CY28445-5

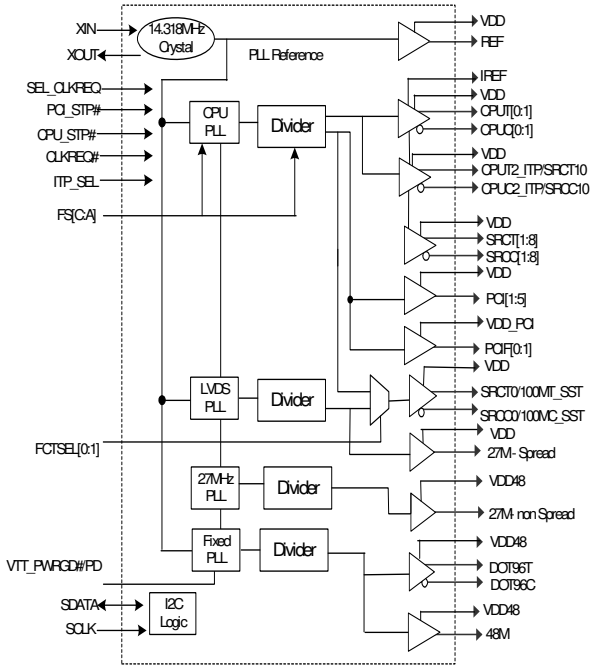
Clock Generator for Intel®Calistoga Chipset

Features

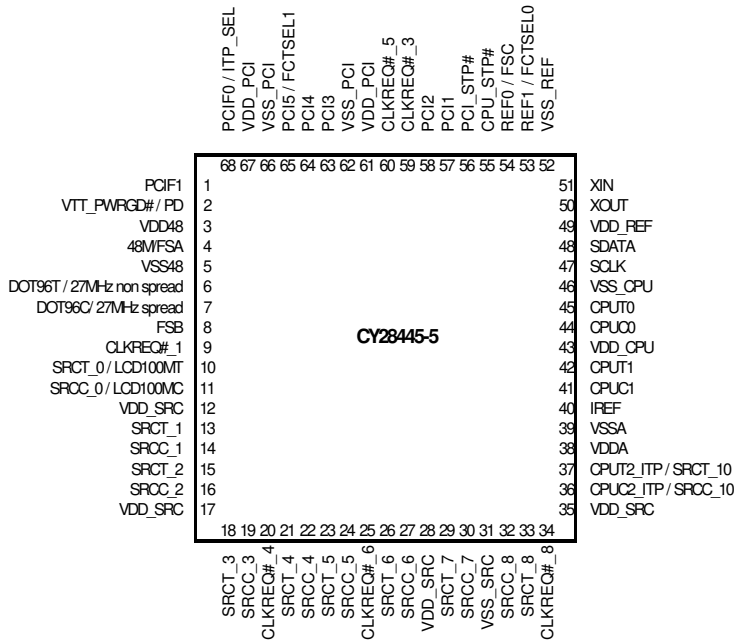
- Compliant to Intel® CK410M
- Selectable CPU frequencies
- Differential CPU clock pairs
- 100 MHz differential SRC clocks
- 96 MHz differential dot clock
- 27 MHz Spread and Non-spread video clock
- 48 MHz USB clock
- SRC clocks independently stoppable through CLKREQ#
- 96/100 MHz Spreadable differential video clock.
- 33 MHz PCI clock
- Buffered 14.318 MHz Reference Clock
- Low-voltage frequency select input
- I^2C support with readback capabilities
- Ideal Lexmark Spread Spectrum profile for maximum electromagnetic interference (EMI) reduction
- 3.3V power supply
- 68-pin QFN (MLF) package

CPU	SRC	PCI	REF	DOT96	USB_48M	LCD100M	27M
x2 / x3	x8/9/10	x7	x2	x 1	x 1	x1	x2

Block Diagram



Pin Configuration



400 West Cesar Chavez, Austin, TX 78701 1+(512) 416-8500 1+(512) 416-9669 www.silabs.com

Pin Descriptions

Pin No.	Name	Type	Description
1	PCIF1	O, SE	**33 MHz clock output**
2	VTT_PWRGD#/PD	I, PD	**3.3V LVTTL input.** This pin is a level sensitive strobe used to latch the FS[C:A], ITP_SEL, FCTSEL[1:0], SEL_CLKREQ#. After VTT_PWRGD# (active LOW) assertion, this pin becomes a real-time input for asserting power-down (active HIGH).
3	VDD48	PWR	**3.3V power supply**.
4	FSA/48M	I/O	**3.3V-tolerant input for CPU frequency selection / Fixed 48 MHz clock output**. Refer to DC Electrical Specification Table for Vil_FS and Vih_FS specifications.
5	VSS48	GND	**Ground**.
6, 7	DOT96T/27M_non spread DOT96C/27M_Spread	O, DIF	**Fixed 96 MHz differential clock output / Single ended 27 MHz clock outputs**. When configured for 27 MHz, only the clock on pin 7contains spread. Selected via FCTSEL[0:1] at VTT_PWRGD# assertion.
8	FSB	I	**3.3V-tolerant input for CPU frequency selection**. Refer to DC Electrical Specification Table for Vil_FS and Vih_FS specifications
9, 20, 25, 34, 59, 60	CLKREQ#[1], [3:6], [8]	I, PU	**3.3V LVTTL input for enabling assigned SRC clock (active LOW)**
10, 11	SRC[T/C]0/ LCD100M[T/C]	O,DIF	**100 MHz differential serial reference clock output / 100 MHz LVDS differential clock output**. Selected via FCTSEL[0:1] at VTT_PWRGD# assertion
12, 17, 28, 35	VDD_SRC	PWR	**3.3V power supply**
13,14, 15, 16, 18, 19, 21, 22, 23, 24, 26, 27, 29, 30, 32, 33,	SRC[T/C][1:8]	O, DIF	**100 MHz differential serial reference clock outputs**.
31	VSS_SRC	GND	**Ground**.
36, 37	CPUT2_ITP/SRCT10, CPUC2_ITP/SRCC10	O, DIF	**Selectable differential CPU / SRC clock output**. ITP_EN = 0 @ VTT_PWRGD# assertion = SRC10 (default) ITP_EN = 1@ VTT_PWRGD# assertion =CPU2_ITP
38	VDDA	PWR	**3.3V power supply for PLL**.
39	VSSA	GND	**Ground for PLL**.
40	IREF	I	**A precision resistor is attached to this pin**, which is connected to the internal current reference.
41, 42, 44, 45	CPU[T/C][0:1]	O, DIF	**Differential CPU clock outputs**.
43	VDD_CPU	PWR	**3.3V power supply**
46	VSS_CPU	GND	**Ground**
47	SCLK	I	**SMBus-compatible SCLOCK**.
48	SDATA	I/O, OD	**SMBus-compatible SDATA**.
49	VDD_REF	PWR	**3.3V power supply**
50	XOUT	O, SE	**14.318 MHz crystal output**.
51	XIN	I	**14.318 MHz crystal input**.

Pin Descriptions (continued)

Pin No.	Name	Type	Description
53	REF1/FCTSEL0	I/O, SE PD	**Fixed 14.318 MHz clock output / 3.3V LVTTL input for selecting for pin 6, 7 (DOT96[T/C], 27M-non-spread and Spread) and pin 10,11 (SRC[T/C]0 or 100M[T/C]_SST)** (sampled on the VTT_PWRGD# assertion).
54	REF0/FSC	I/O	**Fixed 14.318 MHz clock output / 3.3V-tolerant input for CPU frequency selection.** Refer to DC Electrical Specification Table for VilFS_C, VimFS_C and VihFS_C specifications
55	CPU_STP#	I, PU	**3.3V LVTTL input for CPU_STP# active LOW**.
56	PCI_STP#	I, PU	**3.3V LVTTL input for PCI_STP# active LOW**.
57, 58, 63, 64	PCI[1:4]	O, SE	**33 MHz clock outputs**.
61, 67	VDD_PCI	PWR	**3.3V power supply**
62, 66	VSS_PCI	GND	**Ground**
65	PCI5/FCTSEL1	O, SE PD	**33 MHz clock output / 3.3V LVTTL input for selecting for pin 6, 7 (DOT96[T/C], 27M-non-spread and Spread) and pin10,11 (SRC[T/C]0 or 100M[T/C]_SST)** (sampled on the VTT_PWRGD# assertion).
68	PCIF0/ITP_SEL	I/O, SE	**33 MHz clock output / 3.3V LVTTL input to enable SRC[T/C]10 or CPU[T/C]2_ITP on pin 36, 37.** (sampled on the VTT_PWRGD# assertion). 0 = SRC10 (default) 1 = CPU2_ITP,

FCTSEL1	FCTSEL0	PIN 6	PIN 7	PIN 10	PIN 11
0	0	DOT96T	DOT96C	100MT_SST	100MC_SST
0	1	DOT96T	DOT96C	SRCT0	SRCC0
1	0	27M_non spread	27M_Spread	SRCT0	SRCC0
1	1	OFF Low	TBD	SRCT0	SRCC0

Table 1. Frequency Select Table FSA, FSB and FSC

FSC	FSB	FSA	CPU	SRC	PCIF/PCI	27MHz	REF0	DOT96	USB
1	0	1	100 MHz	100 MHz	33 MHz	27 MHz	14.318 MHz	96 MHz	48 MHz
0	0	1	133 MHz	100 MHz	33 MHz	27 MHz	14.318 MHz	96 MHz	48 MHz
0	1	1	166 MHz	100 MHz	33 MHz	27 MHz	14.318 MHz	96 MHz	48 MHz
0	1	0	200 MHz	100 MHz	33 MHz	27 MHz	14.318 MHz	96 MHz	48 MHz

Frequency Select Pins (FSA, FSB, and FSC)

Host clock frequency selection is achieved by applying the appropriate logic levels to FSA, FSB, FSC inputs prior to VTT_PWRGD# assertion (as seen by the clock synthesizer). Upon VTT_PWRGD# being sampled low by the clock chip (indicating processor VTT voltage is stable), the clock chip samples the FSA, FSB, and FSC input values. For all logic levels of FSA, FSB, and FSC, VTT_PWRGD# employs a one-shot functionality in that once a valid low on VTT_PWRGD# has been sampled, all further VTT_PWRGD#, FSA, FSB, and FSC transitions will be ignored, except in test mode.

Serial Data Interface

To enhance the flexibility and function of the clock synthesizer, a two-signal serial interface is provided. Through the Serial Data Interface, various device functions, such as individual clock output buffers, can be individually enabled or disabled. The registers associated with the Serial Data Interface initialize to their default setting upon power-up, and therefore use of this interface is optional. Clock device register changes are normally made upon system initialization, if any are required. The interface cannot be used during system operation for power management functions.

Data Protocol

The clock driver serial protocol accepts byte write, byte read, block write, and block read operations from the controller. For block write/read operation, the bytes must be accessed in sequential order from lowest to highest byte (most significant bit first) with the ability to stop after any complete byte has been transferred. For byte write and byte read operations, the system controller can access individually indexed bytes. The offset of the indexed byte is encoded in the command code, as described in *Table 2*.

The block write and block read protocol is outlined in *Table 3* while *Table 4* outlines the corresponding byte write and byte read protocol. The slave receiver address is 11010010 (D2h).

Table 2. Command Code Definition

Bit	Description
7	0 = Block read or block write operation, 1 = Byte read or byte write operation
(6:0)	Byte offset for byte read or byte write operation. For block read or block write operations, these bits should be '0000000'

Table 3. Block Read and Block Write Protocol

Block Write Protocol		Block Read Protocol	
Bit	**Description**	**Bit**	**Description**
1	Start	1	Start
8:2	Slave address – 7 bits	8:2	Slave address – 7 bits
9	Write	9	Write
10	Acknowledge from slave	10	Acknowledge from slave
18:11	Command Code – 8 bits	18:11	Command Code – 8 bits
19	Acknowledge from slave	19	Acknowledge from slave
27:20	Byte Count – 8 bits (Skip this step if I^2C_EN bit set)	20	Repeat start
28	Acknowledge from slave	27:21	Slave address – 7 bits
36:29	Data byte 1 – 8 bits	28	Read = 1
37	Acknowledge from slave	29	Acknowledge from slave
45:38	Data byte 2 – 8 bits	37:30	Byte Count from slave – 8 bits
46	Acknowledge from slave	38	Acknowledge
....	Data Byte /Slave Acknowledges	46:39	Data byte 1 from slave – 8 bits
....	Data Byte N – 8 bits	47	Acknowledge
....	Acknowledge from slave	55:48	Data byte 2 from slave – 8 bits
....	Stop	56	Acknowledge
		....	Data bytes from slave / Acknowledge
		....	Data Byte N from slave – 8 bits
		....	NOT Acknowledge
		....	Stop

Table 4. Byte Read and Byte Write Protocol

Byte Write Protocol		Byte Read Protocol	
Bit	**Description**	**Bit**	**Description**
1	Start	1	Start
8:2	Slave address – 7 bits	8:2	Slave address – 7 bits
9	Write	9	Write
10	Acknowledge from slave	10	Acknowledge from slave
18:11	Command Code – 8 bits	18:11	Command Code – 8 bits
19	Acknowledge from slave	19	Acknowledge from slave
27:20	Data byte – 8 bits	20	Repeated start
28	Acknowledge from slave	27:21	Slave address – 7 bits
29	Stop	28	Read
		29	Acknowledge from slave
		37:30	Data from slave – 8 bits
		38	NOT Acknowledge
		39	Stop

Control Registers

Byte 0: Control Register 0

Bit	@Pup	Name	Description
7	1	SRC[T/C]7	SRC[T/C]7 Output Enable 0 = Disable (Tri-state), 1 = Enable
6	1	SRC[T/C]6	SRC[T/C]6 Output Enable 0 = Disable (Tri-state), 1 = Enable
5	1	SRC[T/C]5	SRC[T/C]5 Output Enable 0 = Disable (Tri-state), 1 = Enable
4	1	SRC[T/C]4	SRC[T/C]4 Output Enable 0 = Disable (Tri-state), 1 = Enable
3	1	SRC[T/C]3	SRC[T/C]3 Output Enable 0 = Disable (Tri-state), 1 = Enable
2	1	SRC[T/C]2	SRC[T/C]2 Output Enable 0 = Disable (Tri-state), 1 = Enable
1	1	SRC[T/C]1	SRC[T/C]1 Output Enable 0 = Disable (Tri-state), 1 = Enable
0	1	SRC[T/C]0 /LCD100M[T/C]	SRC[T/C]0 /LCD100M[T/C] Output Enable 0 = Disable (Hi-Z), 1 = Enable

Byte 1: Control Register 1

Bit	@Pup	Name	Description
7	1	PCIF0	PCIF0 Output Enable 0 = Disabled, 1 = Enabled
6	1	27M_nss / DOT_96[T/C]	27M_nss and DOT_96 MHz Output Enable 0 = Disable (Tri-state), 1 = Enabled
5	1	USB_48MHz	USB_48M MHz Output Enable 0 = Disabled, 1 = Enabled
4	1	REF0	REF0 Output Enable 0 = Disabled, 1 = Enabled
3	1	REF1	REF1 Output Enable 0 = Disabled, 1 = Enabled

Byte 1: Control Register 1 (continued)

Bit	@Pup	Name	Description
2	1	CPU[T/C]1	CPU[T/C]1 Output Enable 0 = Disable (Tri-state), 1 = Enabled
1	1	CPU[T/C]0	CPU[T/C]0 Output Enable 0 = Disable (Tri-state), 1 = Enabled
0	0	CPU	PLL1 (CPU PLL) Spread Spectrum Enable 0 = Spread off, 1 = Spread on

Byte 2: Control Register 2

Bit	@Pup	Name	Description
7	1	PCI5	PCI5 Output Enable 0 = Disabled, 1 = Enabled
6	1	PCI4	PCI4 Output Enable 0 = Disabled, 1 = Enabled
5	1	PCI3	PCI3 Output Enable 0 = Disabled, 1 = Enabled
4	1	PCI2	PCI2 Output Enable 0 = Disabled, 1 = Enabled
3	1	PCI1	PCI1 Output Enable 0 = Disabled, 1 = Enabled
2	1	RESERVED	RESERVED
1	1	CPU[T/C]2	CPU[T/C]2 Output Enable 0 = Disabled (Hi-Z), 1 = Enabled
0	1	PCIF1	PCIF1 Output Enable 0 = Disabled, 1 = Enabled

Byte 3: Control Register 3

Bit	@Pup	Name	Description
7	0	SRC7	Allow control of SRC[T/C]7 with assertion of PCI_STP# or SW PCI_STP# 0 = Free running, 1 = Stopped with PCI_STP#
6	0	SRC6	Allow control of SRC[T/C]6 with assertion of PCI_STP# or SW PCI_STP# 0 = Free running, 1 = Stopped with PCI_STP#
5	0	SRC5	Allow control of SRC[T/C]5 with assertion of PCI_STP# or SW PCI_STP# 0 = Free running, 1 = Stopped with PCI_STP#
4	0	SRC4	Allow control of SRC[T/C]4 with assertion of PCI_STP# or SW PCI_STP# 0 = Free running, 1 = Stopped with PCI_STP#
3	0	SRC3	Allow control of SRC[T/C]3 with assertion of PCI_STP# or SW PCI_STP# 0 = Free running, 1 = Stopped with PCI_STP#
2	0	SRC2	Allow control of SRC[T/C]2 with assertion of PCI_STP# or SW PCI_STP# 0 = Free running, 1 = Stopped with PCI_STP#
1	0	SRC1	Allow control of SRC[T/C]1 with assertion of PCI_STP# or SW PCI_STP# 0 = Free running, 1 = Stopped with PCI_STP#
0	0	SRC0	Allow control of SRC[T/C]0 with assertion of PCI_STP# or SW PCI_STP# 0 = Free running, 1 = Stopped with PCI_STP#

Byte 4: Control Register 4

Bit	@Pup	Name	Description
7	0	LCD100M[T/C]	LCD100M[T/C] PWRDWN Drive Mode 0 = Driven in PWRDWN, 1 = Tri-state
6	0	DOT96[T/C]	DOT PWRDWN Drive Mode 0 = Driven in PWRDWN, 1 = Tri-state
5	0	SRC[T/C]	SRC[T/C] Stop Drive Mode when CLKREQ# asserted 0 = Driven, 1 = Tri-state
4	0	PCIF1	Allow control of PCIF1 with assertion of SW and HW PCI_STP# 0 = Free running, 1 = Stopped with PCI_STP#
3	0	PCIF0	Allow control of PCIF0 with assertion of SW and HW PCI_STP# 0 = Free running, 1 = Stopped with PCI_STP#
2	1	CPU[T/C]2	Allow control of CPU[T/C]2 with assertion of CPU_STP# 0 = Free running, 1 = Stopped with CPU_STP#
1	1	CPU[T/C]1	Allow control of CPU[T/C]1 with assertion of CPU_STP# 0 = Free running, 1 = Stopped with CPU_STP#
0	1	CPU[T/C]0	Allow control of CPU[T/C]0 with assertion of CPU_STP# 0 = Free running, 1 = Stopped with CPU_STP#

Byte 5: Control Register 5

Bit	@Pup	Name	Description
7	0	SRC[T/C]	SRC[T/C] Stop Drive Mode 0 = Driven when PCI_STP# asserted,1 = Tri-state when PCI_STP# asserted
6	0	CPU[T/C]2	CPU[T/C]2 Stop Drive Mode 0 = Driven when CPU_STP# asserted,1 = Tri-state when CPU_STP# asserted
5	0	CPU[T/C]1	CPU[T/C]1 Stop Drive Mode 0 = Driven when CPU_STP# asserted,1 = Tri-state when CPU_STP# asserted
4	0	CPU[T/C]0	CPU[T/C]0 Stop Drive Mode 0 = Driven when CPU_STP# asserted,1 = Tri-state when CPU_STP# asserted
3	0	SRC[T/C]	SRC[T/C] PWRDWN Drive Mode 0 = Driven when PD asserted,1 = Tri-state when PD asserted
2	0	CPU[T/C]2	CPU[T/C]2 PWRDWN Drive Mode 0 = Driven when PD asserted,1 = Tri-state when PD asserted
1	0	CPU[T/C]1	CPU[T/C]1 PWRDWN Drive Mode 0 = Driven when PD asserted,1 = Tri-state when PD asserted
0	0	CPU[T/C]0	CPU[T/C]0 PWRDWN Drive Mode 0 = Driven when PD asserted,1 = Tri-state when PD asserted

Byte 6: Control Register 6

Bit	@Pup	Name	Description
7	0	TEST_SEL	REF/N or Tri-state Select 0 = Tri-state, 1 = REF/N Clock
6	0	TEST_MODE	Test Clock Mode Entry Control 0 = Normal operation, 1 = REF/N or Tri-state mode,
5	1	REF1	REF0 Output Drive Strength 0 = Low, 1 = High
4	1	REF0	REF0 Output Drive Strength 0 = Low, 1 = High

Byte 6: Control Register 6 (continued)

Bit	@Pup	Name	Description
3	1	PCI, PCIF and SRC clock outputs except those set to free running	SW PCI_STP Function 0 = SW PCI_STP assert, 1 = SW PCI_STP deassert When this bit is set to 0, all STOPPABLE PCI, PCIF and SRC outputs will be stopped in a synchronous manner with no short pulses. When this bit is set to 1, all STOPPED PCI, PCIF and SRC outputs will resume in a synchronous manner with no short pulses.
2	HW	FSC	FSC Reflects the value of the FSC pin sampled on power-up 0 = FSC was low during VTT_PWRGD# assertion
1	HW	FSB	FSB Reflects the value of the FSB pin sampled on power-up 0 = FSB was low during VTT_PWRGD# assertion
0	HW	FSA	FSA Reflects the value of the FSA pin sampled on power-up 0 = FSA was low during VTT_PWRGD# assertion

Byte 7: Vendor ID

Bit	@Pup	Name	Description
7	0	Revision Code Bit 3	Revision Code Bit 3
6	0	Revision Code Bit 2	Revision Code Bit 2
5	0	Revision Code Bit 1	Revision Code Bit 1
4	1	Revision Code Bit 0	Revision Code Bit 0
3	1	Vendor ID Bit 3	Vendor ID Bit 3
2	0	Vendor ID Bit 2	Vendor ID Bit 2
1	0	Vendor ID Bit 1	Vendor ID Bit 1
0	0	Vendor ID Bit 0	Vendor ID Bit 0

Byte 8: Control Register 8

Bit	@Pup	Name	Description
7	0	CPU_SS	0: –0.5% (Peak to peak) 1: –1.0% (Peak to peak)
6	0	CPU-DWN_SS	0: Down Spread 1: Center Spread
5	0	RESERVED	RESERVED, Set = 0
4	0	RESERVED	RESERVED, Set = 0
3	0	RESERVED	RESERVED, Set = 0
2	1	48M	48-MHz Output Drive Strength 0 = Low, 1 = High
1	1	PCI1	33-MHz Output Drive Strength 0 = Low, 1 = High
0	1	PCIF0	33-MHz Output Drive Strength 0 = Low, 1 = High

Byte 9: Control Register 9

Bit	@Pup	Name	Description
7	0	S3	27_96_100_SSC Spread Spectrum Selection table: S[3:0] SS% '0000' = –0.45%(Default value) '0001' = –0.9% '0010' = –1.45% '0011' = –1.9% '0100' = ±0.225% '0101' = ±0.45% '0110' = ±0.725% '0111' = ±0.95% '1000' = –0.34% '1001' = –0.68% '1010' = –1.09% '1011' = –1.425% '1100' = ±0.17% '1101' = ±0.34% '1110' = ±0.545% '1111' = ±0.712%
6	0	S2	
5	0	S1	
4	0	S0	
3	1	RESERVED	RESERVED, Set = 1
2	1	27_M Spread	27_MHz Spread Output Enable 0 = Disable (Hi-Z), 1 = Enable.
1	1	27M_SS / LCD100M SS Enable	27M_SS / LCD100M Spread Spectrum Enable. 0 = Disable, 1 = Enable.
0	0	PCIF1	33-MHz Output Drive Strength 0 = Low, 1 = High

Byte 10: Control Register 10

Bit	@Pup	Name	Description
7	1	SRC[T/C]10	SRC[T/C]10 Output Enable 0 = Disable (Hi-Z), 1 = Enable
6	1	RESERVED	RESERVED
5	1	RESERVED	RESERVED
4	1	SRC[T/C]8	SRC[T/C]8 Output Enable 0 = Disable (Hi-Z), 1 = Enable
3	0	RESERVED	RESERVED
2	0	SRC[T/C]10	Allow control of SRC[T/C]10 with assertion of SW PCI_STP# 0 = Free running, 1 = Stopped with PCI_STP#
1	0	RESERVED	RESERVED
0	0	SRC[T/C]8	Allow control of SRC[T/C]8 with assertion of SW PCI_STP# 0 = Free running, 1 = Stopped with PCI_STP#

Byte 11: Control Register 11

Bit	@Pup	Name	Description
7	0	RESERVED	RESERVED Set = 0
6	HW	RESERVED	RESERVED
5	HW	RESERVED	RESERVED
4	HW	RESERVED	RESERVED
3	0	27M spread and non-spread output drive strength	27M (Spread and Non-spread) Output Drive Strength 0 = Low, 1 = High

Byte 11: Control Register 11

Bit	@Pup	Name	Description
2	0	RESERVED	RESERVED Set = 0
1	0	RESERVED	RESERVED Set = 0
0	HW	RESERVED	RESERVED

Byte 12: Control Register 12

Bit	@Pup	Name	Description
7	0	RESERVED	RESERVED
6	0	CLKREQ#8	CLKREQ#8 Input Enable 0 = Disable 1 = Enable
5	0	RESERVED	RESERVED
4	0	CLKREQ#6	CLKREQ#6 Input Enable 0 = Disable 1 = Enable
3	0	CLKREQ#5	CLKREQ#5 Input Enable 0 = Disable 1 = Enable
2	0	CLKREQ#4	CLKREQ#4 Input Enable 0 = Disable 1 = Enable
1	0	CLKREQ#3	CLKREQ#3 Input Enable 0 = Disable 1 = Enable
0	0	RESERVED	RESERVED

Byte 13: Control Register 13

Bit	@Pup	Name	Description
7	0	CLKREQ#1	CLKREQ#1 Input Enable 0 = Disable 1 = Enable
6	1	LCDCLK Speed	LCD 96/100 MHz clock speed selection 0 = 96 MHz, 1 = 100 MHz
5	1	RESERVED	RESERVED
4	1	RESERVED	RESERVED
3	1	PCI5	PCI5 (Spread and Non-spread) Output Drive Strength 0 = Low, 1 = High
2	1	PCI4	PCI4 (Spread and Non-spread) Output Drive Strength 0 = Low, 1 = High
1	1	PCI3	PCI3 (Spread and Non-spread) Output Drive Strength 0 = Low, 1 = High
0	1	PCI2	PCI2 (Spread and Non-spread) Output Drive Strength 0 = Low, 1 = High

Byte 14: Control Register 14

Bit	@Pup	Name	Description
7	1	RESERVED	RESERVED
6	0	RESERVED	RESERVED
5	0	RESERVED	RESERVED
4	0	RESERVED	RESERVED
3	0	RESERVED	RESERVED
2	0	RESERVED	RESERVED
1	0	RESERVED	RESERVED

Byte 14: Control Register 14 (continued)

Bit	@Pup	Name	Description
0	0	RESERVED	RESERVED

Byte 15: Control Register 15

Bit	@Pup	Name	Description
7	1	CLKREQ#8	SRC[T/C]8 Control 0 = SRC[T/C]8 not stoppable by CLKREQ#8 1 = SRC[T/C]8 stoppable by CLKREQ#8
6	0	CLKREQ#8	SRC[T/C]7 Control 0 = SRC[T/C]7 not stoppable by CLKREQ#8 1 = SRC[T/C]7 stoppable by CLKREQ#8
5	0	CLKREQ#8	SRC[T/C]6 Control 0 = SRC[T/C]6 not stoppable by CLKREQ#8 1 = SRC[T/C]6 stoppable by CLKREQ#8
4	0	CLKREQ#8	SRC[T/C]5 Control 0 = SRC[T/C]5 not stoppable by CLKREQ#8 1 = SRC[T/C]5 stoppable by CLKREQ#8
3	0	CLKREQ#8	SRC[T/C]4 Control 0 = SRC[T/C]4 not stoppable by CLKREQ#8 1 = SRC[T/C]4 stoppable by CLKREQ#8
2	0	CLKREQ#8	SRC[T/C]3 Control 0 = SRC[T/C]3 not stoppable by CLKREQ#8 1 = SRC[T/C]3 stoppable by CLKREQ#8
1	0	CLKREQ#8	SRC[T/C]2 Control 0 = SRC[T/C]2 not stoppable by CLKREQ#8 1 = SRC[T/C]2 stoppable by CLKREQ#8
0	0	CLKREQ#8	SRC[T/C]1 Control 0 = SRC[T/C1 not stoppable by CLKREQ#8 1 = SRC[T/C]1 stoppable by CLKREQ#8

Byte 16: Control Register 16

Bit	@Pup	Name	Description
7	0	CLKREQ#5	SRC[T/C]8 Control 0 = SRC[T/C]8 not stoppable by CLKREQ#5 1 = SRC[T/C]8 stoppable by CLKREQ#5
6	0	CLKREQ#5	SRC[T/C]7 Control 0 = SRC[T/C]7 not stoppable by CLKREQ#5 1 = SRC[T/C]7 stoppable by CLKREQ#5
5	0	CLKREQ#5	SRC[T/C]6 Control 0 = SRC[T/C]6 not stoppable by CLKREQ#5 1= SRC[T/C]6 stoppable by CLKREQ#5
4	1	CLKREQ#5	SRC[T/C]5 Control 0 = SRC[T/C]5 not stoppable by CLKREQ#5 1= SRC[T/C]5 stoppable by CLKREQ#5
3	0	CLKREQ#5	SRC[T/C]4 Control 0 = SRC[T/C]4 not stoppable by CLKREQ#5 1 = SRC[T/C]4 stoppable by CLKREQ#5
2	0	CLKREQ#5	SRC[T/C]3 Control 0 = SRC[T/C]3 not stoppable by CLKREQ#5 1 = SRC[T/C]3 stoppable by CLKREQ#5
1	0	CLKREQ#5	SRC[T/C]2 Control 0 = SRC[T/C]2 not stoppable by CLKREQ#5 1 = SRC[T/C]2 stoppable by CLKREQ#5

Byte 16: Control Register 16 (continued)

Bit	@Pup	Name	Description
0	0	CLKREQ#5	SRC[T/C]1 Control 0 = SRC[T/C]1 not stoppable by CLKREQ#5 1 = SRC[T/C]1 stoppable by CLKREQ#5

Byte 17: Control Register 17

Bit	@Pup	Name	Description
7	0	CLKREQ#4	SRC[T/C]8 Control 0 = SRC[T/C]8 not stoppable by CLKREQ#4 1 = SRC[T/C]8 stoppable by CLKREQ#4
6	0	CLKREQ#4	SRC[T/C]7 Control 0 = SRC[T/C]7 not stoppable by CLKREQ#4 1 = SRC[T/C]7 stoppable by CLKREQ#4
5	0	CLKREQ#4	SRC[T/C]6 Control 0 = SRC[T/C]6 not stoppable by CLKREQ#4 1 = SRC[T/C]6 stoppable by CLKREQ#4
4	0	CLKREQ#4	SRC[T/C]5 Control 0 = SRC[T/C]5 not stoppable by CLKREQ#4 1 = SRC[T/C]5 stoppable by CLKREQ#4
3	1	CLKREQ#4	SRC[T/C]4 Control 0 = SRC[T/C]4 not stoppable by CLKREQ#4 1 = SRC[T/C]4 stoppable by CLKREQ#4
2	0	CLKREQ#4	SRC[T/C]3 Control 0 = SRC[T/C]3 not stoppable by CLKREQ#4 1 = SRC[T/C]3 stoppable by CLKREQ#4
1	0	CLKREQ#4	SRC[T/C]2 Control 0 = SRC[T/C]2 not stoppable by CLKREQ#4 1 = SRC[T/C]2 stoppable by CLKREQ#4
0	0	CLKREQ#4	SRC[T/C]1 Control 0 = SRC[T/C]1 not stoppable by CLKREQ#4 1 = SRC[T/C]1 stoppable by CLKREQ#4

Byte 18: Control Register 18

Bit	@Pup	Name	Description
7	0	CLKREQ#3	SRC[T/C]8 Control 0 = SRC[T/C]8 not stoppable by CLKREQ#3 1 = SRC[T/C]8 stoppable by CLKREQ#3
6	0	CLKREQ#3	SRC[T/C]7 Control 0 = SRC[T/C]7 not stoppable by CLKREQ#3 1 = SRC[T/C]7 stoppable by CLKREQ#3
5	0	CLKREQ#3	SRC[T/C]6 Control 0 = SRC[T/C]6 not stoppable by CLKREQ#3 1 = SRC[T/C]6 stoppable by CLKREQ#3
4	0	CLKREQ#3	SRC[T/C]5 Control 0 = SRC[T/C]5 not stoppable by CLKREQ#3 1 = SRC[T/C]5 stoppable by CLKREQ#3
3	0	CLKREQ#3	SRC[T/C]4 Control 0 = SRC[T/C]4 not stoppable by CLKREQ#3 1 = SRC[T/C]4 stoppable by CLKREQ#3
2	1	CLKREQ#3	SRC[T/C]3 Control 0 = SRC[T/C]3 not stoppable by CLKREQ#3 1 = SRC[T/C]3 stoppable by CLKREQ#3

Byte 18: Control Register 18 (continued)

Bit	@Pup	Name	Description
1	0	CLKREQ#3	SRC[T/C]2 Control 0 = SRC[T/C]2 not stoppable by CLKREQ#3 1 = SRC[T/C]2 stoppable by CLKREQ#3
0	0	CLKREQ#3	SRC[T/C]1 Control 0 = SRC[T/C]1 not stoppable by CLKREQ#3 1 = SRC[T/C]1 stoppable by CLKREQ#3

Byte 19: Control Register 19

Bit	@Pup	Name	Description
7	0	CLKREQ#1	SRC[T/C]8 Control 0 = SRC[T/C]8 not stoppable by CLKREQ#1 1 = SRC[T/C]8 stoppable by CLKREQ#1
6	0	CLKREQ#1	SRC[T/C]7 Control 0 = SRC[T/C]7 not stoppable by CLKREQ#1 1 = SRC[T/C]7 stoppable by CLKREQ#1
5	0	CLKREQ#1	SRC[T/C]6 Control 0 = SRC[T/C]6 not stoppable by CLKREQ#1 1= SRC[T/C]6 stoppable by CLKREQ#1
4	0	CLKREQ#1	SRC[T/C]5 Control 0 = SRC[T/C]5 not stoppable by CLKREQ#1 1 = SRC[T/C]5 stoppable by CLKREQ#1
3	0	CLKREQ#1	SRC[T/C]4 Control 0 = SRC[T/C]4 not stoppable by CLKREQ#1 1 = SRC[T/C]4 stoppable by CLKREQ#1
2	0	CLKREQ#1	SRC[T/C]3 Control 0 = SRC[T/C]3 not stoppable by CLKREQ#1 1 = SRC[T/C]3 stoppable by CLKREQ#1
1	0	CLKREQ#1	SRC[T/C]2 Control 0 = SRC[T/C]2 not stoppable by CLKREQ#1 1 = SRC[T/C]2 stoppable by CLKREQ#1
0	1	CLKREQ#1	SRC[T/C]1 Control 0 = SRC[T/C]1 not stoppable by CLKREQ#1 1 = SRC[T/C]1 stoppable by CLKREQ#1

Table 5. Crystal Recommendations

Frequency (Fund)	Cut	Loading	Load Cap	Drive (max.)	Shunt Cap (max.)	Motional (max.)	Tolerance (max.)	Stability (max.)	Aging (max.)
14.31818 MHz	AT	Parallel	20 pF	0.1 mW	5 pF	0.016 pF	35 ppm	30 ppm	5 ppm

The CY28445-5 requires a Parallel Resonance Crystal. Substituting a series resonance crystal will cause the CY28445-5 to operate at the wrong frequency and violate the ppm specification. For most applications there is a 300-ppm frequency shift between series and parallel crystals due to incorrect loading.

Crystal Loading

Crystal loading plays a critical role in achieving low ppm performance. To realize low ppm performance, the total capacitance the crystal will see must be considered to calculate the appropriate capacitive loading (CL).

Figure 1 shows a typical crystal configuration using the two trim capacitors. An important clarification for the following discussion is that the trim capacitors are in series with the crystal not parallel. It's a common misconception that load capacitors are in parallel with the crystal and should be approximately equal to the load capacitance of the crystal. This is not true.

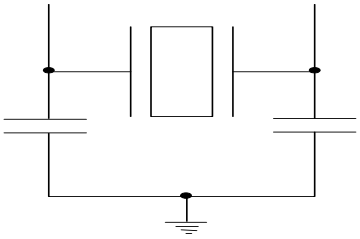


Figure 1. Crystal Capacitive Clarification

Calculating Load Capacitors

In addition to the standard external trim capacitors, trace capacitance and pin capacitance must also be considered to correctly calculate crystal loading. As mentioned previously, the capacitance on each side of the crystal is in series with the crystal. This means the total capacitance on each side of the crystal must be twice the specified crystal load capacitance (CL). While the capacitance on each side of the crystal is in series with the crystal, trim capacitors (Ce1,Ce2) should be calculated to provide equal capacitive loading on both sides.

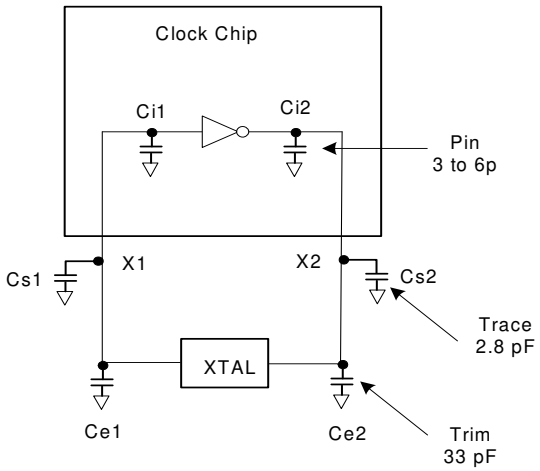


Figure 2. Crystal Loading Example

Use the following formulas to calculate the trim capacitor values for Ce1 and Ce2.

Load Capacitance (each side)

$$Ce = 2 * CL - (Cs + Ci)$$

Total Capacitance (as seen by the crystal)

$$CLe = \frac{1}{\left(\frac{1}{Ce1 + Cs1 + Ci1} + \frac{1}{Ce2 + Cs2 + Ci2}\right)}$$

CL.....Crystal load capacitance

CLe..... Actual loading seen by crystal using standard value trim capacitors

Ce..... External trim capacitors

Cs.....Stray capacitance (terraced)

Ci .....Internal capacitance (lead frame, bond wires etc.)

CLKREQ# Description

The CLKREQ# signals are active LOW inputs used for clean enabling and disabling selected SRC outputs. The outputs controlled by CLKREQ# are determined by the settings in register byte 8. The CLKREQ# signal is a de-bounced signal in that it's state must remain unchanged during two consecutive rising edges of SRCC to be recognized as a valid assertion or deassertion. (The assertion and deassertion of this signal is absolutely asynchronous.).

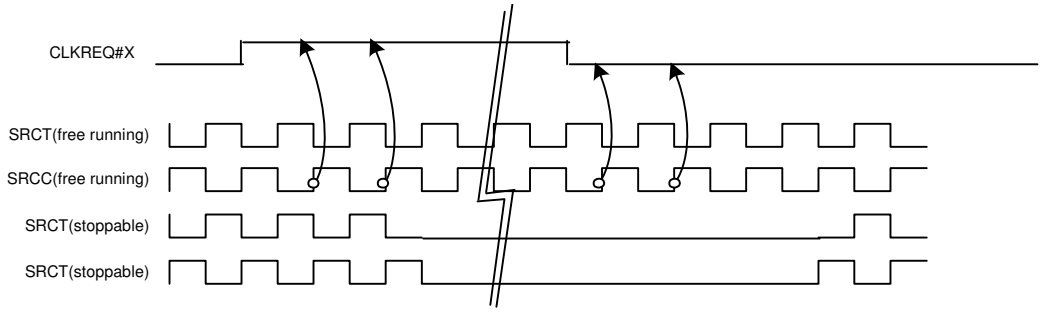


Figure 3. CLK_REQ# Deassertion/Assertion Waveform

CLKREQ# Assertion (CLKREQ# -> LOW)

All differential outputs that were stopped are to resume normal operation in a glitch free manner. The maximum latency from the assertion to active outputs is between 2–6 SRC clock periods (2 clocks are shown) with all SRC outputs resuming simultaneously. All stopped SRC outputs must be driven high within 10 ns of CLKREQ# deassertion to a voltage greater than 200 mV.

CLKREQ# Deassertion (CLKREQ# -> HIGH)

The impact of deasserting the CLKREQ# pins is all SRC outputs that are set in the control registers to stoppable via deassertion of CLKREQ# are to be stopped after their next transition. The final state of all stopped DIF signals is low, both SRCT clock and SRCC clock outputs will not be driven.PD (Power-down) Clarification

The VTT_PWRGD# /PD pin is a dual-function pin. During initial power-up, the pin functions as VTT_PWRGD#. Once VTT_PWRGD# has been sampled low by the clock chip, the pin assumes PD functionality. The PD pin is an asynchronous active high input used to shut off all clocks cleanly prior to shutting off power to the device. This signal is synchronized internal to the device prior to powering down the clock synthesizer. PD is also an asynchronous input for powering up the system. When PD is asserted high, all clocks need to be driven to a low value and held prior to turning off the VCOs and the crystal oscillator.

PD Assertion

When PD is sampled high by two consecutive rising edges of CPUC, all single-ended outputs will be held low on their next high to low transition and differential clocks must held high or tri-stated (depending on the state of the control register drive mode bit) on the next diff clock# high to low transition within 4 clock periods. When the SMBus PD drive mode bit corresponding to the differential (CPU, SRC, and DOT) clock output of interest is programmed to ‘0’, the clock output are held with “Diff clock” pin driven high at 2 x Iref, and “Diff clock#” tristate. If the control register PD drive mode bit corresponding to the output of interest is programmed to “1”, then both the “Diff clock” and the “Diff clock#” are tri-state. Note the example below shows CPUT = 133 MHz and PD drive mode = ‘1’ for all differential outputs. This diagram and description is applicable to valid CPU frequencies 100, 133, 166, and 200 MHz. In the event that PD mode is desired as the initial power-on state, PD must be asserted high in less than 10 µs after asserting Vtt_PwrGd#. It should be noted that 96_100_SSC will follow the DOT waveform is selected for 96 MHz and the SRC waveform when in 100-MHz mode.

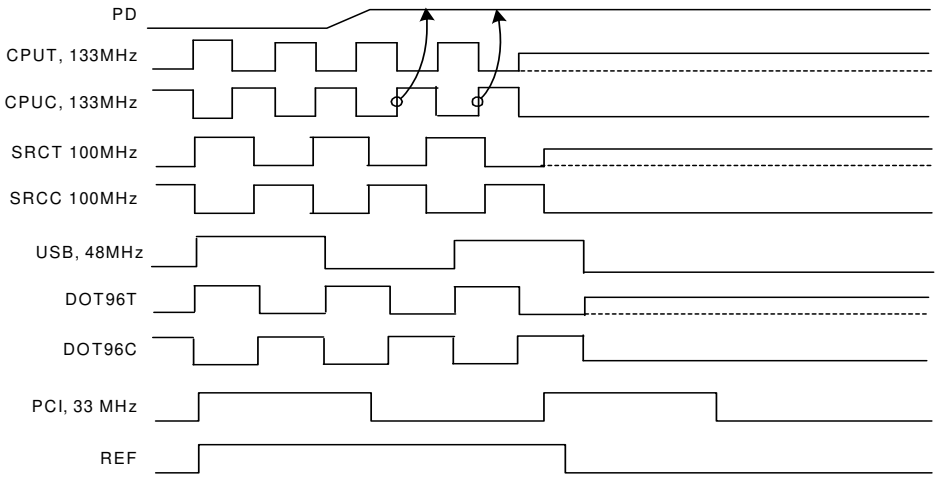


Figure 4. PD Assertion Timing Waveform

PD Deassertion

The power-up latency is less than 1.8 ms. This is the time from the deassertion of the PD pin or the ramping of the power supply until the time that stable clocks are output from the clock chip. All differential outputs stopped in a three-state condition resulting from power down will be driven high in less than 300 µs of PD deassertion to a voltage greater than 200 mV. After the clock chip’s internal PLL is powered up and locked, all outputs will be enabled within a few clock cycles of each other. Below is an example showing the relationship of clocks coming up. It should be noted that 96_100_SSC will follow the DOT waveform is selected for 96 MHz and the SRC waveform when in 100-MHz mode.

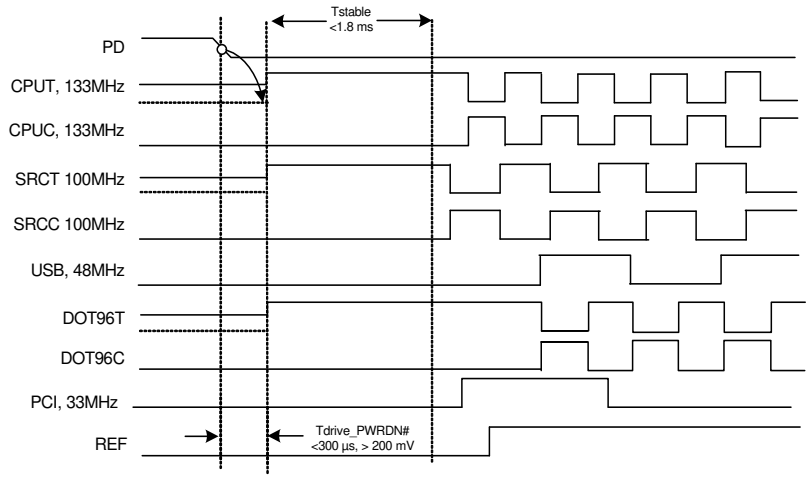


Figure 5. PD Deassertion Timing Waveform

CPU_STP# Assertion

The CPU_STP# signal is an active low input used for synchronous stopping and starting the CPU output clocks while the rest of the clock generator continues to function. When the CPU_STP# pin is asserted, all CPU outputs that are set with the SMBus configuration to be stoppable via assertion of CPU_STP# will be stopped within two–six CPU clock periods after being sampled by two rising edges of the internal CPUC clock. The final states of the stopped CPU signals are CPUT = HIGH and CPUC = LOW. There is no change to the output drive current values during the stopped state. The CPUT is driven HIGH with a current value equal to 6 x (Iref), and the CPUC signal will be Tri-stated.

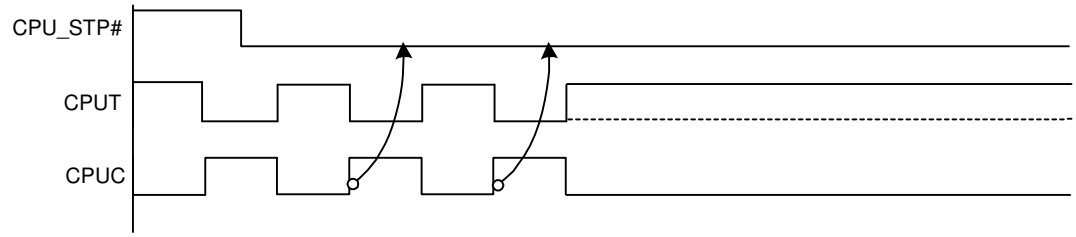


Figure 6. CPU_STP# Assertion Waveform

CPU_STP# Deassertion

The deassertion of the CPU_STP# signal will cause all CPU outputs that were stopped to resume normal operation in a synchronous manner. Synchronous manner meaning that no short or stretched clock pulses will be produce when the clock resumes. The maximum latency from the deassertion to active outputs is no more than two CPU clock cycles.

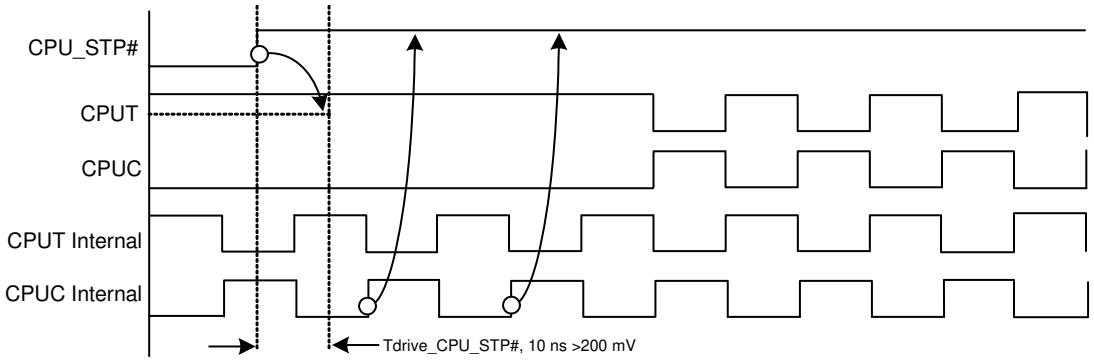


Figure 7. CPU_STP# Deassertion Waveform

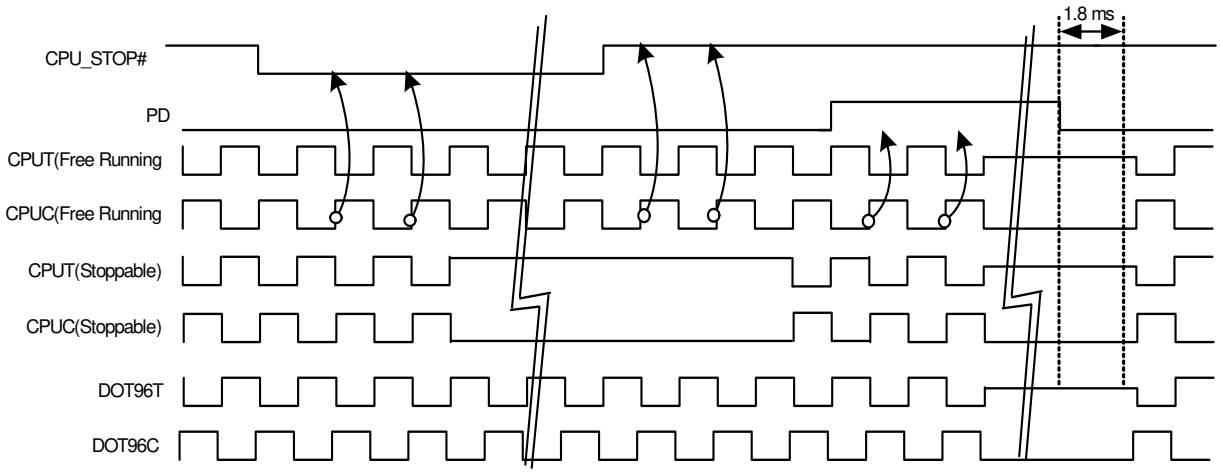


Figure 8. CPU_STP#= Driven, CPU_PD = Driven, DOT_PD = Driven

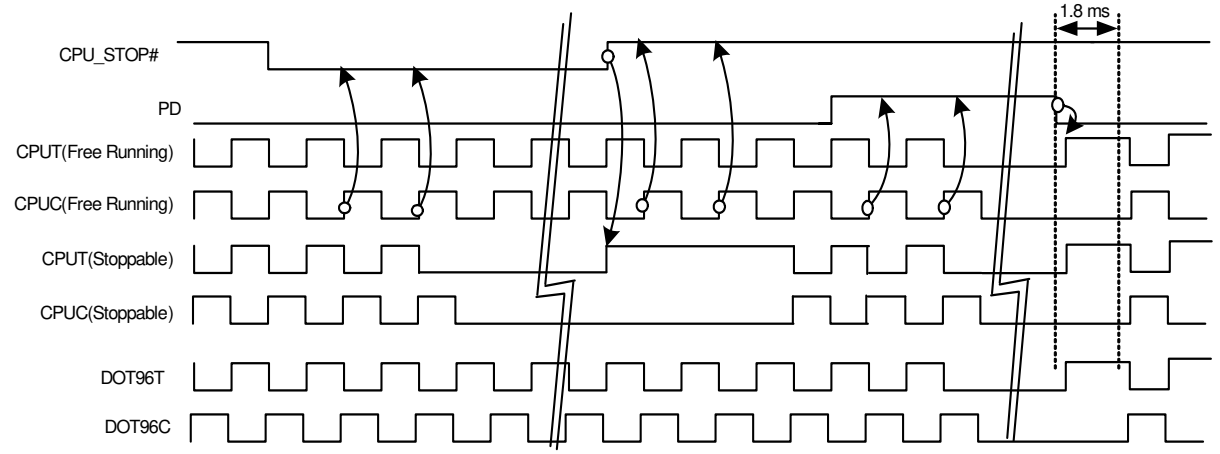


Figure 9. CPU_STP# = Tri-state, CPU_PD = Tri-state, DOT_PD = Tri-state

PCI_STP# Assertion

The PCI_STP# signal is an active LOW input used for synchronous stopping and starting the PCI outputs while the rest of the clock generator continues to function. The set-up time for capturing PCI_STP# going LOW is 10 ns (t_{SU}). (See *Figure 10*.) The PCIF clocks will not be affected by this pin if their corresponding control bit in the SMBus register is set to allow them to be free running.

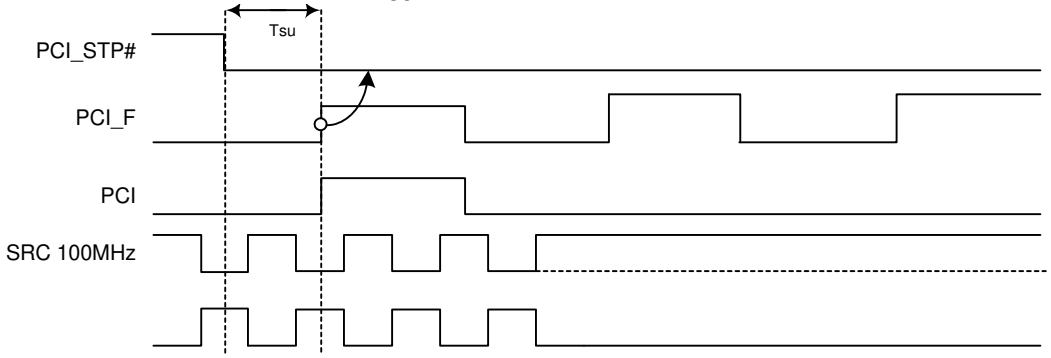


Figure 10. PCI STP# Assertion Waveform

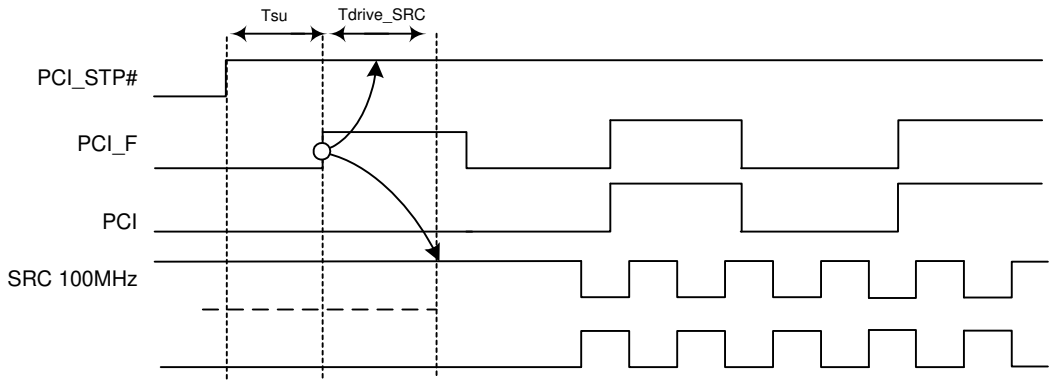


Figure 11. PCI_STP# Deassertion Waveform

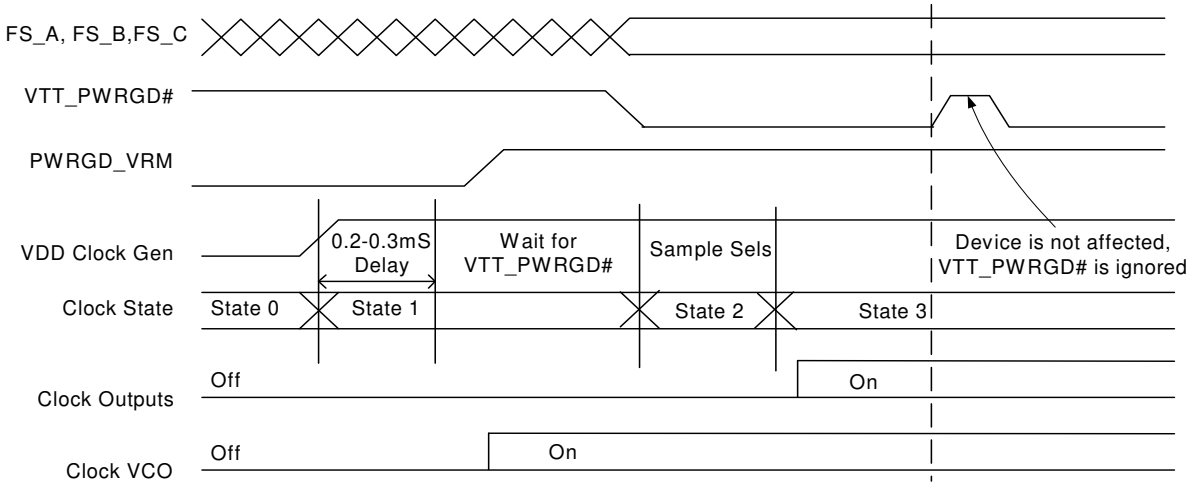


Figure 12. VTTPWRGD# Timing Diagram

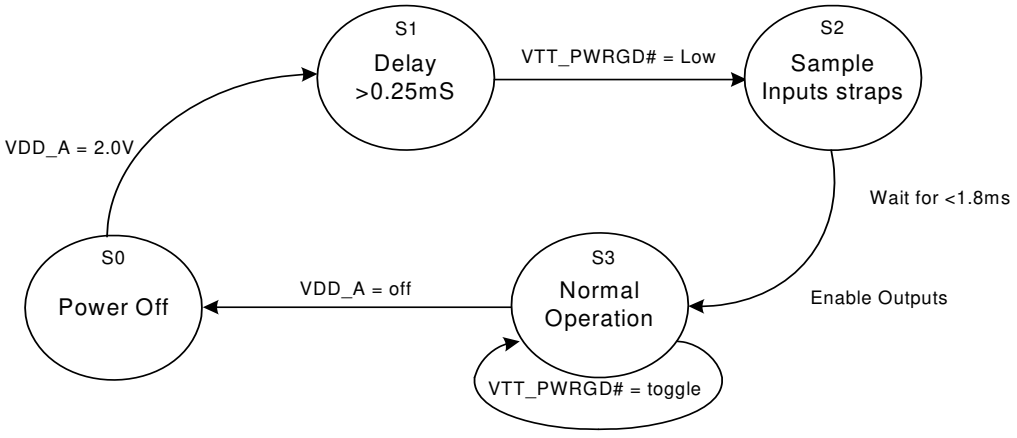


Figure 13. Clock Generator Power-up/Run State Diagram

Absolute Maximum Conditions

Parameter	Description	Condition	Min.	Max.	Unit
V_{DD}	Core Supply Voltage		–0.5	4.6	V
V_{DD_A}	Analog Supply Voltage		–0.5	4.6	V
V_{IN}	Input Voltage	Relative to V_{SS}	–0.5	V_{DD} + 0.5	VDC
T_S	Temperature, Storage	Non-functional	–65	150	°C
T_A	Temperature, Operating Ambient	Functional	0	85	°C
T_J	Temperature, Junction	Functional	–	150	°C
$Ø_{JC}$	Dissipation, Junction to Case	Mil-STD-883E Method 1012.1	–	20	°C/W
$Ø_{JA}$	Dissipation, Junction to Ambient	JEDEC (JESD 51)	–	60	°C/W
ESD_{HBM}	ESD Protection (Human Body Model)	MIL-STD-883, Method 3015	2000	–	V
UL-94	Flammability Rating	At 1/8 in.	V–0		
MSL	Moisture Sensitivity Level		1		

Multiple Supplies: The Voltage on any input or I/O pin cannot exceed the power pin during power-up. Power supply sequencing is NOT required.

DC Electrical Specifications

Parameter	Description	Condition	Min.	Max.	Unit
All V_{DD}s	3.3V Operating Voltage	3.3 ± 5%	3.135	3.465	V
V_{ILI2C}	Input Low Voltage	SDATA, SCLK	–	1.0	V
V_{IHI2C}	Input High Voltage	SDATA, SCLK	2.2	–	V
V_{IL_FS}	FS_[A,B] Input Low Voltage		V_{SS} – 0.3	0.35	V
V_{IH_FS}	FS_[A,B] Input High Voltage		0.7	V_{DD} + 0.5	V
V_{ILFS_C}	FS_C Input Low Voltage		V_{SS} – 0.3	0.35	V
V_{IMFS_C}	FS_C Input Middle Voltage	Typical	0.7	1.7	V
V_{IHFS_C}	FS_C Input High Voltage	Typical	2.0	V_{DD} + 0.5	V
V_{IL}	3.3V Input Low Voltage		V_{SS} – 0.3	0.8	V
V_{IH}	3.3V Input High Voltage		2.0	V_{DD} + 0.3	V
I_{IL}	Input Low Leakage Current	Except internal pull-up resistors, $0 < V_{IN} < V_{DD}$	–5	5	µA
I_{IH}	Input High Leakage Current	Except internal pull-down resistors, $0 < V_{IN} < V_{DD}$	–	5	µA
V_{OL}	3.3V Output Low Voltage	I_{OL} = 1 mA	–	0.4	V
V_{OH}	3.3V Output High Voltage	I_{OH} = –1 mA	2.4	–	V
I_{OZ}	High-impedance Output Current		–10	10	µA
C_{IN}	Input Pin Capacitance		3	5	pF
C_{OUT}	Output Pin Capacitance		3	6	pF
L_{IN}	Pin Inductance		–	7	nH
V_{XIH}	Xin High Voltage		$0.7V_{DD}$	V_{DD}	V
V_{XIL}	Xin Low Voltage		0	$0.3V_{DD}$	V
$I_{DD3.3V}$	Dynamic Supply Current	At max. load and freq. per *Figure 15*	–	400	mA
$I_{PD3.3V}$	Power-down Supply Current	PD asserted, Outputs Driven	–	70	mA
$I_{PD3.3V}$	Power-down Supply Current	PD asserted, Outputs Tri-state	–	5	mA

AC Electrical Specifications

Parameter	Description	Condition	Min.	Max.	Unit
Crystal					
T_{DC}	XIN Duty Cycle	The device will operate reliably with input duty cycles up to 30/70 but the REF clock duty cycle will not be within specification	47.5	52.5	%
T_{PERIOD}	XIN Period	When XIN is driven from an external clock source	69.841	71.0	ns
T_R / T_F	XIN Rise and Fall Times	Measured between $0.3V_{DD}$ and $0.7V_{DD}$	–	10.0	ns
T_{CCJ}	XIN Cycle to Cycle Jitter	As an average over 1-µs duration	–	500	ps
L_{ACC}	Long-term Accuracy	Measured at crossing point V_{OX}	–	300	ppm
CPU at 0.7V					
T_{DC}	CPUT and CPUC Duty Cycle	Measured at crossing point V_{OX}	45	55	%
T_{PERIOD}	100-MHz CPUT and CPUC Period	Measured at crossing point V_{OX}	9.997001	10.00300	ns
T_{PERIOD}	133-MHz CPUT and CPUC Period	Measured at crossing point V_{OX}	7.497751	7.502251	ns
T_{PERIOD}	166-MHz CPUT and CPUC Period	Measured at crossing point V_{OX}	5.998201	6.001801	ns
T_{PERIOD}	200-MHz CPUT and CPUC Period	Measured at crossing point V_{OX}	4.998500	5.001500	ns
$T_{PERIODSS}$	100-MHz CPUT and CPUC Period, SSC	Measured at crossing point V_{OX}	9.997001	10.05327	ns
$T_{PERIODSS}$	133-MHz CPUT and CPUC Period, SSC	Measured at crossing point V_{OX}	7.497751	7.539950	ns
$T_{PERIODSS}$	166-MHz CPUT and CPUC Period, SSC	Measured at crossing point V_{OX}	5.998201	6.031960	ns
$T_{PERIODSS}$	200-MHz CPUT and CPUC Period, SSC	Measured at crossing point V_{OX}	4.998500	5.026634	ns
$T_{PERIODAbs}$	100-MHz CPUT and CPUC Absolute period	Measured at crossing point V_{OX}	9.912001	10.08800	ns
$T_{PERIODAbs}$	133-MHz CPUT and CPUC Absolute period	Measured at crossing point V_{OX}	7.412751	7.587251	ns
$T_{PERIODAbs}$	166-MHz CPUT and CPUC Absolute period	Measured at crossing point V_{OX}	5.913201	6.086801	ns
$T_{PERIODAbs}$	200-MHz CPUT and CPUC Absolute period	Measured at crossing point V_{OX}	4.913500	5.086500	ns
$T_{PERIODSSAbs}$	100-MHz CPUT and CPUC Absolute period, SSC	Measured at crossing point V_{OX}	9.912001	10.13827	ns
$T_{PERIODSSAbs}$	133-MHz CPUT and CPUC Absolute period, SSC	Measured at crossing point V_{OX}	7.412751	7.624950	ns
$T_{PERIODSSAbs}$	166-MHz CPUT and CPUC Absolute period, SSC	Measured at crossing point V_{OX}	5.913201	6.116960	ns
$T_{PERIODSSAbs}$	200-MHz CPUT and CPUC Absolute period, SSC	Measured at crossing point V_{OX}	4.913500	5.111634	ns
T_{CCJ}	CPUT/C Cycle to Cycle Jitter	Measured at crossing point V_{OX}	–	85	ps
T_{CCJ2}	CPU2_ITP Cycle to Cycle Jitter	Measured at crossing point V_{OX}	–	125[1]	ps
L_{ACC}	Long-term Accuracy	Measured at crossing point V_{OX}	–	300	ppm
T_{SKEW}	CPU1 to CPU0 Clock Skew	Measured at crossing point V_{OX}	–	100	ps
T_R / T_F	CPUT and CPUC Rise and Fall Time	Measured from V_{OL} = 0.175 to V_{OH} = 0.525V	175	700 [1]	ps
T_{RFM}	Rise/Fall Matching	Determined as a fraction of $2*(T_R - T_F)/(T_R + T_F)$	–	20	%
ΔT_R	Rise Time Variation		–	125	ps
ΔT_F	Fall Time Variation		–	125	ps
V_{HIGH}	Voltage High	Math averages *Figure 15*	660	850	mV
V_{LOW}	Voltage Low	Math averages *Figure 15*	–150	–	mV

AC Electrical Specifications (continued)

Parameter	Description	Condition	Min.	Max.	Unit
V_{OX}	Crossing Point Voltage at 0.7V Swing		250	550	mV
V_{OVS}	Maximum Overshoot Voltage		–	V_{HIGH} + 0.3	V
V_{UDS}	Minimum Undershoot Voltage		–0.3	–	V
V_{RB}	Ring Back Voltage	See *Figure 15*. Measure SE	–	0.2	V
SRC at 0.7V					
T_{DC}	SRCT and SRCC Duty Cycle	Measured at crossing point V_{OX}	45	55	%
T_{PERIOD}	100-MHz SRCT and SRCC Period	Measured at crossing point V_{OX}	9.997001	10.00300	ns
$T_{PERIODSS}$	100-MHz SRCT and SRCC Period, SSC	Measured at crossing point V_{OX}	9.997001	10.05327	ns
$T_{PERIODAbs}$	100-MHz SRCT and SRCC Absolute Period	Measured at crossing point V_{OX}	9.872001	10.12800	ns
$T_{PERIODSSAbs}$	100-MHz SRCT and SRCC Absolute Period, SSC	Measured at crossing point V_{OX}	9.872001	10.17827	ns
T_{SKEW}	Any SRCT/C to SRCT/C Clock Skew	Measured at crossing point V_{OX}	–	250	ps
T_{CCJ}	SRCT/C Cycle to Cycle Jitter	Measured at crossing point V_{OX}	–	125[1]	ps
L_{ACC}	SRCT/C Long Term Accuracy	Measured at crossing point V_{OX}	–	300	ppm
T_R / T_F	SRCT and SRCC Rise and Fall Time	Measured from V_{OL} = 0.175 to V_{OH} = 0.525V	175	730	ps
T_{RFM}	Rise/Fall Matching	Determined as a fraction of $2*(T_R - T_F)/(T_R + T_F)$	–	20	%
ΔT_R	Rise TimeVariation		–	125	ps
ΔT_F	Fall Time Variation		–	125	ps
V_{HIGH}	Voltage High	Math averages *Figure 15*	660	850	mV
V_{LOW}	Voltage Low	Math averages *Figure 15*	–150	–	mV
V_{OX}	Crossing Point Voltage at 0.7V Swing		240	550	mV
V_{OVS}	Maximum Overshoot Voltage		–	V_{HIGH} + 0.3	V
V_{UDS}	Minimum Undershoot Voltage		–0.3	–	V
V_{RB}	Ring Back Voltage	See *Figure 15*. Measure SE	–	0.2	V
LCD100M_SSC/SRC0 at 0.7V					
T_{DC}	SSCT and SSCC Duty Cycle	Measured at crossing point V_{OX}	45	55	%
T_{PERIOD}	100-MHz SSCT and SSCC Period	Measured at crossing point V_{OX}	9.997001	10.00300	ns
$T_{PERIODSS}$	100-MHz SSCT and SSCC Period, SSC	Measured at crossing point V_{OX}	9.997001	10.05327	ns
$T_{PERIODAbs}$	100-MHz SSCT and SSCC Absolute Period	Measured at crossing point V_{OX}	9.872001	10.12800	ns
$T_{PERIODSSAbs}$	100-MHz SRCT and SRCC Absolute Period, SSC	Measured at crossing point V_{OX}	9.872001	10.17827	ns
T_{PERIOD}	96-MHz SSCT and SSCC Period	Measured at crossing point V_{OX}	10.41354	10.41979	ns
$T_{PERIODSS}$	96-MHz SSCT and SSCC Period, SSC	Measured at crossing point V_{OX}	10.41354	10.47215	ns
$T_{PERIODAbs}$	96-MHz SSCT and SSCC Absolute Period	Measured at crossing point V_{OX}	10.16354	10.66979	ns
$T_{PERIODSSAbs}$	96-MHz SRCT and SRCC Absolute Period, SSC	Measured at crossing point V_{OX}	10.16354	10.72266	ns
T_{CCJ}	SSCT/C Cycle to Cycle Jitter	Measured at crossing point V_{OX}	–	140	ps
L_{ACC}	SSCT/C Long Term Accuracy	Measured at crossing point V_{OX}	–	300	ppm
T_R / T_F	SSCT and SSCC Rise and Fall Time	Measured from V_{OL} = 0.175 to V_{OH} = 0.525V	175	700	ps

AC Electrical Specifications (continued)

Parameter	Description	Condition	Min.	Max.	Unit
T_{RFM}	Rise/Fall Matching	Determined as a fraction of $2*(T_R - T_F)/(T_R + T_F)$	–	20	%
ΔT_R	Rise TimeVariation		–	125	ps
ΔT_F	Fall Time Variation		–	125	ps
V_{HIGH}	Voltage High	Math averages *Figure 15*	660	850	mV
V_{LOW}	Voltage Low	Math averages *Figure 15*	–150	–	mV
V_{OX}	Crossing Point Voltage at 0.7V Swing		250	550	mV
V_{OVS}	Maximum Overshoot Voltage		–	V_{HIGH} + 0.3	V
V_{UDS}	Minimum Undershoot Voltage		–0.3	–	V
V_{RB}	Ring Back Voltage	See *Figure 15.* Measure SE	–	0.2	V
PCI/PCIF at 3.3V					
T_{DC}	PCI Duty Cycle	Measurement at 1.5V	45	55	%
T_{PERIOD}	Spread Disabled PCIF/PCI Period	Measurement at 1.5V	29.99100	30.00900	ns
$T_{PERIODSS}$	Spread Enabled PCIF/PCI Period, SSC	Measurement at 1.5V	29.9910	30.15980	ns
$T_{PERIODAbs}$	Spread Disabled PCIF/PCI Period	Measurement at 1.5V	29.49100	30.50900	ns
$T_{PERIODSSAbs}$	Spread Enabled PCIF/PCI Period, SSC	Measurement at 1.5V	29.49100	30.65980	ns
T_{HIGH}	PCIF and PCI high time	Measurement at 2.4V	11.6	–	ns
T_{LOW}	PCIF and PCI low time	Measurement at 0.4V	12.0	–	ns
T_R / T_F	PCIF/PCI rising and falling Edge Rate	Measured between 0.8V and 2.0V	0.5	4.0	V/ns
T_{SKEW}	Any PCI clock to Any PCI clock Skew	Measurement at 1.5V	–	500	ps
T_{CCJ}	PCIF and PCI Cycle to Cycle Jitter	Measurement at 1.5V	–	500[1]	ps
L_{ACC}	PCIF/PCI Long Term Accuracy	Measured at crossing point V_{OX}	–	300	ppm
DOT96 at 0.7V					
T_{DC}	DOT96T and DOT96C Duty Cycle	Measured at crossing point V_{OX}	45	55	%
T_{PERIOD}	DOT96T and DOT96C Period	Measured at crossing point V_{OX}	10.41354	10.41979	ns
$T_{PERIODAbs}$	DOT96T and DOT96C Absolute Period	Measured at crossing point V_{OX}	10.16354	10.66979	ns
T_{CCJ}	DOT96T/C Cycle to Cycle Jitter	Measured at crossing point V_{OX}	–	250	ps
L_{ACC}	DOT96T/C Long Term Accuracy	Measured at crossing point V_{OX}	–	300	ppm
T_R / T_F	DOT96T and DOT96C Rise and Fall Time	Measured from V_{OL} = 0.175 to V_{OH} = 0.525V	175	760	ps
T_{RFM}	Rise/Fall Matching	Determined as a fraction of $2*(T_R - T_F)/(T_R + T_F)$	–	20	%
ΔT_R	Rise Time Variation		–	125	ps
ΔT_F	Fall Time Variation		–	125	ps
V_{HIGH}	Voltage High	Math averages *Figure 15*	660	850	mV
V_{LOW}	Voltage Low	Math averages *Figure 15*	–150	–	mV
V_{OX}	Crossing Point Voltage at 0.7V Swing		250	550	mV
V_{OVS}	Maximum Overshoot Voltage		–	V_{HIGH} + 0.3	V
V_{UDS}	Minimum Undershoot Voltage		–0.3	–	V
V_{RB}	Ring Back Voltage	See *Figure 15.* Measure SE	–	0.2	V
48_M at 3.3V					
T_{DC}	Duty Cycle	Measurement at 1.5V	45	55	%
T_{PERIOD}	Period	Measurement at 1.5V	20.83125	20.83542	ns

AC Electrical Specifications (continued)

Parameter	Description	Condition	Min.	Max.	Unit
$T_{PERIODAbs}$	Absolute Period	Measurement at 1.5V	20.48125	21.18542	ns
T_{HIGH}	48_M High time	Measurement at 2.4V	8.094	11.036	ns
T_{LOW}	48_M Low time	Measurement at 0.4V	7.694	10.836	ns
T_R / T_F	Rising and Falling Edge Rate	Measured between 0.8V and 2.0V	1.0	2.2	V/ns
T_{CCJ}	Cycle to Cycle Jitter	Measurement at 1.5V	–	350	ps
L_{ACC}	48M Long Term Accuracy	Measured at crossing point V_{OX}	–	100	ppm
27_M at 3.3V					
T_{DC}	Duty Cycle	Measurement at 1.5V	45	55	%
T_{PERIOD}	Spread Disabled 27M Period	Measurement at 1.5V	27.000	27.0547	ns
	Spread Enabled 27M Period	Measurement at 1.5V	27.000	27.0547	
T_{HIGH}	27_M High time	Measurement at 2.0V	10.5	–	ns
T_{LOW}	27_M Low time	Measurement at 0.8V	10.5	–	ns
T_R / T_F	Rising and Falling Edge Rate	Measured between 0.8V and 2.0V	1.0	4.0	V/ns
T_{CCJ}	Cycle to Cycle Jitter	Measurement at 1.5V	–	500	ps
L_{ACC}	27_M Long Term Accuracy	Measured at crossing point V_{OX}	–	0	ppm
REF at 3.3V					
T_{DC}	REF Duty Cycle	Measurement at 1.5V	45	55	%
T_{PERIOD}	REF Period	Measurement at 1.5V	69.8203	69.8622	ns
$T_{PERIODAbs}$	REF Absolute Period	Measurement at 1.5V	68.82033	70.86224	ns
T_R / T_F	REF Rising and Falling Edge Rate	Measured between 0.8V and 2.0V	0.9	4.0	V/ns
T_{SKEW}	REF Clock to REF Clock	Measurement at 1.5V	–	500	ps
T_{CCJ}	REF Cycle to Cycle Jitter	Measurement at 1.5V	–	1000	ps
L_{ACC}	Long Term Accuracy	Measurement at 1.5V	–	300	ppm
ENABLE/DISABLE and SET-UP					
T_{STABLE}	Clock Stabilization from Power-up		–	1.8	ms
T_{SS}	Stopclock Set-up Time		10.0	–	ns
T_{SH}	Stopclock Hold Time		0	–	ns

Note:
1. Measured under typical condition.

Test and Measurement Set-up

For PCI Single-ended Signals and Reference

The following diagram shows the test load configuration of single-ended PCI, USB output signals.

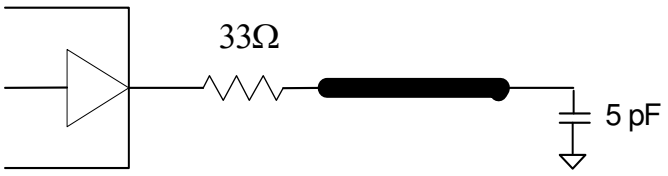


Figure 14. Single-ended PCI, USB Load Configuration

The following diagram shows the test load configuration for the differential CPU and SRC outputs.

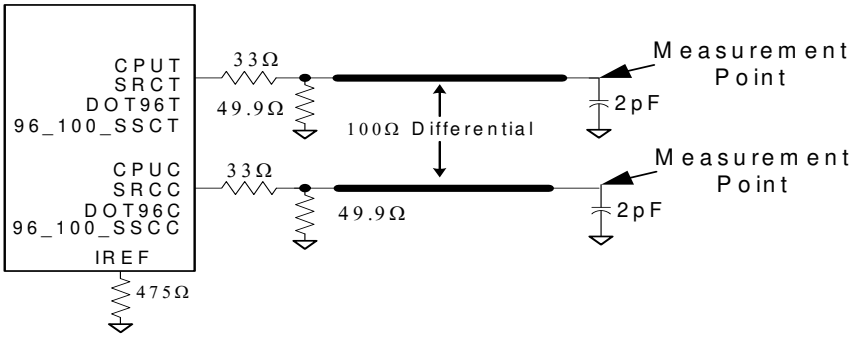


Figure 15. 0.7V Differential Load Configuration

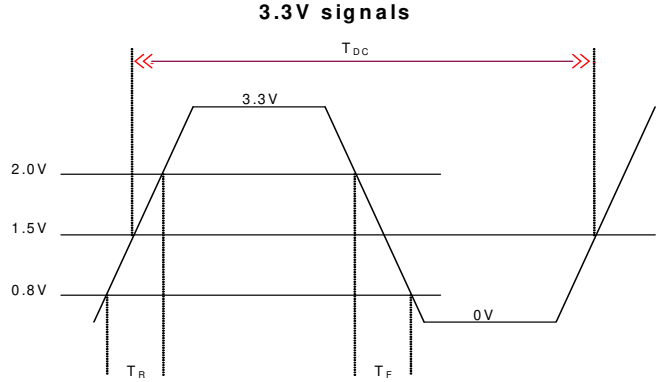


Figure 16. Single-ended Output Signals (for AC Parameters Measurement)

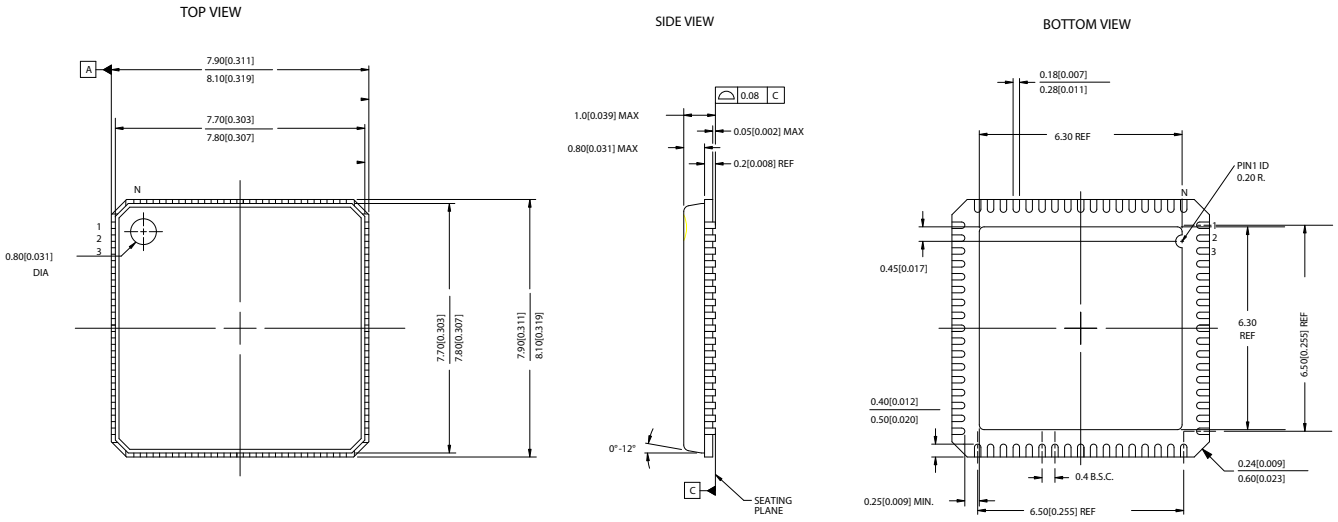
Ordering Information

Part Number	Package Type	Product Flow
Lead-free		
CY28445LFXC-5	68-pin QFN	Commercial
CY28445LFXC-5T	68-pin QFN - Tape and Reel	Commercial

Package Drawing and Dimensions

68-Lead QFN 8 x 8 mm (0.4-mm Pitch) LY68A

DIMENSIONS IN MM[INCHES] MIN/MAX
REFERENCE JEDEC MO-220
PACKAGE WEIGHT: 0.17 grams



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