



SGM48755

High Isolation and Low Leakage 4:1 CMOS Analog Signal Multiplexer

GENERAL DESCRIPTION

The SGM48755 is a 4:1 CMOS analog signal multiplexer. It operates from 2.5V to 5.5V single power supply and all digital inputs support 1.8V logic control.

The SGM48755 features low voltage, high off-isolation and low off-leakage current. The high performances make it very suitable for multiple applications, such as cellular phones, audio and video signal routing, etc.

The SGM48755 is available in a Green MSOP-10 package. It operates over an ambient temperature range of -40°C to +85°C.

FEATURES

- **Single Supply Voltage Range: 2.5V to 5.5V**
- **On-Resistance: 24Ω (TYP) with 5V Supply**
- **1.8V Logic Compatible**
- **“T” Type Switch**
- **Low On-Resistance Flatness**
- **High Off-Isolation: -80dB ($R_L = 50\Omega$, $f = 1\text{MHz}$)**
- **Low Off-Leakage Current: 1nA (TYP) at +25°C**
- **Low On-Leakage Current: 1nA (TYP) at +25°C**
- **Low Distortion: 0.35% ($R_L = 600\Omega$, $f = 20\text{Hz to } 20\text{kHz}$)**
- **-40°C to +85°C Operating Temperature Range**
- **Available in a Green MSOP-10 Package**

APPLICATIONS

Automotive
Portable Equipment
Sample-and-Hold Circuits
Data-Acquisition Systems
Battery-Powered Systems
Audio and Video Signal Routing

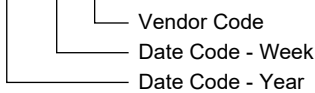
PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM48755	MSOP-10	-40°C to +85°C	SGM48755YMS10G/TR	SGM48755 YMS10 XXXXX	Tape and Reel, 4000

MARKING INFORMATION

NOTE: XXXXX = Date Code and Vendor Code.

XXXXX



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 _{CC} to GND	-0.3V to 6V
Voltage into Any Terminal ⁽¹⁾	-0.3V to (V _{CC} + 0.3V)
Continuous Current into Any Terminal.....	±20mA
Peak Current (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.....	4000V
MM.....	300V

NOTE:

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

RECOMMENDED OPERATING CONDITIONS

Supply Voltage Range	2.5V to 5.5V
Operating Temperature Range	-40°C to +85°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.

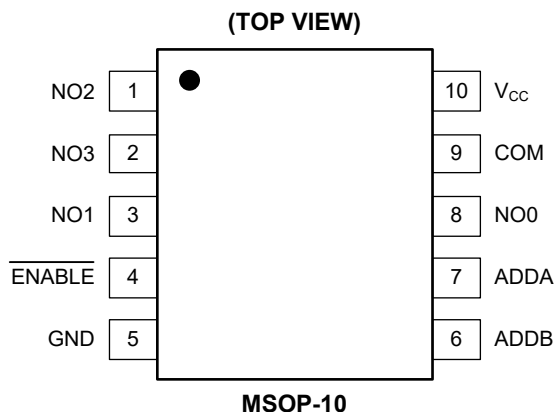
ESD SENSITIVITY CAUTION

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.

PIN CONFIGURATION



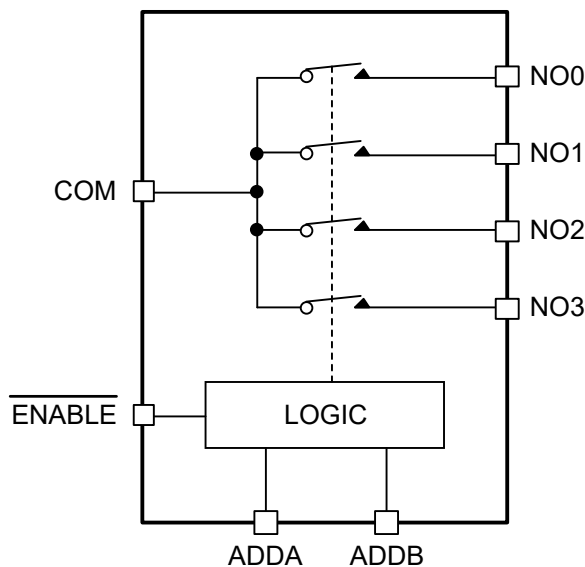
PIN DESCRIPTION

PIN	NAME	FUNCTION
1	NO2	Normally Open Input 2 Pin.
2	NO3	Normally Open Input 3 Pin.
3	NO1	Normally Open Input 1 Pin.
4	$\overline{\text{ENABLE}}$	Digital Enable Control Pin. Normally connected to GND.
5	GND	Ground.
6	ADDB	Logic-Level Address Input Pin.
7	ADDA	Logic-Level Address Input Pin.
8	NO0	Normally Open Input 0 Pin.
9	COM	Common Pin.
10	V _{CC}	Positive Analog and Digital Supply Voltage Input 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.

FUNCTIONAL BLOCK DIAGRAM



FUNCTION TABLE

ENABLE INPUT	SELECT INPUTS		ON SWITCHES
	ADDB	ADDA	
1	X	X	NONE
0	0	0	COM-NO0
0	0	1	COM-NO1
0	1	0	COM-NO2
0	1	1	COM-NO3

X = Don't care.

ELECTRICAL CHARACTERISTICS

(V_{CC} = 5.0V, Full = -40°C to +85°C, typical values are at T_A = +25°C, unless otherwise noted.)

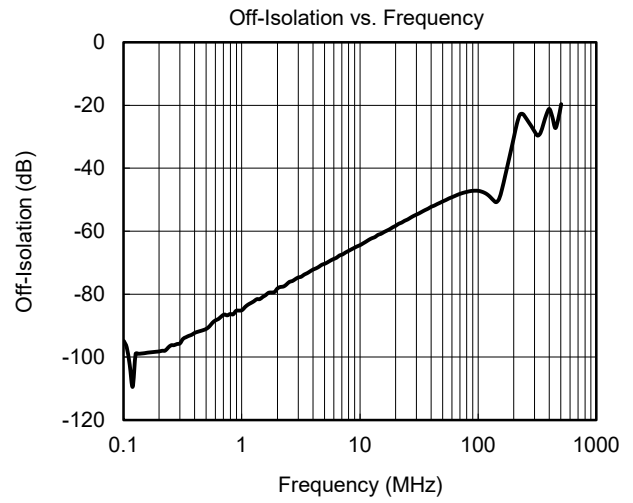
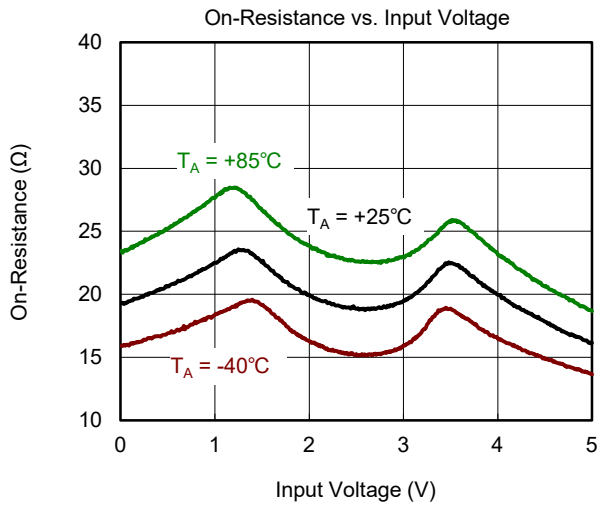
PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Analog Switch							
Analog Signal Range	V _{NO_} , V _{COM}		Full	GND		V _{CC}	V
On-Resistance	R _{ON}	I _{COM} = 1mA	+25°C		24	30	Ω
			Full			35	
On-Resistance Match Between Channels	ΔR _{ON}	I _{COM} = 1mA	+25°C		1	2.6	Ω
			Full			3.1	
On-Resistance Flatness	R _{FLAT(ON)}	I _{COM} = 1mA	+25°C		8	11	Ω
			Full			14	
Channel Off Leakage Current	I _{NO_(OFF)}	V _{NO_} = 4.5V or 0V, V _{COM} = 4.5V or 0V	+25°C		1	2000	nA
	I _{COM(OFF)}	V _{NO_} = 4.5V or 0V, V _{COM} = 4.5V or 0V	+25°C		1	1000	
Channel On Leakage Current	I _{NO_(ON)} , I _{COM(ON)}	V _{NO_} = 4.5V or 0V, V _{COM} = 4.5V or 0V	+25°C		1	1000	nA
Digital I/O							
Logic Input Logic Threshold High	V _{ADDAH} , V _{ADDBH} , V _{ENABLEH}		+25°C	1.7			V
Logic Input Logic Threshold Low	V _{ADDAL} , V _{ADDBL} , V _{ENABLEL}		+25°C			0.5	V
Input-Current High	I _{ADDAH} , I _{ADDBH} , I _{ENABLEH}	V _{ADDA} , V _{ADDB} , V _{ENABLE} = V _{CC}	+25°C		1		nA
Input-Current Low	I _{ADDAL} , I _{ADDBL} , I _{ENABLEL}	V _{ADDA} , V _{ADDB} , V _{ENABLE} = 0V	+25°C		1		nA
Dynamic Characteristics							
Address Transition Time	t _{TRANS}	V _{NO_} = 3V/0V, R _L = 300Ω, C _L = 35pF, Test Circuit 1	+25°C		65		ns
ENABLE Turn-On Time	t _{ON}	V _{NO_} = 3V, R _L = 300Ω, C _L = 35pF, Test Circuit 2	+25°C		50		ns
ENABLE Turn-Off Time	t _{OFF}	V _{NO_} = 3V, R _L = 300Ω, C _L = 35pF, Test Circuit 2	+25°C		85		ns
Input Transition Rise or Fall Rate	Δt/ΔV		+25°C			20	ns/V
Break-Before-Make Time Delay	t _d	V _{NO_} = 3V, R _L = 300Ω, C _L = 35pF, Test Circuit 3	+25°C		45		ns
Charge Injection	Q	R _S = 0Ω, C _L = 1nF, V _S = 0V, Test Circuit 4	+25°C		3		pC
Off-Isolation	O _{ISO}	R _L = 50Ω, f = 1MHz, Test Circuit 5	+25°C		-80		dB
Input Off-Capacitance	C _{NO_(OFF)}	V _{NO_} = 0V, f = 1MHz, Test Circuit 6	+25°C		6		pF
Output Off-Capacitance	C _{COM(OFF)}	V _{NO_} = 0V, f = 1MHz, Test Circuit 6	+25°C		13		pF
Output On-Capacitance	C _{COM(ON)}	V _{NO_} = 0V, f = 1MHz, Test Circuit 6	+25°C		19		pF
-3dB Bandwidth	BW	R _L = 50Ω	+25°C		180		MHz
Total Harmonic Distortion	THD	R _L = 600Ω, 5V _{P-P} , f = 20Hz to 20kHz	+25°C		0.35		%
Power Supply							
Power Supply Range	V _{CC}		Full	2.5		5.5	V
Power Supply Current	I _{CC}	V _{ADDA} , V _{ADDB} , V _{ENABLE} = V _{CC} or 0V	+25°C		0.001	6	μA

ELECTRICAL CHARACTERISTICS (continued)(V_{CC} = 3.3V, Full = -40°C to +85°C, typical values are at T_A = +25°C, unless otherwise noted.)

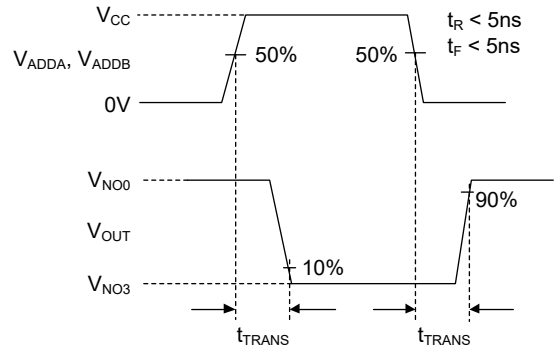
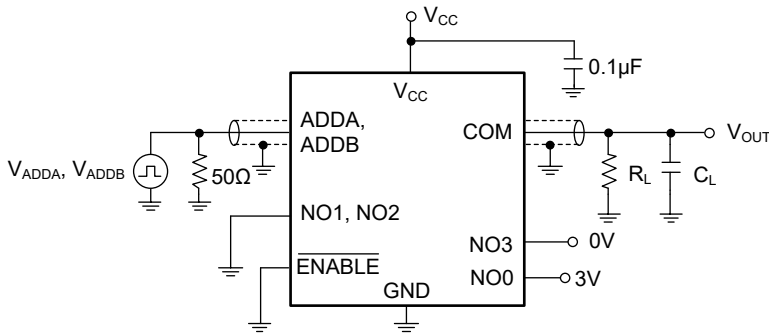
PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Analog Switch							
Analog Signal Range	V _{NO_} , V _{COM}		Full	GND		V _{CC}	V
On-Resistance	R _{ON}	I _{COM} = 1mA	+25°C		40	59	Ω
			Full			62	
Channel Off Leakage Current	I _{NO_(OFF)} , I _{COM(OFF)}	V _{NO_} = 1V or 3V, V _{COM} = 3V or 1V	+25°C		1	1000	nA
Channel On Leakage Current	I _{NO_(ON)} , I _{COM(ON)}	V _{NO_} = 1V or 3V, V _{COM} = 3V or 1V	+25°C		1	1000	nA
Digital I/O							
Logic Input Logic Threshold High	V _{ADDAH} , V _{ADDBH} , V _{ENABLEH}		+25°C	1.7			V
Logic Input Logic Threshold Low	V _{ADDAL} , V _{ADDBL} , V _{ENABLEL}		+25°C			0.5	V
Input-Current High	I _{ADDAH} , I _{ADDBH} , I _{ENABLEH}	V _{ADDA} , V _{ADDB} , V _{ENABLE} = V _{CC}	+25°C		1		nA
Input-Current Low	I _{ADDAL} , I _{ADDBL} , I _{ENABLEL}	V _{ADDA} , V _{ADDB} , V _{ENABLE} = 0V	+25°C		1		nA
Dynamic Characteristics							
Address Transition Time	t _{TRANS}	V _{NO_} = 3V/0V, R _L = 300Ω, C _L = 35pF, Test Circuit 1	+25°C		120		ns
$\overline{\text{ENABLE}}$ Turn-On Time	t _{ON}	V _{NO_} = 3V, R _L = 300Ω, C _L = 35pF, Test Circuit 2	+25°C		85		ns
$\overline{\text{ENABLE}}$ Turn-Off Time	t _{OFF}	V _{NO_} = 3V, R _L = 300Ω, C _L = 35pF, Test Circuit 2	+25°C		115		ns
Input Transition Rise or Fall Rate	Δt/ΔV		+25°C			100	ns/V
Break-Before-Make Time Delay	t _D	V _{NO_} = 3V, R _L = 300Ω, C _L = 35pF, Test Circuit 3	+25°C		65		ns
-3dB Bandwidth	BW	R _L = 50Ω	+25°C		180		MHz
Charge Injection	Q	R _S = 0Ω, C _L = 1nF, V _S = 0V, Test Circuit 4	+25°C		4		pC
Power Supply							
Power Supply Current	I _{CC}	V _{ADDA} , V _{ADDB} , V _{ENABLE} = V _{CC} or 0V	+25°C		0.001	3	μA

TYPICAL PERFORMANCE CHARACTERISTICS

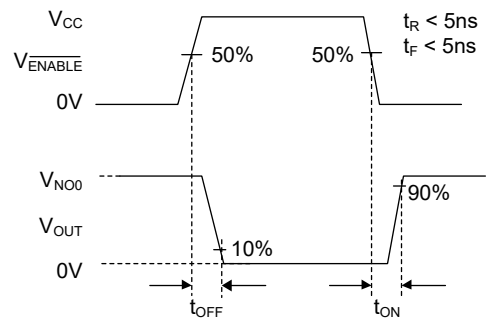
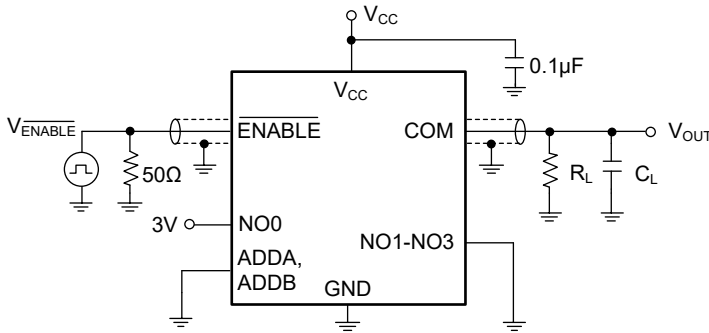
V_{CC} = 5.0V, unless otherwise noted.



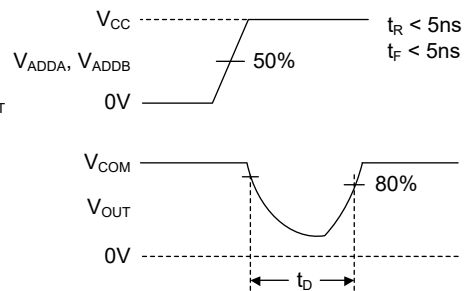
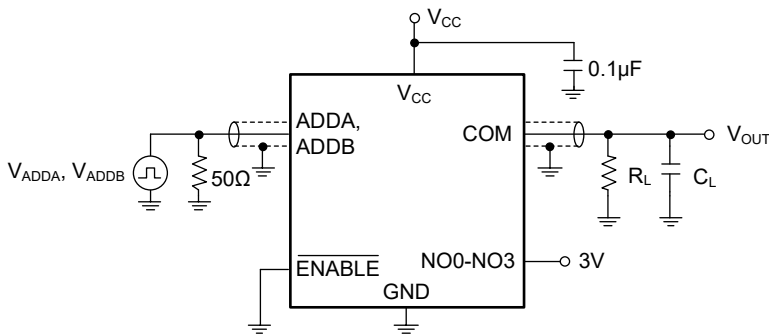
TEST CIRCUITS



Test Circuit 1. Address Transition Times (t_{TRANS})

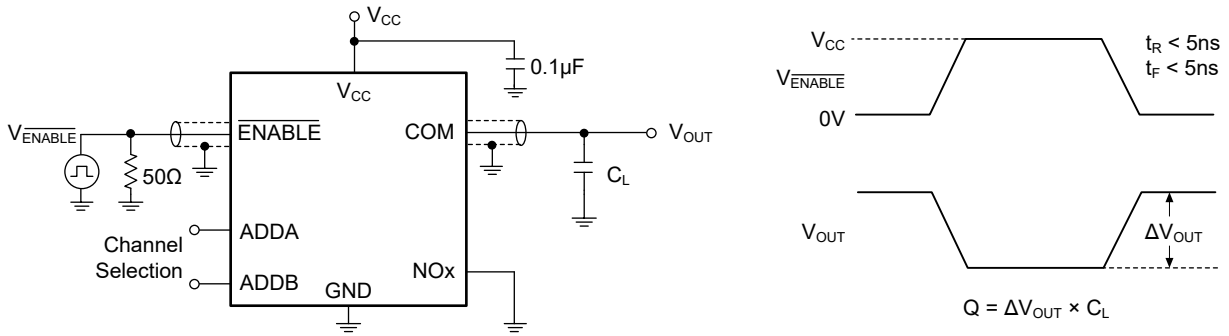


Test Circuit 2. Switching Times (t_{ON} , t_{OFF})

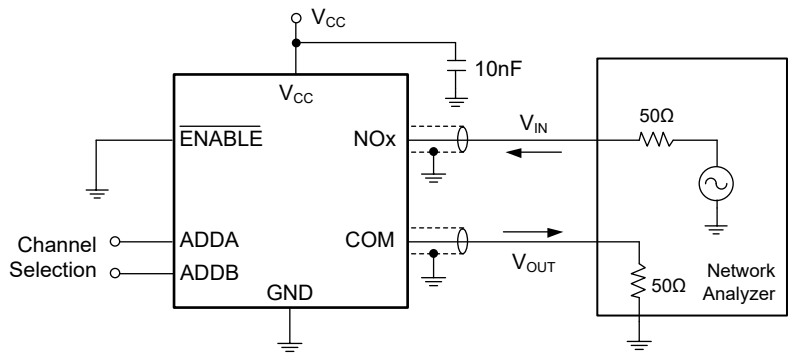


Test Circuit 3. Break-Before-Make Time Delay (t_D)

TEST CIRCUITS (continued)



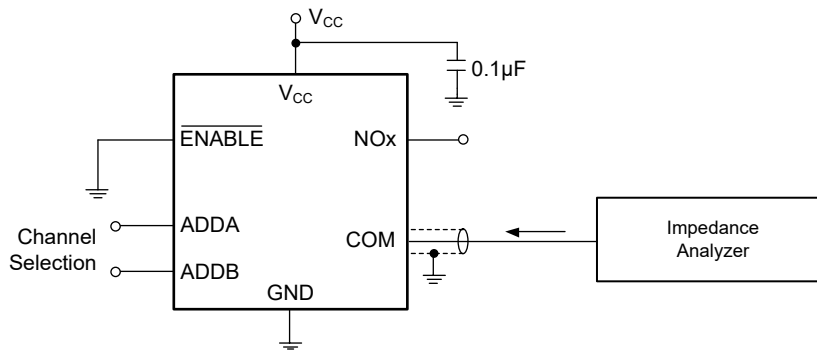
Test Circuit 4. Charge Injection (Q)



Off-Isolation = $20 \log (V_{OUT}/V_{IN})$ (Measured between COM and "OFF" NO Terminal on Each Switch)

On Loss = $20 \log (V_{OUT}/V_{IN})$ (Measured between COM and "ON" NO Terminal on Each Switch)

Test Circuit 5. Off-Isolation, On Loss



Test Circuit 6. Capacitance

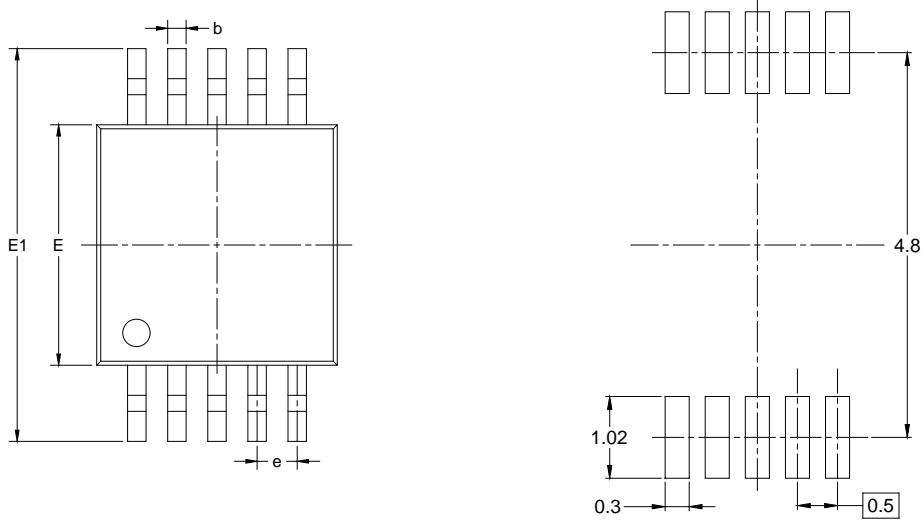
REVISION HISTORY

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

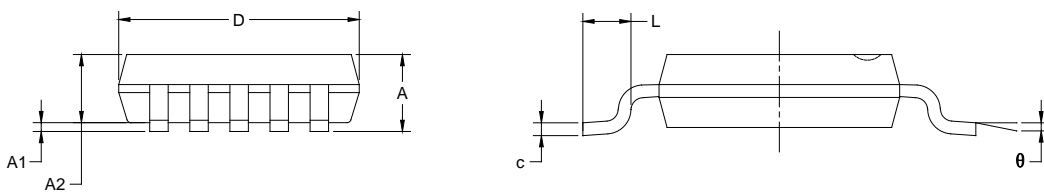
AUGUST 2022 – REV.A to REV.A.1	Page
Updated Test Circuits section	7
<hr/>	
Changes from Original (JANUARY 2015) to REV.A	
Changed from product preview to production data	All

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°

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
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
13"	386	280	370	5

DD0002