Broadcast Concepts Inc
11700 NW 102 Road Suite 4 Medley FL 33178
TEL: 305.887.8400 FAX 305.887.8444; website: http://broadcastconcepts.com

Model P1700FMXR-25 FM Pallet Amplifier Module

This amplifier module is ideal for driver and final output stages in analog and digital FM broadcast equipment.

- **86 – 110MHz**
- **45-50 Volts**
- **VSWR immune**
- **Pout: 1700W**
- **25dB Gain (1700W)**
- **Thermal Tracking Bias**
- **Temperature monitor with automatic bias disable.**
- **Low harmonic output**
- **NXP BLF178XR Mosfet**
- **75% efficiency typical.**

Dimension (L x W x H inch) [8.7” x 5.00” x 1.5”]

Absolute Maximum Ratings (T case = 25C)			
Symbol	Parameter	Value	Unit
Vs	Drain voltage supply	52	V DC
Is	Supply Current	50	A dc
VSWR	Load Mismatch (All phase angles, Id=26A, TC=+55C)	3 to 1	
Tstg	Storage temperature range	-40 to +85C	Celsius
Tc	Base plate operating temperature	-40 to +65C	Celsius
RF IN	RF Input	4.5	Watts
RF OUT	Peak Saturated Power	1750	Watts

Electrical Specifications (T base = 25C, 50 ohm loaded, VS=50V bias=100ma)				
Characteristics	min	typ	max	unit
Operating Frequency range	87.5		108	MHz
Fundamental output power	1675	1700	1750	W
Power Input		3.5	4.5	W
Input return loss		-25	-20	dB
Power Gain (1200w output)	24	25	26	dB
Collector Efficiency	72	75		%
Collector Current (1700w output)	45	45.5	46.5	A dc
Insertion Phase variation (unit to unit)		+/-3.5		degrees
Power gain (unit to unit)		+/-1.0		dB
F2 Second Harmonic @ 1000W		-35dB	-30dB	dB
F3 Third Harmonic @ 1000W		-20dB		dB
Transistor Bias Current: Factory set to 100ma @48V. Adjustment is not required		100		ma dc

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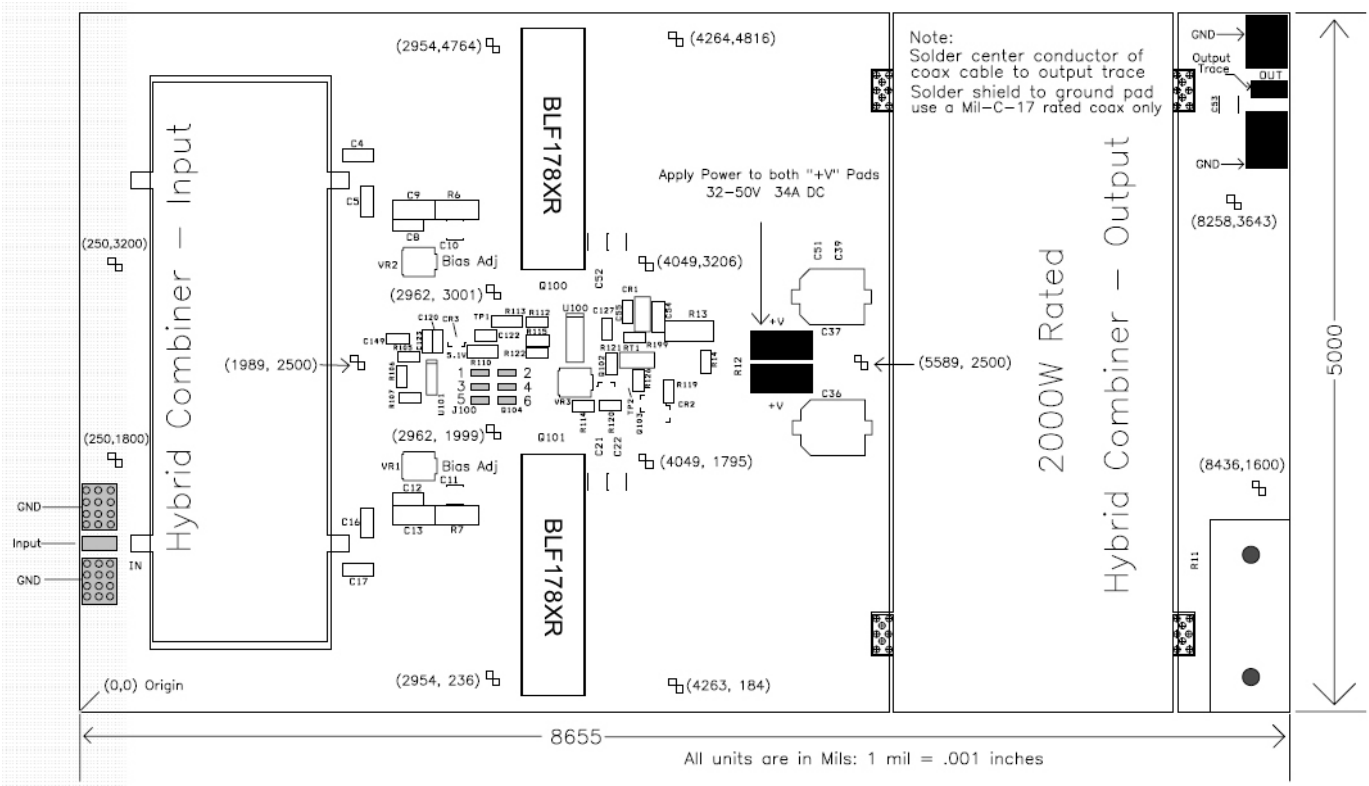
Amplifier Drawing



Electrical Connections:

- Apply 48V to both power pads marked +V with a minimum 12 AWG Teflon insulated wire. The amplifier uses an LM723 voltage regulator to control the bias voltage. The amplifier can operate from 45 to 50V; however, the circuit has been optimized for 45 volts @ 1500W. The bias circuitry will automatically disable the bias below 25 volts.(Amplifier can operate over 32 – 45V with reduced performance)
- All units are set to 100ma bias per transistor at 48 volts and 25C. The bias circuitry including the temperature sensor consumes 20ma. When the pallet is powered up on 48 volts it will draw approximately 220ma with no RF input. The bias point of 100ma per mosfet offers the best compromise between efficiency and gain.
- Make all coaxial connections with a Teflon Mil-C-17 rated coax. Do not attempt to connect oversized cables (LMR400, Belden 9913) to the RF output. They will damage the circuit board. Use harbor industries RG402 or equivalent.
- Attach the ground wire to the heat sink. It is not necessary to attach the ground wire directly to the pallet. Do not attach anything to the hybrid covers because this can interfere with the amplifier frequency response.
- Use ferrite beads on the power supply lines. An improperly bypassed DC line can cause the amplifier to create spurs and in extreme cases it can damage the amplifier.

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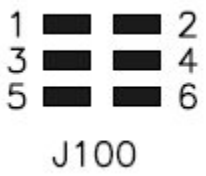
Notes:

Warning: Careless adjustment of the transistor bias pots can cause the transistors to burn out.
Warning: Do not adjust bias pot VR3. It sets the thermal tracking bias rate and it is for factory use only.



J100-1 TTL HI when pallet base exceeds 70C
J100-2 Alarm Input: Jumper to J100-1 to enable automatic shut down feature. The amplifier will shut down at 70C.
J100-3 Ground
J100-4 Bias supply. Remove 0 ohm 0805 resistor R199 to power bias circuit from this pin.
J100-5 Temp: Output voltage from LM56 temperature sensor.
J100-6 Bias Disable. Apply TTL HI to disable bias.

This connector is a standard 0.1 inch pitch.

Heatsink Mounting/Hardware

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

Use of cooling air on top of pallet to keep output transformers cool is recommended. Output transformers are rated for continuous operation at 150C. Keep any external circuitry away from input and output transformers to avoid any interference - give at least 1.5” clearance to avoid creating feedback paths.

Warning: Failure to use a proper heat sink will cause the transistors to burn out. This type of failure is not covered by warranty. This product can be ordered with a custom heat sink. Please contact factory for more information.

Theory of Operation:

The NXP BLF178XR is a modern high power LDMOS transistor available for broadcast applications. The transistors are rated for 1200W each on a 50V supply.

Amplifier efficiency is function of supply voltage and input power. In order to obtain maximum efficiency please reduce supply voltage in function of desired output power. High voltage supply and low input power result in a significant reduction in the efficiency. **Please note that this amplifier is designed to have the best efficiency from 1400 to 1600W @ 45V.**

This pallet uses an LM723 voltage regulator to maintain constant bias voltage. The pallet can be operated from 32 to 50V and bias adjustment is not required; however, advanced users may find it necessary to adjust the bias voltage for a specific operating condition. Care must be taken to set the bias current to the same value for both transistors. Operation below 45V results in a significant reduction in performance.

This amplifier uses a 4:1 output coaxial transformer. In theory a 9:1 should work better; however, FM band efficiency and harmonic performance were found to be unacceptable in our experiments. This is an area of continued research.

We have found that the BLF178P produces more power in our FM circuit than the BLF178XR. Peak saturated power on the BLF178P 1800W FM pallet is around 1950W and on the BLF178XR it is around 1750W. Both the BLF178P and BLF178XR have the same efficiency. The BLF178XR maximum power rating is lower because of the lower peak saturated power performance. We believe that the "XR" transistors sacrifice some performance in exchange for VSWR immunity. The choice between BLF178P and BLF178XR depends on final application. If a good VSWR protection is available then the BLF178P transistors will work well.

Upgrades & Repairs
When transistor replacement is necessary, a BLF578 or BLF178P FM pallet can be repaired with a BLF178XR; however, there are component and coax cable changes required. Contact us for more information.

Low Pass Filter
In commercial broadcast applications it is necessary to use a low pass filter to prevent the transmission of harmonic signals.

Notes: **Solid state amplifiers can be easily destroyed! Pay attention to these precautions.**

- Do not over drive the amplifier. Exceeding 1700W or 50 amps can destroy the transistor.
- Do not run the amplifier into an open circuit. Do not run the amplifier when the SWR is unknown. System integrator must foresee adding VSWR protection if there is a risk that the amplifier will be subjected to high VSWR conditions. This transistor is extremely rugged; however, It can still fail from thermal overload.
- Do not allow the amplifier to overheat. Do not let the base plate temp exceed 65C.
- Do not adjust the bias settings without a DC ammeter attached.
- Do not place the pallet in a sealed box with no ventilation.
- The BLF178XR can operate into open and short circuits without damage; however, operation into a mismatched load for even a few minutes can cause the transistor to fail from thermal stress. The BLF178XR

is not clown proof. Thermal overload and RF overdrive will still destroy the transistor. It should be noted that load mismatches that cause the transistor to draw high current (worst phase angle) are the ones that are most likely to cause a thermal failure.

- The XR transistors cannot tolerate reversed polarity. We are not aware of any transistor that can withstand reversed polarity.
- Suggested power supply is 1 RSP3000 or 2 RSP1500 MeanWell. We have these supplies in stock.
- Constant operation into a high VSWR may damage output baluns. This type of damage is not covered by warranty.

Warranty Disclaimer:

We will replace or repair any amplifier that fails due to a defect in workmanship during the lifetime of the amplifier. We do not warranty this product against damage caused by improper installation. All amplifiers are template tested on HP 8753ES vector network analyzers in accordance with professional engineering practices prior to shipment.