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Understanding [Embedded - CPLDs \(Complex Programmable Logic Devices\)](#)

Embedded - CPLDs, or Complex Programmable Logic Devices, are highly versatile digital logic devices used in electronic systems. These programmable components are designed to perform complex logical operations and can be customized for specific applications. Unlike fixed-function ICs, CPLDs offer the flexibility to reprogram their configuration, making them an ideal choice for various embedded systems. They consist of a set of logic gates and programmable interconnects, allowing designers to implement complex logic circuits without needing custom hardware.

Applications of Embedded - CPLDs

Details

Product Status	Obsolete
Programmable Type	In-System Reprogrammable™ (ISR™) CMOS
Delay Time tpd(1) Max	12 ns
Voltage Supply - Internal	3V ~ 3.6V
Number of Logic Elements/Blocks	-
Number of Macrocells	64
Number of Gates	-
Number of I/O	69
Operating Temperature	-40°C ~ 85°C (TA)
Mounting Type	Surface Mount
Package / Case	100-LQFP
Supplier Device Package	100-TQFP (14x14)
Purchase URL	https://www.e-xfl.com/product-detail/infineon-technologies/cy37064vp100-100axi

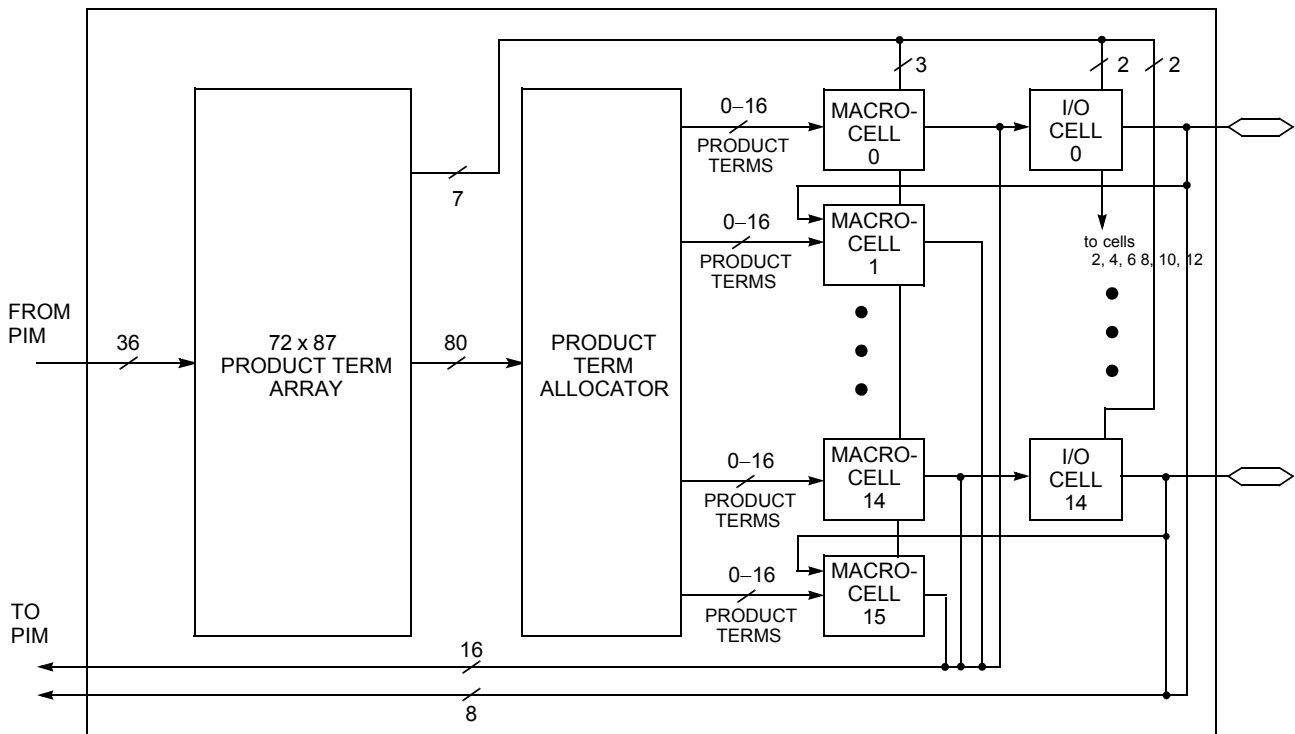


Figure 1. Logic Block with 50% Buried Macrocells

Low-Power Option

Each logic block can operate in high-speed mode for critical path performance, or in low-power mode for power conservation. The logic block mode is set by the user on a logic block basis.

Product Term Allocator

Through the product term allocator, software automatically distributes product terms among the 16 macrocells in the logic block as needed. A total of 80 product terms are available from the local product term array. The product term allocator provides two important capabilities without affecting performance: product term steering and product term sharing.

Product Term Steering

Product term steering is the process of assigning product terms to macrocells as needed. For example, if one macrocell requires ten product terms while another needs just three, the product term allocator will “steer” ten product terms to one macrocell and three to the other. On Ultra37000 devices, product terms are steered on an individual basis. Any number between 0 and 16 product terms can be steered to any macrocell. Note that 0 product terms is useful in cases where a particular macrocell is unused or used as an input register.

Product Term Sharing

Product term sharing is the process of using the same product term among multiple macrocells. For example, if more than one output has one or more product terms in its equation that are common to other outputs, those product terms are only programmed once. The Ultra37000 product term allocator allows sharing across groups of four output macrocells in a

variable fashion. The software automatically takes advantage of this capability—the user does not have to intervene.

Note that neither product term sharing nor product term steering have any effect on the speed of the product. All worst-case steering and sharing configurations have been incorporated in the timing specifications for the Ultra37000 devices.

Ultra37000 Macrocell

Within each logic block there are 16 macrocells. Macrocells can either be I/O Macrocells, which include an I/O Cell which is associated with an I/O pin, or buried Macrocells, which do not connect to an I/O. The combination of I/O Macrocells and buried Macrocells varies from device to device.

Buried Macrocell

Figure 2 displays the architecture of buried macrocells. The buried macrocell features a register that can be configured as combinatorial, a D flip-flop, a T flip-flop, or a level-triggered latch.

The register can be asynchronously set or asynchronously reset at the logic block level with the separate set and reset product terms. Each of these product terms features programmable polarity. This allows the registers to be set or reset based on an AND expression or an OR expression.

Clocking of the register is very flexible. Four global synchronous clocks and a product term clock are available to clock the register. Furthermore, each clock features programmable polarity so that registers can be triggered on falling as well as rising edges (see the Clocking section). Clock polarity is chosen at the logic block level.

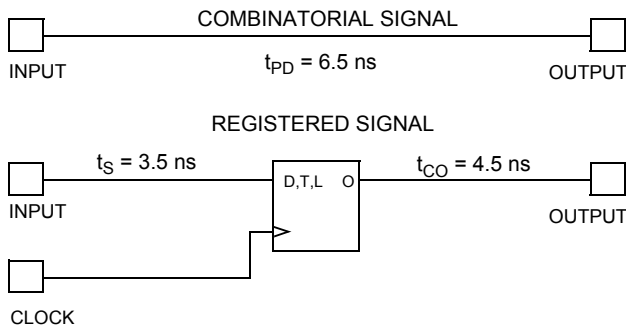


Figure 5. Timing Model for CY37128

JTAG and PCI Standards

PCI Compliance

5V operation of the Ultra37000 is fully compliant with the PCI Local Bus Specification published by the PCI Special Interest Group. The 3.3V products meet all PCI requirements except for the output 3.3V clamp, which is in direct conflict with 5V tolerance. The Ultra37000 family's simple and predictable timing model ensures compliance with the PCI AC specifications independent of the design.

IEEE 1149.1-compliant JTAG

The Ultra37000 family has an IEEE 1149.1 JTAG interface for both Boundary Scan and ISR.

Boundary Scan

The Ultra37000 family supports Bypass, Sample/Preload, Extest, Idcode, and Usercode boundary scan instructions. The JTAG interface is shown in Figure 6.

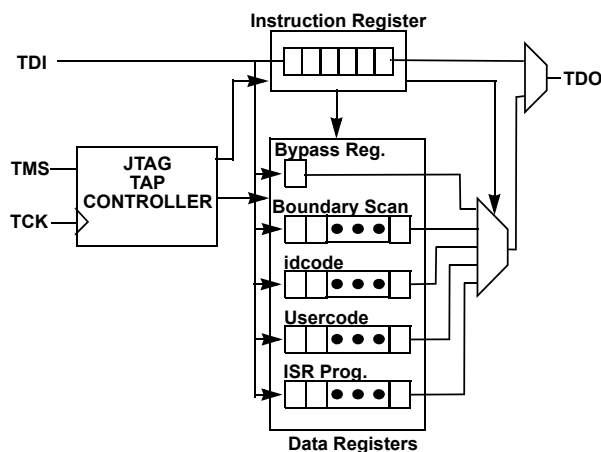


Figure 6. JTAG Interface

In-System Reprogramming (ISR)

In-System Reprogramming is the combination of the capability to program or reprogram a device on-board, and the ability to support design changes without changing the system timing or device pinout. This combination means design changes during debug or field upgrades do not cause board respins. The Ultra37000 family implements ISR by providing a JTAG compliant interface for on-board programming, robust routing

resources for pinout flexibility, and a simple timing model for consistent system performance.

Development Software Support

Warp

Warp is a state-of-the-art compiler and complete CPLD design tool. For design entry, Warp provides an IEEE-STD-1076/1164 VHDL text editor, an IEEE-STD-1364 Verilog text editor, and a graphical finite state machine editor. It provides optimized synthesis and fitting by replacing basic circuits with ones pre-optimized for the target device, by implementing logic in unused memory and by perfect communication between fitting and synthesis. To facilitate design and debugging, Warp provides graphical timing simulation and analysis.

Warp Professional™

Warp Professional contains several additional features. It provides an extra method of design entry with its graphical block diagram editor. It allows up to 5 ms timing simulation instead of only 2 ms. It allows comparison of waveforms before and after design changes.

Warp Enterprise™

Warp Enterprise provides even more features. It provides unlimited timing simulation and source-level behavioral simulation as well as a debugger. It has the ability to generate graphical HDL blocks from HDL text. It can even generate testbenches.

Warp is available for PC and UNIX platforms. Some features are not available in the UNIX version. For further information see the Warp for PC, Warp for UNIX, Warp Professional and Warp Enterprise data sheets on Cypress's web site (www.cypress.com).

Third-Party Software

Although Warp is a complete CPLD development tool on its own, it interfaces with nearly every third party EDA tool. All major third-party software vendors provide support for the Ultra37000 family of devices. Refer to the third-party software data sheet or contact your local sales office for a list of currently supported third-party vendors.

Programming

There are four programming options available for Ultra37000 devices. The first method is to use a PC with the 37000 UltraISR programming cable and software. With this method, the ISR pins of the Ultra37000 devices are routed to a connector at the edge of the printed circuit board. The 37000 UltraISR programming cable is then connected between the parallel port of the PC and this connector. A simple configuration file instructs the ISR software of the programming operations to be performed on each of the Ultra37000 devices in the system. The ISR software then automatically completes all of the necessary data manipulations required to accomplish the programming, reading, verifying, and other ISR functions. For more information on the Cypress ISR Interface, see the ISR Programming Kit data sheet (CY3700i).

The second method for programming Ultra37000 devices is on automatic test equipment (ATE). This is accomplished through a file created by the ISR software. Check the Cypress website for the latest ISR software download information.



Ultra37000 CPLD Family

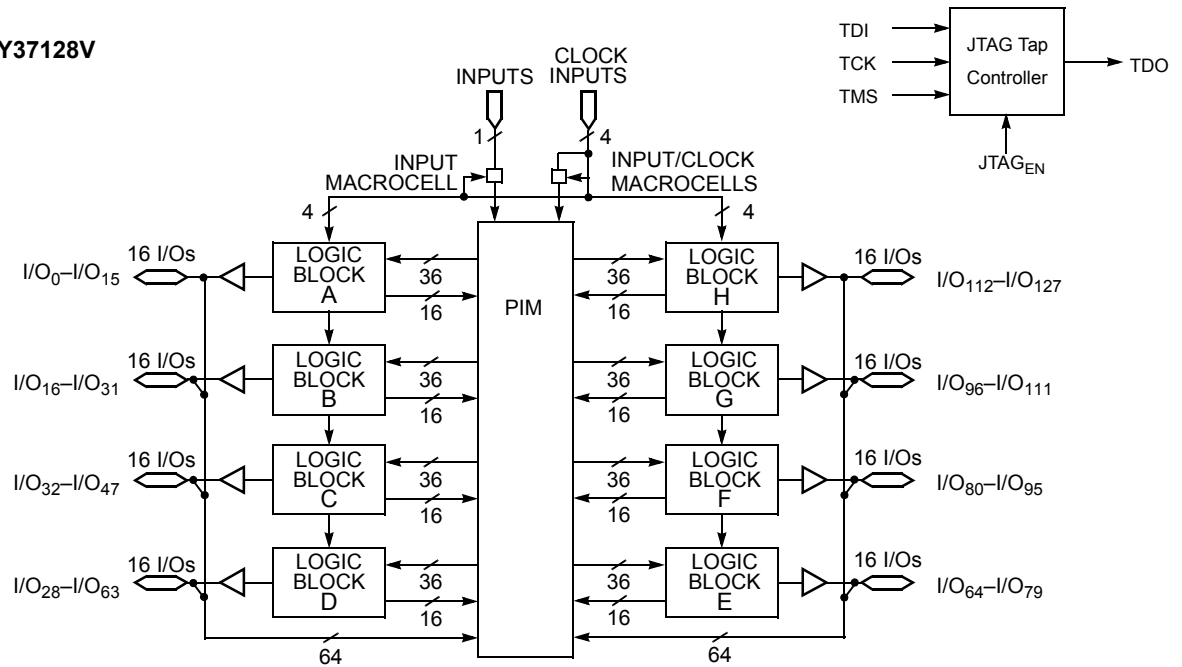
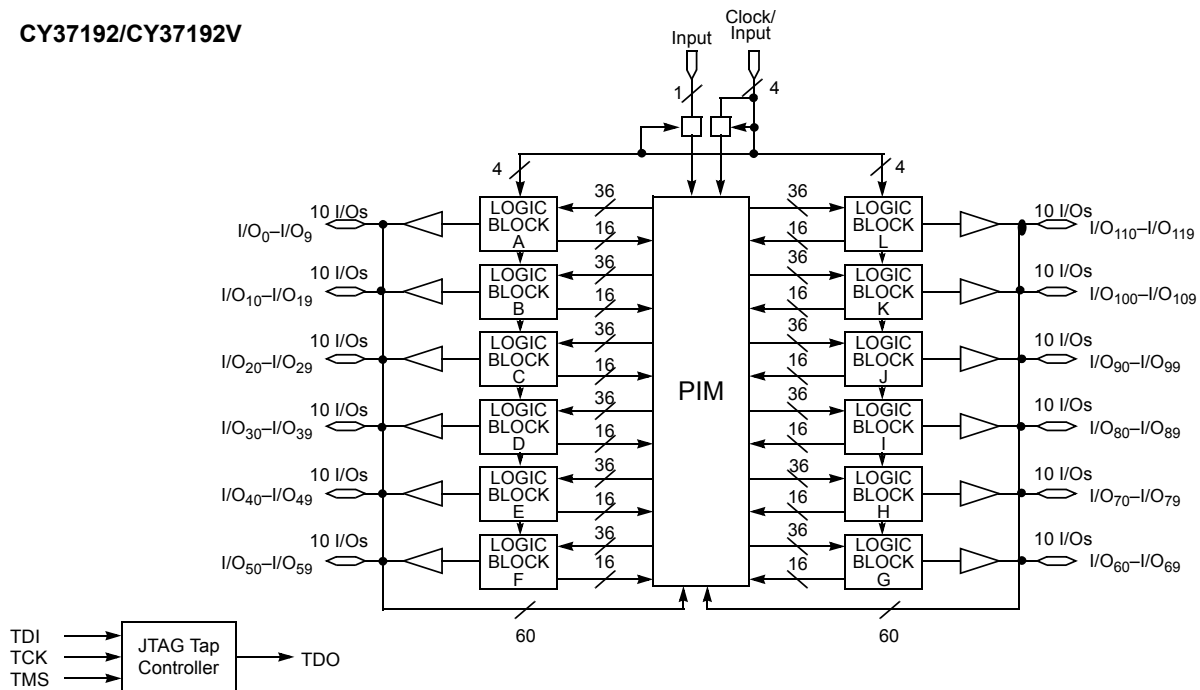
The third programming option for Ultra37000 devices is to utilize the embedded controller or processor that already exists in the system. The Ultra37000 ISR software assists in this method by converting the device JEDEC maps into the ISR serial stream that contains the ISR instruction information and the addresses and data of locations to be programmed. The embedded controller then simply directs this ISR stream to the chain of Ultra37000 devices to complete the desired reconfiguring or diagnostic operations. Contact your local sales office for information on availability of this option.

The fourth method for programming Ultra37000 devices is to use the same programmer that is currently being used to program FLASH370i devices.

For all pinout, electrical, and timing requirements, refer to device data sheets. For ISR cable and software specifications, refer to the UltraISR kit data sheet (CY3700i).

Third-Party Programmers

As with development software, Cypress support is available on a wide variety of third-party programmers. All major third-party programmers (including BP Micro, Data I/O, and SMS) support the Ultra37000 family.

Logic Block Diagrams (continued)
CY37128/CY37128V

CY37192/CY37192V


Inductance^[5]

Parameter	Description	Test Conditions	44-Lead TQFP	44-Lead PLCC	44-Lead CLCC	84-Lead PLCC	84-Lead CLCC	100-Lead TQFP	160-Lead TQFP	208-Lead PQFP	Unit
L	Maximum Pin Inductance	$V_{IN} = 5.0V$ at $f = 1\text{ MHz}$	2	5	2	8	5	8	9	11	nH

Capacitance^[5]

Parameter	Description	Test Conditions	Max.	Unit
$C_{I/O}$	Input/Output Capacitance	$V_{IN} = 5.0V$ at $f = 1\text{ MHz}$ at $T_A = 25^\circ C$	10	pF
C_{CLK}	Clock Signal Capacitance	$V_{IN} = 5.0V$ at $f = 1\text{ MHz}$ at $T_A = 25^\circ C$	12	pF
C_{DP}	Dual-Function Pins ^[9]	$V_{IN} = 5.0V$ at $f = 1\text{ MHz}$ at $T_A = 25^\circ C$	16	pF

Endurance Characteristics^[5]

Parameter	Description	Test Conditions	Min.	Typ.	Unit
N	Minimum Reprogramming Cycles	Normal Programming Conditions ^[2]	1,000	10,000	Cycles

3.3V Device Characteristics
Maximum Ratings

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

Storage Temperature $-65^\circ C$ to $+150^\circ C$

Ambient Temperature with

Power Applied $-55^\circ C$ to $+125^\circ C$

Supply Voltage to Ground Potential $-0.5V$ to $+4.6V$

DC Voltage Applied to Outputs

in High-Z State $-0.5V$ to $+7.0V$

DC Input Voltage $-0.5V$ to $+7.0V$

DC Program Voltage 3.0 to $3.6V$

Current into Outputs 8 mA

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

Latch-up Current $> 200\text{ mA}$

Operating Range^[2]

Range	Ambient Temperature ^[2]	Junction Temperature	V_{CC} ^[10]
Commercial	$0^\circ C$ to $+70^\circ C$	$0^\circ C$ to $+90^\circ C$	$3.3V \pm 0.3V$
Industrial	$-40^\circ C$ to $+85^\circ C$	$-40^\circ C$ to $+105^\circ C$	$3.3V \pm 0.3V$
Military ^[3]	$-55^\circ C$ to $+125^\circ C$	$-55^\circ C$ to $+130^\circ C$	$3.3V \pm 0.3V$

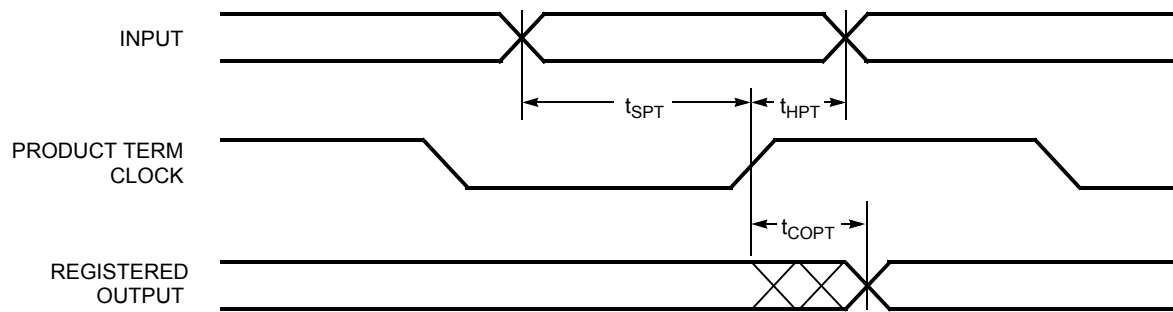
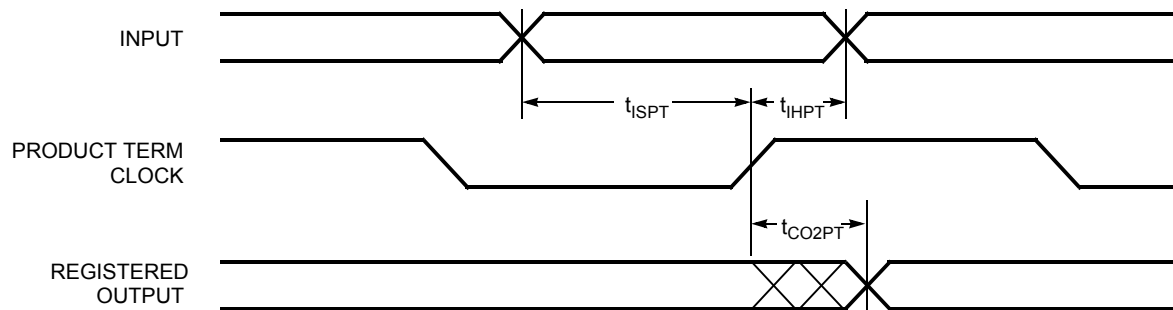
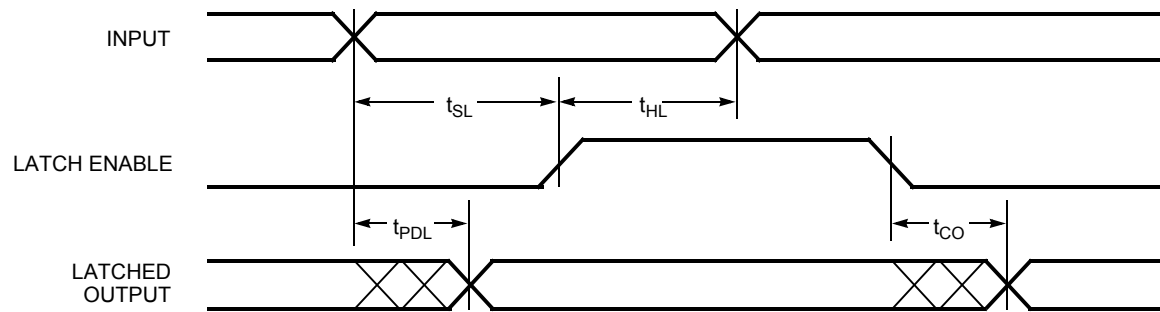
3.3V Device Electrical Characteristics Over the Operating Range

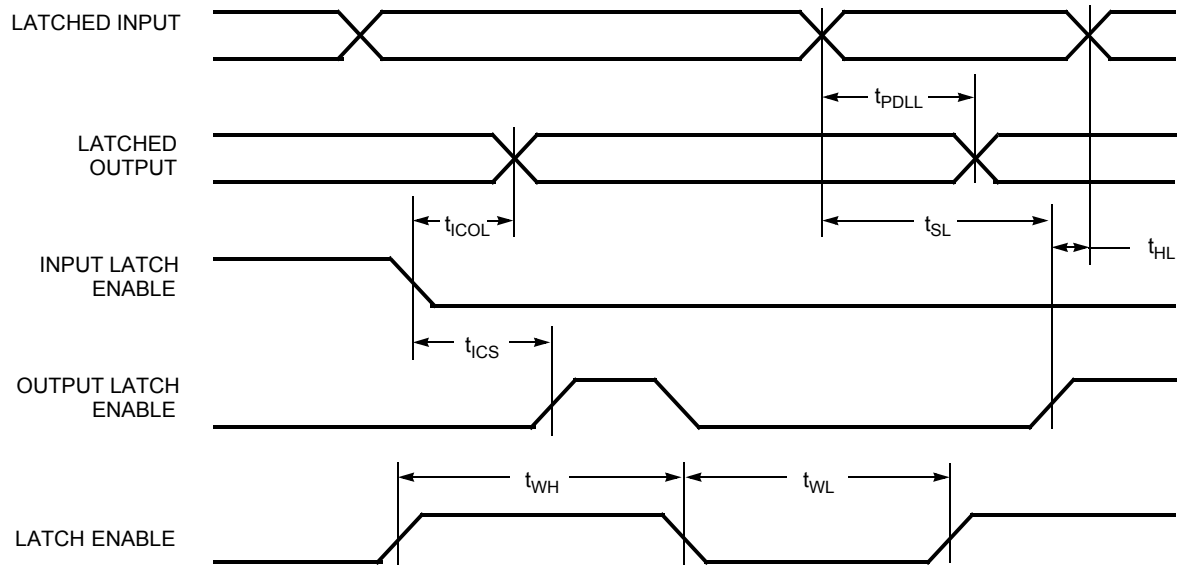
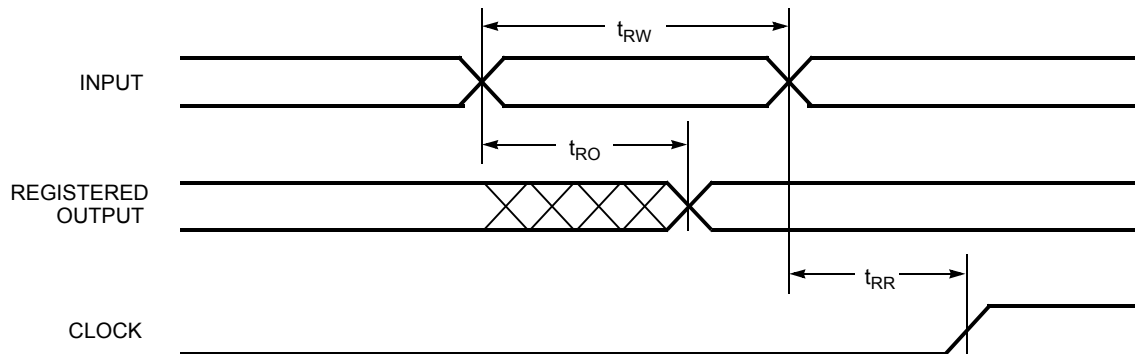
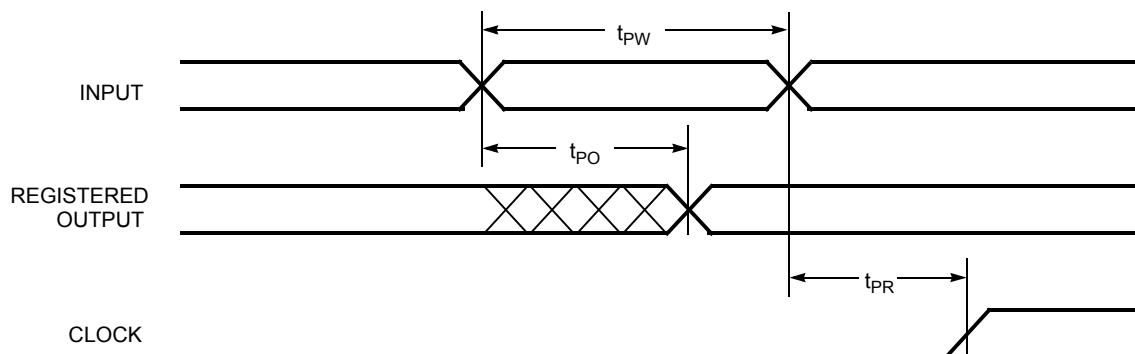
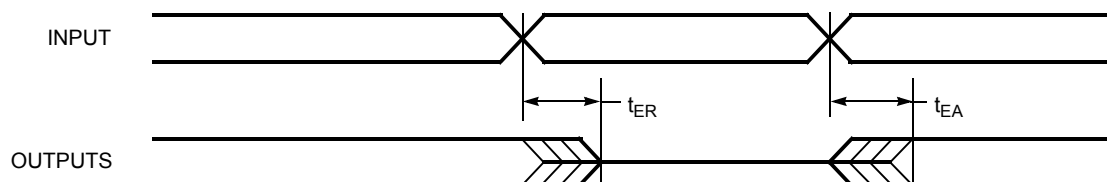
Parameter	Description	Test Conditions	Min.	Max.	Unit
V_{OH}	Output HIGH Voltage	$V_{CC} = \text{Min.}$ $I_{OH} = -4\text{ mA (Com'I)}^{[4]}$ $I_{OH} = -3\text{ mA (Mil)}^{[4]}$	2.4		V
V_{OL}	Output LOW Voltage	$V_{CC} = \text{Min.}$ $I_{OL} = 8\text{ mA (Com'I)}^{[4]}$ $I_{OL} = 6\text{ mA (Mil)}^{[4]}$		0.5	V
V_{IH}	Input HIGH Voltage	Guaranteed Input Logical HIGH Voltage for all Inputs ^[7]	2.0	5.5	V
V_{IL}	Input LOW Voltage	Guaranteed Input Logical LOW Voltage for all Inputs ^[7]	-0.5	0.8	V
I_{IX}	Input Load Current	$V_I = \text{GND OR } V_{CC}$, Bus-Hold Disabled	-10	10	μA
I_{OZ}	Output Leakage Current	$V_O = \text{GND or } V_{CC}$, Output Disabled, Bus-Hold Disabled	-50	50	μA
I_{OS}	Output Short Circuit Current ^[5, 8]	$V_{CC} = \text{Max.}$, $V_{OUT} = 0.5V$	-30	-160	mA
I_{BHL}	Input Bus-Hold LOW Sustaining Current	$V_{CC} = \text{Min.}$, $V_{IL} = 0.8V$	+75		μA
I_{BHH}	Input Bus-Hold HIGH Sustaining Current	$V_{CC} = \text{Min.}$, $V_{IH} = 2.0V$	-75		μA
I_{BHLO}	Input Bus-Hold LOW Overdrive Current	$V_{CC} = \text{Max.}$		+500	μA
I_{BHHO}	Input Bus-Hold HIGH Overdrive Current	$V_{CC} = \text{Max.}$		-500	μA

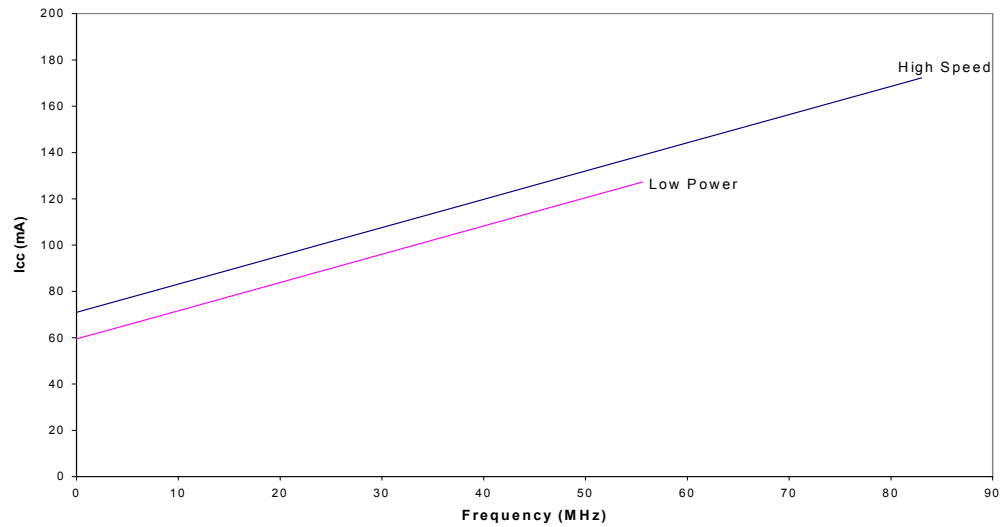
Notes:

9. Dual pins are I/O with JTAG pins.

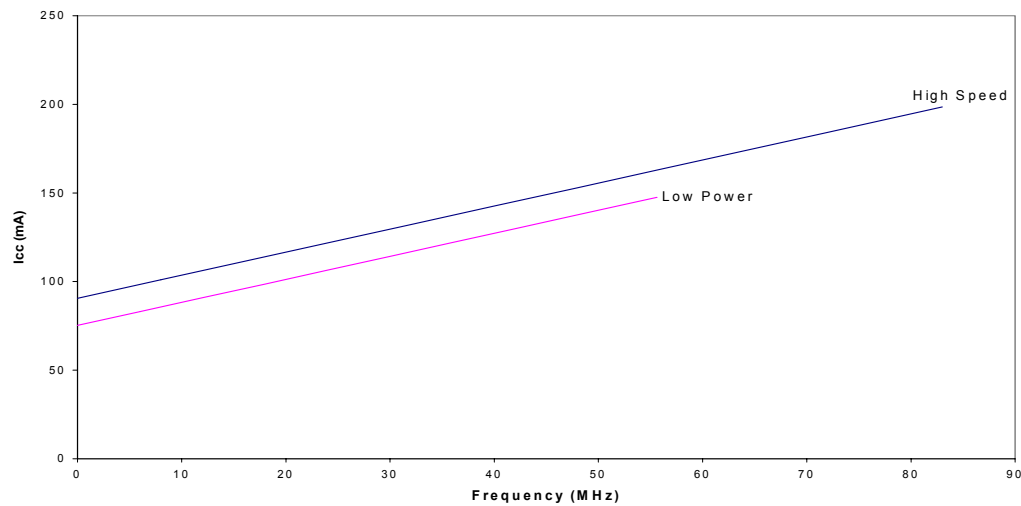
10. For CY37064VP100-143AC, CY37064VP100-143BBC, CY37064VP44-143AC, CY37064VP48-143BAC; Operating Range: V_{CC} is $3.3V \pm 0.16V$.

Switching Waveforms (continued)
Registered Output with Product Term Clocking Input Going Through the Array

Registered Output with Product Term Clocking Input Coming From Adjacent Buried Register

Latched Output


Switching Waveforms (continued)
Latched Input and Output

Asynchronous Reset

Asynchronous Preset

Output Enable/Disable


Typical 3.3V Power Consumption (continued)
CY37384V


The typical pattern is a 16-bit up counter, per logic block, with outputs disabled.
 $V_{CC} = 3.3V$, $T_A = \text{Room Temperature}$

CY37512V


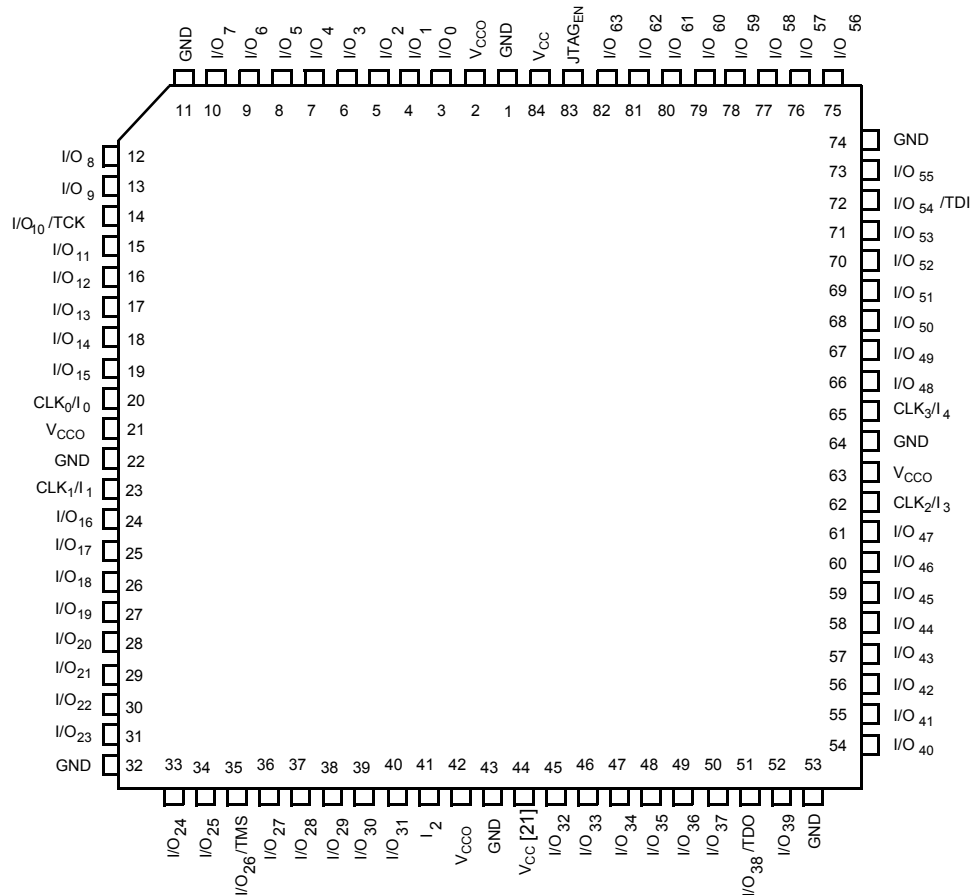
The typical pattern is a 16-bit up counter, per logic block, with outputs disabled.
 $V_{CC} = 3.3V$, $T_A = \text{Room Temperature}$

Pin Configurations^[20] (continued)
48-ball Fine-Pitch BGA (BA50)
Top View

	1	2	3	4	5	6	7	8
A	I/O ₅ TCK	V _{CC}	I/O ₃	I/O ₁	I/O ₃₁	I/O ₃₀	V _{CC}	I/O ₂₇ TDI
B	V _{CC}	I/O ₄	I/O ₂	I/O ₀	I/O ₂₉	I/O ₂₈	I/O ₂₆	CLK ₁ /I ₄
C	CLK ₂ /I ₀	I/O ₇	I/O ₆	GND	GND	I/O ₂₅	I/O ₂₄	I ₃
D	JTAG _{EN}	I/O ₈	I/O ₉	GND	GND	I/O ₂₂	I/O ₂₃	CLK ₃ /I ₂
E	CLK ₀ /I ₁	I/O ₁₂	I/O ₁₁	I/O ₁₀	I/O ₁₆	I/O ₂₀	I/O ₂₁	V _{CC}
F	I/O ₁₃ TMS	V _{CC}	I/O ₁₄	I/O ₁₅	I/O ₁₇	I/O ₁₈	V _{CC}	I/O ₁₉ TDO

Note:

20. For 3.3V versions (Ultra37000V), V_{CCO} = V_{CC}.

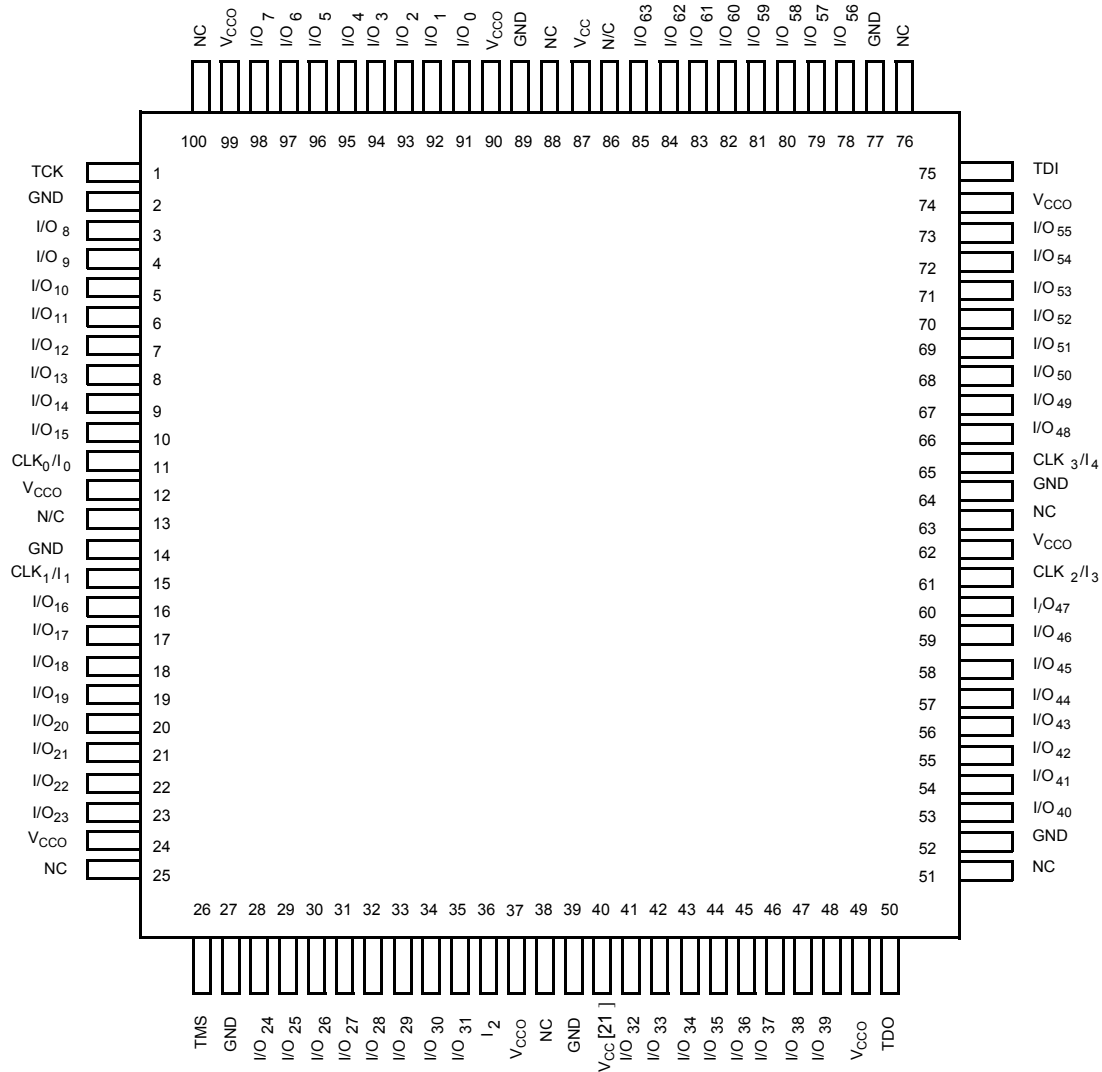
84-lead PLCC (J83) / CLCC (Y84)
Top View

Note:

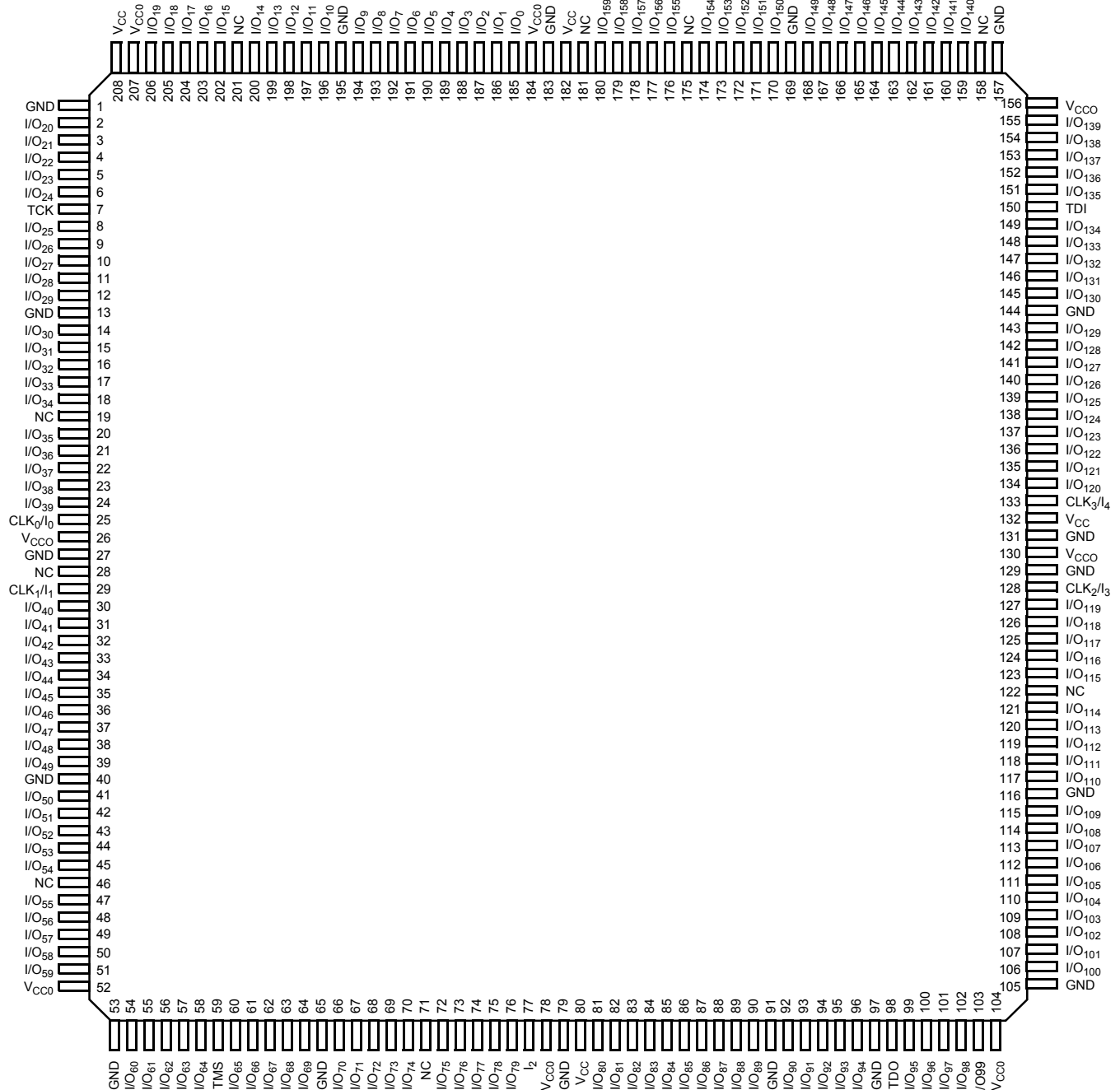
21. This pin is a N/C, but Cypress recommends that you connect it to V_{CC} to ensure future compatibility.

Pin Configurations^[20] (continued)

100-lead TQFP (A100)

Top View

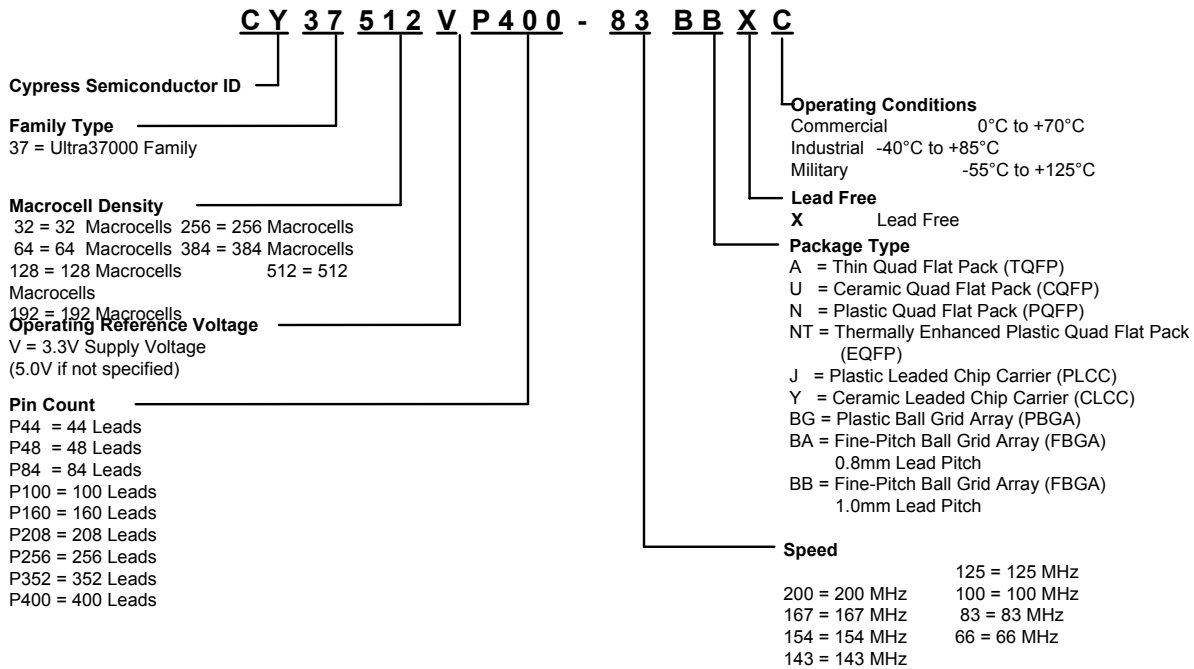


Pin Configurations^[20] (continued)
**208-Lead PQFP (N208) / CQFP (U208)
Top View**


Pin Configurations^[20] (continued)
388-Lead PBGA (BG388)
Top View

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
A	GND	GND	I/O ₁₉	I/O ₁₅	I/O ₁₃	I/O ₃₄	I/O ₃₁	I/O ₂₈	I/O ₂₅	I/O ₁₀	I/O ₇	I/O ₄	I/O ₁	I/O ₂₆₃	I/O ₂₆₀	I/O ₂₅₇	I/O ₂₅₄	I/O ₂₃₉	I/O ₂₃₇	I/O ₂₃₂	I/O ₂₂₉	I/O ₂₅₀	I/O ₂₄₈	I/O ₂₄₄	GND	GND
B	GND	NC	I/O ₁₈	I/O ₁₇	I/O ₁₄	I/O ₃₅	I/O ₃₂	I/O ₂₉	I/O ₂₆	I/O ₁₁	I/O ₈	I/O ₅	I/O ₂	V _{CC}	I/O ₂₆₁	I/O ₂₅₈	I/O ₂₅₅	I/O ₂₅₂	I/O ₂₃₄	I/O ₂₃₁	I/O ₂₂₈	I/O ₂₄₉	I/O ₂₄₆	I/O ₂₄₅	I/O ₂₄₀	GND
C	I/O ₂₃	I/O ₃₈	I/O ₃₇	I/O ₁₆	I/O ₁₂	I/O ₃₃	I/O ₃₀	I/O ₂₇	I/O ₂₄	I/O ₉	I/O ₆	I/O ₃	I/O ₀	I/O ₂₆₂	I/O ₂₅₉	I/O ₂₅₆	I/O ₂₅₃	I/O ₂₃₈	I/O ₂₃₅	I/O ₂₃₃	I/O ₂₃₀	I/O ₂₅₁	I/O ₂₄₇	I/O ₂₂₅	I/O ₂₂₄	I/O ₂₂₇
D	I/O ₃₉	I/O ₄₀	I/O ₃₆	NC	NC	I/O ₂₁	I/O ₂₀	V _{CCO}	V _{CCO}	NC	GND	GND	V _{CCO}	V _{CCO}	GND	GND	NC	V _{CCO}	V _{CCO}	I/O ₂₃₆	I/O ₂₄₃	NC	NC	I/O ₂₂₆	I/O ₂₂₂	I/O ₂₂₃
E	I/O ₄₂	TCK	I/O ₄₁	NC																			NC	TDI	I/O ₂₂₁	I/O ₂₂₀
F	I/O ₄₅	I/O ₄₄	I/O ₄₃	I/O ₂₂																			I/O ₂₄₂	I/O ₂₁₉	I/O ₂₁₈	I/O ₂₁₇
G	I/O ₄₈	I/O ₄₇	I/O ₄₆	I/O ₆₃																			I/O ₂₄₁	I/O ₂₁₆	I/O ₂₁₅	I/O ₂₁₄
H	I/O ₄₉	I/O ₅₀	I/O ₅₁	V _{CCO}																			V _{CCO}	I/O ₂₁₁	I/O ₂₁₂	I/O ₂₁₃
J	I/O ₅₂	I/O ₅₃	I/O ₅₄	V _{CCO}																			V _{CCO}	I/O ₂₀₈	I/O ₂₀₉	I/O ₂₁₀
K	I/O ₅₅	I/O ₅₆	I/O ₅₇	NC																			NC	I/O ₂₀₅	I/O ₂₀₆	I/O ₂₀₇
L	I/O	I/O ₅₉	I/O ₅₈	GND																			GND	I/O ₂₀₄	I/O	I/O ₁₉₇
M	I/O ₆₁	I/O ₆₀	I/O	GND																			GND	I/O	I/O ₂₀₃	I/O ₂₀₂
N	I/O ₆₄	V _{CC}	I/O ₆₂	V _{CCO}																			V _{CCO}	I/O ₂₀₁	I/O ₂₀₀	I/O ₁₉₉
P	I/O ₆₅	I/O ₆₆	I/O ₆₇	V _{CCO}																			V _{CCO}	I/O ₁₉₆	V _{CC}	I/O ₁₉₈
R	I/O ₆₈	I/O ₆₉	I/O ₇₀	GND																			GND	I/O ₁₉₃	I/O ₁₉₄	I/O ₁₉₅
T	I/O ₇₁	I/O ₈₄	I/O ₈₅	GND																			GND	I/O ₁₇₈	I/O ₁₇₉	I/O ₁₉₂
U	I/O ₈₈	I/O ₈₇	I/O ₈₆	NC																			NC	I/O ₁₇₇	I/O ₁₇₆	I/O ₁₇₅
V	I/O ₉₁	I/O ₉₀	I/O ₈₉	V _{CCO}																			V _{CCO}	I/O ₁₇₄	I/O ₁₇₃	I/O ₁₇₂
W	I/O ₉₄	I/O ₉₃	I/O ₉₂	V _{CCO}																			V _{CCO}	I/O ₁₇₁	I/O ₁₇₀	I/O ₁₆₉
Y	I/O ₉₅	I/O ₇₂	I/O ₇₃	I/O ₁₁₀																			I/O ₁₅₃	I/O ₁₉₀	I/O ₁₉₁	I/O ₁₆₈
AA	I/O ₇₄	I/O ₇₅	I/O ₇₆	I/O ₁₁₁																			I/O ₁₅₂	I/O ₁₈₇	I/O ₁₈₈	I/O ₁₈₉
AB	I/O ₇₇	I/O ₇₈	I/O ₇₉	NC																			NC	I/O ₁₈₄	I/O ₁₈₅	I/O ₁₈₆
AC	I/O ₈₁	I/O ₈₀	I/O ₁₀₈	NC	NC	I/O ₁₁₂	I/O ₁₁₃	V _{CCO}	V _{CCO}	NC	GND	GND	V _{CCO}	V _{CCO}	GND	GND	NC	V _{CCO}	V _{CCO}	I/O ₁₅₀	I/O ₁₅₁	NC	NC	I/O ₁₅₅	I/O ₁₈₃	I/O ₁₈₂
AD	I/O ₁₀₉	I/O ₈₂	I/O ₈₃	I/O ₁₁₇	I/O ₉₇	I/O ₁₀₀	I/O ₁₀₂	I/O ₁₀₅	I/O ₁₂₀	I/O ₁₂₃	I/O ₁₂₆	I/O ₁₂₉	I/O	I/O ₁₃₃	I/O ₁₃₆	I/O ₁₃₉	I/O ₁₄₂	I/O ₁₅₇	I/O ₁₅₉	I/O ₁₆₁	I/O ₁₆₃	I/O ₁₆₆	I/O ₁₄₆	I/O ₁₈₀	I/O ₁₈₁	I/O ₁₅₄
AE	GND	NC	I/O ₁₁₅	I/O ₁₁₆	I/O ₁₁₉	I/O ₉₈	I/O ₁₀₁	I/O ₁₀₃	I/O ₁₀₆	I/O ₁₂₁	I/O ₁₂₄	I/O ₁₂₇	V _{CC}	I/O ₁₃₀	I/O ₁₃₄	I/O ₁₃₇	I/O ₁₄₀	I/O ₁₄₃	I/O ₁₆₀	I/O ₁₆₂	I/O ₁₆₅	I/O ₁₄₄	I/O ₁₄₇	I/O ₁₄₈	NC	GND
AF	GND	GND	I/O ₁₁₄	I/O ₁₁₈	I/O ₉₆	I/O ₉₉	TMS	I/O ₁₀₄	I/O ₁₀₇	I/O ₁₂₂	I/O ₁₂₅	I/O ₁₂₈	I/O ₁₃₁	I/O ₁₃₂	I/O ₁₃₅	I/O ₁₃₈	I/O ₁₄₁	I/O ₁₅₆	I/O ₁₅₈	TDO	I/O ₁₆₄	I/O ₁₆₇	I/O ₁₄₅	I/O ₁₄₉	GND	GND

Ordering Information



5.0V Ordering Information

Macrocells	Speed (MHz)	Ordering Code	Package Name	Package Type	Operating Range
32	200	CY37032P44-200AC	A44	44-Lead Thin Quad Flat Pack	Commercial
		CY37032P44-200AXC	A44	44-Lead Lead Free Thin Quad Flat Pack	
		CY37032P44-200JC	J67	44-Lead Plastic Leaded Chip Carrier	
		CY37032P44-200JXC	J67	44-Lead Lead Free Plastic Leaded Chip Carrier	
	154	CY37032P44-154AC	A44	44-Lead Thin Quad Flat Pack	Commercial
		CY37032P44-154JC	J67	44-Lead Plastic Leaded Chip Carrier	
		CY37032P44-154AI	A44	44-Lead Thin Quad Flat Pack	Industrial
		CY37032P44-154AXI	A44	44-Lead Lead Free Thin Quad Flat Pack	
		CY37032P44-154JI	J67	44-Lead Plastic Leaded Chip Carrier	
		CY37032P44-154JXI	J67	44-Lead Lead Free Plastic Leaded Chip Carrier	
	125	CY37032P44-125AC	A44	44-Lead Thin Quad Flat Pack	Commercial
		CY37032P44-125AXC	A44	44-Lead Lead Free Thin Quad Flat Pack	
		CY37032P44-125JC	J67	44-Lead Plastic Leaded Chip Carrier	
		CY37032P44-125JXC	J67	44-Lead Lead Free Plastic Leaded Chip Carrier	
		CY37032P44-125AI	A44	44-Lead Thin Quad Flat Pack	Industrial
		CY37032P44-125JI	J67	44-Lead Plastic Leaded Chip Carrier	
64	200	CY37064P44-200AC	A44	44-Lead Thin Quad Flat Pack	Commercial
		CY37064P44-200AXC	A44	44-Lead Lead Free Thin Quad Flat Pack	
		CY37064P44-200JC	J67	44-Lead Plastic Leaded Chip Carrier	
		CY37064P44-200JXC	J67	44-Lead Lead Free Plastic Leaded Chip Carrier	
		CY37064P84-200JC	J83	84-Lead Plastic Leaded Chip Carrier	
		CY37064P100-200AC	A100	100-Lead Thin Quad Flat Pack	
		CY37064P100-200AXC	A100	100-Lead Lead Free Thin Quad Flat Pack	

5.0V Ordering Information (continued)

Macrocells	Speed (MHz)	Ordering Code	Package Name	Package Type	Operating Range
64	154	CY37064P44-154AC	A44	44-Lead Thin Quad Flat Pack	Commercial
		CY37064P44-154JC	J67	44-Lead Plastic Leaded Chip Carrier	
		CY37064P84-154JC	J83	84-Lead Plastic Leaded Chip Carrier	
		CY37064P100-154AC	A100	100-Lead Thin Quad Flat Pack	
		CY37064P44-154AI	A44	44-Lead Thin Quad Flat Pack	Industrial
		CY37064P44-154AXI	A44	44-Lead Lead Free Thin Quad Flat Pack	
		CY37064P44-154JI	J67	44-Lead Plastic Leaded Chip Carrier	
		CY37064P44-154JXI	J67	44-Lead Lead Free Plastic Leaded Chip Carrier	
		CY37064P84-154JI	J83	84-Lead Plastic Leaded Chip Carrier	
		CY37064P100-154AI	A100	100-Lead Thin Quad Flat Pack	
		5962-9951902QYA	Y67	44-Lead Ceramic Leadless Chip Carrier	Military
	125	CY37064P44-125AC	A44	44-Lead Thin Quad Flat Pack	Commercial
		CY37064P44-125AXC	A44	44-Lead Lead Free Thin Quad Flat Pack	
		CY37064P44-125JC	J67	44-Lead Plastic Leaded Chip Carrier	
		CY37064P44-125JXC	J67	44-Lead Lead Free Plastic Leaded Chip Carrier	
		CY37064P84-125JC	J83	84-Lead Plastic Leaded Chip Carrier	
		CY37064P100-125AC	A100	100-Lead Thin Quad Flat Pack	
		CY37064P100-125AXC	A100	100-Lead Lead Free Thin Quad Flat Pack	
		CY37064P44-125AI	A44	44-Lead Thin Quad Flat Pack	Industrial
		CY37064P44-125AXI	A44	44-Lead Lead Free Thin Quad Flat Pack	
		CY37064P44-125JI	J67	44-Lead Plastic Leaded Chip Carrier	
		CY37064P84-125JI	J83	84-Lead Plastic Leaded Chip Carrier	
		CY37064P100-125AI	A100	100-Lead Thin Quad Flat Pack	
		CY37064P100-125AXI	A100	100-Lead Lead Free Thin Quad Flat Pack	
		5962-9951901QYA	Y67	44-Lead Ceramic Leadless Chip Carrier	Military

5.0V Ordering Information (continued)

Macrocells	Speed (MHz)	Ordering Code	Package Name	Package Type	Operating Range
128	167	CY37128P84-167JC	J83	84-Lead Plastic Leaded Chip Carrier	Commercial
		CY37128P84-167JXC	J83	84-Lead Lead Free Plastic Leaded Chip Carrier	
		CY37128P100-167AC	A100	100-Lead Thin Quad Flat Pack	
		CY37128P100-167AXC	A100	100-Lead Lead Free Thin Quad Flat Pack	
		CY37128P160-167AC	A160	160-Lead Thin Quad Flat Pack	
		CY37128P160-167AXC	A160	160-Lead Lead Free Thin Quad Flat Pack	
	125	CY37128P84-125JC	J83	84-Lead Plastic Leaded Chip Carrier	Commercial
		CY37128P84-125JXC	J83	84-Lead Lead Free Plastic Leaded Chip Carrier	
		CY37128P100-125AC	A100	100-Lead Thin Quad Flat Pack	
		CY37128P100-125AXC	A100	100-Lead Lead Free Thin Quad Flat Pack	
		CY37128P160-125AC	A160	160-Lead Thin Quad Flat Pack	
		CY37128P160-125AXC	A160	160-Lead Lead Free Thin Quad Flat Pack	
		CY37128P84-125JI	J83	84-Lead Plastic Leaded Chip Carrier	Industrial
		CY37128P84-125JXI	J83	84-Lead Lead Free Plastic Leaded Chip Carrier	
		CY37128P100-125AI	A100	100-Lead Thin Quad Flat Pack	
		CY37128P100-125AXI	A100	100-Lead Lead Free Thin Quad Flat Pack	
		CY37128P160-125AI	A160	160-Lead Thin Quad Flat Pack	
		CY37128P160-125AXI	A160	160-Lead Lead Free Thin Quad Flat Pack	
		5962-9952102QYA	Y84	84-Lead Ceramic Leaded Chip Carrier	Military
	100	CY37128P84-100JC	J83	84-Lead Plastic Leaded Chip Carrier	Commercial
		CY37128P84-100JXC	J83	84-Lead Lead Free Plastic Leaded Chip Carrier	
		CY37128P100-100AC	A100	100-Lead Thin Quad Flat Pack	
		CY37128P100-100AXC	A100	100-Lead Lead Free Thin Quad Flat Pack	
		CY37128P160-100AC	A160	160-Lead Thin Quad Flat Pack	
		CY37128P160-100AXC	A160	160-Lead Lead Free Thin Quad Flat Pack	
		CY37128P84-100JI	J83	84-Lead Plastic Leaded Chip Carrier	Industrial
		CY37128P100-100AI	A100	100-Lead Thin Quad Flat Pack	
		CY37128P100-100AXI	A100	100-Lead Lead Free Thin Quad Flat Pack	
		CY37128P160-100AI	A160	160-Lead Thin Quad Flat Pack	
		5962-9952101QYA	Y84	84-Lead Ceramic Leaded Chip Carrier	Military
192	154	CY37192P160-154AC	A160	160-Lead Thin Quad Flat Pack	Commercial
		CY37192P160-154AXC	A160	160-Lead Lead Free Thin Quad Flat Pack	
	125	CY37192P160-125AC	A160	160-Lead Thin Quad Flat Pack	Commercial
		CY37192P160-125AXC	A160	160-Lead Lead Free Thin Quad Flat Pack	
		CY37192P160-125AI	A160	160-Lead Thin Quad Flat Pack	Industrial
		CY37192P160-125AXI	A160	160-Lead Lead Free Thin Quad Flat Pack	
	83	CY37192P160-83AC	A160	160-Lead Thin Quad Flat Pack	Commercial
		CY37192P160-83AXC	A160	160-Lead Lead Free Thin Quad Flat Pack	
		CY37192P160-83AI	A160	160-Lead Thin Quad Flat Pack	Industrial
		CY37192P160-83AXI	A160	160-Lead Lead Free Thin Quad Flat Pack	

5.0V Ordering Information (continued)

Macrocells	Speed (MHz)	Ordering Code	Package Name	Package Type	Operating Range
256	154	CY37256P160-154AC	A160	160-Lead Thin Quad Flat Pack	Commercial
		CY37256P160-154AXC	A160	160-Lead Lead Free Thin Quad Flat Pack	
		CY37256P208-154NC	N208	208-Lead Plastic Quad Flat Pack	
		CY37256P256-154BGC	BG292	292-Ball Plastic Ball Grid Array	
	125	CY37256P160-125AC	A160	160-Lead Thin Quad Flat Pack	Commercial
		CY37256P160-125AXC	A160	160-Lead Lead Free Thin Quad Flat Pack	
		CY37256P208-125NC	N208	208-Lead Plastic Quad Flat Pack	
		CY37256P256-125BGC	BG292	292-Ball Plastic Ball Grid Array	
		CY37256P160-125AI	A160	160-Lead Thin Quad Flat Pack	Industrial
		CY37256P160-125AXI	A160	160-Lead Lead Free Thin Quad Flat Pack	
		CY37256P208-125NI	N208	208-Lead Plastic Quad Flat Pack	
		CY37256P256-125BGI	BG292	292-Ball Plastic Ball Grid Array	
		5962-9952302QZC	U162	160-Lead Ceramic Quad Flat Pack	Military
	83	CY37256P160-83AC	A160	160-Lead Thin Quad Flat Pack	Commercial
		CY37256P160-83AXC	A160	160-Lead Lead Free Thin Quad Flat Pack	
		CY37256P208-83NC	N208	208-Lead Plastic Quad Flat Pack	
		CY37256P256-83BGC	BG292	292-Ball Plastic Ball Grid Array	
		CY37256P160-83AI	A160	160-Lead Thin Quad Flat Pack	Industrial
		CY37256P160-83AXI	A160	160-Lead Lead Free Thin Quad Flat Pack	
		CY37256P208-83NI	N208	208-Lead Plastic Quad Flat Pack	
		CY37256P256-83BGI	BG292	292-Ball Plastic Ball Grid Array	
		5962-9952301QZC	U162	160-Lead Ceramic Quad Flat Pack	Military
384	125	CY37384P208-125NC	N208	208-Lead Plastic Quad Flat Pack	Commercial
		CY37384P256-125BGC	BG292	292-Ball Plastic Ball Grid Array	
	83	CY37384P208-83NC	N208	208-Lead Plastic Quad Flat Pack	Commercial
		CY37384P256-83BGC	BG292	292-Ball Plastic Ball Grid Array	
		CY37384P208-83NI	N208	208-Lead Plastic Quad Flat Pack	Industrial
		CY37384P256-83BGI	BG292	292-Ball Plastic Ball Grid Array	

5.0V Ordering Information (continued)

Macrocells	Speed (MHz)	Ordering Code	Package Name	Package Type	Operating Range
512	125	CY37512P208-125NC	N208	208-Lead Plastic Quad Flat Pack	Commercial
		CY37512P256-125BGC	BG292	292-Ball Plastic Ball Grid Array	
		CY37512P352-125BGC	BG388	388-Ball Plastic Ball Grid Array	
	100	CY37512P208-100NC	N208	208-Lead Plastic Quad Flat Pack	Commercial
		CY37512P256-100BGC	BG292	292-Ball Plastic Ball Grid Array	
		CY37512P352-100BGC	BG388	388-Ball Plastic Ball Grid Array	
		CY37512P208-100NI	N208	208-Lead Plastic Quad Flat Pack	Industrial
		CY37512P256-100BGI	BG292	292-Ball Plastic Ball Grid Array	
		CY37512P352-100BGI	BG388	388-Ball Plastic Ball Grid Array	
		5962-9952502QZC	U208	208-Lead Ceramic Quad Flat Pack	Military
	83	CY37512P208-83NC	N208	208-Lead Plastic Quad Flat Pack	Commercial
		CY37512P256-83BGC	BG292	292-Ball Plastic Ball Grid Array	
		CY37512P352-83BGC	BG388	388-Ball Plastic Ball Grid Array	
		CY37512P208-83NI	N208	208-Lead Plastic Quad Flat Pack	Industrial
		CY37512P256-83BGI	BG292	292-Ball Plastic Ball Grid Array	
		CY37512P352-83BGI	BG388	388-Ball Plastic Ball Grid Array	
		5962-9952501QZC	U208	208-Lead Ceramic Quad Flat Pack	Military

3.3V Ordering Information

Macrocells	Speed (MHz)	Ordering Code	Package Name	Package Type	Operating Range
32	143	CY37032VP44-143AC	A44	44-Lead Thin Quad Flat Pack	Commercial
		CY37032VP44-143AXC	A44	44-Lead Lead Free Thin Quad Flat Pack	
		CY37032VP48-143BAC	BA50	48-Ball Fine Pitch Ball Grid Array	
	100	CY37032VP44-100AC	A44	44-Lead Thin Quad Flat Pack	Commercial
		CY37032VP44-100AXC	A44	44-Lead Lead Free Thin Quad Flat Pack	
		CY37032VP48-100BAC	BA50	48-Ball Fine Pitch Ball Grid Array	
		CY37032VP44-100AI	A44	44-Lead Thin Quad Flat Pack	Industrial
		CY37032VP44-100AXI	A44	44-Lead Lead Free Thin Quad Flat Pack	
		CY37032VP48-100BAI	BA50	48-Ball Fine Pitch Ball Grid Array	
		CY37032VP44-100JI	J67	44-Lead Plastic Leaded Chip Carrier	
		CY37032VP44-100JXI	J67	44-Lead Lead Free Plastic Leaded Chip Carrier	

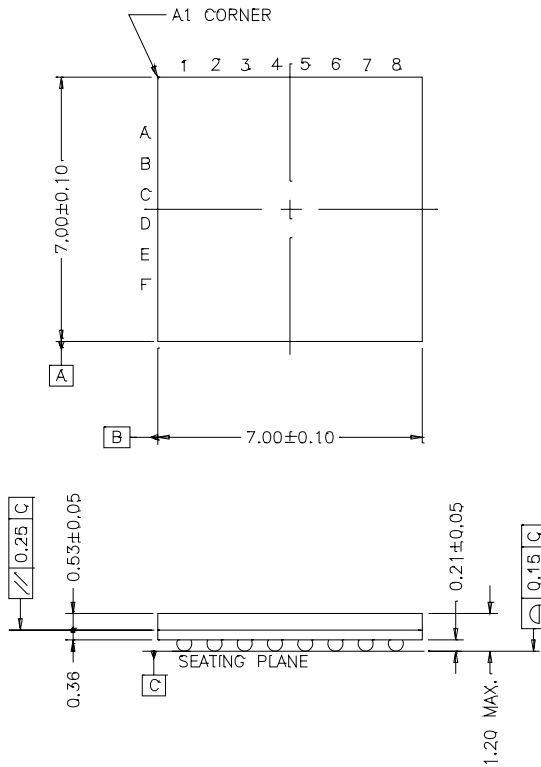
3.3V Ordering Information (continued)

Macrocells	Speed (MHz)	Ordering Code	Package Name	Package Type	Operating Range
64	143	CY37064VP44-143AC	A44	44-Lead Thin Quad Flatpack	Commercial
		CY37064VP44-143AXC	A44	44-Lead Lead Free Thin Quad Flatpack	
		CY37064VP48-143BAC	BA50	48-Ball Fine-Pitch Ball Grid Array	
		CY37064VP100-143AC	A100	100-Lead Thin Quad Flatpack	
		CY37064VP100-143AXC	A100	100-Lead Lead Free Thin Quad Flatpack	
		CY37064VP100-143BBC	BB100	100-Ball Fine-Pitch Ball Grid Array	
	100	CY37064VP44-100AC	A44	44-Lead Thin Quad Flatpack	Commercial
		CY37064VP44-100AXC	A44	44-Lead Lead Free Thin Quad Flatpack	
		CY37064VP48-100BAC	BA50	48-Ball Fine-Pitch Ball Grid Array	
		CY37064VP100-100AC	A100	100-Lead Thin Quad Flatpack	
		CY37064VP100-100AXC	A100	100-Lead Lead Free Thin Quad Flatpack	
		CY37064VP100-100BBC	BB100	100-Ball Fine-Pitch Ball Grid Array	
		CY37064VP44-100AI	A44	44-Lead Thin Quad Flatpack	Industrial
		CY37064VP44-100AXI	A44	44-Lead Lead Free Thin Quad Flatpack	
		CY37064VP48-100BAI	BA50	48-Ball Fine-Pitch Ball Grid Array	
		CY37064VP100-100BBI	BB100	100-Ball Fine-Pitch Ball Grid Array	
		CY37064VP100-100AI	A100	100-Lead Thin Quad Flatpack	
		CY37064VP100-100AXI	A100	100-Lead Lead Free Thin Quad Flatpack	
		5962-9952001QYA	Y67	44-Lead Ceramic Leaded Chip Carrier	Military
128	125	CY37128VP100-125AC	A100	100-Lead Thin Quad Flat Pack	Commercial
		CY37128VP100-125AXC	A100	100-Lead Lead Free Thin Quad Flat Pack	
		CY37128VP100-125BBC	BB100	100-Ball Fine-Pitch Ball Grid Array	
		CY37128VP160-125AC	A160	160-Lead Thin Quad Flat Pack	Industrial
		CY37128VP160-125AXC	A160	160-Lead Lead Free Thin Quad Flat Pack	
		CY37128VP160-125AI	A160	160-Lead Thin Quad Flat Pack	
		CY37128VP160-125AXI	A160	160-Lead Lead Free Thin Quad Flat Pack	
	83	CY37128VP100-83AC	A100	100-Lead Thin Quad Flat Pack	Commercial
		CY37128VP100-83AXC	A100	100-Lead Lead Free Thin Quad Flat Pack	
		CY37128VP100-83BBC	BB100	100-Ball Fine-Pitch Ball Grid Array	
		CY37128VP160-83AC	A160	160-Lead Thin Quad Flat Pack	Industrial
		CY37128VP160-83AXC	A160	160-Lead Lead Free Thin Quad Flat Pack	
		CY37128VP100-83AI	A100	100-Lead Thin Quad Flat Pack	
		CY37128VP100-83AXI	A100	100-Lead Lead Free Thin Quad Flat Pack	
		CY37128VP100-83BBI	BB100	100-Ball Fine-Pitch Ball Grid Array	
		CY37128VP160-83AI	A160	160-Lead Thin Quad Flat Pack	
		CY37128VP160-83AXI	A160	160-Lead Lead Free Thin Quad Flat Pack	
		5962-9952201QYA	Y84	84-Lead Ceramic Leaded Chip Carrier	Military
192	100	CY37192VP160-100AC	A160	160-Lead Thin Quad Flat Pack	Commercial
		CY37192VP160-100AXC	A160	160-Lead Lead Free Thin Quad Flat Pack	
	66	CY37192VP160-66AC	A160	160-Lead Thin Quad Flat Pack	Commercial
		CY37192VP160-66AXC	A160	160-Lead Lead Free Thin Quad Flat Pack	
		CY37192VP160-66AI	A160	160-Lead Thin Quad Flat Pack	Industrial

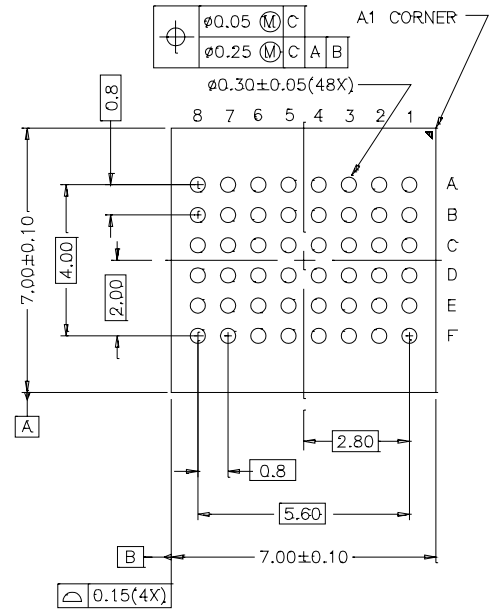
Package Diagrams (continued)

48-Ball (7.0 mm x 7.0 mm x 1.2 mm, 0.80 pitch) Thin BGA BA48D

TOP VIEW



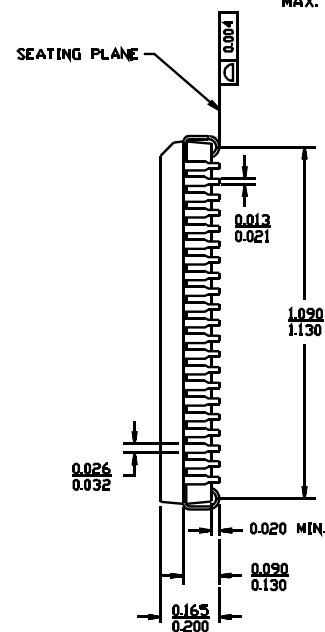
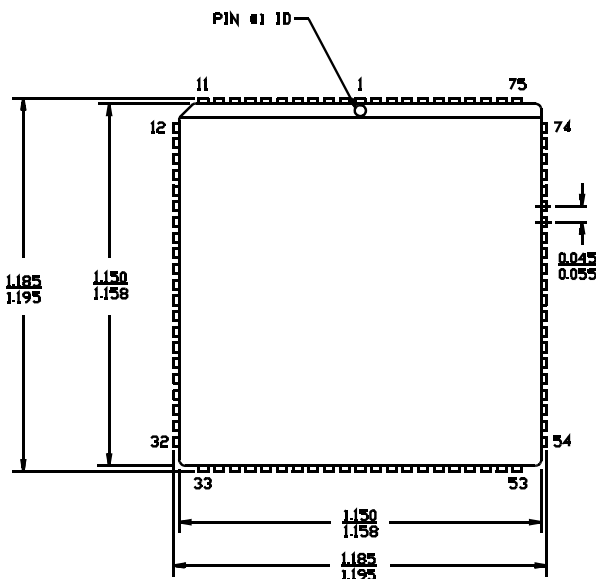
BOTTOM VIEW



51-85109-*C

84-Lead Lead (Pb)-Free Plastic Leaded Chip Carrier J83

DIMENSIONS IN INCHES MIN. MAX.



51-85006-*A

Package Diagrams (continued)

100-Lead Lead (Pb)-Free Thin Plastic Quad Flat Pack (TQFP) A100

