

SGM3799

0.5Ω, Low Voltage Dual, DPDT Analog Switch

GENERAL DESCRIPTION

The SGM3799 is a dual, ultra low on-resistance, low voltage, double-pole/double-throw (DPDT) CMOS analog switch. This device is designed for low operating voltage, high current switching of speaker output and earpiece for cellphone applications. It can switch a balanced stereo output.

The SGM3799 can handle a balanced microphone/speaker/ring-tone generator in a monophone mode. It contains a break-before-make (BBM) feature.

The SGM3799 is configured as a dual double-pole/double-throw (DPDT) analog switch with two logic control inputs that control two SPDT switches each. The configuration can be used as a dual differential 2-to-1 multiplexer/demultiplexer.

The SGM3799 is available in Green TQFN-2.6×1.8-16L package.

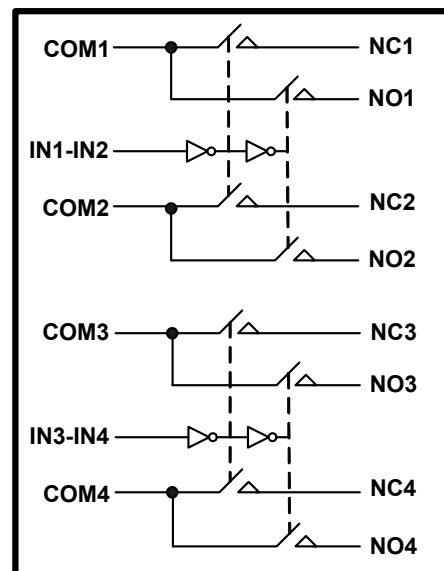
APPLICATIONS

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

FEATURES

- **Low Voltage Operation: 1.8V to 4.35V**
- **Ultra Low On-Resistance: 0.5Ω (TYP)**
- **Low On-Resistance Flatness**
- **-3dB Bandwidth: 70MHz**
- **Fast Switching Times (4.2V)**
 - $t_{ON} = 52\text{ns}$
 - $t_{OFF} = 25\text{ns}$
- **Rail-to-Rail Input and Output Operation**
- **Low Power Consumption**
- **TTL/CMOS Compatible Logic Control**
- **-40°C to +85°C Operating Temperature Range**
- **Available in Green TQFN-2.6×1.8-16L Package**

BLOCK DIAGRAM



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PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM3799	TQFN-2.6×1.8-16L	-40°C to +85°C	SGM3799YTQA16/TR	GC XXXXX	Tape and Reel, 3000

NOTE: XXXXX = Date Code and Vendor Code.

ABSOLUTE MAXIMUM RATINGS

V ₊ to GND.....	0V to 4.6V
Analog, Digital Voltage Range ⁽¹⁾	-0.3V to (V ₊) + 0.3V
Continuous Current NO, NC, or COM	±200mA
Peak Current NO, NC, or COM	±350mA
Operating Temperature Range.....	-40°C to +85°C
Junction Temperature.....	150°C
Storage Temperature Range.....	-65°C to +150°C
Lead Temperature (Soldering, 10s)	260°C
ESD Susceptibility	
HBM.....	4000V
MM.....	400V

NOTES:

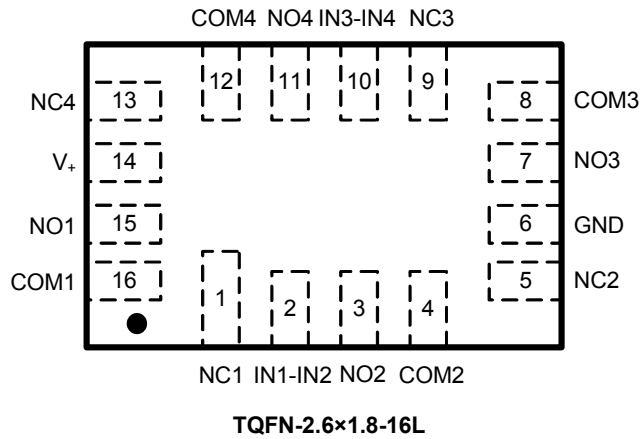
1. Signals on NC, NO, or COM or I_{Nx} exceeding V₊ will be clamped by internal diodes. Limit forward diode current to maximum current ratings.
2. Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation 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 CONFIGURATION (TOP VIEW)



PIN DESCRIPTION

PIN	NAME	FUNCTION
14	V ₊	Power Supply.
6	GND	Ground.
2, 10	IN _x	Digital Control Pin to Connect the COM Terminal to the NO or NC Terminals.
16, 4, 8, 12	COM _x	Common Terminal.
15, 3, 7, 11	NO _x	Normally-Open Terminal.
1, 5, 9, 13	NC _x	Normally-Closed Terminal.

NOTE: NO_x, NC_x and COM_x terminals 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

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ELECTRICAL CHARACTERISTICS

(V₊ = +4.2V, GND = 0V, V_{IH} = +1.6V, V_{IL} = +0.5V, Full = -40°C to +85°C, unless otherwise noted.)

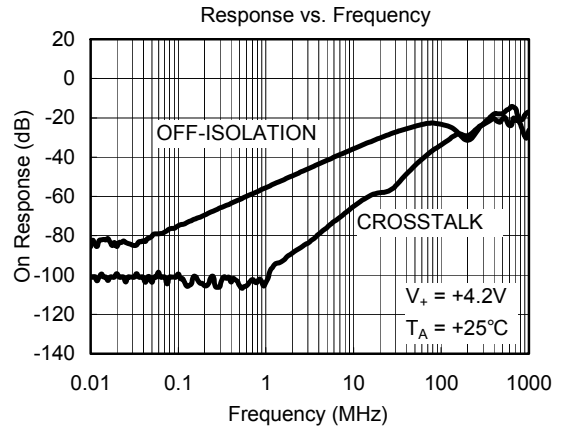
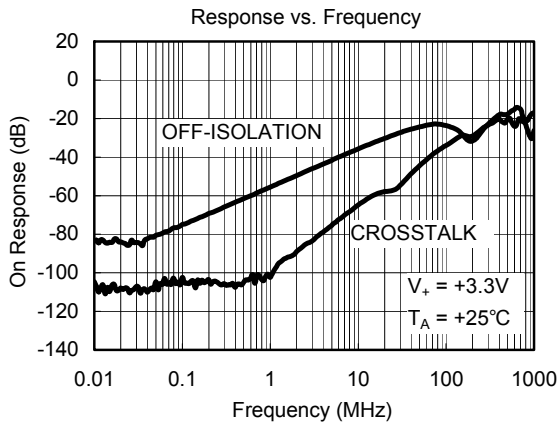
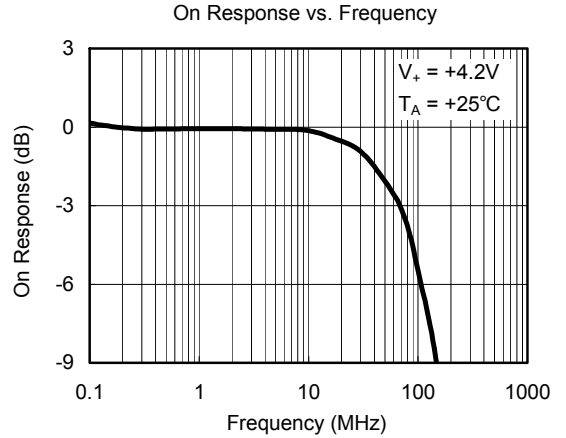
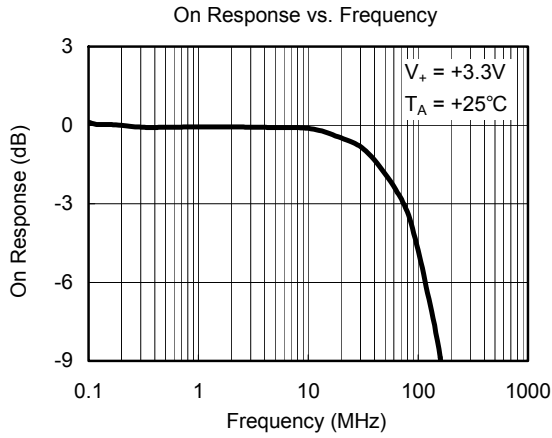
PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
ANALOG SWITCH							
Analog Signal Range	V _{NO} , V _{NC} , V _{COM}		Full	0		V ₊	V
On-Resistance	R _{ON}	V _{NO} or V _{NC} = 1V, I _{COM} = -100mA, Test Circuit 1	+25°C		0.5	0.85	Ω
			Full			1.2	Ω
On-Resistance Match Between Channels	ΔR _{ON}	V _{NO} or V _{NC} = 1V, I _{COM} = -100mA, Test Circuit 1	+25°C		0.1	0.22	Ω
			Full			0.45	Ω
On-Resistance Flatness	R _{FLAT(ON)}	V _{NO} or V _{NC} = 1V, 2.5V, I _{COM} = -100mA, Test Circuit 1	+25°C		0.15	0.25	Ω
			Full			0.35	Ω
Source OFF Leakage Current	I _{NC(OFF)} , I _{NO(OFF)}	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 _{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 _{IN} = 0V or 4.2V	Full			1	μA
DYNAMIC CHARACTERISTICS							
Turn-On Time	t _{ON}	V _{NO} or V _{NC} = 2.0V, R _L = 50Ω, C _L = 35pF, Test Circuit 2	+25°C		52		ns
Turn-Off Time	t _{OFF}		+25°C		25		ns
Charge Injection	Q	C _L = 1.0nF, V _G = 0V, R _G = 0Ω, Test Circuit 3	+25°C		30		pC
Break-Before-Make Time Delay	t _D	V _{NO} or V _{NC} = 1.5V, R _L = 50Ω, C _L = 35pF, Test Circuit 4	+25°C		8		ns
Off Isolation	O _{ISO}	Signal = 0dBm, R _L = 50Ω, C _L = 5pF, Test Circuit 5	f = 100kHz	+25°C		-75	dB
			f = 1MHz	+25°C		-55	
Channel-to-Channel Crosstalk	X _{TALK}	Signal = 0dBm, R _L = 50Ω, C _L = 5pF, Test Circuit 6	f = 1MHz	+25°C		-103	dB
			f = 10MHz	+25°C		-65	
-3dB Bandwidth	BW	Signal = 0dBm, R _L = 50Ω, C _L = 5pF, Test Circuit 7	+25°C		70		MHz
Channel ON Capacitance	C _{NC(ON)} , C _{NO(ON)} , C _{COM(ON)}	f = 1MHz	+25°C		80		pF
POWER REQUIREMENTS							
Power Supply Range	V ₊		Full	1.8		4.35	V
Power Supply Current	I ₊	V _{IN} = 0V or V ₊	Full			1	μA

ELECTRICAL CHARACTERISTICS

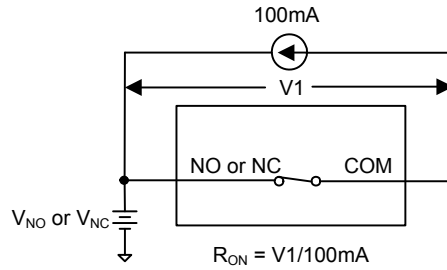
(V_+ = +2.7 to +3.6V, GND = 0V, V_{IH} = +1.5 V, V_{IL} = +0.4V, Full = -40°C to +85°C. Typical values are at V_+ = +3.0V, T_A = +25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
ANALOG SWITCH							
Analog Signal Range	V_{NO}, V_{NC}, V_{COM}		Full	0		V_+	V
On-Resistance	R_{ON}	V_+ = 2.7V, V_{NO} or V_{NC} = 1V, I_{COM} = -100mA, Test Circuit 1	+25°C		0.6	0.9	Ω
			Full			1.3	Ω
On-Resistance Match Between Channels	ΔR_{ON}	V_+ = 2.7V, V_{NO} or V_{NC} = 1V, I_{COM} = -100mA, Test Circuit 1	+25°C		0.15	0.25	Ω
			Full			0.5	Ω
On-Resistance Flatness	$R_{FLAT(ON)}$	V_+ = 2.7V, V_{NO} or V_{NC} = 1V, 2.5V, I_{COM} = -100mA, Test Circuit 1	+25°C		0.15	0.25	Ω
			Full			0.35	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_+ = 3.6V, V_{IN} = 0V or 3.6V	Full			1	μA
DYNAMIC CHARACTERISTICS							
Turn-On Time	t_{ON}	V_+ = 3.3V, V_{NO} or V_{NC} = 2.0V, R_L = 50Ω, C_L = 35pF, Test Circuit 2	+25°C		54		ns
Turn-Off Time	t_{OFF}		+25°C		38		ns
Charge Injection	Q	C_L = 1.0nF, V_G = 0V, R_G = 0Ω Test Circuit 3	+25°C		26		pC
Break-Before-Make Time Delay	t_D	V_{NO} or V_{NC} = 1.5V, R_L = 50Ω, C_L = 35pF, Test Circuit 4	+25°C		12		ns
Off Isolation	O_{ISO}	Signal = 0dBm, R_L = 50Ω, C_L = 5pF, Test Circuit 5	f = 100kHz	+25°C		-75	dB
			f = 1MHz	+25°C		-55	
Channel-to-Channel Crosstalk	X_{TALK}	Signal = 0dBm, R_L = 50Ω, C_L = 5pF, Test Circuit 6	f = 1MHz	+25°C		-103	dB
			f = 10MHz	+25°C		-65	
-3dB Bandwidth	BW	Signal = 0dBm, R_L = 50Ω, C_L = 5pF, Test Circuit 7	+25°C		70		MHz
Channel ON Capacitance	$C_{NC(ON)},$ $C_{NO(ON)},$ $C_{COM(ON)}$	f = 1MHz	+25°C		80		pF

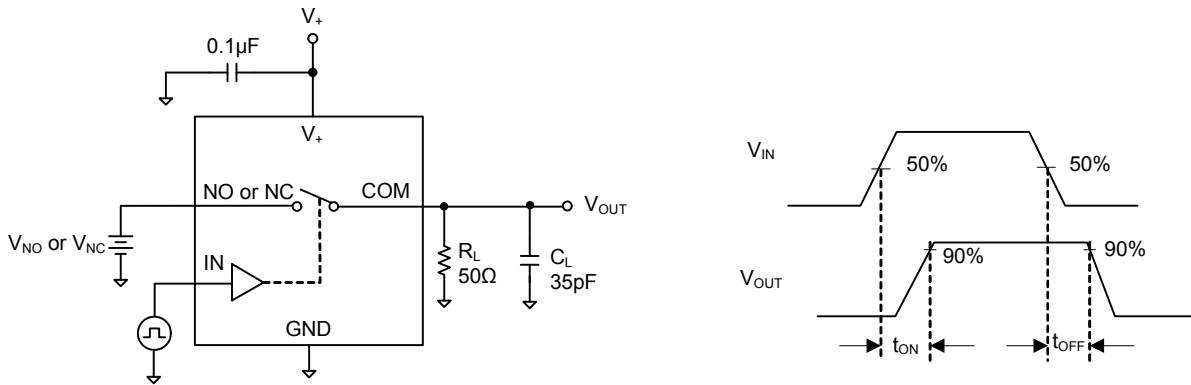
TYPICAL PERFORMANCE CHARACTERISTICS



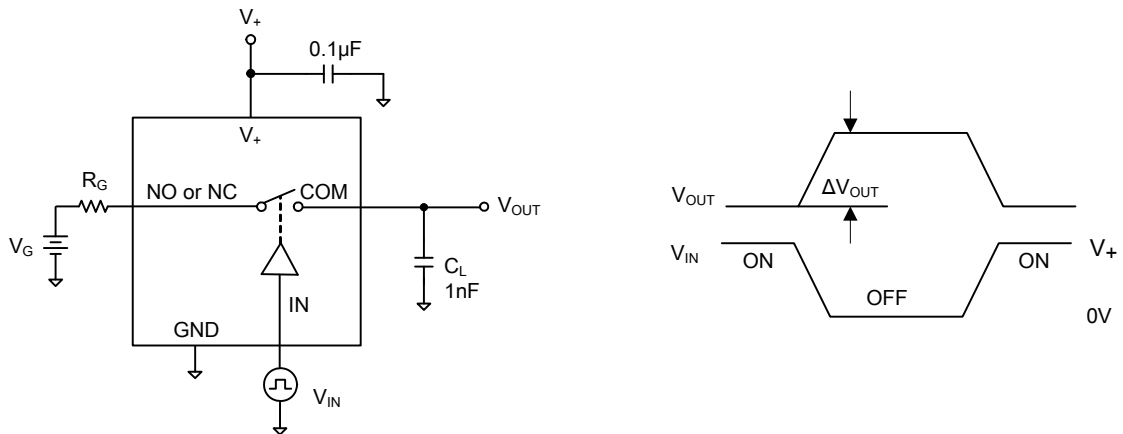
TEST CIRCUITS



Test Circuit 1. On-Resistance

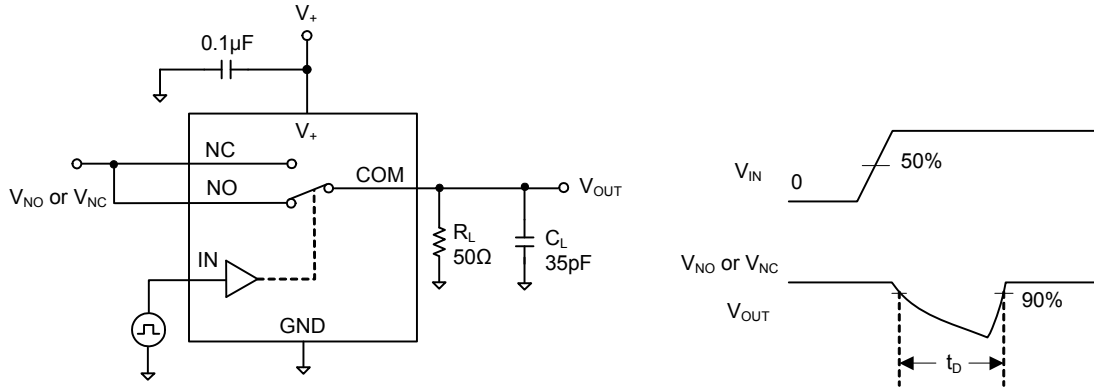


Test Circuit 2. Switching Times

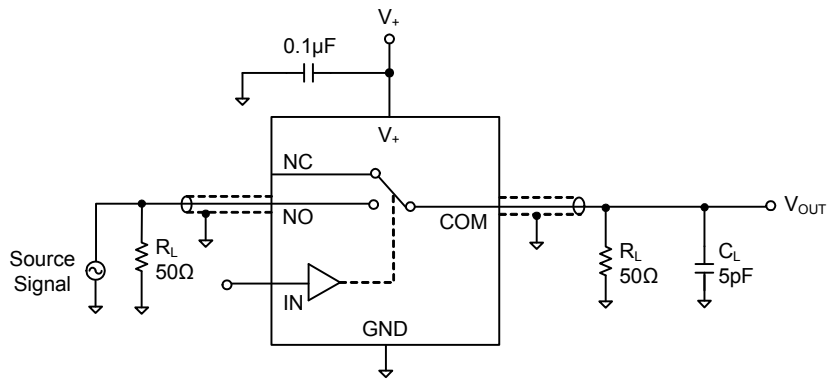


Test Circuit 3. Charge Injection

TEST CIRCUITS (Cont.)

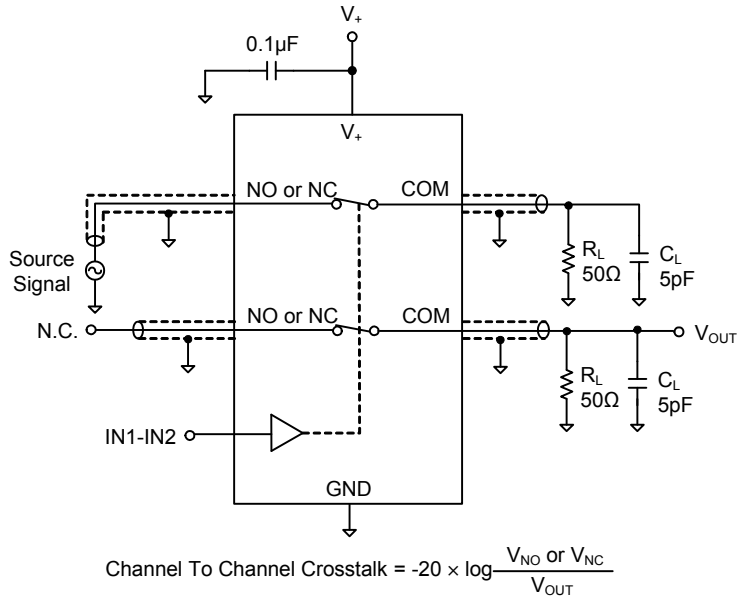


Test Circuit 4. Break-Before-Make Time Delay, t_b

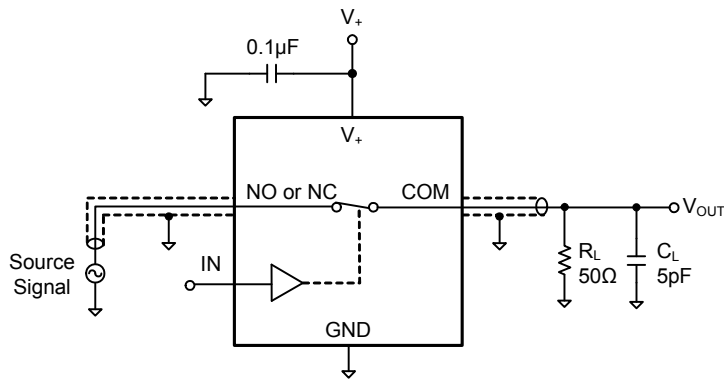


Test Circuit 5. Off Isolation

TEST CIRCUITS (Cont.)



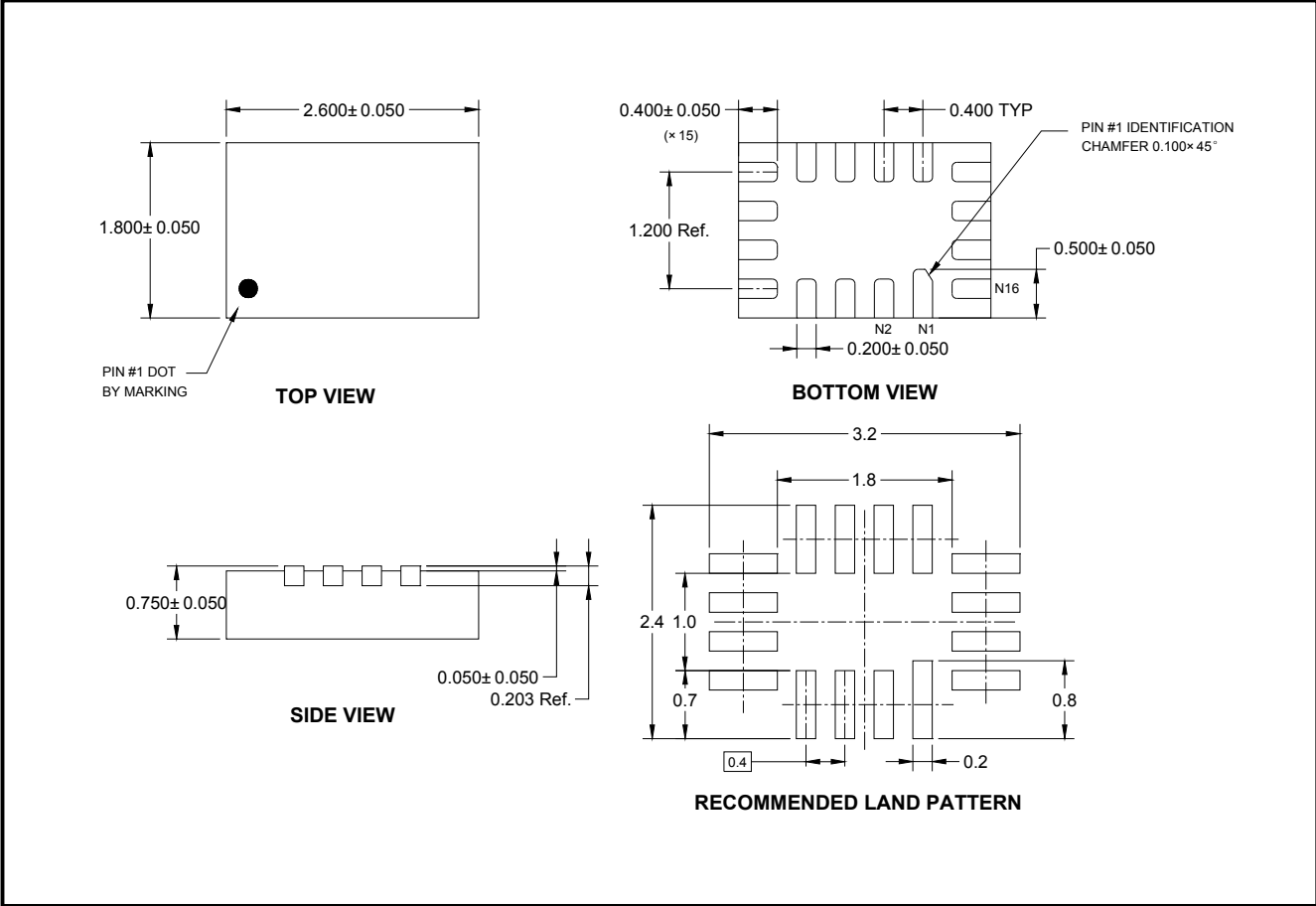
Test Circuit 6. Channel-to-Channel Crosstalk



Test Circuit 7. -3dB Bandwidth

PACKAGE OUTLINE DIMENSIONS

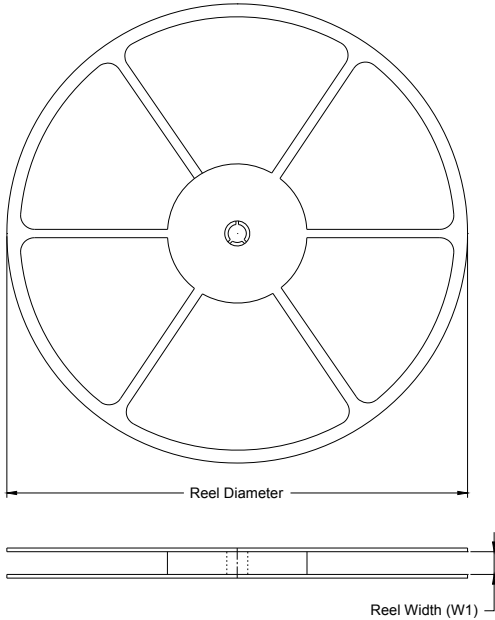
TQFN-2.6×1.8-16L



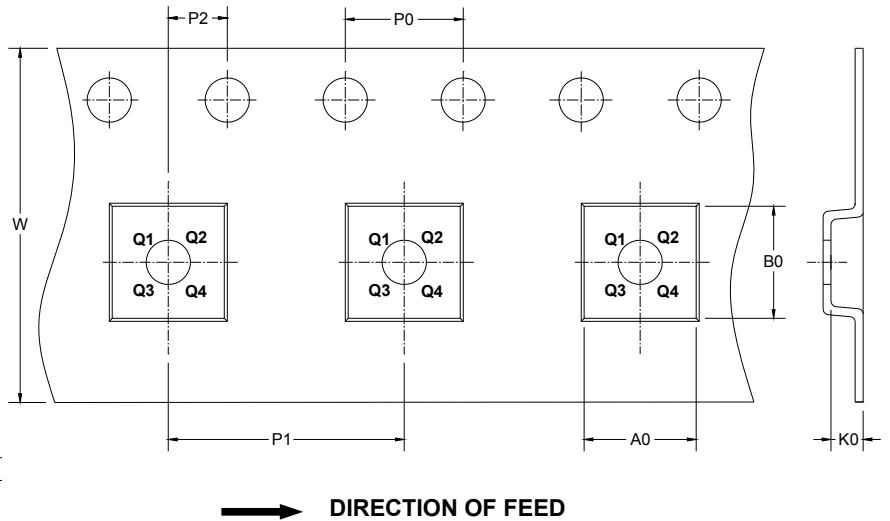
NOTE: All linear dimensions are in millimeters.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



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

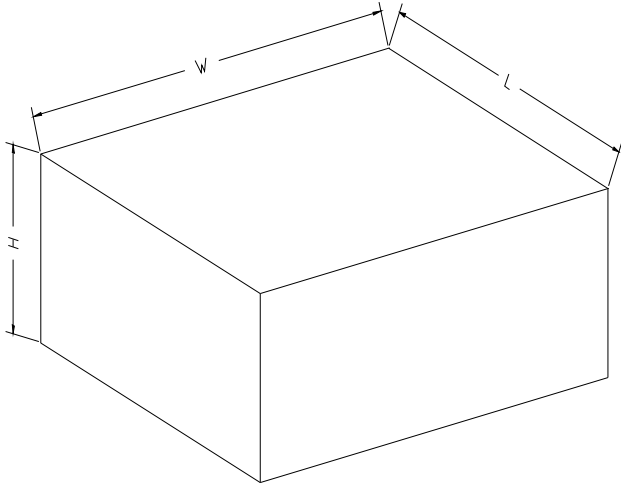
KEY PARAMETER LIST OF TAPE AND REEL

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

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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