

## DR-DG-40-MO-BB

40 Gbps NRZ / RZ Medium Output Voltage  
Driver Module

### PRELIMINARY

### Digital Driver



#### Features

- Output voltage 6.3 V<sub>pp</sub>
- Flat gain up to 40 GHz
- Single voltage power supply
- Gain and crossing point adjustment

#### Applications

- LiNbO<sub>3</sub> & InP modulators
- 40 Gbps - 44 Gbps NRZ / RZ
- SONET OC-768 / SDH-256
- Research & Development

#### Options

- Heat-sink
- Alternative RF connectors gender
- GPPO connectors
- Low output version for EAM

The DR-DG-40-MO-BB is a driver module optimized for digital applications at 40 Gbps – 44 Gbps data rate. It exhibits an output voltage of 6.3 V<sub>pp</sub> and a broad bandwidth of 40 GHz.

The DR-DG-40-MO-BB is housed in a compact package that integrates voltage regulators allowing for flexible biasing, while internal bias sequencing circuitry assures robust operation and single voltage power supply for maximum ease of use. It features two control inputs : one for gain control, the second one for crossing point adjustment. The RF connectors are V type, allowing easy and repeatable connections.

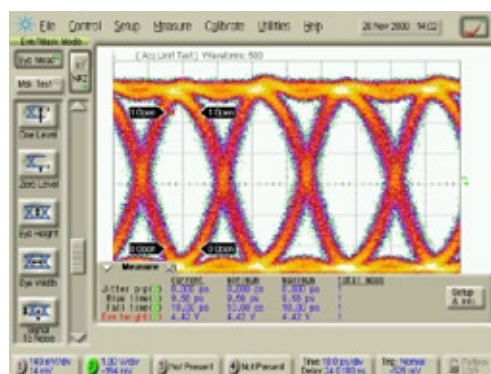
The DR-DG-40-MO-BB combines high performance and user friendliness, it is the ideal device to drive 40 Gbps modulators and to obtain widely opened optical eye diagrams with short jitter and high SNR.

#### Performance Highlights

Parameter	Min	Typ	Max	Unit
Cut-off frequencies	50 k	-	40 G	Hz
Output Voltage	-	6.3	-	V <sub>pp</sub>
Gain	-	26	-	dB
Saturated Power	20	-	-	dBm
Added Jitter	-	0.42	-	ps
Rise / Fall Times	-	8	12	ps

Measurements for V<sub>bias</sub> = 8 V, V<sub>amp</sub> = 1.5 V, V<sub>xp</sub> = 0.8 V, I<sub>bias</sub> = 300 mA

#### 40 Gbps Output Response



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### DC Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
Supply voltage (fixed)	$V_{bias}$	7	8	12	V
Current consumption	$I_{bias}$	-	300	-	mA
Gain control voltage	$V_{amp}$	0	1.5	2	V
Cross point control voltage	$V_{xp}$	0	0.8	1.2	V

### Electrical Characteristics

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

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Lower frequency	$f_{3dB, lower}$	-3 dB point	-	-	50	kHz
Upper frequency	$f_{3dB, upper}$	-3 dB point	36	40	-	GHz
Gain	$S_{21}$	Small signal	-	26	-	dB
Gain ripple	-	< 40 GHz	-	$\pm 1.5$	-	dB
Input return loss	$S_{11}$	50 MHz < f < 35 GHz	-	-10	-	dB
Output return loss	$S_{22}$	50 MHz < f < 35 GHz	-	-10	-	dB
Saturated Power	$P_{sat}$	$V_{in} = 0.65 V_{pp}$	20	-	-	dBm
Output voltage	$V_{out}$	$V_{in} = 0.65 V_{pp}$	-	6.3	6.5	$V_{pp}$
Rise time / Fall time	$t_r / t_f$	20 % - 80 %	-	8	12	ps
Added jitter	$J_{RMS}$	$J_{RMS} = \sqrt{J_{RMS-total}^2 - J_{RMS-source}^2}$	-	0.42	-	ps
Power dissipation	P	$V_{out} = 6.3 V_{pp}$	-	2.4	-	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	$V_{pp}$
Supply voltage	$V_{bias}$	0	12	V
DC current	$I_{bias}$	0	330	mA
Gain control voltage	$V_{amp}$	0	2	V
Cross point control voltage	$V_{xp}$	0	2.4	V
Power dissipation	$P_{diss}$	-	3	W
Temperature of operation	$T_{op}$	0	+50	W
Storage temperature	$T_{st}$	-10	+70	$^\circ\text{C}$

# DR-DG-40-MO-BB

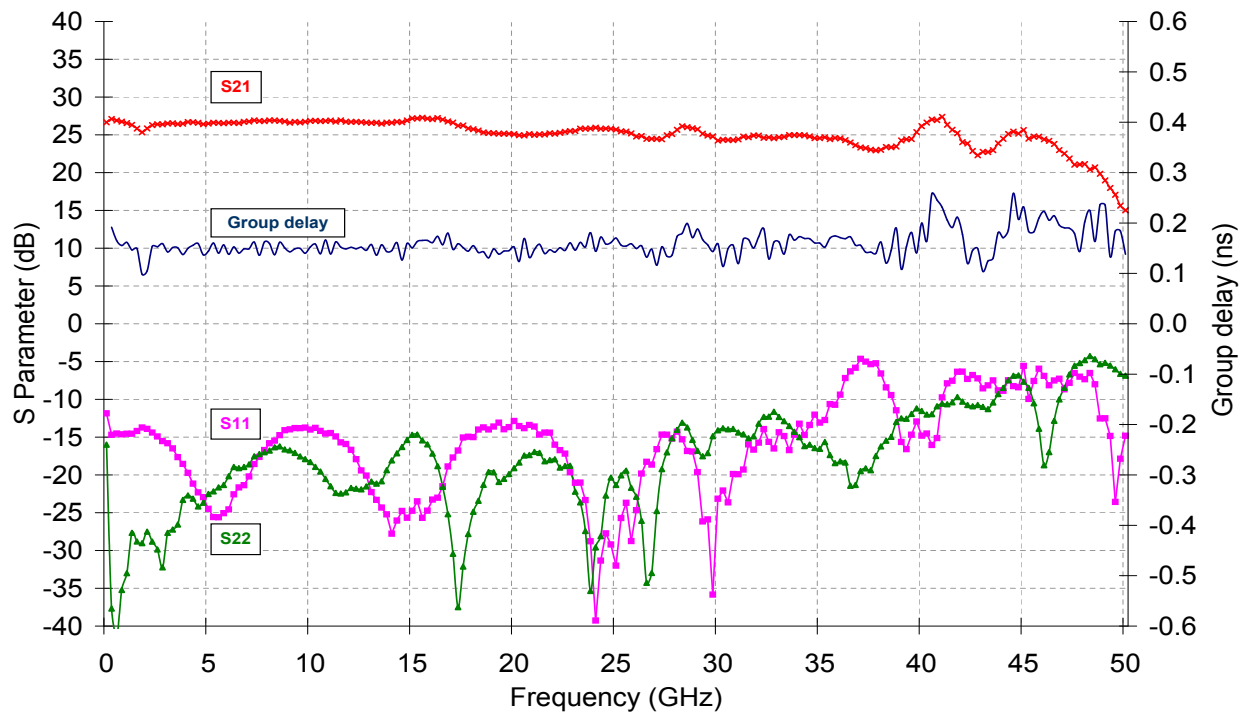
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## Digital Driver

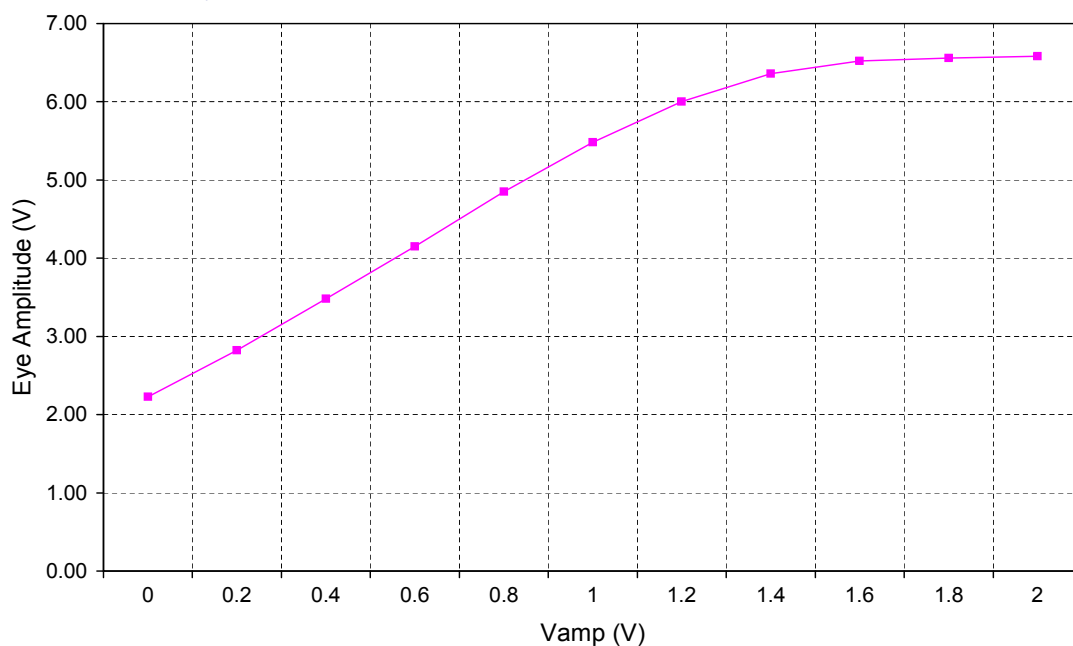
### S parameters curves

Conditions:  $V_{bias} = 12\text{ V}$ ,  $V_{amp} = 1.5\text{ V}$ ,  $V_{xp} = 0.8\text{ V}$ ,  $I_{bias} = 300\text{ mA}$



### Typical output voltage amplitude vs gain control $V_{amp}$ tuning

Conditions:  $V_{bias} = 12\text{ V}$ ,  $V_{xp} = 0.8\text{ V}$



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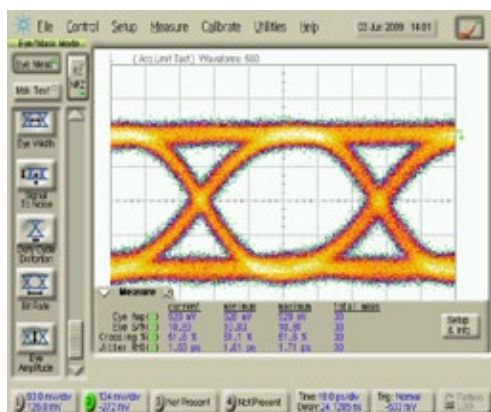
## Digital Driver

### Eye Diagrams

#### 20 Gbps data rate

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

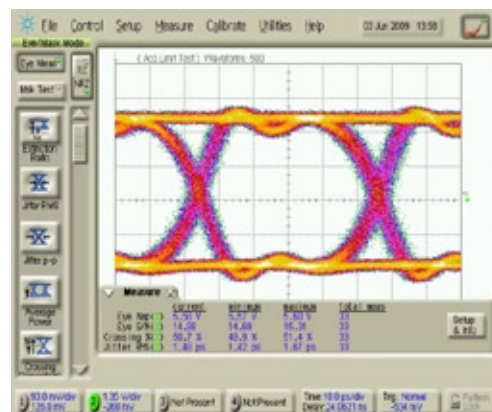
$$V_{\text{bias}} = 8 \text{ V}, V_{\text{amp}} = 1.5 \text{ V}, V_{\text{xp}} = 0.8 \text{ V}, I_{\text{bias}} = 305 \text{ mA}$$



**Input signal**

Generated with a NEL MOF15A 2:1 selector

Eye amplitude = 0.53 V<sub>pp</sub>, Rise time = 20.2 ps  
Jitter RMS = 1.63 ps, SNR = 10.9



**Output response**

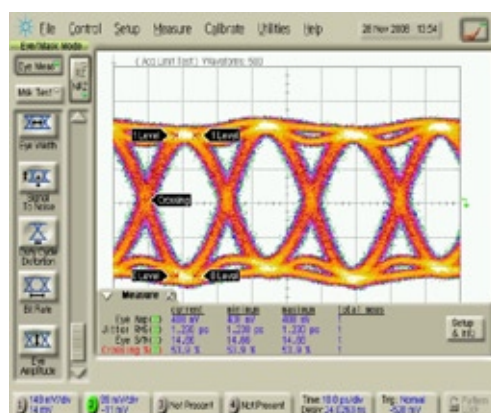
Measured using Agilent 86100B with two 50 GHz

8348A channels module, and without precision time-base module  
Eye amplitude = 5.58 V<sub>pp</sub>, Rise time = 9.8 ps  
Jitter RMS = 1.48 ps, SNR = 14.9

#### 40 Gbps data rate

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

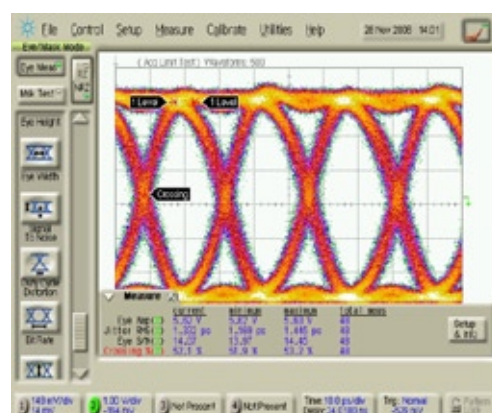
$$V_{\text{bias}} = 8 \text{ V}, V_{\text{amp}} = 1.5 \text{ V}, V_{\text{xp}} = 0.8 \text{ V}, I_{\text{bias}} = 305 \text{ mA}$$



**Input signal**

Generated using Centellax MUX MS4S1V2M 56Gbps 4:1

Eye amplitude = 0.41 V<sub>pp</sub>, Rise time = 10.2 ps  
Jitter RMS = 1.23 ps, SNR = 14.7



**Output response**

Measured using Agilent 86100B with two 50 GHz

8348A channels module, and without precision time-base module  
Eye amplitude = 5.62 V<sub>pp</sub>, Rise time = 9.56 ps  
Jitter RMS = 1.33 ps, SNR = 14.1

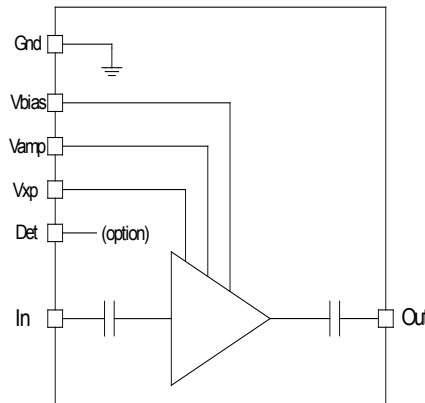
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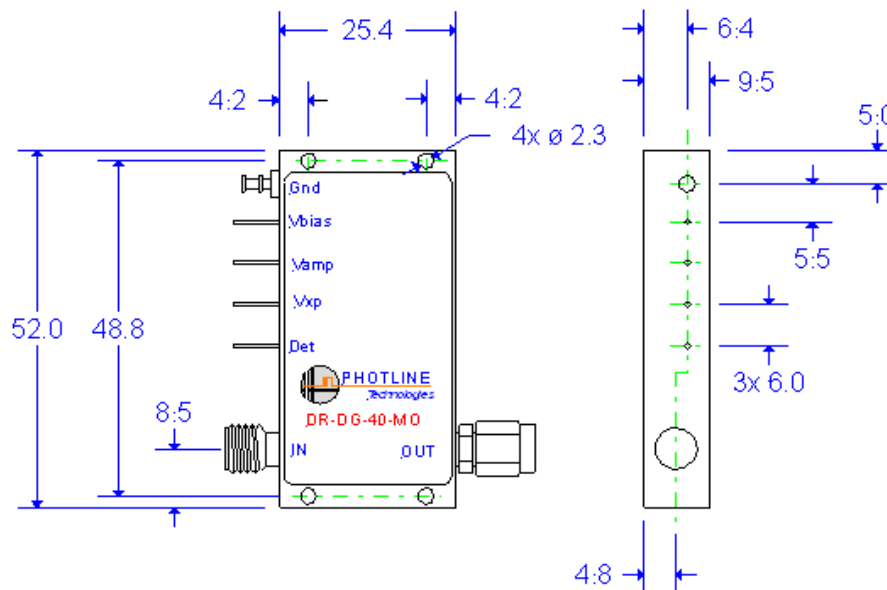
## Digital Driver

### Electrical Schematic Diagram



### 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	V-conector female
OUT	RF Out	V-conector 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>	Output voltage cross point adjustment	Adjust for cross point control tuning



## DR-DG-40-MO-BB

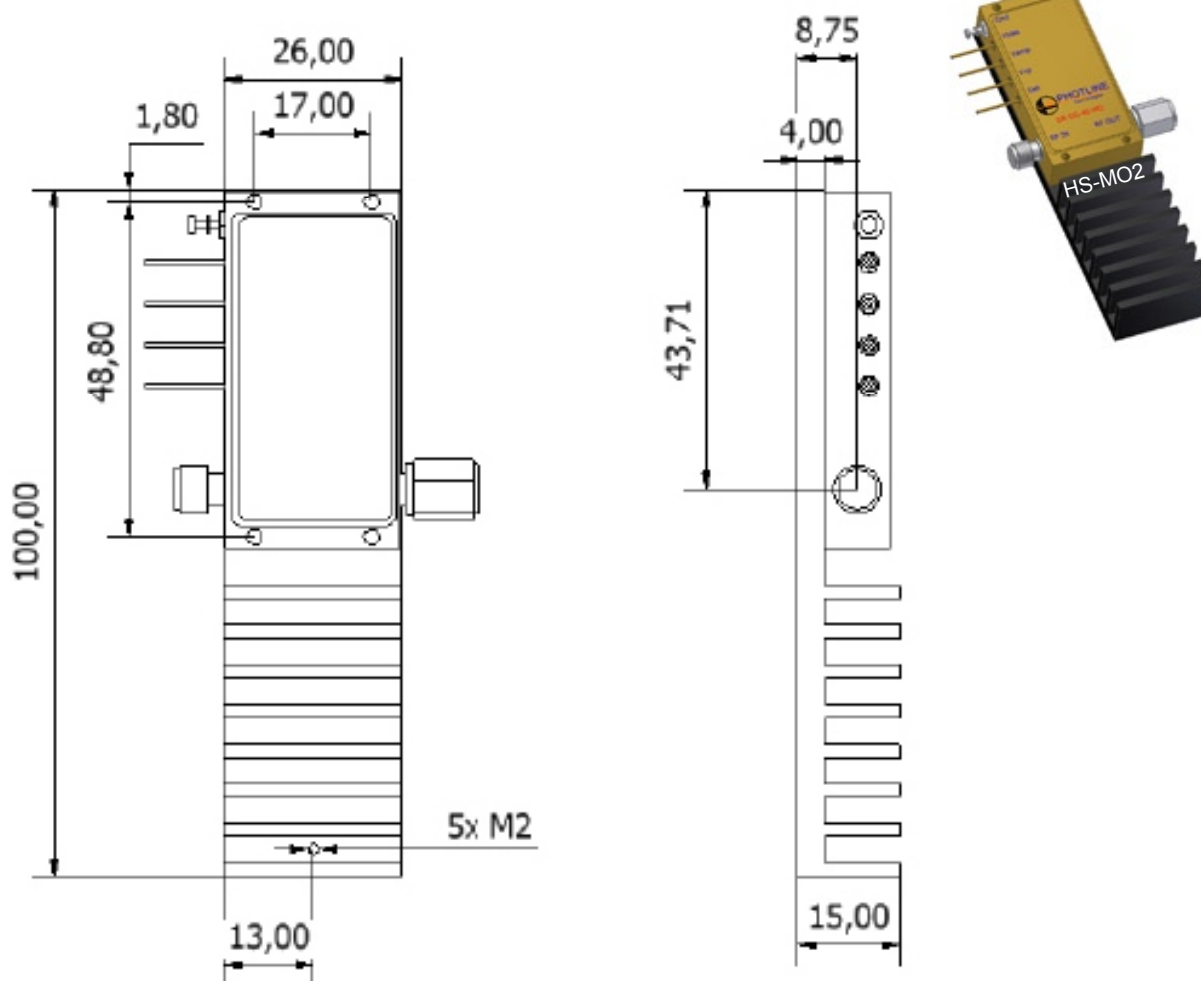
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#### Mechanical diagram and pinout with HS-MO2 heatsink

All measurements in mm



## ABOUT US

Photline Technologies is a provider of Fiber Optics Modulation Solutions based on the company  $\text{LiNbO}_3$  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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