

# Active Waveguide Modules

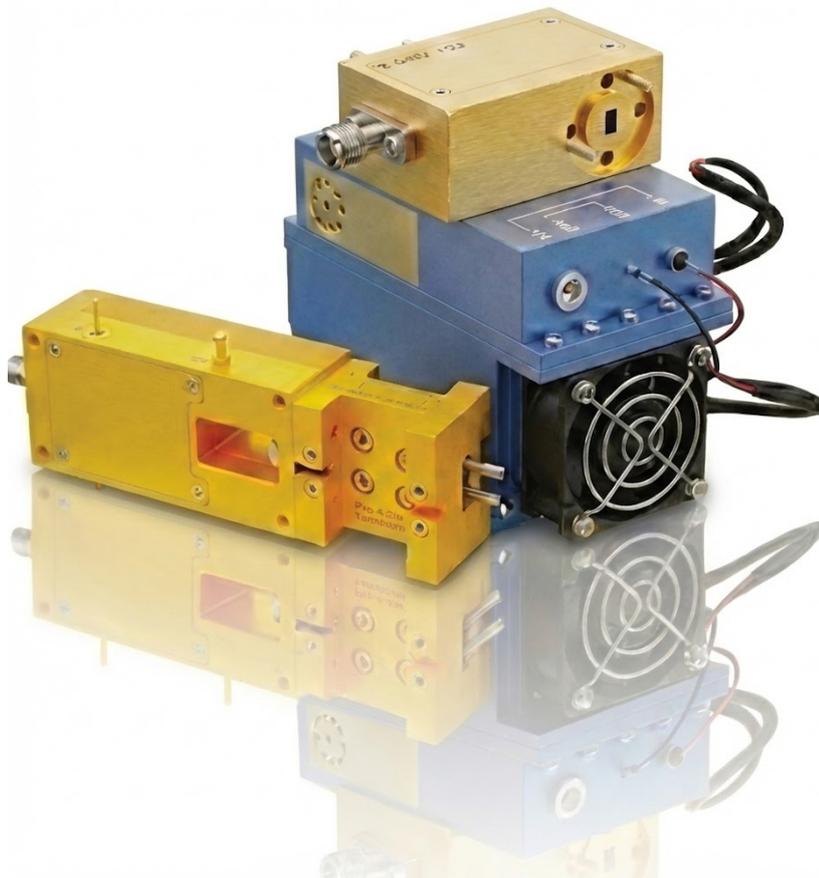
## (Amplifiers, Frequency Multipliers & Mixers)

### At a Glance

We provide integrated active waveguide modules spanning 33–500 GHz (covering waveguide sizes from WR-22 down to WR-2.2), designed to support high-performance mmWave and sub-THz signal chains.

Our portfolio features LNAs up to 340 GHz , PAs up to 260 GHz , and frequency multipliers reaching 500 GHz. We also offer high-performance harmonic mixers and compact converter modules with integrated LO chains to simplify system integration.

These modules reduce integration risk by delivering repeatable amplification, multiplication, and frequency conversion in standardized waveguide packages—enabling faster bring-up of Tx/Rx front-ends, extension chains, and test fixtures



# Low-Noise Amplifier Modules

## Full Waveguide Band

- Standard waveguide bands, series lineup
- Consistent mechanical interface across bands
- Easier band upgrades, less redesign

## Low/High Gain Options

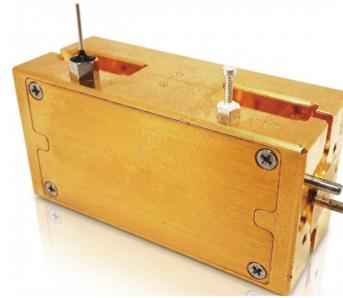
- Choose sensitivity vs dynamic range
- Reduce need for external padding/stages
- Fit different link budgets quickly

## Low-Noise Performance

- Improved receiver sensitivity
- Better weak-signal detection margin
- Optimized for front-end LNA use

## Single-Supply Bias

- One supply rail, simpler wiring
- Faster bring-up and integration
- Lower risk of biasing mistakes



Part Number	Band	Frequency (GHz)	Gain (dB)	NF (dB)	Waveguide
LNA-3350-XX28	Q	33–50	23/38	2.8	WR-22
LNA-4060-1803	U	40–60	18	3.0	WR-19
LNA-4060-3803	U	40–60	38	3.0	WR-19
LNA-5075-1825	V	50–75	18	2.5	WR-15
LNA-5075-3825	V	50–75	38	2.5	WR-15
LNA-6090-1805	E	60–90	18	5.0	WR-12
LNA-6090-3805	E	60–90	38	5.0	WR-12
LNA-75110-1804	W	75–110	18	4.0	WR-10
LNA-75110-4204	W	75–110	42	4.0	WR-10
LNA-90140-1605	F	90–140	16	5.0	WR-08
LNA-110170-1806	D	110–170	18	6.0	WR-06
LNA-110170-3306	D	110–170	33	6.0	WR-06
LNA-140220LG	G	140–220	15	6.0	WR-05
LNA-210260-1508	H	210–260	15	8.0	WR-4.3
LNA-220270-1508	J	220–270	15	8.0	WR-3.4
LNA-325G1	–	310–340	15	10.0	WR-2.8

# PA Modules

## Full Waveguide Band

- Series lineup across standard WR bands
- Consistent waveguide flange interfaces
- Easier platform reuse across frequencies

## • High Output Power

- More Tx margin with fewer cascaded stages
- Better drive capability for chains/fixtures
- Supports demanding link-budget targets

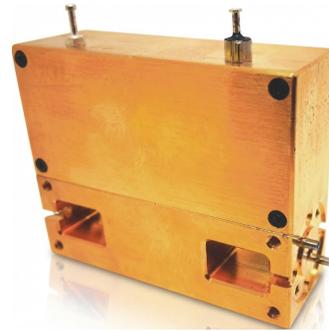


## Low/High Gain Options

- Choose gain for system budget vs stability
- Reduce extra driver stages or padding
- Match different test setups quickly

## Single-Supply Bias

- One rail simplifies power design
- Faster bring-up, fewer wiring errors
- More repeatable deployment and servicing



Part Number	Band	Frequency (GHz)	Gain (dB)	Psat (dBm)	Waveguide
PA-4060-XX20	U	40-60	18/38	+20	WR-19
PA-4060-3032	U	40-60	30	+32	WR-19
PA-4060-3034	U	40-60	30	+34	WR-19
PA-5075-XX20	V	50-75	18/38	+20	WR-15
PA-5075-XX31	V	50-75	20/38	+31	WR-15
PA-6090-XX18	E	60-90	18/35	+18	WR-12
PA-6090-3027	E	60-90	30	+27	WR-12
PA-75110-1513	W	75-110	15	+13	WR-10
PA-75110-XX20	W	75-110	16/30	+20	WR-10
PA-75110-2729	W	75-110	27	+29	WR-10
PA-90140-1310	F	90-140	13	+10	WR-08
PA-90140-XX20	F	90-140	15/28	+20	WR-08
PA-110170-2018	D	110-170	20	+18	WR-06
PA-126142-3320	D	126-142	33	+20	WR-06
PA-195220-1810	H	195-220	18	+10	WR-04
PA-170260-1608	H	170-260	16	+8	WR-04

# Active Frequency Multipliers

## Full Waveguide Band

- Standard waveguide bands up to sub-THz
- Modular blocks for frequency chains
- Simplifies multi-band system builds

## Multiplier Factors: x4 - 24

- Flexible frequency planning options
- Fewer intermediate stages required
- Easier path to target high-frequency bands

## Low/High Output Options

- Select drive level for downstream blocks
- Balance power vs spurs/linearity
- Avoid over/under-driving the next stage

## Customization Available

- Band, interface, and drive level tailoring
- Fit project constraints without redesign
- Shorten integration and iteration cycles



Part Number	Band	Multiplier Factor	Frequency (GHz)	Psat (dBm)	Waveguide
AM4-3350-23L	Q	X4/X6	33-50	+23	WR-22
AM4-4060-18	U	X2/X4	40-60	+18	WR-19
AM4-5075-15L	V	X4	50-75	+15	WR-15
AM6-5075-15L	V	X6	50-75	+15	WR-15
AM6-6090-17L	E	X4/X6/X8	60-90	+12 to +22	WR-12
AM6-5590-20L	E	X6	55-90	+20	WR-12
AM6-75110-13L	W	X4/X6/X8	75-110	+13 to +20	WR-10
AM6-70110-20L	W	X6	70-110	+20	WR-10
AM8-90140L	F	X4/X8	90-140	0 to +23	WR-08
AM8-85140E-10L	F	X8	85-140	+10	WR-08
AM8-85140-18L	F	X8	85-140	+18	WR-08
AM12-110170L	D	X6/X8/X12	110-170	0	WR-06
AM12-110170-18L	D	X6/X8/X12	110-170	+18	WR-06
AM12-140220DP	G	X12/X24	140-220	+5	WR-05
AM18-170260DP	H	X18	170-260	+5	WR-4.3
AM18-220330DP	J	X18	220-330	+3	WR-3.4

# Compact Tx/Rx Module

## Full Waveguide Band

- Mixer lineup across standard WR bands
- Supports scalable platform architectures
- Consistent mechanical integration approach

## Multiplier Factors: x4 - 24

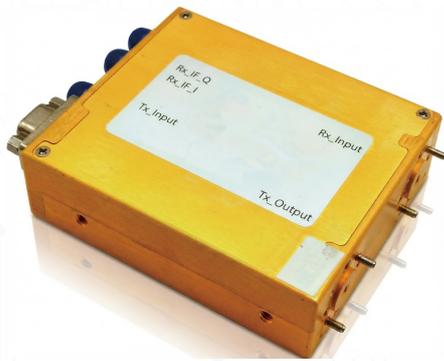
- Fewer external LO/multiplier blocks
- Less cabling and alignment work
- Improved setup repeatability

## Tx/Rx-ready Applications

- Supports both up/down-conversion
- Easier reuse across signal-chain roles
- Simplifies spares and qualification

## Customization Available

- RF/LO/IF combinations tailored to need
- Align performance to system constraints
- Reduce risk for tightly specified designs



Part Number	Band	Multiplier	Frequency (GHz)	CL (dB)	Waveguide
4MIX-3350L	Q	X4	33-50	-10	WR-22
4MIX-4060L	U	X4	40-60	-10	WR-19
4MIX-5075H	V	X4/X6	50-75	-10	WR-15
4MIX-4580L	V	X4/X6	45-80	-10	WR-15
6MIX-6090L	E	X4/X6	60-90	-10	WR-12
6MIX-7186L	E	X6	71-86	-10	WR-12
6MIX-75110L	W	X4/X6	75-110	-10	WR-10
8MIX-75110L	W	X8	75-110	-10	WR-10
8MIX-90140BN	F	X8	90-140	-12	WR-08
8MIX-110170D1	D	X8	110-170	-12	WR-06
12MIX-110170BN	D	X12	110-170	-12	WR-06
16MIX-190240D1	H	X16	190-240	-13	WR-4.3
16MIX-170260D1	H	X16	170-260	-13	WR-4.3
12MIX-220300D1	J	X12	220-300	-15	WR-3.4
24MIX-220300D1	J	X24	220-300	-15	WR-3.4
24MIX-260400D1	-	X24	260-400	-20	WR-2.8