2-Mbit (128K x 16) Static RAM

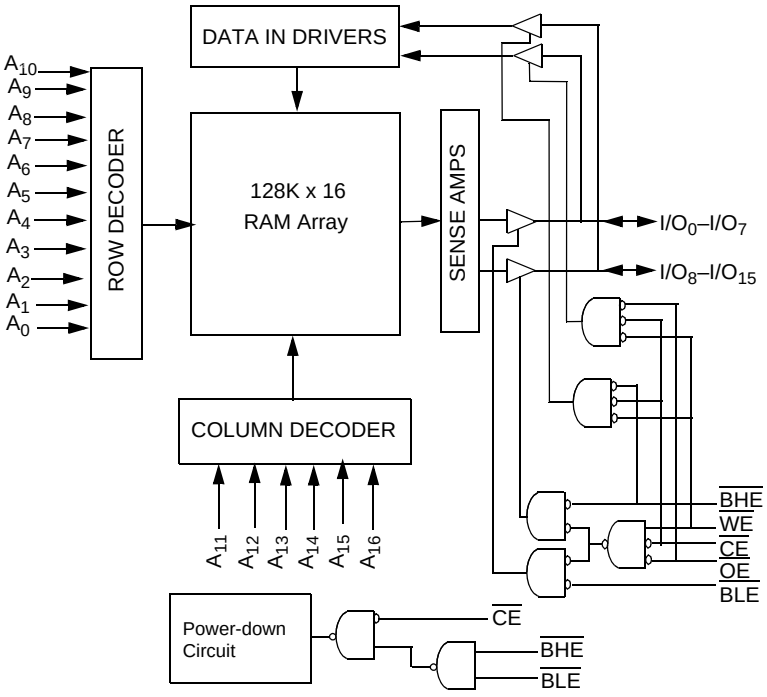
Features

- **Temperature Ranges**
  - **— Industrial: –40°C to 85°C**
  - **— Automotive-A: –40°C to 85°C**
  - **— Automotive-E: –40°C to 125°C**
- **High Speed: 55 ns**
- **Wide voltage range: 2.7V–3.6V**
- **Ultra-low active, standby power**
- **Easy memory expansion with $\overline{CE}$ and $\overline{OE}$ features**
- **TTL-compatible inputs and outputs**
- **Automatic power-down when deselected**
- **CMOS for optimum speed/power**
- **Available in Pb-free 44-pin TSOP Type II package**

Functional Description[1]

The CY62137VN is a high-performance CMOS static RAM organized as 128K words by 16 bits. This device features advanced circuit design to provide ultra-low active current. This is ideal for providing More Battery Life™ (MoBL®) in portable applications such as cellular telephones. The device also has an automatic power-down feature that reduces power consumption by 99% when addresses are not toggling. The device can also be put into standby mode when deselected ($\overline{CE}$ HIGH) or when $\overline{CE}$ is LOW and both $\overline{BLE}$ and $\overline{BHE}$ are HIGH. The input/output pins (I/O_0 through I/O_{15}) are placed in a high-impedance state when: deselected ($\overline{CE}$ HIGH), outputs are disabled ($\overline{OE}$ HIGH), $\overline{BHE}$ and $\overline{BLE}$ are disabled ($\overline{BHE}$, $\overline{BLE}$ HIGH), or during a write operation ($\overline{CE}$ LOW, and $\overline{WE}$ LOW).Writing to the device is accomplished by taking Chip Enable ($\overline{CE}$) and Write Enable ($\overline{WE}$) inputs LOW. If Byte Low Enable ($\overline{BLE}$) is LOW, then data from I/O pins (I/O_0 through I/O_7), is written into the location specified on the address pins (A_0 through A_{16}). If Byte High Enable ($\overline{BHE}$) is LOW, then data from I/O pins (I/O_8 through I/O_{15}) is written into the location specified on the address pins (A_0 through A_{16}).Reading from the device is accomplished by taking Chip Enable ($\overline{CE}$) and Output Enable ($\overline{OE}$) LOW while forcing the Write Enable ($\overline{WE}$) HIGH. If Byte Low Enable ($\overline{BLE}$) is LOW, then data from the memory location specified by the address pins will appear on I/O_0 to I/O_7. If Byte High Enable ($\overline{BHE}$) is LOW, then data from memory will appear on I/O_8 to I/O_{15}. See the truth table at the back of this data sheet for a complete description of read and write modes.

Logic Block Diagram



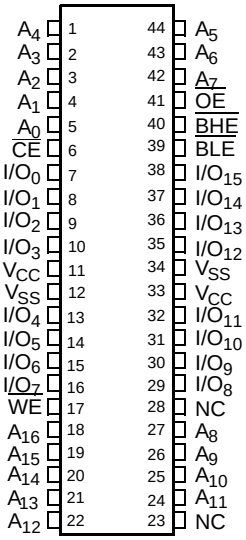
Note:
1. For best practice recommendations, please refer to the Cypress application note “System Design Guidelines” on http://www.cypress.com.

Product Portfolio

Product		V_{CC} Range (V)			Speed (ns)	Power Dissipation			
						Operating, I_{CC} (mA)		Standby, I_{SB2} (µA)	
		Min.	Typ.[3]	Max.		Typ.[3]	Max.	Typ.[3]	Max.
CY62137VNLL	Industrial	2.7	3.0	3.6	55	7	20	1	15
CY62137VNLL					70	7	15	1	15
CY62137VNLL	Automotive-A				70	7	15	1	15
CY62137VNLL	Automotive-E				70	7	15	1	20

Pin Configurations

TSOP II (Forward)
Top View



Pin Definitions

Pin Number	Type	Description
1–5, 18–22, 24–27, 42–45	Input	**A_0–A_{16}**. Address Inputs
7–10, 13–16, 29–32, 35–38	Input/Output	**I/O_0–I/O_{15}**. Data lines. Used as input or output lines depending on operation
23	No Connect	**NC**. This pin is not connected to the die
17	Input/Control	**$\overline{WE}$**. When selected LOW, a WRITE is conducted. When selected HIGH, a READ is conducted
6	Input/Control	**$\overline{CE}$**. When LOW, selects the chip. When HIGH, deselects the chip
40, 39	Input/Control	**Byte Write Select Inputs, active LOW**. $\overline{BHE}$ controls I/O_{15}–I/O_8, $\overline{BLE}$ controls I/O_7–I/O_0.
41	Input/Control	**$\overline{OE}$**. Output Enable. Controls the direction of the I/O pins. When LOW, the I/O pins behave as outputs. When deasserted HIGH, I/O pins are tri-stated, and act as input data pins
12, 34	Ground	**V_{SS}**. Ground for the device
11, 33	Power Supply	**V_{CC}**. Power supply for the device

Notes:
2. NC pins are not connected on the die.
3. Typical values are included for reference only and are not guaranteed or tested. Typical values are measured at $V_{CC} = V_{CC(TYP)}$., $T_A = 25°C$.

Maximum Ratings

(Above which the useful life may be impaired. For user guidelines, not tested.)

Storage Temperature ..... –65°C to +150°C

Ambient Temperature with Power Applied..... –55°C to +125°C

Supply Voltage to Ground Potential ..... –0.5V to +4.6V

DC Voltage Applied to Outputs in High-Z State[4] ..... –0.5V to V_{CC} + 0.5V

DC Input Voltage[4]..... –0.5V to V_{CC} + 0.5V

Output Current into Outputs (LOW)..... 20 mA

Static Discharge Voltage..... > 2001V (per MIL-STD-883, Method 3015)

Latch-up Current..... > 200 mA

Operating Range

Range	Ambient Temperature	V_{CC}
Industrial	–40°C to +85°C	2.7V to 3.6V
Automotive-A	–40°C to +85°C	
Automotive-E	–40°C to +125°C	

Electrical Characteristics Over the Operating Range

Parameter	Description	Test Conditions			-55			-70			Unit
					Min.	Typ.[3]	Max.	Min.	Typ.[3]	Max.	
V_{OH}	Output HIGH Voltage	V_{CC} = 2.7V, I_{OH} = –1.0 mA			2.4			2.4			V
V_{OL}	Output LOW Voltage	V_{CC} = 2.7V, I_{OL} = 2.1 mA					0.4			0.4	V
V_{IH}	Input HIGH Voltage				2.2		V_{CC} + 0.5V	2.2		V_{CC} + 0.5V	V
V_{IL}	Input LOW Voltage				–0.5		0.8	–0.5		0.8	V
I_{IX}	Input Leakage Current	GND ≤ V_I ≤ V_{CC}			–1		+1	–1		+1	µA
I_{OZ}	Output Leakage Current	GND ≤ V_O ≤ V_{CC}, Output Disabled			–1		+1	–1		+1	µA
I_{CC}	V_{CC} Operating Supply Current	I_{OUT} = 0 mA, f = f_{MAX} = $1/t_{RC}$, CMOS Levels	V_{CC} = 3.6V	Ind'l		7	20		7	15	mA
				Auto-A/ Auto-E					7	15	
		I_{OUT} = 0 mA, f = 1 MHz, CMOS Levels		Ind'l		1	2		1	2	mA
				Auto-A/ Auto-E					1	2	
I_{SB1}	Automatic CE Power-down Current—CMOS Inputs	$\overline{CE}$ ≥ V_{CC} – 0.3V, V_{IN} ≥ V_{CC} – 0.3V or V_{IN} ≤ 0.3V, f = f_{MAX}	V_{CC} = 3.6V	Ind'l			100			100	µA
				Auto-A/ Auto-E						100	
I_{SB2}	Automatic CE Power-down Current—CMOS Inputs	$\overline{CE}$ ≥ V_{CC} – 0.3V V_{IN} ≥ V_{CC} – 0.3V or V_{IN} ≤ 0.3V, f = 0	V_{CC} = 3.6V	Ind'l/		1	15		1	15	µA
				Auto-A					1	15	
				Auto-E					1	20	

Capacitance[5]

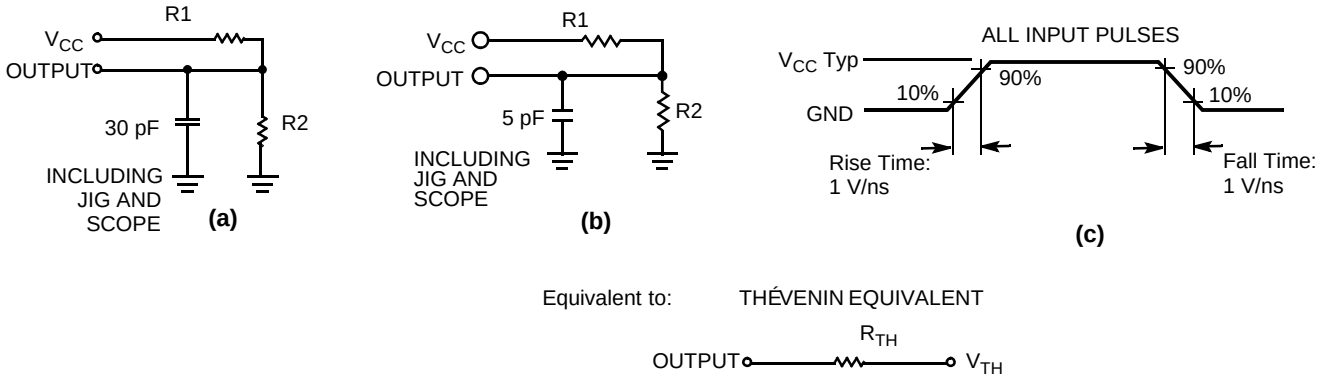
Parameter	Description	Test Conditions	Max.	Unit
C_{IN}	Input Capacitance	T_A = 25°C, f = 1 MHz, V_{CC} = $V_{CC(typ)}$	6	pF
C_{OUT}	Output Capacitance		8	pF

Thermal Resistance[5]

Parameter	Description	Test Conditions	TSOPII	Unit
Θ_{JA}	Thermal Resistance (Junction to Ambient)	Still Air, soldered on a 4.25 x 1.125 inch, 2-layer printed circuit board	60	°C/W
Θ_{JC}	Thermal Resistance (Junction to Case)		22	°C/W

Notes:
4. V_{IL}(min.) = –2.0V for pulse durations less than 20 ns.
5. Tested initially and after any design or process changes that may affect these parameters.

AC Test Loads and Waveforms

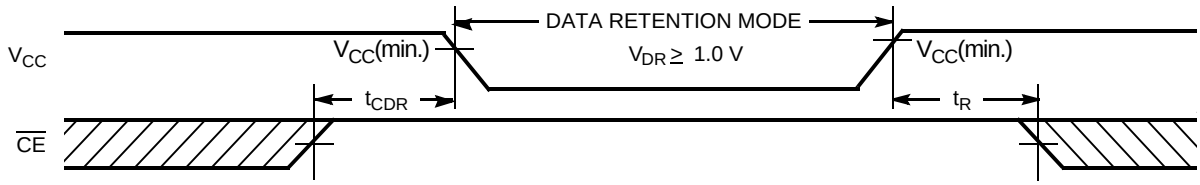


Parameters	Value	Unit
R1	1105	Ohms
R2	1550	Ohms
R_{TH}	645	Ohms
V_{TH}	1.75	Volts

Data Retention Characteristics (Over the Operating Range)

Parameter	Description	Conditions		Min.	Typ.[3]	Max.	Unit
V_{DR}	V_{CC} for Data Retention			1.0			V
I_{CCDR}	Data Retention Current	V_{CC} = 1.0V, $\overline{CE} \geq V_{CC} - 0.3V$, $V_{IN} \geq V_{CC} - 0.3V$ or $V_{IN} \leq 0.3V$; No input may exceed V_{CC} + 0.3V	Ind'l/Auto-A		0.5	7.5	µA
			Auto-E			10	
t_{CDR}[5]	Chip Deselect to Data Retention Time			0			ns
t_R	Operation Recovery Time			t_{RC}			ns

Data Retention Waveform



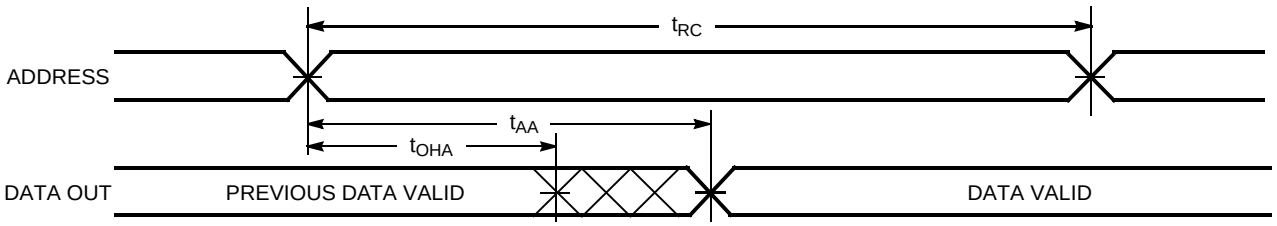
Switching Characteristics Over the Operating Range [6]

Parameter	Description	55 ns		70 ns		Unit
		Min.	Max.	Min.	Max.	
Read Cycle						
t_{RC}	Read Cycle Time	55		70		ns
t_{AA}	Address to Data Valid		55		70	ns
t_{OHA}	Data Hold from Address Change	10		10		ns
t_{ACE}	$\overline{CE}$ LOW to Data Valid		55		70	ns
t_{DOE}	$\overline{OE}$ LOW to Data Valid		25		35	ns
t_{LZOE}	$\overline{OE}$ LOW to Low-Z[7]	5		5		ns
t_{HZOE}	$\overline{OE}$ HIGH to High-Z[7, 8]		25		25	ns
t_{LZCE}	$\overline{CE}$ LOW to Low-Z[7]	10		10		ns
t_{HZCE}	$\overline{CE}$ HIGH to High-Z[7, 8]		25		25	ns
t_{PU}	$\overline{CE}$ LOW to Power-up	0		0		ns
t_{PD}	$\overline{CE}$ HIGH to Power-down		55		70	ns
t_{DBE}	$\overline{BHE}$ / $\overline{BLE}$ LOW to Data Valid		55		70	ns
t_{LZBE} (9)	$\overline{BHE}$ / $\overline{BLE}$ LOW to Low-Z	5		5		ns
t_{HZBE}	$\overline{BHE}$ / $\overline{BLE}$ HIGH to High-Z		25		25	ns
Write Cycle[10, 11]						
t_{WC}	Write Cycle Time	55		70		ns
t_{SCE}	$\overline{CE}$ LOW to Write End	45		60		ns
t_{AW}	Address Set-up to Write End	45		60		ns
t_{HA}	Address Hold from Write End	0		0		ns
t_{SA}	Address Set-up to Write Start	0		0		ns
t_{PWE}	$\overline{WE}$ Pulse Width	40		50		ns
t_{SD}	Data Set-up to Write End	25		30		ns
t_{HD}	Data Hold from Write End	0		0		ns
t_{HZWE}	$\overline{WE}$ LOW to High-Z[7, 8]		20		25	ns
t_{LZWE}	$\overline{WE}$ HIGH to Low-Z[7]	5		10		ns
t_{BW}	$\overline{BHE}$ / $\overline{BLE}$ LOW to End of Write	50		60		ns

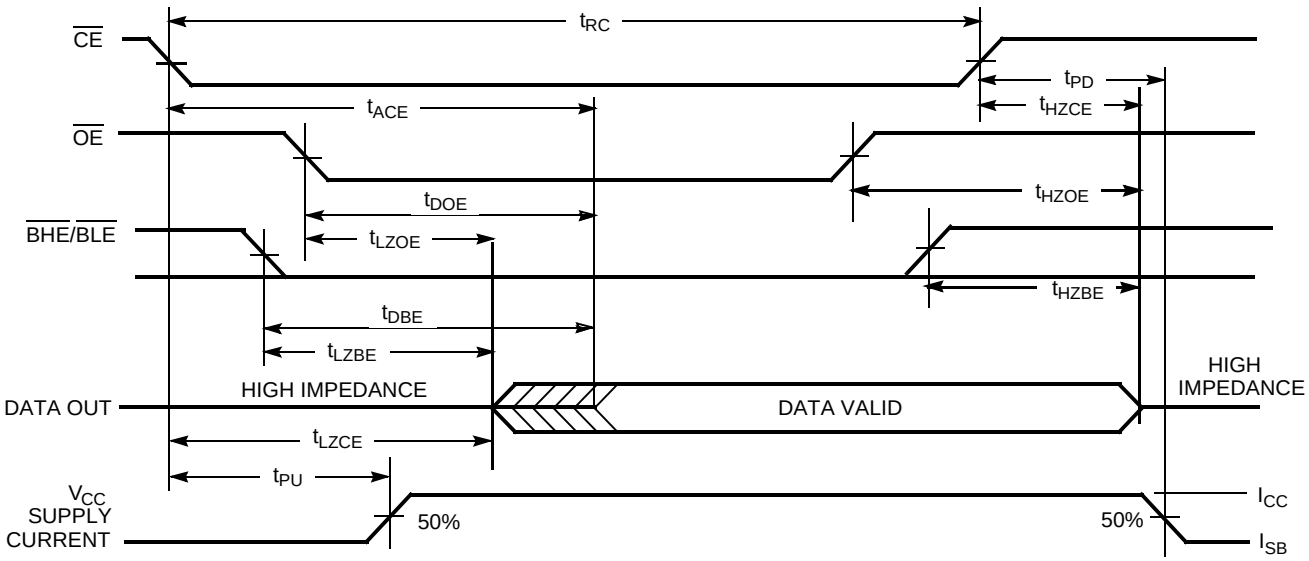
Notes:
6. Test conditions assume signal transition time of 5 ns or less, timing reference levels of 1.5V, input levels of 0 to V_{CC} typ., and output loading of the specified I_{OL}/I_{OH} and 30 pF load capacitance.
7. At any given temperature and voltage condition, t_{HZCE} is less than t_{LZCE}, t_{HZOE} is less than t_{LZOE}, and t_{HZWE} is less than t_{LZWE} for any given device.
8. t_{HZOE}, t_{HZCE}, and t_{HZWE} are specified with C_L = 5 pF as in (b) of AC Test Loads. Transition is measured ±500 mV from steady-state voltage.
9. If both byte enables are toggled together this value is 10 ns.
10. The internal write time of the memory is defined by the overlap of $\overline{CE}$ LOW and $\overline{WE}$ LOW. Both signals must be LOW to initiate a write and either signal can terminate a write by going HIGH. The data input set-up and hold timing should be referenced to the rising edge of the signal that terminates the write.
11. The minimum write cycle time for write cycle #3 ($\overline{WE}$ controlled, $\overline{OE}$ LOW) is the sum of t_{HZWE} and t_{SD}.

Switching Waveforms

Read Cycle No. 1[12, 13]



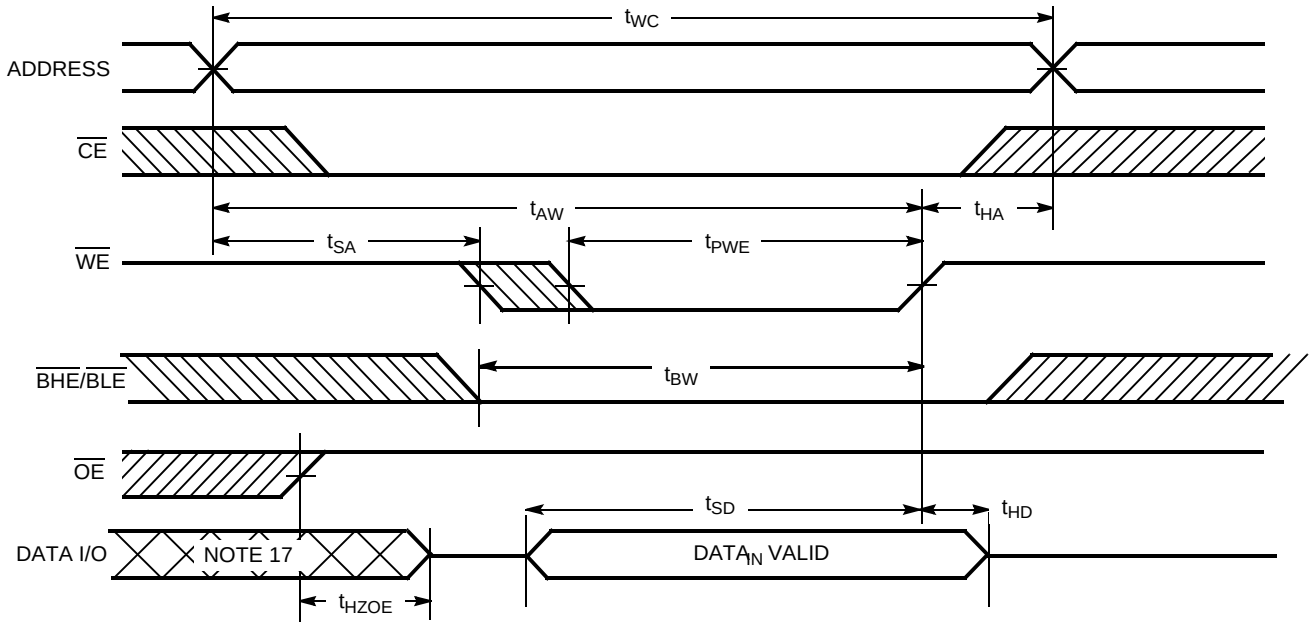
Read Cycle No. 2[13, 14]



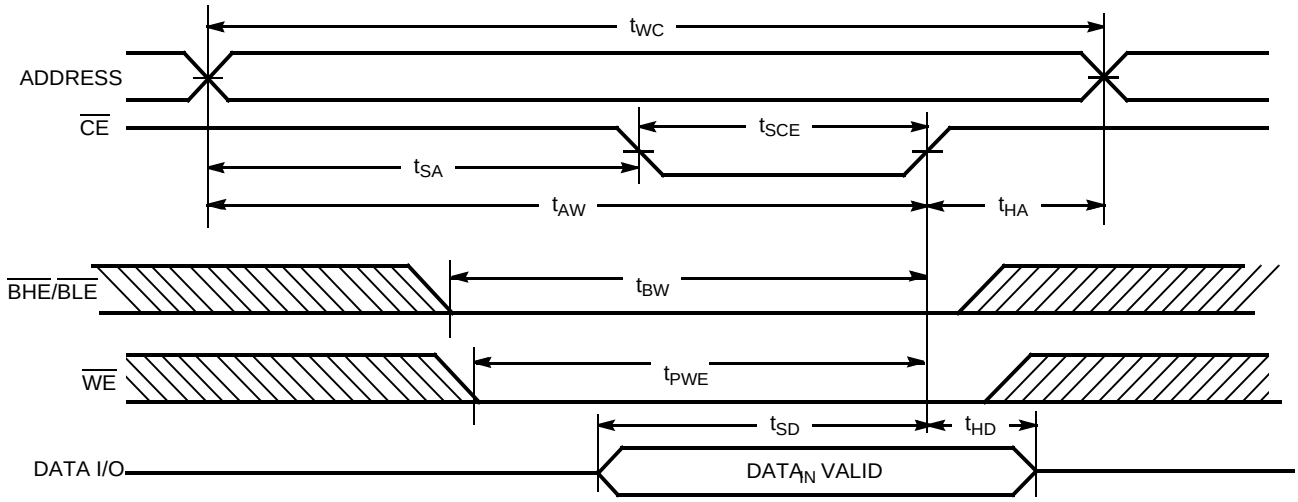
Notes:
12. Device is continuously selected. $\overline{OE}$, $\overline{CE}$ = V_{IL}.
13. WE is HIGH for read cycle.
14. Address valid prior to or coincident with $\overline{CE}$ transition LOW.

Switching Waveforms (continued)

Write Cycle No. 1 (WE Controlled)[10, 15, 16]



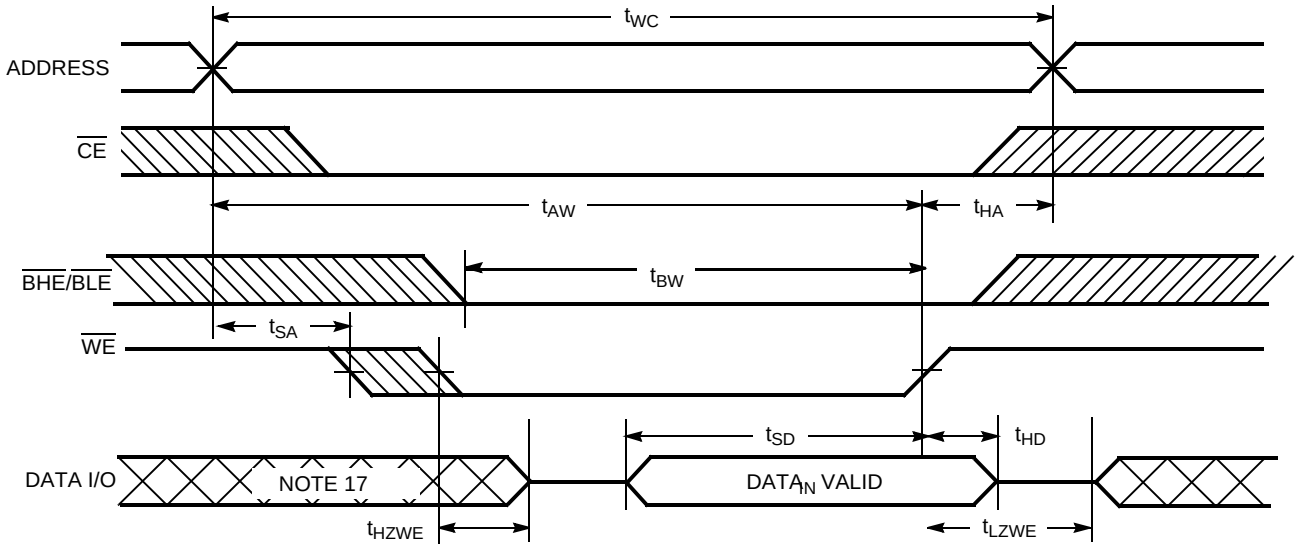
Write Cycle No. 2 (CE Controlled)[10, 15, 16]



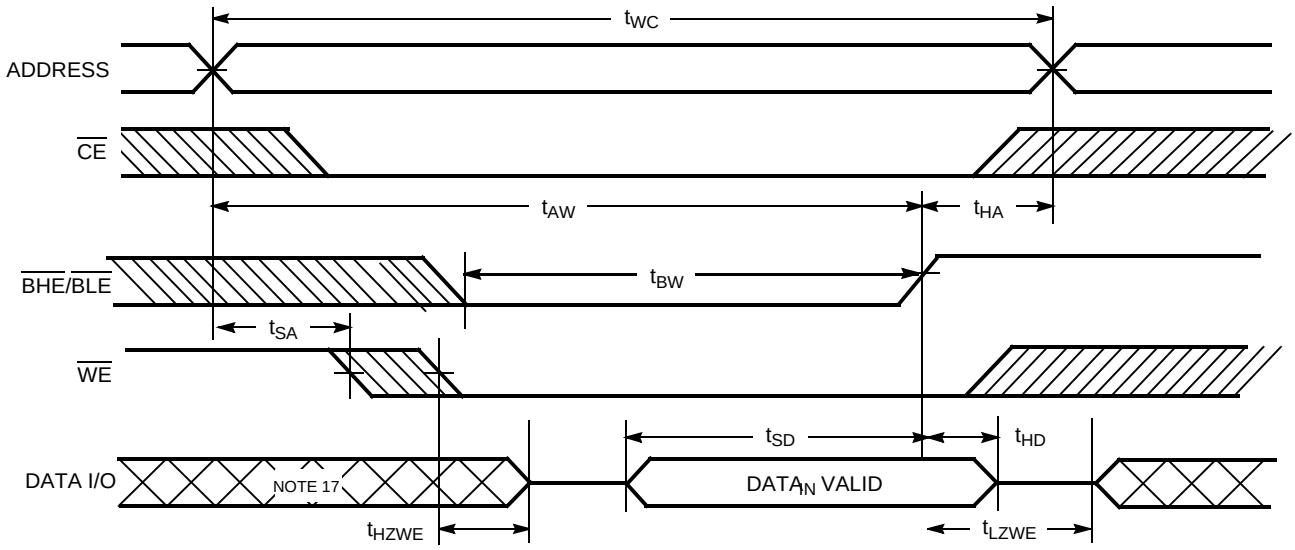
Notes:
15. Data I/O is high-impedance if $\overline{OE}$ = V_{IH}.
16. If $\overline{CE}$ goes HIGH simultaneously with $\overline{WE}$ HIGH, the output remains in a high-impedance state.
17. During this period, the I/Os are in output state and input signals should not be applied.

Switching Waveforms (continued)

Write Cycle No. 3 (WE Controlled, OE LOW)[11, 16]

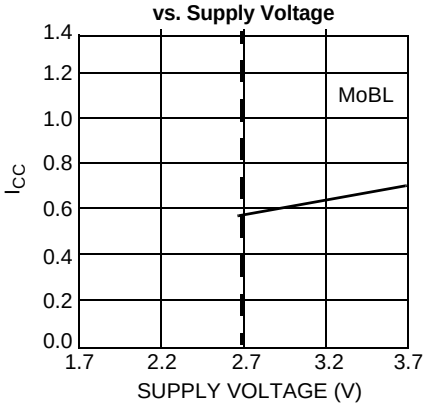


Write Cycle No. 4 (BHE/BLE Controlled, OE LOW)[17]

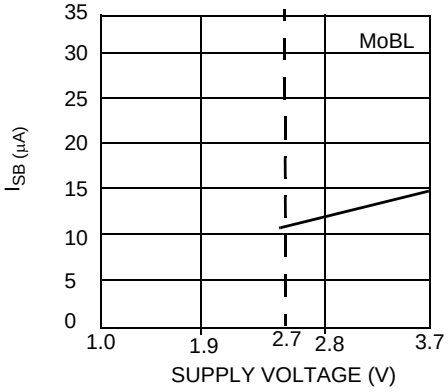


Typical DC and AC Characteristics

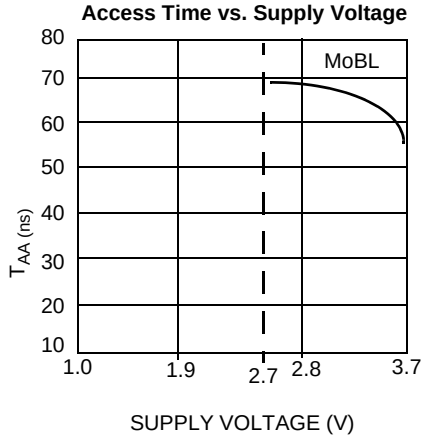
Normalized Operating Current vs. Supply Voltage



Standby Current vs. Supply Voltage



Access Time vs. Supply Voltage



Truth Table

$\overline{CE}$	$\overline{WE}$	$\overline{OE}$	$\overline{BHE}$	$\overline{BLE}$	I/O_8–I/O_{15}	I/O_0–I/O_7	Mode	Power
H	X	X	X	X	High-Z	High-Z	Deselect/Power-down	Standby (I_{SB})
X	X	X	H	H	High-Z	High-Z	Deselect/Power-down	Standby (I_{SB})
L	H	L	L	L	Data Out	Data Out	Read	Active (I_{CC})
L	H	L	H	L	High-Z	Data Out	Read	Active (I_{CC})
L	H	L	L	H	Data Out	High-Z	Read	Active (I_{CC})
L	H	H	X	X	High-Z	High-Z	Output Disabled	Active (I_{CC})
L	L	X	L	L	Data In	Data In	Write	Active (I_{CC})
L	L	X	H	L	High-Z	Data In	Write	Active (I_{CC})
L	L	X	L	H	Data In	High-Z	Write	Active (I_{CC})

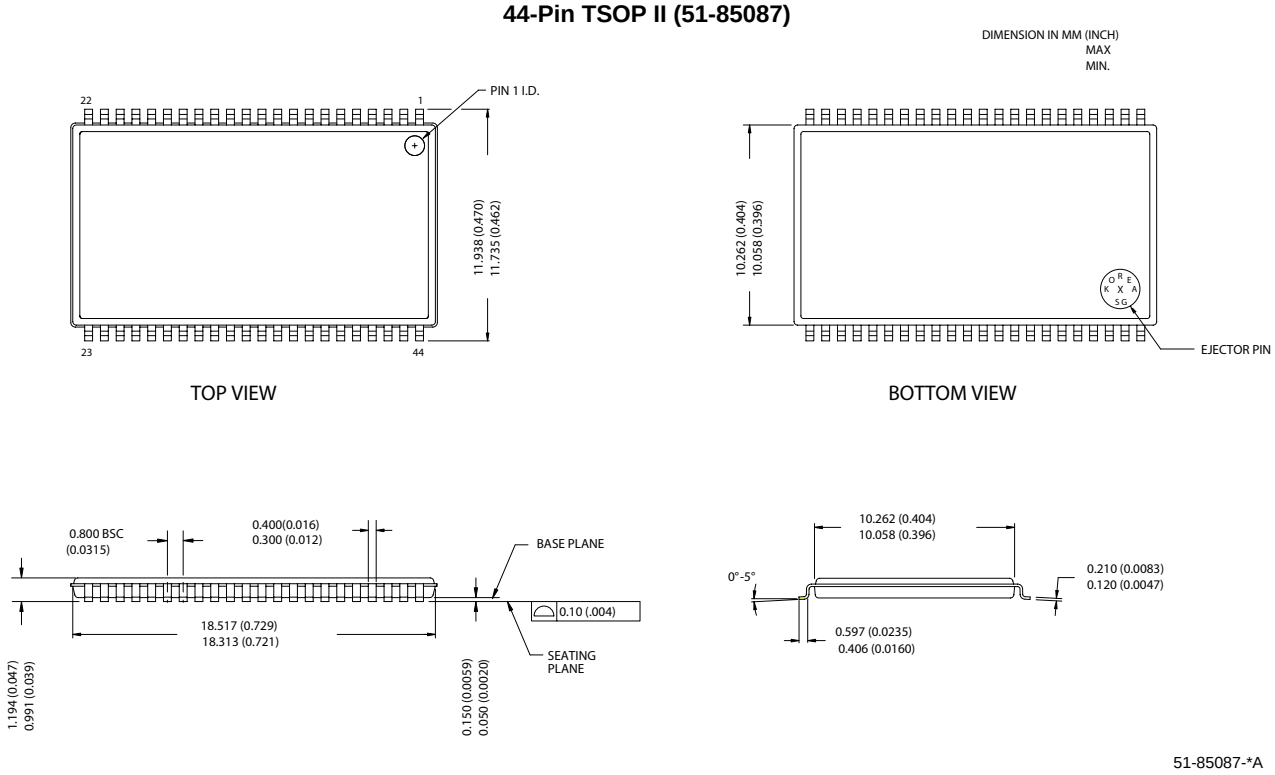
Ordering Information

Speed (ns)	Ordering Code	Package Diagram	Package Type	Operating Range
55	CY62137VNLL-55ZXI	51-85087	44-pin TSOP II (Pb-free)	Industrial
70	CY62137VNLL-70ZXI		44-pin TSOP II (Pb-free)	Industrial
	CY62137VNLL-70ZSXA		44-pin TSOP II (Pb-free)	Automotive-A
	CY62137VNLL-70ZSXE		44-pin TSOP II (Pb-free)	Automotive-E

Please contact your local Cypress sales representative for availability of these parts

Package Diagram

44-Pin TSOP II (51-85087)



51-85087-*A

Document History Page

Document Title: CY62137VN MoBL® 2-Mbit (128K x 16) Static RAM Document Number: 001-06497				
REV.	**ECN NO.**	**Issue Date**	**Orig. of Change**	**Description of Change**
**	426503	See ECN	NXR	New Data Sheet
*A	488954	See ECN	NXR	Added Automotive product Updated Ordering Information table