SGM44603
4.5Ω, High Speed, Low Voltage Quad, SPDT Analog Switch

GENERAL DESCRIPTION

The SGM44603 is a quad, SPDT (single-pole/double-throw), TTL/CMOS compatible analog switch. It operates from a 1.8V to 5.5V single power supply.

The SGM44603 features high-speed, low on-resistance, low voltage and high bandwidth. The high performances make it very suitable for multiple applications, such as portable equipment, audio and video signal routing, etc.

The SGM44603 is available in a Green TQFN-2.6×1.8-16L package. It operates over an ambient temperature range of -40℃ to +85℃.

FEATURES

- **Single Supply Voltage Range: 1.8V to 5.5V**
- **-3dB Bandwidth: 300MHz**
- **Low On-Resistance: 4.5Ω (TYP) at 5V**
- **Low On-Resistance Flatness**
- **High Off-Isolation: -70dB at 1MHz**
- **Low Crosstalk: -90dB at 1MHz**
- **Fast Switching Times:**
  - **t_{ON}: 40ns**
  - **t_{OFF}: 30ns**
- **Rail-to-Rail Input and Output Operation**
- **Low Power Consumption**
- **TTL/CMOS Compatible**
- **-40℃ to +85℃ Operating Temperature Range**
- **Available in a Green TQFN-2.6×1.8-16L Package**

APPLICATIONS

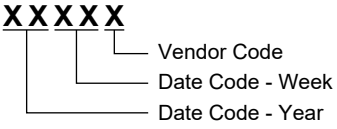
Cellular Phones
Portable Equipment
Computer Peripherals
Sample-and-Hold Circuits
Personal Digital Assistants
USB 1.1 Signal Switching Circuits
Battery-Powered Systems
Audio and Video Signal Routing

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM44603	TQFN-2.6×1.8-16L	-40℃ to +85℃	SGM44603YTQA16/TR	44603 XXXXX	Tape and Reel, 3000

MARKING INFORMATION

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℃
Storage Temperature Range ..... -65℃ to +150℃
Lead Temperature (Soldering, 10s) ..... +260℃
ESD Susceptibility (2) (3)
HBM ..... ±1500V
CDM ..... ±1000V

NOTES:

1. Internal diodes will clamp the voltage on NC, NO, or COM or INX when it exceeds V+. Limit the current through the forward diode to the maximum ratings.

2. For human body model (HBM), all pins comply with ANSI/ESDA/JEDEC JS-001 specifications.

3. For charged device model (CDM), all pins comply with ANSI/ESDA/JEDEC JS-002 specifications.

RECOMMENDED OPERATING CONDITIONS

Operating Temperature Range ..... -40℃ to +85℃

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

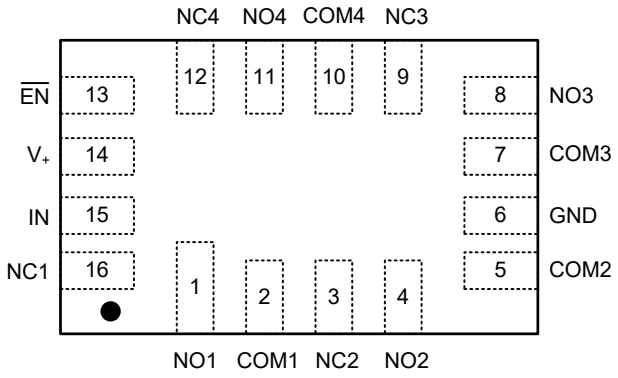
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance 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

(TOP VIEW)



TQFN-2.6×1.8-16L

PIN DESCRIPTION

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

NOTE: NO_X, NC_X and COM_X pins may be an input or output.

FUNCTION TABLE

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

√ = Don't Care.

ELECTRICAL CHARACTERISTICS

(V_+ = +4.5V to +5.5V, GND = 0V, Full = -40℃ to +85℃. Typical values are at V_+ = +5.0V, T_A = +25℃, 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, 0V ≤ V_{NO} or V_{NC} ≤ V_+, I_{COM} = -100mA, Test Circuit 1		+25℃		4.5	7	Ω
				Full			8	
On-Resistance Match between Channels	ΔR_{ON}	V_+ = 4.5V, 0V ≤ V_{NO} or V_{NC} ≤ V_+, I_{COM} = -100mA, Test Circuit 1		+25℃		0.8	3.6	Ω
				Full			4.2	
On-Resistance Flatness	$R_{FLAT(ON)}$	V_+ = 4.5V, 0V ≤ V_{NO} or V_{NC} ≤ V_+, I_{COM} = -100mA, Test Circuit 1		+25℃		3	3.7	Ω
				Full			4.5	
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}, $V_{\overline{EN}}$ = 0V or V_+		Full			1	μA
Dynamic Characteristics								
Turn-On Time	t_{ON}	V_{NO} or V_{NC} = 3V, C_L = 35pF, R_L = 300Ω, Test Circuit 2		+25℃		40		ns
Turn-Off Time	t_{OFF}			+25℃		30		ns
Charge Injection Select Input to Common I/O	Q	V_S = GND, R_S = 0Ω, C_L = 1nF, Q = C_L × V_{OUT}, Test Circuit 3		+25℃		20		pC
Break-Before-Make Delay Time	t_D	V_{NO} or V_{NC} = 3V, R_L = 300Ω, C_L = 35pF, Test Circuit 4		+25℃		18		ns
Off-Isolation	O_{ISO}	R_L = 50Ω, Signal = 0dBm, Test Circuit 5	1MHz	+25℃		-70		dB
			10MHz	+25℃		-50		
Channel-to-Channel Crosstalk	X_{TALK}	R_L = 50Ω, Signal = 0dBm, Test Circuit 6	1MHz	+25℃		-90		dB
			10MHz	+25℃		-60		
-3dB Bandwidth	BW	R_L = 50Ω, Signal = 0dBm, Test Circuit 7		+25℃		300		MHz
Channel On Capacitance	C_{ON}			+25℃		64		pF
Power Requirements								
Power Supply Range	V_+			Full	1.8		5.5	V
Power Supply Current	I_+	V_+ = 5.5V, V_S, $V_{\overline{EN}}$ = 0V or V_+		Full			1	μA

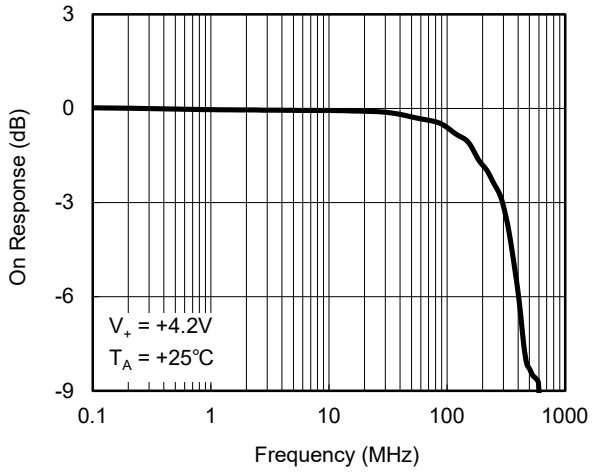
ELECTRICAL CHARACTERISTICS (continued)

(V_+ = +2.7V to +3.6V, Full = -40℃ to +85℃. Typical values are at V_+ = +3.0V, T_A = +25℃, unless otherwise noted.)

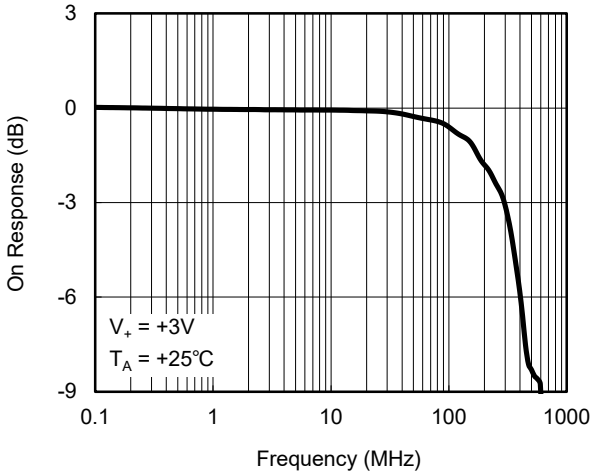
PARAMETER	SYMBOL	CONDITIONS		TEMP	MIN	TYP	MAX	UNITS
Analog Switch								
Analog Signal Range	V_{NO}, V_{NC}, V_{COM}			Full	0		V_+	V
On-Resistance	R_{ON}	V_+ = 2.7V, 0V ≤ V_{NO} or V_{NC} ≤ V_+, I_{COM} = -100mA, Test Circuit 1		+25℃		11	15.5	Ω
				Full			18.5	
On-Resistance Match between Channels	ΔR_{ON}	V_+ = 2.7V, 0V ≤ V_{NO} or V_{NC} ≤ V_+, I_{COM} = -100mA, Test Circuit 1		+25℃		1.6	4	Ω
				Full			4.6	
On-Resistance Flatness	$R_{FLAT(ON)}$	V_+ = 2.7V, 0V ≤ V_{NO} or V_{NC} ≤ V_+, I_{COM} = -100mA, Test Circuit 1		+25℃		7	9.4	Ω
				Full			13	
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_+ = 2.7V, V_{IN}, $V_{\overline{EN}}$ = 0V or V_+		Full			1	μA
Dynamic Characteristics								
Turn-On Time	t_{ON}	V_{NO} or V_{NC} = 1.5V, C_L = 35pF, R_L = 300Ω, Test Circuit 2		+25℃		48		ns
Turn-Off Time	t_{OFF}			+25℃		45		ns
Charge Injection Select Input to Common I/O	Q	V_S = GND, R_S = 0Ω, C_L =1nF, Q = C_L × V_{OUT}, Test Circuit 3		+25℃		20		pC
Break-Before-Make Delay Time	t_D	V_{NO} or V_{NC} = 1.5V, R_L = 300Ω, C_L = 35pF, Test Circuit 4		+25℃		20		ns
Off-Isolation	O_{ISO}	R_L = 50Ω, Signal = 0dBm, Test Circuit 5	1MHz	+25℃		-70		dB
			10MHz	+25℃		-50		
Channel-to-Channel Crosstalk	X_{TALK}	R_L = 50 Ω, Signal = 0dBm, Test Circuit 6	1MHz	+25℃		-90		dB
			10MHz	+25℃		-60		
-3dB Bandwidth	BW	R_L = 50Ω, Signal = 0dBm, Test Circuit 7		+25℃		300		MHz
Channel On Capacitance	C_{ON}			+25℃		64		pF

TYPICAL PERFORMANCE CHARACTERISTICS

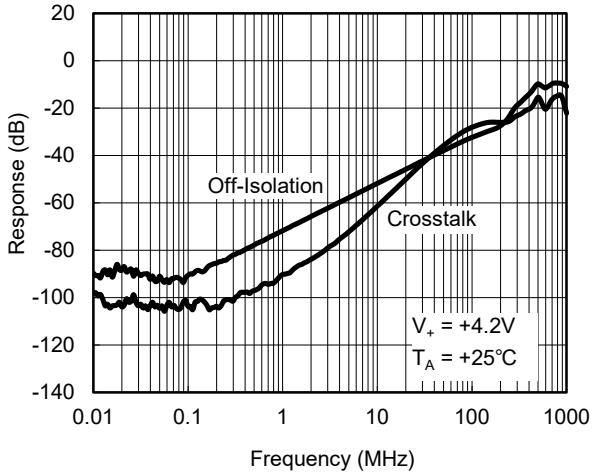
On Response vs. Frequency



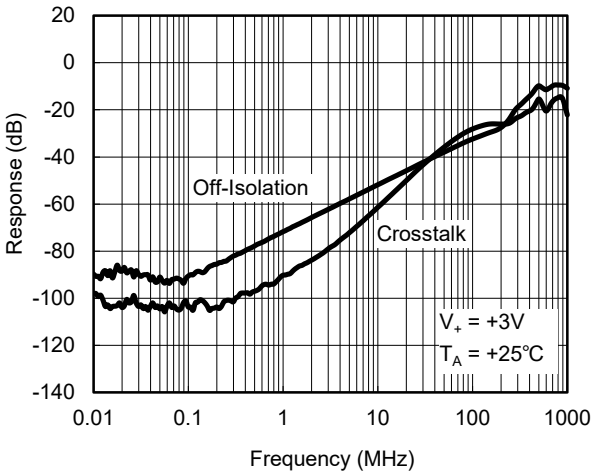
On Response vs. Frequency



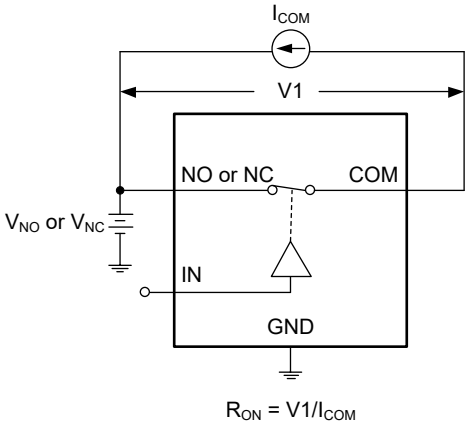
Response vs. Frequency



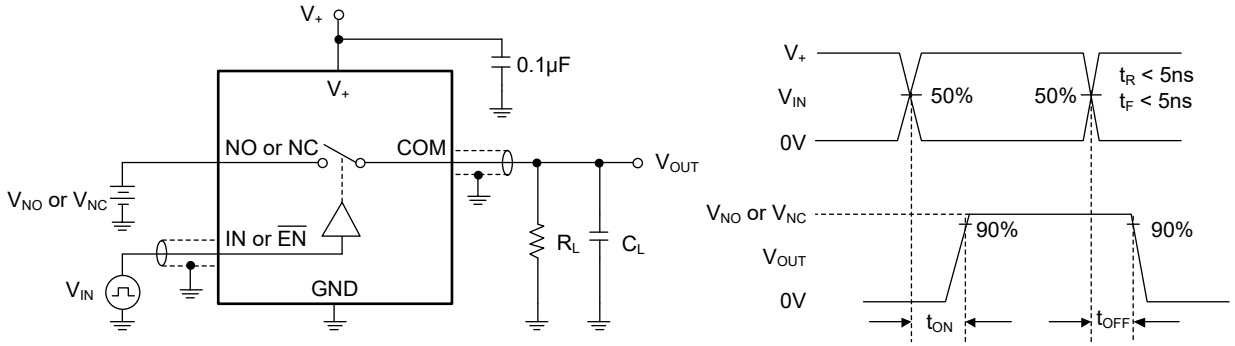
Response vs. Frequency



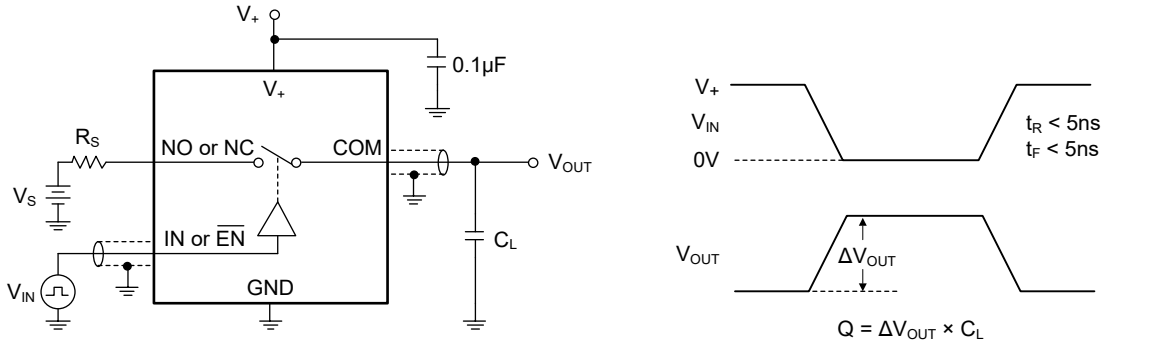
TEST CIRCUITS



Test Circuit 1. On-Resistance

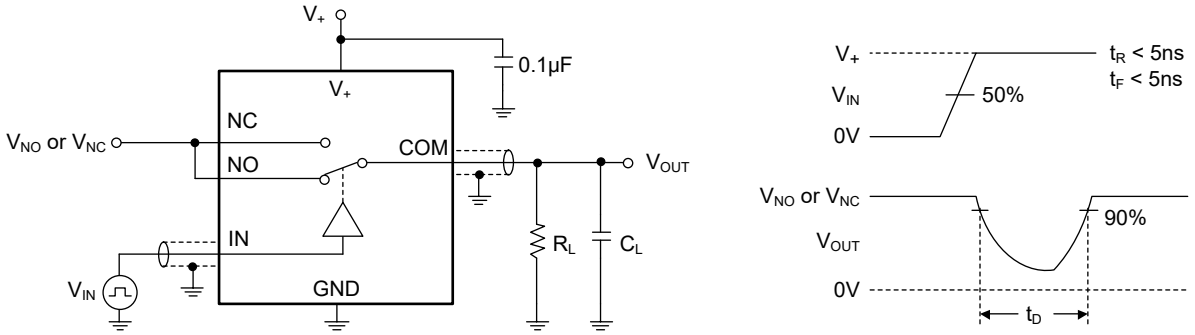


Test Circuit 2. Switching Times

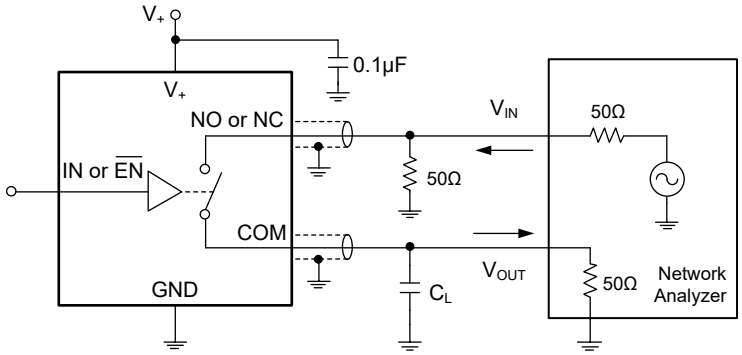


Test Circuit 3. Charge Injection

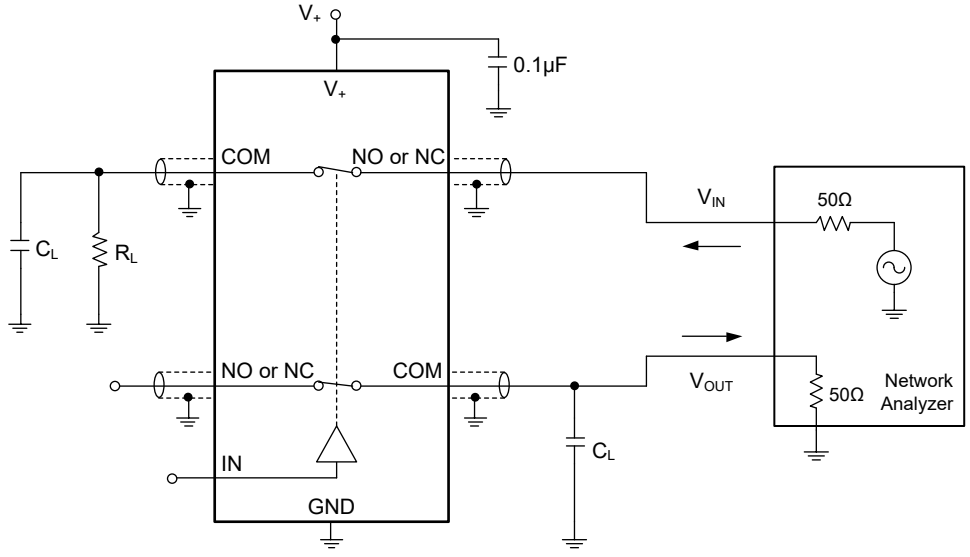
TEST CIRCUITS (continued)



Test Circuit 4. Break-Before-Make Delay Time (t_D)



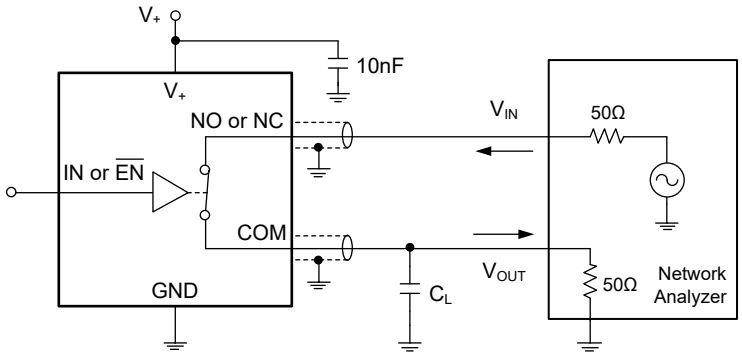
Test Circuit 5. Off-Isolation



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

Test Circuit 6. Channel-to-Channel Crosstalk

TEST CIRCUITS (continued)



Test Circuit 7. -3dB Bandwidth

REVISION HISTORY

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

NOVEMBER 2024 – REV.A.4 to REV.B	Page
Added ESD Susceptibility	2

MAY 2016 – REV.A.3 to REV.A.4	Page
Updated Package Outline Dimensions section	10
Updated Tape and Reel Information section	12

JANUARY 2013 – REV.A.2 to REV.A.3	Page
Updated Package Outline Dimensions section	10
Updated Tape and Reel Information section	11, 12

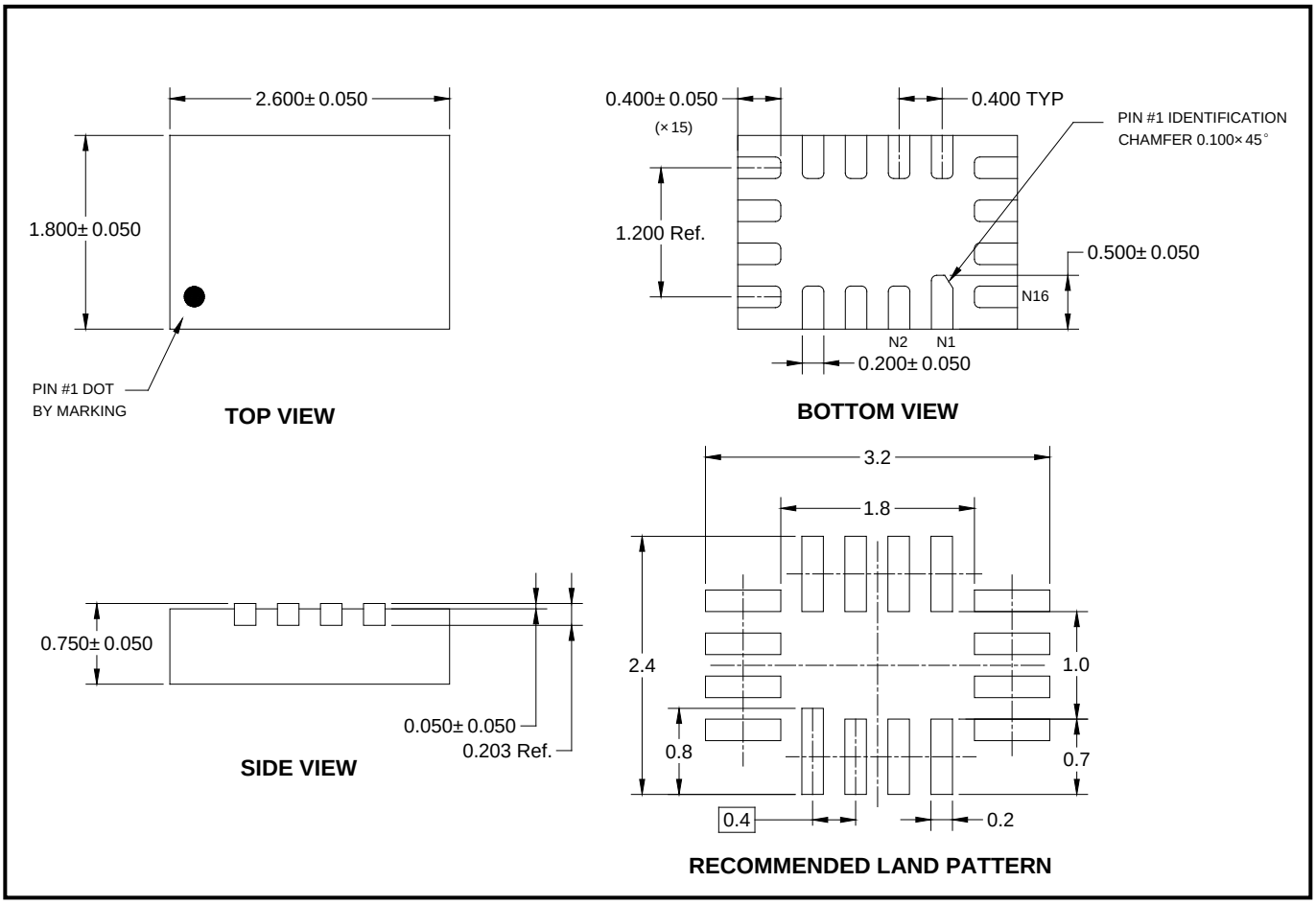
MAY 2011 – REV.A.1 to REV.A.2	Page
Updated package name	All

DECEMBER 2008 – REV.A to REV.A.1	Page
Updated typeset	All

Changes from Original (MAY 2008) to REV.A	Page
Changed from product preview to production data	All

PACKAGE OUTLINE DIMENSIONS

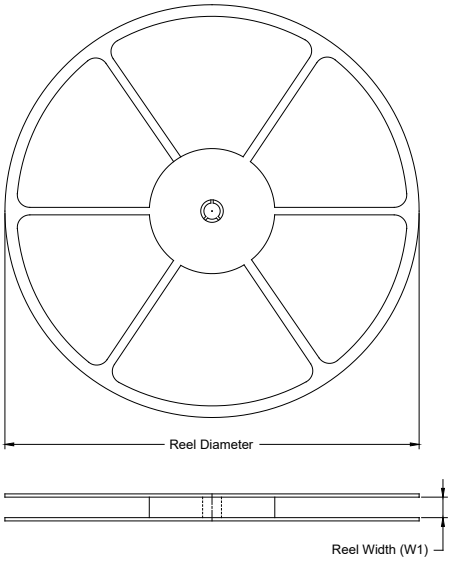
TQFN-2.6×1.8-16L



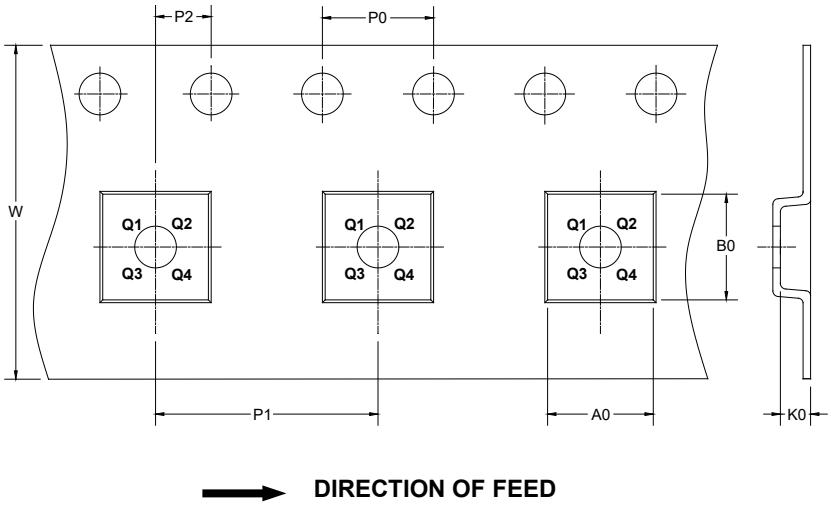
NOTES:
1. All linear dimensions are in millimeters.
2. This drawing is subject to change without notice.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



DIRECTION OF FEED

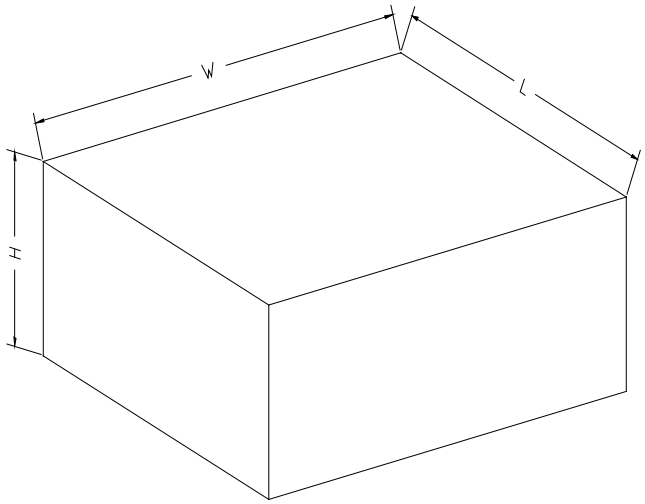
NOTE: The picture is only for reference. Please make the object as the standard.

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
TQFN-2.6×1.8-16L	7″	9.0	2.01	2.81	0.93	4.0	4.0	2.0	8.0	Q1

DD0001

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

DD0002