

TERMINAL DIAGRAM  
CDP1866, CDP1868

## CMOS 4-Bit Latch and Decoder Memory Interfaces

### Features:

- Performs memory address latch and decoder functions multiplexed or non-multiplexed
- Interfaces directly with all CDP1800 family CPUs

The RCA-CDP1866, CDP1867, and CDP1868 are CMOS 4-bit memory latch and decoder circuits intended for use in CDP1800 series microprocessor systems. They can interface directly with the multiplexed address bus of this system at maximum clock frequency, and up to eight 4096-bit random-access memories to provide a 4096-byte RAM system. All the necessary chip selects are provided as outputs along with additional enable inputs so that in larger memory systems, the 9-chip 4096-byte blocks can be readily accessed.

These devices are also compatible with non-multiplexed address bus microprocessors.

By connecting the clock input to V<sub>DD</sub>, the latches are in the

data-following mode and the decoded outputs can be used in general-purpose memory-system applications.

The CDP1866 and CDP1868 are intended for use with 1024-word RAMs and are identical except that in the CDP1868, CE1 and CE2 are latched and CS2 is valid on MWR only. This allows the CDP1868 to be used in a color display system with the CDP1861 and CDP1862 (see Fig. 9). The CDP1867 is intended for use with 4096-word RAMs.

The CDP1866, CDP1867, and CDP1868 are supplied in an 18-lead hermetic dual-in-line ceramic package (D suffix) and an 18-lead plastic package (E suffix). The CDP1866C, CDP1867C, and the CDP1868C are available in chip form (H suffix).

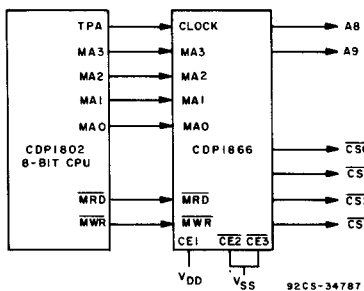
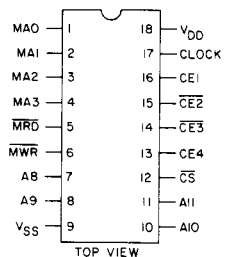


Fig. 1 - CDP1866 used as a high-order address latch decoder.



TERMINAL DIAGRAM  
CDP1867

## CDP1866, CDP1867, CDP1868

### MAXIMUM RATINGS, Absolute-Maximum Values:

DC SUPPLY-VOLTAGE RANGE, ( $V_{DD}$ )

(Voltage referenced to  $V_{SS}$  Terminal)

CDP1866, CDP1867, CDP1868	.....	-0.5 to 11 V
CDP1866C, CDP1867C, CDP1868C	.....	-0.5 to 7 V

INPUT VOLTAGE RANGE, ALL INPUTS ..... -0.5 to  $V_{DD} + 0.5$  V

DC INPUT CURRENT, ANY ONE INPUT .....  $\pm 10$  mA

POWER DISSIPATION PER PACKAGE ( $P_D$ ):

For  $T_A = -40$  to  $+60^\circ\text{C}$  (PACKAGE TYPE E) ..... 500 mW

For  $T_A = +60$  to  $+85^\circ\text{C}$  (PACKAGE TYPE E) ..... Derate Linearly at 12 mW/ $^\circ\text{C}$  to 200 mW

For  $T_A = -55$  to  $+100^\circ\text{C}$  (PACKAGE TYPE D) ..... 500 mW

For  $T_A = +100$  to  $+125^\circ\text{C}$  (PACKAGE TYPE D) ..... Derate Linearly at 12 mW/ $^\circ\text{C}$  to 200 mW

DEVICE DISSIPATION PER OUTPUT TRANSISTOR

FOR  $T_A = \text{FULL PACKAGE-TEMPERATURE RANGE (All Package Types)}$  ..... 40 mW

OPERATING-TEMPERATURE RANGE ( $T_A$ ):

PACKAGE TYPE D .....  $-55$  to  $+125^\circ\text{C}$

PACKAGE TYPE E .....  $-40$  to  $+85^\circ\text{C}$

STORAGE TEMPERATURE RANGE ( $T_{stg}$ ) .....  $-65$  to  $+150^\circ\text{C}$

LEAD TEMPERATURE (DURING SOLDERING):

At distance  $1/16 \pm 1/32$  inch ( $1.59 \pm 0.79$  mm) from case for 10 s max. ....  $+265^\circ\text{C}$

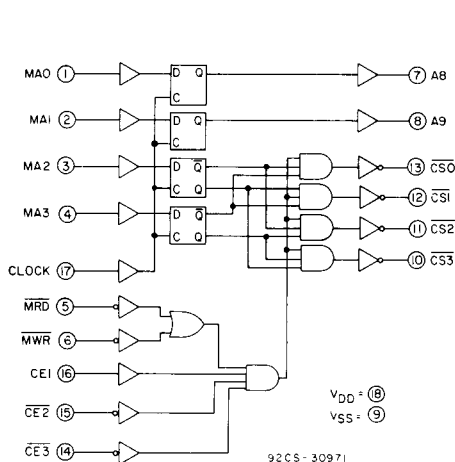


Fig. 2 - Functional diagram for the CDP1866.

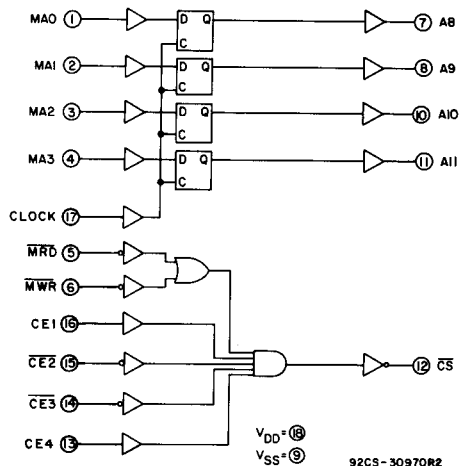


Fig. 3 - Functional diagram for the CDP1867.

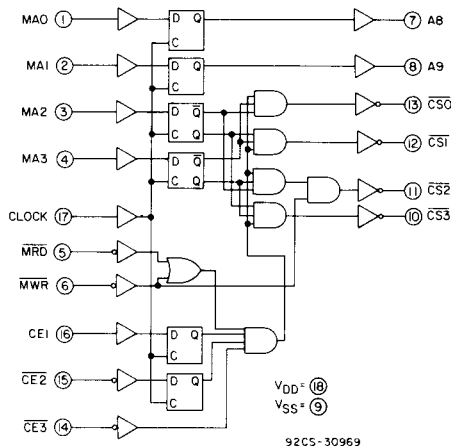


Fig. 4 - Functional diagram for the CDP1868.

## CDP1866, CDP1867, CDP1868

**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:

CHARACTERISTIC	LIMITS				UNITS
	CDP1866, CDP1867, CDP1868		CDP1866C, CDP1867C, CDP1868C		
	Min.	Max.	Min.	Max.	
DC Operating Voltage Range	4	10.5	4	6.5	V
Input Voltage Range	$V_{SS}$	$V_{DD}$	$V_{SS}$	$V_{DD}$	

**STATIC ELECTRICAL CHARACTERISTICS** at  $T_A = -40$  to  $+85^\circ\text{C}$ ,  $V_{DD} \pm 5\%$ , Except as noted

CHARACTERISTIC	CONDITIONS			LIMITS						UNITS
	$V_O$ (V)	$V_{IN}$ (V)	$V_{DD}$ (V)	CDP1866, CDP1867, CDP1868			CDP1866C, CDP1867C, CDP1868C			
				Min.	Typ.*	Max.	Min.	Typ.*	Max.	
Quiescent Device Current $I_{DD}$	— —	0,5 0,10	5 10	— —	1 10	10 100	— —	5 —	50 —	$\mu\text{A}$
Output Low Drive (Sink) Current $I_{OL}$	0.4 0.5	0,5 0,10	5 10	1.6 2.6	3.2 5.2	— —	1.6 —	3.2 —	— —	$\text{mA}$
Output High Drive (Source) Current $I_{OH}$	4.6 9.5	0,5 0,10	5 10	-1.15 -2.6	-2.3 -5.2	— —	-1.15 —	-2.3 —	— —	
Output Voltage Low-Level $V_{OL}\ddagger$	— —	0,5 0,10	5 10	— —	0 0	0.1 0.1	— —	0 —	0.1 —	V
Output Voltage High-Level $V_{OH}\ddagger$	— —	0,5 0,10	5 10	4.9 9.9	5 10	— —	4.9 —	5 —	— —	
Input Low Voltage $V_{IL}$	0.5,4.5 0.5,9.5	— —	5 10	— —	— —	1.5 3	— —	— —	1.5 —	
Input High Voltage $V_{IH}$	0.5,4.5 0.5,9.5	— —	5 10	3.5 7	— —	— —	3.5 —	— —	— —	
Input Leakage Current $I_{IN}$	Any Input	0,5 0,10	5 10	— —	— —	$\pm 1$ $\pm 2$	— —	— —	$\pm 1$ —	$\mu\text{A}$
Input Capacitance $C_{IN}$	—	—	—	—	5	7.5	—	5	7.5	$\text{pF}$
Output Capacitance $C_{OUT}$	—	—	—	—	10	15	—	10	15	
Operating Device Current $I_{DD\Delta}$	0,5 0,10	0,5 0,10	5 10	— —	50 150	100 300	— —	50 —	100 —	$\mu\text{A}$
Minimum Data Retention Voltage $V_{DR}$	$V_{DD} = V_{DR}$			—	2	2.4	—	2	2.4	V
Data Retention Current $I_{DR}$	$V_{DD} = 2.4\text{ V}$			—	0.01	1	—	0.5	5	$\mu\text{A}$

\*Typical values are for  $T_A = 25^\circ\text{C}$ .  $\ddagger I_{OL} = I_{OH} = 1\ \mu\text{A}$ .

$\Delta$ Operating current is measured at 200 kHz for  $V_{DD} = 5\text{ V}$  and 400 kHz for  $V_{DD} = 10\text{ V}$ , with open outputs (worst-case frequencies for CDP1802A system operating at maximum speed of 3.2 MHz).

CDP1866, CDP1867, CDP1868

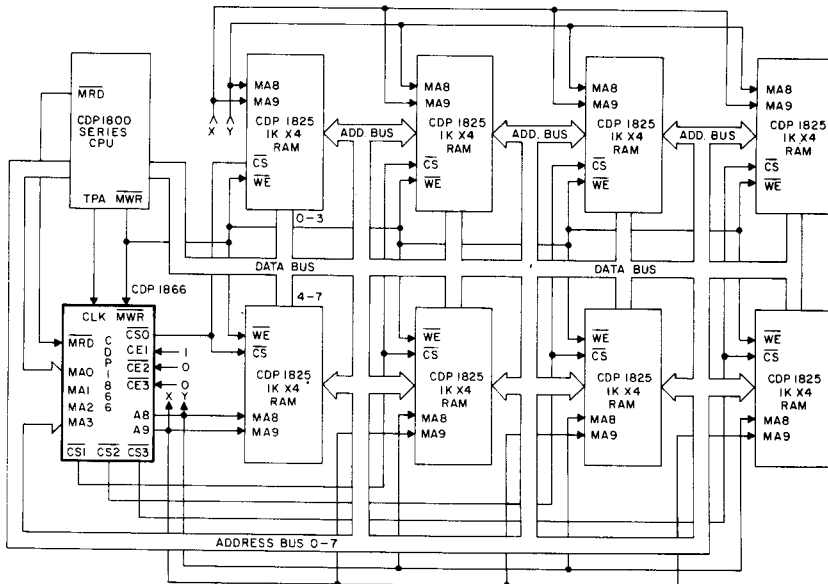
TRUTH TABLES FOR THE CDP1866 AND CDP1868

MRD or MWR	INPUTS						OUTPUTS			
	CE1	CE2	CE3	CLK	MA2	MA3	CS0	CS1	CS2	CS3
0	1	0	0	1	0	0	0	1	1	1
0	1	0	0	1	1	0	1	0	1	1
0*	1	0	0	1	1	1	1	1	0*	1
0	1	0	0	1	1	1	1	1	1	0
0	1	0	0	0	X	X	PREVIOUS STATE			
X	X	X	1	X	X	X	1	1	1	1
X	X	1	X	X	X	X	1	1	1	1
X	0	X	X	X	X	X	1	1	1	1
1	X	X	X	X	X	X	1	1	1	1

\*In the CDP1868, CS2 will be valid (CS2=0) only if MRW is low, regardless of the polarity of MRD.

INPUTS			OUTPUTS	
CLK	MA0	MA1	A8	A9
1	0	0	0	0
1	0	1	0	1
1	1	0	1	0
1	1	1	1	1
0	X	X	PREVIOUS STATE	

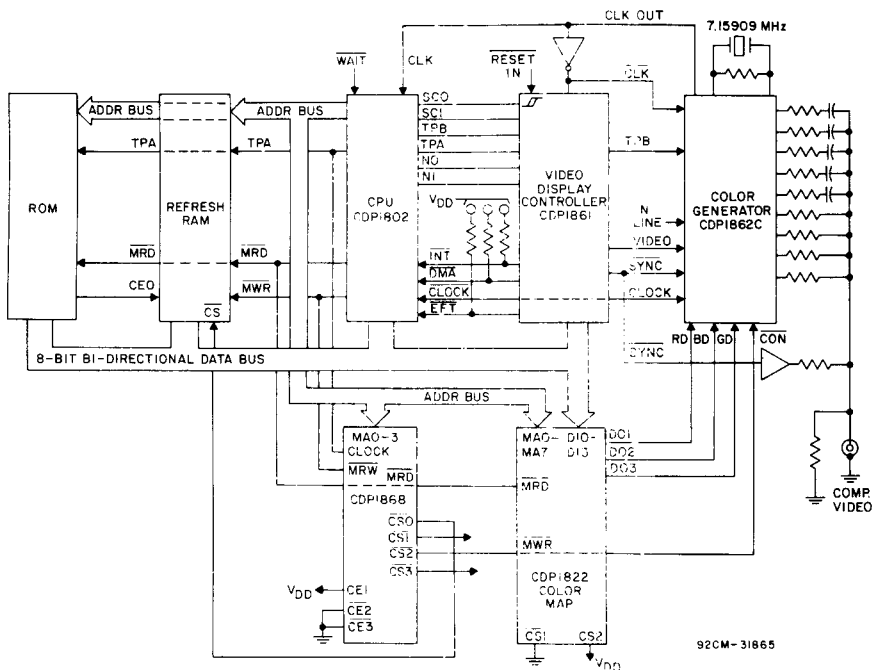
MRD	MWR	MRD or MWR
0	0	1
0	1	1
1	0	1
1	1	0



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Fig. 5 - 4096-word by 8-bit random-access memory system using the CDP1866.

## CDP1866, CDP1867, CDP1868



CHIP SELECT	ADDRESS
CS0	0000 - 03FF
CS1	0400 - 07FF
CS2	0800 - 0BFF
CS3	0C00 - 0FFF

Fig. 6 - Typical color display system using the CDP1868.

The CDP1868 can be used in a color display system to write to the refresh RAM and the color map RAM at different address locations, as shown in Fig. 9. Both the refresh RAM and the color map RAM are read from the same address. The purpose of reading from the same address is that when a byte of data from the refresh RAM is sent to the video display controller (CDP1861), an additional 3 bits of color information are needed from the color map RAM for the color generator (CDP1862). In Fig. 9, the bit display data are written into the refresh RAM at 0000-00FF. The color display data are written into the color map RAM at locations 0800-08FF. Both are read at locations 0000-00FF.

## CDP1866, CDP1867, CDP1868

DYNAMIC ELECTRICAL CHARACTERISTICS at  $T_A = -40$  to  $+85^\circ\text{C}$ ,  $V_{DD} \pm 5\%$ ,  $t_r, t_f = 20$  ns,  
 $V_{IH} = 0.7 V_{DD}$ ,  $V_{IL} = 0.3 V_{DD}$ ,  $C_L = 100$  pF. See Fig. 8

CHARACTERISTIC	$V_{DD}$ (V)	LIMITS						UNITS		
		CDP1866			CDP1866C					
		Min.	Typ.*	Max.Δ	Min.	Typ.*	Max.Δ			
Minimum Setup Time, Memory Address to CLOCK,	$t_{MACL}$	5	—	50	75	—	50	75	ns	
Memory Address to CLOCK, Memory Address After CLOCK,	$t_{CLMA}$	10	—	25	40	—	—	—		
Minimum Hold Time, Memory Address After CLOCK,	$t_{CLMA}$	5	—	50	75	—	50	75		
Minimum CLOCK Pulse Width	$t_{CLCL}$	10	—	25	40	—	—	—		
Propagation Delay Times:										
Chip Enable to Chip Select,	$t_{CECS}$	5	—	150	225	—	150	225		
MRD or MRW to Chip Select,	$t_{MCS}$	10	—	125	200	—	125	200		
CLOCK to Chip Select,	$t_{CLCS}$	5	—	175	275	—	175	275		
CLOCK to Address,	$t_{CLA}$	10	—	90	150	—	—	—		
Memory Address to Chip Select,	$t_{MACS}$	5	—	125	200	—	125	200		
Memory Address to Address,	$t_{MAA}$	10	—	65	125	—	—	—		
Memory Address to Chip Select,	$t_{MACS}$	5	—	150	225	—	150	225		
Memory Address to Address,	$t_{MAA}$	10	—	80	125	—	80	125		
Memory Address to Address,	$t_{MAA}$	10	—	40	60	—	—	—		

\*Typical values are for  $T_A = 25^\circ\text{C}$ .

ΔMaximum limits of minimum characteristics are the values above which all devices function.

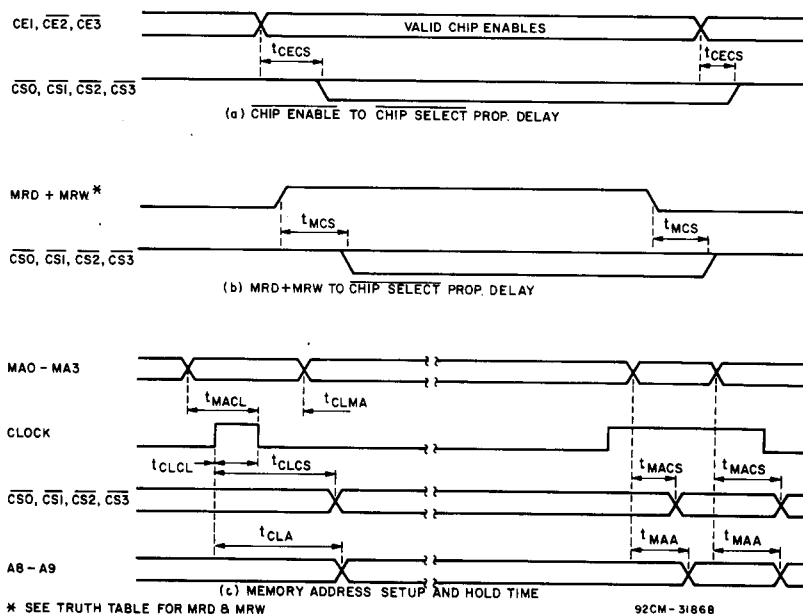


Fig. 8 - CDP1866 timing waveforms.

CDP1866, CDP1867, CDP1868

DYNAMIC ELECTRICAL CHARACTERISTICS at  $T_A = -40$  to  $+85^\circ\text{C}$ ,  $V_{DD} \pm 5\%$ ,  $t_r, t_f = 20$  ns,

$V_{IH} = 0.7 V_{DD}$ ,  $V_{IL} = 0.3 V_{DD}$ ,  $C_L = 100$  pF. See Fig. 9

CHARACTERISTIC	$V_{DD}$ (V)	LIMITS						UNITS	
		CDP1867			CDP1867C				
		Min.	Typ.*	Max.Δ	Min.	Typ.*	Max.Δ		
Minimum Setup Time, Memory Address to CLOCK,	$t_{MACL}$	5	—	50	75	—	50	75	ns
Minimum Hold Time, Memory Address After CLOCK,	$t_{CLMA}$	10	—	25	40	—	—	—	
Minimum CLOCK Pulse Width	$t_{CLCL}$	5	—	50	75	—	50	75	
Propagation Delay Times: Chip Enable to Chip Select,	$t_{CECS}$	5	—	100	150	—	100	150	
MRD or MRW to Chip Select,	$t_{MCS}$	10	—	50	75	—	—	—	
CLOCK to Address,	$t_{CLA}$	5	—	80	125	—	80	125	
Memory Address to Address,	$t_{MAA}$	10	—	40	60	—	—	—	
		5	—	75	125	—	75	125	
		10	—	40	60	—	—	—	

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

ΔMaximum limits of minimum characteristics are the values above which all devices function.

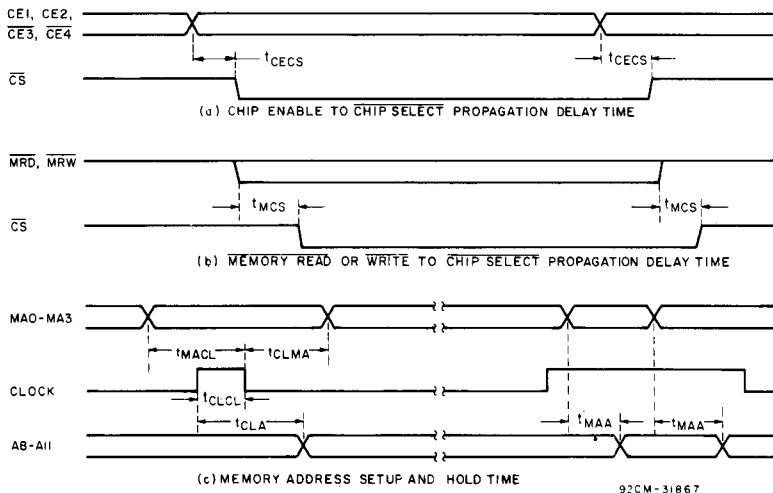


Fig. 9 - CDP1867 timing waveforms.

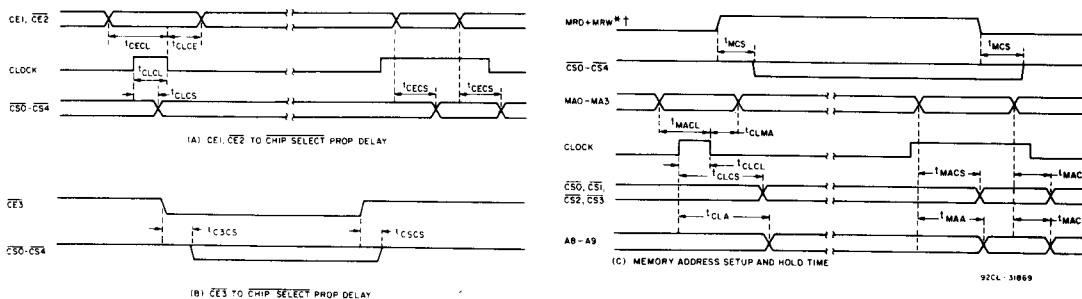
## CDP1866, CDP1867, CDP1868

DYNAMIC ELECTRICAL CHARACTERISTICS at  $T_A = -40$  to  $+85^\circ\text{C}$ ,  $V_{DD} \pm 5\%$ ,  $t_r, t_f = 20$  ns,  
 $V_{IH} = 0.7 V_{DD}$ ,  $V_{IL} = 0.3 V_{DD}$ ,  $C_L = 100$  pF. See Fig. 10

CHARACTERISTIC	$V_{DD}$ (V)	LIMITS						UNITS
		CDP1868			CDP1868C			
		Min.	Typ.*	Max.Δ	Min.	Typ.*	Max.Δ	
Minimum Setup Times:								
Chip Enable to CLOCK,	5	—	50	75	—	50	75	ns
$t_{CECL}$	10	—	25	40	—	—	—	
Memory Address to CLOCK,	5	—	50	75	—	50	75	
$t_{MACL}$	10	—	25	40	—	—	—	
Minimum Hold Times:								
Chip Enable After CLOCK,	5	—	50	75	—	50	75	
$t_{CLCE}$	10	—	25	40	—	—	—	
Memory Address After CLOCK,	5	—	50	75	—	50	75	
$t_{CLMA}$	10	—	25	40	—	—	—	
Minimum CLOCK Pulse Width,	5	—	50	75	—	50	75	
$t_{CLCL}$	10	—	25	40	—	—	—	
Propagation Delay Times:								
CLOCK to Chip Select,	5	—	175	275	—	175	275	
$t_{CLCS}$	10	—	90	150	—	—	—	
Chip Enable to Chip Select,	5	—	150	225	—	150	225	
$t_{CECS}$	10	—	75	125	—	—	—	
Chip Enable 3 to Chip Select,	5	—	150	225	—	150	225	
$t_{C3CS}$	10	—	75	125	—	—	—	
MRD or MRW to Chip Select,	5	—	125	200	—	125	200	
$t_{MCS}$	10	—	65	100	—	—	—	
CLOCK to Address,	5	—	125	200	—	125	200	
$t_{CLA}$	10	—	65	100	—	—	—	
Memory Address to Chip Select,	5	—	125	200	—	125	200	
$t_{MACS}$	10	—	65	100	—	—	—	
Memory Address to Address,	5	—	80	120	—	80	120	
$t_{MAA}$	10	—	40	60	—	—	—	

\*Typical values are for  $T_A = 25^\circ\text{C}$  and nominal.

ΔMaximum limits of minimum characteristics are the values above which all devices function.



\*SEE TRUTH TABLE FOR MRD+MRW  
 †CS2 WILL BE VALID (CS2=0) ONLY IF MRW IS LOW REGARDLESS OF MRD  
 SIGNAL POLARITY

Fig. 10 - CDP1868 timing waveforms.