

## Electro-optic Modulators & Drivers

List of EO Modulators & Drivers

- Phase Modulator
- Intensity Modulator
- Driver

### 1. Electro-optic Intensity Modulator



The STK-KY-AM series electro-optic intensity modulator utilizes the electro-optical effect of lithium niobate and push-pull Mach-Zehnder interference structure to achieve intensity modulation of optical signals. It features low insertion loss, high modulation bandwidth, high extinction ratio, low half-wave voltage and high damage optical power. This product is mainly used for electro-optical signal conversion in high-speed optical fiber communication systems, the generation of light sidebands, high extinction ratio light pulse generation in quantum communication, microwave fiber link and other fields.

#### Key Features

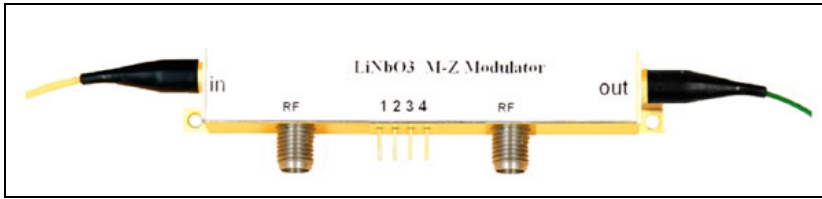
- Wavelengths optional
- Low half-wave voltage
- High bandwidth
- Low insertion loss

#### Applications

- High-speed optical fiber communication systems
- Microwave fiber link
- Quantum communication

Parameters	Symbol	STK-KY-AM-08	STK-KY-AM-10	STK-KY-AM-15-10G	STK-KY-AM-15-20G
Wavelength		830±40	1064±60	1550±100nm	155±100nm
Insertion loss	IL	<5 dB	<4 dB	<4 dB	<4.5 dB
Optical return loss	ORL	-40 dB	-45 dB	-45dB	-45dB
Bandwidth (-3dB)	S <sub>21</sub>	2.5GHz	10GHz-	10GHz	20GHz
Rise time 10%~90%	tr	150ps	35ps	35ps	18ps
Half-wave voltage @50KHz, RF	V <sub>π</sub>	5V	4.5V	4V	5V
Half wave voltage @Bias	V <sub>π</sub>	6V	6V	5V	5V
Extinction ratio	ER	28dB	30dB	>25dB	>25dB
Input resistance	Z <sub>RF</sub>	50 @RF, 1M @Bias			
Electrical interface		SMA(f)			K(f)
Electrical return loss	S11	<-10dB			
Input fiber		PM Panda slow axis alignment			
Output fiber		Single mode fiber or PM fiber			
Fiber connector		FC/APC or customer specified			
Operating temperature	Top	-10~60 C			
Storage temperature	Tst	-40~80 C			
RF input power	Pi	<28dBm			
Max. input optical power	Po	30mW	50mW	100mW	100mW

## 1.1 1064nm High Extinction Ratio Electro-optic Intensity Modulator STK-KY-AM-10



### Key Features

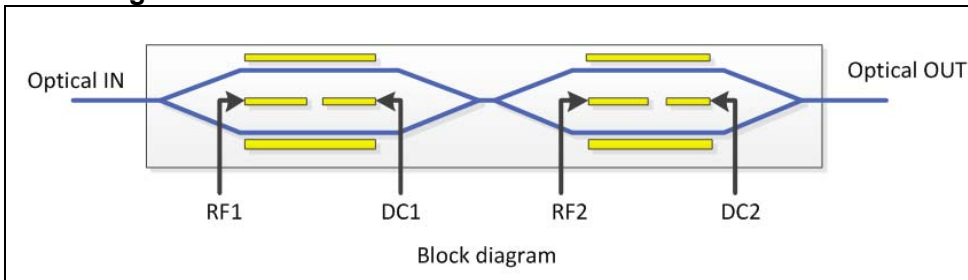
- 1064nm Operation
- Low insertion loss
- 3dB bandwidth 5GHz
- Low half-wave voltage
- High Extinction Ratio >50dB

### Applications

- Optical Pulse Generation
- Optical fiber sensing system
- Laser mode locking

The 1064nm high extinction ratio electro-optical intensity modulator integrates two Mach-Zehnder intensity modulators with a push-pull structure, which can achieve an extinction ratio of up to 50dB. It is used in the fields of high-speed optical pulse generation, fiber sensing, and laser mode locking.

### Block diagram

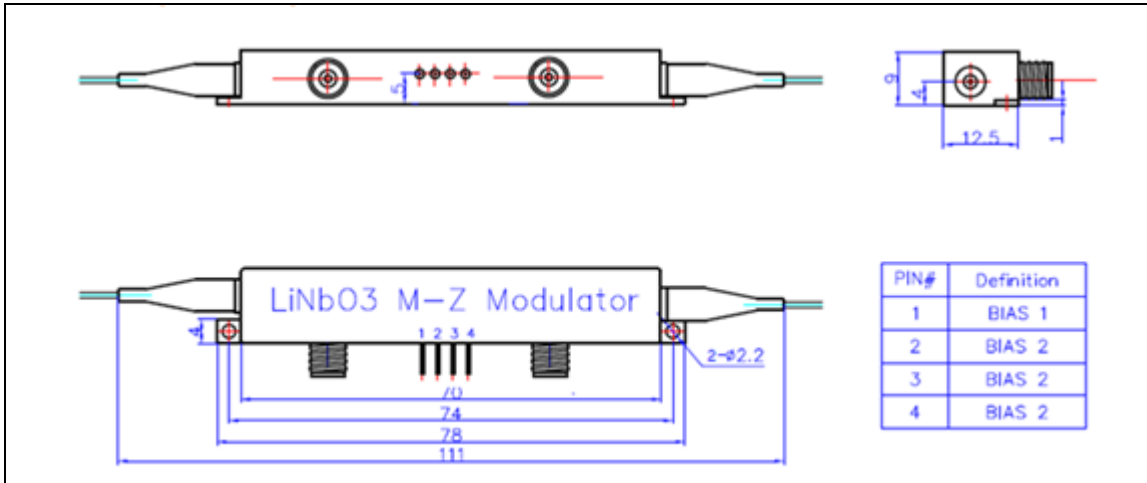


Parameters	Symbol	Min.	Typ.	Max.	Unit
Optical Parameters					
Crystal		LiNbO3 X-Cut Y-Prop			
Waveguide process		APE			
Wavelength		980	1064	1100	nm
Insertion loss*	IL		7	8	dB
Optical return loss	ORL			-40	dB
Extinction ratio @DC	ER@DC	50			dB
Polarization extinction ratio*	PER	25	28		dB
Fiber	Input	Panda PM 980			
	Output	Panda PM 980			
Fiber connector		FC/PC、FC/APC or user specified			
Electrical Parameters					
Bandwidth (-3dB)	$S_{21}$	5			GHz
Half-wave voltage $V_{\pi}$	RF1 & RF2	$V_{\pi@50KHz}$	4.5	5	V
	Bias1 & Bias2	$V_{\pi@Bias}$	4	5	V
Electrical return loss	$S_{11}$		-12	-10	dB
Input impedance	RF1 & RF2	$Z_{RF}$	50		
	Bias1 & Bias2	$Z_{BIAS}$	1M		
Electrical connector	RF1 & RF2		SMA(f)		
	Bias1 & Bias2		4pin		

\*with connector

### Absolute Maximum Ratings

Parameters	Symbol	Unit	Min.	Typ.	Max.
Input optical power	$P_{in,Max}$	dBm			10
RF input power		dBm			28
Bias voltage	Vbias	V	-15		15
Operating temperature	Top	°C	-10		60
Storage temperature	Tst	°C	-40		85
Humidity	RH	%	5		90
Dimension		mm		111x12.5x9	



### Ordering Information

STK-KY-AM-10-BW-PP-FA/FP-HER

WL—Wavelength: 10-1064nm

BW—Bandwidth: 5G---5GHz

FA/FP—Connector: FA---FC/APC; FP---FC/PC

### 1.2 1550nm High Extinction Ratio Electro-optic Intensity Modulator



### Key Features

- C and L-Band Operation
- Low insertion loss
- 3dB bandwidth 10GHz
- Extinction ratio 35/40dB
- Low half-wave voltage
- Integrated Monitor Photodiode
- Telecordia GR-468-CORE

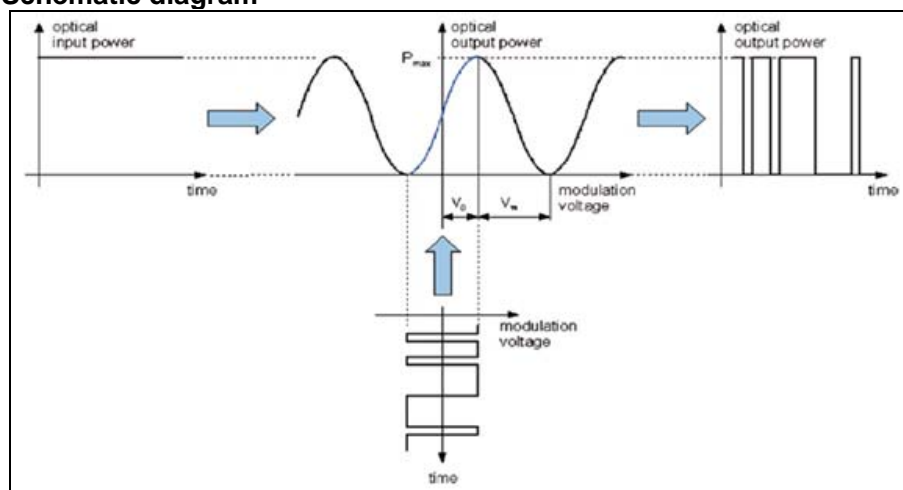
### Applications

- Microwave fiber link
- Quantum communication
- Optical pulse generation
- Optical fiber sensing system
- Laser mode locking

The 1550nm High Extinction Ratio LiNbO3 electro-optical intensity modulator based on the M-Z push-pull structure has a low half-wave voltage and stable physical and chemical characteristics, and the

device has a high response rate, high extinction ratio(>40dB) and is therefore widely used in microwave fiber link, Quantum communication, optical Q-switched systems, laser mode-locking, and fiber sensing .

### Schematic diagram

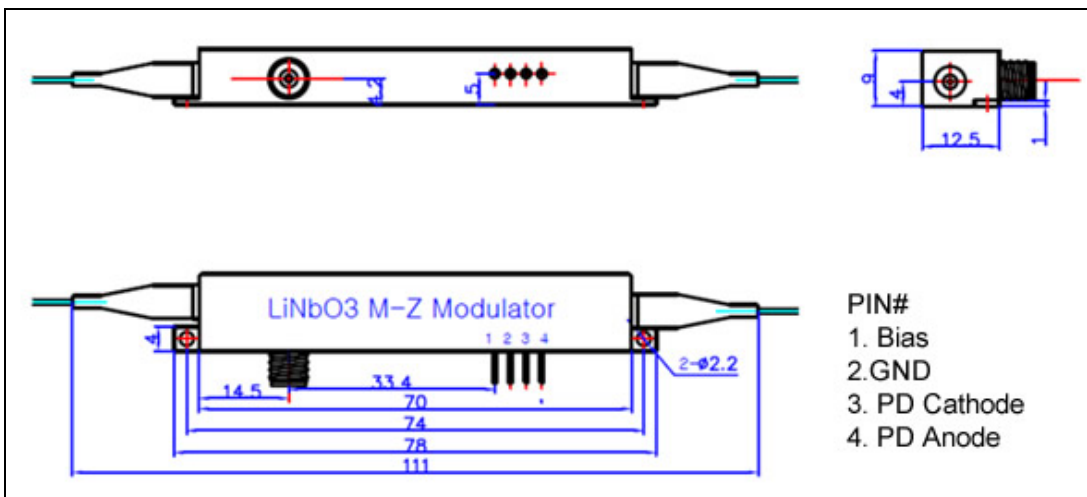
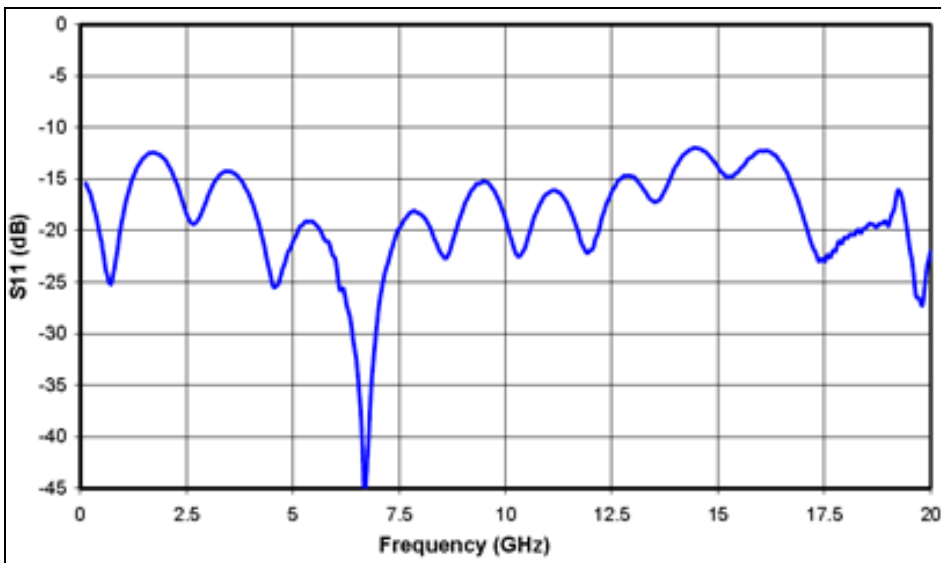
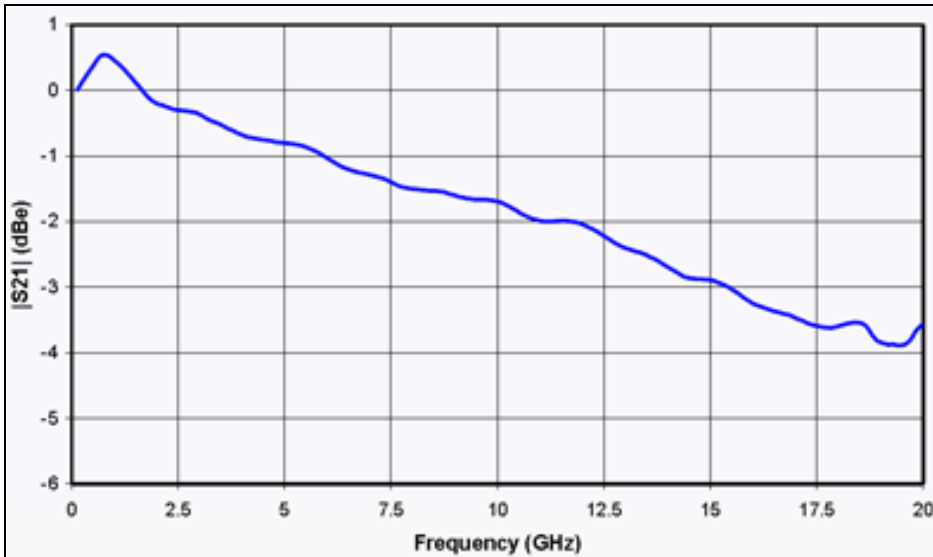


Parameters	Symbol	Min.	Typ.	Max.	Unit
<b>Optical Parameters</b>					
Wavelength		1525		1565	nm
Insertion loss(with connector)	IL		4	5	dB
Optical return loss	ORL			-45	dB
Extinction ratio @DC	ER@DC	35	40		dB
Fiber	Input	Panda PM Fujikura SM 15-P-8/125-UV/UV-400			
	Output	Panda PM Fujikura SM 15-P-8/125-UV/UV-400			
Fiber interface		FC/PC、FC/APC or user specified			
<b>Electrical Parameters</b>					
Bandwidth (-3dB)	S <sub>21</sub>	10	12		GHz
Rise time (10%~90%)	Tr	35			ps
Half-wave voltage V <sub>pi</sub>	RF	V <sub>π@50KHz</sub>		5	V
	Bias	V <sub>π@Bias</sub>		6	V
Electrical return loss	S <sub>11</sub>		-12	-10	dB
Photodiode Responsivity	R <sub>p</sub>	10 <sup>-3</sup>			A/W
Input impedance	RF	Z <sub>RF</sub>	50		
	Bias	Z <sub>BIAS</sub>	1M		
Electrical interface		SMA(f)			
Dimension		111x12.5x9			mm

### Absolute Maximum Ratings

Parameters	Symbol	Unit	Min.	Typ.	Max.
Input optical power	P <sub>in,Max</sub>	dBm			20
RF input power		dBm			28
Bias voltage	V <sub>bias</sub>	V	-20		20
Operating temperature	T <sub>op</sub>	°C	-10		60
Storage temperature	T <sub>st</sub>	°C	-40		85
Humidity	RH	%	5		90

### Characteristic Curve



**Ordering Information**

STK-KY-AM-WL-BW-PP-FA/FP-ER

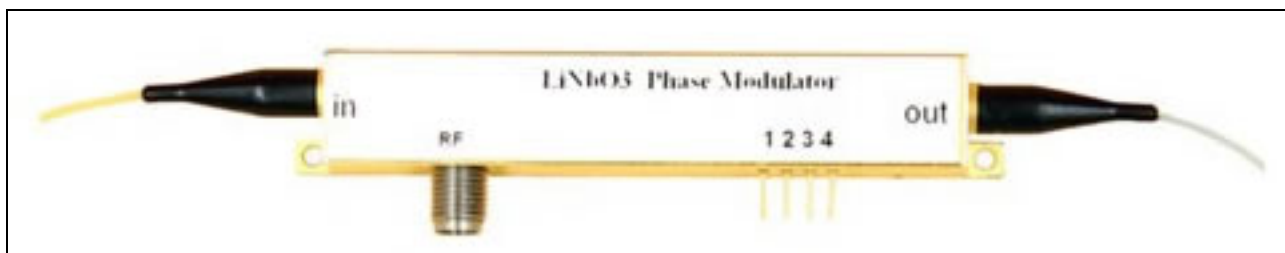
WL—Wavelength: 15-1550nm

BW—Bandwidth: 10G---10GHz 20G-20GHz

FA/FP—Connector: FA---FC/APC; FP---FC/PC

ER----Extinction Ratio: 35dB, 40dB

## 2. Electro-optic Phase Modulator



The STK-KY-PM series electro-optic phase modulator utilizes the electro-optical effect of lithium niobate to achieve phase modulation of optical signals, and uses titanium diffusion or proton exchange process to fabricate optical waveguides, which can achieve dual-polarization or single-polarization phase modulation. It has low insertion loss, high modulation bandwidth, low half-wave voltage, high damage optical power, etc. This product is mainly used for optical chirp control in high-speed optical communication systems, phase delay in coherent communication systems, the generation of optical sidebands, phase modulation in quantum communication, reducing stimulated Brillouin scattering (SBS) in analog optical fiber communication systems and other fields.

### Key Features

- Wavelengths optional
- Low half-wave voltage
- Low insertion loss
- High damage optical power

### Applications

- Optical fiber sensing systems
- Optical fiber communication
- Laser coherent synthesis
- Phase delay (movement)
- Quantum communication

Parameters	Symbol	STK-KY-PM830-1	STK-KY-PM1064-1	STK-KY-PM1550-1	STK-KY-PM1550-2
Wavelength		830 40	1064 60	1550	50nm
Insertion loss	IL	<5 dB	<4 dB	<4 dB	4 dB
Optical return loss	ORL	-40 dB	-45 dB	-45dB	-40 dB
Bandwidth (-3dB)	$S_{21}$	2.5GHz	10GHz-	300MHz	10GHz
Rise time 10%~90%	$t_r$	150ps	35ps	1ns	35ps
$V_{\pi@50KHz}$	$V_{\pi}$	5V	4.5V	4V	4V
Input resistance	$Z_{RF}$	50		1M	50
Electrical interface		SMA(f)		3pin	SMA(f)
Electrical return loss	S11	<-10dB			
Input/output fiber		PM Panda slow axis alignment			
Fiber connector		FC/APC or customer specified			
Operating temperature	Top	-10~60 C			
Storage temperature	Tst	-40~80 C			
RF input power	Pi	<28dBm			
Maximum input optical power	Po	30mW	100mW	100mW	100mW

## 2.1 1550nm Optical CS-SSB Modulation Modules



The STK-KY-MU-SSB-15 series product is an optical CS-SSB modulation module developed by our company. The modulation module integrates Mach-Zehnder dual parallel modulators, bias point control circuits, 90 degree hybrid splitter, can achieve stable and reliable single sideband modulation, and can switch between left and right sideband control as needed. This product is mainly used in Brillouin fiber sensing systems, microwave photonics, gas detection and other fields.

### Key Features

- I Wavelength C-band
- I Sideband suppression ratio: >30dB
- I Carrier suppression ratio: >26dB
- I Up and down sidebands
- I Convenient to use and reliable

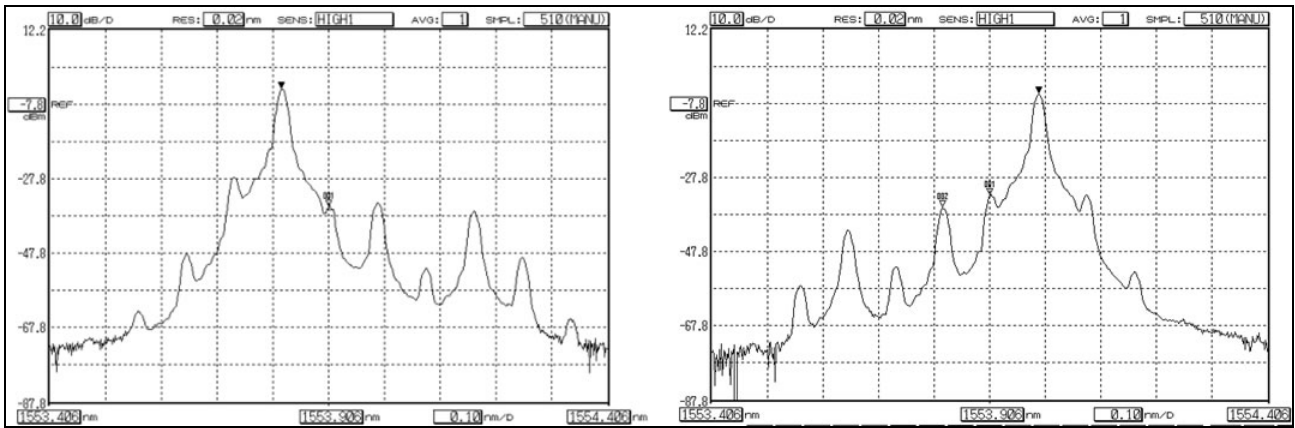
### Applications

- I Optical fiber sensing system
- I Microwave photonics
- I Gas detection
- I Optical fiber communication systems

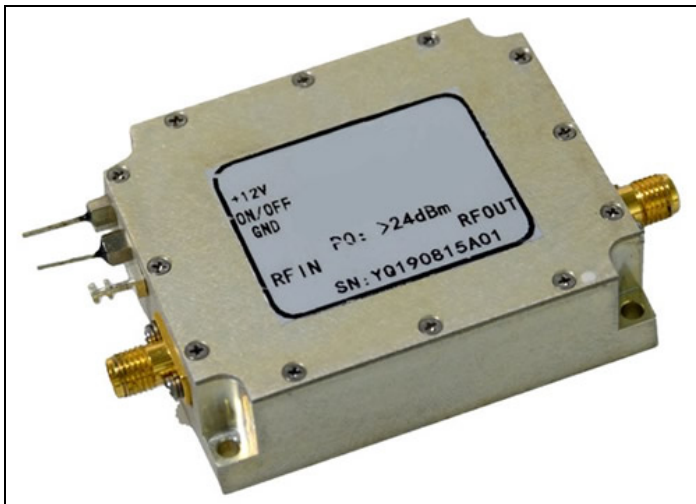
Parameters	Symbol	Min.	Typ.	Max.	Unit
Carrier Optical Source Parameters (Provided by the user)					
Laser type	DFB source or wavelength tunable source				
Wavelength	I	1510		1560	nm
Line width	Dn	-		1	MHz
Polarization extinction ratio	PER		20	-	dB
Power	Pi		10	100	mW
Modulator Specification Parameters					
Modulator type	X-cut double parallel M-Z modulator				
Modulator bandwidth S21@3dB	BW	10	12	-	GHz
Insertion loss	IL		7	8	dB
Return loss	RL	-45	-50	-	dB
Bias Controller Parameters					
Automatic feedback bias controller		Jitter mode			
Jitter signal frequency		400	1000	1400	Hz
Jitter signal amplitude		10	50	1000	mV
Preset work point		Lowest point			
CS-SSB Optical Output Signal					
Single sideband modulation range*	F	1		12	GHz
Input RF power	PRF	-5		5	dBm
Sideband suppression ratio @1550nm		30	35	-	dB



Carrier suppression ratio @1550nm		26		32	dB
Interface					
Input fiber		Panda type polarization-maintaining fiber			
Output fiber		Panda type polarization-maintaining fiber			
Fiber optic interface		PM FC/APC Slow axis alignment			
Input RF signal interface		SMA (50Ω)			
Bias controller communication interface		J30J			
Other Parameters					
Operating temperature	To	+15	-	+35	°C
Stored temperature	Ts	-40	-	+75	°C
Power supply	V	-	15	-	V
Module size	LWH	160*125*20 mm			
Weight		-	0.3	-	Kg



### 3. Drive Module for Electro-optic Modulator



#### Key Features

- 10G, 20G, 40GHz optional bandwidth
- Gain> 25dB
- Saturated output Max.25dBm (11Vpp)
- Rise time Min.<8ps
- Low jitter
- DC12V power supply
- Easy to use

#### Applications

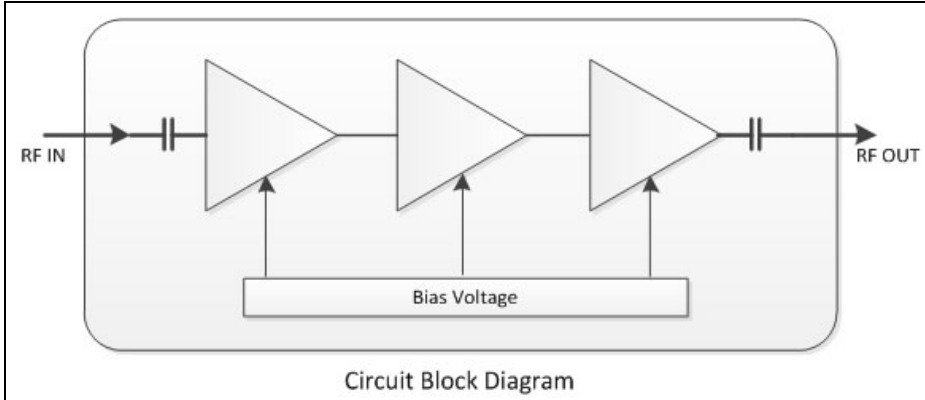
- High-speed optical fiber communication system
- Quantum communication
- Picosecond pulse amplification



- Optical fiber sensing system

### Product List

- 10G driver module
- 10G high output driver module
- 20G driver module
- 40G driver module



The STK-KY-MD-XX series electro-optic modulator driver is a broadband, high-output driver amplifier mainly used for lithium niobate electro-optical intensity and phase modulator. Its working bandwidth is up to 30K ~ 40GHz, and it can achieve a maximum of 42Gbps NRZ wideband signal amplification up to 8Vpp. It is mainly used in high-speed optical fiber communication systems, quantum communication, picosecond pulse amplification, and optical fiber sensing systems.

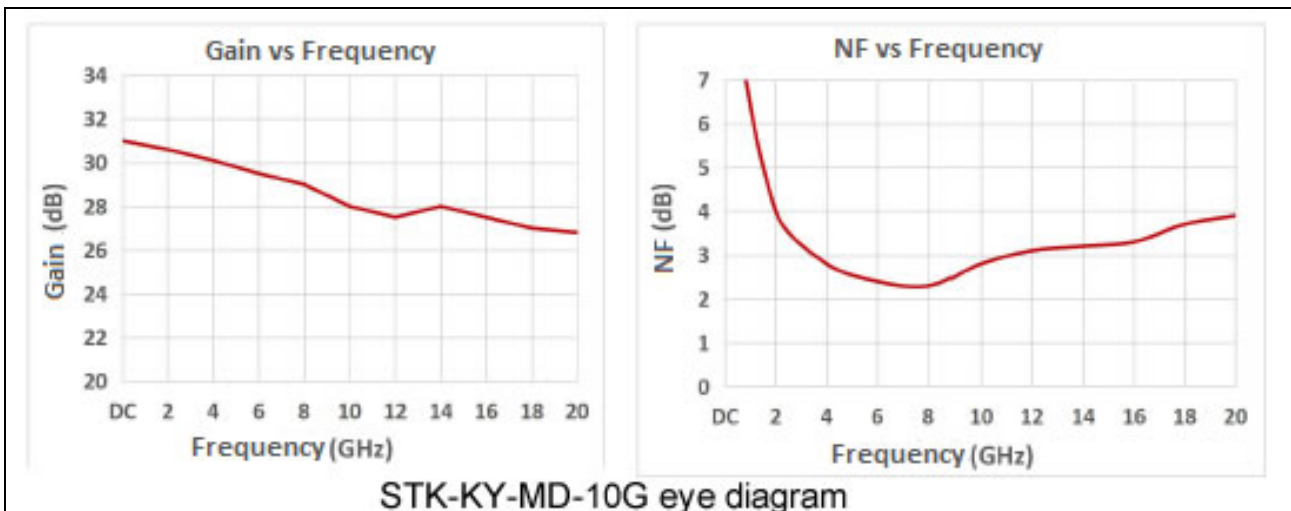
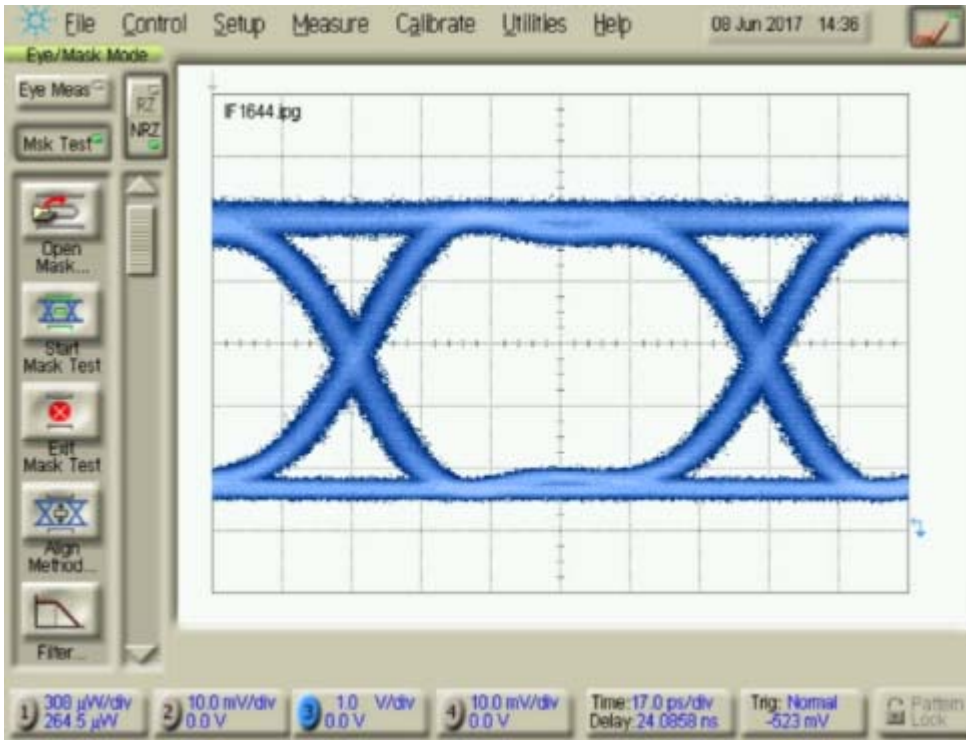
Parameters	Symbol	Unit	STK-KY-MD-10G	STK-KY-MD-10G-HO	STK-KY-MD-20G	STK-KY-MD-40G
Bandwidth (-3dB)	S <sub>21-High</sub>	GHz	>10	>8	>20	>35
	S <sub>21-Low</sub>	KHz	30	100	30	30
Data rate		bps	100k~12.5G	100k~10G	100k~25G	100k~42G
Gain	G	dB	>26	>30	>28	>28
Gain ripple	DG	dB	<3	<3	<3	<3
Output amplitude *	V <sub>out</sub>	Vpp	8	11	8	8
Saturated output power	P <sub>s</sub>	dBm	23	25	23	23
Rise time (10% -90%)	Tr	ps	35	40	18	8
Jitter **	Jitter <sub>RMS</sub>	ps	<2	<2	<1	<1
Isolation	S <sub>12</sub>	dB	<-40			
Electrical return loss	S <sub>11</sub>	dB	<-12	<-10	<-10	<-10
RF connector			SMA(f)		K(f)	
Operating Voltage	V <sub>DC</sub>	V	DC 12V			
Working current	I <sub>o</sub>	mA	<500			
Dimensions	LxWxH	mm	50x33x15			

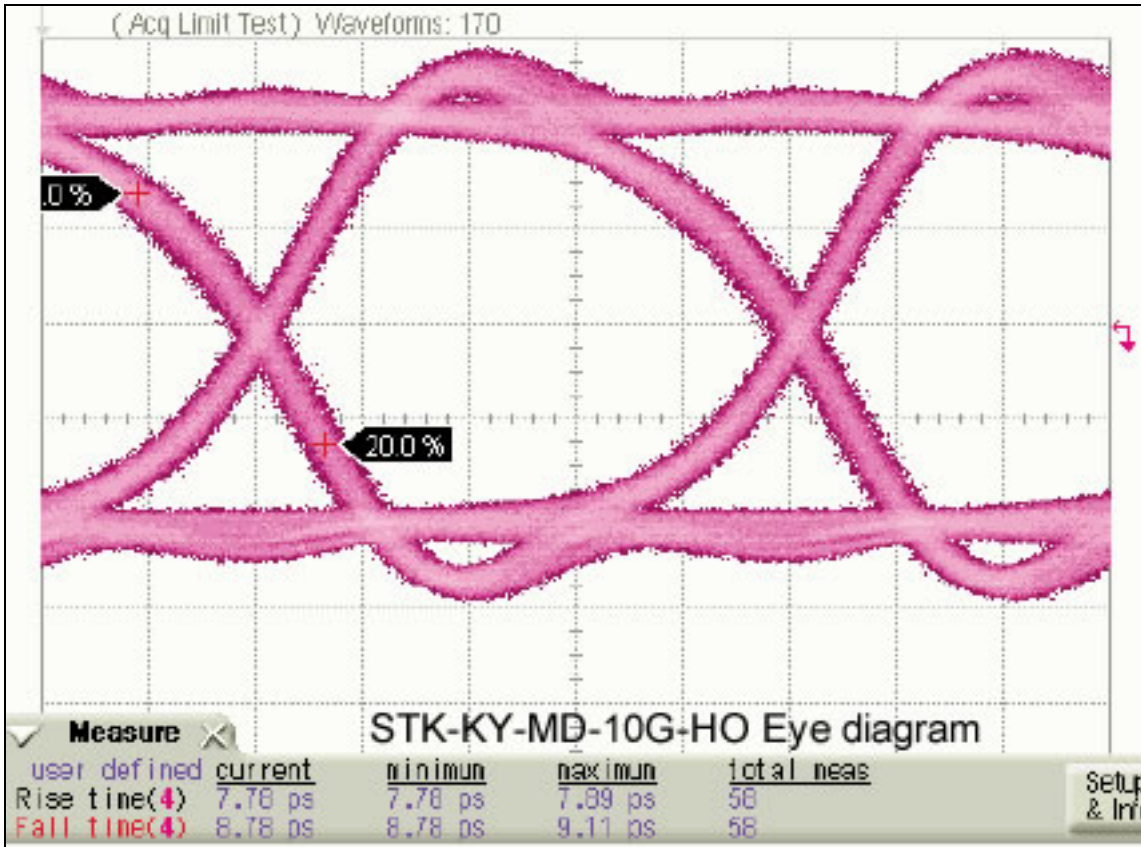
\* Duty cycle 1:1    \*\*Additional jitter  $Jitter_{RMS} = \sqrt{J_{RMS\_total}^2 - J_{RMS\_source}^2}$

### Absolute Maximum Ratings

Parameters	Symbol	Unit	Min.	Typ.	Max.
Input signal amplitude	V <sub>in</sub>	Vpp			1.5
Operating Voltage	DC	V	11.5		13
Operating temperature	T <sub>op</sub>	°C	-20		60
Storage temperature	T <sub>st</sub>	°C	-40		85

Characteristic Curve





**Typical Application**

