SGM44600
4Ω, High Speed, Low Voltage Dual, DPDT Analog Switch

GENERAL DESCRIPTION

The SGM44600 is a dual, high-speed, low-voltage, double-pole/double-throw (DPDT) CMOS analog switch that is designed to operate from a single 1.8V to 5.5V power supply. It features high-bandwidth (300MHz) and low on-resistance (4Ω TYP), targeted applications for audio switching.

The SGM44600 consists of four SPDT switches. The configuration can be used as a bidirectional quad 2-channel multiplexer/demultiplexer with a single switch-enable (IN) input.

SGM44600 can handle rail-to-rail analog signals and is available in Green TQFN-3×3-16L package.

FEATURES

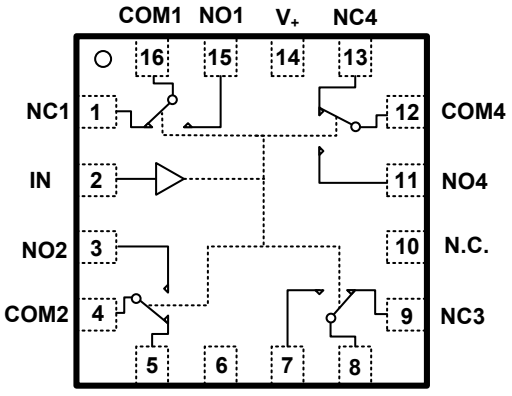
- **Low Voltage Operation: 1.8V to 5.5V**
- **Low On-Resistance: 4Ω (TYP)**
- **Low On-Resistance Flatness**
- **-3dB Bandwidth: 300MHz**
- **High Off-Isolation: -75dB at 1MHz**
- **Low Crosstalk: -100dB at 1MHz**
- **Rail-to-Rail Input and Output Operation**
- **Typical Power Consumption (< 0.01μW)**
- **TTL/CMOS Compatible**
- **-40℃ to +85℃ Operating Temperature Range**
- **Available in Green TQFN-3×3-16L Package**

APPLICATIONS

Communication Systems
Cell Phones
Portable Instrumentation
Audio Signal Routing
Audio and Video Switching
PCMCIA Cards
Computer Peripherals
Modems
PDAs

PIN CONFIGURATION

(TOP VIEW)



TQFN-3×3-16L

FUNCTION TABLE

IN	FUNCTION	
	NC1, 2, 3 and 4	NO1, 2, 3 and 4
0	ON	OFF
1	OFF	ON

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM44600	TQFN-3×3-16L	-40℃ to +85℃	SGM44600YTQ16/TR	44600 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 ..... 0V 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

Power Supply 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 DESCRIPTION

NAME	PIN	FUNCTION
V_+	14	Power Supply.
GND	6	Ground.
IN	2	Digital Control Pin to Connect the COM Terminal to the NO or NC Terminals.
N.C.	10	Not Internally Connected.
COM_X	16, 4, 8, 12	Common Terminal.
NO_X	15, 3, 7, 11	Normally-Open Terminal.
NC_X	1, 5, 9, 13	Normally-Closed Terminal.
Exposed Pad	GND	Exposed pad should be soldered to PCB board and connected to GND.

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

ELECTRICAL CHARACTERISTICS

(V_+ = +4.5V to +5.5V, GND = 0V, V_{IH} = +1.6V, V_{IL} = +0.6V, T_A = -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}			-40℃ to +85℃	0		V_+	V
On-Resistance	R_{ON}	V_+ = 4.5V, V_{NO} or V_{NC} = 1.2V, I_{COM} = -100mA, Test Circuit 1		+25℃		4	6	Ω
				-40℃ to +85℃			7	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℃		0.4	2.5	Ω
				-40℃ to +85℃			3	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℃		2	3	Ω
				-40℃ to +85℃			3.5	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		-40℃ to +85℃			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		-40℃ to +85℃			1	μA
DIGITAL INPUTS								
Input High Voltage	V_{INH}			-40℃ to +85℃	1.6			V
Input Low Voltage	V_{INL}			-40℃ to +85℃			0.5	V
Input Leakage Current	I_{IN}	V_+ = 5.5V, V_{IN} = 0V or 5.5V		-40℃ to +85℃			1	μA
DYNAMIC CHARACTERISTICS								
Turn-On Time	t_{ON}	V_{IH} = 3V, V_{IL} = 0V, Test Circuit 2		+25℃		29.5		ns
Turn-Off Time	t_{OFF}			+25℃		29.5		ns
Break-Before-Make Time Delay	t_D	V_{IH} = 3V, V_{IL}= 0V, Test Circuit 4		+25℃		10.0		ns
Charge Injection	Q	V_G = GND, R_G = 0Ω, V_{IH} = 3V, V_{IL}= 0V, C_L = 1.0nF, Q = C_L × V_{OUT}, Test Circuit 3		+25℃		4.8		pC
Off Isolation	O_{ISO}	V_{BIAS} = 2.1V, Signal = 0dBm, V_{IH} = 3V, V_{IL} = 0V, Test Circuit 5	1MHz	+25℃		-75		dB
			10MHz	+25℃		-55		
Channel-to-Channel Crosstalk	X_{TALK}	V_{BIAS} = 2.1V, Signal = 0dBm, V_{IH} = 3V, V_{IL} = 0V, Test Circuit 6	1MHz	+25℃		-100		dB
			10MHz	+25℃		-60		
-3dB Bandwidth	BW	V_{BIAS} = 2.1V, Signal = 0dBm, V_{IH} = 3V, V_{IL} = 0V, Test Circuit 7		+25℃		300		MHz
Channel ON Capacitance	$C_{NC(ON)}$, $C_{NO(ON)}$, $C_{COM(ON)}$			+25℃		43.0		pF
POWER REQUIREMENTS								
Power Supply Range	V_+			-40℃ to +85℃	1.8		5.5	V
Power Supply Current	I_+	V_+ = 5.5V, V_{IN} = 0V or V_+		-40℃ to +85℃			1	μA

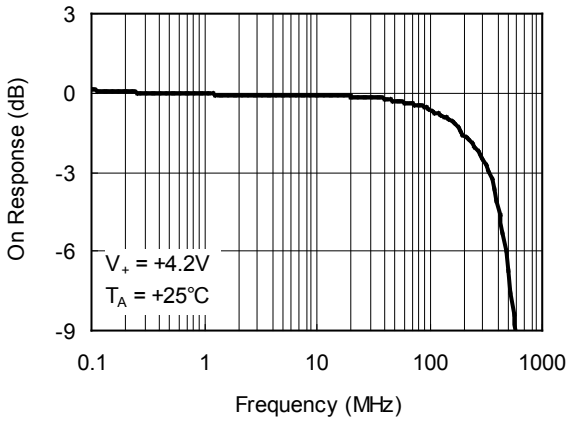
ELECTRICAL CHARACTERISTICS (continued)

(V_+ = +2.7V to +3.6V, V_{IH} = +1.6V, V_{IL} = +0.4V, T_A = -40℃ to +85℃. Typical values are at V_+ = +3.0V, T_A = +25℃, unless otherwise noted.)

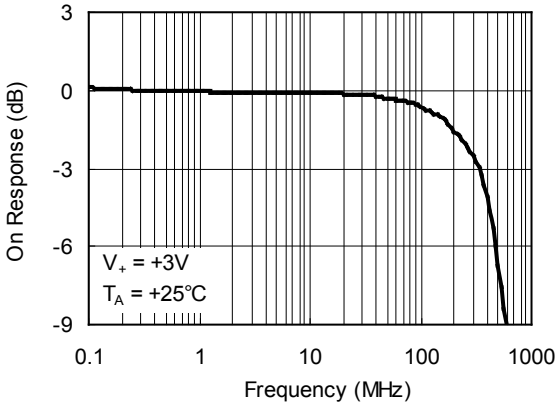
PARAMETER	SYMBOL	CONDITIONS		TEMP	MIN	TYP	MAX	UNITS
ANALOG SWITCH								
Analog Signal Range	V_{NO}, V_{NC}, V_{COM}			-40℃ to +85℃	0		V_+	V
On-Resistance	R_{ON}	V_+ = 2.7V, V_{NO} or V_{NC} = 1.2V, I_{COM} = -10mA, Test Circuit 1		+25℃		10	15	Ω
				-40℃ to +85℃			18	Ω
On-Resistance Match Between Channels	ΔR_{ON}	V_+ = 2.7V, V_{NO} or V_{NC} = 1.2V, I_{COM} = -100mA, Test Circuit 1		+25℃		1	3	Ω
				-40℃ to +85℃			4	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℃		6	9	Ω
				-40℃ to +85℃			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		-40℃ to +85℃			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		-40℃ to +85℃			1	μA
DIGITAL INPUTS								
Input High Voltage	V_{INH}			-40℃ to +85℃	1.5			V
Input Low Voltage	V_{INL}			-40℃ to +85℃			0.4	V
Input Leakage Current	I_{IN}	V_+ = 5.5V, V_{IN} = 0V or 3.6V		-40℃ to +85℃			1	μA
DYNAMIC CHARACTERISTICS								
Turn-On Time	t_{ON}	V_{IH} = 1.5V, V_{IL} = 0V, Test Circuit 2		+25℃		38.0		ns
Turn-Off Time	t_{OFF}			+25℃		45.0		ns
Break-Before-Make Time Delay	t_D	V_{IH} = 1.5V, V_{IL} = 0V, Test Circuit 4		+25℃		5.6		ns
Charge Injection	Q	V_G = GND, R_G = 0Ω, V_{IH} = 1.5V, V_{IL}= 0V, C_L = 1.0nF, Q = C_L × V_{OUT}, Test Circuit 3		+25℃		2.6		pC
Off Isolation	O_{ISO}	V_{BIAS} = 1.5V, Signal = 0dBm, V_{IH} = 1.5V, V_{IL} = 0V, Test Circuit 5	1MHz	+25℃		-75		dB
			10MHz	+25℃		-55		
Channel-to-Channel Crosstalk	X_{TALK}	V_{BIAS} = 1.5V, Signal = 0dBm, V_{IH} = 1.5V, V_{IL} = 0V, Test Circuit 6	1MHz	+25℃		-100		dB
			10MHz	+25℃		-60		
-3dB Bandwidth	BW	V_{BIAS} = 1.5V, Signal = 0dBm, V_{IH} = 1.5V, V_{IL} = 0V, Test Circuit 7		+25℃		300		MHz
Channel ON Capacitance	$C_{NC(ON)}$, $C_{NO(ON)}$, $C_{COM(ON)}$			+25℃		43.0		pF

TYPICAL PERFORMANCE CHARACTERISTICS

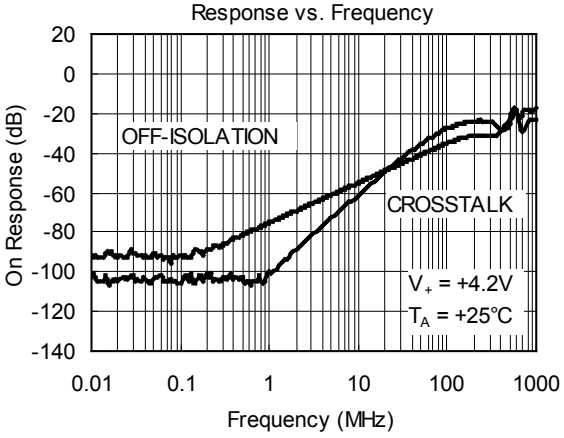
On Response vs. Frequency



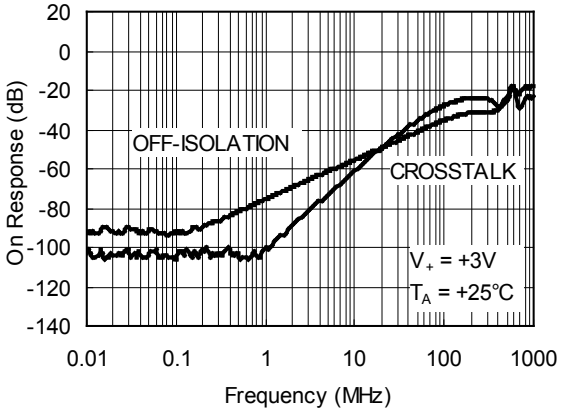
On Response vs. Frequency



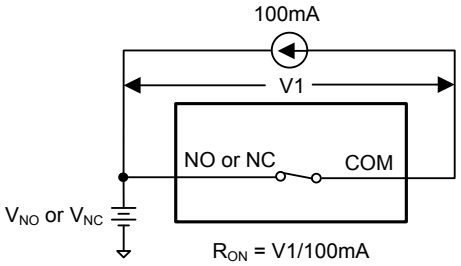
Response vs. Frequency



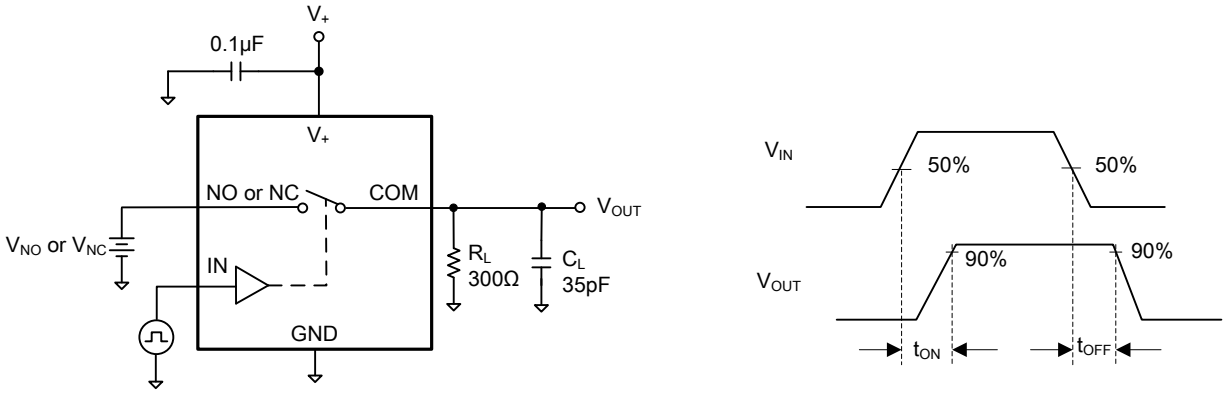
Response vs. Frequency



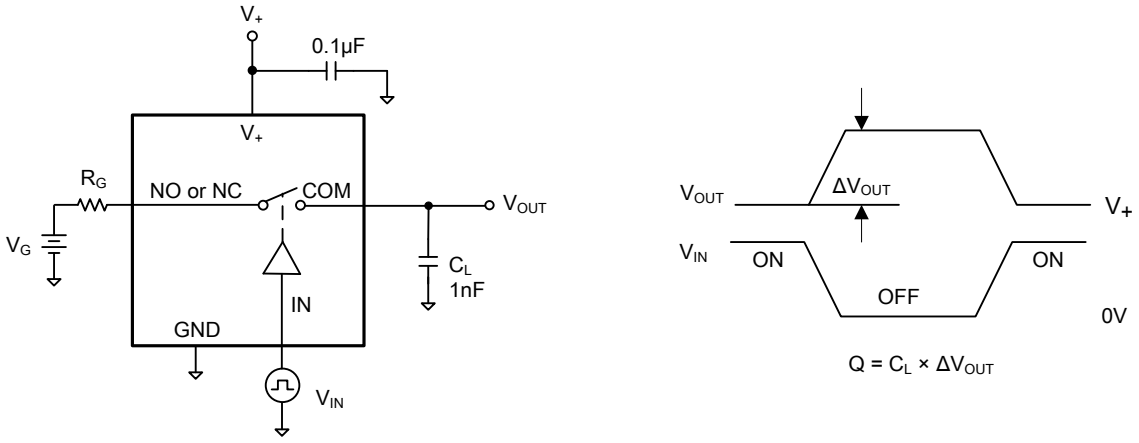
TEST CIRCUITS



Test Circuit 1. On Resistance

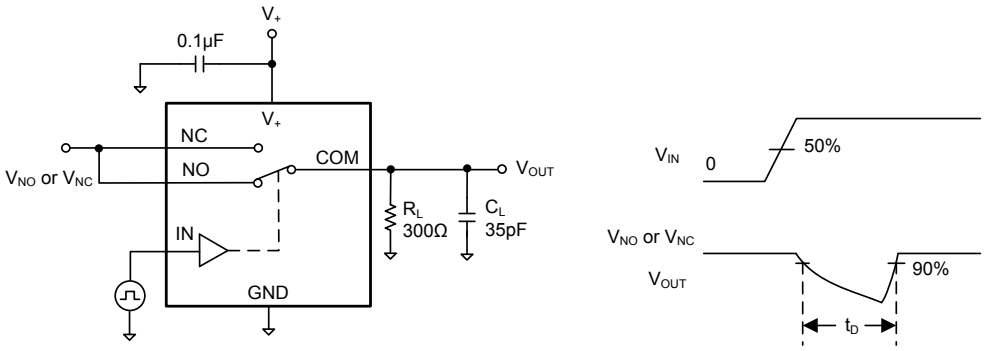


Test Circuit 2. Switching Times (t_{ON}, t_{OFF})

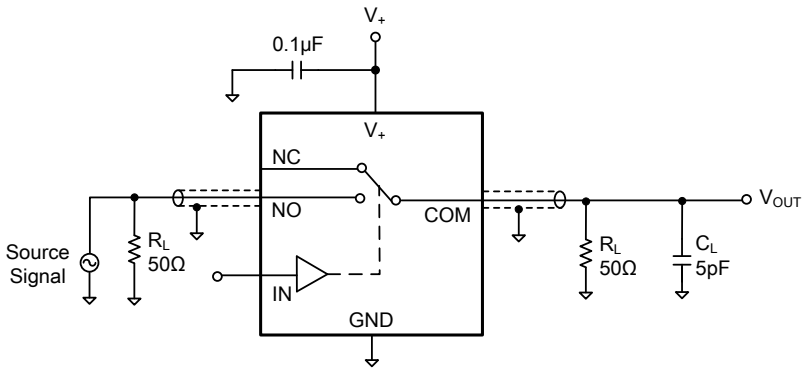


Test Circuit 3. Charge Injection

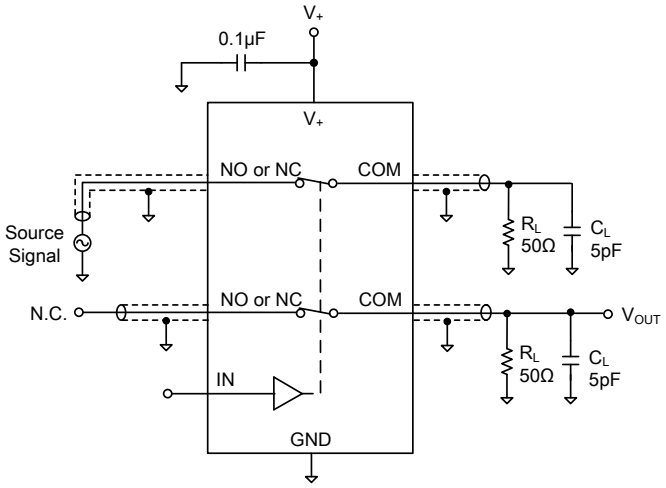
TEST CIRCUITS (continued)



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



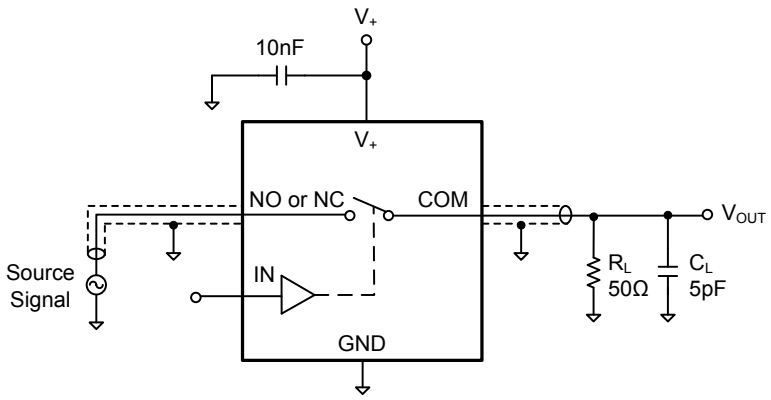
Test Circuit 5. Off Isolation



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

Test Circuit 6. Channel-to-Channel Crosstalk

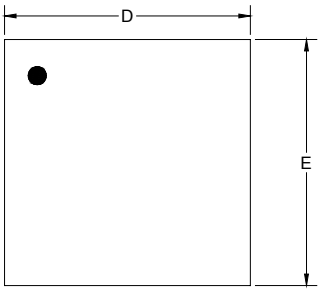
TEST CIRCUITS (continued)



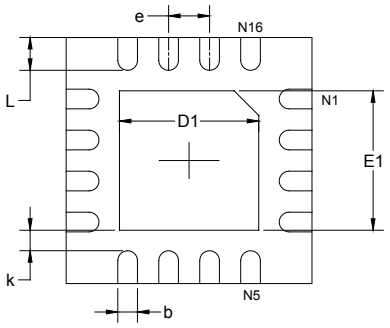
Test Circuit 7. -3dB Bandwidth

PACKAGE OUTLINE DIMENSIONS

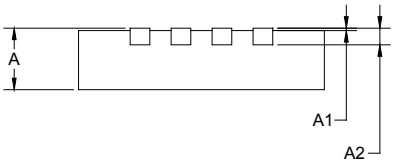
TQFN-3×3-16L



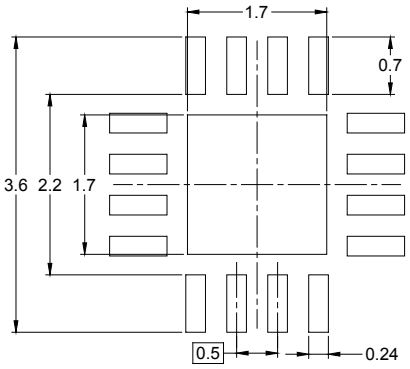
TOP VIEW



BOTTOM VIEW



SIDE VIEW

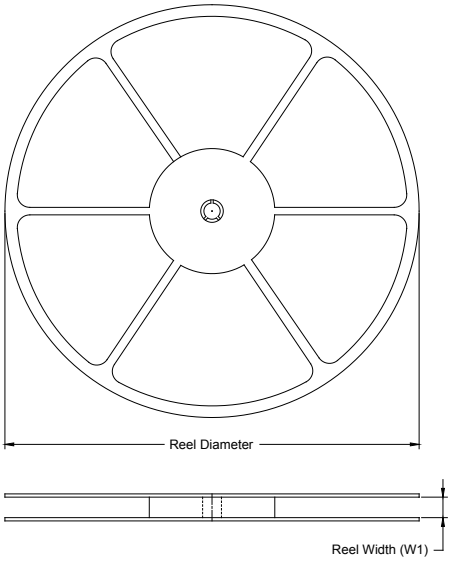


RECOMMENDED LAND PATTERN (Unit: mm)

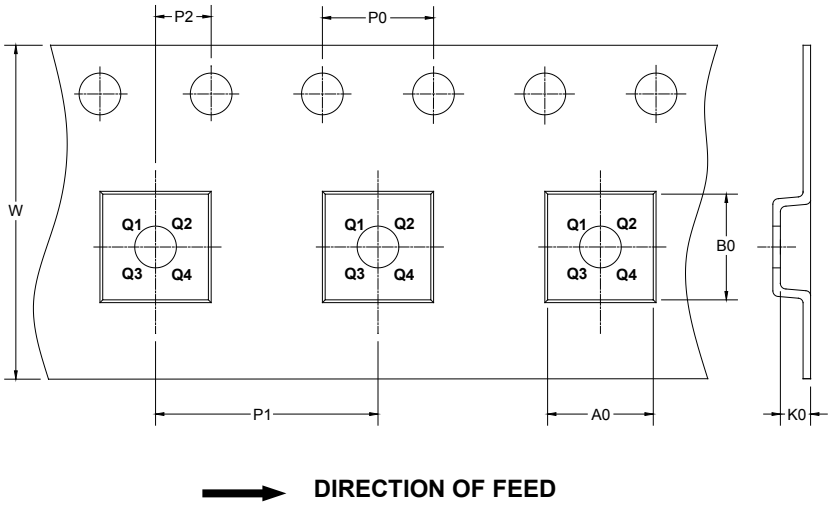
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203 REF		0.008 REF	
D	2.900	3.100	0.114	0.122
D1	1.600	1.800	0.063	0.071
E	2.900	3.100	0.114	0.122
E1	1.600	1.800	0.063	0.071
k	0.200 MIN		0.008 MIN	
b	0.180	0.300	0.007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



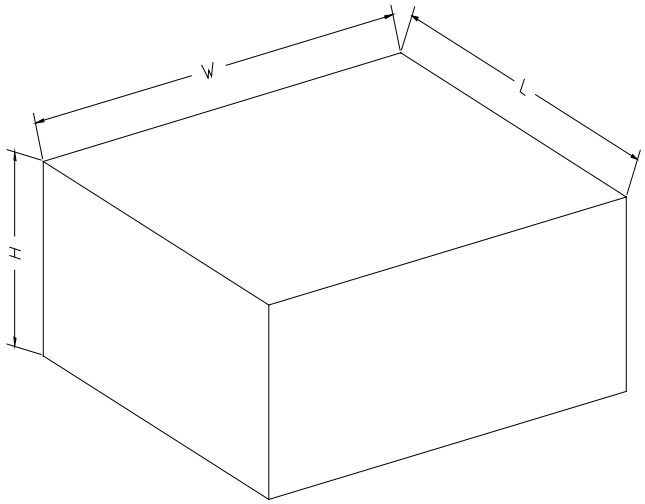
NOTE: The picture is only for reference. Please make the object as the standard.

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-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
13″	386	280	370	5

DD0002