

### GENERAL DESCRIPTION

The SGM72112A is a single-pole/twelve-throw (SP12T) 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 SGM72112A is not subject to cellular interference and is applied to multi-mode and multi-band LTE mobile phones.

The SGM72112A has the ability to integrate SP12T 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 SGM72112A is available in a Green UTQFN-2.5×2.5-20L 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: 0.75dB (TYP) at 2.7GHz**
- **MIPI RFFE Interface Compatible**
- **No External DC Blocking Capacitors Required**
- **Available in a Green UTQFN-2.5×2.5-20L Package**

### BLOCK DIAGRAM

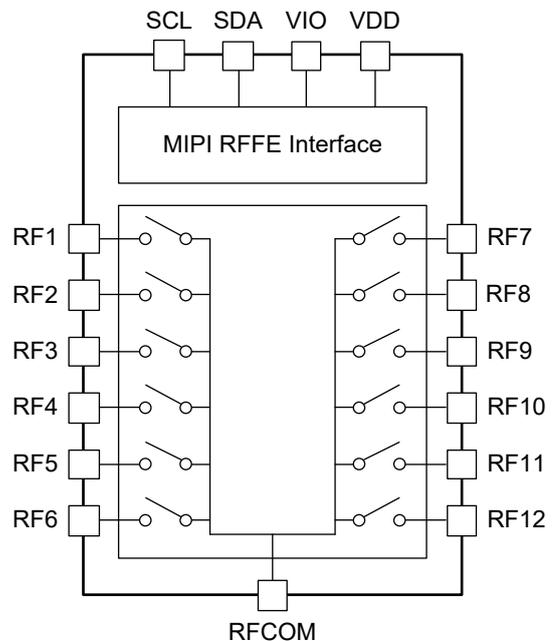


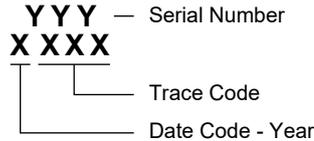
Figure 1. SGM72112A Block Diagram

PACKAGE/ORDERING INFORMATION

Table with 6 columns: MODEL, PACKAGE DESCRIPTION, SPECIFIED TEMPERATURE RANGE, ORDERING NUMBER, PACKAGE MARKING, PACKING OPTION. Row 1: SGM72112A, UTQFN-2.5x2.5-20L, -40°C to +85°C, SGM72112AYURE20G/TR, RD8 XXXX, Tape and Reel, 2000

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, VDD.....5V
Supply Voltage for MIPI, VIO.....2V
SDA, SCL Control Voltage, VCTL.....2V
RF Input Power, PIN.....26dBm
Junction Temperature.....+150°C
Storage Temperature Range.....-55°C to +150°C
Lead Temperature (Soldering, 10s).....+260°C
ESD Susceptibility
HBM.....1000V

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.

RECOMMENDED OPERATING CONDITIONS

- Operating Temperature Range.....-40°C to +85°C
Operating Frequency Range.....0.1GHz to 3.0GHz
Supply Voltage, VDD.....2.4V to 4.8V
Supply Voltage for MIPI, VIO.....1.65V to 1.95V

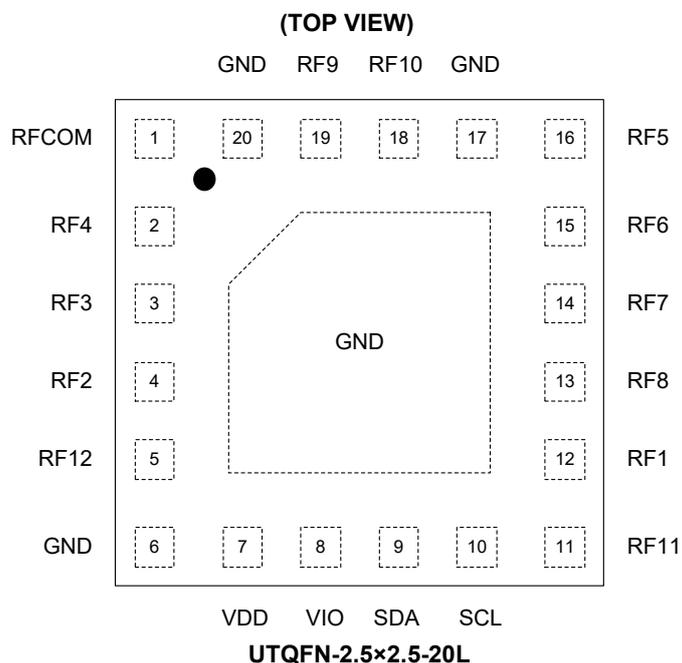
ESD SENSITIVITY CAUTION

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	RFCOM	RF Common Port.
2	RF4	RF Port 4.
3	RF3	RF Port 3.
4	RF2	RF Port 2
5	RF12	RF Port 12.
6, 17, 20	GND	Ground.
7	VDD	DC Power Supply.
8	VIO	Supply Voltage for MIPI.
9	SDA	RFFE Data Signal.
10	SCL	RFFE Clock Signal.
11	RF11	RF Port 11.
12	RF1	RF Port 1.
13	RF8	RF Port 8.
14	RF7	RF Port 7.
15	RF6	RF Port 6.
16	RF5	RF Port 5.
18	RF10	RF Port 10.
19	RF9	RF Port 9.
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	1	0	0
3	RF2	0	0	0	0	0	1	1	1
4	RF3	0	0	0	0	1	0	0	1
5	RF4	0	0	0	0	1	0	1	1
6	RF5	0	0	0	0	1	1	0	0
7	RF6	0	0	0	0	0	0	0	1
8	RF7	0	0	0	0	0	0	1	0
9	RF8	0	0	0	0	0	0	1	1
10	RF9	0	0	0	0	1	0	1	0
11	RF10	0	0	0	0	1	0	0	0
12	RF11	0	0	0	0	0	1	0	1
13	RF12	0	0	0	0	0	1	1	0

## ELECTRICAL CHARACTERISTICS

(T<sub>A</sub> = +25°C, V<sub>DD</sub> = 2.4V to 4.8V, P<sub>IN</sub> = 0dBm, 50Ω, typical values are at V<sub>DD</sub> = 2.8V, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
<b>DC Characteristics</b>						
Supply Voltage	V <sub>DD</sub>		2.4	2.8	4.8	V
Supply Current	I <sub>VDD</sub>			32	70	μA
Supply Voltage for MIPI	V <sub>IO</sub>		1.65	1.8	1.95	V
Supply Current for MIPI	I <sub>VIO</sub>			4.8	11	μA
Control Voltage	V <sub>CTL_H</sub>	High	0.8 × V <sub>IO</sub>	V <sub>IO</sub>	1.95	V
	V <sub>CTL_L</sub>	Low	0		0.45	
Switching Time	t <sub>sw</sub>	50% of control voltage to 90% of RF power		1	2	μs
Turn-On Time	t <sub>ON</sub>	Time from V <sub>DD</sub> = 0V to part on and RF at 90%		5	10	μs
<b>RF Characteristics</b>						
Insertion Loss (RFCOM to All RF Ports)	IL	f <sub>0</sub> = 0.1GHz to 1.0GHz		0.50	0.85	dB
		f <sub>0</sub> = 1.0GHz to 2.0GHz		0.60	1.05	
		f <sub>0</sub> = 2.0GHz to 2.7GHz		0.75	1.25	
Isolation (RFCOM to All RF Ports)	ISO	f <sub>0</sub> = 0.1GHz to 1.0GHz	24	42		dB
		f <sub>0</sub> = 1.0GHz to 2.0GHz	17	36		
		f <sub>0</sub> = 2.0GHz to 2.7GHz	14	31		
Input Return Loss (RFCOM to All RF Ports)	RL	f <sub>0</sub> = 0.1GHz to 1.0GHz		22		dB
		f <sub>0</sub> = 1.0GHz to 2.0GHz		21		
		f <sub>0</sub> = 2.0GHz to 2.7GHz		13		
0.1dB Compression Point (RFCOM to All RF Ports)	P <sub>0.1dB</sub>	f <sub>0</sub> = 0.1GHz to 3.0GHz		26		dBm

MIPI READ AND WRITE TIMING

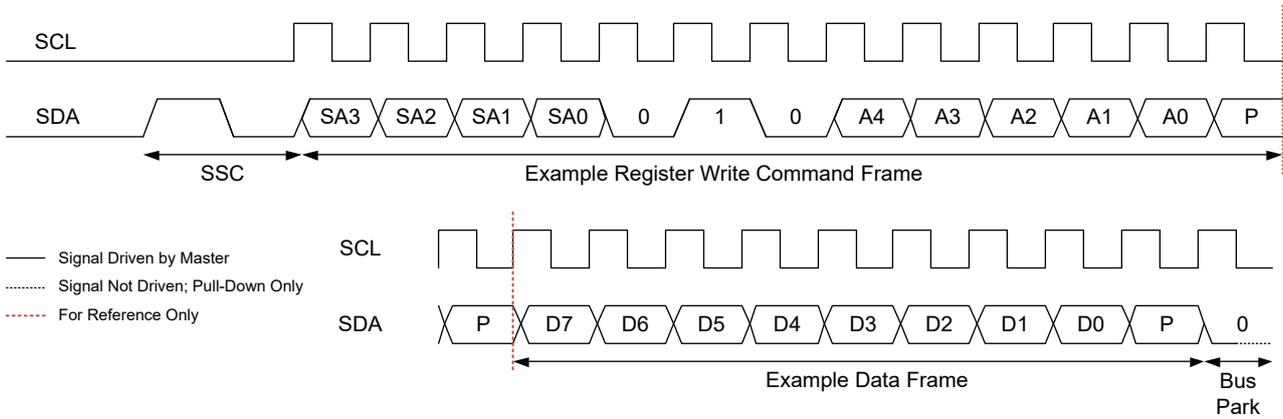


Figure 2. Register Write Command Timing Diagram

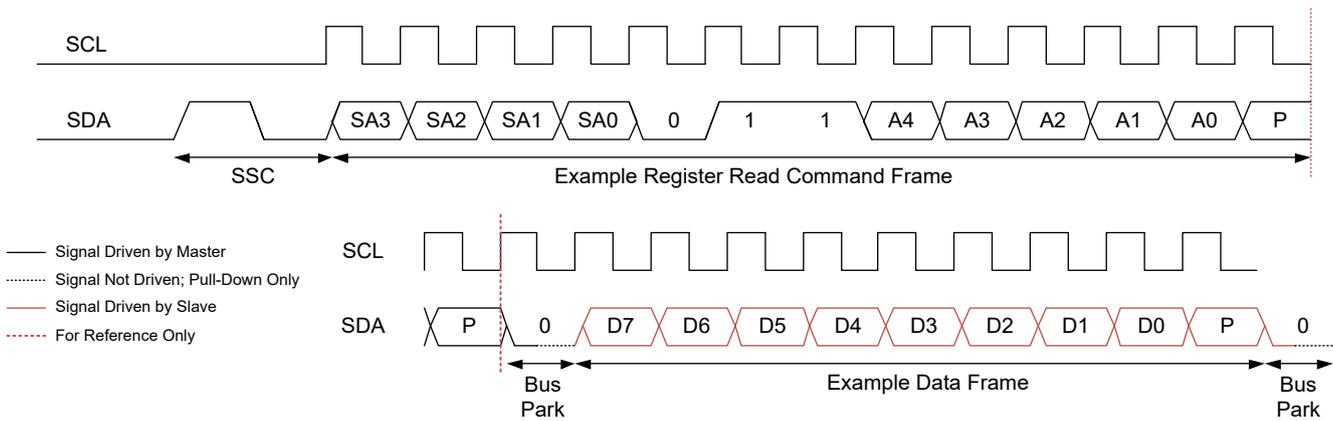


Figure 3. Register Read Command Timing Diagram

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	-	-	-
Reg <sup>0</sup> 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	0	R/W	No	No
D[4]	TRIGGER_MASK_1	0: TRIGGER_1 enabled 1: TRIGGER_1 disabled				
D[3]	TRIGGER_MASK_0	0: TRIGGER_0 enabled 1: TRIGGER_0 disabled				
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.	00000011	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

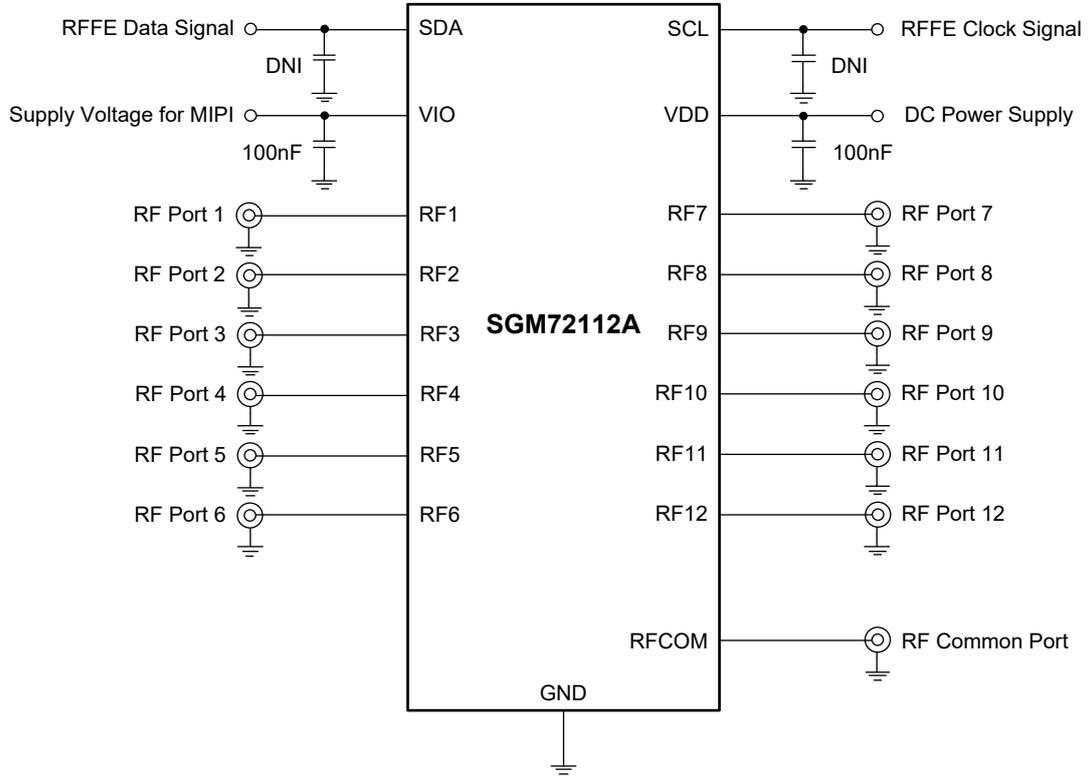


Figure 4. SGM72112A Typical Application Circuit

EVALUATION BOARD LAYOUT

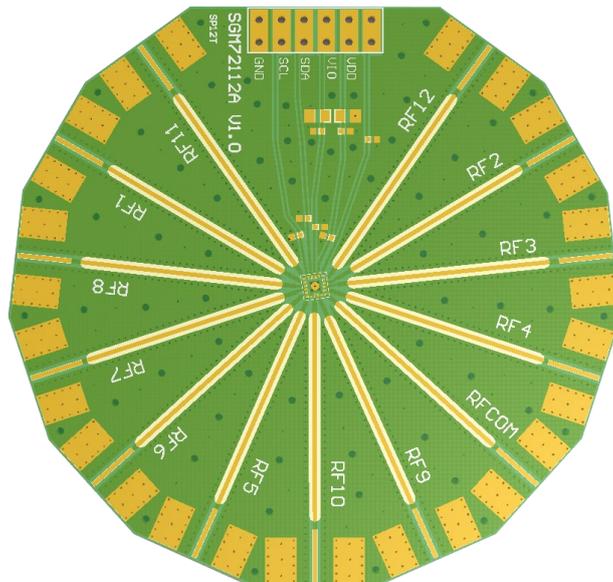


Figure 5. SGM72112A Evaluation Board Layout

**REVISION HISTORY**

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

<b>DECEMBER 2022 - REV.A to REV.A.1</b>	<b>Page</b>
Updated Electrical Characteristics .....	4

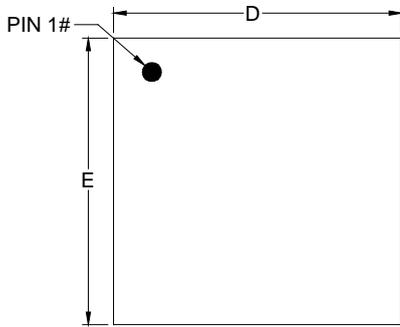
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<b>Changes from Original (MAY 2022) to REV.A</b>	<b>Page</b>
Changed from product preview to production data.....	All

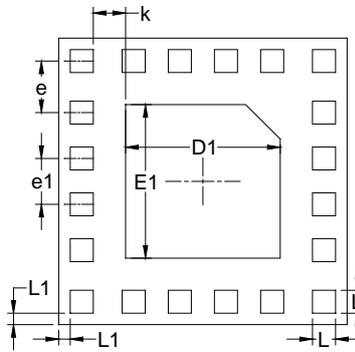
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PACKAGE OUTLINE DIMENSIONS

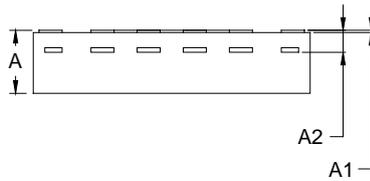
UTQFN-2.5x2.5-20L



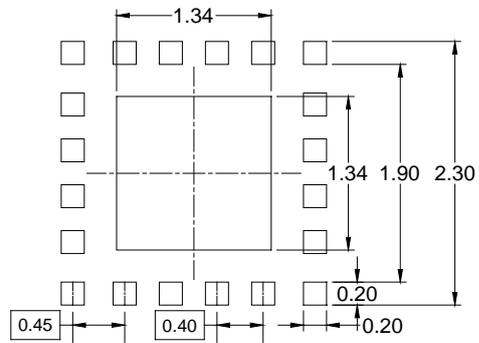
TOP VIEW



BOTTOM VIEW



SIDE VIEW



RECOMMENDED LAND PATTERN (Unit: mm)

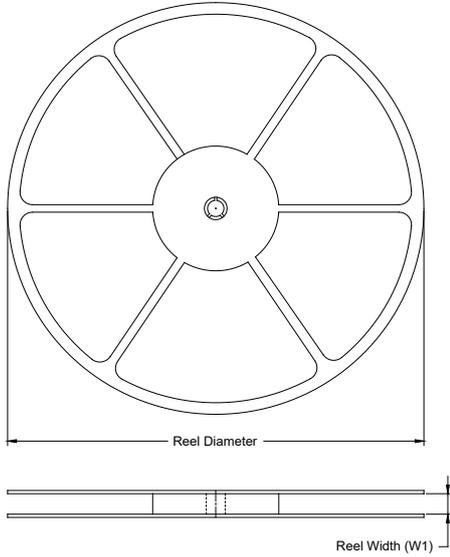
Symbol	Dimensions In Millimeters		
	MIN	MOD	MAX
A	0.500	0.550	0.600
A1	0.000	0.020	0.050
A2	0.152 REF		
D	2.400	2.500	2.600
E	2.400	2.500	2.600
D1	1.240	1.340	1.440
E1	1.240	1.340	1.440
e	0.450 BSC		
e1	0.400 BSC		
k	0.280 REF		
L	0.150	0.200	0.250
L1	0.100 REF		

NOTE: This drawing is subject to change without notice.

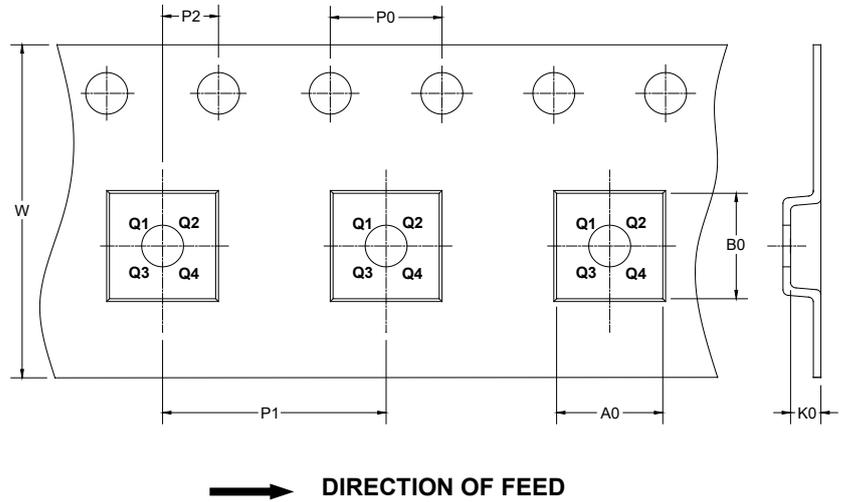
# PACKAGE INFORMATION

## TAPE AND REEL INFORMATION

### REEL DIMENSIONS



### TAPE DIMENSIONS



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

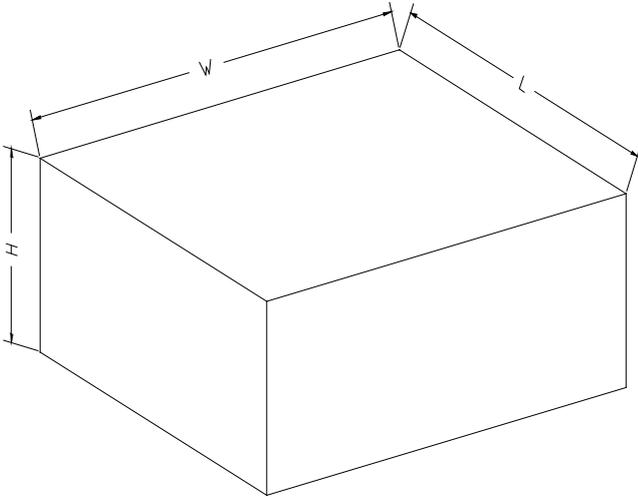
### KEY PARAMETER LIST OF TAPE AND REEL

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-2.5×2.5-20L	7"	12.4	2.66	2.69	0.77	4.0	8.0	2.0	12.0	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

DD0002