SGM44599
4Ω, High Speed, Low Voltage Dual, DPDT Analog Switch

GENERAL DESCRIPTION

The SGM44599 is a dual-independent double-pole/ double-throw (DPDT), TTL/CMOS compatible analog switch. It operates from a 1.8V to 5.5V single power supply.

The SGM44599 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. In addition, the SGM44599 can be used as a dual 2-to-1 multiplexer because it has two logic control inputs. Low power consumption is also one of the important reasons that make it a good choice.

The SGM44599 is available in Green TQFN-3×3-16L and TQFN-2.5×2.5-16L packages. 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: 4Ω (TYP)**
- **Low On-Resistance Flatness**
- **High Off-Isolation: -75dB at 1MHz**
- **Low Crosstalk: -100dB at 1MHz**
- **Fast Switching Times:**
  - **t_{ON}: 31.5ns**
  - **t_{OFF}: 30ns**
- **Rail-to-Rail Input and Output Operation**
- **TTL/CMOS Compatible**
- **-40℃ to +85℃ Operating Temperature Range**
- **Available in Green TQFN-3×3-16L and TQFN-2.5×2.5-16L Packages**

APPLICATIONS

Cellular Phones
Portable Equipment
Medical Equipment
Sample-and-Hold Circuits
Personal Digital Assistants
Battery-Powered Systems
Audio and Video Signal Routing

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM44599	TQFN-3×3-16L	-40℃ to +85℃	SGM44599YTQ16/TR	44599 XXXXX	Tape and Reel, 3000
	TQFN-2.5×2.5-16L	-40℃ to +85℃	SGM44599YTQB16/TR	44599 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 ..... -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
HBM 2000V
MM 200V

RECOMMENDED OPERATING CONDITIONS

Supply Voltage Range ..... 1.8V to 5.5V
Operating Temperature Range ..... -40℃ to +85℃

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

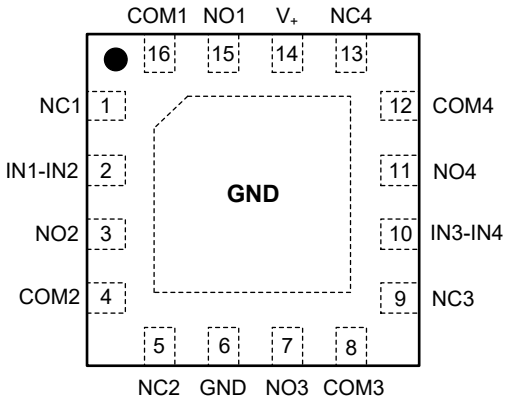
This integrated circuit can be damaged by ESD if you don't pay attention to ESD protection. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance 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 CONFIGURATIONS

(TOP VIEW)



TQFN-3×3-16L/TQFN-2.5×2.5-16L

PIN DESCRIPTION

PIN	NAME	FUNCTION
TQFN-3×3-16L TQFN-2.5×2.5-16L		
14	V_+	Positive Power Supply Pin.
6	GND	Ground.
2, 10	IN_X	Digital Control Input Pin to Connect the COM Pins to the NO or NC Pins.
16, 4, 8, 12	COM_X	Common Pins.
15, 3, 7, 11	NO_X	Normally Open Pins.
1, 5, 9, 13	NC_X	Normally Closed Pins.

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

FUNCTION TABLE

IN1-IN2	FUNCTION	
	NC1 and NC2	NO1 and NO2
0	ON	OFF
1	OFF	ON

IN3-IN4	FUNCTION	
	NC3 and NC4	NO3 and NO4
0	ON	OFF
1	OFF	ON

ELECTRICAL CHARACTERISTICS

(V_+ = 4.5V to 5.5V, GND = 0V, V_{IH} = 1.6V, V_{IL} = 0.5V, Full = -40℃ to +85℃. Typical values are at V_+ = 5V, 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	6.2	Ω
				Full			7.2	Ω
On-Resistance Match Between Channels	ΔR_{ON}	V_+ = 4.5V, 0V ≤ V_{NO} or V_{NC} ≤ V_+, I_{COM} = -100mA, Test Circuit 1		+25℃		0.4	2.6	Ω
				Full			3.1	Ω
On-Resistance Flatness	$R_{FLAT(ON)}$	V_+ = 4.5V, 0V ≤ V_{NO} or V_{NC} ≤ V_+, I_{COM} = -100mA, Test Circuit 1		+25℃		2	3.1	Ω
				Full			3.6	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_{NC} or V_{NO} = 3V, R_L = 300Ω, C_L = 35pF, Test Circuit 2		+25℃		31.5		ns
Turn-Off Time	t_{OFF}			+25℃		30.0		ns
Break-Before-Make Time Delay	t_D	V_{NC} or V_{NO} = 3V, R_L = 300Ω, C_L = 35pF, Test Circuit 4		+25℃		11.5		ns
Charge Injection	Q	V_S = GND, R_S = 0Ω, C_L = 1nF, Q = C_L × V_{OUT}, Test Circuit 3		+25℃		3.5		pC
Off Isolation	O_{ISO}	Signal = 0dBm, R_L = 50Ω, Test Circuit 5	1MHz	+25℃		-75		dB
			10MHz	+25℃		-55		
Channel-to-Channel Crosstalk	X_{TALK}	Signal = 0dBm, R_L = 50Ω, Test Circuit 6	1MHz	+25℃		-100		dB
			10MHz	+25℃		-60		
-3dB Bandwidth	BW	Signal = 0dBm, R_L = 50Ω, Test Circuit 7		+25℃		300		MHz
Channel On Capacitance	$C_{NC(ON)}$, $C_{NO(ON)}$, $C_{COM(ON)}$			+25℃		43.2		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

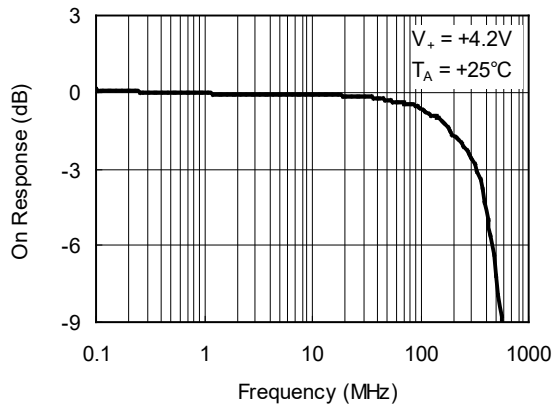
ELECTRICAL CHARACTERISTICS (continued)

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

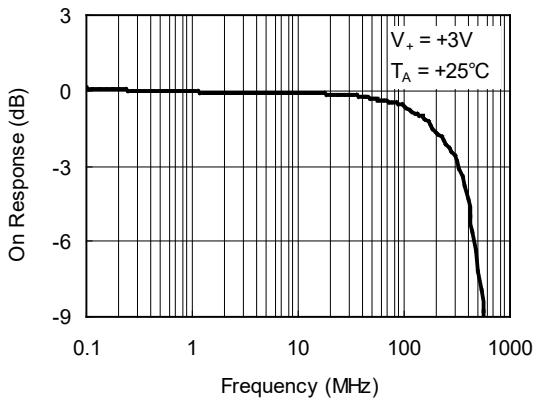
PARAMETER	SYMBOL	CONDITIONS		TEMP	MIN	TYP	MAX	UNITS
ANALOG SWITCH								
Analog Signal Range	V_{NO}, V_{NC}, V_{COM}			Full	0		V_+	V
On-Resistance	R_{ON}	V_+ = 2.7V, 0V ≤ V_{NO} or V_{NC} ≤ V_+, I_{COM} = -100mA, Test Circuit 1		+25℃		10	15	Ω
				Full			18	Ω
On-Resistance Match Between Channels	ΔR_{ON}	V_+ = 2.7V, 0V ≤ V_{NO} or V_{NC} ≤ V_+, I_{COM} = -100mA, Test Circuit 1		+25℃		1	3	Ω
				Full			4	Ω
On-Resistance Flatness	$R_{FLAT(ON)}$	V_+ = 2.7V, 0V ≤ V_{NO} or V_{NC} ≤ V_+, I_{COM} = -100mA, Test Circuit 1		+25℃		6	9	Ω
				Full			12	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_+ = 2.7V, V_{IN} = 0V or 2.7V		Full			1	μA
DYNAMIC CHARACTERISTICS								
Turn-On Time	t_{ON}	V_{NC} or V_{NO} = 1.5V, R_L = 300Ω, C_L = 35pF, Test Circuit 2		+25℃		38.0		ns
Turn-Off Time	t_{OFF}			+25℃		44.0		ns
Break-Before-Make Time Delay	t_D	V_{NC} or V_{NO} = 1.5V, R_L = 300Ω, C_L = 35pF, Test Circuit 4		+25℃		5.8		ns
Charge Injection	Q	V_S = GND, R_S = 0Ω, C_L = 1nF, Q = C_L × V_{OUT}, Test Circuit 3		+25℃		2.6		pC
Off Isolation	O_{ISO}	Signal = 0dBm, R_L = 50Ω, Test Circuit 5	1MHz	+25℃		-75		dB
			10MHz	+25℃		-55		
Channel-to-Channel Crosstalk	X_{TALK}	Signal = 0dBm, R_L = 50Ω, Test Circuit 6	1MHz	+25℃		-100		dB
			10MHz	+25℃		-60		
-3dB Bandwidth	BW	Signal = 0dBm, R_L = 50Ω, Test Circuit 7		+25℃		300		MHz
Channel On Capacitance	$C_{NC(ON)}$, $C_{NO(ON)}$, $C_{COM(ON)}$			+25℃		43.2		pF

TYPICAL PERFORMANCE CHARACTERISTICS

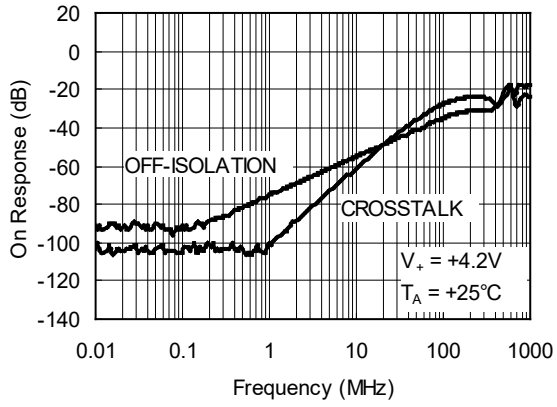
On Response vs. Frequency



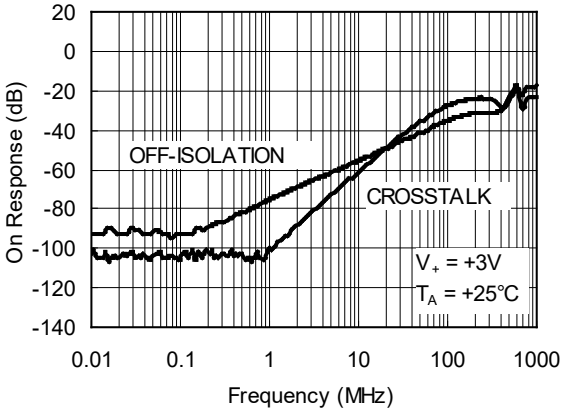
On Response vs. Frequency



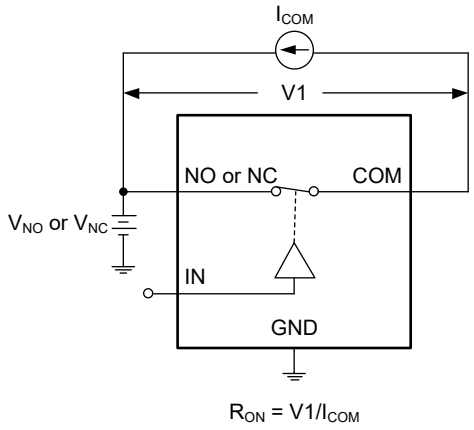
Response vs. Frequency



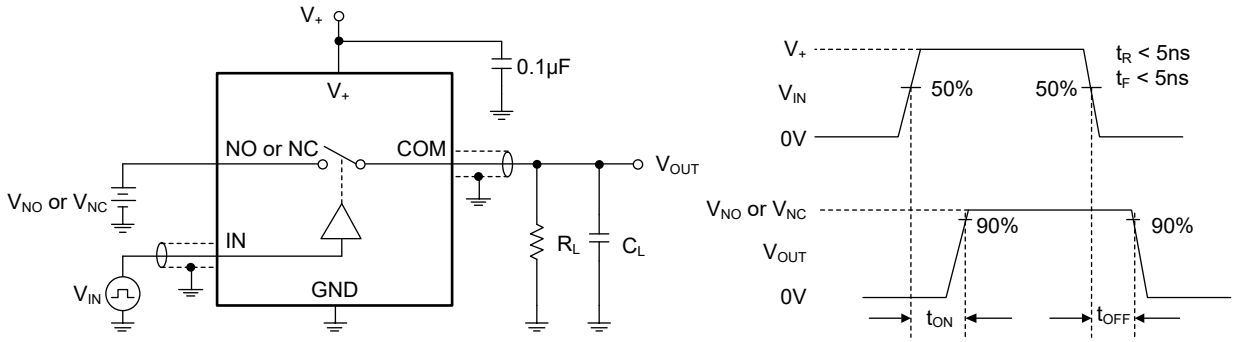
Response vs. Frequency



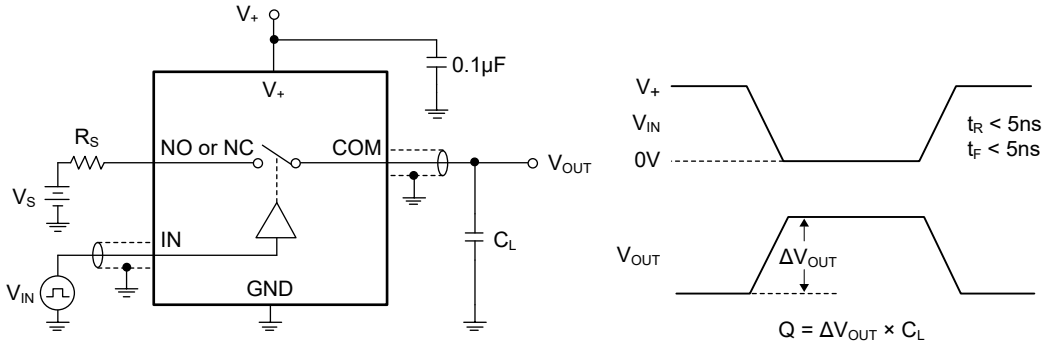
TEST CIRCUITS



Test Circuit 1. On-Resistance

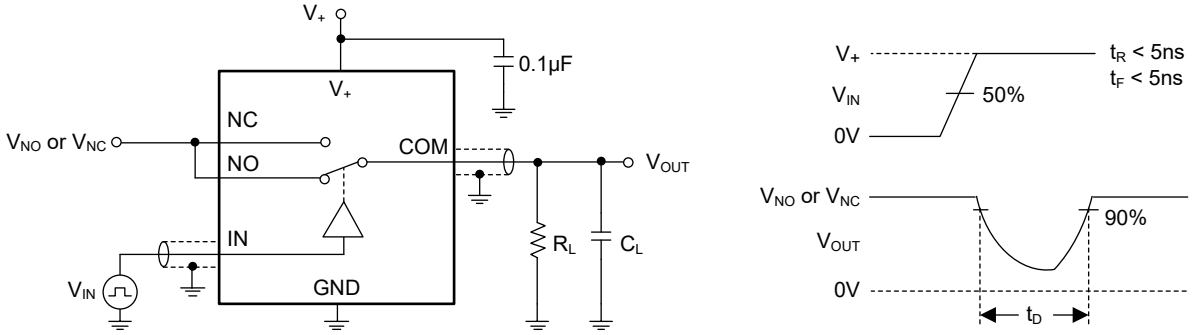


Test Circuit 1. Switching Times (t_{ON}, t_{OFF})

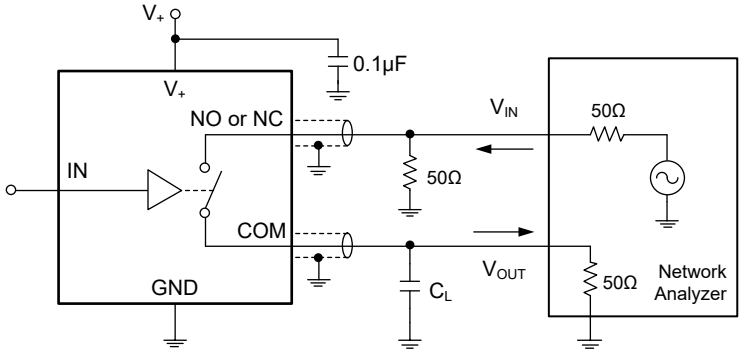


Test Circuit 2. Charge Injection

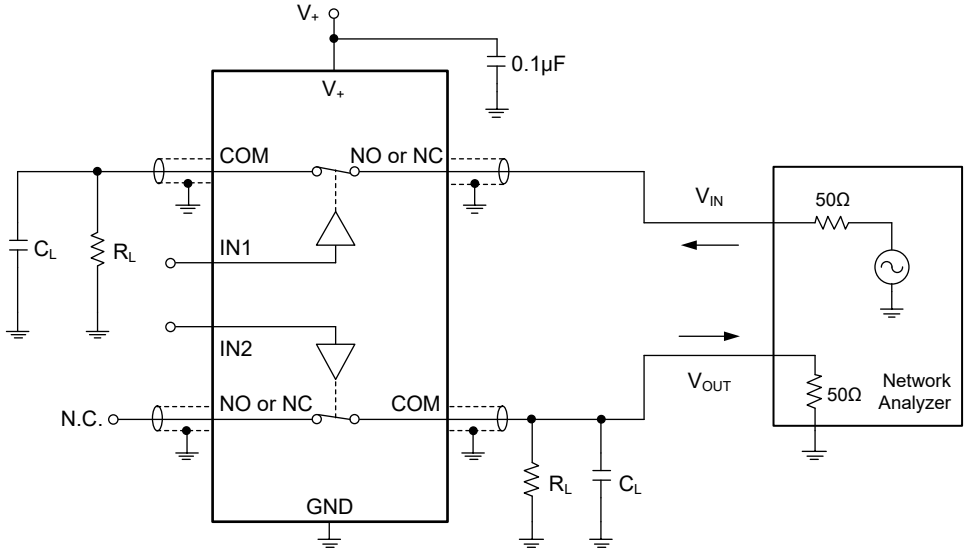
TEST CIRCUITS (continued)



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



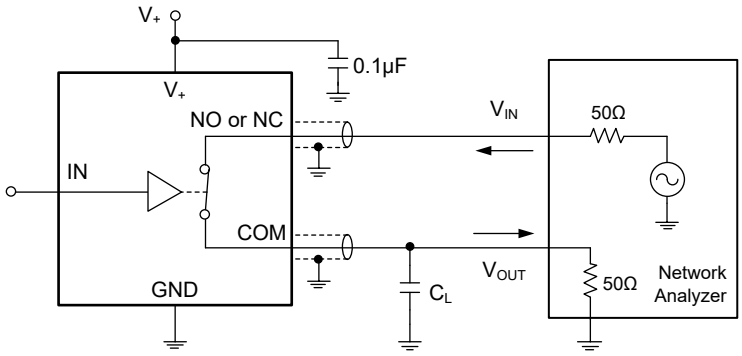
Test Circuit 3. Off Isolation



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

Test Circuit 4. Channel-to-Channel Crosstalk

TEST CIRCUITS (continued)



Test Circuit 5. -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 10, 11
Added Tape and Reel Information..... 12, 13

MAY 2011 – REV.A.2 to REV.A.3

Updated Package Description ..... All

MAY 2010 – REV.A.1 to REV.A.2

Updated General Description section..... 1

DECEMBER 2008 – REV.A to REV.A.1

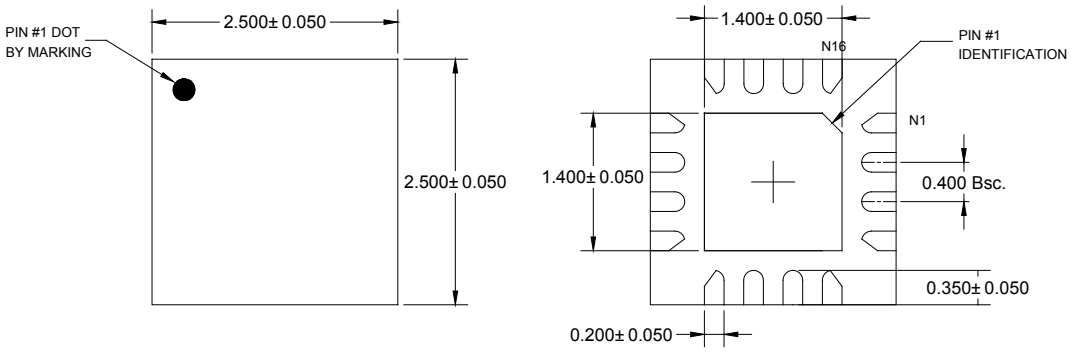
Changed Absolute Maximum Ratings section..... 2

Changes from Original (JANUARY 2008) to REV.A

Changed from product preview to production data..... All

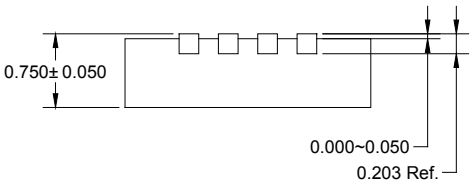
PACKAGE OUTLINE DIMENSIONS

TQFN-2.5×2.5-16L

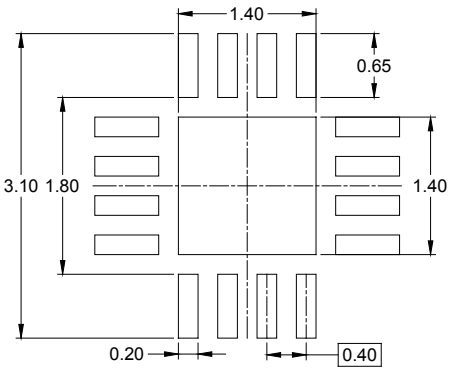


TOP VIEW

BOTTOM VIEW



SIDE VIEW

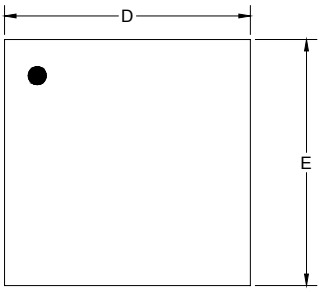


RECOMMENDED LAND PATTERN

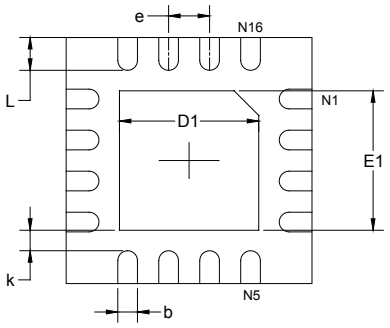
NOTE: All linear dimensions are in millimeters.

PACKAGE OUTLINE DIMENSIONS

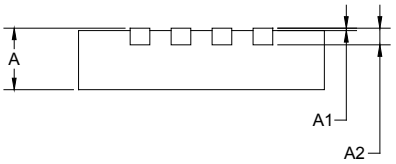
TQFN-3×3-16L



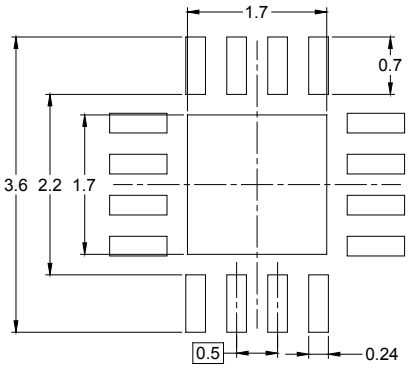
TOP VIEW



BOTTOM VIEW



SIDE VIEW

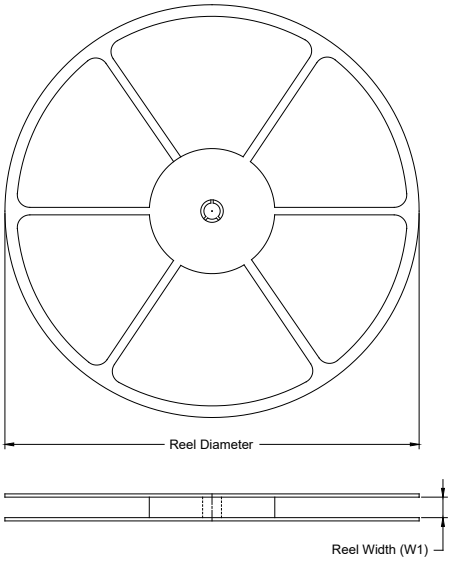


RECOMMENDED LAND PATTERN (Unit: mm)

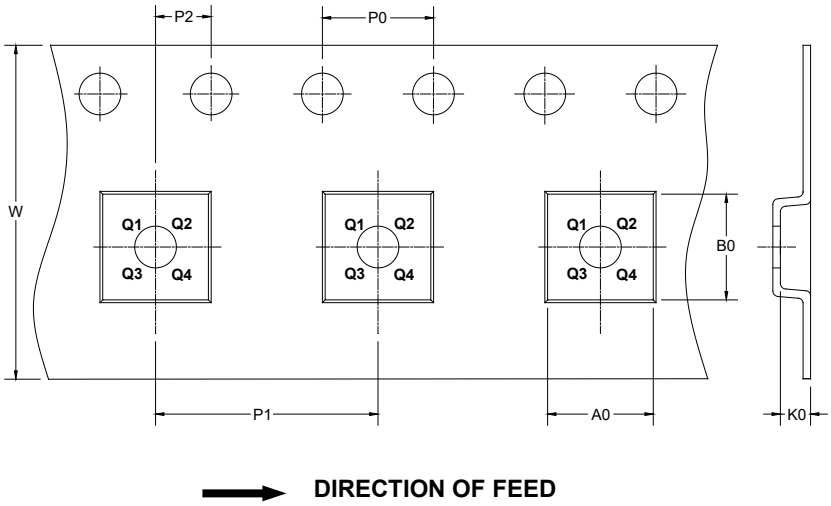
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203 REF		0.008 REF	
D	2.900	3.100	0.114	0.122
D1	1.600	1.800	0.063	0.071
E	2.900	3.100	0.114	0.122
E1	1.600	1.800	0.063	0.071
k	0.200 MIN		0.008 MIN	
b	0.180	0.300	0.007	0.012
e	0.500 TYP		0.020 TYP	
L	0.300	0.500	0.012	0.020

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



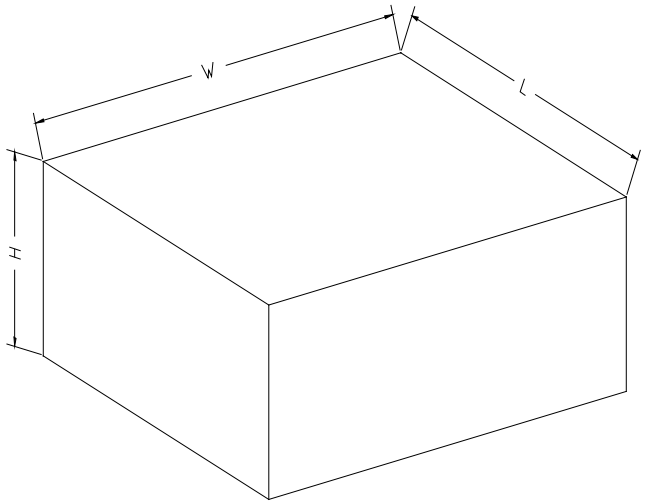
NOTE: The picture is only for reference. Please make the object as the standard.

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
TQFN-2.5×2.5-16L	7″	13.0	2.80	2.80	1.10	4.0	4.0	2.0	12.0	Q1
TQFN-3×3-16L	13″	12.4	3.35	3.35	1.13	4.0	8.0	2.0	12.0	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
13″	386	280	370	5

DD0002