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74VHC161284 IEEE 1284 Transceiver

General Description

The VHC161284 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 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). 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} supply to provide proper termination and pull-ups for open drain mode.

Outputs on the Peripheral side are standard LOW-drive CMOS outputs. The DIR input controls data flow on the A_1 – A_8 / B_1 – B_8 transceiver pins.

Features

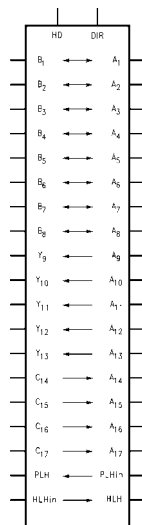
- Supports IEEE 1284 Level 1 and Level 2 signaling standards for bidirectional parallel communications between personal computers and printing peripherals
- Replaces the function of two (2) 74ACT1284 devices
- All inputs have hysteresis to provide noise margin
- B and Y output resistance optimized to 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

Ordering Code:

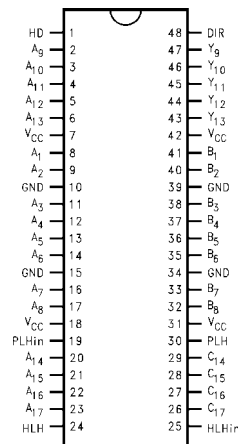
Ordering Number	Package Number	Package Description
74VHC161284MEA	MS48A	48-Lead Small Shrink Outline Package (SSOP), JEDEC MO-118, 0.300" Wide
74VHC161284MTD	MTD48	48-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide

Surface mount packages are also available on Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

Logic Symbol



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

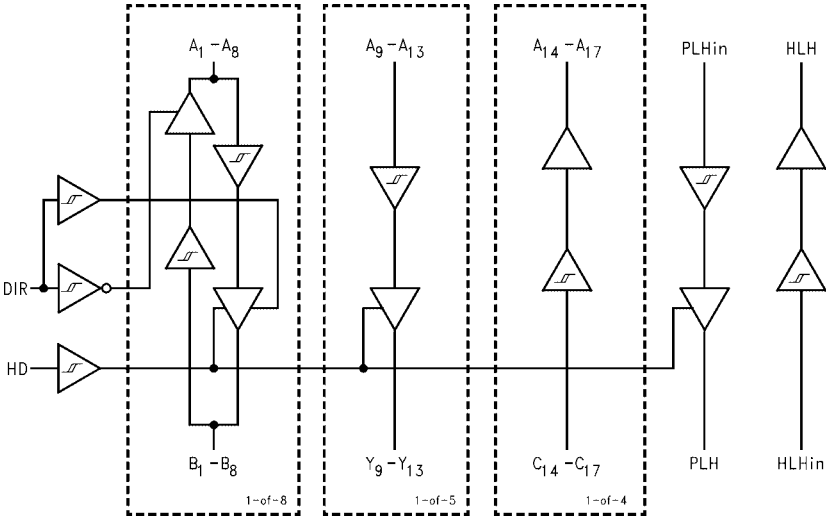
Truth Table

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: Y₉–Y₁₃ Open Drain Outputs

Note 2: B₁–B₈ Open Drain Outputs

Logic Diagram



Absolute Maximum Ratings(Note 3)

Supply Voltage

V_{CC} -0.5V to + 7.0V

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} , -20 mA

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} 4.5V 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 continuous ratings are those values beyond which damage to the device may occur. Exposure to these indicated may adversely affect device reliability. Functional operation under absolute maximum rated conditions is not implied.

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

DC Electrical Characteristics

Symbol	Parameter		V_{CC} (V)	$T_A = -40^\circ\text{C to } +85^\circ\text{C}$	Units	Conditions
				Guaranteed Limits		
V_{IK}	Input Clamp Diode Voltage		3.0	-1.2	V	$I_I = -18$ mA
V_{IH}	Minimum HIGH Level Input Voltage	A_n , PLH_{IN} , DIR, HD	4.5 – 5.5	$0.7 V_{CC}$	V	
		B_n	4.5 – 5.5	2.0		
		C_n	4.5 – 5.5	2.3		
		HLH_{IN}	4.5 – 5.5	2.6		
V_{IL}	Maximum LOW Level Input Voltage	A_n , PLH_{IN} , DIR, HD	4.5 – 5.5	$0.3 V_{CC}$	V	
		B_n	4.5 – 5.5	0.8		
		C_n	4.5 – 5.5	0.8		
		HLH_{IN}	4.5 – 5.5	1.6		
ΔVT	Minimum Input Hysteresis	A_n , PLH_{IN} , DIR, HD	4.5 – 5.5	0.4	V	$V_T^+ - V_T^-$
		B_n	4.5 – 5.5	0.4		$V_T^+ - V_T^-$
		C_n	5.0	0.8		$V_T^+ - V_T^-$
		HLH_{IN}	5.0	0.3		$V_T^+ - V_T^-$
V_{OH}	Minimum HIGH Level Output Voltage	A_n , HLH	4.5	4.4	V	$I_{OH} = -50$ μ A
			4.5	3.8		$I_{OH} = -8$ mA
		B_n , Y_n	4.5	3.73		$I_{OH} = -14$ mA
		PLH	4.5	4.45		$I_{OH} = -500$ μ A

DC Electrical Characteristics (Continued)

Symbol	Parameter		V _{CC} (V)	T _A = -40°C to +85°C	Units	Conditions
				Guaranteed Limits		
V _{OL}	Maximum LOW Level Output Voltage	A _n , HLH	4.5	0.1	V	I _{OL} = 50 μA
			4.5	0.44		I _{OL} = 8 mA
		B _n , Y _n	4.5	0.77		I _{OL} = 14 mA
		PLH	4.5	0.7		I _{OL} = 84 mA
RD	Maximum Output Impedance	B ₁ –B ₈ , Y ₉ –Y ₁₃	5.0	55	Ω	(Note 5)(Note 6)
	Minimum Output Impedance	B ₁ –B ₈ , Y ₉ –Y ₁₃	5.0	35	Ω	(Note 5)(Note 6)
RP	Maximum Pull-Up Resistance	B ₁ –B ₈ , Y ₉ –Y ₁₃ , C ₁₄ –C ₁₇	5.0	1650	Ω	
	Minimum Pull-Up Resistance	B ₁ –B ₈ , Y ₉ –Y ₁₃ , C ₁₄ –C ₁₇	5.0	1150	Ω	
I _{IH}	Maximum Input Current in HIGH State	A ₉ –A ₁₃ , PLH _{IN} , HD, DIR, HLH _{IN}	5.5	1.0	μA	V _I = 5.5V
		C ₁₄ –C ₁₇	5.5	100		V _I = 5.5V
I _{IL}	Maximum Input Current in LOW State	A ₉ –A ₁₃ , PLH _{IN} , HD, DIR, HLH _{IN}	5.5	–1.0	μA	V _I = 0.0V
		C ₁₄ –C ₁₇	5.5	–5.0	mA	V _I = 0.0V
I _{OZH}	Maximum Output Disable Current (HIGH)	A ₁ –A ₈	5.5	20	μA	V _O = 5.5V
		B ₁ –B ₈	5.5	100		V _O = 5.5V
I _{OZL}	Maximum Output Disable Current (LOW)	A ₁ –A ₈	5.5	–20	μA	V _O = 0.0V
		B ₁ –B ₈	5.5	–5.0		
I _{OFF}	Power Down Output Leakage	B ₁ –B ₈ , Y ₉ –Y ₁₃ , PLH	0.0	100	μA	V _O = 5.5V
I _{OFF}	Power Down Input Leakage	C ₁₄ –C ₁₇ , HLH _{IN}	0.0	100	μA	V _I = 5.5V
I _{OFF} – I _{CC}	Power Down Leakage to V _{CC}		0.0	250	μA	(Note 7)
I _{CC}	Maximum Supply Current		5.5	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: This parameter is guaranteed but not tested, characterized only.

Note 7: Power-down leakage to V_{CC} is tested by simultaneously forcing all pins on the cable-side (B₁–B₈, Y₉–Y₁₃, PLH, C₁₄–C₁₇ and HLH_{IN}) to 5.5V and measuring the resulting I_{CC}.

AC Electrical Characteristics

Symbol	Parameter	T _A = -40°C to +85°C V _{CC} = 4.5V – 5.5V		Units	Figure Number
		Min	Max		
t _{PHL}	A ₁ –A ₈ to B ₁ –B ₈	2.0	30.0	ns	Figure 1
t _{PLH}	A ₁ –A ₈ to B ₁ –B ₈	2.0	30.0	ns	Figure 2
t _{PHL}	B ₁ –B ₈ to A ₁ –A ₈	2.0	30.0	ns	Figure 3
t _{PLH}	B ₁ –B ₈ to A ₁ –A ₈	2.0	30.0	ns	Figure 3
t _{PHL}	A ₉ –A ₁₃ to Y ₉ –Y ₁₃	2.0	30.0	ns	Figure 1
t _{PLH}	A ₉ –A ₁₃ to Y ₉ –Y ₁₃	2.0	30.0	ns	Figure 2
t _{PHL}	C ₁₄ –C ₁₇ to A ₁₄ –A ₁₇	2.0	30.0	ns	Figure 3
t _{PLH}	C ₁₄ –C ₁₇ to A ₁₄ –A ₁₇	2.0	30.0	ns	Figure 3
t _{SKEW}	LH-LH or HL-HL		6.0	ns	(Note 9)
t _{PHL}	PLH _{IN} to PLH	2.0	30.0	ns	Figure 1
t _{PLH}	PLH _{IN} to PLH	2.0	30.0	ns	Figure 2
t _{PHL}	HLH _{IN} to HLH	2.0	30.0	ns	Figure 3
t _{PLH}	HLH _{IN} to HLH	2.0	30.0	ns	Figure 3
t _{PHZ}	Output Disable Time	2.0	18.0	ns	Figure 7
t _{PLZ}	DIR to A ₁ –A ₈	2.0	18.0	ns	
t _{PZH}	Output Enable Time	2.0	25.0	ns	Figure 8
t _{PZL}	DIR to A ₁ –A ₈	2.0	25.0	ns	
t _{PHZ}	Output Disable Time	2.0	25.0	ns	Figure 9
t _{PLZ}	DIR to B ₁ –B ₈	2.0	25.0	ns	
t _{pEN}	Output Enable Time HD to B ₁ –B ₈ , Y ₉ –Y ₁₃	2.0	28.0	ns	Figure 2
t _{pDis}	Output Disable Time HD to B ₁ –B ₈ , Y ₉ –Y ₁₃	2.0	28.0	ns	Figure 2
t _{pEn} –t _{pDis}	Output Enable-Output Disable		20.0	ns	
t _{SLEW}	Output Slew Rate				
t _{PLH}	B ₁ –B ₈ , Y ₉ –Y ₁₃	0.05	0.40	V/ns	Figure 5
t _{PHL}		0.05	0.40		Figure 4
t _r , t _f	t _{RISE} and t _{FALL} B ₁ –B ₈ , Y ₉ –Y ₁₃ (Note 8)		120	ns	Figure 6
			120		(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) A₁–A₈ to B₁–B₈, A₉–Y₁₃ to Y₉–Y₁₃

(ii) B₁–B₈ to A₁–A₈

(iii) C₁₄–C₁₇ to A₁₄–A₁₇

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

Capacitance (Note 11)

Symbol	Parameter	Typ	Units	Conditions
C _{IN}	Input Capacitance	5	pF	V _{CC} = 0.0V (HD, DIR, A ₉ –A ₁₃ , C ₁₄ –C ₁₇ , PLH _{IN} and HLH _{IN})
C _{I/O}	I/O Pin Capacitance	12	pF	V _{CC} = 3.3V

Note 11: Capacitance is measured at frequency = 1 MHz.

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.

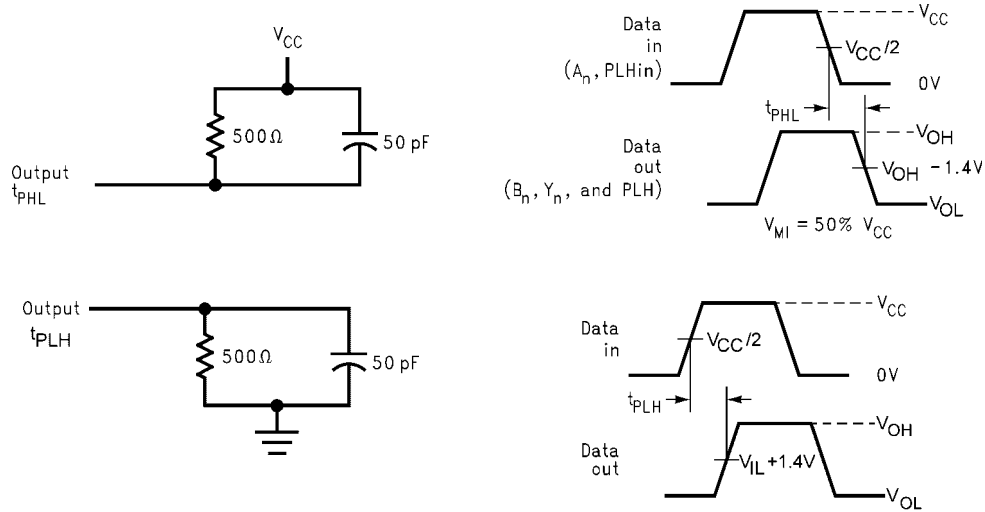


FIGURE 1. Part A to B and A to Y Propagation Delay Load and Waveforms

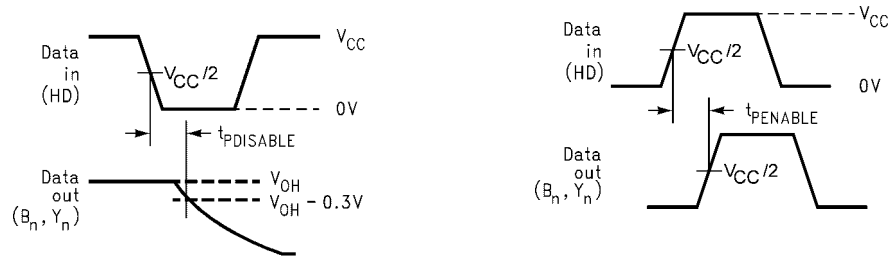


FIGURE 2. Port A to B and a to Y Output Waveforms

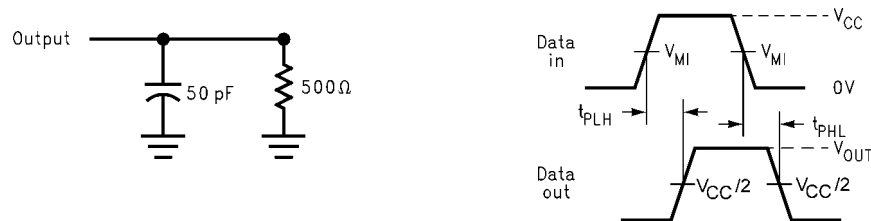


FIGURE 3. Port B to A, C to A and HLHin to HLH Propagation Delay Waveforms

AC Loading and Waveforms (Continued)

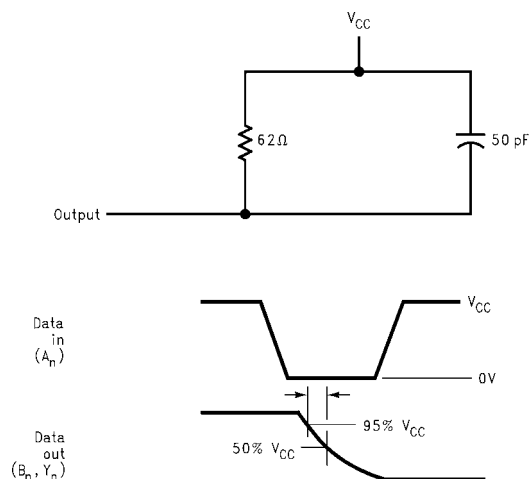


FIGURE 4. Port A to B and A to Y HL Slew Test Load and Waveforms

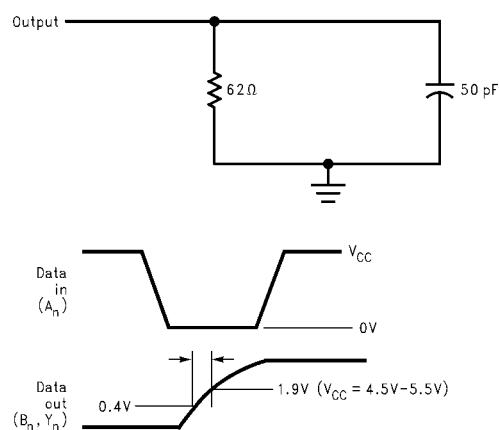
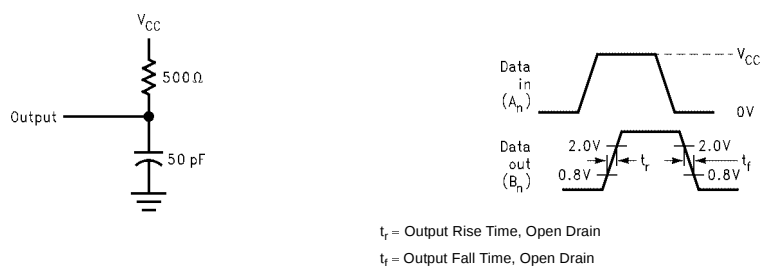
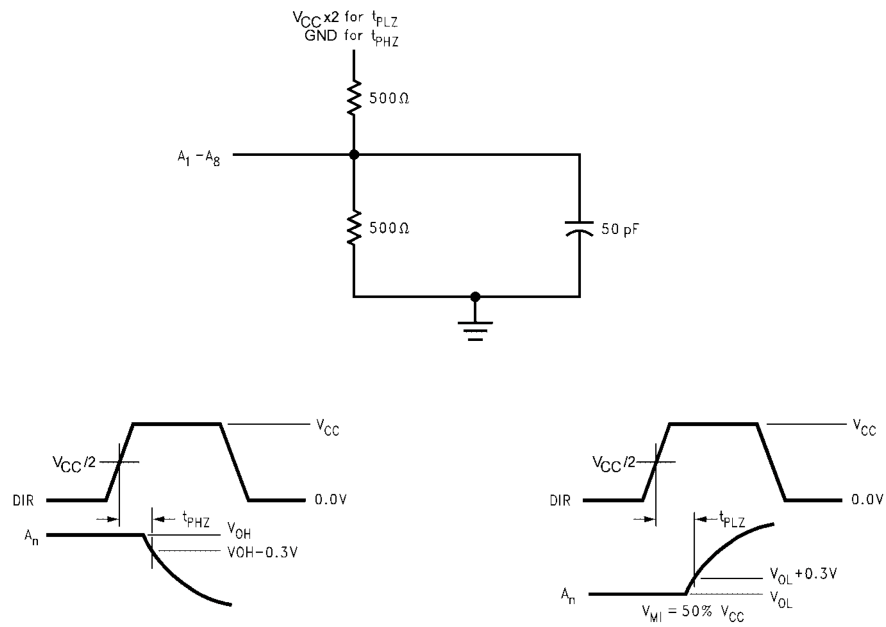
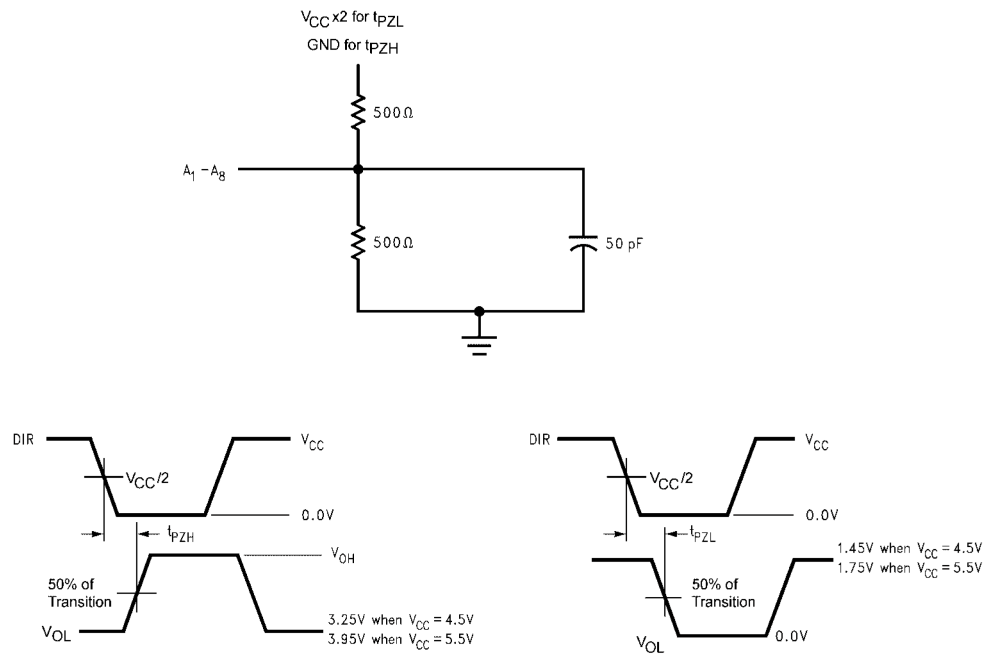


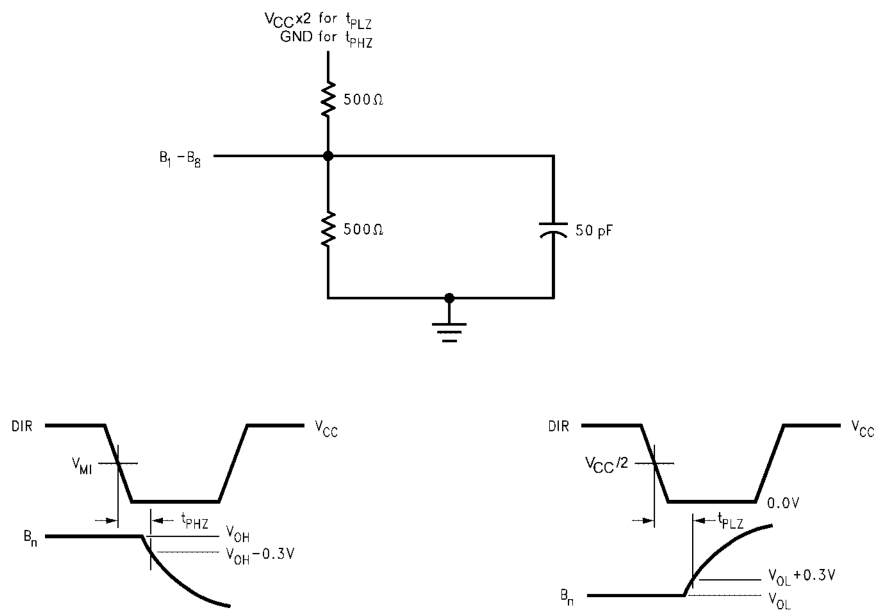
FIGURE 5. Part A to b and A to Y LH Slew Test Load and Waveforms

FIGURE 6. t_{RISE} and t_{FALL} Test Load and Waveforms for Open Drain Outputs
A₁-A₈ to B₁-B₈, A₉-A₁₃ to Y₉-Y₁₃

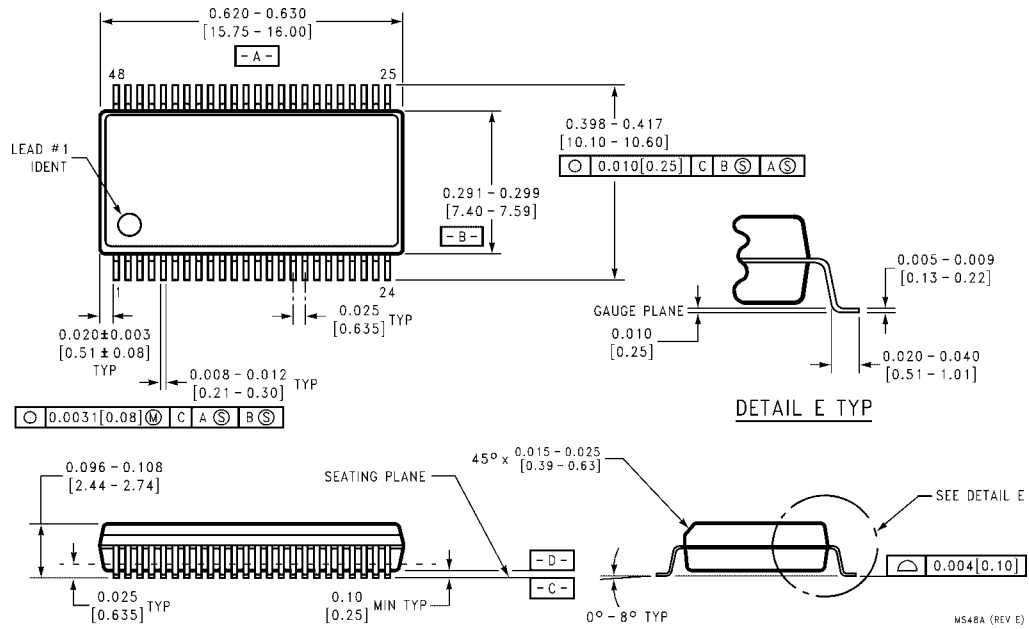
AC Loading and Waveforms (Continued)

FIGURE 7. t_{PHZ} and t_{PLZ} Test Load and Waveforms, DIR to A_1 - A_8 FIGURE 8. t_{PZH} and t_{PZL} Test Load and Waveforms, DIR to A_1 - A_8

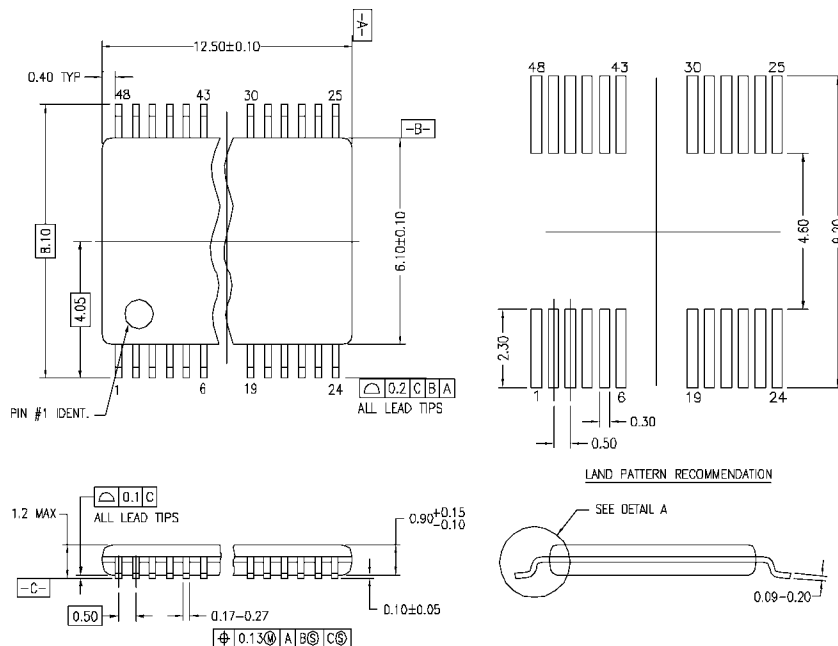
AC Loading and Waveforms (Continued)

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**

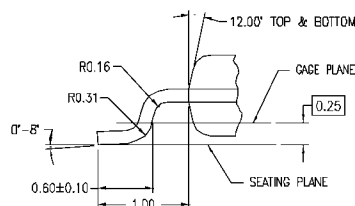
Physical Dimensions inches (millimeters) unless otherwise noted (Continued)

DIMENSIONS ARE IN MILLIMETERS

NOTES:

- A. CONFORMS TO JEDEC REGISTRATION MO-153, VARIATION ED,
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- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH,
AND TIE BAR EXTRUSIONS.
- D. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1982.

MTD48REV C



DETAIL A

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

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