

# **TIFF2MEBES**

## **Bitmap to MEBES & GDSII Converter**

The need to convert "bitmapped" data into a format that can drive a high resolution laser writer or Ebeam machine is arising more frequently. For example, one may need to build a filter whose density changes with distance from the center or a hologram template that appears to consist of completely random data until viewed with the proper wavelength of light.

There is also increased interest in scanning documents, greatly reducing the image size and writing it onto a very durable substrate such as ceramic in order to archive it for hundreds or thousands of years. In order to get a large amount of information on a small substrate the image is reduced 400X so that the height of each character is only a few microns.

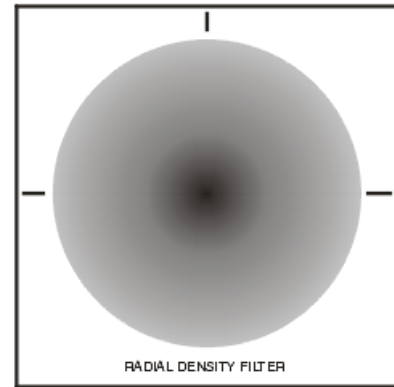
To achieve such tiny features, one can use existing semiconductor equipment such as Ebeam or laser writers. These machines are controlled by a data format called MEBES.

TIFF2MEBES reads a monochrome TIFF file and creates a tiny MEBES square for each pixel. The program also "compresses" the MEBES file by combining adjacent pixels into larger rectangles.

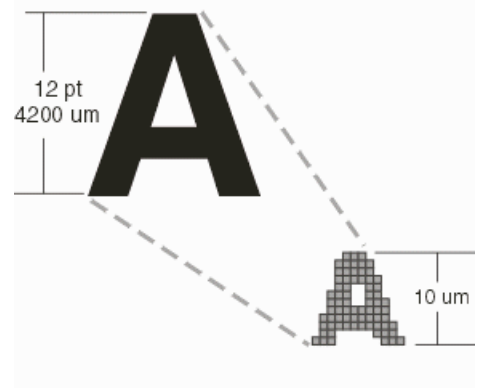
TIFF2MEBES can also output GDSII instead of MEBES although the resulting file will be much larger. GDSII output is useful when you wish to scan a logo and place it into a chip design.

### **File Size Matters**

TIFF2MEBES is especially effective when large files are involved. Consider the case where you have a 10,000 x 10,000 pixel image to write to a mask. If you attempt to do this using GDSII or CLIB (CATS internal file format) as an intermediate file format you will find that the intermediate



A radial filter's density changes with distance from the center.



One way to save data for posterity is to scan the text or image and then shrink it so that hundreds of pages can be placed onto a stainless steel or ceramic substrate. 500 years from now only a microscope will be needed to read it.

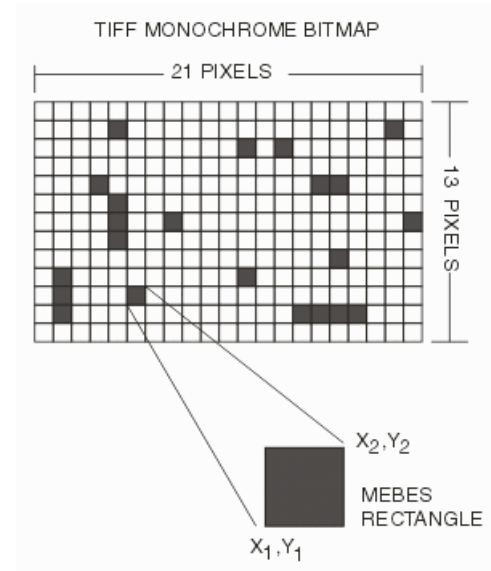
file size generated (before you then fracture to MEBES) is about 2GB. TIFF2MEBES will produce a 200 MB file directly in MEBES format. Both disk space and significant fracturing time are saved.

## Principal of Operation

Think of a TIFF file as a grid of black and white squares. Each pixel represents a square. The converter translates each "black" pixel into a square in MEBES format. As a user, you determine the size of the square; so the DPI set in the TIFF file is advisory only.

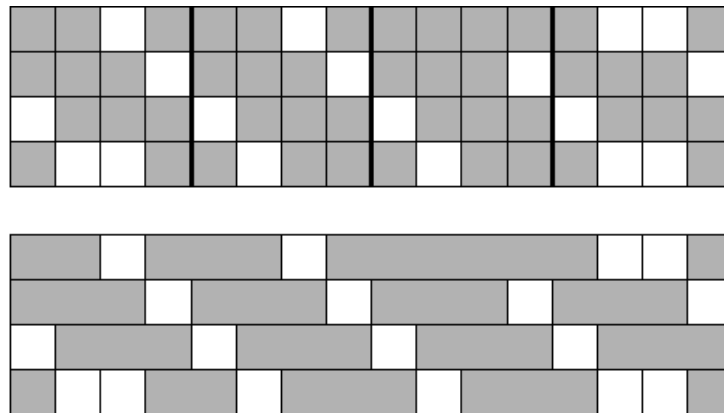
In principle, you can set the MEBES square to any size you like - but there are some practical limits to deal with. The MEBES database is grid based and when we define a MEBES square we must define the corners therefore the pixel size should be an integral multiple of the grid size.

It is useful to know that standard grid sizes in the IC industry are 0.25 um, 0.5 um and 1.0 um. You should not specify a grid smaller than you need - the MEBES file may become larger; mask cost increase rapidly with decreasing grid size.



## Data Compression

TIFF monochrome files are very compact - not only does each pixel require only a single bit, but recurring bits are further compressed using either a packbits or LZW scheme. The MEBES database, while compact will still be much much larger than the TIFF file -- typically from 10 to 50 times larger.



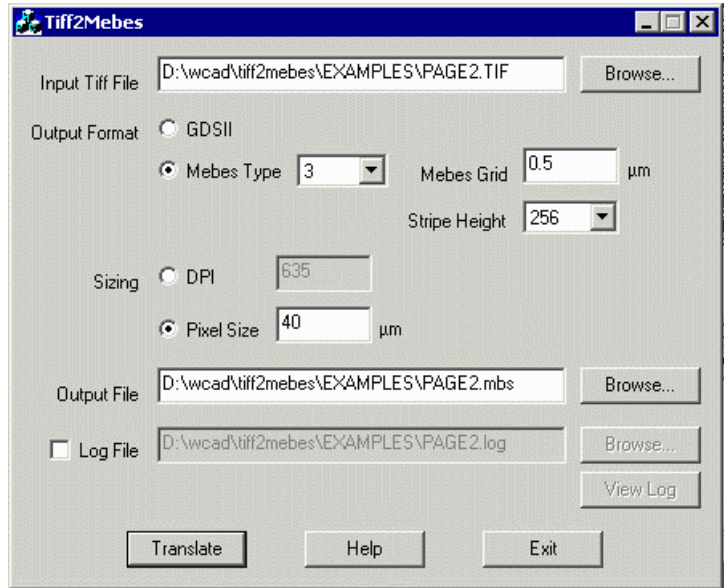
In order to keep the MEBES file from growing out of control, TIFF2MEBES attempts to minimize the number of rectangles needed by combining adjacent rectangles (line by line.) The file size reduction depends of course on the nature of the image - highly regular images might compress 25:1 while dithered images might see only a very slight compression.

## Running the Program

TIFF2MEBES can be run either from a simple dialog box or from a command line interface. Use the dialog box when converting a single file; use the command line interface if you wish to convert many files via batch, script or another application. The GUI is available only on Windows - UNIX platforms are command line only.

## Dialog Box

From the dialog box you can select the input and output files, MEBES or GDSII and the version of MEBES. For older MEBES formats (1 and 2) the address grid and stripe height is fixed. For the more advanced MEBES formats (3,4,5) one has the ability to control both the address grid and the stripe height.



## Image Size

Image size can be controlled in two ways. If you use the TIFF file's internal DPI then the image size is the number of pixels times the pixel size (1/DPI). For example a 4800 x 4800 bitmap with a 600 dpi internal value will be 4x4 inches.

The user can also set the "pixel" size manually. If you take the same 4800 by 4800 bitmap but set the pixel size to 10 um then the image will be 48,000 x 48,000 um or approximately 1.88 x 1.88 inches.

It is important that the user know both the number of pixels in the image and the DPI if you intend to use the DPI setting -- otherwise you risk generating an image that might be too large to image on the mask. A tool such as Adobe Photoshop or other pixel editor can tell you both the TIFF file's size in pixels and DPI setting.

## TIFF File Requirements

TIFF input files must be monochrome - if you have a paletted, RGB or grayscale image you must first convert it to monochrome. Input files should not be compressed - future versions of TIFF2MEBES will support packbits and LZW compression. TIFF has at least 6 different compression modes but we recommend that for maximum compatibility you do not compress the files. One bit TIFF files are not that large anyway.

## TIFF2MEBES Command Line

The tiff2mebes conversion engine can be run from the command line. This enables it to be called from scripts and other applications. The command line syntax is:

```
tiff2mebes [options] input_file output_file
```

where:

options

- dpi:DPI                   when this option is used, the TIFF file's internal DPI setting is ignored and the user defined DPI setting is used.
  - log:LOG                   copies the stdout to a file or destination named log.
  - gds                        Instructs TIFF2MEBES to output GDSII stream and not MEBES.
  - mebes:N                   Instructs TIFF2MEBES to output MEBES. Five different versions of MEBES can be output: 1,2,3,4,5.
  - pixel:X                   instructs TIFF2MEBES to use this value (in microns) for the size of the output pixel and to ignore the DPI settings.
  - grid:X                    sets the MEBES address grid. Early versions of MEBES (I/II) have fixed address grids. MEBES III has a limited range of address grids (0.25,0.5 and 1.0 um) and MEBES IV/V allow a user defined grid in the range from 0.025 to 1.1 um.
  - stripeheight:S           Older MEBES formats (I/II) have a fixed strip height. Newer formats allow the stripe height to be user set. Allowable values are: 256,512,1024.
- input\_file                 name of the input file (TIFF) to convert. You can specify just the filename if it is located in the current working directory or a complete path if so needed. On Windows, you should quote the path/filename if it contains spaces i.e. "C:\My Files\test of a input file.tif"
- output\_file                name of the output file (and path information).

## ***Supported Platforms***

Sun Solaris 2.6 or later  
HPUX 10.2 or later  
Linux (Redhat 7.2 or later)  
Windows NT/2000

## ***ARTWORK CONVERSION SOFTWARE, INC***

417 Ingalls St., Santa Cruz, CA T 831.426.6163 F 831 426.2824 email: [info@artwork.com](mailto:info@artwork.com) WEB [www.artwork.com](http://www.artwork.com)