



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.

The 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.

The SGM5018 is available in Green TSSOP-16 package.

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**

APPLICATIONS

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

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM5018	TSSOP-16	-40°C to +85°C	SGM5018YTS/TR	SGM5018 YTS 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 ₊ to GND	-0.3V to 6V
Analog, Digital Voltage Range ⁽¹⁾	-0.3V to (V ₊) + 0.3V
Continuous Current NO, NC, or COM	±100mA
Junction Temperature	+150°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (Soldering, 10s)	+260°C
ESD Susceptibility	
HBM	4000V
MM	400V

NOTE:

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.

RECOMMENDED OPERATING CONDITIONS

Operating Temperature Range	-40°C to +85°C
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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.

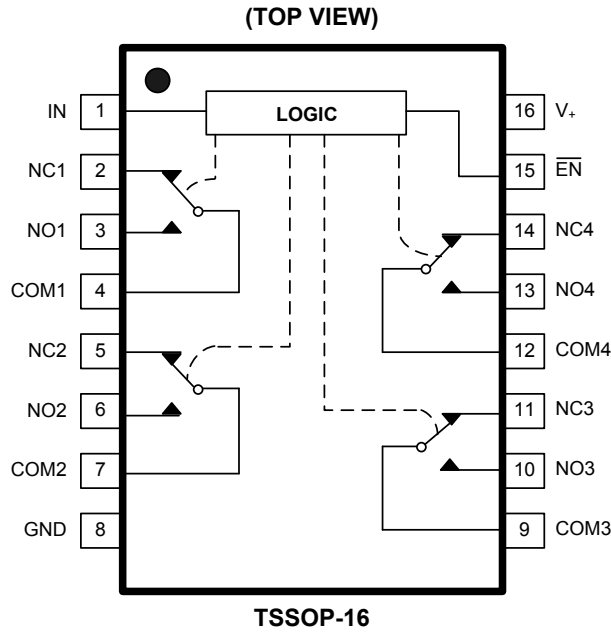
ESD SENSITIVITY CAUTION

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 CONFIGURATION



PIN DESCRIPTION

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

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

FUNCTION TABLE

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

NOTE: √ = Don't Care.

ELECTRICAL CHARACTERISTICS

($V_+ = 4.5V$ to $5.5V$, $GND = 0V$, $V_{IH} = 1.6V$, $V_{IL} = 0.5V$, Full = $-40^\circ C$ to $+85^\circ C$. Typical values are at $V_+ = 5V$, $T_A = +25^\circ C$, unless otherwise noted.)

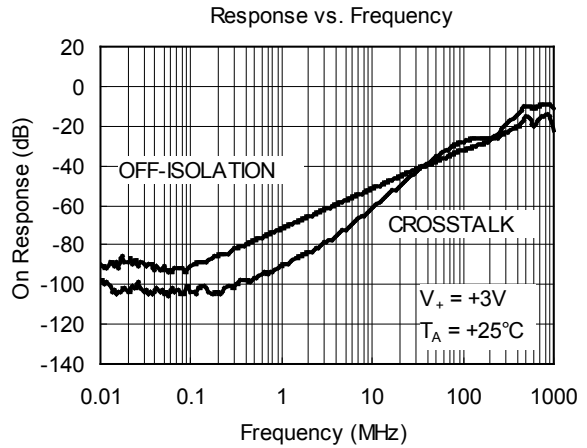
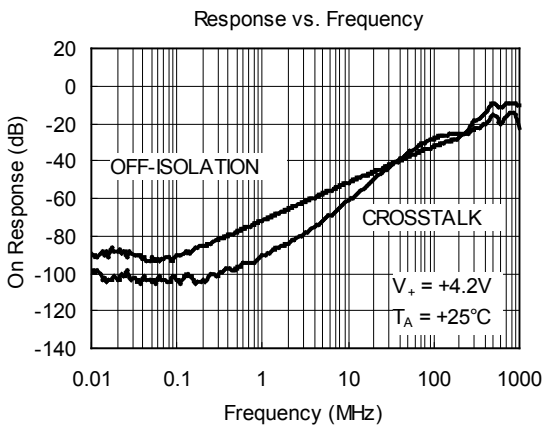
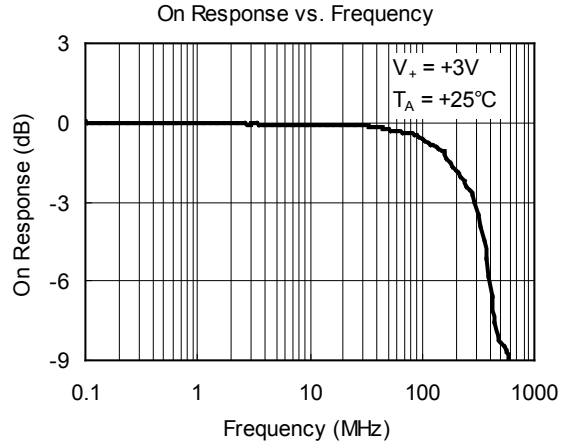
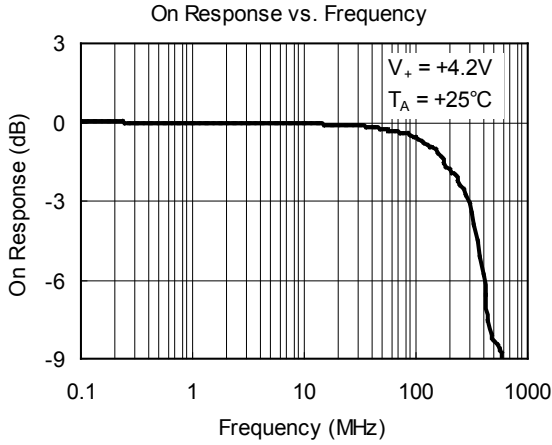
PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
ANALOG SWITCH							
Analog Signal Range	V_{NO}, V_{NC}, V_{COM}		Full	0		V_+	V
On-Resistance	R_{ON}	$V_+ = 4.5V, V_{NO}$ or $V_{NC} = 1.2V,$ $I_{COM} = -100mA$, Test Circuit 1	$+25^\circ C$		4.5	7	Ω
			Full			8	Ω
On-Resistance Match Between Channels	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
			Full			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
			Full			4.5	Ω
Source Off Leakage Current	$I_{NC(OFF)}, I_{NO(OFF)}$	$V_+ = 5.5V, V_{NO}$ or $V_{NC} = 3.3V/0.3V,$ $V_{COM} = 0.3V/3.3V$	Full			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	Full			1	μA
DIGITAL INPUTS							
Input High Voltage	V_{INH}		Full	1.6			V
Input Low Voltage	V_{INL}		Full			0.5	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 $V_{NC} = 2V, C_L = 35pF, R_L = 300\Omega,$ Test Circuit 2	$+25^\circ C$		40		ns
Turn-Off Time	t_{OFF}		$+25^\circ C$		30		ns
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 Circuit 3	$+25^\circ C$		20		pC
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 Circuit 5	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 Circuit 6	1MHz	$+25^\circ C$		-90	dB
			10MHz	$+25^\circ C$		-60	dB
-3dB Bandwidth	BW	$R_L = 50\Omega, \text{Signal} = 0dBm, V_{BIAS} = 350mV,$ Test Circuit 7	$+25^\circ C$		300		MHz
Channel On Capacitance	C_{ON}		$+25^\circ C$		42		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			1	μA

ELECTRICAL CHARACTERISTICS (continued)

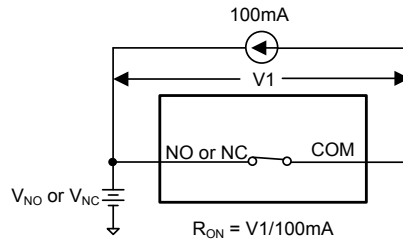
($V_+ = 2.7V$ to $3.6V$, $V_{IH} = 1.6V$, $V_{IL} = 0.4V$, Full = $-40^\circ C$ to $+85^\circ C$. Typical values are at $V_+ = 3V$, $T_A = +25^\circ C$, unless otherwise noted.)

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 $V_{NC} = 1.2V$, $I_{COM} = -100mA$, Test Circuit 1	$+25^\circ C$		11	15.5	Ω
			Full			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
			Full			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
			Full			13	Ω
Source Off Leakage Current	$I_{NC(OFF)}, I_{NO(OFF)}$	$V_+ = 3.6V$, V_{NO} or $V_{NC} = 3.3V/0.3V$, $V_{COM} = 0.3V/3.3V$	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	1.5			V
Input Low Voltage	V_{INL}		Full			0.4	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 $V_{NC} = 2V$, $C_L = 35pF$, $R_L = 300\Omega$, Test Circuit 2	$+25^\circ C$		48		ns
Turn-Off Time	t_{OFF}		$+25^\circ C$		45		ns
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 Circuit 3	$+25^\circ C$		20		pC
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 Circuit 5	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 Circuit 6	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 Circuit 7	$+25^\circ C$		300		MHz
Channel On Capacitance	C_{ON}		$+25^\circ C$		42		pF

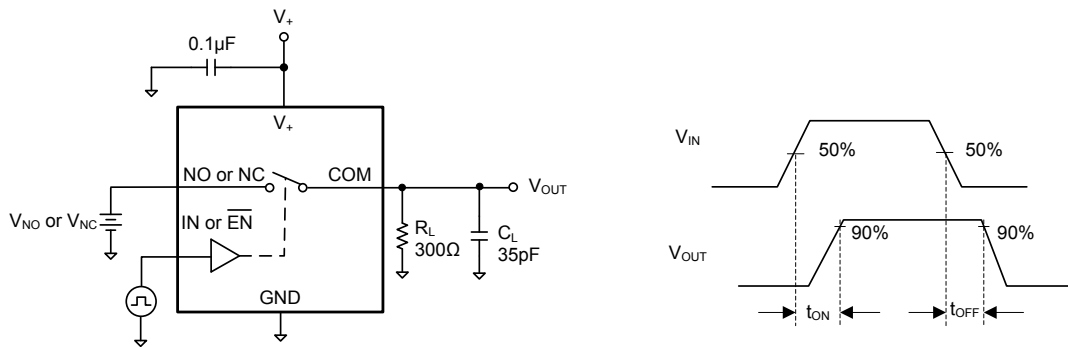
TYPICAL PERFORMANCE CHARACTERISTICS



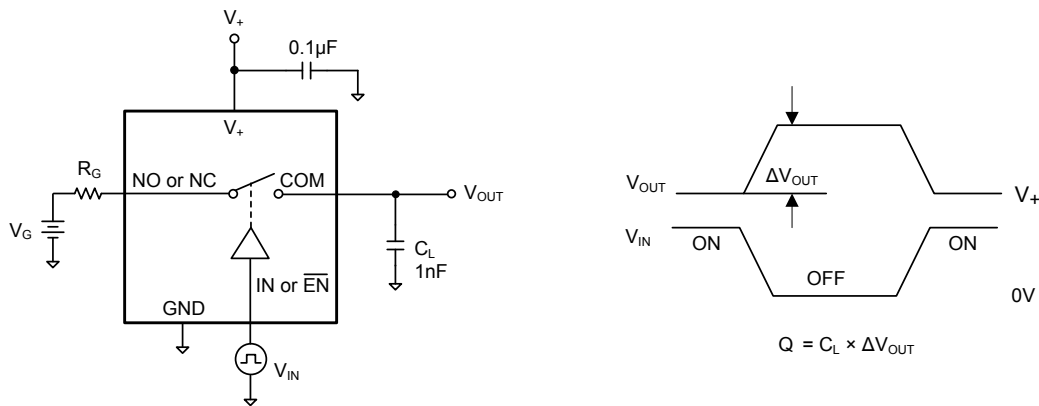
TEST CIRCUITS



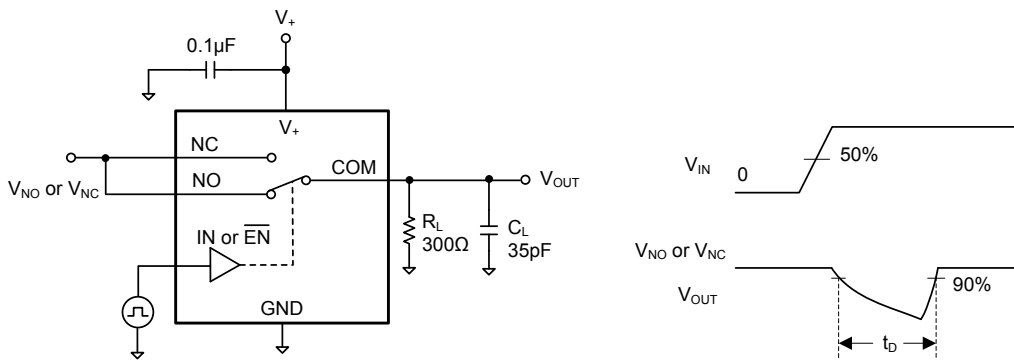
Test Circuit 1. On-Resistance



Test Circuit 2. Switching Times

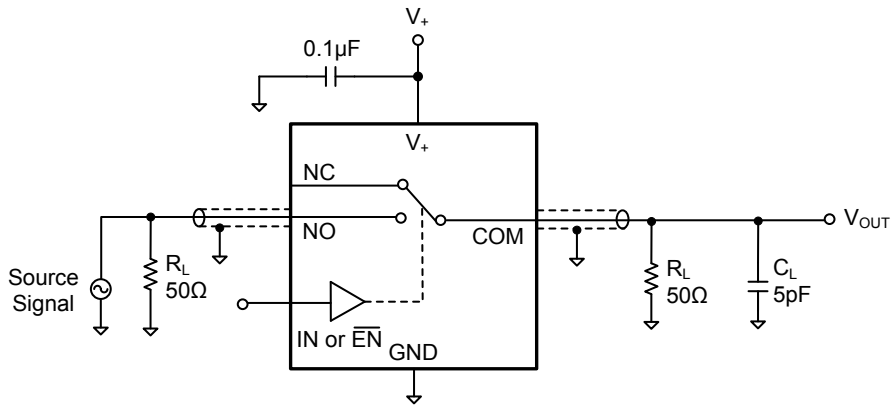


Test Circuit 3. Charge Injection

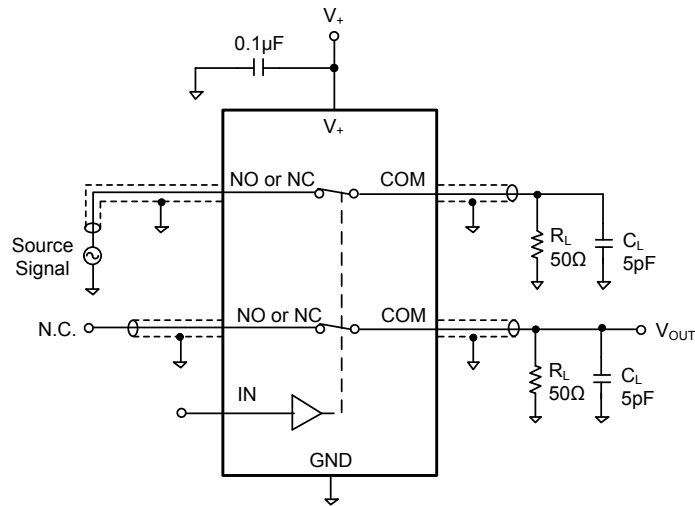


Test Circuit 4. Break-Before-Make Time Delay, t_D

TEST CIRCUITS (continued)

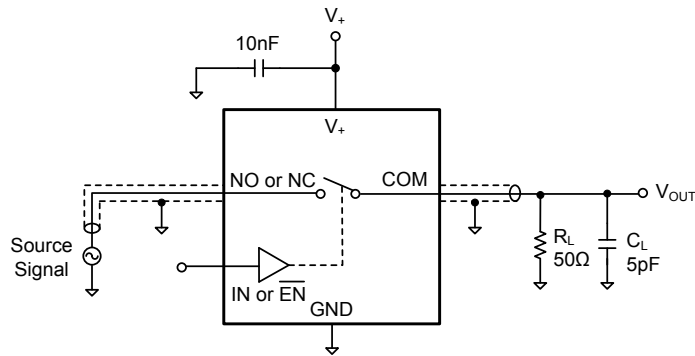


Test Circuit 5. Off Isolation



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

Test Circuit 6. Channel-to-Channel Crosstalk



Test Circuit 7. -3dB Bandwidth

REVISION HISTORY

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

JANUARY 2013 – REV.A.3 to REV.A.4

Added Recommended Land Pattern Information	9
Added Tape and Reel Information section	10, 11

MAY 2011 – REV.A.2 to REV.A.3

Updated Package Outline Dimensions.....	9
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DECEMBER 2008 – REV.A.1 to REV.A.2

Changes to Absolute Maximum Ratings section	2
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MAY 2008 – REV.A to REV.A.1

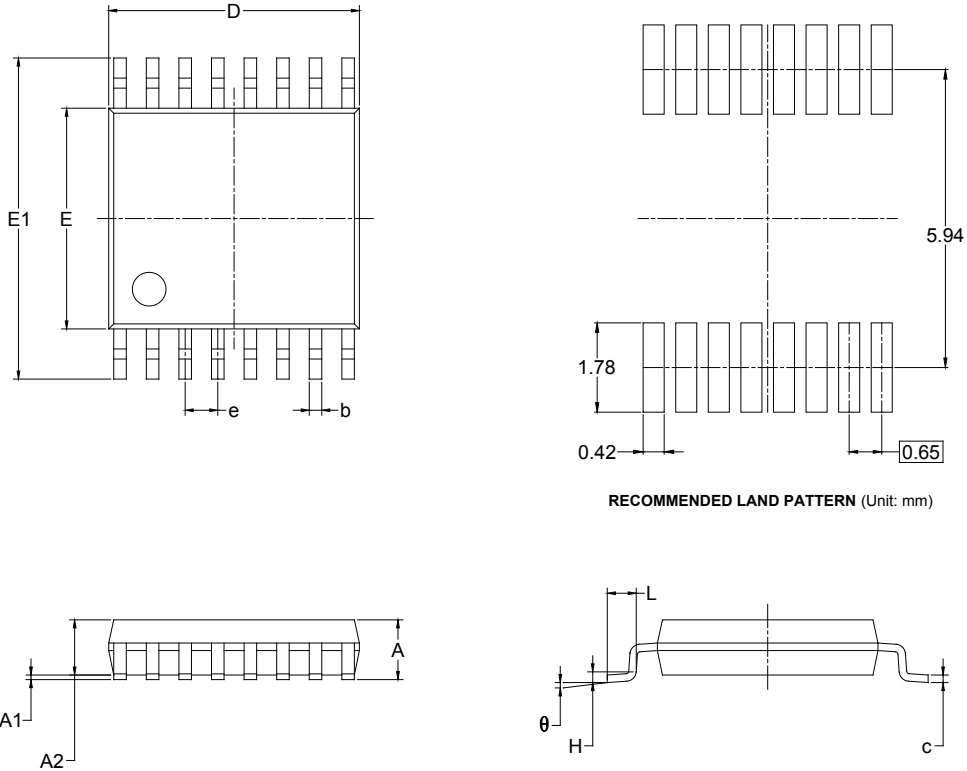
Changed Electrical Characteristics section	3, 4
Changed Test Circuits section	5, 6

Changes from Original (JANUARY 2008) to REV.A

Changed from product preview to production data.....	All
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PACKAGE OUTLINE DIMENSIONS

TSSOP-16



RECOMMENDED LAND PATTERN (Unit: mm)

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°

PACKAGE INFORMATION

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	6.90	5.60	1.20	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