

Datasheet

SMC10 – Low-Noise Current Source

C-Series Modules – Diode Laser Controller

- Ultra-low current noise
 - 0 to 200 mA_{DC}
 - Noise < 100 pA/√Hz
 - Noise < XXX100 nA_{RMS} @ 1 MHz bandwidth
- Adjustable current limiter
- 1-mA/V servo modulation input
- 100-MHz RF modulation input
- Slow turn-on
- Analog design - Free of digital noise
- EMI noise immunity
- Ideal for rapid and reliable prototyping
- All schematic diagrams included



Overview

The SMC-Series modules are the ideal instruments for controlling the current and the temperature of diodes laser in AMO physics. With an ultra-low current noise density $\leq 100 \text{ pA}/\sqrt{\text{Hz}}$ (SMC10) and sub-mK thermal control stability (SMC20 & SMC31), the SMC-Series is the right choice for the most demanding applications.

Because SMC-Series was first designed for frequency stabilization and OPLL applications using diodes laser, the SMC10 low-noise current source provides both Servo and RF inputs for current modulation over large bandwidths. Its ultra-low noise current feature is a key parameter for achieving the best phase noise performance of your stabilized lasers. Using the SMC-Series laser diode controller with the SMA- or SMB-Series modules, complete turn-key solutions are available for your laser frequency stabilizations or phase-locked lasers.

Like all SM-Series modules, the SMC10 is shipped with the schematic diagrams of its electronic circuitry providing all required information for advanced users.

Important Notice

The specifications provided apply to the SMC10-R17B module. Information in this document is subject to change without notice. Copyright © SISYPH, 2018. All rights reserved.

Current Source Specifications

Current Source Output

Terminals	front-panel SMA connector or 50-pin stack-through connector
Setpoint	front-panel 20-turn trimmer
Range	0 to +200 mA
Noise Density ^{a,d}	< XXX pA/√Hz, $f = 100$ Hz
Noise Density ^{a,d}	< XXX pA/√Hz, $f = 1$ kHz
Noise Density ^{a,d}	< XXX pA/√Hz, $f = 10$ kHz
Noise Density ^{a,d}	< XXX pA/√Hz, $f = 100$ kHz
Noise Density ^{a,d}	< XXX pA/√Hz, $f = 1$ MHz
RMS Noise ^{a,d}	< XXX nA, $f = 10$ Hz – 100 kHz
RMS Noise ^{a,d}	< XXX nA, $f = 10$ Hz – 1 MHz
Compliance Voltage Max. ^c	XXX V

Current Limiter

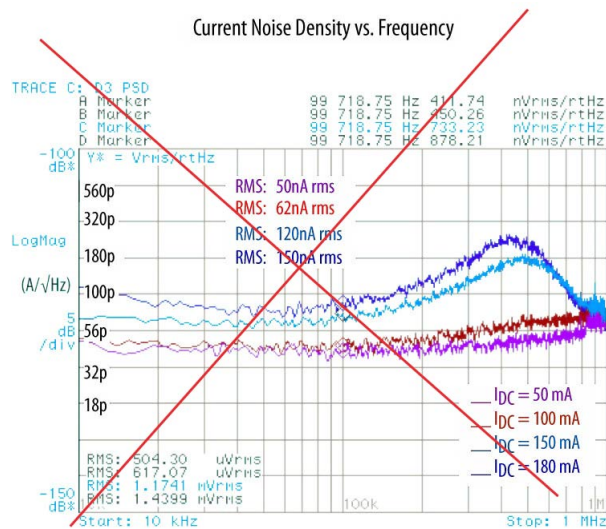
Setpoint	front-panel 20-turn trimmer
Range	0 to +220 mA

^aTest is performed at $I_{OUT} = 50, 100$ and 200mA_{DC} .

^cLevel above this threshold is detected as a fault condition.

^dFor more information, see *Typical Performance Curves* online.

Typical Current Noise Density



Analog Interface Specifications

Servo Input

Terminal ^a	front-panel BNC connector or 50-pin stack-through connector
Impedance ^b	1 k Ω
Sensitivity ^c	+1 mA/V
Range	± 10 V
Bandwidth ^{d,e}	DC to XXX MHz

RF Modulation Input

Terminal	front-panel SMA connector
Impedance	50 Ω
Frequency Range	1 – 100 MHz
Max. Level ^f	0 dBm

Setpoint External Input

Terminal	50-pin stack-through connector
Impedance	10 k Ω
Sensitivity	+40 mA/V
Range	0 to +5 V
Settling time	10 ms

Current Monitor

Terminal	50-pin stack-through connector
Impedance	1 k Ω
Sensitivity	+1 V/100 mA
Range	0 to +2 V
Accuracy	$\pm 5\%$

Current Limit Monitor

Terminal	50-pin stack-through connector
Impedance	1 k Ω
Sensitivity	+1 V/100 mA
Range	0 to +2.2 V
Accuracy	$\pm 5\%$

Shorting Relay Contacts

Terminal	50-pin stack-through connector
Rated current	250 mA _{DC}
Max. switching voltage	24 V _{DC}

^aSignal source is selected using the switch SW401 located on the PCB, see *User's Guide*.

^bThe given impedance value refers to the BNC input. When the signal is sourced from the AIO bus, the input impedance is 10 k Ω .

^cLower sensitivities are allowed, please contact us.

^dCut-off frequency measured at -3 dB.

^eFor more information, see *Typical Performance Curves* online.

^fThe laser diode must be biased before applying the RF signal. Excessive voltage applied to this input could damage the laser diode. Always refer to the laser diode specifications to guarantee safe operation.

Digital Interface Specifications

Active-Low Inputs^a

Terminal	50-pin stack-through connector
Impedance	100 k Ω pull-up resistor
Level	5-V CMOS compatible

Active-Low Outputs^b

Terminal	50-pin stack-through connector
Limitation resistor	1 k Ω
Level	5-V CMOS compatible
Apply to	

Interlock

Terminal	50-pin stack-through connector
Level	5-V CMOS compatible
Interlock Source Output	+5 V/1 mA max. (1 k Ω current limiting resistor)
Interlock Sense Input	100 k Ω pull-down resistor

^aSpecifications apply for /Setpoint Enable, /Laser Enable, /Power Fault and /Temperature Fault inputs.

^bSpecifications apply for /Laser ON and /Limit outputs.

General Specifications

This module is designed to be operated in laboratory environment.

Operating

Temperature	+15°C to +30°C
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Power Requirements

+15 V	250 mA
-15 V	100 mA
+5 V	50 mA
+24 V	Not used

Physical Properties

Height (component side)	\leq 17 mm
Weight	\leq XXX g
PCB	4-layer FR4, 100 \times 100 mm

Warranty

One (1) year parts and labor on defects

Ordering Information

Front Panel Options

SMC10-FP-xx	Shielded 3U-4HP front-panel
SMC10-NP-xx	none

Stack-through Header Options

SMC10-xx-SC	50-pin header ^a
SMC10-xx-NC	none

Ordering Code

SMC10-FP-SC	Standard
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^aTyco Part Number: 1-173145-4.

Document Identifier

SMC10-SS01-R18A

Document Revision History

Changes from Revision R17A to Revision R18A

Features

Noise density and RMS values updated.

Current Source Specifications

Noise density updated.
Test conditions changed.
Figure updated.

Analog Interface Specifications

Added note on precautions using the RF Modulation Input.
Updated bandwidth of Servo Input.

General Specifications

Weight changed.