3.3V CMOS 18-BIT UNIVERSAL BUS TRANSCEIVER WITH PARITY GENERATORS/CHECKERS, 5V TOLERANT I/O

IDT74LVC16901
ADVANCE INFORMATION

FEATURES:

- Typical $t_{SK(0)}$ (Output Skew) < 250ps
- ESD > 2000V per MIL-STD-883, Method 3015; > 200V using machine model (C = 200pF, R = 0)
- 0.50mm pitch TSSOP package
- Extended commercial range of -40°C to +85°C
- V_{CC} = 3.3V ±0.3V, Normal Range
- V_{CC} = 2.7V to 3.6V, Extended Range
- CMOS power levels (0.4µW typ. static)
- All inputs, outputs and I/O are 5 Volt tolerant
- Supports hot insertion

Drive Features for LVCH16901:

- High Output Drivers: ±24mA
- Reduced system switching noise

APPLICATIONS:

- 5V and 3.3V mixed voltage systems
- Data communication and telecommunication systems

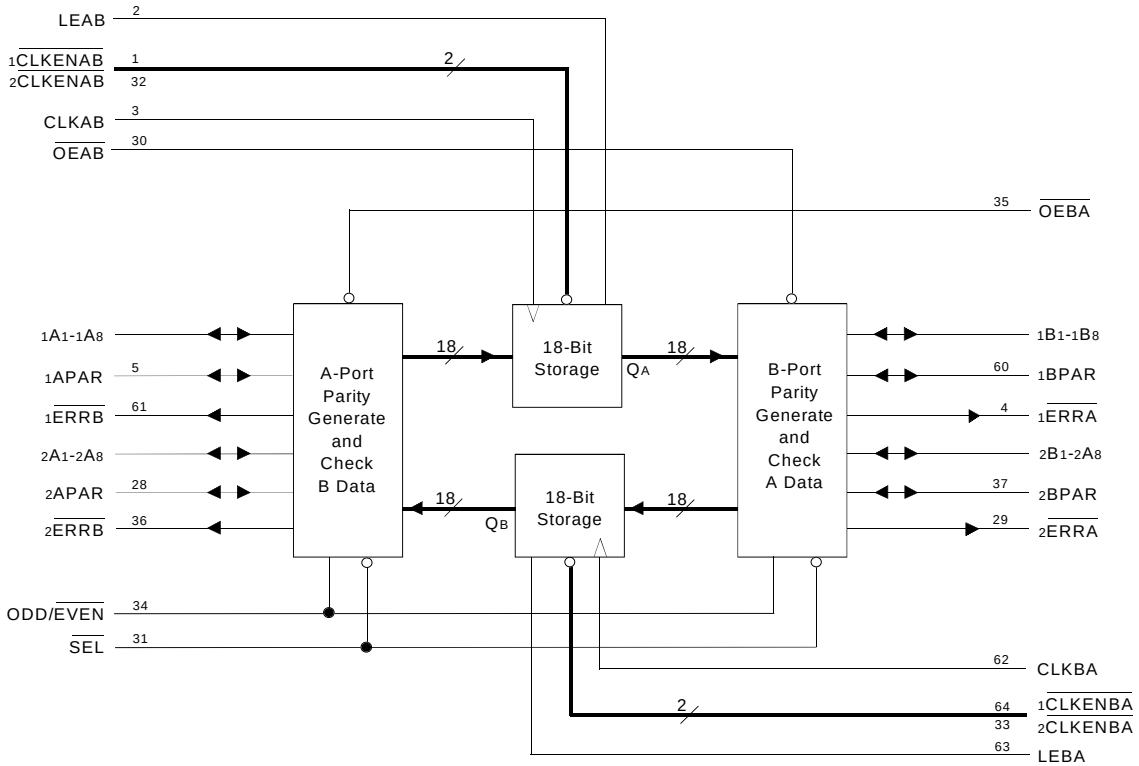
DESCRIPTION:

This 18-bit universal bus transceiver is built using advanced dual metal CMOS technology. The LVC16901 is a dual 9-bit to dual 9-bit parity transceiver with registers. The device can operate as a feed-through transceiver or it can generate/check parity from the two 8-bit data buses in either direction.

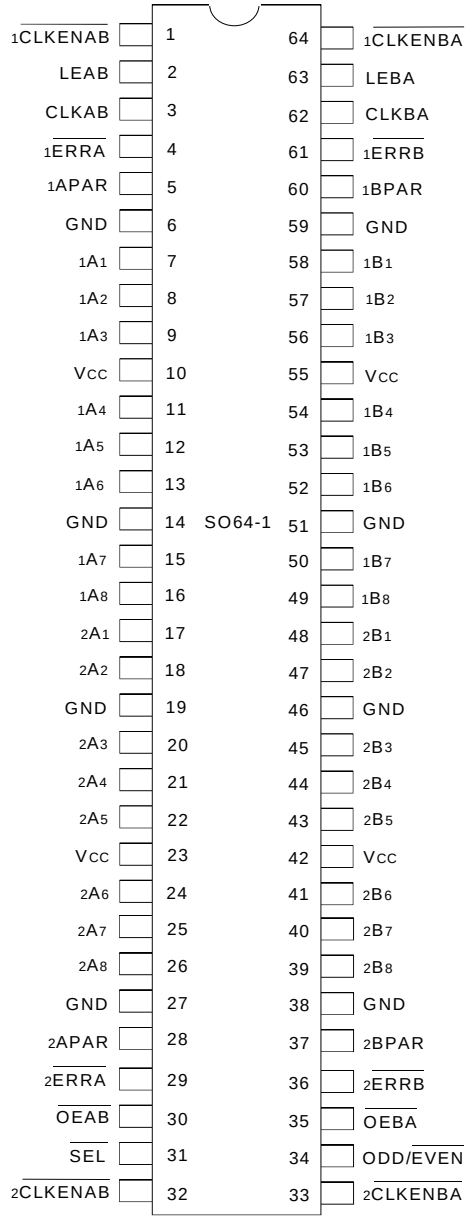
The LVC16901 features independent clock (CLKAB or CLKBA), latch-enable (LEAB or LEBA), and dual 9-bit clock enable ($\overline{CLKENAB}$ or $\overline{CLKENBA}$) inputs. It also provides parity-enable ($\overline{SEL}$) and parity-select (ODD/$\overline{EVEN}$) inputs and separate error-signal ($\overline{ERRA}$ and $\overline{ERRB}$) outputs for checking parity. The direction of data flow is controlled by $\overline{OEAB}$ and $\overline{OEBA}$. When $\overline{SEL}$ is low, the parity functions are enabled. When $\overline{SEL}$ is high, the parity functions are disabled and the device acts as an 18-bit registered transceiver. Inputs can be driven from either 3.3V or 5V devices. This feature allows the use of this device as a translator in a mixed 3.3V/5V supply system.

The LVC16901 has been designed with a ±24mA output driver. This driver is capable of driving a moderate to heavy load while maintaining speed performance.

Functional Block Diagram



PIN CONFIGURATION



TSSOP
TOP VIEW

CAPACITANCE (T_A = +25°C, f = 1.0MHz)

Symbol	Parameter(1)	Conditions	Typ.	Max.	Unit
C_{IN}	Input Capacitance	V_{IN} = 0V	4.5	6	pF
C_{OUT}	Output Capacitance	V_{OUT} = 0V	6.5	8	pF
$C_{I/O}$	I/O Port Capacitance	V_{IN} = 0V	6.5	8	pF

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NOTE:
1. As applicable to the device type.

ABSOLUTE MAXIMUM RATINGS (1)

Symbol	Description	Max.	Unit
V_{TERM}(2)	Terminal Voltage with Respect to GND	– 0.5 to +6.5	V
V_{TERM}(3)	Terminal Voltage with Respect to GND	– 0.5 to +6.5	V
T_{STG}	Storage Temperature	– 65 to +150	°C
I_{OUT}	DC Output Current	– 50 to +50	mA
I_{IK} I_{OK}	Continuous Clamp Current, V_I < 0 or V_O < 0	– 50	mA
I_{CC} I_{SS}	Continuous Current through each V_{CC} or GND	±100	mA

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NOTES:
1. Stresses greater than those listed under ABSOLUTE 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.
2. V_{CC} terminals.
3. All terminals except V_{CC}.

PIN DESCRIPTION

Pin Names	Description
$\overline{OEAB}$	A-to-B Output Enable Input (Active LOW)
$\overline{OEBA}$	B-to-A Output Enable Input (Active LOW)
LEAB	A-to-B Latch Enable Input
LEBA	B-to-A Latch Enable Input
$\overline{xCLKENAB}$	A-to-B 9-bit Clock Enables
$\overline{xCLKENBA}$	B-to-A 9-bit Clock Enables
CLKAB	A-to-B Clock Input
CLKBA	B-to-A Clock Input
$\overline{xERRA}$	A Error-Signal Outputs
$\overline{xERRB}$	B Error-Signal Outputs
xAPAR	A Port Parities
xBPAR	B Port Parities
ODD/$\overline{EVEN}$	Parity Select Input
$\overline{SEL}$	Parity Enables
xAx	A-to-B Data Inputs or B-to-A 3-State Outputs
xBx	B-to-A Data Inputs or A-to-B 3-State Outputs

FUNCTION TABLE (1,2)

Inputs					Outputs
$\overline{CLKENAB}$	$\overline{OEAB}$	LEAB	CLKAB	xAx	xBx
X	H	X	X	X	Z
X	L	H	X	L	L
X	L	H	X	H	H
H	L	L	X	X	B_0(3)
L	L	L	↑	L	L
L	L	L	↑	H	H
L	L	L	L	X	B_0(3)
L	L	L	H	X	B_0(4)

NOTES:
1. A-to-B data flow is shown. B-to-A data flow is similar but uses $\overline{OEBA}$, LEBA, and $\overline{CLKENBA}$.
2. H = HIGH Voltage Level
   L = LOW Voltage Level
   X = Don't Care
   Z = High-Impedance
   ↑ = LOW-to-HIGH Transition
3. Output level before the indicated steady-state input conditions were established.
4. Output level before the indicated steady-state input conditions were established, provided that CLKAB was LOW before LEAB went LOW.

PARITY ENABLE

Inputs			Operation or Function	
$\overline{SEL}$	$\overline{OEBA}$	$\overline{OEAB}$		
L	H	L	Parity is checked on port A and is generated on port B.	
L	L	H	Parity is checked on port B and is generated on port A.	
L	H	H	Parity is checked on port B and port A.	
L	L	L	Parity is generated on port A and B if device is in FF mode.	
H	L	L	Parity functions are	Q_A data to B, Q_B data to A
H	L	H	disabled; device acts as	Q_B data to A
H	H	L	a standard 18 bit registered	Q_A data to B
H	H	H	transceiver.	Isolation

PARITY

Inputs								Outputs			
$\overline{SEL}$	$\overline{OEBA}$	$\overline{OEAB}$	ODD/$\overline{EVEN}$	∑ OF INPUTS A1–A8 = H	∑ OF INPUTS B1–B8 = H	xAPAR	xBPAR	xAPAR	$\overline{xERRA}$	xBPAR	$\overline{xERRB}$
L	H	L	L	0, 2, 4, 6, 8	N/A	L	N/A	N/A	H	L	Z
L	H	L	L	1, 3, 5, 7	N/A	L	N/A	N/A	L	H	Z
L	H	L	L	0, 2, 4, 6, 8	N/A	H	N/A	N/A	L	L	Z
L	H	L	L	1, 3, 5, 7	N/A	H	N/A	N/A	H	H	Z
L	L	H	L	N/A	0, 2, 4, 6, 8	N/A	L	L	Z	N/A	H
L	L	H	L	N/A	1, 3, 5, 7	N/A	L	H	Z	N/A	L
L	L	H	L	N/A	0, 2, 4, 6, 8	N/A	H	L	Z	N/A	L
L	L	H	L	N/A	1, 3, 5, 7	N/A	H	H	Z	N/A	H
L	H	L	H	0, 2, 4, 6, 8	N/A	L	N/A	N/A	L	H	Z
L	H	L	H	1, 3, 5, 7	N/A	L	N/A	N/A	H	L	Z
L	H	L	H	0, 2, 4, 6, 8	N/A	H	N/A	N/A	H	H	Z
L	H	L	H	1, 3, 5, 7	N/A	H	N/A	N/A	L	L	Z
L	L	H	H	N/A	0, 2, 4, 6, 8	N/A	L	H	Z	N/A	L
L	L	H	H	N/A	1, 3, 5, 7	N/A	L	L	Z	N/A	H
L	L	H	H	N/A	0, 2, 4, 6, 8	N/A	H	H	Z	N/A	H
L	L	H	H	N/A	1, 3, 5, 7	N/A	H	L	Z	N/A	L
L	H	H	L	0, 2, 4, 6, 8	0, 2, 4, 6, 8	L	L	Z	H	Z	H
L	H	H	L	1, 3, 5, 7	1, 3, 5, 7	L	L	Z	L	Z	L
L	H	H	L	0, 2, 4, 6, 8	0, 2, 4, 6, 8	H	H	Z	L	Z	L
L	H	H	L	1, 3, 5, 7	1, 3, 5, 7	H	H	Z	H	Z	H
L	H	H	H	0, 2, 4, 6, 8	0, 2, 4, 6, 8	L	L	Z	L	Z	L
L	H	H	H	1, 3, 5, 7	1, 3, 5, 7	L	L	Z	H	Z	H
L	H	H	H	0, 2, 4, 6, 8	0, 2, 4, 6, 8	H	H	Z	H	Z	H
L	H	H	H	1, 3, 5, 7	1, 3, 5, 7	H	H	Z	L	Z	L
L	L	L	L	N/A	N/A	N/A	N/A	PE(1)	Z	PE(1)	Z
L	L	L	H	N/A	N/A	N/A	N/A	PO(2)	Z	PO(2)	Z

NOTES:
1. Parity output is set to the level so that the specific bus side is set to even parity.
2. Parity output is set to the level so that the specific bus side is set to odd parity.

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:
Operating Condition: T_A = –40°C to +85°C

Symbol	Parameter	Test Conditions		Min.	Typ.(1)	Max.	Unit
V_{IH}	Input HIGH Voltage Level	V_{CC} = 2.3V to 2.7V		1.7	—	—	V
		V_{CC} = 2.7V to 3.6V		2	—	—	
V_{IL}	Input LOW Voltage Level	V_{CC} = 2.3V to 2.7V		—	—	0.7	V
		V_{CC} = 2.7V to 3.6V		—	—	0.8	
I_{IH} I_{IL}	Input Leakage Current	V_{CC} = 3.6V	V_I = 0 to 5.5V	—	—	±5	µA
I_{OZH} I_{OZL}	High Impedance Output Current (3-State Output pins)	V_{CC} = 3.6V	V_O = 0 to 5.5V	—	—	±10	µA
I_{OFF}	Input/Output Power Off Leakage	V_{CC} = 0V, V_{IN} or $V_O \leq$ 5.5V		—	—	±50	µA
V_{IK}	Clamp Diode Voltage	V_{CC} = 2.3V, I_{IN} = – 18mA		—	– 0.7	– 1.2	V
V_H	Input Hysteresis	V_{CC} = 3.3V		—	100	—	mV
I_{CCL} I_{CCH}	Quiescent Power Supply Current	V_{CC} = 3.6V	V_{IN} = GND or V_{CC}	—	—	10	µA
I_{CCZ}			$3.6 \leq V_{IN} \leq 5.5V$(2)	—	—	10	
ΔI_{CC}	Quiescent Power Supply Current Variation	One input at V_{CC} - 0.6V other inputs at V_{CC} or GND		—	—	500	µA

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NOTES:
1. Typical values are at V_{CC} = 3.3V, +25°C ambient.
2. This applies in the disabled state only.

OUTPUT DRIVE CHARACTERISTICS

Symbol	Parameter	Test Conditions(1)		Min.	Max.	Unit
V_{OH}	Output HIGH Voltage	V_{CC} = 2.3V to 3.6V	I_{OH} = – 0.1mA	V_{CC} – 0.2	—	V
		V_{CC} = 2.3V	I_{OH} = – 6mA	2	—	
		V_{CC} = 2.3V	I_{OH} = – 12mA	1.7	—	
		V_{CC} = 2.7V		2.2	—	
		V_{CC} = 3.0V		2.4	—	
		V_{CC} = 3.0V	I_{OH} = – 24mA	2.2	—	
V_{OL}	Output LOW Voltage	V_{CC} = 2.3V to 3.6V	I_{OL} = 0.1mA	—	0.2	V
		V_{CC} = 2.3V	I_{OL} = 6mA	—	0.4	
			I_{OL} = 12mA	—	0.7	
		V_{CC} = 2.7V	I_{OL} = 12mA	—	0.4	
		V_{CC} = 3.0V	I_{OL} = 24mA	—	0.55	

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NOTE:
1. V_{IH} and V_{IL} must be within the min. or max. range shown in the DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE table for the appropriate V_{CC} range. T_A = – 40°C to +85°C.

OPERATING CHARACTERISTICS, T_A = 25°C

Symbol	Parameter	Test Conditions	V_{CC} = 1.8V Typical	V_{CC} = 2.5V ± 0.2V Typical	V_{CC} = 3.3V ± 0.3V Typical	Unit
C_{PD}	Power Dissipation Capacitance Outputs enabled	C_L = 0pF, f = 10Mhz	37	52	68	pF
C_{PD}	Power Dissipation Capacitance Outputs disabled		16	22	28	pF

SWITCHING CHARACTERISTICS (1)

Symbol	Parameter	V_{CC} = 1.8V	V_{CC} = 2.5V ± 0.2V		V_{CC} = 2.7V		V_{CC} = 3.3V ± 0.3V		Unit
		Typical	Min.	Max.	Min.	Max.	Min.	Max.	
f_{MAX}		125	125	—	125	—	125	—	MHz
t_{PLH} t_{PHL}	Propagation Delay xAx to xBx or xBx to xAx	5.9	1	6.2	—	5.8	1	5.4	ns
t_{PLH} t_{PHL}	Propagation Delay xAx to xBPAR or xBx to xAPAR	12.7	2	9.9	—	8.6	2	7.7	ns
t_{PLH} t_{PHL}	Propagation Delay xAPAR to xBPAR or xBPAR to xAPAR	7	1	6.7	—	6.2	1	5.7	ns
t_{PLH} t_{PHL}	Propagation Delay xAPAR to $x\overline{ERRA}$ or xBPAR to $x\overline{ERRB}$	13	2	10.7	—	9.7	2	8.5	ns
t_{PLH} t_{PHL}	Propagation Delay ODD/$\overline{EVEN}$ to $x\overline{ERRB}$ or $x\overline{ERRA}$	9.9	1.5	9.7	—	8.9	1.5	7.8	ns
t_{PLH} t_{PHL}	Propagation Delay ODD/$\overline{EVEN}$ to xAPAR or xBPAR	10.4	1.5	9.3	—	8.6	1.5	7.5	ns
t_{PLH} t_{PHL}	Propagation Delay $\overline{SEL}$ to xAPAR or xBPAR	6.9	1	7.1	—	6.9	1	6.1	ns
t_{PLH} t_{PHL}	Propagation Delay LEBA to xAx or LEAB to xBx	6.8	1	7	—	6.5	1	5.8	ns
t_{PLH} t_{PHL}	Propagation Delay LEBA to xAPAR or LEAB to xBPAR (parity feed through)	7.9	1.5	7.7	—	7	1.5	6.3	ns
t_{PLH} t_{PHL}	Propagation Delay LEBA to xAPAR or LEAB to xBPAR (parity generated)	13.6	2.5	10.8	—	9.3	2	8.4	ns
t_{PLH} t_{PHL}	Propagation Delay LEBA to $x\overline{ERRB}$ or LEAB to $x\overline{ERRA}$	13.5	2.5	10.9	—	9.5	2	8.5	ns
t_{PLH} t_{PHL}	Propagation Delay CLKBA to xAx or CLKAB to xBx	6.9	1	7.4	—	6.8	1	6.1	ns
t_{PLH} t_{PHL}	Propagation Delay CLKBA to xAPAR or CLKAB to xBPAR (parity feed through)	8.5	1.5	8.1	—	7.3	1.5	6.6	ns
t_{PLH} t_{PHL}	Propagation Delay CLKBA to xAPAR or CLKAB to xBPAR (parity generated)	14.1	2.5	11.2	—	9.7	2	8.7	ns
t_{PLH} t_{PHL}	Propagation Delay CLKBA to $x\overline{ERRB}$ or CLKAB to x $\overline{ERRA}$	14.3	2.5	11.5	—	9.9	2	8.9	ns

(CONTINUED ON NEXT PAGE)

SWITCHING CHARACTERISTICS (CONTINUED)[1]

Symbol	Parameter	Vcc = 1.8V		Vcc = 2.5V ± 0.2V		Vcc = 2.7V		Vcc = 3.3V ± 0.3V		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
t_{PZH} t_{PZL}	Output Enable Time $\overline{OEAB}$ or $\overline{OEBA}$ to xBx, xBPAR or xAx, xAPAR	—	6.8	1.4	7.3	—	7.1	1	6.3	ns
t_{PZH} t_{PZL}	Output Enable Time $\overline{OEAB}$ or $\overline{OEBA}$ to x$\overline{ERRA}$ or x$\overline{ERRB}$	—	7.4	1.4	7.2	—	6.5	1	5.9	ns
t_{PZH} t_{PZL}	Output Enable Time $\overline{SEL}$ to x$\overline{ERRA}$ or x$\overline{ERRB}$	—	7.6	1.4	7.7	—	7.5	1	6.5	ns
t_{PHZ} t_{PLZ}	Output Disable Time $\overline{OEAB}$ or $\overline{OEBA}$ to xBx, xBPAR or xAx, xAPAR	—	6.9	1.3	7.1	—	6.2	1.5	5.9	ns
t_{PHZ} t_{PLZ}	Output Disable Time $\overline{OEAB}$ or $\overline{OEBA}$ to x$\overline{ERRA}$ or x$\overline{ERRB}$	—	9.3	1.3	8.3	—	7.5	1	6.7	ns
t_{PHZ} t_{PLZ}	Output Disable Time $\overline{SEL}$ to x$\overline{ERRA}$ or x$\overline{ERRB}$	—	7.8	1.3	7.4	—	6.4	1.5	5.9	ns
t_{SU}	Set-up Time, HIGH or LOW, xAx, xAPAR or xBx, xBPAR before CLK↑	4.7	—	2.7	—	2.8	—	2.5	—	ns
t_{SU}	Set-up Time, HIGH or LOW, x$\overline{CLKENAB}$ or x$\overline{CLKENBA}$ before CLK↑	4.5	—	2.9	—	2.9	—	2.5	—	ns
t_{SU}	Set-up Time, HIGH or LOW, xAx, xAPAR or xBx, xBPAR before LE↓	0	—	2.2	—	2.1	—	2	—	ns
t_H	Hold Time, HIGH or LOW, xAx, xAPAR or xBx, xBPAR after CLK↑	0	—	1.2	—	1.2	—	1.3	—	ns
t_H	Hold Time, HIGH or LOW, x$\overline{CLKENAB}$ or x$\overline{CLKENBA}$ after CLK↑	0	—	1.3	—	1.3	—	1.5	—	ns
t_H	Hold Time, HIGH or LOW, xAx, xAPAR or xBx, xBPAR after LE↓	1	—	1.7	—	1.9	—	1.7	—	ns
t_W	Pulse Width LEAB or LEBA HIGH	3	—	3	—	3	—	3	—	ns
t_W	Pulse Width CLKAB or CLKBA HIGH or LOW	4	—	3	—	3	—	3	—	ns
$t_{SK(o)}$	Output Skew[2]	—	—	—	—	—	—	—	500	ps

NOTES:
1. See test circuits and waveforms. T_A = – 40°C to + 85°C.
2. Skew between any two outputs of the same package and switching in the same direction.

TEST CIRCUITS AND WAVEFORMS

TEST CONDITIONS

Symbol	$V_{CC}^{(1)}$= 3.3V ±0.3V	$V_{CC}^{(1)}$ = 2.7V	$V_{CC}^{(2)}$= 2.5V ±0.2V	Unit
V_{LOAD}	6	6	2 x Vcc	V
V_{IH}	2.7	2.7	Vcc	V
V_T	1.5	1.5	Vcc / 2	V
V_{LZ}	300	300	150	mV
V_{HZ}	300	300	150	mV
C_L	50	50	30	pF

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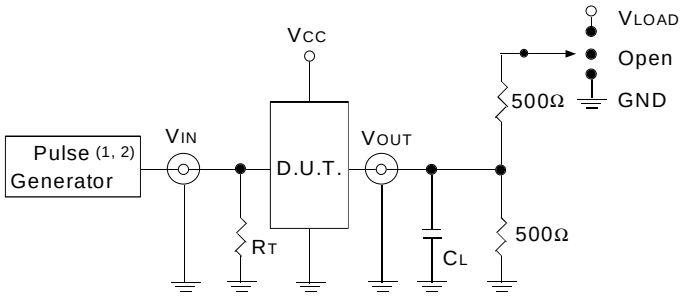
TEST CIRCUITS FOR ALL OUTPUTS



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DEFINITIONS:

C_L = Load capacitance: includes jig and probe capacitance.
R_T = Termination resistance: should be equal to Z_{OUT} of the Pulse Generator.

NOTES:

1. Pulse Generator for All Pulses: Rate ≤ 10MHz; t_F ≤ 2.5ns; t_R ≤ 2.5ns.
2. Pulse Generator for All Pulses: Rate ≤ 10MHz; t_F ≤ 2ns; t_R ≤ 2ns.

SWITCH POSITION

Test	Switch
Open Drain Disable Low Enable Low	V_{LOAD}
Disable High Enable High	GND
All Other tests	Open

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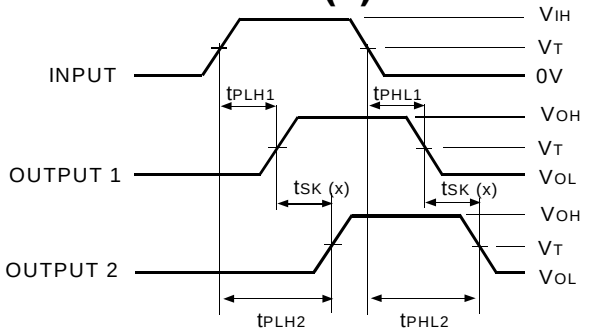
OUTPUT SKEW - t_{SK} (x)



$t_{SK(x)} = |t_{PLH2} - t_{PLH1}|$ or $|t_{PHL2} - t_{PHL1}|$

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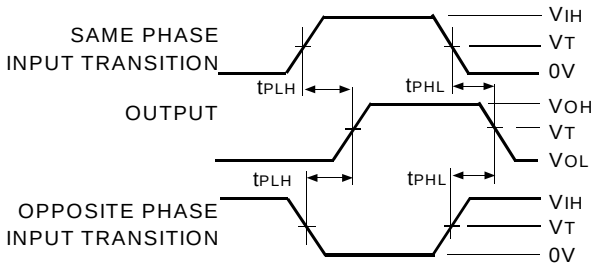
NOTES:

1. For t_{SK}(o) OUTPUT1 and OUTPUT2 are any two outputs.
2. For t_{SK}(b) OUTPUT1 and OUTPUT2 are in the same bank.

PROPAGATION DELAY



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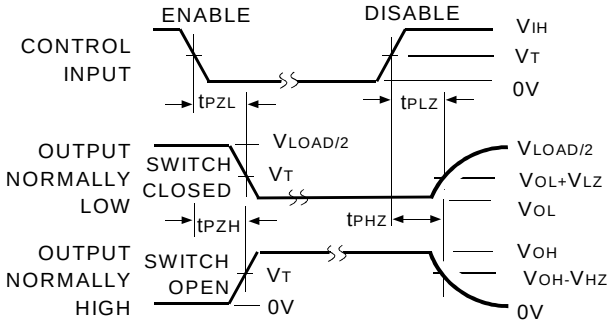
ENABLE AND DISABLE TIMES



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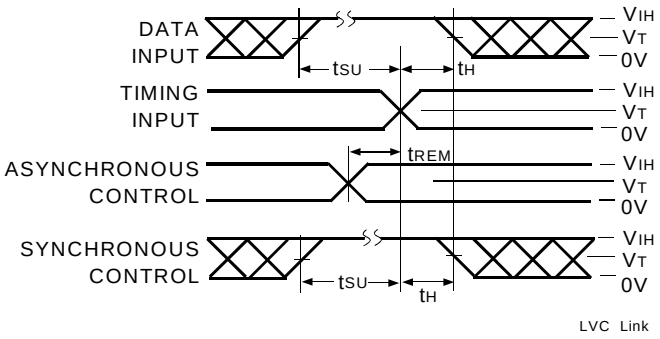
NOTE:

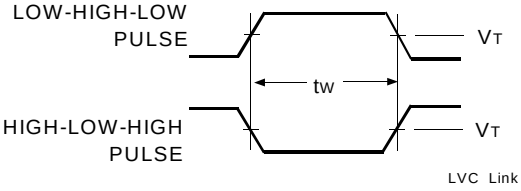
1. Diagram shown for input Control Enable-LOW and input Control Disable-HIGH.

SET-UP, HOLD, AND RELEASE TIMES



LVC Link

PULSE WIDTH



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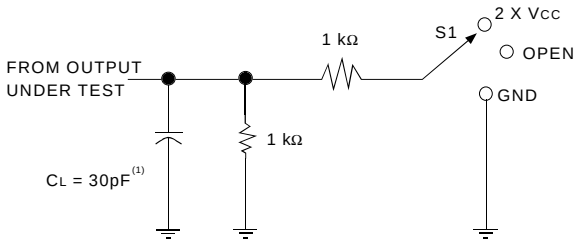
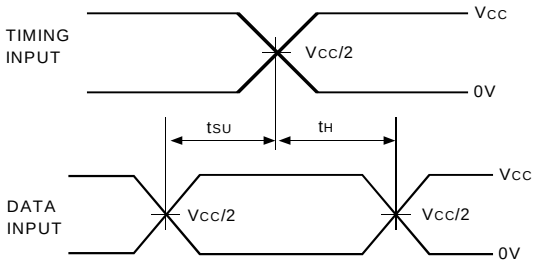
PARAMETER MEASUREMENT INFORMATION
Vcc = 1.8V

LOAD CIRCUIT

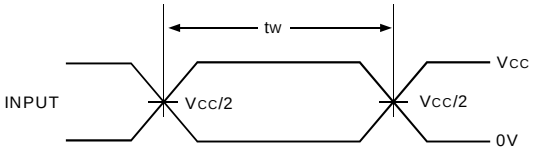


TEST	S1
t_{PD}	Open
t_{PLZ}/t_{PZL}	2 x Vcc
t_{PHZ}/t_{PZH}	GND

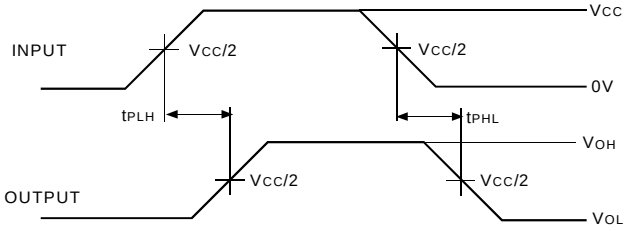
VOLTAGE WAVEFORMS SETUP AND HOLD TIMES



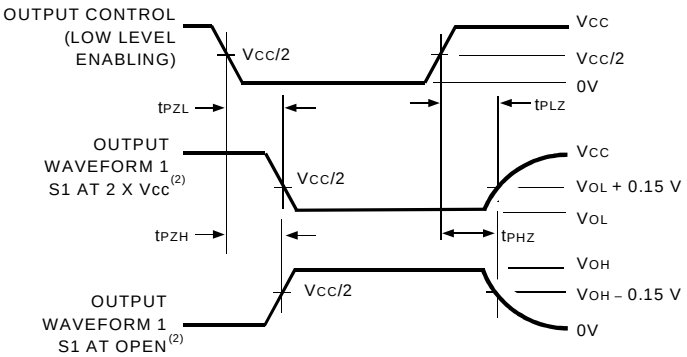
VOLTAGE WAVEFORMS PULSE DURATION



VOLTAGE WAVEFORMS PROPAGATION DELAY TIMES



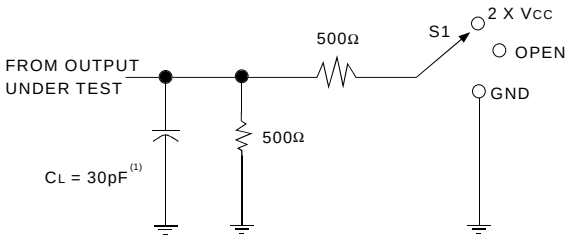
VOLTAGE WAVEFORMS ENABLE AND DISABLE TIMES



NOTES:
1. C_L includes probe and jig capacitance.
2. Waveform 1 is for an output with internal conditions such that the output is LOW except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is HIGH except when disabled by the output control.
3. All input pulses are supplied by generators having the following characteristics: PRR ≤ 10MHz, Zo = 50Ω, $t_R \leq$ 2ns, $t_F \leq$ 2ns.
4. The outputs are measured one at a tiime with one transition per measurement.
5. t_{PLZ} and t_{PHZ} are the same as t_{DIS}.
6. t_{PZL} and t_{PZH} are the same as t_{EN}.
7. t_{PLH} and t_{PHL} are the same as t_{PD}.

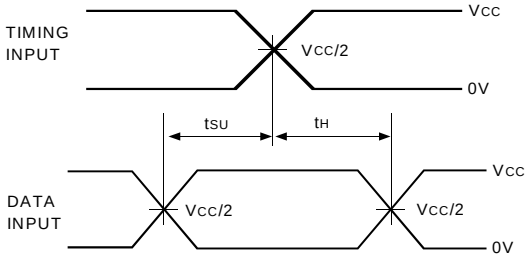
PARAMETER MEASUREMENT INFORMATION
Vcc = 2.5V ± 0.2V

LOAD CIRCUIT

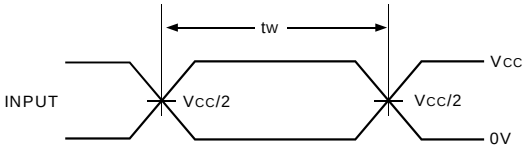


TEST	S1
tPD	Open
tPLZ/tPZL	2 x Vcc
tPHZ/tPZH	GND

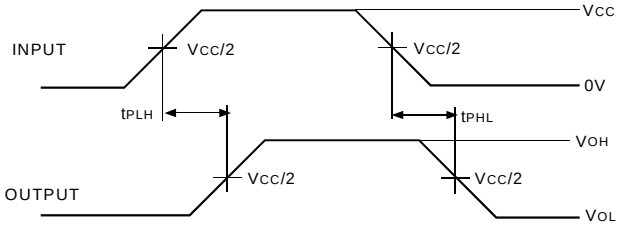
VOLTAGE WAVEFORMS SETUP AND HOLD TIMES



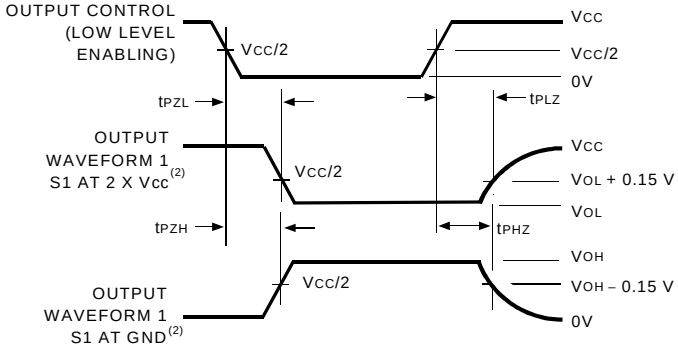
VOLTAGE WAVEFORMS PULSE DURATION



VOLTAGE WAVEFORMS PROPAGATION DELAY TIMES



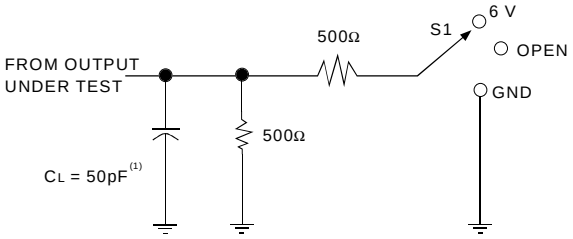
VOLTAGE WAVEFORMS ENABLE AND DISABLE TIMES



NOTES:
1. CL includes probe and jig capacitance.
2. Waveform 1 is for an output with internal conditions such that the output is LOW except when disabled by the output control.
   Waveform 2 is for an output with internal conditions such that the output is HIGH except when disabled by the output control.
3. All input pulses are supplied by generators having the following characteristics: PRR ≤ 10MHz, Zo = 50Ω, tR ≤ 2ns, tF ≤ 2ns.
4. The outputs are measured one at a tiime with one transition per measurement.
5. tPLZ and tPHZ are the same as tDIS.
6. tPZL and tPZH are the same as tEN.
7. tPLH and tPHL are the same as tPD.

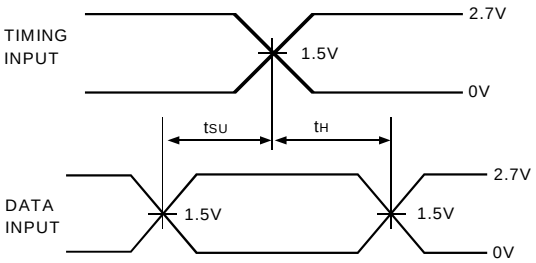
PARAMETER MEASUREMENT INFORMATION
Vcc = 2.7V and 3.3V ± 0.3V

LOAD CIRCUIT

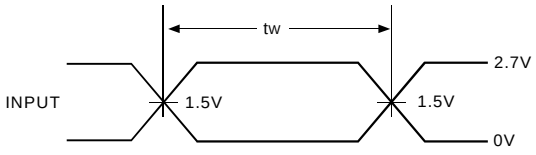


TEST	S1
t_{PD}	Open
t_{PLZ}/t_{PZL}	2 x Vcc
t_{PHZ}/t_{PZH}	GND

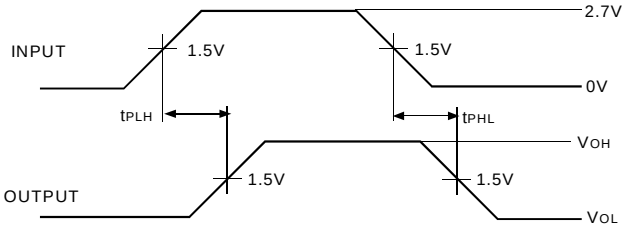
VOLTAGE WAVEFORMS SETUP AND HOLD TIMES



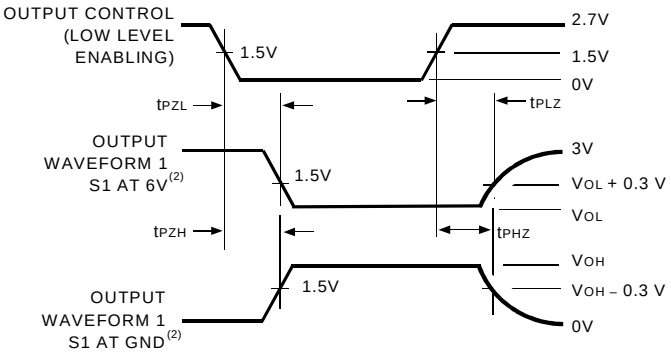
VOLTAGE WAVEFORMS PULSE DURATION



VOLTAGE WAVEFORMS PROPAGATION DELAY TIMES

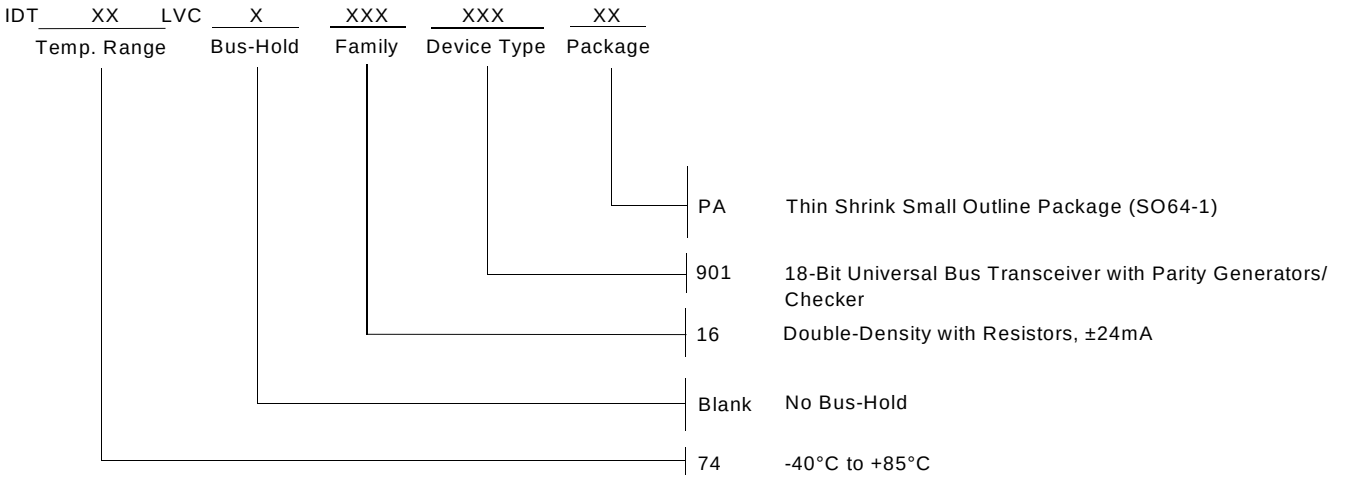


VOLTAGE WAVEFORMS ENABLE AND DISABLE TIMES



NOTES:
1. C_L includes probe and jig capacitance.
2. Waveform 1 is for an output with internal conditions such that the output is LOW except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is HIGH except when disabled by the output control.
3. All input pulses are supplied by generators having the following characteristics: PRR ≤ 10MHz, Zo = 50Ω, $t_R \leq$ 2ns, $t_F \leq$ 2ns.
4. The outputs are measured one at a tiime with one transition per measurement.
5. t_{PLZ} and t_{PHZ} are the same as t_{DIS}.
6. t_{PZL} and t_{PZH} are the same as t_{EN}.
7. t_{PLH} and t_{PHL} are the same as t_{PD}.

ORDERING INFORMATION



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