SGM72108
SP8T LTE Switch with MIPI RFFE Interface

GENERAL DESCRIPTION

The SGM72108 is a single-pole/eight-throw (SP8T) antenna switch, which supports from 0.1GHz to 3.0GHz. The device features low insertion loss and high isolation, which make it suitable for high linearity receiving applications. It also has the advantage of high linearity performance. The SGM72108 is not subject to cellular interference and is applied to multi-mode and multi-band LTE mobile phones.

The SGM72108 has the ability to integrate SP8T RF switch and MIPI controller on silicon-on-insulator (SOI) process. Internal driver and decoder for switch control signals are offered by the controller, which makes it flexible in RF path band and routing selection.

No external DC blocking capacitors are required on the RF paths as long as no external DC voltage is applied, which can save PCB area and cost.

The SGM72108 is available in a Green UTQFN-2×2-14AL package.

APPLICATIONS

3G/4G Applications

FEATURES

- **Supply Voltage Range: 2.4V to 4.8V**
- **Advanced Silicon-On-Insulator (SOI) Process**
- **Frequency Range: 0.1GHz to 3.0GHz**
- **Low Insertion Loss: 0.65dB (TYP) at 2.7GHz**
- **MIPI RFFE Interface Compatible**
- **No External DC Blocking Capacitors Required**
- **Available in a Green UTQFN-2×2-14AL Package**

BLOCK DIAGRAM

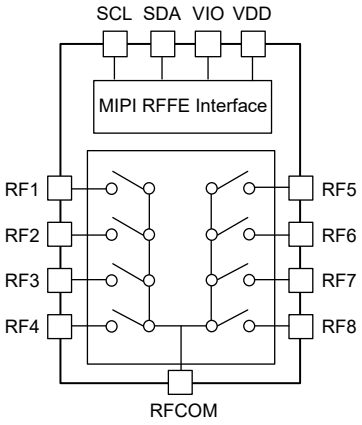


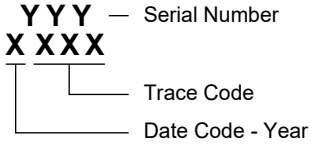
Figure 1. SGM72108 Block Diagram

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM72108	UTQFN-2×2-14AL	-40℃ to +85℃	SGM72108YURP14G/TR	RD6 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} 5V
Supply Voltage for MIPI, V_{IO} 2V
SDA, SCL Control Voltage, V_{CTL} 2V
RF Input Power, P_{IN} 27dBm
Junction Temperature ..... +150℃
Storage Temperature Range ..... -55℃ to +150℃
Lead Temperature (Soldering, 10s) ..... +260℃
ESD Susceptibility
HBM 1000V

RECOMMENDED OPERATING CONDITIONS

Operating Temperature Range ..... -40℃ to +85℃
Operating Frequency Range ..... 0.1GHz to 3.0GHz
Supply Voltage, V_{DD} ..... 2.4V to 4.8V
Supply Voltage for MIPI, V_{IO} ..... 1.65V to 1.95V

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

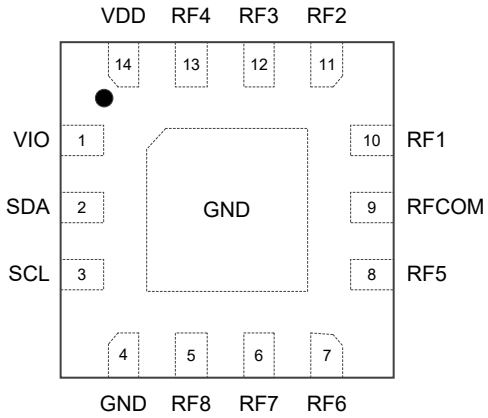
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance 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

(TOP VIEW)



UTQFN-2×2-14AL

PIN DESCRIPTION

PIN	NAME	FUNCTION
1	VIO	Supply Voltage for MIPI.
2	SDA	RFFE Data Signal.
3	SCL	RFFE Clock Signal.
4	GND	Ground.
5	RF8	RF Port 8.
6	RF7	RF Port 7.
7	RF6	RF Port 6.
8	RF5	RF Port 5.
9	RFCOM	RF Common Port.
10	RF1	RF Port 1.
11	RF2	RF Port 2.
12	RF3	RF Port 3.
13	RF4	RF Port 4.
14	VDD	DC Power Supply.
Exposed Pad	GND	Ground.

Register_0 TRUTH TABLE

Table 1. Register_0 Truth Table

State	Mode	Register_0 Bits							
		D7	D6	D5	D4	D3	D2	D1	D0
1	Isolation	0	0	0	0	0	0	0	0
2	RF1	0	0	0	0	0	0	1	0
3	RF2	0	0	0	0	1	0	1	0
4	RF3	0	0	0	0	1	1	1	0
5	RF4	0	0	0	0	1	0	1	1
6	RF5	0	0	0	0	0	0	0	1
7	RF6	0	0	0	0	1	0	0	1
8	RF7	0	0	0	0	0	1	1	0
9	RF8	0	0	0	0	0	1	0	0

ELECTRICAL CHARACTERISTICS

(T_A = +25℃, V_{DD} = 2.4V to 4.8V, P_{IN} = 0dBm, 50Ω, typical values are at V_{DD} = 2.8V, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
DC Characteristics						
Supply Voltage	V_{DD}		2.4	2.8	4.8	V
Supply Current	I_{VDD}			32	60	μA
Supply Voltage for MIPI	V_{IO}		1.65	1.8	1.95	V
Supply Current for MIPI	I_{VIO}			4.8	10	μA
Control Voltage	V_{CTL_H}	High	0.8 × V_{IO}	V_{IO}	1.95	V
	V_{CTL_L}	Low	0		0.45	
Switching Time	t_{SW}	50% of control voltage to 90% of RF power		1	2	μs
Turn-On Time	t_{ON}	Time from V_{DD} = 0V to part on and RF at 90%		5	10	μs
RF Characteristics						
Insertion Loss (RFCOM to All RF Ports)	IL	f_0 = 0.1GHz to 1.0GHz		0.42	0.60	dB
		f_0 = 1.0GHz to 2.0GHz		0.55	0.70	
		f_0 = 2.0GHz to 2.7GHz		0.65	0.90	
Isolation (RFCOM to All RF Ports)	ISO	f_0 = 0.1GHz to 1.0GHz	25	42		dB
		f_0 = 1.0GHz to 2.0GHz	22	34		
		f_0 = 2.0GHz to 2.7GHz	18	30		
Input Return Loss (RFCOM to All RF Ports)	RL	f_0 = 0.1GHz to 1.0GHz		20		dB
		f_0 = 1.0GHz to 2.0GHz		13		
		f_0 = 2.0GHz to 2.7GHz		16		
0.1dB Compression Point (RFCOM to All RF Ports)	$P_{0.1dB}$	f_0 = 0.1GHz to 3.0GHz		27		dBm

MIPI READ AND WRITE TIMING

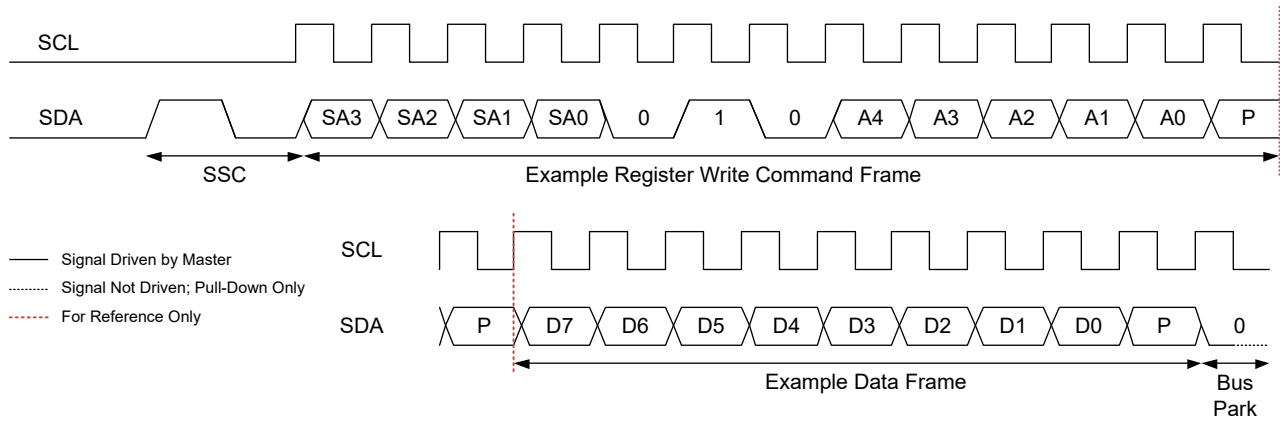


Figure 2. Register Write Command Timing Diagram

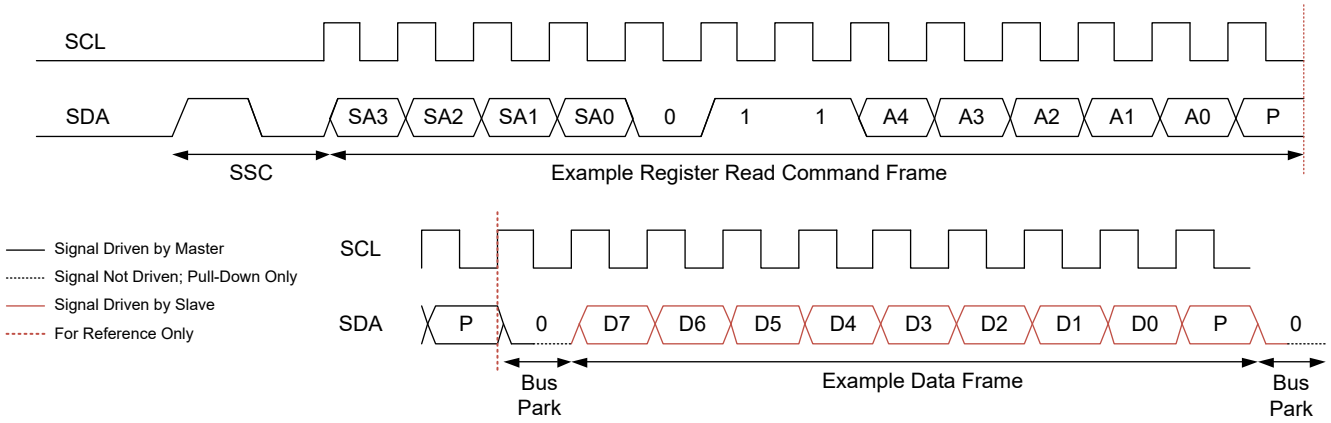


Figure 3. Register Read Command Timing Diagram

COMMAND SEQUENCE BIT DEFINITIONS

Type	SSC	Command Frame Bits					Parity Bits	Bus Park Cycle	Extended Operation					
		C[11:8]	C[7]	C[6:5]	C[4]	C[3:0]			Data Frame Bits	Parity Bits	Bus Park Cycle	Data Frame Bits	Parity Bits	Bus Park Cycle
Reg Write	Y	SA[3:0]	0	10	A[4]	A[3:0]	Y	-	D[7:0]	Y	Y	-	-	-
Reg Read	Y	SA[3:0]	0	11	A[4]	A[3:0]	Y	Y	D[7:0]	Y	Y	-	-	-
Reg0 Write	Y	SA[3:0]	1	D[6:5]	D[4]	D[3:0]	Y	Y	-	-	-	-	-	-

Legends:
SSC = Sequence Start Command
SA = Slave Address
A = Register Address
D = Data Bit

REGISTER MAPS

Register_0

Register Address: 0x00; R/W

Table 2. Register_0 Register Details

Bits	Bit Name	Description	Default	Type	B/G	Trig
D[7:0]	MODE_CTRL	See Table 1 section.	00000000	R/W	No	0, 1, 2

PM_TRIG

Register Address: 0x1C; R/W and W

Table 3. PM_TRIG Register Details

Bits	Bit Name	Description	Default	Type	B/G	Trig
D[7]	PWR_MODE_1	0: Normal 1: Low power	0	R/W	Yes	No
D[6]	PWR_MODE_0	0: Active - Normal 1: Startup - All registers are reset to the default	0	R/W	Yes	No
D[5]	TRIGGER_MASK_2	0: TRIGGER_2 enabled 1: TRIGGER_2 disabled If any one of the three TRIGGER_MASK_x is set to logic '1', the corresponding trigger is disabled, in that case data written to a register associated with the trigger goes directly to the destination register. Otherwise, if the TRIGGER_MASK_x is set to logic '0', incoming data is written to the shadow register, and the destination register is unchanged until its corresponding trigger is asserted.	0	R/W	No	No
D[4]	TRIGGER_MASK_1	0: TRIGGER_1 enabled 1: TRIGGER_1 disabled	0	R/W	No	No
D[3]	TRIGGER_MASK_0	0: TRIGGER_0 enabled 1: TRIGGER_0 disabled	0	R/W	No	No
D[2]	TRIGGER_2	0: Keep its associated destination registers unchanged 1: Load its associated destination registers with the data in the parallel shadow register, provided TRIGGER_MASK_2 is set to logic '0'	0	W	Yes	No
D[1]	TRIGGER_1	0: Keep its associated destination registers unchanged 1: Load its associated destination registers with the data in the parallel shadow register, provided TRIGGER_MASK_1 is set to logic '0'	0	W	Yes	No
D[0]	TRIGGER_0	0: Keep its associated destination registers unchanged 1: Load its associated destination registers with the data in the parallel shadow register, provided TRIGGER_MASK_0 is set to logic '0'	0	W	Yes	No

PRODUCT_ID

Register Address: 0x1D; R

Table 4. PRODUCT_ID Register Details

Bits	Bit Name	Description	Default	Type	B/G	Trig
D[7:0]	PRODUCT_ID	Product number.	00000001	R	No	No

MANUFACTURER_ID

Register Address: 0x1E; R

Table 5. MANUFACTURER_ID Register Details

Bits	Bit Name	Description	Default	Type	B/G	Trig
D[7:0]	MANUFACTURER_ID[7:0]	Lower eight bits of Manufacturer ID. Read-only. Note that during USID programming, the write command sequence is executed on the register, but the value does not change.	01001010	R	No	No

REGISTER MAPS (continued)

MAN_USID

Register Address: 0x1F; R and R/W

Table 6. MAN_USID Register Details

Bits	Bit Name	Description	Default	Type	B/G	Trig
D[7:6]	Reserved	Reserved.	00	R	No	No
D[5:4]	MANUFACTURER_ID[9:8]	Upper two bits of Manufacturer ID. Read-only. Note that during USID programming, the write command sequence is executed on the register, but the value does not change.	00	R	No	No
D[3:0]	USID	USID of the device.	1011	R/W	No	No

TYPICAL APPLICATION CIRCUIT

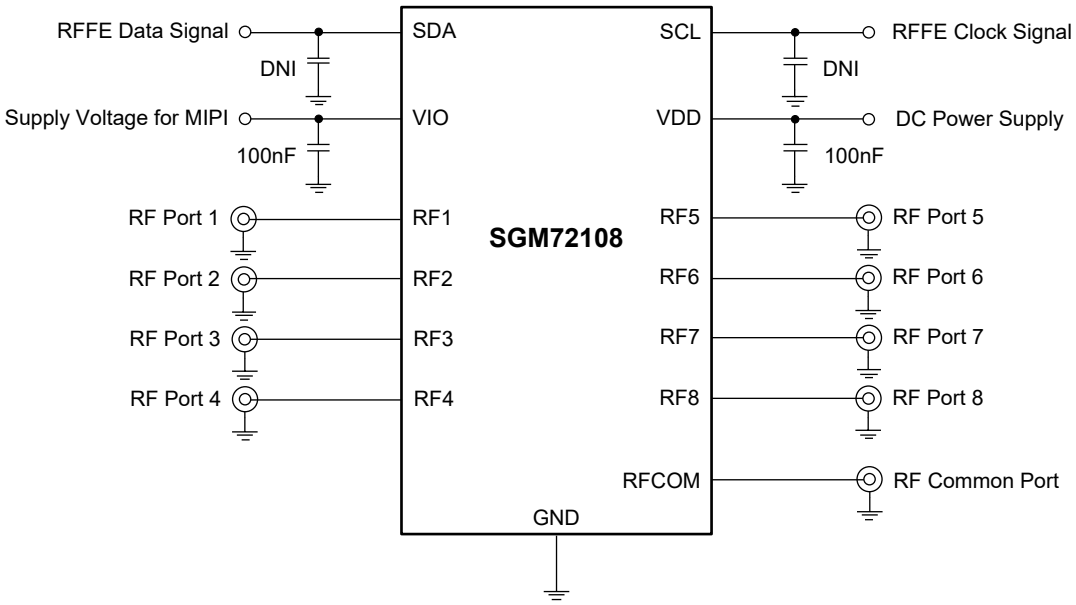


Figure 4. SGM72108 Typical Application Circuit

EVALUATION BOARD LAYOUT

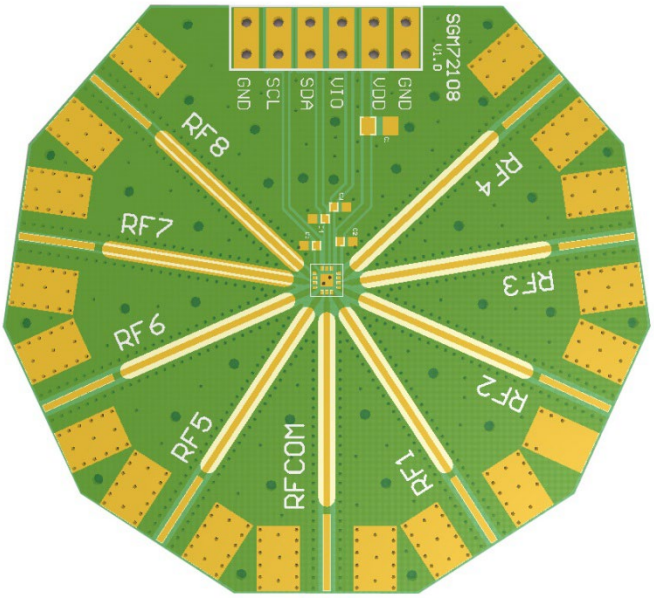


Figure 5. SGM72108 Evaluation Board Layout

REVISION HISTORY

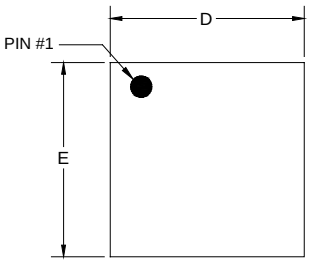
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

DECEMBER 2022 - REV.A to REV.A.1	Page
Updated Electrical Characteristics	4

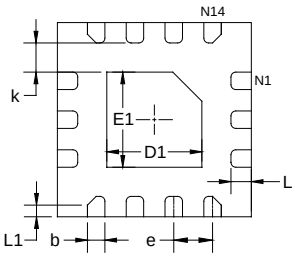
Changes from Original (MAY 2022) to REV.A	Page
Changed from product preview to production data	All

PACKAGE OUTLINE DIMENSIONS

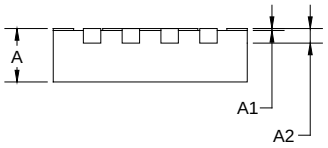
UTQFN-2×2-14AL



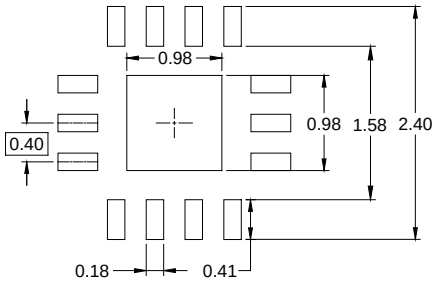
TOP VIEW



BOTTOM VIEW



SIDE VIEW



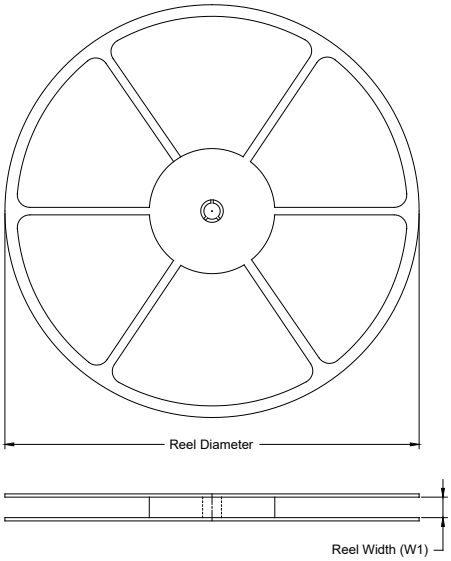
RECOMMENDED LAND PATTERN (Unit: mm)

Symbol	Dimensions In Millimeters		
	MIN	MOD	MAX
A	0.500	0.550	0.600
A1	0.000	0.020	0.050
A2	0.150 REF		
D	1.950	2.000	2.050
E	1.950	2.000	2.050
D1	0.880	0.980	1.080
E1	0.880	0.980	1.080
b	0.130	0.180	0.230
e	0.400 BSC		
k	0.150	-	-
L	0.160	0.210	0.260
L1	0.120 REF		

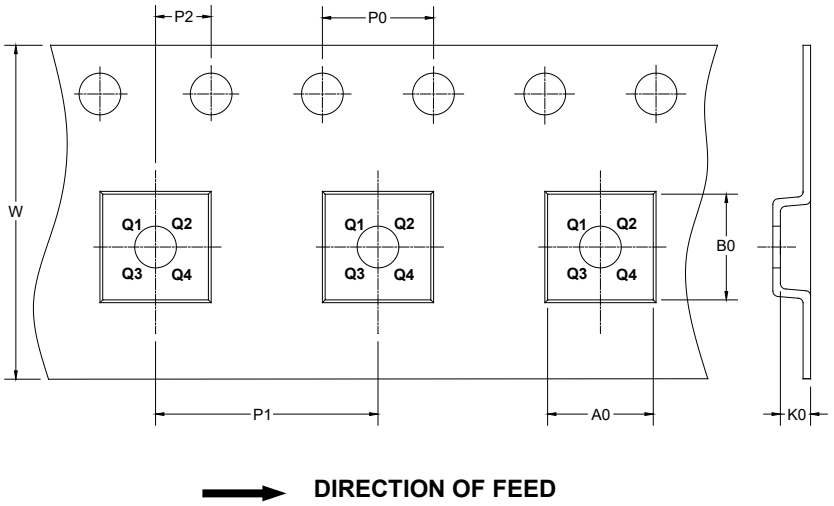
NOTE: This drawing is subject to change without notice.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



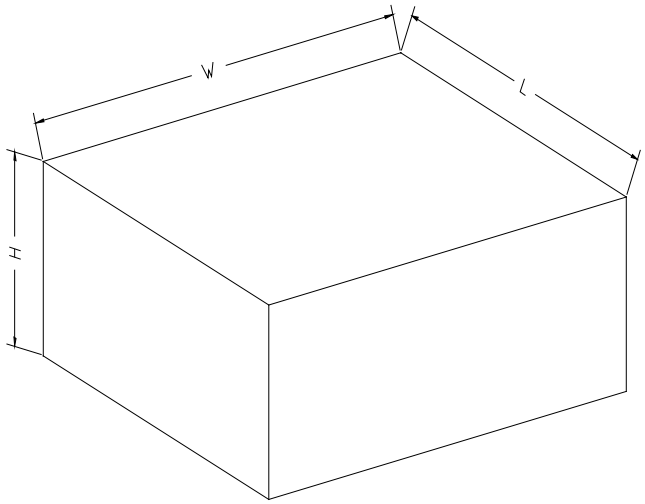
NOTE: The picture is only for reference. Please make the object as the standard.

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-2×2-14AL	7″	9.5	2.25	2.25	0.75	4.0	4.0	2.0	8.0	Q2

DD0001

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