

Revision 1.c Release Date July 24, 2007

Revision Notes

## Technical Specifications Summary

Frequency Range:	50 - 88 MHz	Gain:	36dB
P1dB:	60 Watts CW	Efficiency:	10%
Class:	A	Temperature Range:	0 to 60°C
Supply Voltage:	28.0V	Max VSWR:	5:1

## Amplifier General Description

The PA25-VHF-L-36 is a versatile output or driver pallet amplifier. Offering a typical 40dB gain, this two stage amplifier can be used as a driver or output stage depending on the application. With no circuit changes required, the PA25-VHF-L-36 can be configured as a Class A driver or Class AB output stage offering excellent flexibility. All gold-metallized MOSFETS are used in construction.

- No RF assembly or circuit tuning!
- 25 Watts of Linear Output Power Minimum!
- 40dB typical gain at Channel 6!
- Combined **Video and Aural** at full rated power!
- Modular Construction for ease of Integration!

## Amplifier Picture



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Parameter	Min	Typ	Max	Units	Notes
Frequency	50		88	MHz	
P1dB		60		W, CW	
Linear Power Out	25			W,pkSync	
IMD3	-54	-58		dBc	For 2 tones, 1MHz spacing, 25 W PEP
Power Input	8	10	13	W, CW	
Gain	36			dB	
Vsupply	26	28	32	V, DC	
Drain Current		3	5	A, DC	
Input VSWR		1.2:1	1.5:1		
Insertion Phase Variation		±5		°	Unit to unit
Gain Variation		±1		dB	Unit to unit
F2 Second Harmonic		-15		dBc	
F3 Third Harmonic		-25		dBc	
Baseplate Operating Temperature	0		+60	°C	

Physical Dimensions 2.0" x 5.0" x 1.0" / 5cm x 13cm x 3cm

All specifications valid for 50  $\Omega$  output load,  $V_{sup} = +28VDC$ ,  $I_{dq} = 2.77ADC$

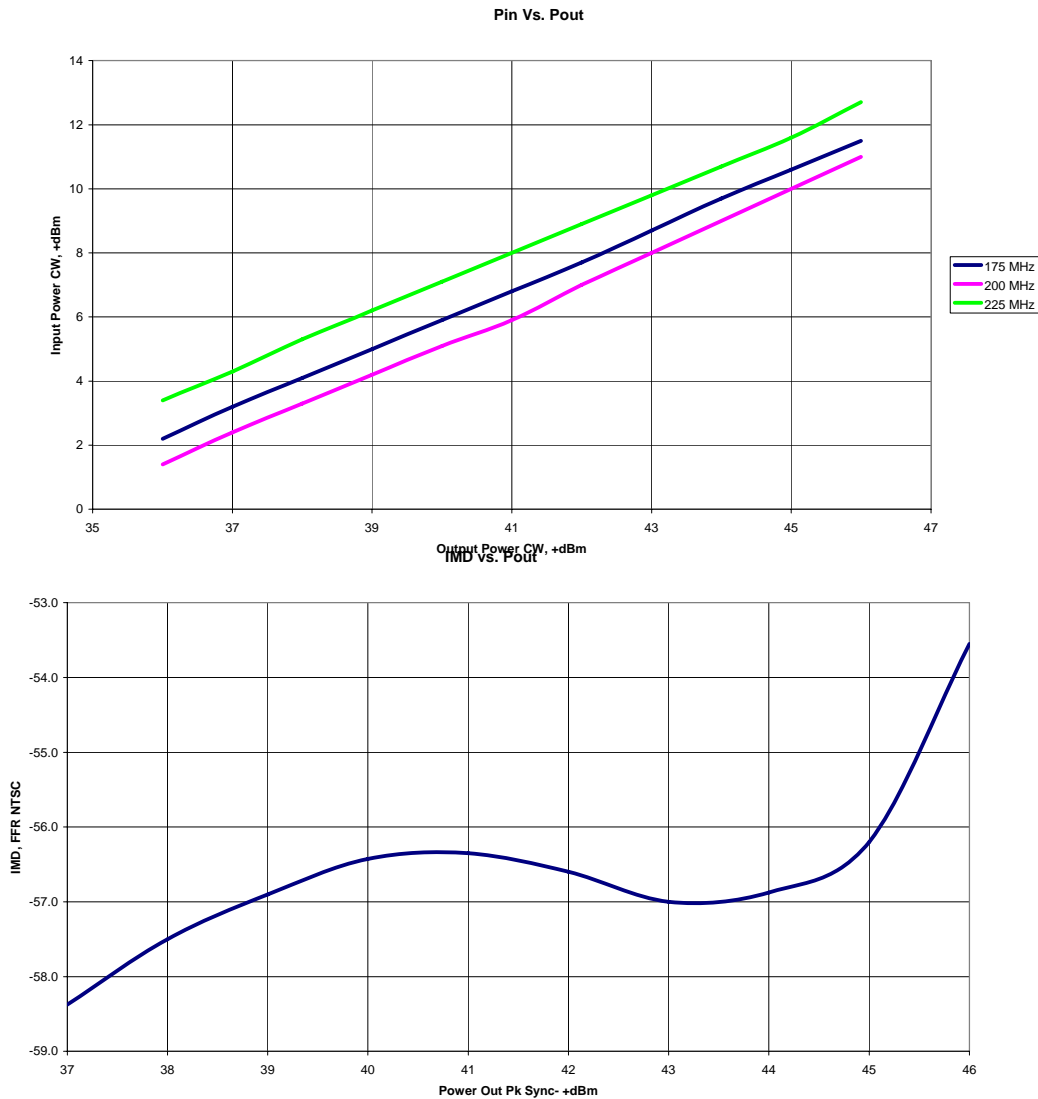
## Absolute Maximum Ratings

Parameter	Value	Units	Notes
Maximum Operating Voltage	+32.0	VDC	
Stable Operating Voltage	+26.0 to +32.0	VDC	
Maximum Bias Current, Q1	0.25	A,DC	Factory set to 0.02A
Maximum Bias Current, Q4	3.0	A,DC	Factory set to 2.75A
Maximum Drain Current	5	A,DC	
Load Mismatch Survival	5:1		
Storage Temperature	-40 to +105	°C	
Maximum Operating Baseplate Temp	+60	°C	

## Features, Auxillary Functions

- ◆ Temperature Compensated Bias
- ◆ Temperature Controller - Analog Temperature Output
- ◆ High Temperature Alarm with Selectable Automatic PA Disable
- ◆ High Temperature Alarm Output
- ◆ Amplifier Disable
- ◆ Current Sense, Each Transistor
- ◆ Connectorized Power and I/O
- ◆ Flexible RF Locations





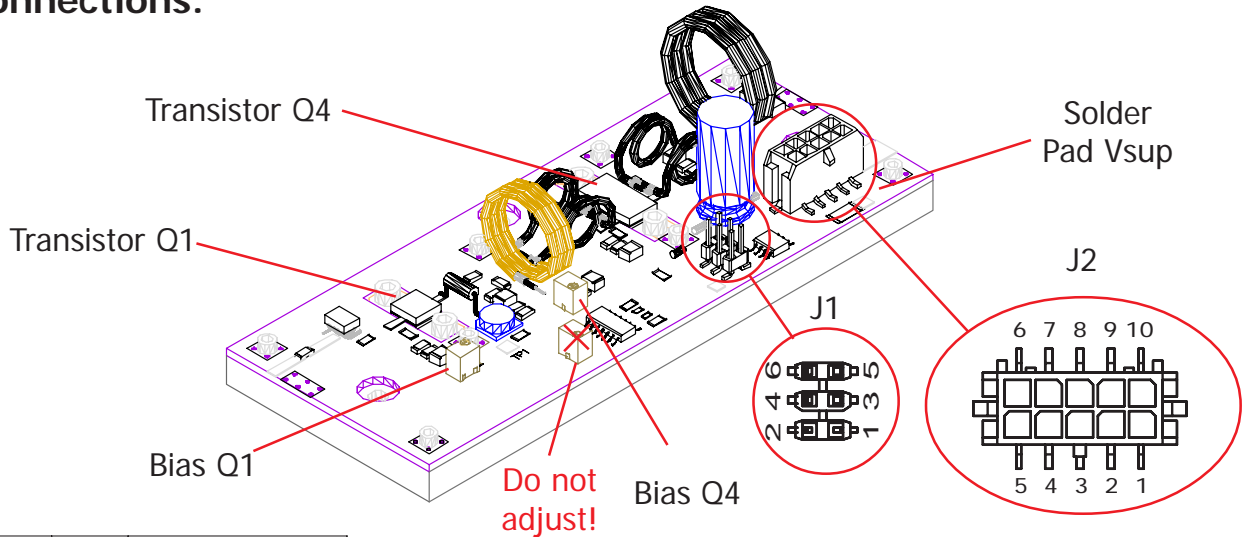
This amplifier has been designed for two purposes - as an output stage and as an ultra-linear driver.

**Driver** - the amplifier is shipped from the factory biased best case for driver use from 2 - 20W, depending on needed output power (please see curves above). Frequency specific improvements may be made by adjusting the bias on Q1 (refer to page 4). Do not exceed rated bias current for Q1.

**Output Stage** - for improved harmonic performance and efficiency, reset bias for Q1 to 0.250A, and reset bias to Q4 to 0.500A. Minor adjustments may need to be performed on Q1 / Q4 for optimum IMD performance. Do not exceed rated bias current for Q1.



## Electrical Connections:



<b>I/O</b> Standard 0.100" pitch DIP /D/C header: SAMTEC type ESD, HCS D 3M type 89106-0101 AMP 102393-1, 102398-1 BERG 71602-306 -or- Solder directly to Pin in I/O connector	J1-1	ALARM_OUT	TTL Hi when baseplate exceeds 70C
	J1-2	ALARM_IN	Jumper to J1-1 for automatic shutdown at 70C, automatically re-enables at 60C
	J1-3	GROUND	
	J1-4	BIAS_SUP	Not used for this amplifier. Vsup internally connected here.
	J1-5	TEMP	Baseplate Temperature
	J1-6	DISABLE	TTL Hi to Disable amplifier
<b>Power</b> 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	J2-1,10	CURRENT	Current Sense, Transistor Q1, Q4
	J2-2,3,8,9	GROUND	System Ground
	J2-4,5,6,7	Vsup	+28 to +32 VDC

### Connections:

Connect amplifier to +Vsup and Ground using either 3.0mm modular 10-position plug (J2) or soldering directly to pad adjacent to connector. If using Single connection, 14 gauge wire 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.

I/O connector (J1) connections are optional.

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 applied. The system must allow drain voltage to reach +26V minimum before applying drive or damage will result to the amplifier and void warranty. This typically takes between 2 - 10 seconds and should be verified by the system integrator. This can be accomplished in several ways:

- 1) Apply power to amp at J2. After proper voltage has been reached, amplifier is ready for use.
- 2) Apply power to amp at J2. Place a TTL Hi (+5V) to J1-6 DISABLE. After proper voltage has been reached, remove TTL Hi from J1-6 DISABLE. Amplifier is ready for use.

### Bias Current:

Bias current 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 0.10A Q1 and 2.750A Q4 at +28.0V DC. This bias point has been selected to offer the optimum balance between IMD performance, efficiency, and gain. If the bias point is changed, take great care not to exceed the bias listed on page 1 - Absolute Maximum Ratings. Please refer to applications note on Page 2.

### Fault Condition - Bad VSWR

Current sense J2-1, J2-10 (pins are internally connected) should be monitored for excessive current. The voltage difference between J2-1, J2-10 (transistors Q1, Q4) to J2-4,5,6,7 is scaled 1A per 0.010 V. If transistors experience currents in excess of normal operation, a fault condition exists, and the amplifier should be disabled through J1-6 DISABLE.

### Temperature Sense and Temperature Fault

An on board temperature controller reports temperature on pin J1-5 TEMP. This is scaled to +395mV + (Temperature °C X +6.20mV/°C) and has an output impedance of 1.5kohm typical. An output alarm, J1-1 ALARM OUT, is TTL Low when the temperature exceeds approximately 70°C, and the alarm is cleared when the baseplate temperature drops below approximately 60°C. For automatic operation, jumper J1-1 ALARM OUT to J1-2 ALARM IN and the amplifier will automatically disable by removing bias when the temperature exceeds 70°C, and automatically re-enable when the temperature drops below 60°C.

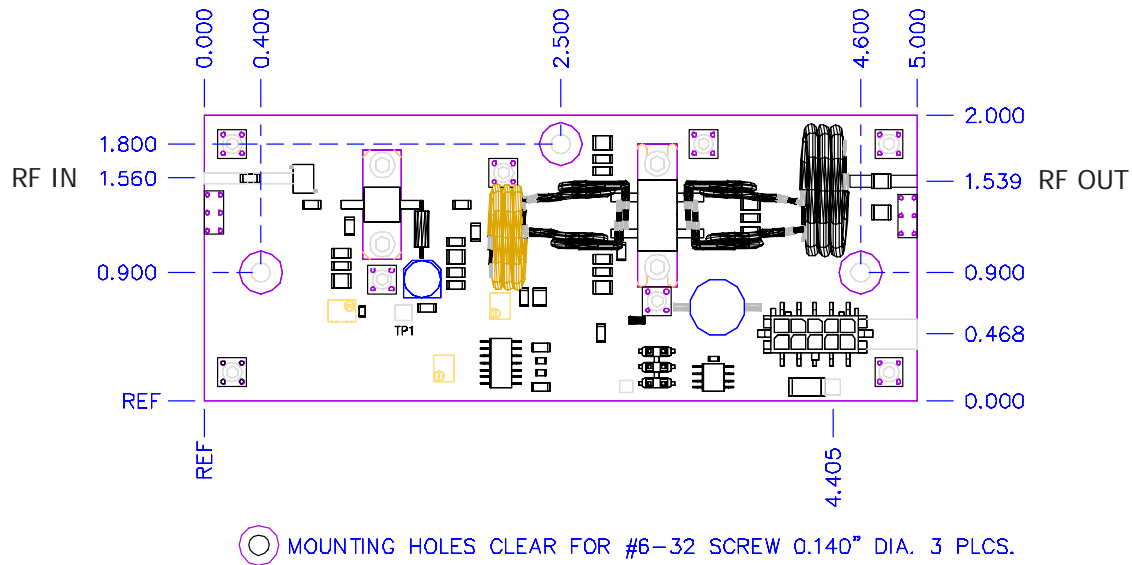
### Amplifier Shutdown

To prevent damage to amplifier and surrounding systems, bias and drive should be removed prior to powering down PA. This can be accomplished by applying TTL Hi (+5V) to J1-6 DISABLE. Power can safely be removed from PA.

### 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.





#### 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" / "
- 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 30%. At 25W Pk power output, 15W Average, +28.0V DC operation, 84 total watts are consumed, which leaves 70W 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  $30^{\circ}\text{C}/74\text{W} = 0.4^{\circ}\text{C}/\text{W}$ .

Since the baseplate is aluminum, it is important to find a heat sink that is sized at least as big as the outline of the PA which can give this thermal resistance. For example, a 100mm x 54mm heat sink with serrated fins, 70mm in length, (20 fins across 127mm dimension) with an air velocity of 4 m / s exceeds this value.



**Ordering Information:**

Order Code	Description	DRFT Reference
PA25-VHF-L-36	25W VHF Band I TV Linear Pallet Amplifier	1111
PAB25-VHF-L-36	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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