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List of Tables

Chapter 1
Using Calibre with OASIS

This document describes the Calibre support for and implementation of the OASIS®[1] (Open Artwork System Interchange Standard) layout format.

You can obtain a copy of the OASIS specification on the SEMI®[2] web site at the following URL:

www.semi.org

_____**Note**_____

In the event of OASIS-specific issues outside of Mentor Graphics implementation of this standard, contact the Semiconductor Equipment and Materials International (SEMI) trade association.

_____

The Calibre implementation of the OASIS file format is based on the following:

- Compliance with the OASIS SEMI standard.

- Environment of Calibre that is currently reading GDSII.

- Experience in IC design layout file handling over many years.

Calibre supports all layout features dominant in the IC industry and will support more features as the industry requires their use for future applications.

Updates and enhancements for the OASIS format support in the Calibre tool are intended to be fully backwards-compatible. Files generated with a specific version of the Calibre tool are readable in subsequent versions of the tool, as is the case with the GDSII file format.

Documentation Conventions

The command descriptions use font properties and several metacharacters to document the command syntax.

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1. OASIS® is a registered Trademark of Thomas Grebinski and licensed for use to SEMI, San Jose, California.
2. SEMI® is a registered trademark of Semiconductor Equipment and Materials International

Table 1-1. Syntax Conventions

Convention	Description
Bold	Bold fonts indicate a required item.
Italic	Italic fonts indicate a user-supplied argument.
`Monospace`	Monospace fonts indicate a shell command, line of code, or URL. A bold monospace font identifies text you enter.
<u>Underline</u>	Underlining indicates either the default argument or the default value of an argument.
UPPercase	For certain case-insensitive commands, uppercase indicates the minimum keyword characters. In most cases, you may omit the lowercase letters and abbreviate the keyword.
[ ]	Brackets enclose optional arguments. Do not include the brackets when entering the command unless they are quoted.
{ }	Braces enclose arguments to show grouping. Do not include the braces when entering the command unless they are quoted.
' '	Quotes enclose metacharacters that are to be entered literally. Do not include single quotes when entering braces or brackets in a command.
| or ||	Vertical bars indicate a choice between items. Do not include the bars when entering the command.
…	Three dots (an ellipsis) follows an argument or group of arguments that may appear more than once. Do not include the ellipsis when entering the command.

Example:

   DEVice {*element_name* ['('*model_name*')']}

    device_layer {*pin_layer* ['('*pin_name*')'] …}

   ['<'*auxiliary_layer*'>' …]

   ['('*swap_list*')' …]

   [<u>BY NET</u> | BY SHAPE]

Calibre Product Support for OASIS

Calibre products support OASIS in the same manner GDSII is supported for reading and writing. The currently supported version is OASIS 1.0.

The *$CALIBRE_HOME/bin* directory includes the following utilities that support OASIS:

- fdi2oasis
- gds2oasis Translator
- drc_waiv_asc2gds

Calibre DESIGNrev supports OASIS through the oasisout command. Calibre MDPview supports OASIS through the following utilities:

- mebes2oasis
- vsb2oasis
- jeol2oasis
- hitachi2oasis
- micronic2oasis
- jobToOasis
- oasis2oasis
- gds2oasis (note, this MDPview utility has a different command usage than the one found in *$CALIBRE_HOME/bin*)

See the *Calibre MDPview User's and Reference Manual* for more details.

Output to OASIS-type DRC results databases for Calibre mask data applications (such as Calibre nmDRC, Calibre MDP, and Calibre RET) is much faster, especially if the database size is very large.

Output to OASIS-type DRC results databases can include DFM properties along with the geometries, if they exist. To save a layer with properties, use the PROPERTIES option on a DRC Check Map statement. This is primarily for DFM applications.

OASIS output is done in parallel in MT/MTflex runs. This has major positive performance impact in flows, such as OPC, where output data volume can be huge. Note that the DRC Results Database and PSEUDO and USER options exhibit much greater scalability in MT/MTflex runs than does USER MERGED for OASIS results.

The following topics describe how to use OASIS with Calibre:

Specify the OASIS Format for Input and Output

Most of the specification statements that support GDSII also support the OASIS layout format. You can specify the OASIS format for input or output using SVRF statements in your rule file.

The statements in the following table are used for layout input and output.

Table 1-2. Supported SVRF Rule File Statements for OASIS

SVRF Statement	Specifies	Keyword	Usage Examples
Layout System	Input	OASIS	LAYOUT SYSTEM OASIS
Layout System2	Input	OASIS	LAYOUT SYSTEM2 OASIS
DRC Results Database	Output	OASIS	DRC RESULTS DATABASE … OASIS
DRC Check Map	Output	OASIS	DRC CHECK MAP … OASIS
DFM RDB	Output	OASIS	DFM RDB OASIS …

The following MDPview SVRF statements support the OASIS format:

- Fracture OASIS_MASK

- MDP Checkmap

- MDP Embed

- MDP_OASIS2OASIS

- MDPverify

Related Topics

Calibre Product Support for OASIS

Documentation Conventions

File-Level OASIS Properties

OASIS has PROPERTY records. The PROPERTY records can have many different values and types. They may or may not be named with PROPNAME records. They may or may not have PROPSTRING records.

You can insert or replace file-level OASIS properties taken from an input OASIS database. The modifications to properties are then output to the specified OASIS nmDRC results database. The Layout Property Audit specification statement enables this capability.

You can read OASIS properties in as text objects by using the Layout Property Text OASIS specification statement.

The SVRF Property specification statement allows for the specification of an OASIS property in the rule file. It enables you to reference a potentially complex OASIS property by a single user-defined name. Refer to the *Standard Verification Rule Format (SVRF) Manual* for more information.

Related Topics

Calibre Product Support for OASIS

Documentation Conventions

Write Out the OASIS Format with Calibre Layout Viewers

You can write out an OASIS file from the Calibre® WORKbench™, Calibre® LITHOview™, Calibre® DESIGNrev, or Calibre® MDPview™ tools.

Procedure

Use either of the following methods when a GDS file is loaded in the layout editor.

    a. Choose **File > Export Layout** and select Oasis as the format.

    b. In the shell where the viewer was invoked, use one of these commands:

```
% $L oasisout filename

% $L oasisout filename primary_cell_name
```

where $L is the handle of the layout file loaded in Calibre layout viewer. For a complete list of command options, see $L oasisout in the *Calibre DESIGNrev Reference Manual.*

> __ **Note** __
> You can also specify layout exception severities with any of these Calibre layout viewers. Consult "Specify Layout Input Exceptions with Calibre Viewers".

Related Topics

Calibre Product Support for OASIS

Documentation Conventions

Translate JEOL, Hitachi, MEBES, and VSB11 Files

When translating JEOL, Hitachi, MEBES, or VSB11 files to OASIS, use the Calibre MDPview conversion batch commands.

You can also translate JEOL, Hitachi, MEBES, and VSB11 job decks using the *jobToOasis* conversion batch command in Calibre MDPview. For complete information, refer to the *Calibre MDPview User's Manual*.

Related Topics

Calibre Product Support for OASIS

Documentation Conventions

Specify Layout Input Exceptions with Calibre Viewers

Use the Layout Input Exception statement to control how issues are treated when reading an OASIS file.

You can specify "Layout Input Exception Severity" SVRF statements in an ASCII file for use in any of the following Calibre layout viewers:

- Calibre WORKbench

- Calibre LITHOview

- Calibre DESIGNrev

- Calibre MDPview

You define the exceptions in the *readerprefs* ASCII file using SVRF statement options. By default, Calibre viewers place the *readerprefs* ASCII file in your *$HOME/ .calibrewb_workspace* directory. This file uses the following format:

```
# Reader Preferences File
exceptionSeverity TEXTSTRING_ASTRING 1
```

You can modify the *readerprefs* file with an ASCII text editor before you invoke a Calibre viewers. On input, the Calibre viewer reads this file when you load the layout file, and processes the exception types.

Related Topics

Calibre Product Support for OASIS

Documentation Conventions

gds2oasis Translator

You can translate your GDSII databases directly into OASIS using the gds2oasis translator.

> **Note**
>
> By default, the gds2oasis translator ignores any GDS BOX records. You can use the
> -translate_box_records switch during invocation, which treats BOX and BOXTYPE records
> exactly like BOUNDARY and DATATYPE records, respectively.

Usage

$CALIBRE_HOME/bin/gds2oasis
    [-translate_box_records] [-preserve_paths] [-noenforce] [-64]
    gdsii_database oasis_filename

Arguments

- *gdsii_database*

  Required input GDSII database pathname. Any filename ending in .gz or .Z is treated as a compressed file. Such files can be opened by Calibre using gunzip or uncompress, respectively, if these utilities are in your PATH variable.

  Some versions of these utilities cannot open files larger than two GB. If you cannot open compressed files larger than two GB, you may need to update to a newer version of gunzip or uncompress. These utilities may also have difficulty opening files across a network. Neither of these issues are Calibre limitations.

- *oasis_filename*

  Required argument specifying the name you want for the translated OASIS file.

- -translate_box_records

  Optional switch for treating BOX and BOXTYPE records exactly like BOUNDARY and DATATYPE records, respectively.

- -preserve_paths

  Optional switch that prevents paths from being converted into rectangles. By default, two-point orthogonal paths are converted into rectangles because these are more efficiently stored in OASIS format.

- -noenforce

  Optional switch that prevents the converter from generating a fatal error when an illegal text string object is encountered.

Description

The gds2oasis translator translates the content of GDS files to OASIS format, creating equivalent OASIS data for most GDS records in the file. See "OASIS Implementation in Calibre Tools" for specific information.

The gds2oasis translator writes each GDS PROPATTR and PROPVALUE pair as an OASIS PROPERTY record of the name S_GDS_PROPERTY, with two property values. The first value is the integer PROPATTR, and the second value is the PROPVALUE string.

___**Note**___

Calibre tools require that the CALIBRE_HOME environment variable be set. See "Setting the CALIBRE_HOME Environment Variable" in the *Calibre Administrator's Guide* for details.

Related Topics

Calibre Product Support for OASIS

Documentation Conventions

gds2oasis Translator Warnings and Errors

The gds2oasis tool issues warnings and errors related to OASIS files.

If you choose to use Calibre to read the subsequent OASIS data, you may notice familiar warnings or errors for data that Calibre does not interpret from the GDS. These errors or warnings can be addressed using the information found in the Implementation of Records table.

Examples of such messages occur for the following GDS and OASIS data by default:

- Zero-width paths

- Degenerate polygons (for example, a single-point path)

- Self-intersecting polygons and paths (for example, bow tie polygons)

- Single point paths

- Circles

- A non a-string for a TEXTSTRING record

Related Topics

Calibre Product Support for OASIS

Documentation Conventions

Using the fdi2oasis Translator

The fdi2oasis translator is a script that enables the translation of LEF/DEF and OpenAccess format databases to OASIS format.

See the *Calibre Layout Comparison and Translation Guide* for details.

The implementation of OASIS in Calibre tools may differ from third-party tools.

Implementation of Data Constructs

Calibre tools implement OASIS data constructs with certain restrictions.

Table 2-1. Data Constructs

integers	Fully compliant but restricted to unsigned integer values in [0,+0xFFFFFFFF] (or [0, 2^64 -1]) and signed integer values in 0x7FFFFFFF, +0x7FFFFFFF] (or [-2^63 -1, +2^63 -1]).
reals	Fully compliant; Calibre reads all; no Calibre output of real type 4 or 7.
strings	Compliant with the following exceptions:
	ASCII strings (a-string) • Calibre converts zero-length a-strings to a-strings of length one. The converted a-string contains a single space character (ASCII 0x20). This operation cannot be changed.
	Binary strings (b-string) • Calibre converts zero-length b-strings used for property values to b-strings of length one. The converted b-string contains a single space character (ASCII 0x20). • Calibre converts any embedded zero character in a b-string used for a property value to a space character (ASCII 0x20). These operations cannot be changed.

Table 2-1. Data Constructs (cont.)

deltas	Fully compliant but restricted to delta magnitude in [0, +0x7FFFFFFF] (or, [0, 2^63 -1]) and on input, magnitude outside of this range is a fatal error.
repetitions	Fully compliant; Calibre reads type 8; no Calibre output for repetition type 8. Calibre may restrict values in repetitions to the 32-bit range even on 64-bit platforms.
points lists	Fully compliant; Calibre reads all; no Calibre output for point lists types 0, 1, and 5.

Implementation of Cell Referencing

Calibre tools implement OASIS cell referencing.

Table 2-2. Cell Referencing

CELL	Compliant with the following exceptions:
	• Cell name transcription, warning messages, and error messages only include cell number if the cell name is not available. Cell names are not available in 32-bit mode. Use 64-bit mode if you need Calibre to read the cell name.
	• The n-string name restriction may be relaxed in Calibre using Layout Input Exception Severity CELLNAME_NSTRING exception.
	• Input of multiple or duplicate CELL records using the DUPLICATE_CELL severity.
PLACEMENT	Compliant with the following exceptions:
	• Cell name transcription, warning messages, and error messages only include cell number if the cell name is not yet available.
	• Allows external CELLNAME records.
	• The n-string name restriction may be relaxed in Calibre using CELLNAME_NSTRING exception.

Implementation of Layers, Datatypes, and Texttypes

Fully compliant with the OASIS specification. The Calibre tools have a layer number limit of 65535.

Implementation of Modal Variables

Fully compliant with the OASIS specification.

No Calibre output of the following modal variables:

- placement-cell

- text-string

- xy-mode

- polygon-point-list

- path-point-list

- path-start-extension

- path-end-extension

- circle-radius

- last-property-name

- last-value-list

Implementation of Records

Calibre tools implement OASIS records.

Table 2-3. Record Implementation

Record	Notes
CBLOCK	Fully compliant on input and output.
CELL	See "Implementation of Cell Referencing" on page 20.
CELLNAME	Compliant with the following exceptions: • No post-association of a (name, number) coordinate via forward referencing defined as a separate instantiation of "name" and "number" followed by instantiation of (name, number). • The n-string name restriction may be relaxed in Calibre using the Layout Input Exception Severity CELLNAME_NSTRING severity. • Duplicate cell names are allowed in Calibre when Layout Allow Duplicate Cell YES is specified in the rule file.
CIRCLE	Compliant with the following exception: • No requirements for the upper two bits of the CIRCLE info byte to be 0 (zero). • The Calibre tool does not expand or instantiate circles on input. You can control this on input using the Layout Input Exception Severity CIRCLE exception.

Table 2-3. Record Implementation (cont.)

Record	Notes
CTRAPEZOID	• On input if type 16-19, 22-23, or 25, then the Calibre tool ignores the geometry-h modal variable. • On input if type 20-21, then the Calibre tool ignores the geometry-w modal variable. Exceptions: • For types 6-7 and 14-15, the Calibre tool uses the w < h and h < w, respectively, for representing malformed ctrapezoids.
END	Compliant on input. Note the following, which are not clearly stated as exceptions in the OASIS spec: • The end record does not have to be 256 bytes. • There does not need to be an end-of-file following the END record. • The padded string does not have to be NUL characters. • There does not need to be a validation signature and there is no check for a scheme in the range [0-2]. Fully compliant on output.
LAYERNAME	Calibre currently considers LAYERNAME records to be annotation-only. They are quietly skipped on input (with no exception handling except n-string name enforcement).
PATH	Compliant with the following exceptions: • Paths with less than two vertices are not necessarily fatal errors. You can control this on input using the PATH_DEGENERATE exception. • No support for PATH repetitions, modality for path point lists, or modality for path end extensions on output. • PATH records are converted to polygons in the Calibre database and remain in that configuration for all processing.
PLACEMENT	See "Implementation of Cell Referencing" on page 20.
POLYGON	Compliant with the following exceptions: • Input of polygons with fewer than 3 vertices using the POLYGON_DEGENERATE exception. • No requirement for the upper two bits of the POLYGON info bit to be 0 (zero).
PROPNAME	Compliant with the following exception: The n-string name restriction may be relaxed in Calibre using the CELLNAME_NSTRING exception.
PROPSTRING	Compliant with the following exception: No support for b-strings for PROPSTRING values.

Table 2-3. Record Implementation (cont.)

Record	Notes
RECTANGLE	Compliant assuming if, on input, the S bit in the info bit is 1, then the Calibre tool ignores the geometry-h modal variable.
START	Fully compliant.
TEXT	Compliant with the following exceptions: • No support for forward references to TEXTSTRING records. • No requirement for the upper bit of the TEXT info byte to be 0 (zero).
TEXTSTRING	Fully compliant. • The TEXTSTRING must be an a-string. • You can control this on input using the Layout Input Exception Severity TEXTSTRING_ASTRING exception.
TRAPEZOID	Compliant with the following exception: On input, the Calibre tool allows for user control over exception handing for degenerate TRAPEZOID records.
XELEMENT	No support. See "Implementation of Data Constructs" on page 19.
XGEOMETRY	
XNAME	
XYABSOLUTE	Fully compliant.
XYRELATIVE	Fully compliant.

Name Records and Table Offsets

OASIS allows name records (CELLNAME, TEXTSTRING, PROPNAME, PROPSTRING, LAYERNAME, and XNAME) to be en-tabled (entered in a lookup table by record type), dispersed throughout the file, or partially en-tabled (some records in one table, remainder dispersed). En-tabled records in OASIS may be located by the beginning offset either in the START record or the END record.

In 64-bit CALIBRE, name records in strict-mode OASIS files are scanned and input prior to the main file read (this scan does not occur if the input file is from STDIN or is a compressed file). Other than that, strict mode is not enforced by Calibre.

OASIS format states that unresolved name record references (for example, a CELL record referencing a non-existing CELLNAME record in the same file) are fatal exceptions. OASIS is less clear about whether forward name record references are allowed, especially if name records are dispersed.

Calibre supports forward references to CELLNAME, TEXTSTRING, PROPNAME, and PROPSTRING records in the same file, whether or not these records are en-tabled, dispersed, or en-tabled by strict mode. However, all references are required to be resolved in the same file, as mandated by OASIS. In addition, for internal reasons, Calibre does not allow post-association of a (name,number) coordinate using forward referencing of CELLNAME records; this is defined as instantiation of "name" and "number" from CELL or PLACEMENT records, followed by subsequent instantiation of (name,number) from a CELLNAME record. This problem generally does not occur in 64-bit Calibre when the OASIS file is strict mode, due to the scan for name records discussed previously.

Refer to the SEMI OASIS specification for a detailed explanation of OASIS strict mode and name tables.

Output of OASIS CBLOCK Records and Strict Mode

Output of OASIS CBLOCK records and output of strict-mode OASIS-to-OASIS DRC results databases written by Calibre applications are supported as user-controllable options.

The DRC Results Database specification statement has two optional secondary keywords, CBLOCK and STRICT, which may be specified if the secondary keyword OASIS is also specified. These keywords enable CBLOCK and strict-mode output, respectively, for OASIS DRC results databases.

```
DRC RESULTS DATABASE filename { OASIS [ CBLOCK ] [ STRICT ] } …
```

The CBLOCK and STRICT parameters are only defined for 64-bit nmDRC and nmDRC-H applications, and are ignored in 32-bit applications. They are global attributes and apply to all OASIS-type Calibre nmDRC results databases.

The CBLOCK parameter instructs Calibre to embed compressed data in an OASIS results database using CBLOCK records. The number and location of these records are at the discretion of Calibre. In general, using the CBLOCK parameter provides a larger degree of compression in the output database(s). Compressing OASIS files (such as with gzip) that use CBLOCK compression should be avoided. It may also be faster to write OASIS with CBLOCK records because of internal optimizations.

The STRICT parameter instructs Calibre nmDRC to create strict-mode output for all fields in the table-offsets structure. To review, the table-offsets structure consists of six pairs of unsigned integers. Each pair is a flag field, and a corresponding byte-offset field, in the following order:

Table 2-4. Flag and Byte-Offset

FLAG	BYTE-OFFSET
cellname-flag	cellname-offset

Table 2-4. Flag and Byte-Offset (cont.)

FLAG	BYTE-OFFSET
textstring-flag	textstring-offset
propname-flag	propname-offset
propstring-flag	propstring-offset
layername-flag	layername-offset
xname-flag	xname-offset

The table-offsets structure is stored in the START record if the offset-flag (an unsigned integer) is 0; the table-offsets structure is stored in the END record if the offset-flag is 1. The offset-flag is located in the START record. Calibre always stores the table-offsets structure in the START record. A flag is 0 indicating non-strict mode for the corresponding records, and 1 indicating strict mode.

If strict mode is not specified, then all flags and offsets in Table 2-4 are zero. If strict mode is specified, then CELLNAME, TEXTSTRING, PROPNAME, PROPSTRING, and LAYERNAME records are *placed into tables*, the corresponding flags are set to 1, and the byte-offsets are set to address the beginning of each table. The actual location of each table in the file is at the discretion of Calibre. In addition, as required by strict mode, all references to the corresponding classes of objects are made exclusively by reference-number. XNAME records are not written by Calibre and these remain non-strict mode.

Also, in strict mode, each CELLNAME record in the CELLNAME table has an adjoining S_CELL_OFFSET standard property whose value is the byte-offset of the CELL record that references the associated CELLNAME record. If compressed output is specified via the CBLOCK parameter, the byte-offset value in the S_CELL_OFFSET property is the byte-offset of the CELL record before decompression.

S_TOP_CELL Standard Property

The OASIS S_TOP_CELL standard property is written to all OASIS-type Calibre nmDRC results databases. The value of the property is the name of the top-level cell in the input layout database. Refer to the SEMI OASIS specification for a detailed explanation of OASIS standard properties.

Unsupported Functionality

Some OASIS data structures are not supported in this release of the Calibre tool.

Table 2-5. Unsupported Functionality

Name record entabulation	Unsupported.

Table 2-5. Unsupported Functionality (cont.)

Forward referencing	See "Implementation of Records" on page 21 and "Implementation of Cell Referencing" on page 20.
XNAME	Unsupported for input or output.
XELEMENT	Unsupported for input or output.
XGEOMETRY	Unsupported for input or output.

Note - Viewing PDF files within a web browser causes some links not to function. Use HTML for full navigation.

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Third-Party Information

Details on open source and third-party software that may be included with this product are available in the *<your_software_installation_location>/legal* directory.