

# Embedded Master™ TFT Module



## Introduction

Embedded Master™ implements Microsoft .NET Micro Framework on a very small (1.55"×1.8") OEM board. On top of the many benefits that .NET Micro Framework has, Embedded Master adds many other software and hardware features.

This module is designed to be compatible with original Embedded Master non-TFT module based designs. Make sure your design can accept the TFT modules.

## What is .NET Micro Framework?

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

## Extended Framework Features

Embedded Master module supports a complete set of .NET Micro Framework features such as FAT, USB device and many more. In addition, it supports many other exclusive GHI features, for example, USB host, CAN, ADC, DAC, PPP, GPRS, 3G...etc. With embedded master, you can access files on SD/MMC cards and USB memory devices such as Thumb Drives and Hard Disks. Also, the USB host stack can access other devices like mice, keyboards, joysticks, printers, Bluetooth dongles and more.

## SideShow Support

Embedded Master module is ideal for SideShow devices.

## Key Features

- .NET Micro Framework V3.0
- 72Mhz 32-bit Processor
- 8MB RAM
- 4.5MB FLASH
- Embedded LCD controller
- Ethernet with Full TCP/IP Stack
- PPP ( GPRS/ 3G )
- DPWS
- Embedded USB host/device
- 51 GPIO Pins + 20 on LCD Connector
- 29 Interrupt Inputs + 10 on LCD connector
- 2 SPI (8/16bit)
- I2C
- 4 UART
- 2 CAN Channels
- 7 10-bit Analog Inputs.
- 10-bit Analog Output
- 4-bit SD Memory card interface
- 5 PWM
- 160 mA current consumption with everything enabled
- 40mA Hibernate Mode
- -40°C to +85°C Operational
- RoHS Lead Free

## Connectors and Pin-out

No.	Name	No.	Name
1	3.3V	70	Reset#
2	GND	69	GND
3	E0*P0.4\CAN_RD2\BTN_DN	68	SD_PWR
4	E1*(P0.5\CAN_TD2\BTN_RT	67	E44\P1.3\SD_CMD
5	E2*P0.3\UART_RXD0	66	E43\P1.6\SD_DAT0
6	E3*P0.2\UART_TXD0	65	E42\P1.2\SD_CLK
7	E4*P2.30\BTN_UP	64	E41\P1.7\SD_DAT1
8	E5*P0.24\ADC1	63	E40\P1.11\SD_DAT2
9	E6*P0.25\ADC2\UART_TXD3	62	E39\P1.12\SD_DAT3
10	E7*P0.26\ADC3\AOUT\UART_RXD3	61	E38*P0.8\LCD_MISO\SPI2_MISO
11	E8*P0.23\ADC0	60	E37*P2.0\UART_TXD1
12	E9 \P4.29\LCD_RST	59	E36*P0.9\LCD_MOSI\SPI2_MOSI
13	E10\P4.28\Piezo	58	E35*P0.7\LCD_SCK\SPI2_SCK
14	E11*P0.28\I2C_SCL (open drain)	57	E34\P3.18\UART_CTS1
15	E12*P0.27\I2C_SDA (open drain)	56	E33*P0.6\LCD_SSEL\SPI2_SSEL
16	E13\P3.16\PWM0 ( PWM Timer 0 )	55	E32*P2.1\UART_RXD1
17	E14\P3.24\PWM1 ( PWM Timer 1 )	54	E31\P3.30\UART_RTS1
18	E15 \P3.25\LCD_CMD	53	E30*P2.11\BTN_EN
19	E16 \P1.19\USB_PWR_EN	52	E29\P4.22\UART_TXD2
20	E17*P2.21	51	E28\P4.23\UART_RXD2
21	E18*P0.11\BTN_MEN	50	E27*P0.15\SPI1_SCK
22	E19*P2.22	49	E26*P0.16\SPI1_SSEL
23	E20*P0.1\CAN_TD1	48	E25*P0.17\SPI1_MISO
24	E21*P0.10\BTN_BK	47	E24*P0.18\SPI1_MOSI
25	E22 *P0.0\CAN_RD1	46	ENET_TDP
26	USB_VBUS\P1.30	45	ENET_TDM
27	E23*P2.10\BTN_LF	44	ENET_RDP
28	RTC_VBAT	43	ENET_RDM
29	USB_HOST_DM	42	USB_DEVICE_DP
30	USB_HOST_DP	41	USB_DEVICE_DM
31	ET45*P0.12\ADC6	40	ET50\P3.17\PWM2(Timer 0 )
32	ET46*P0.13\ADC7	39	ET49\P3.26\PWM3(Timer 1 )
33	ET47\P1.31\ADC5	38	TFT 5V (used to power TFT expansion with 5 volts)
34	TFT_PWR (used to power TFT expansion with 3.3volts)	37	3.3V
35	ET48\P3.27\PWM4 ( PWM Timer 1 )	36	GND

## 0.5mm TFT display header Pin-out

No.	Name	No.	Name
1	GND	21	GND
2	GND	22	GND
3	TFT_CORE connected directly to EM Pin 34 (TFT_PWR)	23	GND
4		24	BLUE0\ET70*(P2.13)
5	GND	25	BLUE1\ET57(P1.26)
6	GND	26	BLUE2\ET58(P1.27)
7	GND	27	BLUE3\ET59(P1.28)
8	RED0\ET69*(P2.12)	28	BLUE4\ET60(P1.29)
9	RED1\ET65*(P2.6)	29	GND
10	RED2\ET66*(P2.7)	30	LCD_CLK\ET61*(P2.2)
11	RED3\ET67*(P2.8)	31	LCD_EN\ET63*(P2.4)
12	RED4\ET68*(P2.9)	32	HSYNC\ET64*(P2.5)
13	GND	33	VSYNC\ET62*(P2.3)
14	GND	34	NC
15	GREEN0\ET51(P1.20)	35	TFT_5V connected directly to EM Pin 38 (TFT 5V)
16	GREEN1\ET52(P1.21)	36	
17	GREEN2\ET53(P1.22)	37	NC
18	GREEN3\ET54(P1.23)	38	NC
19	GREEN4\ET55(P1.24)	39	GND
20	GREEN5\ET56(P1.25)	40	GND

\* Interrupt capable input.

<sup>1)</sup>Note: Usually USB VBUS signal is used to detect the USB physical connection thus it can be connected to any GPIO pin to detect the USB cable is connected or not.



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