

# Dual octal registered transceiver (3-State)

# MB2052

## FEATURES

- Two 8-bit registered transceivers
- Live insertion/extraction permitted
- Power-up 3-State
- Power-up reset
- Multiple V<sub>CC</sub> and GND pins minimize switching noise
- Independent registers for A and B buses
- Output capability: +64mA/-32mA

- Latch-up protection exceeds 500mA per Jedec JC40.2 Std 17
- ESD protection exceeds 2000V per MIL STD 883 Method 3015 and 200V per Machine Model

## DESCRIPTION

The MB2052 high-performance BiCMOS device combines low static and dynamic power dissipation with high speed and high output drive.

The MB2052 is a dual octal registered transceiver. Two 8-bit registers store data flowing in both directions between two bidirectional buses. Data applied to the inputs is entered and stored on the rising edge of the Clock (nCPXX) provided that the Clock Enable (nCEXX) is Low. The data is then present at the 3-State output buffers, but is only accessible when the Output Enable (nOEXX) is Low. Data flow from A inputs to B outputs is the same as for B inputs to A outputs.

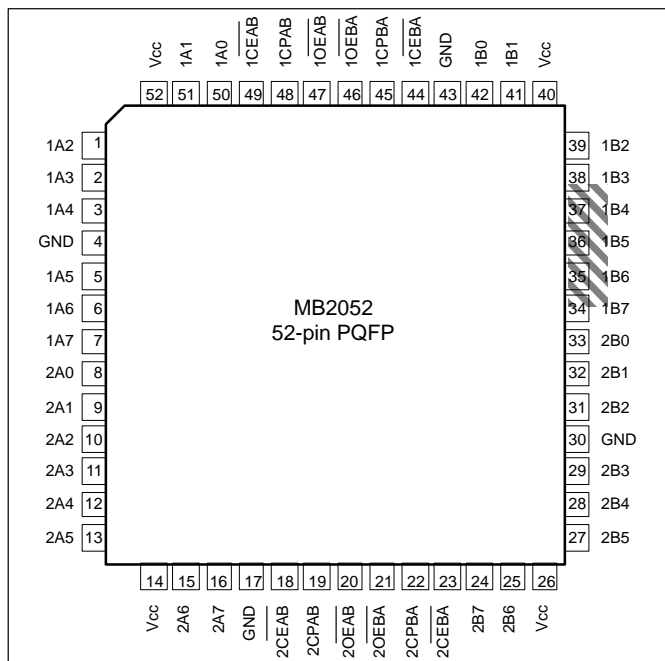
## QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS T <sub>amb</sub> = 25°C; GND = 0V	TYPICAL	UNIT
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay nCPBA to nAx or nCPAB to nBx	C <sub>L</sub> = 50pF; V <sub>CC</sub> = 5V	5.7	ns
C <sub>IN</sub>	Input capacitance	V <sub>I</sub> = 0V or V <sub>CC</sub>	4	pF
C <sub>I/O</sub>	I/O capacitance	V <sub>O</sub> = 0V or V <sub>CC</sub> ; 3-State	7	pF
I <sub>CCZ</sub>	Total supply current	Outputs disabled; V <sub>CC</sub> = 5.5V	120	nA

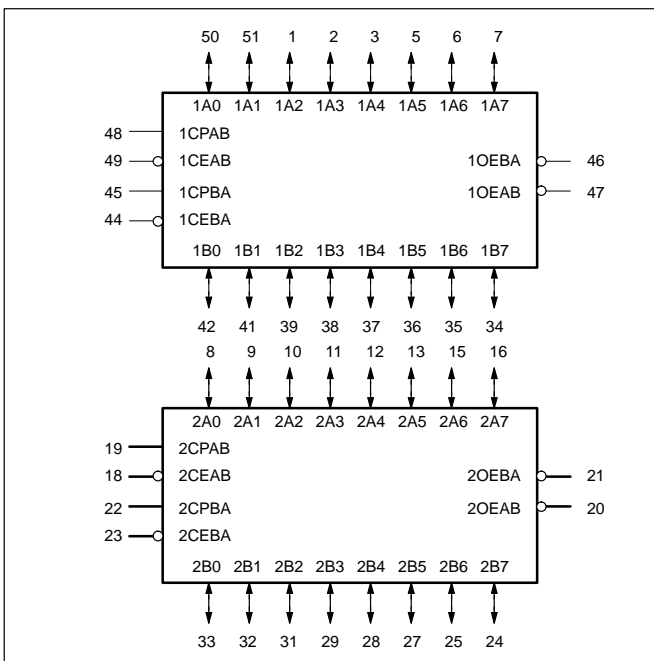
## ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	ORDER CODE	DRAWING NUMBER
52-pin plastic Quad Flat Pack	-40°C to +85°C	MB2052BB	1418B

## PIN CONFIGURATION



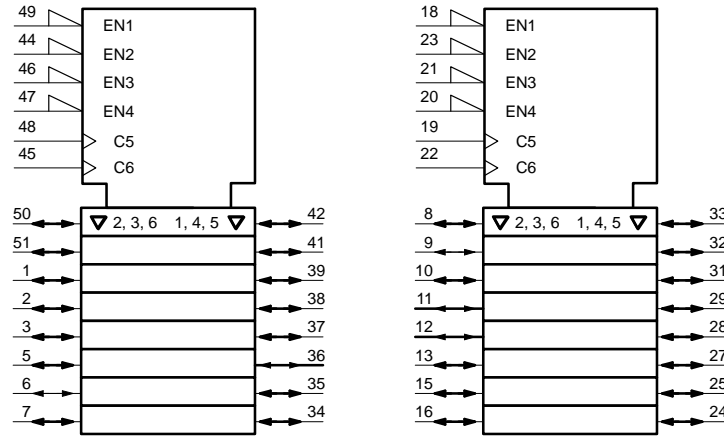
## LOGIC SYMBOL



# Dual octal registered transceiver (3-State)

MB2052

## LOGIC SYMBOL (IEEE/IEC)



## PIN DESCRIPTION

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

## FUNCTION TABLE for Register nAx or nBx

INPUTS		INTERNAL Q	OPERATING MODE
nAx or nBx	nCPXX		
X	X	NC	Hold data
L H	↑ ↑	L H	Load data

H = High voltage level  
 L = Low voltage level  
 ↑ = Low-to-High transition  
 X = Don't care  
 XX = AB or BA  
 NC = No change

# Dual octal registered transceiver (3-State)

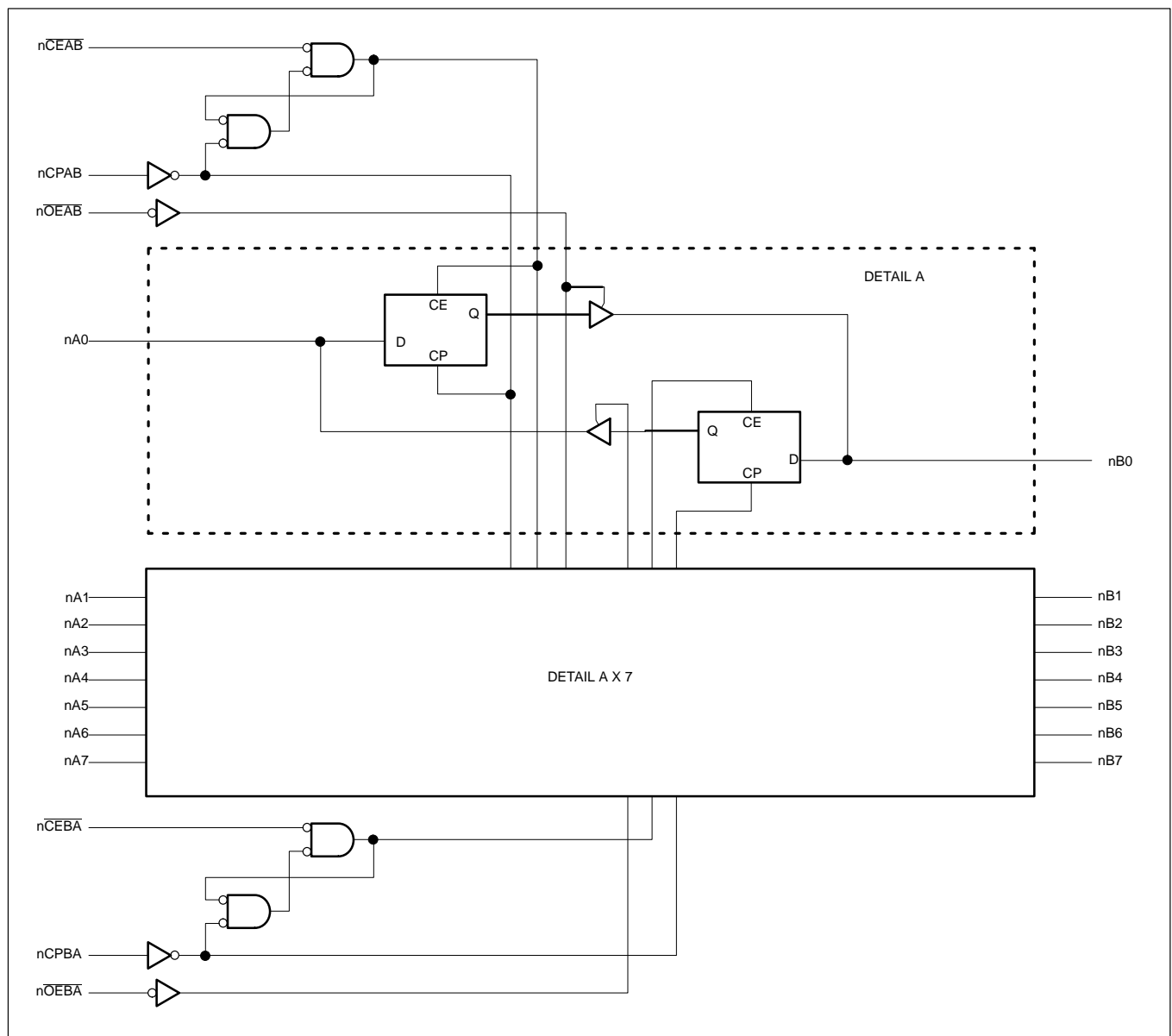
MB2052

## FUNCTION TABLE for Output Enable

INPUTS	INTERNAL	nAx or nBx	OPERATING
nOEXX	Q	OUTPUTS	MODE
H	X	Z	Disable outputs
L	L	L	Enable outputs
L	H	H	

H = High voltage level  
 L = Low voltage level  
 X = Don't care  
 XX = AB or BA  
 Z = High impedance "off" state

## LOGIC DIAGRAM



## Dual octal registered transceiver (3-State)

MB2052

**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>I</sub> < 0	-18	mA
V <sub>I</sub>	DC input voltage <sup>3</sup>		-1.2 to +7.0	V
I <sub>OK</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.
- The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

**RECOMMENDED OPERATING CONDITIONS**

SYMBOL	PARAMETER	LIMITS		UNIT
		MIN	MAX	
V <sub>CC</sub>	DC supply voltage	4.5	5.5	V
V <sub>I</sub>	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

# Dual octal registered transceiver (3-State)

MB2052

## DC ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS					UNIT
			T <sub>amb</sub> = +25°C			T <sub>amb</sub> = -40°C to +85°C		
			MIN	TYP	MAX	MIN	MAX	
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 <sub>OH</sub>	High-level output voltage	V <sub>CC</sub> = 4.5V; I <sub>OH</sub> = -3mA; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>	2.5	2.9		2.5		V
		V <sub>CC</sub> = 5.0V; I <sub>OH</sub> = -3mA; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>	3.0	3.4		3.0		V
		V <sub>CC</sub> = 4.5V; I <sub>OH</sub> = -32mA; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>	2.0	2.4		2.0		V
V <sub>OL</sub>	Low-level output voltage	V <sub>CC</sub> = 4.5V; I <sub>OL</sub> = 64mA; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>		0.42	0.55		0.55	V
V <sub>RST</sub>	Power-up output low voltage <sup>3</sup>	V <sub>CC</sub> = 5.5V; I <sub>OL</sub> = 1mA; V <sub>I</sub> = GND or V <sub>CC</sub>		0.13	0.55		0.55	V
I <sub>I</sub>	Input leakage current	Control pins V <sub>CC</sub> = 5.5V; V <sub>I</sub> = GND or 5.5V		±0.01	±1.0		±1.0	µA
		Data pins V <sub>CC</sub> = 5.5V; V <sub>I</sub> = GND or 5.5V		5	100		100	µA
I <sub>OFF</sub>	Power-off leakage current	V <sub>CC</sub> = 0V; V <sub>O</sub> or V <sub>I</sub> ≤ 4.5V		±5.0	±100		±100	µA
I <sub>PU/PD</sub>	Power-up/down 3-State output current <sup>4</sup>	V <sub>CC</sub> = 2.1V; V <sub>O</sub> = 0.5V; V <sub>I</sub> = GND or V <sub>CC</sub> ; V <sub>OE</sub> = Don't care		±5.0	±50		±50	µA
I <sub>IH</sub> + I <sub>OZH</sub>	3-State output High current	V <sub>CC</sub> = 5.5V; V <sub>O</sub> = 2.7V; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>		5.0	50		50	µA
I <sub>IL</sub> + I <sub>OZL</sub>	3-State output Low current	V <sub>CC</sub> = 5.5V; V <sub>O</sub> = 0.5V; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>		-5.0	-50		-50	µA
I <sub>CEX</sub>	Output High leakage current	V <sub>CC</sub> = 5.5V; V <sub>O</sub> = 5.5V; V <sub>I</sub> = GND or V <sub>CC</sub>		5.0	50		50	µA
I <sub>O</sub>	Output current <sup>1</sup>	V <sub>CC</sub> = 5.5V; V <sub>O</sub> = 2.5V	-50	-70	-180	-50	-180	mA
I <sub>CCH</sub>	Quiescent supply current	V <sub>CC</sub> = 5.5V; Outputs High, V <sub>I</sub> = GND or V <sub>CC</sub>		120	250		250	µA
I <sub>CCL</sub>		V <sub>CC</sub> = 5.5V; Outputs Low, V <sub>I</sub> = GND or V <sub>CC</sub>		39	60		60	mA
I <sub>CCZ</sub>		V <sub>CC</sub> = 5.5V; Outputs 3-State; V <sub>I</sub> = GND or V <sub>CC</sub>		120	250		250	µA
ΔI <sub>CC</sub>	Additional supply current per input pin <sup>2</sup>	V <sub>CC</sub> = 5.5V; one input at 3.4V, other inputs at V <sub>CC</sub> or GND		0.5	1.5		1.5	mA

**NOTES:**

1. Not more than one output should be tested at a time, and the duration of the test should not exceed one second.
2. This is the increase in supply current for each input at 3.4V.
3. For valid test results, data must not be loaded into the flip-flops (or latches) after applying the power.
4. This parameter is valid for any V<sub>CC</sub> between 0V and 2.1V with a transition time of up to 10msec. From V<sub>CC</sub> = 2.1V to V<sub>CC</sub> = 5V ± 10% a transition time of up to 100µsec is permitted.

## AC CHARACTERISTICS

GND = 0V; t<sub>R</sub> = t<sub>F</sub> = 2.5ns; C<sub>L</sub> = 50pF, R<sub>L</sub> = 500Ω

SYMBOL	PARAMETER	WAVEFORM	LIMITS					UNIT
			T <sub>amb</sub> = +25°C V <sub>CC</sub> = +5.0V			T <sub>amb</sub> = -40°C to +85°C V <sub>CC</sub> = +5.0V ±0.5V		
			MIN	TYP	MAX	MIN	MAX	
f <sub>MAX</sub>	Maximum clock frequency	1	200	250		200		MHz
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay nCPBA to nAx, nCPAB to nBx	1	2.1 2.6	3.7 4.1	4.9 5.3	2.1 2.6	5.4 5.8	ns
t <sub>PZH</sub> t <sub>PZL</sub>	Output enable time nOEBA to nAx, nOEAB to nBx	3 4	1.2 2.0	2.9 3.7	4.1 5.0	1.2 2.0	4.8 5.8	ns
t <sub>PHZ</sub> t <sub>PLZ</sub>	Output disable time nOEBA to nAx, nOEAB to nBx	3 4	1.0 1.5	3.5 3.0	4.7 4.1	1.0 1.5	5.2 4.6	ns

# Dual octal registered transceiver (3-State)

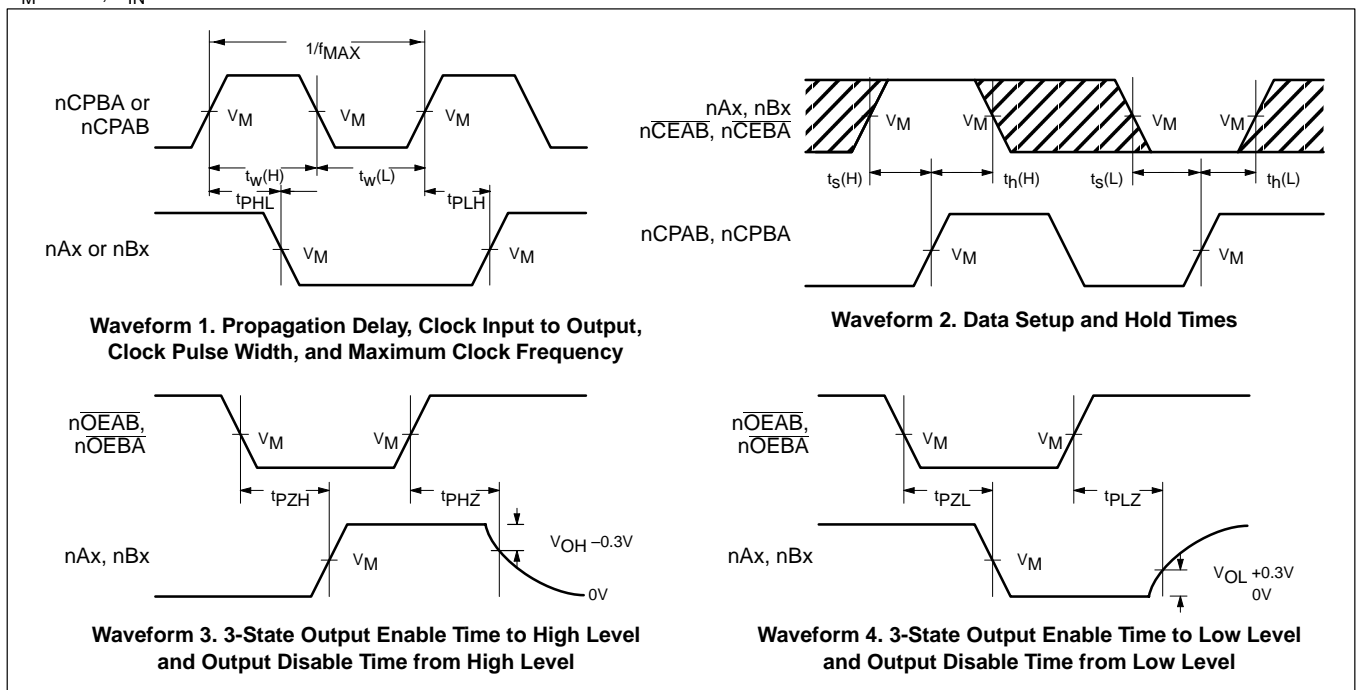
MB2052

## AC SETUP REQUIREMENTS

SYMBOL	PARAMETER	WAVEFORM	LIMITS			UNIT
			$T_{amb} = +25^{\circ}C$ $V_{CC} = +5.0V$		$T_{amb} = -40^{\circ}C$ to $+85^{\circ}C$ $V_{CC} = +5.0V \pm 0.5V$	
			MIN	TYP	MIN	
$t_s(H)$ $t_s(L)$	Setup time nAx to nCPAB or nBx to nCPBA	2	2.5 01.5	0.8 0.0	2.5 1.5	ns
$t_h(H)$ $t_h(L)$	Hold time nAx to nCPAB or nBx to nCPBA	2	1.5 0.5	0.0 -0.8	1.5 0.5	ns
$t_s(H)$ $t_s(L)$	Setup time nCEAB to nCPAB, nCEBA to nCPBA	2	3.0 2.0	1.4 0.7	3.0 2.0	ns
$t_h(H)$ $t_h(L)$	Hold time nCEAB to nCPAB, nCEBA to nCPBA	2	0.5 0.0	-0.7 -1.3	0.5 0.0	ns
$t_w(H)$ $t_w(L)$	nCPAB or nCPBA pulse width, High or Low	1	2.5 3.5	1.4 2.1	2.5 3.5	ns

## AC WAVEFORMS

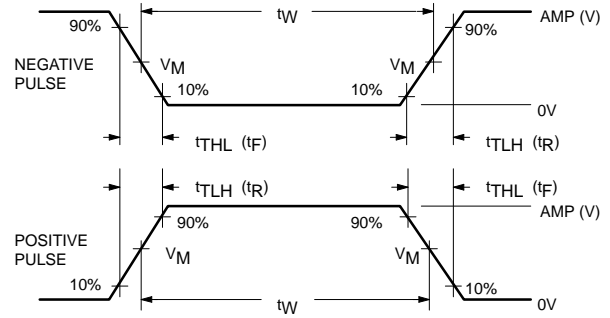
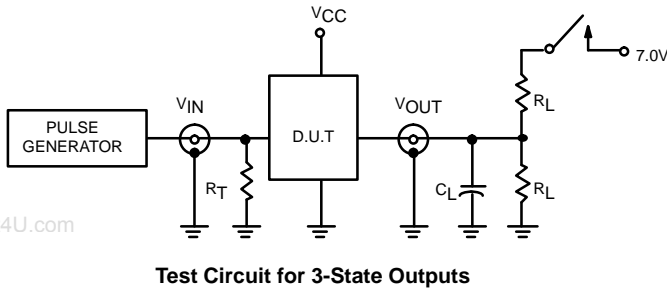
$V_M = 1.5V$ ,  $V_{IN} = GND$  to  $3.0V$



# Dual octal registered transceiver (3-State)

MB2052

## TEST CIRCUIT AND WAVEFORMS



VM = 1.5V  
Input Pulse Definition

### SWITCH POSITION

TEST	SWITCH
tPLZ	closed
tPZL	closed
All other	open

### DEFINITIONS

RL = Load resistor; see AC CHARACTERISTICS for value.

CL = Load capacitance includes jig and probe capacitance; see AC CHARACTERISTICS for value.

RT = Termination resistance should be equal to ZOUT of pulse generators.

FAMILY	INPUT PULSE REQUIREMENTS				
	Amplitude	Rep. Rate	tw	tr	tf
MB	3.0V	1MHz	500ns	2.5ns	2.5ns