

GENERAL DESCRIPTION

The SGM4511 and SGM4512 are low cost, CMOS monolithic, quad single-pole/single-throw (SPST) analog switches. They operate from +4.5V to +40V single power supply or $\pm 4.5\text{V}$ to $\pm 20\text{V}$ dual power supplies.

The SGM4511 and SGM4512 are designed with improved charge injection compensation to minimize switching transients. Also, both of them have improved continuous current rating of 30mA. In ON conditions, both devices can provide true bidirectional performance. In OFF condition, both devices can block the signal to the supply level. These high performances make them very suitable for general purpose switching applications for industrial automation instrument communication systems, portable equipment and etc.

The SGM4511 and SGM4512 are available in Green SOIC-16 and TSSOP-16 packages. They operate over an ambient temperature range of -40°C to $+85^{\circ}\text{C}$.

FEATURES

- **Single Supply Voltage Range:** +4.5V to +40V
- **Dual-Supply Voltage Range:** $\pm 4.5\text{V}$ to $\pm 20\text{V}$
- **1.8V Control Logic**
- **Low On-Resistance:** 23Ω (TYP)
- **Fast Switching Time:**
 - $t_{\text{ON}} = 40\text{ns}$
 - $t_{\text{OFF}} = 120\text{ns}$
- **Low Charge Injection:** 18pC
- **Simple Logic Interface**
- **Minimum Transients**
- **-40°C to $+85^{\circ}\text{C}$ Operating Temperature Range**
- **Available in Green SOIC-16 and TSSOP-16 Packages**

APPLICATIONS

Computer Peripheral Equipment
Disk Drives
Industrial Automation Instruments
Test Equipment
Sampling Hold Circuits
Communications Systems
Portable Equipment

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM4511	SOIC-16	-40°C to +85°C	SGM4511YS16G/TR	SGM4511YS16 XXXXX	Tape and Reel, 2500
	TSSOP-16	-40°C to +85°C	SGM4511YTS16G/TR	SGM4511 YTS16 XXXXX	Tape and Reel, 4000
SGM4512	SOIC-16	-40°C to +85°C	SGM4512YS16G/TR	SGM4512YS16 XXXXX	Tape and Reel, 2500
	TSSOP-16	-40°C to +85°C	SGM4512YTS16G/TR	SGM4512 YTS16 XXXXX	Tape and Reel, 4000

MARKING INFORMATION

NOTE: XXXXX = Date Code and Vendor Code.

XXXXX

Vendor Code
Date Code - Week
Date Code - Year

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

Voltages Referenced to V_{EE}

V_{CC} 44V

GND 25V

Digital Inputs ⁽¹⁾, V_S , V_D

($V_{EE} - 0.3V$) to ($V_{CC} + 0.3V$) or 30mA, whichever occurs first
Current (Any Terminal) 30mA

Peak Current, S_x or D_x

(Pulsed at 1ms, 10% Duty Cycle Max.) 100mA

Storage Temperature Range -65°C to +150°C

Junction Temperature 150°C

Lead Temperature (Soldering, 10s) 260°C

ESD Susceptibility

HBM 4000V

MM 300V

NOTE:

1. Internal diodes will clamp any signals on S_x , D_x , or IN_x that exceed V_{CC} or V_{EE} . Limit the current through the forward diode to the maximum ratings.

RECOMMENDED OPERATING CONDITIONS

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.

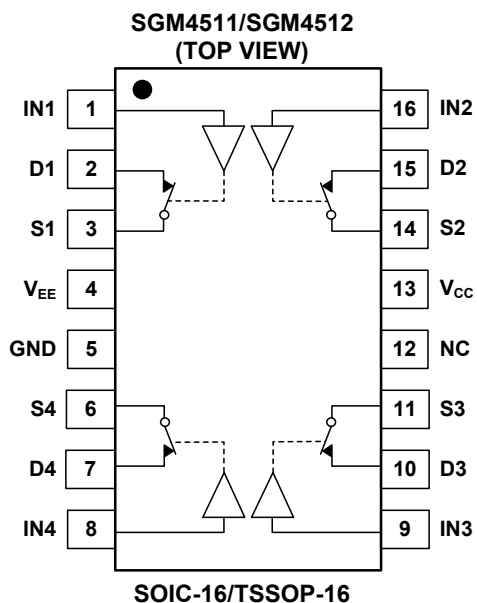
ESD SENSITIVITY CAUTION

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 CONFIGURATIONS



FUNCTIONAL BLOCK DIAGRAM

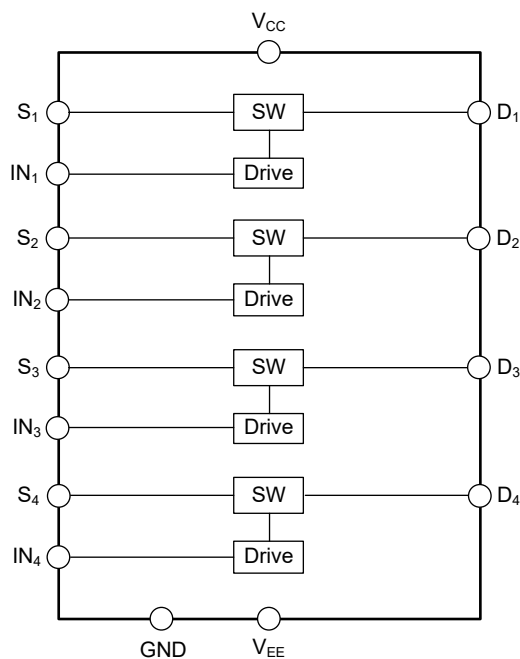


Figure 1. Block Diagram

FUNCTION TABLE

LOGIC	SGM4511	SGM4512
0	ON	OFF
1	OFF	ON

NOTES:

1. Logic "0" $\leq 0.5V$.
2. Logic "1" $\geq 1.6V$.

ELECTRICAL CHARACTERISTICS ($V_{CC} = 15V$)

($V_{CC} = 15V$, $V_{EE} = -15V$, $GND = 0V$, $V_{INH} = 1.6V$, $V_{INL} = 0.5V$, Full = $-40^{\circ}C$ to $+85^{\circ}C$. Typical values are at $T_A = +25^{\circ}C$, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Analog Switch							
Analog Signal Range	V _{ANALOG}		Full	-15		15	V
Drain-Source On-Resistance	R _{DS(ON)}	V _D = ±10V, I _S = 10mA	+25°C		23	30	Ω
			Full			37	
On-Resistance Match	ΔR _{DS(ON)}	V _D = ±10V, I _S = 10mA	+25°C		0.4	1.4	Ω
			Full			1.6	
Source Off Leakage Current	I _{S(OFF)}	V _S = ±10V, V _D = ∓10V	+25°C		0.1	1	μA
Drain Off Leakage Current	I _{D(OFF)}	V _D = ±10V, V _S = ∓10V	+25°C		0.1	1	μA
Drain On Leakage Current	I _{D(ON)}	V _D = ±10V, V _S = ±10V or floating	+25°C		0.1	1.5	μA
Digital Control							
Input Voltage High	V _{INH}	V _{CC} = ±4.5V to ±20V	Full	1.6			V
Input Voltage Low	V _{INL}	V _{CC} = ±4.5V to ±20V	Full			0.5	V
Input Current	I _{INH}	V _{IN} = V _{INH}	+25°C		6	11	μA
			Full			12	
	I _{INL}	V _{IN} = V _{EE} or 0V	+25°C		0.1	1	
			Full			2	
Input Capacitance	C _{IN}	V _{IN} = 0V, f = 1MHz	+25°C		8		pF
Dynamic Characteristics							
Turn-On Time	t _{ON}	V _S = 10V, R _L = 1kΩ, C _L = 35pF, Test Circuit 1	+25°C		40		ns
Turn-Off Time	t _{OFF}		+25°C		120		
-3dB Bandwidth	BW	Signal = 0dBm, R _L = 50Ω, C _L = 5pF	+25°C		300		MHz
Off-Isolation	O _{ISO}	C _L = 15pF, R _L = 50Ω, Signal = 0dBm, f = 100kHz, Test Circuit 2	+25°C		-90		dB
Channel-to-Channel Crosstalk	X _{TALK}	C _L = 15pF, R _L = 50Ω, Signal = 0dBm, f = 100kHz, Test Circuit 3	+25°C		-90		dB
Charge Injection	Q	C _L = 1nF, V _G = 0V, R _G = 0Ω, Test Circuit 4	+25°C		18		pC
Source-Off Capacitance	C _{S(OFF)}	V _S = 0V, f = 1MHz	+25°C		8		pF
Drain-Off Capacitance	C _{D(OFF)}	V _D = 0V, f = 1MHz	+25°C		8		pF
Channel-On Capacitance	C _{D(ON)}	V _D = 0V, f = 1MHz	+25°C		12		pF
Power Supply							
Positive Supply Current	I _{CC}	V _{CC} = 20V, V _{EE} = -20V, V _{IN} = V _{INH} (SGM4511) or 0V (SGM4512)	+25°C		200	310	μA
			Full			360	
Negative Supply Current	I _{EE}		+25°C	-125	-65		
			Full	-170			
Positive Supply Current	I _{CC}		+25°C		350	520	
			Full			610	
Negative Supply Current	I _{EE}		+25°C	-330	-200		
			Full	-380			
Power Supply Range for Continuous Operation	V _{OP}		Full	±4.5		±20	V

ELECTRICAL CHARACTERISTICS ($V_{CC} = 12V$)

($V_{CC} = 12V$, $V_{EE} = 0V$, $GND = 0V$, $V_{INH} = 1.6V$, $V_{INL} = 0.5V$, Full = $-40^{\circ}C$ to $+85^{\circ}C$. Typical values are at $T_A = +25^{\circ}C$, unless otherwise noted.)

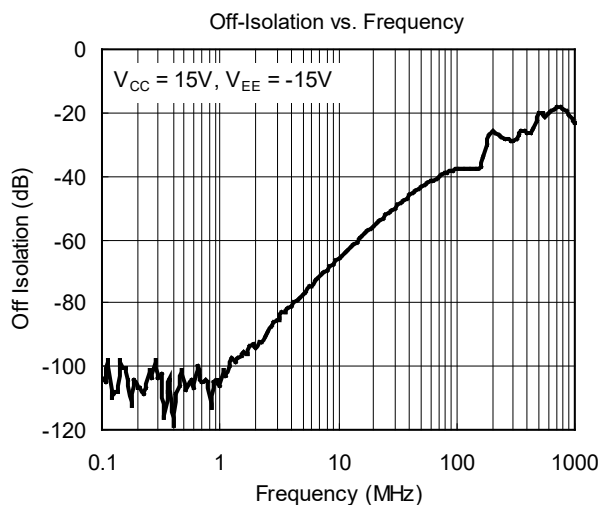
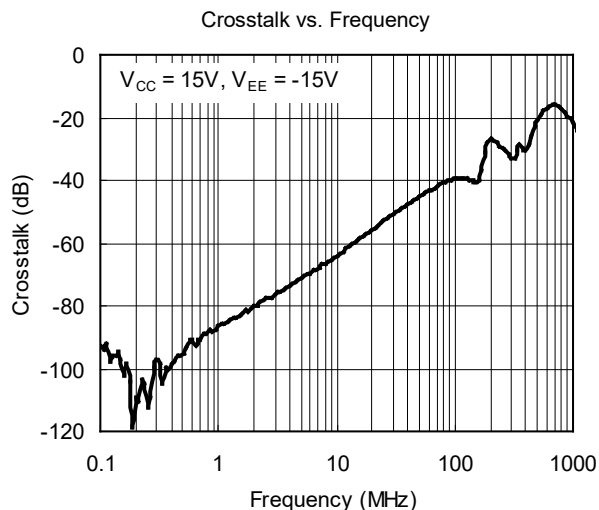
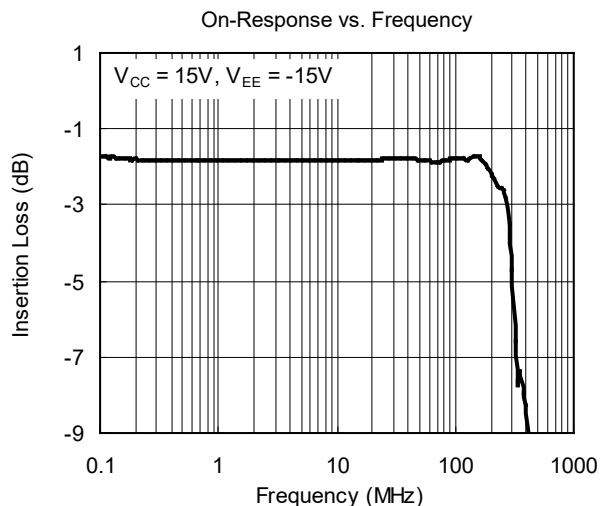
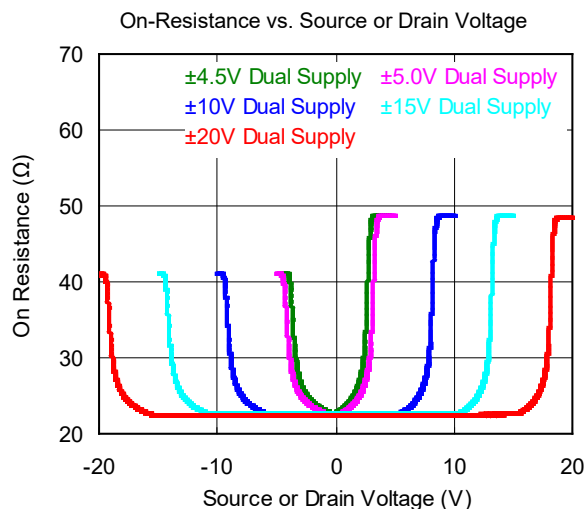
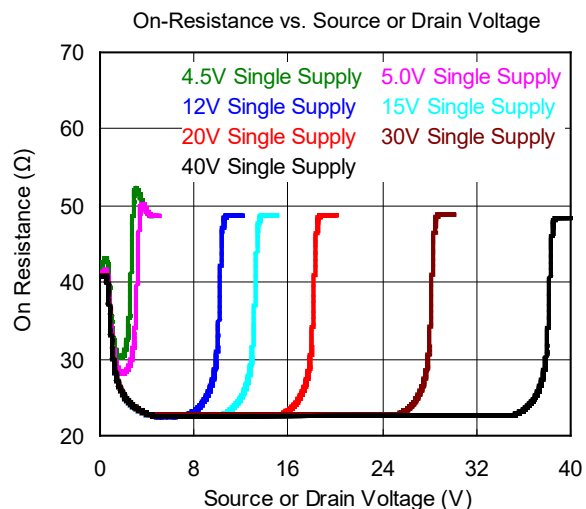
PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Analog Switch							
Analog Signal Range	V _{ANALOG}		Full	0		12	V
Drain-Source On-Resistance	R _{DS(ON)}	V _D = 5V or 7V, I _S = 10mA	+25°C		23	30	Ω
			Full			37	
On-Resistance Match	ΔR _{DS(ON)}		+25°C		0.4	1.4	
			Full			1.6	
Dynamic Characteristics							
Turn-On Time	t _{ON}	V _S = 8V, R _L = 1kΩ, C _L = 35pF	+25°C		45		ns
Turn-Off Time	t _{OFF}		+25°C		240		
Charge Injection	Q	C _L = 1nF, V _G = 6V, R _G = 0Ω	+25°C		10		pC

ELECTRICAL CHARACTERISTICS ($V_{CC} = 40V$)

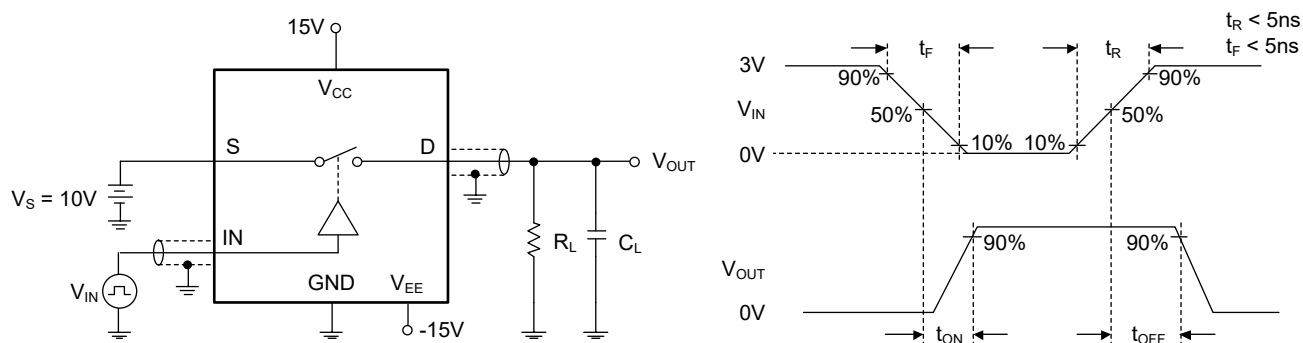
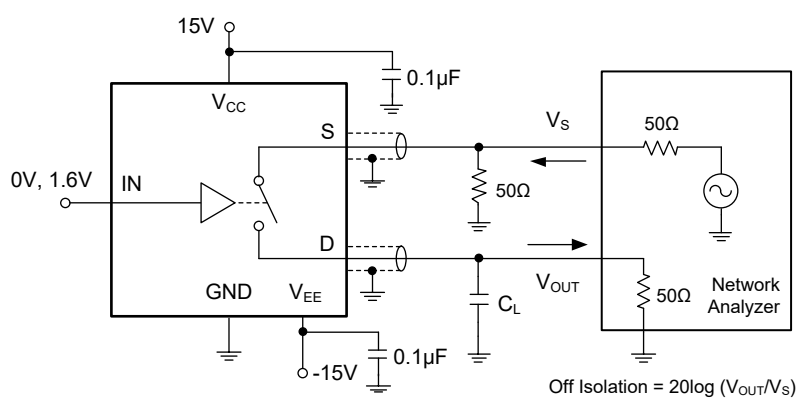
($V_{CC} = 40V$, $V_{EE} = 0V$, $GND = 0V$, $V_{INH} = 1.6V$, $V_{INL} = 0.5V$, Full = $-40^{\circ}C$ to $+85^{\circ}C$. Typical values are at $T_A = +25^{\circ}C$, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Analog Switch							
Analog Signal Range	V_{ANALOG}		Full	0		40	V
Drain-Source On-Resistance	$R_{DS(ON)}$	$V_D = 5V$ or $35V$, $I_S = 10mA$	$+25^{\circ}C$		23	30	Ω
			Full			37	
On-Resistance Match	$\Delta R_{DS(ON)}$		$+25^{\circ}C$		0.4	1.4	
			Full			1.6	

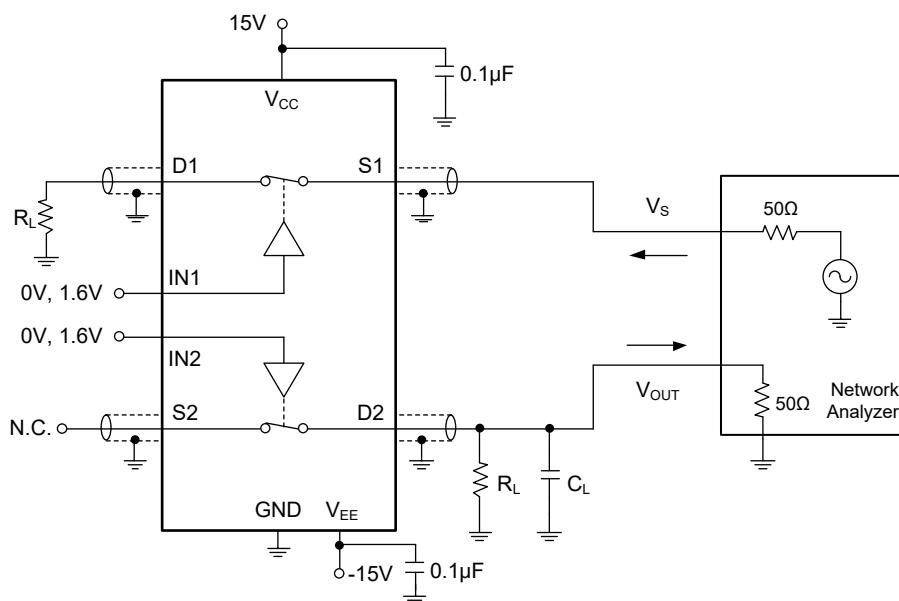
TYPICAL PERFORMANCE CHARACTERISTICS



TEST CIRCUITS

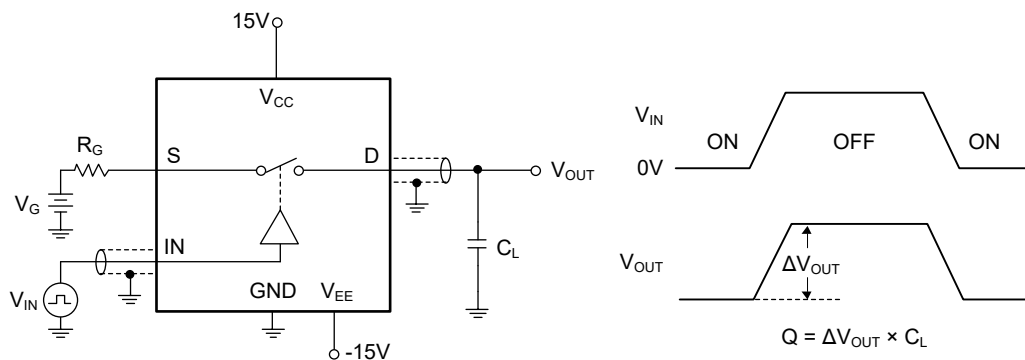
Test Circuit 1. Switching Times (t_{ON} , t_{OFF})

Test Circuit 2. Off-Isolation



Test Circuit 3. Channel-to-Channel Crosstalk

TEST CIRCUITS (continued)



Test Circuit 4. Charge Injection

REVISION HISTORY

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

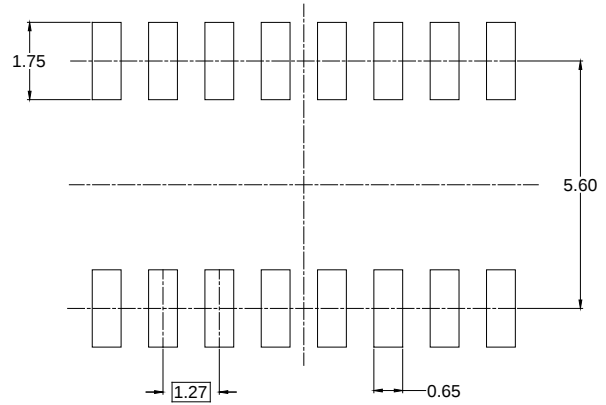
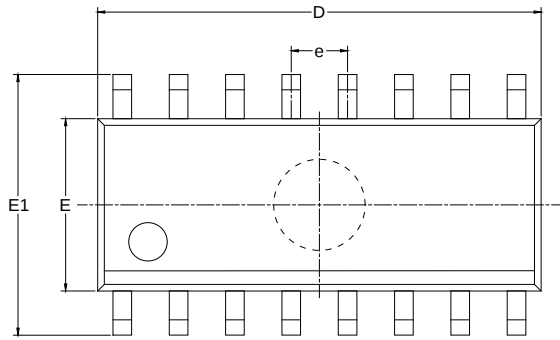
Changes from Original (MAY 2015) to REV.A

Page

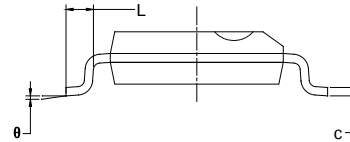
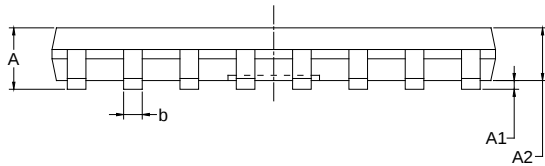
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PACKAGE OUTLINE DIMENSIONS

SOIC-16



RECOMMENDED LAND PATTERN (Unit: mm)



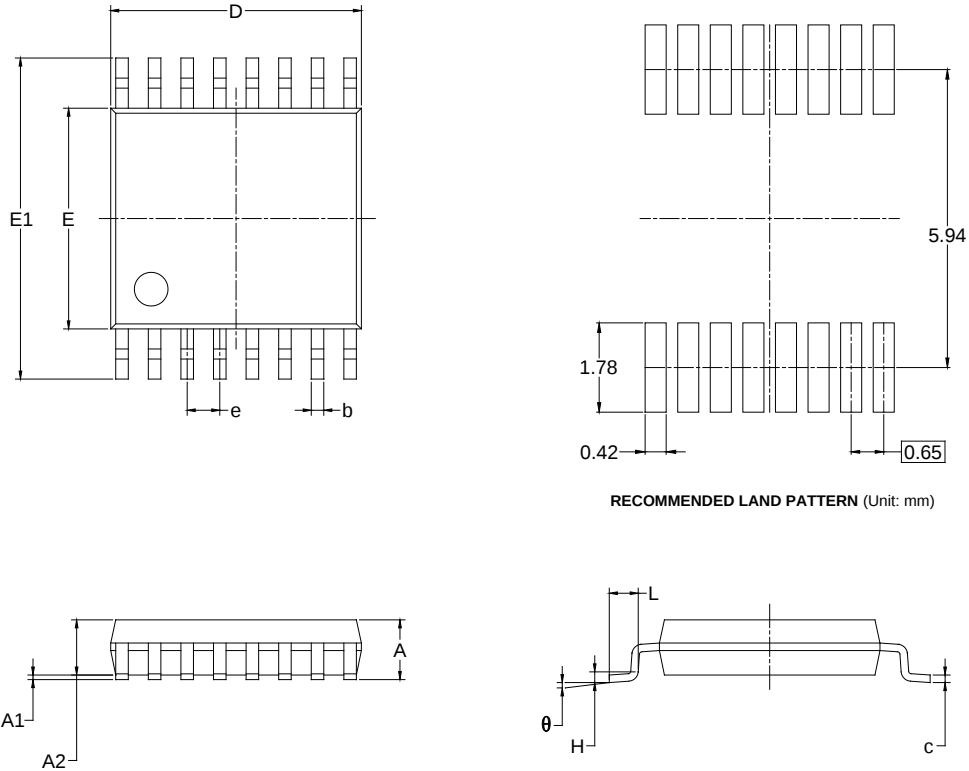
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	9.800	10.200	0.386	0.402
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.27 BSC		0.050 BSC	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

NOTES:

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

PACKAGE OUTLINE DIMENSIONS

TSSOP-16



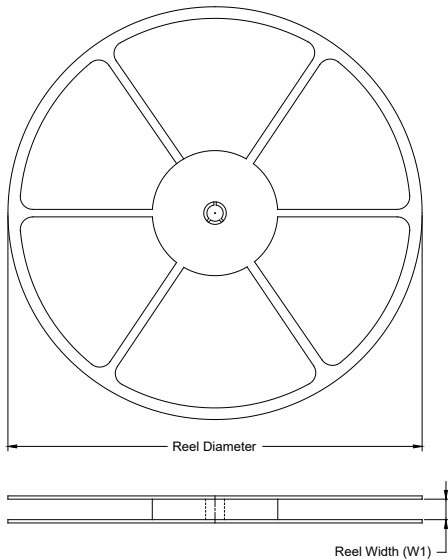
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A		1.200		0.047
A1	0.050	0.150	0.002	0.006
A2	0.800	1.050	0.031	0.041
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
D	4.860	5.100	0.191	0.201
E	4.300	4.500	0.169	0.177
E1	6.200	6.600	0.244	0.260
e	0.650 BSC		0.026 BSC	
L	0.500	0.700	0.02	0.028
H	0.25 TYP		0.01 TYP	
θ	1°	7°	1°	7°

NOTES:

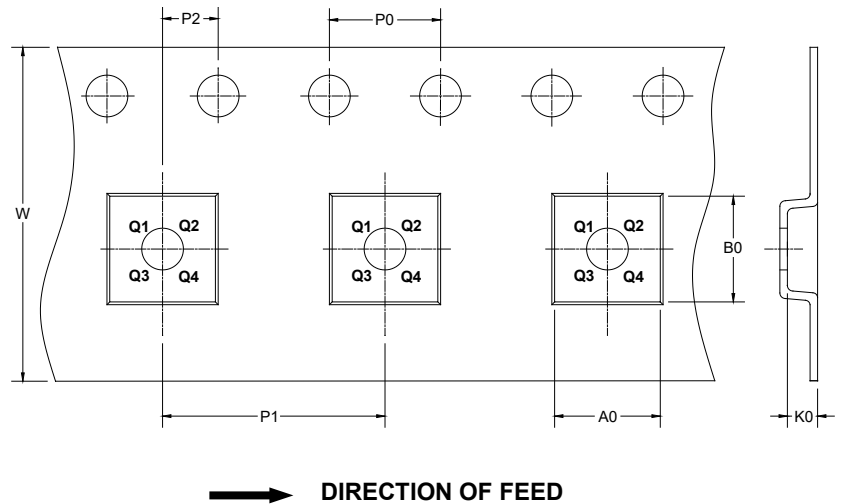
1. Body dimensions do not include mode flash or protrusion.
2. This drawing is subject to change without notice.

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
SOIC-16	13"	16.4	6.5	10.3	2.1	4.0	8.0	2.0	16.0	Q1
TSSOP-16	13"	12.4	6.9	5.6	1.2	4.0	8.0	2.0	12.0	Q1

DD0001

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