

The RF Line Broadband R.F. Array for TV Transmitter

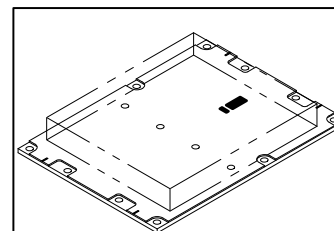
MRFA2604

**230 W PEAK SYNC.
470–860 MHz
CLASS AB
RF POWER AMPLIFIER**

The MRFA2604 is a solid state class AB amplifier specifically designed for TV transposers and transmitters. This amplifier incorporates microstrip technology and reliable Motorola push–pull transistors.

The MRFA2604 includes a thermal compensation (differential gain is constant versus average picture level (APL)) which can be partially disconnected.

- Specified 28 Volts, 470–860 MHz Characteristics
Output Power = 175 Watts (CW)/230 Watts (Video)
Minimum Gain = 8.0 dB (@ Nominal Power)
- 50 Ω Input and Output Impedance
- Class AB Operation
- Thermally Compensated



CASE 439-01, STYLE 1

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Supply Voltage	V_{CC}	32	Vdc
Current	I_{max}	15	Adc
Storage Temperature Range	T_{stg}	–40 to +100	°C
Operating Temperature (1)	T_{op}	–20 to +70	°C

NOMINAL OPERATION CONDITION

Supply Voltage/Quiescent Current (2)	$V_{CC} = 28\text{ V}$	$I_Q = 0.9\text{ A}$
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ELECTRICAL CHARACTERISTICS IN CW ($T_C = 25^\circ\text{C}$, $V_{CC} = 28\text{ V}$, $I_Q = 0.5\text{ A}$, without thermal correction)

Characteristic	Symbol	Min	Typ	Max	Unit
Instantaneous Bandwidth	BW	470	—	860	MHz
Power Gain ($P_{out} = 175\text{ W}$)	G_p	8.0	9.0	—	dB
Gain Ripple ($P_{out} = 175\text{ W}$)	G_{rple}	—	± 0.5	± 1.0	dB
Output Power @ 1.0 dB Compression	P_{out}	175 (3)	190	—	W
Efficiency ($P_{out} = 175\text{ W}$)	η	45 (3)	50	—	%
Input Return Loss	I_{RL}	—	–20	–15	dB

ELECTRICAL CHARACTERISTICS IN VIDEO ($T_C = 25^\circ\text{C}$, $I_{sup} = 0.9\text{ A}$, with thermal compensation)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Power @ 28 V (Peak Sync. B/G standard)	P_{out}	230	240	—	W
Power Gain @ black level ($P_{sync} = 230\text{ W}$, $V_{CC} = 28\text{ V}$)	G_p	8.0	9.0	—	dB

- (1) Temperature is measured at temperature test point (on the flange of the transistor).
- (2) Tuned in the factory for optimum thermal correction @ 25°C.
- (3) Thermal correction cannot be disconnected, and CW performances are slightly affected (–5.0 W, –3% typical), but output power with a video signal remain the same.

TYPICAL CHARACTERISTICS

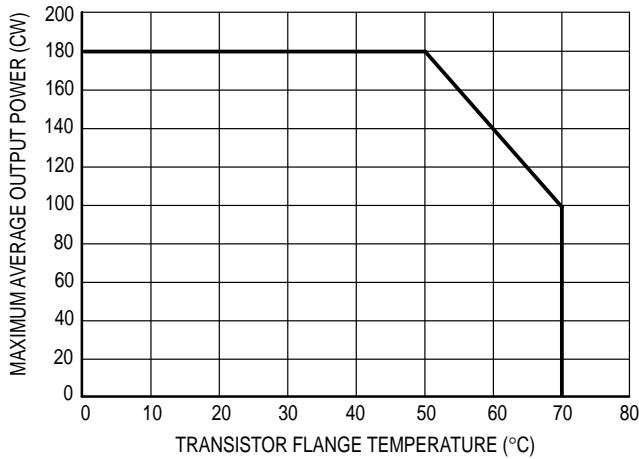


Figure 1. Maximum Average Output Power versus Temperature

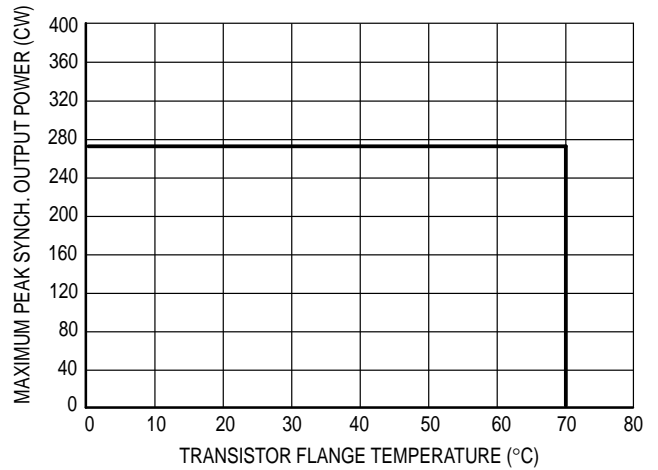


Figure 2. Maximum Peak Synchronizing Output Power (B/G Standard) versus Temperature

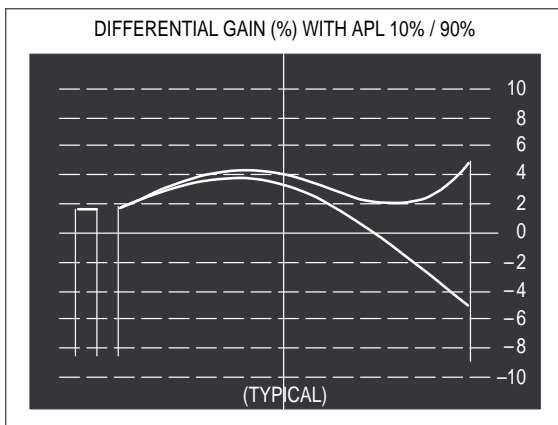


Figure 3. Without Thermal Compensation

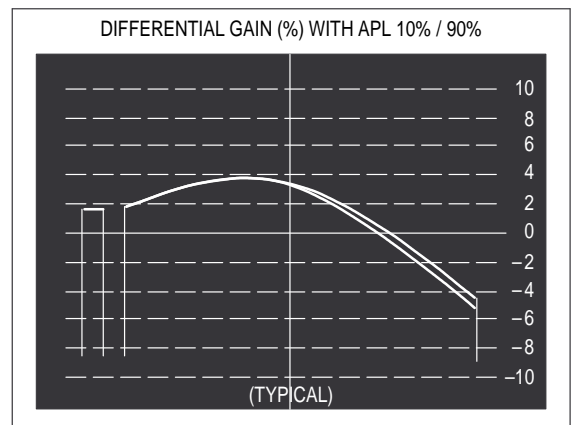
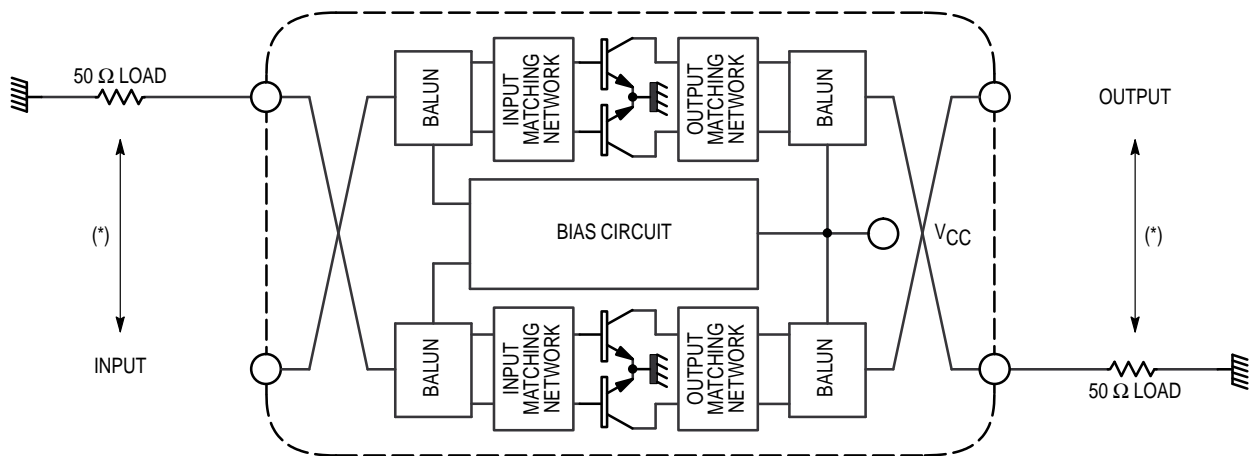


Figure 4. With Thermal Compensation

WARNING: Please read instructions carefully for operating/set-up and mounting recommendations prior to operating this device.



* Loads positions can be inverted if required.

Figure 5. Internal Schematic and External Connections

CW MEASUREMENTS WITHOUT THERMAL COMPENSATION**
(see Figure 23)

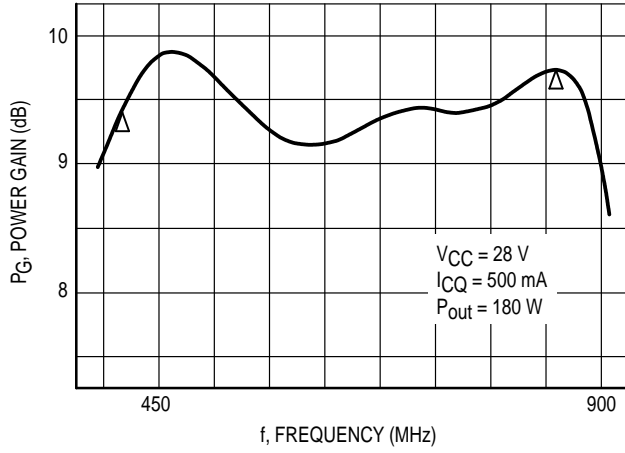


Figure 6. Power Gain versus Frequency

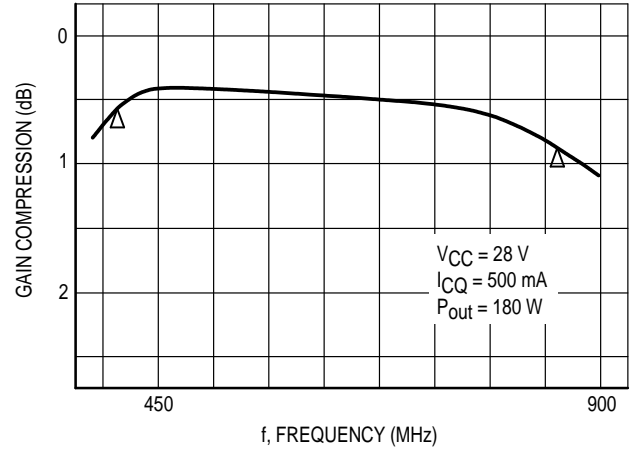


Figure 7. Gain Compression versus Frequency

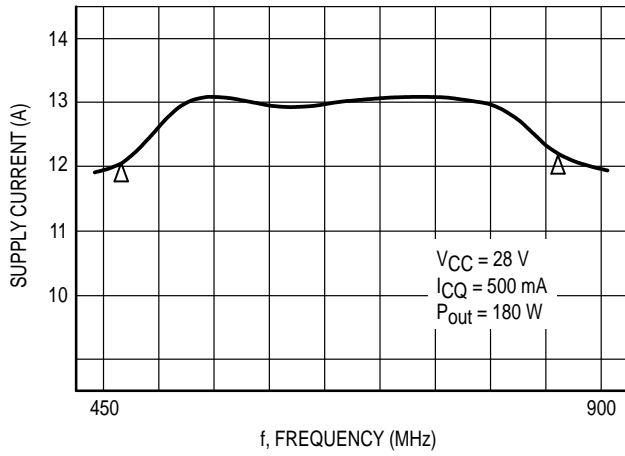


Figure 8. Supply Current versus Frequency

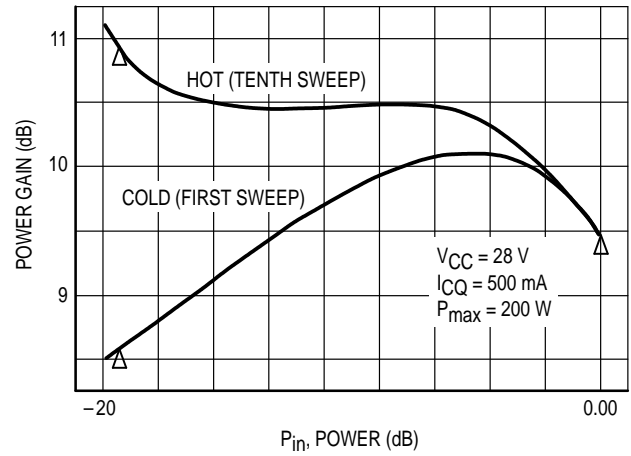


Figure 9. Power Gain versus Input Power

** Measurement results are typical values and are not guaranteed

VIDEO MEASUREMENTS WITH THERMAL COMPENSATION, B/G STANDARD
(Measurement results are typical values and are not guaranteed)

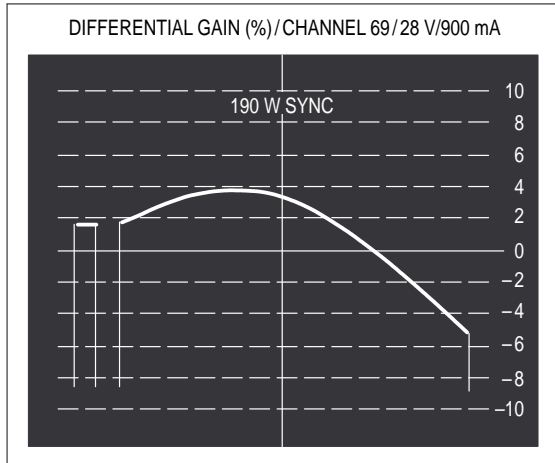


Figure 10. Differential Gain 190 W Sync

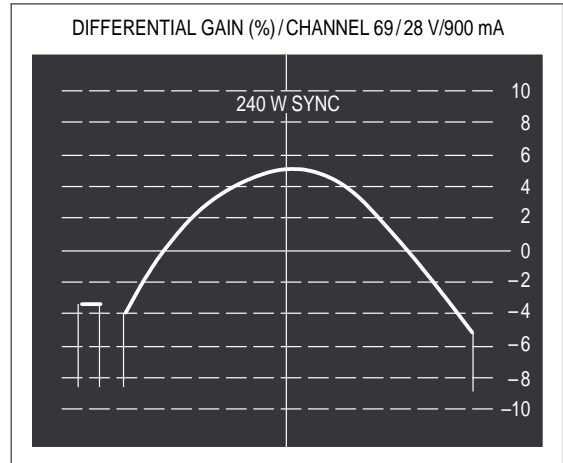


Figure 11. Differential Gain 240 W Sync

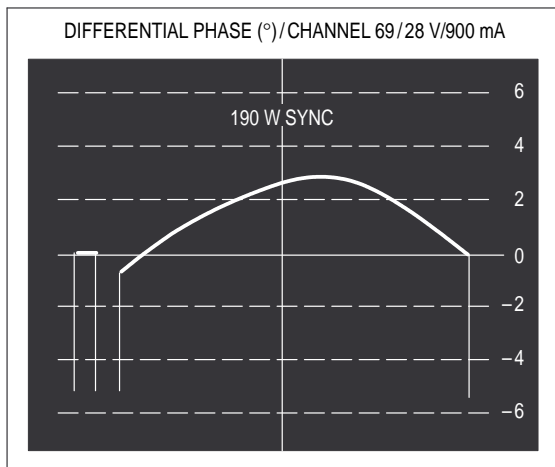


Figure 12. Differential Phase 190 W Sync

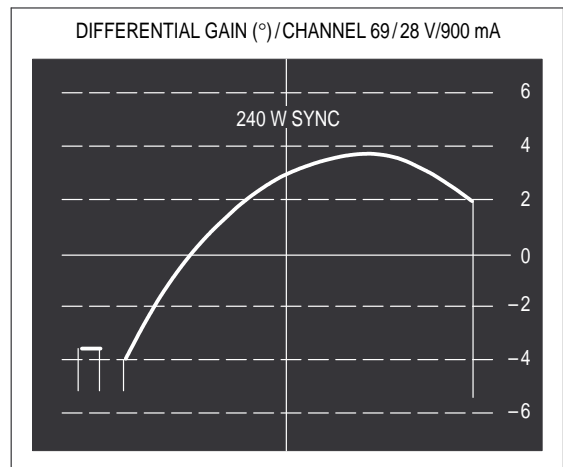
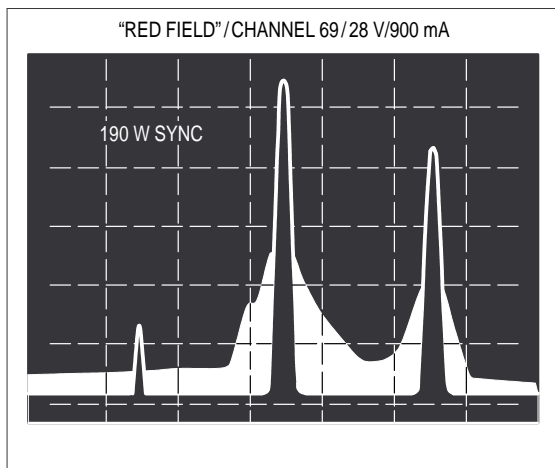
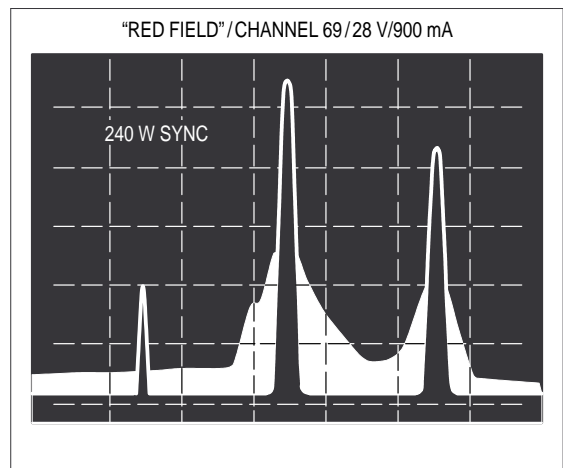


Figure 13. Differential Phase 240 W Sync



SIDE BAND REGENERATION 10 dB/div-2 MHz/div

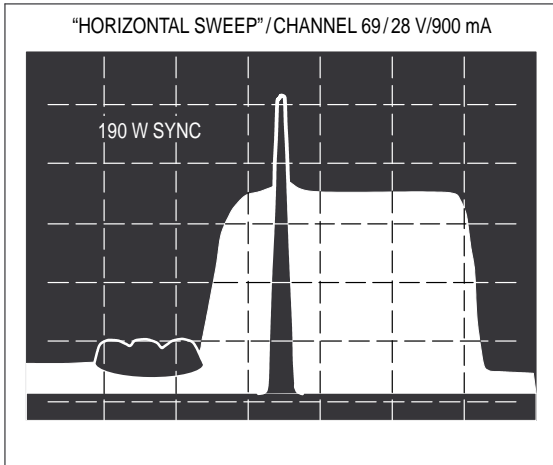
Figure 14. "Red Field" 190 W Sync



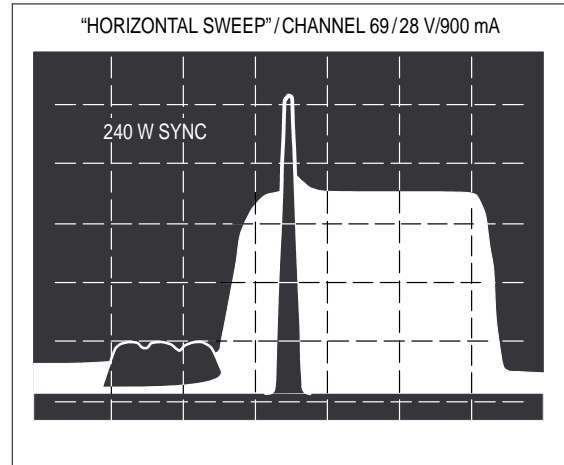
SIDE BAND REGENERATION 10 dB/div-2 MHz/div

Figure 15. "Red Field" 240 W Sync

VIDEO MEASUREMENTS WITH THERMAL COMPENSATION, BG STANDARD
 (Measurement results are typical values and are not guaranteed)



SIDE BAND REGENERATION 10 dB/div-2 MHz/div
Figure 16. "Horizontal Sweep" 190 W Sync



SIDE BAND REGENERATION 10 dB/div-2 MHz/div
Figure 17. "Horizontal Sweep" 240 W Sync

RELATIVE INPUT SYNC. LEVEL TO MAINTAIN OUTPUT
 SYNC. @ 27% OF RF POWER

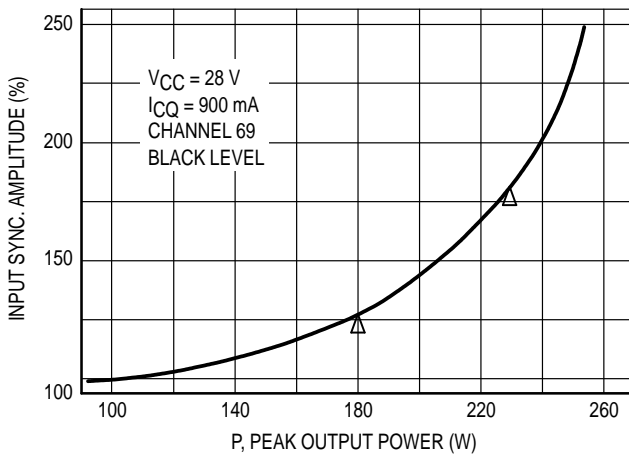


Figure 18. Input Sync. versus Output Power

POWER SWEEP ON A NETWORK ANALYZER
 (GAIN MAGNITUDE & GAIN PHASE)

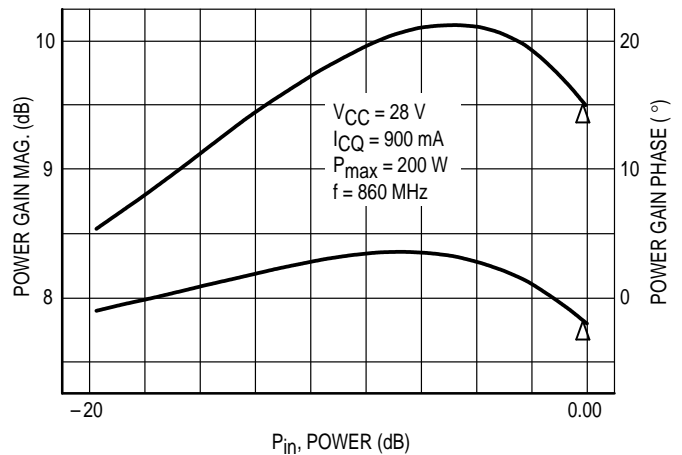


Figure 19. Power Gain versus Input Power

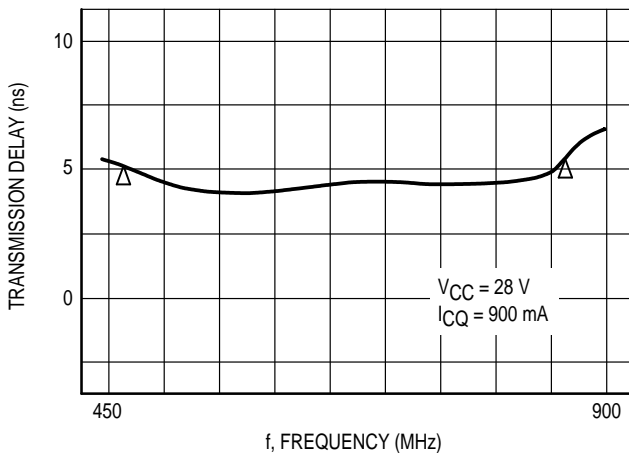


Figure 20. Delay versus Frequency

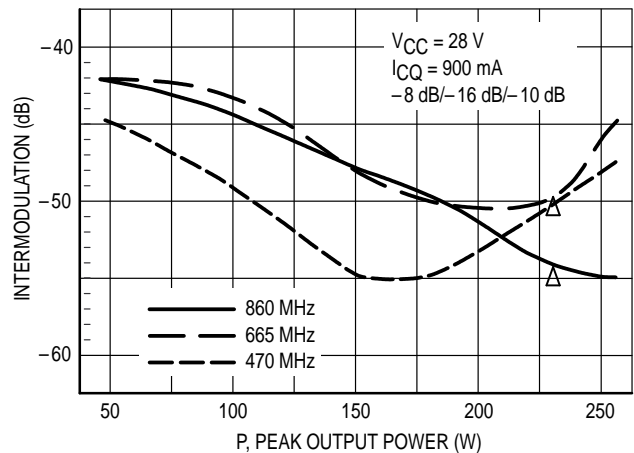


Figure 21. Intermodulation versus Output Power

OPERATING AND SET-UP RECOMMENDATIONS

1. QUIESCENT CURRENT

- **With Thermal Compensation:** The amplifier is tuned in the factory at 28 V/900 mA (total current) with the compensation "ON." Depending on the temperature of the amplifier and of the RF transistor, this value can be slightly different but it does not affect the overall performances.
- **Without Thermal Compensation:** If the amplifier has to be used without the compensation, P1 (tuning of quiescent current) has to be set-up in its initial position before applying power supply (see Figure 22). When power supply is applied P1 is tuned to obtain 500 mA.
- **Max. current:** In any case I_Q must not exceed 1.2 A.

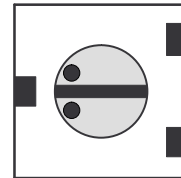


Figure 22. Initial Position of P1

2. THERMAL COMPENSATION

The amplifier is tuned in the factory for optimum compensation at 180 W peak, B/G standard, channel 69. If the amplifier is used at a different level (driver for instance), the compensation may not be optimized and can be retuned by using P2.

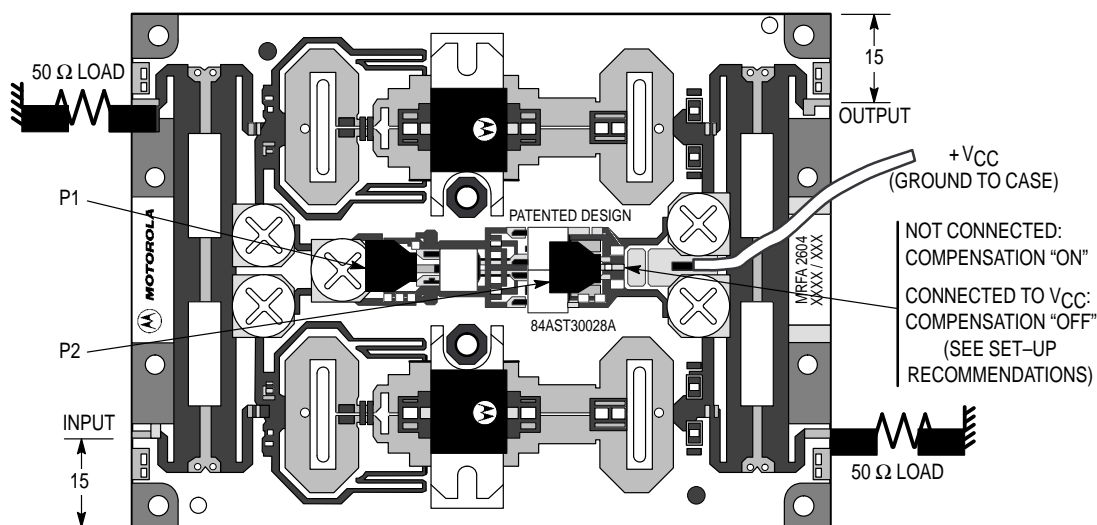


Figure 23. MRFA2604 Connections

MOUNTING RECOMMENDATIONS

1. HEATSINK TOOLING

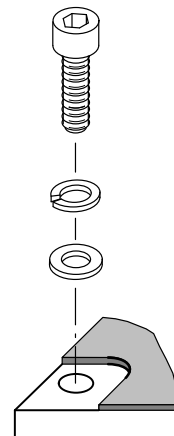
- Flatness: better than 0.03 mm
- Roughness: Typical value 0.8

2. SCREWS

- CHC M3 x 10 for Copper/Aluminum Heatsink
- Socket head cap screws
- Material: Nickel plated steel

3. WASHERS

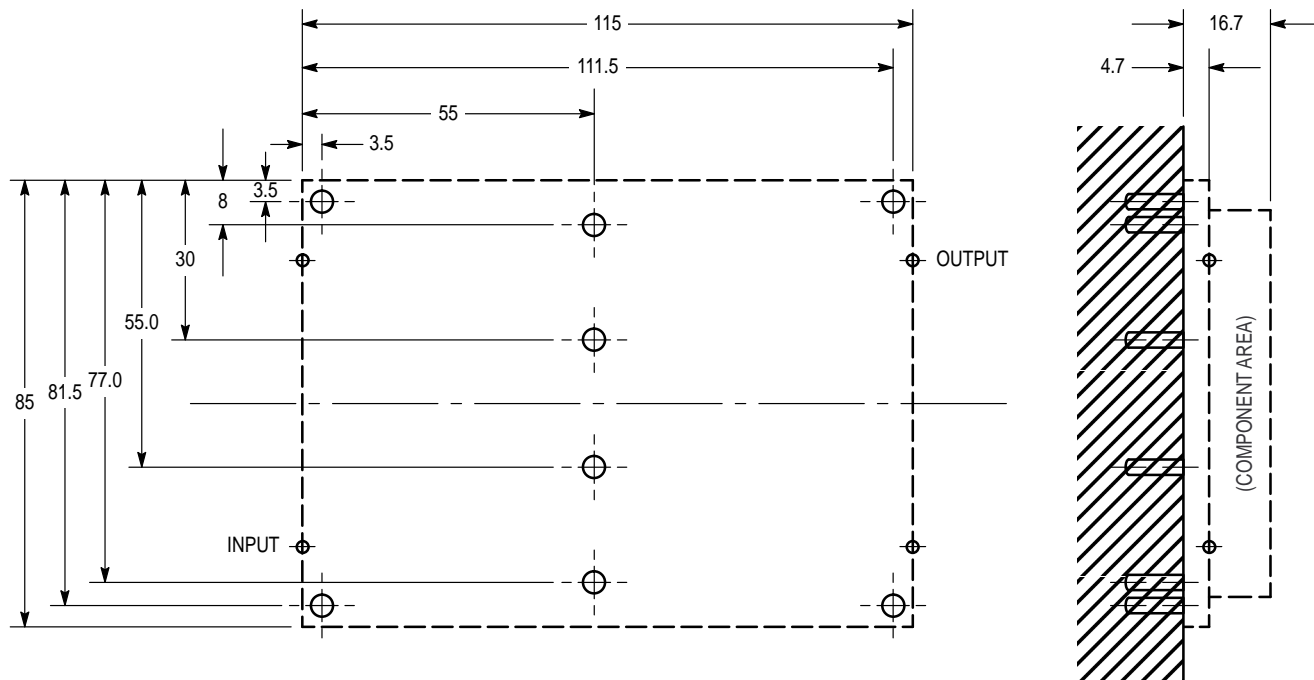
- Split lock washers WZ Ø3 + Flat washers ZU Ø3



MOUNTING RECOMMENDATIONS (cont')

5. THERMAL COMPOUND:

- Paste with silicones: SICERONT KF Ref. 1201 Recommended.
- Thickness: optimum between 0.06 mm and 0.15 mm, on the whole back surface of the amplifier.
(Typical volume: 700 mm³ for 0.1 mm thickness)
(Equivalent weight: 1.5 g for 2.2 density paste).

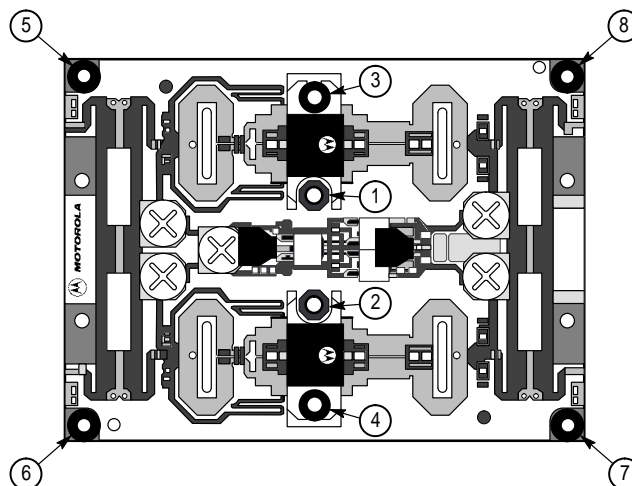


6. TIGHTENING SEQUENCE:

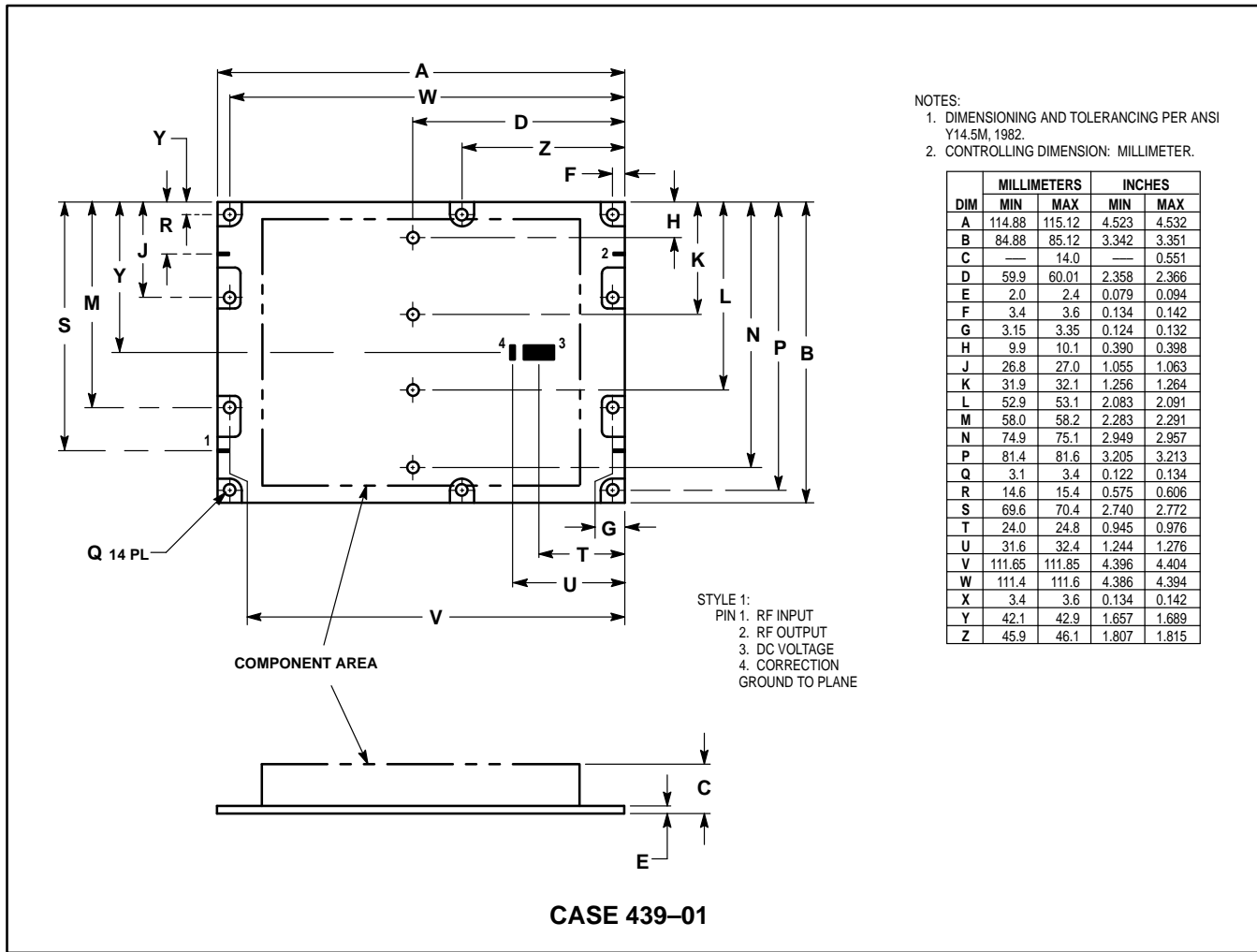
Engage all screws down to contact, then apply torque **according to given sequence** (see drawing on the right).

7. TORQUE:

Maximum Recommended Torque: 12 Kg.cm (10.5 in. lbs.)



PACKAGE DIMENSIONS



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