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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/ringtone 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 a DFN-6 package.

APPLICATIONS

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

FUNCTION TABLE

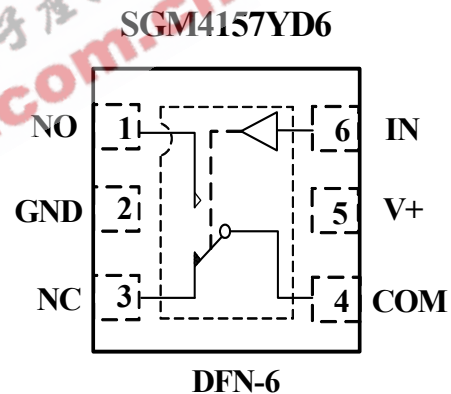
LOGIC	NO	NC
0	OFF	ON
1	ON	OFF

Switches Shown For Logic "0" Input

FEATURES

- Voltage Operation : 1.8 V to 5.5 V
- On-Resistance: 0.8Ω (TYP) at 4.5V
- -3dB Bandwidth: 80 MHz
- 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 CONFIGURATIONS (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

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



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	TPY	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}	$V_+ = 2.7V, V_{NO}$ or $V_{NC} = 1.5V,$ $I_{COM} = -10$ mA, Test Circuit 1	+25°C		1.9		Ω
			-40°C to +85°C			2.3	Ω
On-Resistance Match Between Channels	ΔR_{ON}	$V_+ = 2.7V, V_{NO}$ or $V_{NC} = 1.5V,$ $I_{COM} = -10$ mA, Test Circuit 1	+25°C		0.45		Ω
			-40°C to +85°C			0.5	Ω
On-Resistance Flatness	$R_{FLAT(ON)}$	$V_+ = 2.7V, V_{NO}$ or $V_{NC} = 1.0V, 1.5V, 2.0V,$ $I_{COM} = -10$ mA, Test Circuit 1	+25°C		0.2		Ω
			-40°C to +85°C			0.35	Ω
Source OFF Leakage current	$I_{NC(OFF)}, I_{NO(OFF)}$	$V_+ = 3.6V, V_{NO}$ or $V_{NC} = 0.3V, 3.3V, V_{COM} = 0.3V, 3.3V,$	-40°C to +85°C			1	μA
Channel ON Leakage current	$I_{NC(ON)}, I_{NO(ON)}, I_{COM(ON)}$	$V_+ = 3.6V, V_{COM} = 0.3V, 3.3V,$ 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	0.9			V
Input Low Voltage	V_{INL}		-40°C to +85°C			0.55	V
Input Leakage Current	I_{IN}	$V_+ = +3.6V, V_{IN} = 0$ or $5.5V$	-40°C to +85°C		0.001	1	μA
DYNAMIC CHARACTERISTICS							
Turn-On Time	t_{ON}	V_{NO} or $V_{NC} = 1.5V,$ $R_L = 300\Omega, C_L = 35pF,$ Test Circuit 2; $V_{IH} = 1.5V, V_{IL} = 0V$	+25°C		28		ns
Turn-Off Time	t_{OFF}	V_{NO} or $V_{NC} = 1.5V,$ $R_L = 300\Omega, C_L = 35pF,$ Test Circuit 2; $V_{IH} = 1.5V, V_{IL} = 0V$	+25°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°C		27		ns
Skew	t_{SKEW}	$R_S = 39\Omega, C_L = 50pF,$ Test Circuit 4	+25°C		9		ns
Off Isolation	O_{ISO}	$R_L = 50\Omega, C_L = 5pF,$ Signal = 0dBm, Test Circuit 5	f = 10MHz	+25°C	-40		dB
			f = 1MHz	+25°C	-60		dB
Bandwidth -3 dB	BW	Signal = 0dBm, $R_L = 50\Omega, C_L = 5pF,$ Test Circuit 6	+25°C		80		MHz
Source OFF Capacitance	$C_{NC(OFF)}, C_{NO(OFF)}$	f = 1MHz	+25°C		20		pF
Channel ON Capacitance	$C_{NC(ON)}, C_{NO(ON)}, C_{COM(ON)}$	f = 1MHz	+25°C		73		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		0.001	3	μA

Specifications subject to change without notice.

ELECTRICAL CHARACTERISTICS

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

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TPY	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 $V_{NC} = 3.5V,$ $I_{COM} = -10$ mA, Test Circuit 1	+25°C		0.8		Ω
			-40°C to +85°C			2	Ω
On-Resistance Match Between Channels	ΔR_{ON}	$V_+ = 4.5V, V_{NO}$ or $V_{NC} = 3.5V,$ $I_{COM} = -10$ mA, Test Circuit 1	+25°C		0.43		Ω
			-40°C to +85°C			0.47	Ω
On-Resistance Flatness	$R_{FLAT(ON)}$	$V_+ = 4.5V, V_{NO}$ or $V_{NC} = 1.0V, 2.0V,$ $3.5V, I_{COM} = -10$ mA, Test Circuit 1	+25°C		0.2		Ω
			-40°C to +85°C			0.3	Ω
Source OFF Leakage current	$I_{NC(OFF)}, I_{NO(OFF)}$	$V_+ = 5.5V, V_{NO}$ or $V_{NC} = 1.0V, 4.5V,$ $V_{COM} = 1.0V, 4.5V,$	-40°C to +85°C			1	μA
Channel ON Leakage current	$I_{NC(ON)}, I_{NO(ON)},$ $I_{COM(ON)}$	$V_+ = 5.5V, V_{COM} = 1.0V, 4.5V,$ V_{NO} or $V_{NC} = 1.0V, 4.5V,$ or floating	-40°C to +85°C			1	μA
DIGITAL INPUTS							
Input High Voltage	V_{INH}		-40°C to +85°C	1.5			V
Input Low Voltage	V_{INL}		-40°C to +85°C			0.6	V
Input Leakage Current	I_{IN}	$V_+ = +5.5V, V_{IN} = 0$ or $5.5V$	-40°C to +85°C		0.001	1	μA
DYNAMIC CHARACTERISTICS							
Turn-On Time	t_{ON}	V_{NO} or $V_{NC} = 3.0V,$ $R_L = 300\Omega, C_L = 35pF,$ Test Circuit 2; $V_{IH} = 1.5V, V_{IL} = 0V$	+25°C		20		ns
Turn-Off Time	t_{OFF}	V_{NO} or $V_{NC} = 3.0V,$ $R_L = 300\Omega, C_L = 35pF,$ Test Circuit 2; $V_{IH} = 1.5V, V_{IL} = 0V$	+25°C		23		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°C		23		ns
Skew	t_{SKEW}	$R_S = 39\Omega, C_L = 50pF,$ Test Circuit 4	+25°C		9.0		ns
Off Isolation	O_{ISO}	$R_L = 50\Omega, C_L = 5pF,$ Signal = 0dBm, Test Circuit 5	$f = 10MHz$	+25°C		-40	dB
			$f = 1MHz$	+25°C		-60	dB
Bandwidth -3 dB	BW	Signal = 0dBm, $R_L = 50\Omega, C_L = 5pF,$ Test Circuit 6	+25°C		80		MHz
Source OFF Capacitance	$C_{NC(OFF)}, C_{NO(OFF)}$	$f = 1MHz$	+25°C		20		pF
Channel ON Capacitance	$C_{NC(ON)}, C_{NO(ON)},$ $C_{COM(ON)}$	$f = 1MHz$	+25°C		73		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		0.001	3	μA

Specifications subject to change without notice.

ORDERING INFORMATION

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

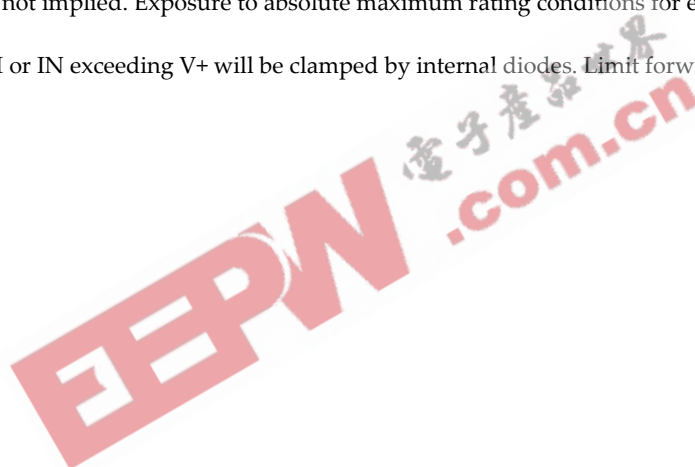
ABSOLUTE MAXIMUM RATINGS

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

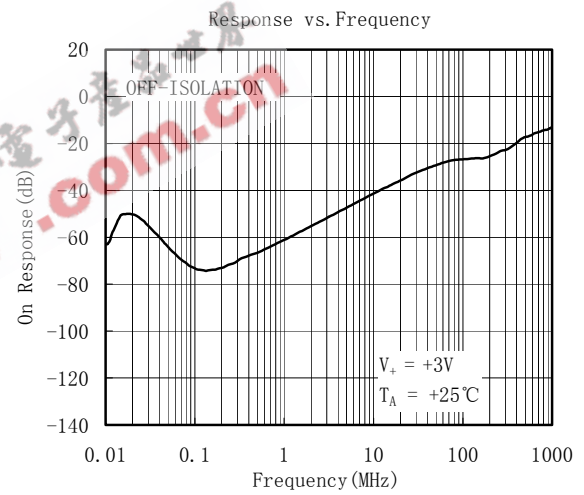
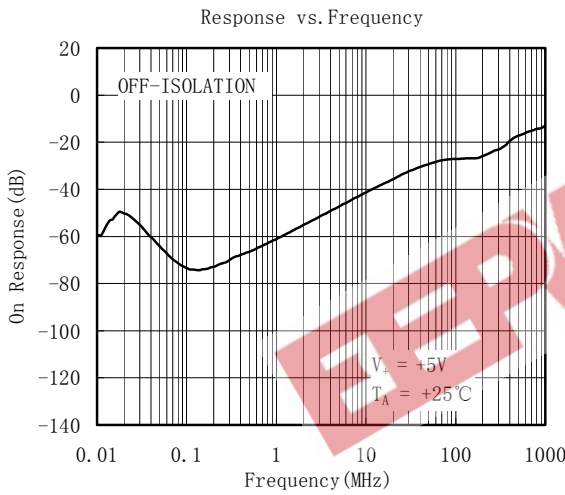
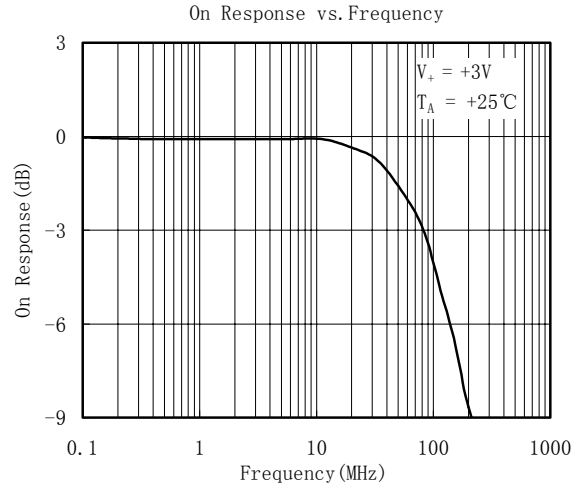
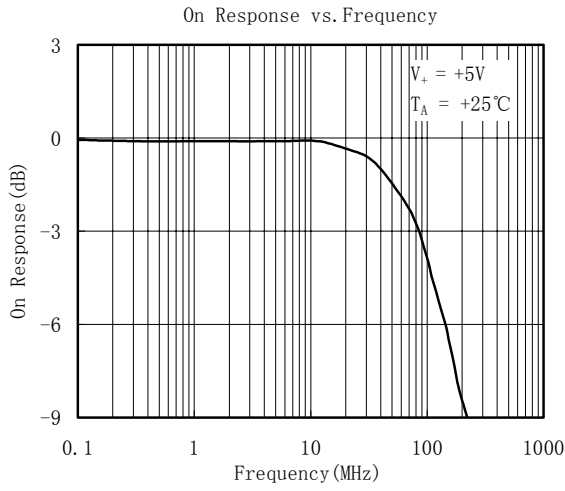
Junction Temperature.....+150°C
 Storage Temperature.....- 65°C to +150°C
 Lead Temperature (soldering, 10s).....+260°C
 ESD(HBM).....3000V

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.

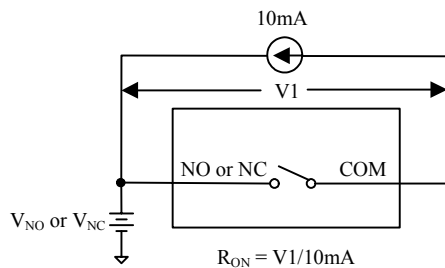
(1) Signals on NC, NO, or COM or IN exceeding V₊ will be clamped by internal diodes. Limit forward diode current to maximum current ratings.



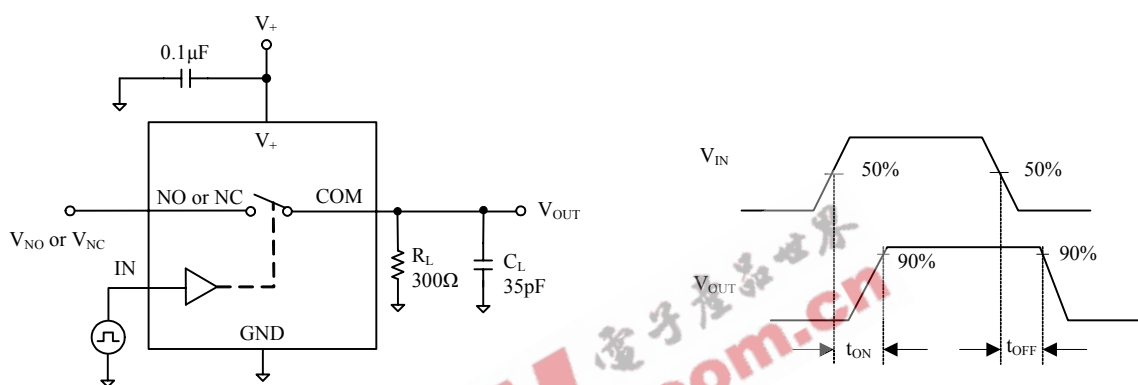
TYPICAL PERFORMANCE CHARACTERISTICS



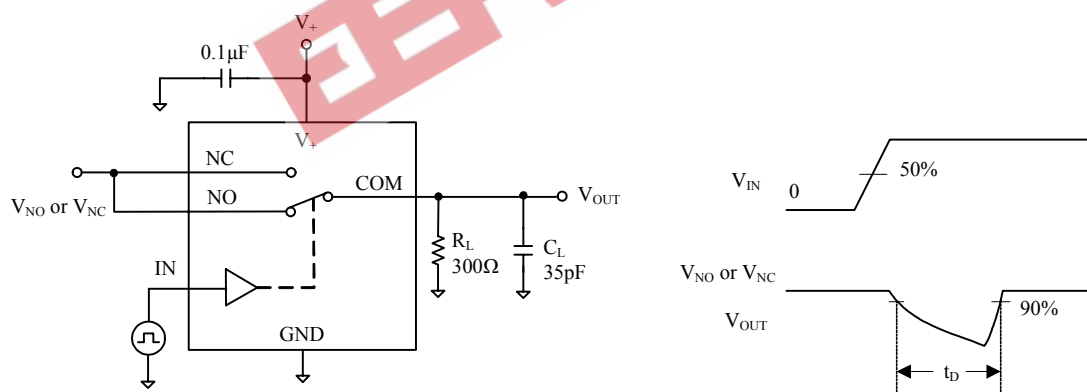
TEST CIRCUITS



Test Circuit 1. On Resistance

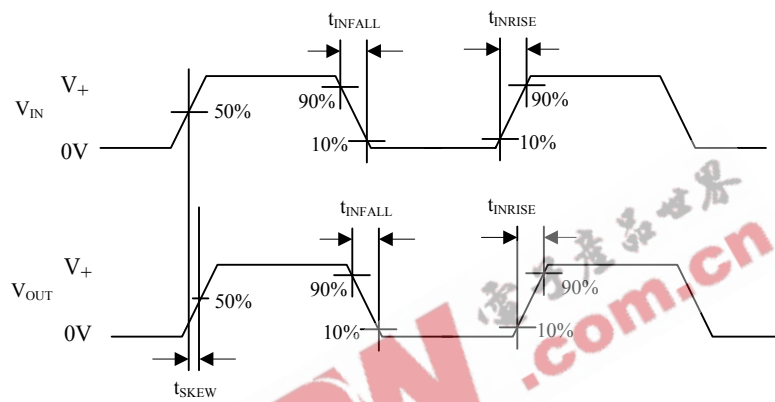
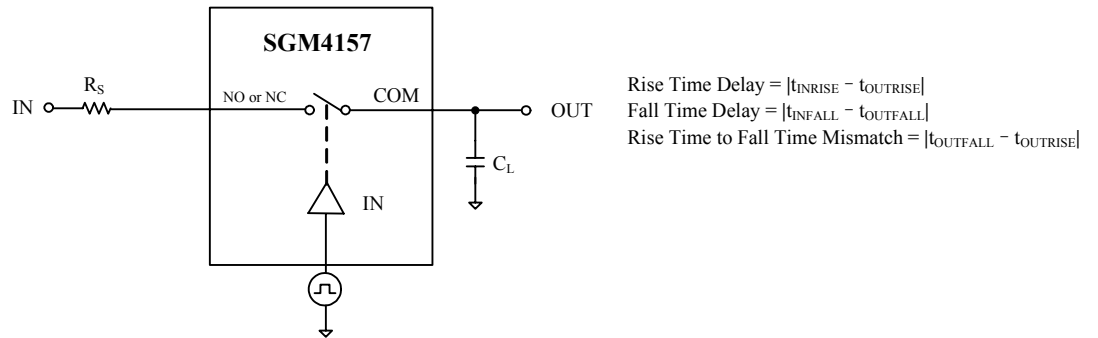


Test Circuit 2. Switching Times

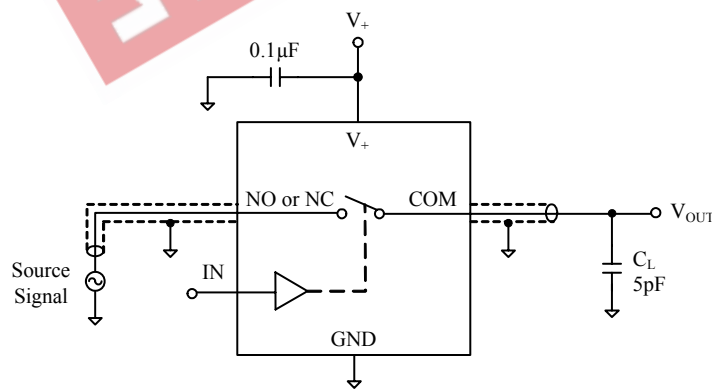


Test Circuit 3. Break-Before-Make Time Delay, t_D

TEST CIRCUITS (Cont.)

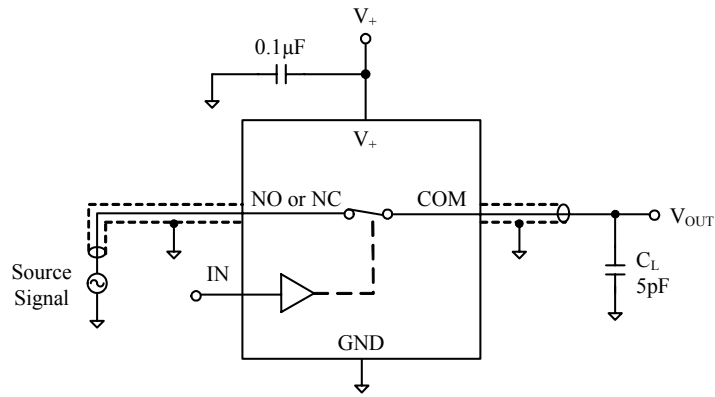


Test Circuit 4. Output Signal Skew



Test Circuit 5. Off Isolation

TEST CIRCUITS (Cont.)

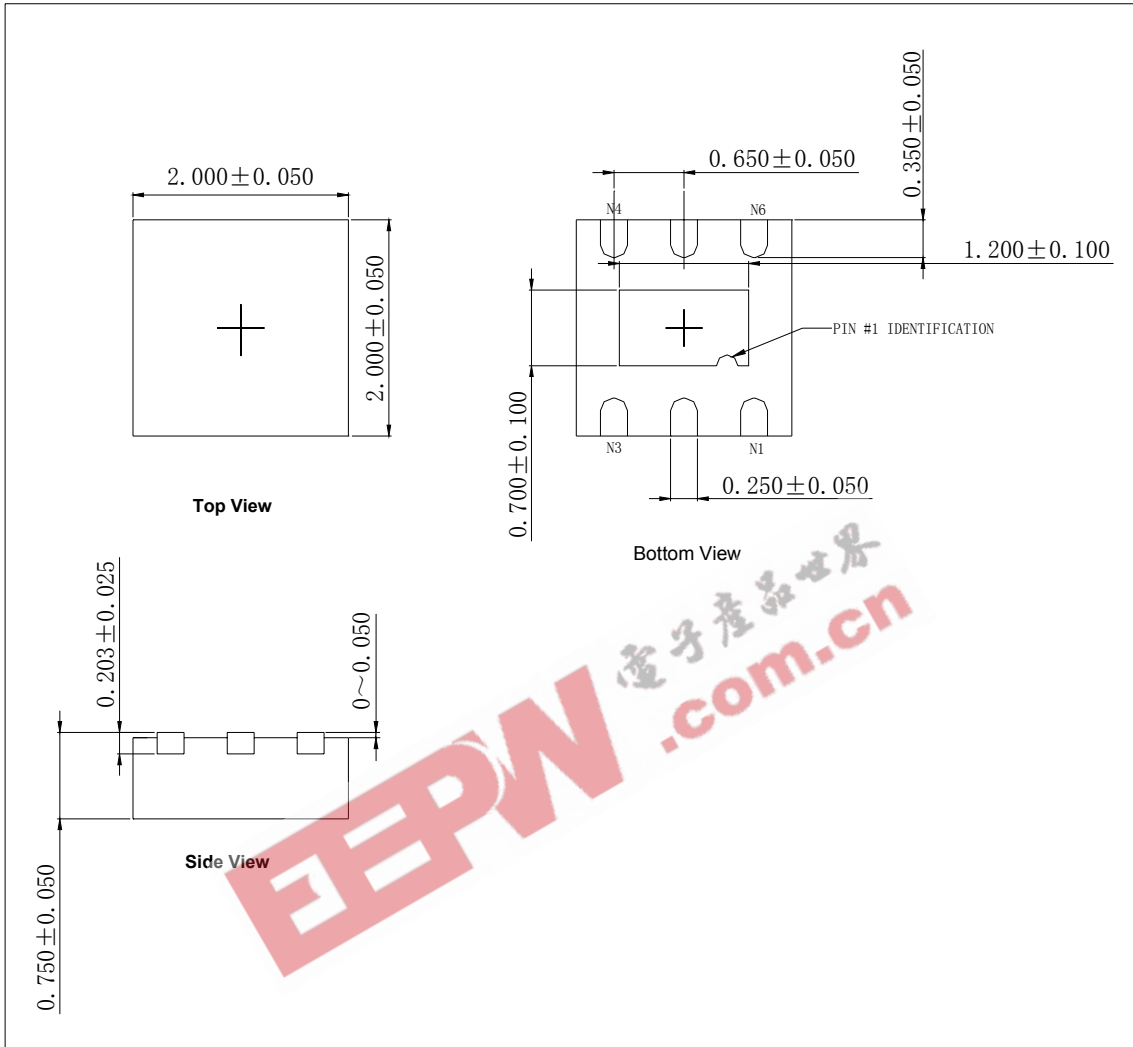


Test Circuit 6. Bandwidth

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PACKAGE OUTLINE DIMENSIONS

DFN-6



NOTES:

1. All dimensions are in millimeters.

REVISION HISTORY

Location	Page
06/07— Data Sheet REV. A	
10/07— Data Sheet changed from REV.A to REV.B	
Changes to TYPICAL PERFORMANCE CHARACTERISTICS	5



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