

Four-Bit Parallel Bidirectional Bus Driver

- Data bus buffer driver for 8080 type CPU's
- Low input load current — 0.25mA maximum
- High output drive capability for driving system data bus — 50mA at 0.5V
- Am8216 has non-inverting outputs
- Output high voltage compatible with direct interface to MOS

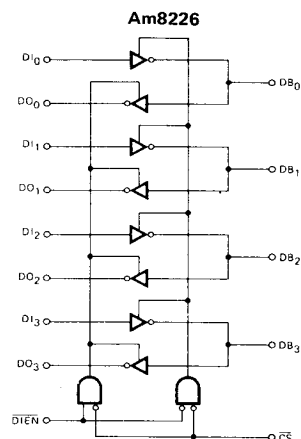
- Three-state outputs
- Advanced Schottky processing
- Available in military and commercial temperature range
- Am8226 has inverting outputs

The Am8216 and Am8226 are four-bit, bi-directional bus drivers for use in bus oriented applications. The non-inverting Am8216, and inverting Am8226 drivers are provided for flexibility in system design.

tional bus. The DO outputs on this side of the driver have a special high voltage output drive capability so that direct interface to the 8080 type CPUs is achieved with an adequate amount of noise immunity.

The $\overline{\text{DIEN}}$ input controls the direction of data flow which is accomplished by forcing one of the pair of buffers into its high impedance state and allowing the other to transmit its data. A simple two gate circuit is used for this function.

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Package Type	Temperature Range	Am8216 Order Number	Am8226 Order Number
Hermetic DIP	-55°C to +125°C	MD8216	MD8226
Hermetic DIP	0°C to +70°C	D8216	D8226
Molded DIP	0°C to +70°C	P8216	P8226
Dice	0°C to +70°C	AM8216XC	AM8226XC

1 is marked orientation.

Am8216
Am8226

16 V_{CC}

15 DIER DATA IN ENABLE (DIRECTION CONTROL)

14 DO₃ DATA OUTPUT

13 DB₃ DATA BUS BI DIRECTIONAL

12 DI₃ DATA INPUT

11 DO₂ DATA OUTPUT

10 DB₂ DATA BUS BI DIRECTIONAL

9 DI₂ DATA INPUT

8 GND

7 DI₁ DATA INPUT

6 DB₁ DATA BUS BI DIRECTIONAL

5 DO₁ DATA OUTPUT

4 DI₀ DATA INPUT

3 DB₀ DATA BUS BI DIRECTIONAL

2 DO₀ DATA OUTPUT

1 CS CHIP SELECT

LIC:

Note: Pin 1 is marked
for orientation.

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MAXIMUM RATINGS (Above which the useful life may be impaired)

Temperature (Ambient) Under Bias	-55°C to +125°C
Storage Temperature	-65°C to +150°C
All Output and Supply Voltages	-0.5V to +7.0V
All Input Voltages	-1.0V to +5.5V
Output Currents	125mA

Am8216 AND Am8226 MILITARY**ELECTRICAL CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE** (-55°C to +125°C)

The following conditions apply unless otherwise specified:

MD8216, MD8226 (MIL) $T_A = -55^\circ\text{C to } +125^\circ\text{C}$ $V_{CC} = 5.0\text{V} \pm 10\%$ **DC CHARACTERISTICS**

Parameters	Description	Test Conditions	Min.	Typ. (Note 1)	Max.	Units
I_{F1}	Input Load Current DIEN, CS	$V_F = 0.45$		-0.15	-0.5	mA
I_{F2}	Input Load Current All Other Inputs	$V_F = 0.45$		-0.08	-0.25	mA
I_{R1}	Input Leakage Current DIEN, CS	$V_R = 5.5\text{V}$			80	μA
I_{R2}	Input Leakage Current DI Inputs	$V_R = 5.5\text{V}$			40	μA
V_C	Input Forward Voltage Clamp	$I_C = -5.0\text{mA}$			-1.2	Volts
V_{IL}	Input LOW Voltage	Am8216			0.95	Volts
		Am8226			0.9	
V_{IH}	Input HIGH Voltage		2.0			Volts
I_O	Output Leakage Current (Three-State)	DO	$V_O = 0.45\text{V}/5.5\text{V}$		20	μA
		DB			100	
I_{CC}	Power Supply Current	Am8216		95	130	mA
		Am8226		85	120	
V_{OL1}	Output LOW Voltage	DO Outputs $I_{OL} = 15\text{mA}$ DB Outputs $I_{OL} = 25\text{mA}$		0.3	0.45	Volts
V_{OL2}	Output LOW Voltage	DB Outputs $I_{OL} = 45\text{mA}$		0.5	0.6	Volts
V_{OH1}	Output HIGH Voltage	DO Outputs	$I_{OH} = -0.5\text{mA}$	3.4	4.0	Volts
			$I_{OH} = -2.0\text{mA}$	2.4		
V_{OH2}	Output HIGH Voltage	DB Outputs $I_{OH} = -5.0\text{mA}$	2.4	3.0		Volts
I_{OS}	Output Short Circuit Current	DO Outputs $\approx 0\text{V}$, $V_{CC} = 5.0\text{V}$	-15	-35	-65	mA
		DB Outputs $\approx 0\text{V}$, $V_{CC} = 5.0\text{V}$	-30	-75	-120	

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AC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (-55°C to +125°C)

Parameters	Description	Test Conditions	Min.	Typ. (Note 1)	Max.	Units
t_{PD1}	Input to Output Delay DO Outputs	$C_L = 30\text{pF}$, $R_1 = 300\Omega$, $R_2 = 600\Omega$		15	25	ns
t_{PD2}	Input to Output Delay DB Outputs	Am8216		20	33	ns
		Am8226		16	25	
t_E	Output Enable Time	Am8216	Note 2	45	75	ns
		Am8226	Note 3	35	62	
t_D	Output Disable Time	Am8216	Note 4	20	40	ns
		Am8226		16	38	

Am8216 • Am8226

Am8216 AND Am8226 COMMERCIAL

ELECTRICAL CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (0°C to +70°C)

The following conditions apply unless otherwise specified:

D8216, D8226, P8216, P8226 (COM'L) T_A = 0°C to +70°C V_{CC} = 5.0V ± 5%

DC CHARACTERISTICS

Parameters	Description		Test Conditions	Min.	Typ. (Note 1)	Max.	Units
I _{F1}	Input Load Current DIEN, CS		V _F = 0.45		-0.15	-0.5	mA
I _{F2}	Input Load Current All Other Inputs		V _F = 0.45		-0.08	-0.25	mA
I _{R1}	Input Leakage Current DIEN, CS		V _R = 5.25V			20	μA
I _{R2}	Input Leakage Current DI Inputs		V _R = 5.25V			10	μA
V _C	Input Forward Voltage Clamp		I _C = -5.0mA			-1.0	Volts
V _{IL}	Input LOW Voltage					0.95	Volts
V _{IH}	Input HIGH Voltage			2.0			Volts
I _{IOI}	Output Leakage Current (Three-State)	DO	V _O = 0.45V/5.5V			20	μA
		DB				100	
I _{CC}	Power Supply Current	Am8216			95	130	mA
		Am8226			85	120	
V _{OL1}	Output LOW Voltage		DB Outputs I _{OL} = 15mA DB Outputs I _{OL} = 25mA		0.3	0.45	Volts
V _{OL2}	Output LOW Voltage	Am8216	DB Outputs I _{OL} = 55mA		0.5	0.6	Volts
		Am8226	DB Outputs I _{OL} = 50mA		0.5	0.6	
V _{OH1}	Output HIGH Voltage		DO Outputs I _{OH} = -1.0mA COM'L	3.65	4.0		Volts
V _{OH2}	Output HIGH Voltage		DB Outputs I _{OH} = -10mA	2.4	3.0		Volts
I _{OS}	Output Short Circuit Current		DO Outputs ≅ 0V	-15	-35	-65	mA
			DB Outputs V _{CC} = 5.0V	-30	-75	-120	

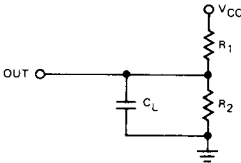
AC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (0°C to +70°C)

Parameters	Description		Test Conditions	Min.	Typ. (Note 1)	Max.	Units
t _{PD1}	Input to Output Delay DO Outputs		C _L = 30pF, R ₁ = 300Ω, R ₂ = 600Ω		15	25	ns
t _{PD2}	Input to Output Delay DB Outputs	Am8216	C _L = 300pF, R ₁ = 90Ω, R ₂ = 180Ω		20	30	ns
		Am8226			16	25	
t _E	Output Enable Time	Am8216	Note 2		45	65	ns
		Am8226	Note 3		35	54	
t _D	Output Disable Time		Note 4		20	35	ns

TEST CONDITIONS

Input pulse amplitude of 2.5V.
Input rise and fall times of 5.0ns between 1.0 and 2.0 volts.
Output loading is 5.0mA and 10pF.
Speed measurements are made at 1.5V levels.

TEST LOAD CIRCUIT



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CAPACITANCE (Note 5)

Parameters	Description	Test Conditions	Min.	Typ. (Note 1)	Max.	Units
C_{IN}	Input Capacitance	$V_{BIAS} = 2.5V$, $V_{CC} = 5.0V$ $T_A = 25^\circ C$, $f = 1.0MHz$		4.0	8.0	pF
C_{OUT1}	Output Capacitance			6.0	10	pF
C_{OUT2}	Output Capacitance			13	18	pF

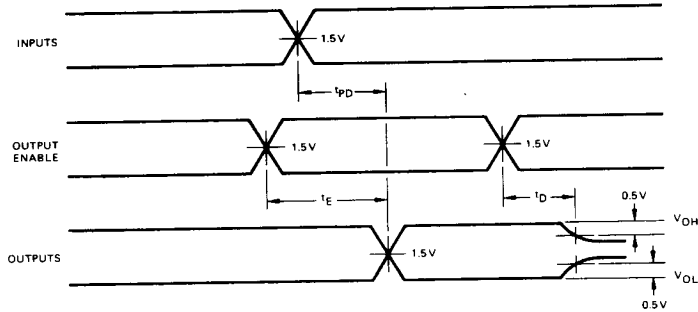
Notes: 1. Typical values are for $T_A = 25^\circ C$, $V_{CC} = 5.0V$.

2. DO outputs, $C_L = 30pF$, $R_1 = 300/10k\Omega$, $R_2 = 180/1.0k\Omega$; DB outputs, $C_L = 300pF$, $R_1 = 90/10k\Omega$, $R_2 = 180/1.0k\Omega$.

3. DO outputs, $C_L = 30pF$, $R_1 = 300/10k\Omega$, $R_2 = 600/1.0k\Omega$; DB outputs, $C_L = 300pF$, $R_1 = 90/10k\Omega$, $R_2 = 180/1.0k\Omega$.

4. DO outputs, $C_L = 5.0pF$, $R_1 = 300/10k\Omega$, $R_2 = 600/1.0k\Omega$; DB outputs, $C_L = 5.0pF$, $R_1 = 90/10k\Omega$, $R_2 = 180/1.0k\Omega$.

5. This parameter is periodically sampled and not 100% tested.

SWITCHING WAVEFORMS

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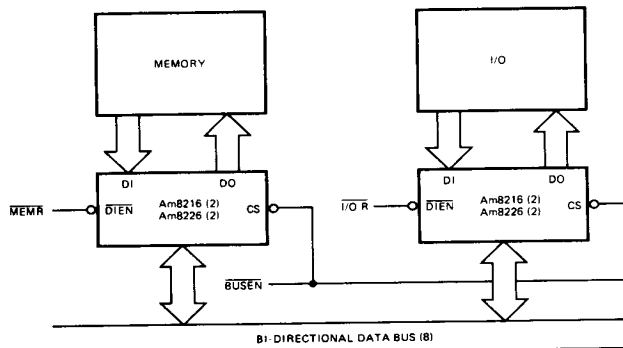
FUNCTION TABLE

$\overline{DIEN}$	$\overline{CS}$		8216		8226	
			DB	DO	DB	DO
L	L	$DI \Rightarrow DB$	DI	Z	$\overline{DI}$	Z
H	L	$DB \Rightarrow DO$	Z	DB	Z	$\overline{DB}$
L	H		Z	Z	Z	Z
H	H		Z	Z	Z	Z

H = HIGH

L = LOW

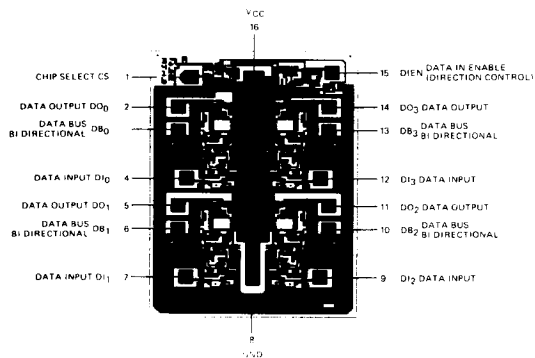
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TYPICAL APPLICATION**MEMORY AND I/O INTERFACE TO A BI-DIRECTIONAL BUS**

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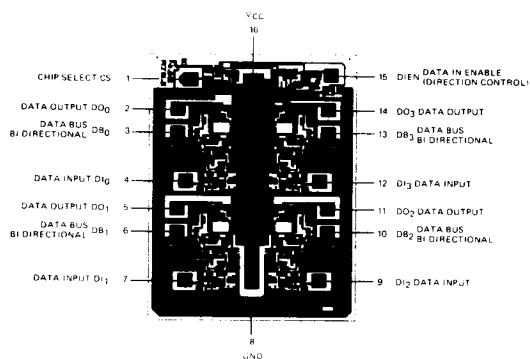
Metallization and Pad Layout

Am8216



DIE SIZE 0.066" X 0.090"

Am8226



DIE SIZE 0.066" X 0.090"