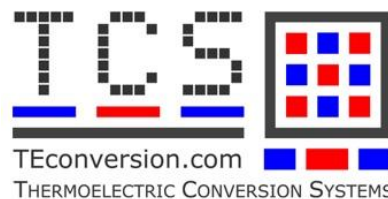


I2C COMMUNICATION FOR TCS PRODUCTS

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Introduction

This document details the communication protocol required to successfully communicate to any TCS product implementing I2C communication, either as master or slave.

TCS I2C communication protocol is based on PMBus™ (Power System Management Protocol) rev 1.3.1.

General Considerations

A Byte comprises of 8 bits, the least significant bit (LSB) is indicated as Bit 0. The most significant bit (MSB) of a byte is always Bit 7.

When sending a word, the low data byte is transmitted first, the high data byte last.

Communication by the master is represented in images on white background, while data on grey background is related to the slave device. Moreover, the following notation is used:

- S: start or repeated- start condition
- P: stop condition
- A: acknowledge (ACK, logic-low)
- NA: not acknowledge (NACK, logic-high)
- W: write bit (logic-low)
- R: read (logic-high)

General Communication Structure

It comprises of one (slave) address (ADDR), one command code (CMD) and two bytes (i.e. one word) of data.

The address is made of 7 bits, following I2C rules to left-shift it by 1 bit.

The command code is made of one byte and it identifies a certain piece of data.

The data can be read-only or R/W, therefore if the master tries to write on read-only data, the master data is discarded by the slave.

When the master requires data related to a command that is not identified by the slave, the slave replies with 0xFFFF.

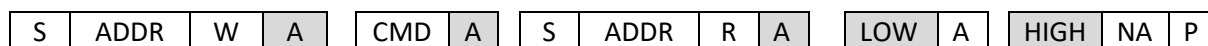
The “Write” Operation (by the master)

In this communication instance the master wants to write a word to the information represented by the command. The write-word operation is as follows, where each segment represents 9 bits, one per each master clock pulse:



The “Read” Operation (by the master)

In this communication instance the master wants to write a word to the information represented by the command. The write-word operation is as follows, where each segment represents 9 bits, one per each master clock pulse:



List of Commands

0x20 - VOUT_MODE

This command is used to select between output voltage regulation – set to 0x01 – or input voltage regulation (if a voltage source is connected to the output) – set to 0x00.

0x21 - VOUT_COMMAND

It reads the output voltage.

0x24 - VOUT_MAX

It reads/sets the working voltage to control the battery at when in battery management.

0x25 - VOUT_MARGIN_HIGH

It reads/sets the absolute maximum output voltage.

0x26 - VOUT_MARGIN_LOW

It reads/sets the absolute minimum output voltage.

0x27 - VOUT_TRANSITION_RATE

It reads/sets the transition voltage between forced maximum power point tracking (MPPT) and battery management.

0x28 - VOUT_DROOP

It reads/sets the minimum voltage at which is safe to operate in MPPT.

0x31 – POUT_MAX

It reads/sets the maximum power to operate at.

0x32 – MAX_DUTY

It reads/sets the maximum duty cycle.

0x33 – FREQUENCY_SWITCH

It reads the switching frequency.

0x35 – VIN_ON

It reads the open-circuit voltage provided by the pellets measurement.

0x36 – VIN_OFF

It reads the open-circuit voltage. The converter switches OFF briefly to make the measurement.

0x46 – IOUT_OC_FAULT_LIMIT

It reads/sets the maximum allowed output current.

0x4B – IOUT_UC_FAULT_LIMIT

It reads/sets the minimum current for trickle charge operation.

0x78 – STATUS_BYTE

It reads/sets settings related to the product.

0x88 – READ_VIN

It reads the current operating input voltage.

0x89 – READ_IIN

It reads the actual operating input current.

0x8B – READ_VOUT

It reads the actual operating output voltage.

0x8C – READ_IOUT

It reads the actual operating output current.

0x94 – READ_DUTY_CYCLE

It reads the actual operating duty cycle.

0x96 – READ_POUT

It reads the actual output power.

0x97 – READ_PIN

It reads the actual input power.

0x9A – MANUFACTURER MODEL

It reads the TCS model code.

0x9A – MANUFACTURER MODEL

It reads the TCS model code.

0x9B – MANUFACTURER REVISION

It reads the revision number of the TCS model.

0x9E – MANUFACTURER SERIAL

It reads the TCS serial code for the TCS product.

0xD0 – USE_PELLETS

Set to 0x01 when using the MPPT converter with the monTEG devices.

0xD2 – PERCENTAGE OF VOC

It reads/sets the percentage of the open-circuit voltage that the MPPT operates the TEG device at by default.

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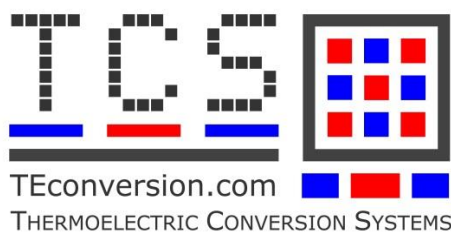
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