

MINDRACER GEN.3 REDPOLL

Datasheet

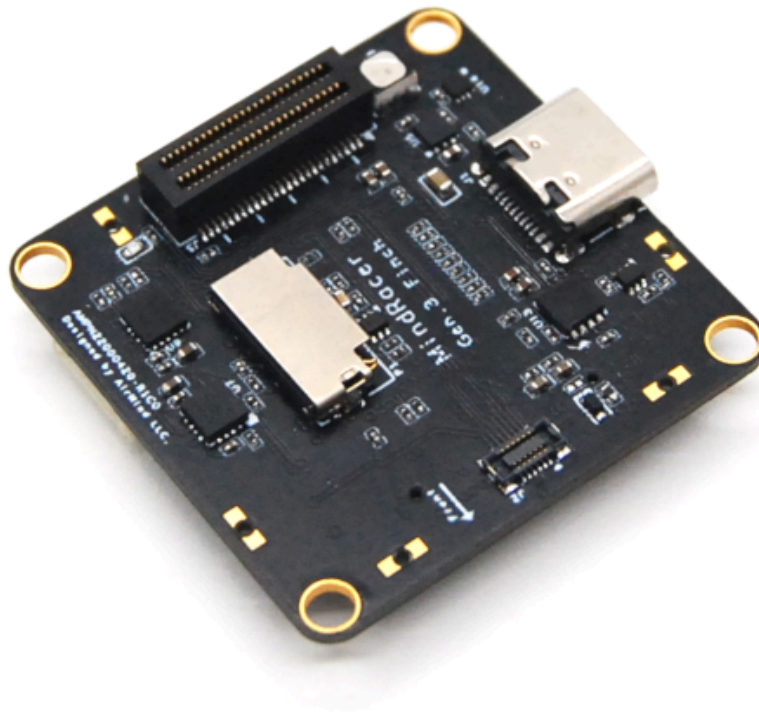


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Introduction

MindRacer Gen.3 Redpoll is a new generation flight controller designed for racing drone and other miniature size drones. Within the same 35x35mm racing drone form-factor, the new generation features more powerful MCU, larger memory, and more I/O ports than its predecessors. The hardware is re-designed to be the essential part of modularized drone architecture.

Hardware specification

On-board elements

- STM32H743VIT6 MCU (400MHz, 2MB flash storage)
- IMU sensors
 - ICM20602 6-axis accelerometer & gyro (on SPI4)
 - QMC5883L compass (on I2C1)
 - DPS310 barometer (on I2C1)
- CAN bus transceiver (TJA1051TK/3)
- System status tricolor LED
- TF card slot (SPI3 to MMCSD)
- USB-C connector
- 6-pin Mini-debug port
- 12-pin isolated redundant IMU socket (shared bus)
- 98-pin WEP2 I/O connectors (48 (bottom) + 50 (top and bottom))

Top side

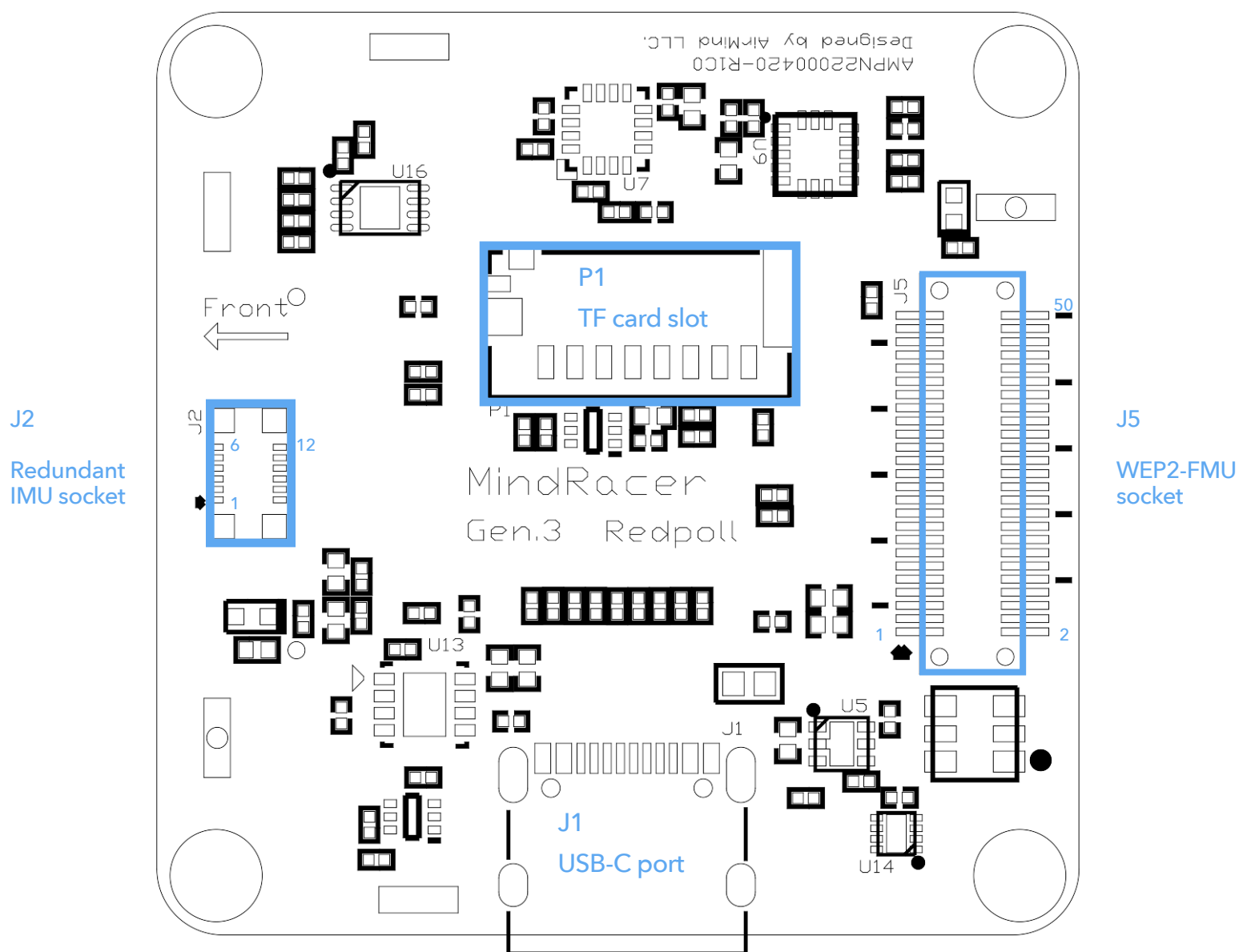


Fig.1 Top side

Bottom side (see through)

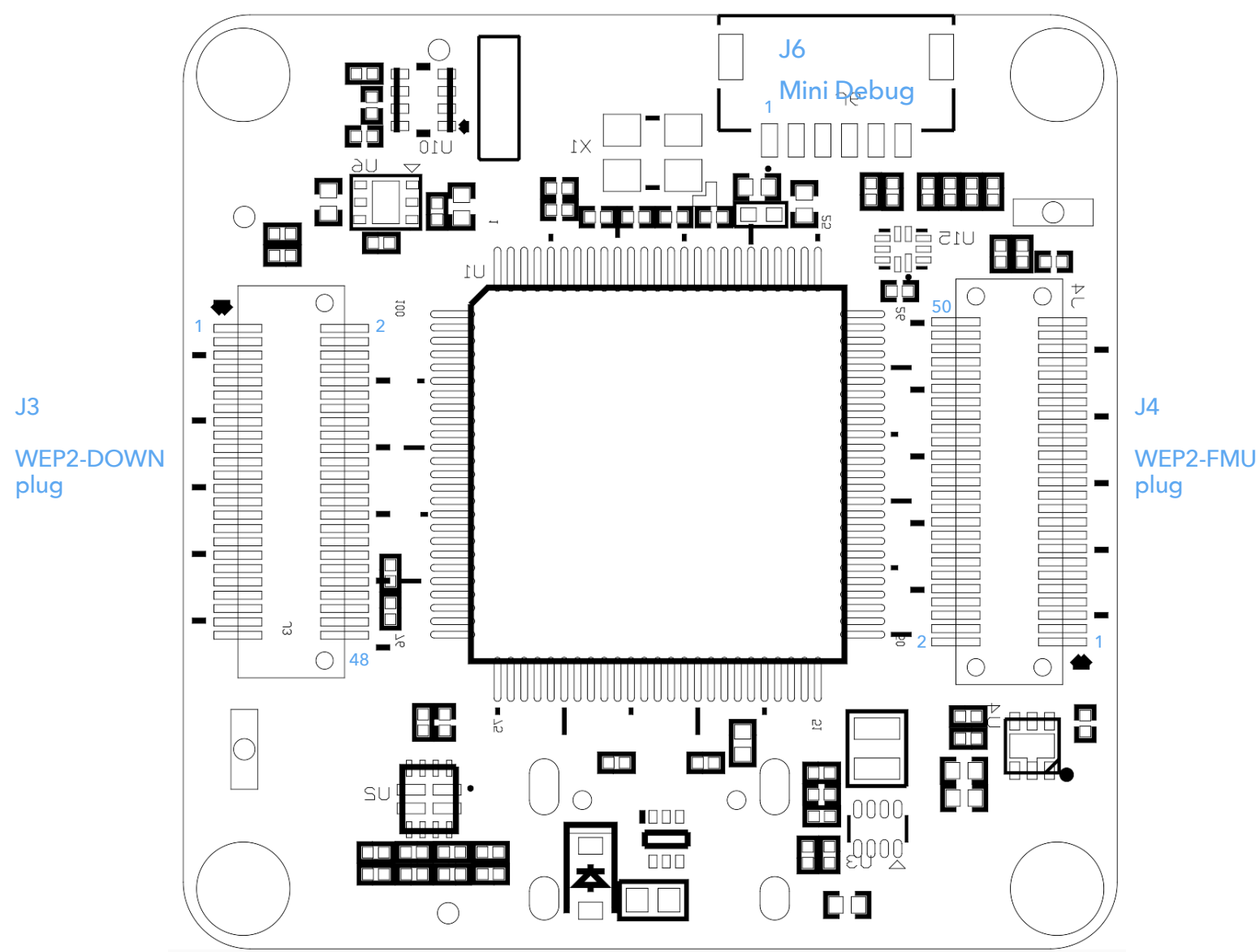


Fig.2 Bottom side (see through)

I/O specification

- Total 14 PWM outputs (8 AUX channels + 6 FMU channels)
- Spare ADC 6.6V x 1
- PWM capture input channel x 1
- External SPI bus x 1
- S.Bus input/output
- ESC telemetry input x 1
- CAN x 1
- ETH RMII x 1
- Full UART x 1 (with flow control), USART x 2
- I2C x 2

Connector specification

- O - Output direction (From MCU to device)

I - Input direction (From device to MCU)
- I/O - bi-direction

NC - no connection

Mini-debug port specification (J6)

| Pin # | Signal name | Direction | Level/default | pin# | Signal name | Direction | Level/default |
|-------|---------------|-----------|---------------|------|-------------|-----------|---------------|
| 1 | VRef | O | 3.3V | 4 | FMU_SWDIO | I/O | 3.3V |
| 2 | FMU_USART3_TX | O | 3.3V | 5 | FMU_SWCLK | O | 3.3V |
| 3 | FMU_USART3_RX | I | 3.3V | 6 | GND | N/A | N/A |

Table.1 Mini-debug port

Redundant IMU socket specification (J2)

| Pin # | Signal name | Direction | Level/default | pin# | Signal name | Direction | Level/default |
|-------|---------------|-----------|---------------|------|-----------------------|-----------|---------------|
| 1 | FMU_SPIx_SYNC | O | 3.3V | 7 | FMU_SPI4_DRDY2_SENSOR | I | 3.3V |
| 2 | NC | N/A | N/A | 8 | FMU_SPI4_nCS2_SENSOR | O | 3.3V |
| 3 | GND | N/A | N/A | 9 | FMU_SPI4_MOSI_SENSOR | O | 3.3V |
| 4 | FMU_Heater | O | 3.3V | 10 | FMU_SPI4_MISO_SENSOR | I | 3.3V |
| 5 | FMU_I2C1_SDA | I/O | 3.3V | 11 | FMU_SPI4_SCK_SENSOR | O | 3.3V |
| 6 | FMU_I2C1_SCL | O | 3.3V | 12 | VENSOR_3V3 | O | 3.3V |

Table.2 Redundant IMU socket (Panasonic AXE512127)

WEP2 interface specification (J3, J4, J5)

WEP2 interface brings out total 98 I/O signals, provided by one 48-pin connector (named WEP2_DOWN) and one 50-pin connector(named WEP2_FMU). The connectors can be either plug (bottom side mount) or socket (top side mount).

Note: The WEP2 plug’s pin definition is a swap of even pin column and odd pin column in following tables of socket. E.g., WEP2-DOWN plug’s pin #1 is pin #2 of WEP2-DOWN socket, etc.

WEP2-DOWN (socket)

| Pin # | Signal name | Direction | Level/default | pin# | Signal name | Direction | Level/default |
|-------|----------------------|-----------|---------------|------|--------------------|-----------|---------------|
| 1 | FMU_CH1 | O | 3.3V | 2 | AUX_CH1 | O | 3.3V |
| 3 | FMU_CH2 | O | 3.3V | 4 | AUX_CH2 | O | 3.3V |
| 5 | FMU_CH3 | O | 3.3V | 6 | AUX_CH3 | O | 3.3V |
| 7 | FMU_CH4 | O | 3.3V | 8 | AUX_CH4 | O | 3.3V |
| 9 | FMU_SPI2_EXT_nRST | O | 3.3V | 10 | AUX_CH5 | O | 3.3V |
| 11 | FMU_SPIx_SYNC | O | 3.3V | 12 | AUX_CH6 | O | 3.3V |
| 13 | Reserved | | | 14 | AUX_CH7 | O | 3.3V |
| 15 | FMU_I2C1_SCL | O | 3.3V | 16 | AUX_CH8 | O | 3.3V |
| 17 | FMU_I2C1_SDA | I/O | 3.3V | 18 | Reserved | | |
| 19 | GND | N/A | N/A | 20 | Reserved | | |
| 21 | FMU_UART5_TX_SBUS_TX | O | 3.3V | 22 | ETH_MDIO | I/O | 3.3V |
| 23 | ESC_TELEM_UART5_RX | I | 3.3V | 24 | ETH_MDC | O | 3.3V |
| 25 | Reserved | | | 26 | FMU_SPI2_EXT_DRDY1 | I | 3.3V |
| 27 | Reserved | | | 28 | FMU_SPI2_EXT_nCS1 | O | 3.3V |
| 29 | Reserved | | | 30 | Reserved | | |
| 31 | GND | | | 32 | Reserved | | |
| 33 | RC_RSSI | I | 3.3V | 34 | Reserved | | |
| 35 | GND | N/A | N/A | 36 | GND | N/A | N/A |
| 37 | BAT_VOL_SENSE | I | 3.3V | 38 | Reserved | | |
| 39 | BAT_CUR_SENSE | I | 3.3V | 40 | Reserved | | |
| 41 | GND | N/A | N/A | 42 | GND | N/A | N/A |
| 43 | VBAT_FC_5V | I | 5V | 44 | VBAT_FC_5V | I | 5V |
| 45 | VBAT_FC_5V | I | 5V | 46 | VBAT_FC_5V | I | 5V |
| 47 | VBAT_FC_5V | I | 5V | 48 | VBAT_FC_5V | I | 5V |

Table.3 WEP2-DOWN socket pin definition

WEP2-FMU (socket)

| Pin # | Signal name | Direction | Level/default | pin# | Signal name | Direction | Level/default |
|-------|-----------------------|-----------|---------------|------|-------------------|-----------|---------------|
| 1 | VBAT_12V | I | 12V | 2 | VPE_5V | O | 5V |
| 3 | VBAT_12V | I | 12V | 4 | VPE_5V | O | 5V |
| 5 | VBAT_12V | I | 12V | 6 | VPE_5V | O | 5V |
| 7 | FMU_USART1_TX | O | | 8 | VPE_3V3 | O | 3.3V |
| 9 | FMU_USART2_RX_SBUS_IN | I | | 10 | BUZZ | O | |
| 11 | ETH_TX_EN | O | | 12 | GND | N/A | N/A |
| 13 | nARMED | I/O | | 14 | ETH_TXD0 | O | |
| 15 | Reserved | | | 16 | ETH_TXD0 | O | |
| 17 | Reserved | | | 18 | GND | N/A | N/A |
| 19 | Reserved | | | 20 | FMU_CAP1 | I | |
| 21 | Reserved | | | 22 | Reserved | | |
| 23 | FMU_UART7_CTS_TELEM1 | O | | 24 | Reserved | | |
| 25 | FMU_UART7_RTS_TELEM1 | I | | 26 | FMU_SPI2_EXT_SCK | O | |
| 27 | FMU_UART7_TXD_TELEM1 | O | | 28 | FMU_CH6 | O | |
| 29 | FMU_UART7_RXD_TELEM1 | I | | 30 | FMU_CH5 | O | |
| 31 | FMU_USART1_RX | I | | 32 | FMU_SPI2_EXT_nCS2 | O | |
| 33 | GND | N/A | N/A | 34 | FMU_SPI2_EXT_MISO | I | |
| 35 | ETH_RXD1 | I | | 36 | FMU_SPI2_EXT_MOSI | O | |
| 37 | ETH_RXD0 | I | | 38 | GND | N/A | N/A |
| 39 | GND | N/A | N/A | 40 | FMU_I2C4_SCL | O | |
| 41 | ETH_REF_CLK | I/O | | 42 | FMU_I2C4_SDA | I/O | |
| 43 | GND | N/A | N/A | 44 | FMU_UART8_RX | I | |
| 45 | ETH_CRSDV | I | | 46 | FMU_UART8_TX | O | |
| 47 | ADC_6V6 | I | | 48 | CANN_L | I/O | |
| 49 | GND | N/A | N/A | 50 | CANN_H | I/O | |

Table.4 WEP2-FMU socket pin definition

Electrical Characteristics

| | Voltage | Current | USB version | USB data rate | Min | Max | Unit |
|------------------------|---------|---------|-------------|---------------|------|------|------|
| USB-C Input voltage* | 5 | | 2.0 | 12Mbps | 4.75 | 5.25 | V |
| USB-C Input current | | 0.5 | | | 0.5 | 3 | A |
| Battery Input voltage* | 5 | | | | 4.75 | 5.25 | V |
| Battery Input current | | 0.5 | | | 0.5 | 6 | A |
| VPE_5V output voltage | 5 | | | | 4.75 | 5.25 | V |
| VPE_5V current | | | | | | 3 | A |
| VPE_3V3 output voltage | 3.3 | | | | 3.0 | 3.5 | V |
| VPE_3V3 current | | 0.1 | | | | 0.5 | A |

Table.5 Electrical characteristics

* USB-C input takes priority over Battery input when both connected.

Mechanical form-factors

| | |
|--|-----------|
| Dimension: | 35 x 35mm |
| PCB thickness: | 1.0mm |
| Height(maximum): | 9.0mm |
| WEF2 connector mated height: | 6.0mm |
| Mounting hole to mounting hole distance: | 30.5mm |
| Weight: | 6g |

