The SystemID Format for Power Architecture™ Development Systems

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Freescale Semiconductor Power Architecture™ technology-based evaluation and development platforms may optionally implement a "System ID" non-volatile memory device. This device stores important configuration data about the board, including the following:

- Board serial number
- Board errata indicators
- Manufacturing build date
- MAC addresses for each ethernet port
- Temperature calibration factors

The SystemID EEPROM is typically programmed at the factory as part of the manufacturing process and is subsequently write-protected for security.

Contents

1 Hardware Implementation

The SystemID device is implemented by a 256-byte serial I2C EEPROM. A typical device is the Atmel AT24C02 or equivalent. Table 1 shows the SystemID hardware requirements.

Table 1. SystemID EEPROM Data Characteristics

Characteristic	Value	Notes
Size	256 bytes	Maximum size for non-extended addressing
Address	0x57	—
Addressing	Non-extended	—
I2C Bus	2	**Optional:** Not all CPUs have a second I2C bus available.
Write Protection	Required	• **Preferred**: Resistor option, which can be overdriven by test hardware (assumes in-system programming) • **Alternate**: DIP switch, which is toggled after programming

2 Data Formats

There are two fairly similar SystemID EEPROM formats, NXID and CCID. NXID is the newer and preferred version to use for new platforms. Table 2 shows the existing SystemID formats.

Table 2. SystemID Formats

Format	TAG	Applicability
CCID	"CCID"	CDS-boards with attached processor daughter cards
NXID	"NXID"	MPC8xxx-based development systems All QorIQ™ development systems (P1xxx, P2xxx, P4xxx, etc.)

To allow easy identification of the subsequent data, all SystemID EEPROMs start with the four-character tag as shown in the TAG column.

NXID differs from CCID, as follows:

- The errata field is longer and null-terminated.
- Hardware version information was removed to external, hardware-controlled, resources.
- Thermal diode calibration data was added.
- A version field was added for minor versioning.

2.1 NXID Data Format

The NXID format is the preferred format for new boards. The NXID information in a SystemID EEPROM follows the format as described in Table 3.

Table 3. NXID Data Format

Bytes (Hex)	Field Name	Description
0x00–0x03	TagID	<u>EEPROM Tag:</u> Always the four ISO-8859 characters "NXID", with no null termination If not found, the EEPROM may not be initialized, or may reside on a different I2C interface.
0x04–0x0F	SN	<u>Serial Number:</u> From 0 to 11 ISO-8859 characters of board/system serial number data, terminated by a NULL character
0x10–0x14	ERRATA	<u>Errata Level:</u> From 0 to 4 ISO-8859 characters of board/system errata data, terminated by a NULL character
0x15–0x1A	DATE[0:5]	<u>Build Date:</u> A field showing the manufacturing build date and time, in BCD format, is as follows: 0: YY year, a BCDvalue from 0x00 to 0x99 1: MM month, a BCD value from 0x01 to 0x12 2: DD day, a BCD value from 0x00 to 0x31 3: hh hour, a BCD value from 0x00 to 0x23 (24-hour format) 4: mm minute, a BCD value from 0x00 to 0x59 5: ss seconds, a BCD value from 0x00 to 0x59
0x1B	—	*reserved*
0x1C–0x1F	VERSION	<u>NXID Version:</u> A 32-bit integer field containing NXID SystemID format revision information is as follows: 0: Original version 1: Current (expanded) version
0x20–0x27	TEMPCAL[0:7]	<u>Temperature Calibration Factors:</u> Signed values from 0x80 (–128) to 0x7F (127) indicating an offset to be added to a temperature measuring circuit for CPU #0 through CPU #7
0x28–0x29	TEMPCALSYS[0:1]	<u>System Temperature Calibration Factors:</u> Signed values from 0x80 (–128) to 0x7F (127) indicating an offset to be added to a system (environmental) temperature measuring circuit
0x2A	TEMPCALFLAGS	<u>Temperature Calibration Flags:</u> bits 0[MSB]: reserved bits 1..3: Number of valid TEMPCAL entries bits 4..5: reserved bits 6..7[LSB]: Number of valid TEMPCALSYS entries
0x2B–0x3F	—	*reserved*
0x40	MACSIZE	<u>MAC table size:</u> A value indicating how many valid MAC addresses are stored in the MAC1–MAC8 fields (version 0) or MAC1–MAC8 + MAC9–MAC16 fields (version 1 or later).
0x41	MACFLAGS	<u>MAC table flags:</u> Unused currently; reads as 0x00.

Table 3. NXID Data Format (continued)

Bytes (Hex)	Field Name	Description
0x42 – 0x47 0x48 – 0x4D 0x4E – 0x53 0x54 – 0x59 0x5A – 0x5F 0x60 – 0x65 0x66 – 0x6B 0x6C – 0x71	MAC1 MAC2 MAC3 MAC4 MAC5 MAC6 MAC7 MAC8	MAC addresses: 6 hex digits representing the MAC address for Ethernet ports 1 through 8 Fields with an address greater than MACSIZE may have undefined values and should not be used.
0x72 – 0x75	CRC32	Checksum (version = 0): 32-bit CRC value of bytes 0x00 through 0x71, inclusive
0x72 – 0x77 0x78 – 0x7D 0x7E – 0x83 0x84 – 0x89 0x8A – 0x8F 0x90 – 0x95 0x96 – 0x9B 0x9C – 0xA1	MAC9 MAC10 MAC11 MAC12 MAC13 MAC14 MAC15 MAC16	MAC addresses (version >= 1): 6 hex digits representing the MAC address for Ethernet ports 9 through 16 Fields with an address greater than MACSIZE may have undefined values and should not be used.
0xA2 – 0xFB	*reserved*	Reserved for additional MAC addresses or other data. NXID readers need only consider the MACSIZE field to determine if this space is used for additional MAC addresses.
0xFC – 0xFF	CRC32	Checksum (version >= 1): 32-bit CRC value of bytes 0x00 through 0xFB, inclusive

Undefined fields are reserved and may read as any value. Fields should be set to 0xFF during programming.

In summary, the differences between NXID version 0 and NXID version 1 are as follows:

- Eight additional MAC address are supported.
- Up to 14 more MAC addresses may be added without revising the NXID format.
- The CRC is moved to the end of the 256-byte I2C memory, and the additional space is allocated for a larger number of MAC addresses.

The following "C" structure may be helpful:

```
typedef struct {

                                    // Offset in hex

        unsigned char    tagid[4];         // 00-03: literal "NXID"

        unsigned char    sn[12];           // 04-0F: serial number

        unsigned char    errata[5];        // 10-14: errata label

        unsigned char    date[6];          // 15-1A: build date/time

        unsigned char    res_0;            // 1B   : reserved

        unsigned char    version[4];       // 1C-1F: NXID structure version

        unsigned char    tempcal[8];       // 20-27: CPU temp. calibration factors
```

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```
        unsigned char    tempcalsys[2];    // 28-29: Board temp. calibration factors

        unsigned char    tempcalflags;     // 2A   : Temp cal enable/qty/etc.

        unsigned char    res_1[21];        // 2B-3F: reserved

        unsigned char    macsize;          // 40   : number of valid MAC addresses

        unsigned char    macflag;          // 41   : MAC table flags

        unsigned char    mac[30][6];       // 42-F5: MAC addresses, array of 6-byte

        unsigned char    res_u[7];         // F6-FB: reserved

        unsigned int     crc32;            // FC-FF: crc-32 checksum
} NXSystemID;
```

2.2   CCID Data Format

The CCID information in a SystemID EEPROM follows the format as described in Table 4.

Table 4. CCID Data Format

Bytes (Hex)	Field Name	Description
0x00–0x03	TagID	EEPROM Tag: Always the four ISO-8859 characters "CCID," with no null termination If not found, the EEPROM may not be initialized, or may reside on a different I2C interface.
0x04	MAJOR	Major Revision: One ISO-8859 character indicating the major revision of the CDS system board. "1" means V1.x. Used in conjunction with the following MINOR field.
0x05	MINOR	Minor Revision: One ISO-8859 character indicating the minor revision of the CDS system board. "1" means VX.1. Used in conjunction with the preceding MAJOR field.
0x06–0x0F	SN	Serial Number: From 0 to 9 ISO-8859 characters of board/system serial number data, terminated by a NULL character
0x10–0x11	ERRATA	Errata Level: From 0 to 2 ISO-8859 characters of board/system errata There is no terminating NULL character.
0x12–0x17	DATE[0:5]	Build Date: A field showing the manufacturing build date and time is as follows: 0: YY year, a BCD value from 0x00 to 0x99 1: MM month, a BCD value from 0x01 to 0x12 2: DD day, a BCD value from 0x00 to 0x31 3: hh hour, a BCD value from 0x00 to 0x23 (24-hour format) 4: mm minute, a BCD value from 0x00 to 0x59 5: ss seconds, a BCD value from 0x00 to 0x59 **Note:** This data is copied directly from a PC-type RTC device, which is BCD-based.
0x18–0x3F	—	*reserved*

Table 4. CCID Data Format (continued)

Bytes (Hex)	Field Name	Description
0x40	MACSIZE	MAC table size: bits 0[MSB]..4: reserved bits 5..7[LSB]: A value from 0 to 7 indicating how many valid MAC addresses are stored in the MAC1–MAC8 fields
0x41	MACFLAGS	MAC table flags: Unused currently; reads as 0x00.
0x42 – 0x47 0x48 – 0x4D 0x4E – 0x53 0x54 – 0x59 0x5A – 0x5F 0x60 – 0x65 0x66 – 0x6B 0x6C – 0x71	MAC1 MAC2 MAC3 MAC4 MAC5 MAC6 MAC7 MAC8	MAC addresses: 6 hex digits representing the MAC address for Ethernet ports 1 through 8 Fields with an address greater than MACSIZE may have undefined values and should not be used.
0x72 – 0x75	CRC32	Checksum: 32-bit CRC value of bytes 0x00 through 0x71, inclusive If the checksum value is 0xFFFFFFFF, no valid checksum has been written, so this field should be ignored.
0x76 – 0xFF	—	*reserved*

Undefined fields are reserved and may read as any value.

The following "C" structure may be helpful:

```
typedef struct {
                                            // Offset in hex
        unsigned char    tagid[4];         // 00-03: literal "CCID"
        unsigned char    major;            // 04   : major revision
        unsigned char    minor;            // 05   : minor revision
        unsigned char    sn[10];           // 06-0F: serial number
        unsigned char    errata[2];        // 10-11: errata label
        unsigned char    date[6];          // 12-17: build date/time
        unsigned char    res_0[40];        // 18-3F: reserved
        unsigned char    macsize;          // 40   : number of valid MAC addresses
        unsigned char    macflag;          // 41   : MAC table flags
        unsigned char    mac[8][6];        // 42-71: MAC addresses, array of 6-byte
        unsigned int     crc32;            // 72-75: crc-32 checksum
        unsigned char    res_u[138];       // 76-FF: reserved
} CCSystemID;
```

3   Revision History

Table 5 provides a revision history for this application note.

Table 5. Revision History

Rev Number	Date	Substantive Changes
2	10/2009	Updated Section 2, "Data Formats," to include NXID information, and added Section 2.1, "NXID Data Format."
1	03/2008	Initial public release.

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