

M52259DEMOMCU

Demonstration Board for Freescale MCF52259
Microcontroller

USER GUIDE



Email: www.axman.com

Support: support@axman.com

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REVISION

Date	Rev	Comments
August 7, 2008	A	Initial Release.

CAUTIONARY NOTES

- 1) Electrostatic Discharge (ESD) prevention measures should be used when handling this product. ESD damage is not a warranty repair item.
- 2) Axiom Manufacturing does not assume any liability arising out of the application or use of any product or circuit described herein; neither does it convey any license under patent rights or the rights of others.
- 3) EMC Information on the M52259DEMOMCU board:
 - a) This product, as shipped from the factory with associated power supplies and cables, has been verified to meet with FCC requirements as a CLASS A product.
 - b) This product is designed and intended for use as a development platform for hardware or software in an educational or professional laboratory.
 - c) In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate prevention measures.
 - d) Attaching additional wiring to this product or modifying the product operation from the factory default as shipped may effect its performance and cause interference with other apparatus in the immediate vicinity. If such interference is detected, suitable mitigating measures should be taken.

TERMINOLOGY

This development board uses option selection jumpers. A jumper is a plastic shunt that connects 2 terminals electrically. Terminology for application of the option jumpers is as follows:

Jumper on, in, or installed - jumper is installed such that 2 pins are connected together.

Jumper off, out, or idle - jumper is installed on 1 pin only. It is recommended that jumpers be idled by installing on 1 pin so they will not be lost.

Cut-Trace – a circuit trace connection between component pads. The circuit trace may be cut using a knife to break the default connection. To reconnect the circuit, simply install a suitably sized 0-ohm resistor or attach a wire across the pads.

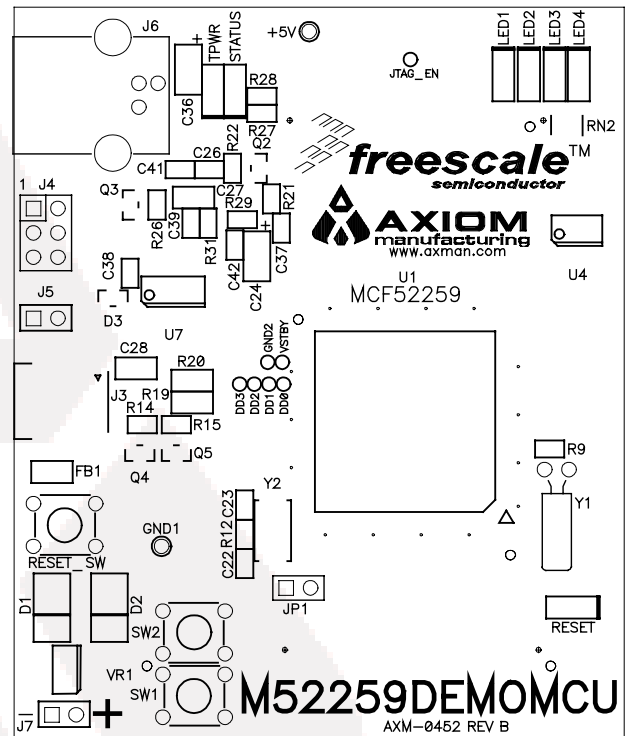
Signal names in this document that are followed by an asterisk (*) denotes active-low signals.

FEATURES

The M52259DEMOMCU is a low-cost development board for the Freescale MCF52259 Cold-Fire microcontroller. Two stack headers allow additional features to be added quickly and easily. In addition to the MCF52259 MCU, the board features an integrated, Open-Source, USB-BDM, and a USB port with mini-AB connector supporting both Host and Device mode operation. CodeWarrior Development Studio is also included to ease application development and debug.

Features:

- MCF52259 CPU, 144 LQFP
 - V2 ColdFire Core w/ eMAC
 - 80MHz internal bus
 - 512 KB FLASH
 - 64 KB SRAM
 - 4ch, DMA Controller w/ Timers
 - Fast Ethernet Controller (FEC)
 - USB Physical Layer Interface (PHY)
 - Mini-FlexBus External Bus Interface
 - Fast A – D Converter
 - FlexCAN 2.0B Module
 - I2C, UART(s), QSPI,
- Integrated, Open-Source, USB BDM
- 48 MHz XTAL
- miniAB USB Port
- RESET switch w/ indicator
- Power Input Selection Jumper
 - Power Input from USB BDM
 - Power input from miniUSB
 - Power Input from on-board regulator
 - Power Input from terminal block (not installed)
- User Features
 - 4 User LED's w/ enable
 - 2 User Push Switches
- Connectors
 - 0.5mm Stack Connectors for ease of expansion
 - Type B USB connector
 - miniAB USB Connector
- Supplied with DB9 Serial Cable, USB cable, Ethernet Cable, Support CD, and CodeWarrior Development Studio CD



Specifications:

Board Size 2.0" x 2.0"

Power Input: +5 to +16 VDC, 9VDC typical

REFERENCES

Reference documents are provided on the support CD in Acrobat Reader format.

M52259DEMOMCU_UG.pdf	M52259DEMOMCU User Guide (this document)
M52259DEMOMCU_SCH_B.pdf	M52259DEMOMCU Schematic
M52259DEMOMCU_Silk_B.pdf	M52259DEMOMCU Top Silkscreen
CFPRM.pdf	ColdFire Programmers Reference Manual
USB_20_05122006.zip	USB2.0 Specification and OTG Supplement with errata

OVERVIEW

The M52259DEMO consists of the M52259DEMOMCU and the M52259DEMOCOM boards connected via 0.5mm stack connectors. The M52259DEMO allows the user to easily add functionality by simply matching the stack connector pin-out.

The M52259DEMOMCU board features the MCF52259 ColdFire microcontroller. An, open-source, USB-BDM has been integrated to simplify application development and debug. A USB port with mini-AB USB connector is also provided. Four user LEDs and 2 user push buttons complete the M52259DEMOMCU board features. Additional MCU features are available at the stack connector.

The M52259DEMOCOM boards expands the M52259DEMO feature set. The M52259DEMOCOM supports 10/100 Ethernet, high-speed CAN, and RS-232 functionality. Please refer to the M52259DEMOCOM User Guide for details.

GETTING STARTED

To get started quickly, please refer to the Quick Start Guide. This quick start will illustrate connecting the board to a PC, installing the correct version of CodeWarrior Development Studio, and running a simple application.

SOFTWARE DEVELOPMENT

Software development requires a ColdFire assembler or compiler, a host PC running a ColdFire BDM interface, and a ColdFire BDM cable. An Open-Source, USB-BDM cable has been integrated into the M52259DEMOMCU board to simplify application development. CodeWarrior Special Edition, supplied with this board, allows the user to develop and debug application code and to program flash.

MEMORY MAP

Refer to the MCF52259 Integrated Microcontroller Reference Manual (RM) for details. The RM may be downloaded from the Freescale web site at www.freescale.com.

DEVELOPMENT SUPPORT

Application development and debug for the target MCF52259 is supported through the BDM interface. The debug interface consists of an integrated, open-source USB BDM debugger. In addition to allowing quick and easy application development, the integrated BDM can also power the target module. Refer to the MCF52259 RM for details on using the Background Debug Module

JTAG access to unsecure the target MCU is also supported through the integrated BDM.

Integrated BDM_PORT

The M52259DEMOMCU board features an open-source, integrated, USB BDM debugger. The integrated debugger supports application development and debugging via the background debug mode. A type B, USB connector provides connectivity between the target board and the host PC.

NOTE: Using the integrated USB BDM requires CodeWarrior Development Studio for ColdFire, v7.0, Special Edition or later.

The integrated debugger provides power and ground to the target, thereby eliminating the need to power the board externally. Power from the integrated USB BDM is derived from the USB bus; therefore, current consumption is limited by the USB specification. Total current consumption for the target board, and any connected circuitry, must not exceed **500mA**. Excessive current drain will violate the USB specification causing the bus to disconnect. This will force a target POR.

CAUTION

Violating the USB specification will cause the USB bus to disconnect forcing a target reset. Damage to the board or host PC may also result.

POWER

The M52259DEMOMCU board may be powered from several sources. The integrated USB-BDM is designed to provide power during application development and debug. The board may also be powered from the min-AB USB connector when the target MCU is configured for device mode operation. For stand-alone operations, power may be applied directly to connector J7.

When using the integrated USB BDM to power the target board, the board draws power from the USB bus. Excessive current drain will violate the USB specification causing the USB bus

to disconnect forcing a POR. Total current consumption of the board and any connected circuitry, therefore, must be less than **500mA**.

CAUTION

USB current is limited to **500mA** maximum. Excessive current drain will cause the USB bus to disconnect causing the DEMO board to reset. This may also cause damage to the DEMO board and the host PC.

Power to the target board is supplied by a voltage regulator at VR1. The on-board regulator can supply up to 500 mA of output power to the board. Voltage input to the regulator is supplied from connector J7 (not installed), the USB BDM, or from the USB port. Power from the USB-BDM or the USB port are diode protected to prevent back biasing. No protection is provide on the J7 connector input.

Input voltage to connector J7 should be limited to $5.0 \leq V_{IN} \leq 12V$. The voltage regulator at VR1 will tolerate input voltage up to +20V; however, input voltage should be kept below +12 to prevent excessive heating.

CAUTION

Input protection is **NOT** applied to the J7 power inputs. Excessive input voltage or current will damage the board.

RESET

The M52259DEMOMCU provides a RESET button, with indicator, to reset the target device. The MCF52259 also supports several internal resets. Consult the MCF52259 RM for details on all supported resets.

RESET SWITCH

The RESET switch applies an asynchronous reset to the MCU and is connected directly to the RSTI* input. Pressing the RESET switch holds RSTI* low until the switch is released. An external pull-up on the RSTI* line prevents spurious resets allowing normal operation.

RESET INDICATOR

The RESET LED is connected to the RSTO* output on the MCF52259. This LED lights while the MCU is in RESET and remains on for the duration of an asserted RSTO* signal.

LOW-POWER MODES

The MCF52259 supports several operational modes designed to reduce power consumption. Low-power modes include Wait, Doze, Stop, and Halt. Refer to the MCF52259 RM at www.freescale.com for details on configuring and using the various low-power modes.

TIMING

A 48MHz crystal oscillator (XTAL) provides timing for the M52259DEMOMCU. Refer to the MCF52259 RM at www.freescale.com for details on use and configuration of the clock module.

COMMUNICATIONS

The M52259DEMOMCU applies a USB port capable of Host mode and Device mode functionality directly. The M52259DEMOMCU also supports 1 UART channel, 1 FlexCAN channel, and 1 Fast Ethernet port on the connected M52259DEMOCOM board.

Refer to the M52259DEMOCOM User Guide for details. Additional communications channels including, QSPI and I2C, are available on the stack connectors.

USB PORT

The MCF52259 features an integrated USB physical layer interface (PHY). The PHY support low- and full-speed USB communications. A mini-AB connector is provided to enable both Host mode functionality and Device mode functionality. When configured for Device mode operation, the board will source current from the attached Host. When configured for Host mode operation, the board can supply power to the device.

Due to design considerations, the M52259DEMOMCU can only supply power to a connected USB device when powered from the integrated USB BDM. This limits total current available to the attached device. However, available current should be well above 200 mA.

The USB2.0 Specification can be downloaded from the USB Implementers Forum (USB-IF) at www.usb.org/developers.

INTEGRATED BDM

The M52259DEMOMCU applies an open-source, USB-BDM for ease of application debug and development. The integrated BDM is fully compatible with CodeWarrior Development Studio. The board may be powered from the BDM during application development and debugging. The integrated BDM support JTAG access to unsecure the target MCU.

The BDM uses 2 LED indicators to show status. The TPWR LED lights when the BDM circuit is powering the DEMO board. The STATUS LED indicates activity on the BGND signal line.

USER OPTIONS

The M52259DEMOMCU includes various input and output devices to aid application development. User I/O devices include 2 pushbutton switches, and 4 green LEDs. Each user device is directly connected to the target MCU.

Pushbutton Switches

Two push button switches provide momentary, active-low input, for user applications. Pull-ups internal to the MCU must be enabled to provide error-free switch operation. Table 1 below shows the User push-button connections.

User LED's

Four green LED's are provided for use in application development and debug. Each LED is configured for active-high operation. An LED_EN option header enables indicators LED1 through LED4. A tri-state buffer between the MCU port and the user LED's provides the drive current necessary to control the LED's. Table 1 below shows the User LED connections.

Table 1: User Option Connections

SW1	IRQ5*/FEC_MDC/PNQ5
SW2	IRQ1*/FEC_ALTCLK/PNQ1
LED1	DTIN0/DTOUT0/PWM0/PTC0
LED2	DTIN/DTOUT1/PWM2/PTC1
LED3	DTIN2/DTOUT2/PWM4/PTC2
LED	DTIN3/DTOUT3/PWM6/PTC3

I/O PORT CONNECTOR

The IO Port connector consists of 2 stack connectors mounted on the bottom layer. These connectors allow the M52259DEMOMCU to be easily expanded by simply adding functionality. The figures below show the pin-out of connectors J1 and J2.

Figure 1: Connector J1

		J1			
QSPI_CS3/SYNCA/USB_DP_PDOWN/PQS6	1	2			
QSPI_CS2/SYNCB/USB_DM_PDOWN/PQS5	3	4			
QSPI_DIN/I2C_SDA1/URXD1/PQS1	5	6			
QSPI_DOUT/I2C_SCL1/UTXD1/PQS0	7	8			
QSPI_CLK/I2C_SCL0/URTS1/PQS2	9	10			
QSPI_CS0/I2C_SDA0/UCTS1/PQS3	11	12			
	13	14			
I2C_SCL0/UTXD2/PAS0	15	16			
I2C_SDA0/URXD2/PAS1	17	18			
	19	20			
	21	22			
FB_AD07/PTE7	23	24	FB_AD08/PTF0		
FB_AD06/PTE6	25	26	FB_AD09/PTF1		
FB_AD05/PTE5	27	28			
FB_ALE/FB_CS1*/PAS2	29	30			
	31	32			
	33	34			
	35	36	TMS/BKPT*		
	37	38	TRST*/DSCLK		
	39	40			
	41	42	TDI/DSI		
	43	44	TDO/DSO		
	45	46	ALLPST		
FB_CS0*/PTG5	47	48	TCLK/PSTCLK/CLKOUT/FB_CLK		
FB_D0/SYNCB/PTG7	49	50	JTAG_EN		
FB_D1/SYNCA/PTG6	51	52			
FB_D2/USB_VBUSE/PTH0	53	54	FB_D3/USB_VBUSD/PTH1		
FB_AD02/PTE2	55	56			
FB_AD03/PTE3	57	58			
FB_AD04/PTE4	59	60	FB_RW*/PTH7		
FB_AD01/PTE1	61	62	FB_AD00/PTE0		
	63	64			
	65	66			
	67	68			
UCTS1*/SYNCA/URSC2/PUB3	69	70	GPT3/ICOC3PWM7/PTA3		
URTS1*/SYNCB/UTXD2/PUB2	71	72			
URXD1/I2C_SDA1/PUB1	73	74	DTIN2/DTOUT2/PWM4/PTC2		
UTXD1/I2C_SCL1/PUB0	75	76			
	77	78			
AN1/PAN1	79	80	AN4/PAN4		
AN0/PAN0	81	82	AN5/PAN5		
AN2/PAN2	83	84	AN6/PAN6		
AN3/PAN3	85	86	AN7/PAN7		
+5V	87	88	+5V		
+5V	89	90	+5V		
+5V	91	92	+5V		
GND	93	94	GND		
	95	96	+3.3V		
	97	98	+3.3V		
GND	99	100	GND		

Figure 2: Stack Connector J2

		J2		
URTS0*/USB_VBUS/PUA2	1	2		DTIN1/DTOUT1/PWM2/PTC1
URXD0/PUA1	3	4		DTIN0/DTOUT0/PWM0/PTC0
UTXD0/PUA0	5	6		DTIN3/DTOUT3/PWM6/PTC3
UCTS0*/USB_BUSE/PUA3	7	8		
GND	9	10		FB_AD10/PTF2
GND	11	12		FB_AD11/PTF3
	13	14		FB_AD12/PTF4
	15	16		FB_AD13/PTF5
	17	18		FB_AD14/PTF6
	19	20		
	21	22		RSTI*
	23	24		RSTO*
	25	26		
	27	28		FB_D4/I2C_SCL1/PTH2
	29	30		FB_D5/I2C_SDA/PTH3
	31	32		FB_D6/CANRX/PTH4
	33	34		FB_D7/CANRX/PTH5
	35	36		FB_OE*/PTH6
	37	38		FB_AD15/PTF7
	39	40		FB_AD16/PTG0
	41	42		FB_AD17/PTG1
	43	44		FB_AD18/PTG2
	45	46		FB_AD19/PTG3
	47	48		
	49	50		IRQ3*/FEC_MDIO/PNQ3
	51	52		IRQ5*/FEC_MDC/PNQ5
	53	54		
	55	56		
	57	58		FEC_RXD3/PTI6
	59	60		FEC_RXD2/PTI5
	61	62		FEC_RXD1/PTI4
	63	64		FEC_RXD0/PTI3
GPT0/ICOC0PWM1/PTA0	65	66		FEC_RXDV/PTI7
GPT1/ICOC1PWM3/PTA1	67	68		FEC_RXCLK/PTI2
GPT2/ICOC2PWM1/PTA2	69	70		FEC_RXER/PTJ0
	71	72		FEC_TXER/PTJ7
	73	74		FEC_TXCLK/PTJ1
UCTS2*/I2C_SCL1/USB_BUSCHG/PUC3	75	76		FEC_TXEN/PTJ6
URTS2*/I2C_SDA1/USB_VBUSDIS/PUC2	77	78		FEC_TXD0/PTJ2
UTXD2/CANTX/PUC0	79	80		FEC_TXD1/PTJ3
URXD2/CANRX/PUC1	81	82		FEC_TXD2/PTJ4
	83	84		FEC_TXD3/PTJ5
	85	86		FEC_COL/PTI0
IRQ7*/PNQ7	87	88		FEC_CRS/PTI1
IRQ1*/USB_ALTCLK/PNQ1	89	90		
+3.3V	91	92		+3.3V
+3.3V	93	94		+3.3V
+3.3V	95	96		+3.3V
+3.3V	97	98		+3.3V
GND	99	100		GND