Sintec Optronics

AO Q-switch Driver (RF Driver)

1. High-power AO Q-switch Drivers (50W and above)

1.1 QSD Series 27MHz 20-100W Q-switch Drivers

A high power RF driver module is available in output powers of 50W, 75W or 100W. Powered from 220VAC or 110VAC, the modulation inputs allow either full digital control or activation of an internal pulse generator. First pulse suppression is automatically implemented.

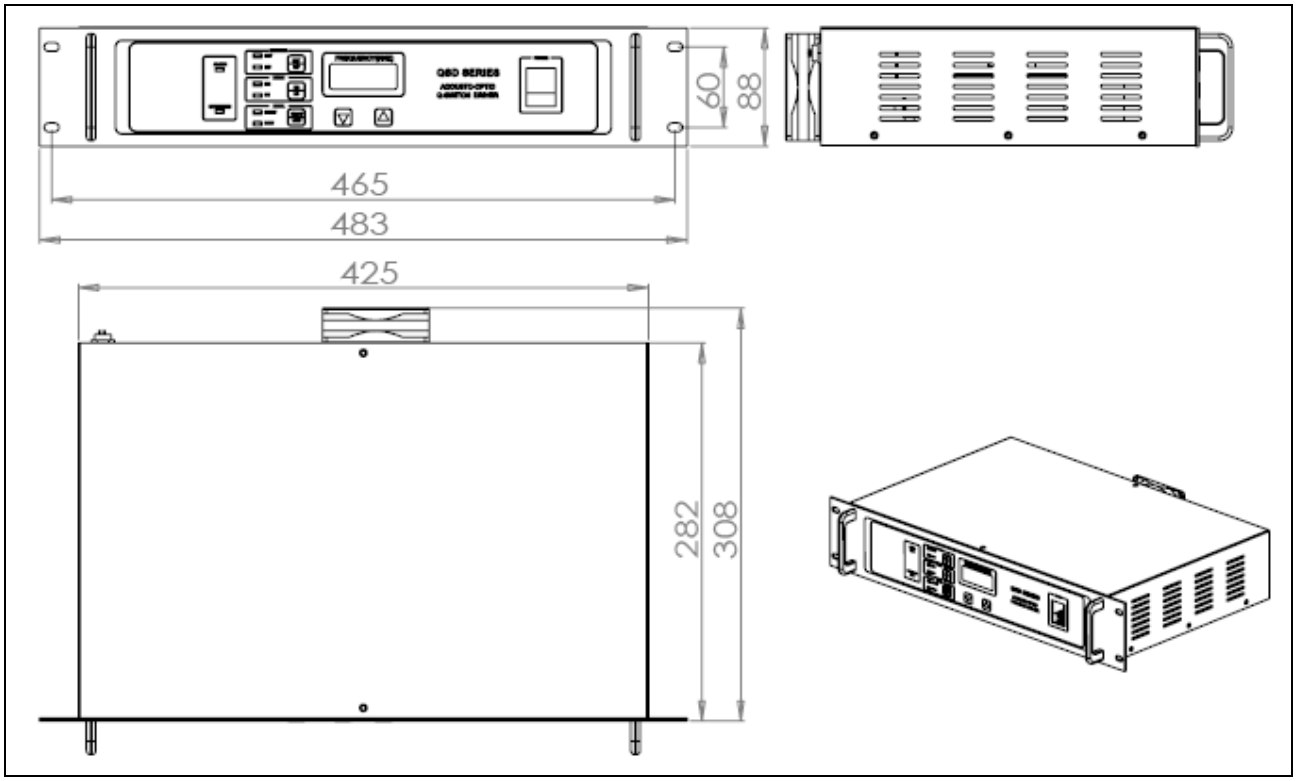
QSDxxyyT: 19”, 2U, 483×88×308mm, 8kg

Model Numbers: QSDxxyyA
QSD – QSD series RF driver
XX – RF frequency, 27-27MHz, 24-24MHz
YY – RF output power (W), 50-50W, 75-75W
A – Classification Z, T
Example QSD-2750T (50W), QSD-2775T (75W) or QSD-27100Z (100W)

Main Specifications:
RF power output: 20W, 50W, 75W or 100W
Frequency: 27.125MHz
VSWR: ≤1.2:1
Modulation repetition rate: 800Hz-50KHz
First pulse suppression
Modulation control inputs: digital TTL, till 100kHz
Driver over-heat, Q-Switch over-heat
Internal over-temperature protection and over-current protection
Digital display of frequency
Supply voltage input: 220VAC/110VAC, <150W

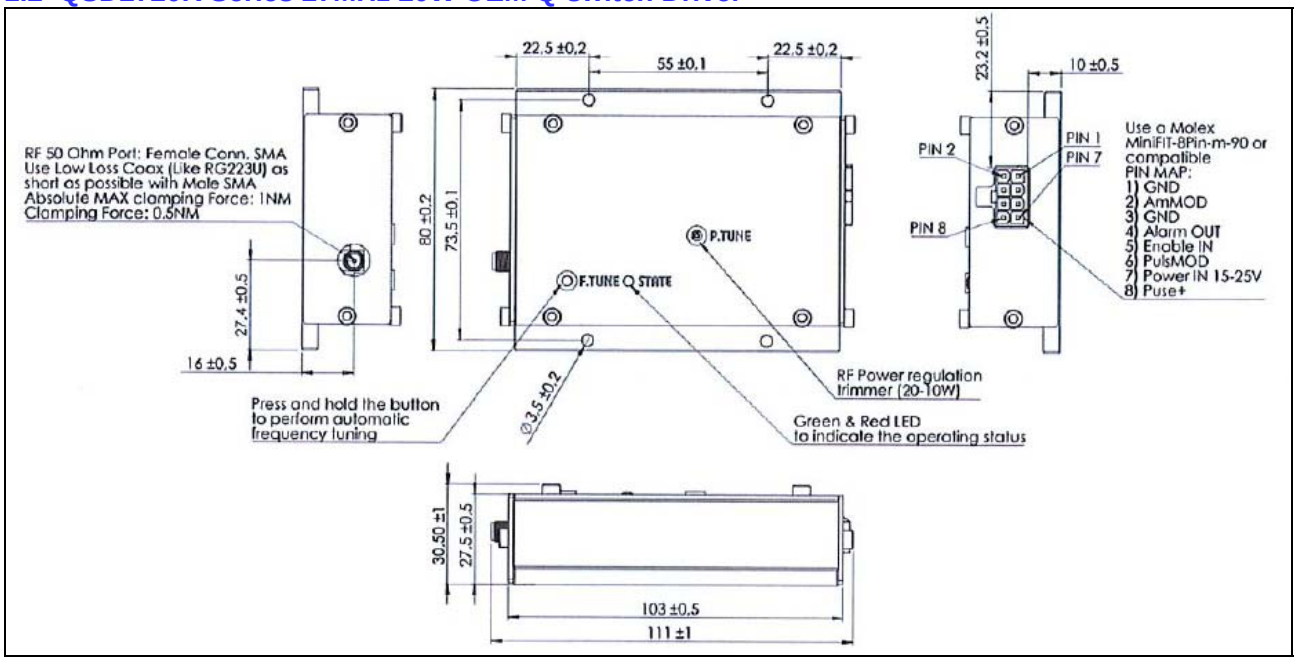
Main Features of QSDxxyyT Series Digital Q-switch Driver:
Newly designed digital RF driver has the following features comparing with analog version:

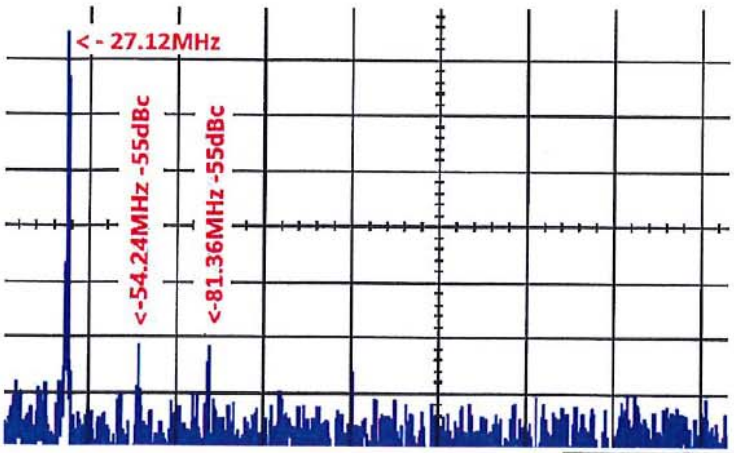
- Touch panel,
- Digital circuit to improve control accuracy with frequency resolution of 0.01Hz (0.001Hz or less upon request)
- Internal trigger synchronizing with laser, to achieve perfect marking
- Integrated open load protection
- Easier and more accurate panel controlled laser delay.



Outline of QSDxxyyT series drivers

1.2 QSD2720R Series 27MHz 20W OEM Q-switch Driver



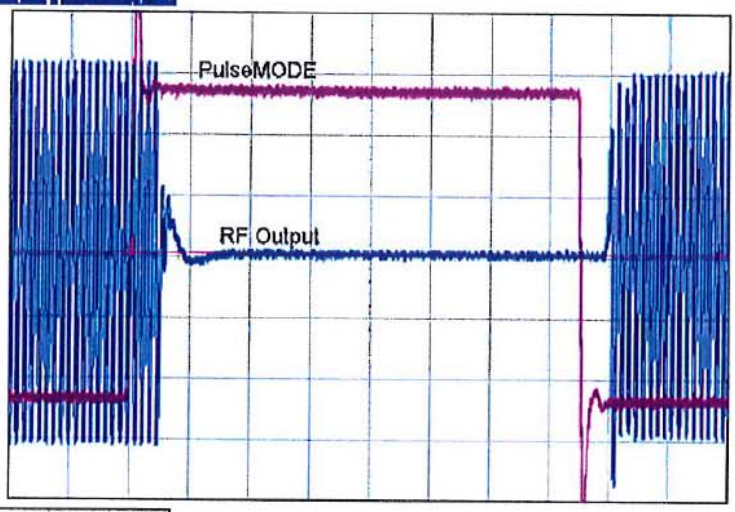


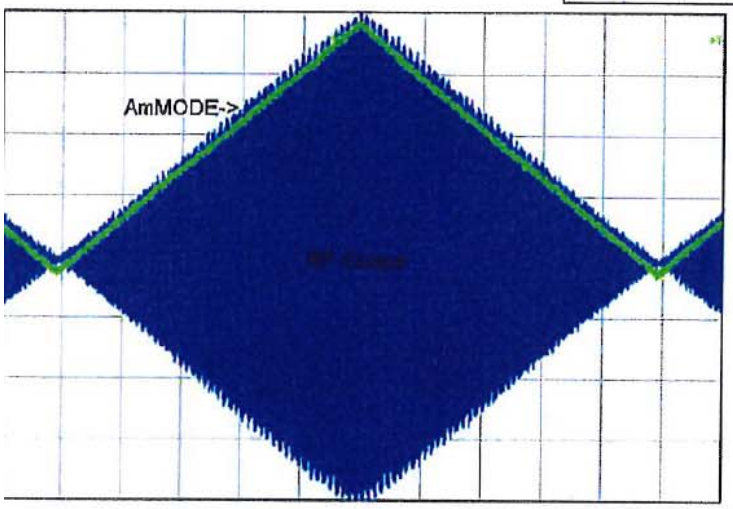
RF OUT SPECTRUM
Frequency Domain Analysis

The device is designed to have very low harmonic content.
All harmonics must by low –50dbm
Typically 2nd and 3rd harmonics are –55dBm, other harmonics are below the noise floor.

PULSE MODE
Fast RF drop

The "Pulse Mode" Input PIN must be driven from digital 5V logic level.
The maximum delay between the control signal and the switching of the RF signal is 110nS.
The delay between ON/OFF switching is the same.



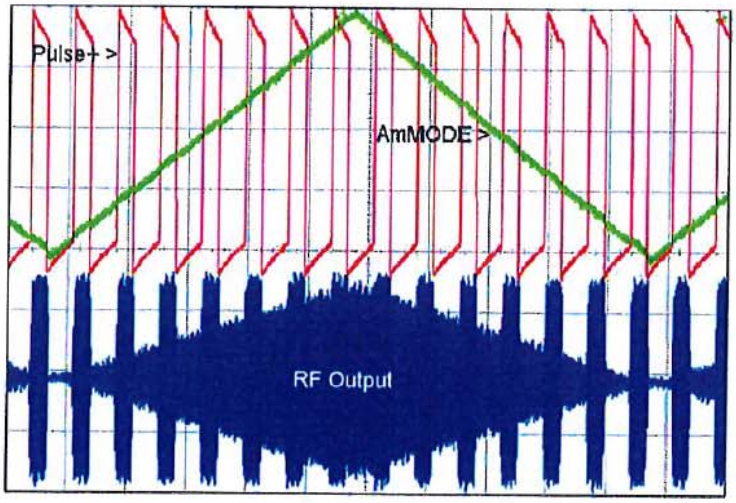


Am MODE
RF Amplitude Modulation

The "AmMODE" Input PIN must be driven from 5V logic level.
The linear range input is from 0.5V to 4.5V
Below 0.5V RF is Off (Below 50mW)
Above 4.5V RF is at maximum output power (Trimmer P.TUNE).

Pulse+
RF Pulse at the MAX Power

The "Pulse+" Input PIN must be driven from digital 5V logic level.
It's used in combination with "AmMode" signal to create RF Peaks, at the maximum power, during normal amplitude modulation.



1.3 MQH0XX-YYDM-ZZZ (24-80MHz, 25-100W)

Sintec Optronics

Former Model Number: R390XX-YYDMZZZ-A

Description:
The *MQH0XX-YYDM-ZZZ* module is a high power RF driver, designed to drive a Q-switch. The driver has two digital modulation inputs: Fixed and Variable. These controls allow the customer to issue a pulse command of a "Fixed" pulse width, the duration determined by the Driver's pulse width control, settable by the customer, or issue a "Variable" pulse command, the duration determined by the input signal's pulse width. The output power is controlled by the analog input, where the mode of operation is defined by ZZZ = A05 normal analog mode, or R05 analog switched to full RF mode or a triggered RF Ramp Down mode where ZZZ = FPS first pulse suppression mode or PPK pre-pulse kill mode. The choices of Frequency (XX), Output Power (YY), and Power Control (ZZZ) option are "Factory Set" when ordered. The RF Driver requires forced air cooling.

The product delivered will be manufactured to be compliant with EU Directive 2002/95/EC for Reduction of Hazardous Substance. The product will be manufactured to other standards upon customer request.

Key Features:
- 24, 27.12, 40.68, 68, or 80 MHz RF frequency (XX)
- 0.01% Quartz Stabilized
- Up to 100* watts RF power output (YY)
- Two TTL Digital Modulation Inputs: fixed and variable pulse width.
- Analogue Modulation or Triggered RF Ramp Down Mode (ZZZ)
- Up to 100 kHz Pulse Rate.
- Fault Protection on Low Power, High Power, and High VSWR
- Operates on 28 VDC

Applications:
- RF Driver for an Acousto-Optic Q-Switch Device used to spoil the "Q" of a CW laser so as to output an intense pulse of light.
- Used in industrial, medical, or military applications.

Specifications:

RF Frequency:	24.00, 27.12, 40.68, 68.00, 80.00 MHz ± 0.01%
Spurious Levels:	-50 dBc maximum
Harmonic Distortion	-30 dBc maximum
Digital Inputs:	
Fixed Mod In	TTL Levels, Triggered on Rising Edge. Pulse Width Applied >50 ns.
Variable Mod In	TTL Levels, TTL High = RF off
Extinction Ratio:	35 dB minimum
RF Rise Time 10% to 90%	500 ns maximum
RF Fall Time: 90% to 10%	100 ns maximum
Modulation Repetition Rates:	1 Hz to 100 kHz for Fixed Modulation DC to 100 kHz for Variable Modulation
Fixed Modulation Output Pulse Width Adjustment Range:	1 to 14 ms, Customer Adjustable
Available Pulse Control Options:	ZZZ = Mode
Pulse Control Mode is "Factory Set When Ordered":	FPS = First Pulse Suppression PPK = Pre Pulse Kill A05 = Analog Control R05 = RF Switched to Analog Control ___ = Digital Modulation Only
FPS Trigger / Analog input	Units configured with FPS, PPK: TTL Levels, Triggered on TTL Rising Edge. Units configured with A05, R05: 0 to 5 volts analog.
*RF Output Power "Factory Set When Ordered":	YY = 50 or 100 watts nominal for 24, 27, 41, and 68 MHz units Adjustable from 25 to 100 watts. 50 watts nominal for 80 MHz units, Adjustable from 20 to 50W
Output Impedance:	50 ohms nominal
Shutter Output:	0.3 sec delay. Opens on fault. Capable of sinking 1 amp at 28 volts Maximum.
Supply Voltage Input	+28 VDC ± 1%

Supply Current Input	6.5 A for 50 W units 9.0 A for 100 W units
Operating Temperature	+10°C to +55°C
Air Flow through Heat Sink	> 36 CFM (> 17 litres / second) @ 25°C

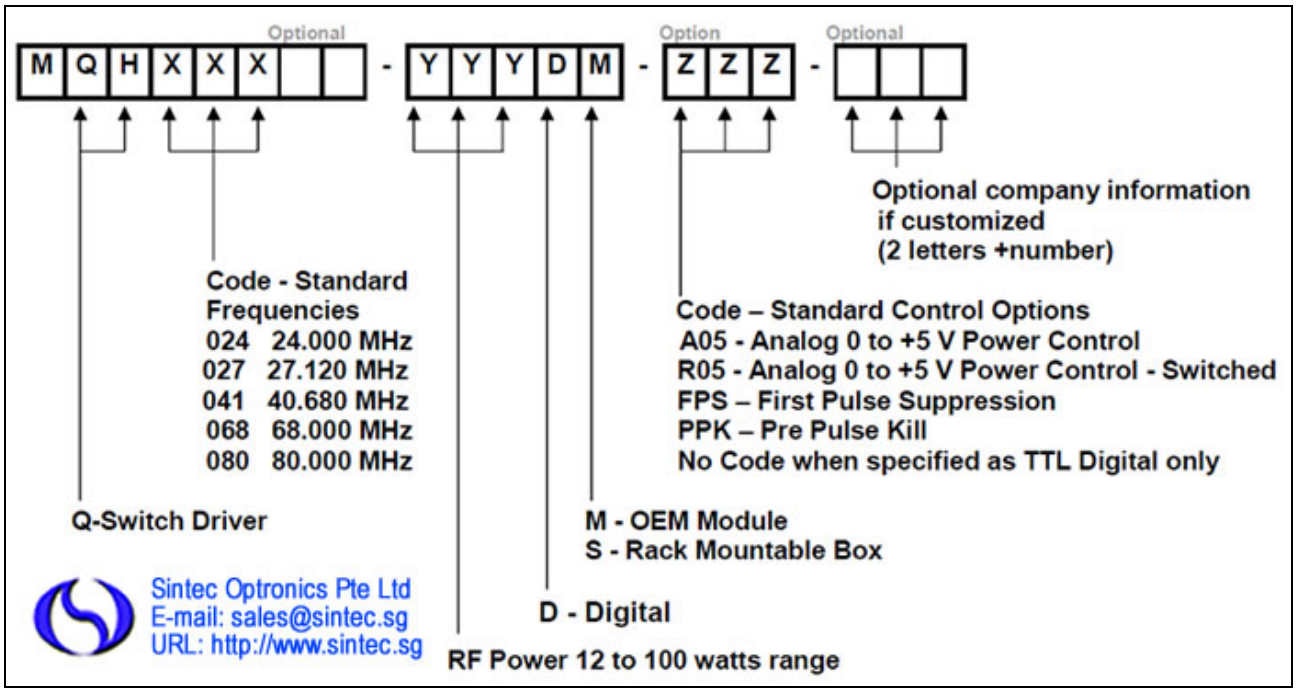
MAXIMUM RATINGS:

Supply Voltage:	30 volts DC maximum
Power Output:	No DC Feedback Allowed
Storage Temperature:	-20°C to +85°C

CONNECTORS & MECHANICAL:	Located on front panel	
RF Output Connector:	BNC Female	
Power Supply Connections:	Vcc,	Solder Post
	Return	Ground Lug

Ordering Codes:

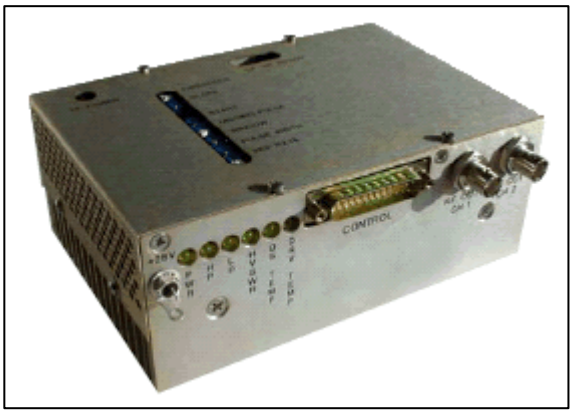
Example: MQH027-100DM-A05, A 27 MHz RF Driver with two TTL digital Modulation inputs (fixed and variable pulse width) and an analog input (A05) which enables control of the RF output power. Designed to Drive an AO Q-switch requiring 100 watts RF Power or less. Delivered as a RoHS compliant, forced air cooled OEM Module.



1.4 Dual-channel Q-switch Driver QH0XX-YYDM-ZZZ-2S

Former Model Number: 390XX-YYDMZZZ-2CH-A

- 2x25W or 2x50W dual channel outputs
- 24, 27 or 41MHz
- 28VDC module



The MQH0XX-YYDM-ZZZ-2S module is a high power RF driver with two RF outputs derived from one oscillator and is designed to drive two Q-Switches. There are two digital modulation control inputs: fixed and variable. These controls allow the customer to issue a pulse command of a "fixed" pulse width, the duration determined by the driver's pulse width control, settable by the customer, or issue a "variable" pulse command, the duration determined by the input signal's pulse width. The output power of both channels are controlled by the analog input, where the mode of operation is defined by ZZZ = A05 normal analog mode, or R05 analog switched to full RF mode or a triggered RF ramp down mode where ZZZ = FPS first pulse suppression mode or PPK pre-pulse kill mode. The choices of frequency (XX), output power (YY), and power control (ZZZ) option are "factory set" when ordered. The driver requires forced air cooling.

The product delivered will be manufactured to be compliant with EU Directive 2011/65/EU for Reduction of Hazardous Substance. The product will be manufactured to other standards upon customer request. A compact, dual channel RF driver module manufactured, enabling synchronous control of two AO Q-Switches.

Key Features:

24, 27.12, 40.68, 68, or 80 MHz RF Frequency (XX)
0.01% Quartz Stabilized
2 Outputs with up to 50 watts RF power output (YY) per channel (2S)
Two TTL Digital Modulation Inputs: fixed and variable pulse width.
Up to 100 kHz pulse rate.
Analogue Modulation or Triggered RF Ramp Down Mode (ZZZ)
Fault Protection on Low Power, High Power, and High VSWR
Operates on 28 VDC

Applications:

RF Driver for an Acousto-Optic Q-Switch Device used spoiling the “Q” of a CW laser so as to output an intense pulse of light.

Used in industrial, medical, or military applications.

RF Power Output (yy)	2x25W (yy=25) or 2x50W (yy=50)
Frequency (xx=24, 27, 41, 68 or 80)	24.00MHz, 27.12MHz,40.68MHz, 68MHz, 80MHz (2x25W)
First Pulse Suppression	Triggered First Pulse Suppression FPS
Pulse Control Mode (zzz=FPS, PPK, R05, A05)	PPK: pre pulse kill; A05: analog control; R05: RF switched to analog control; ___: digital modulation only
FPS Trigger / Analog input	Units Configured With FPS, PPK: TTL Levels, Triggered on TTL Rising Edge. Units Configured With A05, R05: 0 to 5 Volts Analog
Frequency Tolerance	± 0.02%
Output Impedance	50Ω
RF Fall-Time 90% to 10%	< 100ns
RF Rise-Time 10% to 90%	500ns typical
Extinction Ratio	> 52dB
Harmonic Levels	< -30dB at full power
Supply Voltage Input	28VDC ± 5%
Supply Current Input	6.5A (2x25W), 9.0A (2x50W)
Modulation Control Inputs	Digital TTL (TTL high = RF off)
Modulation Repetition Rate	1Hz to 100kHz for fixed modulation; DC to 100kHz for variable mpdulation
Fixed Modulation	Output pulse width adjustable range: 1 to 14us, customer adj.
Internal Pulse Width	1µs to 14µs, typical
Status Monitoring	Power supply on, High VSWR RF power low, RF power maximum Driver over-heat, Q-Switch over-heat
Housing	Module
Storage Temperature	-20ºC to +85ºC
Operating Temperature	+10ºC to +55ºC
Dimension	177x121x54mm

2. Low Power AO Q-switch Drivers (2-50W)

2.1 QCxxx-yyDC-zz-aaV (former part number R390xx-yyDMzzz-SC) drivers

The QCxx-yyDC-zzz module is a compact low power RF driver, designed to drive an AO modulator or Q-switch. The unit has two digital modulation inputs: Fixed and Variable. These controls allow the customer to issue a pulse command of a "Fixed" pulse width, the duration determined by the Driver's pulse width control, settable by the customer, or issue a "Variable" pulse command, the duration determined by the input signal’s pulse width. The output power is controlled by the analog input, where the mode of operation is defined by ZZZ = A05 normal analog mode, or R05 analog switched to full RF mode or a triggered RF Ramp Down mode where ZZZ = FPS first pulse suppression mode or PPK pre-pulse kill mode. The choices of Frequency (XX), Output Power (YY), and Power Control (ZZZ) option are "Factory Set" when ordered. This driver has a Zero Crossing function where the output pulse can be

synchronized to the zero crossing point of the RF Energy. When enabled the pulse to pulse stability is improved.

The product delivered will be manufactured to be compliant with EU Directive 2002/95/EC for Reduction of Hazardous Substance. The product will be manufactured to other standards upon customer request.

Key Features:

- 24, 27.12, 40.68, 68, 80 or 110 MHz RF Frequency (XX)
- 0.01% Quartz Stabilized
- Up to 24 watts RF power output (YY)
- Two TTL Digital Modulation Inputs: fixed and variable pulse width.
- Up to 500 kHz pulse rate.
- Analogue Modulation or Triggered RF Ramp Down Mode (ZZZ)
- Synchronization to RF by 'Zero cross'
- Fault Protection on Low Power, High Power, and High VSWR
- Operates on 12, 15 or 24 VDC (Factory set)

Applications:

- RF Driver for an Acousto-Optic Q-Switch Device used to spoil the "Q" of a CW laser so as to output an intense pulse of light.
- Used in industrial, medical, or military applications.

Parameter	Specification
Output Frequency:	**XX** = 24, 27, 41, 68, 80 or 110 ,where RF Frequency = 24.00, 27.12, 40.68, 68, 80 or 110MHz ± 0.01%
Spurious Levels:	-50 dBc Maximum
Harmonic Distortion	-20 dB Maximum
Modulation Input	
Mod In Fixed (pin 3)	TTL Levels Triggered on TTL Rising Edge. Pulse Width Applied >50 ns.
Mod In Variable (pin 5)	TTL Levels TTL HIGH = RF Off
Extinction Ratio:	40 dB Minimum
RF Rise Time 10% to 90%	100 ns Maximum
RF Fall Time: 90% to 10%	50 ns Maximum
Modulation Repetition Rates:	1 Hz to 500 kHz for Fixed Modulation DC to 500 kHz for Variable Modulation
Fixed Modulation Output Pulse Width Adjustment Range:	1 to 20 µs, Customer Adjustable
Available Pulse Suppression Modes: Modulation Operating Mode is "Factory Set" Internally.	**ZZZ =** Mode FPS = First Pulse Suppression PPK = Pre Pulse Kill R05 = RF Switched to Analog Control A05 = Analog Control
FPS Trigger (pin 2) for Pulse	TTL Levels, Triggered on TTL Rising Edge

Suppression for Units Configured with FPS, PPK:	
Analog in (pin 6) for Power Control for Units Configured with A05, R05	0 to 5 volts Analog
Enable - Stand by Mode (pin 11)	< 3 watt dissipation in stand by mode. TTL High or no connection = Normal operation TTL Low = Stand by Mode Momentary TTL Low = Driver Reset - after fault is removed.
Zero Crossing Enable (pin 7) normally:	TTL high or no connection- disabled, TTL low- enabled
If model # is (-ZC):	TTL high or no connection- enabled, TTL low- disabled
Sync out (pin 1)	Outputs 3.3 volt signal
RF Power Output:	**YY** watts where YY = 2 to 24 watts
Output Impedance:	50 Ω
Supply Voltage:	+12, +15 VDC or +24 VDC (factory set)
Supply Current:	< 3 amps.
OPERATING TEMPERATURE:	+10 to +55 ^{0}C Case Temperature
Contact Cooled	The Driver must be attached to a heatsink capable of dissipating 25 watts
MAXIMUM RATINGS:	
Supply Voltage:	+15, +18 or +30 volts
Power Output:	No DC Feedback Allowed
Storage Temperature:	-20 to + 85 ^{0}C

RF POWER (watts)

Supply Voltage (V)	27.12 MHz	41 MHz	80 MHz	
12	5	10	10	
15	10	<15	<15	Harmonics <20dBc
15	15	24	20	Harmonics <15dBc
24	20	24	24	

Ordering Codes:

Example: QC041-20DM-A05-15V: A 41 MHz RF Driver with two TTL Digital Modulation inputs (fixed and variable pulse width) and an analog input (A05) which enables control of the RF output power. Designed to Drive an AO Q-Switch requiring 20 watts RF Power or less. Delivered as a RoHS compliant, contact cooled OEM Module, input voltage 15V.

	①				②		③	④		⑤				⑥			⑦			⑧		
Q	C	X	X	X	-	Y	Y	D	D	C	-	Z	Z	Z	-	A	A	V	-			-			

①	Characteristic	Frequency					
	Code	024 = 24.00 MHz	027 = 27.12 MHz	041 = 40.68 MHz	068 = 68.00 MHz	080 = 80.00 MHz	110 = 110.00 MHz

②	Characteristic	RF output power
	Code	2 to 24 W Range (refer to table on page 4 for maximum power for chosen frequency)

③	Characteristic	Digital modulation	
	Code	D = Standard	DN = Inverted digital

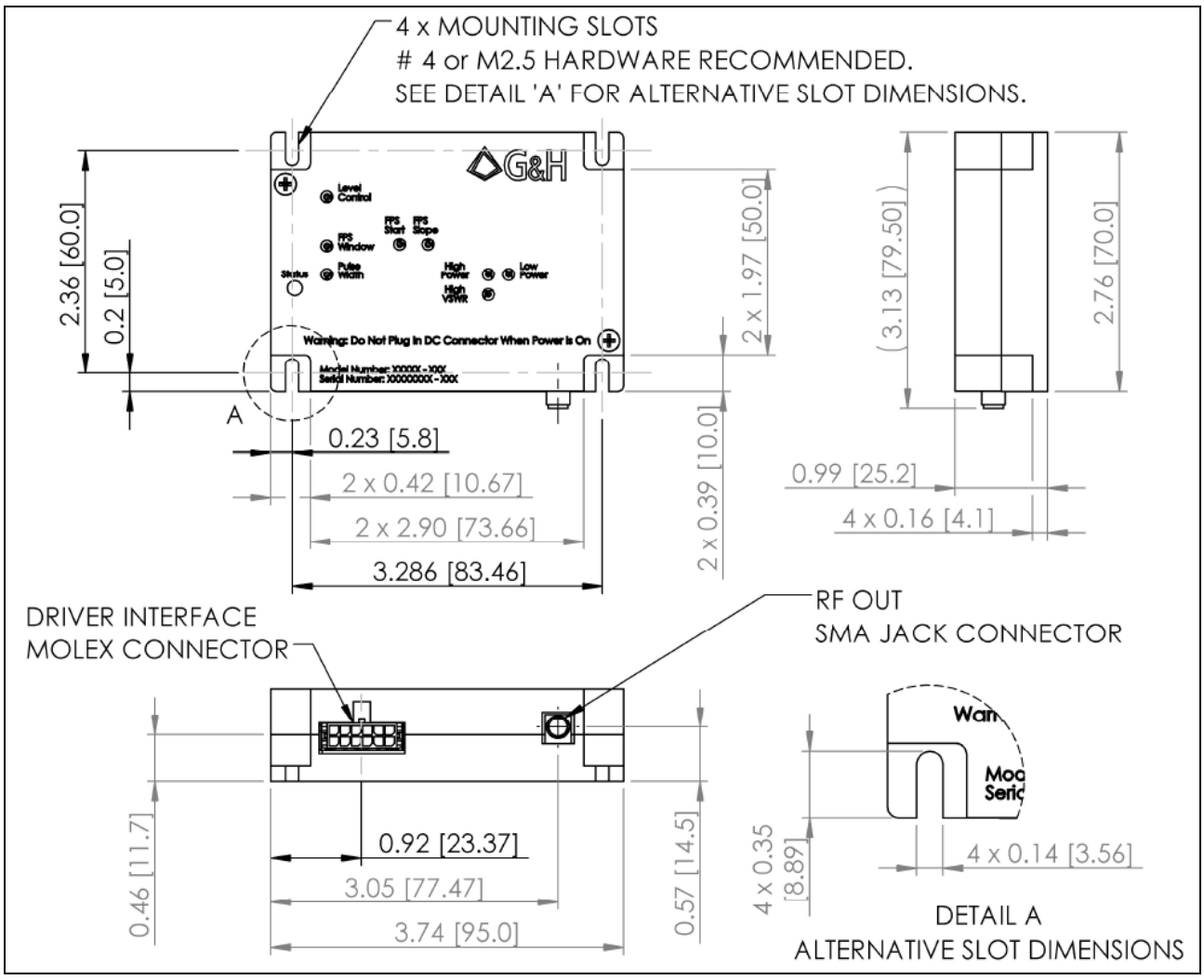
④	Characteristic	Cooling
	Code	C = Contact cooled (legacy denotation all QC drivers are contact cooled)

⑤	Characteristic	First Pulse Suppression Mode				
	Code	A05 = Analog power control	R05 = Analog power control (Switched)	FPS = First pulse suppression	PPK = Pre pulse kill	M05 = Analog control configured for AOM

⑥	Characteristic	Supply voltage (V)		
	Code	12 V	15 V	24 V

⑦	Characteristic	Additional options (optional)
	Code	ZC = Active zero cross (enabled by default)

⑧	Characteristic	Custom unit identification (optional)
	Code	Usually customer specific denotation



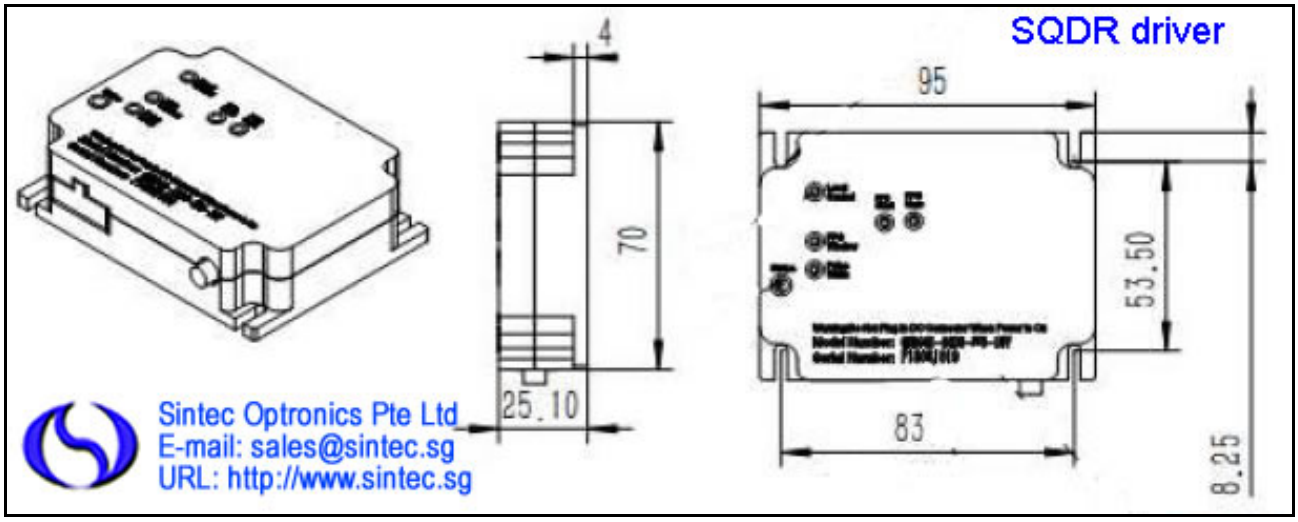
2.2 SQDR Series Drivers

SQDRxxx-yyDC-zzz-aaa series RF drivers are similar to QC0xx-yyDC-zzz drivers but cheaper.

xxx is operation frequency (xxx=041 means 40.68MHz and xxx=080 means 80MHz), yy is maximum output RF power (yy=20 means 20W), D means digital modulation, C means compact size, zzz means operation mode (FPS, PPK, A05 or A05, FPS is default), aaa is input voltage (aaa=15V means input voltage is 15VDC).

The outline dimension is 95x70x25mm.

SQDR driver



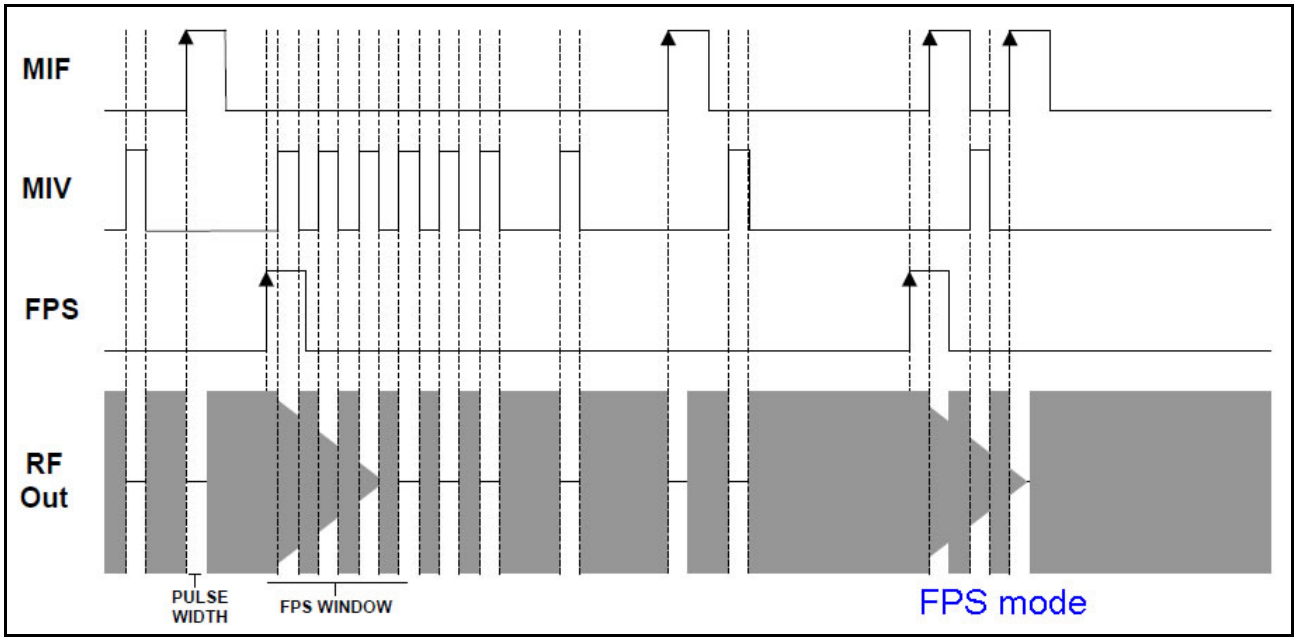
2.3 SQDM Series Q-switch Driver

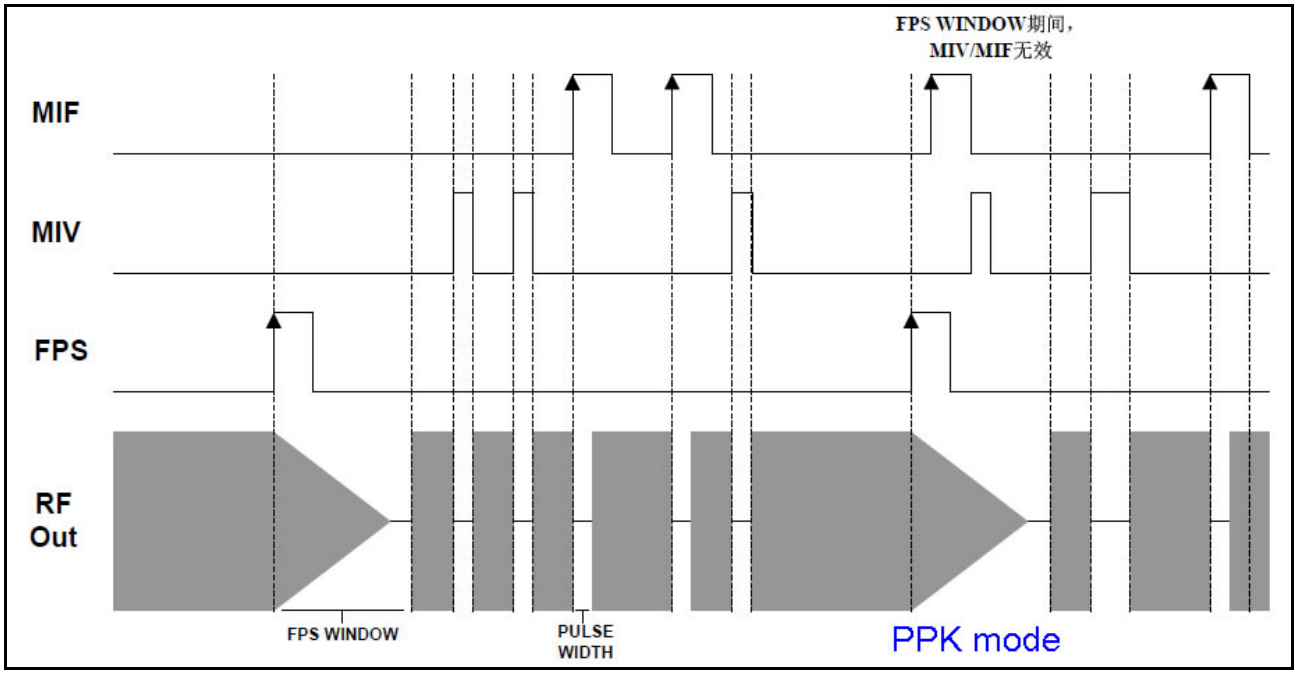
SQDMxxx-yyW-aaV-zzz series RF drivers are similar to QCxxx-yyDC-zzz drivers but cheaper. Their outlines are similar too.

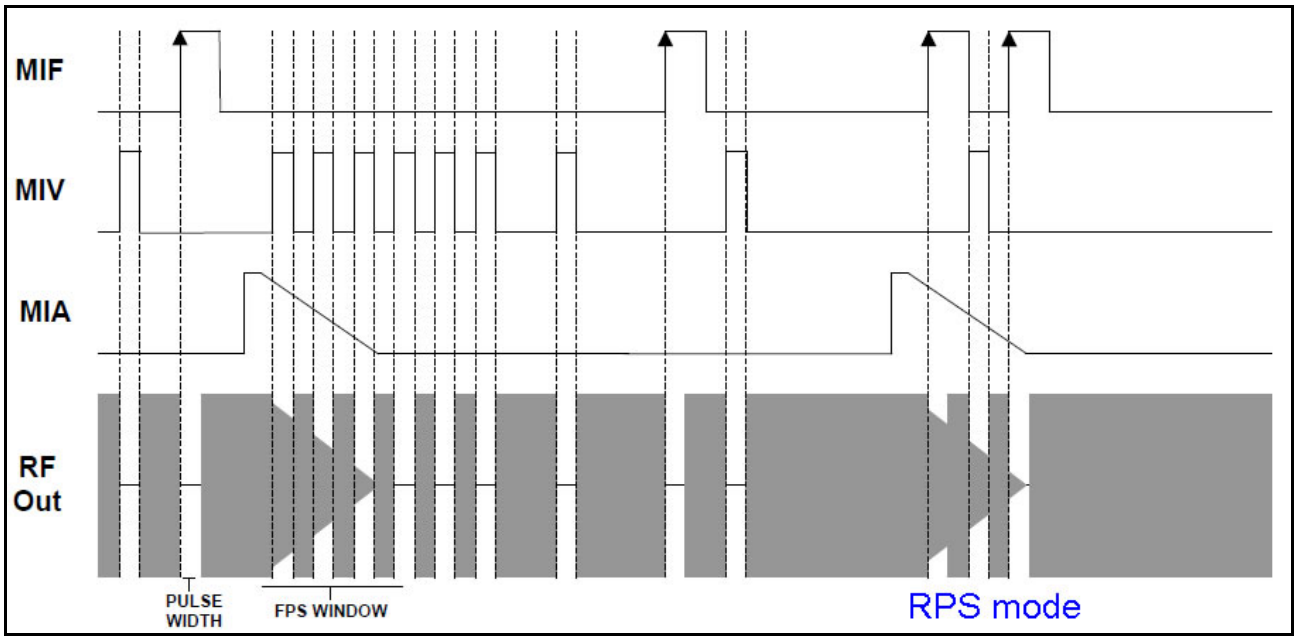
xxx is operation frequency in MHz (xxx=041 means 40.68MHz and xxx=080 means 80MHz), yy is maximum output RF power (yy=20 means 20W), aa means input voltage (aa=15 means 15VDC input, zzz means operation mode (FPS, PPK, RPS or APS, PPK is default). For example, SQDM041-20W-15V-PPK means operation frequency 40.68MHz, output RF power 20W, input voltage 15V and operation mode PPK.

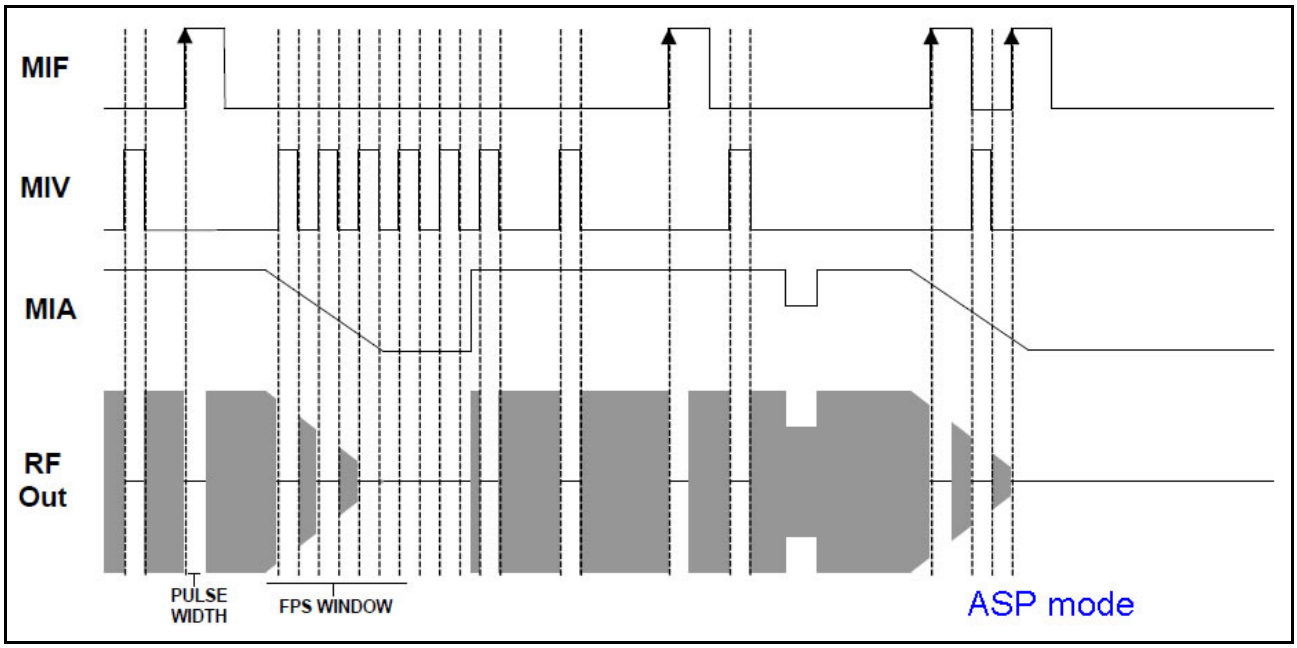
The outline dimensions are 95x70x25mm.

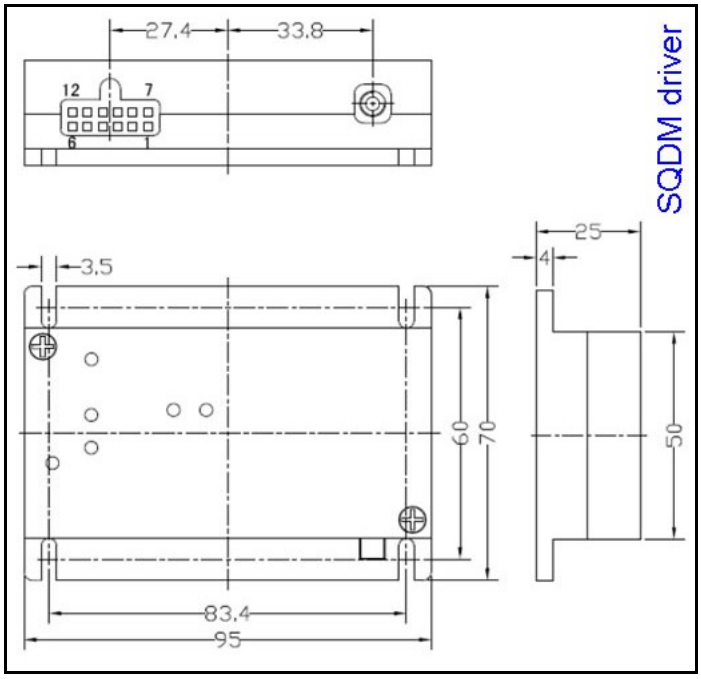

SQDM Series Q-switch Drivers


MIF
MIV
FPS
RF
Out
PULSE
WIDTH
FPS WINDOW
FPS mode


FPS WINDOW期间，
MIV/MIF无效
MIF
MIV
FPS
RF
Out
FPS WINDOW
PULSE
WIDTH
PPK mode

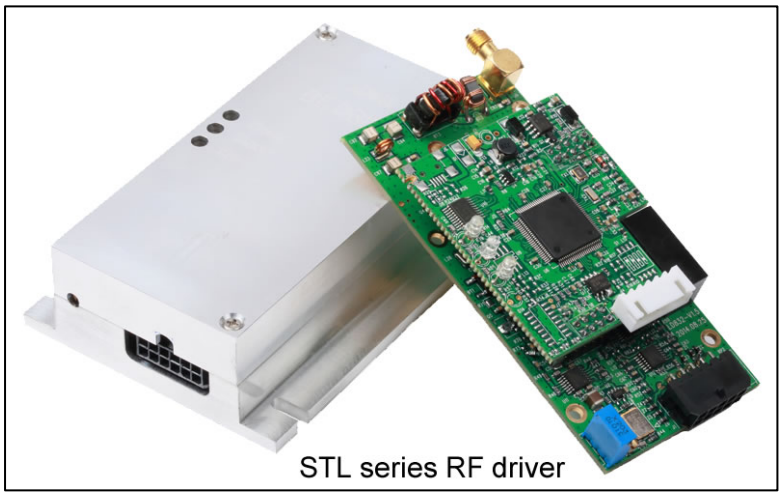

MIF
MIV
MIA
RF
Out
PULSE
WIDTH
FPS WINDOW
RPS mode





2.4 STL Series Q-switch Driver (80MHz, 15W)

- Part number: STL-080MHz-15W-12V
- Output Frequency: 80MHz,±0.01% (100ppm)
- Output Power: >15.0W @50Ω
- Modulation Input: TTL, 1Hz to 1.2MHz
- Sync Out Level: 3.3V ±5%
- Supply Voltage: +12.0V ±5%
- Supply Current: <2.20A
- Spurious Levels: -50dBc Maximum
- Harmonic Distortion: -20dB Maximum
- Extinction Ratio: 40dB Maximum
- RF Rise Time 10% to 90%: <25ns
- RF Fall Time 90% to 10%<25ns
- Operation Temperature:+10°C to +50°C
- Storage Temperature: －20°C to +85°C



R390 Series RF Drivers: FPS Guidance Notes

When Q-Switching lasers at high repetition rates, it is normal to observe a giant first pulse after a pause in operation. For many applications this excess energy must be dissipated before or during the next modulation cycle. For example, in laser markers, when the time taken for the scanning head to move to a new location exceeds the repetition rate, the next mark can be more intense and hence may appear inconsistent or even result in damage to the substrate.

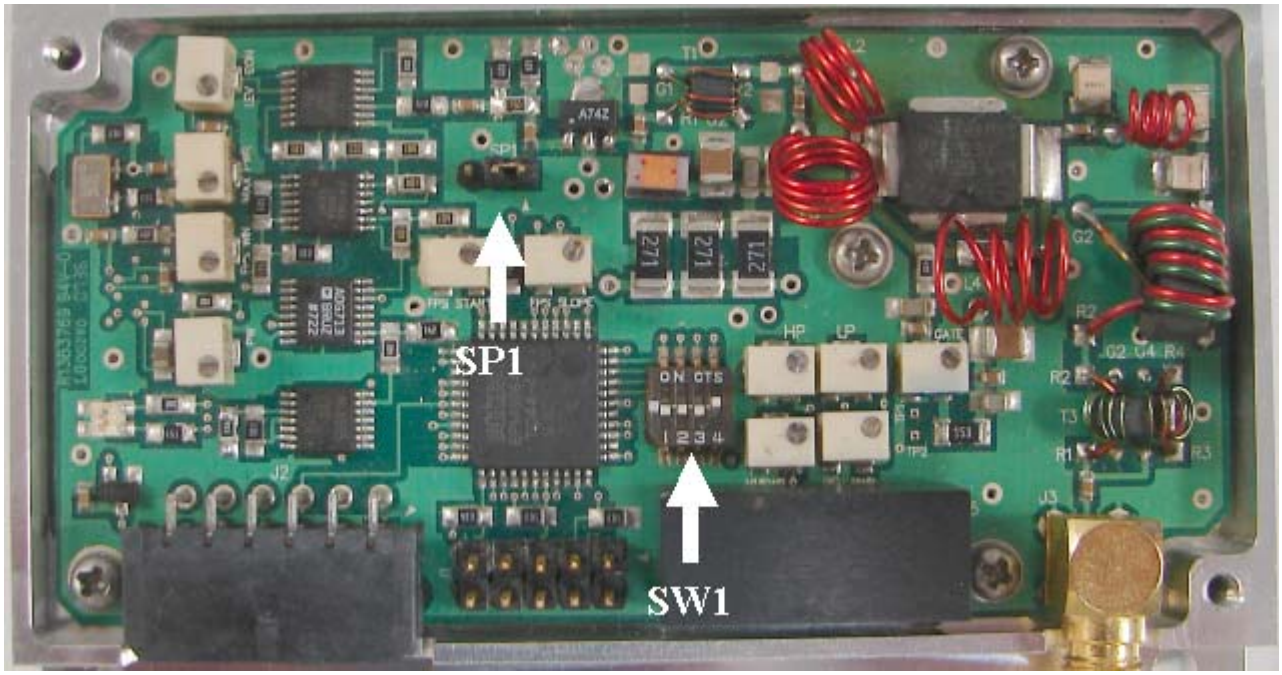
The R390 series RF driver can be manufactured with any one of four pulse control options.

First Pulse Suppression Options

FPS (First Pulse Suppression)	A TTL input triggers automatic ramping of the 'RF off level' allowing controlled release of the first pulse whilst materials processing.
PPK (Pre-Pulse Kill)	A TTL input triggers automatic ramping of the 'RF off level' allowing controlled release of the first pulse prior to materials processing.
RF Off Analogue Control (R05)	Manual control of the 'RF off level' (1-5V) allows controlled release of the first pulse whilst materials processing.
Analogue Modulation (A05 or A13)	Complete manual control of the RF level (0-5V or 2-13V) allows for PPK or FPS type suppression. (This option has certain requirements from your analogue voltage)

For R39041-20DM-ZZZ (ZZZ=FPS, PPK, R05 or A05), Switches 3 & 4 of SW1 are set as follows

Pulse control option (ZZZ)	Status of Switch 3	Status of Switch 4
FPS	On	Off
PPK	On	On
R05	Off	Off
A05	Off	On



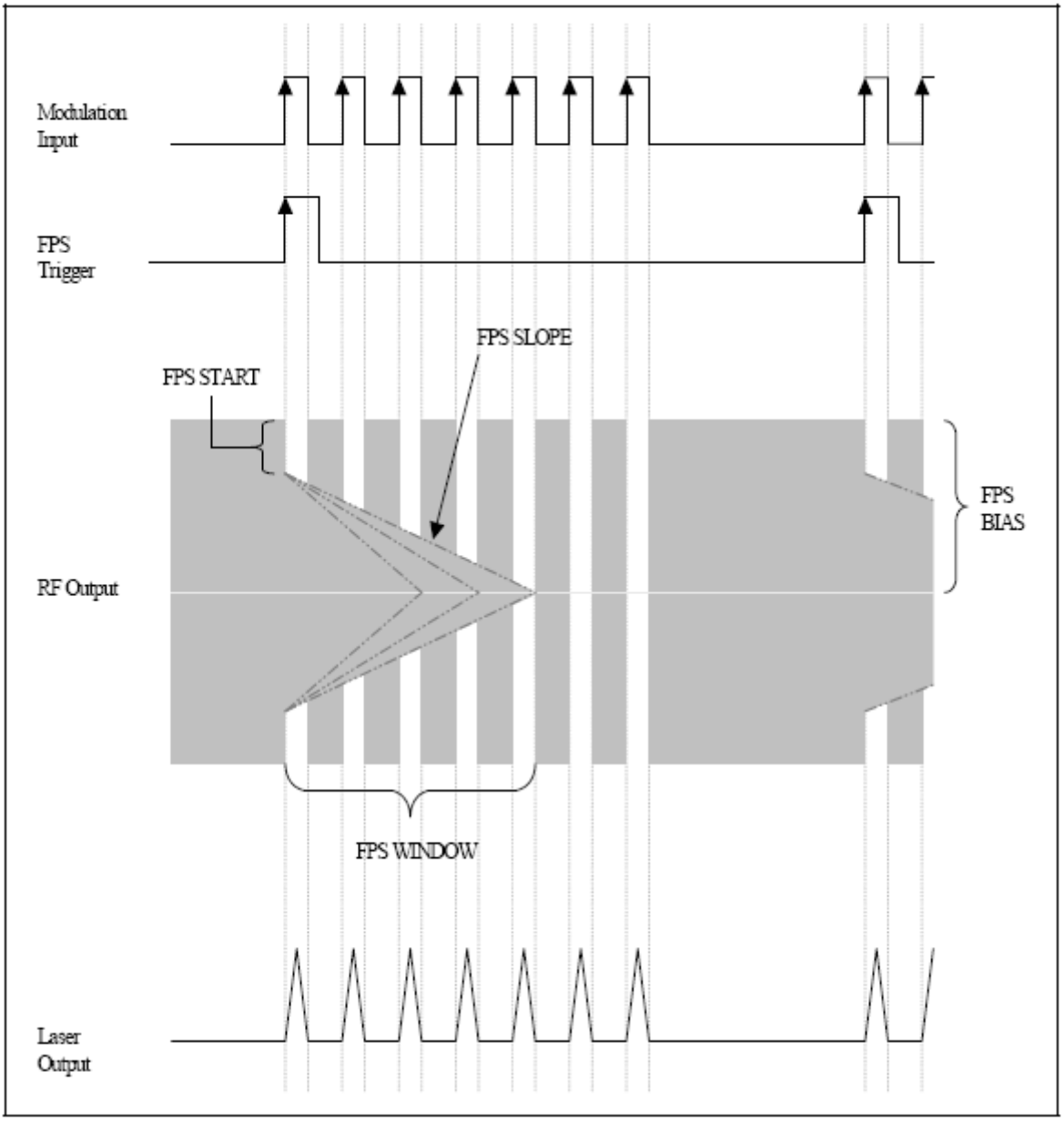
SW1 on above setting is A05 (Switches 3 & 4 are set as off and on, respectively). If you want to change its setting and then change pulse control option, just change SW1 setting as above table.

First Pulse Suppression (FPS)

With this method, the excess energy of the giant first pulse is dissipated within the first few laser pulses.

To enable this, a TTL input (FPS trigger) must be provided at the start of the modulation cycle, triggering an automatic RF power ramp.

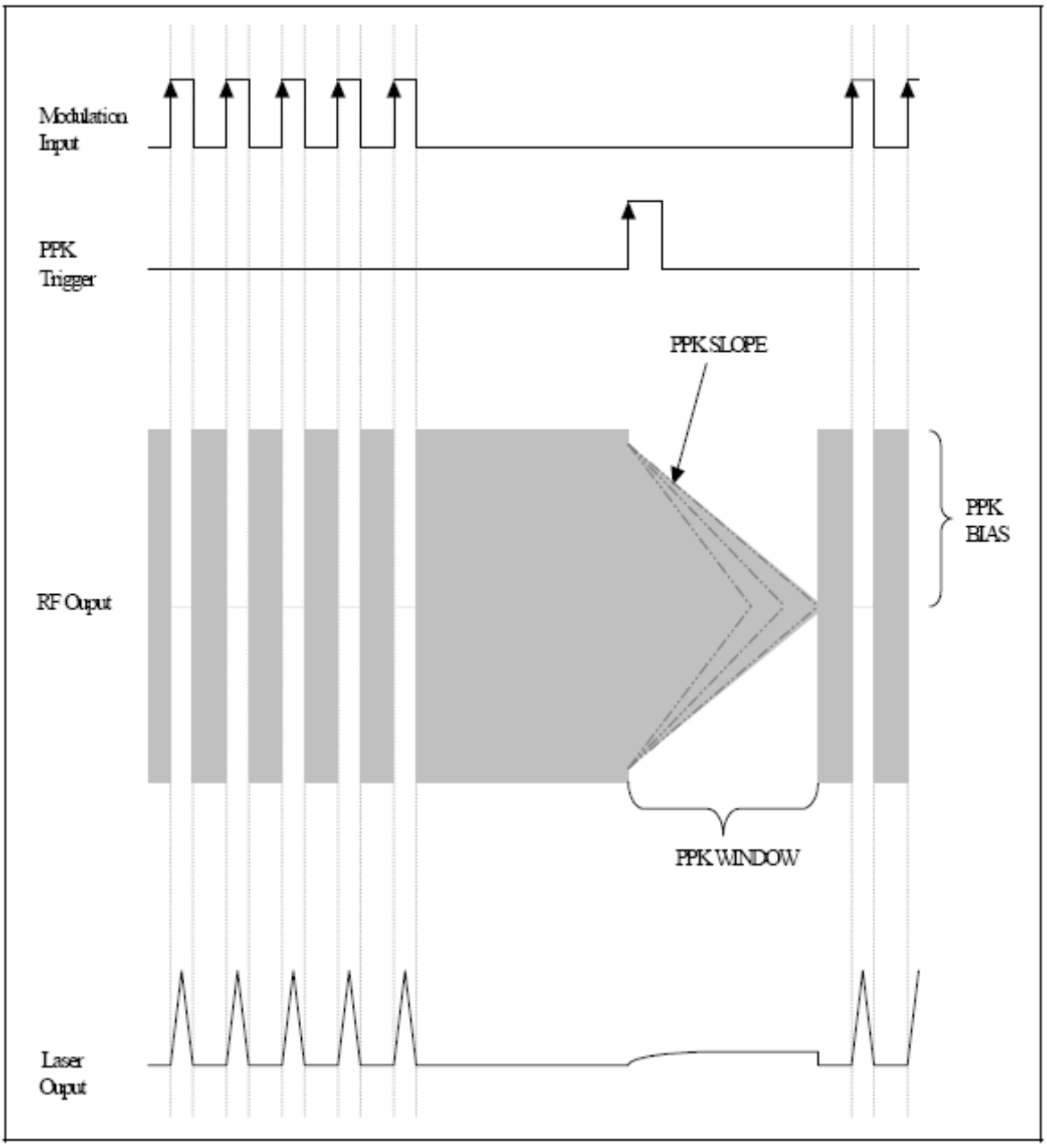
The shape of the ramp is manually adjustable using a series of trimpots onboard the driver.



Pre-Pulse Kill (PPK)

With this method, the excess energy of the giant first pulse is dissipated before pulsed laser output begins.

To enable this, a TTL input (PPK trigger) must be provided in advance of the modulation cycle, triggering an automatic RF power ramp. The shape of the ramp is manually adjustable using a series of trimpots onboard the driver.

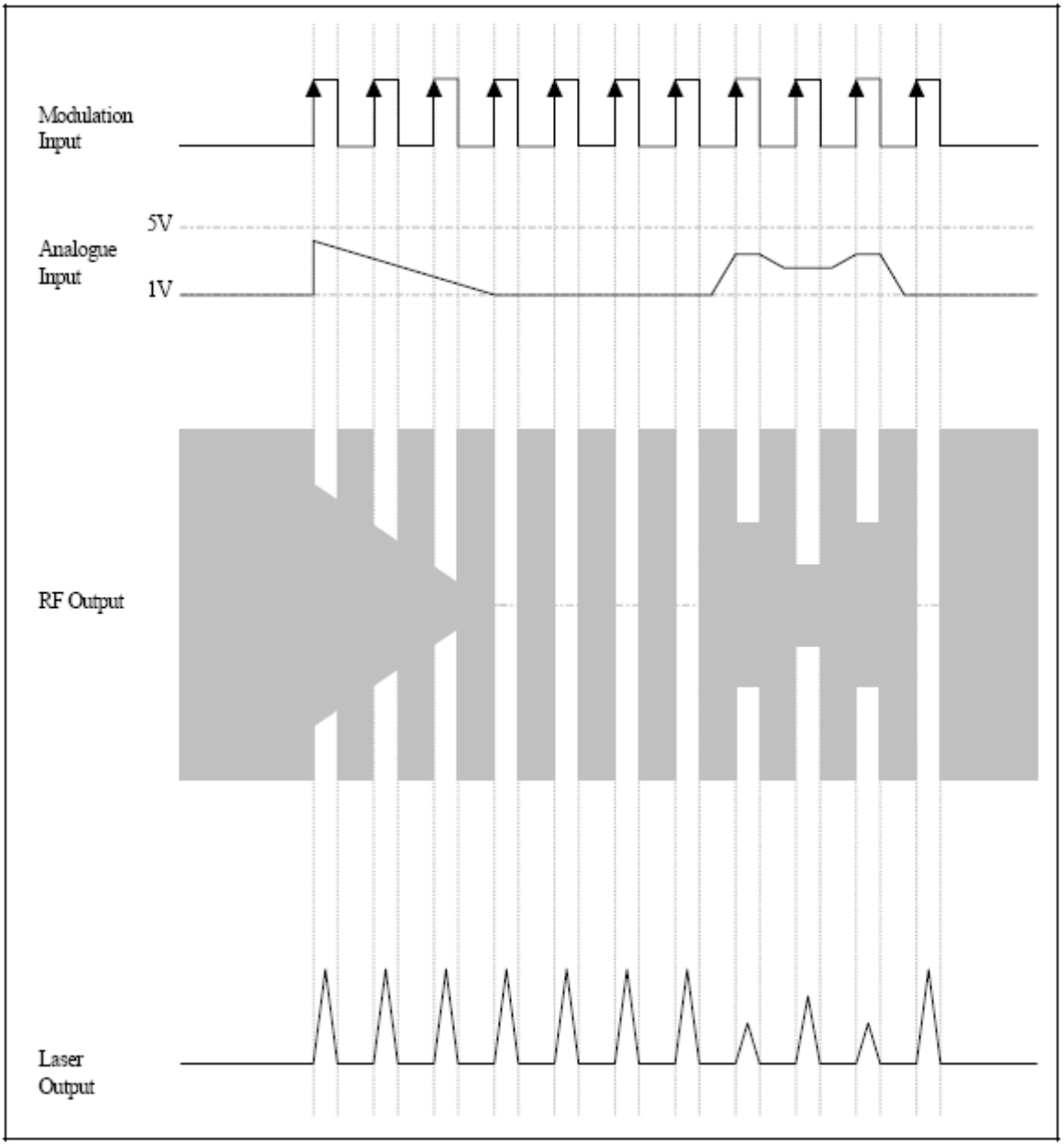


RF Off Analogue Control (R05)

This method enables full manual control of FPS using an analogue input to control the RF off level by ramping the voltage at the beginning of the pulsed laser output.

This function can also be used to control the laser pulse power as illustrated.

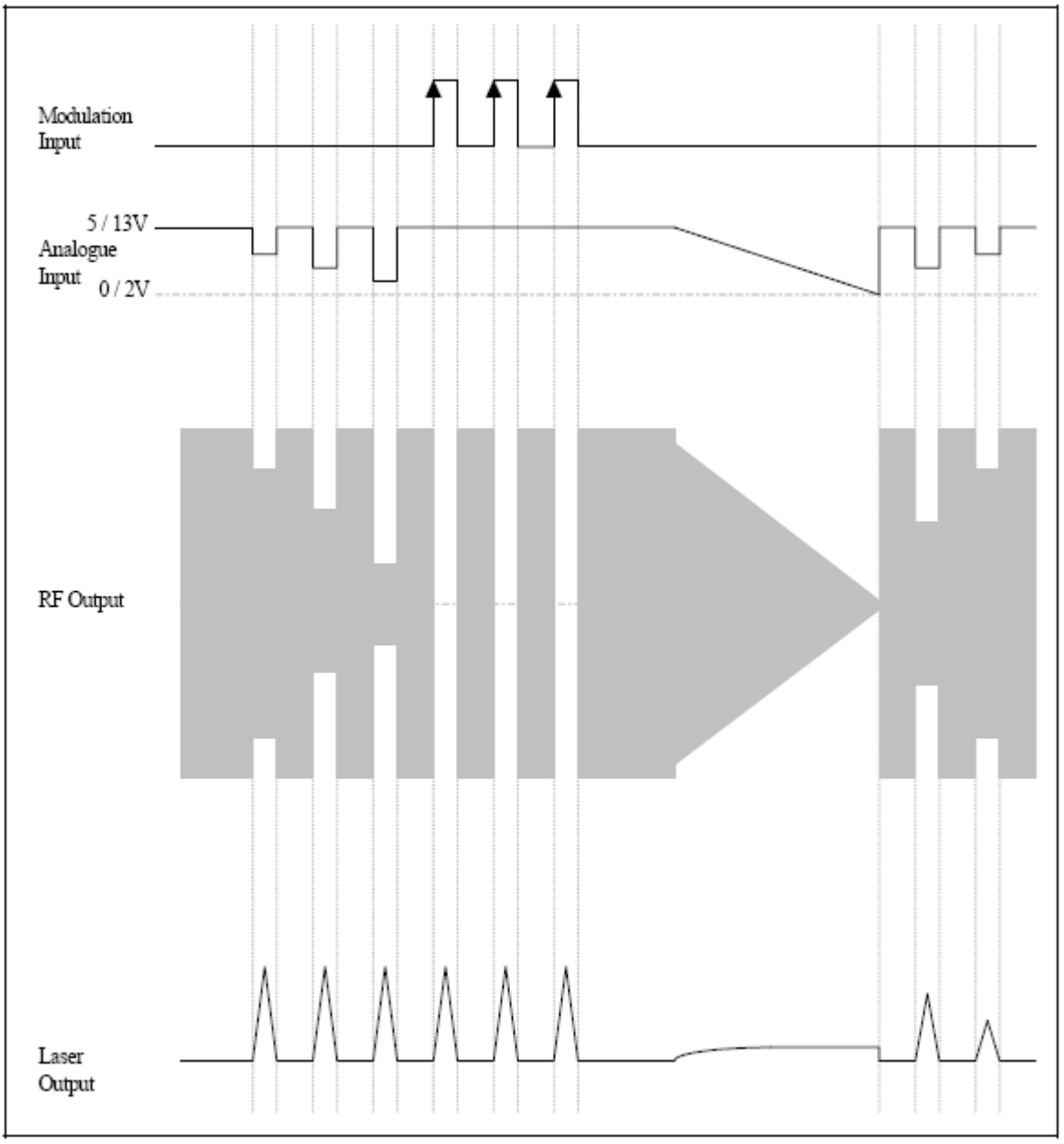
Between 0 and 1V, the RF off level is zero. From 1 to 5V the RF level varies from zero to full power.



Analogue Modulation (A05 / A13)

An analogue input enables manual control of the RF power output, allowing FPS type suppression by modulating and ramping the voltage simultaneously, or PPK type suppression by simply ramping the voltage between modulation pulse trains.

Additionally, this control input can be used to vary the laser pulse power level. This option is available as either 0 to 5V (A05) or 2 to 13V (A13). Note that TTL modulation cannot be applied at the same time as the analogue input.



STG Series RF Drivers for Acousto-Optic Modulators

An RF driver generates an RF signal that is used to generate the acoustic wave within the crystal of an AO device. The frequency and intensity of the applied RF signal will determine how much an optical beam is modulated, deflected, or tuned.

We offer a wide variety of stable high frequency drivers with analog and digital modulation capability, optimized by application. Explore our new line of flexible dual drivers, or contact us to discuss a custom OEM design.

A RF driver typically consists of an RF oscillator, a modulation circuit, and a power amplifier which generates an RF signal to drive an AO device. The transducer within the acousto-optic modulator uses the piezoelectric effect to very precisely convert the RF signal to an acousto-optic wave in an interactive optical material at a fixed or variable frequency.

An acousto-optic device and its RF driver should be selected as a unit to optimize speed and stability for each application. Additional application-specific features may include first pulse suppression, synchronization, pulse shaping, or multi-channel operation.

As our AO product lines expand, we are creating more flexible, adaptive RF drivers with dual analog/digital operation and configurable firmware to accommodate functionality like triggering and temperature control without the need for new hardware. Our OEM designs, in contrast, are optimized to each customer's application, maximizing performance in the required form factor.

CHOOSING AN RF DRIVER

The needs of the AO device will dictate the choice of RF driver. The primary factors to consider are shown below, though speed, duty cycle, and special functions are also important.

- RF power: ranges from 150 W
- Modulation: digital or analog
- Frequency of operation: may be fixed, variable (linearly swept), or programmable
- Stability: influencing choice of VCO vs DDS when frequency is not fixed
- Number of channels: number of output ports or number of output tones from a single port
- Special functions: pulse-killing, synchronization, etc.

MODULATION: DIGITAL VS ANALOG

The modulation mode determines how the applied RF power is varied, and thus the intensity of diffracted light. In digital modulation, the RF power is applied in an on/off state via an applied TTL signal, thus controlling whether the beam is diffracted. In analog modulation, the RF power is controlled through application of a voltage within a specified range, yielding control over the diffraction efficiency and allowing shaping of that waveform in time.

FIXED VS VARIABLE FREQUENCY DRIVERS

Fixed frequency drivers provide a single output frequency which is matched to the AO device. Offered from 24-440 MHz, fixed frequency drivers may be controlled via analog or TTL input, some with manually adjustable output RF power. These are used most often for modulation applications.

Variable and programmable frequency RF drivers allow active control of output frequency. Voltage controlled oscillators (VCOs) provide a linearly swept (variable) RF drive frequency, and are flexible enough to be used for any AO device. Direct digital synthesizer (DDS) drivers offer programmable frequency. They can create random waveforms from a single, fixed-frequency reference clock, and thus are ideal for pulse shaping and special functions. DDS drivers are software driven, and can be run from a user-friendly interface (a GUI), or controlled directly via computer driver commands. Our high-performance multi-frequency DDS drivers generate up to 8 channels of RF frequencies simultaneously.

DUAL DRIVERS

Dual drivers allow simple or complex digital waveforms to be synthesized, converted to analog signals, and amplified to drive the AO device. This gives great flexibility; for example, it allows the driver to provide multiple programmable frequencies or to swap freely between multiple, complex, bespoke waveforms.

FREQUENCY AGILITY AND CONTROL

We offer Direct Digital Synthesizer (DDS) drivers that offer high stability and linearity, with fast switching time and high resolution. They are capable of creating arbitrary waveforms from a single, fixed-frequency reference clock, and thus are ideal for pulse shaping and special functions. DDS drivers can be run from a GUI or via driver commands in two modes: 1) random access, with digital words mapping to specific frequencies, and 2) chirped mode for continuous scanning in frequency increments. DDS drivers are also referred to as DFS (digital frequency synthesizer) drivers.

Our technical support team is available to advise on selection and optimization of RF drivers for specific applications, as well as customization of products for OEM integration.

APPLICATIONS OF RF DRIVERS

Driving and control of acousto-optic devices, including modulators, deflectors, cavity dumpers, fiber-coupled modulators, frequency shifters, mode lockers, multi-channel modulators, pulse pickers, Q-switches, tunable filters.

Product	Compatible AO Device	Operating Frequency	Max RF Power	Key Feature
64020-200-2ADMDFS-A	Deflector, Special Modulator, Tunable Filter	20 - 200 MHz	2.0 W	Programmable frequency; single channel DDS
64020-250-1ADMDFS-A	Deflector, Special Modulator, Tunable Filter	20 - 250 MHz	1.0 W	Programmable frequency; single channel DDS
97-02925-32	Deflector, Tunable Filter	20 - 160 MHz	0.4 W	Programmable frequency; single channel DDS
6000 Series Driver	Deflector, Tunable Filter	50-450 MHz	15-20 W	Dual channel outputs
97-03926-12	Deflector, Tunable Filter	20 - 160 MHz	3.2 W	Programmable frequency; 8 channel DDS
97-02910-xx	Fiber-Q	80-200 MHz	2.5-3.0 W	Fixed single frequency; low power draw
3307 series	Fiber-Q, Frequency Shifter	80 - 350 MHz	1-4 W	Fixed single frequency
3910 series	Fiber-Q, Frequency Shifter, Modulator	80 - 350 MHz	0.5-8.0 W	Fixed single frequency
A35xxx-S-1/50-p4k7u	Fiber-Q, Frequency Shifter, Modulator	40-300 MHz	0.5-5.0 W	Fixed single frequency; analog & digital modulation
MHPXXX-YYADM-A1 Formerly 31XXX-YYADM	Fiber-Q, Modulator	24 - 260 MHz	2-20 W	Fixed single frequency
MCX0XX-Y.YZC-MINx	Frequency Shifter, Modulator	40-80 MHz	0.5-2.5 W	Fixed single frequency; ultra-compact size
HP041-125ADG-A10	Modulator	40.68 MHZ	125 W	Fixed single frequency; Ge AO devices
HP040-060-150ADG-A10-2X	Modulator	40/60 MHz	2 x75 W	Fixed dual frequencies; Dual channel Ge AO devices
Compact low power RF AOM and AOQS	Modulator, Q Switch	24-110 MHz	2-24 W	Fixed single frequency; compact, low power; fixed/variable pulse width
MQH0XX-YYDM-ZZZ	Modulator, Q Switch	24-80 MHz	25-100 W	Fixed single frequency; fixed/variable pulse width
MQH0XX-YYDM-ZZZ-2S	Q Switch	24-80 MHz	25-50W per channel	Fixed single frequency; 2 channel; fixed/variable pulse width
SD020-200-5UC-4x1	Tunable Filter	20 - 200 MHz	5.0 W	Programmable frequency; single or multi-channel DDS

1. A35xxx (40 to 350MHz, 5W)

The A35xxx RF driver series provides up to 5 Watt output power. Various types cover a frequency range from 40 to 350 MHz.

The maximum RF output power is adjustable by an internal potentiometer. The analogue modulation voltage controls the output power from 0 to 100% of the adjusted maximum power.

Additionally to the analogue modulation voltage a digital modulation control signal can switch on and off

the RF power. An operation scheme below (page 5) illustrates the interaction of the two modulation signals in detail.

Both the analogue and digital modulation are characterized by extraordinary on/off ratios of at least 65dB.

The driver can be operated with modulation frequencies (analogue and digital) up to 25% of the carrier frequency and 50 MHz maximum.

Optimum EMC shielding and mechanical protection is achieved by an aluminium casing. The base plate serves for mounting as well as for heat dissipation.

Key Features:

- Frequency range 40 to 350 MHz
- RF output power 5 Watt
- RF on/off ratio > 65 dB
- Constant output power design
- Models with a modulation frequency up to 50 MHz available
- Conductive cooling through base plate
- Compact casing, fully shielded (EMC)

Applications:

- Fast modulation components for extra cavity applications, e. g. laser projection systems
- Frequency shifting

Technical Data

Supply voltage	+24 VDC			
Supply current	typ. 1.5 A @ 5 W RF output power			
Output impedance	nom. 50Ω			
Maximum RF output power (adjustable) *	> 5 W (+37 dBm)			
Adjustment range	<0.1W …… >5W			
Frequency accuracy	< ±25 ppm			
Harmonics distortion*	< -26 dBc			
Analogue modulation**				
Impedance	50Ω			
Voltage range @ 50Ω	0 … +1 V			
RF ON / OFF ratio	> 65 dB			
Digital modulation**				
Impedance	4.7kOhm (pull-up)			
Level	High = ≥ 3V … 5V (=RF on) Low = 0 … < 2V (=RF off)			
RF ON / OFF ratio	> 100 dB			
RF output frequency* [MHz]**	**40 … <80**	**80 … <140**	**140 … <200**	**200 … 350**
Analogue modulation RF rise time / fall time (PRF: 10 … 90%) *	< 25 ns	< 15 ns	< 10 ns	< 8 ns
Digital modulation RF rise time / fall time (PRF: 10 … 90%) *	< 25 ns	< 15 ns	< 10 ns	< 8 ns

* into 50 _ load
** other configurations on request
*** standard frequencies: 40, 80, 110, 150, 200 MHz

Connectors, Dimensions, Weight, Cooling

RF output connector	SMA female
Control input connector	D-Sub 7W2
Pins 1 and 2, inside linked	GND (case)
Pins 3 and 5, inside linked	+Vs (24 VDC)
Pin 4	not connected
Pin A1 (coaxial)	Analogue modulation
Pin A2 (coaxial)	Digital modulation
Dimensions	120 x 70 x 35 mm (LxWxH)
Weight	360 grams
Cooling	Conduction, the base plate must be attached to a suitable heat sink.

heat sink capable of dissipating 36 Watt.

Environmental Conditions

Warm up time	10 minutes for optimum stability
Base plate temperature	+10°C … +60°C. For optimum output power stability constant base plate temperature should be provided.
Storage temperature	-20°C … +70°C, non condensing

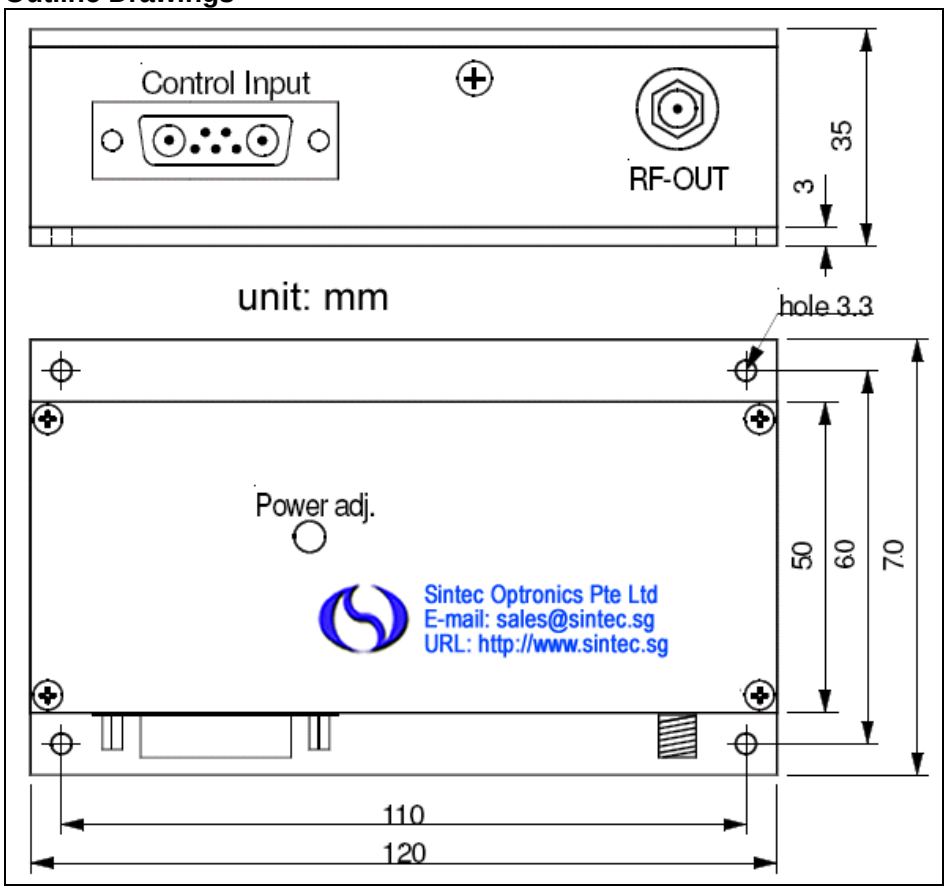
Absolute Maximum Ratings

Supply voltage max.	+26 VDC
Analogue modulation	
Voltage range @ 0 … +1 V	-0.5 V … +1.1 V
Digital modulation	
Level	-0.5 V … +5.5 V
Maximum operating temperature	+65°C base plate temperature

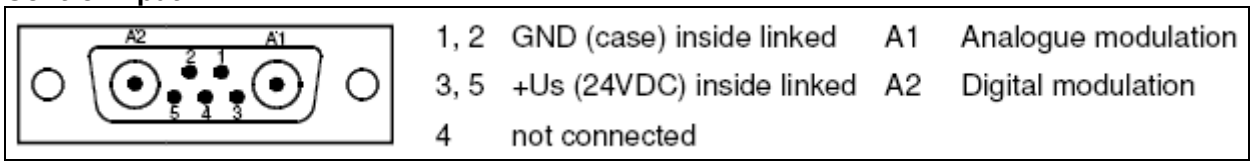
Quality Standards

EU 2002/95/EC (RoHS)	compliant
EMC standards	VDE 0871-B
	FCC Rules Part 15-B
Thermal test	2h @ 70°C passive
Burn-in test	30 minutes @ maximum RF power output

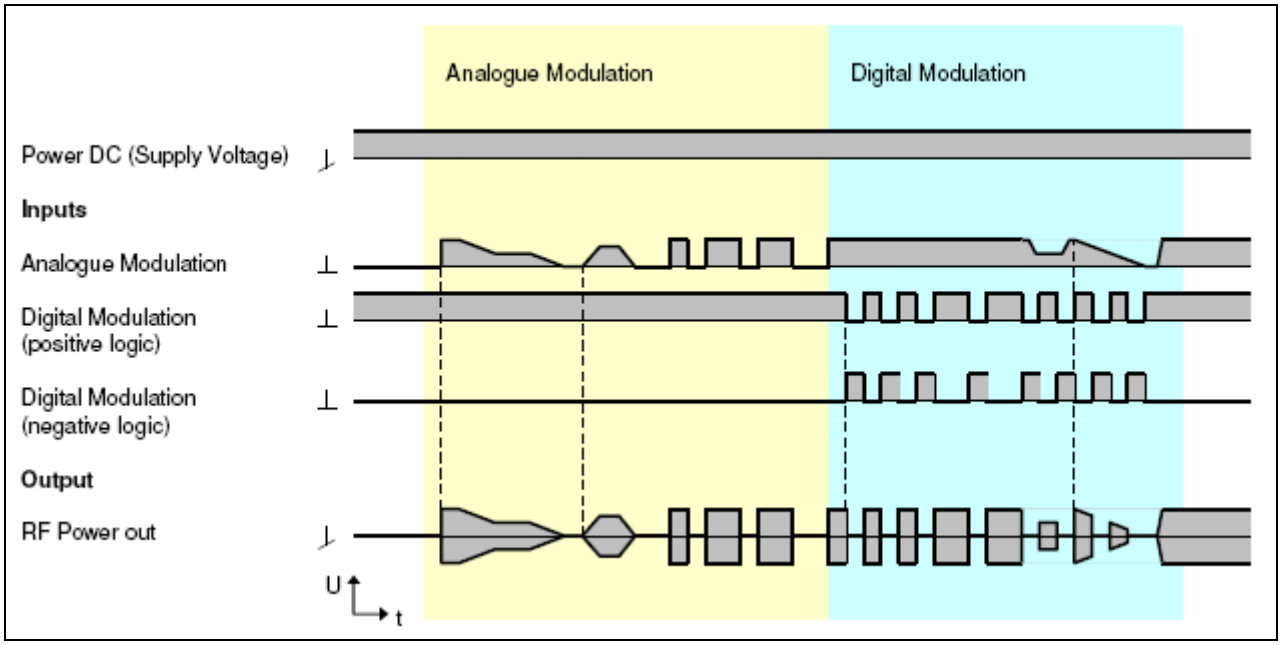
Outline Drawings



Control Input



Operation Scheme of Analogue and Digital Modulation



Variants List / Ordering Codes

A35 ☐ – ☐ – ☐ – ☐

Frequency [MHz]		Base Plate)[1]		Analogue Modulation Input)[2])[4]			Digital Modulation Input)[4]		
				Voltage Range	Impedance		Logic	Impedance)[3]
080	s	standard 120x70 mm	1/50	0...1V	50Ω	p4k7u	positive	4,7kΩ pull-up
100						p4k7d	positive	4,7kΩ pull-down
110			5/50	0...5V	50Ω	p50u	positive	50Ω pull-up
150						p50d	positive	50Ω pull-down
200	c	compatible 165x70	5/600	0...5V	600Ω	n4k7u	negative	4,7kΩ pull-up
250						n4k7d	negative	4,7kΩ pull-down
300			10/600	0...10V	600Ω	n50u	negative	50Ω pull-up
350						n50d	negative	50Ω pull-down

Other frequencies and customized versions are available on request.

Accessories
Connector Kit for AOM Driver Series A35xxx and A36xxx Part-No. 508A00169

2. AOM Driver A36-Series

The A36xxx RF driver series provides up to 2 Watt output power. Various types cover a frequency range from 80 to 350 MHz. The frequency is customizable.

The maximum RF output power is adjustable by an internal potentiometer. The analogue modulation voltage controls the output power from 0 to 100% of the adjusted maximum power.

Additional to the analogue modulation voltage a digital modulation control signal can switch on and off the RF power. An operation scheme below (page 6) illustrates the interaction of the two modulation signals in detail。

Both the analogue and digital modulation are characterized by extraordinary on/off ratios of at least 70

dB.

The driver can be operated with modulation frequencies (analogue and digital) up to 1/4 of the carrier frequency.

Optimum EMC shielding and mechanical protection is achieved by an aluminium casing and a conductive surface passivation. The base plate serves for mounting as well as for heat dissipation.

Key Features:
- Frequency range 80 to 350 MHz, customizable
- RF output power 2 Watt
- RF on/off ratio > 70 dB
- Constant output power design
- Models with a modulation frequency up to 50 MHz available
- Conductive cooling through base plate
- Compact casing, fully shielded (EMC)

Applications:
- Fast modulation components for extra cavity applications, e. g. laser projection systems
- Frequency shifting Compact casing, fully shielded (EMC)

Technical Data

Supply voltage	+24 VDC
Supply current	typ. 1.1 A @ 2 W RF output power
Output impedance	nom. 50Ω
Maximum RF output power (adjustable) *	> 2 W (+33 dBm)
Analogue modulation	
Impedance	50 or 600Ω
Voltage range @ 50Ω	0 … +1 V or 0 … +5 V **
Voltage range @ 600Ω	0 … +5 V or 0 … +10 V **
RF ON / OFF ratio	> 70 dB
Digital modulation	
Impedance	4k7 or 50 _ (pull-up or pull-down) **
Level	High = ≥ 3V … 5V Low = 0 … < 2V

Logic styles	Input signal:	High	Low	not connected
positive logic, pull-up	RF power:	on	off	on
positive logic, pull-down		on	off	off
negative logic, pull-up		off	on	off
negative logic, pull-down		off	on	on

RF ON / OFF ratio	> 100 dB
* into 50Ω load	** other combinations on request

Technical Data, Frequency-Dependent

RF output frequency [MHz]	80	100	110	150	200	250	300	350
Frequency accuracy [ppm]			< ±30		< ±30			
Harmonics distortion * [dBc]			< -26		< -26			
Analogue modulation RF rise time / fall time (10 … 90%) *			< 8 ns		< 8 ns			
Digital modulation RF rise time / fall time (10 … 90%) *			< 8 ns		< 8 ns			

* into 50Ω load

Connectors, Dimensions, Weight, Cooling

RF output connector	SMA female
Control input connector	D-Sub 7W2
Pins 1 and 2, inside linked	GND (case)
Pins 3 and 5, inside linked	+Us (24 VDC)
Pin 4	not connected
Pin A1 (coaxial)	Analogue modulation
Pin A2 (coaxial)	Digital modulation
Dimensions	

Casing	120 mm x 50 mm x 35 mm **
Mounting plate, standard case	120 mm x 70 mm x 3 mm **
	** length x width x height

Weight

Standard case	300 grams

Cooling Conduction, the base plate must be attached to a suitable heat sink.

Environmental Conditions

Warm up time	10 minutes for optimum stability
Base plate temperature	+10°C … +40°C For optimum output power stability constant base plate temperature should be provided.
Storage temperature	-20°C … +70°C, non condensing

Absolute Maximum Ratings

Supply voltage max.	+26 VDC

Analogue modulation

Voltage range @ 0 … +1 V	-0.5 V … +1.1 V
Voltage range @ 0 … +5 V	-0.5 V … +5.5 V
Voltage range @ 0 … +10 V	-0.5 V … +11.0 V

Digital modulation

Level	-0.5 V … +5.5 V

Maximum operating temperature +50°C base plate temperature

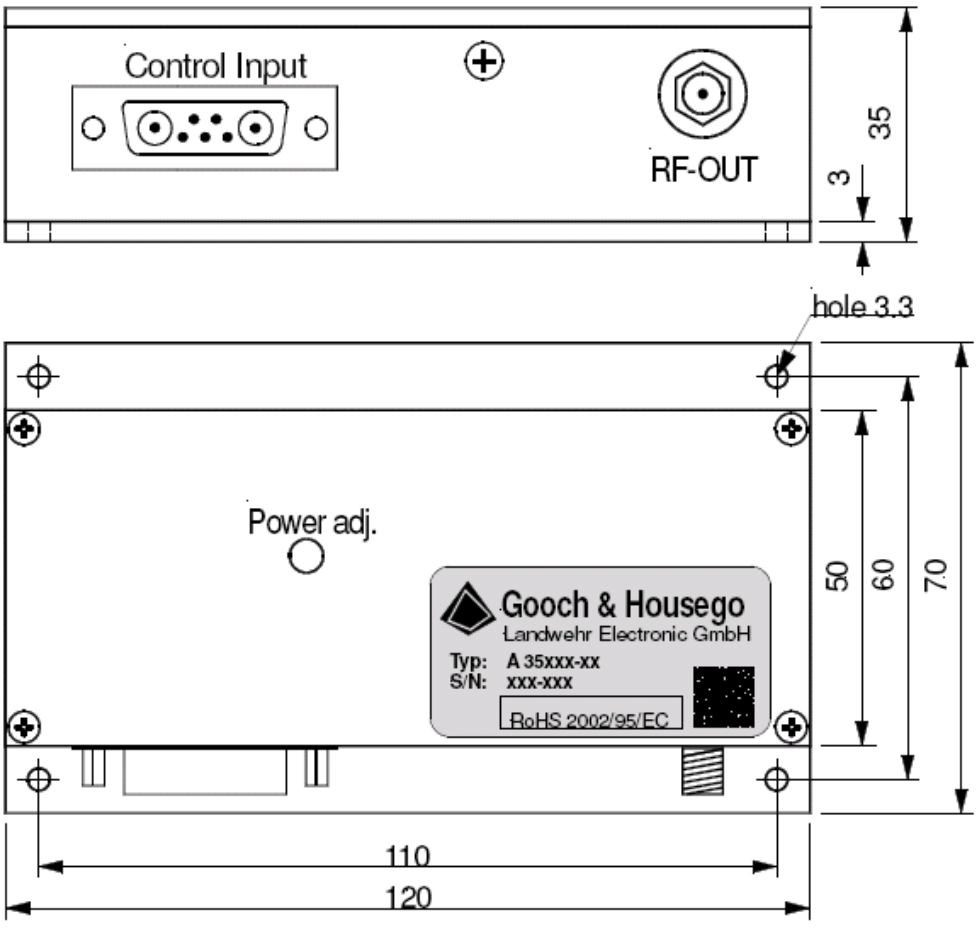
Quality Standards

EU 2002/95/EC (RoHS)	compliant
EMC standards	VDE 0871-B
	FCC Rules Part 15-B
Thermal test	2h @ 70°C passive
Burn-in test	30 minutes @ maximum RF power output

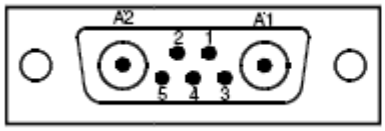
Outline Drawings

Dimensions in mm

Standard casing

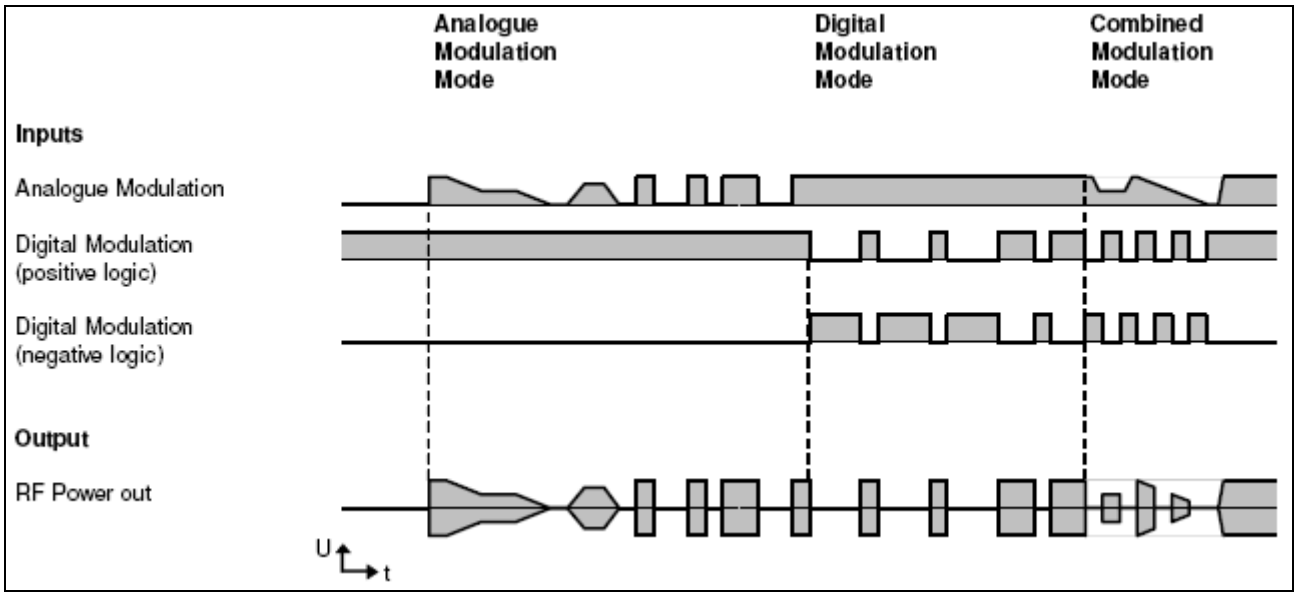


Control Input



1, 2	GND (case) inside linked	A1	Analogue modulation
3, 5	+Us (24VDC) inside linked	A2	Digital modulation
4	not connected		

Operation Scheme of Analogue and Digital Modulation



Variants List / Ordering Codes

A36 [ ] - [ ] - [ ]

Frequency [MHz]
080
100
110
150
200
250
300
350

	Analogue Modulation Input)[1])[3]	
	Voltage Range	Impedance
1/50	0...1V	50Ω
5/50	0...5V	50Ω
5/600	0...5V	600Ω
10/600	0...10V	600Ω

	Digital Modulation Input)[3]	
	Logic	Impedance)[2]
p4k7u	positive	4,7kΩ pull-up
p4k7d	positive	4,7kΩ pull-down
p50u	positive	50Ω pull-up
p50d	positive	50Ω pull-down
n4k7u	negative	4,7kΩ pull-up
n4k7d	negative	4,7kΩ pull-down
n50u	negative	50Ω pull-up
n50d	negative	50Ω pull-down

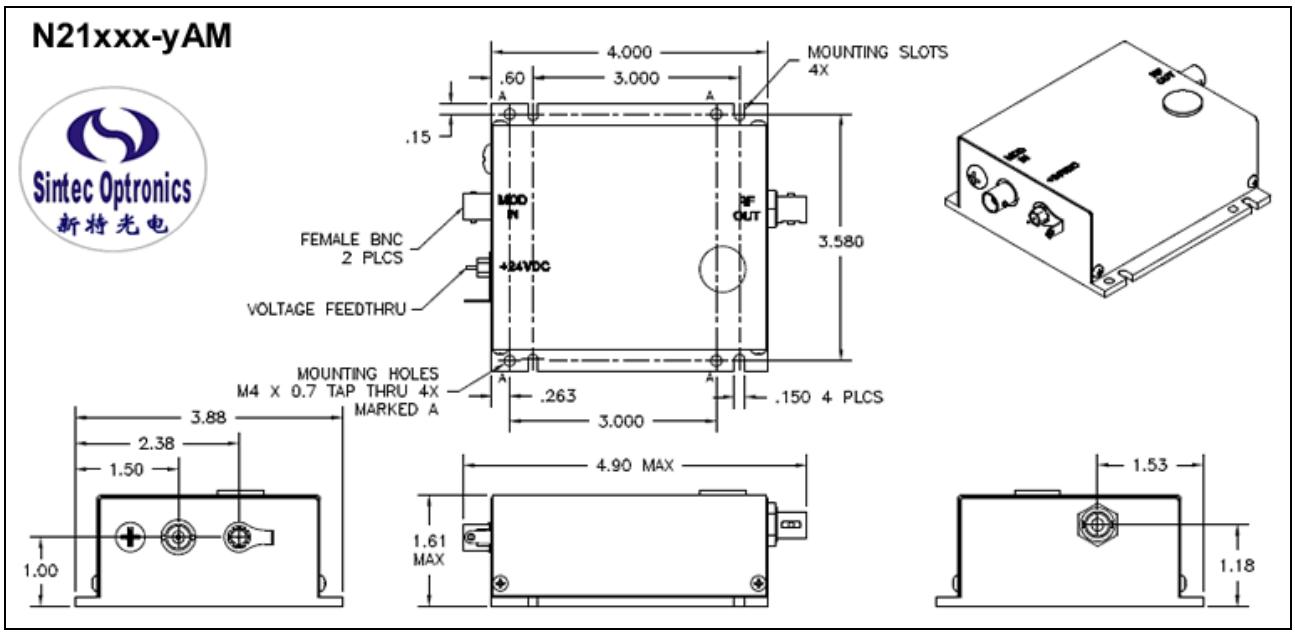
Remarks
1 The voltage range corresponds to 0 to 100% of the potentiometer pre-adjusted maximum RF output power.
2 A pull-up resistor provides HIGH level, a pull-down resistor LOW level in case of not connected input.
3 Further configurations on request.

3. AOM Driver: N21xxx-yDM (27 to 300MHz, 0.4 to 2W)

The N21xxx-yDM OEM Module Is A RF Driver With Digital Modulation Input And Maximum 2 Watt Output Into A 50 Ohm Load. The model number is described as follows:

xxx = a fixed frequency of between 27 and 300 MHz crystal controlled.
y = 0.4, 1, or 2 Watts output
D = Digital Modulation
M = OEM Module

Parameter	**Specification**
Output Frequency (**xxx**)	27 to 300 MHz + 0.01% Quartz Stabilized
Spurious Levels	-50 dBc Maximum
Harmonic Distortion	-15 dBc Maximum
Digital Input	TTL Levels (TTL HIGH = Full RF Power; TTL LOW = Minimum RF Power)
Extinction Ratio	50 dB Minimum
RF Rise	20 ns Maximum
PRF	10 to 90 %
Fall Time	20 ns Maximum
PRF	90 to 10 %
RF Output Power (**y**)	0.4, 1 or 2 Watts Nominal, Adjustable. Factory Set for Optimum Performance When Paired with a NEOS AO Device.
Output Impedance	50 Ohms Nominal
Supply Voltage	+ 24 VDC + 0.5 Volt
Supply Current	1 Amp Maximum
MAXIMUM RATINGS	
Supply Voltage	+ 28 Volts
Power Output	No DC Feedback Allowed
Case Temperature	+ 55^{0}C. The Driver Must Be Attached to an Adequate Heatsink.
CONNECTORS & MECHANICAL	
RF Output Connector	BNC Female
Modulation Input Connector	BNC Female
Power Supply Connections	Vcc: Solder Post; Return: Ground Lug
Physical Size	4.8" L x 1.61" H x 3.87" W

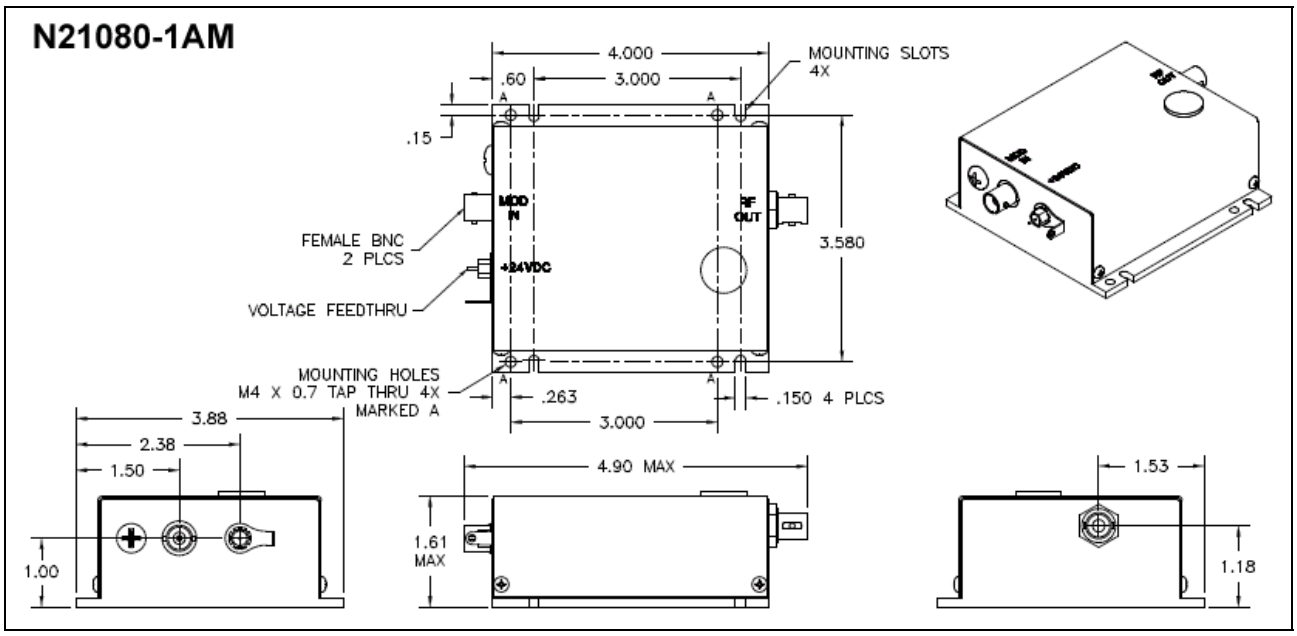


4. AOM Driver: N21xxx-yAM (27 to 300MHz, 0.4 to 2W)

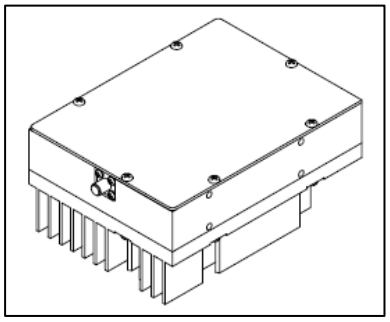
The N21xxx-yAM OEM Module Is A RF Driver With Analog Modulation Input And Maximum 2 Watt Output Into A 50 Ohm Load. The model number is described as follows:

xxx = a fixed frequency of between 27 and 300 MHz crystal controlled.
y = 0.4, 1, or 2 Watts output
A = Anolog Modulation
M = OEM Module

PARAMETER	**SPECIFICATION**
Output Frequency (**xxx**)	27 to 300 MHz + 0.01% Quartz Stabilized
Spurious Levels	-50 dBc Maximum
Harmonic Distortion	-15 dBc Maximum
Analog Input	+ 1 Volt into 50 Ohms (+ 1 Volt = Full RF Power; 0 Volt = Minimum RF Power)
Extinction Ratio	50 dB Minimum
RF Rise	20 ns Maximum
PRF	10 to 90 %
Fall Time	20 ns Maximum
PRF	90 to 10 %
RF Output Power (**y**)	0.4, 1 or 2 Watts Nominal, Adjustable
Output Impedance	50 Ohms Nominal
Supply Voltage	+ 24 VDC + 0.5 Volt
Supply Current	1 Amp Maximum
MAXIMUM RATINGS	
Supply Voltage	+ 28 Volts
Power Output	No DC Feedback Allowed
Case Temperature	+ 55^{0}C. The Driver Must Be Attached to an Adequate Heatsink.
CONNECTORS & MECHANICAL	
RF Output Connector	BNC Female
Modulation Input Connector	BNC Female
Power Supply Connections	Vcc: Solder Post; Return: Ground Lug
Physical Size	4.8" L x 1.61" H x 3.87" W



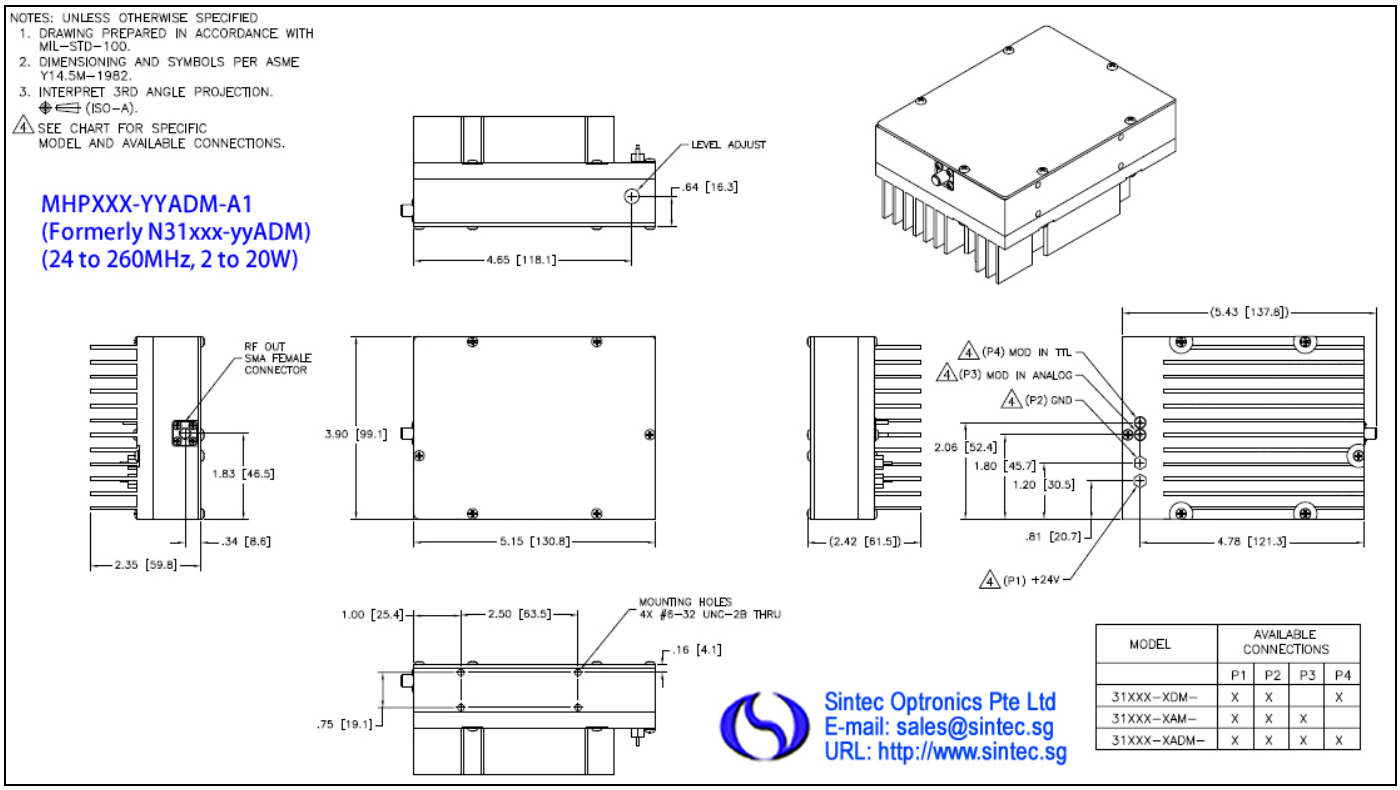
5. AOM Driver MHPXXX-YYADM-A1 (Formerly N31xxx-yyADM) (24 to 260MHz, 2 to 20W)



The MHPxxx-yyADM-A1 driver is a RF driver module with analog and digital modulation input and up to 20 Watts Output into a 50 Ohm load. The model number is described as follows:

xxx = a fixed frequency of between 24 and 260 MHz crystal controlled.
yy = 2 to 20W nominal. Set by internal pot
A = Analog Modulation
D = Digital Modulation
M = OEM Module

Output Frequency (**xxx**)	24 MHz to 260 MHz ±0.01% quartz stabilized
Spurious Levels	-40 dBc maximum
Harmonic Distortion	-15 dBc maximum
Analog Input	0-1 Volt into 50 Ohms (+ 1 Volt = Full RF power; 0 Volt = minimum RF power)
Digital Input	TTL Levels (TTL HIGH = FULL RF power; YYL LOW = minimum RF power)
Extinction Ratio	40 dB minimum
RF Rise/ Fall Time	30ns maximum, 20 ns typical, 10ns > 210MHz (P_{RF}: 10 to 90%)
RF Output Power (**yy**)	2 to 20 Watts nominal. maximum output power set by internal pot.
Output Impedance	50 Ohms nominal
Supply Voltage	+ 24 VDC + 0.5 Volt
Supply Current	3 Amp maximum
Air Flow Across heat sink	18 CFM at 25 ^{o}C
MAXIMUM RATINGS	
Supply Voltage	+ 28 Volts
Power Output	No DC feedback allowed
Case Temperature	+ 55^{0}C.
CONNECTORS & MECHANICAL	
RF Output Connector	BNC female
Modulation Input Connector	Feed Through Pin
Power Supply Connections	Vcc: Vcc feed through Pin; Return: Feed through Pin
Physical Size	5.43" L x 2.42" H x 3.90" W



6. AOM Driver 2910 Series 1 to 4 Watt RF Drivers for Acousto-Optic Modulators

The 2910 Series RF driver provides up to 4 Watts output power. Various types cover a frequency range of 80 to 350MHz. The maximum RF output power is adjustable by an internal potentiometer. The driver is available in either analogue or digital modulation control. The analogue modulation voltage controls the output power from 0 to 100% of the adjusted maximum power. The digital modulation control signal can switch on and off the RF power.

The driver can be operated with modulation frequencies (analogue and digital) up to 25% of the carrier frequency and 50 MHz maximum at the higher carrier frequencies. Optimum EMC shielding and mechanical protection is achieved by an aluminium casing. The base plate serves for mounting and heat dissipation purposes.

Key Features:

- Frequency range 80 to 350 MHz
- RF output power up to 4 Watt
- RF on/off ratio 60 dB (Digital Modulation)
- RF on/off ratio 50 dB (Analogue Modulation)
- Constant output power design
- Models with a modulation frequency up to 50MHz available
- Conductive cooling through base plate
- Compact casing

Applications:

- Fast modulation components for extra cavity applications, e. g. laser projection systems
- Frequency shifting

Technical Specifications:

Supply voltage	+24V DC
Supply current	600 mA (nominal) with Pout = 1.0 W 625 mA (nominal) with Pout = 1.5 W 775 mA (nominal) with Pout = 2.5 W 825 mA (nominal) with Pout = 3.0 W 900 mA (nominal) with Pout = 4.0 W 2700 mA (nominal) with Pout = 20 W*
Output impedance	50 (nominal)
Maximum RF power (adjustable)	< 0.1 W … > Pout
Frequency accuracy	± 0.1%
Harmonic distortion**	≤ -20 dBc***
Analogue modulation impedance Voltage range @50 RF ON/OFF ratio	50 (nominal) 0 … +1 V ≥ 50 dB****
Digital modulation Impedance Level RF ON / OFF ratio	75 (nominal)***** Standard TTL ≥ 60 dB
RF output frequencies	80, 110, 150, 200, 260 & 350 MHz
RF rise/fall times (Rise=10% to 90%) (Fall=90% to 10%)	12 nsec @ 80 MHz 9 nsec @ 110 MHz 7 nsec @ 150 MHz 5 nsec @ 200 MHz 4 nsec @ 260 MHz 4 nsec @ 350 MHz

* A 20 W version available using external amplifier.
** Into 50 load
*** Part numbers -16 and -17 are ≤ -15 dBc
**** Part numbers -12, -14 and -16 are 45 dB
***** Part number -11 is 600 (nominal)

Connectors

RF output connector : SMA (female)
Modulation connector: SMC (male)
Power Supply connector:
Input: Solder terminal (filtered feed-thru)
Ground: Solder lug

Cooling, Dimensions, Weight

Cooling	Conduction Base plate should be attached to suitable heat sink capable of dissipating
1.0 W - 1.5 W	15 W

2.5 W - 3.0 W	20 W
4.0 W	22 W
Dimensions inches [mm] L x W x H	4 x 1.12 x 3.15 [102 x 29 x 80]
Weight lbs [kg]	0.53 [0.24] (nominal)

Environmental Conditions

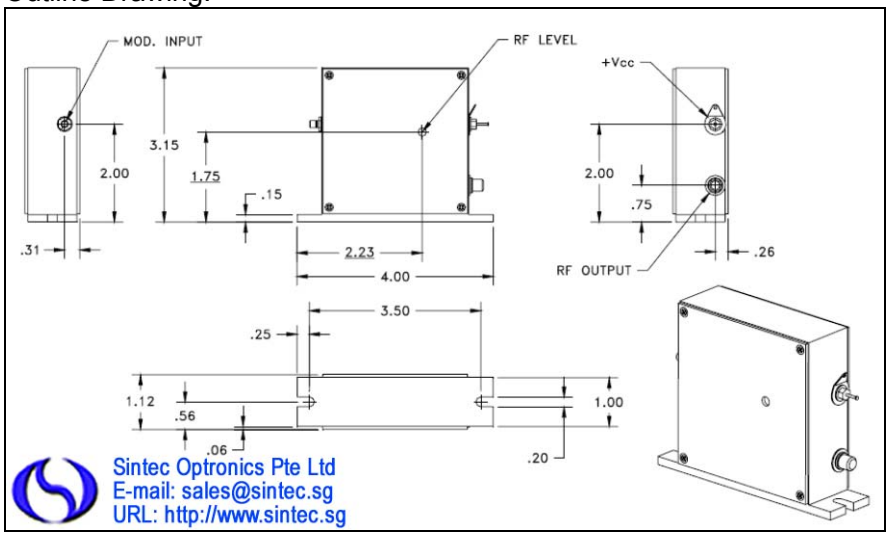
Warn-up Time	5 minutes (nominal)
Base Plate Temperature	0C to +60C. For optimum output power stability constant base plate temperature should be provided
Storage Temperature	-25C to +85C (non condensing)

Absolute Maximum Ratings

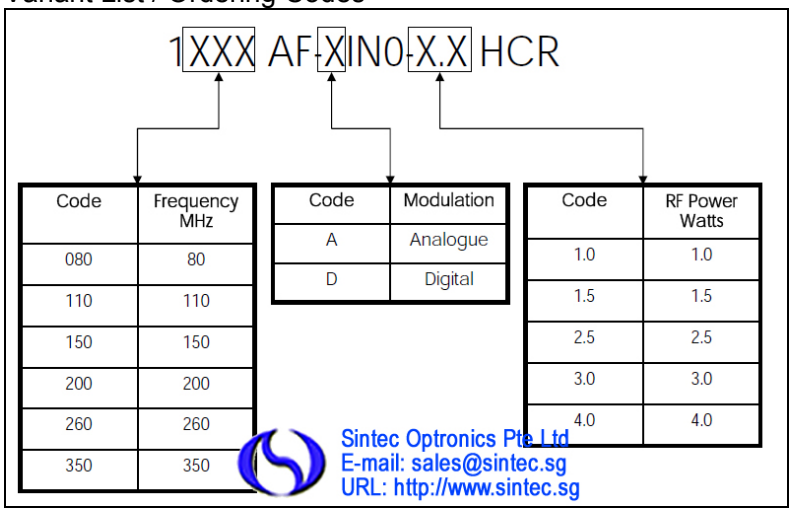
Supply Voltage	+28 VDC
Analogue Modulation	-1.5 V to +1.5 V
Digital Modulation	-0.5 V to +2.75 V
Operating Temperature	+65 C (base plate temperature)

Quality Standards
EU 2002/95/EC (RoHS): Compliant
Burn-in: 12 Hours min @ +25 C and Pout

Outline Drawing:



Variant List / Ordering Codes



Other Frequencies and customized versions available upon request.

7. 3910 Series RF Drivers

Next Generation AO Modulator Driver

The 3910 series RF drivers offer a significant upgrade over our 2910 series while maintaining backwards compatibility.

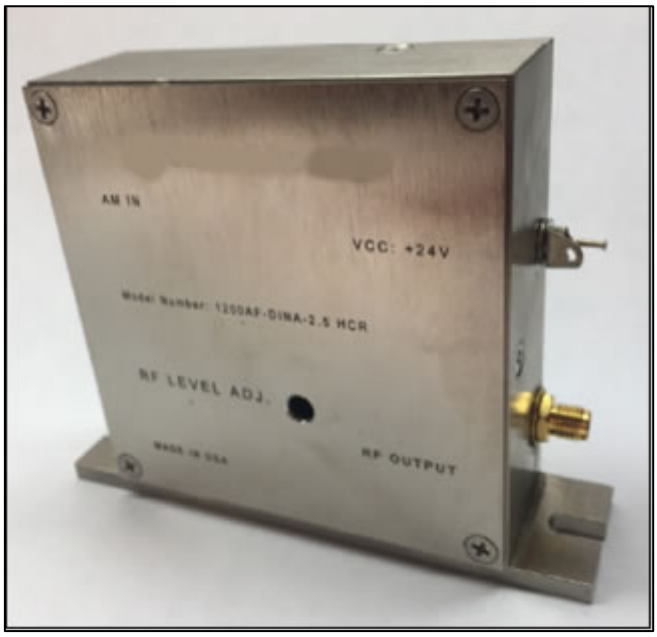
The 2910 series RF driver has been a workhorse for powering AO modulator applications over the last decade. The line has received a complete makeover to further enhance the success of this signature driver. All of its functions have been improved and a few key features have been added while maintaining its affordable price.

The 3910 modulation input now allows the user to switch from three modulation schemes: Digital, Analog and Digital+Analog. This function will be standard on all models. The RF power has been doubled from 4Watts to 8Watts (at +28Vcc). The 3910 features more efficient power consumption than its predecessor. The Frequency range has been increased up to 500MHz, making it able to control any of the currently available AO modulator models. The rise time is <4ns at all power levels and frequencies >250MHz. Another new feature is the optional ability to synchronize the driver to an external clock reference. The 3910 RF driver offers more power, higher frequencies, faster rise times, more modulation choices, synchronization capabilities and the latest electronic components over the 2910 series driver while maintaining the same footprint and pricing.

Key Features
- Up to 500MHz center frequency
- Selectable modulation input
- Adjustable RF power up to 8 Watts
- Rise time as low as 4 ns
- Optional external clock synchronization

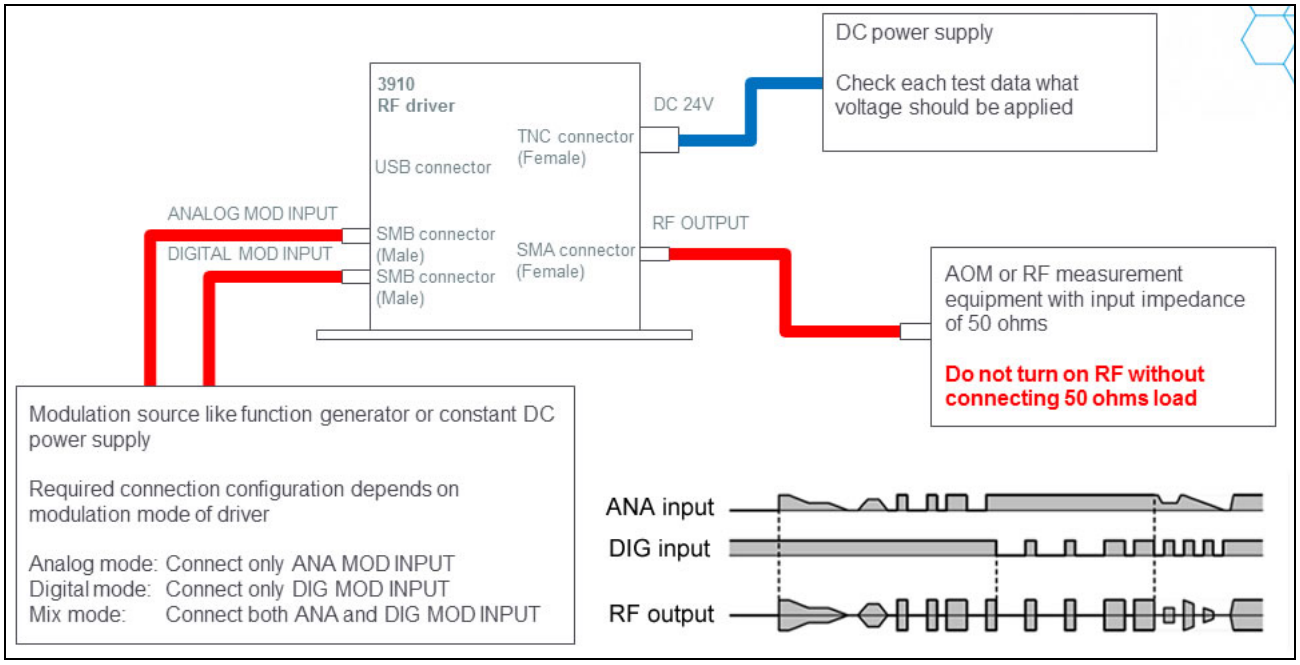
Key Benefits
- Proven reliability
- Consistent performance
- Lower power consumption
- Test documentation
- One year limited warranty

Applications
- Micromachining
- Materials processing
- Laser displays
- Printing
- Heterodyne interferometry
- Pulse picking

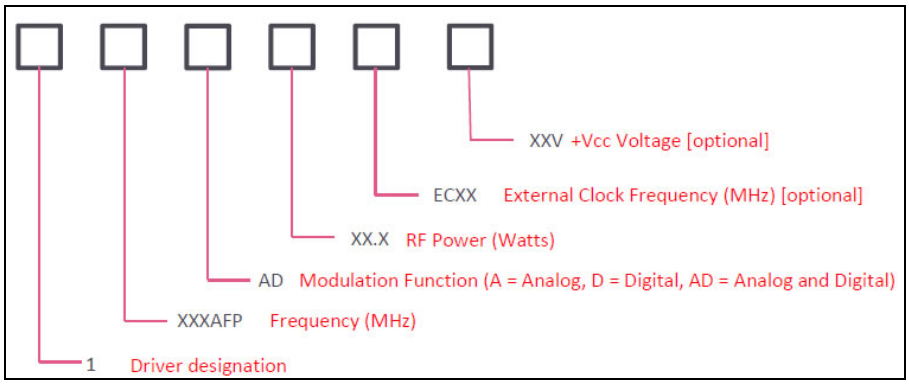


Parameter	Performance
Center frequency	45 – 500 MHz fixed
RF output	0.25 – 8.0 Watts adjustable (at +28 V)
Input voltage +Vcc	+24 to +28 V
2nd harmonic level	< -20dBc
Output VSWR	1.5:1 max
Output waveform	Sinusoidal
Rise / fall time	4 nsec max (frequencies ≥ 250 MHz)
Contrast ratio	50 dB min
Analog input voltage	0 – 1 V
Analog input impedance	50 Ohms
Digital input voltage	Standard TTL levels
Digital input impedance	10 kOhms
Frequency stability	+/-1.5 ppm over temp
Frequency accuracy	+/-1%
Thermal management	Conduction cooled heat sink
Operating temperature range	10°C to 60°C

Dimension	4x1.12x3.31in (101.6x28.4x84mm)



Model Code Generation:



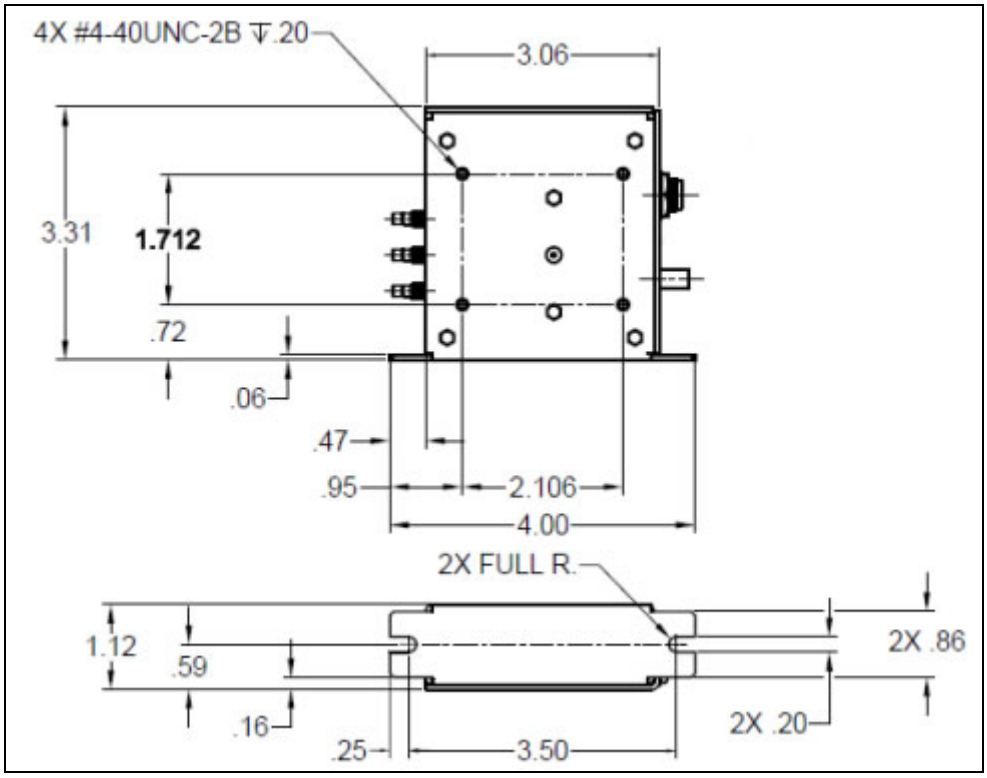
Based on the different configurations, we split the 3910 driver part number into 12 categories as follows:

3910 - <3.0W, <100MHz, No heat sink, Internal Clock
3911 - <3.0W, 100-199MHz, No heat sink, Internal Clock
3912 - <3.0W, >199MHz, No heat sink, Internal Clock

3940 - >=3.0W, <100MHz, Heat sink, Internal Clock
3941 - >=3.0W, 100-199MHz, Heat sink, Internal Clock
3942 - >=3.0W, >199MHz, Heat sink, Internal Clock

3950 - <3.0W, <100MHz, No heat sink, External Clock
3951 - <3.0W, 100-199MHz, No heat sink, External Clock
3952 - <3.0W, >199MHz, No heat sink, External Clock

3960 - >=3.0W, <100MHz, Heat sink, External Clock
3961 - >=3.0W, 100-199MHz, Heat sink, External Clock
3962 - >=3.0W, >199MHz, Heat sink, External Clock



8. AOM Driver (RF Driver) 64020-200-2ADMDFS-A

A digital frequency synthesizer OEM module with analog and digital modulation input and a 2 Watt RF output. When specified as R64020-200-2ADMDFS-A, the unit delivered will be manufactured to be compliant with EU Directive 2002/95/EC for reduction of hazardous substance.

PARAMETER	SPECIFICATION
Bandwidth:	20 – 200 MHz typical
Clock Frequency:	1000 MHz
Step Size:	< 1 Hz with 30 Bits input
Frequency Settling Time:	250 ns Maximum
Power Out:	2 watts typical
Harmonic Distortion:	2nd:-20 dBc Maximum; 3rd: -15 dBc Maximum
Analog Modulation:	0 to +1 volt Analog into 50 ohm, +1volt = Full RF power output.
Digital Modulation:	1) TTL levels; 2) TTL Active High = Full RF output power; 3) TTL Active Low = Minimum RF output power; 4) No Signal = Full RF output power (pulled high internally)
Rise and Fall Time:	20 ns
Extinction Ratio: Digital:	30 dB Minimum
Analog:	40 dB Minimum
Reference Out:	A reference signal from the un-modulated output of the synthesizer. +0 dBm nominal
Applied Power:	+ 28 volts DC @ 1 amp Maximum + 3.3 volts DC @ 1 amp Maximum
MAXIMUM RATINGS:	
Ambient Temperature:	400 C
RF Output:	No DC Feedback
Supply Voltage:	30 volts DC; 3.5 volts DC
INPUT / OUTPUT CONNECTIONS:	
+28v, +3.3V, and Gnd	Filtered Feedthru
Mod In	SMC Male
Reference Out	SMC Male
RF Output	SMA Female
"FREQUENCY SELECT" Control	TTL 30 bit binary word, Digital Modulation Input, Reset, and a Latch control input through the 37 pin D sub connector.
Dimension	140x109x40.6mm

Outline Drawing	53D3887

CONTROL WORD CALCULATIONS

The output frequency and step size is a function of the clock rate and the "FREQUENCY SELECT" data. The output frequency can be calculated from the formula:

$$f_{out} = \frac{(f_c)(k_{10})}{2^n}$$

Where: f_c = clock frequency in Hz
k_{10} = input word in decimal notation
n = 31 *See note below.

The minimum output frequency and step size are given by:

$$f_{min} = \frac{f_c}{2^n}$$

An example of setting the frequency:
Clock frequency = 1000×10^6 Hz
Desired output frequency = 30.00×10^6 Hz

$$K_{10} = \frac{f_{OUT\,(Hz)}(2^{31})}{f_{OSC\,(Hz)}}$$

$$K_{10} = \frac{30 \times 10^6 (2^{31})}{(1000 \times 10^6)}$$

$K_{10} = 64424509.44$ Decimal

Convert K_{10} to HEX \/- MSB \/ - LSB

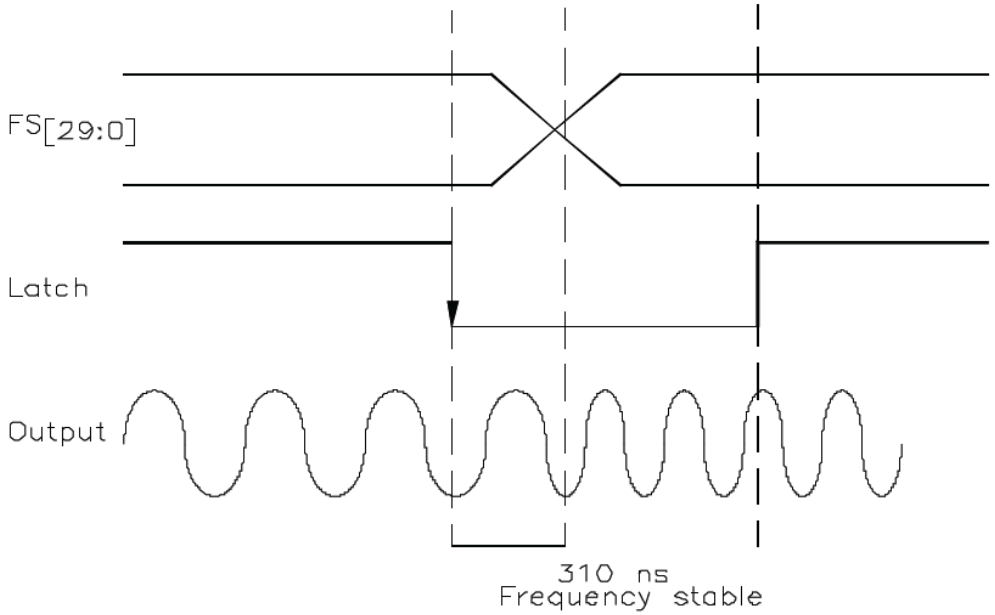
K_{HEX} = 3D70A3D → 03D70A3D -Setting for front panel "HEX" switches
NOTE: The switches on the front panel of the driver are LSB to MSB - right to left.

Convert K_{HEX} to Binary \/ LSB - pin1

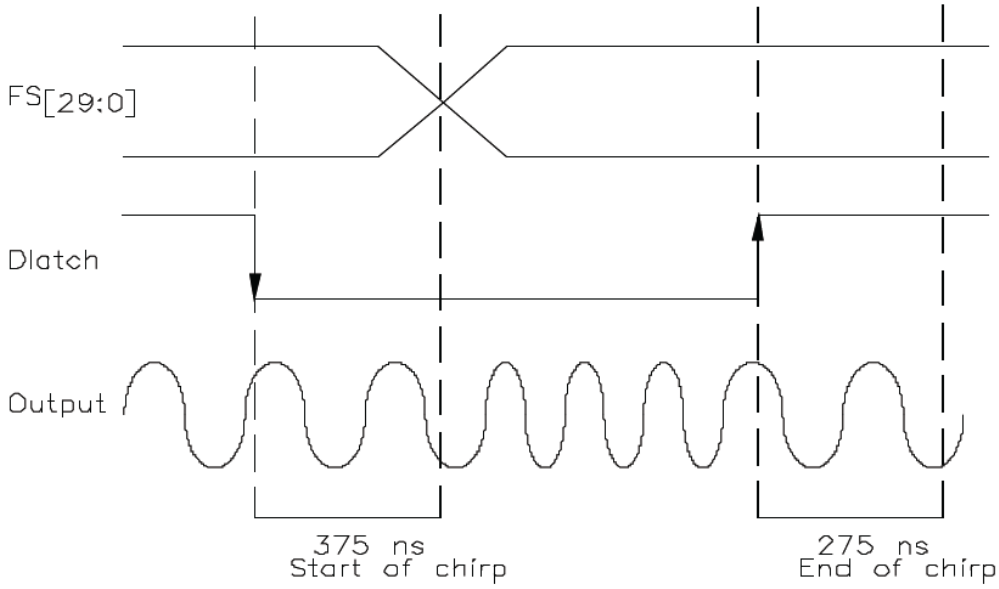
K_B = 00001111010111000010100011110 1 -Setting for binary word input to back panel "FREQUENCY SELECT" 37 pin D-sub connector
/\
These 4 bits are added to complete the 30 bit word

*Note: (1) This system only uses 30 bits to set the frequency output from the driver. The accumulator inside the chip is 31 bit, so use 231 in your calculations for precision. (2) The LATCH function (pin 16) is a TTL compatible input which is used to load new frequency information into the driver. Frequency data is loaded into the driver when the signal on the LATCH pin goes from HIGH to LOW (falling edge). (3) Master RESET is a TTL active HIGH and resets the accumulator to zero, ie, no frequency output, when a TTL HIGH is applied to pin 17. This is pulled LOW via. a 1 KΩ resistor.

To generate a single frequency, apply the binary frequency word to the FS input, A falling edge on the LATCH input will then load the data and change the frequency.



To generate a ferquency chirp, set the starting frequency as above and then apply the delta word to the FS input. A falling edge on DLATCH will then load the delta frequency word and initiate the chrip. The chirp will stop and output will return to to starting value or a rising edge.



9. AOM Driver (RF Driver) 64020-250-1ADMDFS-A

A digital frequency synthesizer OEM module with analog and digital modulation input and a 1 Watt RF output. The unit can be used to generate a frequency chirp. When specified as R64020-250-1ADMDFS-A, the unit delivered will be manufactured to be compliant with EU Directive 2002/95/EC for reduction of hazardous substance.

PARAMETER	SPECIFICATION
Bandwidth:	20 – 250 MHz typical
Clock Frequency:	1000 MHz
Step Size:	< 1 Hz with 30 Bits input
Frequency Settling Time:	310 ns Maximum
Power Out:	1 watts typical
Harmonic Distortion:	2nd:-20 dBc Maximum; 3rd: -15 dBc Maximum
Analog Modulation:	0 to +1 volt Analog into 50 ohm, +1volt = Full RF power output.
Digital Modulation:	1) TTL levels; 2) TTL Active High = Full RF output power; 3)

	TTL Active Low = Minimum RF output power; 4) No Signal = Full RF output power (pulled high internally)
Rise and Fall Time:	20 ns
Extinction Ratio: Digital:	30 dB Minimum
Analog:	40 dB Minimum
Reference Out:	A reference signal from the un-modulated output of the synthesizer. +0 dBm nominal
Applied Power:	+ 28 volts DC @ 1 amp Maximum + 3.3 volts DC @ 1 amp Maximum
MAXIMUM RATINGS:	
Ambient Temperature:	400 C
RF Output:	No DC Feedback
INPUT / OUTPUT CONNECTIONS:	
+28v, +3.3V, and Gnd	Filtered Feedthru
Mod In	SMC Male
Reference Out	SMC Male
RF Output	SMA Female
"FREQUENCY SELECT" Control	TTL 30 bit binary word, Digital Modulation Input, Reset, and a Latch control input through the 37 pin D sub connector.
Dimension	140x109x40.6mm
Outline Drawing	53D3887

CONTROL WORD CALCULATIONS

The output frequency and step size is a function of the clock rate and the FREQUENCY SELECT (FS) data. The output frequency can be calculated from the formula:

$FS_{[29:0]} = F_{out} (2^{31}) / 1000$ MHz

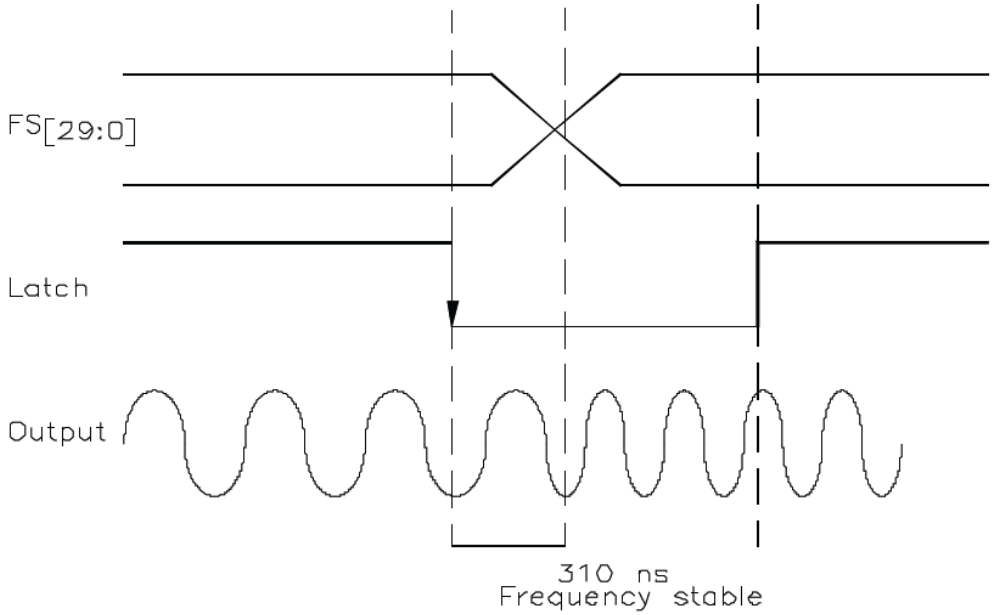
Where F_{out} is output frequency in MHz

The LATCH function (pin 16) is a TTL compatible input which is used to load new frequency information into the driver. Frequency data is loaded into the driver when the signal on the LATCH pin goes from HIGH to LOW (falling edge).

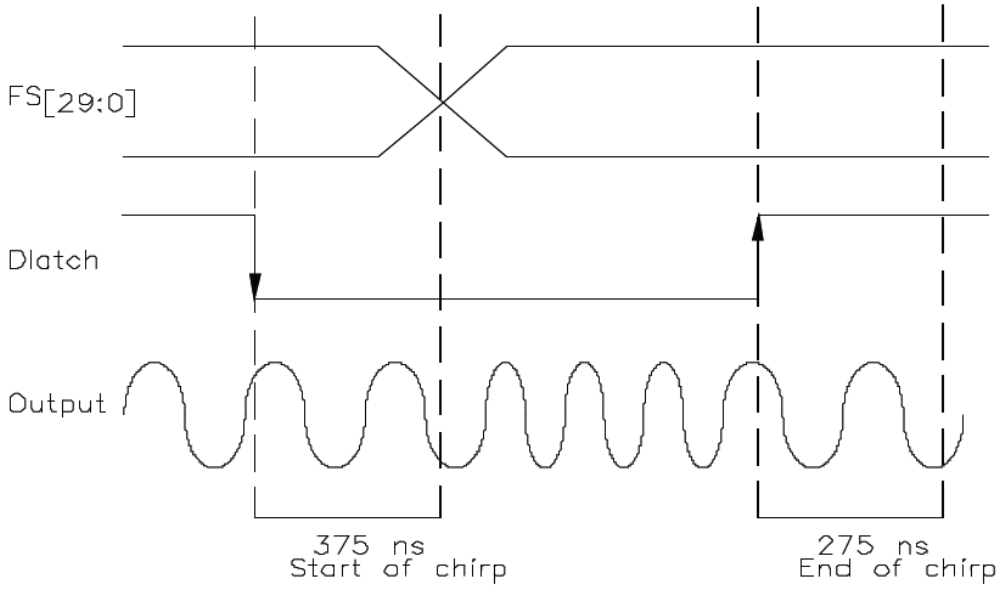
The DELTA FREQUENCY LATCH function (pin 36) is a TTL compatible input which is used to load new data frequency information into the driver. For Delta frequency word, the same calculation is used as the output frequency with negative values being entered in twos complement data is loaded on the falling edge.

Master RESET is a TTL active HIGH and resets the accumulator to zero, ie, no frequency output, when a TTL HIGH is applied to pin 17. This is pulled LOW via. a 1 K resistor.

To generate a single frequency, apply the binary frequency word to the FS input, A falling edge on the LATCH input will then load the data and change the frequency.



To generate a ferquency chirp, set the starting frequency as above and then apply the delta word to the FS input. A falling edge on DLATCH will then load the delta frequency word and initiate the chrip. The chirp will stop and output will return to to starting value or a rising edge.



10. AOM Driver 97-02925-32 (20-160MHz, 0.4W)

General Features

- On-board output power measurement.
- Linear amplitude modulation, blanking, frequency shift keying and RS232 in common connector.
- Robust command set.
- Built in Network Protocols (i.e. Point to Point Protocol PPP, Link Control Protocol LCP,
- Password Authentication Protocol PAP, Internet Control Message Protocol, etc)
- Control Voltage Levels: RS232.

Specifications

Part code	160T1-1SNR-12-0.4J
Frequency specifications	
Frequency range	20-160MHz
Frequency resolution (1)	0.1Hz
Frequency stability	+/-2 ppm/deg C

Frequency preload time (2)	<10 us
Frequency toggle time (3)	<20ns
Amplitude Specifications	
RF output power (4)	0.4W
RF output gain adjust (5)	30dB
Modulation bandwidth (6)	>2MHz
Dynamic range (7)	>40dB
Intermodulation (8)	>40dB
Spurious	>30dBc
Signal to noise ratio (9)	>90dB
Interfaces	
RF output impedance	50 Ohms
Amplitude modulation input level	0-10V
FSK modulation input level	3.3V
Blanking input level	3.3V
Digital controls	ASCII
Sensor input	+/-3.3V
Power input,from DC supply	12V@1A
Dimension	165x132x25mm

Remarks:

1. Actually 0.0931 Hz, closest approximation to set frequency will be chosen.
2. Typically 1-10 μs, each frequency requires 32 bits, plus a starting RAM address.
3. 3 independently pre loaded preset frequencies
4. At maximum output gain adjustment.
5. Linear in dB at constant signal to noise ratio.
6. Measured at -3 dB point, DC coupled.
7. 20-160 MHz, from 1 dB compression point to minimum achievable output.
8. 2 tone test, 100 MHz + 105 MHz, each of 125 mW output
9. 1 MHz measurement bandwidth , 125 mW reference tone.

Host Interface Connector

Pin	Direction	Description	Pin	Direction	Description
1	-	VCC12	21	-	VCC12
2	-	VCC12	22	-	GND
3	-	GND	23	-	GND
4	Bidirectional Digital 3.3V	ONE_WIRE	24	-	GND
5	Output RS232 or Digital 3.3V	Host TxD	25	Input RS232 or digital 3.3V	Host RxD
6	Output RS232 or Digital 3.3V	Host RTS	26	Input RS232 or digital 3.3V	Host CTS
7	-	GND	27	-	GND
8	Bidirectional Digital 3.3V	I2CSDA	28	Bidirectional Digital 3.3V	I2CSCL
9	Input Digital 3.3V	RESET#	29	-	GND
10	Input LVDS	BLANK_N	30	Input LVDS	BLANK_P
11	-	GND	31	-	GND
12	Input LVDS	FSK_N	32	Input LVDS	FSK_P
13	-	No Connection	33	-	No Connection
14	-	No Connection	34	-	No Connection
15	Input Analog -5V to +5V	ANALOG_N	35	Input Analog -5V to +5V	ANALOG_P
16	-	No Connection	36	-	No Connection
17	-	No Connection	37	-	No Connection
18	-	No Connection	38	-	No Connection
19	Input LVDS	DIN_N	39	Input LVDS	DIN_P
20	Input LVDS	CLK_N	40	Input LVDS	CLK_P

11. AOM Driver 97-03926-12 (20-160MHz, 3.2W, 8 channels)

General Features

- 8 channels, combined as composite output.
- On-board composite output power measurement.
- Independent linear amplitude modulation on each channel.
- Common blanking signal for all channels.
- Independent frequency shift modulation on each channel.
- Robust command set.
- Built in Network Protocols (i.e. Point to Point Protocol PPP, Link Control Protocol LCP, Password Authentication Protocol PAP, Internet Control Message Protocol, etc.)
- Control Voltage Levels: RS232.

Specifications

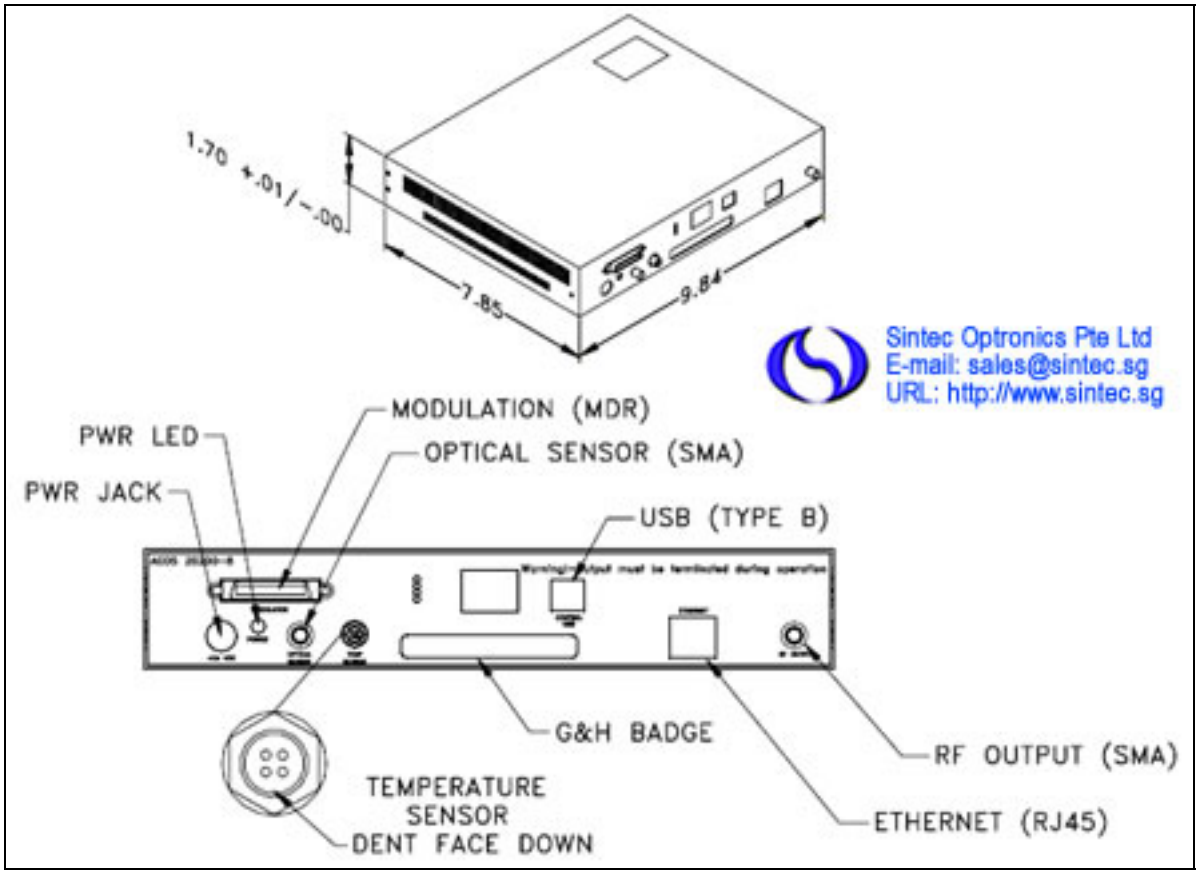
Part code	160T2-8SAR-24-3.2B
Frequency specifications	
Frequency range	20-160MHz
Frequency resolution (1)	0.1Hz
Frequency stability	+/-2 ppm/deg C
Frequency preload time (2)	<8 us
Frequency toggle time (3)	<80ns
Amplitude Specifications	
RF output power	3.2W
RF output power, per channel	0.4W
Modulation bandwidth (4)	>2MHz
Dynamic range (5)	>35dB
Intermodulation (6)	>41dB
Spurious	>45dBc
Signal to noise ratio (7)	>75dB
Interfaces	
RF output impedance	50 Ohms
Amplitude modulation input level	0-10V
FSK modulation input level	3.3V
Blanking input level	3.3V
Digital controls	ASCII
Sensor input	+/-3.3V
Power input, from DC supply	24V@2A
Dimension	165x132x25mm

Remarks:

1. Actually 0.0931 Hz, closest approximation to set frequency will be chosen.
2. Typically 1-8 µs, each frequency requires 32 bits, plus a starting RAM address.
3. Direct switch mode to one of three preset frequency.
4. Measured at -3 dB point, DC coupled.
5. 20-160 MHz.
6. 2 tone test, 100 MHz + 105 MHz, each of 125 mW output
7. 1 MHz measurement bandwidth , 125 mW reference tone.
8. Reference Outline Drawing 97-03926-12-15.

Modulation and FSK/Blank Connector Pin out

Pin	Function	Direction		Description	Pin	Function	Direction	
1	VCC24	-	-		21	VCC24	-	-
2	VCC24	-	-		22	GND	-	-
3	GRD	-	-		23	FSK0	-	-
4	GND	-	-		24	FSK1	-	-
5	GND	-	-		25	FSK2	-	-
6	GND	-	-		26	FSK3	-	-
7	GND	-	-		27	FSK4	-	-
8	GND	-	-		28	FSK5	-	-
9	GND	-	-		29	FSK6	-	-
10	GND	-	-		30	FSK7	-	-
11	GND	-	-		31	BLANK	-	-
12	GND	-	-		32	GRD	-	-
13	MOD 0	-	-		33	MOD 0+	-	-
14	MOD 1-	-	-		34	MOD 1+	-	-
15	MOD 2-	-	-		35	MOD 2+	-	-
16	MOD 3-	-	-		36	MOD 3+	-	-
17	MOD 4-	-	-		37	MOD 4+	-	-
18	MOD 5-	-	-		38	MOD 5+	-	-
19	MOD 6-	-	-		39	MOD 6+	-	-
20	MOD 7-	-	-		40	MOD 7+	-	-



12. 6000 SERIES DRIVER (20-450MHz, 2 channels, 15W)

15 W Output – Configurable Operation

Our 15 W output RF driver provides up to two independent RF channels with a fast parallel interface as well as USB controllability.

Ideally suited for controlling a two element phased array acousto-optic (AO) beam deflector (MUX mode), the driver can also be used to drive two single element AO beam deflectors for two dimensional scanning (Dual Channel mode). The 6000 driver has additional flexibility for controlling AO tunable filters (multi-tone mode). With its arbitrary waveform playback capability, multiple wavelengths can be simultaneously diffracted by tunable filters and multiple beam spots can be generated by beam deflectors.

Two independent 15 W RF amplifiers are housed in a compact form factor with a fast parallel frequency programming interface. Remote control over an included USB interface is also available with an intuitive command set and GUI. Dual amplitude and relative phase control inputs are included on the rear panel with the parallel interface connectors. Capabilities include dynamic frequency chirp control. An all digital option allows high speed programming of frequency, amplitude and phase. The default, power-on is stand-alone mode, not requiring PC control; connecting the USB connection enables a Host PC mode. A single channel version is also available.

The 6000 driver is available in three frequency bands, and each unit includes a monitor output that covers the entire 20-450 MHz frequency band. Driver functionality can be re-configured over the USB interface.

Key Features

- Two 15 W independent RF outputs
- Parallel interface for frequency programming
- USB interface and compact command set
- 20-450 MHz in three bands: (1) Low band 20-150 MHz; (2) Mid band 40- 245 MHz; (3) High band 140-450 MHz
- Re-configurable functionality
- Playback mode for custom waveforms
- Amplitude and phase modulation
- 10 spare definable control inputs

Key Benefits

- Dual RF outputs
- Compact form factor
- Host PC control or fast interface
- Functional re-configurability

Applications

- OEM AODF/AOTF systems
- Via drilling/micro-machining systems
- Optical inspection systems

Parameter	Min	Max	Units
Output frequency range: low band model mid band model high band model	 20 40 140	 150 245 450	MHz
Rated RF output power (1)(9)	15		W
RF power flatness (2) across frequency band, nominal power		+/-0.5	dB
2nd harmonic distortion at rated RF output power	-25		dBc
Non-harmonic spurious free dynamic range	-50		dBc
Standard output waveform (3)	Sinusoid		n/a
Independent RF outputs		2	n/a
Number of programmable tones per output (4)	5		n/a
Frequency resolution (5)	1		kHz
Frequency stability, 15°C to 50°C ambient temperature		+/-0.5	ppm
Frequency settling time after latch signal assertion (6)		200	nS
Frequency update rate (parallel interface)		25	MHz
Amplitude control (analog input) range, each output channel (7)	40		dB
Amplitude blanking	80		dB
Relative phase control (analog input) range, relative (8)	0	+/-180	Deg.
Amplitude/phase control modulation bandwidth		25	MHz
DC voltage input range (9)	24	28	V
DC total system power		100	W
Playback mode waveform file size (per output, 1 GHz clock)		300 k	Samples
Operating temperature range (ambient)	15	50	°C
Dimension		7.27x4.98x1.65	Inch

All specifications at Tambient = 22 °C

1 Rated amplifier output level, requires adequate heatsinking. Contact us for details.

2 Power flatness set internally at factory. User compensation array can be loaded over USB interface.

3 Default output waveform is sinusoidal. User-defined waveforms loaded in playback mode.

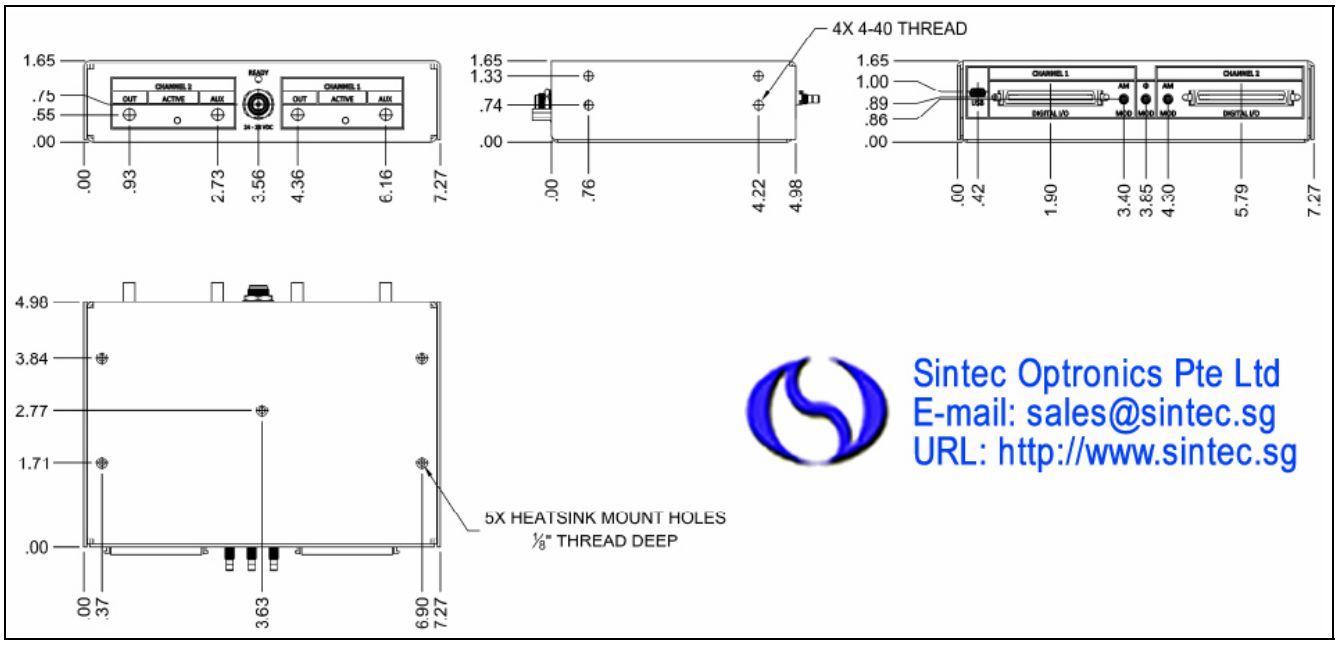
4 Standard firmware build is 1 frequency tone per output port.
5 Frequency tuning word (FTW) is 20 bits.
6 Total latency time from assertion of latch signal to appearance of new frequency at RF output (FTW pre-loaded at interface).
7 Output power linear with input control voltage.
8 Sets phase of output #2 relative to output #1, defined only for identical programmed frequencies on both outputs.
9 Rated output power at 28 VDC.

Command Set (Host PC Mode via USB interface)

Command	Action
Freq X, YYY	Sets output frequency YYY (MHz) on channel X (1 or 2)
Amp X, YY	Sets output power YY (00 – 99) on channel X (1 or 2)
Pha YYY	Sets relative phase to YYY (0 to 360 degrees)
Latch X	Latch command for channel X, latches the pre-loaded FTW
Soft on	Allows USB control of output power levels
Soft off	Reverts system to hardware mode, requires analog amplitude control

Interface Description

Interface Definition	Connector	Levels	Input / Output Assignments
Parallel interface, Ch #1, #2	MDR mini-D 68 pin (x2)	TTL	Frequency word [19:0], spares (5), latch In (1), trigger in (1), blank (1), sync (1), status out (1)
Amplitude modulation inputs	SMB (x2)	0–1V	Ch #1, Ch #2
Phase modulation input	SMB (x1)	0–1V	Relative phase between channels
USB	USB mini-B	USB	USB 2.0 Interface (mass storage)
Main RF output	SMA (x2)	RF Output	Main RF output ports, per model
Aux RF output	SMA (x2)	Aux Output	Auxiliary RF output, 20-450 MHz
Main DC power input	2mm power jack	24–28 VDC	Main DC power input



13. 125 Watt Germanium Acousto-optic Modulator Driver: HP041-125ADADG-A10

The HP041-125ADADG-A10 RF driver provides up to 125 Watt output power at 40.68 MHz signal frequency. The driver can be operated with modulation frequencies (analogue and digital) up to 1 MHz. An operation scheme illustrates the interaction of the two modulation signals in detail.

Water cooling parts made from copper ensures highest standards for corrosion protection. Optimum EMC shielding and mechanical protection is achieved by an aluminium casing and a conductive surface passivation.

This product conforms to the requirements of the European Union Directive 2011/65/EU of the European Parliament and of the Council on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment.

Key Features
RF output power up to 125 Watt•
Copper water-cooling path•
Constant output power design•
High SWR and overheat safety shutdown•
Compact casing, fully shielded (EMC)
•

Applications:
Industrial (material processing):
PCB via drilling
Marking and engraving
Light guide panel processing
Micro-perforation

Device:	AO Modulator
Supply voltage	+24
Supply current	max. 12.5 @ 125 W F output power
Maximum RF output power (adjustable) * Adjustment range	> 15 W/mm2 < 1 … >125 Watt
Output impedance	nom. 50 Ω
Frequency accuracy	< ±30 ppm
RF ON/OFF ratio	> 50 dB
Analogue modulation Impedance Voltage range @ 50 Ω The voltage range corresponds to 0 to 100% of the potentiometer pre-adjusted maximum RF output power.	600 Ω 0 … +10
Digital modulation Impedance Level	4.7 kΩ (pull-up) High=≥ 3 … 5 (= RF on); Low=0 … < 2 (=RF off)
Maximum modulation frequency (digital and analogue)	1 [MHz]
RF output frequency	40.68 [MHz]
Harmonics distortion *	< -30 [dBc]
Analogue modulation RF rise time / fall time(10 90%) *	< 80 [ns]
igital modulation F rise time / fall time(10 … 90%) *	< 80 [ns]

* into 50 Ω load

Connectors, Cooling, Dimensions, Weight

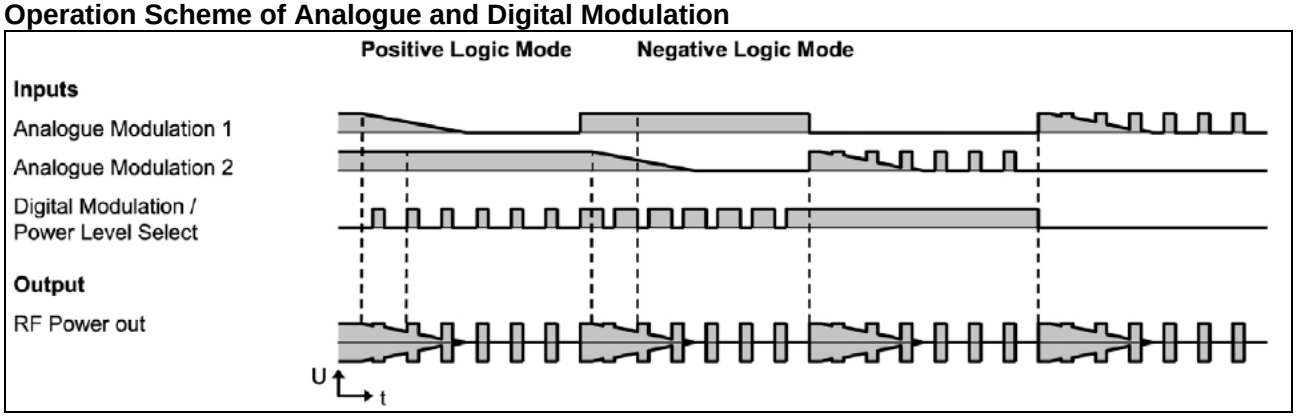
RF output connector	BNC female
Control connector	D-Sub 25-pole, female for pin assignment refer to section Control Connector
Power Supply Cords red (or yellow) black (or violet)	2x750±50 mm H07-K 1.5 mm2 +Vs (24VDC) CGND (case ground)
Cooling Flow rate	Water cooling; Cooling block material: Copper, 2 x G 1/4'' thread fitted with 6mm push in connectors; More than 1 litre/minute at less than 25˚C
Diemnsions [mm]	200 x 100 x 52.5 (length x width x height)
Weight	1470 grams

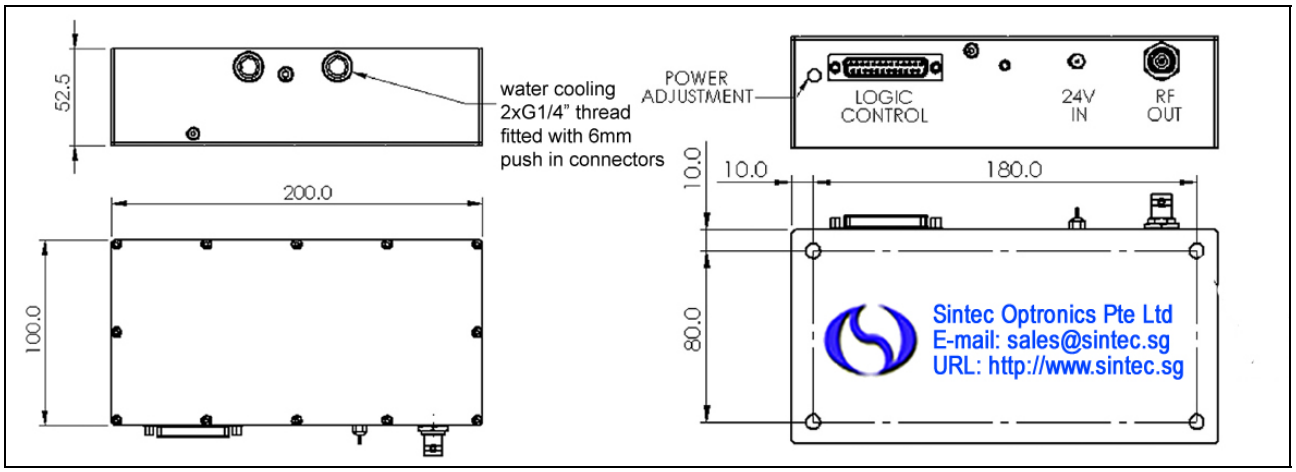
Environmental Conditions
Warm up time: 10 minutes for optimum stability
Operating case temperature: < +50°C, safety shutdown at ≈55°C
Storage temperature: -20°C … +65°C, non condensing

Absolute Maximum Ratings
Supply voltage max.: +26 VDC
Analogue modulation voltage range @ 0 … +10 V: -0.5 V … +11 V
Digital modulation Level: -0.5 V … +5.5 V
Maximum operating temperature: +55°C heat sink / base plate temperature

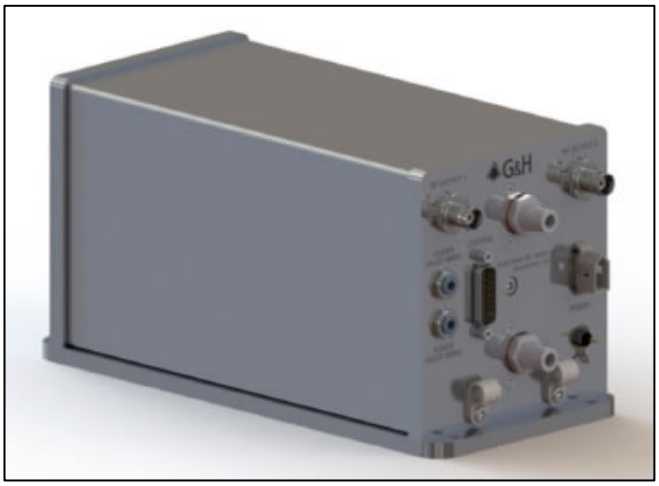
Control Connector
D-Sub 25-pole, female, Pin assignment
Any signals refer to chassis ground (CGND) unless denoted differently.
Pin1 RF ON status (out); Pin2 SWR fault indication (out); Pin3 Driver temperature fault indication (out); Pin4 Reset SWR fault / Init (in); Pin5 Interlock 2 fault indication (out); Pin6 Interlock 2 (in); Pin7 Interlock 1 (in); Pin8 Interlock 1 fault indication (out); Pin9 Driver temperature monitor (out); Pin10 Modulation Ground (MGND); Pin11 Analogue modulation 2 (ref. MGND); Pin12 Analogue modulation 1 (ref. MGND); Pin13 Power Level Select (ref. MGND); LOW →select Analogue Mod. 1; HIGH → select Analogue Mod. 2; Pin14…22 Chassis ground (CGND); Pin23…24 Modulation Ground (MGND); Pin25 not connected

Operation Scheme of Analogue and Digital Modulation





14. Ge AOM RF Driver (40/60MHz, 2x75 Watt)



The HP040-060-150ADG-A10-2Xdriver provides up to 150 Watt combined output power and is designed to drive dual frequency germanium acousto-optic modulators. The driver can be operated with modulation frequencies (analogue and digital) up to 1 MHz for RF amplitude control and up to 5 MHz for drive frequency control. Water cooling parts made from copper ensures highest standards for corrosion protection. Optimum EMC shielding and mechanical protection is achieved by an aluminium casing and a conductive surface passivation. This product conforms to the requirements of the European Union Directive 2011/65/EU of the European Parliament and of the Council on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment.

Key Features
Combined RF output power up to 150 Watt•
Constant output power design•
High SWR and Overheat safety shutdown•

Copper cooling parts•
Compact casing, fully shielded (EMC)

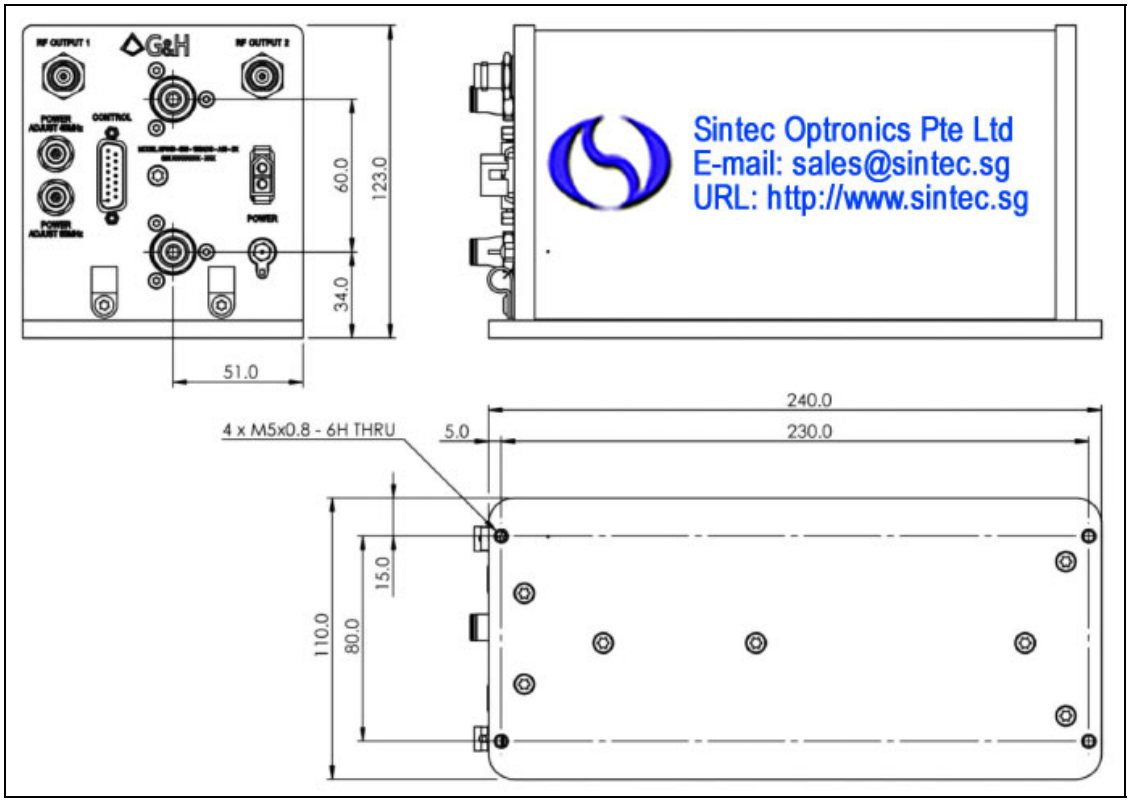
Applications:
Industrial (material processing): PCB via drilling; Marking and engraving; Micro-perforation.

Supply voltage	+24 VDC
Supply current	typ. 15A @ 150 W RF output power
Number of channels	2
Maximum RF output power (adjustable) * Adjustment range	> 75 Watt W per channel < 1 … >75 Watt per channel
Output impedance	nom. 50 Ω
RF output frequency	40MHz and 60MHz switchable (RF Signal phase shift between channels at 40 and 60MHz)
Frequency accuracy	< ±50 ppm
Frequency stability	< ±50 ppm
Extinction ratio	> 40 dB
Harmonics distortion*	< -26 dBc @ 75W per channel
Spurious level *	< -50 dBc
Analogue modulation Impedance Voltage range @ 50 Ω The voltage range corresponds to 0 to 100% of the potentiometer pre-adjusted maximum RF output power.	 600 Ω 0 … +10 (0…+5 option)
Digital / Frequency modulation Impedance Level	4.7 kΩ (pull-up) TTL compatible (V_ IL= 0.8V, V_IH = 2.0); Logic High = RF On / 40MHz; Logic Low = RF Off / 60MHz
Maximum modulation frequency (Amplitude – digital and analogue) (Drive frequency)	 1 MHz 5 MHz
Digital / Analogue modulation RF rise time / fall time (10 … 90%)	 < 100 ns

* into 50 Ω load)

Connectors, Cooling, Dimensions, Weight

- RF output connector: 2xBNC female
- Control connector: D-Sub 15-pole, male for pin assignment refer to section Input Connectors
- Power supply connection: Primary: Molex 03-09-2021; Mating: Molex 03-09-1022 (Shell), 02-09-1104 (Crimp contacts); Secondary: Solder-in style connector or pin polarity assignment refer to section Input Connectors
- Cooling: Cooling block material: Copper, 2 x G 1/4'' thread fitted with 6mm push in connectors
- Flow rate: More than 2 litre/minute at 250C ± 100C
- Coolant pressure:< 100 psi (6.9 bar)
- Dimensions [mm]: 240x110x123 (length x width x height)
- Weight: 4 kg


RF OUTPUT 1
G&H
RF OUTPUT 2
CONTROL
POWER
60.0
123.0
34.0
51.0
Sintec Optronics Pte Ltd
E-mail: sales@sintec.sg
URL: http://www.sintec.sg
240.0
230.0
5.0
4 x M5x0.8 - 6H THRU
15.0
80.0
110.0

Sintec Optronics

STBR Series RF Drivers for STBR Series AOM

1. Fixed Frequency RF Drivers

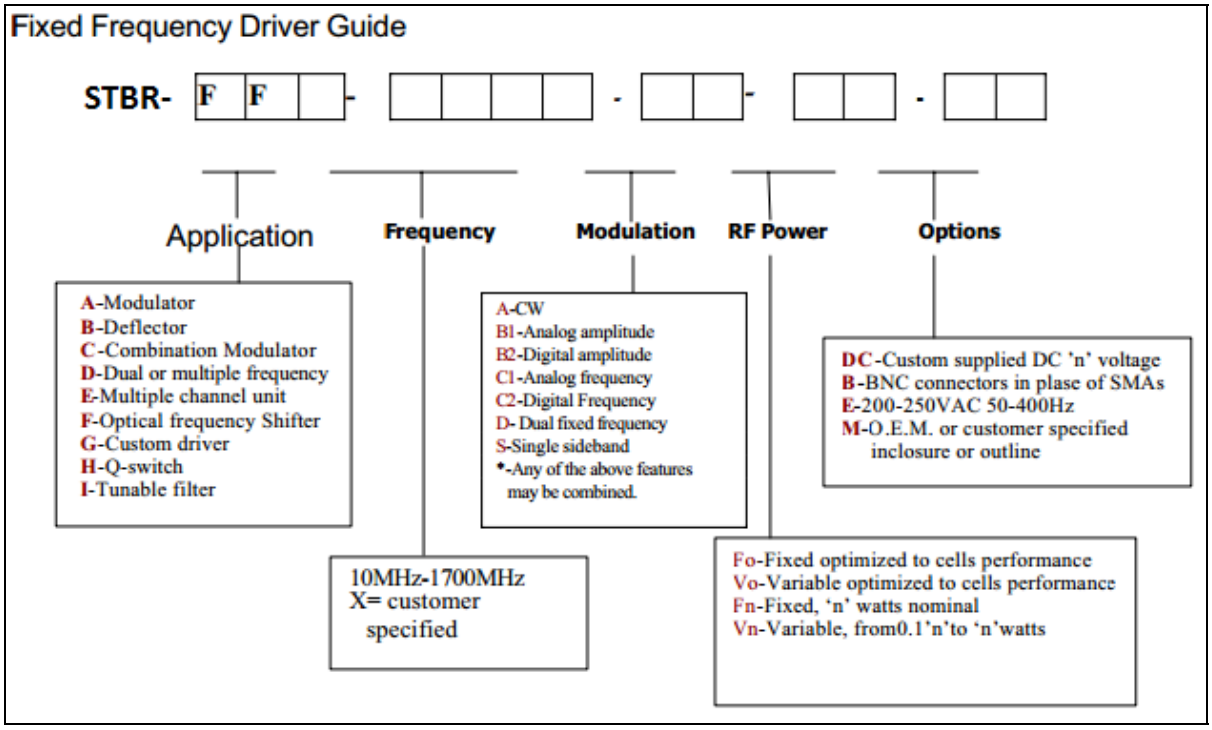
OEM & LAB VERSION RF DRIVERS

- Fixed or Variable Frequency Configuration
- PC-Controlled High Performance RF Frequency Synthesizers
- Quartz Referenced Phase Locked Loop
- TTL or Analog Amplitude Modulation or Combination of Both
- High Extinction Ratio >70 dB with TTL
- Fast Modulation Speed <10 nsec
- Compact Sizes

Typical fixed frequency RF drivers configurations:

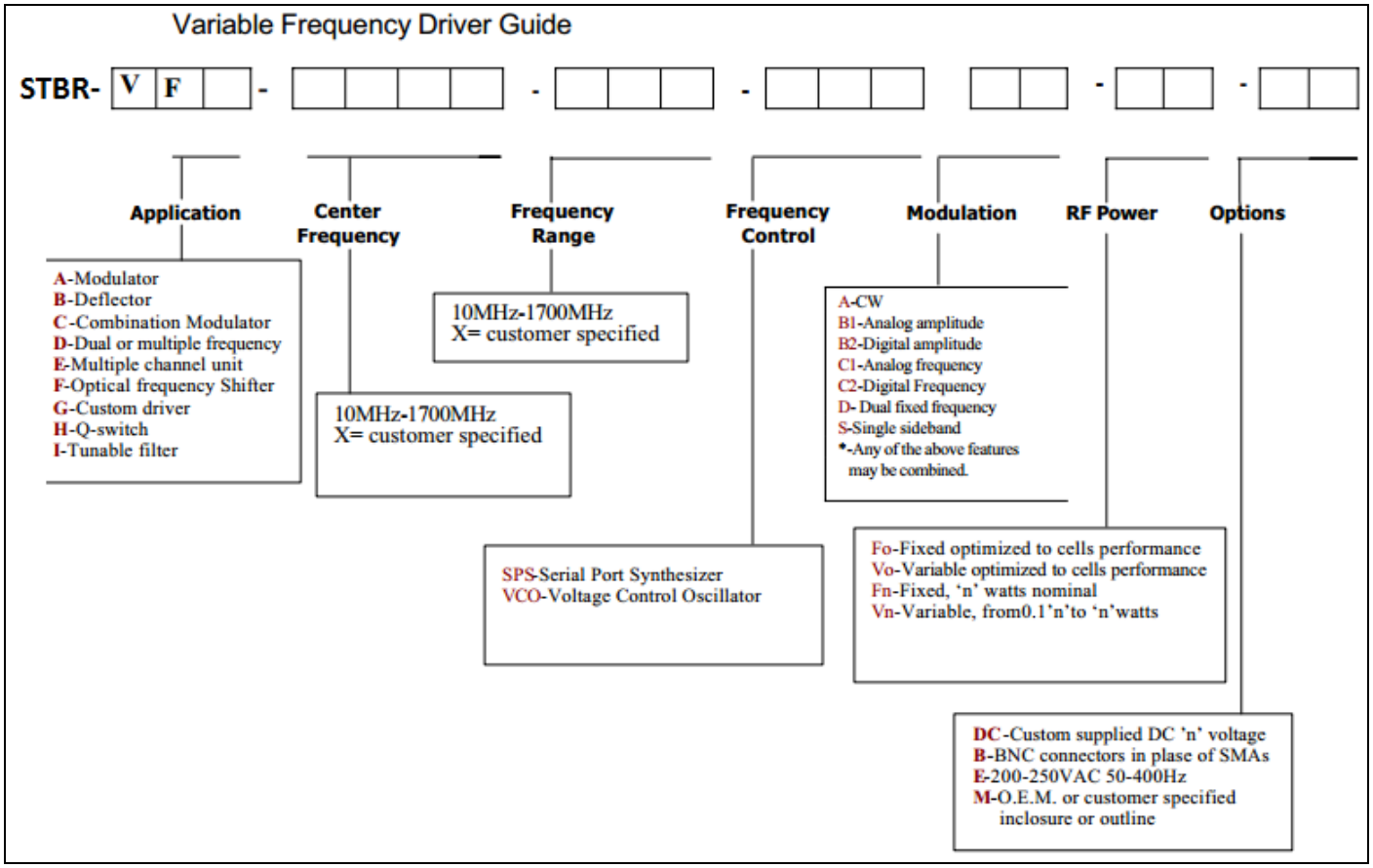
Types	Laboratory Version	OEM Version
Model #	FFA-____*-(B1 or B2)-F____**-ER50	
Carrier Frequency	____MHz	
Frequency Control	Quartz crystal referenced phase locked loop	
Harmonic Content	≤ -15 dBc	
Frequency Stability	0.0015% minimum after 15 minute warm-up	
Output Power **	Power is optimized for peak efficiency with supplied AO device.	
Modulation B1 Modulation Input	Analog Amplitude; DC-50 MHz 0 -1 V, 50 Ω input impedance	
Modulation B2 Modulation Input	TTL Compatible; DC-50 MHz 0 -5 V, 330 Ω input impedance	
Operating Power	90-240 VAC +/-10% 50-60Hz, 55W max.	+24 VDC, 1A
Enclosure	The unit will be packaged in a 7.5 in wide by 3.5 in high by 8.75 in deep instrument case. The rear panel heat sink increases depth to 10.5 inch max. Size is exclusive of connectors.	OEM Enclosure. The unit will be packaged in a 4 in wide by 1.6 high by 4 in deep instrument case. Size is exclusive of connectors.
Environmental	Nominal Laboratory conditions: Max ambient temperature -+35 deg C; the unit is not sealed against moisture or condensing humidity. A detachable AC line cord is provided.	Max temperature: 0-35 deg C ambient. Mounting flange must be heat sinked. Temperature at the mounting flange must not exceed 60 deg C.
Option ER50	50 dB amplitude extinction ratio for B2 modulations. System extinction ratio will be ~ 43 dB.	

* Carrier Frequency is defined by AO Modulator
** Output Power to match the AOM requirement



2. Variable Frequency RF Drivers

Model	STBR-VFB-XX-YY-V-A-F2	STBR-VFE-XX—YY-V-A-F2/2CH
Output Frequency Range	Corresponding to AO Device Requirements	Matching the 2-D AOD controlled by application of external tuning voltage
Tuning Voltage	0 - 10 V analog (-2 to +20 VDC no damage)	
Frequency Accuracy	1% nominal after 15 minute warm-up, constant temperature	
Scanning speed	50 micro sec from min to max frequency with step change in tuning voltage	
Output power	Power is optimised for peak efficiency with supplied AO device	
Modulation Type	Analog amplitude or TTL compatible (optional)	Analog Amplitude; DC-10MHz independent for each channel
Modulation Input	50 ohm; 0-1V OR 330ohm; 0-5V	50 ohm; 0-1V
Operating Power	90-240 VAC, +-25%, 50-60Hz	
Enclosure	The unit will be packaged in a 190mm (7.5inch) wide by 90mm (4inch) high by 220,, (8,75inch) deep instrument case. The rear panel heat sink increases the depth to 240mm(9.75inches) maximum. The size is exclusive of connectors	
Environmental	Nominal Lab conditions: Max temperature is +35 degC. The unit is not seals against moisture or condensing humidity	


Variable Frequency Driver Guide
STBR- V F - - - -
Application
A-Modulator
B-Deflector
C-Combination Modulator
D-Dual or multiple frequency
E-Multiple channel unit
F-Optical frequency Shifter
G-Custom driver
H-Q-switch
I-Tunable filter
Center Frequency
10MHz-1700MHz
X= customer specified
Frequency Range
10MHz-1700MHz
X= customer specified
Frequency Control
SPS-Serial Port Synthesizer
VCO-Voltage Control Oscillator
Modulation
A-CW
B1-Analog amplitude
B2-Digital amplitude
C1-Analog frequency
C2-Digital Frequency
D- Dual fixed frequency
S-Single sideband
*-Any of the above features may be combined.
RF Power
Fo-Fixed optimized to cells performance
Vo-Variable optimized to cells performance
Fn-Fixed, 'n' watts nominal
Vn-Variable, from0.1'n'to 'n'watts
Options
DC-Custom supplied DC 'n' voltage
B-BNC connectors in plase of SMAs
E-200-250VAC 50-400Hz
M-O.E.M. or customer specified inclosure or outline