

Features

- High-speed access times
 - Com'l: 12, 15, 17 and 20 ns
 - Ind: 15, 17 and 20 ns
- Low power operation (typical)
 - PDM31516SA
 - Active: 200 mW
 - Standby: 50 mW
- High-density 32K x 16 architecture
- 3.3V ($\pm 0.3V$) power supply
- Fully static operation
- TTL-compatible inputs and outputs
- Outbut buffer controls: $\overline{OE}$
- Data byte controls: $\overline{LB}$, $\overline{UB}$
- Packages:
 - 44-pin Plastic TSOP - T
 - 44-pin Plastic SOJ (400 mil) - SO

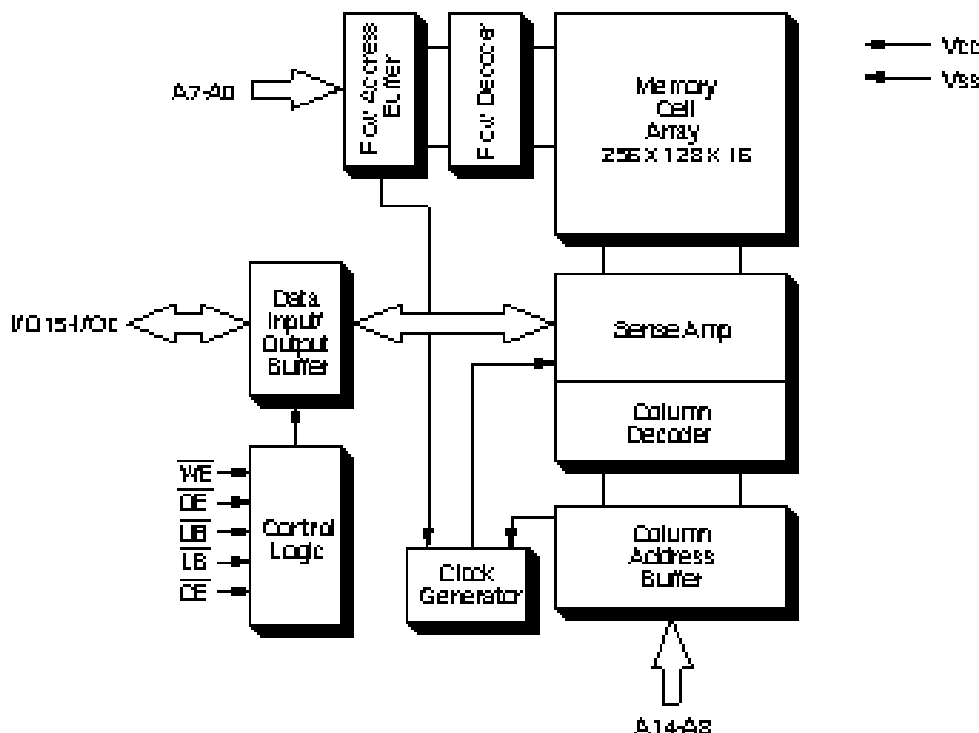
Description

The PDM31516 is a high-performance CMOS static RAM organized as 32,768 x 16 bits. This product is produced using Paradigm's proprietary CMOS technology which offers the designer the highest speed parts. The PDM31516 features low power dissipation using chip enable ($\overline{CE}$) and has an output enable input ($\overline{OE}$) for fast memory access. Byte access is supported by upper and lower byte controls.

The PDM31516 operates from a single +3.3V power supply and all the inputs and outputs are fully TTL-compatible.

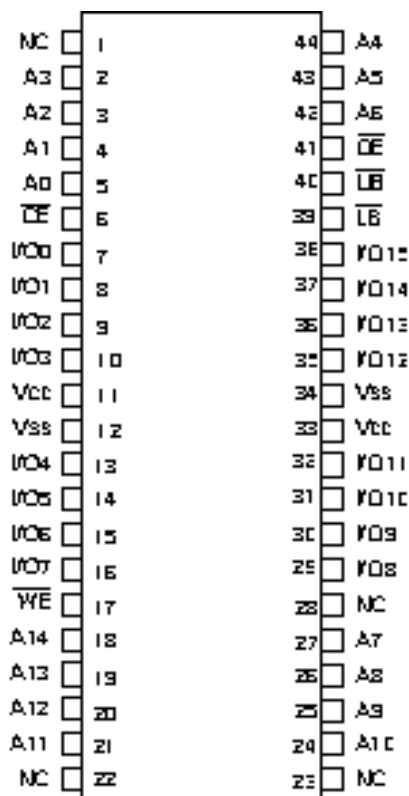
The PDM31516 is available in a 400-mil 44-pin plastic SOJ and a 44-pin plastic TSOP package.

Functional Block Diagram

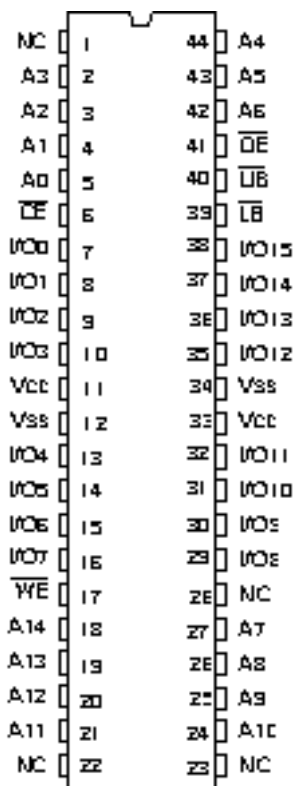


Pin Configuration

44-Pin TSOP



44-Pin SOJ



Pin Description

Name	Description
A14-A0	Address Inputs
I/O15-I/O0	Data Inputs/Outputs
$\overline{CE}$	Chip Enable Input
$\overline{WE}$	Write Enable Input
$\overline{OE}$	Output Enable Input
$\overline{LB}$, $\overline{UB}$	Data Byte Control Inputs
NC	No Connect
V _{CC}	Power (+3.3V)
V _{SS}	Ground

Operating Mode

Mode	CE	OE	WE	LB	UB	I/O7-I/O0	I/O15-I/O8	Power
Read	L	L	H	L	L	Output	Output	I _{CC}
				H	L	High Impedance	Output	I _{CC}
				L	H	Output	High Impedance	I _{CC}
Write	L	X	L	L	L	Input	Input	I _{CC}
				H	L	High Impedance	Input	I _{CC}
				L	H	Input	High Impedance	I _{CC}
Output Disable	L	H	H	X	X	High Impedance	High Impedance	I _{CC}
	L	X	X	H	H	High Impedance	High Impedance	I _{CC}
Standby	H	X	X	X	X	High Impedance	High Impedance	I _{SB}

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

Absolute Maximum Ratings

Symbol	Rating	Com'l.	Ind.	Unit
V_{TERM}	Terminal Voltage with Respect to V_{SS}	−0.5 to +4.6	−0.5 to +4.6	V
T_{BIAS}	Temperature Under Bias	−55 to +125	−55 to +135	°C
T_{STG}	Storage Temperature	−55 to +125	−65 to +150	°C
P_D	Power Dissipation	1.5	1.5	W
I_{OUT}	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	Description	Min.	Typ.	Max.	Unit
V_{CC}	Supply Voltage	3.0	3.3	3.6	V
V_{SS}	Supply Voltage	0	0	0	V
Industrial	Ambient Temperature	−40	25	85	°C
Commercial	Ambient Temperature	0	25	70	°C

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DC Electrical Characteristics ($V_{CC} = 3.3V \pm 0.3V$)

Symbol	Parameter	Test Conditions		Min.	Max.	Unit
I_{LI}	Input Leakage Current	$V_{CC} = \text{Max.}, V_{IN} = V_{SS} \text{ to } V_{CC}$	Com'l/ Ind.	−5	5	μA
I_{LO}	Output Leakage Current	$V_{CC} = \text{Max.},$ $CE = V_{IH}, V_{OUT} = V_{SS} \text{ to } V_{CC}$	Com'l/ Ind.	−5	5	μA
V_{IL}	Input Low Voltage			−0.3 ⁽¹⁾	0.8	V
V_{IH}	Input High Voltage			2.2	$V_{CC} + 0.3$	V
V_{OL}	Output Low Voltage	$I_{OL} = 8 \text{ mA}, V_{CC} = \text{Min.}$		—	0.4	V
V_{OH}	Output High Voltage	$I_{OH} = -4 \text{ mA}, V_{CC} = \text{Min.}$		2.4	—	V

NOTE:1.Undershoots to −3.0V for 10 ns are allowed once per cycle.

Power Supply Characteristics

Symbol	Parameter	-12	-15		-17		-20		Unit
		Com'l.	Com'l.	Ind.	Com'l.	Ind.	Com'l.	Ind.	
I_{CC}	Operating Current $\overline{CE} = V_{IL}$ $f = f_{MAX} = 1/t_{RC}$ $V_{CC} = \text{Max.}$ $I_{OUT} = 0 \text{ mA}$	150	140	150	130	140	120	130	mA
I_{SB}	Standby Current $\overline{CE} = V_{IH}$ $f = f_{MAX} = 1/t_{RC}$ $V_{CC} = \text{Max.}$	40	35	35	35	35	30	30	mA
I_{SB1}	Full Standby Current $\overline{CE} \geq V_{HC}$ $f = 0$ $V_{CC} = \text{Max.},$ $V_{IN} \geq V_{CC} - 0.2V \text{ or } \leq 0.2V$	10	10	15	10	15	10	15	mA

NOTES: All values are maximum guaranteed values.

$V_{LC} \leq 0.2V$, $V_{HC} \geq V_{CC} - 0.2V$

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

Symbol	Parameter	Conditions	Max.	Unit
C_{IN}	Input Capacitance	$V_{IN} = V_{SS}$	6	pF
$C_{I/O}$	Output Capacitance	$V_{I/O} = V_{SS}$	8	pF

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

AC Test Conditions

Input pulse levels	V_{SS} to 3.0V
Input rise and fall times	2.5 ns
Input timing reference levels	1.5V
Output reference levels	1.5V
Output load	See Figures 1 and 2

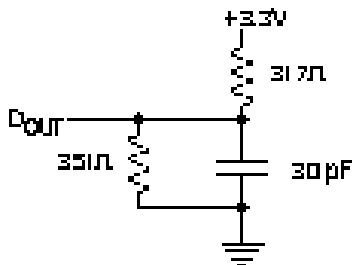


Figure 1. Output Load

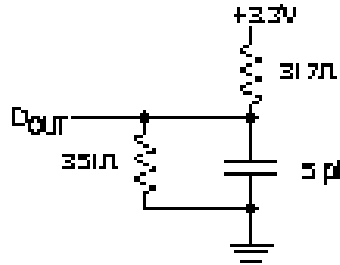
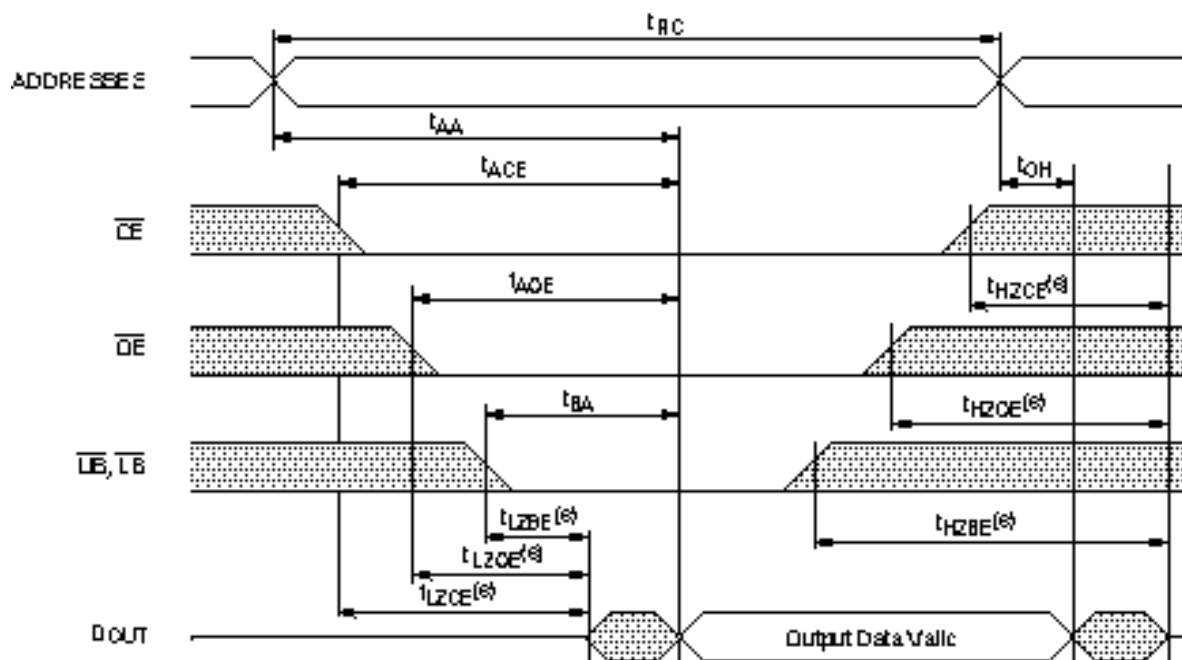


Figure 2. Output Load Equivalent
(for t_{LZCE} , t_{HZCE} , t_{LZWE} , t_{HZWE})

Read Cycle Timing Diagram⁽¹⁾

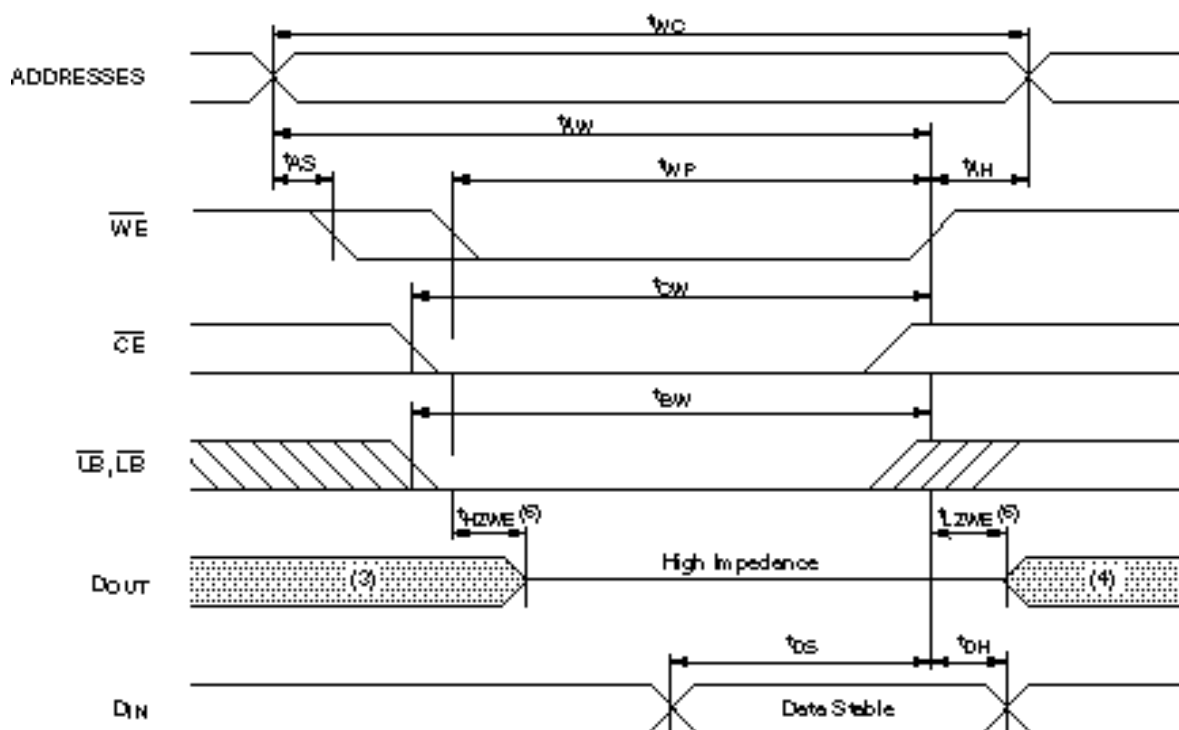


AC Electrical Characteristics

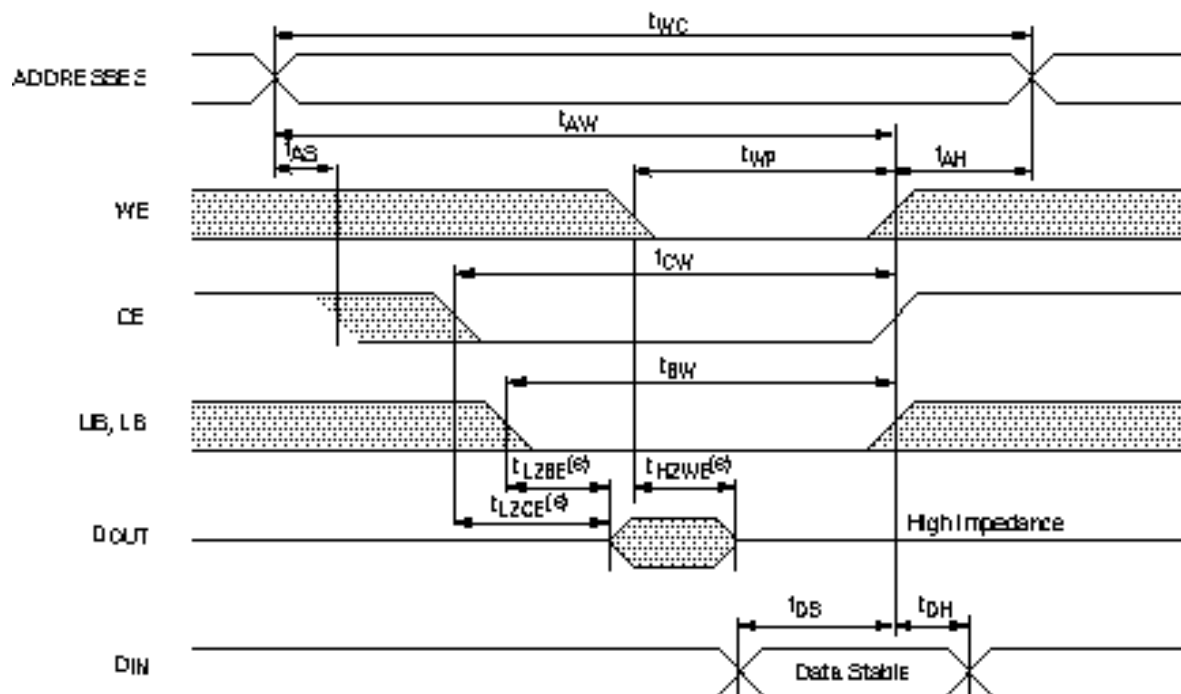
Description	Symbol	-12		-15		-17		-20		Unit
READ Cycle		Min	Max	Min	Max	Min	Max	Min	Max	
READ cycle time	t_{RC}	12	—	15	—	17	—	20	—	ns
Address access time	t_{AA}	—	12	—	15	—	17	—	20	ns
Chip enable access time	t_{ACE}	—	12	—	15	—	17	—	20	ns
Byte access time	t_{BA}	—	7	—	8	—	9	—	9	ns
Output hold from address change	t_{OH}	3	—	3	—	3	—	3	—	ns
Byte disable to output in low-Z	t_{LZBE}	0	—	0	—	0	—	0	—	ns
Byte enable to output in high-Z	t_{HZBE}	—	8	—	9	—	9	—	7	ns
Chip enable to output in low-Z ⁽¹⁾	t_{LZCE}	3	—	3	—	3	—	3	—	ns
Chip disable to output high-Z ^(1,2)	t_{HZCE}	—	7	—	8	—	9	—	9	ns
Output enable access time	t_{AOE}	—	7	—	8	—	9	—	9	ns
Output enable to output in low-Z	t_{LZOE}	1	—	1	—	1	—	1	—	ns
Output disable to output in high-Z ⁽²⁾	t_{HZOE}	—	7	—	8	—	9	—	9	ns

- NOTES: 1. At any given temperature and voltage condition, t_{HZCE} is less than t_{LZCE} and t_{HZWE} is less than t_{LZWE} .
2. t_{HZCE} , t_{HZOE} , and t_{HZWE} are specified with $C_L = 5$ pF as in Figure 2. Transition is measured ± 200 mV from steady state voltage.

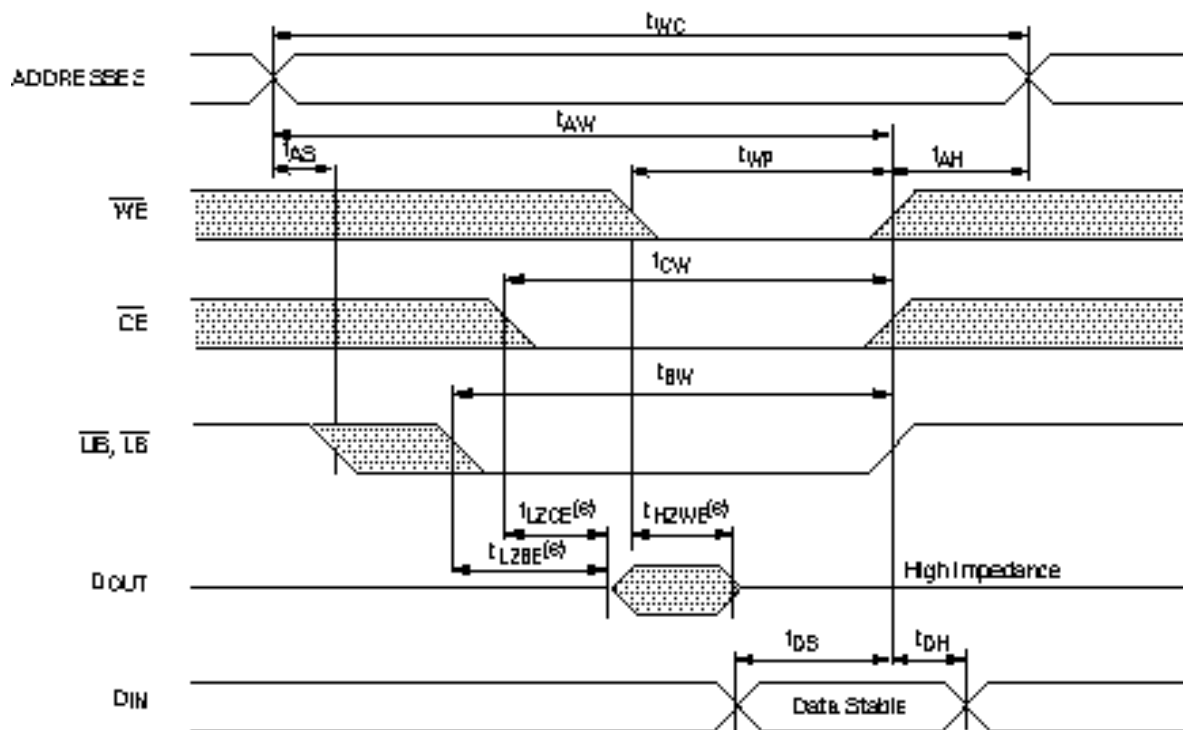
Write Cycle 1 Timing Diagram⁽⁵⁾ ($\overline{WE}$ Controlled)



Write Cycle 2 Timing Diagram⁽⁵⁾ ($\overline{CE}$ Controlled)



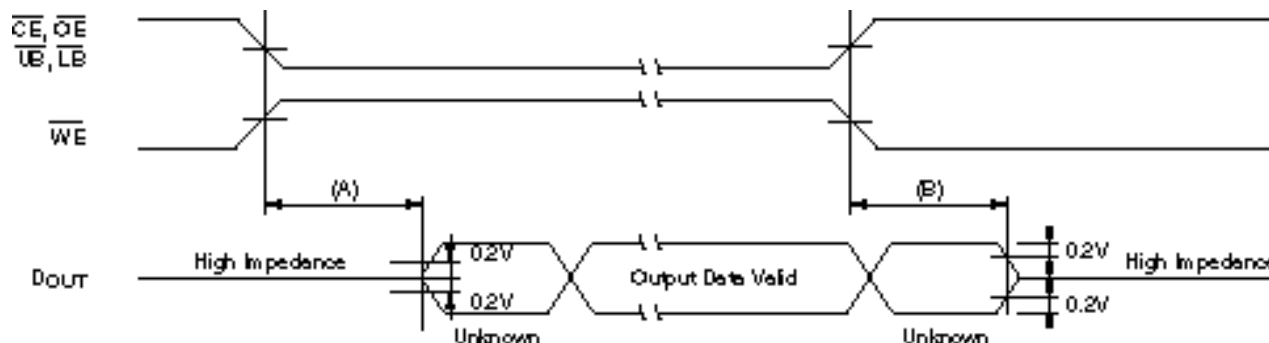
Write Cycle 3 Timing Diagram⁽⁵⁾ ($\overline{\text{UB}}$, $\overline{\text{LB}}$ Controlled)



AC Electrical Characteristics

Description	Sym	-12		-15		-17		-20		Unit
WRITE Cycle		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
WRITE cycle time	t_{WC}	12	—	15	—	17	—	20	—	ns
Chip enable to end of write	t_{CW}	10	—	11	—	11	—	12	—	ns
Address valid to end of write	t_{AW}	10	—	11	—	11	—	12	—	ns
Byte pulse width	t_{BW}	10	—	12	—	12	—	13	—	ns
Address setup time	t_{AS}	0	—	0	—	0	—	0	—	ns
Address hold from end of write	t_{AH}	0	—	0	—	0	—	0	—	ns
Write pulse width	t_{WP}	8	—	9	—	9	—	10	—	ns
Data setup time	t_{DS}	7	—	8	—	9	—	9	—	ns
Data hold time	t_{DH}	0	—	0	—	0	—	0	—	ns
Byte disable to output in low $Z^{(4,5)}$	$t_{\text{LZBE}}^{(5)}$	1	—	1	—	1	—	1	—	ns
Byte enable to output in high $Z^{(4,5)}$	$t_{\text{HZBE}}^{(5)}$	—	7	—	8	—	8	—	9	ns
Output disable to output in low $Z^{(4,5)}$	$t_{\text{LZOE}}^{(5)}$	0	—	0	—	0	—	0	—	ns
Output enable to output in high $Z^{(4,5)}$	$t_{\text{HZOE}}^{(5)}$	—	7	—	8	—	8	—	9	ns
Write disable to output in low $Z^{(4,5)}$	$t_{\text{LZWE}}^{(5)}$	1	—	1	—	1	—	1	—	ns
Write enable to output in high $Z^{(4,5)}$	$t_{\text{HZWE}}^{(5)}$	—	7	—	8	—	8	—	9	ns

- NOTES:**
1. The operating temperature (T_A) is guaranteed with transverse air flow exceeding 400 linear feet per minute.
 2. $\overline{WE}$ is HIGH for read cycles.
 3. If the $\overline{CE}$ LOW transition occurs coincident with or after the $\overline{WE}$ LOW transition, outputs remain in a high impedance state.
 4. If the $\overline{CE}$ HIGH transition occurs coincident with or after the $\overline{WE}$ HIGH transition, outputs remain in a high impedance state.
 5. If $\overline{OE}$ is HIGH during a write cycle, the outputs are in a high-impedance state during this period.
 6. The following parameters are measured using the load shown in Figures 1 and 2.
 - (A) t_{COE} , t_{OEE} , t_{BE} , $t_{OE\overline{W}}$ Output Enable Time
 - (B) t_{COD} , t_{ODO} , t_{BD} , $t_{OD\overline{W}}$ Output Disable Time



Ordering Information

PDM	xxxxx	X	XX	X	X	
	Device Type	Power	Speed	Package Type	Process Temp. Range	
						Blank
						I
						Commercial (0° to +70°C)
						Industrial (-40°C to +85°C)
						SO
						T
						44-pin 400-mil Plastic SOJ
						44-pin Plastic TSOP
						12
						15
						17
						20
						Commercial Only
						SA
						Standard
						31516
						32K x 16 Static RAM