PROGRAMMABLE SYSTEM CLOCK CHIP FOR ATI RSXXX-K8™ BASED SYSTEMS 9LPRS485D

General Description

The 9LPRS485D is a main clock synthesizer chip that provides all clocks required for ATI RSxxx-based systems using AMD processors. An SMBus interface allows full control of the device.

Recommended Application

ATI RS780/790/880 systems using AMD K8 processors

Output Features

- 2 - Greyhound compatible K8 CPU pair
- 4 - low-power differential SRC pairs
- 2 - low-power differential SouthBridge SRC pairs
- 3 - low-power differential ATIG pairs
- 1 - Selectable 100MHz low-power differential/ 66 MHz single-ended HTT clock
- 2 - 48MHz USB clock
- 3 - 14.318MHz Reference clock

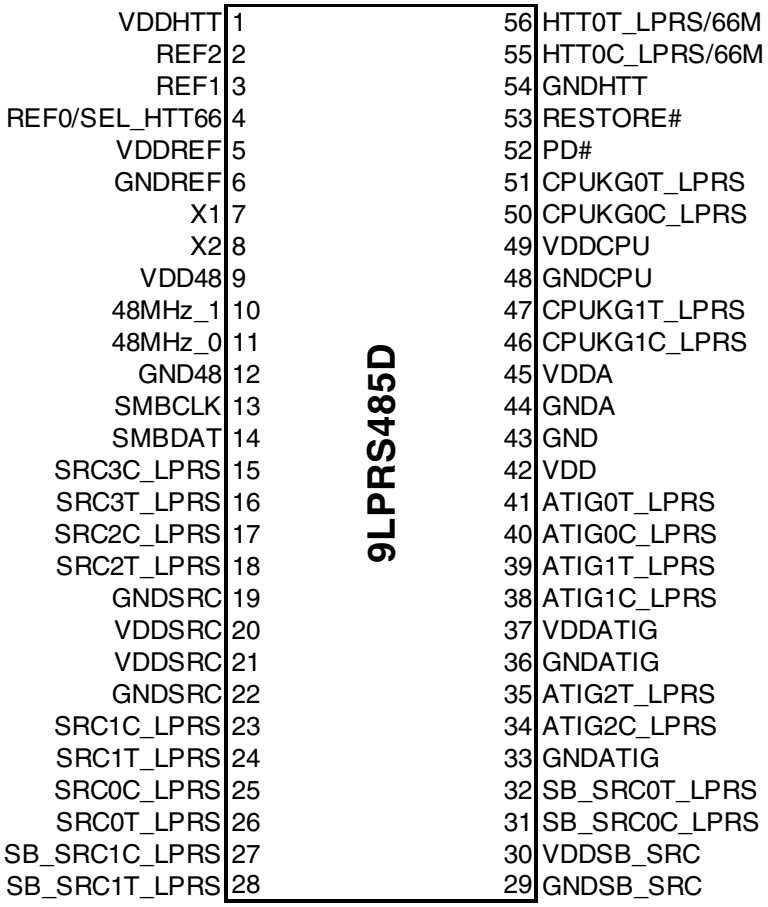
Features/Benefits

- CPU, ATIG, SB_SRC and SRC outputs are independently programmable for frequency
- Spread Spectrum for EMI reduction
- Outputs may be disabled via SMBus
- External crystal load capacitors for maximum frequency accuracy
- Meets PCIEX Gen2 specifications
- Meets USB3.0 PCIEX clock modulation rate of 30kHz to 33kHz

Key Specifications

- CPU outputs cycle-to-cycle jitter <85ps
- SRC outputs cycle-to-cycle jitter <125ps
- ATIG outputs cycle-to-cycle jitter <125ps
- +/- 300ppm frequency accuracy on CPU, SRC & ATIG clocks

Pin Configuration



56-Pin TSSOP

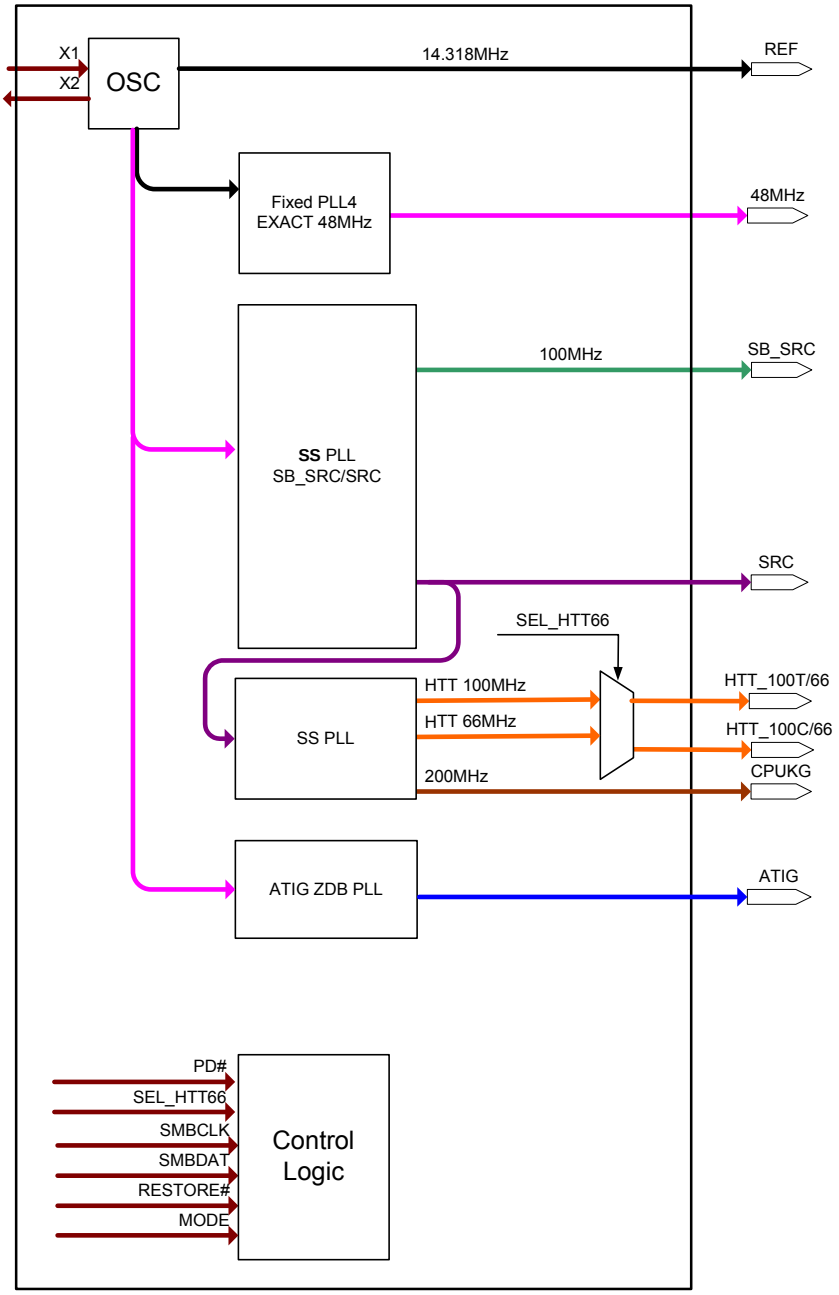
Pin Descriptions

PIN #	PIN NAME	TYPE	DESCRIPTION
1	VDDHTT	PWR	Supply for HTT clocks, nominal 3.3V.
2	REF2	OUT	14.318 MHz reference clock, 3.3V
3	REF1	OUT	14.318 MHz reference clock, 3.3V
4	REF0/SEL_HTT66	I/O	14.318 MHz 3.3V reference clock./ 3.3V tolerant latched input to select Hyper Transport Clock Frequency. 0 = 100MHz differential HTT clock, 1 = 66MHz 3.3V single ended HTT clock
5	VDDREF	PWR	Ref, XTAL power supply, nominal 3.3V
6	GNDREF	GND	Ground pin for the REF outputs.
7	X1	IN	Crystal input, nominally 14.318MHz
8	X2	OUT	Crystal output, nominally 14.318MHz
9	VDD48	PWR	Power pin for the 48MHz outputs and core. 3.3V
10	48MHz_1	OUT	48MHz clock output.
11	48MHz_0	OUT	48MHz clock output.
12	GND48	GND	Ground pin for the 48MHz outputs
13	SMBCLK	IN	Clock pin of SMBus circuitry, 5V tolerant.
14	SMBDAT	I/O	Data pin for SMBus circuitry, 5V tolerant.
15	SRC3C_LPRS	OUT	Complement clock of low power differential SouthBridge SRC clock pair. (no 50ohm shunt resistor to GND and no 33 ohm series resistor needed)
16	SRC3T_LPRS	OUT	True clock of low power differential SRC clock pair. (no 50ohm shunt resistor to GND and no 33 ohm series resistor needed)
17	SRC2C_LPRS	OUT	Complement clock of low power differential SouthBridge SRC clock pair. (no 50ohm shunt resistor to GND and no 33 ohm series resistor needed)
18	SRC2T_LPRS	OUT	True clock of low power differential SRC clock pair. (no 50ohm shunt resistor to GND and no 33 ohm series resistor needed)
19	GNDSRC	GND	Ground pin for the SRC outputs
20	VDDSRC	PWR	Supply for SRC core, 3.3V nominal
21	VDDSRC	PWR	Supply for SRC core, 3.3V nominal
22	GNDSRC	GND	Ground pin for the SRC outputs
23	SRC1C_LPRS	OUT	Complement clock of low power differential SouthBridge SRC clock pair. (no 50ohm shunt resistor to GND and no 33 ohm series resistor needed)
24	SRC1T_LPRS	OUT	True clock of low power differential SRC clock pair. (no 50ohm shunt resistor to GND and no 33 ohm series resistor needed)
25	SRC0C_LPRS	OUT	Complement clock of low power differential SouthBridge SRC clock pair. (no 50ohm shunt resistor to GND and no 33 ohm series resistor needed)
26	SRC0T_LPRS	OUT	True clock of low power differential SRC clock pair. (no 50ohm shunt resistor to GND and no 33 ohm series resistor needed)
27	SB_SRC1C_LPRS	OUT	Complement clock of low power differential SouthBridge SRC clock pair. (no 50ohm shunt resistor to GND and no 33 ohm series resistor needed)
28	SB_SRC1T_LPRS	OUT	True clock of low power differential SouthBridge SRC clock pair. (no 50ohm shunt resistor to GND and no 33 ohm series resistor needed)

Pin Descriptions (cont.)

PIN #	PIN NAME	TYPE	DESCRIPTION
29	GNDSB_SRC	GND	Ground pin for the SB_SRC outputs
30	VDDSB_SRC	PWR	Supply for SRC core, 3.3V nominal
31	SB_SRC0C_LPRS	OUT	Complement clock of low power differential SouthBridge SRC clock pair. (no 50ohm shunt resistor to GND and no 33 ohm series resistor needed
32	SB_SRC0T_LPRS	OUT	True clock of low power differential SouthBridge SRC clock pair. (no 50ohm shunt resistor to GND and no 33 ohm series resistor needed
33	GNDATIG	GND	Ground pin for the ATIG outputs
34	ATIG2C_LPRS	OUT	Complementary clock of low-power differential push-pull PCI-Express pair with integrated series resistor. (no 50ohm shunt resistor to GND and no 33 ohm series resistor needed)
35	ATIG2T_LPRS	OUT	True clock of low-power differential push-pull PCI-Express pair with integrated series resistor. (no 50ohm shunt resistor to GND and no 33 ohm series resistor needed)
36	GNDATIG	GND	Ground pin for the ATIG outputs
37	VDDATIG	PWR	Power supply for ATIG core, nominal 3.3V
38	ATIG1C_LPRS	OUT	Complementary clock of low-power differential push-pull PCI-Express pair with integrated series resistor. (no 50ohm shunt resistor to GND and no 33 ohm series resistor needed)
39	ATIG1T_LPRS	OUT	True clock of low-power differential push-pull PCI-Express pair with integrated series resistor. (no 50ohm shunt resistor to GND and no 33 ohm series resistor needed)
40	ATIG0C_LPRS	OUT	Complementary clock of low-power differential push-pull PCI-Express pair with integrated series resistor. (no 50ohm shunt resistor to GND and no 33 ohm series resistor needed)
41	ATIG0T_LPRS	OUT	True clock of low-power differential push-pull PCI-Express pair with integrated series resistor. (no 50ohm shunt resistor to GND and no 33 ohm series resistor needed)
42	VDD	PWR	Power pin. 3.3V
43	GND	GND	Ground
44	GNDA	GND	Ground for the Analog Core
45	VDDA	PWR	3.3V Power for the Analog Core
46	CPUKG1C_LPRS	OUT	Complementary signal of low-power differential push-pull AMD K8 "Greyhound" clock with integrated series resistor.(no 33 ohm series resistor needed)
47	CPUKG1T_LPRS	OUT	True signal of low-power differential push-pull AMD K8 "Greyhound" clock with integrated series resistor. (no 33 ohm series resistor needed)
48	GNDCPU	GND	Ground pin for the CPU outputs
49	VDDCPU	PWR	Supply for CPU core, 3.3V nominal
50	CPUKG0C_LPRS	OUT	Complementary signal of low-power differential push-pull AMD K8 "Greyhound" clock with integrated series resistor. (no 33 ohm series resistor needed)
51	CPUKG0T_LPRS	OUT	True signal of low-power differential push-pull AMD K8 "Greyhound" clock with integrated series resistor.(no 33 ohm series resistor needed)
52	PD#	IN	Enter /Exit Power Down. 0 = Power Down, 1 = normal operation.
53	RESTORE#	I/O	Open Drain I/O. As an input it restores the PLL's to power up default state. As an output, this signal is driven low when the internal watchdog hardware timer expires. It is cleared when the internal watchdog hardware timer is reset or disabled. The input
54	GNDHTT	PWR	Ground pin for the HTT outputs
55	HTT0C_LPRS/66M	OUT	Complementary signal of low-power differential push-pull hypertransport clock with integrated series resistor. (no 50ohm shunt resistor to GND and no 33 ohm series resistor needed) / 3.3V single ended 66MHz hyper transport clock
56	HTT0T_LPRS/66M	OUT	True signal of low-power differential push-pull hypertransport clock with integrated series resistor. (no 50ohm shunt resistor to GND and no 33 ohm series resistor needed) / 3.3V single ended 66MHz hyper transport clock

Block Diagram



Power Groups

Pin Number		Description
VDD	GND	
9	12	48M I/O & Core
20, 21	19, 22	SRC & SRCI/O I/O & Core; SRC PLL Analog
30	29	SB_SRCI/O I/O & Core; SB_SRC PLL Analog / Digital
37	36	ATIG I/O & Core; ATIG PLL Analog
45	44	SATA I/O & Core; FIX PLL Analog / Digital
37	33	ATIG PLL & SRC PLL Digital
49	48	CPU I/O & Core; CPU PLL Analog / Digital
1	54	HTT I/O & Core
5	6	Crystal, REF I/O & Core

Table1: CPU and HTT Frequency Selection Table

Byte 3					CPU (MHz)	HTT Single-ended	HTT Differential	Spread % (B6b6=1 and B3b5=1)	CPU OverClock %
Bit4	Bit3	Bit2	Bit1	Bit0					
CPU FS4	CPU FS3	CPU FS2	CPU FS1	CPU FS0		SEL_HTT66 = 1	SEL_HTT66 = 0		
0	0	0	0	0	200.00	66.67	100.00	Depends on SB_SRC PLL. See Table 4.	0%
0	0	0	0	1	205.00	68.33	102.50		2%
0	0	0	1	0	210.00	70.00	105.00		5%
0	0	0	1	1	215.00	71.67	107.50		8%
0	0	1	0	0	220.00	73.33	110.00		10%
0	0	1	0	1	225.00	75.00	112.50		13%
0	0	1	1	0	230.00	76.67	115.00		15%
0	0	1	1	1	235.00	78.33	117.50		18%
0	1	0	0	0	240.00	80.00	120.00		20%
0	1	0	0	1	245.00	81.67	122.50		23%
0	1	0	1	0	250.00	83.33	125.00		25%
0	1	0	1	1	255.00	85.00	127.50		28%
0	1	1	0	0	260.00	86.67	130.00		30%
0	1	1	0	1	265.00	88.33	132.50		33%
0	1	1	1	0	270.00	90.00	135.00		35%
0	**1**	**1**	**1**	**1**	**200.00**	**66.67**	**100.00**		**0%**
1	0	0	0	0	280.00	93.33	140.00		40%
1	0	0	0	1	285.00	95.00	142.50		43%
1	0	0	1	0	290.00	96.67	145.00		45%
1	0	0	1	1	295.00	98.33	147.50		48%
1	0	1	0	0	300.00	100.00	150.00		50%
1	0	1	0	1	305.00	101.67	152.50		53%
1	0	1	1	0	310.00	103.33	155.00		55%
1	0	1	1	1	315.00	105.00	157.50		58%
1	1	0	0	0	320.00	106.67	160.00		60%
1	1	0	0	1	325.00	108.33	162.50		63%
1	1	0	1	0	330.00	110.00	165.00		65%
1	1	0	1	1	335.00	111.67	167.50		68%
1	1	1	0	0	340.00	113.33	170.00		70%
1	1	1	0	1	345.00	115.00	172.50		73%
1	1	1	1	0	350.00	116.67	175.00		75%
1	1	1	1	1	355.00	118.33	177.50		78%

Table 2: SRC Frequency Selection Table

B12b3	Byte 4				SRC (MHz)	Spread % (B6b5=1)	SRC OverClock %
	Bit3	Bit2	Bit1	Bit0			
OC Latch	SB FS3	SB FS2	SB FS1	SB FS0			
0	0	0	0	0	100.00	OFF[1]	0%
0	0	0	0	1	101.00		1%
0	0	0	1	0	102.00		2%
0	0	0	1	1	103.00		3%
0	0	1	0	0	104.00		4%
0	0	1	0	1	105.00		5%
0	0	1	1	0	106.00		6%
0	0	1	1	1	107.00		7%
0	1	0	0	0	108.00		8%
0	1	0	0	1	109.00		9%
0	1	0	1	0	110.00		10%
0	1	0	1	1	111.00		11%
0	1	1	0	0	112.00		12%
0	1	1	0	1	113.00		13%
0	1	1	1	0	114.00		14%
0	**1**	**1**	**1**	**1**	**100.00**	**OFF**	0%
1	0	0	0	0	100.00	OFF[1]	0%
1	0	0	0	1	101.00		1%
1	0	0	1	0	102.00		2%
1	0	0	1	1	103.00		3%
1	0	1	0	0	104.00		4%
1	0	1	0	1	105.00		5%
1	0	1	1	0	106.00		6%
1	0	1	1	1	107.00		7%
1	1	0	0	0	108.00		8%
1	1	0	0	1	109.00		9%
1	1	0	1	0	110.00		10%
1	1	0	1	1	111.00		11%
1	1	1	0	0	112.00		12%
1	1	1	0	1	113.00		13%
1	1	1	1	0	114.00		14%
1	1	1	1	1	100.00	OFF	0%

Note [1]: After SRC SS_EN bit is enabled through SMBus Byte 6 bit 5, there will be no spread for SRC's by default. To obtain spread spectrum on SRC outputs, please program Byte23 & Byte24.

Table3: ATIG Frequency Selection Table

B12b3	Byte 5				ATIG(3:0) (MHz)	Spread % (B6b7=1)	ATIG OverClock %
	Bit3	Bit2	Bit1	Bit0			
OC Latch	ATIG FS3	ATIG FS2	ATIG FS1	ATIG FS0			
0	0	0	0	0	100.00	-0.50%	0%
0	0	0	0	1	101.00		1%
0	0	0	1	0	102.00		2%
0	0	0	1	1	103.00		3%
0	0	1	0	0	104.00		4%
0	0	1	0	1	105.00		5%
0	0	1	1	0	106.00		6%
0	0	1	1	1	107.00		7%
0	1	0	0	0	108.00		8%
0	1	0	0	1	109.00		9%
0	1	0	1	0	110.00		10%
0	1	0	1	1	111.00		11%
0	1	1	0	0	112.00		12%
0	1	1	0	1	113.00		13%
0	1	1	1	0	114.00		14%
0	**1**	**1**	**1**	**1**	**100.00**	**OFF**	0%
1	0	0	0	0	100.00	-0.50%	0%
1	0	0	0	1	101.00		1%
1	0	0	1	0	102.00		2%
1	0	0	1	1	103.00		3%
1	0	1	0	0	104.00		4%
1	0	1	0	1	105.00		5%
1	0	1	1	0	106.00		6%
1	0	1	1	1	107.00		7%
1	1	0	0	0	108.00		8%
1	1	0	0	1	109.00		9%
1	1	0	1	0	110.00		10%
1	1	0	1	1	111.00		11%
1	1	1	0	0	112.00		12%
1	1	1	0	1	113.00		13%
1	1	1	1	0	114.00		14%
1	1	1	1	1	100.00	OFF	0%

Table4: SB_SRC Frequency Selection Table

Byte 6					SB_SRC (1:0) (MHz)	Spread % (B6b6=1)	SB_SRC OverClock %
Bit4	Bit3	Bit2	Bit1	Bit0			
SRC FS4	SRC FS3	SRC FS2	SRC FS1	SRC FS0			
0	0	0	0	0	85.00	-0.50%	-15%
0	0	0	0	1	86.00		-14%
0	0	0	1	0	87.00		-13%
0	0	0	1	1	88.00		-12%
0	0	1	0	0	89.00		-11%
0	0	1	0	1	90.00		-10%
0	0	1	1	0	91.00		-9%
0	0	1	1	1	92.00		-8%
0	1	0	0	0	93.00		-7%
0	1	0	0	1	94.00		-6%
0	1	0	1	0	95.00		-5%
0	1	0	1	1	96.00		-4%
0	1	1	0	0	97.00		-3%
0	1	1	0	1	98.00		-2%
0	1	1	1	0	99.00		-1%
0	**1**	**1**	**1**	**1**	**100.00**	**OFF**	**0%**
1	0	0	0	0	100.00	-0.50%	0%
1	0	0	0	1	101.00		1%
1	0	0	1	0	102.00		2%
1	0	0	1	1	103.00		3%
1	0	1	0	0	104.00		4%
1	0	1	0	1	105.00		5%
1	0	1	1	0	106.00		6%
1	0	1	1	1	107.00		7%
1	1	0	0	0	108.00		8%
1	1	0	0	1	109.00		9%
1	1	0	1	0	110.00		10%
1	1	0	1	1	111.00		11%
1	1	1	0	0	112.00		12%
1	1	1	0	1	113.00		13%
1	1	1	1	0	114.00		14%
1	1	1	1	1	115.00		15%

NOTE: All frequencies assume that the SB_SRC are at 0% Overclocking.

Table 5: IO_Vout select table

B12b2	B12b1	B12b0	IO_Vout
0	0	0	0.3V
0	0	1	0.4V
0	1	0	0.5V
0	1	1	0.6V
1	0	0	0.7V
1	**0**	**1**	**0.8V**
1	1	0	0.9V
1	1	1	1.0V

Bold Entry is Power up Default

General SMBus Serial Interface Information for 9LPRS485D

How to Write

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

Index Block Write Operation			
Controller (Host)			**IDT (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		

Read Address	Write Address
$D3_{(H)}$	$D2_{(H)}$

How to Read

- Controller (host) will send a start bit
- Controller (host) sends the write address
- IDT clock will **acknowledge**
- Controller (host) sends the beginning byte location = N
- IDT clock will **acknowledge**
- Controller (host) will send a separate start bit
- Controller (host) sends the read address
- IDT clock will **acknowledge**
- IDT clock will send the data byte count = X
- IDT clock sends Byte **N+X-1**
- IDT clock sends **Byte 0 through Byte X (if $X_{(H)}$ was written to Byte 8)**
- 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)			**IDT (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 acknowledge		
P	stoP bit		

SMBus Table: Latched Input Readback Output Enable Control Register

Byte 0	Name	Description	Type	0	1	Default
Bit 7	SEL_HTT66 readback	Hypertransport Select	R	100MHz Differential HTT clock	66 MHz 3.3V Single-ended HTT clock	Latch
Bit 6	Reserved					X
Bit 5	REF0_OE	Output Enable	RW	**Hi-Z**	Enabled	1
Bit 4	REF1_OE	Output Enable	RW	**Hi-Z**	Enabled	1
Bit 3	REF2_OE	Output Enable	RW	**Hi-Z**	Enabled	1
Bit 2	48MHz_1_OE	Output Enable	RW	Low	Enabled	1
Bit 1	48MHz_0_OE	Output Enable	RW	Low	Enabled	1
Bit 0	Reserved					X

SMBus Table:Output Enable Control Register

Byte 1	Name	Control Function	Type	0	1	Default
Bit 7	Reserved					X
Bit 6	Reserved					X
Bit 5	SRC3_OE	Output Enable	RW	Low/Low	Enabled	1
Bit 4	SRC2_OE	Output Enable	RW	Low/Low	Enabled	1
Bit 3	Reserved					X
Bit 2	Reserved					X
Bit 1	SRC1_OE	Output Enable	RW	Low/Low	Enabled	1
Bit 0	SRC0_OE	Output Enable	RW	Low/Low	Enabled	1

SMBus Table: Output Enable and 48MHz Strength Control Register

Byte 2	Name	Control Function	Type	0	1	Default
Bit 7	SB_SRC1_OE	Output Enable	RW	Low/Low	Enabled	1
Bit 6	SB_SRC0_OE	Output Enable	RW	Low/Low	Enabled	1
Bit 5	ATIG2_OE	Output Enable	RW	Low/Low	Enabled	1
Bit 4	Reserved					X
Bit 3	ATIG1_OE	Output Enable	RW	Low/Low	Enabled	1
Bit 2	ATIG0_OE	Output Enable	RW	Low/Low	Enabled	1
Bit 1	48MHz_1_Strength	48MHz_1 Drive Strength Sel.	RW	1 Load	2 Load	1
Bit 0	48MHz_0_Strength	48MHz_0 Drive Strength Sel.	RW	1 Load	2 Load	1

SMBus Table: CPU/HTT Frequency Control Register

Byte 3	Name	Control Function	Type	0	1	Default
Bit 7	CPU1_OE	Output enable	RW	Low/Low	Enable	1
Bit 6	CPU0_OE	Output enable	RW	Low/Low	Enable	1
Bit 5	CPU Spread Source	CPU Spread Source	RW	Fix PLL	SB_SRC PLL	1
Bit 4	CPU_FS4	CPU Frequency Select MSB	RW	See CPU Frequency Select Table Default value corresponds to 200MHz. Note that Selected HTT frequency tracks the CPU frequency.		0
Bit 3	CPU_FS3	CPU Frequency Select	RW			1
Bit 2	CPU_FS2	CPU Frequency Select	RW			1
Bit 1	CPU_FS1	CPU Frequency Select	RW			1
Bit 0	CPU_FS0	CPU Frequency Select LSB	RW			1

SMBus Table: SRC Frequency Control Register

Byte 4	Name	Control Function	Type	0	1	Default
Bit 7	REF0_Strength	REF0_Drive Strength Sel	RW	1 Load	2 Load	1
Bit 6	REF1_Strength	REF1_Drive Strength Sel	RW	1 Load	2 Load	1
Bit 5	REF2_Strength	REF2_Drive Strength Sel	RW	1 Load	2 Load	1
Bit 4	Reserved					0
Bit 3	SRC_FS3	SRC Frequency Select	RW	See SRC Frequency Select Table		1
Bit 2	SRC_FS2	SRC Frequency Select	RW			1
Bit 1	SRC_FS1	SRC Frequency Select	RW			1
Bit 0	SRC_FS0	SRC Frequency Select LSB	RW			1

Byte 5	Name	Control Function	Type	0	1	Default
Bit 7	Reserved					X
Bit 6	Reserved					X
Bit 5	Reserved					X
Bit 4	DISABLE_ORT	Disable Overshoot Reduction Technology during CPU PLL M/N Programming	RW	ENABLE ORT	DISABLE ORT	0
Bit 3	ATIG_FS3	ATIG Frequency Select	RW	See ATIG Frequency Select Table		1
Bit 2	ATIG_FS2	ATIG Frequency Select	RW			1
Bit 1	ATIG_FS1	ATIG Frequency Select	RW			1
Bit 0	ATIG_FS0	ATIG Frequency Select LSB	RW			1

SMBus Table: SB_SRC Frequency Select Register

Byte 6	Name	Control Function	Type	0	1	Default
Bit 7	ATIG SSEN	ATIG Spread Enable	RW	Disable	Enable	0
Bit 6	SB_SRC/CPU SSEN	SB_SRC/CPU Spread Enable	RW	Disable	Enable	0
Bit 5	SRC SSEN	SRC Spread Enable	RW	Disable	Enable	0
Bit 4	SB_SRC_FS4	SB_SRC Frequency Select MSB	RW	See SB_SRC Frequency Select Table Note: SB_SRC and CPU Clocks are synchronous. Changing this frequency will alter the SB_SRC and CPU frequency by the same percentage.		0
Bit 3	SB_SRC_FS3	SB_SRC Frequency Select	RW			1
Bit 2	SB_SRC_FS2	SB_SRC Frequency Select	RW			1
Bit 1	SB_SRC_FS1	SB_SRC Frequency Select	RW			1
Bit 0	SB_SRC_FS0	SB_SRC Frequency Select LSB	RW			1

SMBus Table: Device ID register

Byte 7	Name	Control Function	Type	0	1	Default
Bit 7	Device ID7	Device ID	R	75 hex for 9LPRS485		x
Bit 6	Device ID6		R			x
Bit 5	Device ID5		R			x
Bit 4	Device ID4		R			x
Bit 3	Device ID3		R			x
Bit 2	Device ID2		R			x
Bit 1	Device ID1		R			x
Bit 0	Device ID0		R			x

SMBus Table: Vendor & Revision ID Register

Byte 8	Name	Control Function	Type	0	1	Default
Bit 7	RID3	REVISION ID	R	-	-	0
Bit 6	RID2		R	-	-	1
Bit 5	RID1		R	-	-	0
Bit 4	RID0		R	-	-	0
Bit 3	VID3	VENDOR ID	R	-	-	0
Bit 2	VID2		R	-	-	0
Bit 1	VID1		R	-	-	0
Bit 0	VID0		R	-	-	1

SMBus Table: WatchDog Timer Control Register

Byte 9	Name	Control Function	Type	0	1	Default
Bit 7	HWD_EN	Watchdog Hard Alarm Enable	RW	Disable and Reload Hartd Alarm Timer, Clear WD Hard status bit.	Enable Timer	0
Bit 6	SWD_EN	Watchdog Soft Alarm Enable	RW	Disable	Enable	0
Bit 5	WD Hard Status	WD Hard Alarm Status	R	Normal	Alarm	X
Bit 4	WD Soft Status	WD Soft Alarm Status	R	Normal	Alarm	X
Bit 3	WDTCtrl	Watch Dog Alarm Time base Control	RW	290ms Base	1160ms Base	0
Bit 2	HWD2	WD Hard Alarm Timer Bit 2	RW	These bits represent the number of Watch Dog Time Base Units that pass before the Watch Alarm expires. Default is 7 X 290ms = 2s.		1
Bit 1	HWD1	WD Hard Alarm Timer Bit 1	RW			1
Bit 0	HWD0	WD Hard Alarm Timer Bit 0	RW			1

SMBus Table: WD Timer Safe Frequency Control Register

Byte 10	Name	Control Function	Type	0	1	Default
Bit 7	SWD2	WD Soft Alarm Timer Bit 2	RW	These bits represent the number of Watch Dog Time Base Units that pass before the Watch Alarm expires. Default is 7 X 290ms = 2s.		1
Bit 6	SWD1	WD Soft Alarm Timer Bit 1	RW			1
Bit 5	SWD0	WD Soft Alarm Timer Bit 0	RW			1
Bit 4	WD SF4	Watch Dog Safe Freq Programming bits	RW	These bits configure the safe frequency that the device returns to if the Watchdog Timer expires. The value show here corresponds to the power up default of the device. See the various Frequency Select Tables for the exact frequencies.		0
Bit 3	WD SF3		RW			1
Bit 2	WD SF2		RW			1
Bit 1	WD SF1		RW			1
Bit 0	WD SF0		RW			1

SMBus Table: Byte Count Register

Byte 11	Name	Control Function	Type	0	1	Default
Bit 7	Reserved					X
Bit 6	Reserved					X
Bit 5	BC5	Byte Count bit 5 (MSB)	RW	Determines the number of bytes that are read back from the device. Default is 0F hex.		0
Bit 4	BC4	Byte Count bit 4	RW			0
Bit 3	BC3	Byte Count bit 3	RW			1
Bit 2	BC2	Byte Count bit 2	RW			1
Bit 1	BC1	Byte Count bit 1	RW			1
Bit 0	BC0	Byte Count bit 0 (LSB)	RW			1

SMBus Table: M/N Programming Enable and I/O Vout Control Register

Byte 12	Name	Control Function	Type	0	1	Default
Bit 7	CPU M/N En	CPU PLL M/N Prog. Enable	RW	M/N Prog. Disabled	M/N Prog. Enabled	0
Bit 6	SRC M/N En	SRC M/N Prog.Enable	RW	M/N Prog. Disabled	M/N Prog. Enabled	0
Bit 5	ATIG M/N En	ATIG M/N Prog. Enable	RW	M/N Prog. Disabled	M/N Prog. Enabled	0
Bit 4	SB_SRC M/N En	SB_SRC M/N Prog. Enable	RW	M/N Prog. Disabled	M/N Prog. Enabled	0
Bit 3	Reserved					X
Bit 2	IO_VOUT2	IO Output Voltage Select (Most Significant Bit)	RW	See Table 5: V_IO Selection (Default is 0.8V)		1
Bit 1	IO_VOUT1	IO Output Voltage Select	RW			0
Bit 0	IO_VOUT0	IO Output Voltage Select (Least Significant Bit)	RW			1

Bytes 13/14 are reserved

SMBus Table:Test Mode Register

Byte 15	Name	Control Function	Type	0	1	Default
Bit 7	Test_Sel	Selects Test Mode	**RW**	Normal mode	All ouputs are REF/N	0
Bit 6	SB_SRC Source	SB_SRC Source Selection	RW	SB_SRC PLL	SRC PLL	1
Bit 5	Reserved					X
Bit 4	Reserved					X
Bit 3	Reserved					X
Bit 2	Reserved					X
Bit 1	Reserved					X
Bit 0	Reserved					X

SMBus Table: CPU PLL Frequency Control Register

Byte 16	Name	Control Function	Type	0	1	Default
Bit 7	N Div2	N Divider Prog bit 2	RW	The decimal representation of M and N Divider in Byte 16 and 17 will configure the VCO frequency. Default at power up = Byte 3 Rom table. See M/N Caculation Tables for VCO frequency formulas.		X
Bit 6	N Div1	N Divider Prog bit 1	RW			X
Bit 5	M Div5	M Divider Programming bits	RW			X
Bit 4	M Div4		RW			X
Bit 3	M Div3		RW			X
Bit 2	M Div2		RW			X
Bit 1	M Div1		RW			X
Bit 0	M Div0		RW			X

SMBus Table: CPU PLL Frequency Control Register

Byte 17	Name	Control Function	Type	0	1	Default
Bit 7	N Div10	N Divider Programming b(10:3)	RW	The decimal representation of M and N Divider in Byte 16 and 17 will configure the VCO frequency. Default at power up = Byte 3 Rom table. See M/N Caculation Tables for VCO frequency formulas.		X
Bit 6	N Div9		RW			X
Bit 5	N Div8		RW			X
Bit 4	N Div7		RW			X
Bit 3	N Div6		RW			X
Bit 2	N Div5		RW			X
Bit 1	N Div4		RW			X
Bit 0	N Div3		RW			X

SMBus Table: SB_SRC PLL Spread Spectrum Control Register

Byte 18	Name	Control Function	Type	0	1	Default
Bit 7	SSP7	Spread Spectrum Programming b(7:0)	RW	These bits set the SB_SRC spread pecentage.Please contact IDT for the appropriate values.		X
Bit 6	SSP6		RW			X
Bit 5	SSP5		RW			X
Bit 4	SSP4		RW			X
Bit 3	SSP3		RW			X
Bit 2	SSP2		RW			X
Bit 1	SSP1		RW			X
Bit 0	SSP0		RW			X

SMBus Table: SB_SRC PLL Spread Spectrum Control Register

Byte 19	Name	Control Function	Type	0	1	Default
Bit 7	SSP15	Spread Spectrum Programming b(15:8)	RW	These bits set the SB_SRC spread pecentage.Please contact IDT for the appropriate values.		X
Bit 6	SSP14		RW			X
Bit 5	SSP13		RW			X
Bit 4	SSP12		RW			X
Bit 3	SSP11		RW			X
Bit 2	SSP10		RW			X
Bit 1	SSP9		RW			X
Bit 0	SSP8		RW			X

SMBUS Table: CPU Output Divider Register

Byte 20	Name	Control Function	Type	0	1	Default
Bit 7	CPU NDiv0	LSB N Divider Programming	RW	Byte 28 has the N Divider LSB (bit 0) for CPU M/N		X
Bit 6	Reserved					X
Bit 5	Reserved					X
Bit 4	Reserved					X
Bit 3	CPUDiv3	CPU Divider Ratio Programming Bits	RW	0000:/2 ; 0100:/4	1000:/8 ; 1100:/16	X
Bit 2	CPUDiv2		RW	0001:/3 ; 0101:/6	1001:/12 ; 1101:/24	X
Bit 1	CPUDiv1		RW	0010:/5 ; 0110:/10	1010:/20 ; 1110:/40	X
Bit 0	CPUDiv0		RW	0011:/9 ; 0111:/18	1011:/36 ; 1111:/72	X

SMBUS Table: SRC Frequency Control Register

Byte 21	Name	Control Function	Type	0	1	Default
Bit 7	N Div2	N Divider Prog bit 2	RW	The decimal representation of M and N Divider in Byte 21 and 22 configure the SRC VCO frequency. See M/N Caculation Tables for VCO frequency formulas.		X
Bit 6	N Div1	N Divider Prog bit 1	RW			X
Bit 5	M Div5	M Divider Programming bit (5:0)	RW			X
Bit 4	M Div4		RW			X
Bit 3	M Div3		RW			X
Bit 2	M Div2		RW			X
Bit 1	M Div1		RW			X
Bit 0	M Div0		RW			X

SMBUS Table: SRC Frequency Control Register

Byte	22	Name	Control Function	Type	0	1	Default
	Bit 7	N Div10	N Divider Programming Byte16 bit(7:0) and Byte15 bit(7:6)	RW	The decimal representation of M and N Divider in Byte 21 and 22 configure the SRC VCO frequency. See M/N Caculation Tables for VCO frequency formulas.		X
	Bit 6	N Div9		RW			X
	Bit 5	N Div8		RW			X
	Bit 4	N Div7		RW			X
	Bit 3	N Div6		RW			X
	Bit 2	N Div5		RW			X
	Bit 1	N Div4		RW			X
	Bit 0	N Div3		RW			X

SMBUS Table: SRC Spread Spectrum Control Register

Byte	23	Name	Control Function	Type	0	1	Default
	Bit 7	SSP7	Spread Spectrum Programming bit(7:0)	RW	These bits set the SRC spread pecentages.Please contact IDT for the appropriate values.		X
	Bit 6	SSP6		RW			X
	Bit 5	SSP5		RW			X
	Bit 4	SSP4		RW			X
	Bit 3	SSP3		RW			X
	Bit 2	SSP2		RW			X
	Bit 1	SSP1		RW			X
	Bit 0	SSP0		RW			X

SMBUS Table: SRC Spread Spectrum Control Register

Byte	24	Name	Control Function	Type	0	1	Default
	Bit 7	Reserved					0
	Bit 6	SSP14	Spread Spectrum Programming bit(14:8)	RW	These bits set the SRC spread pecentages.Please contact IDT for the appropriate values.		X
	Bit 5	SSP13		RW			X
	Bit 4	SSP12		RW			X
	Bit 3	SSP11		RW			X
	Bit 2	SSP10		RW			X
	Bit 1	SSP9		RW			X
	Bit 0	SSP8		RW			X

SMBUS Table: SRC Output Divider Control Register

Byte	25	Name	Control Function	Type	0	1	Default
	Bit 7	SB_SRC NDiv0	LSB N Divider Programming	RW	N Divider LSB (bit 0) for SRC M/N programming.		X
	Bit 6	Reserved					X
	Bit 5	Reserved					X
	Bit 4	Reserved					X
	Bit 3	SRCDiv3	SRC Divider Ratio Programming Bits	RW	0000:/2 ; 0100:/4	1000:/8 ; 1100:/16	X
	Bit 2	SRCDiv2		RW	0001:/3 ; 0101:/6	1001:/12 ; 1101:/24	X
	Bit 1	SRCDiv1		RW	0010:/5 ; 0110:/10	1010:/20 ; 1110:/40	X
	Bit 0	SRCDiv0		RW	0011:/9 ; 0111:/18	1011:/36 ; 1111:/72	X

SMBUS Table: ATIG Frequency Control Register

Byte	26	Name	Control Function	Type	0	1	Default
	Bit 7	N Div2	N Divider Prog bit 2	RW	The decimal representation of M and N Divider in Byte 26 and 27 will configure the VCO frequency. Default at power up = Byte 5 Rom table. See M/N Caculation Tables for VCO frequency formulas.		X
	Bit 6	N Div1	N Divider Prog bit 1	RW			X
	Bit 5	M Div5	M Divider Programming bit (5:0)	RW			X
	Bit 4	M Div4		RW			X
	Bit 3	M Div3		RW			X
	Bit 2	M Div2		RW			X
	Bit 1	M Div1		RW			X
	Bit 0	M Div0		RW			X

SMBUS Table: ATIG Frequency Control Register

Byte	27	Name	Control Function	Type	0	1	Default
	Bit 7	SSP15	Spread Spectrum Programming bit(15:8)	RW	These bits set the SRC spread pecentages.Please contact IDT for the appropriate values.		X
	Bit 6	SSP14		RW			X
	Bit 5	SSP13		RW			X
	Bit 4	SSP12		RW			X
	Bit 3	SSP11		RW			X
	Bit 2	SSP10		RW			X
	Bit 1	SSP9		RW			X
	Bit 0	SSP8		RW			X

SMBUS Table: ATIG Output Divider Control Register

Byte	28	Name	Control Function	Type	0	1	Default
	Bit 7	ATIG NDiv0	LSB N Divider Programming	RW	N Divider LSB (bit 0) for ATIG M/N programming.		X
	Bit 6	Reserved					X
	Bit 5	Reserved					X
	Bit 4	Reserved					X
	Bit 3	ATIGDiv3	ATIG Divider Ratio Programming Bits	RW	0000:/2 ; 0100:/4	1000:/8 ; 1100:/16	X
	Bit 2	ATIGDiv2		RW	0001:/3 ; 0101:/6	1001:/12 ; 1101:/24	X
	Bit 1	ATIGDiv1		RW	0010:/5 ; 0110:/10	1010:/20 ; 1110:/40	X
	Bit 0	ATIGDiv0		RW	0011:/9 ; 0111:/18	1011:/36 ; 1111:/72	X

SMBUS Table: SB_SRC Frequency Control Register

Byte	29	Name	Control Function	Type	0	1	Default
	Bit 7	N Div2	N Divider Prog bit 2	RW	The decimal representation of M and N Divider in Byte 29 and 30 will configure the VCO frequency. Default at power up = Byte 6 Rom table. See M/N Caculation Tables for VCO frequency formulas.		X
	Bit 6	N Div1	N Divider Prog bit 1	RW			X
	Bit 5	M Div5	M Divider Programming bit (5:0)	RW			X
	Bit 4	M Div4		RW			X
	Bit 3	M Div3		RW			X
	Bit 2	M Div2		RW			X
	Bit 1	M Div1		RW			X
	Bit 0	M Div0		RW			X

SMBUS Table: SB_SRC Frequency Control Register

Byte	30	Name	Control Function	Type	0	1	Default
	Bit 7	N Div10	N Divider Programming Byte20 bit(7:0) and Byte19 bit(7:6)	RW	The decimal representation of M and N Divider in Byte 29 and 30 will configure the VCO frequency. Default at power up = Byte 6 Rom table. See M/N Caculation Tables for VCO frequency formulas.		X
	Bit 6	N Div9		RW			X
	Bit 5	N Div8		RW			X
	Bit 4	N Div7		RW			X
	Bit 3	N Div6		RW			X
	Bit 2	N Div5		RW			X
	Bit 1	N Div4		RW			X
	Bit 0	N Div3		RW			X

SMBUS Table: SB_SRC Output Divider Control Register

Byte	31	Name	Control Function	Type	0	1	Default
	Bit 7	SB_SRC NDiv0	LSB N Divider Programming	RW	N Divider LSB (bit 0) for SRC M/N programming.		X
	Bit 6	Reserved					X
	Bit 5	Reserved					X
	Bit 4	Reserved					X
	Bit 3	SB_SRCDiv3	SB_SRC Divider Ratio Programming Bits	RW	0000:/2 ; 0100:/4	1000:/8 ; 1100:/16	X
	Bit 2	SB_SRCDiv2		RW	0001:/3 ; 0101:/6	1001:/12 ; 1101:/24	X
	Bit 1	SB_SRCDiv1		RW	0010:/5 ; 0110:/10	1010:/20 ; 1110:/40	X
	Bit 0	SB_SRCDiv0		RW	0011:/9 ; 0111:/18	1011:/36 ; 1111:/72	X

Bytes 32-40 are reserved

SMBus Table: ATIG PLL Spread Spectrum Control Register

Byte	41	Name	Control Function	Type	0	1	Default
	Bit 7	SSP7	Spread Spectrum Programming b(7:0)	RW	These bits set the ATIG spread pecentage.Please contact IDT for the appropriate values.		X
	Bit 6	SSP6		RW			X
	Bit 5	SSP5		RW			X
	Bit 4	SSP4		RW			X
	Bit 3	SSP3		RW			X
	Bit 2	SSP2		RW			X
	Bit 1	SSP1		RW			X
	Bit 0	SSP0		RW			X

SMBus Table: ATIG PLL Spread Spectrum Control Register

Byte	42	Name	Control Function	Type	0	1	Default
	Bit 7	SSP15	Spread Spectrum Programming b(15:8)	RW	These bits set the ATIG spread pecentage.Please contact IDT for the appropriate values.		X
	Bit 6	SSP14		RW			X
	Bit 5	SSP13		RW			X
	Bit 4	SSP12		RW			X
	Bit 3	SSP11		RW			X
	Bit 2	SSP10		RW			X
	Bit 1	SSP9		RW			X
	Bit 0	SSP8		RW			X

Absolute Maximum Ratings

Stresses above the ratings listed below can cause permanent damage to the 9LPRS485D. These ratings, which are standard values for IDT commercially rated parts, are stress ratings only. Functional operation of the device at these or any other conditions above those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods can affect product reliability. Electrical parameters are guaranteed only over the recommended operating temperature range.

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS	Notes
3.3V Core Supply Voltage	VDDxxx	-		3.3	GND + 3.9V	V	1
Storage Temperature	Ts	-	-65		150	˚C	1
Ambient Operating Temp	Tambient	-	0		70	°C	1
Case Temperature	Tcase	-			115	°C	1
Input ESD protection HBM	ESD prot	-	2000			V	1

[1]Guaranteed by design and characterization, not 100% tested in production.

Electrical Characteristics–Input/Supply/Common Output Parameters

PARAMETER	SYMBOL	CONDITIONS*	MIN	TYP	MAX	UNITS	Notes
3.3V Core Supply Voltage	VDDxxx	-	3.135	3.3	3.465	V	1
Input High Voltage	V_{IH}	VDD = 3.3 V +/-5%	2		V_{DD} + 0.3	V	1
Input Low Voltage	V_{IL}	VDD = 3.3 V +/-5%	V_{SS} - 0.3		0.8	V	1
Input High Current	I_{IH}	$V_{IN} = V_{DD}$	-5		5	uA	1
Input Low Current	I_{IL1}	V_{IN} = 0 V; Inputs with no pull-up resistors	-5			uA	1
	I_{IL2}	V_{IN} = 0 V; Inputs with pull-up resistors	-200			uA	1
Low Threshold Input-High Voltage	V_{IH_FS}	VDD = 3.3 V +/-5%	0.7		V_{DD} + 0.3	V	1
Low Threshold Input-Low Voltage	V_{IL_FS}	VDD = 3.3 V +/-5%	V_{SS} - 0.3		0.35	V	1
Operating Current	$I_{DD3.3OP}$	all outputs driven			225	mA	1
Powerdown Current	$I_{DD3.3PD}$	all diff pairs low/low			12	mA	1
Input Frequency	F_i	VDD = 3.3 V +/-5%		14.31818		MHz	2
Pin Inductance	L_{pin}				7	nH	1
Input Capacitance	C_{IN}	Logic Inputs			5	pF	1
	C_{OUT}	Output pin capacitance			6	pF	1
	C_{INX}	X1 & X2 pins			5	pF	1
Clk Stabilization	T_{STAB}	From VDD Power-Up or de-assertion of PD to 1st clock			1.8	ms	1
Modulation Frequency		Triangular Modulation	30		33	kHz	1
Tdrive_PD		CPU output enable after PD de-assertion			300	us	1
Tfall_PD		PD fall time of			5	ns	1
Trise_PD		PD rise time of			5	ns	1
SMBus Voltage	V_{DDSMB}		2.7		5.5	V	1
Low-level Output Voltage	V_{OLSMB}	@ I_{PULLUP}			0.4	V	1
Current sinking at V_{OL} = 0.4 V	$I_{PULLUPSMB}$		4	6		mA	1
SMBCLK/SMBDAT Clock/Data Rise Time	T_{RSMB}	(Max VIL - 0.15) to (Min VIH + 0.15)			1000	ns	1
SMBCLK/SMBDAT Clock/Data Fall Time	T_{FSMB}	(Min VIH + 0.15) to (Max VIL - 0.15)			300	ns	1

*TA = 0 - 70°C; Supply Voltage VDD = 3.3 V +/-5%

[1]Guaranteed by design and characterization, not 100% tested in production.

[2] Input frequency should be measured at the REF pin and tuned to ideal 14.31818MHz to meet ppm frequency accuracy on PLL outputs.

AC Electrical Characteristics–Low-Power DIF Outputs: CPUKG and HTT

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS	NOTES
Crossing Point Variation	ΔV_{CROSS}	Single-ended Measurement			140	mV	1,2,5
Frequency	f	Spread Specturm On	198.8		200	MHz	1,3
Long Term Accuracy	ppm	Spread Specturm Off	-300		+300	ppm	1,11
Rising Edge Slew Rate	S_{RISE}	Differential Measurement	0.5		10	V/ns	1,4
Falling Edge Slew Rate	S_{FALL}	Differential Measurement	0.5		10	V/ns	1,4
Slew Rate Variation	t_{SLVAR}	Single-ended Measurement			20	%	1
CPU, DIF HTT Jitter - Cycle to Cycle	$CPUJ_{C2C}$	Differential Measurement			150	ps	1,6
Accumulated Jitter	t_{JACC}	See Notes			1	ns	1,7
Peak to Peak Differential Voltage	$V_{D(PK-PK)}$	Differential Measurement	400		2400	mV	1,8
Differential Voltage	V_D	Differential Measurement	200		1200	mV	1,9
Duty Cycle	D_{CYC}	Differential Measurement	45		55	%	1
Amplitude Variation	ΔV_D	Change in V_D DC cycle to cycle	-75		75	mV	1,10
CPU[1:0] Skew	CPU_{SKEW10}	Differential Measurement			100	ps	1

*TA = 0 - 70°C; Supply Voltage VDD = 3.3 V +/-5%, CL = 2pF with Rs = 0Ω (unless otherwise specified)

[1]Guaranteed by design and characterization, not 100% tested in production.

[2]Single-ended measurement at crossing point. Value is maximum – minimum over all time. DC value of common mode is not important due to the blocking cap.

[3]Minimum Frequency is a result of 0.5% down spread spectrum

[4]Differential measurement through the range of ±100 mV, differential signal must remain monotonic and within slew rate spec when crossing through this region.

[5] Defined as the total variation of all crossing voltages of CLK rising and CLK# falling. Matching applies to rising edge rate of CLK and falling edge of CLK#. It is measured using a +/-75mV window centered on the average cross point where CLK meets CLK#.

[6] Max difference of t_{CYCLE} between any two adjacent cycles.

[7] Accumulated tjc.over a 10µs time period, measured with JIT2 TIE at 50ps interval.

[8] VD(PK-PK) is the overall magnitude of the differential signal.

[9] VD(min) is the amplitude of the ring-back differential measurement, guaranteed by design, that ring-back will not cross 0V VD. VD(max) is the largest amplitude allowed.

[10] The difference in magnitude of two adjacent VD_DC measurements. VD_DC is the stable post overshoot and ring-back part of the signal.

[11] All Long Term Accuracy and Clock Period specifications are guaranteed assuming that REFOUT is at 14.31818MHz

AC Electrical Characteristics–Low-Power DIF Outputs: SRC, SB_SRC, ATIG

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS	NOTES
Rising Edge Slew Rate	t_{SLR}	Differential Measurement	0.6		4	V/ns	1,2
Falling Edge Slew Rate	t_{FLR}	Differential Measurement	0.6		4	V/ns	1,2
Slew Rate Variation	t_{SLVAR}	Single-ended Measurement			20	%	1
Maximum Output Voltage	V_{HIGH}	Includes overshoot			1150	mV	1
Minimum Output Voltage	V_{LOW}	Includes undershoot	-300			mV	1
Differential Voltage Swing	V_{SWING}	Differential Measurement	300			mV	1
Crossing Point Voltage	V_{XABS}	Single-ended Measurement	300		550	mV	1,3,4
Crossing Point Variation	$V_{XABSVAR}$	Single-ended Measurement			140	mV	1,3,5
Duty Cycle	D_{CYC}	Differential Measurement	45		55	%	1
SRC, SB_SRC, ATIG, Jitter - Cycle to Cycle	$SRCJ_{C2C}$	Differential Measurement			125	ps	1
SRC[5:0] Skew	SRC_{SKEW}	Differential Measurement			250	ps	1
SB_SRC[1:0] Skew	SRC_{SKEW}	Differential Measurement			100	ps	1
ATIG[3:0] Skew	SRC_{SKEW}	Differential Measurement			100	ps	1

*TA = 0 - 70°C; Supply Voltage VDD = 3.3 V +/-5%, CL = 2pF with Rs = 0Ω (unless otherwise specified)

[1]Guaranteed by design and characterization, not 100% tested in production.

[2] Slew rate measured through Vswing centered around differential zero

[3] Vxabs is defined as the voltage where CLK = CLK#

[4] Only applies to the differential rising edge (CLK rising and CLK# falling)

[5] Defined as the total variation of all crossing voltages of CLK rising and CLK# falling. Matching applies to rising edge rate of CLK and falling edge of CLK#. It is measured using a +/-75mV window centered on the average cross point where CLK meets CLK#.

[6] All Long Term Accuracy and Clock Period specifications are guaranteed assuming that REFOUT is at 14.31818MHz

Electrical Characteristics–Single-Ended HTT 66MHz Clock

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS	Notes
Long Accuracy	ppm	see Tperiod min-max values	-300		300	ppm	1,2
PCI33 Clock period	T_{period}	33.33MHz output nominal	29.9910		30.0090	ns	2
		33.33MHz output spread	29.9910		30.1598	ns	2
HTT66 Clock period	T_{period}	66.67MHz output nominal	14.9955		15.0045	ns	2
		66.67MHz output spread	14.9955		15.0799	ns	2
Output High Voltage	V_{OH}	I_{OH} = -1 mA	2.4			V	1
Output Low Voltage	V_{OL}	I_{OL} = 1 mA			0.55	V	1
Output High Current	I_{OH}	V_{OH} @MIN = 1.0 V	-33			mA	1
		V_{OH}@ MAX = 3.135 V			-33	mA	1
Output Low Current	I_{OL}	V_{OL} @ MIN = 1.95 V	30			mA	1
		V_{OL} @ MAX = 0.4 V			38	mA	1
Edge Rate	0V0 t	Rising edge rate	1		4	V/ns	1
Edge Rate	0V0 t	Falling edge rate	1		4	V/ns	1
Rise Time	t_{r1}	V_{OL} = 0.4 V, V_{OH} = 2.4 V	0.5		2	ns	1
Fall Time	t_{f1}	V_{OH} = 2.4 V, V_{OL} = 0.4 V	0.5		2	ns	1
Duty Cycle	d_{t1}	V_T = 1.5 V	45		55	%	1
Jitter, Cycle to cycle	$t_{jcyc-cyc}$	V_T = 1.5 V			180	ps	1

*TA = 0 - 70°C; Supply Voltage VDD = 3.3 V +/-5%, CL = 5pF with Rs = 33Ω (unless otherwise specified)

[1]Guaranteed by design and characterization, not 100% tested in production.

[2] All Long Term Accuracy and Clock Period specifications are guaranteed with the assumption that REF is at 14.31818MHz

Electrical Characteristics–USB - 48MHz

PARAMETER	SYMBOL	CONDITIONS*	MIN	TYP	MAX	UNITS	NOTES
Long Accuracy	ppm	see Tperiod min-max values	-100		100	ppm	1,2
Clock period	T_{period}	48.00MHz output nominal	20.8229		20.8344	ns	2
Clock Low Time	T_{low}	Measure from < 0.6V	9.3750		11.4580	ns	2
Clock High Time	T_{high}	Measure from > 2.0V	9.3750		11.4580	ns	2
Output High Voltage	V_{OH}	I_{OH} = -1 mA	2.4			V	1
Output Low Voltage	V_{OL}	I_{OL} = 1 mA			0.55	V	1
Output High Current	I_{OH}	V_{OH} @MIN = 1.0 V	-33			mA	1
		V_{OH}@MAX = 3.135 V			-33	mA	1
Output Low Current	I_{OL}	V_{OL} @ MIN = 1.95 V	30			mA	1
		V_{OL} @ MAX = 0.4 V			38	mA	1
Rise Time	t_{r_USB}	V_{OL} = 0.4 V, V_{OH} = 2.4 V	0.5		1.5	ns	1
Fall Time	t_{f_USB}	V_{OH} = 2.4 V, V_{OL} = 0.4 V	0.5		1.5	ns	1
Duty Cycle	d_{t1}	V_T = 1.5 V	45		55	%	1
Group Skew	t_{skew}	V_T = 1.5 V			250	ps	1
Jitter, Cycle to cycle	$t_{jcyc-cyc}$	V_T = 1.5 V			130	ps	1,2

*TA = 0 - 70°C; Supply Voltage VDD = 3.3 V +/-5%, CL = 5pF with Rs = 33Ω (unless otherwise specified)

[1]Guaranteed by design and characterization, not 100% tested in production.

[2] IDT recommended and/or chipset vendor layout guidelines must be followed to meet this specification

Electrical Characteristics–REF-14.318MHz

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS	Notes
Long Accuracy	ppm	see Tperiod min-max values	-300		300	ppm	1,2
Clock period	T_{period}	14.318MHz output nominal	69.8270		69.8550	ns	2
Clock Low Time	T_{low}	Measure from < 0.6V	30.9290		37.9130	ns	2
Clock High Time	T_{high}	Measure from > 2.0V	30.9290		37.9130	ns	2
Output High Voltage	V_{OH}	I_{OH} = -1 mA	2.4			V	1
Output Low Voltage	V_{OL}	I_{OL} = 1 mA			0.4	V	1
Output High Current	I_{OH}	V_{OH} @MIN = 1.0 V, V_{OH}@MAX = 3.135 V	-29		-23	mA	1
Output Low Current	I_{OL}	V_{OL} @MIN = 1.95 V, V_{OL} @MAX = 0.4 V	29		27	mA	1
Rise Time	t_{r1}	V_{OL} = 0.4 V, V_{OH} = 2.4 V	1		1.5	ns	1
Fall Time	t_{f1}	V_{OH} = 2.4 V, V_{OL} = 0.4 V	1		1.5	ns	1
Skew	t_{sk1}	V_T = 1.5 V			250	ps	1
Duty Cycle	d_{t1}	V_T = 1.5 V	45		55	%	1
Jitter	$t_{jcyc-cyc}$	V_T = 1.5 V			200	ps	1

*TA = 0 - 70°C; Supply Voltage VDD = 3.3 V +/-5%, CL = 5pF with Rs = 33Ω (unless otherwise specified)

[1]Guaranteed by design and characterization, not 100% tested in production.

[2] All Long Term Accuracy and Clock Period specifications are guaranteed assuming that REFOUT is at 14.31818MHz

Clock Jitter Specifications–Low Power Differential Outputs

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS	NOTES
SRC/SB_SRC/ATIG Phase Jitter	$t_{jphasePLL}$	PCIe Gen 1			86	ps (p-p)	1,2
	$t_{jphaseLo}$	PCIe Gen 2 10kHz < f < 1.5MHz			3	ps (RMS)	1,4
	$t_{jphaseHigh}$	PCIe Gen 2 1.5MHz < f < Nyquist (50MHz)			3.1	ps (RMS)	1,4

*TA = 0 - 70°C; Supply Voltage VDD = 3.3V +/-5%, Rs = 0ohms, CL = 2pF

[1] Unless otherwise noted, guaranteed by design and characterization, not 100% tested in production.

[2]JItter specs are specified as measured on a clock characterization board. System designers need to take special care not to use these numbers, as the in-system performance will be somewhat degraded. The receiver EMTS (chispet or CPU) will have the receiver jitter specs as measured in a real system.

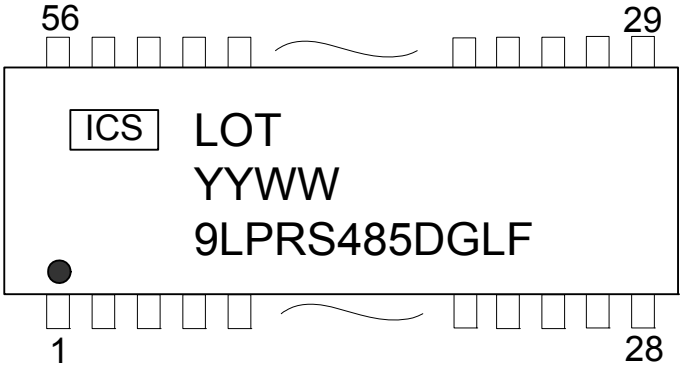
[3] Phase jitter requirement: The deisgnated Gen2 outputs will meet the reference clock jitter requiremernts from the PCI Express Gen2 Base Spec. The test is performed on a componnet test board under quiet condittions with all outputs on.

[4]See http://www.pcisig.com for complete specs

Thermal Characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Thermal Resistance Junction to Ambient	θ_{JA}	Still air		84		°C/W
	θ_{JA}	1 m/s air flow		76		°C/W
	θ_{JA}	2.5 m/s air flow		67		°C/W
Thermal Resistance Junction to Case	θ_{JC}			50		°C/W
Thermal Resistance Junction to Top of Case	Ψ_{JT}	Still air		2		°C/W

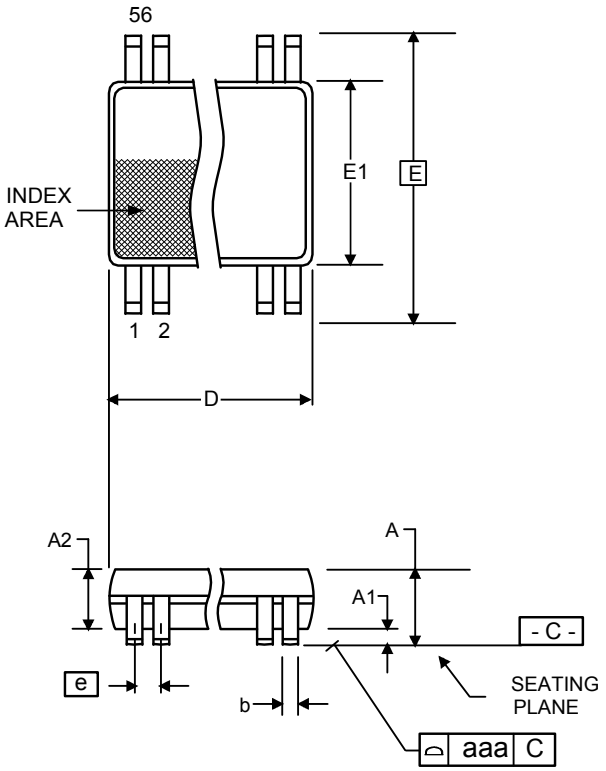
Marking Diagram



Notes:

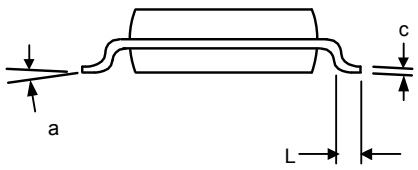
1. 'LOT' is the lot number.
2. YYWW is the last two digits of the year and week that the part was assembled.
3. "LF" denotes RoHS compliant package.
4. Bottom marking: country of origin if not USA.

Package Outline and Package Dimensions (56-pin TSSOP, 6.10 mm Body, 0.50 mm pitch)



	Millimeters		Inches*	
Symbol	**Min**	**Max**	**Min**	**Max**
A	--	1.20	--	0.047
A1	0.05	0.15	0.002	0.006
A2	0.80	1.05	0.032	0.041
b	0.17	0.27	0.007	0.011
c	0.09	0.20	0.0035	0.008
D	13.90	14.10	0.547	0.555
E	8.10 BASIC		0.319 BASIC	
E1	6.00	6.20	0.236	0.244
e	0.50 Basic		0.020 Basic	
L	0.45	0.75	0.018	0.030
α	0°	8°	0°	8°
aaa	--	0.10	--	0.004

*For reference only. Controlling dimensions in mm.



Ordering Information

Part / Order Number	Shipping Packaging	Package	Temperature
9LPRS485DGLF	Tubes	56-pin TSSOP	0 to +70° C
9LPRS485DGLFT	Tape and Reel	56-pin TSSOP	0 to +70° C

"LF" suffix to the part number are the Pb-Free configuration and are RoHS compliant.

"D" is the device revision designator (will not correlate with the datasheet revision).

Revision History

Rev.	WHO	Issue Date	Description	Page #
0.1	DC	11/7/2011	Initial Release	-

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