TPSGM5223YU

Low-Voltage, 1.2Ω Dual-SPDT Analog Switch

GENERAL DESCRIPTION

The is a high-performance, dual single-pole double-throw (SPDT) analog switch. Specified over a wide operating power supply voltage range 1.65V to 5.0V, Targeted applications include battery powered equipment that benefit from ultra-low ON-resistance (1.2Ω) and fast switching speeds.

Break-before-make switching prevents both switches being enabled simultaneously. This eliminates signal disruption during switching.

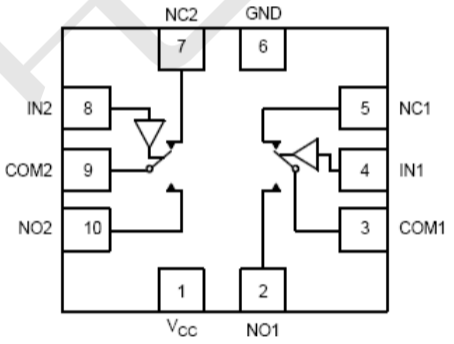
APPLICATIONS

- Cell Phones
- PDAs
- Portable Instrumentation
- Battery Powered Communications

FEATURES

- Low ON Resistance: 1.2 Ω at 4.2V
- Wide VCC Range: 1.65V to 5.0V
- Rail-to-Rail Signal Range
- ON-Resistance Matching: 0.1 Ω (TYP)
- ON-Resistance Flatness: 0.2Ω (TYP)
- Break-Before-Make Switching
- -3dB Bandwidth: 100 MHz
- High Off Isolation: 58dB at 1MHz
- Extended Industrial Temperature Range: –40°C to 85°C
- Packaging (Pb-free & Green available): QFN1.8x1.4-10L

PIN CONFIGURATION (TOP VIEW)



PIN DESCRIPTION

PIN	NAME	FUNCTION
2 , 10	NO1,NO2	Data Port (Normally Opened)
6	GND	Ground
5 , 7	NC1,NC2	Data Port (Normally Closed)
3 , 9	COM1,COM2	Data Port (Common Port)
1	VCC	Power Supply
4 , 8	IN1,IN2	Logic Control

FUNCTION TABLE

IN1,IN2 INPUT	ON SWITCHES
0	NC1/NC2 Connected to COM1/COM2
1	NO1/NO2 Connected to COM1/COM2

ABSOLUTE MAXIMUM RATINGS

V_{CC}, IN1, IN2 to GND .....-0.3V to +5.25V
Analog Input Voltage
(V_{NO}, V_{NC}, or V_{COM}).....-0.3V to (V_{CC}+ 0.3V)
Continuous Current into COM to NC/NO .....±300mA
Peak Current COM to NC/NO
(Pulsed at 1ms, 10% duty cycle).....±500mA
Storage Temperature Range.....-65℃ to +150℃
Junction Temperature.....150℃
Operating Temperature Range.....-40℃ to +85℃
Lead Temperature (Soldering, 10 sec).....260℃

NOTE:
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. Broadchip 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.

Broadchip reserves the right to make any change in circuit design, specification or other related things if necessary without notice at any time. Please contact Broadchip sales office to get the latest datasheet.

ELECTRICAL CHARACTERISTICS

(Typical values are at Vcc = +4.2V, TA = +25°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		VCC	V
On-Resistance	R_{ON}	V_{cc} = 4.2 V, V_{NO}, V_{NC} or V_{COM} = 1 V, I_{COM} = -100 mA, Test Circuit 1		+25°C		1.2	1.8	Ω
				- 40°C to +85°C			2.0	Ω
On-Resistance Match Between Channels	ΔR_{ON}	V_{cc} = 4.2 V, V_{NO}, V_{NC} or V_{COM} = 1 V, I_{COM} = -100 mA, Test Circuit 1		+25°C		0.1	0.3	Ω
				- 40°C to +85°C			0.4	Ω
On-Resistance Flatness	$R_{FLAT(ON)}$	V_{cc} = 4.2 V, V_{NO}, V_{NC} or V_{COM} = 0V, 1 V, 2V, I_{COM} = -100 mA, Test Circuit 1		+25°C		0.2	0.4	Ω
				- 40°C to +85°C			0.5	Ω
Source OFF Leakage current	$I_{NC(OFF)}$, $I_{NO(OFF)}$	V_{cc} = 4.2 V, V_{NO} or V_{NC} = 3.3 V/ 0.3 V, V_{COM} = 0.3 V/ 3.3 V		- 40°C to +85°C			1	μA
Channel ON Leakage current	$I_{NC(ON)}$, $I_{NO(ON)}$, $I_{COM(ON)}$	V_{cc} = 4.2 V, V_{COM} = 0.3 V/ 3.3 V, V_{NO} or V_{NC} = 0.3 V/ 3.3 V, or floating		- 40°C to +85°C			1	μA
DIGITAL INPUTS								
Input High Voltage	V_{INH}			- 40°C to +85°C	1.6			V
Input Low Voltage	V_{INL}			- 40°C to +85°C			0.5	V
Input Leakage Current	I_{IN}	V_{cc} = 4.2 V, V_{IN} = 0 V or 4.2 V		- 40°C to +85°C			1	μA
DYNAMIC CHARACTERISTICS								
Turn-On Time	t_{ON}	V_{IN} = 2.1 V to 0 V, R_L = 50 Ω, C_L = 35 pF, V_{NO1} or V_{NC1} = V_{NO2} or V_{NC2} = 2.1 V, Test Circuit2		+25°C		88		ns
Turn-Off Time	t_{OFF}	V_{IN} = 2.1 V to 0 V, R_L = 50 Ω, C_L = 35 pF, V_{NO1} or V_{NC1} = V_{NO2} or V_{NC2} = 2.1 V, Test Circuit2		+25°C		16		ns
Break-Before-Make Time Delay	t_D	V_{IN} = 2.1 V to 0 V, R_L = 50 Ω, C_L = 35 pF, V_{NO1} or V_{NC1} = V_{NO2} or V_{NC2} = 2.1 V, Test Circuit3		+25°C		6.0		ns
Off Isolation	O_{ISO}	V_{BIAS} = 2.1 V, V_{IN} = 0 dBm, Test Circuit4	100KHz	+25°C		-78		dB
			1MHz	+25°C		-58		dB

(Continued)

PARAMETER	SYMBOL	CONDITIONS		TEMP	MIN	TPY	MAX	UNITS
Channel-to-Channel Crosstalk	X_{TALK}	V_{BIAS} = 2.1 V, V_{IN} = 0dBm, Test Circuit5	100KHz	+25°C		-103		dB
			1MHz	+25°C		-90		dB
Bandwidth –3 dB	BW	V_{BIAS} = 2.1 V, V_{IN} = 0 dBm, Test Circuit6		+25°C		100		MHz
Charge Injection Select Input to Common I/O	Q	V_{NO1} or V_{NC1} = V_{NO2} or V_{NC2} = 0 V, C_L = 1.0 nF, Test Circuit7		+25°C		4.0		pC
Channel ON Capacitance	C_{ON}			+25°C		50		pF
POWER REQUIREMENTS								
Power Supply Range	VCC			- 40°C to +85°C	1.65		5.0	V
Power Supply Current	I_+	VCC = 4.2 V, V_{IN} = 0 V or V_{cc}		- 40°C to +85°C			1	μA

(Typical values are at Vcc = +2.7V, TA = +25°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		VCC	V
On-Resistance	R_{ON}	Vcc = 2.7 V, V_{NO}, V_{NC} or V_{COM} = 1 V, I_{COM} = -100 mA, Test Circuit 1	+25°C		1.5	2.0	Ω
			- 40°C to +85°C			2.2	Ω
On-Resistance Match Between Channels	ΔR_{ON}	Vcc = 2.7 V, V_{NO}, V_{NC} or V_{COM} = 1 V, I_{COM} = -100 mA, Test Circuit 1	+25°C		0.1	0.4	Ω
			- 40°C to +85°C			0.5	Ω
On-Resistance Flatness	$R_{FLAT(ON)}$	Vcc = 2.7 V, V_{NO}, V_{NC} or V_{COM} = 0V, 1 V, 2V , I_{COM} = -100 mA, Test Circuit 1	+25°C		0.3	0.6	Ω
			- 40°C to +85°C			0.7	Ω
Source OFF Leakage current	$I_{NC(OFF)}$, $I_{NO(OFF)}$	Vcc = 3.6 V, V_{NO} or V_{NC} = 3.3 V / 0.3 V, V_{COM} = 0.3 V/ 3.3 V	- 40°C to +85°C			1	μA
Channel ON Leakage current	$I_{NC(ON)}$, $I_{NO(ON)}$, $I_{COM(ON)}$	Vcc = 3.6 V, V_{COM} = 0.3 V/ 3.3 V, V_{NO} or V_{NC} = 0.3 V/ 3.3 V, 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			0.4	V
Input Leakage Current	I_{IN}	Vcc = 2.7 V, V_{IN} = 0 V or 2.7 V	- 40°C to +85°C			1	μA
DYNAMIC CHARACTERISTICS							
Turn-On Time	t_{ON}	V_{IN} =1.5 V to 0 V, R_L = 50 Ω, C_L = 35 pF, V_{NO1} or V_{NC1} = V_{NO2} or V_{NC2} = 1.5 V, Test Circuit2	+25°C		100		ns
Turn-Off Time	t_{OFF}	V_{IN} = 1.5 V to 0 V, R_L = 50 Ω, C_L = 35 pF, V_{NO1} or V_{NC1} = V_{NO2} or V_{NC2} = 1.5 V, Test Circuit2	+25°C		20		ns
Break-Before-Make Time Delay	t_D	V_{IN} = 1.5 V to 0 V, R_L = 50 Ω, C_L = 35 pF, V_{NO1} or V_{NC1} = V_{NO2} or V_{NC2} =1.5 V, Test Circuit3	+25°C		9.2		ns

(Continued)

PARAMETER	SYMBOL	CONDITIONS		TEMP	MIN	TPY	MAX	UNITS
ANALOG SWITCH								
Off Isolation	O_{ISO}	V_{BIAS} = 2.1 V, V_{IN} = 0 dBm, Test Circuit4	100KHz	+25°C		-78		dB
			1MHz	+25°C		-58		dB
Channel-to-Channel Crosstalk	XTALK	VBIAS = 2.1 V, VIN = 0 dBm, Test Circuit5	100KHz	+25°C		-103		dB
			1MHz	+25°C		-90		dB
Bandwidth –3 dB	BW	VBIAS = 2.1 V, VIN = 0 dBm, Test Circuit6		+25°C		100		MHz
Charge Injection Select Input to Common I/O	Q	VNO1 or VNC1 = VNO2 or VNC2 =0 V, CL=1.0nF Test Circuit7		+25°C		3.0		pC
Channel ON Capacitance	CON			+25°C		50		pF

TEST CIRCUITS

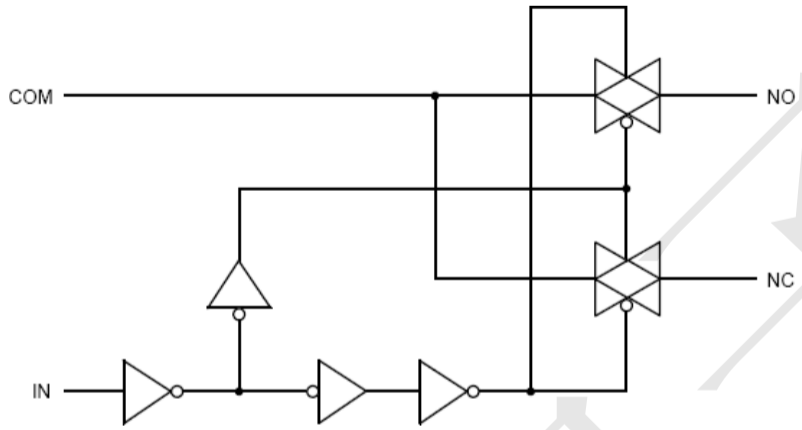


Figure 1. Logic equivalent circuit

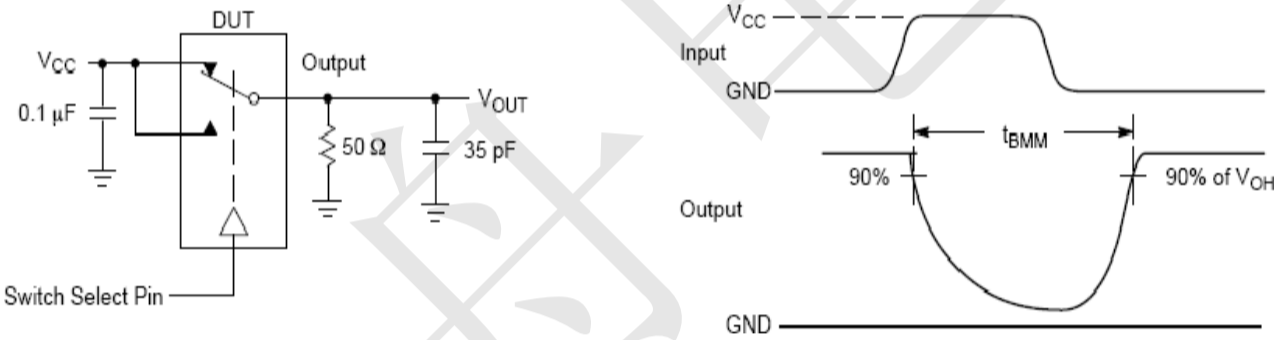


Figure 2. tBBM (Time Break-Before-Make)

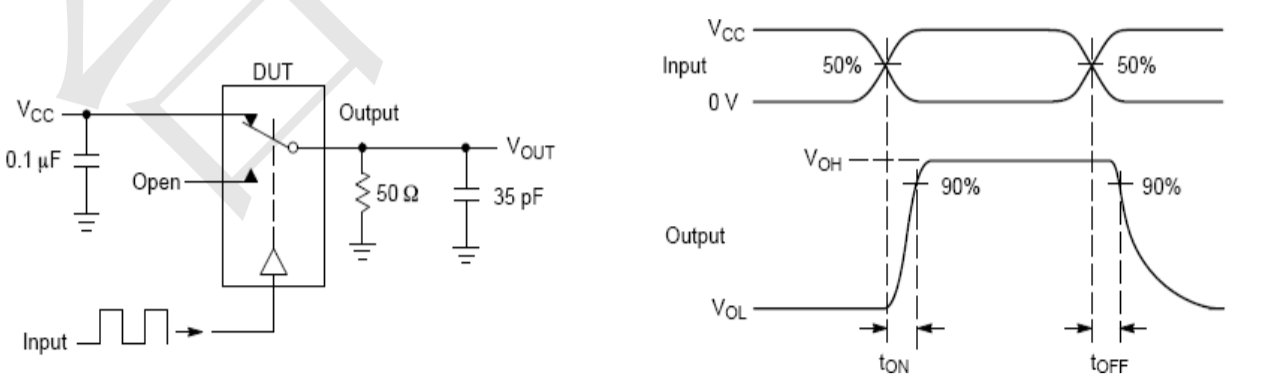


Figure 3. $t_{ON/OFF}$

TEST CIRCUITS

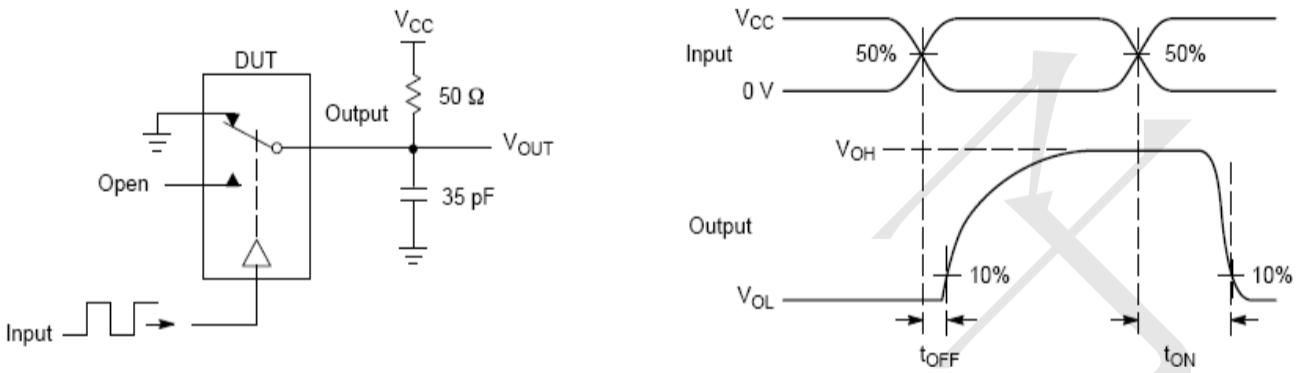


Figure 4. tON/OFF

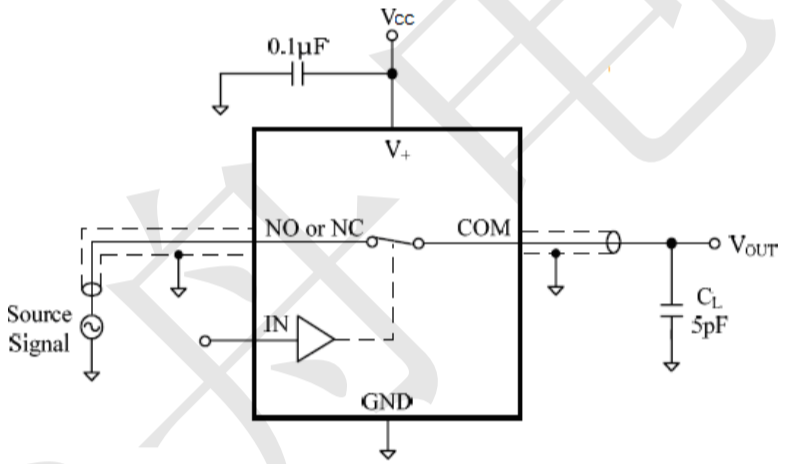


Figure 5. Bandwidth -3dB

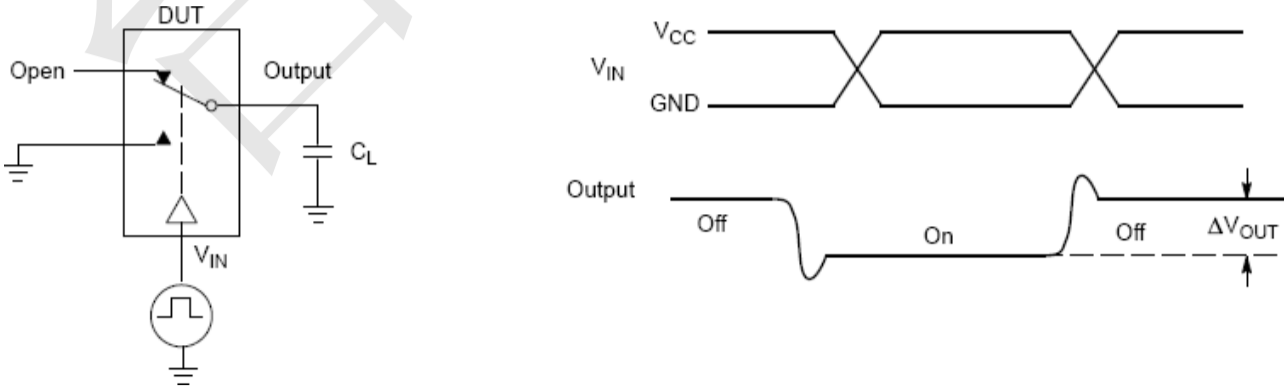
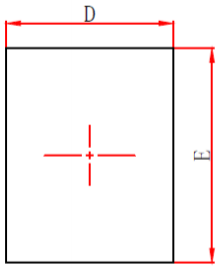


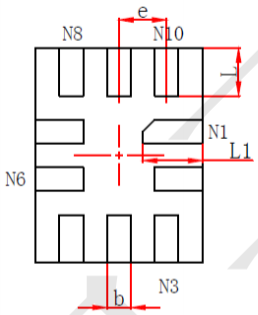
Figure 6. Charge Injecting (Q)

PACKAGE OUTLINE DIMENSIONS

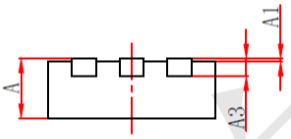
QFN1.8x1.4-10L



Top View



Bottom View



Side View

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.500	0.600	0.020	0.024
A1	0.000	0.050	0.000	0.002
A3	0.152REF.		0.006REF.	
D	1.350	1.450	0.053	0.057
E	1.750	1.850	0.069	0.073
D1	—	—	—	—
E1	—	—	—	—
k	—		—	
b	0.150	0.250	0.006	0.010
e	0.400TYP.		0.016TYP.	
L	0.350	0.450	0.014	0.018
L1	0.450	0.550	0.018	0.022