User's Guide

SMD20 *Mézeyrac* – Variable DC-Output Power Supply

D-Series Modules – Subnanosecond Pulse Generator

1 General Information

1.1 Important Notice

The information given in this guide is subject to change without notice. Copyright © SISYPH, 2020. All rights reserved.

1.2 Scope

This manual provides the user with a description of the operation for the variable DC-output power supply module SMD20-R20A.

1.3 Related Documents

All documents listed below are available online. See the product page.

Document	Release Number
Datasheet	SMD20-SS01-R20A (online)
Block diagram	SMD20-CG01-R20A (online)

1.4 Certification

Signals and Systems for Physics certifies that this product met its published specifications at the time of shipment.

1.5 Warranty

This *Signals and Systems for Physics* product is warranted against defects in materials and workmanship for a period of one (1) year from the date of shipment.

1.6 Absolute Maximum Ratings

All SMD-Series modules are designed to be operated in laboratory environment.

Parameter	Rating
Environmental Temperature	$> 15°\,\mathrm{C}$ and $< 30°\,\mathrm{C}$
Environmental Humidity	$< 60\,\%$

1.7 Specifications

All specifications regarding the product are reported in the datasheet available online. See section 1.3.

Contents

2 Overview

The modules of the SMD-Series provide the scientists a complete line of instruments for the generation of short pulses at high repetition rates. First designed for stroboscopic magnetic imaging TEM (Transmission Electron Microscope), the SMD-Series offers a complete solution to deliver sub-nanosecond pulses into 50-Ω loads at repetition rates ranging from DC to 10 MHz.

2.1 Description

Referring to its block diagram (see section 1.3), the SMD20 *Variable DC-Output Power Supply* module consists in a high-efficiency DC/DC converter and a fan cooler. The output voltage of the regulator stage is used to power the pulse generator of the SMD10 module while the fan cooler removes the heat from the same pulse generator. Indeed, the SMD20 module is able to remove the heat from the adjacent SMD10 module due to its fan cooler facing the power stage.

In order to generate DC-variable voltage from the +35 V input, the SMD20 uses an high-efficiency DC/DC converter based on a step-down pre-regulator cascaded with a linear low-dropout voltage regulator (LDO). This block is able to provide DC voltages ranging from +5 V to +30 V. The output current is limited to deliver no more than the 5 W required by the SMD10 *Pulse Sharpener* module. The DC level is controlled by the user using serial commands through the SPI port.

The fan cooler's operating voltage is also controlled *via* the SPI port while a digital input is provided to control the driver. Voltage and current monitoring signals provide a measure of the actual operating conditions of the fan cooler.

3 Operation

3.1 Front Panel

Because the SMD20 is entirely controlled through its bus connectors, the front panel is limited to three leds only. Since these leds are not driven by the SMD20 module itself, the display may differs from the following default specifications.

3.1.1 Red Status Led

By default, this led is lit when a fault condition has been detected by the SMD20, such a regulator voltage failure.

3.1.2 Yellow Status Led

By default, this led is turned on if the fan cooler is enabled.

3.1.3 Green Status Led

By default, this led is lit if the regulator stage is enabled.

3.2 Analog I/O Interface Connector

Like all SMC-Series modules, the SMD20 has two 50-pin stack-through headers acting as Analog I/O and Digital I/O interfaces. In this section each pin allocated to the analog interface is described.

3.2.1 Regulator Current Monitor

This pin provides the measure of the regulator's actual output current. Because this measure is not buffered, only light loads are allowed. Can be left open if not used.

3.2.2 Pre-Regulator Output

This pin is connected to the output of the pre-regulator stage, for diagnostic purpose. Can be left open if not used.

3.2.3 Regulator Output Monitor

This pin provides an attenuated copy of the output of the regulator stage. Can be left open if not used.

3.2.4 Pre-Regulator Output Monitor

This pin provides an attenuated copy of the output of the pre-regulator stage. Can be left open if not used.

3.2.5 Fan Voltage Monitor

A measure of the actual operating voltage of the fan cooler is available from this pin. Can be left open if not used.

3.2.6 Fan Current Monitor

A measure of the actual operating current of the fan cooler is available from this pin. Can be left open if not used.

3.2.7 Fan Pos. and Fan Neg. Outputs

These pins are directly connected to the fan driver outputs. They can be used to connect an additional fan cooler. Contact us for detailled informations.

3.2.8 Power and Power Ground Inputs

The pre-regulator can be fed from two different sources. These pins correspond to the optional source, which can be connected between this pin and **PGND**. Contact us for detailled informations. Refer to the datasheet for maximum admissible ratings.

3.2.9 Regulator Output

This pin is connected to the regulator output from which the SMD10 *Pulse Sharpener* module is powered.

3.2.10 Analog Power Supply

The analog circuitry of the module operates from $+15\,\text{V}$ and $-15\,\text{V}$ power supplies. It is recommended to use the SMZ00 module to connect these sources. The digital ground **DGND** and power ground **PGND** terminals must be tied to the analog ground **AGND**.

3.2.11   Pin Assignments of the Analog Bus Connector

Signal label	Pin assignment	Direction
Regulator Current Monitor	AIO.12	output
Pre-Regulator Output	AIO.16	output
PGND	AIO.15	output
Regulator Output Monitor	AIO.18	output
AGND	AIO.17	output
Pre-Regulator Output Monitor	AIO.20	output
Fan Voltage Monitor	AIO.22	output
Fan Current Monitor	AIO.24	output
Fan Cooler Pos.	AIO.26	output
Fan Cooler Neg.	AIO.25	output
Regulator Output	AIO.30	output
PGND	AIO.29	output
Power (Opt.)	AIO.28	input
PGND	AIO.27	input
$-15\,\text{V}$	AIO.45	power input
$+15\,\text{V}$	AIO.47	power input
AGND	AIO.49	power input
AGND	AIO.43	power input
Chassis	AIO.2	chassis ground input (Earth)

3.3   Digital I/O Interface Connector

Like all SMD-Series modules, the SMD20 has two 50-pin stack-through headers acting as Analog I/O and Digital I/O interfaces. In this section each pin allocated to the digital interface is described.

3.3.1   /DPOT0 Select Input

The SPI port uses this pin to select the two digital potentiometers setting the regulator output's voltage and the fan cooler's operating voltage. This active low input is controlled by the SMD30 *Controller* module.

3.3.2   /Fault Output

This pin is driven low when the regulator's output voltage differs from its setpoint value. Left open if not used.

3.3.3   /Fan Enable Input

Drive this input low to enable the fan cooler's driver. In this case, the setpoint voltage is applied between the fan's terminals. Otherwise, the setpoint is overriden to set the output driver's voltage near ground. The fan driver is disabled if this pin is left open.

3.3.4   /Regulator Enable Input

When this pin is driven low, the regulator stage is enabled and power is delivered to the load. Otherwise the regulator is disabled and the regulator output is grounded. The regulator is disabled when the pin is left open.

3.3.5   /Pre-Regulator Enable Input

Drive this pin low to enable the pre-regulator. *The pre-regulator must be enabled prior the regulator.* When this pin is left open, the step-down pre-regulator is disabled.

3.3.6   /Led Green-Bottom Input

Drive this pin low to turn this led on. Can be left open if not used.

3.3.7   /Led Yellow-Middle Input

Drive this pin low to turn this led on. Can be left open if not used.

3.3.8   /Led Red-Top Input

Drive this pin low to turn this led on. Can be left open if not used.

3.3.9   SCK Input

Connect this pin to the SCK line of the SPI port of the remote controller.

3.3.10   MOSI Input

Connect this pin to the MOSI line of the SPI port of the remote controller.

3.3.11   MISO Input

Connect this pin to the MISO line of the SPI port of the remote controller.

3.3.12   Digital Power Supply

The digital circuitry of the module operates from a +5 V power supply. It is recommended to use the SMZ00 module to connect this source. The digital ground **DGND** terminal must be tied to the analog ground **AGND**.

3.3.13 Pin Assignments of the Digital Bus Connector

Signal label	Pin assignment	Direction
/DPOT0 Select	DIO.24	input
/Fan Enable	DIO.18	input
/Regulator Enable	DIO.20	input
/Pre-Regulator Enable	DIO.22	input
/Led Green-Bottom	DIO.32	input
/Led Yellow-Middle	DIO.34	input
/Led Red-Top	DIO.36	input
DGND	DIO.13	input
/Fault	DIO.16	output
SCK	DIO.44	input
MOSI	DIO.46	input
MISO	DIO.43	output
+5 V	DIO.47	power input
+5 V	DIO.48	power input
DGND	DIO.49	power input
DGND	DIO.50	power input
Chassis	DIO.1	chassis ground (Earth)

Document Identifier

This document is identified as **SMD20-SN01-R20A**.