



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.

APPLICATIONS

- Communication Systems
- Cell Phones
- Portable Instrumentation
- Audio Signal Routing
- Audio and Video Switching
- PCMCIA Cards
- Computer Peripherals
- Modems
- PDA's

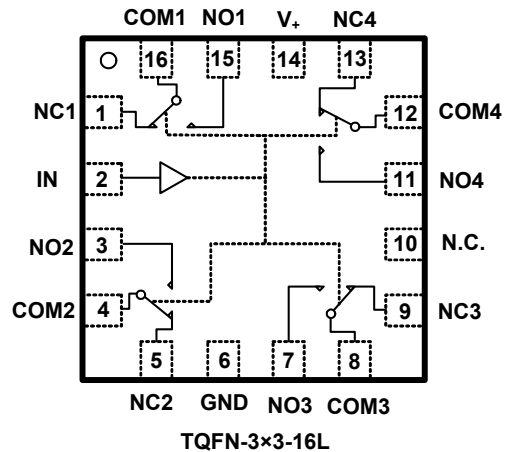
FUNCTION TABLE

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

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**
- **Available in Green TQFN-3×3-16L Package**
- **Extended Industrial Temperature Range: -40°C to +85°C**

PIN CONFIGURATION (TOP VIEW)



SGM44600

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

PACKAGE/ORDERING INFORMATION

MODEL	PIN-PACKAGE	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKAGE OPTION
SGM44600	TQFN-3×3-16L	-40°C to +85°C	SGM44600YTQ16/TR	44600	Tape and Reel, 3000

ABSOLUTE MAXIMUM RATINGS

V ₊ to GND.....	0V to 6V	Storage Temperature Range.....	-65°C to +150°C
Analog, Digital voltage range.....	-0.3V to (V ₊) + 0.3V	Lead Temperature (soldering, 10s).....	260°C
Continuous Current NO, NC, or COM	±100mA	ESD Susceptibility	
Operating Temperature Range.....	-40°C to +85°C	HBM.....	2000V
Junction Temperature.....	150°C	MM.....	200V

NOTE: Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

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.

SGMICRO reserves the right to make any change in circuit design, specification or other related things if necessary without notice at any time. Please contact SGMICRO sales office to get the latest datasheet.

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°C to +85°C. Typical values are at V_+ = +5.0V, T_A = +25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
ANALOG SWITCH							
Analog Signal Range	V_{NO}, V_{NC}, V_{COM}		-40°C to +85°C	0		V_+	V
On-Resistance	R_{ON}	V_+ = 4.5V, V_{NO} or V_{NC} = 1.2V, I_{COM} = -100mA, Test Circuit 1	+25°C		4	6	Ω
			-40°C to +85°C			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°C		0.4	2.5	Ω
			-40°C to +85°C			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°C		2	3	Ω
			-40°C to +85°C			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°C to +85°C			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°C to +85°C			1	μA
DIGITAL INPUTS							
Input High Voltage	V_{INH}		-40°C to +85°C	1.6			V
Input Low Voltage	V_{INL}		-40°C to +85°C			0.5	V
Input Leakage Current	I_{IN}	V_+ = 5.5V, V_{IN} = 0V or 5.5V	-40°C to +85°C			1	μA
DYNAMIC CHARACTERISTICS							
Turn-On Time	t_{ON}	V_{IH} = 3V, V_{IL} = 0V, Test Circuit2	+25°C		29.5		ns
Turn-Off Time	t_{OFF}		+25°C		29.5		ns
Break-Before-Make Time Delay	t_D	V_{IH} = 3V, V_{IL} = 0V, Test Circuit4	+25°C		10.0		ns
Charge Injection	Q	V_G = GND, R_G = 0Ω, V_{IH} = 3V, V_{IL} = 0V, C_L = 1.0nF, Q = $C_L \times V_{OUT}$, Test Circuit3	+25°C		4.8		pC
Off Isolation	O_{ISO}	V_{BIAS} = 2.1V, Signal = 0dBm, V_{IH} = 3V, V_{IL} = 0V, Test Circuit5	1MHz	+25°C		-75	dB
			10MHz	+25°C		-55	
Channel-to-Channel Crosstalk	X_{TALK}	V_{BIAS} = 2.1V, Signal = 0dBm, V_{IH} = 3V, V_{IL} = 0V, Test Circuit6	1MHz	+25°C		-100	dB
			10MHz	+25°C		-60	
-3dB Bandwidth	BW	V_{BIAS} = 2.1V, Signal = 0dBm, V_{IH} = 3V, V_{IL} = 0V, Test Circuit7	+25°C		300		MHz
Channel ON Capacitance	$C_{NC(ON)}, C_{NO(ON)}, C_{COM(ON)}$		+25°C		43.0		pF
POWER REQUIREMENTS							
Power Supply Range	V_+		-40°C to +85°C	1.8		5.5	V
Power Supply Current	I_+	V_+ = 5.5V, V_{IN} = 0V or V_+	-40°C to +85°C			1	μA

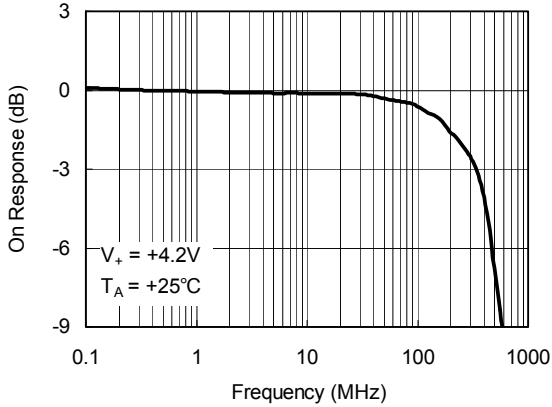
ELECTRICAL CHARACTERISTICS

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

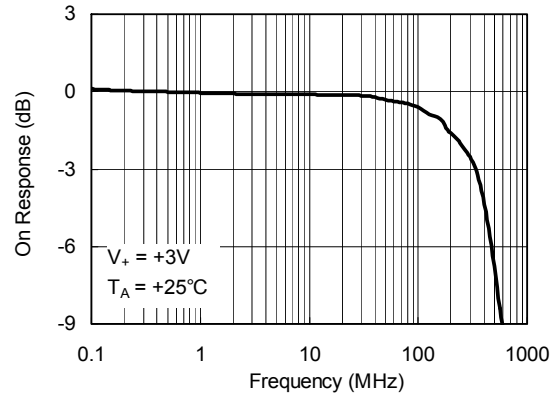
PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
ANALOG SWITCH							
Analog Signal Range	V_{NO}, V_{NC}, V_{COM}		$-40^\circ C$ to $+85^\circ C$	0		V_+	V
On-Resistance	R_{ON}	$V_+ = 2.7V$, V_{NO} or $V_{NC} = 1.2V$, $I_{COM} = -10mA$, Test Circuit 1	$+25^\circ C$		10	15	Ω
			$-40^\circ C$ to $+85^\circ C$			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	$+25^\circ C$		1	3	Ω
			$-40^\circ C$ to $+85^\circ C$			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	$+25^\circ C$		6	9	Ω
			$-40^\circ C$ to $+85^\circ C$			12	Ω
Source OFF Leakage Current	$I_{NC(OFF)}, I_{NO(OFF)}$	$V_+ = 3.6V$, V_{NO} or $V_{NC} = 3.3V/0.3V$, $V_{COM} = 0.3V/3.3V$	$-40^\circ C$ to $+85^\circ C$			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	$-40^\circ C$ to $+85^\circ C$			1	μA
DIGITAL INPUTS							
Input High Voltage	V_{INH}		$-40^\circ C$ to $+85^\circ C$	1.5			V
Input Low Voltage	V_{INL}		$-40^\circ C$ to $+85^\circ C$			0.4	V
Input Leakage Current	I_{IN}	$V_+ = 5.5V$, $V_{IN} = 0V$ or $3.6V$	$-40^\circ C$ to $+85^\circ C$			1	μA
DYNAMIC CHARACTERISTICS							
Turn-On Time	t_{ON}	$V_{IH} = 1.5V$, $V_{IL} = 0V$, Test Circuit2	$+25^\circ C$		38.0		ns
Turn-Off Time	t_{OFF}		$+25^\circ C$		45.0		ns
Break-Before-Make Time Delay	t_D	$V_{IH} = 1.5V$, $V_{IL} = 0V$, Test Circuit4	$+25^\circ C$		5.6		ns
Charge Injection	Q	$V_G = GND$, $R_G = 0\Omega$, $V_{IH} = 1.5V$, $V_{IL} = 0V$, $C_L = 1.0nF$, $Q = C_L \times V_{OUT}$, Test Circuit3	$+25^\circ C$		2.6		pC
Off Isolation	O_{ISO}	$V_{BIAS} = 1.5V$, Signal = 0dBm, $V_{IH} = 1.5V$, $V_{IL} = 0V$, Test Circuit5	1MHz	$+25^\circ C$		-75	dB
			10MHz	$+25^\circ C$		-55	dB
Channel-to-Channel Crosstalk	X_{TALK}	$V_{BIAS} = 1.5V$, Signal = 0dBm, $V_{IH} = 1.5V$, $V_{IL} = 0V$, Test Circuit6	1MHz	$+25^\circ C$		-100	dB
			10MHz	$+25^\circ C$		-60	dB
-3dB Bandwidth	BW	$V_{BIAS} = 1.5V$, Signal = 0dBm, $V_{IH} = 1.5V$, $V_{IL} = 0V$, Test Circuit7	$+25^\circ C$		300		MHz
Channel ON Capacitance	$C_{NC(ON)},$ $C_{NO(ON)},$ $C_{COM(ON)}$		$+25^\circ C$		43.0		pF

TYPICAL PERFORMANCE CHARACTERISTICS

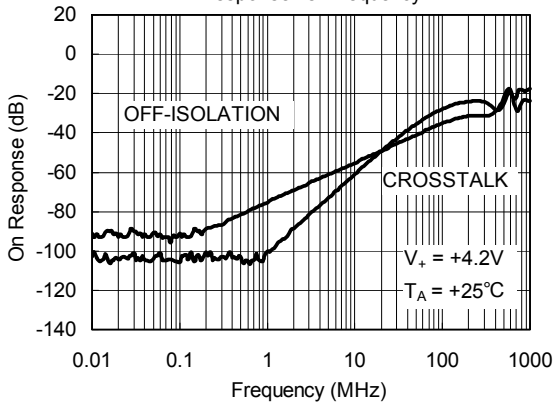
On Response vs. Frequency



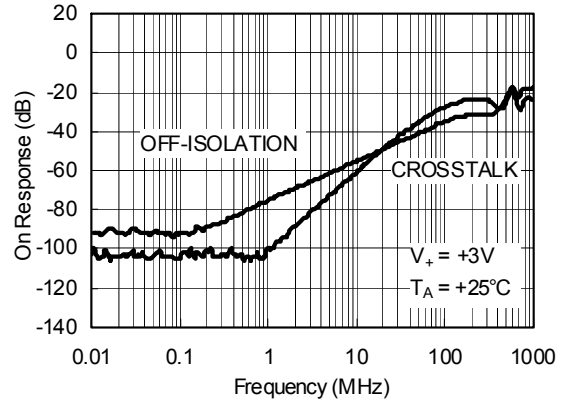
On Response vs. Frequency



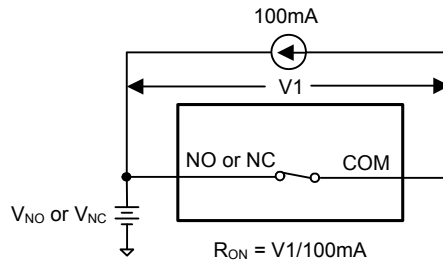
Response vs. Frequency



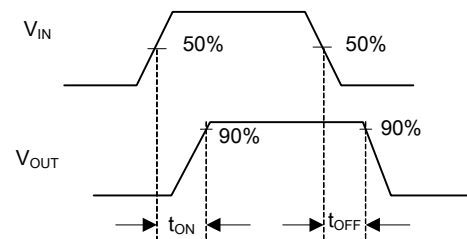
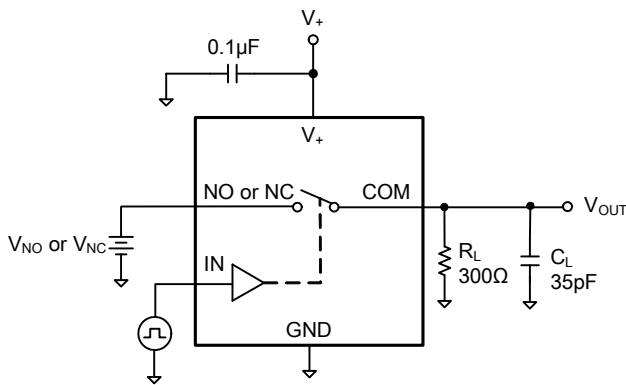
Response vs. Frequency



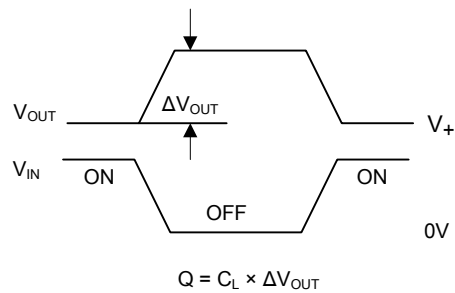
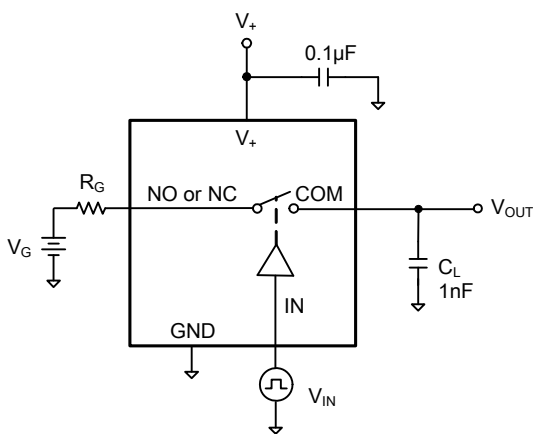
TEST CIRCUITS



Test Circuit 1. On Resistance

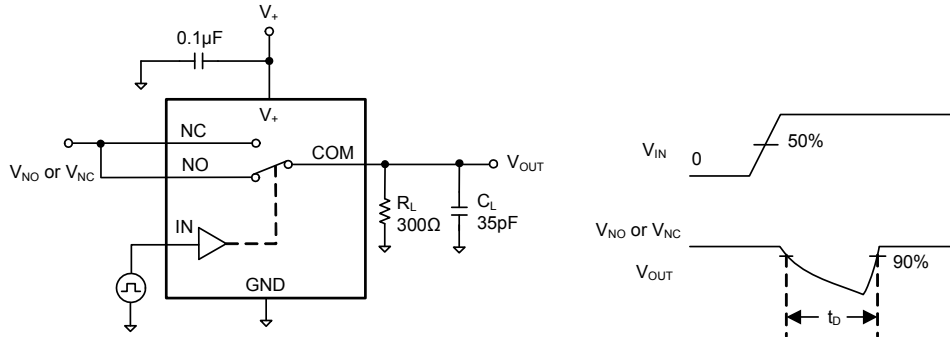


Test Circuit 2. Switching Times (t_{ON} , t_{OFF})

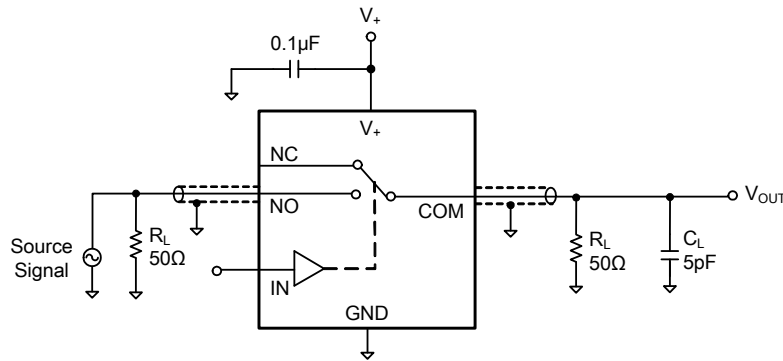


Test Circuit 3. Charge Injection

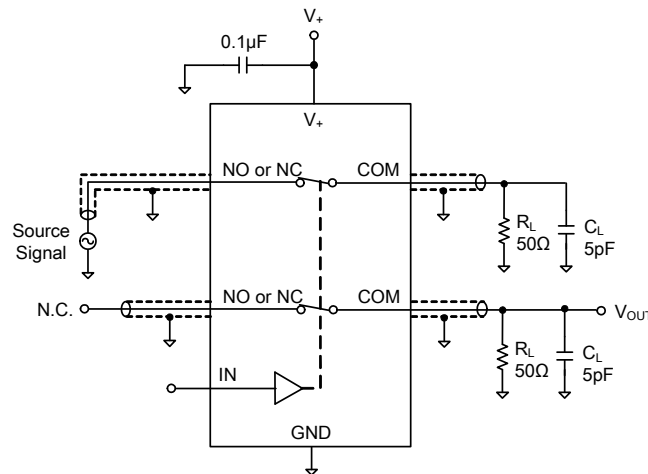
TEST CIRCUITS (Cont.)



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



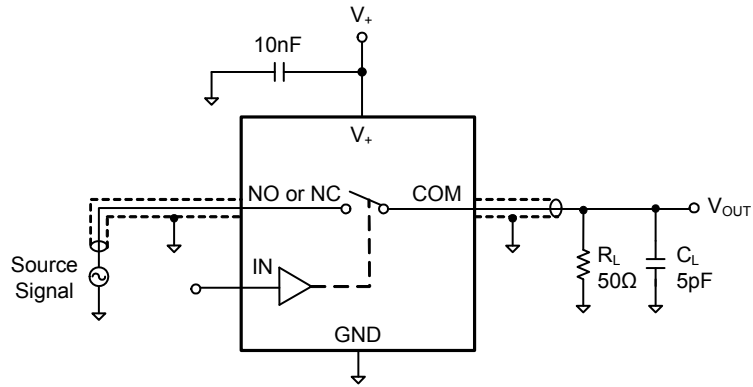
Test Circuit 5. Off Isolation



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

Test Circuit 6. Channel-to-Channel Crosstalk

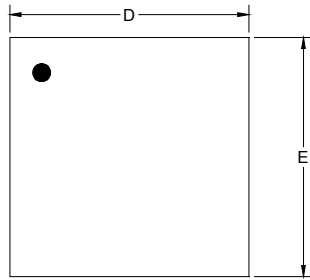
TEST CIRCUITS (Cont.)



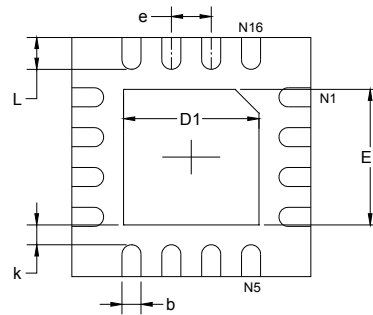
Test Circuit 7. -3dB Bandwidth

PACKAGE OUTLINE DIMENSIONS

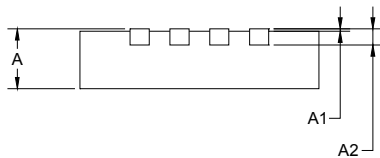
TQFN-3×3-16L



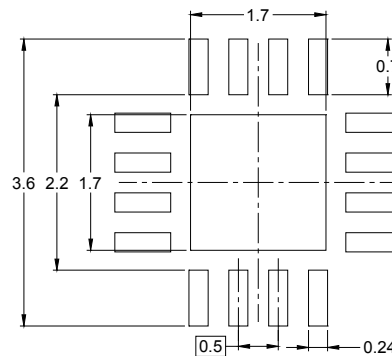
TOP VIEW



BOTTOM VIEW



SIDE VIEW

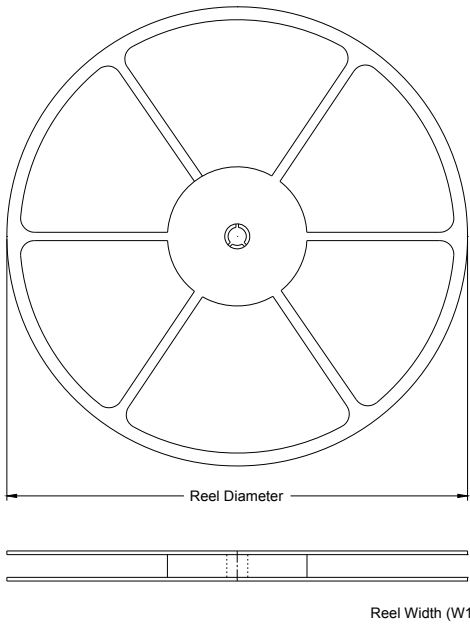


RECOMMENDED LAND PATTERN (Unit: mm)

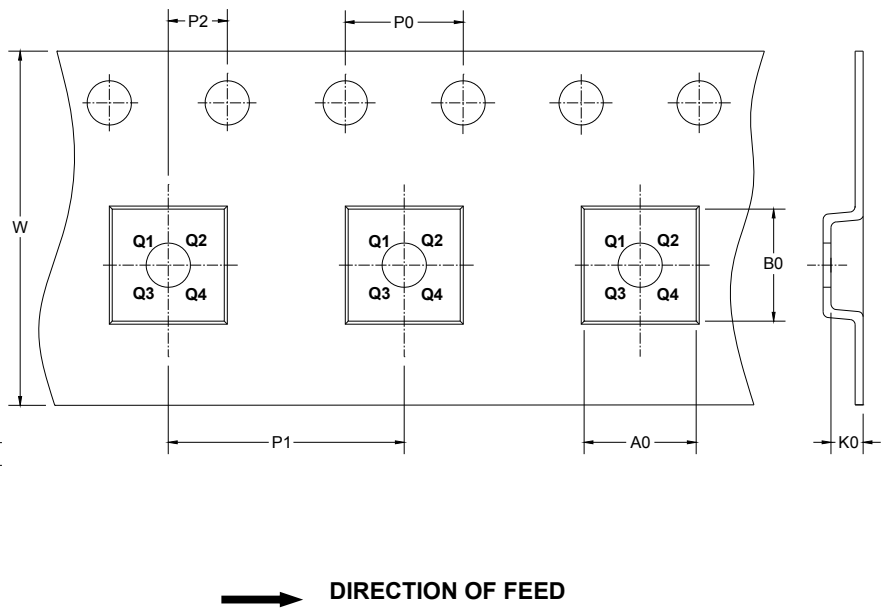
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203 REF		0.008 REF	
D	2.900	3.100	0.114	0.122
D1	1.600	1.800	0.063	0.071
E	2.900	3.100	0.114	0.122
E1	1.600	1.800	0.063	0.071
k	0.200 MIN		0.008 MIN	
b	0.180	0.300	0.007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

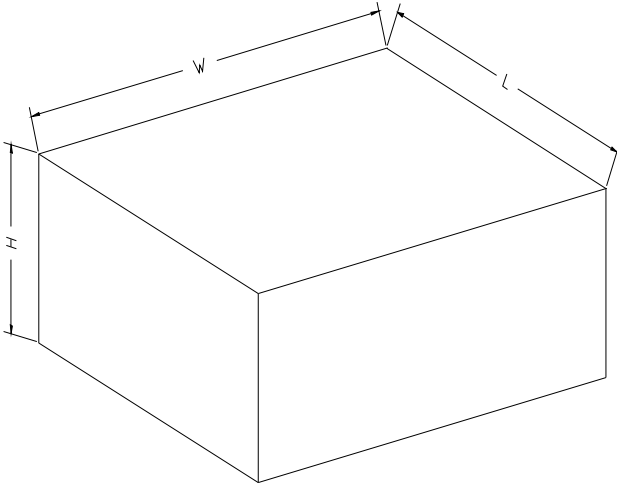
KEY PARAMETER LIST OF TAPE AND REEL

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"	12.40	3.35	3.35	1.13	4.00	4.00	2.00	12.00	Q1

SGM44600

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

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