

March 1997

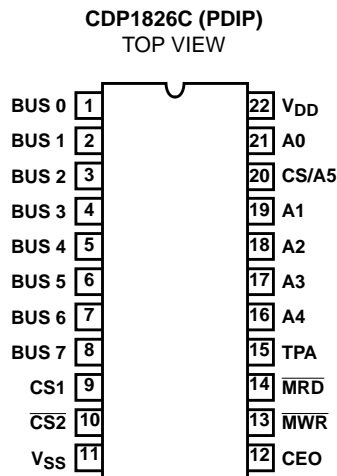
### Features

- Ideal for Small, Low-Power RAM Memory Requirements in Microprocessor and Microcomputer Applications
- Interfaces with CDP1800-Series Microprocessors Without Additional Address Decoding
- Daisy Chain Feature to Further Reduce External Decoding Needs
- Multiple Chip-Select Inputs for Versatility
- Single Voltage Supply
- No Clock or Precharge Required.

### Ordering Information

PACKAGE	TEMP. RANGE	PART NUMBER	PKG. NO.
PDIP	-40°C to +85°C	CDP1826CE	E22.4

### Pinout



### Description

The CDP1826C is a general purpose, fully static, 64-word x 8-bit random-access memory, for use in CDP1800-series or other microprocessor systems where minimum component count and/or price performance and simplicity in use are desirable.

The CDP1826C has 8 common data input and data-output terminals with three-state capability for direct connection to a standard bidirectional data bus. Two chip-select inputs - CS1 and CS2 - are provided to simplify memory-system expansion. An additional select pin, CS/A5, is provided to enable the CDP1826C to be selected directly from the CDP1800 multiplexed address bus without additional latching or decoding. In an 1800 system, the CS/A5 pin can be tied to any MA address line from the CDP1800 processor. A TPA input is provided to latch the high-order bit of this address line as a chip-select for the CDP1826C. If this CS/A5 input is latched high, and if CS = 1 and CS2 = 0 at the appropriate time in the memory cycle, the CDP1826C will be enabled for writing or reading. In a non-1800 system, the TPA pin can be tied high, and the CS/A5 pin can be used as a normal address input.

The six input-address buffers are gated with the chip-select function to reduce standby current when the device is deselected, as well as to provide for a simplified power down mode by reducing address buffer sensitivity to long fall times from address drivers which are being powered down.

Two memory control signals, MRD and MWR, are provided for reading from the writing to the CDP1826C. The logic is designed so that MWR overrides MRD, allowing the chip to be controlled from a single R/W.

A CHIP ENABLE OUTPUT is provided for daisy-chaining to additional memories or I/O devices. This output is high whenever the chip-select function selects the CDP1826C, which deselected any other chip which has its CS input connected to the CDP1826C CEO output. The connected chip is selected when the CDP1826C is deselected and the MRD input is low. Thus, the CEO is only active for a read cycle and can be setup so that a CEO of another device can feed the MRD of the CDP1826C, which in turn selects a third chip in the daisy chain.

The CDP1826C has a recommended operating voltage of 4.5V to 5.5V and is supplied in 22 lead dual-in-line plastic packages (E suffix). The CDP1826C is also available in chip form (H suffix).

# CDP1826C

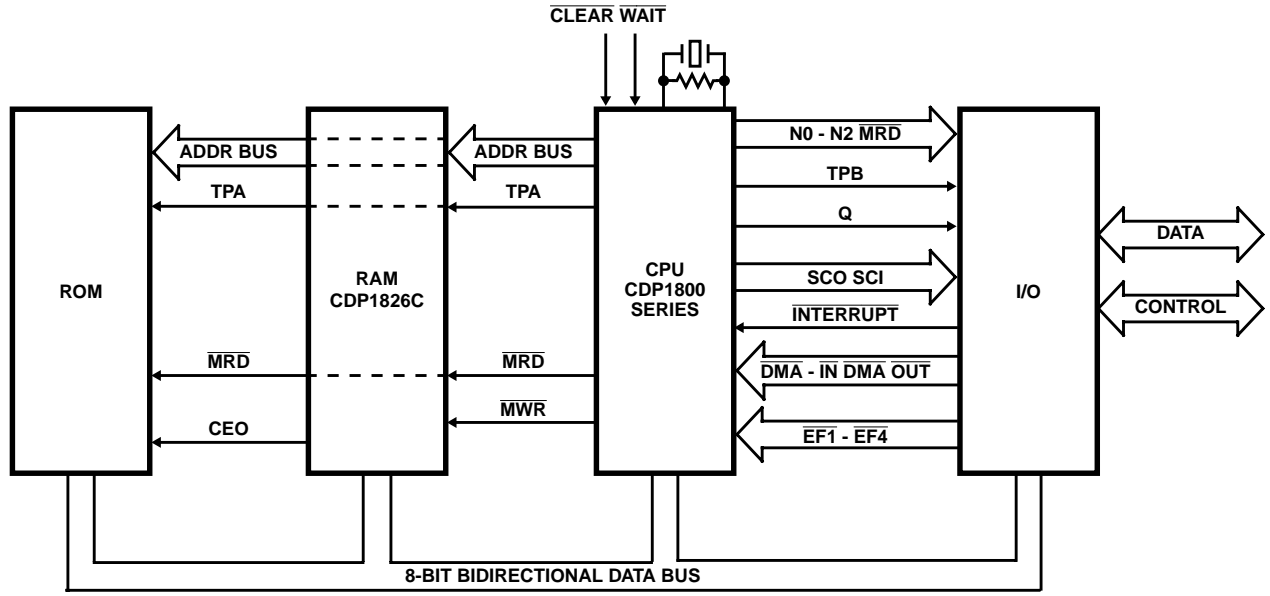


FIGURE 1. TYPICAL CDP1802 MICROPROCESSOR SYSTEM

# CDP1826C

## Absolute Maximum Ratings

DC Supply Voltage Range, ( $V_{DD}$ ) (All Voltages Referenced to $V_{SS}$ Terminal)	
CDP1826C	-0.5V to +7V
Input Voltage Range, All Inputs	-0.5V to $V_{DD} + 0.5V$
DC Input Current, Any One Input	$\pm 10mA$
Power Dissipation Per Package ( $P_D$ )	
$T_A = -40^\circ C$ to $+60^\circ C$ (Package Type E)	500mW
$T_A = +60^\circ C$ to $+85^\circ C$ (Package Type E)	Derate Linearly at 12mW/ $^\circ C$ to 200mW
$T_A = -55^\circ C$ to $+100^\circ C$ (Package Type D)	500mW
$T_A = +100^\circ C$ to $+125^\circ C$ (Package Type D)	Derate Linearly at 12mW/ $^\circ C$ to 200mW

## Thermal Information

Thermal Resistance (Typical)	$\theta_{JA}$ ( $^\circ C/W$ )	$\theta_{JC}$ ( $^\circ C/W$ )
PDIP Package	75	N/A
Device Dissipation Per Output Transistor		
$T_A =$ Full Package Temperature Range (All Package Types)		100mW
Operating Temperature Range ( $T_A$ )		
Package Type D	$-55^\circ C$ to $+125^\circ C$	
Package Type E	$-40^\circ C$ to $+85^\circ C$	
Storage Temperature Range ( $T_{STG}$ )	$-65^\circ C$ to $+150^\circ C$	
Lead Temperature (During Soldering)		
At distance 1/16 $\pm$ 1/32 In. (1.59 $\pm$ 0.79mm)		
from case for 10s max		$+265^\circ C$

**Recommended Operating Conditions** At  $T_A =$  Full Package Temperature Range. For maximum reliability, operating conditions should be selected so that operation is always within the following ranges:

PARAMETER	SYMBOL	CDP1826C		UNITS
		MIN	MAX	
DC Operating Voltage Range		4	6.5	V
Input Voltage Range		$V_{SS}$	$V_{DD}$	V
Input Signal Rise or Fall Time, $V_{DD} = 5V$	$t_R, t_F$	-	10	$\mu s$

**Static Electrical Specifications** At  $T_A = -40^\circ C$  to  $+85^\circ C$ ,  $V_{DD} = 5V \pm 5\%$ , Except as Noted:

PARAMETER	SYMBOL	CONDITIONS		LIMITS			UNITS
		$V_O$ (V)	$V_{IN}$ (V)	CDP1826C			
				MIN	(NOTE 1) TYP	MAX	
Quiescent Device Current	$I_{DD}$	-	0, $V_{DD}$	-	5	50	$\mu A$
Output Low (Sink) Current	BUS	0.4	0, $V_{DD}$	1.6	3.2	-	mA
	CEO	0.4	0, $V_{DD}$	0.8	1.6	-	mA
Output High (Source) Current	BUS	$V_{DD} - 0.4$	0, $V_{DD}$	-1.0	-1.5	-	mA
	CEO	$V_{DD} - 0.4$	0, $V_{DD}$	-0.6	-1.0	-	mA
Output Voltage Low-Level	$V_{OL}$	-	0, $V_{DD}$	-	0	0.1	V
Output Voltage High-Level	$V_{OH}$	-	0, $V_{DD}$	$V_{DD} - 0.1$	$V_{DD}$	-	V
Input Low Voltage	$V_{IL}$	-	-	-	-	1.5	V
Input High Voltage	$V_{IH}$	-	-	3.5	-	-	V
Input Leakage Current	$I_{IN}$	Any Input	0, $V_{DD}$	-	$\pm 0.1$	$\pm 1$	$\mu A$
Operating Device Current (Note 2)	$I_{OPER}$	-	0, $V_{DD}$	-	5	10	mA
Three-State Output Leakage Current	$I_{OUT}$	0, $V_{DD}$	0, $V_{DD}$	-	$\pm 0.1$	$\pm 1$	$\mu A$
Input Capacitance	$C_{IN}$	-	-	-	5	7.5	pF
Output Capacitance	$C_{OUT}$	-	0, $V_{DD}$	-	10	15	pF

**NOTES:**

1. Typical values are for  $T_A = +25^\circ C$  and nominal  $V_{DD}$ .
2. Outputs open circuited; Cycle time = 1 $\mu s$ .

### Signal Descriptions

**A0 - A4, CS/A5 (Address Inputs):** These inputs must be stable prior to a write operation, but may change asynchronously during Read operations.

In an 1800 system, the multiplexed high-order address bit at pin CS/A5 can be latched at the end of TPA. A high level will provide a valid chip select for the CDP1826C. The low-order address bit which appears after TPA is used for data word selection. In non-1800 systems, TPA can be tied high to disable the latch and allow the CS/A5 pin to function as a normal address input.

**BUS 0 - BUS 7:** 8-bit three-state common input/output data bus.

**TPA:** High-order address strobe input. The high-order address bit at input CS/A5 is latched on the high-to-low tran-

sition of the TPA input. Tie TPA high to disable the CS/A5 latch feature.

**CS1, CS2 (Chip Selector):** Either chip select (CS1 or  $\overline{\text{CS2}}$ ), when not valid, powers down the chip, disables READ and WRITE functions, and gates off the address and output buffers.

**MRD, MWR:** Read and Write control signals.  $\overline{\text{MWR}}$  overrides  $\overline{\text{MRD}}$ , allowing the CDP1826C to be controlled from a single R/W line.

**CEO (Chip Enable Output):** Allows daisy chaining to additional memories. CEO is high whenever the CDP1826C is selected. CEO is only active (low) for a Read cycle with the CDP1826C deselected and the  $\overline{\text{MRD}}$  input low.

**VDD, VSS:** Power supply connections.

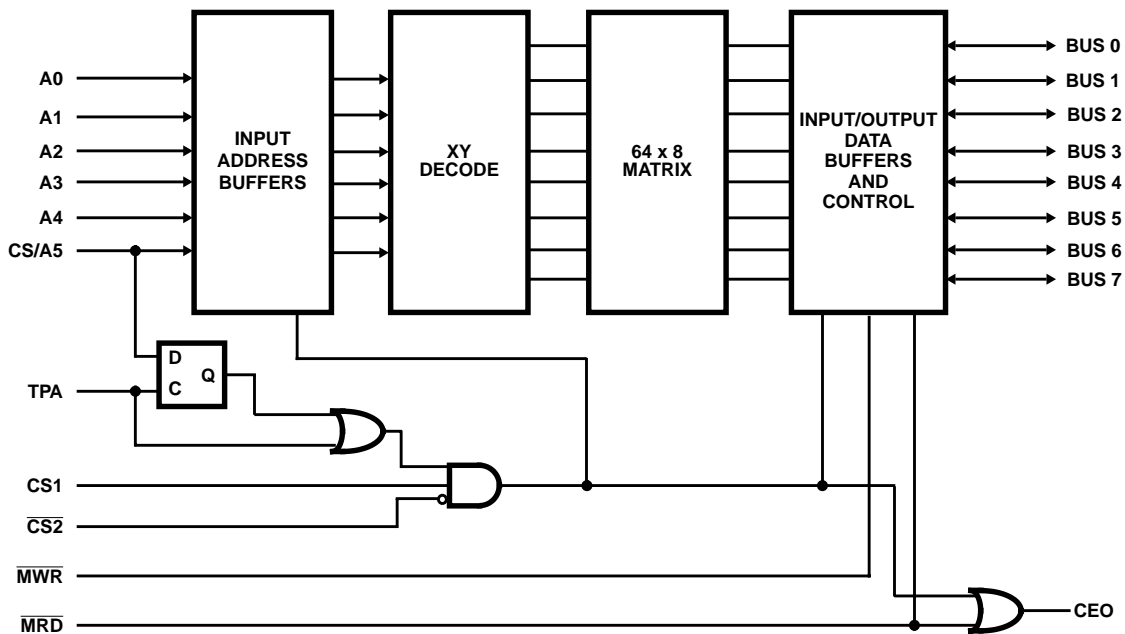
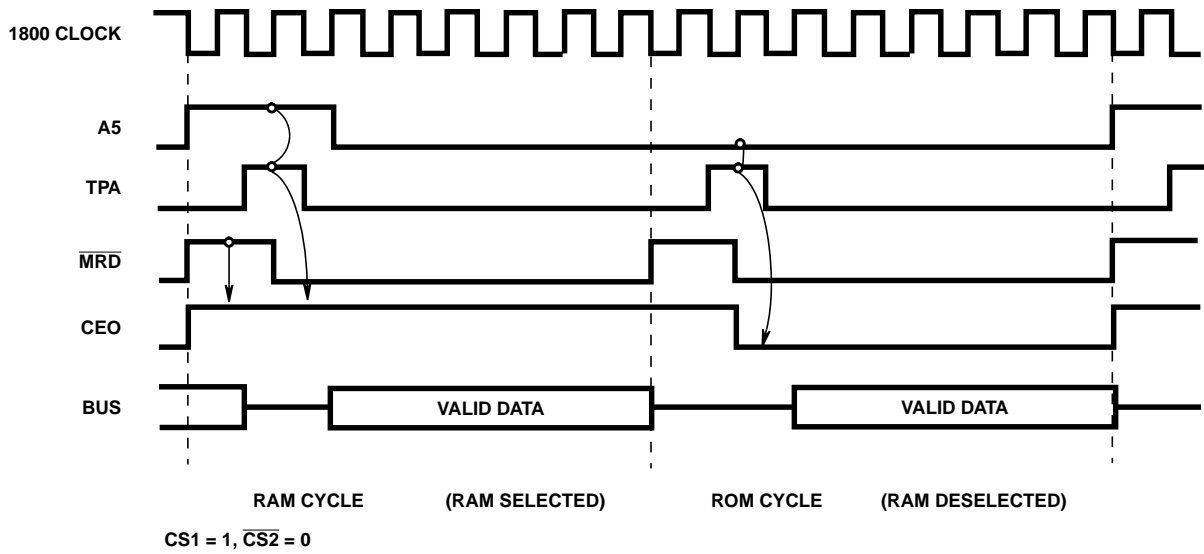


FIGURE 2. FUNCTIONAL DIAGRAM

# CDP1826C



## OPERATING MODES

	FUNCTION	$\overline{\text{MRD}}$	$\overline{\text{MWR}}$	$\text{CS1} \cdot \overline{\text{CS2}}$	TPA	(NOTE 1) CS/A5	CEO
CDP1800 Mode	Write	X	O	I		I	I
	Read	O	I	I		I	I
	Deselect	I	I	I		I	I
	Deselect	I	X	O	X	X	I
	Deselect	O	X	O	X	X	O
	Deselect	I	X	X		O	I
	Deselect	O	X	X		O	O
Non-CDP1800 Mode	Write	X	O	I	I	X	I
	Read	O	I	I	I	X	I
	Deselect	I	I	I	I	X	I
	Deselect	I	X	O	I	X	I
	Deselect	O	X	O	I	X	O

NOTE:

1. For CDP1800 Mode, refers to high order memory address bit level at time when TPA transition takes place.

FIGURE 3. CHIP ENABLE OUTPUT TIMING WAVEFORMS FOR CDP1800 BASED SYSTEMS

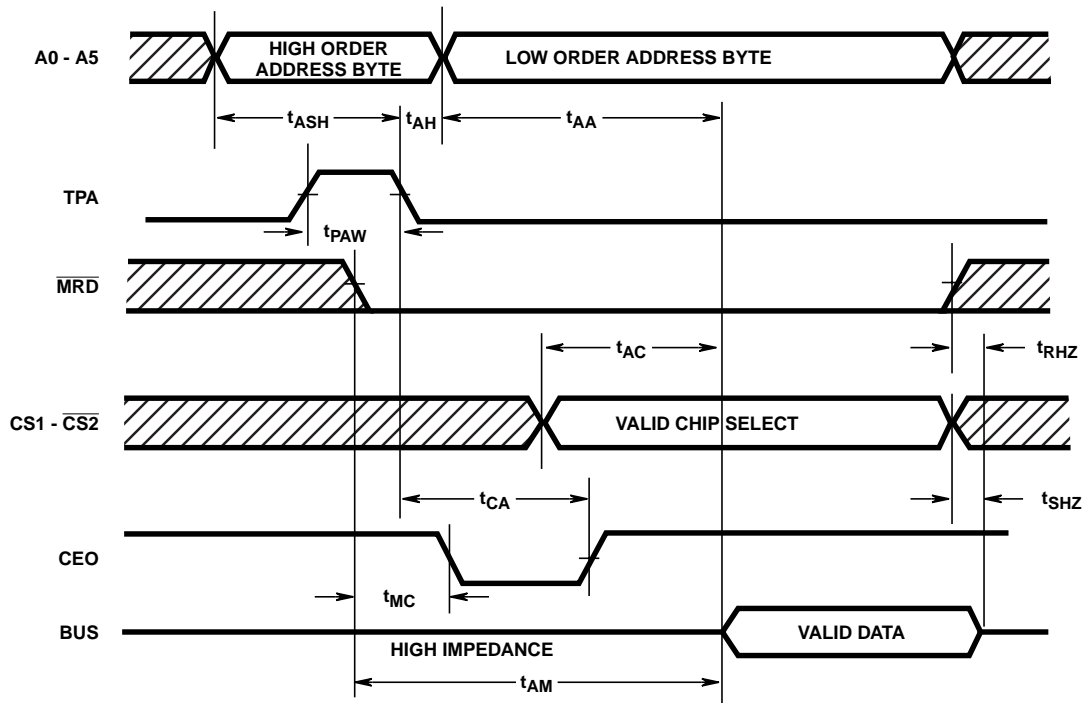
# CDP1826C

**Dynamic Electrical Specifications** At  $T_A = -40$  to  $+85^\circ\text{C}$ ,  $V_{DD} = 5V \pm 5\%$ , Input  $t_R, t_F = 10\text{ns}$ ;  $C_L = 50\text{pF}$  and 1 TTL Load

PARAMETER	LIMITS			UNITS	
	CDP1826C				
	(NOTE 1) MIN	(NOTE 2) TYP	MAX		
<b>READ - CYCLE TIMES (FIGURES 4 AND 5)</b>					
Address to TPA Setup	$t_{ASH}$	100	-	-	ns
Address to TPA Hold	$t_{AH}$	100	-	-	ns
Access from Address Change	$T_{AA}$	-	500	1000	ns
TPA Pulse Width	$t_{PAW}$	200	-	-	ns
Output Valid from $\overline{\text{MRD}}$	$t_{AM}$	-	500	1000	ns
Access from Chip Select	$t_{AC}$	-	500	1000	ns
CEO Delay from TPA $\nearrow$ Edge	$t_{CA}$	-	150	300	ns
$\overline{\text{MRD}}$ to CEO Delay	$t_{MC}$	75	-	-	ns
Output High Z from Invalid $\overline{\text{MRD}}$	$t_{RHZ}$	-	-	125	ns
Output High Z from Chip Deselect	$t_{SHZ}$	-	-	225	ns

**NOTES:**

1. Time required by a limit device to allow for the indicated function.
2. Typical values are at  $T_A = 25^\circ\text{C}$  and nominal  $V_{DD}$ .



**FIGURE 4. TIMING WAVEFORMS FOR READ CYCLE 1**

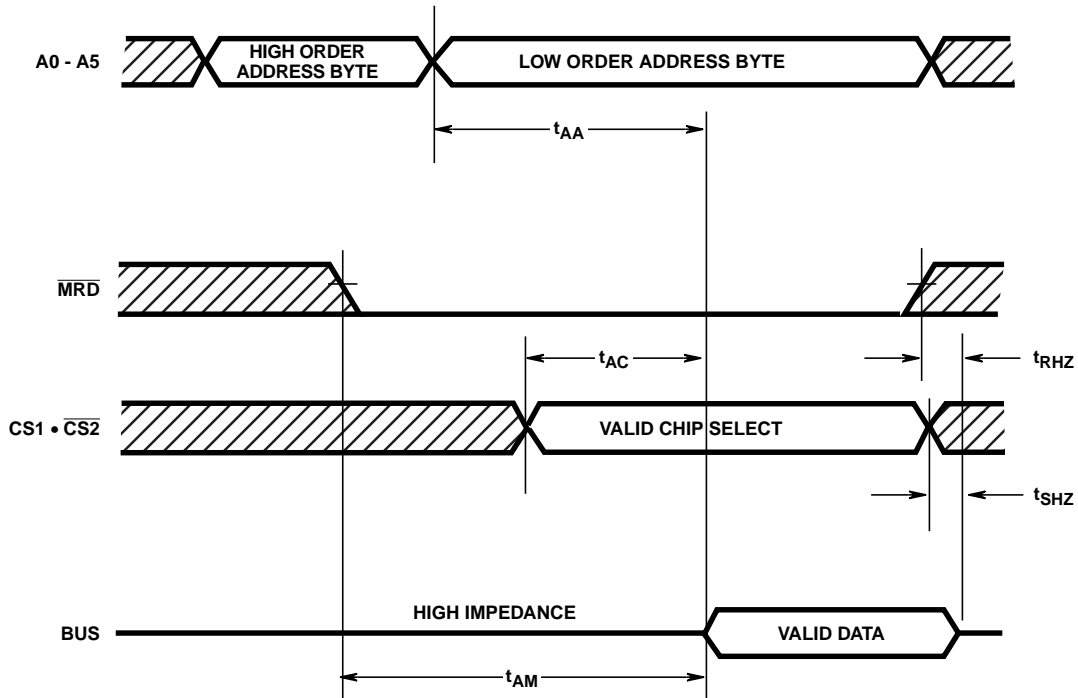


FIGURE 5. TIMING WAVEFORMS FOR READ-CYCLE 2 (TPA HIGH)

**Dynamic Electrical Specifications** At  $T_A = -40$  to  $+85^\circ\text{C}$ ,  $V_{DD} = 5V \pm 5\%$ , Input  $t_R, t_F = 10\text{ns}$ ;  $C_L = 50\text{pF}$  and 1 TTL Load

PARAMETER	LIMITS			UNITS	
	CDP1826C				
	(NOTE 1) MIN	(NOTE 2) TYP	MAX		
<b>WRITE - CYCLE TIMES (FIGURES 6 AND 7)</b>					
Address to TPA Setup, High Byte	$t_{ASH}$	100	-	-	ns
Address to TPA Hold	$t_{AH}$	100	-	-	ns
Address Setup, Low Byte	$T_{ASL}$	500	250	-	ns
TPA Pulse Width	$t_{PAW}$	200	-	-	ns
Chip Select Setup	$t_{CS}$	700	350	-	ns
Write Pulse Width	$t_{WW}$	300	200	-	ns
Write Recovery	$t_{WR}$	100	-	-	ns
Data Setup	$t_{DS}$	400	200	-	ns
Data Hold from End of $\overline{MWR}$	$t_{DH1}$	100	50	-	ns
Data Hold from End of Chip Select	$t_{DH2}$	125	50	-	ns

NOTES:

1. Time required by a limit device to allow for the indicated function.
2. Typical values are for  $T_A = 25^\circ\text{C}$  and nominal  $V_{DD}$ .

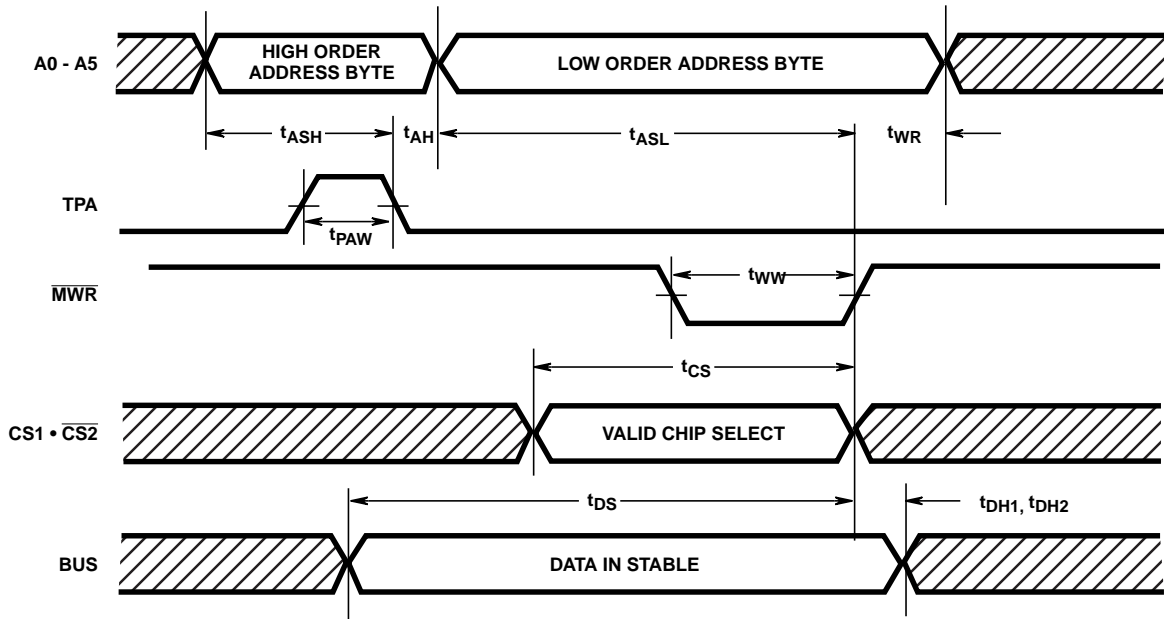


FIGURE 6. TIMING WAVEFORMS FOR WRITE-CYCLE 1

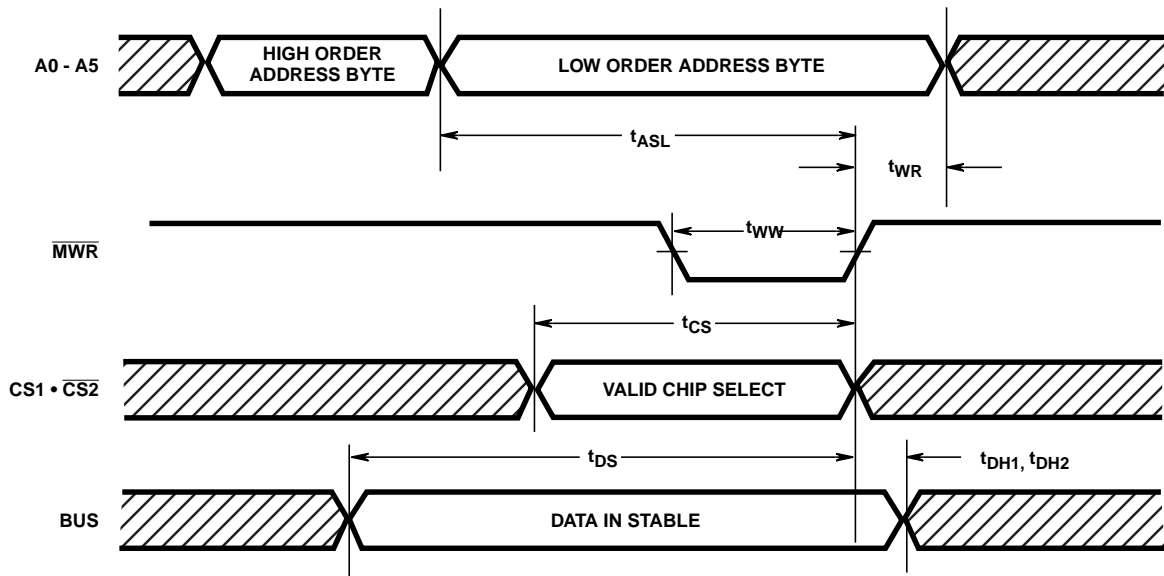


FIGURE 7. TIMING WAVEFORMS FOR WRITE-CYCLE 2 (TPA = HIGH)



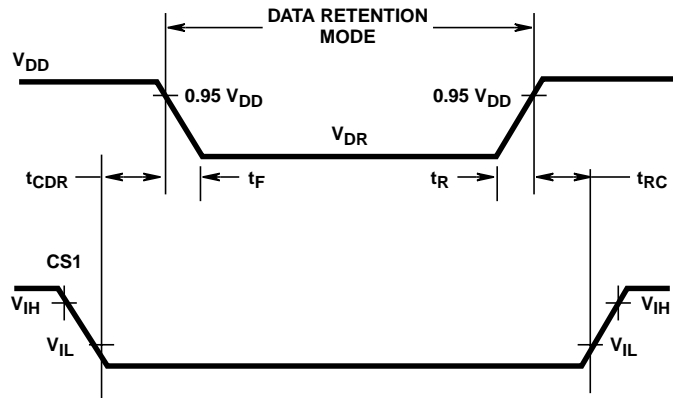
# CDP1826C

## Data Retention Specifications At $T_A = -40$ to $+85^\circ\text{C}$ , see Figure 8

PARAMETER	TEST CONDITIONS	$V_{DR}$ (V)	$V_{DD}$ (V)	MIN	(NOTE 1) TYP	LIMITS		UNITS
						CDP1826C		
						MAX		
Minimum Data Retention Voltage	$V_{DR}$	-	-	-	2	2.5		V
Data Retention Quiescent Current	$t_{DD}$	2.5	-	-	5	25		$\mu\text{A}$
Chip Deselect to Data Retention Time	$t_{CDR}$	-	5	600	-	-		ns
Recovery to Normal Operation Time	$t_{RC}$	-	5	600	-	-		ns
$V_{DD}$ to $V_{DR}$ Rise and Fall Time	$t_R, t_F$	2.5	5	1	-	-		$\mu\text{A}$

**NOTE:**

1. Typical values are at  $T_A = 25^\circ\text{C}$  and nominal  $V_{DD}$ .



**FIGURE 8. LOW  $V_{DD}$  DATA RETENTION TIMING WAVEFORMS**

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