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<table>
<thead>
<tr>
<th>Revision</th>
<th>Changes</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Note added to “Installing the Allegro Interface” on page 1-8 specifying that the installation pathname must not contain spaces.</td>
<td>Oct 2013</td>
</tr>
</tbody>
</table>
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## Chapter 1

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**End-User License Agreement**
Chapter 1
Allegro PCB Designer Interface

This document describes the Allegro PCB Designer interface to FloTHERM PCB and FloEDA Bridge software. It enables users to directly send layout information from Allegro PCB layout software to be used by FloTHERM PCB in a new or existing FloTHERM PCB project or to be imported into FloEDA Bridge for subsequent transfer into FloTHERM. It also allows the user to import modified component placements made by FloTHERM PCB to improve the thermal performance of the board, back into the Allegro design.

Interface Prerequisites

The prerequisites for direct interface with Cadence Allegro PCB Designer software are:

1. An installation of Cadence Allegro PCB Designer software, version 16.3 or later (16.5 recommended)
2. An installation of Mentor Graphics FloTHERM PCB software for thermal analysis of PCBs, version 5.1 or later (6.2 recommended) or an installation of FloTHERM V8.1 or later (that contains FloEDA Bridge)
3. Knowledge of the use of above tools

Both software installations must be on Microsoft® Windows® platforms. If they must be run on separate machines for operational or licensing reasons then data files can be transferred over the network, however the direct invoking of FloTHERM PCB from within Allegro will not function.
Installing the Allegro Interface

Follow this procedure to install the interface:

**Procedure**

1. Identify the location where the interface should be installed.

   The recommended installation directory is the `allegro_site` location. This can be found using the **Tools > Utilities > Env Variables** option in Allegro and scrolling down to find the entry for `allegro_site`. Usually, this location is:

   ```
   <cds_root>\share\local\pcb
   ```

   where `<cds_root>` is the installation path for the Cadence software.

   **Note**
   
   The pathname must not contain any space characters.

2. In the just identified installation directory, check if the files `menus\allegro.men` and/or `skill\allegro.ilinit` exist due to earlier customizing.

   If the two files exist, then rename them to have `.old` extensions. If they are different from the ones supplied then they should be merged; see the next step for details.

3. Install the interface in two (or three) stages:

   a. **Note:** If you have unzipped a previous version of this interface, remove all of the previously unzipped files. Refer to **Table 1-1**.

   **Table 1-1. Old Unzipped Installation Files**

<table>
<thead>
<tr>
<th>Path</th>
<th>Filename</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>&lt;allegro_site&gt;\forms</code></td>
<td>flo_settings.form</td>
</tr>
<tr>
<td><code>&lt;allegro_site&gt;\menus</code></td>
<td>allegro.men</td>
</tr>
<tr>
<td></td>
<td>allegro_157_flo.men</td>
</tr>
<tr>
<td></td>
<td>flotherm_interface_men_fragment.txt</td>
</tr>
<tr>
<td><code>&lt;allegro_site&gt;\skill</code></td>
<td>allegro.ilinit</td>
</tr>
<tr>
<td></td>
<td>EDAtoFLOEDA2.exe</td>
</tr>
<tr>
<td></td>
<td>flotherm_functions.il</td>
</tr>
<tr>
<td></td>
<td>QtCore4.dll</td>
</tr>
<tr>
<td></td>
<td>QtGui4.dll</td>
</tr>
</tbody>
</table>
b. Unzip the supplied file:

```
...\eda_interfaces\Allegro\FloTHERM_Allegro_Interface.zip
```

where ... refers to the installation for either FloTHERM or FloTHERM PCB. This is typically C:\Program Files\MentorMA\flosuite_\version\flotherm or C:\Program Files\MentorMA\flosuite_\version\fopcb_\version\ respectively.

The zip file contains a PDF version of this document and the zip file for the installation.

c. Unzip the installation file:

```
FloTHERM_Allegro_Interface_v2.23.zip
```

to the allegro_site location identified earlier.

This will add files to the forms, menus and skill directories.

If an earlier version of Allegro is in use, edit the allegro.mem in your installation file to include the FloTHERM menu section found in allegro.mem.

4. If required to launch FloTHERM PCB or FloEDA Bridge from Allegro, display the System Properties dialog and update the environment path variable to include the FloTHERM PCB bin directory.

For example, in Windows XP, choose Start > Control Panel > System and under the Advanced tab of the System Properties dialog click Environment Variables to display the current user and system environment variables. Update the path variable as follows:

- To the user (or system, depending on requirements) environment variable path add the following, separating the new value from the existing values and each other with a “;”:

  For FloTHERM installations:

  `<install_dir>`\flosuite_\version\common\WinXP\bin

  For FloTHERM PCB installations:

  `<install_dir>`\flosuite_\version\fopcb_\version\WinXP\bin

Note

To export data for subsequent import into FloTHERM via FloEDA Bridge use the Export .floeda file menu option. See “Menu Options” on page 12.

5. Start Allegro PCB Designer and check that FloTHERM Interface appears in the top menu bar between the Analyze and Manufacture menus.

The interface is now ready to use.
Installing the Allegro Interface

If any problems are encountered, consult “Troubleshooting” on page 19.
Using the Allegro Interface

The Allegro PCB Designer interface allows the transfer of board outline, placement keep out areas, and component and package information to FloTHERM PCB or FloEDA Bridge.

This section describes the operational menu options and customizing dialogs under the following topics:

- Menu Options .......................................................... 12
- FloTHERM Interface Settings Dialog .......................... 15
- Adding and Changing Interface Settings by Command Line ...................................................... 17
- Component Height Properties .................................... 18
Menu Options

Usage

FloTHERM Interface

Description

The menu options are shown in Figure 1-1 and described below.

Figure 1-1. FloTHERM Interface Menu in Allegro PCB Designer

Elements

- **Load into new FloTHERM PCB project**
  This creates the FloTHERM PCB board data interface file and invokes FloTHERM PCB to load it in, creating a new project. There is no user interaction involved. FloTHERM PCB will appear having loaded the board data.

- **Load into existing FloTHERM PCB project**
  This enables the user to select an existing FloTHERM PCB project (which may be an empty template or an earlier version of this board). The interface then creates the FloTHERM PCB board data interface file and invokes FloTHERM PCB to load the project file then load the board data to update that project. If this is the second or subsequent time this option has been used then the path name of the last project used will be displayed in the message window. This is saved within the design so will only be kept if the design is saved after using this option.

  **Note**
  The full path and filename of the project file must not contain spaces due to an internal Allegro limitation. If this happens, an error message will appear and the interface will not be invoked.

- **Export .floeda file**
  — for subsequent import into FloTHERM PCB or FloEDA Bridge
  This creates the board data interface file for transfer to another system which runs FloTHERM PCB or for import into FloEDA Bridge for subsequent transfer to FloTHERM. Use the file browser to set the output path and filename. This file will have an extension of .floeda. If the file already exists, a prompt will appear to check that the file should be
overwritten. When using the image option the interface will take longer to run so please wait for the file to be successfully output to the specified directory. See “FloTHERM Interface Settings Dialog” on page 15 for a description of the Use Image calculation method.

- **Import Placement Changes**

  This enables the user to select a component position file (.floplc), exported from FloTHERM PCB or FloEDA Bridge, and load the revised placement into the Allegro board design. Each changed component position can be approved individually or all changes can be approved in one click.

To import the placement changes:

1. First select the <name>.floplc file using the file browser. The file is then processed and if any differences in position, rotation or side of any component is detected, a Yes/No dialog box will appear asking “Approve all component placement changes?”

2. Respond to the prompt:
   - Select **No** to allow all component changes to be carried out in a single step.
   - Select **Yes** to selectively approve each component change using a Yes/No/Cancel dialog. The dialog will supply the operation information:

     \[
     \text{Move } \text{comp\_ref}(x=X, y=Y, \text{rot}=r, \text{mirror}=\text{YES/NO}) \text{ to } (x=X', y=Y', \text{rot}=r', \text{mirror}=\text{YES/NO})
     \]

     where the field in italics will be replaced with the current values and the new possible values for the component `comp\_ref`.
   - Select **Yes** to apply the changes to the component.
   - Select **No** to skip just this change.
   - Select **Cancel** to skip all further changes.

   If a component cannot be updated, an Error box will appear identifying the component that cannot be moved. The problem may be due to the component or an attached test point being fixed or the end position would be outside the board extents.

   Also contained in the file are property updates as a result of any changes to the power, height and thermal properties made in FloTHERM PCB or FloEDA Bridge which are back annotated into the Allegro file and will be used for future .floeda files produced from this design to reduce the need to change the values every time. Where these changes are changes to an existing property or overriding a value on the symbol or part then a warning message will be output to the message window.

3. At the end of processing the file, a message dialog will appear showing how many components were moved (if any) which must be acknowledged by selecting **OK**. If any properties have been updated, a message dialog will appear showing how many changes have been made, and must be acknowledged by selecting **OK**.

**Notes:**
Menu Options

- Only accepting some component changes, and not others, may result in components overlapping, so a DRC check should be carried out after loading the new placement.

- This option is also able to load the place.txt files output by Cadence.

- Allegro will be paused while the FLOEDA file is generated. For large designs, when using the image option, this may take a minute or more.

**Settings**

This displays a form that allows the configuration options of the interface to be changed. See “FloTHERM Interface Settings Dialog” on page 15 for details.

**Help**

This displays a PDF file containing usage information for the interface.

**General Notes:**

- The file browser is shared by the Load into existing FloTHERM PCB project, Export .floeda file and Import Placement Changes options and therefore the last directory used by any of those options will be the directory which will be the starting point for the next option used. The starting directory is reset every time a new design is loaded.

- If the design has no board outline data, a warning message will appear. This is acknowledged by selecting OK. This may also cause a problem when reading into FloTHERM PCB or FloEDA Bridge.

- Board outline lines should form a contiguous shape or there may be a problem when reading into FloTHERM PCB or FloEDA Bridge.

- If the design has no components, a prompt will appear asking if the interface should continue. If this occurs:
  - Select Yes to transfer just the board outline/package keep out area information (if any)
  - Select No to cancel the interface. A warning message recommending another design should be used will appear, to be acknowledged by selecting OK.
FloTHERM Interface Settings Dialog

To access: FloTHERM Interface > Settings

Description

Use this dialog to customize items transferred to FloTHERM PCB or FloEDA Bridge from Allegro. The settings are saved between runs of the Allegro application in a settings file in the user’s home directory.

Figure 1-2. FloTHERM Interface Settings Dialog

Table 1-2. FloTHERM Interface Settings Dialog Contents

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Package Outline Layer</td>
<td>The symbol layer (subclass) that is used for the outline of the components in FloTHERM PCB or FloEDA Bridge. See Usage Notes.</td>
<td>PLACE_BOUND_TOP layer is used by the IDF interface. Boards with no components loaded will have one entry called NO_SYMBOL_LAYER to indicate this situation</td>
</tr>
<tr>
<td>Component Settings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Default Package Height</td>
<td>The default package height to be used for components that do not have a HEIGHT (or FLOPCB_HEIGHT) property defined.</td>
<td>Default is 150 mils and must be zero or greater.</td>
</tr>
</tbody>
</table>
### Table 1-2. FloTHERM Interface Settings Dialog Contents

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Property</td>
<td>The property to be looked for components for their operational power rating.</td>
<td>Default is POWER_OPR (operating power) and is expected to be in milliwatts (mW).</td>
</tr>
<tr>
<td>Package Name Property</td>
<td>The property to be looked for on components, symbols and parts for which the FloTHERM PCB package is known.</td>
<td>Default is FLOPCB_PKG.</td>
</tr>
<tr>
<td>Package Material Property</td>
<td>The property to be looked for on components for which the package material is known.</td>
<td>Default is FLOPCB_PKG_MATL.</td>
</tr>
</tbody>
</table>
| Include Unplaced Components  | • When checked, all unplaced components are included in the .floeda file for placement within FloTHERM.PCB or FloEDA Bridge. Unplaced components are placed to the left of the board.  
• When unchecked, any unplaced components are not included in the .floeda file. | Default is checked. |

### Copper Coverage

| Calculation Method           | **Calculate** — calculate the coverage based on the current state of routing on the board. This adds up areas of track copper, copper shapes and lines, and pin/via pad shapes. No allowance is made for tracks overlapping pads. Also see Usage Notes.  
**Use default** — for an unrouted board.  
**Use Image** — uses a picture of the board layer as coverage. | **Calculate**, **Use default** or **Use Image** |
| Default Signal Coverage      | The default coverage in percentage for signal layers. | From 0 to 100%. The default is 20% |
| Default Plane Coverage       | The default coverage in percentage for reference plane layers. | From 0 to 100%. The default is 90% |

### Usage Notes

- The **Package Outline Layer** options available are dependent on the layers used by the symbols that are referenced by the components in the design. This means that when changing between designs with varied symbol libraries, this layer may be invalid. A warning will be printed if this needs to be changed due to the existing setting not being present in a symbol in this design. This warning will also be output when the interface is run if this layer has not been updated. If there is no data on that layer for a component symbol in a particular design then the bounding box of the pins will be used by FloTHERM PCB and FloEDA Bridge.
Only the layers used in the symbol definitions are listed, however, components on the bottom side of the board will use the component outline for that side.

- The **Copper Coverage** section describes how to control the representation of the distribution of copper on layers within the board.
- If the **Calculate** calculation method is used and the board is not fully routed, a prompt will appear stating what the percentage of nets routed is and whether the interface should continue with the calculation or use the default values.
- Click **OK** to accept all changes and close the dialog.
- Click **Cancel** to undo all changes and close the dialog.
- Click **Reset** to reset all changes made since the dialog was opened.

**Related Topics**
- “Adding and Changing Interface Settings by Command Line” on page 17
- “Component Height Properties” on page 18

### Adding and Changing Interface Settings by Command Line

The `flotherm_add_properties` command can be used to set up the power, height, FloTHERM PCB package, package material and thermal properties in the dictionary using the names in the settings dialog, refer to “FloTHERM Interface Settings Dialog” on page 15.

Enter the command in the command input window as follows:

```
> flotherm_add_properties
```

If the properties do not already exist in the design dictionary then they will be added, and a confirmation dialog displayed.

If the properties already exist a message will be displayed. They can be subsequently edited using **Setup > Property definitions** in Allegro PCB Designer.

The Allegro library can be updated to add these properties to the part (component definition) or symbol to reduce the need to define them within the design and minimize the time required to setup designs for analysis in FloTHERM PCB.

The precedence level in decreasing order for the all the properties except height is:

1. Component
2. Symbol
3. Part
Component Height Properties

Components, symbols and parts can have the property, FLOPCB_HEIGHT, added to them to override:

- The PACKAGE_HEIGHT_MAX attribute assigned to shapes in the symbol from the library if defined,
- The property HEIGHT on parts, or
- The default height set in the FloTHERM Interface Settings Dialog.

FloTHERM PCB supports a single height, so the maximum height is used if only the PACKAGE_HEIGHT_MAX is defined on multiple shapes.

The precedence level for finding the component height is, in decreasing order:

1. Component (FLOPCB_HEIGHT)
2. Symbol (FLOPCB_HEIGHT)
3. Symbol figures (PACKAGE_HEIGHTMAX - largest)
4. Part (FLOPCB_HEIGHT, then HEIGHT)
Troubleshooting

- If the FloTHERM Interface menu does not appear in the top bar — check the environment variable MENUPATH and check that the allegro.men supplied is the first one found when processing the paths shown in order.

- If undefined function errors are produced when the menu options are selected — check the environment variable allegro_site and check that the allegro.ilinit is in a subdirectory named skill of this path.

- If an error appears “Unable to find interface program in path. Check FloTHERM PCB interface installation” — check the file EDAItoFLOEDA2.exe is in the same location as the allegro.ilinit file.

- If an error appears “Error extracting data for output. Please check extract.log and contact Mentor Graphics Support” — check the log file that appears for errors and contact Mentor Graphics Support if you are unable to resolve the issue.

- If FloTHERM PCB does not start — check that the runflopcb.bat file can be found in one of the directories on the environment variable path as described in the installation instructions. The command flopcb_show_paths will display the current paths in use. This may be overridden for site-specific issues if required, please contact Mentor Graphics Support for details.

- If FloTHERM PCB or FloEDA Bridge gives an error of design has no date — check that the board outline is defined and there are no breaks in the outline shape.

- If the interface fails — try running EDAItoFLOEDA2.exe from the command line to check the version number, and that all the required libraries are installed. As of version 2.20, Visual Studio 2010 Service Pack 1 redistributable libraries are required to be installed.

- If any other errors occur — please note the circumstances (board used, operation, and so on) and any error messages in the Allegro window and notify Mentor Graphics Support.

If any of these problems continue, please contact Mentor Graphics Support for advice.
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4.3. Customer agrees to maintain Beta Code in confidence and shall restrict access to the Beta Code, including the methods and concepts utilized therein, solely to those employees and Customer location(s) authorized by Mentor Graphics to perform beta testing. Customer agrees that any written evaluations and all inventions, product improvements, modifications or developments that Mentor Graphics conceived or made during or subsequent to this Agreement, including those based partly or wholly on Customer’s feedback, will be the exclusive property of Mentor Graphics. Mentor Graphics will have exclusive rights, title and interest in all such property. The provisions of this Subsection 4.3 shall survive termination of this Agreement.

5. **RESTRICTIONS ON USE.**

5.1. Customer may copy Software only as reasonably necessary to support the authorized use. Each copy must include all notices and legends embedded in Software and affixed to its medium and container as received from Mentor Graphics. All copies shall remain the property of Mentor Graphics or its licensors. Customer shall maintain a record of the number and primary location of all copies of Software, including copies merged with other software, and shall make those records available to Mentor Graphics upon request. Customer shall not make Products available in any form to any person other than Customer’s employees and on-site contractors, excluding Mentor Graphics competitors, whose job performance requires access and who are under obligations of confidentiality. Customer shall take appropriate action to protect the confidentiality of Products and ensure that any person permitted access does not disclose or use Products except as permitted by this Agreement. Customer shall give Mentor Graphics written notice of any unauthorized disclosure or use of the Products as soon as Customer becomes aware of such unauthorized disclosure or use. Except as otherwise permitted for purposes of interoperability as specified by applicable and mandatory local law, Customer shall not reverse-assemble, reverse-compile, reverse-engineer or in any way derive any source code from Software. Log files, data files, rule files and script files generated by or for the Software (collectively “Files”), including without limitation files containing Standard Verification Rule Format (“SVRF”) and Tcl Verification Format (“TVF”) which are Mentor Graphics’ proprietary syntaxes for expressing process rules, constitute or include confidential information of Mentor Graphics. Customer may share Files with third parties, excluding Mentor Graphics competitors, provided that the confidentiality of such Files is protected by written agreement at least as well as Customer protects other information of a similar nature or importance, but in any case with at least reasonable care. Customer may use Files containing SVRF or TVF only with Mentor Graphics products. Under no circumstances shall Customer use Software or Files or allow their use for the purpose of developing, enhancing or marketing any product that is in any way competitive with Software, or disclose to any third party the results of, or information pertaining to, any benchmark.

5.2. If any Software or portions thereof are provided in source code form, Customer will use the source code only to correct software errors and enhance or modify the Software for the authorized use. Customer shall not disclose or permit disclosure of source code, in whole or in part, including any of its methods or concepts, to anyone except Customer’s employees or on-site contractors, excluding Mentor Graphics competitors, with a need to know. Customer shall take all reasonable precautions to prevent the loss or unauthorized disclosure of, or information pertaining to, any benchmark.

5.3. Customer may not assign this Agreement or the rights and duties under it, or relocate, sublicense or otherwise transfer the Products, whether by operation of law or otherwise (“Attempted Transfer”), without Mentor Graphics’ prior written consent and payment of Mentor Graphics’ then-current applicable relocation and/or transfer fees. Any Attempted Transfer without Mentor Graphics’ prior written consent shall be a material breach of this Agreement and may, at Mentor Graphics’ option, result in the immediate termination of the Agreement and/or the licenses granted under this Agreement. The terms...
of this Agreement, including without limitation the licensing and assignment provisions, shall be binding upon Customer’s permitted successors in interest and assigns.

5.4. The provisions of this Section 5 shall survive the termination of this Agreement.

6. SUPPORT SERVICES. To the extent Customer purchases support services, Mentor Graphics will provide Customer with updates and technical support for the Products, at the Customer site(s) for which support is purchased, in accordance with Mentor Graphics’ then current End-User Support Terms located at http://supportnet.mentor.com/about/legal/.

7. LIMITED WARRANTY.

7.1. Mentor Graphics warrants that during the warranty period its standard, generally supported Products, when properly installed, will substantially conform to the functional specifications set forth in the applicable user manual. Mentor Graphics does not warrant that Products will meet Customer’s requirements or that operation of Products will be uninterrupted or error free. The warranty period is 90 days starting on the 15th day after delivery or upon installation, whichever first occurs. Customer must notify Mentor Graphics in writing of any nonconformity within the warranty period. For the avoidance of doubt, this warranty applies only to the initial shipment of Software under an Order and does not renew or reset, for example, with the delivery of (a) Software updates or (b) authorization codes or alternate Software under a transaction involving Software re-mix. This warranty shall not be valid if Products have been subject to misuse, unauthorized modification, improper installation or Customer is not in compliance with this Agreement. MENTOR GRAPHICS’ ENTIRE LIABILITY AND CUSTOMER’S EXCLUSIVE REMEDY SHALL BE, AT MENTOR GRAPHICS’ OPTION, EITHER (A) REFUND OF THE PRICE PAID UPON RETURN OF THE PRODUCTS TO MENTOR GRAPHICS OR (B) MODIFICATION OR REPLACEMENT OF THE PRODUCTS THAT DO NOT MEET THIS LIMITED WARRANTY. MENTOR GRAPHICS MAKES NO WARRANTIES WITH RESPECT TO: (A) SERVICES; (B) PRODUCTS PROVIDED AT NO CHARGE; OR (C) BETA CODE; ALL OF WHICH ARE PROVIDED “AS IS.”

7.2. THE WARRANTIES SET FORTH IN THIS SECTION 7 ARE EXCLUSIVE. NEITHER MENTOR GRAPHICS NOR ITS LICENSORS MAKE ANY OTHER WARRANTIES EXPRESS, IMPLIED OR STATUTORY, WITH RESPECT TO PRODUCTS PROVIDED UNDER THIS AGREEMENT. MENTOR GRAPHICS AND ITS LICENSORS SPECIFICALLY DISCLAIM ALL IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NON-INFRINGEMENT OF INTELLECTUAL PROPERTY.

8. LIMITATION OF LIABILITY. EXCEPT WHERE THIS EXCLUSION OR RESTRICTION OF LIABILITY WOULD BE VOID OR INEFFECTIVE UNDER APPLICABLE LAW, IN NO EVENT SHALL MENTOR GRAPHICS OR ITS LICENSORS BE LIABLE FOR INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES (INCLUDING LOST PROFITS OR SAVINGS) WHETHER BASED ON CONTRACT, TORT OR ANY OTHER LEGAL THEORY. EVEN IF MENTOR GRAPHICS OR ITS LICENSORS HAVE BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, IN NO EVENT SHALL MENTOR GRAPHICS OR ITS LICENSORS’ LIABILITY UNDER THIS AGREEMENT EXCEED THE AMOUNT RECEIVED FROM CUSTOMER FOR THE HARDWARE, SOFTWARE LICENSE OR SERVICE GIVING RISE TO THE CLAIM. IN THE CASE WHERE NO AMOUNT WAS PAID, MENTOR GRAPHICS AND ITS LICENSORS SHALL HAVE NO LIABILITY FOR ANY DAMAGES WHATSOEVER. THE PROVISIONS OF THIS SECTION 8 SHALL SURVIVE THE TERMINATION OF THIS AGREEMENT.

9. HAZARDOUS APPLICATIONS. CUSTOMER ACKNOWLEDGES IT IS SOLELY RESPONSIBLE FOR TESTING ITS PRODUCTS USED IN APPLICATIONS WHERE THE FAILURE OR INACCURACY OF ITS PRODUCTS MIGHT RESULT IN DEATH OR PERSONAL INJURY (“HAZARDOUS APPLICATIONS”). EXCEPT TO THE EXTENT THIS EXCLUSION OR RESTRICTION OF LIABILITY WOULD BE VOID OR INEFFECTIVE UNDER APPLICABLE LAW, IN NO EVENT SHALL MENTOR GRAPHICS OR ITS LICENSORS BE LIABLE FOR ANY DAMAGES RESULTING FROM OR IN CONNECTION WITH THE USE OF MENTOR GRAPHICS PRODUCTS IN OR FOR HAZARDOUS APPLICATIONS. THE PROVISIONS OF THIS SECTION 9 SHALL SURVIVE THE TERMINATION OF THIS AGREEMENT.

10. INDEMNIFICATION. CUSTOMER AGREES TO INDEMNIFY AND HOLD HARMLESS MENTOR GRAPHICS AND ITS LICENSORS FROM ANY CLAIMS, LOSS, COST, DAMAGE, EXPENSE OR LIABILITY, INCLUDING ATTORNEYS’ FEES, ARISING OUT OF OR IN CONNECTION WITH THE USE OF MENTOR GRAPHICS PRODUCTS IN OR FOR HAZARDOUS APPLICATIONS. THE PROVISIONS OF THIS SECTION 10 SHALL SURVIVE THE TERMINATION OF THIS AGREEMENT.

11. INFRINGEMENT.

11.1. Mentor Graphics will defend or settle, at its own expense, any action brought against Customer in the United States, Canada, Japan, or member state of the European Union which alleges that any standard, generally supported Product acquired by Customer hereunder infringes a patent or copyright or misappropriates a trade secret in such jurisdiction. Mentor Graphics will pay costs and damages finally awarded against Customer that are attributable to such action. Customer understands and agrees that as conditions to Mentor Graphics’ obligations under this section Customer must: (a) notify Mentor Graphics promptly in writing of the action; (b) provide Mentor Graphics all reasonable information and assistance to settle or defend the action; and (c) grant Mentor Graphics sole authority and control of the defense or settlement of the action.
11.2. If a claim is made under Subsection 11.1 Mentor Graphics may, at its option and expense: (a) replace or modify the Product so that it becomes noninfringing; (b) procure for Customer the right to continue using the Product; or (c) require the return of the Product and refund to Customer any purchase price or license fee paid, less a reasonable allowance for use.

11.3. Mentor Graphics has no liability to Customer if the action is based upon: (a) the combination of Software or hardware with any product not furnished by Mentor Graphics; (b) the modification of the Product other than by Mentor Graphics; (c) the use of other than a current unaltered release of Software; (d) the use of the Product as part of an infringing process; (e) a product that Customer makes, uses, or sells; (f) any Beta Code or Product provided at no charge; (g) any software provided by Mentor Graphics’ licensors who do not provide such indemnification to Mentor Graphics’ customers; or (h) infringement by Customer that is deemed willful. In the case of (h), Customer shall reimburse Mentor Graphics for its reasonable attorney fees and other costs related to the action.

11.4. This Section 11 is Subject to Section 8 Above and States the Entire Liability of Mentor Graphics and Its licensors, and Customer’s Sole and Exclusive Remedy, for Defense, Settlement and Damages, with Respect to Any Alleged Patent or Copyright Infringement or Trade Secret Misappropriation by Any Product Provided under This Agreement.

12. Termination and Effect of Termination.

12.1. If a Software license was provided for limited term use, such license will automatically terminate at the end of the authorized term. Mentor Graphics may terminate this Agreement and/or any license granted under this Agreement immediately upon written notice if Customer: (a) exceeds the scope of the license or otherwise fails to comply with the licensing or confidentiality provisions of this Agreement, or (b) becomes insolvent, files a bankruptcy petition, institutes proceedings for liquidation or winding up or enters into an agreement to assign its assets for the benefit of creditors. For any other material breach of any provision of this Agreement, Mentor Graphics may terminate this Agreement and/or any license granted under this Agreement upon 30 days written notice if Customer fails to cure the breach within the 30 day notice period. Termination of this Agreement or any license granted hereunder will not affect Customer’s obligation to pay for Products shipped or licenses granted prior to the termination, which amounts shall be payable immediately upon the date of termination.

12.2. Upon termination of this Agreement, the rights and obligations of the parties shall cease except as expressly set forth in this Agreement. Upon termination, Customer shall ensure that all use of the affected Products ceases, and shall return hardware and either return to Mentor Graphics or destroy Software in Customer’s possession, including all copies and documentation, and certify in writing to Mentor Graphics within ten business days of the termination date that Customer no longer possesses any of the affected Products or copies of Software in any form.

13. Export. The Products provided hereunder are subject to regulation by local laws and United States (“U.S.”) government agencies, which prohibit export, re-export or diversion of certain products, information about the products, and direct or indirect products thereof, to certain countries and certain persons. Customer agrees that it will not export or re-export Products in any manner without first obtaining all necessary approval from appropriate local and U.S. government agencies. If Customer wishes to disclose any information to Mentor Graphics that is subject to any U.S. or other applicable export restrictions, including without limitation the U.S. International Traffic in Arms Regulations (ITAR) or special controls under the Export Administration Regulations (EAR), Customer will notify Mentor Graphics personnel, in advance of each instance of disclosure, that such information is subject to such export restrictions.

14. U.S. Government License Rights. Software was developed entirely at private expense. The parties agree that all Software is commercial computer software within the meaning of the applicable acquisition regulations. Accordingly, pursuant to U.S. FAR 48 CFR 12.212 and DFAR 48 CFR 227.7202, use, duplication and disclosure of the Software by or for the U.S. government or a U.S. government subcontractor is subject solely to the terms and conditions set forth in this Agreement, which shall supersede any conflicting terms or conditions in any government order document, except for provisions which are contrary to applicable mandatory federal laws.

15. Third Party Beneficiary. Mentor Graphics Corporation, Mentor Graphics (Ireland) Limited, Microsoft Corporation and other licensors may be third party beneficiaries of this Agreement with the right to enforce the obligations set forth herein.

16. Review of License Usage. Customer will monitor the access to and use of Software. With prior written notice and during Customer’s normal business hours, Mentor Graphics may engage an internationally recognized accounting firm to review Customer’s software monitoring system and records deemed relevant by the internationally recognized accounting firm to confirm Customer’s compliance with the terms of this Agreement or U.S. or other local export laws. Such review may include FlexNet (or successor product) report log files that Customer shall capture and provide to Mentor Graphics’ request. Customer shall make records available in electronic format and shall fully cooperate with data gathering to support the license review. Mentor Graphics shall bear the expense of any such review unless a material non-compliance is revealed. Mentor Graphics shall treat as confidential information all information gained as a result of any request or review and shall only use or disclose such information as required by law or to enforce its rights under this Agreement. The provisions of this Section 16 shall survive the termination of this Agreement.

17. Controlling Law, Jurisdiction and Dispute Resolution. The owners of certain Mentor Graphics intellectual property licensed under this Agreement are located in Ireland and the U.S. To promote consistency around the world, disputes shall be resolved as follows: excluding conflict of laws rules, this Agreement shall be governed by and construed under the laws of the State of Oregon, U.S., if Customer is located in North or South America, and the laws of Ireland if
Customer is located outside of North or South America. All disputes arising out of or in relation to this Agreement shall be submitted to the exclusive jurisdiction of the courts of Portland, Oregon when the laws of Oregon apply, or Dublin, Ireland when the laws of Ireland apply. Notwithstanding the foregoing, all disputes in Asia arising out of or in relation to this Agreement shall be resolved by arbitration in Singapore before a single arbitrator to be appointed by the chairman of the Singapore International Arbitration Centre ("SIAC") to be conducted in the English language, in accordance with the Arbitration Rules of the SIAC in effect at the time of the dispute, which rules are deemed to be incorporated by reference in this section. Nothing in this section shall restrict Mentor Graphics’ right to bring an action (including for example a motion for injunctive relief) against Customer in the jurisdiction where Customer’s place of business is located. The United Nations Convention on Contracts for the International Sale of Goods does not apply to this Agreement.

18. **SEVERABILITY.** If any provision of this Agreement is held by a court of competent jurisdiction to be void, invalid, unenforceable or illegal, such provision shall be severed from this Agreement and the remaining provisions will remain in full force and effect.

19. **MISCELLANEOUS.** This Agreement contains the parties’ entire understanding relating to its subject matter and supersedes all prior or contemporaneous agreements. Some Software may contain code distributed under a third party license agreement that may provide additional rights to Customer. Please see the applicable Software documentation for details. This Agreement may only be modified in writing, signed by an authorized representative of each party. Waiver of terms or excuse of breach must be in writing and shall not constitute subsequent consent, waiver or excuse.

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