



QP MICROWAVE

RF and Microwave Products

PRODUCTION



- ◎ Production plant qualified to ISO-9001-2015 and EN-9100:2018
- ◎ Hybrid assembly in a class 10.000 (ISO 7) clean room
- ◎ Class 100 (ISO 5) laminar flow area
- ◎ Nitrogen generation
- ◎ Ultrasonic cleaning
- ◎ UVO (UV + Ozone) cleaning
- ◎ Wire & Ribbon wedge bonding
- ◎ Epoxy and Eutectic Die Attach
- ◎ Parallel Gap Welding
- ◎ Resistance Soldering
- ◎ Iron and Hot Air and Soldering
- ◎ Laser Marking
- ◎ Hermeticity on demand



INSPECTION



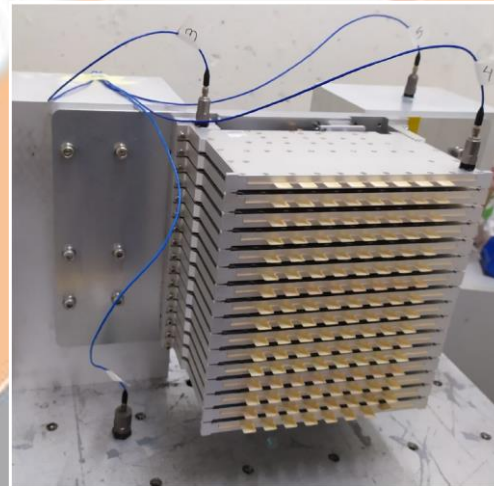
- ⦿ Our products are inspected according to our procedures based on the MIL standard or the customer requirements
- ⦿ ESD control
- ⦿ Real Time 3D X-Rays
- ⦿ High and low magnitude stereoscopes
- ⦿ Humidity and Temperature control
- ⦿ Dimension and Weight
- ⦿ Bond Pull Testing
- ⦿ Die Shear Testing
- ⦿ Thermography



ENVIRONMENTAL TEST



- ◎ Our products are designed and tested to meet the most demanding environmental conditions
- ◎ Our test procedures are based on the MIL-STD-883 and MIL-STD-202 standards
- ◎ In-house testing:
 - > High and Low Temperature
 - > Thermal Cycling
 - > Thermal Shock
 - > Burn-in
 - > Life Test
- ◎ Test on demand:
 - > EMI-EMC
 - > HAST
 - > Humidity
 - > Mechanical Test (Vibration and Shock)
 - > Hermeticity (Gross and Fine leak)



ELECTRICAL TEST



◎ We have a complete electrical test lab that includes:

- › 2-Port R&S ZVA to 50 GHz
- › 2-Port Keysight PNA to 40 GHz
- › 2-Port Keysight Portable VNA to 26.5 GHz
- › 4-Port VNA to 9GHz & 3-Port VNA to 9 GHz
- › Agilent Spectrum Analyzers (26.5 GHz, 50 GHz)
- › R&S Spectrum Analyzers (40 GHz)
- › Power Testing up to 67 GHz
- › RF generators up to 67 GHz
- › Phase Noise Test System up to 40 GHz
- › IMD and Harmonics and TRD testing
- › Noise Figure Testing up to 50 GHz
- › High Speed Oscilloscopes up to 4 GHz
- › 100W Power Amplifier up to 3GHz
- › 100W CW Inline Power Sensor up to 4 GHz
- › Freq & Time Analyzer
- › GPS clock reference
- › Temperature Characterization
- › Programmable Power Supply
- › High Precision Multimeters
- › Handheld Multimeters
- › Automatic testing via GPIB & LAN



PRODUCTS



We design and manufacture high performance standard and custom products:

- ◎ Digital Attenuators

- › Up to 64 dB / up to 40 GHz / up to 11 bits / Narrowband, Octave Bandwidth and Broadband models / High Precision / Extremely low temperature drift

- ◎ Switches

- › Broadband up to 40 GHz / Low Loss and High Isolation / Miniature Packages

- ◎ Amplifiers

- › LNAs, Medium Power, Temperature Compensation, Gain Equalization, Variable Gain

- ◎ Synthesizers

- › Up to 40 GHz, Low Phase Noise, High speed, Harmonic filtering.

- ◎ Others

- › Detectors, Bias Tees, DC Blocks, Filters, Phase Shifters, Limiters, Mixers...

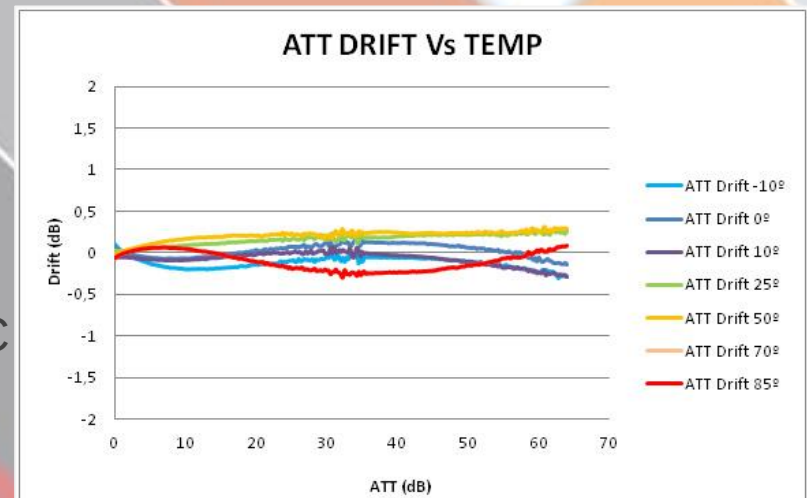
- ◎ Custom modules

DIGITAL ATTENUATOR



© **QP-ATDIG-2729-01** is an S-Band Precision Digital Attenuator. The main features are:

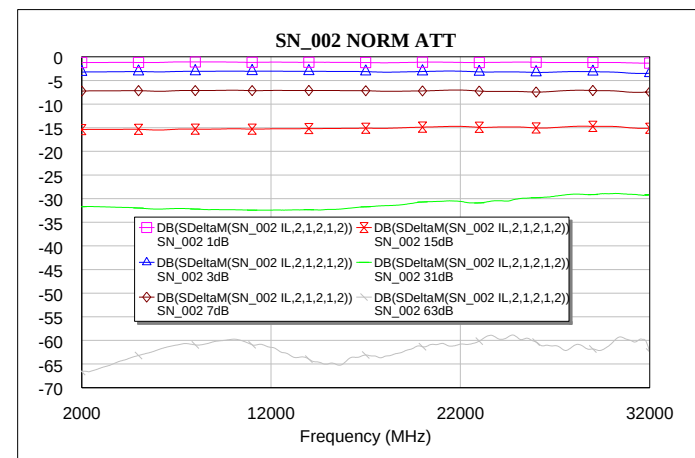
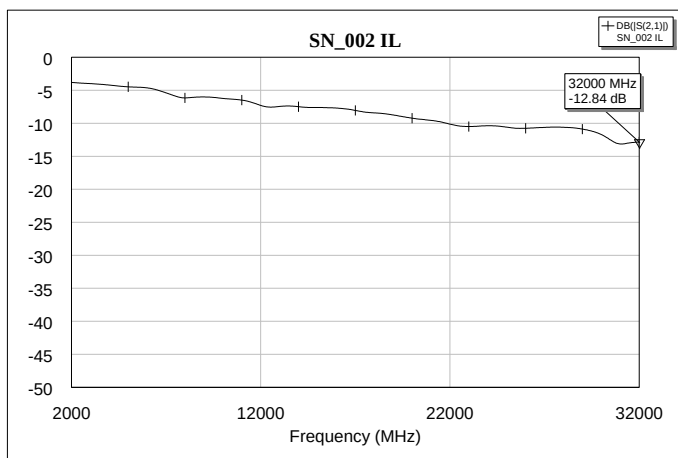
- › 64 dB attenuation range
- › 11 Bits (0.03125 dB step)
- › Guaranteed monotonicity
- › Bandwidth: 2.7 to 2.9 GHz
- › Flatness: ± 0.5 dB (0 to 64 dB)
- › Accuracy: ± 0.5 dB (0 to 64 dB)
- › **Temperature Drift: ± 0.5 dB**
- › Insertion loss: < 1.8 dB
- › Low Phase Drift
- › Switching Time: < 500 ns
- › Low Switching Glitches
- › VSWR: $< 1.5:1$
- › Operating Temperature: -40° to 85°C



BROADBAND DIG. ATT. (1) QP_{MW}

© **QP-ATDIG-0232-01** is a Broadband Digital Attenuator. The main features are:

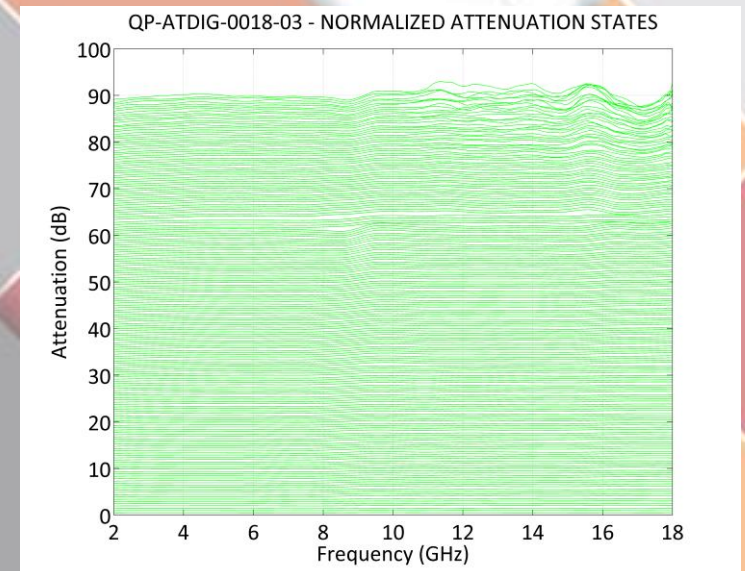
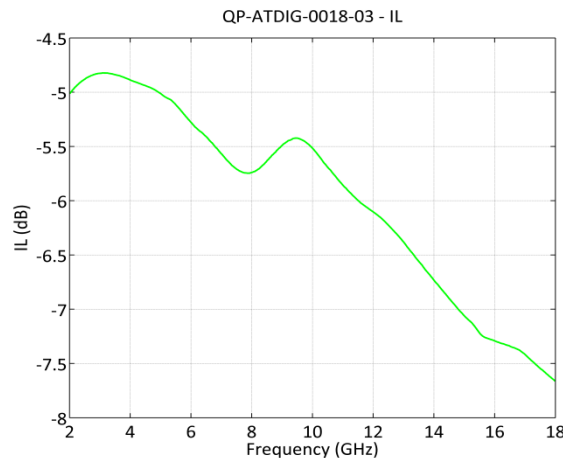
- 64-dB attenuation range
- 6 Bits (7-bit version available)
- Bandwidth: 2 to 32 GHz (possible to 40 GHz)
- Insertion loss: <15 dB
- +-5 V, 50 mA Power Supply
- Switching Time: <100 ns
- VSWR: < 2.5:1
- Operating Temperature: -40° to 85°C



BROADBAND DIG. ATT. (2) QP_{MW}

© **QP-ATDIG-0018-03** is a Broadband Digital Attenuator. Its main features are:

- > 90-dB attenuation range
- > 8 Bits (0.5dB step)
- > Bandwidth: 0.5 to 18 GHz (extensible up to 40 GHz)
- > Insertion loss: <8 dB
- > +-5 to 12 V, 25 mA Power Supply
- > Switching Time: <300 ns
- > VSWR: < 2:1
- > Operating Temperature: -40° to 85°C

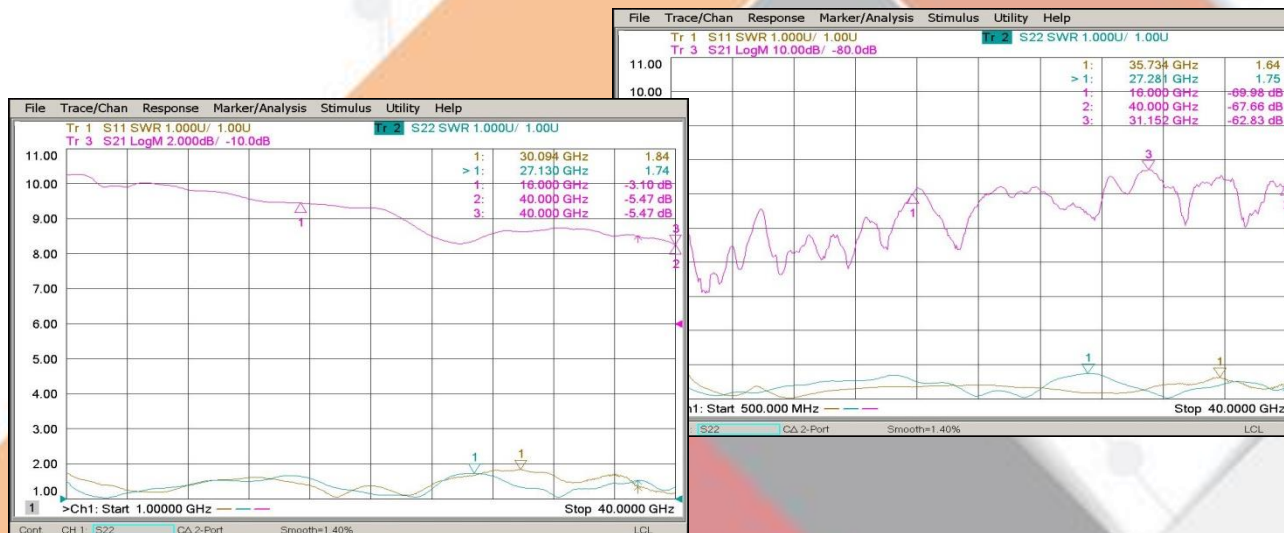
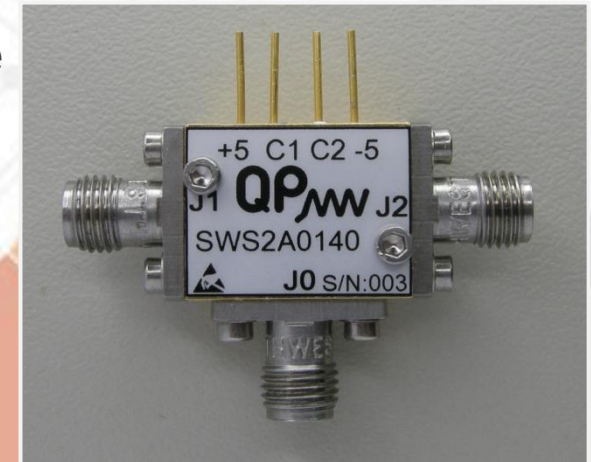


SPDT SWITCH



◎ **QP-SWS2A-0140-01** is a miniature switch covering 1 to 40 GHz. The main characteristics are:

- **13.5mm × 17.5mm × 8.5mm miniature case**
- Absorptive design
- 60-dB Minimum Isolation
- 6-dB Maximum Insertion Loss
- VSWR: < 2.5:1
- 25-ns Switching time
- Operating Temperature: -40° to 85°C

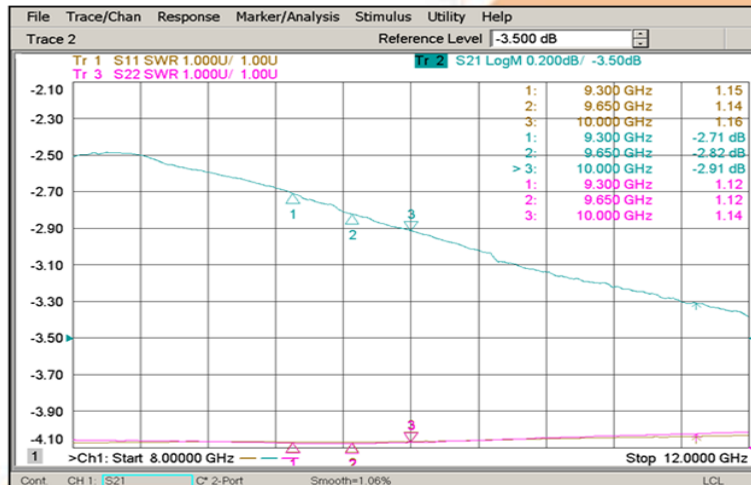


TRANSFER SWITCH



◎ **QP-SWTRF-0910-01** is a transfer Switch optimizes for X-band. Its main characteristics are:

- 9 to 10 GHz
- 70-dB Minimum Isolation
- 3-dB Maximum Insertion Loss
- VSWR <2:1
- 300 ns Switching time
- **BITE functionality**
- Operating Temperature: -40° to 85°C

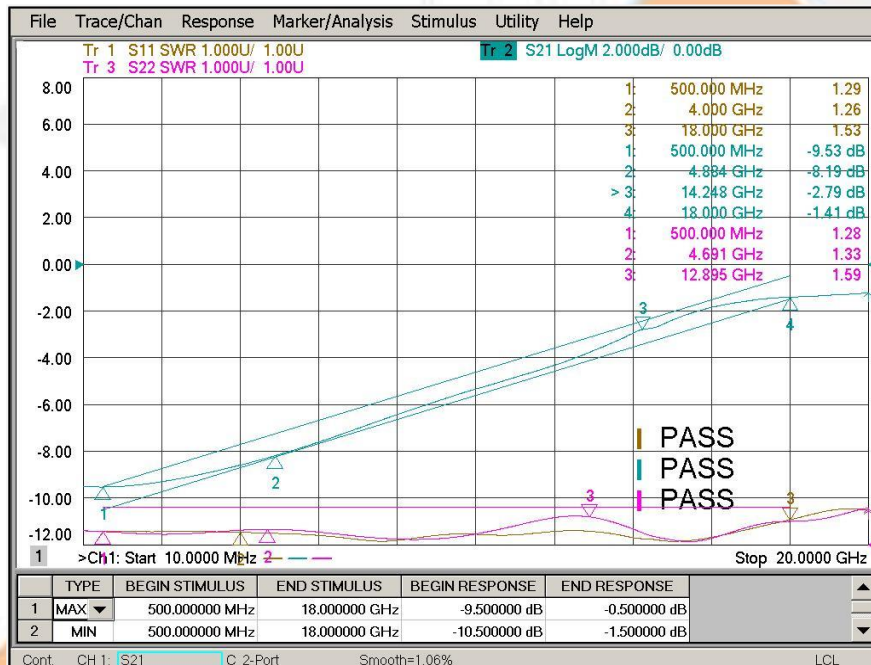


GAIN EQUALIZER

QPMW

◎ **QP-EQ9D0-0018-05** is a slope equalizer covering 0.5 to 18 GHz with the following performance:

- Ø9mm × 41.8mm miniature case
- VSWR: <1.8:1
- 9 dB ± 0.5 dB linear negative slope
- Available in slopes from 2 to 25 dB

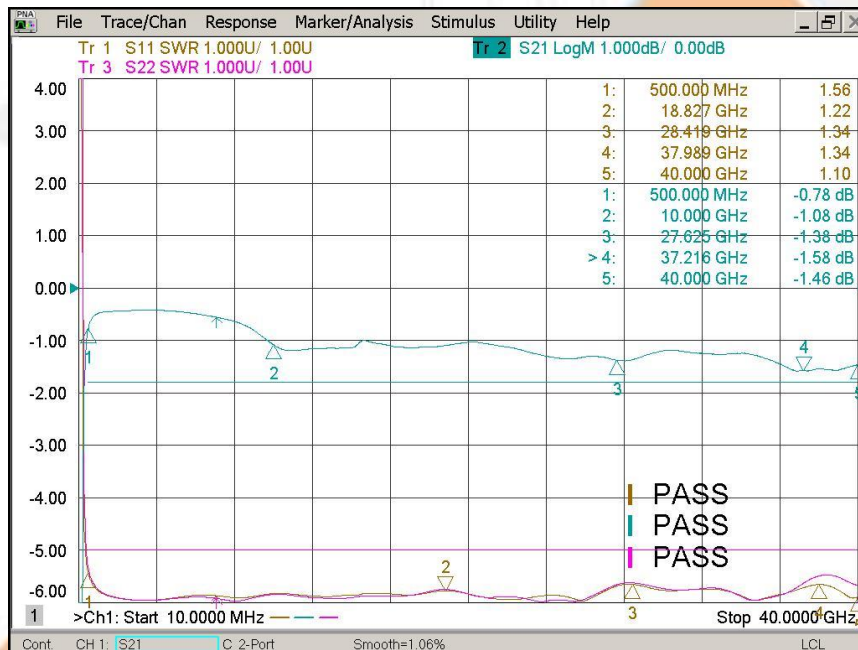


BIAS TEE



◎ **QP-BITEE-0040-03** is a High Current Broadband Bias Tee from 0.5 to 40 GHz:

- 19.1mm × 21.2mm × 9.3mm miniature case
- 50V, 1000mA
- 1.5-dB Insertion Loss
- 1.6:1 VSWR

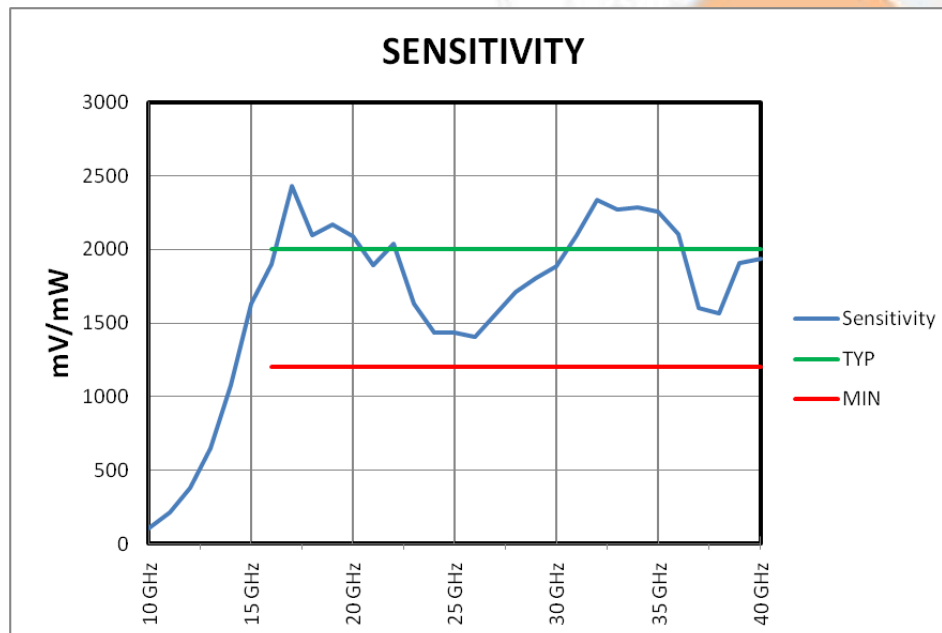


SCHOTTKY DETECTOR



◎ **QP-DTSTK-1640-01** is biased precision Schottky detector from 16 to 40 GHz:

- 2000 mV/mW sensitivity typ.
- 2.5:1 VSWR typ.
- Operating Temperature: -40° to 85°C

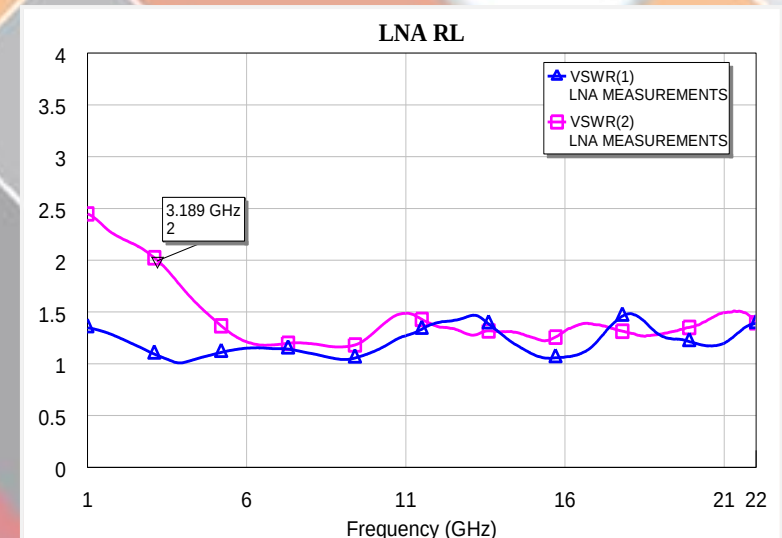
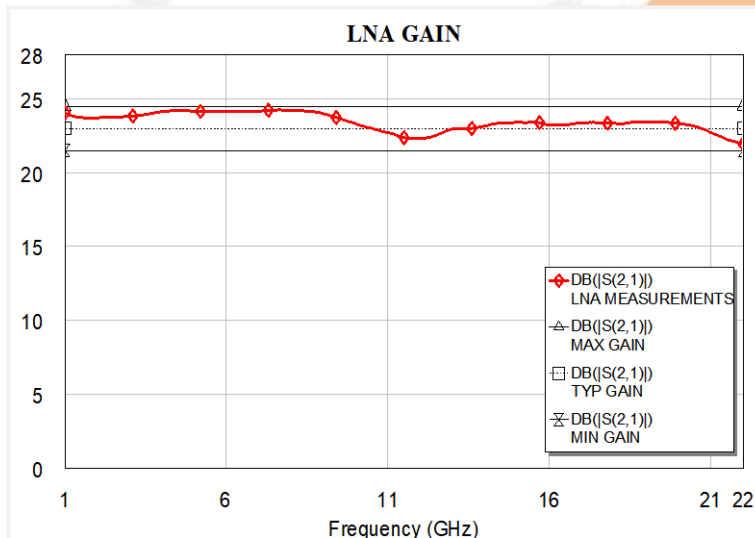


LOW NOISE AMPLIFIER



◎ **QP-AMLNA-0122-01** is a Low Noise, High Power, Flat response microwave amplifier from 1 to 22 GHz:

- 12 V, 500 mA Single Power Supply
- 4-dB Noise Figure
- 0.5-W Output Power
- 23-dB Gain typ.
- ± 1.5 -dB Flatness max.
- Operating Temperature: -40° to 85°C

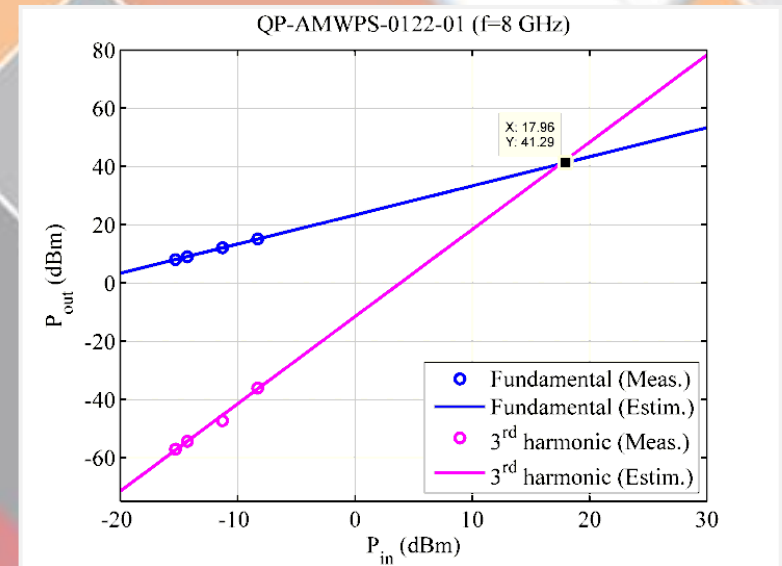
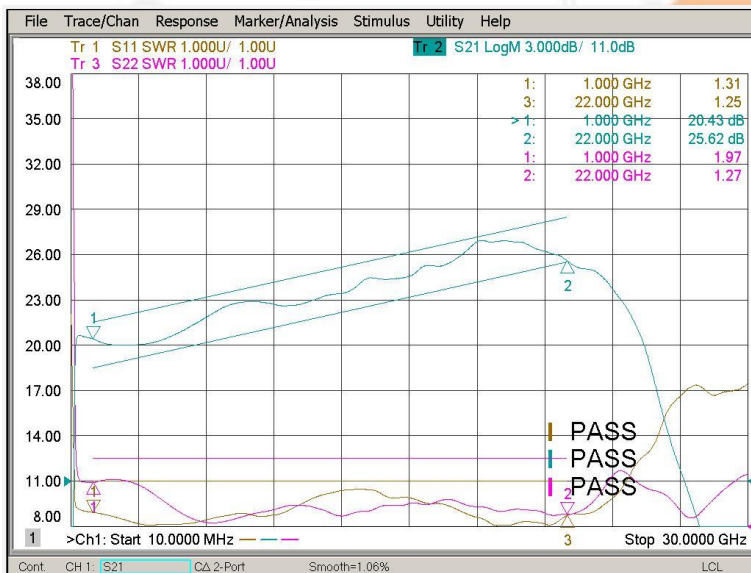


SLOPE AMPLIFIER

QPMW

◎ **QP-AMWPS-0122-01** is a Low Noise, High Linearity, Positive Slope microwave amplifier from 1 to 22 GHz.

- 12 V, 500 mA Single Power Supply
- 20-dB Gain @ 1 GHz
- 7-dB Slope
- 4-dB Noise Figure typ.
- 40-dBm OIP3 typ.
- Operating Temperature: -40° to 85°C

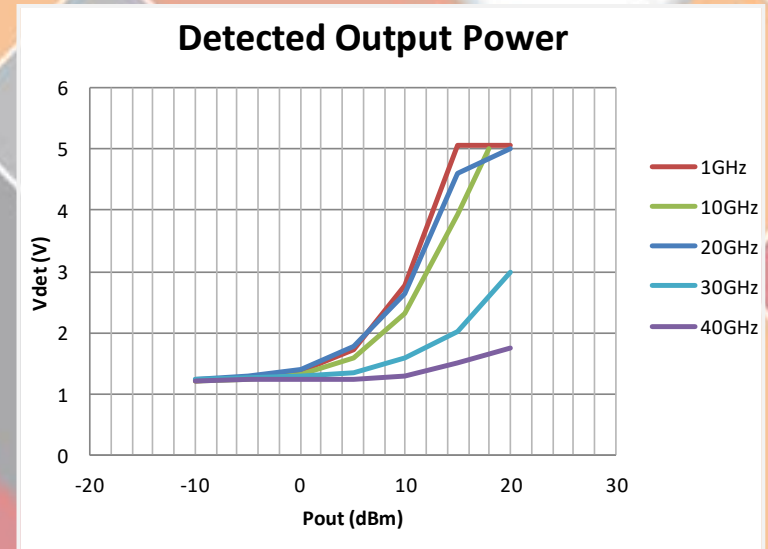
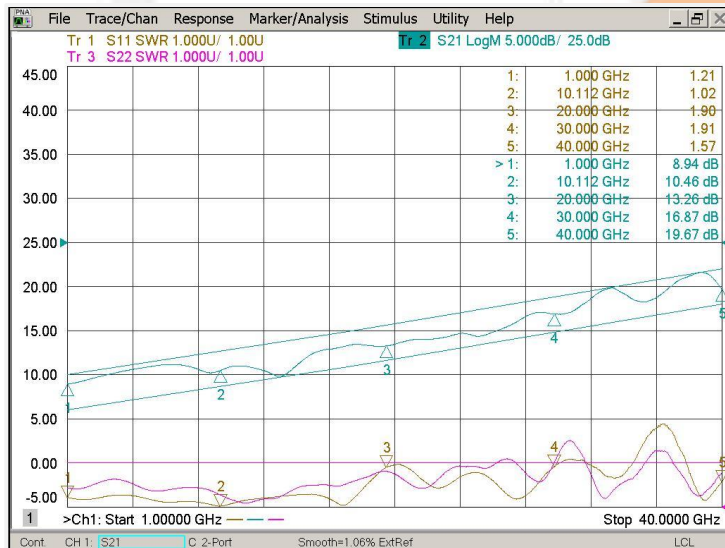


SLOPE AMPLIFIER



◎ **QP-AMWPS-0140-02** is a Low Noise Positive Slope microwave amplifier from 1 to 40 GHz.

- 8-dB Gain @ 1 GHz
- 12-dB Slope, ± 2 -dB Flatness
- 26-dBm OIP3 min. @ 1 GHz
- Output Power Detection
- 12 V, 540 mA Single Power Supply
- Operating Temperature: -40° to 85°C



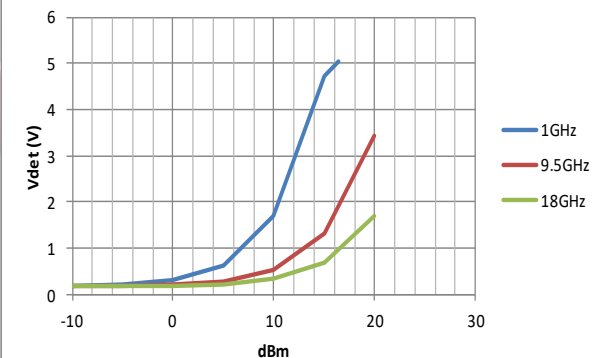
VARIABLE GAIN AMPLIFIER QP_{MW}

◎ **QP-AMATT-0118-01** is a Variable Gain Amplifier from 1 to 18 GHz.

- 23-dB Gain Typ. ± 2 -dB Flatness
- 25-dB Attenuation Range
- 8-dB Noise Figure @ 0dB att.
- Output Power Detection
- 12 V, 360 mA Single Power Supply
- SPI digital control



Detector Voltage vs Power

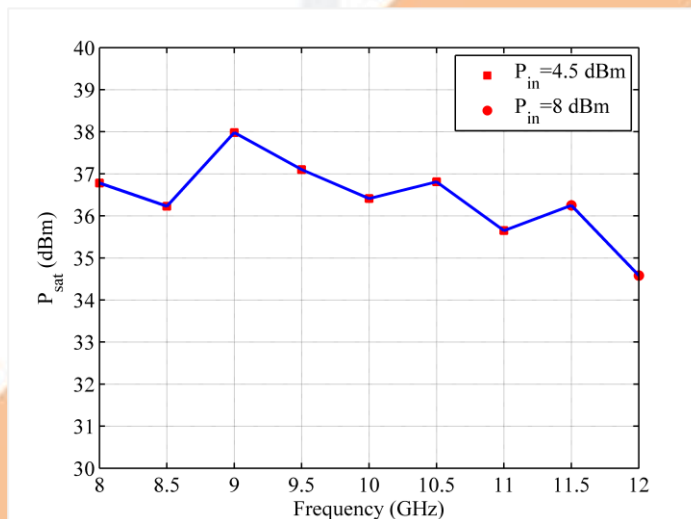
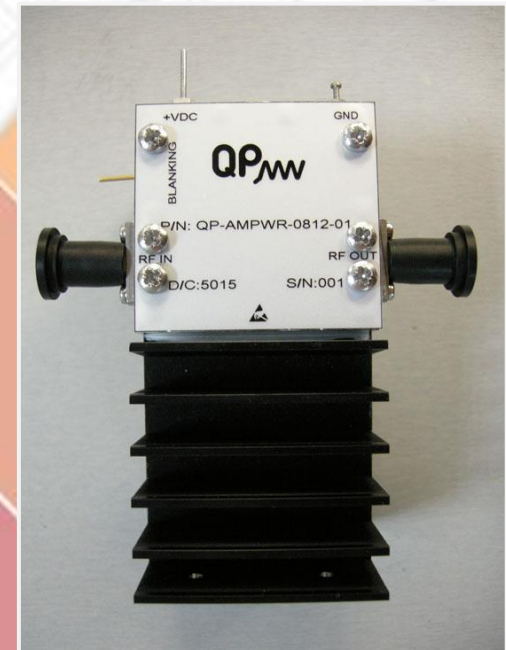


POWER AMPLIFIER



◎ **QP-AMPWR-0812-01** is a High Power, High Gain, X- Band Amplifier:

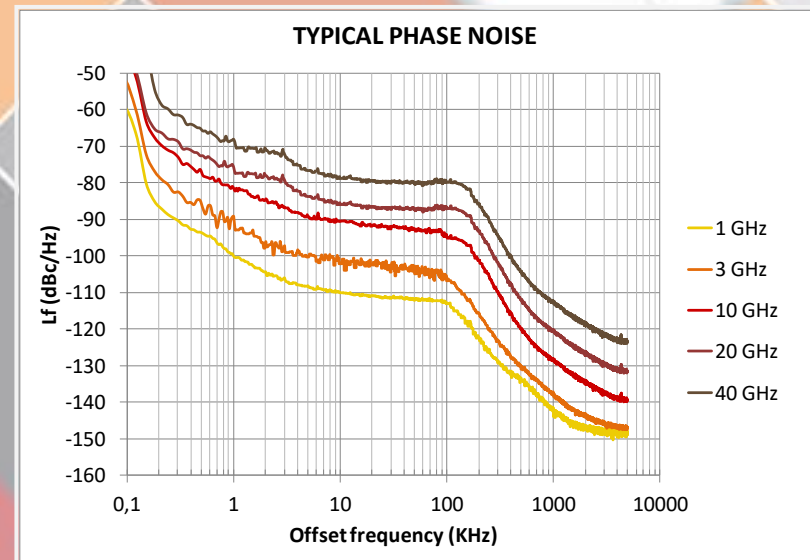
- 8 V, 3.2 A Single Power Supply
- 35-dB Gain Typ.
- 5W Output Power
- 2:1 VSWR Max.
- Small Size: 37.5mm × 39.1mm × 11.3mm
- Operating Temperature: -40° to 85°C



FREQUENCY SYNTHESIZER **QP_{mw}**

◎ QP-FSPLL-0040-01 Frequency Synthesizer:

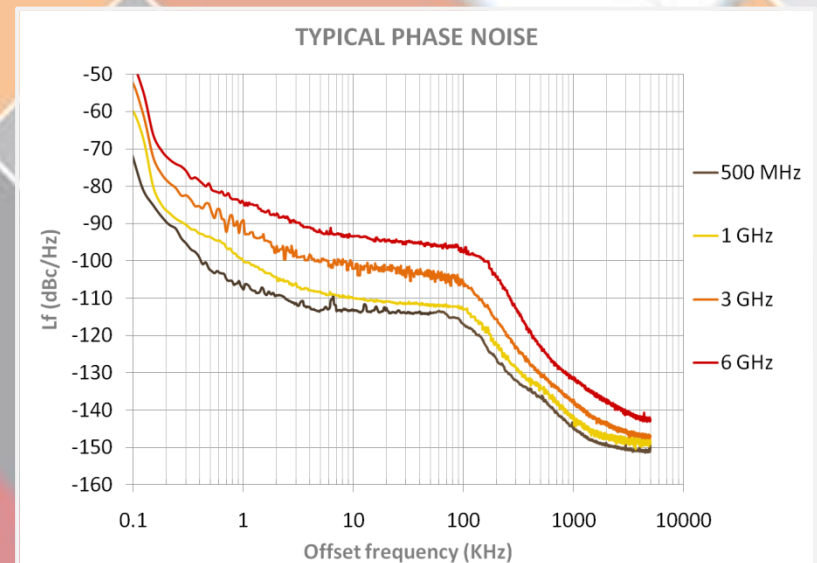
- 50 MHz to 40 GHz
- Up to 0.04-Hz Freq Step
- Up to 30- μ s Switching Time
- 15-dBm Output Power
- Low harmonics and spurious levels
- Operating Temperature: -20° to 70°C
- IP67 ruggedized rack-mounted case



FREQUENCY SYNTHESIZER QP_{MW}

© QP-FSPLM-0006-01 Frequency Synthesizer:

- 50 MHz to 6 GHz
- Up to 1-Hz Frequency Step
- 100 μ s Switching Time
- -10 dBm to 20 dBm Output Power
- 1-dB Power Step
- Low harmonics and spurious levels
- Operating Temperature: -20° to 70°C



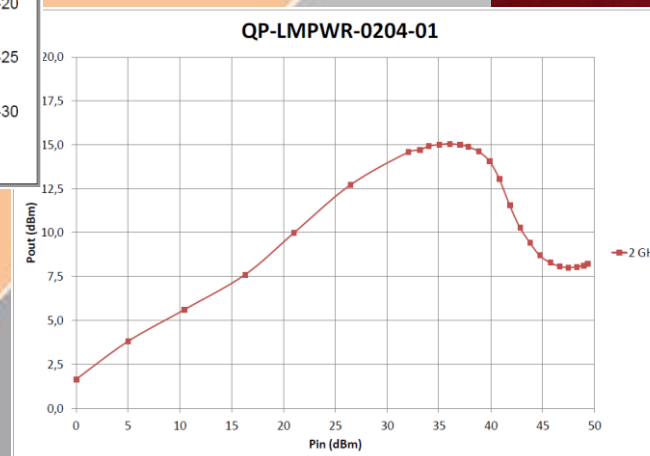
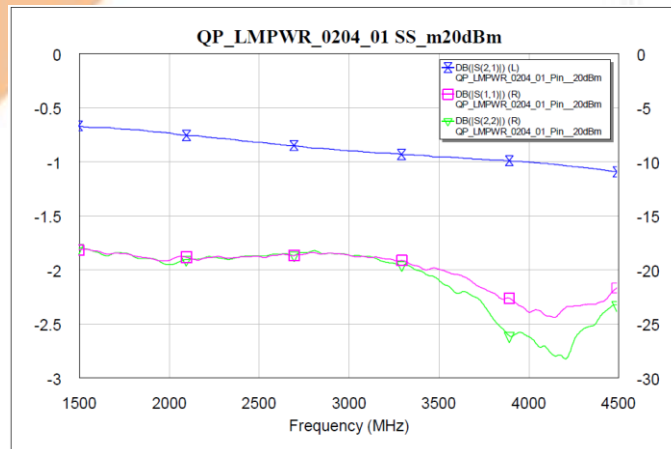
POWER LIMITER

QPMW

NEW
RELEASE

◎ QP-LMPWR-0204-01 Power Limiter:

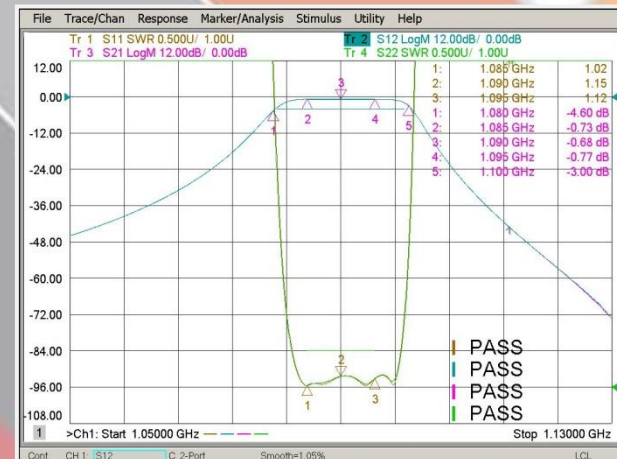
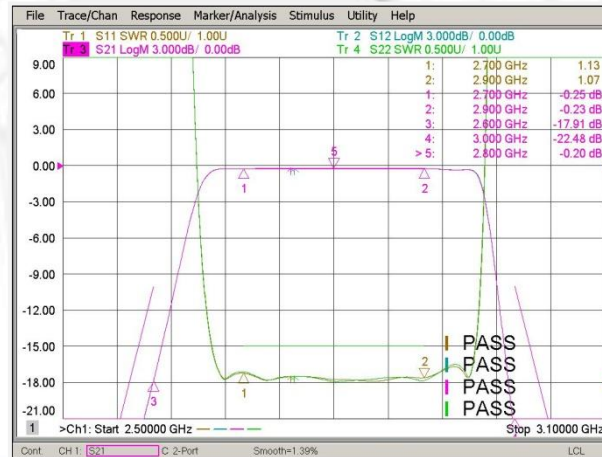
- 2 GHz to 4 GHz
- HIGH POWER: 1kW Peak / 100W CW
- 15-dBm Leakage
- Low Loss
- Excellent VSWR.



FILTERS



© We can offer filters under customer specifications

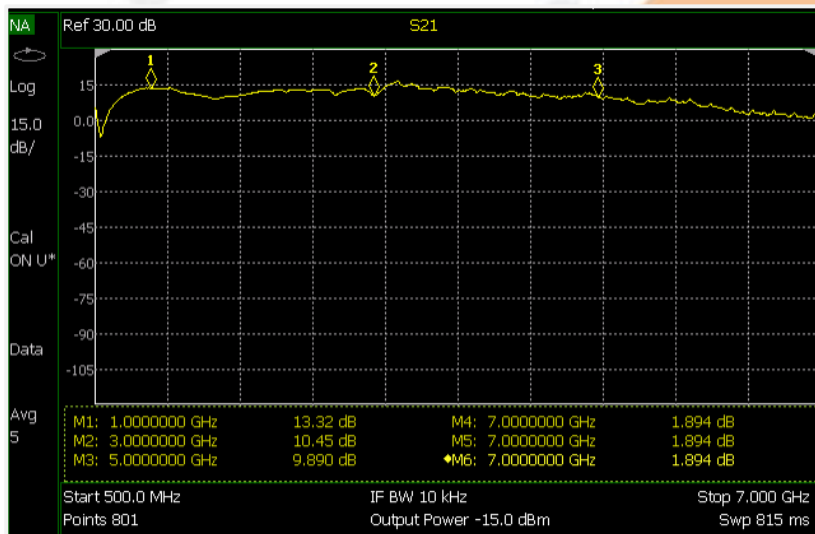


OPTICAL LINK



◎ QP-TROPT-0555-01 Optical Transceiver:

- > 0.5 to 5.5 GHz
- > 10-dB RF Link Gain min.
- > 5-dBm Optical Output Power
- > 50-Ohm TX Input Impedance
- > 1310-nm TX wavelength
- > 850- to 1600-nm RX wavelength
- > 5 V, 300 mA Single Power Supply
- > Operating temperature: 0 to 40°C

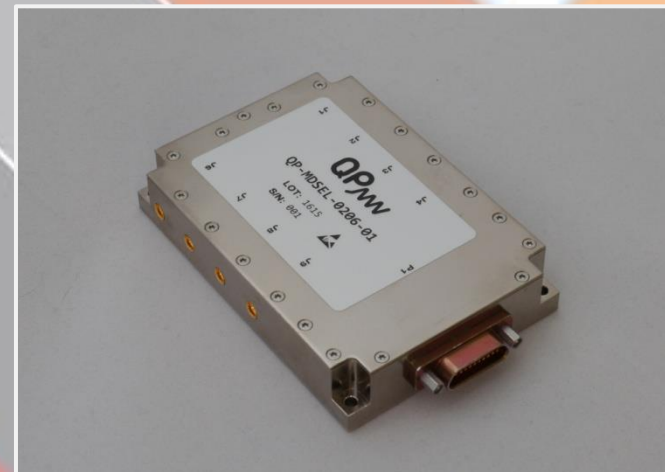
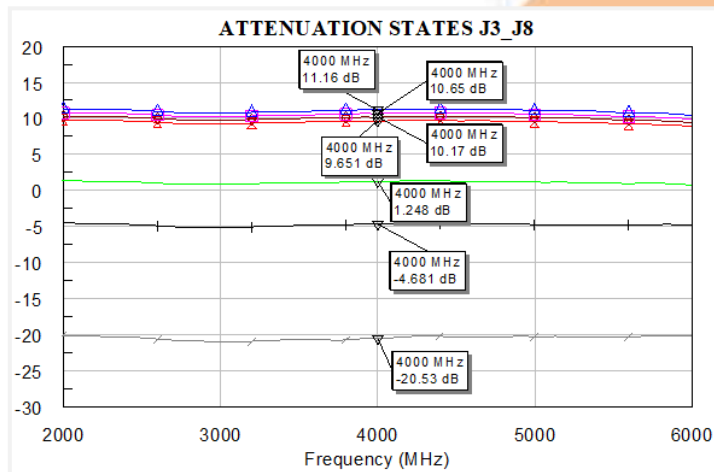


CUSTOM MODULES (1)



◎ QP-MDSEL-0206-01 Input Selector Module:

- 2 to 6 GHz
- 10-dB Gain $\pm$ 2-dB Flatness
- 2:1 VSWR
- 10-dBm OP1dB min.
- 12-dB NF max.
- GPO/SMP male full detent connectors (RF)
- 21-pin socket MIL-C-83513 connector (Power supply/Control)
- 7V, 800mA Power Supply



CUSTOM MODULES (2)



◎ MXSSB-0518-03 Image Rejection Mixer:

- RF: 4GHz to 18.5 GHz
- IF: 70 to 1100 MHz
- IF VSWR < 2:0
- CONVERSION LOSS < 14dB.
- IF Rejection > 60dB @ 1280 MHz
- GPO/SMP male full detent connectors (RF)

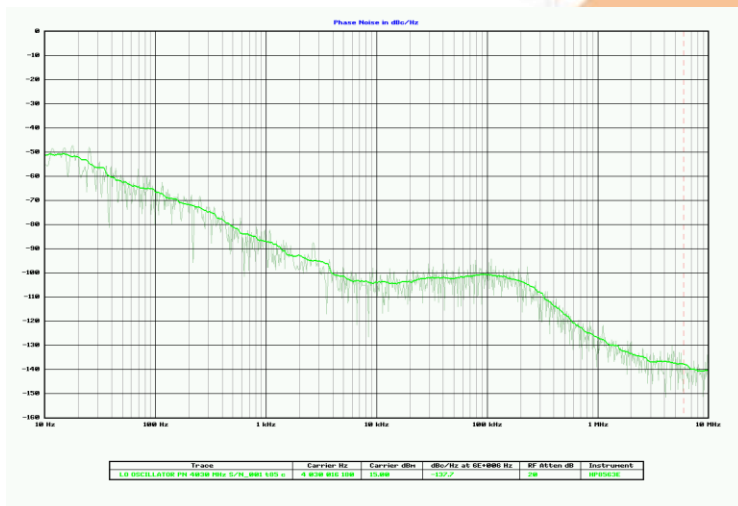


CUSTOM MODULES (3)



◎ Custom Oscillator Module 4.03/ 4.43 / 4.735 GHz:

- RF: 4GHz, 4.43 GHz & 4.735 GHz Selectable
- Two RF Outputs (GPO)
- Output Power: 13 dBm $\pm$ 2 dB
- Blanking: -70 dBm Min.
- GPO/SMP male full detent connectors (RF)
- Spurious Level: -75 dBc Max.
- Harmonics Level: 50 dBc Min.
- BITE Output

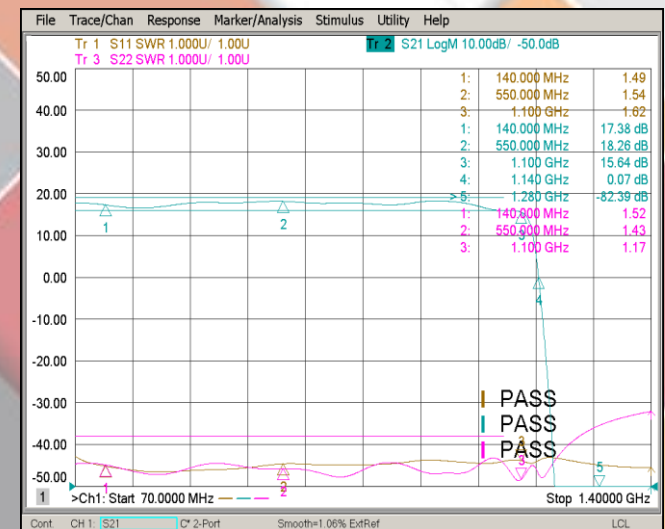


CUSTOM MODULES (4)



◎ Custom Mixer Module :

- › OL Frequency Range: 6.5 to 24 GHz
- › RF Frequency Range: 5 to 18.5 GHz
- › IF Frequency Range: 4.875 to 5.875 GHz
- › 2nd IF Frequency Range: 140 to 1140 MHz
- › Gain: 16-19 dB
- › Noise Figure: 3.5 dB Max.
- › OP1dB: 20 dBm Min.
- › VSWR: 2.2 Max.
- › Harmonics: -35 dBc Min.
- › Spurs: -70 dBc Max.
- › Analog BITE
- › Group Delay: 4 ns Max.

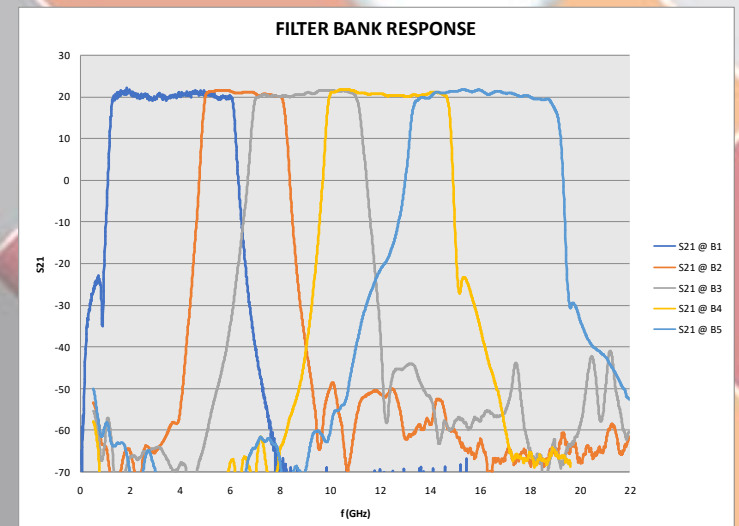
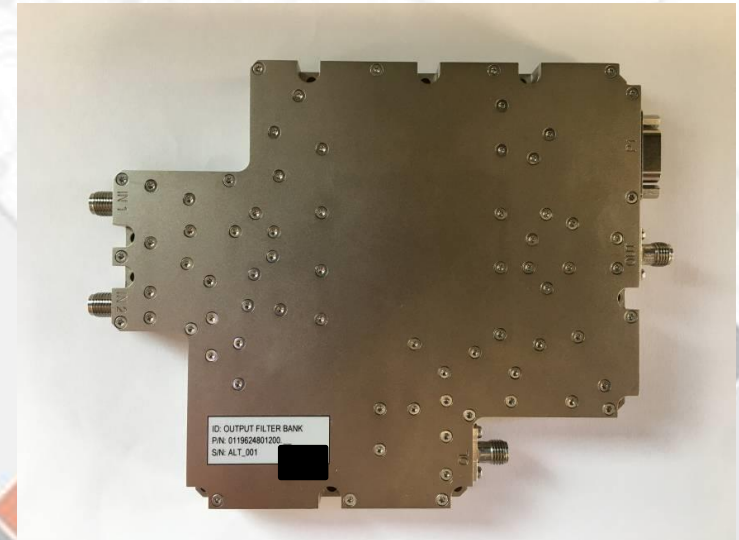


CUSTOM MODULES (5)



◎ Custom Filter Bank:

- › 1.5 to 18.5 GHz in 5 bands
- › One down-converted band
- › 2 switchable inputs
- › Gain: 20 dB
- › P1dB: 20 dBm
- › Rejection: 70 dB
- › Switching time: 75 ns
- › Harmonics: -40 dBc
- › Spurs: -80 dBc
- › Temperature-compensated
- › Fully tested between -40 to 85°C

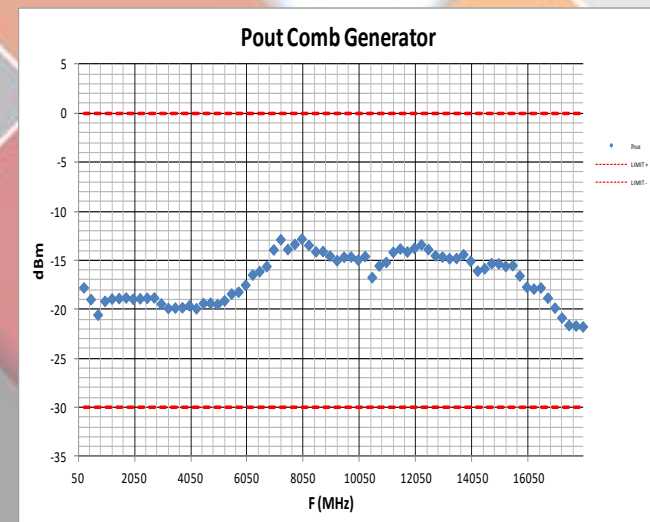


CUSTOM MODULES (6)



◎ Comb Generator:

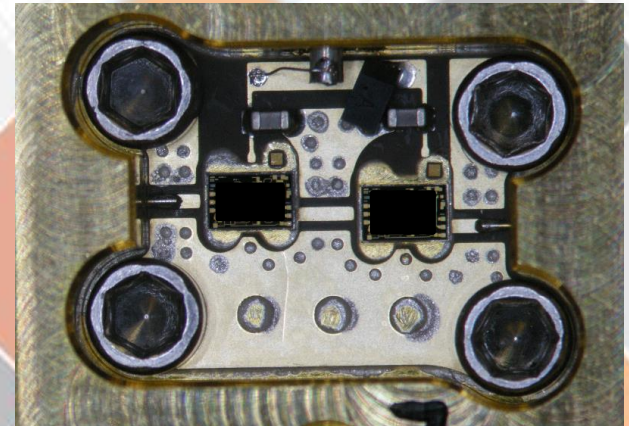
- › 250 MHz to 18 GHz
- › Equalized output
- › Stabilized power output vs temperature
- › Temperature drift: 0.15 ppm @ -40 to 70°C
- › Blanking mode: -110 dBm
- › Blanking time: 100 ns
- › Phase Noise:
 - 115 dBc/Hz @ 250MHz/100 kHz
 - 103 dBc/Hz @ 18GHz/100 kHz
- › Spurious: -90 dBm
- › Fully tested between -40 to 85°C



MODULE ASSEMBLY (1)



- ◎ 24 to 40 GHz LNA
- ◎ Data Pack includes:
 - › Route card as per customer procedure
 - › Consignment form
 - › Work order
 - › Traceability sheet
 - › CoC
- ◎ Assembly Processes:
 - › Cleaning
 - › SMD Assembly
 - › Feedthrough Soldering
 - › PCB Attach (Epoxy)
 - › Die and Single-Layer Capacitor Attach (Epoxy)
 - › Wire Bonding
 - › Ribbon Bonding
 - › Electrical verification



MODULE ASSEMBLY (2)



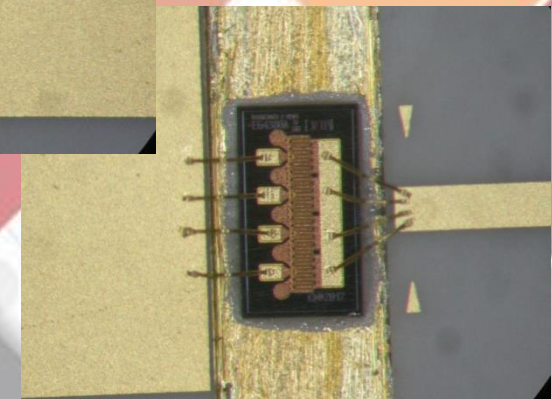
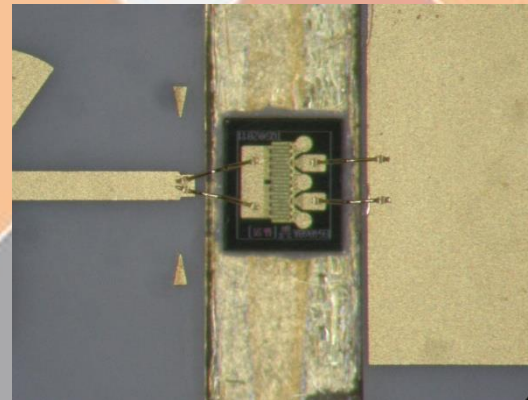
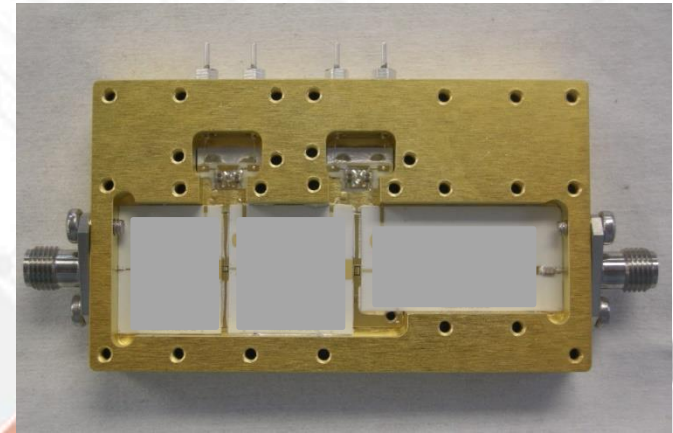
◎ GaN-based SSPA

◎ Data Pack includes:

- › Route card as per customer procedure
- › Consignment form
- › Work order
- › Traceability sheet
- › CoC

◎ Assembly Processes:

- › Cleaning
- › SMD Assembly
- › Feedthrough Soldering
- › PCB Attach (Epoxy)
- › Die and SLC Attach (Epoxy)
- › Wire Bonding
- › Ribbon Bonding



MODULE ASSEMBLY (3)



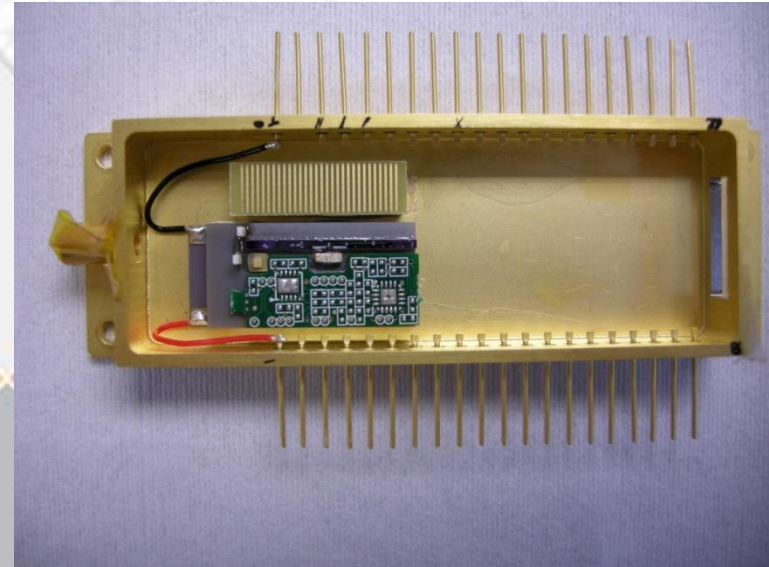
◎ Optical-fiber Module for Medical Applications

◎ Assembly Process:

- › Cleaning
- › SMD Assembly
- › PCB Attach (epoxy)
- › Die Attach (controlled thickness)
- › Thermal Spreader Attach
- › Wire Bonding
- › Ribbon Bonding
- › Parallel gap

◎ Qualification Process:

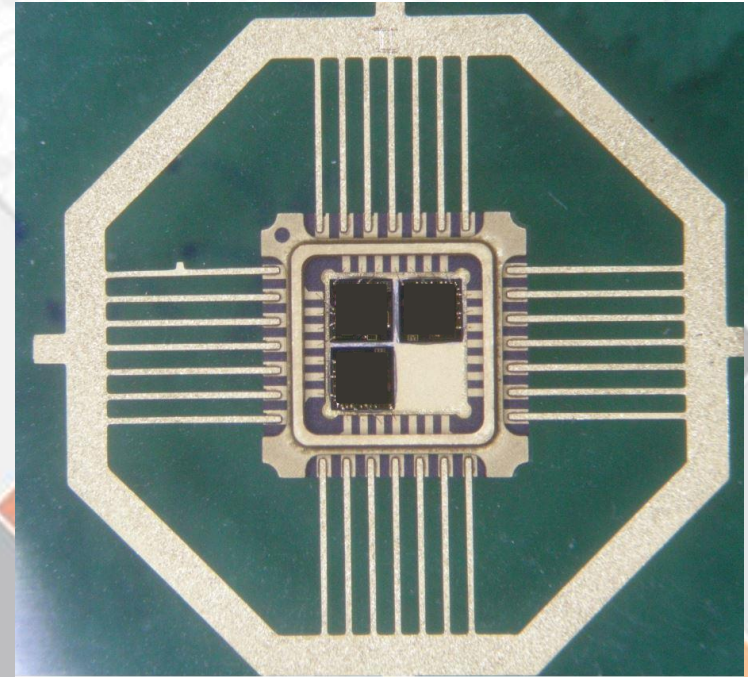
- › Visual Inspection
- › Thermal Cycling
- › Radiography Inspection
- › Bond Pull
- › Die Shear



MMIC ASSEMBLY



- ◎ QFP Multichip for Space
- ◎ Package design:
 - › Mechanical Design
 - › 3D EM Simulation and Optimization
 - › Lid with H₂ getter
- ◎ Assembly Process:
 - › Die Attach (controlled thickness)
 - › Wire Bonding
 - › Eutectic Lid Sealing
- ◎ Qualification Process:
 - › Die Shear
 - › Bond Pull
 - › RX Inspection
 - › Seal Test (Fine and Gross leak)

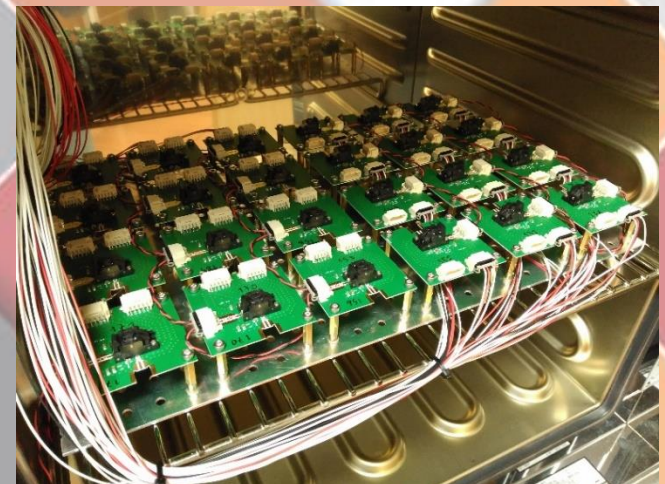
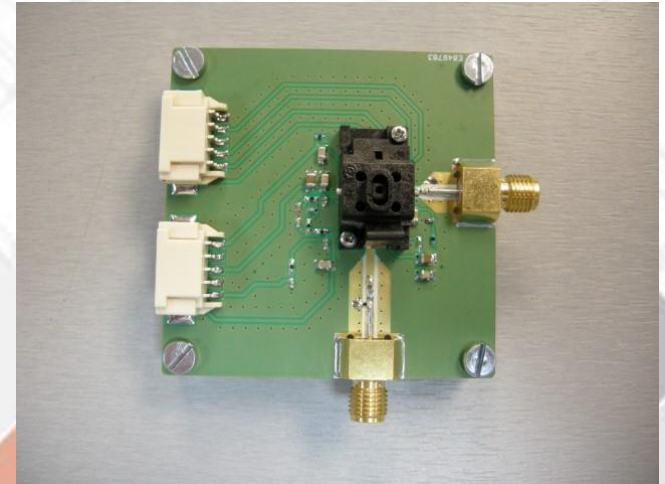


DEVICE UPGRADING (1)



◎ PLL with VCO for Space (QFN)

- › Test fixture Design & Manufacturing
- › Automatic Electrical Test
- › Burn-in board Design & Manufacturing
- › Evaluation:
 - › Electrical Characterization (5T)
 - › Constructional Analysis
 - › Outgassing
 - › TID
 - › C-SAM
 - › HAST
 - › Thermal Cycling
 - › Life Test
 - › DPA
- › Screening (3 campaigns)
 - › Electrical test (3T)
 - › RX Inspection
 - › Burn-In
 - › Thermal Cycling



DEVICE UPGRADING (2)



◎ Gain Block for Space

- › Test fixture Design & Manufacturing
- › Automatic Electrical Test
- › Burn-In board Design & Manufacturing
- › Evaluation:
 - › Electrical Characterization
 - › Constructional Analysis
 - › Life test
 - › Mechanical Shock / Vibration
 - › Thermal Cycling
 - › Seal test (Fine and Gross leak)
 - › Life Test
 - › DPA
- › Screening (2 campaigns)
 - › RX Inspection
 - › Electrical Test (3T)
 - › Mechanical Shock
 - › Thermal Cycling
 - › Burn-In
 - › Seal test (Fine and Gross leak)
 - › PIND
- › Failure Analysis

