

# M5L8216P / M5L8226P

T-52-09

MITSUBISHI (MICMPTR/MIPRC)

4-BIT PARALLEL BIDIRECTIONAL BUS DRIVERS

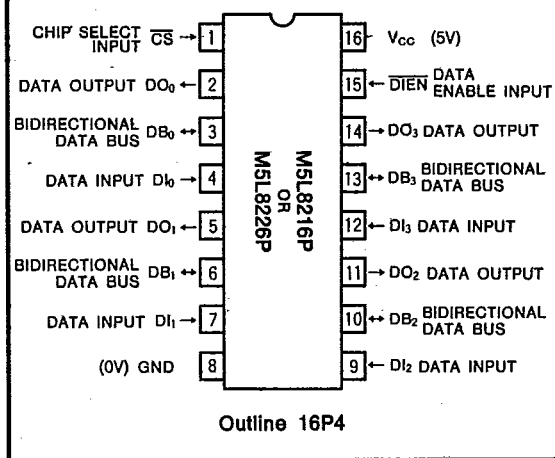
## DESCRIPTION

The M5L8216P and M5L8226P are 4-bit bidirectional bus drivers and suitable for the 8-bit parallel CPU M5L8085AP.

## FEATURES

- Parallel 8-bit data bus buffer driver
- Low input current  $\overline{DIEN}$ ,  $\overline{CS}$ :  
 $I_{iL} = -500\mu A(\text{max.})$   
 $I_{iL} = -250\mu A(\text{max.})$
- High output current M5L8216P  
 DB:  $I_{oL} = 55\text{mA}(\text{max.})$   
 $I_{oH} = -10\text{mA}(\text{max.})$   
 DO:  $I_{oH} = -1\text{mA}(\text{max.})$   
 M5L8226P  
 DB:  $I_{oL} = 50\text{mA}(\text{max.})$   
 $I_{oH} = -10\text{mA}(\text{max.})$   
 DO:  $I_{oH} = -1\text{mA}(\text{max.})$
- Outputs can be connected with the CPU M5L8085AP:  $V_{oH} = 3.65\text{V}(\text{min.})$
- Three-state output

## PIN CONFIGURATION (TOP VIEW)



## APPLICATION

Bidirectional bus driver/receiver for various types of micro-computer systems.

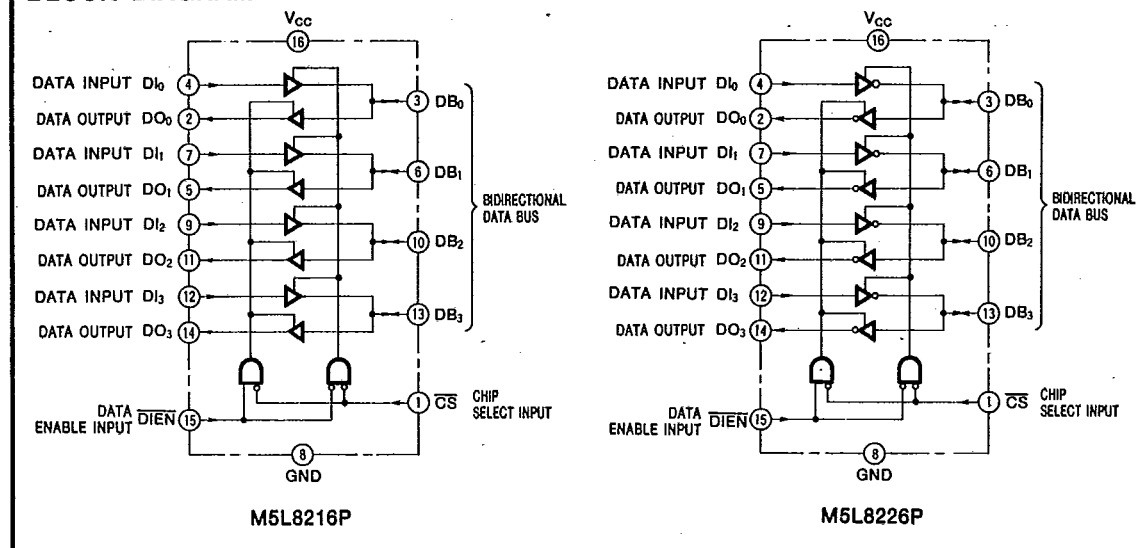
## FUNCTION

The M5L8216P is a non-inverting and the M5L8226P is an inverting 4-bit bidirectional bus driver.

When the terminal  $\overline{CS}$  is high-level, all outputs are in high-impedance state, and when low-level, the direction of the bidirectional bus can be controlled by the terminal  $\overline{DIEN}$ .

The terminal  $\overline{DIEN}$  controls the data flow. The data flow control is performed by placing one of a pair of buffers in high-impedance state and allowing the other to transfer the data.

## BLOCK DIAGRAM



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ABSOLUTE MAXIMUM RATINGS ( $T_a=0\sim 75^\circ\text{C}$ , unless otherwise noted)

Symbol	Parameter	Conditions	Rating	Unit
$V_{CC}$	Supply voltage		7	V
$V_i$	Input voltage, CS, DIEN, DI inputs	With respect to GND	5.5	V
$V_i$	Input voltage, DB input		$V_{CC}$	V
$V_o$	High-level output voltage		$V_{CC}$	V
$P_d$	Power dissipation	$T_a=25^\circ\text{C}$	700	mW
$T_{opr}$	Operating free-air temperature range		0~75	$^\circ\text{C}$
$T_{stg}$	Storage temperature range		-65~+150	$^\circ\text{C}$

RECOMMENDED OPERATING CONDITIONS ( $T_a=0\sim 75^\circ\text{C}$ , unless otherwise noted)

Symbol	Parameter	Limits			Unit
		Min	Nom	Max	
$V_{CC}$	Supply voltage	4.75	5	5.25	V
$I_{OH}$	High-level output current, DO output			-1	mA
$I_{OH}$	High-level output current, DB output			-10	mA
$I_{OL}$	Low-level output current, DO output			15	mA
$I_{OL}$	Low-level output current, DB output			25	mA

ELECTRICAL CHARACTERISTICS ( $T_a=0\sim 75^\circ\text{C}$ , unless otherwise noted)

Symbol	Parameter	Conditions	Limits			Unit
			Min	Typ	Max	
$V_{IH}$	High-level input voltage		2			V
$V_{IL}$	Low-level input voltage				0.95	V
$V_{IC}$	Input clamp voltage	$V_{CC}=4.75\text{V}$ , $I_{IC}=-5\text{mA}$			-1	V
$V_{OH}$	High-level output voltage, DO output	$V_{CC}=4.75\text{V}$ $V_{IH}=2\text{V}$ $V_{IL}=0.95\text{V}$	$I_{OH}=-1\text{mA}$	3.65		V
$V_{OH}$	High-level output voltage, DB output		$I_{OH}=-10\text{mA}$	2.4		V
$V_{OL1}$	Low-level output voltage, DO output		$I_{OL}=15\text{mA}$		0.45	V
$V_{OL1}$	Low-level output voltage, DB output		$I_{OL}=25\text{mA}$		0.45	V
$V_{OL2}$	Low-level output voltage, DB output	M5L8216P	$I_{OL}=55\text{mA}$		0.6	V
		M5L8226P	$I_{OL}=50\text{mA}$		0.6	
$I_{OZH}$	Off-state output current, DO output	$V_{CC}=5.25\text{V}$	$V_O=5.25\text{V}$		20	$\mu\text{A}$
$I_{OZH}$	Off-state output current, DB output				100	$\mu\text{A}$
$I_{OZL}$	Off-state output current, DO output		$V_O=0.45\text{V}$		-20	$\mu\text{A}$
$I_{OZL}$	Off-state output current, DB output				-100	$\mu\text{A}$
$I_{IH}$	High-level input current, DIEN, CS inputs	$V_{CC}=5.25\text{V}$ , $V_{IH}=4.5\text{V}$			20	$\mu\text{A}$
$I_{IH}$	High-level input current, DI, DB inputs				10	$\mu\text{A}$
$I_{IL}$	Low-level input current, DIEN, CS inputs	$V_{CC}=5.25\text{V}$ , $V_{IH}=4.5\text{V}$			-500	$\mu\text{A}$
$I_{IL}$	Low-level input current, DI, DB input				-250	$\mu\text{A}$
$I_{OS}$	Short-circuit output DO output (Note 2)	$V_{CC}=5.25\text{V}$ , $V_O=0\text{V}$	-15		-65	mA
$I_{OS}$	Short-circuit output, DB output (Note 2)		-30		-120	mA
$I_{CC}$	Supply current	M5L8216P			100	mA
		M5L8226P			100	
$I_{CCZ}$	Supply current z	M5L8216P	$V_{CC}=5.25\text{V}$		120	mA
		M5L8226P			100	

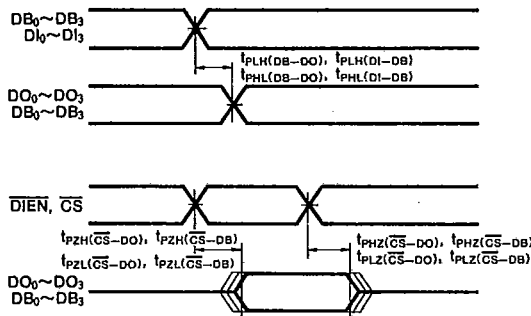
Note 1 : Current flowing into an IC is positive, out is negative.

2 : All measurements should be done quickly, and not more than one output should be shorted at a time.

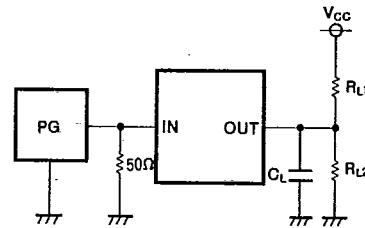
**SWITCHING CHARACTERISTICS** ( $V_{CC}=5V \pm 5\%$ ,  $T_a=25^\circ C$ , unless otherwise noted)

Symbol	Parameter	Test conditions (Note 3)	Limits			Unit
			Min	Typ	Max	
$t_{PHL}(DB-DO)$ $t_{PLH}(DB-DO)$	High-to-low and low-to-high output propagation time, from input DB to output DO	$C_L=30pF, R_{L1}=300\Omega, R_{L2}=600\Omega$			25	ns
$t_{PHL}(DI-DB)$ $t_{PLH}(DI-DB)$	High-to-low and low-to-high output propagation time, from input DI to output DB	$C_L=300pF, R_{L1}=90\Omega, R_{L2}=180\Omega$			30	ns
$t_{PHZ}(\overline{CS}-DO)$ $t_{PLZ}(\overline{CS}-DO)$	High-to-Z and low-to-Z output propagation time, from inputs $\overline{DIEN}, \overline{CS}$ , to output DO	$C_L=5pF, R_{L1}=10k\Omega, R_{L2}=1k\Omega$ $C_L=5pF, R_{L1}=300\Omega, R_{L2}=600\Omega$			35	ns
$t_{PZH}(\overline{CS}-DO)$ $t_{PZL}(\overline{CS}-DO)$	Output enable time, from inputs $\overline{DIEN}, \overline{CS}$ to output DO	$C_L=30pF, R_{L1}=10k\Omega, R_{L2}=1k\Omega$			65	ns
$t_{PHZ}(\overline{CS}-DB)$ $t_{PLZ}(\overline{CS}-DB)$	Output disable time, from inputs $\overline{DIEN}, \overline{CS}$ , to output DB	$C_L=5pF, R_{L1}=10k\Omega, R_{L2}=1k\Omega$ $C_L=5pF, R_{L1}=90\Omega, R_{L2}=180\Omega$			35	ns
$t_{PZH}(\overline{CS}-DB)$ $t_{PZL}(\overline{CS}-DB)$	Output enable time, from inputs $\overline{DIEN}, \overline{CS}$ , to output DB	$C_L=300pF, R_{L1}=10k\Omega, R_{L2}=1k\Omega$ $C_L=300pF, R_{L1}=90\Omega, R_{L2}=180\Omega$			65	ns

**TIMING DIAGRAM** (Reference level=1.5V)



Note 3 : Test circuit



**APPLICATION EXAMPLES**

Fig. 1 shows a pair of M5L8216Ps or M5L8226Ps which are directly connected with the 8080A CPU data bus, and their control signal. Fig. 2 shows an example circuit in which the M5L8216P or M5L8226P is used as an interface for memory and I/O to a bidirectional bus.

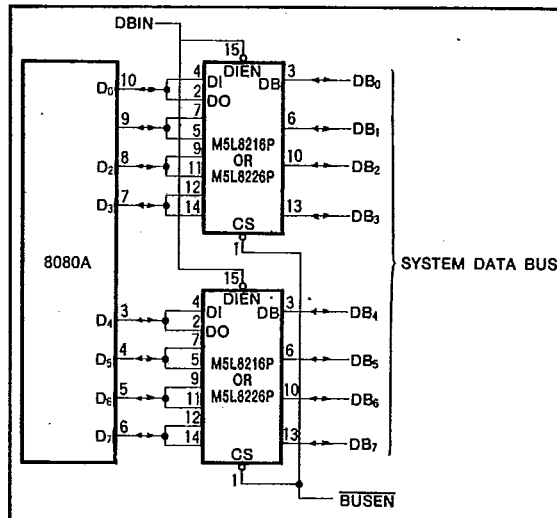


Fig. 1 Data bus buffer

**M5L8216P / M5L8226P**

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**4-BIT PARALLEL BIDIRECTIONAL BUS DRIVERS**

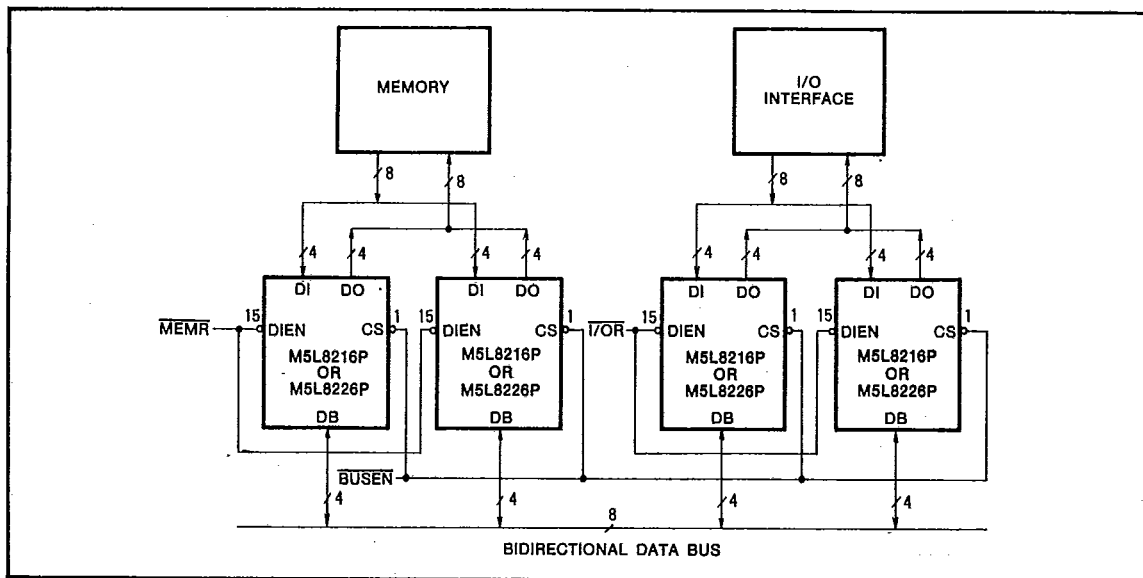


Fig. 2 Memory and I/O Interface to bidirectional data bus

**PRECAUTIONS FOR USE**

When the M5L8216P data input or two-way data bus is set to high to disable-output from the two-way bus or data output, care is required as a low glitch of approximate width 10ns will be generated.