

Revision 0.B Release Date October 19, 2007

Revision Notes Final production release

## Technical Specifications Summary

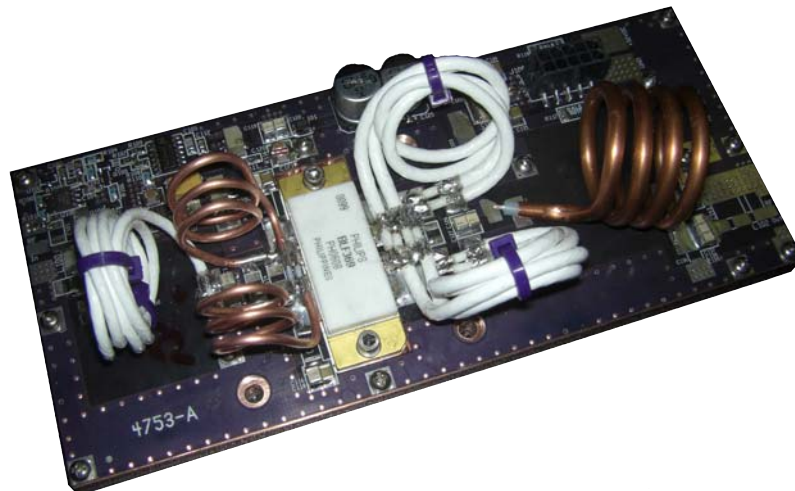
Frequency Range: 86 - 108 MHz  
P1dB: 500 Watts CW  
Class: C  
Supply Voltage: 32.0V

Gain: 17dB  
Efficiency: 80%  
Temperature Range: -20 to 65°C  
Max VSWR: 3:1

## Amplifier General Description

This next generation pallet amplifier is designed specifically for FM commercial radio. Using a single gold metallized LDMOS transistor, this Class C amplifier offers excellent efficiency, reliability, and value. Because of the high power density in this amplifier, a copper baseplate is used and allows extended temperature operation. An on-board thermostat protects the amplifier against thermal faults.

## Amplifier Picture

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Parameter	Min	Typ	Max	Units	Notes
Frequency	87		108	MHz	
P1dB		500		W, CW	
Power Input		7		W, CW	
Gain	17	18.5		dB	
Vsupply		28		V, DC	
Drain Current		22		A, DC	
Input VSWR			1.5:1		
Insertion Phase Variation		±5		°	Unit to unit
Gain Variation		±1		dB	Unit to unit
F2 Second Harmonic		-30		dBc	
F3 Third Harmonic		-15		dBc	
Baseplate Operating Temperature	-20		65	°C	

## Physical Dimensions

5.75" x 2.50" x 1.5"

All specifications valid for 50  $\Omega$  output impedance,  $V_{sup} = +28VDC$ ,  $I_{dq} = 0.0A$ 

## Absolute Maximum Ratings

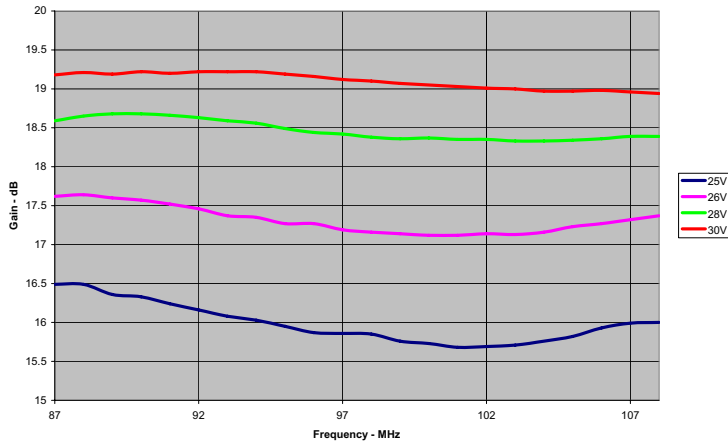
Parameter	Value	Units	Notes
Maximum Operating Voltage	32	V, DC	
Maximum Bias Current, Q100	1	A, DC	
Maximum Drain Current	30	A, DC	
Load Mismatch Survival	3:1		
Storage Temperature	- 20 to 85	°C	
Maximum Operating Baseplate Temp	65	°C	

## Features, Auxillary Functions

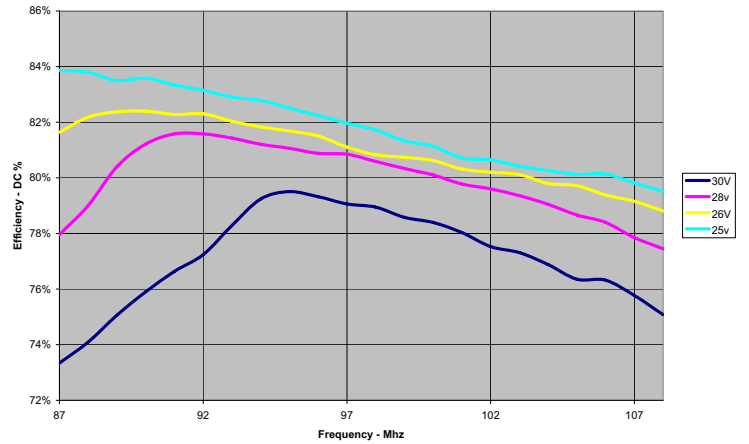
- ◆ Temperature Controller - Analog Temperature Output
- ◆ High Temperature Alarm with Automatic PA Disable
- ◆ Amplifier Disable
- ◆ Current Sense
- ◆ Connectorized Power



Gain vs. Frequency varying Vsup

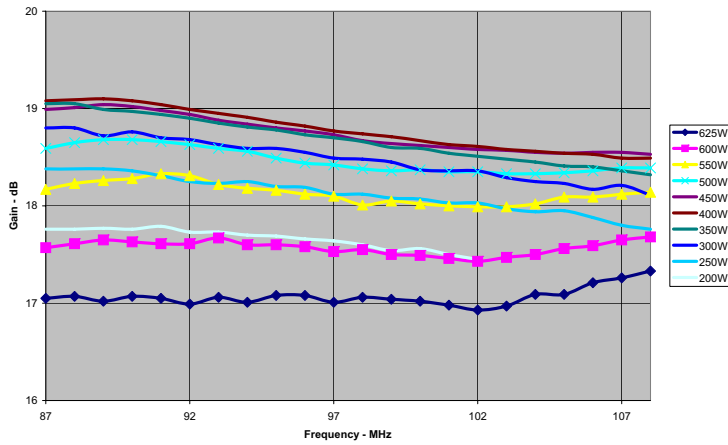


Efficiency vs. Frequency varying Vsup



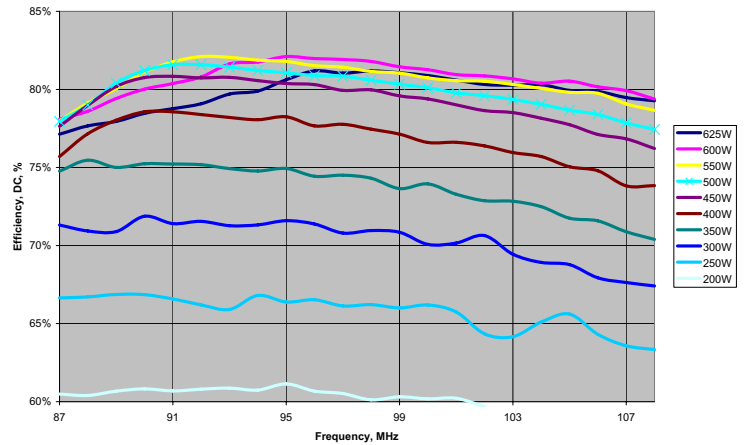
Graph 1. Gain vs. Vsupply, 500W

Gain vs. Frequency varying Pout



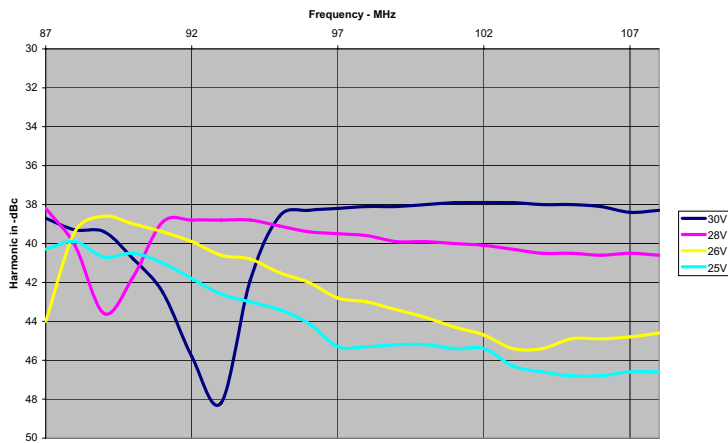
Graph 2. Efficiency vs. Vsupply, 500W

Efficiency vs. Freq at varying Pout



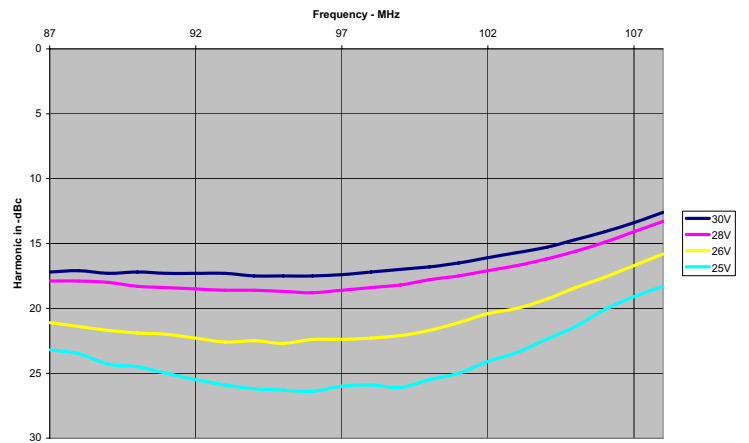
Graph 3. Gain vs. Pout, 28V

Second Harmonic vs. Frequency varying Vsup



Graph 4. Efficiency vs. Pout, 28V

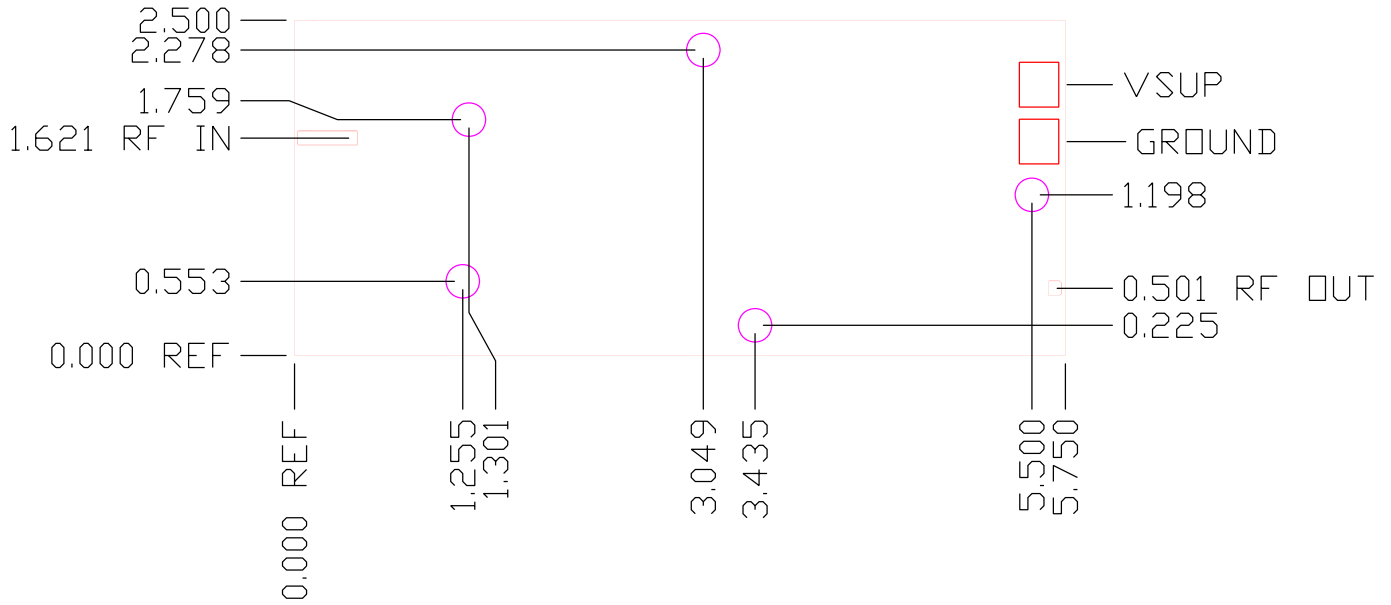
Third Harmonic vs. Frequency Varying Vsup



Graph 5. Second Harmonic, 500W

Graph 6. Third Harmonic, 500W





All holes clear for #6 mounting screw.

#### Tips for Mechanical Mounting:

- 1 All holes are clear for #6 Screw. Stainless Steel mounting hardware is recommended, grade 18-8 or better. A lock washer of same material should also be used.
- 2 Ensure mounting surface is flat to better than  $0.003" / \text{in}$
- 3 Use a thin layer of thermal compound on the backside of the PA - no more than  $0.001" - 0.002"$  thickness!
- 4 Torque all screws to 10-12 in-lbs

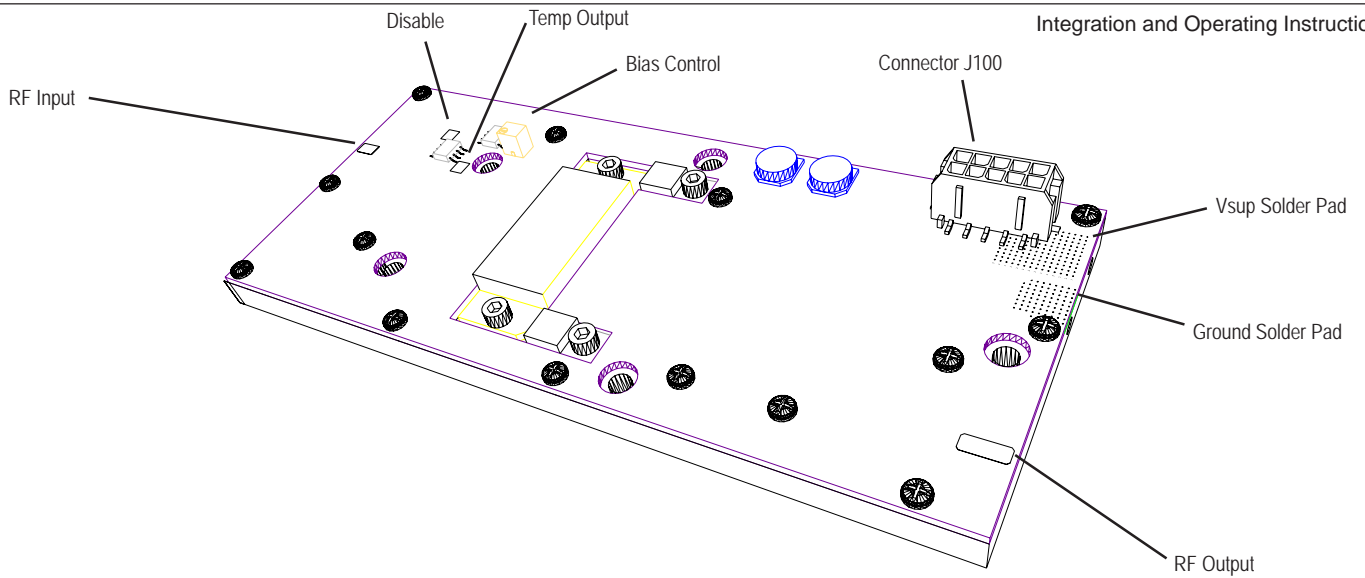
#### Considerations for Mechanical Mounting:

- Considerations for proper thermal design include
- Total power dissipated = Total DC Power Consumed x (1-Efficiency)
- Ambient Airflow
- Thermal Resistance of Heat Sink

For this PA, typical DC efficiency is 80%. At 500W CW power output, +28.0V DC operation, 625 total watts are consumed, which leaves 125W dissipated power. If we assume an input air temperature of +25°C, and a maximum desired baseplate temperature of 55°C, this leaves a temperature differential between baseplate and ambient air of 30°C. The desired thermal resistance for heatsink mounting surface to air is therefore  $30^\circ\text{C}/125\text{W} = 0.24^\circ\text{C/W}$ .

Since the baseplate is aluminum, it is important to find a heat sink that is sized at the same outline as the PA which can give this thermal resistance. For example, a 230mm x 127mm heat sink with serrated fins, 70mm in length, (40 fins across 127mm dimension) with an air velocity of 4 m / s achieves this value.





Power 3.0MM Micro Connector: MOLEX 43025-1000 MOLEX Pin 43030-0001, 43030-0007 AMP 1-794617-0 AMP Pin 794610, 794606 -or- Solder directly to pad adjacent to connector	J100-1, 10	CURRENT	Current Sense
	J100-2,3,8,9	GROUND	System Ground
	J100-4,5,6,7	Vsup	+26 to +30 V Supply Voltage

**Connections:**

Connect amplifier to +Vsup and Ground using either 3.0mm modular 10-position plug (J100) or soldering directly to pads adjacent to connector. If using Single connection, 14 gauge wire to each side is recommended, 12 gauge ground wire. 20 gauge wire is recommended for use in modular connector, and all power connections must be used! In all cases, use of teflon insulated wire is highly recommended. Connect coaxial cable to input and output RF connections (semi rigid or flexible) using best RF practices. Ensure output cable is of sufficient power handling rating. Pads are provided for ground on co-axial connections.

**Amplifier Startup**

+Vsup should be applied to amplifier with no drive if possible. The system should allow drain voltage to reach +24V minimum before applying bias and drive to prevent chance for low voltage oscillation if load VSWR is bad. This typically takes 2 seconds and should be verified by the system integrator.

**Bias Current:**

Bias is controlled via temperature compensated bias system that uses a hermetically sealed glass thermistor as reference. If excessive air is directed above the amplifier such that the thermistor is cooled below the temperature of the baseplate, this circuitry may not perform properly. Bias has been pre-set at the factory to 0A at +28.0V DC. This bias point has been selected to offer the optimum balance between efficiency and gain. If the bias point is changed, take great care not to exceed the bias listed on page 2.

**Fault Condition - Bad VSWR**

Current sense J100-1 and 10 (internally connected) should be monitored for excessive current. The voltage difference between J100-1, 10 to J100-4,5,6,7 is scaled 1A per 0.010 V. If transistor experiences currents in excess of normal operation, a fault condition exists, and the amplifier should be disabled through J100-6 DISABLE and drive removed. This amplifier is capable of pulling in excess of 50A under adverse conditions, so appropriate care must be taken by integrator to limit current.

**Temperature Sense and Temperature Fault**

An on board temperature controller reports temperature on temp pad. This is scaled to +395mV + (Temperature °C X +6.20mV/°C) and has an output impedance of 1.5kohm typical. An output alarm automatically triggers disable when the pallet amplifier reaches approximately 70°C, and the alarm is cleared when the baseplate temperature drops below approximately 60°C.

**Amplifier Disable**

Amplifier disable pad is a TTL compatible disable line. When this pad is +5V (hi) the amplifier is disabled. When grounded, or left open, the amplifier will operate automatically. Since this amplifier has an extremely low bias condition, the disable line when activated will not completely shut down the amplifier. It should be used as protection only. When disabled, the amplifier output will be reduced by 1 - 2 dB only. The best method for disabling the amplifier is to remove drive or remove Vsup.

**Miscellaneous:**

Placing noisy analog or digital systems, such as additional control circuitry, directly over the top of transistors or RF path can cause improper operation. Care should be taken to locate these components where they will not cause interference.



**Ordering Information:**

Order Code	Description	DRFT Reference
P500-FM-18	500W Class C pallet Amplifier	4759
PAB500-FM-18	Amplifier in Enclosure	TBD

**Options**

-A11	SMA Female Connectors In / Out	0201
-A12	Heat Sink Option	0202
-A13	Heat Sink Option with DC Fan, pre wired	0203
-A14	Ruggedized for vibration	0204
-A15	Wire harness, 1' length, 10 wires for pallet amplifier only (NON-FM)	0205
-A16	Wire harness, customer specified length for pallet amplifier only	0206
-T2	Extended Burn In	0271
-T3	Extended Data Collection	0272

**Standard Pallet Options:**

**SMA Female Connectors**, Input and Output. Stainless Body, Gold Center pin, 4-hole SMA bolted to pallet amplifier edge through bottom two holes located at amplifiers RF IN and RF OUT locations. All stainless steel hardware.

**Enclosure**- all aluminum machined enclosure available for most pallet amplifiers. Alodined aluminum, alloy 6061-T6. SMA Female input and output RF connectors. Supply voltage and ground through solder / feedthrough connections. Module must be bolted to appropriate heatsink.

**Heat Sink** - aluminum extruded heat sink, black anodized. Pallet amplifier or module will be bolted to heatsink. Customer will be required to provide adequate airflow.

**Heat sink with fan** - aluminum extruded heat sink as above, with included fan bolted to push air through the heat sink. Depending on heat requirements, a second fan may also be provided on the output of the unit.

**Ruggedized** - all screws have threadlocking compound applied, and all flying components are staked and attached to base. Designed to withstand MIL-STD-810E 514.4 Category 8.

**Power Connector** - a 10 pin molex connector is used on all standard pallet amplifiers to supply +Vsup and Ground connections, as well as hi-side current shunts for current monitoring. Delta RF offers the mating connector with 1' wires - Red (Vsup), Black (Ground), Yellow (Current monitor). All wires are 18 gauge teflon insulated wires. Customer may optionally specify wire length and wire color.

**Testing Options:**

**Standard** - includes power test and brief burn - in under laboratory conditions. Printed test report gives graph of Gain and Input Return Loss at rated P1dB and Voltage Conditions. Report shows pass/fail criteria. All amplifiers include this test.

**Extended burn in** - 8-hour burn in at P1dB with standard test run at completion. Unit is monitored during test and any discrepancy reported. Standard test data is included.

**Extended data collection** - Standard data is run and included. Detailed data is taken point by point giving the customer 25 - 70 frequency points, depending on the amplifier model. For each frequency point, data is generated to include gain, input power, input return loss, current, second harmonic, third harmonic, efficiency, audio distortion.

Other tests available - Vibration, Temp cycling, Shock. Please inquire.

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