◼️Lattice®
Semiconductor Corporation

ispLSI® 1048
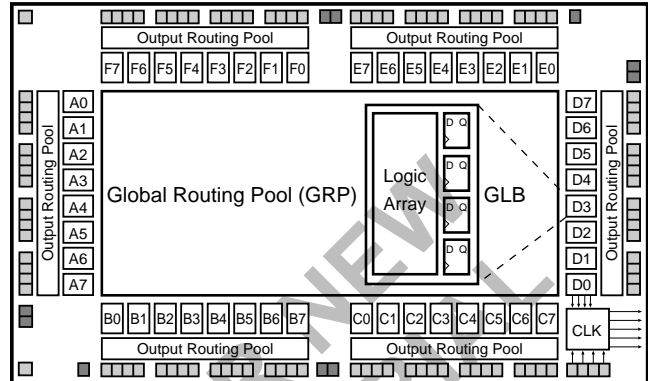## In-System Programmable High Density PLD

Features

- **HIGH-DENSITY PROGRAMMABLE LOGIC**
  - **— 8000 PLD Gates**
  - **— 96 I/O Pins, Ten Dedicated Inputs**
  - **— 288 Registers**
  - **— High-Speed Global Interconnects**
  - **— Wide Input Gating for Fast Counters, State Machines, Address Decoders, etc.**
  - **— Small Logic Block Size for Random Logic**
  - **— Security Cell Prevents Unauthorized Copying**
- **HIGH PERFORMANCE E²CMOS® TECHNOLOGY**
  - **— f_max = 80 MHz Maximum Operating Frequency**
  - **— f_max = 50 MHz for Industrial Devices**
  - **— t_pd = 15 ns Propagation Delay**
  - **— TTL Compatible Inputs and Outputs**
  - **— Electrically Erasable and Reprogrammable**
  - **— Non-Volatile E²CMOS Technology**
  - **— 100% Tested**
- **IN-SYSTEM PROGRAMMABLE**
  - **— In-System Programmable™ (ISP™) 5-Volt Only**
  - **— Increased Manufacturing Yields, Reduced Time-to-Market, and Improved Product Quality**
  - **— Reprogram Soldered Devices for Faster Debugging**
- **COMBINES EASE OF USE AND THE FAST SYSTEM SPEED OF PLDs WITH THE DENSITY AND FLEX-IBILITY OF FIELD PROGRAMMABLE GATE ARRAYS**
  - **— Complete Programmable Device Can Combine Glue Logic and Structured Designs**
  - **— Four Dedicated Clock Input Pins**
  - **— Synchronous and Asynchronous Clocks**
  - **— Flexible Pin Placement**
  - **— Optimized Global Routing Pool Provides Global Interconnectivity**
- **ispDesignEXPERT™ – LOGIC COMPILER AND COM-PLETE ISP DEVICE DESIGN SYSTEMS FROM HDL SYNTHESIS THROUGH IN-SYSTEM PROGRAMMING**
  - **— Superior Quality of Results**
  - **— Tightly Integrated with Leading CAE Vendor Tools**
  - **— Productivity Enhancing Timing Analyzer, Explore Tools, Timing Simulator and ispANALYZER™**
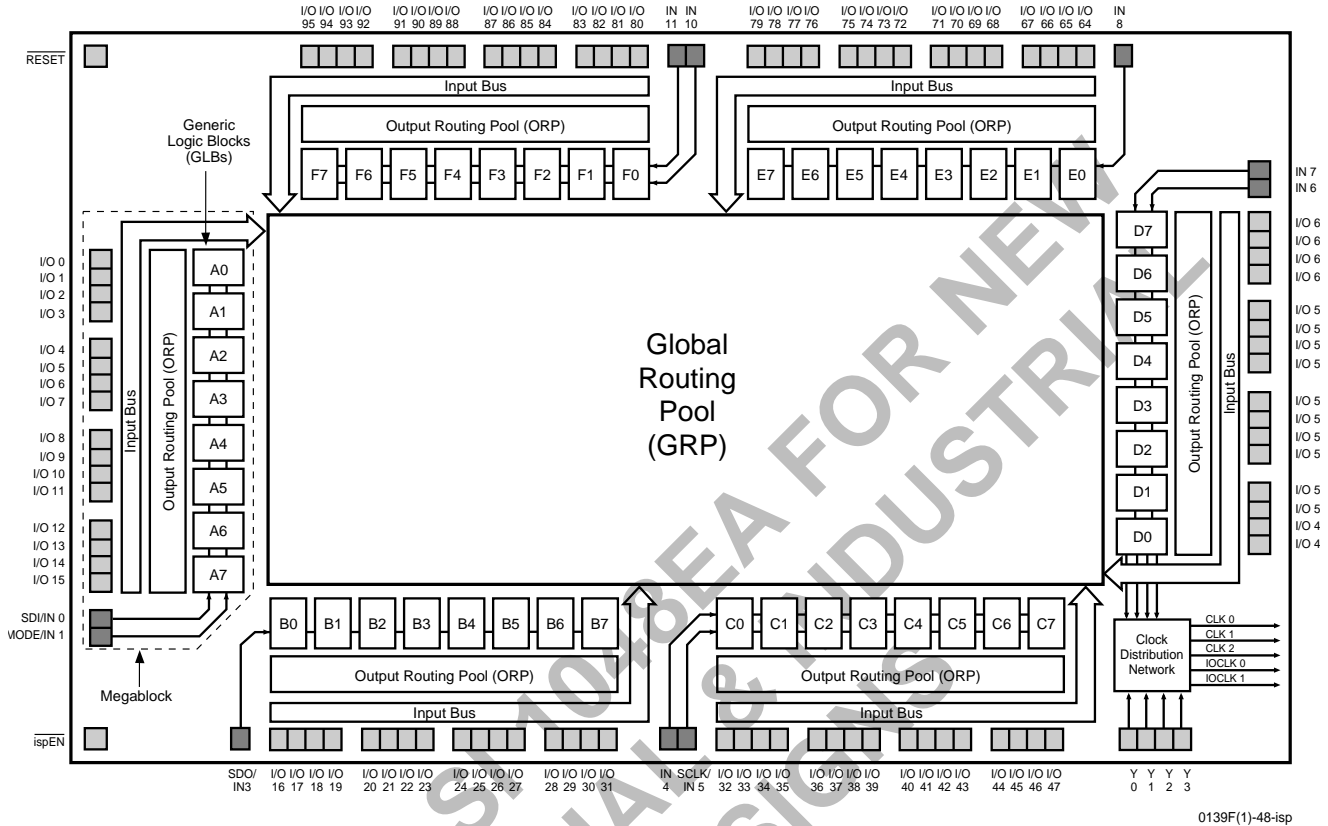 - **— PC and UNIX Platforms**

Functional Block Diagram

Description

The ispLSI 1048 is a High-Density Programmable Logic Device which contain 288 Registers, 96 Universal I/O pins, ten Dedicated Input pins, four Dedicated Clock Input pins and a Global Routing Pool (GRP). The GRP provides complete interconnectivity between all of these elements. The ispLSI 1048 features 5-Volt in-system programming and in-system diagnostic capabilities. It is the first device which offers non-volatile reprogrammability of the logic, as well as the interconnect to provide truly reconfigurable systems.

The basic unit of logic on the ispLSI 1048 devices is the Generic Logic Block (GLB). The GLBs are labeled A0, A1 .. F7 (see figure 1). There are a total of 48 GLBs in the ispLSI 1048 device. Each GLB has 18 inputs, a program-mable AND/OR/XOR array, and four outputs which can be configured to be either combinatorial or registered. Inputs to the GLB come from the GRP and dedicated inputs. All of the GLB outputs are brought back into the GRP so that they can be connected to the inputs of any other GLB on the device.

Functional Block Diagram

Figure 1. ispLSI 1048 Functional Block Diagram

0139F(1)-48-isp

The device also has 96 I/O cells, each of which is directly connected to an I/O pin. Each I/O cell can be individually programmed to be a combinatorial input, registered input, latched input, output or bi-directional I/O pin with 3-state control. Additionally, all outputs are polarity selectable, active high or active low. The signal levels are TTL compatible voltages and the output drivers can source 4 mA or sink 8 mA.

Eight GLBs, 16 I/O cells, two dedicated inputs (one dedicated input in Megablock B and E) and one ORP are connected together to make a Megablock (see figure 1). The outputs of the eight GLBs are connected to a set of 16 universal I/O cells by the ORP. The ispLSI 1048 device contains six of these Megablocks.

The GRP has as its inputs the outputs from all of the GLBs and all of the inputs from the bi-directional I/O cells. All of these signals are made available to the inputs of the GLBs. Delays through the GRP have been equalized to minimize timing skew.

Clocks in the ispLSI 1048 device are selected using the Clock Distribution Network. Four dedicated clockpins (Y0, Y1, Y2 and Y3) are brought into the distribution network, and five clock outputs (CLK 0, CLK 1, CLK 2, IOCLK 0 and IOCLK 1) are provided to route clocks to the GLBs and I/O cells. The Clock Distribution Network can also be driven from a special clock GLB (D0 on the ispLSI 1048 device). The logic of this GLB allows the user to create an internal clock from a combination of internal signals within the device.

Absolute Maximum Ratings [1]

Supply Voltage V_{cc} .... -0.5 to +7.0V

Input Voltage Applied .... -2.5 to V_{CC} +1.0V

Off-State Output Voltage Applied ..... -2.5 to V_{CC} +1.0V

Storage Temperature .... -65 to 150°C

Case Temp. with Power Applied .... -55 to 125°C

Max. Junction Temp. (T_J) with Power Applied ... 150°C

1. Stresses above those listed under the "Absolute Maximum Ratings" may cause permanent damage to the device. Functional operation of the device at these or at any other conditions above those indicated in the operational sections of this specification is not implied (while programming, follow the programming specifications).

DC Recommended Operating Conditions

SYMBOL	PARAMETER			MIN.	MAX.	UNITS
V_{CC}	Supply Voltage	Commercial	$T_A = 0°C$ to +70°C	4.75	5.25	V
		Industrial	$T_A = -40°C$ to +85°C	4.5	5.5	
V_{IL}	Input Low Voltage			0	0.8	V
V_{IH}	Input High Voltage			2.0	V_{CC} + 1	V

Capacitance (T_A=25°C, f=1.0 MHz)

SYMBOL	PARAMETER	MAXIMUM[1]	UNITS	TEST CONDITIONS
C_1	Dedicated Input Capacitance	8	pf	V_{CC}=5.0V, V_{IN}=2.0V
C_2	I/O and Clock Capacitance	10	pf	V_{CC}=5.0V, $V_{I/O}$, V_Y=2.0V

1. Guaranteed but not 100% tested.

Data Retention Specifications

PARAMETER	MINIMUM	MAXIMUM	UNITS
Data Retention	20	—	Years
Erase/Reprogram Cycles	10000	—	Cycles

Table 2- 0008B

Switching Test Conditions

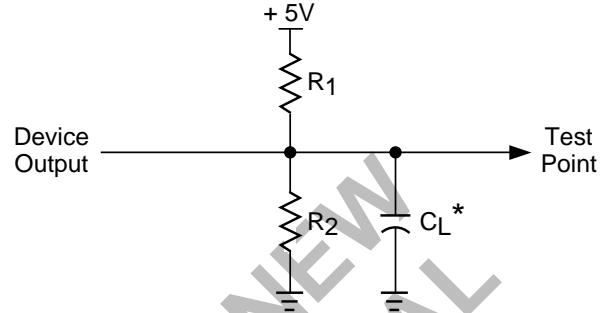| Input Pulse Levels	GND to 3.0V
Input Rise and Fall Time	≤ 3ns 10% to 90%
Input Timing Reference Levels	1.5V
Output Timing Reference Levels	1.5V
Output Load	See figure 2

3-state levels are measured 0.5V from steady-state active level.

Table 2- 0003

Figure 2. Test Load

*C_L includes Test Fixture and Probe Capacitance.

Output Load Conditions (see figure 2)

Test Condition		R1	R2	CL
A		470Ω	390Ω	35pF
B	Active High	∞	390Ω	35pF
	Active Low	470Ω	390Ω	35pF
C	Active High to Z at V_{OH} - 0.5V	∞	390Ω	5pF
	Active Low to Z at V_{OL} + 0.5V	470Ω	390Ω	5pF

DC Electrical Characteristics

Over Recommended Operating Conditions

SYMBOL	PARAMETER	CONDITION		MIN.	TYP.[3]	MAX.	UNITS
V_{OL}	Output Low Voltage	I_{OL} =8 mA		–	–	0.4	V
V_{OH}	Output High Voltage	I_{OH} =-4 mA		2.4	–	–	V
I_{IL}	Input or I/O Low Leakage Current	$0V \leq V_{IN} \leq V_{IL}$ (MAX.)		–	–	-10	µA
I_{IH}	Input or I/O High Leakage Current	$3.5V \leq V_{IN} \leq V_{CC}$		–	–	10	µA
I_{IL-isp}	isp Input Low Leakage Current	$0V \leq V_{IN} \leq V_{IL}$ (MAX.)		–	–	-150	µA
I_{IL-PU}	I/O Active Pull-Up Current	$0V \leq V_{IN} \leq V_{IL}$		–	–	-150	µA
I_{OS}[1]	Output Short Circuit Current	V_{CC} = 5V, V_{OUT} = 0.5V		–	–	-200	mA
I_{CC}[2,4]	Operating Power Supply Current	V_{IL} = 0.5V, V_{IH} = 3.0V	Commercial	–	165	235	mA
		f_{TOGGLE} = 1 MHz	Industrial	–	165	260	mA

1. One output at a time for a maximum duration of one second. V_{out} = 0.5V was selected to avoid test problems by tester ground degradation. Characterized but not 100% tested.
2. Measured using twelve 16-bit counters.
3. Typical values are at V_{CC} = 5V and T_A = 25°C.
4. Maximum I_{CC} varies widely with specific device configuration and operating frequency. Refer to the Power Consumption section of this datasheet and Thermal Management section of this Lattice Semiconductor Data Book or CD-ROM to estimate maximum I_{CC}.

Table 2- 0007A-48-isp

External Timing Parameters

Over Recommended Operating Conditions

PARAMETER	TEST [5] COND.	#[2]	DESCRIPTION[1]	-80 MIN.	-80 MAX.	-70 MIN.	-70 MAX.	-50 MIN.	-50 MAX.	UNITS
t_{pd1}	A	1	Data Propagation Delay, 4PT bypass, ORP bypass	–	15	–	18	–	24	ns
t_{pd2}	A	2	Data Propagation Delay, Worst Case Path	–	20	–	23	–	30.7	ns
f_{max} (Int.)	A	3	Clock Frequency with Internal Feedback[3]	80	–	71.4	–	53.6	–	MHz
f_{max} (Ext.)	–	4	Clock Frequency with External Feedback $\left(\frac{1}{t_{su2} + t_{co1}}\right)$	50	–	41.7	–	31.3	–	MHz
f_{max} (Tog.)	–	5	Clock Frequency, Max Toggle[4]	100	–	83	–	71.4	–	MHz
t_{su1}	–	6	GLB Reg. Setup Time before Clock, 4PT bypass	7	–	9	–	12	–	ns
t_{co1}	A	7	GLB Reg. Clock to Output Delay, ORP bypass	–	10	–	12	–	16	ns
t_{h1}	–	8	GLB Reg. Hold Time after Clock, 4 PT bypass	0	–	0	–	0	–	ns
t_{su2}	–	9	GLB Reg. Setup Time before Clock	10	–	12	–	16	–	ns
t_{co2}	–	10	GLB Reg. Clock to Output Delay	–	12	–	14	–	18.7	ns
t_{h2}	–	11	GLB Reg. Hold Time after Clock	0	–	0	–	0	–	ns
t_{r1}	A	12	Ext. Reset Pin to Output Delay	–	17	–	17	–	22.7	ns
t_{rw1}	–	13	Ext. Reset Pulse Duration	10	–	10	–	13	–	ns
t_{en}	B	14	Input to Output Enable	–	18	–	20	–	26.7	ns
t_{dis}	C	15	Input to Output Disable	–	18	–	20	–	26.7	ns
t_{wh}	–	16	Ext. Sync. Clock Pulse Duration, High	5	–	6	–	7	–	ns
t_{wl}	–	17	Ext. Sync. Clock Pulse Duration, Low	5	–	6	–	7	–	ns
t_{su5}	–	18	I/O Reg. Setup Time before Ext. Sync. Clock (Y2, Y3)	2	–	2	–	2.7	–	ns
t_{h5}	–	19	I/O Reg. Hold Time after Ext. Sync. Clock (Y2, Y3)	6.5	–	6.5	–	8.7	–	ns

1. Unless noted otherwise, all parameters use a GRP load of 4 GLBs, 20 PTXOR path, ORP and Y0 clock.
2. Refer to Timing Model in this data sheet for further details.
3. Standard 16-Bit loadable counter using GRP feedback.
4. f_{max} (Toggle) may be less than $1/(t_{wh} + t_{wl})$. This is to allow for a clock duty cycle of other than 50%.
5. Reference Switching Test Conditions section.

Table 2- 0030A-48/80,70,50

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Internal Timing Parameters[1]

PARAMETER	#[2]	DESCRIPTION	-80 MIN.	-80 MAX.	-70 MIN.	-70 MAX.	-50 MIN.	-50 MAX.	UNITS
Inputs									
t_{iobp}	20	I/O Register Bypass	–	2.5	–	3.0	–	4.0	ns
t_{iolat}	21	I/O Latch Delay	–	3.3	–	4.0	–	5.3	ns
t_{iosu}	22	I/O Register Setup Time before Clock	5.3	–	6.0	–	8.1	–	ns
t_{ioh}	23	I/O Register Hold Time after Clock	1.5	–	0.5	–	0.9	–	ns
t_{ioco}	24	I/O Register Clock to Out Delay	–	2.5	–	3.0	–	3.9	ns
t_{ior}	25	I/O Register Reset to Out Delay	–	2.9	–	3.5	–	4.6	ns
t_{din}	26	Dedicated Input Delay	–	5.0	–	6.0	–	8.0	ns
GRP									
t_{grp1}	27	GRP Delay, 1 GLB Load	–	2.1	–	2.5	–	3.3	ns
t_{grp4}	28	GRP Delay, 4 GLB Loads	–	2.5	–	3.0	–	4.0	ns
t_{grp8}	29	GRP Delay, 8 GLB Loads	–	3.3	–	4.0	–	5.3	ns
t_{grp12}	30	GRP Delay, 12 GLB Loads	–	4.2	–	5.0	–	6.7	ns
t_{grp16}	31	GRP Delay, 16 GLB Loads	–	5.0	–	6.0	–	8.0	ns
t_{grp48}	32	GRP Delay, 48 GLB Loads	–	13.3	–	16.0	–	21.3	ns
GLB									
t_{4ptbp}	33	4 Product Term Bypass Path Delay	–	5.4	–	6.5	–	8.6	ns
t_{1ptxor}	34	1 Product Term/XOR Path Delay	–	6.5	–	7.0	–	9.3	ns
$t_{20ptxor}$	35	20 Product Term/XOR Path Delay	–	7.6	–	7.5	–	10.0	ns
t_{xoradj}	36	XOR Adjacent Path Delay[3]	–	8.4	–	9.5	–	12.7	ns
t_{gbp}	37	GLB Register Bypass Delay	–	0.8	–	1.0	–	1.3	ns
t_{gsu}	38	GLB Register Setup Time before Clock	0.8	–	1.5	–	2.0	–	ns
t_{gh}	39	GLB Register Hold Time after Clock	5.0	–	6.0	–	8.0	–	ns
t_{gco}	40	GLB Register Clock to Output Delay	–	2.1	–	2.5	–	3.3	ns
t_{gr}	41	GLB Register Reset to Output Delay	–	2.1	–	2.5	–	3.3	ns
t_{ptre}	42	GLB Product Term Reset to Register Delay	–	8.3	–	10.0	–	13.3	ns
t_{ptoe}	43	GLB Product Term Output Enable to I/O Cell Delay	–	8.8	–	9.0	–	11.9	ns
t_{ptck}	44	GLB Product Term Clock Delay	2.9	6.3	3.5	7.5	4.6	9.9	ns
ORP									
t_{orp}	45	ORP Delay	–	3.2	–	3.5	–	4.7	ns
t_{orpbp}	46	ORP Bypass Delay	–	1.3	–	1.5	–	2.0	ns

1. Internal Timing Parameters are not tested and are for reference only.
2. Refer to Timing Model in this data sheet for further details.
3. The XOR adjacent path can only be used by hard macros.
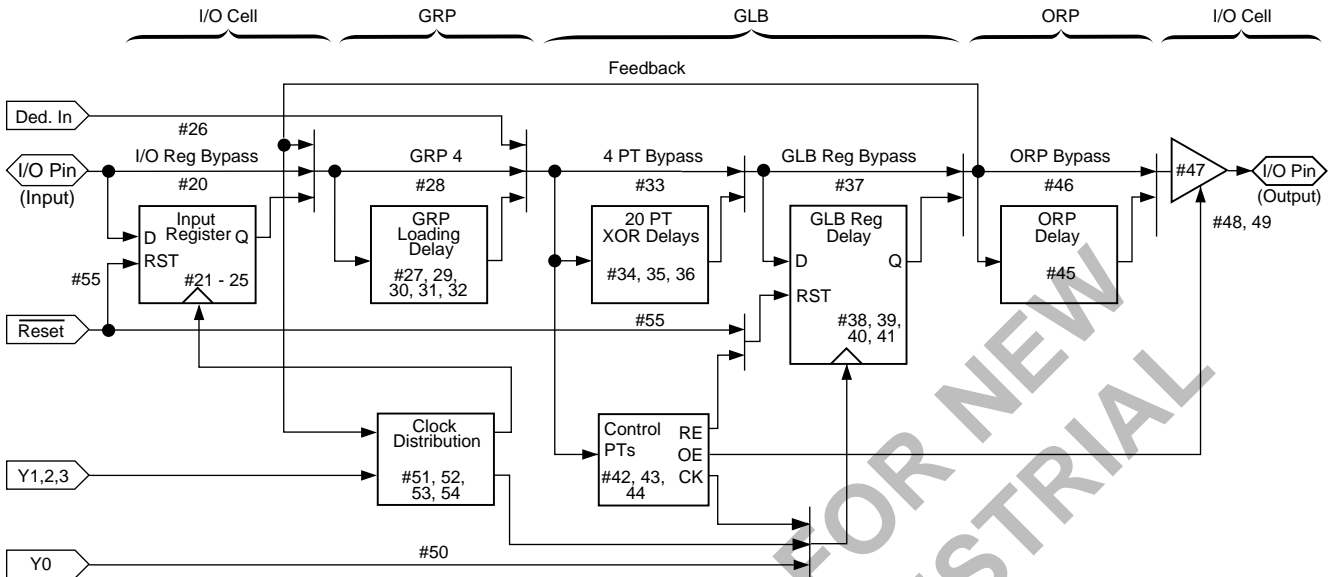
Table 2- 0036A-48/80,70,50.eps

Internal Timing Parameters[1]

PARAMETER	#[2]	DESCRIPTION	-80		-70		-50		UNITS
			MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
Outputs									
t_{ob}	47	Output Buffer Delay	–	2.5	–	3.0	–	4.0	ns
t_{oen}	48	I/O Cell OE to Output Enabled	–	4.2	–	5.0	–	6.7	ns
t_{odis}	49	I/O Cell OE to Output Disabled	–	4.2	–	5.0	–	6.7	ns
Clocks									
t_{gy0}	50	Clock Delay, Y0 to Global GLB Clock Line (Ref. clock)	4.2	4.2	5.0	5.0	6.7	6.7	ns
$t_{gy1/2}$	51	Clock Delay, Y1 or Y2 to Global GLB Clock Line	3.3	5.0	4.0	6.0	5.3	8.0	ns
t_{gcp}	52	Clock Delay, Clock GLB to Global GLB Clock Line	0.8	4.2	1.0	5.0	1.3	6.6	ns
$t_{ioy2/3}$	53	Clock Delay, Y2 or Y3 to I/O Cell Global Clock Line	3.3	5.0	4.0	6.0	5.3	8.0	ns
t_{iocp}	54	Clock Delay, Clock GLB to I/O Cell Global Clock Line	0.8	4.2	1.0	5.0	1.3	6.6	ns
Global Reset									
t_{gr}	55	Global Reset to GLB and I/O Registers	–	9.2	–	8.0	–	10.6	ns

1. Internal Timing Parameters are not tested and are for reference only.
2. Refer to Timing Model in this data sheet for further details.

ispLSI 1048 Timing Model

Derivations of tsu, th and tco from the Product Term Clock[1]

$$t_{su} = \text{Logic} + \text{Reg su} - \text{Clock (min)}$$
$$= (t_{iobp} + t_{grp4} + t_{20ptxor}) + (t_{gsu}) - (t_{iobp} + t_{grp4} + t_{ptck(min)})$$
$$= (\#20 + \#28 + \#35) + (\#38) - (\#20 + \#28 + \#44)$$
$$5.5 \text{ ns} = (3.0 + 3.0 + 7.5) + (1.5) - (3.0 + 3.0 + 3.5)$$

$$t_h = \text{Clock (max)} + \text{Reg h} - \text{Logic}$$
$$= (t_{iobp} + t_{grp4} + t_{ptck(max)}) + (t_{gh}) - (t_{iobp} + t_{grp4} + t_{20ptxor})$$
$$= (\#20 + \#28 + \#44) + (\#39) - (\#20 + \#28 + \#35)$$
$$6.0 \text{ ns} = (3.0 + 3.0 + 7.5) + (6.0) - (3.0 + 3.0 + 7.5)$$

$$t_{co} = \text{Clock (max)} + \text{Reg co} + \text{Output}$$
$$= (t_{iobp} + t_{grp4} + t_{ptck(max)}) + (t_{gco}) + (t_{orp} + t_{ob})$$
$$= (\#20 + \#28 + \#44) + (\#40) + (\#45 + \#47)$$
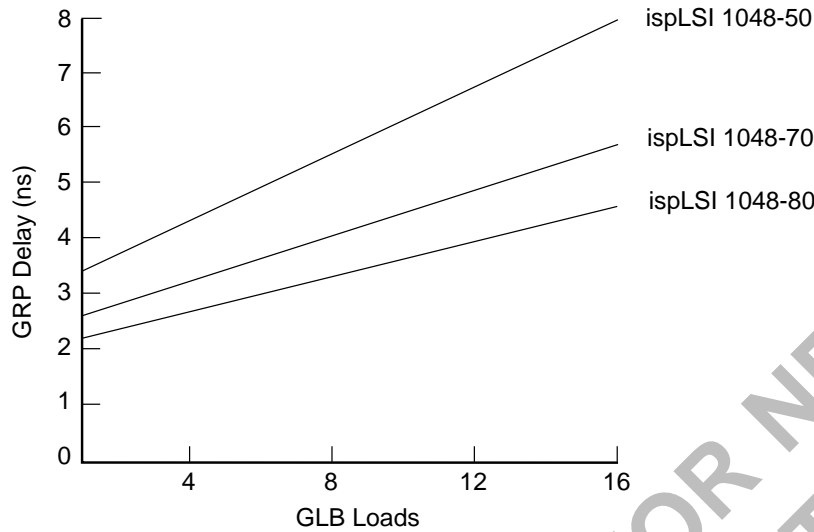$$22.5 \text{ ns} = (3.0 + 3.0 + 7.5) + (2.5) + (3.5 + 3.0)$$

Derivations of tsu, th and tco from the Clock GLB[1]

$$t_{su} = \text{Logic} + \text{Reg su} - \text{Clock (min)}$$
$$= (t_{iobp} + t_{grp4} + t_{20ptxor}) + (t_{gsu}) - (t_{gy0(min)} + t_{gco} + t_{gcp(min)})$$
$$= (\#20 + \#28 + \#35) + (\#38) - (\#50 + \#40 + \#52)$$
$$6.5 \text{ ns} = (3.0 + 3.0 + 7.5) + (1.5) - (5.0 + 2.5 + 1.0)$$

$$t_h = \text{Clock (max)} + \text{Reg h} - \text{Logic}$$
$$= (t_{gy0(max)} + t_{gco} + t_{gcp(max)}) + (t_{gh}) - (t_{iobp} + t_{grp4} + t_{20ptxor})$$
$$= (\#50 + \#40 + \#52) + (\#39) - (\#20 + \#28 + \#35)$$
$$5.0 \text{ ns} = (5.0 + 2.5 + 5.0) + (6.0) - (3.0 + 3.0 + 7.5)$$

$$t_{co} = \text{Clock (max)} + \text{Reg co} + \text{Output}$$
$$= (t_{gy0(max)} + t_{gco} + t_{gcp(max)}) + (t_{gco}) + (t_{orp} + t_{ob})$$
$$= (\#50 + \#40 + \#52) + (\#40) + (\#45 + \#47)$$
$$21.5 \text{ ns} = (5.0 + 2.5 + 5.0) + (2.5) + (3.5 + 3.0)$$

1. Calculations are based upon timing specifications for the ispLSI 1048-70.

Maximum GRP Delay vs GLB Loads

0126A-48-80-isp

Power Consumption

Power consumption in the ispLSI 1048 device depends on two primary factors: the speed at which the device is operating, and the number of Product Terms used. Figure 3 shows the relationship between power and operating speed.

Figure 3. Typical Device Power Consumption vs fmax

Notes: Configuration of Twelve 16-bit Counters
Typical Current at 5V, 25°C

I_{CC} can be estimated for the ispLSI 1048 using the following equation:

I_{CC} = 73 + (# of PTs * 0.23) + (# of nets * Max. freq * 0.010) where:
# of PTs = Number of Product Terms used in design
# of nets = Number of Signals used in device
Max. freq = Highest Clock Frequency to the device

The I_{CC} estimate is based on typical conditions (V_{CC} = 5.0V, room temperature) and an assumption of 2 GLB loads on average exists. These values are for estimates only. Since the value of I_{CC} is sensitive to operating conditions and the program in the device, the actual I_{CC} should be verified.

0127A-48-80-isp

Pin Description

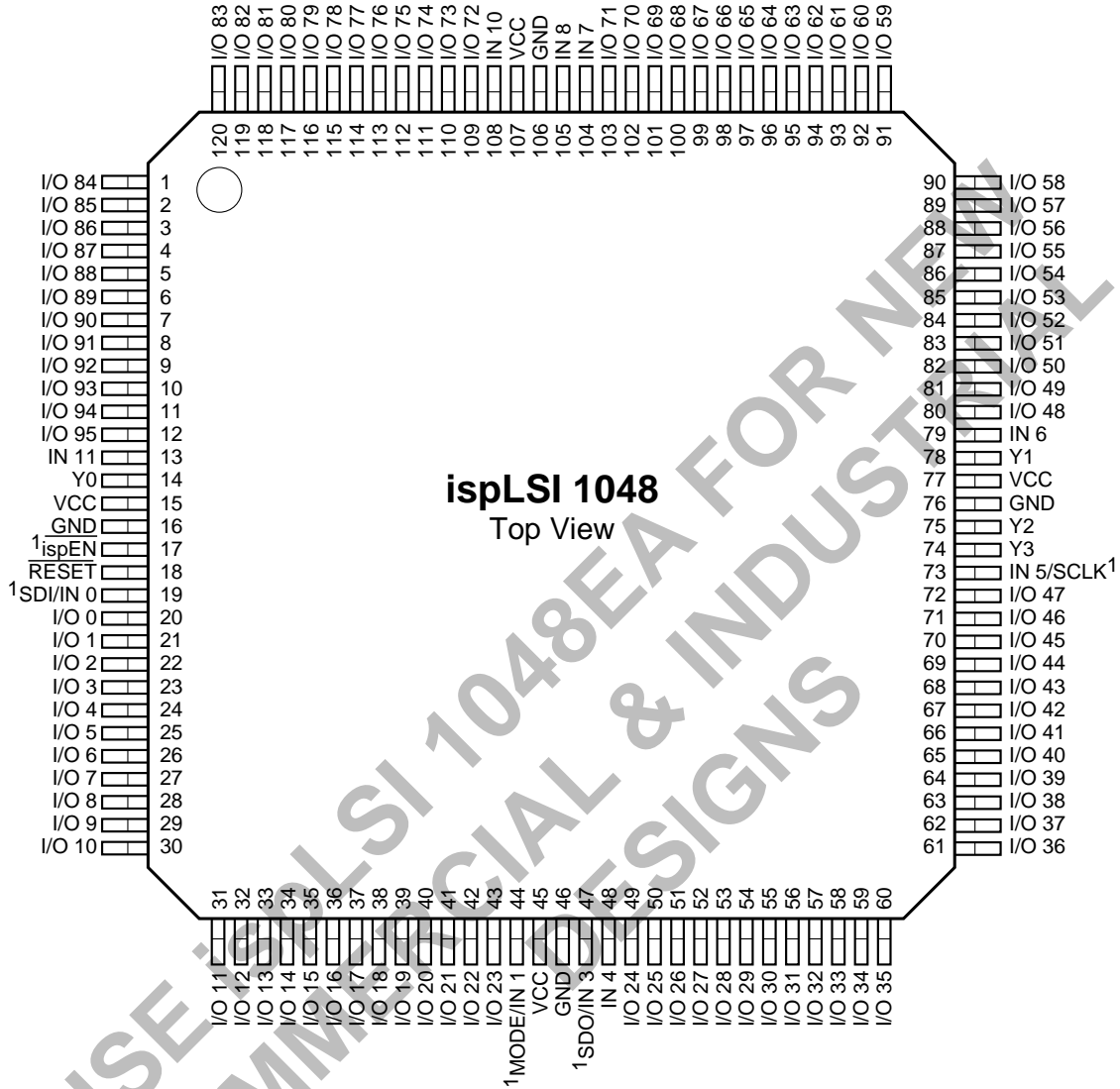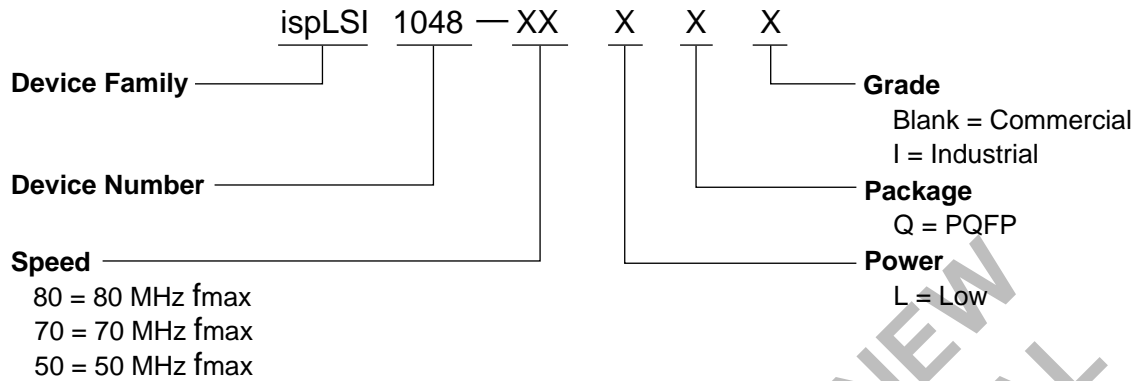| NAME	PQFP PIN NUMBERS	DESCRIPTION
I/O 0 - I/O 5 I/O 6 - I/O 11 I/O 12 - I/O 17 I/O 18 - I/O 23 I/O 24 - I/O 29 I/O 30 - I/O 35 I/O 36 - I/O 41 I/O 42 - I/O 47 I/O 48 - I/O 53 I/O 54 - I/O 59 I/O 60 - I/O 65 I/O 66 - I/O 71 I/O 72 - I/O 77 I/O 78 - I/O 83 I/O 84 - I/O 89 I/O 90 - I/O 95	20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99,100,101,102,103, 109,110,111,112,113,114, 115,116,117,118,119,120, 1, 2, 3, 4 5, 6, 7, 8, 9, 10, 11, 12	Input/Output Pins - These are the general purpose I/O pins used by the logic array.
IN 4 IN 6 - IN 11	48, 79,104,105, – 108, 13	Dedicated input pins to the device. (IN 2 and IN 9 not available)
$\overline{\text{ispEN}}$	17	Input – Dedicated in-system programming enable input pin. This pin is brought low to enable the programming mode. The MODE, SDI, SDO and SCLK options become active.
SDI/IN 0[1]	19	Input – This pin performs two functions. It is a dedicated input pin when ispEN is logic high. When ispEN is logic low, it functions as an input pin to load programming data into the device. SDI/IN 0 also is used as one of the two control pins for the isp state machine.
MODE/IN 1[1]	44	Input – This pin performs two functions. It is a dedicated input pin when ispEN is logic high. When ispEN is logic low, it functions as a pin to control the operation of the isp state machine.
SDO/IN 3[1]	47	Input/Output – This pin performs two functions. It is a dedicated input pin when ispEN is logic high. When ispEN is logic low, it functions as an output pin to read serial shift register data.
SCLK/IN 5[1]	73	Input – This pin performs two functions. It is a dedicated input when ispEN is logic high. When ispEN is logic low, it functions as a clock pin for the Serial Shift Register.
$\overline{\text{RESET}}$	18	Active Low (0) Reset pin which resets all of the GLB and I/O registers in the device.
Y0	14	Dedicated Clock input. This clock input is connected to one of the clock inputs of all of the GLBs on the device.
Y1	78	Dedicated clock input. This clock input is brought into the clock distribution network, and can optionally be routed to any GLB on the device.
Y2	75	Dedicated clock input. This clock input is brought into the clock distribution network, and can optionally be routed to any GLB and/or any I/O cell on the device.
Y3	74	Dedicated clock input. This clock input is brought into the clock distribution network, and can optionally be routed to any I/O cell on the device.
GND Vcc	46, 76,106, 16 15, 45, 77, 107	Ground (GND) V_{CC}

1. Pins have dual function capability.

Table 2- 0002C-48-isp

Pin Configuration

ispLSI 1048 120-Pin PQFP Pinout Diagram

Top pins (left to right): I/O 83, I/O 82, I/O 81, I/O 80, I/O 79, I/O 78, I/O 77, I/O 76, I/O 75, I/O 74, I/O 73, I/O 72, IN 10, VCC, GND, IN 8, IN 7, I/O 71, I/O 70, I/O 69, I/O 68, I/O 67, I/O 66, I/O 65, I/O 64, I/O 63, I/O 62, I/O 61, I/O 60, I/O 59

Top pin numbers (left to right): 120, 119, 118, 117, 116, 115, 114, 113, 112, 111, 110, 109, 108, 107, 106, 105, 104, 103, 102, 101, 100, 99, 98, 97, 96, 95, 94, 93, 92, 91

ispLSI 1048
Top View

Left side (top to bottom):
Pin	Name
1	I/O 84
2	I/O 85
3	I/O 86
4	I/O 87
5	I/O 88
6	I/O 89
7	I/O 90
8	I/O 91
9	I/O 92
10	I/O 93
11	I/O 94
12	I/O 95
13	IN 11
14	Y0
15	VCC
16	GND
17	ispEN [1]
18	RESET
19	SDI/IN 0 [1]
20	I/O 0
21	I/O 1
22	I/O 2
23	I/O 3
24	I/O 4
25	I/O 5
26	I/O 6
27	I/O 7
28	I/O 8
29	I/O 9
30	I/O 10

Right side (top to bottom):
Pin	Name
90	I/O 58
89	I/O 57
88	I/O 56
87	I/O 55
86	I/O 54
85	I/O 53
84	I/O 52
83	I/O 51
82	I/O 50
81	I/O 49
80	I/O 48
79	IN 6
78	Y1
77	VCC
76	GND
75	Y2
74	Y3
73	IN 5/SCLK [1]
72	I/O 47
71	I/O 46
70	I/O 45
69	I/O 44
68	I/O 43
67	I/O 42
66	I/O 41
65	I/O 40
64	I/O 39
63	I/O 38
62	I/O 37
61	I/O 36

Bottom pin numbers (left to right): 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60

Bottom pins (left to right): I/O 11, I/O 12, I/O 13, I/O 14, I/O 15, I/O 16, I/O 17, I/O 18, I/O 19, I/O 20, I/O 21, I/O 22, I/O 23, MODE/IN 1 [1], VCC, GND, SDO/IN 3 [1], IN 4, I/O 24, I/O 25, I/O 26, I/O 27, I/O 28, I/O 29, I/O 30, I/O 31, I/O 32, I/O 33, I/O 34, I/O 35

1. Pins have dual function capability.

0124 -48-isp

Part Number Description

ispLSI 1048 — XX X X X

Device Family

Device Number

Speed
80 = 80 MHz fmax
70 = 70 MHz fmax
50 = 50 MHz fmax

Grade
Blank = Commercial
I = Industrial

Package
Q = PQFP

Power
L = Low

0212-80B-isp1048

ispLSI 1048 Ordering Information

COMMERCIAL

Family	fmax (MHz)	tpd (ns)	Ordering Number	Package
ispLSI	80	15	ispLSI 1048-80LQ	120-Pin PQFP
	70	18	ispLSI 1048-70LQ	120-Pin PQFP
	50	24	ispLSI 1048-50LQ	120-Pin PQFP

INDUSTRIAL

Family	fmax (MHz)	tpd (ns)	Ordering Number	Package
ispLSI	50	24	ispLSI 1048-50LQI	120-Pin PQFP

Table 2- 0041A-48-isp