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How to update the Galaxy Radios For using IRF520 MOSFET's.

Dual final AM/FM/SSB Chassis Only

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SECTION 1

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NOTE: There may be more information in this package than you need depending on your experience. When you click the print icon you can select print all the pages, range of pages or any current page you have displayed.

1.0 INTRODUCTION:

Soon all Mitsubishi 2SC1969, 2SC2166 and 2SC2312 transistors will disappear or become too expensive to buy. This is how to correctly update the Galaxy Radios for using IRF520 MOSFET's.
This project is not for novices or anyone who does not have the proper equipment for aligning RF circuitry, or anyone faint at heart.
Leave the installation and alignment to a proven technician.

NOTE:
Update sheet is written on the assumption that you know the basics.
Exercise a great deal of care with this mod!
Due to the placement, size, and close proximity of the surrounding traces.
If done wrong you could destroy the PCB.

If you have even the slightest doubts or the proper equipment, it would be wise to have someone else you trust perform the mod for you.

SO TAKE YOUR TIME AND DOUBLE CHECK YOUR WORK!!!!

1.1 TOOLS NEEDED

You will need a Soldering Iron, solder, and de-soldering pump
Long nose pliers.
Cutting pliers (What you are looking for are "flush cutting" pliers rather than the traditional "dikes" or "diagonal cutting pliers.)
Digital Multimeter.
Magnifier for examining circuit board traces and solder connections.
Preferably some experience soldering and de-soldering components.

1.2 BEFORE YOU START NOTES:

If you properly replace the 2SC2166 driver and 2SC1969 finals in SSB chassis with three IRF520 mosfets, you will gain slightly more power when done correctly. The radio will also have less than 10% distortion at full-modulated power. Pushing the mosfets harder will naturally give higher wattage but this comes with problems like harmonics, distortion and high temp plus they will become very unstable.

So be weary of those that post numbers of 25 watts per mosfet when in reality the safe numbers are closer to 8 -12 watts each. Mosfets are not as forgiving as bipolar's so failure rates for mosfet radios will be very high when tweakers and peakers start casting their magic spells on them.

One other thing to be weary of are the folks out there that's going to jump on the kit bandwagon. Ask questions about their kit of components.

For Example:
1. Does the kit come with all of the components needed?
2. If doing a single to dual final update. Does the kit come with the Heatsink, and transistor mounting hardware?
3. Do they offer any support if you have problems?

Be REAL careful with the bunch on eBay.

Preparing the Radio for the Mod.
1. Fully check out the radio and make sure everything is in full working order before starting this conversion!
2. Carefully remove the top and bottom radio covers. When removing the bottom cover, disconnect the speaker connector from the main board.
3. Put the Radio back to stock i.e.
    a. If AMC has been defeated, return AMC back to stock operation.
    b. Remove any of the so-called swing Mods.

2.0 MODELS COVERED:

Radios with the following Main Chassis (**Dual final SSB only**)
EPT360011B, EPT360012B, EPT360014B, EPT360014C.
DX11B, DX77HML, DX88HL, DX99V, Galaxy Plus

Updated By Rick Jackson (Euro Radio Co)

3.0 WHERE TO GET THE PARTS NEEDED:

All Galaxy DX Radio parts and IRF520's, purchased directly from the following distributors **RF PARTS CO.** 435 S. Pacific St. San Marcos CA 92069 TEL: (800) 737-2787 strictly orders only! (760) 744-0700 all other questions FAX: (760) 744-1943 Web Site: http://www.rfparts.com/ **MAYCOM COMMUNICATIONS PRODUCTS** 1134 W. JOHN BEERS ROAD STEVENSVILLE (DERBY), MICHIGAN 49127 1-269-429-8522 1-269-429-8541 Fax: 1-269-429-2137 Web Site: http://maycomcomm.com/	All Galaxy DX Radio parts and IRF520's Wholesale Only Distributors **J T I Distributors** PO Box 300 Welcome NC 27374-0300 Toll Free: 1-800-626-3059 strictly orders only! Local: 336-731-8177 Fax: 336-731-2805 Web Site: http://www.jtronix.com/ Mouser has the IRF520's also **MOUSER ELECTRONICS** 1000 N. Main St. Mansfield TX 76063 TEL: (800) 346-6873, (817) 483-4422 (800) 992-9943 to get a catalog only FAX: (817) 483-0931 Web Site: http://www.mouser.com/

NOTE: The IRF520's are not expensive do your research and check prices.

4.0 PARTS LIST:

Dual Final Models		
3	IRF520 MOSFET	TR43, TR44, TR56
3	5.6 Volt 400mWatt Zener	D88, D89, D112
1	12K 1/4 Watt	L47-R218
2	1K 1/4 Watt	L35-R216, L50-R271
1	390pF /UL	C175
2	152 /M (1500pF) 100volt Mylar	C171, C209
3	100KB (Galaxy Part # RE10400020)	VR10, VR11, VR20
3	100K 1/4 Watt	R215, R219, R270
2	47K 1 Watt	R217, R272
1	150pF /UJ	C167
2	104 (0.1uF) Disc Ceramic	C173, C210

5.0 OVERVIEW OF STEPS FOR A DUAL FINAL MODEL:

Remove all the components as shown hi-lighted in Violet on (6.2 Dual Final chassis schematic and PCB layout (1) (Before Conversion)) **Page 9.**

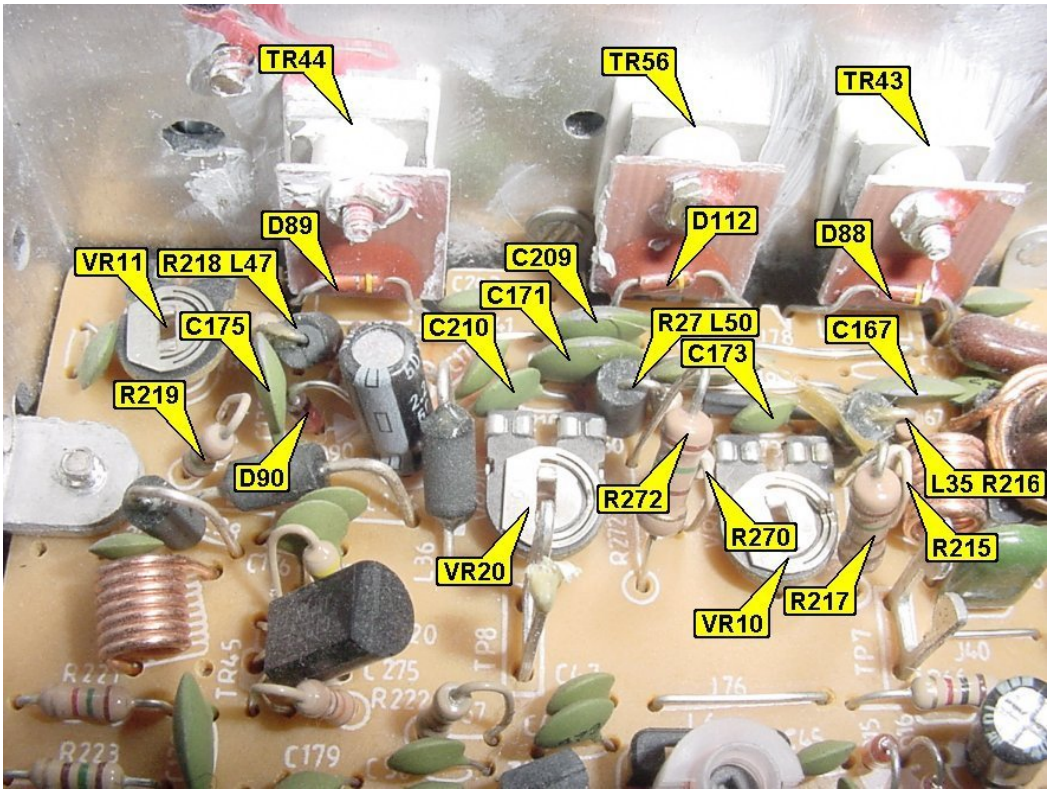
Insert the following components as shown hi-lighted in Green on (6.3 Dual Final chassis schematic and PCB layout (2) (After Conversion)) **Page 10.**

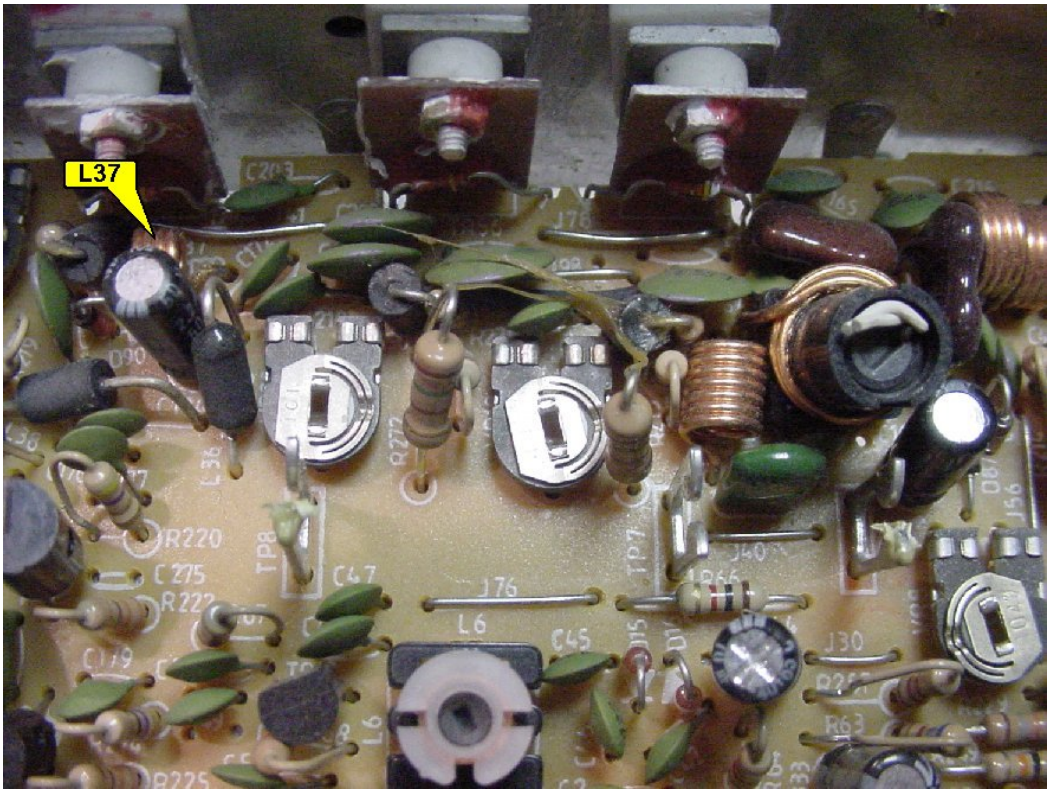
Before insert the MOSFET's TR43, 44 and 56 make sure that the Ceramic Insulators and Insulating Bushes are in good condition and use a good quality Heat Sink Compound.
You must use Ceramic Insulators and not the mica type.
Use a liberal amount of heat sink compound.

Updated By Rick Jackson (Euro Radio Co)

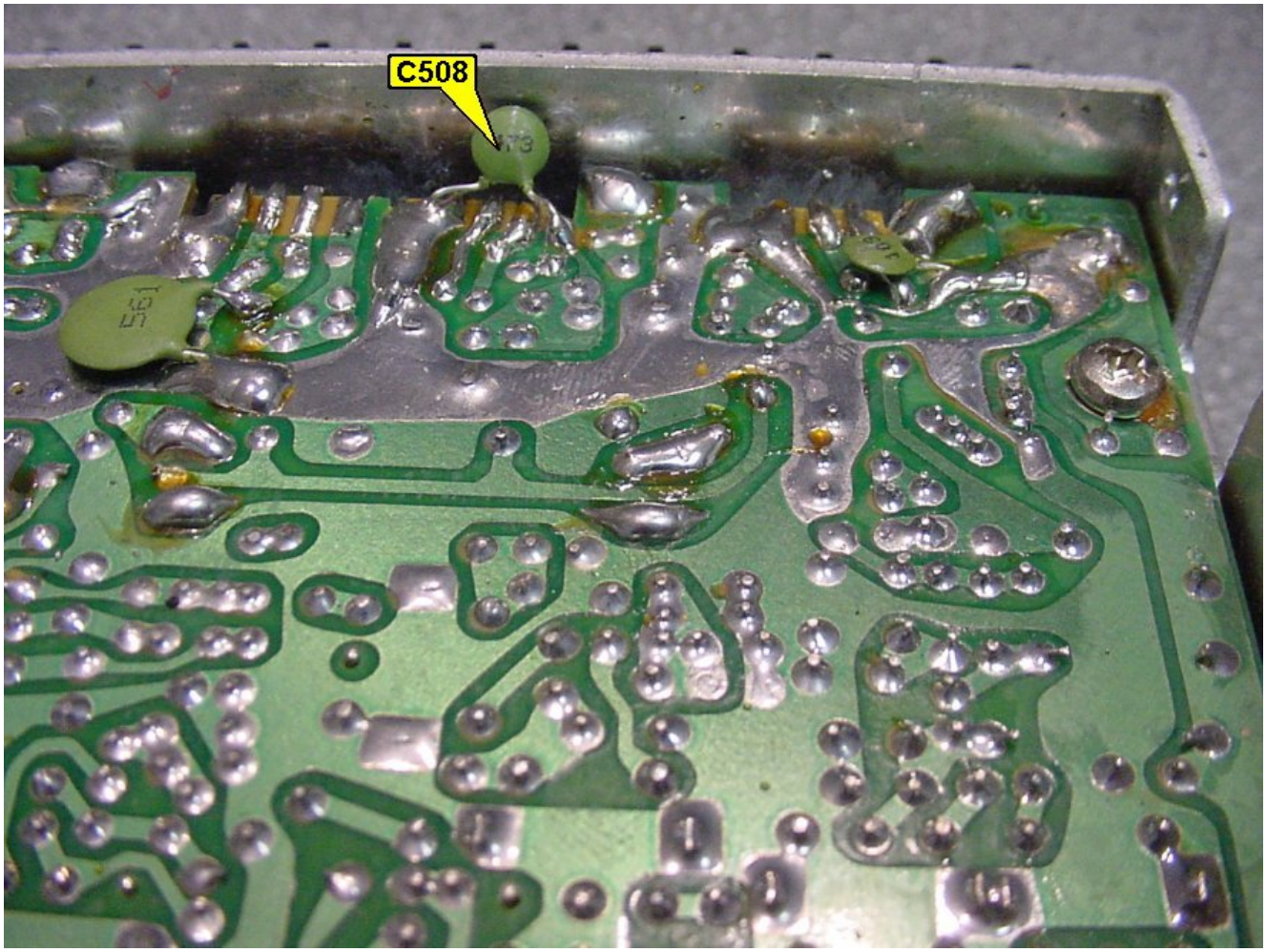
1. Remove rear heatsink
2. Add TR44 to IRF520 MOSFET
3. Add TR43 to IRF520 MOSFET
4. Add TR56 to IRF520 MOSFET
5. Add L47-R218 to 12K 1/4 Watt
6. Add L35-R216 and L50-R271 to 1K 1/4 Watt
7. Add D89 to 5.6 Volt Zener (Install reversed, see attached schematic and PCB layout)
8. Add D88 to 5.6 Volt Zener (Install reversed, see attached schematic and PCB layout)
9. Add D112 to 5.6 Volt Zener (Install reversed, see attached schematic and PCB layout)
10. Add C175 to 390pF /UL
11. Add C171 and C209 to 152/M (1500pF) Mylar
12. Add VR10, VR11, and VR20 to 100KB
13. Add R215, R219, and R270 to 100K 1/4 Watt
15. Add R217 and R272 to 47K 1 Watt
16. Add C167 to 390pF /UJ
17. Remove C508 (not used on all models, located on solder side of PCB across TR56)
18. Add C173 and C210 to 104 (0.1uF) Disc Ceramic.
19. Remove C170 and C208 (If fitted)
20. Re-install rear heatsink

6.0 3600xxx DUAL FINAL CHASSIS PICTURES BEFORE CONVERSION COMPONENT SIDE VIEW:

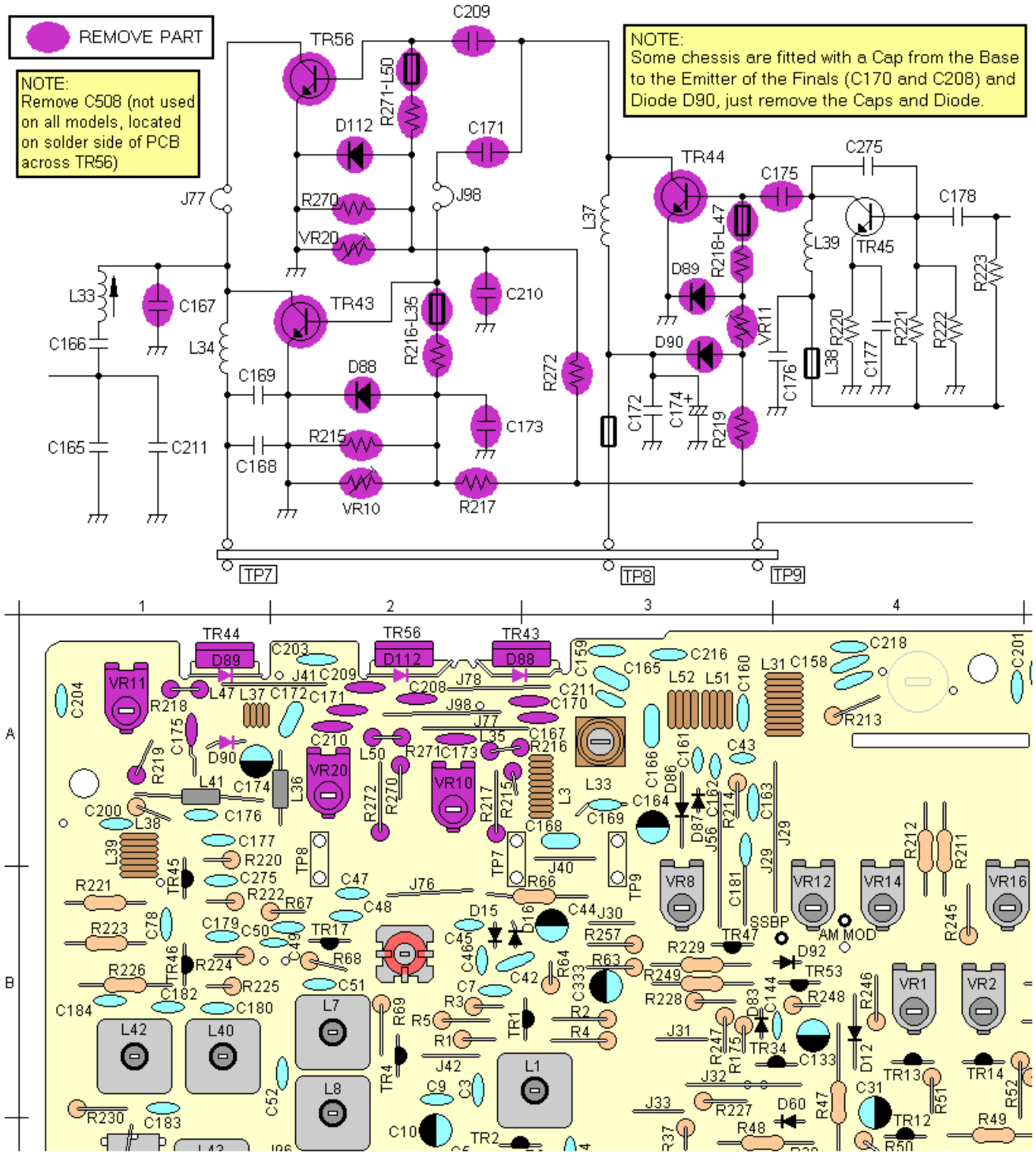




6.1 3600xxx DUAL FINAL CHASSIS PICTURES BEFORE CONVERSION COPPER SIDE VIEW:

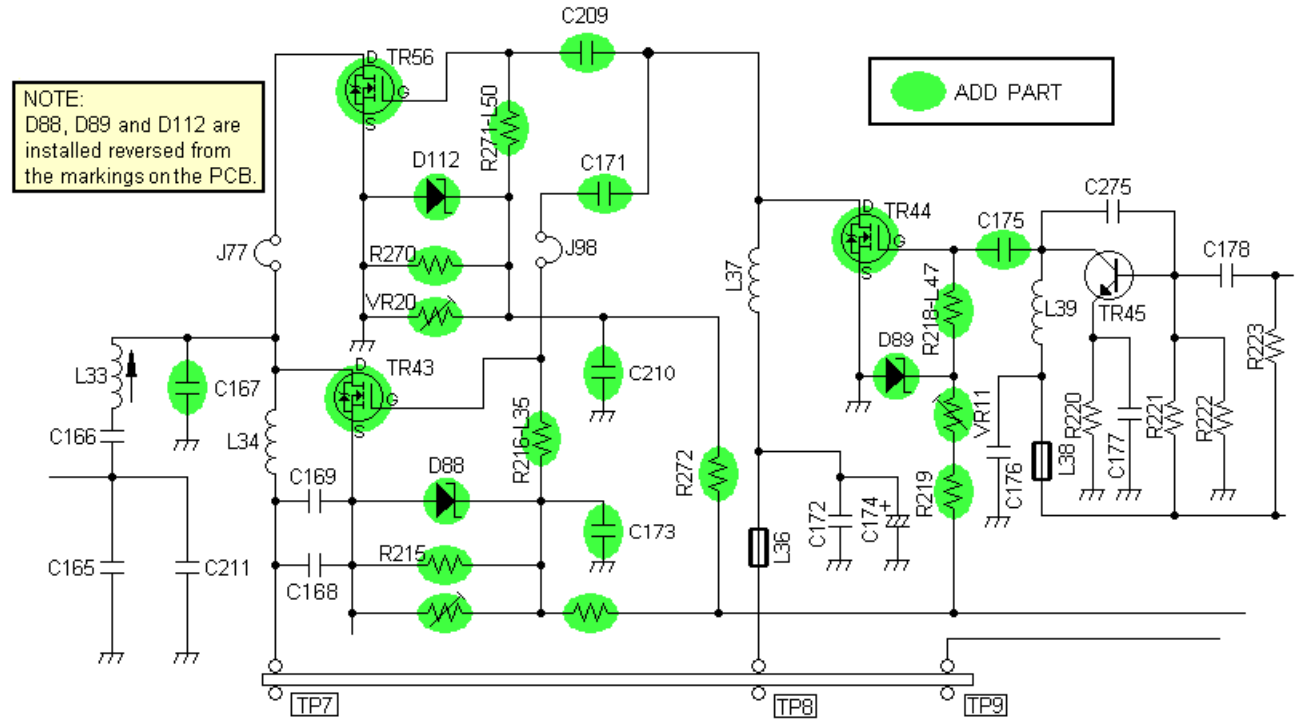


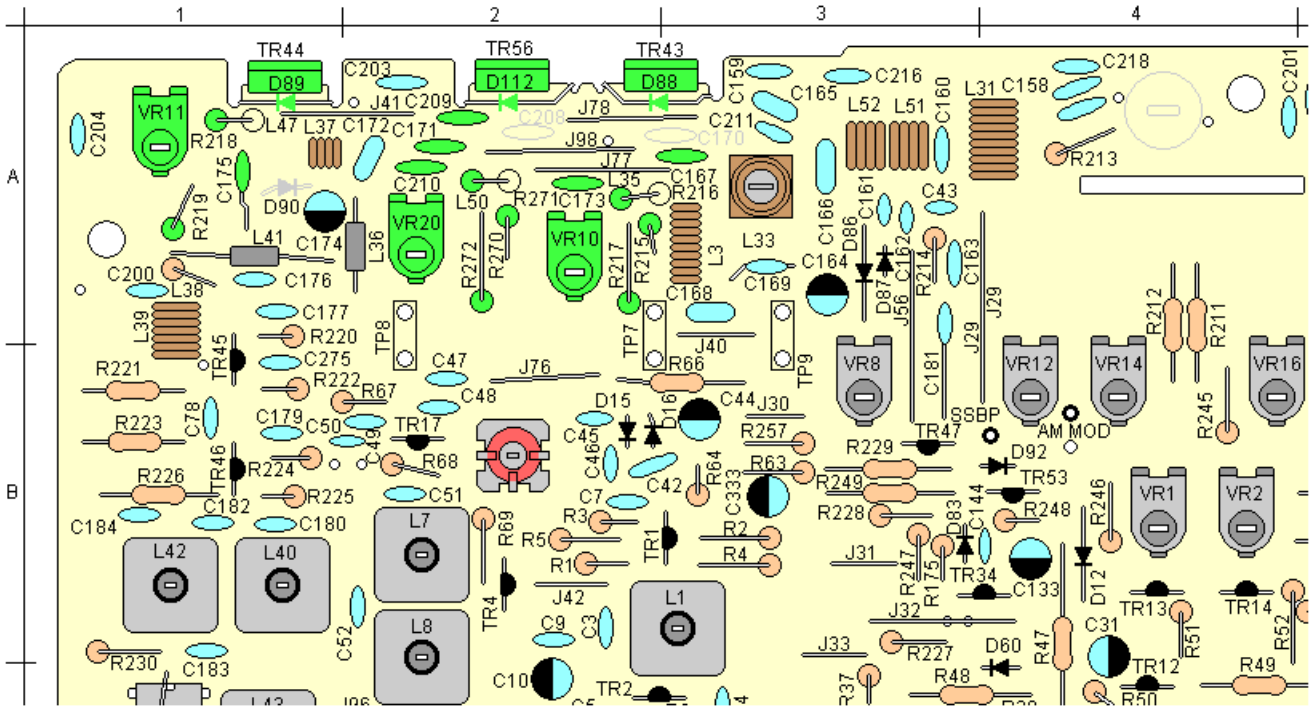
6.2 3600xxx DUAL FINAL CHASSIS SCHEMATIC AND PCB LAYOUT BEFORE CONVERSION:



Dual Final Chassis (Before Conversion)
Schematic And PCB Layout (1)
Rev. 1.6

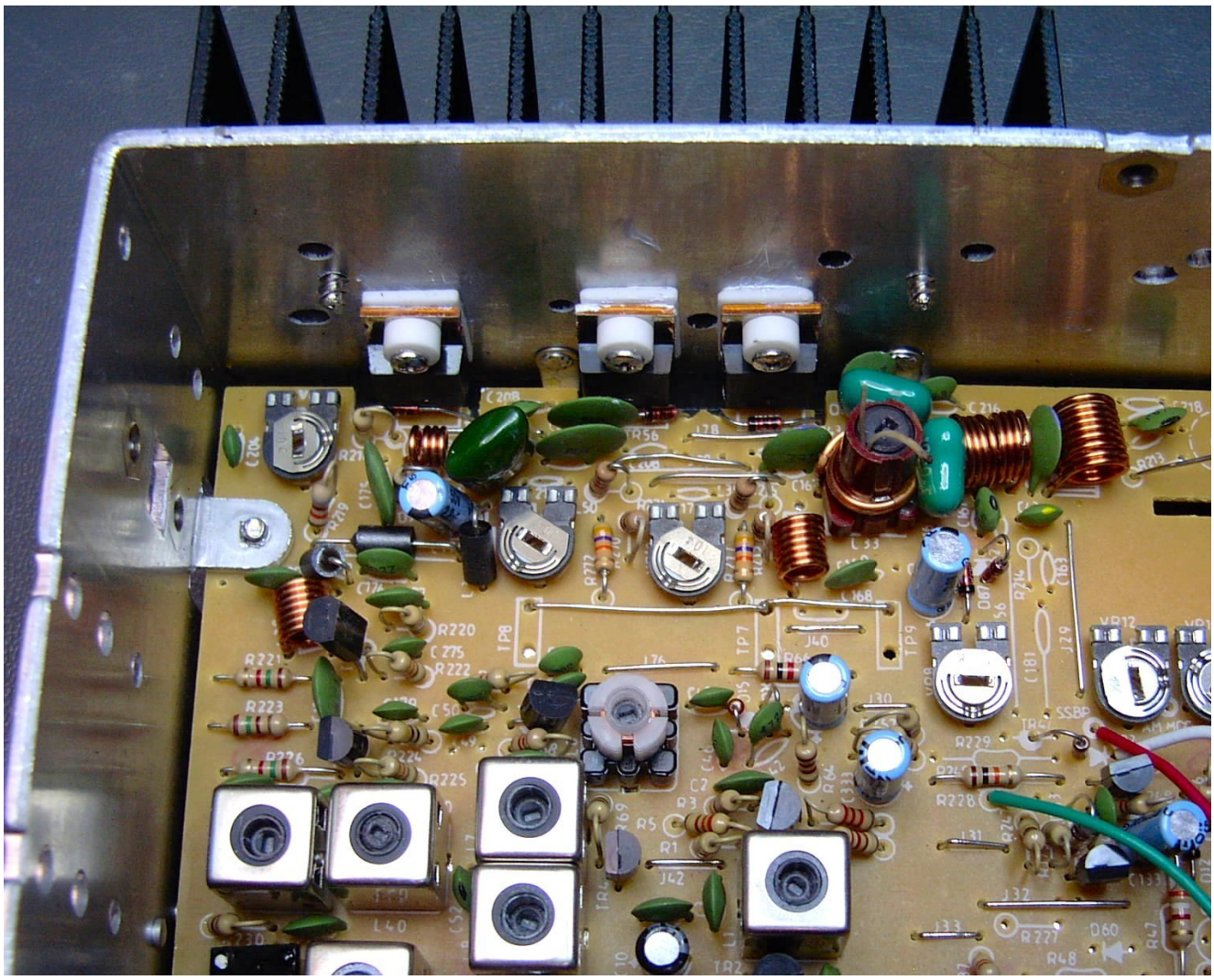
6.3 3600xxx DUAL FINAL CHASSIS SCHEMATIC AND PCB LAYOUT AFTER CONVERSION:



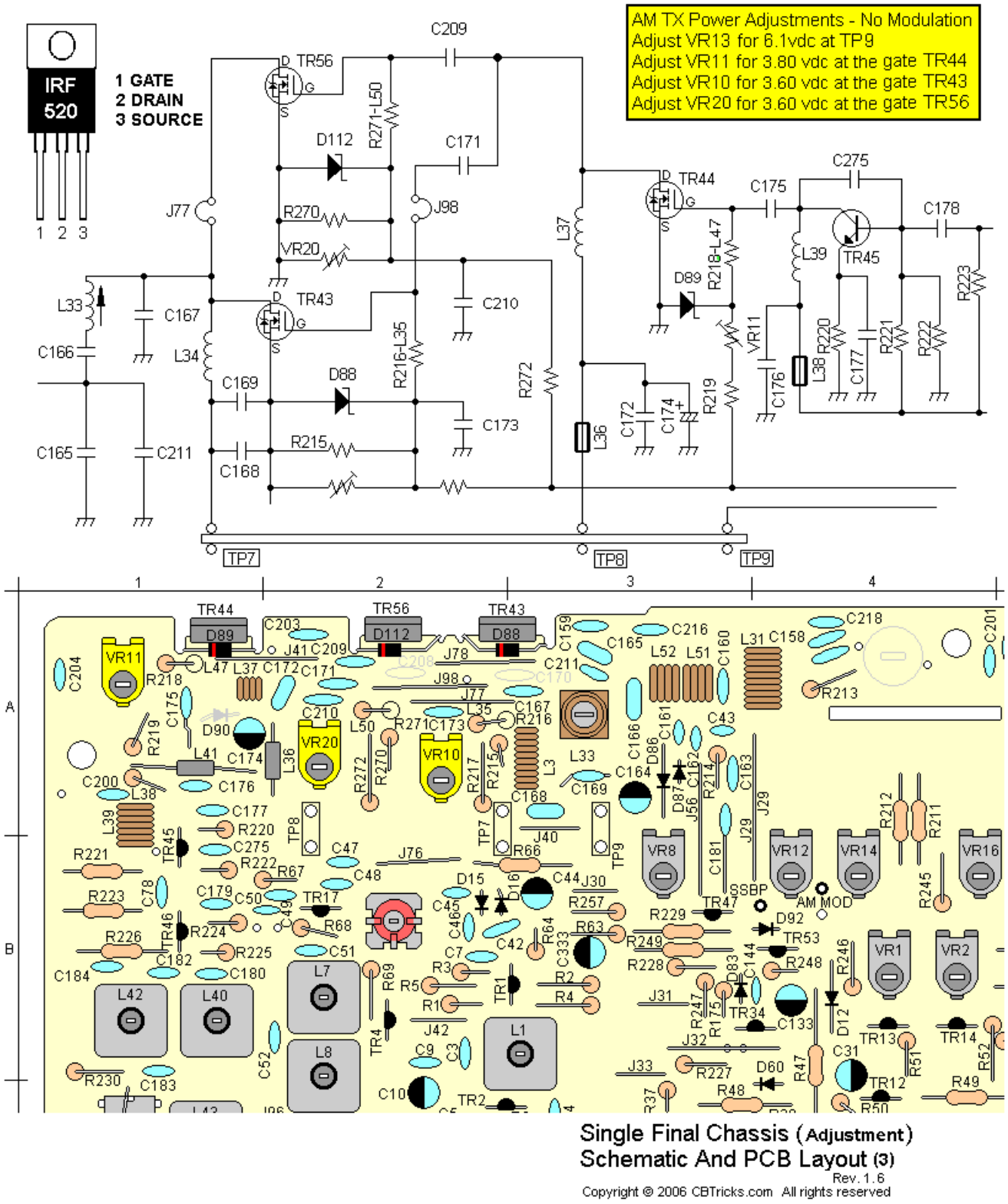


Single Final Chassis (After Conversion)
Schematic And PCB Layout (2)
Rev. 1.6

6.4 3600xxx DUAL FINAL MOSFET PICTURES AFTER CONVERSION:



7.0 ADJUSTMENT:



8.0 TRANSISTOR DATASHEET:

The IRF520 was developed by International Rectifier, thus the IRF part prefix.
Several other manufacturers have been licensed manufacture the part also.
ST (Thompson)
Fairchild
Intersil
Supertex
And others
If you need to look at the IRF datasheet it is on-line at CBTricks.com website.

8.1 FINAL NOTES:

We have made every effort to make sure this project easy to follow and three people have tested it before it was uploaded to the site.

OLDER RADIOS:
One of the test radios was an older EPT3600xxx and after the mod and the radio tested the harmonic was too high. It was found there was a bad cap in the final section C165.

Also the AM regulator may need to be stepped up in some of the oldest chassis. The 2SB754 (60 watt) has been discontinued and replaced with 2SB827 (60 watt). Also a good replacement would be a 2SB688 (80 watt) or 2SB817 (100 watt).

Some 3600xxx L33 is adjustable, if your is like this do not remove L33 slug (required to balance power on upper and lower bands.)

REFERENCE:
Here is a good read, http://www.aoc.nrao.edu/~pharden/hobby/_ClassDEF1.pdf
You don't need to understand it all just the simple basics where he is explaining the differences between bipolar and mosfets in the same application. Most everything we need to learn here is on pages 1& 2. The rest is just different classifications.

Post you findings, questions and ideals of improvement of the mod or mod sheet at the following.
CBTricks Forum.
http://www.cbtricks.com/forums/
Radio Modification/Conversion and Repair/Troubleshooting Discussions

Thanks go to the following from working out the mod to testing.
Credits
Galaxy DX Radios Tech Support (Ray)
Rick Jackson (Euro Radio Co)
Nchannel

Enjoy
Bennie
http://www.cbtricks.com/