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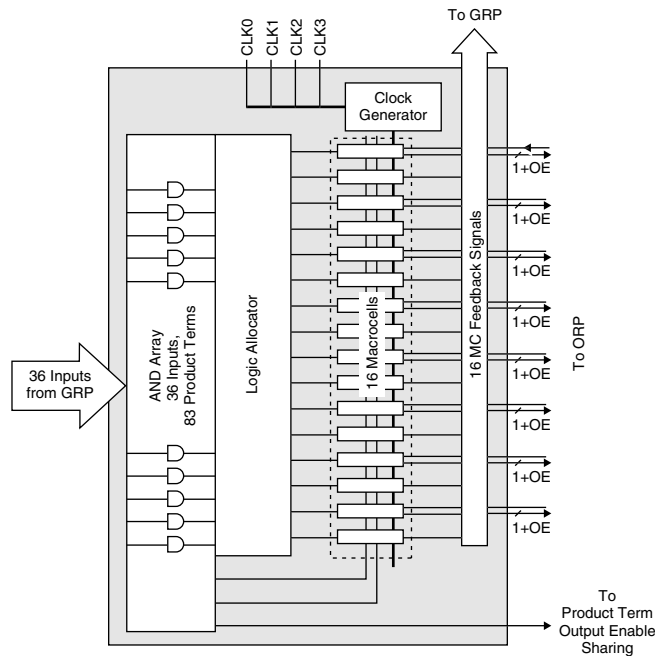
Understanding [Embedded - CPLDs \(Complex Programmable Logic Devices\)](#)

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

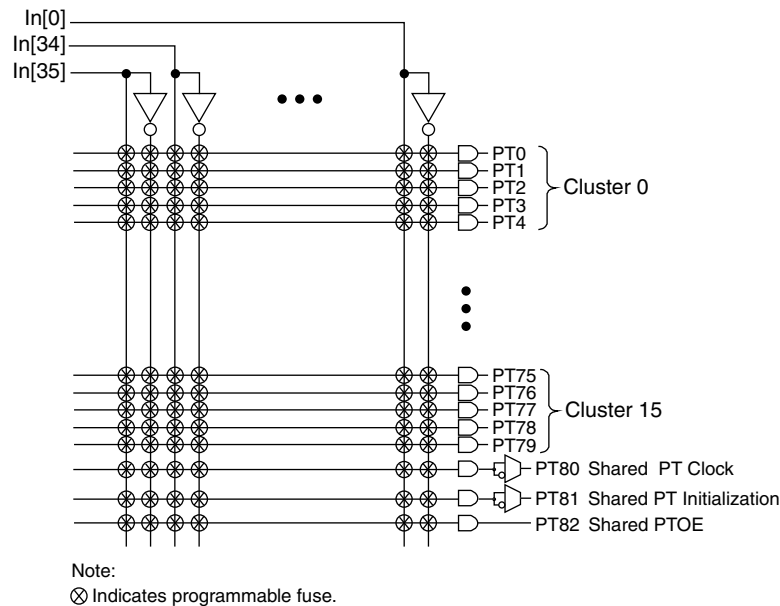
Product Status	Obsolete
Programmable Type	In System Programmable
Delay Time tpd(1) Max	7.5 ns
Voltage Supply - Internal	1.7V ~ 1.9V
Number of Logic Elements/Blocks	16
Number of Macrocells	256
Number of Gates	-
Number of I/O	128
Operating Temperature	-40°C ~ 130°C (TJ)
Mounting Type	Surface Mount
Package / Case	176-LQFP
Supplier Device Package	176-TQFP (24x24)
Purchase URL	https://www.e-xfl.com/product-detail/lattice-semiconductor/lc4256zc-75t176e

Figure 2. Generic Logic Block

AND Array

The programmable AND Array consists of 36 inputs and 83 output product terms. The 36 inputs from the GRP are used to form 72 lines in the AND Array (true and complement of the inputs). Each line in the array can be connected to any of the 83 output product terms via a wired-AND. Each of the 80 logic product terms feed the logic allocator with the remaining three control product terms feeding the Shared PT Clock, Shared PT Initialization and Shared PT OE. The Shared PT Clock and Shared PT Initialization signals can optionally be inverted before being fed to the macrocells.

Every set of five product terms from the 80 logic product terms forms a product term cluster starting with PT0. There is one product term cluster for every macrocell in the GLB. Figure 3 is a graphical representation of the AND Array.

Figure 3. AND Array

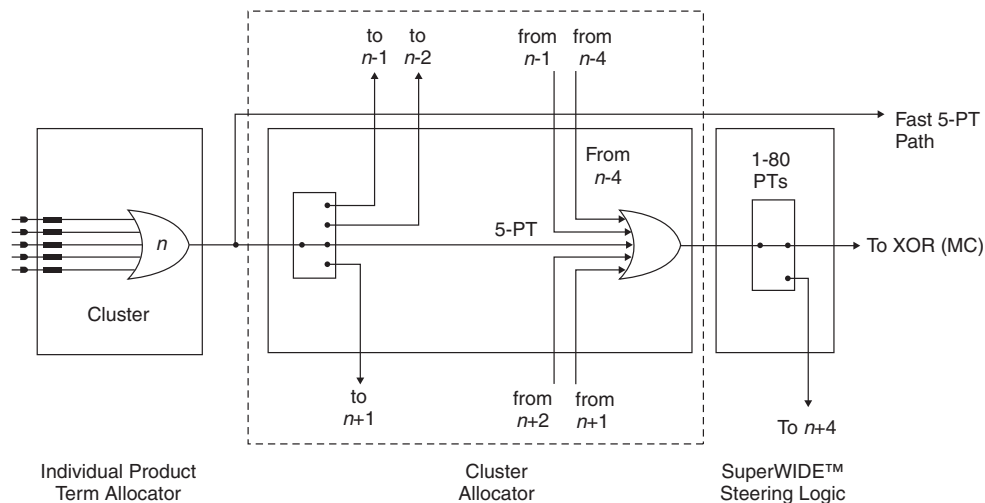
Enhanced Logic Allocator

Within the logic allocator, product terms are allocated to macrocells in product term clusters. Each product term cluster is associated with a macrocell. The cluster size for the ispMACH 4000 family is 4+1 (total 5) product terms. The software automatically considers the availability and distribution of product term clusters as it fits the functions within a GLB. The logic allocator is designed to provide three speed paths: 5-PT fast bypass path, 20-PT Speed Locking path and an up to 80-PT path. The availability of these three paths lets designers trade timing variability for increased performance.

The enhanced Logic Allocator of the ispMACH 4000 family consists of the following blocks:

- Product Term Allocator
- Cluster Allocator
- Wide Steering Logic

Figure 4 shows a macrocell slice of the Logic Allocator. There are 16 such slices in the GLB.

Figure 4. Macrocell Slice

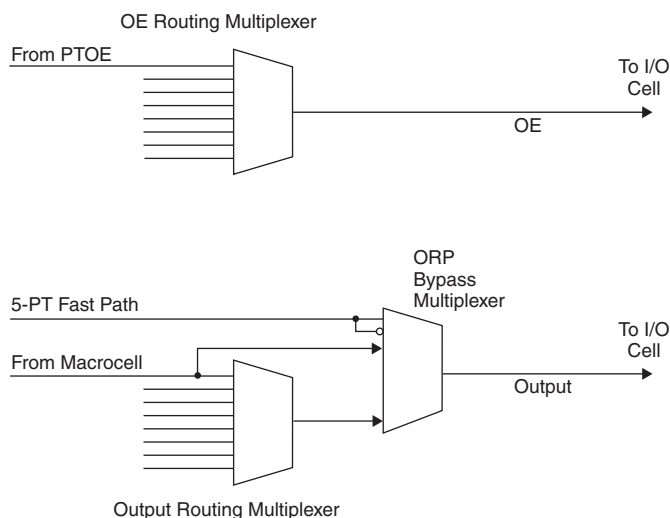
Output Routing Pool (ORP)

The Output Routing Pool allows macrocell outputs to be connected to any of several I/O cells within an I/O block. This provides greater flexibility in determining the pinout and allows design changes to occur without affecting the pinout. The output routing pool also provides a parallel capability for routing macrocell-level OE product terms. This allows the OE product term to follow the macrocell output as it is switched between I/O cells. Additionally, the output routing pool allows the macrocell output or true and complement forms of the 5-PT bypass signal to bypass the output routing multiplexers and feed the I/O cell directly. The enhanced ORP of the ispMACH 4000 family consists of the following elements:

- Output Routing Multiplexers
- OE Routing Multiplexers
- Output Routing Pool Bypass Multiplexers

Figure 7 shows the structure of the ORP from the I/O cell perspective. This is referred to as an ORP slice. Each ORP has as many ORP slices as there are I/O cells in the corresponding I/O block.

Figure 7. ORP Slice



Output Routing Multiplexers

The details of connections between the macrocells and the I/O cells vary across devices and within a device dependent on the maximum number of I/Os available. Tables 5-9 provide the connection details.

Table 6. ORP Combinations for I/O Blocks with 8 I/Os

I/O Cell	Available Macrocells
I/O 0	M0, M1, M2, M3, M4, M5, M6, M7
I/O 1	M2, M3, M4, M5, M6, M7, M8, M9
I/O 2	M4, M5, M6, M7, M8, M9, M10, M11
I/O 3	M6, M7, M8, M9, M10, M11, M12, M13
I/O 4	M8, M9, M10, M11, M12, M13, M14, M15
I/O 5	M10, M11, M12, M13, M14, M15, M0, M1
I/O 6	M12, M13, M14, M15, M0, M1, M2, M3
I/O 7	M14, M15, M0, M1, M2, M3, M4, M5

Absolute Maximum Ratings^{1, 2, 3}

	ispMACH 4000C/Z (1.8V)	ispMACH 4000B (2.5V)	ispMACH 4000V (3.3V)
Supply Voltage (V_{CC})	-0.5 to 2.5V	-0.5 to 5.5V	-0.5 to 5.5V
Output Supply Voltage (V_{CCO})	-0.5 to 4.5V	-0.5 to 4.5V	-0.5 to 4.5V
Input or I/O Tristate Voltage Applied ^{4, 5}	-0.5 to 5.5V	-0.5 to 5.5V	-0.5 to 5.5V
Storage Temperature	-65 to 150°C	-65 to 150°C	-65 to 150°C
Junction Temperature (T_j) with Power Applied	-55 to 150°C	-55 to 150°C	-55 to 150°C

1. Stress above those listed under the “Absolute Maximum Ratings” may cause permanent damage to the device. Functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.
2. Compliance with Lattice [Thermal Management](#) document is required.
3. All voltages referenced to GND.
4. Undershoot of -2V and overshoot of (V_{IH} (MAX) + 2V), up to a total pin voltage of 6.0V, is permitted for a duration of < 20ns.
5. Maximum of 64 I/Os per device with $V_{IN} > 3.6V$ is allowed.

Recommended Operating Conditions

Symbol	Parameter		Min.	Max.	Units
V _{CC}	Supply Voltage for 1.8V Devices	ispMACH 4000C	1.65	1.95	V
		ispMACH 4000Z	1.7	1.9	V
		ispMACH 4000Z, Extended Functional Voltage Operation	1.6 ^{1, 2}	1.9	V
	Supply Voltage for 2.5V Devices		2.3	2.7	V
	Supply Voltage for 3.3V Devices		3.0	3.6	V
T _j	Junction Temperature (Commercial)		0	90	C
	Junction Temperature (Industrial)		-40	105	C
	Junction Temperature (Extended)		-40	130	C

1. Devices operating at 1.6V can expect performance degradation up to 35%.
2. Applicable for devices with 2004 date codes and later. Contact factory for ordering instructions.

Erase Reprogram Specifications

Parameter	Min.	Max.	Units
Erase/Reprogram Cycle	1,000	—	Cycles

Note: Valid over commercial temperature range.

Hot Socketing Characteristics^{1,2,3}

Symbol	Parameter	Condition	Min.	Typ.	Max.	Units
I_{DK}	Input or I/O Leakage Current	$0 \leq V_{IN} \leq 3.0V$, $T_j = 105^\circ C$	—	± 30	± 150	μA
		$0 \leq V_{IN} \leq 3.0V$, $T_j = 130^\circ C$	—	± 30	± 200	μA

1. Insensitive to sequence of V_{CC} or V_{CCO} . However, assumes monotonic rise/fall rates for V_{CC} and V_{CCO} , provided $(V_{IN} - V_{CCO}) \leq 3.6V$.
2. $0 < V_{CC} < V_{CC} (MAX)$, $0 < V_{CCO} < V_{CCO} (MAX)$.
3. I_{DK} is additive to I_{PU} , I_{PD} or I_{BH} . Device defaults to pull-up until fuse circuitry is active.

I/O DC Electrical Characteristics

Over Recommended Operating Conditions

Standard	V_{IL}		V_{IH}		V_{OL} Max (V)	V_{OH} Min (V)	I_{OL}^1 (mA)	I_{OH}^1 (mA)
	Min (V)	Max (V)	Min (V)	Max (V)				
LVTTTL	-0.3	0.80	2.0	5.5	0.40	$V_{CCO} - 0.40$	8.0	-4.0
					0.20	$V_{CCO} - 0.20$	0.1	-0.1
LVCMOS 3.3	-0.3	0.80	2.0	5.5	0.40	$V_{CCO} - 0.40$	8.0	-4.0
					0.20	$V_{CCO} - 0.20$	0.1	-0.1
LVCMOS 2.5	-0.3	0.70	1.70	3.6	0.40	$V_{CCO} - 0.40$	8.0	-4.0
					0.20	$V_{CCO} - 0.20$	0.1	-0.1
LVCMOS 1.8 (4000V/B)	-0.3	0.63	1.17	3.6	0.40	$V_{CCO} - 0.45$	2.0	-2.0
					0.20	$V_{CCO} - 0.20$	0.1	-0.1
LVCMOS 1.8 (4000C/Z)	-0.3	$0.35 * V_{CC}$	$0.65 * V_{CC}$	3.6	0.40	$V_{CCO} - 0.45$	2.0	-2.0
					0.20	$V_{CCO} - 0.20$	0.1	-0.1
PCI 3.3 (4000V/B)	-0.3	1.08	1.5	5.5	$0.1 V_{CCO}$	$0.9 V_{CCO}$	1.5	-0.5
PCI 3.3 (4000C/Z)	-0.3	$0.3 * 3.3 * (V_{CC} / 1.8)$	$0.5 * 3.3 * (V_{CC} / 1.8)$	5.5	$0.1 V_{CCO}$	$0.9 V_{CCO}$	1.5	-0.5

1. The average DC current drawn by I/Os between adjacent bank GND connections, or between the last GND in an I/O bank and the end of the I/O bank, as shown in the logic signals connection table, shall not exceed $n * 8\text{mA}$. Where n is the number of I/Os between bank GND connections or between the last GND in a bank and the end of a bank.

ispMACH 4000V/B/C External Switching Characteristics

Over Recommended Operating Conditions

Parameter	Description ^{1, 2, 3}	-25		-27		-3		-35		Units
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
t _{PD}	5-PT bypass combinatorial propagation delay	—	2.5	—	2.7	—	3.0	—	3.5	ns
t _{PD_MC}	20-PT combinatorial propagation delay through macrocell	—	3.2	—	3.5	—	3.8	—	4.2	ns
t _S	GLB register setup time before clock	1.8	—	1.8	—	2.0	—	2.0	—	ns
t _{ST}	GLB register setup time before clock with T-type register	2.0	—	2.0	—	2.2	—	2.2	—	ns
t _{SIR}	GLB register setup time before clock, input register path	0.7	—	1.0	—	1.0	—	1.0	—	ns
t _{SIRZ}	GLB register setup time before clock with zero hold	1.7	—	2.0	—	2.0	—	2.0	—	ns
t _H	GLB register hold time after clock	0.0	—	0.0	—	0.0	—	0.0	—	ns
t _{HT}	GLB register hold time after clock with T-type register	0.0	—	0.0	—	0.0	—	0.0	—	ns
t _{HIR}	GLB register hold time after clock, input register path	0.9	—	1.0	—	1.0	—	1.0	—	ns
t _{HIRZ}	GLB register hold time after clock, input register path with zero hold	0.0	—	0.0	—	0.0	—	0.0	—	ns
t _{CO}	GLB register clock-to-output delay	—	2.2	—	2.7	—	2.7	—	2.7	ns
t _R	External reset pin to output delay	—	3.5	—	4.0	—	4.4	—	4.5	ns
t _{RW}	External reset pulse duration	1.5	—	1.5	—	1.5	—	1.5	-	ns
t _{PTOE/DIS}	Input to output local product term output enable/disable	—	4.0	—	4.5	—	5.0	—	5.5	ns
t _{GPTOE/DIS}	Input to output global product term output enable/disable	—	5.0	—	6.5	—	8.0	—	8.0	ns
t _{GOE/DIS}	Global OE input to output enable/disable	—	3.0	—	3.5	—	4.0	—	4.5	ns
t _{CW}	Global clock width, high or low	1.1	—	1.3	—	1.3	—	1.3	—	ns
t _{GW}	Global gate width low (for low transparent) or high (for high transparent)	1.1	—	1.3	—	1.3	—	1.3	—	ns
t _{WIR}	Input register clock width, high or low	1.1	—	1.3	—	1.3	—	1.3	—	ns
f _{MAX} ⁴	Clock frequency with internal feedback	—	400	—	333	—	322	—	322	MHz
f _{MAX} (Ext.)	Clock frequency with external feedback, [1/ (t _S + t _{CO})]	—	250	—	222	—	212	—	212	MHz

1. Timing numbers are based on default LVCMOS 1.8 I/O buffers. Use timing adjusters provided to calculate other standards.

Timing v.3.2

2. Measured using standard switching circuit, assuming GRP loading of 1 and 1 output switching.

3. Pulse widths and clock widths less than minimum will cause unknown behavior.

4. Standard 16-bit counter using GRP feedback.

ispMACH 4000V/B/C Internal Timing Parameters (Cont.)**Over Recommended Operating Conditions**

Parameter	Description	-2.5		-2.7		-3		-3.5		Units
t_{PDLi}	Propagation Delay through Transparent Latch to Output/ Feedback MUX	—	0.25	—	0.25	—	0.25	—	0.25	ns
t_{SRi}	Asynchronous Reset or Set to Output/Feedback MUX Delay	0.28	—	0.28	—	0.28	—	0.28	—	ns
t_{SRR}	Asynchronous Reset or Set Recovery Time	1.67	—	1.67	—	1.67	—	1.67	—	ns
Control Delays										
t_{BCLK}	GLB PT Clock Delay	—	1.12	—	1.12	—	1.12	—	1.12	ns
t_{PTCLK}	Macrocell PT Clock Delay	—	0.87	—	0.87	—	0.87	—	0.87	ns
t_{BSR}	Block PT Set/Reset Delay	—	1.83	—	1.83	—	1.83	—	1.83	ns
t_{PTSR}	Macrocell PT Set/Reset Delay	—	1.11	—	1.41	—	1.51	—	1.61	ns
t_{GPTOE}	Global PT OE Delay	—	2.83	—	4.13	—	5.33	—	5.33	ns
t_{PTOE}	Macrocell PT OE Delay	—	1.83	—	2.13	—	2.33	—	2.83	ns

Timing v.3.2

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

ispMACH 4000Z Timing Adders ¹

Adder Type	Base Parameter	Description	-35		-37		-42		Units
			Min.	Max.	Min.	Max.	Min.	Max.	
Optional Delay Adders									
t _{INDIO}	t _{INREG}	Input register delay	—	1.00	—	1.00	—	1.30	ns
t _{EXP}	t _{MCELL}	Product term expander delay	—	0.40	—	0.40	—	0.45	ns
t _{ORP}	—	Output routing pool delay	—	0.40	—	0.40	—	0.40	ns
t _{BLA}	t _{ROUTE}	Additional block load-ing adder	—	0.04	—	0.05	—	0.05	ns
t _{IOI} Input Adjusters									
LVTTTL_in	t _{IN} , t _{GCLK_IN} , t _{GOE}	Using LVTTTL standard	—	0.60	—	0.60	—	0.60	ns
LVC MOS33_in	t _{IN} , t _{GCLK_IN} , t _{GOE}	Using LVC MOS 3.3 standard	—	0.60	—	0.60	—	0.60	ns
LVC MOS25_in	t _{IN} , t _{GCLK_IN} , t _{GOE}	Using LVC MOS 2.5 standard	—	0.60	—	0.60	—	0.60	ns
LVC MOS18_in	t _{IN} , t _{GCLK_IN} , t _{GOE}	Using LVC MOS 1.8 standard	—	0.00	—	0.00	—	0.00	ns
PCI_in	t _{IN} , t _{GCLK_IN} , t _{GOE}	Using PCI compatible input	—	0.60	—	0.60	—	0.60	ns
t _{IOO} Output Adjusters									
LVTTTL_out	t _{BUF} , t _{EN} , t _{DIS}	Output configured as TTL buffer	—	0.20	—	0.20	—	0.20	ns
LVC MOS33_out	t _{BUF} , t _{EN} , t _{DIS}	Output configured as 3.3V buffer	—	0.20	—	0.20	—	0.20	ns
LVC MOS25_out	t _{BUF} , t _{EN} , t _{DIS}	Output configured as 2.5V buffer	—	0.10	—	0.10	—	0.10	ns
LVC MOS18_out	t _{BUF} , t _{EN} , t _{DIS}	Output configured as 1.8V buffer	—	0.00	—	0.00	—	0.00	ns
PCI_out	t _{BUF} , t _{EN} , t _{DIS}	Output configured as PCI compatible buffer	—	0.20	—	0.20	—	0.20	ns
Slow Slew	t _{BUF} , t _{EN}	Output configured for slow slew rate	—	1.00	—	1.00	—	1.00	ns

Note: Open drain timing is the same as corresponding LVC MOS timing.

Timing v.2.2

1. Refer to TN1004, [ispMACH 4000 Timing Model Design and Usage Guidelines](#) for information regarding the use of these adders.

ispMACH 4000V/B/C/Z Power Supply and NC Connections¹ (Cont.)

Signal	132-ball csBGA ⁷	144-pin TQFP ⁴	176-pin TQFP ⁴	256-ball ftBGA/fpBGA ^{2,3,7,9}
VCC	P1, A14, B7, N8	36, 57, 108, 129	42, 69, 88, 130, 157, 176	B2, B15, G8, G9, K8, K9, R2, R15
VCCO0 VCCO (Bank 0)	G3, P5, C1 ⁸ , M2 ⁸ , C5	3, 19, 34, 47, 136	4, 22, 40, 56, 166	D6, F4, H7, J7, L4, N6
VCCO1 VCCO (Bank 1)	M10, M14 ⁸ , H12, A10, C13 ⁸	64, 75, 91, 106, 119	78, 92, 110, 128, 144	D11, F13, H10, J10, L13, N11
GND	B1, P2, N14, A13	1, 37, 73, 109	2, 46 ⁵ , 65, 90, 134, 153	A1, A16, C6, C11, F3, F14, G7, G10, H8, H9, J8, J9, K7, K10, L3, L14, P6, P11, T1, T16
GND (Bank 0)	E2, K2, N4, B4	10, 18 ⁶ , 27, 46, 127, 137	13, 31, 55, 155, 167	
GND (Bank 1)	N11, K13, E13, B11	55, 65, 82, 90 ⁶ , 99, 118	67, 79, 101, 119, 143	
NC	4064Z: C1, C3, E1, E3, H2, J3, K1, M2, M4, N5, P7, P8, M8, P10, P11, P14, M12, K14, K12, G13, G14, E14, C13, B13, B10, C10, A7, B5, A5, A4, A1 4128Z: P8, A7	4128V: 17, 20, 38, 45, 72, 89, 92, 110, 117, 144 4256V: 18, 90	1, 43, 44, 45, 89, 131, 132, 133	4256V/B/C, 128 I/O: A4, A5, A6, A11, A12, A13, A15, B5, B6, B11, B12, B14, C7, D1, D4, D5, D10, D12, D16, E1, E2, E4, E5, E7, E10, E13, E14, E15, E16, F1, F2, F15, F16, G1, G4, G5, G6, G12, G13, G14, J11, K3, K4, K15, L1, L2, L12, L15, L16, M1, M2, M3, M4, M5, M12, M13, M15, M16, N1, N2, N7, N10, N12, N14, P5, P12, R4, R5, R6, R11, R12, R16, T2, T4, T5, T6, T11, T12, T13, T15 4256V/B/C, 160 I/O: A5, A12, A15, B5, B6, B11, B12, B14, D4, D5, D12, E1, E4, E5, E13, E15, E16, F1, F2, F15, G1, G5, G12, G14, L1, L2, L12, L15, L16, M1, M2, M3, M12, M16, N1, N12, N14, P5, R4, R5, R6, R11, R12, R16, T4, T5, T12, T15 4384V/B/C: B5, B12, D5, D12, E1, E15, E16, F2, L12, M1, M2, M16, N12, R5, R12, T4 4512V/B/C: None

1. All grounds must be electrically connected at the board level. However, for the purposes of I/O current loading, grounds are associated with the bank shown.
2. Internal GNDs and I/O GNDs (Bank 0/1) are connected inside package.
3. VCCO balls connect to two power planes within the package, one for VCCO0 and one for VCCO1.
4. Pin orientation follows the conventional order from pin 1 marking of the top side view and counter-clockwise.
5. ispMACH 4384V/B/C pin 46 is tied to GND (Bank 0).
6. ispMACH 4128V only.
7. Pin orientation A1 starts from the upper left corner of the top side view with alphabetical order ascending vertically and numerical order ascending horizontally.
8. ispMACH 4128Z and 4256Z only. NC for ispMACH 4064Z.
9. Use 256 ftBGA package for all new designs. Refer to PCN#14A-07 for 256 fpBGA package discontinuance.

**ispMACH 4032V/B/C and 4064V/B/C Logic Signal Connections:
44-Pin TQFP**

Pin Number	Bank Number	ispMACH 4032V/B/C		ispMACH 4064V/B/C	
		GLB/MC/Pad	ORP	GLB/MC/Pad	ORP
1	-	TDI	-	TDI	-
2	0	A5	A ⁵	A10	A ⁵
3	0	A6	A ⁶	A12	A ⁶
4	0	A7	A ⁷	A14	A ⁷
5	0	GND (Bank 0)	-	GND (Bank 0)	-
6	0	VCCO (Bank 0)	-	VCCO (Bank 0)	-
7	0	A8	A ⁸	B0	B ⁰
8	0	A9	A ⁹	B2	B ¹
9	0	A10	A ¹⁰	B4	B ²
10	-	TCK	-	TCK	-
11	-	VCC	-	VCC	-
12	-	GND	-	GND	-
13	0	A12	A ¹²	B8	B ⁴
14	0	A13	A ¹³	B10	B ⁵
15	0	A14	A ¹⁴	B12	B ⁶
16	0	A15	A ¹⁵	B14	B ⁷
17	1	CLK2/I	-	CLK2/I	-
18	1	B0	B ⁰	C0	C ⁰
19	1	B1	B ¹	C2	C ¹
20	1	B2	B ²	C4	C ²
21	1	B3	B ³	C6	C ³
22	1	B4	B ⁴	C8	C ⁴
23	-	TMS	-	TMS	-
24	1	B5	B ⁵	C10	C ⁵
25	1	B6	B ⁶	C12	C ⁶
26	1	B7	B ⁷	C14	C ⁷
27	1	GND (Bank 1)	-	GND (Bank 1)	-
28	1	VCCO (Bank 1)	-	VCCO (Bank 1)	-
29	1	B8	B ⁸	D0	D ⁰
30	1	B9	B ⁹	D2	D ¹
31	1	B10	B ¹⁰	D4	D ²
32	-	TDO	-	TDO	-
33	-	VCC	-	VCC	-
34	-	GND	-	GND	-
35	1	B12	B ¹²	D8	D ⁴
36	1	B13	B ¹³	D10	D ⁵
37	1	B14	B ¹⁴	D12	D ⁶
38	1	B15/GOE1	B ¹⁵	D14/GOE1	D ⁷
39	0	CLK0/I	-	CLK0/I	-
40	0	A0/GOE0	A ⁰	A0/GOE0	A ⁰
41	0	A1	A ¹	A2	A ¹

**ispMACH 4064Z, 4128Z and 4256Z Logic Signal Connections:
132-Ball csBGA (Cont.)**

Ball Number	Bank Number	ispMACH 4064Z		ispMACH 4128Z		ispMACH 4256Z	
		GLB/MC/Pad	ORP	GLB/MC/Pad	ORP	GLB/MC/Pad	ORP
E3	0	NC	-	B8	B ⁶	D12	D ⁶
F2	0	A12	A ¹²	B9	B ⁷	D10	D ⁵
F1	0	A13	A ¹³	B10	B ⁸	D8	D ⁴
F3	0	A14	A ¹⁴	B12	B ⁹	D6	D ³
G1	0	A15	A ¹⁵	B13	B ¹⁰	D4	D ²
G2	0	I	-	B14	B ¹¹	D2	D ¹
G3	0	VCCO (Bank 0)	-	VCCO (Bank 0)	-	VCCO (Bank 0)	-
H2	0	NC	-	C14	C ¹¹	E2	E ¹
H1	0	B15	B ¹⁵	C13	C ¹⁰	E4	E ²
H3	0	B14	B ¹⁴	C12	C ⁹	E6	E ³
J1	0	B13	B ¹³	C10	C ⁸	E8	E ⁴
J2	0	B12	B ¹²	C9	C ⁷	E10	E ⁵
J3	0	NC	-	C8	C ⁶	E12	E ⁶
K2	0	GND (Bank 0)	-	GND (Bank 0)	-	GND (Bank 0)	-
K1	0	NC	-	C6	C ⁵	F2	F ¹
K3	0	B11	B ¹¹	C5	C ⁴	F4	F ²
L2	0	B10	B ¹⁰	C4	C ³	F6	F ³
L1	0	B9	B ⁹	C2	C ²	F8	F ⁴
L3	0	B8	B ⁸	C1	C ¹	F10	F ⁵
M1	0	I	-	C0	C ⁰	F12	F ⁶
M2	0	NC	-	VCCO (Bank 0)	-	VCCO (Bank 0)	-
N1	-	TCK	-	TCK	-	TCK	-
P1	-	VCC	-	VCC	-	VCC	-
P2	-	GND	-	GND	-	GND	-
N2	0	I	-	D14	D ¹¹	G12	G ⁶
P3	0	B7	B ⁷	D13	D ¹⁰	G10	G ⁵
M3	0	B6	B ⁶	D12	D ⁹	G8	G ⁴
N3	0	B5	B ⁵	D10	D ⁸	G6	G ³
P4	0	B4	B ⁴	D9	D ⁷	G4	G ²
M4	0	NC	-	D8	D ⁶	G2	G ¹
N4	0	GND (Bank 0)	-	GND (Bank 0)	-	GND (Bank 0)	-
P5	0	VCCO (Bank 0)	-	VCCO (Bank 0)	-	VCCO (Bank 0)	-
N5	0	NC	-	D6	D ⁵	H12	H ⁶
M5	0	B3	B ³	D5	D ⁴	H10	H ⁵
N6	0	B2	B ²	D4	D ³	H8	H ⁴
P6	0	B1	B ¹	D2	D ²	H6	H ³
M6	0	B0	B ⁰	D1	D ¹	H4	H ²
P7	0	NC	-	D0	D ⁰	H2	H ¹
N7	0	CLK1/I	-	CLK1/I	-	CLK1/I	-
M7	1	CLK2/I	-	CLK2/I	-	CLK2/I	-
N8	-	VCC	-	VCC	-	VCC	-

ispMACH 4000B (2.5V) Commercial Devices (Cont.)

Device	Part Number	Macrocells	Voltage	t _{PD}	Package	Pin/Ball Count	I/O	Grade
LC4256B	LC4256B-3FT256AC	256	2.5	3	ftBGA	256	128	C
	LC4256B-5FT256AC	256	2.5	5	ftBGA	256	128	C
	LC4256B-75FT256AC	256	2.5	7.5	ftBGA	256	128	C
	LC4256B-3FT256BC	256	2.5	3	ftBGA	256	160	C
	LC4256B-5FT256BC	256	2.5	5	ftBGA	256	160	C
	LC4256B-75FT256BC	256	2.5	7.5	ftBGA	256	160	C
	LC4256B-3F256AC ¹	256	2.5	3	fpBGA	256	128	C
	LC4256B-5F256AC ¹	256	2.5	5	fpBGA	256	128	C
	LC4256B-75F256AC ¹	256	2.5	7.5	fpBGA	256	128	C
	LC4256B-3F256BC ¹	256	2.5	3	fpBGA	256	160	C
	LC4256B-5F256BC ¹	256	2.5	5	fpBGA	256	160	C
	LC4256B-75F256BC ¹	256	2.5	7.5	fpBGA	256	160	C
	LC4256B-3T176C	256	2.5	3	TQFP	176	128	C
	LC4256B-5T176C	256	2.5	5	TQFP	176	128	C
	LC4256B-75T176C	256	2.5	7.5	TQFP	176	128	C
	LC4256B-3T100C	256	2.5	3	TQFP	100	64	C
	LC4256B-5T100C	256	2.5	5	TQFP	100	64	C
	LC4256B-75T100C	256	2.5	7.5	TQFP	100	64	C
LC4384B	LC4384B-35FT256C	384	2.5	3.5	ftBGA	256	192	C
	LC4384B-5FT256C	384	2.5	5	ftBGA	256	192	C
	LC4384B-75FT256C	384	2.5	7.5	ftBGA	256	192	C
	LC4384B-35F256C ¹	384	2.5	3.5	fpBGA	256	192	C
	LC4384B-5F256C ¹	384	2.5	5	fpBGA	256	192	C
	LC4384B-75F256C ¹	384	2.5	7.5	fpBGA	256	192	C
	LC4384B-35T176C	384	2.5	3.5	TQFP	176	128	C
	LC4384B-5T176C	384	2.5	5	TQFP	176	128	C
	LC4384B-75T176C	384	2.5	7.5	TQFP	176	128	C
LC4512B	LC4512B-35FT256C	512	2.5	3.5	ftBGA	256	208	C
	LC4512B-5FT256C	512	2.5	5	ftBGA	256	208	C
	LC4512B-75FT256C	512	2.5	7.5	ftBGA	256	208	C
	LC4512B-35F256C ¹	512	2.5	3.5	fpBGA	256	208	C
	LC4512B-5F256C ¹	512	2.5	5	fpBGA	256	208	C
	LC4512B-75F256C ¹	512	2.5	7.5	fpBGA	256	208	C
	LC4512B-35T176C	512	2.5	3.5	TQFP	176	128	C
	LC4512B-5T176C	512	2.5	5	TQFP	176	128	C
	LC4512B-75T176C	512	2.5	7.5	TQFP	176	128	C

1. Use ftBGA package. fpBGA package devices have been discontinued via PCN#14A-07.

ispMACH 4000B (2.5V) Industrial Devices (Cont.)

Family	Part Number	Macrocells	Voltage	t _{PD}	Package	Pin/Ball Count	I/O	Grade
LC4384B	LC4384B-5FT256I	384	2.5	5	ftBGA	256	192	I
	LC4384B-75FT256I	384	2.5	7.5	ftBGA	256	192	I
	LC4384B-10FT256I	384	2.5	10	ftBGA	256	192	I
	LC4384B-5F256I ¹	384	2.5	5	fpBGA	256	192	I
	LC4384B-75F256I ¹	384	2.5	7.5	fpBGA	256	192	I
	LC4384B-10F256I ¹	384	2.5	10	fpBGA	256	192	I
	LC4384B-5T176I	384	2.5	5	TQFP	176	128	I
	LC4384B-75T176I	384	2.5	7.5	TQFP	176	128	I
	LC4384B-10T176I	384	2.5	10	TQFP	176	128	I
LC4512B	LC4512B-5FT256I	512	2.5	5	ftBGA	256	208	I
	LC4512B-75FT256I	512	2.5	7.5	ftBGA	256	208	I
	LC4512B-10FT256I	512	2.5	10	ftBGA	256	208	I
	LC4512B-5F256I ¹	512	2.5	5	fpBGA	256	208	I
	LC4512B-75F256I ¹	512	2.5	7.5	fpBGA	256	208	I
	LC4512B-10F256I ¹	512	2.5	10	fpBGA	256	208	I
	LC4512B-5T176I	512	2.5	5	TQFP	176	128	I
	LC4512B-75T176I	512	2.5	7.5	TQFP	176	128	I
	LC4512B-10T176I	512	2.5	10	TQFP	176	128	I

1. Use ftBGA package. fpBGA package devices have been discontinued via PCN#14A-07.

ispMACH 4000V (3.3V) Commercial Devices

Device	Part Number	Macrocells	Voltage	t _{PD}	Package	Pin/Ball Count	I/O	Grade
LC4032V	LC4032V-25T48C	32	3.3	2.5	TQFP	48	32	C
	LC4032V-5T48C	32	3.3	5	TQFP	48	32	C
	LC4032V-75T48C	32	3.3	7.5	TQFP	48	32	C
	LC4032V-25T44C	32	3.3	2.5	TQFP	44	30	C
	LC4032V-5T44C	32	3.3	5	TQFP	44	30	C
	LC4032V-75T44C	32	3.3	7.5	TQFP	44	30	C
LC4064V	LC4064V-25T100C	64	3.3	2.5	TQFP	100	64	C
	LC4064V-5T100C	64	3.3	5	TQFP	100	64	C
	LC4064V-75T100C	64	3.3	7.5	TQFP	100	64	C
	LC4064V-25T48C	64	3.3	2.5	TQFP	48	32	C
	LC4064V-5T48C	64	3.3	5	TQFP	48	32	C
	LC4064V-75T48C	64	3.3	7.5	TQFP	48	32	C
	LC4064V-25T44C	64	3.3	2.5	TQFP	44	30	C
	LC4064V-5T44C	64	3.3	5	TQFP	44	30	C
	LC4064V-75T44C	64	3.3	7.5	TQFP	44	30	C

ispMACH 4000V (3.3V) Commercial Devices (Cont.)

Device	Part Number	Macrocells	Voltage	t _{PD}	Package	Pin/Ball Count	I/O	Grade
LC4512V	LC4512V-35FT256C	512	3.3	3.5	ftBGA	256	208	C
	LC4512V-5FT256C	512	3.3	5	ftBGA	256	208	C
	LC4512V-75FT256C	512	3.3	7.5	ftBGA	256	208	C
	LC4512V-35F256C ¹	512	3.3	3.5	fpBGA	256	208	C
	LC4512V-5F256C ¹	512	3.3	5	fpBGA	256	208	C
	LC4512V-75F256C ¹	512	3.3	7.5	fpBGA	256	208	C
	LC4512V-35T176C	512	3.3	3.5	TQFP	176	128	C
	LC4512V-5T176C	512	3.3	5	TQFP	176	128	C
	LC4512V-75T176C	512	3.3	7.5	TQFP	176	128	C

1. Use ftBGA package. fpBGA package devices have been discontinued via PCN#14A-07.

ispMACH 4000V (3.3V) Industrial Devices

Family	Part Number	Macrocells	Voltage	t _{PD}	Package	Pin/Ball Count	I/O	Grade
LC4032V	LC4032V-5T48I	32	3.3	5	TQFP	48	32	I
	LC4032V-75T48I	32	3.3	7.5	TQFP	48	32	I
	LC4032V-10T48I	32	3.3	10	TQFP	48	32	I
	LC4032V-5T44I	32	3.3	5	TQFP	44	30	I
	LC4032V-75T44I	32	3.3	7.5	TQFP	44	30	I
	LC4032V-10T44I	32	3.3	10	TQFP	44	30	I
LC4064V	LC4064V-5T100I	64	3.3	5	TQFP	100	64	I
	LC4064V-75T100I	64	3.3	7.5	TQFP	100	64	I
	LC4064V-10T100I	64	3.3	10	TQFP	100	64	I
	LC4064V-5T48I	64	3.3	5	TQFP	48	32	I
	LC4064V-75T48I	64	3.3	7.5	TQFP	48	32	I
	LC4064V-10T48I	64	3.3	10	TQFP	48	32	I
	LC4064V-5T44I	64	3.3	5	TQFP	44	30	I
	LC4064V-75T44I	64	3.3	7.5	TQFP	44	30	I
	LC4064V-10T44I	64	3.3	10	TQFP	44	30	I
LC4128V	LC4128V-5T144I	128	3.3	5	TQFP	144	96	I
	LC4128V-75T144I	128	3.3	7.5	TQFP	144	96	I
	LC4128V-10T144I	128	3.3	10	TQFP	144	96	I
	LC4128V-5T128I	128	3.3	5	TQFP	128	92	I
	LC4128V-75T128I	128	3.3	7.5	TQFP	128	92	I
	LC4128V-10T128I	128	3.3	10	TQFP	128	92	I
	LC4128V-5T100I	128	3.3	5	TQFP	100	64	I
	LC4128V-75T100I	128	3.3	7.5	TQFP	100	64	I
	LC4128V-10T100I	128	3.3	10	TQFP	100	64	I

Lead-Free Packaging**ispMACH 4000Z (Zero Power, 1.8V) Lead-Free Commercial Devices**

Device	Part Number	Macrocells	Voltage	t _{PD}	Package	Pin/Ball Count	I/O	Grade
LC4032ZC	LC4032ZC-35MN56C	32	1.8	3.5	Lead-free csBGA	56	32	C
	LC4032ZC-5MN56C	32	1.8	5	Lead-free csBGA	56	32	C
	LC4032ZC-75MN56C	32	1.8	7.5	Lead-free csBGA	56	32	C
	LC4032ZC-35TN48C	32	1.8	3.5	Lead-free TQFP	48	32	C
	LC4032ZC-5TN48C	32	1.8	5	Lead-free TQFP	48	32	C
	LC4032ZC-75TN48C	32	1.8	7.5	Lead-free TQFP	48	32	C
LC4064ZC	LC4064ZC-37MN132C	64	1.8	3.7	Lead-free csBGA	132	64	C
	LC4064ZC-5MN132C	64	1.8	5	Lead-free csBGA	132	64	C
	LC4064ZC-75MN132C	64	1.8	7.5	Lead-free csBGA	132	64	C
	LC4064ZC-37TN100C	64	1.8	3.7	Lead-free TQFP	100	64	C
	LC4064ZC-5TN100C	64	1.8	5	Lead-free TQFP	100	64	C
	LC4064ZC-75TN100C	64	1.8	7.5	Lead-free TQFP	100	64	C
	LC4064ZC-37MN56C	64	1.8	3.7	Lead-free csBGA	56	32	C
	LC4064ZC-5MN56C	64	1.8	5	Lead-free csBGA	56	32	C
	LC4064ZC-75MN56C	64	1.8	7.5	Lead-free csBGA	56	32	C
	LC4064ZC-37TN48C	64	1.8	3.7	Lead-free TQFP	48	32	C
	LC4064ZC-5TN48C	64	1.8	5	Lead-free TQFP	48	32	C
	LC4064ZC-75TN48C	64	1.8	7.5	Lead-free TQFP	48	32	C
LC4128ZC	LC4128ZC-42MN132C	128	1.8	4.2	Lead-free csBGA	132	96	C
	LC4128ZC-75MN132C	128	1.8	7.5	Lead-free csBGA	132	96	C
	LC4128ZC-42TN100C	128	1.8	4.2	Lead-free TQFP	100	64	C
	LC4128ZC-75TN100C	128	1.8	7.5	Lead-free TQFP	100	64	C
LC4256ZC	LC4256ZC-45TN176C	256	1.8	4.5	Lead-free TQFP	176	128	C
	LC4256ZC-75TN176C	256	1.8	7.5	Lead-free TQFP	176	128	C
	LC4256ZC-45MN132C	256	1.8	4.5	Lead-free csBGA	132	96	C
	LC4256ZC-75MN132C	256	1.8	7.5	Lead-free csBGA	132	96	C
	LC4256ZC-45TN100C	256	1.8	4.5	Lead-free TQFP	100	64	C
	LC4256ZC-75TN100C	256	1.8	7.5	Lead-free TQFP	100	64	C

ispMACH 4000Z (Zero Power, 1.8V) Lead-Free Industrial Devices

Device	Part Number	Macrocells	Voltage	t _{PD}	Package	Pin/Ball Count	I/O	Grade
LC4032ZC	LC4032ZC-5MN56I	32	1.8	5	Lead-free csBGA	56	32	I
	LC4032ZC-75MN56I	32	1.8	7.5	Lead-free csBGA	56	32	I
	LC4032ZC-5TN48I	32	1.8	5	Lead-free TQFP	48	32	I
	LC4032ZC-75TN48I	32	1.8	7.5	Lead-free TQFP	48	32	I

ispMACH 4000Z (Zero Power, 1.8V) Lead-Free Industrial Devices (Cont.)

Device	Part Number	Macrocells	Voltage	t _{PD}	Package	Pin/Ball Count	I/O	Grade
LC4064ZC	LC4064ZC-5MN132I	64	1.8	5	Lead-free csBGA	132	64	I
	LC4064ZC-75MN132I	64	1.8	7.5	Lead-free csBGA	132	64	I
	LC4064ZC-5TN100I	64	1.8	5	Lead-free TQFP	100	64	I
	LC4064ZC-75TN100I	64	1.8	7.5	Lead-free TQFP	100	64	I
	LC4064ZC-5MN56I	64	1.8	5	Lead-free csBGA	56	32	I
	LC4064ZC-75MN56I	64	1.8	7.5	Lead-free csBGA	56	32	I
	LC4064ZC-5TN48I	64	1.8	5	Lead-free TQFP	48	32	I
	LC4064ZC-75TN48I	64	1.8	7.5	Lead-free TQFP	48	32	I
LC4128ZC	LC4128ZC-75MN132I	128	1.8	7.5	Lead-free csBGA	132	96	I
	LC4128ZC-75TN100I	128	1.8	7.5	Lead-free TQFP	100	64	I
LC4256ZC	LC4256ZC-75TN176I	256	1.8	7.5	Lead-free TQFP	176	128	I
	LC4256ZC-75MN132I	256	1.8	7.5	Lead-free csBGA	132	96	I
	LC4256ZC-75TN100I	256	1.8	7.5	Lead-free TQFP	100	64	I

ispMACH 4000Z (Zero Power, 1.8V) Lead-Free Extended Temperature Devices

Device	Part Number	Macrocells	Voltage	t _{PD}	Package	Pin/Ball Count	I/O	Grade
LC4032ZC	LC4032ZC-75TN48E	32	1.8	7.5	Lead-free TQFP	48	32	E
LC4064ZC	LC4064ZC-75TN100E	64	1.8	7.5	Lead-free TQFP	100	64	E
	LC4064ZC-75TN48E	64	1.8	7.5	Lead-free TQFP	48	32	E
LC4128ZC	LC4128ZC-75TN100E	128	1.8	7.5	Lead-free TQFP	100	64	E
LC4256ZC	LC4256ZC-75TN176E	256	1.8	7.5	Lead-free TQFP	176	128	E
	LC4256ZC-75TN100E	256	1.8	7.5	Lead-free TQFP	100	64	E

ispMACH 4000C (1.8V) Lead-Free Commercial Devices

Device	Part Number	Macrocells	Voltage	t _{PD}	Package	Pin/Ball Count	I/O	Grade
LC4032C	LC4032C-25TN48C	32	1.8	2.5	Lead-free TQFP	48	32	C
	LC4032C-5TN48C	32	1.8	5	Lead-free TQFP	48	32	C
	LC4032C-75TN48C	32	1.8	7.5	Lead-free TQFP	48	32	C
	LC4032C-25TN44C	32	1.8	2.5	Lead-free TQFP	44	30	C
	LC4032C-5TN44C	32	1.8	5	Lead-free TQFP	44	30	C
	LC4032C-75TN44C	32	1.8	7.5	Lead-free TQFP	44	30	C

ispMACH 4000B (2.5V) Lead-Free Commercial Devices (Cont.)

Device	Part Number	Macrocells	Voltage	t _{PD}	Package	Pin/Ball Count	I/O	Grade
LC4384B	LC4384B-35FTN256C	384	2.5	3.5	Lead-Free ftBGA	256	192	C
	LC4384B-5FTN256C	384	2.5	5	Lead-Free ftBGA	256	192	C
	LC4384B-75FTN256C	384	2.5	7.5	Lead-Free ftBGA	256	192	C
	LC4384B-35FN256C ¹	384	2.5	3.5	Lead-Free fpBGA	256	192	C
	LC4384B-5FN256C ¹	384	2.5	5	Lead-Free fpBGA	256	192	C
	LC4384B-75FN256C ¹	384	2.5	7.5	Lead-Free fpBGA	256	192	C
	LC4384B-35TN176C	384	2.5	3.5	Lead-Free TQFP	176	128	C
	LC4384B-5TN176C	384	2.5	5	Lead-Free TQFP	176	128	C
	LC4384B-75TN176C	384	2.5	7.5	Lead-Free TQFP	176	128	C
LC4512B	LC4512B-35FTN256C	512	2.5	3.5	Lead-Free ftBGA	256	208	C
	LC4512B-5FTN256C	512	2.5	5	Lead-Free ftBGA	256	208	C
	LC4512B-75FTN256C	512	2.5	7.5	Lead-Free ftBGA	256	208	C
	LC4512B-35FN256C ¹	512	2.5	3.5	Lead-Free fpBGA	256	208	C
	LC4512B-5FN256C ¹	512	2.5	5	Lead-Free fpBGA	256	208	C
	LC4512B-75FN256C ¹	512	2.5	7.5	Lead-Free fpBGA	256	208	C
	LC4512B-35TN176C	512	2.5	3.5	Lead-Free TQFP	176	128	C
	LC4512B-5TN176C	512	2.5	5	Lead-Free TQFP	176	128	C
	LC4512B-75TN176C	512	2.5	7.5	Lead-Free TQFP	176	128	C

1. Use ftBGA package. fpBGA package devices have been discontinued via PCN#14A-07.

ispMACH 4000B (2.5V) Lead-Free Industrial Devices

Device	Part Number	Macrocells	Voltage	t _{PD}	Package	Pin/Ball Count	I/O	Grade
LC4032B	LC4032B-5TN48I	32	2.5	5	Lead-Free TQFP	48	32	I
	LC4032B-75TN48I	32	2.5	7.5	Lead-Free TQFP	48	32	I
	LC4032B-10TN48I	32	2.5	10	Lead-Free TQFP	48	32	I
	LC4032B-5TN44I	32	2.5	5	Lead-Free TQFP	44	30	I
	LC4032B-75TN44I	32	2.5	7.5	Lead-Free TQFP	44	30	I
	LC4032B-10TN44I	32	2.5	10	Lead-Free TQFP	44	30	I
LC4064B	LC4064B-5TN100I	64	2.5	5	Lead-Free TQFP	100	64	I
	LC4064B-75TN100I	64	2.5	7.5	Lead-Free TQFP	100	64	I
	LC4064B-10TN100I	64	2.5	10	Lead-Free TQFP	100	64	I
	LC4064B-5TN48I	64	2.5	5	Lead-Free TQFP	48	32	I
	LC4064B-75TN48I	64	2.5	7.5	Lead-Free TQFP	48	32	I
	LC4064B-10TN48I	64	2.5	10	Lead-Free TQFP	48	32	I
	LC4064B-5TN44I	64	2.5	5	Lead-Free TQFP	44	30	I
	LC4064B-75TN44I	64	2.5	7.5	Lead-Free TQFP	44	30	I
	LC4064B-10TN44I	64	2.5	10	Lead-Free TQFP	44	30	I

ispMACH 4000B (2.5V) Lead-Free Industrial Devices (Cont.)

Device	Part Number	Macrocells	Voltage	t _{PD}	Package	Pin/Ball Count	I/O	Grade
LC4128B	LC4128B-5TN128I	128	2.5	5	Lead-Free TQFP	128	92	I
	LC4128B-75TN128I	128	2.5	7.5	Lead-Free TQFP	128	92	I
	LC4128B-10TN128I	128	2.5	10	Lead-Free TQFP	128	92	I
	LC4128B-5TN100I	128	2.5	5	Lead-Free TQFP	100	64	I
	LC4128B-75TN100I	128	2.5	7.5	Lead-Free TQFP	100	64	I
	LC4128B-10TN100I	128	2.5	10	Lead-Free TQFP	100	64	I
LC4256B	LC4256B-5FTN256AI	256	2.5	5	Lead-Free ftBGA	256	128	I
	LC4256B-75FTN256AI	256	2.5	7.5	Lead-Free ftBGA	256	128	I
	LC4256B-10FTN256AI	256	2.5	10	Lead-Free ftBGA	256	128	I
	LC4256B-5FTN256BI	256	2.5	5	Lead-Free ftBGA	256	160	I
	LC4256B-75FTN256BI	256	2.5	7.5	Lead-Free ftBGA	256	160	I
	LC4256B-10FTN256BI	256	2.5	10	Lead-Free ftBGA	256	160	I
	LC4256B-5FN256AI ¹	256	2.5	5	Lead-Free fpBGA	256	128	I
	LC4256B-75FN256AI ¹	256	2.5	7.5	Lead-Free fpBGA	256	128	I
	LC4256B-10FN256AI ¹	256	2.5	10	Lead-Free fpBGA	256	128	I
	LC4256B-5FN256BI ¹	256	2.5	5	Lead-Free fpBGA	256	160	I
	LC4256B-75FN256BI ¹	256	2.5	7.5	Lead-Free fpBGA	256	160	I
	LC4256B-10FN256BI ¹	256	2.5	10	Lead-Free fpBGA	256	160	I
	LC4256B-5TN176I	256	2.5	5	Lead-Free TQFP	176	128	I
	LC4256B-75TN176I	256	2.5	7.5	Lead-Free TQFP	176	128	I
	LC4256B-10TN176I	256	2.5	10	Lead-Free TQFP	176	128	I
	LC4256B-5TN100I	256	2.5	5	Lead-Free TQFP	100	64	I
	LC4256B-75TN100I	256	2.5	7.5	Lead-Free TQFP	100	64	I
	LC4256B-10TN100I	256	2.5	10	Lead-Free TQFP	100	64	I
LC4384B	LC4384B-5FTN256I	384	2.5	5	Lead-Free ftBGA	256	192	I
	LC4384B-75FTN256I	384	2.5	7.5	Lead-Free ftBGA	256	192	I
	LC4384B-10FTN256I	384	2.5	10	Lead-Free ftBGA	256	192	I
	LC4384B-5FN256I ¹	384	2.5	5	Lead-Free fpBGA	256	192	I
	LC4384B-75FN256I ¹	384	2.5	7.5	Lead-Free fpBGA	256	192	I
	LC4384B-10FN256I ¹	384	2.5	10	Lead-Free fpBGA	256	192	I
	LC4384B-5TN176I	384	2.5	5	Lead-Free TQFP	176	128	I
	LC4384B-75TN176I	384	2.5	7.5	Lead-Free TQFP	176	128	I
	LC4384B-10TN176I	384	2.5	10	Lead-Free TQFP	176	128	I
LC4512B	LC4512B-5FTN256I	512	2.5	5	Lead-Free ftBGA	256	208	I
	LC4512B-75FTN256I	512	2.5	7.5	Lead-Free ftBGA	256	208	I
	LC4512B-10FTN256I	512	2.5	10	Lead-Free ftBGA	256	208	I
	LC4512B-5FN256I ¹	512	2.5	5	Lead-Free fpBGA	256	208	I
	LC4512B-75FN256I ¹	512	2.5	7.5	Lead-Free fpBGA	256	208	I
	LC4512B-10FN256I ¹	512	2.5	10	Lead-Free fpBGA	256	208	I
	LC4512B-5TN176I	512	2.5	5	Lead-Free TQFP	176	128	I
	LC4512B-75TN176I	512	2.5	7.5	Lead-Free TQFP	176	128	I
	LC4512B-10TN176I	512	2.5	10	Lead-Free TQFP	176	128	I

1. Use ftBGA package. fpBGA package devices have been discontinued via PCN#14A-07.

ispMACH 4000V (3.3V) Lead-Free Commercial Devices

Device	Part Number	Macrocells	Voltage	t _{PD}	Package	Pin/Ball Count	I/O	Grade
LC4032V	LC4032V-25TN48C	32	3.3	2.5	Lead-free TQFP	48	32	C
	LC4032V-5TN48C	32	3.3	5	Lead-free TQFP	48	32	C
	LC4032V-75TN48C	32	3.3	7.5	Lead-free TQFP	48	32	C
	LC4032V-25TN44C	32	3.3	2.5	Lead-free TQFP	44	30	C
	LC4032V-5TN44C	32	3.3	5	Lead-free TQFP	44	30	C
	LC4032V-75TN44C	32	3.3	7.5	Lead-free TQFP	44	30	C
LC4064V	LC4064V-25TN100C	64	3.3	2.5	Lead-free TQFP	100	64	C
	LC4064V-5TN100C	64	3.3	5	Lead-free TQFP	100	64	C
	LC4064V-75TN100C	64	3.3	7.5	Lead-free TQFP	100	64	C
	LC4064V-25TN48C	64	3.3	2.5	Lead-free TQFP	48	32	C
	LC4064V-5TN48C	64	3.3	5	Lead-free TQFP	48	32	C
	LC4064V-75TN48C	64	3.3	7.5	Lead-free TQFP	48	32	C
	LC4064V-25TN44C	64	3.3	2.5	Lead-free TQFP	44	30	C
	LC4064V-5TN44C	64	3.3	5	Lead-free TQFP	44	30	C
	LC4064V-75TN44C	64	3.3	7.5	Lead-free TQFP	44	30	C
LC4128V	LC4128V-27TN144C	128	3.3	2.7	Lead-free TQFP	144	96	C
	LC4128V-5TN144C	128	3.3	5	Lead-free TQFP	144	96	C
	LC4128V-75TN144C	128	3.3	7.5	Lead-free TQFP	144	96	C
	LC4128V-27TN128C	128	3.3	2.7	Lead-free TQFP	128	92	C
	LC4128V-5TN128C	128	3.3	5	Lead-free TQFP	128	92	C
	LC4128V-75TN128C	128	3.3	7.5	Lead-free TQFP	128	92	C
	LC4128V-27TN100C	128	3.3	2.7	Lead-free TQFP	100	64	C
	LC4128V-5TN100C	128	3.3	5	Lead-free TQFP	100	64	C
	LC4128V-75TN100C	128	3.3	7.5	Lead-free TQFP	100	64	C

ispMACH 4000V (3.3V) Lead-Free Industrial Devices

Device	Part Number	Macrocells	Voltage	t _{PD}	Package	Pin/Ball Count	I/O	Grade
LC4032V	LC4032V-5TN48I	32	3.3	5	Lead-free TQFP	48	32	I
	LC4032V-75TN48I	32	3.3	7.5	Lead-free TQFP	48	32	I
	LC4032V-10TN48I	32	3.3	10	Lead-free TQFP	48	32	I
	LC4032V-5TN44I	32	3.3	5	Lead-free TQFP	44	30	I
	LC4032V-75TN44I	32	3.3	7.5	Lead-free TQFP	44	30	I
	LC4032V-10TN44I	32	3.3	10	Lead-free TQFP	44	30	I
LC4064V	LC4064V-5TN100I	64	3.3	5	Lead-free TQFP	100	64	I
	LC4064V-75TN100I	64	3.3	7.5	Lead-free TQFP	100	64	I
	LC4064V-10TN100I	64	3.3	10	Lead-free TQFP	100	64	I
	LC4064V-5TN48I	64	3.3	5	Lead-free TQFP	48	32	I
	LC4064V-75TN48I	64	3.3	7.5	Lead-free TQFP	48	32	I
	LC4064V-10TN48I	64	3.3	10	Lead-free TQFP	48	32	I
	LC4064V-5TN44I	64	3.3	5	Lead-free TQFP	44	30	I
	LC4064V-75TN44I	64	3.3	7.5	Lead-free TQFP	44	30	I
	LC4064V-10TN44I	64	3.3	10	Lead-free TQFP	44	30	I
LC4128V	LC4128V-5TN144I	128	3.3	5	Lead-free TQFP	144	96	I
	LC4128V-75TN144I	128	3.3	7.5	Lead-free TQFP	144	96	I
	LC4128V-10TN144I	128	3.3	10	Lead-free TQFP	144	96	I
	LC4128V-5TN128I	128	3.3	5	Lead-free TQFP	128	92	I
	LC4128V-75TN128I	128	3.3	7.5	Lead-free TQFP	128	92	I
	LC4128V-10TN128I	128	3.3	10	Lead-free TQFP	128	92	I
	LC4128V-5TN100I	128	3.3	5	Lead-free TQFP	100	64	I
	LC4128V-75TN100I	128	3.3	7.5	Lead-free TQFP	100	64	I
	LC4128V-10TN100I	128	3.3	10	Lead-free TQFP	100	64	I