



SGM4157 SPDT 1Ω Analog Switch

GENERAL DESCRIPTION

The SGM4157 is a single Low on-resistance (1Ω), fast single-pole double-throw (SPDT) CMOS switch. It is designed for low operating voltage, high current switching of speaker output for cell phone applications. The SGM4157 can handle a balanced microphone/speaker generator in a monophone mode. The device contains a break-before-make (BBM) feature.

The control input, IN, tolerates input drive signals up to 5.5V, independent of supply voltage.

SGM4157 is available in Green TDFN-2×2-6L package.

APPLICATIONS

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

FUNCTION TABLE

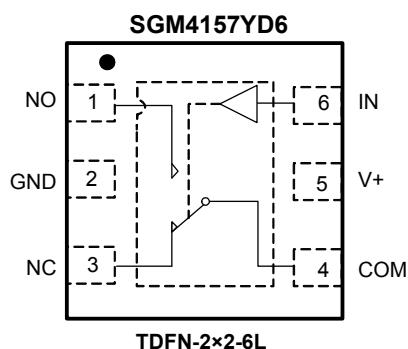
LOGIC	NO	NC
0	OFF	ON
1	ON	OFF

Switches Shown For Logic "0" Input.

FEATURES

- **Voltage Operation:** 1.8V to 5.5V
- **On-Resistance:** 0.8Ω (TYP) at 4.5V
- **-3dB Bandwidth:** 80MHz
- **High Off-Isolation:** -60dB at 1MHz
- **Rail-to-Rail Operation**
- **Low Static Power**
- **TTL/CMOS Compatible**
- **Break-Before-Make Switching**
- **Extended Industrial Temperature Range:** -40°C to +85°C
- **Microsize Package**

PIN CONFIGURATION (TOP VIEW)



PIN DESCRIPTION

NAME	PIN	FUNCTION
NO	1	Normally-Open Terminal.
GND	2	Ground.
NC	3	Normally-Closed Terminal.
COM	4	Common Terminal.
V+	5	Power Supply.
IN	6	Digital Control Pin to Connect the COM Terminal to the NO or NC Terminals.
Exposed Pad	GND	Exposed pad should be soldered to PCB board and connected to GND.

NOTE: NO, NC and COM terminal may be an input or output.

PACKAGE/ORDERING INFORMATION

MODEL	PIN- PACKAGE	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKAGE OPTION
SGM4157	TDFN-2×2-6L	-40°C to +85°C	SGM4157YD6/TR	4157	Tape and Reel, 3000

ABSOLUTE MAXIMUM RATINGS

V₊, IN to GND.....-0.3V to 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.....±300mA
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 (HBM).....3000V

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.

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.)

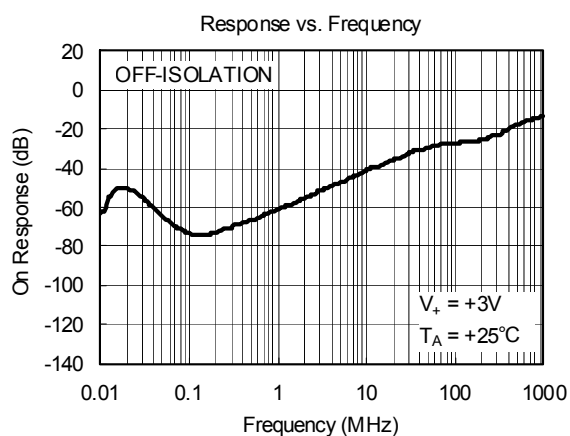
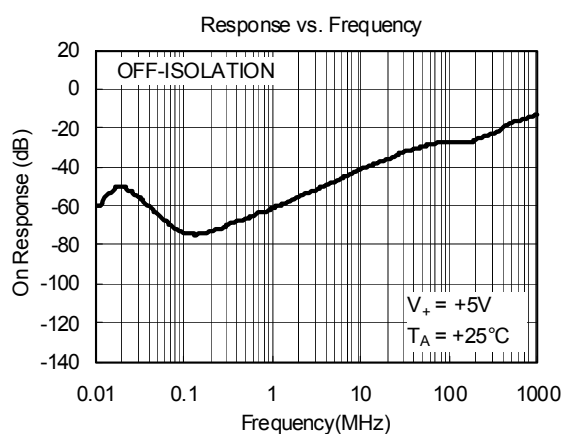
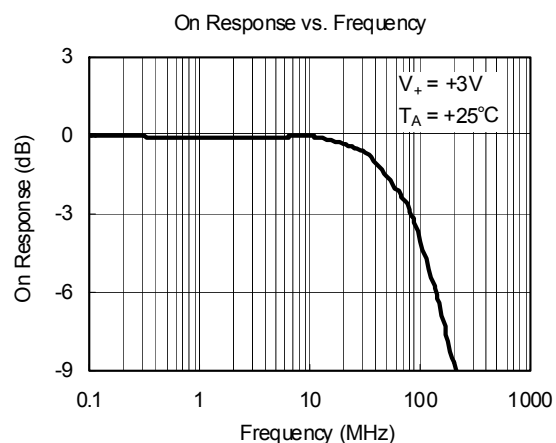
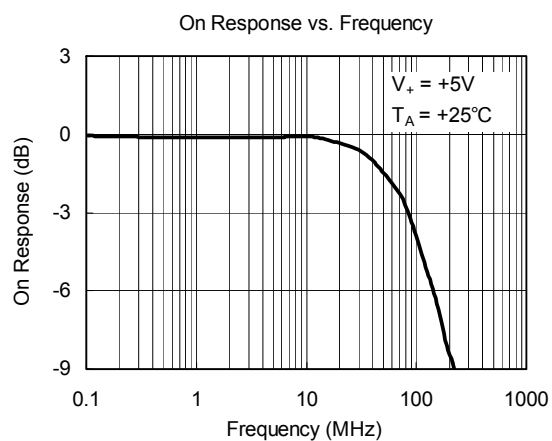
PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
ANALOG SWITCH							
Analog Signal Range	V_{NO}, V_{NC}, V_{COM}		-40°C to $+85^\circ\text{C}$	0		V_+	V
On-Resistance	R_{ON}	$V_+ = 4.5\text{V}$, V_{NO} or $V_{NC} = 3.5\text{V}$, $I_{COM} = -10\text{mA}$, Test Circuit 1	$+25^\circ\text{C}$		0.8		Ω
			-40°C to $+85^\circ\text{C}$			2	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	$+25^\circ\text{C}$		0.43		Ω
			-40°C to $+85^\circ\text{C}$			0.47	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	$+25^\circ\text{C}$		0.2		Ω
			-40°C to $+85^\circ\text{C}$			0.3	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}	$V_+ = +5.5\text{V}$, $V_{IN} = 0\text{V}$ or 5.5V	-40°C to $+85^\circ\text{C}$		0.001	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	$+25^\circ\text{C}$		23		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	$+25^\circ\text{C}$		23		ns
Skew	t_{SKEW}	$R_S = 39\Omega$, $C_L = 50\text{pF}$, Test Circuit 4	$+25^\circ\text{C}$		9.0		ns
Off Isolation	O_{ISO}	$R_L = 50\Omega$, Signal = 0dBm , $C_L = 5\text{pF}$, Test Circuit 5	$f = 10\text{MHz}$ $+25^\circ\text{C}$		-40		dB
			$f = 1\text{MHz}$ $+25^\circ\text{C}$		-60		dB
-3dB Bandwidth	BW	$R_L = 50\Omega$, Signal = 0dBm , $C_L = 5\text{pF}$, Test Circuit 6	$+25^\circ\text{C}$		80		MHz
Source OFF Capacitance	$C_{NC(OFF)}, C_{NO(OFF)}$	$f = 1\text{MHz}$	$+25^\circ\text{C}$		20		pF
Channel ON Capacitance	$C_{NC(ON)}, C_{NO(ON)}, C_{COM(ON)}$	$f = 1\text{MHz}$	$+25^\circ\text{C}$		73		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 $+85^\circ\text{C}$		0.001	3	μA

ELECTRICAL CHARACTERISTICS

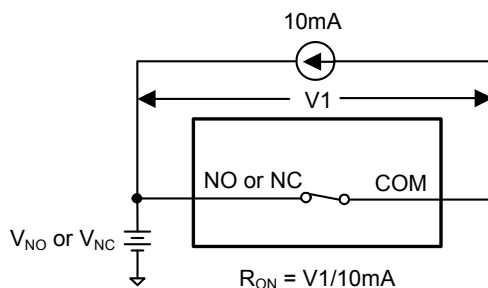
($V_+ = +2.7V$ to $+3.6V$, $V_{IH} = +1.4V$, $V_{IL} = +0.5V$, $T_A = -40^\circ C$ to $+85^\circ C$. Typical values are at $V_+ = 3.0V$, $T_A = +25^\circ C$, unless otherwise noted.)

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	$+25^\circ C$		1.9		Ω
			$-40^\circ C$ to $+85^\circ C$			2.3	Ω
On-Resistance Match Between Channels	ΔR_{ON}	$V_+ = 2.7V$, V_{NO} or $V_{NC} = 1.5V$, $I_{COM} = -10mA$, Test Circuit 1	$+25^\circ C$		0.45		Ω
			$-40^\circ C$ to $+85^\circ C$			0.5	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	$+25^\circ C$		0.2		Ω
			$-40^\circ C$ to $+85^\circ C$			0.35	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 $+85^\circ C$	0.9			V
Input Low Voltage	V_{INL}		$-40^\circ C$ to $+85^\circ C$			0.55	V
Input Leakage Current	I_{IN}	$V_+ = 5.5V$, $V_{IN} = 0V$ or $3.6V$	$-40^\circ C$ to $+85^\circ C$		0.001	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	$+25^\circ C$		28		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	$+25^\circ C$		22		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	$+25^\circ C$		27		ns
Skew	t_{SKEW}	$R_S = 39\Omega$, $C_L = 50pF$, Test Circuit 4	$+25^\circ C$		9		ns
Off Isolation	O_{ISO}	$R_L = 50\Omega$, Signal = 0dBm, $C_L = 5pF$, Test Circuit 5	$f = 10MHz$	$+25^\circ C$		-40	dB
			$f = 1MHz$	$+25^\circ C$		-60	dB
-3dB Bandwidth	BW	Signal = 0dBm, $R_L = 50\Omega$, $C_L = 5pF$, Test Circuit 6	$+25^\circ C$		80		MHz
Source OFF Capacitance	$C_{NC(OFF)}, C_{NO(OFF)}$	$f = 1MHz$	$+25^\circ C$		20		pF
Channel ON Capacitance	$C_{NC(ON)}, C_{NO(ON)}, C_{COM(ON)}$	$f = 1MHz$	$+25^\circ C$		73		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 $+85^\circ C$		0.001	3	μA

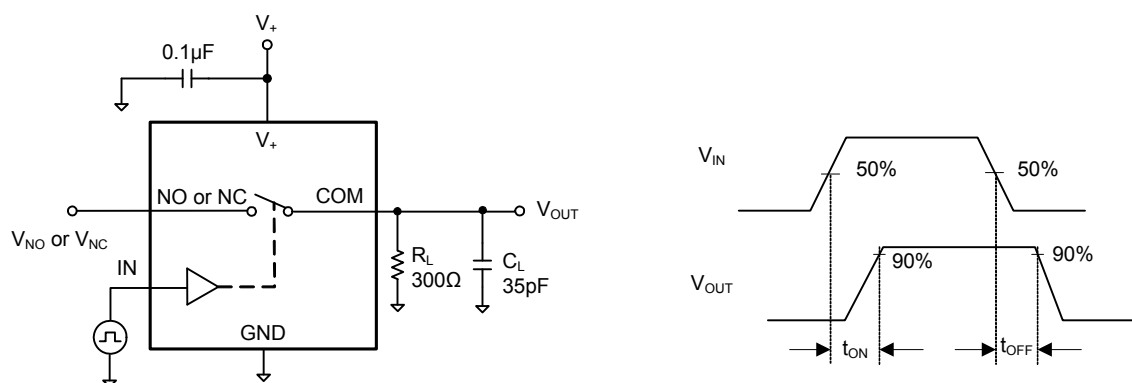
TYPICAL PERFORMANCE CHARACTERISTICS



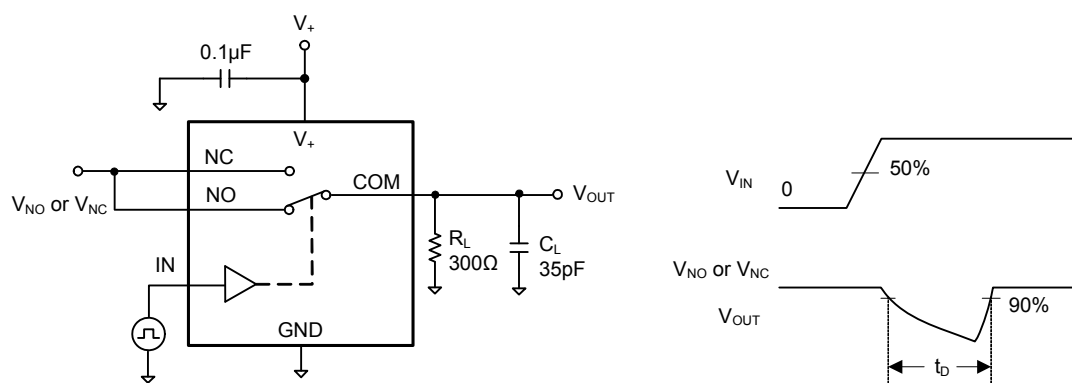
TEST CIRCUITS



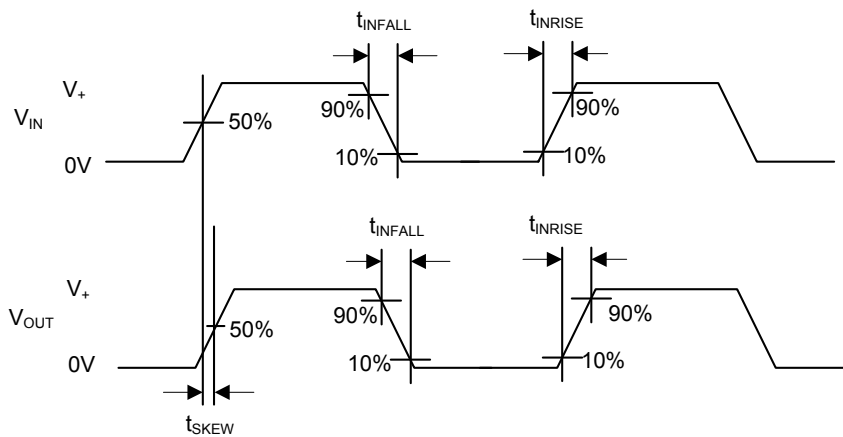
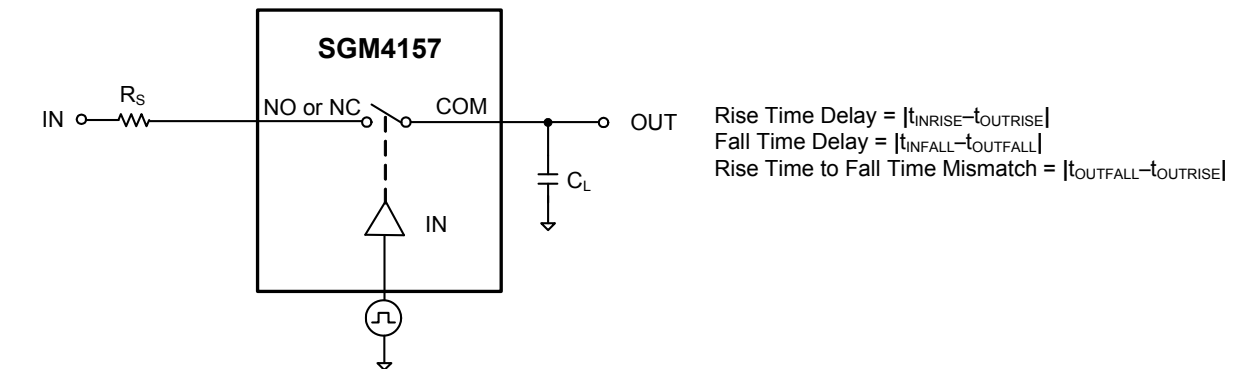
Test Circuit 1. On Resistance



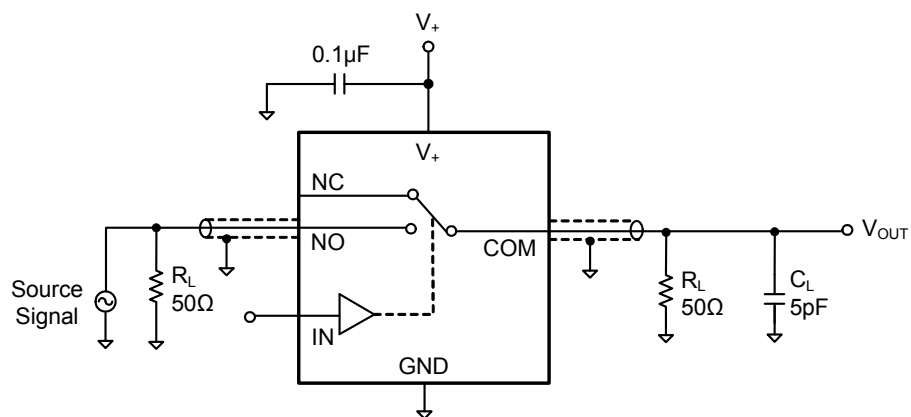
Test Circuit 2. Switching Times

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

TEST CIRCUITS (Cont.)

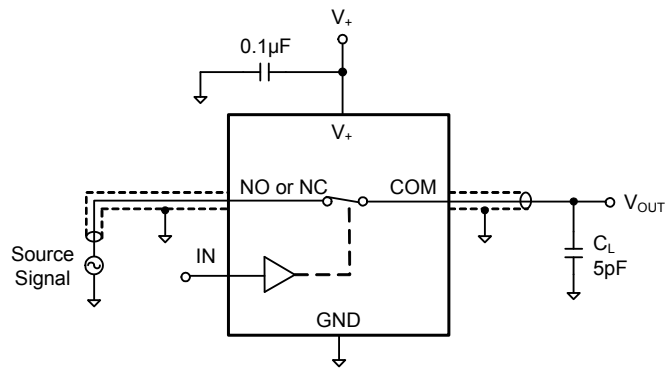


Test Circuit 4. Output Signal Skew



Test Circuit 5. Off Isolation

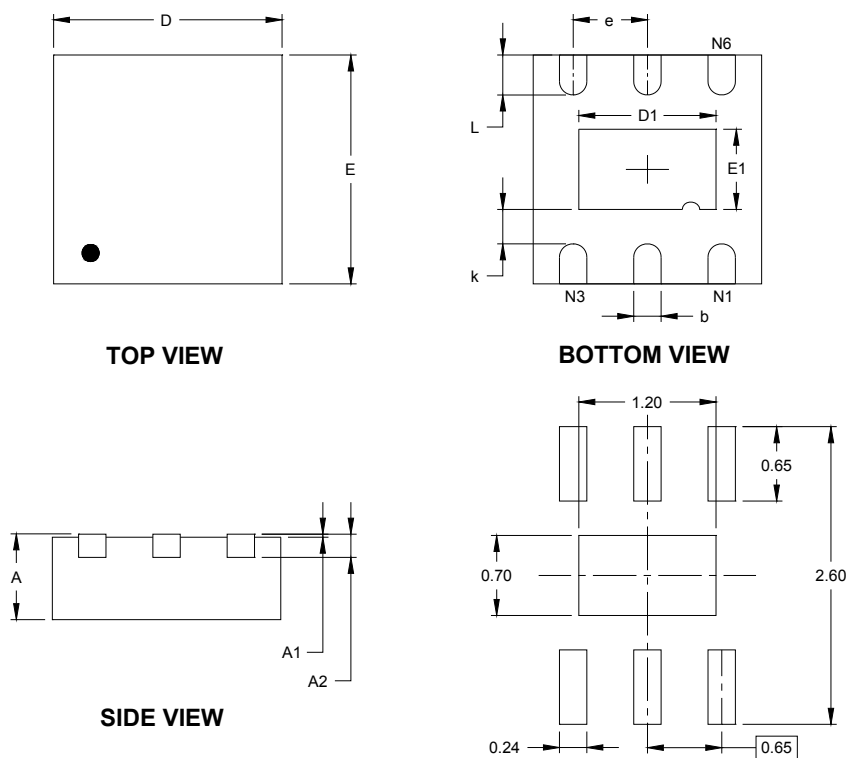
TEST CIRCUITS (Cont.)



Test Circuit 6. -3dB Bandwidth

PACKAGE OUTLINE DIMENSIONS

TDFN-2×2-6L

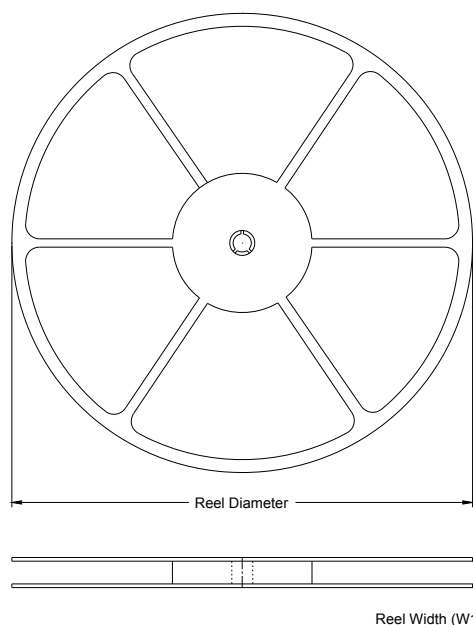


RECOMMENDED LAND PATTERN (Unit: mm)

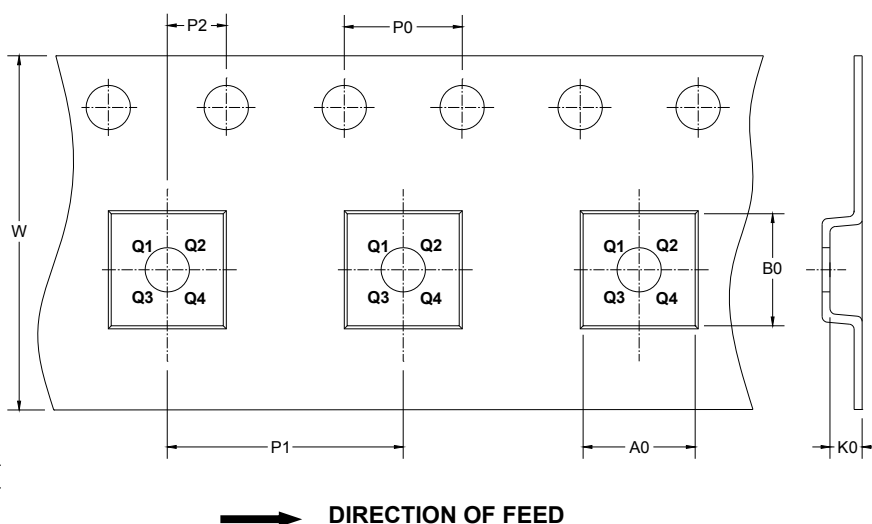
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203 REF		0.008 REF	
D	1.900	2.100	0.075	0.083
D1	1.100	1.300	0.043	0.051
E	1.900	2.100	0.075	0.083
E1	0.600	0.800	0.024	0.031
k	0.200 MIN		0.008 MIN	
b	0.180	0.300	0.007	0.012
e	0.650 TYP		0.026 TYP	
L	0.250	0.450	0.010	0.018

TAPE AND REEL INFORMATION

REEL DIMENSIONS



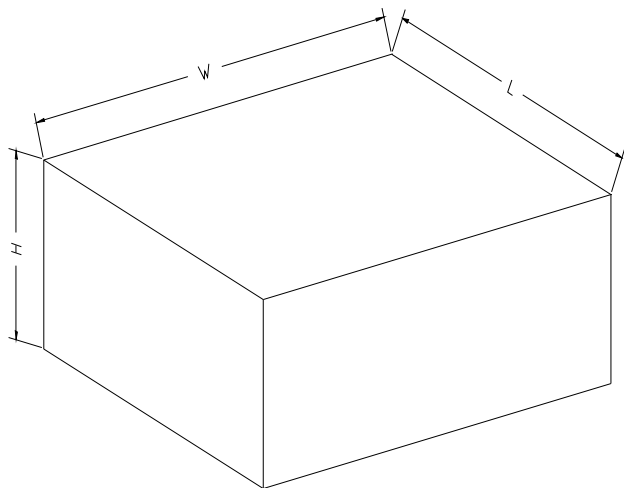
TAPE DIMENSIONS



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-2×2-6L	7"	9.5	2.30	2.30	1.10	4.00	4.00	2.00	8.00	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