SLG7RN45689

GreenPAK ™

Supervisor - Reset

General Description

Dialog SLG4L45689 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.

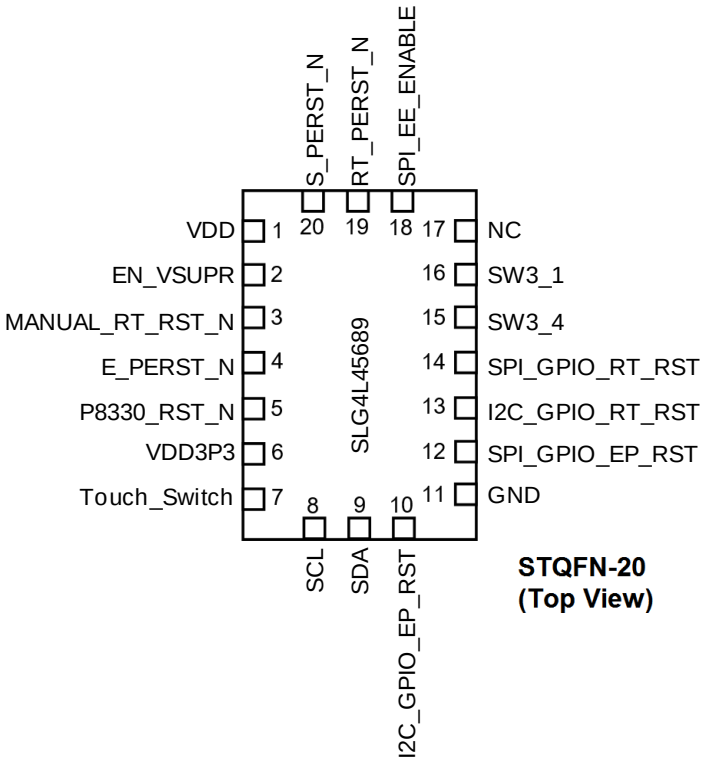
Features

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

Output Summary

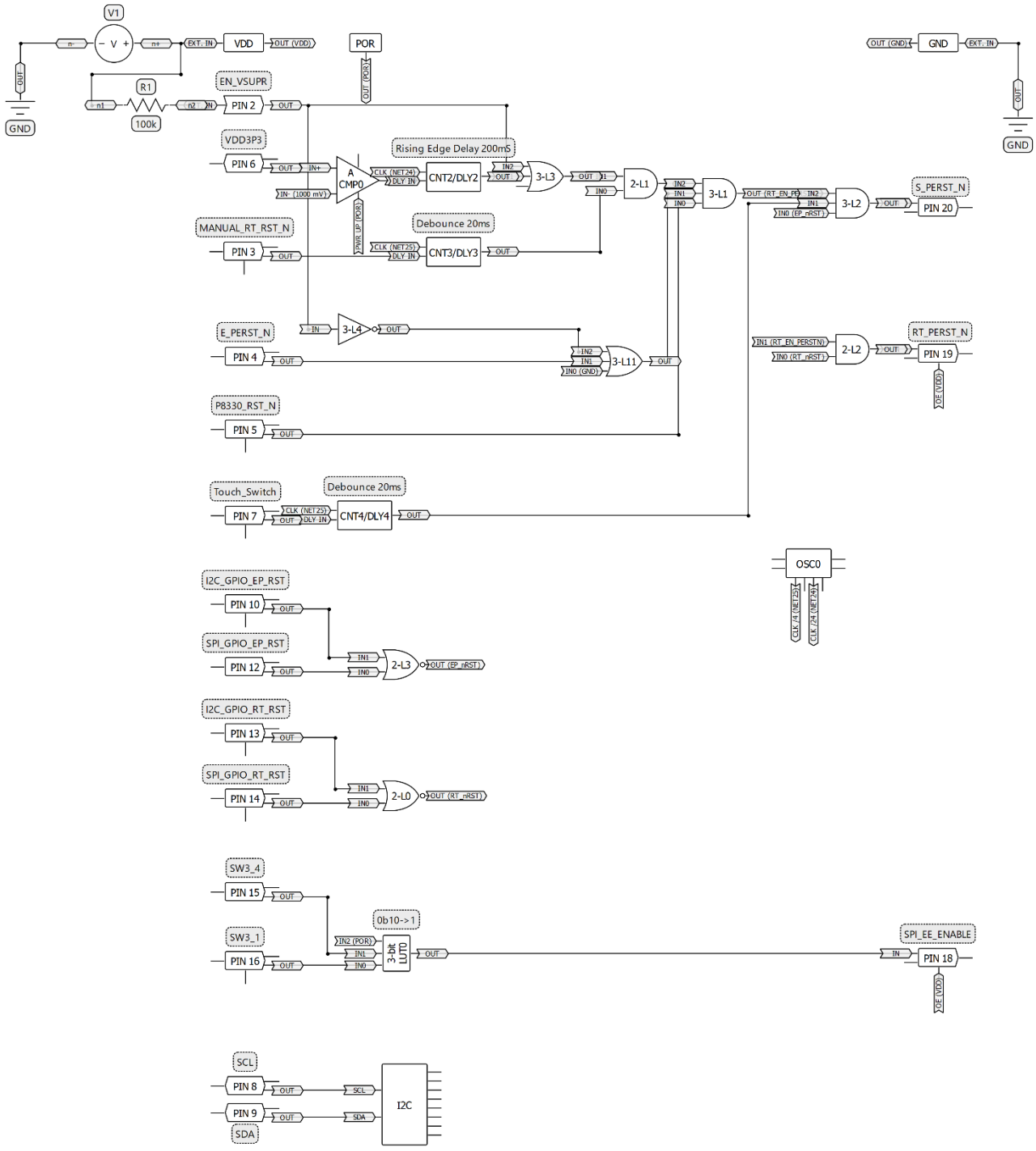
1 Output - Push Pull 1X
2 Outputs - Push Pull 2X

Pin Configuration



STQFN-20
(Top View)

Block Diagram



Pin Configuration

Pin #	Pin Name	Type	Pin Description	Internal Resistor
1	VDD	PWR	Supply Voltage	--
2	EN_VSUPR	Digital Input	Digital Input without Schmitt trigger	floating
3	MANUAL_RT_RST_N	Digital Input	Digital Input without Schmitt trigger	10kΩ pullup
4	E_PERST_N	Digital Input	Digital Input without Schmitt trigger	10kΩ pullup
5	P8330_RST_N	Digital Input	Digital Input without Schmitt trigger	10kΩ pullup
6	VDD3P3	Analog Input/Output	Analog Input/Output	1MΩ pulldown
7	Touch_Switch	Digital Input	Digital Input without Schmitt trigger	10kΩ pullup
8	SCL	Digital Input	Digital Input without Schmitt trigger	floating
9	SDA	Digital Input	Digital Input without Schmitt trigger	floating
10	I2C_GPIO_EP_RST	Digital Input	Low Voltage Digital Input	10kΩ pulldown
11	GND	GND	Ground	--
12	SPI_GPIO_EP_RST	Digital Input	Low Voltage Digital Input	10kΩ pulldown
13	I2C_GPIO_RT_RST	Digital Input	Low Voltage Digital Input	10kΩ pulldown
14	SPI_GPIO_RT_RST	Digital Input	Low Voltage Digital Input	10kΩ pulldown
15	SW3_4	Digital Input	Digital Input without Schmitt trigger	10kΩ pullup
16	SW3_1	Digital Input	Digital Input without Schmitt trigger	10kΩ pullup
17	NC	--	Keep Floating or Connect to GND	--
18	SPI_EE_ENABLE	Digital Output	Push Pull 1X	floating
19	RT_PERST_N	Digital Output	Push Pull 2X	floating
20	S_PERST_N	Digital Output	Push Pull 2X	floating

Ordering Information

Part Number	Package Type
SLG4L45689V	20-pin STQFN
SLG4L45689VTR	20-pin STQFN - Tape and Reel (3k units)

Absolute Maximum Conditions

Parameter		Min.	Max.	Unit
Supply Voltage on VDD relative to GND		-0.5	7	V
DC Input Voltage		GND - 0.5V	VDD + 0.5V	V
Maximum Average or DC Current (Through pin)	Push-Pull 1x	--	11	mA
	Push-Pull 2x	--	16	
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	3.3	3.6	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	--	43	--	µA
V_O	Maximal Voltage Applied to any PIN in High-Impedance State		--	--	VDD	V
I_{VDD}	Maximum Average or DC Current Through VDD Pin (Per chip side, see Note 2)	T_J = 85°C	--	--	45	mA
		T_J = 110°C	--	--	22	mA
I_{GND}	Maximum Average or DC Current Through GND Pin (Per chip side, see Note 2)	T_J = 85°C	--	--	86	mA
		T_J = 110°C	--	--	41	mA
V_{IH}	HIGH-Level Input Voltage	Logic Input at VDD=3.3V	1.81	--	VDD	V
		Low-Level Logic Input at VDD=3.3V	1.06	--	VDD	V
V_{IL}	LOW-Level Input Voltage	Logic Input at VDD=3.3V	0	--	1.31	V
		Low-Level Logic Input at VDD=3.3V	0	--	0.67	V
V_{OH}	HIGH-Level Output Voltage	Push-Pull 1X, I_{OH}=3mA, at VDD=3.3V	2.7	3.12	--	V
		Push-Pull 2X, I_{OH}=3mA, at VDD=3.3V	2.85	3.21	--	V
V_{OL}	LOW-Level Output Voltage	Push-Pull 1X, I_{OL}=3mA, at VDD=3.3V	--	0.13	0.23	V
		Push-Pull 2X, I_{OL}=3mA, at VDD=3.3V	--	0.06	0.11	V
I_{OH}	HIGH-Level Output Current (Note 1)	Push-Pull 1X, V_{OH}=2.4V, at VDD=3.3V	6.05	12.08	--	mA
		Push-Pull 2X, V_{OH}=2.4V, at VDD=3.3V	11.54	24.16	--	mA

I_{OL}	LOW-Level Output Current (Note 1)	Push-Pull 1X, V_{OL}=0.4V, at VDD=3.3V	4.88	8.24	--	mA
		Push-Pull 2X, V_{OL}=0.4V, at VDD=3.3V	9.75	16.49	--	mA
R_{PULL_UP}	Internal Pull Up Resistance	Pull up on PINs 3, 4, 5, 7, 15, 16	--	10	--	kΩ
R_{PULL_DOWN}	Internal Pull Down Resistance	Pull down on PINs 10, 12, 13, 14	--	10	--	kΩ
		Pull down on PIN 6	--	1	--	MΩ
T_{DLY2}	Delay2 Time	At temperature 25°C	196.41	201.09	205.98	ms
		At temperature -40 +85°C (Note 3)	185.67	201.09	215.81	ms
T_{DLY3}	Delay3 Time	At temperature 25°C	19.49	20.05	20.63	ms
		At temperature -40 +85°C (Note 3)	18.42	20.05	21.61	ms
T_{DLY4}	Delay4 Time	At temperature 25°C	19.49	20.05	20.63	ms
		At temperature -40 +85°C (Note 3)	18.42	20.05	21.61	ms
V_{ACMP0}	Analog Comparator0 Threshold Voltage	Low to High transition, at temperature 25°C	2972	--	3112	mV
		Low to High transition, at temperature -40 +85°C (Note 3)	2951	--	3117	mV
		High to Low transition, at temperature 25°C	2896	--	3020	mV
		High to Low transition, at temperature -40 +85°C (Note 3)	2884	--	3020	mV
V_{HYST}	Analog Comparator Hysteresis Voltage (Note 3)	ACMP 0 at temperature 25°C	--	25	--	mV
		ACMP 0 at temperature -40 +85°C	--	25	--	mV
T_{SU}	Startup Time	From VDD rising past PON_{THR}	0.67	1.38	2.03	ms
PON_{THR}	Power On Threshold	V_{DD} Level Required to Start Up the Chip	1.39	1.55	1.68	V
$POFF_{THR}$	Power Off Threshold	V_{DD} Level Required to Switch Off the Chip	1.01	1.17	1.35	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, 6, 7, 8, and 19 are connected to one side, PINs 11, 12, 13, 14, 15, 17, 18, 21 and 22 to another.
3. Guaranteed by Design.

I²C Specifications

Symbol	Parameter	Condition/Note	Min.	Typ.	Max.	Unit
F_{SCL}	Clock Frequency, SCL	V_{DD} = (1.71…5.5) V	--	--	400	kHz
t_{LOW}	Clock Pulse Width Low	V_{DD} = (1.71…5.5) V	1300	--	--	ns
t_{HIGH}	Clock Pulse Width High	V_{DD} = (1.71…5.5) V	600	--	--	ns
t_I	Input Filter Spike Suppression (SCL, SDA)	V_{DD} = 3.3V ± 10%	--	--	60.1	ns
t_{AA}	Clock Low to Data Out Valid	V_{DD} = (1.71…5.5) V	--	--	900	ns

t_{BUF}	Bus Free Time between Stop and Start	V_{DD} = (1.71…5.5) V	1300	--	--	ns
t_{HD_STA}	Start Hold Time	V_{DD} = (1.71…5.5) V	600	--	--	ns
t_{SU_STA}	Start Set-up Time	V_{DD} = (1.71…5.5) V	600	--	--	ns
t_{HD_DAT}	Data Hold Time	V_{DD} = (1.71…5.5) V	0	--	--	ns
t_{SU_DAT}	Data Set-up Time	V_{DD} = (1.71…5.5) V	100	--	--	ns
t_R	Inputs Rise Time	V_{DD} = (1.71…5.5) V	--	--	300	ns
t_F	Inputs Fall Time	V_{DD} = (1.71…5.5) V	--	--	300	ns
t_{SU_STO}	Stop Set-up Time	V_{DD} = (1.71…5.5) V	600	--	--	ns
t_{DH}	Data Out Hold Time	V_{DD} = (1.71…5.5) V	50	--	--	ns

Chip address

HEX	BIN	DEC
0x08	0001000	8

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.

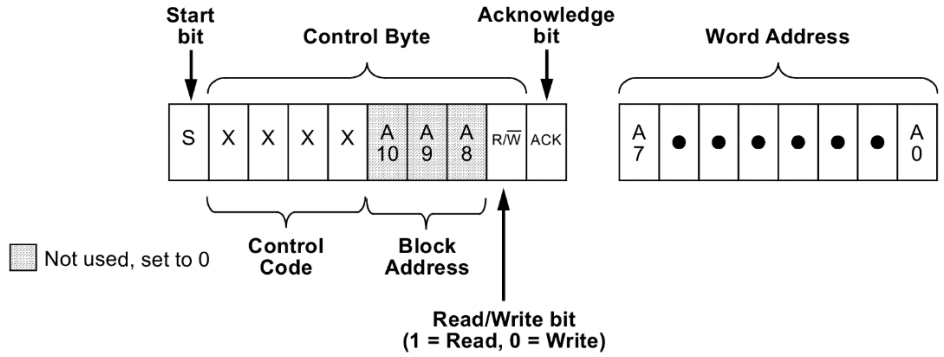


Figure1. I2C Basic Command Structure

2. I2C Serial General Timing

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

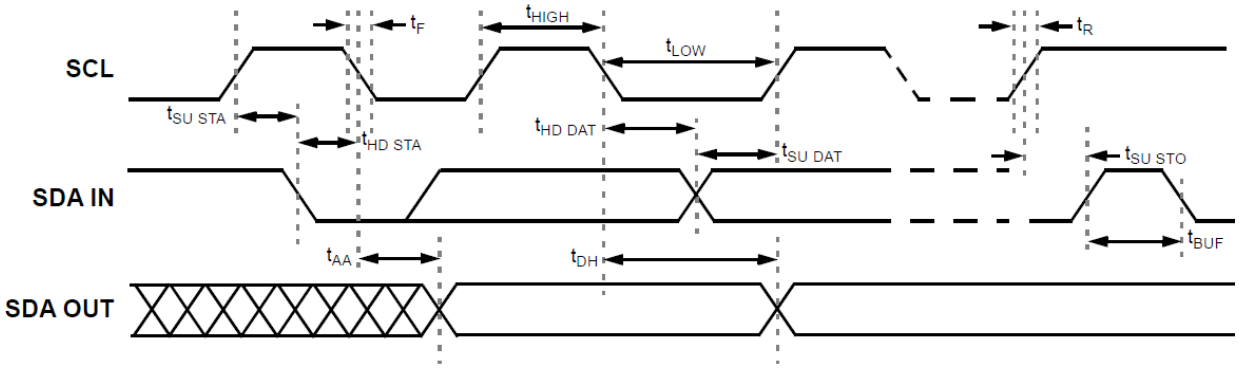


Figure2. I2C Serial General Timing

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 SLG7RN45689 to the correct data byte to be written. After the SLG7RN45689 sends another Acknowledge bit, the Bus Master will transmit the data byte to be written into the addressed memory location. The SLG7RN45689 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 SLG7RN45689 generates the Acknowledge bit.

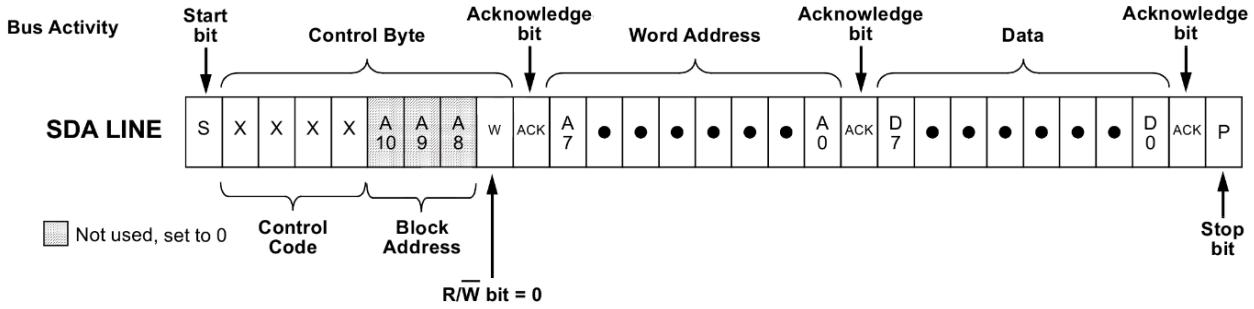


Figure3. I2C Write Command

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 SLG7RN45689 issues an Acknowledge bit, followed by the requested eight data bits.

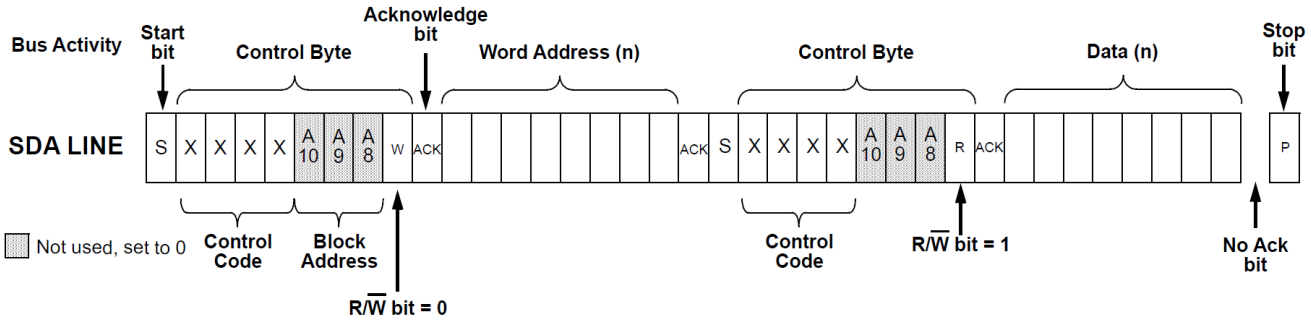


Figure4. I2C Random Read Command

4. I2C register control data

Address Byte	Register Bit	Block	Function
0xC0	reg<1543:1536>	CNT2 Control Data	CNT2 Control Data Default is 0xD0. Delay time is 200mS
0xC1	reg<1551:1544>	CNT3 Control Data	CNT3 Control Data Default is 0x7C. Delay time is 20mS
0xC2	reg<1559:1552>	CNT4 Control Data	CNT4 Control Data Default is 0x7C. Delay time is 20mS

5. I2C Commands:

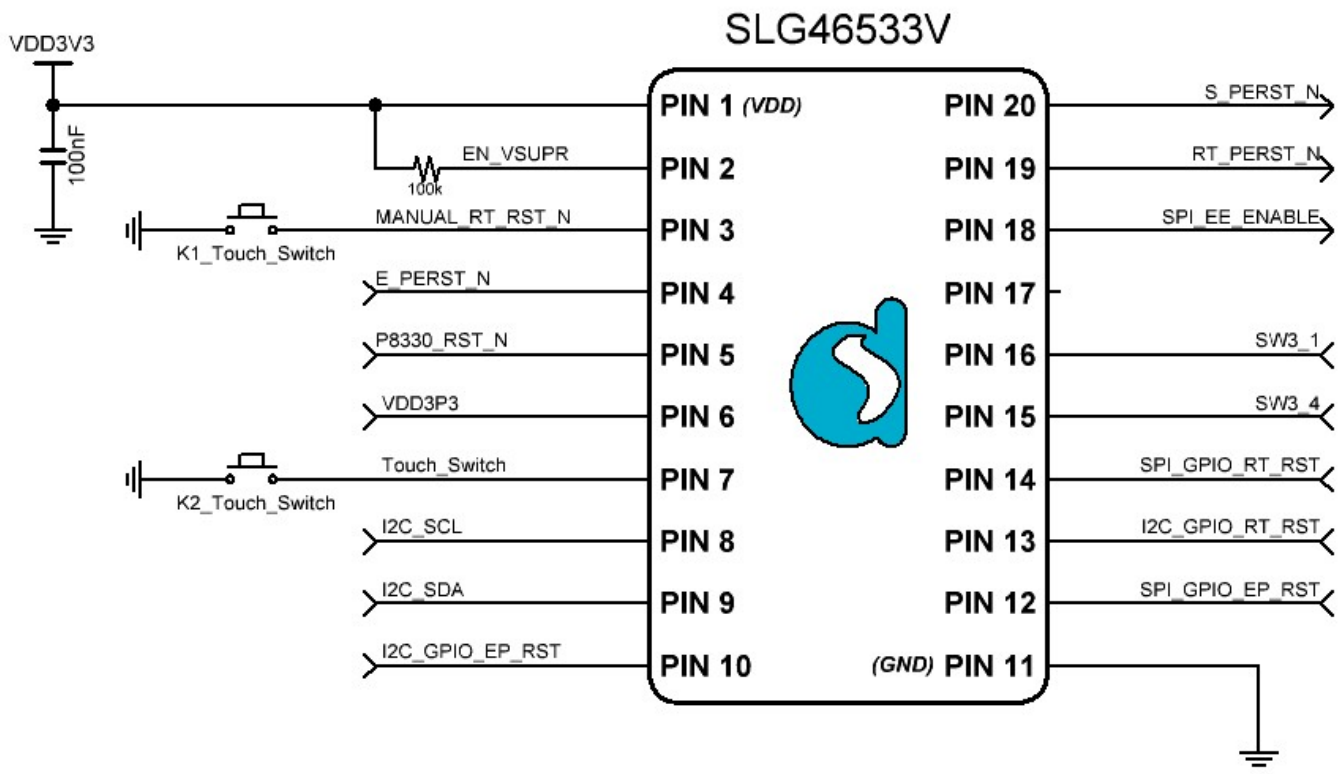
1. [start] [0x08] [w] [0xC0] [xxxxxxxx] [stop] // set Control Data for CNT2.
2. [start] [0x08] [w] [0xC1] [xxxxxxxx] [stop] // set Control Data for CNT3.
3. [start] [0x08] [w] [0xC2] [xxxxxxxx] [stop] // set Control Data for CNT4.

Truth Tables

SW3_4	SW3-1	SPI_EE_ENABLE
0	0	0
0	1	0
1	0	1
1	1	0

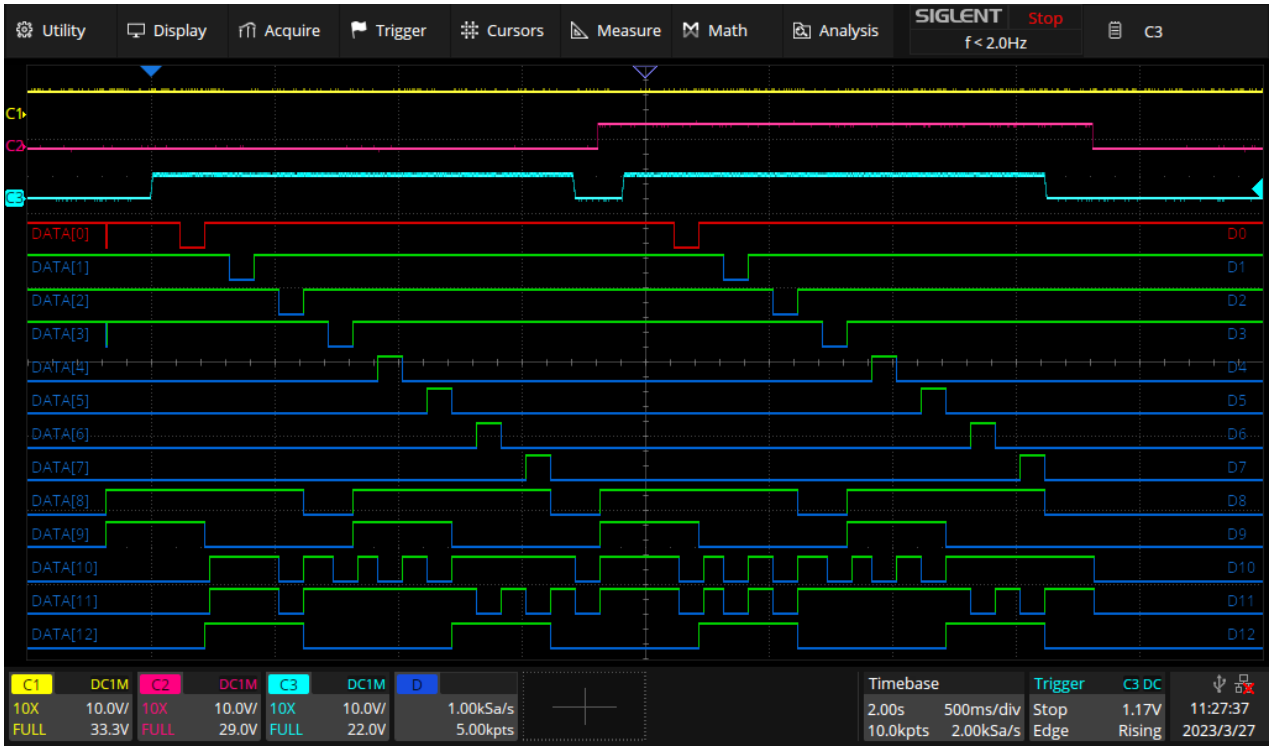
EE_SEL_Decode	no EEPROM	Reserved	SPI_EENPROM	I2C_EEPROM
MI2C_SCL,MI2C_SDA	0b00	0b01	0b10	0b11
SW3-1	Pin2 to 3	Pin2 to 3	Pin2 to 1	Pin2 to 1
SW3-2	Pin5 to 6	Pin5 to 4	Pin5 to 6	Pin5 to 4
SPI_EE_ENABLE	low	low	High	low

Typical Application Circuit

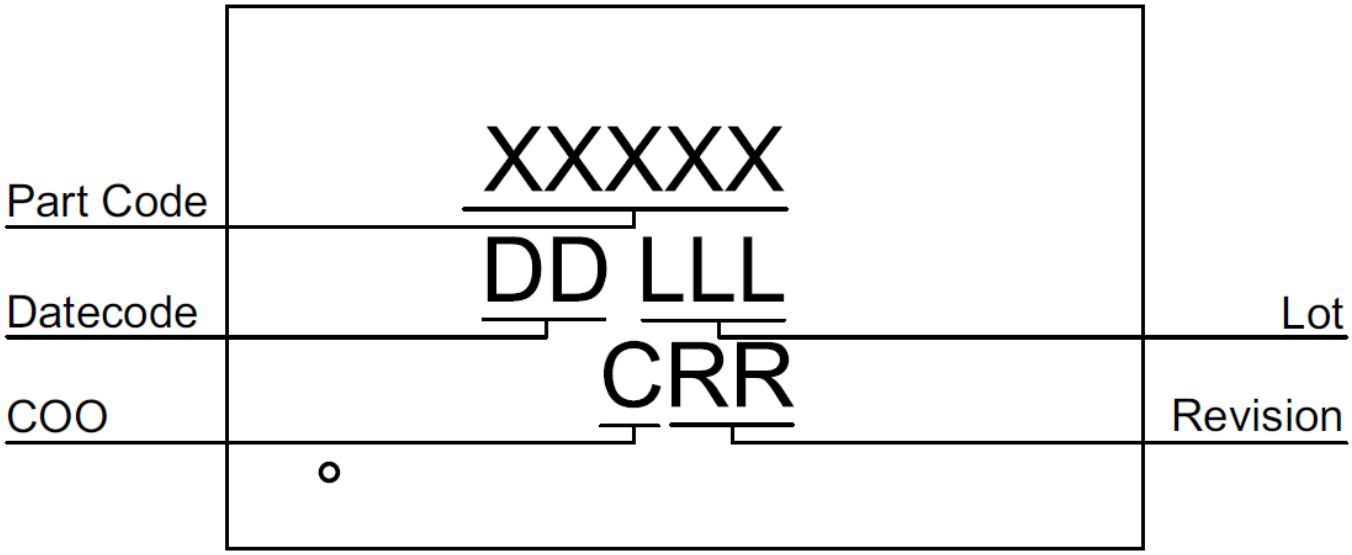


Functionality Waveforms

Channel 1 (blue/top line) – PIN# 1 (VDD) with external 5kΩ pull up resistor
Channel 2 (magenta /2nd line) – PIN# 2 (EN_VSUPR)
Channel 3 (light blue/2nd line) – PIN# 6 (VDD3P3) with external 5kΩ pull up resistor
D0 – PIN# 3 (MANUAL_RT_RST_N)
D1 – PIN# 4 (E_PERST_N)
D2 – PIN# 5 (P8330_RST_N)
D3 – PIN# 7 (Touch_Switch)
D4 – PIN# 10 (I2C_GPIO_EP_RST)
D5 – PIN# 12 (SPI_GPIO_EP_RST)
D6 – PIN# 13 (I2C_GPIO_RT_RST)
D7 – PIN# 14 (SPI_GPIO_RT_RST)
D8 – PIN# 15 (SW3_4)
D9 – PIN# 16 (SW3_1)
D10 – PIN# 20 (S_PERST_N)
D11 – PIN# 19 (RT_PERST_N)
D12 – PIN# 18 (SPI_EE_ENABLE)



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
0.13	003	U	0x6A44420F	45689		03/22/2023

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

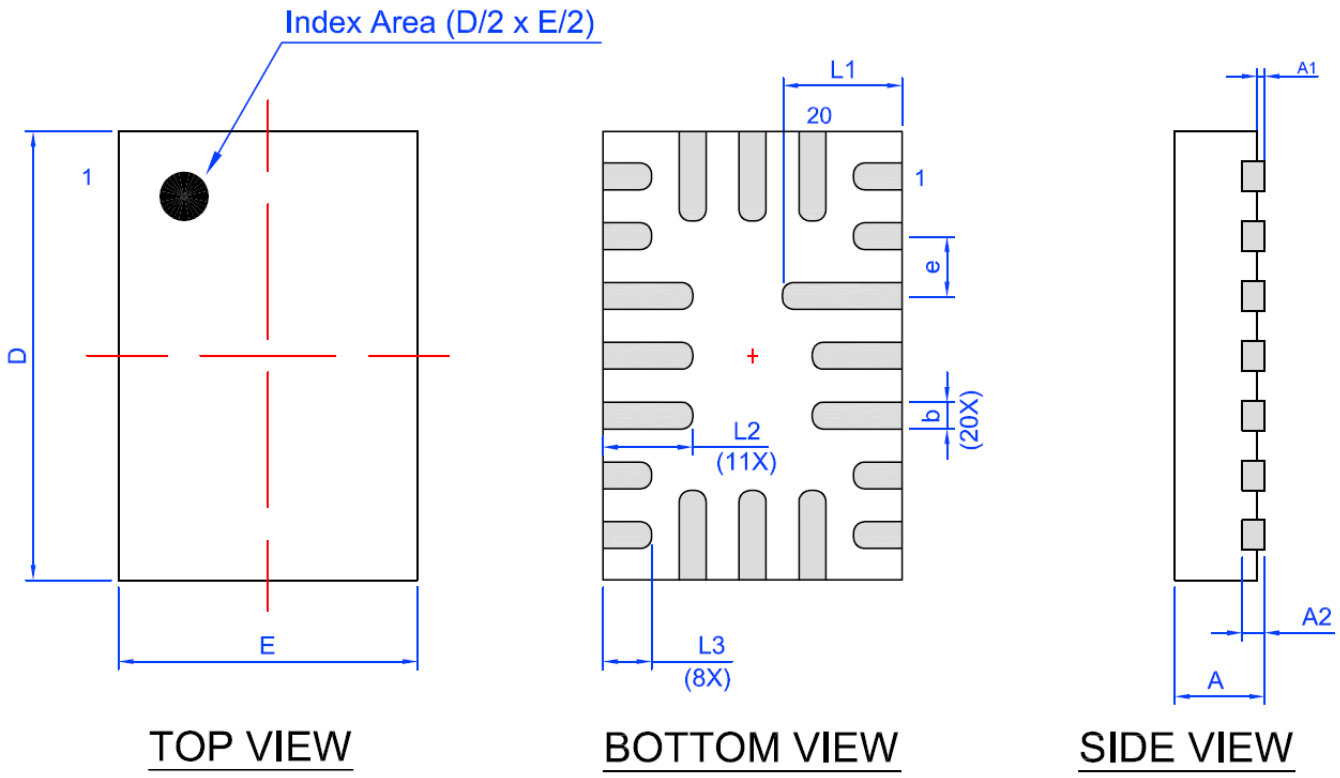
√	Unlocked
	Locked for read, bits <1535:0>
	Locked for write, bits <1535:0>
	Locked for write all bits
	Locked for read and write bits <1535:0>
	Locked for read bits <1535:0> and write of all bits

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 COL Package

JEDEC MO-220



Unit: mm

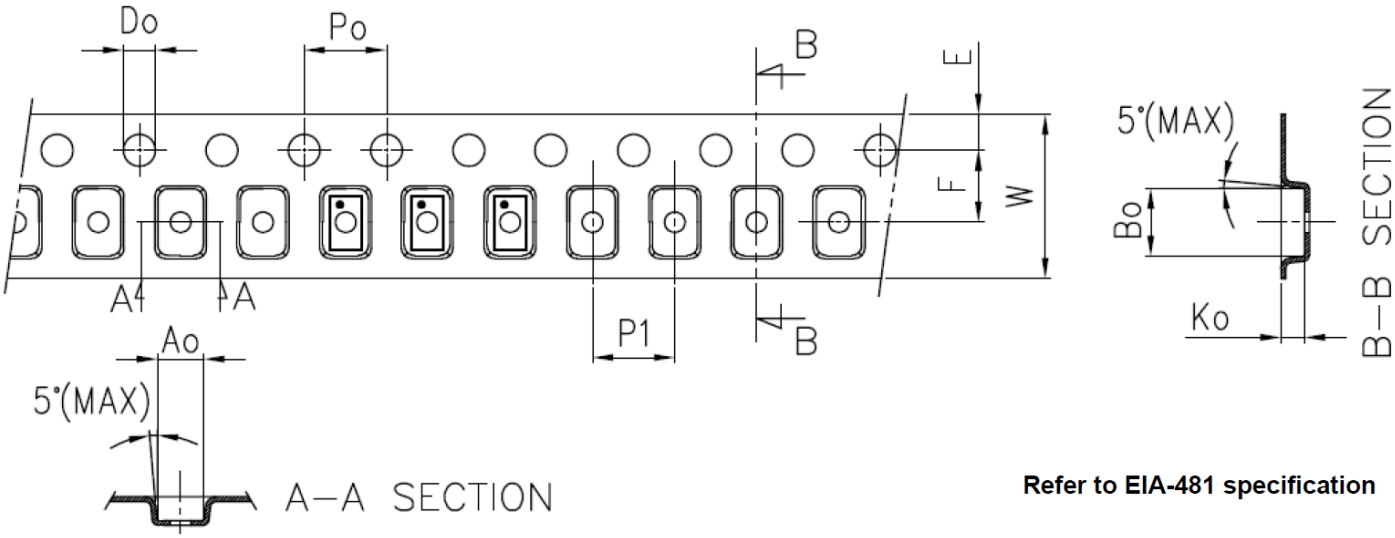
Symbol	Min	Nom.	Max	Symbol	Min	Nom.	Max
A	0.50	0.55	0.60	D	2.95	3.00	3.05
A1	0.005	-	0.050	E	1.95	2.00	2.05
A2	0.10	0.15	0.20	L1	0.75	0.80	0.85
b	0.13	0.18	0.23	L2	0.55	0.60	0.65
e	0.40 BSC			L3	0.275	0.325	0.375

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 2x3 mm 0.4P COL	20	2x3x0.55	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 2x3 mm 0.4P COL	2.2	3.15	0.76	4	4	1.5	1.75	3.5	8



Refer to EIA-481 specification

Recommended Reflow Soldering Profile

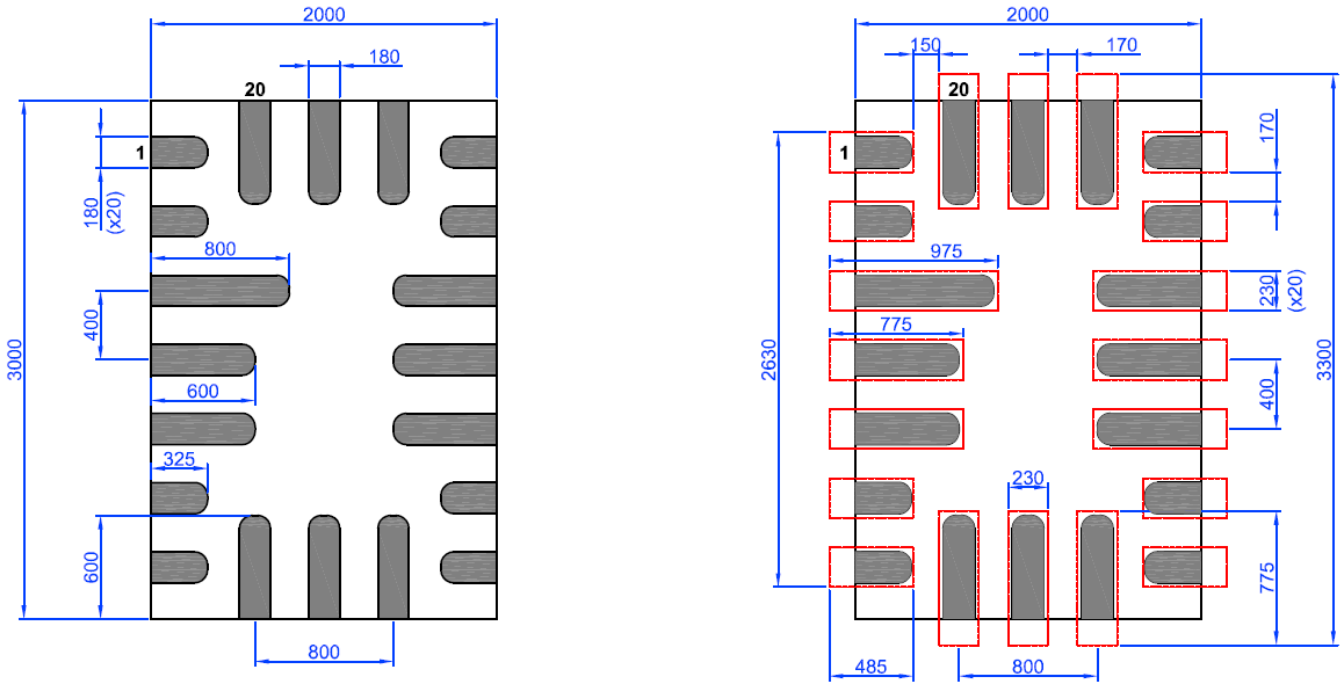
Please see IPC/JEDEC J-STD-020: latest revision for reflow profile based on package volume of 3.30 mm^3 (nominal). More information can be found at www.jedec.org.

Recommended Land Pattern

Exposed Pad
(Top View)

Recommended Land Pattern
(Top View)

Units: µm



Datasheet Revision History

Date	Version	Change
04/07/2022	0.10	New design for SLG46533V chip
04/13/2022	0.11	Add I2C block
07/13/2022	0.12	Updated Device Revision Table
03/22/2023	0.13	Customer change the design

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 Jan 2024)

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.