



# SGM72008

## SP8T Diversity RF Switch

### GENERAL DESCRIPTION

The SGM72008 is a low insertion loss, high isolation Single Pole Eight Throw (SP8T) antenna switch for diversity receiving application, supporting from 0.1GHz to 3GHz. High linearity performance makes it suitable for multi-mode multi-band LTE handsets, immune to cellular interferences.

The SGM72008 integrates a GPIO controller and a SP8T RF switch on a single SOI chip. The GPIO controller provides internal decoder and driver for switch control signals, allowing flexibility in RF paths routing and band selection.

The SGM72008 is among diversity receiving switch family. This product is encapsulated in a compact 2mm × 2mm, 14-pin, UTQFN package, RoHS compliant and halogen free. When no external DC is applied, there is no need for external DC blocking capacitors, saving PCB area and cost.

### FEATURES

- **Advanced SOI Process**
- **Broad Frequency Range: 0.1GHz to 3GHz**
- **Low Insertion Loss: 0.6dB (TYP) at 2.7GHz**
- **High Isolation: > 20dB at 2.7GHz**
- **GPIO Control Interface**
- **Compact 2mm × 2mm, 14-Pin, UTQFN Package**
- **No External DC Blocking Capacitors Required**

### APPLICATIONS

2G/3G/4G Antenna Diversity

Pre-PA Switching and Receiving Band Switching

### BLOCK DIAGRAM

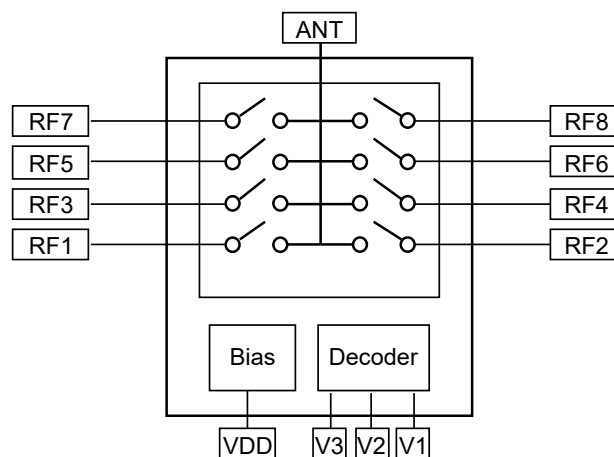


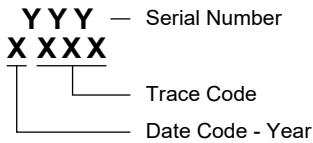
Figure 1. SGM72008 Block Diagram

**PACKAGE/ORDERING INFORMATION**

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM72008	UTQFN-2x2-14L	-40°C to +85°C	SGM72008YURB14G/TR	R89 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,  $V_{DD}$ ..... 3.3V
- Control Voltage ( $V1/V2/V3$  Pins),  $V_{CTL}$ ..... 3V
- RF Input Power,  $P_{IN}$ ..... +27dBm
- 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 +85°C
- Operating Frequency..... 0.1GHz to 3GHz
- Supply Voltage,  $V_{DD}$ ..... 2.4V to 3V
- Control High Voltage,  $V_{INH}$ ..... 1.3V to 3V
- Control Low Voltage,  $V_{INL}$ ..... 0.45V

**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.

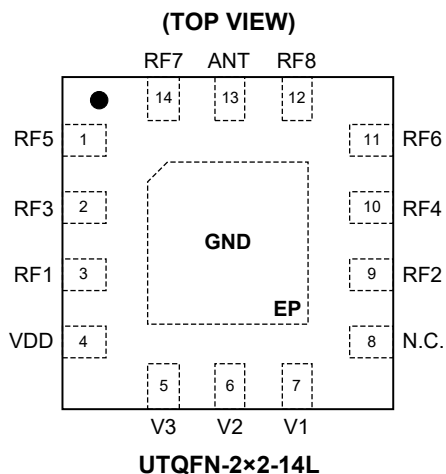
**ESD SENSITIVITY CAUTION**

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	RF5	RF I/O Path 5.
2	RF3	RF I/O Path 3.
3	RF1	RF I/O Path 1.
4	VDD	DC Power Supply.
5	V3	DC Control Voltage 3.
6	V2	DC Control Voltage 2.
7	V1	DC Control Voltage 1.
8	N.C.	Not Connected.
9	RF2	RF I/O Path 2.
10	RF4	RF I/O Path 4.
11	RF6	RF I/O Path 6.
12	RF8	RF I/O Path 8.
13	ANT	Antenna Port.
14	RF7	RF I/O Path 7.
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	RF5	RF6	RF7	RF8
0	0	0	Insertion Loss	Isolation	Isolation	Isolation	Isolation	Isolation	Isolation	Isolation
0	0	1	Isolation	Insertion Loss	Isolation	Isolation	Isolation	Isolation	Isolation	Isolation
0	1	0	Isolation	Isolation	Insertion Loss	Isolation	Isolation	Isolation	Isolation	Isolation
0	1	1	Isolation	Isolation	Isolation	Insertion Loss	Isolation	Isolation	Isolation	Isolation
1	0	0	Isolation	Isolation	Isolation	Isolation	Insertion Loss	Isolation	Isolation	Isolation
1	0	1	Isolation	Isolation	Isolation	Isolation	Isolation	Insertion Loss	Isolation	Isolation
1	1	0	Isolation	Isolation	Isolation	Isolation	Isolation	Isolation	Insertion Loss	Isolation
1	1	1	Isolation	Isolation	Isolation	Isolation	Isolation	Isolation	Isolation	Insertion Loss

## ELECTRICAL CHARACTERISTICS

(Typical values,  $V_{DD} = 2.8V$ ,  $T_{OP} = +25^{\circ}C$ ,  $P_{IN} = 0dBm$ ,  $50\Omega$ , unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
<b>DC Specifications</b>						
Supply Voltage	$V_{DD}$		2.4	2.8	3	V
Supply Current	$I_{DD}$			40	60	$\mu A$
Control Voltage	$V_{INH}$	High	1.3	1.8	3	V
	$V_{INL}$	Low	0		0.45	
Control Current	$I_{CTL}$	$V_{CTL} = 0V$		3	5	$\mu A$
Switching Time	$t_{SW}$	50% of control voltage to 90% of RF power		1	2	$\mu s$
Turn-On Time	$t_{ON}$	Time from $V_{DD} = 0V$ to part ON and RF at 90%		5	10	$\mu s$
<b>RF Specifications</b>						
Insertion Loss (ANT to All RF Ports)	IL	0.1GHz to 1.0GHz		0.35	0.60	dB
		1.0GHz to 2.0GHz		0.45	0.65	
		2.0GHz to 2.7GHz		0.60	0.80	
Isolation (ANT to All RF Ports)	ISO	0.1GHz to 1.0GHz	23	37		dB
		1.0GHz to 2.0GHz	20	30		
		2.0GHz to 2.7GHz	18	25		
Input Return Loss (ANT to All RF Ports)	RL	0.1GHz to 1.0GHz	25	30		dB
		1.0GHz to 2.0GHz	15	22		
		2.0GHz to 2.7GHz	15	20		
0.1dB Compression Point (ANT to All RF Ports)	P0.1dB	0.1GHz to 3GHz		+27		dBm
2 <sup>nd</sup> Harmonics	2f <sub>0</sub>	$P_{IN} = 26dBm$ , 0.1GHz to 3GHz	+75	+85		dBc
3 <sup>rd</sup> Harmonics	3f <sub>0</sub>	$P_{IN} = 26dBm$ , 0.1GHz to 3GHz	+70	+80		dBc

TYPICAL APPLICATION CIRCUIT

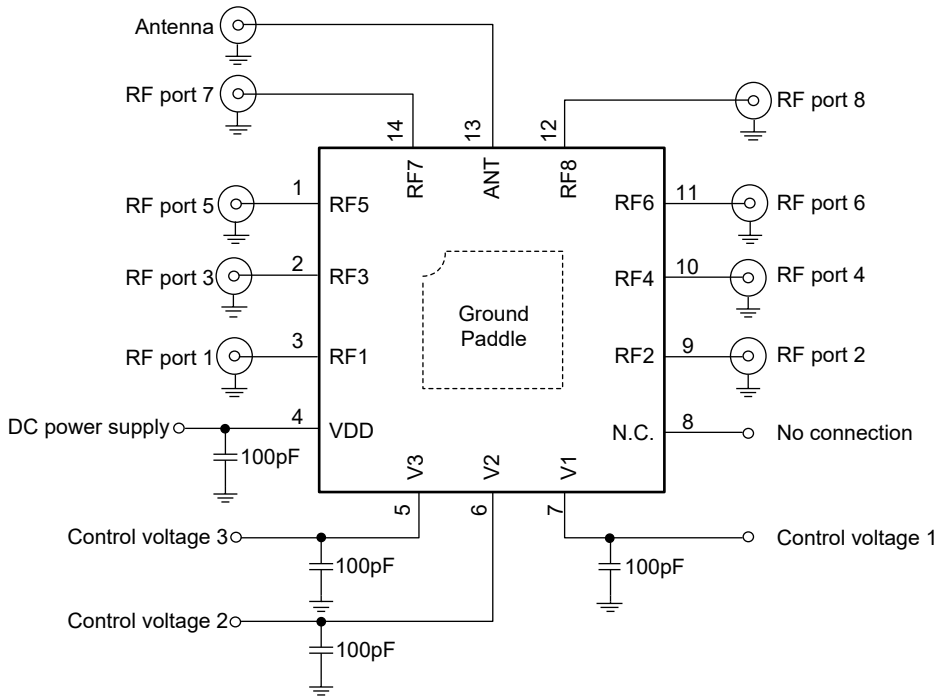


Figure 2. SGM72008 Typical Application Circuit

EVALUATION BOARD LAYOUT

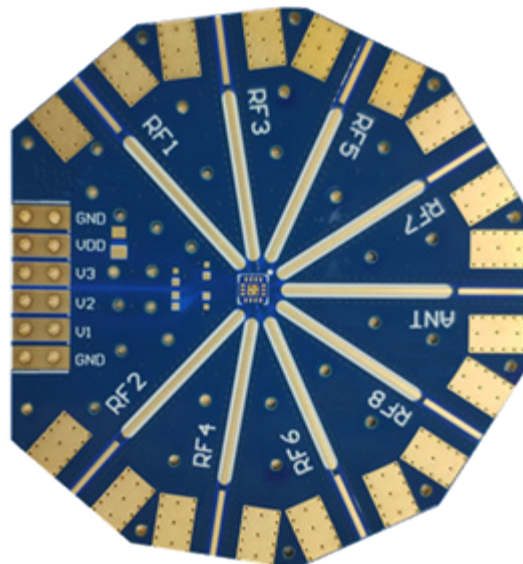
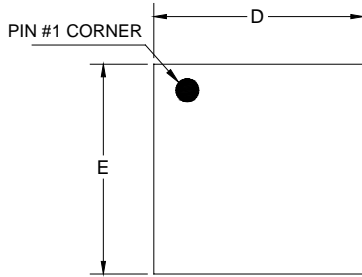


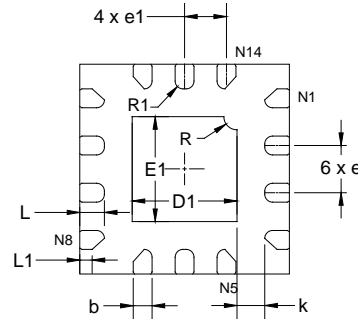
Figure 3. SGM72008 Evaluation Board Layout

PACKAGE OUTLINE DIMENSIONS

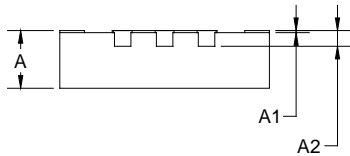
UTQFN-2x2-14L



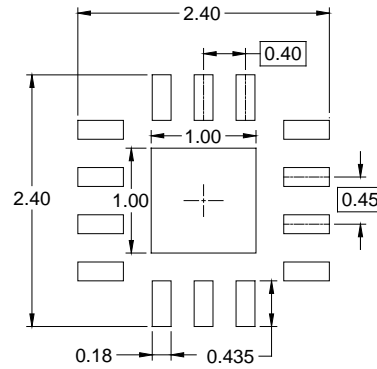
TOP VIEW



BOTTOM VIEW



SIDE VIEW



RECOMMENDED LAND PATTERN (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

000001

# 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

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