

#### Features

- ☐ High speed access times  
Com'l: 8, 10, 12, 15, 20 and 25 ns  
Ind'l: 10, 12, 15, 20, and 25 ns
- ☐ Low power operation
  - PDM41298SA  
Active: 400 mW (typ.)  
Standby: 150 mW (typ.)
  - PDM41298LA  
Active: 350 mW (typ.)  
Standby: 25 mW (typ.)
- ☐ Output Enable pin available for greater system flexibility
- ☐ Single +5V ( $\pm 10\%$ ) power supply
- ☐ TTL compatible inputs and outputs
- ☐ Packages
  - Plastic DIP (300 mil) - P
  - Cerdip (300 mil) - D
  - Plastic SOJ (300 mil) - SO
  - Plastic TSOP - T

#### Description

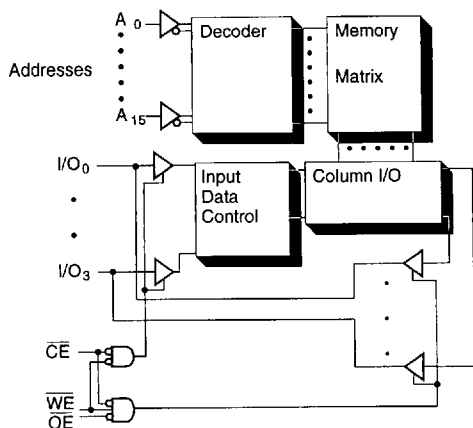
The PDM41298 is a high-performance CMOS static RAM organized as 65,536 x4 bits. This product is produced in Paradigm's proprietary CMOS technology which offers the designer the highest speed parts. Writing to this devices is accomplished when the write enable ( $\overline{WE}$ ) and the chip enable ( $\overline{CE}$ ) inputs are both LOW. Reading is accomplished when  $\overline{WE}$  remains HIGH and  $\overline{CE}$  and  $\overline{OE}$  are both LOW.

The PDM41298 operates from a single +5V power supply and all the inputs and outputs are fully TTL compatible. The PDM41298 comes in two versions, the standard power version PDM41298SA and a low power version the PDM41298LA. The two versions are functionally the same and only differ in their power consumption.

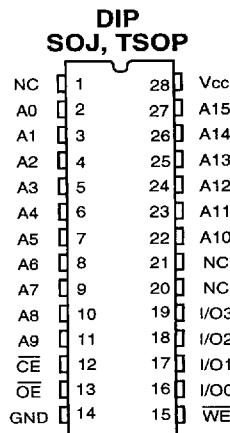
The PDM41298 is available in a 28-pin 300 mil DIP, a 28-pin 300 mil Cerdip, a 28-pin plastic TSOP, and a 28-pin 300 mil SOJ for surface mount applications.

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#### Functional Block Diagram



#### Pin Configuration



**Truth Table**

| OE | WE | CE | I/O              | MODE           |
|----|----|----|------------------|----------------|
| X  | X  | H  | Hi-Z             | Standby        |
| L  | H  | L  | D <sub>OUT</sub> | Read           |
| X  | L  | L  | D <sub>IN</sub>  | Write          |
| H  | H  | L  | Hi-Z             | Output Disable |

NOTE: 1. H =  $V_{IH}$ , L =  $V_{IL}$ , X = DON'T CARE

**Absolute Maximum Ratings <sup>(1)</sup>**

| Symbol            | Rating                            | Com'l.       | Ind.         | Unit |
|-------------------|-----------------------------------|--------------|--------------|------|
| V <sub>TERM</sub> | Terminal Voltage with Respect GND | -0.5 to +7.0 | -0.5 to +7.0 | V    |
| T <sub>BIAS</sub> | Temperature Under Bias            | -55 to +125  | -65 to +135  | °C   |
| T <sub>STG</sub>  | Storage Temperature               | -55 to +125  | -65 to +150  | °C   |
| P <sub>T</sub>    | Power Dissipation                 | 1.0          | 1.0          | W    |
| I <sub>OUT</sub>  | DC Output Current                 | 50           | 50           | mA   |

NOTE: 1. Stresses greater than 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 reliability.

**Recommended DC Operating Conditions**

| Symbol          | Parameter           | Min. | Typ. | Max. | Unit |
|-----------------|---------------------|------|------|------|------|
| V <sub>CC</sub> | Supply Voltage      | 4.5  | 5.0  | 5.5  | V    |
| GND             | Supply Voltage      | 0    | 0    | 0    | V    |
| Commercial      | Ambient Temperature | 0    | 25   | 70   | °C   |
| Industrial      | Ambient Temperature | -40  | 25   | 85   | °C   |

DC Electrical Characteristics ( $V_{CC} = 5.0V \pm 10\%$ )

| Symbol   | Parameter              | Test Conditions                                                                                 |                | PDM41298SA          |            | PDM41298LA          |            | Unit          |
|----------|------------------------|-------------------------------------------------------------------------------------------------|----------------|---------------------|------------|---------------------|------------|---------------|
|          |                        |                                                                                                 |                | Min.                | Max.       | Min.                | Max.       |               |
| $I_{LI}$ | Input Leakage Current  | $V_{CC} = \text{MAX.}, V_{IN} = \text{GND to } V_{CC}$                                          | Com'l/<br>Ind. | -5                  | 5          | -2                  | 5          | $\mu\text{A}$ |
| $I_{LO}$ | Output Leakage Current | $V_{CC} = \text{MAX.},$<br>$\overline{CE} = V_{IH}, V_{OUT} = \text{GND to } V_{CC}$            | Com'l/<br>Ind. | -5                  | 5          | -2                  | 5          | $\mu\text{A}$ |
| $V_{IH}$ | Input High Voltage     |                                                                                                 |                | 2.2                 | 6.0        | 2.2                 | 6.0        | V             |
| $V_{IL}$ | Input Low Voltage      |                                                                                                 |                | -0.5 <sup>(1)</sup> | 0.8        | -0.5 <sup>(1)</sup> | 0.8        | V             |
| $V_{OL}$ | Output Low Voltage     | $I_{OL} = 8 \text{ mA}, V_{CC} = \text{Min.}$<br>$I_{OL} = 10 \text{ mA}, V_{CC} = \text{Min.}$ |                | —                   | 0.4<br>0.5 | —                   | 0.4<br>0.5 | V<br>V        |
| $V_{OH}$ | Output High Voltage    | $I_{OH} = -4 \text{ mA}, V_{CC} = \text{Min.}$                                                  |                | 2.4                 | —          | 2.4                 | —          | V             |

NOTE: 1.  $V_{IL}(\text{min}) = -3.0\text{V}$  for pulse width less than 20 ns.

## Power Supply Characteristics

| Symbol    | Parameter                                                                                    | Power | -8     | -10    |      | -12    |      | -15    |      | -20    |      | -25    |      |
|-----------|----------------------------------------------------------------------------------------------|-------|--------|--------|------|--------|------|--------|------|--------|------|--------|------|
|           |                                                                                              |       | Com'l. | Com'l. | Ind. | Com'l. | Ind. | Com'l. | Ind. | Com'l. | Ind. | Com'l. | Ind. |
| $I_{CC}$  | Operating Current<br>$\overline{CE} = V_{IL}$                                                | SA    | 200    | 190    | 200  | 180    | 190  | 170    | 180  | 160    | 170  | 150    | 160  |
|           | $f = f_{\text{MAX}} = 1/t_{RC}$<br>$V_{CC} = \text{Max}$<br>$I_{OUT} = 0 \text{ mA}$         | LA    | 180    | 170    | 180  | 160    | 170  | 150    | 160  | 140    | 150  | 130    | 140  |
| $I_{SB}$  | Standby Current<br>$\overline{CE} = V_{IH}$                                                  | SA    | 80     | 70     | 70   | 60     | 60   | 50     | 50   | 40     | 40   | 35     | 35   |
|           | $f = f_{\text{MAX}} = 1/t_{RC}$<br>$V_{CC} = \text{Max}$                                     | LA    | 80     | 70     | 70   | 60     | 60   | 50     | 50   | 40     | 40   | 35     | 35   |
| $I_{SB1}$ | Full Standby Current<br>$\overline{CE} \geq V_{CC} - 0.2\text{V}$                            | SA    | 20     | 20     | 20   | 20     | 20   | 10     | 20   | 10     | 20   | 10     | 20   |
|           | $f = 0$<br>$V_{CC} = \text{Max}$<br>$V_{IN} \geq V_{CC} - 0.2\text{V}$ or $\leq 0.2\text{V}$ | LA    | 5      | 5      | 10   | 5      | 10   | 5      | 10   | 5      | 10   | 5      | 10   |

SHADED AREA = PRELIMINARY DATA.

NOTE: All values are maximum guaranteed values.

Capacitance<sup>(1)</sup> ( $T_A = +25^\circ\text{C}$ ,  $f = 1.0 \text{ MHz}$ )

| Symbol    | Parameter          | Max. | Unit |
|-----------|--------------------|------|------|
| $C_{IN}$  | Input Capacitance  | 8    | pF   |
| $C_{OUT}$ | Output Capacitance | 8    | pF   |

NOTE: 1. This parameter is determined by device characterization but is not production tested.

# AC Test Conditions

|                               |                     |
|-------------------------------|---------------------|
| Input Pulse Levels            | GND to 3.0V         |
| Input rise and fall times     | 5 ns                |
| Input timing reference levels | 1.5V                |
| Output reference levels       | 1.5V                |
| Output load                   | See figures 1 and 2 |

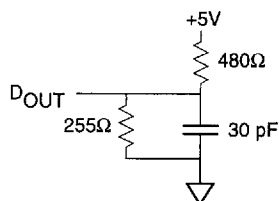


Figure 1. Output Load Equivalent

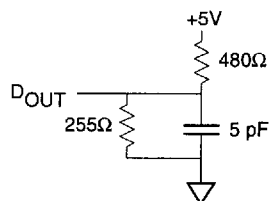
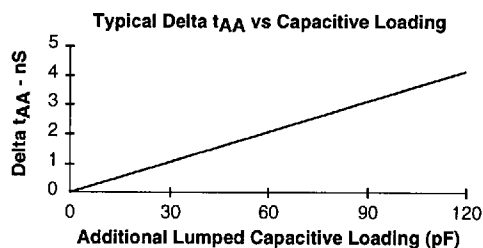
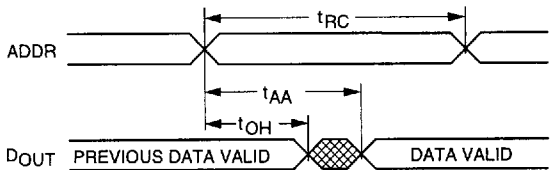


Figure 2. Output Load Equivalent  
(for  $t_{LZCE}$ ,  $t_{HZCE}$ ,  $t_{LZWE}$ ,  $t_{HZWE}$ ,  $t_{LZOE}$ ,  $t_{HZOE}$ )

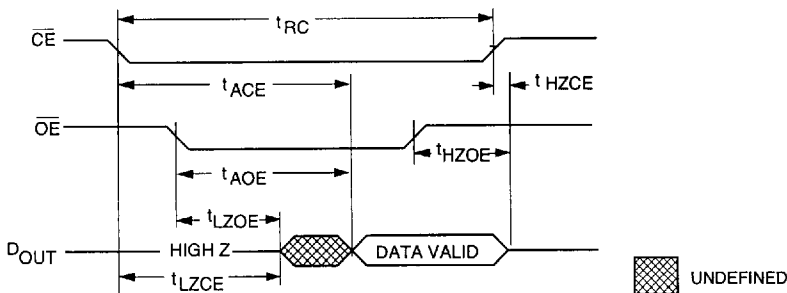


Read Cycle No. 1<sup>(1)</sup>



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Read Cycle No. 2<sup>(2)</sup>



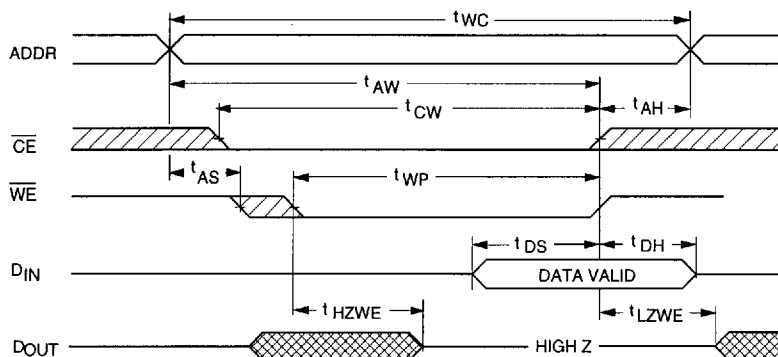
AC Electrical Characteristics (V<sub>CC</sub> = 5V ± 10%, All Temperature Ranges)

| Description                                           |                   | -8 <sup>(6)</sup> |      | -10 <sup>(6)</sup> |      | -12  |      | -15  |      | -20  |      | -25  |      |       |
|-------------------------------------------------------|-------------------|-------------------|------|--------------------|------|------|------|------|------|------|------|------|------|-------|
| READ Cycle                                            | Sym               | Min.              | Max. | Min.               | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Units |
| READ cycle time                                       | t <sub>RC</sub>   | 8                 |      | 10                 |      | 12   |      | 15   |      | 20   |      | 25   |      | ns    |
| Address access time                                   | t <sub>AA</sub>   |                   | 8    |                    | 10   |      | 12   |      | 15   |      | 20   |      | 25   | ns    |
| Chip enable access time                               | t <sub>ACE</sub>  |                   | 8    |                    | 10   |      | 12   |      | 15   |      | 20   |      | 25   | ns    |
| Output hold from address change                       | t <sub>OH</sub>   | 3                 |      | 3                  |      | 3    |      | 3    |      | 3    |      | 3    |      | ns    |
| Chip enable to output in low Z <sup>(3, 4, 5)</sup>   | t <sub>LZCE</sub> | 5                 |      | 5                  |      | 5    |      | 5    |      | 5    |      | 5    |      | ns    |
| Chip disable to output in high Z <sup>(3, 4, 5)</sup> | t <sub>HCZE</sub> |                   | 8    |                    | 10   |      | 10   |      | 10   |      | 15   |      | 15   | ns    |
| Chip enable to power up time <sup>(4)</sup>           | t <sub>PU</sub>   | 0                 |      | 0                  |      | 0    |      | 0    |      | 0    |      | 0    |      | ns    |
| Chip disable to power down time <sup>(4)</sup>        | t <sub>PD</sub>   |                   | 8    |                    | 10   |      | 12   |      | 15   |      | 20   |      | 25   | ns    |
| Output enable access time                             | t <sub>AOE</sub>  |                   | 5    |                    | 5    |      | 6    |      | 8    |      | 10   |      | 12   | ns    |
| Output enable to output in low Z <sup>(4, 5)</sup>    | t <sub>LZOE</sub> | 0                 |      | 0                  |      | 0    |      | 0    |      | 0    |      | 0    |      | ns    |
| Output disable to output in high Z <sup>(4, 5)</sup>  | t <sub>HZOE</sub> |                   | 8    |                    | 8    |      | 8    |      | 8    |      | 8    |      | 10   | ns    |

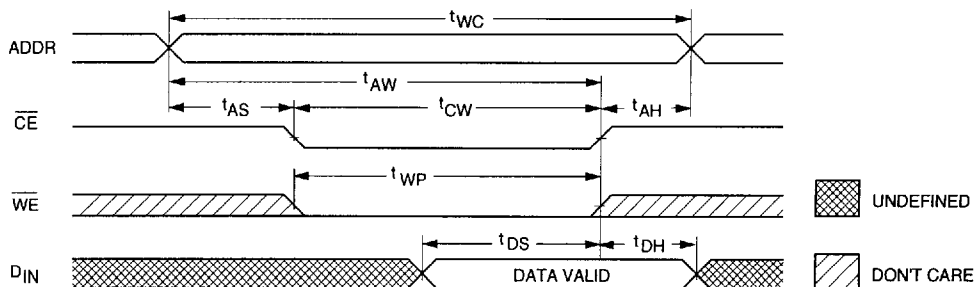
SHADED AREA = PRELIMINARY DATA.

Notes referenced are after Data Retention Table.

## Write Cycle No. 1 (Write Enable Controlled)



## Write Cycle No. 2 (Chip Enable Controlled)

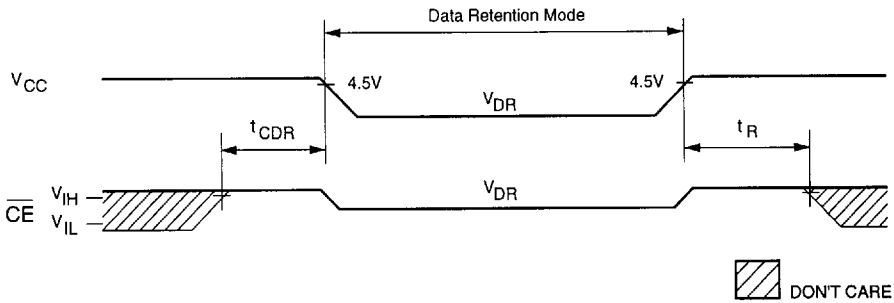


## AC Electrical Characteristics ( $V_{CC} = 5V \pm 10\%$ , All Temperature Ranges)

| Description                                 | Sym        | -8 <sup>(6)</sup> |      | -10 <sup>(6)</sup> |      | -12  |      | -15  |      | -20  |      | -25  |      | Units |
|---------------------------------------------|------------|-------------------|------|--------------------|------|------|------|------|------|------|------|------|------|-------|
|                                             |            | Min.              | Max. | Min.               | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. |       |
| WRITE Cycle                                 |            |                   |      |                    |      |      |      |      |      |      |      |      |      |       |
| WRITE Cycle time                            | $t_{WC}$   | 8                 |      | 10                 |      | 12   |      | 15   |      | 20   |      | 25   |      | ns    |
| Chip enable to end of write                 | $t_{CW}$   | 8                 |      | 10                 |      | 10   |      | 12   |      | 13   |      | 15   |      | ns    |
| Address Valid to end of write               | $t_{AW}$   | 8                 |      | 10                 |      | 10   |      | 12   |      | 13   |      | 15   |      | ns    |
| Address setup time                          | $t_{AS}$   | 0                 |      | 0                  |      | 0    |      | 0    |      | 0    |      | 0    |      | ns    |
| Address hold from end of write              | $t_{AH}$   | 0                 |      | 0                  |      | 0    |      | 0    |      | 0    |      | 0    |      | ns    |
| Write pulse width                           | $t_{WP}$   | 8                 |      | 10                 |      | 10   |      | 11   |      | 12   |      | 15   |      | ns    |
| Data setup time                             | $t_{DS}$   | 7                 |      | 7                  |      | 7    |      | 8    |      | 9    |      | 10   |      | ns    |
| Data hold time                              | $t_{DH}$   | 0                 |      | 0                  |      | 0    |      | 0    |      | 0    |      | 0    |      | ns    |
| Write disable to output in low $Z^{(4, 5)}$ | $t_{LZWE}$ | 0                 |      | 0                  |      | 0    |      | 0    |      | 0    |      | 0    |      | ns    |
| Write enable to output in high $Z^{(4, 5)}$ | $t_{HZWE}$ |                   | 3    |                    | 3    |      | 3    |      | 3    |      | 3    |      | 5    | ns    |

SHADED AREA = PRELIMINARY DATA.

Low V<sub>CC</sub> Data Retention Waveform



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Data Retention Electrical Characteristics (LA Version Only)

| Symbol                        | Parameter                            | Test Conditions                                                          |                                | Min.            | Typ.      | Max.       | Unit    |
|-------------------------------|--------------------------------------|--------------------------------------------------------------------------|--------------------------------|-----------------|-----------|------------|---------|
| V <sub>DR</sub>               | V <sub>CC</sub> for Retention Data   |                                                                          |                                | 2               | —         | —          | V       |
| I <sub>CCDR</sub>             | Data Retention Current               | $CE \geq V_{CC} - 0.2V$<br>$V_{IN} \geq V_{CC} - 0.2V$<br>or $\leq 0.2V$ | $V_{CC} = 2V$<br>$V_{CC} = 3V$ | —               | 95<br>350 | 500<br>750 | $\mu A$ |
| t <sub>CDR</sub>              | Chip Deselect to Data Retention Time |                                                                          |                                | 0               | —         | —          | ns      |
| t <sub>R</sub> <sup>(4)</sup> | Operation Recovery Time              |                                                                          |                                | t <sub>RC</sub> | —         | —          | ns      |

NOTES: (For 3 previous Electrical Characteristics tables)

- 1. The device is continuously selected. All the Chip Enables are held in their active state.
- 2. The address is valid prior to or coincident with the latest occurring Chip Enable.
- 3. At any given temperature and voltage condition, t<sub>HZCE</sub> is less than t<sub>LZCE</sub>.
- 4. This parameter is sampled.
- 5. The parameter is tested with CL = 5 pF as shown in Figure 2. Transition is measured ±200 mV from steady state voltage.
- 6. V<sub>CC</sub> = 5V ± 5%.

# Ordering Information

| PDM | XXXXX       | A     | XX    | A       | A                           |                                   |
|-----|-------------|-------|-------|---------|-----------------------------|-----------------------------------|
|     | Device Type | Power | Speed | Package | Process / Temperature Range |                                   |
|     |             |       |       |         | Blank                       | Commercial (0° to +70°C)          |
|     |             |       |       |         | I                           | Industrial Temp. (-40°C to +85°C) |
|     |             |       |       |         | P                           | 28-pin 300 mil Plastic Dip        |
|     |             |       |       |         | D                           | 28-pin 300 mil Cerdip             |
|     |             |       |       |         | SO                          | 28-pin 300 mil Plastic SOJ        |
|     |             |       |       |         | T                           | 28-pin TSOP                       |
|     |             |       |       |         | 8                           | Commercial Only                   |
|     |             |       |       |         | 10                          |                                   |
|     |             |       |       |         | 12                          |                                   |
|     |             |       |       |         | 15                          |                                   |
|     |             |       |       |         | 20                          |                                   |
|     |             |       |       |         | 25                          |                                   |
|     |             |       |       |         | SA                          | Standard Power                    |
|     |             |       |       |         | LA                          | Low Power                         |
|     |             |       |       |         | 41298                       | 256K (64K x 4) Static RAM         |

| Chip     | Package Type        |
|----------|---------------------|
| PDM41298 | 28-pin Plastic DIP  |
|          | 28-pin Cerdip       |
|          | 28-pin Plastic SOJ  |
|          | 28-pin Plastic TSOP |