

## DR-DG-20-HO 22 Gbps High Output Voltage Driver Module

### Digital Driver



The DR-DG-20-HO is a driver module optimized for digital applications requiring an upper operation voltage. It exhibits 12.5 V<sub>pp</sub> output voltage and 29 dB gain up to 23 GHz.

The DR-DG-20-HO module is especially useful for driving LiNbO<sub>3</sub> modulators with 22 Gbps DPSK and 2 x 22 Gbps (D) QPSK modulation formats. It is operated from a single power supply voltage for safety and ease of use and offers gain and cross-point control. The DR-DG-20-HO comes with K type RF connectors (female in, male out) and with an optional heat sink. It is a non-inverting and single ended amplifier.

### Features

- High output voltage 12.5 V<sub>pp</sub>
- High gain 29 dB
- Flat gain up to 20 GHz
- Single voltage power supply

### Applications

- LiNbO<sub>3</sub> & InP modulators
- 22 Gbps DPSK
- 2x22 Gbps (D)QPSK
- Research & Development

### Options

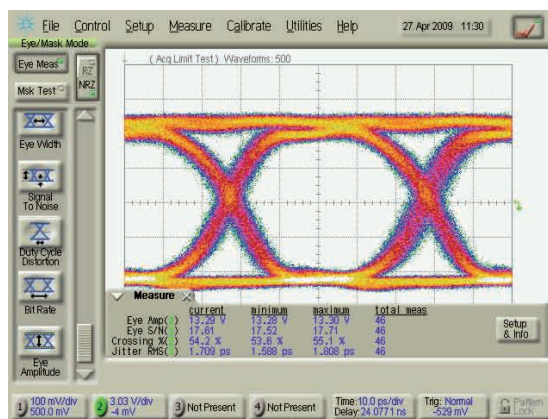
- 13.5 V<sub>pp</sub> output voltage
- Heat-sink
- Alternative RF connectors
- Detector and Bias tee

### Performance Highlights

Parameter	Min	Typ	Max	Unit
Cut-off frequencies	80 k	23 G	25 G	Hz
Output Voltage	-	12.5	13.5	V
Gain	-	29	-	dB
Saturated Power	26	-	-	dBm
Added Jitter	-	1.75	-	ps
Rise / Fall Times	-	12 / 16	-	ps

Measurements for V<sub>bias</sub> = 12 V, V<sub>amp</sub> = 1.2 V, V<sub>xp</sub> = 0.7 V, I<sub>bias</sub> = 650 mA

### 20 Gbps Output Response



# DR-DG-20-HO

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## DC Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
Supply voltage (fixed)	$V_{bias}$	-	12	15	V
Current consumption	$I_{bias}$	-	0.650	-	A
Gain control voltage	$V_{amp}$	0	1.2	2	V
Cross point control voltage	$V_{xp}$	0	0.7	1	V

## Electrical Characteristics

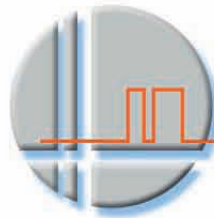
Conditions:  $V_{in} = 0.65 V_{pp}$ ,  $T_{amb} = 25\text{ }^{\circ}\text{C}$ ,  $50\text{ }\Omega$  system

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Lower frequency	$f_{3dB, lower}$	-3 dB point	-	-	80	kHz
Upper frequency	$f_{3dB, upper}$	-3 dB point	20	23	-	GHz
Gain	$S_{21}$	Small signal	-	29	-	dB
Gain ripple	-	< 18 GHz	-	$\pm 1.5$	-	dB
Input return loss	$S_{11}$	50 kHz < f < 18 GHz	-	-10	-	dB
Output return loss	$S_{22}$	50 kHz < f < 15 GHz	-	-10	-	dB
Output voltage	$V_{out}$	$V_{in} = 0.65 V_{pp}$ @ 20 Gbps	-	12.5	13.5 ( $V_{in} = 1V_{pp}$ )	$V_{pp}$
Rise time / Fall time	$t_r / t_f$	20 % - 80 %	-	12 / 16	-	ps
Added jitter	$J_{RMS}$	$J_{RMS} = \sqrt{J_{RMS-total}^2 - J_{RMS-source}^2}$	-	1.75	-	ps
Power dissipation	P	$V_{out} = 12.5 V_{pp}$	-	8.6	-	W

## Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Parameter	Symbol	Min	Max	Unit
RF input voltage	$V_{in}$	-	1.5	V
Power supply voltage	$V_{bias}$	-	15	V
DC current	$I_{bias}$	-	0.7	A
Gain control voltage	$V_{amp}$	0	2	V
Cross point control	$V_{xp}$	0	1	V
Power dissipation	$P_{diss}$	-	9.8	W
Temperature of operation	$T_{op}$	-5	+50	$^{\circ}\text{C}$

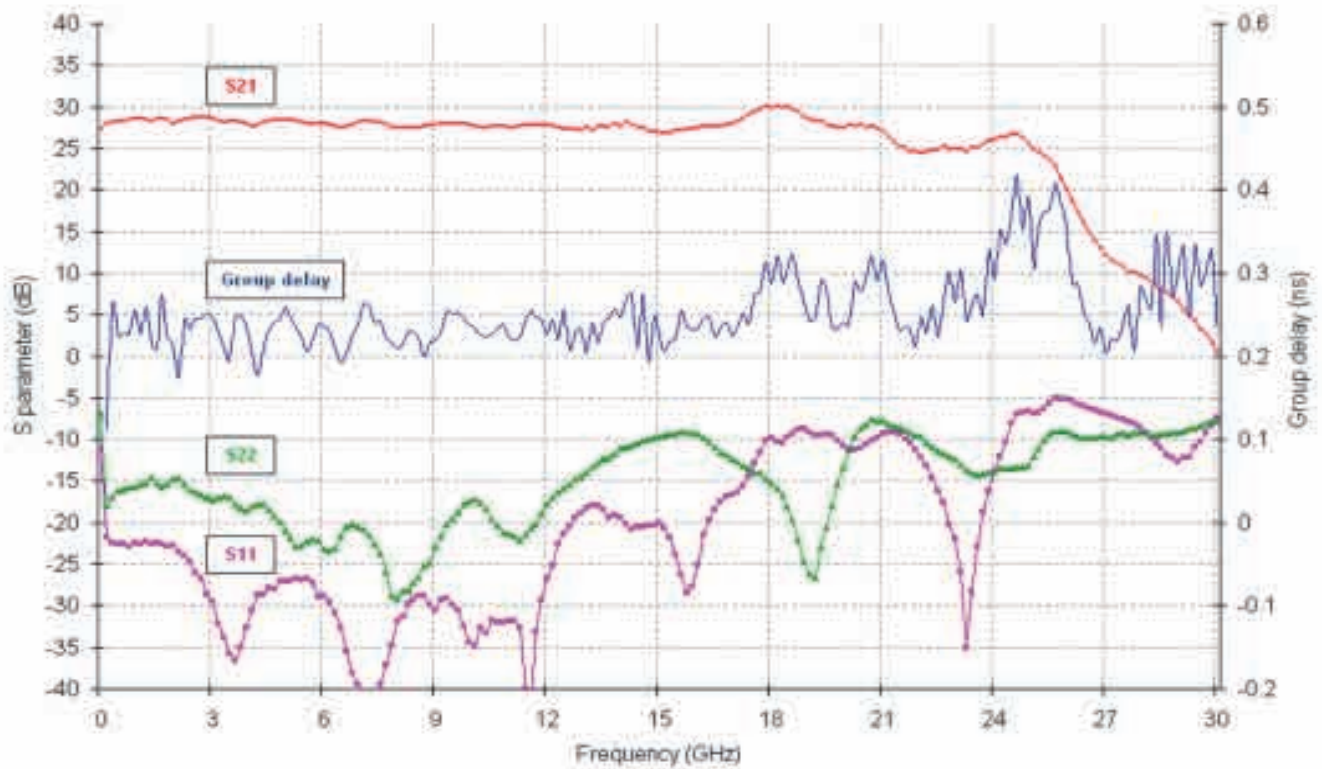


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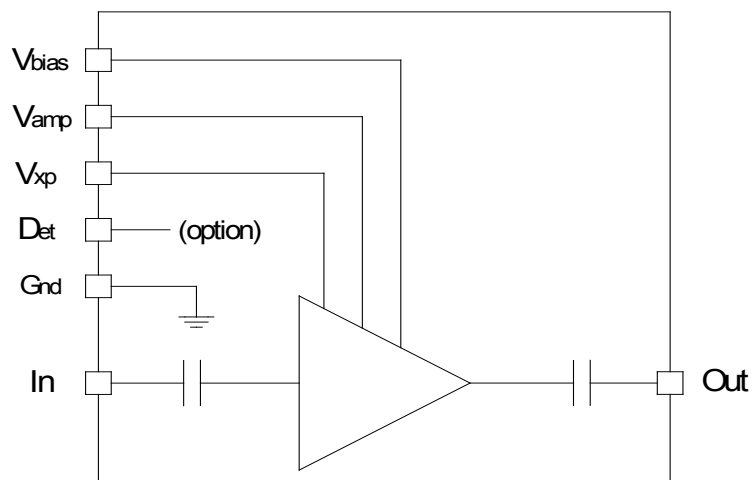
### Digital Driver

#### S parameters curves

Conditions:  $V_{bias} = 12\text{ V}$ ,  $V_{amp} = 1.2\text{ V}$ ,  $V_{xp} = 0.7\text{ V}$ ,  $I_{bias} = 650\text{ mA}$



#### Electrical Schematic Diagram



**DR-DG-20-HO**  
22 Gbps High Output Voltage Driver Module

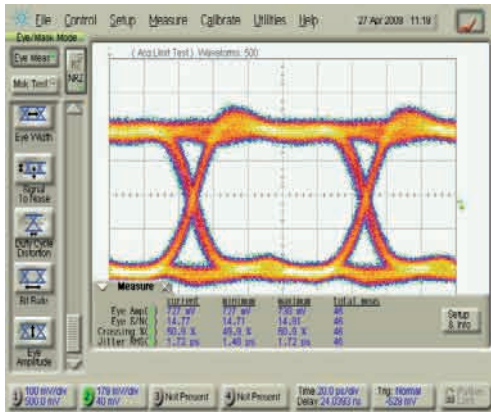
**Digital Driver**

**Eye Diagrams**

**10 Gbps data rate**

Conditions: Ratio  $\frac{1}{2}$ , Pattern  $2^{31}-1$

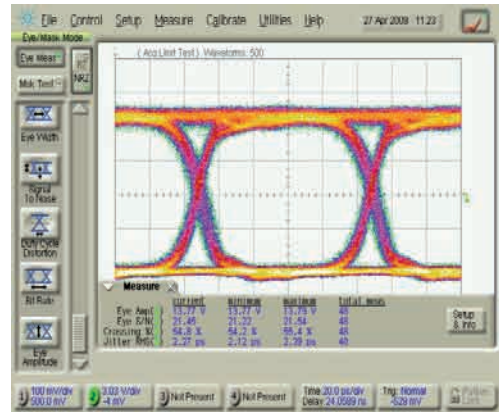
$$V_{bias} = 12 \text{ V}, V_{amp} = 1.2 \text{ V}, V_{xp} = 0.7 \text{ V}, I_{bias} = 650 \text{ mA}$$



**Input signal**

Generated by Anritsu MP1758A

Eye amplitude = 0.727 V, Rise time = 16 ps  
Jitter RMS = 1.72 ps, SNR = 14.77



**Output response**

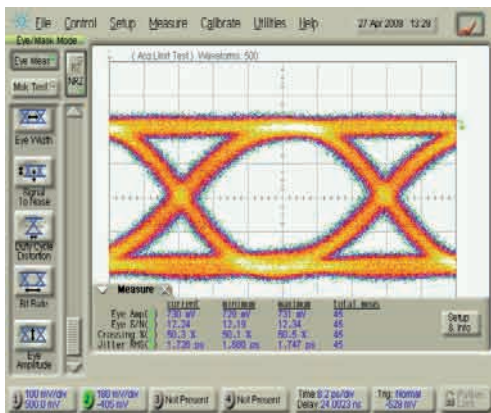
Measured using Agilent 86100B with two 50 GHz

8348A channels module, and without precision time-base module  
Eye amplitude = 13.77 V, Rise time = 14 ps  
Jitter RMS = 2.27 ps, SNR = 21.45

**20 Gbps data rate**

Conditions: Ratio  $\frac{1}{2}$ , Pattern  $2^{31}-1$

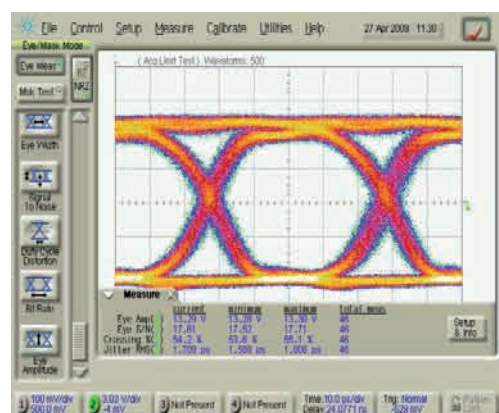
$$V_{bias} = 12 \text{ V}, V_{amp} = 1.2 \text{ V}, V_{xp} = 0.7 \text{ V}, I_{bias} = 650 \text{ mA}$$



**Input signal**

Generated with a NEL MOF15A 2:1 selector

Eye amplitude = 0.73 mV, Rise time = 19 ps  
Jitter RMS = 1.726 ps, SNR = 12.24



**Output response**

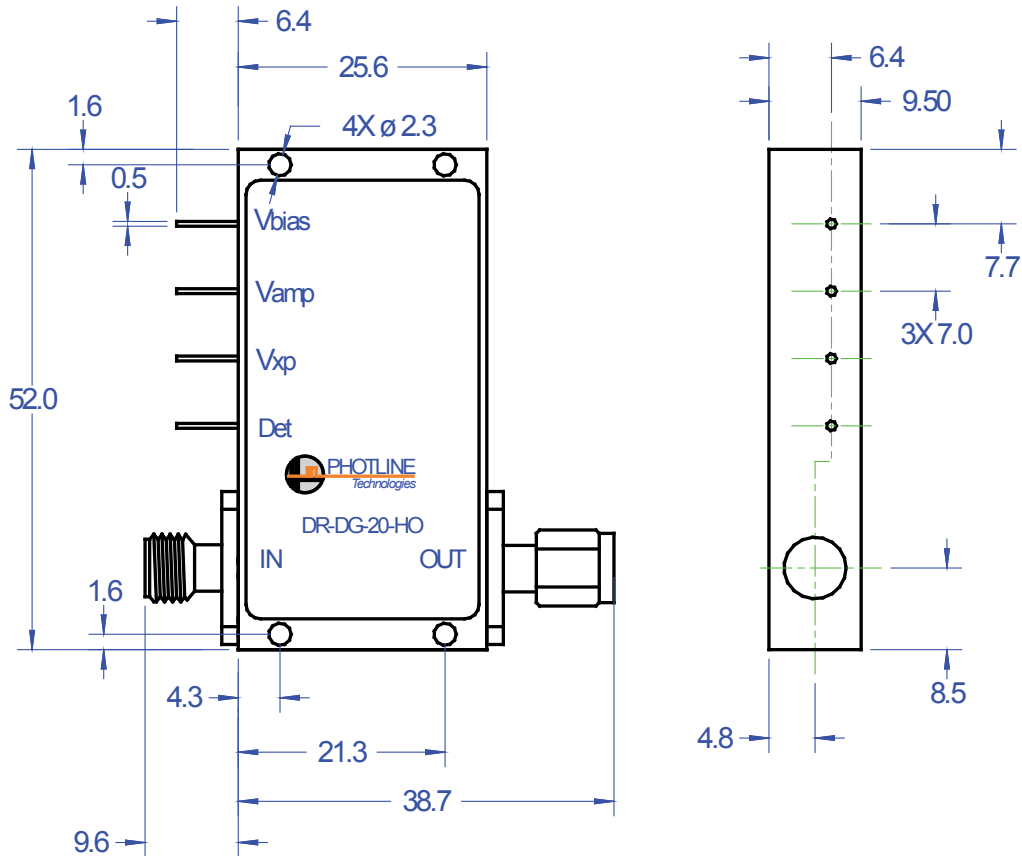
Measured using Agilent 86100B with two 50 GHz

8348A channels module, and without precision time-base module  
Eye amplitude = 13.29 V, Rise time = 13.33 ps  
Jitter RMS = 1.709 ps, SNR = 17.61

**DR-DG-20-HO**  
22 Gbps High Output Voltage Driver Module

**Digital Driver**

**Mechanical diagram and pinout**  
All measurements in mm



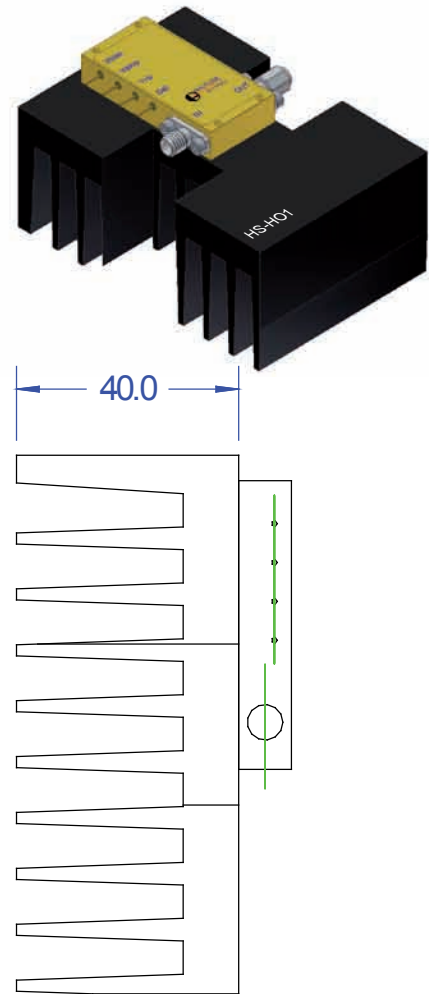
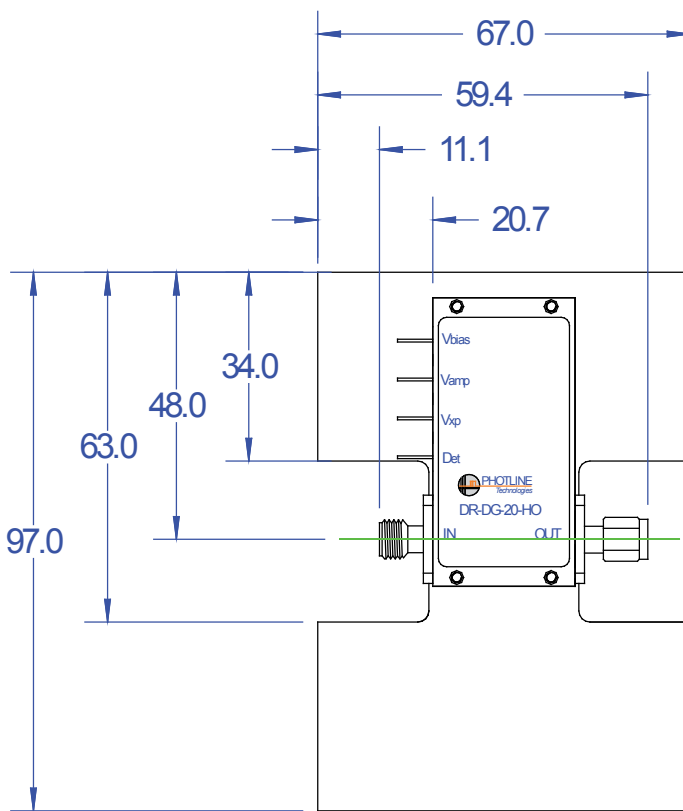
The heatsinking of the module is necessary. It's user responsibility to use an adequate heatsink. Refer to page 6 for Photline Technologies recommended heatsink.

PIN	Function	Operational Notes
IN	RF In	K-connector female
OUT	RF Out	K-connector male
V <sub>bias</sub>	Power supply voltage	Set at typical operating specification
V <sub>amp</sub>	Output voltage amplitude adjustment	Adjust for gain control tuning
V <sub>xp</sub>	Cross point adjustment	Adjust for gain control and eye diagram crossing point tuning
Det	RF power detector	Option

**DR-DG-20-HO**  
22 Gbps High Output Voltage Driver Module

**Digital Driver**

**Mechanical diagram and pinout with HS-HO1 heatsink**  
All measurements in mm



V1, PT-Q1-2009

**ABOUT US**

Photline Technologies is a provider of Fiber Optics Modulation Solutions based on the company LiNbO3 modulators and high-speed electronics modules. Photline Technologies offers high speed and high data rate modulation solutions for the telecommunication industry and the defense, aerospace, instruments and sensors markets. The products offered by the company include : comprehensive range of intensity and phase modulators (800 nm, 1060 nm, 1300 nm, 1550 nm), RF drivers and modules, transmitters and modulation units.

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