Mali™ Texture Compression Tool
Version: 4.0.1
User Guide
Mali Texture Compression Tool
User Guide

Copyright © 2009, 2011-2012 ARM. All rights reserved.

Release Information

The following changes have been made to this book.

<table>
<thead>
<tr>
<th>Date</th>
<th>Issue</th>
<th>Confidentiality</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>14 October 2009</td>
<td>A</td>
<td>Non-Confidential</td>
<td>First release for v2.1.</td>
</tr>
<tr>
<td>28 October 2011</td>
<td>B</td>
<td>Non-Confidential</td>
<td>Updated for v3.0.</td>
</tr>
<tr>
<td>18 November 2011</td>
<td>C</td>
<td>Non-Confidential</td>
<td>Added information on requirement for Java.</td>
</tr>
<tr>
<td>30 July 2012</td>
<td>D</td>
<td>Non-Confidential</td>
<td>Updated for v4.0 with OpenGL ES 3.0.</td>
</tr>
<tr>
<td>14 September 2012</td>
<td>E</td>
<td>Non-Confidential</td>
<td>Updated for v4.0.1</td>
</tr>
</tbody>
</table>

Proprietary Notice

Words and logos marked with ® or ™ are registered trademarks or trademarks of ARM® in the EU and other countries, except as otherwise stated below in this proprietary notice. Other brands and names mentioned herein may be the trademarks of their respective owners.

Neither the whole nor any part of the information contained in, or the product described in, this document may be adapted or reproduced in any material form except with the prior written permission of the copyright holder.

The product described in this document is subject to continuous developments and improvements. All particulars of the product and its use contained in this document are given by ARM in good faith. However, all warranties implied or expressed, including but not limited to implied warranties of merchantability, or fitness for purpose, are excluded.

This document is intended only to assist the reader in the use of the product. ARM shall not be liable for any loss or damage arising from the use of any information in this document, or any error or omission in such information, or any incorrect use of the product.

Where the term ARM is used it means “ARM or any of its subsidiaries as appropriate”.

Confidentiality Status

This document is Non-Confidential. The right to use, copy and disclose this document may be subject to license restrictions in accordance with the terms of the agreement entered into by ARM and the party that ARM delivered this document to.

Product Status

The information in this document is final, that is for a developed product.

Web Address

http://www.arm.com
Contents

Mali Texture Compression Tool User Guide

Preface

About this book ............................................................................................................ v
Feedback ................................................................................................................... vii

Chapter 1

Introduction

1.1 About the Mali Texture Compression Tool ........................................................................ 1-2

Chapter 2

Installing the Mali Texture Compression Tool

2.1 Installing the Mali Texture Compression Tool on Mac OS X ............................................ 2-2
2.2 Installing the Mali Texture Compression Tool on Microsoft Windows .......................... 2-3
2.3 Installing the Mali Texture Compression Tool on Linux ............................................. 2-4

Chapter 3

Using the Mali Texture Compression Tool

3.1 Using the Mali Texture Compression Tool Graphical User Interface ............................ 3-2
3.2 Using the Mali Texture Compression Tool from the command line ...................... 3-11
Preface

This preface introduces the Mali™ Texture Compression Tool. It contains the following sections:

- About this book on page v
- Feedback on page vii.
About this book

This is the Mali Texture Compression Tool User Guide. It provides guidelines for using the Mali Texture Compression Tool to assist in the development of applications for Mali Graphics Processing Units (GPU). This book is part of a suite belonging to the Mali Developer Tools.

Intended audience

This guide is written for software developers who are writing OpenGL ES applications for a Mali GPU.

Using this book

This book is organized into the following chapters:

Chapter 1 Introduction

Read this chapter for an introduction to the Mali Texture Compression Tool and supported formats.

Chapter 2 Installing the Mali Texture Compression Tool

Read this chapter for information about how to install the Texture Compression Tool.

Chapter 3 Using the Mali Texture Compression Tool

Read this chapter for information about how to compress images so that they can be used more efficiently on Mali GPUs. The Mali Texture Compression Tool is intended to be used by developers of 2D and 3D content.

Glossary

The ARM Glossary is a list of terms used in ARM documentation, together with definitions for those terms. The ARM Glossary does not contain terms that are industry standard unless the ARM meaning differs from the generally accepted meaning.


Typographical Conventions

The typographical conventions are:

**italic** Highlights important notes, introduces special terminology, denotes internal cross-references, and citations.

**bold** Highlights interface elements, such as menu names. Denotes signal names. Also used for terms in descriptive lists, where appropriate.

**monospace** Denotes text that you can enter at the keyboard, such as commands, file and program names, and source code.

**mono** space Denotes a permitted abbreviation for a command or option. You can enter the underlined text instead of the full command or option name.

**monospace italic** Denotes arguments to monospace text where the argument is to be replaced by a specific value.

**monospace bold** Denotes language keywords when used outside example code.
<and>

Enclose replaceable terms for assembler syntax where they appear in code or code fragments. For example:

MRC p15, 0 <Rd>, <Crn>, <Crm>, <Opcode_2>

Additional reading

This section lists publications by ARM and by third parties.


ARM publications

This guide contains information that is specific to the Mali Developer Tools. See the following documents for other relevant information:

• Mali GPU Application Optimization Guide (ARM DUI 0555)
• Mali GPU Shader Developer Studio User Guide (ARM DUI 0504)
• OpenGL ES Emulator User Guide (ARM DUI 0511)
• Mali OpenGL ES 2.0 Software Development Kit for Linux on ARM (ARM DUI 0607)
• Mali OpenGL ES 2.0 Software Development Kit for Android (ARM DUI 0587)
• Mali GPU Shader Library User Guide (ARM DUI 0510)

Other publications

This section lists relevant documents published by third parties:

• ETC2: Texture Compression using Invalid Combinations (2007), Association for Computing Machinery, Inc. ACM 978-1-59593-625-7/07/0008.
Feedback

ARM welcomes feedback on this product and its documentation.

Feedback on this product

If you have any comments or suggestions about this product, contact your supplier and give:

- The product name.
- The product revision or version.
- An explanation with as much information as you can provide. Include symptoms and diagnostic procedures if appropriate.

Feedback on content

If you have comments on content then send an e-mail to errata@arm.com. Give:

- the title
- the number, DUI 0503E
- the page numbers to which your comments apply
- a concise explanation of your comments.

ARM also welcomes general suggestions for additions and improvements.
Chapter 1
Introduction

This chapter describes the Mali Texture Compression Tool. It contains the following section:

• *About the Mali Texture Compression Tool on page 1-2.*
1.1 About the Mali Texture Compression Tool

This section gives an overview of the Mali Texture Compression Tool.

Texture compression enables you to reduce the bandwidth usage required to load textures in graphics applications.

This can give your application superior performance and reduce the power consumption of your platform.

Your graphics application that is running on your platform reads and displays the compressed texture data produced by the Texture Compression Tool.

You can compress individual textures or multiple textures. You can view the original texture and the compressed texture together for comparison.

The Texture Compression Tool is compatible with Windows 7, Linux, and Mac OS X. See Chapter 2 Installing the Mali Texture Compression Tool.

The Texture Compression Tool can read and convert many common graphic formats including bmp, jpg, png, tga, gif, tif, and psd. See the documentation supplied with the ImageMagick tool for a full list.

The Texture Compression Tool can uncompress ktx and pkm files to many formats including ppm, pgm, jpg, jpeg, png, gif, bmp, tif, tiff, psd, tga, raw, pct, sgi, and xpm.

The Texture Compression Tool compresses textures using the Ericsson Texture Compression (ETC) algorithm. The ETC algorithm compresses each group of 4x4 pixels into a single 64-bit word.

The Texture Compression Tool can be used from a Graphical User Interface (GUI) or from a command line.
Chapter 2
Installing the Mali Texture Compression Tool

This section describes how to install the Mali Texture Compression Tool. It contains the following sections.

- *Installing the Mali Texture Compression Tool on Mac OS X* on page 2-2
- *Installing the Mali Texture Compression Tool on Microsoft Windows* on page 2-3
- *Installing the Mali Texture Compression Tool on Linux* on page 2-4.
2.1 Installing the Mali Texture Compression Tool on Mac OS X

This section describes how to install the Texture Compression Tool on Mac OS X. It contains the following sections:

- Installation requirements
- Installing the Mali Texture Compression Tool on Mac OS X.

2.1.1 Installation requirements

To install the Texture Compression Tool on Mac OS X, you require:

- Mac OS X, 10.6 or higher.
- 40 MB free hard disk space.
- Java runtime version 1.6.0 or higher.

2.1.2 Installing the Mali Texture Compression Tool on Mac OS X

To install the Texture Compression Tool on Mac OS X:

1. If you do not already have the Java 1.6.0 or higher runtime installed, select Software Update from the Apple menu and install the Java update.

2. Locate the Mali Developer Center web site at:
   http://www.malideveloper.com

3. Download the following package:
   Mali_Texture_Compression_Tool_m_n_o_p_MacOSX.tar.gz
   where:
   - \( m \) identifies the major version
   - \( n.o.p \) identifies the minor version.

4. Double-click on the file to decompress it.

   By default, the Texture Compression Tool is extracted to:
   Mali_Texture_Compression_Tool_m.n.o

   The Texture Compression Tool samples are extracted to:
   Mali_Texture_Compression_Tool_m.n.o/samples/

   The Texture Compression Tool command line executable is extracted to:
   Mali_Texture_Compression_Tool_m.n.o/bin/
2.2 Installing the Mali Texture Compression Tool on Microsoft Windows

This section describes how to install the Texture Compression Tool on Microsoft Windows. It contains the following sections:

- Installation requirements
- Installing the Mali Texture Compression Tool.

2.2.1 Installation requirements

To install the Texture Compression Tool on Microsoft Windows, you require:

- Microsoft Windows 7.
- 40 MB free hard disk space.
- Java runtime version 1.6.0 or higher.

___ Note ___

The Texture Compression Tool has been tested successfully on a 32-bit computer.

2.2.2 Installing the Mali Texture Compression Tool

To install the Texture Compression Tool on Microsoft Windows:

1. If you do not already have the Java runtime installed, install it from www.java.com.

___ Note ___

The Java version must be 1.6.0 or higher.

___

2. Go to the Mali Developer Center web site at:
   http://www.malideveloper.com

3. Download the Mali Texture Compression Tool package.

4. Run the file Mali_Texture_Compression_Tool_m.n.o.p.Win32.msi.
   where:
   - m identifies the major version
   - n.o.p identifies the minor version.

5. Select the required installation options and then click Finish to complete the installation.

By default, the Texture Compression Tool is installed in:

C:\Program Files\ARM\Mali Developer Tools\Mali Texture Compression Tool v.m.n.o

The Texture Compression Tool samples are installed in:

C:\Program Files\ARM\Mali Developer Tools\Mali Texture Compression Tool v.m.n.o\samples

The Texture Compression Tool command line executable is installed in:

C:\Program Files\ARM\Mali Developer Tools\Mali Texture Compression Tool v.m.n.o\bin
2.3 Installing the Mali Texture Compression Tool on Linux

This section describes how to install the Texture Compression Tool on Linux. It contains the following sections:

- Installation requirements
- Procedure for installing the Texture Compression Tool.

2.3.1 Installation requirements

To install the Texture Compression Tool on Linux, you require:

- Ubuntu Linux version 10.4 or higher.
- 40 MB free hard disk space.
- Java runtime version 1.6.0 or higher.

Note

The Texture Compression Tool has been tested successfully on a 32-bit computer.

2.3.2 Procedure for installing the Texture Compression Tool

To install the Texture Compression Tool on Linux:

1. If you do not already have the Java runtime installed, install it from www.java.com.

   Note
   
   The Java version must be 1.6.0 or higher.
   
2. Install the libraries required by ImageMagick:
   a. Start the package manager.
   b. Install the following libraries:
      
      libjpeg62
      libpng12-0
      libxml2
   
3. Locate the Mali Developer Center web site at:
   http://www.malideveloper.com

4. Download the following package:
   Mali_Texture_Compression_Tool_m_n_o_p_Linux.tar.gz
   where:
   m identifies the major version
   n.o.p identifies the minor version.

5. To decompress the file:
   - open a command terminal and navigate to the directory where you have downloaded the package
   - type the following command:
     
     tar -zxvf Mali_Texture_Compression_Tool_m_n_o_p_Linux.tar.gz

By default, the Texture Compression Tool is extracted to:
Mali_Texture_Compression_Tool_m.n.o

The Texture Compression Tool samples are extracted to:
Mali_Texture_Compression_Tool_m.n.o/samples/

The Texture Compression Tool command line executable is extracted to:
Mali_Texture_Compression_Tool_m.n.o/bin/
Chapter 3
Using the Mali Texture Compression Tool

This chapter describes how to use the Mali Texture Compression Tool. It contains the following sections:

- Using the Mali Texture Compression Tool Graphical User Interface on page 3-2
- Using the Mali Texture Compression Tool from the command line on page 3-11.
3.1 Using the Mali Texture Compression Tool Graphical User Interface

This section describes how to use the Texture Compression Tool from the provided GUI. It contains the following sections:

- Starting the GUI Version of the Texture Compression Tool
- The Texture Compression Tool main window
- Compressing textures on page 3-5
- Using the Preferences dialog on page 3-9.

3.1.1 Starting the GUI Version of the Texture Compression Tool

This section describes the basic operation of the Texture Compression Tool. It contains the following sections:

- Starting the Texture Compression Tool from Mac OS X
- Starting the Texture Compression Tool from Microsoft Windows
- Starting the Texture Compression Tool from Linux.

Starting the Texture Compression Tool from Mac OS X

To start the Texture Compression Tool from Mac OS X, navigate to the installation directory and double-click on Texture Compression Tool.

Starting the Texture Compression Tool from Microsoft Windows

To start the Texture Compression Tool from Microsoft Windows, select:

Start → All Programs → ARM → Mali Developer Tools → Mali Texture Compression Tool

Starting the Texture Compression Tool from Linux

To start the Texture Compression Tool from Linux:

1. Open a command terminal
2. Navigate to:
   Mali_Texture_Compression_Tool_m.n.o
   where:
   m identifies the major version
   n.o identifies the minor version.
3. Type the following command to run the executable:
   ./tct

3.1.2 The Texture Compression Tool main window

Figure 3-1 on page 3-3 shows the Texture Compression Tool with textures loaded.
Figure 3-1 Texture Compression Tool window

---

**Note**

- All graphics in this section are from the Microsoft Windows version of the Texture Compression Tool.

- The Linux and Mac OS X versions of the tool have minor differences in appearance.
You can control the Texture Compression Tool using menu options or buttons on the Icon bar. Table 3-1 shows the Texture Compression Tool buttons, their equivalent menu items, and their action.

Table 3-1 Texture Compression Tool GUI buttons and menu items

<table>
<thead>
<tr>
<th>Button</th>
<th>Equivalent menu entry</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Open Images" /></td>
<td>Open Images</td>
<td>Open a texture for compression.</td>
</tr>
<tr>
<td><img src="image2" alt="Remove Selected Images" /></td>
<td>Remove Selected Images</td>
<td>Remove all selected textures from the GUI tool window. You can also press the Del key to delete the selected images.</td>
</tr>
<tr>
<td><img src="image3" alt="Compress Selected Images" /></td>
<td>Compress Selected Images</td>
<td>Compress a texture. Clicking this button displays the Compression Options window. The number of compressed images is displayed in the small Compressed count pane.</td>
</tr>
<tr>
<td><img src="image4" alt="Cancel All Compression Jobs" /></td>
<td>Cancel All Compression Jobs</td>
<td>Stop compression.</td>
</tr>
<tr>
<td><img src="image5" alt="Compare Two Images" /></td>
<td>Compare Two Images</td>
<td>Compare two images. Exactly two images must be selected in the Image list.</td>
</tr>
<tr>
<td><img src="image6" alt="About" /></td>
<td>About</td>
<td>Display the About box.</td>
</tr>
<tr>
<td><img src="image7" alt="Zoom in or out" /></td>
<td>-</td>
<td>Zoom in or out.</td>
</tr>
<tr>
<td><img src="image8" alt="Fit the image to the view" /></td>
<td>-</td>
<td>Fit the image to the view.</td>
</tr>
<tr>
<td><img src="image9" alt="Resize the image to 100%" /></td>
<td>-</td>
<td>Resize the image to 100%.</td>
</tr>
<tr>
<td><img src="image10" alt="Preferences" /></td>
<td>Preferences</td>
<td>Display the Preferences dialog.</td>
</tr>
</tbody>
</table>

In addition to the control icons, you can use the following controls to display images or image details:

Sort by drop-down list
If you have multiple images open in the image list, select an entry from the list to select the sort criteria. To reverse the sort order, click the Sort order button next to the control.

Filter image text box
If you have multiple images open in the image list, enter all or part of the name in the search box and click the search icon.

Image list
This lists all images you have opened. Select one or more items in the list for compression.

Image pane
The image pane displays the selected image. If the image has been compressed, both the original and compress images are displayed.
If the cursor is over an image, you can use the mouse scroll wheel or the + and - keys on your keyboard to zoom in or out on the image.
To display the texture at its original size, right click on a zoomed texture at any time and select Original size.
Mipmap Level slider

Use the Mipmap Level slider to show how the image appears at different Mipmap levels.

If Enable mipmaps is checked in the Compression Options dialog, multiple Mipmaps are produced and the Mipmap slider displays the original and compressed version of the Mipmap.

Progress indicator

This indicates that images are being loaded or compressed. You can click on this to open a more descriptive view.

3.1.3 Compressing textures

To compress one or more textures:

1. Open a texture for compression:
   a. From the menu, select Open Images from the File menu or click the Open icon. The Select images to compress window opens.
   b. Navigate to the required texture and click Open. The texture appears in the left pane of the Texture Compression Tool.
   c. Click on the texture in the left pane of the Texture Compression Tool to display it in the main pane.

2. Click a texture in the left pane of the Texture Compression Tool to select it.
   
   Note
   You can select multiple textures for compression by holding down the CTRL key while selecting images with the mouse.

3. Compress the selected texture:
   a. Click the Compress button on the toolbar or select Compress from the Mali TCT menu.

   Note
   If you have images selected, you can right-click in the left pane and select Compress selection as an alternative to step 3.

   b. The Compression options dialog box shown in Figure 3-2 on page 3-6 displays:
c. Select the compression options described in Table 3-2.

Table 3-2 Options for ETC compression

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output directory</td>
<td>The current output directory is shown. You can click the Select Output Directory icon to open a dialog and select a new output directory.</td>
</tr>
<tr>
<td>Output file format</td>
<td>The options are:</td>
</tr>
<tr>
<td></td>
<td>• <strong>PKM</strong> is a simple file format for single compressed images. If you generate Mipmaps, multiple PKM files are created.</td>
</tr>
<tr>
<td></td>
<td>• <strong>KTX</strong> format that provides a container for images. If you generate Mipmaps, a single KTX file is generated.</td>
</tr>
<tr>
<td>Compression speed</td>
<td>The options are:</td>
</tr>
<tr>
<td></td>
<td>• <strong>Fast</strong> Gives fast compression, but possibly lower quality.</td>
</tr>
<tr>
<td></td>
<td>• <strong>Slow</strong> Gives optimum quality, but requires more processing time.</td>
</tr>
<tr>
<td>ETC compression options</td>
<td>The options are:</td>
</tr>
<tr>
<td>Compressed format</td>
<td>• <strong>ETC1</strong> Compatible with OpenGL ES 1.1 and higher.</td>
</tr>
<tr>
<td></td>
<td>• <strong>ETC2</strong> Highest quality for OpenGL ES 3.0, but not backward compatible.</td>
</tr>
</tbody>
</table>
d. Click **OK**. The texture is compressed and the Texture Compression Tool displays the results. Figure 3-3 on page 3-9 shows an example window after compression. The window contains the following sections:

**Compression Options**

A summary of the compression options used in the compression.
If you selected **Enable Mipmap**, a slider is displayed to enable you to vary the displayed mipmap level. The lowest mipmap level is zero, and uses the original texture size. Setting successive higher levels enables you to use the next available mipmap in the series, each of which is half the size.

**Difference**

This view shows the difference between the RGB values of the original and compressed textures.

With good quality compression, there is little difference between the uncompressed and compressed versions, resulting in a low RGBA difference. In such cases, you can use the **Difference** slider located below the Compressions Options view to amplify the difference and improve the view.

Place the cursor over any part of the texture to view RGBA values for the original and compressed versions.

If the image is too large to fit into the available space, part of the image is displayed and you must use the horizontal and vertical sliders to display other parts of the image.

**Mipmap level**

If you selected **Mipmap generation** from the compression dialog, the **Mipmap Level** slider enables you to view different Mipmaps.

**Original image**

The name of the input file, its size, and resolution is displayed above the uncompressed image.

**Compressed image**

The name of the input file, its size, and resolution is displayed above the compressed image.

**Image list**

The image list displays both compressed and uncompressed textures. A compression icon indicates if a texture has been compressed.

You can expand compressed textures in the list to show individual mipmap levels. You can also expand the mipmap levels to show the corresponding color and alpha components.
Figure 3-3 Compression results

e. To use the compressed textures in your application, copy the files from the output directory to your application development environment.

3.1.4 Using the Preferences dialog

You can modify application options from the Preferences dialog shown in Figure 3-4 on page 3-10:
To open the dialog, select Preferences from the Mali TCT menu.

The dialog has the following controls:

**Command line compressor**

Displays the location of the etcpack executable. To change this entry, click **Browse** and navigate to the new location.

**ImageMagick convert executable**

Displays the location of the imagemagik executable. To change this entry, click **Browse** and navigate to the new location.

**Restore Defaults**

Click this button to restore all entries to their default values.

**Apply**

Click this button to apply the changes you made.

**Cancel**

Click this button to cancel the changes you made and close the dialog.

**OK**

Click this button to apply the changes you made and close the dialog.
3.2 Using the Mali Texture Compression Tool from the command line

This section describes how to use the Texture Compression Tool from the command line. It contains the following sections:

- About the command-line version of the Texture Compression Tool
- Compressing files from the command line on page 3-12
- Log and error messages on page 3-13
- Internal format for the compression options on page 3-15
- Relationship between compression options on page 3-16.

3.2.1 About the command-line version of the Texture Compression Tool

You can use the Texture Compression Tool from the command line, this enables you to compress textures using a single command. You can use arguments and options to specify the:

- texture compression algorithm to use
- name of the file to compress
- output directory to store compressed file
- texture compression options specific to the compression algorithm used
- extension of decompressed images.

Starting the Texture Compression Tool from the command line on Microsoft Windows

To start the Texture Compression Tool on Microsoft Windows:

1. Select Run... from the Start menu.
2. Type cmd and click OK to open a command line.
3. Navigate to the following directory:
   C:\Program Files\ARM\Mali Developer Tools\Mali Texture Compression Tool \v.m.n.o\bin
   where:
   - m identifies the major version
   - n.o identifies the minor version.
4. Type the following command
etcpack

The etcpack command without arguments or options displays help information about the command.

Starting the Texture Compression Tool from the command line on Mac OS X

To start the Texture Compression Tool on Mac OS X:

1. Open a command line.
2. Navigate to the following directory:
   Mali_Texture_Compression_Tool_\v.m.n.o/bin
   where:
   - m identifies the major version
   - n.o identifies the minor version.
3. Type the following command
Starting the Texture Compression Tool from the command line on Linux

To start the Texture Compression Tool Linux:
1. Open a command line.
2. Navigate to the following directory:
   Mali_Texture_Compression_Tool_m.n.o/bin
   where:
   - **m** identifies the major version
   - **n.o** identifies the minor version.
3. Type the following command
   ./etcpack

The etcpack command without arguments or options displays help information about the command.

3.2.2 Compressing files from the command line

Use the following command to compress a texture:

```
etcpack input_filename output_directory <options>
```

The arguments are:

- **input_filename**
  The input file to be compressed.

- **output_directory**
  The directory to place the compressed file into.
  You must specify an output directory. If an output directory is not specified, the Texture Compression Tool requests one.

The options are:

- **-s {fast|slow}**
  Compression speed. The default is fast. Same as Fast and Slow options on the Compression options dialog.

- **-e {perceptual|nonperceptual}**
  Set the error measure parameter. The default is perceptual. Same as the Error Metric option on the Compression options dialog.

- **-c {etc1|etc2}**
  Set the compression codec. The default is etc2.

- **-f {R|R_signed|RG|RG_signed|RGB|RGBA|RGBA1}**
  Set the compression format. The default is RGB. RGBA8 is an alias for RGBA.
The different options select the number of channels and the number of bits for the alpha channel. Table 3-3 lists the corresponding options on the Compression options dialog:

Table 3-3 Compression dialog equivalents for command line compression format options

<table>
<thead>
<tr>
<th>Compression option</th>
<th>Format option on Compression dialog</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>R11_EAC</td>
</tr>
<tr>
<td>R_signed</td>
<td>SignedR11_EAC</td>
</tr>
<tr>
<td>RG</td>
<td>RG11_EAC</td>
</tr>
<tr>
<td>RG_signed</td>
<td>SignedRG11_EAC</td>
</tr>
<tr>
<td>RGB</td>
<td>RGBA8_ETC2</td>
</tr>
<tr>
<td>RGBA (or RGB8)</td>
<td>RGBA8_ETC2_EAC</td>
</tr>
<tr>
<td>RGBA1</td>
<td>RGBA8_PUNCHTHROUGH_ALPHA1_ETC2</td>
</tr>
</tbody>
</table>

-ext \{PPM|PGM|JPG|JPEG|PNG|GIF|BMP|TIF|TIFF|PSD|RAW|PCT|SGI|XPM\}

Set the format for the uncompressed file. The default is PPM.

-mipmaps

Generate mipmaps. A mipmap is a collection of scaled-down bitmap images that accompanies a main texture. Using mipmaps can increase rendering speed and reduce artifacts.

-aa

Use the alpha channel and create a texture atlas. (Only available with -c etc1 option.) Same as the Create Atlas option on the Compression options dialog.

-as

Use the alpha channel and create a separate image. (Only available with -c etc1 option.) Same as the Create separate compressed image option on the Compression options dialog.

-ar

Use the alpha channel and create a raw image. (Only available with -c etc1 option.) Same as the Create separate uncompressed image option on the Compression options dialog.

-ktx

Output ktx files instead of the default pkm files.

-progress

Report the percentage progress of each compression.

-v

Verbose mode. Prints additional information during execution.

-version

Prints version number.

-help

Print usage information and exit.

For more information on compression options, see Table 3-2 on page 3-6.

3.2.3 Log and error messages

During operation, the Texture Compression Tool can print status and error messages to the standard error output.

Error messages

If an error occurs the Texture Compression Tool outputs a message of the form:
Error: <error_message>

If there are errors in the command line arguments, the error message is followed by the standard help message.

**Informational messages**

Normal informational messages are in the following form:

```markdown
malitc-<number><message_text>: <message_data>
```

where the fields are as described in Table 3-4:

<table>
<thead>
<tr>
<th>Number</th>
<th>Message text</th>
<th>Message data</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Compressing. Output file</td>
<td>file name</td>
<td>Output before the RGB component of an image or mipmap is compressed.</td>
</tr>
<tr>
<td>2</td>
<td>Compressing alpha component. Output file</td>
<td>file name</td>
<td>Output before the alpha component of an image or mipmap is compressed.</td>
</tr>
<tr>
<td>3</td>
<td>Writing uncompressed alpha. Output file</td>
<td>file name</td>
<td>Output when saving uncompressed alpha data.</td>
</tr>
<tr>
<td>4</td>
<td>Compression time</td>
<td>time in ms</td>
<td>Output when each compression completes. The time value is an integer and is followed by the string &quot;ms&quot; for readability.</td>
</tr>
<tr>
<td>5</td>
<td>RMSE</td>
<td>RMSE value in floating point format</td>
<td>Output for each compression.</td>
</tr>
<tr>
<td>6</td>
<td>PSNR</td>
<td>PSNR value in floating point format</td>
<td>Output for each compression.</td>
</tr>
<tr>
<td>7</td>
<td>Perceptually weighted RMSE</td>
<td>Perceptually weighted RMSE value in floating point format</td>
<td>Output for each compression.</td>
</tr>
<tr>
<td>8</td>
<td>Perceptual PSNR</td>
<td>Perceptually weighted PSNR value in floating point format</td>
<td>Output for each compression.</td>
</tr>
<tr>
<td>9</td>
<td>PSNR</td>
<td>“infinite”</td>
<td>Used for infinite PSNR (perfect compression) in place of message 6.</td>
</tr>
<tr>
<td>10</td>
<td>Perceptual PSNR</td>
<td>“infinite”</td>
<td>Used for infinite perceptual PSNR (perfect compression) in place of message 8.</td>
</tr>
<tr>
<td>11</td>
<td>Mipmap level</td>
<td>mipmap level</td>
<td>Output before each compression or pair of compressions of a mipmap level.</td>
</tr>
<tr>
<td>12</td>
<td>Compression progress</td>
<td>percent progress</td>
<td>Percent of current compression, not of the whole job, followed by percent symbol &quot;%&quot; for readability.</td>
</tr>
<tr>
<td>13</td>
<td>RMSE for alpha channel:</td>
<td>RMSE value - floating point</td>
<td>Output for each compression in RGBA1 and RGBA8.</td>
</tr>
<tr>
<td>14</td>
<td>PSNR for alpha channel:</td>
<td>PSNR value - floating point</td>
<td>Output for each compression in RGBA1 and RGBA8.</td>
</tr>
</tbody>
</table>
Tools that analyze the output must ignore everything except the number and data. The data always follows the only colon in the message.

### 3.2.4 Internal format for the compression options

Table 3-5 lists the internal formats for the etc2 codec:

#### Table 3-5 Internal formats for the etc2 codec

<table>
<thead>
<tr>
<th>Compression option</th>
<th>GL base internal format</th>
<th>GL internal format</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>GL_R</td>
<td>GL_COMPRESSED_R11_EAC</td>
</tr>
<tr>
<td>R_signed</td>
<td>GL_R</td>
<td>GL_COMPRESSED_SIGNED_R11_EAC</td>
</tr>
<tr>
<td>RG</td>
<td>GL_RG</td>
<td>GL_COMPRESSED_RG11_EAC</td>
</tr>
<tr>
<td>RG_signed</td>
<td>GL_RG</td>
<td>GL_COMPRESSED_SIGNED_RG11_EAC</td>
</tr>
<tr>
<td>RGB</td>
<td>GL_RGB</td>
<td>GL_COMPRESSED_RGB8_ETC2</td>
</tr>
<tr>
<td>RGBA or RGB8</td>
<td>GL_RGBA</td>
<td>GL_COMPRESSED_RGBA8_ETC2_EAC</td>
</tr>
<tr>
<td>RGBA1</td>
<td>GL_RGBA</td>
<td>GL_COMPRESSED_PUNCHTHROUGHHA_RGBA8_ETC2</td>
</tr>
</tbody>
</table>

Table 3-6 lists the internal formats for the etc1 codec:

#### Table 3-6 Internal formats for the etc1 codec

<table>
<thead>
<tr>
<th>Compression option</th>
<th>GL base internal format</th>
<th>GL internal format</th>
</tr>
</thead>
<tbody>
<tr>
<td>no alpha option</td>
<td>GL_RGB</td>
<td>GL_ETC1_RGB8_OES</td>
</tr>
</tbody>
</table>
### 3.2.5 Relationship between compression options

The compression options related with metric (perceptual or non-perceptual) and speed (fast or exhaustive) are not available or applicable to all compression formats. Table 3-7 lists the support for the metric and speed parameters for different compression options:

<table>
<thead>
<tr>
<th>Codec</th>
<th>Compression option</th>
<th>Metric perceptual</th>
<th>Metric non-perceptual</th>
<th>Speed fast</th>
<th>Speed exhaustive</th>
</tr>
</thead>
<tbody>
<tr>
<td>etc2</td>
<td>R</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>etc2</td>
<td>R_signed</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>etc2</td>
<td>RG</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>etc2</td>
<td>RG_signed</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>etc2</td>
<td>RGB</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>etc2</td>
<td>RGBA</td>
<td>Yes, but only for RGB channels</td>
<td>Yes, but only for RGB channels</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>etc2</td>
<td>RGBA1</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>etc1</td>
<td>RGB</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

---

**Table 3-6 Internal formats for the etc1 codec (continued)**

<table>
<thead>
<tr>
<th>Compression option</th>
<th>GL base internal format</th>
<th>GL internal format</th>
</tr>
</thead>
<tbody>
<tr>
<td>-aa</td>
<td>Uncompressed GL ALPHA</td>
<td>Uncompressed GL ALPHA</td>
</tr>
<tr>
<td>-as</td>
<td>GL_RGB</td>
<td>GL_ETC1_RGB8_OES</td>
</tr>
<tr>
<td>-ar</td>
<td>GL_RGB</td>
<td>GL_ETC1_RGB8_OES</td>
</tr>
</tbody>
</table>