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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	15 ns
Voltage Supply - Internal	3V ~ 3.6V
Number of Logic Elements/Blocks	-
Number of Macrocells	128
Number of Gates	-
Number of I/O	133
Operating Temperature	0°C ~ 70°C (TA)
Mounting Type	Surface Mount
Package / Case	160-LQFP
Supplier Device Package	160-TQFP (24x24)
Purchase URL	https://www.e-xfl.com/product-detail/infineon-technologies/cy37128vp160-83axc

Selection Guide

5.0V Selection Guide

General Information

Device	Macrocells	Dedicated Inputs	I/O Pins	Speed (t_{PD})	Speed (f_{MAX})
CY37032	32	5	32	6	200
CY37064	64	5	32/64	6	200
CY37128	128	5	64/128	6.5	167
CY37192	192	5	120	7.5	154
CY37256	256	5	128/160/192	7.5	154
CY37384	384	5	160/192	10	118
CY37512	512	5	160/192/264	10	118

Speed Bins

Device	200	167	154	143	125	100	83	66
CY37032	X		X		X			
CY37064	X		X		X			
CY37128		X			X	X		
CY37192			X		X		X	
CY37256			X		X		X	
CY37384					X		X	
CY37512					X	X	X	

Device-Package Offering and I/O Count

Device	44-Lead TQFP	44-Lead PLCC	44-Lead CLCC	84-Lead PLCC	84-Lead CLCC	100-Lead TQFP	160-Lead TQFP	160-Lead CQFP	208-Lead PQFP	208-Lead CQFP	292-Lead PBGA	388-Lead PBGA
CY37032	37	37										
CY37064	37	37	37	69		69						
CY37128				69	69	69	133					
CY37192							125					
CY37256							133	133	165		197	
CY37384									165		197	
CY37512									165	165	197	269

3.3V Selection Guide

General Information

Device	Macrocells	Dedicated Inputs	I/O Pins	Speed (t_{PD})	Speed (f_{MAX})
CY37032V	32	5	32	8.5	143
CY37064V	64	5	32/64	8.5	143
CY37128V	128	5	64/80/128	10	125
CY37192V	192	5	120	12	100
CY37256V	256	5	128/160/192	12	100
CY37384V	384	5	160/192	15	83
CY37512V	512	5	160/192/264	15	83

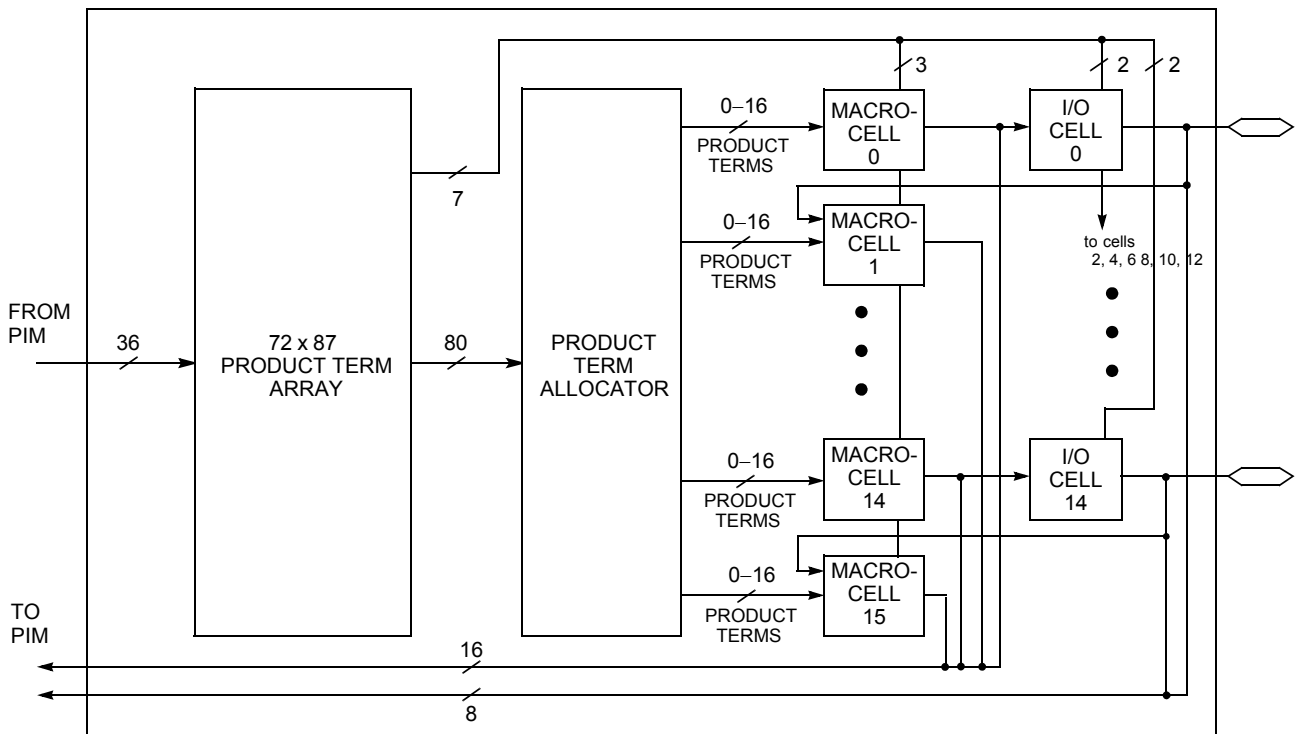


Figure 1. Logic Block with 50% Buried Macrocells

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.



Ultra37000 CPLD Family

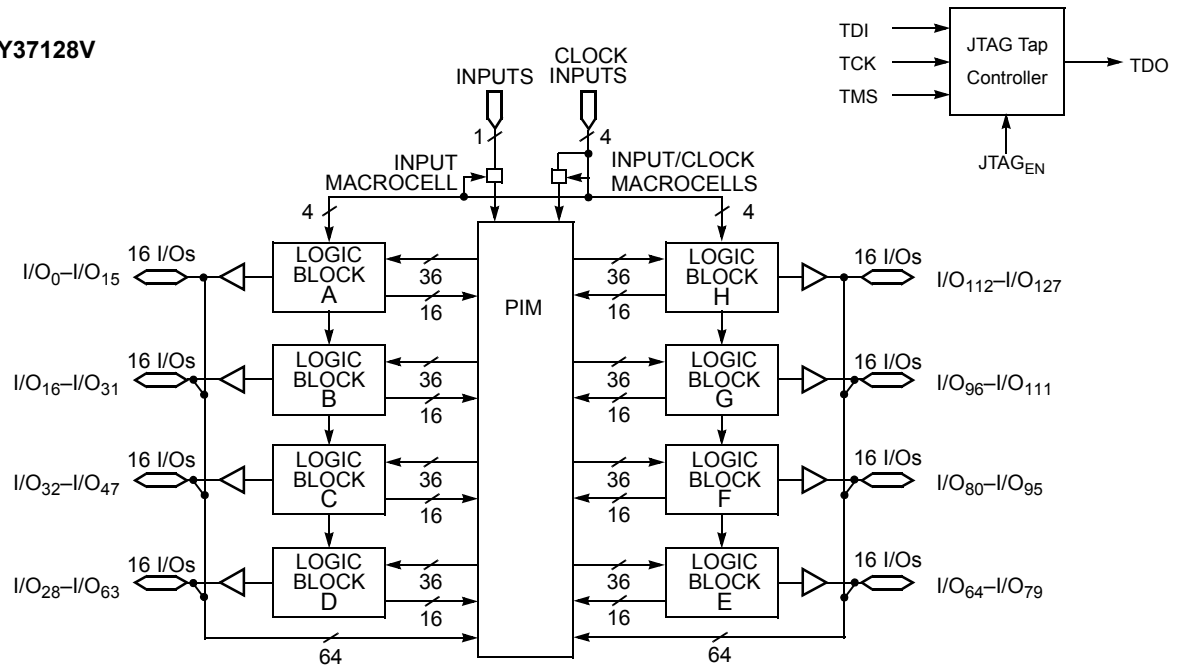
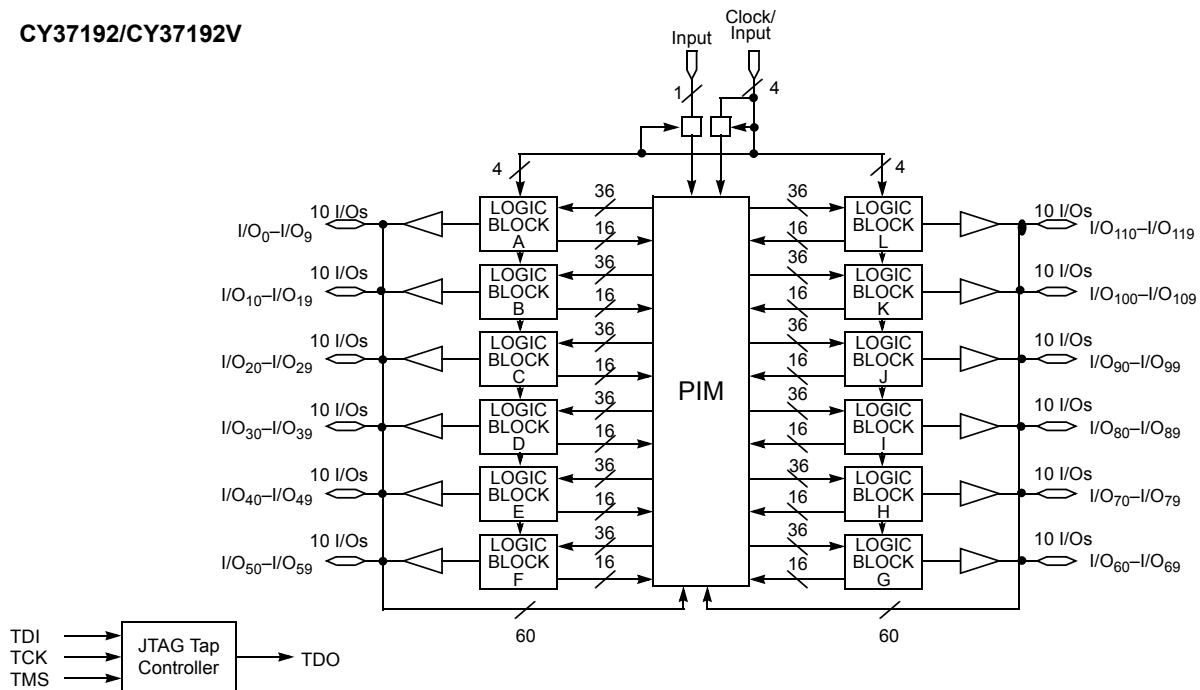
The third programming option for Ultra37000 devices is to utilize the embedded controller or processor that already exists in the system. The Ultra37000 ISR software assists in this method by converting the device JEDEC maps into the ISR serial stream that contains the ISR instruction information and 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).

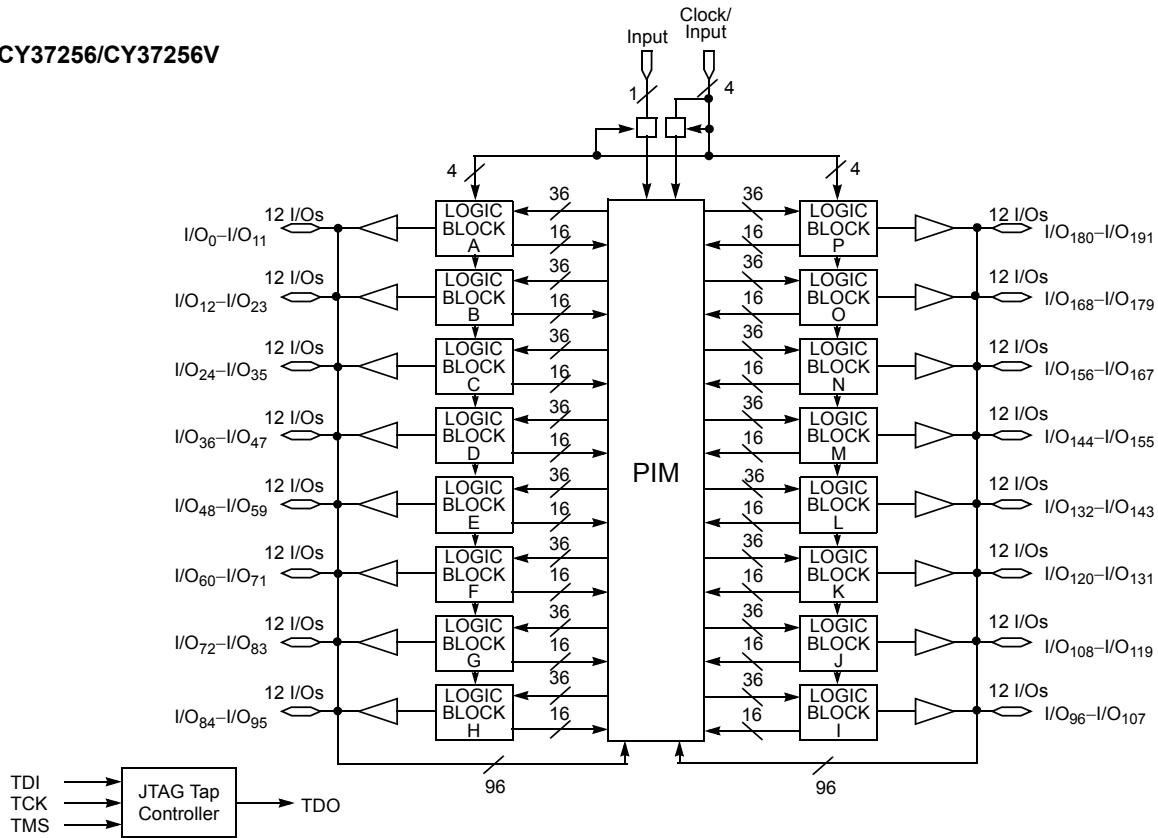
Third-Party Programmers

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


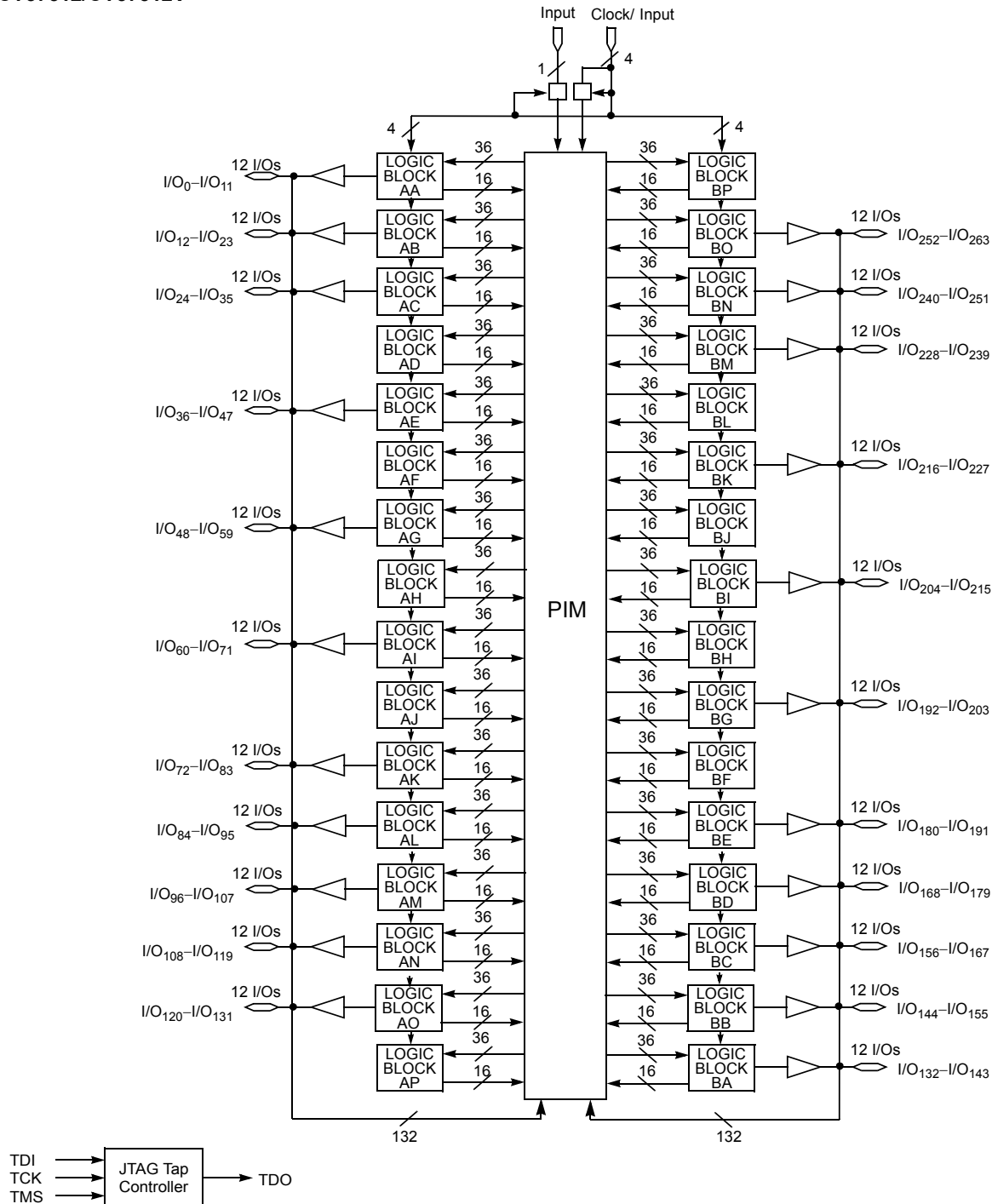
Logic Block Diagrams (continued)

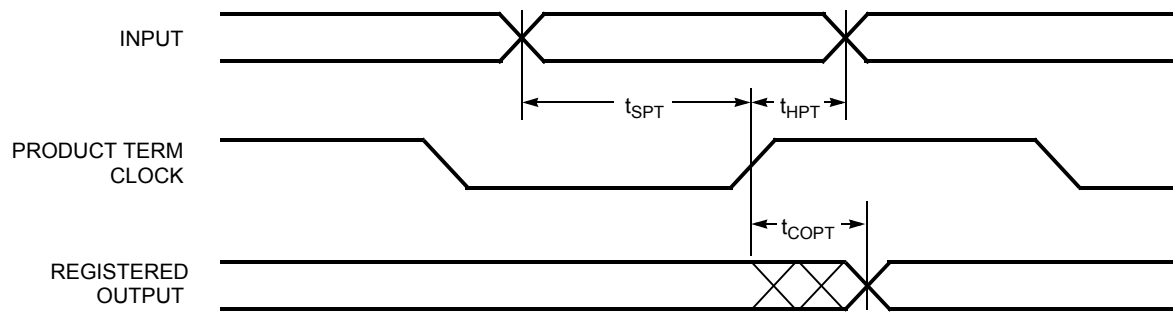
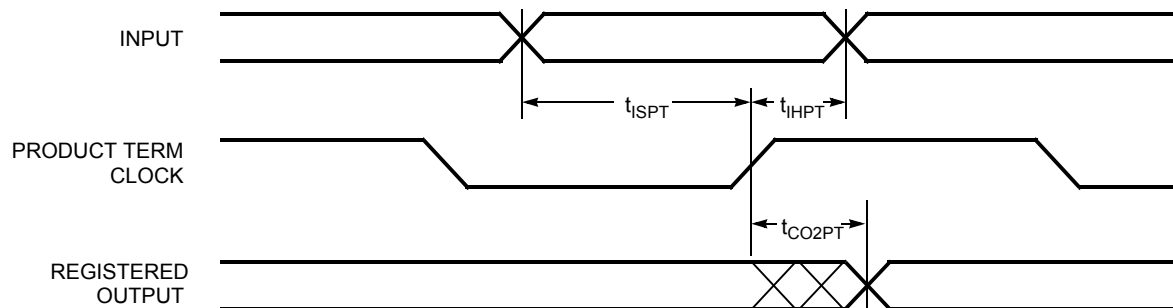
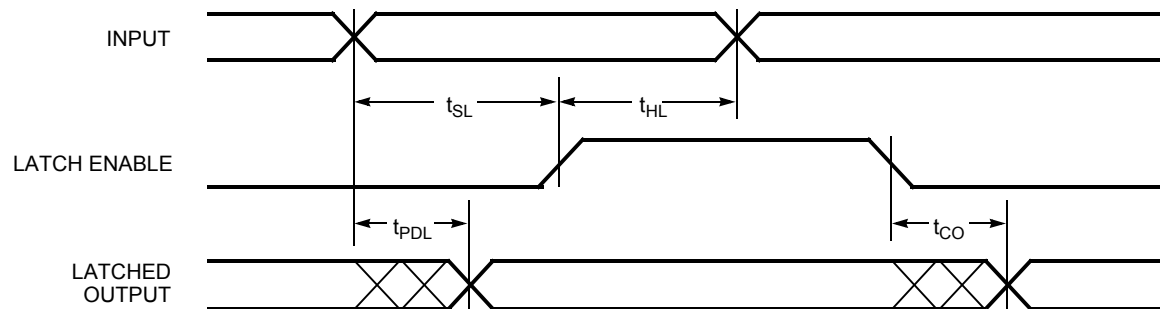
CY37256/CY37256V

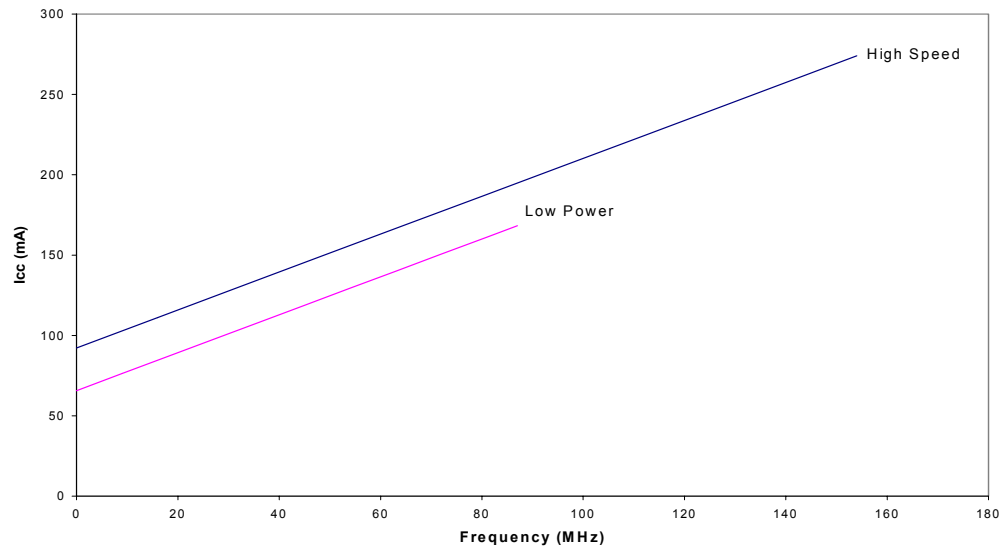


Logic Block Diagrams (continued)

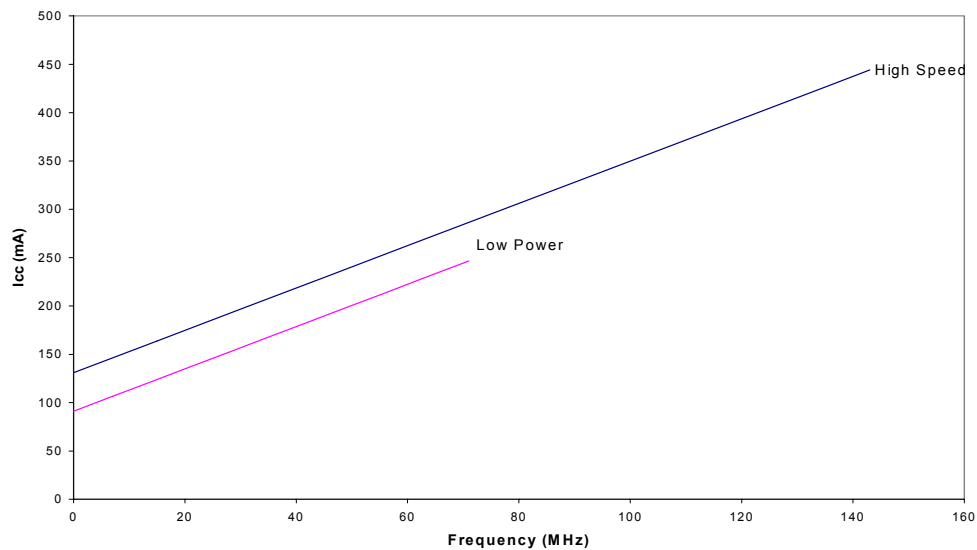
CY37512/CY37512V



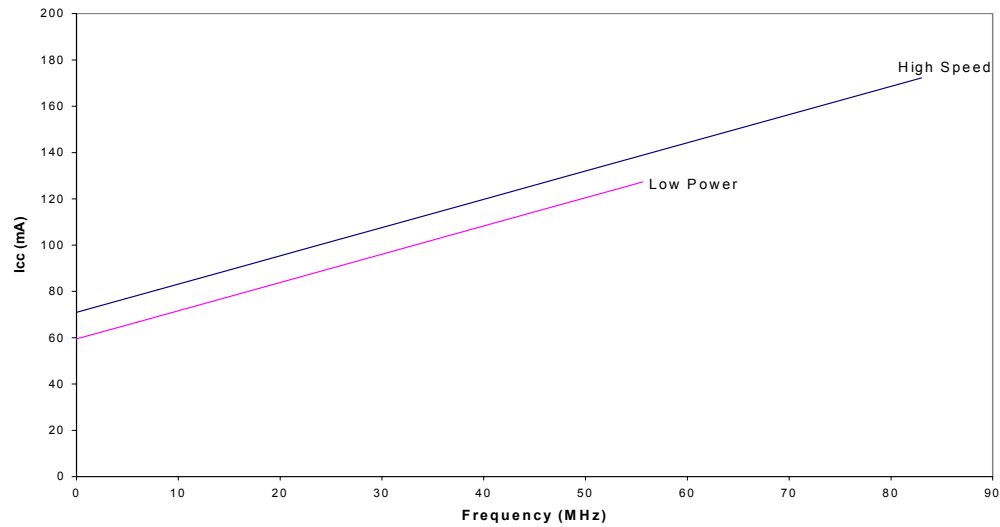
Switching Waveforms (continued)
Registered Output with Product Term Clocking Input Going Through the Array

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

Latched Output


Typical 5.0V Power Consumption (continued)
CY37256


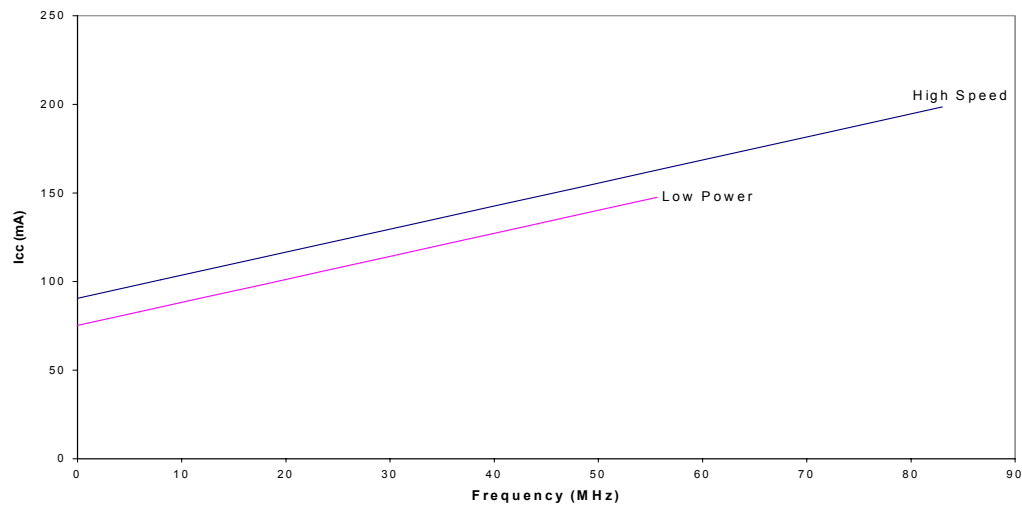
The typical pattern is a 16-bit up counter, per logic block, with outputs disabled.
 $V_{CC} = 5.0V$, $T_A = \text{Room Temperature}$

CY37384


The typical pattern is a 16-bit up counter, per logic block, with outputs disabled.
 $V_{CC} = 5.0V$, $T_A = \text{Room Temperature}$

Typical 3.3V Power Consumption (continued)
CY37384V


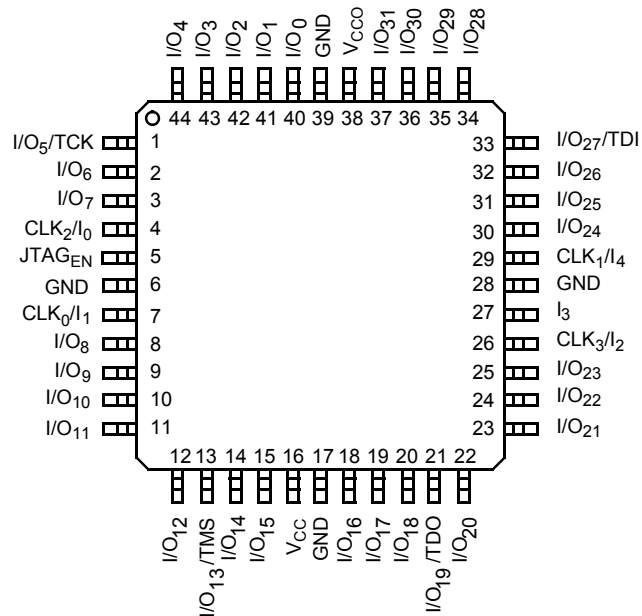
The typical pattern is a 16-bit up counter, per logic block, with outputs disabled.
 $V_{CC} = 3.3V$, $T_A = \text{Room Temperature}$

CY37512V


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

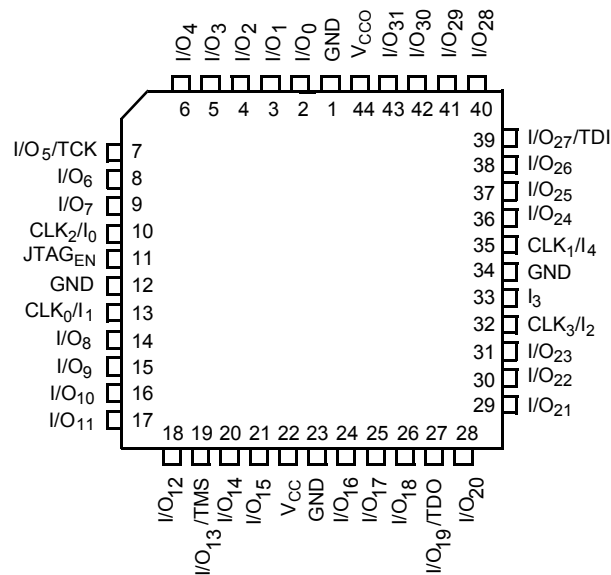
44-pin TQFP (A44)

Top View



44-pin PLCC (J67) / CLCC (Y67)

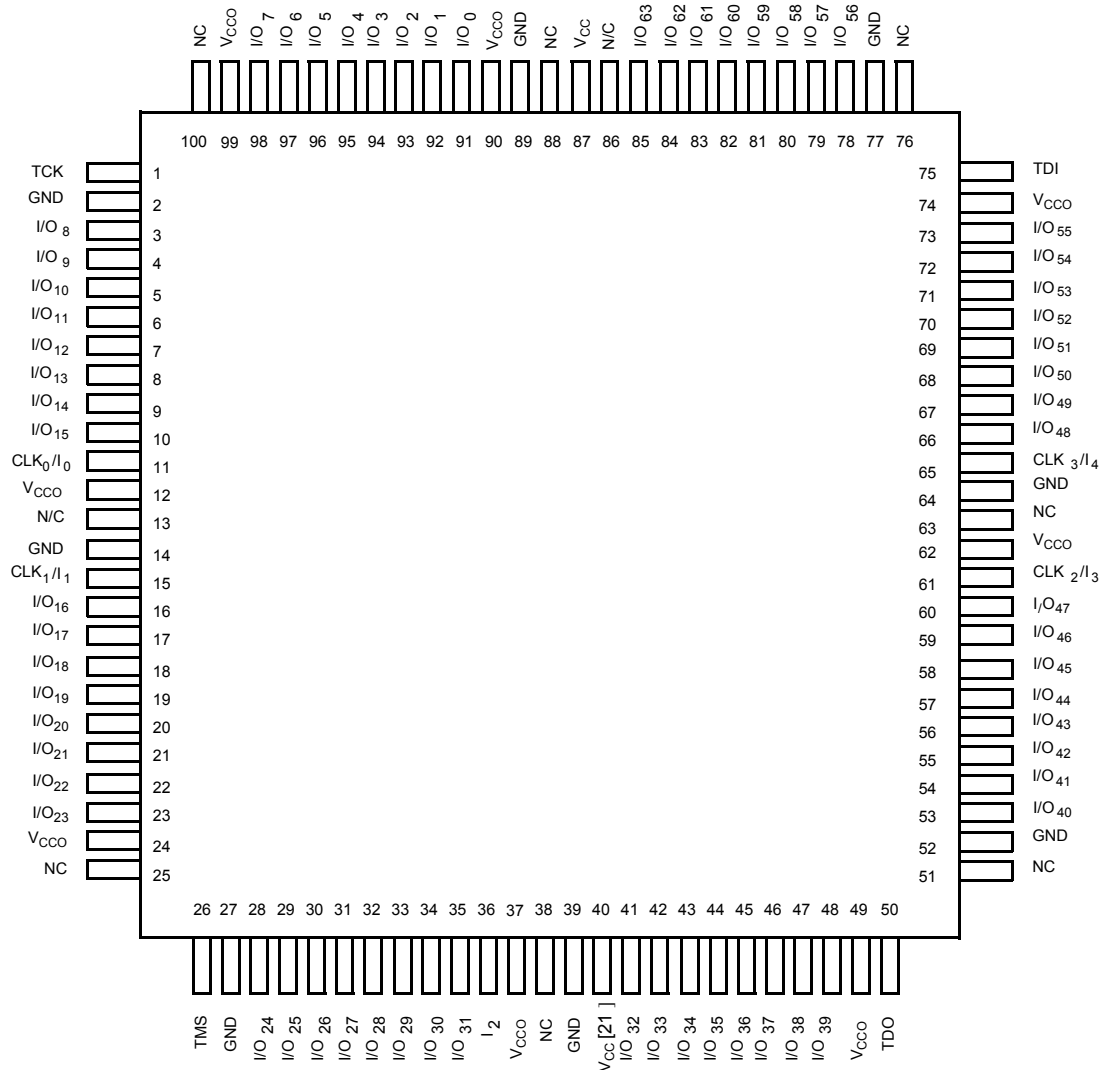
Top View

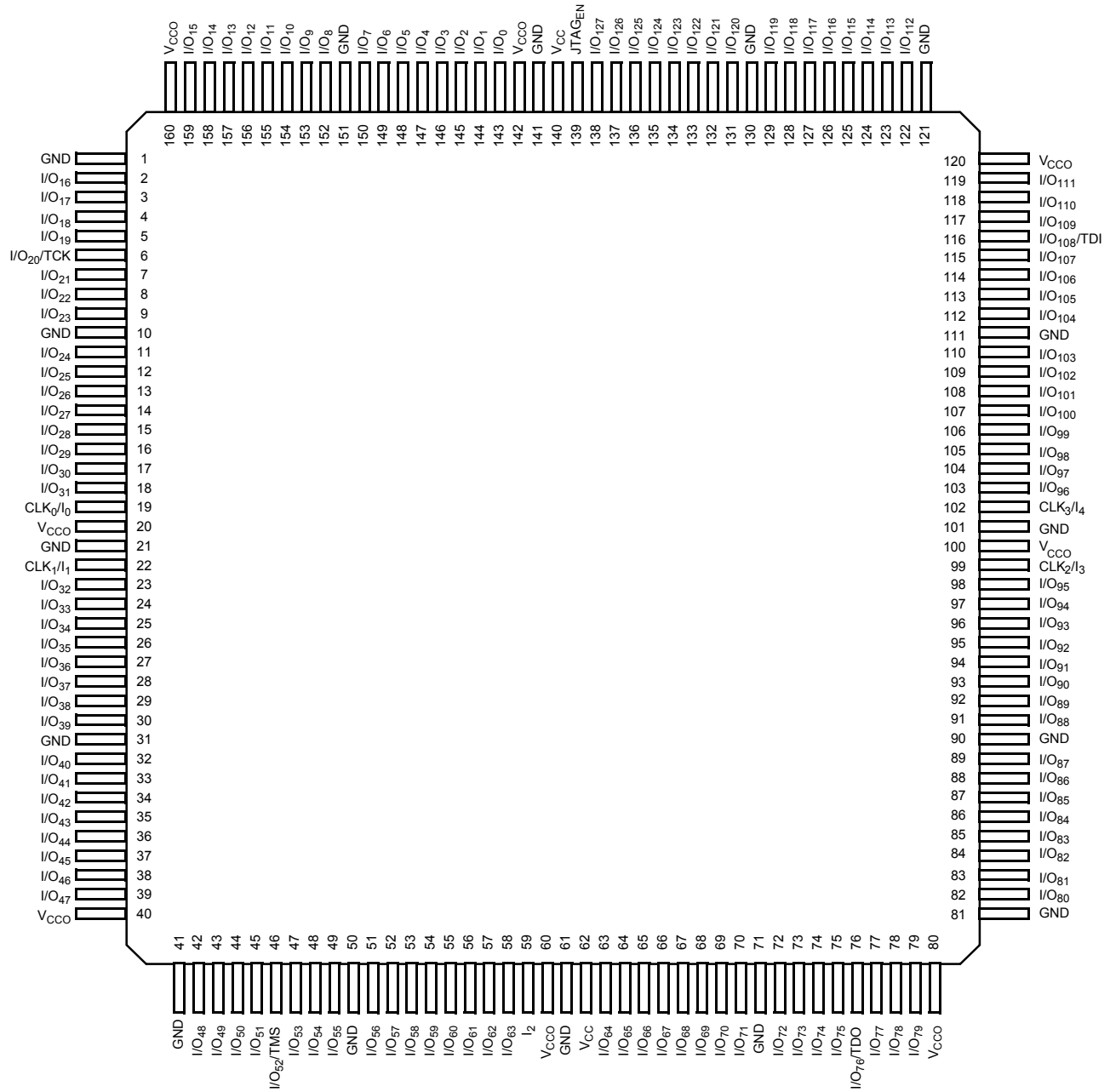


Pin Configurations^[20] (continued)

100-lead TQFP (A100)

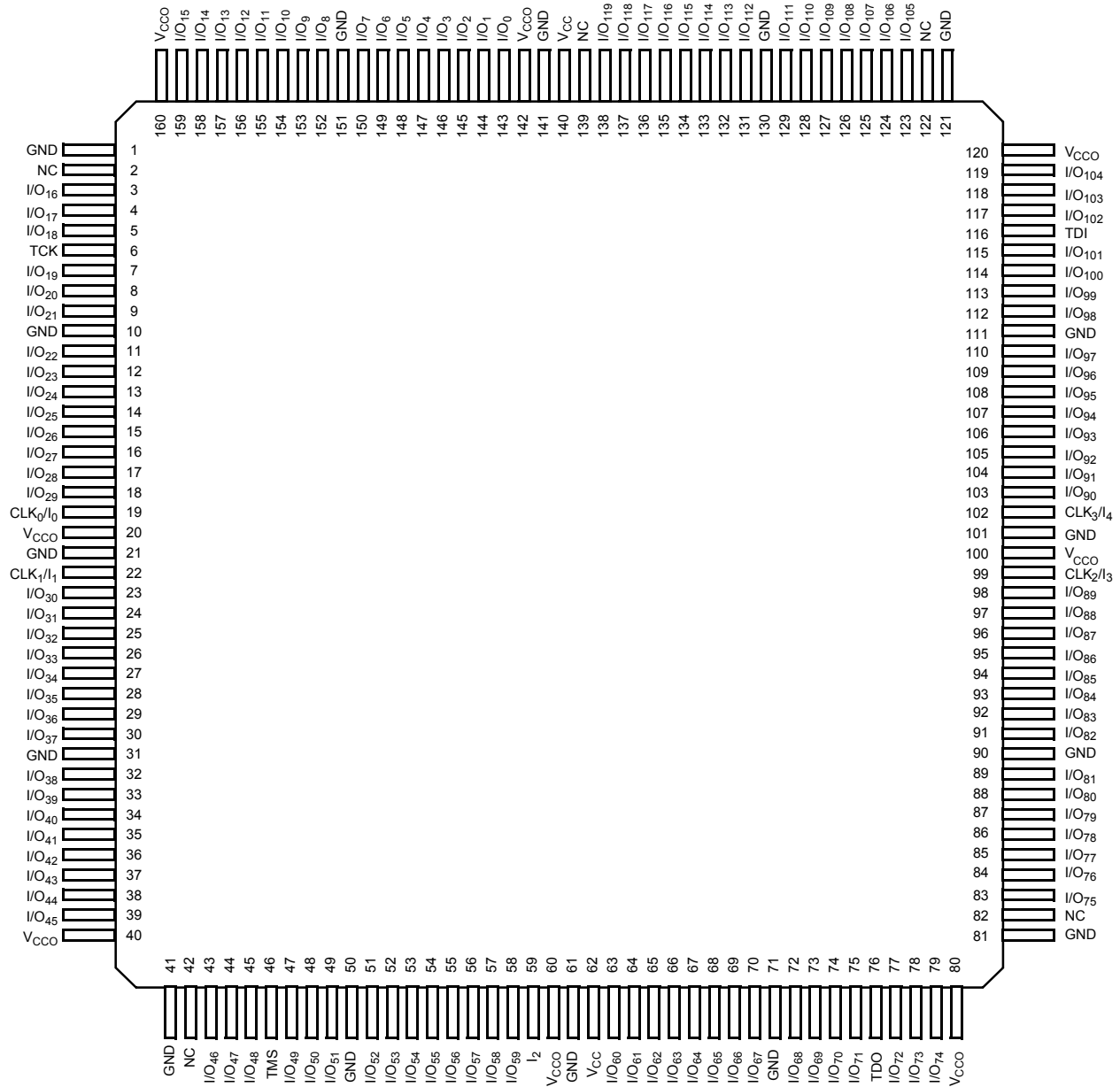
Top View



Pin Configurations^[20] (continued)
**160-Lead TQFP (A160) / CQFP (U162)
for CY37128(V) and CY37256(V)
Top View**


Pin Configurations^[20] (continued)

160-Lead TQFP (A160) for CY37192(V)
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

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	

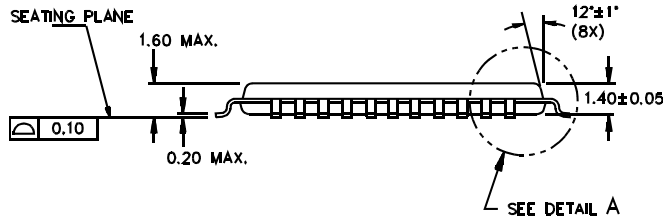
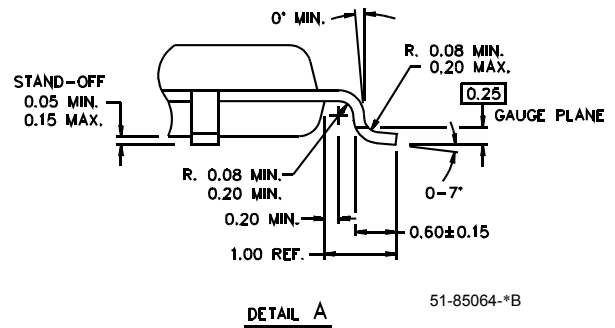
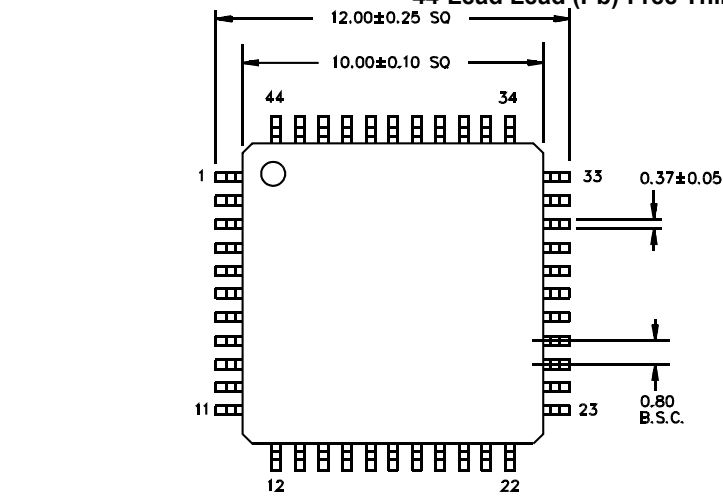
3.3V Ordering Information (continued)

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

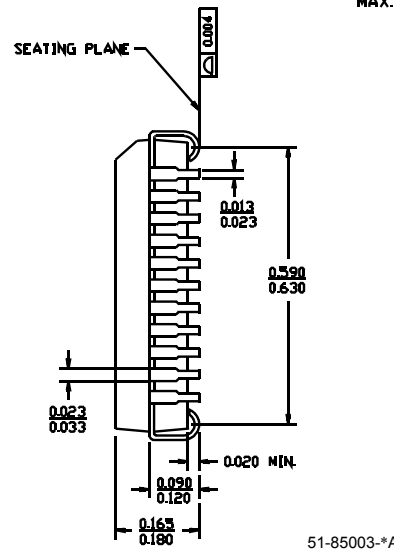
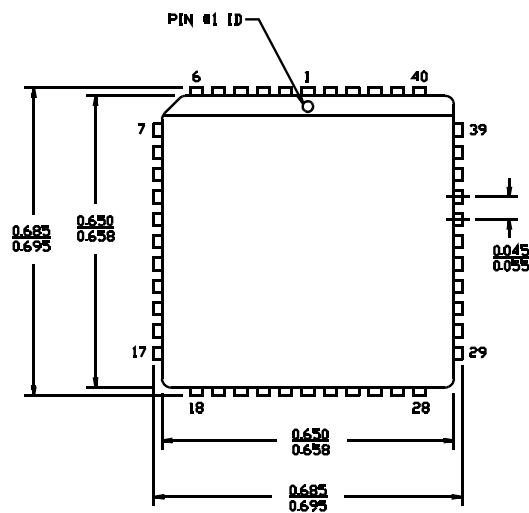
44-Lead Lead (Pb)-Free Thin Plastic Quad Flat Pack A44

DIMENSIONS ARE IN MILLIMETERS



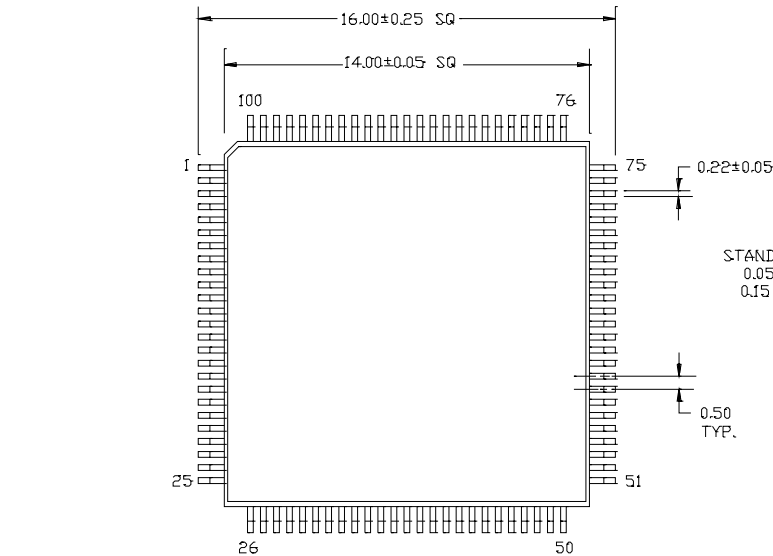
44-Lead Lead (Pb)-Free Plastic Leaded Chip Carrier J67

DIMENSIONS IN INCHES MIN. MAX.

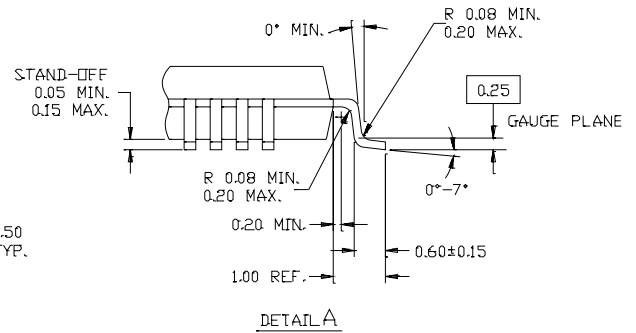


Package Diagrams (continued)

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



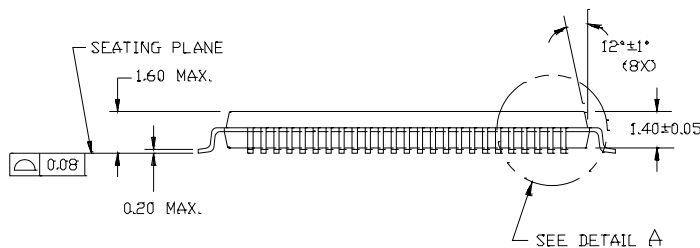
DIMENSIONS ARE IN MILLIMETERS.



NOTE: PKG. CAN HAVE



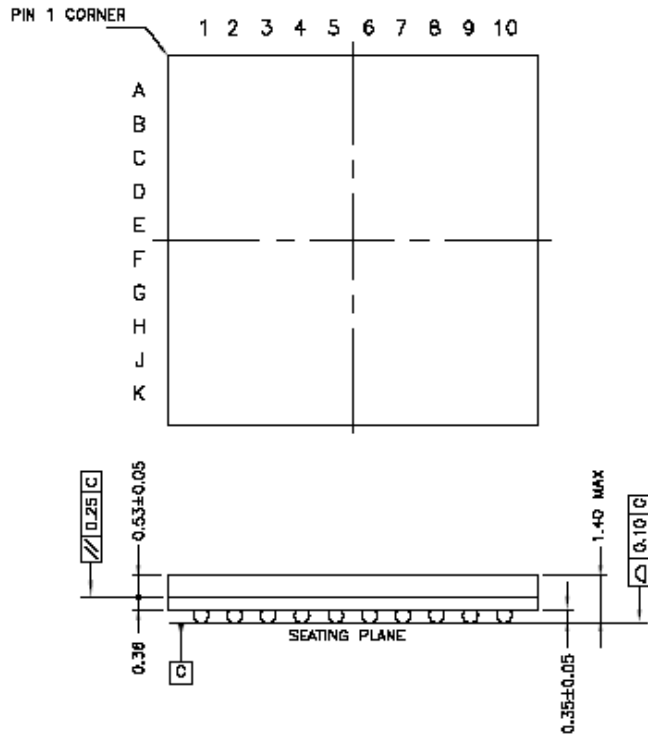
51-85048-*B



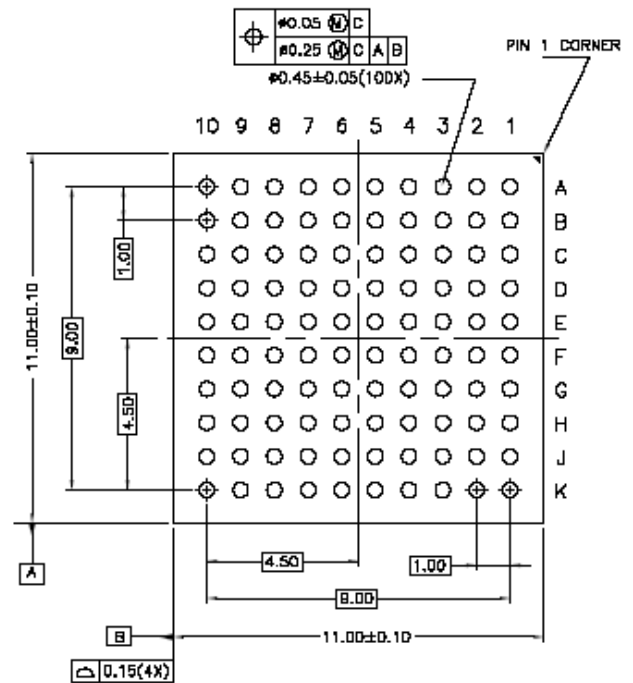
Package Diagrams (continued)

100-Ball Thin Ball Grid Array (11 x 11 x 1.4 mm) BB100

TOP VIEW



BOTTOM VIEW



51-85107-B

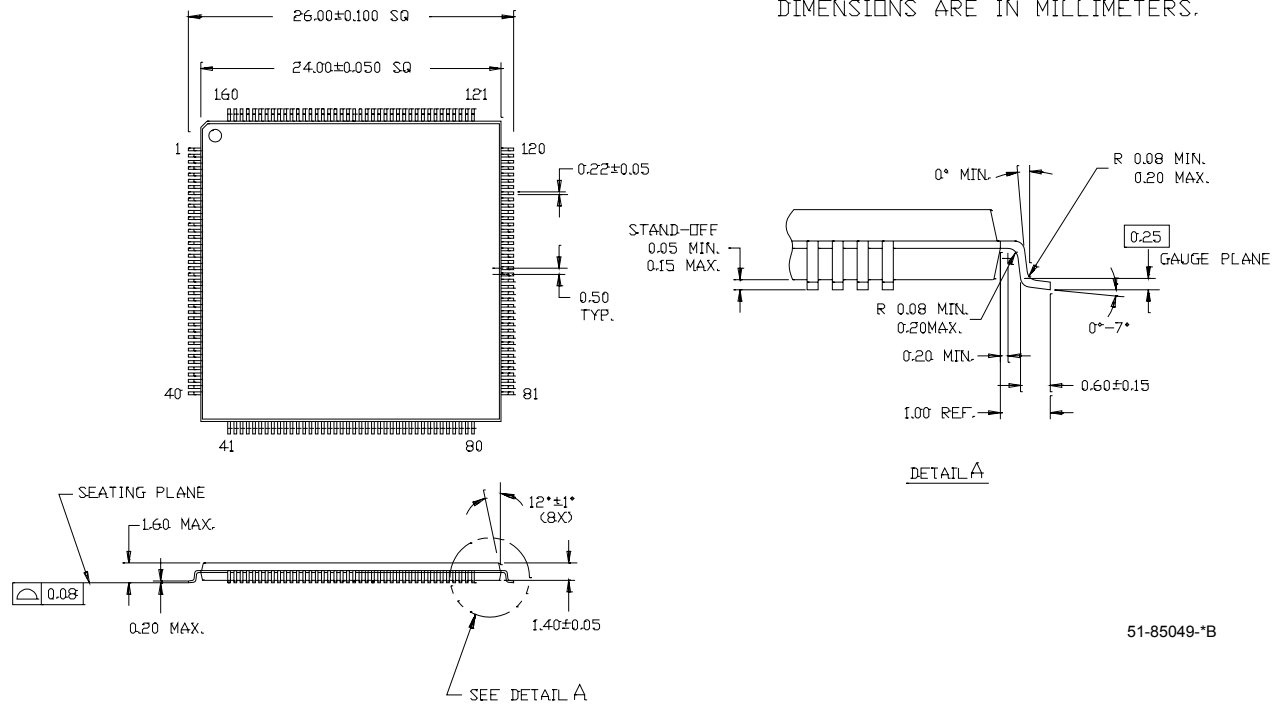


Ultra37000 CPLD Family

Package Diagrams (continued)

160-Lead Lead (Pb)-Free Thin Plastic Quad Flat Pack (24 x 24 x 1.4 mm) (TQFP) A160

DIMENSIONS ARE IN MILLIMETERS.



51-85049-*B