CDP1822, CDP1822C

256-Word x 4-Bit LSI Static RAM

March 1997

Features

- **Low Operating Current**
  - **V_{DD} = 5V, Cycle Time 1μs 8mA**
- **Industry Standard Pinout**
- **Two Chip-Select Inputs-Simple Memory Expansion**
- **Memory Retention for Standby Battery Voltage of 2V Minimum**
- **Output-Disable for Common I/O Systems**
- **Three-State Data Output for Bus-Oriented Systems**
- **Separate Data Inputs and Outputs**

Ordering Information

5V	10V	PACKAGE	TEMP. RANGE	PKG. NO.
CDP1822CE	CDP1822E	PDIP	-40°C to +85°C	E22.4
CDP1822CEX	CDP1822EX	Burn-In		E22.4
CDP1822CD	CDP1822D	SBDIP	-40°C to +85°C	D22.4A
CDP1822CDX	-	Burn-In		D22.4A

Description

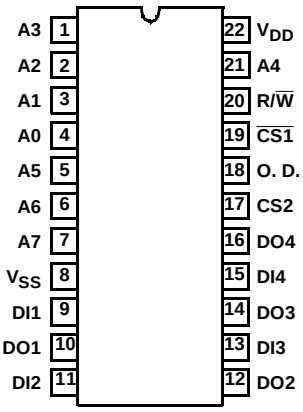
The CDP1822 and CDP1822C are 256-word by 4-bit static random-access memories designed for use in memory systems where high speed, low operating current, and simplicity in use are desirable. The CDP1822 features high speed and a wide operating voltage range. Both types have separate data inputs and outputs and utilize single power supplies of 4V to 6.5V for the CDP1822C and 4V to 10.5V for the CDP1822.

Two Chip-Select inputs are provided to simplify system expansion. An Output Disable control provides Wire-OR capability and is also useful in common Input/Output systems. The Output Disable input allows these RAMs to be used in common data Input/Output systems by forcing the output into a high-impedance state during a write operation independent of the Chip-Select input condition. The output assumes a high-impedance state when the Output Disable is at high level or when the chip is deselected by $\overline{CS1}$ and/or CS2.

The high noise immunity of the CMOS technology is preserved in this design. For TTL interfacing at 5V operation, excellent system noise margin is preserved by using an external pull-up resistor at each input.

Pinout

CDP1822, CDP1822C
(PDIP, SBDIP)
TOP VIEW



OPERATIONAL MODES

MODE	INPUTS				OUTPUT
	$\overline{CHIP\ SELECT\ 1}$ ($\overline{CS_1}$)	CHIP SELECT 2 (CS_2)	OUTPUT DISABLE (OD)	$\overline{READ/WRITE}$ ($R/\overline{W}$)	
Read	0	1	0	1	Read
Write	0	1	0	0	Data In
Write	0	1	1	0	High Impedance
Standby	1	X	X	X	High Impedance
Standby	X	0	X	X	High Impedance
Output Disable	X	X	1	X	High Impedance

NOTE:
Logic 1 = High, Logic 0 = Low, X = Don't Care.

Absolute Maximum Ratings

DC Supply Voltage Range, (V_{DD})
(All Voltages Referenced to V_{SS} Terminal)
CDP1822 . . . . . -0.5V to +11V
CDP1822C. . . . . -0.5V to +7V
Input Voltage Range, All Inputs . . . . . -0.5V to V_{DD} +0.5V
DC Input Current, Any One Input . . . . . ±10mA

Thermal Information

Thermal Resistance (Typical)	θ_{JA} (^{o}C/W)	θ_{JC} (^{o}C/W)
PDIP Package	75	N/A
SBDIP Package	80	21

Maximum Operating Temperature Range (T_A)
Package Type D . . . . . -55^{o}C to +125^{o}C
Package Type E . . . . . -40^{o}C to +85^{o}C
Maximum Junction Temperature
Ceramic Package . . . . . 175^{o}C
Plastic Package. . . . . 150^{o}C
Storage Temperature Range (T_{STG}) . . . . . -65^{o}C to +150^{o}C
T_A = -40^{o}C to +60^{o}C (Package Type E). 500mW
T_A = +60^{o}C to +85^{o}C (Package Type E) . . . . . Derate Linearly at 12mW/^{o}C to 200mW
Lead Temperature (During Soldering) . . . . . 300^{o}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	LIMITS				UNITS
		CDP1822		CDP1822C		
		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}	V

Static Electrical Specifications

At T_A = -40^{o}C to +85^{o}C, Except as Noted

PARAMETER	SYMBOL	CONDITIONS			LIMITS						UNITS
					CDP1822			CDP1822C			
		V_O (V)	V_{IN} (V)	V_{DD} (V)	MIN	(NOTE 1) TYP	MAX	MIN	(NOTE 1) TYP	MAX	
Quiescent Device Current	I_{DD}	-	0, 5	5	-	-	500	-	-	500	µA
		-	0, 10	10	-	-	1000	-	-	-	µA
Output Low (Sink) Current	I_{OL}	0.4	0, 5	5	2	4	-	2	4	-	mA
		0.5	0, 10	10	4.5	9	-	-	-	-	mA
Output High (Source) Current	I_{OH}	4.6	0, 5	5	-1	-2	-	-1	-2	-	mA
		9.5	0, 10	10	-2.2	-4.4	-	-	-	-	mA
Output Voltage Low-Level	V_{OL}	-	0, 5	5	-	0	0.1	-	0	0.1	V
		-	0, 10	10	-	0	0.1	-	-	-	V
Output Voltage High-Level	V_{OH}	-	0, 5	5	4.9	5	-	4.9	5	-	V
		-	0, 10	10	9.9	10	-	-	-	-	V
Input Low Voltage	V_{IL}	0.5, 4.5	-	5	-	-	1.5	-	-	1.5	V
		0.5, 9.5	-	10	-	-	3	-	-	-	V
Input High Voltage	V_{IH}	0.5, 9.5	-	5	3.5	-	-	3.5	-	-	V
		0.5, 9.5	-	10	7	-	-	-	-	-	V
Input Leakage Current	I_{IN}	-	0, 5	5	-	-	±5	-	-	±5	µA
		-	0, 10	10	-	-	±10	-	-	-	µA

Static Electrical Specifications At T_A = -40°C to +85°C, Except as Noted **(Continued)**

PARAMETER	SYMBOL	CONDITIONS			LIMITS						UNITS
					CDP1822			CDP1822C			
		V_O (V)	V_{IN} (V)	V_{DD} (V)	MIN	(NOTE 1) TYP	MAX	MIN	(NOTE 1) TYP	MAX	
Operating Current (Note 2)	I_{DD1}	-	0, 5	5	-	4	8	-	4	8	mA
		-	0, 10	10	-	8	16	-	-	-	mA
Three-State Output Leakage Current	I_{OUT}	0, 5	0, 5	5	-	-	±5	-	-	±5	µA
		0, 10	0, 10	10	-	-	±10	-	-	-	µA
Input Capacitance	C_{IN}	-	-	-	-	5	7.5	-	5	7.5	pF
Output Capacitance	C_{OUT}	-	-	-	-	10	15	-	10	15	pF

NOTES:

1. Typical values are for T_A = +25°C and nominal V_{DD}.
2. Outputs open circuited; Cycle time = 1µs.

Dynamic Electrical Specifications At T_A + -40 to +85°C, V_{DD} ±5%, Input t_R, t_F = 20ns, V_{IH} = 0.7 V_{DD}, V_{IL} = 0.3 V_{DD}, C_L = 100 pF

PARAMETER		TEST CONDITIONS	LIMITS						UNITS
			CD1822			CDP1822C			
		V_{DD} (V)	(NOTE 1) MIN	(NOTE 2) TYP	MAX	(NOTE 1) MIN	(NOTE 2) TYP	MAX	
Read Cycle Times (Figure 1)									
Read Cycle	t_{RC}	5	450	-	-	450	-	-	ns
		10	250	-	-	-	-	-	ns
Access from Address	t_{AA}	5	-	250	450	-	250	450	ns
		10	-	150	250	-	-	-	ns
Output Valid from $\overline{\text{Chip-Select}}$ 1	t_{DOA1}	5	-	250	450	-	250	450	ns
		10	-	150	250	-	-	-	ns
Output Valid from Chip-Select 2	t_{DOA2}	5	-	250	450	-	250	450	ns
		10	-	150	250	-	-	-	ns
Output Valid from Output Disable	t_{DOA3}	5	-	-	200	-	-	200	ns
		10	-	-	110	-	-	-	ns
Output Hold from $\overline{\text{Chip-Select}}$ 1	t_{DOH1}	5	20	-	-	20	-	-	ns
		10	20	-	-	-	-	-	ns
Output Hold from Chip-Select 2	t_{DOH2}	5	20	-	-	20	-	-	ns
		10	20	-	-	-	-	-	ns
Output Hold from Output Disable	t_{DOH3}	5	20	-	-	20	-	-	ns
		10	20	-	-	-	-	-	ns

Dynamic Electrical Specifications At T_A + -40 to +85°C, V_{DD} ±5%, Input t_R, t_F = 20ns, V_{IH} = 0.7 V_{DD}, V_{IL} = 0.3 V_{DD}, C_L = 100 pF **(Continued)**

PARAMETER	TEST CONDITIONS V_{DD} (V)	LIMITS CD1822 (NOTE 1) MIN	CD1822 (NOTE 2) TYP	CD1822 MAX	CDP1822C (NOTE 1) MIN	CDP1822C (NOTE 2) TYP	CDP1822C MAX	UNITS

NOTES:

1. Time required by a limit device to allow for indicated function.
2. Typical values are for T_A = 25°C and nominal V_{DD}.

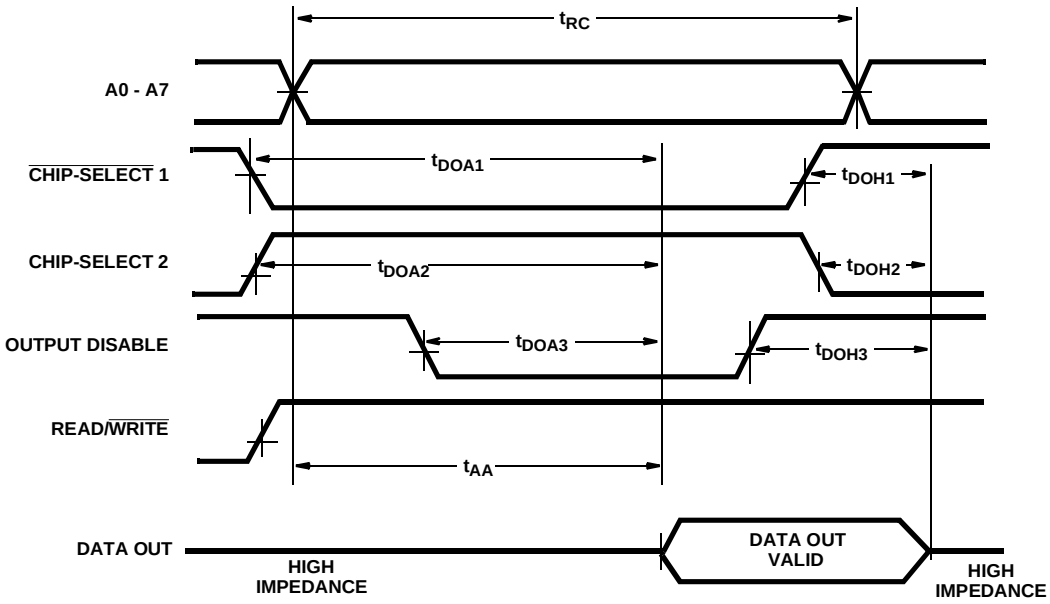


FIGURE 1. READ CYCLE TIMING WAVEFORMS

Dynamic Electrical Specifications At T_A + -40 to +85°C, V_{DD} ±5%, Input t_R, t_F = 20ns, V_{IH} = 0.7 V_{DD}, V_{IL} = 0.3 V_{DD}, C_L = 100 pF.

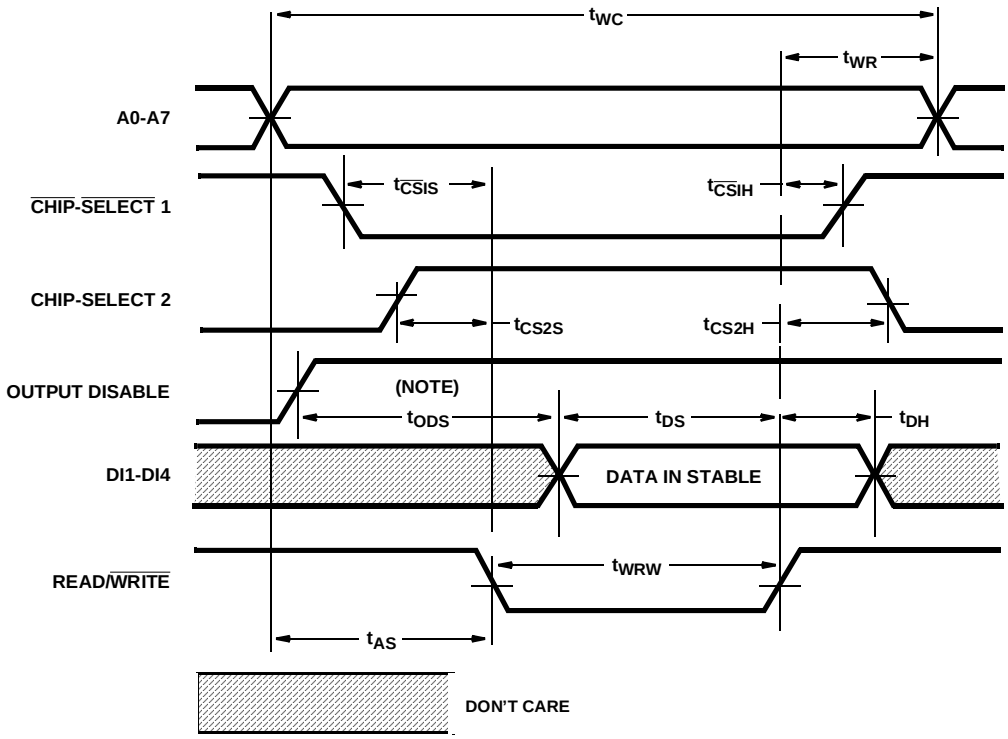
PARAMETER		TEST CONDITIONS V_{DD} (V)	LIMITS CD1822 (NOTE 1) MIN	CD1822 (NOTE 2) TYP	CD1822 MAX	CDP1822C (NOTE 1) MIN	CDP1822C (NOTE 2) TYP	CDP1822C MAX	UNITS
Read Cycle Times (Figure 2)									
Write Cycle	t_{WC}	5	500	-	-	500	-	-	ns
		10	300	-	-	-	-	-	ns
Address Setup	t_{AS}	5	200	-	-	200	-	-	ns
		10	110	-	-	-	-	-	ns
Write Recovery	t_{WR}	5	50	-	-	50	-	-	ns
		10	40	-	-	-	-	-	ns
Write Width	t_{WRW}	5	250	-	-	250	-	-	ns
		10	150	-	-	-	-	-	ns

Dynamic Electrical Specifications At T_A + -40 to +85^{o}C, V_{DD} ±5%, Input t_R, t_F = 20ns, V_{IH} = 0.7 V_{DD}, V_{IL} = 0.3 V_{DD}, C_L = 100 pF. **(Continued)**

PARAMETER		TEST CONDITIONS	LIMITS						UNITS
			CD1822			CDP1822C			
		V_{DD} (V)	(NOTE 1) MIN	(NOTE 2) TYP	MAX	(NOTE 1) MIN	(NOTE 2) TYP	MAX	
Input Data Setup Time	t_{DS}	5	250	-	-	250	-	-	ns
		10	150	-	-	-	-	-	ns
Data Hold	t_{DH}	5	50	-	-	50	-	-	ns
		10	40	-	-	-	-	-	ns
$\overline{\text{Chip-Select}}$ 1 Setup	$t_{\overline{CS}1S}$	5	200	-	-	200	-	-	ns
		10	110	-	-	-	-	-	ns
Chip-Select 2 Setup	t_{CS2S}	5	200	-	-	200	-	-	ns
		10	110	-	-	-	-	-	ns
$\overline{\text{Chip-Select}}$ 1 Hold	$t_{\overline{CS}1H}$	5	0	-	-	0	-	-	ns
		10	0	-	-	0	-	-	ns
Chip-Select 2 Hold	t_{CS2H}	5	0	-	-	0	-	-	ns
		10	0	-	-	0	-	-	ns
Output Disable Set-Up	t_{ODS}	5	200	-	-	200	-	-	ns
		10	110	-	-	-	-	-	ns

NOTES:

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



NOTE: t_{ODS} is required for common I/O operation only. For separate I/O operations, output disable is don't care.

FIGURE 2. WRITE CYCLE TIME WAVEFORMS

Data Retention Specifications At T_A = -40 to +85°C, see Figure 3.

PARAMETER		TEST CONDITIONS		LIMITS						UNITS
				CDP1822			CDP1822C			
		V_{DR} (V)	V_{DD} (V)	MIN	(NOTE 1) TYP	MAX	MIN	(NOTE 1) TYP	MAX	
Min. Data Retention Voltage	V_{DR}	-	-	-	1.5	2	-	1.5	2	V
Data Retention Quiescent Current	I_{DD}	2	-	-	30	100	-	30	100	µA
Chip Deselect to Data Retention Time	t_{CDR}	-	5	600	-	-	600	-	-	ns
		-	10	300	-	-	-	-	-	ns
Recovery to Normal Operation Time	t_{RC}	-	5	600	-	-	600	-	-	ns
		-	10	300	-	-	-	-	-	ns
V_{DD} to VDR Rise and Fall Time	t_R, t_F	2	5	1	-	-	1	-	-	µA

NOTE: Typical values are for T_A = 25°C and nominal V_{DD}.

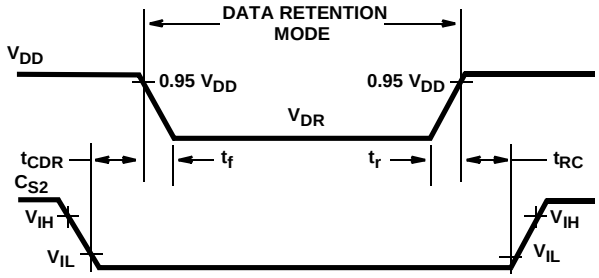


FIGURE 3. LOW V_{DD} DATA RETENTION TIME WAVEFORMS

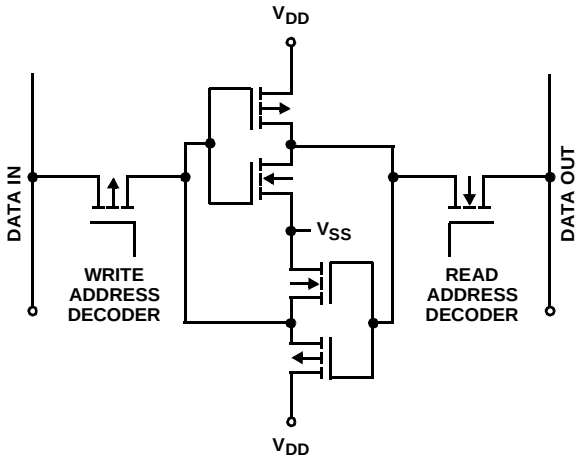


FIGURE 4. MEMORY CELL CONFIGURATION

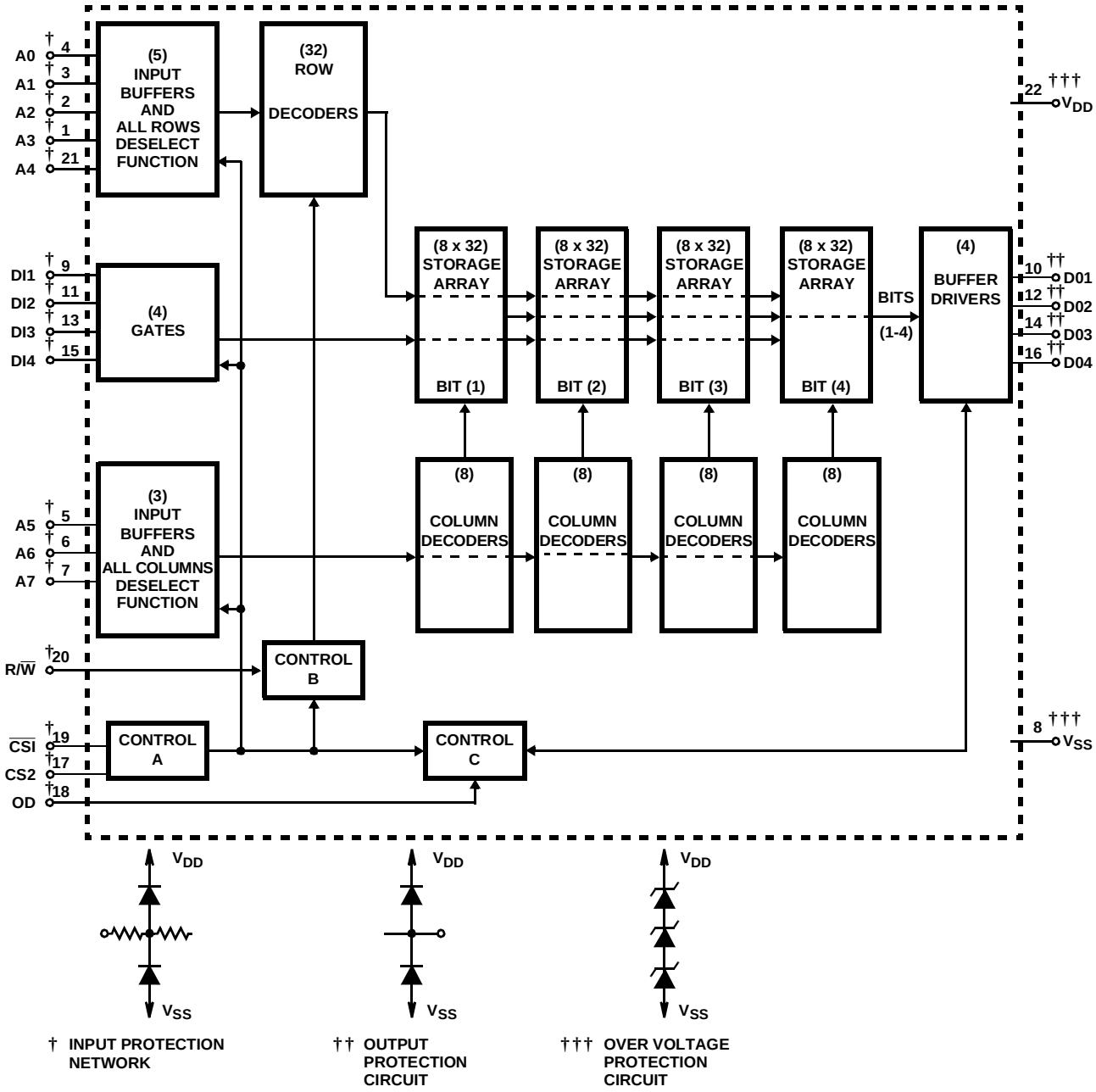


FIGURE 5. FUNCTIONAL BLOCK DIAGRAM FOR CDP1822 AND CDP1822C

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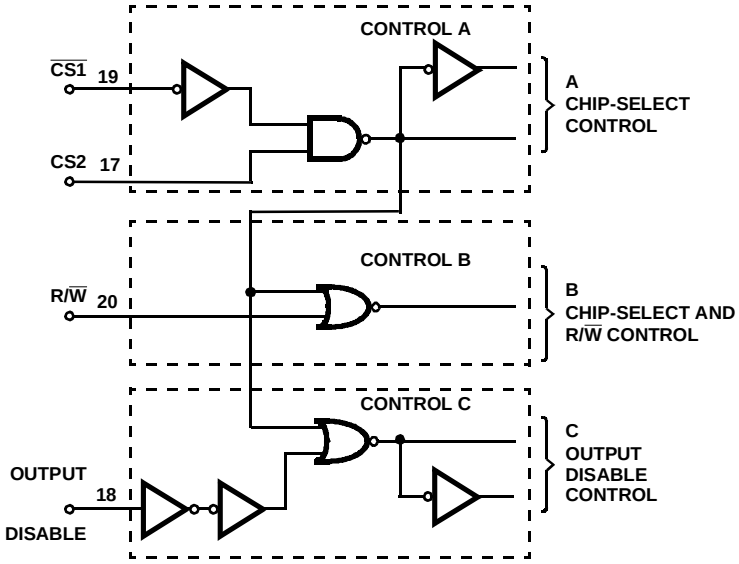

FIGURE 6. LOGIC DIAGRAM OF CONTROLS FOR CDP1822 AND CDP1822C