

General Description

Renesas SLG7RN46384 is a low power and small form device. The SoC is housed in a 2mm x 3mm STQFN package which is optimal for using with small devices.

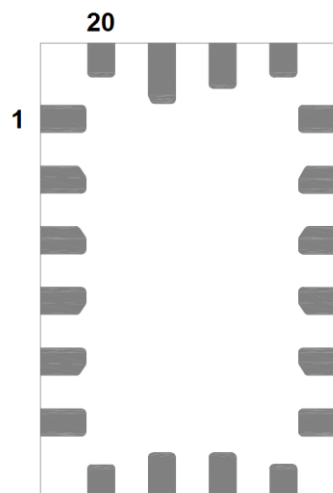
Features

- Low Power Consumption
- Pb - Free / RoHS Compliant
- Halogen - Free
- STQFN - 20 Package

Output Summary

1 Output - Push Pull 1X
7 Outputs - Push Pull 2X

Pin Configuration

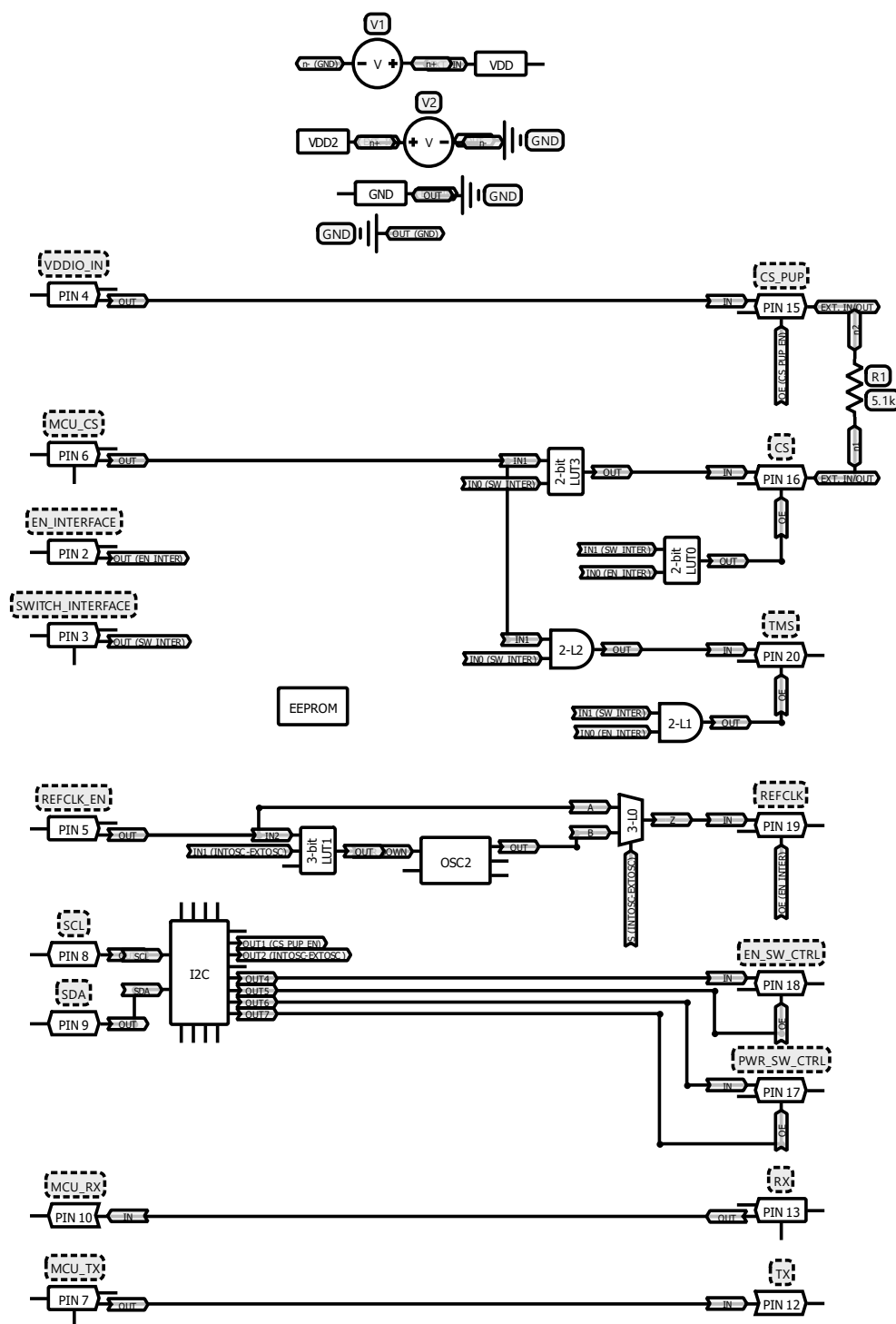


20-pin STQFN
(Top View)

Pin name

Pin #	Pin name	Pin #	Pin name
1	VDD	11	GND
2	EN_INTERFACE	12	TX
3	SWITCH_INTERFACE	13	RX
4	VDDIO_IN	14	VDD2
5	REFCLK_EN	15	CS_PUP
6	MCU_CS	16	CS
7	MCU_TX	17	PWR_SW_CTRL
8	SCL	18	EN_SW_CTRL
9	SDA	19	REFCLK
10	MCU_RX	20	TMS

Block Diagram



Pin Configuration

Pin #	Pin Name	Type	Pin Description	Internal Resistor
1	VDD	PWR	Supply Voltage	--
2	EN_INTERFACE	Digital Input	Digital Input without Schmitt trigger	10kΩ pulldown
3	SWITCH_INTERFACE	Digital Input	Digital Input without Schmitt trigger	10kΩ pulldown
4	VDDIO_IN	Digital Input	Low Voltage Digital Input	1MΩ pulldown
5	REFCLK_EN	Digital Input	Digital Input without Schmitt trigger	floating
6	MCU_CS	Digital Input	Digital Input without Schmitt trigger	floating
7	MCU_TX	Digital Input	Digital Input without Schmitt trigger	floating
8	SCL	Digital Input	Digital Input without Schmitt trigger	floating
9	SDA	Digital Input	Digital Input without Schmitt trigger	floating
10	MCU_RX	Digital Output	Push Pull 1X	floating
11	GND	GND	Ground	--
12	TX	Digital Output	Push Pull 2X	floating
13	RX	Digital Input	Digital Input without Schmitt trigger	100kΩ pulldown
14	VDD2	PWR	Supply Voltage	--
15	CS_PUP	Bi-directional	Digital Input without Schmitt trigger / Push Pull 2X	floating
16	CS	Bi-directional	Digital Input without Schmitt trigger / Push Pull 2X	floating
17	PWR_SW_CTRL	Bi-directional	Digital Input without Schmitt trigger / Push Pull 2X	floating
18	EN_SW_CTRL	Bi-directional	Digital Input without Schmitt trigger / Push Pull 2X	floating
19	REFCLK	Bi-directional	Digital Input without Schmitt trigger / Push Pull 2X	floating
20	TMS	Bi-directional	Digital Input without Schmitt trigger / Push Pull 2X	floating

Ordering Information

Part Number	Package Type
SLG7RN46384V	20-pin STQFN
SLG7RN46384V	20-pin STQFN - Tape and Reel (3k units)

Absolute Maximum Conditions

Parameter	Min.	Max.	Unit
V _{HIGH} to GND	-0.3	7	V
Voltage at Input Pin	GND-0.5V	VDD+0.5V	V
Maximum Average or DC Current Through V _{DD} Pin	--	90	mA
Maximum Average or DC Current Through V _{DD2} Pin	--	90	mA
Maximum Average or DC Current Through GND Pin (Per chip side, (Note 1))	--	100	mA
Maximum Average or DC Current (Through pin)	Push-Pull 1x	15.3	mA
	Push-Pull 2x	22.1	
Current at Input Pin	-1.0	1.0	mA
Input leakage (Absolute Value)	--	1000	nA
Storage Temperature Range	-65	150	°C
Junction Temperature	--	150	°C
ESD Protection (Human Body Model)	2000	--	V
ESD Protection (Charged Device Model)	1300	--	V
Moisture Sensitivity Level	1		

Note 1 The GreenPAK's GND rail is divided in two sides. IOs 0 to 6, SCL, SDA are connected to one side and IOs 7 to 14 are connected to another side.

Electrical Characteristics

Symbol	Parameter	Condition/Note	Min.	Typ.	Max.	Unit
V _{DD}	Supply Voltage		5	5	5	V
V _{DD2}	Supply Voltage		5	5	5	V
T _A	Operating Temperature		-40	25	85	°C
C _{VDD}	Capacitor Value at VDD		--	0.1	--	μF
C _{IN}	Input Capacitance		--	4	--	pF
I _Q	Quiescent Current	Static inputs and floating outputs PIN8 and PIN9 are HIGH PINs 5 – 7, 15 – 20 are LOW	--	380	--	μA
V _O	Maximal Voltage Applied to any PIN in High-Impedance State		--	--	VDD+0.3	V
V _{IH}	HIGH-Level Input Voltage (Note 1)	Logic Input	0.7xVDD	--	VDD+0.3	V
		Low-Level Logic Input	1.25	--	VDD+0.3	V
V _{IL}	LOW-Level Input Voltage (Note 1)	Logic Input	GND-0.3	--	0.3xVDD	V
		Low-Level Logic Input	GND-0.3	--	0.5	V
V _{OH}	HIGH-Level Output Voltage (Note 1)	Push-Pull 1X, I _{OH} =5mA at VDD=5.0V	4.678	--	--	V
		Push-Pull 2X, I _{OH} =5mA at VDD=5.0V	4.821	--	--	V
V _{OL}	LOW-Level Output Voltage (Note 1)	Push-Pull 1X, I _{OL} =5mA, at VDD=5.0V	--	--	0.256	V
		Push-Pull 2X, I _{OL} =5mA, at VDD=5.0V	--	--	0.145	V
I _{OH}	HIGH-Level Output Current (Note 1)	Push-Pull 1X, V _{OH} =2.4V at VDD=5.0V	25.12	--	--	mA
		Push-Pull 2X, V _{OH} =2.4V at VDD=5.0V	48.49	--	--	mA

I _{OL}	LOW-Level Output Current (Note 1)	Push-Pull 1X, V _{OL} =0.4V, at V _{DD} =5.0V	7.67	--	--	mA
		Push-Pull 2X, V _{OL} =0.4V, at V _{DD} =5.0V	13.52	--	--	mA
R _{PULL_DOWN}	Internal Pull Down Resistance (Note 1)	Pull down on PINs 2, 3	--	10	--	kΩ
		Pull down on PIN 13	--	100	--	kΩ
		Pull down on PIN 4	--	1	--	MΩ
T _{SU}	Startup Time	From V _{DD} rising past P _{ON} _{THR}	--	1.66	2.59	ms
P _{ON} _{THR}	Power On Threshold	V _{DD} Level Required to Start Up the Chip	1.60	1.85	2.07	V
P _{OFF} _{THR}	Power Off Threshold	V _{DD} Level Required to Switch Off the Chip	0.97	1.23	1.46	V
Note: 1. PINs 1 to 10 are powered from V _{DD} and PINs 12 to 20 are powered from V _{DD} 2. 2. Guaranteed by Design.						

I²C Specifications

Symbol	Parameter	Condition/Note	Min.	Typ.	Max.	Unit
F _{SCL}	Clock Frequency, SCL	V _{DD} = (2.3...5.5) V	--	--	400	kHz
t _{LOW}	Clock Pulse Width Low	V _{DD} = (2.3...5.5) V	1300	--	--	ns
t _{HIGH}	Clock Pulse Width High	V _{DD} = (2.3...5.5) V	600	--	--	ns
t _i	Input Filter Spike Suppression (SCL, SDA)	V _{DD} = (2.3...5.5) V	--	--	95	ns
t _{AA}	Clock Low to Data Out Valid	V _{DD} = (2.3...5.5) V	--	--	900	ns
t _{BUF}	Bus Free Time between Stop and Start	V _{DD} = (2.3...5.5) V	1300	--	--	ns
t _{HD_STA}	Start Hold Time	V _{DD} = (2.3...5.5) V	600	--	--	ns
t _{SU_STA}	Start Set-up Time	V _{DD} = (2.3...5.5) V	600	--	--	ns
t _{HD_DAT}	Data Hold Time	V _{DD} = (2.3...5.5) V	0	--	--	ns
t _{SU_DAT}	Data Set-up Time	V _{DD} = (2.3...5.5) V	100	--	--	ns
t _R	Inputs Rise Time	V _{DD} = (2.3...5.5) V	--	--	300	ns
t _F	Inputs Fall Time	V _{DD} = (2.3...5.5) V	--	--	300	ns
t _{SU_STO}	Stop Set-up Time	V _{DD} = (2.3...5.5) V	600	--	--	ns
t _{DH}	Data Out Hold Time	V _{DD} = (2.3...5.5) V	50	--	--	ns

Chip address

HEX	BIN	DEC
0x70	1110000	112

I2C Description

1. I2C Basic Command Structure

Each command to the I2C Serial Communications block begins with a Control Byte. The bits inside this Control Byte are shown in Figure 1. After the Start bit, the first four bits are a control code, which can be set by the user in reg<1623:1620>. The Block Address is the next three bits (A10, A9, A8), which will define the most significant bits in the addressing of the data to be read ("1") or written ("0") by the command. This Control Byte will be followed by an Acknowledge bit (ACK).

With the exception of the Current Address Read command, all commands will have the Control Byte followed by the Word Address. The Word Address, in conjunction with the three address bits in the Control Byte, will define the specific data byte to be read or written in the command. Figure 1 shows this basic command structure.

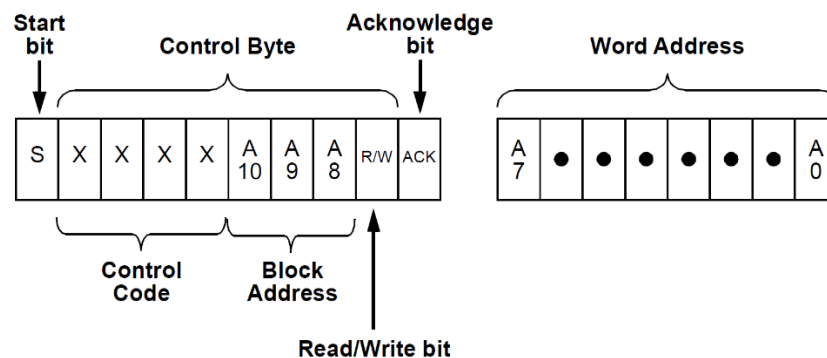


Figure1. I2C Basic Command Structure

2. I2C Serial General Timing

Shown in Figure 2 is the general timing characteristics for the I2C Serial Communications block.

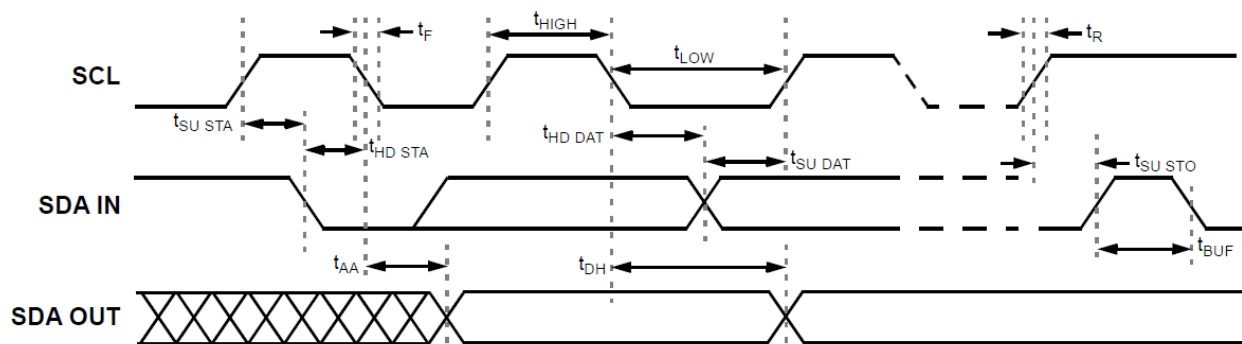


Figure2. I2C Serial General Timing

3. I2C Serial Communications: Read and Write Commands

Following the Start condition from the master, the Control Code [4 bits], the block address [3 bits] and the R/W bit (set to “0”), is placed onto the bus by the Bus Master. After the I2C Serial Communications block has provided an Acknowledge bit (ACK) the next byte transmitted by the master is the Word Address. The Block Address is the next three bits, and is the higher order addressing bits (A10, A9, A8), which when added to the Word Address will together set the internal address pointer in the SLG7RN46384 to the correct data byte to be written. After the SLG7RN46384 sends another Acknowledge bit, the Bus Master will transmit the data byte to be written into the addressed memory location. The SLG7RN46384 again provides an Acknowledge bit and then the Bus Master generates a Stop condition. The internal write cycle for the data will take place at the time that the SLG7RN46384 generates the Acknowledge bit.

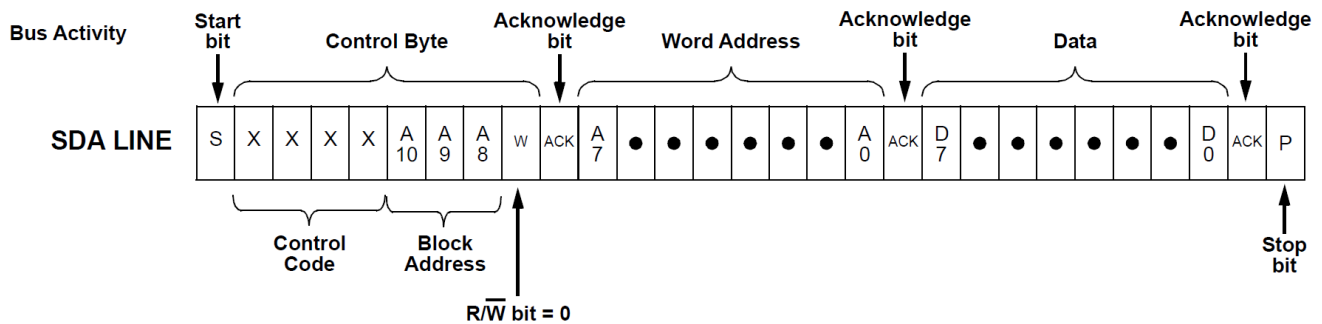


Figure3. I2C Write Command

The Random Read command starts with a Control Byte (with $\overline{R/W}$ bit set to “0”, indicating a write command) and Word Address to set the internal byte address, followed by a Start bit, and then the Control Byte for the read (exactly the same as the Byte Write command). The Start bit in the middle of the command will halt the decoding of a Write command, but will set the internal address counter in preparation for the second half of the command. After the Start bit, the Bus Master issues a second control byte with the $\overline{R/W}$ bit set to “1”, after which the SLG7RN46384 issues an Acknowledge bit, followed by the requested eight data bits.

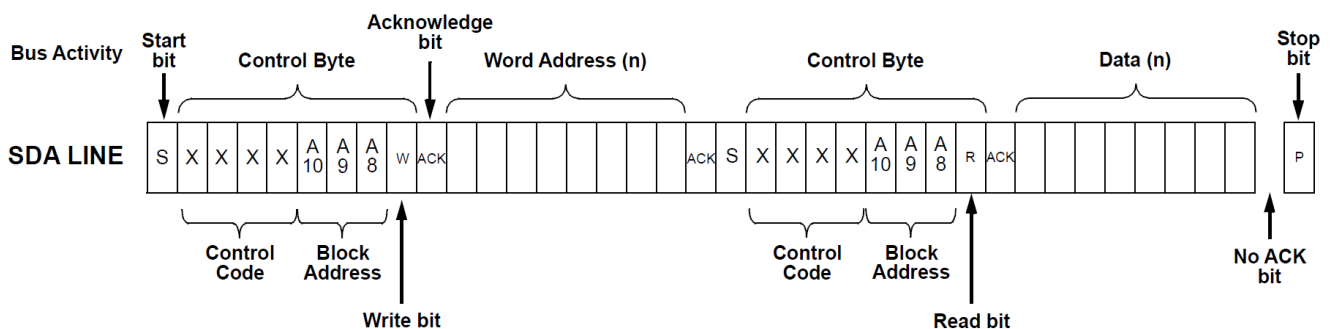


Figure4. I2C Random Read Command

4. Chip reconfiguration

SLG7RN46384 has an ISP capability. This means that the chip internal blocks configuration may be changed on the fly or even re-programmed via I2C. If there is a need for temporary change of the chip configuration (it will be reset to the programmed configuration after the chip is reset or powered ON again) one should use Registers (A10, A9, A8 = “000”). To reprogram a configuration via I2C NVM should be accessed with A10, A9, A8 = “010”. Please keep in mind that random byte write procedure is not supported, this may lead to incorrect chip configuration. Only page write procedure is supported.

Package Top Marking

Part Code	XXXXX	
Date Code	DDLLL	Lot #
Pin 1 Identifier	● CRR	COO + Revision

- XXXXX - Part ID FieldL identifies the specific device configuration
DD - Date Code Field: Coded date of manufacture
LLL - Lot Code: Designates Lot #
C - Assembly Site/COO: Specifies Assembly Site/Country of Origin
RR - Revision Code: Device Revision

Datasheet Revision	Programming Code Number	Lock Status	Checksum	Part Code	Revision	Date
0.11	001	U	0x97551618	46384	AA	03/22/2023

Lock coverage for this part is indicated by √, from one of the following options:

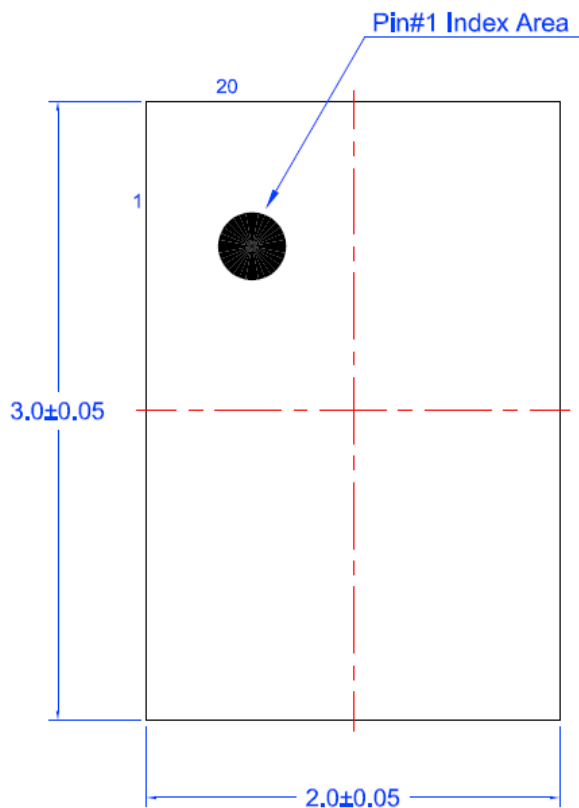
√	Unlocked
	Partly lock read
	Partly lock write
	Partly lock read and write
	Partly lock read and lock write
	Lock read and partly lock write
	Read lock
	Write lock
	Lock read and write

The IC security bit is locked/set for code security for production unless otherwise specified. The Programming Code Number is not changed based on the choice of locked vs. unlocked status.

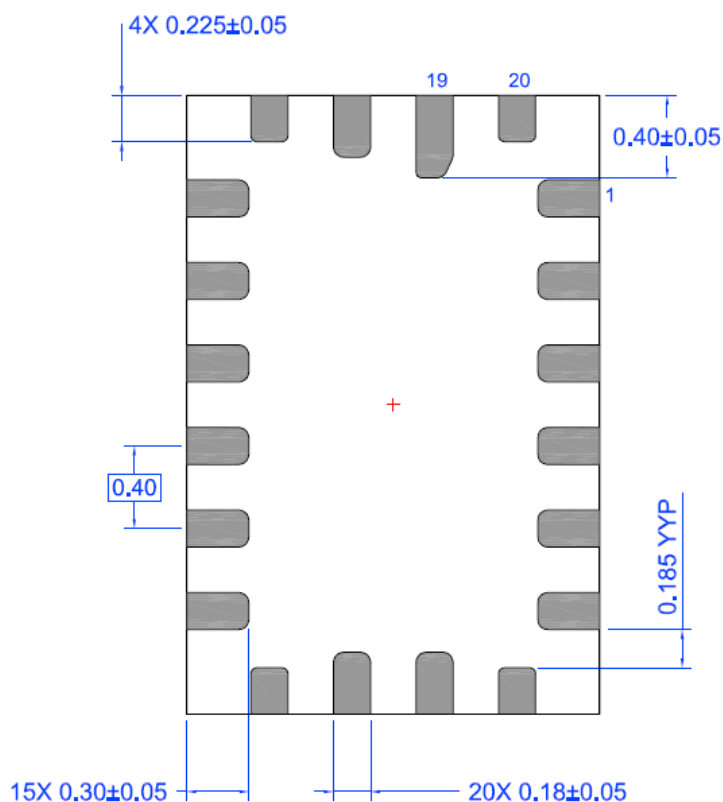
Package Outlines

STQFN 20L 2x3mm 0.4P FCD Package

IC Net Weight: 0.008 g



Marking View



BTM View



Side View

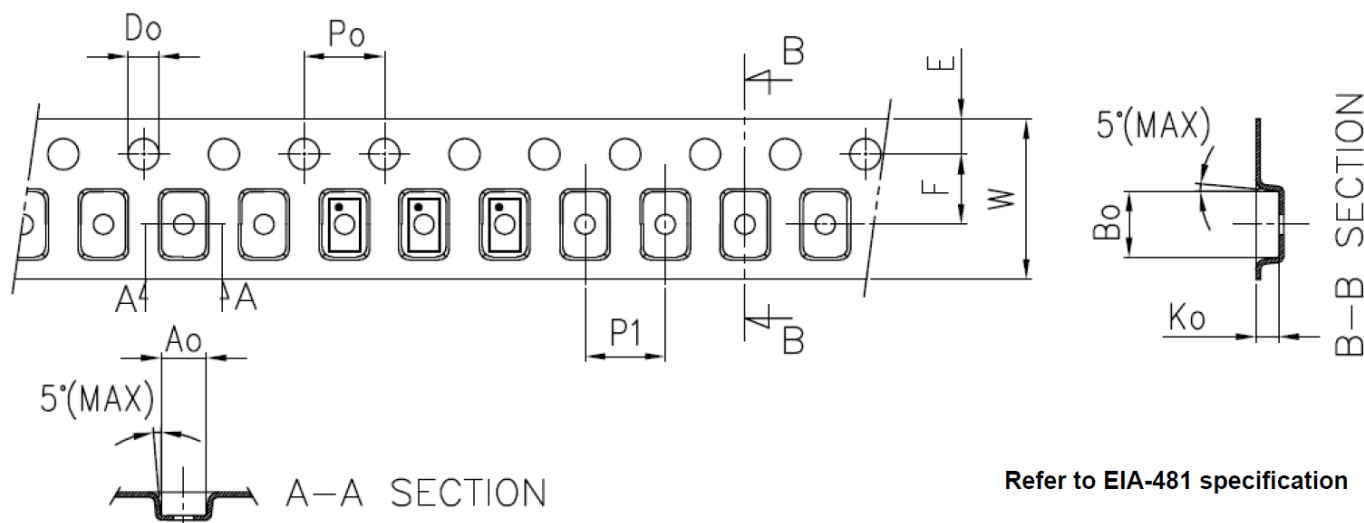
Unit: mm

Tape and Reel Specification

Package Type	# of Pins	Nominal Package Size [mm]	Max Units		Reel & Hub Size [mm]	Leader (min)		Trailer (min)		Tape Width [mm]	Part Pitch [mm]
			per Reel	per Box		Pockets	Length [mm]	Pockets	Length [mm]		
STQFN 20L 2x3mm 0.4P FCD	20	2 x 3 x 0.55	3000	3000	178 / 60	100	400	100	400	8	4

Carrier Tape Drawing and Dimensions

Package Type	Pocket BTM Length	Pocket BTM Width	Pocket Depth	Index Hole Pitch	Pocket Pitch	Index Hole Diameter	Index Hole to Tape Edge	Index Hole to Pocket Center	Tape Width
	A0	B0	K0	P0	P1	D0	E	F	W
STQFN 20L 2x3mm 0.4P FCD	2.2	3.15	0.76	4	4	1.5	1.75	3.5	8



Recommended Reflow Soldering Profile

Please see IPC/JEDEC J-STD-020: latest revision for reflow profile based on package volume of 3.30 mm³ (nominal). More information can be found at www.jedec.org.

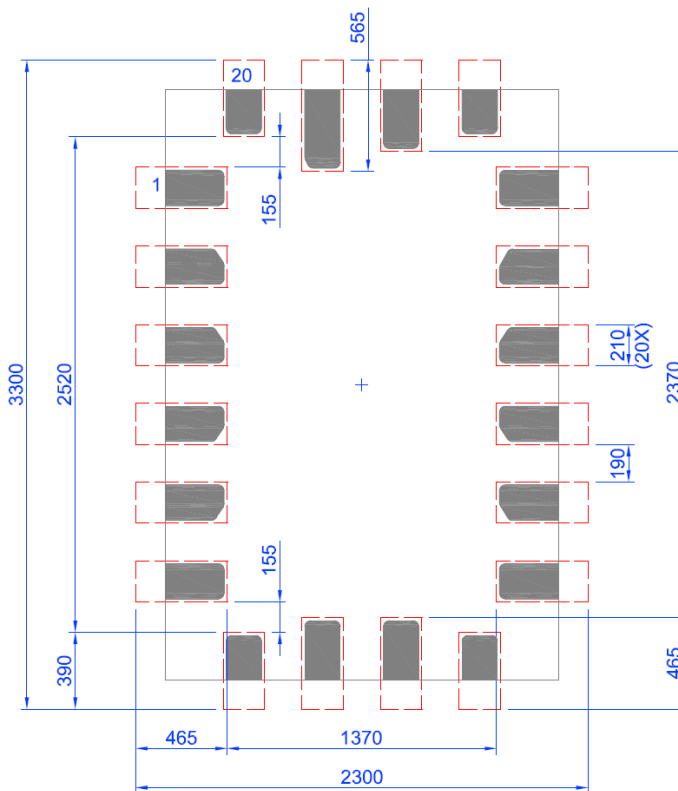
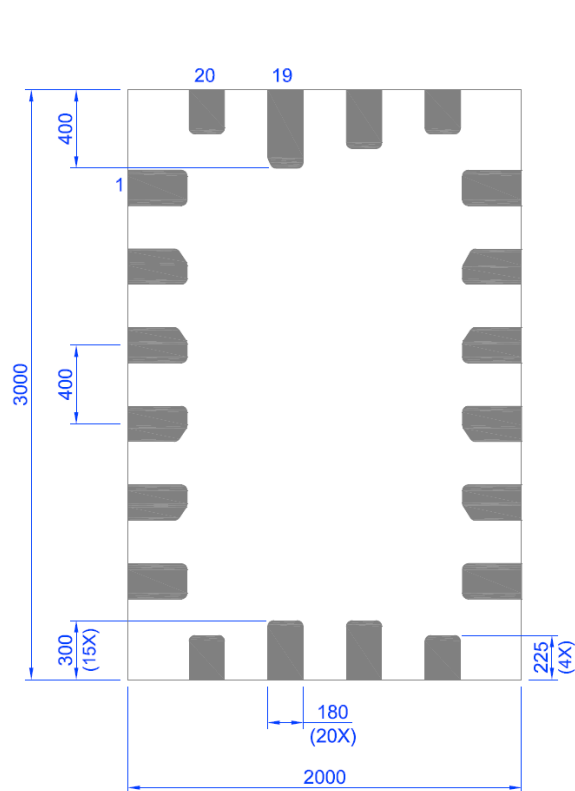
Layout Guidelines



Exposed Pad
(PKG face down)



Recommended Land Pattern
(PKG face down)



Unit: μm

Datasheet Revision History

Date	Version	Change
03/15/2023	0.10	New design for SLG46826 chip
03/22/2023	0.11	Updated Device Revision Table

IMPORTANT NOTICE AND DISCLAIMER

RENESAS ELECTRONICS CORPORATION AND ITS SUBSIDIARIES ("RENESAS") PROVIDES TECHNICAL SPECIFICATIONS AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT OF THIRD-PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for developers who are designing with Renesas products. You are solely responsible for (1) selecting the appropriate products for your application, (2) designing, validating, and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements. These resources are subject to change without notice. Renesas grants you permission to use these resources only to develop an application that uses Renesas products. Other reproduction or use of these resources is strictly prohibited. No license is granted to any other Renesas intellectual property or to any third-party intellectual property. Renesas disclaims responsibility for, and you will fully indemnify Renesas and its representatives against, any claims, damages, costs, losses, or liabilities arising from your use of these resources. Renesas' products are provided only subject to Renesas' Terms and Conditions of Sale or other applicable terms agreed to in writing. No use of any Renesas resources expands or otherwise alters any applicable warranties or warranty disclaimers for these products.

(Disclaimer Rev.1.01)

Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,
Koto-ku, Tokyo 135-0061, Japan
www.renesas.com

Contact Information

For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit www.renesas.com/contact-us/.

Trademarks

Renesas and the Renesas logo are trademarks of Renesas Electronics Corporation. All trademarks and registered trademarks are the property of their respective owners.