Ethernet-Enabled Intelligent Display Modules (IDMs)

Ordering Information

Product No.	Description
MDL-IDM	Stellaris® Ethernet-Enabled Intelligent Display Module (with PoE) for Single-Unit Packaging
MDL-IDM-B	Stellaris® Ethernet-Enabled Intelligent Display Module (with PoE) for Volume Packaging
MDL-IDM28	Stellaris® Ethernet-Enabled Intelligent Display Module for Single-Unit Packaging
MDL-IDM28-B	Stellaris® Ethernet-Enabled Intelligent Display Module for Volume Packaging
RDK-IDM	Stellaris® Ethernet-Enabled Intelligent Display Module Reference Design Kit (includes MDL-IDM board)



Figure 1. Intelligent QVGA Touch Panel

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General Description

The Stellaris® Intelligent Display Modules (MDL-IDM and MDL-IDM28) offer a complete graphical touch-screen user interface solution for control, automation, and instrumentation applications. The compact design is based on a Stellaris® LM3S6918 microcontroller; a highly integrated controller incorporating a 32-bit ARM® Cortex™-M3 core. A key feature of the MDL-IDM is the Power over Ethernet (PoE) power system that facilitates both network and power connections with a single RJ45 cable. The MDL-IDM28 module offers the same features as the standard MDL-IDM, but without the Power Over Ethernet capability.

10/100 Ethernet connects the MDL-IDM and MDL-IDM28 to an array of networks—from dedicated industrial networks to the internet. The example application includes source code for an embedded web server.

Development of software for the IDM modules is simplified by using the comprehensive Stellaris graphics library and ARM development tools from our tools partners. First-time users should purchase the RDK-IDM Reference Design Kit which includes the touch panel module, a documentation CD, power supply, and cables.

Refer to the *RDK-IDM Quickstart Guide* and *RDK-IDM User's Manual* for complete technical details on using and customizing the Intelligent Display Module.

Feature Summary

Highlighted capabilities of the MDL-IDM and MDL-IDM28 modules include:

- Bright QVGA LCD Display with touch
- Ethernet and serial connectivity
- Easy to customize – full source code and design files included
- Flexible power supply options
- Compact size simplifies system integration

Features

The MDL-IDM and MDL-IDM28 provide the following features:

- LCD display
  - 2.8" QVGA 240 x 320 pixels
  - 16-bit color
  - White LED backlight
  - 4-wire resistive touch panel
- 10/100 Ethernet
  - Auto MDI/MDIX
  - Traffic/Link indicator LED
- Serial communications
  - Header provides TXD and RXD signals
  - RS232 signal levels
  - Default 115.2k,8,n,1 operation
- Stellaris® microcontroller
  - 32-bit ARM® Cortex™-M3
  - 50 MHz operation
- Memory
  - 256 KB main flash memory
  - 64 KB SRAM
  - 168 KB image RAM

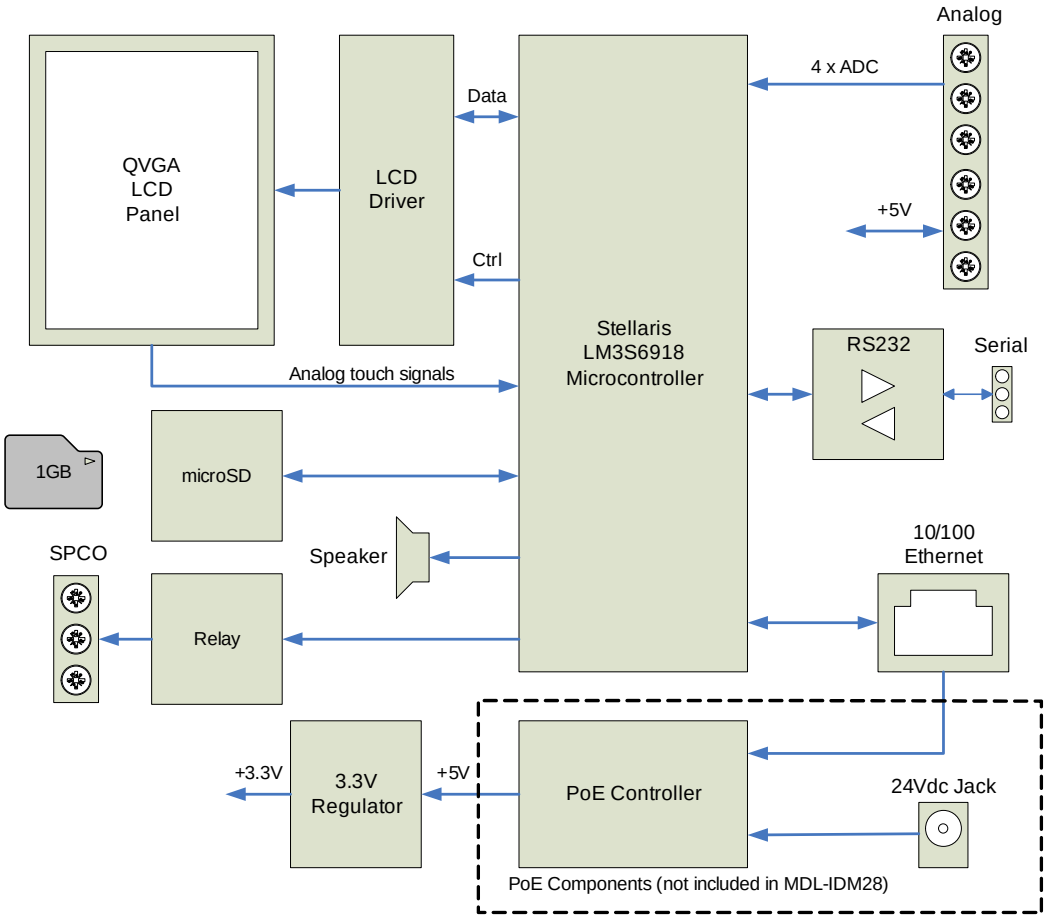
- microSD slot (typically 1 GB storage)

- Power-supply options
  - Power over Ethernet (IEEE 802.3af-compliant)
  - 24 V DC power jack (PoE-equipped modules only)
  - 5 V DC terminals (all modules)
- Peripherals
  - Four analog measurement inputs
  - One relay output (1 form C/SPDT contact)
- Software
  - Example applications included
  - Supports development tools from Keil, IAR, Code Sourcery, and Code Red Technologies
  - Stellaris Graphics Library

Module Block Diagram

Figure 2 shows the block diagram for the MDL-IDM and MDL-IDM28.

Figure 2. Intelligent Display Module Block Diagram



Operational Specifications

Table 1 shows the operating parameters for the MDL-IDM and MDL-IDM28.

Table 1. Operating Specifications

Parameter Name	Min	Nom	Max	Unit
Power Supply				
PoE Supply Voltage (MDL-IDM only)	38	48	55	V DC
PoE Supply Current (MDL-IDM only)	–	21	–	mA
DC Jack Supply Voltage (alternative to PoE on MDL-IDM)	20	24	55	V DC
DC Jack Supply Current (MDL-IDM only)	–	42	–	mA
Terminal Block Supply Voltage (alternative to PoE)	4.5	5	5.5	V DC
Terminal Block Supply Current	–	200	300	mA
PoE Isolation Voltage (MDL-IDM only)	–	–	250	V DC
Auxiliary Power Output (PoE modules only)				
Terminal Block Output Voltage	4.75	5.0	5.25	V
Terminal Block Output Current	–	–	100	mA
Environment				
Operating Temperature Range	-20	–	+50	°C
Storage Temperature Range	-30	–	+70	°C
Display				
Brightness	210	220	–	Cd/m^2
View Angle (V)	-10	–	+35	deg
View Angle (H)	-45	–	+45	deg
Contrast Ratio	–	–	–	–
Peripherals				
Analog Input Range	0	–	3	V DC
Analog Input – Electrical Limits	-0.3	–	3.3	V DC
Relay Contact Voltage	–	–	60	V DC
Relay Contact Current	–	–	250	mA
RS232				
Data Rate	–	–	120	Kbps
Transmitter Voltage Swing	±5.0	±5.4	–	Vdc
Input Threshold Low	0.6	1.2	–	–
Input Threshold High	–	1.5	2.4	–

Power over Ethernet (PoE)

The MDL-IDM identifies itself as a Class 1 Powered Device. The IEEE 802.af specification defines Class 1 devices as those that draw between 0.44 W and 3.84 W.

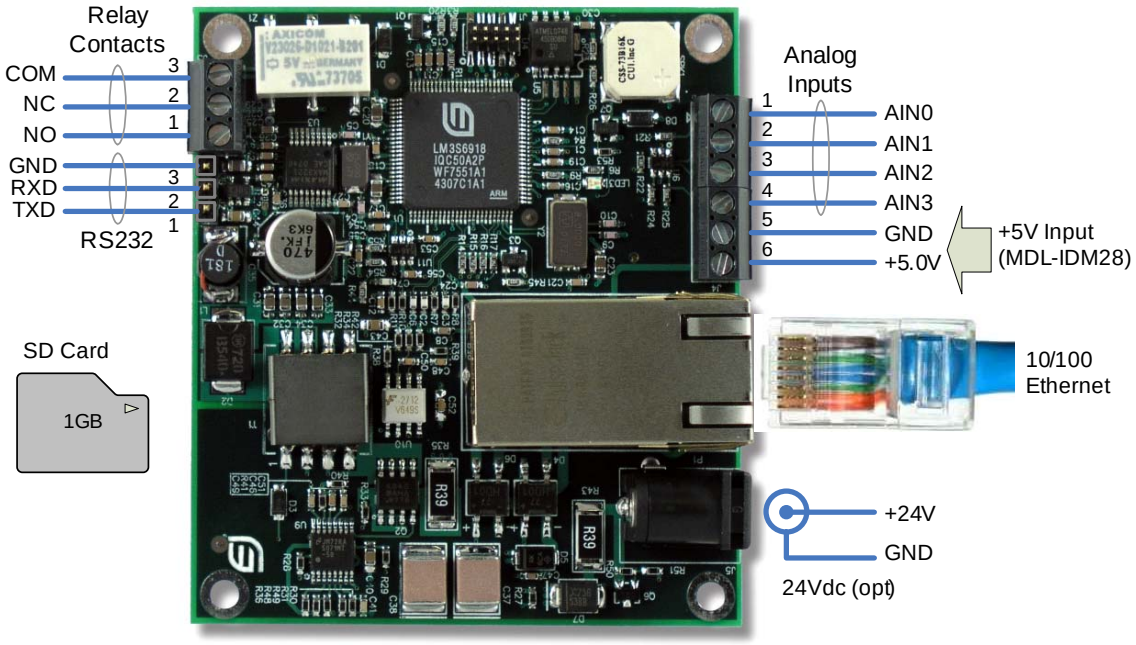
If a PoE-equipped network switch or hub is not available, the MDL-IDM may be powered either from a 24 Vdc power source or from a 5 Vdc power source. In all cases, the power supply must be regulated within the electrical limits listed in the specification table.

When powered using PoE or a 24 V supply, the MDL-IDM is able to supply 5 V power to external devices such as sensors or signal conditioning circuits.

Wiring

In many applications, only a single RJ45 cable is required for MDL-IDM and MDL-IDM28 operation. Figure 3 shows all possible electrical connections, including RS232, analog inputs, and relay contacts. The actual functionality of the peripheral connections is determined by the application software.

Figure 3. Connection Diagram



Software Development

The MDL-IDM and MDL-IDM28 modules ship with a factory-programmed example application. This application must be replaced with a program specific to the end product. Development requires the use of a compiler capable of generating code for an ARM® Cortex™-M3 processor. Visit www.luminarymicro.com to download evaluation versions of suitable development tools.

The Stellaris Graphics Library accelerates software development by providing a range of display-related extensions to the standard Peripheral Driver Library. The Graphics Library includes widgets, low-level drawing primitives, and display drivers.

Graphics Library widgets encapsulate the ability to render a GUI element, detect if a touchscreen press occurred within its bounds, and react to presses. Widgets may be used in a hierarchical manner to provide groups of associated widgets, such as radio buttons. Examples of widgets include check boxes, buttons, and images.

Drawing primitives are elementary geometric items. The Graphics Library includes primitives such as lines, circles, filled circles, rectangles, and fonts. A selection of pre-built fonts is included and additional user fonts may be added to the library.

The display driver provides low-level code for initializing the display controller and a method for setting pixels. Graphics Library includes a display driver optimized for the RDK-IDM LCD panel and therefore, users do not need low-level knowledge of LCD-driver operation.

Refer to the Stellaris *Graphics Library Reference Manual* for full details.

Programming the MDL-IDM and MDL-IDM28

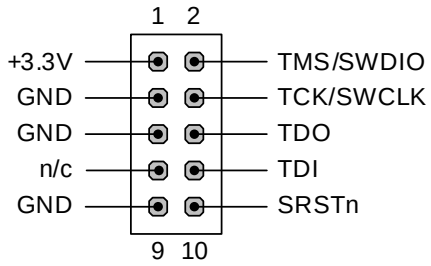
Once an application has been compiled and linked to a binary file, it can be loaded into the MDL-IDM and MDL-IDM28 by several different methods:

- Over Ethernet using the Stellaris Ethernet boot loader
- Over the RS232 serial port using the Stellaris serial boot loader
- Using the JTAG or SWD port and an In-circuit Debug Interface (ICDI)

All three methods are supported by the LMFlash utility included on the software and documentation CD and available from the www.luminarymicro.com web site.

The IDM Reference Design Kit includes an adaptor to convert the fine-pitch, 10-way debug header to the common 20-pin ARM debug header.

Figure 4. Fine-Pitch Debug Header Pin Assignments



Reference Design Kit Contents

The RDK-IDM RDK includes the following:

- MDL-IDM Intelligent QVGA Touch Panel with Ethernet
- 24 Vdc power supply
  - Provides power if PoE power source is unavailable

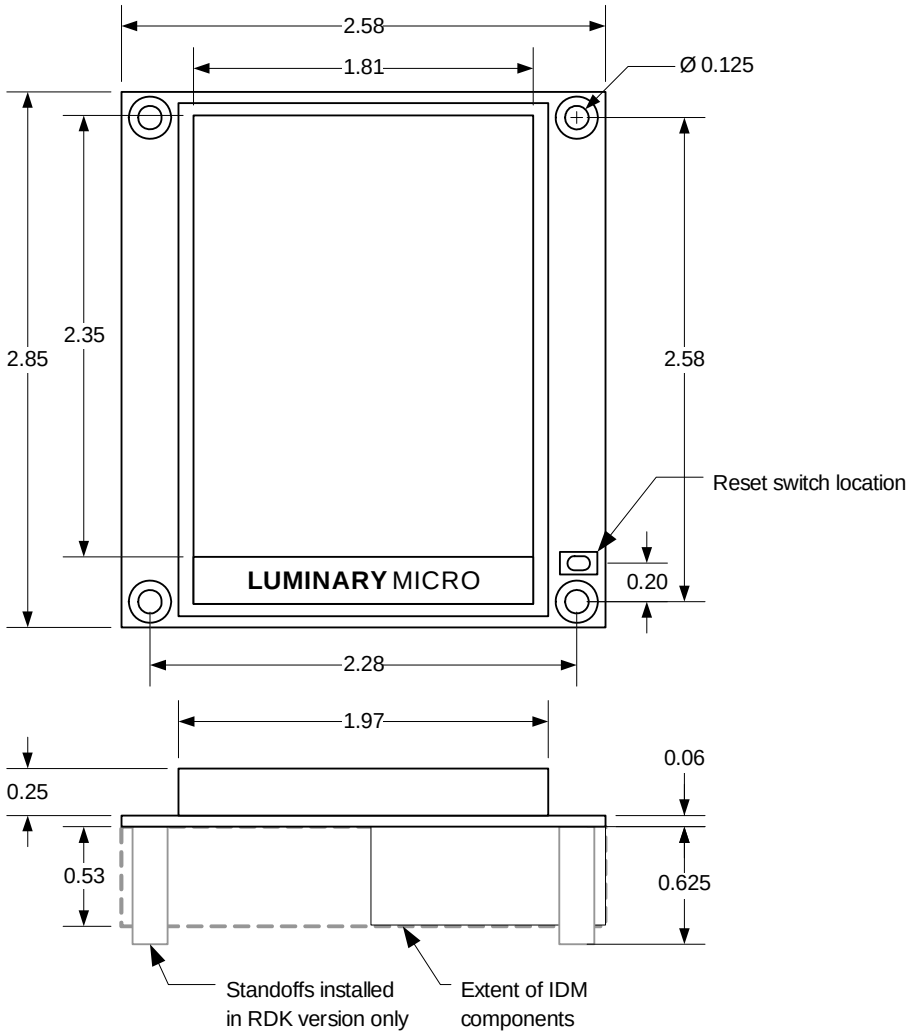
  - Includes plugs for US, UK, Europe, and Australia
- Ethernet cable
- Debug adapter
  - Fine pitch to 0.1” standard header
- Documentation and source code CD

The RDK-IDM Reference Design Kit can be used for developing applications for both PoE-equipped and non-PoE-equipped IDM applications.

Mechanical Installation

The MDL-IDM and MDL-IDM28 mount to a front panel mounting using four screws and appropriate stand-offs.

Figure 5. Wiring Diagram



TEXAS INSTRUMENTS

Additional Information

The following documents are available for download at www.luminarymicro.com:

- *Stellaris® Ethernet-Enabled Intelligent Display Module (IDM) Reference Design Kit User's Manual*, document order number RDK-IDM
- *Stellaris Peripheral Driver Library User's Guide*, document order number SW-DRL-UG

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