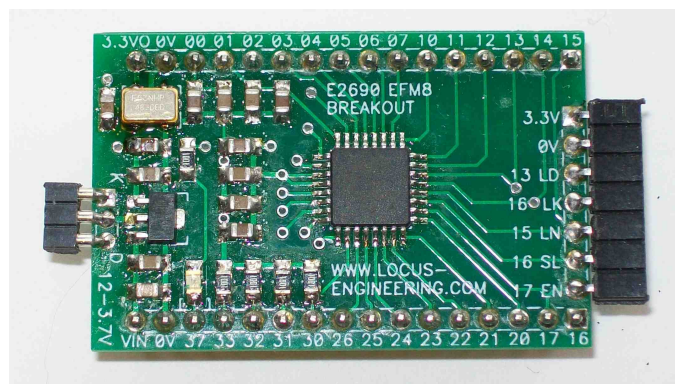


FEATURES

- 50MIPs EFM8BB31F64G microcontroller
- +3.3V 100mA regulator with output pin
- optional external oscillator
- 3 pin C2 program interface
- Display + Select & Enter switch interface
- 28 I/O port, 5mA source 12.5mA sink
- 0.100" header pin grid
- +3.6V to +12V input
- 256 + 4096 bytes RAM
- 64KB Flash program memory, in-system programmable
- internal 49MHz, 24.5MHz oscillators
- (6) 16 bit timer/counters
- 6 channel PWM/PCA, watchdog timer
- 2 UARTs up to 3Mb, SPI, I2C
- 16 bit CRC engine
- (4) 12 bit DACs @200Ksamples/s
- 12 bit ADC @340Ksamples/s
- ADC reference voltage output
- 20 channel analog multiplexer
- 2 analog comparators
- 1.65V, 1.2V, 2.4V analog reference
- temperature sensor



DESCRIPTION

The E2690 Silicon Labs™ EFM8BB31F64G Microcontroller Breakout Board uses a low cost, high performance mixed signal 8051 architecture EFM8BB31F64G microcontroller on a simple to use board including voltage regulator, test LED, and C2 program interface. All port I/O pins are available and a connector is provided for the Locus Engineering E1832 Display Switch Interface. An optional external oscillator is available for more accurate timing requirements. This development board is ideal for mixed signal projects as it includes analog multiplexer, ADC, DACs, and reference voltages.

Table 1. Absolute Maximum Ratings

Parameter	Rating
V _{in} to GND	-0.3 to +16.0V
Port pin input voltage to GND, port 0&1	-0.3 to +5.8V
Port pin input voltage to GND, port 2&3	-0.3 to +3.6V
Port pin output current	100mA
Supply current	100mA
Storage temperature range	-65 to +150°C

Table 2. Electrical Characteristics

Test Conditions: Supply Voltage V_{in} = +6.0V, T_{ambient} = 25° C, unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit
V _{dd}	Supply voltage	3.6	5-6	12.0	V
I _{dd}	Supply current, see EFM8 datasheet for specifics			15	mA
V _{IH}	Digital high input voltage	2.31V			V
V _{IL}	Digital low input voltage			0.99	V
V _{OH}	Digital high output voltage	2.6V @I _{out} -7mA			V
V _{OL}	Digital low output voltage			0.6V @I _{out} 7mA	V
I _{sink}	Digital output sink current			12.5	mA
I _{source}	Digital output source current			-5.0	mA
T _{operate}	Operating temperature	-40		+85	°C

General Precautions

Charged devices and circuit boards can discharge without warning. Proper ESD precautions should be followed to avoid failure.

This device is not authorized for use in any product where the failure or malfunction of the product can reasonably be expected to cause failure in a life support system or to significantly affect its operation.

Locus Engineering Inc. reserves the right to make changes at any time without notice to improve product features or reliability.

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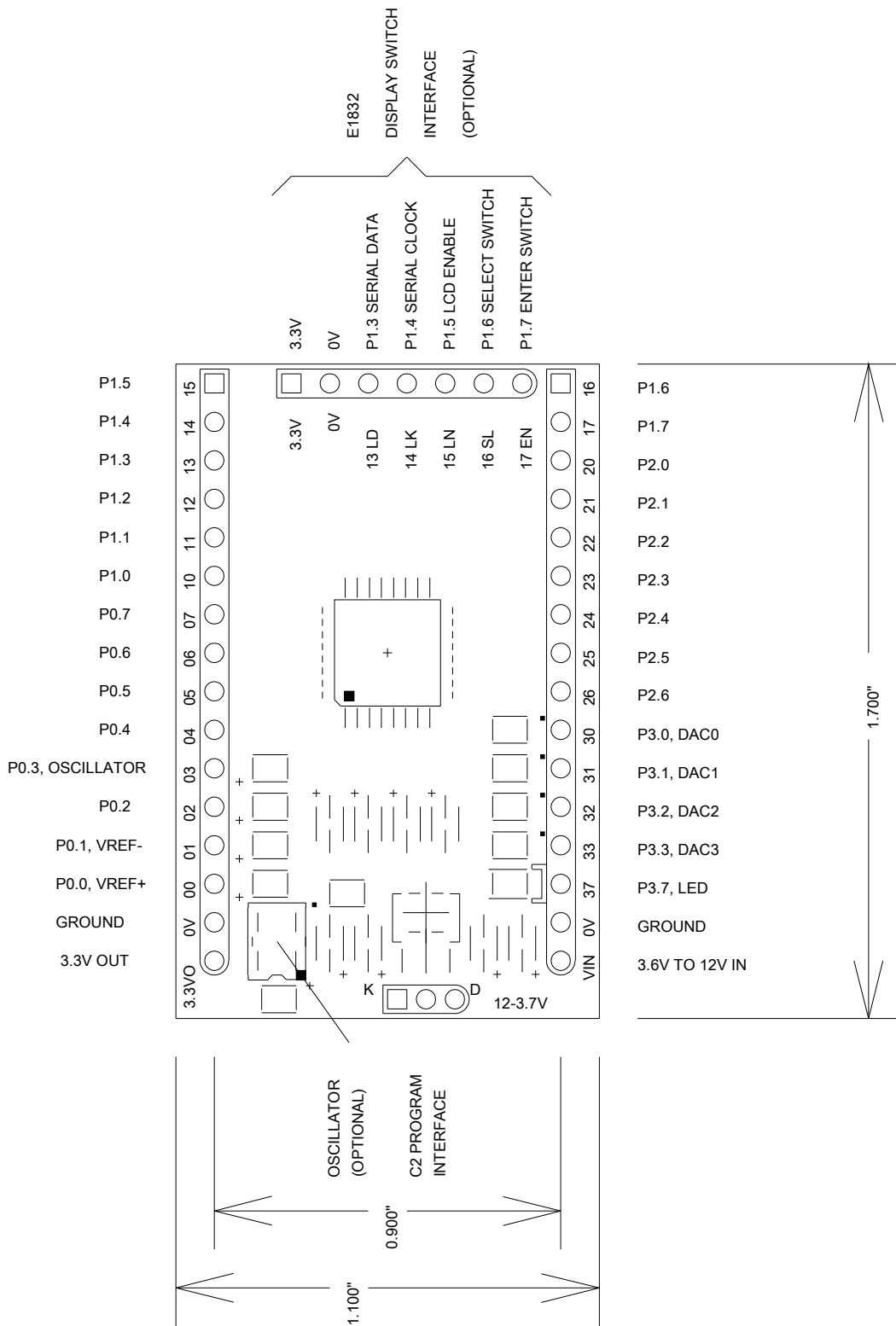
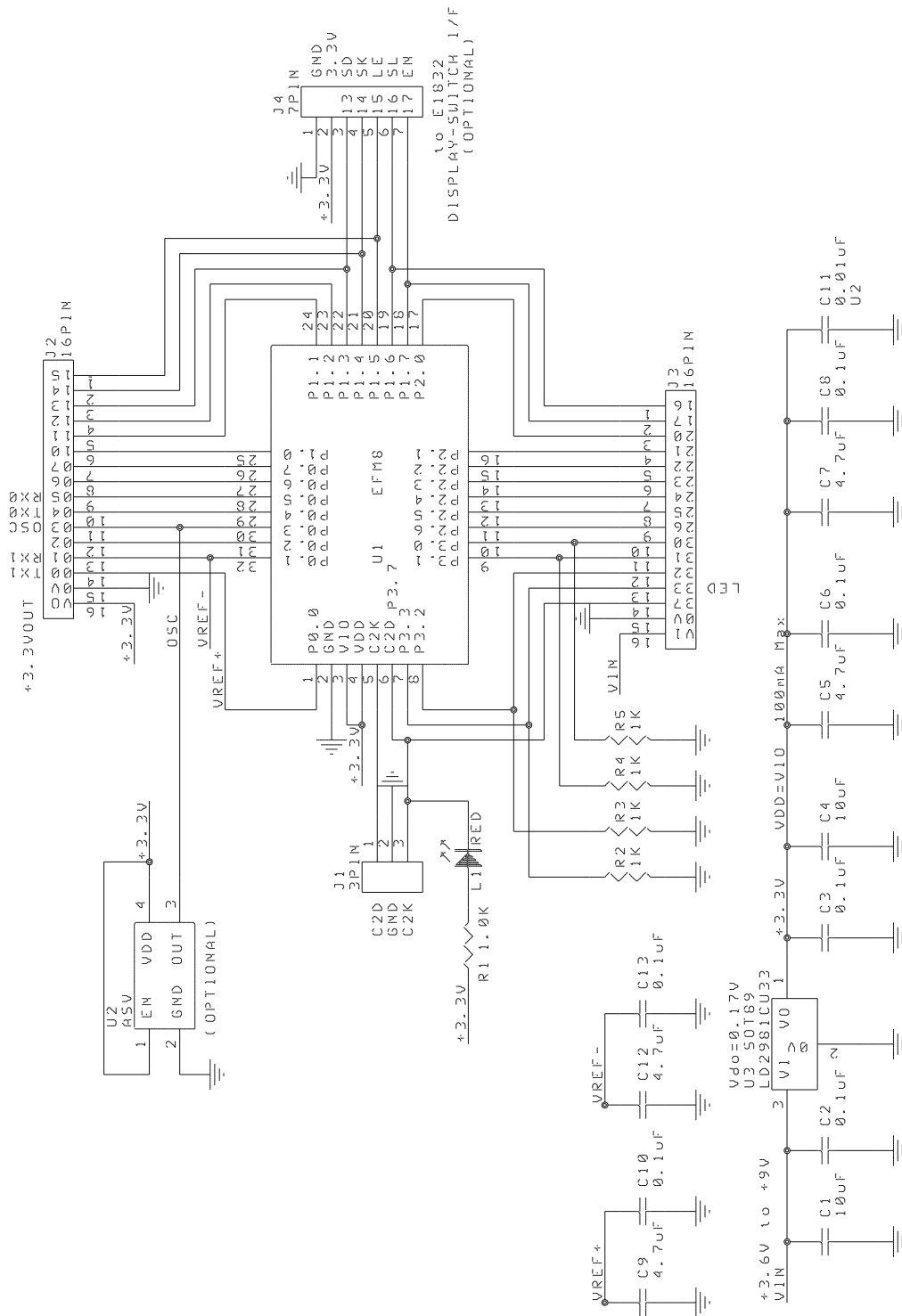


Figure 1. Module Pinout



EFMS DEVELOPMENT BOARD

Figure 2. Schematic

Installation

The module is easiest installed on a breadboard with a 0.100" grid. Connect a power supply providing 5V to 12V with a minimum of 200mA to Vin and 0V. Check the regulator output on the module for 3.3V. The LCD voltage is 3.3V at the E1832 Display Switch Interface connector.

Port I/O

The port pins can sink 12.5mA or source 5mA, the total of which should not exceed the 100mA regulator current limit. Input voltages should be limited to 5.8V for ports 0&1, and 3.6V for ports 2&3. Input voltages are typically CMOS with <0.99V for a guaranteed low and >2.31V for a guaranteed high. Port pins used as outputs should be configured appropriately with pullup resistors for open drain, or set as push-pull. Note there is no P2.7, or P3.4-P3.6 on the chip.

The following table summarizes the module pinouts and some of the special functions associated with some port pins:

Left Module Connector J2		Display Switch Interface J4		Right Module Connector J3	
J2.1	P1.5	J4.1	Ground	J3.1	P1.6
J2.2	P1.4	J4.2	3.3V	J3.2	P1.7
J2.3	P1.3	J4.3	P1.3 Serial LCD data	J3.3	P2.0
J2.4	P1.2	J4.4	P1.4 Serial LCD clock	J3.4	P2.1
J2.5	P1.1	J4.5	P1.5 LCD Enable	J3.5	P2.2
J2.6	P1.0	J4.6	P1.6 Select switch	J3.6	P2.3
J2.7	P0.7	J4.7	P1.7 Enter Switch	J3.7	P2.4
J2.8	P0.6			J3.8	P2.5
J2.9	P0.5, serial port RX0			J3.9	P2.6
J2.10	P0.4, serial port TX0			J3.10	P3.0
J2.11	P0.3, external clock input			J3.11	P3.1
J2.12	P0.2			J3.12	P3.2
J2.13	P0.1, Vref-, serial port RX1			J3.13	P3.3
J2.14	P0.0, Vref+, serial port TX1			J3.14	P3.7
J2.15	Ground			J3.15	Ground
J2.16	3.3Vout			J3.16	3.6V to 12V input

C2 Program Interface

The C2 Program Interface requires the Silicon Labs™ USB Debug Adapter and the Locus Engineering E1947 3 Pin C2 Program Interface Adapter, the latter converting between the 10 pin IDC connector to a 3 pin 2mm connector. The latest Silicon Labs™IDE can be downloaded from their website. The LED is connected to P3.7 which is also the C2 serial data during debug. If P3.7 is to be used, no additional load should be added unless the LED is disconnected otherwise the device will not program.

External Oscillator

For more demanding timing applications, the E2690 board includes placement for a standard 5mmx3.2mm oscillator which is connected to P0.3. Otherwise the internal oscillators are accurate to 2%.

Display Switch Interface

The module includes a connector compatible with the E1832 Display Switch Interface which has a three wire serial LCD and Select & Enter switches. Port pins P1.3 to P1.7 are reserved for these functions if the display switch interface is used.

P1.3	P1.4	P1.5	P1.6	P1.7
LCD Serial Data	LCD Serial Clock	LCD Enable	Select Switch	Enter Switch

Voltage References

The module includes decoupling and filter capacitors for the voltage references on port pin P0.0 for Vref+ and P0.1 for Vref-. These capacitors should be removed if these port pins will be used for digital functions.

Voltage Regulator

The 3.3V voltage regulator is a low dropout type with $V_{do}=0.17V @ 100mA$. The SOT-89 package allows up to 9V input at 100mA without shutdown due to overheating, and up to 16V at lower currents.

DAC

The module includes four DAC outputs DAC0 to DAC3 on port pins P3.0 to P3.3 respectively. These outputs have 1.0K load resistors to ground. These resistors should be removed if these port pins will be used for digital functions.