

MNDS1776-X REV 2A0

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PI-BUS TRANSCEIVER
General Description

The DS1776 is an octal PI-bus Transceiver. The A to B path is latched. B outputs are open collector with series Schottky diode, ensuring minimum B output loading. B inputs have glitch rejection circuitry, 4 ns typical.

Designed using Nationals Bi-CMOS process for both low operating and disabled power. AC performance is optimized for the PI-Bus inter-operability requirements.

The DS1776 is an octal latched transceiver and is intended to provide the electrical interface to a high performance wired-or bus. This bus has a loaded characteristic impedance range of 20 Ohm to 50 Ohm and is terminated on each end with a 30 Ohm to 40 Ohm resistor.

The DS1776 is an octal bidirectional transceiver with open collector B and TRI-STATE A port output drivers. A latch function is provided for the A port signals. The B port output driver is designed to sink 100 mA from 2V and features a controlled linear ramp to minimize crosstalk and ringing on the bus.

A separate high level control voltage (Vx) is provided to prevent the A side output high level from exceeding future high density processor supply voltage levels. For 5V systems, Vx is tied to Vcc.

Industry Part Number

DS1776

NS Part Numbers

DS1776E/883

Prime Die

DS1776

Controlling Document

5962-9231701M3A

Processing

MIL-STD-883, Method 5004

Quality Conformance Inspection

MIL-STD-883, Method 5005

Subgrp	Description	Temp (°C)
1	Static tests at	+25
2	Static tests at	+125
3	Static tests at	-55
4	Dynamic tests at	+25
5	Dynamic tests at	+125
6	Dynamic tests at	-55
7	Functional tests at	+25
8A	Functional tests at	+125
8B	Functional tests at	-55
9	Switching tests at	+25
10	Switching tests at	+125
11	Switching tests at	-55

(Absolute Maximum Ratings)

A0-A7 Current Applied to Output in Low Output State (I_o)	40mA
A0-A7, B0-B7 Input Voltage (V_i)	-0.5V to +5.5V
B0-B7 Current Applied to Output in Low Output State (I_o)	200mA
ESD Tolerance Czap = 120pF, Rzap = 1500 Ohms	0.5kV
Input Current (I_i)	-40mA to +5mA
Lead Temperature (Soldering, 10 seconds)	260 C
Storage Temperature Range	-65 C to +150 C
Supply Voltage (V_{cc})	-0.5V to +7.0V
Voltage Applied to Output in High Output State (V_o)	-0.5V to + V_{cc}
V_x , V_{oh} Output Level Control Voltage (A Outputs)	-0.5V to +7.0V
$\overline{OE}n$, OEA , \overline{LE} Input Voltage (V_i)	-0.5V to +7.0V
Power Dissipation LCC PKG	740 mW

Recommended Operating Conditions

Operating Temperature Range (T_A)	Min=-55, Max=+125 C
Supply Voltage (V_{cc})	Min=4.5V, Max=5.5V

Electrical Characteristics

DC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)

DC: $V_{CC} = 5.5V$

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Vil2	Low Level In Voltage B0-B7	$V_{CC} = 4.5$	1			1.45	V	1, 2, 3
Vil1	All Other Inputs	$V_{CC} = 4.5$.8	V	1, 2, 3
Vih1	Hi Level In Voltage OEB0/1, OEA, An, LE		1		2		V	1, 2, 3
Vih2	High Level In Voltage B0-B7				1.6		V	1, 2, 3
Ioh1	High Level Output Current A0-A7	$V_{CC} = 4.5, V_{in} = V_{ih} \text{ or } V_{il}, V_{oh} = 2.5V$	2			-3	mA	1, 2, 3
Ioh2	High Level Output Current B0-B7	$V_{CC} = 5.5, V_{il} = 0.8V, V_{ih} = 2.0V, V_{oh} = 2.1V$				100	uA	1, 2, 3
Iol1	Low Level Output Current A0-A7	$V_{CC} = 4.5, V_{in} = V_{ih} \text{ or } V_{il}, V_{ol} = 0.5V$	3			20	mA	1, 2, 3
Iol2	Low Level Output Current B0-B7	$V_{CC} = 4.5, V_{in} = V_{ih} \text{ or } V_{il}, V_{ol} = 1.15V$				100	mA	1, 2, 3
Voh	High Level Output Voltage A0-A7	$V_{CC} = 4.5, V_{in} = V_{il} \text{ or } V_{ih}, I_{oh} = -3 \text{ mA}, V_x = 4.5v$			2.5	4.5	V	1, 2, 3
		$V_{CC} = 4.5, V_{in} = V_{il} \text{ or } V_{ih}, I_{oh} = -0.4 \text{ mA}, V_x = 3.13/3.47$			2.5	VX	V	1, 2, 3
Vol	Low Level Output Voltage A0-A7	$V_{CC} = 4.5, V_{il} = \text{Max}, V_{ih} = \text{Min}, I_{ol} = 20\text{mA}, V_x = V_{CC}$				0.5	V	1, 2, 3
Volb	Low Level Output Voltage B0-B7	$V_{CC} = 4.5, V_{il} = \text{Max}, V_{ih} = \text{Min}, I_{ol} = 100\text{mA}$				1.15	V	1, 2, 3
		$V_{CC} = 4.5, V_{il} = \text{Max}, V_{ih} = \text{Min}, I_{ol} = 4\text{mA}$			0.4		V	1, 2, 3
Vik	Input Clamp Voltage A0-A7	$V_{CC} = 4.5, I_i = -40\text{mA}$				-0.5	V	1, 2, 3
Vik	Input Clamp Voltage Other Inputs	$V_{CC} = 4.5, I_i = -18\text{mA}$				-1.2	V	1, 2, 3
Iih1	Input Current Max Input Voltage OEBn, OEA, LE	$V_{CC} = 5.5, V_i = 7.0V$				100	uA	1, 2, 3
Iih2	Input Current Max Input Voltage A0-A7, B0-B7	$V_{CC} = 5.5, V_i = 5.5V$				1	mA	1, 2, 3
Iih3	High Level Input Current OEBn, OEA, LE	$V_{CC} = 5.5, V_i = 2.7V$				20	uA	1, 2, 3

Electrical Characteristics

DC PARAMETERS (Continued)

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: $V_{CC} = 5.5V$

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Iih4	High Level Input Current B0-B7	$V_{CC} = 5.5, V_i = 2.1V$				100	uA	1, 2, 3
Iil1	Low Level Input Current OEBn, OEA	$V_{CC} = 5.5, V_i = 0.5V$				-20	uA	1, 2, 3
Iil2	Low Level Input Current LE	$V_{CC} = 5.5, V_i = 0.5V$				-20	uA	1
						-40	uA	2, 3
Iil3	Low Level Input Current B0-B7	$V_{CC} = 5.5, V_i = 0.3V$				-100	uA	1, 2, 3
Iozh + Iih	TRI-STATE Output Current, High Level Voltage Applied A0-A7	$V_{CC} = 5.5, V_o = 2.7V$				70	uA	1, 2, 3
Iozl + Iil	TRI-STATE Output Current, Low Level Voltage Applied A0-A7	$V_{CC} = 5.5, V_o = 0.5V$				-70	uA	1, 2, 3
Ix	High Level Control Current	$V_{CC}=5.5, V_x=5.5V, \overline{LE}=OEA=\overline{OEBn}=2.7V, A0-A7 = 2.7, B0-B7 = 2V$			-100	100	uA	1, 2, 3
		$V_{CC}=5.5, V_x=3.13V \text{ and } 3.47V, \overline{LE}=OEA=2.7V, \overline{OEBn}=A0-A7=2.7V, B0-B7=2V$			-10	10	mA	1, 2, 3
Ios	Short Circuit Output Current A0-A7 only	$V_{CC}=5.5, B_n = 1.9V, OEA = 2.0V, \overline{OEBn} = 2.7V, V_{out} = 0V$	4		-60	-150	mA	1, 2, 3
Icch	Supply Current (Total) ICCH	$V_{CC}=5.5, V_{in} (A_n) = 5.0V$				37	mA	1, 2
						41	mA	3
Iccl	Supply Current (Total) ICCL	$V_{CC}=5.5, V_{in} (A_n) = 0.5V$				38	mA	1, 3
						34	mA	2
Iccz	Supply Current (Total) ICCZ	$V_{CC}=5.5, V_{in} (A_n) = 0.5V$				35	mA	1, 2, 3
Ioff	Power Off Output Current B0-B7	$V_{CC}=0, B_n = 2.1V, V_{il} = \text{Max}, V_{ih} = \text{Min}$				100	uA	1, 2, 3

Electrical Characteristics

AC PARAMETERS: B to A PATH

(The following conditions apply to all the following parameters, unless otherwise specified.)
AC: $V_{cc} = 5V \pm 10\%$, $C_1 = 50pF$, $R_1 = 500 \text{ Ohms}$

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
TPLH	Propagation Delay B to A				4.5	17	nS	9, 10, 11
TPHL	Propagation Delay B to A				6.0	17	nS	9, 10, 11
TPZH	Output Enable OEA To A				4.0	17	nS	9, 10, 11
TPZL	Output Enable OEA To A				4.0	21	nS	9, 10, 11
TPHZ	Output Disable OEA to A				2.0	12	nS	9, 10, 11
TPLZ	Output Disable OEA to A				2.0	13	nS	9, 10, 11

AC PARAMETERS: A to B PATH

(The following conditions apply to all the following parameters, unless otherwise specified.)
AC: $V_{cc} = 5V \pm 10\%$, $C_1 = 30pF$, $R_1 = 9 \text{ Ohms}$

TPLH	Propagation Delay A to B				2.0	13	nS	9, 11
					2.0	17	nS	10
TPHL	Propagation Delay A to B				2.5	13	nS	9, 10, 11
TPLH	Propagation Delay LE to B				2.0	16	nS	9, 11
TPLH	Propagation Delay LE to B				2.0	22	nS	10
TPHL	Propagation Delay LE to B				2.0	16	nS	9, 10, 11
TPLH	Enable/Disable Time OEEn to B				2.0	13	nS	9, 11
TPLH	Enable/Disable Time OEEn to B				2.0	16	nS	10
TPHL	Enable/Disable Time OEEn to B				3.5	14	nS	9
TPHL	Enable/Disable Time OEEn to B				3.5	13	nS	10
TPHL	Enable/Disable Time OEEn to B				3.5	16	nS	11

Electrical Characteristics

AC PARAMETERS: SETUP/HOLD/PULSE WIDTH SPECS

(The following conditions apply to all the following parameters, unless otherwise specified.)
AC: $V_{cc} = 5V \pm 10\%$

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
TS	A to LE Setup				7.0		nS	9, 10, 11
TH	A to LE Hold				0.0		nS	9, 10, 11
TW	LE Pulse Width Low				12		nS	9, 10, 11

Note 1: Tested Go/No Go.

Note 2: Same as Voh.

Note 3: Same as Vol.

Note 4: Not more than one output to be shorted at a time.

Graphics and Diagrams

GRAPHICS#	DESCRIPTION
6138HRC1	28L LEADLESS CHIP CARRIER TYPE C(B/I CKT)
E28ARD	LCC (E), TYPE C, 28 TERMINAL(P/P DWG)

See attached graphics following this page.

Revision History

Rev	ECN #	Rel Date	Originator	Changes
2A0	M0003000	08/24/98	Mike Fitzgerald	Changed tpZL (Output Enable OEA to A) maximum limit from 17ns to 21ns, subgroups 9,10,11.