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/$\overline{\text{Receive}}$ 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

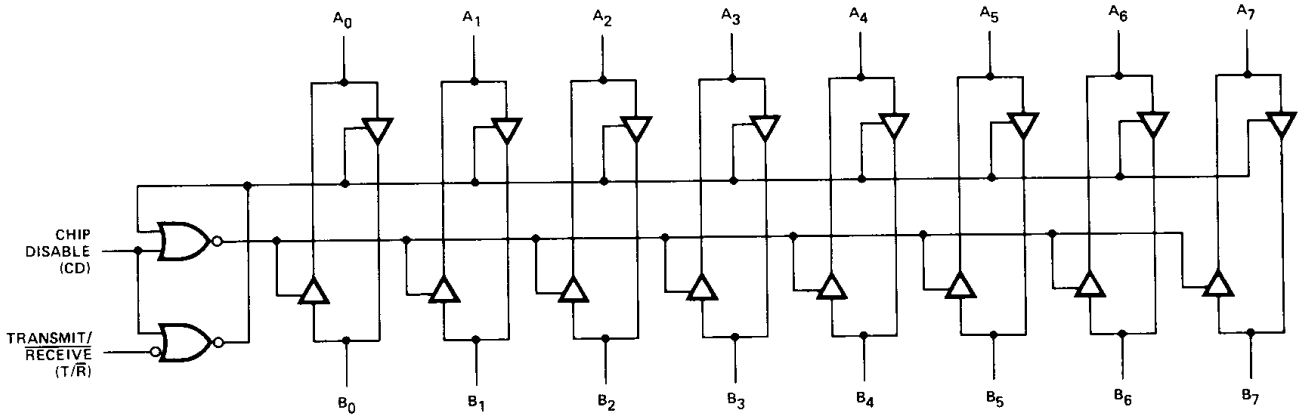
FUNCTIONAL DESCRIPTION

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/$\overline{\text{Receive}}$ 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.

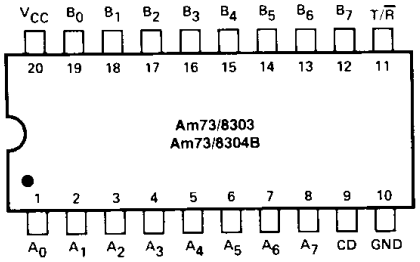
The output high voltage (V_{OH}) is specified at V_{CC} −1.15V minimum to allow interfacing with MOS, CMOS, TTL, ROM, RAM, or microprocessors.

Am73/8304B LOGIC DIAGRAM



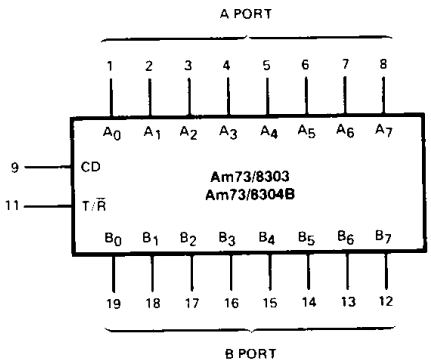
Am73/8303 has inverting transceivers

CONNECTION DIAGRAM Top View



Note: Pin 1 is marked for orientation.

LOGIC SYMBOL



V_{CC} = Pin 20
GND = Pin 10

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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°C	V_{CC} MIN = 4.5V	V_{CC} MAX = 5.5V
COM'L	T_A = 0 to +70°C	V_{CC} MIN = 4.75V	V_{CC} MAX = 5.25V

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/$\overline{R}$ = 2.0V			2.0			Volts
V_{IL}	Logical "0" Input Voltage	CD = V_{IL} MAX, T/$\overline{R}$ = 2.0V		COM'L			0.8	Volts
				MIL			0.7	
V_{OH}	Logical "1" Output Voltage	CD = V_{IL} MAX, T/$\overline{R}$ = 0.8V	I_{OH} = −0.4mA		V_{CC}−1.15	V_{CC}−0.7		Volts
			I_{OH} = −3.0mA		2.7	3.95		
V_{OL}	Logical "0" Output Voltage	CD = V_{IL} MAX, T/$\overline{R}$ = 0.8V	I_{OL} = 8mA			0.3	0.4	Volts
			COM'L	I_{OL} = 16mA		0.35	0.50	
I_{OS}	Output Short Circuit Current	CD = V_{IL} MAX, T/$\overline{R}$ = 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/$\overline{R}$ = 2.0V, V_I = 2.7V				0.1	80	µA
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/$\overline{R}$ = 2.0V, V_I = 0.4V				−70	−200	µA
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				−200	µA
			V_O = 4.0V				80	
B PORT (B_0-B_7)								
V_{IH}	Logical "1" Input Voltage	CD = V_{IL} MAX, T/$\overline{R}$ = V_{IL} MAX			2.0			Volts
V_{IL}	Logical "0" Input Voltage	CD = V_{IL} MAX, T/$\overline{R}$ = V_{IL} MAX		COM'L			0.8	Volts
				MIL			0.7	
V_{OH}	Logical "1" Output Voltage	CD = V_{IL} MAX, T/$\overline{R}$ = 2.0V	I_{OH} = −0.4mA		V_{CC}−1.15	V_{CC}−0.8		Volts
			I_{OH} = −5.0mA		2.7	3.9		
			I_{OH} = −10mA		2.4	3.6		
V_{OL}	Logical "0" Output Voltage	CD = V_{IL} MAX, T/$\overline{R}$ = 2.0V	I_{OL} = 20mA			0.3	0.4	Volts
			I_{OL} = 48mA			0.4	0.5	
I_{OS}	Output Short Circuit Current	CD = V_{IL} MAX, T/$\overline{R}$ = 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/$\overline{R}$ = V_{IL} MAX, V_I = 2.7V				0.1	80	µA
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/$\overline{R}$ = V_{IL} MAX, V_I = 0.4V				−70	−200	µA
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				−200	µA
			V_O = 4.0V				200	
CONTROL INPUTS CD, T/$\overline{R}$								
V_{IH}	Logical "1" Input Voltage				2.0			Volts
V_{IL}	Logical "0" Input Voltage			COM'L			0.8	Volts
				MIL			0.7	
I_{IH}	Logical "1" Input Current	V_I = 2.7V				0.5	20	µA
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/$\overline{R}$		−0.1	−0.25	mA
				CD		−0.1	−0.25	
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/$\overline{R}$ = 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/$\overline{R}$ = 2.0V, V_{CC} = MAX			90	140	

AC ELECTRICAL CHARACTERISTICS (V_{CC} = 5.0V, T_A = 25°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°C.
2. Only one output at a time should be shorted.

FUNCTION TABLE

Inputs	Conditions		
Chip Disable	0	0	1
Transmit/$\overline{Receive}$	0	1	X
A Port	Out	In	HI-Z
B Port	In	Out	HI-Z

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AC ELECTRICAL CHARACTERISTICS (V_{CC} = 5.0V, T_A = 25°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	14	18	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	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/$\overline{R}$ = 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/$\overline{R}$ = 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 = 0.4V, T/$\overline{R}$ = 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/$\overline{R}$ = 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/$\overline{R}$ = 2.4V (Figure 1) R_1 = 100Ω, R_2 = 1k, C_1 = 300pF	18	23	ns
		R_1 = 667Ω, R_2 = 5k, C_1 = 45pF	11	18	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	16	23	ns
		R_1 = 667Ω, R_2 = 5k, C_1 = 45pF	11	18	ns
t_{PLZB}	Propagation Delay from a Logical "0" to 3-State from CD to B Port	A_0 to A_7 = 0.4V, 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 = 2.4V, 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 = 0.4V, T/$\overline{R}$ = 2.4V (Figure 3) S_3 = 1, R_5 = 100Ω, C_4 = 300pF	32	40	ns
		S_3 = 1, R_5 = 667Ω, C_4 = 45pF	16	22	ns
t_{PZHB}	Propagation Delay from 3-State to a Logical "1" from CD to B Port	A_0 to A_7 = 2.4V, T/$\overline{R}$ = 2.4V (Figure 3) S_3 = 0, R_5 = 1k, C_4 = 300pF	26	35	ns
		S_3 = 0, R_5 = 5k, C_4 = 45pF	14	22	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 = 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/$\overline{R}$ 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/$\overline{R}$ 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/$\overline{R}$ 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°C.
2. Only one output at a time should be shorted.

DEFINITION OF FUNCTIONAL TERMS

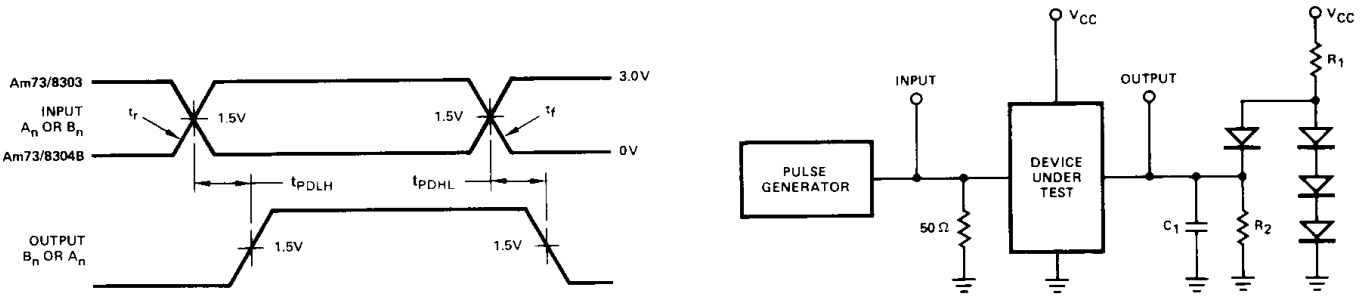
A_0-A_7 A port inputs/outputs are receiver output drivers when T/$\overline{R}$ is LOW and are transmit inputs when T/$\overline{R}$ is HIGH.

B_0-B_7 B port inputs/outputs are transmit output drivers when T/$\overline{R}$ is HIGH and receiver inputs when T/$\overline{R}$ is LOW.

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

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

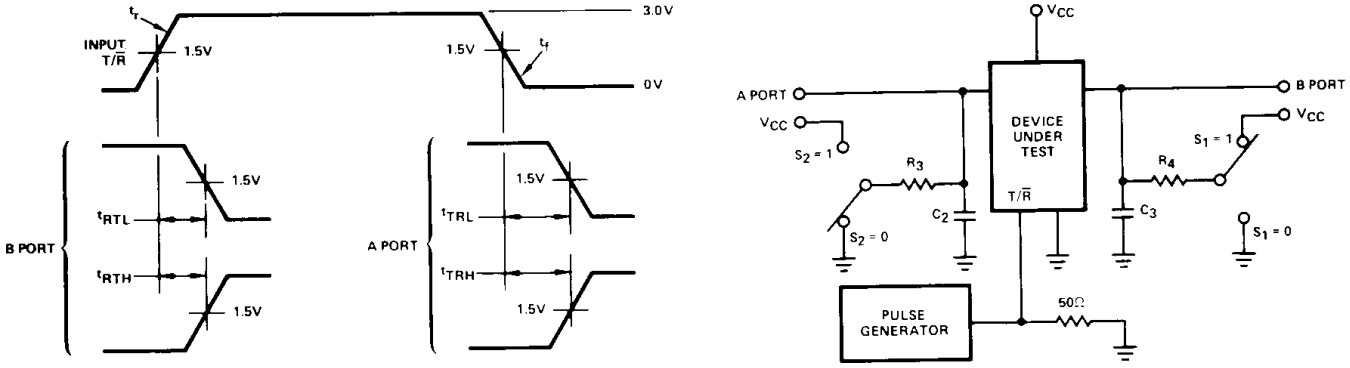
SWITCHING TIME WAVEFORMS AND AC TEST CIRCUITS



$t_r = t_f < 10ns$
10% to 90%

Note: C_1 includes test fixture capacitance.

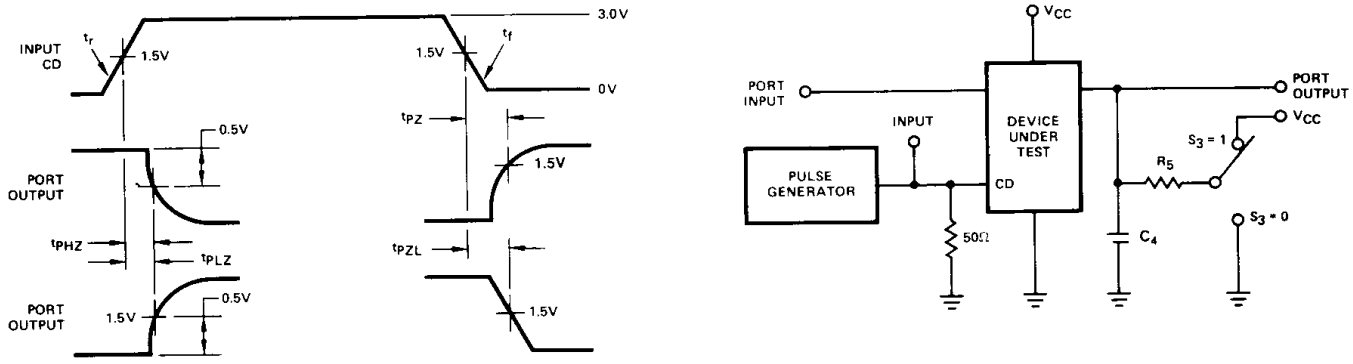
Figure 1. Propagation Delay from A Port to B Port or from B Port to A Port.



$t_r = t_f < 10ns$
10% to 90%

Note: C_2 and C_3 include test fixture capacitance.

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



$t_r = t_f < 10ns$
10% to 90%

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.

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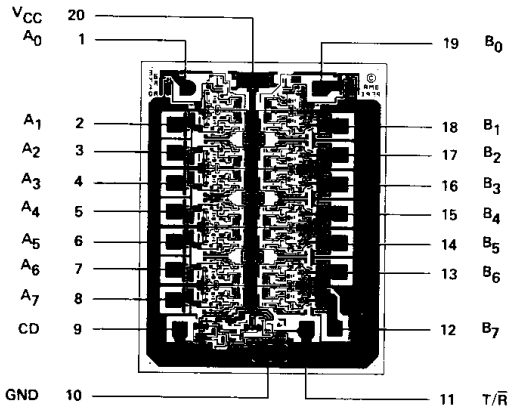
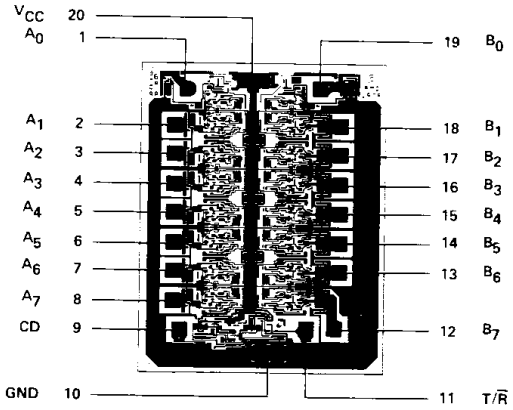
Metallization and Pad Layouts

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.