

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

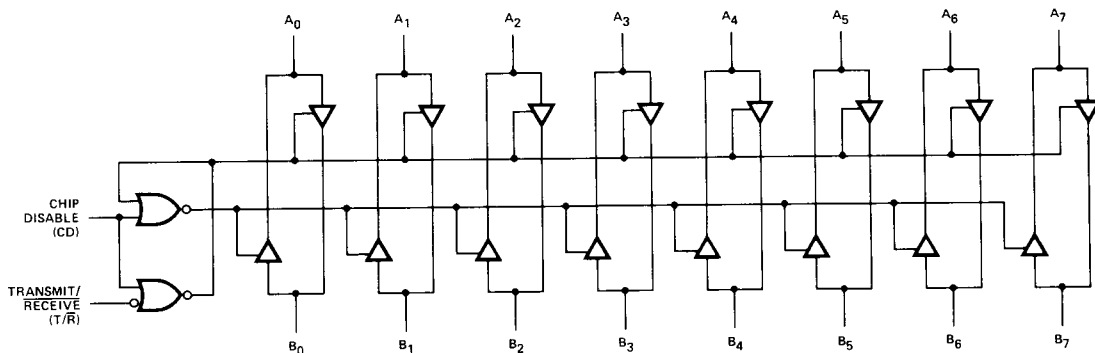
FUNCTIONAL DESCRIPTION

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.

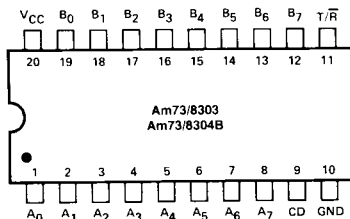
The output high voltage (V_{OH}) is specified at $V_{CC} - 1.15V$ minimum to allow interfacing with MOS, CMOS, TTL, ROM, RAM, or microprocessors.

**Am73/8304B
LOGIC DIAGRAM**



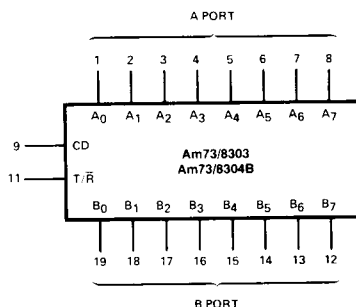
Am73/8303 has inverting transceivers

**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 (A ₀ -A ₇)							
V _{IH}	Logical "1" Input Voltage	CD = V _{IL} MAX, T/ $\bar{R}$ = 2.0V	2.0			Volts	
V _{IL}	Logical "0" Input Voltage	CD = V _{IL} MAX, T/ $\bar{R}$ = 2.0V	COM'L MIL		0.8 0.7	Volts	
V _{OH}	Logical "1" Output Voltage	CD = V _{IL} MAX, T/ $\bar{R}$ = 0.8V	I _{OH} = -0.4mA I _{OH} = -3.0mA	V _{CC} -1.15 2.7	V _{CC} -0.7 3.95	Volts	
V _{OL}	Logical "0" Output Voltage	CD = V _{IL} MAX, T/ $\bar{R}$ = 0.8V	I _{OL} = 8mA COM'L I _{OL} = 16mA		0.3 0.35	0.4 0.50	Volts
I _{OS}	Output Short Circuit Current	CD = V _{IL} MAX, T/ $\bar{R}$ = 0.8V, V _O = 0V, V _{CC} = MAX, Note 2	-10	-38	-75	mA	
I _{IH}	Logical "1" Input Current	CD = V _{IL} MAX, T/ $\bar{R}$ = 2.0V, V _I = 2.7V		0.1	80	μ A	
I _I	Input Current at Maximum Input Voltage	CD = 2.0V, V _{CC} MAX, V _I = V _{CC} MAX			1	mA	
I _{IL}	Logical "0" Input Current	CD = V _{IL} MAX, T/ $\bar{R}$ = 2.0V, V _I = 0.4V		-70	-200	μ A	
V _C	Input Clamp Voltage	CD = 2.0V, I _{IN} = -12mA		-0.7	-1.5	Volts	
I _{OD}	Output/Input 3-State Current	CD = 2.0V	V _O = 0.4V V _O = 4.0V		-200 80	μ A	
B PORT (B ₀ -B ₇)							
V _{IH}	Logical "1" Input Voltage	CD = V _{IL} MAX, T/ $\bar{R}$ = V _{IL} MAX	2.0			Volts	
V _{IL}	Logical "0" Input Voltage	CD = V _{IL} MAX, T/ $\bar{R}$ = V _{IL} MAX	COM'L MIL		0.8 0.7	Volts	
V _{OH}	Logical "1" Output Voltage	CD = V _{IL} MAX, T/ $\bar{R}$ = 2.0V	I _{OH} = -0.4mA I _{OH} = -5.0mA I _{OH} = -10mA	V _{CC} -1.15 2.7 2.4	V _{CC} -0.8 3.9 3.6	Volts	
V _{OL}	Logical "0" Output Voltage	CD = V _{IL} MAX, T/ $\bar{R}$ = 2.0V	I _{OL} = 20mA I _{OL} = 48mA		0.3 0.4	0.4 0.5	Volts
I _{OS}	Output Short Circuit Current	CD = V _{IL} MAX, T/ $\bar{R}$ = 2.0V, V _O = 0V V _{CC} = MAX, Note 2	-25	-50	-150	mA	
I _{IH}	Logical "1" Input Current	CD = V _{IL} MAX, T/ $\bar{R}$ = V _{IL} MAX, V _I = 2.7V		0.1	80	μ A	
I _I	Input Current at Maximum Input Voltage	CD = 2.0V, V _{CC} = MAX, V _I = V _{CC} MAX			1	mA	
I _{IL}	Logical "0" Input Current	CD = V _{IL} MAX, T/ $\bar{R}$ = V _{IL} MAX, V _I = 0.4V		-70	-200	μ A	
V _C	Input Clamp Voltage	CD = 2.0V, I _{IN} = -12mA		-0.7	-1.5	Volts	
I _{OD}	Output/Input 3-State Current	CD = 2.0V	V _O = 0.4V V _O = 4.0V		-200 200	μ A	
CONTROL INPUTS CD, T/ $\bar{R}$							
V _{IH}	Logical "1" Input Voltage		2.0			Volts	
V _{IL}	Logical "0" Input Voltage		COM'L MIL		0.8 0.7	Volts	
I _{IH}	Logical "1" Input Current	V _I = 2.7V		0.5	20	μ A	
I _I	Input Current at Maximum Input Voltage	V _{CC} = MAX, V _I = V _{CC} MAX			1.0	mA	
I _{IL}	Logical "0" Input Current	V _I = 0.4V	T/ $\bar{R}$ CD	-0.1 -0.1	-0.25 -0.25	mA	
V _C	Input Clamp Voltage	I _{IN} = -12mA		-0.8	-1.5	Volts	
POWER SUPPLY CURRENT							
I _{CC}	Power Supply Current	Am73/8303	CD = V _I = 2.0V, V _{CC} = MAX	70	100	mA	
			CD = 0.4V, V _{INA} = T/ $\bar{R}$ = 2.0V, V _{CC} = MAX	100	150		
		Am73/8304B	CD = 2.0V, V _I = 0.4V, V _{CC} = MAX	70	100	mA	
			CD = V _{INA} = 0.4V, T/ $\bar{R}$ = 2.0V, V _{CC} = 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

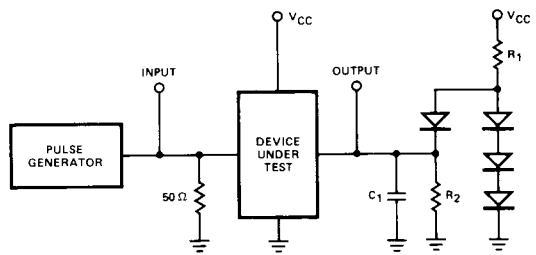
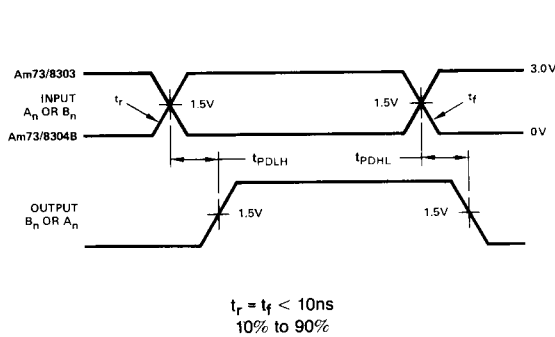
A₀-A₇ A port inputs/outputs are receiver output drivers when $T/\bar{R}$ is LOW and are transmit inputs when $T/\bar{R}$ is HIGH.

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, $\bar{CS}$).

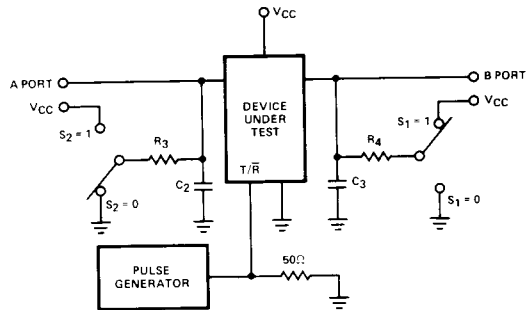
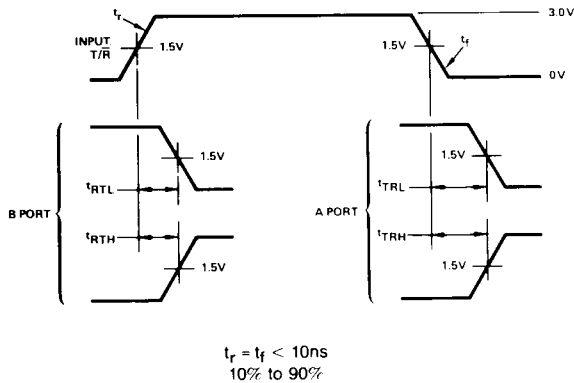
$T/\bar{R}$ Transmit/Receive direction control determines whether A port or B port drivers are in 3-state. With $T/\bar{R}$ HIGH A port is the input and B port is the output. With $T/\bar{R}$ LOW A port is the output and B port is the input.

SWITCHING TIME WAVEFORMS AND AC TEST CIRCUITS



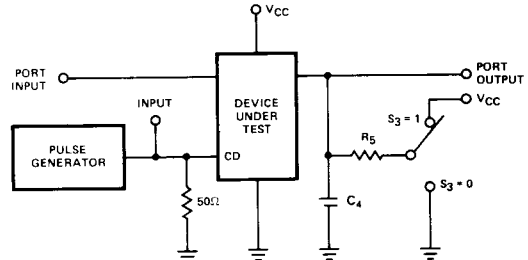
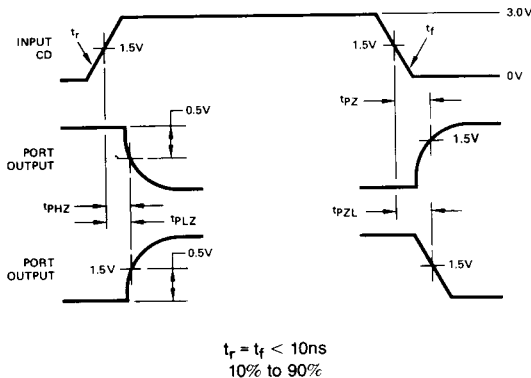
Note: C_1 includes test fixture capacitance.

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.

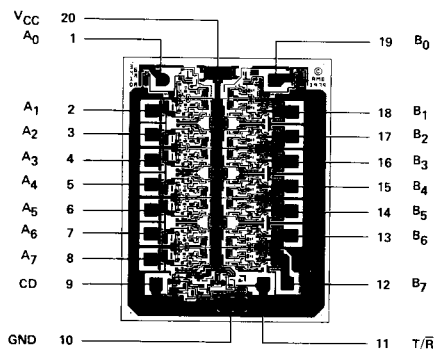


Note: C_4 includes test fixture capacitance.
Port input is in a fixed logical condition.

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

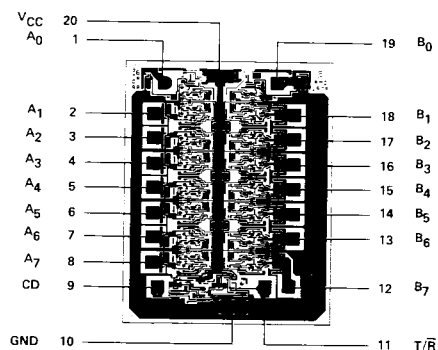
Metallization and Pad Layouts

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.