CY6264

8 K × 8 Static RAM

Features

- Temperature ranges:
  - Commercial: 0 °C to 70 °C
  - Industrial: –40 °C to 85 °C
  - Automotive-A: –40 °C to 85 °C
- High speed
  - 55 ns
- CMOS for optimum speed/power
- Easy memory expansion with $\overline{CE}_1$, CE_2 and $\overline{OE}$ features
- TTL-compatible inputs and outputs
- Automatic power-down when deselected
- Available in Pb-free 28-pin SNC package

Functional Description

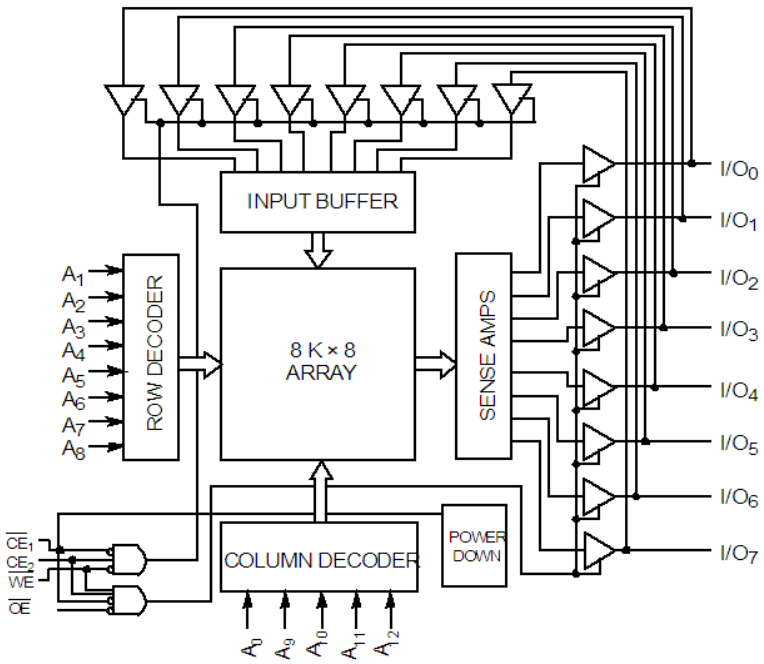
The CY6264 is a high-performance CMOS static RAM organized as 8192 words by 8 bits. Easy memory expansion is provided by an active LOW chip enable ($\overline{CE}_1$), an active HIGH chip enable (CE_2), and active LOW output enable ($\overline{OE}$) and three-state drivers. Both devices have an automatic power-down feature ($\overline{CE}_1$), reducing the power consumption by over 70% when deselected. The CY6264 is packaged in a 450-mil (300-mil body) SOIC.

An active LOW write enable signal ($\overline{WE}$) controls the writing/reading operation of the memory. When $\overline{CE}_1$ and $\overline{WE}$ inputs are both LOW and CE_2 is HIGH, data on the eight data input/output pins (I/O_0 through I/O_7) is written into the memory location addressed by the address present on the address pins (A_0 through A_{12}). Reading the device is accomplished by selecting the device and enabling the outputs, $\overline{CE}_1$ and $\overline{OE}$ active LOW, CE_2 active HIGH, while $\overline{WE}$ remains inactive or HIGH. Under these conditions, the contents of the location addressed by the information on address pins is present on the eight data input/output pins.

The input/output pins remain in a high-impedance state unless the chip is selected, outputs are enabled, and write enable ($\overline{WE}$) is HIGH. A die coat is used to ensure alpha immunity.

For a complete list of related documentation, click here.

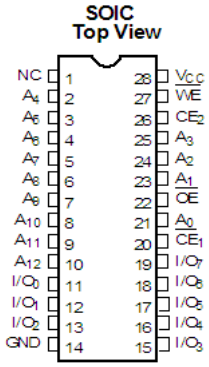
Logic Block Diagram



Contents

Pin Configuration

Figure 1. 28-pin SOIC pinout (Top View)



Selection Guide

Description	Range	-55	-70	Unit
Maximum access time		55	70	ns
Maximum operating current	Commercial	100	100	mA
	Industrial	260	200	mA
	Automotive-A	–	200	mA
Maximum CMOS standby current	Commercial	15	15	mA
	Industrial	30	30	mA
	Automotive-A	–	30	mA

Maximum Ratings

Exceeding maximum ratings may shorten the useful life of the device. User guidelines are not tested.

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

Ambient temperature with power applied ..... –55 °C to +125 °C

Supply voltage to ground potential [1] .....–0.5 V to +7.0 V

DC voltage applied to outputs in high Z state [1] .....–0.5 V to +7.0 V

DC input voltage [1] .....–0.5 V to +7.0 V

Output current into outputs (LOW) ..... 20 mA

Static discharge voltage (per MIL-STD-883, Method 3015) ..... > 2001 V

Latch-up current ..... > 200 mA

Operating Range

Range	Ambient Temperature	V_{CC}
Commercial	0 °C to +70 °C	5 V ± 10%
Industrial	–40 °C to +85 °C	
Automotive-A	–40 °C to +85 °C	

Electrical Characteristics

Over the Operating Range

Parameter	Description	Test Conditions		-55		-70		Unit
				Min	Max	Min	Max	
V_{OH}	Output HIGH voltage	V_{CC} = Min, I_{OH} = –4.0 mA		2.4	–	2.4	–	V
V_{OL}	Output LOW voltage	V_{CC} = Min, I_{OL} = 8.0 mA		–	0.4	–	0.4	V
V_{IH}	Input HIGH voltage			2.2	V_{CC}	2.2	V_{CC}	V
V_{IL}	Input LOW voltage[1]			–0.5	0.8	–0.5	0.8	V
I_{IX}	Input leakage current	GND ≤ V_I ≤ V_{CC}		–5	+5	–5	+5	µA
I_{OZ}	Output leakage current	GND ≤ V_I ≤ V_{CC}, output disabled		–5	+5	–5	+5	µA
I_{CC}	V_{CC} operating supply current	V_{CC} = Max, I_{OUT} = 0 mA	Commercial	–	100	–	100	mA
			Industrial	–	260	–	200	
			Automotive-A	–		–	200	
I_{SB1}	Automatic $\overline{CE}_1$ power-down current	Max V_{CC}, $\overline{CE}_1$ ≥ V_{IH}, Min duty cycle = 100%	Commercial	–	20	–	20	mA
			Industrial	–	50	–	40	
			Automotive-A	–		–	40	
I_{SB2}	Automatic $\overline{CE}_1$ power-down current	Max V_{CC}, $\overline{CE}_1$ ≥ V_{CC} – 0.3 V, V_{IN} ≥ V_{CC} – 0.3 V or V_{IN} ≤ 0.3 V	Commercial	–	15	–	15	mA
			Industrial	–	30	–	30	
			Automotive-A	–		–	30	

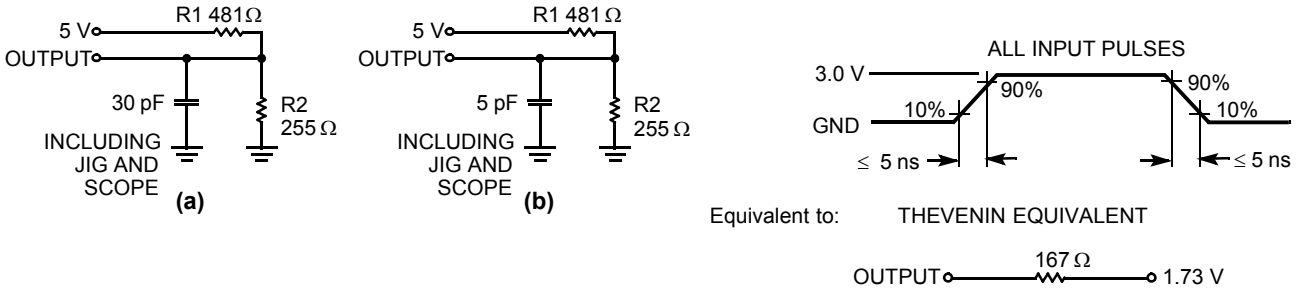
Note
1. Minimum voltage is equal to –3.0 V for pulse durations less than 30 ns.

Capacitance

Parameter [2]	Description	Test Conditions	Max	Unit
C_{IN}	Input capacitance	T_A = 25 °C, f = 1 MHz, V_{CC} = 5.0 V	7	pF
C_{OUT}	Output capacitance		7	pF

AC Test Loads and Waveforms

Figure 2. AC Test Loads and Waveforms



Note
2. Tested initially and after any design or process changes that may affect these parameters.

Switching Characteristics

Over the Operating Range

Parameter [3]	Description	-55		-70		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	5		5	–	ns
t_{ACE1}	$\overline{CE}_1$ LOW to data valid	–	55	–	70	ns
t_{ACE2}	CE_2 HIGH to data valid	–	40	–	70	ns
t_{DOE}	$\overline{OE}$ LOW to data valid	–	25	–	35	ns
t_{LZOE}	$\overline{OE}$ LOW to low Z	3		5	–	ns
t_{HZOE}	$\overline{OE}$ HIGH to high Z[4]	–	20	–	30	ns
t_{LZCE1}	$\overline{CE}_1$ LOW to low Z[5]	5	–	5	–	ns
t_{LZCE2}	CE_2 HIGH to low Z	3	–	5	–	ns
t_{HZCE}	$\overline{CE}_1$ HIGH to high Z[4, 6] CE_2 LOW to high Z	–	20	–	30	ns
t_{PU}	$\overline{CE}_1$ LOW to power-up	0	–	0	–	ns
t_{PD}	$\overline{CE}_1$ HIGH to power-down	–	25	–	30	ns
WRITE CYCLE [6, 7]						
t_{WC}	Write cycle time	50	–	70	–	ns
t_{SCE1}	$\overline{CE}_1$ LOW to write end	40	–	60	–	ns
t_{SCE2}	CE_2 HIGH to write end	30	–	50	–	ns
t_{AW}	Address setup to write end	40	–	55	–	ns
t_{HA}	Address hold from write end	0	–	0	–	ns
t_{SA}	Address setup to write start	0	–	0	–	ns
t_{PWE}	$\overline{WE}$ pulse width	25	–	40	–	ns
t_{SD}	Data setup to write end	25	–	35	–	ns
t_{HD}	Data hold from write end	0	–	0	–	ns
t_{HZWE}	$\overline{WE}$ LOW to high Z[4]	–	20	–	30	ns
t_{LZWE}	$\overline{WE}$ HIGH to low Z	5	–	5	–	ns

Notes

3. Test conditions assume signal transition time of 5 ns or less, timing reference levels of 1.5 V, input pulse levels of 0 to 3.0 V, and output loading of the specified I_{OL}/I_{OH} and 30-pF load capacitance.
4. t_{HZOE}, t_{HZCE}, and t_{HZWE} are specified with C_L = 5 pF as in part (b) of AC Test Loads. Transition is measured ±500 mV from steady-state voltage.
5. At any temperature and voltage condition, t_{HZCE} is less than t_{LZCE} for any device.
6. The internal write time of the memory is defined by the overlap of $\overline{CE}_1$ LOW, CE_2 HIGH, 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 setup and hold timing should be referenced to the rising edge of the signal that terminates the write.
7. The minimum write cycle time for Write Cycle No. 3 ($\overline{WE}$ Controlled, $\overline{OE}$ LOW) is the sum of t_{HZWE} and t_{SD}.

Switching Waveforms

Figure 3. Read Cycle No. 1 [8, 9]

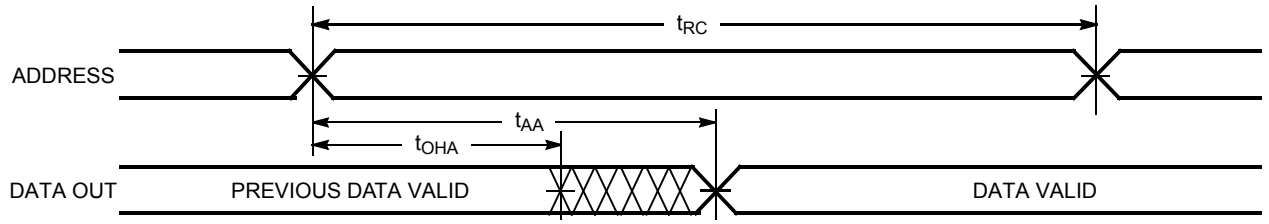
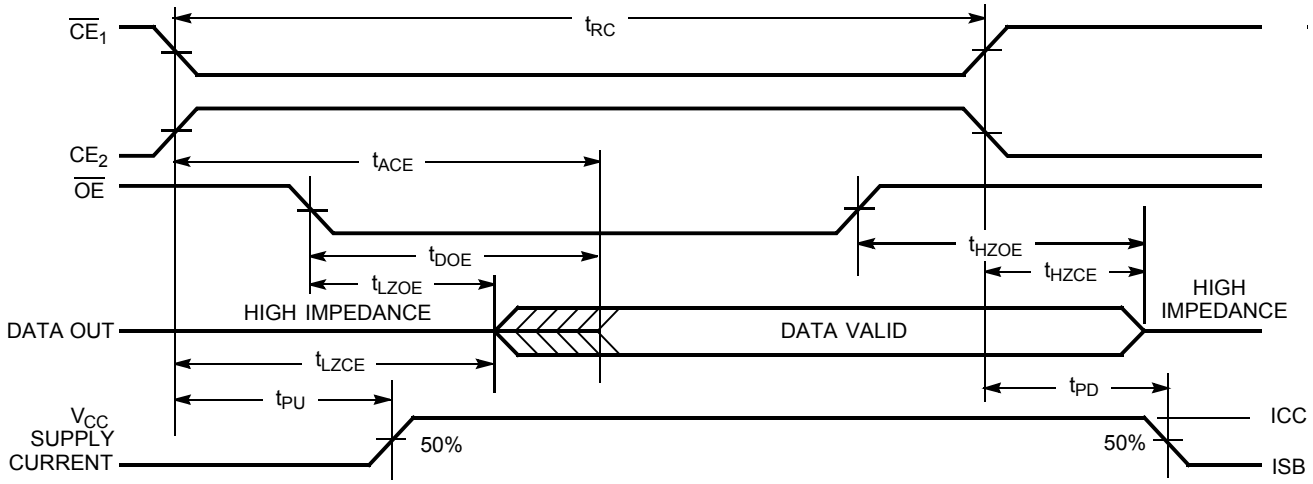


Figure 4. Read Cycle No. 2 [10, 11]



Notes
8. Device is continuously selected. $\overline{OE}$, $\overline{CE}$ = V_{IL}. CE_2 = V_{IH}.
9. Address valid prior to or coincident with $\overline{CE}$ transition LOW.
10. $\overline{WE}$ is HIGH for read cycle.
11. Data I/O is High Z if $\overline{OE}$ = V_{IH}, $\overline{CE}_1$ = V_{IH}, or $\overline{WE}$ = V_{IL}.

Switching Waveforms (continued)

Figure 5. Write Cycle No. 1 ($\overline{WE}$ Controlled) [12, 13]

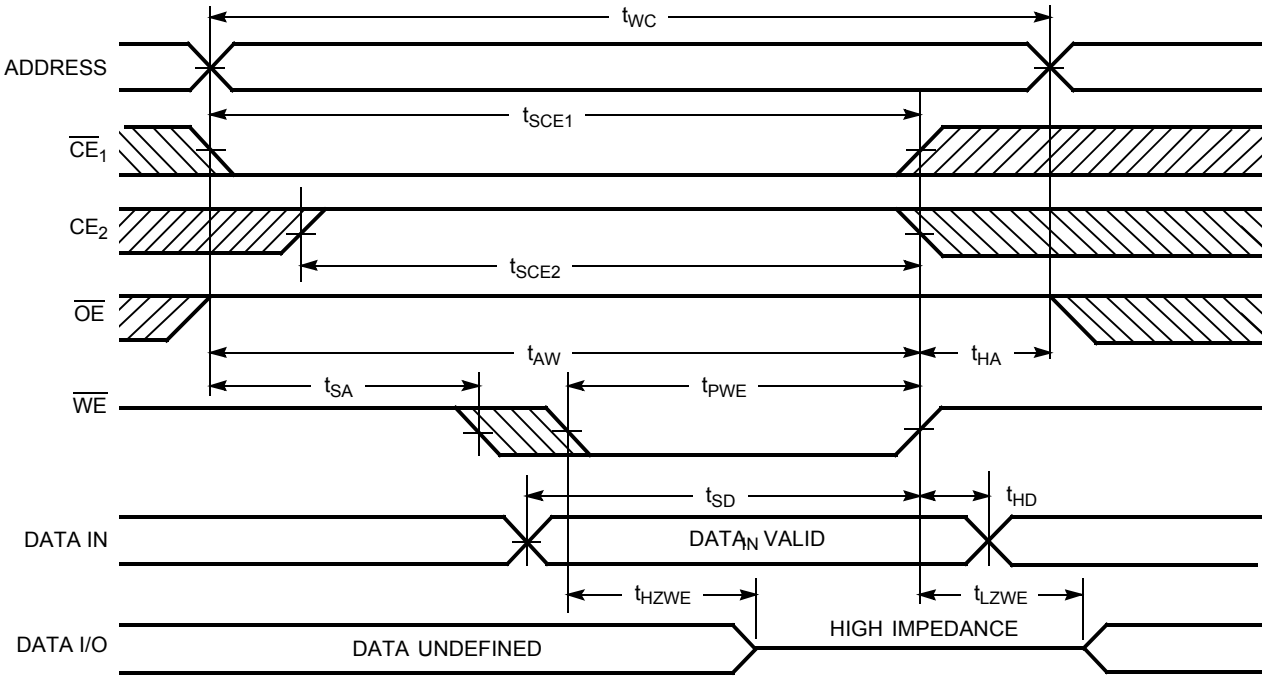
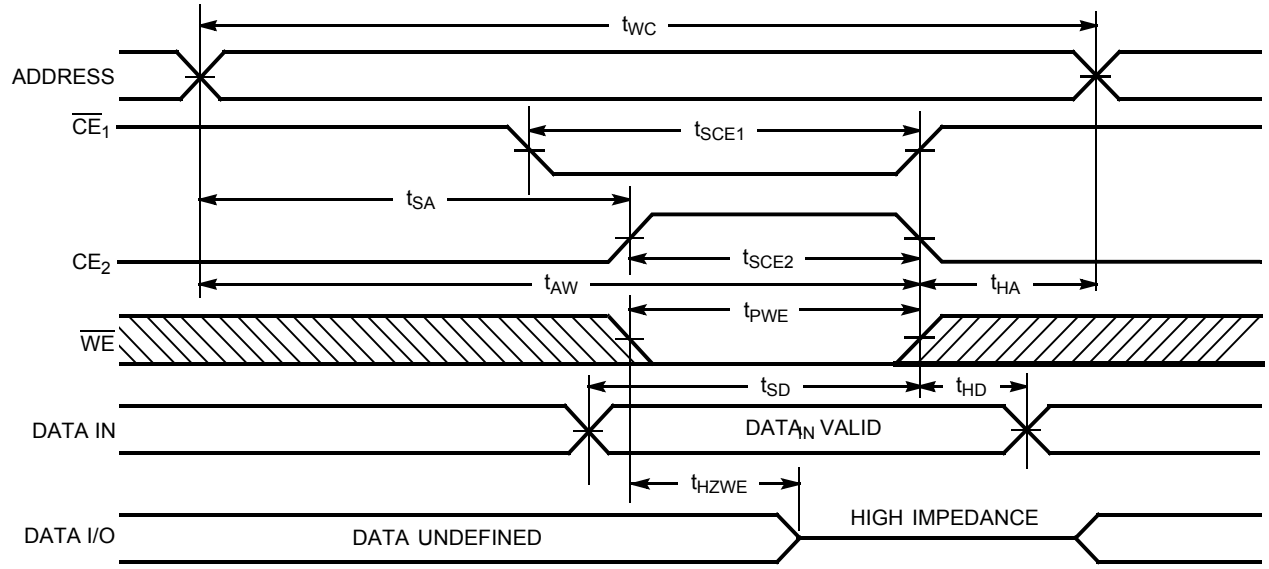


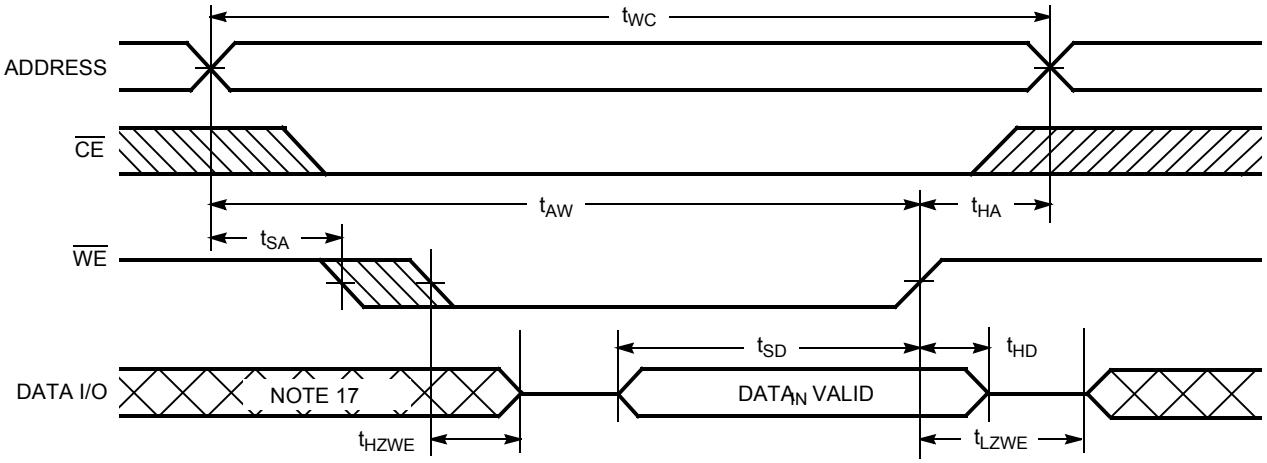
Figure 6. Write Cycle No. 2 ($\overline{CE}$ Controlled) [12, 13, 14]



Notes
12. Address valid prior to or coincident with $\overline{CE}$ transition LOW.
13. Data I/O is High Z if $\overline{OE}$ = V_{IH}, $\overline{CE}_1$ = V_{IH}, or $\overline{WE}$ = V_{IL}.
14. If $\overline{CE}$ goes HIGH simultaneously with $\overline{WE}$ HIGH, the output remains in a high-impedance state.

Switching Waveforms (continued)

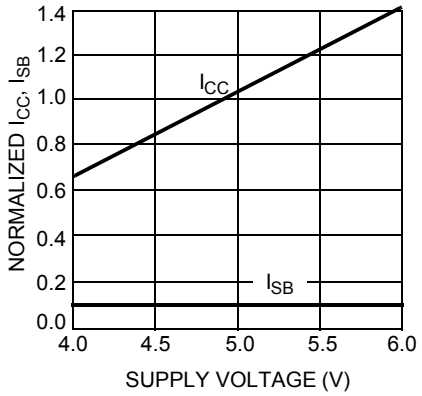
Figure 7. Write Cycle No. 3 ($\overline{WE}$ Controlled, $\overline{OE}$ LOW) [15, 16]



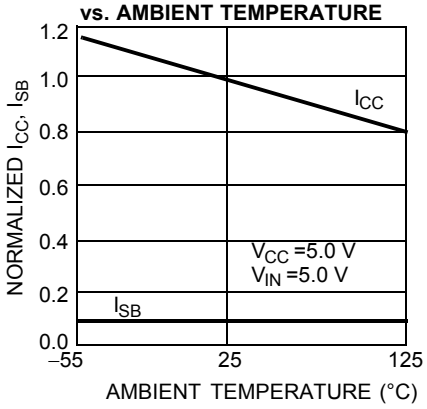
Notes
15. If $\overline{CE}$ goes HIGH simultaneously with $\overline{WE}$ HIGH, the output remains in a high-impedance state.
16. The minimum write cycle time for Write Cycle No. 3 ($\overline{WE}$ Controlled, $\overline{OE}$ LOW) is the sum of t_{HZWE} and t_{SD}.
17. During this period, the I/Os are in output state and input signals should not be applied.

Typical DC and AC Characteristics

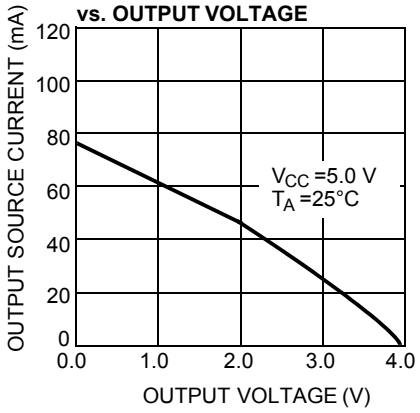
NORMALIZED SUPPLY CURRENT vs. SUPPLY VOLTAGE



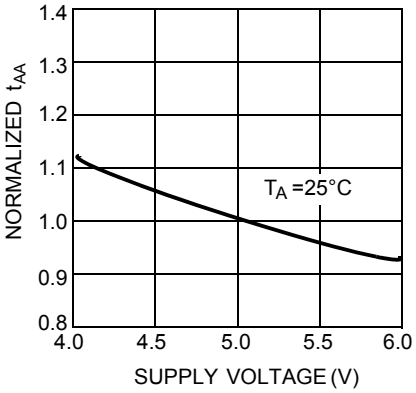
NORMALIZED SUPPLY CURRENT vs. AMBIENT TEMPERATURE



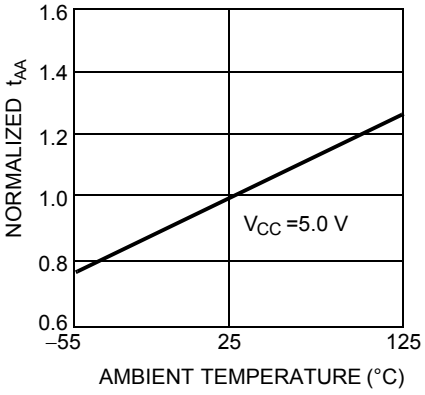
OUTPUT SOURCE CURRENT vs. OUTPUT VOLTAGE



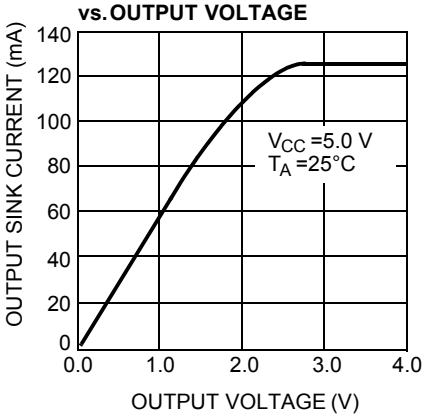
NORMALIZED ACCESS TIME vs. SUPPLY VOLTAGE



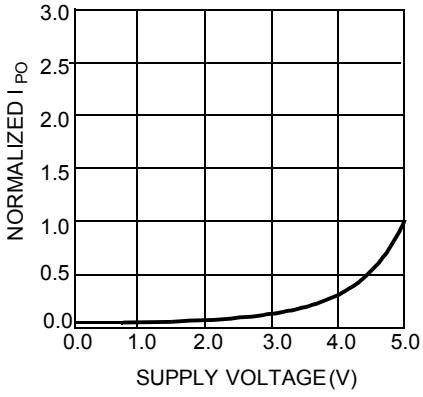
NORMALIZED ACCESS TIME vs. AMBIENT TEMPERATURE



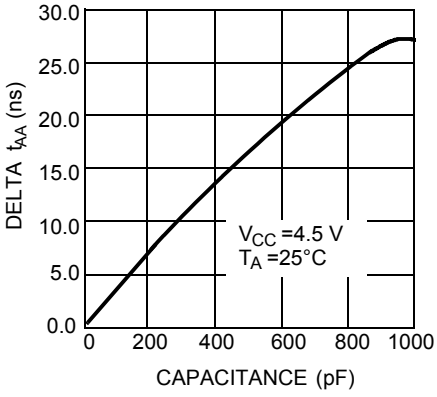
OUTPUT SINK CURRENT vs. OUTPUT VOLTAGE



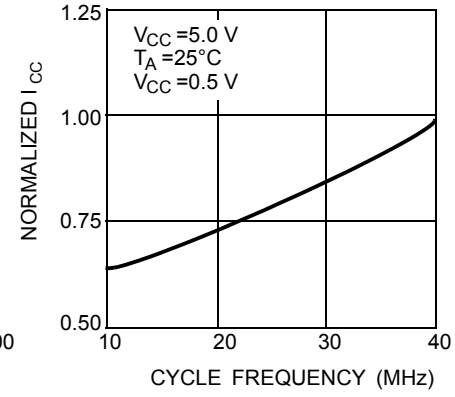
TYPICAL POWER-ON CURRENT vs. SUPPLY VOLTAGE



TYPICAL ACCESS TIME CHANGE vs. OUTPUT LOADING



NORMALIZED I_{CC} vs. CYCLE TIME



Truth Table

$\overline{CE_1}$	CE_2	$\overline{WE}$	$\overline{OE}$	Input/Output	Mode
H	X	X	X	High Z	Deselect/Power-down
X	L	X	X	High Z	Deselect
L	H	H	L	Data Out	Read
L	H	L	X	Data In	Write
L	H	H	H	High Z	Deselect

Address Designators

Address Name	Address Function	Pin Number
A4	X3	2
A5	X4	3
A6	X5	4
A7	X6	5
A8	X7	6
A9	Y1	7
A10	Y4	8
A11	Y3	9
A12	Y0	10
A0	Y2	21
A1	X0	23
A2	X1	24
A3	X2	25

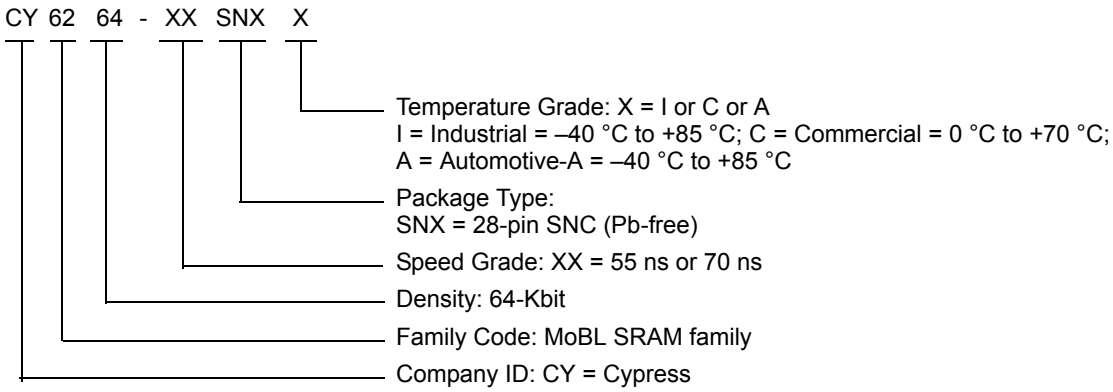
Ordering Information

Table 1 lists the CY6264 key package features and ordering codes. The table contains only the parts that are currently available. If you do not see what you are looking for, contact your local sales representative. For more information, visit the Cypress website at www.cypress.com and see the product summary page at http://www.cypress.com/products.

Table 1. Static RAM Key Features and Ordering Information

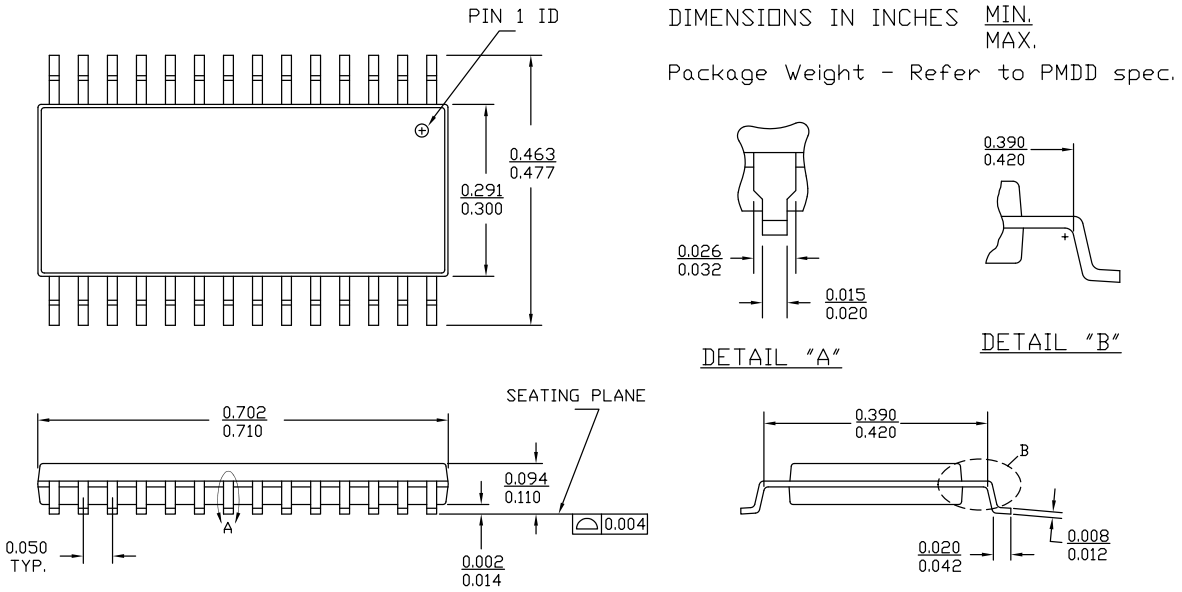
Speed (ns)	Ordering Code	Package Diagram	Package Type	Operating Range
55	CY6264-55SNXI	51-85092	28-pin SNC (300 Mils) Narrow Body (Pb-free)	Industrial
70	CY6264-70SNXC		28-pin SNC (300 Mils) Narrow Body (Pb-free)	Commercial

Ordering Code Definitions



Package Diagram

Figure 8. 28-pin SNC (300 Mils) SN28.3 (Narrow Body) Package Outline, 51-85092



Acronyms

Acronym	Description
CMOS	Complementary Metal Oxide Semiconductor
I/O	Input/Output
SRAM	Static Random Access Memory
TSOP	Thin Small Outline Package
VFBGA	Very Fine-Pitch Ball Grid Array

Document Conventions

Units of Measure

Symbol	Unit of Measure
°C	degrees Celsius
MHz	megahertz
µA	microampere
mA	milliampere
ns	nanosecond
Ω	ohm
pF	picofarad
V	volt
W	watt

Document History Page

Document Title: CY6264, 8 K × 8 Static RAM Document Number: 001-02367				
Revision	**ECN**	**Orig. of Change**	**Submission date**	**Description of Change**
**	384870	PCI	06/28/05	Spec # change from 38-00425 to 001-02367
*A	488954	VKN	See ECN	Added Automotive product Added 55 ns Industrial spec Removed SOIC package from the product offering Changed the description of I_{IX} from Input Load Current to Input Leakage Current in DC Electrical Characteristics table Removed I_{OS} parameter from DC Electrical Characteristics table Updated ordering Information table
*B	2892510	VKN	See ECN	Updated Ordering Information table Updated Package Diagram Added Sales, Solutions, and Legal Information
*C	3329873	RAME	07/27/11	Updated template and styles according to current Cypress standards. Added acronyms, units, and ordering code definitions. Removed reference to AN1064 SRAM system guidelines.
*D	4122787	VINI	09/13/2013	Updated Package Diagram: spec 51-85092 – Changed revision from *C to *E. Updated in new template. Completing Sunset Review.
*E	4525875	VINI	10/06/2014	Updated Maximum Ratings: Referred Note 1 in “Supply voltage to ground potential”. Updated Switching Characteristics: Added Note 7 and referred the same note in “WRITE CYCLE”. Updated Switching Waveforms: Added Figure 7. Added Note 15, 16, 17 and referred the same notes in Figure 7. Completing Sunset Review.
*F	4576406	VINI	01/16/2015	Added related documentation hyperlink in page 1. Removed the prune part number CY6264-70SNXA in Ordering Information.

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