



SGM3003

Ultra Low On-Resistance, Low Voltage, SPDT Analog Switch

GENERAL DESCRIPTION

The SGM3003 is a bidirectional, SPDT (single-pole/double-throw), TTL/CMOS compatible analog switch. It operates from a 1.8V to 5.5V single power supply.

The SGM3003 features low on-resistance, low voltage and fast switching times. The high performances make it very suitable for multiple applications, such as portable equipment, audio and video signal routing, etc. In addition, the SGM3003 has one normally open switch and one normally closed switch. When the two switches are open, each switch has the same conductivity in both directions. Low power consumption is also one of the important reasons that make it a good choice.

The SGM3003 is available in a Green MSOP-8 package. It operates over an ambient temperature range of -40°C to +125°C.

FEATURES

- **Single Supply Voltage Range: 1.8V to 5.5V**
- **-3dB Bandwidth: 30MHz**
- **Low On-Resistance: 0.5Ω (TYP)**
- **Low On-Resistance Flatness**
- **Fast Switching Times ($V_+ = 5V$):**
 - t_{ON} : 21ns
 - t_{OFF} : 9ns
- **Low Power Consumption**
- **Rail-to-Rail Input and Output Operation**
- **TTL/CMOS Compatible**
- **-40°C to +125°C Operating Temperature Range**
- **Available in a Green MSOP-8 Package**

APPLICATIONS

Cellular Phones
Portable Equipment
Medical Equipment
Sample-and-Hold Circuits
Personal Digital Assistants
Battery-Powered Systems
Audio and Video Signal Routing

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM3003	MSOP-8	-40°C to +125°C	SGM3003XMS/TR	SGM3003 XMS XXXXX	Tape and Reel, 3000

NOTE: XXXXX = Date Code and Vendor Code.

Green (RoHS & HSF): SG Micro Corp defines "Green" to mean Pb-Free (RoHS compatible) and free of halogen substances. If you have additional comments or questions, please contact your SGMICRO representative directly.

ABSOLUTE MAXIMUM RATINGS

V₊ to GND -0.3V to 6V
 Analog, Digital Voltage Range ⁽¹⁾ -0.3V to (V₊) + 0.3V
 Continuous Current NO, NC, or COM..... ±300mA
 Peak Current NO, NC, or COM..... ±500mA
 Package Thermal Resistance @ T_A = +25°C
 MSOP-8, θ_{JA} 216°C/W
 Junction Temperature +150°C
 Storage Temperature Range -65°C to +150°C
 Lead Temperature (Soldering, 10s) +260°C
 ESD Susceptibility
 HBM..... 2000V
 MM..... 400V

NOTE:

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.

RECOMMENDED OPERATING CONDITIONS

Operating Temperature Range -40°C to +125°C

OVERSTRESS CAUTION

Stresses beyond those listed may cause permanent damage to the device. Functional operation of the device at these or any other conditions beyond those indicated in the operational section of the specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

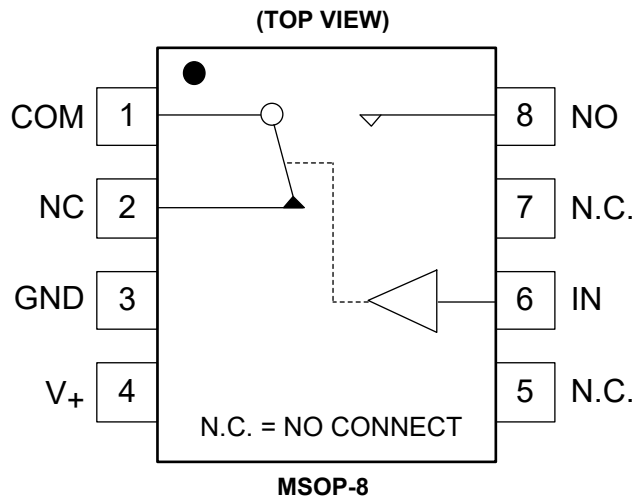
ESD SENSITIVITY CAUTION

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.

DISCLAIMER

SG Micro Corp reserves the right to make any change in circuit design, specification or other related things if necessary without notice at any time.

PIN CONFIGURATION



PIN DESCRIPTION

PIN	NAME	FUNCTION
1	COM	Common Pin.
2	NC	Normally Closed Pin.
3	GND	Ground.
4	V+	Positive Power Supply.
5, 7	N.C.	No Internal Connection.
6	IN	Digital Control Input Pin to Connect the COM Pin to the NO or NC Pins.
8	NO	Normally Open Pin.

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

FUNCTION TABLE

LOGIC	NC	NO
0	ON	OFF
1	OFF	ON

ELECTRICAL CHARACTERISTICS

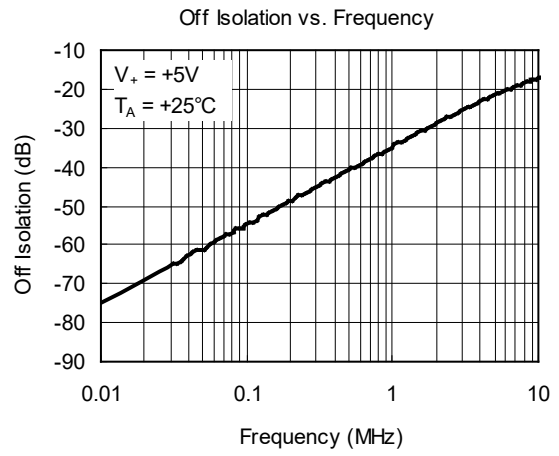
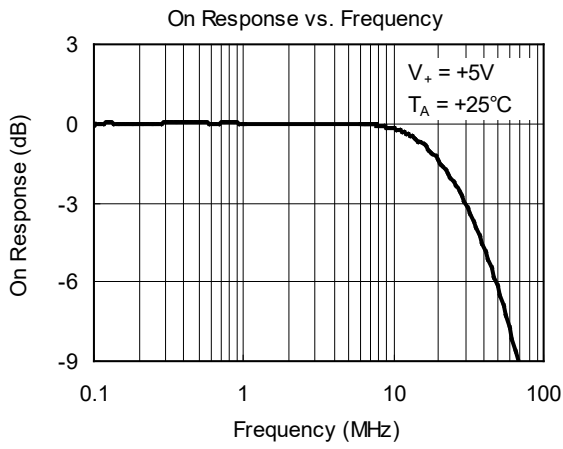
(V₊ = 5V ± 10%, GND = 0V, Full = -40°C to +125°C. Typical values are at T_A = +25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	SGM3003			
			+25°C	-40°C to +125°C	UNITS	MIN/MAX
ANALOG SWITCH						
Analog Signal Range	V _{NO} , V _{NC} , V _{COM}			0	V	MIN
				V ₊	V	MAX
On-Resistance	R _{ON}	0 ≤ V _{NO} or V _{NC} ≤ V ₊ , I _{COM} = -10mA, Test Circuit 1	0.5		Ω	TYP
			0.9	1.1	Ω	MAX
On-Resistance Flatness	R _{FLAT(ON)}	0 ≤ V _{NO} or V _{NC} ≤ V ₊ , I _{COM} = -10mA, Test Circuit 1	0.13		Ω	TYP
			0.2	0.4	Ω	MAX
LEAKAGE CURRENTS						
Source Off Leakage Current	I _{NC(OFF)} , I _{NO(OFF)}	V _{NO} or V _{NC} = 4.5V/1V, V _{COM} = 1V/4.5V, V ₊ = 5.5V, Test Circuit 2	±4		nA	TYP
			±10	±1000	nA	MAX
Channel On Leakage Current	I _{NC(ON)} , I _{NO(ON)} , I _{COM(ON)}	V _{NO} or V _{NC} = V _{COM} = 1V or 4.5V, V ₊ = 5.5V, Test Circuit 3	±4		nA	TYP
			±10	±1000	nA	MAX
DIGITAL INPUTS						
Input High Voltage	V _{INH}			2.4	V	MIN
Input Low Voltage	V _{INL}			0.8	V	MAX
Input Current	I _{INL} or I _{INH}	V _{IN} = V _{INH} or V _{INL}	±0.01		μA	TYP
			±0.1	±1	μA	MAX
DYNAMIC CHARACTERISTICS						
Turn-On Time	t _{ON}	V _{NO} or V _{NC} = 3V, R _L = 300Ω, C _L = 35pF, Test Circuit 4	21		ns	TYP
Turn-Off Time	t _{OFF}	V _{NO} or V _{NC} = 3V, R _L = 300Ω, C _L = 35pF, Test Circuit 4	9		ns	TYP
Charge Injection	Q	C _L = 1.0nF, V _S = 0V, R _S = 0Ω, Test Circuit 5	5		pC	TYP
Break-Before-Make Time Delay	t _d	V _{NO1} or V _{NC1} = V _{NO2} or V _{NC2} = 3V, R _L = 300Ω, C _L = 35pF, Test Circuit 6	10		ns	TYP
Off Isolation	O _{ISO}	R _L = 50Ω, C _L = 5pF, Test Circuit 7	f = 100kHz	-55	dB	TYP
			f = 10kHz	-75	dB	TYP
Total Harmonic Distortion	THD	f = 20Hz to 20kHz, V _{COM} = 3.5V _{P-P} , R _L = 600Ω, C _L = 50pF	0.065		%	TYP
-3dB Bandwidth	BW	R _L = 50Ω, C _L = 5pF, Test Circuit 8	30		MHz	TYP
Source Off Capacitance	C _{NC(OFF)} , C _{NO(OFF)}		82		pF	TYP
Channel On Capacitance	C _{NC(ON)} , C _{NO(ON)} , C _{COM(ON)}		380		pF	TYP
POWER REQUIREMENTS						
Power Supply Current	I ₊	V ₊ = 5.5V, V _{IN} = 0V or 5V	0.001		μA	TYP
				1	μA	MAX

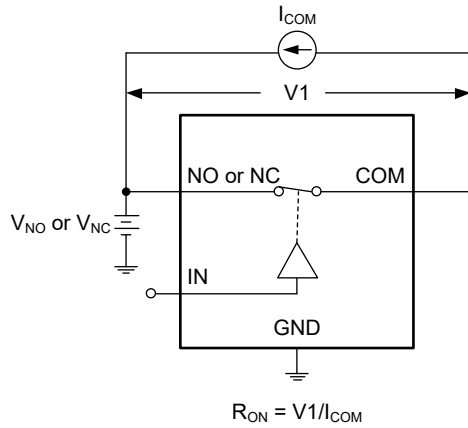
ELECTRICAL CHARACTERISTICS (continued)(V₊ = 3V ± 10%, GND = 0V, Full = -40°C to +125°C. Typical values are at T_A = +25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	SGM3003			
			+25°C	-40°C to +125°C	UNITS	MIN/MAX
ANALOG SWITCH						
Analog Signal Range	V _{NO} , V _{NC} , V _{COM}			0 V ₊	V V	MIN MAX
On-Resistance	R _{ON}	0 ≤ V _{NO} or V _{NC} ≤ V ₊ , I _{COM} = -10mA, Test Circuit 1	0.6 1.0		Ω Ω	TYP MAX
On-Resistance Flatness	R _{FLAT(ON)}	0 ≤ V _{NO} or V _{NC} ≤ V ₊ , I _{COM} = -10mA, Test Circuit 1	0.18 0.3		Ω Ω	TYP MAX
LEAKAGE CURRENTS						
Source Off Leakage Current	I _{NC(OFF)} , I _{NO(OFF)}	V _{NO} or V _{NC} = 3V/1V, V _{COM} = 1V/3V, V ₊ = 3.3V, Test Circuit 2	±5 ±11		nA nA	TYP MAX
Channel On Leakage Current	I _{NC(ON)} , I _{NO(ON)} , I _{COM(ON)}	V _{NO} or V _{NC} = V _{COM} = 1V or 3V, V ₊ = 3.3V, Test Circuit 3	±5 ±11		nA nA	TYP MAX
DIGITAL INPUTS						
Input High Voltage	V _{INH}			2.0	V	MIN
Input Low Voltage	V _{INL}			0.4	V	MAX
Input Current	I _{INL} or I _{INH}	V _{IN} = V _{INH} or V _{INL}	±0.01 ±0.1		μA μA	TYP MAX
DYNAMIC CHARACTERISTICS						
Turn-On Time	t _{ON}	V _{NO} or V _{NC} = 2V, R _L = 300Ω, C _L = 35pF, Test Circuit 4	32		ns	TYP
Turn-Off Time	t _{OFF}	V _{NO} or V _{NC} = 2V, R _L = 300Ω, C _L = 35pF, Test Circuit 4	20		ns	TYP
Charge Injection	Q	C _L = 1.0nF, V _S = 0V, R _S = 0Ω, Test Circuit 5	10		pC	TYP
Break-Before-Make Time Delay	t _D	V _{NO1} or V _{NC1} = V _{NO2} or V _{NC2} = 2V, R _L = 300Ω, C _L = 35pF, Test Circuit 6	12		ns	TYP
Off Isolation	O _{ISO}	R _L = 50Ω, C _L = 5pF, Test Circuit 7		f = 100kHz f = 10kHz	-55 -75	dB dB
Total Harmonic Distortion	THD	f = 20Hz to 20kHz, V _{COM} = 2V _{P-P} , R _L = 600Ω, C _L = 50pF	0.06		%	TYP
-3dB Bandwidth	BW	R _L = 50Ω, C _L = 5pF, Test Circuit 8	30		MHz	TYP
Source Off Capacitance	C _{NC(OFF)} , C _{NO(OFF)}		82		pF	TYP
Channel On Capacitance	C _{NC(ON)} , C _{NO(ON)} , C _{COM(ON)}		380		pF	TYP
POWER REQUIREMENTS						
Power Supply Current	I ₊	V ₊ = 3.3V, V _{IN} = 0V or 3V	0.001		μA	TYP
				1	μA	MAX

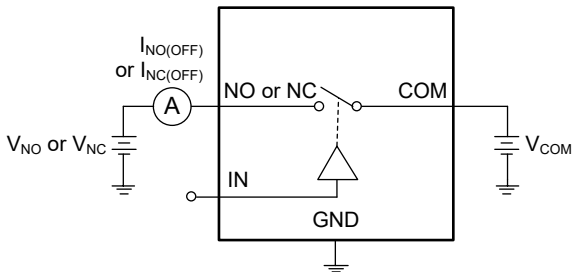
TYPICAL PERFORMANCE CHARACTERISTICS



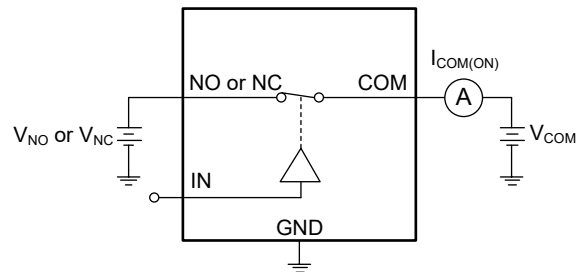
TEST CIRCUITS



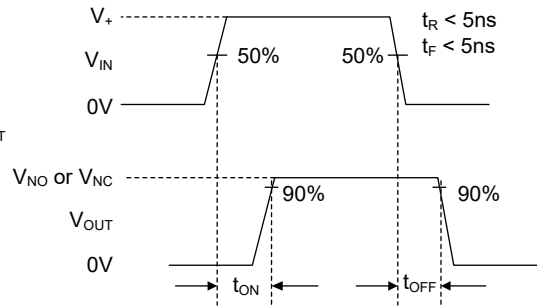
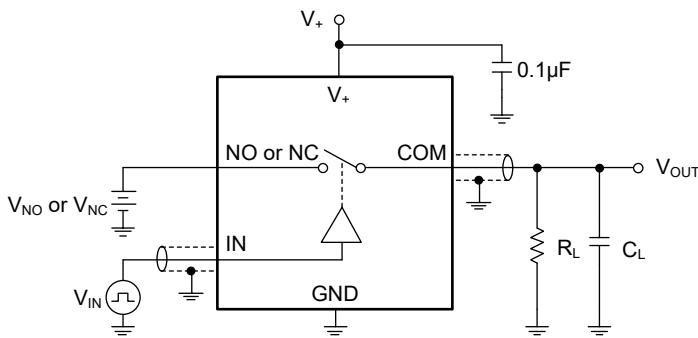
Test Circuit 1. On-Resistance



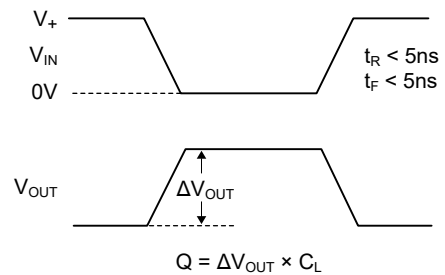
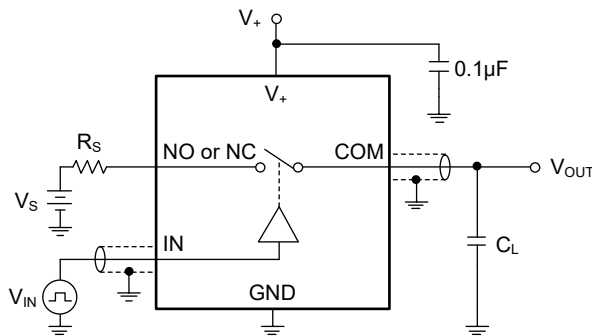
Test Circuit 2. Off Leakage



Test Circuit 3. On Leakage

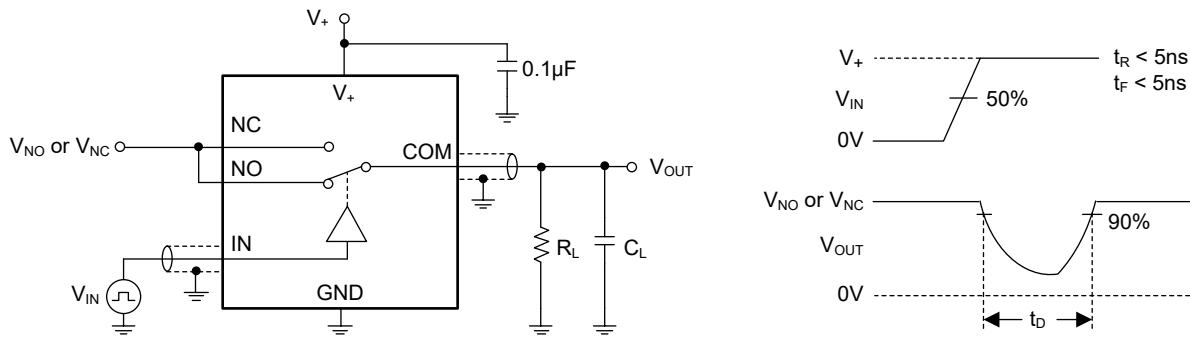


Test Circuit 4. Switching Times

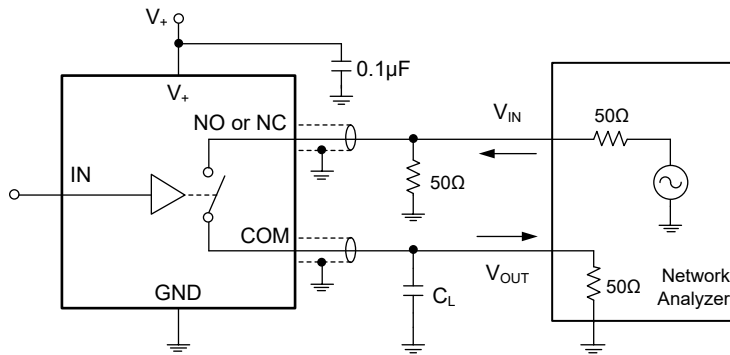


Test Circuit 5. Charge Injection

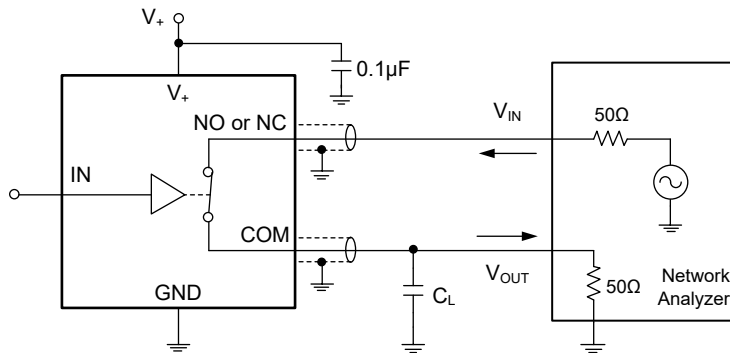
TEST CIRCUITS (continued)



Test Circuit 6. Break-Before-Make Time Delay, t_D



Test Circuit 7. Off Isolation



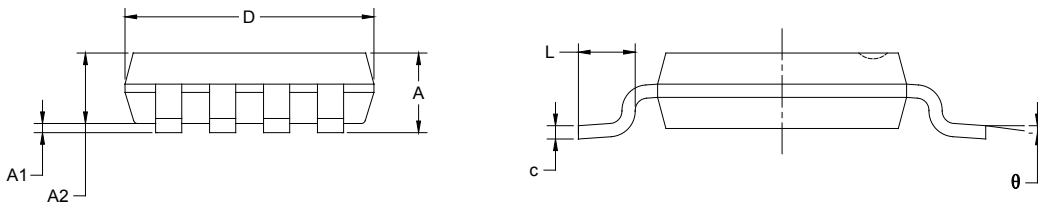
Test Circuit 8. -3dB Bandwidth

PACKAGE OUTLINE DIMENSIONS

MSOP-8



RECOMMENDED LAND PATTERN (Unit: mm)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.250	0.380	0.010	0.015
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
e	0.650 BSC		0.026 BSC	
L	0.400	0.800	0.016	0.031
θ	0°	6°	0°	6°

PACKAGE INFORMATION

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
MSOP-8	13"	12.4	5.20	3.30	1.50	4.0	8.0	2.0	12.0	Q1

DD0001

PACKAGE INFORMATION

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

DD0002