



CY7C0850V/CY7C0851V
CY7C0852V/CY7C0853V

FLEX36™ 3.3V 32K/64K/128K/256K x 36 Synchronous Dual-Port RAM

Features

- True dual-ported memory cells that allow simultaneous access of the same memory location
- Synchronous pipelined operation
- Organization of 1-Mbit, 2-Mbit, 4-Mbit and 9-Mbit devices
- Pipelined output mode allows fast operation
- 0.18-micron CMOS for optimum speed and power
- High-speed clock to data access
- 3.3V low power
 - Active as low as 225 mA (typ)
 - Standby as low as 55 mA (typ)
- Mailbox function for message passing
- Global master reset
- Separate byte enables on both ports
- Commercial and industrial temperature ranges
- IEEE 1149.1-compatible JTAG boundary scan
- 172-ball FBGA (1 mm pitch) (15 mm × 15 mm)
- 176-pin TQFP (24 mm × 24 mm × 1.4 mm)
- Counter wrap around control
 - Internal mask register controls counter wrap-around
 - Counter-interrupt flags to indicate wrap-around
 - Memory block retransmit operation
- Counter readback on address lines
- Mask register readback on address lines
- Dual Chip Enables on both ports for easy depth expansion

Functional Description

The FLEX36 family includes 1M, 2M, 4M and 9M pipelined, synchronous, true dual-port static RAMs that are high-speed, low-power 3.3V CMOS. Two ports are provided, permitting independent, simultaneous access to any location in memory. The result of writing to the same location by more than one port at the same time is undefined. Registers on control, address, and data lines allow for minimal set-up and hold time.

During a Read operation, data is registered for decreased cycle time. Each port contains a burst counter on the input address register. After externally loading the counter with the initial address, the counter will increment the address internally (more details to follow). The internal Write pulse width is independent of the duration of the R/W input signal. The internal Write pulse is self-timed to allow the shortest possible cycle times.

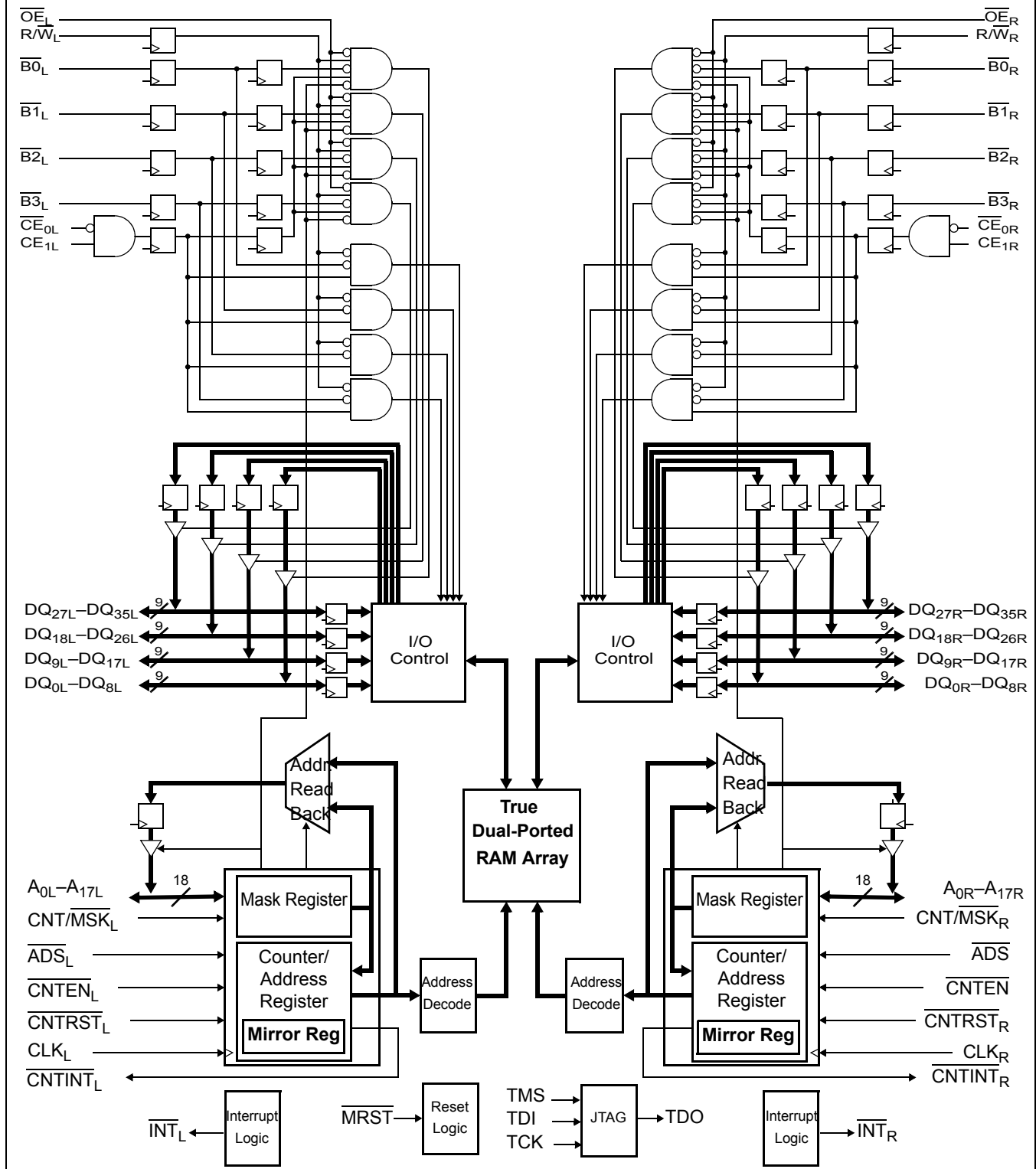
A HIGH on $\overline{CE0}$ or LOW on CE1 for one clock cycle will power down the internal circuitry to reduce the static power consumption. One cycle with chip enables asserted is required to reactivate the outputs.

Additional features include: readback of burst-counter internal address value on address lines, counter-mask registers to control the counter wrap-around, counter interrupt (CNTINT) flags, readback of mask register value on address lines, retransmit functionality, interrupt flags for message passing, JTAG for boundary scan, and asynchronous Master Reset (MRST).

The CY7C0853 device in this family has limited features. Please see See "Address Counter and Mask Register Operations^[10]" on page 8. for details.

Table 1. Product Selection Guide

| Density | 1-Mbit (32K x 36) | 2-Mbit (64K x 36) | 4-Mbit (128K x 36) | 9-Mbit (256K x 36) |
|---------------------------------------|----------------------|----------------------|-----------------------|-----------------------|
| Part Number | CY7C0850V | CY7C0851V | CY7C0852V | CY7C0853V |
| Max. Speed (MHz) | 167 | 167 | 167 | 133 |
| Max. Access Time - clock to Data (ns) | 4.0 | 4.0 | 4.0 | 4.7 |
| Typical operating current (mA) | 225 | 225 | 225 | 270 |
| Package | 176TQFP 172FBGA | 176TQFP 172FBGA | 176TQFP 172FBGA | 172FBGA |

Logic Block Diagram^[1]

Note:

1. ,9M device has 18 address bits, 4M device has 17 address bits, 2M device has 16 address bits, and 1M device has 15 address bits.

Pin Configurations
172-ball BGA
Top View

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---|-----------------------------|-------------------------|-----------------------------|-----------------------------|--------------------------|-------|-------|-------|-------|--------------------------|-----------------------------|-----------------------------|-------------------------|-----------------------------|
| A | DQ32L | DQ30L | $\overline{\text{CNTINTL}}$ | VSS | DQ13L | VDD | DQ11L | DQ11R | VDD | DQ13R | VSS | $\overline{\text{CNTINTR}}$ | DQ30R | DQ32R |
| B | A0L | DQ33L | DQ29L | DQ17L | DQ14L | DQ12L | DQ9L | DQ9R | DQ12R | DQ14R | DQ17R | DQ29R | DQ33R | A0R |
| C | NC | A1L | DQ31L | DQ27L | $\overline{\text{INTL}}$ | DQ15L | DQ10L | DQ10R | DQ15R | $\overline{\text{INTR}}$ | DQ27R | DQ31R | A1R | NC |
| D | A2L | A3L | DQ35L | DQ34L | DQ28L | DQ16L | VSS | VSS | DQ16R | DQ28R | DQ34R | DQ35R | A3R | A2R |
| E | A4L | A5L | CE1L | $\overline{\text{B0L}}$ | VDD | VSS | | | VDD | VDD | $\overline{\text{B0R}}$ | CE1R | A5R | A4R |
| F | VDD | A6L | A7L | $\overline{\text{B1L}}$ | VDD | | | | | VSS | $\overline{\text{B1R}}$ | A7R | A6R | VDD |
| G | $\overline{\text{OEL}}$ | $\overline{\text{B2L}}$ | $\overline{\text{B3L}}$ | $\overline{\text{CE0L}}$ | | | | | | | $\overline{\text{CE0R}}$ | $\overline{\text{B3R}}$ | $\overline{\text{B2R}}$ | $\overline{\text{OER}}$ |
| H | VSS | $\overline{\text{RWL}}$ | A8L | CLKL | | | | | | | CLKR | A8R | $\overline{\text{RWR}}$ | VSS |
| J | A9L | A10L | VSS | $\overline{\text{ADSL}}$ | VSS | | | | | VDD | $\overline{\text{ADSR}}$ | $\overline{\text{MRST}}$ | A10R | A9R |
| K | A11L | A12L | A15L ^[2] | $\overline{\text{CNTRSTL}}$ | VDD | VDD | | | VSS | VDD | $\overline{\text{CNTRSTR}}$ | A15R ^[2] | A12R | A11R |
| L | $\overline{\text{CNTMSKL}}$ | A13L | $\overline{\text{CNTENL}}$ | DQ26L | DQ25L | DQ19L | VSS | VSS | DQ19R | DQ25R | DQ26R | $\overline{\text{CNTENR}}$ | A13R | $\overline{\text{CNTMSKR}}$ |
| M | A16L ^[2] | A14L | DQ22L | DQ18L | TDI | DQ7L | DQ2L | DQ2R | DQ7R | TCK | DQ18R | DQ22R | A14R | A16R ^[2] |
| N | DQ24L | DQ20L | DQ8L | DQ6L | DQ5L | DQ3L | DQ0L | DQ0R | DQ3R | DQ5R | DQ6R | DQ8R | DQ20R | DQ24R |
| P | DQ23L | DQ21L | TDO | VSS | DQ4L | VDD | DQ1L | DQ1R | VDD | DQ4R | VSS | TMS | DQ21R | DQ23R |

CY7C0850V
CY7C0851V
CY7C0852V

Note:

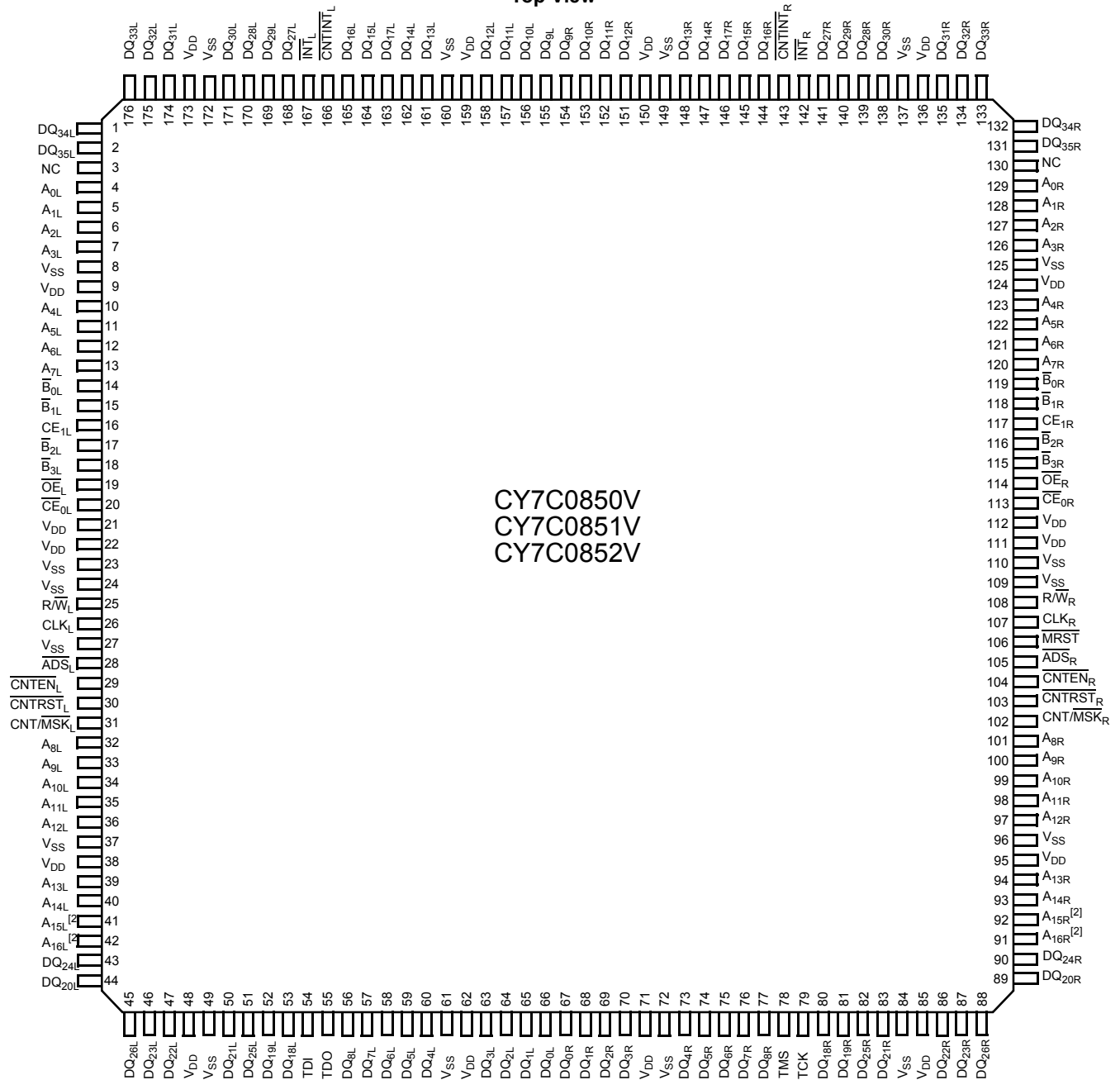
2. For CY7C0851V, pins M1 and M14 are NC. For CY7C0850V, pins K3, K12 M1, and M14 are NC

Pin Configurations (continued)
172-ball BGA
Top View

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---|-------------------------|-------------------------|-------------------------|-------------------------|--------------------------|-------|------------------|-------|-------|--------------------------|-------------------------|--------------------------|-------------------------|-------------------------|
| A | DQ32L | DQ30L | NC | VSS | DQ13L | VDD | DQ11L | DQ11R | VDD | DQ13R | VSS | NC | DQ30R | DQ32R |
| B | A0L | DQ33L | DQ29L | DQ17L | DQ14L | DQ12L | DQ9L | DQ9R | DQ12R | DQ14R | DQ17R | DQ29R | DQ33R | A0R |
| C | A17L | A1L | DQ31L | DQ27L | $\overline{\text{INTL}}$ | DQ15L | DQ10L | DQ10R | DQ15R | $\overline{\text{INTR}}$ | DQ27R | DQ31R | A1R | A17R |
| D | A2L | A3L | DQ35L | DQ34L | DQ28L | DQ16L | VSS | VSS | DQ16R | DQ28R | DQ34R | DQ35R | A3R | A2R |
| E | A4L | A5L | VDD | $\overline{\text{B0L}}$ | VDD | VSS | | | VDD | VDD | $\overline{\text{B0R}}$ | VDD | A5R | A4R |
| F | VDD | A6L | A7L | $\overline{\text{B1L}}$ | VDD | | | | | VSS | $\overline{\text{B1R}}$ | A7R | A6R | VDD |
| G | $\overline{\text{OEL}}$ | $\overline{\text{B2L}}$ | $\overline{\text{B3L}}$ | VSS | | | CY7C0853V | | | | VSS | $\overline{\text{B3R}}$ | $\overline{\text{B2R}}$ | $\overline{\text{OER}}$ |
| H | VSS | $\overline{\text{RWL}}$ | A8L | CLKL | | | | | | | CLKR | A8R | $\overline{\text{RWR}}$ | VSS |
| J | A9L | A10L | VSS | VSS | VSS | | | | | VDD | VSS | $\overline{\text{MRST}}$ | A10R | A9R |
| K | A11L | A12L | A15L | VDD | VDD | VDD | | | VSS | VDD | VDD | A15R | A12R | A11R |
| L | VDD | A13L | VSS | DQ26L | DQ25L | DQ19L | VSS | VSS | DQ19R | DQ25R | DQ26R | VSS | A13R | VDD |
| M | A16L | A14L | DQ22L | DQ18L | TDI | DQ7L | DQ2L | DQ2R | DQ7R | TCK | DQ18R | DQ22R | A14R | A16R |
| N | DQ24L | DQ20L | DQ8L | DQ6L | DQ5L | DQ3L | DQ0L | DQ0R | DQ3R | DQ5R | DQ6R | DQ8R | DQ20R | DQ24R |
| P | DQ23L | DQ21L | TDO | VSS | DQ4L | VDD | DQ1L | DQ1R | VDD | DQ4R | VSS | TMS | DQ21R | DQ23R |

Pin Configurations (continued)

176-pin Thin Quad Flat Pack (TQFP)
 Top View



Pin Definitions

| Left Port | Right Port | Description |
|---|---|--|
| A _{0L} -A _{17L} ^[1] | A _{0R} -A _{17R} ^[1] | Address Inputs. |
| $\overline{\text{ADS}}_L$ ^[3] | $\overline{\text{ADS}}_R$ ^[3] | Address Strobe Input. Used as an address qualifier. This signal should be asserted LOW for the part using the externally supplied address on the address pins and for loading this address into the burst address counter. |
| $\overline{\text{CE}}_0L$ ^[3] | $\overline{\text{CE}}_0R$ ^[3] | Active LOW Chip Enable Input. |
| CE _{1L} ^[3] | CE _{1R} ^[3] | Active HIGH Chip Enable Input. |
| CLK _L | CLK _R | Clock Signal. Maximum clock input rate is f _{MAX} . |
| $\overline{\text{CNTEN}}_L$ ^[3] | $\overline{\text{CNTEN}}_R$ ^[3] | Counter Enable Input. Asserting this signal LOW increments the burst address counter of its respective port on each rising edge of CLK. The increment is disabled if ADS or CNTRST are asserted LOW. |
| $\overline{\text{CNTRST}}_L$ ^[3] | $\overline{\text{CNTRST}}_R$ ^[3] | Counter Reset Input. Asserting this signal LOW resets to zero the unmasked portion of the burst address counter of its respective port. CNTRST is not disabled by asserting ADS or CNTEN. |
| CNT/MSK _L ^[3] | CNT/MSK _R ^[3] | Address Counter Mask Register Enable Input. Asserting this signal LOW enables access to the mask register. When tied HIGH, the mask register is not accessible and the address counter operations are enabled based on the status of the counter control signals. |
| DQ _{0L} -DQ _{35L} | DQ _{0R} -DQ _{35R} | Data Bus Input/Output. |
| $\overline{\text{OE}}_L$ | $\overline{\text{OE}}_R$ | Output Enable Input. This asynchronous signal must be asserted LOW to enable the DQ data pins during Read operations. |
| $\overline{\text{INT}}_L$ | $\overline{\text{INT}}_R$ | Mailbox Interrupt Flag Output. The mailbox permits communications between ports. The upper two memory locations can be used for message passing. INT _L is asserted LOW when the right port writes to the mailbox location of the left port, and vice versa. An interrupt to a port is deasserted HIGH when it reads the contents of its mailbox. |
| $\overline{\text{CNTINT}}_L$ ^[3] | $\overline{\text{CNTINT}}_R$ ^[3] | Counter Interrupt Output. This pin is asserted LOW when the unmasked portion of the counter is incremented to all "1s." |
| R/W _L | R/W _R | Read/Write Enable Input. Assert this pin LOW to write to, or HIGH to Read from the dual port memory array. |
| $\overline{\text{B}}_0L$ - $\overline{\text{B}}_3L$ | $\overline{\text{B}}_0R$ - $\overline{\text{B}}_3R$ | Byte Select Inputs. Asserting these signals enables Read and Write operations to the corresponding bytes of the memory array. |
| $\overline{\text{MRST}}$ | | Master Reset Input. MRST is an asynchronous input signal and affects both ports. Asserting $\overline{\text{MRST}}$ LOW performs all of the reset functions as described in the text. A MRST operation is required at power-up. |
| TMS | | JTAG Test Mode Select Input. It controls the advance of JTAG TAP state machine. State machine transitions occur on the rising edge of TCK. |
| TDI | | JTAG Test Data Input. Data on the TDI input will be shifted serially into selected registers. |
| TCK | | JTAG Test Clock Input. |
| TDO | | JTAG Test Data Output. TDO transitions occur on the falling edge of TCK. TDO is normally three-stated except when captured data is shifted out of the JTAG TAP. |
| V _{SS} | | Ground Inputs. |
| V _{DD} | | Power Inputs. |

Note:

3. These pins are not available for CY7C0853V device.

Master Reset

The FLEx36 family devices undergo a complete reset by taking its MRST input LOW. The MRST input can switch asynchronously to the clocks. The MRST initializes the internal burst counters to zero, and the counter mask registers to all ones (completely unmasked). The MRST also forces the Mailbox Interrupt (INT) flags and the Counter Interrupt (CNTINT) flags HIGH. The MRST must be performed on the FLEx36 family devices after power-up.

Mailbox Interrupts

The upper two memory locations may be used for message passing and permit communications between ports. Table 2 shows the interrupt operation for both ports of CY7C0853V. The highest memory location, 3FFFF is the mailbox for the right port and 3FFFE is the mailbox for the left port. Table 2










shows that in order to set the $\overline{\text{INT}}_R$ flag, a Write operation by the left port to address 3FFFF will assert INT_R LOW. At least one byte has to be active for a Write to generate an interrupt. A valid Read of the 3FFFF location by the right port will reset INT_R HIGH. At least one byte has to be active in order for a Read to reset the interrupt. When one port Writes to the other port's mailbox, the $\overline{\text{INT}}$ of the port that the mailbox belongs to is asserted LOW. The $\overline{\text{INT}}$ is reset when the owner (port) of the mailbox Reads the contents of the mailbox. The interrupt flag is set in a flow-thru mode (i.e., it follows the clock edge of the writing port). Also, the flag is reset in a flow-thru mode (i.e., it follows the clock edge of the reading port).

Each port can read the other port's mailbox without resetting the interrupt. And each port can write to its own mailbox without setting the interrupt. If an application does not require message passing, INT pins should be left open.

Table 2. Interrupt Operation Example [1, 4, 5, 6, 7]

| Function | Left Port | | | | Right Port | | | |
|---------------------------------|------------------|-----------------|---------------------|------------------|------------------|-----------------|---------------------|------------------|
| | R/W _L | CE _L | A _{0L-17L} | INT _L | R/W _R | CE _R | A _{0R-17R} | INT _R |
| Set Right INT_R Flag | L | L | 3FFFF | X | X | X | X | L |
| Reset Right INT_R Flag | X | X | X | X | H | L | 3FFFF | H |
| Set Left INT_L Flag | X | X | X | L | L | L | 3FFFE | X |
| Reset Left INT_L Flag | H | L | 3FFFE | H | X | X | X | X |

Table 3. Address Counter and Counter-Mask Register Control Operation (Any Port) [8, 9]

| CLK | MRST | CNT/MSK | CNTRST | ADS | CNTEN | Operation | Description |
|---|------|---------|--------|-----|-------|-------------------|--|
| X | L | X | X | X | X | Master Reset | Reset address counter to all 0s and mask register to all 1s. |
|  | H | H | L | X | X | Counter Reset | Reset counter unmasked portion to all 0s. |
|  | H | H | H | L | L | Counter Load | Load counter with external address value presented on address lines. |
|  | H | H | H | L | H | Counter Readback | Read out counter internal value on address lines. |
|  | H | H | H | H | L | Counter Increment | Internally increment address counter value. |
|  | H | H | H | H | H | Counter Hold | Constantly hold the address value for multiple clock cycles. |
|  | H | L | L | X | X | Mask Reset | Reset mask register to all 1s. |
|  | H | L | H | L | L | Mask Load | Load mask register with value presented on the address lines. |
|  | H | L | H | L | H | Mask Readback | Read out mask register value on address lines. |
|  | H | L | H | H | X | Reserved | Operation undefined |

Notes:

1. $\overline{\text{CE}}$ is internal signal. $\overline{\text{CE}} = \text{LOW}$ if $\overline{\text{CE}}_0 = \text{LOW}$ and $\text{CE}_1 = \text{HIGH}$. For a single Read operation, CE only needs to be asserted once at the rising edge of the CLK and can be deasserted after that. Data will be out after the following CLK edge and will be three-stated after the next CLK edge.
2. OE is "Don't Care" for mailbox operation.
3. At least one of B0, B1, B2, or B3 must be LOW.
4. A16x is a NC for CY7C0851V, therefore the Interrupt Addresses are FFFF and EFFF; A16x and A15x are NC for CY7C0850V, therefore the Interrupt Addresses are 7FFF and 6FFF.
5. "X" = "Don't Care," "H" = HIGH, "L" = LOW.
6. Counter operation and mask register operation is independent of chip enables.

Address Counter and Mask Register Operations^[10]

This section describes the features only apply to CY7C0850V/CY7C0851V/CY7C0852V devices, but not to CY7C0853 device. Each port of these devices has a programmable burst address counter. The burst counter contains three registers: a counter register, a mask register, and a mirror register.

The **counter register** contains the address used to access the RAM array. It is changed only by the Counter Load, Increment, Counter Reset, and by master reset (MRST) operations.

The **mask register** value affects the Increment and Counter Reset operations by preventing the corresponding bits of the counter register from changing. It also affects the counter interrupt output (CNTINT). The mask register is changed only by the Mask Load and Mask Reset operations, and by the MRST. The mask register defines the counting range of the counter register. It divides the counter register into two regions: zero or more "0s" in the most significant bits define the masked region, one or more "1s" in the least significant bits define the unmasked region. Bit 0 may also be "0," masking the least significant counter bit and causing the counter to increment by two instead of one.

The **mirror register** is used to reload the counter register on increment operations (see "retransmit," below). It always contains the value last loaded into the counter register, and is changed only by the Counter Load, and Counter Reset operations, and by the MRST.

Table 3 summarizes the operation of these registers and the required input control signals. The MRST control signal is asynchronous. All the other control signals in Table 3 (CNT/MSK, CNTRST, ADS, CNTEN) are synchronized to the port's CLK. All these counter and mask operations are independent of the port's chip enable inputs (CE0 and CE1).

Counter enable (CNTEN) inputs are provided to stall the operation of the address input and utilize the internal address generated by the internal counter for fast, interleaved memory applications. A port's burst counter is loaded when the port's address strobe (ADS) and CNTEN signals are LOW. When the port's CNTEN is asserted and the ADS is deasserted, the address counter will increment on each LOW to HIGH transition of that port's clock signal. This will Read/Write one word from/into each successive address location until CNTEN is deasserted. The counter can address the entire memory array, and will loop back to the start. Counter reset (CNTRST) is used to reset the unmasked portion of the burst counter to 0s. A counter-mask register is used to control the counter wrap.

Counter Reset Operation

All unmasked bits of the counter and mirror registers are reset to "0." All masked bits remain unchanged. A Mask Reset followed by a Counter Reset will reset the counter and mirror registers to 00000, as will master reset (MRST).

Notes:

10. This section describes the CY7C0852V, which have 17 address bits and a maximum address value of 1FFFF. The CY7C0851V has 16 address bits, register lengths of 16 bits, and a maximum address value of FFFF. The CY7C0850V has 15 address bits, register lengths of 15 bits, and a maximum address value of 7FFF.
11. CNTINT and CNTRST specs are guaranteed by design to operate properly at speed grade operating frequency when tied together.

Counter Load Operation

The address counter and mirror registers are both loaded with the address value presented at the address lines.

Counter Readback Operation

The internal value of the counter register can be read out on the address lines. Readback is pipelined; the address will be valid t_{CA2} after the next rising edge of the port's clock. If address readback occurs while the port is enabled (CE0 LOW and CE1 HIGH), the data lines (DQs) will be three-stated. Figure 1 shows a block diagram of the operation.

Counter Increment Operation

Once the address counter register is initially loaded with an external address, the counter can internally increment the address value, potentially addressing the entire memory array. Only the unmasked bits of the counter register are incremented. The corresponding bit in the mask register must be a "1" for a counter bit to change. The counter register is incremented by 1 if the least significant bit is unmasked, and by 2 if it is masked. If all unmasked bits are "1," the next increment will wrap the counter back to the initially loaded value. If an Increment results in all the unmasked bits of the counter being "1s," a counter interrupt flag (CNTINT) is asserted. The next Increment will return the counter register to its initial value, which was stored in the mirror register. The counter address can instead be forced to loop to 00000 by externally connecting CNTINT to CNTRST.^[11] An increment that results in one or more of the unmasked bits of the counter being "0" will de-assert the counter interrupt flag. The example in Figure 2 shows the counter mask register loaded with a mask value of 0003Fh unmasking the first 6 bits with bit "0" as the LSB and bit "16" as the MSB. The maximum value the mask register can be loaded with is 1FFFFh. Setting the mask register to this value allows the counter to access the entire memory space. The address counter is then loaded with an initial value of 8h. The base address bits (in this case, the 6th address through the 16th address) are loaded with an address value but do not increment once the counter is configured for increment operation. The counter address will start at address 8h. The counter will increment its internal address value till it reaches the mask register value of 3Fh. The counter wraps around the memory block to location 8h at the next count. CNTINT is issued when the counter reaches its maximum value.

Counter Hold Operation

The value of all three registers can be constantly maintained unchanged for an unlimited number of clock cycles. Such operation is useful in applications where wait states are needed, or when address is available a few cycles ahead of data in a shared bus interface.

Counter Interrupt

The counter interrupt ($\overline{\text{CNTINT}}$) is asserted LOW when an increment operation results in the unmasked portion of the counter register being all “1s.” It is deasserted HIGH when an Increment operation results in any other value. It is also de-asserted by Counter Reset, Counter Load, Mask Reset and Mask Load operations, and by MRST.

Retransmit

Retransmit is a feature that allows the Read of a block of memory more than once without the need to reload the initial address. This eliminates the need for external logic to store and route data. It also reduces the complexity of the system design and saves board space. An internal “mirror register” is used to store the initially loaded address counter value. When the counter unmasked portion reaches its maximum value set by the mask register, it wraps back to the initial value stored in this “mirror register.” If the counter is continuously configured in increment mode, it increments again to its maximum value and wraps back to the value initially stored into the “mirror register.” Thus, the repeated access of the same data is allowed without the need for any external logic.

Mask Reset Operation

The mask register is reset to all “1s,” which unmask every bit of the counter. Master reset ($\overline{\text{MRST}}$) also resets the mask register to all “1s.”

Mask Load Operation

The mask register is loaded with the address value presented at the address lines. Not all values permit correct increment operations. Permitted values are of the form $2^n - 1$ or $2^n - 2$. From the most significant bit to the least significant bit, permitted values have zero or more “0s,” one or more “1s,” or one “0.” Thus 1FFFF, 003FE, and 00001 are permitted values, but 1F0FF, 003FC, and 00000 are not.

Mask Readback Operation

The internal value of the mask register can be read out on the address lines. Readback is pipelined; the address will be valid $t_{\text{CM}2}$ after the next rising edge of the port's clock. If mask readback occurs while the port is enabled (CE0 LOW and CE1 HIGH), the data lines (DQs) will be three-stated. *Figure 1* shows a block diagram of the operation.

Counting by Two

When the least significant bit of the mask register is “0,” the counter increments by two. This may be used to connect the CY7C0850V/CY7C0851V/CY7C0852V as a 72-bit single port SRAM in which the counter of one port counts even addresses and the counter of the other port counts odd addresses. This even-odd address scheme stores one half of the 72-bit data in even memory locations, and the other half in odd memory locations.

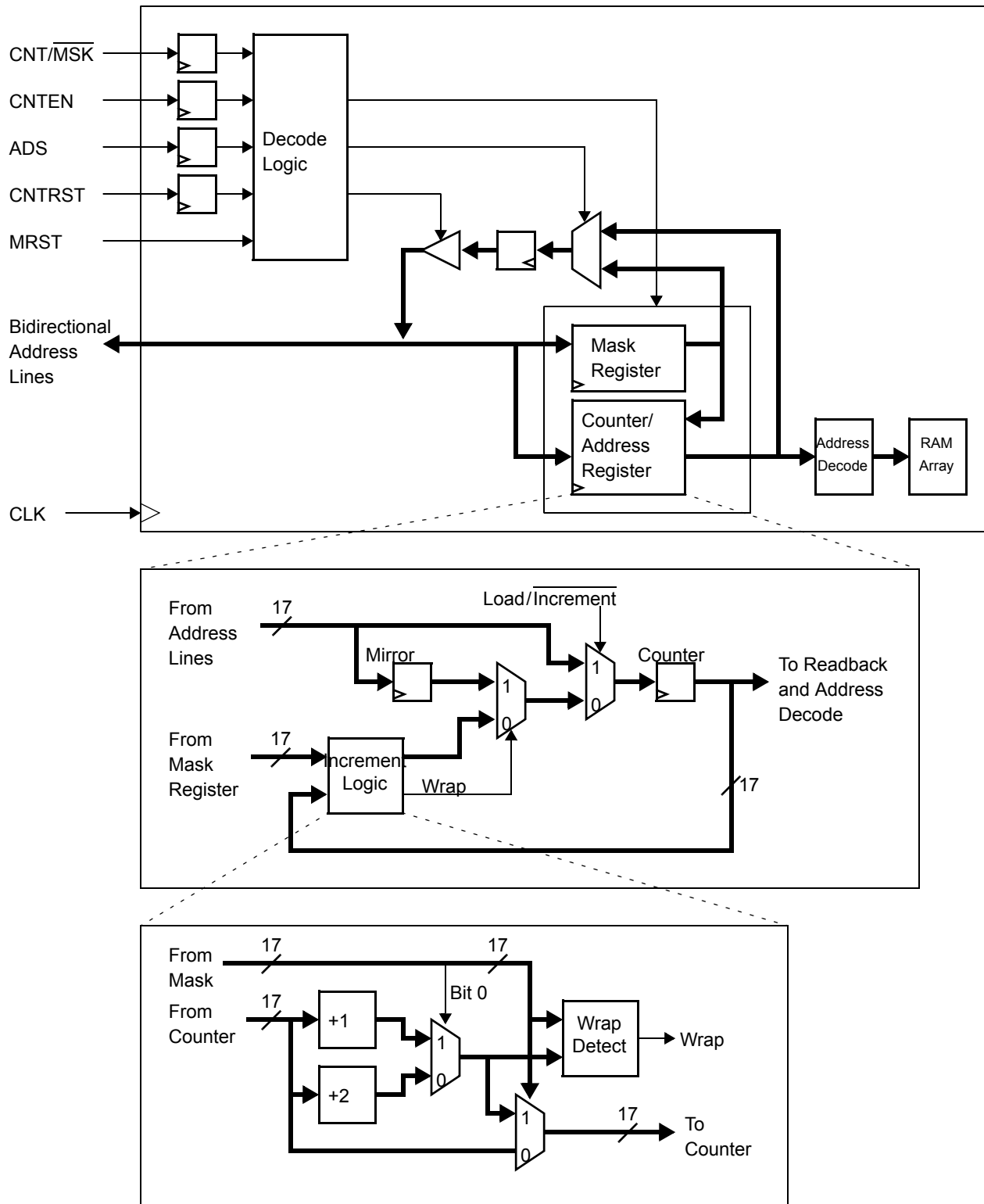


Figure 1. Counter, Mask, and Mirror Logic Block Diagram^[1]

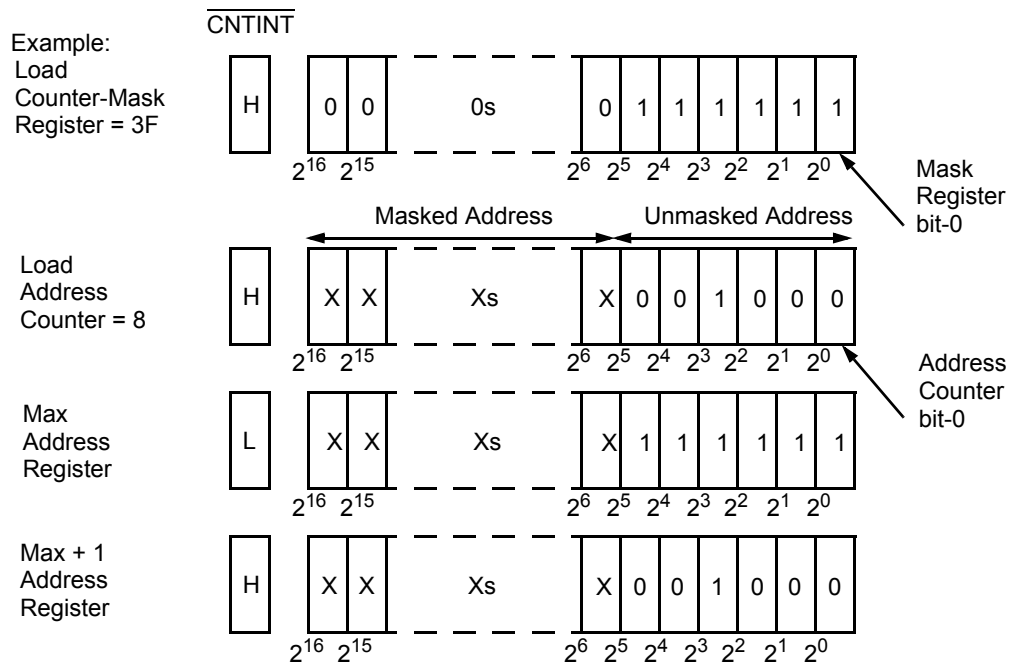


Figure 2. Programmable Counter-Mask Register Operation^[1, 12]

IEEE 1149.1 Serial Boundary Scan (JTAG)^[13]

The CY7C0850V/CY7C0851V/CY7C0852V/CY7C0853V incorporates an IEEE 1149.1 serial boundary scan test access port (TAP). The TAP controller functions in a manner that does not conflict with the operation of other devices using 1149.1-compliant TAPs. The TAP operates using JEDEC-standard 3.3V I/O logic levels. It is composed of three input connections and one output connection required by the test logic defined by the standard.

Performing a TAP Reset

A reset is performed by forcing TMS HIGH (V_{DD}) for five rising edges of TCK. This reset does not affect the operation of the devices, and may be performed while the devices are

operating. An $\overline{\text{MRST}}$ must be performed on the devices after power-up.

Performing a Pause/Restart

When a SHIFT-DR PAUSE-DR SHIFT-DR is performed the scan chain will output the next bit in the chain twice. For example, if the value expected from the chain is 1010101, the device will output a 11010101. This extra bit will cause some testers to report an erroneous failure for the devices in a scan test. Therefore the tester should be configured to never enter the PAUSE-DR state.

Table 4. Identification Register Definitions

| Instruction Field | Value | Description |
|---------------------------|-------|--|
| Revision Number (31:28) | 0h | Reserved for version number. |
| Cypress Device ID (27:12) | C001h | Defines Cypress part number for the CY7C0851V |
| | C002h | Defines Cypress part number for the CY7C0852V and CY7C0853V |
| | C092h | Defines Cypress part number for the CY7C0850V |
| Cypress JEDEC ID (11:1) | 034h | Allows unique identification of the DP family device vendor. |
| ID Register Presence (0) | 1 | Indicates the presence of an ID register. |

Notes:

12. The "X" in this diagram represents the counter upper bits.

13. Boundary scan is IEEE 1149.1-compatible. See "Performing a Pause/Restart" for deviation from strict 1149.1 compliance

Table 5. Scan Registers Sizes

| Register Name | Bit Size |
|----------------|-------------------|
| Instruction | 4 |
| Bypass | 1 |
| Identification | 32 |
| Boundary Scan | n ^[14] |

Table 6. Instruction Identification Codes

| Instruction | Code | Description |
|----------------|-----------------|---|
| EXTEST | 0000 | Captures the Input/Output ring contents. Places the BSR between the TDI and TDO. |
| BYPASS | 1111 | Places the BYR between TDI and TDO. |
| IDCODE | 1011 | Loads the IDR with the vendor ID code and places the register between TDI and TDO. |
| HIGHZ | 0111 | Places BYR between TDI and TDO. Forces all CY7C0851V/CY7C0852V/ CY7C0853V output drivers to a High-Z state. |
| CLAMP | 0100 | Controls boundary to 1/0. Places BYR between TDI and TDO. |
| SAMPLE/PRELOAD | 1000 | Captures the input/output ring contents. Places BSR between TDI and TDO. |
| NBSRST | 1100 | Resets the non-boundary scan logic. Places BYR between TDI and TDO. |
| RESERVED | All other codes | Other combinations are reserved. Do not use other than the above. |

Note:

14. See details in the device BSDL files.

Maximum Ratings ^[15]

(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.....-0.5V to V_{DD} + 0.5V

DC Input Voltage -0.5V to V_{DD} + 0.5V^[16]
 Output Current into Outputs (LOW)..... 20 mA
 Static Discharge Voltage..... > 2000V (JEDEC JESD22-A114-2000B)
 Latch-up Current..... > 200 mA

Operating Range

| Range | Ambient Temperature | V _{DD} |
|------------|---------------------|-----------------|
| Commercial | 0°C to +70°C | 3.3V ± 165 mV |
| Industrial | -40°C to +85°C | 3.3V ± 165 mV |

Electrical Characteristics Over the Operating Range

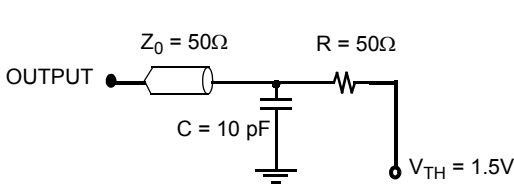
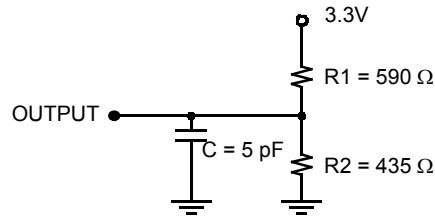
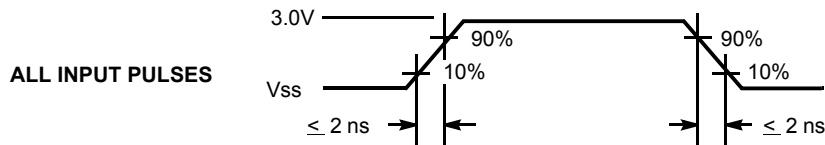
| Parameter | Description | -167 | | | -133 | | | -100 | | | Unit |
|----------------------------------|---|------|------|------|------|------|------|------|------|------|------|
| | | Min. | Typ. | Max. | Min. | Typ. | Max. | Min. | Typ. | Max. | |
| V _{OH} | Output HIGH Voltage (V _{DD} = Min., I _{OH} = -4.0 mA) | 2.4 | | | 2.4 | | | 2.4 | | | V |
| V _{OL} | Output LOW Voltage (V _{DD} = Min., I _{OL} = +4.0 mA) | | | 0.4 | | | | 0.4 | | 0.4 | V |
| V _{IH} | Input HIGH Voltage | 2.0 | | | 2.0 | | | 2.0 | | | V |
| V _{IL} | Input LOW Voltage | | | 0.8 | | | | 0.8 | | 0.8 | V |
| I _{OZ} | Output Leakage Current | -10 | | 10 | -10 | | | 10 | -10 | 10 | µA |
| I _{IX1} | Input Leakage Current Except TDI, TMS, MRST | -10 | | 10 | -10 | | | 10 | -10 | 10 | µA |
| I _{IX2} | Input Leakage Current TDI, TMS, MRST | -0.1 | | 1.0 | -0.1 | | | 1.0 | -0.1 | 1.0 | mA |
| I _{CC} | Operating Current for (V _{DD} = Max., I _{OUT} = 0 mA), Outputs Disabled | | | 225 | 300 | | | 225 | 300 | | mA |
| | | | | | | | | 270 | 400 | 200 | 310 |
| I _{SB1} ^[18] | Standby Current (Both Ports TTL Level) CE _L and CE _R ≥ V _{IH} , f = f _{MAX} | | 90 | 115 | | 90 | 115 | | 90 | 115 | mA |
| I _{SB2} ^[18] | Standby Current (One Port TTL Level) CE _L CE _R ≥ V _{IH} , f = f _{MAX} | | 160 | 210 | | 160 | 210 | | 160 | 210 | mA |
| I _{SB3} ^[18] | Standby Current (Both Ports CMOS Level) CE _L and CE _R ≥ V _{DD} - 0.2V, f = 0 | | 55 | 75 | | 55 | 75 | | 55 | 75 | mA |
| I _{SB4} ^[18] | Standby Current (One Port CMOS Level) CE _L CE _R ≥ V _{IH} , f = f _{MAX} | | 160 | 210 | | 160 | 210 | | 160 | 210 | mA |

Capacitance ^[17]

| Part Number | Parameter | Description | Test Conditions | Max. | Unit |
|---------------------------------|------------------|--------------------|---|------|------|
| CY7C0850V/7C0851V/ CY7C0852V | C _{IN} | Input Capacitance | T _A = 25°C, f = 1 MHz, V _{DD} = 3.3V | 13 | pF |
| | C _{OUT} | Output Capacitance | | 10 | pF |
| CY7C0853V | C _{IN} | Input Capacitance | | 22 | pF |
| | C _{OUT} | Output Capacitance | | 20 | pF |

Note:

15. The voltage on any input or I/O pin can not exceed the power pin during power-up.
16. Pulse width < 20 ns.
17. C_{OUT} also references C_{I/O}
18. I_{SB1}, I_{SB2}, I_{SB3} and I_{SB4} are not applicable for CY7C0853V because it can not be powered down by using chip enable pins.

AC Test Load and Waveforms

(a) Normal Load (Load 1)

(b) Three-state Delay (Load 2)

Switching Characteristics Over the Operating Range

| Parameter | Description | -167 | | -133 | | -100 | | Unit | | |
|--------------|-----------------------------|-------------------------------------|------|-------------------------------------|------|-----------|------|------|-----|-----|
| | | CY7C0850V CY7C0851V CY7C0852V | | CY7C0850V CY7C0851V CY7C0852V | | CY7C0853V | | | | |
| | | Min. | Max. | Min. | Max. | Min. | Max. | | | |
| f_{MAX2} | Maximum Operating Frequency | | 167 | | 133 | | 133 | | 100 | MHz |
| t_{CYC2} | Clock Cycle Time | 6.0 | | 7.5 | | 7.5 | | 10.0 | | ns |
| t_{CH2} | Clock HIGH Time | 2.7 | | 3.0 | | 3.0 | | 4.0 | | ns |
| t_{CL2} | Clock LOW Time | 2.7 | | 3.0 | | 3.0 | | 4.0 | | ns |
| $t_R^{[19]}$ | Clock Rise Time | | 2.0 | | 2.0 | | 2.0 | | 3.0 | ns |
| $t_F^{[19]}$ | Clock Fall Time | | 2.0 | | 2.0 | | 2.0 | | 3.0 | ns |
| t_{SA} | Address Set-up Time | 2.3 | | 2.5 | | 2.5 | | 3.0 | | ns |
| t_{HA} | Address Hold Time | 0.6 | | 0.6 | | 0.6 | | 0.6 | | ns |
| t_{SB} | Byte Select Set-up Time | 2.3 | | 2.5 | | 2.5 | | 3.0 | | ns |
| t_{HB} | Byte Select Hold Time | 0.6 | | 0.6 | | 0.6 | | 0.6 | | ns |
| t_{SC} | Chip Enable Set-up Time | 2.3 | | 2.5 | | NA | | NA | | ns |
| t_{HC} | Chip Enable Hold Time | 0.6 | | 0.6 | | NA | | NA | | ns |
| t_{SW} | R/W Set-up Time | 2.3 | | 2.5 | | 2.5 | | 3.0 | | ns |
| t_{HW} | R/W Hold Time | 0.6 | | 0.6 | | 0.6 | | 0.6 | | ns |
| t_{SD} | Input Data Set-up Time | 2.3 | | 2.5 | | 2.5 | | 3.0 | | ns |
| t_{HD} | Input Data Hold Time | 0.6 | | 0.6 | | 0.6 | | 0.6 | | ns |
| t_{SAD} | ADS Set-up Time | 2.3 | | 2.5 | | NA | | NA | | ns |
| t_{HAD} | ADS Hold Time | 0.6 | | 0.6 | | NA | | NA | | ns |
| t_{SCN} | CNTEN Set-up Time | 2.3 | | 2.5 | | NA | | NA | | ns |
| t_{HCN} | CNTEN Hold Time | 0.6 | | 0.6 | | NA | | NA | | ns |
| t_{SRST} | CNTRST Set-up Time | 2.3 | | 2.5 | | NA | | NA | | ns |
| t_{HRST} | CNTRST Hold Time | 0.6 | | 0.6 | | NA | | NA | | ns |
| t_{SCM} | CNT/MSK Set-up Time | 2.3 | | 2.5 | | NA | | NA | | ns |
| t_{HCM} | CNT/MSK Hold Time | 0.6 | | 0.6 | | NA | | NA | | ns |

Notes:

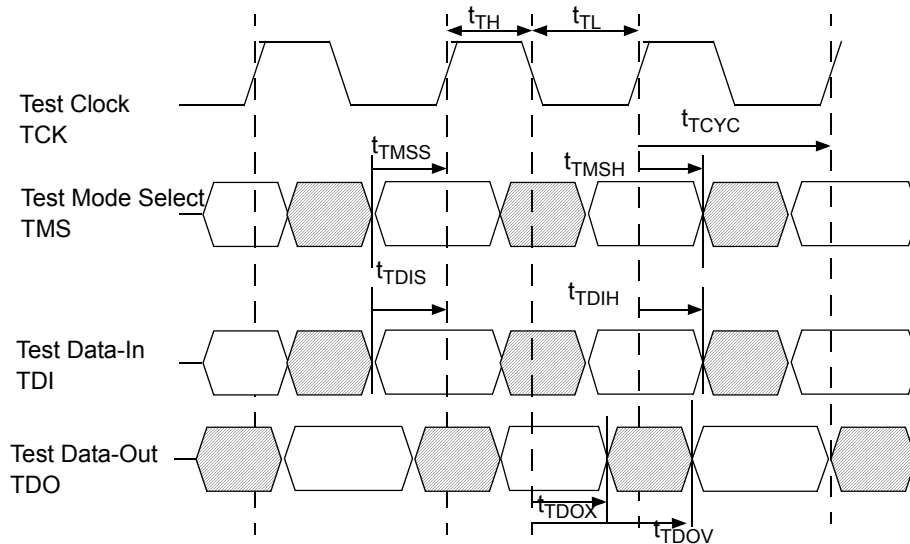
19. Except JTAG signals (t_r and $t_f < 10\text{ ns}$ [max.]).
20. This parameter is guaranteed by design, but it is not production tested.
21. Test conditions used are Load 2.

Switching Characteristics Over the Operating Range (continued)

| Parameter | Description | -167 | | -133 | | | | -100 | | Unit |
|---------------------------------------|---|-------------------------------------|------|-------------------------------------|------|-----------|------|-----------|------|------|
| | | CY7C0850V CY7C0851V CY7C0852V | | CY7C0850V CY7C0851V CY7C0852V | | CY7C0853V | | CY7C0853V | | |
| | | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | |
| t _{OE} | Output Enable to Data Valid | | 4.0 | | 4.4 | | 4.7 | | 5.0 | ns |
| t _{OLZ} ^[20, 21] | OE to Low Z | 0 | | 0 | | 0 | | 0 | | ns |
| t _{OZH} ^[20, 21] | OE to High Z | 0 | 4.0 | 0 | 4.4 | 0 | 4.7 | 0 | 5.0 | ns |
| t _{CD2} | Clock to Data Valid | | 4.0 | | 4.4 | | 4.7 | | 5.0 | ns |
| t _{CA2} | Clock to Counter Address Valid | | 4.0 | | 4.4 | | NA | | NA | ns |
| t _{CM2} | Clock to Mask Register Readback Valid | | 4.0 | | 4.4 | | NA | | NA | ns |
| t _{DC} | Data Output Hold After Clock HIGH | 1.0 | | 1.0 | | 1.0 | | 1.0 | | ns |
| t _{CKHZ} ^[20, 21] | Clock HIGH to Output High Z | 0 | 4.0 | 0 | 4.4 | 0 | 4.7 | 0 | 5.0 | ns |
| t _{CKLZ} ^[20, 21] | Clock HIGH to Output Low Z | 1.0 | 4.0 | 1.0 | 4.4 | 1.0 | 4.7 | 1.0 | 5.0 | ns |
| t _{SINT} | Clock to INT Set Time | 0.5 | 6.7 | 0.5 | 7.5 | 0.5 | 7.5 | 0.5 | 10 | ns |
| t _{RINT} | Clock to INT Reset Time | 0.5 | 6.7 | 0.5 | 7.5 | 0.5 | 7.5 | 0.5 | 10 | ns |
| t _{SCINT} | Clock to CNTINT Set Time | 0.5 | 5.0 | 0.5 | 5.7 | NA | NA | NA | NA | ns |
| t _{RCINT} | Clock to CNTINT Reset time | 0.5 | 5.0 | 0.5 | 5.7 | NA | NA | NA | NA | ns |
| Port to Port Delays | | | | | | | | | | |
| t _{CCS} | Clock to Clock Skew | 5.2 | | 6.0 | | 6.0 | | 8.0 | | ns |
| Master Reset Timing | | | | | | | | | | |
| t _{RS} | Master Reset Pulse Width | 7.0 | | 7.5 | | 7.5 | | 10.0 | | ns |
| t _{RSS} | Master Reset Set-up Time | 6.0 | | 6.0 | | 6.0 | | 8.5 | | ns |
| t _{RSR} | Master Reset Recovery Time | 6.0 | | 7.5 | | 7.5 | | 10.0 | | ns |
| t _{RSF} | Master Reset to Outputs Inactive | | 6.0 | | 6.5 | | 6.5 | | 8.0 | ns |
| t _{RSCNTINT} | Master Reset to Counter Interrupt Flag Reset Time | | 5.8 | | 7.0 | | NA | | NA | ns |

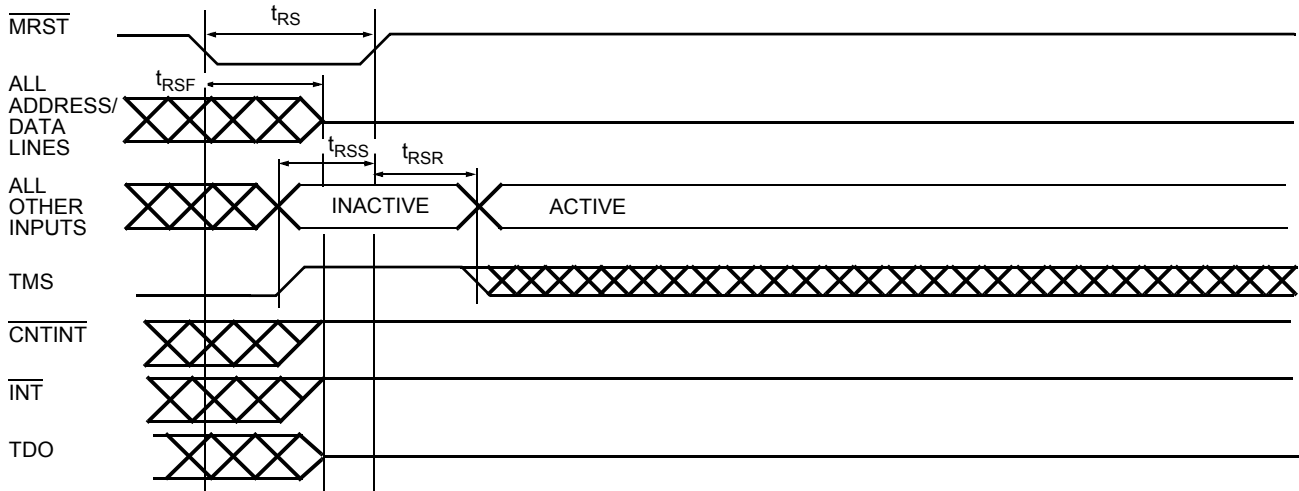
JTAG Timing

| Parameter | Description | 167/133/100 | | Unit |
|------------|---------------------------------------|-------------|------|------|
| | | Min. | Max. | |
| f_{JTAG} | Maximum JTAG TAP Controller Frequency | | 10 | MHz |
| t_{TCYC} | TCK Clock Cycle Time | 100 | | ns |
| t_{TH} | TCK Clock HIGH Time | 40 | | ns |
| t_{TL} | TCK Clock LOW Time | 40 | | ns |
| t_{TMSS} | TMS Set-up to TCK Clock Rise | 10 | | ns |
| t_{TMSH} | TMS Hold After TCK Clock Rise | 10 | | ns |
| t_{TDIS} | TDI Set-up to TCK Clock Rise | 10 | | ns |
| t_{TDIH} | TDI Hold After TCK Clock Rise | 10 | | ns |
| t_{TDOV} | TCK Clock LOW to TDO Valid | | 30 | ns |
| t_{TDOX} | TCK Clock LOW to TDO Invalid | 0 | | ns |

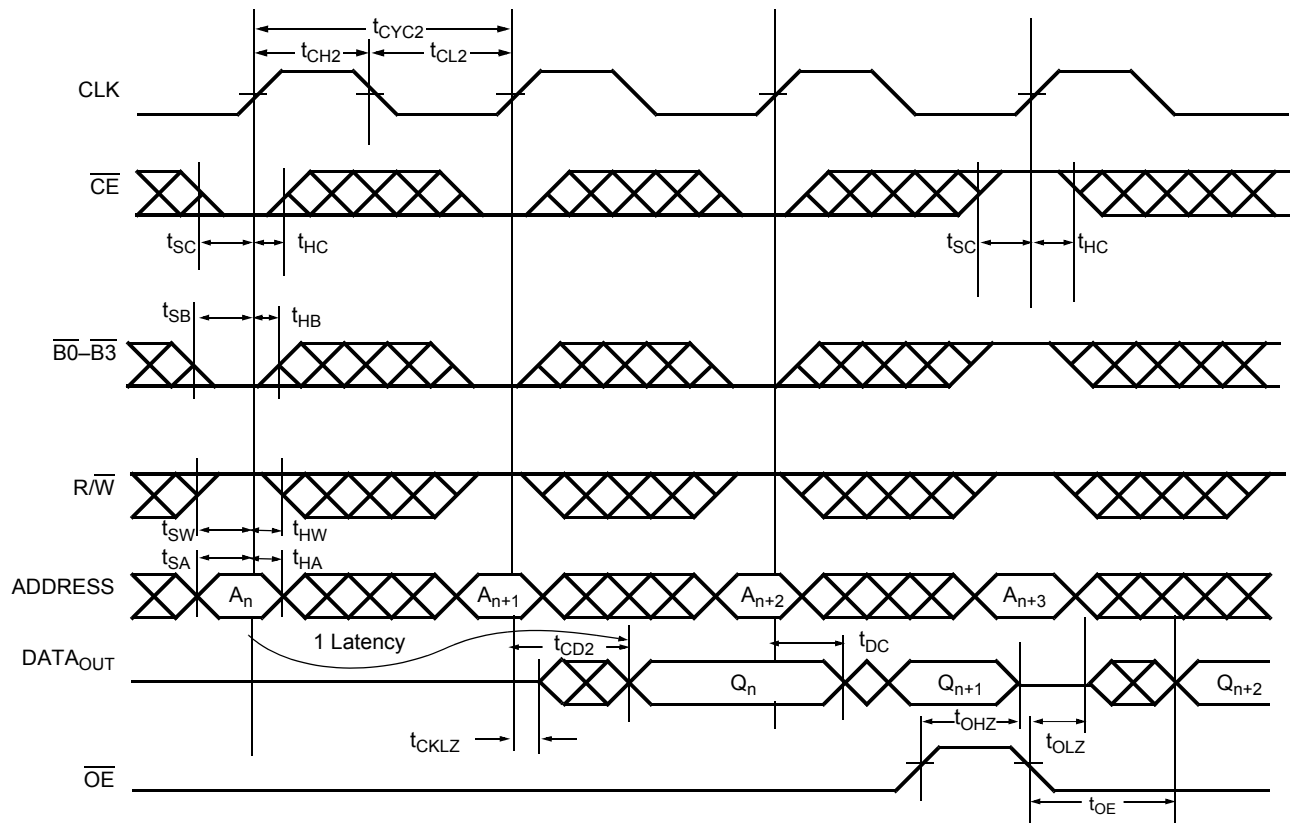
JTAG Switching Waveform


Switching Waveforms

Master Reset

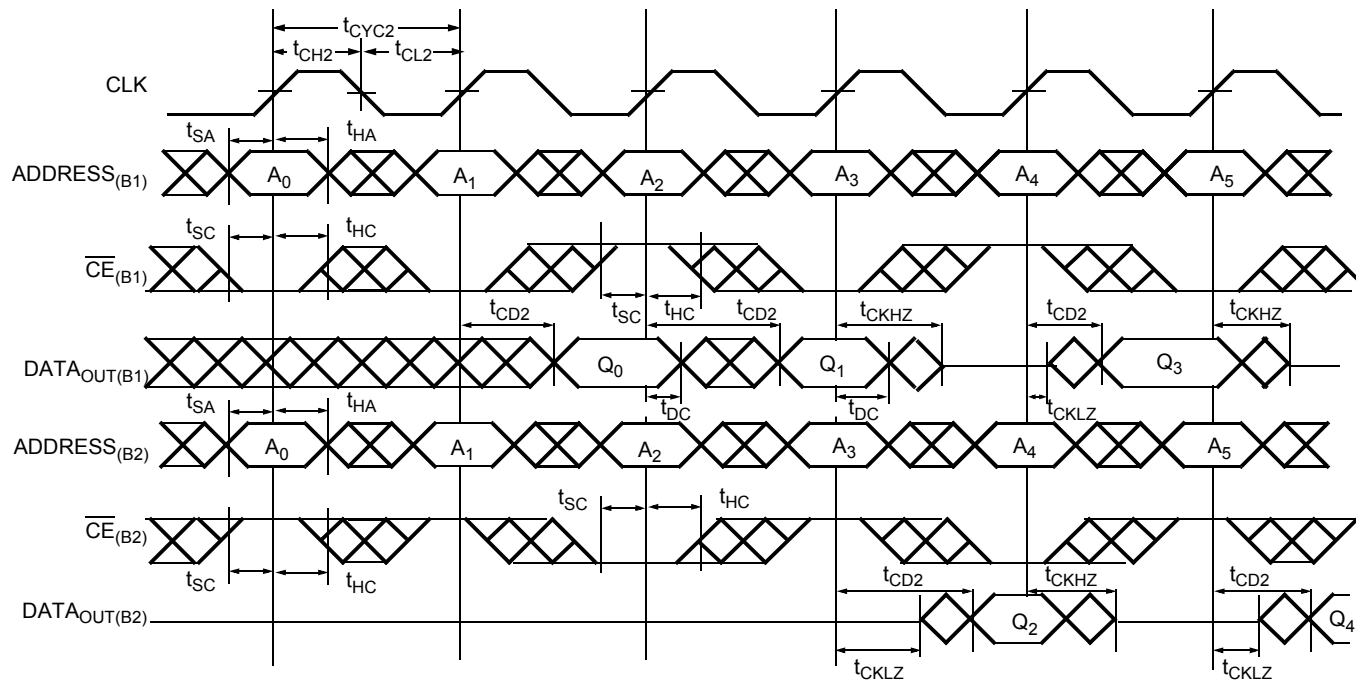
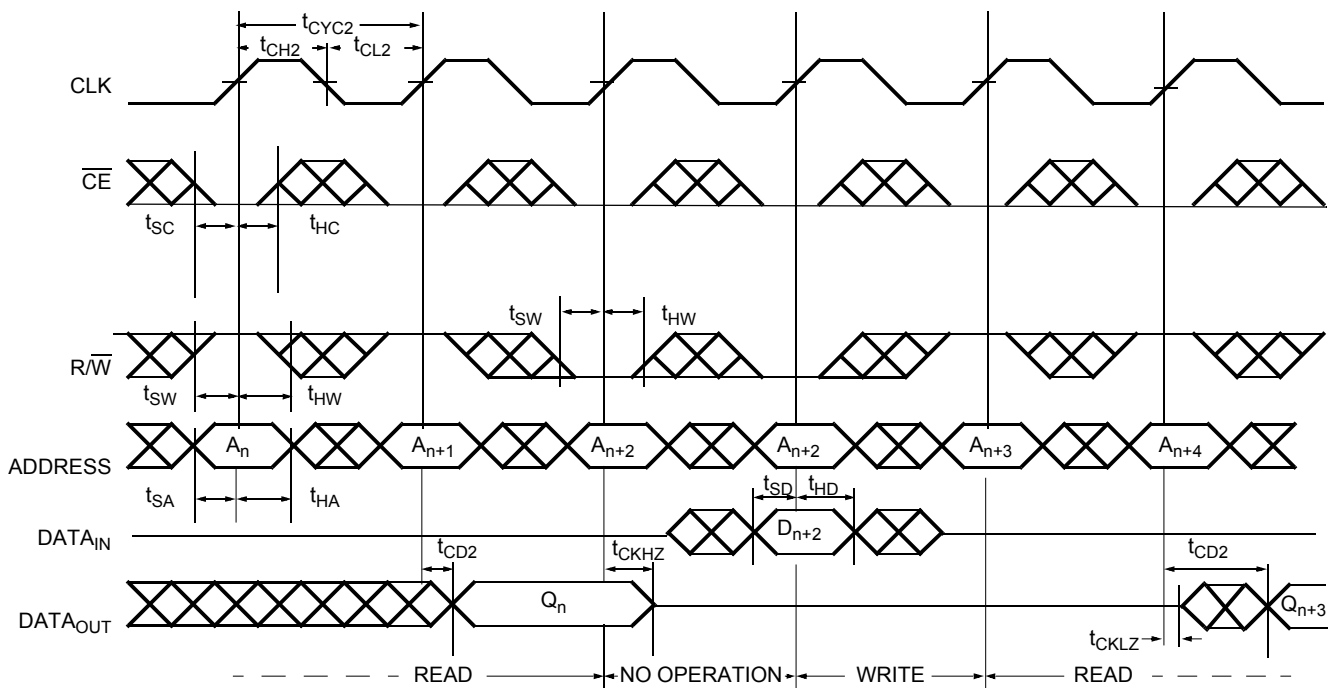


Read Cycle^[4, 22, 23, 24, 25]

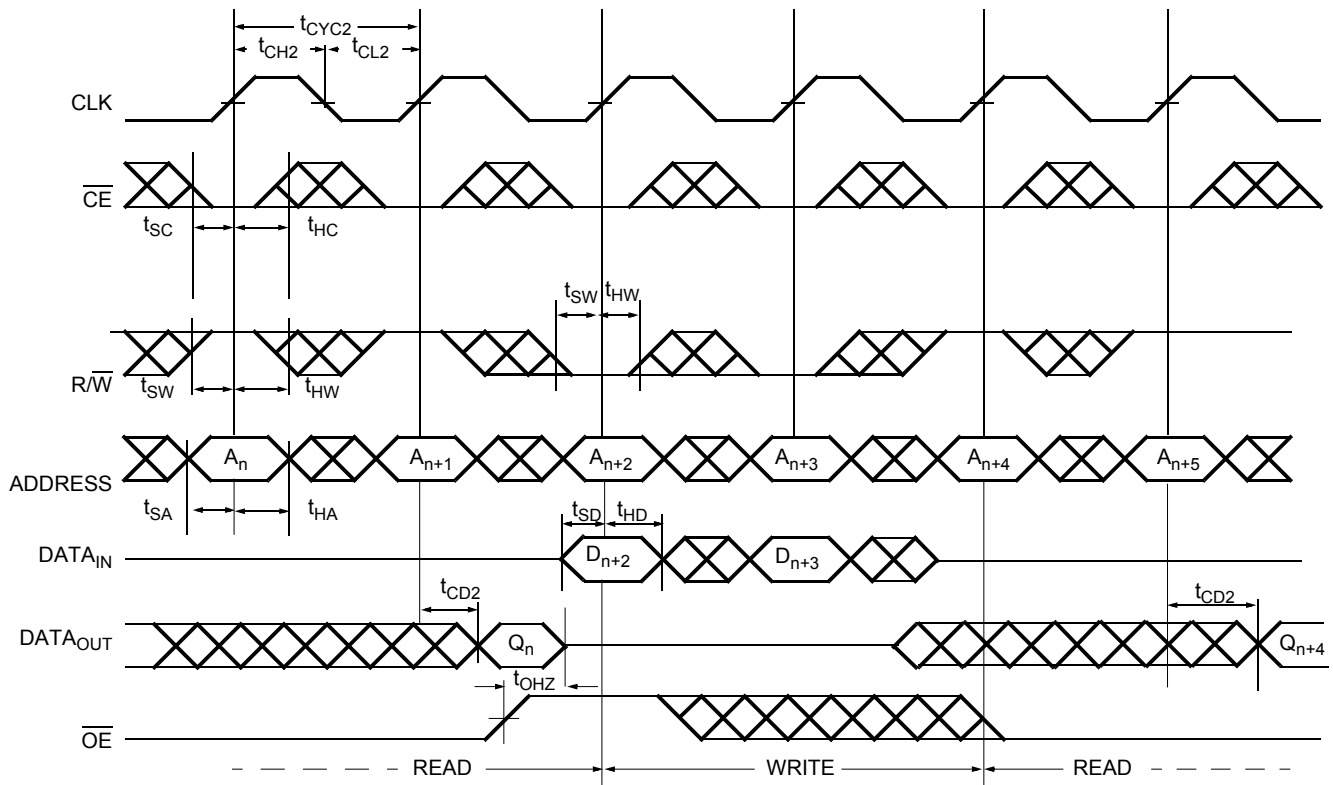
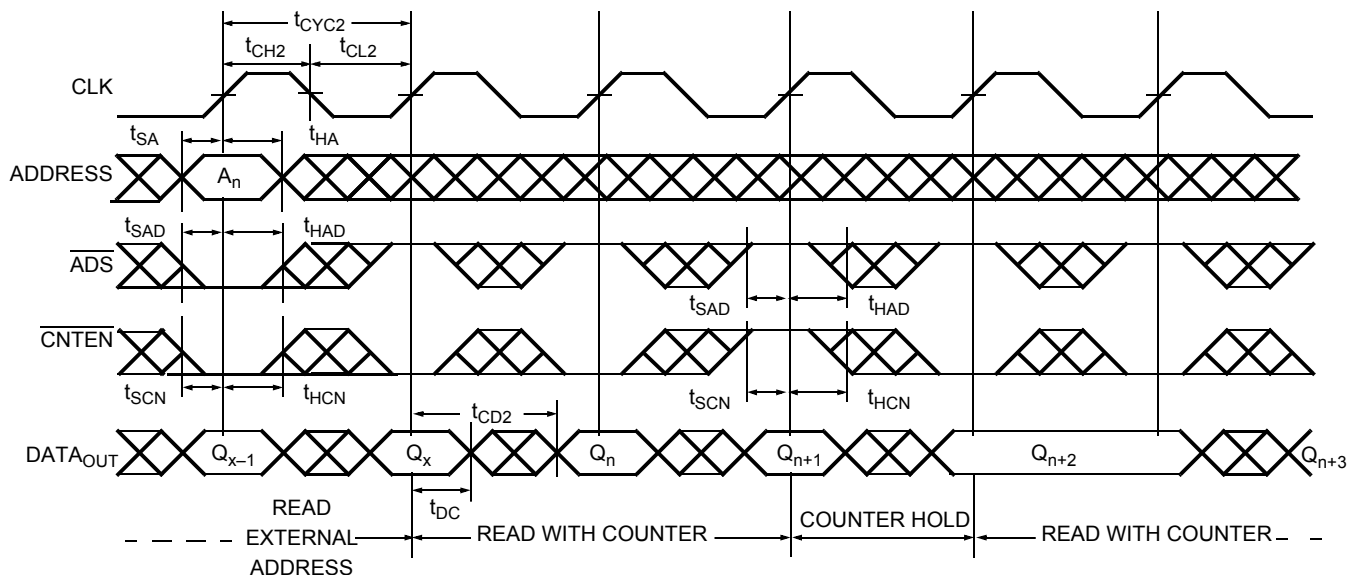


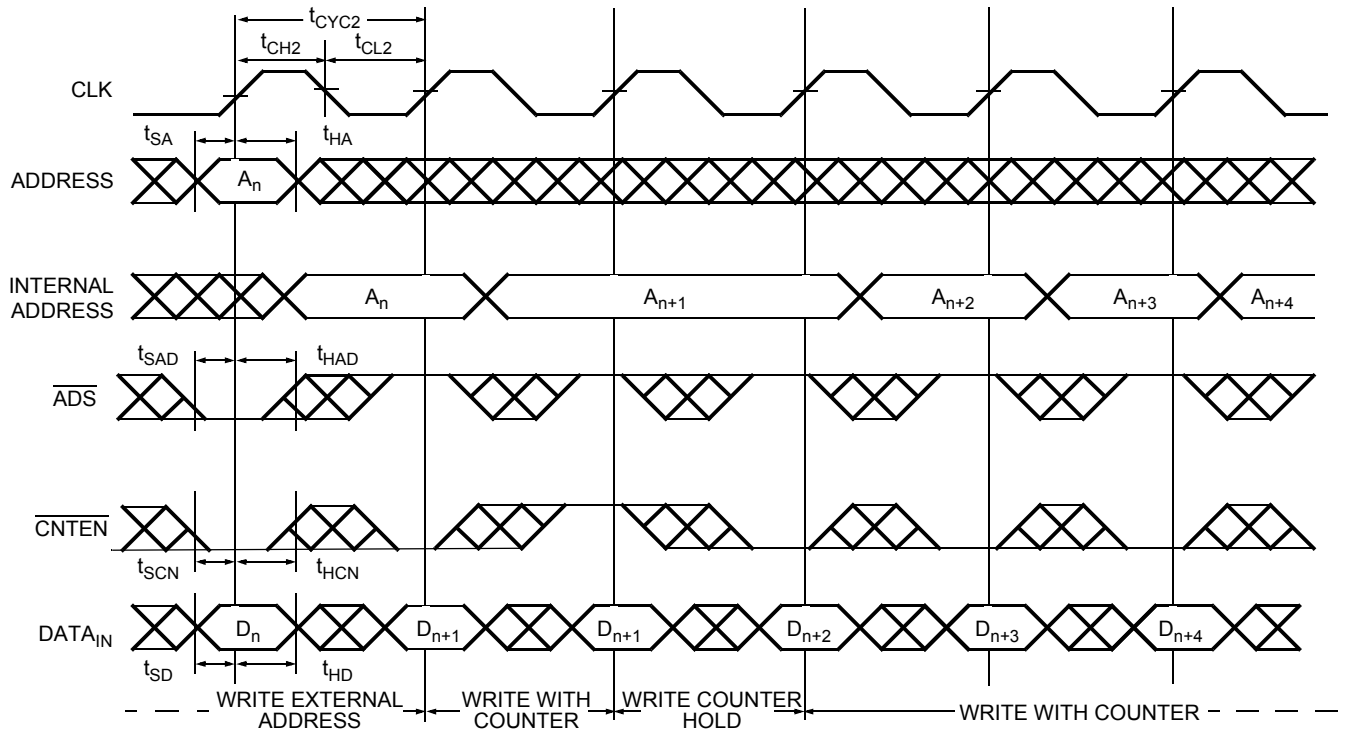
Notes:

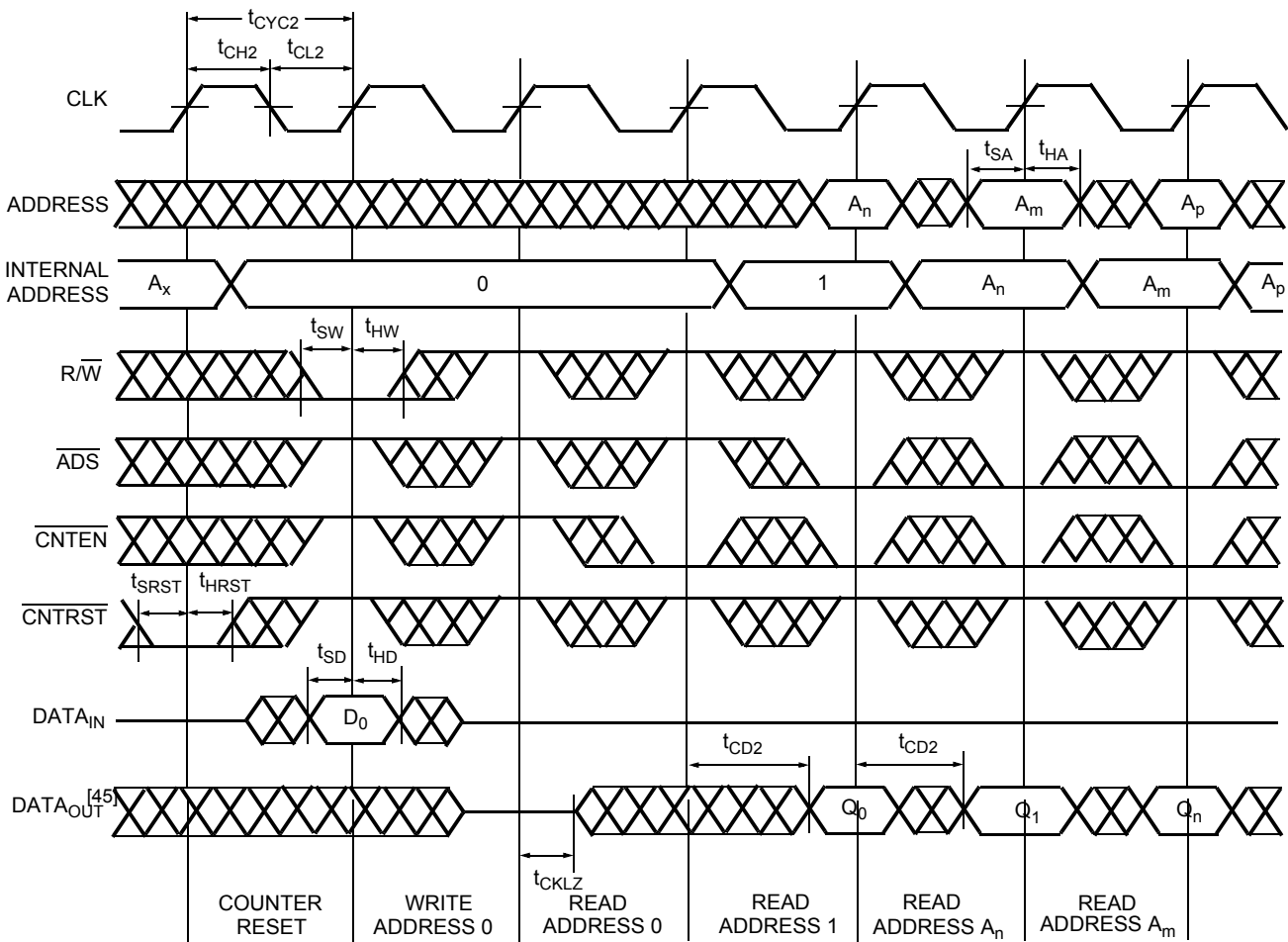
22. \overline{OE} is asynchronously controlled; all other inputs (excluding \overline{MRST} and JTAG) are synchronous to the rising clock edge.
23. $ADS = CNTEN = LOW$, and $MRST = CNTRST = CNT/MSK = HIGH$.
24. The output is disabled (high-impedance state) by $CE = V_{IH}$ following the next rising edge of the clock.
25. Addresses do not have to be accessed sequentially since $ADS = CNTEN = V_{IL}$ with $CNT/MSK = V_{IH}$ constantly loads the address on the rising edge of the CLK. Numbers are for reference only.

Switching Waveforms (continued)
Bank Select Read^[26, 27]

Read-to-Write-to-Read ($\overline{OE} = \text{LOW}$)^[25, 28, 29, 30, 31]

Notes:

26. In this depth-expansion example, B1 represents Bank #1 and B2 is Bank #2; each bank consists of one Cypress CY7C0851V/CY7C0852V device from this data sheet. $\text{ADDRESS}_{(B1)} = \text{ADDRESS}_{(B2)}$.
27. $\overline{ADS} = \overline{CNTEN} = \overline{B0 - B3} = \overline{OE} = \text{LOW}$; $\overline{MRST} = \overline{CNRST} = \overline{CNT/MSK} = \text{HIGH}$.
28. Output state (HIGH, LOW, or high-impedance) is determined by the previous cycle control signals.
29. During "No Operation," data in memory at the selected address may be corrupted and should be rewritten to ensure data integrity.
30. $\overline{CE}_0 = \overline{OE} = \overline{B0 - B3} = \text{LOW}$; $\overline{CE}_1 = \overline{R/W} = \overline{CNRST} = \overline{MRST} = \text{HIGH}$.
31. $\overline{CE}_0 = \overline{B0 - B3} = \overline{R/W} = \text{LOW}$; $\overline{CE}_1 = \overline{CNRST} = \overline{MRST} = \overline{CNT/MSK} = \text{HIGH}$. When $\overline{R/W}$ first switches low, since $\overline{OE} = \text{LOW}$, the Write operation cannot be completed (labelled as no operation). One clock cycle is required to three-state the I/O for the Write operation on the next rising edge of CLK.

Switching Waveforms (continued)
Read-to-Write-to-Read (\overline{OE} Controlled)^[25, 28, 30, 31]

Read with Address Counter Advance^[30]


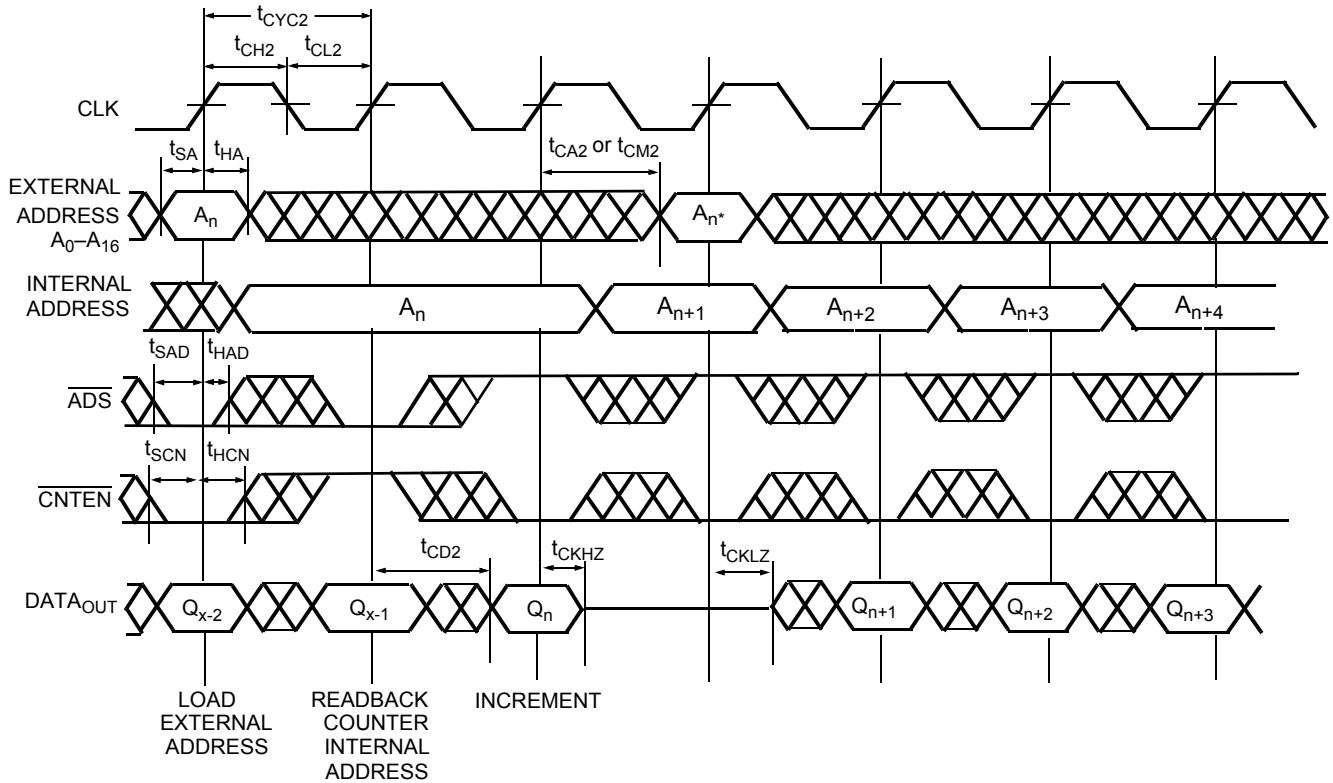
Switching Waveforms (continued)
Write with Address Counter Advance ^[31]


Switching Waveforms (continued)
Counter Reset [32, 33]

Notes:

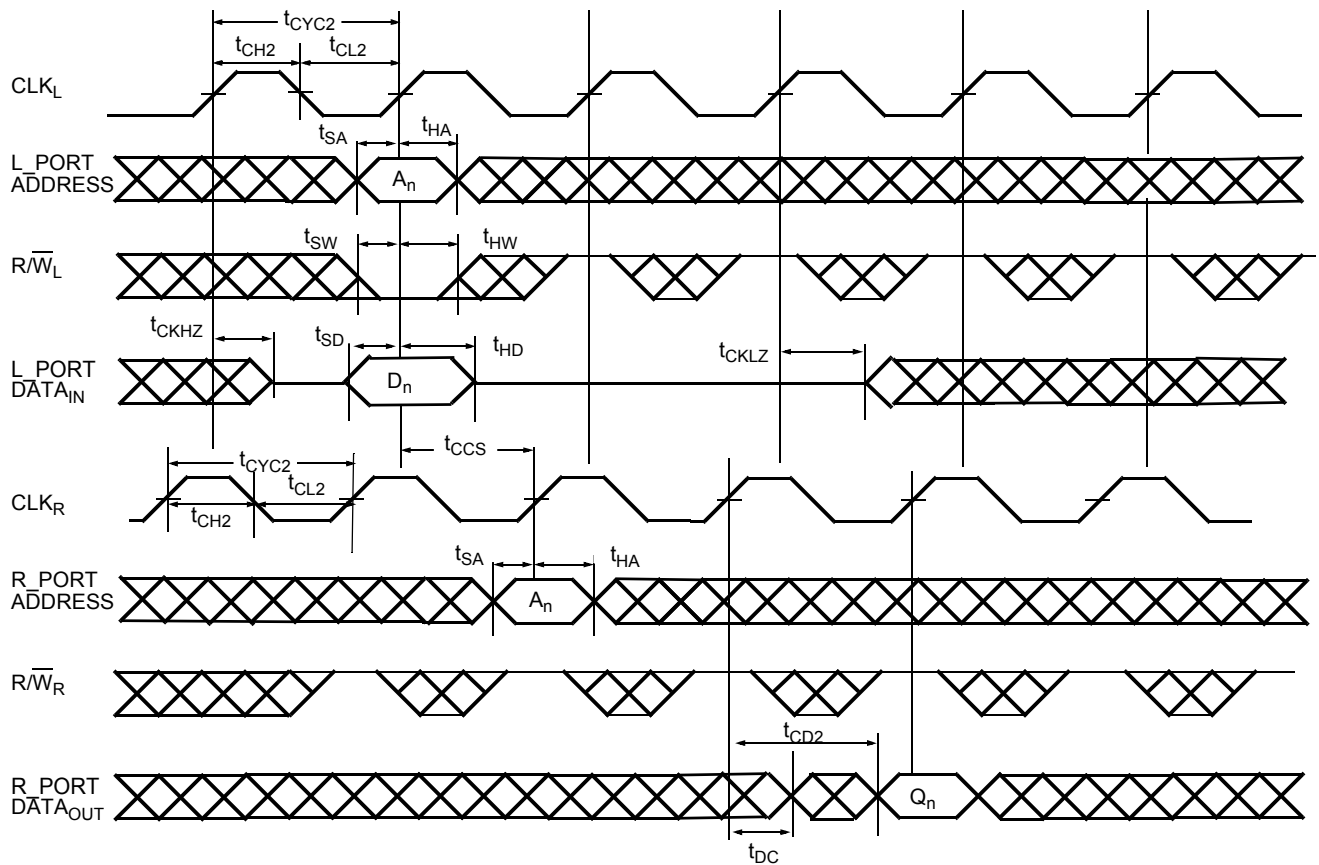
32. $\overline{CE}_0 = \overline{B0} - \overline{B3} = \text{LOW}$; $CE_1 = \overline{MRST} = \text{CNT}/\overline{MSK} = \text{HIGH}$.

33. No dead cycle exists during counter reset. A Read or Write cycle may be coincidental with the counter reset.

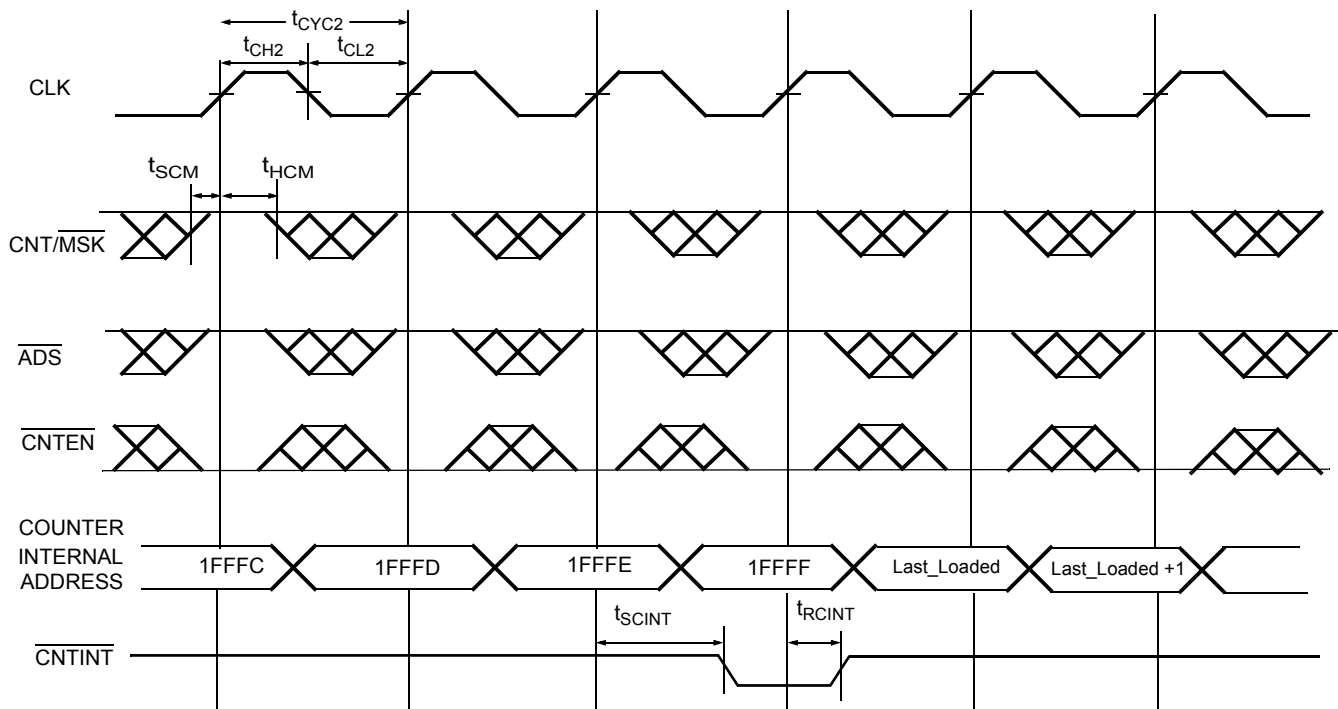
Switching Waveforms (continued)

Readback State of Address Counter or Mask Register^[34, 35, 36, 37]

Notes:

34. $\overline{CE}_0 = \overline{OE} = \overline{B0} - \overline{B3} = \text{LOW}$; $CE_1 = R/\overline{W} = \overline{CNTRST} = \overline{MRST} = \text{HIGH}$.
35. Address in output mode. Host must not be driving address bus after t_{CKLZ} in next clock cycle.
36. Address in input mode. Host can drive address bus after t_{CKHZ}.
37. An * is the internal value of the address counter (or the mask register depending on the CNT/MSK level) being Read out on the address lines.

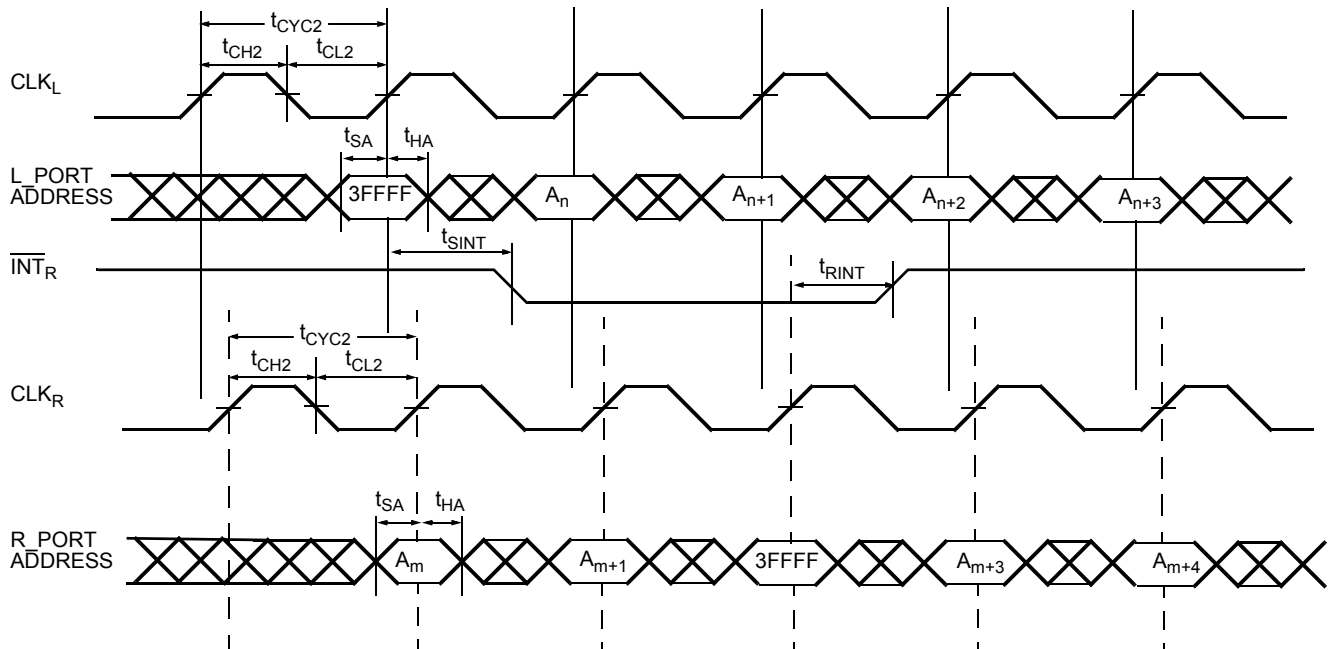
Switching Waveforms (continued)
Left_Port (L_Port) Write to Right_Port (R_Port) Read^[38, 39, 40]

Notes:

38. $\overline{CE}_0 = \overline{OE} = \overline{ADS} = \overline{CNTEN} = \overline{B0} - \overline{B3} = \text{LOW}$; $CE_1 = \overline{CNTRST} = \overline{MRST} = \overline{CNT/MSK} = \text{HIGH}$.
39. This timing is valid when one port is writing, and other port is reading the same location at the same time. If t_{CCS} is violated, indeterminate data will be Read out.
40. If $t_{CCS} <$ minimum specified value, then R_Port will Read the most recent data (written by L_Port) only ($2 * t_{CYC2} + t_{CD2}$) after the rising edge of R_Port's clock.
If $t_{CCS} \geq$ minimum specified value, then R_Port will Read the most recent data (written by L_Port) ($t_{CYC2} + t_{CD2}$) after the rising edge of R_Port's clock.

Switching Waveforms (continued)
Counter Interrupt and Retransmit^[41, 42, 43, 44, 45]

Notes:

41. $\overline{CE}_0 = \overline{OE} = \overline{B0} - \overline{B3} = \text{LOW}$; $CE_1 = R/\overline{W} = \overline{CNRST} = \overline{MRST} = \text{HIGH}$.
42. \overline{CNTINT} is always driven.
43. \overline{CNTINT} goes LOW when the unmasked portion of the address counter is incremented to the maximum value.
44. The mask register assumed to have the value of 1FFFFh.
45. Retransmit happens if the counter remains in increment mode after it wraps to initially loaded value.

Switching Waveforms (continued)

MailBox Interrupt Timing^[46, 47, 48, 49, 50]

Table 7. Read/Write and Enable Operation (Any Port)^[1, 8, 51, 52]

| Inputs | | | | | Outputs | Operation |
|-----------------|-----|--------|--------|-----|------------------|------------------|
| \overline{OE} | CLK | CE_0 | CE_1 | R/W | $DQ_0 - DQ_{35}$ | |
| X | | H | X | X | High-Z | Deselected |
| X | | X | L | X | High-Z | Deselected |
| X | | L | H | L | D_{IN} | Write |
| L | | L | H | H | D_{OUT} | Read |
| H | X | L | H | X | High-Z | Outputs Disabled |

Notes:

46. $\overline{CE}_0 = \overline{OE} = \overline{ADS} = \overline{CNTEN} = \text{LOW}$; $CE_1 = \overline{CNTRST} = \overline{MRST} = \overline{CNT/MSK} = \text{HIGH}$.
47. Address "3FFFF" is the mailbox location for R_Port of a 9M device.
48. L_Port is configured for Write operation, and R_Port is configured for Read operation.
49. At least one byte enable (B0 – B3) is required to be active during interrupt operations.
50. Interrupt flag is set with respect to the rising edge of the Write clock, and is reset with respect to the rising edge of the Read clock.
51. OE is an asynchronous input signal.
52. When CE changes state, deselection and Read happen after one cycle of latency.

Ordering Information
256K × 36 (9M) 3.3V Synchronous CY7C0853V Dual-Port SRAM

| Speed (MHz) | Ordering Code | Package Name | Package Type | Operating Range |
|-------------|------------------|--------------|---|-----------------|
| 133 | CY7C0853V-133BBC | BB172 | 172-ball Grid Array 15 mm × 15 mm with 1.0 mm pitch (BGA) | Commercial |
| | CY7C0853V-133BBI | BB172 | 172-ball Grid Array 15 mm × 15 mm with 1.0 mm pitch (BGA) | Industrial |
| 100 | CY7C0853V-100BBC | BB172 | 172-ball Grid Array 15 mm × 15 mm with 1.0 mm pitch (BGA) | Commercial |
| | CY7C0853V-100BBI | BB172 | 172-ball Grid Array 15 mm × 15 mm with 1.0 mm pitch (BGA) | Industrial |

128K × 36 (4M) 3.3V Synchronous CY7C0852V Dual-Port SRAM

| Speed (MHz) | Ordering Code | Package Name | Package Type | Operating Range |
|-------------|------------------|--------------|---|-----------------|
| 167 | CY7C0852V-167BBC | BB172 | 172-ball Grid Array 15 mm × 15 mm with 1.0 mm pitch (BGA) | Commercial |
| | CY7C0852V-167AC | A176 | 176-pin Flat Pack 24 mm × 24 mm (TQFP) | Commercial |
| 133 | CY7C0852V-133BBC | BB172 | 172-ball Grid Array 15 mm × 15 mm with 1.0 mm pitch (BGA) | Commercial |
| | CY7C0852V-133BBI | BB172 | 172-ball Grid Array 15 mm × 15 mm with 1.0 mm pitch (BGA) | Industrial |
| | CY7C0852V-133AC | A176 | 176-pin Flat Pack 24 mm × 24 mm (TQFP) | Commercial |
| | CY7C0852V-133AI | A176 | 176-pin Flat Pack 24 mm × 24 mm (TQFP) | Industrial |

64K × 36 (2M) 3.3V Synchronous CY7C0851V Dual-Port SRAM

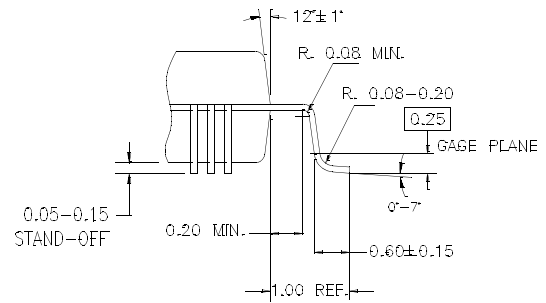
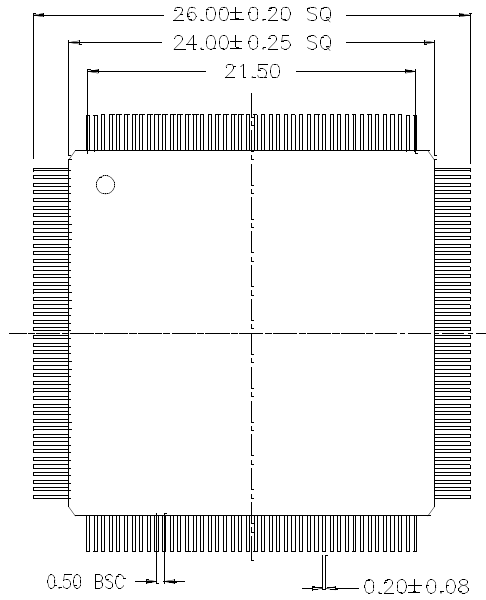
| Speed (MHz) | Ordering Code | Package Name | Package Type | Operating Range |
|-------------|------------------|--------------|---|-----------------|
| 167 | CY7C0851V-167BBC | BB172 | 172-ball Grid Array 15 mm × 15 mm with 1.0 mm pitch (BGA) | Commercial |
| | CY7C0851V-167AC | A176 | 176-pin Flat Pack 24 mm × 24 mm (TQFP) | Commercial |
| 133 | CY7C0851V-133BBC | BB172 | 172-ball Grid Array 15 mm × 15 mm with 1.0 mm pitch (BGA) | Commercial |
| | CY7C0851V-133BBI | BB172 | 172-ball Grid Array 15 mm × 15 mm with 1.0 mm pitch (BGA) | Industrial |
| | CY7C0851V-133AC | A176 | 176-pin Flat Pack 24 mm × 24 mm (TQFP) | Commercial |
| | CY7C0851V-133AI | A176 | 176-pin Flat Pack 24 mm × 24 mm (TQFP) | Industrial |

32K × 36 (1M) 3.3V Synchronous CY7C0850V Dual-Port SRAM

| Speed (MHz) | Ordering Code | Package Name | Package Type | Operating Range |
|-------------|------------------|--------------|---|-----------------|
| 167 | CY7C0850V-167BBC | BB172 | 172-ball Grid Array 15 mm × 15 mm with 1.0 mm pitch (BGA) | Commercial |
| | CY7C0850V-167AC | A176 | 176-pin Flat Pack 24 mm × 24 mm (TQFP) | Commercial |
| 133 | CY7C0850V-133BBC | BB172 | 172-ball Grid Array 15 mm × 15 mm with 1.0 mm pitch (BGA) | Commercial |
| | CY7C0850V-133BBI | BB172 | 172-ball Grid Array 15 mm × 15 mm with 1.0 mm pitch (BGA) | Industrial |
| | CY7C0850V-133AC | A176 | 176-pin Flat Pack 24 mm × 24 mm (TQFP) | Commercial |
| | CY7C0850V-133AI | A176 | 176-pin Flat Pack 24 mm × 24 mm (TQFP) | Industrial |

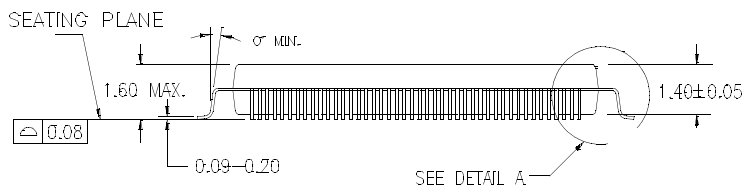
Package Diagrams

176-lead Thin Quad Flat Pack (24 × 24 × 1.4 mm) A176



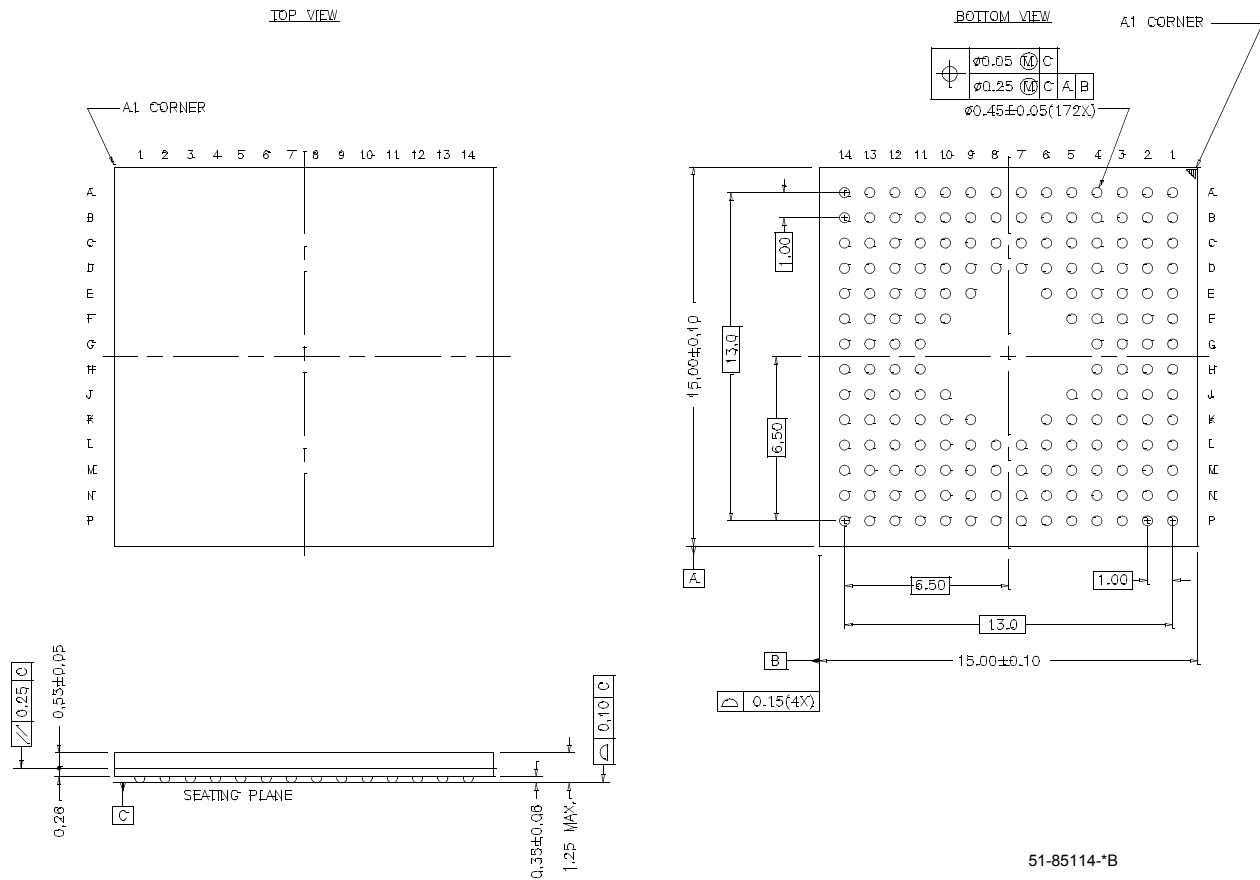
DETAIL A

51-85132-**



Package Diagrams (continued)

172-Ball FBGA (15 x 15 x 1.25 mm) BB172



51-85114-*B

Document History Page

| Document Title: CY7C0850V/CY7C0851V/CY7C0852V/CY7C0853V FLEx36™ 3.3V 32K/64K/128K/256K x 36 Synchronous Dual-Port RAM Document Number: 38-06070 | | | | |
|--|----------------|-------------------|------------------------|---|
| REV. | ECN NO. | Issue Date | Orig. of Change | Description of Change |
| ** | 127809 | 08/04/03 | SPN | This data sheet has been extracted from another data sheet: the 2M/4M/9M data sheet. The following changes have been made from the original as pertains to this device: Updated capacitance values Updated "Read-to-Write-to-Read (OE Controlled)" waveform Revised static discharge voltage Corrected 0853 pins L3 and L12 Added discussion of Pause/Restart for JTAG boundary scan Power up requirements added to Maximum Ratings information Revise t _{cd2} , t _{OE} , t _{OHZ} , t _{CKHZ} , t _{CKLZ} for the CY7C0853V to 4.7 ns Updated I _{cc} numbers Updated t _{HA} , t _{HB} , t _{HD} for -100 speed Separated out from the 4M data sheet Added 133-MHz Industrial device to Ordering Information table |
| *A | 210948 | See ECN | YDT | Changed mailbox addresses from 1FFFE and 1FFFF to 3FFFE and 3FFFF. |
| *B | 216190 | See ECN | YDT/Dcon | Corrected Revision of Document. CMS does not reflect this rev change |
| *C | 231996 | See ECN | YDT | Removed "A particular port can write to a certain location while another port is reading that location." from Functional Description. |
| *D | 238938 | See ECN | WWZ | Merged 0853 (9Mx36) with 0852 (4Mx36) and 0851(2Mx36), add 0850 (1M x36), to the datasheet. Added product selection table. Added JTAG ID code for 1M device. Added note 14. Updated boundry scan section section. Updated function description for the merge and addition. |