# INTEGRATED CIRCUITS



Product specification Supersedes data of 1993 Aug 18 IC23 Data Handbook

1998 Jan 16



## MB2245

#### **FEATURES**

- 16-bit bidirectional bus interface
- Power–up 3-State
- Multiple V<sub>CC</sub> and GND pins minimize switching noise
- 3-State buffers
- Output capability: +64 mA/-32mA
- Latch-up protection exceeds 500mA per Jedec Std 17
- ESD protection exceeds 2000 V per MIL STD 883 Method 3015 and 200V per Machine Model
- Inputs are disabled during 3-State mode

#### DESCRIPTION

The MB2245 high-performance BiCMOS device combines low static and dynamic power dissipation with high speed and high output drive.

The MB2245 device is a 16-bit transceiver featuring non-inverting 3-State bus compatible outputs in both send and receive directions. The control function implementation minimizes external timing requirements. The device features two Output Enable  $(1\overline{OE}, 2\overline{OE})$  inputs for easy cascading and two Direction (1DIR, 2DIR) inputs for direction control.

# QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS T <sub>amb</sub> = 25°C; GND = 0V	TYPICAL	UNIT
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay nAx to nBx or nBx to nAx	C <sub>L</sub> = 50pF; V <sub>CC</sub> = 5V	3.2 3.1	ns
C <sub>IN</sub>	Input capacitance	$V_I = 0V \text{ or } V_{CC}$	4	pF
C <sub>I/O</sub>	I/O pin capacitance	$V_{O} = 0V \text{ or } V_{CC}$ ; 3-State	7	pF
I <sub>CCZ</sub>	Total supply current	Outputs disabled; $V_{CC} = 5.5V$	65	μΑ

#### **ORDERING INFORMATION**

PACKAGES	TEMPERATURE RANGE	OUTSIDE NORTH AMERICA	NORTH AMERICA	DWG NUMBER
52-pin plastic Quad Flat Pack	–40°C to +85°C	MB2245 BB	MB2245 BB	SOT379-1

#### **PIN CONFIGURATION**



#### **PIN DESCRIPTION**

PIN NUMBER	SYMBOL	NAME AND FUNCTION	
47, 19	1DIR, 2DIR	Direction control inputs (Active-High)	
44, 43, 41, 40, 38, 37, 35, 34, 32, 31, 29, 28, 26, 25, 23, 22	1A0 – 1A7, 2A0 – 2A7	Data inputs/outputs (A side)	
48, 49, 51, 52, 2, 3, 5, 6, 8, 9, 11, 12, 14, 15, 17, 18	1B0 – 1B7, 2B0 – 2B7	Data outputs/outputs (B side)	
45, 21	1 <u>0E</u> , 2 <u>0E</u>	Output enable (Active-Low)	
4, 7, 10, 16, 20, 24, 30, 33, 36, 42, 46, 50	GND	Ground (0V)	
1, 13, 27, 39	V <sub>CC</sub>	Positive supply voltage	

## MB2245



#### **FUNCTION TABLE**

INPU	UTS	INPUTS/OUTPUTS			
nOE	nDIR	nAx	nBx		
L	L	A = B	Inputs		
L	н	Inputs	B = A		
н	х	Z	Z		

## LOGIC SYMBOL (IEEE/IEC)





1998 Jan 16

## MB2245

## ABSOLUTE MAXIMUM RATINGS<sup>1, 2</sup>

SYMBOL	PARAMETER	CONDITIONS	RATING	UNIT
V <sub>CC</sub>	DC supply voltage		-0.5 to +7.0	V
I <sub>IK</sub>	DC input diode current	V <sub>1</sub> < 0	-18	mA
VI	DC input voltage <sup>3</sup>		-1.2 to +7.0	V
I <sub>ОК</sub>	DC output diode current	V <sub>O</sub> < 0	-50	mA
V <sub>OUT</sub>	DC output voltage <sup>3</sup>	output in Off or High state	-0.5 to +5.5	V
I <sub>OUT</sub>	DC output current	output in Low state	128	mA
T <sub>stg</sub>	Storage temperature range		–65 to 150	°C

NOTES:

 Stresses beyond those listed may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

 The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability. The maximum junction temperature of this integrated circuit should not exceed 150°C.

3. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

## **RECOMMENDED OPERATING CONDITIONS**

SYMBOL	PARAMETER	LIM	ITS	UNIT
		Min	Max	
V <sub>CC</sub>	DC supply voltage	4.5	5.5	V
VI	Input voltage	0	V <sub>CC</sub>	V
V <sub>IH</sub>	High-level input voltage	2.0		V
V <sub>IL</sub>	Low-level Input voltage		0.8	V
I <sub>OH</sub>	High-level output current		-32	mA
I <sub>OL</sub>	Low-level output current		64	mA
Δt/Δv	Input transition rise or fall rate	0	10	ns/V
T <sub>amb</sub>	Operating free-air temperature range	-40	+85	°C

#### Product specification

# 16-bit transceiver with direction pins (3-State)

## **DC ELECTRICAL CHARACTERISTICS**

			LIMITS					
SYMBOL PARAMETER	PARAMETER	TEST CONDITIONS	T <sub>amb</sub> = +25°C			T <sub>amb</sub> = −40°C to +85°C		
			Min	Тур	Max	Min	Мах	1
V <sub>IK</sub>	Input clamp voltage	V <sub>CC</sub> = 4.5V; I <sub>IK</sub> = -18mA		-0.9	-1.2		-1.2	V
		$V_{CC}$ = 4.5V; $I_{OH}$ = -3mA; $V_I$ = $V_{IL}$ or $V_{IH}$	2.5	2.9		2.5		V
V <sub>OH</sub>	High-level output voltage	$V_{CC}$ = 5.0V; $I_{OH}$ = -3mA; $V_I$ = $V_{IL}$ or $V_{IH}$	3.0	3.4		3.0		V
		$V_{CC}$ = 4.5V; $I_{OH}$ = -32mA; $V_I$ = $V_{IL}$ or $V_{IH}$	2.0	2.4		2.0		V
V <sub>OL</sub>	Low-level output voltage	$V_{CC}$ = 4.5V; $I_{OL}$ = 64mA; $V_I$ = $V_{IL}$ or $V_{IH}$		0.42	0.55		0.55	V
II.	Input leakage current	V <sub>CC</sub> = 5.5V; V <sub>I</sub> = GND or 5.5V		±0.01	±1.0		±1.0	μΑ
I <sub>OFF</sub>	Power-off leakage current	$V_{CC}$ = 0.0V; $V_{O}$ or $V_{I} \le 4.5V$		±5.0	±100		±100	μΑ
I <sub>PU</sub> /I <sub>PU</sub>	Power-up/down 3-State output current	$V_{\underline{CC}}$ = 2.0V; $V_{O}$ = 0.5V; $V_{I}$ = GND or $V_{CC};$ $V_{OE}$ = $V_{CC}$		±5.0	±50		±50	μA
I <sub>OZH</sub>	3-State output High current	$V_{CC}$ = 5.5V; $V_{O}$ = 2.7V; $V_{I}$ = $V_{IL}$ or $V_{IH}$		5.0	50		50	μΑ
I <sub>OZL</sub>	3-State output Low current	$V_{CC}$ = 5.5V; $V_{O}$ = 0.5V; $V_{I}$ = $V_{IL}$ or $V_{IH}$		-5.0	-50		-50	μΑ
I <sub>CEX</sub>	Output high leakage current	$V_{CC}$ = 5.5V; $V_{O}$ = 5.5V; $V_{I}$ = GND or $V_{CC}$		5.0	50		50	μΑ
Ι <sub>Ο</sub>	Output current <sup>1</sup>	$V_{CC} = 5.5V; V_{O} = 2.5V$	-50	-70	-180	-50	-180	mA
I <sub>CCH</sub>		$V_{CC}$ = 5.5V; Outputs High, $V_{I}$ = GND or $V_{CC}$		65	250		250	μΑ
I <sub>CCL</sub>	Quiescent supply current	$V_{CC}$ = 5.5V; Outputs Low, $V_I$ = GND or $V_{CC}$		48	60		60	mA
I <sub>CCZ</sub>	]	$V_{CC}$ = 5.5V; Outputs 3-State; V <sub>I</sub> = GND or V <sub>CC</sub>		65	250		250	μΑ
$\Delta I_{CC}$	Additional supply current per input pin <sup>2</sup>	Outputs enabled, one input at 3.4V, other inputs at V <sub>CC</sub> or GND; $V_{CC} = 5.5V$		0.5	1.5		1.5	mA

#### NOTES:

Not more than one output should be tested at a time, and the duration of the test should not exceed one second.
This is the increase in supply current for each input at 3.4V.

### **AC CHARACTERISTICS**

GND = 0V;  $t_R = t_F$  = 2.5ns;  $C_L$  = 50pF,  $R_L$  = 500 $\Omega$ 

					LIMIT	ſS		
SYMBOL	PARAMETER	WAVEFORM	T <sub>2</sub> V	amb = +25° ′CC = +5.0′	C V	$T_{amb} = -40^{\circ}$ $V_{CC} = +5^{\circ}$	°C to +85°C .0V ±0.5V	UNIT
			Min	Тур	Мах	Min	Max	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay nAx to nBx or nBx to nAx	1	1.2 1.2	3.2 3.1	4.5 4.5	1.2 1.2	5.1 5.1	ns
t <sub>PZH</sub> t <sub>PZL</sub>	Output enable time to High and Low level	2	2.1 2.4	3.8 4.7	5.2 6.1	2.1 2.4	5.8 7.1	ns
t <sub>PHZ</sub> t <sub>PLZ</sub>	Output disable time from High and Low level	2	2.1 2.1	4.5 4.0	5.8 5.3	2.1 2.1	6.4 5.9	ns

## MB2245

#### AC WAVEFORMS



Waveform 1. Waveforms Showing the Input to Output Propagation Delays



#### Waveform 2. Waveforms Showing the 3-State Output Enable and Disable Times

#### $V_{CC}$ AMP (V) 90% 90% Q -0 7.0V $\mathsf{V}_\mathsf{M}$ VM NEGATIVE PULSE 10% 10% $V_{\text{IN}}$ VOUT Rı 0V PULSE D.U.T. t<sub>THL</sub> (t<sub>F</sub>) 6 -0t<sub>TLH</sub> (t<sub>R</sub>) GENERATOR $t_{\mathsf{TLH}}~(t_{\mathsf{R}})$ $\mathsf{R}_\mathsf{T}$ $C_L$ RL $t_{THL}$ ( $t_F$ ) AMP (V) 90% 90% POSITIVE Vм VN PULSE Test Circuit for 3-State Outputs 10% 10% tw 0V SWITCH POSITION V<sub>M</sub> = 1.5V Input Pulse Definition TEST SWITCH closed t<sub>PLZ</sub> closed t<sub>PZL</sub> All other open INPUT PULSE REQUIREMENTS DEFINITIONS FAMILY $R_L =$ Load resistor; see AC CHARACTERISTICS for value. Amplitude Rep. Rate t<sub>F</sub> t<sub>W</sub> t<sub>R</sub> $C_L =$ Load capacitance includes jig and probe capacitance; see AC CHARACTERISTICS for value. MB 3.0V 1MHz 500ns 2.5ns 2.5ns Termination resistance should be equal to $\ensuremath{\mathsf{Z}}_{\ensuremath{\mathsf{OUT}}}$ of pulse generators. R<sub>T</sub> = SB00010

## **TEST CIRCUIT AND WAVEFORMS**









## Product specification

# 16-bit transceivers with direction pins (3-State)

NOTES

## MB2245

#### Data sheet status

Data sheet status	Product status	Definition [1]
Objective specification	Development	This data sheet contains the design target or goal specifications for product development. Specification may change in any manner without notice.
Preliminary specification	Qualification	This data sheet contains preliminary data, and supplementary data will be published at a later date. Philips Semiconductors reserves the right to make chages at any time without notice in order to improve design and supply the best possible product.
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[1] Please consult the most recently issued datasheet before initiating or completing a design.

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Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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