

ELECTRONICS DIVISION

# MICROWAVE POWER SOLUTIONS

LEONARDO



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:

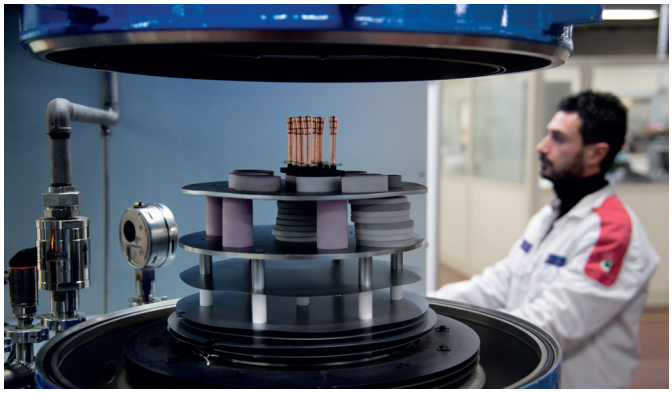
- Seekers and threat simulators;
- SAR (synthetic aperture radar) for standoff airborne application or EO (earth observation) space payloads;
- ATM (Air Traffic Management) systems and wheatear forecast ground radar.

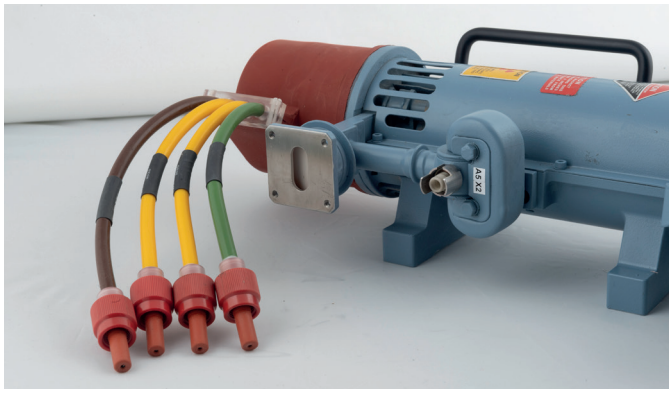
C-Band, X-Band, Ku-Band & CC TWT for:

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









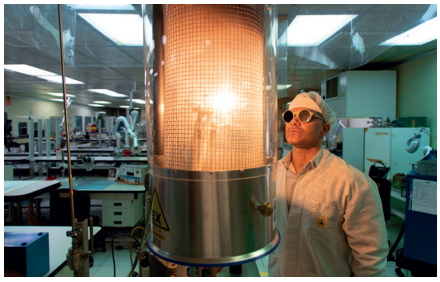
| Type | Frequency Range | Power Output | Cathode voltage | Cathode current | Duty Cycle | Cooling | Focussing |
|---|---|---|---|---|---|---|---|
| ET948 | 5.3 to 5.8 GHz | 120 kW | -46 kV | 14.5 A | 8% max | Liquid | solenoid |
| ET960 | 8.5 to 9.5 GHZ | 12 kW | -22 kV | 4 A | 2.7% max | Forced air | 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



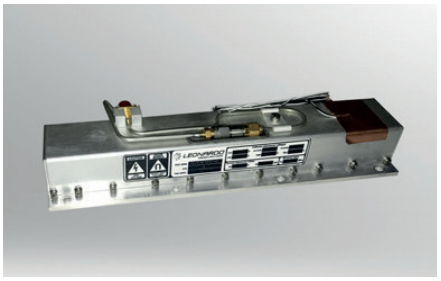



| Type | Frequency range | Power Output | Cathode voltage | Cathode current | Duty Cycle |
|---|---|---|---|---|---|
| ET3201 | 1 to 2 GHz | 280 W | -3.6 kV | 475 mA | CW |
| ET3301 | 2 to 4 GHz | 250 W | -4.2 kV | 450 mA | CW |
| ET3407 | 4 to 8 GHz | 280 W | -8 kV | 320 mA | CW |
| ET3602 | 27.5 to 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





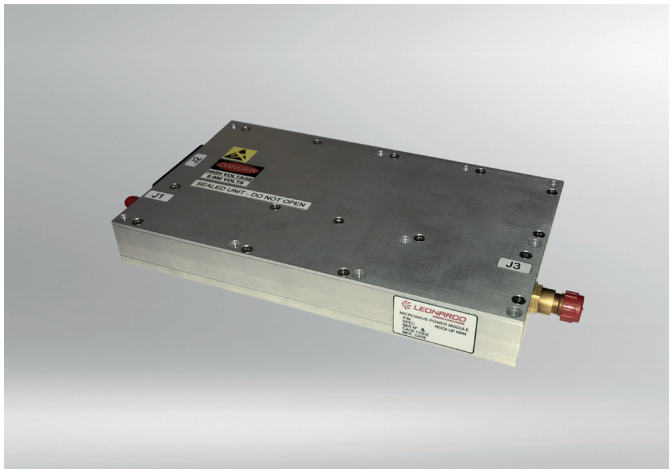
| Type | Frequency range | Power Output | Cathode voltage | Cathode current | Duty Cycle | Control Electrode |
|---|---|---|---|---|---|---|
| ET3580 | 4.5 to 18 GHz | 150 W | -4.5 kV | 230 mA | up to CW | Focus |
| ET5515 | 13.5 to 14.0 GHz | 370Wpk | -8.9 kV | 250 mA | 25% max | Grid |
| ET5530 | 9 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.

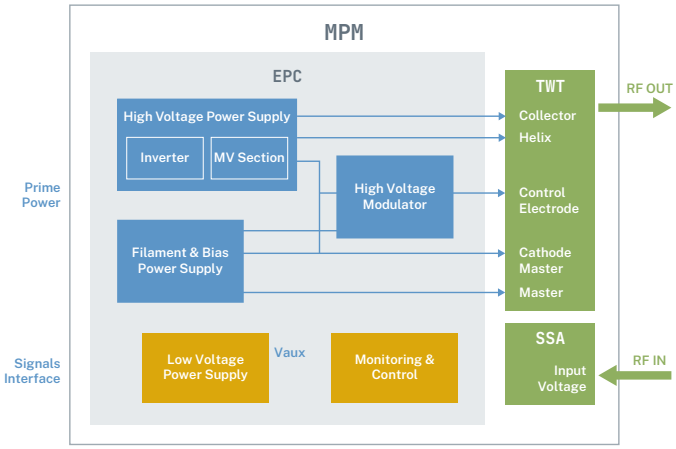
All the parts are packaged into a single compact, lightweight housing. With respect to traditional TWT-Amplifiers, the MPM is much smaller, lighter, more efficient, with significant noise reduction.

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 efficient of these SSPAs is outstanding because the amplifiers are based on a proprietary novel power combining network that enable the compact outline line and light weight.

## Applications for Airborne, Surface and Missile platforms

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

## Key Features

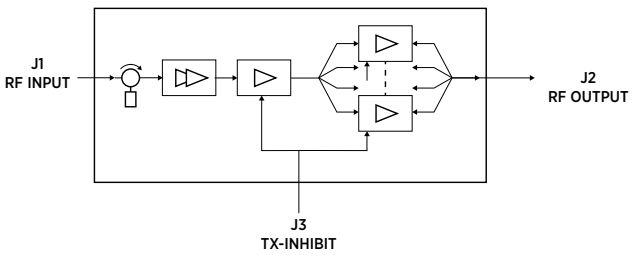
The amplifiers are designed for:
- 70 dB typical small signal gain
- -40°C to +70°C operating baseplate temperat. (TBP)
- Output power flatness 1dB (typ.)
- -30dBm/MHz noise power density (typ.)
- Very long pulse width

Several control bite 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% | 228,6x 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 µW 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

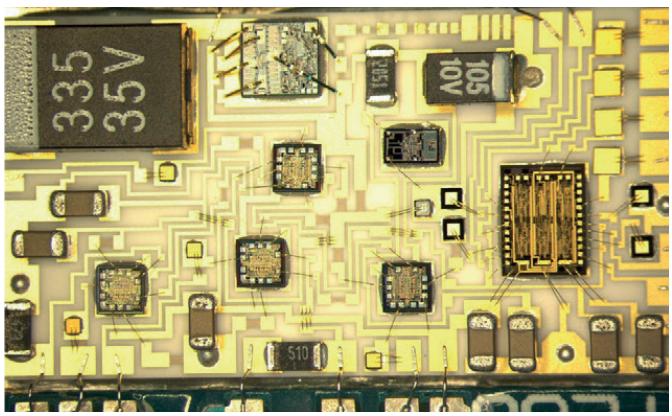
## Active Components

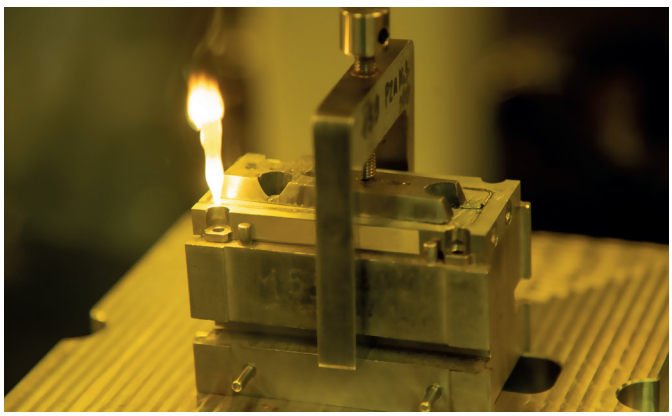
- Compact Receivers
- Multifunction Hybrids (HPA, TTD, Switch matrix, etc...)
- Antenna Subsystem (Planks, Panels & Manifolds)

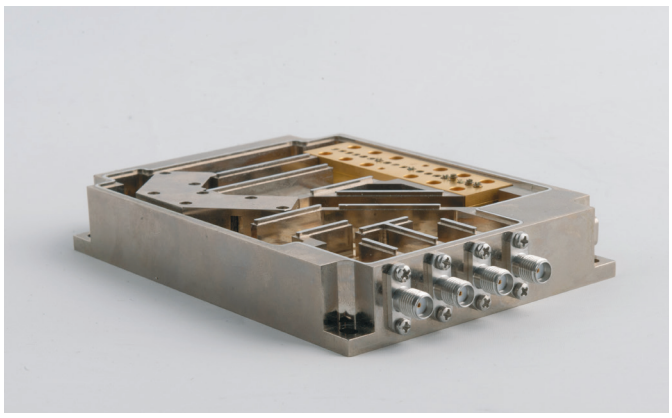
## Radar and EW component and subsystem

- 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 |











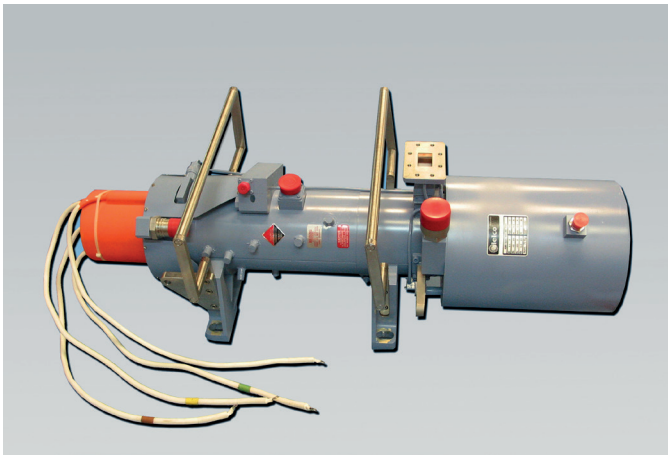
# PRODUCTS CATALOGUE


PA30

# 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)<br>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

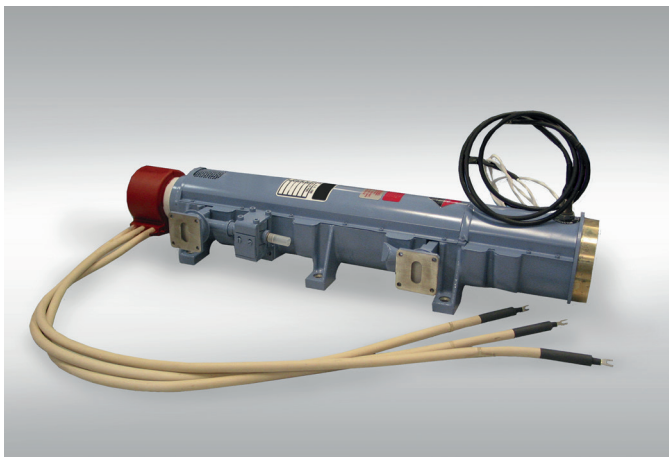
### Mechanical

| | |
|---|---|
| Weight | 75kg max |
| Cooling | Liquid |
| Dimensions | 920 x 290 x 300 mm<br>(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)<br>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

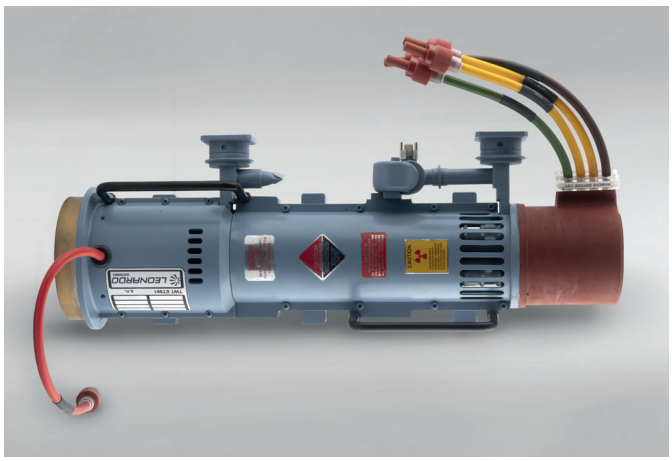
### Mechanical

| | |
|---|---|
| Mounting position | Any |
| Weight | 8kg |
| Cooling | Forced air |
| Dimensions | 570 x 136 x 104 mm<br>(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)<br>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

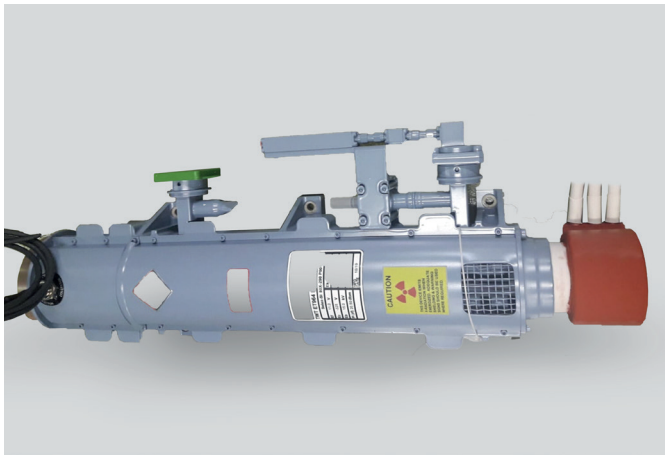
### Mechanical

| | |
|---|---|
| Mounting position | Any |
| Weight | 6.5kg |
| Cooling | Forced air |
| Dimensions | 455 x 120 x 120 mm<br>(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)<br>270V (beam on) |
| Grid current | 10mA |
| Collector voltage | -First stage 13.9kV<br>-Second stage 9.4kV |
| Collector current | 3.5A<br>First stage (with RF) 1.5A<br>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<br>(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<br>9.7 kV 2nd stage |
| Collector Currents (max): | 1.6 A 1st stage (with RF)<br>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 |

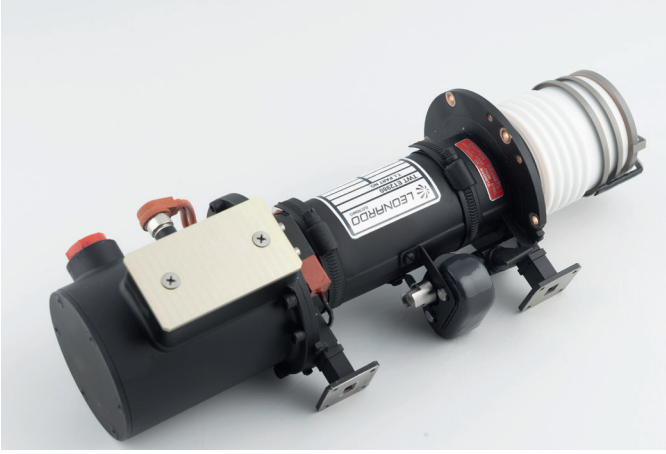
### Environmental

- 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)<br>270V (beam on) |
| Grid current | 10mA |
| Collector voltage | First stage 17kV<br>Second stage 14kV |
| Collector current | 3.5A<br>first stage (with RF) 0.4A<br>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<br>(excluding connectors) |
| Mounting position | Any |
| Weight | 5kg |
| Cooling | Liquid |
| R.F. input Waveguide | UG-419 |
| R.F. output Waveguide | UG-419 |

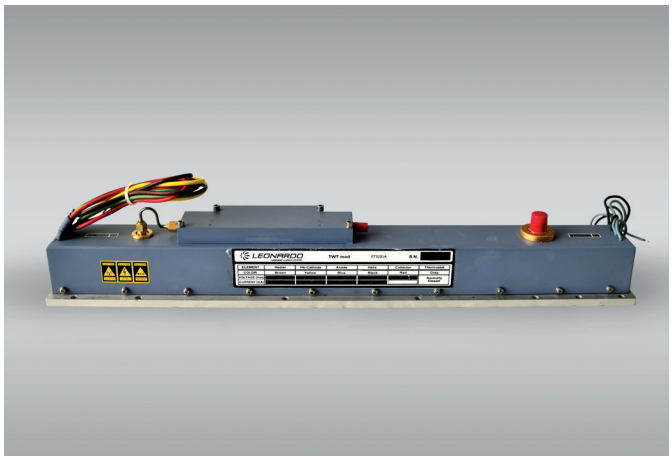
### Environmental

- 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
- Output Power: 280 W
- 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 |

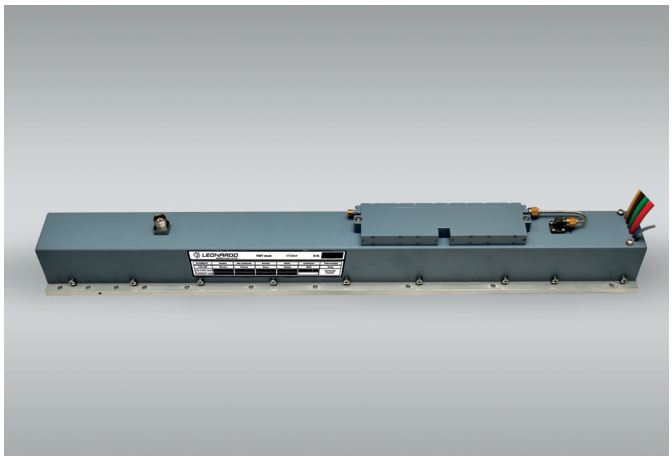
### Environmental

- 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
- 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 |

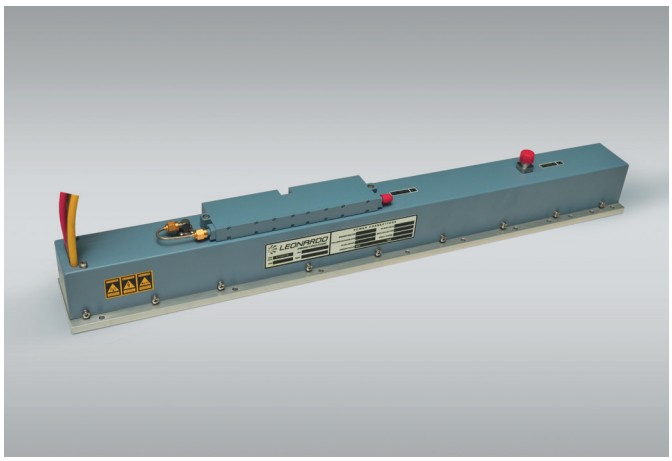
### Environmental

- 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<br>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 |

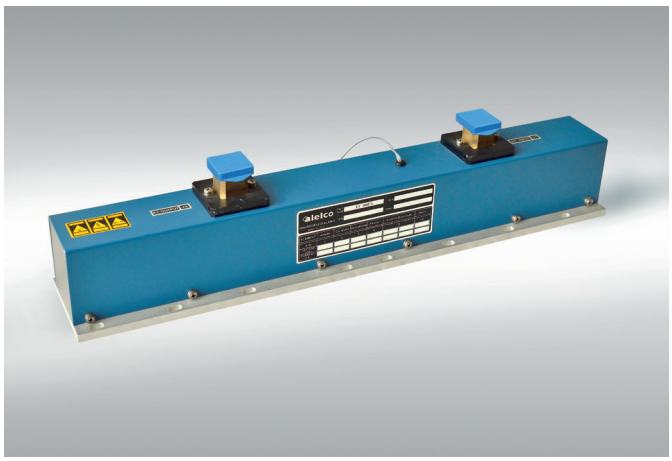
### Environmental

- 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)<br>0.5dB max (any 110MHz) |
| Gain slope | ±0.01 dB/MHz max |
| AM/PM conversion backoff) | 5°/dB max (at 6dB |
| Third order intermodulation | -27dBc max<br>(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)<br>-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<br>(excluding connectors) |
| Weight | 3.2kg max |
| Cooling | By conduction |
| RF input connector | UG 599/U |
| RF output connector | |

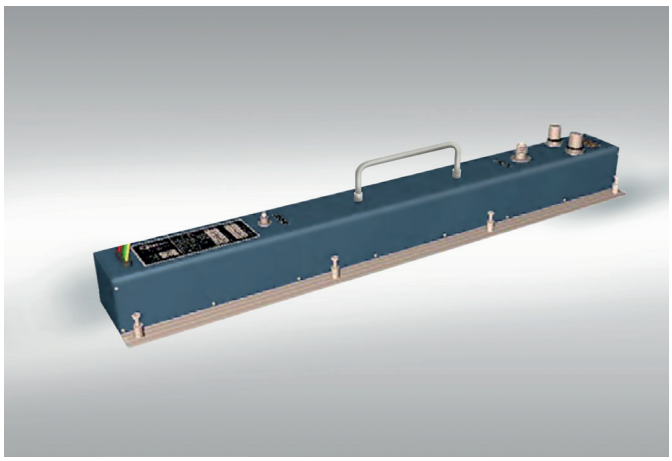
### Environmental

- 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)<br>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<br>(excluding connectors) |
| Weight | 9Kg max |
| Cooling | Liquid |
| RF input connector | SMA female |
| RF output connector | SC female |

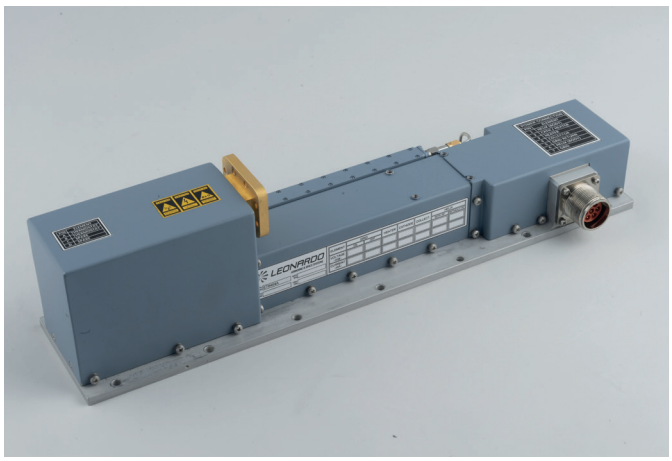
### Environmental

- 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)<br>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<br>(excluding connectors) |
| Weight | 3.2kg max |
| Cooling | By conduction |
| RF input connector | SMA female |
| RF output connector | WRD 475 |

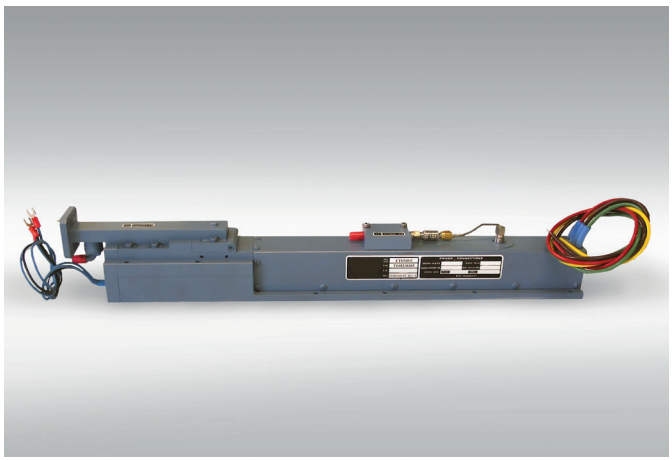
### Environmental

- 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)<br>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<br>(excluding connectors) |
| Weight | 2.5kg max |
| Cooling | By conduction |
| RF input connector | SMA female |
| RF output connector | WRD 750 |

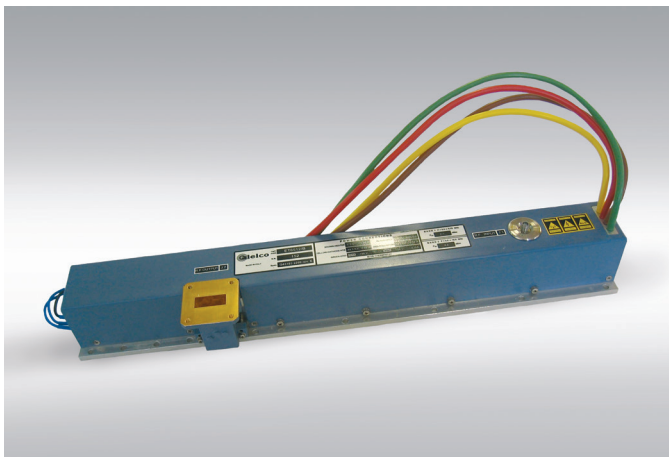
### Environmental

- 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<br>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<br>(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)<br>180V (beam on) |
| Grid current | 5mA |
| Collector Voltage | 8kV (first stage)<br>4kV (second stage) |
| Collector current | 0.7A first stage (with rf)<br>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<br>(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 Cicle 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)<br>130 to 200V (beam ON) |
| Grid current 0 mA | |
| Collector Voltages: | 65 to 71 % of Ek 1st stage<br>32 to 38 % of Ek 2nd stage |
| Collector Currents: | 0.6 A 1st stage)<br>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<br>(including connectors) |
| Weight | 2 kg max |
| Cooling | Conduction |
| RF input connector | SMA female |
| RF output connector | TNC female |

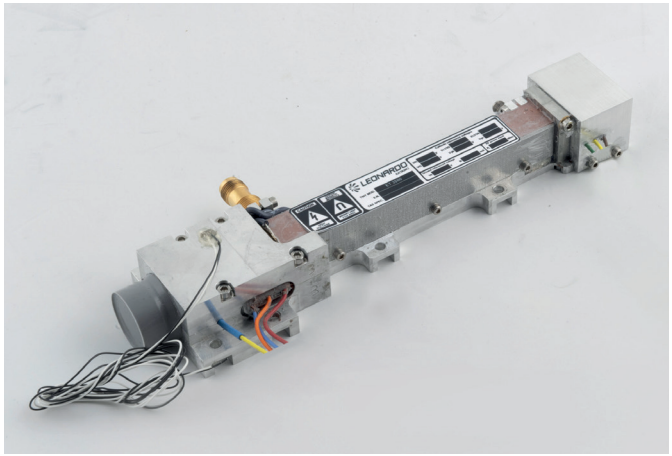
### Environmental

- 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<br>-7 dBc at 6 GHz<br>-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)<br>0V (beam ON) |
| BFE current | 0 mA max |
| Collector Voltages: | 2.85 kV 1st stage<br>2 kV 2nd stage<br>1 kV 3rd stage |
| Collector Currents: | 150 mA 1st stage (with RF)<br>90 mA 2nd stage (with RF)<br>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.

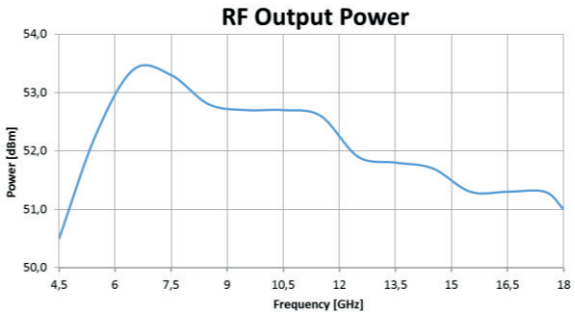
## Physical Data

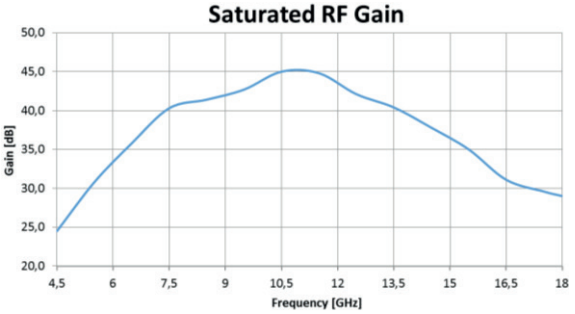
### Mechanical

| | |
|---|---|
| Dimensions | 220 x 50 70 mm<br>(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.

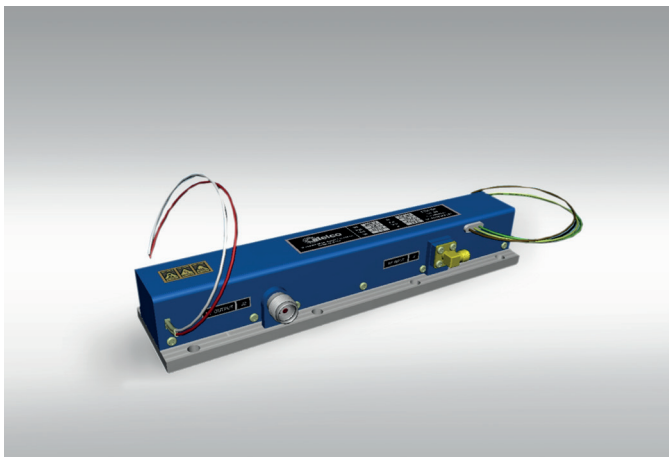


# ET5515
# KU-BAND PULSED MINI TWT

## 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)<br>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)<br>105V (beam on) |
| Grid current 1 0mA | |
| Collector Voltage (second stage) | 4.4kV (first stage)2.7kV |
| Collector current | 160mA first stage (with rf)<br>200mA second stage (no rf) |
| Heater voltage | 9.0V fast warm up (3 sec overvolt)<br>5.5V steady state |
| Heather Current | 6A (surge) |
| Heather 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<br>(excluding connectors) |
| Weight | 0.45kg max |
| Cooling | By conduction |
| RF input connector | SMA female |
| RF output connector | TNC female |

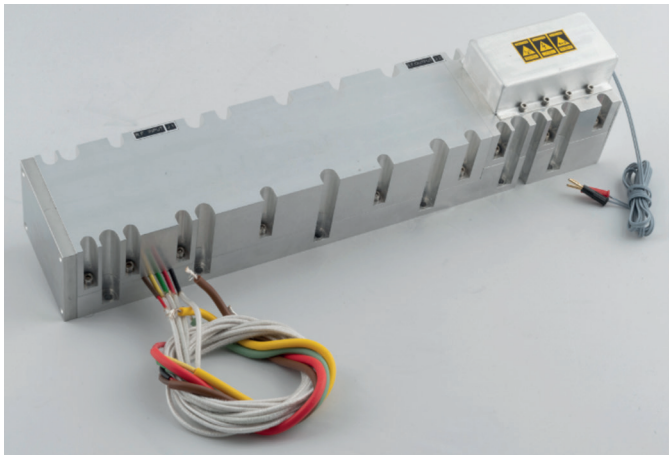
### Environmental

- 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 |

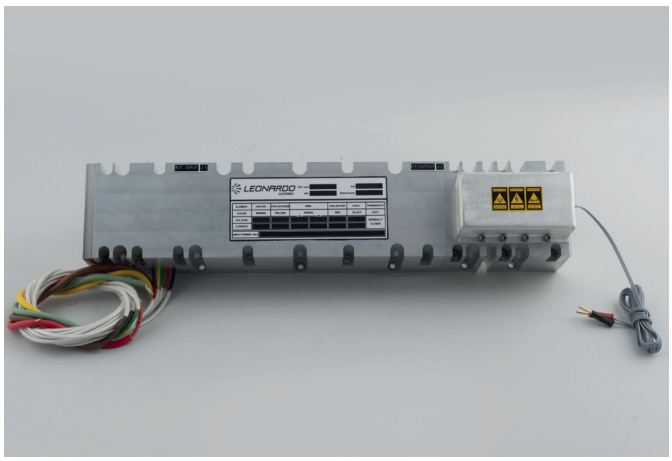
### Environmental

| | |
|---|---|
| Operative Temperature | -15÷85°C |

# 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 |

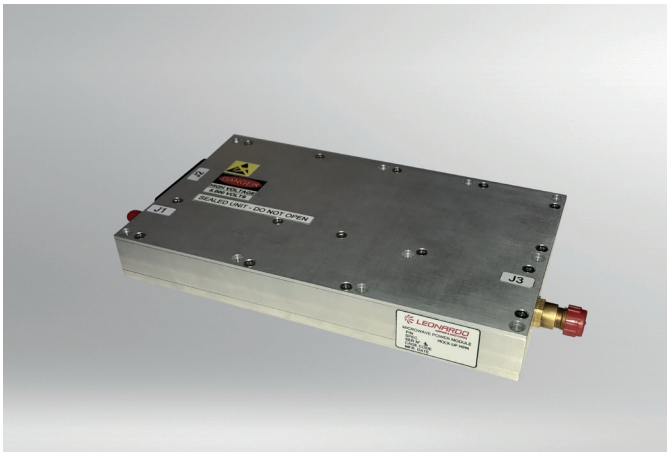
### Environmental

| | |
|---|---|
| Operative Temperature | -15÷85°C |

# 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<br>550 W max |

### Interfaces & Protections

| | |
|---|---|
| Controls TTL | |
| Monitors | MPM Status<br>Fault disable<br>Helix current<br>TWT temperature |
| Protections | Cathode over & under voltage Helix over current<br>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<br>11 msec |
| Acceleration | 3.6 g |
| Vibration | 20 ÷ 1000 Hz<br>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<br>>7 GHz -5.5 dBc max |
| Spurious | -40 dBc max |
| Noise power density | -25 dfBm/MHz |
| Duty Cycle | 100% |
| Prime Power | -270 V DC<br>640 W max |

### Interfaces & Protections

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

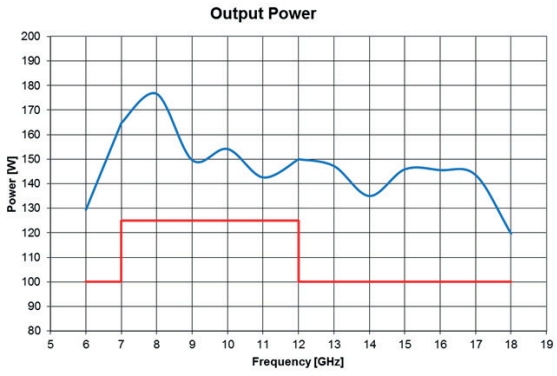
## Physical Data

### 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<br>CBM43W2M2000S-S1414 |

### Environmental

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

# 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 Cicle 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 Range 9÷9.6 GHz
- Output Power 500 W
- Duty Cicle 20%
- Pulse width 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 | 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 |

# 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 Cicle 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

# MHXA024-02
# HIGH POWER SSPA X-BAND 1 KW

## Features

- State of the Art Gan Technology
- Frequency Range 9÷10 GHz
- Output Power: 1 kW
- Duty Cicle 10% (15% 30sec)
- Pulse Width up to 256 µsec
- Efficiency (typ) 20%
- Applications Airborne, 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 |
| Pulsewidth | 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% |

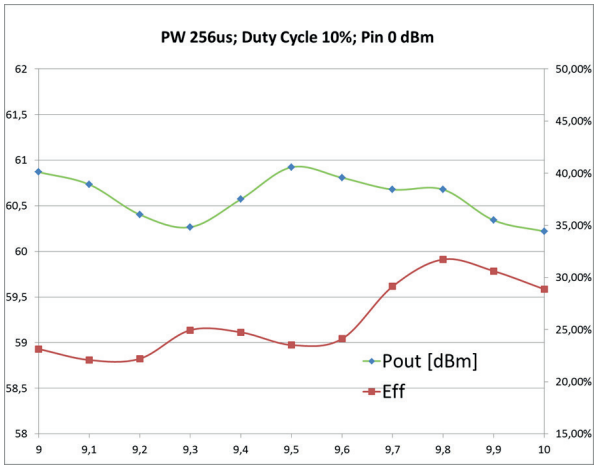
## Physical Data

### 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

# 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

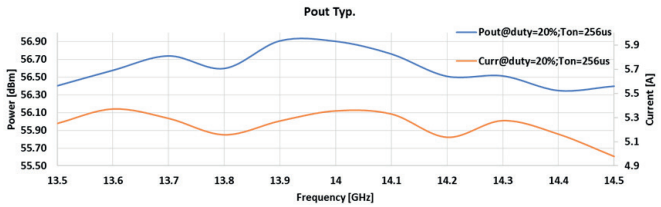
## Physical Data

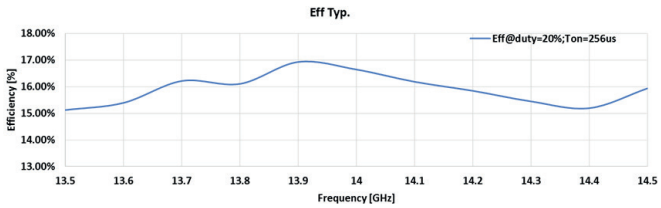
### Mechanical

| | |
|---|---|
| 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 |

# 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
- TOI: 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)<br>S1=S2=1 (Calibration path J2-J3)<br>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<br>[-12]V |
| Current average | 450mA @ +12V<br>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

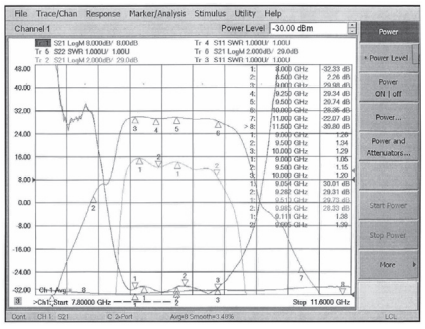
## Physical Data

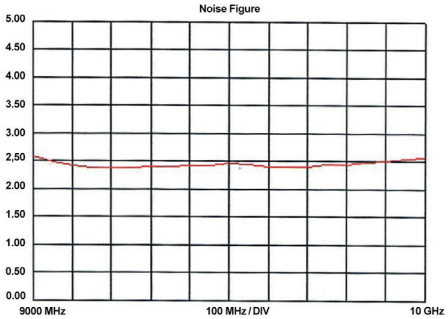
### Mechanical

| | |
|---|---|
| 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) | |

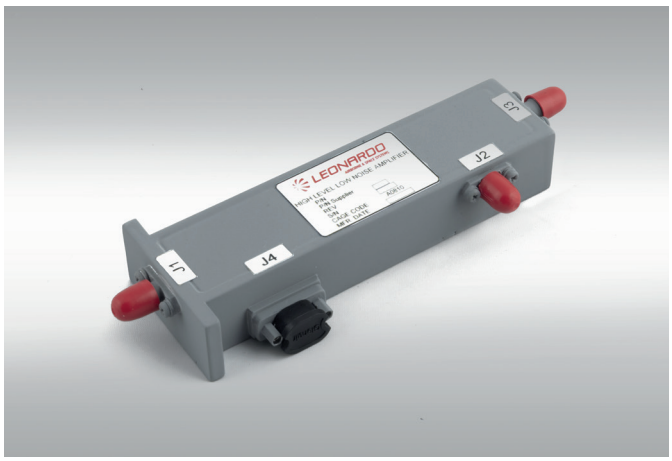




# MHXA015-01 HL-LNA
# HIGH LEVEL LOW NOISE AMPLIFIER X-BAND WITHOUT T/R LIMITER

## Features

- State of the Art GaN Technology
- Frequency range: 9 to 10 GHz
- NF: 2 dB
- Gain: 30 dB
- TOI: 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)<br>S1=S2=1 (Calibration path J2-J3)<br>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<br>[-12]V |
| Current average | 450mA @ +12V<br>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

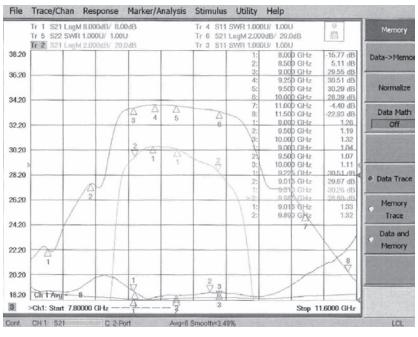
## Physical Data

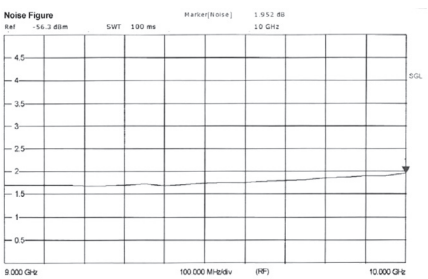
### Mechanical

| | |
|---|---|
| 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 Bandwith, 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<br>Lock Bit |

## Physical Data

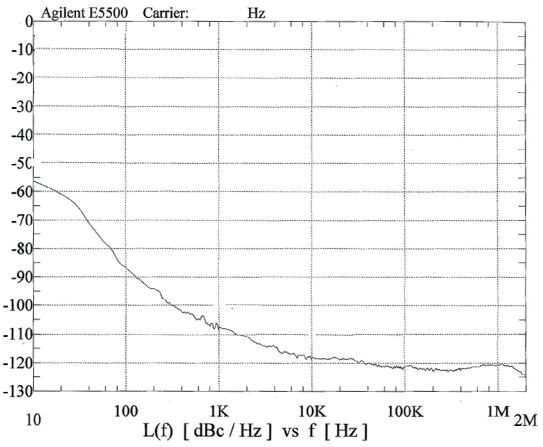
### Mechanical

| | |
|---|---|
| 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<br>0.15 g2/Hz from 80 to 90Hz<br>1*10-6 g2/Hz @ 2000Hz |

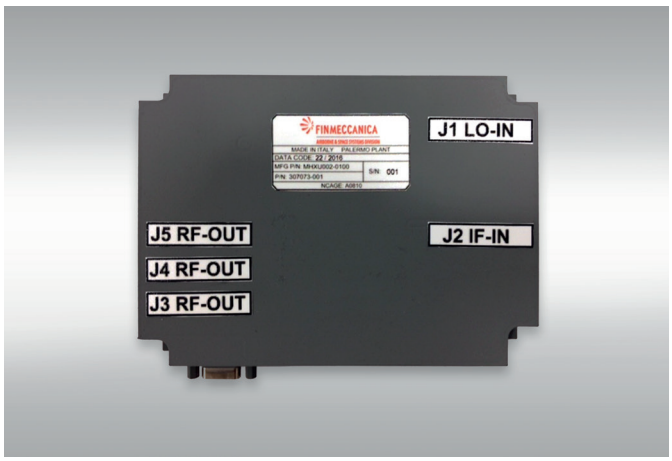
Typical Phase Noise curve @ 25°C X Band Frequency



# 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<br>[-7.5]V |
| Current average | 650mA @ +7.5V<br>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 |

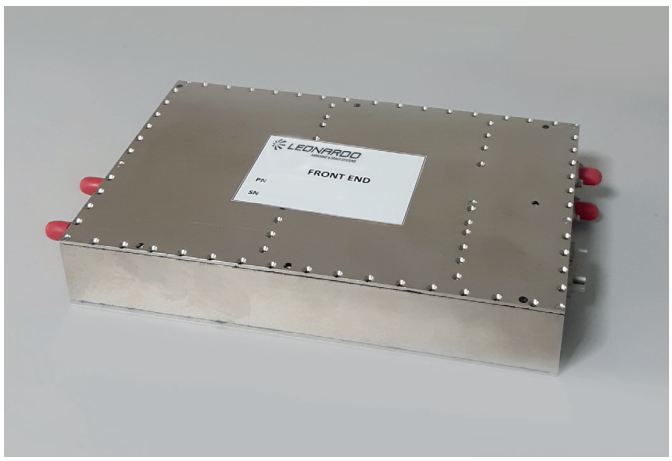
### Environmental

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

# MHWRU001-01
# WIDE BAND FRONT END

## Features

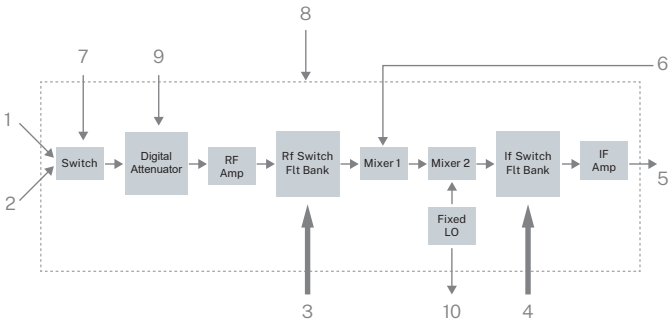
- Wide band range frequency: 0.8-20GHz
- Low noise: <15dB @20 GHz
- High Spurious rejection > 50dB type
- High Dynamic range: 70 dB
- 8 Channel Switched Filter Bank
- Controlled Attenuator for dynamic extension.




## 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.




1 RF input 1
2 RF input 2
3 RF Band Selection signal
4 IF Bandwidth Selection signal
5 IF Output
6 Variable frequency Local oscillator input
7 RF Input control
8 ±15 V DC Power
9 External control signal of attenuation
10 Lo2 Output

## Electrical Data

### RF Performance

| | |
|---|---|
| Frequency range | 0.8-20GHz |
| IF Output | 1GHz |
| IF Bandwith | 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<br>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 |

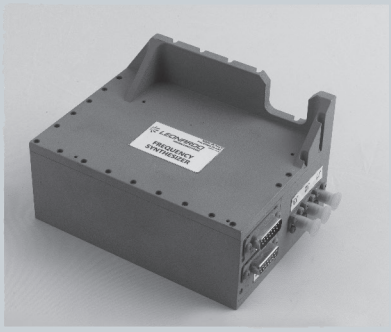
### Environmental

| | |
|---|---|
| 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<br>0.024 g2/Hz from380 to 1380Hz<br>0.016 g2/Hz @ 2000Hz |

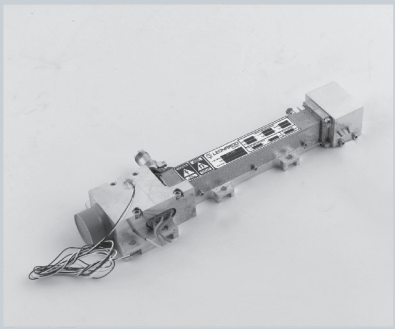






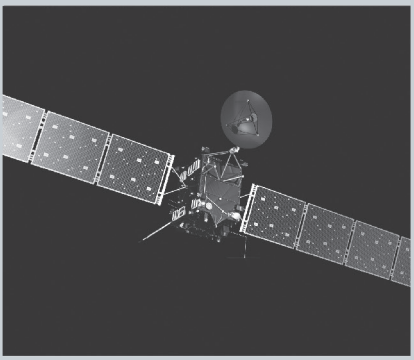
*Microelectronics hybrids*



*Mini TWT*



*Coupled Cavity TWT*

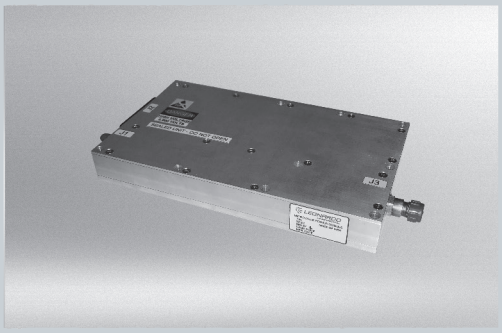




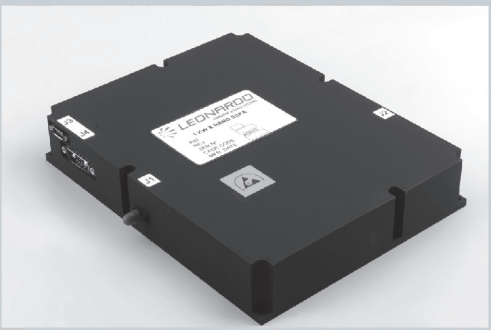





*Helix TWT*



*Microwave Power Module (MPM)*




*Solid State Power Amplifier (SSPA)*

MM08956 03-22

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