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# High Power Amplifier

**ZHL-30W-262-S+**  
**ZHL-30W-262X-S+**

50Ω 30W 2300 to 2550 MHz

## THE BIG DEAL

- High Power, 30 Watt
- Low Current consumption, 3.2A typ.
- Usable over 2200 to 2600 MHz
- Good Gain Flatness,  $\pm 1.5$  dB typ.
- Excellent VSWR, 1.25:1 typ.
- No damage with an open or short output load under full CW output power
- Shuts off when base plate temperature exceeds  $+80^{\circ}\text{C}$
- Accepts wide range of DC supply voltage  $+25$  to  $+29\text{V}$



Generic photo used for illustration purposes only

|            |                  |                  |
|------------|------------------|------------------|
| Model No.  | ZHL-30W-262-S+   | ZHL-30W-262X-S+▲ |
| Case Style | BT1344           |                  |
| Connectors | SMA / D-Sub Male |                  |

## APPLICATIONS

- WiFi
- Lab test

## PRODUCT OVERVIEW

ZHL-30W-262-S+ is a ruggedized High Power Amplifier delivering 30W signals covering the 2400 MHz ISM, WLAN and S-Band radar bands. This amplifier supports a variety of applications from communication, radar to critical test and measurement systems and includes over-temperature self-protect and alarming circuits as well as internal protection circuits to prevent damage due to operation into an open or short under full RF power.

## KEY FEATURES

| Feature                                 | Advantages                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Good Gain Flatness, $\pm 1.5$ dB        | Predictable performance and signal level strength                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Excellent Input and Output VSWR, 1.25:1 | Well-matched for full power transmission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Over temperature shut down              | The ZHL-30W-262+ includes internal temperature monitoring circuits to automatically shut down the amplifier in the event of over temperature operation. Set for approximately $+85^{\circ}\text{C}$ shutdown (with auto recovery at $70^{\circ}\text{C}$ ), this feature ensures that users whom have difficulty in controlling their thermal environment or need to operate in a remote mode and cannot monitor the amplifier real time, can function with the security that a thermal run-away condition will be avoided through this self management feature. Furthermore, the ZHL-30W-262+ provides a TTL output to indicate thermal shutdown for remote automated systems. |
| Output load protection                  | A high root cause for damage to power amplifiers is the operation into highly reflective loads. The ZHL-30W-262+ power amplifier includes circuits to enable the amplifier to operate without damage in the presence of an open or short over all phases.                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Excellent Output Power: 30W             | Providing 30W of output power at the WiFi bands, this amplifier is an ideal lab test amplifier operating over the entire 2.3 to 2.5 GHz band.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

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## ELECTRICAL SPECIFICATIONS

| Parameter                                 | Condition (MHz) | ZHL-30W-262-S+ |      |      | ZHL-30W-262X-S <sup>▲</sup> |      |      | Units |
|-------------------------------------------|-----------------|----------------|------|------|-----------------------------|------|------|-------|
|                                           |                 | Min.           | Typ. | Max. | Min                         | Typ. | Max. |       |
| Frequency Range                           |                 | 2300           | —    | 2550 | 2300                        | —    | 2550 | MHz   |
| Gain                                      | 2300-2550       | 42             | 50   | 55   | 42                          | 50   | 55   | dB    |
|                                           | 2400-2500       | 43             | 50   | 55   | 43                          | 50   | 55   |       |
| Gain Flatness                             | 2300-2550       | —              | —    | ±3.5 | —                           | —    | ±3.5 | dB    |
|                                           | 2400-2500       | —              | —    | ±1.2 | —                           | —    | ±1.2 |       |
| Output Power at 1dB compression           | 2300-2550       | +41            | +43  | —    | +41                         | +43  | —    | dBm   |
|                                           | 2400-2500       | +42            | +43  | —    | +42                         | +43  | —    |       |
| Saturated Output Power at 3dB compression | 2300-2550       | +43            | +45  | —    | +43                         | +45  | —    | dBm   |
|                                           | 2400-2500       | +44            | +45  | —    | +44                         | +45  | —    |       |
| Noise Figure                              | 2300-2550       | —              | 7.0  | —    | —                           | 7.0  | —    | dB    |
| Output third order intercept point        | 2300-2550       | —              | +50  | —    | —                           | +50  | —    | dBm   |
|                                           | 2400-2500       | —              | +51  | —    | —                           | +51  | —    |       |
| Input VSWR                                | 2300-2550       | —              | 1.3  | —    | —                           | 1.3  | —    | :1    |
|                                           | 2400-2500       | —              | 1.2  | —    | —                           | 1.2  | —    |       |
| Output VSWR                               | 2300-2550       | —              | 1.3  | —    | —                           | 1.3  | —    | :1    |
|                                           | 2400-2500       | —              | 1.2  | —    | —                           | 1.2  | —    |       |
| DC Supply Voltage                         | 2300-2550       | —              | 28   | 29   | —                           | 28   | 29   | V     |
| Supply Current <sup>1</sup>               | 2300-2550       | —              | 3.2  | 4.3  | —                           | 3.2  | 4.0  | A     |

1. Small signal input power -35 dBm typ.

2. Power Supply should be capable of delivering 7.5A at start up.

▲ Heat sink and fan not included. Alternative heat sinking and heat removal must be provided by the user to limit maximum base-plate temperature to 60°C, in order to ensure proper performance. For reference, this requires thermal resistance of user's external heat sink to be 0.157°C/W max.

## ABSOLUTE MAXIMUM RATINGS

| Parameter                                  | Ratings          |
|--------------------------------------------|------------------|
| Ambient Operating Temperature <sup>3</sup> | -20 °C to 41 °C  |
| Storage Temperature                        | -55 °C to 100 °C |
| Base Plate Temperature                     | -20 °C to 60 °C  |
| Input RF Power (no damage)                 | +9 dBm           |

3. For ZHL-30W-262-S+ (with heatsink and fan) only.

Permanent damage may occur if any of these limits are exceeded.

D-SUB MALE CONNECTOR PIN CONNECTIONS<sup>3</sup>

| Pin Function                                                                    | Label on unit            | Pin #   | Color  | Gauge     |
|---------------------------------------------------------------------------------|--------------------------|---------|--------|-----------|
| None                                                                            | N/C1, N/C2<br>N/C4, N/C5 | 1,2,4,5 | None   | None      |
| Thermal Shut-Off Indication:<br>Shut-Off: +2 to +5V<br>Not Shut-Off: 0 to +0.8V | TTL Out                  | 3       | Orange | 28<br>AWG |
| DC Input (+)                                                                    | Vdc                      | 6,7     | Red    | 18<br>AWG |
| Ground                                                                          | GND                      | 8,9     | Black  | 18<br>AWG |

3. Each amplifier will come packaged with an additional D-Sub connector for mating with the amplifier.



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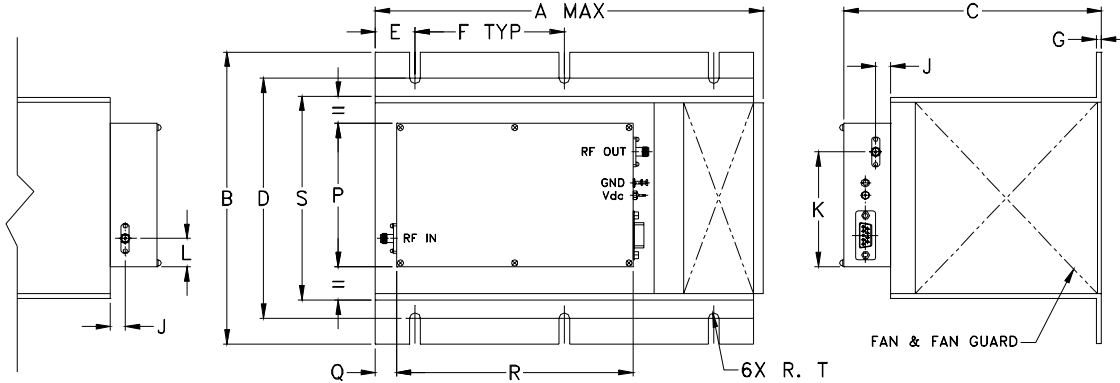
## High Power Amplifier

**ZHL-30W-262-S+**  
**ZHL-30W-262X-S+**

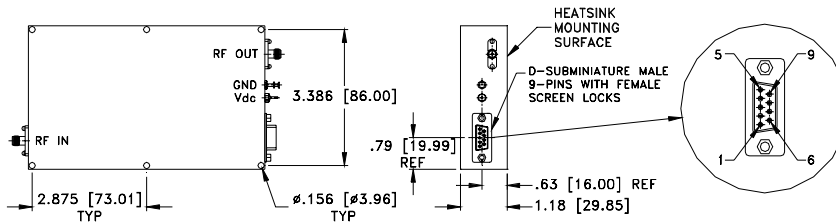
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50Ω 30W 2300 to 2550 MHz

## CASE STYLE DRAWING



## MOUNTING INFORMATION FOR MODELS WITHOUT HEATSINK.

OUTLINE DIMENSIONS (Inch  
mm)

| A      | B      | C      | D      | E     | F     | G    | J    | K     | L     | P     | Q     | R      | S      | T           | wt   |
|--------|--------|--------|--------|-------|-------|------|------|-------|-------|-------|-------|--------|--------|-------------|------|
| 9.85   | 7.3    | 6.5    | 6.00   | 1.00  | 3.75  | .13  | .37  | 2.87  | .71   | 3.58  | .5    | 5.95   | 5.1    | .135 grams* |      |
| 250.19 | 185.42 | 165.10 | 152.40 | 25.40 | 95.25 | 3.30 | 9.40 | 72.90 | 18.03 | 90.93 | 12.70 | 151.13 | 129.54 | 3.43        | 4265 |

\*580 grams without heatsink

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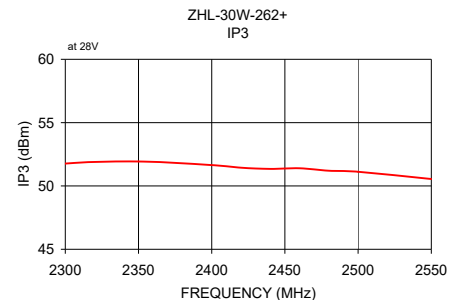
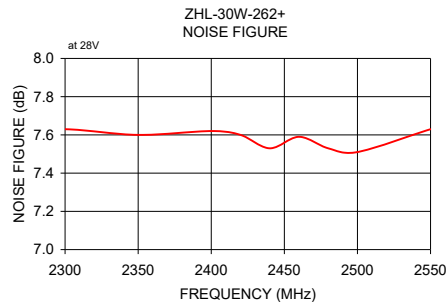
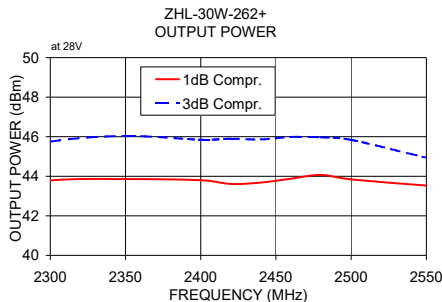
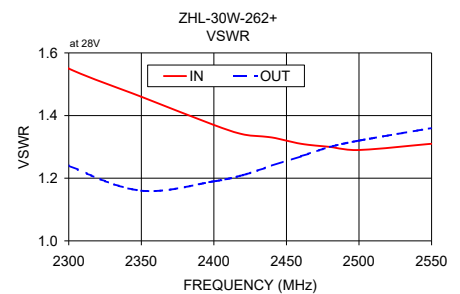
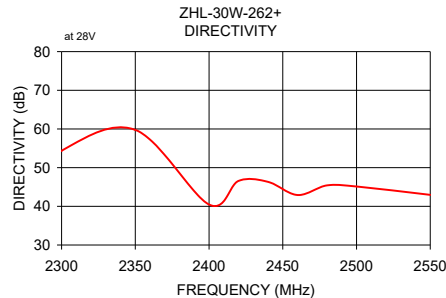
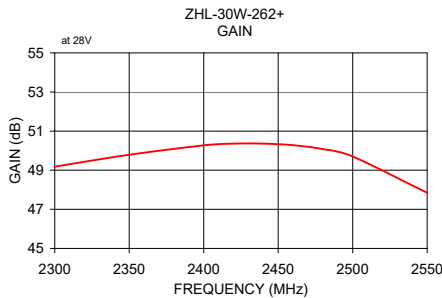
# High Power Amplifier

**ZHL-30W-262-S+**  
**ZHL-30W-262X-S+**

50Ω 30W 2300 to 2550 MHz

## TYPICAL PERFORMANCE DATA / GRAPHS

| Frequency<br>(MHz) | Gain (dB) | Directivity (dB) | VSWR (:1) |      | Noise<br>Figure<br>(dB) | POUT<br>(dBm) |             | Output<br>IP3<br>(dBm) |
|--------------------|-----------|------------------|-----------|------|-------------------------|---------------|-------------|------------------------|
|                    |           |                  | IN        | OUT  |                         | 1 dB Compr.   | 3 dB Compr. |                        |
| 2200.00            | 47.93     | 46.39            | 1.78      | 1.52 | 7.53                    | 41.85         | 43.75       | 50.73                  |
| 2250.00            | 48.55     | 38.56            | 1.67      | 1.36 | 7.62                    | 43.19         | 44.86       | 51.03                  |
| 2300.00            | 49.18     | 54.37            | 1.55      | 1.24 | 7.63                    | 43.79         | 45.75       | 51.77                  |
| 2350.00            | 49.79     | 59.76            | 1.46      | 1.16 | 7.60                    | 43.86         | 46.04       | 51.93                  |
| 2400.00            | 50.27     | 40.46            | 1.37      | 1.19 | 7.62                    | 43.80         | 45.85       | 51.65                  |
| 2420.00            | 50.36     | 46.57            | 1.34      | 1.21 | 7.60                    | 43.61         | 45.90       | 51.44                  |
| 2440.00            | 50.36     | 46.32            | 1.33      | 1.24 | 7.53                    | 43.68         | 45.86       | 51.35                  |
| 2460.00            | 50.28     | 42.92            | 1.31      | 1.27 | 7.59                    | 43.88         | 45.99       | 51.40                  |
| 2480.00            | 50.08     | 45.43            | 1.30      | 1.30 | 7.53                    | 44.07         | 45.97       | 51.20                  |
| 2500.00            | 49.70     | 45.12            | 1.29      | 1.32 | 7.51                    | 43.84         | 45.84       | 51.12                  |
| 2550.00            | 47.85     | 42.96            | 1.31      | 1.36 | 7.63                    | 43.53         | 44.94       | 50.55                  |



## NOTES

- Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
- Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
- The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the standard terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at [www.minicircuits.com/terms/viewterm.html](http://www.minicircuits.com/terms/viewterm.html)



# High Power Amplifier

## ZHL-30W-262+

### Typical Performance Data

| FREQ.<br>(MHz) | GAIN<br>(dB)<br>28V | DIRECTIVITY<br>(dB)<br>28V | VSWR<br>(:1) |            | NOISE<br>FIGURE<br>(dB)<br>28V | POUT @ 1 dB<br>COMPRESSION<br>(dBm)<br>28V | POUT @ 3 dB<br>COMPRESSION<br>(dBm)<br>28V | OUTPUT IP3<br>(dBm)<br>28V |
|----------------|---------------------|----------------------------|--------------|------------|--------------------------------|--------------------------------------------|--------------------------------------------|----------------------------|
|                |                     |                            | IN<br>28V    | OUT<br>28V |                                |                                            |                                            |                            |
| 2200.0         | 47.93               | 46.39                      | 1.78         | 1.52       | 7.53                           | 41.85                                      | 43.75                                      | 50.73                      |
| 2250.0         | 48.55               | 38.56                      | 1.67         | 1.36       | 7.62                           | 43.19                                      | 44.86                                      | 51.03                      |
| 2300.0         | 49.18               | 54.37                      | 1.55         | 1.24       | 7.63                           | 43.79                                      | 45.75                                      | 51.77                      |
| 2350.0         | 49.79               | 59.76                      | 1.46         | 1.16       | 7.60                           | 43.86                                      | 46.04                                      | 51.93                      |
| 2400.0         | 50.27               | 40.46                      | 1.37         | 1.19       | 7.62                           | 43.80                                      | 45.85                                      | 51.65                      |
| 2420.0         | 50.36               | 46.57                      | 1.34         | 1.21       | 7.60                           | 43.61                                      | 45.90                                      | 51.44                      |
| 2440.0         | 50.36               | 46.32                      | 1.33         | 1.24       | 7.53                           | 43.68                                      | 45.86                                      | 51.35                      |
| 2460.0         | 50.28               | 42.92                      | 1.31         | 1.27       | 7.59                           | 43.88                                      | 45.99                                      | 51.40                      |
| 2480.0         | 50.08               | 45.43                      | 1.30         | 1.30       | 7.53                           | 44.07                                      | 45.97                                      | 51.20                      |
| 2500.0         | 49.70               | 45.12                      | 1.29         | 1.32       | 7.51                           | 43.84                                      | 45.84                                      | 51.12                      |
| 2550.0         | 47.85               | 42.96                      | 1.31         | 1.36       | 7.63                           | 43.53                                      | 44.94                                      | 50.55                      |



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IF/RF MICROWAVE COMPONENTS

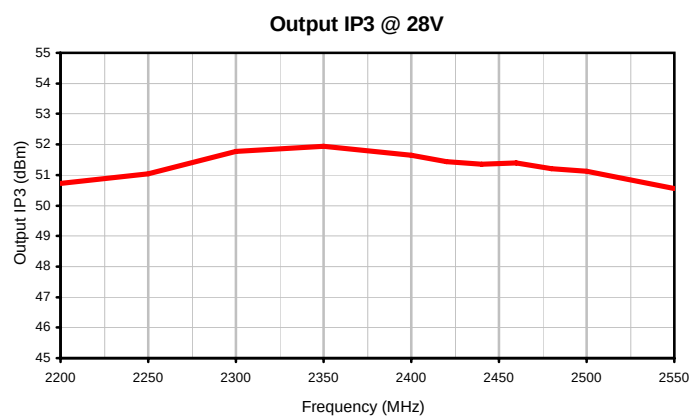
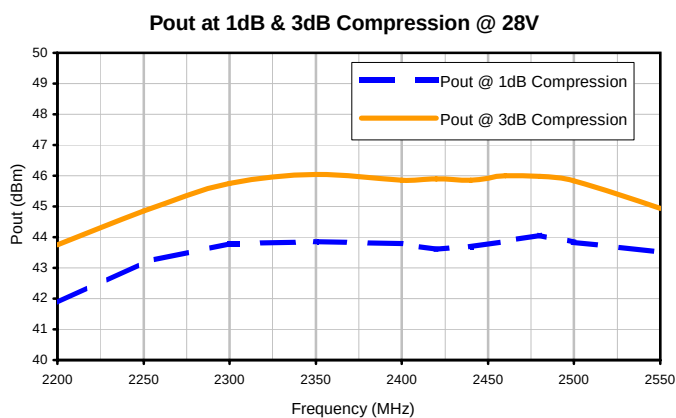
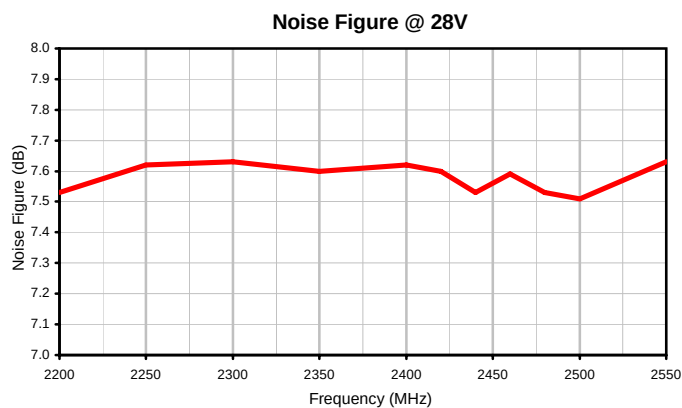
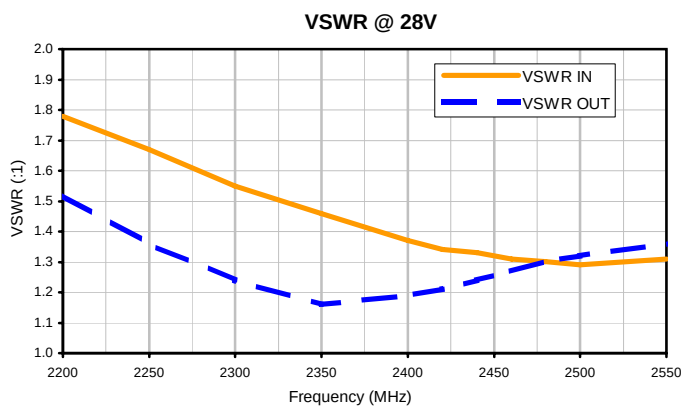
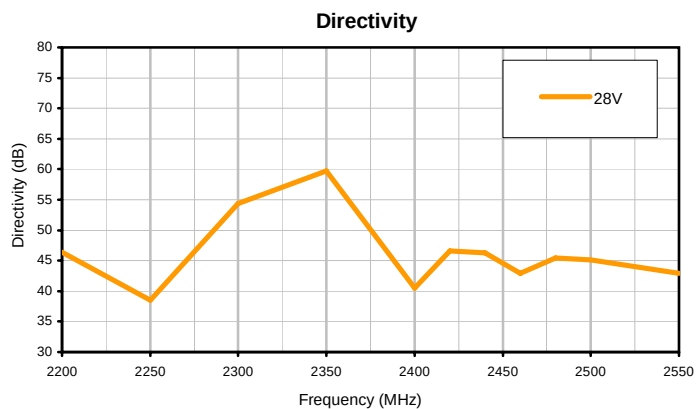
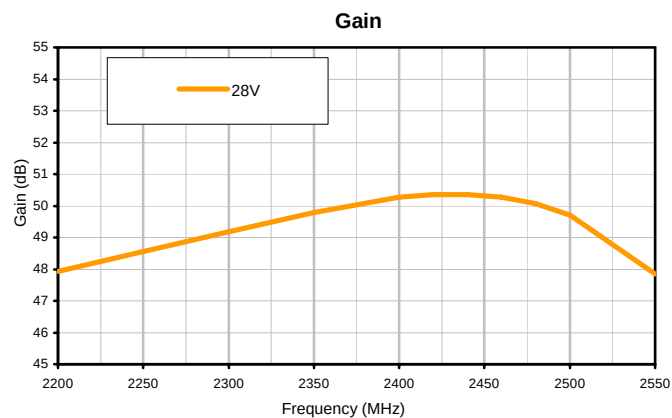


REV. X1  
ZHL-30W-262+  
4/23/2010  
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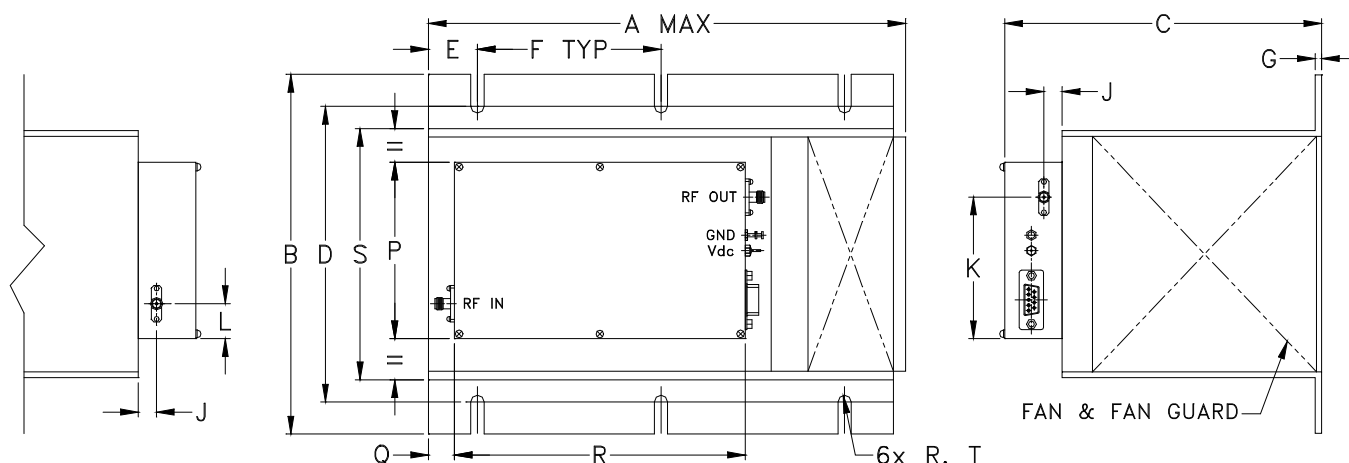
# High Power Amplifier

## Typical Performance Curves

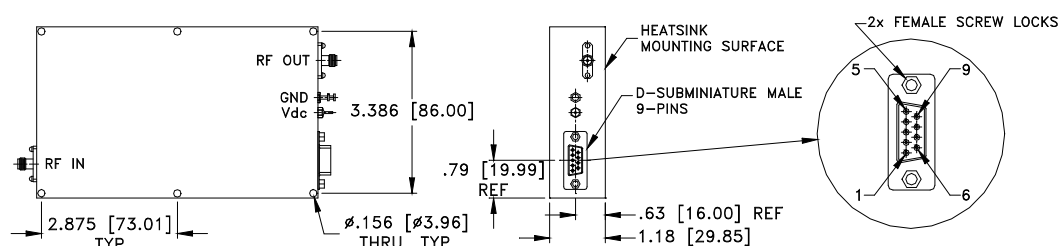
ZHL-30W-262+



### Outline Dimensions



### MOUNTING INFORMATION FOR MODELS WITHOUT HEATSINK.



| CASE#  | A                | B               | C               | D                | E               | F               | G             | H | J             | K               | L              | M | N |
|--------|------------------|-----------------|-----------------|------------------|-----------------|-----------------|---------------|---|---------------|-----------------|----------------|---|---|
| BT1344 | 9.85<br>(250.19) | 7.3<br>(185.42) | 6.5<br>(165.10) | 6.00<br>(152.40) | 1.00<br>(25.40) | 3.75<br>(95.25) | .13<br>(3.30) | - | .37<br>(9.40) | 2.87<br>(72.90) | .71<br>(18.03) | - | - |

| CASE#  | P               | Q             | R                | S               | T              | WT, GRAM | WT WITHOUT HEATSINK, GRAM |
|--------|-----------------|---------------|------------------|-----------------|----------------|----------|---------------------------|
| BT1344 | 3.58<br>(90.93) | .5<br>(12.70) | 5.95<br>(151.13) | 5.1<br>(129.54) | .135<br>(3.43) | 4265     | 580                       |

Dimensions are in inches (mm). Tolerances: 1 Pl.  $\pm .1$ ; 2 Pl.  $\pm .03$ ; 3 Pl.  $\pm .015$

#### Notes:

- Case material: Aluminum alloy.
- Finish:  
For RoHS Case Styles: Clear Chemical conversion coating, non-chrome or trivalent chrome based.
- Heatsink finish: Black anodize.
- Refer to the individual model data sheet for the type of connectors available.
- Recommended screws for mounting model without heat sink on 3/32" thick sheet: #6-32, 1.50" Length.



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RF/IF MICROWAVE COMPONENTS



All Mini-Circuits products are manufactured under exacting quality assurance and control standards, and are capable of meeting published specifications after being subjected to any or all of the following physical and environmental test.

| Specification             | Test/Inspection Condition              | Reference/Spec                                     |
|---------------------------|----------------------------------------|----------------------------------------------------|
| Operating Temperature     | -20° to 60°C<br>Base Plate Temperature | Individual Model Data Sheet                        |
| Storage Temperature       | -55° to 100° C<br>Ambient Environment  | Individual Model Data Sheet                        |
| Stabilization Bake        | (non-operating)<br>125°C, 24 hours     | - - -                                              |
| Burn-in at Elevated Temp. | (DC on)<br>160 hours at 60° C          | MIL-STD-202, Method 108                            |
| Thermal Shock             | -55° to 100°C, 5 cycles                | MIL-STD-202, Method 107, Condition A, except 100°C |