

Description

The SiT92316 family of parts are HCSL Low-Power (HCSL-LP), 6 output differential Fan-Out buffers that meet or exceed all the performance requirements of the Intel DB800Z specification. They are suitable for PCI Express Gen 1–7 or QPI/UPI applications.

The SMBus interface and multiple output-enable pins allow the configuration and control of all 6 outputs individually.

It is packaged in a compact VQFN package and uses a standard pin configuration.

Applications

- Micro server and Tower Server
- Rack server
- Storage area network and host bus adapter card
- Network attached storage
- Hardware accelerator

Features

- HCSL-LP outputs with $Z_o = 85 \Omega$ and 100Ω
- Saves power and board space – no termination resistors required.
- Supports PCIe and QPI applications
- Spread spectrum compatible; tracks spreading input clock for low EMI
- Additive phase jitter
 - Fclk=156.25 MHz (12k-20M) band ~ 32 fs (Typical)
 - Fclk=100 MHz
 - PCIe Gen5 filter (CC) ~13 fs RMS
 - PCIe Gen6 filter (CC) ~8 fs RMS
 - PCIe Gen7 filter (CC) ~6 fs RMS
- Programmable output slew rate control
- Selectable SMBus address
- 1.8 V core and IO supply voltages
- Hardware-controlled low power mode (PDN)
- Current consumption: 29 mA Typical with all 6 outputs enabled at 100 MHz, driving a 5 inch T line and 2 pF load on each output.

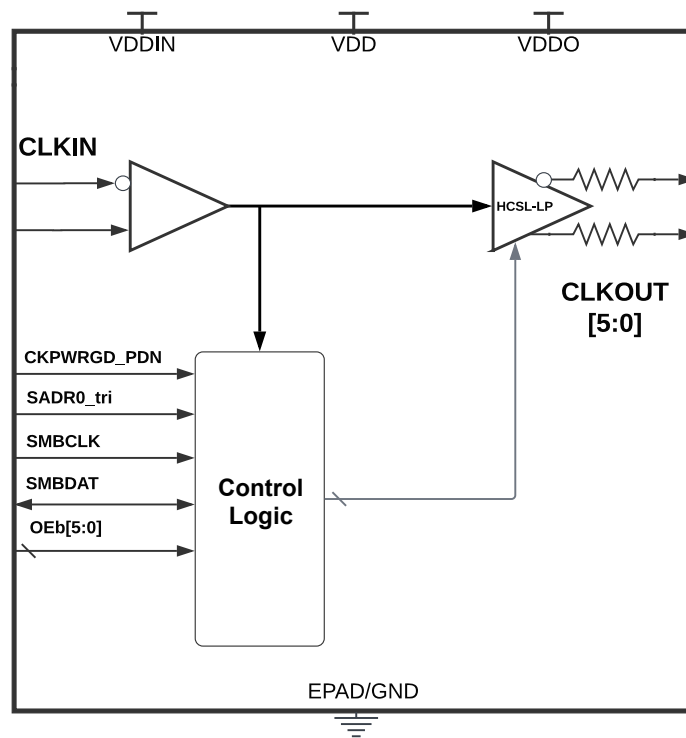


Figure 1. SiT92316 Functional Overview

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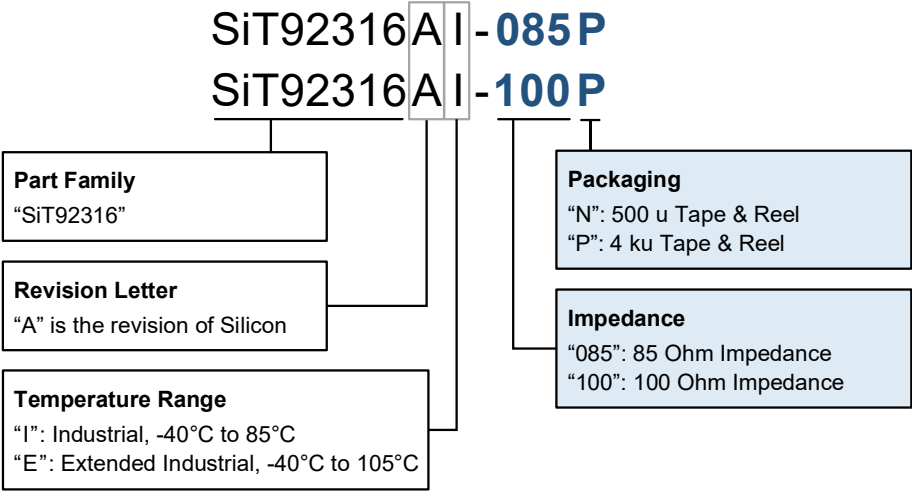
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Ordering Information



Electrical Characteristics

Table 1. Absolute Maximum Ratings

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Supply Voltage	Input Supply Core Supply	VDDIN VDD			1.89	V
Output Bank Supply Voltage	Output Driver Supply	VDDO			1.89	V
Input Low Voltage		V _{IL}	GND-0.5			V
Input High Voltage	Except for SMBus interface	V _{IH}			VDD+0.5	V
Input High Voltage	SMBus clock and data pins	V _{IHSMB}			1.89	V
Storage Temperature		T _S	-65		150	°C
Junction Temperature		T _J			125	°C
ESD (Human Body Model)	JESD22A-114	ESD _{HBM}			2000	V
ESD (Charge Device Model)		ESD _{CDM}			500	V
Latch Up	JEDEC JESD78D	LU			100	mA
Moisture Sensitivity level			MSL 3			

Notes:

1. Exceeding maximum ratings may shorten the useful life of the device.
2. Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or at any other conditions beyond those indicated under the DC Electrical Characteristics is not implied. Exposure to Absolute-Maximum-Rated conditions for extended periods may affect device reliability or cause permanent device damage.

Table 2. Recommended Operating Supply and Temperature

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Input Supply Voltage		VDDIN	1.71	1.8	1.89	V
Core Supply Voltage		VDD	1.71	1.8	1.89	V
Output Supply Voltage		VDDO	1.71	1.8	1.89	V
Ambient Temperature	Industrial (I)	T _A	-40		85	°C
	Extended industrial (E)		-40		105	°C
Junction Temperature		T _J			125	°C

Table 3. Electrical Characteristics

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Operating Supply Current, CKPWRGD High ^[1,2]	Input Supply Current, No Clock	IDD _{VDDIN_STATIC}		7.3	9.5	mA
	Input Supply Current, 100 MHz Clock	IDD _{VDDIN_DYN}		7.4	9.5	mA
	Core Supply Current, No Clock	IDD _{VDD_STATIC}		5.7	9.5	mA
	Core Supply Current, 100M Clock (Industrial (I))	IDD _{VDD_DYN}		7	11	mA
	(Extended industrial (E))			7	13	mA
Output Supply Current, CKPWRGD High ^[1]	Output Supply Current, No Clock	IDD _{VDDO_STATIC}		6.6	8	mA
	All Outputs Enabled, driving a 10in T-line terminated with 2 pF cap at 100 MHz clock, SiT92316AIP	IDD _{VDDO_DYN}		29	46	mA
	SiT92316AI100P			27	42	
Power Down Current ^[1,2]	CKPWRGD = Low	IDD _{VDDIN_PDN}		0.023	0.1	mA
		IDD _{VDD_PDN}		3.5	5	mA
		IDD _{VDDO_PDN}		0.44	1.25	mA
Input Control Pin Characteristics						
Input high voltage – Logic inputs ^[2]		V _{IH}	0.7xVDDIN			V
Input low voltage – Logic inputs ^[2]		V _{IL}			0.3xVDDIN	V
Input High Voltage, Tri Level Inputs		V _{IH, TRILVL}	0.75 x V _{DD}		V _{DD}	V
Input Mid Voltage, Tri Level Inputs		V _{IM, TRILVL}	0.4 x V _{DD}	0.5 x V _{DD}	0.56 x V _{DD}	V
Input Low Voltage, Tri level Inputs		V _{IL, TRILVL}	0		0.25 x V _{DD}	V

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Pin Inductance ^[3]		L _{PIN}			2	nH
Capacitance ^[3]	Logic Inputs, except DIF_IN.	C _{IN}			4.5	pF
	DIF_IN differential clock inputs	C _{INDIF_IN}			2.7	
	Output pin capacitance	C _{OUT}			4.5	

Notes:

1. Guaranteed by characterization.
2. Guaranteed by production testing.
3. Guaranteed by design.

Table 4. Input Clock Characteristics

Unless otherwise specified: VDDIN = 3.3 V $\pm$ 5%, VDDO = 3.3 V $\pm$ 5%, -40°C $\leq$ T_A $\leq$ 85°C, CLKIn driven differentially.

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Input frequency range ^[1,2]		FCLKIn	1		400M	Hz
Peak differential input voltage swing ^[2]		VID	0.1			V
Input Slew Rate – CLKIN ^[1]	Measured differentially	dv/dt	2			V/ns
Input Duty Cycle ^[1]	Measurement from differential waveform	dTIN		50		%
Input Crossover Voltage ^[2]	Crossover voltage		0.1		0.9	V

Notes:

1. All parameters are guaranteed by Characterization.
2. Guaranteed by production testing.

Table 5. Output Clock Characteristics (HCSL-LP) at 100 MHz

T_A = T_{COM}; Supply Voltage VDDO = 3.3 V $\pm$ 5%

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Slew rate ^{[1][5][6]}	Scope averaging on	Trf	2.4	2.9	3.5	V/ns
Slew rate matching ^[1]	Slew rate matching. Scope averaging on	Δ Trf			18	%
Voltage High ^{[1][5][6]}	Statistical measurement on single-ended signal using oscilloscope math function. (Scope averaging on) (Industrial (I))	V _{High}	721	794	868	mV
	(Extended industrial (E))	V _{High}	721	794	870	mV
Voltage Low ^{[1][5]}	Statistical measurement on single-ended signal using oscilloscope math function. (Scope averaging on)	V _{Low}	-86	11	84	mV
Max Voltage ^{[1][5][6]}	Measurement on single ended signal using absolute value. (Scope averaging off) (Industrial (I))	V _{MAX}	811	856	890	mV
Min Voltage ^{[1][5]}	(Extended industrial (E))	V _{MIN}	-119	-49	22	
		V _{MIN}	-119	-49	32	
Vswing ^{[1][5][6]}	Scope averaging off [pk to pk, single ended]	V _{SWING}	841	905	973	mV
Crossing Voltage (abs) ^[1]	Scope averaging off	V _{cross_abs}	380	423	455	mV
Crossing Voltage (var) ^[1]	Scope averaging off	Δ -V _{CROSS}	-19	27	71	mV
Differential Impedance ^[2]	SiT92316AI100P	Z _{DIFF}	94	100	106	Ω
Clock Stabilization ^[3,4]	From VDDO power-up and after input clock stabilization or assertion of CKPWRGD to 1st Clock	T _{STAB}		1.0	1.8	ms
OEB Latency ^[3,4]	DIF starts after OEB assertion DIF stop after OEB de-assertion	t _{LATOEB}	4		6	Clocks
Tdrive_PDb ^[3,4]	DIF output enable after CKPWRGD assertion	t _{DRVPDb}		100	300	μ s

Notes:

1. Guaranteed by characterization, measured on 5 inch T-line with 2pf load.
2. Guaranteed by production testing
3. Control input must be monotonic from 20% to 80% of input swing.
4. Guaranteed by limited testing of typical parts
5. Default factory configuration
6. The cpk = 1.33

Table 6. SMBus Electrical Parameters

$T_A = T_{AMB}$. Supply voltages are per normal conditions. See Test loads for loading conditions.

Parameter	Conditions	Symbol	Min	Typ	Max	Units
SMBus Input Low Voltage ^[1]		V_{ILSMB}			$0.3 \times VDD$	V
SMBus Input High Voltage ^[1]		V_{IHSMB}	$0.7 \times VDD$		VDD	V
Hysteresis on SMBUS pins		V_{HYS}	0.048			V
SMBus Output Voltage ^[1]	$I_{OH} = -2 \text{ mA}$	V_{OHSMB}	$0.75 \times VDD$			V
	$I_{OL} = 2 \text{ mA}$	V_{OLSMB}			$0.25 \times VDD$	V
SMBus Operating Frequency ^[1]		f_{SMB}	4		400	kHz
Max Capacitive Load for Each Bus line		C_B		400		pf

Notes:

1. Guaranteed by characterization.

Table 7. Skew and Differential Jitter Parameters

Parameter	Conditions	Symbol	Min	Typ	Max	Units
CLK INx, CLKOUTx ^[1,2,4,5,6,7,9]	Input-to-Output Skew in nominal value @ 25°C, 3.3 V (Industrial (I))	t_{PD}	455	600	723	ps
	(Extended industrial (E))	t_{PD}	411	600	744	ps
CLKINx, CLKOUTx ^[1,2,6,7,8]	Input-to-Output Skew Variation across temperature	T_{PD_DRIFT}		0.4	0.82	ps/C
DIF ^[1,2,5,6,7,9]	Output-to-Output Skew across all outputs (Industrial (I))	t_{SKEW_ALL}		----	50	ps
	(Extended industrial (E))	t_{SKEW_ALL}	----	----	50	ps
DIF Skew	Output to output skew variation across temp				0.07	ps/C
Duty Cycle Distortion ^[1,3,5,6]	Measured differentially, @100MHz	t_{DCD}	-1	0.1	1	%

Notes:

1. Guaranteed by characterization.
2. Differential cross-point to differential cross-point measurement.
3. The difference in Duty Cycle between the output and input clock is referred as Duty Cycle Distortion.
4. Mean Value measured through scope averaging.
5. Measured from differential waveform.
6. Measured into fixed 2pF load cap. Input to output skew is measured at the first output edge following the corresponding input.
7. All input-to-output specs refer to the timing between an input edge and the specific output edge created by it.
8. This is the amount of input-to-output delay variation with respect to temperature.
9. The cpk = 1.33.

Table 8. PCIe Phase Jitter Parameters with 100 MHz Clock

Parameters	Conditions	Symbol	Min	Typ	Max	Units
Additive Phase Jitter Common Clock	PCIe Gen 1 HF ^[1,2,3,4]	tjph _{PCIeG1-CC}		1.9	4.7	ps (p-p)
	PCIe Gen 2 HF ^[1,2,3,4,5,6]	tjph _{PCIeG2-CC}		102	138.4	fs rms
	PCIe Gen 2 LF ^[1,2,3,4,5,6]	tjph _{PCIeG2-CC}		4	7.7	fs rms
	PCIe Gen 3 ^[1,2,3,4,5,6]	tjph _{PCIeG3-CC}		33	44.3	fs rms
	PCIe Gen4 ^[1,2,3,4,5,6]	tjph _{PCIeG4-CC}		33	44.3	fs rms
	PCIe Gen5 ^[1,2,3,4,5,6]	tjph _{PCIeG5-CC}		13	17.5	fs rms
	PCIe Gen6 ^[1,2,3,4,5,6]	tjph _{PCIeG6-CC}		8	10.6	fs rms
Additive Phase Jitter SRIS	PCIe Gen7 ^[1,2,3,4,5,6]	tjph _{PCIeG7-CC}		5	7.4	fs rms
	PCIe Gen 2 HF ^[1,2,3,4,5,6]	tjph _{PCIeG2-SRIS}		70	122.7	fs rms
	PCIe Gen 2 LF ^[1,2,3,4,5,6]	tjph _{PCIeG2-SRIS}		18	2.8	fs rms
	PCIe Gen 3 ^[1,2,3,4,5,6]	tjph _{PCIeG3-SRIS}		29	53.7	fs rms
	PCIe Gen4 ^[1,2,3,4,5,6]	tjph _{PCIeG4-SRIS}		30	55.3	fs rms
	PCIe Gen5 ^[1,2,3,4,5,6]	tjph _{PCIeG5-SRIS}		10	17.1	fs rms
	PCIe Gen6 ^[1,2,3,4,5,6]	tjph _{PCIeG6-SRIS}		7	11.0	fs rms
Additive Phase Jitter SRNS	PCIe Gen7 ^[1,2,3,4,5,6]	tjph _{PCIeG7-SRIS}		4	8.7	fs rms
	PCIe Gen 2 HF ^[1,2,3,4,5,6]	tjph _{PCIeG2-SRNS}		68	110.2	fs rms
	PCIe Gen 2 LF ^[1,2,3,4,5,6]	tjph _{PCIeG2-SRNS}		1	1.3	fs rms
	PCIe Gen 3 ^[1,2,3,4,5,6]	tjph _{PCIeG3-SRNS}		24	36.2	fs rms
	PCIe Gen4 ^[1,2,3,4,5,6]	tjph _{PCIeG4-SRNS}		24	36.2	fs rms
	PCIe Gen5 ^[1,2,3,4,5,6]	tjph _{PCIeG5-SRNS}		9	13.2	fs rms
	PCIe Gen6 ^[1,2,3,4,5,6]	tjph _{PCIeG6-SRNS}		6	9.7	fs rms
	PCIe Gen7 ^[1,2,3,4,5,6]	tjph _{PCIeG7-SRNS}		4	6.8	fs rms

Notes:

- Guaranteed by design and characterization. Applies to all differential outputs.
- Input to SIT92316 is fed using low phase noise source SMA100B while SIT92316 is configured as 100 MHz LP-HCSL Output Driver and fed to the channels of the DSO through low noise high slew drivers to minimize the impact of DSO broadband noise.
- Additive RMS Jitter Measurement for PCIe are made using DSO. Commercially available and popular PCIe jitter post processing tools are used to report PCIe jitter.
- Additive jitter for RMS values is calculated by solving the equation for b [$b = \sqrt{c^2 - a^2}$] where 'a' is the rms input jitter and "c" is the rms total jitter.
- Input to SIT92316 is fed using low phase noise source SMA100B, SIT92316 is configured as 100MHz HCSL Output Driver [VDDOx = 3.3 V] and fed to the channels of DSA90804A using the exact measurement set up.
- For each type of PCIe jitter – Common Clock, SRIS, SRNS, there are 64 possible PCIE GEN filter values. We take the worst case jitter value over process, voltage and temperature among these 64 filters. The spec of H1, H2 (TX, RX PLL transfer functions) are F3dB = [2,4,5] MHz, Peaking = [0.01, 1, 2] dB, For H3 filter F3dB=[10] MHz.

Table 9. Phase Jitter Parameters

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Additive Phase Jitter	Fclk = 156.25M, 12K-20MHz (Industrial (I))	tjph_12K_20M		32	42	fs rms
	Fclk = 156.25M, 12K-20MHz (Extended Industrial (E))				44	
	Fin = 312.5 MHz 12K-20MHz with 4MHz HPF ^[1] (Industrial (I))	tjph_420B		20	28.5	fs rms
	Fin = 312.5 MHz 12K-20MHz with 4MHz HPF ^[1] (Extended Industrial (E))				30.0	

Note:

- HPF: High Pass Filter.

Pin Configuration

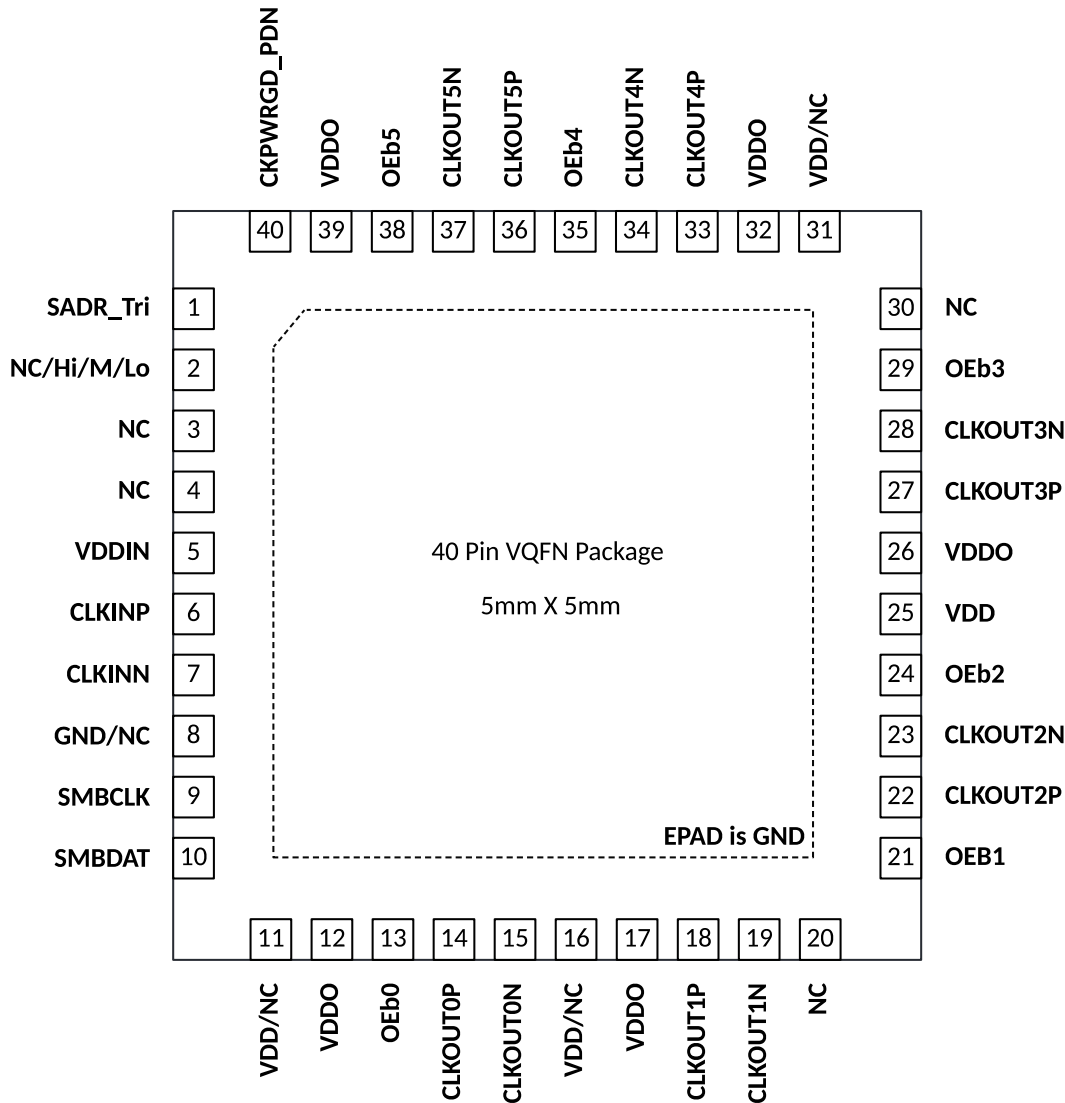


Figure 2. Pin Configuration

Table 10. Pin Description

Pin Name	Pin No.	I/O Type	Description
SADR_Tri	1	I, PD, PDT	SMBUS address strap pin. There is a 3 level input decoding on this pad
NC/Hi/M/Lo	2	N/A	This pin does not have any specific user function. NC or any static level will be acceptable.
VDDIN	5	PWR	1.8V power for differential input clock (receiver). This VDD should be treated as an analog power rail and filtered appropriately.
CLKINP	6	I,PDT	0.8 V Differential True input
CLKINN	7	I,PDT	0.8 V Differential Complementary Input
GND/NC	8	Gnd	Differential Input clock (receiver) GND
SMBCLK	9	I, OD, PDT	Clock pin of SMBUS circuitry, 1.8 V tolerant
SMBDAT	10	I/O, OD, PDT	Data pin of SMBUS circuitry, 1.8 V tolerant
VDD/NC	11, 16, 31	N/A	This pin will not affect the functionality of the Chip.
NC	3, 4, 20, 30	N/A	No Connection. Recommended to be grounded.
VDDO	12, 17, 26, 32, 39	PWR	Power Supply for the Output Drivers, nominal 1.8 V. Can be lowered to 1.05 V to achieve low power operation

Pin Name	Pin No.	I/O Type	Description
OEB0	13	I, PD, PDT	Active low input for enabling Clock pair 0. 1 = disable outputs, 0 = enable outputs
CLKOUT0P	14	O	0.8 V differential true clock output
CLKOUT0N	15	O	0.8 V differential Complementary clock output
CLKOUT1P	18	O	0.8 V differential true clock output
CLKOUT1N	19	O	0.8 V differential Complementary clock output
OEB1	21	I, PD, PDT	Active low input for enabling Clock pair 1. 1 = disable outputs, 0 = enable outputs
CLKOUT2P	22	O	0.8 V differential true clock output
CLKOUT2N	23	O	0.8 V differential Complementary clock output
OEB2	24	I, PD, PDT	Active low input for enabling Clock pair 2. 1 = disable outputs, 0 = enable outputs
VDD	25	PWR	1.8 V Power Supply
OEB3	29	I, PD, PDT	Active low input for enabling Clock pair 3. 1 = disable outputs, 0 = enable outputs
CLKOUT3P	27	O	0.8 V differential true clock output
CLKOUT3N	28	O	0.8 V differential Complementary clock output
CLKOUT4P	33	O	0.8 V differential true clock output
CLKOUT4N	34	O	0.8 V differential Complementary clock output
OEB4	35	I, PD, PDT	Active low input for enabling Clock pair 4. 1 = disable outputs, 0 = enable outputs
OEB5	38	I, PD, PDT	Active low input for enabling Clock pair 5. 1 = disable outputs, 0 = enable outputs
CLKOUT5P	36	O	0.8 V differential true clock output
CLKOUT5N	37	O	0.8 V differential Complementary clock output
CKPWRGD_PDN	40	I,PU,PDT	1.8 V Input notifies device to sample latched inputs and start up on first high assertion or exit Power Down Mode on subsequent assertions. Low enters Power Down Mode.

Notes:

1. PU is weak internal Pull-up with 200 K Ω resistor.
2. PD is weak internal Pull-down with 200 K Ω resistor.
3. PU/PD are weak internal Pull-up/Pull-down with 200 K Ω resistor.
4. PDT (Power Down Tolerant) pins can be driven when the device is powered down without accidentally waking up the device.
5. Clock input pins are power down tolerant for voltage level < 1.8 V on pins.
6. OD (Open Drain). It requires an external Pull-up on the board.
7. 'b' suffix (in OEB) indicates an active-low control.

Functional Description

Typical Application

Figure 3 shows a SiT92316 typical application. In this application, a clock generator provides a 100-MHz reference to the SiT92316 which then distributes that clock

to PCIe endpoints. The clock generator may either be a discrete clock generator, or it may be integrated in a larger component such as a Platform Controller Hub (PCH) or application processor.

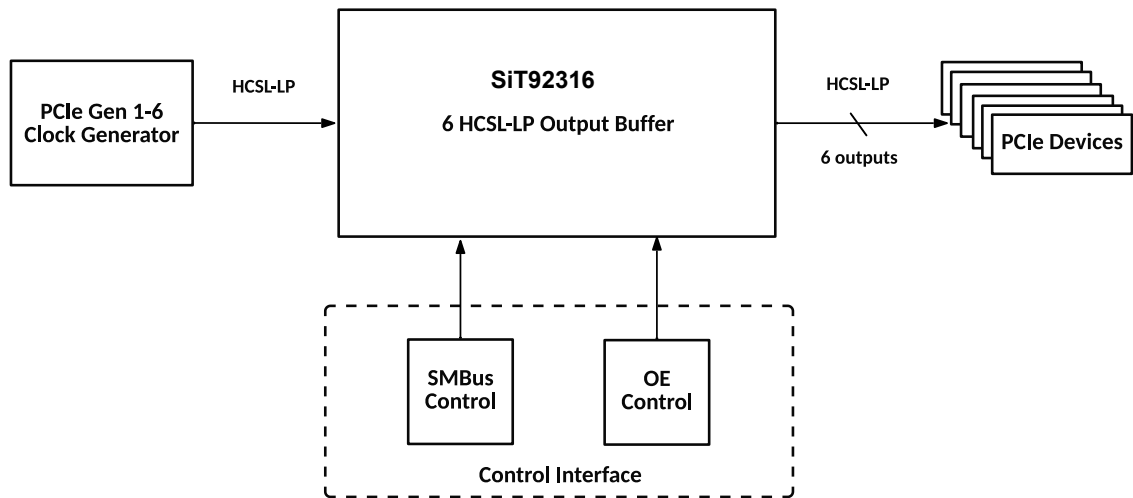


Figure 3. Typical Application Diagram

Parameter Measurement Information

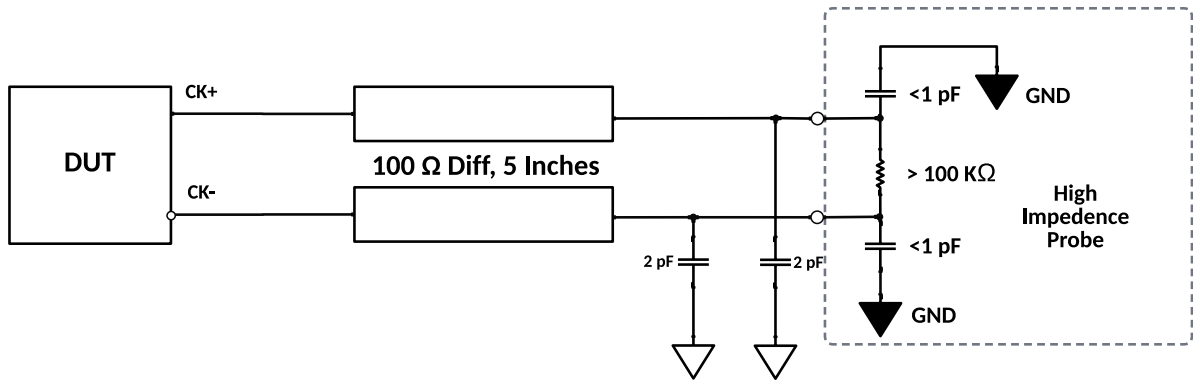


Figure 4. AC Test Mode

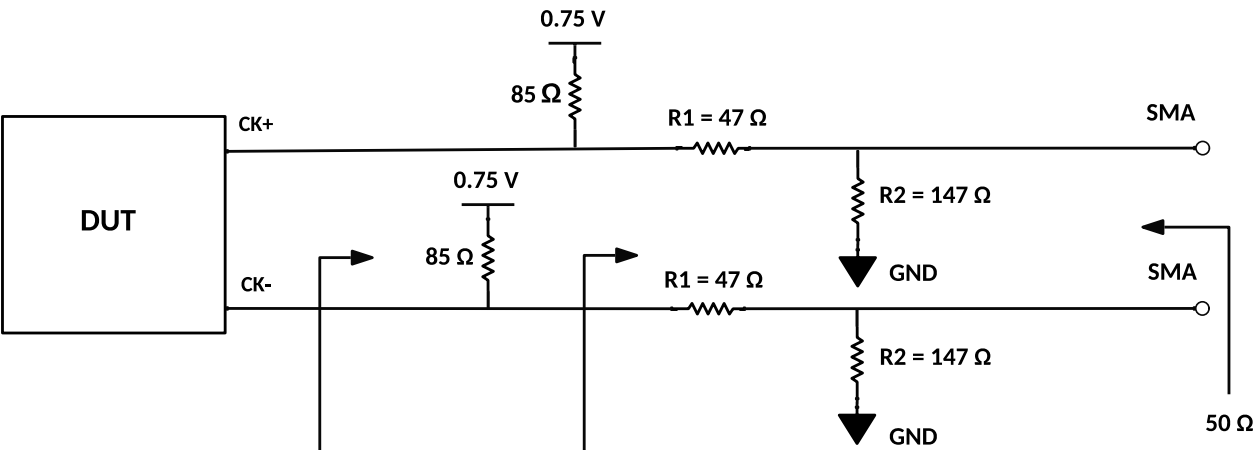


Figure 5. DC Simulation Mode

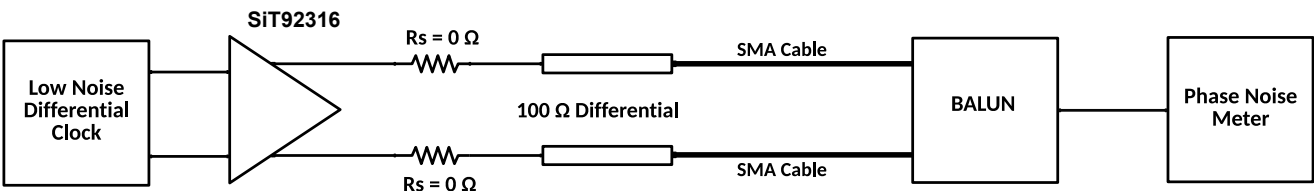


Figure 6. Phase Noise Measurement Setup

Table 11. Input vs Output States

Control Inputs	CLKIN	OEB[5:0] HARDWARE PINS AND SMBus CONTROL REGISTER BIT			CLKOUT[5:0] _P / CLKOUT[5:0] _N
		OE[5:0]b Pin	OUT_EN_CLK[5:0]	STOP_STATE_CONFIG_REG	
1	X	X	0	0	LOW/LOW
				1	HiZ/HiZ
				2	High/Low
				3	Low/High
		1	X	0	LOW/LOW
				1	HiZ/HiZ
				2	High/Low
				3	Low/High
0	X	X	X	Running	Output Follow input
				0	LOW/LOW
				1	HiZ/HiZ
				2	High/Low
				3	Low/High

Power Good Assertion and De-assertion

Power Good (CKPWRGD_PDN) is asserted high and de-asserted low. De-assertion of CKPWRGD_PDN (pulling the signal low) is equivalent to indicating a powerdown condition. CKPWRGD_PDN (assertion) is used by the DB800Z to sample initial configurations such as SA selections.

After CKPWRGD_PDN has been asserted high for the first time, the pin becomes a PWRDNb (Power Down) pin that can be used to shut off all clocks cleanly and instruct the device to invoke power savings mode. PWRDNb is a completely asynchronous active low input.

When entering power savings mode, PWRDNb should be asserted low prior to shutting off the input clock or power to ensure all clocks shut down in a glitch free manner. When PWRDNb is de-asserted high, all clocks will start and stop without any abnormal behavior and will meet all AC and DC parameters.

NOTE: The assertion and de-assertion of PWRDNb is asynchronous.

Warning: Disabling of the CLKIN input clock prior to the assertion of PWRDNb is an undefined

mode and is not recommended. Operation in this mode may result in glitches.

Power Good De-Assertion

When PWRDNb is sampled low by two consecutive rising edges of CLKINN, all differential outputs must be held Tri-stated on the next CLKINN high to low transition.

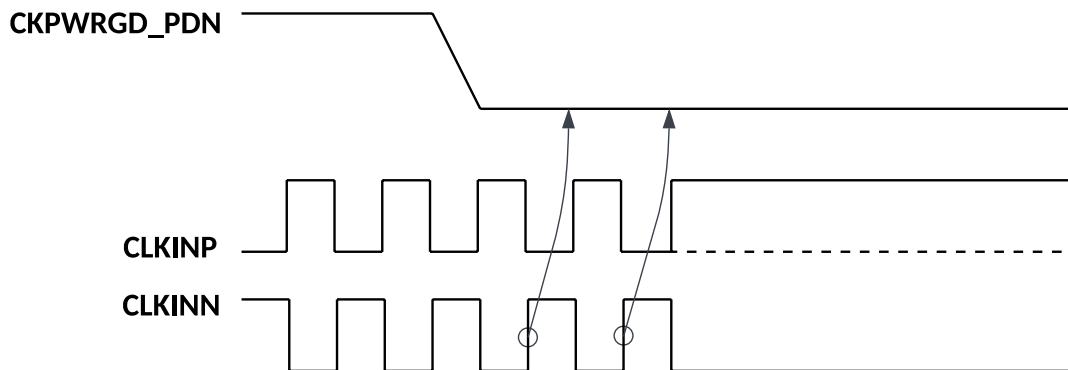


Figure 7. Power Good Assertion

Power Good Assertion

CKPWRGD_PDN must not be asserted to the clock buffer before VDD reaches VDD_{MIN}. Prior to VDD_{MIN} it is recommended to hold PWRGD low (less than 0.25 V).

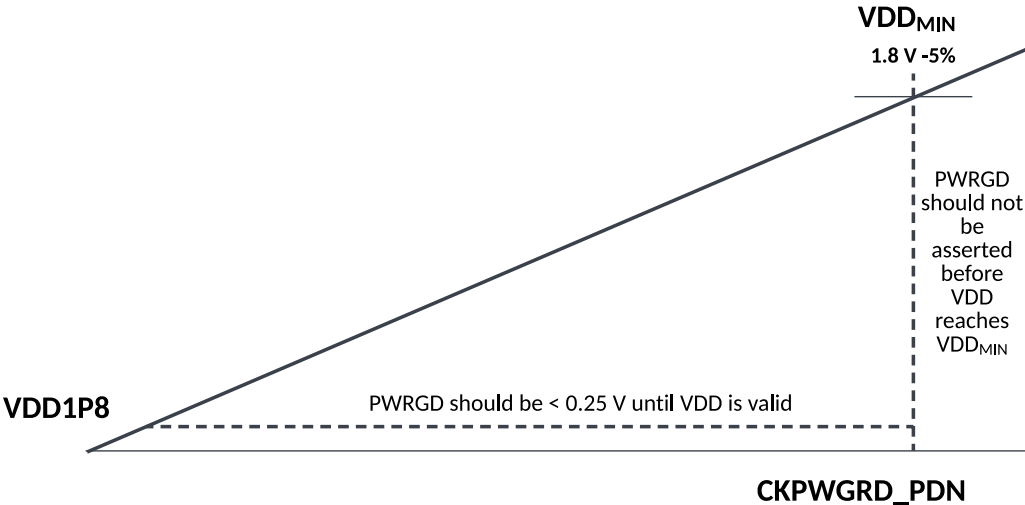


Figure 8. Power Good vs VDD1P8 relationship

The power-up latency in T_{STABLE} is to be less than 1.8 ms. This is the time from the valid CLKINx input and the assertion of the PWRGD signal until the output of the stable clocks from the buffer chip.

All differential outputs stopped in a Tri-state condition resulting from power down must be driven high in less than 300 μs of the PWRGD assertion to a voltage greater than 200 mV.

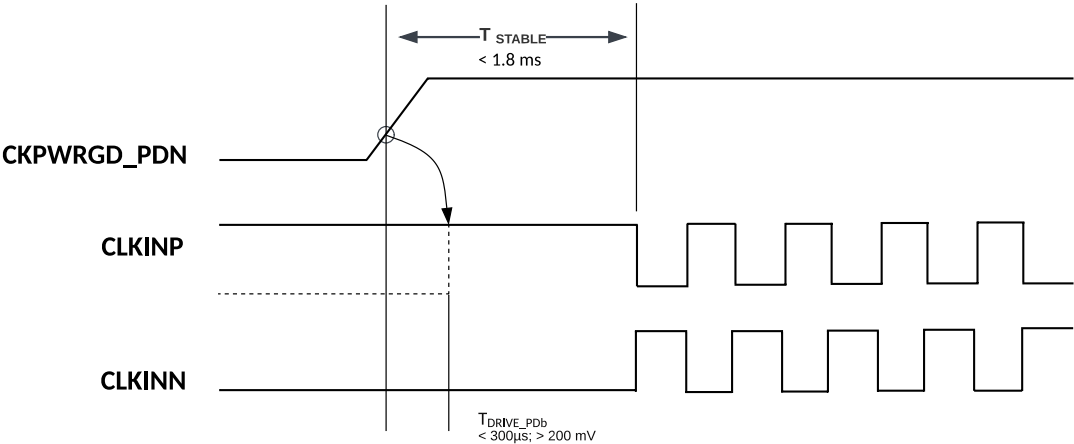


Figure 9. Power Good Assertion

Serial Interface Information: SMBus

System Management Bus (SMBus) is a 2 wire interface, which uses SMBCLK and SMBDAT on the device for serial communication. SMBus will be active only when CKPWRGD_PDN is High (V_{IH}).

Generic SMBus Description

The Figure 10 illustrates a generic SMBus sequence along with the description and functions of the constituent bytes elaborated in Table 12.

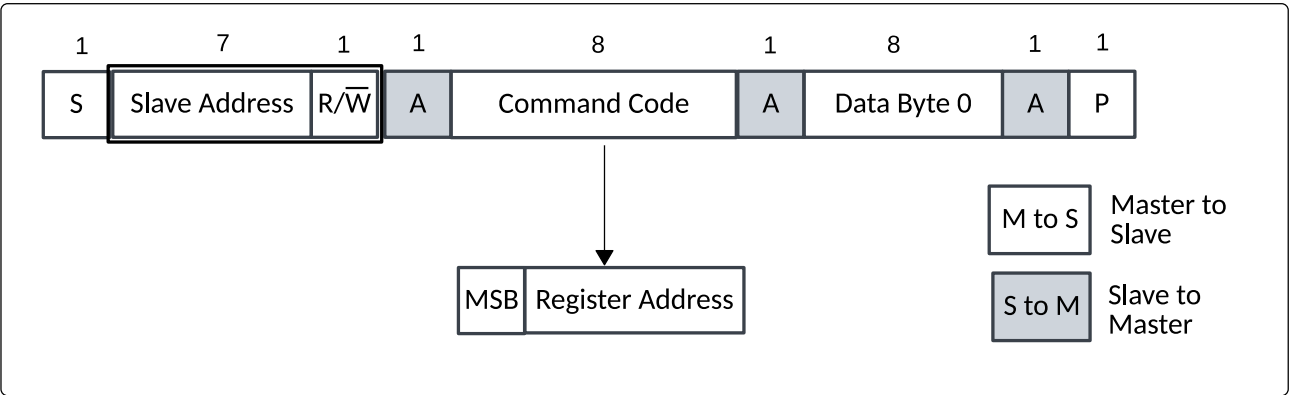


Figure 10. Generic SMBus Sequence

Table 12. SMBus Address Register Description

Description	Bit Range	Function
S	1	Start Condition
Sr	1	Repeated start condition
Slave Address	7 [7:1]	Address of the slave device.
R/W	1 [LSB]	1 = Read (Rd), 0 = Write (Wr)
A	1	1 = No-Acknowledgement (NA), 0 = Acknowledgement (A)
P	1	Stop condition
Command Code	1 [MSB]	1 = Byte read/write, 0 = Block read/write
	7 [6:0]	Register address

The register number should be specified when reading or writing a register in a SMBus slave device. While mentioning the register address, MSB must be SET for byte operation and must be RESET for block operations.

SMBus Byte: Read and Write Operations

Byte Read

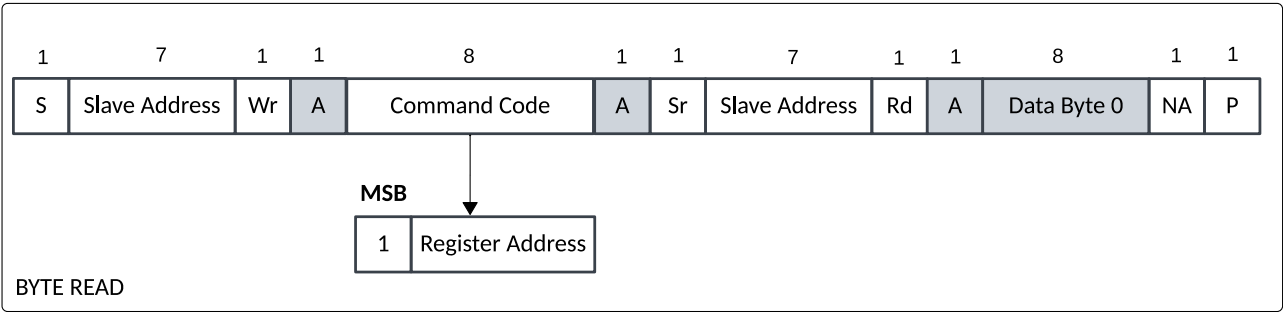


Figure 11. Byte Read Operation

- Master sends a start bit
- Master sends the slave address with LSB = Write
- Slave device will send acknowledgement (A)
- Master sends 8 bit register address (with MSB = 1 and byte read starting address [6:0])
- Slave device will send acknowledgement (A)
- Master sends a repeated start bit
- Master sends the slave address with LSB = Read
- Slave device will send acknowledgement (A)
- Slave device will send data byte
- Master will send not-acknowledgment (NA)
- Master will send a stop bit

Byte Write

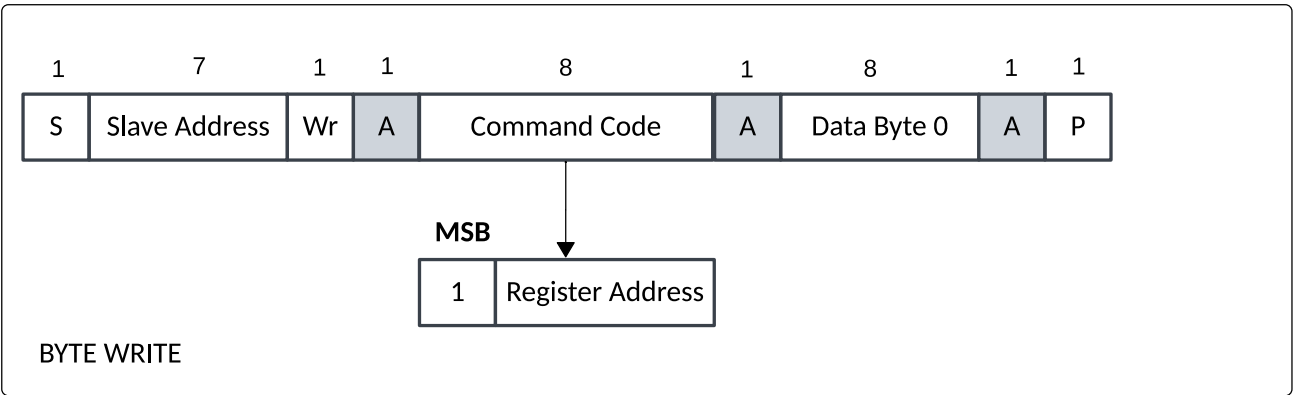


Figure 12. Byte Write Operation

- Master sends a start bit
- Master sends the slave address with LSB = Write
- Slave device will send acknowledgement (A)
- Master sends 8 bit register address (with MSB = 1 and byte write starting address [6:0])
- Slave device will send acknowledgement (A)
- Master sends data byte to be written
- Slave device will send acknowledgement (A)
- Master sends a stop bit

SMBus Block: Read and Write Operations

Block Read

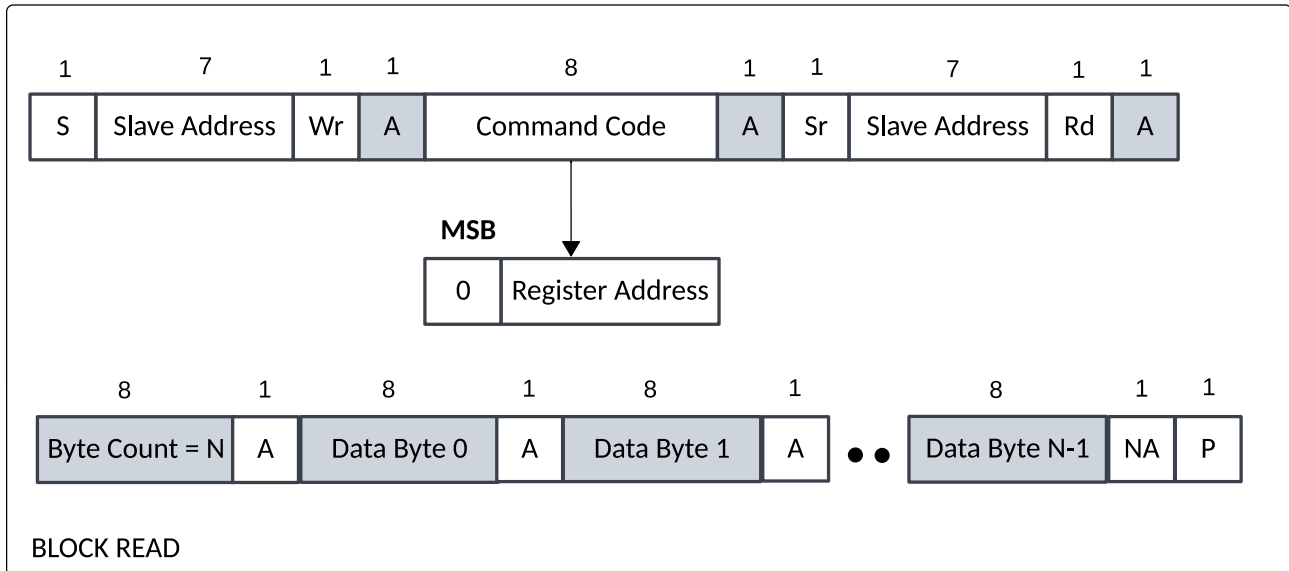


Figure 13. Block Read Operation

- Master sends a start bit
- Master sends the slave address with LSB = Write
- Slave device will send acknowledgement (A)
- Master sends 8 bit register address (with MSB = 0 and block read starting address [6:0])
- Slave device will send acknowledgement (A)
- Master sends a repeated start bit
- Master sends the slave address with LSB = Read
- Slave device will send acknowledgement (A)
- Slave device will send byte count N ($0 < N < 33$) that slave will transfer to the master
- Master sends acknowledgement (A)
- Slave device sends data bytes from data byte 0 to data byte N-1
- Master will send acknowledgement (A) for each data byte received (one at a time) except for the last data byte (N-1)
- Master will send not-acknowledgment (NA)
- Master will send a stop bit

Block Write

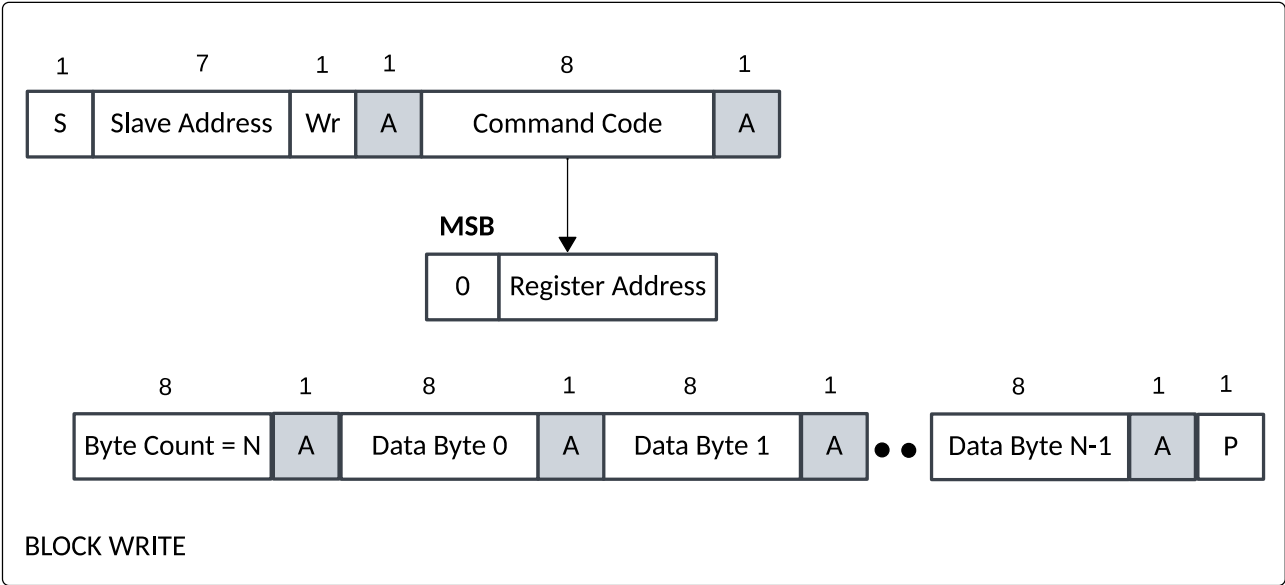


Figure 14. Block Write Operation

- Master sends a start bit
- Master sends the slave address with LSB = Write
- Slave device will send acknowledgement (A)
- Master sends 8 bit register address (with MSB = 0 and block write starting address [6:0])
- Slave device will send acknowledgement (A)
- Master sends byte count N ($0 < N < 33$) that master will transfer to the slave device
- Slave device will send acknowledgement (A)
- Master sends data bytes to be written from data byte 0 to data byte N-1
- Slave device will send acknowledgement (A) for each data byte received (one at a time)
- Master sends a stop bit

Note: For cases where an SMBus bus transaction concludes with a write operation, ensure that the SMBus master does not toggle the clock inadvertently between the STOP and the next START condition to prevent unintended write operations. For cases where inadvertent clocks can occur between the STOP and the next START condition, it is recommended to conclude the SMBus transaction with a read operation.

Table 13. SMBus Address Selection

Pin (SADR_tri)	SMBus Address	+ Read/Write bit
0	1101100	x
M	1101101	x
1	1101111	x

Register Address

Table 14. Register Map Address

Register Address	Bit Range	Register name	Default	Type	SiT92316 Bit Name	Description and Function
0x00	7:0	RCR1	0	RO	RESERVED	
0x01	7	OE_CTRL 1	1	RW	RESERVED	1: Output Enable 0: STOP_STATE Mode
	6		1		DIF3_ENABLE	
	5		1		DIF2_ENABLE	
	4		1		DIF1_ENABLE	
	3		0		RESERVED	
	2		1		DIF0_ENABLE	
	1		1		RESERVED	
	0		0		RESERVED	
					RESERVED	
0x02	7:3	OE_CTRL 2	0	RW	RESERVED	1: Output Enable 0: STOP_STATE Mode
	2		1		DIF5_ENABLE	
	1		0		RESERVED	
	0		1		DIF4_ENABLE	
0x03	7:0	RCR2	0	RO	RESERVED	
0x04	7:0	RCR3	0	RO	RESERVED	
0x05	7:4	VEN_REV_ID	0xa2	RO	REVISION_ID	0xa: REVA
	3:0				VENDOR_ID	0x2: SiTime product
0x06	7:0	DEV_ID	0	RO	DEVICE_ID	Device ID bits[7:0] map to register bits[7:0] directly. Product Code
0x07	7:5	BYTES_READ_COUNT	0	RO	RESERVED	Reserved
	4:0		8	RW	BYTES_READ_COUNT_VALUE	Writing to this register configures how many bytes will be read back on a block
0x10	7	OE_PIN_READ_BACK	0	RO	RB_OE5	Output Enable# Pin read Back
	6		0		RB_OE4	
	5		0		RESERVED	
	4		0		RE_OE3	
	3		0		RB_OE2	
	2		0		RB_OE1	
	1		0		RB_OE0	
	0		0		RESERVED	
0x14	7:2	STOP_STATE_CONFIG_REG	0	RO	RESERVED	
	1:0		0	RW	STOP_STATE	00 = Low/Low 01 = Hiz/Hiz 10 = High/Low 11 Low/High
0x15	7:2	SLEW_CTRL_REG	0x1	RO	RESERVED	Refer Table 15
	1:0			RW	SLEW_RATE	
0x16	7:4	AMP_CTRL_REG	0	RO	RESERVED	Default Amplitude is 0.8V/peak typical. Step size is 25mV typical and monotonically decreasing from code 0 to 15
	3:0		0	RW	OUTPUT_AMPLITUDE	

Note:

- For changing the default amplitude value, Readback the amplitude code and apply the relative change in code.

Table 15. Default Slew Value

Slew Code Reg. 0x15[1:0]	Typical Slewrate Value (V/ns) @ for 0.8V swing (measured on 5 inch T-line with 2pf load)
0	3.8
1	2.9
2	2.4
3	2

Package Dimensions and Land Patterns

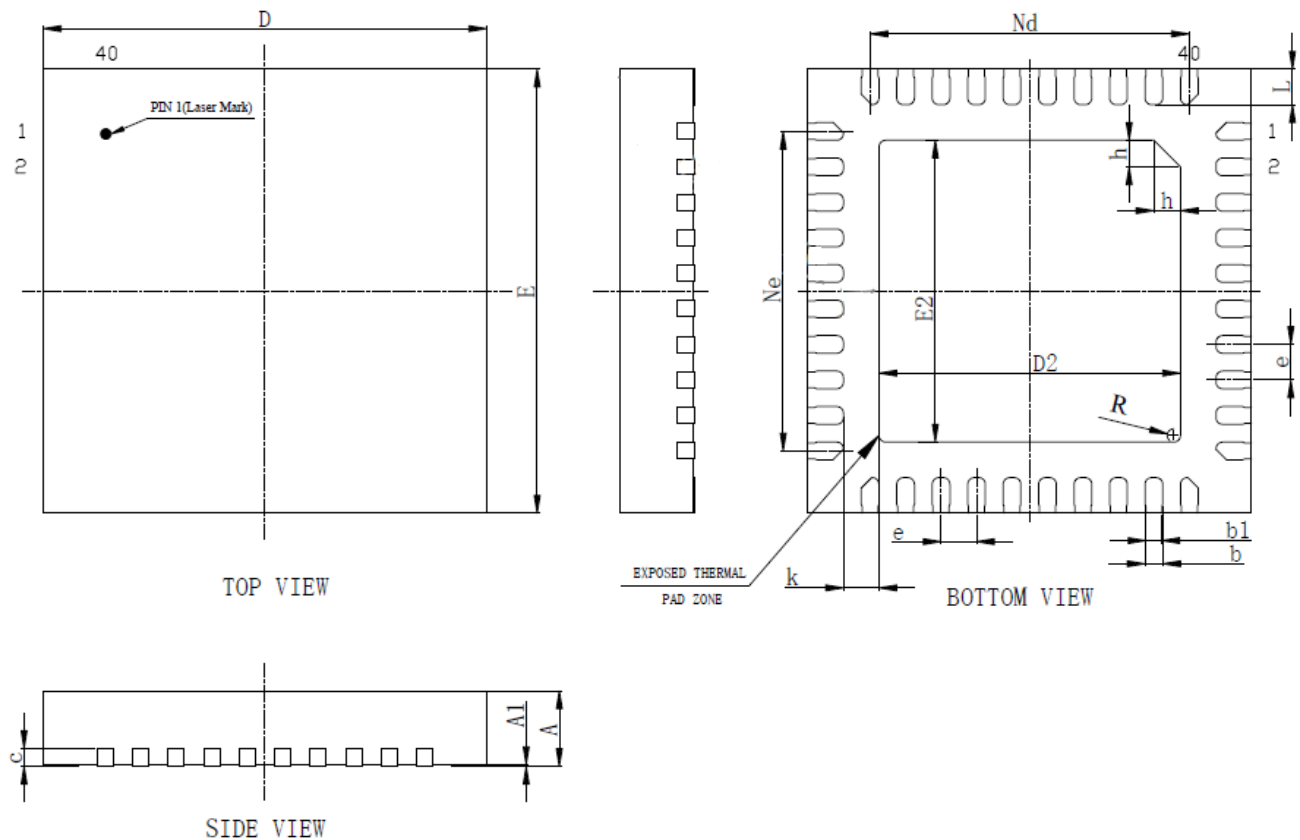


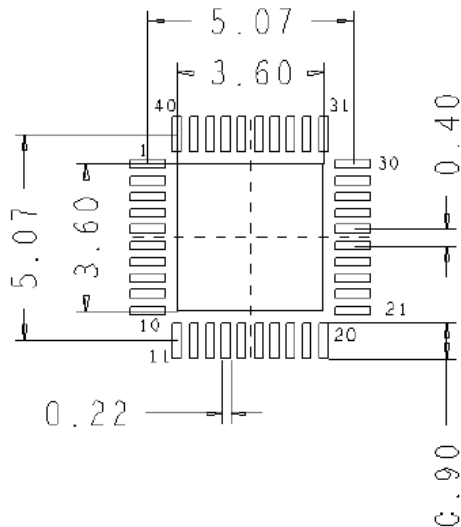
Figure 15. Package Diagram SiT92316 40 pin QFN

Symbol	Millimeter		
	MIN	NOM	MAX
A	0.80	0.85	0.95
A1	0	0.02	0.05
b	0.15	0.20	0.25
b1	0.18 REF		
c	0.18 REF		
D	4.90	5.00	5.10
D2	3.35	3.40	3.45
e	0.40 BSC		
Ne	3.60 BSC		
Nd	3.60 BSC		
E	4.90	5.00	5.10
E2	3.35	3.40	3.45
L	0.35	0.40	0.45
h	0.25	0.30	0.35
R	0.075 REF		
K	0.35	0.40	0.45

Notes: All measurements are in millimeters (mm).

Land Pattern and Solder

LAND PATTERN EXAMPLE



SOLDER PASTE EXAMPLE

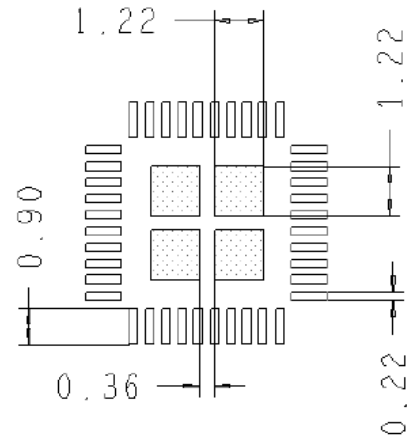


Figure 16. SiT92316 Land Pattern Diagram

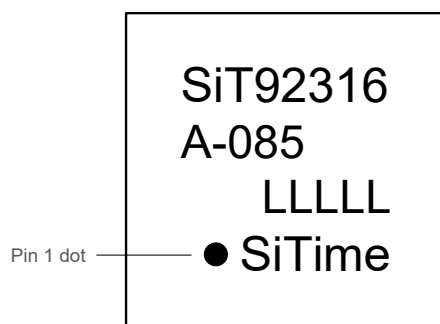
General Notes

1. All dimensions shown are in millimeters (mm) unless otherwise noted.
2. This Land Pattern Design is based on the IPC-7351 guidelines.
3. All dimensions shown are at Maximum Material Condition (MMC). Least Material Condition is calculated based on a fabrication allowance of 0.05 mm.

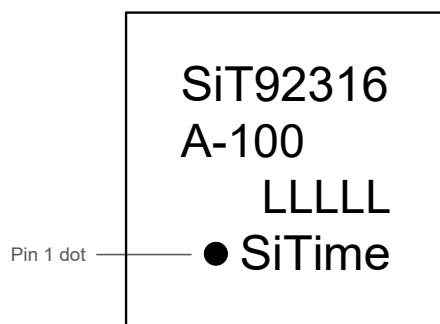
SOLDER MASK DESIGN

1. All metal pads are to be non-solder mask defined (NSMD).

Top Marking



Line 1: "SiT92316" SiTime part number
Line 2: "A-085" represent revision A and 85 Ohm impedance
Line 3: "LLLLL" Lot code from SiTime
Line 4: Pin 1 dot and "SiTime" logo



Line 1: "SiT92316" SiTime part number
Line 2: "A-100" represent revision A and 100 Ohm impedance
Line 3: "LLLLL" Lot code from SiTime
Line 4: Pin 1 dot and "SiTime" logo

Revision History

Table 16. Revision History

Revisions	Release Date	Change Summary
0.5	7-Dec-2023	Initial Release
0.52	4-Apr-2025	Ordering Code for Packaging updated with 4Ku/reel code "P" and 500u/reel code "N" Added Top Marking section
0.53	15-Jul-2025	Correct documents header, remove "85 ohm impedance"
0.56	25-Mar-2026	Electrical specificationDatasheet tables have been updated to include support up to 105°C. Land pattern is added Additive jitter results with BRMC filter is added
1.0	3-Sep-2026	Top marking and jitter specs updated Disclaimer updated Production release
1.01	10-Sep-2026	Top marking udpated Ordering Information updated

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