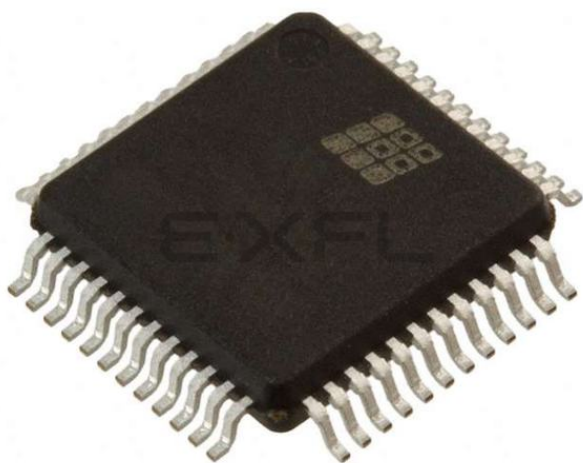




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### Understanding [Embedded - CPLDs \(Complex Programmable Logic Devices\)](#)

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           | 5 ns                                                                                                                                                              |
| Voltage Supply - Internal       | 1.65V ~ 1.95V                                                                                                                                                     |
| Number of Logic Elements/Blocks | 2                                                                                                                                                                 |
| Number of Macrocells            | 32                                                                                                                                                                |
| Number of Gates                 | -                                                                                                                                                                 |
| Number of I/O                   | 32                                                                                                                                                                |
| Operating Temperature           | 0°C ~ 90°C (TJ)                                                                                                                                                   |
| Mounting Type                   | Surface Mount                                                                                                                                                     |
| Package / Case                  | 48-LQFP                                                                                                                                                           |
| Supplier Device Package         | 48-TQFP (7x7)                                                                                                                                                     |
| Purchase URL                    | <a href="https://www.e-xfl.com/product-detail/lattice-semiconductor/lc4032c-5tn48c">https://www.e-xfl.com/product-detail/lattice-semiconductor/lc4032c-5tn48c</a> |

**Table 2. ispMACH 4000Z Family Selection Guide**

|                                   | ispMACH 4032ZC      | ispMACH 4064ZC                               | ispMACH 4128ZC       | ispMACH 4256ZC                    |
|-----------------------------------|---------------------|----------------------------------------------|----------------------|-----------------------------------|
| Macrocells                        | 32                  | 64                                           | 128                  | 256                               |
| I/O + Dedicated Inputs            | 32+4/32+4           | 32+4/32+12/<br>64+10/64+10                   | 64+10/96+4           | 64+10/96+6/<br>128+4              |
| t <sub>PD</sub> (ns)              | 3.5                 | 3.7                                          | 4.2                  | 4.5                               |
| t <sub>S</sub> (ns)               | 2.2                 | 2.5                                          | 2.7                  | 2.9                               |
| t <sub>CO</sub> (ns)              | 3.0                 | 3.2                                          | 3.5                  | 3.8                               |
| f <sub>MAX</sub> (MHz)            | 267                 | 250                                          | 220                  | 200                               |
| Supply Voltage (V)                | 1.8                 | 1.8                                          | 1.8                  | 1.8                               |
| Max. Standby I <sub>CC</sub> (μA) | 20                  | 25                                           | 35                   | 55                                |
| Pins/Package                      | 48 TQFP<br>56 csBGA | 48 TQFP<br>56 csBGA<br>100 TQFP<br>132 csBGA | 100 TQFP<br>132csBGA | 100 TQFP<br>132 csBGA<br>176 TQFP |

## ispMACH 4000 Introduction

The high performance ispMACH 4000 family from Lattice offers a SuperFAST CPLD solution. The family is a blend of Lattice's two most popular architectures: the ispLSI® 2000 and ispMACH 4A. Retaining the best of both families, the ispMACH 4000 architecture focuses on significant innovations to combine the highest performance with low power in a flexible CPLD family.

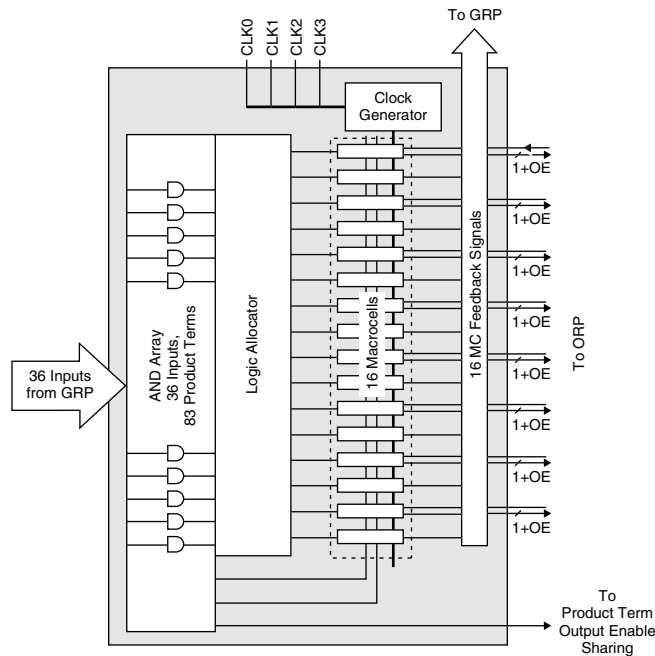
The ispMACH 4000 combines high speed and low power with the flexibility needed for ease of design. With its robust Global Routing Pool and Output Routing Pool, this family delivers excellent First-Time-Fit, timing predictability, routing, pin-out retention and density migration.

The ispMACH 4000 family offers densities ranging from 32 to 512 macrocells. There are multiple density-I/O combinations in Thin Quad Flat Pack (TQFP), Chip Scale BGA (csBGA) and Fine Pitch Thin BGA (ftBGA) packages ranging from 44 to 256 pins/balls. Table 1 shows the macrocell, package and I/O options, along with other key parameters.

The ispMACH 4000 family has enhanced system integration capabilities. It supports 3.3V (4000V), 2.5V (4000B) and 1.8V (4000C/Z) supply voltages and 3.3V, 2.5V and 1.8V interface voltages. Additionally, inputs can be safely driven up to 5.5V when an I/O bank is configured for 3.3V operation, making this family 5V tolerant. The ispMACH 4000 also offers enhanced I/O features such as slew rate control, PCI compatibility, bus-keeper latches, pull-up resistors, pull-down resistors, open drain outputs and hot socketing. The ispMACH 4000 family members are 3.3V/2.5V/1.8V in-system programmable through the IEEE Standard 1532 interface. IEEE Standard 1149.1 boundary scan testing capability also allows product testing on automated test equipment. The 1532 interface signals TCK, TMS, TDI and TDO are referenced to V<sub>CC</sub> (logic core).

## Overview

The ispMACH 4000 devices consist of multiple 36-input, 16-macrocell Generic Logic Blocks (GLBs) interconnected by a Global Routing Pool (GRP). Output Routing Pools (ORPs) connect the GLBs to the I/O Blocks (IOBs), which contain multiple I/O cells. This architecture is shown in Figure 1.

**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.

**Table 10. ORP Combinations for I/O Blocks with 12 I/Os**

| I/O Cell | Available Macrocells                 |
|----------|--------------------------------------|
| I/O 0    | M0, M1, M2, M3, M4, M5, M6, M7       |
| I/O 1    | M1, M2, M3, M4, M5, M6, M7, M8       |
| I/O 2    | M2, M3, M4, M5, M6, M7, M8, M9       |
| I/O 3    | M4, M5, M6, M7, M8, M9, M10, M11     |
| I/O 4    | M5, M6, M7, M8, M9, M10, M11, M12    |
| I/O 5    | M6, M7, M8, M9, M10, M11, M12, M13   |
| I/O 6    | M8, M9, M10, M11, M12, M13, M14, M15 |
| I/O 7    | M9, M10, M11, M12, M13, M14, M15, M0 |
| I/O 8    | M10, M11, M12, M13, M14, M15, M0, M1 |
| I/O 9    | M12, M13, M14, M15, M0, M1, M2, M3   |
| I/O 10   | M13, M14, M15, M0, M1, M2, M3, M4    |
| I/O 11   | M14, M15, M0, M1, M2, M3, M4, M5     |

## ORP Bypass and Fast Output Multiplexers

The ORP bypass and fast-path output multiplexer is a 4:1 multiplexer and allows the 5-PT fast path to bypass the ORP and be connected directly to the pin with either the regular output or the inverted output. This multiplexer also allows the register output to bypass the ORP to achieve faster  $t_{CO}$ .

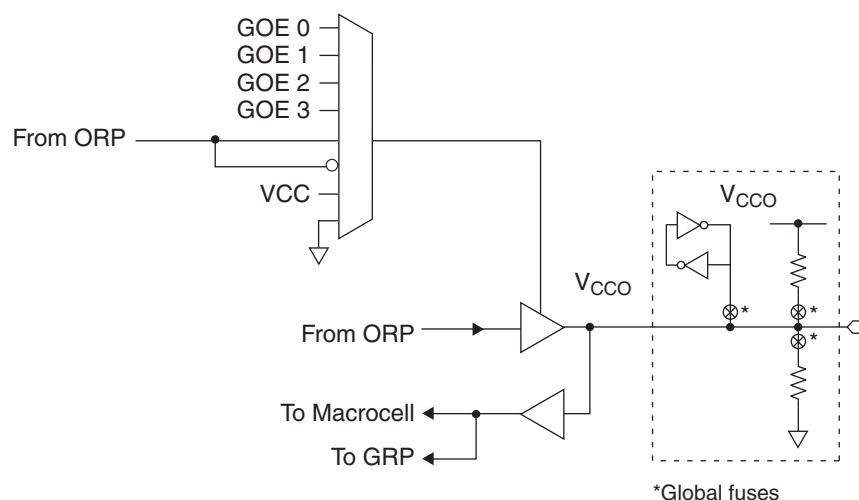
## Output Enable Routing Multiplexers

The OE Routing Pool provides the corresponding local output enable (OE) product term to the I/O cell.

## I/O Cell

The I/O cell contains the following programmable elements: output buffer, input buffer, OE multiplexer and bus maintenance circuitry. Figure 8 details the I/O cell.

**Figure 8. I/O Cell**



Each output supports a variety of output standards dependent on the  $V_{CCO}$  supplied to its I/O bank. Outputs can also be configured for open drain operation. Each input can be programmed to support a variety of standards, independent of the  $V_{CCO}$  supplied to its I/O bank. The I/O standards supported are:

**Absolute Maximum Ratings**<sup>1, 2, 3</sup>

|                                                       | ispMACH 4000C/Z<br>(1.8V) | ispMACH 4000B<br>(2.5V) | ispMACH 4000V<br>(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 <sup>4, 5</sup> | -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 <sub>CC</sub> | 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 <sup>1, 2</sup> | 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 <sub>j</sub>  | 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**<sup>1,2,3</sup>

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

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

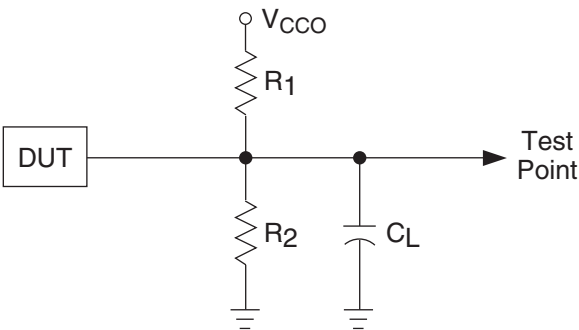
| Standard                | $V_{IL}$ |                              | $V_{IH}$                     |         | $V_{OL}$<br>Max (V) | $V_{OH}$<br>Min (V) | $I_{OL}^1$<br>(mA) | $I_{OH}^1$<br>(mA) |
|-------------------------|----------|------------------------------|------------------------------|---------|---------------------|---------------------|--------------------|--------------------|
|                         | 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<br>(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<br>(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.

Switching Test Conditions

Figure 12 shows the output test load that is used for AC testing. The specific values for resistance, capacitance, voltage, and other test conditions are shown in Table 11.

Figure 12. Output Test Load, LVTTTL and LVCMOS Standards



0213A/ispm4k

Table 11. Test Fixture Required Components

| Test Condition               | $R_1$        | $R_2$        | $C_L^1$ | Timing Ref.              | $V_{CCO}$          |
|------------------------------|--------------|--------------|---------|--------------------------|--------------------|
| LVCMOS I/O, (L -> H, H -> L) | 106 $\Omega$ | 106 $\Omega$ | 35pF    | LVCMOS 3.3 = 1.5V        | LVCMOS 3.3 = 3.0V  |
|                              |              |              |         | LVCMOS 2.5 = $V_{CCO}/2$ | LVCMOS 2.5 = 2.3V  |
|                              |              |              |         | LVCMOS 1.8 = $V_{CCO}/2$ | LVCMOS 1.8 = 1.65V |
| LVCMOS I/O (Z -> H)          | $\infty$     | 106 $\Omega$ | 35pF    | 1.5V                     | 3.0V               |
| LVCMOS I/O (Z -> L)          | 106 $\Omega$ | $\infty$     | 35pF    | 1.5V                     | 3.0V               |
| LVCMOS I/O (H -> Z)          | $\infty$     | 106 $\Omega$ | 5pF     | $V_{OH} - 0.3$           | 3.0V               |
| LVCMOS I/O (L -> Z)          | 106 $\Omega$ | $\infty$     | 5pF     | $V_{OL} + 0.3$           | 3.0V               |

1.  $C_L$  includes test fixtures and probe capacitance.

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

| Pin Number | Bank Number | ispMACH 4032V/B/C |                | ispMACH 4064V/B/C |                |
|------------|-------------|-------------------|----------------|-------------------|----------------|
|            |             | GLB/MC/Pad        | ORP            | GLB/MC/Pad        | ORP            |
| 42         | 0           | A2                | A <sup>2</sup> | A4                | A <sup>2</sup> |
| 43         | 0           | A3                | A <sup>3</sup> | A6                | A <sup>3</sup> |
| 44         | 0           | A4                | A <sup>4</sup> | A8                | A <sup>4</sup> |

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

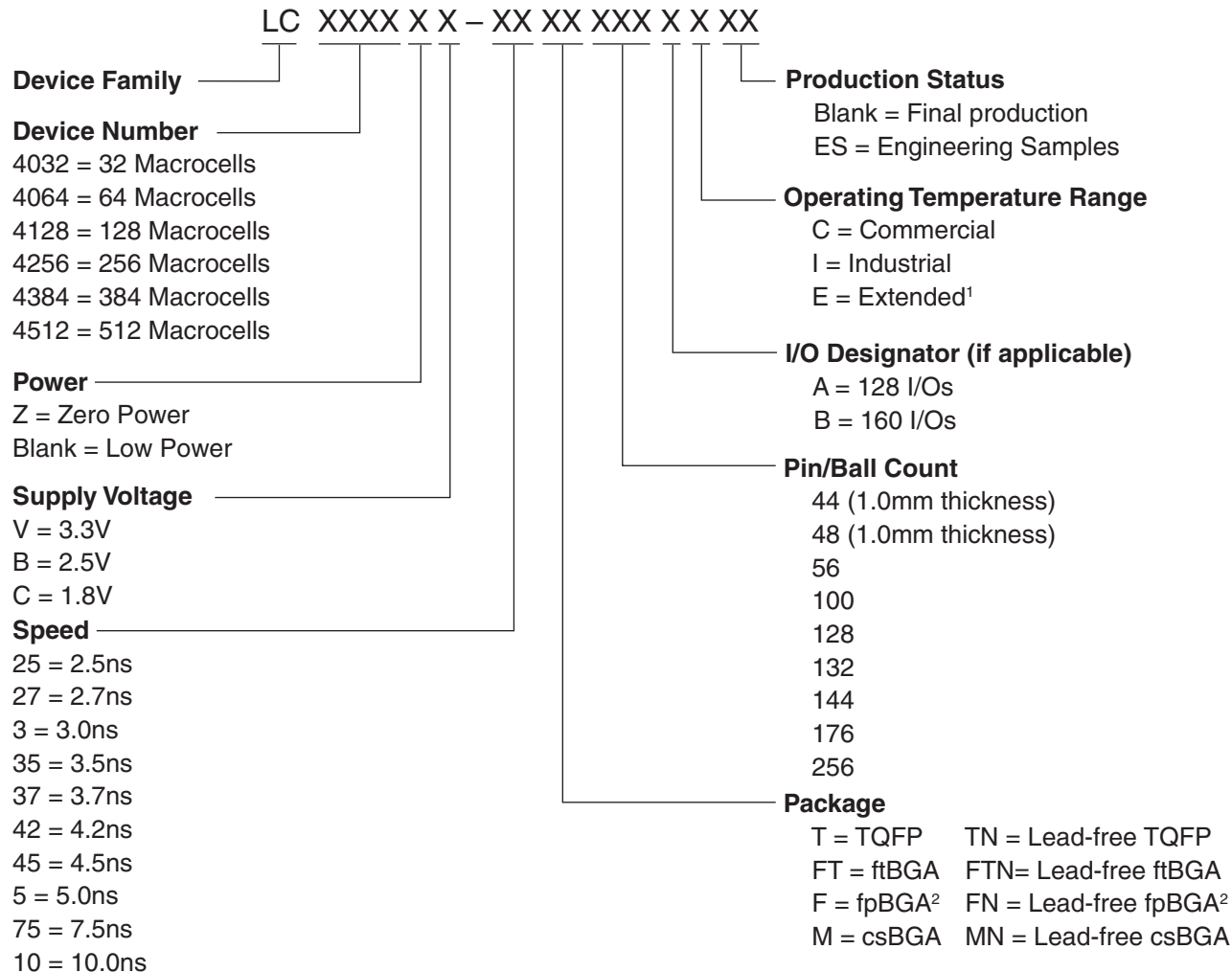
| Pin Number | Bank Number | ispMACH 4032V/B/C/Z |                 | ispMACH 4064V/B/C |                | ispMACH 4064Z |                |
|------------|-------------|---------------------|-----------------|-------------------|----------------|---------------|----------------|
|            |             | GLB/MC/Pad          | ORP             | GLB/MC/Pad        | ORP            | GLB/MC/Pad    | ORP            |
| 1          | -           | TDI                 | -               | TDI               | -              | TDI           | -              |
| 2          | 0           | A5                  | A <sup>5</sup>  | A10               | A <sup>5</sup> | A8            | A <sup>5</sup> |
| 3          | 0           | A6                  | A <sup>6</sup>  | A12               | A <sup>6</sup> | A10           | A <sup>6</sup> |
| 4          | 0           | A7                  | A <sup>7</sup>  | A14               | A <sup>7</sup> | A11           | A <sup>7</sup> |
| 5          | 0           | GND (Bank 0)        | -               | GND (Bank 0)      | -              | GND (Bank 0)  | -              |
| 6          | 0           | VCCO (Bank 0)       | -               | VCCO (Bank 0)     | -              | VCCO (Bank 0) | -              |
| 7          | 0           | A8                  | A <sup>8</sup>  | B0                | B <sup>0</sup> | B15           | B <sup>7</sup> |
| 8          | 0           | A9                  | A <sup>9</sup>  | B2                | B <sup>1</sup> | B12           | B <sup>6</sup> |
| 9          | 0           | A10                 | A <sup>10</sup> | B4                | B <sup>2</sup> | B10           | B <sup>5</sup> |
| 10         | 0           | A11                 | A <sup>11</sup> | B6                | B <sup>3</sup> | B8            | B <sup>4</sup> |
| 11         | -           | TCK                 | -               | TCK               | -              | TCK           | -              |
| 12         | -           | VCC                 | -               | VCC               | -              | VCC           | -              |
| 13         | -           | GND                 | -               | GND               | -              | GND           | -              |
| 14         | 0           | A12                 | A <sup>12</sup> | B8                | B <sup>4</sup> | B6            | B <sup>3</sup> |
| 15         | 0           | A13                 | A <sup>13</sup> | B10               | B <sup>5</sup> | B4            | B <sup>2</sup> |
| 16         | 0           | A14                 | A <sup>14</sup> | B12               | B <sup>6</sup> | B2            | B <sup>1</sup> |
| 17         | 0           | A15                 | A <sup>15</sup> | B14               | B <sup>7</sup> | B0            | B <sup>0</sup> |
| 18         | 0           | CLK1/I              | -               | CLK1/I            | -              | CLK1/I        | -              |
| 19         | 1           | CLK2/I              | -               | CLK2/I            | -              | CLK2/I        | -              |
| 20         | 1           | B0                  | B <sup>0</sup>  | C0                | C <sup>0</sup> | C0            | C <sup>0</sup> |
| 21         | 1           | B1                  | B <sup>1</sup>  | C2                | C <sup>1</sup> | C1            | C <sup>1</sup> |
| 22         | 1           | B2                  | B <sup>2</sup>  | C4                | C <sup>2</sup> | C2            | C <sup>2</sup> |
| 23         | 1           | B3                  | B <sup>3</sup>  | C6                | C <sup>3</sup> | C4            | C <sup>3</sup> |
| 24         | 1           | B4                  | B <sup>4</sup>  | C8                | C <sup>4</sup> | C6            | C <sup>4</sup> |
| 25         | -           | TMS                 | -               | TMS               | -              | TMS           | -              |
| 26         | 1           | B5                  | B <sup>5</sup>  | C10               | C <sup>5</sup> | C8            | C <sup>5</sup> |
| 27         | 1           | B6                  | B <sup>6</sup>  | C12               | C <sup>6</sup> | C10           | C <sup>6</sup> |
| 28         | 1           | B7                  | B <sup>7</sup>  | C14               | C <sup>7</sup> | C11           | C <sup>7</sup> |
| 29         | 1           | GND (Bank 1)        | -               | GND (Bank 1)      | -              | GND (Bank 1)  | -              |
| 30         | 1           | VCCO (Bank 1)       | -               | VCCO (Bank 1)     | -              | VCCO (Bank 1) | -              |
| 31         | 1           | B8                  | B <sup>8</sup>  | D0                | D <sup>0</sup> | D15           | D <sup>7</sup> |
| 32         | 1           | B9                  | B <sup>9</sup>  | D2                | D <sup>1</sup> | D12           | D <sup>6</sup> |



**ispMACH 4256V/B/C, 4384V/B/C, 4512V/B/C Logic Signal Connections:  
256-Ball ftBGA/fpBGA (Cont.)**

| Ball Number | I/O Bank | ispMACH 4256V/B/C<br>128-I/O |                  | ispMACH 4256V/B/C<br>160-I/O |                  | ispMACH 4384V/B/C |                   | ispMACH 4512V/B/C |                   |
|-------------|----------|------------------------------|------------------|------------------------------|------------------|-------------------|-------------------|-------------------|-------------------|
|             |          | GLB/MC/Pad                   | ORP              | GLB/MC/Pad                   | ORP              | GLB/MC/Pad        | ORP               | GLB/MC/Pad        | ORP               |
| R5          | 0        | NC                           | -                | NC                           | -                | NC                | -                 | L4                | L <sup>^</sup> 1  |
| T5          | 0        | NC                           | -                | NC                           | -                | I2                | I <sup>^</sup> 1  | L8                | L <sup>^</sup> 2  |
| R6          | 0        | NC                           | -                | NC                           | -                | I0                | I <sup>^</sup> 0  | L12               | L <sup>^</sup> 3  |
| T6          | 0        | NC                           | -                | H14                          | H <sup>^</sup> 9 | G12               | G <sup>^</sup> 6  | M8                | M <sup>^</sup> 2  |
| N7          | 0        | NC                           | -                | H12                          | H <sup>^</sup> 8 | G14               | G <sup>^</sup> 7  | M12               | M <sup>^</sup> 3  |
| P7          | 0        | H14                          | H <sup>^</sup> 7 | H10                          | H <sup>^</sup> 7 | L14               | L <sup>^</sup> 7  | P14               | P <sup>^</sup> 7  |
| R7          | 0        | H12                          | H <sup>^</sup> 6 | H9                           | H <sup>^</sup> 6 | L12               | L <sup>^</sup> 6  | P12               | P <sup>^</sup> 6  |
| L8          | 0        | H10                          | H <sup>^</sup> 5 | H8                           | H <sup>^</sup> 5 | L10               | L <sup>^</sup> 5  | P10               | P <sup>^</sup> 5  |
| T7          | 0        | H8                           | H <sup>^</sup> 4 | H6                           | H <sup>^</sup> 4 | L8                | L <sup>^</sup> 4  | P8                | P <sup>^</sup> 4  |
| M8          | 0        | H6                           | H <sup>^</sup> 3 | H4                           | H <sup>^</sup> 3 | L6                | L <sup>^</sup> 3  | P6                | P <sup>^</sup> 3  |
| N8          | 0        | H4                           | H <sup>^</sup> 2 | H2                           | H <sup>^</sup> 2 | L4                | L <sup>^</sup> 2  | P4                | P <sup>^</sup> 2  |
| R8          | 0        | H2                           | H <sup>^</sup> 1 | H1                           | H <sup>^</sup> 1 | L2                | L <sup>^</sup> 1  | P2                | P <sup>^</sup> 1  |
| P8          | 0        | H0                           | H <sup>^</sup> 0 | H0                           | H <sup>^</sup> 0 | L0                | L <sup>^</sup> 0  | P0                | P <sup>^</sup> 0  |
| -           | -        | GND                          | -                | GND                          | -                | GND               | -                 | GND               | -                 |
| T8          | 0        | CLK1/I                       | -                | CLK1/I                       | -                | CLK1/I            | -                 | CLK1/I            | -                 |
| -           | 1        | GND (Bank 1)                 | -                | GND (Bank 1)                 | -                | GND (Bank 1)      | -                 | GND (Bank 1)      | -                 |
| N9          | 1        | CLK2/I                       | -                | CLK2/I                       | -                | CLK2/I            | -                 | CLK2/I            | -                 |
| -           | -        | VCC                          | -                | VCC                          | -                | VCC               | -                 | VCC               | -                 |
| P9          | 1        | I0                           | I <sup>^</sup> 0 | I0                           | I <sup>^</sup> 0 | M0                | M <sup>^</sup> 0  | AX0               | AX <sup>^</sup> 0 |
| R9          | 1        | I2                           | I <sup>^</sup> 1 | I1                           | I <sup>^</sup> 1 | M2                | M <sup>^</sup> 1  | AX2               | AX <sup>^</sup> 1 |
| T9          | 1        | I4                           | I <sup>^</sup> 2 | I2                           | I <sup>^</sup> 2 | M4                | M <sup>^</sup> 2  | AX4               | AX <sup>^</sup> 2 |
| T10         | 1        | I6                           | I <sup>^</sup> 3 | I4                           | I <sup>^</sup> 3 | M6                | M <sup>^</sup> 3  | AX6               | AX <sup>^</sup> 3 |
| R10         | 1        | I8                           | I <sup>^</sup> 4 | I6                           | I <sup>^</sup> 4 | M8                | M <sup>^</sup> 4  | AX8               | AX <sup>^</sup> 4 |
| M9          | 1        | I10                          | I <sup>^</sup> 5 | I8                           | I <sup>^</sup> 5 | M10               | M <sup>^</sup> 5  | AX10              | AX <sup>^</sup> 5 |
| P10         | 1        | I12                          | I <sup>^</sup> 6 | I9                           | I <sup>^</sup> 6 | M12               | M <sup>^</sup> 6  | AX12              | AX <sup>^</sup> 6 |
| L9          | 1        | I14                          | I <sup>^</sup> 7 | I10                          | I <sup>^</sup> 7 | M14               | M <sup>^</sup> 7  | AX14              | AX <sup>^</sup> 7 |
| N10         | 1        | NC                           | -                | I12                          | I <sup>^</sup> 8 | BX14              | BX <sup>^</sup> 7 | DX0               | DX <sup>^</sup> 0 |
| T11         | 1        | NC                           | -                | I14                          | I <sup>^</sup> 9 | BX12              | BX <sup>^</sup> 6 | DX4               | DX <sup>^</sup> 1 |
| R11         | 1        | NC                           | -                | NC                           | -                | P0                | P <sup>^</sup> 0  | EX0               | EX <sup>^</sup> 0 |
| T12         | 1        | NC                           | -                | NC                           | -                | P2                | P <sup>^</sup> 1  | EX4               | EX <sup>^</sup> 1 |
| N12         | 1        | NC                           | -                | NC                           | -                | NC                | -                 | EX8               | EX <sup>^</sup> 2 |
| -           | 1        | VCCO (Bank 1)                | -                | VCCO (Bank 1)                | -                | VCCO (Bank 1)     | -                 | VCCO (Bank 1)     | -                 |
| -           | 1        | GND (Bank 1)                 | -                | GND (Bank 1)                 | -                | GND (Bank 1)      | -                 | GND (Bank 1)      | -                 |
| R12         | 1        | NC                           | -                | NC                           | -                | NC                | -                 | EX12              | EX <sup>^</sup> 3 |
| T13         | 1        | NC                           | -                | J0                           | J <sup>^</sup> 0 | BX10              | BX <sup>^</sup> 5 | DX8               | DX <sup>^</sup> 2 |
| P12         | 1        | NC                           | -                | J1                           | J <sup>^</sup> 1 | BX8               | BX <sup>^</sup> 4 | DX12              | DX <sup>^</sup> 3 |
| M10         | 1        | J0                           | J <sup>^</sup> 0 | J2                           | J <sup>^</sup> 2 | N0                | N <sup>^</sup> 0  | BX0               | BX <sup>^</sup> 0 |
| R13         | 1        | J2                           | J <sup>^</sup> 1 | J4                           | J <sup>^</sup> 3 | N2                | N <sup>^</sup> 1  | BX2               | BX <sup>^</sup> 1 |
| L10         | 1        | J4                           | J <sup>^</sup> 2 | J6                           | J <sup>^</sup> 4 | N4                | N <sup>^</sup> 2  | BX4               | BX <sup>^</sup> 2 |
| T14         | 1        | J6                           | J <sup>^</sup> 3 | J8                           | J <sup>^</sup> 5 | N6                | N <sup>^</sup> 3  | BX6               | BX <sup>^</sup> 3 |
| M11         | 1        | J8                           | J <sup>^</sup> 4 | J9                           | J <sup>^</sup> 6 | N8                | N <sup>^</sup> 4  | BX8               | BX <sup>^</sup> 4 |

## Part Number Description



1. For automotive AEC-Q100 compliant devices, refer to the LA-ispMACH 4000V/Z Automotive Family Data Sheet (DS1017).

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

## ispMACH 4000 Family Speed Grade Offering

|                   | -25 | -27 | -3  | -35 | -37 | -42 | -45 | -5  |     | -75 |     |     | -10 |
|-------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                   | Com | Com | Com | Com | Com | Com | Com | Com | Ind | Com | Ind | Ext | Ind |
| ispMACH 4032V/B/C |     |     |     |     |     |     |     |     |     |     |     | 1   |     |
| ispMACH 4064V/B/C |     |     |     |     |     |     |     |     |     |     |     | 1   |     |
| ispMACH 4128V/B/C |     |     |     |     |     |     |     |     |     |     |     | 1   |     |
| ispMACH 4256V/B/C |     |     |     |     |     |     |     |     |     |     |     |     |     |
| ispMACH 4384V/B/C |     |     |     |     |     |     |     |     |     |     |     |     |     |
| ispMACH 4512V/B/C |     |     |     |     |     |     |     |     |     |     |     |     |     |
| ispMACH 4032ZC    |     |     |     |     |     |     |     |     |     |     |     | 1   |     |
| ispMACH 4064ZC    |     |     |     |     |     |     |     |     |     |     |     | 1   |     |
| ispMACH 4128ZC    |     |     |     |     |     |     |     |     |     |     |     | 1   |     |
| ispMACH 4256ZC    |     |     |     |     |     |     |     |     |     |     |     |     |     |

1. 3.3V only.

## ispMACH 4000C (1.8V) Industrial Devices

| Family  | Part Number                   | Macrocells | Voltage | t <sub>PD</sub> | Package | Pin/Ball Count | I/O | Grade |
|---------|-------------------------------|------------|---------|-----------------|---------|----------------|-----|-------|
| LC4032C | LC4032C-5T48I                 | 32         | 1.8     | 5               | TQFP    | 48             | 32  | I     |
|         | LC4032C-75T48I                | 32         | 1.8     | 7.5             | TQFP    | 48             | 32  | I     |
|         | LC4032C-10T48I                | 32         | 1.8     | 10              | TQFP    | 48             | 32  | I     |
|         | LC4032C-5T44I                 | 32         | 1.8     | 5               | TQFP    | 44             | 30  | I     |
|         | LC4032C-75T44I                | 32         | 1.8     | 7.5             | TQFP    | 44             | 30  | I     |
|         | LC4032C-10T44I                | 32         | 1.8     | 10              | TQFP    | 44             | 30  | I     |
| LC4064C | LC4064C-5T100I                | 64         | 1.8     | 5               | TQFP    | 100            | 64  | I     |
|         | LC4064C-75T100I               | 64         | 1.8     | 7.5             | TQFP    | 100            | 64  | I     |
|         | LC4064C-10T100I               | 64         | 1.8     | 10              | TQFP    | 100            | 64  | I     |
|         | LC4064C-5T48I                 | 64         | 1.8     | 5               | TQFP    | 48             | 32  | I     |
|         | LC4064C-75T48I                | 64         | 1.8     | 7.5             | TQFP    | 48             | 32  | I     |
|         | LC4064C-10T48I                | 64         | 1.8     | 10              | TQFP    | 48             | 32  | I     |
|         | LC4064C-5T44I                 | 64         | 1.8     | 5               | TQFP    | 44             | 30  | I     |
|         | LC4064C-75T44I                | 64         | 1.8     | 7.5             | TQFP    | 44             | 30  | I     |
|         | LC4064C-10T44I                | 64         | 1.8     | 10              | TQFP    | 44             | 30  | I     |
| LC4128C | LC4128C-5T128I                | 128        | 1.8     | 5               | TQFP    | 128            | 92  | I     |
|         | LC4128C-75T128I               | 128        | 1.8     | 7.5             | TQFP    | 128            | 92  | I     |
|         | LC4128C-10T128I               | 128        | 1.8     | 10              | TQFP    | 128            | 92  | I     |
|         | LC4128C-5T100I                | 128        | 1.8     | 5               | TQFP    | 100            | 64  | I     |
|         | LC4128C-75T100I               | 128        | 1.8     | 7.5             | TQFP    | 100            | 64  | I     |
|         | LC4128C-10T100I               | 128        | 1.8     | 10              | TQFP    | 100            | 64  | I     |
| LC4256C | LC4256C-5FT256AI              | 256        | 1.8     | 5               | ftBGA   | 256            | 128 | I     |
|         | LC4256C-75FT256AI             | 256        | 1.8     | 7.5             | ftBGA   | 256            | 128 | I     |
|         | LC4256C-10FT256AI             | 256        | 1.8     | 10              | ftBGA   | 256            | 128 | I     |
|         | LC4256C-5FT256BI              | 256        | 1.8     | 5               | ftBGA   | 256            | 160 | I     |
|         | LC4256C-75FT256BI             | 256        | 1.8     | 7.5             | ftBGA   | 256            | 160 | I     |
|         | LC4256C-10FT256BI             | 256        | 1.8     | 10              | ftBGA   | 256            | 160 | I     |
|         | LC4256C-5F256AI <sup>1</sup>  | 256        | 1.8     | 5               | fpBGA   | 256            | 128 | I     |
|         | LC4256C-75F256AI <sup>1</sup> | 256        | 1.8     | 7.5             | fpBGA   | 256            | 128 | I     |
|         | LC4256C-10F256AI <sup>1</sup> | 256        | 1.8     | 10              | fpBGA   | 256            | 128 | I     |
|         | LC4256C-5F256BI <sup>1</sup>  | 256        | 1.8     | 5               | fpBGA   | 256            | 160 | I     |
|         | LC4256C-75F256BI <sup>1</sup> | 256        | 1.8     | 7.5             | fpBGA   | 256            | 160 | I     |
|         | LC4256C-10F256BI <sup>1</sup> | 256        | 1.8     | 10              | fpBGA   | 256            | 160 | I     |
|         | LC4256C-5T176I                | 256        | 1.8     | 5               | TQFP    | 176            | 128 | I     |
|         | LC4256C-75T176I               | 256        | 1.8     | 7.5             | TQFP    | 176            | 128 | I     |
|         | LC4256C-10T176I               | 256        | 1.8     | 10              | TQFP    | 176            | 128 | I     |
|         | LC4256C-5T100I                | 256        | 1.8     | 5               | TQFP    | 100            | 64  | I     |
|         | LC4256C-75T100I               | 256        | 1.8     | 7.5             | TQFP    | 100            | 64  | I     |
|         | LC4256C-10T100I               | 256        | 1.8     | 10              | TQFP    | 100            | 64  | I     |

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

| Family  | Part Number                  | Macrocells | Voltage | t <sub>PD</sub> | 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 <sup>1</sup>  | 384        | 1.8     | 5               | fpBGA   | 256            | 192 | I     |
|         | LC4384C-75F256I <sup>1</sup> | 384        | 1.8     | 7.5             | fpBGA   | 256            | 192 | I     |
|         | LC4384C-10F256I <sup>1</sup> | 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 <sup>1</sup>  | 512        | 1.8     | 5               | fpBGA   | 256            | 208 | I     |
|         | LC4512C-75F256I <sup>1</sup> | 512        | 1.8     | 7.5             | fpBGA   | 256            | 208 | I     |
|         | LC4512C-10F256I <sup>1</sup> | 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 <sub>PD</sub> | 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) Industrial Devices (Cont.)

| Family  | Part Number                  | Macrocells | Voltage | t <sub>PD</sub> | 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 <sup>1</sup>  | 384        | 2.5     | 5               | fpBGA   | 256            | 192 | I     |
|         | LC4384B-75F256I <sup>1</sup> | 384        | 2.5     | 7.5             | fpBGA   | 256            | 192 | I     |
|         | LC4384B-10F256I <sup>1</sup> | 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 <sup>1</sup>  | 512        | 2.5     | 5               | fpBGA   | 256            | 208 | I     |
|         | LC4512B-75F256I <sup>1</sup> | 512        | 2.5     | 7.5             | fpBGA   | 256            | 208 | I     |
|         | LC4512B-10F256I <sup>1</sup> | 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 <sub>PD</sub> | 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 <sub>PD</sub> | Package | Pin/Ball Count | I/O | Grade |
|---------|-------------------------------|------------|---------|-----------------|---------|----------------|-----|-------|
| LC4128V | LC4128V-27T144C               | 128        | 3.3     | 2.7             | TQFP    | 144            | 96  | C     |
|         | LC4128V-5T144C                | 128        | 3.3     | 5               | TQFP    | 144            | 96  | C     |
|         | LC4128V-75T144C               | 128        | 3.3     | 7.5             | TQFP    | 144            | 96  | C     |
|         | LC4128V-27T128C               | 128        | 3.3     | 2.7             | TQFP    | 128            | 92  | C     |
|         | LC4128V-5T128C                | 128        | 3.3     | 5               | TQFP    | 128            | 92  | C     |
|         | LC4128V-75T128C               | 128        | 3.3     | 7.5             | TQFP    | 128            | 92  | C     |
|         | LC4128V-27T100C               | 128        | 3.3     | 2.7             | TQFP    | 100            | 64  | C     |
|         | LC4128V-5T100C                | 128        | 3.3     | 5               | TQFP    | 100            | 64  | C     |
|         | LC4128V-75T100C               | 128        | 3.3     | 7.5             | TQFP    | 100            | 64  | C     |
| LC4256V | LC4256V-3FT256AC              | 256        | 3.3     | 3               | ftBGA   | 256            | 128 | C     |
|         | LC4256V-5FT256AC              | 256        | 3.3     | 5               | ftBGA   | 256            | 128 | C     |
|         | LC4256V-75FT256AC             | 256        | 3.3     | 7.5             | ftBGA   | 256            | 128 | C     |
|         | LC4256V-3FT256BC              | 256        | 3.3     | 3               | ftBGA   | 256            | 160 | C     |
|         | LC4256V-5FT256BC              | 256        | 3.3     | 5               | ftBGA   | 256            | 160 | C     |
|         | LC4256V-75FT256BC             | 256        | 3.3     | 7.5             | ftBGA   | 256            | 160 | C     |
|         | LC4256V-3F256AC <sup>1</sup>  | 256        | 3.3     | 3               | fpBGA   | 256            | 128 | C     |
|         | LC4256V-5F256AC <sup>1</sup>  | 256        | 3.3     | 5               | fpBGA   | 256            | 128 | C     |
|         | LC4256V-75F256AC <sup>1</sup> | 256        | 3.3     | 7.5             | fpBGA   | 256            | 128 | C     |
|         | LC4256V-3F256BC <sup>1</sup>  | 256        | 3.3     | 3               | fpBGA   | 256            | 160 | C     |
|         | LC4256V-5F256BC <sup>1</sup>  | 256        | 3.3     | 5               | fpBGA   | 256            | 160 | C     |
|         | LC4256V-75F256BC <sup>1</sup> | 256        | 3.3     | 7.5             | fpBGA   | 256            | 160 | C     |
|         | LC4256V-3T176C                | 256        | 3.3     | 3               | TQFP    | 176            | 128 | C     |
|         | LC4256V-5T176C                | 256        | 3.3     | 5               | TQFP    | 176            | 128 | C     |
|         | LC4256V-75T176C               | 256        | 3.3     | 7.5             | TQFP    | 176            | 128 | C     |
|         | LC4256V-3T144C                | 256        | 3.3     | 3               | TQFP    | 144            | 96  | C     |
|         | LC4256V-5T144C                | 256        | 3.3     | 5               | TQFP    | 144            | 96  | C     |
|         | LC4256V-75T144C               | 256        | 3.3     | 7.5             | TQFP    | 144            | 96  | C     |
|         | LC4256V-3T100C                | 256        | 3.3     | 3               | TQFP    | 100            | 64  | C     |
|         | LC4256V-5T100C                | 256        | 3.3     | 5               | TQFP    | 100            | 64  | C     |
|         | LC4256V-75T100C               | 256        | 3.3     | 7.5             | TQFP    | 100            | 64  | C     |
| LC4384V | LC4384V-35FT256C              | 384        | 3.3     | 3.5             | ftBGA   | 256            | 192 | C     |
|         | LC4384V-5FT256C               | 384        | 3.3     | 5               | ftBGA   | 256            | 192 | C     |
|         | LC4384V-75FT256C              | 384        | 3.3     | 7.5             | ftBGA   | 256            | 192 | C     |
|         | LC4384V-35F256C <sup>1</sup>  | 384        | 3.3     | 3.5             | fpBGA   | 256            | 192 | C     |
|         | LC4384V-5F256C <sup>1</sup>   | 384        | 3.3     | 5               | fpBGA   | 256            | 192 | C     |
|         | LC4384V-75F256C <sup>1</sup>  | 384        | 3.3     | 7.5             | fpBGA   | 256            | 192 | C     |
|         | LC4384V-35T176C               | 384        | 3.3     | 3.5             | TQFP    | 176            | 128 | C     |
|         | LC4384V-5T176C                | 384        | 3.3     | 5               | TQFP    | 176            | 128 | C     |
|         | LC4384V-75T176C               | 384        | 3.3     | 7.5             | TQFP    | 176            | 128 | C     |

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

| Device  | Part Number                  | Macrocells | Voltage | t <sub>PD</sub> | 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 <sup>1</sup> | 512        | 3.3     | 3.5             | fpBGA   | 256            | 208 | C     |
|         | LC4512V-5F256C <sup>1</sup>  | 512        | 3.3     | 5               | fpBGA   | 256            | 208 | C     |
|         | LC4512V-75F256C <sup>1</sup> | 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 <sub>PD</sub> | 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     |

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

| Device   | Part Number       | Macrocells | Voltage | t <sub>PD</sub> | 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 <sub>PD</sub> | 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 <sub>PD</sub> | 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 4000C (1.8V) Lead-Free Commercial Devices (Cont.)**

| Device  | Part Number                   | Macrocells | Voltage | t <sub>PD</sub> | Package         | Pin/Ball Count | I/O | Grade |
|---------|-------------------------------|------------|---------|-----------------|-----------------|----------------|-----|-------|
| LC4512C | LC4512C-35FTN256C             | 512        | 1.8     | 3.5             | Lead-free ftBGA | 256            | 208 | C     |
|         | LC4512C-5FTN256C              | 512        | 1.8     | 5               | Lead-free ftBGA | 256            | 208 | C     |
|         | LC4512C-75FTN256C             | 512        | 1.8     | 7.5             | Lead-free ftBGA | 256            | 208 | C     |
|         | LC4512C-35FN256C <sup>1</sup> | 512        | 1.8     | 3.5             | Lead-free fpBGA | 256            | 208 | C     |
|         | LC4512C-5FN256C <sup>1</sup>  | 512        | 1.8     | 5               | Lead-free fpBGA | 256            | 208 | C     |
|         | LC4512C-75FN256C <sup>1</sup> | 512        | 1.8     | 7.5             | Lead-free fpBGA | 256            | 208 | C     |
|         | LC4512C-35TN176C              | 512        | 1.8     | 3.5             | Lead-free TQFP  | 176            | 128 | C     |
|         | LC4512C-5TN176C               | 512        | 1.8     | 5               | Lead-free TQFP  | 176            | 128 | C     |
|         | LC4512C-75TN176C              | 512        | 1.8     | 7.5             | Lead-free TQFP  | 176            | 128 | C     |

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

**ispMACH 4000C (1.8V) Lead-Free Industrial Devices**

| Device  | Part Number      | Macrocells | Voltage | t <sub>PD</sub> | Package        | Pin/Ball Count | I/O | Grade |
|---------|------------------|------------|---------|-----------------|----------------|----------------|-----|-------|
| LC4032C | LC4032C-5TN48I   | 32         | 1.8     | 5               | Lead-free TQFP | 48             | 32  | I     |
|         | LC4032C-75TN48I  | 32         | 1.8     | 7.5             | Lead-free TQFP | 48             | 32  | I     |
|         | LC4032C-10TN48I  | 32         | 1.8     | 10              | Lead-free TQFP | 48             | 32  | I     |
|         | LC4032C-5TN44I   | 32         | 1.8     | 5               | Lead-free TQFP | 44             | 30  | I     |
|         | LC4032C-75TN44I  | 32         | 1.8     | 7.5             | Lead-free TQFP | 44             | 30  | I     |
|         | LC4032C-10TN44I  | 32         | 1.8     | 10              | Lead-free TQFP | 44             | 30  | I     |
| LC4064C | LC4064C-5TN100I  | 64         | 1.8     | 5               | Lead-free TQFP | 100            | 64  | I     |
|         | LC4064C-75TN100I | 64         | 1.8     | 7.5             | Lead-free TQFP | 100            | 64  | I     |
|         | LC4064C-10TN100I | 64         | 1.8     | 10              | Lead-free TQFP | 100            | 64  | I     |
|         | LC4064C-5TN48I   | 64         | 1.8     | 5               | Lead-free TQFP | 48             | 32  | I     |
|         | LC4064C-75TN48I  | 64         | 1.8     | 7.5             | Lead-free TQFP | 48             | 32  | I     |
|         | LC4064C-10TN48I  | 64         | 1.8     | 10              | Lead-free TQFP | 48             | 32  | I     |
|         | LC4064C-5TN44I   | 64         | 1.8     | 5               | Lead-free TQFP | 44             | 30  | I     |
|         | LC4064C-75TN44I  | 64         | 1.8     | 5               | Lead-free TQFP | 44             | 30  | I     |
|         | LC4064C-10TN44I  | 64         | 1.8     | 10              | Lead-free TQFP | 44             | 30  | I     |
| LC4128C | LC4128C-5TN128I  | 128        | 1.8     | 5               | Lead-free TQFP | 128            | 92  | I     |
|         | LC4128C-75TN128I | 128        | 1.8     | 7.5             | Lead-free TQFP | 128            | 92  | I     |
|         | LC4128C-10TN128I | 128        | 1.8     | 10              | Lead-free TQFP | 128            | 92  | I     |
|         | LC4128C-5TN100I  | 128        | 1.8     | 5               | Lead-free TQFP | 100            | 64  | I     |
|         | LC4128C-75TN100I | 128        | 1.8     | 7.5             | Lead-free TQFP | 100            | 64  | I     |
|         | LC4128C-10TN100I | 128        | 1.8     | 10              | Lead-free TQFP | 100            | 64  | I     |

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

| Device  | Part Number                    | Macrocells | Voltage | t <sub>PD</sub> | 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 <sup>1</sup>  | 256        | 1.8     | 5               | Lead-free fpBGA | 256            | 128 | I     |
|         | LC4256C-75FN256AI <sup>1</sup> | 256        | 1.8     | 7.5             | Lead-free fpBGA | 256            | 128 | I     |
|         | LC4256C-10FN256AI <sup>1</sup> | 256        | 1.8     | 10              | Lead-free fpBGA | 256            | 128 | I     |
|         | LC4256C-5FN256BI <sup>1</sup>  | 256        | 1.8     | 5               | Lead-free fpBGA | 256            | 160 | I     |
|         | LC4256C-75FN256BI <sup>1</sup> | 256        | 1.8     | 7.5             | Lead-free fpBGA | 256            | 160 | I     |
|         | LC4256C-10FN256BI <sup>1</sup> | 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 <sup>1</sup>   | 384        | 1.8     | 5               | Lead-free fpBGA | 256            | 192 | I     |
|         | LC4384C-75FN256I <sup>1</sup>  | 384        | 1.8     | 7.5             | Lead-free fpBGA | 256            | 192 | I     |
|         | LC4384C-10FN256I <sup>1</sup>  | 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 <sup>1</sup>   | 512        | 1.8     | 5               | Lead-free fpBGA | 256            | 208 | I     |
|         | LC4512C-75FN256I <sup>1</sup>  | 512        | 1.8     | 7.5             | Lead-free fpBGA | 256            | 208 | I     |
|         | LC4512C-10FN256I <sup>1</sup>  | 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 4000B (2.5V) Lead-Free Commercial Devices (Cont.)**

| Device  | Part Number                   | Macrocells | Voltage | t <sub>PD</sub> | 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 <sup>1</sup> | 384        | 2.5     | 3.5             | Lead-Free fpBGA | 256            | 192 | C     |
|         | LC4384B-5FN256C <sup>1</sup>  | 384        | 2.5     | 5               | Lead-Free fpBGA | 256            | 192 | C     |
|         | LC4384B-75FN256C <sup>1</sup> | 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 <sup>1</sup> | 512        | 2.5     | 3.5             | Lead-Free fpBGA | 256            | 208 | C     |
|         | LC4512B-5FN256C <sup>1</sup>  | 512        | 2.5     | 5               | Lead-Free fpBGA | 256            | 208 | C     |
|         | LC4512B-75FN256C <sup>1</sup> | 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 <sub>PD</sub> | 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 4000V (3.3V) Lead-Free Commercial Devices

| Device  | Part Number      | Macrocells | Voltage | t <sub>PD</sub> | 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 <sub>PD</sub> | 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     |