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January 1999
Revised June 2005

74LVX161284
Low Voltage IEEE 161284 Translating Transceiver

General Description

The LVX161284 contains eight bidirectional data buffers and eleven control/status buffers to implement a full IEEE 1284 compliant interface. The device supports the IEEE 1284 standard and is intended to be used in an Extended Capabilities Port mode (ECP). The pinout allows for easy connection from the Peripheral (A-side) to the Host (cable side).

Outputs on the cable side can be configured to be either open drain or high drive (± 14 mA) and are connected to a separate power supply pin (V_{CC}-cable) to allow these outputs to be driven by a higher supply voltage than the A-side. The pull-up and pull-down series termination resistance of these outputs on the cable side is optimized to drive an external cable. In addition, all inputs (except HLH) and outputs on the cable side contain internal pull-up resistors connected to the V_{CC}-cable supply to provide proper termination and pull-ups for open drain mode.

Outputs on the Peripheral side are standard low-drive CMOS outputs designed to interface with 3V logic. The DIR input controls data flow on the A_1–A_8/B_1–B_8 transceiver pins.

Features

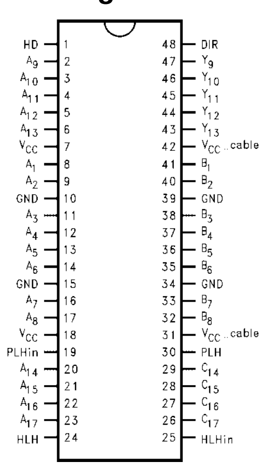
- Supports IEEE 1284 Level 1 and Level 2 signaling standards for bidirectional parallel communications between personal computers and printing peripherals
- Translation capability allows outputs on the cable side to interface with 5V signals
- All inputs have hysteresis to provide noise margin
- B and Y output resistance optimized to drive external cable
- B and Y outputs in high impedance mode during power down
- Inputs and outputs on cable side have internal pull-up resistors
- Flow-through pin configuration allows easy interface between the “Peripheral and Host”
- Replaces the function of two (2) 74ACT1284 devices

Ordering Code

Order Number	Package Number	Package Description
74LVX161284MEA	MS48A	48-Lead Small Shrink Outline Package (SSOP), JEDEC MO-118, 0.300" Wide
74LVX161284MTD	MTD48	48-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide

Device also available in Tape and Reel. Specify by appending suffix letter “X” to the ordering code.

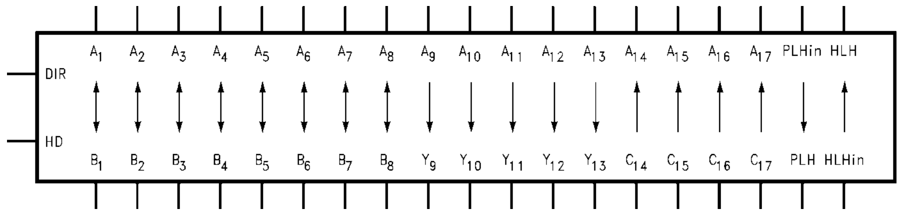
Connection Diagram



Pin Descriptions

Pin Names	Description
HD	High Drive Enable Input (Active HIGH)
DIR	Direction Control Input
A_1–A_8	Inputs or Outputs
B_1–B_8	Inputs or Outputs
A_9–A_{13}	Inputs
Y_9–Y_{13}	Outputs
A_{14}–A_{17}	Outputs
C_{14}–C_{17}	Inputs
PLH_{IN}	Peripheral Logic HIGH Input
PLH	Peripheral Logic HIGH Output
HLH_{IN}	Host Logic HIGH Input
HLH	Host Logic HIGH Output

Logic Symbol



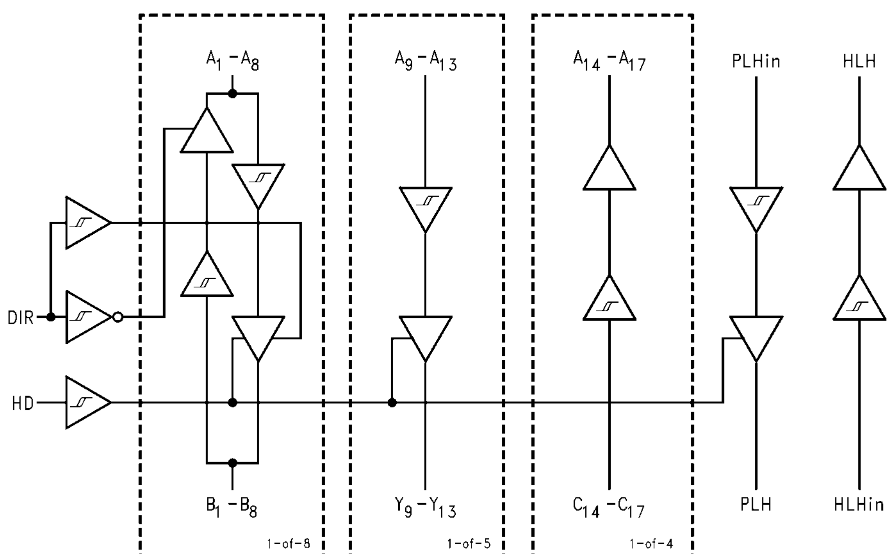
Truth Table

Inputs		Outputs
DIR	**HD**	
L	L	B_1–B_8 Data to A_1–A_8, and
		A_9–A_{13} Data to Y_9–Y_{13} (Note 1)
		C_{14}–C_{17} Data to A_{14}–A_{17}
		PLH Open Drain Mode
L	H	B_1–B_8 Data to A_1–A_8, and
		A_9–A_{13} Data to Y_9–Y_{13}
		C_{14}–C_{17} Data to A_{14}–A_{17}
H	L	A_1–A_8 Data to B_1–B_8 (Note 2)
		A_9–A_{13} Data to Y_9–Y_{13} (Note 1)
		C_{14}–C_{17} Data to A_{14}–A_{17}
		PLH Open Drain Mode
H	H	A_1–A_8 Data to B_1–B_8
		A_9–A_{13} Data to Y_9–Y_{13}
		C_{14}–C_{17} Data to A_{14}–A_{17}

Note 1: Y_9–Y_{13} Open Drain Outputs

Note 2: B_1–B_8 Open Drain Outputs

Logic Diagram



Absolute Maximum Ratings (Note 3)

Supply Voltage

V_{CC}	−0.5V to +4.6V
$V_{CC—Cable}$	−0.5V to +7.0V
$V_{CC—Cable}$ Must Be ≥ V_{CC}	
Input Voltage (V_I)—(Note 4)	
A_1–A_{13}, PLH_{IN}, DIR, HD	−0.5V to V_{CC} + 0.5V
B_1–B_8, C_{14}–C_{17}, HLH_{IN}	−0.5V to +5.5V (DC)
B_1–B_8, C_{14}–C_{17}, HLH_{IN}	−2.0V to +7.0V*
	*40 ns Transient
Output Voltage (V_O)	
A_1–A_8, A_{14}–A_{17}, HLH	−0.5V to V_{CC} +0.5V
B_1–B_8, Y_9–Y_{13}, PLH	−0.5V to +5.5V (DC)
B_1–B_8, Y_9–Y_{13}, PLH	−2.0V to +7.0V*
	*40 ns Transient
DC Output Current (I_O)	
A_1–A_8, HLH	±25 mA
B_1–B_8, Y_9–Y_{13}	±50 mA
PLH (Output LOW)	84 mA
PLH (Output HIGH)	−50 mA
Input Diode Current (I_{IK})—(Note 4)	
DIR, HD, A_9–A_{13}, PLH, HLH, C_{14}–C_{17}	−20 mA
Output Diode Current (I_{OK})	
A_1–A_8, A_{14}–A_{17}, HLH	±50 mA
B_1–B_8, Y_9–Y_{13}, PLH	−50 mA
DC Continuous V_{CC} or Ground Current	±200 mA
Storage Temperature	−65°C to +150°C
ESD (HBM) Last Passing Voltage	2000V

Recommended Operating Conditions

Supply Voltage

V_{CC}	3.0V to 3.6V
$V_{CC—Cable}$	3.0V to 5.5V
DC Input Voltage (V_I)	0V to V_{CC}
Open Drain Voltage (V_O)	0V to 5.5V
Operating Temperature (T_A)	−40°C to +85°C

Note 3: Absolute maximum ratings are values beyond which the device may be damaged or have its useful life impaired. Fairchild does not recommend operation outside the databook specifications.

Note 4: Either voltage limit or current limit is sufficient to protect inputs.

DC Electrical Characteristics

Symbol	Parameter		V_{CC} (V)	$V_{CC—Cable}$ (V)	T_A = 0°C to +70°C	T_A = −40°C to +85°C	Units	Conditions
					Guaranteed Limits			
V_{IK}	Input Clamp Diode Voltage		3.0	3.0	−1.2	−1.2	V	I_I= −18 mA
V_{IH}	Minimum HIGH Level Input Voltage	A_n, B_n, PLH_{IN}, DIR, HD	3.0–3.6	3.0–5.5	2.0	2.0	V	
		C_n	3.0–3.6	3.0–5.5	2.3	2.3		
		HLH_{IN}	3.0–3.6	3.0–5.5	2.6	2.6		
V_{IL}	Maximum LOW Level Input Voltage	A_n, B_n, PLH_{IN}, DIR, HD	3.0–3.6	3.0–5.5	0.8	0.8	V	
		C_n	3.0–3.6	3.0–5.5	0.8	0.8		
		HLH_{IN}	3.0–3.6	3.0–5.5	1.6	1.6		
ΔV_T	Minimum Input Hysteresis	A_n, B_n, PLH_{IN}, DIR, HD	3.3	5.0	0.4	0.4	V	V_T^+–V_T^-
		C_n	3.3	5.0	0.8	0.8		V_T^+–V_T^-
		HLH_{IN}	3.3	5.0	0.2	0.2		V_T^+–V_T^-
V_{OH}	Minimum HIGH Level Output Voltage	A_n, HLH	3.0	3.0	2.8	2.8	V	I_{OH} = −50 μA
			3.0	3.0	2.4	2.4		I_{OH} = −4 mA
		B_n, Y_n	3.0	3.0	2.0	2.0		I_{OH} = −14 mA
		B_n, Y_n	3.0	4.5	2.23	2.23		I_{OH} = −14 mA
		PLH	3.15	3.15	3.1	3.1		I_{OH} = −500 μA

DC Electrical Characteristics (Continued)

Symbol	Parameter		V_{CC} (V)	$V_{CC—Cable}$ (V)	$T_A = 0°C$ to $+70°C$	$T_A = -40°C$ to $+85°C$	Units	Conditions
					Guaranteed Limits			
V_{OL}	Maximum LOW Level Output Voltage	A_n, HLH	3.0	3.0	0.2	0.2	V	$I_{OL} = 50\ \mu A$
			3.0	3.0	0.4	0.4		$I_{OL} = 4$ mA
		B_n, Y_n	3.0	3.0	0.8	0.8		$I_{OL} = 14$ mA
		B_n, Y_n	3.0	4.5	0.77	0.77		$I_{OL} = 14$ mA
		PLH	3.0	3.0	0.85	0.95		$I_{OL} = 84$ mA
		PLH	3.0	4.5	0.8	0.9		$I_{OL} = 84$ mA
R_D	Maximum Output Impedance	B_1–B_8, Y_9–Y_{13}	3.3	3.3	60	60	Ω	(Note 5)(Note 7)
			3.3	5.0	55	55		
	Minimum Output Impedance	B_1–B_8, Y_9–Y_{13}	3.3	3.3	30	30		(Note 5)(Note 7)
			3.3	5.0	35	35		
R_P	Maximum Pull-Up Resistance	B_1–B_8, Y_9–$Y_{13,}$ C_{14}–C_{17}	3.3	3.3	1650	1650	Ω	
			3.3	5.0	1650	1650		
	Minimum Pull-Up Resistance	B_1–B_8, Y_9–Y_{13} C_{14}–C_{17}	3.3	3.3	1150	1150	Ω	
			3.3	5.0	1150	1150		
I_{IH}	Maximum Input Current in HIGH State	A_9–A_{13}, PLH_{IN}, HD, DIR, HLH_{IN}	3.6	3.6	1.0	1.0	μA	$V_I = 3.6V$
		C_{14}–C_{17}	3.6	3.6	50.0	50.0		$V_I = 3.6V$
		C_{14}–C_{17}	3.6	5.5	100	100		$V_I = 5.5V$
I_{IL}	Maximum Input Current in LOW State	A_9–A_{13}, PLH_{IN}, HD, DIR, HLH_{IN}	3.6	3.6	−1.0	−1.0	μA	$V_I = 0.0V$
		C_{14}–C_{17}	3.6	3.6	−3.5	−3.5	mA	$V_I = 0.0V$
		C_{14}–C_{17}	3.6	5.5	−5.0	−5.0	mA	$V_I = 0.0V$
I_{OZH}	Maximum Output Disable Current (HIGH)	A_1–A_8	3.6	3.6	20	20	μA	$V_O = 3.6V$
		B_1–B_8	3.6	3.6	50	50	μA	$V_O = 3.6V$
		B_1–B_8	3.6	5.5	100	100	μA	$V_O = 5.5V$
I_{OZL}	Maximum Output Disable Current (LOW)	A_1–A_8	3.6	3.6	−20	−20	μA	$V_O = 0.0V$
		B_1–B_8	3.6	3.6	−3.5	−3.5	mA	
		B_1–B_8	3.6	5.5	−5.0	−5.0	mA	
I_{OFF}	Power Down Output Leakage	B_1–B_8, Y_9–Y_{13}, PLH	0.0	0.0	100	100	μA	$V_O = 5.5V$
I_{OFF}	Power Down Input Leakage	C_{14}–C_{17}, HLH_{IN}	0.0	0.0	100	100	μA	$V_I = 5.5V$
$I_{OFF—ICC}$	Power Down Leakage to V_{CC}		0.0	0.0	250	250	μA	(Note 6)
$I_{OFF—ICC2}$	Power Down Leakage to $V_{CC—Cable}$		0.0	0.0	250	250	μA	(Note 6)
I_{CC}	Maximum Supply Current		3.6	3.6	45	45	mA	$V_I = V_{CC}$ or GND
			3.6	5.5	70	70	mA	$V_I = V_{CC}$ or GND

Note 5: Output impedance is measured with the output active LOW and active HIGH (HD = HIGH).

Note 6: Power-down leakage to V_{CC} or $V_{CC—Cable}$ is tested by simultaneously forcing all pins on the cable-side (B_1–B_8, Y_9–Y_{13}, PLH, C_{14}–C_{17} and HLH_{IN}) to 5.5V and measuring the resulting I_{CC} or $I_{CC—Cable}$.

Note 7: This parameter is guaranteed but not tested, characterized only.

AC Electrical Characteristics

Symbol	Parameter	$T_A = 0°C$ to $+70°C$, $V_{CC} = 3.0V–3.6V$, $V_{CC—Cable} = 3.0V–5.5V$		$T_A = -40°C$ to $+85°C$, $V_{CC} = 3.0V–3.6V$, $V_{CC—Cable} = 3.0V–5.5V$		Units	Figure Number
		Min	Max	Min	Max		
t_{PHL}	$A_1–A_8$ to $B_1–B_8$	2.0	40.0	2.0	44.0	ns	Figure 1
t_{PLH}	$A_1–A_8$ to $B_1–B_8$	2.0	40.0	2.0	44.0	ns	Figure 2
t_{PHL}	$B_1–B_8$ to $A_1–A_8$	2.0	40.0	2.0	44.0	ns	Figure 3
t_{PLH}	$B_1–B_8$ to $A_1–A_8$	2.0	40.0	2.0	44.0	ns	Figure 3
t_{PHL}	$A_9–A_{13}$ to $Y_9–Y_{13}$	2.0	40.0	2.0	44.0	ns	Figure 1
t_{PLH}	$A_9–A_{13}$ to $Y_9–Y_{13}$	2.0	40.0	2.0	44.0	ns	Figure 2
t_{PHL}	$C_{14}–C_{17}$ to $A_{14}–A_{17}$	2.0	40.0	2.0	44.0	ns	Figure 3
t_{PLH}	$C_{14}–C_{17}$ to $A_{14}–A_{17}$	2.0	40.0	2.0	44.0	ns	Figure 3
t_{SKEW}	LH-LH or HL-HL		10.0		12.0	ns	(Note 9)
t_{PHL}	PLH_{IN} to PLH	2.0	40.0	2.0	44.0	ns	Figure 1
t_{PLH}	PLH_{IN} to PLH	2.0	40.0	2.0	44.0	ns	Figure 2
t_{PHL}	HLH_{IN} to HLH	2.0	40.0	2.0	44.0	ns	Figure 3
t_{PLH}	HLH_{IN} to HLH	2.0	40.0	2.0	44.0	ns	Figure 3
t_{PHZ} t_{PLZ}	Output Disable Time DIR to $A_1–A_8$	2.0 2.0	15.0 15.0	2.0 2.0	18.0 18.0	ns	Figure 7
t_{PZH} t_{PZL}	Output Enable Time DIR to $A_1–A_8$	2.0 2.0	50.0 50.0	2.0 2.0	50.0 50.0	ns	Figure 8
t_{PHZ} t_{PLZ}	Output Disable Time DIR to $B_1–B_8$	2.0 2.0	50.0 50.0	2.0 2.0	50.0 50.0	ns	Figure 9
t_{pEN}	Output Enable Time HD to $B_1–B_8$, $Y_9–Y_{13}$	2.0 2.0	25.0 25.0	2.0 2.0	28.0 28.0	ns	Figure 2
t_{pDIS}	Output Disable Time HD to $B_1–B_8$, $Y_9–Y_{13}$	2.0 2.0	25.0 25.0	2.0 2.0	28.0 28.0	ns	Figure 2
$t_{pEN}–t_{pDIS}$	Output Enable- Output Disable		10.0		12.0	ns	
t_{SLEW} t_{PLH} t_{PHL}	Output Slew Rate $B_1–B_8$, $Y_9–Y_{13}$	 0.05 0.05	 0.40 0.40	 0.05 0.05	 0.40 0.40	V/ns	 Figure 5 Figure 4
t_r, t_f	t_{RISE} and t_{FALL} $B_1–B_8$ (Note 8), $Y_9–Y_{13}$ (Note 8)		120 120		120 120	ns	Figure 6 (Note 10)

Note 8: Open Drain

Note 9: t_{SKEW} is measured for common edge output transitions and compares the measured propagation delay for a given path type:

(i) $A_1–A_8$ to $B_1–B_8$, $A_9–A_{13}$ to $Y_9–Y_{13}$

(ii) $B_1–B_8$ to $A_1–A_8$

(iii) $C_{14}–C_{17}$ to $A_{14}–A_{17}$

Note 10: This parameter is guaranteed but not tested, characterized only.

Capacitance

Symbol	Parameter	Typ	Units	Conditions
C_{IN}	Input Capacitance	3	pF	$V_{CC} = 0.0V$ (HD, DIR, $A_9–A_{13}$, $C_{14}–C_{17}$, PLH_{IN} and HLH_{IN})
$C_{I/O}$ (Note 11)	I/O Pin Capacitance	5	pF	$V_{CC} = 3.3V$

Note 11: $C_{I/O}$ is measured at frequency = 1 MHz, per MIL-STD-883B, Method 3012

AC Loading and Waveforms

Pulse Generator for all pulses: Rate ≤1.0 MHz; $Z_O \leq 50\Omega$; $t_f \leq 2.5$ ns, $t_r \leq 2.5$ ns.

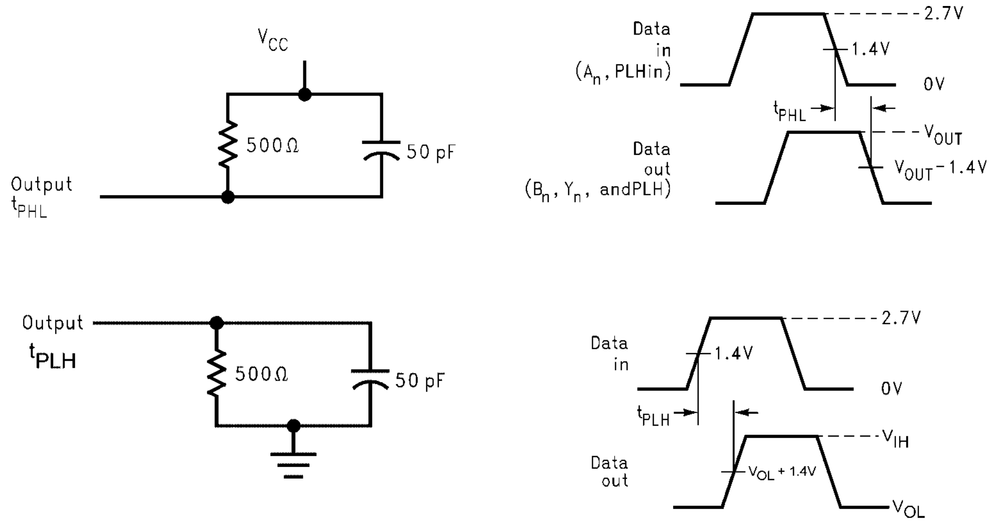


FIGURE 1. Port A to B and A to Y Propagation Delay Waveforms

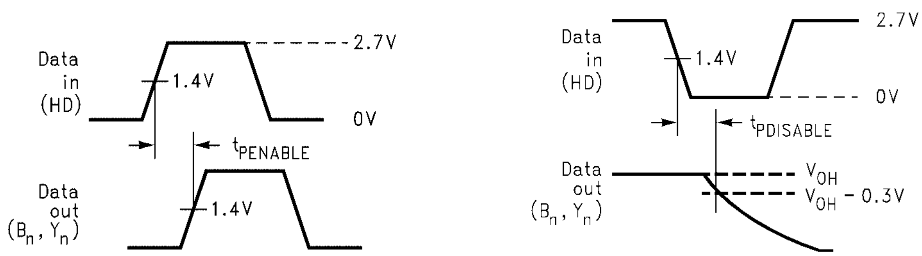


FIGURE 2. Port A to B and A to Y Output Waveforms

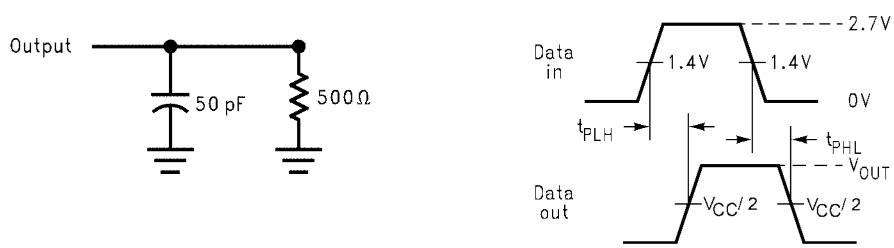


FIGURE 3. Port B to A, C to A and HLHin to HLH Propagation Delay Waveforms

AC Loading and Waveforms (Continued)

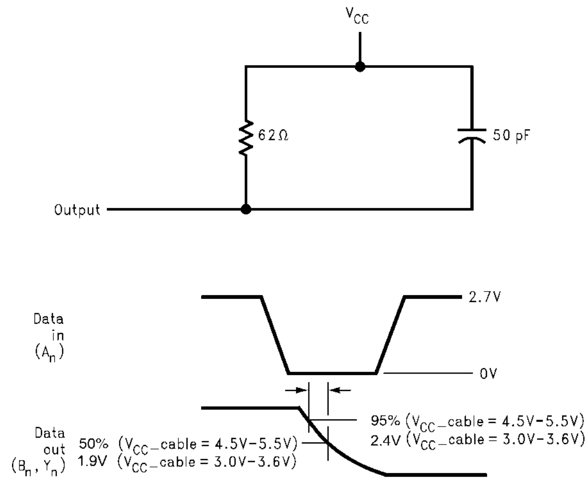


FIGURE 4. Port A to B and A to Y HL Slew Test Load and Waveforms

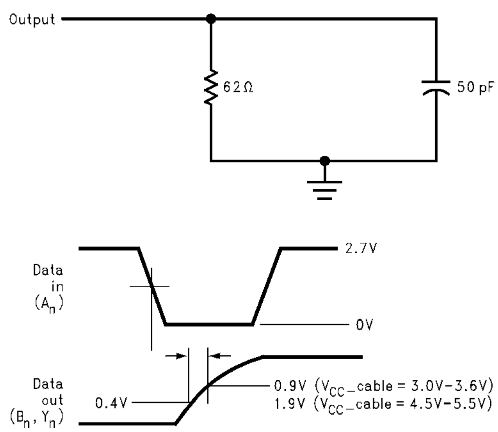
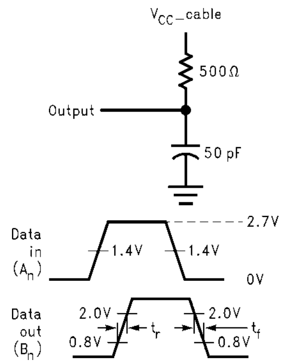


FIGURE 5. Port A to B and A to Y LH Slew Test Load and Waveforms

AC Loading and Waveforms (Continued)



t_r = Output Rise Time, Open Drain

t_f = Output Fall Time, Open Drain

FIGURE 6. Ports A to B and A to Y Rise and Fall Test Load and Waveforms for Open Drain Outputs

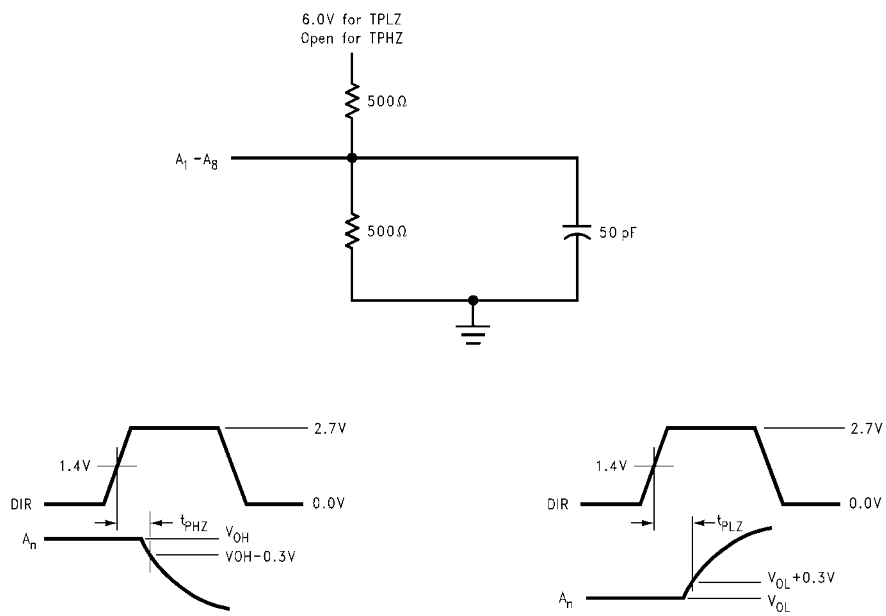


FIGURE 7. t_{PHZ} and t_{PLZ} Test Load and Waveforms, DIR to A_1–A_8

AC Loading and Waveforms (Continued)

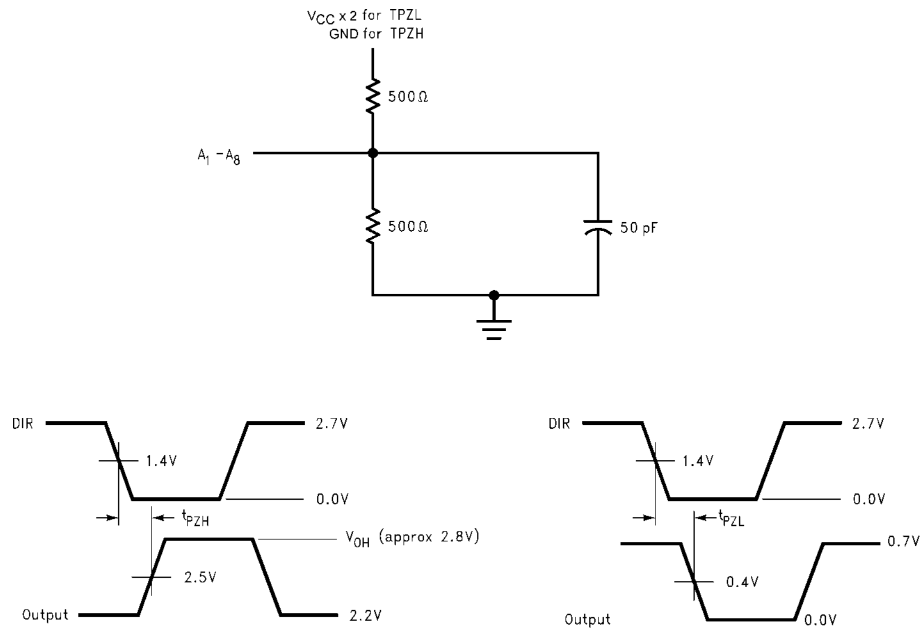


FIGURE 8. t_{PZH} and t_{PZL} Test Load and Waveforms, DIR to A_1–A_8

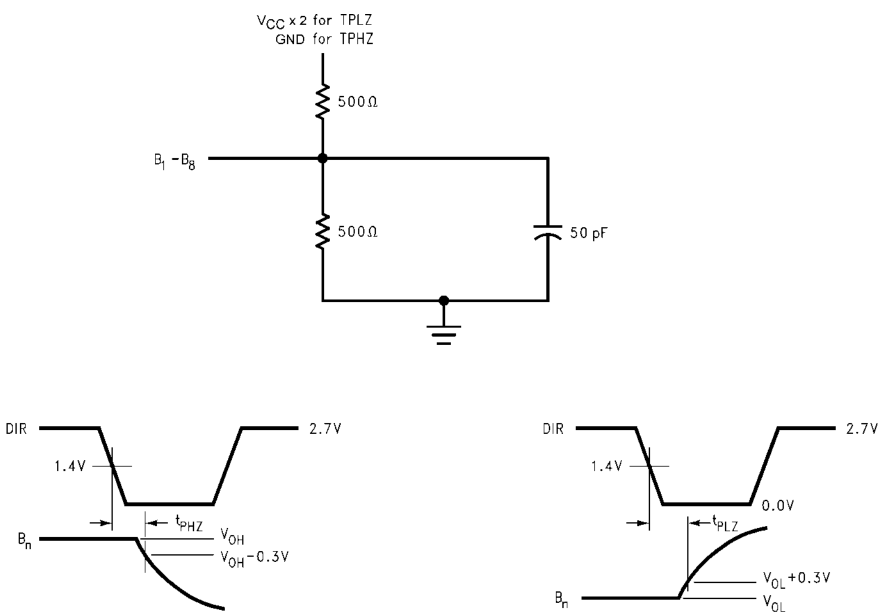
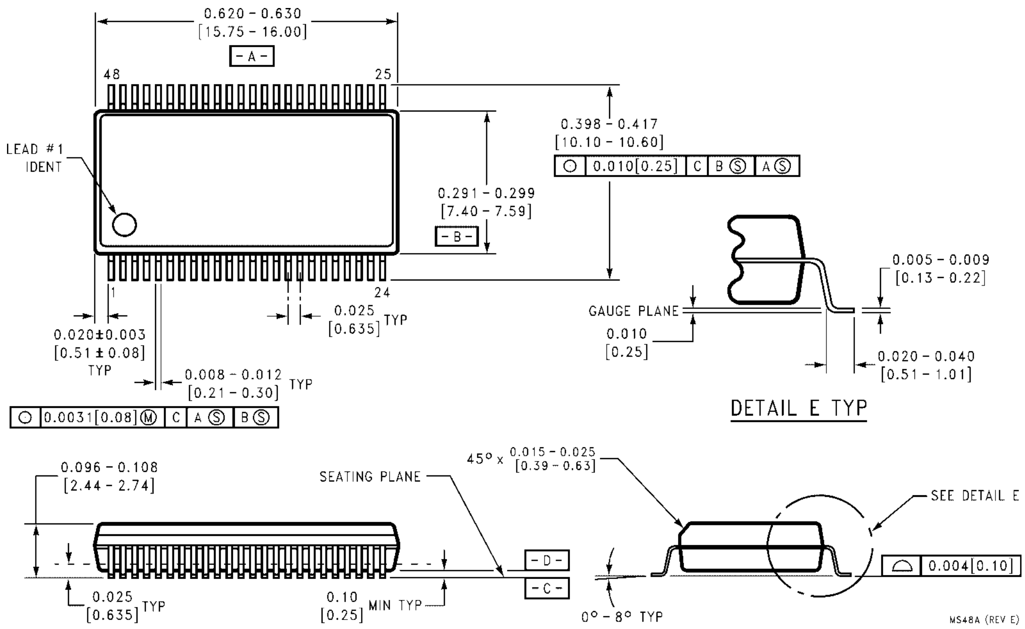


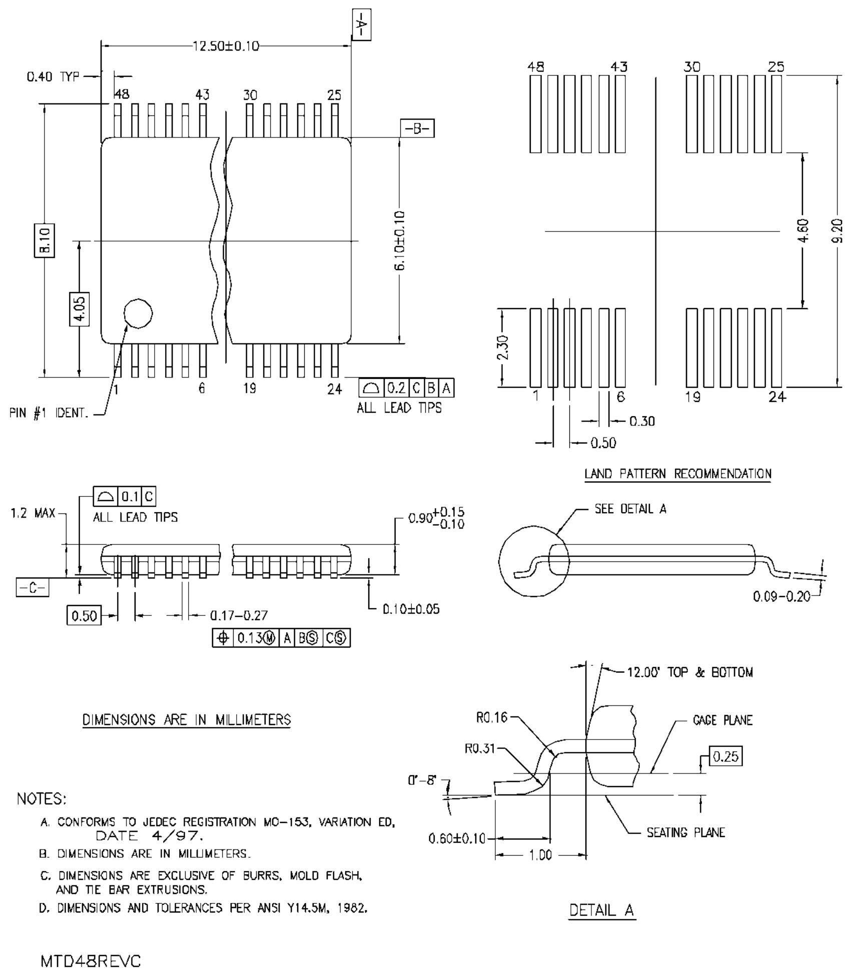
FIGURE 9. t_{PHZ} and t_{PLZ} Test Load and Waveforms
DIR to B_1–B_8

Physical Dimensions inches (millimeters) unless otherwise noted



48-Lead Small Shrink Outline Package (SSOP), JEDEC MO-118, 0.300" Wide
Package Number MS48A

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



48-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide
Package Number MTD48

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