

**GPIO and display coprocessor**

**Power Supply:** +3V3, GND

**Crystal Oscillator:** C9 (10uF), R23 (100k)

**Microcontroller Pin Connections:**

- RH\_DAT 1
- HC 2
- BL\_CTL 3
- 4
- BLE\_TX 5
- 6
- 7
- PGD 8
- PGC 9
- 10
- BLE\_RX 11
- 12
- ET\_CTS 13
- E\_UITX 14
- E\_UTRX 15
- GND 16
- +3V3 17
- CMCLR 18
- ET\_TX 19
- ET\_RX 20
- AUX\_TX 21
- AUX\_RX 22

**Microcontroller Internal Connections:**

- SDA1/RP9/PMD3/RVC/CN21/RB9
- RP22/PMA1/CN18/RC6
- RP23/PMA0/CN17/RC7
- RP24/PMA5/CN20/RC8
- RP25/PMA6/CN19/RC9
- DISVREG
- VCAP/VDDCORE
- PGED2/D+/VPIO/RP10/CN16/RB10
- PGEC2/D-/VMIO/RP11/CN15/RB11
- VUSB
- AN11/C1INC/RP13/REFO/PMRD/SESSEND/CN11/RB15
- TMS/PMA10/RA10
- TCK/PMA7/RA7
- AN10/C3INB/CVREF/VCPCON/VBUSON/RP14/CN12/RB14
- AN9/C3INA/VBUSCHG/RP15/VBUSST/CN11/RB15
- AVSS
- AVDD
- MCLR
- PGED3/AN0/C3INC/VREF+/ASDA1/RP5/PMD7/CTED1/VBUSVLD/VCMPTST1/CN2/RA0
- PGEC3/AN1/C3IND/VREF-/ASCL1/RP6/PMD6/CTED2/SESSVLD/VCMPTST2/CN3/RA1
- PGED1/AN2/C2INB/DPH/RP0/PMD0/CN4/RB0
- PGEC1/AN3/C2INA/DMH/RP1/PMD1/CN5/RB1
- USBOEN/SCL1/RP8/PMD4/CN22/RB8
- RP7/OMD5/INT0/CN23/RB7
- VBUS
- CN27/USBID/RB5
- VDD
- VSS
- RP21/PMA3/CN26/RC5
- RP20/PMA4/CN25/RC4
- AN12/RP19/PMBE/CN28/RC3
- TDI/PMA9/RA9
- SOSCO/SCLKI/T1CK/C2INC/CN0/RA4
- SOSCI/C2IND/RP4/CN1/RB4
- DO/PMA8/RA8
- OSCO/CLK0/CN29/RA3
- OSCI/CLKI/C1IND/PMCS1/CN30/RA2
- VSS
- VDD
- AN8/RP18/PMA2/CN10/RC2
- AN7/RP17/CN9/RC1
- AN6/RP16/CN8/RC0
- AN5/C1INA/DMLN/RTCC/SCL2/RP3/PMWR/CN7/RB3
- AN4/C1INB/DPLN/SDA2/RP2/PMD2/CN6/RB2

**Display Coprocessor Pin Connections:**

- 44 RH\_CLK
- 43 C\_INT0
- 42
- 41 LCD\_EN
- 40
- 39
- 38 FL\_MISO
- 37 FL\_MOSI
- 36 FL\_CLK
- 35 LCD\_RST
- 34 RESETB
- 33 TP\_IRQ
- 32 BLF\_CTS
- 31 BLF\_RTS
- 30 FL\_CS
- 29
- 28
- 27 L\_SPL\_MISO
- 26 L\_SPL\_MOSI
- 25 L\_SPL\_CLK
- 24 L\_SPL\_TP\_CS
- 23 L\_SPL\_LCD\_CS

**Other Connections:**

- +3V3
- GND
- +3V3
- GND
- +3V3
- GND

**Component Values:**

- C9: 10uF
- R23: 100k
- C10: 100nF

**Microcontroller Part Number:** PIC24FJ64GB004

Power regulation and decoupling

The diagram illustrates the power regulation and decoupling circuit. It features a +14V input connected to a 100nF capacitor (C1) and the VIN pin of an OKI-78SR-3V3 voltage regulator (U2). The regulator's VOUT pin is connected to a 1uF capacitor (C2) and the +3V3 output. The regulator's GND pin is connected to ground. The +3V3 output is also connected to a series of decoupling capacitors (C4-C13) connected to ground. The capacitors are: C4 (100nF), C5 (100nF), C6 (100nF), C7 (100nF), C11 (100nF), C12 (100nF), and C13 (100nF). The diagram also shows two multi-pin connectors, J3 and J5, with pins 1 and 2 connected to the power lines.

The diagram illustrates a low-side switching circuit for three different loads: a fan, a heater, and an LCD. The circuit is powered by a 5V supply (indicated by the '5V' label at the top left) and grounded (GND).

**Fan Circuit:** The fan is controlled by three NPN transistors (Q1, Q2, Q3). The base of Q1 is connected to the 5V supply through resistor R11 (10k). The base of Q2 is connected to the 5V supply through resistor R12 (10k). The base of Q3 is connected to the 5V supply through resistor R13 (10k). The emitters of Q1, Q2, and Q3 are connected to GND. The collectors of Q1, Q2, and Q3 are connected to the fan motor (represented by a circle with an 'X' inside). The fan motor is also connected to GND.

**Heater Circuit:** The heater is controlled by two NPN transistors (Q4, Q5). The base of Q4 is connected to the 5V supply through resistor R14 (1k). The base of Q5 is connected to the 5V supply through resistor R3 (10k). The emitters of Q4 and Q5 are connected to GND. The collectors of Q4 and Q5 are connected to the heater (represented by a circle with an 'X' inside). The heater is also connected to GND.

**LCD Circuit:** The LCD is controlled by two NPN transistors (Q6, Q7). The base of Q6 is connected to the 5V supply through resistor R14 (1k). The base of Q7 is connected to the 5V supply through resistor R3 (10k). The emitters of Q6 and Q7 are connected to GND. The collectors of Q6 and Q7 are connected to the LCD (represented by a circle with an 'X' inside). The LCD is also connected to GND.

**Control Signals:** The control signals for the fan, heater, and LCD are labeled FAN\_NEG, HEAT\_NEG, and LCD\_EN. These signals are connected to the bases of the transistors Q1, Q4, and Q5 respectively.

**Grounding:** The common ground for the entire circuit is labeled GND.

Diagram illustrating the pin configuration for the M25P32 flash memory. The pins are labeled as follows:

- Pin 1: P\_HOLD (13/7)
- Pin 2: P\_VCC (2)
- Pin 3: S\_VCC (14/8)
- Pin 4: P\_Q (8)
- Pin 5: S\_Q (4/2)
- Pin 6: P\_VSS (10)
- Pin 7: P\_CS (7)
- Pin 8: S\_CS (3/1)
- Pin 9: P\_W (9)
- Pin 10: S\_W (5/3)
- Pin 11: P\_D (15)
- Pin 12: S\_D (11/5)
- Pin 13: P\_CLK (16)
- Pin 14: S\_CLK (12/6)
- Pin 15: P\_MOSI (15)
- Pin 16: S\_MOSI (11/5)

Power connections are indicated:

- +3V3 is connected to pins 2 and 3.
- +3V3 is connected to pins 4 and 5.
- GND is connected to pins 10 and 11.

**EPIC-PR06-PORT**

**MSP430 JTAG**

TMS  
TDI  
TDO  
TCK  
GND  
VDD

**FLASH SPI**

TMS  
TDI  
TDO  
TCK  
GND  
VDD

**J7**

**J12**

**J8**

+3V3  
E\_U1TX  
TCK  
5

VDD  
TX1  
TCK  
GND  
RX1  
RST#

**GND**

2  
4  
6

E\_U1RX  
RST

**PIC ICSP**

RESET  
VDD  
GND  
PGD  
PGC  
LVP

+3V3  
CMCLR

PGD  
PGC

**GND**

**J10**

Bluetooth Low Energy (BLE) Transceiver

The diagram shows a BLE Transceiver module with the following connections:

- UART Pins:** UART\_TX, UART\_RX, UART\_CTS, UART\_RTS.
- GPIO Pins:** BLE\_TX, BLE\_RX, BLE\_CTS, BLE\_RTS, BLEGPIO, SYSKEY.
- Control Pins:** RESETB, VCC, GND1.
- Power Pins:** +3V3, GND2, GND3.
- Other Pins:** NC1, NC2, NC3, NC4, NC5, NC6, NC7, NC8, NC9, NC10, NC11, UB\_D+, USB\_D-.

Component values and connections:

- R15:** 4k7 resistor, connected between +3V3 and RESETB.
- C3:** 10uF capacitor, connected between +3V3 and VCC.

The schematic diagram illustrates the electrical connections for the screen, sensing, and actuation headers of the HMI board. It includes the following components and connections:

- FAN Neg (J2):** A 2-pin header connected to a +14V source (pin 1) and GND (pin 2).
- HEAT Neg (J6):** A 2-pin header connected to a +14V source (pin 1) and GND (pin 2).
- UI elements header (J11):** A 14-pin header with the following connections:
  - Pins 1, 3, 5, 7, 9, 11, 13: +3V3
  - Pins 2, 4, 6, 8, 10, 12, 14: GND
  - Pin 1: ACTL0
  - Pin 3: ACTL2
  - Pin 5: ACTL4
  - Pin 7: DCTL0
  - Pin 9: DCTL2
  - Pin 11: ACTL1
  - Pin 13: DCTL1
  - Pin 15: ACTL3
  - Pin 17: ACTL5
  - Pin 19: DCTL3
- RH/Temp header (J9):** A 6-pin header connected to a +3V3 source (pin 1), GND (pin 2), RH\_CLK (pin 3), and RH\_DAT (pin 4).
- LCD header (J13):** A 12-pin header with the following connections:
  - Pins 1, 3, 5, 7, 9, 11: +3V3
  - Pins 2, 4, 6, 8, 10, 12: GND
  - Pin 1: L\_SPI\_CLK
  - Pin 3: L\_SPI\_MISO
  - Pin 5: L\_SPI\_LCD\_CS
  - Pin 7: LCD\_RST
  - Pin 9: LCD\_GND
  - Pin 11: L\_SPI\_MOSI
  - Pin 13: L\_SPI\_TP\_CS
  - Pin 15: TP\_IRQ
  - Pin 17: BL\_CTL
- MODBUS header (J1):** A 6-pin header connected to a +14V source (pin 1), GND (pin 2), and +3V3 (pin 3). Pins 4 and 5 are connected to AUX\_TX and AUX\_RX, respectively.

The schematic diagram illustrates the power and signal connections for the EPIC core. The central component is the EPIC-CORE\_A chip, which is connected to various external components and power supplies.

**Power Connections:**

- +3V3 Supply:** The +3V3 supply is connected to the chip through a diode-ORed network (D1, D2, D3) and resistors (R16, R17, R18). The chip has multiple pins (P568-P552) connected to this supply.
- +14V Supply:** The +14V supply is connected to the chip through a resistor network (R1, R2). The chip has pins (P518-P534) connected to this supply.
- AVDD and DVDD:** The chip has pins for AVDD (P517) and DVDD (P568) connected to the +3V3 supply.
- RVDD:** The chip has pins for RVDD (P552) connected to the +3V3 supply.

**Signal and I/O Connections:**

- GPIOs:** The chip has multiple pins for GPIOs (P561-P552) connected to the +3V3 supply.
- UARTs:** The chip has pins for UART1TX (P561), UART1RX (P562), UART0TX (P559), and UART0RX (P558) connected to the +3V3 supply.
- I2C:** The chip has pins for I2C0 (P552) and I2C1 (P553) connected to the +3V3 supply.
- Flash:** The chip has pins for FLASH\_WP (P537) and FLASH\_CS (P536) connected to the +3V3 supply.
- Antenna:** The chip has pins for ANT1 (P535) connected to the +3V3 supply.

The chip is labeled EPIC-CORE\_A and has a GND pin (P552) connected to ground.

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