



# Release Notes for Lattice Diamond 2.0.1

Welcome to Lattice Diamond<sup>®</sup>, the complete design environment for Lattice Semiconductor FPGAs. Lattice Diamond design software offers leading-edge design and implementation tools optimized for cost-sensitive, low-power Lattice FPGA architectures. Diamond is the next generation replacement for ispLEVER<sup>®</sup>, featuring design exploration, ease of use, improved design flow, and numerous other enhancements. Diamond is available for both the Windows and Linux operating systems. For details, see “Windows System Requirements” on page 10 or “Linux System Requirements” on page 12.

This version of Diamond adds a variety of enhancements to make designing for Lattice Semiconductor programmable devices easier than ever. The design tools also include support for the latest Lattice Semiconductor devices. See “What’s New” on page 2.

Known issues and workarounds are described in the Lattice Forums on the Lattice Semiconductor Web site: [www.latticesemi.com/latticeforums](http://www.latticesemi.com/latticeforums). Under “Questions & Answers,” find “Lattice Diamond Known Issues” and click on the version number.

Under Design Tools and IP, click **Lattice Diamond** for the latest questions and answers. You can also ask questions in the Lattice Forums.

Lattice Semiconductor offers a rich variety of information sources, including the Help system, PDF manuals, tutorials, and online discussions. The easiest way to reach them all is through the online Help. The first topic in the [Help](#) provides links to all the other sources of information.

You can also find extensive information about Diamond, its capabilities, tools, and workflow on the Lattice Semiconductor Web site under:

[www.latticesemi.com/latticediamond](http://www.latticesemi.com/latticediamond)

## What's New

This release of Diamond provides a variety of new features in the following areas. See the online Help for details.

### What's New in Diamond 2.0.1

**New Device Support** The iCE40™ devices can be simulated with Aldec® Active-HDL™ Lattice Edition and can be programmed with Programmer.

Devices supported by the ispLEVER Classic design tools can also be simulated with the Active-HDL simulator found in Diamond.

LatticeECP4™ is no longer supported.

**Timing Simulation** Diamond supports the timing simulation flow when a design includes DDR2 or DDR3 memory interfaces.

**Schematic Editor** Schematic Editor has a variety of enhancements.

### What's New in Diamond 2.0

**64-Bit Windows 7** The following software is now available in 64-bit versions that run on 64-bit Windows 7:

- ▶ Lattice Diamond with the full Diamond tool set
- ▶ Power Estimator
- ▶ Programmer
- ▶ Reveal™ Analyzer

The 64-bit version of IPexpress requires modules and IP that have been modified for the 64-bit environment. Modules are included with the software and can be configured and used with the 64-bit version. Previously downloaded and installed 32-bit IP cannot be configured with 64-bit IPexpress. However, 32-bit IP that have already been configured and generated will continue to work in your designs but cannot be modified.

Use IPexpress to download updated IP. If you are using 64-bit Diamond, IP that have not yet been updated are grayed out and cannot be downloaded. If the IP you need is not yet available, check again later or contact Lattice Applications. For instructions for downloading and installing IP, open the online Help and go to [Entering the Design > Designing with Modules > Creating IPexpress Modules and IP > Downloading IPexpress IP](#).

**Red Hat Linux** The following software are now available on Red Hat Enterprise Linux 6:

- ▶ Lattice Diamond with the full Diamond tool set
- ▶ LatticeMico System
- ▶ Power Estimator
- ▶ Programmer
- ▶ Reveal Analyzer

For Red Hat Enterprise Linux (all supported versions), there is now parallel port support for Programmer, Reveal, and LatticeMico System. A special installer is required to enable this feature. See the “Lattice Diamond 2.0 Installation Notice for Linux.”

**Deployment Tool** Deployment Tool has been updated with such new features as file conversion capability, including the ability to convert bitstream, JEDEC, IEEE 1532 ISC data, and application-specific BSDL files from one format to another; external memory capability, including advanced SPI flash and sysCONFIG™ daisy chain; the ability to edit the USERCODE; and the ability to edit security fuse settings.

Deployment Tool enhancements include embedded system ability to copy the embedded source code to the output file directory; enhanced I<sup>2</sup>C embedded features including JEDEC file input support, the ability to specify the I<sup>2</sup>C slave address, the ability to include comments, and the ability to specify fixed pulse width. Also, embedded slave SPI now supports JEDEC file input.

For more information, open the online Help and go to: [Programming the FPGA > Deploying the Design with the Deployment Tool](#).

**Documentation** With this release, Lattice introduces an online *FPGA Design Guide* including in depth discussion of “[Design Planning](#)” and “[Timing Closure](#)” with Lattice FPGAs. For easy access, see the Start Page in Diamond.

*IPexpress Module Reference Guide* is now called [Lattice Module Reference Guide](#) because it now includes the similar System Planner modules. See “System Planner” on page 6.

The “[Designing with Modules](#)” section of *Entering the Design* has been re-organized by module type. The section has all the same topics with the same information, but you may find this organization easier to understand.

**ECO Editor** The new Signal Probes sheet enables you to assign signals to external pins as test probes for debugging. For more information, open the online Help and go to [Applying Engineering Change Orders > Adding Signal Probes](#).

**Floorplan View and Physical View** The new Find dialog box enables you to search for a component, net, or site. For more information, open the online Help and go to [Applying Design Constraints > Using Diamond's Preference Views > Searching for Design Elements](#).

**Hierarchy** The Hierarchy view now shows the full path name of the files that define each module. For more information, open the online Help and go to: [Managing Projects > Analyzing a Design > Working with the HDL Diagram Interface > Hierarchy View](#).

**Incremental Design Flow** This release of Diamond supports the Incremental Design flow feature for LatticeECP2M and LatticeECP3 devices. Incremental Design is a design methodology that preserves certain process results and performance on portions of a design while reducing re-processing time by focusing on other parts of the design during multiple design processing iterations. It accomplishes this by using design partitions you define in synthesis through Compile Points. Partitions allow you to lock down and preserve timing stability by preventing specified modules from being changed in the next design iteration. For more information, open the online Help and go to [Using Incremental Design Flow](#).

**IPexpress** IPexpress™ contains numerous improvements to existing modules.

**ispLeverDSP** The ispLeverDSP software, blocks, and reference designs are no longer included with Diamond.

**LatticeMico System** LatticeMico™ System has been upgraded to the Eclipse 3.6.2 Platform. For more information, refer to the “LatticeMico System Software Release Notes for Diamond.” To access the release notes:

- ▶ If LatticeMico System is installed with Diamond, go to the Windows Start menu and choose **Programs > Lattice Diamond > Accessories > LatticeMico System Release Notes**.
- ▶ If LatticeMico System is installed as a stand-alone tool, go to the Windows Start menu and choose **Programs > Lattice Diamond > LatticeMico System Release Notes**.

**Pin Migration** The new “Check Areas” section of the Incompatible Pins dialog box allows you to narrow the list of incompatible pins to those whose type, configuration, LVDS/high speed, and bank numbers differ between the current device and the selected devices. For more information, open the online Help and go to [Applying Design Constraints > Setting Preferences > Migrating Pin Assignments](#).

**Place & Route** The negotiation-based router (NBR), which helps reduce runtime on designs that are highly congested or difficult to route, is set as the default router. For more information, open the online Help and go to [Implementing the Design > Place and Route > Improving PAR Results for Highly Congested Routing](#).

**Preferences** A new preference allows you to block a path going to a specific pin of a specific physical component:

```
BLOCK COMP <comp_name> PIN <pin_name> ;
```

COMP is a COMPONENT like SLICE\_4. For more information, open the online Help and go to [Constraints Reference Guide > Preferences > BLOCK](#).

**Programmer** Programmer has been updated with such new features as support for MachXO2 I<sup>2</sup>C programming, custom I/O state, capture I/O state, dynamic I/O state, dual boot secure sector support, and custom SPI flash.

Programmer enhancements include support for custom SPI flash, a new device ID column in the spreadsheet, a new device package column in the spreadsheet, and a new display register dialog box.

For more information, open the online Help and go to [Programming the FPGA](#).

**Power Calculator** The enhanced Startup Wizard for the stand-alone Power Calculator enables you to open a Power Calculator project file, calculate the power usage of an existing .ncd file, or estimate power usage based on a selected device. For more information, open the online Help and go to [Analyzing Power Consumption > Starting Power Calculator as a Stand-Alone Tool](#).

**Power Estimator** The new Lattice Power Estimator is a stand-alone tool that does not require the installation of Diamond. Power Estimator gives you the option of estimating power consumption based on a selected device, performance grade, and operating conditions; or of extracting the settings from a saved Power Calculator project file (.pcf).

**Reveal Analyzer** Reveal Analyzer supports easily changing the cable connection to the board after the Reveal Analyzer project has been created. Previously you had to recreate the project if you had to change port or the cable type used. For more information, open the online Help and go to [Testing and Debugging On-Chip > Performing Logic Analysis > Starting Reveal Analyzer > Changing the Cable Connection](#).

**Run Manager** Run Manager can also be controlled by the Process menu commands, but they only affect the active implementation. You can choose commands from the Process menu in the menu bar or the right-click menu in the Process view. The Process view also shows the status of the active implementation. For more information, open the online Help and go to: [Managing Projects > Working with Run Manager](#).

**Spreadsheet View** The new "File > Export All SSV Preferences to LPF" command enables you to export all Spreadsheet View preferences, including default preferences, to a single logical preference file. For more information, open the online Help and go to [Applying Design Constraints > Exporting/Importing Pin Files and Preference Sheets](#).

**Strategy Options** In previous versions, Diamond only saved strategy settings that were changed from the defaults. If nothing was saved for an option, the default would be used. However, sometimes a default value is changed in later versions of the software. So in a previous version the default was True, but in the new version of Diamond the default is False. New design projects might work better, but someone upgrading Diamond during a project might see an unexpected change in their implementation.

With the 2.0 release, Diamond saves all strategy values whether they are default values or not. If a strategy is migrated to a future version of Diamond,

the saved values will be used regardless of any future changes to the defaults, providing more consistent results from one release to another.

**Synthesis Tools** The Synopsys® [Synplify Pro](#)® for Lattice and Lattice Synthesis Engine (LSE) synthesis tools have been updated.

**TRACE** A cross-probing feature has been added that enables you to cross-probe a path from the TRACE report to the HDL Analyst view in Synplify Pro. For more information, open the online Help and go to [Analyzing Static Timing > Running TRACE > Cross-Probing to Synplify Pro HDL Analyst](#).

The “Check Unconstrained Paths” option has been enhanced to report the start point and end point of each path that is unconstrained. For more information, open the online Help and go to [Analyzing Static Timing > Running TRACE > Setting TRACE Options](#).

The Map and Place & Route Trace Reports have the option to report connections and paths that are not covered by timing preferences. You can control these reports with the new strategy options Check Unconstrained Connections and Number of Unconstrained Paths. These options are available under both Map Trace and Place & Route Trace in the Strategies dialog box. To see the dialog box, go to the File List view and double-click a strategy.

## Supported Third-Party Tools

This version of Diamond has been tested with the following third-party tools:

- ▶ Active-HDL™ 9.1
- ▶ Modelsim® (SE) for 32-bit Windows 10.0b
- ▶ Modelsim® (SE) for 64-bit Linux 10.0d
- ▶ NC-Sim 10.20-P008
- ▶ Questa for Windows 10.1a
- ▶ Riviera 2010.10
- ▶ Synplify Pro F-2012.03L
- ▶ Precision 2010a Update 2
- ▶ VCS 2010.06-SP1

## Supported Devices

Lattice Diamond can be used with either a free license or a subscription license. The two licenses provide access to different device families.

Device Family	Free License	Subscription License
LatticeEC™	◀	◀
LatticeECP™	◀	◀
LatticeECP2™	◀	◀
LatticeECP2M™		◀
LatticeECP2S		◀
LatticeECP2MS		◀
LatticeECP3™		◀
LatticeSC™		◀
LatticeSCM™		◀
LatticeXP™	◀	◀
LatticeXP2™	◀	◀
MachXO™	◀	◀
MachXO2™	◀	◀
Platform Manager™	◀	◀

## Updating Projects from an Earlier Version

If you want to work on a design project created with an earlier version of Diamond, start with the following procedures. These procedures adapt the project for the following changes in Diamond.

Find out which version of Diamond your project was created with. Then work through the changes for that and every later version, starting with the earliest and going to the most recent. For example, if your project was created with Diamond 1.1, you would start with the changes for 1.1. After completing those changes you would work on the changes for each later version (1.2).

When you open a project from Diamond 1.2 or earlier, Diamond opens a dialog box warning that Diamond will automatically move all SDC files to the Synthesis Constraint Files folder in File List view and remove the “Input SDC Constraint File” options from the strategies. If the project is using LSE, the filenames will be changed to use an .ldc extension.

Once saved, the project will not be compatible with earlier versions of Diamond.

## 1.4 Projects

For Diamond 1.4 and earlier, there might be some constraints that are not honored because of the Synplify Pro cross-probing feature. This EDIF renaming is usually related to bus names.

If such a problem occurs, you can turn off the renaming feature by placing the following line in the “Command line Options” text box of the Synplify Pro section of the active strategy:

```
set_option -syn_edif_array_rename 0
```

## 1.2 Projects

There were several enhancements for IP and MachXO2.

### IP Incompatibilities

SPI4.2 2.7 is not compatible with Diamond 1.3 or later. If you are using this IP, check the Lattice Semiconductor Web site for a more recent version.

### MachXO2 Changes

See if your design involves any of the following features:

- ▶ For EFB modules with user flash memory (UFM), regenerate the module.
- ▶ For IO\_TYPE=PCI33 on a MachXO2-1200 or larger device, check if the CLAMP is using the default setting. With Diamond 1.3 the CLAMP default changes from ON to PCI and the I/O will be placed in bank 2. If you were using the default and still want the setting to be ON, you need to set it explicitly.
- ▶ For PCI33 MT 6.5 and PCI33 T 6.4 IP, either set the CLAMP to ON explicitly or choose a bigger package (256 or more).

## 1.1 or 1.0 Projects

There were several enhancements for IP and MachXO2.

### IP Incompatibilities

The following IP versions are not compatible with Diamond 1.2 or later. If you are using any of these IP, check the Lattice Semiconductor Web site for a more recent version.

- ▶ Convolution Block Encoder 3.6
- ▶ Interleaver Deinterleaver 3.5
- ▶ DDR1 6.9
- ▶ PCI\_MT\_33 6.4
- ▶ DDR2 7.1
- ▶ PCIe RC Lite 1.2
- ▶ DDR3 1.2.1
- ▶ Tri-Speed MAC 3.4
- ▶ DDR1\_CP 1.1 with MachXO2
- ▶ Viterbi Block Decoder 4.6
- ▶ DDR2\_CP 1.1 with MachXO2

### MachXO2 Support

Some aspects of the software support for MachXO2 designs have been improved. See if your design involves any of the following features:

- ▶ The 4K/7K design with PLL has a CIB-to-PLL jump change. If you are using this design, recompile it.
- ▶ The EFB simulation model has changed. If you are using the EFB module, rerun your simulation tests to see more accurate results.
- ▶ In the DDR\_GENERIC module of IPexpress, the GDDR1\_RX.Aligned with PLL interface is no longer supported. If you are using such a module, use IPexpress to regenerate it without the PLL option.

Also, MachXO2 has IP evaluation capability and TransFR mode for all I/Os.

## Migrating ispLEVER Projects

Diamond uses a different project structure than ispLEVER and cannot directly open an ispLEVER project. However, design projects created in ispLEVER can easily be imported into Diamond. The process is automatic except for the ispLEVER process properties, which are similar to the Diamond strategy settings, and some modules and IPs. All of your ispLEVER project source will be automatically handled.

Projects created using ispLEVER can be imported into Lattice Diamond through two different paths:

- ▶ On the Start Page, click **Import ispLEVER Project** (in the upper-left corner).
- ▶ From the File menu, choose **Open > Import ispLEVER Project**.

Follow the directions in the dialog box that opens to convert your ispLEVER project into a Lattice Diamond project.

Limitations to the import/conversion process include:

- ▶ NGO files in ispLEVER projects need to be manually copied into the Lattice Diamond project if the NGO files were originally copied into the ispLEVER project. For example, NGO files that were copied from Lattice IP generation.
- ▶ The .lpc files are replaced with .ipx files in Lattice Diamond. You need to regenerate your IP by double-clicking on the .lpc file. The resultant wizard will help you generate the new .ipx file, replacing the old .lpc file.

More information on importing ispLEVER projects can be found in the *Lattice Diamond User Guide*, online Help (see Managing Projects > [Importing ispLEVER Projects](#)), and training videos on the Lattice Web site.

## Other Information Resources

Other available information resources for the Diamond software include the following.

- ▶ General Information: General information on Lattice Diamond can be found on the Lattice Web site at:  
[www.latticesemi.com/latticediamond](http://www.latticesemi.com/latticediamond)
- ▶ Online Help: Start Lattice Diamond and choose **Help > Lattice Diamond Help**.
- ▶ *Lattice Diamond User Guide*: This document can be found from a link on the Start Page view or downloaded from:  
[www.latticesemi.com/latticediamond/downloads](http://www.latticesemi.com/latticediamond/downloads)
- ▶ Training Videos: Several short videos are available on different aspects of the Lattice Diamond software. These can be viewed online at:  
[www.latticesemi.com/latticediamond/videos](http://www.latticesemi.com/latticediamond/videos)

## Windows System Requirements

The basic system requirements for Lattice Diamond on Windows are:

- ▶ Intel Pentium or Pentium-compatible PC
- ▶ Windows XP, Windows Vista (32-bit), or Windows 7 (32-bit or 64-bit)

### Note

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If your operating system is Windows Vista, make sure you have installed all the latest patches from Microsoft.

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- ▶ Approximately 5.75 GB free disk space

- ▶ 1024 X 768 graphics display
- ▶ Microsoft-compatible mouse and mouse driver
- ▶ Network adapter

#### Note

A node-locked license is based on the physical (hard-coded) address provided by the network adapter. Network connectivity is not required for a node-locked license. In the absence of a network connection, you can install the NWLink IPX/SPX protocol to force recognition of your NIC card ID (see the installation notice).

A floating license requires access to the license server, so both a network adapter and connectivity are required.

- ▶ JScript-capable Web browser
- ▶ Acrobat Reader 5.0 or later

## Memory Requirements

Table 1 lists the minimum memory requirements and the recommended memory for all the Lattice Semiconductor FPGA families. Designing for the largest FPGAs may require more than the usual 2 GB of memory. For help in extending your memory to 3 GB, see “Extending Memory” on page 12. Designing for LatticeECP3 with more than 95K LUT requires a 64-bit operating system.

**Table 1: Recommended Memory for Windows**

Device	Size	Minimum	Recommended
LatticeEC, LatticeECP	Up to 20K LUT	512 MB	768 MB
	Up to 50K LUT	768 MB	1 GB
LatticeECP2/M	Up to 20K LUT	768 MB	1 GB
	Up to 50K LUT	1 GB	1.5 GB
	Up to 100K LUT	1 GB	2 GB
LatticeECP3	Up to 95K LUT	2 GB	3 GB
	Up to 150K LUT	3 GB	4 GB
LatticeSC/M	Up to 40K LUT	768 MB	1 GB
	Up to 115K LUT	1 GB	2.5 GB
LatticeXP, LatticeXP2	Up to 20K LUT	512 MB	768 MB
	Up to 50K LUT	768 MB	1 GB
MachXO, MachXO2	All	256 MB	512 MB
Platform Manager	All	256 MB	512 MB

## Extending Memory

Designing for LatticeECP3 may require more than the 2 GB normally available with 32-bit Windows systems. But you can configure Windows to use up to 3 GB of memory.

Note that increasing the amount of memory available to applications, decreases the amount available for the file cache, paged pool, and nonpaged pool, which can affect applications with heavy networking or I/O.

### In Windows XP

In Windows XP Professional, add the **/3GB** switch to the end of the startup line in the boot.ini file. For details, see the following Microsoft articles:

- ▶ “Windows XP SP1 May Not Start with the /3GB or /USERVA Switch”:  
[support.microsoft.com/?kbid=328269](http://support.microsoft.com/?kbid=328269)
- ▶ “How to edit the Boot.ini file in Windows XP”:  
[support.microsoft.com/default.aspx?scid=kb;en-us;q289022](http://support.microsoft.com/default.aspx?scid=kb;en-us;q289022)
- ▶ “Memory Support and Windows Operating System” shows an example of the boot.ini with the /3GB switch:  
[msdn.microsoft.com/en-us/windows/hardware/gg487508.aspx](http://msdn.microsoft.com/en-us/windows/hardware/gg487508.aspx)

### In All Other Versions of Windows

Use the **BCDEdit /set increaseuserva 3072** command to set the boot entry option to 3 GB. For details, see Microsoft article “BCDEdit /set”:  
[msdn.microsoft.com/en-us/library/ff542202.aspx](http://msdn.microsoft.com/en-us/library/ff542202.aspx)

## Linux System Requirements

The basic system requirements for Lattice Diamond on Linux are:

- ▶ Intel Pentium or Pentium-compatible PC, or AMD Opteron system support  
The ispVM System contains a 32-bit driver to support the 32-bit system only.
- ▶ Red Hat Enterprise Linux 4.X, 5.3, or 6; or Novell SUSE Linux Enterprise 10 SP1 or 11 operating system  
The host operating system can be either 32-bit or 64-bit. Diamond is a 32-bit application requiring 32-bit support libraries to run on a 64-bit host operating system.  
Version 5.3 of Red Hat Enterprise Linux has some extra installation requirements. See “Configuring Red Hat 5.3” on page 13.
- ▶ Approximately 5.75 GB free disk space
- ▶ 1024 x 768 graphics display
- ▶ JScript-capable Web browser

- ▶ Adobe Acrobat Reader, or equivalent PDF reader
- ▶ Network adapter and network connectivity

A floating license requires access to the license server, so both a network adapter and connectivity are required.

## Memory Requirements

Table 2 lists the minimum memory requirements and recommended memory for all the Lattice Semiconductor FPGA families.

**Table 2: Recommended Memory for Linux**

Device	Size	Minimum	Recommended
LatticeEC, LatticeECP	Up to 20K LUT	512 MB	768 MB
	Up to 50K LUT	768 MB	1 GB
LatticeECP2/M	Up to 20K LUT	768 MB	1 GB
	Up to 50K LUT	1 GB	1.5 GB
	Up to 100K LUT	1 GB	2 GB
LatticeECP3	Up to 95K LUT	2 GB	3 GB
	Up to 150K LUT	3 GB	4 GB
LatticeSC/M	Up to 40K LUT	768 MB	1 GB
	Up to 115K LUT	1 GB	2.5 GB
LatticeXP, LatticeXP2	Up to 20K LUT	512 MB	768 MB
	Up to 50K LUT	768 MB	1 GB
MachXO, MachXO2	All	256 MB	512 MB
Platform Manager	All	256 MB	512 MB

## Configuring Red Hat 5.3

Red Hat Enterprise Linux 5.3 has some extra requirements for Diamond:

- ▶ In addition to the basic installation of Red Hat 5.3, under Development/ Legacy Software Development, select:

```
1:gtk+-1.2.10-56.el5.i386 - GIMP Toolkit (GTK+) sb:(9 of 9)
```

Under Base System/Legacy Software Support, add the following to the default items:

```
Openmotif22-2.2.3-18.i386 - Open Motif runtime
```

Proper Diamond operation depends upon these libraries being installed.

- ▶ When installing the Red Hat Enterprise Linux version, be sure to install the PERL modules XML::Parser, XML::DOM, and XML::RegExp. These PERL modules are available at [www.cpan.org](http://www.cpan.org).

## Contacting Technical Support

**FAQs** The first place to look. The [Lattice FAQs](#) (frequently asked questions) provide solutions to questions that many of our customers have already asked. Lattice Applications Engineers are continuously adding to the FAQs.

**Online Forums** [Lattice Forums](#) contain a wealth of knowledge and are actively monitored by Lattice Applications Engineers.

**Telephone Support Hotline** Receive direct technical support for all Lattice products by calling Lattice Applications from 5:30 a.m. to 6 p.m. Pacific Time.

- ▶ For USA & Canada: 1-800-LATTICE (528-8423)
- ▶ For other locations: +1 503 268 8001

In Asia, call Lattice Applications from 8:30 a.m. to 5:30 p.m. Beijing Time (CST), +0800 UTC. Chinese and English language only.

- ▶ For Asia: +86 21 52989090

### E-mail Support

- ▶ [techsupport@latticesemi.com](mailto:techsupport@latticesemi.com)
- ▶ [techsupport-asia@latticesemi.com](mailto:techsupport-asia@latticesemi.com)

**For Local Support** Contact your nearest [Lattice Sales Office](#).

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## Trademarks

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