



SGM3158

4.5Ω Dual SPDT

Analog Switch in 12-Pin TDFN

GENERAL DESCRIPTION

The SGM3158 is a dual, bidirectional, single-pole/double-throw (SPDT) CMOS analog switch designed to operate from a single +1.8V to +5.5V supply. It features high-bandwidth (270MHz) and low on-resistance (4.5Ω TYP), targeted applications for audio switching.

SGM3158 features guaranteed on-resistance matching (0.3Ω MAX) between switches and guaranteed on-resistance flatness over the signal range (2.3Ω TYP). This ensures excellent linearity and low distortion when switching audio signals.

SGM3158 is available in Green TDFN-3×1-12L package.

FEATURES

- **Voltage Operation:** 1.8V to 5.5V
- **On-Resistance:** 4.5Ω (TYP) at 5.0V
- **Fast Switching Times**
 - t_{ON} 20ns
 - t_{OFF} 15ns
- **High Bandwidth:** 270MHz
- **High Off-Isolation:** -51dB at 10MHz
- **Rail-to-Rail Operation**
- **TTL/CMOS Compatible**
- **Break-Before-Make Switching**
- **Extended Industrial Temperature Range:** -40°C to +85°C
- **Available in Green TDFN-3×1-12L Package**

APPLICATIONS

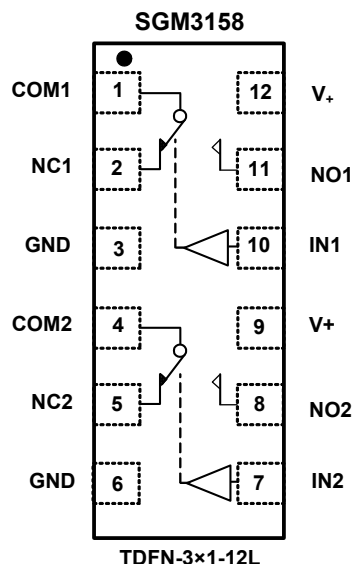
Portable Instrumentation
Battery-Operated Equipment
Computer Peripherals
Cell Phones
PDAs
MP3s

FUNCTION TABLE

LOGIC	NO	NC
0	OFF	ON
1	ON	OFF

Switches Shown for Logic "0" Input

PIN CONFIGURATION (TOP VIEW)



PACKAGE/ORDERING INFORMATION

MODEL	PIN-PACKAGE	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKAGE OPTION
SGM3158	TDFN-3×1-12L	-40°C to +85°C	SGM3158YD/TR	3158	Tape and Reel, 3000

ABSOLUTE MAXIMUM RATINGS

V ₊ , IN to GND.....	-0.3V to 6V	Storage Temperature Range.....	-65°C to +150°C
Analog, Digital Voltage Range ⁽¹⁾	-0.3V to (V ₊) + 0.3V	Lead Temperature (Soldering, 10s).....	260°C
Continuous Current NO, NC, or COM.....	±50mA	ESD Susceptibility	
Peak Current NO, NC, or COM.....	±80mA	HBM.....	2000V
Operating Temperature Range.....	-40°C to +85°C	MM.....	400V
Junction Temperature.....	150°C		

NOTES:

1. Signals on NC, NO, or COM or IN 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 DESCRIPTION

NAME	FUNCTION
NO1, NO2	Normally-Open Terminal.
GND	Ground.
NC1, NC2	Normally-Closed Terminal.
COM1, COM2	Common Terminal.
V ₊	Power Supply.
IN1, IN2	Digital Control Pin to Connect the COM Terminal to the NO or NC Terminals.

NOTE: NO1 or NO2, NC1 or NC2, and COM1 or COM2 terminals may be an input or output.

ELECTRICAL CHARACTERISTICS

($V_+ = +4.5\text{V}$ to $+5.5\text{V}$, $V_{IH} = +2.0\text{V}$, $V_{IL} = +0.8\text{V}$, $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$, Typical values are at $V_+ = 5.0\text{V}$, $T_A = +25^\circ\text{C}$, unless otherwise noted.)

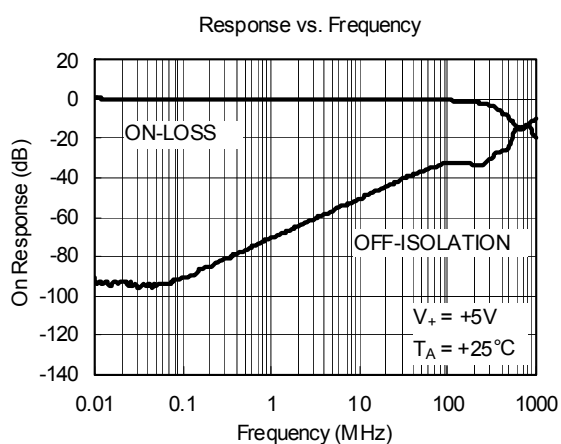
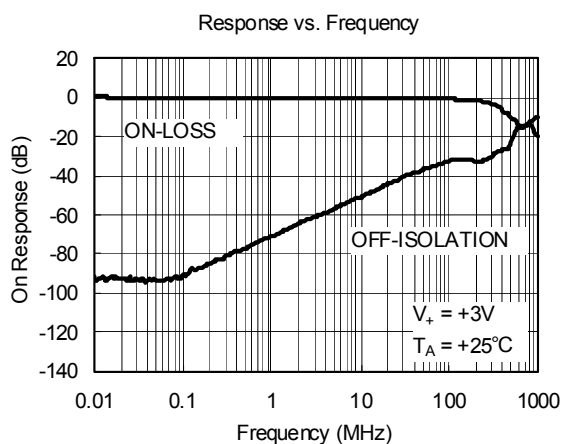
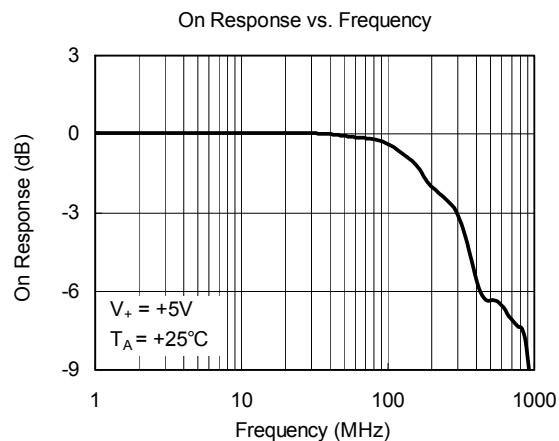
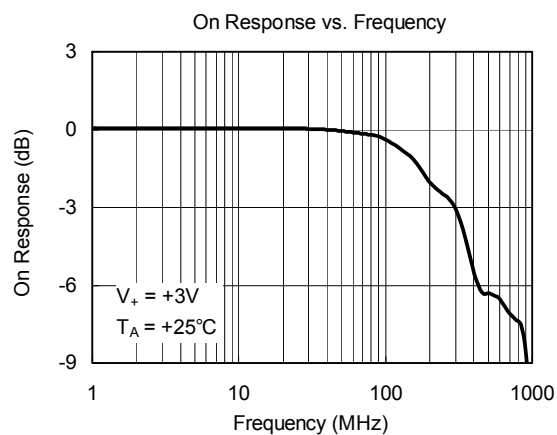
PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
ANALOG SWITCH							
Analog Signal Range	V_{NO}, V_{NC}, V_{COM}		-40°C to $+85^\circ\text{C}$	0		V_+	V
On-Resistance	R_{ON}	$V_+ = 4.5\text{V}$, V_{NO} or $V_{NC} = 3.5\text{V}$, $I_{COM} = -10\text{mA}$, Test Circuit 1	$+25^\circ\text{C}$		4.5	8	Ω
			-40°C to $+85^\circ\text{C}$			8.5	Ω
On-Resistance Match Between Channels	ΔR_{ON}	$V_+ = 4.5\text{V}$, V_{NO} or $V_{NC} = 3.5\text{V}$, $I_{COM} = -10\text{mA}$, Test Circuit 1	$+25^\circ\text{C}$		0.15	0.3	Ω
			-40°C to $+85^\circ\text{C}$			0.4	Ω
On-Resistance Flatness	$R_{FLAT(ON)}$	$V_+ = 4.5\text{V}$, V_{NO} or $V_{NC} = 1.0\text{V}, 2.0\text{V}, 3.5\text{V}$, $I_{COM} = -10\text{mA}$, Test Circuit 1	$+25^\circ\text{C}$		2.3	3.3	Ω
			-40°C to $+85^\circ\text{C}$			3.7	Ω
Source OFF Leakage Current	$I_{NC(OFF)}, I_{NO(OFF)}$	$V_+ = 5.5\text{V}$, V_{NO} or $V_{NC} = 1.0\text{V}, 4.5\text{V}$, $V_{COM} = 4.5\text{V}, 1.0\text{V}$	-40°C to $+85^\circ\text{C}$			1	μA
Channel ON Leakage Current	$I_{NC(ON)}, I_{NO(ON)}, I_{COM(ON)}$	$V_+ = 5.5\text{V}$, $V_{COM} = 1.0\text{V}, 4.5\text{V}$, V_{NO} or $V_{NC} = 1.0\text{V}, 4.5\text{V}$, or floating	-40°C to $+85^\circ\text{C}$			1	μA
DIGITAL INPUTS							
Input High Voltage	V_{INH}		-40°C to $+85^\circ\text{C}$	1.5			V
Input Low Voltage	V_{INL}		-40°C to $+85^\circ\text{C}$			0.6	V
Input Leakage Current	I_{IN}	$V_+ = 5.5\text{V}$, $V_{IN} = 0$ or 5.5V	-40°C to $+85^\circ\text{C}$			1	μA
DYNAMIC CHARACTERISTICS							
Turn-On Time	t_{ON}	V_{NO} or $V_{NC} = 3.0\text{V}$, $V_{IH} = 1.5\text{V}$, $V_{IL} = 0\text{V}$, $R_L = 300\Omega$, $C_L = 35\text{pF}$, Test Circuit 2	$+25^\circ\text{C}$		20		ns
Turn-Off Time	t_{OFF}	V_{NO} or $V_{NC} = 3.0\text{V}$, $V_{IH} = 1.5\text{V}$, $V_{IL} = 0\text{V}$, $R_L = 300\Omega$, $C_L = 35\text{pF}$, Test Circuit 2	$+25^\circ\text{C}$		15		ns
Break-Before-Make Time Delay	t_D	V_{NO1} or $V_{NC1} = V_{NO2}$ or $V_{NC2} = 3\text{V}$, $R_L = 300\Omega$, $C_L = 35\text{pF}$, Test Circuit 3	$+25^\circ\text{C}$		5		ns
Skew	t_{SKEW}	$R_S = 39\Omega$, $C_L = 50\text{pF}$, Test Circuit 4	$+25^\circ\text{C}$		5		ns
Off Isolation	O_{ISO}	$R_L = 50\Omega$, $C_L = 5\text{pF}$, Signal = 0dBm , Test Circuit 5	$f = 10\text{MHz}$	$+25^\circ\text{C}$		-51	dB
			$f = 1\text{MHz}$	$+25^\circ\text{C}$		-72	dB
-3dB Bandwidth	BW	Signal = 0dBm , $R_L = 50\Omega$, $C_L = 5\text{pF}$, Test Circuit 6	$+25^\circ\text{C}$		270		MHz
Source OFF Capacitance	$C_{NC(OFF)}, C_{NO(OFF)}$	$f = 1\text{MHz}$	$+25^\circ\text{C}$		5.5		pF
Channel ON Capacitance	$C_{NC(ON)}, C_{NO(ON)}, C_{COM(ON)}$	$f = 1\text{MHz}$	$+25^\circ\text{C}$		15.5		pF
POWER REQUIREMENTS							
Power Supply Range	V_+		-40°C to $+85^\circ\text{C}$	1.8		5.5	V
Power Supply Current	I_+	$V_+ = 5.5\text{V}$, $V_{IN} = 0\text{V}$ or V_+	-40°C to $+85^\circ\text{C}$			5	μA

ELECTRICAL CHARACTERISTICS

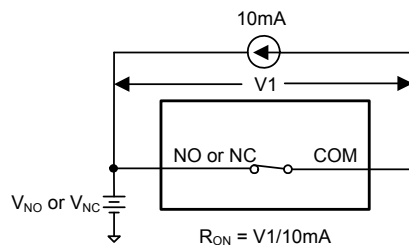
($V_+ = +2.7V$ to $+3.6V$, $V_{IH} = +1.4V$, $V_{IL} = +0.5V$, $T_A = -40^\circ C$ to $+85^\circ C$, Typical values are at $V_+ = 3.0V$, $T_A = +25^\circ C$, unless otherwise noted.)

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 $V_{NC} = 1.5V$, $I_{COM} = -10mA$, Test Circuit 1	$+25^\circ C$		7	10	Ω
			$-40^\circ C$ to $+85^\circ C$			10.5	Ω
On-Resistance Match Between Channels	ΔR_{ON}	$V_+ = 2.7V$, V_{NO} or $V_{NC} = 1.5V$, $I_{COM} = -10mA$, Test Circuit 1	$+25^\circ C$		0.15	0.3	Ω
			$-40^\circ C$ to $+85^\circ C$			0.4	Ω
On-Resistance Flatness	$R_{FLAT(ON)}$	$V_+ = 2.7V$, V_{NO} or $V_{NC} = 1.0V, 1.5V, 2.0V$, $I_{COM} = -10mA$, Test Circuit 1	$+25^\circ C$		3	4	Ω
			$-40^\circ C$ to $+85^\circ C$			4.3	Ω
Source OFF Leakage Current	$I_{NC(OFF)}, I_{NO(OFF)}$	$V_+ = 3.6V$, V_{NO} or $V_{NC} = 0.3V, 3.3V$, $V_{COM} = 3.3V, 0.3V$	$-40^\circ C$ 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			V
Input Low Voltage	V_{INL}		$-40^\circ C$ to $+85^\circ C$			0.5	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_{NO} or $V_{NC} = 1.5V$, $V_{IH} = 1.5V$, $V_{IL} = 0V$, $R_L = 300\Omega$, $C_L = 35pF$, Test Circuit 2	$+25^\circ C$		30		ns
Turn-Off Time	t_{OFF}	V_{NO} or $V_{NC} = 1.5V$, $V_{IH} = 1.5V$, $V_{IL} = 0V$, $R_L = 300\Omega$, $C_L = 35pF$, Test Circuit 2	$+25^\circ C$		25		ns
Break-Before-Make Time Delay	t_D	V_{NO1} or $V_{NC1} = V_{NO2}$ or $V_{NC2} = 3V$, $R_L = 300\Omega$, $C_L = 35pF$, Test Circuit 3	$+25^\circ C$		8		ns
Skew	t_{SKEW}	$R_S = 39\Omega$, $C_L = 50pF$, Test Circuit 4	$+25^\circ C$		2		ns
Off Isolation	O_{ISO}	$R_L = 50\Omega$, $C_L = 5pF$, Signal = 0dBm, Test Circuit 5	$f = 10MHz$	$+25^\circ C$		-51	dB
			$f = 1MHz$	$+25^\circ C$		-72	dB
-3dB Bandwidth	BW	Signal = 0dBm, $R_L = 50\Omega$, $C_L = 5pF$, Test Circuit 6	$+25^\circ C$		270		MHz
Source OFF Capacitance	$C_{NC(OFF)}, C_{NO(OFF)}$	$f = 1MHz$	$+25^\circ C$		5.5		pF
Channel ON Capacitance	$C_{NC(ON)}, C_{NO(ON)}, C_{COM(ON)}$	$f = 1MHz$	$+25^\circ C$		15.5		pF
POWER REQUIREMENTS							
Power Supply Range	V_+		$-40^\circ C$ to $+85^\circ C$	1.8		5.5	V
Power Supply Current	I_+	$V_+ = 5.5V$, $V_{IN} = 0V$ or V_+	$-40^\circ C$ to $+85^\circ C$			5	μA

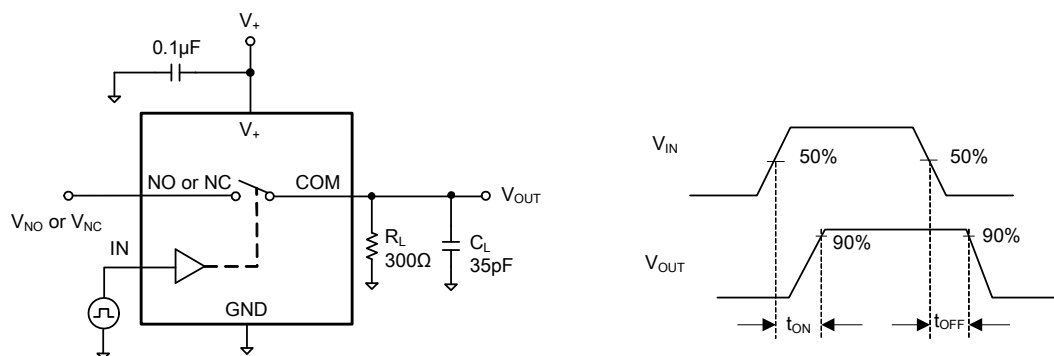
TYPICAL PERFORMANCE CHARACTERISTICS



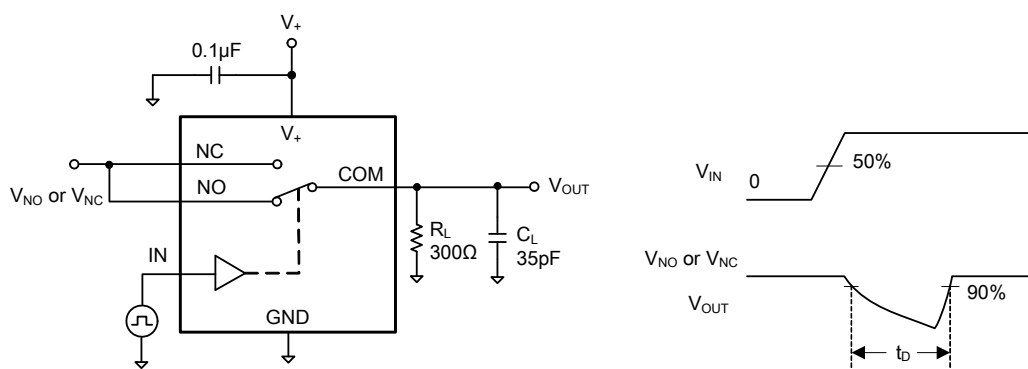
TEST CIRCUITS



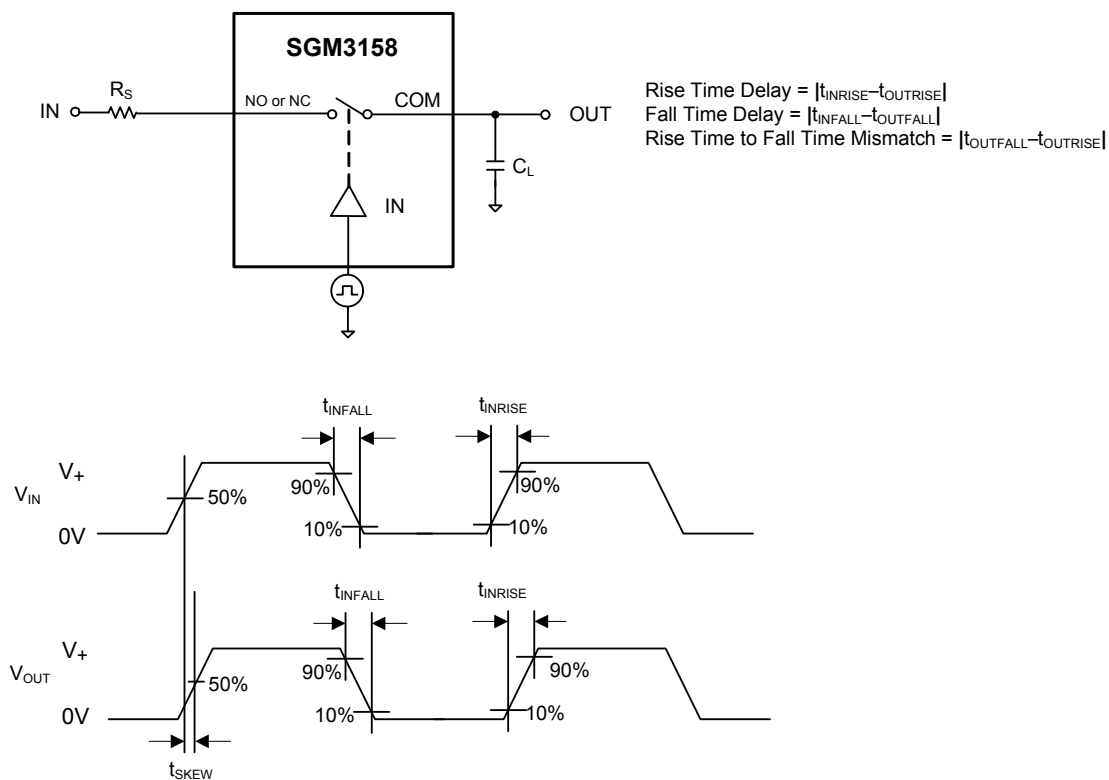
Test Circuit 1. On Resistance



Test Circuit 2. Switching Times

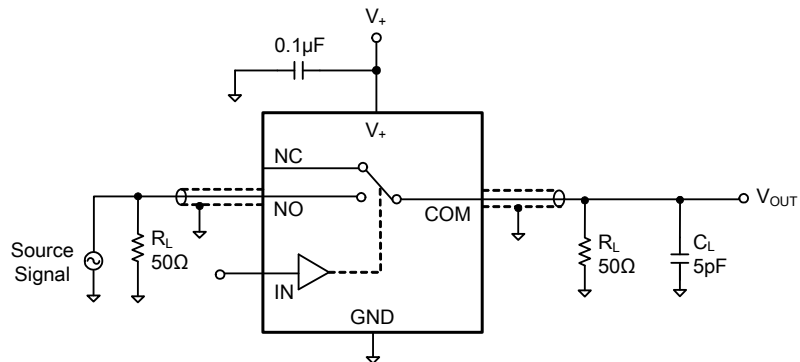
Test Circuit 3. Break-Before-Make Time Delay, t_D

TEST CIRCUITS (Cont.)

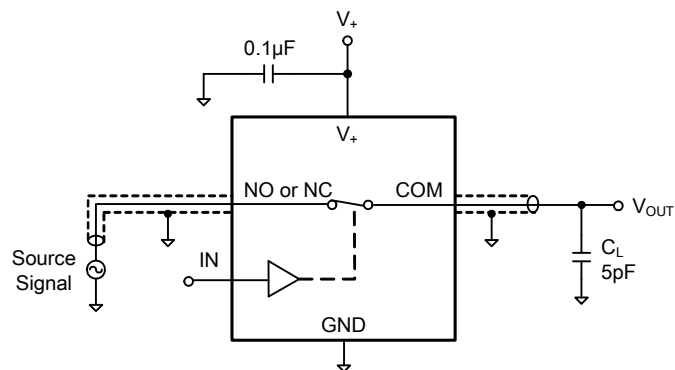


Test Circuit 4. Output Signal Skew

TEST CIRCUITS (Cont.)



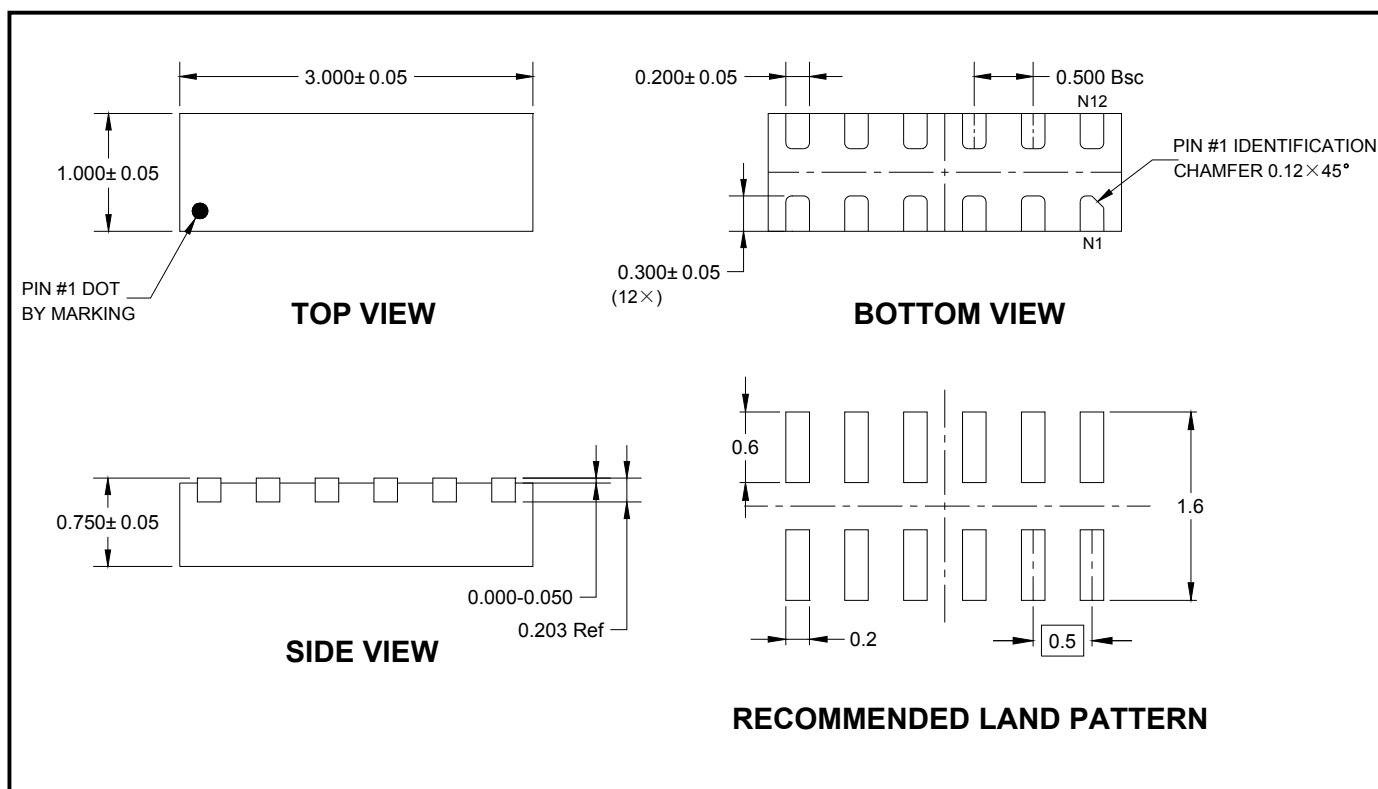
Test Circuit 5. Off Isolation



Test Circuit 6. -3dB Bandwidth

PACKAGE OUTLINE DIMENSIONS

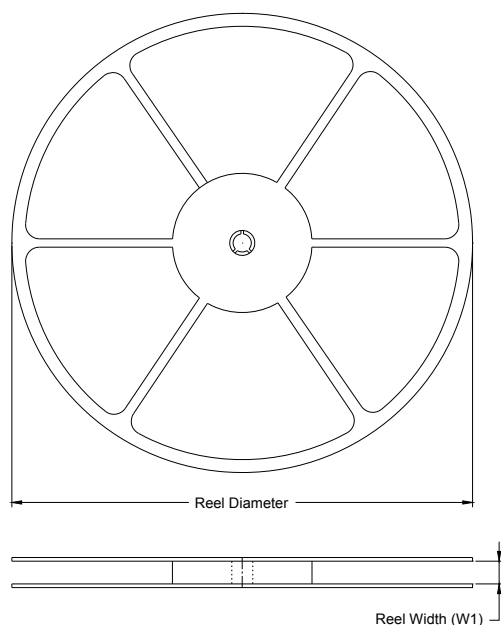
TDFN-3×1-12L



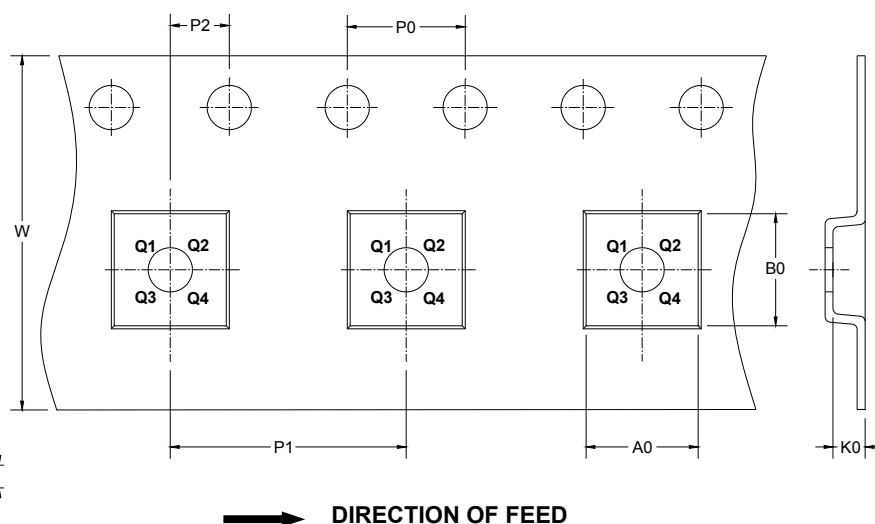
NOTE: All linear dimensions are in millimeters.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



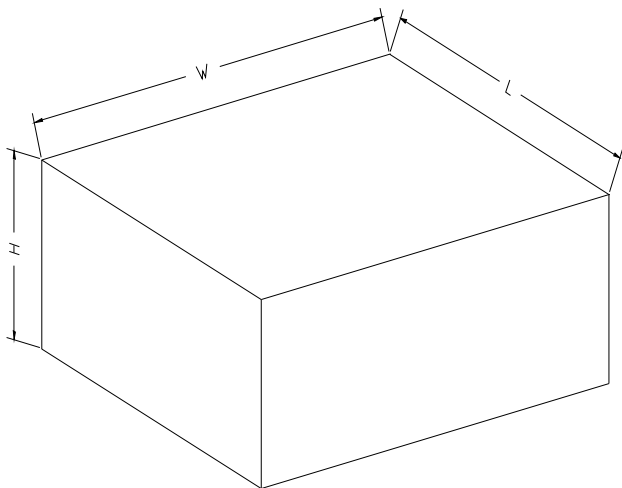
TAPE DIMENSIONS



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
TDFN-3×1-12L	7"	9.0	1.15	3.15	0.88	4.0	4.0	2.0	8.0	Q1

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