B.1 Adressmap

Register Name	Adress	Number of bits	Unit	Access	Default value	Description
FW_VERSION	0x00	8	-	R	-	Current firmware version.
ADC_VALUE	0x02	12	V/V	R/$\overline{\text{W}}$	-	12-bit ADC value.
PT100_READING	0x04	8	°C	R	-	ADC value converted to degrees celsius.
TEMPERATURE_LIMIT	0x06	8	°C	R/$\overline{\text{W}}$	100°C	On measuring a temperature above TEMPERATURE_LIMIT the enable signals will be set low. Error 0x01.
DAC_VALUE	0x08	10	V/V	R/$\overline{\text{W}}$	0x00	DAC voltage output from the MCU, input from 0x00 to 0x400 creates an output of 0 V to 2.5 V. NOTE: Read about the PWELL generation before changing. DOUBLE NOTE: The DAC utilises the 10 most significant bits!
PWELL_VOLTAGE_MCU	0x0A	13	mV	$\overline{\text{W}}$	0x00	The desired PWELL voltage in millivolt. Writing a value to this registers triggers the MCU to create the complementary voltage on the PWELL line.
DVDD_CURRENT_THRESHOLD1	0x0C	14	mV	R/$\overline{\text{W}}$	0x00	INA3221 DVDD critical threshold. If the DVDD line exceed this current draw the enable signals are set low. Error 0x02
DVDD_CURRENT_THRESHOLD2	0x0E	14	mA	R	0x00	DVDD warning threshold. Error 0x03
DVDD_VOLTAGE	0x10	13	mV	R	-	DVDD shunt resistor measured voltage.
DVDD_CURRENT	0x12	13	mA	R	-	DVDD shunt resistor measured current.
AVDD_CURRENT_THRESHOLD1	0x14	14	mA	R/$\overline{\text{W}}$	0x00	INA3221 AVDD critical threshold. If the AVDD line exceed this current draw the enable signals are set low. Error 0x04
AVDD_CURRENT_THRESHOLD2	0x16	14	mA	R/$\overline{\text{W}}$	0x00	INA3221 AVDD warning threshold. Error 0x05
AVDD_VOLTAGE	0x18	13	mV	R	-	AVDD Voltage
AVDD_CURRENT	0x1A	13	mA	R	-	AVDD CURRENT
PWELL_CURRENT_THRESHOLD1	0x1C	14	mA	R/$\overline{\text{W}}$	0x00	INA3221 PWELL critical threshold. If the PWELL line exceed this current draw the enable signals are set low. Error 0x06
PWELL_CURRENT_THRESHOLD2	0x1E	14	mA	R/$\overline{\text{W}}$	0x00	INA3221 AVDD warning threshold. Error 0x07
PWELL_VOLTAGE_INA3221	0x20	14	mV	R	-	PWELL voltage measured by the INA3221
PWELL_CURRENT	0x22	14	mV	R	-	PWELL Current measured by the INA3221
ENABLE_SIGNALS	0x24	12	-	R/$\overline{\text{W}}$	0x00	Each bit represents an enable line controlling the power to a string. String 0 is tied to LSB.
STRING_DVDD_CURRENT_VALUE[n]	0x26+[2n]	13·12	mA	R	0x00	The DVDD current values for each string after the scan flag has been asserted. In total 12 register with 13 bytes each. Each string register takes two bytes, and the address for string n is offset by 2n bytes.

Register Name	Adress	Number of bits	Unit	Access	Default value	Description
STRING_AVDD_CURRENT_VALUE[n]	0x3E+[2n]	13·12	mA	R	0x00	The AVDD current values for each string after the scan flag has been asserted. In total 12 register with 13 bytes each. Each string register takes two bytes, and the address for string n is offset by 2n bytes.
STRING_PWELL_CURRENT_VALUE[n]	0x56+[2n]	13·12	mA	R	0x00	The PWELL current values for each string after the scan flag has been asserted. In total 12 register with 13 bytes each. Each string register takes two bytes, and the address for string n is offset by 2n bytes.

Register Name	Adress	Number of bits	Unit	Access	Default value	Description
CTRL1	0x6E	8	-	R/$\overline{\text{W}}$	-	Control register A
CTRL2	0x70	8	-	R/$\overline{\text{W}}$	-	Control register B
CTRL3	0x72	8	-	R/$\overline{\text{W}}$	-	Control register C
ERROR_COUNT	0x74	8	-	R/$\overline{\text{W}}$	0x00	Amount of errors since last clear. Is cleared by writing 0x00 to this register.
ERROR_MSG	0x76	128	-	R	0x00	Error messages stored in sequence, each byte is an error message. The most reccent error is placed in LSB. Automatically cleared by clearing ERROR_COUNT

B.2 Error Codes

Error name	Error code	Description
Temperature limit reached	0x01	The ADC value is reported to be above the temperature set by the TEMPERATURE_LIMIT register.
DVDD critical current	0x02	Critical current reached on DVDD line.
DVDD warning current	0x03	Warning current reached on DVDD line.
AVDD critical current	0x04	Critical current reached on AVDD line.
AVDD warning current	0x05	Warning current reached on AVDD line.
PWELL critical current	0x06	Critical current reached on PWELL line.
PWELL warning current	0x07	Warning current reached on PWELL line.
Write/Read denied	0x08	Tried to write or read a register that should not have been read or written.
String current error	0x09	Large current draws from the strings recorded.
Enable scan error	0x0A	Large current draws from a single string recorded during the enable scan.

B.3 Control Registers

ResRegs				ErrorRes	SoftStart	EnScan	EnOff

Figure B.1: CTRL1 register.

Bit 7 - ResRegs: Reset Registers
Resets all registers back to its default values(check the registermap for default values).

Bit 6 - :

Bit 5 - :

Bit 4 - :

Bit 3 - ErrorRes: Reset Errormessages
Clears the error message registers completely and resets the ERROR_COUNT pointer to 0.

Bit 2 - SoftStart: Soft Startup
Soft startup initialization. On asserting the bit the MCU turns off all enable signals and writes the current and voltage values to the INA modules. The MCU loops through the strings one by one and saves the current draw. On detection of large current draws from a string error 0x09 is written to the error register.

Bit 1 - EnScan: Enable Scan
Performs a scan of all the strings while logging the current values in the STRING_CURRENT_VALUEn register. The values are not reported back automatically. On completion the enable signals are tied low(off).

Bit 0 - EnOff: Enable Off
Turns off all enable lines. A bit faster than writing to the ENABLE_SIGNALS register as it is stored in a single byte, also ensures that all values are 0.