SmartFusion®2

MSS Embedded Nonvolatile Memory (eNVM) Configuration

Introduction

The MSS Embedded Nonvolatile Memory (eNVM) configurator allows you to create memory regions (clients) that need to be programmed in SmartFusion®2 device eNVM blocks.

This document describes how to configure eNVM blocks. For more details about eNVM, refer to the Microsemi SmartFusion2 User's Guide.

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1. Important Information About eNVM Reserved Pages

Some eNVM pages are reserved to store the Certificate, Digest and security information. 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 the following table.

Table 1-1. Device Type and eNVM Reserved Pages

SmartFusion2 Device	Reserved Pages for Certificate/Digest
M2S005, M2S010, M2S025, M2S050	16
M2S060, M2S090, M2S150	64

Note: Your application should not write into these reserved pages because it might 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 considered. For example, the M2S050 device data sheet shows a total of 2048 pages in the eNVM, but the eNVM Configurator (Figure 1-1) shows 2032 Available Pages, because 16 pages have been reserved by MSS and made unavailable to you.

2. Creating Clients

The main page of the eNVM configurator allows you to add clients to your eNVM block. The main grid displays the characteristics of any configured clients, along with usage statistics.

An **Optimize** button allows you 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.

Figure 2-1. eNVM Configurator

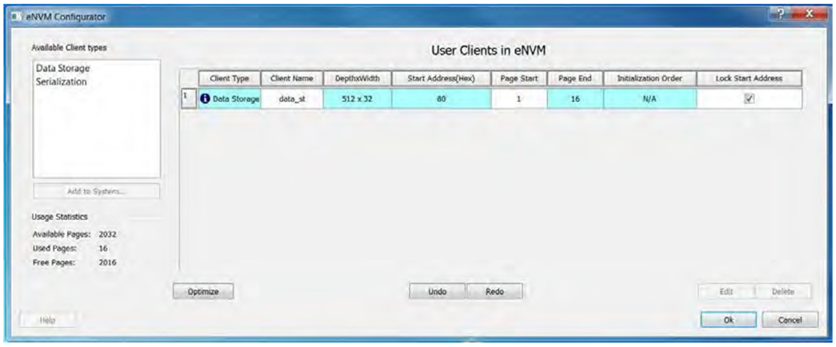


Table 2-1. Elements on the eNVM Configurator Main Page

Element	Description
Available Client types	
Data Storage client type	Defines 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.
User Clients in eNVM	
Client Type column	Type of the client that is added to the system.
Client Name column	Name of the client. Must be unique across the system.
Depth/Width	Depth/Width includes number of words/bits based on the memory file used for initializing the eNVM client.
Start Address(Hex) column	Hexadecimal address where the client is located in eNVM. The start address must be on a page boundary. Overlapping addresses between different clients are not allowed.
Word Size	Client word size, in bits.
Page Start	Page on which the start address begins.
Page End column	Page on which the client memory region ends. Page end is computed automatically based on the start address, word size, and number of words for a client.
Initialization Order column	This field is not used by the SmartFusion eNVM configurator.
Lock Start Address check box	If you do not want the eNVM configurator to change your start address when clicking the **Optimize** button, check this button.
Usage Statistics	
Available Pages	Total number of pages available to create clients. The number of available pages may vary based on the selected die. This number is the total number of pages available to you after the reserved pages have been considered.
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.

3. Configuring a Data Storage Client

You must specify the following options in the Client Configuration dialog box.

3.1 eNVM Content Description

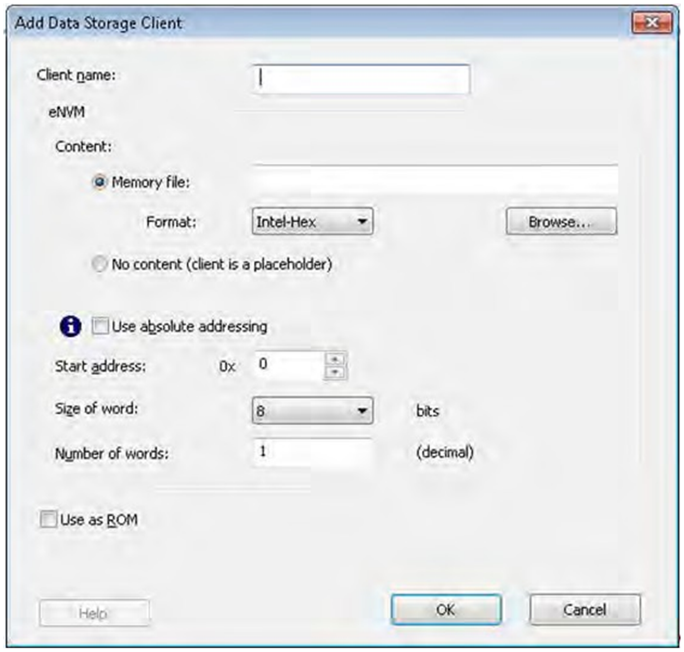
Table 3-1. eNVM Content Description

Field	Description
Content	Specify the memory content you want to program into eNVM. Options are: • **Memory File** - select a file on a disk that matches one of the following memory file formats: Intel HEX, Motorola-S, Microsemi-S, or Microsemi-Binary. • **No content** - client is a placeholder. You can load a memory file using FlashPro/FlashPoint at programming time without having to return to this configurator.
Use absolute addressing	Allows the memory content file to determine 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. When you select this option, the software extracts the smallest address from the memory content file and uses that address as the start address for the client.
Start Address	The eNVM address where the content is programmed.
Size of Word	Word size, in bits, of the initialized client. Choices are: • 8 • 16 • 32
Number of Words	Number of words of the client.

3.2 Use as ROM

If you select **Use as ROM** in the Add Data Storage Client dialog box, the data storage client content is protected and its content cannot be overwritten.

Figure 3-1. Add Data Storage Client Dialog Box



4. Memory File Formats

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

- Intel HEX
- Motorola-S
- Microsemi-BINARY
- Microsemi-HEX

The following sections provide information about these memory file formats.

4.1 Intel HEX Memory File Format

Intel HEX is an industry-standard file format created by Intel. File extensions are “hex” and “ihx” (for example, “file2.hex” and “file3.ihx”).

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. Each record starts with a ':' character. For more information, refer to the Intel HEX Record Format Specification document on the web (search Intel Hexadecimal Object File for several examples).

An Intel HEX record is comprised of five fields arranged as follows:

```
:llaaaatt[dd...]cc
```

Refer to the following table for a description of these fields.

Table 4-1. Description of Intel HEX Record Fields

Field	Description
`:`	Start code of every Intel HEX record.
`ll`	Byte count of the data field.
`aaaa`	16-bit address of the beginning of the memory position for the data. Address is big endian.
`tt`	Record type that 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...]`	Sequence of *n* bytes of the data, where *n* is equivalent to the value specified in the `ll` field.
`cc`	Checksum of count, address, and data.

Intel HEX Record Example

```
:10000000112233445566778899FFFA
```

In this example:

- `11` is the LSB.
- `FF` is the MSB.

4.2 Motorola S-record Memory File Format

Motorola S-record is an industry-standard file. File extension is “s” (for example, “file4.s”).

Like Intel HEX, Motorola S-record uses ASCII files, hex characters, and records to specify memory content. For more information about this format, refer to the Motorola S-record description document (search Motorola S-record description for several examples). The RAM Content Manager uses only the S1 through S3 record types, and ignores the others.

The major differences between Intel HEX and Motorola S-record are the record formats and some extra error checking features 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 comprised of six fields arranged as follows:

`Stllaaaa[dd...]cc`

Refer to the following table for a description of these fields.

Table 4-2. Description of Motorola-S Record Fields

Field	Description
`S`	Start code of every Motorola S-record.
`t`	Record type that defines the data field.
`ll`	Byte count of the data field.
`aaaa`	16-bit address of the beginning of the memory position for the data. Address is big endian.
`[dd...]`	Sequence of n bytes of the data, where *n* is equivalent to the value specified in the `ll` field.
`cc`	Checksum of count, address, and data.

Motorola S-Record Example

`S10a0000112233445566778899FFFA`

In this example:

- 11 is the LSB.
- FF is the MSB.

4.3 Microsemi BINARY Memory File Format

Microsemi BINARY is the simplest of the supported memory formats. 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. File extension is “mem” (for example, “file1.mem”).

Microsemi BINARY Example

In this example, depth is 6 and width is 8.

```
01010011
11111111
01010101
11100010
```

```
10101010
11110000
```

4.4 Microsemi-HEX Memory File Format

Microsemi-HEX is a simple address/data pair format. All the addresses that have content are specified. Addresses with no content specified are initialized to zeroes. The file extension is “ahx” (for example, “filex.ahx”).

The format is:

```
AA:D0
```

where `AA` is the address location in hexadecimal format and `D0` is the MSB. The data size must match the word size.

Microsemi HEX Example

In this example, depth 6 and width is 8.

```
00:FF
01:AB
02:CD
03:EF
04:12
05:BB
```

All other addresses will be zeroes.

5. Interpreting Memory Content

5.1 Relative vs. Absolute Addressing

Relative Addressing

With Relative Addressing, addresses in the memory content file do not determine where the client is 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 you place a client at 0x80 and the content of the memory file is:

```
Address: 0x0000 data: 0102030405060708
```

```
Address: 0x0008 data: 090A0B0C0D0E0F10
```

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.

Consequently, the addresses in the memory content file are relative to the client itself. The location where the client is placed in memory is secondary.

Absolute Addressing

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

5.2 Data Interpretation Example

The following table shows 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.

Table 5-1. Data Interpretations for Various Word Sizes

Word Size	Example

32-bit	`0x22EE11FF (address 0)`
	`0x44CC33DD (address 1)`
	`0x000055BB (address 2)`

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

8-bit	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)

6. Revision History

Revision	Date	Description
A	11/2020	Converted this document to the Microchip template. Initial Revision.

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