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**Agilent Technologies**

8346A  
26.5 to 40 GHz

8347A  
100 kHz to 3 GHz

8348A  
2 to 26.5 GHz

8349B  
2 to 20 GHz



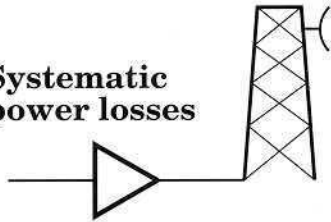
**High performance  
broadband amplifiers**

## General-purpose broadband amplifiers for RF through millimeter-wave...

### Broadband instrumentation amplifiers

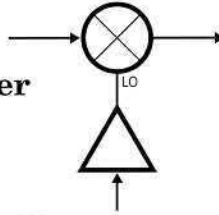
The HP 8346A, 8347A, 8348A, and 8349B are general-purpose broadband instrumentation amplifiers capable of providing gain and power to overcome systematic RF losses, drive high-power devices, improve measurement system performance, and drive millimeter-wave source modules.

### Systematic power losses



Examples of systematic power losses include switching and signal routing in ATE systems, frequency conversion, and long transmission paths to remote devices like antennas on towers. By using the HP 8346A, 8347A, 8348A, and 8349B such losses can be overcome. In antenna testing, for example, long cables often prevent enough power from reaching the antenna under test resulting in insufficient measurement dynamic range. Problems like this can be overcome by placing an amplifier at the test location, allowing the source to be operated from a more convenient location and still deliver needed power to characterize the device under test.

### Driving high power devices

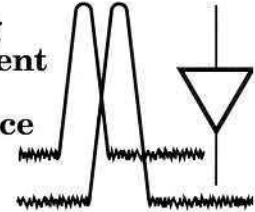


Many devices, like mixers, power amplifiers, TWT's, and optical modulators require high-power drive signals. The HP 8346A, 8347A, 8348A, and 8349B provide the power to drive and characterize these high power devices. Additionally, some of these devices are very level-sensitive. Using the internal coupler/detector of the HP 8347A and 8349B to provide flat, leveled output power allows proper device operation for complete characterization of power sensitive devices and reduces mismatch and reflection effects in a measurement system.

### Amplifier selection guide

	HP 8346A	HP 8347A	HP 8348A	HP 8349B
Frequency Range	26.5–40 GHz	100 kHz–3 GHz	2–26.5 GHz	2–20 GHz
Internal Coupler/Detector	NO	YES	NO	YES
Source Module Interface	NO	NO	NO	YES
Connector Type	2.4 mm(m)	Type-N(f)	3.5 mm(m)	Type-N(f)

### Improving measurement system performance



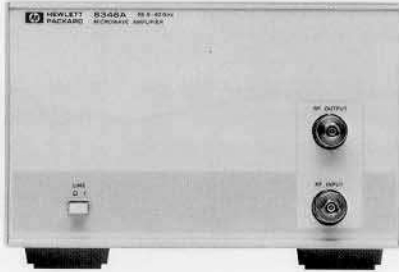
Filter rejection and switch isolation are examples of device characterizations requiring a great deal of dynamic range. The HP 8347A, 8348A, and 8349B can be used to increase low-level sweep speed in increased dynamic range measurements using a network analyzer.

### Dedicated driver for the HP millimeter-wave source modules (HP 8349B only)

The HP 8349B provides the power, DC bias, and control lines needed for proper operation of the HP 83550-series of millimeter-wave source modules.

## HP 8346A Amplifier specifications

**Specifications** describe the instrument's warranted performance over the temperature range 20 to 30°C. **Supplemental characteristics**, denoted typical or nominal, are intended to provide information useful in applying the instrument, but are non-warranted parameters.



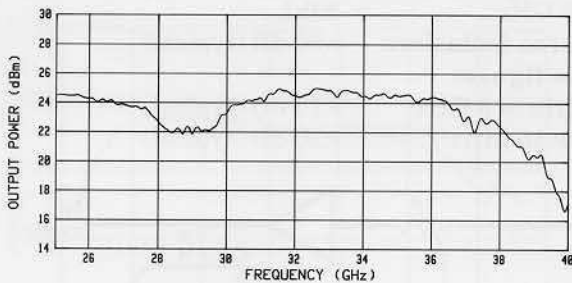
**Frequency range:** 26.5 to 40.0 GHz

### Maximum output power:

(at +7 dBm input)

25.0 to 26.5 GHz:  $\geq +17$  dBm (typical)  
 26.5 to 38.0 GHz:  $\geq +17$  dBm  
 38.0 to 40.0 GHz:  $\geq +13$  dBm

### Typical maximum unlevelled output power



### Power flatness:

(at +7 dBm input)

26.5 to 38 GHz:  $\pm 3$  dB (typical)  
 26.5 to 40 GHz:  $\pm 4$  dB (typical)

### Minimum small signal gain:

(at -5 dBm input)

25.0 to 26.5 GHz:  $\geq 10$  dB (typical)  
 26.5 to 38.0 GHz:  $\geq 10$  dB  
 38.0 to 40.0 GHz:  $\geq 8$  dB

### Harmonics:

(at maximum specified output power)

$< -30$  dBc (typical)

### Maximum continuous input:

Microwave Power: +22 dBm  
 DC Voltage:  $\pm 10$  V

### Input and output impedance:

50  $\Omega$ , nominal

**Input SWR:**  $< 4:1$  (typical)

**Output SWR:**  $< 3:1$  (typical)

### Reverse isolation:

26.5 to 38 GHz:  $> 35$  dB (typical)

38 to 40 GHz:  $> 25$  dB (typical)

### Noise figure:

$< 13$  dB (typical)

### Pulse transmission capability

**Rise/fall time:**  $< 10$  ns (typical)

**Delay time:**  $< 10$  ns (typical)

### General specifications

**Input and output connectors:** 2.4 mm male

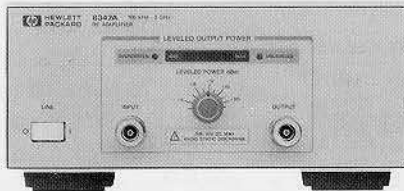
**Power requirement:** 50 to 400 Hz, 100, 120, 200, or 240 Volts AC ( $\pm 10\%$ ); 85 VA maximum

**Weight:** Net 7 kg (15 lb); shipping 14 kg (31 lb).

**Dimensions:** 133 H x 214 W x 366 mm D (5.2 H x 8.4 W x 14.4 in D).

## HP 8347A Amplifier specifications

**Specifications** describe the instrument's warranted performance over the temperature range 20 to 30°C. **Supplemental characteristics**, denoted typical or nominal, are intended to provide information useful in applying the instrument, but are non-warranted parameters.



**Frequency range:** 100 kHz to 3 GHz

**Maximum leveled output power:**  
≥+20 dBm

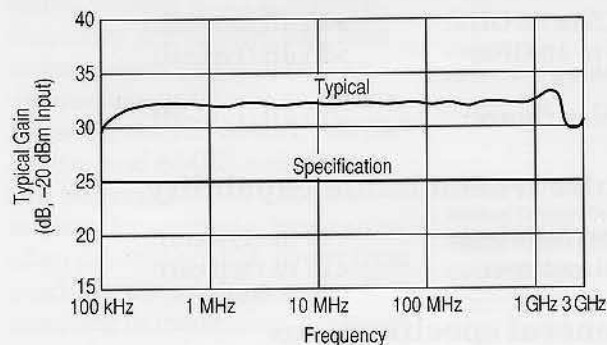
**Output power leveling range:**  
+2 to +20 dBm

**1 dB compression point:**  
+22 dBm nominal

**Power flatness:** (ALC On) ±1.5 dB

**Minimum small signal gain:**  
≥25 dB

### Typical gain



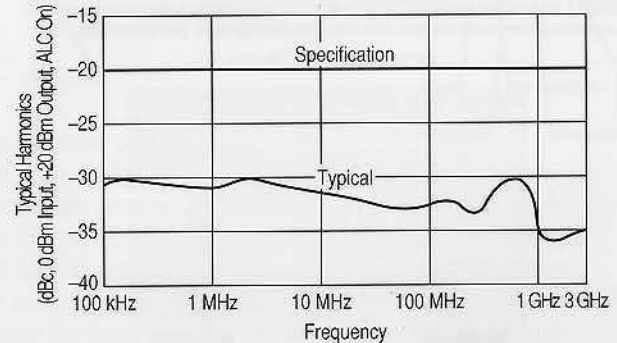
**Harmonics:** (at maximum specified output power)

ALC Off: < -25 dBc

ALC On: < -20 dBc

**Third-order intercept:** +30 dBm, nominal

### Typical harmonics



**Maximum continuous input:**

Microwave power: +27 dBm

DC voltage: ±10 V

**Input and output impedance:**

50Ω, nominal

**Input SWR:** <2.0:1 (typical)

**Output SWR:** (typical)

ALC on: 1.5:1

ALC off:

Below 2 GHz: 2.0:1

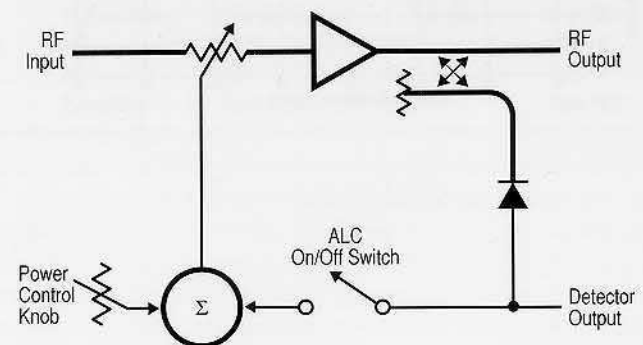
2 to 3 GHz: 3.0:1

**Reverse isolation:** >60 dB (typical)

**Noise figure:**

10 MHz to 3 GHz: <15 dB (typical)

Below 10 MHz: <20 dB (typical)



**Simplified block diagram**

### General specifications

**Input and output connectors:** Type N Female

**Power requirement:** 50 to 400 Hz, 100, 120,

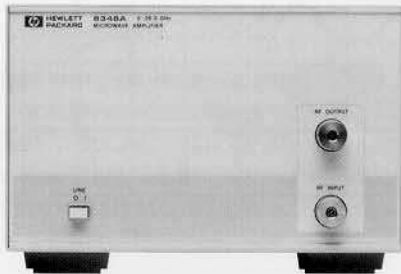
200, or 240 Volts AC (±10%); 45 VA maximum

**Weight:** Net 4 kg (8 lb); shipping 5 kg (11 lb).

**Dimensions:** 102 H x 213 W x 298 mm D (4 H x 8.4 W x 11.7 in D).

## HP 8348A Amplifier specifications

**Specifications** describe the instrument's warranted performance over the temperature range 20 to 30°C. **Supplemental characteristics**, denoted typical or nominal, are intended to provide information useful in applying the instrument, but are non-warranted parameters.



**Frequency range:** 2.0 to 26.5 GHz

### Maximum output power:

(at 0 dBm input)

1.0 to 2.0 GHz:  $\geq +20$  dBm (typical)  
 2.0 to 20.0 GHz:  $\geq +25$  dBm  
 20.0 to 26.5 GHz:  $\geq +23$  dBm

### Typical maximum unlevelled output power



### Power flatness:

(at 0 dBm input)  $\pm 4$  dB (typical)

### Minimum small signal gain:

(at -15 dBm input)

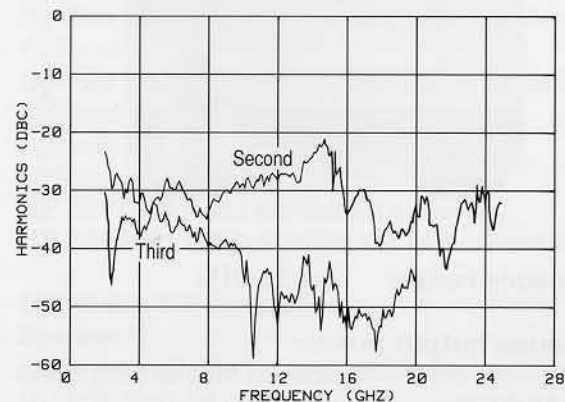
1.0 to 2.0 GHz:  $\geq 20$  dB (typical)  
 2.0 to 20.0 GHz:  $\geq 25$  dB  
 20.0 to 26.5 GHz:  $\geq 23$  dB

### Harmonics: (typical)

(at maximum specified output power)

1.0 to 2.0 GHz:  $< -20$  dBc  
 2.0 to 26.5 GHz:  $< -15$  dBc

### Typical second and third order harmonics



### Third order intercept:

2.0 to 20.0 GHz: +36 dBm, nominal  
 20.0 to 26.5 GHz: +31 dBm, nominal

### Maximum continuous input:

Microwave power: +22 dBm  
 DC Voltage:  $\pm 10$ V

### Input and output impedance:

50Ω, nominal

**Input SWR:**  $< 3:1$  (typical)

**Output SWR:** (typical)

1.0 to 2.0 GHz:  $< 6:1$

2.0 to 20 GHz:  $< 4.5:1$

20 to 26.5 GHz:  $< 2:1$

**Reverse isolation:**  $> 50$  dB (typical)

### Noise figure: (typical)

1.0 to 20 GHz:  $< 10$  dB

20 to 26.5 GHz:  $< 13$  dB

### Pulse transmission capability

**Rise/fall time:**  $< 5$  ns (typical)

**Delay time:**  $< 5$  ns (typical)

### General specifications

**Input and output connectors:** 3.5 mm male

**Power requirement:** 50 to 400 Hz, 100, 120,

200, or 240 Volts AC ( $\pm 10\%$ ); 85 VA maximum

**Weight:** Net 7 kg (15 lb); shipping 14 kg (31 lb).

**Dimensions:** 133 H x 214 W x 366 mm D (5.2 H x 8.4 W x 14.4 in D).

## HP 8349B Amplifier specifications

**Specifications** describe the instrument's warranted performance over the temperature range 20 to 30°C. **Supplemental characteristics**, denoted typical or nominal, are intended to provide information useful in applying the instrument, but are non-warranted parameters.



**Frequency range:** 2 to 20 GHz

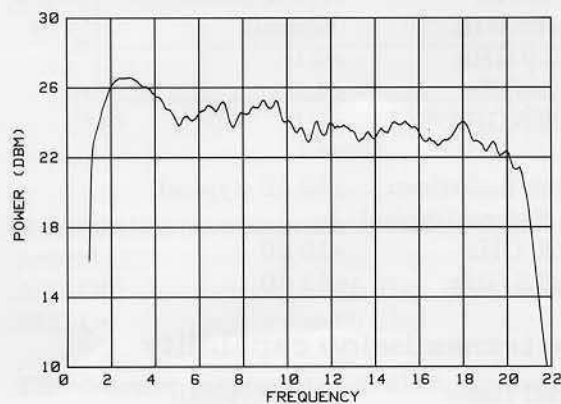
### Maximum output power:

	Unleveled (at +5 dBm input)
2.0 to 18.6 GHz:	+20 dBm
18.6 to 20 GHz:	+18 dBm
Internally leveled	
2.0 to 18.6 GHz:	+19 dBm
18.6 to 20 GHz:	+17 dBm

**Power flatness:**  $\pm 3$  dB (at 0 dBm input)

**1 dB compression point:** +21 dBm, nominal

### Typical maximum unleveled output power



**Power flatness:** (ALC On)  $\pm 1.25$  dB

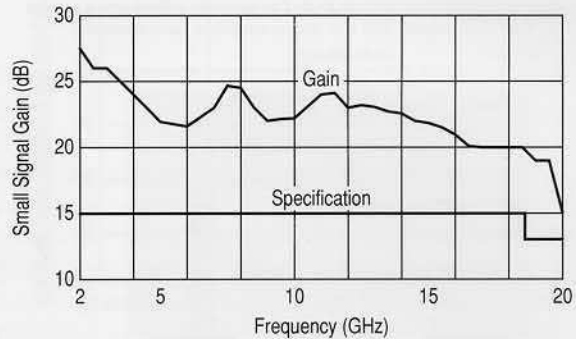
### LED display accuracy

Calibrated range:	+0 dBm to +20 dBm
Calibrated accuracy:	$\pm 1.5$ dB

### Minimum small signal gain:

(at -5 dBm input)	
2.0 to 18.6 GHz:	$\geq 15$ dB
18.6 to 20.0 GHz:	$\geq 13$ dB

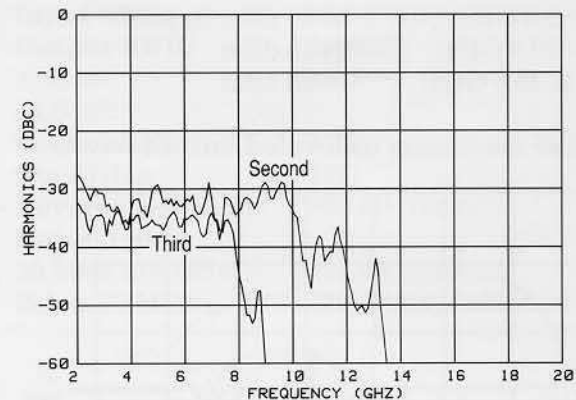
### Typical small signal gain (at -5 dBm input)



### Harmonics: (at maximum specified output power)

2.0 to 11.0 GHz:	$< -20$ dBc
11.0 to 20.0 GHz:	$< -30$ dBc

### Typical second and third order harmonics



### Non-harmonic spurious

(dB below the fundamental at maximum specified output power):  $< -55$  dBc

### Third order intercept:

+33 dBm, nominal

### Maximum continuous input:

Microwave power:	+27 dBm
DC voltage:	$\pm 10$ V

### Input and output impedance:

50 $\Omega$ , nominal

**Input SWR:**  $\leq 2.8:1$  (typical)

**Output SWR:** (typical)

ALC on:  $\leq 2.5:1$

ALC off:

2.0 to 5.0 GHz:  $\leq 4.8:1$

5.0 to 11.0 GHz:  $\leq 3.8:1$

11.0 to 20.0 GHz:  $\leq 3.2:1$

**Reverse isolation:**  $> 50$  dB (typical)

**Noise figure:**  $< 13$  dB (typical)

## Pulse transmission capability

**Rise/fall time:** <10 ns (typical)  
**Delay time:** <8 ns (typical)

## General specifications

**Input and output connectors:** Type N Female  
**Power requirement:** 50 to 400 Hz, 100, 120, 200, or 240 Volts AC ( $\pm 10\%$ ); 85 VA maximum  
**Weight:** Net 7 kg (15 lb); shipping 14 kg (31 lb).  
**Dimensions:** 133 H x 214 W x 366 mm D (5.2 H x 8.4 W x 14.4 in D).

### Rear panel inputs

**POS Z BLANK:** BNC connector, holds the amplifier's LED power display, and the external display while the swept source passes switch points and retraces.

### Rear panel outputs

**Detector output:** BNC connector, outputs approximately  $-10\text{mV/mW}$  for use when leveling.

**Millimeter-wave source modules** (option 002 is recommended for use with the HP millimeter-wave source modules)

**Source module interface:** 20-pin B connector, connects the HP 8349B and the HP 83550 series millimeter-wave source modules via a cable to provide the source modules with the DC bias and control signals from the HP 8349B.

**0.5V/GHz:** BNC connector, provides a voltage that is proportional to the frequency of the microwave source. This signal is used in the power flatness correction feature.

**Synthesizer interface:** 20-pin B connector, connects the HP 8349B to a compatible source to enable the source to pass information directly to and from the millimeter-wave source modules.

## Ordering information

### HP 8346A and 8348A Amplifiers

**Option 001:** Rear panel RF input/output

**Option 002:** Rear panel RF input and front panel RF output

**Option 910:** Extra operating manual

**Option 1BN:** MIL-STD 45662A Certificate of Calibration

**Option 1BP:** MIL-STD 45662A Certificate of Calibration with Data

### System II

Kits are available for rack mounting.

HP P/N 5061-0089 provides handles.

HP P/N 5061-0057 provides the rack mount flange.

### HP 8347A RF Amplifier

#### System II

Kits are available for rack mounting as

HP P/N 5061-9672

### HP 8349B Amplifier

**Option 001:** Rear panel RF input/output

**Option 002:** Rear panel RF input and front panel RF output

**Option 910:** Extra operating manual

#### System II

Kits are available for rack mounting.

HP P/N 5061-0089 provides handles.

HP P/N 5061-0057 provides the rack mount flange.

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