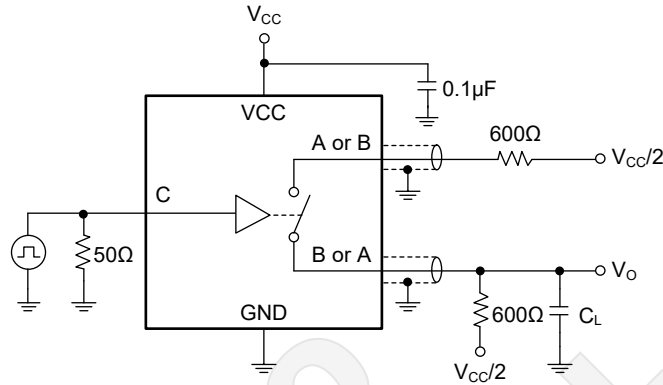


$R_L = 600\Omega$: $R = 550\Omega$, $R_T = 50\Omega$
 $R_L = 50\Omega$: $R = 0\Omega$, $R_T = \text{Open}$

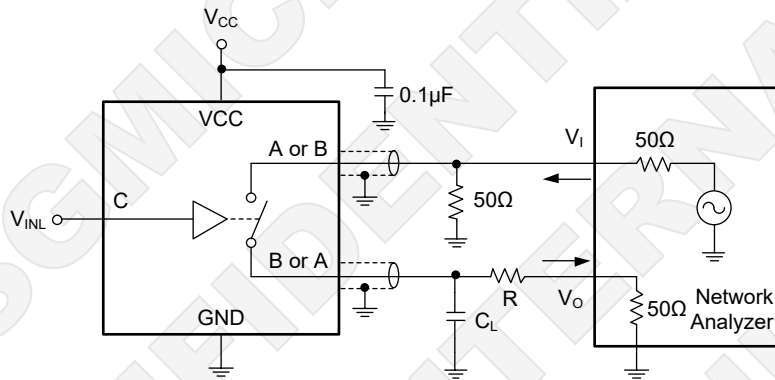
Crosstalk (Between Switches) = $20 \log (V_{O2}/V_{I1} \text{ or } V_{O1}/V_{I2})$

Test Circuit 6. Crosstalk (Between Switches)

TEST CIRCUITS (continued)

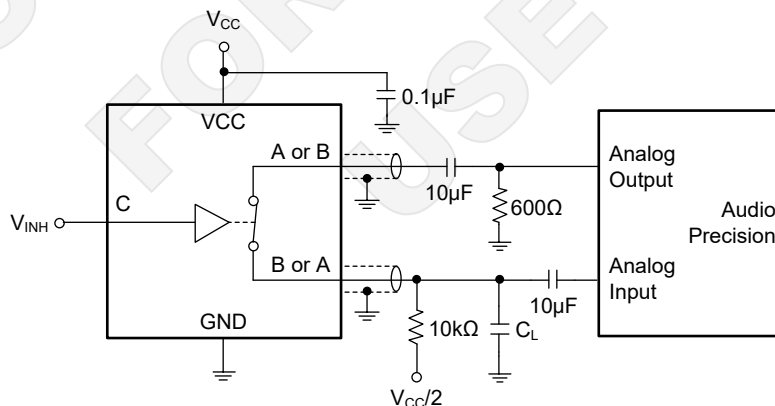


Test Circuit 7. Crosstalk (Control Input to Signal Output)



$R_L = 600\Omega$: $R = 550\Omega$
 $R_L = 50\Omega$: $R = 0\Omega$

Test Circuit 8. Feedthrough (Switch Off)



$V_{CC} = 1.65V$, $V_I = 1.4V_{P-P}$
 $V_{CC} = 2.3V$, $V_I = 2V_{P-P}$
 $V_{CC} = 3V$, $V_I = 2.5V_{P-P}$
 $V_{CC} = 4.5V$, $V_I = 4V_{P-P}$

Test Circuit 9. Sine-Wave Distortion

DETAILED DESCRIPTION

The SGM48759 operates power supply voltage range from 1.65V to 5.5V. Each analog switch in the SGM48759 can support up to 5.5V bidirectional signal transmission. When the input control pin (C) accepts a high-level voltage, the analog switch is turned on and the signal transmission is started. When the input control pin (C) accepts a low-level voltage, the analog switch is turned off and the signal transmission is prohibited. Each analog switch in the SGM48759 is completely independent and can be controlled by its own input control pin (C).

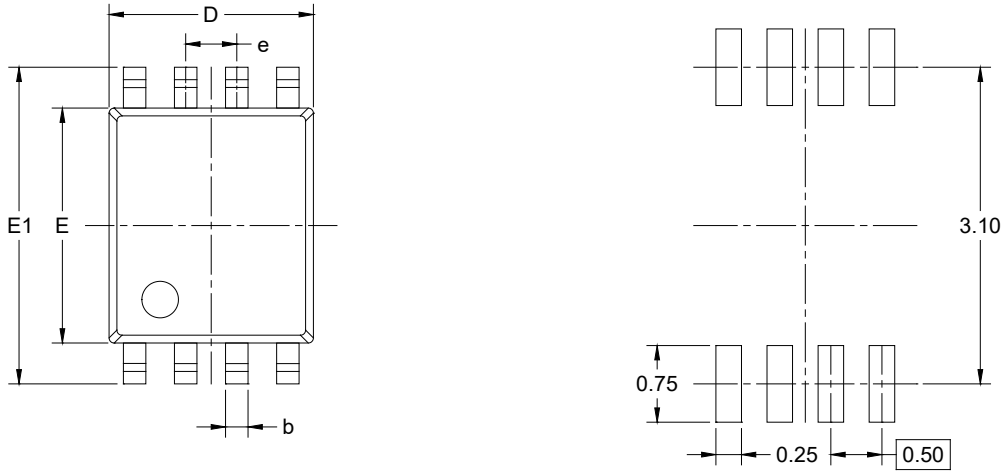
Feature Description

The SGM48759 has low on-resistance of 4.5Ω (TYP) at 4.5V V_{CC} and low t_{PD} of 0.7ns (TYP) at 3.3V, so that it can be applied to high-speed signal transmission. Besides, its low enable and disable times make this device suitable for high-speed signal switching applications. In particular, the control pin can accept a higher voltage than V_{CC} because the SGM48759 has no equivalent diodes between the control pin and VCC pin. The maximum input voltage of control pin can reach to 5.5V when V_{CC} is 0V. This feature allows the SGM48759 to be used in applications where the control pin voltage is higher than the power supply.

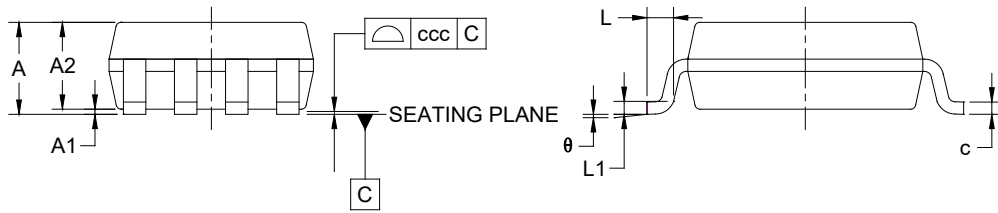
SGMICRO
CONFIDENTIAL
FOR INTERNAL
USE ONLY

PACKAGE OUTLINE DIMENSIONS

VSSOP-8



RECOMMENDED LAND PATTERN (Unit: mm)



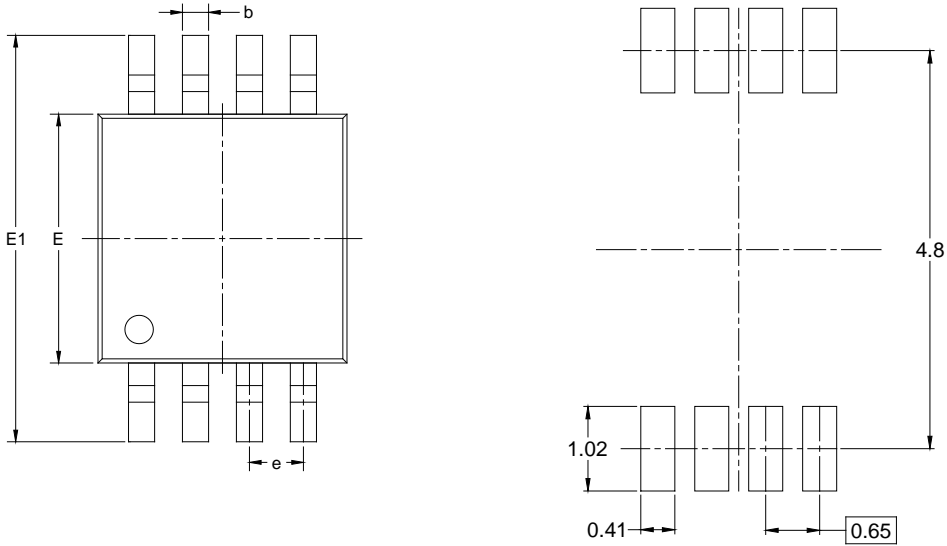
Symbol	Dimensions In Millimeters		
	MIN	MOD	MAX
A	-	-	0.900
A1	0	-	0.100
A2	0.650	-	0.800
b	0.170	-	0.270
c	0.100	-	0.180
D	1.900	-	2.100
E	2.200	-	2.400
E1	3.000	-	3.200
e	0.500 BSC		
L	0.200	-	0.350
L1	0.120 BSC		
θ	0°	-	6°
ccc	0.100		

NOTES:

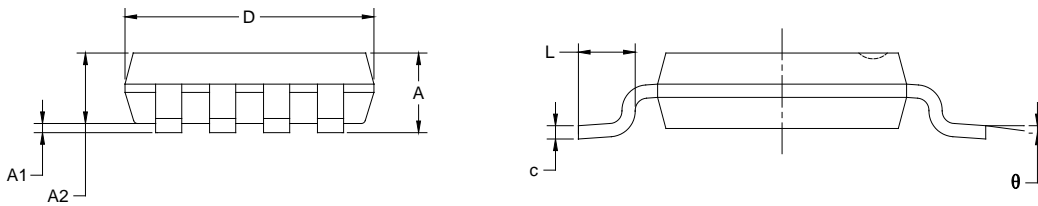
1. This drawing is subject to change without notice.
2. The dimensions do not include mold flashes, protrusions or gate burrs.
3. Reference JEDEC MO-187 CA.

PACKAGE OUTLINE DIMENSIONS

MSOP-8



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	0.250	0.380	0.010	0.015
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	0.650 BSC		0.026 BSC	
L	0.400	0.800	0.016	0.031
θ	0°	6°	0°	6°

NOTES:

1. Body dimensions do not include mode flash or protrusion.
2. This drawing is subject to change without notice.

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
VSSOP-8	7"	9.5	2.25	3.35	1.05	4.0	4.0	2.0	8.0	Q3
MSOP-8	13"	12.4	5.20	3.30	1.50	4.0	8.0	2.0	12.0	Q1

D00001

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

DD0002