SLG7RN47205

GreenPAK ™

3.3V-3.6V changeable 600mA LDO

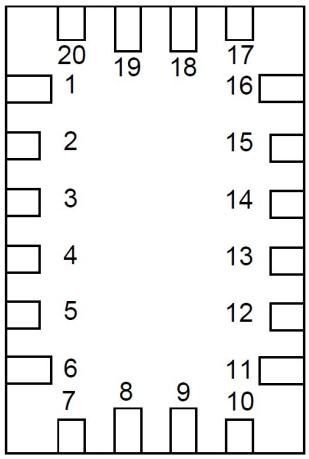
General Description

Renesas SLG7RN47205 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

Pin Configuration

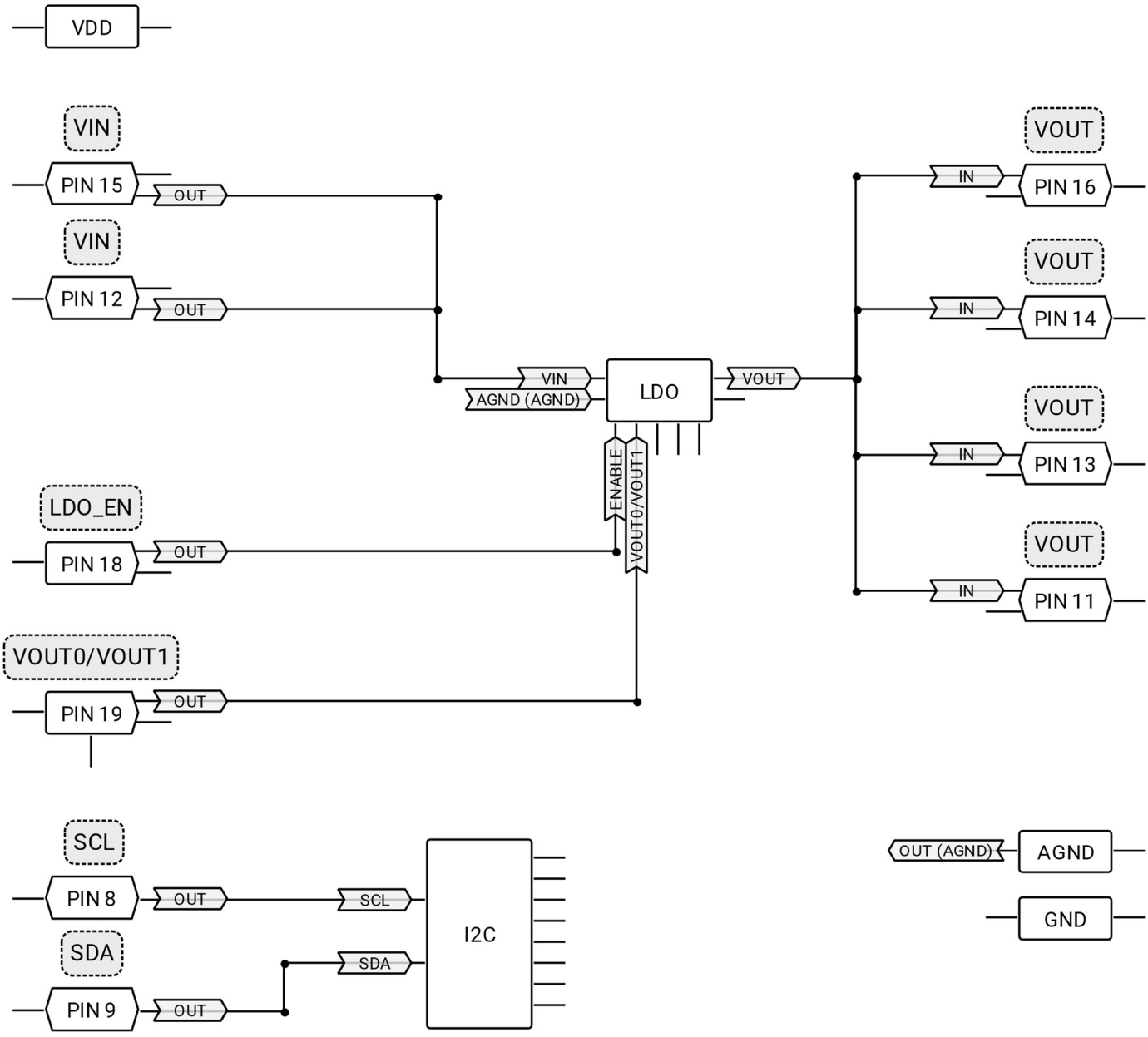


STQFN-20
(Top view)

Pin Name

Pin #	Pin name	Pin #	Pin name
1	NC	11	VOUT
2	NC	12	VIN
3	NC	13	VOUT
4	NC	14	VOUT
5	NC	15	VIN
6	NC	16	VOUT
7	VDD	17	AGND
8	SCL	18	LDO_EN
9	SDA	19	VOUT0/VOUT1
10	NC	20	GND

Block Diagram



Pin Configuration

Pin #	Pin Name	Type	Pin Description	Internal Resistor
1	NC	--	Keep Floating or Connect to GND	--
2	NC	--	Keep Floating or Connect to GND	--
3	NC	--	Keep Floating or Connect to GND	--
4	NC	--	Keep Floating or Connect to GND	--
5	NC	--	Keep Floating or Connect to GND	--
6	NC	--	Keep Floating or Connect to GND	--
7	VDD	PWR	Supply Voltage	--
8	SCL	Digital Input	Digital Input without Schmitt trigger	floating
9	SDA	Digital Input	Digital Input without Schmitt trigger	floating
10	NC	--	Keep Floating or Connect to GND	--
11	VOUT	Analog Output	LDO VOUT Analog Output	floating
12	VIN	Analog Input	LDO VIN Analog Input	floating
13	VOUT	Analog Output	LDO VOUT Analog Output	floating
14	VOUT	Analog Output	LDO VOUT Analog Output	floating
15	VIN	Analog Input	LDO VIN Analog Input	floating
16	VOUT	Analog Output	LDO VOUT Analog Output	floating
17	AGND	AGND	Ground	--
18	LDO_EN	Digital Input	Digital Input without Schmitt trigger	1MΩ pulldown
19	VOUT0/VOUT1	Digital Input	Digital Input without Schmitt trigger	1MΩ pulldown
20	GND	GND	Ground	--

Ordering Information

Part Number	Package Type
SLG7RN47205V	20-pin STQFN - Tape and Reel (3k units)

Absolute Maximum Conditions

Parameter	Min.	Max.	Unit
Supply Voltage on VDD relative to GND	-0.3	7	V
DC Input Voltage	GND - 0.5V	VDD + 0.5V	V
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		

Electrical Characteristics

Symbol	Parameter	Condition/Note	Min.	Typ.	Max.	Unit
V_{DD}	Supply Voltage		3.9	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. PINs 12 and 15 are LOW, PINs 8 and 9 are HIGH	--	1	--	µA
V_O	Maximal Voltage Applied to any PIN in High-Impedance State		--	--	VDD+0.3	V
I_{VDD}	Maximum Average or DC Current Through VDD Pin (Per chip side, see Note 2)	T_J = 85°C	--	--	73	mA
		T_J = 110°C	--	--	35	mA
I_{GND}	Maximum Average or DC Current Through GND Pin (Per chip side, see Note 2)	T_J = 85°C	--	--	152	mA
		T_J = 110°C	--	--	72	mA
V_{IH}	HIGH-Level Input Voltage	Logic Input	0.7xVDD	--	VDD+0.3	V
V_{IL}	LOW-Level Input Voltage	Logic Input	GND-0.3	--	0.3xVDD	V
R_{PULL_DOWN}	Internal Pull Down Resistance	Pull down on PINs 18, 19	--	1	--	MΩ
LDO0	LDO0 output voltage	Vout0 voltage	--	3.30	--	V
		Vout1 voltage	--	3.60	--	V
T_{SU}	Startup Time	From VDD rising past PON_{THR}	--	1.3	--	ms
PON_{THR}	Power On Threshold	V_{DD} Level Required to Start Up the Chip	1.34	1.55	1.74	V
$POFF_{THR}$	Power Off Threshold	V_{DD} Level Required to Switch Off the Chip	1.05	1.25	1.45	V

Note:
1. DC or average current through any pin should not exceed value given in Absolute Maximum Conditions.
2. The GreenPAK's power rails are divided in two sides. PINs 1, 2, 3, 4, 5 and 6 are connected to one side, PINs 8, 9, 10, 18 and 19 to another.
3. 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} = 3.3V ± 10%	--	--	95	ns
		V_{DD} = 5.0V ± 10%	--	--	111	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

LDO Regulator Thermal Limitations

Symbol	Parameter	Condition/Note	Min.	Typ.	Max.	Unit
IC_{TL}	Thermal Limitation	85 °C ambient, Total IC package	--	--	0.6	W
		70 °C ambient, Total IC package	--	--	0.8	W
Shutdown[2]	Thermal Shutdown[1]		89	103	117	°C
	Thermal Shutdown Recovery		83	87	91	°C

Note:
1. Lower Thermal shutdown levels may be achieved by using the temperature sensor and comparator.
2. TA = 85 °C.

LDO HP MODE Electrical Specifications at T = 25°C

Symbol	Parameter	Condition/Note	Min.	Typ.	Max.	Unit
I_{OUT}	Output Current Rating		--	--	600	mA
V_{IN}	Voltage Input		2.3	--	VDD	V
V_{DO}	Voltage Dropout		--	250	300	mV
ΔV_{OUT}	Output Voltage Accuracy (see Note 1)	over PVT of V_{OUT} > 1.5 V	-3	--	+3	%
		over PVT of V_{OUT} ≤ 1.5 V	-60	--	+60	mV
e_N	Noise Voltage (rms)	10 Hz to 100 kHz	--	75	--	µV
PSRR	Power Supply Rejection Ratio (see Note 2)	100 Hz to 100 kHz	--	50	--	dB
CTRR	Crosstalk Rejection Ratio		--	50	--	dB
ΔV_{LINE}	Line Regulation	V_{OUT} + 0.5 V < V_{IN} ≤ 5.5 V	-1%	--	+1%	%/V
ΔV_{LOAD}	Load Regulation	1 mA < I_{OUT} < 600 mA	--	--	0.075	mV/mA
ΔV_{TC}	V_{OUT} Temp Coefficient		--	100	--	ppm/C
C_{IN}	External Input Capacitor (see Note 2)		4	--	--	µF

C_{OUT}	External Output Capacitor (see Note 2)		8	--	--	µF
SS0	SS Slew Rate 0	V_{OUT} = 5% to 95%	--	10	--	V/ms
SS1	SS Slew Rate 1	V_{OUT} = 5% to 95%	--	20	--	V/ms
SS2	SS Slew Rate 2	V_{OUT} = 5% to 95%	--	1.25	--	V/ms
SS3	SS Slew Rate 3	V_{OUT} = 5% to 95%	--	2.50	--	V/ms
t_{WAIT}	Wait Time	Time from EN=1 to V_{OUT} start rise	--	420	--	µs

Note:
1. Accuracy specifies all the effects of line regulation (ΔV_{LINE}), load regulation (ΔV_{LOAD}), and temperature coefficient (ΔV_{TC}),
2. X7R-type and X5R-type capacitors are recommended

Chip Address

HEX	BIN	DEC
0x08	0001000	8

Description

PIN 18 (LDO_EN)	PIN19 (VOUT0/VOUT1)	LDO status
L	L	Disabled
L	H	Disabled
H	L	Active output 3.3V
H	H	Active output 3.6V

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<1867:1864>. 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.

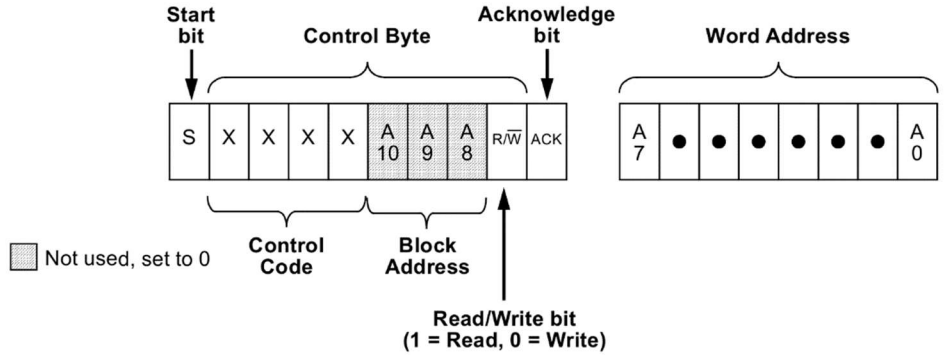


Figure1. I2C Basic Command Structure

2. I2C Serial General Timing

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

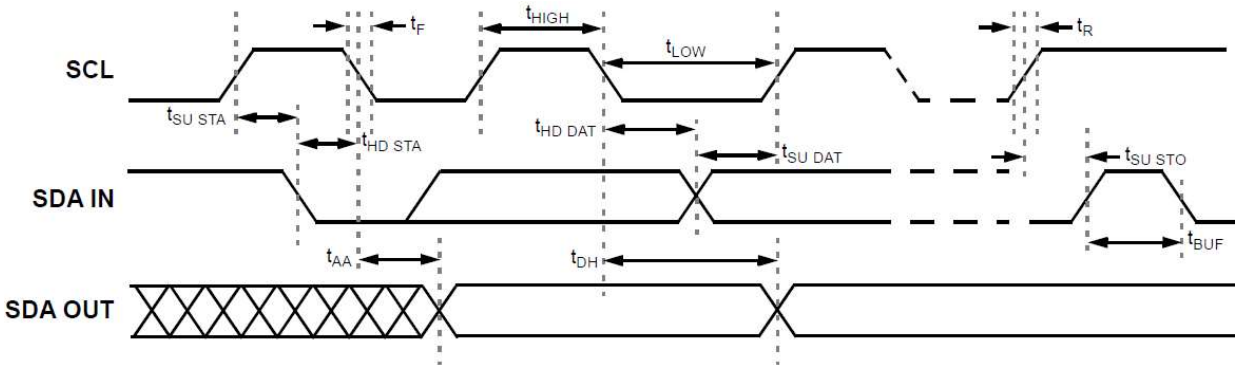


Figure2. I2C Serial General Timing

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 SLG7RN47205 to the correct data byte to be written. After the SLG7RN47205 sends another Acknowledge bit, the Bus Master will transmit the data byte to be written into the addressed memory location. The SLG7RN47205 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 SLG7RN47205 generates the Acknowledge bit.

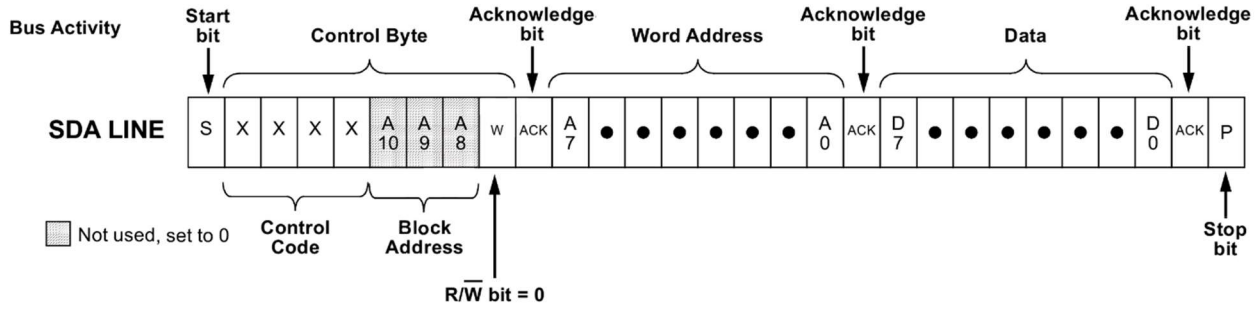


Figure3. I2C Write Command

The Random Read command starts with a Control Byte (with R/$\overline{W}$ 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 R/$\overline{W}$ bit set to “1”, after which the SLG7RN47205 issues an Acknowledge bit, followed by the requested eight data bits.

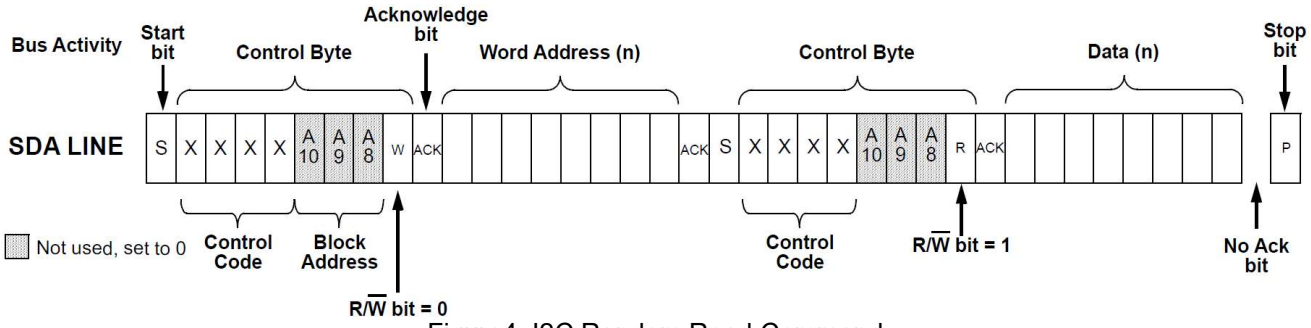
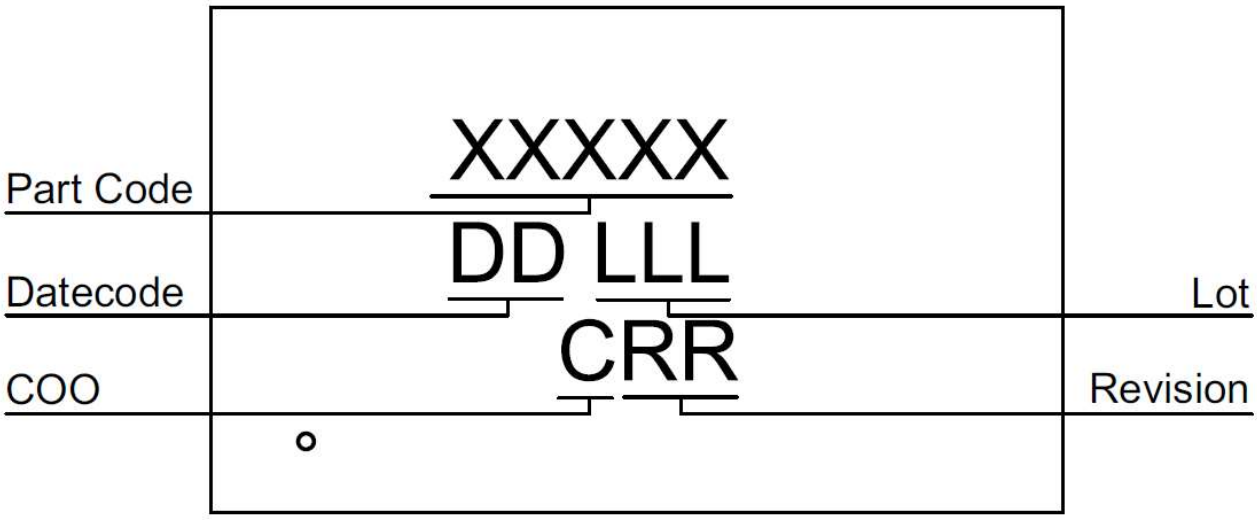


Figure4. I2C Random Read Command

Package Top Marking



XXXXX – Part ID Field: 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
1.00	001	L	0xE261D6B	47205	AB	11/01/2024

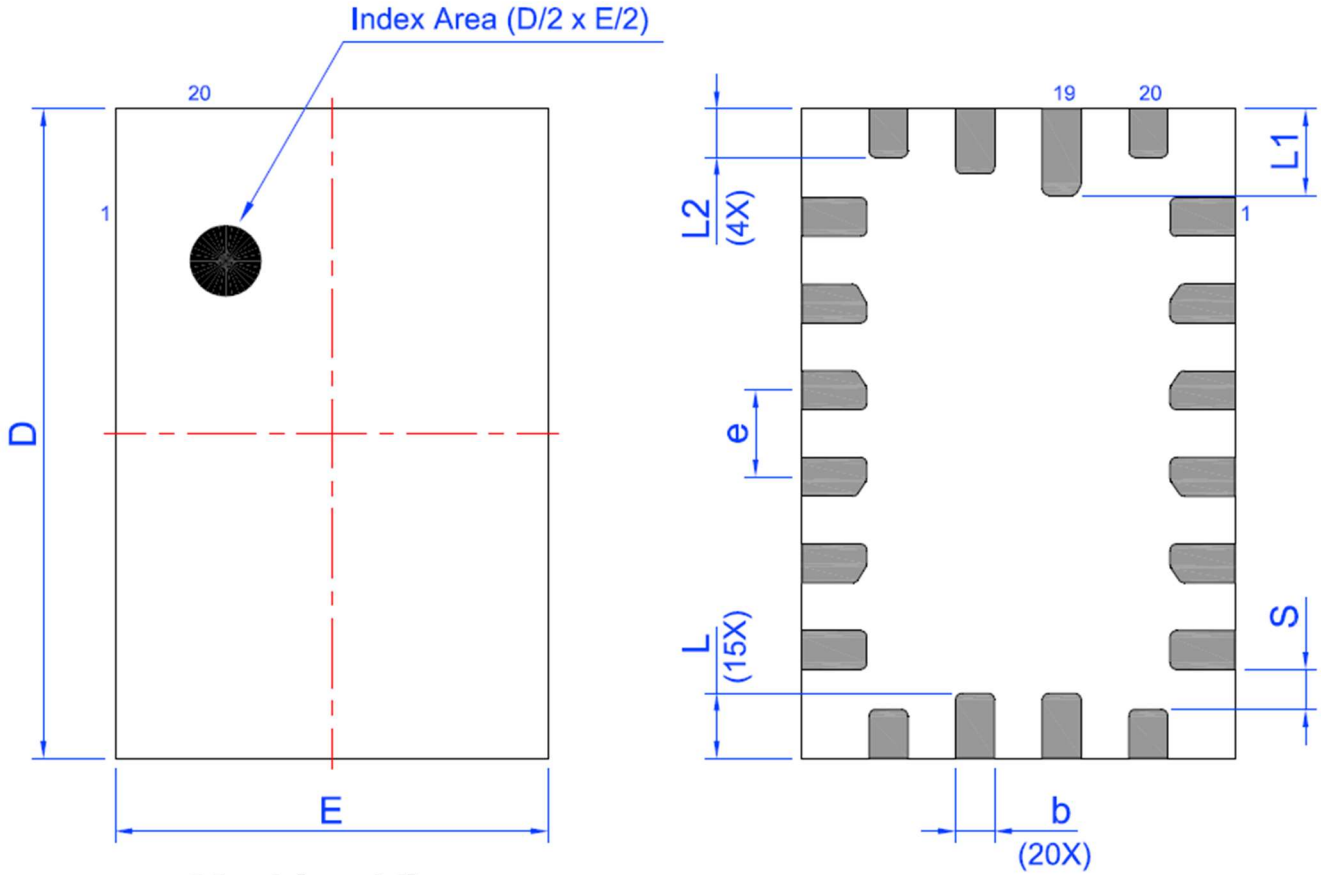
Lock coverage for this part is indicated by √, from one of the following options:

	Unlocked
	Locked for read, bits <1535:0>
	Locked for write, bits <1535:0>
	Locked for write all bits
	Locked for read and write bits <1535:0>
√	Locked for read bits <1535:0> and write of all bits

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.

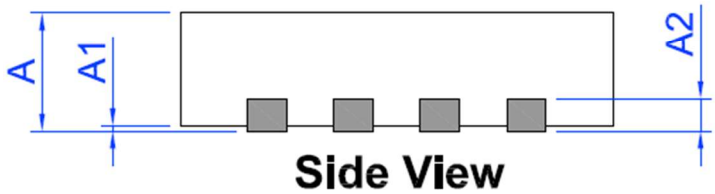
Package Drawing and Dimensions

STQFN 20L 2x3mm 0.4P FCD Package
JEDEC MO-220, Variation WECE



Marking View

BTM View



Side View

Unit: mm

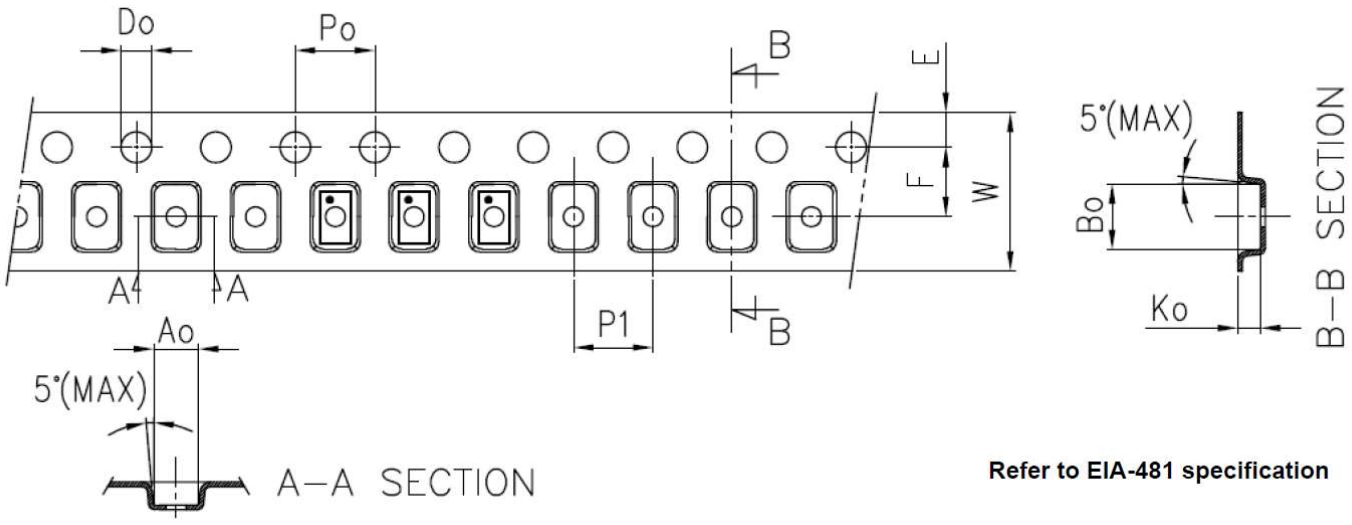
Symbol	Min	Nom.	Max	Symbol	Min	Nom.	Max
A	0.50	0.55	0.60	D	2.95	3.00	3.05
A1	0.005	-	0.050	E	1.95	2.00	2.05
A2	0.10	0.15	0.20	L	0.25	0.30	0.35
b	0.13	0.18	0.23	L1	0.35	0.40	0.45
e	0.40 BSC			L2	0.175	0.225	0.275
S	0.185 TYP						

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



Refer to EIA-481 specification

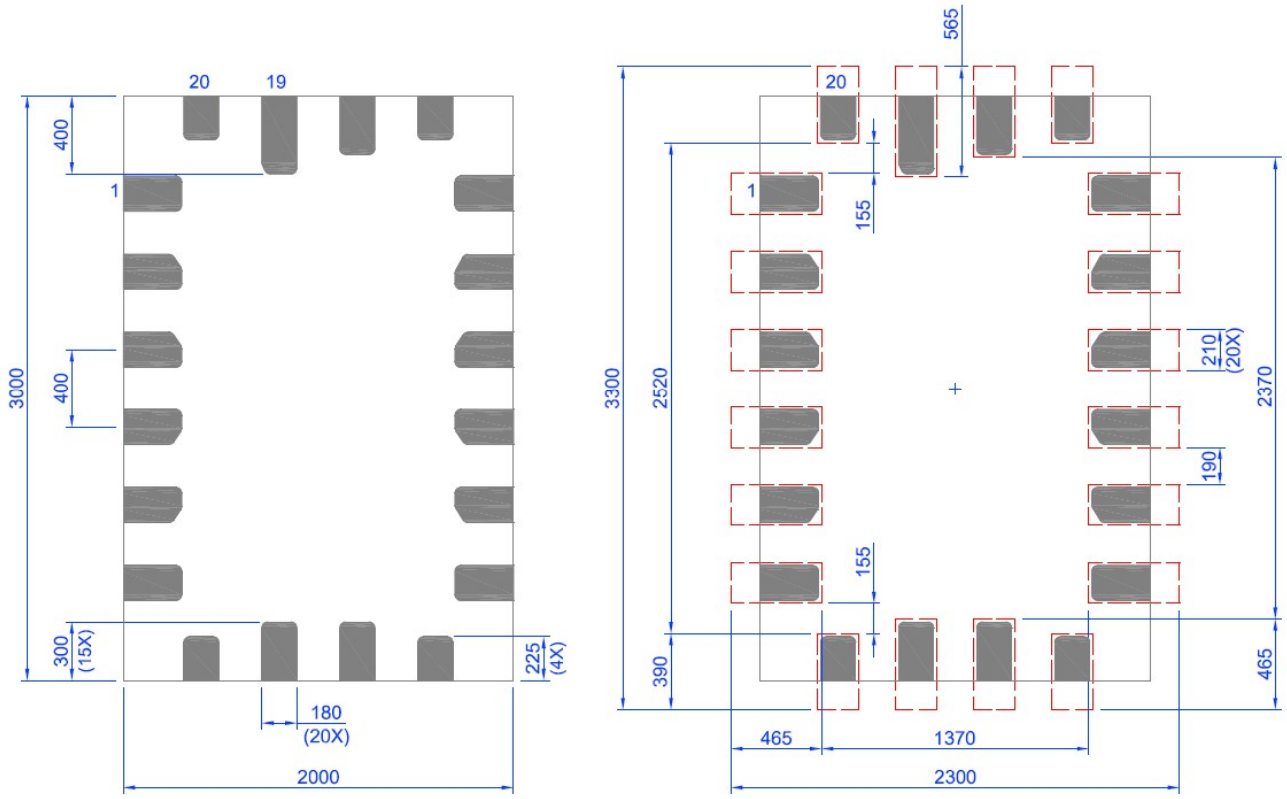
Recommended Reflow Soldering Profile

Please see IPC/JEDEC J-STD-020: latest revision for reflow profile based on package volume of 3.30 mm^3 (nominal). More information can be found at www.jedec.org.

Recommended Land Pattern

Exposed Pad
(PKG face down)

Recommended Land Pattern
(PKG face down)



Unit:um

Datasheet Revision History

Date	Version	Change
12/12/2023	0.10	New design
12/152023	0.11	Updated Device Revision Table
10/25/2024	0.12	Locked design, deleted ASM Specifications table, added LDO Specification table and Description, updated conditions for quiescent current measurement
10/30/2024	0.13	Updated Device Revision Table
11/01/2024	1.00	Production Release

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.