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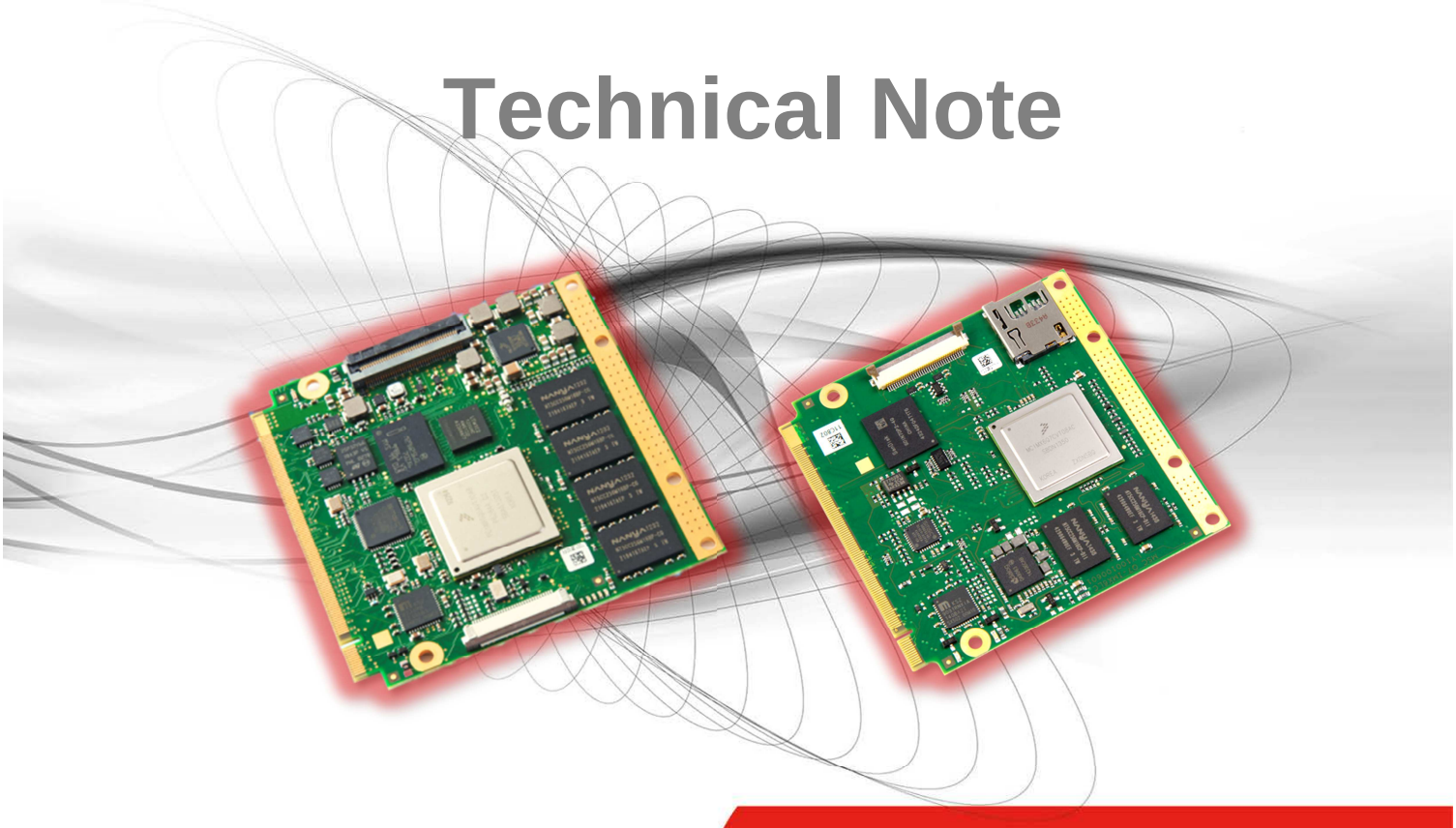
Technical Note



Engineering Leadership

Comparison between the Q7-IMX6 Module and the new Q7-MX6PLUS Module

Rev. 0.3

26 October 2015

Contents

Preface

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1 General Information

1.1 Revisions and Modifications

Rev.	Date		Comment
0.1	07.07.2015		Initial Version
0.2	08.10.2015		Additions and Corrections
0.3	26.10.2015		Added Watchdog

1.2 Introduction

This Technical Note describes the hardware differences between the Q7-IMX6 and the new Q7-IMX6PLUS modules and aims at highlighting the differences for operating systems, drivers and application software.

2 Hardware Details of Q7-IMX6 Module

2.1 Block Diagram

In the User's Manual available in the Support section of the MSC website, the complete block diagram of the Q7-IMX6 module can be found:

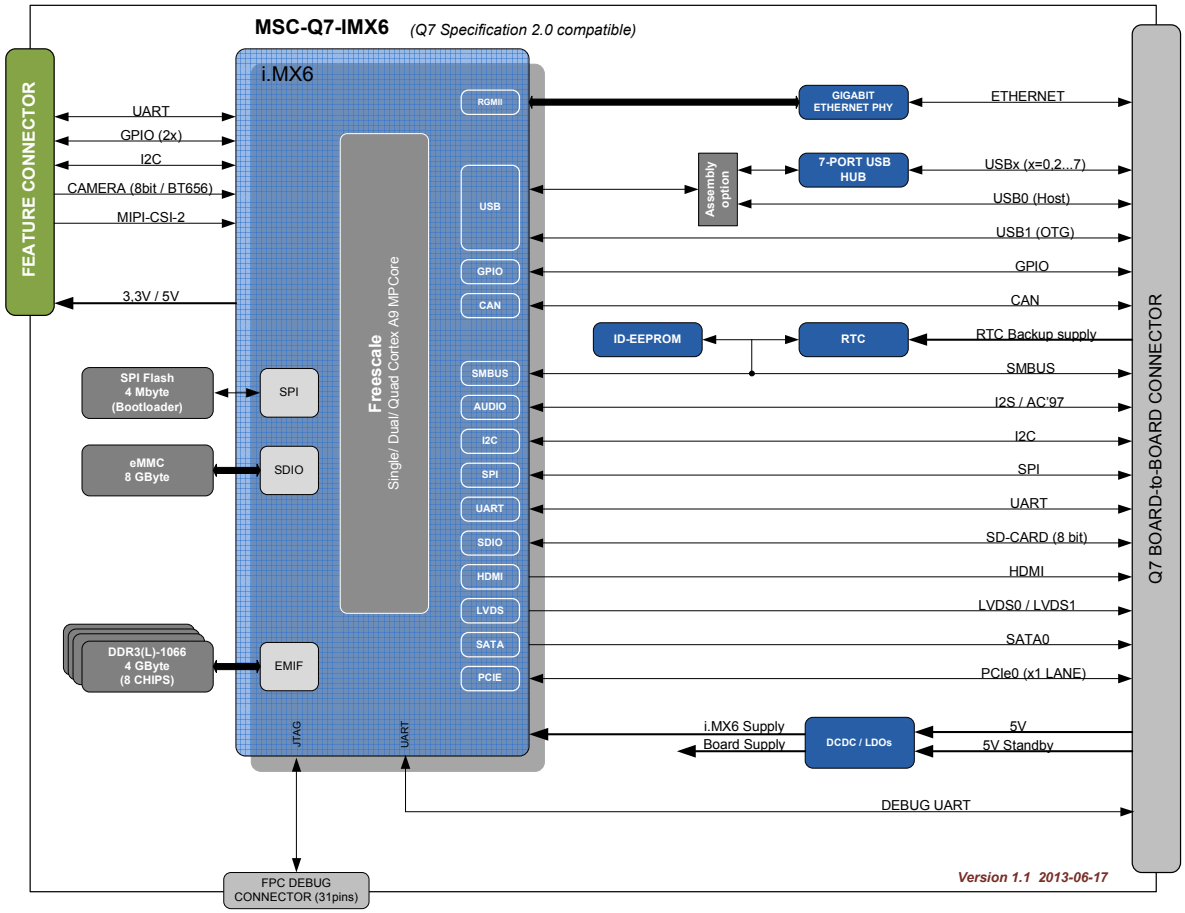

Fig. 1: Block Diagram of the Q7-IMX6 module

2.2 Focus on Hardware Details

Some select details of the hardware implementation of the Q7-IMX6 module will be highlighted where differences to the Q7-IMX6PLUS can be found:

a) Power Management Controller

The Q7-IMX6 uses the PMIC Freescale MMPF0100 ("PFUZE") to control the voltages (but one) required on the module:

Fig. 2: Power management on the Q7-IMX6 module

The MMPF0100 is tailored for the requirements of the i.MX6 device and was the only choice for board designers at the time of the development start for the Q7-IMX6 module.

b) DRAM Subsection

The Q7-IMX6 can be assembled with up to 8 DRAM chips, and these are arranged in two banks of 4 chips each operating in 64-bit width:

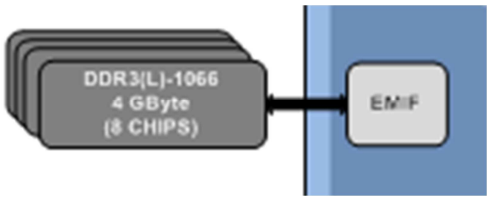

Fig. 3: DRAM Chips connected to i.MX6 SOC

For modules with single-core or dual-lite CPUs, only 32-bit bus width is supported so that each bank can only provide two memory chips and total memory is limited to 2GB. For dual-core and quad-core modules, the maximum memory population is 4GB using a total of 8 memory chips.

c) USB Subsection

The Q7-IMX6 uses an optional 7-Port USB Hub to generate 7 USB 2.0 Host lines covering USB lines 0, 2…7 if populated on the particular module variant:

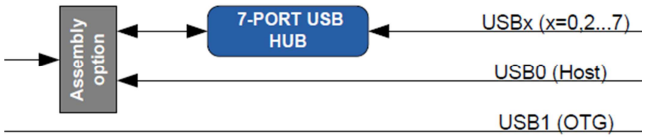

Fig. 4: Assembly option with 7-Port USB Hub

If assembled on the Q7-IMX6 module, the 7-Port USB Hub enables the module to offer 7x USB 2.0 Host ports while USB1 continues to carry USB 2.0 OTG (Host/Client). For module variants not having the Hub assembled, only two USB lines can be used: USB0 with USB 2.0 Host and USB 1 with USB 2.0 OTG.

d) Feature Connector

The Q7-IMX6 provides a Feature Connector assembled for most module variants which gives access to a number of useful interfaces not accessible on the Qseven connector:

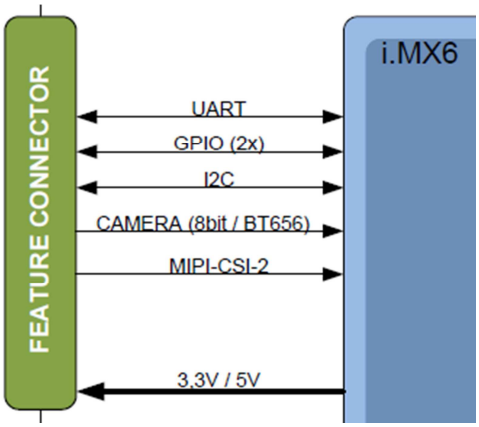

Fig. 5: Feature Connector signal groups

Next to MIPI-CSI2 with 4 lanes of camera signals, a parallel 8-bit BT656 camera input is offered on the Feature Connector. Also an I2C bus, an additional UART and two GPIOs are accessible on the connector. The connector provides 40 leads altogether.

e) UART on Qseven Connector

The Q7-IMX6 provides a UART on the Qseven connector on the same place as defined for the Qseven 2.0 standard – even though the Q7-IMX6 was still designed according to the previous Qseven 1.2 standard which does not provide any UART on the connector (but keeps these signal lines unused).

When the Q7-IMX6 module was developed, the Qseven Consortium (later integrated into the SGeT Standardization Group) was already finalizing the technical details of the Qseven 2.0 standard so that MSC wanted to add this useful feature to the new module.

f) Heatspreader

For the Q7-IMX6 module, MSC provides two suitable Heatspreaders which fit exactly the geometry of the module's surface establishing contact to the CPU using a suitable gap pad:

MSC Q7-IMX6-01 HSP-001 (SAP #42592)
For all dual-core and quad-core modules in extended temperature rating

MSC Q7-IMX6-02 HSP-001 (SAP #1112356)
For all single-core and dual-lite modules and for all standard temperature modules

g) Micro-SD Card Holder

The Q7-IMX6 module does not provide a µSD Card Holder: The eMMC Flash memory provided on some variants of the module is very similar to a “soldered” SD Card and hence can be used for the same purposes – booting OS, non-volatile storage etc. but obviously it is not mobile as an SD Card.

h) Watchdog

The implementation of the watchdog on this module was done using the built-in features of the CPU, i.e. the watchdog is software-based. Actions to be done by the Watchdog are performed by an on-board CPLD.

i) Software Considerations

The Linux development environment from MSC for the Q7-IMX6 is based on the 3.10.17 kernel as provided by Freescale, and with some module-specific add-ons contributed by MSC. This kernel support will no longer be updated to subsequent versions. It is recommended that customers move to the Q7-IMX6PLUS module in order to get up-to-date Linux support.

For Windows Embedded Compact 7 and Windows Embedded Compact 2013, MSC is providing the Boot Loader and a binary Board Support Package (BSP) required to generate executable images.

3 Hardware Details of Q7-IMX6PLUS Module

3.1 Block Diagram

In the User's Manual the Q7-IMX6PLUS module, the complete block diagram of can be found:

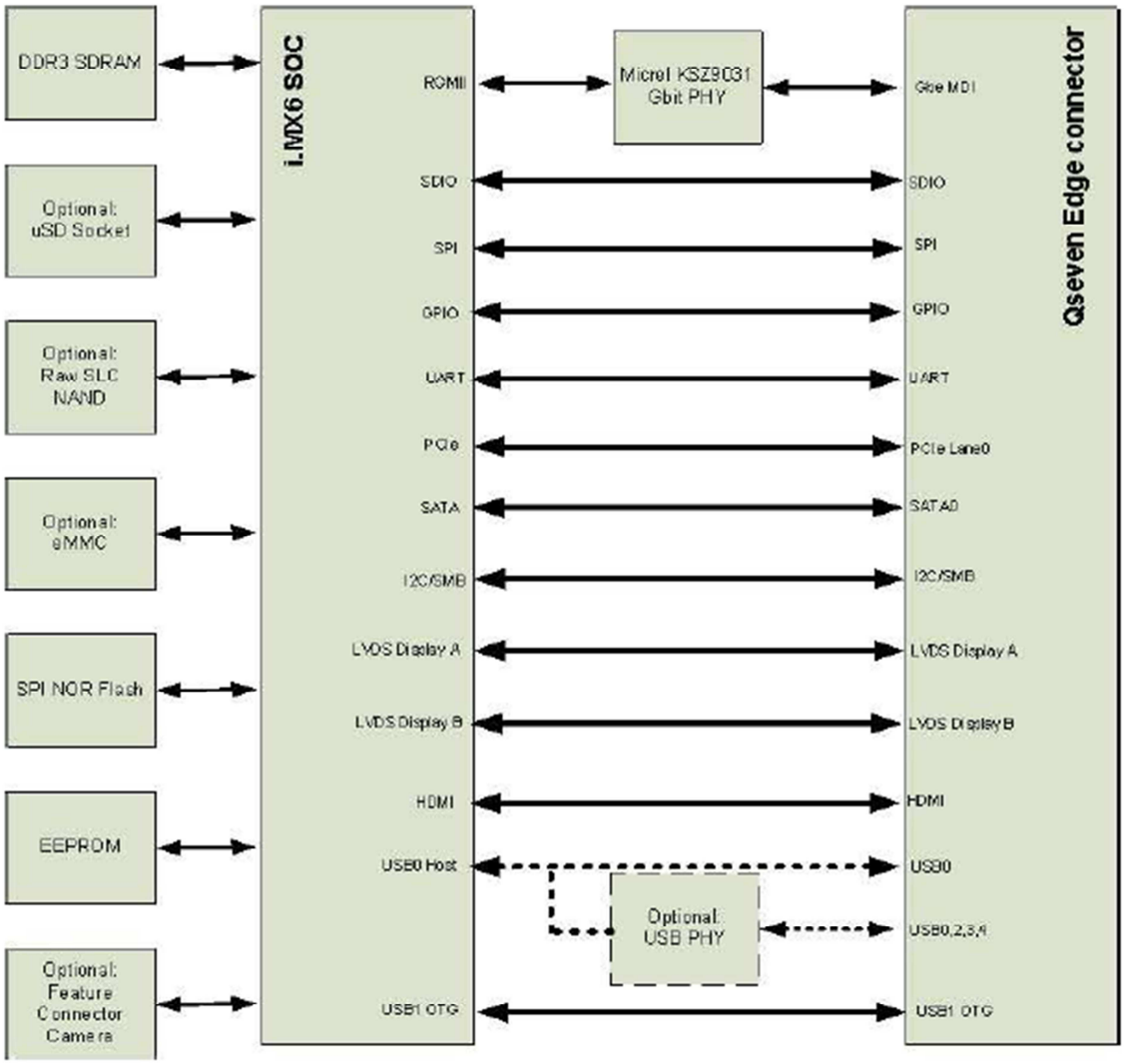

Fig. 6: Block Diagram of the Q7-IMX6PLUS module

3.2 Focus on Hardware Details

Some select details of the hardware implementation of the Q7-IMX6PLUS module will be highlighted where differences to the Q7-IMX6 can be found:

a) Power Management Controller

The Q7-IMX6PLUS uses the PMIC Dialog DA9063 to control the voltages required on the module:

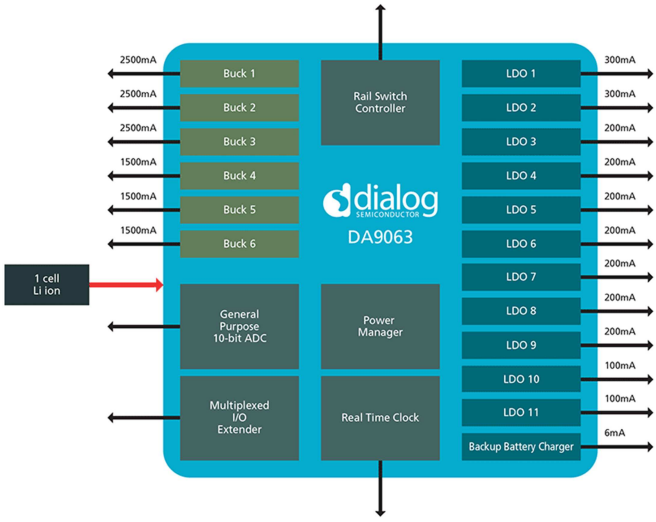

Fig. 7: Power management chip on the Q7-IMX6PLUS module

The DA9063 is ideal for the requirements of the i.MX6 device and generates and controls all voltages required on the Q7-IMX6PLUS module.

For the new i.MX 6DualPlus and 6QuadPlus CPU variants, higher current must be provided than for i.MX6Q/D/DL/S chips as before. This is taken care of by the new power management controller chip.

b) DRAM Subsection

The Q7-IMX6PLUS can be assembled with up to 4 DRAM chips, and these represent a single bank of 4 chips operating in 64-bit width:

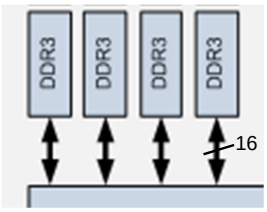

Fig. 3: DRAM Chips connected to i.MX6 SOC

For modules with single-core or dual-lite CPUs, only 32-bit bus width is supported so that only two memory chips can be provided and total memory is limited to 2GB. For dual-core and quad-core modules, the maximum memory population is 4GB using a total of 4 memory chips.

c) USB Subsection

The Q7-IMX6PLUS uses an optional 4-Port USB Hub to generate 4 USB 2.0 Host lines covering USB lines 0, 2, 3 and 4 if populated on the particular module variant:

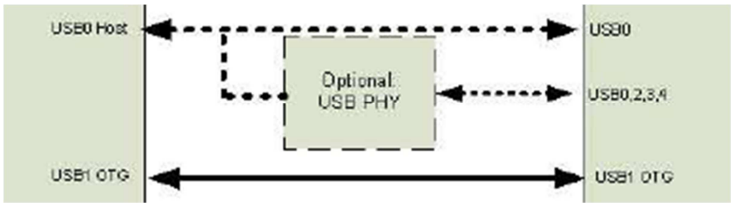

Fig. 8: Assembly option with 4-Port USB Hub

If assembled on the Q7-IMX6PLUS module, the 4-Port USB Hub enables the module to offer 4x USB 2.0 Host ports while USB1 continues to carry USB 2.0 OTG (Host/Client). For module variants not having the Hub assembled, only two USB lines can be used: USB0 with USB 2.0 Host and USB 1 with USB 2.0 OTG.

d) Feature Connector

The Q7-IMX6PLUS provides a 36-lead Feature Connector assembled for most module variants which gives access to a 4-lane MIPI-CSI2 Camera interface:

Example of possible connectors (not a complete list):

1. Hirose FH12A-36S-0.5SH(55)
2. FCI 62684-362100ALF
3. Tyco 3-1734592-6

Fig. 9: MIPI-CSI2 Feature Connector

The Feature Connector implements one MIPI-CSI2 camera interface with up to 4 lanes of camera signals and one GPIO pin for camera control. The pin-out, form, fit and function of this Feature Connector was standardized by SGeT (Standardization Group for embedded Technologies) in December 2014. Therefore it will soon be possible to find compatible cameras on the market immediately fitting the feature connector.

e) UART on Qseven Connector

The Q7-IMX6PLUS was designed to the latest Qseven 2.0 standard including all additions. Therefore the connector signal list includes the UART typical for Qseven 2.0 modules.

f) Heatspreader

For the Q7-IMX6PLUS module, MSC will provide suitable Heatspreaders to fit exactly the geometry of the module's surface establishing contact to the CPU using a suitable gap pad:

MSC Q7-IMX6PLUS-03 HSP-002 (SAP 1128532)
For all dual-core and quad-core modules in industrial temperature rating

MSC Q7-IMX6PLUS-03 HSP-001 (SAP 1128531)
For all single-core and dual-lite modules and for all standard temperature modules

g) Micro-SD Card Holder

The Q7-IMX6PLUS module provides a µSD Card Holder: Along with this, also a soldered eMMC Flash memory is provided on some variants of the module. Both Flash memories can be used for similar purposes – booting OS, non-volatile storage etc. but obviously only the µSD Card is mobile and can be removed from its card holder.

h) Watchdog

The implementation of the watchdog on this module is done using an external watchdog chip on the module which is attached to the i.MX6 CPU using the I2C interface.

i) Software Considerations

The new Linux development environment from MSC for the Q7-IMX6PLUS is based on the Yocto Project build version 1.7.1, and will try to follow the most recent kernel in due time. It is recommended that customers use the Boot Loader, root file system and functional libraries provided by MSC in order to compile their application programs.

For Windows Embedded Compact 7 and Windows Embedded Compact 2013, MSC is providing the Boot Loader and a binary Board Support Package (BSP) required to generate executable images.

MSC is preparing a demo image for the Android Operating system, and will support customers in their Android development in due course.

4 Summary: Differences between Q7-IMX6 and IMX6PLUS

Based on the previously highlighted hardware features of both modules, the differences between the Q7-IMX6 and Q7-IMX6PLUS modules can now be summarized:

Feature	Q7-IMX6	Q7-IMX6PLUS
PMIC Power Management	Freescale MMPF0100	Dialog DA9063
USB Lines	1x USB 2.0 Host/Device 1x or 7x USB 2.0 Host	1x USB 2.0 Host/Device 1x or 4x USB 2.0 Host
Feature Connector	1x MIPI-CSI2 up to 4 lanes, 1x 8-bit BT656 camera I/F, I2C bus, UART , 2x GPIOs	1x MIPI-CSI2 up to 4 lanes on SGeT-compatible 36-pin flatfoil connector
UARTs	1x UART on Qseven Connector; 1x UART on Feature Connector	1x UART on Qseven Connector
µSD Card Holder	-	1x µSD Card Holder
Heatspreaders	MSC Q7-IMX6-01 HSP-001 MSC Q7-IMX6-02 HSP-001	MSC Q7-IMX6PLUS-03 HSP-002 MSC Q7-IMX6PLUS-03 HSP-001
Software Support	Linux: Kernel 3.10.17 WEC 7, WEC 2013	Linux: The Yocto Project build rev. 1.7.1 WEC 7, WEC 2013 Android
Watchdog	Software Watchdog	Hardware Watchdog

Table 1: Differences between Q7-IMX6 and Q7-IMX6PLUS modules

Due to the use of a different Power Management controller, changes will have to be done to the Q7-IMX6 Boot Loader software before it can be used for Q7-IMX6PLUS modules. MSC is providing a new, modified Boot Loader to cover all changes to the hardware of the Q7-IMX6PLUS.

Application programs will not necessarily have to be modified unless features or interfaces are used which no longer exist on Q7-IMX6PLUS (e.g. USB 5…7).

5 Product Support

MSC Technologies engineers and technicians are committed to provide support to our customers whenever needed.

Before contacting Technical Support of MSC Technologies GmbH, please consult the respective pages on our web site at www.msc-technologies.eu for the latest documentation, drivers and software downloads.

If the information provided there does not solve your problem, please contact our Technical Support as follows:

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Phone: +49 (0)8165 906-200