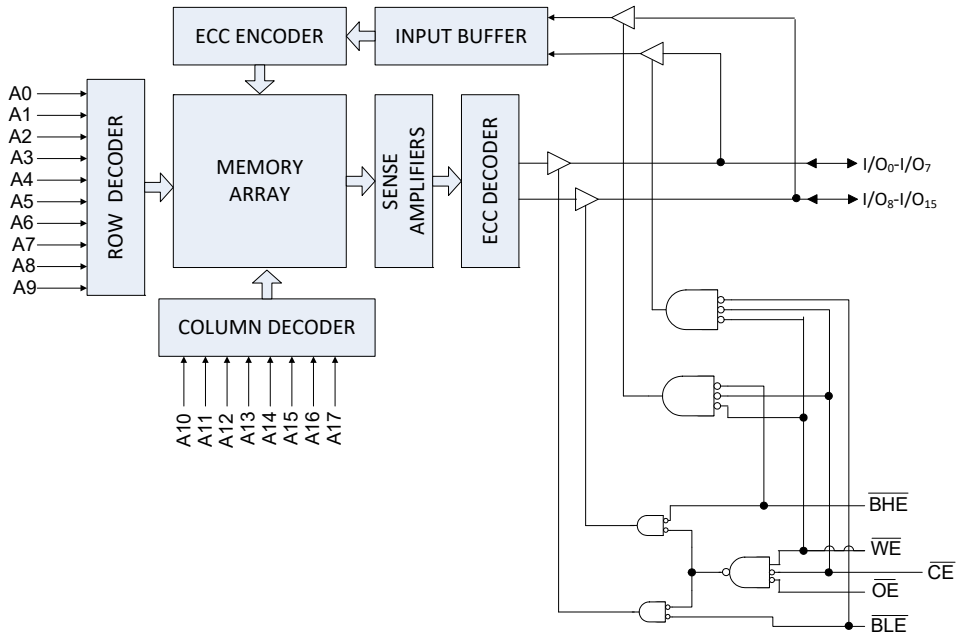
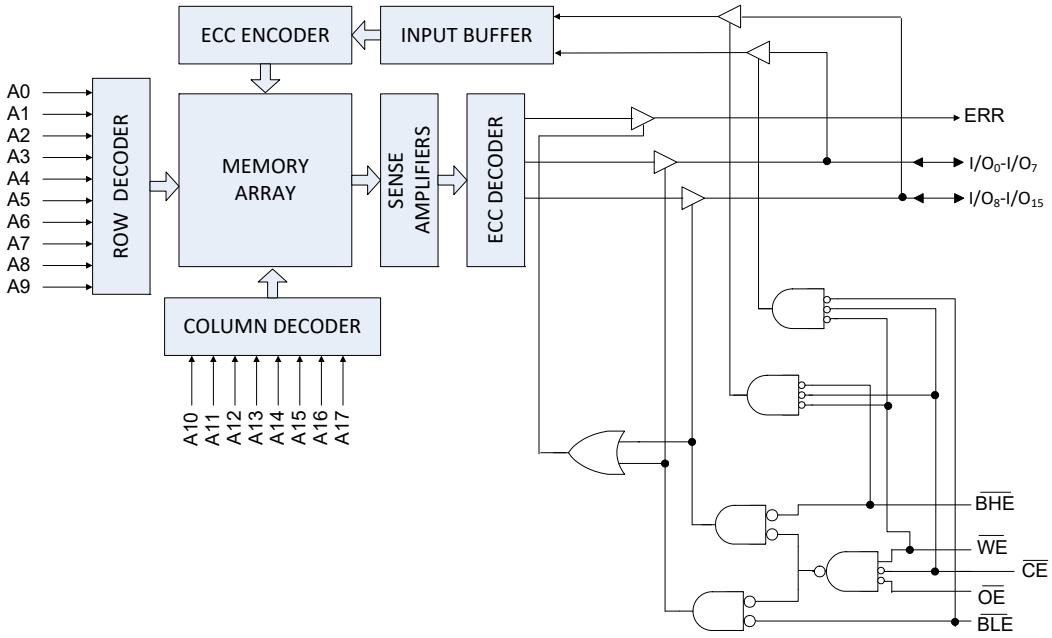
Logic Block Diagram – CY7C1041G



Logic Block Diagram – CY7C1041GE



Contents

Pin Configurations

Figure 1. 48-ball VFBGA (6 × 8 × 1.0 mm) Single Chip Enable without ERR, CY7C1041G [5], Package/Grade ID: BVXI [7]

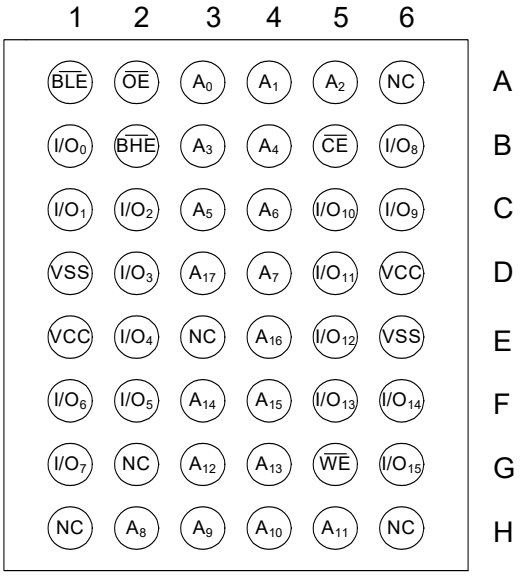


Figure 2. 48-ball VFBGA (6 × 8 × 1.0 mm) Single Chip Enable with ERR, CY7C1041GE [5, 6], Package/Grade ID: BVXI [7]

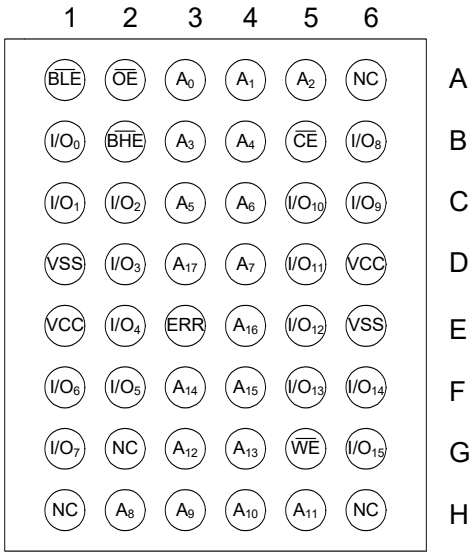


Figure 3. 48-ball VFBGA (6 × 8 × 1.0 mm) Single Chip Enable without ERR, CY7C1041G [5], Package/Grade ID: BVJXI [7]

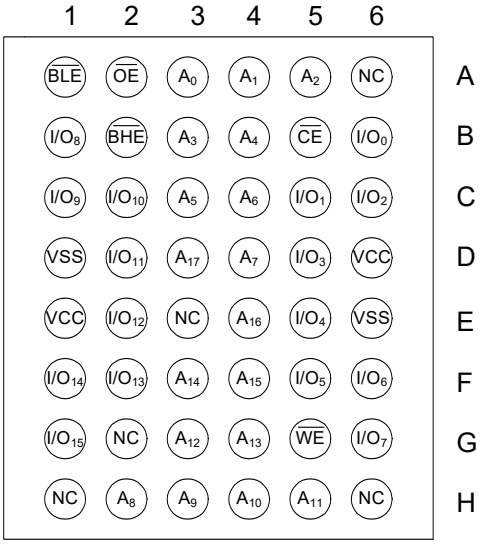
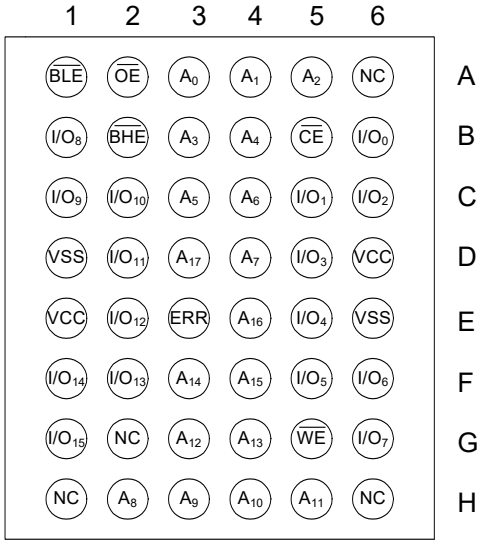


Figure 4. 48-ball VFBGA (6 × 8 × 1.0 mm) Single Chip Enable with ERR, CY7C1041GE [5, 6], Package/Grade ID: BVJXI [7]



Notes
5. NC pins are not connected internally to the die.
6. ERR is an output pin.
7. Package type BVJXI is JEDEC compliant compared to package type BVXI. The difference between the two is that the higher and lower byte I/Os ($I/O_{[7:0]}$ and $I/O_{[15:8]}$ balls are swapped.

Pin Configurations (continued)

Figure 5. 44-pin TSOP II/44-pin SOJ Single Chip Enable with ERR, CY7C1041GE [8, 9]

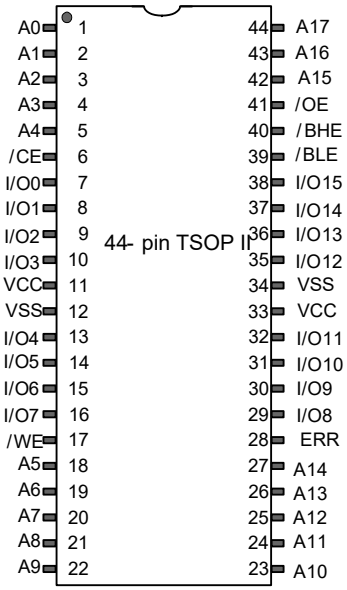
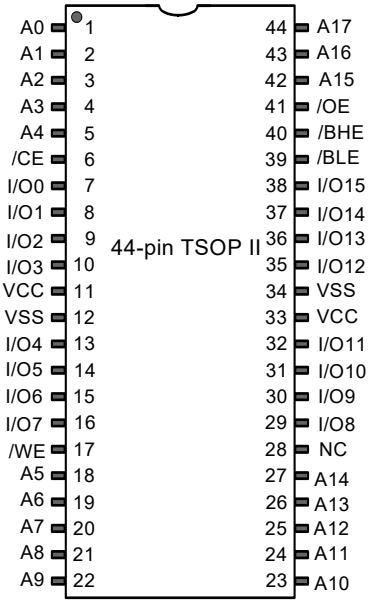


Figure 6. 44-pin TSOP II/44-pin SOJ Single Chip Enable without ERR, CY7C1041G [8]



Notes
8. NC pins are not connected internally to the die.
9. ERR is an output pin.

Maximum Ratings

Exceeding maximum ratings may impair the useful life of the device. These user guidelines are not tested.

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

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

Supply voltage on V_{CC} relative to GND [10] ..... –0.5 V to V_{CC} + 0.5 V

DC voltage applied to outputs in HI-Z State [10] ..... –0.5 V to V_{CC} + 0.5 V

DC input voltage [10] ..... –0.5 V to V_{CC} + 0.5 V

Current into outputs (in LOW state) ..... 20 mA

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

Latch-up current ..... > 140 mA

Operating Range

Grade	Ambient Temperature	V_{CC}
Industrial	–40 °C to +85 °C	1.65 V to 2.2 V, 2.2 V to 3.6 V, 4.5 V to 5.5 V

DC Electrical Characteristics

Over the operating range of –40 °C to 85 °C

Parameter	Description		Test Conditions	10 ns/15 ns			Unit
				Min	Typ [11]	Max	
V_{OH}	Output HIGH voltage	1.65 V to 2.2 V	V_{CC} = Min, I_{OH} = –0.1 mA	1.4	–	–	V
		2.2 V to 2.7 V	V_{CC} = Min, I_{OH} = –1.0 mA	2	–	–	
		2.7 V to 3.0 V	V_{CC} = Min, I_{OH} = –4.0 mA	2.2	–	–	
		3.0 V to 3.6 V	V_{CC} = Min, I_{OH} = –4.0 mA	2.4	–	–	
		4.5 V to 5.5 V	V_{CC} = Min, I_{OH} = –4.0 mA	2.4	–	–	
		4.5 V to 5.5 V	V_{CC} = Min, I_{OH} = –0.1 mA	V_{CC} – 0.5 [12]	–	–	
V_{OL}	Output LOW voltage	1.65 V to 2.2 V	V_{CC} = Min, I_{OL} = 0.1 mA	–	–	0.2	V
		2.2 V to 2.7 V	V_{CC} = Min, I_{OL} = 2 mA	–	–	0.4	
		2.7 V to 3.6 V	V_{CC} = Min, I_{OL} = 8 mA	–	–	0.4	
		4.5 V to 5.5 V	V_{CC} = Min, I_{OL} = 8 mA	–	–	0.4	
V_{IH}	Input HIGH voltage	1.65 V to 2.2 V	–	1.4	–	V_{CC} + 0.2 [10]	V
		2.2 V to 2.7 V	–	2	–	V_{CC} + 0.3 [10]	
		2.7 V to 3.6 V	–	2	–	V_{CC} + 0.3 [10]	
		4.5 V to 5.5 V	–	2	–	V_{CC} + 0.5 [10]	
V_{IL}	Input LOW voltage	1.65 V to 2.2 V	–	–0.2 [10]	–	0.4	V
		2.2 V to 2.7 V	–	–0.3 [10]	–	0.6	
		2.7 V to 3.6 V	–	–0.3 [10]	–	0.8	
		4.5 V to 5.5 V	–	–0.5 [10]	–	0.8	
I_{IX}	Input leakage current		GND ≤ V_{IN} ≤ V_{CC}	–1	–	+1	µA
I_{OZ}	Output leakage current		GND ≤ V_{OUT} ≤ V_{CC}, Output disabled	–1	–	+1	µA
I_{CC}	Operating supply current		Max V_{CC}, I_{OUT} = 0 mA, CMOS levels, f = 100 MHz	–	38	45	mA
			Max V_{CC}, I_{OUT} = 0 mA, CMOS levels, f = 66.7 MHz	–	–	40	
I_{SB1}	Automatic CE power-down current – TTL inputs		Max V_{CC}, $\overline{CE}$ ≥ V_{IH}, V_{IN} ≥ V_{IH} or V_{IN} ≤ V_{IL}, f = f_{MAX}	–	–	15	mA
I_{SB2}	Automatic CE power-down current – CMOS inputs		Max V_{CC}, $\overline{CE}$ ≥ V_{CC} – 0.2 V, V_{IN} ≥ V_{CC} – 0.2 V or V_{IN} ≤ 0.2 V, f = 0	–	6	8	mA

Notes

10. $V_{IL(min)}$ = –2.0 V and $V_{IH(max)}$ = V_{CC} + 2 V for pulse durations of less than 20 ns.
11. Typical values are included for reference only and are not guaranteed or tested. Typical values are measured at V_{CC} = 1.8 V (for V_{CC} range of 1.65 V – 2.2 V), V_{CC} = 3 V (for V_{CC} range of 2.2V – 3.6 V), and V_{CC} = 5 V (for V_{CC} range of 4.5 V – 5.5 V), T_A = 25 °C.
12. This parameter is guaranteed by design and not tested.

Capacitance

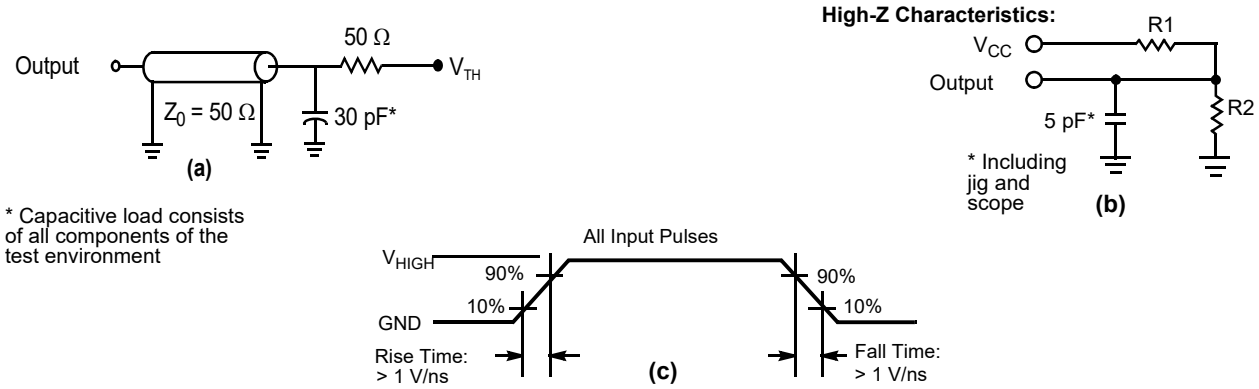
Parameter [13]	Description	Test Conditions	48-ball VFBGA	44-pin SOJ	44-pin TSOP II	Unit
C_{IN}	Input capacitance	T_A = 25 °C, f = 1 MHz, V_{CC} = $V_{CC(typ)}$	10	10	10	pF
C_{OUT}	I/O capacitance		10	10	10	pF

Thermal Resistance

Parameter [13]	Description	Test Conditions	48-ball VFBGA	44-pin SOJ	44-pin TSOP II	Unit
Θ_{JA}	Thermal resistance (junction to ambient)	Still air, soldered on a 3 × 4.5 inch, four-layer printed circuit board	31.35	55.37	68.85	°C/W
Θ_{JC}	Thermal resistance (junction to case)		14.74	30.41	15.97	°C/W

AC Test Loads and Waveforms

Figure 7. AC Test Loads and Waveforms [14]



Parameters	1.8 V	3.0 V	5.0 V	Unit
R1	1667	317	317	Ω
R2	1538	351	351	Ω
V_{TH}	0.9	1.5	1.5	V
V_{HIGH}	1.8	3	3	V

Notes
13. Tested initially and after any design or process changes that may affect these parameters.
14. Full-device AC operation assumes a 100-µs ramp time from 0 to $V_{CC(min)}$ and a 100-µs wait time after V_{CC} stabilization.

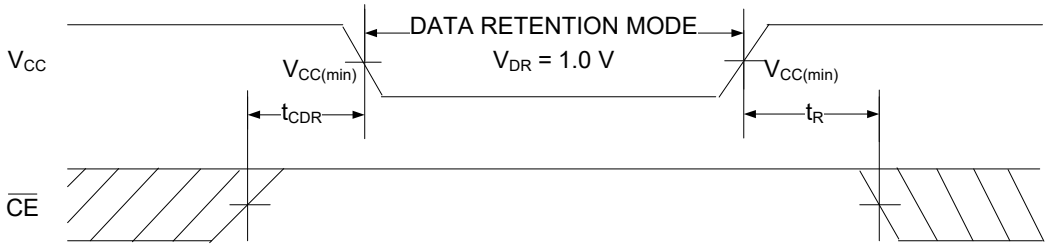
Data Retention Characteristics

Over the operating range of –40 °C to 85 °C

Parameter	Description	Conditions	Min	Max	Unit
V_{DR}	V_{CC} for data retention		1	–	V
I_{CCDR}	Data retention current	V_{CC} = 1.2 V, $\overline{CE} \geq V_{CC} - 0.2$ V[15], $V_{IN} \geq V_{CC} - 0.2$ V, or $V_{IN} \leq 0.2$ V	–	8	mA
t_{CDR}[16]	Chip deselect to data retention time		0	–	ns
t_R[15, 16]	Operation recovery time	$V_{CC} \geq 2.2$ V	10	–	ns
		$V_{CC} < 2.2$ V	15	–	ns

Data Retention Waveform

Figure 8. Data Retention Waveform [15]



Notes
15. Full-device operation requires linear V_{CC} ramp from V_{DR} to $V_{CC(min)} \geq 100$ µs or stable at $V_{CC\ (min)} \geq 100$ µs.
16. These parameters are guaranteed by design.

AC Switching Characteristics

Over the operating range of –40 °C to 85 °C

Parameter [17]	Description	10 ns		15 ns		Unit
		Min	Max	Min	Max	
Read Cycle						
t_{RC}	Read cycle time	10	–	15	–	ns
t_{AA}	Address to data / ERR valid	–	10	–	15	ns
t_{OHA}	Data / ERR hold from address change	3	–	3	–	ns
t_{ACE}	$\overline{CE}$ LOW to data / ERR valid	–	10	–	15	ns
t_{DOE}	$\overline{OE}$ LOW to data / ERR valid	–	4.5	–	8	ns
t_{LZOE}	$\overline{OE}$ LOW to low impedance [18]	0	–	0	–	ns
t_{HZOE}	$\overline{OE}$ HIGH to HI-Z [18, 19]	–	5	–	8	ns
t_{LZCE}	$\overline{CE}$ LOW to low impedance [18]	3	–	3	–	ns
t_{HZCE}	$\overline{CE}$ HIGH to HI-Z [18, 19]	–	5	–	8	ns
t_{PU}	$\overline{CE}$ LOW to power-up [19, 18]	0	–	0	–	ns
t_{PD}	$\overline{CE}$ HIGH to power-down [19, 18]	–	10	–	15	ns
t_{DBE}	Byte enable to data valid	–	4.5	–	8	ns
t_{LZBE}	Byte enable to low impedance [18]	0	–	0	–	ns
t_{HZBE}	Byte disable to HI-Z [19]	–	6	–	8	ns
Write Cycle [20, 21]						
t_{WC}	Write cycle time	10	–	15	–	ns
t_{SCE}	$\overline{CE}$ LOW to write end	7	–	12	–	ns
t_{AW}	Address setup to write end	7	–	12	–	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	7	–	12	–	ns
t_{SD}	Data setup to write end	5	–	8	–	ns
t_{HD}	Data hold from write end	0	–	0	–	ns
t_{LZWE}	$\overline{WE}$ HIGH to low impedance [18]	3	–	3	–	ns
t_{HZWE}	$\overline{WE}$ LOW to HI-Z [19]	–	5	–	8	ns
t_{BW}	Byte Enable to write end	7	–	12	–	ns

Notes

17. Test conditions assume a signal transition time (rise/fall) of 3 ns or less, timing reference levels of 1.5 V (for $V_{CC} \geq 3$ V) and $V_{CC}/2$ (for $V_{CC} < 3$ V), and input pulse levels of 0 to 3 V (for $V_{CC} \geq 3$ V) and 0 to V_{CC} (for $V_{CC} < 3$ V). Test conditions for the read cycle use output loading, as shown in part (a) of Figure 7 on page 7, unless specified otherwise
18. t_{HZOE}, t_{HZCE}, t_{HZWE}, t_{HZBE}, t_{LZOE}, t_{LZCE}, t_{LZWE}, and t_{LZBE} are specified with a load capacitance of 5 pF, as shown in part (b) of Figure 7 on page 7. Transition is measured ±200 mV from steady state voltage.
19. These parameters are guaranteed by design and are not tested.
20. The internal write time of the memory is defined by the overlap of $\overline{WE}$ = V_{IL}, $\overline{CE}$ = V_{IL}, and $\overline{BHE}$ or $\overline{BLE}$ = V_{IL}. These signals must be LOW to initiate a write, and the HIGH transition of any of these signals can terminate the operation. The input data setup and hold timing should be referenced to the edge of the signal that terminates the write.
21. The minimum write cycle pulse width in Write Cycle No 2 ($\overline{WE}$ Controlled, $\overline{OE}$ LOW) should be equal to sum of $t_{sd}$and t_{HZWE}.

Switching Waveforms

Figure 9. Read Cycle No. 1 of CY7C1041G (Address Transition Controlled) [22, 23]

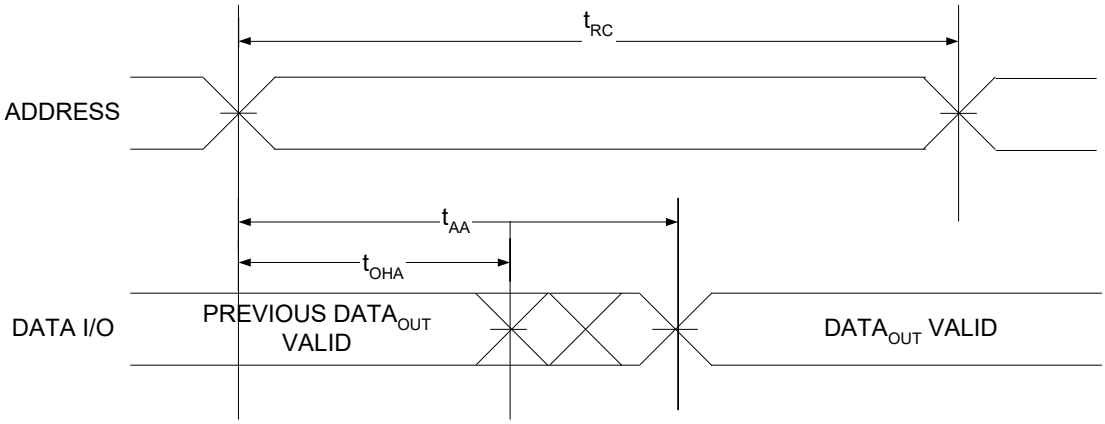
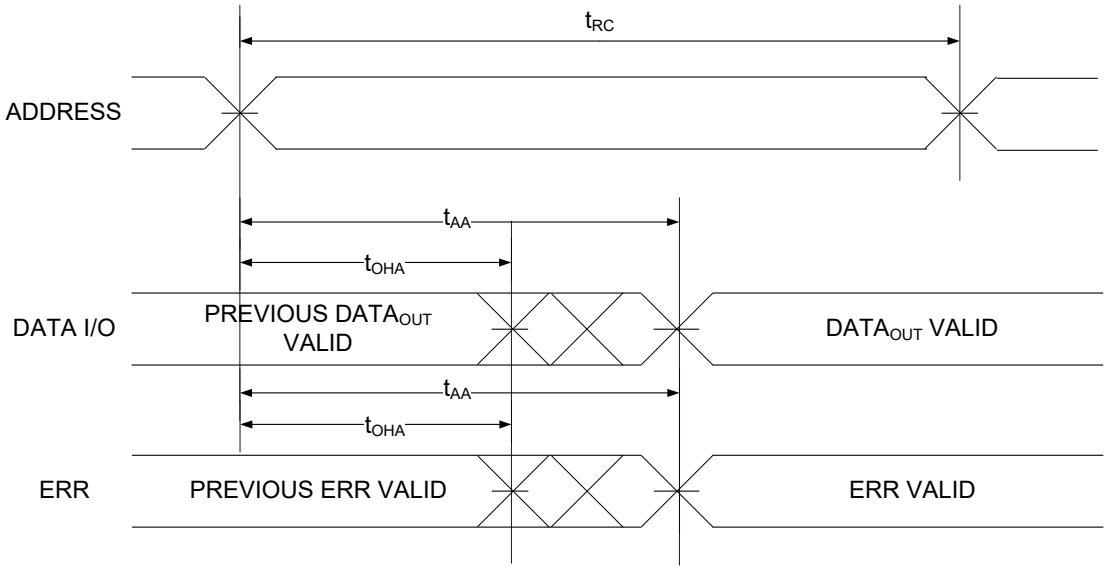


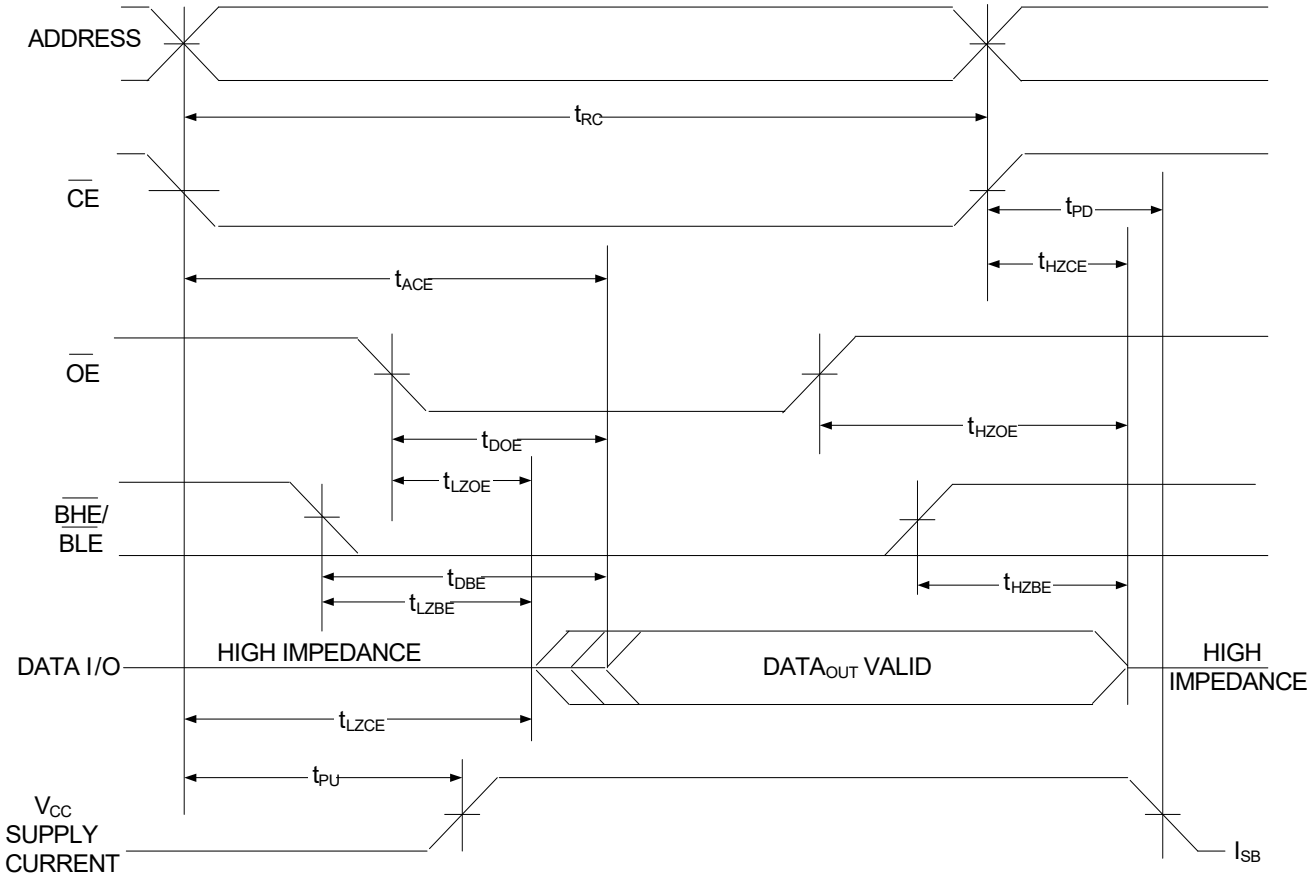
Figure 10. Read Cycle No. 1 of CY7C1041GE (Address Transition Controlled) [22, 23]



Notes
22. The device is continuously selected, $\overline{OE}$ = V_{IL}, $\overline{CE}$ = V_{IL}, $\overline{BHE}$ or $\overline{BLE}$ or both = V_{IL}.
23. $\overline{WE}$ is HIGH for the read cycle.

Switching Waveforms (continued)

Figure 11. Read Cycle No. 2 (OE Controlled) [24, 25]



Notes
24. WE is HIGH for the read cycle.
25. Address valid prior to or coincident with CE LOW transition.

Switching Waveforms (continued)

Figure 12. Write Cycle No. 1 ($\overline{CE}$ Controlled) [26, 27]

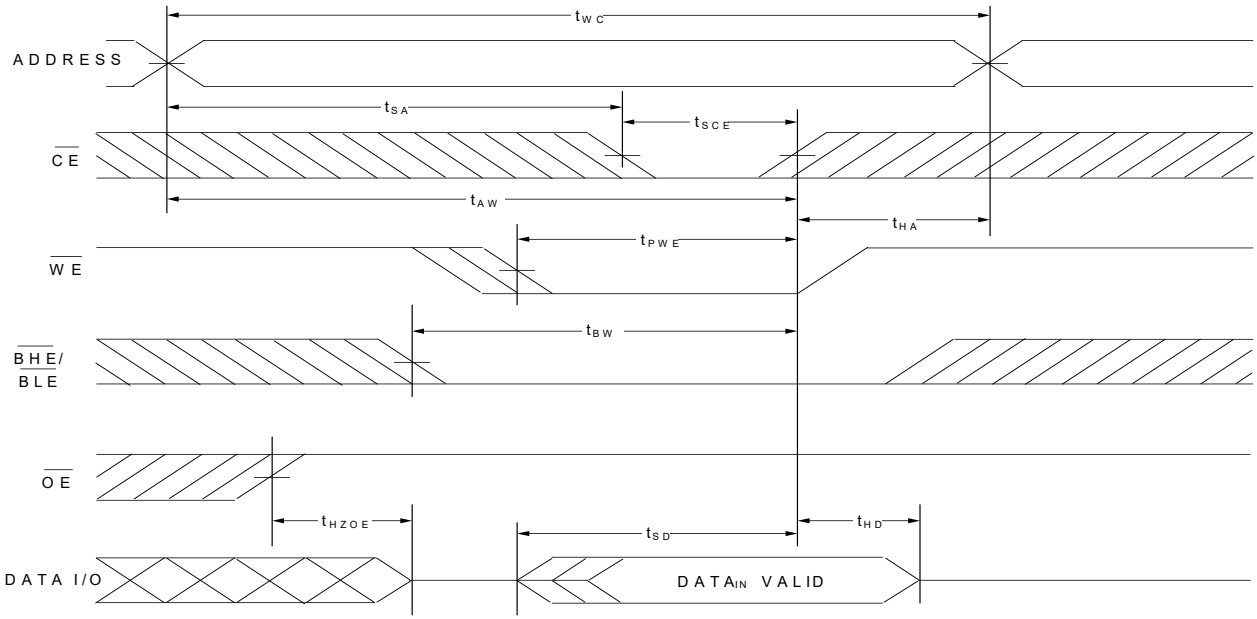
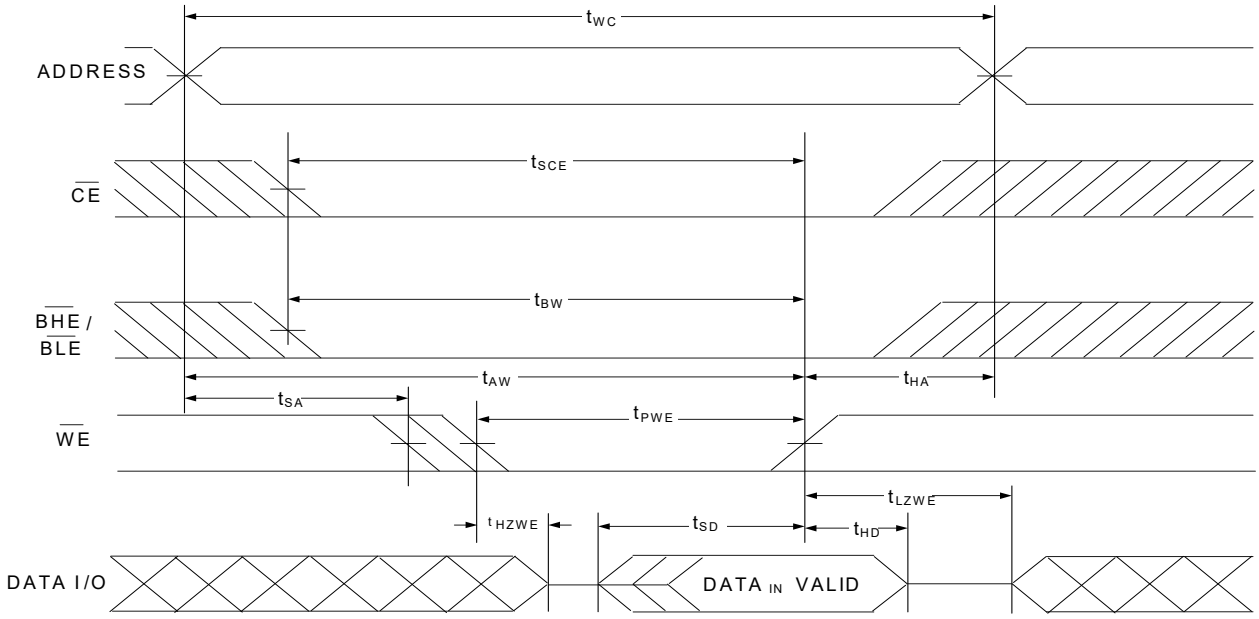


Figure 13. Write Cycle No. 2 ($\overline{WE}$ Controlled, $\overline{OE}$ LOW) [26, 27, 28]



Notes

26. The internal write time of the memory is defined by the overlap of $\overline{WE}$ = V_{IL}, $\overline{CE}$ = V_{IL}, and $\overline{BHE}$ or $\overline{BLE}$ = V_{IL}. These signals must be LOW to initiate a write, and the HIGH transition of any of these signals can terminate the operation. The input data setup and hold timing should be referenced to the edge of the signal that terminates the write.
27. Data I/O is in HI-Z state if $\overline{CE}$ = V_{IH}, or $\overline{OE}$ = V_{IH}, or $\overline{BHE}$, and/or $\overline{BLE}$ = V_{IH}.
28. The minimum write cycle pulse width should be equal to sum of t_{SD} and t_{HZWE}.

Switching Waveforms (continued)

Figure 14. Write Cycle No. 3 (BLE or BHE Controlled) [29, 30]

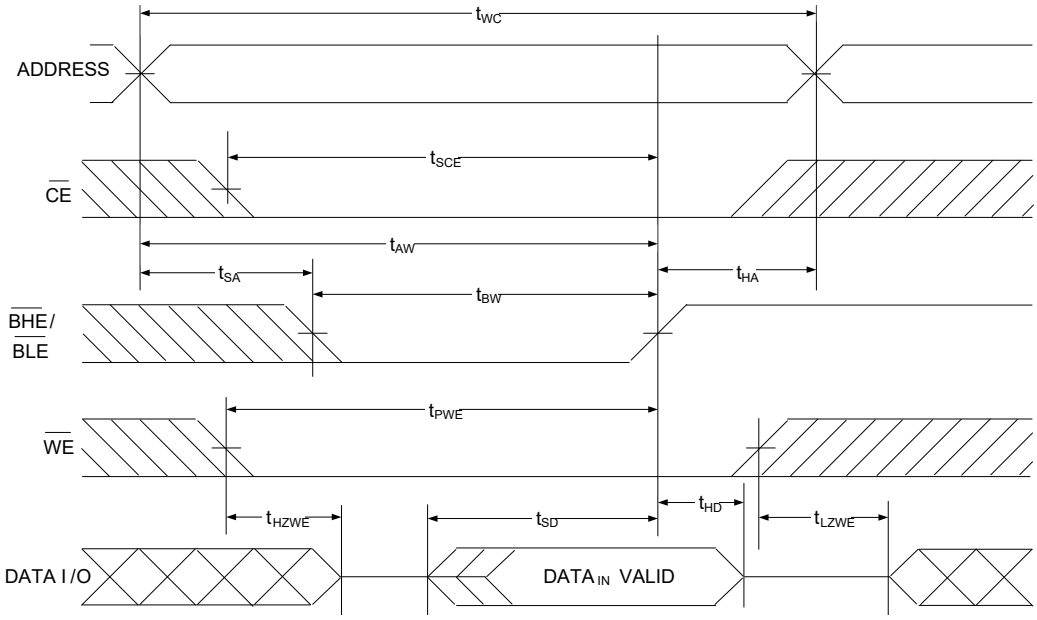
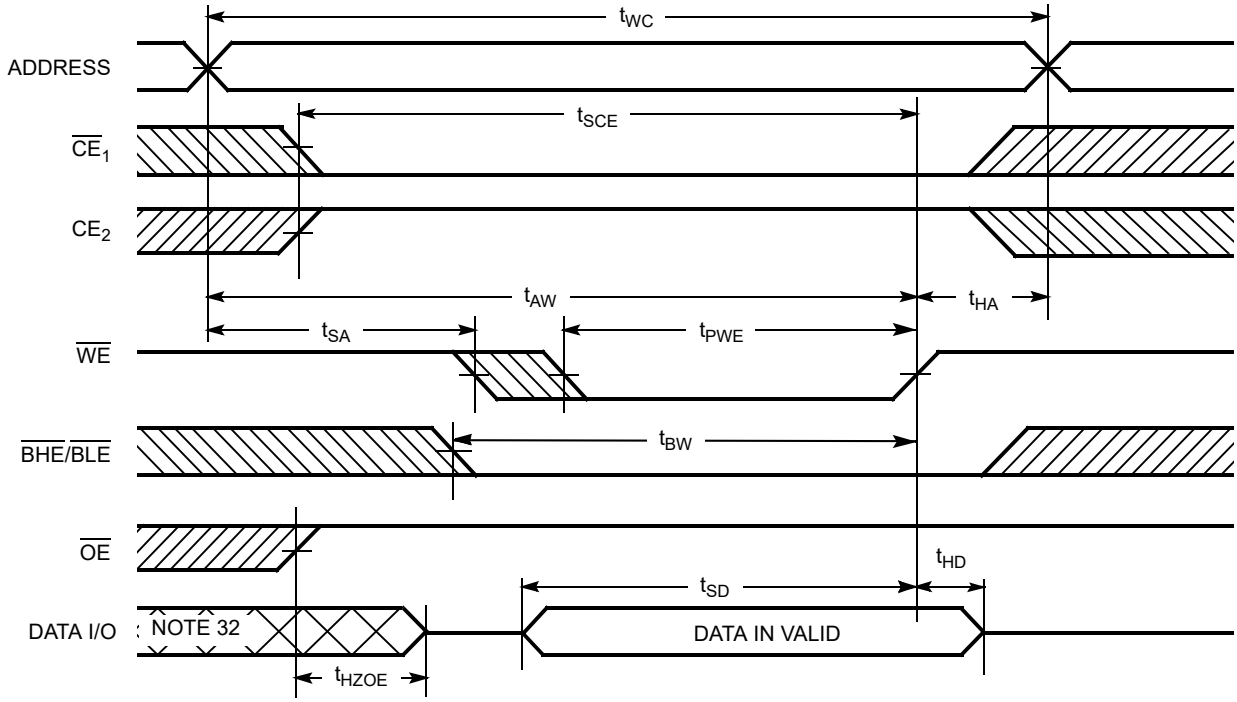


Figure 15. Write Cycle No. 4 (WE Controlled) [29, 30, 31]



Notes

29. The internal write time of the memory is defined by the overlap of $\overline{WE}$ = V_{IL}, $\overline{CE}$ = V_{IL}, and $\overline{BHE}$ or $\overline{BLE}$ = V_{IL}. These signals must be LOW to initiate a write, and the HIGH transition of any of these signals can terminate the operation. The input data setup and hold timing should be referenced to the edge of the signal that terminates the write.
30. Data I/O is in HI-Z state if $\overline{CE}$ = V_{IH}, or $\overline{OE}$ = V_{IH}, or $\overline{BHE}$, and/or $\overline{BLE}$ = V_{IH}.
31. Data I/O is high impedance if $\overline{OE}$ = V_{IH}.
32. During this period the I/Os are in output state. Do not apply input signals.

Truth Table

$\overline{CE}$	$\overline{OE}$	$\overline{WE}$	$\overline{BLE}$	$\overline{BHE}$	$I/O_0–I/O_7$	$I/O_8–I/O_{15}$	Mode	Power
H	X[33]	X[33]	X[33]	X[33]	HI-Z	HI-Z	Power down	Standby (I_{SB})
L	L	H	L	L	Data out	Data out	Read all bits	Active (I_{CC})
L	L	H	L	H	Data out	HI-Z	Read lower bits only	Active (I_{CC})
L	L	H	H	L	HI-Z	Data out	Read upper bits only	Active (I_{CC})
L	X	L	L	L	Data in	Data in	Write all bits	Active (I_{CC})
L	X	L	L	H	Data in	HI-Z	Write lower bits only	Active (I_{CC})
L	X	L	H	L	HI-Z	Data in	Write upper bits only	Active (I_{CC})
L	H	H	X	X	HI-Z	HI-Z	Selected, outputs disabled	Active (I_{CC})
L	X	X	H	H	HI-Z	HI-Z	Selected, outputs disabled	Active (I_{CC})

ERR Output – CY7C1041GE

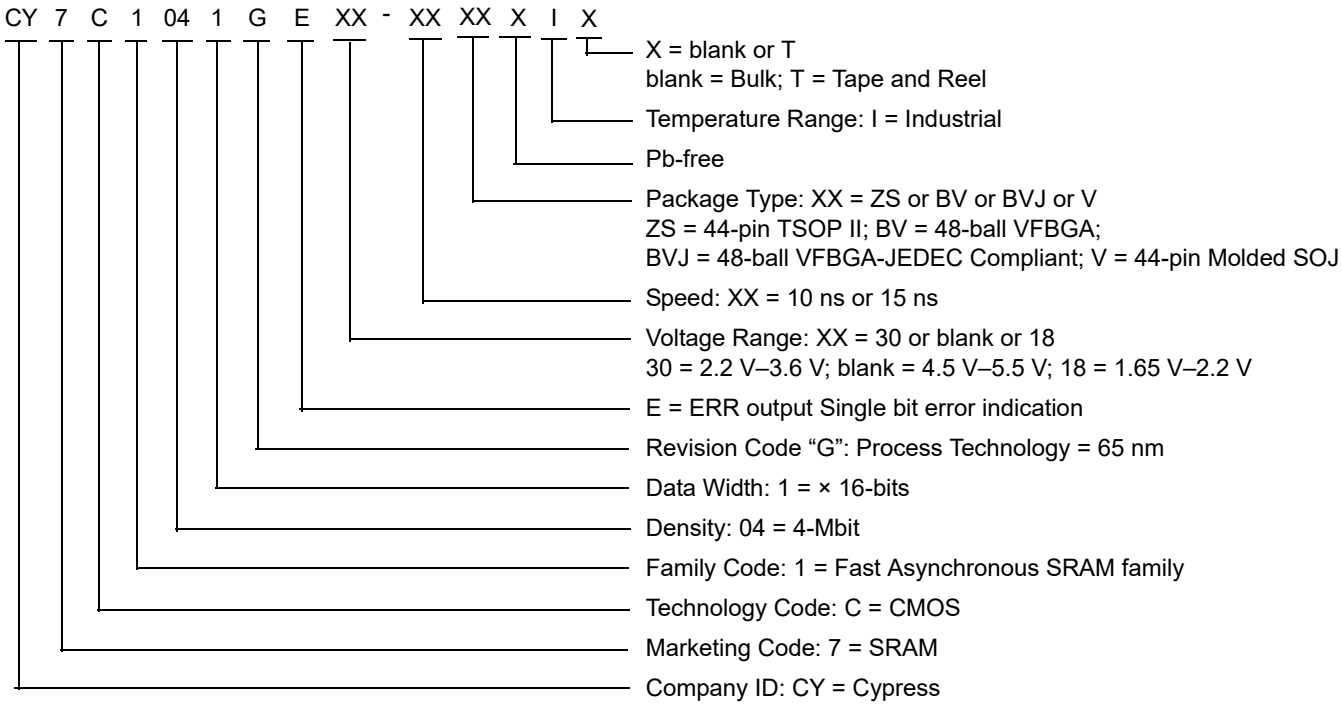
Output [34]	Mode
0	Read operation, no single-bit error in the stored data.
1	Read operation, single-bit error detected and corrected.
HI-Z	Device deselected or outputs disabled or Write operation

Notes
33. The input voltage levels on these pins should be either at V_{IH} or V_{IL}.
34. ERR is an Output pin.If not used, this pin should be left floating.

Ordering Information

Speed (ns)	Voltage Range	Ordering Code	Package Diagram	Package Type (all Pb-free)	Operating Range
10	2.2 V–3.6 V	CY7C1041GE30-10ZSXI	51-85087	44-pin TSOP II, ERR output	Industrial
		CY7C1041GE30-10ZSXIT	51-85087	44-pin TSOP II, ERR output, Tape and Reel	
		CY7C1041G30-10ZSXI	51-85087	44-pin TSOP II	
		CY7C1041G30-10ZSXIT	51-85087	44-pin TSOP II, Tape and Reel	
		CY7C1041GE30-10BVXI	51-85150	48-ball VFBGA (6 × 8 × 1.0 mm), ERR output	
		CY7C1041GE30-10BVXIT	51-85150	48-ball VFBGA (6 × 8 × 1.0 mm), ERR output, Tape and Reel	
		CY7C1041G30-10BVXI	51-85150	48-ball VFBGA (6 × 8 × 1.0 mm)	
		CY7C1041G30-10BVXIT	51-85150	48-ball VFBGA (6 × 8 × 1.0 mm), Tape and Reel	
		CY7C1041G30-10BVJXI	51-85150	48-ball VFBGA (6 × 8 × 1.0 mm), JEDEC	
		CY7C1041G30-10BVJXIT	51-85150	48-ball VFBGA (6 × 8 × 1.0 mm), JEDEC, Tape and Reel	
		CY7C1041G30-10VXI	51-85082	44-pin SOJ (400 Mils)	
		CY7C1041G30-10VXIT	51-85082	44-pin SOJ (400 Mils), Tape and Reel	
		CY7C1041GE30-10VXI	51-85082	44-pin SOJ (400 Mils), ERR output	
		CY7C1041GE30-10VXIT	51-85082	44-pin SOJ (400 Mils), ERR output, Tape and Reel	
	4.5 V–5.5 V	CY7C1041G-10ZSXI	51-85087	44-pin TSOP II	
		CY7C1041G-10ZSXIT	51-85087	44-pin TSOP II, Tape and Reel	
		CY7C1041GE-10ZSXI	51-85087	44-pin TSOP II, ERR output	
		CY7C1041GE-10ZSXIT	51-85087	44-pin TSOP II, ERR output, Tape and Reel	
		CY7C1041GE-10VXI	51-85082	44-pin SOJ (400 Mils), ERR output	
		CY7C1041GE-10VXIT	51-85082	44-pin SOJ (400 Mils), ERR output, Tape and Reel	
		CY7C1041G-10VXI	51-85082	44-pin SOJ (400 Mils)	
		CY7C1041G-10VXIT	51-85082	44-pin SOJ (400 Mils), Tape and Reel	
15	1.65 V–2.2 V	CY7C1041G18-15ZSXI	51-85087	44-pin TSOP II	
		CY7C1041G18-15ZSXIT	51-85087	44-pin TSOP II, Tape and Reel	
		CY7C1041G18-15VXI	51-85082	44-pin SOJ (400 Mils)	
		CY7C1041G18-15VXIT	51-85082	44-pin SOJ (400 Mils), Tape and Reel	
		CY7C1041G18-15BVXI	51-85150	48-ball VFBGA (6 × 8 × 1.0 mm)	
		CY7C1041G18-15BVXT	51-85150	48-ball VFBGA (6 × 8 × 1.0 mm), Tape and Reel	

Ordering Code Definitions



Package Diagrams

Figure 16. 44-pin TSOP II (Z44) Package Outline, 51-85087

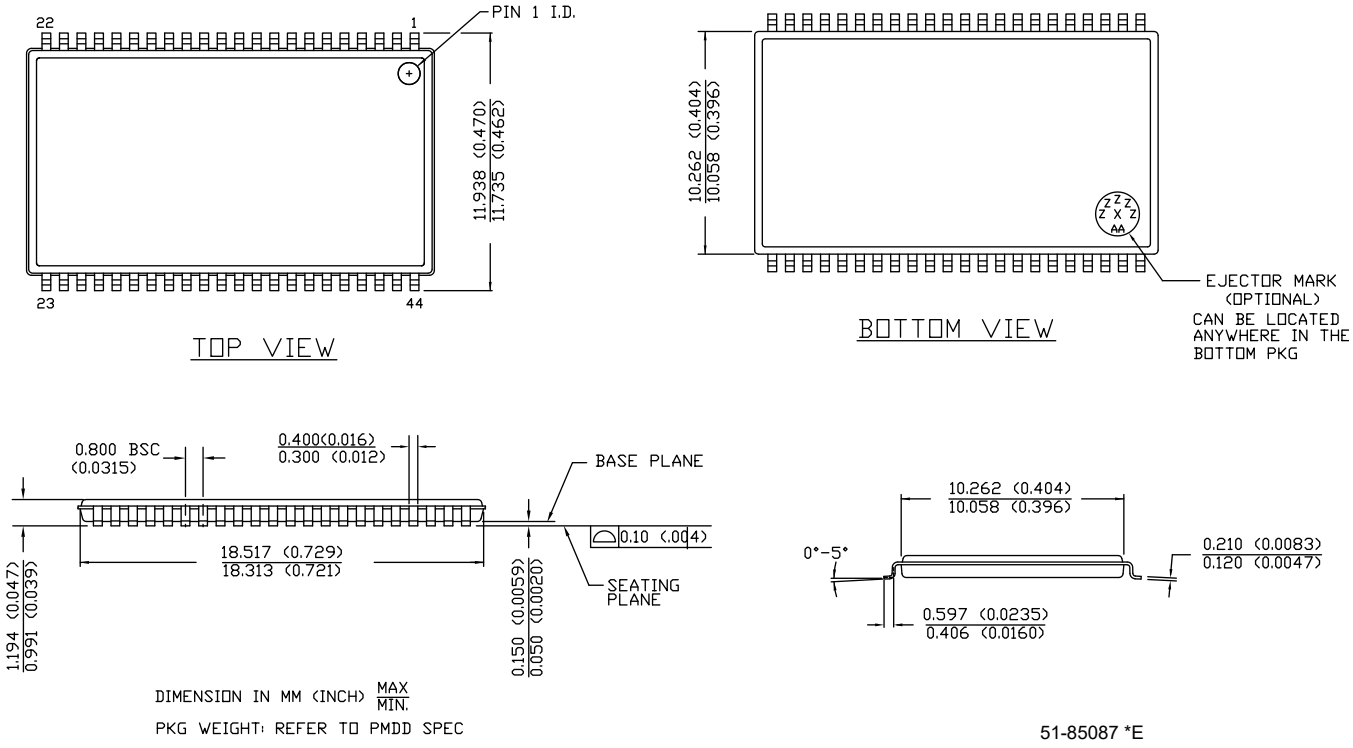
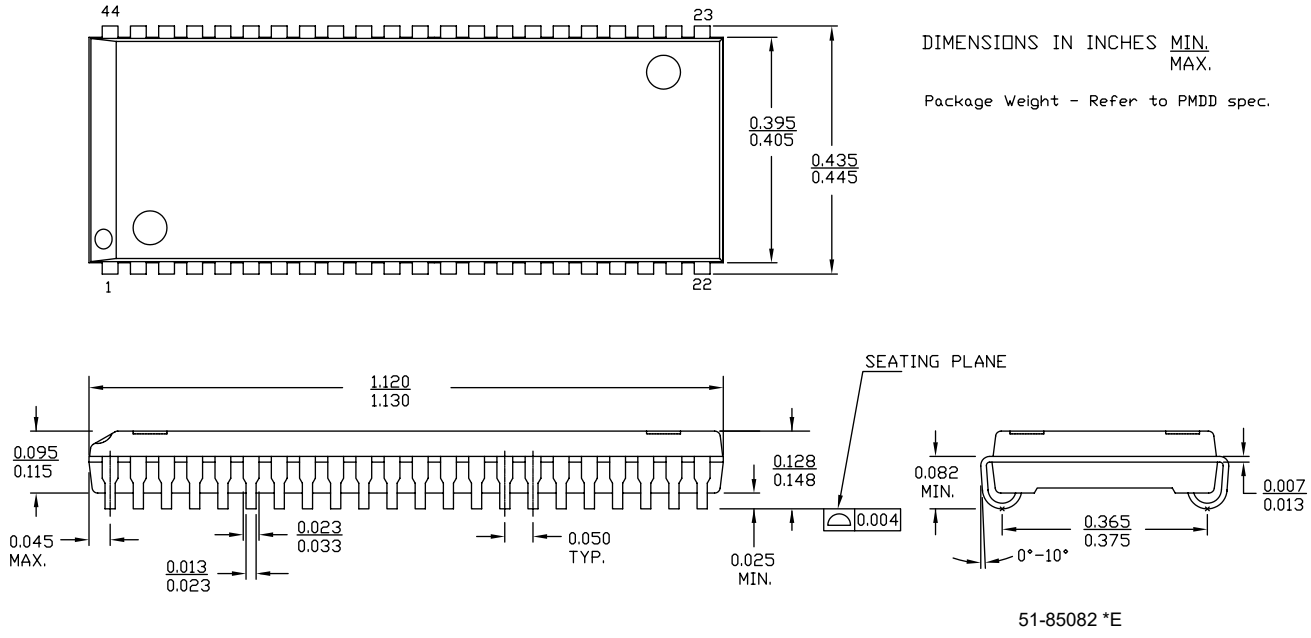
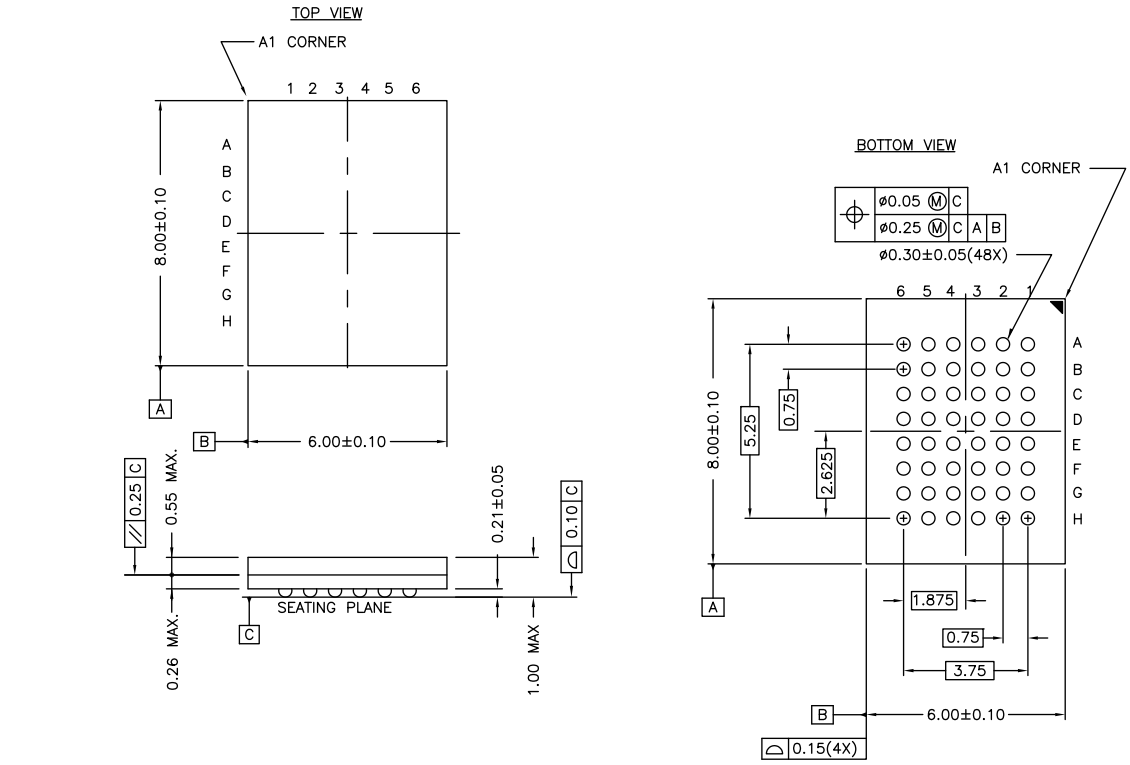


Figure 17. 44-pin SOJ (400 Mils) Package Outline, 51-85082



Package Diagrams (continued)

Figure 18. 48-ball VFBGA (6 × 8 × 1.0 mm) BV48/BZ48 Package Outline, 51-85150



NOTE:
PACKAGE WEIGHT: See Cypress Package Material Declaration Datasheet (PMDD) posted on the Cypress web.

51-85150 *H

Acronyms

Acronym	Description
$\overline{BHE}$	byte high enable
$\overline{BLE}$	byte low enable
$\overline{CE}$	chip enable
CMOS	complementary metal oxide semiconductor
I/O	input/output
$\overline{OE}$	output enable
SRAM	static random access memory
TSOP	thin small outline package
TTL	transistor-transistor logic
VFBGA	very fine-pitch ball grid array
$\overline{WE}$	write enable

Document Conventions

Units of Measure

Symbol	Unit of Measure
°C	Degrees Celsius
MHz	megahertz
µA	microamperes
µs	microseconds
mA	milliamperes
mm	millimeters
ns	nanoseconds
Ω	ohms
%	percent
pF	picofarads
V	volts
W	watts

Document History Page

Document Title: CY7C1041G/CY7C1041GE, 4-Mbit (256K words × 16-bit) Static RAM with Error-Correcting Code (ECC) Document Number: 001-91368				
Rev.	**ECN No.**	**Orig. of Change**	**Submission Date**	**Description of Change**
*F	4867081	NILE	07/31/2015	Changed status from Preliminary to Final.
*G	4876251	NILE	08/07/2015	Updated Ordering Information: Updated part numbers.
*H	4968879	NILE	10/16/2015	Fixed typo in bookmarks.
*I	5019226	VINI	11/18/2015	Updated Ordering Information: Updated part numbers.
*J	5122043	NILE	02/02/2016	Updated Truth Table.
*K	5223335	NILE	08/30/2016	Updated DC Electrical Characteristics: Removed values of V_{OH} parameter corresponding to “2.7 V to 3.6 V” range. Added values of V_{OH} parameter corresponding to “2.7 V to 3.0 V” and “3.0 V to 3.6 V” ranges. Updated Note 10 (Replaced “2 ns” with “20 ns”). Updated Ordering Information: Updated part numbers. Updated to new template.
*L	5655218	NILE	03/09/2017	Updated Logic Block Diagram – CY7C1041G (Updated diagram to change the devices from Dual Chip enabled to Single Chip enabled). Updated Logic Block Diagram – CY7C1041GE (Updated diagram to change the devices from Dual Chip enabled to Single Chip enabled). Updated to new template.
*M	5731242	GNKK	05/09/2017	Updated logo and copyright. Completing Sunset Review.
*N	6245720	NILE	07/13/2018	Updated Features: Added Note 2 and referred the same note in “Embedded ECC for single-bit error correction”. Updated to new template. Completing Sunset Review.

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