

### GENERAL DESCRIPTION

The SGM72004B is a single-pole/four-throw (SP4T) antenna switch, which supports from 0.1GHz to 3GHz. The device features low insertion loss and high isolation, which make it suitable for diversity reception applications. It also has the advantage of high linearity performance. The SGM72004B is not subject to cellular interference and is applied to multi-mode and multi-band LTE mobile phones.

The SGM72004B has the ability to integrate SP4T RF switch and GPIO controller on a SOI chip. Internal driver and decoder for switch control signals are offered by the GPIO controller, which makes it flexible in RF path band and routing selection.

No external blocking capacitor requirements on the RF paths as long as no external DC voltage is applied which can save PCB area and cost.

The SGM72004B is available in a Green UTQFN-2x2-14L package.

### APPLICATIONS

Receiving Band Switching and Pre-PA Switching  
2G/3G/4G Antenna Diversity

### FEATURES

- **Supply Voltage Range: 2.4V to 3.4V**
- **GPIO Controller**
- **Low Insertion Loss: 0.6dB (TYP) at 2.7GHz**
- **Operating Frequency Range: 0.1GHz to 3GHz**
- **High Isolation: 20dB (MIN) at 2.7GHz**
- **Advanced Silicon-On-Insulator (SOI) Process**
- **No External DC Blocking Capacitors Required**
- **Available in a Green UTQFN-2x2-14L Package**

### BLOCK DIAGRAM

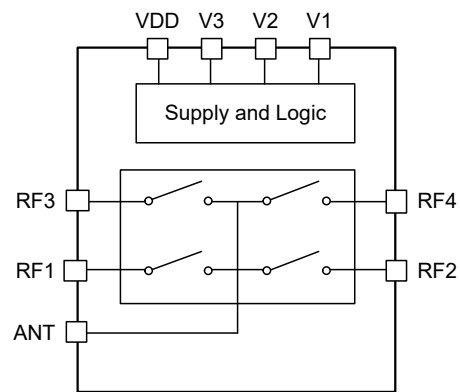


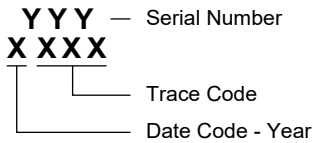
Figure 1. SGM72004B Block Diagram

**PACKAGE/ORDERING INFORMATION**

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM72004B	UTQFN-2×2-14L	-40°C to +105°C	SGM72004BGURB14G/TR	RA7 XXXX	Tape and Reel, 3000

**MARKING INFORMATION**

NOTE: XXXX = Date Code and Trace 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**

- Supply Voltage, V<sub>DD</sub>..... 3.6V
- Control Voltage (V1, V2 and V3 Pins), V<sub>CTL</sub>..... 3.6V
- RF Input Power, P<sub>IN</sub>..... 30dBm
- Junction Temperature..... +150°C
- Storage Temperature Range..... -55°C to +150°C
- Lead Temperature (Soldering, 10s)..... +260°C
- ESD Susceptibility
- HBM..... 1000V

**RECOMMENDED OPERATING CONDITIONS**

- Operating Temperature Range..... -40°C to +105°C
- Operating Frequency Range..... 0.1GHz to 3GHz
- Supply Voltage, V<sub>DD</sub>..... 2.4V to 3.4V
- Control High Voltage, V<sub>CTL\_H</sub>..... 1.3V to 3.4V
- Control Low Voltage, V<sub>CTL\_L</sub>..... 0.4V

**OVERSTRESS CAUTION**

Stresses beyond those listed in Absolute Maximum Ratings may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect reliability. Functional operation of the device at any conditions beyond those indicated in the Recommended Operating Conditions section is not implied.

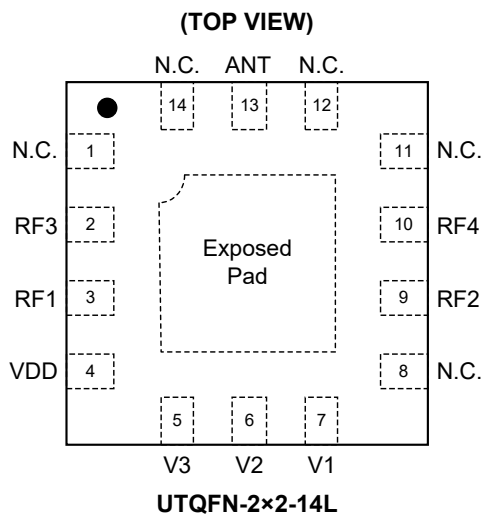
**ESD SENSITIVITY CAUTION**

This integrated circuit can be damaged if ESD protections are not considered carefully. 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 even small parametric changes could cause the device not to meet the published specifications.

**DISCLAIMER**

SG Micro Corp reserves the right to make any change in circuit design, or specifications without prior notice.

**PIN CONFIGURATION**



**PIN DESCRIPTION**

PIN	NAME	FUNCTION
1, 8, 11, 12, 14	N.C.	No Connection.
2	RF3	RF I/O Port 3.
3	RF1	RF I/O Port 1.
4	VDD	DC Power Supply.
5	V3	DC Control Voltage 3.
6	V2	DC Control Voltage 2.
7	V1	DC Control Voltage 1.
9	RF2	RF I/O Port 2.
10	RF4	RF I/O Port 4.
13	ANT	Antenna Port.
Exposed Pad	GND	Ground. Exposed pad must be connected to ground.

## LOGIC TRUTH TABLE

CONTROL PINS			SWITCHED RF PATHS			
V1	V2	V3	RF1	RF2	RF3	RF4
0	0	0	Insertion Loss	Isolation	Isolation	Isolation
0	0	1	Isolation	Insertion Loss	Isolation	Isolation
0	1	0	Isolation	Isolation	Insertion Loss	Isolation
0	1	1	Isolation	Isolation	Isolation	Insertion Loss
1	X	X	Isolation	Isolation	Isolation	Isolation

X = Either 0 or 1.

## ELECTRICAL CHARACTERISTICS

( $V_{DD} = 2.4V$  to  $3.4V$ ,  $T_A = +25^\circ C$ ,  $P_{IN} = 0dBm$ ,  $50\Omega$ , typical values are at  $V_{DD} = 2.8V$ , unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
<b>DC Specifications</b>						
Supply Voltage	$V_{DD}$		2.4	2.8	3.4	V
Supply Current	$I_{DD}$			40	95	$\mu A$
Control Voltage	$V_{CTL\_H}$	High	1.3	1.8	3.4	V
	$V_{CTL\_L}$	Low	0		0.4	
Control Current	$I_{CTL}$	$V_{CTL} = 0V$		3	6	$\mu A$
Switching Time	$t_{SW}$	50% of control voltage to 90% of RF power		0.5	2	$\mu s$
Turn-On Time	$t_{ON}$	Time from $V_{DD} = 0V$ to part on and RF at 90%		5		$\mu s$
<b>RF Specifications</b>						
Insertion Loss (ANT to All RF Ports)	IL	0.1GHz to 1.0GHz		0.35	0.97	dB
		1.0GHz to 2.0GHz		0.45	1.33	
		2.0GHz to 2.7GHz		0.60	1.45	
Isolation (ANT to All RF Ports)	ISO	0.1GHz to 1.0GHz	23	37		dB
		1.0GHz to 2.0GHz	19	30		
		2.0GHz to 2.7GHz	18	25		
Input Return Loss (ANT to All RF Ports)	RL	0.1GHz to 1.0GHz		30		dB
		1.0GHz to 2.0GHz		22		
		2.0GHz to 2.7GHz		20		
0.1dB Compression Point (ANT to All RF Ports)	$P_{0.1dB}$	0.1GHz to 3GHz		30		dBm
2 <sup>nd</sup> Harmonics	$2f_0$	$P_{IN} = 26dBm$ , 0.1GHz to 3GHz		85		dBc
3 <sup>rd</sup> Harmonics	$3f_0$	$P_{IN} = 26dBm$ , 0.1GHz to 3GHz		80		dBc

TYPICAL APPLICATION CIRCUIT

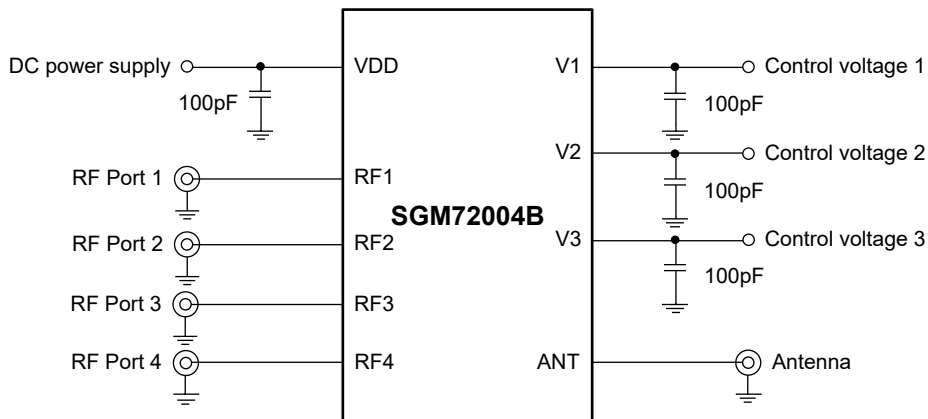


Figure 2. SGM72004B Typical Application Circuit

EVALUATION BOARD LAYOUT

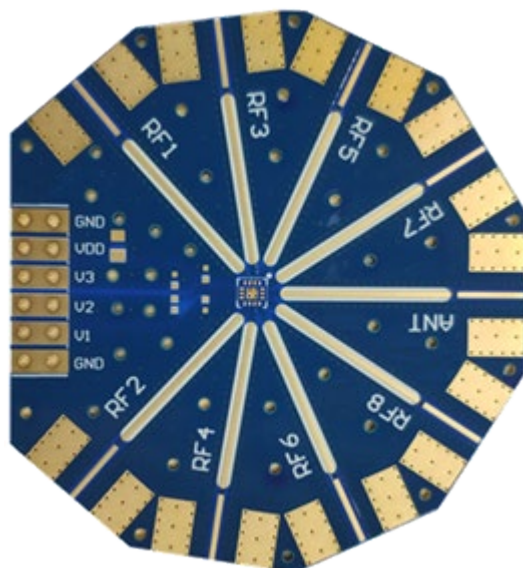


Figure 3. SGM72004B Evaluation Board Layout

**REVISION HISTORY**

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

<b>AUGUST 2023 – REV.A.2 to REV.A.3</b>	<b>Page</b>
Update Operating Temperature Range .....	2

<b>APRIL 2023 – REV.A.1 to REV.A.2</b>	<b>Page</b>
Update Operating Temperature Range .....	2

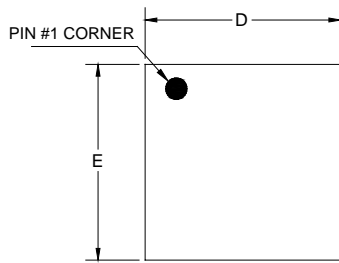
<b>JANUARY 2022 – REV.A to REV.A.1</b>	<b>Page</b>
Update Absolute Maximum Ratings section .....	2
Update Recommended Operating Conditions section .....	2
Update Electrical Characteristics section .....	4

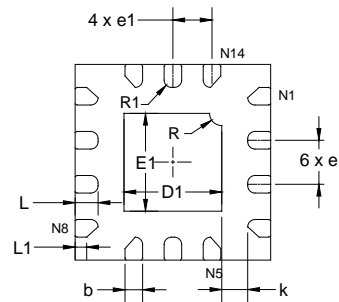
<b>Changes from Original (JULY 2021) to REV.A</b>	<b>Page</b>
Changed from product preview to production data .....	All

PACKAGE OUTLINE DIMENSIONS

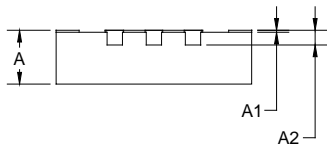
UTQFN-2x2-14L



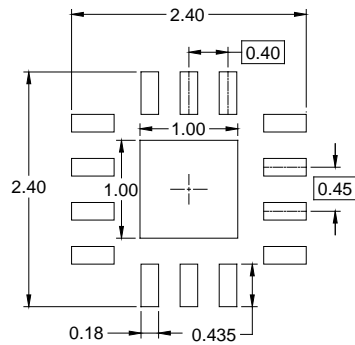
TOP VIEW



BOTTOM VIEW



SIDE VIEW



RECOMMENDED LAND PATTERN (Unit: mm)

Symbol	Dimensions In Millimeters		
	MIN	MOD	MAX
A	0.50	0.55	0.60
A1	0.00	0.02	0.05
A2	0.15 REF		
b	0.13	0.18	0.23
D	1.90	2.00	2.10
E	1.90	2.00	2.10
D1	0.90	1.00	1.10
E1	0.90	1.00	1.10
e	0.40	0.45	0.50
e1	0.35	0.40	0.45
k	0.15	-	-
L	0.185	0.235	0.285
L1	0.118 REF		
R	0.125 REF		
R1	0.075	-	-

# 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
UTQFN-2x2-14L	7"	9.5	2.25	2.25	0.75	4.0	4.0	2.0	8.0	Q2

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# 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
7" (Option)	368	227	224	8
7"	442	410	224	18

DD0002