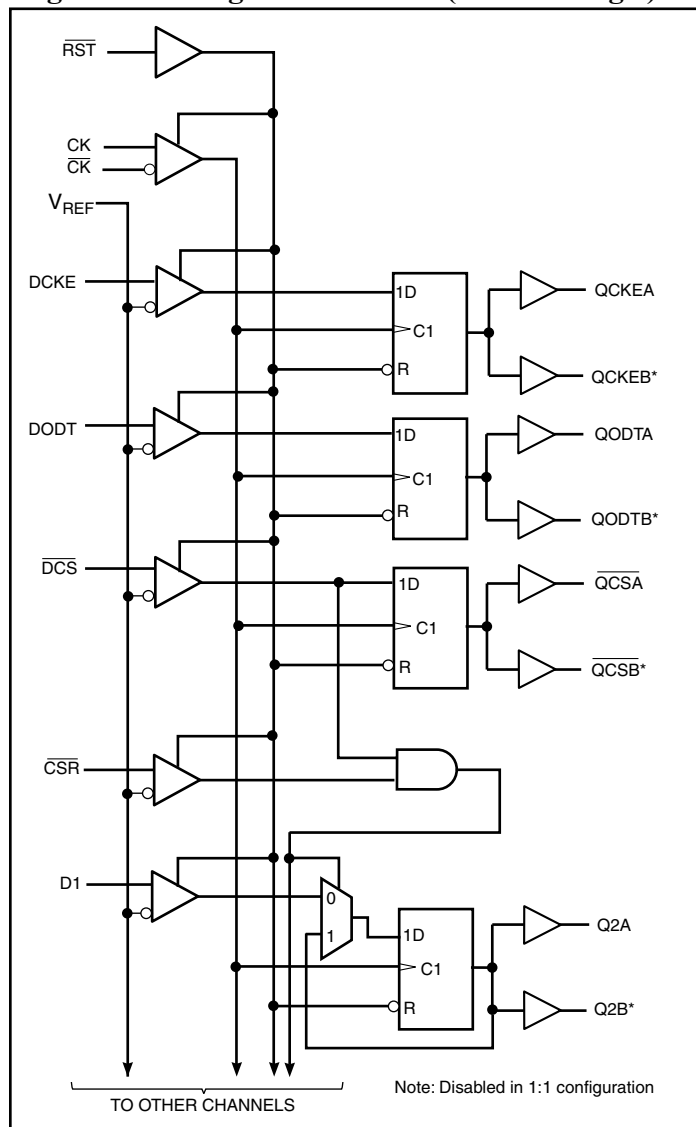


## 25-bit 1:1 or 14-bit 1:2 Configurable Registered Buffer with Parity

### Product Features

- PI74SSTU32866 is a low-voltage device with  $V_{DD} = 1.8V$
- Supports Low Power Standby Operation
- All Inputs are SSTL\_18 Compatible, except  $\overline{RST}$ , C0, C1, which are LVCMOS.
- Output drivers are optimized to drive DDR-II DIMM loads
- Packaging (Pb-free & Green):
  - 96-Ball LFBGA (NB)
- PI74SSTU32866 supports DDR2-533/400

### Logic Block Diagram 1:2 Mode (Positive Logic)



### Product Description

This 25-bit 1:1 or 14-bit 1:2 configurable registered buffer with parity is designed for 1.7 V to 1.9 V  $V_{DD}$  operation. All clock and data inputs are compatible with the JEDEC standard for SSTL\_18. The control and reset ( $\overline{RST}$ ) inputs are LVCMOS. All data outputs are 1.8 V CMOS drivers that have been optimized to drive the DDR-II DIMM load, and meet SSTL\_18 specifications. The error ( $\overline{QERR}$ ) output is 1.8 V open-drain driver.

The PI74SSTU32866 operates from a differential clock (CK and  $\overline{CK}$ ). Data are registered at the crossing of CK going high, and  $\overline{CK}$  going low.

The PI74SSTU32866 accepts a parity bit from the memory controller on the parity bit (PAR\_IN) input, compares it with the data received on the DIMM-independent D-inputs (D2–D3, D5–D6, D8–D25) when

C0 = 0 and C1 = 0; D2–D3, D5–D6, D8–D14 when C0 = 0 and C1=1; or D1–D6, D8–D13 when C0 = 1 and C1=1) and indicates whether a parity error has occurred on the open-drain  $\overline{QERR}$  pin (active low). The convention is even parity, i.e., valid parity is defined as an even number of ones across the DIMM-independent data inputs combined with the parity input bit. To calculate parity, all DIMM-independent data inputs must be tied to a known logic state.

When used as a single device, the C0 and C1 inputs are tied low. In this configuration, parity is checked on the PAR\_IN input which arrives one cycle after the input data to which it applies. The partial-parity-out (PPO) and  $\overline{QERR}$  signals are valid three cycles after the corresponding data inputs.

When used in pairs, the C0 input of the first register is tied low and the C0 input of the second register is tied high. The C1 input of both registers are tied high. Parity, which arrives one cycle after the data input to which it applies, is checked on the PAR\_IN input of the first device. The PPO and  $\overline{QERR}$  signals are produced on the second device three clock cycles after the corresponding data inputs. The PPO output of the first register is cascaded to the PAR\_IN of the second register. The  $\overline{QERR}$  output of the first register is left floating and the valid error information is latched on the  $\overline{QERR}$  output of the second register.

If an error occurs and the  $\overline{QERR}$  output is driven low, it stays latched low for two clock cycles or until  $\overline{RST}$  is driven low. The DIMM-dependent signals (DCKE,  $\overline{DCS}$ , DODT, and CSR) are not included in the parity check computation.

The C0 input controls the pinout configuration for the 1:2 pinout from A configuration (when low) to B configuration (when high). The C1 input controls the pinout configuration from 25-bit 1:1 (when low) to 14-bit 1:2 (when high).

In the DDR-II RDIMM application,  $\overline{RST}$  is specified to be completely asynchronous with respect to CK and  $\overline{CK}$ . Therefore,

## Product Description - Continued

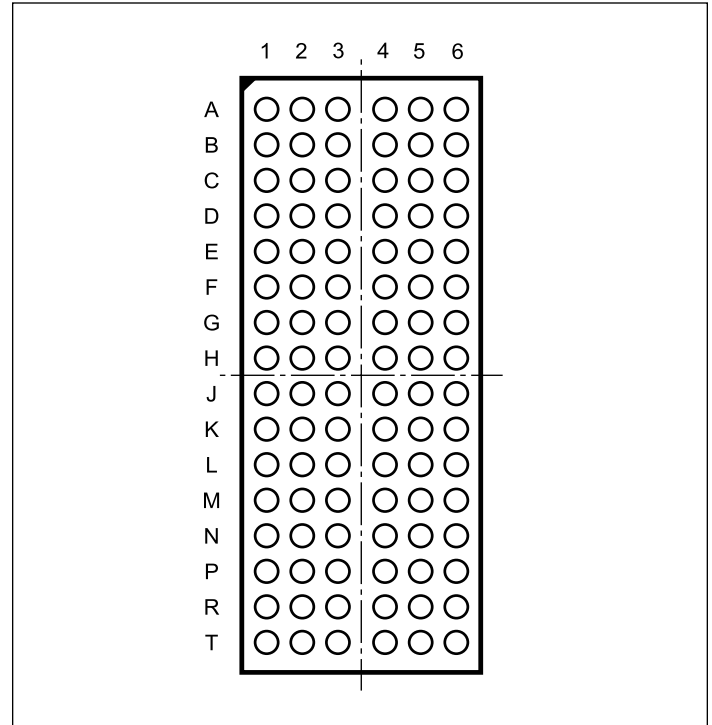
no timing relationship can be guaranteed between the two. When entering reset, the register will be cleared and the Qn outputs will be driven low quickly, relative to the time to disable the differential input receivers. However, when coming out of reset, the register will become active quickly, relative to the time to enable the differential input receivers. As long as the data inputs are low, and the clock is stable during the time from the low-to-high transition of  $\overline{RST}$  until the input receivers are fully enabled, the design of the PI74SSTU32866 must ensure that the outputs will remain low, thus ensuring no glitches on the output.

To ensure defined outputs from the register before a stable clock has been supplied,  $\overline{RST}$  must be held in the low state during power up.

The device supports low-power standby operation. When  $\overline{RST}$  is low, the differential input receivers are disabled, and undriven (floating) data, clock and reference voltage ( $V_{REF}$ ) inputs are allowed. In addition, when  $\overline{RST}$  is low all registers are reset, and all outputs are forced low. The LVCMOS  $\overline{RST}$ , C0, and C1 inputs must always be held at a valid logic high or low level.

The device also supports low-power active operation by monitoring both system chip select ( $\overline{DCS}$  and  $\overline{CSR}$ ) inputs and will gate the Qn and PPO outputs from changing states when both  $\overline{DCS}$  and  $\overline{CSR}$  inputs are high. If either  $\overline{DCS}$  or  $\overline{CSR}$  input is low, the Qn and PPO outputs will function normally. The  $\overline{RST}$  input has priority over the  $\overline{DCS}$  and  $\overline{CSR}$  control and when driven low will force the Qn and PPO outputs low, and the QERR output high. If the  $\overline{DCS}$  control functionality is not desired, then the  $\overline{CSR}$  input can be hard-wired to ground, in which case, the setup-time requirement for  $\overline{DCS}$  would be the same as for the other D data inputs. To control the low-power mode with  $\overline{DCS}$  only, then the  $\overline{CSR}$  input should be pulled up to  $V_{DD}$  through a pullup resistor.

## 96-ball LFBGA (MO-205CC)



**Pin Configuration<sup>(1,2)</sup> 1:1 Register (C0 = 0, C1 = 0)**

	1	2	3	4	5	6
<b>A</b>	DCKE	PPO	V <sub>REF</sub>	V <sub>DD</sub>	QCKE	DNU
<b>B</b>	D2	D15	GND	GND	Q2	Q15
<b>C</b>	D3	D16	V <sub>DD</sub>	V <sub>DD</sub>	Q3	Q15
<b>D</b>	DODT	$\overline{QERR}$	GND	GND	QODT	DNU
<b>E</b>	D5	D17	V <sub>DD</sub>	V <sub>DD</sub>	Q5	Q17
<b>F</b>	D6	D18	GND	GND	Q6	Q18
<b>G</b>	PAR_IN	$\overline{RST}$	V <sub>DD</sub>	V <sub>DD</sub>	C1	C0
<b>H</b>	CK	$\overline{DCS}$	GND	GND	$\overline{QCS}$	DNU
<b>J</b>	$\overline{CK}$	$\overline{CSR}$	V <sub>DD</sub>	V <sub>DD</sub>	NC	NC
<b>K</b>	D8	D19	GND	GND	Q8	Q19
<b>L</b>	D9	D20	V <sub>DD</sub>	V <sub>DD</sub>	Q9	Q20
<b>M</b>	D10	D21	GND	GND	Q10	Q21
<b>N</b>	D11	D22	V <sub>DD</sub>	V <sub>DD</sub>	Q11	Q22
<b>P</b>	D12	D23	GND	GND	Q12	Q23
<b>R</b>	D13	D24	V <sub>DD</sub>	V <sub>DD</sub>	Q13	Q24
<b>T</b>	D14	D25	V <sub>REF</sub>	V <sub>DD</sub>	Q14	Q25

**Notes:**

1. DNU denotes do not use.
2. NC denotes No Internal Connection.

**Pin Configuration 1:2 Register A (C0 = 0, C1 = 1)**

	1	2	3	4	5	6
<b>A</b>	DCKE	PPO	V <sub>REF</sub>	V <sub>DD</sub>	QCKEA	QCKEB
<b>B</b>	D2	DNU	GND	GND	Q2A	Q2B
<b>C</b>	D3	DNU	V <sub>DD</sub>	V <sub>DD</sub>	Q3A	Q3B
<b>D</b>	DODT	$\overline{QERR}$	GND	GND	QODTA	QODTB
<b>E</b>	D5	NC	V <sub>DD</sub>	V <sub>DD</sub>	Q5A	Q5B
<b>F</b>	D6	NC	GND	GND	Q6A	Q6B
<b>G</b>	PAR_IN	$\overline{RST}$	V <sub>DD</sub>	V <sub>DD</sub>	C1	C0
<b>H</b>	CK	$\overline{DCS}$	GND	GND	QCSA	QCSB
<b>J</b>	$\overline{CK}$	$\overline{CSR}$	V <sub>DD</sub>	V <sub>DD</sub>	NC	NC
<b>K</b>	D8	DNU	GND	GND	Q8A	Q8B
<b>L</b>	D9	DNU	V <sub>DD</sub>	V <sub>DD</sub>	Q9A	Q9B
<b>M</b>	D10	DNU	GND	GND	Q10A	Q10B
<b>N</b>	D11	DNU	V <sub>DD</sub>	V <sub>DD</sub>	Q10A	Q11B
<b>P</b>	D12	DNU	GND	GND	Q12A	Q12B
<b>R</b>	D13	DNU	V <sub>DD</sub>	V <sub>DD</sub>	Q13A	Q13B
<b>T</b>	D14	DNU	V <sub>REF</sub>	V <sub>DD</sub>	Q14A	Q14B

**Pin Configuration<sup>(3,4)</sup> 1:2 Register B (C0 = 1, C1 = 1)**

	1	2	3	4	5	6
<b>A</b>	D1	PPO	V <sub>REF</sub>	V <sub>DD</sub>	Q1A	QB
<b>B</b>	D2	DNU	GND	GND	Q2A	Q2B
<b>C</b>	D3	DNU	V <sub>DD</sub>	V <sub>DD</sub>	Q3A	Q3B
<b>D</b>	D4	$\overline{QERR}$	GND	GND	Q4A	Q4B
<b>E</b>	D5	DNU	V <sub>DD</sub>	V <sub>DD</sub>	Q5A	Q5B
<b>F</b>	D6	DNU	GND	GND	Q6A	Q6B
<b>G</b>	PAR_IN	$\overline{RST}$	V <sub>DD</sub>	V <sub>DD</sub>	C1	C0
<b>H</b>	CK	$\overline{DCS}$	GND	GND	$\overline{QCSA}$	$\overline{QCSB}$
<b>J</b>	$\overline{CK}$	$\overline{CSR}$	V <sub>DD</sub>	V <sub>DD</sub>	NC	NC
<b>K</b>	D8	DNU	GND	GND	Q8A	Q8B
<b>L</b>	D9	DNU	V <sub>DD</sub>	V <sub>DD</sub>	Q9A	Q9B
<b>M</b>	D10	DNU	GND	GND	Q10A	Q10B
<b>N</b>	DODT	DNU	V <sub>DD</sub>	V <sub>DD</sub>	QODTA	QODTB
<b>P</b>	D12	DNU	GND	GND	Q12A	Q12B
<b>R</b>	D13	DNU	V <sub>DD</sub>	V <sub>DD</sub>	Q13A	Q13B
<b>T</b>	DCKE	DNU	V <sub>REF</sub>	V <sub>DD</sub>	QCKEA	QCKEB

**Notes:**

3. DNU denotes do not use.
4. NC denotes No Internal Connection.

**Terminal Functions**

Name	Description	Characteristics
GND	Ground	Ground Input
V <sub>DD</sub>	Power Supply	1.8V nominal
V <sub>REF</sub>	Input Reference Voltage	0.9V nominal
CK	Positive master clock input	Differential Clock input
$\overline{CK}$	Negative master clock input	Differential Clock input
C0, C1	Configuration control inputs	LVC MOS inputs
$\overline{RST}$	Asynchronous reset input - resets registers and disables V <sub>REF</sub> data and clock differential - input receivers	LVC MOS inputs
$\overline{CSR}$ , $\overline{DCS}$	Chip select inputs disables D1-D25 outputs switching when both inputs are high <sup>(5)</sup>	SSTL <sub>18</sub> input
D1-D25	Data input - clocked in on the crossing of the rising edge of CK and the falling edge of CK	SSTL <sub>18</sub> input
DODT	The outputs of this register bit will not be suspended by the $\overline{DCS}$ and $\overline{CSR}$ control	SSTL <sub>18</sub> input
PAR_IN	Parity input - arrives one clock cycle after the corresponding data input	SSTL <sub>18</sub> input
DCKE	The outputs of this register bit will not be suspended by the $\overline{DCS}$ and $\overline{CSR}$ control	SSTL <sub>18</sub> input
Q1-Q25	Data outputs that are suspended by the $\overline{DCS}$ and $\overline{CSR}$ control <sup>(6)</sup>	1.8V CMOS output
PPO	Partial Parity out - indicates odd parity of inputs D1- D25 <sup>(5)</sup>	1.8V CMOS output
$\overline{QCS}$	Data output that will not be suspended by the $\overline{DCS}$ and $\overline{CSR}$ control	1.8V CMOS output
QODT	Data output that will not be suspended by the $\overline{DCS}$ and $\overline{CSR}$ control	1.8V CMOS output
QCKE	Data output that will not be suspended by the $\overline{DCS}$ and $\overline{CSR}$ control	1.8V CMOS output
$\overline{QERR}$	Output error bit - generated one clock cycle after the corresponding data output	Open-drain output
NC	No internal connection	
DNU	Do not use - inputs are in stand-by-equivalent mode and outputs are driven low	

**Notes:**

5. Data inputs = D2, D3, D5, D6, D8-D25 when C0=0 and C1=0  
 Data inputs = D2, D3, D5, D6, D8-D14 when C0=0 and C1=1  
 Data inputs = D1-D6, D8-D10, D12, D13 when C0=1 and C1=1
6. Data outputs = Q2, Q3, Q5, Q6, Q8-Q25 when C0=0 and C1=0  
 Data outputs = Q2, Q3, Q5, Q6, Q8-Q14 when C0=0 and C1=1  
 Data outputs = Q1-Q6, Q8-Q10, Q12, Q13 when C0=1 and C1=1

**Function Table (each flip flop)**

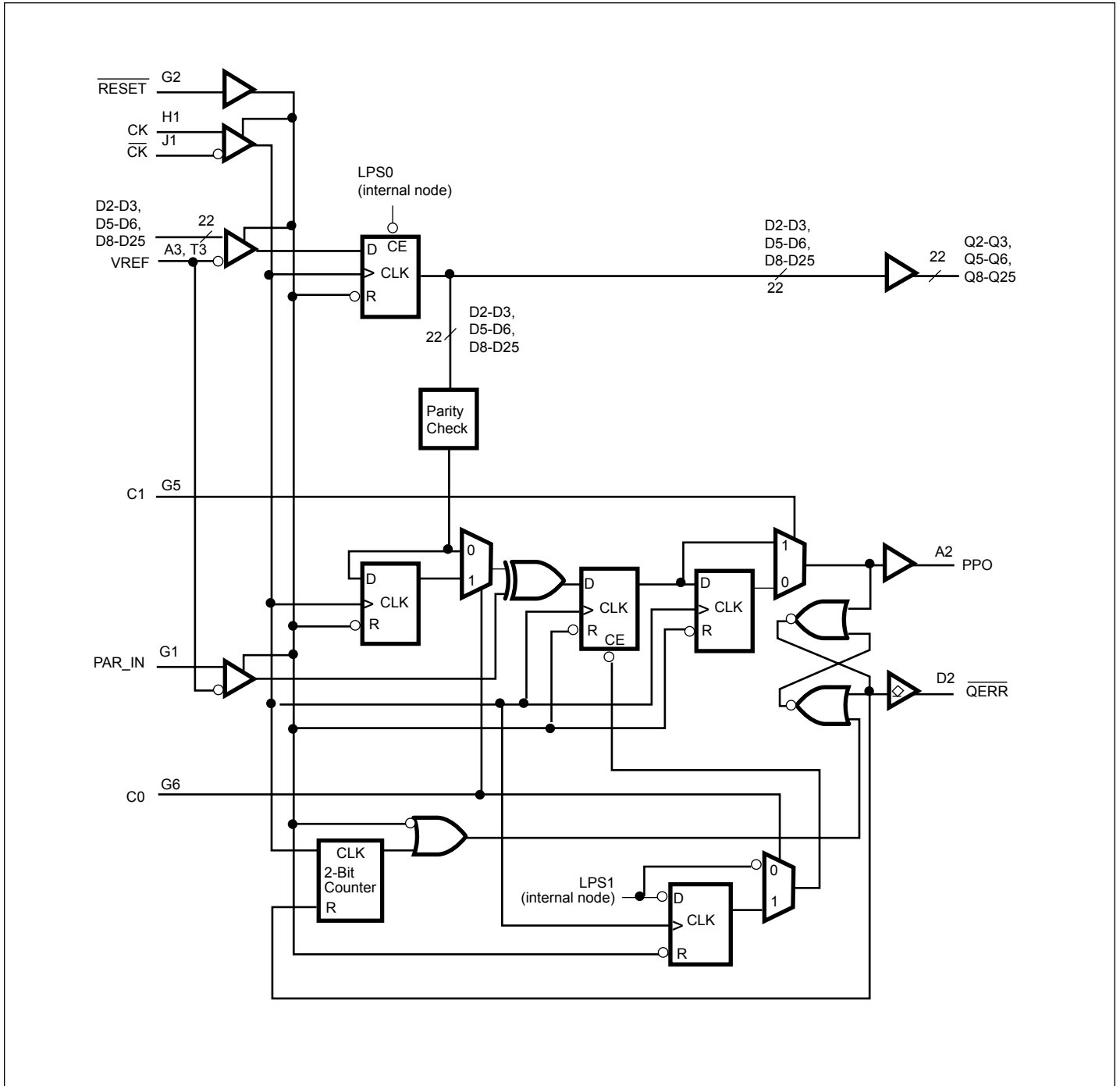
Inputs						Outputs		
$\overline{\text{RST}}$	$\overline{\text{DCS}}$	$\overline{\text{CSR}}$	CK	$\overline{\text{CK}}$	Dn, DODT, DCKE	Qn	$\overline{\text{QCS}}$	QODT, QCKE
H	L	L	↑	↓	L	L	L	L
H	L	L	↑	↓	H	H	L	H
H	L	L	L or H	L or H	X	Q0	Q0	Q0
H	L	H	↑	↓	L	L	L	L
H	L	H	↑	↓	H	H	L	H
H	L	H	L or H	L or H	X	Q0	Q0	Q0
H	H	L	↑	↓	L	L	H	L
H	H	L	↑	↓	H	H	H	H
H	H	L	L or H	L or H	X	Q0	Q0	Q0
H	H	H	↑	↓	L	Q0	H	L
H	H	H	↑	↓	H	Q0	H	H
H	H	H	L or H	L or H	X	Q0	Q0	Q0
L	X or floating	X or floating	X or floating	X or floating	X or floating	L	L	L

**Function Table (Parity and Stand-by)**

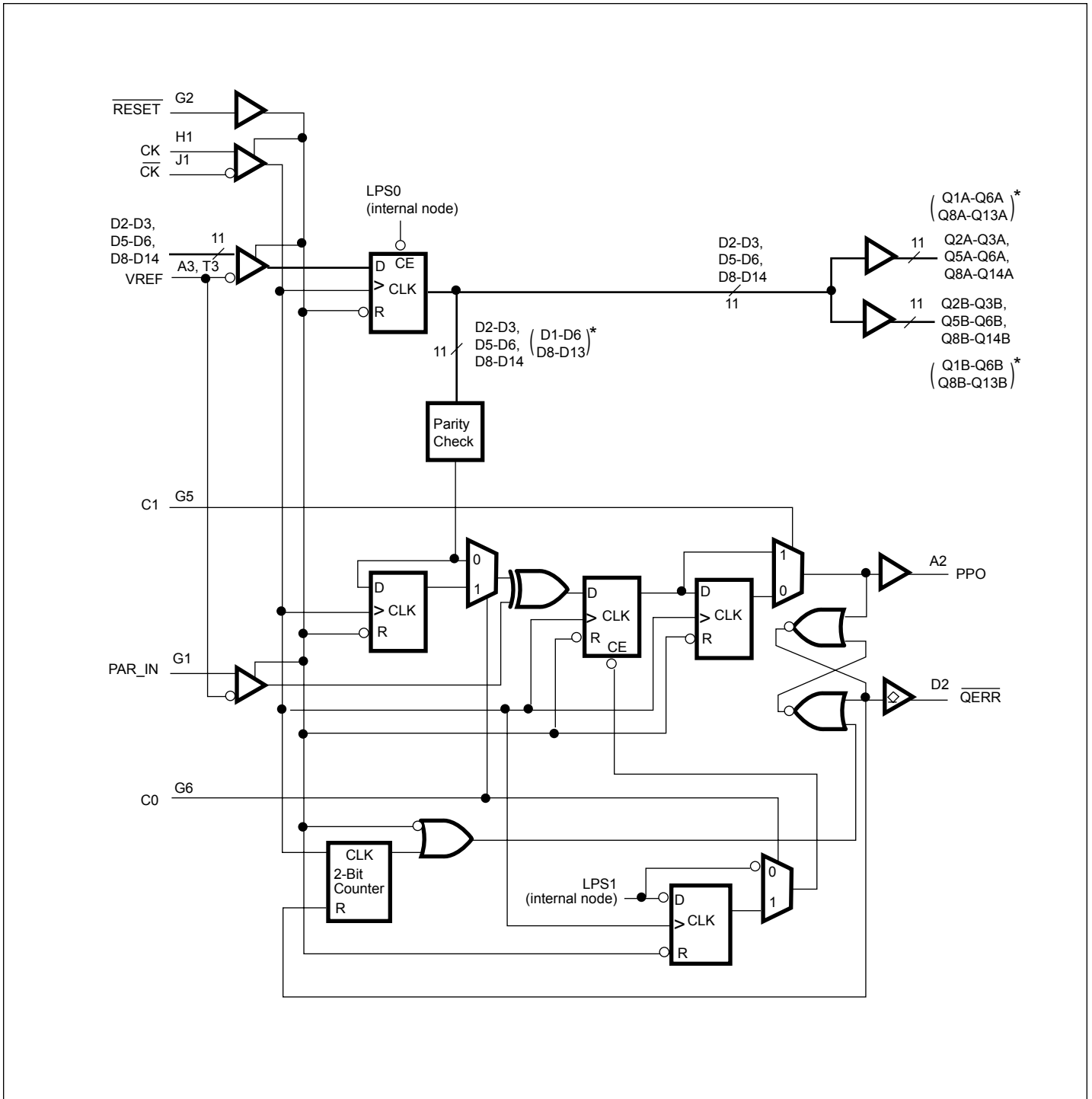
Inputs						Outputs		
$\overline{\text{RST}}$	$\overline{\text{DCS}}$	$\overline{\text{CSR}}$	CK	$\overline{\text{CK}}$	$\Sigma$ of inputs = H (D1- D25) <sup>(7)</sup>	PAR_IN <sup>(8)</sup>	PPO	$\overline{\text{QERR}}$ <sup>(9)</sup>
H	L	X	↑	↓	Even	L	L	H
H	L	X	↑	↓	Odd	L	H	L
H	L	X	↑	↓	Even	H	H	L
H	L	X	↑	↓	Odd	H	L	H
H	H	L	↑	↓	Even	L	L	H
H	H	L	↑	↓	Odd	L	H	L
H	H	L	↑	↓	Even	H	H	L
H	H	L	↑	↓	Odd	H	L	H
H	H	H	↑	↓	X	X	PPO <sub>0</sub>	$\overline{\text{QERR}}$ <sub>0</sub>
H	X	X	L or H	L or H	X	X	PPO <sub>0</sub>	$\overline{\text{QERR}}$ <sub>0</sub>
L	X or floating	X or floating	X or floating	X or floating	X or floating	X or floating	L	H

**Notes:**

- Data inputs = D2, D3, D5, D6, D8-D25 when C0=0 and C1=0  
Data inputs = D2, D3, D5, D6, D8-D14 when C0=0 and C1=1  
Data inputs = D1-D6, D8-D10, D12, D13 when C0=1 and C1=1
- PAR\_IN arrives one clock cycle (C0=0), or two clock cycles (C0=1), after the data to which it applies
- this transition assumes  $\overline{\text{QERR}}$  is high at the crossing of CK going high and  $\overline{\text{CK}}$  going low. If  $\overline{\text{QERR}}$  is low, it stays latched low for two clock cycles or until RST is driven low

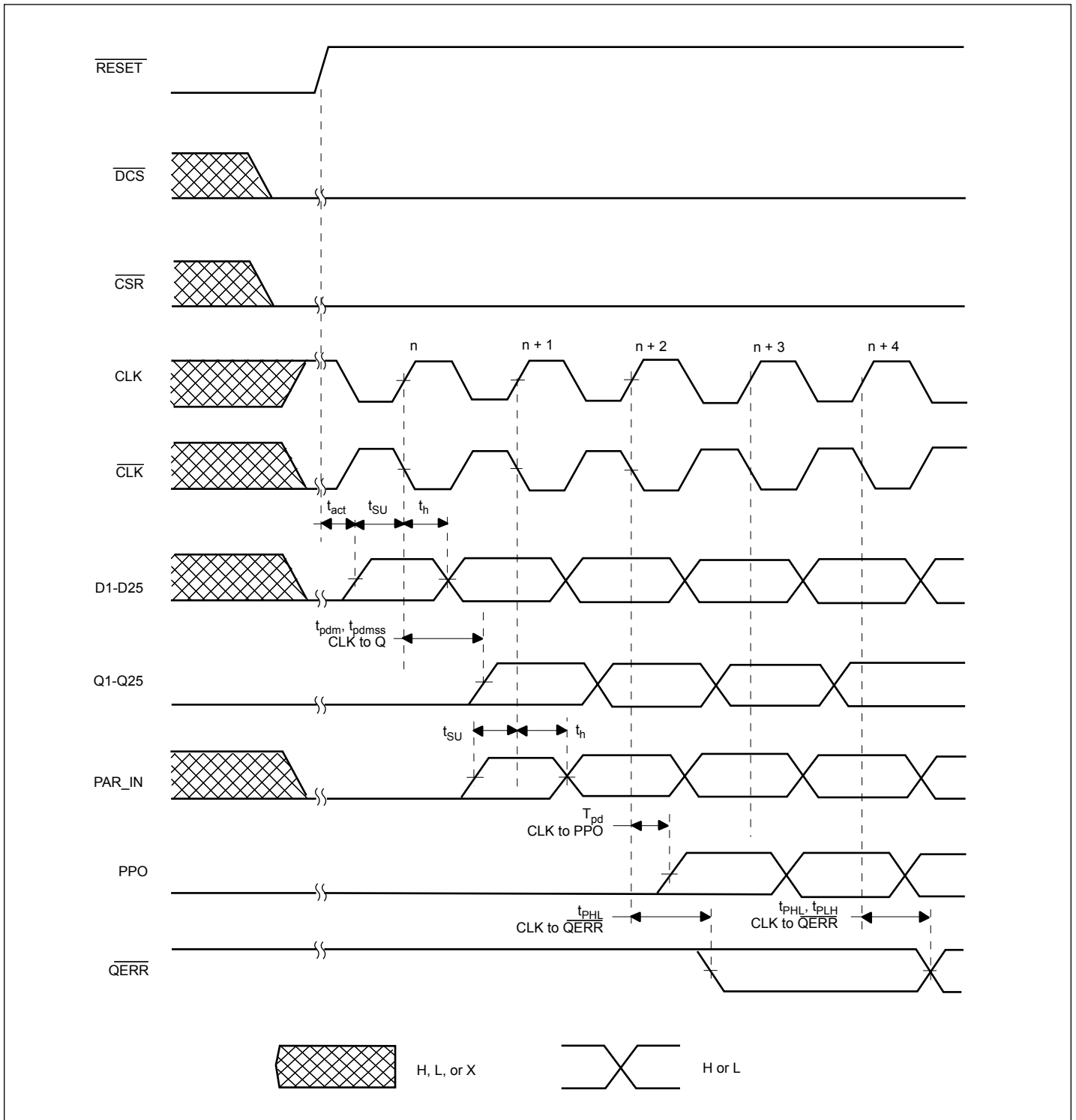


Parity Logic Diagram 1:1 Configuration (C0 = 0, C1 = 0)

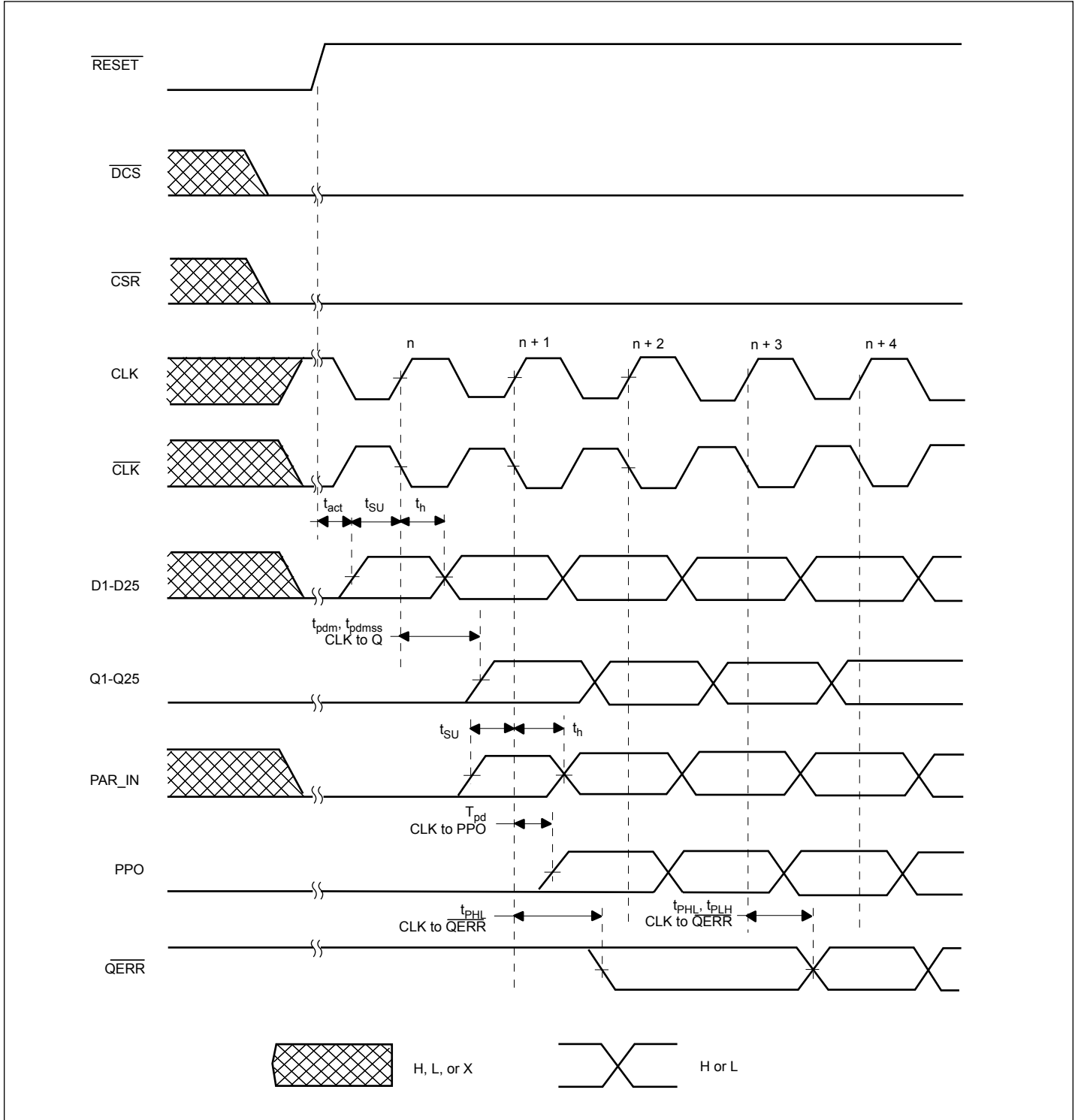


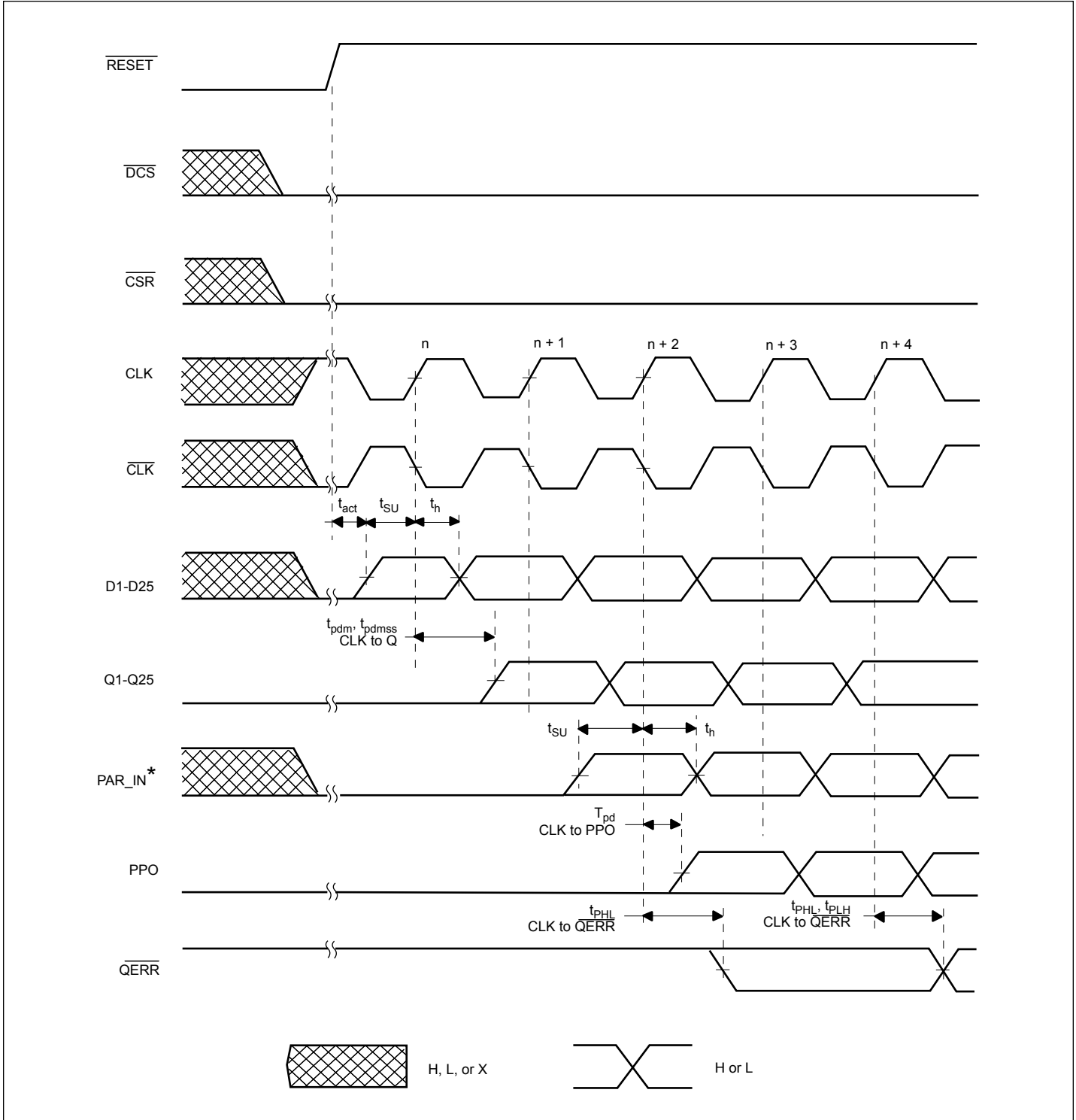
Parity Logic Diagram for 1:2 configuration Register A (C0 = 0, C1 = 1)  
\*Parity Logic Diagram for 1:2 configuration Register B (C0 = 1, C1 = 1)





**Timing Diagram for 1:1 Configuration (C0 = 0, C1 = 0)**


**Timing Diagram for 1:2 Configuration Register A (C0 = 0, C1 = 1)**



**Timing Diagram for 1:2 Configuration Register B (C0 = 1, C1 = 1)**

\* PAR\_IN is driven from PPO of Register A (C0 = 0, C1 = 1)

### Maximum Ratings<sup>(10,11,12)</sup>

(Above which the useful life may be impaired. For user guidelines, not tested.)

Storage Temperature .....	-65°C to +150°C
Supply Voltage Range, $V_{DD}$ .....	-0.5V to 2.5V
Input Voltage Range, $V_I$ : (See Notes 2 and 3): .....	-0.5V to 2.5V
Output Voltage Range, $V_O$ (See Notes 2 and 3)....	-0.5V to $V_{DD} + 0.5V$
Input Clamp current, $I_{IK}$ ( $V_I < 0$ or $V_I = V_{DD}$ ) .....	-50mA
Output Clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{DD}$ ).....	$\pm 50mA$
Continuous Output Current, $I_O$ ( $V_O = 0$ to $V_{DD}$ ) .....	$\pm 50mA$
Continuous Current through each $V_{DD}$ or GND.....	$\pm 100mA$
Storage Temperature, $T_{STG}$ .....	150 °C

**Notes:**

10. Stresses greater than those listed under MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.
11. The input and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
12. This value is limited to 2.5V maximum

### Recommended Operating Conditions<sup>(13)</sup>

Parameters	Description	Min.	Nom.	Max.	Units
$V_{DD}$	Supply Voltage	1.7		1.9	V
$V_{REF}$	Reference Voltage	$0.49 \times V_{DD}$	$0.50 \times V_{DD}$	$0.51 \times V_{DD}$	
$V_{TT}$	Termination Voltage	$V_{REF} - 40mA$	$V_{REF}$	$V_{REF} - 40mA$	
$V_I$	Input Voltage	0		$V_{DD}$	
$V_{IH}$	AC High - Level Input Voltage	$V_{REF} + 250mV$		$V_{REF} - 250mV$	
$V_{IL}$	AC Low- Level Input Voltage				
$V_{IH}$	DC High - Level Input Voltage				
$V_{IL}$	DC Low- Level Input Voltage				
$V_{IH}$	High Level Input Voltage	$0.65 \times V_{DD}$			
$V_{IL}$	Low Level Input Voltage				
$V_{ICR}$	Common-mode input Voltage	0.675		1.125	
$V_{ID}$	Differential Input Voltage				
$I_{OH}$	High-Level Output Current			-8	
$I_{OL}$	Low-Level Output Current			8	
$T_A$	Operating Free-air Temperature	0		70	°C

**Note:**

13. The  $\overline{RST}$  and Cn inputs of the device must be held at valid levels (not floating) to ensure proper device operation. The differential inputs must not be floating, unless  $\overline{RST}$  is low.

**Electrical Characteristics** (Over Recommended Operating Free Air Temperature range)

Parameter	Description	Test Conditions	V <sub>DD</sub>	Min.	Nom.	Max.	Units
V <sub>OH</sub>	Output High Voltage	I <sub>OH</sub> = -6 mA	1.7V	1.2			V
V <sub>OL</sub>	Output Low Voltage	I <sub>OL</sub> = 6 mA	1.7V			0.5	
I <sub>I</sub>	All inputs	V <sub>I</sub> = V <sub>DD</sub> or GND	1.9V			±5	μA
I <sub>DD</sub>	Static Stand-by	$\overline{\text{RST}} = \text{GND}$	1.9V			100	
	Static Operating Current	$\overline{\text{RST}} = \text{V}_{\text{DD}}, V_{\text{I}} = V_{\text{IH(AC)}} \text{ or } V_{\text{IL(AC)}}$	1.9V			40	mA
I <sub>DDD</sub>	Dynamic Operating Current - clock only	$\overline{\text{RST}} = \text{V}_{\text{DD}}, V_{\text{I}} = V_{\text{IH(AC)}}, \text{ or } V_{\text{IL(AC)}} \text{ CK and } \overline{\text{CK}} \text{ switching 50\% duty cycle}$	1.8V	28			μA/MHz
	Dynamic Operating - per each data input, 1:1 mode	$\overline{\text{RST}} = \text{V}_{\text{DD}}, V_{\text{I}} = V_{\text{IH(AC)}}, \text{ or } V_{\text{IL(AC)}}, \text{ CK and } \overline{\text{CK}} \text{ switching 50\% duty cycle. One data input switching at half clock frequency, 50\% duty cycle}$	1.8V	36			μA/MHz
	Dynamic Operating - per each data input, 1:2 mode	$\overline{\text{RST}} = \text{V}_{\text{DD}}, V_{\text{I}} = V_{\text{IH(AC)}}, \text{ or } V_{\text{IL(AC)}} \text{ CK and } \overline{\text{CK}} \text{ switching 50\% duty cycle. One data input switching at half clock frequency, 50\% duty cycle}$	1.8V	36			
C <sub>I</sub>	Input capacitance, Data and CSR inputs	V <sub>I</sub> = V <sub>REF</sub> ± 250mV	1.8V	2.5		3.5	pF
	Input capacitance, $\overline{\text{CK}}$ and $\overline{\text{CK}}$	V <sub>ICR</sub> = 0.9V, V <sub>ID</sub> = 600mV		2		3	
	Input capacitance, $\overline{\text{RST}}$	V <sub>I</sub> = V <sub>DD</sub> or GND			2.5		

**Timing Requirements** Over Recommended Operating Free Air Temperature range (See Figure 1)

Parameter	Description	Min.	Max	Units
f <sub>clock</sub>	Clock frequency		270	MHz
t <sub>w</sub>	Pulse Duration, CK, $\overline{\text{CK}}$ , High or low	1		ns
t <sub>act</sub>	Differential inputs active time <sup>(14, 15)</sup>		10	
t <sub>inact</sub>	Differential inputs inactive time <sup>(14, 15, 16)</sup>		15	
t <sub>su</sub>	Setup time	$\overline{\text{DCS}}$ before CK↑, $\overline{\text{CK}}\downarrow$ , $\overline{\text{CSR}}$ high, $\overline{\text{CSR}}$ before CK↑, $\overline{\text{CK}}\downarrow$ , $\overline{\text{DCS}}$ high	0.7	
		$\overline{\text{DCS}}$ before CK↑, CK↓, $\overline{\text{CSR}}$ low	0.5	
		DODT, DCKE and data before CK↑, $\overline{\text{CK}}\downarrow$	0.5	
		PAR_IN before CK↑, $\overline{\text{CK}}\downarrow$	0.5	
t <sub>h</sub>	Hold Time	DCS, DODT, DCKE and data before CK↑, $\overline{\text{CK}}\downarrow$	0.5	
		PAR_IN after CK↑, $\overline{\text{CK}}\downarrow$	0.5	

**Notes:** 14. This parameter is not necessarily production tested.

15. Data and V<sub>REF</sub> inputs must be a low minimum time of t<sub>act</sub> max, after  $\overline{\text{RST}}$  is taken high.

16. Data and clock inputs must be held at valid levels (not floating) a minimum time of t<sub>inact</sub> max after  $\overline{\text{RST}}$  is taken low.

**Switching Characteristics** Over Recommended Operating Free Air Temperature range (See Figure 1)

Symbol	Parameter	Measure Condition	Min.	Max.	Units
$f_{MAX}$	Maximum input clock frequency		270		MHz
$t_{PDM}$	Propagation Delay, single bit switching	From $CK\uparrow$ and $\overline{CK}\downarrow$ to $Q_n$	1.41	2.15	ns
$t_{PDMS}^{(17,18)}$	Propagation Delay Simultaneous Switching			2.35	ns
$t_{PD}$	Propagation Delay	From $CK\uparrow$ and $\overline{CK}\downarrow$ to $\overline{PPO}$	0.5	1.8	ns
$t_{LH}$	Low-to-High propagation delay	From $CK\uparrow$ and $CK\downarrow$ to $\overline{QERR}$	1.2	3	ns
$t_{HL}$	High-to-Low propagation delay		1	2.4	ns
$t_{PHL}$	High-to-Low propagation delay	From $\overline{RST}\downarrow$ to $Q_n\downarrow$		3	ns
$t_{PHL}$	High-to-Low propagation delay	From $\overline{RST}\downarrow$ to $\overline{PPO}\downarrow$		3	ns
$t_{PLH}$	Low-to-high propagation delay	From $\overline{RST}\downarrow$ to $\overline{QERR}\downarrow$		3	ns

**Notes:**

17. Includes 350ps test load transmission-line delay.  
 18. This parameter is not necessarily production tested.

**Data Output Edge Rates** Over Recommended Operating Free Air Temperature range (See Figure 2)

Symbol	Parameter	Measurement Conditions	Min.	Max.	Units
$dV/dt_r$	Rising edge slew rate	From 20% to 80%	1	4	V/ns
$dV/dt_f$	Falling edge slew rate	From 20% to 80%	1	4	
$dV/dt_{\Delta}^{(19)}$	absolute difference between $dV/dt_r$ and $dV/dt_f$	From 20% or 80% to 80% or 20%		1	

**Notes:**

19. Difference between  $dV/dt_r$  (rising edge rate) and  $dV/dt_f$  (falling edge rate).

### Test Circuit and Switching Waveforms<sup>(20-28)</sup>

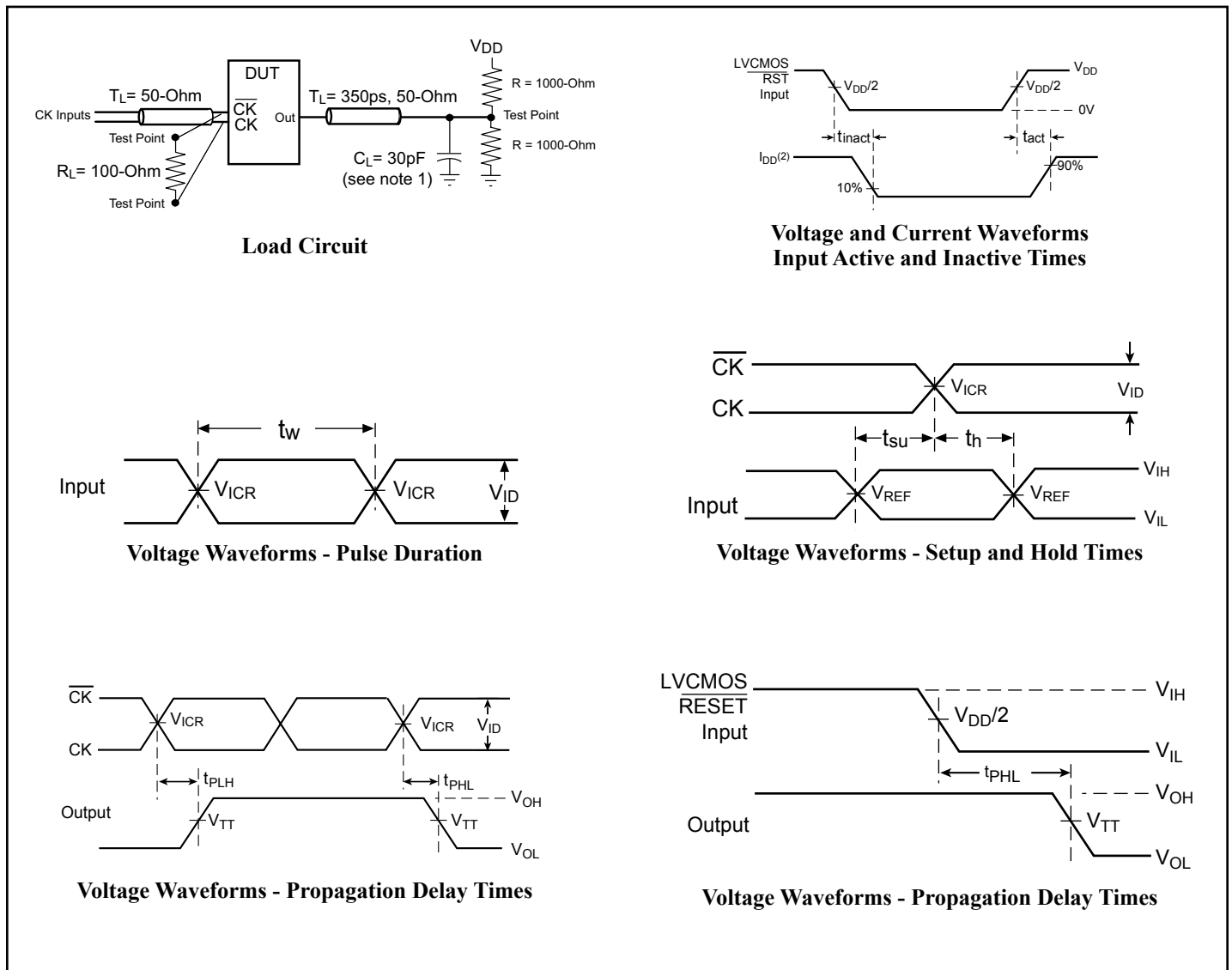


Figure 1. Parameter Measurement Information ( $V_{DD} = 1.8V \pm 0.1V$ )

**Notes:**

20.  $C_L$  includes probe and jig capacitance
21.  $I_{DD}$  tested with clock and data inputs held at  $V_{DD}$  or GND and  $I_O = 0mA$
22. All input pulses are supplied by generators having the following characteristics: Pulse Repetition Rate  $\geq 10$  MHz,  $Z_O = 50\Omega$ , input slew rate =  $1V/ns \pm 20\%$  (unless otherwise specified).
23. The outputs are measured one at a time with one transition per measurement.
24.  $V_{REF} = V_{DD}/2$
25.  $V_{IH} = V_{REF} + 250mV$  (ac voltage levels) for differential inputs.  $V_{IH} = V_{DD}$  for LVC MOS input.
26.  $V_{IL} = V_{REF} - 250mV$  (ac voltage levels) for differential inputs.  $V_{IL} = GND$  for LVC MOS input.
27.  $V_{ID} = 600mV$
28.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pdm}$ .

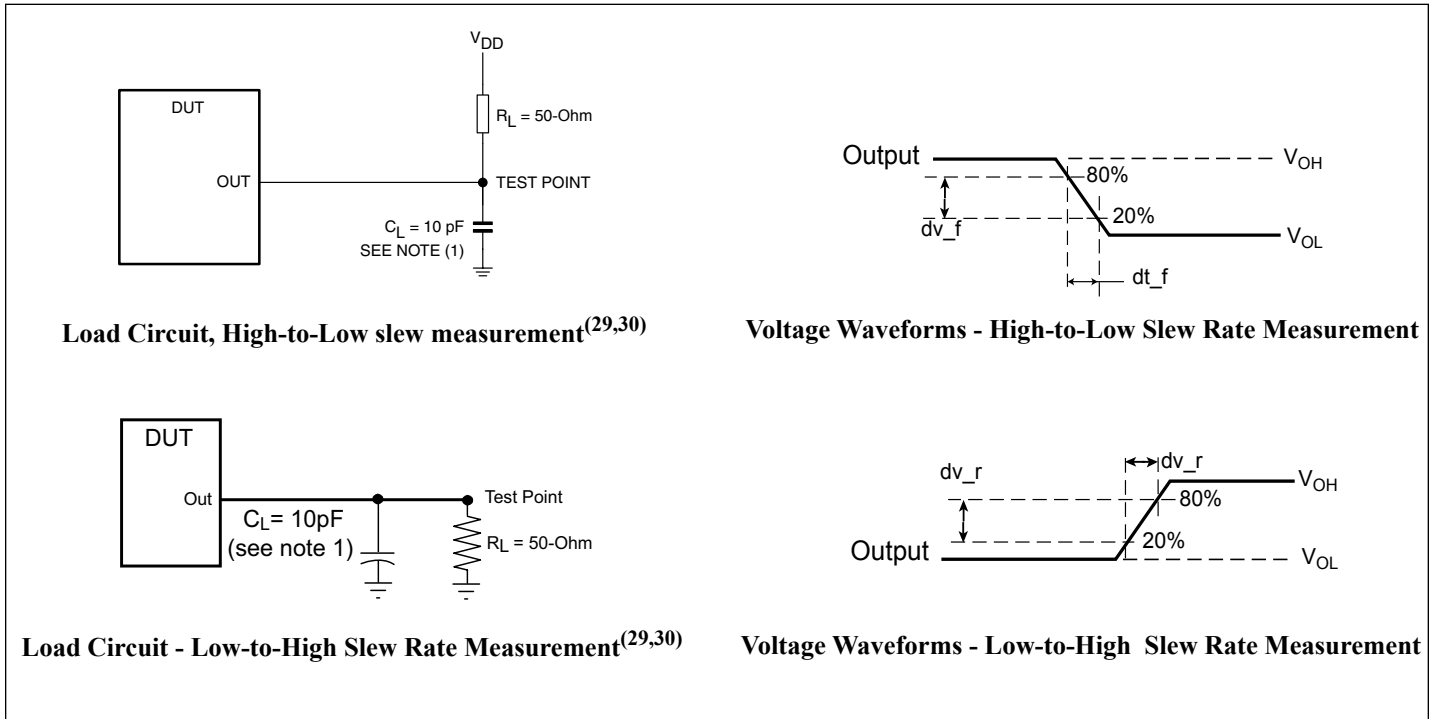


Figure 2. Data Output Slew-Rate Measurement Information ( $V_{DD} = 1.8V \pm 0.1V$ )

**Notes:**

29.  $C_L$  includes probe and jig capacitance

30. All input pulses are supplied by generators having the following characteristics:  
PRR  $\leq$  10 MHz,  $Z_O = 50\Omega$ , input slew rate = 1 V/ns  $\pm$  20% (unless otherwise specified).

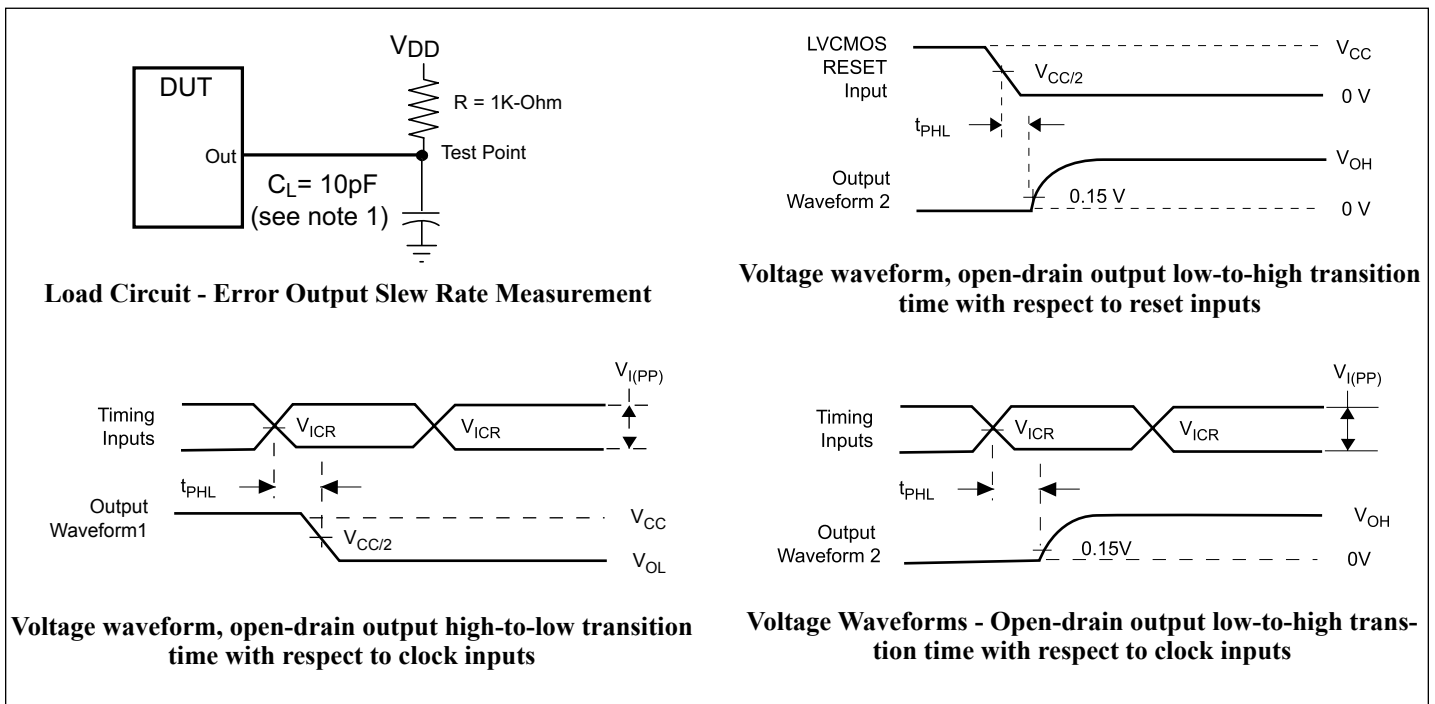
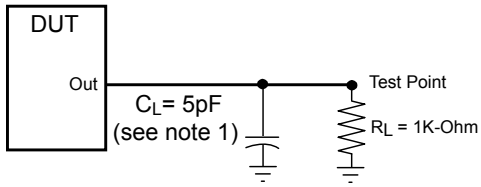
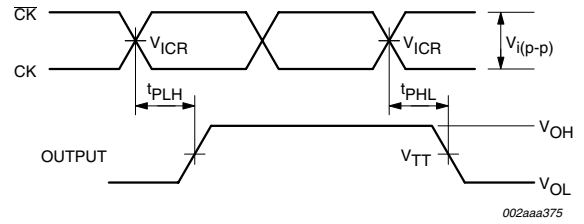


Figure 3. Error output Measurement Information ( $V_{DD} = 1.8V \pm 0.1V$ )

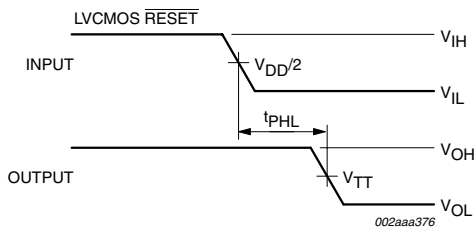




**Partial-Parity-Out (PPO) load circuit**



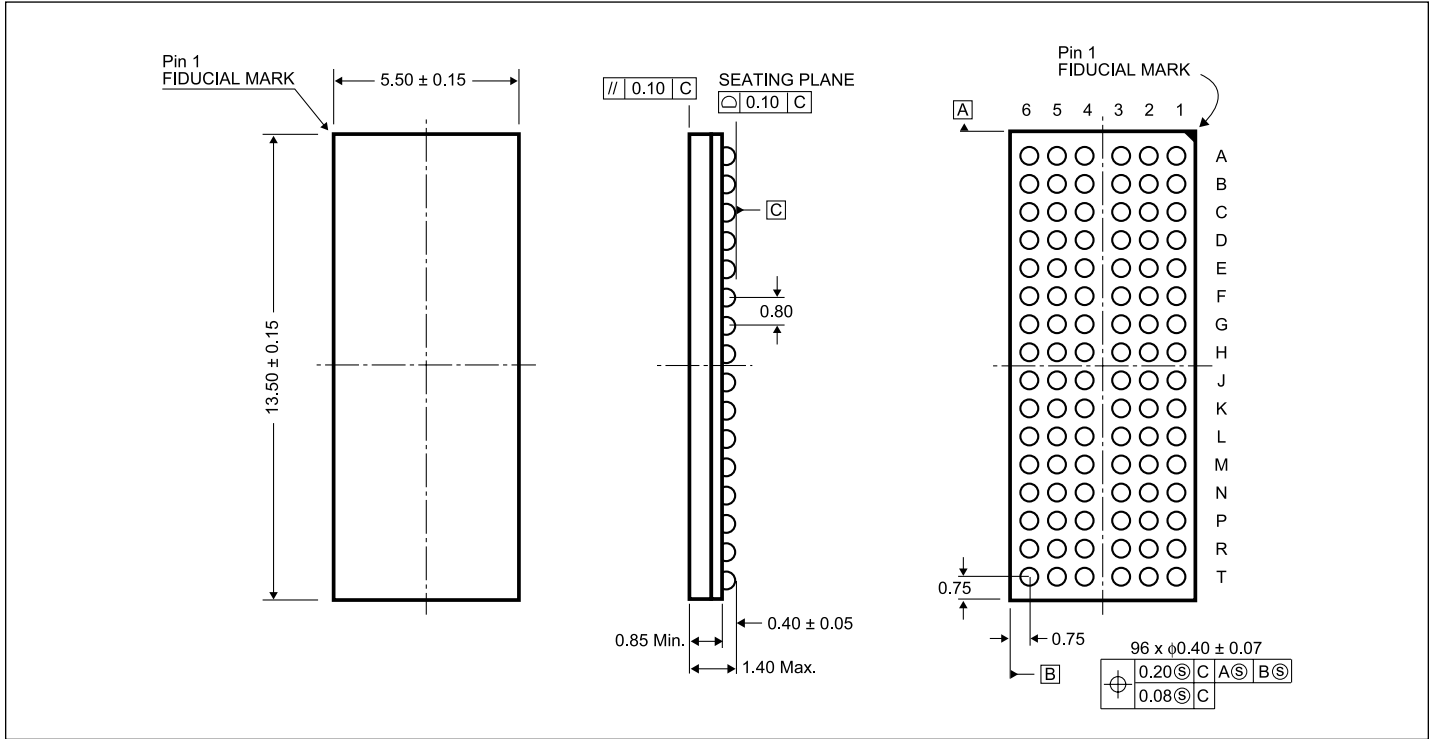
**Partial-Parity-Out (PPO) voltage waveforms; propagation delay times with respect to clock inputs**



**Partial-Parity-Out (PPO) voltage waveforms; propagation delay times with respect to reset inputs**

**Figure 4. Partial-Parity-Out (PPO) Measurement Information ( $V_{DD} = 1.8\text{V} \pm 0.1\text{V}$ )**

**Packaging Mechanical: 96-ball LFBGA (NB)**



**Ordering Information (1,2,3)**

Ordering Code	Package Code	Package Type
PI74SSTU32866NB	NB	96-Ball LFBGA
PI74SSTU32866NBE	NB	Pb-free & Green, 96-Ball LFBGA

**Notes:**

1. Thermal characteristics can be found on the company web site at [www.pericom.com/packaging/](http://www.pericom.com/packaging/)
2. E = Pb-free & Green
3. X suffix = Tape/Reel