Features

- PCIe Gen5 additive phase jitter: 6fs RMS
- PCIe Gen6 additive phase jitter: 5fs RMS
- PCIe Gen7 additive phase jitter: 3fs RMS
- DB2000Q additive phase jitter: 15fs RMS
- 12kHz to 20MHz additive phase jitter: 40fs RMS at 156.25MHz
- Power Down Tolerant (PDT) inputs
- Flexible Startup Sequencing (FSS)
- Automatic Clock Parking (ACP) upon loss of CLKIN
- Selectable output slew rate via pin or SMBus
- 4-wire Side-Band Interface supports high-speed
- serial output enable and device daisy-chaining
- 9 selectable SMBus addresses
- SMBus write protection features
- Spread-spectrum tolerant
- 85Ω or 100Ω (-100 suffix) output impedance
- CLKIN accepts HCSL or LVDS signal levels
- -40 to +105°C, 3.3V ±10% operation

Applications

- Cloud/High-performance Computing
- NVMe Storage
- Networking
- Accelerators

Description

The RS2CB190xx (RS2CB19020, RS2CB19016, RS2CB19013, RS2CB19008, RS2CB19004) ultra-high performance fanout buffers support PCIe Gen6 and Gen7. They provide a Loss-Of-Signal (LOS) output for system monitoring and redundancy. The devices also incorporate Power Down Tolerant (PDT) and Flexible Startup Sequencing (FSS) features, easing system design. They can drive both source-terminated and double terminated loads, operating up to 400MHz. The family offers 4,8,13,16,20 Low-Power (LP) HCSL output pairs in 4 × 4 mm to 10 x 10 mm packages. The RS2CB190xx devices offer higher output counts in smaller packages compared to earlier buffer families. The buffers support both Common Clock (CC) and Independent Reference (IR) PCIe clock architectures.

Ordering Information

Part Number	Number of Outputs	Differential Output Impedance (Ω)	Package	Operation Temperature
RS2CB19020ZDE	20	85	TQFN 10x10X0.85-72L	-40 to +105°C
RS2CB19020-100ZDE	20	100		
RS2CB19016ZDE	16	85	TQFN 9X9X0.85-64L	-40 to +105°C
RS2CB19016-100ZDE	16	100		
RS2CB19013ZLE	13	85	TQFN 7X7X0.85-56L	-40 to +105°C
RS2CB19013-100ZLE	13	100		
RS2CB19008ZLAE	8	85	TQFN 5x5x0.85-40L	-40 to +105°C
RS2CB19008-100ZLAE	8	100		
RS2CB19004ZWAE	4	85	QFN 4x4x0.85-28L	-40 to +105°C
RS2CB19004-100ZWAE	4	100		

Block Diagram

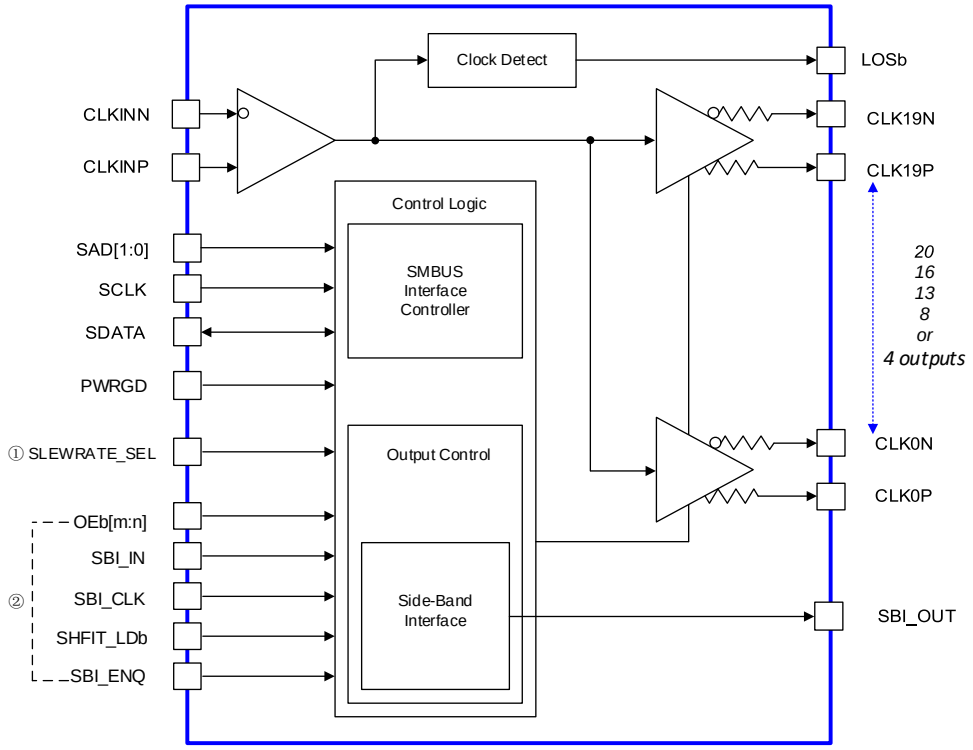


Figure 1. RS2CB190xx Block Diagram

1. RS2CB19016/13/08/04 only. Other devices use SMBus.
2. Some devices mux SBI with OEb pins. See specific pinouts. Devices with SBI have dedicated SBI_ENQ pin.

1. Pin Definition

1.1 Signal Types

Term	Description
I	Input
O	Input
OD	Open Drain Output
I/O	Bi-Directional
PD	Pull-down
PU	Pull-up
Z	Tristate
D	Driven
X	Don't care
SE	Single ended
DIF	Differential
PWR	3.3 V power
GND	Ground
PDT	Power Down Tolerant: These signals must tolerate being driven when the device is powered down.

Note that some pins have both internal pull-up and pull-down resistors which bias the pins to VDD/2. Other pins are multi-mode and have an internal pull-up *or* internal pull-down depending on the mode.

1.2 RS2CB19020 Pin Configuration

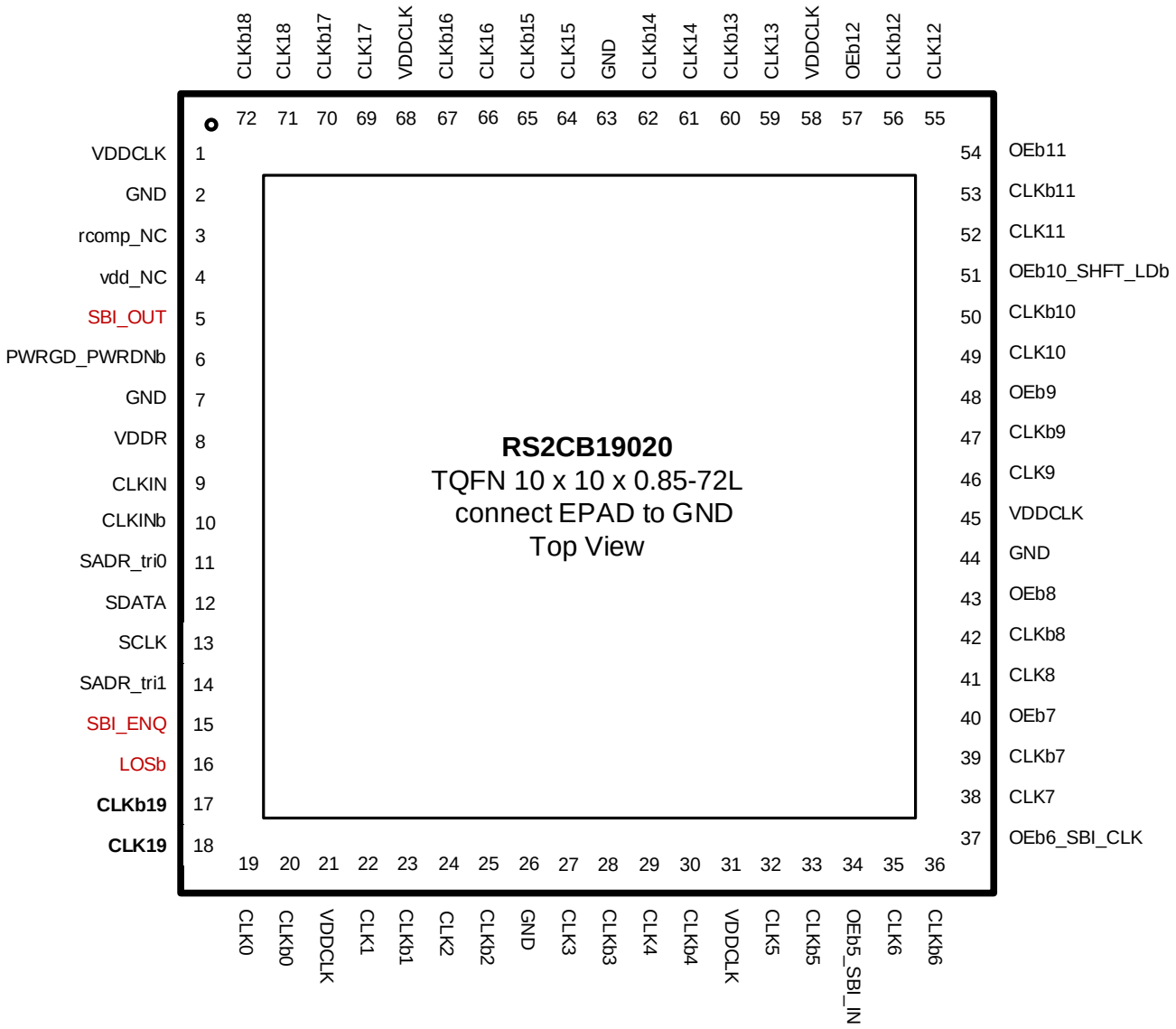


Figure 2. RS2CB19020 TQFN-72L – Top View

1.2.1 RS2CB19020 Pin Descriptions

Table 1. RS2CB19020 Pin Descriptions

Pin Number	Pin Name	Type	Description
1	VDDCLK	PWR	Power supply for clock outputs.
2	GND	GND	Ground pin.
3	rcomp_NC	NC	The DB2000Q specification calls this pin RCOMP. This pin is not connected by default.
4	vdd_NC	NC	The DB2000Q specification calls this pin VDD. This pin is not connected by default.
5	SBI_OUT	O, SE	Side-Band Interface data output.

Pin Number	Pin Name	Type	Description
6	PWRGD_PWRDNb	I, SE, PU, PDT	Input notifies device to sample latched inputs and start up on first high assertion. Low enters Power Down Mode, subsequent high assertions exit Power Down Mode.
7	GND	GND	Ground pin.
8	VDDR	PWR	Power supply for clock input.
9	CLKIN	I, DIF, PDT	True clock input.
10	CLKINb	I, DIF, PDT	Complementary clock input.
11	SADR_tri0	I, SE, PD, PU	SMBus address bit. This is a tri-level input that works in conjunction with other SADR pins, if present, to decode SMBus Addresses. See the SMBus Address Decode table and refer to the tri-level input thresholds in the electrical tables.
12	SDATA	I/O, SE, OD, PDT	Data pin for SMBus interface.
13	SCLK	I, SE, PDT	Clock pin of SMBus interface.
14	SADR_tri1	I, SE, PD, PU	SMBus address bit. This is a tri-level input that works in conjunction with other SADR pins, if present, to decode SMBus Addresses. See the SMBus Address Decode table and refer to the tri-level input thresholds in the electrical tables.
15	SBI_ENQ	I, SE, PD, PDT	Input that selects function of pins that are multiplexed between OE and SBI functionality. SMBus output enable bits and non-multiplexed OE pins remain functional when SBI is enabled. This pin must be strapped to its desired state. It cannot dynamically change. 0 = SBI is disabled. Multiplexed pins function as output enables. 1 = SBI is enabled. Multiplexed pins function as SBI control pins.
16	LOSb	O, OD, PDT	Output indicating Loss of Input Signal. This pin is an open drain output and requires an external pull up resistor for proper functionality. A low output on this pin indicates a loss of signal on the input clock.
17	CLKb19	O, DIF	Complementary clock output.
18	CLK19	O, DIF	True clock output.
19	CLK0	O, DIF	True clock output.
20	CLKb0	O, DIF	Complementary clock output.
21	VDDCLK	PWR	Power supply for clock outputs.
22	CLK1	O, DIF	True clock output.
23	CLKb1	O, DIF	Complementary clock output.
24	CLK2	O, DIF	True clock output.
25	CLKb2	O, DIF	Complementary clock output.
26	GND	GND	Ground pin.
27	CLK3	O, DIF	True clock output.
28	CLKb3	O, DIF	Complementary clock output.
29	CLK4	O, DIF	True clock output.
30	CLKb4	O, DIF	Complementary clock output.
31	VDDCLK	PWR	Power supply for clock outputs.
32	CLK5	O, DIF	True clock output.
33	CLKb5	O, DIF	Complementary clock output.

Pin Number	Pin Name	Type	Description
34	OEb5_SBI_IN	I, SE, PD, PDT	Active low input for enabling output 5 or the data pin for the Side-Band Interface. The function is this pin is controlled by the SBEN or SBI_ENQ pin. Refer to the Side-Band Interface (SBI) section for details. OE mode: 0 = enable output, 1 = disable output. Side-Band mode with internal pull down: SBI shift register data input pin
35	CLK6	O, DIF	True clock output.
36	CLKb6	O, DIF	Complementary clock output.
37	OEb6_SBI_CLK	I, SE, PD, PDT	Active low input for enabling output 6 or the clock pin for the SBI shift register. The function is this pin is controlled by the SBEN or SBI_ENQ pin. Refer to the Side- Band Interface (SBI) section for details. OE mode: 0 = enable output, 1 = disable output. Side-Band mode with internal pull down: Clocks data into the SBI shift register on the rising edge.
38	CLK7	O, DIF	True clock output.
39	CLKb7	O, DIF	Complementary clock output.
40	OEb7	I, SE, PD, PDT	Active low input for enabling output 7. 0 = enable output, 1 = disable output.
41	CLK8	O, DIF	True clock output.
42	CLKb8	O, DIF	Complementary clock output.
43	OEb8	I, SE, PD, PDT	Active low input for enabling output 8. 0 = enable output, 1 = disable output.
44	GND	GND	Ground pin.
45	VDDCLK	PWR	Power supply for clock outputs.
46	CLK9	O, DIF	True clock output.
47	CLKb9	O, DIF	Complementary clock output.
48	OEb9	I, SE, PD, PDT	Active low input for enabling output 9. 0 = enable output, 1 = disable output.
49	CLK10	O, DIF	True clock output.
50	CLKb10	O, DIF	Complementary clock output.
51	OEb10_SHFT_LDb	I, SE, PD, PDT	Active low input for enabling output 10 or SHFT_LDb pin for the Side-Band Interface. The function of this pin is controlled by the SBEN or SBI_ENQ pin. Refer to the Side-Band Interface (SBI) section for details. OE mode: 0 = enable output, 1 = disable output. Side-Band Mode with internal pull-down: 0 = Disable SBI shift register, 1 = Enable SBI shift register. A falling edge transfers SBI shift register contents to SBI output control register.
52	CLK11	O, DIF	True clock output.
53	CLKb11	O, DIF	Complementary clock output.
54	OEb11	I, SE, PD, PDT	Active low input for enabling output 11. 0 = enable output, 1 = disable output.
55	CLK12	O, DIF	True clock output.

Pin Number	Pin Name	Type	Description
56	CLKb12	O, DIF	Complementary clock output.
57	OEb12	I, SE, PD, PDT	Active low input for enabling output 12. 0 = enable output, 1 = disable output.
58	VDDCLK	PWR	Power supply for clock outputs.
59	CLK13	O, DIF	True clock output.
60	CLKb13	O, DIF	Complementary clock output.
61	CLK14	O, DIF	True clock output.
62	CLKb14	O, DIF	Complementary clock output.
63	GND	GND	Ground pin.
64	CLK15	O, DIF	True clock output.
65	CLKb15	O, DIF	Complementary clock output.
66	CLK16	O, DIF	True clock output.
67	CLKb16	O, DIF	Complementary clock output.
68	VDDCLK	PWR	Power supply for clock outputs.
69	CLK17	O, DIF	True clock output.
70	CLKb17	O, DIF	Complementary clock output.
71	CLK18	O, DIF	True clock output.
72	CLKb18	O, DIF	Complementary clock output.
73	EPAD	GND	Connect EPAD to Ground.

1.3 RS2CB19016 Pin Assignments

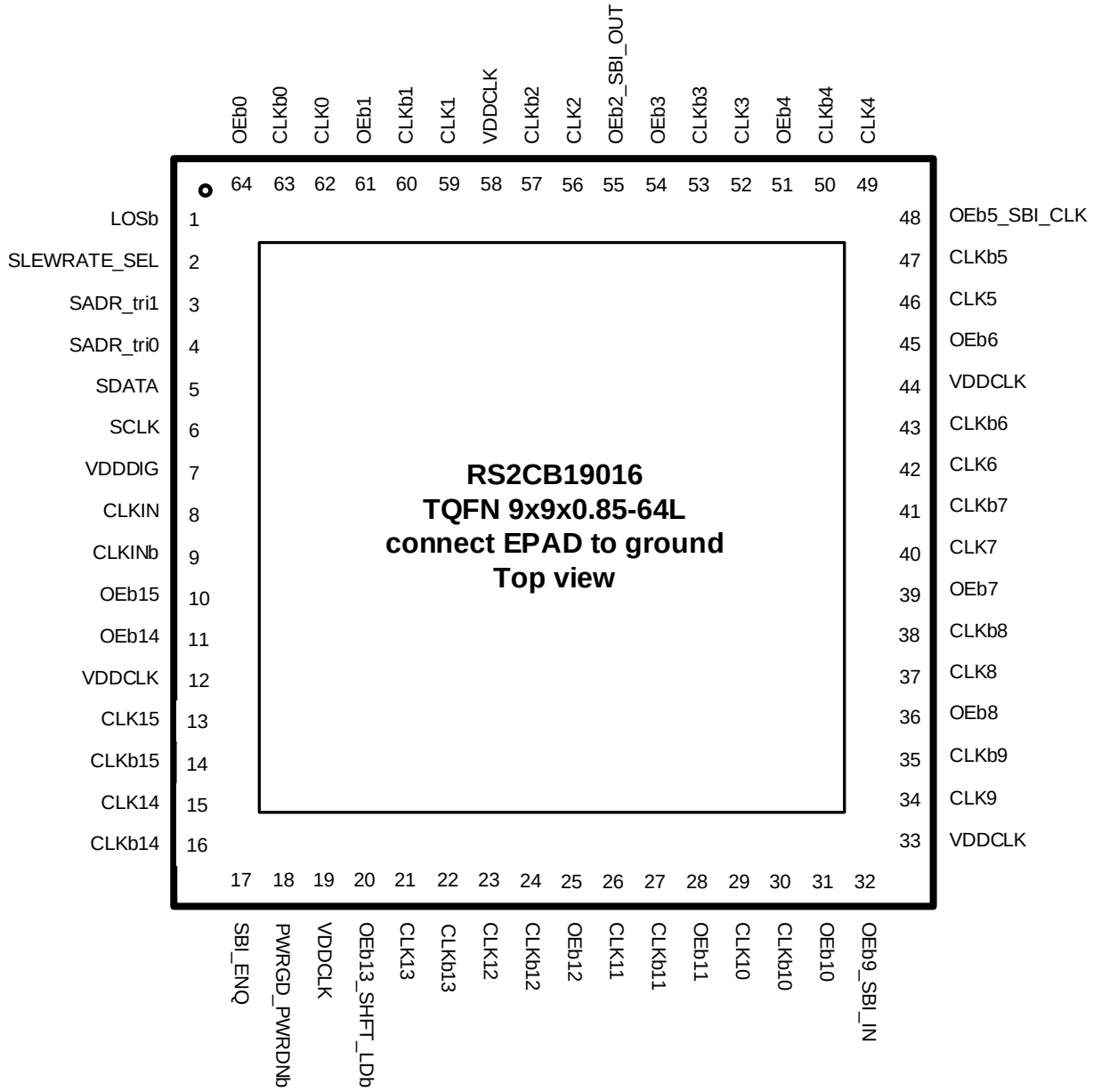


Figure 3. RS2CB19016 TQFN-64L – Top View

1.3.1 RS2CB19016 Pin Descriptions

Table 2. RS2CB19016 Pin Descriptions

Pin Number	Pin Name	Type	Description
1	LOSb	O, OD, PDT	Output indicating Loss of Input Signal. This pin is an open-drain output and requires an external pull-up resistor for proper functionality. A low output on this pin indicates a loss of signal on the input clock.
2	SLEWRATE_SEL	I, SE, PU, PDT	Input to select default slew rate of the outputs. 0 = Slow Slew Rate, 1 = Fast Slew Rate.

Pin Number	Pin Name	Type	Description
3	SADR_tri1	I, SE, PD, PU	SMBus address bit. This is a tri-level input that works in conjunction with other SADR pins, if present, to decode SMBus Addresses. See the SMBus Address Decode table and the tri-level input thresholds in the electrical tables.
4	SADR_tri0	I, SE, PD, PU	SMBus address bit. This is a tri-level input that works in conjunction with other SADR pins, if present, to decode SMBus Addresses. See the SMBus Address Decode table and the tri-level input thresholds in the electrical tables.
5	SDATA	I/O, SE, OD	Data pin for SMBus interface.
6	SCLK	I, SE	Clock pin of SMBus interface.
7	VDDDIG	PWR	Digital power.
8	CLKIN	I, DIF	True clock input.
9	CLKINb	I, DIF	Complementary clock input.
10	OEb15	I, SE, PU, PDT	Active low input for enabling output 15. 0 = Enable output, 1 = Disable output.
11	OEb14	I, SE, PU, PDT	Active low input for enabling output 14. 0 = Enable output, 1 = Disable output.
12	VDDCLK	PWR	Clock power supply.
13	CLK15	O, DIF	True clock output.
14	CLKb15	O, DIF	Complementary clock output.
15	CLK14	O, DIF	True clock output.
16	CLKb14	O, DIF	Complementary clock output.
17	SBI_ENQ	I, SE, PD, PDT	Input that selects function of pins that are multiplexed between OE and SBI functionality. SMBus output enable bits and non-multiplexed OE pins remain functional when SBI is enabled. This pin must be strapped to its desired state. It cannot dynamically change. 0 = SBI is disabled. Multiplexed pins function as output enables. 1 = SBI is enabled. Multiplexed pins function as SBI control pins.
18	PWRGD_PWRDNb	I, SE, PU, PDT	Input notifies device to sample latched inputs and start up on first high assertion. Low enters Power Down Mode, subsequent high assertions exit Power Down Mode.
19	VDDCLK	PWR	Clock power supply.
20	OEb13_SHFT_LDb	I, SE, PU, PDT	Active low input for enabling output 13 or SHFT_LDb pin for the Side-Band Interface. The function of this pin is controlled by the SBI_ENQ pin. For more information, see Side-Band Interface (SBI). OE mode: 0 = Enable output, 1 = Disable output. Side-Band mode: 0 = Disable SBI shift register, 1 = Enable SBI shift register. A falling edge transfers SBI shift register contents to SBI output control register.
21	CLK13	O, DIF	True clock output.
22	CLKb13	O, DIF	Complementary clock output.
23	CLK12	O, DIF	True clock output.
24	CLKb12	O, DIF	Complementary clock output.
25	OEb12	I, SE, PU, PDT	Active low input for enabling output 12. 0 = Enable output, 1 = Disable output.

Pin Number	Pin Name	Type	Description
26	CLK11	O, DIF	True clock output.
27	CLKb11	O, DIF	Complementary clock output.
28	OEb11	I, SE, PU, PDT	Active low input for enabling output 11. 0 = Enable output, 1 = Disable output.
29	CLK10	O, DIF	True clock output.
30	CLKb10	O, DIF	Complementary clock output.
31	OEb10	I, SE, PU, PDT	Active low input for enabling output 10. 0 = Enable output, 1 = Disable output.
32	OEb9_SBI_IN	I, SE, PU, PDT	Active low input for enabling output 9 or the data pin for the Side-Band Interface. The function is this pin is controlled by the SBI_ENQ pin. For more information, see Side-Band Interface (SBI). OE mode: 0 = Enable output, 1 = Disable output. Side-Band mode: SBI shift register data input pin
33	VDDCLK	PWR	Clock Power supply.
34	CLK9	O, DIF	True clock output.
35	CLKb9	O, DIF	Complementary clock output.
36	OEb8	I, SE, PU, PDT	Active low input for enabling output 8. 0 = Enable output, 1 = Disable output.
37	CLK8	O, DIF	True clock output.
38	CLKb8	O, DIF	Complementary clock output.
39	OEb7	I, SE, PU, PDT	Active low input for enabling output 7. 0 = Enable output, 1 = Disable output.
40	CLK7	O, DIF	True clock output.
41	CLKb7	O, DIF	Complementary clock output.
42	CLK6	O, DIF	True clock output.
43	CLKb6	O, DIF	Complementary clock output.
44	VDDCLK	PWR	Clock Power supply.
45	OEb6	I, SE, PU, PDT	Active low input for enabling output 6. 0 = Enable output, 1 = Disable output.
46	CLK5	O, DIF	True clock output.
47	CLKb5	O, DIF	Complementary clock output.
48	OEb5_SBI_CLK	I, SE, PU, PDT	Active low input for enabling output 5 or the clock pin for the SBI shift register. The function is this pin is controlled by the SBI_ENQ pin. For more information, see Side-Band Interface (SBI). OE mode: 0 = Enable output, 1 = Disable output. Side-Band mode: Clocks data into the SBI on the rising edge.
49	CLK4	O, DIF	True clock output.
50	CLKb4	O, DIF	Complementary clock output.
51	OEb4	I, SE, PU, PDT	Active low input for enabling output 4 0 = Enable output, 1 = Disable output.
52	CLK3	O, DIF	True clock output.
53	CLKb3	O, DIF	Complementary clock output.
54	OEb3	I, SE, PU, PDT	Active low input for enabling output 3. 0 = Enable output, 1 = Disable output.

Pin Number	Pin Name	Type	Description
55	OEb2_SBI_OUT	I/O, SE, PU, PDT	Active low input for enabling output 2 or the SBI shift register data output. The function is this pin is controlled by the SBI_ENQ. For more information, see Side- Band Interface (SBI). *Note: This pin is NOT PDT.* OE mode: 0 = Enable output, 1 = Disable output. Side-Band mode: SBI shift register data output.
56	CLK2	O, DIF	True clock output.
57	CLKb2	O, DIF	Complementary clock output.
58	VDDCLK	PWR	Clock Power supply.
59	CLK1	O, DIF	True clock output.
60	CLKb1	O, DIF	Complementary clock output.
61	OEb1	I, SE, PU, PDT	Active low input for enabling output 1. 0 = Enable output, 1 = Disable output.
62	CLK0	O, DIF	True clock output.
63	CLKb0	O, DIF	Complementary clock output.
64	OEb0	I, SE, PU, PDT	Active low input for enabling output 0. 0 = Enable output, 1 = Disable output.
65	EPAD	GND	Ground pin.

1.4 RS2CB19013 Pin Assignments

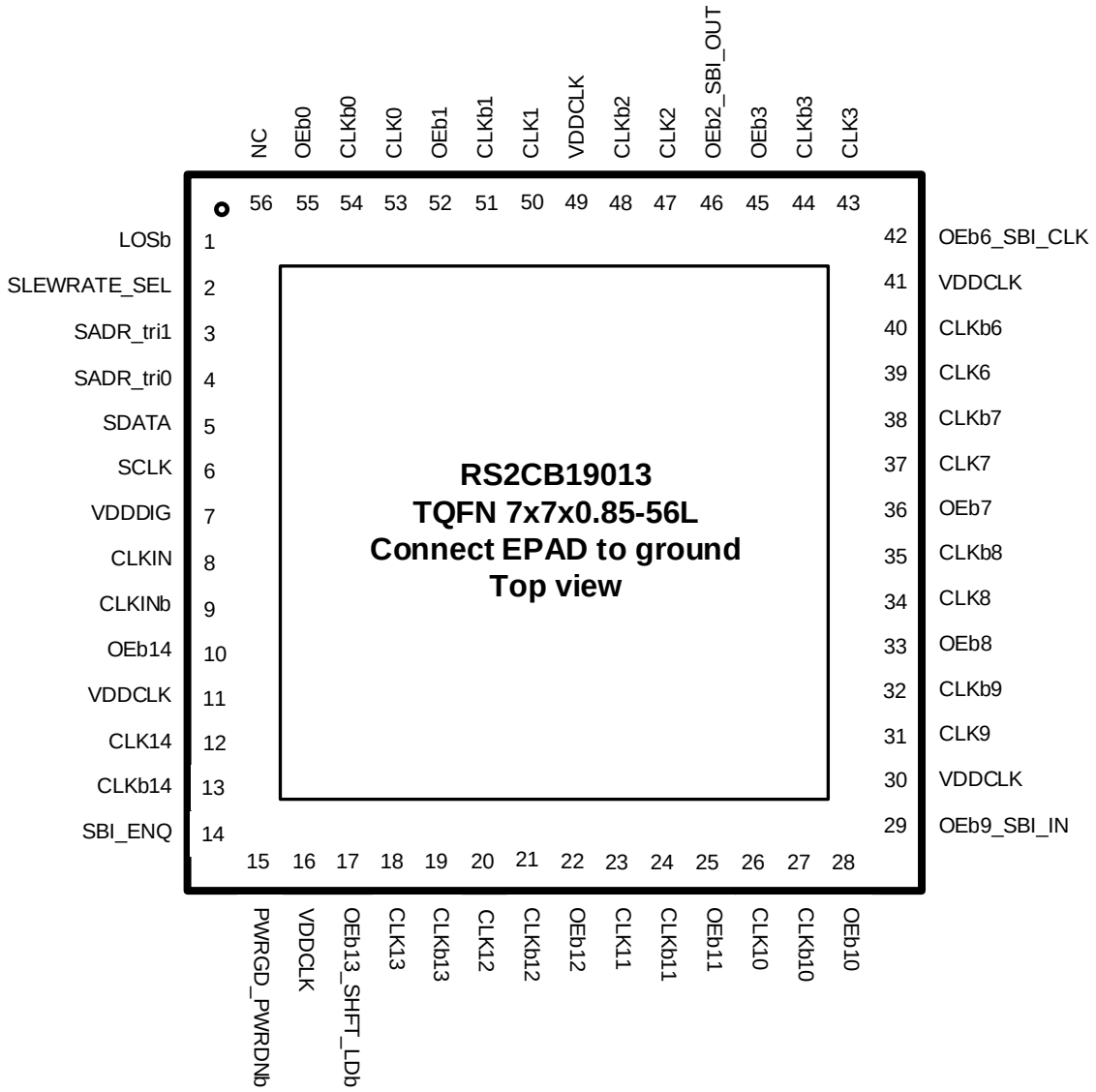


Figure 4. RS2CB19013 TQFN-56L – Top View

1.4.1 RS2CB19013 Pin Descriptions

Table 3. RS2CB19013 Pin Descriptions

Pin Number	Pin Name	Type	Description
1	LOSb	O, OD, PDT	Output indicating Loss of Input Signal. This pin is an open-drain output and requires an external pull-up resistor for proper functionality. A low output on this pin indicates a loss of signal on the input clock.
2	SLEWRATE_SEL	I, SE, PU, PDT	Input to select default slew rate of the outputs. 0 = Slow Slew Rate, 1 = Fast Slew Rate.

Pin Number	Pin Name	Type	Description
3	SADR_tri1	I, SE, PD, PU	SMBus address bit. This is a tri-level input that works in conjunction with other SADR pins, if present, to decode SMBus Addresses. See the SMBus Address Decode table and the tri-level input thresholds in the electrical tables.
4	SADR_tri0	I, SE, PD, PU	SMBus address bit. This is a tri-level input that works in conjunction with other SADR pins, if present, to decode SMBus Addresses. See the SMBus Address Decode table and the tri-level input thresholds in the electrical tables.
5	SDATA	I/O, SE, OD	Data pin for SMBus interface.
6	SCLK	I, SE	Clock pin of SMBus interface.
7	VDDDIG	PWR	Digital power.
8	CLKIN	I, DIF	True clock input.
9	CLKINb	I, DIF	Complementary clock input.
10	OEb14	I, SE, PU, PDT	Active low input for enabling output 14. 0 = Enable output, 1 = Disable output.
11	VDDCLK	PWR	Clock power supply.
12	CLK14	O, DIF	True clock output.
13	CLKb14	O, DIF	Complementary clock output.
14	SBI_ENQ	I, SE, PD, PDT	Input that selects function of pins that are multiplexed between OE and SBI functionality. SMBus output enable bits and non-multiplexed OE pins remain functional when SBI is enabled. This pin must be strapped to its desired state. It cannot dynamically change. 0 = SBI is disabled. Multiplexed pins function as output enables. 1 = SBI is enabled. Multiplexed pins function as SBI control pins.
15	PWRGD_PWRDNb	I, SE, PU, PDT	Input notifies device to sample latched inputs and start up on first high assertion. Low enters Power Down Mode, subsequent high assertions exit Power Down Mode.
16	VDDCLK	PWR	Clock power supply.
17	OEb13_SHFT_LDb	I, SE, PU, PDT	Active low input for enabling output 13 or SHFT_LDb pin for the Side-Band Interface. The function of this pin is controlled by the SBI_ENQ pin. For more information, see Side-Band Interface (SBI). OE mode: 0 = Enable output, 1 = Disable output. Side-Band mode: 0 = Disable SBI shift register, 1 = Enable SBI shift register. A falling edge transfers SBI shift register contents to SBI output control register.
18	CLK13	O, DIF	True clock output.
19	CLKb13	O, DIF	Complementary clock output.
20	CLK12	O, DIF	True clock output.
21	CLKb12	O, DIF	Complementary clock output.
22	OEb12	I, SE, PU, PDT	Active low input for enabling output 12. 0 = Enable output, 1 = Disable output.
23	CLK11	O, DIF	True clock output.
24	CLKb11	O, DIF	Complementary clock output.
25	OEb11	I, SE, PU, PDT	Active low input for enabling output 11. 0 = Enable output, 1 = Disable output.

Pin Number	Pin Name	Type	Description
26	CLK10	O, DIF	True clock output.
27	CLKb10	O, DIF	Complementary clock output.
28	OEb10	I, SE, PU, PDT	Active low input for enabling output 10. 0 = Enable output, 1 = Disable output.
29	OEb9_SBI_IN	I, SE, PU, PDT	Active low input for enabling output 9 or the data pin for the Side-Band Interface. The function is this pin is controlled by the SBI_ENQ pin. For more information, see Side-Band Interface (SBI). OE mode: 0 = Enable output, 1 = Disable output. Side-Band mode: SBI shift register data input pin
30	VDDCLK	PWR	Clock Power supply.
31	CLK9	O, DIF	True clock output.
32	CLKb9	O, DIF	Complementary clock output.
33	OEb8	I, SE, PU, PDT	Active low input for enabling output 8. 0 = Enable output, 1 = Disable output.
34	CLK8	O, DIF	True clock output.
35	CLKb8	O, DIF	Complementary clock output.
36	OEb7	I, SE, PU, PDT	Active low input for enabling output 7. 0 = Enable output, 1 = Disable output.
37	CLK7	O, DIF	True clock output.
38	CLKb7	O, DIF	Complementary clock output.
39	CLK6	O, DIF	True clock output.
40	CLKb6	O, DIF	Complementary clock output.
41	VDDCLK	PWR	Clock Power supply.
42	OEb6_SBI_CLK	I, SE, PU, PDT	Active low input for enabling output 6 or the clock pin for the SBI shift register. The function is this pin is controlled by the SBI_ENQ pin. For more information, see Side-Band Interface (SBI). OE mode: 0 = Enable output, 1 = Disable output. Side-Band mode: Clocks data into the SBI on the rising edge.
43	CLK3	O, DIF	True clock output.
44	CLKb3	O, DIF	Complementary clock output.
45	OEb3	I, SE, PU, PDT	Active low input for enabling output 3. 0 = Enable output, 1 = Disable output.
46	OEb2_SBI_OUT	I/O, SE, PU, PDT	Active low input for enabling output 2 or the SBI shift register data output. The function is this pin is controlled by the SBI_ENQ. For more information, see Side- Band Interface (SBI). *Note: This pin is NOT PDT.* OE mode: 0 = Enable output, 1 = Disable output. Side-Band mode: SBI shift register data output.
47	CLK2	O, DIF	True clock output.
48	CLKb2	O, DIF	Complementary clock output.
49	VDDCLK	PWR	Clock Power supply.
50	CLK1	O, DIF	True clock output.
51	CLKb1	O, DIF	Complementary clock output.

Pin Number	Pin Name	Type	Description
52	OEb1	I, SE, PU, PDT	Active low input for enabling output 1. 0 = Enable output, 1 = Disable output.
53	CLK0	O, DIF	True clock output.
54	CLKb0	O, DIF	Complementary clock output.
55	OEb0	I, SE, PU, PDT	Active low input for enabling output 0. 0 = Enable output, 1 = Disable output.
56	NC		
57	EPAD	GND	Ground pin.

1.5 RS2CB19008 Pin Assignments

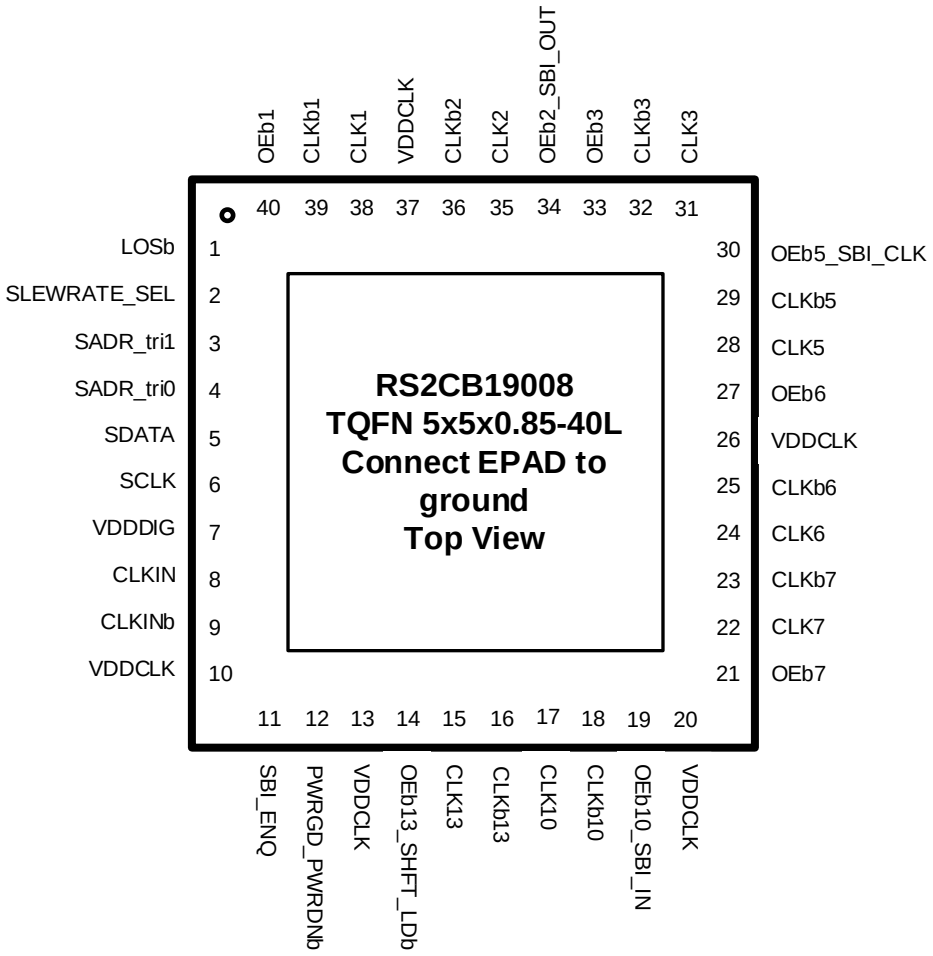


Figure 5. RS2CB19008 TQFN-40L – Top View

1.5.1 RS2CB19008 Pin Descriptions

Table 4. RS2CB19008 Pin Descriptions

Pin Number	Pin Name	Type	Description
1	LOSb	O, OD, PDT	Output indicating Loss of Input Signal. This pin is an open-drain output and requires an external pull-up resistor for proper functionality. A low output on this pin indicates a loss of signal on the input clock.
2	SLEWRATE_SEL	I, SE, PU, PDT	Input to select default slew rate of the outputs. 0 = Slow Slew Rate, 1 = Fast Slew Rate.
3	SADR_tri1	I, SE, PD, PU	SMBus address bit. This is a tri-level input that works in conjunction with other SADR pins, if present, to decode SMBus Addresses. See the SMBus Address Decode table and the tri-level input thresholds in the electrical tables.
4	SADR_tri0	I, SE, PD, PU	SMBus address bit. This is a tri-level input that works in conjunction with other SADR pins, if present, to decode SMBus Addresses. See the SMBus Address Decode table and the tri-level input thresholds in the electrical tables.

Pin Number	Pin Name	Type	Description
5	SDATA	I/O, SE, OD	Data pin for SMBus interface.
6	SCLK	I, SE	Clock pin of SMBus interface.
7	VDDDIG	PWR	Digital power.
8	CLKIN	I, DIF	True clock input.
9	CLKINb	I, DIF	Complementary clock input.
10	VDDCLK	PWR	Clock power supply.
11	SBI_ENQ	I, SE, PD, PDT	Input that selects function of pins that are multiplexed between OE and SBI functionality. SMBus output enable bits and non-multiplexed OE pins remain functional when SBI is enabled. This pin must be strapped to its desired state. It cannot dynamically change. 0 = SBI is disabled. Multiplexed pins function as output enables. 1 = SBI is enabled. Multiplexed pins function as SBI control pins.
12	PWRGD_PWRDNb	I, SE, PU, PDT	Input notifies device to sample latched inputs and start up on first high assertion. Low enters Power Down Mode, subsequent high assertions exit Power Down Mode.
13	VDDCLK	PWR	Clock power supply.
14	OEb13_SHFT_LDb	I, SE, PU, PDT	Active low input for enabling output 13 or SHFT_LDb pin for the Side-Band Interface. The function of this pin is controlled by the SBI_ENQ pin. For more information, see Side-Band Interface (SBI). OE mode: 0 = Enable output, 1 = Disable output. Side-Band mode: 0 = Disable SBI shift register, 1 = Enable SBI shift register. A falling edge transfers SBI shift register contents to SBI output control register.
15	CLK13	O, DIF	True clock output.
16	CLKb13	O, DIF	Complementary clock output.
17	CLK10	O, DIF	True clock output.
18	CLKb10	O, DIF	Complementary clock output.
19	OEb10_SBI_IN	I, SE, PU, PDT	Active low input for enabling output 10 or the clock pin for the SBI shift register. The function is this pin is controlled by the SBI_ENQ pin. For more information, see Side-Band Interface (SBI). OE mode: 0 = Enable output, 1 = Disable output. Side-Band mode: Clocks data into the SBI on the rising edge.
20	VDDCLK	PWR	Clock Power supply.
21	OEb7	I, SE, PU, PDT	Active low input for enabling output 7. 0 = Enable output, 1 = Disable output.
22	CLK7	O, DIF	True clock output.
23	CLKb7	O, DIF	Complementary clock output.
24	CLK6	O, DIF	True clock output.
25	CLKb6	O, DIF	Complementary clock output.
26	VDDCLK	PWR	Clock Power supply.
27	OEb6	I, SE, PU, PDT	Active low input for enabling output 6. 0 = Enable output, 1 = Disable output.

Pin Number	Pin Name	Type	Description
28	CLK5	O, DIF	True clock output.
29	CLKb5	O, DIF	Complementary clock output.
30	OEb5_SBI_CLK	I, SE, PU, PDT	Active low input for enabling output 5 or the clock pin for the SBI shift register. The function is this pin is controlled by the SBI_ENQ pin. For more information, see Side-Band Interface (SBI). OE mode: 0 = Enable output, 1 = Disable output. Side-Band mode: Clocks data into the SBI on the rising edge.
31	CLK3	O, DIF	True clock output.
32	CLKb3	O, DIF	Complementary clock output.
33	OEb3	I, SE, PU, PDT	Active low input for enabling output 3. 0 = Enable output, 1 = Disable output.
34	OEb2_SBI_OUT	I/O, SE, PU, PDT	Active low input for enabling output 2 or the SBI shift register data output. The function is this pin is controlled by the SBI_ENQ. For more information, see Side- Band Interface (SBI). *Note: This pin is NOT PDT.* OE mode: 0 = Enable output, 1 = Disable output. Side-Band mode: SBI shift register data output.
35	CLK2	O, DIF	True clock output.
36	CLKb2	O, DIF	Complementary clock output.
37	VDDCLK	PWR	Clock power supply.
38	CLK1	O, DIF	True clock output.
39	CLKb1	O, DIF	Complementary clock output.
40	OEb1	I, SE, PU, PDT	Active low input for enabling output 1. 0 = Enable output, 1 = Disable output.
41	EPAD	GND	Ground pin.

1.6 RS2CB19004 Pin Assignments

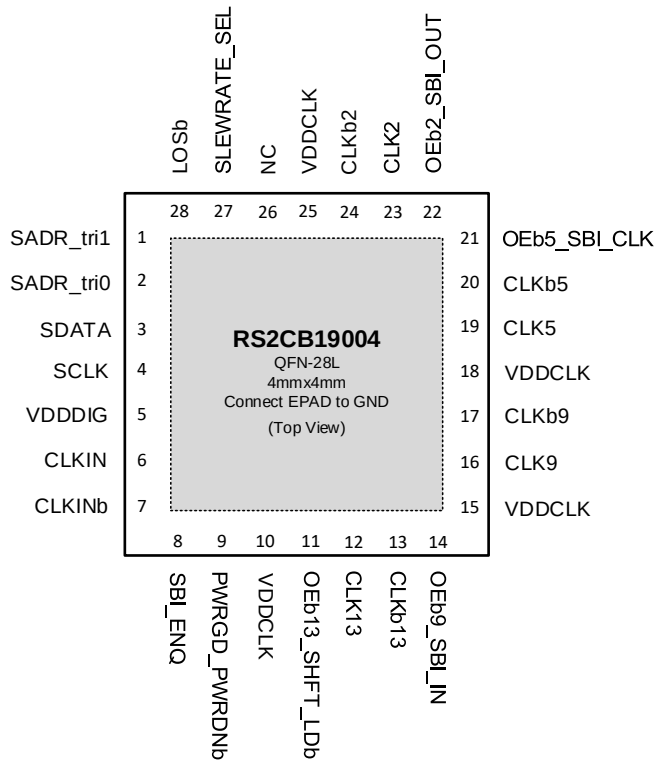


Figure 6. RS2CB19004 TQFN-28L – Top View

1.6.1 RS2CB19004 Pin Descriptions

Table 5. RS2CB19004 Pin Descriptions

Pin Number	Pin Name	Type	Description
1	SADR_tri1	I, SE, PD, PU	SMBus address bit. This is a tri-level input that works in conjunction with other SADR pins, if present, to decode SMBus Addresses. See the SMBus Address Decode table and the tri-level input thresholds in the electrical tables.
2	SADR_tri0	I, SE, PD, PU	SMBus address bit. This is a tri-level input that works in conjunction with other SADR pins, if present, to decode SMBus Addresses. See the SMBus Address Decode table and the tri-level input thresholds in the electrical tables.
3	SDATA	I/O, SE, OD	Data pin for SMBus interface.
4	SCLK	I, SE	Clock pin of SMBus interface.
5	VDDDIG	PWR	Digital power.
6	CLKIN	I, DIF	True clock input.
7	CLKINb	I, DIF	Complementary clock input.

Pin Number	Pin Name	Type	Description
8	SBI_ENQ	I, SE, PD, PDT	Input that selects function of pins that are multiplexed between OE and SBI functionality. SMBus output enable bits and non-multiplexed OE pins remain functional when SBI is enabled. This pin must be strapped to its desired state. It cannot dynamically change. 0 = SBI is disabled. Multiplexed pins function as output enables. 1 = SBI is enabled. Multiplexed pins function as SBI control pins.
9	PWRGD_PWRDNb	I, SE, PU, PDT	Input notifies device to sample latched inputs and start up on first high assertion. Low enters Power Down Mode, subsequent high assertions exit Power Down Mode.
10	VDDCLK	PWR	Clock power supply.
11	OEb13_SHFT_LDb	I, SE, PU or PD	Active low input for enabling output 13 or SHFT_LDb pin for the Side-Band Interface. The function of this pin is controlled by the SBI_ENQ pin. For more information, see Side-Band Interface (SBI). OE mode with internal pull-up: 0 = Enable output, 1 = Disable output. Side-Band mode with internal pull-down: 0 = Disable SBI shift register, 1 = Enable SBI shift register. A falling edge transfers SBI shift register contents to SBI output control register.
12	CLK13	O, DIF	True clock output.
13	CLKb13	O, DIF	Complementary clock output.
14	OEb9_SBI_IN	I, SE, PDT, PU or PD	Active low input for enabling output 9 or the data pin for the Side-Band Interface. The function is this pin is controlled by the SBI_ENQ pin. For more information, see Side-Band Interface (SBI). OE mode with internal pull-up: 0 = Enable output, 1 = Disable output. Side-Band mode with internal pull-down: SBI shift register data input pin
15	VDDCLK	PWR	Clock power supply.
16	CLK9	O, DIF	True clock output.
17	CLKb9	O, DIF	Complementary clock output.
18	VDDCLK	PWR	Clock power supply.
19	CLK5	O, DIF	True clock output.
20	CLKb5	O, DIF	Complementary clock output.
21	OEb5_SBI_CLK	I, SE, PDT, PU or PD	Active low input for enabling output 5 or the clock pin for the SBI shift register. The function is this pin is controlled by the SBI_ENQ pin. For more information, see Side-Band Interface (SBI).OE mode with internal pull-up: 0 = Enable output, 1 = Disable output. Side-Band mode with internal pull-down:Clocks data into the SBI on the rising edge.

Pin Number	Pin Name	Type	Description
22	OEb2_SBI_OUT	I/O, SE	Active low input for enabling output 2 or the SBI shift register data output. The function is this pin is controlled by the SBI_ENQ pin. For more information, see Side-Band Interface (SBI). Note: This pin is NOT PDT. OE mode with internal pull-up: 0 = Enable output, 1 = Disable output. Side-Band mode: SBI shift register data output.
23	CLK2	O, DIF	True clock output.
24	CLKb2	O, DIF	Complementary clock output.
25	VDDCLK	PWR	Clock power supply.
26	NC	NC	No connect.
27	SLEWRATE_SEL	I, SE, PU, PDT	Input to select default slew rate of the outputs. 0 = Slow Slew Rate, 1 = Fast Slew Rate.
28	LOSb	O, OD, PDT	Output indicating Loss of Input Signal. This pin is an open drain output and requires an external pull up resistor for proper functionality. A low output on this pin indicates a loss of signal on the input clock.
29	EPAD	GND	Connect to ground.

1. Specifications

1.1 Absolute Maximum Ratings

Symbol	Parameter	Condition	MIN	MAX	Unit
V_{DDx}	Supply Voltage with respect to Ground	Any VDD pin	-0.5	3.9	V
V_{IN}	Input Voltage	[1]	-0.5	3.9	V
V_{IN}	Input Voltage	[2]	-0.5	V_{DDx} + 0.3	V
I_{IN}	Input Current	All SE inputs and CLKIN [2]	-	±50	mA
I_{OUT}	Output Current – Continuous	CLK	-	30	mA
		SDATA, SBI_OUT	-	25	mA
	Output Current – Surge	CLK	-	60	mA
		SDATA, SBI_OUT	-	50	mA
T_J	Maximum Junction Temperature	-	-	150	°C
T_S	Storage Temperature	Storage Temperature	-65	150	°C

1. Pins designated Power Down Tolerant (PDT) in the pin description tables.
2. Pins not designated Power Down Tolerant (PDT) in the pin description tables.

1.2 ESD Ratings

Symbol	Parameter	Condition	Rating	Unit
ESD	HBM	JESD22-A114 (JS-001) Classification	6000	V
	CDM	JESD22-C101 Classification	1000	V

1.3 Recommended Operation Conditions

Symbol	Parameter	Condition	MIN	TYP	MAX	Unit
T_J	Maximum Junction Temperature	-	-	-	125	°C
T_A	Ambient Operating Temperature	-	-40	25	105	°C
V_{DDx}	Supply Voltage with respect to Ground	Any VDD pin, 3.3V ±10% supply.	2.97	3.3	3.63	V
t_{PU}	Power-up time for all VDDs to reach minimum specified voltage (power ramps must be monotonic)	-	0.05	-	5	ms

1.4 Thermal Information

Package [1]	Symbol	Condition	TYP Value (°C/W)
TQFN 10x10X0.85-72L	θJc	Junction to Case	16.9
	θJb	Junction to Base	2.7
	θJA0	Junction to Air, still air	26.4
	θJA1	Junction to Air, 1 m/s air flow	22.7
	θJA3	Junction to Air, 3 m/s air flow	20.6
	θJA5	Junction to Air, 5 m/s air flow	19.8
TQFN 9X9X0.85-64L	θJc	Junction to Case	24.6
	θJb	Junction to Base	2.7
	θJA0	Junction to Air, still air	26.8
	θJA1	Junction to Air, 1 m/s air flow	22.9
	θJA3	Junction to Air, 3 m/s air flow	21.5
	θJA5	Junction to Air, 5 m/s air flow	20.7
TQFN 7X7X0.85-56L	θJc	Junction to Case	26.6
	θJb	Junction to Base	3.4
	θJA0	Junction to Air, still air	26.9
	θJA1	Junction to Air, 1 m/s air flow	23.4
	θJA3	Junction to Air, 3 m/s air flow	21.9
	θJA5	Junction to Air, 5 m/s air flow	21
TQFN 5x5x0.85-40L	θJc	Junction to Case	37
	θJb	Junction to Base	4.8
	θJA0	Junction to Air, still air	33.1
	θJA1	Junction to Air, 1 m/s air flow	29.6
	θJA3	Junction to Air, 3 m/s air flow	28
	θJA5	Junction to Air, 5 m/s air flow	27.1
TQFN 4x4x0.85-28L	θJc	Junction to Case	45.3
	θJb	Junction to Base	2.2
	θJA0	Junction to Air, still air	36.3
	θJA1	Junction to Air, 1 m/s air flow	32.7
	θJA3	Junction to Air, 3 m/s air flow	31.0
	θJA5	Junction to Air, 5 m/s air flow	30.0

1. ePad soldered to board.

1.5 Electrical Characteristics

1.5.1 Phase Jitter

Table 5. PCIe Refclk Phase Jitter - Normal Conditions [1][2][3][9]

Symbol	Parameter	Condition	TYP	MAX	Specification Limit	Unit
$t_{jphPCIeG1-CC}$	Additive PCIe Phase Jitter (Common Clocked Architecture) SSC ≤ -0.5%	PCIe Gen1 (2.5 GT/s)	500	600	86000	fs p-p
$t_{jphPCIeG2-CC}$		PCIe Gen2 Hi Band (5.0 GT/s)	50	60	3,100	fs RMS
		PCIe Gen2 Lo Band (5.0 GT/s)	10	20	3,000	
$t_{jphPCIeG3-CC}$		PCIe Gen3 (8.0 GT/s)	15	25	1,000	
$t_{jphPCIeG4-CC}$		PCIe Gen4 (16.0 GT/s) [3] [4]	15	25	500	
$t_{jphPCIeG5-CC}$		PCIe Gen5 (32.0 GT/s) [3] [5]	6	8	150	
$t_{jphPCIeG6-CC}$		PCIe Gen6 (64.0 GT/s) [3] [6]	5	6	100	
$T_{jphPCIeG7-CC}$		PCIe Gen7 (128.0 GT/s) [3] [7]	3	4	67	
$t_{jphPCIeG2-IR}$	Additive PCIe Phase Jitter (IR Architectures - SRIS, SRNS) SSC ≤ -0.3%	PCIe Gen2 (5.0 GT/s)	40	50	[8]	fs RMS
$t_{jphPCIeG3-IR}$		PCIe Gen3 (8.0 GT/s)	15	25		
$t_{jphPCIeG4-IR}$		PCIe Gen4 (16.0 GT/s)	15	25		
$t_{jphPCIeG5-IR}$		PCIe Gen5 (32.0 GT/s)	5	6		
$t_{jphPCIeG6-IR}$		PCIe Gen6 (64.0 GT/s)	4	5		
$t_{jphPCIeG7-IR}$		PCIe Gen7 (128.0 GT/s)	3	4		

1. The Refclk jitter is measured after applying the filter functions found in the *PCI Express Base Specification 6.0, Revision 1.0*. For the exact measurement setup, see Test Loads. The worst case results for each data rate are summarized in this table. Equipment noise is removed from all measurements.
2. Jitter measurements should be made with a capture of at least 100,000 clock cycles captured by a real-time oscilloscope (RTO) with a sample rate of 20GS/s or greater. Broadband oscilloscope noise must be minimized in the measurement. The measured PP jitter is used (no extrapolation) for RTO measurements. Alternately, jitter measurements can be used with a Phase Noise Analyzer (PNA) extending (flat) and integrating and folding the frequency content up to an offset from the carrier frequency of at least 200MHz (at 300MHz absolute frequency) below the Nyquist frequency. For PNA measurements for the 2.5GT/s data rate, the RMS jitter is converted to peak-to-peak jitter using a multiplication factor of 8.83.
3. SSC spurs from the fundamental and harmonics are removed up to a cutoff frequency of 2MHz taking care to minimize removal of any non-SSC content.
4. Note that 0.7ps RMS is to be used in channel simulations to account for additional noise in a real system.
5. Note that 0.25ps RMS is to be used in channel simulations to account for additional noise in a real system.
6. Note that 0.15ps RMS is to be used in channel simulations to account for additional noise in a real system.
7. Note that 0.10ps RMS is to be used in channel simulations to account for additional noise in a real system.
8. The rms sum of the source jitter and the additive jitter (arithmetic sum for PCIe Gen1) must be less than the jitter specification listed.
9. The *PCI Express Base Specification 6.0, Revision 1.0* provides the filters necessary to calculate SRIS jitter values; it does not provide specification limits, therefore, the reference to this footnote in the Limit column. SRIS values are informative only. A common practice is to split the common clock budget in half. For 16GT/s data rates and above, the user must choose whether to use the output jitter specification, or the input jitter specification, which includes an allocation for the jitter added by the channel. Using 32GT/s, the Refclk jitter budget is 150fs RMS. One half of the Refclk jitter budget is 106fs RMS. At the clock input, the system must deliver 250fs RMS. One half of this value is 177fs RMS. If the clock is placed next to the PCIe device in an SRIS system, the channel is very short and the user can choose to use this more relaxed value as the jitter limit.
10. Differential input swing ≥ 1600mV and input slew rate ≥ 3.5V/ns

Table 6. Non-PCIe Refclk Phase Jitter [1][2][3]

Symbol	Parameter	Condition	TYP	MAX	Specification Limit	Unit
$t_{jphDB2000Q}$	Additive Phase Jitter - normal conditions [4]	100MHz, Intel-supplied filter [3]	15	18	80 [5]	fs RMS
$t_{jph12k-20M}$		156.25MHz (12kHz to 20MHz)	40	48	N/A	

1. See Test Loads for test configuration.
2. SMA100B used as signal source.
3. The RS2CB19xxx devices meet all legacy QPI/UPI specifications by meeting the PCIe and DB2000Q specifications listed in this document.
4. Differential input swing = 1,600mV and input slew rate = 3.5V/ns.
5. The rms sum of the source jitter and the additive jitter (arithmetic sum for PCIe Gen1) must be less than the jitter specification listed.

1.5.2 Output Frequencies, Startup Time, and LOS Timing

Table 7. Output Frequencies, Startup Time, and LOS Timing

Symbol	Parameter	Condition	MIN	TYP	MAX	Unit
f_{OP}	Operating Frequency	Automatic Clock Parking (ACP) Circuit disabled	1	-	400	MHz
		Automatic Clock Parking (ACP) Circuit enabled	25	-	400	
$t_{STARTUP}$	Start-up Time	[1]	-	1.2	3	ms
$t_{STARTUP}$	Start-up Time	[2]	-	0.3	1	ms
t_{LATOEb}	OEb latency	OEb assertion/de-assertion CLK start/stop latency. Input clock must be running.	4	5	10	clks
$t_{LOSAssert}$	LOS Assert Time	Time from disappearance of input clock to LOS assert. [3][4]	-	123	200	ns
$t_{LOSDeassert}$	LOS De-assert Time	Time from appearance of input clock to LOS de-assert. [3][5]	-	6	9	clks

1. Measured from when all power supplies have reached > 90% of nominal voltage to the first stable clock edge on the output. PWRGD_PWRDNb tied to VDD in this case.
2. VDD stable, measured from de-assertion of PWRGD_PWRDNb.
3. The clock detect circuit does not qualify the accuracy of the input clock. The first input clock must appear to release the power on reset and enable the LOS circuit at power up.
4. PWRGD_PWRDNb high. The Automatic Clock Parking (ACP) circuit - if enabled - will park the outputs in a low/low state within this time. See Byte4, bit 4 LOSb_ACP_ENABLE.
5. PWRGD_PWRDNb high. The device will drive the outputs to a high/low state within this time and then begin clocking the outputs.

1.5.3 RS2CB19020 CLK Output AC/DC Characteristics

The tables in this section apply to the RS2CB19020.

Table 8. RS2CB19020 85Ω CLK AC/DC Characteristics - Source-Terminated 100MHz PCIe [1]

Symbol	Parameter	Conditions	MIN	TYP	MAX	Specification Limit [2]	Unit
V_{MAX}	Absolute Max Voltage Includes 300mV of Overshoot (Vovs) [3][4]	Across all settings in this table at 100MHz.	-	-	1100	1150	mV
V_{MIN}	Absolute Min Voltage Includes -300mV of Undershoot (Vuds) [3][5]		-160	-	-	-300	
V_{HIGH}	Voltage High [3]	V_{HIGH} set to 800mV.	660	805	980	-	
V_{LOW}	Voltage Low [3]		-90	30	150	-	
V_{CROSS}	Crossing Voltage (abs) [3][6][7]	V_{HIGH} set to 800mV, scope averaging off.	280	405	540	250 to 550	
ΔV_{CROSS}	Crossing Voltage (var) [3][6][8]		-	20	100	140	
dv/dt	Slew Rate [9][10]	V_{HIGH} set to 800mV, Fast slew rate, scope averaging on.	2.0	2.9	4.0	2 to 5	V/ns
		V_{HIGH} set to 800mV, Slow slew rate, scope averaging on.	1.6	2.4	3.4	1.5 to 3.5	
$\Delta T_{R/F}$	Rise/Fall Matching [3] [11]	V_{HIGH} set to 800mV. Fast slew rate.	-	8	19	20	%
		V_{HIGH} set to 800mV. Slow slew rate.	-	10	24	N/A	
V_{HIGH}	Voltage High [3]	V_{HIGH} set to 900mV.	700	890	1080	-	mV
V_{LOW}	Voltage Low [3]		-110	30	160	-	
V_{CROSS}	Crossing Voltage (abs) [3] [6][7]	V_{HIGH} set to 900mV, scope averaging off.	270	450	580	250 to 600	
ΔV_{CROSS}	Crossing Voltage (var) [3] [6][8]		-	30	110	140	
dv/dt	Slew Rate [9][10]	V_{HIGH} set to 900mV, Fast slew rate, scope averaging on.	2.2	3	4.8	2 to 5	V/ns
		V_{HIGH} set to 900mV, Slow slew rate, scope averaging on.	1.6	2.6	3.4	1.5 to 3.5	
$\Delta T_{R/F}$	Rise/Fall Matching [3][11]	V_{HIGH} set to 900mV. Fast slew rate.	-	5	19	20	%
		V_{HIGH} set to 900mV. Slow slew rate.	-	8	26	N/A	
t_{DC}	Output Duty Cycle [9]	V_T = 0V differential. 50% duty cycle input.	48	50	52	45 to 55	%

1. Standard high impedance load with C_L = 2pF. See Test Loads.
2. The specification limits are taken from either the *PCIe Base Specification Revision 6.0* or from relevant x86 processor specifications, whichever is more stringent.
3. Measured from single-ended waveform.
4. Defined as the maximum instantaneous voltage including overshoot.
5. Defined as the minimum instantaneous voltage including undershoot.

6. Measured at crossing point where the instantaneous voltage value of the rising edge of REFCLK+ equals the falling edge of REFCLK-.
7. Refers to the total variation from the lowest crossing point to the highest, regardless of which edge is crossing. Refers to all crossing points for this measurement.
8. Defined as the total variation of all crossing voltages of Rising REFCLK+ and Falling REFCLK-. This is the maximum allowed variance in VCROSS for any particular system.
9. Measured from differential waveform.
10. Measured from -150 mV to +150 mV on the differential waveform (derived from REFCLK+ minus REFCLK-). The signal must be monotonic through the measurement region for rise and fall time. The 300 mV measurement window is centered on the differential zero crossing.
11. Matching applies to rising edge rate for REFCLK+ and falling edge rate for REFCLK-. It is measured using a ±75 mV window centered on the median cross point where REFCLK+ rising meets REFCLK- falling. The median cross point is used to calculate the voltage thresholds the oscilloscope is to use for the edge rate calculations. The Rise Edge Rate of REFCLK+ should be compared to the Fall Edge Rate of REFCLK-; the maximum allowed difference should not exceed 20% of the slowest edge rate.

Table 9. RS2CB19020 100Ω CLK AC/DC Characteristics - Source-Terminated 100MHz PCIe Apps [1]

Symbol	Parameter	Condition	MIN	TYP	MAX	Specification Limit [2]	Unit
V_{MAX}	Absolute Max Voltage Includes 300mV of Overshoot (Vovs) [3][4]	Across all settings in this table at 100MHz.	-	-	1050	1150	mV
V_{MIN}	Absolute Min Voltage Includes -300mV of Undershoot (Vuds) [3][5]		-150	-	-	-300	
V_{HIGH}	Voltage High [3]	V_{HIGH} set to 800mV.	710	815	915	-	mV
V_{LOW}	Voltage Low [3]		-35	20	75	-	
V_{CROSS}	Crossing Voltage (abs) [3][6][7]	V_{HIGH} set to 800mV, scope averaging off.	285	410	500	250 to 550	
ΔV_{CROSS}	Crossing Voltage (var) [3][6][8]		-25	35	105	140	
dv/dt	Slew Rate [9][10]	V_{HIGH} set to 800mV, Fast slew rate, scope averaging on.	2.1	3	3.7	2 to 4	V/ns
		V_{HIGH} set to 800mV, Slow slew rate, scope averaging on.	1.6	2.6	3.4	1.5 to 3.5	
$\Delta T_{R/F}$	Rise/Fall Matching [3][11]	V_{HIGH} set to 800mV. Fast slew rate.	-	4	16	20	%
$\Delta T_{R/F}$	Rise/Fall Matching [3][11]	V_{HIGH} set to 800mV. Slow slew rate.	-	3.5	15.5	20	%
V_{HIGH}	Voltage High [3]	V_{HIGH} set to 900mV.	802	907	1012	-	mV
V_{LOW}	Voltage Low [3]		-38	21	80	-	
V_{CROSS}	Crossing Voltage (abs) [3][6][7]	V_{HIGH} set to 900mV, scope averaging off.	320	450	540	300 to 600	
ΔV_{CROSS}	Crossing Voltage (var) [3][6][8]		-35	40	115	140	
dv/dt	Slew Rate [9][10]	V_{HIGH} set to 900mV, Fast slew rate, scope averaging on.	2.1	3.0	3.9	2 to 4	V/ns
		V_{HIGH} set to 900mV, Slow slew rate, scope averaging on.	1.6	2.8	3.4	1.5 to 3.5	
$\Delta T_{R/F}$	Rise/Fall Matching [3][11]	V_{HIGH} set to 900mV. Fast slew rate.	-	5	19.7	20	%

Table 9. RS2CB19020 100Ω CLK AC/DC Characteristics - Source-Terminated 100MHz PCIe Apps [1] (Cont.)

Symbol	Parameter	Condition	MIN	TYP	MAX	Specification Limit [2]	Unit
$\Delta T_{R/F}$	Rise/Fall Matching [3][11]	V_{HIGH} set to 900mV. Slow slew rate.	-	4.9	19.5	20	%
t_{DC}	Output Duty Cycle [9]	V_T = 0V differential.	48	50	52	45 to 55	%

1. Standard high impedance load with C_L= 2pF. For more information, see Test Loads.
2. The specification limits are taken from either the *PCIe Base Specification Revision 6.0* or from relevant **x86** processor specifications, whichever is more stringent.
3. Measured from single-ended waveform.
4. Defined as the maximum instantaneous voltage including overshoot.
5. Defined as the minimum instantaneous voltage including undershoot.
6. Measured at crossing point where the instantaneous voltage value of the rising edge of REFCLK+ equals the falling edge of REFCLK-.
7. Refers to the total variation from the lowest crossing point to the highest, regardless of which edge is crossing. Refers to all crossing points for this measurement.
8. Defined as the total variation of all crossing voltages of Rising REFCLK+ and Falling REFCLK-. This is the maximum allowed variance in VCROSS for any particular system.
9. Measured from differential waveform.
10. Measured from -150mV to +150mV on the differential waveform (derived from REFCLK+ minus REFCLK-). The signal must be monotonic through the measurement region for rise and fall time. The 300mV measurement window is centered on the differential zero crossing.
11. Matching applies to rising edge rate for REFCLK+ and falling edge rate for REFCLK-. It is measured using a ±75mV window centered on the median cross point where REFCLK+ rising meets REFCLK- falling. The median cross point is used to calculate the voltage thresholds the oscilloscope is to use for the edge rate calculations. The Rise Edge Rate of REFCLK+ should be compared to the Fall Edge Rate of REFCLK-; the maximum allowed difference should not exceed 20% of the slowest edge rate.

Table 10. RS2CB19020 85Ω CLK AC/DC Characteristics - Non-PCIe, Source-Terminated Loads [1]

Symbol	Parameter	Conditions	MIN	TYP	MAX	Unit
V_{OH}	Output High Voltage [2]	V_{HIGH} = 800mV, Fast Slew Rate, 25MHz, 156.25MHz, 312.5MHz.	630	800	1003	mV
V_{OL}	Output Low Voltage [2]		-150	15	160	
V_{CROSS}	Crossing Voltage (abs) [3]		230	395	570	
ΔV_{CROSS}	Crossing Voltage (var) [3][4][5]		-	50	140	
t_R	Rise Time [2] V_T = 20% to 80% of swing		135	480	780	ps
t_F	Fall Time [2] V_T = 20% to 80% of swing		155	425	748	ps
V_{OH}	Output High Voltage [2]	V_{HIGH} = 900mV, Fast Slew Rate, 25MHz, 156.25MHz, 312.5MHz.	700	890	1100	mV
V_{OL}	Output Low Voltage [2]		-155	30	195	
V_{CROSS}	Crossing Voltage (abs) [3]		260	430	640	
ΔV_{CROSS}	Crossing Voltage (var) [3][4][5]		-	40	165	
t_R	Rise Time [2] V_T = 20% to 80% of swing		160	500	870	ps
t_F	Fall Time [2] V_T = 20% to 80% of swing		150	430	765	ps
t_{DC}	Output Duty Cycle [6]	Across all settings in this table, V_T = 0V.	47	50	52	%

1. Standard high impedance load with C_L = 2pF. See Test Loads.
2. Measured from single-ended waveform.
3. Measured at crossing point where the instantaneous voltage value of the rising edge of CLK equals the falling edge of CLKb.

4. Refers to the total variation from the lowest crossing point to the highest, regardless of which edge is crossing. Refers to all crossing points for this measurement.
5. Defined as the total variation of all crossing voltages of Rising CLK and Falling CLKb. This is the maximum allowed variance in VCROSS for any particular system.
6. Measured from differential waveform.

Table 11. RS2CB19020 85Ω CLK AC/DC Characteristics - Non-PCIe, Double-Terminated Loads [1]

Symbol	Parameter	Conditions	MIN	TYP	MAX	Unit
V_{OH}	Output High Voltage [2]	V_{HIGH} = 800mV, Fast Slew Rate, 25MHz, 156.25MHz, 312.5MHz (amplitude is reduced by ~50% due to double termination).	370	430	475	mV
V_{OL}	Output Low Voltage [2]		-30	11	60	
V_{CROSS}	Crossing Voltage (abs) [3]		150	215	245	
ΔV_{CROSS}	Crossing Voltage (var) [3][4][5]		-	8	40	
t_R	Rise Time [2] V_T = 20% to 80% of swing		205	320	570	ps
t_F	Fall Time [2] V_T = 20% to 80% of swing		120	300	450	ps
V_{OH}	Output High Voltage [2]	V_{HIGH} = 900mV, Fast Slew Rate, 25MHz, 100MHz, 156.25MHz, 312.5MHz (amplitude is reduced by ~50% due to double termination).	385	490	555	mV
V_{OL}	Output Low Voltage [2]		-30	12	60	
V_{CROSS}	Crossing Voltage (abs) [3]		170	220	265	
ΔV_{CROSS}	Crossing Voltage (var) [3][4][5]		-	8	45	
t_R	Rise Time [2] V_T = 20% to 80% of swing		215	330	610	ps
t_F	Fall Time [2] V_T = 20% to 80% of swing		140	310	400	ps
t_{DC}	Output Duty Cycle [6]	Across all settings in this table, V_T = 0V.	49	50	51	%

1. Both Tx and Rx are terminated (double-terminated) with C_L = 2pF. This reduces amplitude by 50%. See Test Loads.
2. Measured from single-ended waveform.
3. Measured at crossing point where the instantaneous voltage value of the rising edge of CLK equals the falling edge of CLKb.
4. Refers to the total variation from the lowest crossing point to the highest, regardless of which edge is crossing. Refers to all crossing points for this measurement.
5. Defined as the total variation of all crossing voltages of Rising CLK and Falling CLKb. This is the maximum allowed variance in VCROSS for any particular system.
6. Measured from differential waveform.

Table 12. RS2CB19020 100Ω CLK AC/DC Characteristics - Non-PCIe Apps, Source-Terminated Loads [1]

Symbol	Parameter	Condition	MIN	TYP	MAX	Unit
V_{OH}	Output High Voltage [2]	V_{HIGH} = 800mV, Fast Slew Rate, 156.25MHz, 312.5MHz. (Slow slew rate is not recommended for frequencies > 100MHz)	700	795	910	mV
V_{OL}	Output Low Voltage [2]		-70	30	120	
V_{CROSS}	Crossing Voltage (abs) [3]		252	375	495	
ΔV_{CROSS}	Crossing Voltage (var) [3][4][5]		0	35	135	
t_R	Rise Time [2] VT = 20% to 80% of swing		205	320	590	ps
t_F	Fall Time [2] VT = 20% to 80% of swing		145	315	585	ps
V_{OH}	Output High Voltage [2]	V_{HIGH} = 900mV, Fast Slew Rate, 156.25MHz, 312.5MHz. (Slow slew rate is not recommended for frequencies > 100MHz)	750	885	1020	mV
V_{OL}	Output Low Voltage [2]		-80	20	145	
V_{CROSS}	Crossing Voltage (abs) [3]		260	400	545	
ΔV_{CROSS}	Crossing Voltage (var) [3][4][5]		0	45	145	

t_R	Rise Time [2] VT = 20% to 80% of swing		200	390	610	ps
t_F	Fall Time [2] VT = 20% to 80% of swing		120	325	595	ps
t_{DC}	Output Duty Cycle [6]	Across all settings in this table, V_T = 0V.	48	50	52	%

1. Standard high impedance load with C_L= 2pF. For more information, see Test Loads.
2. Measured from single-ended waveform.
3. Measured at crossing point where the instantaneous voltage value of the rising edge of CLK equals the falling edge of CLKb.
4. Refers to the total variation from the lowest crossing point to the highest, regardless of which edge is crossing. Refers to all crossing points for this measurement.
5. Defined as the total variation of all crossing voltages of Rising CLK and Falling CLKb. This is the maximum allowed variance in VCROSS for any particular system.
6. Measured from differential waveform.

Table 13. RS2CB19020 100Ω CLK AC/DC Characteristics–Non-PCIe Apps, Double-Terminated Loads [1]

Symbol	Parameter	Condition	MIN	TYP	MAX	Unit
V_{OH}	Output High Voltage [2]	V_{HIGH} = 800mV, Fast Slew Rate, 156.25MHz, 312.5MHz - amplitude is reduced by ~50% due to double termination. (Slow slew rate is not recommended for frequencies > 100MHz)	360	395	430	mV
V_{OL}	Output Low Voltage [2]		-25	8	45	
V_{CROSS}	Crossing Voltage (abs) [3]		150	185	215	
ΔV_{CROSS}	Crossing Voltage (var) [3][4][5]		-12	10	30	
t_R	Rise Time [2] VT = 20% to 80% of swing		150	310	557	ps
t_F	Fall Time [2] VT = 20% to 80% of swing		110	260	380	ps
V_{OH}	Output High Voltage [2]	V_{HIGH} = 900mV, Fast Slew Rate, 156.25MHz, 312.5MHz - amplitude is reduced by ~50% due to double termination. (Slow slew rate is not recommended for frequencies >100MHz)	380	480	560	mV
V_{OL}	Output Low Voltage [2]		-30	10	50	
V_{CROSS}	Crossing Voltage (abs) [3]		165	220	280	
ΔV_{CROSS}	Crossing Voltage (var) [3][4][5]		-18	10	30	
t_R	Rise Time [2] VT = 20% to 80% of swing		170	320	610	ps
t_F	Fall Time [2] VT = 20% to 80% of swing		130	305	400	ps
t_{DC}	Output Duty Cycle [6]	Across all settings in this table, V_T = 0V.	48	50	52	%

1. Both Tx and Rx are terminated (double-terminated) with C_L= 2pF. This reduces amplitude by 50%. For more information, see Test Loads.
2. Measured from single-ended waveform.
3. Measured at crossing point where the instantaneous voltage value of the rising edge of CLK equals the falling edge of CLKb.
4. Refers to the total variation from the lowest crossing point to the highest, regardless of which edge is crossing. Refers to all crossing points for this measurement.
5. Defined as the total variation of all crossing voltages of Rising CLK and Falling CLKb. This is the maximum allowed variance in VCROSS for any particular system.
6. Measured from differential waveform.

1.5.4 RS2CB190xx CLK Output AC/DC Characteristics

The tables in the section apply to the RS2CB19016, RS2CB19013, RS2CB19008，RS2CB19004.

Table 14. RS2CB19016/13/08/04 85Ω CLK AC/DC Characteristics - Source-Terminated 100MHz PCIe Applications [1]

Symbol	Parameter	Condition	MIN	TYP	MAX	Specification Limit [2]	Unit
V_{MAX}	Absolute Max Voltage Includes 300mV of Overshoot (Vovs) [3][4]	Across all settings in this table at 100MHz.	-	870	968	1150	mV
V_{MIN}	Absolute Min Voltage Includes -300mV of Undershoot (Vuds) [3][5]		-45	2	36	-300	
V_{HIGH}	Voltage High [3]	V_{HIGH} set to 800mV.	710	795	869	-	mV
V_{LOW}	Voltage Low [3]		-45	31	108	-	
V_{CROSS}	Crossing Voltage (abs) [3][6][7]	V_{HIGH} set to 800mV, scope averaging off.	280	406	535	250 to 550	
ΔV_{CROSS}	Crossing Voltage (var) [3][6][8]		-32	30	136	140	
dv/dt	Slew Rate [9][10]	V_{HIGH} set to 800mV, Fast slew rate, scope averaging on.	2.1	3.2	4.6	2 to 5	V/ns
		V_{HIGH} set to 800mV, Slow slew rate, scope averaging on.	1.6	2.3	3.2	1.5 to 3.5	
$\Delta T_{R/F}$	Rise/Fall Matching [3][11]	V_{HIGH} set to 800mV. Fast slew rate.	-	5	20	25	%
$\Delta T_{R/F}$	Rise/Fall Matching [3][11]	V_{HIGH} set to 800mV. Slow slew rate.	-	7	24	28	%
V_{HIGH}	Voltage High [3]	V_{HIGH} set to 900mV.	750	880	960	-	mV
V_{LOW}	Voltage Low [3]		-44	32	112	-	
V_{CROSS}	Crossing Voltage (abs) [3][6][7]	V_{HIGH} set to 900mV, scope averaging off.	312	441	567	300 to 600	
ΔV_{CROSS}	Crossing Voltage (var) [3][6][8]		-45	33	140	140	
dv/dt	Slew Rate [9][10]	V_{HIGH} set to 900mV, Fast slew rate, scope averaging on.	2.1	3.4	4.9	2 to 5	V/ns
		V_{HIGH} set to 900mV, Slow slew rate, scope averaging on.	1.6	2.4	3.3	1.5 to 3.5	
$\Delta T_{R/F}$	Rise/Fall Matching [3][11]	V_{HIGH} set to 900mV. Fast slew rate.	-	5	20	25	%
$\Delta T_{R/F}$	Rise/Fall Matching [3][11]	V_{HIGH} set to 900mV. Slow slew rate.	-	7	24	28	%
t_{DC}	Output Duty Cycle [9]	V_T = 0V differential.	48	50	52	45 to 55	%

1. Standard high impedance load with C_L= 2pF. For more information, see Test Loads.
2. The specification limits are taken from either the *PCIe Base Specification Revision 6.0* or from relevant x86 processor specifications, whichever is more stringent.
3. Measured from single-ended waveform.
4. Defined as the maximum instantaneous voltage including overshoot.

5. Defined as the minimum instantaneous voltage including undershoot.
6. Measured at crossing point where the instantaneous voltage value of the rising edge of REFCLK+ equals the falling edge of REFCLK-.
7. Refers to the total variation from the lowest crossing point to the highest, regardless of which edge is crossing. Refers to all crossing points for this measurement.
8. Defined as the total variation of all crossing voltages of Rising REFCLK+ and Falling REFCLK-. This is the maximum allowed variance in VCROSS for any particular system.
9. Measured from differential waveform.
10. Measured from -150mV to +150mV on the differential waveform (derived from REFCLK+ minus REFCLK-). The signal must be monotonic through the measurement region for rise and fall time. The 300mV measurement window is centered on the differential zero crossing.
11. Matching applies to rising edge rate for REFCLK+ and falling edge rate for REFCLK-. It is measured using a ±75mV window centered on the median cross point where REFCLK+ rising meets REFCLK- falling. The median cross point is used to calculate the voltage thresholds the oscilloscope is to use for the edge rate calculations. The Rise Edge Rate of REFCLK+ should be compared to the Fall Edge Rate of REFCLK-; the maximum allowed difference should not exceed 25% of the slowest edge rate.

Table 15. RS2CB19016/13/08/04 100Ω CLK AC/DC Characteristics - Source-Terminated 100MHz PCIe Apps [1]

Symbol	Parameter	Condition	MIN	TYP	MAX	Specification Limit [2]	Unit
V_{MAX}	Absolute Max Voltage Includes 300mV of Overshoot (Vovs) [3][4]	Across all settings in this table at 100MHz.	844	930	1017	1150	mV
V_{MIN}	Absolute Min Voltage Includes -300mV of Undershoot (Vuds) [3][5]		-51	7	65	-300	
V_{HIGH}	Voltage High [3]	V_{HIGH} set to 800mV.	713	816	918	-	mV
V_{LOW}	Voltage Low [3]		-35	22	78	-	
V_{CROSS}	Crossing Voltage (abs) [3][6][7]	V_{HIGH} set to 800mV, scope averaging off.	296	420	540	250 to 550	
ΔV_{CROSS}	Crossing Voltage (var) [3][6][8]		-28	39	106	140	
dv/dt	Slew Rate [9][10]	V_{HIGH} set to 800mV, Fast slew rate, scope averaging on.	2.1	2.9	3.7	2 to 4	V/ns
		V_{HIGH} set to 800mV, Slow slew rate, scope averaging on.	1.6	2.4	3.2	1.5 to 3.5	
$\Delta T_{R/F}$	Rise/Fall Matching [3][11]	V_{HIGH} set to 800mV. Fast slew rate.	-	3.6	15.6	20	%
$\Delta T_{R/F}$	Rise/Fall Matching [3][11]	V_{HIGH} set to 800mV. Slow slew rate.	-	3.5	15.5	20	%
V_{HIGH}	Voltage High [3]	V_{HIGH} set to 900mV.	802	907	1012	-	mV
V_{LOW}	Voltage Low [3]		-38	21	80	-	
V_{CROSS}	Crossing Voltage (abs) [3][6][7]	V_{HIGH} set to 900mV, scope averaging off.	326	454	560	300 to 600	
ΔV_{CROSS}	Crossing Voltage (var) [3][6][8]		-31	40	111	140	
dv/dt	Slew Rate [9][10]	V_{HIGH} set to 900mV, Fast slew rate, scope averaging on.	2.1	3.0	4.0	2 to 4	V/ns
		V_{HIGH} set to 900mV, Slow slew rate, scope averaging on.	1.7	2.6	3.4	1.5 to 3.5	
$\Delta T_{R/F}$	Rise/Fall Matching [3][11]	V_{HIGH} set to 900mV. Fast slew rate.	-	4.8	19.7	20	%

Table 15. RS2CB19016/13/08/04 100Ω CLK AC/DC Characteristics - Source-Terminated 100MHz PCIe Apps [1] (Cont.)

Symbol	Parameter	Condition	MIN	TYP	MAX	Specification Limit [2]	Unit
$\Delta T_{R/F}$	Rise/Fall Matching [3][11]	V_{HIGH} set to 900mV. Slow slew rate.	-	4.9	19.4	20	%
t_{DC}	Output Duty Cycle [9]	V_T = 0V differential.	48	50	52	45 o 55	%

1. Standard high impedance load with C_L= 2pF. For more information, see Test Loads.
2. The specification limits are taken from either the *PCIe Base Specification Revision 6.0* or from relevant **x86** processor specifications, whichever is more stringent.
3. Measured from single-ended waveform.
4. Defined as the maximum instantaneous voltage including overshoot.
5. Defined as the minimum instantaneous voltage including undershoot.
6. Measured at crossing point where the instantaneous voltage value of the rising edge of REFCLK+ equals the falling edge of REFCLK-.
7. Refers to the total variation from the lowest crossing point to the highest, regardless of which edge is crossing. Refers to all crossing points for this measurement.
8. Defined as the total variation of all crossing voltages of Rising REFCLK+ and Falling REFCLK-. This is the maximum allowed variance in VCROSS for any particular system.
9. Measured from differential waveform.
10. Measured from -150mV to +150mV on the differential waveform (derived from REFCLK+ minus REFCLK-). The signal must be monotonic through the measurement region for rise and fall time. The 300mV measurement window is centered on the differential zero crossing.
11. Matching applies to rising edge rate for REFCLK+ and falling edge rate for REFCLK-. It is measured using a ±75mV window centered on the median cross point where REFCLK+ rising meets REFCLK- falling. The median cross point is used to calculate the voltage thresholds the oscilloscope is to use for the edge rate calculations. The Rise Edge Rate of REFCLK+ should be compared to the Fall Edge Rate of REFCLK-; the maximum allowed difference should not exceed 20% of the slowest edge rate.

Table 16. RS2CB19016/13/08/04 85Ω CLK AC/DC Characteristics - Non-PCIe Apps, Source-Terminated Loads [1]

Symbol	Parameter	Condition	MIN	TYP	MAX	Unit
V_{OH}	Output High Voltage [2]	V_{HIGH} = 800mV, Fast Slew Rate, 156.25MHz, 312.5MHz. (Slow slew rate is not recommended for frequencies > 100MHz)	695	811	950	mV
V_{OL}	Output Low Voltage [2]		-52	30	108	
V_{CROSS}	Crossing Voltage (abs) [3]		283	431	582	
ΔV_{CROSS}	Crossing Voltage (var) [3][4][5]		0	35	168	
t_R	Rise Time [2] VT = 20% to 80% of swing		93	334	543	ps
t_F	Fall Time [2] VT = 20% to 80% of swing		103	293	539	ps
V_{OH}	Output High Voltage [2]	V_{HIGH} = 900mV, Fast Slew Rate, 156.25MHz, 312.5MHz. (Slow slew rate is not recommended for frequencies > 100MHz)	744	901	1084	mV
V_{OL}	Output Low Voltage [2]		-51	27	102	
V_{CROSS}	Crossing Voltage (abs) [3]		234	446	656	
ΔV_{CROSS}	Crossing Voltage (var) [3][4][5]		0	35	168	
t_R	Rise Time [2] VT = 20% to 80% of swing		65	386	683	ps
t_F	Fall Time [2] VT = 20% to 80% of swing		82	302	565	ps
t_{DC}	Output Duty Cycle [6]	Across all settings in this table, V_T = 0V.	48	50	52	%

1. Standard high impedance load with C_L= 2pF. For more information, see Test Loads.
2. Measured from single-ended waveform.
3. Measured at crossing point where the instantaneous voltage value of the rising edge of CLK equals the falling edge of CLKb.
4. Refers to the total variation from the lowest crossing point to the highest, regardless of which edge is crossing. Refers to all crossing points for this measurement.
5. Defined as the total variation of all crossing voltages of Rising CLK and Falling CLKb. This is the maximum allowed variance in VCROSS for any particular system.
6. Measured from differential waveform.

Table 17. RS2CB19016/13/08/04 85Ω CLK AC/DC Characteristics - Non-PCIe Apps, Double-Terminated Loads [1]

Symbol	Parameter	Condition	MIN	TYP	MAX	Unit
V_{OH}	Output High Voltage [2]	V_{HIGH} = 800mV, Fast Slew Rate, 156.25MHz, 312.5MHz - amplitude is reduced by ~50% due to double termination. (Slow slew rate is not recommended for frequencies >100MHz)	385	431	475	mV
V_{OL}	Output Low Voltage [2]		-22	12	46	
V_{CROSS}	Crossing Voltage (abs) [3]		164	205	245	
ΔV_{CROSS}	Crossing Voltage (var) [3][4][5]		-19	10	40	
t_R	Rise Time [2] VT = 20% to 80% of swing		185	396	615	ps
t_F	Fall Time [2] VT = 20% to 80% of swing		185	253	355	ps
V_{OH}	Output High Voltage [2]	V_{HIGH} = 900mV, Fast Slew Rate, 156.25MHz, 312.5MHz - amplitude is reduced by ~50% due to double termination. (Slow slew rate is not recommended for frequencies >100MHz)	430	479	526	mV
V_{OL}	Output Low Voltage [2]		-26	12	49	
V_{CROSS}	Crossing Voltage (abs) [3]		179	223	260	
ΔV_{CROSS}	Crossing Voltage (var) [3][4][5]		-24	10	45	
t_R	Rise Time [2] VT = 20% to 80% of swing		259	456	670	ps
t_F	Fall Time [2] VT = 20% to 80% of swing		197	256	345	ps
t_{DC}	Output Duty Cycle [6]	Across all settings in this table, V_T = 0V.	48	49.8	52	%

1. Both Tx and Rx are terminated (double-terminated) with C_L = 2pF. This reduces amplitude by 50%. For more information, see Test Loads.
2. Measured from single-ended waveform.
3. Measured at crossing point where the instantaneous voltage value of the rising edge of CLK equals the falling edge of CLKb.
4. Refers to the total variation from the lowest crossing point to the highest, regardless of which edge is crossing. Refers to all crossing points for this measurement.
5. Defined as the total variation of all crossing voltages of Rising CLK and Falling CLKb. This is the maximum allowed variance in VCROSS for any particular system.
6. Measured from differential waveform.

Table 18. RS2CB19016/13/08/04 100Ω CLK AC/DC Characteristics - Non-PCIe Apps, Source-Terminated Loads [1]

Symbol	Parameter	Condition	MIN	TYP	MAX	Unit
V_{OH}	Output High Voltage [2]	V_{HIGH} = 800mV, Fast Slew Rate, 156.25MHz, 312.5MHz. (Slow slew rate is not recommended for frequencies > 100MHz)	702	808	914	mV
V_{OL}	Output Low Voltage [2]		-73	34	118	
V_{CROSS}	Crossing Voltage (abs) [3]		256	376	496	
ΔV_{CROSS}	Crossing Voltage (var) [3][4][5]		0	37	133	
t_R	Rise Time [2] VT = 20% to 80% of swing		217	376	467	ps
t_F	Fall Time [2] VT = 20% to 80% of swing		140	365	576	ps
V_{OH}	Output High Voltage [2]	V_{HIGH} = 900mV, Fast Slew Rate, 156.25MHz, 312.5MHz. (Slow slew rate is not recommended for frequencies > 100MHz)	756	890	1024	mV
V_{OL}	Output Low Voltage [2]		-85	31	147	
V_{CROSS}	Crossing Voltage (abs) [3]		269	405	541	
ΔV_{CROSS}	Crossing Voltage (var) [3][4][5]		0	47	144	
t_R	Rise Time [2] VT = 20% to 80% of swing		222	412	610	ps
t_F	Fall Time [2] VT = 20% to 80% of swing		127	368	591	ps
t_{DC}	Output Duty Cycle [6]	Across all settings in this table, V_T = 0V.	48.2	48.9	52.1	%

1. Standard high impedance load with C_L= 2pF. For more information, see Test Loads.
2. Measured from single-ended waveform.
3. Measured at crossing point where the instantaneous voltage value of the rising edge of CLK equals the falling edge of CLKb.
4. Refers to the total variation from the lowest crossing point to the highest, regardless of which edge is crossing. Refers to all crossing points for this measurement.
5. Defined as the total variation of all crossing voltages of Rising CLK and Falling CLKb. This is the maximum allowed variance in VCROSS for any particular system.
6. Measured from differential waveform.

Table 19. RS2CB19016/13/08/04 100Ω CLK AC/DC Characteristics–Non-PCIe Apps, Double-Terminated Loads [1]

Symbol	Parameter	Condition	MIN	TYP	MAX	Unit
V_{OH}	Output High Voltage [2]	V_{HIGH} = 800mV, Fast Slew Rate, 156.25MHz, 312.5MHz - amplitude is reduced by ~50% due to double termination. (Slow slew rate is not recommended for frequencies > 100MHz)	365	398	435	mV
V_{OL}	Output Low Voltage [2]		-20	10	43	
V_{CROSS}	Crossing Voltage (abs) [3]		152	186	216	
ΔV_{CROSS}	Crossing Voltage (var) [3][4][5]		-14	7	29	
t_R	Rise Time [2] VT = 20% to 80% of swing		237	409	634	ps
t_F	Fall Time [2] VT = 20% to 80% of swing		174	260	380	ps

Table 19. RS2CB19016/13/08/04 100Ω CLK AC/DC Characteristics–Non-PCIe Apps, Double-Terminated Loads [1]

Symbol	Parameter	Condition	MIN	TYP	MAX	Unit
V_{OH}	Output High Voltage [2]	V_{HIGH} = 900mV, Fast Slew Rate, 156.25MHz, 312.5MHz - amplitude is reduced by ~50% due to double termination. (Slow slew rate is not recommended for frequencies >100MHz)	405	442	485	mV
V_{OL}	Output Low Voltage [2]		-22	12	45	
V_{CROSS}	Crossing Voltage (abs) [3]		167	201	232	
ΔV_{CROSS}	Crossing Voltage (var) [3][4][5]		-14	8	30	
t_R	Rise Time [2] VT = 20% to 80% of swing		280	467	695	ps
t_F	Fall Time [2] VT = 20% to 80% of swing		180	263	385	ps
t_{DC}	Output Duty Cycle [6]	Across all settings in this table, V_T = 0V.	48	50	52	%

1. Both Tx and Rx are terminated (double-terminated) with C_L = 2pF. This reduces amplitude by 50%. For more information, see Test Loads.
2. Measured from single-ended waveform.
3. Measured at crossing point where the instantaneous voltage value of the rising edge of CLK equals the falling edge of CLKb.
4. Refers to the total variation from the lowest crossing point to the highest, regardless of which edge is crossing. Refers to all crossing points for this measurement.
5. Defined as the total variation of all crossing voltages of Rising CLK and Falling CLKb. This is the maximum allowed variance in VCROSS for any particular system.
6. Measured from differential waveform.

1.5.5 Output-to-Output and Input-to-Output Skew

Table 20. RS2CB19020 Output-to-Output and Input-to-Output Skew [1]

Symbol	Parameter	Condition	MIN	TYP	MAX	Unit
t_{SK}	Output-to-Output Skew [2]	Any two outputs, all outputs at fast slew rate.	-	38	50	ps
		Any two outputs, all outputs at slow slew rate.	-	40	60	ps
t_{PD}	Input-to-Output Delay Double-Terminated [3]	Clock in to any output, all outputs at fast slew rate.	1.1	1.2	1.4	ns
		Clock in to any output, all outputs at slow slew rate.	1.2	1.4	1.6	ns
t_{PD}	Input-to-Output Delay Source-Terminated [3]	Clock in to any output, all outputs at fast slew rate.	1.2	1.4	1.6	ns
		Clock in to any output, all outputs at slow slew rate.	1.4	1.5	1.8	ns
Δt_{PD}	Input-to-Output Delay Variation [3]	A single device, over temperature *and voltage*.	-	1.4	2	ps/°C

1. For more information, see Test Loads.
2. This parameter is defined in accordance with JEDEC Standard 65.
3. Defined as the time between to output rising edge and the input rising edge that caused it.

Table 21. RS2CB19016/13/08/04 Output-to-Output and Input-to-Output Skew[1]

Symbol	Parameter	Condition	MIN	TYP	MAX	Unit
t_{SK}	Output-to-Output Skew [2]	Any two outputs, all outputs at fast slew rate.	-	37	50	ps
		Any two outputs, all outputs at slow slew rate.	-	39	60	ps
t_{PD}	Input-to-Output Delay Double-Terminated [3]	Clock in to any output, all outputs at fast slew rate.	1.1	1.4	1.6	ns
		Clock in to any output, all outputs at slow slew rate.	1.2	1.5	1.8	ns
t_{PD}	Input-to-Output Delay Source-Terminated [3]	Clock in to any output, all outputs at fast slew rate.	1.2	1.4	1.7	ns
		Clock in to any output, all outputs at slow slew rate.	1.3	1.5	1.8	ns
Δt_{PD}	Input-to-Output Delay Variation [3]	A single device, over temperature *and voltage*.	-	1.5	1.8	ps/°C

1. For more information, see Test Loads.
2. This parameter is defined in accordance with JEDEC Standard 65.
3. Defined as the time between to output rising edge and the input rising edge that caused it.

1.5.6 I/O Signals

Table 22. I/O Electrical Characteristics

Symbol	Parameter	Condition	MIN	TYP	MAX	Unit
V_{IH}	Input High Voltage [1][2]	Single-ended inputs, unless otherwise listed.	2	-	VDD + 0.3	V
V_{IL}	Input Low Voltage [1][2]		-0.3	-	0.8	V
V_{IH}	Input High Voltage	SADR_tri[1:0].	2.4	-	VDD+0.3	V
V_{IM}	Input Mid Voltage		1.2	-	1.8	V
V_{IL}	Input Low Voltage		-0.3	-	0.8	V
V_{OH}	Output High Voltage [2]	SBI_OUT, IOH = -2mA	2.4	3.2	VDD + 0.3	V
V_{OL}	Output Low Voltage [2]	SBI_OUT, IOL = 2mA	-	0.1	0.4	V
I_{IH}	Input Leakage Current High, V_{IN} = VDD	CLKIN (RS2CB19020)	-	-	70	µA
		CLKINb (RS2CB19020)	-	-	70	
		CLKIN (RS2CB19016/13/08/04)	-	-	70	
		CLKINb (RS2CB19016/13/08/04)	-	-	70	
		Single-ended inputs, unless otherwise listed.	25	-	35	
		PWRGD_PWRDNb	-1	-	5	
		SADR_tri[1:0]	25	-	35	

Table 23. I/O Electrical Characteristics (Cont.)

Symbol	Parameter	Condition	MIN	TYP	MAX	Unit
I_{IL}	Input Leakage Current Low, V_{IN} = 0V	CLKIN (RS2CB19020)	-12	-	-6	µA
		CLKINb (RS2CB19020)	-3	-	+3	
		CLKIN (RS2CB19016/13/08/04)	-3	-	+3	
		CLKINb (RS2CB19016/13/08/04)	-12	-	-6	
		Single-ended inputs, unless otherwise listed.	-3	-	+3	
		PWRGD_PWRDNb	-35	-	-20	
		SADR_tri[1:0]	-35	-	-20	
Rp	PD_CLKIN	Value of internal pull-down resistor to ground (CLKIN)	-	53	-	kΩ
	PU_CLKINb	Value of internal pull-up resistor to 0.5V (CLKINb).	-	57	-	
	Pull-up/Pull-down Resistor	Single-ended inputs.	-	125	-	
Zo	Output Impedance	SBI_OUT pin.	-	50	-	Ω
		CLK outputs, RS2CB190xx (single-ended value).	-	41	-	Ω
		CLK outputs, RS2CB190xx-**100** (single-ended value).	-	48	-	Ω

1. For SCLK and SDATA, see the SMBus Electrical Characteristics table.
2. These values are compliant with JESD8C.01.

1.5.7 Power Supply Current

Table 24. Power Supply Current [1][2][3] (Cont.)

Symbol	Parameter	Condition	MIN	TYP	MAX	Unit
I_{DDCLK}	V_{DDCLK} Operating Current – RS2CB19020	85Ω impedance, fast slew rate, source-terminated load at 100MHz. PWRGD_PWRDNb = 1.	-	155	175	mA
		85Ω impedance, fast slew rate, double-terminated load at 100MHz. PWRGD_PWRDNb = 1.	-	190	205	
		85Ω impedance, fast slew rate, source-terminated load at maximum output frequency. PWRGD_PWRDNb = 1.	-	160	180	
		85Ω impedance, fast slew rate, double-terminated load at maximum output frequency. PWRGD_PWRDNb = 1.	-	200	220	
I_{DDCLK}	V_{DDCLK} Operating Current – RS2CB19016	85Ω impedance, fast slew rate, source-terminated load at 100MHz. PWRGD_PWRDNb = 1.	-	154	175	mA
		85Ω impedance, fast slew rate, double-terminated load at 100MHz. PWRGD_PWRDNb = 1.	-	210	231	
		85Ω impedance, fast slew rate, source-terminated load at maximum output frequency. PWRGD_PWRDNb = 1.	-	270	291	
		85Ω impedance, fast slew rate, double-terminated load at maximum output frequency. PWRGD_PWRDNb = 1.	-	336	357	
I_{DDCLK}	V_{DDCLK} Operating Current – RS2CB19013	85Ω impedance, fast slew rate, source-terminated load at 100MHz. PWRGD_PWRDNb = 1.	-	110	131	mA
		85Ω impedance, fast slew rate, double-terminated load at 100MHz. PWRGD_PWRDNb = 1.	-	174	194	
		85Ω impedance, fast slew rate, source-terminated load at maximum output frequency. PWRGD_PWRDNb = 1.	-	215	236	
		85Ω impedance, fast slew rate, double-terminated load at maximum output frequency. PWRGD_PWRDNb = 1.	-	276	297	

Table 24. Power Supply Current [1][2][3] (Cont.)

Symbol	Parameter	Condition	MIN	TYP	MAX	Unit
I_{DDCLK}	V_{DDCLK} Operating Current – RS2CB19008	85Ω impedance, fast slew rate, source-terminated load at 100MHz. PWRGD_PWRDNb = 1.	-	72	92	mA
		85Ω impedance, fast slew rate, double-terminated load at 100MHz. PWRGD_PWRDNb = 1.	-	116	137	
		85Ω impedance, fast slew rate, source-terminated load at maximum output frequency. PWRGD_PWRDNb = 1.	-	126	146	
		85Ω impedance, fast slew rate, double-terminated load at maximum output frequency. PWRGD_PWRDNb = 1.	-	183	203	
I_{DDCLK}	V_{DDCLK} Operating Current – RS2CB19004	85Ω impedance, fast slew rate, source-terminated load at 100MHz. PWRGD_PWRDNb = 1.	-	39	59	mA
		85Ω impedance, fast slew rate, double-terminated load at 100MHz. PWRGD_PWRDNb = 1.	-	60	80	
		85Ω impedance, fast slew rate, source-terminated load at maximum output frequency. PWRGD_PWRDNb = 1.	-	79	100	
		85Ω impedance, fast slew rate, double-terminated load at maximum output frequency. PWRGD_PWRDNb = 1.	-	102	122	
I_{DDCLK}	V_{DDCLK} Operating Current – RS2CB19016-100	100Ω impedance, fast slew rate, source-terminated load at 100MHz. PWRGD_PWRDNb = 1.	-	151	172	mA
		100Ω impedance, fast slew rate, double-terminated load at 100MHz. PWRGD_PWRDNb = 1.	-	187	208	
		100Ω impedance, fast slew rate, source-terminated load at maximum output frequency. PWRGD_PWRDNb = 1.	-	265	285	
		100Ω impedance, fast slew rate, double-terminated load at maximum output frequency. PWRGD_PWRDNb = 1.	-	303	323	
I_{DDCLK}	V_{DDCLK} Operating Current – RS2CB19013-100	100Ω impedance, fast slew rate, source-terminated load at 100MHz. PWRGD_PWRDNb = 1.	-	97	117	mA
		100Ω impedance, fast slew rate, double-terminated load at 100MHz. PWRGD_PWRDNb = 1.	-	160	180	
		100Ω impedance, fast slew rate, source-terminated load at maximum output frequency. PWRGD_PWRDNb = 1.	-	194	214	
		100Ω impedance, fast slew rate, double-terminated load at maximum output frequency. PWRGD_PWRDNb = 1.	-	257	278	

Table 24. Power Supply Current [1][2][3] (Cont.)

Symbol	Parameter	Condition	MIN	TYP	MAX	Unit
I_{DDCLK}	V_{DDCLK} Operating Current – RS2CB19008-100	100Ω impedance, fast slew rate, source-terminated load at 100MHz. PWRGD_PWRDNb = 1.	-	70	90	mA
		100Ω impedance, fast slew rate, double-terminated load at 100MHz. PWRGD_PWRDNb = 1.	-	106	126	
		100Ω impedance, fast slew rate, source-terminated load at maximum output frequency. PWRGD_PWRDNb = 1.	-	121	142	
		100Ω impedance, fast slew rate, double-terminated load at maximum output frequency. PWRGD_PWRDNb = 1.	-	169	190	
I_{DDCLK}	V_{DDCLK} Operating Current – RS2CB19004-100	100Ω impedance, fast slew rate, source-terminated load at 100MHz. PWRGD_PWRDNb = 1.	-	38	59	mA
		100Ω impedance, fast slew rate, double-terminated load at 100MHz. PWRGD_PWRDNb = 1.	-	59	79	
		100Ω impedance, fast slew rate, source-terminated load at maximum output frequency. PWRGD_PWRDNb = 1.	-	74	94	
		100Ω impedance, fast slew rate, double-terminated load at maximum output frequency. PWRGD_PWRDNb = 1.	-	97	118	
I_{DDDIG}	V_{DDDIG} Operating Current	PWRGD_PWRDNb = 1, RS2CB19016/13/08/04	-	0.6	1.3	mA
I_{DDR}	V_{DDR} Operating Current – RS2CB19020	85Ω impedance, fast slew rate, at 100MHz. PWRGD_PWRDNb = 1.	-	35	40	mA
		85Ω impedance, fast slew rate, at maximum output frequency. PWRGD_PWRDNb = 1.	-	90	100	mA
I_{DDCLK_PD}	V_{DDCLK} Power-down Current	PWRGD_PWRDNb = 0, RS2CB19016/13/08/04	-	0.6	1.3	mA
		PWRGD_PWRDNb = 0, RS2CB19020	-	0.25	0.5	mA
I_{DDDIG_PD}	V_{DDDIG} Power-down Current	PWRGD_PWRDNb = 0, RS2CB19016/13/08/04	-	3.1	5.0	mA
I_{DDR_PD}	V_{DDR} Power-down Current	PWRGD_PWRDNb = 0, RS2CB19020	-	4.8	6	mA

1. For more information, see Test Loads.
2. Output voltage set to 800mV. Slew rate has negligible effect on current consumption, so only fast is listed.
3. Total operating current is obtained by adding IDDCLK + IDDDIG, or IDDCLK + IDDR for a particular device and operating mode. Power down current is obtained by adding IDDCLK_PD + IDDDIG_PD, or IDDCLK_PD + IDDR_PD for a particular device.

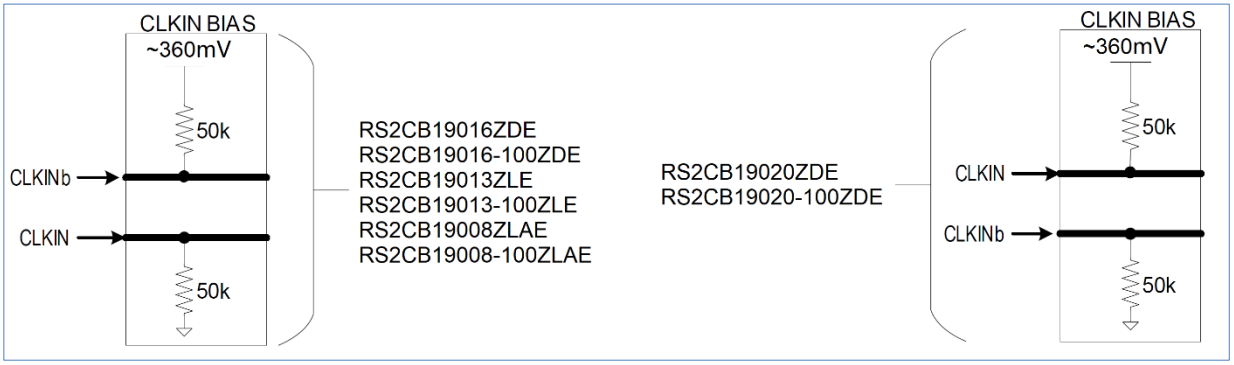
1.5.8 CLKIN AC/DC Characteristics

Table 25. CLKIN AC/DC Characteristic

Symbol	Parameter	Condition	MIN	TYP	MAX	Unit
V_{CROSS}	Input Crossover Voltage	-	100	-	1400	mV
V_{SWING}	Input Swing	Differential value.	200	-	-	mV
dv/dt	Input Slew Rate	Measured differentially. [2]	0.6	-	-	V/ns

1. For values required for performance, see the Phase Jitter tables.
2. Measured from -150mV to +150mV on the differential waveform (derived from REFCLK+ minus REFCLK-). The signal must be monotonic through the measurement region for rise and fall time. The 300mV measurement window is centered on the differential zero-crossing.

Figure 6. Clock Input Bias Network



1.5.9 SMBus Electrical Characteristics

Table 26. SMBus DC Electrical Characteristics [1]

Symbol	Parameter	Condition	Minimum	Typical	Maximum	Unit
V_{IH}	High-level Input Voltage for SMBCLK and SMBDAT	-	0.8 VDD	-	-	V
V_{IL}	Low-level Input Voltage for SMBCLK and SMBDAT	-	-	-	0.3 VDD	
V_{HYS}	Hysteresis of Schmitt Trigger Inputs	-	0.05 VDD	-	-	
V_{OL}	Low-level Output Voltage for SMBCLK and SMBDAT	I_{OL} = 4mA	-	0.28	0.4	
I_{IN}	Input Leakage Current per Pin	-	[2]	-	[2]	µA
C_B	Capacitive Load for Each Bus Line	-	-	-	400	pF

1. V_{OH} is governed by the V_{PUP}, the voltage rail to which the pull-up resistors are connected.
2. For more information, see I/O Electrical Characteristics.

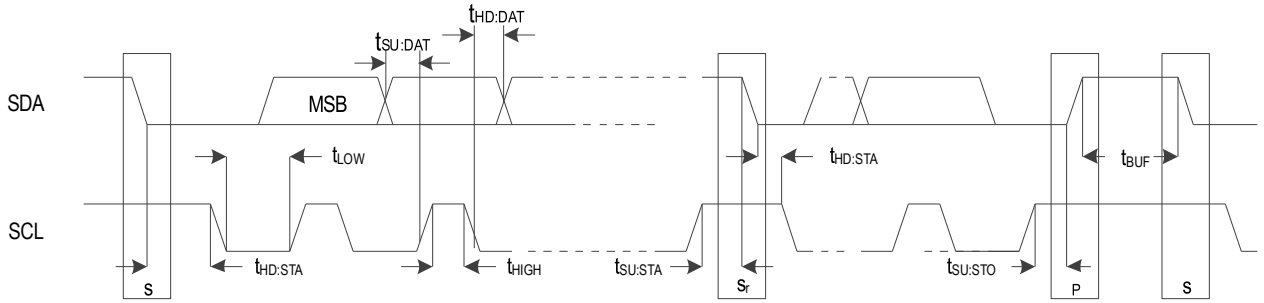


Figure 7. SMBus Slave Timing

Table 27. SMBus AC Electrical Characteristics

Symbol	Parameter	Condition	100kHz		400kHz		Unit
			MIN	MAX	MIN	MAX	
f_{SMB}	SMBus Operating Frequency	[1]	10	100	10	400	kHz
t_{BUF}	Bus free time between STOP and START Condition	-	4.7	-	1.3	-	µs
$t_{HD:STA}$	Hold Time after (REPEATED) START Condition	[2]	4	-	0.6	-	µs
$t_{SU:STA}$	REPEATED START Condition Setup Time	-	4.7	-	0.6	-	µs
$t_{SU:STO}$	STOP Condition Setup Time	-	4	-	0.6	-	µs
$t_{HD:DAT}$	Data Hold Time	[3]	300	-	300	-	ns
$t_{SU:DAT}$	Data Setup Time	-	250	-	100	-	ns
$t_{TIMEOUT}$	Detect SCL_SCLK Low Timeout	[4]	25	35	25	35	ms
$t_{TIMEOUT}$	Detect SDA_nCS Low Timeout	[5]	25	35	25	35	ms
t_{LOW}	Clock Low Period	-	4.7	-	1.3	-	µs
t_{HIGH}	Clock High Period	[6]	4	50	0.6	50	µs
$t_{LOW:SEXT}$	Cumulative Clock Low Extend Time - Slave	[7]	N/A		N/A		ms
$t_{LOW:MEXT}$	Cumulative Clock Low Extend Time - Master	[8]	N/A		N/A		ms
t_F	Clock/Data Fall Time	[9]	-	300	-	300	ns
t_R	Clock/Data Rise Time	[9]	-	1000	-	300	ns
t_{SPIKE}	Noise Spike Suppression Time	[10]	-	–	0	50	ns

1. Power must be applied and PWRGD_PWRDNb must be a 1 for the SMBus to be active.
2. A master should not drive the clock at a frequency below the minimum f_{SMB}. Further, the operating clock frequency should not be reduced below the minimum value of fSMB due to periodic clock extending by slave devices as defined in Section 5.3.3 of System Management Bus (SMBus) Specification, Version 3.1, dated 19 Mar 2018. This limit does not apply to the bus idle condition, and this limit is independent from the $t_{LOW:SEXT}$ and $t_{LOW:MEXT}$ limits. For example, if the SMBCLK is high for $t_{HIGH,MAX}$, the clock must not be periodically stretched longer than $1/f_{SMB,MIN} – t_{HIGH,MAX}$. This requirement does not pertain to a device that extends the SMBCLK low for data processing of a received byte, data buffering and so forth for longer than 100 µs in a non-periodic way.
3. A device must internally provide sufficient hold time for the SMBDAT signal (with respect to the VIH,MIN of the SMBCLK signal) to bridge the undefined region of the falling edge of SMBCLK.
4. Slave devices may have caused other slave devices to hold SDA low. This is the maximum time that a device can hold SMBDAT low after the master raises SMBCLK after the last bit of a transaction. A slave device may detect how long SDA is held low and release SDA after the time out period.
5. Devices participating in a transfer can abort the transfer in progress and release the bus when any single clock low interval exceeds the value of $t_{TIMEOUT,MIN}$. After the master in a transaction detects this condition, it must generate a stop condition within or after the current data byte in the transfer process. Devices that have detected this condition must reset their communication and be able to receive a new START condition no later than $t_{TIMEOUT,MAX}$. Typical device examples include the host controller, and embedded controller, and most devices that can master the SMBus. Some simple devices do not contain a clock low drive circuit; this simple kind of device typically may reset its communications port after a start or a stop condition. A timeout condition can only be ensured if the device that is forcing the timeout holds the SMBCLK low for $t_{TIMEOUT,MAX}$ or longer.
6. The device has the option of detecting a timeout if the SMBDATA pin is also low for this time.
7. $t_{HIGH,MAX}$ provides a simple guaranteed method for masters to detect bus idle conditions. A master can assume that the bus is free if it detects that the clock and data signals have been high for greater than $t_{HIGH,MAX}$.
8. tLOW:MEXT is the cumulative time a master device is allowed to extend its clock cycles within each byte of a message as defined from START-to-ACK, ACK-to-ACK, or ACK-to-STOP. It is possible that a slave device or another master will also extend the clock causing the combined clock low time to be greater than tLOW:MEXT on a given byte. This parameter is measured with a full speed slave device as the sole target of the master.
9. The rise and fall time measurement limits are defined as follows:
   Rise Time Limits: ($V_{IL:MAX}$ - 0.15 V) to ($V_{IH:MIN}$ + 0.15 V)
   Fall Time Limits: ($V_{IH:MIN}$ + 0.15 V) to ($V_{IL:MAX}$ - 0.15 V)
10. Devices must provide a means to reject noise spikes of a duration up to the maximum specified value.

1.5.10 Side-Band Interface

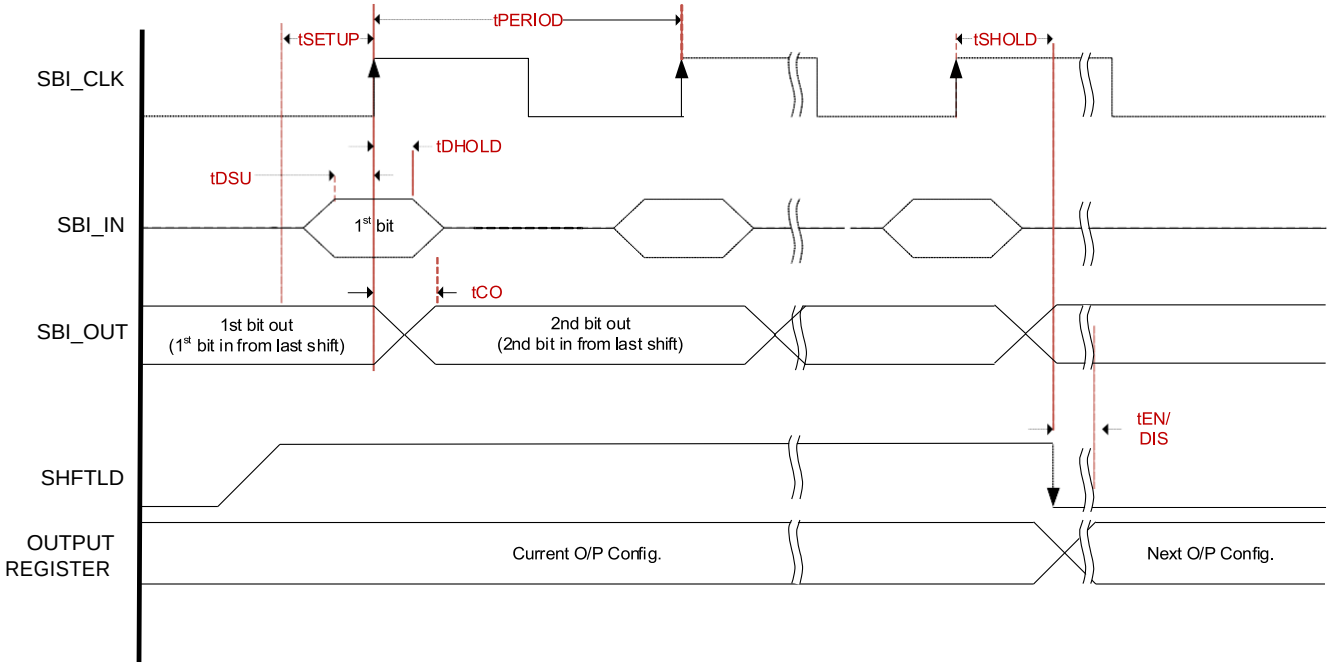


Figure 8. Side-Band Interface Timing

Figure 8 is the timing diagram and Table 28 provides the electrical characteristics for the Side-Band Interface. The SBI supports clock rates up to 25MHz.

Table 28. Electrical Characteristics – Side-Band Interface

Symbol	Parameter	Condition	MIN	TYP	MAX	Unit
t_{PERIOD}	Clock Period	Clock period.	40	-	-	ns
t_{SETUP}	SHFT Setup Time to Clock	SHFT_LDB high to SBI_CLK rising edge.	10	-	-	ns
t_{DSU}	SBI_IN Setup Time	SBI_IN setup to SBI_CLK rising edge.	5	-	-	ns
t_{DHOLD}	SBI_IN Hold Time	SBI_IN hold after SBI_CLK rising edge.	2	-	-	ns
t_{CO}	SBI_CLK to SBI_OUT	SBI_CLK rising edge to SBI_OUT valid.	2	-	-	ns
t_{SHOLD}	SHFT Hold Time	SHFT_LDB hold (high) after SBI_CLK rising edge (SBI_CLK to SHFT_LDB falling edge).	10	-	-	ns
$t_{EN/DIS}$	Enable/Disable Time	Delay from SHFT_LDB falling edge to next output configuration taking effect.[1]	4	-	12	clocks
t_{SLEW}	Slew Rate	SBI_CLK (between 20% and 80%).[2]	0.7	-	6	V/ns

1. Refers to the output clock.
2. Control input must be monotonic from 20% to 80% of input swing.

3. Test Loads

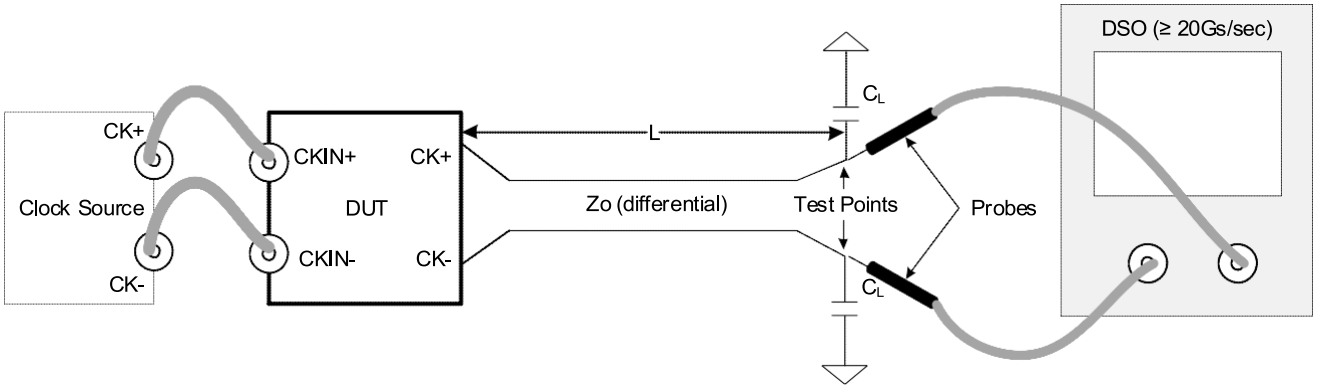


Figure 9. AC/DC Test Load for Differential Outputs (Standard PCIe Source-Terminated)

Table 29. Parameters for AC/DC Test Load (Standard PCIe Source-Terminated)

Device	Clock Source	Rs (ohms)	Zo (ohms)	L (cm)	C_L (pF)
RS2CB19xxx	SMA100B	Internal	85	25.4	2
RS2CB19xxx-100	SMA100B	Internal	100	25.4	2

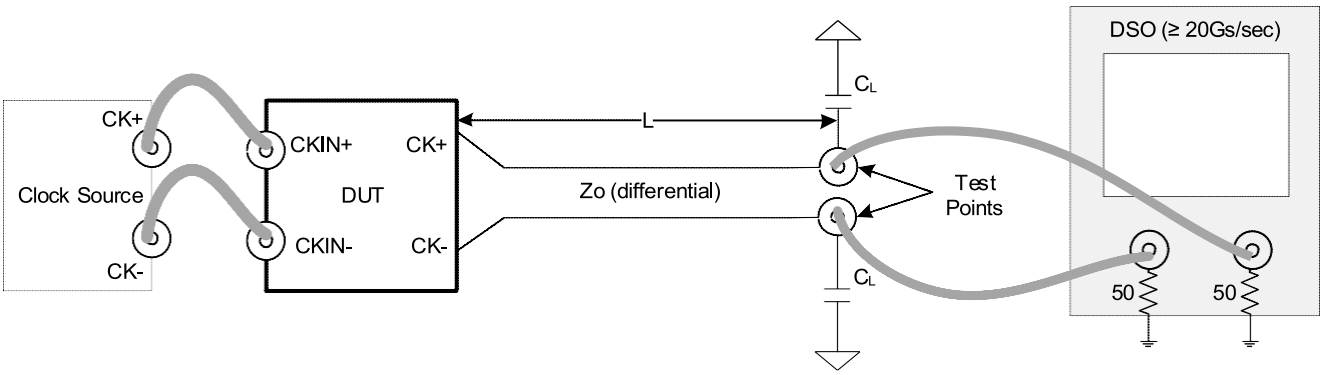


Figure 10. AC/DC Test Load for Differential Outputs (Double-Terminated)

Table 30. Parameters for AC/DC Test Load (Double-Terminated)

Device	Clock Source	Rs (ohms)	Zo (ohms)	L (cm)	C_L (pF)
RS2CB19xxx	SMA100B	Internal	85	25.4	2
RS2CB19xxx-100	SMA100B	Internal	100	25.4	2

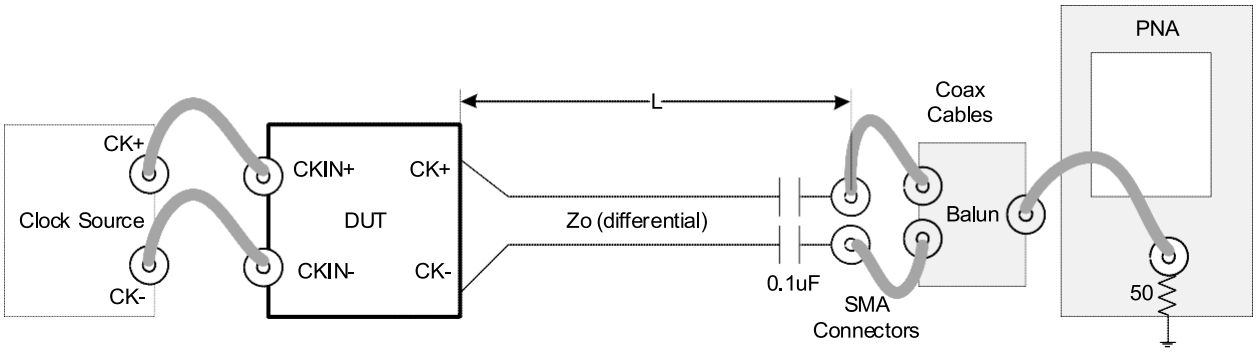


Figure 11. Test Load for PCIe Phase Jitter Measurements

Table 31. Parameters for PCIe Gen5 Jitter Measurement

Device	Clock Source	Rs (ohms)	Zo (ohms)	L (cm) [1]	C_L (pF)
RS2CB19xxx	SMA100B	Internal	85	25.4	2
RS2CB19xxx-**100**	SMA100B	Internal	100	25.4	2

1. PCIe Gen6 specifies L = 0cm for 32 and 64 GT/s. L = 25.4cm is more conservative.

4. SMBus Interface

4.1 Write Sequence

- Controller (host) sends a start bit
- Controller (host) sends the write address
- RS2CB190xx clock will **acknowledge**
- Controller (host) sends the beginning byte Location= N
- RS2CB190xx clock will **acknowledge**
- Controller (host) sends the byte count = X
- RS2CB190xx clock will **acknowledge**
- Controller (host) starts sending Byte **N through Byte N+X-1**
- RS2CB190xx clock will **acknowledge** each byte one at a time
- Controller (host) sends a stop bit

Index Block Write Operation			
Controller (Host)			**RS2CB190xx (Slave/Receiver)**
T	start bit		
Slave Address			
WR	Write		
			ACK
Beginning Byte = N			
			ACK
Data Byte Count = X			
			ACK
Beginning Byte N		X Byte	
			ACK
O			
O			O
O			O
			O
Byte N + X - 1			
			ACK
P	stop bit		

4.2 Read Sequence

- Controller (host) will send a start bit
- Controller (host) sends the write address
- RS2CB190xx clock will **acknowledge**
- Controller (host) sends the beginning byte Location= N
- RS2CB190xx clock will **acknowledge**
- Controller (host) will send a separate start bit
- Controller (host) sends the read address
- RS2CB190xx clock will **acknowledge**
- RS2CB190xx clock will send the data byte count = X
- RS2CB190xx clock sends Byte **N+X-1**
- RS2CB190xx clock sends **Byte L through Byte X (if X(H) was written to Byte 7)**
- Controller (host) will need to acknowledge each byte
- Controller (host) will send a not acknowledge bit
- Controller (host) will send a stop bit

Index Block Read Operation			
Controller (Host)			**RS2CB190xx (Slave/Receiver)**
T	start bit		
Slave Address			
WR	Write		
			ACK
Beginning Byte = N			
			ACK
RT	Repeat start		
Slave Address			
RD	Read		
			ACK
			Data Byte Count=X
ACK			
		X Byte	Beginning Byte N
ACK			
			O
O			O
O			O
O			
			Byte N + X - 1
N	Not		
P	stop bit		

4.3 SMBus Bit Types

Bit Description	Definition
RO	Read-only
RW	Read-write
RW1C	Read/Write '1' to clear
RESERVED	Undefined do not write

4.4 Write Lock Functionality

WRITE_LOCK	WRITE_LOCK RW1C	SMBus Write Protect
0	0	No
0	1	Yes
1	0	Yes
1	1	Yes

4.5 SMBus Address Decode

Address Selection		Binary Value								Hex Value
SADR_tri1	SADR_tri0	7	6	5	4	3	2	1	Rd/Wrt	
0	0	1	1	0	1	1	0	0	0	D8
	M	1	1	0	1	1	0	1	0	DA
	1	1	1	0	1	1	1	1	0	DE
M	0	1	1	0	0	0	0	1	0	C2
	M	1	1	0	0	0	1	0	0	C4
	1	1	1	0	0	0	1	1	0	C6
1	0	1	1	0	0	1	0	1	0	CA
	M	1	1	0	0	1	1	0	0	CC
	1	1	1	0	0	1	1	1	0	CE

4.6 RS2CB19020 SMBus Registers

Table 32. RS2CB19020 SMBus Registers

Byte	Register	Name	Bit	Type	Default	Description	Definition
0	OUTPUT_ENABLE_2	RESERVED	[7]	RW	0	RESERVED	0 = output is disabled (low/low) 1 = output is enabled
		CLK19_EN	[6]	RW	1	Output Enable for CLK19	
		CLK18_EN	[5]	RW	1	Output Enable for CLK18	
		CLK17_EN	[4]	RW	1	Output Enable for CLK17	
		CLK16_EN	[3]	RW	1	Output Enable for CLK16	
		RESERVED	[2:0]	RW	0	RESERVED	
1	OUTPUT_ENABLE_0	CLK7_EN	[7]	RW	1	Output Enable for CLK7	0 = output is disabled (low/low) 1 = output is enabled
		CLK6_EN	[6]	RW	1	Output Enable for CLK6	
		CLK5_EN	[5]	RW	1	Output Enable for CLK5	
		CLK4_EN	[4]	RW	1	Output Enable for CLK4	
		CLK3_EN	[3]	RW	1	Output Enable for CLK3	
		CLK2_EN	[2]	RW	1	Output Enable for CLK2	
		CLK1_EN	[1]	RW	1	Output Enable for CLK1	
		CLK0_EN	[0]	RW	1	Output Enable for CLK0	
2	OUTPUT_ENABLE_1	CLK15_EN	[7]	RW	1	Output Enable for CLK15	0 = output is disabled (low/low) 1 = output is enabled
		CLK14_EN	[6]	RW	1	Output Enable for CLK14	
		CLK13_EN	[5]	RW	1	Output Enable for CLK13	
		CLK12_EN	[4]	RW	1	Output Enable for CLK12	
		CLK11_EN	[3]	RW	1	Output Enable for CLK11	
		CLK10_EN	[2]	RW	1	Output Enable for CLK10	
		CLK9_EN	[1]	RW	1	Output Enable for CLK9	
		CLK8_EN	[0]	RW	1	Output Enable for CLK8	
3	OEb_PIN_READBACK	RB_OEb_12	[7]	RO	1'bX	Status of OEb12	0 = pin low 1 = pin high
		RB_OEb_11	[6]	RO	1'bX	Status of OEb11	
		RB_OEb_10 [1]	[5]	RO	1'bX	Status of OEb10	
		RB_OEb_9	[4]	RO	1'bX	Status of OEb9	
		RB_OEb_8	[3]	RO	1'bX	Status of OEb8	
		RB_OEb_7	[2]	RO	1'bX	Status of OEb7	
		RB_OEb_6 [1]	[1]	RO	1'bX	Status of OEb6	
		RB_OEb_5 [1]	[0]	RO	1'bX	Status of OEb5	
4	SBEN_RDBK_ ACP_CONFIG	RESERVED	[7:5]	RW	1'b111	RESERVED	-
		ACP_ENABLE	[4]	RW	1	Enable Automatic Clock Parking to low/low when LOS event is detected	0 = disable ACP 1 = enable ACP
		RESERVED	[3:1]	RW	1'b110	RESERVED	-
		RB_SBI_ENQ	[0]	RO	1'bX	Status of SBI_ENQ	0 = pin low 1 = pin

Table 32. RS2CB19020 SMBus Registers (Cont.)

Byte	Register	Name	Bit	Type	Default	Description	Definition
5	VENDOR_REVISION_ID	RID	[7:4]	RO	0x0	REVISION ID, A revision is 0000	-
		VID	[3:0]	RO	0x1	VENDOR ID	-
6	DEVICE_ID	DEVICE_ID	[7:0]	RO	0xC8	Device ID	-
7	BYTE_COUNT	RESERVED	[7:5]	RW	0x0	RESERVED	-
		BC	[4:0]	RW	0x7	Writing to this register configures how many bytes will be read back in a block read	-
8	OEb_Configuration_A	CFGA_OEb12	[7]	RW	1	Controls CLK12	0 = OEb does not control output 1 = OEb controls output
		CFGA_OEb11	[6]	RW	1	Controls CLK11	
		CFGA_OEb10	[5]	RW	1	Controls CLK10 when SBI_ENQ = 0	
		CFGA_OEb9	[4]	RW	1	Controls CLK9	
		CFGA_OEb8	[3]	RW	1	Controls CLK8	
		CFGA_OEb7	[2]	RW	1	Controls CLK7	
		CFGA_OEb6	[1]	RW	1	Controls CLK6 when SBI_ENQ = 0	
		CFGA_OEb5	[0]	RW	1	Controls CLK5 when SBI_ENQ = 0	
9	OEb_Configuration_B	CFGB_OEb12	[7]	RW	0	Controls CLK13	0 = OEb does not control output 1 = OEb controls output
		CFGB_OEb11	[6]	RW	0	Controls CLK14	
		CFGB_OEb10	[5]	RW	0	Controls CLK15 when SBI_ENQ = 0	
		CFGB_OEb9	[4]	RW	0	Controls CLK0	
		CFGB_OEb8	[3]	RW	0	Controls CLK1	
		CFGB_OEb7	[2]	RW	0	Controls CLK2	
		CFGB_OEb6	[1]	RW	0	Controls CLK3 when SBI_ENQ = 0	
		CFGB_OEb5	[0]	RW	0	Controls CLK4 when SBI_ENQ = 0	
10	OEb_Configuration_C _ AMP_Control_	CFGC_OEb12	[7]	RW	0	Controls CLK16	0 = OEb does not control output 1 = OEb controls output
		CFGC_OEb11	[6]	RW	0	Controls CLK17	
		CFGC_OEb10	[5	RW	0	Controls CLK18 when SBI_EN = 0	
		CFGC_OEb9	[4]	RW	0	Controls CLK19	
		AMPLITUDE_CTRL	[3:0]	RW	0x7	Global Differential output Control 0.625V~1V 25mV/step Default = 0.8V	-

Table 32. RS2CB19020 SMBus Registers (Cont.)

Byte	Register	Name	Bit	Type	Default	Description	Definition
11	OUTPUT_SLEW _ RATE_0	CLK7_SLEWRATE	[7]	RW	1	CLK7 Slewrate Control	0 = low slew rate 1 = high slew rate
		CLK6_SLEWRATE	[6]	RW	1	CLK6 Slewrate Control	
		CLK5_SLEWRATE	[5]	RW	1	CLK5 Slewrate Control	
		CLK4_SLEWRATE	[4]	RW	1	CLK4 Slewrate Control	
		CLK3_SLEWRATE	[3]	RW	1	CLK3 Slewrate Control	
		CLK2_SLEWRATE	[2]	RW	1	CLK2 Slewrate Control	
		CLK1_SLEWRATE	[1]	RW	1	CLK1 Slewrate Control	
		CLK0_SLEWRATE	[0]	RW	1	CLK0 Slewrate Control	
12	OUTPUT_SLEW _ RATE_1	CLK15_SLEWRATE	[7]	RW	1	CLK15 Slewrate Control	0 = low slew rate 1 = high slew rate
		CLK14_SLEWRATE	[6]	RW	1	CLK14 Slewrate Control	
		CLK13_SLEWRATE	[5]	RW	1	CLK13 Slewrate Control	
		CLK12_SLEWRATE	[4]	RW	1	CLK12 Slewrate Control	
		CLK11_SLEWRATE	[3]	RW	1	CLK11 Slewrate Control	
		CLK10_SLEWRATE	[2]	RW	1	CLK10 Slewrate Control	
		CLK9_SLEWRATE	[1]	RW	1	CLK9 Slewrate Control	
		CLK8_SLEWRATE	[0]	RW	1	CLK8 Slewrate Control	
13	OUTPUT_SLEW _ RATE_2	RESERVED	[7:4]	RW	0b1111	RESERVED	0 = low slew rate 1 = high slew rate
		CLK19_SLEWRATE	[3]	RW	1	CLK19 Slewrate Control	
		CLK18_SLEWRATE	[2]	RW	1	CLK18 Slewrate Control	
		CLK17_SLEWRATE	[1]	RW	1	CLK17 Slewrate Control	
		CLK16_SLEWRATE	[0]	RW	1	CLK16 Slewrate Control	
14 - 20	RESERVED	-	-	-	-	RESERVED	-

Table 32. RS2CB19020 SMBus Registers (Cont.)

Byte	Register	Name	Bit	Type	Default	Description	Definition
21	PD_RESTORE_LOSb	AC_IN	[7]	RW	0	Enable receiver bias when CLKIN is AC coupled,	0 = DC coupled input 1 = AC coupled input
		Rx_TERM	[6]	RW	0	Enable termination resistors on CLKIN	0 = input termination R is disabled 1 = input termination R is enabled
		RESERVED	[5]	RW	1'b1	RESERVED	-
		CLK Acquired	[4]	RO	1'bX	A clock was acquired	1 = clock acquired
		PD_RESTOREb	[3]	RW	1	Save Configuration in Power Down	0 = Config Cleared 1 = Config Saved
		SDATA_TIMEOUT_EN	[2]	RW	1	Enable SMB SDATA time out monitoring	0 = disable SDATA time out 1 = enable SDATA time out
		RESERVED	[1]	RO	1'bX	-	-
		LOSb_RB	[0]	RO	1'bX	Real time read back of loss detect block output	0 = LOS event detected 1 = NO LOS event detected.
22	SBI_MASK_0 [2]	MASK7	[7]	RW	0	Masks off Side-band Disable for CLK7	0 = SBI may disable the output 1 = SBI cannot disable the output
		MASK6	[6]	RW	0	Masks off Side-band Disable for CLK6	
		MASK5	[5]	RW	0	Masks off Side-band Disable for CLK5	
		MASK4	[4]	RW	0	Masks off Side-band Disable for CLK4	
		MASK3	[3]	RW	0	Masks off Side-band Disable for CLK3	
		MASK2	[2]	RW	0	Masks off Side-band Disable for CLK2	
		MASK1	[1]	RW	0	Masks off Side-band Disable for CLK1	
		MASK0	[0]	RW	0	Masks off Side-band Disable for CLK0	

Table 32. RS2CB19020 SMBus Registers (Cont.)

Byte	Register	Name	Bit	Type	Default	Description	Definition
23	SBI_MASK_1 [2]	MASK15	[7]	RW	0	Masks off Side-band Disable for CLK15	0 = SBI may disable the output 1 = SBI cannot disable the output
		MASK14	[6]	RW	0	Masks off Side-band Disable for CLK14	
		MASK13	[5]	RW	0	Masks off Side-band Disable for CLK13	
		MASK12	[4]	RW	0	Masks off Side-band Disable for CLK12	
		MASK11	[3]	RW	0	Masks off Side-band Disable for CLK11	
		MASK10	[2]	RW	0	Masks off Side-band Disable for CLK10	
		MASK9	[1]	RW	0	Masks off Side-band Disable for CLK9	
		MASK8	[0]	RW	0	Masks off Side-band Disable for CLK8	
24	SBI_MASK_2 [2]	RESERVED	[7]	RW	0	RESERVED	0 = SBI may disable the output 1 = SBI cannot disable the output
		RESERVED	[6]	RW	0	RESERVED	
		RESERVED	[5]	RW	0	RESERVED	
		RESERVED	[4]	RW	0	RESERVED	
		MASK19	[3]	RW	0	Masks off Side-band Disable for CLK19	
		MASK18	[2]	RW	0	Masks off Side-band Disable for CLK18	
		MASK17	[1]	RW	0	Masks off Side-band Disable for CLK17	
		MASK16	[0]	RW	0	Masks off Side-band Disable for CLK16	
25–32	RESERVED	RESERVED	[7:0]	RW	0xXX	RESERVED	-

Table 32. RS2CB19020 SMBus Registers (Cont.)

Byte	Register	Name	Bit	Type	Default	Description	Definition
33	SBI_READBACK_0 [2]	SBI_CLK7	[7]	RO	1'bX	Readback of Side-band Disable for CLK7	0 = bit low 1 = bit high
		SBI_CLK6	[6]	RO	1'bX	Readback of Side-band Disable for CLK6	
		SBI_CLK5	[5]	RO	1'bX	Readback of Side-band Disable for CLK5	
		SBI_CLK4	[4]	RO	1'bX	Readback of Side-band Disable for CLK4	
		SBI_CLK3	[3]	RO	1'bX	Readback of Side-band Disable for CLK3	
		SBI_CLK2	[2]	RO	1'bX	Readback of Side-band Disable for CLK2	
		SBI_CLK1	[1]	RO	1'bX	Readback of Side-band Disable for CLK1	
		SBI_CLK0	[0]	RO	1'bX	Readback of Side-band Disable for CLK0	
34	SBI_READBACK_1 [2]	SBI_CLK15	[7]	RO	1'bX	Readback of Side-band Disable for CLK15	0 = bit low 1 = bit high
		SBI_CLK14	[6]	RO	1'bX	Readback of Side-band Disable for CLK14	
		SBI_CLK13	[5]	RO	1'bX	Readback of Side-band Disable for CLK13	
		SBI_CLK12	[4]	RO	1'bX	Readback of Side-band Disable for CLK12	
		SBI_CLK11	[3]	RO	1'bX	Readback of Side-band Disable for CLK11	
		SBI_CLK10	[2]	RO	1'bX	Readback of Side-band Disable for CLK10	
		SBI_CLK9	[1]	RO	1'bX	Readback of Side-band Disable for CLK9	
		SBI_CLK8	[0]	RO	1'bX	Readback of Side-band Disable for CLK8	
35	SBI_READBACK_2 [2]	RESERVED	[7:4]	RO	1'bXXX	RESERVED	0 = bit low 1 = bit high
		SBI_CLK19	[3]	RO	1'bX	Readback of Side-band Disable for CLK19	
		SBI_CLK18	[2]	RO	1'bX	Readback of Side-band Disable for CLK18	
		SBI_CLK17	[1]	RO	1'bX	Readback of Side-band Disable for CLK17	
		SBI_CLK16	[0]	RO	1'bX	Readback of Side-band Disable for CLK16	
36-37	RESERVED	RESERVED	[7:0]	RW	0xXX	RESERVED	RESERVED

Table 32. RS2CB19020 SMBus Registers (Cont.)

Byte	Register	Name	Bit	Type	Default	Description	Definition
38	WRITE_LOCK_NCLEAR	RESERVED	[7:1]	RW	0x0	RESERVED	-
		WRITE_LOCK	[0]	RW	0	Non-clearable SMBus Write Lock bit. Once written to '1', the SMBus control registers cannot be written to. This bit can only be cleared by cycling power.	0 = SMBus not locked for writing by this bit. See WRITE_LOCK_ R W1C bit. 1 = SMBus locked for writing
39	WRITE_LOCK_CLEAR _ LOS_EVENT	RESERVED	[7:2]	RW1C	1'b111000	-	-
		LOS_EVT	[1]	RW1C	0	LOS Event Status When high, indicates that a LOS event was detected. Can be cleared by writing a 1 to it.	0 = No LOS event detected 1 = LOS event detected.
		WRITE_LOCK_RW1C	[0]	RW1C	0	Clearable SMBus Write Lock bit. When written to one, other SMBus control registers cannot be written to. This bit can be cleared by writing a 1 to it.	0 = SMBus not locked for writing by this bit. See WRITE_LOCK bit. 1 = SMBus locked for writing

1. Register is only valid when the Side-Band Interface is not enabled (SBI_ENQ = 0).
2. Register only valid when the Side-Band Interface is enabled (SBI_ENQ = 1).

4.7 RS2CB19016/13/08/04 SMBus Registers

Table 33. RS2CB19016/13/08/04 SMBus Registers

Byte	Register	Name	Bit	Type	Default	Description	Definition
0	OUTPUT_ENABLE_0	[7]	CLK7_EN	RW	1	Output Enable Bit for CLK7	0 = output is disabled (low/low) 1 = output is enabled
		[6]	CLK6_EN	RW	1	Output Enable Bit for CLK6	
		[5]	CLK5_EN	RW	1	Output Enable Bit for CLK5	
		[4]	CLK4_EN	RW	1	Output Enable Bit for CLK4	
		[3]	CLK3_EN	RW	1	Output Enable Bit for CLK3	
		[2]	CLK2_EN	RW	1	Output Enable Bit for CLK2	
		[1]	CLK1_EN	RW	1	Output Enable Bit for CLK1	
		[0]	CLK0_EN	RW	1	Output Enable Bit for CLK0	

Table 33. RS2CB19016/13/08/04 SMBus Registers(Cont.)

Byte	Register	Name	Bit	Type	Default	Description	Definition
1	OUTPUT_ENABLE_1	[7]	CLK15_EN	RW	1	Output Enable Bit for CLK15	0 = output is disabled (low/low) 1 = output is enabled
		[6]	CLK14_EN	RW	1	Output Enable Bit for CLK14	
		[5]	CLK13_EN	RW	1	Output Enable Bit for CLK13	
		[4]	CLK12_EN	RW	1	Output Enable Bit for CLK12	
		[3]	CLK11_EN	RW	1	Output Enable Bit for CLK11	
		[2]	CLK10_EN	RW	1	Output Enable Bit for CLK10	
		[1]	CLK9_EN	RW	1	Output Enable Bit for CLK9	
		[0]	CLK8_EN	RW	1	Output Enable Bit for CLK8	
2	OEb_PIN_READBACK_0	[7]	OE7b_Readback	RO	pin	Status of OE7b pin	0 = OEb pin low 1 = OEb Pin high
		[6]	OE6b_Readback	RO	pin	Status of OE6b pin	
		[5]	OE5b_Readback	RO	pin	Status of OE5b pin	
		[4]	OE4b_Readback	RO	pin	Status of OE4b pin	
		[3]	OE3b_Readback	RO	pin	Status of OE3b pin	
		[2]	OE2b_Readback	RO	pin	Status of OE2b pin	
		[1]	OE1b_Readback	RO	pin	Status of OE1b pin	
		[0]	OE0b_Readback	RO	pin	Status of OE0b pin	
3	OEb_PIN_READBACK_1	[7]	OE15b_Readback	RO	pin	Status of OE15b pin	0 = OEb pin low 1 = OEb Pin high
		[6]	OE14b_Readback	RO	pin	Status of OE14b pin	
		[5]	OE13b_Readback	RO	pin	Status of OE13b pin	
		[4]	OE12b_Readback	RO	pin	Status of OE12b pin	
		[3]	OE11b_Readback	RO	pin	Status of OE11b pin	
		[2]	OE10b_Readback	RO	pin	Status of OE10b pin	
		[1]	OE9b_Readback	RO	pin	Status of OE9b pin	
		[0]	OE8b_Readback	RO	pin	Status of OE8b pin	
4	SBEN_RDBK_ LOS_CONFIG	[7:5]	RESERVED	-	-	-	-
		[4]	LOSb_ACP_ENABLE	RW	1	Enable input loss detect to park outputs low/low	0 = disable, 1 = enable
		[3:2]	RESERVED	-	-	-	-
		[1]	RESERVED	-	-	-	-
		[0]	RB_SBI_EN	RO	pin	Status of SBI_EN	0 = pin low 1 = pin high
5	VENDOR_REVISION_ ID	[7:4]	RID	RO	0x0	REVISION ID, A rev is 0000	-
		[3:0]	VID	RO	0x1	VENDOR ID	-

Table 33. RS2CB19016/13/08/04 SMBus Registers(Cont.)

Byte	Register	Name	Bit	Type	Default	Description	Definition
6	DEVICE_ID	[7:0]	DEVICE_ID	RO		Device ID: RS2CB19016 = 0h10 RS2CB19013 = 0h0D RS2CB19008 = 0h08 RS2CB19004 = 0h04 RS2CB19016-100 = 0h90 RS2CB19013-100 = 0h8D RS2CB19008-100 = 0h88 RS2CB19004-100 = 0h84	-
7	BYTE_COUNT	[7:5]	RESERVED	-	-	-	-
		[4:0]	BC	RW	0x7	Writing to this register configures how many bytes will be read back in a block read.	-
8	SBI_MASK_0 (Register only functional and/or valid when SBEN = 1)	[7]	MASK7	RW	0	Masks off Side-band Disable for CLK7	0 = SBI may disable the output 1 = SBI cannot disable the output
		[6]	MASK6	RW	0	Masks off Side-band Disable for CLK6	
		[5]	MASK5	RW	0	Masks off Side-band Disable for CLK5	
		[4]	MASK4	RW	0	Masks off Side-band Disable for CLK4	
		[3]	MASK3	RW	0	Masks off Side-band Disable for CLK3	
		[2]	MASK2	RW	0	Masks off Side-band Disable for CLK2	
		[1]	MASK1	RW	0	Masks off Side-band Disable for CLK1	
		[0]	MASK0	RW	0	Masks off Side-band Disable for CLK0	
9	SBI_MASK_1 (Register only functional and/or valid when SBEN = 1)	[7]	MASK15	RW	0	Masks off Side-band Disable for CLK15	0 = SBI may disable the output 1 = SBI cannot disable the output
		[6]	MASK14	RW	0	Masks off Side-band Disable for CLK14	
		[5]	MASK13	RW	0	Masks off Side-band Disable for CLK13	
		[4]	MASK12	RW	0	Masks off Side-band Disable for CLK12	
		[3]	MASK11	RW	0	Masks off Side-band Disable for CLK11	
		[2]	MASK10	RW	0	Masks off Side-band Disable for CLK10	
		[1]	MASK9	RW	0	Masks off Side-band Disable for CLK9	
		[0]	MASK8	RW	0	Masks off Side-band Disable for CLK8	
10	RESERVED	[7:0]	Reserved	-	-	-	-

Table 33. RS2CB19016/13/08/04 SMBus Registers(Cont.)

Byte	Register	Name	Bit	Type	Default	Description	Definition
11	SBI_READBACK_0 (Register only functional and/or valid when SBEN = 1)	[7]	SBI_CLK7	RO	X	Readback of Side-band Disable for CLK7	0 = bit low 1 = bit high
		[6]	SBI_CLK6	RO	X	Readback of Side-band Disable for CLK6	
		[5]	SBI_CLK5	RO	X	Readback of Side-band Disable for CLK5	
		[4]	SBI_CLK4	RO	X	Readback of Side-band Disable for CLK4	
		[3]	SBI_CLK3	RO	X	Readback of Side-band Disable for CLK3	
		[2]	SBI_CLK2	RO	X	Readback of Side-band Disable for CLK2	
		[1]	SBI_CLK1	RO	X	Readback of Side-band Disable for CLK1	
		[0]	SBI_CLK0	RO	X	Readback of Side-band Disable for CLK0	
12	SBI_READBACK_1 (Register only functional and/or valid when SBEN = 1)	[7]	SBI_CLK15	RO	X	Readback of Side-band Disable for CLK15	0 = bit low 1 = bit high
		[6]	SBI_CLK14	RO	X	Readback of Side-band Disable for CLK14	
		[5]	SBI_CLK13	RO	X	Readback of Side-band Disable for CLK13	
		[4]	SBI_CLK12	RO	X	Readback of Side-band Disable for CLK12	
		[3]	SBI_CLK11	RO	X	Readback of Side-band Disable for CLK11	
		[2]	SBI_CLK10	RO	X	Readback of Side-band Disable for CLK10	
		[1]	SBI_CLK9	RO	X	Readback of Side-band Disable for CLK9	
		[0]	SBI_CLK8	RO	X	Readback of Side-band Disable for CLK8	
13–16	RESERVED	[7:0]	Reserved	-	-	-	-
17	LPHCSL_AMP_CTRL	[7:4]	Global Amplitude Control	RW	0x7	0.625V~1V in 25mV steps.	Default = 0.8V
		[3:0]	Reserved	-	-	-	-

Table 33. RS2CB19016/13/08/04 SMBus Registers(Cont.)

Byte	Register	Name	Bit	Type	Default	Description	Definition
18	PD_RESTORE_LOSb _ ENABLE	[7]	AC_IN	RW	0	Enable receiver self bias when input clock is AC coupled,	0 = DC coupled input 1 = AC coupled input
		[6]	Rx_TERM	RW	0	Enable termination resistor on CLKIN/CLKINb	0 = input termination is disabled 1 =input termination is enabled
		[5:4]	Reserved	-	-	-	-
		[3]	PD_RESTOREb	RW	1	Save Configuration in Power Down	0 = Config Cleared 1 = Config Saved
		[2:1]	Reserved	-	-	-	-
		[0]	LOSb_Readback	RO	X	real time read back of loss detect block output	0 = LOS event detected 1 = NO LOS event detected.
19	RESERVED	[7:0]	Reserved	-	-	-	-
20	OUTPUT_SLEW_ RATE_0	[7]	CLK7_SLEWRATE	RW	1	CLK7 Slew Rate Control	0 = low slew rate 1 = high slew rate
		[6]	CLK6_SLEWRATE	RW	1	CLK6 Slew Rate Control	
		[5]	CLK5_SLEWRATE	RW	1	CLK5 Slew Rate Control	
		[4]	CLK4_SLEWRATE	RW	1	CLK4 Slew Rate Control	
		[3]	CLK3_SLEWRATE	RW	1	CLK3 Slew Rate Control	
		[2]	CLK2_SLEWRATE	RW	1	CLK2 Slew Rate Control	
		[1]	CLK1_SLEWRATE	RW	1	CLK1 Slew Rate Control	
		[0]	CLK0_SLEWRATE	RW	1	CLK0 Slew Rate Control	
21	OUTPUT_SLEW_ RATE_1	[7]	CLK15_SLEWRATE	RW	1	CLK15 Slewrate Control	0 = low slew rate 1 = high slew rate
		[6]	CLK14_SLEWRATE	RW	1	CLK14 Slewrate Control	
		[5]	CLK13_SLEWRATE	RW	1	CLK13 Slewrate Control	
		[4]	CLK12_SLEWRATE	RW	1	CLK12 Slewrate Control	
		[3]	CLK11_SLEWRATE	RW	1	CLK11 Slewrate Control	
		[2]	CLK10_SLEWRATE	RW	1	CLK10 Slewrate Control	
		[1]	CLK9_SLEWRATE	RW	1	CLK9 Slewrate Control	
		[0]	CLK8_SLEWRATE	RW	1	CLK8 Slewrate Control	
23–37	Reserved	[7:0]	Reserved	-	-	-	-
		[7:1]	Reserved	RW	0	reserved	-

Byte	Register	Name	Bit	Type	Default	Description	Definition
38	WRITE_LOCK _ NOCLEAR	[0]	WRITE_LOCK	RW	0	Non-clearable SMBus Write Lock bit. When written to one, the SMBus control registers cannot be written to. This bit can only be cleared by cycling power.	0 = SMBus not locked for writing by this bit. See WRITE_LOCK _RW1C bit. 1 = SMBus locked for writing
39	WRITE_LOCK_ CLEAR_LOS_EVEN T	[7:2]	Reserved	-	-	-	-
		[1]	LOS_EVT	R/ W 1C	0	LOS Event Status When high, indicates that a LOS event was detected. Can be cleared by writing a 1 to it.	0 = No LOS event detected 1 = LOS event detected.
		[0]	WRITE_LOCK_RW1C	R/ W 1C	0	Clearable SMBus Write Lock bit. When written to one, the SMBus control registers cannot be written to. This bit can be cleared by writing a 1 to it.	0 = SMBus not locked for writing by this bit. See WRITE_LOCK bit. 1 = SMBus locked for writing

5. Applications Information

5.1 Inputs, Outputs, and Output Control

5.1.1 Recommendations for Unused Inputs and Outputs

5.1.1.1 Unused Differential CLKIN Inputs

The CLKIN/CLKINb inputs of the RS2CB19016/13/08/04 devices have internal bias networks that protect the devices from a floating input clock condition. For RS2CB19020 multiplexers that use only one input clock, the unused input can be left open. It is recommended that no trace be attached to unused CLKIN pins.

5.1.1.2 Unused Single-ended Control Inputs

The single-ended control pins have internal pull-up and/or internal pull-down resistors and do not require external resistors. They can be left floating if the default pin state is the desired state. If external resistors are needed to change the pin state or are desired for design robustness, 10kohm is the recommended value.

5.1.1.3 Unused Differential CLK Outputs

All unused CLK outputs can be left floating. RSM recommends that no trace be attached to unused CLK outputs. While not required (but is highly recommended), the best design practice is to disable unused CLK outputs.

5.1.1.4 Unused SMBus Clock and Data Pins

If the SMBus interface is not used, the clock and data pins must be pulled high with an external resistor. The two pins can share a resistor if there is no possibility of using the SMBus interface for debug purposes. If the interface may be used for debug, separate resistors should be used. 10kohm is the recommended value.

5.1.2 Differential CLKIN Configurations

The RS2CB19xxx clock input supports four configurations:

- Direct connection to HCSL-level inputs
- Direct connection to LVDS-level inputs with *external* termination resistor
- Internal self-bias circuit for applications that *externally* AC-couple the input clock
  - This feature is enabled by the **AC_IN** bit.
- Internal pull-down resistors (Rp) to terminate the clock input at the receiver.
  - This feature is enabled by the **Rx_TERM** bit.

Devices with multiple input clocks have individual AC_IN and Rx_TERM configuration bits for each input. The internal input clock terminations prevent reflections and are useful for non-PCIe applications, where the frequency and transmission line length vary from the 100MHz PCIe standard.

Figure 12 through Figure 15 illustrate the above items.

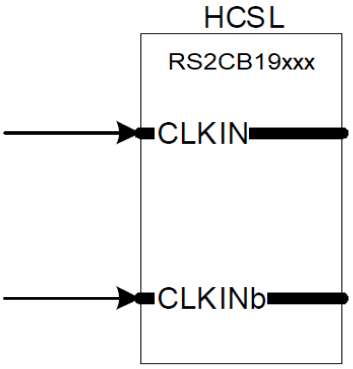


Figure 12. HCSL Input Levels (PCI-e Standard)

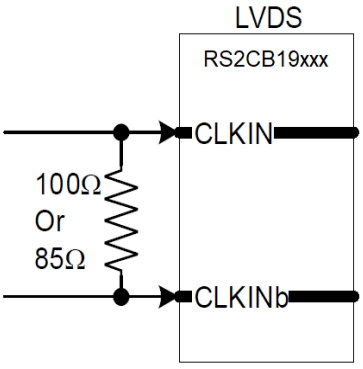


Figure 13. LVDS Input Levels

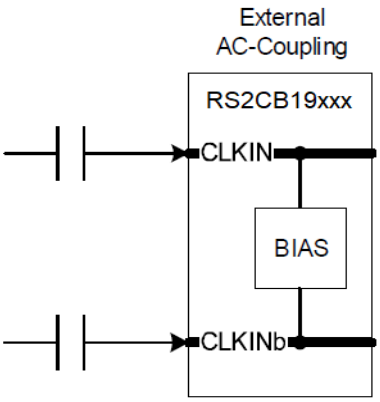


Figure 14. External AC-Coupling

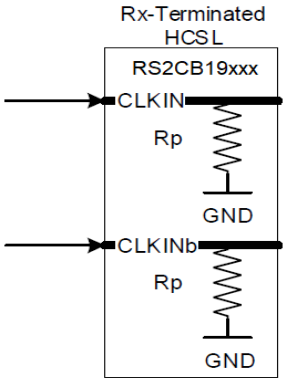


Figure 15. Receiver Termination

5.1.3 Differential CLK Output Configurations

5.1.3.1 Direct-Coupled HCSL Loads

The RS2CB19xxx LP-HCSL clock outputs have internal source terminations and directly drive industry-standard HCSL-level inputs with no external components. They support both 85ohm and 100ohm differential impedances. The clock outputs can also drive receiver-terminated HCSL loads. The combination of source termination and receiver termination results in a double-terminated load. When double-terminated, the clock output swing will be half of the source-terminated values.

5.1.3.2 AC-Coupled non-HCSL Loads

The RS2CB19xxx clock output can directly drive AC-coupling capacitors without any termination components. The clock input side of the AC-coupling capacitor may require an input-dependent bias network (BN). For examples of terminating the RS2CB19xxx clock outputs to other logic families such as LVDS, LVPECL, or CML.

Figure 16 to Figure 18 show the various clock output configurations.

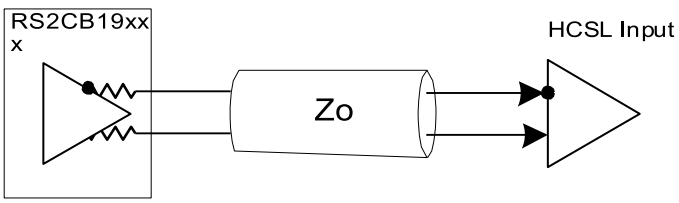


Figure 16. Direct-Coupled Source-Terminated HCSL

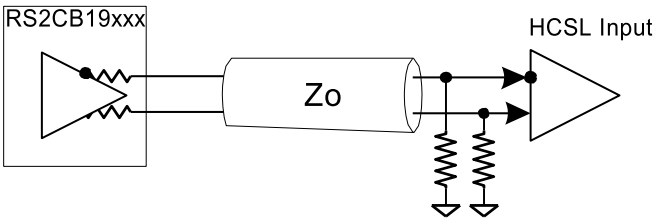


Figure 17. Direct-Coupled Double-Terminated HCSL

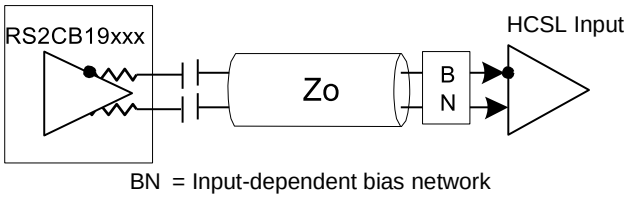


Figure 18. AC-Coupled

5.2 Power Down Tolerant Pins

Pins that are Power Down Tolerant (PDT) can be driven by voltages as high as the normal VDD of the chip, even though VDD is not present (the device is not powered). There will be no ill effects to the device and it will power up normally. This feature supports disaggregation, where the RS2CB19xxx may be on one circuit board and devices that interface with it are on other boards. These boards may power up at different times, driving pins on the RS2CB19xxx before it has received power.

5.3 Flexible Startup Sequence

RS2CB19xxx support Flexible Startup Sequencing (FSS). FSS allows application of CLKIN at different times in the system startup sequence. FSS is an additional feature that helps the system designer manage the impact of disaggregation. Table 34 shows the supported sequences; that is, the RS2CB19xxx can have CLKIN running before VDD is applied, and can have VDD applied and sit for extended periods with no input clock.

Table 34. Flexible Startup Sequences

VDD	PWRGD_PWRDN	CLKIN/CLKINb
Not present	X	Running
		Floating
		Low/Low
Present	0 or 1	Running
		Floating
		Low/Low

5.4 Loss of Signal and Automatic Clock Parking

The RS2CB190xx buffers and multiplexers have a Loss of Signal (LOS) circuit to detect the presence or absence of an input clock. The LOS circuit drives the open-drain LOSb pin (the “b” suffix indicates “bar”, or active-low) and sets the LOS_EVT bit in the SMBus register space. There are two slightly different LOSb pin behaviors at power up. Figure 19 shows the LOSb de-assertion timing for the 8, 13, 16 and 20-output buffers. CLKIN is represented differentially in Figure 19 and Figure 20.

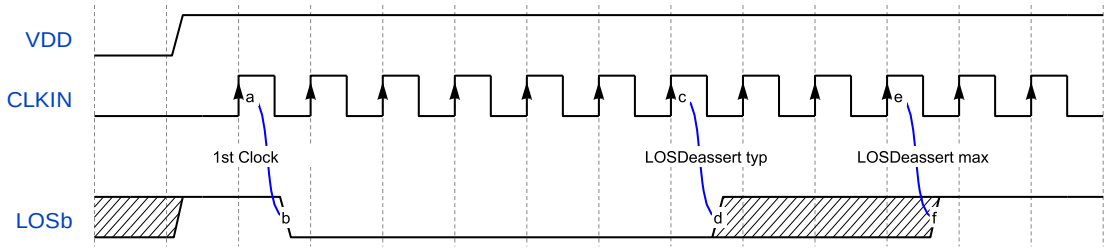


Figure 19. LOSb De-assert Timing, RS2CB19008, RS2CB19013, RS2CB19016

Note: The LOS circuit on the RS2CB19016/13/08/04 output buffers requires a CLKIN edge to release the LOSb pin after power up. So, the LOSb pin will be high until the first clock edge after power up.

Figure 20 shows the LOSb de-assertion timing for RS2CB19020.

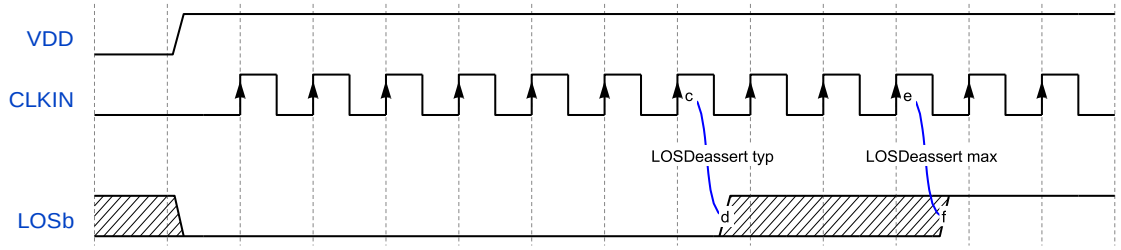


Figure 20. LOSb De-assert Timing RS2CB19020 Devices

Note: The LOSb pin monitors the *selected input clock* in the RS2CB19020 multiplexers.

The following diagram shows the LOSb assertion sequence when the CLKIN is lost. It also shows the Automatic Clock Parking (ACP) circuit bring the inputs to a Low/Low state after an LOS event. For exact timing, see Electrical Characteristics.

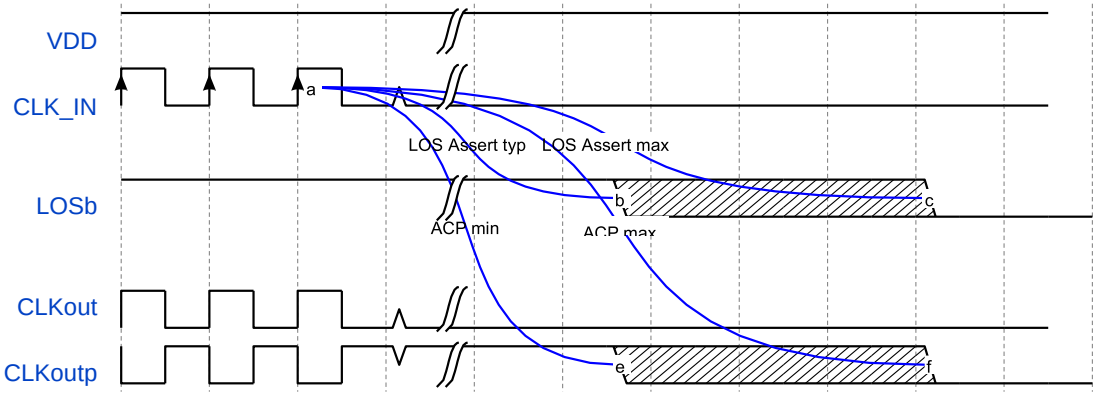


Figure 21. LOSb Assert Timing

5.5 Output Enable Control

The RS2CB19xxx buffer family provides three mechanisms to enable or disable clock outputs. All three mechanisms start and stop the output clocks in a synchronous, glitch-free manner. A clock output is enabled only when all three mechanisms indicate “enabled.” The following sections describe the three mechanisms.

5.5.1 SMBus Output Enable Bits

The RS2CB19xxx family has a traditional SMBus output enable bit for each output. The power-up default is 1, or enabled. Changing this bit to a 0 disables the output to a low/low state. The transitions between the enable and disable states are glitch-free in both directions.

Note: The glitch-free synchronization logic requires the CLKIN be running to enable or disable the outputs with this mechanism.

5.5.2 Output Enable (OEb) Pins

The OEb (Note: the “b” suffix indicates “bar”, or active-low) pins on the RS2CB19xxx family provide flexible CLKREQb functionality for PCIe slots and/or banked OE control for ‘motherboard-down’ devices (depending on the device). If the OEb pin is low the controlled output is enabled. If the OEb pin is high, the controlled output is disabled to a low/low state. All OEb pins enable and disable the controlled outputs in a glitch-free, synchronous manner.

Note: The glitch-free synchronization logic requires the CLKIN be running to enable or disable the outputs with this mechanism.

The RS2CB19020 each have 8 OEb pins. Some of the pins are muxed with SBI functions.

The RS2CB19020 OEb pins may be configured to control up to 2 outputs. Details are provided in Table 35.

Table 35. RS2CB19020 OEb Mapping[1]

Pin Name	SBI_ENQ Pin	Default Pin Function	Optional Pin Function
OEb12	X	CLK12 OEb	CLK13 OEb
OEb11	X	CLK11 OEb	CLK14 OEb
OEb10_SHFT_LDb	0 (Disabled)	CLK10 OEb	CLK15 OEb
	1 (Enabled)	SHFT_LDb	N/A
OEb9	X	CLK9 OEb	CLK0 OEb
OEb8	X	CLK8 OEb	CLK1 OEb
OEb7	X	CLK7 OEb	CLK2 OEb
OEb6_SBI_CLK	0 (Disabled)	CLK6 OEb	CLK3 OEb
	1 (Enabled)	SBI_CLK	N/A
OEb5_SBI_IN	0 (Disabled)	CLK5 OEb	CLK4 OEb
	1 (Enabled)	SBI_IN	N/A

1. See the OEb_ASSIGNMENT registers in Table 32.

The RS2CB19016/13/08/04 devices (16, 13, 8 and 4 outputs respectively) provide a dedicated OEb pin for each output, and therefore do not have OEb_ASSIGNMENT registers. Note that four OEb pins are used for the SBI interface when SBI_ENQ = 1 (for more information, see Table 35).

Table 36. RS2CB19016, RS2CB19013, RS2CB19008,RS2CB19004 Buffer OEb Mapping

Pin Name	SBI_ENQ Pin	RS2CB19016 Pin Function	RS2CB19013 Pin Function	RS2CB19008 Pin Function	RS2CB19004 Pin Function
OEb0	X	CLK0 OEb	CLK0 OEb	-	-
OEb1	X	CLK1 OEb	CLK1 OEb	CLK1 OEb	-
OEb2_SBI_OUT	0 (Disabled)	CLK2 OEb	CLK2 OEb	CLK2 OEb	CLK2 OEb
	1 (Enabled)	SBI_OUT	SBI_OUT	SBI_OUT	SBI_OUT
OEb3	X	CLK3 OEb	CLK3 OEb	CLK3 OEb	-
OEb4	X	CLK4 OEb	-	-	-
OEb5_SBI_CLK	0 (Disabled)	CLK5 OEb	-	CLK5 OEb	CLK5 OEb
	1 (Enabled)	SBI_CLK	-	SBI_CLK	SBI_CLK
OEb6	X	CLK6 OEb	-	CLK6 OEb	-
OEb6_SBI_CLK	0 (Disabled)	-	CLK6 OEb	-	-
	1 (Enabled)	-	SBI_CLK	-	-
OEb7	X	CLK7 OEb	CLK7 OEb	CLK7 OEb	-
OEb8	X	CLK8 OEb	CLK8 OEb	-	-
OEb9_SBI_IN	0 (Disabled)	CLK9 OEb	CLK9 OEb	-	CLK9 OEb
	1 (Enabled)	SBI_IN	SBI_IN	-	SBI_IN
OEb10	X	CLK10 OEb	CLK10 OEb	-	-
OEb10_SBI_IN	0 (Disabled)	-	-	CLK10 OEb	-
	1 (Enabled)	-	-	SBI_IN	-
OEb11	X	CLK11 OEb	CLK11 OEb	-	-
OEb12	X	CLK12 OEb	CLK12 OEb	-	-
OEb13_SHFT_LDb	0 (Disabled)	CLK13 OEb	CLK13 OEb	CLK13 OEb	CLK13 OEb
	1 (Enabled)	SHFT_LDb	SHFT_LDb	SHFT_LDb	SHFT_LDb
OEb14	X	CLK14 OEb	CLK14 OEb	-	-
OEb15	X	CLK15 OEb	-	-	-

5.5.3 Side-Band Interface (SBI)

SMBus output enable bits and OEb pins are the traditional methods for enabling and disabling clocks. The 2-wire SMBus interface can enable or disable all clock outputs in a device. This pin efficiency is its advantage. The SMBus interface's main drawback is that it is a relatively slow physical interface, whose software is one of several routines running on an often overtaxed micro-controller. OEb pins are real-time and are ideally dedicated to an individual clock output. As buffers grow in output count, dedicated OEb pins become problematic for two reasons. First, the clock buffer pin count becomes much larger than it otherwise would be, resulting in a larger package. Second, unless the OEb pins are used for CLKREQ# functionality, the number of pins that need to be controlled outgrows the GPIO pins of an FPGA or micro-controller.

A third output enable/disable mechanism, the Side-Band Interface (SBI), addresses these issues. The SBI is a simple 3-wire (4-wire if the SBI_OUT pin is used) interface that can control all outputs across multiple devices. The SBI is only slightly less pin efficient than the SMBus, and is much more pin efficient than a dedicated OEb pins per output. It is protocol-free, hardware-oriented and runs at speeds up to 25MHz, much faster than SMBus.

Another SBI advantage is that it is active after power is applied and before PWRGD is asserted. External logic can disable specific outputs before PWRGD is asserted, and can then dynamically adjust the output run state during device operation. The SBI can make the adjustments much more rapidly than SMBus.

The RS2CB19xxx 4-wire SBI interface consists of the SBI_IN, SBI_CLK, SHFT_LDb, and SBI_OUT pins. The RS2CB19xxx SBI is enabled by strapping the SBI_ENQ pin to 1. When enabled, various OEb pins become the SBI interface. The exact pins that are multiplexed vary with device (for more information, see Table 36).

The SBI_ENQ pin strap takes effect as soon as power is applied and is not dependent on the assertion of PWRGD_PWRDNb to 1. Because of this, the SBI_ENQ must be static and cannot change once power is applied. If SBI_ENQ is 0 when power is applied, the SBI is disabled and has no impact on enabling or disabling outputs.

The SBI consists of a shift register, an SMBus readback register (of the shift register contents), and an SMBus MASK register. The SBI shifts a bit stream containing the enable/disable pattern into the shift register. A 1 enables an output and a 0 disables an output. All shift-register bits default to 1 at power up, indicating an enabled state. This means that the SBI can be used to disable outputs at power up because the default is enabled.

The SBI has its own SBI_CLK and does not need a running CLKIN to shift in an enable/disable pattern. This provides utmost flexibility for setting output run state before the SMBus becomes active or before the CLKIN is applied. When the SBI indicates enabled, the standard SMBus output enable bits and OEb pins can control the outputs.

The SBI feeds common output enable/disable synchronization logic ensuring glitch-free enable and disable of outputs. Note: The glitch-free synchronization logic requires the CLKIN be running to enable or disable the outputs with this mechanism.

If the application does not use the SBI, the SBI_ENQ pin can be tied to 0, and the entire SBI has no impact on enabling or disabling clock outputs.

The SBI Mask registers allow the user to block the disable function of the SBI via the SMBus. The SBI Mask registers default to 0 at power-up, allowing the SBI shift register bits to disable their respective output. After asserting the PWRGD_PWRDNb pin high, the SMBus is active and the SBI mask registers can be configured via SMBus to mask off (block) the SBI disable function. In other words, setting and SBI Mask bit to 1 forces the SBI to always indicate "enable" for the respective output. This allows the user to prevent the SBI from accidentally turning off a critical output.

The RS2CB190xx clock buffers provide the ability to read back the SBI shift register contents via the SMBus. The SMBus readback values update on each falling edge of SHFT_LDb. Note: The SBI shift register can only be read using the SMBus; the SMBus *cannot* be used to load it.

5.5.4.1 Using the SBI

Using the RS2CB19020 as an example, we see the SBI shift order follows the order of the SMBus enable bits. in Byte [2:0] as shown in Figure 22. The first bit shifted in would be the output enable/disable bit for the CLK19, which is in Byte 0 bit 6. The last bit shifted in would be the output enable/disable for CLK0, which is in Byte 1, bit 0.

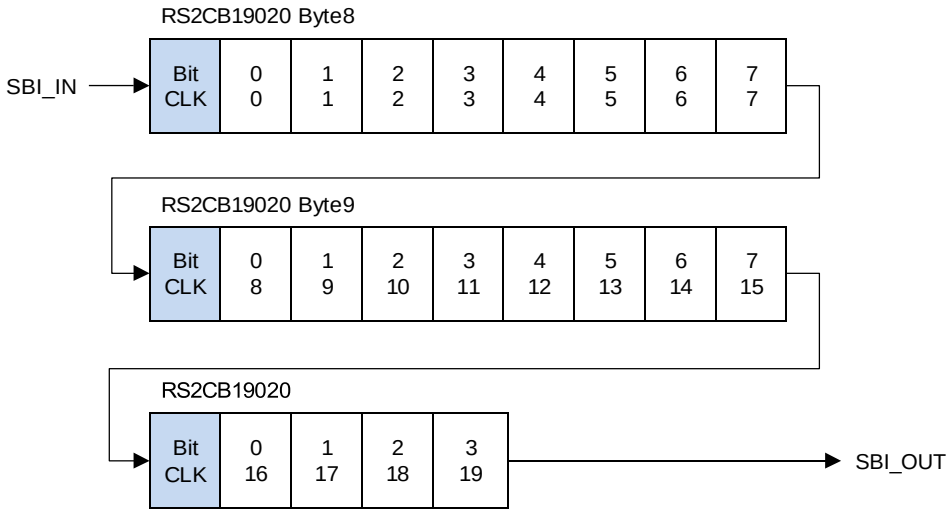


Figure 22. RS2CB19020 Side-Band Shift Order

Figure 23 through Figure 25 show the Side-Band Shift order for the RS2CB19016, RS2CB19013, RS2CB19008. Notice that the Side-Band Shift Count is equal to the number of outputs in each device.

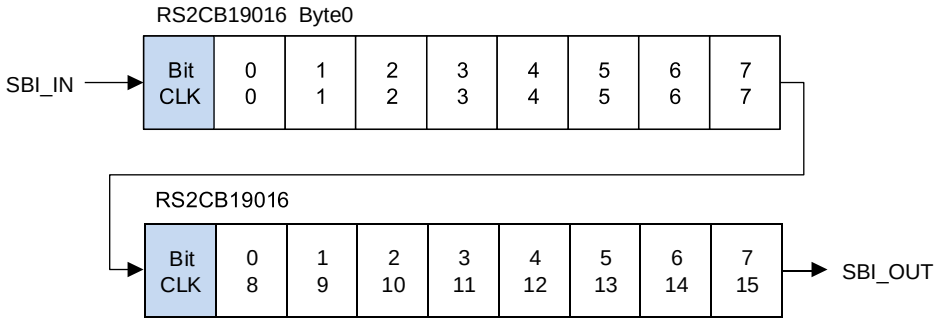


Figure 23. RS2CB19016 Side-Band Shift Order

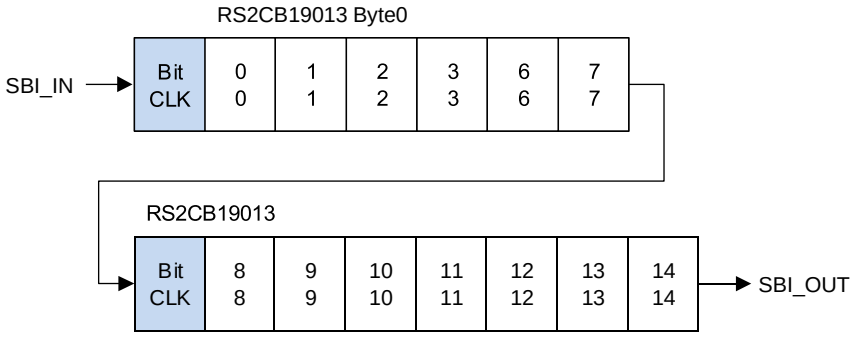


Figure 24. RS2CB19013 Side-Band Shift Order

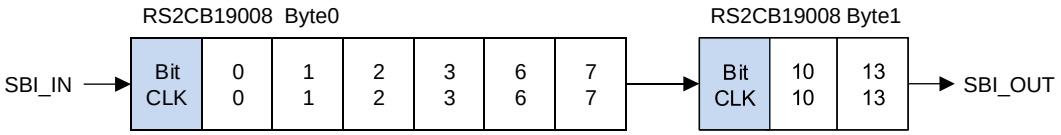


Figure 25. RS2CB19008 Side-Band Shift Order

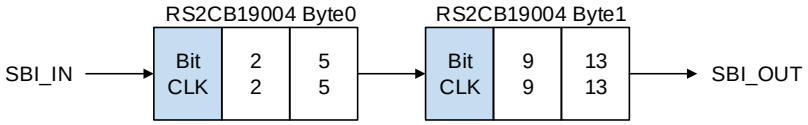


Figure 26. RS2CB19004 Side-Band Shift Order

5.5.4.2 Side-Band Interface Timing

Figure 26 shows the basic timing of the side-band interface. The SHFT_LDb pin goes high to enable the SBI_CLK input. Next, the rising edge of SBI_CLK clocks SBI_IN data into the shift register. After the 24th clock (assuming the RS2CB19020), stop the SBI_CLK low and drive the SHFT_LDB pin low. The falling edge of SHFT_LDb latches the shift register contents to the output control register, disabling or enabling the outputs. Always shift the complete set of bits into the shift register to control the outputs. For the Side-Band Interface AC/DC Electrical Characteristics, see Table 28.

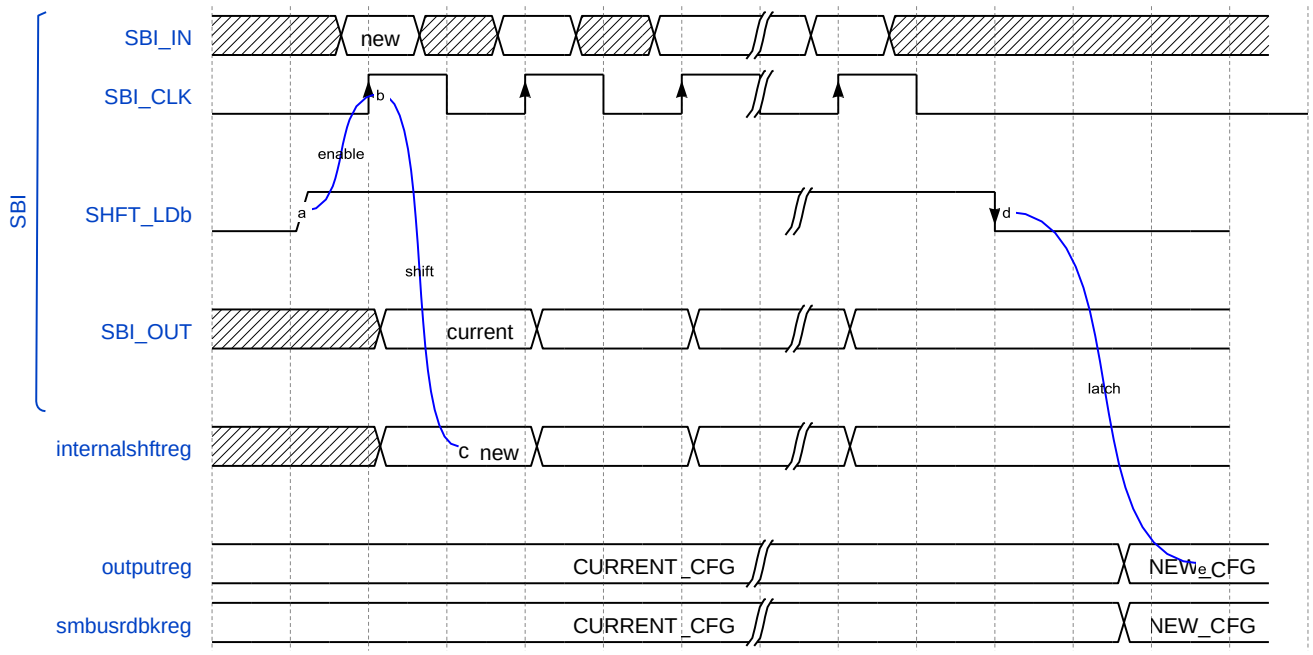


Figure 26. Side-Band Interface Functional Timing

5.5.4.3 Side-Band Interface Connection Topologies

The RS2CB19xxx support two SBI connection topologies: Star and Daisy-chain.

In a Star topology, multiple devices can share the SBI_CLK and SBI_IN pins. In this topology, each RS2CB190xx has a dedicated **SHFT_LDb** pin.

In a Daisy-chain topology, the SBI_OUT of one device connects to the SBI_IN of a downstream device. When using the daisy-chain topology, the user must shift a complete set of bits for the combined devices. Two daisy-chained RS2CB19020 require shifting 2 × 20 = 40 bits. An RS2CB19016 followed by an RS2CB19008 would require shifting 8 + 16 = 24 bits. When the SHFT_LDb pin is low, the SBI interface ignores any activity on the SBI_CLK and SBI_IN pins.

Figure 27 shows a star topology connection for the RS2CB19xxx SBI interface. The star topology allows independent configuration of each device. For the RS2CB19020, this means shifting 20 bits at a time. A disadvantage is that a separate SHFT_LDb pin is required for each device. The star topology allows additional devices to be controlled at the cost of an additional GPIO per device.

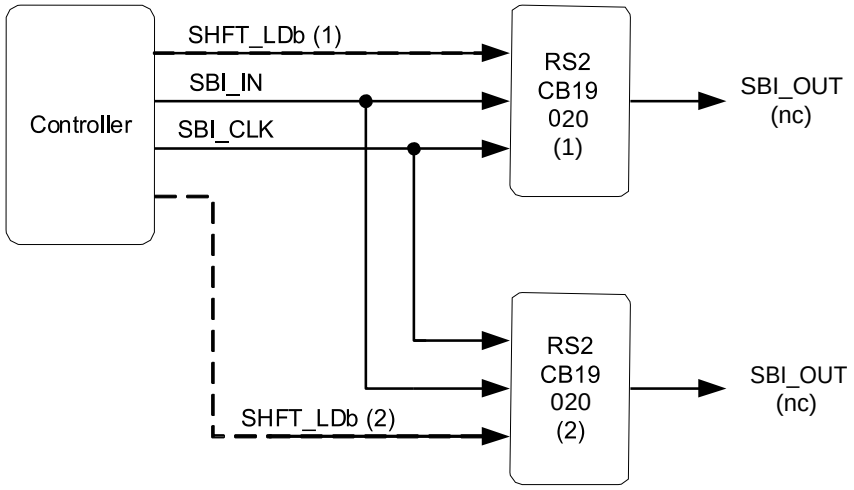


Figure 27. Side-Band Interface Star Topology

The Daisy-chain topology allows configuration of any number of devices with only three signals from the SBI controller. It uses the SBI_OUT pin of one device to drive the SBI_IN pin of the next device in the daisy chain. Users must take care to shift the proper number of bits in this configuration. For the example shown in Figure 28, the SBI bit stream consists of 32 bits.

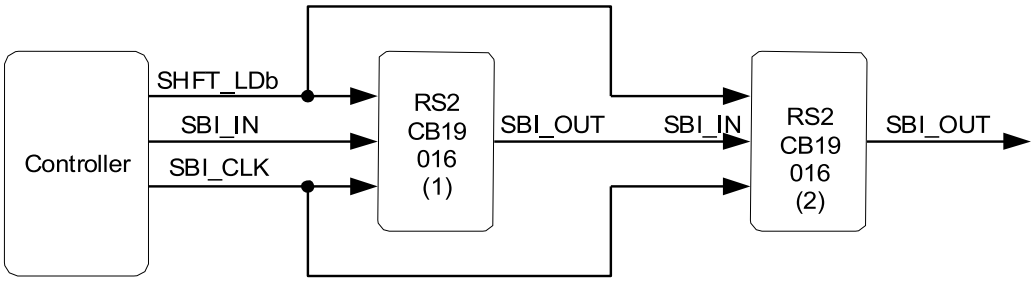


Figure 28. Side-Band Interface Daisy-Chain Topology

5.5.5 Output Enable/Disable Priority

The RS2CB19xxx output enable/disable priority is an “AND” function of all enable methods. This means that the SMBus output enable bit AND the OEb pin (if present/assigned) AND the SBI must indicate that the output is enabled in order for the output to be enabled. A logical representation of the priority logic is shown in Figure 29.

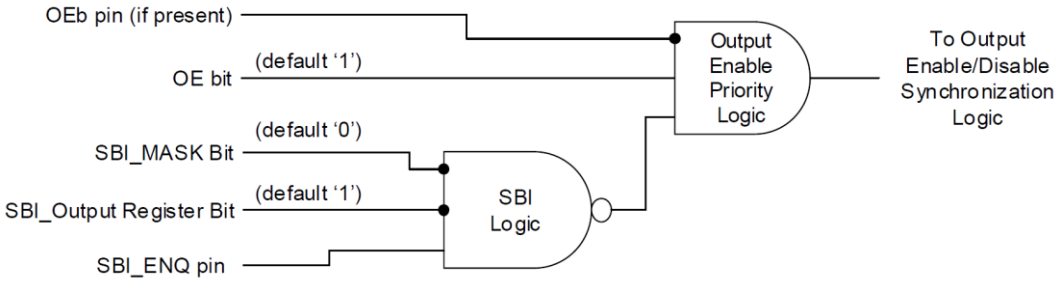
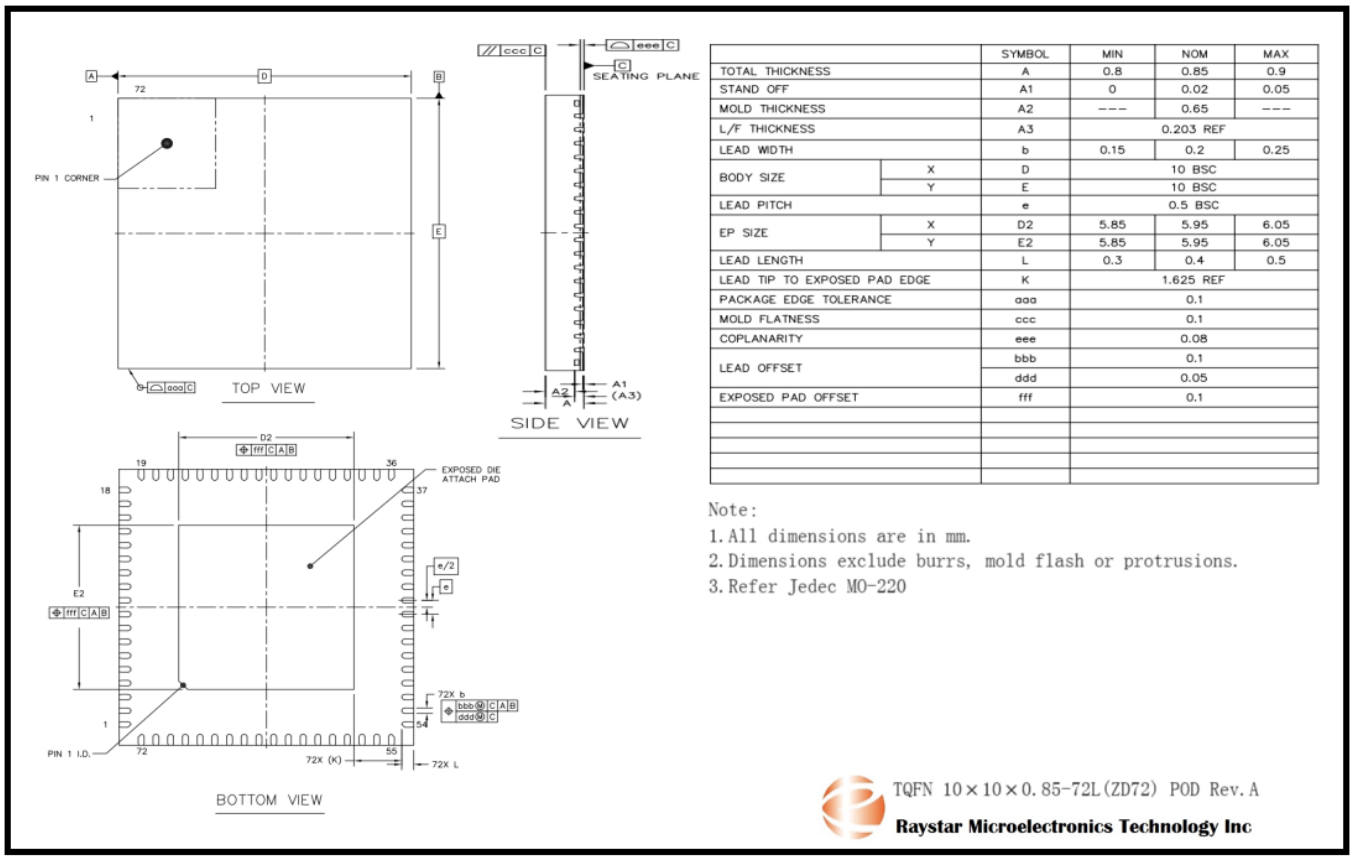


Figure 29. Output Enable/Disable Priority (Logical)

6. Package Information

The package outline drawings are located at the end of this document and are accessible from the website. The package information is the most current data available and is subject to change without revision of this document.

TQFN 10x10X0.85-72L

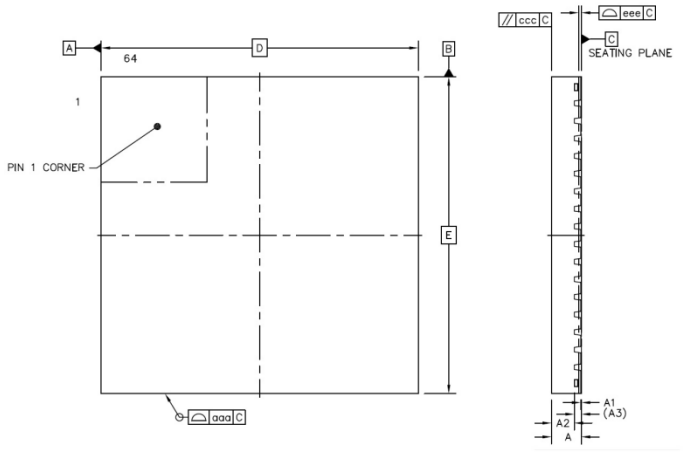


		SYMBOL	MIN	NOM	MAX
TOTAL THICKNESS		A	0.8	0.85	0.9
STAND OFF		A1	0	0.02	0.05
MOLD THICKNESS		A2	---	0.65	---
L/F THICKNESS		A3		0.203 REF	
LEAD WIDTH		b	0.15	0.2	0.25
BODY SIZE	X	D		10 BSC	
	Y	E		10 BSC	
LEAD PITCH		e		0.5 BSC	
EP SIZE	X	D2	5.85	5.95	6.05
	Y	E2	5.85	5.95	6.05
LEAD LENGTH		L	0.3	0.4	0.5
LEAD TIP TO EXPOSED PAD EDGE		K		1.625 REF	
PACKAGE EDGE TOLERANCE		aaa		0.1	
MOLD FLATNESS		ccc		0.1	
COPLANARITY		eee		0.08	
LEAD OFFSET		bbb		0.1	
		ddd		0.05	
EXPOSED PAD OFFSET		fff		0.1	

Note:
1. All dimensions are in mm.
2. Dimensions exclude burrs, mold flash or protrusions.
3. Refer Jedec MO-220

TQFN 10×10×0.85-72L(ZD72) POD Rev.A
Raystar Microelectronics Technology Inc

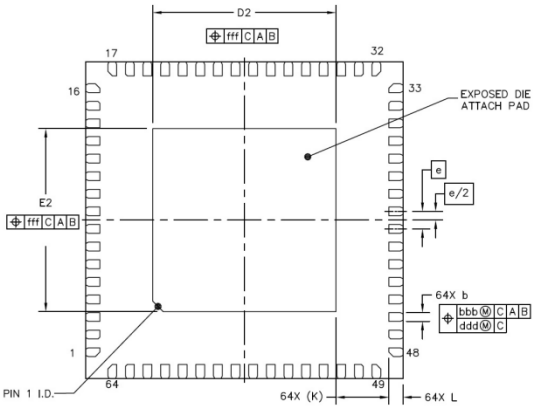
TQFN 9X9X0.85-64L



Top View

Side View

		SYMBOL	MIN	NOM	MAX
TOTAL THICKNESS		A	0.8	0.85	0.9
STAND OFF		A1	0	0.02	0.05
MOLD THICKNESS		A2	---	0.65	---
L/F THICKNESS		A3		0.203 REF	
LEAD WIDTH		b	0.2	0.25	0.3
BODY SIZE	X	D		9 BSC	
	Y	E		9 BSC	
LEAD PITCH		e		0.5 BSC	
EP SIZE	X	D2	5.1	5.2	5.3
	Y	E2	5.1	5.2	5.3
LEAD LENGTH		L	0.3	0.4	0.5
LEAD TIP TO EXPOSED PAD EDGE		K		1.5 REF	
PACKAGE EDGE TOLERANCE		aaa		0.1	
MOLD FLATNESS		ccc		0.1	
COPLANARITY		eee		0.08	
LEAD OFFSET		bbb		0.1	
		ddd		0.05	
EXPOSED PAD OFFSET		fff		0.1	



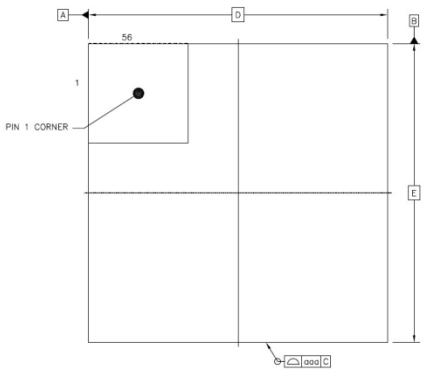
Bottom View

Note:
1.All dimensions are in mm.
2.Dimensions exclude burrs, mold flash or protrusions.
3.Refer Jedec MO-220

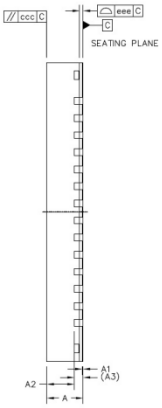
TQFN 9X9X0.85-64L(ZD64) POD Rev.0

Raystar Microelectronics Technology Inc

TQFN 7X7X0.85-56L

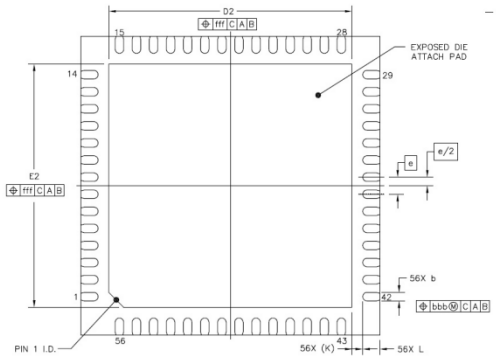


Top View



Side View

		SYMBOL	MIN	NOM	MAX
TOTAL THICKNESS		A	0.8	0.85	0.9
STAND OFF		A1	0	0.02	0.05
MOLD THICKNESS		A2	---	0.65	---
L/F THICKNESS		A3		0.203 REF	
LEAD WIDTH		b	0.15	0.2	0.25
BODY SIZE	X	D		7 BSC	
	Y	E		7 BSC	
LEAD PITCH		e		0.4 BSC	
EP SIZE	X	D2	5.6	5.7	5.8
	Y	E2	5.6	5.7	5.8
LEAD LENGTH		L	0.3	0.4	0.5
LEAD TIP TO EXPOSED PAD EDGE		K		0.25 REF	
PACKAGE EDGE TOLERANCE		aaa		0.1	
MOLD FLATNESS		ccc		0.1	
COPLANARITY		eee		0.08	
LEAD OFFSET		bbb		0.07	
EXPOSED PAD OFFSET		fff		0.1	

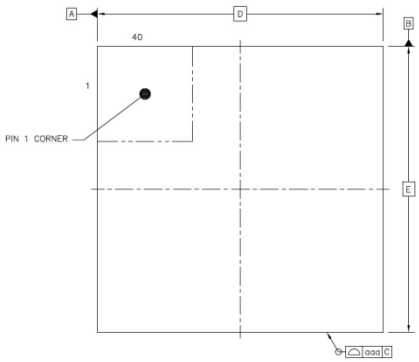


Bottom View

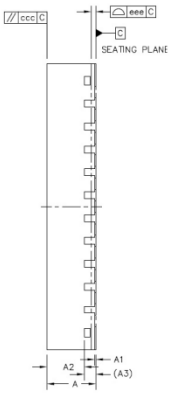
Note:
1.All dimensions are in mm.
2.Dimensions exclude burrs, mold flash or protrusions.
3.Refer Jedec MO-220

TQFN 7x7x0.85mm(ZL56) POD Rev.0
Raystar Microelectronics Technology Inc

TQFN 5x5x0.85-40L

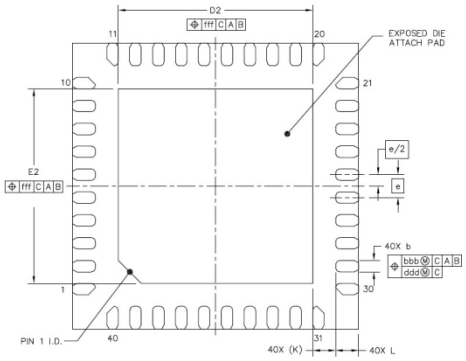


Top View



Side View

		SYMBOL	MIN	NOM	MAX
TOTAL THICKNESS		A	0.8	0.85	0.9
STAND OFF		A1	0	0.02	0.05
MOLD THICKNESS		A2	---	0.65	---
L/F THICKNESS		A3		0.203 REF	
LEAD WIDTH		b	0.15	0.2	0.25
BODY SIZE	X	D		5 BSC	
	Y	E		5 BSC	
LEAD PITCH		e		0.4 BSC	
EP SIZE	X	D2	3.3	3.4	3.5
	Y	E2	3.3	3.4	3.5
LEAD LENGTH		L	0.3	0.4	0.5
LEAD TIP TO EXPOSED PAD EDGE		K		0.4 REF	
PACKAGE EDGE TOLERANCE		aaa		0.1	
MOLD FLATNESS		ccc		0.1	
COPLANARITY		eee		0.08	
LEAD OFFSET		bbb		0.07	
		ddd		0.05	
EXPOSED PAD OFFSET		fff		0.1	

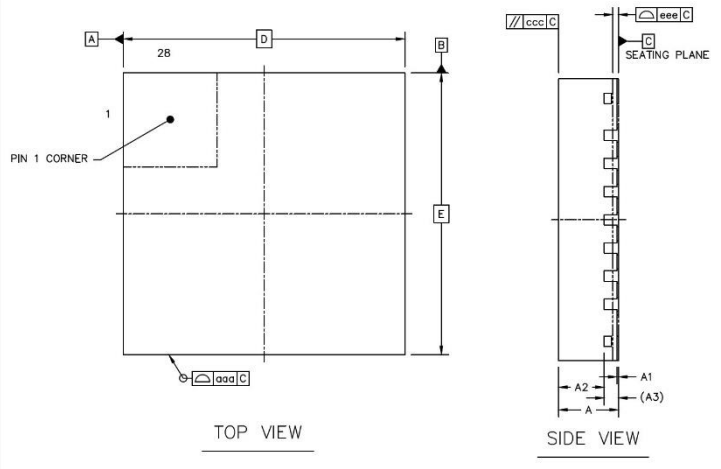


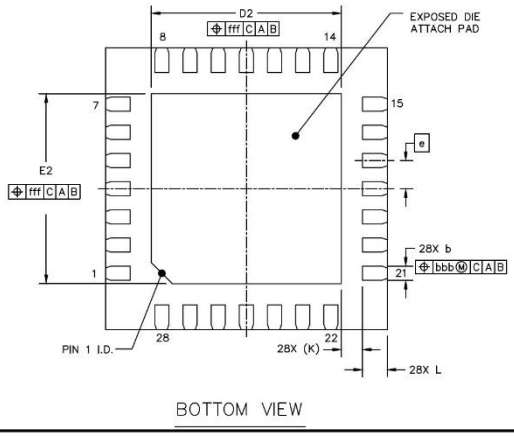
Bottom View

Note:
1.All dimensions are in mm.
2.Dimensions exclude burrs, mold flash or protrusions.
3.Refer Jedec MO-220

TQFN 5x5x0.85mm(ZLA40) POD Rev.0
Raystar Microelectronics Technology Inc

QFN 4x4x0.85-28L





		SYMBOL	MIN	NOM	MAX
TOTAL THICKNESS		A	0.8	0.85	0.9
STAND OFF		A1	0	0.02	0.05
MOLD THICKNESS		A2	---	0.647	---
L/F THICKNESS		A3		0.203 REF	
LEAD WIDTH		b	0.15	0.2	0.25
BODY SIZE	X	D		4 BSC	
	Y	E		4 BSC	
LEAD PITCH		e		0.4 BSC	
EP SIZE	X	D2	2.6	2.7	2.8
	Y	E2	2.6	2.7	2.8
LEAD LENGTH		L	0.25	0.35	0.45
LEAD TIP TO EXPOSED PAD EDGE		K		0.3 REF	
PACKAGE EDGE TOLERANCE		aaa		0.1	
MOLD FLATNESS		ccc		0.1	
COPLANARITY		eee		0.08	
LEAD OFFSET		bbb		0.1	
EXPOSED PAD OFFSET		fff		0.1	

Note:
1. All dimensions are in mm. Angels in degrees.
2. Refer Jedec MO-220.
3. Dimensions exclude burrs, mold flash or protrusions.

QFN4X4 28L POD Rev.0 (ZWA28)
Raystar Microelectronics Technology Inc.

7. Revision History

Revision	Description	Date
V0.9	Preliminary release	2023/12/01
V1.0	Initial release	2024/01/04
V1.1	1.Modify several parameters. 2.Modify several pin types.	2024/03/12
V1.2	1.Update POD diagram for TQFN 10x10X0.85-72L(Page 74) 2.Modify CLK23 to CLK19,Byte 2 bit 7to Byte 0 bit 6, Byte 0 to Byte 1(Page 70)	2024/9/24
V1.3	Add Part Number RS2CB19004	2025/01/17
V1.4	1. Modify the RS2CB19004 Pin Descriptions error 2. Add PCIe Gen7 Data	2025/12/3

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