National Semiconductor

MICROCIRCUIT DATA SHEET

MNDS1776-X REV 2A0

Original Creation Date: 04/17/96
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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 (Io)	40mA
A0-A7, B0-B7 Input Voltage (Vi)	-0.5V to +5.5V
B0-B7 Current Applied to Output in Low Output State (Io)	200mA
ESD Tolerance Czap = 120pF, Rzap = 1500 Ohms	0.5kV
Input Current (Ii)	-40mA to +5mA
Lead Temperature (Soldering, 10 seconds)	260 C
Storage Temperature Range	-65 C to +150 C
Supply Voltage (Vcc)	-0.5V to +7.0V
Voltage Applied to Output in High Output State (Vo)	-0.5V to +VccV
Vx, Voh Output Level Control Voltage (A Outputs)	-0.5V to +7.0V
$\overline{OEB}$n, OEA, $\overline{LE}$ Input Voltage (Vi)	-0.5V to +7.0V
Power Dissipation LCC PKG	740 mW

Recommended Operating Conditions

Operating Temperature Range (TA)	Min=-55, Max=+125 C
Supply Voltage (Vcc)	Min=4.5V, Max=5.5V

Electrical Characteristics

DC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: Vcc = 5.5V

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Vil2	Low Level In Voltage B0-B7	Vcc = 4.5	1			1.45	V	1, 2, 3
Vil1	All Other Inputs	Vcc = 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	Vcc = 4.5, Vin = Vih or Vil, Voh = 2.5V	2			-3	mA	1, 2, 3
Ioh2	High Level Output Current B0-B7	Vcc = 5.5, Vil = 0.8V, Vih = 2.0V, Voh = 2.1V				100	uA	1, 2, 3
Iol1	Low Level Output Current A0-A7	Vcc = 4.5, Vin = Vih or Vil, Vol = 0.5V	3			20	mA	1, 2, 3
Iol2	Low Level Output Current B0-B7	Vcc = 4.5, Vin = Vih or Vil, Vol = 1.15V				100	mA	1, 2, 3
Voh	High Level Output Voltage A0-A7	Vcc = 4.5, Vin = Vil or Vih, Ioh = -3 mA, Vx = 4.5v			2.5	4.5	V	1, 2, 3
		Vcc = 4.5, Vin = Vil or Vih, Ioh =-0.4 mA,Vx = 3.13/3.47			2.5	VX	V	1, 2, 3
Vol	Low Level Output Voltage A0-A7	Vcc = 4.5, Vil = Max, Vih = Min, Iol = 20mA, Vx = Vcc				0.5	V	1, 2, 3
Volb	Low Level Output Voltage B0-B7	Vcc = 4.5, Vil = Max, Vih = Min, Iol = 100mA				1.15	V	1, 2, 3
		Vcc = 4.5, Vil = Max, Vih = Min, Iol = 4mA			0.4		V	1, 2, 3
Vik	Input Clamp Voltage A0-A7	Vcc = 4.5, Ii = -40mA				-0.5	V	1, 2, 3
Vik	Input Clamp Voltage Other Inputs	Vcc = 4.5, Ii = -18mA				-1.2	V	1, 2, 3
Iih1	Input Current Max Input Voltage OEBn, OEA, LE	Vcc = 5.5, Vi = 7.0V				100	uA	1, 2, 3
Iih2	Input Current Max Input Voltage A0-A7, B0-B7	Vcc = 5.5, Vi = 5.5V				1	mA	1, 2, 3
Iih3	High Level Input Current OEBn, OEA, LE	Vcc = 5.5, Vi = 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: Vcc = 5.5V

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Iih4	High Level Input Current B0-B7	Vcc = 5.5, Vi = 2.1V				100	uA	1, 2, 3
Iil1	Low Level Input Current OEBn, OEA	Vcc = 5.5, Vi = 0.5V				-20	uA	1, 2, 3
Iil2	Low Level Input Current LE	Vcc = 5.5, Vi = 0.5V				-20	uA	1
						-40	uA	2, 3
Iil3	Low Level Input Current B0-B7	Vcc = 5.5, Vi = 0.3V				-100	uA	1, 2, 3
Iozh + Iih	TRI-STATE Output Current, High Level Voltage Applied A0-A7	Vcc = 5.5, Vo = 2.7V				70	uA	1, 2, 3
Iozl + Iil	TRI-STATE Output Current, Low Level Voltage Applied A0-A7	Vcc = 5.5, Vo = 0.5V				-70	uA	1, 2, 3
Ix	High Level Control Current	Vcc=5.5,Vx=5.5V, $\overline{LE}$=OEA=$\overline{OEB}$n=2.7V, A0-A7 = 2.7, B0-B7 = 2V			-100	100	uA	1, 2, 3
		Vcc=5.5,Vx=3.13V and 3.47V, $\overline{LE}$=OEA=2.7V, $\overline{OEB}$n=A0-A7=2.7V, B0-B7-2V			-10	10	mA	1, 2, 3
Ios	Short Circuit Output Current A0-A7 only	Vcc=5.5, Bn = 1.9V, OEA = 2.0V, $\overline{OEB}$n = 2.7V, Vout = 0V	4		-60	-150	mA	1, 2, 3
Icch	Supply Current (Total) ICCH	Vcc=5.5, Vin (An) = 5.0V				37	mA	1, 2
						41	mA	3
Iccl	Supply Current (Total) ICCL	Vcc=5.5, Vin (An) = 0.5V				38	mA	1, 3
						34	mA	2
Iccz	Supply Current (Total) ICCZ	Vcc=5.5, Vin (An) = 0.5V				35	mA	1, 2, 3
Ioff	Power Off Output Current B0-B7	Vcc=0, Bn = 2.1V, Vil = Max, Vih = 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: Vcc = 5V ±10%, Cl = 50pF, Rl = 500 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: Vcc = 5V ±10%, Cl = 30pF, Rl = 9 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 $\overline{LE}$ to B				2.0	16	nS	9, 11
TPLH	Propagation Delay $\overline{LE}$ to B				2.0	22	nS	10
TPHL	Propagation Delay $\overline{LE}$ to B				2.0	16	nS	9, 10, 11
TPLH	Enable/Disable Time $\overline{OEB}$n to B				2.0	13	nS	9, 11
TPLH	Enable/Disable Time $\overline{OEB}$n to B				2.0	16	nS	10
TPHL	Enable/Disable Time $\overline{OEB}$n to B				3.5	14	nS	9
TPHL	Enable/Disable Time $\overline{OEB}$n to B				3.5	13	nS	10
TPHL	Enable/Disable Time $\overline{OEB}$n 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: Vcc = 5V ±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.