User's Guide

SMD30 *Mézenc* – Remote Controller

D-Series Modules – Subnanosecond Pulse Generator

SISYPH
Signals & Systems for Physics

www.sisyph.com

1 General Information

1.1 Important Notice

1.2 Scope

This manual provides the user with a description of the operation for the Remote Controller module SMD30-R20A.

1.3 Related Documents

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

Document	Release Number
Datasheet	SMD30-SS01-R20A (online)
Block diagram	SMD30-SG01-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	$> 15°$ C and $< 30°$ 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 SMD30 *Remote Controller* module consists in a microcontroller and dedicated hardware. This module is aimed at controlling the SMD10 and SMD20 modules over a computer interface.

The *Remote Controller* receives serial commands from the computer via the SMZ320 Serial Interface module. These commands are sent to the Remote Controller in ASCII form. The microcontroller, which is able to decode the string of characters as commands or queries, performs all required operations to control the generation of the impulsions.

3 Operation

3.1 Front Panel

The front panel consists in three leds, one BNC, one SMA and two switches.

3.1.1 Red Status Led

This led indicates that an undervoltage operation of the power supply has been detected.

3.1.2 Yellow Status Led

By default, this led indicates that an error has occurred during the remote control operation : for example, an illegal command or an out-of-range parameter can be displayed using this indicator.

3.1.3 Green Status Led

By default, this led is turned on when an activity over the remote interface has been detected. Both reception or transmission of messages are signaled by this indicator.

3.1.4 SMA Coaxial Connector

No function is assigned to this connector. It is connected to a digital output of a PWM *via* a gate buffer. Contact us for more details.

3.1.5 BNC Coaxial Connector

No function is assigned to this connector. It is connected to a microncontroller's GPIO. Contact us for more details.

3.1.6 Output Enable Switch

This switch controls the generation of the pulse train. When the switch is off, the power amplifier is disabled. Set this switch to enable the output.

3.1.7 Spare Switch

No function is assigned to this switch. It is connected to a microncontroller's GPIO.

3.2 Analog I/O Interface Connector

Like all SMD-Series modules, the SMD30 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 ADC0

This pin is connected to the SMD20's *Regulator Current Monitor Output*, which provides a measure of the current delivered by the regulator stage. It is connected to the ADC for monitoring purpose.

3.2.2 ADC1

This pin is connected to the ADC. It is reserved for future use.

3.2.3 Regulator Monitor

This pin is connected to the SMD20's *Regulator Monitor Output*, which provides an attenuated copy of the output of the regulator stage. It is connected to the ADC for monitoring purpose.

3.2.4 Pre-Regulator Monitor

This pin is connected to the SMD20's *Pre-Regulator Monitor Output*, which provides an attenuated copy of the input of the regulator stage. It is connected to the ADC for monitoring purpose.

3.2.5 Fan Voltage Monitor

This pin is connected to the SMD20's *Fan Voltage Monitor Output*, which provides a measure of the operating voltage of the fan cooler. It is connected to the ADC for monitoring purpose.

3.2.6 Fan Current Monitor

This pin is connected to the SMD20's *Fan Current Monitor Output*, which provides a measure of the operating current of the fan cooler. It is connected to the ADC for monitoring purpose.

3.2.7 TE-Current Monitor

This pin is connected to the SMD10's *TE-Current Monitor Output*, which provides a measure of the bias current of the trailing-edge pulse shaper. It is connected to the ADC for monitoring purpose.

3.2.8 LE-Current Monitor

This pin is connected to the SMD10's *LE-Current Monitor Output*, which provides a measure of the bias current of the leading-edge pulse shaper. It is connected to the ADC for monitoring purpose.

3.2.9 RT Pos. and RT Neg.

These pins are connected to the thermistor measuring the temperature of the SMD10's power stage. A signal conditioner consisting in a current source and a voltage amplifier is used as a resistance-to-voltage converter. Its output is connected to the ADC for monitoring purpose.

3.2.10 Pin Assignments of the Analog Bus Connector

Signal label	Pin assignment	Direction
Regulator Current Monitor	AIO.12	input
ADC1	AIO.14	input
Regulator Voltage Monitor	AIO.18	input
Pre-Regulator Output Monitor	AIO.20	input
Fan Voltage Monitor	AIO.22	input
Fan Current Monitor	AIO.24	input
Thermistor Pos.	AIO.32	input (passive)
Thermistor Neg.	AIO.31	input (passive)
LE-Current Monitor	AIO.40	input
TE-Current Monitor	AIO.36	input
AGND	AIO.13	Ground
AGND	AIO.15	Ground
AGND	AIO.17	Ground
AGND	AIO.29	Ground
AGND	AIO.49	Ground
AGND	AIO.35	Ground
AGND	AIO.39	Ground
−15 V	AIO.45	power input
+15 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 SMDD0 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 SMD10 /DPOT0 et /DPOT0

These pin are driven by the microcontroller to access the digital potentiometers of the SMD10 module.

3.3.2 SMD10 /Reset

The microcontroller pull this pin down to reset the overload flag signaled by the SMD10 module.

3.3.3 SMD10 /Power Enable

The power output stage of the SMD10 module is activated using this pin.

3.3.4 SMD10 /Overload

The microcontroller detects an output overload of the SMD10 module using this pin.

3.3.5 SMD10 /Triggered

This signal reports that the input stage of the SMD10 module has been triggered.

3.3.6 SMD10 /Led Green-Bottom, /Led Yellow-Middle and /Led Red-Top

The three leds of the SMD10's front panel are controlled through these pins.

3.3.7 SMD20 /DPOT0

This pin is driven by the microcontroller to access the digital potentiometer of the SMD20 module.

3.3.8 SMD20 /Fault

This pin is used to detect a mafunction of the SMD20's regulator stage.

3.3.9 SMD20 /Fan Enable

The fan cooler of the SMD20 is activated using this pin.

3.3.10 SMD20 /Regulator Enable

The regulator output of the SMD20 module is enabled using this pin.

3.3.11 SMD20 /Pre-Regulator Enable

This pin controls the activation of the SMD20's pre-regulator.

3.3.12 SMD20 /Led Green-Bottom, /Led Yellow-Middle and /Led Red-Top

The three leds of the SMD20's front panel are controlled through these pins.

3.3.13 SCK, MOSI and MISO Bus Signals

These signals are used by the SPI devices. They are driven by the SPI bus of the microcontroller.

3.3.14 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**.

3.3.15 Pin Assignments of the Digital Bus Connector

Signal label	Pin assignment	Direction
SMD20 /DPot0	DIO.24	output
SMD20 /Fan En	DIO.18	output
SMD20 /Regulator En	DIO.20	output
SMD20 /Pre-Regulator En	DIO.22	output
SMD20 /Led Green-Bottom	DIO.19	output
SMD20 /Led Yellow-Middle	DIO.15	output
SMD20 /Led Red-Top	DIO.15	output
SMD20 /Fault	DIO.16	input
SMD10 /DPot0	DIO.26	output
SMD10 /DPot1	DIO.25	output
SMD10 /Reset	DIO.28	output
SMD10 /Power En	DIO.30	output
SMD10 /Reset	DIO.28	output
SMD10 /Ovld	DIO.40	input
SMD10 /Trigg	DIO.42	input
SMD10 /Led Green-Bottom	DIO.32	output
SMD10 /Led Yellow-Middle	DIO.34	output
SMD10 /Led Red-Top	DIO.36	output
GND	DIO.3	ground
GND	DIO.13	ground
GND	DIO.27	ground
GND	DIO.29	ground
GND	DIO.31	ground
GND	DIO.39	ground
GND	DIO.41	ground
SCK	DIO.44	input
MOSI	DIO.46	input
MISO	DIO.43	output
/Fault	DIO.45	input
+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)

3.4 On-Board Settings and Connectors

There are one group of eight switches and five headers on the printed circuit board.

3.4.1 Configuration Switches (SW503)

Only the first two switches are actually used. The remaining are reserved for future use.

In order to assign an identification number to the remote controller, the user can use the switches SW503-1 and SW503-2 according to the following table.

SW503-1	SW503-2	Id. number
off	off	0
off	on	1
on	off	2
on	on	3

The identification number can be retrieved using the dedicated remote command `DEVI`.

3.4.2 Spare Header Connector (J405)

This 10-pin connector is reserved for future use. Eight GPIOs are connected to the microcontroller through series-resistors (1 kΩ).

Pin number	Assignment
J405-1	GPIO-0
J405-2	GPIO-1
J405-3	GPIO-2
J405-4	GPIO-3
J405-5	GPIO-4
J405-6	GPIO-5
J405-7	GPIO-6
J405-8	GPIO-7
J405-9	GND (0 V)
J405-10	VCC (+5 V)

The VCC pin is internally connected to the power rail and is able to supply up to 50 mA. *Do not connect to +5 V.*

3.4.3 Usart Header Connector (J403)

The RxD and TxD data line of the serial interface are connected to the microcontroller's USART using this header.

Pin number	Assignment
J403-1	GND (0 V)
J403-2	Reserved
J403-3	VCC GND (+5 V)
J403-4	TxD (host)
J403-5	RxD (host)
J403-6	Reserved

The VCC pin is internally connected to the power rail and is able to supply up to 50 mA. *Do not connect to any power source.*

3.4.4 JTAG Header Connector (J404)

This 10-pin connector allows the user to program and debug the microcontroller's firmware using Atmel's JTAG tools.

Pin number	Assignment
J404-1	TCK
J404-2	GND (0 V)
J404-3	TDO
J404-4	VCC (+5 V)
J404-5	TMS
J404-6	/Reset
J404-7	Not connected
J404-8	Not connected
J404-9	TDI
J404-10	GND (0 V)

3.4.5 ISP Programming Header Connector (J501)

This 6-pin connector allows the user to program the microcontroller's firmware using Atmel's programming tools.

Pin number	Assignment
J501-1	MISO
J501-2	VCC (+5 V)
J501-3	SCK
J501-4	MOSI
J501-5	/Reset
J501-6	GND (0 V)

3.4.6 I2C Programming Header Connector (J502)

This 4-pin connector is connected to the i2C bus of the microcontroller. It is reserved for future use.

Pin number	Assignment
J502-1	SCL
J502-2	SDA
J502-3	GND (0 V)
J502-4	VCC (+5 V)

The VCC pin is internally connected to the power rail and is able to supply up to 50 mA. *Do not connect to any power source.*

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