

NV1600 Flashtec™ NVRAM Drives Firmware Release Notes

Released

May 2016





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

© 2016 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.

Microsemi Corporation (Nasdaq: MSCC) offers a comprehensive portfolio of semiconductor and system solutions for communications, defense and 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; voice processing devices; RF solutions; discrete components; enterprise storage and communications solutions; security technologies and scalable anti-tamper products; Ethernet solutions; Power-over-Ethernet ICs and midspans; custom design capabilities and services. Microsemi is headquartered in Aliso Viejo, California and has approximately 4,800 employees world-wide. 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 to test 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.

The technology discussed in this document may be protected by one or more patent grants.

Revision History

Issue	Issue Date	Details of Change
7	May 2016	Updated for maintenance release 1.3.
6	November 2015	Updated for maintenance release 1.2.2.
5	November 2015	Updated for maintenance release.
4	October 2015	Updated for maintenance release 1.2.
3	May 2015	Updated for the NV1608 production release.
2	May 2015	Firmware release package update.
1	April 2015	Document created for NV1604 and NV1616 production release.

Contents

1	References.....	7
2	About This Release.....	8
3	Included in This Release.....	9
3.1	Release Components.....	9
3.2	Documentation.....	10
3.3	Device Identification.....	10
3.4	Software API Library.....	10
3.5	Command Line Interface Utility.....	10
3.6	Firmware.....	11
3.6.1	Firmware Upgrades.....	11
4	Testing Environment and Testing Status of this Release.....	13
4.1	System Environment.....	13
5	What is New?.....	14
5.1	Notes for This Release.....	14
5.2	Fixes for This Release.....	15
5.3	Limitations for This Release.....	17

List of Figures

Figure 1 • Flashtec NVRAM Drive.....	10
--------------------------------------	----

List of Tables

Table 1 • Release Details	9
Table 2 • Release Components	9
Table 3 • Supported Devices	10
Table 4 • System Environment Details	13
Table 5 • Supported Firmware/SBL Configurations	13

1 **References**

- PMC-2143476, *NV1600 Flashtec NVRAM Drives Installation and User's Guide*
- PMC-2152852, *NV1600 Flashtec NVRAM Drives Command Line Utility User's Guide*
- PMC-2142284, *NV1600 Flashtec NVRAM Drives Programmers Manual*
- PMC-2150853, *NV1600 Flashtec NVRAM Drives Errata*

2 About This Release

Microsemi's NV1600 Flashtec™ NVRAM Drive products provide a PCIe-based solution for high performance enterprise systems requiring power shortage protection.

This document describes a maintenance update for the 1.3 release for the NV1604, NV1608, and NV1616 production released products.

This release provides all the required software that enables backup and restoration of the drives' memory from the on-board DDR RAM to on-board flash array.

3 Included in This Release

This release of the firmware consists of the following items:

To upgrade your card to the latest firmware package provided with this 1.3 release, see the procedures described in [Firmware Upgrades](#) on page 11.

Table 1 • Release Details

File Name	Date	Build Number	Version Number
PMC_NVRAM_20160407_1327.tgz	April 7, 2016	01	Firmware: 2.7.02.0 API Library (API LIB): 2.7.02.0 CLI Utility: 1.5.5.0

The package is provided as "tgz" archive. To access to the content, unpack the distribution with this Linux command:

```
tar xzf PMC_NVRAM_YYYYMMDD_NNNN.tgz
```

Where:

- *YYYY* is the build year
- *MM* is the build month
- *DD* is the build day
- *NNNN* is the build ID

After unpacking, the following directories should be available:

- doc – contains basic documentation (for additional documents, please contact Microsemi)
- package – contains API library, Linux driver, firmware and firmware burning tool
- demo – contains the demo application

3.1 Release Components

This release consists of the following components:

Table 2 • Release Components

Component Name
NV1600 Flashtec NVRAM Drive Documentation
NV1600 Flashtec NVRAM Drive Software API Library (API LIB)
NV1600 Flashtec NVRAM Drive CLI Utility
NV1600 Flashtec NVRAM firmware, eeprom, superblock images

3.2 Documentation

The release package includes this document (*NV1600 Flashtec NVRAM Drives Release Notes*) located in the “doc” directory.

Additional documentation can be downloaded from [myPMC](#), including the:

- PMC-2143476, *NV1600 Flashtec NVRAM Drives Installation and User's Guide*
- PMC-2152852, *NV1600 Flashtec NVRAM Drives Command Line Utility User's Guide*
- PMC-2142284, *NV1600 Flashtec NVRAM Drives Programmers Manual*
- PMC-2150853, *NV1600 Flashtec NVRAM Drives Errata*

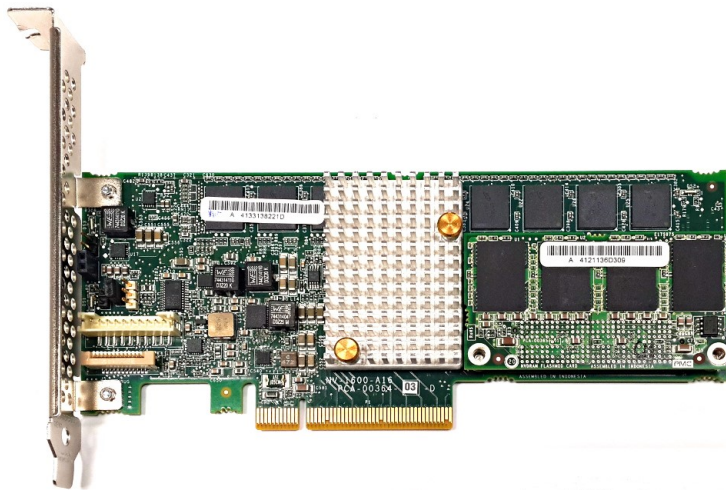
3.3 Device Identification

This firmware release supports the following NV1600 Flashtec NVRAM Drive products and requires CPLD Version 5. Contact Microsemi for details.

Table 3 • Supported Devices

Device type
NV1604 4GB Flashtec NVRAM Drive
NV1608 8GB Flashtec NVRAM Drive
NV1616 16GB Flashtec NVRAM Drive

Figure 1 • NV1600 Flashtec NVRAM Drive



3.4 Software API Library

The API library (API LIB) implements the control APIs as specified in the *NV1600 Flashtec NVRAM Drives Programmers Manual* [3].

3.5 Command Line Interface Utility

The Flashtec NVRAM Drive software includes a command line utility, or CLI, called *pmcnvm*. You can use the CLI as an administration tool to explore and configure the Flashtec NVRAM Drive interactively without issuing API calls from a host application. See the *NV1600 Flashtec NVRAM Drives Command Line Utility User's Guide* [2] for details.

3.6 Firmware

3.6.1 Firmware Upgrades

Upgrading the Firmware for This Release Using the CLI Utility

To upgrade your firmware from a prior release to this maintenance release using the CLI utility:

Important:

This procedure requires that you have installed the latest API library and CLI utility components provided with the latest release package. Releases older than API LIB version 2.6.04.0 and the CLI utility version 1.5.2.0 do not include the `sbl_download` command.

1. Using the CLI utility, download the latest firmware image:

```
firmware_download <SLOT_NUM> DOWNLOAD_FROM_FILE <FIRMWARE_IMAGE_PATH>
```

For example:

```
firmware_download FW_SLOT_3 DOWNLOAD_FROM_FILE /root/MTR_latest/firmware.tar
```

Note:

You must disable autobackup before using the `firmware_download` command.

2. Once the firmware image downloads successfully, restart the device firmware using `'rmmod+insmod'` NVMe or the `'reboot'` API.

Note:

At this stage, the firmware and the SBL images are not in sync. You must upgrade the SBL image before continuing to work with the device.

3. Using the CLI utility, download the SBL image using the following command:

```
sbl_download FW_SLOT_1 DOWNLOAD_FROM_FILE <SBL_IMAGE_PATH>
```

For example:

```
sbl_download FW_SLOT_1 DOWNLOAD_FROM_FILE  
/root/MTR_latest/eeprom.MT_RAMON_MLC_TYPE_S.bin
```

Note:

You must disable autobackup before using the `sbl_download` command.

4. Power-cycle the server to restart it and run the SBL image.

Reinstalling the Manufacturing Firmware

If an upgrade of the manufacturing firmware is necessary, refer to Appendix B of the *NV1600 Flashtec NVRAM Drives Installation and User's Guide* [1] for the upgrade procedure using the `writeFlash` utility provided in the release package and the factory reset procedure.

Note:

1. I2C support for the `writeFlash` utility is not enabled for this release and should not be used.
2. If upgrading from a firmware version older than RC27B, you must run the `writeFlash` utility with the `VBBS` command one time as shown in the example below and then power-cycle the card:

```
writeFlash all ../images/config/<eeprom_file_name>.bin  
../images/config/<superblock_file_name>.bin ../images/fw_images/firmware.tar  
  
writeFlash vbbs ../images/config/<eeprom_file_name>.bin
```

The filename order for the "all" option is significant: EEPROM first, then Superblock, then firmware.

4 Testing Environment and Testing Status of this Release

4.1 System Environment

Table 4 • System Environment Details

Detail	Version
Operating System	Linux, 64-bit
Distribution/Kernel	CentOS/RHEL 6.5 (2.6.32 kernel) CentOS 6.7 (2.6.32-573 kernel) CentOS 7.1503 (3.10.0-229 kernel) Ubuntu 12.04 (3.13 kernel) Ubuntu 14.04.2 (3.16 kernel) Ubuntu 14.02.03 (3.19 kernel) Ubuntu 15.10 (14.04.3) (4.2 kernel) FreeBSD 10.1-RELEASE-p31
NV1600 Flashtec Firmware Base Version	2.7.02.0
BQ Flash Version	NV1604: 0x0105 NV1608: 0x0204 NV1616: 0x0304
API Library (API LIB)	2.7.02.0
CLI Utility	1.5.5.0
PMC NVMe Linux Driver Base Version	1.2-pmc
PMC Kernel Module	0.03 – for Linux 0.01 – for FreeBSD

Table 5 • Supported Firmware/SBL Configurations

Firmware Version	SBL Version
2.7.02.0	2.7.02.0
2.6.06.1	2.6.04.0 2.6.06.0
2.6.06.0	2.6.04.0 2.6.06.0

Note:

The firmware and SBL should be updated to match one of the above combinations.

5 What is New?

1.3 Release

New features of this release include:

- Support has been added for kernel 4.2.
- New functionality was added that provides for redundancy in the firmware slot area of the NAND to better handle any potential bad blocks in that area of the NAND.
- Added download counters for each firmware slot.
- New API added, `fw_metadata_get`, which returns the block status of the firmware slot area.
- Changed the file name convention to include the version number in the file name (i.e. `firmware_2.7.02.0.tar` was `firmware.tar`)

Various Errata items were fixed. See [Fixes for This Release](#) on page 15 for more details.

5.1 Notes for This Release

- Due to sensitivity to the host BIOS implementation and other system parameters, any change in the environment specifications may cause to unexpected errors.
- Available user DDR size:
 - NV-1604: 0xFDBF0000 (3.96 GB)
 - NV-1608: 0x1F9C80000 (7.9 GB)
 - NV-1616: 0x3F3900000 (15.8 GB)
- In order to perform an SBL or firmware download, you must disable automatic backup prior to the appropriate command. Otherwise the download operation is not permitted.

5.2 Fixes for This Release

This release contains the following fixes previously reported in earlier releases:

ERR-15: Certain PMC_NVRAM_config_set API Calls During Flash Operations are Executed but an “Under Operation” Value is Returned	
Symptom	<p>Calling the PMC_NVRAM_config_set API with one of the following parameters while the firmware is performing any BACKUP, RESTORE, RESTORE_CORRUPTED, ERASE or BAD_BLOCK_SCAN flash operation will return the value "UNDER_OPERATION", indicating the firmware is busy, although the NVRAM Config Set operation will still be performed:</p> <ul style="list-style-type: none"> Config_Set NVRAM_CONFIG_TYPE_AUTHENTICATION_KEY_MASTER Config_Set NVRAM_CONFIG_TYPE_AUTHENTICATION_KEY_ADMIN Config_Set NVRAM_CONFIG_TYPE_CPU_TEMPERATURE_THRESHOLD Config_Set NVRAM_CONFIG_TYPE_CPU_CRITICAL_TEMPERATURE_THRESHOLD Config_Set NVRAM_CONFIG_TYPE_SYSTEM_TEMPERATURE_THRESHOLD Config_Set NVRAM_CONFIG_TYPE_SYSTEM_CRITICAL_TEMPERATURE_THRESHOLD Config_Set NVRAM_CONFIG_TYPE_BACKUP_POWER_TEMPERATURE_THRESHOLD Config_Set NVRAM_CONFIG_TYPE_HEARTBEAT_MSG_INTERVAL Config_Set NVRAM_CONFIG_TYPE_HEARTBEAT_MSG_NUMBER Config_Set NVRAM_CONFIG_TYPE_ENABLE_RAMDISK_ENCRYPTION Config_Set NVRAM_CONFIG_TYPE_ENABLE_RAMDISK_DMI_OVERLAP Config_Set NVRAM_CONFIG_TYPE_DMI_SIZE Config_Set NVRAM_CONFIG_TYPE_RAMDISK_SIZE
Impact	<p>There is no operational impact. The host making the NVRAM Config Set call will process the "UNDER_OPERATION" return value normally and is expected to try the Config Set again. If the flash operation has completed at that time, then the return value will indicate success, otherwise it will return another "UNDER_OPERATION" value.</p>

ERR-16: Reboot, Self_Test, and Certain Config_Set APIs Called During Flash Operations are Executed but an “Under Operation” Value is Returned and the Flash Operation May Hang	
Symptom	<p>Calling the PMC_NVRAM_reboot or PMC_NVRAM_self_test APIs, or the PMC_NVRAM_config_set API with one of the following parameters, while the firmware is performing a BACKUP, RESTORE, RESTORE_CORRUPTED, ERASE or BAD_BLOCK_SCAN flash operation will return the value "UNDER_OPERATION", indicating the firmware is "busy":</p> <ul style="list-style-type: none"> Config_Set NVRAM_CONFIG_TYPE_AUTHENTICATION_KEY_MASTER Config_Set NVRAM_CONFIG_TYPE_AUTHENTICATION_KEY_ADMIN <p>The API operation will still be performed, but the flash operation may hang.</p>
Impact	<p>If the flash operation hangs, the server will need to be power-cycled to recover.</p>

ERR-17: DMI Not Functioning Correctly After Firmware Download When Using the Inbox Driver	
Symptom	<p>After performing a firmware download and removing and loading the inbox NVMe driver (rmmod and modprobe/insmod), the DMI functionality on the card is not working correctly.</p>
Impact	<p>DMI operations will not work correctly if this happens.</p>

ERR-18: Firmware Slot Area does not have Redundancy to Handle Bad Blocks	
Symptom	<p>If a NAND block were to go bad in the firmware slot area, an error will be returned when trying to program the slot that has a bad block.</p>

ERR-18: Firmware Slot Area does not have Redundancy to Handle Bad Blocks

Impact	The affected slot will be considered out of service and will not be able to be used in the future.
---------------	--

ERR-19: Card Can Get into a State Where All Commands Will Return "0x7d1" "Busy"

Symptom	The NVRAM firmware can get into a state where all responses to API calls will return "0x7d1" "BUSY" and the card isn't accessible through the API. The cause is related to the super cap learning process which runs every 100 hours. In rare circumstances this may lead to the firmware getting into this state.
Impact	The NVRAM card will not be accessible via any API calls when in this state. Even though a power cycle can get the card out of this state, the condition may occur again. If the card gets in this state, the configured auto-backup will not occur on a power fail.

5.3 Limitations for This Release

MRN-1297: When an NV1600 Product is in Manufacturing Mode, the FreeBSD NVMe Driver Reports an Error

Symptom	When powering-on a system with an NV1600 product in manufacturing mode, the FreeBSD NVMe driver reports an "unable to allocate pci resource" error and reboots the system.
Impact	The system will not boot if the NV1600 product is in manufacturing mode and the NVMe driver is configured to auto-load.
Resolution	None.
Workaround	When configuring the NV1600 product for Manufacturing mode, NVMe driver loading should be disabled during startup of the FreeBSD operating system.

MRN-1311: FreeBSD PMC_NVRAM_reboot API Function Fails

Symptom	In the FreeBSD environment, the <code>PMC_NVRAM_reboot ()</code> API function can fail. This is an issue with the inbox driver. See the FreeBSD Bugzilla Bug 200458 and Bug 200459 .
Impact	None.
Resolution	See the FreeBSD Bugzilla bug reports.
Workaround	<p>Use the following procedure to successfully call the <code>PMC_NVRAM_reboot ()</code> function of the API:</p> <ol style="list-style-type: none"> 1. Stop sending heartbeats from the host. 2. If any exist, unregister any registered event handlers using the <code>PMC_NVRAM_event_handler_unregister ()</code> function. 3. Call the <code>PMC_NVRAM_reboot ()</code> function. 4. Wait 1 second using the <code>sleep (1)</code> function. 5. Send an NVMe Admin command, ignoring the returned status and data. For example, <code>PMC_NVRAM_info_get ()</code>. 6. Wait 1 second with the <code>sleep (1)</code> function.

MRN-1324: In-Box Linux NVMe Driver 0.9 Does Not Support NVMe Reset for Kernels Previous to 4.2	
Symptom	In-Box Linux NVMe Driver 0.9 does not support NVMe reset for kernels previous to 4.2
Impact	Firmware download and reset to activate will not activate the new firmware.
Resolution	Microsemi has provided a potential patch to the Linux community that will be applied in release 4.2 of the NVMe kernel.
Workaround	<p>Prior to kernel 4.2 availability, contact Microsemi Support if you require a fix applied to your NVMe kernel version.</p> <p>Note: A driver reload (rmmod/insmod) operation will activate the firmware.</p>