



ELECTRONICS DIVISION

MICROWAVE POWER SOLUTIONS



Microwave Power Solutions is the complete set of high power microwave products developed and provided by the Leonardo team based in Palermo since 1956, for the production of high power vacuum electronic devices. In the 90s the product range was expanded with the introduction of chip and wire technology for microwave microelectronics hybrid integrated circuits, modules and sub-assemblies.

Today an extensive expertise in the development and production of state-of-the-art Travelling Wave Tubes (TWT), mini TWTs, Microwave Power Modules (MPM), TWT-Amplifiers (TWT-A, including HVPS section) and Solid State Power Amplifiers (SSPA) is available for Airborne, Surface, Missile and Space platforms for the Defense and Aerospace Market.

Microwave Power Solutions from Leonardo have been provided in the four continents for Radar, Security, Surveillance, EW & ESM, Instruments and Communication systems.

TECHNOLOGIES AND CAPABILITIES

Key high power vacuum device technology includes:

- > Vacuum technology including brazing, RF induced and resistance welding
- > Etching and plating
- > Manual and automated microwave high power CW and pulsed testing
- > Facilities for inspection, including CNC contactless equipment and SEM electronic microscope.

Key Microelectronic technology includes:

- > Fully automated epoxy (and other adhesive) dispensing eutectic attach
- > Die placement and wire bonding
- > Advanced microwave module assembling
- > Automatic testing.

COUPLED CAVITY TWT

World class design expertise of Coupled Cavity TWT.

Leonardo Microwave Power Solution is among the few players worldwide that still design , develop and produce such Tubes, among legacy products worth to mention:

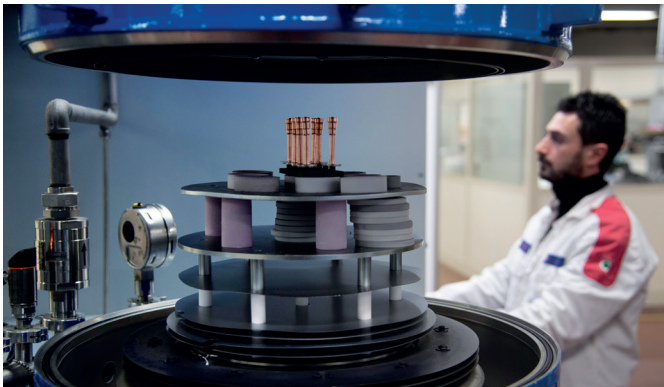
- > Coupled Cavity TWT C-Band, X-Band and Ku-Band with peak output power up to 120kW;

These tubes are ideal for several different application such as:

- > Seekers and threat simulators;
- > SAR (synthetic aperture radar) for standoff airborne application or EO (earth observation) space payloads;
- > ATM (Air Traffic Management) systems and wheatear forecast ground radar.

C-Band, X-Band, Ku-Band & CC TWT for:

- > Seekers and threat simulators
- > Airborne Radar
- > Ground /Shipboard Radar

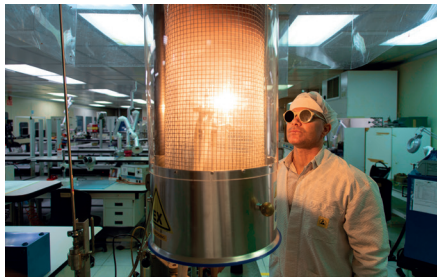
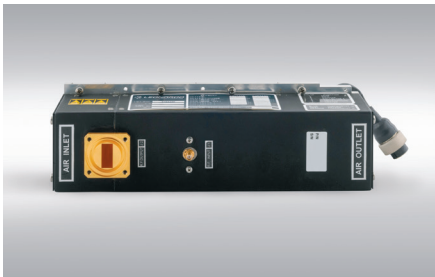


Type	Frequency Range	Power Output	Cathode voltage	Cathode current	Duty Cycle	Cooling	Focussing
ET948	5.3 to 5.8 GHz	120 kW	-46 kV	14.5 A	8% max	Liquid	solenoid
ET960	8.5 to 9.5 GHZ	12 kW	-22 kV	4 A	2.7% max	Forced air	PPM
ET961	8.6 to 9.5 GHZ	20 kW	-26 kV	6.5 A	1.5% max	Forced air	PPM
ET964	10.8 to 11.8 GHz	10 kW	-23.5 kV	3.9 A	2.7% max	Forced air	PPM
ET965	9.5 to 9.9 GHz	12 kW	-25 kV	3.4 A	10.5% max	Liquid	PPM
ET967	9.15 to 10.25 GHz	12 kW	-25 kV	3.4 A	10.5% max	Liquid	PPM
ET2980	16.5 to 17 GHz	13.5 kW	-29 kV	2.1 A	2.7% max	Liquid	PPM

HELIX TRAVELLING WAVE TUBE (HX TWT)

L-S-C-Band, X-Band, Ka-Band
HELIX TWT for:

- > Surface and Airborne Radar
- > Missile Seeker
- > Electronic Counter Measure

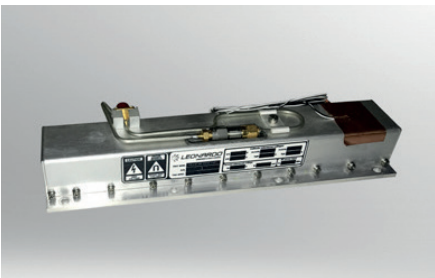


Type	Frequency range	Power Output	Cathode voltage	Cathode current	Duty Cycle
ET3201	1 to 2 GHz	280 W	-3.6 kV	475 mA	CW
ET3301	2 to 4 GHz	250 W	-4.2 kV	450 mA	CW
ET3407	4 to 8 GHz	280 W	-8 kV	320 mA	CW
ET3602	27.5 to 29.5 GHz	100 W	-12 kV	115 mA	CW
ET6305	3.1 to 3.5 GHz	9 kWpk	-14.6 kV	3.2A	2.5% max
ET6404	5.5 to 9.5 GHz	2 kWpk	-9.2 kV	1.6A	10% max
ET6510	8 to 16 GHz	2 kWpk	-10.7 kV	1.7A	2% max
ET6512	8.5 to 10.5 GHz	2 kWpk	-10.9 kV	1.5A	6% max
ET6529	9.5 to 10.0 GHz	4 kWpk	-12 kW	1.5A	6% max
ET6535	8.6 to 9.5 GHz	1.5 kWpk	-8 kV	1.3 mA	10%

MINI HELIX TWT & FOLDED TWT

C-Band, X-Band, Ku-Band, Ka-
Band HELIX TWT for:

- > Surface and Airborne Radar
- > Missile Seeker
- > Electronic Counter Measure



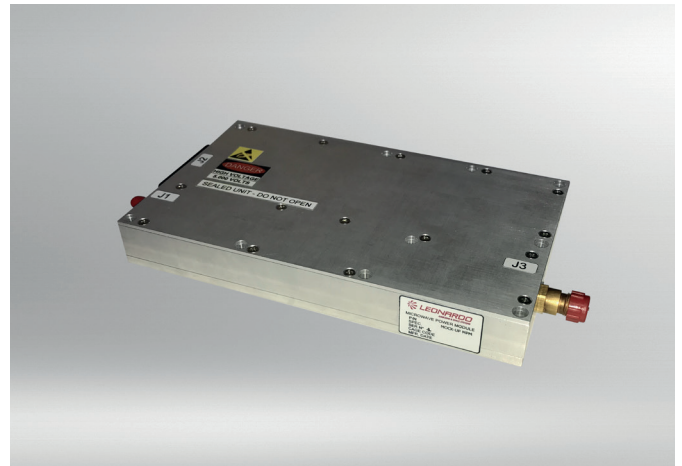
Type	Frequency range	Power Output	Cathode voltage	Cathode current	Duty Cycle	Control Electrode
ET3580	4.5 to 18 GHz	150 W	-4.5 kV	230 mA	up to CW	Focus
ET5515	13.5 to 14.0 GHz	370Wpk	-8.9 kV	250 mA	25% max	Grid
ET5530	9 to 9.8 GHz	300W	-8.5 kV	270 mA	20% max	Grid
ET5711	28 to 40 GHz	150 W	-13.5 ÷ -15.5 kV	170 mA	up to CW	Focus
ET9900	34 to 36 GHz	900 W	-18 ÷ -21 kV	650 mA	12%	Grid
ET9901	33 to 35 GHz	900 W	-18 ÷ -21 kV	650 mA	12%	Grid

MICROWAVE POWER MODULE (MPM)

The Microwave Power Module is a microwave amplifier which includes: the mini TWT, the solid state amplifier and gain equalizer, the RF input and output network and the Electronic Power Conditioner.

All the parts are packaged into a single compact, lightweight housing. With respect to traditional TWT-Amplifiers, the MPM is much smaller, lighter, more efficient, with significant noise reduction.

Based on proprietary novel potting-free concept the HVPS (High Voltage Power Supply) results in high reliable module and very light weight and an easy concept for life cycle support and maintenance.



Applications for Airborne, Surface and Missile platforms

- > Military and Commercial Radars
- > EW Equipment
- > Test and Measurement Equipment

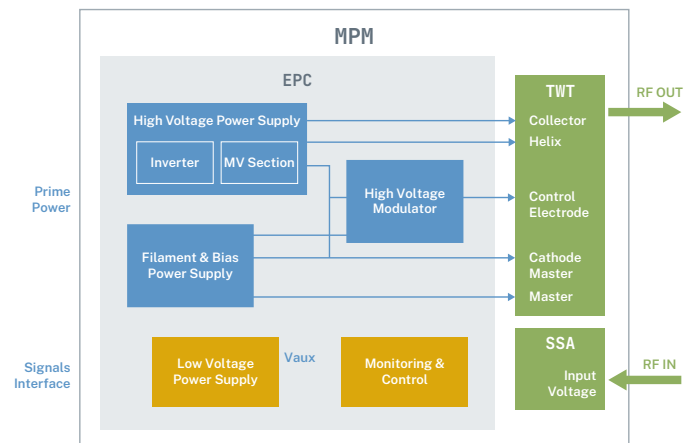
Key Features

The amplifiers are designed for:

- > 70 dB typical small signal gain
- > -40°C to +90°C operating baseplate temperature (TBP)
- > Output power flatness 1dB (typ.)
- > -35dBm/MHz noise power density (typ.)

Unit is conductively cooled through baseplate and HVPS is hermetically sealed.

All the amplifiers are very compact, light weight
270 V DC Nominal input (other can be arranged)
rack mount available.



Type	Frequency Range	Power Output	Dimensions/Weight	Duty/PRF	Input voltage
MPM3502	6 to 18 GHz	100 W	295x197x38mm / 3.5kg	Up to CW / 250kHz	270VDC
MPM3503	6 to 18 GHz	120 W	210x120x27mm / 1.85 kg	Up to CW / 10kHz	270VDC

SOLID STATE POWER AMPLIFIER (SSPA)

Leonardo Solid State Power Amplifier are based on gallium nitride (GaN) monolithic microwave integrated circuit (MMIC) provided in an environmentally sealed compact light weight mechanical housing.

Output power is saturated, in the same enclosure several different output power level are available, the efficiency of these SSPAs is outstanding because the amplifiers are based on a proprietary novel power combining network that enable the compact outline and light weight.

Applications for Airborne, Surface and Missile platforms

- > Military and Commercial Radars
- > EW Equipment
- > Test and Measurement Equipment



Key Features

The amplifiers are designed for:

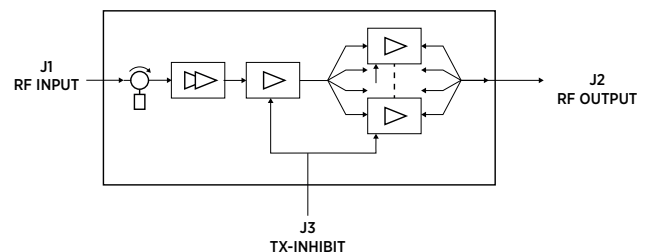
- > 70 dB typical small signal gain
- > -40°C to +70°C operating baseplate temperature (TBP)
- > Output power flatness 1dB (typ.)
- > -30dBm/MHz noise power density (typ.)
- > Very long pulse width

Several control bits are available.

- > Status and control interface 5V TTL compatible
- > Internal thermal regulation
- > Over-temperature protection
- > Alarm status communicated via Control connector

Unit is conductively cooled through baseplate and Hermetically sealed.

All the amplifiers are very compact 177,8mm x 228,6mm x 40,2mm, weight, less than 4kg, 28 V DC Nominal input (27-29 V), rack mount available.



Type	Frequency Range	Power Output	Dimensions/Weight	Duty Cycle	Input Voltage
MHXA017-01	X-Band (9 to 10 GHz)	700W	228,6 x 177,8 x 40,2 mm / 4kg	25%	28VDC
MHXA018-01 (PROTO)	X-Band (7,5 to 12,5 GHz)	100W	228,6 x 177,8 x 40,2 mm / 4kg	CW	28VDC
MHXA019-01	X-Band (9 to 9,6 GHz)	600W	228,6 x 177,8 x 40,2 mm / 3kg	1%	28VDC
MHXA020-01	X-Band (9 to 9,6 GHz)	500W, Eff: 15%	228,6 x 177,8 x 40,2 mm / 3,5 kg	20%	28VDC
MHXA020-02	X-Band (9 to 10 GHz)	500W, Eff: 20%	228,6 x 177,8 x 40,2 mm / 3,5 kg	20%	28VDC
MHXA021-01	X-Band (8,5 to 9,6 GHz)	500W	228,6 x 177,8 x 40,2 mm / 3,5 kg	15%	28VDC
MHXA022-02	X-Band (8,5 to 11 GHz)	120W	228,6 x 177,8 x 30,5 mm / 1,5 kg	25%	28VDC
MHXA024-02	X-Band (9 to 10 GHz)	1000W	228,6 x 177,8 x 40,2 mm / 4,5kg	10% (15% 30sec)	28VDC
MHXA026-01	X-Band (9 to 10 GHz)	2kW	300 x 280 x 180 mm / 10kg	10%	28VDC
MHXA027-01	X-Band (8,5 to 11 GHz)	700W	228,6 x 177,8 x 40,2 mm / 5kg	15%	28VDC
MHKA002-01	Ku-Band (13,5 to 14,5GHz)	400W	204 x 140 x 62 mm / 4,5kg	20%	28VDC
MHKA003-01	Ku-Band (16 to 17 GHz)	200W	228,6 x 177,8 x 40,2 mm / 4kg	20%	28VDC
MHKA004-01	Ku-Band (16 to 17 GHz)	100W	228,6 x 177,8 x 40,2 mm / 4kg	20%	28VDC

MICROELECTRONICS

- > State-of-the-art design expertise in μ W solid-state hybrids: multi-assemblies and front-ends
- > Up-to-date facilities for hybrids manufacturing including fully automated manufacturing line and RF testing capabilities for modules up to 40GHz.
- > Cutting edge expertise for Active Electronically Scanning Antenna Components.
- > Active Phased Array Antenna Technology

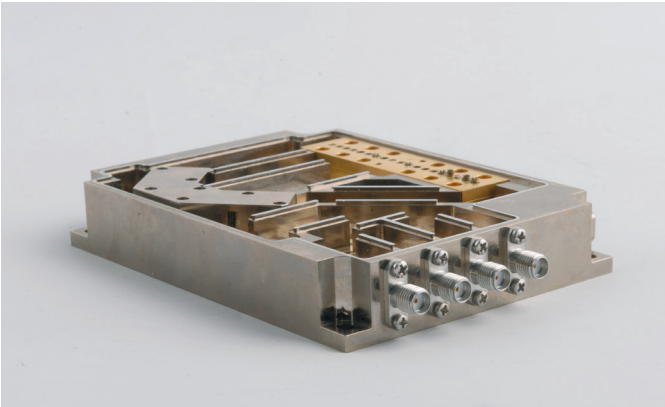
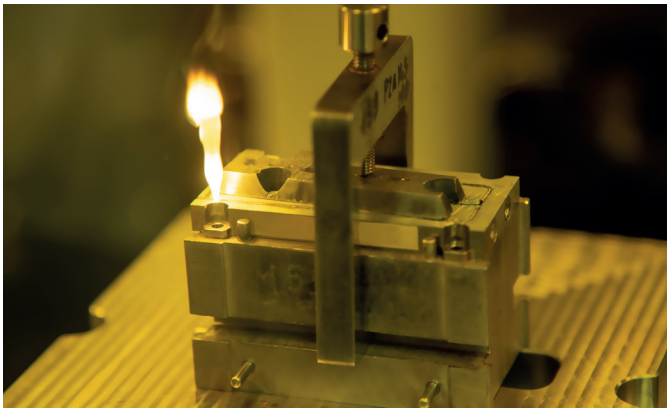
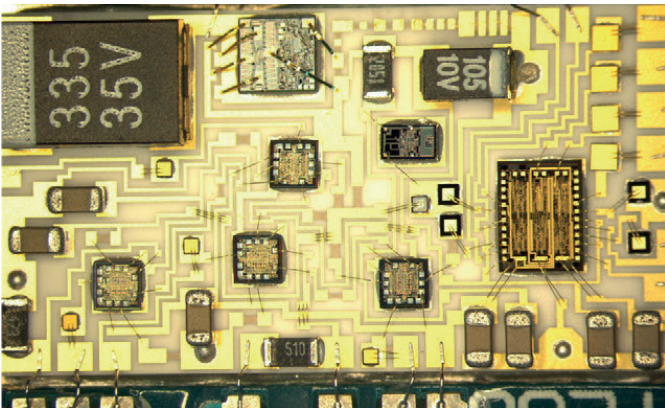
Active Components

- > Compact Receivers
- > Multifunction Hybrids (HPA, TTD, Switch matrix, etc...)
- > Antenna Subsystem (Planks, Panels & Manifolds)

Radar and EW component and subsystem

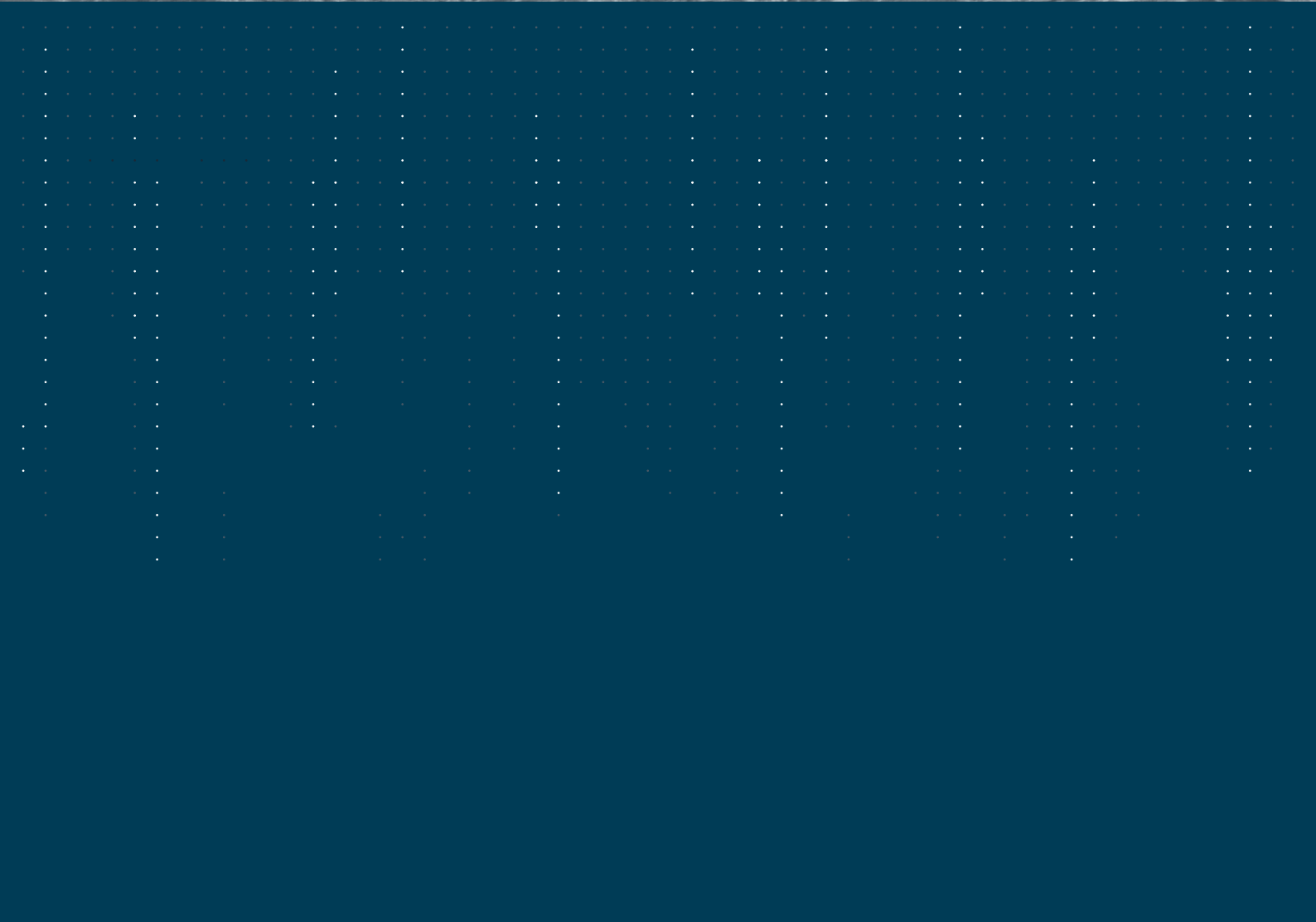
- > Front end and pedestal components
- > Receiver, Exciter, Processor components
 - > Down converter (up to 2 conversion)
 - > Up converter (up to 2conversion)
 - > Stretch module for de-ramp-on-receive SAR mode
 - > Synthesiser: Very low phase noise, fast switching
 - > Exciter and LO distributor
 - > Compact Receiver/Exciter
- > Seeker, AOA/RW Receiver
 - > Multifunction Hybrids
 - > Broadband front end and receiver
- > Very wide band assembly
 - > Front end amplifier and receiver
 - > Fast switching synthesiser
 - > Transceiver.

Type	Frequency Range	Power Output	Description
MHXA013-01	9 to 10 GHz	NF=2.7dB; Gain=29dB; TOI=23dBm; Max_In_Peak_Power=250W	HLLNA (With T/R Limiter)
MHXA015-01	9 to 10 GHz	NF=2 dB; Gain=30dB; TOI=23dBm; Max_In_Peak_Power= 0.1W	HLLNA (Without T/R Limiter)
MHXS002-01	X-Band	50 Channels-PN: <-117 dBc/Hz @ 100KHz; Switching Speed<10us	SYNTH
MHXU002-01	L-Band to X-Band	3 Outputs, 2 selectable up-conversion channels, OL and Image Rejection>50dBc	UP CONVERTER
MHWR001-01	0.8-20GHz to 1GHz	Wide band Converter with 8 RF selectable Frequency Bands	WBFE





PRODUCTS CATALOGUE



ET948
C-BAND PULSED TWT

Features

> Frequency Range

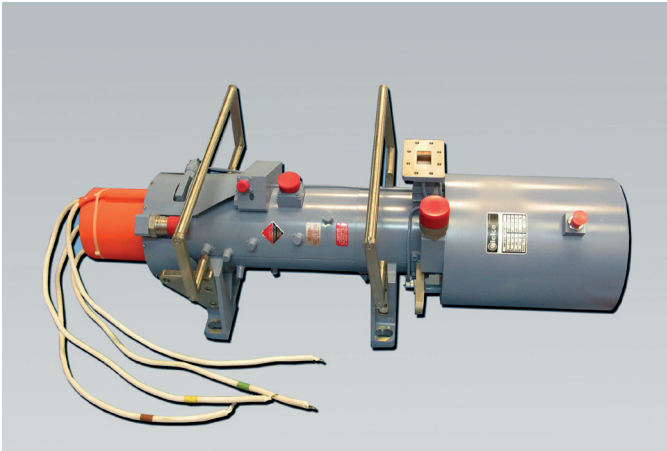
5.3÷5.8 GHz

> Output Power:

120 kW

> Integral solenoid focused

> CC-TWT Type Tube



Electrical Data

RF Performance

> Frequency range	5.3 to 5.8GHz
> Output power	120kW min
> Input drive power	38dBm min
> Duty cycle	8% max

Typical Power Supply Requirements

> Cathode voltage	-46kV
> Cathode current	14.5A
> Body current	1A
> Grid voltage	-800V (beam off) 700V (beam on)
> Grid current	100mA
> Collector voltage	35kV
> Collector current (no RF)	14.3A
> Heater voltage	9V
> Heater current	9A
> Solenoid voltage	200V
> Solenoid current	24A
> Ion pump voltage	3kV
> Ion pump current	2μA
> Power consump. (at 8% duty)	45kW

Physical Data

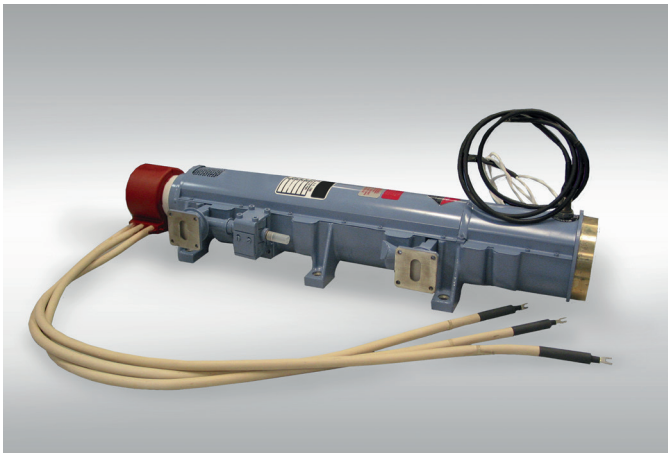
Mechanical

> Weight	75kg max
> Cooling	Liquid
> Dimensions	920 x 290 x 300 mm (excluding connectors)
> R.F. input	Coaxial type N
> R.F. output	Waveguide type CPR187F

ET960
X-BAND PULSED TWT

Features

- > Frequency Range 8.35÷9.5 GHz
- > Output Power: 14 kW
- > CC-TWT Type Tube



Electrical Data

RF Performance

> Frequency range	8.5 to 9.5GHz
> Output power	14kW
> Input drive power	20dBm
> Duty cycle	2.7% max

Typical Power Supply Requirements

> Cathode voltage	-22kV
> Cathode current	4A
> Body current	0.7A
> Grid voltage	-325V (beam off) 270V (beam on)
> Grid current	8mA
> Collector voltage	15kV
> Collector current (no RF)	3.5A
> Heater voltage	10.5V
> Heater current	3.2A
> Ion pump voltage	3kV
> Ion pump current	2μA
> Power consump. (at 2.5% duty)	1.6kW

Physical Data

Mechanical

> Mounting position	Any
> Weight	8kg
> Cooling	Forced air
> Dimensions	570 x 136 x 104 mm (excluding connectors)
> R.F. input	Waveguide UG-39/U
> R.F. output	Waveguide UG-39/U

ET961
X-BAND PULSED TWT

Features

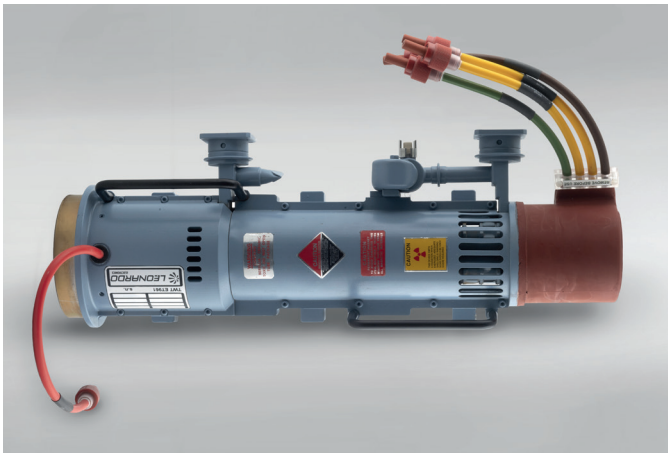
> Frequency Range

8.6÷9.5 GHz

> Output Power:

20 kW

> CC-TWT Type Tube



Electrical Data

Rf Performance

> Frequency range	8.6 to 9.5GHz
> Output power	20kW
> Input drive power	27dBm
> Duty cycle	1.2% max

Typical Power Supply Requirements

> Cathode voltage	-26kV
> Cathode current	6.5A
> Body current	1A
> Grid voltage	-200V (beam off) 270V (beam on)
> Grid current	50mA
> Collector voltage	26kV (undepressed)
> Heater voltage	10.5V
> Heater current	3.5A
> Ion pump voltage	3kV
> Ion pump current	2μA
> Power consump. (at 1% duty)	1.7kW

Physical Data

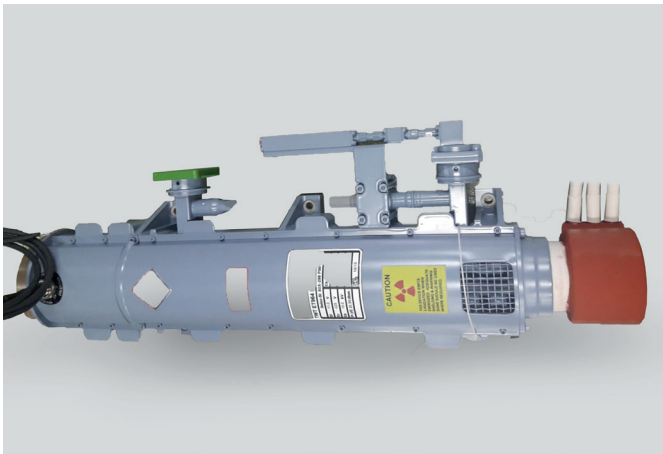
Mechanical

> Mounting position	Any
> Weight	6.5kg
> Cooling	Forced air
> Dimensions	455 x 120 x 120 mm (excluding connectors)
> R.F. input	Waveguide UG-39/U
> R.F. output	Waveguide UG-39/U

ET964
X-BAND PULSED TWT

Features

- > Frequency Range 10.8÷11.8 GHz
- > Output Power: 10 kW
- > CC-TWT Type Tube



Electrical Data

RF PERFORMANCE

> Frequency range	10.8 to 11.8GHz
> Output power	10kW min
> Input drive power	21.75dBm max
> Gain at rated power	50dB typ
> Harmonic output ratio	-20dBc max
> Duty cycle	2.7% max

Typical Power Supply Requirements

> Cathode Voltage	-23.5kV
> Cathode Current	3.9A
> Peak body current (RF)	600mA
> Collector voltage 1	5kV
> Collector Current (no RF)	3.7A
> Heater Voltage	10V
> Heater Current	3.2A
> Ion Pump voltage	3.0kV
> Ion pump current	2μA
> Power consump. (at 2.5% duty)	1.6kW

Note: all voltages are referenced to cathode except the cathode and anode which are referenced to ground.

Physical Data

Mechanical

> Dimensions	550 x 136 x 104 mm
> Weight	10kg max
> Cooling	Forced air
> RF input connctorge	SMA female
> RF output connctorge	UG -39 /U

Constructional features allow tube operation in severe environmental conditions for defence and commercial applications.

ET965
X-BAND PULSED TWT

Features

> Frequency Range

9.5 to 9.9 GHz band

> Output Power:

12 kW

> CC-TWT Type Tube



Electrical Data

RF Performance

> Frequency range	9.5 to 9.9GHz
> Output power	12kW
> Input drive power	25dBm
> Duty cycle	10.5% max

Typical Power Supply Requirements

> Cathode voltage	-25kV
> Cathode current	3.4A
> Body current	0.3A
> Grid voltage	-350V (beam off) 270V (beam on)
> Grid current	10mA
> Collector voltage	-First stage 13.9kV -Second stage 9.4kV
> Collector current	3.5A First stage (with RF) 1.5A Second stage (no RF) 3A
> Heater voltage	11V
> Heater current	2.2A
> Ion pump voltage	3kV
> Ion pump current	2μA
> Power consump. (at 10% duty)	4kW

Note: all voltages are referenced to cathode except the cathode and anode which are referenced to ground..

Physical Data

Mechanical

> Dimensions	445 x 132 x 122 mm (excluding connectors)
> Mounting position	Any
> Weight	8kg
> Cooling	Liquid
> R.F. input	TNC Female
> R.F. output	Waveguide UG-39/U

Environmental

- > Constructional features allow tube operation in severe environmental conditions for defence and commercial applications

ET967
X-BAND PULSED TWT

Features

- > Frequency Range: 9.15 to 10.25 GHz band
- > Output Power: 12 kW
- > Duty Cycle: 10.5%
- > CC-TWT Type Tube



Electrical Data

RF Performance

> Frequency range	9.15 to 10.25 GHz
> Peak Output power	12 kW min
> Input drive power	28 dBm max
> Output Power ripple	0.8 dB max
> Harmonic output ratio	-25 dBc max
> Spurious	-50 dBc max
> Duty Cycle	10.5%

Typical Power Supply Requirements

> Cathode voltage	-25kV min
> Cathode current	3.4 A max
> Body current	350 mA max
> Grid voltage:	-350 V min
> Grid current	20 mA max
> Collector Voltages:	13.7 kV 1st stage 9.7 kV 2nd stage
> Collector Currents (max):	1.6 A 1st stage (with RF) 2.05 A 2nd stage (with RF)
> Heater voltage	10.1 to 11.9 V
> Heater current (max)	2.95 A
> Power Consumption	4.05 kW max

Physical Data

Mechanical

> Dimensions (mm):	450 x 135 x 35 mm
> Weight	8 kg max
> Cooling	Liquid
> RF input connector	SMA female
> RF output connector	WR90 waveguide

Environmental

- > Constructional features allow tube operation in severe environmental conditions for defence and commercial applications

ET2980
KU-BAND PULSED TWT

Features

> Frequency Range:

16.5 to 17 GHz band

> Output Power:

13.5 kW



Electrical Data

RF Performance

> Frequency range	16.5 to 17GHz
> Output power	13.5kW
> Input drive power	25dBm
> Duty cycle	2.7% max

Typical Power Supply Requirements

> Cathode voltage	-29kV
> Cathode current	2.1A
> Body current	0.3A
> Grid voltage	-360V (beam off) 270V (beam on)
> Grid current	10mA
> Collector voltage	First stage 17kV Second stage 14kV
> Collector current	3.5A first stage (with RF) 0.4A second stage (no RF) 1.9A
> Heater voltage	10V
> Heater current	3.5A
> Ion pump voltage	3kV
> Ion pump current	2μA
> Power consump. (at 2.5% duty)	900W

Note: all voltages are referenced to cathode except the cathode and anode which are referenced to ground..

Physical Data

Mechanical

> Dimensions	367 x 120 x 134 mm (excluding connectors)
> Mounting position	Any
> Weight	5kg
> Cooling	Liquid
> R.F. input Waveguide	UG-419
> R.F. output Waveguide	UG-419

Environmental

- > Constructional features allow tube operation in severe environmental conditions for defence and commercial applications.

ET3201
L-BAND CW TWT

Features

>

Frequency Range

1÷2 GHz

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Output Power:

280 W

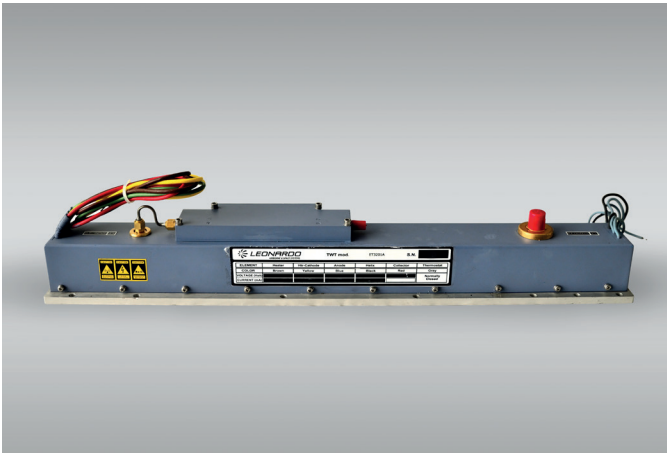
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Gain:

28 dB

>

Helix Type tube



Electrical Data

RF Performance

>	Frequency range	1 to 2GHz
>	Output power	From 1.0 to 1.2GHz 53.4 to 54.5dBm min
		From 1.2 to 2.0GHz 54.5dBm min
>	Input drive power	27dBm max
>	Noise power density	-30dBm/MHz max
>	Harmonic output ratio	-3dBc max

Typical Power Supply Requirements

>	Cathode voltage	-3.6kV
>	Cathode current	475mA
>	Helix current	75mA
>	Anode voltage	200V
>	Collector Voltage	2.5kV
>	Collector current (no rf)	470mA
>	Heater voltage	6.3V
>	Heater current	2.8A
>	Power consumption	1300W

Note: all voltages are referenced to cathode except the cathode and anode which are referenced to ground.

Physical Data

Mechanical

>	Dimensions	610 x 65 x 65 mm (excluding connectors)
>	Weight	5Kg
>	Cooling	By conduction
>	RF input connector	SMA female
>	RF output connector	TNC female

Environmental

- > Constructional features allow tube operation in severe environmental conditions for defence and commercial applications.

ET3301
S-BAND CW TWT

Features

>

Frequency Range

2÷4 GHz

>

Output Power:

250 W

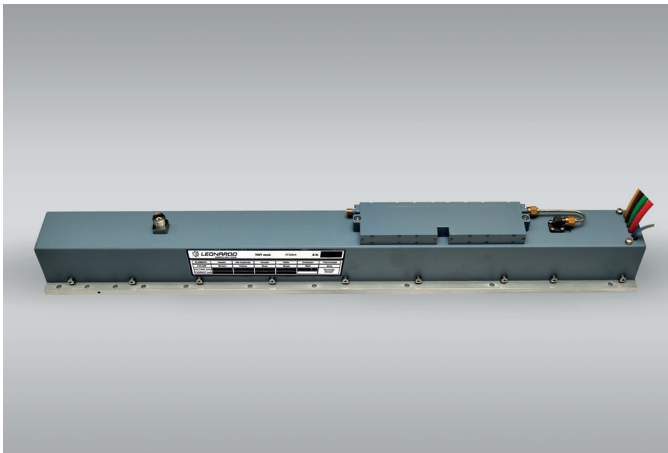
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Gain:

40 dB

>

Helix type tube



Electrical Data

RF Performance

>	Frequency range	2 to 4GHz
>	Output power	From 2.0 to 2.3GHz 53.4 to 54dBm min From 2.3 to 4.0GHz 54dBm min
>	Input drive power	13dBm max
>	Noise power density	-23dBm/MHz max
>	Harmonic output ratio	-4dBc max
>	Hot insertion loss (beam off)	18dB min

Typical Power Supply Requirements

>	Cathode voltage	-4.2kV
>	Cathode current	450mA
>	Helix current	40mA
>	Anode voltage	100V
>	Control electrode voltage:	Beam off -2000V Beam on 0V
>	Collector Voltage	2.9kV
>	Collector current (no rf)	448mA
>	Heater voltage	6.3V
>	Heater current	1.7A
>	Power consumption	1400W

Note: all voltages are referenced to cathode except the cathode and anode which are referenced to ground.

Physical Data

Mechanical

>	Dimensions	533 x 65 x 65 mm (excluding connectors)
>	Weight	3.8Kg max
>	Cooling	By conduction
>	RF input connector	SMA female
>	RF output connector	TNC female

Environmental

- > Constructional features allow tube operation in severe environmental conditions for defence and commercial applications.

ET3407
C-BAND CW TWT

Features

> Frequency Range

4÷8 GHz

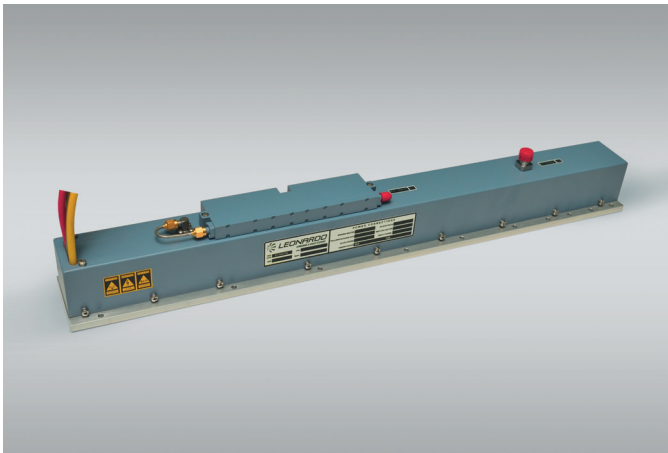
> Output Power:

280 W

> Gain:

40 dB

> Helix Type tube



Electrical Data

RF Performance

>	Frequency range	4 to 8GHz
>	Output power	From 4.0 to 5GHz 53.4 to 54.5dBm min
		From 5 to 7.0GHz 54.5dBm min
		From 7 to 8GHz 54.5 to 53.4dBm min
>	Input drive power	13 dBm max
>	Noise power density	-30dBm/MHz max
>	Harmonic output ratio	-4dBc max
>	Hot insertion loss (beam off)	20dB min

Typical Power Supply Requirements

> Cathode voltage	-8kV
> Cathode current	320mA
> Helix current	10mA
> Anode voltage	200V
> Control electrode voltage:	Beam off -1600V
	Beam on 0V
> Collector Voltage	4.4kV
> Collector current (no rf)	318mA
> Heater voltage	6.3V
> Heater current	1.1A
> Power consumption	1400W

Note: all voltages are referenced to cathode except the cathode and anode which are referenced to ground.

Physical Data

Mechanical

> Dimensions	534 x 65 x 70 mm (excluding connectors)
> Weight	3.6kg max
> Cooling	By conduction
> RF input connector	SMA female
> RF output connector	TNC female

Environmental

- > Constructional features allow tube operation in severe environmental conditions for defence and commercial applications.

ET3602
KA-BAND CW TWT

Features

> Frequency Range

27.5÷29.5 GHz

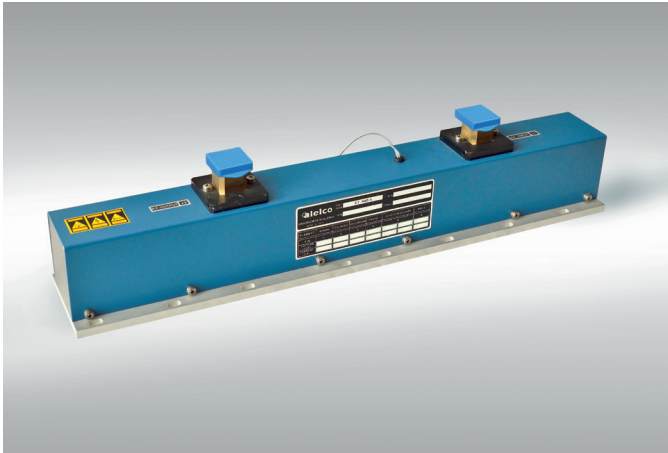
> Output Power:

100 W

> Gain:50 dB

> Low intermod. products

> Helix type tube



Electrical Data

RF Performance

> Frequency range	27.5 to 29.5GHz
> Output power	50dBm min
> Gain at rated power	50dB min
> Gain variation	1.5dB max (whole band) 0.5dB max (any 110MHz)
> Gain slope	±0.01 dB/MHz max
> AM/PM conversion	5°/dB max (at 6dB backoff)
> Third order intermodulation	-27dBc max (at 7dB backoff)
> Noise Figure	40dB max

Typical Power Supply Requirements

> Cathode voltage	-12kV
> Cathode current	115mA
> Helix current	0.2mA
> Anode voltage	800V
> Grid voltage	-800V (beam off) -17V (beam on)
> Collector Voltage	5.4kV
> Collector current (no rf)	115mA
> Heater voltage	6.3V
> Heater current	0.8A
> Power consumption	650W

Note: all voltages are referenced to cathode except the cathode and anode which are referenced to ground.

Physical Data

Mechanical

> Dimensions	407 x 70 x 4 mm (excluding connectors)
> Weight	3.2kg max
> Cooling	By conduction
> RF input connector	UG 599/U
> RF output connector	

Environmental

- > Constructional features allow tube operation in severe environmental conditions for defence and commercial applications.

ET6305
S-BAND PULSED TWT

Features

> Frequency Range

3.1÷3.5 GHz

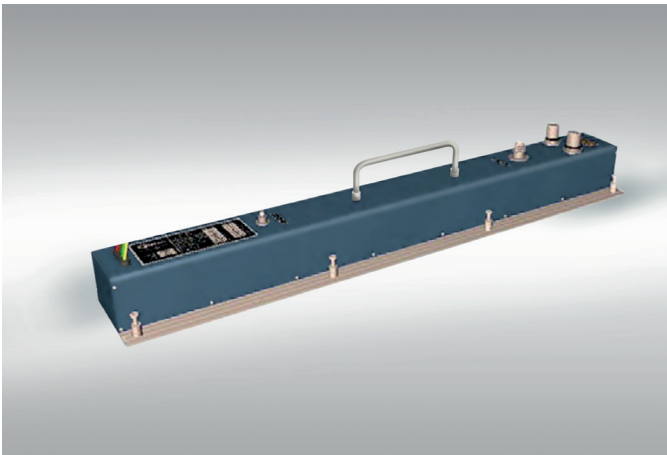
> Output Power:

8 kWpk

> Gain:40 dB

> Duty Cycle: 2.5%

> Helix type tube



Electrical Data

RF Performance

> Frequency range	3.1 to 3.5GHz
> Output power	69dBm min
> Input drive power	29dBm min
> Noise Figure	40dB max
> Harmonic output ratio	-10dBc max
> Duty cycle	2.5% max

Typical Power Supply Requirements

> Cathode voltage	-14.6kV
> Cathode current	3.2A
> Helix current	1.1A
> Grid voltage	-300V (beam off) 290V (beam on)
> Grid current	2mA
> Collector Voltage	11.7kV
> Collector current (no rf)	3.1A
> Heater voltage	6.3V
> Heater current	2.6A
> Power consumption	1050 W (at 2.5% Duty)

Note: all voltages are referenced to cathode except the cathode and anode which are referenced to ground.

Physical Data

Mechanical

> Dimensions	700 x 120 x 66 mm (excluding connectors)
> Weight	9Kg max
> Cooling	Liquid
> RF input connector	SMA female
> RF output connector	SC female

Environmental

> Constructional features allow tube operation in severe environmental conditions for defence and commercial applications.
--

ET6404
X-BAND PULSED TWT

Features

> Frequency Range

5.5÷9.5 GHz

> Output Power:

2 kWpk

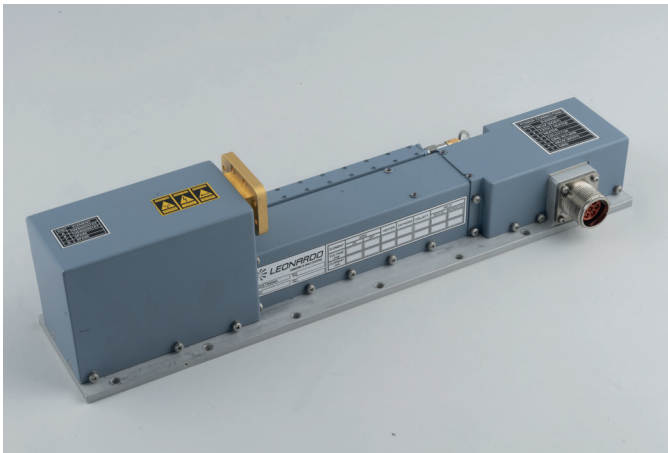
> Gain:

40 dB

> Duty Cycle:

10%

> Helix type tube



Electrical Data

RF Performance

> Frequency range	5.5 to 9.5GHz
> Output power	63dBm min
> Input drive power	23dBm min
> Noise Power density	0dBm/MHz max
> Harmonic output ratio -	7dBc max
> Duty cycle	10% max

Typical Power Supply Characteristics

> Cathode voltage	-9.2kV
> Cathode current	1.6A
> Helix current	350mA
> Grid voltage	-200V (beam off) 200V (beam on)
> Grid current	1mA
> Collector Voltage	5.5kV
> Collector current (no rf)	1.5A
> Heater voltage	6.3V
> Heater current	1.8A
> Power consumption	980W (at 10% Du)

Note: all voltages are referenced to cathode except the cathode and anode which are referenced to ground.

Physical Data

Mechanical

> Dimensions	400 x 85 x 92 mm (excluding connectors)
> Weight	3.2kg max
> Cooling	By conduction
> RF input connector	SMA female
> RF output connector	WRD 475

Environmental

- > Constructional features allow tube operation in severe environmental conditions for defence and commercial applications.

ET6510
8÷16 GHZ PULSED TWT

Features

> Frequency Range

8÷16 GHz

> Output Power:

2 kWpk

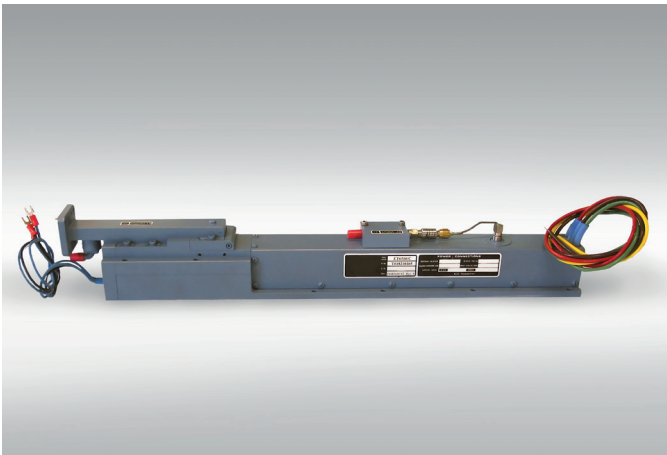
> Gain:

53 dB

> Duty Cycle:

2%

> Helix type tube



Electrical Data

RF Performance

> Frequency range	8 to 16GHz
> Output power	63dBm min
> Input drive power	10dBm max
> Gain at rated power	53dB min
> Noise power density	5dBm/MHz max
> Harmonic output ratio	-3dBc max
> Duty Cycle	2 % max

Typical Power Supply Requirements

> Cathode voltage	-10.7 kV
> Cathode current	1.7A
> Helix current	500mA
> Grid voltage	-150V (beam off) 100V (beam on)
> Grid current	220mA
> Collector voltage	7.2 kV
> Collector current (no rf)	1.3A
> Heater voltage	6.3V
> Heater current	1.4A
> Power consumption	260W (at 2% duty)

Note: all voltages are referenced to cathode except the cathode and anode which are referenced to ground.

Physical Data

Mechanical

> Dimensions	435 x 51 (x 61 mm (excluding connectors)
> Weight	2.5kg max
> Cooling	By conduction
> RF input connector	SMA female
> RF output connector	WRD 750

Environmental

- > Constructional features allow tube operation in severe environmental conditions for defence and commercial applications.

ET6512
X-BAND PULSED TWT

Features

> Frequency Range

8.5÷10.5 GHz

> Output Power:

2 kWpk

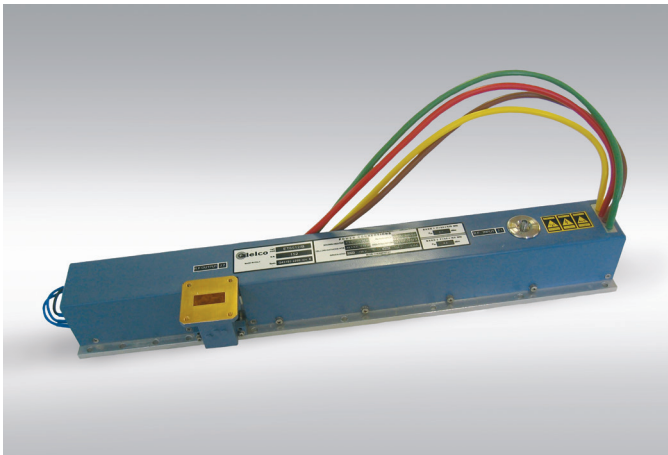
> Gain:

60 dB

> Duty Cycle:

6%

> Helix type tube



Electrical Data

RF Performance

> Frequency range	8.5 to 10.5GHz
> Output power	63dBm min
> Gain at rated power	60dB min
> Noise power density	-5 dBm/MHz max
> AM/PM conversion	
1 to 10kHz off-carrier	-80 to -90 dBc/Hz max
Above 10kHz off-carrier	-90 dBc/Hz max
> Harmonic output ratio	-15 dBc max
> Duty Cycle	6 % max

Typical Power Supply Requirements

> Cathode voltage	-10.9kV
> Cathode current	1.5A
> Helix current	220mA
> Grid voltage	Beam off 200V Beam on 190V
> Grid current	2mA
> Collector Voltage	7.6kV
> Collector current (no rf)	1.4A
> Heater voltage	6.3V
> Heater current	1.8A
> Power consumption (at 6% du)	750W

Note: all voltages are referenced to cathode except the cathode and anode which are referenced to ground.

Physical Data

Mechanical

> Dimensions	436 x 66 x 55 mm (excluding connectors)
> Weight	3.5kg max
> Cooling	By conduction
> RF input connector	SMA female
> RF output connector	UG 39/U

Environmental

- > Constructional features allow tube operation in severe environmental conditions for defence and commercial applications.

ET6529
X-BAND PULSED TWT

Features

> Frequency Range

9.5÷10.8 GHz

> Output Power:

4 kWpk

> Gain:

34 dB

> Duty Cycle:

6%

> Helix type tube



Electrical Data

RF Performance	
> Frequency range	9.5 to 10.0GHz
> Output power	66dBm min
> Input drive power	32dBm max
> Noise Power density	-10dBm/MHz max
> Interpulse noise	-107dBm/MHz max
> AM/PM noise	
1 to 10 kHz off-carrier	-80 to -110dBc/Hz max
Above 10 kHz off-carrier	-110dBc/Hz max
> Harmonic output ratio	-15dBc max
> Duty Cycle	6 % max

Typical Power Supply Requirements

> Cathode voltage	-12kV
> Cathode current	1.5A
> Helix current	350mA
> Grid voltage:	-350V (beam off) 180V (beam on)
> Grid current	5mA
> Collector Voltage	8kV (first stage) 4kV (second stage)
> Collector current	0.7A first stage (with rf) 1.5A second stage (no rf)
> Heater voltage	6.3V
> Heater current	1.8A
> Power consumption	730W (at 6% duty)

Note: all voltages are referenced to cathode except the cathode and anode which are referenced to ground.

Physical Data

Mechanical	
> Dimensions	295 x 96 x 80 mm (excluding connectors)
> Weight	3kg max
> Cooling	By forced air
> RF input connector	SMA female
> RF output connector	UG 39/U

Environmental

- > Constructional features allow tube operation in severe environmental conditions for defence and commercial applications.

ET6535

X-BAND PULSED TWT

Features

- > Frequency Range 8.6÷9.5 GHz
- > Output Power 1.5 kW
- > Gain 30 dB
- > Duty Cycle 10%
- > Helix type tube

Electrical Data

RF Performance

- | | |
|-------------------------|-----------------|
| > Frequency range | 8.6 to 9.5 GHz |
| > Output power | 1.5 kW min. |
| > Input drive power | 33 dBm max |
| > Noise Power density | -25 dBm/MHz max |
| > Harmonic output ratio | -20 dBc typ. |
| > Spurious | -30 dBc min. |
| > Duty Cycle | 10% |

Typical Power Supply Requirements

- | | |
|-----------------------|--|
| > Cathode voltage | -8 to -7 kV |
| > Cathode current | 1.3 A max |
| > Helix current | 140 mA typ. |
| > Grid voltage: | -200 V (beam OFF)
130 to 200V (beam ON) |
| > Grid current | 0 mA |
| > Collector Voltages: | 65 to 71 % of E_k 1st stage
32 to 38 % of E_k 2nd stage |
| > Collector Currents: | 0.6 A 1st stage)
1.3 A 2nd stage |
| > Heater voltage | 6.3V |
| > Heater current | 1.7 A typ. |
| > Power Consumption | 530 W max |

Note: all voltages are referenced to cathode except the cathode and anode which are referenced to ground.

Physical Data

Mechanical

- | | |
|-----------------------|--|
| > Dimensions | 252 x 75 x 45 mm
(including connectors) |
| > Weight | 2 kg max |
| > Cooling | Conduction |
| > RF input connector | SMA female |
| > RF output connector | TNC female |

Environmental

- > Constructional features allow tube operation in severe environmental conditions for defence and commercial applications

ET3580
4.5÷18 GHZ PULSED MINI TWT

Features

>

Frequency Range

4.5÷18 GHz

>

Output Power:

150 W

>

Gain:

30 dB

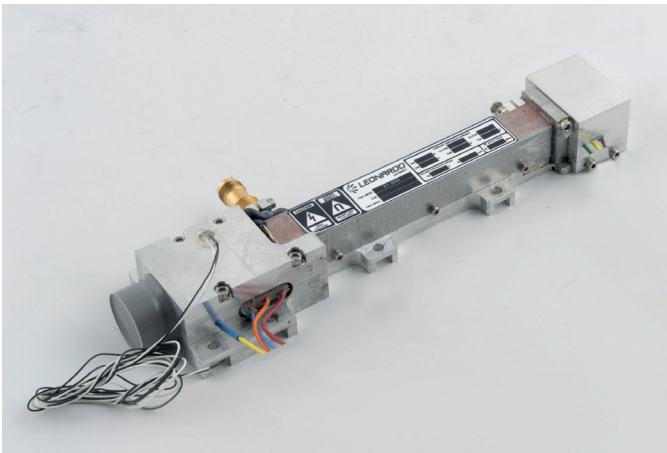
>

Duty Cicle

100%

>

Helix type tube



Electrical Data

RF Performance

>	Frequency range	4.5 to 18 GHz
>	Output power	see graph
>	Input drive power	26 dBm max
>	Noise Power density	-25 dBm/MHz max
>	Harmonic output ratio	-4 dBc at 4.5 GHz -7 dBc at 6 GHz -9 dBc at 9 GHz
>	Spurious	-50 dBc
>	Duty Cycle	100%

Typical Power Supply Requirements

>	Cathode voltage	-4.65 kV
>	Cathode current	230 mA max
>	Helix current	15 mA max
>	BFE voltage:	-1200 V (beam OFF) 0V (beam ON)
>	BFE current	0 mA max
>	Collector Voltages:	2.85 kV 1st stage 2 kV 2nd stage 1 kV 3rd stage
>	Collector Currents:	150 mA 1st stage (with RF) 90 mA 2nd stage (with RF) 230 mA 3rd stage (NO RF)
>	Heater voltage	5.5V
>	Heater current	1.3 A
>	Power Consumption	630 W max

Note: all voltages are referenced to cathode except the cathode and anode which are referenced to ground.

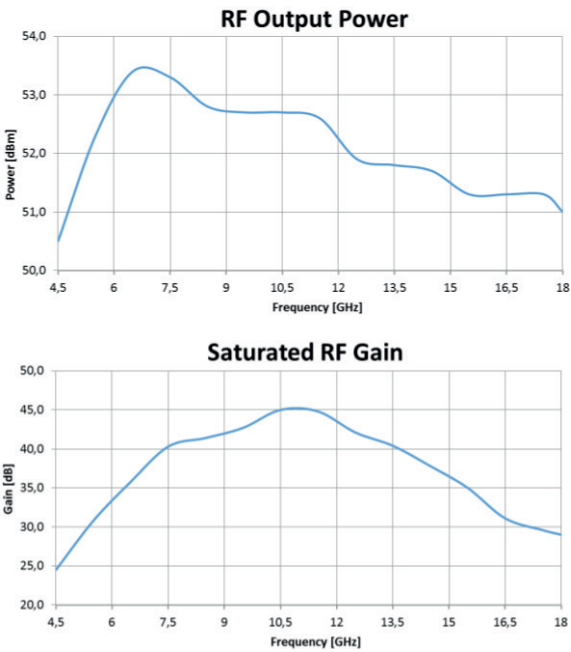
Physical Data

Mechanical

>	Dimensions	220 x 50 70 mm (excluding connectors)
>	Weight	0.6 kg max
>	Cooling	Conduction
>	RF input connector	SMA female
>	RF output connector	TNC female

Environmental

- >
- Constructional features allow tube operation in severe environmental conditions for defence and commercial applications.



ET5515
KU-BAND PULSED MINI TWT

Features

> Frequency Range

13.5÷14GHz

> Output Power:

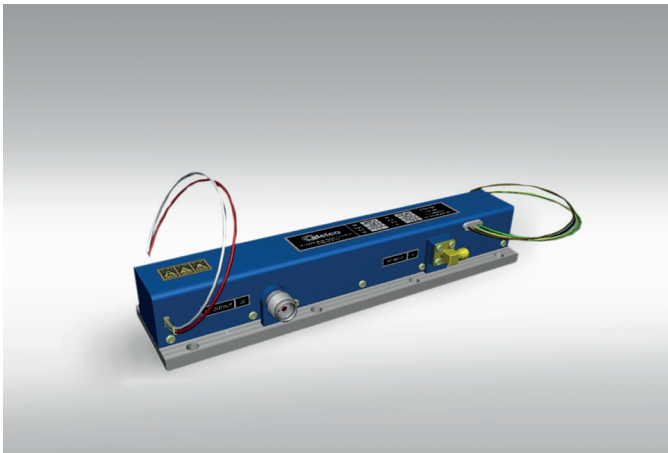
370 Wpk

> Gain:

33 dB

> Fast warm-up

> Helix type tube



Electrical Data

RF Performance

> Frequency range	13.5 to 14.0 GHz
> Output power	55.7dBm min
> Input drive power	23dBm min
> Noise power density	-35dBm max
> AM & PM noise	
0.1 to 10kHz off-carrier	-80 to -105 dBc/Hz max
Above 10kHz off-carrier	-105 dBc/Hz max
> Warm up time	3 sec max (fast) 26 sec max (normal)
> Duty cycle	25% max

Typical Power Supply Requirements

> Cathode voltage	-8.9kV
> Cathode current	250mA
> Helix current	12mA
> Grid voltage:	-350V (beam off) 105V (beam on)
> Grid current	10mA
> Collector Voltage	4.4kV (first stage)2.7kV (second stage)
> Collector current	160mA first stage (with rf) 200mA second stage (no rf)
> Heater voltage	9.0V fast warm up (3 sec overvolt) 5.5V steady state
> Heater Current	6A (surge)
> Heater Current	1.3A (steady surge)
> Power consumption	260W (at 25% duty)

Note: all voltages are referenced to cathode except the cathode and anode which are referenced to ground.

Physical Data

Mechanical

> Dimensions	190 x 45 x 30 mm (excluding connectors)
> Weight	0.45kg max
> Cooling	By conduction
> RF input connector	SMA female
> RF output connector	TNC female

Environmental

- > Constructional features allow tube operation in severe environmental conditions for defence and commercial applications.

ET9900
KA-BAND PULSED HIGH POWER FOLDED TWT

Features

>

Frequency Range

34÷36 GHz

>

Output Power:

800 W typical

>

Duty Cicle

12% (ist. up to 30%)

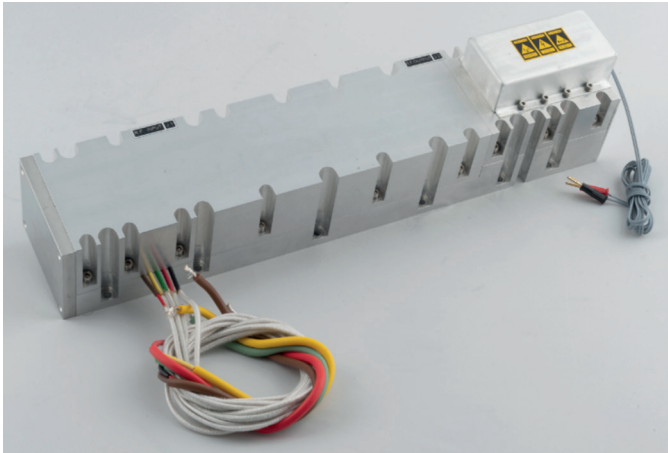
>

Folded type tube

>

Applications

Naval and ground radars



Electrical Data

RF Performance

>	Frequency range	34 to 36 GHz
>	Peak Output power	650 W min.
>	Input drive power	27 dBm max
>	Harmonic output ratio	-40 dBc max
>	Spurious	-70 dBc max
>	Duty Cycle	12% (Instantaneous up to 30%)
>	Propagation Delay	20nsec
>	PRF	0.9 to 50 KHz
>	Pulse Duration	0.2 to 50 µsec

Typical Power Supply Requirements

>	Cathode voltage	-21.5 to -17.5 kV
>	Cathode current	0.55 A max
>	Body current	100 mA max
>	Grid Bias Voltage	-350 V min
>	Grid Capacitance	50 pF max
>	Grid Pulse Voltage	100 to 300 V
>	Grid Pulse Current	1 mA max
>	Collector Voltages:	65% of Cathode voltage
>	Collector Currents (max):	0.55 A
>	Heater voltage	5.5 to 7.5 V

Note: all voltages are referenced to cathode except the cathode and anode which are referenced to ground.

Physical Data

Mechanical

>	Dimensions	400 x 80 x 100 mm
>	Weight	5 kg max
>	Cooling	Conduction
>	RF input connector	WR28 waveguide
>	RF output connector	WR28 waveguide

Environmental

>	Operative Temperature	-15÷85°C
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ET9901
KA-BAND PULSED HIGH POWER FOLDED TWT

Features

> Frequency Range

33÷35 GHz

> Output Power:

800 W typical

> Duty Cicle

12% (ist. up to 30%)

> Folded type tube

> Applications

Naval and ground radars



Electrical Data

RF Performance

> Frequency range	33 to 35 GHz
> Peak Output power	650 W min.
> Input drive power	27 dBm max
> Harmonic output ratio	-40 dBc max
> Spurious	-70 dBc max
> Duty Cycle	12%
> Propagation Delay	20nsec
> PRF	0.9 to 50 KHz
> Pulse Duration	0.2 to 50 µsec

Typical Power Supply Requirements

> Cathode voltage	-18 to -21 kV
> Cathode current	0.65 A max
> Body current	100 mA max
> Grid Bias Voltage	-350 V min
> Grid Capacitance	50 pF max
> Grid Pulse Voltage	100 to 300 V
> Grid Pulse Current	10 mA
> Collector Voltages:	65% of Cathode voltage
> Collector Currents (max):	0.65 A
> Heater voltage	5.5 to 7.5 V

Note: all voltages are referenced to cathode except the cathode and anode which are referenced to ground.

Physical Data

Mechanical

> Dimensions	400 x 80 x 100 mm
> Weight	5 kg max
> Cooling	Conduction
> RF input connector	WR28 waveguide
> RF output connector	WR28 waveguide

Environmental

> Operative Temperature	-15÷85°C
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MPM3502
6÷18 GHZ CW MPM, HIGH PRF

Features

> Frequency Range

6÷18 GHz

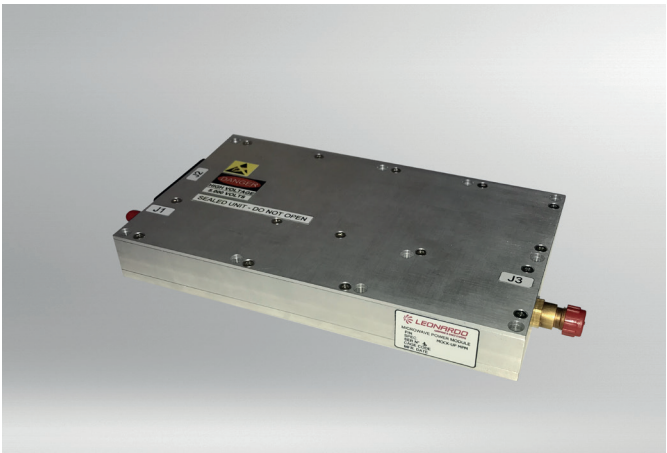
> Output Power

100 W

> Duty Cicle

up to 100%

> Helix type tube



Electrical Data

RF Performance	
> Frequency range	6 to 18 GHz
> Peak Output power	100 W Typ.
> Input drive power	0 dBm
> Pulse Repetition Frequency	up to 250 KHz
> Spurious	-40 dBc max
> Noise power density	-25 dfBm/MHz
> Duty Cycle	up to100%
> Prime Power	-270 V DC 550 W max

Interfaces & Protections

> Controls TTL	
> Monitors	MPM Status Fault disable Helix current TWT temperature
> Protections	Cathode over & under voltage Helix over current TWT over temperature

Physical data

Mechanical	
> Dimensions	295 x 197 x 38 mm
> Weight	3,5 kg max
> Cooling	By Conduction
> RF input connector	SMA Female
> RF output connector	TNC Female
> Prime Power and Control	Positronic Inc. P/N CBM43W2M2000S-S1414

Environmental

> Operative Temperature	-40 ÷ +60°C
> Altitude	11 Km
> Humidity	Up to 95%
> Shock	Half sine 15g 11 msec
> Acceleration	3.6 g
> Vibration	20 ÷ 1000 Hz 0.04 g2/Hz
> EMI / EMC	MIL-STD-461E CE102, RE102, CS114, CS115,RS103

MPM3503
6÷18 GHZ CW MPM

Features

>

Frequency Range

6÷18 GHz

>

Output Power

120 W

>

Duty Cicle

100%

>

Helix type tube



Electrical Data

RF Performance	
> Frequency range	6 to 18 GHz
> Peak Output power	120 W min. see graph
> Input drive power	0 dBm
> Harmonic output ratio	6 ÷ 7 GHz -4 dBc max >7 GHz -5.5 dBc max
> Spurious	-40 dBc max
> Noise power density	-25 dfBm/MHz
> Duty Cycle	100%
> Prime Power	-270 V DC 640 W max

Interfaces & Protections

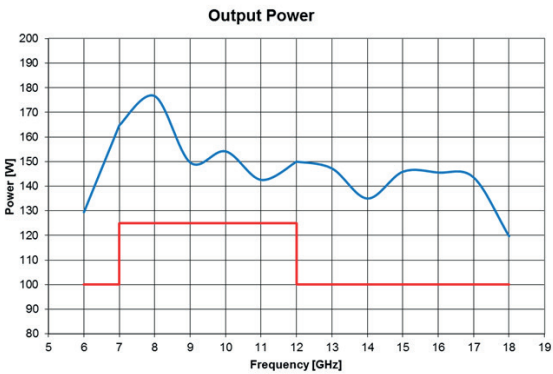
> Controls	TTL serial interface
> Monitors	MPM Status Fault disable Helix current TWT temperature
> Protections	Cathode over & under voltage Helix over current TWT over temperature

Physical Data

Mechanical	
> Dimensions	210 x 121 x 27 mm
> Weight	2 kg max
> Cooling	By Conduction
> RF input connector	SMA Female
> RF output connector	TNC Female
> Prime Power and Control	Positronic Inc. P/N CBM43W2M2000S-S1414

Environmental

> Operative Temperature	-40 ÷ +85°C
> Altitude	55000 feet
> Humidity	Up to 95%
> Shock	Half sine 20g 11 msec
> Acceleration	10 g
> Vibration	20 ÷ 1000 Hz 0.04 g2/Hz



MHXA017
HIGH POWER SSPA X-BAND 700 W

Features

> Frequency Range

9÷10 GHz

> Output Power

700 W

> Duty Cicle

25%

> Pulse width

up to 256µsec

> Efficiency (typ.)

20%

> Applications:

Airborne, Naval & Ground Radars



Electrical Data

RF Performance	
> Frequency range	9 to 10 GHz
> Peak Output power	700 W (typ)
> Input drive power	-1÷5 dBm
> Output Power flatness	1.5 dB max
> Harmonic output ratio	-30 dBc max
> Spurious	-50 dBc max
> Duty Cycle	25% max
> Droop	2dB max@256µsec
> Propagation Delay	20nsec
> Time On	200nsec
> Time Off	300nsec
> Pulsewidth	256µsec max
> TX_INHIBIT [TTL]	200KHz PRFmax, 350nsec Pulse Width min

Typical Power Supply Requirements

> Voltage	[27÷29]V
> Current average	30 A max @25%
> Standby Current	1 A max
> Power Consumption	850W max @25%
> Power Dissipation	675 W max @25%

Note: Voltage [28V] is not referred to ground
TTL is referred to ground.
Chassis is ground connected

Physical data

Mechanical	
> Dimensions:	228.6 x 177.8 x 40.2 mm
> Weight	4 kg max
> Cooling	70°C maximum baseplate temperature must be guarantee
> RF input connector	SMA female
> RF output connector	WR90 waveguide

Environmental	
> Operative Temperature	[-40÷70]°C;
> Operating in relative Humidity range;	[0÷95]%RH (non-condensing);
> Pressure range	[3,45÷15,66]psi;

MHXA019
HIGH POWER SSPA X-BAND 600 W

Features

> Frequency Range

9÷9.6 GHz

> Output Power

600 W

> Duty Cycle

1%

> Pulse width

up to 256µsec

> Efficiency (typ.)

20%

> Applications:

Missile Radars



Electrical Data

RF Performance	
> Frequency range	9 to 9,6 GHz
> Peak Output power	600 W (typ)
> Input drive power	[-1÷5] dBm
> Output Power flatness	1,5 dB max
> Harmonic output ratio	-35 dBc max
> Spurious	-60 dBc max
> Duty Cycle	1% max
> RF Rise time	15nsec
> Propagation Delay	40nsec
> Time On	200nsec
> Time Off	300nsec
> Pulsewidth	1µsec max
> TX_INHIBIT [TTL]	150KHz PRFmax, 350nsec Pulse Width min

Typical Power Supply Requirements

> Voltage	[27÷29]V
> Current average	1,5 A max @1%
> Standby Current	1 A max
> Power Consumption	42W max @1%
> Power Dissipation	37 W max @1%

Note: Voltage [28V] is not referred to ground
TTL is referred to ground.
Chassis is ground connected

Physical data

Mechanical	
> Dimensions	228.6 x 177.8 x 40,2 mm
> Weight	3 kg max
> Cooling	55°C maximum baseplate temperature must be guarantee
> RF input connector	SMA female
> RF output connector	WR90 waveguide

Environmental

> Operative Temperature	[-40÷55]°C
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MHXA020-01

HIGH POWER SSPA X-BAND 500 W

Features

- > State of the art GaN technology
- > Frequency Range 9÷9.6 GHz
- > Output Power 500 W
- > Duty Cycle 20%
- > Pulse width up to 150µsec
- > Efficiency (typ.) 15%
- > Applications: Naval and ground Radars



Electrical Data

RF Performance

> Frequency range	9 to 9,6 GHz
> Peak Output power	500 W (typ)
> Input drive power	[-1÷5] dBm
> Output Power flatness	1,5 dB max
> Harmonic output ratio	-35 dBc max
> Spurious	-60 dBc max
> Duty Cycle	15% max
> Droop	1,5dB max@150µsec
> Propagation Delay	40nsec
> Time On	200nsec
> Time Off	300nsec
> Pulsewidth	150µsec max
> TX_INHIBIT [TTL]	150KHz PRFmax, 350nsec Pulse Width min

Typical Power Supply Requirements

> Voltage	[27÷29]V
> Current average	20,6 A max @15%
> Standby Current	2 A max
> Power Consumption	400W max @15%
> Power Dissipation	360 W max @15%

Note: Voltage [28V] is not referred to ground
TTL is referred to ground.
Chassis is ground connected

Physical data

Mechanical

> Dimensions	228,6 x 177,8 x 40,2 mm
> Weight	3.5 kg max
> Cooling	70°C maximum baseplate temperature must be guarantee
> RF input connector	SMA female
> RF output connector	WR90 waveguide

Environmental

- > Operative Temperature [-30÷70]°C

MHXA020-02
HIGH POWER SSPA X-BAND 500 W

Features

>

State of the art GaN technology

>

Frequency Range9÷9.6 GHz

>

Output Power500 W

>

Duty Cicle20%

>

Pulse widthup to 256µsec

>

Efficiency (typ.)20%

>

Applications:Airborne, Naval and ground Radars



Electrical Data

RF Performance

> Frequency range	9 to 10 GHz
> Peak Output power	500 W (typ)
> Input drive power	[-1÷5] dBm
> Output Power flatness	1,5 dB max
> Harmonic output ratio	-35 dBc max
> Spurious	-60 dBc max
> Duty Cycle	20% max
> Droop	2dB max@256µsec
> Propagation Delay	40nsec
> Time On	200nsec
> Time Off	300nsec
> Pulsewidth	256µsec max
> TX_INHIBIT [TTL]	150KHz PRFmax, 350nsec Pulse Width min

Typical Power Supply Requirements

> Voltage	[27÷29]V
> Current average	23 A max @15%
> Standby Current	2 A max
> Power Consumption	600W max @20%
> Power Dissipation	500 W max @20%

Note: Voltage [28V] is not referred to ground
TTL is referred to ground.
Chassis is ground connected

Physical Data

Mechanical

> Dimensions	228.6 x 177.8 x 40,2 mm
> Weight	3,5 kg max
> Cooling	70°C maximum baseplate temperature must be guarantee
> RF input connector	SMA female
> RF output connector	WR90 waveguide

Environmental

> Operative Temperature	[-40÷70]°C
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MHXA021-01

HIGH POWER SSPA X-BAND 500 W

Features

- > State of the art GaN technology
- > Frequency Range 8.5÷9.6 GHz
- > Output Power 500 W
- > Duty Cycle 20%
- > Pulse width up to 256µsec
- > Efficiency (typ.) 20%
- > Applications: Airborne, Naval and ground Radars



Electrical Data

RF Performance

> Frequency range	8.5 to 9.6 GHz
> Peak Output power	500 W (typ)
> Input drive power	[-1÷5] dBm
> Output Power flatness	1.5 dB max
> Harmonic output ratio	-35 dBc max
> Spurious	-60 dBc max
> Duty Cycle	15% max
> Droop	1.5dB max@150µsec
> Propagation Delay	40nsec
> Time On	200nsec
> Time Off	300nsec
> Pulsewidth	150µsec max
> TX_INHIBIT [TTL]	150KHz PRFmax, 350nsec Pulse Width min

Typical Power Supply Requirements

> Voltage	[27÷29]V
> Current average	20.6 A max @15%
> Standby Current	2 A max
> Power Consumption	400W max @15%
> Power Dissipation	360 W max @15%

Note: Voltage [28V] is not referred to ground
TTL is referred to ground.
Chassis is ground connected

Physical Data

Mechanical

> Dimensions	228.6 x 177.8 x 40.2 mm
> Weight	3.5 kg max
> Cooling	70°C maximum baseplate temperature must be guarantee
> RF input connector	SMA female
> RF output connector	WR90 waveguide

Environmental

> Operative Temperature	[-30÷70]°C
-------------------------	------------

MHXA022-02
HIGH POWER SSPA X-BAND 120 W

Features

>

Frequency range:8.5 to 11 GHz

>

Output Power:120 W

>

Duty Cycle:25%

>

Pulse Width:up to 256μsec

>

Efficiency (typ):20%

>

Applications:Airborne, Naval and Ground Radars



Electrical Data

RF Performance

>	Frequency range	8.5 to 11 GHz
>	Peak Output power	120 W (typ)
>	Input drive power	[-1÷5] dBm
>	Output Power flatness	1.5 dB max
>	Harmonic output ratio	-30 dBc max
>	Spurious	-50 dBc max
>	Duty Cycle	25% max
>	Droop	2dB max@256μsec
>	Propagation Delay	40nsec
>	Time On	200nsec
>	Time Off	300nsec
>	Pulsewidth	256μsec max
>	TX_INHIBIT [TTL]	150KHz PRFmax, 350nsec Pulse Width min

Typical Power Supply Requirements

>	Voltage	[27÷29]V
>	Current average	6 A max @25%
>	Standby Current	1 A max
>	Power Consumption	165W max @25%
>	Power Dissipation	145 W max @25%

Note: Voltage [28V] is not referred to ground
TTL is referred to ground.
Chassis is ground connected

Physical Data

Mechanical

>	Dimensions	228.6 x 177.8 x 30.5 mm
>	Weight	1.6 kg max
>	Cooling	70°C maximum baseplate temperature must be guarantee
>	RF input connector	SMA female
>	RF output connector	SMA female

Environmental

>	Operative Temperature	[-40÷70]°C
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MHXA024-02
HIGH POWER SSPA X-BAND 1 KW

Features

> State of the Art Gan Technology

> Frequency Range9÷10 GHz

> Output Power:1 kW

> Duty Cicle10% (15% 30sec)

> Pulse Widthup to 256 µsec

> Efficiency (typ)20%

> ApplicationsAirborne, Naval and Ground Radars



Electrical Data

RF Performance	
> Frequency range	9 to 10 GHz
> Peak Output power	1000 W (typ)
> Input drive power	[-1÷5] dBm
> Output Power flatness	1,5 dB max
> Harmonic output ratio	-30 dBc max
> Spurious	-50 dBc max
> Duty Cycle	10% (15% 30sec max)
> Droop	2dB max@256µsec
> Propagation Delay	20nsec
> Time On	200nsec
> Time Off	300nsec
> Pulswidth	256µsec max
> TX_INHIBIT [TTL]	200KHz PRFmax, 350nsec Pulse Width min

Typical Power Supply Requirements

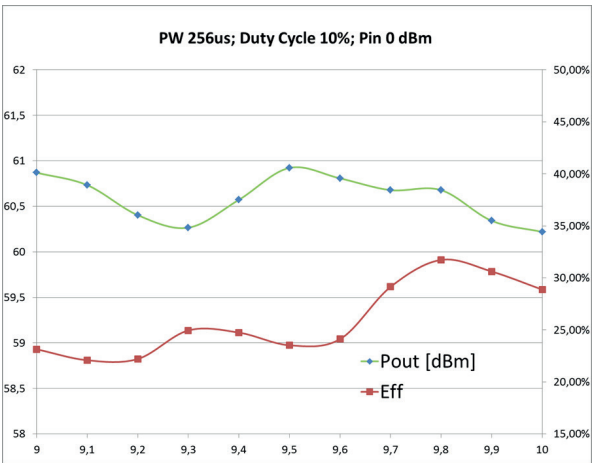
> Voltage	[27÷29]V
> Current average	20 A max @10%
> Standby Current	1,3 A max
> Power Consumption	560 W max @10%
> Power Dissipation	460 W max @10%

Physical Data

Mechanical	
> Dimensions	228,6 x 177,8 x 40,2 mm
> Weight	4,5 kg max
> Cooling	70°C maximum baseplate temperature must be guarantee
> RF input connector	SMA female
> RF output connector	WR90 waveguide

Environmental

> Operative Temperature [-40÷70]°C



MHXA026-01

HIGH POWER SSPA X-BAND 2KW

Features

- > State of the Art GaN Technology
- > Frequency range: 9 to 10 GHz
- > Output Power: 2 kW
- > Duty Cycle: 10% (15% 30sec)
- > PulseWidth: up to 256µsec
- > Efficiency (typ): 20%
- > Applications: Airborne, Naval and Ground Radars

Electrical Data

RF Performance

> Frequency range	9 to 10 GHz
> Peak Output power	2000 W (typ)
> Input drive power	[2÷8] dBm
> Output Power flatness	1,5 dB max
> Harmonic output ratio	-30 dBc max
> Spurious	-50 dBc max
> Duty Cycle	10% (15% 30sec max)
> Droop	2dB max@256µsec
> Propagation Delay	20nsec
> Time On	200nsec
> Time Off	300nsec
> Pulsewidth	256µsec max
> TX_INHIBIT [TTL]	200KHz PRFmax, 350nsec Pulse Width min

Typical Power Supply Requirements

> Voltage	[27÷29]V
> Current average	40 A max @10%
> Standby Current	2,6 A max
> Power Consumption	1120W max @10%
> Power Dissipation	920 W max @10%

Note: Voltage [28V] is not referred to ground
TTL is referred to ground.
Chassis is ground connected

Physical data

Mechanical

> Dimensions	300 x 280 x 180 mm
> Weight	10 kg max
> Cooling	Air forced (air ambient temperature max 55°C)
> RF input connector	SMA female
> RF output connector	WR90 waveguide

Environmental

- > Operative Temperature baseplate [-40÷55]°C

MHXA027-01
HIGH POWER SSPA X-BAND 700W

Features

>

State of the Art GaN Technology

>

Frequency range:8.5 to 11 GHz

>

Output Power:700 W

>

Duty Cycle:15%

>

PulseWidth:up to 256µsec

>

Efficiency (typ):20%

>

Applications:Airborne, Naval and Ground Radars



Electrical Data

RF Performance

>	Frequency range	8.5 to 11 GHz
>	Peak Output power	700 W (typ)
>	Input drive power	[-1÷5] dBm
>	Output Power flatness	1,5 dB max
>	Harmonic output ratio	-30 dBc max
>	Spurious	-50 dBc max
>	Duty Cycle	15% max
>	Droop	2dB max@256µsec
>	Propagation Delay	20nsec
>	Time On	200nsec
>	Time Off	300nsec
>	Pulsewidth	256µsec max
>	TX_INHIBIT [TTL]	200KHz PRFmax, 350nsec Pulse Width min

Typical Power Supply Requirements

>	Voltage	[27÷29]V
>	Current average	18 A max @15%
>	Standby Current	1 A max
>	Power Consumption	510W max @15%
>	Power Dissipation	405 W max @10%

Note: Voltage [28V] is not referred to ground
TTL is referred to ground.
Chassis is ground connected

Physical Data

Mechanical

>	Dimensions (mm)	228.6 x 177.8 x 40.2 mm
>	Weight	5 kg max
>	Cooling	70°C maximum baseplate temperature must be guarantee
>	RF input connector	SMA female
>	RF output connector	WR90 waveguide

Environmental

>	Operative Temperature baseplate	[-40÷70]°C
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MHKA002-01
HIGH POWER SSPA KU-BAND 400W

Features

>

State of the Art GaN Technology

>

Frequency range:13.5 to 14.5 GHz

>

Output Power:400W

>

Duty Cycle:20%

>

PulseWidth:up to 10µsec
(up to 256µsec possible)

>

Efficiency (typ):16%

>

Applications:Airborne, Missile, Naval
and Ground Radars

Electrical Data

RF Performance

> Frequency range	13.5 to 14.5 GHz
> Peak Output power	400 W (typ)
> Input drive power	[-1÷5] dBm
> Output Power flatness	1.5 dB max
> Harmonic output ratio	-30 dBc max
> Spurious	-50 dBc max
> Duty Cycle	20%
> Droop	2dB max@256µsec
> Propagation Delay 2	0nsec
> Time On	300nsec
> Time Off	300nsec
> Pulsewidth 10u max	(256µsec possible)
> TX_INHIBIT [TTL]	150KHz PRFmax, 400nsec Pulse Width min

Typical Power Supply Requirements

> Voltage	[100÷120]V
> Current average	20 A max @20%
> Standby Current	0,25 A max
> Power Consumption	600W max @20%
> Power Dissipation	530 W max @20%

Note: Voltage [110V] is not referred to ground
TTL is referred to ground.
Chassis is ground connected

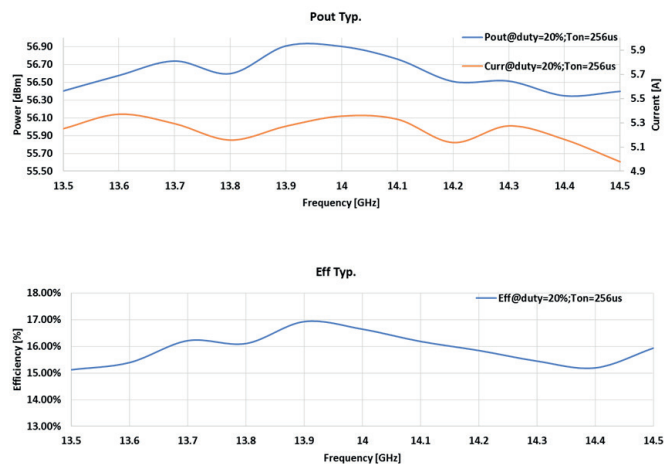
Physical Data

Mechanical

> Dimensions	204 x 134.5 x 61.3 mm
> Weight	4,5 kg max
> Cooling	70°C maximum baseplate temperature must be guarantee
> RF input connector	SMA female
> RF output connector	WR62 waveguide

Environmental

> Operative Temperature [-40÷70]°C



Preliminary Results

MHKA003-01

HIGH POWER SSPA KU-BAND 200W

Features

- > State of the Art GaN Technology
- > Frequency range: 16 to 17 GHz
- > Output Power: 200W
- > Duty Cycle: 15% (CW solution possible)
- > PulseWidth: up to 256µsec
- > Efficiency (typ): 20%
- > Applications: Airborne, Missile, Naval and Ground Radars

Electrical Data

RF Performance

> Frequency range	16 to 17 GHz
> Peak Output power	200 W (typ)
> Input drive power	[-1÷5] dBm
> Output Power flatness	1.5 dB max
> Harmonic output ratio	-30 dBc max
> Spurious	-50 dBc max
> Duty Cycle	15%
> Droop	2dB max@256µsec
> Propagation Delay	40nsec
> Time On	300nsec
> Time Off	300nsec
> Pulsewidth	256µsec max
> TX_INHIBIT [TTL]	150KHz PRFmax, 400nsec Pulse Width min

Typical Power Supply Requirements

> Voltage	[27÷29]V
> Current average	6.6 A max @15%
> Standby Current	1 A max
> Power Consumption	190W max @15%
> Power Dissipation	160 W max @15%

Note: Voltage [28V] is not referred to ground
TTL is referred to ground.
Chassis is ground connected

Physical Data

Mechanical

> Dimensions	228.6 x 177.8 x 40.2 mm
> Weight	4 kg max
> Cooling	70°C maximum baseplate temperature must be guarantee
> RF input connector	SMA female
> RF output connector	WR62 waveguide

Environmental

- > Operative Temperature [-40÷70]°C

MHKA004-01

HIGH POWER SSPA KU-BAND 100W

Features

- > State of the Art GaN Technology
- > Frequency range: 16 to 17 GHz
- > Output Power: 100W
- > Duty Cycle: 15% (CW solution possible)
- > PulseWidth: up to 256µsec
- > Efficiency (typ): 20%
- > Applications: Airborne, Missile, Naval and Ground Radars

Electrical Data

RF Performance

> Frequency range	16 to 17 GHz
> Peak Output power	100 W (typ)
> Input drive power	[-1÷5] dBm
> Output Power flatness	1.5 dB max
> Harmonic output ratio	-30 dBc max
> Spurious	-50 dBc max
> Duty Cycle	15%
> Droop	2dB max@256µsec
> Propagation Delay	40nsec
> Time On	300nsec
> Time Off	300nsec
> Pulsewidth	256µsec max
> TX_INHIBIT [TTL]	150KHz PRFmax, 400nsec Pulse Width min

Typical Power Supply Requirements

> Voltage	[27÷29]V
> Current average	3.3 A max @15%
> Standby Current	1 A max
> Power Consumption	95W max @15%
> Power Dissipation	80 W max @15%

Note: Voltage [110V] is not referred to ground
TTL is referred to ground.
Chassis is ground connected

Physical Data

Mechanical

> Dimensions	228.6 x 177.8 x 40.2 mm
> Weight	4 kg max
> Cooling	70°C maximum baseplate temperature must be guarantee
> RF input connector	SMA female
> RF output connectore	WR62 waveguide

Environmental

> Operative Temperature	[-40÷70]°C
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MHXA013-01 HL-LNA HIGH LEVEL LOW NOISE AMPLIFIER X-BAND WITH T/R LIMITER

Features

- > State of the Art GaN Technology
- > Frequency range: 9 to 10 GHz
- > NF: 2.7 dB
- > Gain: 29dB
- > TOL: 23dBm
- > Max_In_Peak_Power@20%duty: 250W
- > Applications: Airborne, Naval and Ground Radars



Electrical Data

RF Performance

> Frequency range	9 to 10 GHz
> Noise Figure	2.7 dB(typ)
> Max_In_Peak_Power	250 W @20%
> SSG flatness (J1-J3)	30 dB (typ)
> SSG flatness (J1-J3)	-2dB max
> VSWR (J1)	1.7:1
> VSWR (J2, J3)	1.4:1
> I.L (J2-J3)	0dB (typ)
> TTL COMMANDS configurations	S1=S2=0 logic (receiver path J1-J3) S1=S2=1 (Calibration path J2-J3) S1=1;S2=0 (Blanking status J3 isolated)
> Switching Speed	300nsec
> Time Off	300nsec
> Spurious	90dBc
> Out of band response	See table below

Typical Power Supply Requirements

> Voltage	[+12]V [-12]V
> Current average	450mA @ +12V 150mA @ -12V
> Logic COMMANDS S1,S2 TTL	
> Power Consumption	7.2W max

Note: The unit perform as shown when driven by an input signal in the frequency range specified with a power level up to -20 dBm

Voltage and TTL Command are referred to ground
Chassis is ground connected

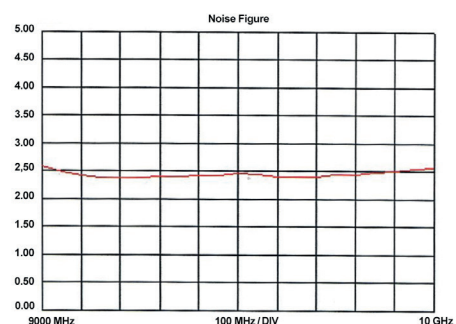
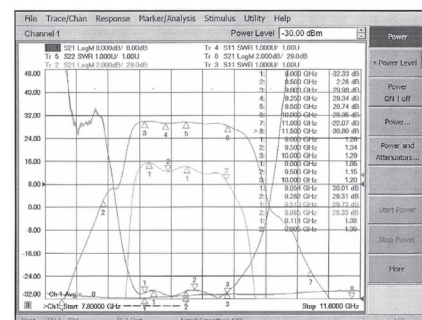
Physical Data

Mechanical

> Dimensions (mm)	150 x 41.28 x 41.28 mm
> Weight	300g max
> Cooling	85°C maximum baseplate temperature must be guarantee
> RF input connector	WR90 waveguide
> DC supply & TTL signals	Micro D 9 pins female
> RF output connector	SMA female

Environmental

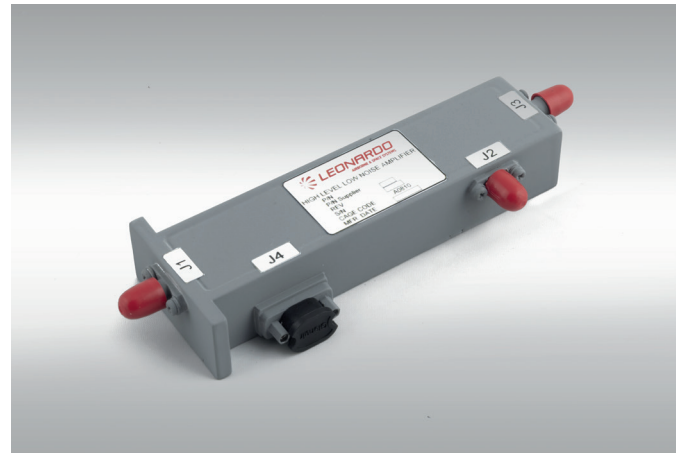
- > Operative Temperature [-40÷85]°C;
- > Operating in relative Humidity range; [0÷95]%RH (non-condensing)



MHXA015-01 HL-LNA HIGH LEVEL LOW NOISE AMPLIFIER X-BAND WITHOUT T/R LIMITER

Features

- > State of the Art GaN Technology
- > Frequency range: 9 to 10 GHz
- > NF: 2 dB
- > Gain: 30 dB
- > TOL: 23 dBm
- > Max_In_Peak_Power@20%duty: 20dBm
- > Applications: Airborne, Naval and Ground Radars



Electrical Data

RF Performance

> Frequency range	9 to 10 GHz
> Noise Figure	2 dB (Typ)
> Max_In_Peak_Power	0.1W@20%
> SSG flatness (J1-J3)	30 dB (typ)
> SSG flatness (J1-J3)	-2dB max
> VSWR (J1)	1.5:1
> VSWR (J2, J3)	1.4:1
> I.L (J2-J3)	0dB (typ)
> TTL COMMANDS configurations	S1=S2=0 logic (receiver path J1-J3) S1=S2=1 (Calibration path J2-J3) S1=1;S2=0 (Blanking status J3 isolated)
> Switching Speed	300nsec
> Time Off	300nsec
> Spurious	90dBc
> Out of band response	See table below

Typical Power Supply Requirements

> Voltage	[+12]V [-12]V
> Current average	450mA @ +12V 150mA @ -12V
> Logic COMMANDS S1,S2	TTL
> Power Consumption	7.2W max

Note:

The unit perform as shown when driven by an input signal in the frequency range specified with a power level up to -20 dBm

Voltage and TTL Command are referred to ground
Chassis is ground connected

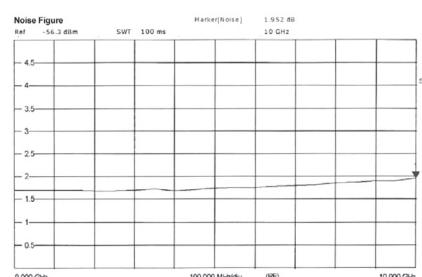
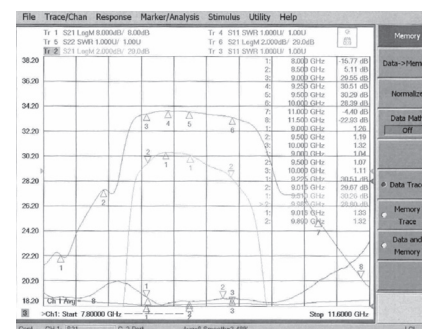
Physical Data

Mechanical

> Dimensions	150 x 41.28 x 41.28 mm
> Weight	300g max
> Cooling	85°C maximum baseplate temperature must be guarantee
> RF input connector	WR90 waveguide
> DC supply & TTL signals	Micro D 9 pins female
> RF output connector	SMA female

Environmental

- > Operative Temperature [-40÷85]°C;
- > Operating in relative Humidity range; [0÷95]%RH (non-condensing)



MHXS002-01
FREQUENCY SYNTHESIZER

Features

> Low Phase Noise -117dBc/Hz @ 10KHz

> 500 MHz Bandwidth, 50 CHs

> Fast Switching

> Compact Size.



Description

The Module is a low phase noise, wideband, compact, fast switching synthesizer, for airborne and other defence applications. It contains direct and indirect frequency synthesis, in order to provide high stable frequency references switched in less than 1 us.

Electrical Data

RF Performance	
> Output Frequency	X-Band
> RF Output Power	10dBm
> Phase Noise @ 100 KHz (Typ)	117dBc/Hz
> Harmonics @ 2F0	40dBc
> Harmonics @ 3F0	40dBc
> Spurious Rejection Fo± 2 MHz	90 dBc
> Spurious Rejection F<12GHz	70 dBc
> Spurious Rejection F<20GHz	55 dBc
> Switching Speed	Typ. 1us
> Frequency Stability	25ppm
> VSWR	1.5:1

Interface

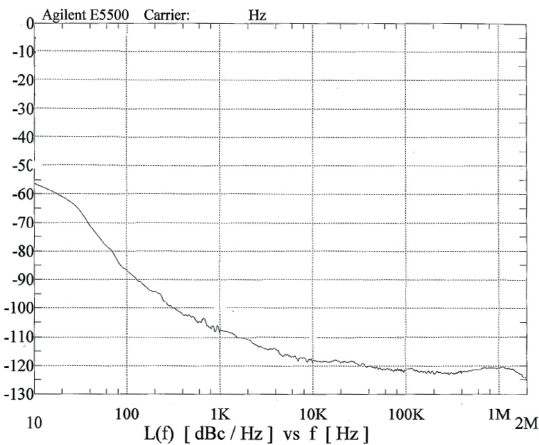
> Monitor	Pout Lock Bit
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Physical Data

Mechanical	
> Dimension	150 x 110 x 60 mm
> Weight	1800g (max)
> RF Input Connector	SSMC
> RF Output Connectors	SMA
> DC Input Connectors	15 pin D-subminiature
> Control Connectors	15 pin D-subminiature

Environmental	
> Operative Temperature	54 to +85°C
> Humidity	MIL-STD-810E, m. 507.3, proc. I
> Shock	15g, 11ms
> Vibration	0.01 g2/Hz from 10 to 65Hz 0.15 g2/Hz from 80 to 90Hz 1*10-6 g2/Hz @ 2000Hz

Typical Phase Noise curve @ 25°C X Band Frequency



MHXU002-01 UP CONVERTER

Features

- > State of the Art GaN Technology
- > Out_PWR_Lvl (J3,J4): 10±2dBm
- > Out_PWR_Lvl (J5): 3±2dBm
- > Applications: Airborne, Naval and Ground Radars
- > Four operation a mode



Electrical Data

RF Performance

> Frequency range	See table 1
> Group Delay	12nsec
> Superimposed ripple to Group Delay	0.2nsec max
> Group Delay matching J3;J4 mode #3	1 nsec max
> Amplitude matching J3;J4 mode #3	0.5 dB max
> VSWR (all RF ports)	1.3:1
> LO-IN Signal Rejection mode #1,#2,#3 vs converted signal	25dBc
> Image Rejection vs “Desired Signal” mode #1,#2, #3	40dBc
> Spurious rejection for 8540+mFIF_IN	See table 2
> Switching speed between operating mode	200nsec
> Output port isolation	30dB min

Typical Power Supply Requirements

> Voltage	[+7.5]V [-7.5]V
> Current average	650mA @ +7.5V 50mA @ -7.5V
> Logic COMMANDS S1,S2	TTL
> Power Consumption	5.3W max

Physical Data

Mechanical

> Dimensions	116 x 84 x 20 mm
> Weight	550g max
> Cooling	85°C maximum baseplate temperature must be guarantee
> RF input connector	SMP Male
> RF output connector	SMP Male
> DC supply & TTL signals	Cannon 15 pins Plug

Environmental

- > Operative Temperature [-40÷85]°C;
- > Operating in relative Humidity range; [0÷95]%RH (non-condensing)

MHWRU001-01

WIDE BAND FRONT END

Features

- > Wide band range frequency: 0.8-20GHz
- > Low noise: <15dB @20 GHz
- > High Spurious rejection > 50dB type
- > High Dynamic range: 70 dB
- > 8 Channel Switched Filter Bank
- > Controlled Attenuator for dynamic extension.

Description

The Module is a Wide Band Front End intended for different applications such as RWR, AOR, and other ECM / ESM applications. The Front End is qualified for different harsh environments such as airborne, missile and other aerospace and defence applications.

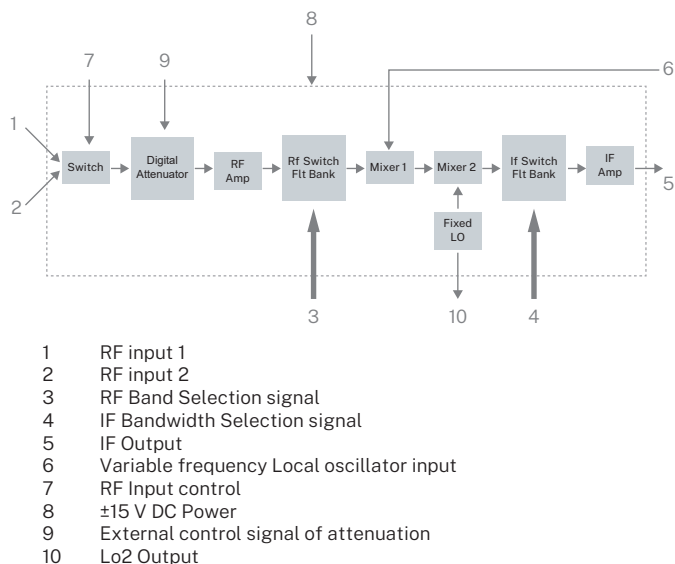
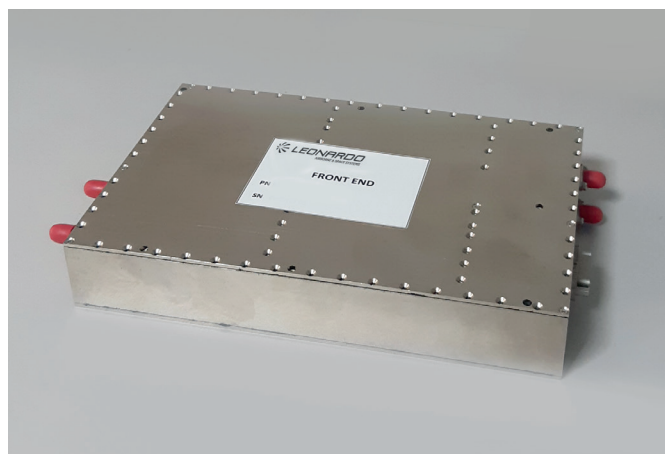
It operates with a RF input signal which spans in the 0.8-20 GHz range.

The RF input signal is down converter in two steps at IF output frequency at 1GHz. The RF chain includes a controlled attenuator in order to extend the dynamic range up to 100dB, and an 8 channel RF switched filter bank. An internal LO source is included for the second conversion while the first conversion is performed by an external LO. Output IF signal bandwidth can be selected as well, from 500MHz bandwidth to 50 MHz.

Electrical Data

RF Performance

> Frequency range	0.8-20GHz
> IF Output	1GHz
> IF Bandwidth	500, 250, 50 (MHz)
> Switched filter bank channel	8
> Gain.(over freq. & temp. range	7 ± 3dB
> Istantaneus Dynamic range	70 dB
> Input 1dB Compression	10 dBm
> Spurious	50dBc(Typ)
> Noise Figure	15 dB
> Dynamic Range extension	30dB (10dB steps)
> LO1 input (+3dBm ± 3dB	5.9-16.9GHz
> Power Supply	1,5 A @+15V 0,5 A @ -15V



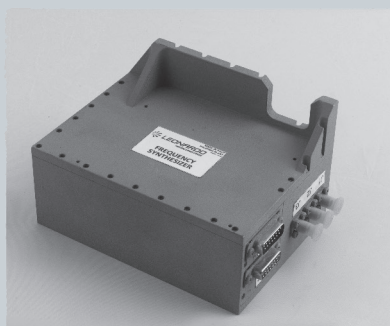
Physical Data

Mechanical

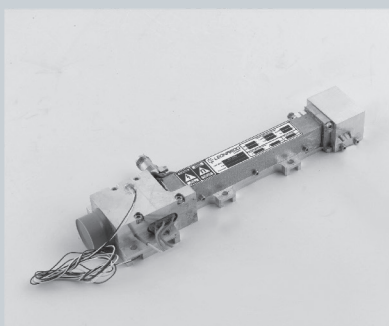
> Dimension	190 x 120 x 30 mm
> Weight	1500g (max)
> RF Connector	SMA
> DC & Control Connectors	21 pin D-subminiature

Environmental

> Operative Temp.	40 to +54°C
> Humidity	MIL-STD-810E, m. 507.3, proc. III
> Shock	15g, 11ms
> Vibration	0.005 g2/Hz from 20 to 79Hz 0.024 g2/Hz from 380 to 1380Hz 0.016 g2/Hz @ 2000Hz



Microelectronics hybrids



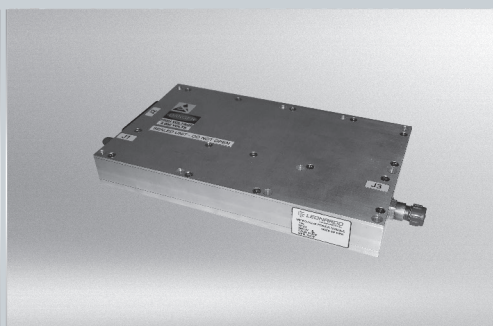
Mini TWT



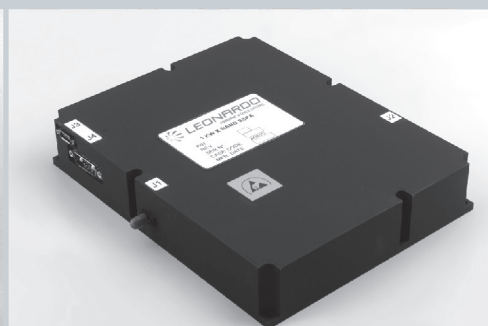
Coupled Cavity TWT



Helix TWT



Microwave Power Module (MPM)



Solid State Power Amplifier (SSPA)

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