



CYPRESS  
SEMICONDUCTOR

CY101E484  
CY10E484  
CY100E484

4096 x 4 ECL Static RAM

## Features

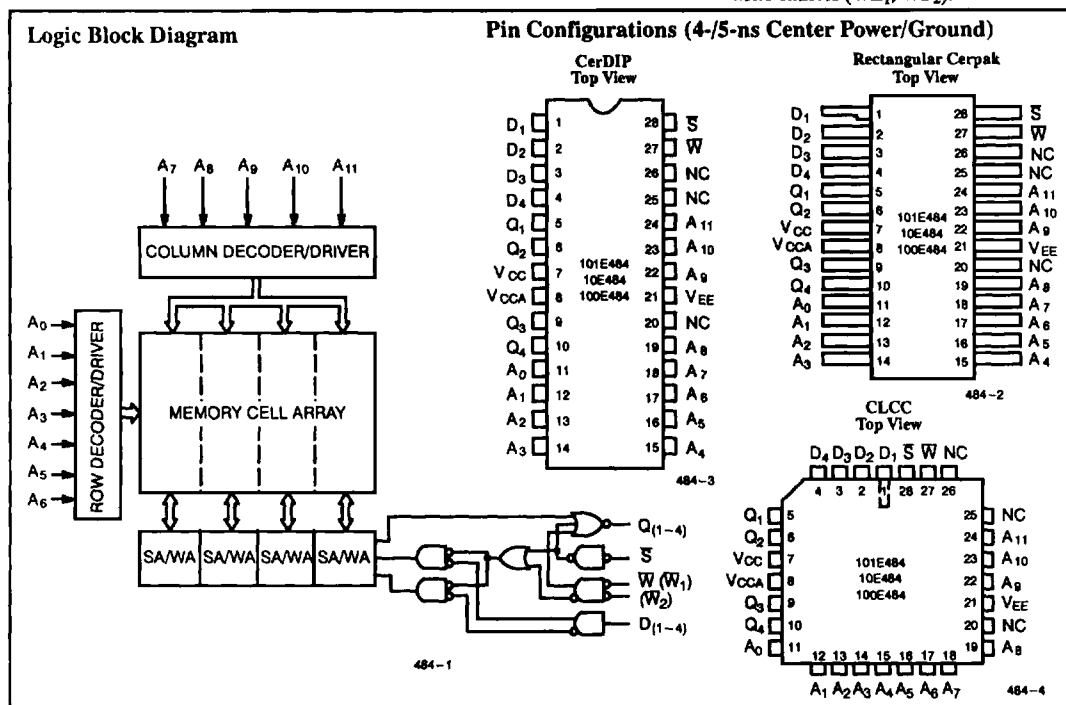
- 4096 x 4-bit organization
- Ultra high speed/standard power
  - $t_{AA} = 4, 5 \text{ ns}$
  - $I_{EE} = 320 \text{ mA}$
- Low-power version
  - $t_{AA} = 7, 10 \text{ ns}$
  - $I_{EE} = 200 \text{ mA}$
- Both 10KH/10K- and 100K-compatible I/O versions
- On-chip voltage compensation for improved noise margin
- Capable of withstanding >2001V ESD

- Open emitter output for ease of memory expansion
- Industry-standard pinout

## Functional Description

The Cypress CY101E484, CY10E484, and CY100E484 are 4K x 4 ECL RAMs designed for scratch pad, control, and buffer storage applications. These parts are fully decoded random access memories organized as 4096 words by 4 bits. The CY10E484 is 10KH-/10K-compatible. The CY100E484 is 100K-compatible, and the CY101E484 is 100K-compatible with a -5.2V supply.

The active LOW chip select ( $\bar{S}$ ) input controls memory selection and allows for memory expansion. The read and write operations are controlled by the state of the active LOW write enable ( $\bar{W}$ ) input. With  $\bar{W}$  and  $\bar{S}$  LOW, the data at  $D_{(1-4)}$  is written into the addressed location. To read,  $\bar{W}$  is held HIGH while  $\bar{S}$  is held LOW. Open emitter outputs allow for wired-OR connection to expand the memory. The 4-ns and 5-ns devices are packaged in 28-pin cerDIPs, CLCCs, and rectangular cerpacks in the high-performance center power-ground version pin configurations. The 7-ns and 10-ns parts are in the corner power-ground pin configurations with two write enables ( $\bar{W}_1, \bar{W}_2$ ).



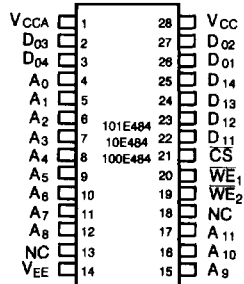
## Selection Guide

|                          | 101E484-4<br>10E484-4<br>100E484-4               | 101E484-5<br>10E484-5<br>100E484-5 | 101E484-7<br>10E484-7<br>100E484-7 | 101E484-10<br>10E484-10<br>100E484-10 |
|--------------------------|--------------------------------------------------|------------------------------------|------------------------------------|---------------------------------------|
| Maximum Access Time (ns) | 4                                                | 5                                  | 7                                  | 10                                    |
| $I_{EE}$ Max. (mA)       | Standard (Center PWR/GND Pinout)                 | 320                                | 320                                |                                       |
|                          | Low Power (L, Corner PWR/GND Pinout)             |                                    | 200                                | 200                                   |
|                          | Military (10K/10KH only) (Corner PWR/GND Pinout) |                                    | 200                                | 200                                   |

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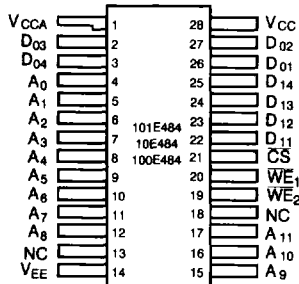
## Pin Configurations (7-ns, 10-ns Corner Power/Ground)

**CerDIP/SOJ**  
**Top View**



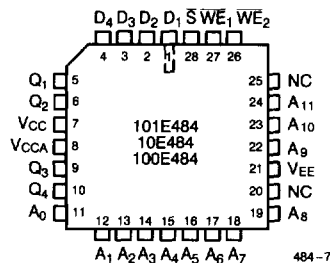
484-5

**Rectangular Cerpak**  
**Top View**



484-6

**PLCC**  
**Top View**



484-7

## Maximum Ratings

(Above which the useful life may be impaired. Exposure to absolute maximum rated conditions for extended periods may affect device reliability. For user guidelines, not tested.)

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

Ambient Temperature with

Power Applied ..... - 55°C to +125°C

Supply Voltage  $V_{EE}$  to  $V_{CC}$  ..... - 7.0V to +0.5V

Input Voltage .....  $V_{EE}$  to +0.5V

Output Current ..... - 50 mA

## Operating Range Referenced to $V_{CC}$

| Range                    | I/O      | Ambient Temperature   | $V_{EE}$          |
|--------------------------|----------|-----------------------|-------------------|
| Commercial (Standard, L) | 10KH/10K | 0°C to 75°C           | - 5.2V $\pm$ 5%   |
| Commercial (Standard, L) | 100K     | 0°C to +85°C          | - 4.5V $\pm$ 0.3V |
| Commercial (Standard, L) | 101      | 0°C to 75°C           | - 5.2V $\pm$ 5%   |
| Military (L)             | 10KH/10K | - 55°C to +125°C Case | - 5.2V $\pm$ 5%   |

## Electrical Characteristics Over the Operating Range

| Parameters | Description         | Test Conditions                                                                                                                               | Temperature <sup>[1]</sup>                   | Min.   | Max.   | Units |
|------------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|--------|--------|-------|
| $V_{OH}$   | Output HIGH Voltage | 10E <sup>[2]</sup> $R_L = 50\Omega$ to - 2V<br>$V_{EE} = - 5.2V$<br>$V_{CC} = V_{CCA} = GND$<br>$V_{IN} = V_{IH}$ Max. or $V_{IL}$ Min.       | $T_C = - 55^\circ C$                         | - 1140 | - 900  | mV    |
|            |                     |                                                                                                                                               | $T_A = 0^\circ C$                            | - 1000 | - 840  | mV    |
|            |                     |                                                                                                                                               | $T_A = +25^\circ C$                          | - 960  | - 810  | mV    |
|            |                     |                                                                                                                                               | $T_A = +75^\circ C$                          | - 900  | - 735  | mV    |
|            |                     |                                                                                                                                               | $T_C = +125^\circ C$                         | - 880  | - 700  | mV    |
|            |                     | 100/101K $R_L = 50\Omega$ to - 2V<br>$V_{EE} = - 4.5V$ (5.2V for 101K)<br>$V_{CC} = V_{CCA} = GND$<br>$V_{IN} = V_{IH}$ Max. or $V_{IL}$ Min. | $T_A = 0^\circ C$ to 85°C<br>(75°C for 101K) | - 1025 | - 880  | mV    |
| $V_{OL}$   | Output LOW Voltage  | 10E $R_L = 50\Omega$ to - 2V<br>$V_{EE} = - 5.2V$<br>$V_{CC} = V_{CCA} = GND$<br>$V_{IN} = V_{IH}$ Max. or $V_{IL}$ Min.                      | $T_C = - 55^\circ C$                         | - 1920 | - 1670 | mV    |
|            |                     |                                                                                                                                               | $T_A = +0^\circ C$                           | - 1870 | - 1665 | mV    |
|            |                     |                                                                                                                                               | $T_A = +25^\circ C$                          | - 1850 | - 1650 | mV    |
|            |                     |                                                                                                                                               | $T_A = +75^\circ C$                          | - 1830 | - 1625 | mV    |
|            |                     |                                                                                                                                               | $T_C = +125^\circ C$                         | - 1830 | - 1610 | mV    |
|            |                     | 100/101K $R_L = 50\Omega$ to - 2V<br>$V_{EE} = - 4.5V$ (5.2V for 101K)<br>$V_{CC} = V_{CCA} = GND$<br>$V_{IN} = V_{IH}$ Max. or $V_{IL}$ Min. | $T_A = 0^\circ C$ to 85°C<br>(75°C for 101K) | - 1810 | - 1620 | mV    |

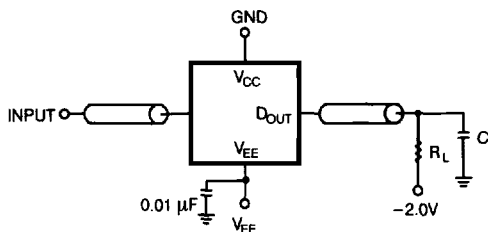
### Electrical Characteristics Over the Operating Range(continued)

| Parameters | Description                                  | Test Conditions                                                      | Temperature <sup>[1]</sup>                                 | Min.  | Max.  | Units   |
|------------|----------------------------------------------|----------------------------------------------------------------------|------------------------------------------------------------|-------|-------|---------|
| $V_{IH}$   | Input HIGH Voltage                           | 10E<br>$V_{EE} = -5.2V$<br>$V_{CC} = V_{CCA} = GND$                  | $T_C = -55^\circ C$                                        | -1260 | -900  | mV      |
|            |                                              |                                                                      | $T_A = 0^\circ C$                                          | -1170 | -840  | mV      |
|            |                                              |                                                                      | $T_A = +25^\circ C$                                        | -1130 | -810  | mV      |
|            |                                              |                                                                      | $T_A = +75^\circ C$                                        | -1070 | -720  | mV      |
|            |                                              |                                                                      | $T_C = +125^\circ C$                                       | -1030 | -700  | mV      |
|            |                                              | 100K $V_{EE} = -4.5V$ (-5.2V for 101K), $V_{CC} = V_{CCA} = GND$     | $T_A = 0^\circ C$ to $85^\circ C$ ( $75^\circ C$ for 101K) | -1165 | -880  | mV      |
| $V_{IL}$   | Input LOW Voltage                            | 10E<br>$V_{EE} = -5.2V$<br>$V_{CC} = V_{CCA} = GND$                  | $T_C = -55^\circ C$                                        | -1950 | -1540 | mV      |
|            |                                              |                                                                      | $T_A = 0^\circ C$                                          | -1950 | -1480 | mV      |
|            |                                              |                                                                      | $T_A = +25^\circ C$                                        | -1950 | -1475 | mV      |
|            |                                              |                                                                      | $T_A = +75^\circ C$                                        | -1950 | -1450 | mV      |
|            |                                              |                                                                      | $T_C = +125^\circ C$                                       | -1950 | -1450 | mV      |
|            |                                              | 100/101K $V_{EE} = -4.5V$ (-5.2V for 101K), $V_{CC} = V_{CCA} = GND$ | $T_A = 0^\circ C$ to $85^\circ C$ ( $75^\circ C$ for 101K) | -1810 | -1475 | mV      |
| $I_{IH}$   | Input HIGH Current                           | $V_{IN} = V_{IH} \text{ Max.}$                                       |                                                            |       | 220   | $\mu A$ |
| $I_{IL}$   | Input LOW Current                            | $V_{IN} = V_{IL} \text{ Min.}$                                       | $\bar{S}$ inputs                                           | 0.5   | 170   | $\mu A$ |
|            |                                              |                                                                      | All other inputs                                           | -50   |       |         |
| $I_{EE}$   | Supply Current (All inputs and outputs open) | Commercial/Military Standard L (Low Power)                           |                                                            | -200  |       | mA      |
|            |                                              | Commercial Standard                                                  |                                                            | -320  |       | mA      |

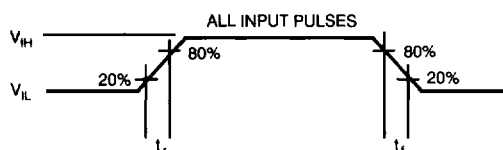
### Capacitance<sup>[3]</sup>

| Parameters | Description            | Typ. | Max. <sup>[4]</sup> | Units |
|------------|------------------------|------|---------------------|-------|
| $C_{IN}$   | Input Pin Capacitance  | 4    | 6                   | pF    |
| $C_{OUT}$  | Output Pin Capacitance | 5    | 7                   | pF    |

### AC Test Loads and Waveforms<sup>[5, 6, 7, 8, 9, 10]</sup>



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#### Notes:

- Commercial grade is specified as ambient temperature with transverse air flow greater than 500 linear feet per minute. Military grade is specified as case temperature.
- 10E specifications support both 10K and 10KH compatibility.
- Tested initially and after any design or process changes that may affect these parameters.
- For all packages except cerDIP (D42), which has maximums of  $C_{IN} = 8 \text{ pF}$ ,  $C_{OUT} = 9 \text{ pF}$ .
- $V_{IL} = V_{IL} \text{ Min.}$ ,  $V_{IH} = V_{IH} \text{ Max.}$  on 10E version.
- $V_{IL} = -1.7V$ ,  $V_{IH} = -0.9V$  on 100K version.
- $R_L = 50\Omega$  C < 5 pF (4-, 5-ns grade) or < 30 pF (7-, 10-ns grade). Includes fixture and stray capacitance.
- All coaxial cables should be 50 $\Omega$  with equal lengths. The delay of the coaxial cables should be "nulled" out of the measurement.
- $t_r = t_f = 0.7 \text{ ns}$ .
- All timing measurements are made from the 50% point of all waveforms.

**Switching Characteristics** Over the Commercial Operating Range

| Parameters       | Description              | 101E484-4<br>10E484-4<br>100E484-4 |      | 101E484-5<br>10E484-5<br>100E484-5 |      | 101E484-7<br>10E484-7<br>100E484-7 |      | 101E484-10<br>10E484-10<br>100E484-10 |      | Units |
|------------------|--------------------------|------------------------------------|------|------------------------------------|------|------------------------------------|------|---------------------------------------|------|-------|
|                  |                          | Min.                               | Max. | Min.                               | Max. | Min.                               | Max. | Min.                                  | Max. |       |
| t <sub>AC</sub>  | Input to Output Delay    |                                    | 2    |                                    | 3    | 0.5                                | 4    | 0.5                                   | 5    | ns    |
| t <sub>RC</sub>  | Chip Select Recovery     |                                    | 2    |                                    | 3    | 0.5                                | 4    | 0.5                                   | 5    | ns    |
| t <sub>AA</sub>  | Address Access Time      |                                    | 4    |                                    | 5    | 1.2                                | 7    | 1.2                                   | 10   | ns    |
| t <sub>WW</sub>  | Write Pulse Width        | 5                                  |      | 5                                  |      | 5                                  |      | 6                                     |      | ns    |
| t <sub>NWW</sub> | Non-Write Pulse          |                                    | 1.5  |                                    | 1.5  |                                    | 1.5  |                                       | 1.5  | ns    |
| t <sub>SD</sub>  | Data Set-Up to Write     | 0                                  |      | 0                                  |      | 1                                  |      | 2                                     |      | ns    |
| t <sub>HD</sub>  | Data Hold to Write       | 0                                  |      | 0                                  |      | 1                                  |      | 2                                     |      | ns    |
| t <sub>SA</sub>  | Address Set-Up/Write     | 0                                  |      | 0                                  |      | 1                                  |      | 2                                     |      | ns    |
| t <sub>HA</sub>  | Address Hold/Write       | 0                                  |      | 0                                  |      | 1                                  |      | 2                                     |      | ns    |
| t <sub>SC</sub>  | Chip Select Set-Up/Write | 0                                  |      | 0                                  |      | 1                                  |      | 2                                     |      | ns    |
| t <sub>HC</sub>  | Chip Select Hold/Write   | 0                                  |      | 0                                  |      | 1                                  |      | 2                                     |      | ns    |
| t <sub>WS</sub>  | Write Disable            | 0.3                                | 2    | 0.3                                | 3    | 0.3                                | 5    | 0.3                                   | 5    | ns    |
| t <sub>WR</sub>  | Write Recovery           | 0.5                                | 4    | 0.5                                | 5    | 0.5                                | 8    | 0.5                                   | 12   | ns    |
| t <sub>r</sub>   | Output Rise Time         | 0.35                               | 1.5  | 0.35                               | 1.5  | 1                                  | 2.5  | 1                                     | 2.5  | ns    |
| t <sub>f</sub>   | Output Fall Time         | 0.35                               | 1.5  | 0.35                               | 1.5  | 1                                  | 2.5  | 1                                     | 2.5  | ns    |

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**Switching Characteristics** Over the Military Operating Range

| Parameters       | Description              | 10E484-7 |      | 10E484-10 |      | Units |
|------------------|--------------------------|----------|------|-----------|------|-------|
|                  |                          | Min.     | Max. | Min.      | Max. |       |
| t <sub>AC</sub>  | Input to Output Delay    | 0.5      | 4    | 0.5       | 5    | ns    |
| t <sub>RC</sub>  | Chip Select Recovery     | 0.5      | 4    | 0.5       | 5    | ns    |
| t <sub>AA</sub>  | Address Access Time      | 1.2      | 7    | 1.2       | 10   | ns    |
| t <sub>WW</sub>  | Write Pulse Width        | 5        |      | 6         |      | ns    |
| t <sub>NWW</sub> | Non-Write Pulse          |          | 1.5  |           | 1.5  | ns    |
| t <sub>SD</sub>  | Data Set-Up to Write     | 1        |      | 2         |      | ns    |
| t <sub>HD</sub>  | Data Hold to Write       | 1        |      | 2         |      | ns    |
| t <sub>SA</sub>  | Address Set-Up/Write     | 1        |      | 2         |      | ns    |
| t <sub>HA</sub>  | Address Hold/Write       | 1        |      | 2         |      | ns    |
| t <sub>SC</sub>  | Chip Select Set-Up/Write | 1        |      | 2         |      | ns    |
| t <sub>HC</sub>  | Chip Select Hold/Write   | 1        |      | 2         |      | ns    |
| t <sub>WS</sub>  | Write Disable            | 0.3      | 5    | 0.3       | 5    | ns    |
| t <sub>WR</sub>  | Write Recovery           | 0.5      | 8    | 0.5       | 12   | ns    |
| t <sub>r</sub>   | Output Rise Time         | 1        | 2.5  | 1         | 2.5  | ns    |
| t <sub>f</sub>   | Output Fall Time         | 1        | 2.5  | 1         | 2.5  | ns    |

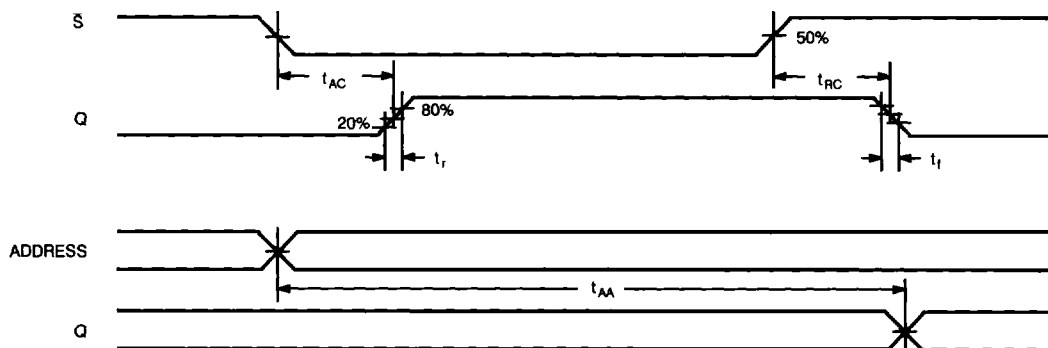
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ECL



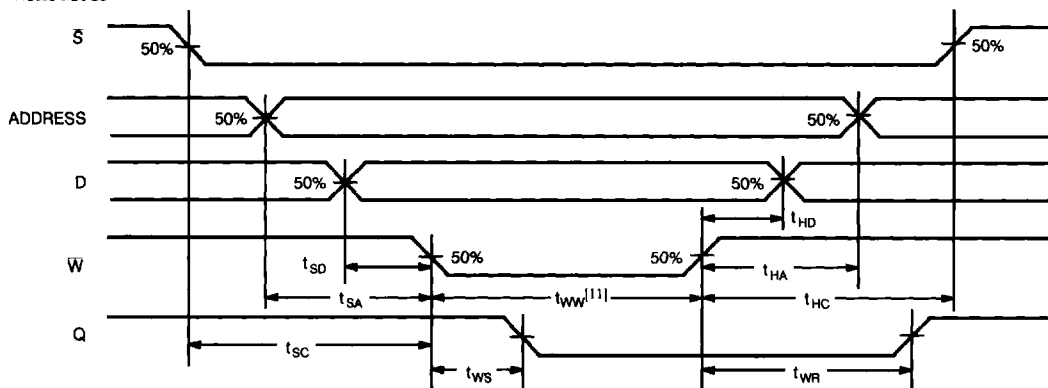
## Switching Waveforms

### Read Mode



484-10

### Write Mode



484-11

### Truth Table

| Inputs    |                   |           | Output    | Mode     |
|-----------|-------------------|-----------|-----------|----------|
| $\bar{S}$ | $\bar{W}$         | $\bar{D}$ | Q         |          |
| H         | X                 | X         | L         | Disabled |
| L         | L                 | H         | L         | Write H  |
| L         | L                 | L         | L         | Write L  |
| L         | H <sup>[12]</sup> | X         | $D_{OUT}$ | Read     |

#### Note:

11. If  $t_{WW} \leq t_{NWW}$ , the device will not write data to the addressed location.
12. The 7-ns and 10-ns parts have two  $\bar{WE}$  pins. Both  $\bar{WE}_1$  and  $\bar{WE}_2$  must be LOW to initiate write operation.

**Ordering Information**

| I/O                  | I <sub>EE</sub><br>(mA) | t <sub>AA</sub><br>(ns) | Ordering Code   | Package Type | Operating Range | Pinout              |
|----------------------|-------------------------|-------------------------|-----------------|--------------|-----------------|---------------------|
| 101E <sup>[13]</sup> | 320                     | 4                       | CY101E484-4DC   | D42          | Commercial      | Center Power/Ground |
|                      |                         |                         | CY101E484-4KC   | K80          |                 |                     |
|                      |                         |                         | CY101E484-4YC   | Y64          |                 |                     |
|                      |                         | 5                       | CY101E484-5DC   | D42          |                 |                     |
|                      |                         |                         | CY101E484-5KC   | K80          |                 |                     |
|                      |                         |                         | CY101E484-5YC   | Y64          |                 |                     |
|                      | 200                     | 7                       | CY101E484L-7DC  | D42          | Commercial      | Corner Power/Ground |
|                      |                         |                         | CY101E484L-7JC  | J64          |                 |                     |
|                      |                         |                         | CY101E484L-7KC  | K80          |                 |                     |
|                      |                         |                         | CY101E484L-7VC  | V21          |                 |                     |
|                      |                         | 10                      | CY101E484L-10DC | D42          |                 |                     |
|                      |                         |                         | CY101E484L-10JC | J64          |                 |                     |
|                      |                         |                         | CY101E484L-10KC | K80          |                 |                     |
|                      |                         |                         | CY101E484L-10VC | V21          |                 |                     |

| I/O  | I <sub>EE</sub><br>(mA) | t <sub>AA</sub><br>(ns) | Ordering Code   | Package Type | Operating Range | Pinout              |
|------|-------------------------|-------------------------|-----------------|--------------|-----------------|---------------------|
| 100E | 320                     | 4                       | CY100E484-4DC   | D42          | Commercial      | Center Power/Ground |
|      |                         |                         | CY100E484-4KC   | K80          |                 |                     |
|      |                         |                         | CY100E484-4YC   | Y64          |                 |                     |
|      |                         | 5                       | CY100E484-5DC   | D42          |                 |                     |
|      |                         |                         | CY100E484-5KC   | K80          |                 |                     |
|      |                         |                         | CY100E484-5YC   | Y64          |                 |                     |
|      | 200                     | 7                       | CY100E484L-7DC  | D42          | Commercial      | Corner Power/Ground |
|      |                         |                         | CY100E484L-7JC  | J64          |                 |                     |
|      |                         |                         | CY100E484L-7KC  | K80          |                 |                     |
|      |                         |                         | CY100E484L-7VC  | V21          |                 |                     |
|      |                         | 10                      | CY100E484L-10DC | D42          |                 |                     |
|      |                         |                         | CY100E484L-10JC | J64          |                 |                     |
|      |                         |                         | CY100E484L-10KC | K80          |                 |                     |
|      |                         |                         | CY100E484L-10VC | V21          |                 |                     |

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**Notes**

13. 101E specifications are 100K-compatible with -5.2V supplies.

**Ordering Information** (continued)

| Ordering Information (continued) |                         |                         |                 |                 |                    |                     |
|----------------------------------|-------------------------|-------------------------|-----------------|-----------------|--------------------|---------------------|
| I/O                              | I <sub>EE</sub><br>(mA) | t <sub>AA</sub><br>(ns) | Ordering Code   | Package<br>Type | Operating<br>Range | Pinout              |
| 10E <sup>[14]</sup>              | 320                     | 4                       | CY10E484-4DC    | D42             | Commercial         | Center Power/Ground |
|                                  |                         |                         | CY10E484-4KC    | K80             |                    |                     |
|                                  |                         |                         | CY10E484-4YC    | Y64             |                    |                     |
|                                  |                         | 5                       | CY10E484-5DC    | D42             |                    |                     |
|                                  |                         |                         | CY10E484-5KC    | K80             |                    |                     |
|                                  |                         |                         | CY10E484-5YC    | Y64             |                    |                     |
|                                  | 200                     | 7                       | CY10E484L-7DC   | D42             | Commercial         | Corner Power/Ground |
|                                  |                         |                         | CY10E484L-7JC   | J64             |                    |                     |
|                                  |                         |                         | CY10E484L-7KC   | K80             |                    |                     |
|                                  |                         |                         | CY10E484L-7VC   | V21             |                    |                     |
|                                  |                         |                         | CY10E484L-7DMB  | D42             | Military           |                     |
|                                  |                         |                         | CY10E484L-7KMB  | K80             |                    |                     |
|                                  |                         | 10                      | CY10E484L-10DC  | D42             | Commercial         |                     |
|                                  |                         |                         | CY10E484L-10JC  | J64             |                    |                     |
|                                  |                         |                         | CY10E484L-10KC  | K80             |                    |                     |
|                                  |                         |                         | CY10E484L-10VC  | V21             |                    |                     |
|                                  |                         |                         | CY10E484L-10DMB | D42             | Military           |                     |
|                                  |                         |                         | CY10E484L-10KMB | K80             |                    |                     |

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**Note:**

14. 10E specifications support both 10K and 10KH compatibility.

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