



EMXTM Module

EMX™ is a combination of hardware (ARM Processor, Flash, RAM, Ethernet PHY...etc) on a very small (1.55"x1.8") SMT OEM 8-Layer board that hosts Microsoft .NET Micro Framework with various PAL/HAL drivers. In addition to the benefits of .NET Micro Framework, EMX includes exclusive software and hardware features, such as support for USB host, PPP networking and more.

EMX Module is a vastly sophisticated piece of hardware. This complexity provides the end-user with a remarkably simple platform to implement in any hardware design. Looking at the EMX Development System schematic shows just how simple it really is. All you need is 3.3 volts and some connections to bring the latest technologies to your products. With manageable features like USB host and WiFi, the possibilities are boundless.



Microsoft's .NET Micro Framework extends the advantages Key Features of .NET and Visual Studio to a class of smaller, less expensive, and more resource-constrained devices than the .NET Compact Framework or the standard .NET framework.

Extended NETMF Features

EMX supports a complete set of .NET Micro Framework features such as TCP/IP, SSL, FAT, USB device and more. Including support for other exclusive GHI features such as full USB host stack (access thumb drives, mice, keyboards, printers and many other USB devices), CAN, ADC, DAC, PPP, GPRS, 3G...etc.

EMX is also protected against firmware or user application piracy.

Runtime Loadable Procedure (RLP)

A very useful and unique feature in EMX is allowing users to load their own compiled native code (C or assembly) and run it directly through managed Micro Framework. Similar to the use of DLLs on PCs and usually used to implement highprocessing and time-critical routines.

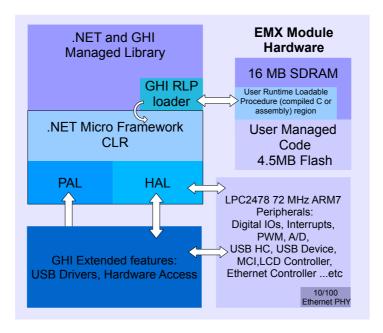
Upgrading from Original Embedded Master Module

EMX Module is designed to be compatible with the original Embedded Master Module based designs. We also provide an "EM vs EMX" document that points out the differences.



- Microsoft .NET Micro Framework
- 72Mhz 32-bit Processor
- 16MB RAM
- 4.5MB FLASH
- Embedded LCD controller
- **Embedded Ethernet PHY with** DMA communication.
- Runtime Loadable Procedure
- Full TCP/IP Stack
- SSL
- ZG2100 WiFi Driver
- PPP (GPRS/3G)
- **DPWS**
- Embedded USB host/device
- 76 GPIO Pins
- 39 Interrupt Inputs
- 2 SPI (8/16bit)
- I2C
- 4 UART
- 2 CAN Channels
- 7 10-bit Analog Inputs.
- 10-bit Analog Output
- 4-bit SD/MMC Memory card interface
- 6 PWM
- 160 mA current consumption with everything enabled
- 40mA Hibernate Mode
- -40°C to +85°C Operational
- RoHS Lead Free

Block Diagram



Getting Started with EMX Modules

GHI Electronics offers a development system for EMX Modules. The development system exposes every peripheral and includes a 320x240 3.5" display with touch screen. We highly recommend starting with the development system. With this option, you will have a running system out-of-the-box.



EMX Module Pin-out

Pins marked with IOxx are general purpose digital I/O. These pins might have other features.

	Name				
No.	LPC2478	EMX IO	2 nd Feature	EMX Module	
	H/W Name			Pin Description	
1		3.3V		Connect to 3.3 volt source.	
2				Connect to Ground.	
3	P0.4	IO0*		RD CAN Channel 2 Data Receive pin (In) and TinyBooter/Firmware Down Button	
4	P0.5	IO1*	CAN2	(Check hardware design consideration). TD CAN Channel 2 Data Transmit pin (Out).	
5	P0.3	102 *		Serial port (UART) RXD receive signal (In) for COM1.	
6	P0.2	103*		Serial port (UART) RXD receive signal (III) for COM1. Serial port (UART) TXD transmit signal (Out) for COM1.	
7	P2.5	104*		General purpose digital I/O	
'	1 2.0	104		and TinyBooter/Firmware Up Button (Check hardware design consideration).	
8	P0.24	IO5*		ADC1 (10Bit Analog to Digital Input)	
9	P0.25	106*		or Touch Screen Y-axis Up analog signal. ADC2 (10Bit Analog to Digital Input)	
9	FU.25	106		or Serial port (UART) TXD transmit signal (Out) for COM4.	
10	P0.26	107*	ADC3/ DAC/	ADC3 (10Bit Analog to Digital Input) or DAC (Digital to Analog Output)	
				or Serial port (UART) RXD receive signal (In) for COM4.	
11	P0.23	IO8*		ADC0 (10Bit Analog to Digital Input) or Touch Screen X-axis Left analog signal.	
12	P4.29	109	N/A	General purpose digital I/O	
13	P4.28	IO10	Piezo	Piezo hardware control.	
14	P0.28	IO11*	I2C	(open drain pin) I2C Interface SCL	
15	P0.27	IO12*	I2C	(open drain pin) I2C Interface SDA	
16	P3.16	IO13	PWM0	PWM0 (Pulse Width Modulation Output) LPC2478 PWM Timer 0.	
17	P3.24	IO14		PWM1 (Pulse Width Modulation Output) LPC2478 PWM Timer 1.	
18	P3.25	IO15	N/A	General purpose digital I/O	
19	P1.19	IO16	N/A	General purpose digital I/O	
20	P2.21	IO17*	N/A	General purpose digital I/O	
21	P0.11	IO18*	N/A	General purpose digital I/O	
22	P2.22	IO19*	N/A	General purpose digital I/O	
23	P0.1	IO20*	CAN1	TD CAN Channel 1 Data Transmit pin (Out)	
24	P0.10	IO21*	N/A	General purpose digital I/O.	
25	P0.0	IO22*	CAN1	RD CAN Channel 1 Data Receive pin (In)	
26	P1.30	N/A	USB_VBUS ¹	USB device power detect signal. Connect to power pin on USB device.	
27	P2.10	IO23*	N/A	General purpose digital I/O	
28	-			Connect to 3.3 volt backup battery to keep the real-time clock running.	
29	USBI			USB negative data line of the USB hosting feature.	
30				USB positive data line of the USB hosting feature.	
31	P0.12	IO45*		ADC6 (10Bit Analog to Digital Input).	
32	P0.13	IO46*		ADC7 (10Bit Analog to Digital Input).	
33	P1.31	1047		ADC5 (10Bit Analog to Digital Input).	
34				Connect to 3.3 volt source.	
35	P3.27			PWM4 (Pulse Width Modulation Output) LPC2478 PWM Timer 1.	
36				Connect to Ground.	
37				Connect to 3.3 volt source.	
38				Not Connected.	
39	P3.26	1049	PWM3	PWM3 (Pulse Width Modulation Output) LPC2478 PWM Timer 1.	
40	P3.17	IO50	PWM2	PWM2 (Pulse Width Modulation Output) LPC2478 PWM Timer 0.	
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	Name				
No.	LPC2478 H/W Name	EMX IO	2 nd Feature	EMX Mo Pin Descr	
41	U	SBD- de	vice	USB negative data line of the USB debugging	interface and for the USB client feature.
42	U:	SBD+ de	vice	USB positive data line of the USB debugging ir	nterface and for the USB client feature.
43	E	thernet F	RD-	Ethernet receive data minus.	Recommended Ethernet connector is
44	E	Ethernet RD+		Ethernet receive data plus.	J0011D01BNL.
45	Е	thernet	ΓD-	Ethernet transmit data minus.	Ethernet PHY is not needed since it is
46	E	Ethernet TD+		Ethernet transmit data plus.	embedded in EMX hardware.
47	P0.18	IO24*	SPI1	SPI master bus interface MOSI signal (Master	Out Slave In) for SPI1.
48	P0.17	IO25*	SPI1	SPI master bus interface MISO signal (Master	In Slave Out) for SPI1.
49	P0.16	IO26*	N/A	General purpose digital I/O.	
50	P0.15	IO27*	SPI1	SPI master bus interface SCK signal (Clock)for	SPI1.
51	P4.23	IO28	COM3	Serial port (UART) RXD receive signal (In) for	COM3.
52	P4.22	1029	COM3	Serial port (UART) TXD transmit signal (Out) for	or COM3.
53	P2.11	IO30*		General purpose digital I/O and TinyBooter/Firmware Select Button (Chec	ck hardware design consideration).
54	P3.30	IO31	COM2	Serial port (UART) RTS hardware handshaking	g signal for COM2.
55	P2.1	IO32*	COM2	Serial port (UART) RXD receive signal (IN) for	COM2.
56	P0.6	IO33*	N/A	General purpose digital I/O.	
57	P3.18	IO34	COM2	Serial port (UART) CTS hardware handshaking	g signal for COM2.
58	P0.7	IO35*	SPI2	SPI master bus interface SCK signal (Clock)for	SPI2.
59	P0.9	IO36*	SPI2	SPI master bus interface MOSI signal (Master	Out Slave In) for SPI2.
60	P2.0	IO37*	COM2	Serial port (UART) TXD transmit signal (Out) for COM2.	
61	P0.8	IO38*	SPI2	SPI master bus interface MISO signal (Master In Slave Out) for SPI2.	
62	P1.12	IO39	SD_DAT3	SD card 4Bit data bus, data line no. 3.	
63	P1.11	IO40	SD_DAT2	SD card 4Bit data bus, data line no. 2.	
64	P1.7	IO41	SD_DAT1	SD card 4Bit data bus, data line no. 1.	
65	P1.2	IO42	SD_CLK	SD card 4Bit data bus, clock line.	
66	P1.6	IO43	SD_DAT0	SD card 4Bit data bus, data line no. 0.	
67	P1.3	IO44	SD_CMD	SD card 4Bit data bus, command line.	
68		SD_PW	R	SD memory power (connect directly to SD soci	ket power pin).
69	GND			Connect to Ground.	
70	RESET#		#	Hardware reset signal, Reset state is on Low.	
T1	P2.12	IO69*	LCD R0	TFT Display, Red signal bit 0.	
T2	P2.6	IO65*	LCD R1	TFT Display, Red signal bit 1.	
T3	P2.7	IO66*	LCD R2	TFT Display, Red signal bit 2.	
T4	P2.8	IO67*	LCD R3	TFT Display, Red signal bit 3.	
T5	P2.9	IO68*	LCD R4	TFT Display, Red signal bit 4.	
T6	P1.20	IO51	LCD G0	TFT Display, Green signal bit 0.	
T7	P1.21	1052	LCD G1	TFT Display, Green signal bit 1.	
T8	P1.22	1053	LCD G2	TFT Display, Green signal bit 2.	
Т9	P1.23	1054	LCD G3	TFT Display, Green signal bit 3.	
T10	P1.24	IO55	LCD G4	TFT Display, Green signal bit 4.	
T11	P1.25	IO56	LCD G5	TFT Display, Green signal bit 5.	
T12	P2.13	IO70*	LCD B0	TFT Display, Blue signal bit 0.	
T13	P1.26	1057	LCD B1	TFT Display, Blue signal bit 1.	
T14	P1.27	IO58	LCD B2	TFT Display, Blue signal bit 2.	
T15	P1.28	IO59	LCD B3	TFT Display, Blue signal bit 3.	
T16	P1.29	1060	LCD B4	TFT Display, Blue signal bit 4.	
T17	P2.2	IO61*	LCD CLK	TFT Display, Clock.	

		Name			
No.	LPC2478 H/W Name	EMX IO	2 nd Feature	EMX Module Pin Description	
T18	P2.4	IO63*	LCD EN	TFT Display, Enable.	
T19	P2.5	IO64*	LCD H-Sync	TFT Display, Horizontal sync.	
T20	P2.3	IO62*	LCD V-Sync	TFT Display, Vertical sync.	
J1	ALARM Le		ALARM	Leave unconnected (future use)	
J2	P3.23	IO71	LMODE	General purpose digital I/O is used to choose the access interface for EMX between USB (Low) or COM1(High or not connected) on startup (refer to EMX access interface section).	
J3	P2.23	1072*	T_X_Right	Touch Screen X-axis Right digital output signal.	
J4	P3.31	1073	T_Y_Down	Touch Screen Y-axis Down digital output signal.	
J5	P3.29	1074	PWM5	PWM5 (Pulse Width Modulation Output) LPC2478 PWM Timer 1.	
J6	P4.31	1075	N/A	General purpose digital I/O	
J7		JTAG TMS		JTAG TMS signal.	
J8		JTAG TCK		JTAG TCK signal.	
J9	JTAG TDO		0	JTAG TDO signal.	
J10	JTAG TRST			JTAG TRST signal.	
J11	JTAG RTCK			JTAG RTCK signal.	
J12	JTAG TDI			JTAG TDI signal.	
J13	Ethernet Speed			Connect to Ethernet Connector Speed LED. High = 100 Mbps Low = 10 Mbps	
J14	Ethernet Link			Connect to Ethernet Connector Link LED. High = Ethernet activity.	
J15	GND			Connect to Ground.	

^{*} Interrupt capable input.

For further Information:

Related Documents:

EMX Development System Brochure and Pinout

EMX Module User Manual

Weblinks:

http://www.ghielectronics.com/

Customer Support:

http://www.ghielectronics.com/support



51410 Milano Dr. Suite 114 Macomb Township, MI 48042 United States

PH: +1 586 693 2696 FAX: +1 586 693 3449 www.ghielectronics.com