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SINCE 1975

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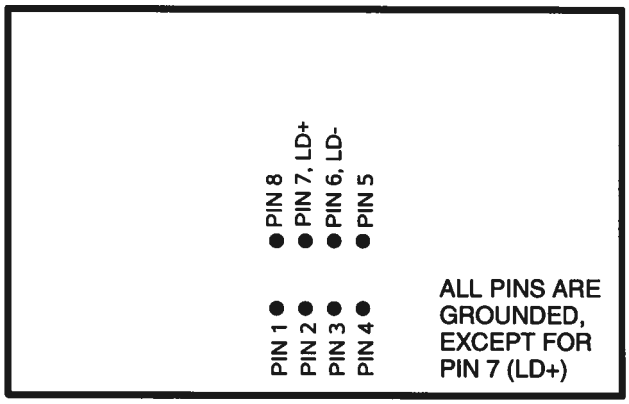
INSTRUCTIONS

MODEL AVX-S3B-P3-NUFB

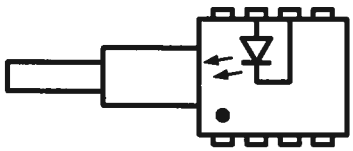
CURRENT-QUADRUPLING OUTPUT MODULE

WITH PLUG-IN SOCKET

SERIAL NUMBER: 11246



AVX-S3B-P3-NUFB OUTPUT MODULE, SOCKET VIEW



MATCHING USER-SUPPLIED DIODE PACKAGE (TOP VIEW). DIP PACKAGE.

WARRANTY

Avtech Electrosystems Ltd. warrants products of its manufacture to be free from defects in material and workmanship under conditions of normal use. If, within one year after delivery to the original owner, and after prepaid return by the original owner, this Avtech product is found to be defective, Avtech shall at its option repair or replace said defective item. This warranty does not apply to units which have been dissembled, modified or subjected to conditions exceeding the applicable specifications or ratings. This warranty is the extent of the obligation assumed by Avtech with respect to this product and no other warranty or guarantee is either expressed or implied.

TECHNICAL SUPPORT

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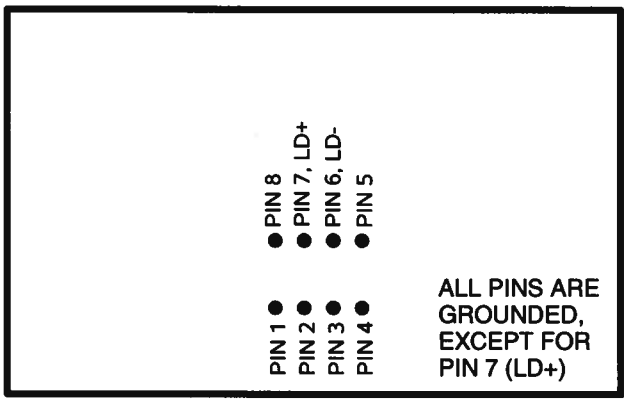
Manual Reference: T:\instructword\avx-s\AVX-S3B-P3-NUFB,sn11246.sxw.
Last modified June 28, 2005.

INTRODUCTION

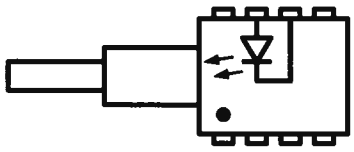
The AVX-S series of bias insertion units is designed to combine a pulse signal with a DC bias, and supply the resulting signal to a laser diode, which is inserted into a high quality socket included on the mount. The bias insertion module includes the necessary networks to match the laser diode to the pulse source, as well as networks for applying DC bias to the diode.

The AVX-S3B-P3-NUFB contains a current-quadrupling transformer. When used with the AVO-9G-B-P-NUFB mainframe, the maximum obtainable current will be approximately 3.6A (see the "Amplitude Control" section for details).

The AVX-S3B-P3-NUFB is specifically designed to accommodate butterfly-packaged laser diodes with the pinout illustrated below:



AVX-S3B-P3-NUFB OUTPUT MODULE, SOCKET VIEW



MATCHING USER-SUPPLIED DIODE PACKAGE (TOP VIEW). DIP PACKAGE.

The diode series resistance must be 0.6 Ohms approximately for proper operation.

ORIGINAL QUOTATION & CORRESPONDENCE (ABRIDGED)

XXXXX,

Thank you for the fax.

We will reduce the series resistance in the AVX-S3B-P3-NUFB from 3 Ohms to 2.4 Ohms.

The maximum current can then be estimated as:

(12.5V - 1.6V) / (2.4 + 0.6 Ohms) = 3.6A

Regards,
Dr. Michael J. Chudobiak
Chief Engineer

--- Avtech Electrosystems Ltd. ---------- since 1975 ---

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> Michael,
>
> I have faxed diode spec to you. Voltage vs Current graph shows 1.3V diode threshold voltage and 0.6-0.7Ohm diode series resistance. The graph is shown only up to 0.4A, but we are going to drive it up to 4A - other people did that with no big issues.
>
> I think those characteristics should be taken into account when designing diode driver.
>
> Please let me know about driver capability with such diode.
>

>
> XXXXX,
>
> We don't recommend reducing the series resistance because:
>
> A) We aren't sure if the current would actually go up as much as you
> might expect (e.g., the lower resistance may reduce the output voltage
> from the mainframe).
>
> B) The AVO-9G-B-P-NUFB expects to see a 50 Ohm load. After the 4:1
> transformer, the load should be 50 Ohms / 4^2 = 3.1 Ohms for a proper
> transmission line match. Deviating from this value will definitely cause
> ringing and overshoot (due to transmission line reflections).
>
>
> Regards,
> Dr. Michael J. Chudobiak
> Chief Engineer
>

>
> > Hello, Michael.
> >
> > Thank you for the explanation.

> > Currently we provide no DC bias to the diode - it works better for our setup.
> >
> > I wonder if it would be possible to reduce series resistor inside diode
> > insertion unit to 2-2.5Ohm?
> >

> > XXXXX,
> >
> > The AVO-9G-B-P-NUFB produces up to 50V at its output. The
> > AVX-S3B-P3-NUFB has a 4:1 transformer which reduces this to 12.5V, so
> > that it can drive the 3 Ohm series resistance.
> >
> > If no DC bias is applied to the diode, the maximum current would be
> > given by (12.5V - 3.5V) / 3 Ohms = 3A.
> >
> > If the diode is biased just below threshold (for example 2.5V) using the
> > DC input on the output module, the maximum current can be boosted since
> > the pulse is AC-coupled on top of the DC bias. Thus, you would obtain
> > (12.5V - 3.5V + 2.5V) / 3 Ohms = 3.8A.
> >
> > To obtain the full 4A under no-bias conditions, the output of the
> > AVO-9G-B-P-NUFB would need to be boosted from 50V to 62V, so that (62V/4
> > - 3.5V) / 3 Ohms = 4.0A. The AVO-9G-B-P-NUFB mainframe would have to be
> > returned to the factory to achieve this. If this is required, let me
> > know and I can provide a quote.
> >
> > I hope this is helpful.
> >
> >
> > Regards,
> > Dr. Michael J. Chudobiak
> > Chief Engineer

> > > Thank you, Michael.
> > >
> > > I just would like to double check few details.
> > > We are going to use 4A unit with the same Lumics diode (as specified in the
> > > quote). At 4A, the voltage drop across the diode may grow up to about 3.5V -
> > > driver should be capable applying that voltage.
> > >
> > > Also as we talked before pulse rise time is about 1ns and ringing <10%. We are
> > > going to use the driver for 20ns-to-200ns pulses.
> > >
> > > Please let me know if there are any issues with that.
> > >

> > > XXXXX,
> > >
> > > We can provide two week delivery of your AVX-S3B-P3-NUFB for a 15%
> > > premium, if you get the order in today. (Time is very tight because of
> > > summer holidays early in July!)
> > >
> > > I am pleased to re-quote with new pricing and delivery time, as follows:
> > >
> > >
> > >
> > > Quote number: 12636
> > >
> > > Model number: AVX-S3B-P3-NUFB
> > >
> > > Description: Laser Diode Bias Insertion Unit with Socket and Internal
> > > Current-Quadrupling Transformer. Can be used to boost AVO-9G-B-P-NUFB
> > > (S/N 11173) output to 4A.
> > >
> > > -P3-NUFB option: The socket will accept pins 1-8 (i.e., all pins) of the
> > > Lumics LU0977M200-2301200 DIP-packaged diode, for which you had
> > > previously faxed us a brief datasheet. (The faxed document doesn't show
> > > detailed dimensions for the package, but you have confirmed that the
> > > package is identical to that shown in the datasheet for the LU0977M140
> > > at http://www.lumics.com/download/LU0977M140-2.pdf). The output pulse

> > > will be applied to the diode anode (pin 7). Pins 1-6 and 8 will be
> > > grounded. It will not be possible to access the photodiode or thermistor
> > > features. The series resistance inside the output module will be 3 Ohms.
> > > The parasitic series resistance of the diode under test must be 0.3 Ohm
> > > or less for proper operation.
> > >
> > > Datasheet & pricing: http://www.avtechpulse.com/laser-bias/avx-s3b
> > >
> > > Price: $2755 US each, FOB destination. Includes 15% premium for rush
> > > delivery.
> > >
> > > Estimated delivery: 2 weeks after receipt of order, if the order is
> > > received today.
> > >
> > >
> > >
> > > Please call or email me if I can be of further assistance.
> > >
> > > Thank you for your interest in our products!
> > >
> > >
> > >
> > > Regards,
> > > Dr. Michael J. Chudobiak
> > > Chief Engineer
> > >
> >
>

SPECIFICATIONS

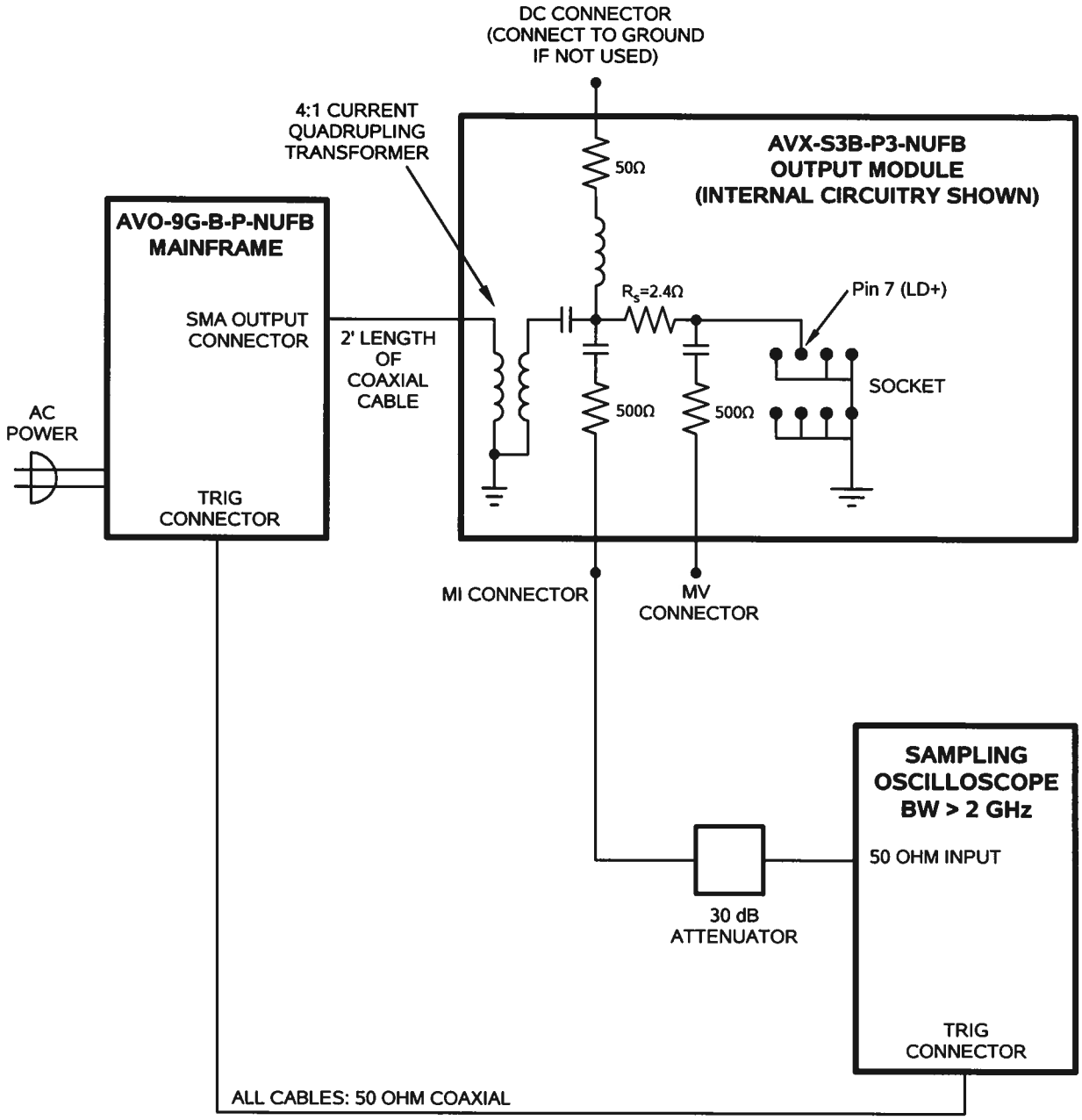
Model:	AVX-S3B
Peak diode current:	28 A
Max. input amplitude:	350 Volts
Pulse width (ns):	2 - 100
Rise time (ns):	1.0
Pulse PRF range:	DC - 10 kHz
Max. bias current:	100 mA
Max. bias voltage:	50 Volts
Input impedance:	50 Ohms
N (transformer ratio[1]):	4
R_S:	2.4 Ohms
IN connector:	SMA
Monitor connector:	SMA
Bias connector:	Solder pin
Dimensions:	H x W x D: 41 mm x 66 mm x 76 mm (1.6" x 2.6" x 3.0")
Material:	Cast aluminum, blue enamel
Mounting:	Any

1) The transformer reduces the input voltage by a factor of N (approx) and increases the current by a factor of N (approx). The load resistance (R_S+R_{DIODE}) must equal 50Ω / N^2 (approx).

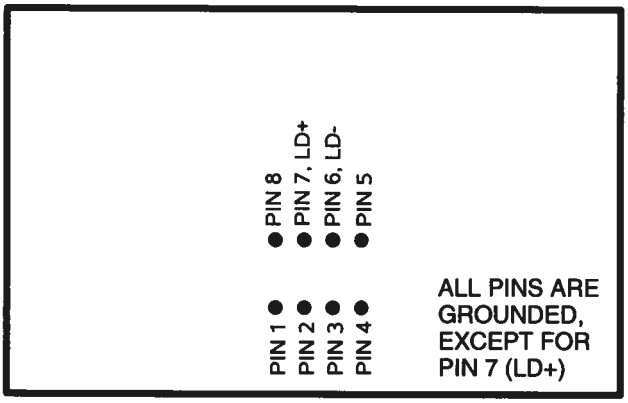
GENERAL INFORMATION

BASIC TEST ARRANGEMENT

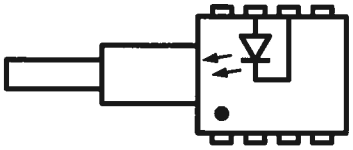
To fully test the AVX-S3B-P3-NUFB, and for normal operation, the output module should be connected as shown below:



The diode load is inserted into the socket on the output module. The physical layout of the socket is shown below:

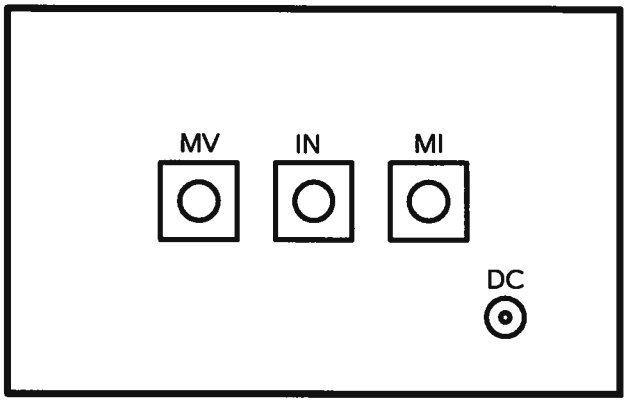


AVX-S3B-P3-NUFB OUTPUT MODULE, SOCKET VIEW



MATCHING USER-SUPPLIED DIODE PACKAGE (TOP VIEW). DIP PACKAGE.

An oscilloscope may be used to monitor the MI and MV outputs. A forward DC bias may be applied to the laser diode by connecting a DC potential of 0 to +10 Volts to the DC solder terminal. The application of a small forward bias often yields a more ideal diode current waveform (as observed on the MI port). Note that the DC port must be shorted to ground if a bias is not applied.



AVX-S3B-P3-NUFB OUTPUT MODULE, CONNECTOR VIEW

AMPLITUDE CONTROL

When using the output module, the pulse current through the diode load is given by:

$$I_{DIODE} \approx ((V_{IN} / 4) - V_{DIODE}) / (2.4\ \Omega + R_{DIODE})$$

where V_{IN} is the amplitude of the input pulse, V_{DIODE} is the forward "knee" voltage of the diode (typically 1.6V), and R_{DIODE} is the series resistance of the diode. For proper operation, R_{DIODE} should be equal to 0.6 Ohms.

For a 50V input from an AVO-9G-B-P-NUFB mainframe (purchased separately), the maximum current can then be estimated as (50V/4 - 1.6V) / (2.4 + 0.6 Ohms) = 3.6A.

MEASUREMENT ISSUES

It is very difficult to accurately observe the electrical waveforms in the AVX-S3B-P3-NUFB system. The "MV" and "MI" outputs will display noticeable ringing and inaccurate rise times due to the effect of parasitic inductance and the low resistances present (R_S = 2.4 Ω).

It may be possible to install current probes (such as the Integrated Sensor Technologies 711S, http://www.isensortech.com) to observe current waveforms on the output socket, but in practice the extra inductance that is added by the measurement system will result in poor measurements. Inductive time constants (given by $\tau = L / R$) will become significant. For instance, if 0.5" of wire is inserted between the LD+ and LD- socket pins (pins 7 and 6), and this wire is fed through a 711S probe, this will introduce approximately 5 nH of inductance. The inductive time constant will then by 5 nH / 2.4 Ω = 2.1 ns.

As a result, the only true measure of the system rise time is to observe the optical output.

June 28/05