# RFM100-500-350-HSD

## 100-500MHz 350W Class A/AB High Performance Amplifier with High Speed Disable

- **Class A/AB 350W linear amplifier**
- **Fast output disable, ≤1μsec**
- **VVA, over 30dB range**
- **Analog temperature out**
- **High temperature alarm**
- **Independent MMIC disable**
- **Output stage current sense**
- **Temperature compensated bias**
- **SMA input, N output connectors**

The RFM100-500-350-HSD is a high gain, high power Class A/AB amplifier module designed for military and commercial communications systems. It features fast output disable with ≤1μsec response time, and includes numerous control and monitoring functions. It exhibits excellent gain flatness and linearity, and is offered in a compact housing with a nickel plated copper base for best possible thermal performance.

**Specifications** (Two power supplies are required.)
$V_{supply1}$ = +28VDC, $I_{DQ}$ = 3.3A, $V_{supply2}$ = +50VDC, $I_{DQ}$ = 0.8A
$P_{out}$ = 350W, $T_{base}$ = 50°C, $Z_{load}$ = 50Ω

| Parameter | Min | Typ | Max | Units |
|---|---|---|---|---|
| Freq. Range | 100 | | 500 | MHz |
| $P_{1dB}$ | 350 | See Fig. 4 | | W |
| Input Power | | -2.3 | +0.7 | dBm |
| Gain | 54.7 | 57.7 | | dB |
| Gain Flatness | | +/-0.6 | +/-1.2 | dB |
| Drain Current, 28VDC | | 3.3 | 3.5 | A |
| Drain Current, 50VDC | | 13.4 | 14.7 | A |
| Efficiency (output stage only) | 48 | 52 | | % |
| IRL | | -23 | -14 | dB |
| $f_2$ | | -49 | -34 | dBc |
| $f_3$ | | -23 | -10 | dBc |
| $IMD_3$ 350W PEP, Δf=100kHz | | -36 | -28 | dBc |
| Dimensions | 4.50 X 8.40 X 1.35 (114.30 X 213.36 X 34.29) | | | inch (mm) |

**Maximum Ratings**
Operation beyond these ratings may damage amplifier.

| Parameter | Value |
|---|---|
| $V_{supply1}$ | 24-28VDC |
| $V_{supply2}$ | 46-50VDC |
| Bias Current, 28VDC | 3.5A |
| Bias Current, 50VDC | 1.0A |
| Drain Current, 28VDC | 3.5A |
| Drain current, 50VDC | 15A |
| Load Mismatch* | 3:1 |
| Housing Base Temperature (See important notes on cooling, Page 5.) | 60°C |
| Storage Temperature | -40°C to 85°C |

*All phase angles, 350W forward power, current limited to 15A for 5 seconds maximum.

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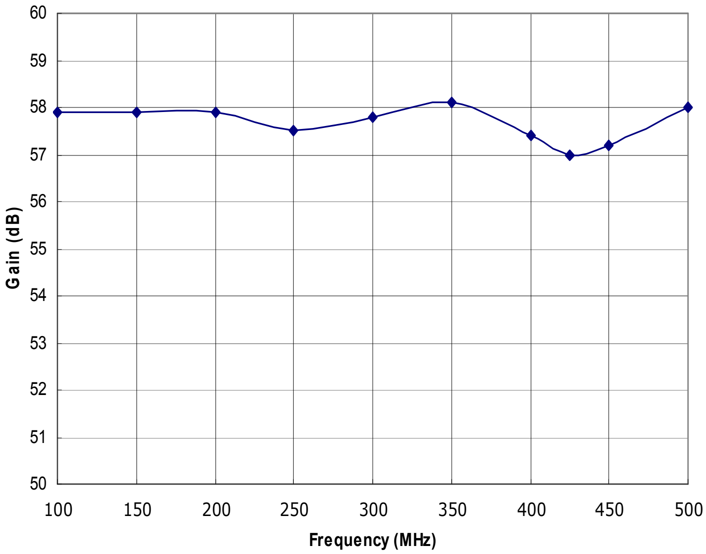



**Figure 1: RFM100-500-350-HSD Typical Gain @ $P_{out}$ = 350W.**

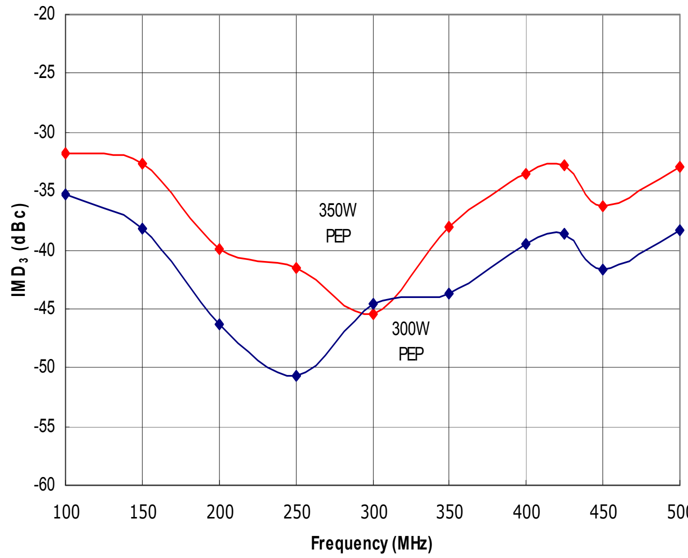



**Figure 2: RFM100-500-350-HSD Typical $IMD_3$ @ 350W and 300W PEP, Δf = 100kHz.**

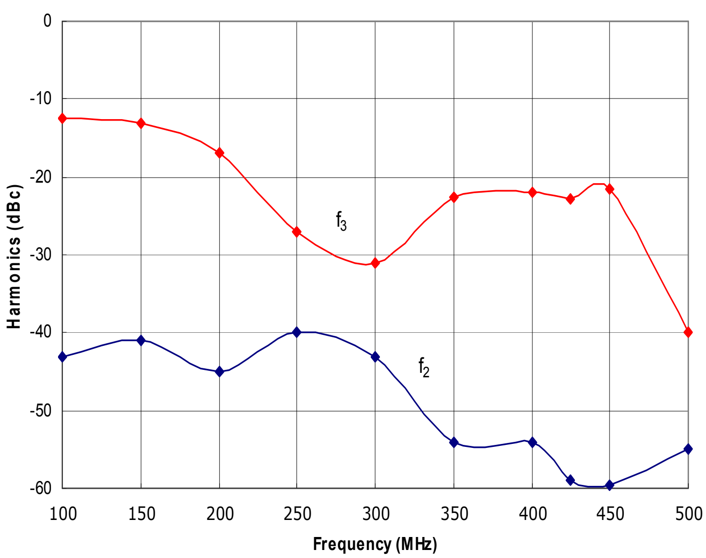



**Figure 3: RFM100-500-350-HSD Typical $f_2$ and $f_3$ @ $P_{out}$ = 350W.**

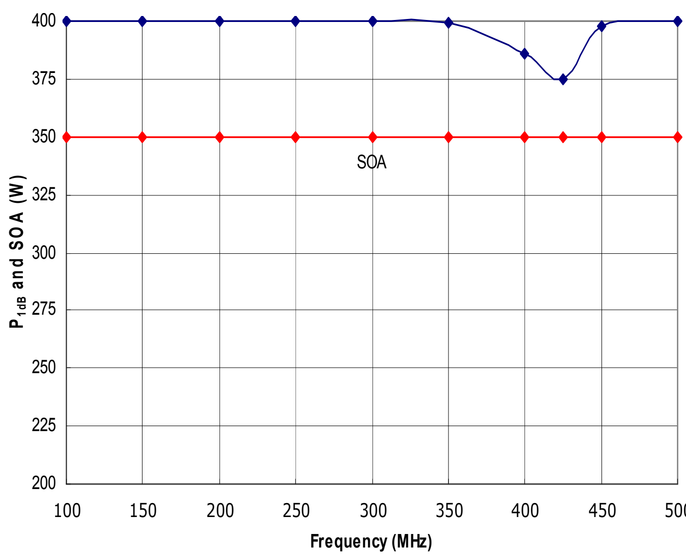
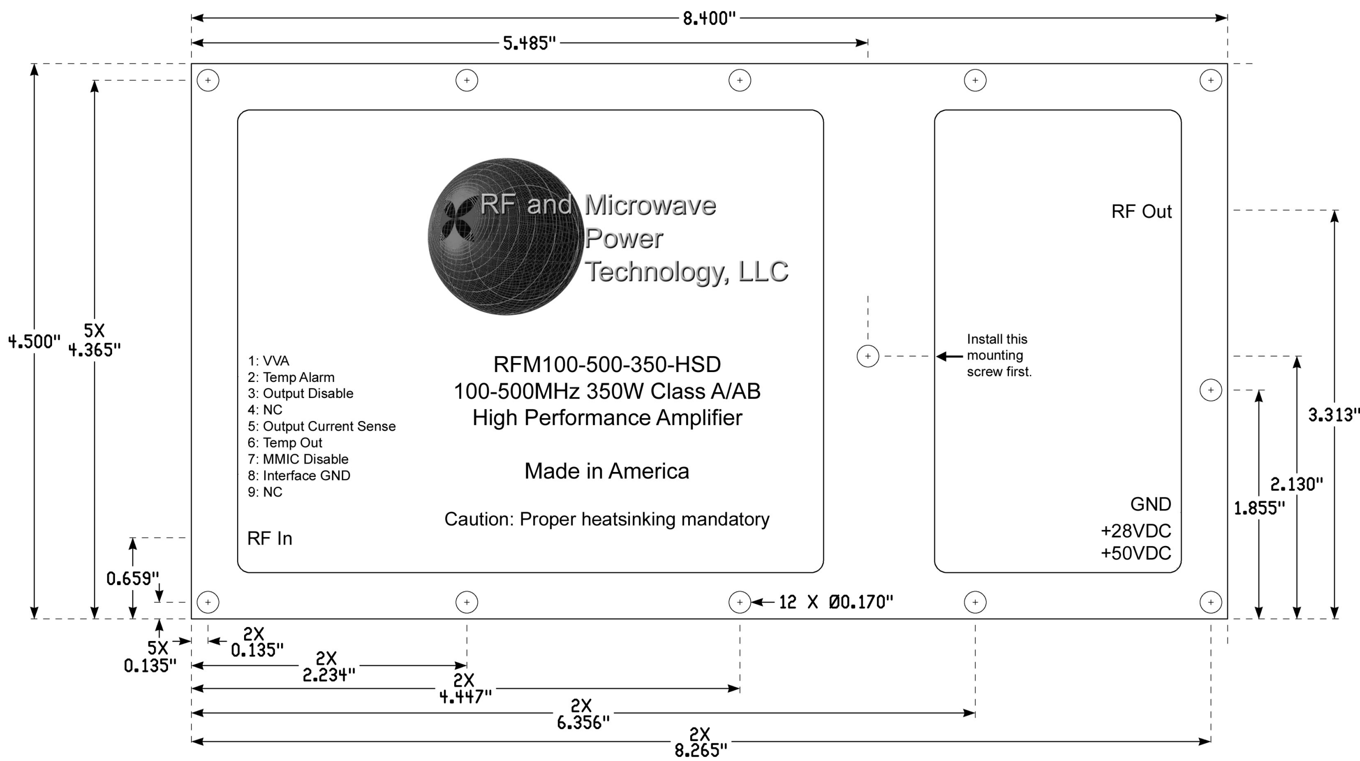
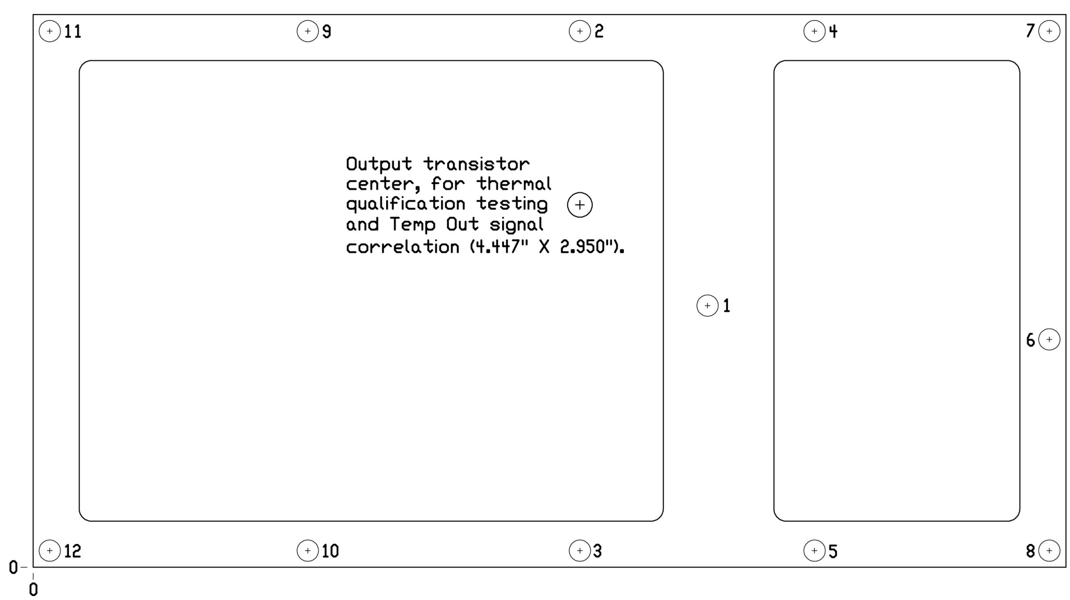



**Figure 4: RFM100-500-350-HSD Typical $P_{1dB}$ and Safe Operating Area (SOA). The amplifier is capable of delivering more power than it is safe to generate. Do not exceed the SOA shown above without first contacting RFMPT to discuss your application.**

## Amplifier Mounting Hole and RF Locations, and Mounting Screw Tightening Sequence



## Interface Pins and Functions

**1: VVA** The voltage variable attenuator has a slope of approximately 14dB/volt, from 1.4 to 3.6VDC. Maximum attenuation is reached by 4.4VDC. The acceptable control range is 0 to 5.0VDC. Do not exceed 5.0VDC on this pin. The VVA control voltage should be set to zero volts during amplifier power up and power down.

**2: Temp Alarm** This indicates an over-temperature condition, and is set to trip at a housing base temperature of approximately +60°C. It is pulled up internally to +5VDC, and will pull down to 0V at +60°C. This signal exhibits 5°C of hysteresis, and will reset to +5VDC at approximately +55°C.

**3: Output Disable** This is active high at +5VDC, and is TTL compatible. It disables the output and its two drive stages simultaneously, and will reduce full rated output power to near zero* in ≤1µsec. When set to 0VDC, the amplifier will return to within 0.25dB of full power in approximately 50µsec. For further RF burst fidelity improvements, the end user may solder an electrolytic capacitor to the +50VDC feedthru cap and ground stud next to it. RFMPT recommends a value of ≥4700uF.

* Due to feedback paths inherent in all stages of the amplifier, there will be a miniscule amount of RF still present on the output even when bias has been disabled. For additional RF quieting, the VVA may be set to maximum attenuation simultaneously with the Output Disable signal.

**4: NC** This pin has no internal connection and should be left floating.

**5: Output Current Sense** This is a DC signal scaled at 0.30V/A, and monitors the output transistor *only*. Over-current protection should be enabled at >4.50VDC, or 15A output transistor current.

**6: Temp Out** This is an analog signal that is a nominal +0.75V at +25°C. The temp monitor IC has a positive slope of 10mV/°C with increasing temperature. However, a temperature gradient and an offset will exist between the temperature reported on this pin and the actual housing base temperature directly under the output transistor (see bottom figure on Page 3). The reported slope will be closer to 6.7mV/°C, rather than the native 10mV/°C of the IC. It is up to the end user to properly characterize this signal's response with their chosen cooling configuration.

**7: MMIC Disable** This is a supplementary disable pin, for additional amplifier quieting at the user's discretion. It exhibits approximately a 50usec delay for enable, and a 30usec delay for disable. Due to the internal biasing resistor in the MMIC, there will be significant RF bleedthrough even when the MMIC is disabled.

**8: Interface GND** All control and monitoring signals should be referenced to this pin. It is tied internally to the amplifier ground plane. A minimum of 20 gauge wire is recommended for best grounding.

**9: NC** This pin has no internal connection and should be left floating.

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## Instructions for Amplifier Use

1) **IMPORTANT:** This amplifier uses a single high power output transistor which will dissipate up to 375W even into a well matched 50 ohm load. Peak dissipation will occur between 400 and 450MHz, and very careful attention **must** be paid to proper amplifier cooling or transistor lifetime will be substantially reduced and will not be covered under warranty. The maximum allowed housing base temperature directly under the center of the output transistor is 60°C (see bottom figure on Page 3 for thermal qualification point location). Due to amplifier cooling requirements, a high performance thermal compound (Wakefield Type 122 or better) **must** be used. Standard performance thermal compounds will be inadequate in air cooled systems, and their use will void the warranty. Apply the thermal compound to the bottom of the amplifier housing. Thinner is better, but ensure that when mounted to your heatsink, contact across the **entire** module base is made. Gaps and air bubbles will significantly reduce cooling, leading to possible amplifier damage. Use 12 #6-32 or M4 screws to mount the amplifier to your heatsink. Refer to the figure on the bottom of Page 3 for the proper order in which to torque the mounting screws.

2) Guarantee sufficient airflow through the heatsink fins to keep the maximum housing base temperature at or less than 60°C. Contact RFMPT for details on how to qualify your heatsink's performance, if needed.

3) Connect a proper signal source to the RF In connector, and desired load to the RF Out connector. Torque connectors to industry standards for the types supplied with the amplifier.

4) Connect +50VDC to the bottom feedthru connector on the output end of the amplifier housing. Use a minimum of 14 gauge wire (12 gauge preferred). Connect +28VDC to the top feedthru connector on the output end of the amplifier housing. Use a minimum of 18 gauge wire. Ensure that the DC supply voltages are within the ranges specified in the Maximum Ratings section. It is preferred to ground the amplifier through the heatsink for lowest impedance ground. In addition, a safety ground should be connected to the ground stud on the output end of the amplifier housing. Use a minimum of 12 gauge wire for this connection.

5) Apply desired signals/monitoring lines to the interface pins in the DB-9 connector. Refer to the Interface Pins and Functions section for signal descriptions, limits, and timing requirements.

6) Apply +50VDC, then +28VDC, then sufficient RF drive to achieve desired output level. The maximum amplifier RF input power is +0.7dBm. This amplifier is designed to operate in a non-saturated linear mode only. Regardless of the input power, ensure that the Safe Operating Area (SOA) power level indicated in Figure 4 is not exceeded, or amplifier damage may occur, and will void the warranty.

7) To disconnect the amplifier, first remove the RF drive, then +28VDC, then +50VDC, then the RF connections.

Contact the factory at sales@rfmpt.com with any questions, or for special options, testing requirements, and/or operating conditions not specified in this document.

### Document Control

| Revision | Date | Notes |
|---|---|---|
| A | 8-16-2017 | Initial release. |
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