

MSC8156EVM

This document describes the MSC8156EVM and its related hardware kit. The MSC8156EVM getting started procedure explains and verifies the board's basic operation in a step-by-step format. Settings for switches, jumpers, LEDs, and push buttons are shown. There are also instructions for connecting the EVM to your development/debug platform with CodeWarrior IDE installed.

The MSC8156EVM functions with an integrated development environment (IDE), such as Freescale CodeWarrior IDE. Instructions for working with the IDE are beyond the scope of this document.

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1 Definitions, Acronyms, and Abbreviations

Table 1. Definitions, Acronyms, and Abbreviations

Usage	Description
EVM	Evaluation Module
BP	Boot Patch Bit (in RCW)
BPRT	Boot Port Field (in RCW)
CLK SEL	Clock Select
CLKIN	Clock Input
CLKOUT/CLKO	Clock Output
CS	Chip Select signal
CTLS	Serial RapidIO interface System Mode Bit (in RCW)
DDR	Double Data Rate Memory
DEVID	Device ID Bit (in RCW)
DIP	Dual-in-Line Package (switches)
EEPROM	Electrical Erasable Programmable Memory
EN	Enable
EP	PCI Express End Point
ETH	Ethernet
eUTAP	Embedded UTAP
EWDT	Watchdog Timer Bit (in RCW)
GE	Gigabit Ethernet Port Bit (in RCW)
GE/TDM	GETH/TDM Port
GETH	Gigabit Ethernet
GPIO	General Purpose I/O
HDC	Hardcoded Option (RCW Source)
HRESET/HRST	Hard Reset
I ² C	Inter-Integrated Circuit Multi-master Serial Computer Bus
IO	Input/Output
J/JP	Jumper
LD/LED	Light-emitting Diode
MAPLE	MSC8156 Internal Module
MODCK	Clock Mode
NMI	Non-Maskable Interrupt
PCB	Printed Circuit Board
PCI	Peripheral Components Interconnect Bus
PG	"Power Good"
PLL	Phased Lock Loop
PRDY	PCI Express Ready Bit (in RCW)
PRESET	Power-on-Reset
RC	MSC8156 Internal Module PCI Express Root Complex
RC[x]	Reset Configuration Bit x
RCW	Reset Configuration Word
RGMII	Reduced General Media Independent Interface
RHE	RIO Host Bit (in RCW)
RJ45	Ethernet Connectors
SBETH	Simple Boot from Ethernet Bit (in RCW)

Table 1. Definitions, Acronyms, and Abbreviations (continued)

Usage	Description
SCLK	SerDes Reference Clock Bit (in RCW)
SerDes	Serializer/Deserializer. The High Speed Serial Communication PHY that multiplexes the PCI Express, serial RapidIO interface, and SGMII signals.
SODIMM	Mini DIMM Form Factor
SRC	Configuration Source
SRESET/SRST	Soft Reset
SW/S	Switch
UART	Universal Asynchronous Receiver/Transmitter
USB	Universal Serial Bus
UTAP	USB TAP "Wiggler"

2 Bit and Byte Conventions

Table 2. Bit and Byte Terminology

Bit		Byte
Binary digit with a single binary value, 1 or 0. Commonly used for measuring the amount of data transferred in one second between two telecommunication points.		A unit of data, eight binary units long, that is used as a measure of computer processor storage and real and virtual memory.
Kbps = Kbit	Kilobit per second (1 Kbps = 10^3 bits)	Kbyte = KB = KByte = 1 Kilobyte = 1024 bytes
Mbps = Mbit	Megabit per second (1 Mbps = 10^6 bits)	Mbyte = MB = MByte = 1 Megabyte = 1,048,576 bytes
Gbps = Gbit	Gigabit per second (1 Gbps = 10^9 bits)	Gbyte = GB = GByte = 1 Gigabyte = 1,073,741,824 bytes

3 Related Reading

The MSC8156EVM includes a set of documentation provided on a CD-ROM. Device specific information for devices supported by this EVM are available at www.freescale.com. This EVM supports the following Freescale DSPs:

- MSC8151
- MSC8152
- MSC8154
- MSC8156
- MSC8251
- MSC8252
- MSC8254
- MSC8256

4 Hardware Kit Contents



Figure 1. Hardware Contents

The kit also includes the following (not shown):

- Packing list that includes a list of printed documents included with the kit. See the list for the specific documents included with the kit.
- CD-ROM with documentation and code examples.
- Memory stick with ENEA software.

5 DIP Switch Location Default Settings

The MSC8156EVM has four push-button switches (SW1, SW3, SW4, and SW5), one slide power switch (S1), and two dual-in-line package (DIP) switches (SW2 and SW6). See [Figure 2](#) for switch locations and [Table 3](#) for the default DIP switch settings. See [Table 5](#) for push-button and power switch functions.

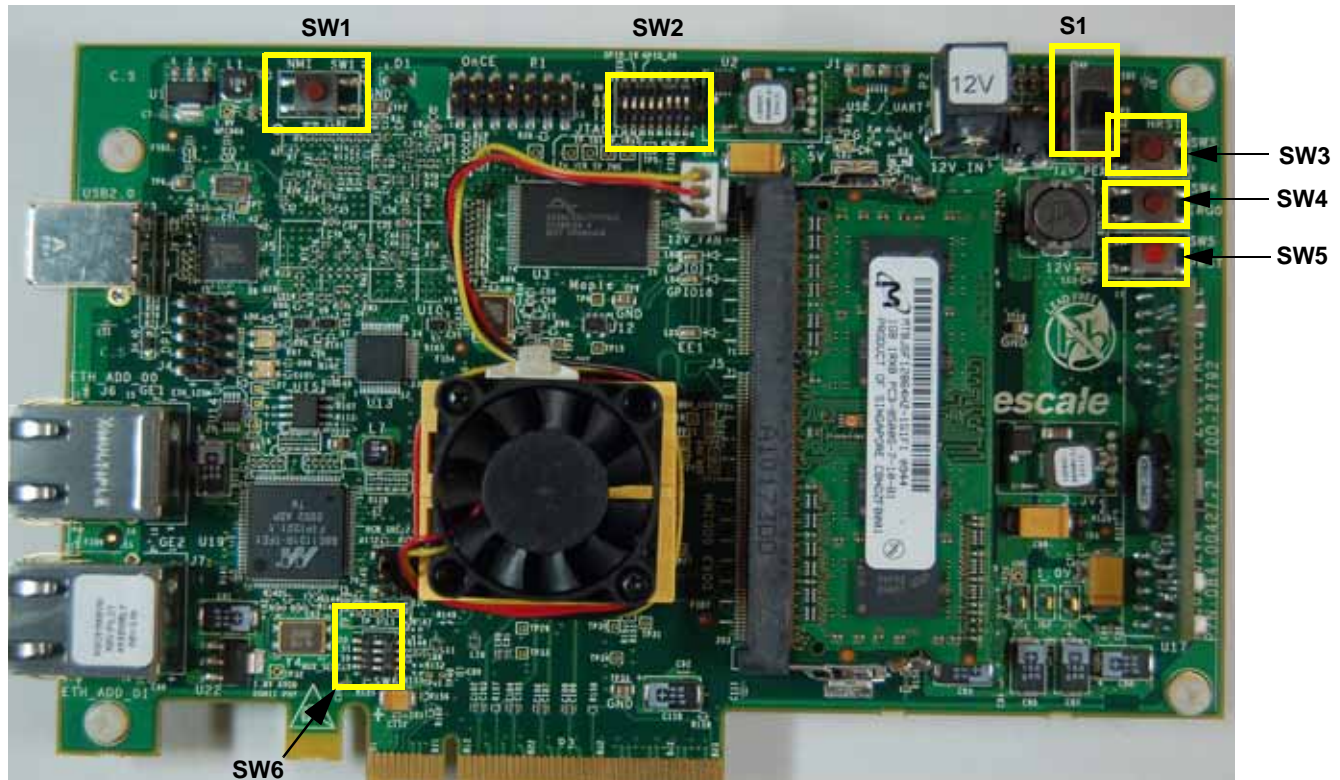



Figure 2. MSC8156EVM Switch Locations

Table 3. MSC8156EVM DIP-Switch Configurations

SW2 Configuration	
	<p>SW2.1: EE0</p> <ul style="list-style-type: none"> • Default: OFF (disable); <p>SW2.2: GPIO_19:USER PROGRAMBLE</p> <ul style="list-style-type: none"> • Default: OFF (disable) <p>SW2.3: GPIO_20:USER PROGRAMBLE</p> <ul style="list-style-type: none"> • Default: OFF (disable) <p>SW2.4: Test Point (general purpose)</p> <ul style="list-style-type: none"> • Default: OFF (disable) <p>SW2.5: empty</p> <p>SW2.6-2.8: Reset Configuration Word bits 7– 9</p> <ul style="list-style-type: none"> • Default: ON ("000") • Defines the boot port interface configuration.

Table 3. MSC8156EVM DIP-Switch Configurations (continued)

SW6 Configuration	
	<p>SW6.1:SS0: SELECT PEX SPREAD SPECTRUM</p> <ul style="list-style-type: none"> Default: ON (= 0 which selects NO SPREAD SPECTRUM) <p>SW6.2-3: S1,S0" SELECT ICS557-03 OUTPUT FREQUENCY</p> <ul style="list-style-type: none"> Default: OFF, ON (= 10 which selects CLKOUT = 100 MHz) <p>SW6.4: MULTIPLEXER SELECT</p> <ul style="list-style-type: none"> Default: OFF (= 1 which selects INTERNAL CLK).

The default DIP-switch positions define the MSC8156EVM configuration modes listed in [Table 4](#).

Table 4. MSC8156EVM Default Configuration Modes

Mode	Value
CLKIN	100 MHz
Core frequency	1000 MHz
DDR2 data rate	800 Mbps
MAPLE clock	450 MHz
QUICC Engine Subsystem clock	500 MHz
PCI Express interface output rate	2.5 Gbps

6 Power Switch and Push Buttons

[Table 5](#) lists the functioning of the MSC8156EVM power switch and push buttons. [Figure 2](#) on page 5 shows their location.

Table 5. Power Switch and Push Button Functionality






Push Button	Position	Description & Default
S1: ON/OFF		Power switch. The ON position activates the external power supply. The OFF position connects power from the PCI Express edge-connector, which supplies 12 V power if the PCI-Express external board is connected and powered.
SW1: NMI		Pressing this switch assert an $\overline{\text{NMI}}$ and aborts program execution.
SW3: HRST		Press to assert $\overline{\text{HRESET}}$.
SW4: IRQ0		Press to assert $\overline{\text{IRQ0}}$ to the board.

Table 5. Power Switch and Push Button Functionality

Push Button	Position	Description & Default
SW5: PRESET		Press to assert $\overline{\text{PRESET}}$ to all board components.

7 Jumper Default Settings

Table 6 lists MSC8156EVM factory default jumper setting. See Figure 3 for jumper location.

Table 6. MSC8156EVM Jumper Default Settings

Jumper	Name	1-2 Position	2-3 Position (default)
JP1	RCW_SRC	External 22-bits (reduced) Configuration Word	I ² C EEPROM RCW

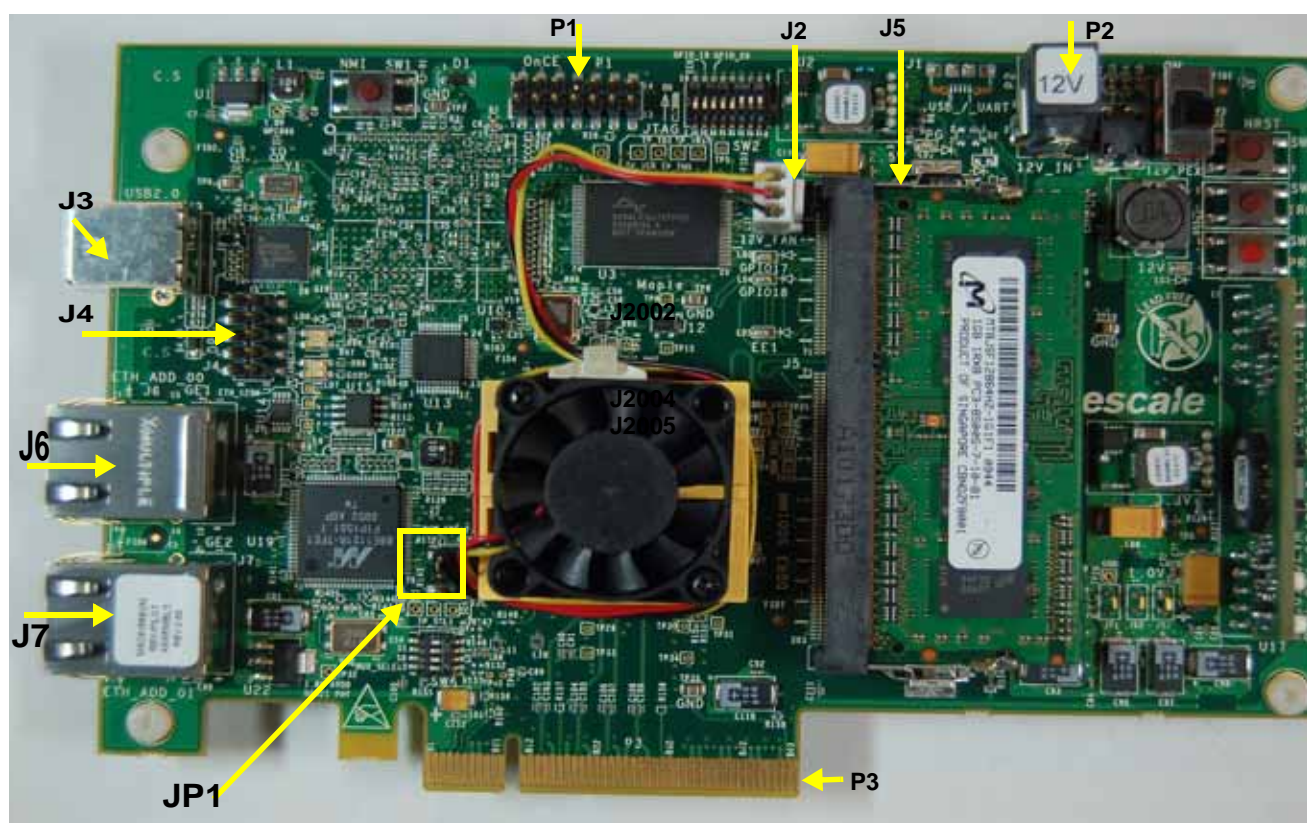


Figure 3. MSC8156EVM Jumper (JP) and Connector (J/P) Locations

8 Connector Default Settings

Table 7 lists MSC8156EVM factory default connector, header, and socket settings. See Figure 3 on page 7 for connector locations.

Table 7. MSC8156EVM Connector Default Settings

#	Type	Description	Function
J2	Header (3-pin)	12V FAN	• Provides power for on-socket fan.
J3	Socket (Type B)	USB2.0	• USB2.0 interface
J4	Header (10-pin)	DPI	• MPC866 debug port connector
J5	SODIMM Socket (204-pin)	DDR3-SODIMM	• DDR3 SODIMM socket
J6	Connector (RJ45)	GE1	• MSC8156 GETH port1 1000-BaseT
J7	Connector (RJ45)	GE2	• MSC8156 GETH port2 1000-BaseT
P1	Header (14-pin)	OnCE	• OnCE connector for external UTAP
P2	Power Connector	12V	• External power supply
P3	Edge Connector	PCIe Backplane	• SerDes high-speed connector

The following list provides brief descriptions of how the connectors are used:

- J2. Provides power to the on-socket fan.
- J3. Provides the default connection between the host PC and the MSC8156EVM for debugging and configuration purposes. Connects to the onboard UTAP.
- J4. Provides an MPC866 debug port connection.
- J5. Used to connect the DDR3 SODIMM.
- J6. The gigabit Ethernet port 1 connection. This port can be connected to the host PC or other Ethernet connection to use for boot over Ethernet or other device configuration operations.
- J7. The gigabit Ethernet port 2 connection. This port can be connected to the host PC or other Ethernet connection to use for boot over Ethernet or other device configuration operations.
- P1. The alternate connection between the host PC and the MSC8156EVM for debugging and configuration purposes. This interface requires the use of an external device, such as a USB TAP, to transform the Host interface to JTAG signals that connects through a 14-pin ribbon cable.
- P2. Provides a connection to the external 12 V power supply.
- P3: Provides a connection to a PCI Express board only. The PCI Express edge connector is designed to connect one of the two SerDes ports (SerDes2) of the MSC8156 device. The four SerDes2 lanes can be configured to support serial RapidIO (1x/2x/4x), PCI Express (1x/2x/4x), or SGMII connections. When connected, the PCI Express interface can supply the 12 V power for the MSC8156EVM, which is enabled when S1 is in the OFF position. The connector is designed to conform to several QorIQ development platforms from Freescale Semiconductor. Contact your Freescale sales office for more information. Basic drivers are provided as part of the SmartDSP OS software shipped with the CodeWarrior IDE and the EVM update software. The software is delivered as an enablement intended for use by customers to develop applications.

NOTE

The PCI Express edge connector is not PCIMIG certified.

9 LED Indicators

Table 8 lists MSC8156EVM LED indicator functions. See Figure 4 for LED locations.

Table 8. MSC8156EVM LEDs

Ref.	Name	Color	LED On	LED Blinking	LED Off
LD1	PG	Green	Power Good	—	Internal power supply failure
LD2	GPIO17	Orange	USER DEFINE.	USER DEFINE.	USER DEFINE.
LD3	12V	Green	Indicates external power or PCIe 1 2V Power is ON	—	The EVM is powered off
LD4	GPIO18	Green	USER DEFINE.	USER DEFINE.	USER DEFINE.
LD5	EE1	Green	MSC8156 in Debug mode	—	MSC8156 not in Debug mode
LD6	HOST	Multicolor	eUTAP mode indication	—	—
LD7	TARGET	Multicolor	eUTAP mode indication	—	—
LEDs in J6	LINK	Green	RGMII PHY1 has Link at 1 Gbps	Activity (not connected, should never light)	No link on Port1
	ACT	Orange	RGMII PHY1 is active		
LEDs in J7	LINK	Green	RGMII PHY 2 has link at 1 Gbps	Activity	No link on Port2
	ACT	Orange	RGMII PHY 2 is active		

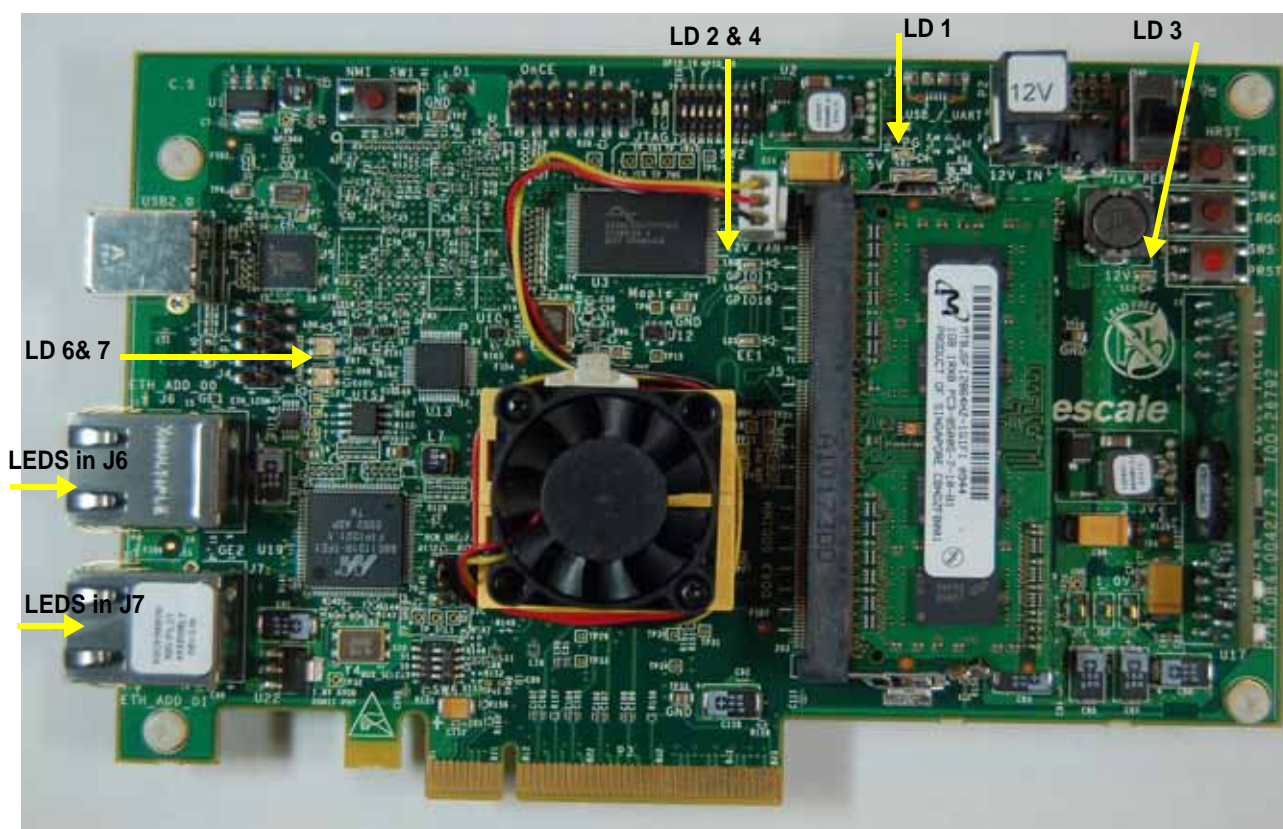


Figure 4. MSC8156EVM LED Locations

10 Getting Started Procedure

Use the following steps to set up and initial the EVM:

1. Review the kit contents as listed in [Section 4 Hardware Kit Contents](#) and make sure you have all the components.
2. Review the default switch settings as listed in [Section 5 DIP Switch Location Default Settings](#) and verify that all switches on the board are set correctly.
3. Review the jumper settings as listed in [Section 7 Jumper Default Settings](#) and verify that all jumpers are set correctly for your desired configuration.
4. Assemble and connect the 12 V power supply (see [Figure 5](#)) using the following steps:
 - a) Make sure that all power is turned off.
 - b) Assemble the AC/DC power supply kit, as follows:
 - Attach the power cable with the country-specific wall output plug for your area.
 - Attach the cable with the plug for the board connection.
 - c) Connect the AC/DC power supply cable to the 12 V (P5) board jack.
 - d) Plug the power cable into the wall outlet.
5. Referring to the information listed in [Section 6 Power Switch and Push Buttons](#) and [Section 9 LED Indicators](#), perform the initial power up and check using the following steps:
 - a) Move the power switch (S1) to the ON position, and check for completion of the PRESET sequence; LEDs 3 (12V POWER) and LED 1 (POWER GOOD) display a constant green light.
 - b) Power the system off by moving the power switch (S1) to the OFF position.



Figure 5. Power and Cable Connections

11 Next Steps

The procedures in this document describe the basic hardware setup. Once board operation is verified, you can proceed to download the Freescale CodeWarrior IDE software to your host PC. See the *MSC8156EVM Software Installation Guide* included on the kit documentation CD.

Once the software is set up, you can connect the USB cable between the MSC8156EVM J13 and the development platform (PC or laptop, for example) with the CodeWarrior software installed to begin the configuration and debugging process. Alternately, you can use the alternate debugging connection through an external USB tap connected through a 14-pin ribbon cable to the 14-ping OnCE/JTAG header on the board. Further instructions for running a debug session are provided in the application note *Configuring a CodeWarrior for StarCore DSPs Project for the MSC8156EVM Board* (AN4229) included on your documentation CD.

You may configure the MSC8156 to use the Ethernet ports (J6 and J7). A single Ethernet cable is supplied with the EVM to allow connection between the EVM and an external Ethernet switch. An Ethernet crossover cable (not supplied) can be used for a direct connection to an Ethernet port on an external PC, for example. Basic Ethernet drivers are provided as part of the SmartDSP OS software shipped with the CodeWarrior IDE and the EVM update software. This software is delivered as an enablement, intended for use by customers to develop applications.

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