IGLOO2 HPMS

Embedded Nonvolatile Memory (eNVM) Configuration



Power Matters."



Table of Contents

	Introduction
1	Creating Clients
2	Configuring a Data Storage Client
3	Memory File Formats12INTEL-HEX12MOTOROLA S-record12Actel BINARY13Actel-HEX13
4	Interpreting Memory Content 14 Absolute vs. Relative Addressing 14 Data Interpretation Example 14
A	Product Support 16 Customer Service 16 Customer Technical Support Center 16 Technical Support 16 Website 16 Contacting the Customer Technical Support Center 16 ITAR Technical Support 17



Introduction

The HPMS Embedded Nonvolatile Memory (eNVM) configurator enables you to create memory regions (clients) that need to be programmed in the IGLOO2 device eNVM block(s).

This document describes how to configure eNVM block(s). For more information about eNVM, refer to the Microsemi IGLOO2 User's Guide.

Important Information About eNVM Reserved Pages

A certain number of eNVM pages are reserved to store the HPMS configuration. These reserved pages are used by the HPMS to store the Certificate/Digest and the Peripheral Initialization Configuration Data for SERDES, FDDR and MDDR. These pages are located at the top of the eNVM address space. The total number of reserved pages in the eNVM is device-dependent, as shown in Table 1.

IGLOO2 Device	Reserved Pages for Peripheral Initialization Configuration Data	Reserved Pages for Certificate/Digest	Total Reserved Pages
M2GL005, M2GL010, M2GL025,M2GL050	32	16	48
M2GL060,M2GL090, M2GL150	32	64	96

Table 1 • Device Type and eNVM Reserved Pages

Note: You application should not write into these reserved pages, as it will most likely cause a runtime failure for your design.

The number of Available Pages displayed in the eNVM Configurator is the total number of pages available to you after the Reserved Pages have been taken into account. For example, the M2GL150S device data sheet shows a total of 4096 pages in the eNVM, but the eNVM Configurator (Figure 1-1) shows only 4000 Available Pages, because 96 pages have been reserved by the HPMS and made unavailable to the user.



1 – Creating Clients

The main page of the eNVM configurator enables you to add clients to your eNVM block (Figure 1-1).

- Data Storage client Use the data storage client to define a generic memory region in the eNVM block. This region can be used to hold your application code or any other data content that your application may need.
- Serialization Client A serialization client stores a value which is different for each device that is programmed.

The main grid also displays characteristics of any configured clients. These characteristics are:

- Client Type Type of the client (Data Storage or Serialization) that is added to the system
- Client Name Name of the client. Must be unique across the system.
- Start Address Address in hex at which the client is located in eNVM. It must be on a page boundary. No overlapping addresses between different clients are allowed.
- Depth x Width of Word Word size of the client in Depth x Width
- Page Start Page on which the start address begins.
- **Page End** Page on which the client memory region ends. It is automatically computed based on the start address, word size, and number of words for a client.
- Initialization Order This field is not used by the IGLOO2 eNVM configurator.
- Lock Start Address Specify this option if you do not want the eNVM configurator to change your start address when clicking the Optimize button. This applies to Data Storage clients only.

Usage statistics for the eNVM are also reported:

- Available Pages Total number of pages available to create clients. The number of available
 pages may vary based on the selected die. This is the total number of pages available to you after
 the reserved pages have been taken into account.
- Used Pages Total number of pages used by the configured clients.
- Free Pages Total number of pages still available for configuring data storage and initialization clients.

Use the **Optimize** feature to resolve the conflicts on overlapping base addresses for clients. This operation does not modify the base addresses for any clients that have Lock Start Address checked.

			User	Clients in eNVM			
Data Storage Serialization	Client	Type Client Name	e DepthxWidth	Start Address(Hex)	Page Start	Page End	Initialization (
	1 Data	Storage data_st	512 x 32	0	0	15	N/A
Add to System Jsage Statistics Available Pages: 4000 Used Pages: 16 Free Pages: 3984			III				•

Figure 1-1 • eNVM Configurator



2 – Configuring a Data Storage Client

To add a Data Storage client, open the eNVM Configurator. For available client types, select Data Storage and click **Add to System**.

The Add Data Storage Client dialog box appears.

Add Data Storage Client	5
Client name:	
eNVM	
Content from file:	
Format: Intel-Hex	
🔄 Use absolute addressing 🛛 🕤	
Content filed with 0s	
No content (client is a placeholder and will not be	programmed)
Start address: 0x 0	
Size of word: 8 -	
Number of words: 1	Decimal
Use as ROM	
Use content for simulation	
use content for simulation	
Help 👻	OK Canor

Figure 2-1 • Adda Data Storage Client

In the Add Data Storage Client dialog box, you must specify the following fields/options in the Client Configuration dialog box.

Client name – Enter a name for the Data Storage. Each client name must be unique across the system.

Content from file – Specify the memory file you want to program into eNVM. Click the Browse button. The Import Memory File dialog box appears.



Import Memory File

The Import Memory File dialog box allows you to navigate to a disk location and import a Memory File for a Data Storage Client or a serialization client.

.ook in:	:			- 0 (0 0	<u>:</u> :: :	
My Comput	er	Name	Size	Туре	Dat	te Modifier *	
		Lib116_for_david_test		File Folder	2/2	2/2016 9:4:	
alex.wong		no-IDE		File Folder	2/1	9/2016 9:34	
		2Work		File Folder	2/1	8/2016 3:2:	
		my.mem	910tes	mem File	1/2	1/27/2016 3:1!	
		blk_top		File Folder	1/8	/2016 2:16:	
		2work_clk_group		File Folder	11/	20/2015 10	
		ing my_mss File Folder		File Folder	9/2	1/2015 10:	
		Lib115_prod_def_vault File Folder		File Folder	9/9/2015 3:49:		
		Lib115_vault_default		File Folder	9/9	/2015 8:34:	
		Lib116_prod		File Folder	9/9	/2015 8:26: +	
	•		iii			÷	
File name: my.m	em					Open	
Files of type: Micro	semi-Binary Files (Files (*.mem)			•	Cancel	
Use absolute pat	h						
C Line calation math	from project dire	rtory					

Figure 2-2 • Import Memory File Dialog Box



Use absolute path – When this radio button is checked, the Absolute Path of the Memory File appears in the Content from File field.

eNVM Content from file: D:/my.mem			
Format: Microsemi-Binary Use absolute addressing Content filled with 0s No content (client is a placeholde	0	rogrammed)	
Start address: 0x 0 Size of word: 8 Bits Number of words: 120		Decimal	
Use as ROM () Imported Memory file location is D:/m	y.mem		
Use content for simulation			

Figure 2-3 • Absolute Path of Memory File

Use relative path from project directory – When this radio button is checked, the Relative Path of the Memory File (relative to the Project location) you import appears in the Content from File field.

Note: On a Windows system, if the memory file and the Project location are on different drives, the Absolute Path is used even when you select Relative Path.



Content from	file:\\my.mem		
	Microsemi-Binary bsolute addressing with 0s		
No content (d)	ient is a placeholder and wi	I not be programmed)	
Start address: Size of word: Number of words:	0x 0 🗇 8 🕶 Bits 120	Decimal	
Use as ROM	0		
Imported Memory	file location is D: \my.mem)	
Use content for	simulation		

Figure 2-4 • Relative Path of Memory File



Copy memory file to project path – Click this radio button and click the Browse button at the far right to navigate to the location of the memory file to copy from.

ook in:			- 0	00	: 🗉 🔳	
My Computer	Name	Size	Туре	Date	Modifier *	
	StandAlonePI		File Folder	6/30/	2014 11:	
alex.wong	sysBUILDER		File Folder	4/21/	2014 10:	
	🎍 test3	File Folder		12/6/2013 9:4:		
	TestMSS		File Folder	10/1/2013 1:3:		
	lestonly	testonly File Folder		7/18/	7/18/2013 7:5:	
	J ThingsToLearn File Folder		1/26/2015 2:44			
	👪 timing_const	👪 timing_const File Folder		10/31/2013 1:		
	al top		File Folder	12/2/	2013 10:0	
	🤒 vishakh		File Folder	7/15/	2013 3:0:	
	📑 my.mem	910tes	mem File	1/27/	2016 3:1! +	
	•				•	
le name: my.mem					Open	
les of type: Microsemi-8	inary Files (*.mem)			•	Cancel	
Use absolute path						
Use relative path from						

Figure 2-5 • Copy Memory File to Project Path

Notes

The memory file cannot be copied to and stored in the project's subfolders: component, smartgen, synthesis, designer, simulation, stimulus, tooldata, and constraint. To prevent users from inadvertently copying the memory file into these subfolders, these project subfolders are hidden from view when you select the project folder.

The copied Memory File path is internally stored as relative path.

If the Memory File is copied to the project, updating the content of the Memory File is the user's responsibility.



f2	•) 🔾 🖓 📑 🗉 🔳
Name	Size Type	Date Modified
	m	•
	f2 Name	

Figure 2-6 • Project Subfolders Hidden from View

Choose one of the following options for the Data Storage client:

Format – Select a file on disk that matches one of the following memory file formats—Intel-Hex, Motorola-S, Microsemi-Hex, or Microsemi-Binary

Use absolute addressing – Lets the memory content file dictate where the client is placed in the eNVM block. The addressing in the memory content file for the client becomes absolute to the whole eNVM block. Once you choose the absolute addressing option, the software extracts the smallest address from the memory content file and uses that address as the start address for the client.

Content filled with 0's - Client content is all 0's.

No content – The client is a place holder. You can load a memory file using FlashPro/FlashPoint at programming time without having to go back to this configurator.

Start Address – The eNVM address where the content is programmed.

Size of Word – Word size, in bits, of the initialized client; can be either 8, 16 or 32.

Number of words – Number of words (in Decimal) of the client.

Use as ROM – When checked (ON), all masters have read-only access to this eNVM client. The client content is protected and its content cannnot be overwritten. When unchecked (OFF), access to this eNVM client is controlled by settings in the MSS security policies configurator.

Use Content for Simulation – When checked, the client content is passed to the Simulator.



Client name:	
eN/M	
Content from file:	
Format: Intel-Hex -	
💹 Use absolute addressing 🛛 🚯	
Content filed with 0s	
 No content (client is a placeholder and will not be progra 	(hanna)
 Invision (dentis a pacerover and will not be progra 	sincey,
Start address: 0x 0	
Size of word: 8 Bits	
Number of words: 1 De	cimal
Use as ROM 🚯	
Use content for simulation	
	100 million (100 m
Help 💌	OK Cancel

Figure 2-7 • Add Data Storage Client Dialog Box



3 – Memory File Formats

The following memory file formats are available as input files into the eNVM Configurator:

- INTEL-HEX
- MOTOROLA S-record
- Actel BINARY
- ACTEL-HEX

An example of how to interpret the memory content is shown below.

INTEL-HEX

Industry standard file. Extensions are HEX and IHX. For example, file2.hex or file3.ihx.

A standard format created by Intel. Memory contents are stored in ASCII files using hexadecimal characters. Each file contains a series of records (lines of text) delimited by new line, '\n', characters and each record starts with a ':' character. For more information on this format, refer to the Intel-Hex Record Format Specification document available on the web (search Intel Hexadecimal Object File for several examples).

The Intel Hex Record is composed of five fields and arranged as follows:

:llaaaatt[dd...]cc

Where:

- : is the start code of every Intel Hex record
- Il is the byte count of the data field
- aaaa is the 16-bit address of the beginning of the memory position for the data. Address is big endian.
- tt is record type, defines the data field:
 - 00 data record
 - 01 end of file record
 - 02 extended segment address record
 - 03 start segment address record (ignored by Microsemi SoC tools)
 - 04 extended linear address record
 - 05 start linear address record (ignored by Microsemi SoC tools)
- [dd...] is a sequence of n bytes of the data; n is equivalent to what was specified in the II field
- cc is a checksum of count, address, and data

Example Intel Hex Record:

:1000000112233445566778899FFFA

Where 11 is the LSB and FF is the MSB.

MOTOROLA S-record

Industry standard file. File extension is s, such as file4.s

This format uses ASCII files, hex characters, and records to specify memory content in much the same way that Intel-Hex does. Refer to the Motorola S-record description document for more information on this format (search Motorola S-record description for several examples). The RAM Content Manager uses only the S1 through S3 record types; the others are ignored.



The major difference between Intel-Hex and Motorola S-record is the record formats, and some extra error checking features that are incorporated into Motorola S.

In both formats, memory content is specified by providing a starting address and a data set. The upper bits of the data set are loaded into the starting address and leftovers overflow into the adjacent addresses until the entire data set has been used.

The Motorola S-record is composed of 6 fields and arranged as follows:

Stllaaaa[dd...]cc

Where:

- S is the start code of every Motorola S-record
- · t is record type, defines the data field
- Il is the byte count of the data field
- aaaa is a 16-bit address of the beginning of the memory position for the data. Address is big endian.
- [dd...] is a sequence of n bytes of the data; n is equivalent to what was specified in the II field
- · cc is the checksum of count, address and data

Example Motorola S-Record:

```
S10a0000112233445566778899FFFA
```

Where 11 is the LSB and FF is the MSB.

Actel BINARY

The simplest memory format. Each memfile contains as many rows as there are words. Each row is one word, where the number of binary digits equals the word size in bits. This format has a very strict syntax. The word size and number of rows must match exactly. The file extension is MEM; for example, file1.mem.

Example: Depth 6, Width is 8

Actel-HEX

A simple address/data pair format. All the addresses that have content are specified. Addresses with no content specified will be initialized to zeroes. The file extension is AHX, such as filex.ahx. The format is: AA:D0D1D2

Where AA is the address location in hex. D0 is the MSB and D2 is the LSB.

```
The data size must match the word size. Example: Depth 6, Width is 8
00:FF
01:AB
02:CD
03:EF
04:12
05:BB
```

All other addresses will be zeroes.



4 – Interpreting Memory Content

Absolute vs. Relative Addressing

In relative addressing, the addresses in the memory content file did not determine where the client was placed in memory. You specify the location of the client by entering the start address. This becomes the 0 address from the memory content file perspective and the client is populated accordingly.

For example, if we place a client at 0x80 and the content of the memory file is as follows:

Address: 0x0000 data: 0102030405060708 Address: 0x0008 data: 090A0B0C0D0E0F10

Then the first set of bytes of this data is written to address 0x80 + 0000 in the eNVM block. The second set of bytes is written to address 0x80 + 0008 = 0x88, and so on.

Thus the addresses in the memory content file are relative to the client itself. Where the client is placed in memory is secondary.

In absolute addressing, the memory content file dictates where the client is placed in the eNVM block. So the addressing in the memory content file for the client becomes absolute to the whole eNVM block. Once you enable the absolute addressing option, the software extracts the smallest address from the memory content file and uses that address as the start address for the client.

Data Interpretation Example

The following examples show how the data is interpreted for various word sizes:

For the given data:

FF 11 EE 22 DD 33 CC 44 BB 55

(where 55 is the MSB and FF is the LSB)

For 32-bit word size:

0x22EE11FF (address 0) 0x44CC33DD (address 1) 0x000055BB (address 2)

For 16-bit word size:

0x11FF (address 0) 0x22EE (address 1) 0x33DD (address 2) 0x44CC (address 3) 0x55BB (address 4)

For 8-bit word size:

 0xFF
 (address
 0)

 0x11
 (address
 1)

 0xEE
 (address
 2)

 0x22
 (address
 3)

 0xDD
 (address
 4)

 0x33
 (address
 5)

 0xCC
 (address
 6)

 0x44
 (address
 7)

 0xBB
 (address
 8)

 0x55
 (address
 9)





A – Product Support

Microsemi SoC Products Group backs its products with various support services, including Customer Service, Customer Technical Support Center, a website, electronic mail, and worldwide sales offices. This appendix contains information about contacting Microsemi SoC Products Group and using these support services.

Customer Service

Contact Customer Service for non-technical product support, such as product pricing, product upgrades, update information, order status, and authorization.

From North America, call **800.262.1060** From the rest of the world, call **650.318.4460** Fax, from anywhere in the world, **650.318.8044**

Customer Technical Support Center

Microsemi SoC Products Group staffs its Customer Technical Support Center with highly skilled engineers who can help answer your hardware, software, and design questions about Microsemi SoC Products. The Customer Technical Support Center spends a great deal of time creating application notes, answers to common design cycle questions, documentation of known issues, and various FAQs. So, before you contact us, please visit our online resources. It is very likely we have already answered your questions.

Technical Support

For Microsemi SoC Products Support, visit http://www.microsemi.com/products/fpga-soc/design-support/ fpga-soc-support.

Website

You can browse a variety of technical and non-technical information on the Microsemi SoC Products Group home page, at www.microsemi.com/soc.

Contacting the Customer Technical Support Center

Highly skilled engineers staff the Technical Support Center. The Technical Support Center can be contacted by email or through the Microsemi SoC Products Group website.

Email

You can communicate your technical questions to our email address and receive answers back by email, fax, or phone. Also, if you have design problems, you can email your design files to receive assistance. We constantly monitor the email account throughout the day. When sending your request to us, please be sure to include your full name, company name, and your contact information for efficient processing of your request.

The technical support email address is soc_tech@microsemi.com.

My Cases

Microsemi SoC Products Group customers may submit and track technical cases online by going to My Cases.

Outside the U.S.

Customers needing assistance outside the US time zones can either contact technical support via email (soc_tech@microsemi.com) or contact a local sales office.

Visit About Us for sales office listings and corporate contacts.

Sales office listings can be found at www.microsemi.com/soc/company/contact/default.aspx.

ITAR Technical Support

For technical support on RH and RT FPGAs that are regulated by International Traffic in Arms Regulations (ITAR), contact us via soc_tech_itar@microsemi.com. Alternatively, within My Cases, select **Yes** in the ITAR drop-down list. For a complete list of ITAR-regulated Microsemi FPGAs, visit the ITAR web page.



Microsemi Corporate Headquarters One Enterprise, Aliso Viejo, CA 92656 USA

Within the USA: +1 (800) 713-4113 Outside the USA: +1 (949) 380-6100 Sales: +1 (949) 380-6136 Fax: +1 (949) 215-4996

E-mail: sales.support@microsemi.com

©2017 Microsemi Corporation. All rights reserved. Microsemi and the Microsemi logo are trademarks of Microsemi Corporation. All other trademarks and service marks are the property of their respective owners.

About Microsemi

Microsemi Corporation (Nasdaq: MSCC) offers a comprehensive portfolio of semiconductor and system solutions for communications, defense & security, aerospace and industrial markets. Products include high-performance and radiation-hardened analog mixed-signal integrated circuits, FPGAs, SoCs and ASICs; power management products; timing and synchronization devices and precise time solutions, setting the world's standard for time; voice processing devices; RF solutions; discrete components; Enterprise Storage and Communication solutions, security technologies and scalable anti-tamper products; Ethernet solutions; Power-over-Ethernet ICs and midspans; as well as custom design capabilities and services. Microsemi is headquartered in Aliso Viejo, Calif. and has approximately 4,800 employees globally. Learn more at **www.microsemi.com**.

Microsemi makes no warranty, representation, or guarantee regarding the information contained herein or the suitability of its products and services for any particular purpose, nor does Microsemi assume any liability whatsoever arising out of the application or use of any product or circuit. The products sold hereunder and any other products sold by Microsemi have been subject to limited testing and should not be used in conjunction with mission-critical equipment or applications. Any performance specifications are believed to be reliable but are not verified, and Buyer must conduct and complete all performance and other testing of the products, alone and together with, or installed in, any end-products. Buyer shall not rely on any data and performance specifications or parameters provided by Microsemi. It is the Buyer's responsibility to independently determine suitability of any products and verify the same. The information provided by Microsemi hereunder is provided "as is, where is" and with all faults, and the entire risk associated with such information is entirely with the Buyer. Microsemi does not grant, explicitly or implicitly, to any party any patent rights, licenses, or any other IP rights, whether with regard to such information itself or anything described by such information. Information provided in this document is proprietary to Microsemi, and Microsemi reserves the right to make any changes to the information in this document or to any products and services at any time without notice.