# RFM30-88-225XR-HSD-C

RF and Microwave Power Technology
BATTLE BORN AMPLIFIERS™

## 30-88MHz 225W Class A/AB High Performance SINCGARS Amplifier with High Speed Disable and RF Power Monitoring

***Preliminary***

- **Class A/AB 225W linear amplifier**
- **Fast output disable, ≤1µsec**
- **FWD and REF power monitoring with VSWR alarm**
- **VVA with over 30dB range**
- **Analog temperature out with high temp alarm**
- **Independent MMIC disable**
- **Output stage current sense**
- **Temperature compensated bias**
- **SMA input, N output connectors**

Representative image

The RFM30-88-225XR-HSD-C is a high gain, high power Class A/AB amplifier module designed for SINCGARS communications systems. It features fast output disable with ≤1µsec response time, and incorporates numerous control and monitoring functions including forward and reflected RF power measurement and a high VSWR alarm. It exhibits excellent gain flatness, and is offered in a compact housing with a nickel plated copper base for best possible thermal performance.

### Specifications

$V_{supply}$ = +50VDC, $I_{DQ}$ = 2.50A $P_{out}$ = 200W, $T_{base}$ = 50°C, $Z_{load}$ = 50Ω

| Parameter | Min | Typ | Max | Units |
|---|---|---|---|---|
| Freq. Range | 30 | | 88 | MHz |
| $P_{1dB}$ | 225 | See Figure 4 | | W |
| Input Power | | -4.5 | -1.5 | dBm |
| Gain | 54.5 | 57.5 | | dB |
| Gain Flatness | | +/-0.4 | +/-0.8 | dB |
| Drain Current | | 9.5 | 10.5 | A |
| Efficiency | 38 | 42 | | % |
| IRL | | -18 | -14 | dB |
| $f_2$ | | -30 | -26 | dBc |
| $f_3$ | | -18 | -14 | dBc |
| $IMD_3$<br>200W PEP, Δf=10kHz | | -34 | -30 | dBc |
| Dimensions | 4.50 X 8.85 X 1.20<br>(114.30 X 224.79 X 30.48) | | | inches (mm) |

### Maximum Ratings

Operation beyond these ratings may damage amplifier.

| Parameter | Value |
|---|---|
| $V_{supply}$ | 46-50VDC |
| Bias Current | 3.0A |
| Drain current | 12A |
| Load Mismatch<br>All phase angles, 200W forward power, housing base held to 65°C max.<br>(See figure on Page 3, forthcoming, for thermal qualification point.) | 3:1, indefinite<br>5:1, 1 minute<br>10:1, 5 seconds max, current limited to 12A |
| Housing Base Temperature | 65°C |
| Storage Temperature | -40°C to 85°C |

### Option Ordering Info

Contact RFMPT to discuss special requirements.

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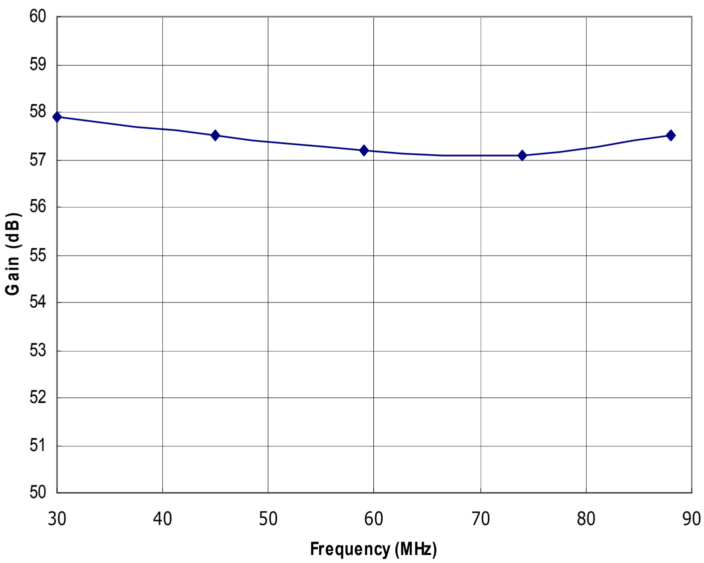


**Figure 1: RFM30-88-225XR-HSD-C Typical Gain @ $P_{out}$ = 200W.**

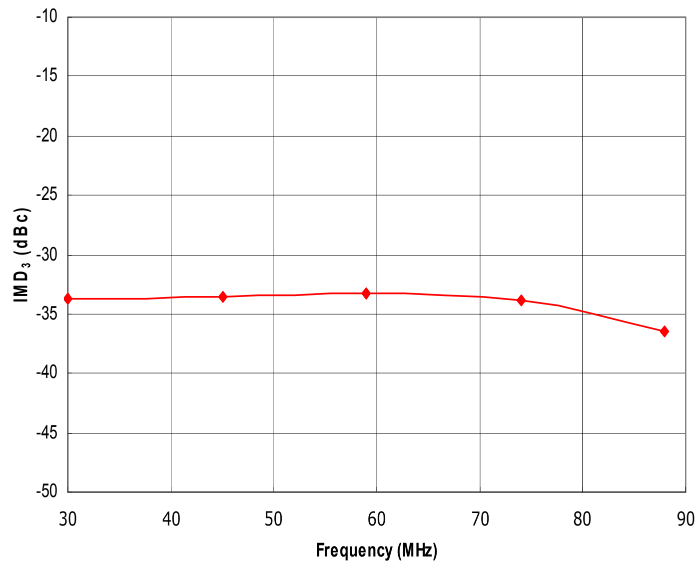


**Figure 2: RFM30-88-225XR-HSD-C Typical $IMD_3$ @ 200W PEP, Δf = 10kHz.**

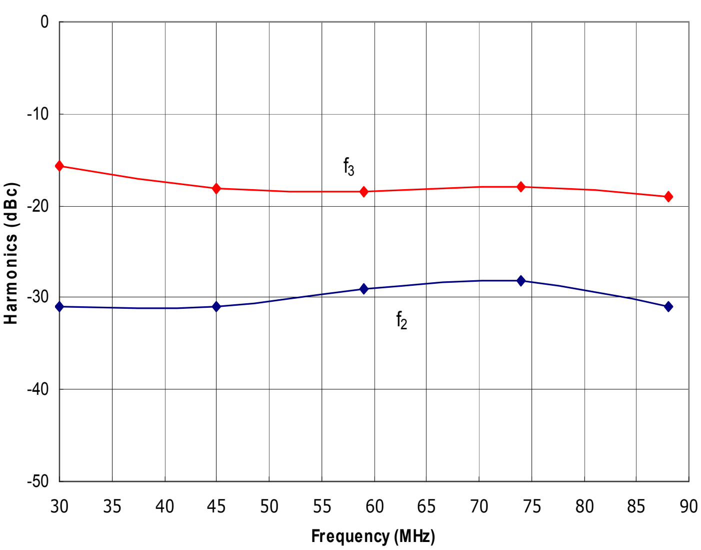


**Figure 3: RFM30-88-225XR-HSD-C Typical $f_2$ and $f_3$ @ $P_{out}$ = 200W.**

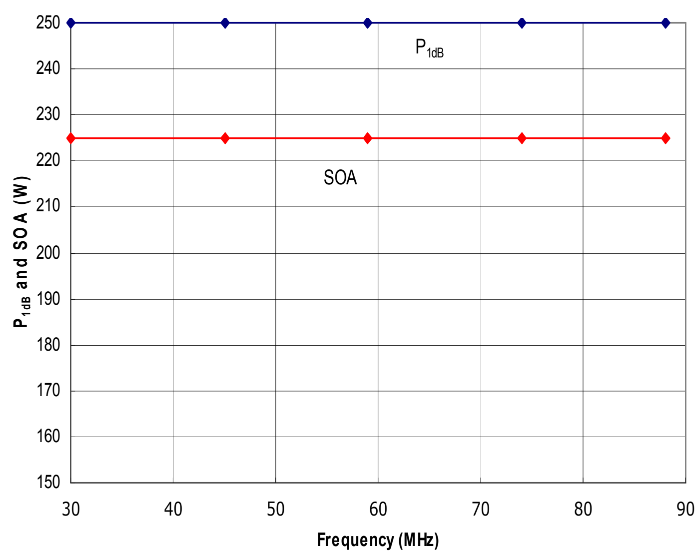


**Figure 4: RFM30-88-225XR-HSD-C Typical $P_{1dB}$ and Safe Operating Area (SOA). The amplifier is capable of delivering more power than it is safe to generate. Do not exceed the SOA shown above without first contacting RFMPT to discuss your application.**

## Interface Pins and Functions (final pin assignment TBD)

**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 line 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 +65°C. It is pulled up internally to +5VDC, and will pull down to 0V at ≥+65°C. This signal exhibits 5°C of hysteresis, and will reset to +5VDC at approximately +60°C.

**3: Output Disable** This is active high at +5VDC. It disables the output and its drive stage simultaneously, and will reduce full rated output power to near zero* in ≤1µsec. When set to 0VDC, the amplifier will return to within 0.3dB of full power in approximately 50µsec.

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

**4: MMIC Disable** This is a supplementary disable pin, active high at +5VDC, for additional amplifier quieting at the user's discretion. It exhibits approximately a 16usec delay for enable, and a 7usec delay for disable. Due to the internal biasing resistor in the MMIC, there will be significant RF bleedthrough even when the MMIC is disabled.

**5: Output Current Sense** This is a DC signal scaled at 0.40V/A, and monitors the output transistor *only*. Over-current protection must be enabled at ≥4.60VDC, or 11.5A *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 figure on Page 3, forthcoming). The reported slope will be closer to 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: Forward RF Power** This signal is set at the factory to be 4.50VDC at 200W forward power. It scales at approximately 0.11V/dB of output power. Data for 20-200W of output power is supplied with each amplifier, so that the actual scaling is available to the end user.

**8: Reflected RF Power** This signal is set at the factory to be 4.50VDC at 200W reflected power. It scales at approximately 0.11V/dB of output power. Its scaling will closely follow that of the supplied forward power scaling data.

**9: VSWR Alarm** This is set to trip at a nominal 3:1 VSWR. It is active high at +5VDC, and is non-latching. Other VSWR trip values are available; consult the factory for options. This signal incorporates approximately 1dB of return loss hysteresis. That is, the output load return loss must improve by 1dB for the alarm to be disabled, and return to 0VDC. As forward power decreases below 200W, the VSWR Alarm trip point automatically increases to allow for greater load mismatch withstand. At approximately 1W forward output power, the VSWR Alarm is disabled.

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**High Performance SINCGARS Amplifier**
**with High Speed Disable**
**and RF Power Monitoring**
***Preliminary***

## Instructions for Amplifier Use

1) **IMPORTANT:** This amplifier uses a single high power output transistor which will dissipate up to 300W even into a well matched 50 ohm load. Peak dissipation occurs at the bottom end of the amplifier's operating frequency range. Careful attention must be paid to proper amplifier cooling or transistor lifetime will be reduced and will not be covered under warranty. The maximum allowable housing base temperature directly under the center of the output transistor is 65°C (see bottom figure, forthcoming, on Page 3 for thermal qualification point location). While not required, it is recommended that a high performance thermal compound (Wakefield Type 122 or better) be used when mounting the amplifier to a heatsink.

   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 9 #6-32 screws to mount the amplifier to your heatsink. Refer to the figure on the bottom of Page 3, forthcoming, 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 65°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 +Vcc to the feedthru connector on the output end of the amplifier housing. Use a minimum of 14 gauge wire. Ensure that the DC supply voltage is within the range 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 14 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 +Vcc, then sufficient RF drive to achieve desired output level. The maximum amplifier RF input power is -1.5dBm. 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 +Vcc, 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 |
|---|---|---|
| Pre | 3-4-2018 | Preliminary release. |
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