Fast Diode Current Modulator VFM 20-25
Part Number 10100371
Operating Manual

mpc

English Edition

Description

The fast diode current modulator VFM 20-25 is a linear modulator with improved properties for driving arbitrary current waveforms into into high voltage laser diodes.Current waveforms can be CW, pulsed, modulated or mixed with frequencies up to 20 MHz and currents up to 40 A.

For achieving maximum performance it is required to mount the modulator as close as possible at the laser diodes and to connect it with low inductance. Conventional wires for connecting are not allowed, this will decrease performance significantly and may lead to an unstable operating.

The modulator is small and compact and it is designed for mounting it with low inductance as close as possible at the laser diodes or for integrating it in laser diode modules. Ask our support for more information and for important hints.

The modulator has two analogue inputs for the current setpoint, a high frequency input (50 Ohm input impedance) with a bandwidth of 20 MHz and a low frequency input with a bandwidth of 100 KHz. Both inputs cover the full current range.
Additionally there is a 10 turns potentiometer for generating a CW-current (bias current).
All set points are added and form the effective current set point.
A set point with a negative sign acts subtracting.

Furthermore the VFM 20-25 has a trigger input (TTL/CMOS) which acts at the high frequency input X2.
This trigger input controls the current set point 1 signal at X2.
A logic High-level at the trigger input puts through the current set point 1 signal to the VFM 20-25, a logic Low-level inhibits the current set point 1 signal.
In this way it is possible to generate fast and clean pulses by feeding in a DC voltage at the X2 input, even if the trigger signal has a bad waveform.

Power dissipation
Dynamic performance of the modulator normally increase with supply voltage, however the electrical power dissipation increase with supply voltage too.
A good compromise is to choose a supply voltage of approx. 2 V ... 5 V above the diode voltage.

Simple formulas for calculating power dissipation:

U_s Supply Voltage (V)
U_d Diode Voltage (V)
I_{dcw} Diode Current CW (A)
I_{dpeak} Diode Current peak value (A) (für sinusoidal and rectangle currents)
t_p Pulse Duration (s)
f   Pulse Frequency (Hz)
P_l Power Dissipation (W)

For operating with CW current:
$P_l = (U_s - U_d) \times I_{dcw}$

For operating with sinusoidal current:
$P_l = (U_s - U_d) \times (I_{dpeak} / 2)$

For operating with rectangle current:
$P_l = (U_s - U_d) \times I_{dpeak} \times t_p \times f$

For operating with sinusoidal current plus CW current:
$P_l = (U_s - U_d) \times ((I_{dpeak} / 2) + I_{dcw}))$

For operating with rectangle current plus CW current:
$P_l = (U_s - U_d) \times (I_{dpeak} \times t_p \times f + I_{dcw})$

Calculating power dissipation with arbitrary current waveforms is rather difficult, therefore a good method for estimating power dissipation is to measure the temperature of the modulator.
The modulator has a precise temperature measurement system inside. The SA-TEMP output reflects the actual temperature in the range of 0 °C … +80 °C.
Values of 60 °C (3 V) to 70 °C (3.5 V) are still not critical.

General Instructions
Never run a negative current set point (effective current set point), this may lead to an overshoot if you alter the negativ current set point to a positive current set point.
If you use a pulse signal generator or a function generator for the current set point, always disconnect it before you change any ranges. Some generators create high voltage or undefined signals if you change ranges, this may damage diodes and the modulator.

If you are not sure what will happen, we recommend the following procedure for starting up:

Disconnect the diode and short-circuit the output of the modulator (connect X6- to X7+ via a short thin metal sheet).
Connect an oscilloscope at the X3 current monitor output, terminate the oscilloscope input with 50 Ohm.
Connect the supply voltage for the diode at X4- and X5+, take a power supply with an adjustable output voltage of approx. 0 V … 25 V. Adjust 0 V.
Connect the supply voltage (3 V … 6 V) for the internal electronics at X4- and X1-8.

Feed in a TTL-square wave or a CMOS-square wave with a pulse length of approx. 5 μs and a repetition rate of approx. 100 Hz at X1-7 (CD-TRIGG).
Feed in a positive DC-voltage of 500 mV (for 20 A) at X2 (CA-DCSP1).

Turn on the power supply for the internal electronics, the green LED must lit.
Turn on the power supply for the diode (0 V).

Enable the modulator.
Adjust the voltage of the power supply for the diode to approx. 2 V … 3 V and watch the X3 current monitor output.
The X3-signal must be a square wave with a pulse length of 5 μs, a repetition rate of 100 Hz and an amplitude of 110 mV.

If the X3-signal is ok (no overshoot or ringing), disable the modulator and turn off the power supplies.
Connect the diode and adjust the supply voltage for the diode to a voltage of 2 V … 3 V above the diode voltage. Be aware of the maximum allowed power dissipation of the modulator.

Adjustment elements
10 turns potentiometer for a CW current set point (bias current)
The potentiomter covers the full current range.

Indicator elements
Green LED for indicating status Ready
Red LED for indicating status Excess Temperature

Connectors
X1, 8-pole single row male connector for control signals, status signals and supply voltage for the internal electronics
X2, female coaxial jack MMCX for current set point 1
X3, female coaxial jack MMCX for actual current (current monitor)
X4-, connection bolt $\varnothing$ 8 mm with female thread M4 for Supply Voltage Minus
X5+, connection bolt $\varnothing$ 8 mm with female thread M4 for Supply Voltage Plus
X6-, connection plate with six female thread M1.6 for laser diode cathode
X7+, connection plate with five female thread M1.6 for laser diode anode

X1 Control Port
8-pole single row male connector
Manufacturer: ERNI Part number 214014
Mating plug:
8-pole single row female connector
Manufacturer: ERNI Part number 224396
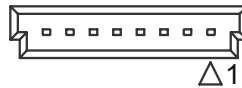
CA=Control Data Analog
CD=Control Data Digital
SA=Status Data Analog
SD=Status Data Digital

Inputs		
Pin	Name	Function
1	GND	Signal Ground
2	CA-DCSP2	Diode Current Set Point 2
3	CD-ENABLE	Enable
4	CD-RESET	Reset
7	CD-TRIGG	Trigger
8	SVI+	Supply voltage for the internal electronics
Outputs		
Pin	Name	Function
1	GND	Signal Ground
5	SA-TEMP	Temperature
6	SD-READY	Ready

X2 Control Port
Female coaxial jack MMCX
CA-DCSP1
Diode Current Set Point 1

X3 Current Monitor Port
Female coaxial jack MMCX
SA-DCACT
Diode Current Actual

X4-
Connection bolt ∅ 8 mm with female thread M4
Supply Voltage Minus for the laser diode

X5+
Connection bolt ∅ 8 mm with female thread M4
Supply Voltage Plus for the laser diode

X6-
Connection plate with six female thread M1.6
Laser Diode Cathode

X7+
Connection plate with five female thread M1.6
Laser Diode Anode

Signal description

SVI+
Supply voltage for the internal electronics
Required voltage: 3 V ... 6 V
Supply current: 300 mA approx.
Plus must be connected at X1-8, Minus at X4-.

CA-DCSP1 (X2)
Control Analog - Diode Current Set Point 1
Analog input 0 … 500 mV, input impedance 50 Ohm
0 … 500 mV corresponds to a diode current of 20 A.

CA-DCSP2 (X1-2)
Control Analog - Diode Current Set Point 2
Analog input 0 … 5 V, input impedance 10 KOhm
0 … 5 V corresponds to a diode current of 20 A.

Diode Current Set Point 1, Diode Current Set Point 2 and the current value of the bias current potentiometer are added internally and build the effective current set point.
A current set point with negative sign acts subtracting.

SA-DCACT (X3)
Status Analog - Diode Current Actual
Analog output 0 … 220 mV (off-load voltage), output impedance 50 Ohm, reflects the actual diode current.
0 … 220 mV corresponds to a diode current of 0 ... 20 A.
For maximum performance the coaxial cable should be terminated with 50 Ohm.
In this case 0 … 110 mV corresponds to a diode current of 0 ... 20 A.

SA-TEMP (X1-5)
Status Analog - Temperature
Analog output 0 … 4 V, reflects the actual temperature of the modulator.
0 V corresponds to 0 °C, 4 V corresponds to +80 °C.

CD-ENABLE (X1-3)
Control Digital - Enabel
Digital TTL input, High if left open.
A Low-Signal or pulling the input to GND enables diode current.

CD-RESET (X1-4)
Control Digital - Reset
Digital TTL input, High if left open.
A Low-Signal or pulling the input to GND resets the modulator if there was an error (maximum allowed current exceeded or excessive temperature).

CD-TRIGG (X1-7)
Control Digital - Trigger
Digital TTL input, controls the current set point 1 signal at X2.
A logic High-level puts through the current set point 1 signal to the modulator,
a logic Low-level inhibits the current set point 1 signal.

SD-READY (X1-6)
Status Digital - Ready
Digital TTL output, High if there are no errors.

SD-EXTEMP (X1-7)
Status Digital - Excess Temperature
Digital TTL output, High if the temperature of the modulator has exceeded 80 °C.
The modulator will be switched off and remains in an off state.
SD-READY signal goes Low, the green Ready-LED goes out and the red
Excess Temperature-LED lits.

Specification

Supply voltage for the internal electronics	3 ... 6 V
Supply current	300 mA
Supply voltage for the diode	1 ... 25 V
Supply current	20 A max
Diode voltage	0 ... 24 V
Diode current CW	0 ... 20 A
Diode current pulsed	0 ... 40 A (short pulses)
Frequency bandwidth	DC ... 20 MHz (CA-DCSP1)
Frequency bandwidth	DC ... 100 KHz (CA-DCSP2)
Rise time	28 ns
Fall time	32 ns
Accuracy	± 0.2 %
Linearity	± 0.2 %
Temperature stability	± 100 ppm / °C
Accuracy of SA-DCACT output	± 2 %
Power dissipation	30 W max. allowed
Cooling	required
Operating temperature range	0 ... +45 °C
Dimensions	95 x 61 x 20 mm
Weight	250 g
Part Number	10100371

Scope of delivery:

Fast Diode Current Modulator	Part Number 10100371
8-pole single row female connector	Part Number 10883510
2 pcs screw M4x6 DIN 7985	Part Number 10701642
11 pcs screw M1.6x3 DIN 7985	Part Number 10701609
11 pcs washer A1.7 DIN 433	Part Number 10705300

Fast Diode Current Modulator VFM 20-25

Dimensions (in mm)

Fast Diode Current Modulator

Model

CAUTION
Do not remove cover
No user serviceable components inside
Refer servicing to qualified personnel

Messtec Power Converter GmbH
Grube 41 D - 82377 Penzberg
www.laserdriver.eu

X1	Control Port
X2	Current Set Point (50 Ohm)
X3	Current Monitor (50 Ohm)
X4−	Supply Voltage −
X5+	Supply Voltage +
X6−	Laser Diode −
X7+	Laser Diode +
Green LED	Ready
Red LED	Excess Temperature

Made in Germany

Bias Current

M1.6x3 D7985 (6x)
A1.7 D433 (6x)
M1.6x3 D7985 (5x)
A1.7 D433 (5x)

M4x6 D7985 (2x)
A4 D127 (2x)

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