

Am73/8303 • Am73/8304B

Octal Three-State Bidirectional Bus Transceivers

DISTINCTIVE CHARACTERISTICS

- 8-bit bidirectional data flow reduces system package count
- 3-state inputs/outputs for interfacing with bus-oriented systems
- PNP inputs reduce input loading
- $V_{CC} - 1.15V$ V_{OH} interfaces with TTL, MOS and CMOS
- 48mA, 300pF bus drive capability
- Am73/8303 inverting transceivers
- Am73/8304B noninverting transceivers
- Transmit/Receive and Chip Disable simplify control logic
- 20-pin ceramic and molded DIP package
- Low power – 8mA per bidirectional bit
- Advanced Schottky processing
- Bus port stays in hi-impedance state during power up/down
- 100% product assurance screening to MIL-STD-883 requirements

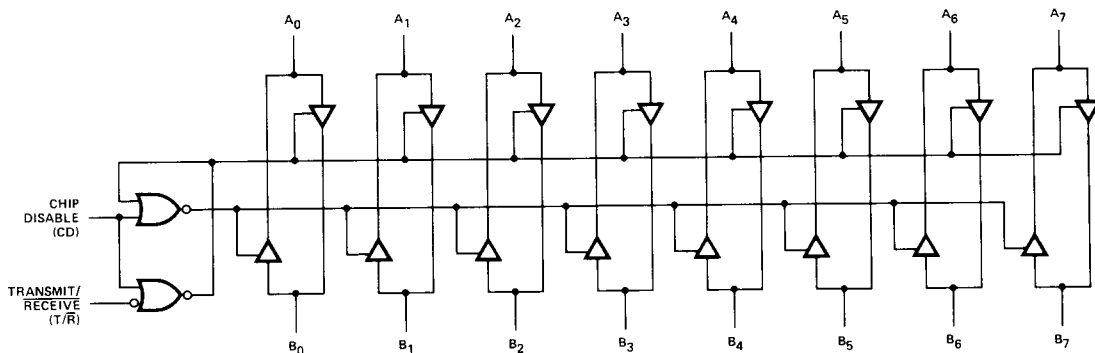
FUNCTIONAL DESCRIPTION

The Am73/8303 and Am73/8304B are 8-bit 3-State Schottky transceivers. They provide bidirectional drive for bus-oriented microprocessor and digital communications systems. Straight through bidirectional transceivers are featured, with 16mA drive capability on the A ports and 48mA bus drive capability on the B ports. PNP inputs are incorporated to reduce input loading.

One input, Transmit/Receive determines the direction of logic signals through the bidirectional transceiver. The Chip Disable input disables both A and B ports by placing them in a 3-state condition. Chip Disable is functionally the same as an active LOW chip select.

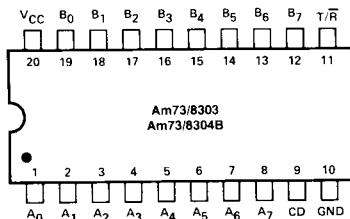
The output high voltage (V_{OH}) is specified at $V_{CC} - 1.15V$ minimum to allow interfacing with MOS, CMOS, TTL, ROM, RAM, or microprocessors.

Am73/8304B
LOGIC DIAGRAM



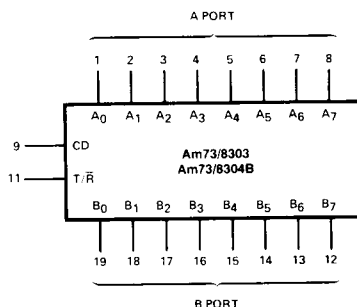
Am73/8303 has inverting transceivers

CONNECTION DIAGRAM
Top View



Note: Pin 1 is marked for orientation.

LOGIC SYMBOL



V_{CC} = Pin 20
GND = Pin 10

ABSOLUTE MAXIMUM RATINGS (Above which the useful life may be impaired)

Storage Temperature	-65 to +150°C
Supply Voltage	7.0V
Input Voltage	5.5V
Output Voltage	5.5V
Lead Temperature (Soldering, 10 seconds)	300°C

ELECTRICAL CHARACTERISTICS

The Following Conditions Apply Unless Otherwise Noted:

MIL	$T_A = -55$ to $+125^\circ\text{C}$	$V_{CC} \text{ MIN} = 4.5\text{V}$	$V_{CC} \text{ MAX} = 5.5\text{V}$
COM'L	$T_A = 0$ to $+70^\circ\text{C}$	$V_{CC} \text{ MIN} = 4.75\text{V}$	$V_{CC} \text{ MAX} = 5.25\text{V}$

DC ELECTRICAL CHARACTERISTICS over operating temperature range

Parameters	Description	Test Conditions	Min	Typ (Note 1)	Max	Units
A PORT (A₀-A₇)						
V_{IH}	Logical "1" Input Voltage	$CD = V_{IL} \text{ MAX}, T/\bar{R} = 2.0\text{V}$	2.0			Volts
V_{IL}	Logical "0" Input Voltage	$CD = V_{IL} \text{ MAX}, T/\bar{R} = 2.0\text{V}$			0.8	Volts
		COM'L			0.7	
		MIL				
V_{OH}	Logical "1" Output Voltage	$CD = V_{IL} \text{ MAX}, T/\bar{R} = 0.8\text{V}$	$I_{OH} = -0.4\text{mA}$	$V_{CC} - 1.15$	$V_{CC} - 0.7$	Volts
			$I_{OH} = -3.0\text{mA}$	2.7	3.95	
V_{OL}	Logical "0" Output Voltage	$CD = V_{IL} \text{ MAX}, T/\bar{R} = 0.8\text{V}$	$I_{OL} = 8\text{mA}$	0.3	0.4	Volts
		COM'L	$I_{OL} = 16\text{mA}$	0.35	0.50	
I_{OS}	Output Short Circuit Current	$CD = V_{IL} \text{ MAX}, T/\bar{R} = 0.8\text{V}, V_O = 0\text{V}, V_{CC} = \text{MAX}, \text{Note 2}$	-10	-38	-75	mA
I_{IH}	Logical "1" Input Current	$CD = V_{IL} \text{ MAX}, T/\bar{R} = 2.0\text{V}, V_I = 2.7\text{V}$		0.1	80	μA
I_I	Input Current at Maximum Input Voltage	$CD = 2.0\text{V}, V_{CC} = \text{MAX}, V_I = V_{CC} \text{ MAX}$			1	mA
I_{IL}	Logical "0" Input Current	$CD = V_{IL} \text{ MAX}, T/\bar{R} = 2.0\text{V}, V_I = 0.4\text{V}$		-70	-200	μA
V_C	Input Clamp Voltage	$CD = 2.0\text{V}, I_{IN} = -12\text{mA}$		-0.7	-1.5	Volts
I_{OD}	Output/Input 3-State Current	$CD = 2.0\text{V}$	$V_O = 0.4\text{V}$		-200	μA
			$V_O = 4.0\text{V}$		80	
B PORT (B₀-B₇)						
V_{IH}	Logical "1" Input Voltage	$CD = V_{IL} \text{ MAX}, T/\bar{R} = V_{IL} \text{ MAX}$	2.0			Volts
V_{IL}	Logical "0" Input Voltage	$CD = V_{IL} \text{ MAX}, T/\bar{R} = V_{IL} \text{ MAX}$			0.8	Volts
		COM'L			0.7	
		MIL				
V_{OH}	Logical "1" Output Voltage	$CD = V_{IL} \text{ MAX}, T/\bar{R} = 2.0\text{V}$	$I_{OH} = -0.4\text{mA}$	$V_{CC} - 1.15$	$V_{CC} - 0.8$	Volts
			$I_{OH} = -5.0\text{mA}$	2.7	3.9	
			$I_{OH} = -10\text{mA}$	2.4	3.6	
V_{OL}	Logical "0" Output Voltage	$CD = V_{IL} \text{ MAX}, T/\bar{R} = 2.0\text{V}$	$I_{OL} = 20\text{mA}$	0.3	0.4	Volts
			$I_{OL} = 48\text{mA}$	0.4	0.5	
I_{OS}	Output Short Circuit Current	$CD = V_{IL} \text{ MAX}, T/\bar{R} = 2.0\text{V}, V_O = 0\text{V}, V_{CC} = \text{MAX}, \text{Note 2}$	-25	-50	-150	mA
I_{IH}	Logical "1" Input Current	$CD = V_{IL} \text{ MAX}, T/\bar{R} = V_{IL} \text{ MAX}, V_I = 2.7\text{V}$		0.1	80	μA
I_I	Input Current at Maximum Input Voltage	$CD = 2.0\text{V}, V_{CC} = \text{MAX}, V_I = V_{CC} \text{ MAX}$			1	mA
I_{IL}	Logical "0" Input Current	$CD = V_{IL} \text{ MAX}, T/\bar{R} = V_{IL} \text{ MAX}, V_I = 0.4\text{V}$		-70	-200	μA
V_C	Input Clamp Voltage	$CD = 2.0\text{V}, I_{IN} = -12\text{mA}$		-0.7	-1.5	Volts
I_{OD}	Output/Input 3-State Current	$CD = 2.0\text{V}$	$V_O = 0.4\text{V}$		-200	μA
			$V_O = 4.0\text{V}$		200	
CONTROL INPUTS $CD, T/\bar{R}$						
V_{IH}	Logical "1" Input Voltage		2.0			Volts
V_{IL}	Logical "0" Input Voltage				0.8	Volts
		COM'L			0.7	
		MIL				
I_{IH}	Logical "1" Input Current	$V_I = 2.7\text{V}$		0.5	20	μA
I_I	Input Current at Maximum Input Voltage	$V_{CC} = \text{MAX}, V_I = V_{CC} \text{ MAX}$			1.0	mA
I_{IL}	Logical "0" Input Current	$V_I = 0.4\text{V}$	T/\bar{R}	-0.1	-0.25	mA
			CD	-0.1	-0.25	
V_C	Input Clamp Voltage	$I_{IN} = -12\text{mA}$		-0.8	-1.5	Volts
POWER SUPPLY CURRENT						
I_{CC}	Power Supply Current	Am73/8303	$CD = V_I = 2.0\text{V}, V_{CC} = \text{MAX}$	70	100	mA
			$CD = 0.4\text{V}, V_{INA} = T/\bar{R} = 2.0\text{V}, V_{CC} = \text{MAX}$	100	150	
		Am73/8304B	$CD = 2.0\text{V}, V_I = 0.4\text{V}, V_{CC} = \text{MAX}$	70	100	mA
			$CD = V_{INA} = 0.4\text{V}, T/\bar{R} = 2.0\text{V}, V_{CC} = \text{MAX}$	90	140	

AC ELECTRICAL CHARACTERISTICS ($V_{CC} = 5.0V$, $T_A = 25^\circ C$)

Parameters	Description	Test Conditions	Typ (Note 1)	Max	Units
A PORT DATA/MODE SPECIFICATIONS					
t _{PDHLA}	Propagation Delay to a Logical "0" from B Port to A Port	CD = 0.4V, T/ \overline{R} = 0.4V (Figure 1) R ₁ = 1k, R ₂ = 5k, C ₁ = 30pF	8	12	ns
t _{PDLHA}	Propagation Delay to a Logical "1" from B Port to A Port	CD = 0.4V, T/ \overline{R} = 0.4V (Figure 1) R ₁ = 1k, R ₂ = 5k, C ₁ = 30pF	11	16	ns
t _{PLZA}	Propagation Delay from a Logical "0" to 3-State from CD to A Port	B ₀ to B ₇ = 2.4V, T/ \overline{R} = 0.4V (Figure 3) S ₃ = 1, R ₅ = 1k, C ₄ = 15pF	10	15	ns
t _{PHZA}	Propagation Delay from a Logical "1" to 3-State from CD to A Port	B ₀ to B ₇ = 0.4V, T/ \overline{R} = 0.4V (Figure 3) S ₃ = 0, R ₅ = 1k, C ₄ = 15pF	8	15	ns
t _{PZLA}	Propagation Delay from 3-State to a Logical "0" from CD to A Port	B ₀ to B ₇ = 2.4V, T/ \overline{R} = 0.4V (Figure 3) S ₃ = 1, R ₅ = 1k, C ₄ = 30pF	20	30	ns
t _{PZHA}	Propagation Delay from 3-State to a Logical "1" from CD to A Port	B ₀ to B ₇ = 0.4V, T/ \overline{R} = 0.4V (Figure 3) S ₃ = 0, R ₅ = 5k, C ₄ = 30pF	19	30	ns
B PORT DATA/MODE SPECIFICATIONS					
t _{PDHLB}	Propagation Delay to a Logical "0" from A Port to B Port	CD = 0.4V, T/ \overline{R} = 2.4V (Figure 1) R ₁ = 100Ω, R ₂ = 1k, C ₁ = 300pF	12	18	ns
		R ₁ = 667Ω, R ₂ = 5k, C ₁ = 45pF	7	12	ns
t _{PDLHB}	Propagation Delay to a Logical "1" from A Port to B Port	CD = 0.4V, T/ \overline{R} = 2.4V (Figure 1) R ₁ = 100Ω, R ₂ = 1k, C ₁ = 300pF	15	20	ns
		R ₁ = 667Ω, R ₂ = 5k, C ₁ = 45pF	9	14	ns
t _{PLZB}	Propagation Delay from a Logical "0" to 3-State from CD to B Port	A ₀ to A ₇ = 2.4V, T/ \overline{R} = 2.4V (Figure 3) S ₃ = 1, R ₅ = 1k, C ₄ = 15pF	13	18	ns
t _{PHZB}	Propagation Delay from a Logical "1" to 3-State from CD to B Port	A ₀ to A ₇ = 0.4V, T/ \overline{R} = 2.4V (Figure 3) S ₃ = 0, R ₅ = 1k, C ₄ = 15pF	8	15	ns
t _{PZLB}	Propagation Delay from 3-State to a Logical "0" from CD to B Port	A ₀ to A ₇ = 2.4V, T/ \overline{R} = 2.4V (Figure 3) S ₃ = 1, R ₅ = 100Ω, C ₄ = 300pF	25	35	ns
		S ₃ = 1, R ₅ = 667Ω, C ₄ = 45pF	16	25	ns
t _{PZHB}	Propagation Delay from 3-State to a Logical "1" from CD to B Port	A ₀ to A ₇ = 0.4V, T/ \overline{R} = 2.4V (Figure 3) S ₃ = 0, R ₅ = 1k, C ₄ = 300pF	22	35	ns
		S ₃ = 0, R ₅ = 5k, C ₄ = 45pF	14	25	ns
TRANSMIT RECEIVE MODE SPECIFICATIONS					
t _{TRL}	Propagation Delay from Transmit Mode to Receive a Logical "0", T/ \overline{R} to A Port	CD = 0.4V (Figure 2) S ₁ = 1, R ₄ = 100Ω, C ₃ = 5pF S ₂ = 1, R ₃ = 1k, C ₂ = 30pF	23	35	ns
t _{TRH}	Propagation Delay from Transmit Mode to Receive a Logical "1", T/ \overline{R} to A Port	CD = 0.4V (Figure 2) S ₁ = 0, R ₄ = 100Ω, C ₃ = 5pF S ₂ = 0, R ₃ = 5k, C ₂ = 30pF	22	35	ns
t _{RTL}	Propagation Delay from Receive Mode to Transmit a Logical "0", T/ \overline{R} to B Port	CD = 0.4V (Figure 2) S ₁ = 1, R ₄ = 100Ω, C ₃ = 300pF S ₂ = 1, R ₃ = 300Ω, C ₂ = 5pF	26	35	ns
t _{RTH}	Propagation Delay from Receive Mode to Transmit a Logical "1", T/ \overline{R} to B Port	CD = 0.4V (Figure 2) S ₁ = 0, R ₄ = 1k, C ₃ = 300pF S ₂ = 0, R ₃ = 300Ω, C ₂ = 5pF	27	35	ns

Notes: 1. All typical values given are for $V_{CC} = 5.0V$ and $T_A = 25^\circ C$.

2. Only one output at a time should be shorted.

FUNCTION TABLE

Inputs	Conditions		
Chip Disable	0	0	1
Transmit/Receive	0	1	X
A Port	Out	In	HI-Z
B Port	In	Out	HI-Z

AC ELECTRICAL CHARACTERISTICS ($V_{CC} = 5.0V$, $T_A = 25^\circ C$)

Parameters	Description	Test Conditions	Typ (Note 1)	Max	Units
A PORT DATA/MODE SPECIFICATIONS					
t _{PDHLA}	Propagation Delay to a Logical "0" from B Port to A Port	CD = 0.4V, T/ \bar{R} = 0.4V (Figure 1) R ₁ = 1k, R ₂ = 5k, C ₁ = 30pF	14	18	ns
t _{PDLHA}	Propagation Delay to a Logical "1" from B Port to A Port	CD = 0.4V, T/ \bar{R} = 0.4V (Figure 1) R ₁ = 1k, R ₂ = 5k, C ₁ = 30pF	13	18	ns
t _{PLZA}	Propagation Delay from a Logical "0" to 3-State from CD to A Port	B ₀ to B ₇ = 0.4V, T/ \bar{R} = 0.4V (Figure 3) S ₃ = 1, R ₅ = 1k, C ₄ = 15pF	11	15	ns
t _{PHZA}	Propagation Delay from a Logical "1" to 3-State from CD to A Port	B ₀ to B ₇ = 2.4V, T/ \bar{R} = 0.4V (Figure 3) S ₃ = 0, R ₅ = 1k, C ₄ = 15pF	8	15	ns
t _{PZLA}	Propagation Delay from 3-State to a Logical "0" from CD to A Port	B ₀ to B ₇ = 0.4V, T/ \bar{R} = 0.4V (Figure 3) S ₃ = 1, R ₅ = 1k, C ₄ = 30pF	27	35	ns
t _{PZHA}	Propagation Delay from 3-State to a Logical "1" from CD to A Port	B ₀ to B ₇ = 2.4V, T/ \bar{R} = 0.4V (Figure 3) S ₃ = 0, R ₅ = 5k, C ₄ = 30pF	19	25	ns
B PORT DATA/MODE SPECIFICATIONS					
t _{PDHLB}	Propagation Delay to a Logical "0" from A Port to B Port	CD = 0.4V, T/ \bar{R} = 2.4V (Figure 1)	18	23	ns
		R ₁ = 100Ω, R ₂ = 1k, C ₁ = 300pF			
		R ₁ = 667Ω, R ₂ = 5k, C ₁ = 45pF			
t _{PDLHB}	Propagation Delay to a Logical "1" from A Port to B Port	CD = 0.4V, T/ \bar{R} = 2.4V (Figure 1)	16	23	ns
		R ₁ = 100Ω, R ₂ = 1k, C ₁ = 300pF			
		R ₁ = 667Ω, R ₂ = 5k, C ₁ = 45pF			
t _{PLZB}	Propagation Delay from a Logical "0" to 3-State from CD to B Port	A ₀ to A ₇ = 0.4V, T/ \bar{R} = 2.4V (Figure 3) S ₃ = 1, R ₅ = 1k, C ₄ = 15pF	13	18	ns
t _{PHZB}	Propagation Delay from a Logical "1" to 3-State from CD to B Port	A ₀ to A ₇ = 2.4V, T/ \bar{R} = 2.4V (Figure 3) S ₃ = 0, R ₅ = 1k, C ₄ = 15pF	8	15	ns
t _{PZLB}	Propagation Delay from 3-State to a Logical "0" from CD to B Port	A ₀ to A ₇ = 0.4V, T/ \bar{R} = 2.4V (Figure 3)	32	40	ns
		S ₃ = 1, R ₅ = 100Ω, C ₄ = 300pF			
		S ₃ = 1, R ₅ = 667Ω, C ₄ = 45pF			
t _{PZHB}	Propagation Delay from 3-State to a Logical "1" from CD to B Port	A ₀ to A ₇ = 2.4V, T/ \bar{R} = 2.4V (Figure 3)	26	35	ns
		S ₃ = 0, R ₅ = 1k, C ₄ = 300pF			
		S ₃ = 0, R ₅ = 5k, C ₄ = 45pF			
TRANSMIT RECEIVE MODE SPECIFICATIONS					
t _{TRL}	Propagation Delay from Transmit Mode to Receive a Logical "0", T/ \bar{R} to A Port	CD = 0.4V (Figure 2) S ₁ = 0, R ₄ = 100Ω, C ₃ = 5pF S ₂ = 1, R ₃ = 1k, C ₂ = 30pF	30	40	ns
t _{TRH}	Propagation Delay from Transmit Mode to Receive a Logical "1", T/ \bar{R} to A Port	CD = 0.4V (Figure 2) S ₁ = 1, R ₄ = 100Ω, C ₃ = 5pF S ₂ = 0, R ₃ = 5k, C ₂ = 30pF	28	40	ns
t _{RTL}	Propagation Delay from Receive Mode to Transmit a Logical "0", T/ \bar{R} to B Port	CD = 0.4V (Figure 2) S ₁ = 1, R ₄ = 100Ω, C ₃ = 300pF S ₂ = 0, R ₃ = 300Ω, C ₂ = 5pF	31	40	ns
t _{RTH}	Propagation Delay from Receive Mode to Transmit a Logical "1", T/ \bar{R} to B Port	CD = 0.4V (Figure 2) S ₁ = 0, R ₄ = 1k, C ₃ = 300pF S ₂ = 1, R ₃ = 300Ω, C ₂ = 5pF	28	40	ns

Notes: 1. All typical values given are for $V_{CC} = 5.0V$ and $T_A = 25^\circ C$.
2. Only one output at a time should be shorted.

DEFINITION OF FUNCTIONAL TERMS

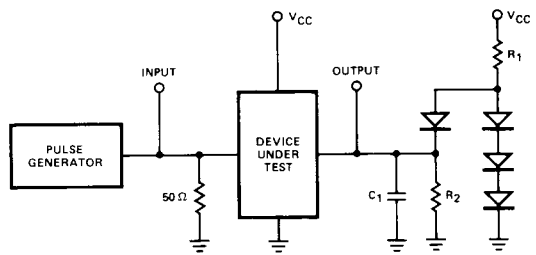
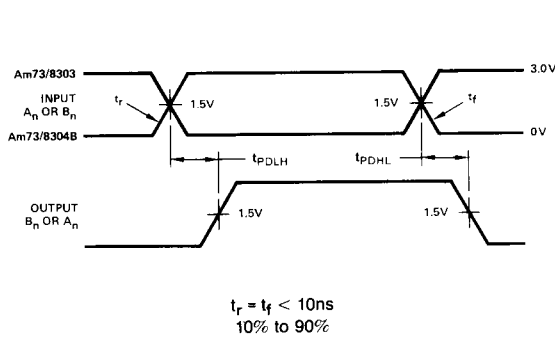
A₀-A₇ A port inputs/outputs are receiver output drivers when T/\bar{R} is LOW and are transmit inputs when T/\bar{R} is HIGH.

B₀-B₇ B port inputs/outputs are transmit output drivers when T/\bar{R} is HIGH and receiver inputs when T/\bar{R} is LOW.

CD Chip Disable forces all output drivers into 3-state when HIGH (same function as active LOW chip select, \bar{CS}).

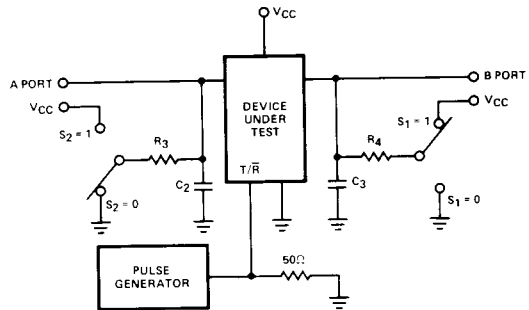
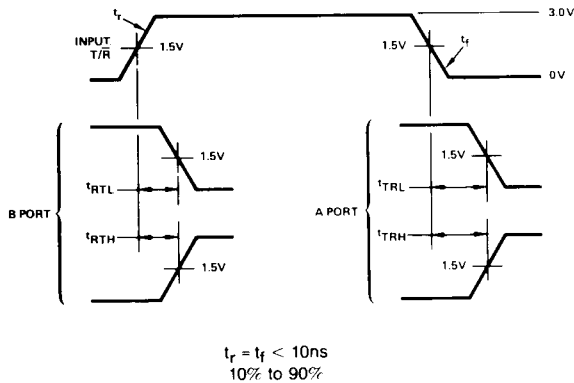
T/\bar{R} Transmit/Receive direction control determines whether A port or B port drivers are in 3-state. With T/\bar{R} HIGH A port is the input and B port is the output. With T/\bar{R} LOW A port is the output and B port is the input.

SWITCHING TIME WAVEFORMS AND AC TEST CIRCUITS



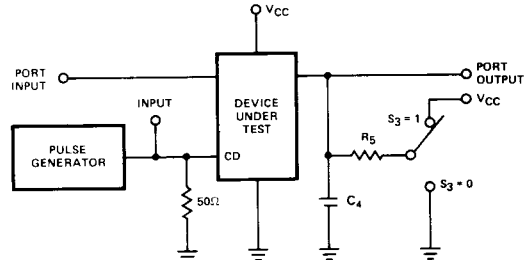
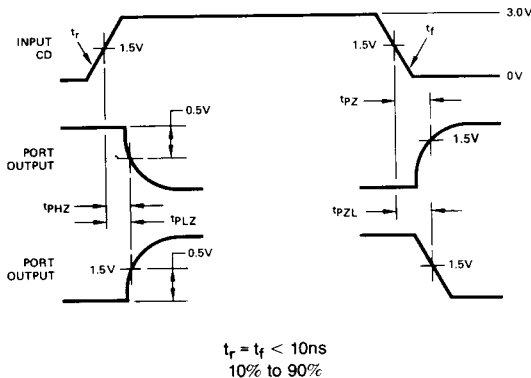
Note: C_1 includes test fixture capacitance.

Figure 1. Propagation Delay from A Port to B Port
or from B Port to A Port.



Note: C_2 and C_3 include test fixture capacitance.

Figure 2. Propagation Delay from T/\bar{R} to A Port or B Port.

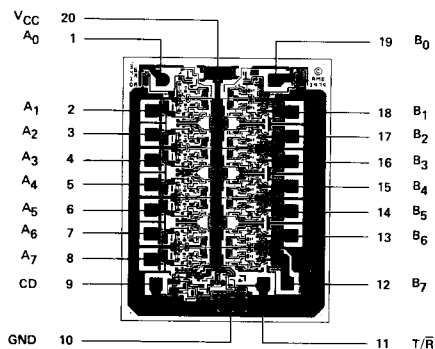


Note: C_4 includes test fixture capacitance.
Port input is in a fixed logical condition.

Figure 3. Propagation Delay from CD to A Port or B Port.

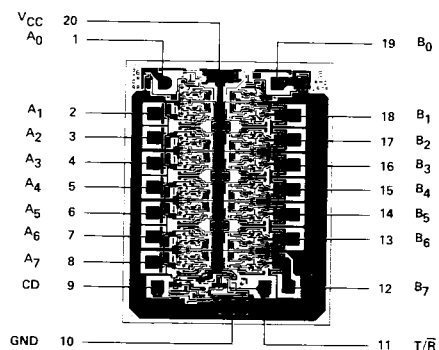
Metallization and Pad Layouts

Am73/8303



DIE SIZE .069" X .089"

Am73/8304B



DIE SIZE .069" X .089"

ORDERING INFORMATION

Order the part number according to the table below to obtain the desired package, temperature range, and screening level.

Am73/8303 Order Number	Am73/8304B Order Number	Package Type (Note 1)	Operating (Note 2)	Screening Level (Note 3)
DP7303J	DP7304BJ	D-20	M	C-3
DP7303JB	DP7304BJB	D-20	M	B-3
DP8303J	DP8304BJ	D-20	C	C-1
DP8303JB	DP8304BJB	D-20	C	B-1
DP8303N	DP8304BN	P-20	C	C-1
DP8303NB	DP8304BNB	P-20	C	B-1
AM7303X	AM7304BX	Dice	M	Visual inspection to MIL-STD-883 Method 2010B.
AM8303X	AM8304BX	Dice	C	

Notes:

1. P = Molded DIP, D = Hermetic DIP, F = Flat Pak. Number following letter is number of leads.
2. C = 0 to 70°C, V_{CC} = 4.75 to 5.25V, M = -55 to +125°C, V_{CC} = 4.50 to 5.50V.
3. Levels C-1 and C-3 conform to MIL-STD-883, Class C. Level B-3 conforms to MIL-STD-883, Class B.