EE4951 Firmware Documentation

Ross Harvey

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**1. Communications Busses**

SPI0

* SD Card
* 10MHz

SPI1

* OLED Display
* 2MHz

UART1

* USB interface (FT232RQ)
* Baudrate: 115200 bps
* Width: 8-bit
* Parity: None

**2. Start-up Options**

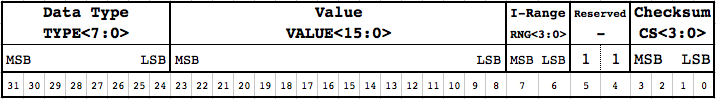
Four GPI bits (OPT<3:0>) are included to run the device in different modes. These four bits will only be read immediately after the MCU is reset or powered on.

|  |  |  |
| --- | --- | --- |
| **OPT<3:0>** | **Mode** | **Description** |
| 0000 | Normal | - |
| 0001 | USB Output | Normal mode with unidirectional USB |
| 0010 | Hardware Debug | Normal mode with bidirectional USB |
| 0011 |  |  |
| 0100 |  |  |
| 0101 |  |  |
| 0110 |  |  |
| 0111 |  |  |
| 1000 |  |  |
| 1001 |  |  |
| 1010 |  |  |
| 1011 |  |  |
| 1100 |  |  |
| 1101 |  |  |
| 1110 |  |  |
| 1111 |  |  |

Table 1: OPT<3:0> assignments

**3. USB-UART Communication (Unidirectional)**

During normal operation, if USB unidirectional mode is enabled with the OPT bits, the MCU will output ADC readings and current status data asynchronously. It will be necessary for the Python script to read these packets from the USB buffer and parse them to obtain readings. The packet structure is given below.



|  |  |  |
| --- | --- | --- |
| **TYPE<7:0>** | **Data Type** | **VALUE<15:0>** |
| 0x00 | DUT Voltage | 16-bit raw values.  See scaling factors |
| 0x01 | DUT Current |
| 0x02 | Self 3.3v Voltage |
| 0x03 | Self 3.3v Current |
| 0x04 | Self 5v Voltage |
| 0x05 | Self 5v Current |
| 0x06 | Status Register | See fig xxxxxxx |
| 0x07 | DUT Current Average |  |
| 0x08 | DUT Voltage Average |  |
| 0x09 | Stats Period | Elapsed time for stats (in seconds) |

**3.1 DUT Voltage**

TYPE<7:0> = 0x00

VALUE<15:0> = Unsigned 16-bit value (Scaled)

To recover VBAT, use *(REV A)*

RNG<1:0> = *not used*

**3.2 DUT Current**

TYPE<7:0> = 0x01

VALUE<15:0> = Unsigned 16-bit value (Scaled)

To recover IDUT, use *(REV A)*

RNG<1:0> = Determines which range is currently active. Affects

scaling factor and IDUT recovery.

|  |  |  |
| --- | --- | --- |
| **RNG<1:0>** | **Range** | **SCALE** |
| 00 | DUT\_RANGE0 | 1.831055x10-4 |
| 01 | DUT\_RANGE1 | 1.831055x10-6 |
| 10 | DUT\_RANGE2 | 1.831055x10-8 |
| 11 | DUT\_RANGE3 | 1.831055x10-9 |

**3.3 Self 3.3v Voltage**

TYPE<7:0> = 0x02

VALUE<15:0> = Unsigned 16-bit value (Scaled)

To recover V3.3v, use *(REV A)*

RNG<1:0> = *not used*

**3.4 Self 3.3v Current**

TYPE<7:0> = 0x03

VALUE<15:0> = Unsigned 16-bit value (Scaled)

To recover I3.3v, use *(REV A)*

RNG<1:0> = *not used*

**3.5 Self 5v Voltage**

TYPE<7:0> = 0x04

VALUE<15:0> = Unsigned 16-bit value (Scaled)

To recover V5v, use *(REV A)*

RNG<1:0> = *not used*

**3.5 Self 5v Current**

TYPE<7:0> = 0x05

VALUE<15:0> = Unsigned 16-bit value (Scaled)

To recover I5v, use *(REV A)*

RNG<1:0> = *not used*

**3.5 Status Register**

TYPE<7:0> = 0x06

VALUE<15:0>

|  |  |  |
| --- | --- | --- |
| **Bits** | **Function** | **Notes** |
| VALUE<15:12> | OPT<3:0> | Startup Options |
| VALUE<11:10> | DUT Current Range | Range 0-3 |
| VALUE<9> | POWER\_FAIL\_IRQ | Power OK (Active High) |
| VALUE<8> | STATS\_IRQ | Stats Start/END Button(Active Low) |
| VALUE<7> | SD\_DETECT | SD Card Present(Active Low) |
| VALUE<6> | SD\_CS | SD Chip Select (Active Low) |
| VALUE<5> | DISP\_RES | Display Reset (Active Low) |
| VALUE<4> | DISP\_CS | Display Chip Select (Active Low) |
| VALUE<3> | DISP\_DC | Display Data/Command (Data High) |
| VALUE<2> | Stats Running | High if collecting stats data |
| VALUE<1:0> | *not used* | *not used* |

**3.6 DUT Current Average**

May be implemented later. More to come…

**3.6 DUT Voltage Average**

May be implemented later. More to come…

**3.6 Stats Period**

May be implemented later. More to come…

**4. USB-UART Communication (Bidirectional)**