AVTECH ELECTROSYSTEMS LTD.

NANOSECOND WAVEFORM ELECTRONICS
SINCE 1975

☐ P.O. BOX 265
OGDENSBURG, NY
U.S.A. 13669-0265
TEL: (315) 472-5270
FAX: (613) 226-2802

TEL: 1-800-265-6681
FAX: 1-800-561-1970

e-mail: info@avtechpulse.com
http://www.avtechpulse.com

☒ P.O. BOX 5120 STN. F
OTTAWA, ONTARIO
CANADA K2C 3H4
TEL: (613) 226-5772
FAX: (613) 226-2802

INSTRUCTIONS

MODEL AVX-S1-MI-MV-MD-KLA2 BIAS TEE

S.N.:

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

Phone: 613-226-5772 or 1-800-265-6681
Fax: 613-226-2802 or 1-800-561-1970

E-mail: info@avtechpulse.com
World Wide Web: http://www.avtechpulse.com

Notes:

1) A general description of the AVX-S1 module is given in the enclosed data sheet.

2) The AVX-S1 module should be connected to your RF source via a 50 Ohm cable (supplied).

3) The laser diode plugs directly into the socket on the side of the AVX-S1 module. The unit was shipped with the diode installed in the socket.

4) A forward DC bias must be applied to the laser diode by connecting a DC potential of 0 to -5 Volts to the DC solder terminal. The turn of delay time of the HL67126 appears to be strongly dependent on this bias. A value of 40 mA was used to obtain the test waveforms which follow.

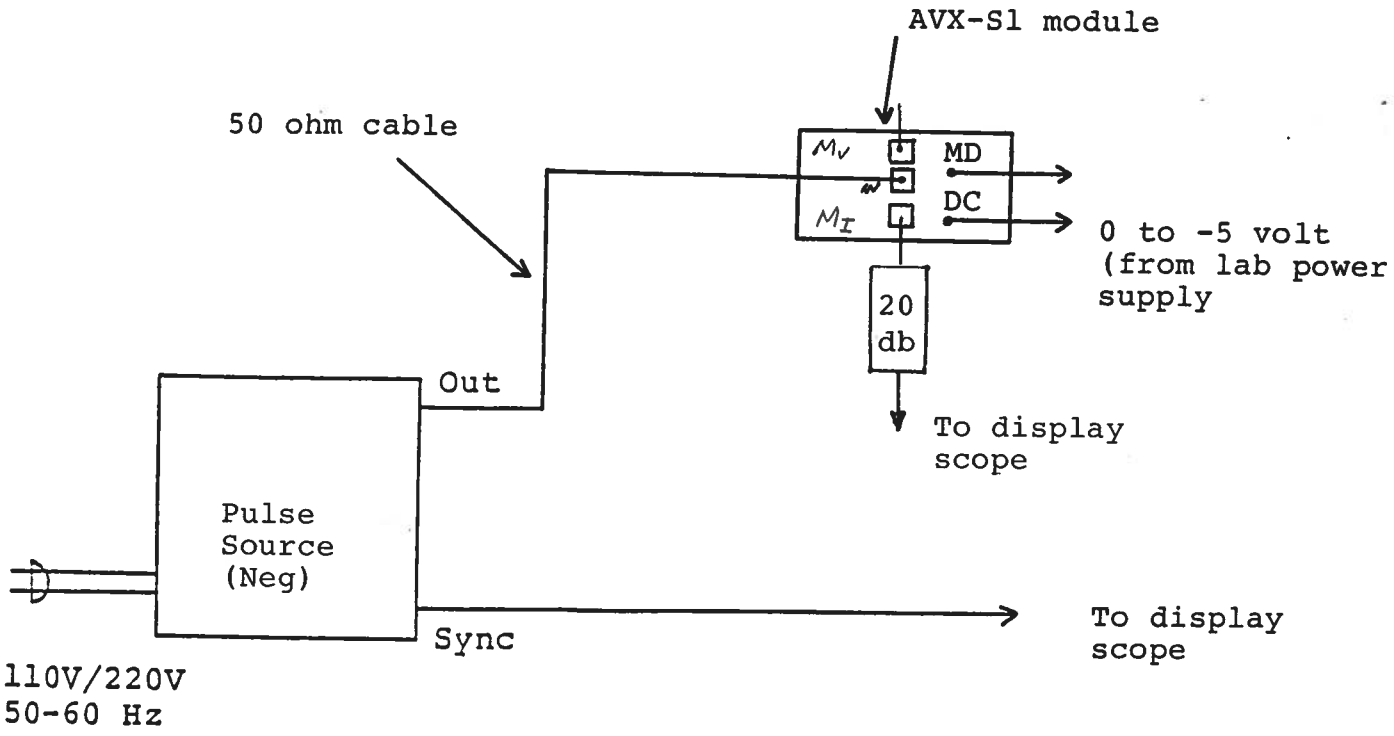
5) The diode RF current may be monitored by connecting the MI and MV output ports to the sampling scope via 20 dB attenuators. The output amplitude (V_{MI} and V_{MV}, Volts) and diode current (I_D, Amp) are related as follows:

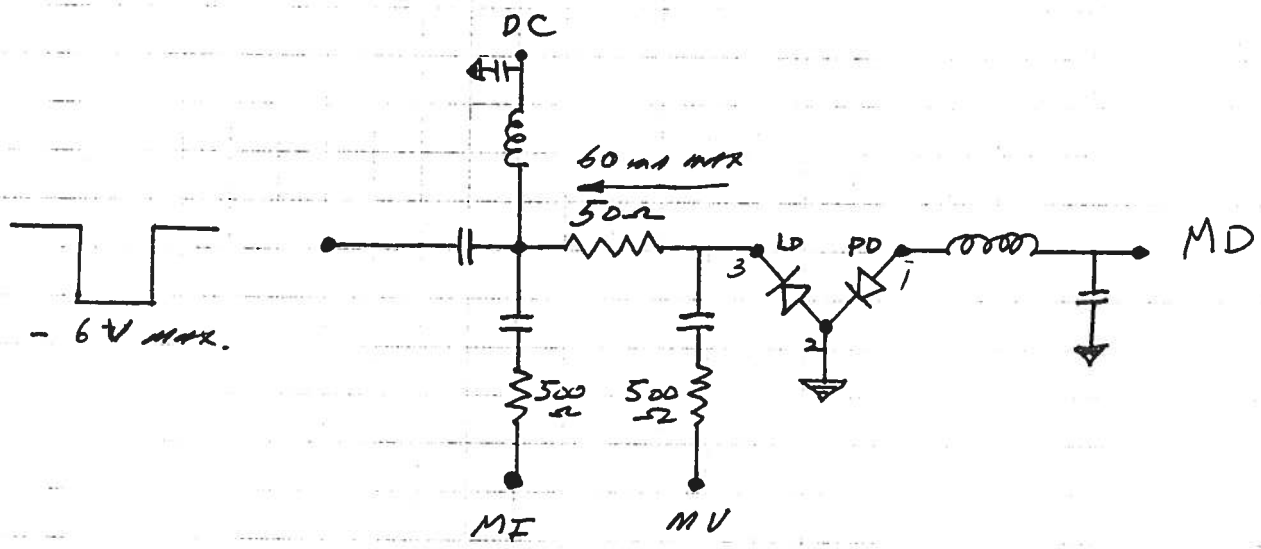
$$I_D = 0.2\ (V_{MI} - V_{MV})$$

The laser diode voltage is given by the following:

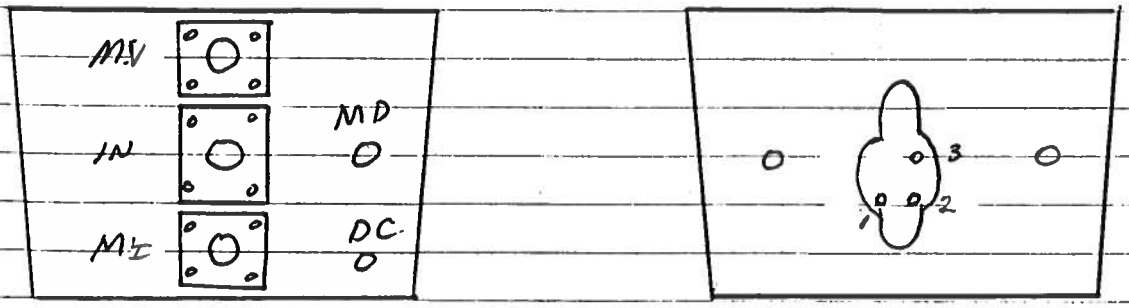
$$V_D = 10\ V_{MV}$$

TEST ARRANGEMENT

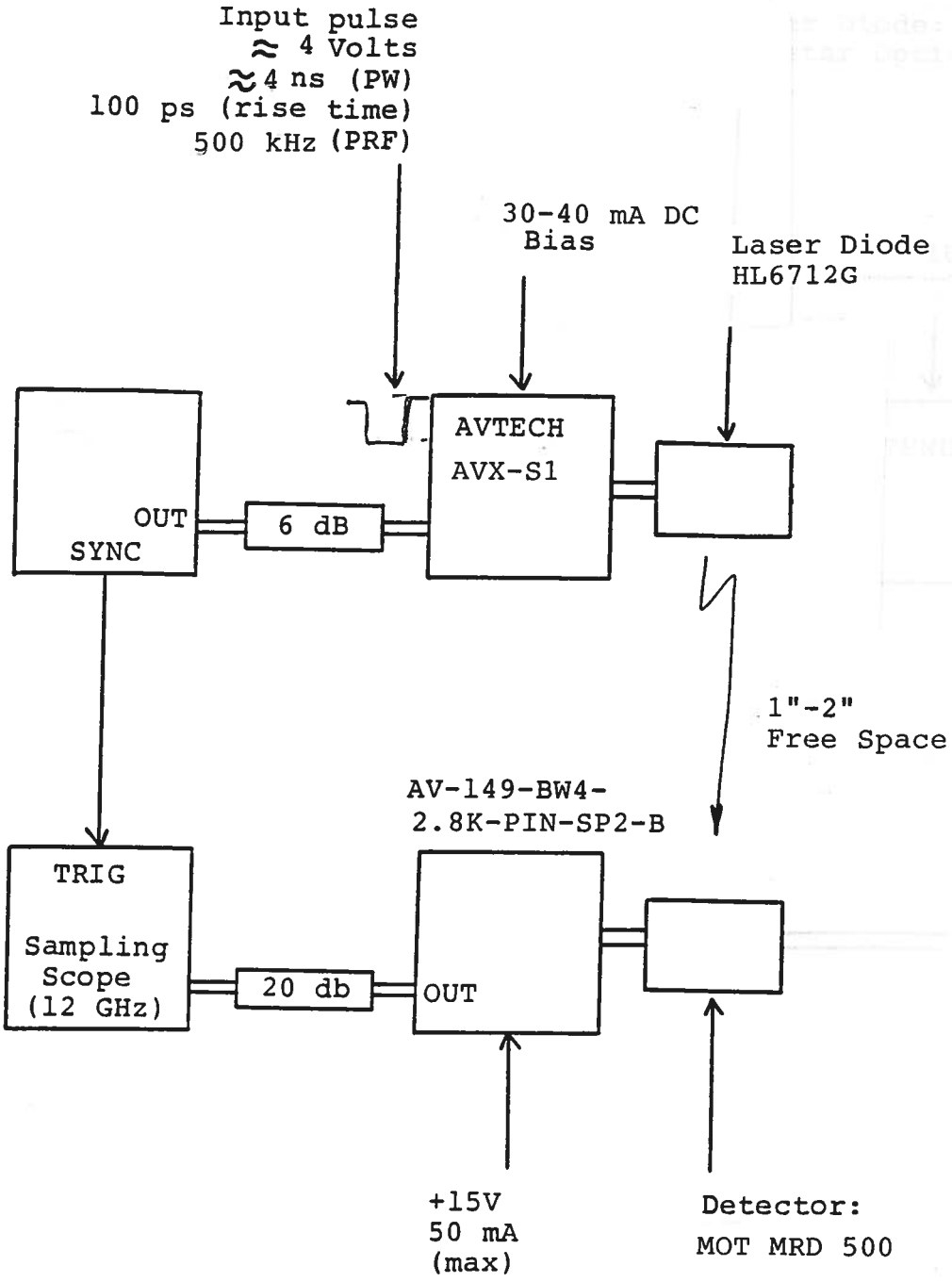




AVX-SI-MI-MV-MD-KCA2 FUNCTIONAL EQUIVALENT CIRCUIT



PACKAGE



BASIC TEST SET-UP (PULSE MODE)

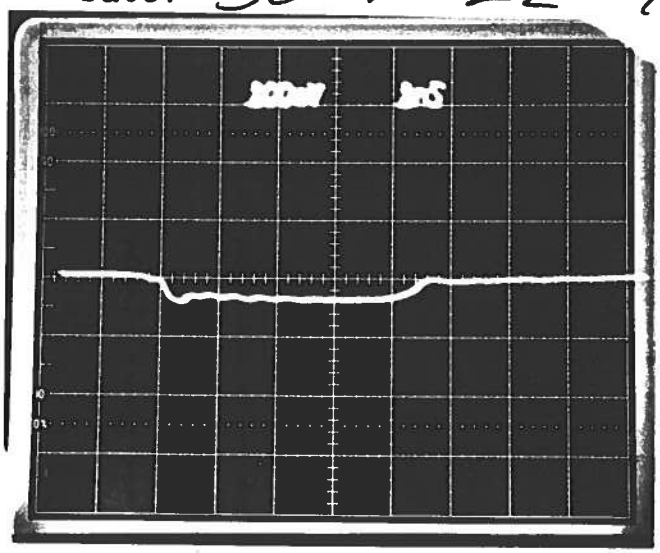
PULSE GENERATOR

PERFORMANCE CHECK

Model: AR-51-MI-MV-MD-KLA2

S.N.: S202

Date: SEPT 22 1997



(A) MI OUT TO 20 dB
(DRIVEN BY AND-91-C-N)

a) Output signal amplitude: NA.

b) Pulse width: 0.4 TO 200 NS

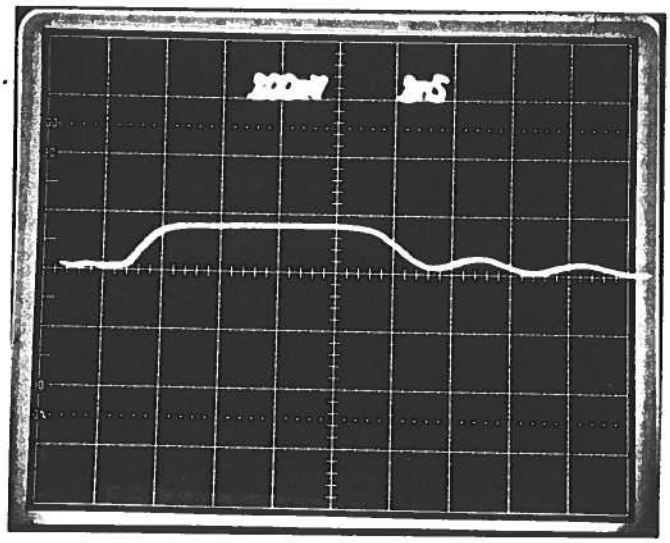
c) Rise time: ≤ 200 PS

d) Fall time: ≤ 20 PS

e) PRF: 0 TO 1 MHZ

f) Jitter, stability: OK

g) Prime power: NA



(B) DETECTED OPTICAL OUTPUT
DETECTOR: MOT MRD500
TIA: ALTECH AV-149-BW4-2.8K
-PIN-SP2.

AVTECH ELECTROSYSTEMS LTD.
NANOSECOND WAVEFORM ELECTRONICS
SINCE 1975

P.O. BOX 265
OGDENSBURG, NY
U.S.A. 13669-0265
TEL: (315) 472-5270
FAX: (613) 226-2802

TEL: 1-800-265-6681
FAX: 1-800-561-1970
U.S.A. & CANADA

e-mail: info@avtechpulse.com

BOX 5120 STN. F
OTTAWA, ONTARIO
CANADA K2C 3H4
TEL: (613) 226-5772
FAX: (613) 226-2802

Fax Ref No: 1847

From: Avtech Electrosystems Ltd.

To: KLA-Tencor

Our Fax No: (613) 226-2802

Date: August 29, 1997

Attn: Howard Carter
Tel: 408-875-6008

Receivers Fax No: 408-428-0545

Subject: Quotation

No. of pages: 4

Following our telephone conversation of August 28th, I am pleased to provide the following revised price and delivery quotation:

Model designation:	AVX-S1-MI-MV-MD-KLA2.
Laser diode:	Hitachi HL6712G (supplied to Avtech by KCA). See enclosed data sheet. Bias insertion unit and laser diode to be tested by Avtech and time domain waveforms supplied.
Functional equivalent circuit:	See enclosed sketch.
Rise time:	≤ 200 ps.
Max required pulse drive voltage: (for 60 mA diode current)	-6.0 Volts.
Pulse width:	0.4 to 200 ns.
Mounting holes:	Two 4-40 tapped holes to be provided on socket face of chassis and 4 standard 4-40 mounting holes on base face (see enclosed sketches).

.../2

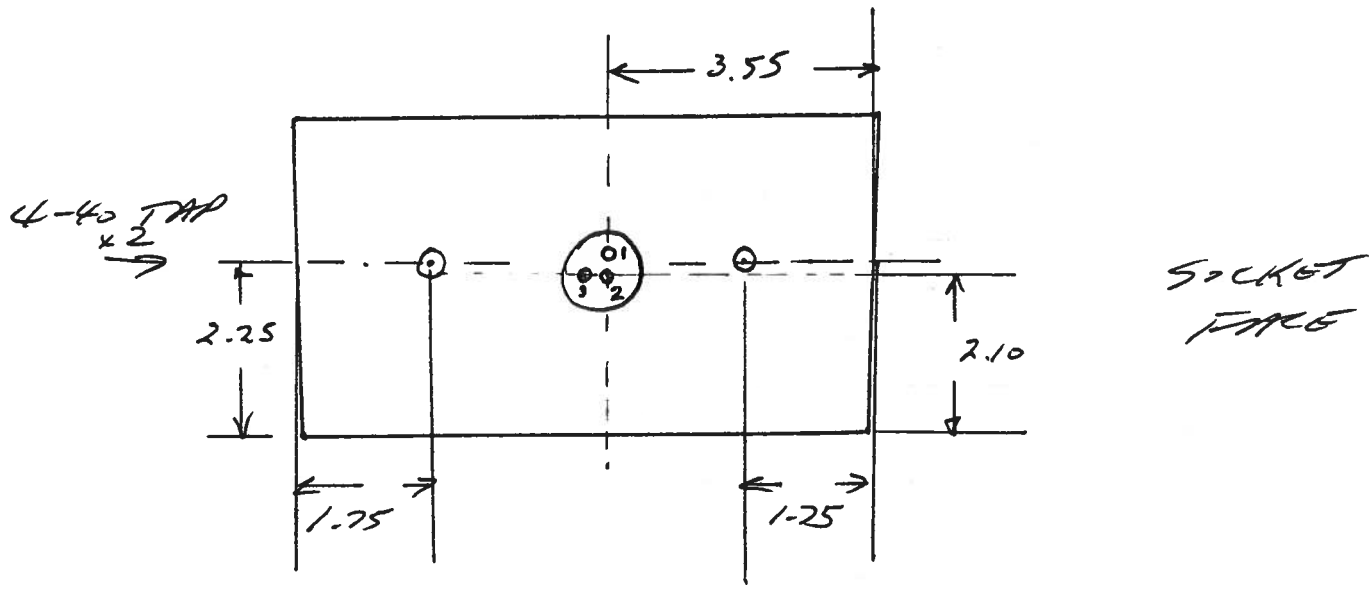
Other:	See standard AVX-S1, Catalog No. 9.
Price:	$1,169.00 US each, FOB destination.
Delivery:	3 weeks ARO.

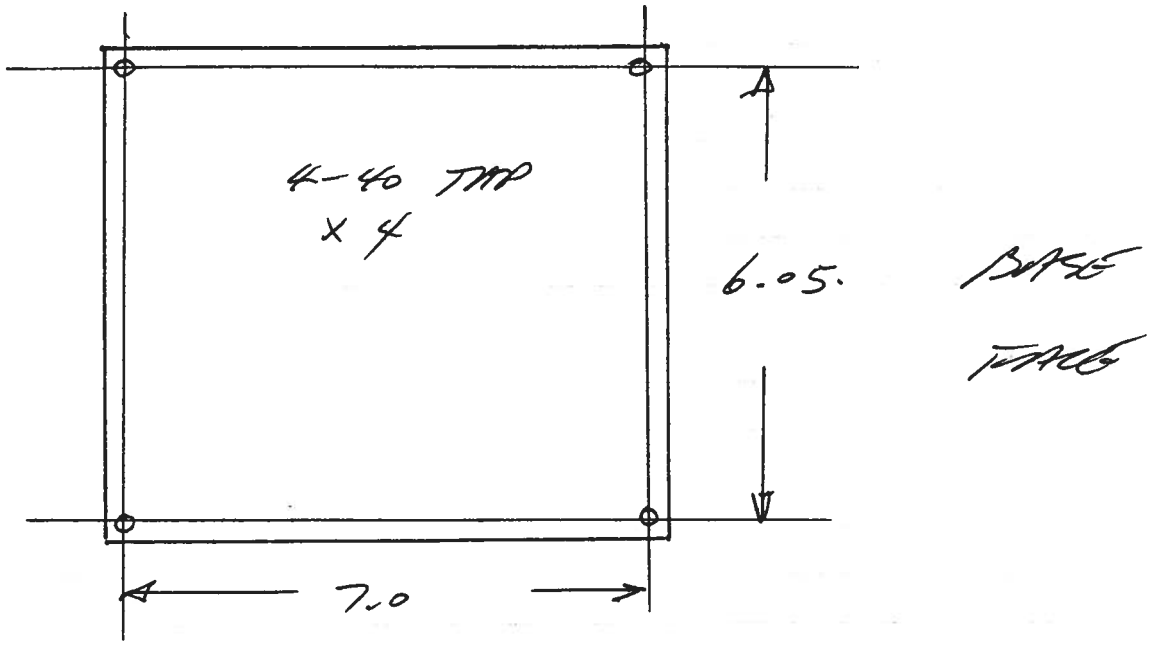
Thank you for your interest in our products. Please call me again (1-800-265-6681) if you require any additional information.

Regards,

Dr. Walter Chudobiak
Chief Engineer

WC:my

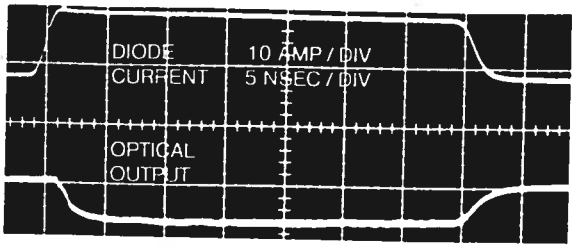




MODEL ARX-S1-MI-MU-MD-KCA2

CHASSIS

ALL 29 97



- Socket mounting of laser diodes
- Peak currents from 100 mA to 48 Amps
- Pulse widths from 0.4 to 200 nsec
- Rise times from 0.2 to 2.0 nsec
- Pulse or CW RF
- Diode current and voltage monitor options

The AVX-S series of bias insertion units is designed for applying pulse or RF CW signals and DC bias to laser diodes which insert 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 or RF source as well as networks for applying DC bias to the diode. Optional outputs allow for monitoring of the laser diode current, voltage and a photo detector diode output. Readily available socket configurations (TO-18, TO-5, TO-3, OP-3) are shown on the following page. Note that the laser diodes are not supplied with the AVX-S series.

The AVX-S series includes 3 basic models namely the AVX-S1, AVX-S2 and the AVX-S3. The basic functional equivalent circuit for the three models are shown below. Model AVX-S1 is specifically designed for ultra high-speed, low current applications (rise times as low as 200 psec, bandwidths to 1 GHz, I <1.0 ampere). Model AVX-S1 is employed in the AVO-9-C series of diode drivers. Model AVX-S2 is intended for application with rise times greater than 2 nsec and currents above 1 ampere. Model AVX-S3 is specifically designed for use with the AVO-2 and AVO-5 series pulse generators (which provide currents in the range of 5 to 50 amperes).

The input series blocking capacitor in Models AVX-S1 and AVX-S2 presents a low impedance to RF CW signals and to baseband pulses while the shunt indicator presents a high impedance to RF (or pulse) signals but an extremely low impedance to the DC bias. The resistor in series with the laser diode is selected to insure that the impedance at the IN port is 50 ohms. Normally a laser diode resistance of 3 ohms is assumed.

The optional diode current monitor (M_I) provides an output waveform (to 50 ohms) which is an attenuated replica of the laser diode current. The output amplitude (V_{MI}, volts) and diode current (I_D, Amps) are related as follows:

-S1: $I_D = 0.2V_{MI}$ -S2: $I_D = V_{MI}$

The optional diode voltage monitor (MV) provides an output waveform that may be related to the voltage across the laser diode (V_D, volts) as follows:

-S1: $V_D = 10\,(V_{MV} - V_{MI})$ - S2: $V_D = 10\,V_{MV}$

Model AVX-S3 is available in four different versions (AVX-S3A, AVX-S3B, AVX-S3C and AVX-S3D) all of which include a matching transformer which effectively boosts the laser diode current beyond that provided by the pulse source.

Model AVX-S3A is designed to match 50 ohm pulse generators such as Model AVO-2-C to 12 ohm loads with peak currents of 5 amperes. Consequently, the resistor R_S in the equivalent circuit for this model is 10 ohm. This resistor is accessible in all AVX-S3 models and may be changed by the user (by desoldering). The series resistance of the laser diode and the resistor R_S must equal the pulse generator source impedance divided by N^2. Consequently, if the series resistance of the laser diode is relatively high, it then may be necessary to reduce the value of R_S. Model AVX-S3B is designed to match 50 ohm pulse generators such as Model AVO-5-C to 3 ohms and will provide peak diode currents up to 28 amperes. Model AVX-S3C is designed to match Models AVO-2W-C and AVO-2-C (25 ohm source impedance) to load resistance of about 5 ohms and will provide peak diode currents as high as 10 amperes. Model AVX-S3D is designed for use with Model AVO-5B-C and will provide up to 48 amperes of diode current.

Two optional SMA output connectors provide attenuated coincident replicas of the diode current (-MI option) and diode voltage (-MV option) as per the following relationships (Amps, Volts):

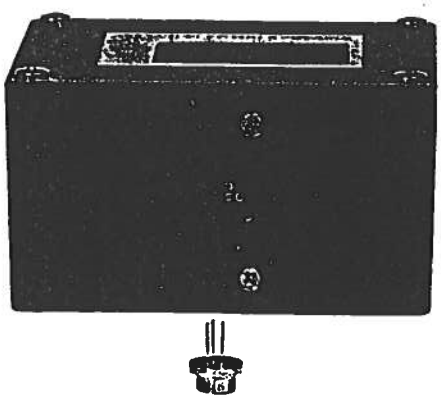
$$I_D = \frac{10\,V_{MI}}{R_S} \qquad V_D = 10\,(V_{MV} - V_{MI})$$

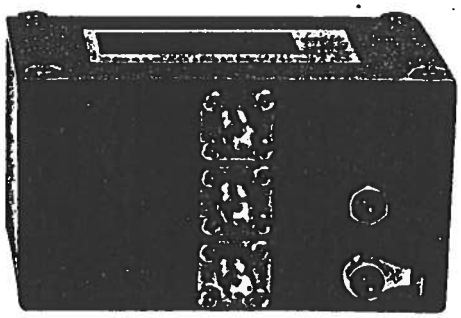
All AVX-S3 units include two foot long input cables with SMA male connectors.

When ordering members of the AVX-S family, the customer must specify the basic model number (eg. AVX-S1) and the following additional information.

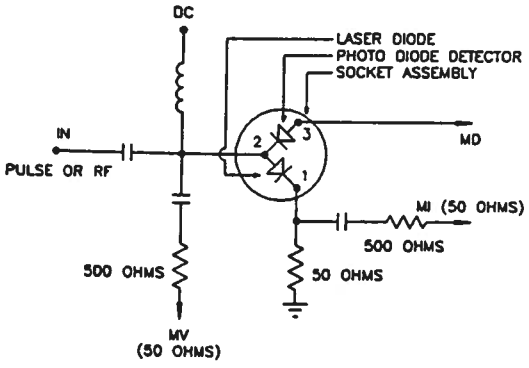
a) Diode package type (eg. TO-18) and the required pin connections (eg. anode, cathode, ground etc). See the following page for readily available package mounting. Contact Avtech for special or different packages.
b) Desired options (eg. -MI, -MV, -MD).

Contact Avtech for your special requirements.

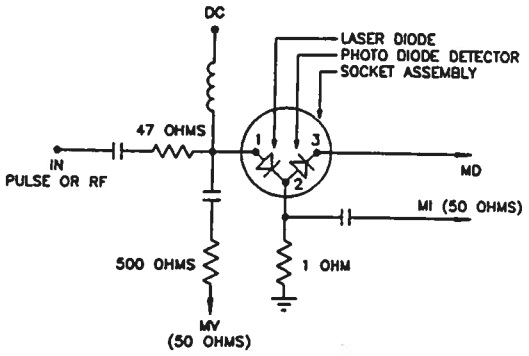




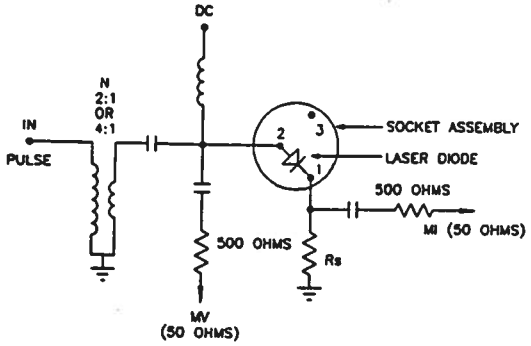
Model:	AVX-S1	AVX-S2	AVX-S3A	AVX-S3B	AVX-S3C	AVX-S3D
Peak diode current:	400 mA	2 Amps	5 Amps	28 Amps	10 Amps	48 Amps
Max. input amplitude:	20 volts	100 volts	150 volts	350 volts	150 volts	150 volts
Pulse width (nsec):	0.4 - 200	1 - 1000	2 - 100	2 - 100	2 - 100	5 - 500
Rise time (nsec):	0.2	0.5	0.5	1.0	0.5	2.0
Pulse PRF range:	DC - 0.5 GHz	DC - 100 MHz	DC - 10 MHz	DC-10 MHz	DC - 10 MHz	DC - 1 MHz
CW frequency range:	10 MHz - 1.0 GHz	1 - 200 MHz	-	-	-	-
Max. bias current:	100 mA	100 mA	100 mA	100 mA	100 mA	100 mA
Max. bias voltage:	50 volts	50 volts	50 volts	50 volts	50 volts	50 volts
Input impedance:	50 ohms	50 ohms	50 ohms	50 ohms	25 ohms	12 ohms
N:	-	-	2	4	2	4
Rs (ohms):	-	-	10	3	5	0.7
IN connector:	SMA					
Monitor connector:	SMA					
Bias connector:	Solder pin					
Size (in):	1.6 x 2.6 x 3.0					
Material:	Cast aluminum, blue enamel					
Mounting:	Any					



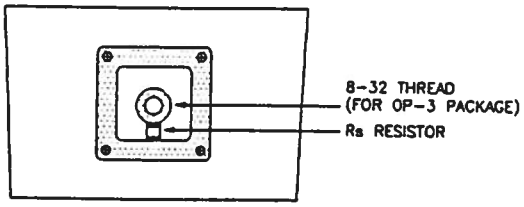
AVX-S1 FUNCTIONAL EQUIVALENT CIRCUIT



AVX-S2 FUNCTIONAL EQUIVALENT CIRCUIT

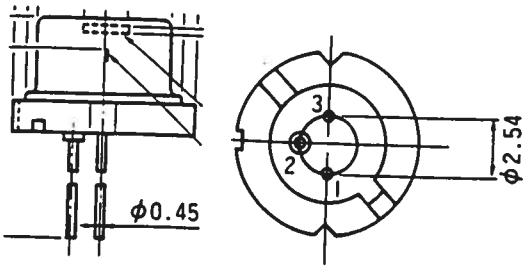


AVX-S3 FUNCTIONAL EQUIVALENT CIRCUIT

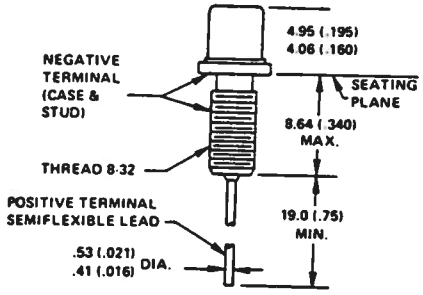


AVX-S3 INPUT ASSEMBLY (FOR OP-3 PACKAGE)

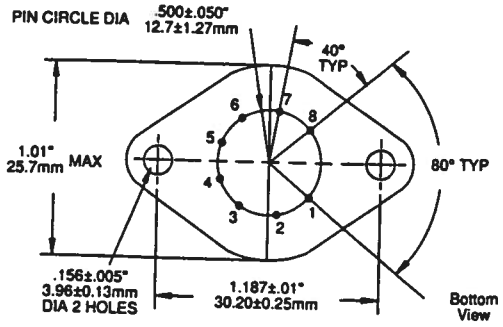
TO-18



OP-3



TO-3 8 PIN



TYPICAL PACKAGES

HL6712G/MG†

AlGaInP LD

Description

The HL6712G/MG are 0.67 µm band AlGaInP index-guided laser diodes with a double heterostructure. They are suitable as light sources for barcode readers, levelers, laser printers and various other types of optical equipment. Hermetic sealing of the packages assure high reliability.

Features

- Visible light output at wavelengths up to 680 nm.
- Single longitudinal mode
- Low threshold current: 40 mA Typ.
- Low astigmatism: 10 µm Typ.
- Operates at temperatures up to 50°C
- Built-in monitor photodiode

Absolute Maximum Ratings (T_C = 25°C)

Item	Symbol	Rated Value	Units
Optical output power	P_O	5	mW
Pulse optical output power	$P_{O\ (pulse)}$	6*	mW
LD reverse voltage	$V_{R\ (LD)}$	2	V
PD reverse voltage	$V_{R\ (PD)}$	30	V
Operating temperature	T_{opr}	–10 to +50	°C
Storage temperature	T_{stg}	–40 to +85	°C

* Maximum 50% duty cycle, maximum 1 µs pulse width

Optical and Electrical Characteristics (T_C = 25°C)

Item		Symbol	Min	Typ	Max	Units	Test Conditions
Threshold current		I_{th}	—	40	65	mA	
Optical output power		P_O	5	—	—	mW	Kink free
Slope efficiency		η	0.3	0.5	0.7	mW/mA	$\frac{3\ (mW)}{I_{(4\ mW)} - I_{(1\ mW)}}$
Lasing wavelength		λ_P	—	675	680	nm	P_O = 5 mW
Beam divergence (parallel)		$\theta_{//}$	5	8	11	deg.	P_O = 5 mW, FWHM
Beam divergence (perpendicular)		$\theta_{\perp}$	22	27	37	deg.	P_O = 5 mW, FWHM
Monitor current	HL6712G	I_S	0.25	0.8	1.25	mA	P_O = 5 mW, $V_{R\ (PD)}$ = 5 V
	HL6712MG		—	—	—		
Astigmatism		A_S	—	10	—	µm	P_O = 5 mW, NA = 0.4

Note: The HL6712MG specifications are preliminary.

Internal Circuit

Package Type
- HL6712G:
- HL6712MG

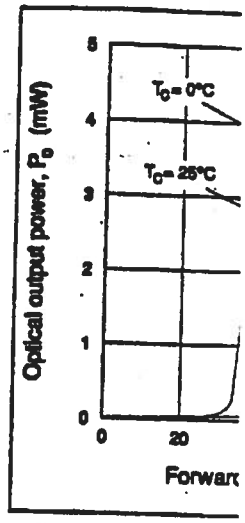


Figure 1 Optical O
Current

HITACHI

Hitachi America, Ltd. • San Francisco Center • 2000 Sierra Point Pkwy. • Brisbane, CA 94005-1819 • (415) 589-8300

InP LD

...ble heterostructure.
vari ...ther types of

...atings (T_C = 25°C)

Rated Value	Units
5	mW
6*	mW
2	V
30	V
−10 to +50	°C
−40 to +85	°C

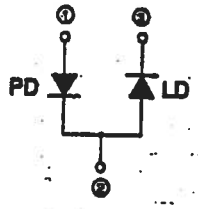
. maximum 1 µs pulse

...t Conditions

k fr
3 (mW)
mW) − $I_{(1\ mW)}$
= 5 mW
= 5 mW, FWHM
= 5 mW, FWHM
= 5 mW, $V_{R\ (PD)}$ = 5 V
= 5 mW, NA = 0.4

Internal Circuit

Package Type
- HL6712G: G1
- HL6712MG: MG



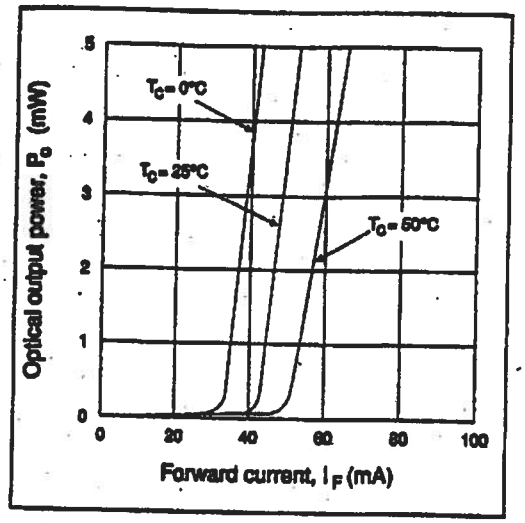


Figure 1 Optical Output Power vs. Forward Current

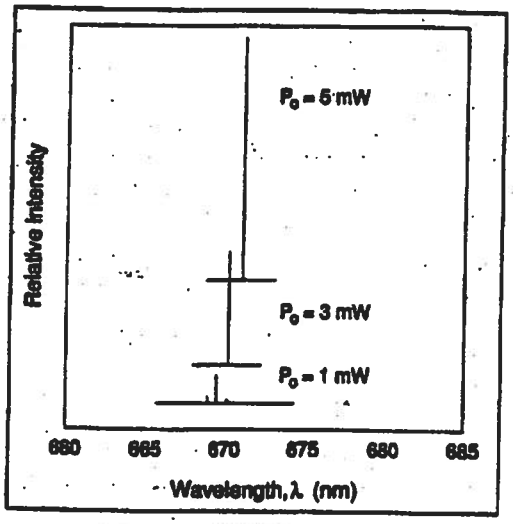


Figure 2 Lasing Spectrum

James Hirasaki

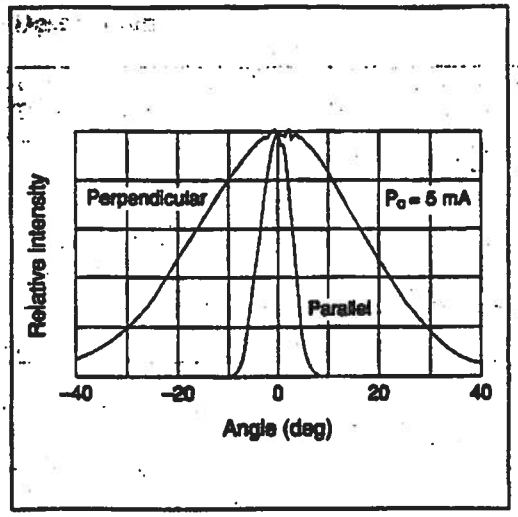


Figure 3 Far Field Pattern

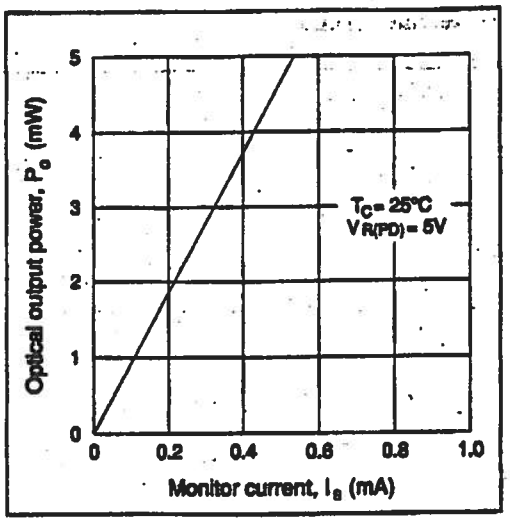


Figure 4 Optical Power vs. Monitor Current

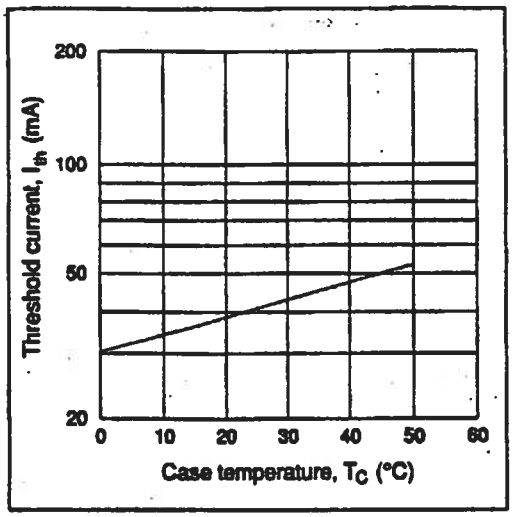


Figure 5 Temperature Dependence of Threshold Current

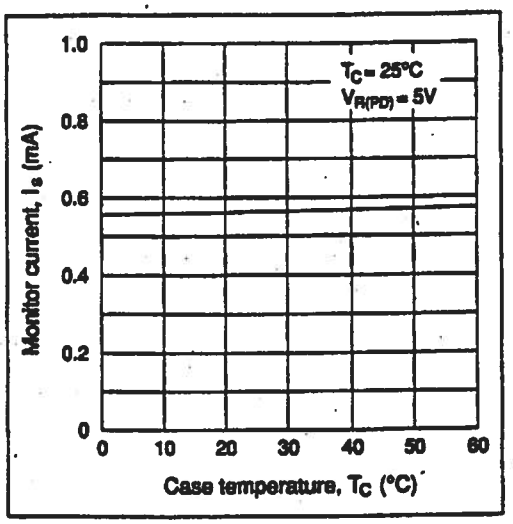


Figure 6 Temperature Dependence of Monitor Current

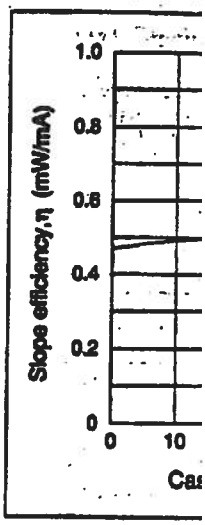
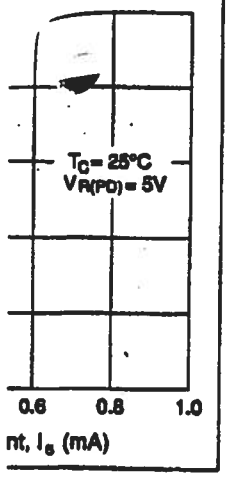
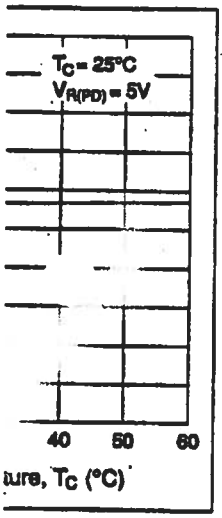


Figure 7 Tem
Slop



er vs. Monitor



Dependence of
ent

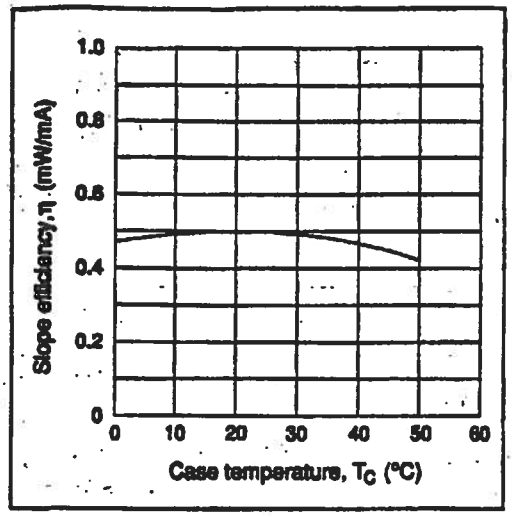


Figure 7 Temperature Dependence of Slope Efficiency

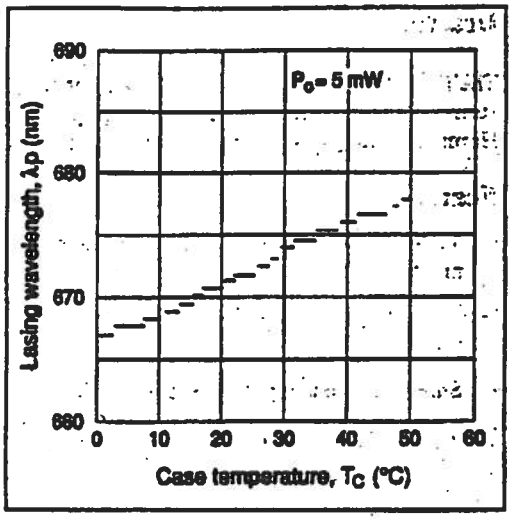


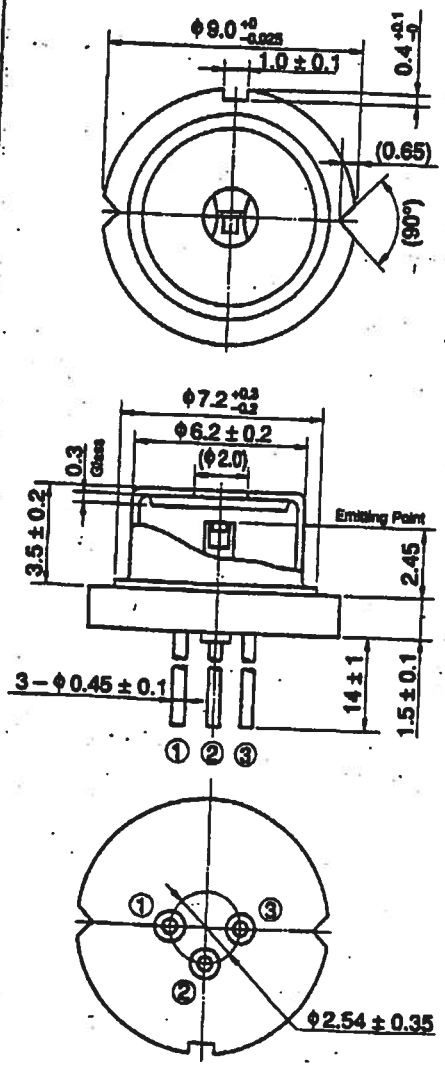
Figure 8 Temperature Dependence of Lasing Wavelength

Package Dimensions

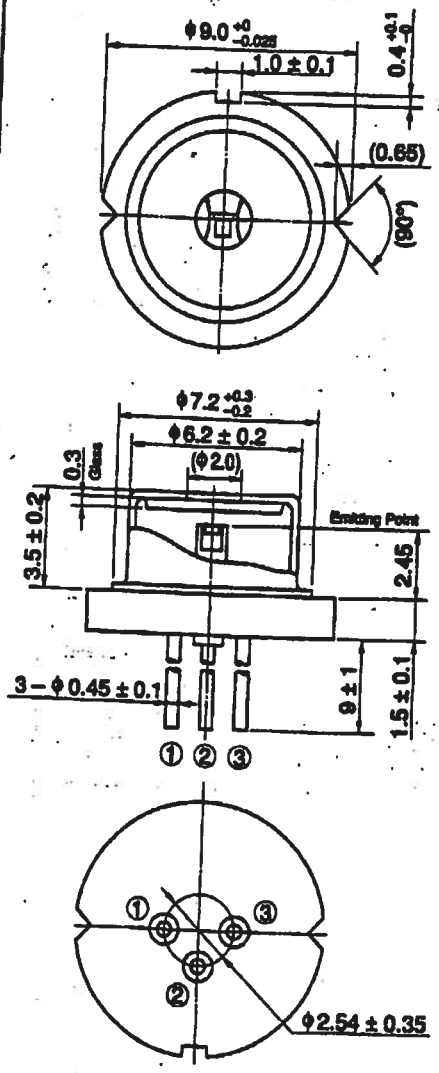
Laser Diodes (cont.)

(Unit: mm)

G1 - Type



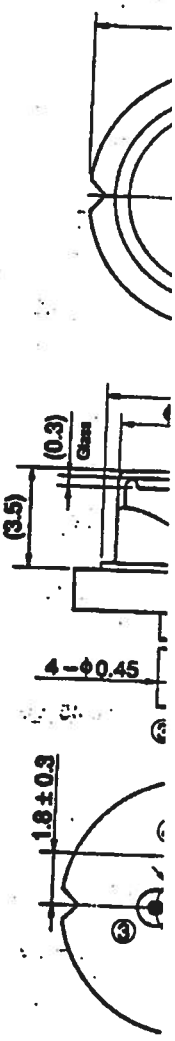
G2 - Type



HITACHI
Hitachi America, Ltd. • San Francisco Center • 2000 Sierra Point Pkwy. • Brisbane, CA 94005-1819 • (415) 589-8300

Laser Diodes

FG - Type



September 22 1987

Disk: AVX-5
File: S1MIMVMD.INS