

## TTL-TO-MOS LEVEL SHIFTER AND HIGH VOLTAGE CLOCK DRIVER

- Four Low Voltage Drivers
- One High Voltage Driver
- TTL and DTL Compatible Inputs
- Outputs Compatible with 2105 and 2107 MOS Memories
- Operates from Standard TTL and MOS Power Supplies
- Maximum MOS Device Protection -- Output Clamp Diodes

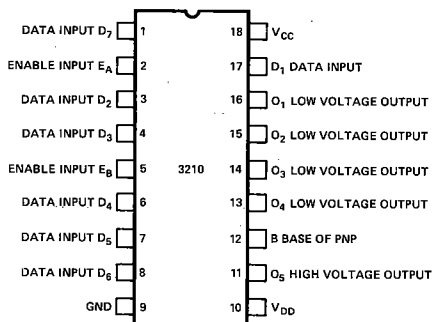
The Intel 3210 is a Bipolar-to-MOS level shifter and high voltage driver which accepts TTL and DTL inputs. It contains four (4) low voltage drivers and one high voltage driver, each with current driving capabilities suitable for driving N-channel MOS memory devices. The 3210 is particularly suitable for driving the 2105 and 2107 N-channel MOS memory chips. The 3210 operates from the 5 volt and 12 volt power supplies used to bias the memory devices.

The four low voltage drivers feature two common enable inputs per pair of drivers which permits address or data decoding. The high voltage driver swings the 12 volts required to drive the chip enable (clock) input for the 2105 and 2107. In addition, the high voltage driver includes AND gate logic which can be used to implement refresh abort for the 2105 MOS memory.

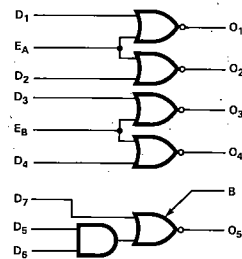
The 3210 high voltage driver requires an externally connected PNP transistor. The PNP base is connected to pin 12, the collector to pin 11, and the emitter to pin 10 or  $V_{DD}$ . The use of a fast switching, high voltage, high current gain PNP, like the 2N5057 or 2N3546 is recommended.

MEMORY PERIPHERALS

### PIN CONFIGURATION



### LOGIC SYMBOL



## Absolute Maximum Ratings\*

Temperature Under Bias	0°C to 75°C
Storage Temperature	-65°C to +150°C
Supply Voltage, V <sub>CC</sub>	-0.5 to +7V
Supply Voltage, V <sub>DD</sub>	-0.5 to +13V

All Input Voltages	-1.0 to +13V
Outputs for Low Voltage Drivers	-1.0 to +7V
Outputs for Clock Driver	-1.0 to +13V
Power Dissipation at 25°C	2W

\*COMMENT: Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

## D.C. Characteristics TA = 0°C to 75°C, V<sub>CC</sub> = 5.0V ± 5%, V<sub>DD</sub> = 12V ± 5%

Symbol	Parameter	Min.	Max.	Unit	Test Conditions
I <sub>FD</sub>	Data Input Load Current		-0.25	mA	V <sub>F</sub> = 0.45V
I <sub>FE</sub>	Enable Input Load Current		-0.50	mA	V <sub>F</sub> = 0.45V
I <sub>RD</sub>	Data Input Leakage Current		10	μA	V <sub>R</sub> = 12.6V
I <sub>RE</sub>	Enable Input Leakage Current		20	μA	V <sub>R</sub> = 12.6V
V <sub>OL</sub>	Output Low Voltage for all Drivers		0.45	V	I <sub>OL</sub> = 3mA, V <sub>IH</sub> = 2V
		-1.0		V	I <sub>OL</sub> = -5mA
V <sub>OH1</sub>	Output High Voltage for Low Voltage Drivers	V <sub>CC</sub> - 0.65		V	I <sub>OH</sub> = -1mA, V <sub>IL</sub> = 0.8V
			V <sub>CC</sub> + 1.0	V	I <sub>OH</sub> = 5mA
V <sub>OH2</sub>	Output High Voltage for High Voltage Driver	V <sub>DD</sub> - 0.75		V	I <sub>OH</sub> = -1mA, V <sub>IL</sub> = 0.8V
			V <sub>DD</sub> + 1.0	V	I <sub>OH</sub> = 5mA
V <sub>IL</sub>	Input Low Voltage, All Inputs		0.8	V	
V <sub>IH</sub>	Input High Voltage, All Inputs	2		V	
I <sub>B</sub>	Base Drive to External PNP (Pin 12)	7	16	mA	V <sub>IL</sub> = 0.8V, V <sub>B</sub> = V <sub>DD</sub> - 0.8V

## POWER SUPPLY CURRENT DRAIN AND POWER DISSIPATION

All driver outputs are in the state indicated

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions -- Input states to ensure the following output states:		Additional Test Conditions
					All Low Voltage Outputs	High Voltage Output	
I <sub>CC1</sub>	Current from V <sub>CC</sub>	27	32	mA	Low	Low	V <sub>CC</sub> = 5.25V, V <sub>DD</sub> = 12.6V
I <sub>DD1</sub>	Current from V <sub>DD</sub>	12.5	16	mA			
P <sub>D1</sub>	Power Dissipation	300	370	mW			
I <sub>CC2</sub>	Current from V <sub>CC</sub>	22	27	mA	Low	High	
I <sub>DD2</sub>	Current from V <sub>DD</sub>	28	34	mA			
P <sub>D2</sub>	Power Dissipation	470	570	mW			
I <sub>CC3</sub>	Current from V <sub>CC</sub>	9	12	mA	High	Low	
I <sub>DD3</sub>	Current from V <sub>DD</sub>	9	11.5	mA			
P <sub>D3</sub>	Power Dissipation	160	210	mW			
I <sub>CC4</sub>	Current from V <sub>CC</sub>	4.5	6	mA	High	High	
I <sub>DD4</sub>	Current from V <sub>DD</sub>	24	30	mA			
P <sub>D4</sub>	Power Dissipation	325	410	mW			

## A.C. Characteristics $T_A = 0^\circ\text{C}$ to $75^\circ\text{C}$ , $V_{CC} = 5.0\text{V} \pm 5\%$ , $V_{DD} = 12\text{V} \pm 5\%$

Symbol	Parameter	Min.	Typ.[1]	Max.	Units	Test Conditions
$t_{LDR}$	Delay Plus Rise Time for Low Voltage Drivers		17	25	ns	$C_L = 200\text{pF}$
$t_{LDF}$	Delay Plus Fall Time for Low Voltage Drivers		16	25	ns	$C_L = 200\text{pF}$
$t_{H\rightarrow+}$	Input to Output Delay for High Voltage Driver	9	15		ns	$C_L = 175\text{pF}$
$t_{HDR}$	Delay Plus Rise Time for High Voltage Driver		27	40	ns	$C_L = 350\text{pF}$
$t_{H\rightarrow-}$	Input to Output Delay for High Voltage Driver	4	8		ns	$C_L = 175\text{pF}$
$t_{HDF}$	Delay Plus Fall Time for High Voltage Driver		18	30	ns	$C_L = 350\text{pF}$
$t_{DB}$	Delay to Base Drive to External PNP (Pin 12)	4	8	17	ns	

Note 1: Typical values measured at  $T_A = 25^\circ\text{C}$ .

## Capacitance\* $T_A = 25^\circ\text{C}$

Symbol	Test	Typ.	Max.
$C_{IN}$	Input Capacitance, except D <sub>7</sub>	5pF	10pF
$C_{IN}$	Input Capacitance, D <sub>7</sub>	8pF	15pF

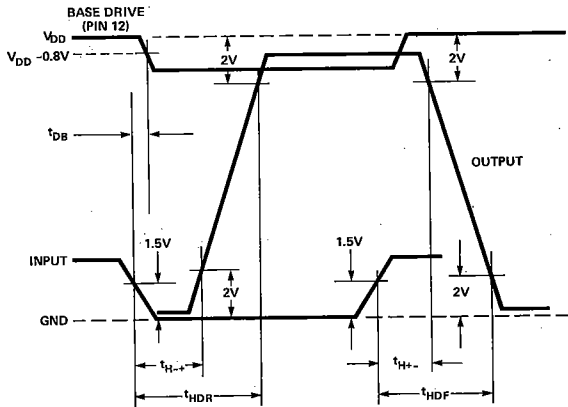
\*This parameter is periodically sampled and is not 100% tested. Condition of measurement is  $f = 1\text{MHz}$ ,  $V_{bias} = 2\text{V}$ ,  $V_{CC} = 0\text{V}$ , and  $T_A = 25^\circ\text{C}$ .

## A.C. CONDITIONS OF TEST

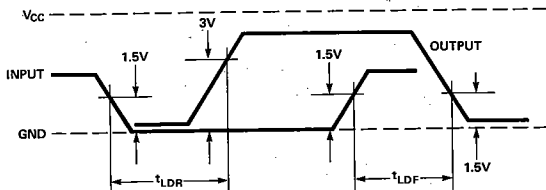
Input Pulse Amplitudes: 3.0V  
 Input Pulse Rise and Fall Times: 5 ns between 1 volt and 2 volts  
 Measurement Points: See Waveforms

## Waveforms

HIGH VOLTAGE DRIVER

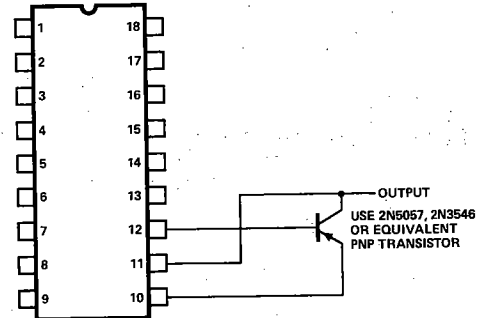


LOW VOLTAGE DRIVER



## Application

HIGH VOLTAGE OUTPUT CONNECTIONS

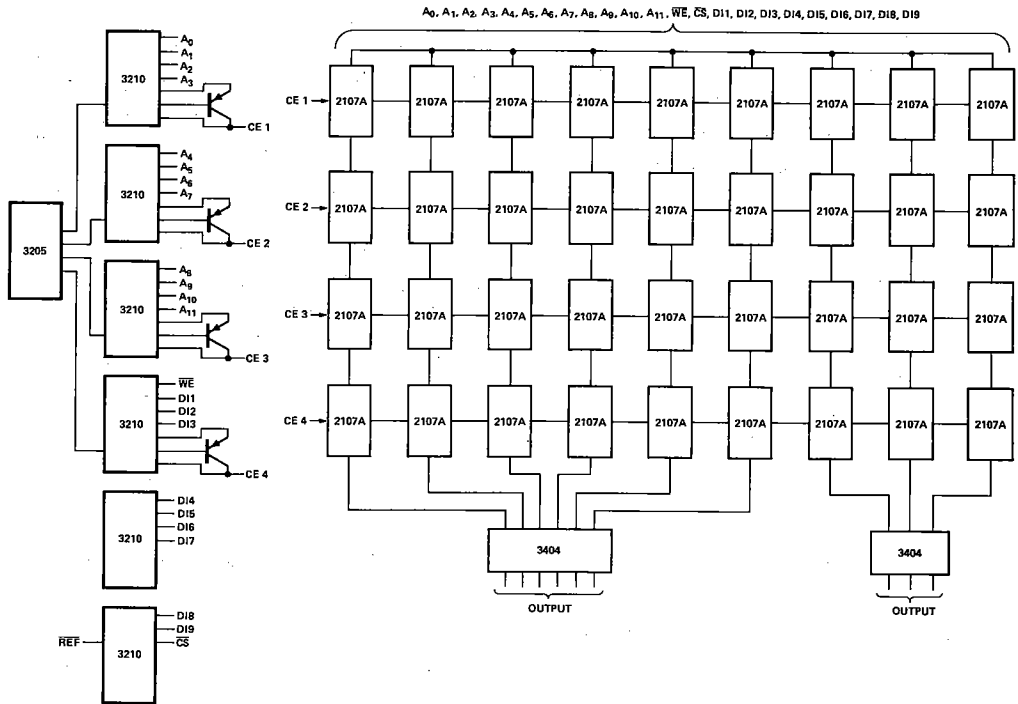


MEMORY PERIPHERALS

# SCHOTTKY BIPOLAR 3210

## TYPICAL SYSTEMS

Below is an example of a 16K x 9 bit memory circuit employing the 3210 driver. Device decoding is done with the CE input. All devices are unselected during refresh with CS input. The 2107A, 3205 and 3404 are standard Intel products.



## TYPICAL CHARACTERISTICS

