



Welcome to [E-XFL.COM](#)

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	1.65V ~ 1.95V
Number of Logic Elements/Blocks	8
Number of Macrocells	128
Number of Gates	-
Number of I/O	92
Operating Temperature	-40°C ~ 105°C (Tj)
Mounting Type	Surface Mount
Package / Case	128-LQFP
Supplier Device Package	128-TQFP (14x14)
Purchase URL	https://www.e-xfl.com/product-detail/lattice-semiconductor/lc4128c-75t128i

Product Term Allocator

The product term allocator assigns product terms from a cluster to either logic or control applications as required by the design being implemented. Product terms that are used as logic are steered into a 5-input OR gate associated with the cluster. Product terms that used for control are steered either to the macrocell or I/O cell associated with the cluster. Table 3 shows the available functions for each of the five product terms in the cluster. The OR gate output connects to the associated I/O cell, providing a fast path for narrow combinatorial functions, and to the logic allocator.

Table 3. Individual PT Steering

Product Term	Logic	Control
PT n	Logic PT	Single PT for XOR/OR
PT $n+1$	Logic PT	Individual Clock (PT Clock)
PT $n+2$	Logic PT	Individual Initialization or Individual Clock Enable (PT Initialization/CE)
PT $n+3$	Logic PT	Individual Initialization (PT Initialization)
PT $n+4$	Logic PT	Individual OE (PTOE)

Cluster Allocator

The cluster allocator allows clusters to be steered to neighboring macrocells, thus allowing the creation of functions with more product terms. Table 4 shows which clusters can be steered to which macrocells. Used in this manner, the cluster allocator can be used to form functions of up to 20 product terms. Additionally, the cluster allocator accepts inputs from the wide steering logic. Using these inputs, functions up to 80 product terms can be created.

Table 4. Available Clusters for Each Macrocell

Macrocell	Available Clusters			
M0	—	C0	C1	C2
M1	C0	C1	C2	C3
M2	C1	C2	C3	C4
M3	C2	C3	C4	C5
M4	C3	C4	C5	C6
M5	C4	C5	C6	C7
M6	C5	C6	C7	C8
M7	C6	C7	C8	C9
M8	C7	C8	C9	C10
M9	C8	C9	C10	C11
M10	C9	C10	C11	C12
M11	C10	C11	C12	C13
M12	C11	C12	C13	C14
M13	C12	C13	C14	C15
M14	C13	C14	C15	—
M15	C14	C15	—	—

Wide Steering Logic

The wide steering logic allows the output of the cluster allocator n to be connected to the input of the cluster allocator $n+4$. Thus, cluster chains can be formed with up to 80 product terms, supporting wide product term functions and allowing performance to be increased through a single GLB implementation. Table 5 shows the product term chains.

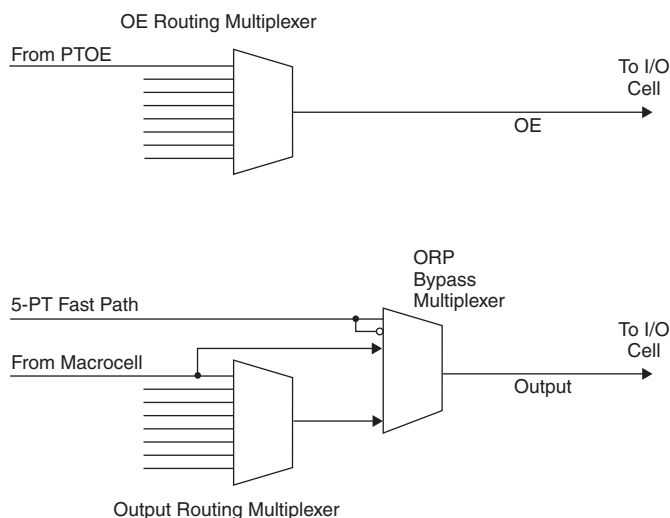
Output Routing Pool (ORP)

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

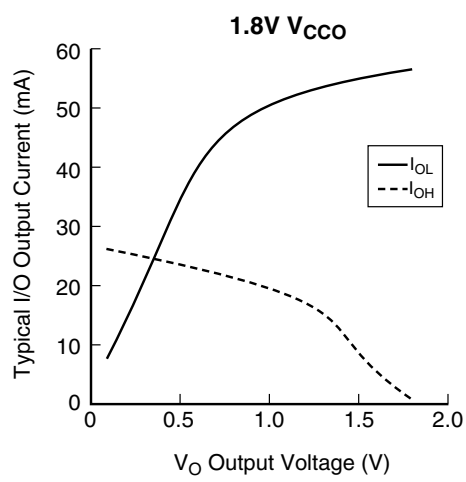
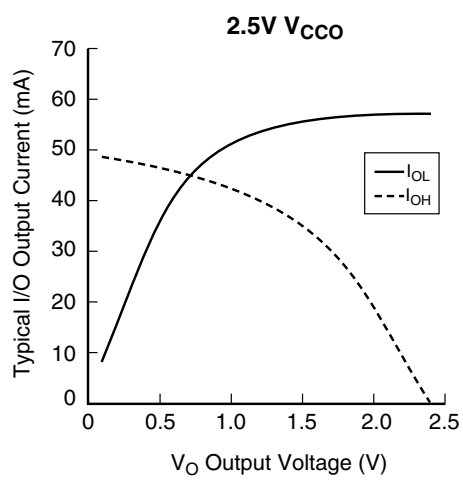
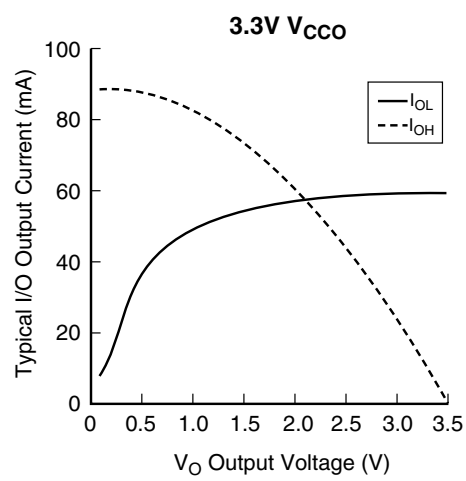


Output Routing Multiplexers

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



ispMACH 4000V/B/C External Switching Characteristics (Cont.)

Over Recommended Operating Conditions

Parameter	Description ^{1, 2, 3}	-5		-75		-10		Units
		Min.	Max.	Min.	Max.	Min.	Max.	
t_{PD}	5-PT bypass combinatorial propagation delay	—	5.0	—	7.5	—	10.0	ns
t_{PD_MC}	20-PT combinatorial propagation delay through macrocell	—	5.5	—	8.0	—	10.5	ns
t_S	GLB register setup time before clock	3.0	—	4.5	—	5.5	—	ns
t_{ST}	GLB register setup time before clock with T-type register	3.2	—	4.7	—	5.5	—	ns
t_{SIR}	GLB register setup time before clock, input register path	1.2	—	1.7	—	1.7	—	ns
t_{SIRZ}	GLB register setup time before clock with zero hold	2.2	—	2.7	—	2.7	—	ns
t_H	GLB register hold time after clock	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	—	ns
t_{HIR}	GLB register hold time after clock, input register path	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	—	ns
t_{CO}	GLB register clock-to-output delay	—	3.4	—	4.5	—	6.0	ns
t_R	External reset pin to output delay	—	6.3	—	9.0	—	10.5	ns
t_{RW}	External reset pulse duration	2.0	—	4.0	—	4.0	—	ns
$t_{PTOE/DIS}$	Input to output local product term output enable/disable	—	7.0	—	9.0	—	10.5	ns
$t_{GPTOE/DIS}$	Input to output global product term output enable/disable	—	9.0	—	10.3	—	12.0	ns
$t_{GOE/DIS}$	Global OE input to output enable/disable	—	5.0	—	7.0	—	8.0	ns
t_{CW}	Global clock width, high or low	2.2	—	2.8	—	4.0	—	ns
t_{GW}	Global gate width low (for low transparent) or high (for high transparent)	2.2	—	2.8	—	4.0	—	ns
t_{WIR}	Input register clock width, high or low	2.2	—	2.8	—	4.0	—	ns
f_{MAX}^4	Clock frequency with internal feedback	—	227	—	168	—	125	MHz
f_{MAX} (Ext.)	Clock frequency with external feedback, $[1/(t_S + t_{CO})]$	—	156	—	111	—	86	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	-5		-75		-10		Units
		Min.	Max.	Min.	Max.	Min.	Max.	
t _{GPTOE}	Global PT OE Delay	—	5.58	—	5.58	—	5.78	ns
t _{PTOE}	Macrocell PT OE Delay	—	3.58	—	4.28	—	4.28	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 Internal Timing Parameters (Cont.)**Over Recommended Operating Conditions**

Parameter	Description	-35		-37		-42		Units
		Min.	Max.	Min.	Max.	Min.	Max.	
t _{GPTOE}	Global PT OE Delay	—	1.9	—	2.35	—	2.60	ns
t _{PPTOE}	Macrocell PT OE Delay	—	2.4	—	3.35	—	2.60	ns

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

Timing v.2.2

ispMACH 4000V/B/C Timing Adders¹

Adder Type	Base Parameter	Description	-25		-27		-3		-35		Units
			Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
Optional Delay Adders											
t _{INDIO}	t _{INREG}	Input register delay	—	0.95	—	1.00	—	1.00	—	1.00	ns
t _{EXP}	t _{MCELL}	Product term expander delay	—	0.33	—	0.33	—	0.33	—	0.33	ns
t _{ORP}	—	Output routing pool delay	—	0.05	—	0.05	—	0.05	—	0.05	ns
t _{BLA}	t _{ROUTE}	Additional block loading adder	—	0.03	—	0.05	—	0.05	—	0.05	ns
t _{IOI} Input Adjusters											
LVTTL_in	t _{IN} , t _{GCLK_IN} , t _{GOE}	Using LVTTL standard	—	0.60	—	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	—	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	—	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	—	0.00	ns
PCI_in	t _{IN} , t _{GCLK_IN} , t _{GOE}	Using PCI compatible input	—	0.60	—	0.60	—	0.60	—	0.60	ns
t _{IOO} Output Adjusters											
LVTTL_out	t _{BUF} , t _{EN} , t _{DIS}	Output configured as TTL buffer	—	0.20	—	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	—	0.20	ns
LVC MOS25_out	t _{BUF} , t _{EN} , t _{DIS}	Output configured as 2.5V buffer	—	0.10	—	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	—	0.00	ns
PCI_out	t _{BUF} , t _{EN} , t _{DIS}	Output configured as PCI compatible buffer	—	0.20	—	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	—	1.00	ns

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

Timing v.3.2

1. Refer to TN1004, [ispMACH 4000 Timing Model Design and Usage Guidelines](#) for information regarding 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 4128V/B/C Logic Signal Connections: 128-Pin TQFP (Cont.)

Pin Number	Bank Number	ispMACH 4128V/B/C	
		GLB/MC/Pad	ORP
19	0	C13	C ¹⁰
20	0	C12	C ⁹
21	0	C10	C ⁸
22	0	C9	C ⁷
23	0	C8	C ⁶
24	0	GND (Bank 0)	-
25	0	C6	C ⁵
26	0	C5	C ⁴
27	0	C4	C ³
28	0	C2	C ²
29	0	C0	C ⁰
30	0	VCCO (Bank 0)	-
31	0	TCK	-
32	0	VCC	-
33	0	GND	-
34	0	D14	D ¹¹
35	0	D13	D ¹⁰
36	0	D12	D ⁹
37	0	D10	D ⁸
38	0	D9	D ⁷
39	0	D8	D ⁶
40	0	GND (Bank 0)	-
41	0	VCCO (Bank 0)	-
42	0	D6	D ⁵
43	0	D5	D ⁴
44	0	D4	D ³
45	0	D2	D ²
46	0	D1	D ¹
47	0	D0	D ⁰
48	0	CLK1/I	-
49	1	GND (Bank 1)	-
50	1	CLK2/I	-
51	1	VCC	-
52	1	E0	E ⁰
53	1	E1	E ¹
54	1	E2	E ²
55	1	E4	E ³
56	1	E5	E ⁴
57	1	E6	E ⁵
58	1	VCCO (Bank 1)	-
59	1	GND (Bank 1)	-
60	1	E8	E ⁶
61	1	E9	E ⁷

ispMACH 4128V/B/C Logic Signal Connections: 128-Pin TQFP (Cont.)

Pin Number	Bank Number	ispMACH 4128V/B/C	
		GLB/MC/Pad	ORP
105	1	VCCO (Bank 1)	-
106	1	H6	H ⁵
107	1	H5	H ⁴
108	1	H4	H ³
109	1	H2	H ²
110	1	H1	H ¹
111	1	H0/GOE1	H ⁰
112	1	CLK3/I	-
113	0	GND (Bank 0)	-
114	0	CLK0/I	-
115	0	VCC	-
116	0	A0/GOE0	A ⁰
117	0	A1	A ¹
118	0	A2	A ²
119	0	A4	A ³
120	0	A5	A ⁴
121	0	A6	A ⁵
122	0	VCCO (Bank 0)	-
123	0	GND (Bank 0)	-
124	0	A8	A ⁶
125	0	A9	A ⁷
126	0	A10	A ⁸
127	0	A12	A ⁹
128	0	A14	A ¹¹

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

Ball Number	Bank Number	ispMACH 4064Z		ispMACH 4128Z		ispMACH 4256Z	
		GLB/MC/Pad	ORP	GLB/MC/Pad	ORP	GLB/MC/Pad	ORP
B1	-	GND	-	GND	-	GND	-
B2	-	TDI	-	TDI	-	TDI	-
C1	0	NC	-	VCCO (Bank 0)	-	VCCO (Bank 0)	-
C3	0	NC	-	B0	B ⁰	C12	C ⁶
C2	0	A8	A ⁸	B1	B ¹	C10	C ⁵
D1	0	A9	A ⁹	B2	B ²	C8	C ⁴
D3	0	A10	A ¹⁰	B4	B ³	C6	C ³
D2	0	A11	A ¹¹	B5	B ⁴	C4	C ²
E1	0	NC	-	B6	B ⁵	C2	C ¹
E2	0	GND (Bank 0)	-	GND (Bank 0)	-	GND (Bank 0)	-

**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
P8	1	NC ¹	-	NC ¹	-	I ¹	-
M8	1	NC	-	E0	E ⁰	I2	I ¹
P9	1	C0	C ⁰	E1	E ¹	I4	I ²
N9	1	C1	C ¹	E2	E ²	I6	I ³
M9	1	C2	C ²	E4	E ³	I8	I ⁴
N10	1	C3	C ³	E5	E ⁴	I10	I ⁵
P10	1	NC	-	E6	E ⁵	I12	I ⁶
M10	1	VCCO (Bank 1)	-	VCCO (Bank 1)	-	VCCO (Bank 1)	-
N11	1	GND (Bank 1)	-	GND (Bank 1)	-	GND (Bank 1)	-
P11	1	NC	-	E8	E ⁶	J2	J ¹
M11	1	C4	C ⁴	E9	E ⁷	J4	J ²
P12	1	C5	C ⁵	E10	E ⁸	J6	J ³
N12	1	C6	C ⁶	E12	E ⁹	J8	J ⁴
P13	1	C7	C ⁷	E13	E ¹⁰	J10	J ⁵
P14	1	NC	-	E14	E ¹¹	J12	J ⁶
N14	-	GND	-	GND	-	GND	-
N13	-	TMS	-	TMS	-	TMS	-
M14	1	NC	-	VCCO (Bank 1)	-	VCCO (Bank 1)	-
M12	1	NC	-	F0	F ⁰	K12	K ⁶
M13	1	C8	C ⁸	F1	F ¹	K10	K ⁵
L14	1	C9	C ⁹	F2	F ²	K8	K ⁴
L12	1	C10	C ¹⁰	F4	F ³	K6	K ³
L13	1	C11	C ¹¹	F5	F ⁴	K4	K ²
K14	1	NC	-	F6	F ⁵	K2	K ¹
K13	1	GND (Bank 1)	-	GND (Bank 1)	-	GND (Bank 1)	-
K12	1	NC	-	F8	F ⁶	L12	L ⁶
J13	1	C12	C ¹²	F9	F ⁷	L10	L ⁵
J14	1	C13	C ¹³	F10	F ⁸	L8	L ⁴
J12	1	C14	C ¹⁴	F12	F ⁹	L6	L ³
H14	1	C15	C ¹⁵	F13	F ¹⁰	L4	L ²
H13	1	I	-	F14	F ¹¹	L2	L ¹
H12	1	VCCO (Bank 1)	-	VCCO (Bank 1)	-	VCCO (Bank 1)	-
G13	1	NC	-	G14	G ¹¹	M2	M ¹
G14	1	NC	-	G13	G ¹⁰	M4	M ²
G12	1	D15	D ¹⁵	G12	G ⁹	M6	M ³
F14	1	D14	D ¹⁴	G10	G ⁸	M8	M ⁴
F13	1	D13	D ¹³	G9	G ⁷	M10	M ⁵
F12	1	D12	D ¹²	G8	G ⁶	M12	M ⁶
E13	1	GND (Bank 1)	-	GND (Bank 1)	-	GND (Bank 1)	-
E14	1	NC	-	G6	G ⁵	N2	N ¹
E12	1	D11	D ¹¹	G5	G ⁴	N4	N ²

**ispMACH 4256V/B/C/Z, 4384V/B/C, 4512V/B/C, Logic Signal Connections:
176-Pin TQFP (Cont.)**

Pin Number	Bank Number	ispMACH 4256V/B/C/Z		ispMACH 4384V/B/C		ispMACH 4512V/B/C	
		GLB/MC/Pad	ORP	GLB/MC/Pad	ORP	GLB/MC/Pad	ORP
101	1	GND (Bank 1)	-	GND (Bank 1)	-	GND (Bank 1)	-
102	1	L14	L ¹⁴	AX14	AX ¹⁴	GX14	GX ¹⁴
103	1	L12	L ¹²	AX12	AX ¹²	GX12	GX ¹²
104	1	L10	L ¹⁰	AX10	AX ¹⁰	GX10	GX ¹⁰
105	1	L8	L ⁸	AX8	AX ⁸	GX8	GX ⁸
106	1	L6	L ⁶	AX6	AX ⁶	GX6	GX ⁶
107	1	L4	L ⁴	AX4	AX ⁴	GX4	GX ⁴
108	1	L2	L ²	AX2	AX ²	GX2	GX ²
109	1	L0	L ⁰	AX0	AX ⁰	GX0	GX ⁰
110	1	VCCO (Bank 1)	-	VCCO (Bank 1)	-	VCCO (Bank 1)	-
111	1	M0	M ⁰	DX0	DX ⁰	JX0	JX ⁰
112	1	M2	M ²	DX2	DX ²	JX2	JX ²
113	1	M4	M ⁴	DX4	DX ⁴	JX4	JX ⁴
114	1	M6	M ⁶	DX6	DX ⁶	JX6	JX ⁶
115	1	M8	M ⁸	DX8	DX ⁸	JX8	JX ⁸
116	1	M10	M ¹⁰	DX10	DX ¹⁰	JX10	JX ¹⁰
117	1	M12	M ¹²	DX12	DX ¹²	JX12	JX ¹²
118	1	M14	M ¹⁴	DX14	DX ¹⁴	JX14	JX ¹⁴
119	1	GND (Bank 1)	-	GND (Bank 1)	-	GND (Bank 1)	-
120	1	N0	N ⁰	FX0	FX ⁰	NX0	NX ⁰
121	1	N2	N ²	FX2	FX ²	NX2	NX ²
122	1	N4	N ⁴	FX4	FX ⁴	NX4	NX ⁴
123	1	N6	N ⁶	FX6	FX ⁶	NX6	NX ⁶
124	1	N8	N ⁸	FX8	FX ⁸	NX8	NX ⁸
125	1	N10	N ¹⁰	FX10	FX ¹⁰	NX10	NX ¹⁰
126	1	N12	N ¹²	FX12	FX ¹²	NX12	NX ¹²
127	1	N14	N ¹⁴	FX14	FX ¹⁴	NX14	NX ¹⁴
128	1	VCCO (Bank 1)	-	VCCO (Bank 1)	-	VCCO (Bank 1)	-
129	-	TDO	-	TDO	-	TDO	-
130	-	VCC	-	VCC	-	VCC	-
131	-	NC	-	NC	-	NC	-
132	-	NC	-	NC	-	NC	-
133	-	NC	-	NC	-	NC	-
134	-	GND	-	GND	-	GND	-
135	1	O14	O ¹⁴	GX14	GX ¹⁴	OX14	OX ¹⁴
136	1	O12	O ¹²	GX12	GX ¹²	OX12	OX ¹²
137	1	O10	O ¹⁰	GX10	GX ¹⁰	OX10	OX ¹⁰
138	1	O8	O ⁸	GX8	GX ⁸	OX8	OX ⁸
139	1	O6	O ⁶	GX6	GX ⁶	OX6	OX ⁶
140	1	O4	O ⁴	GX4	GX ⁴	OX4	OX ⁴
141	1	O2	O ²	GX2	GX ²	OX2	OX ²

ispMACH 4000C (1.8V) Commercial Devices (Cont.)

Device	Part Number	Macrocells	Voltage	t _{PD}	Package	Pin/Ball Count	I/O	Grade
LC4128C	LC4128C-27T128C	128	1.8	2.7	TQFP	128	92	C
	LC4128C-5T128C	128	1.8	5	TQFP	128	92	C
	LC4128C-75T128C	128	1.8	7.5	TQFP	128	92	C
	LC4128C-27T100C	128	1.8	2.7	TQFP	100	64	C
	LC4128C-5T100C	128	1.8	5	TQFP	100	64	C
	LC4128C-75T100C	128	1.8	7.5	TQFP	100	64	C
LC4256C	LC4256C-3FT256AC	256	1.8	3	ftBGA	256	128	C
	LC4256C-5FT256AC	256	1.8	5	ftBGA	256	128	C
	LC4256C-75FT256AC	256	1.8	7.5	ftBGA	256	128	C
	LC4256C-3FT256BC	256	1.8	3	ftBGA	256	160	C
	LC4256C-5FT256BC	256	1.8	5	ftBGA	256	160	C
	LC4256C-75FT256BC	256	1.8	7.5	ftBGA	256	160	C
	LC4256C-3F256AC ¹	256	1.8	3	fpBGA	256	128	C
	LC4256C-5F256AC ¹	256	1.8	5	fpBGA	256	128	C
	LC4256C-75F256AC ¹	256	1.8	7.5	fpBGA	256	128	C
	LC4256C-3F256BC ¹	256	1.8	3	fpBGA	256	160	C
	LC4256C-5F256BC ¹	256	1.8	5	fpBGA	256	160	C
	LC4256C-75F256BC ¹	256	1.8	7.5	fpBGA	256	160	C
	LC4256C-3T176C	256	1.8	3	TQFP	176	128	C
	LC4256C-5T176C	256	1.8	5	TQFP	176	128	C
	LC4256C-75T176C	256	1.8	7.5	TQFP	176	128	C
	LC4256C-3T100C	256	1.8	3	TQFP	100	64	C
	LC4256C-5T100C	256	1.8	5	TQFP	100	64	C
	LC4256C-75T100C	256	1.8	7.5	TQFP	100	64	C
LC4384C	LC4384C-35FT256C	384	1.8	3.5	ftBGA	256	192	C
	LC4384C-5FT256C	384	1.8	5	ftBGA	256	192	C
	LC4384C-75FT256C	384	1.8	7.5	ftBGA	256	192	C
	LC4384C-35F256C ¹	384	1.8	3.5	fpBGA	256	192	C
	LC4384C-5F256C ¹	384	1.8	5	fpBGA	256	192	C
	LC4384C-75F256C ¹	384	1.8	7.5	fpBGA	256	192	C
	LC4384C-35T176C	384	1.8	3.5	TQFP	176	128	C
	LC4384C-5T176C	384	1.8	5	TQFP	176	128	C
	LC4384C-75T176C	384	1.8	7.5	TQFP	176	128	C
LC4512C	LC4512C-35FT256C	512	1.8	3.5	ftBGA	256	208	C
	LC4512C-5FT256C	512	1.8	5	ftBGA	256	208	C
	LC4512C-75FT256C	512	1.8	7.5	ftBGA	256	208	C
	LC4512C-35F256C ¹	512	1.8	3.5	fpBGA	256	208	C
	LC4512C-5F256C ¹	512	1.8	5	fpBGA	256	208	C
	LC4512C-75F256C ¹	512	1.8	7.5	fpBGA	256	208	C
	LC4512C-35T176C	512	1.8	3.5	TQFP	176	128	C
	LC4512C-5T176C	512	1.8	5	TQFP	176	128	C
	LC4512C-75T176C	512	1.8	7.5	TQFP	176	128	C

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

ispMACH 4000C (1.8V) Industrial Devices (Cont.)

Family	Part Number	Macrocells	Voltage	t _{PD}	Package	Pin/Ball Count	I/O	Grade
LC4384C	LC4384C-5FT256I	384	1.8	5	ftBGA	256	192	I
	LC4384C-75FT256I	384	1.8	7.5	ftBGA	256	192	I
	LC4384C-10FT256I	384	1.8	10	ftBGA	256	192	I
	LC4384C-5F256I ¹	384	1.8	5	fpBGA	256	192	I
	LC4384C-75F256I ¹	384	1.8	7.5	fpBGA	256	192	I
	LC4384C-10F256I ¹	384	1.8	10	fpBGA	256	192	I
	LC4384C-5T176I	384	1.8	5	TQFP	176	128	I
	LC4384C-75T176I	384	1.8	7.5	TQFP	176	128	I
	LC4384C-10T176I	384	1.8	10	TQFP	176	128	I
LC4512C	LC4512C-5FT256I	512	1.8	5	ftBGA	256	208	I
	LC4512C-75FT256I	512	1.8	7.5	ftBGA	256	208	I
	LC4512C-10FT256I	512	1.8	10	ftBGA	256	208	I
	LC4512C-5F256I ¹	512	1.8	5	fpBGA	256	208	I
	LC4512C-75F256I ¹	512	1.8	7.5	fpBGA	256	208	I
	LC4512C-10F256I ¹	512	1.8	10	fpBGA	256	208	I
	LC4512C-5T176I	512	1.8	5	TQFP	176	128	I
	LC4512C-75T176I	512	1.8	7.5	TQFP	176	128	I
	LC4512C-10T176I	512	1.8	10	TQFP	176	128	I

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

ispMACH 4000B (2.5V) Commercial Devices

Device	Part Number	Macrocells	Voltage	t _{PD}	Package	Pin/Ball Count	I/O	Grade
LC4032B	LC4032B-25T48C	32	2.5	2.5	TQFP	48	32	C
	LC4032B-5T48C	32	2.5	5	TQFP	48	32	C
	LC4032B-75T48C	32	2.5	7.5	TQFP	48	32	C
	LC4032B-25T44C	32	2.5	2.5	TQFP	44	30	C
	LC4032B-5T44C	32	2.5	5	TQFP	44	30	C
	LC4032B-75T44C	32	2.5	7.5	TQFP	44	30	C
LC4064B	LC4064B-25T100C	64	2.5	2.5	TQFP	100	64	C
	LC4064B-5T100C	64	2.5	5	TQFP	100	64	C
	LC4064B-75T100C	64	2.5	7.5	TQFP	100	64	C
	LC4064B-25T48C	64	2.5	2.5	TQFP	48	32	C
	LC4064B-5T48C	64	2.5	5	TQFP	48	32	C
	LC4064B-75T48C	64	2.5	7.5	TQFP	48	32	C
	LC4064B-25T44C	64	2.5	2.5	TQFP	44	30	C
	LC4064B-5T44C	64	2.5	5	TQFP	44	30	C
	LC4064B-75T44C	64	2.5	7.5	TQFP	44	30	C
LC4128B	LC4128B-27T128C	128	2.5	2.7	TQFP	128	92	C
	LC4128B-5T128C	128	2.5	5	TQFP	128	92	C
	LC4128B-75T128C	128	2.5	7.5	TQFP	128	92	C
	LC4128B-27T100C	128	2.5	2.7	TQFP	100	64	C
	LC4128B-5T100C	128	2.5	5	TQFP	100	64	C
	LC4128B-75T100C	128	2.5	7.5	TQFP	100	64	C

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 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 4000C (1.8V) Lead-Free Industrial Devices (Cont.)

Device	Part Number	Macrocells	Voltage	t _{PD}	Package	Pin/Ball Count	I/O	Grade
LC4256C	LC4256C-5FTN256AI	256	1.8	5	Lead-free ftBGA	256	128	I
	LC4256C-75FTN256AI	256	1.8	7.5	Lead-free ftBGA	256	128	I
	LC4256C-10FTN256AI	256	1.8	10	Lead-free ftBGA	256	128	I
	LC4256C-5FTN256BI	256	1.8	5	Lead-free ftBGA	256	160	I
	LC4256C-75FTN256BI	256	1.8	7.5	Lead-free ftBGA	256	160	I
	LC4256C-10FTN256BI	256	1.8	10	Lead-free ftBGA	256	160	I
	LC4256C-5FN256AI ¹	256	1.8	5	Lead-free fpBGA	256	128	I
	LC4256C-75FN256AI ¹	256	1.8	7.5	Lead-free fpBGA	256	128	I
	LC4256C-10FN256AI ¹	256	1.8	10	Lead-free fpBGA	256	128	I
	LC4256C-5FN256BI ¹	256	1.8	5	Lead-free fpBGA	256	160	I
	LC4256C-75FN256BI ¹	256	1.8	7.5	Lead-free fpBGA	256	160	I
	LC4256C-10FN256BI ¹	256	1.8	10	Lead-free fpBGA	256	160	I
	LC4256C-5TN176I	256	1.8	5	Lead-free TQFP	176	128	I
	LC4256C-75TN176I	256	1.8	7.5	Lead-free TQFP	176	128	I
	LC4256C-10TN176I	256	1.8	10	Lead-free TQFP	176	128	I
	LC4256C-5TN100I	256	1.8	5	Lead-free TQFP	100	64	I
	LC4256C-75TN100I	256	1.8	7.5	Lead-free TQFP	100	64	I
	LC4256C-10TN100I	256	1.8	10	Lead-free TQFP	100	64	I
LC4384C	LC4384C-5FTN256I	384	1.8	5	Lead-free ftBGA	256	192	I
	LC4384C-75FTN256I	384	1.8	7.5	Lead-free ftBGA	256	192	I
	LC4384C-10FTN256I	384	1.8	10	Lead-free ftBGA	256	192	I
	LC4384C-5FN256I ¹	384	1.8	5	Lead-free fpBGA	256	192	I
	LC4384C-75FN256I ¹	384	1.8	7.5	Lead-free fpBGA	256	192	I
	LC4384C-10FN256I ¹	384	1.8	10	Lead-free fpBGA	256	192	I
	LC4384C-5TN176I	384	1.8	5	Lead-free TQFP	176	128	I
	LC4384C-75TN176I	384	1.8	7.5	Lead-free TQFP	176	128	I
	LC4384C-10TN176I	384	1.8	10	Lead-free TQFP	176	128	I
LC4512C	LC4512C-5FTN256I	512	1.8	5	Lead-free ftBGA	256	208	I
	LC4512C-75FTN256I	512	1.8	7.5	Lead-free ftBGA	256	208	I
	LC4512C-10FTN256I	512	1.8	10	Lead-free ftBGA	256	208	I
	LC4512C-5FN256I ¹	512	1.8	5	Lead-free fpBGA	256	208	I
	LC4512C-75FN256I ¹	512	1.8	7.5	Lead-free fpBGA	256	208	I
	LC4512C-10FN256I ¹	512	1.8	10	Lead-free fpBGA	256	208	I
	LC4512C-5TN176I	512	1.8	5	Lead-free TQFP	176	128	I
	LC4512C-75TN176I	512	1.8	7.5	Lead-free TQFP	176	128	I
	LC4512C-10TN176I	512	1.8	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 (Cont.)

Device	Part Number	Macrocells	Voltage	t _{PD}	Package	Pin/Ball Count	I/O	Grade
LC4256V	LC4256V-3FTN256AC	256	3.3	3	Lead-free ftBGA	256	128	C
	LC4256V-5FTN256AC	256	3.3	5	Lead-free ftBGA	256	128	C
	LC4256V-75FTN256AC	256	3.3	7.5	Lead-free ftBGA	256	128	C
	LC4256V-3FTN256BC	256	3.3	3	Lead-free ftBGA	256	160	C
	LC4256V-5FTN256BC	256	3.3	5	Lead-free ftBGA	256	160	C
	LC4256V-75FTN256BC	256	3.3	7.5	Lead-free ftBGA	256	160	C
	LC4256V-3FN256AC ¹	256	3.3	3	Lead-free fpBGA	256	128	C
	LC4256V-5FN256AC ¹	256	3.3	5	Lead-free fpBGA	256	128	C
	LC4256V-75FN256AC ¹	256	3.3	7.5	Lead-free fpBGA	256	128	C
	LC4256V-3FN256BC ¹	256	3.3	3	Lead-free fpBGA	256	160	C
	LC4256V-5FN256BC ¹	256	3.3	5	Lead-free fpBGA	256	160	C
	LC4256V-75FN256BC ¹	256	3.3	7.5	Lead-free fpBGA	256	160	C
	LC4256V-3TN176C	256	3.3	3	Lead-free TQFP	176	128	C
	LC4256V-5TN176C	256	3.3	5	Lead-free TQFP	176	128	C
	LC4256V-75TN176C	256	3.3	7.5	Lead-free TQFP	176	128	C
	LC4256V-3TN144C	256	3.3	3	Lead-free TQFP	144	96	C
	LC4256V-5TN144C	256	3.3	5	Lead-free TQFP	144	96	C
	LC4256V-75TN144C	256	3.3	7.5	Lead-free TQFP	144	96	C
	LC4256V-3TN100C	256	3.3	3	Lead-free TQFP	100	64	C
	LC4256V-5TN100C	256	3.3	5	Lead-free TQFP	100	64	C
	LC4256V-75TN100C	256	3.3	7.5	Lead-free TQFP	100	64	C
LC4384V	LC4384V-35FTN256C	384	3.3	3.5	Lead-free ftBGA	256	192	C
	LC4384V-5FTN256C	384	3.3	5	Lead-free ftBGA	256	192	C
	LC4384V-75FTN256C	384	3.3	7.5	Lead-free ftBGA	256	192	C
	LC4384V-35FN256C ¹	384	3.3	3.5	Lead-free fpBGA	256	192	C
	LC4384V-5FN256C ¹	384	3.3	5	Lead-free fpBGA	256	192	C
	LC4384V-75FN256C ¹	384	3.3	7.5	Lead-free fpBGA	256	192	C
	LC4384V-35TN176C	384	3.3	3.5	Lead-free TQFP	176	128	C
	LC4384V-5TN176C	384	3.3	5	Lead-free TQFP	176	128	C
	LC4384V-75TN176C	384	3.3	7.5	Lead-free TQFP	176	128	C
LC4512V	LC4512V-35FTN256C	512	3.3	3.5	Lead-free ftBGA	256	208	C
	LC4512V-5FTN256C	512	3.3	5	Lead-free ftBGA	256	208	C
	LC4512V-75FTN256C	512	3.3	7.5	Lead-free ftBGA	256	208	C
	LC4512V-35FN256C ¹	512	3.3	3.5	Lead-free fpBGA	256	208	C
	LC4512V-5FN256C ¹	512	3.3	5	Lead-free fpBGA	256	208	C
	LC4512V-75FN256C ¹	512	3.3	7.5	Lead-free fpBGA	256	208	C
	LC4512V-35TN176C	512	3.3	3.5	Lead-free TQFP	176	128	C
	LC4512V-5TN176C	512	3.3	5	Lead-free TQFP	176	128	C
	LC4512V-75TN176C	512	3.3	7.5	Lead-free TQFP	176	128	C

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

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

Device	Part Number	Macrocells	Voltage	t _{PD}	Package	Pin/Ball Count	I/O	Grade
LC4256V	LC4256V-5FTN256AI	256	3.3	5	Lead-free ftBGA	256	128	I
	LC4256V-75FTN256AI	256	3.3	7.5	Lead-free ftBGA	256	128	I
	LC4256V-10FTN256AI	256	3.3	10	Lead-free ftBGA	256	128	I
	LC4256V-5FTN256BI	256	3.3	5	Lead-free ftBGA	256	160	I
	LC4256V-75FTN256BI	256	3.3	7.5	Lead-free ftBGA	256	160	I
	LC4256V-10FTN256BI	256	3.3	10	Lead-free ftBGA	256	160	I
	LC4256V-5FN256AI ¹	256	3.3	5	Lead-free fpBGA	256	128	I
	LC4256V-75FN256AI ¹	256	3.3	7.5	Lead-free fpBGA	256	128	I
	LC4256V-10FN256AI ¹	256	3.3	10	Lead-free fpBGA	256	128	I
	LC4256V-5FN256BI ¹	256	3.3	5	Lead-free fpBGA	256	160	I
	LC4256V-75FN256BI ¹	256	3.3	7.5	Lead-free fpBGA	256	160	I
	LC4256V-10FN256BI ¹	256	3.3	10	Lead-free fpBGA	256	160	I
	LC4256V-5TN176I	256	3.3	5	Lead-free TQFP	176	128	I
	LC4256V-75TN176I	256	3.3	7.5	Lead-free TQFP	176	128	I
	LC4256V-10TN176I	256	3.3	10	Lead-free TQFP	176	128	I
	LC4256V-5TN144I	256	3.3	5	Lead-free TQFP	144	96	I
	LC4256V-75TN144I	256	3.3	7.5	Lead-free TQFP	144	96	I
	LC4256V-10TN144I	256	3.3	10	Lead-free TQFP	144	96	I
	LC4256V-5TN100I	256	3.3	5	Lead-free TQFP	100	64	I
	LC4256V-75TN100I	256	3.3	7.5	Lead-free TQFP	100	64	I
	LC4256V-10TN100I	256	3.3	10	Lead-free TQFP	100	64	I
LC4384V	LC4384V-5FTN256I	384	3.3	5	Lead-free ftBGA	256	192	I
	LC4384V-75FTN256I	384	3.3	7.5	Lead-free ftBGA	256	192	I
	LC4384V-10FTN256I	384	3.3	10	Lead-free ftBGA	256	192	I
	LC4384V-5FN256I ¹	384	3.3	5	Lead-free fpBGA	256	192	I
	LC4384V-75FN256I ¹	384	3.3	7.5	Lead-free fpBGA	256	192	I
	LC4384V-10FN256I ¹	384	3.3	10	Lead-free fpBGA	256	192	I
	LC4384V-5TN176I	384	3.3	5	Lead-free TQFP	176	128	I
	LC4384V-75TN176I	384	3.3	7.5	Lead-free TQFP	176	128	I
	LC4384V-10TN176I	384	3.3	10	Lead-free TQFP	176	128	I
LC4512V	LC4512V-5FTN256I	512	3.3	5	Lead-free ftBGA	256	208	I
	LC4512V-75FTN256I	512	3.3	7.5	Lead-free ftBGA	256	208	I
	LC4512V-10FTN256I	512	3.3	10	Lead-free ftBGA	256	208	I
	LC4512V-5FN256I ¹	512	3.3	5	Lead-free fpBGA	256	208	I
	LC4512V-75FN256I ¹	512	3.3	7.5	Lead-free fpBGA	256	208	I
	LC4512V-10FN256I ¹	512	3.3	10	Lead-free fpBGA	256	208	I
	LC4512V-5TN176I	512	3.3	5	Lead-free TQFP	176	128	I
	LC4512V-75TN176I	512	3.3	7.5	Lead-free TQFP	176	128	I
	LC4512V-10TN176I	512	3.3	10	Lead-free TQFP	176	128	I

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