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Mostly Antennas, Ham Radio, Racing...and other critters...

\$3 to Quintuple the Output Power of a 40 M Pixie Transceiver

The Pixie is a fun and popular QRP transceiver kit. However, typical output power on 40 M is only about 300 to 500 milli-Watts – a bit too QRPp at times...

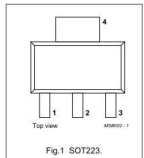
In this article I'll show cheap and easy ways to pump up the output power to around 1.6 or over 2 Watts, depending upon the power supply type.



UPGRADE THE OUTPUT STAGE TRANSISTOR

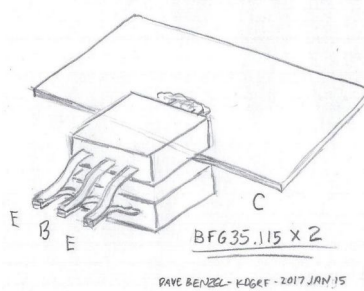
The first modification uses 3 components – 2 x BFG35 transistors in parallel (soldered to a small homebrew copper heat sink) to take the place of the output 2N2222, and a 150 pF capacitor to parallel the existing output capacitor. Note that there are several versions of the Pixie, so the value of the new paralleled capacitor may have to be **empirically determined**.

Total cost of components is less than \$3 from the usual electronics suppliers such as DigiKey, Mouser, Newark, etc...

NXP Semiconductors		Product specification											
NPN 4 GHz wideband transistor		BFG35											
DESCRIPTION	PINNING												
NPN planar epitaxial transistor mounted in a plastic SOT223 envelope, intended for wideband amplifier applications. It features high output voltage capabilities.	<table border="1"><thead><tr><th>PIN</th><th>DESCRIPTION</th></tr></thead><tbody><tr><td>1</td><td>emitter</td></tr><tr><td>2</td><td>base</td></tr><tr><td>3</td><td>emitter</td></tr><tr><td>4</td><td>collector</td></tr></tbody></table>	PIN	DESCRIPTION	1	emitter	2	base	3	emitter	4	collector	Fig.1 SOT223.	
PIN	DESCRIPTION												
1	emitter												
2	base												
3	emitter												
4	collector												
QUICK REFERENCE DATA													
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYR.	MAX.	UNIT							
V_{CE0}	collector-emitter voltage	open base	–	–	18	V							
I_C	DC collector current	–	–	150	mA								
P_{tot}	total power dissipation	up to $T_c = 135\text{ }^\circ\text{C}$ (note 1)	–	–	1	W							
β_{FE}	DC current gain	$I_C = 100\text{ mA}; V_{CE} = 10\text{ V}; T_c = 25\text{ }^\circ\text{C}$	25	70	–	–							

On my unit, existing components are on a non-plated-through circuit board, making standard component removal procedures difficult. The easiest method of removing the 2N2222 was simply to clip it's leads and push the stubs through the board with soldering iron and the new solid wire risers. The solid wire risers are left in place in order to connect to the new transistors; both sides of the board should be soldered.

In preparation for installation, the new transistors are paralleled and soldered to a small "scissor-ware" copper sheet heat sync as shown ==>



The BFG35 transistor stack is soldered to the risers, in place of the 2N2222, as below ==>



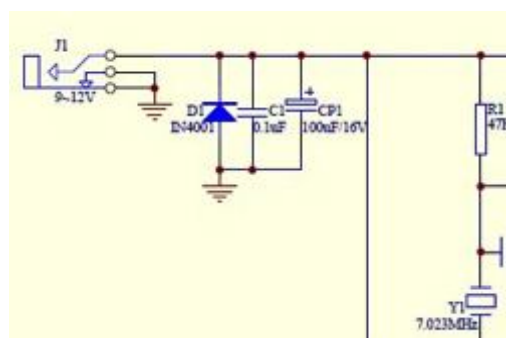
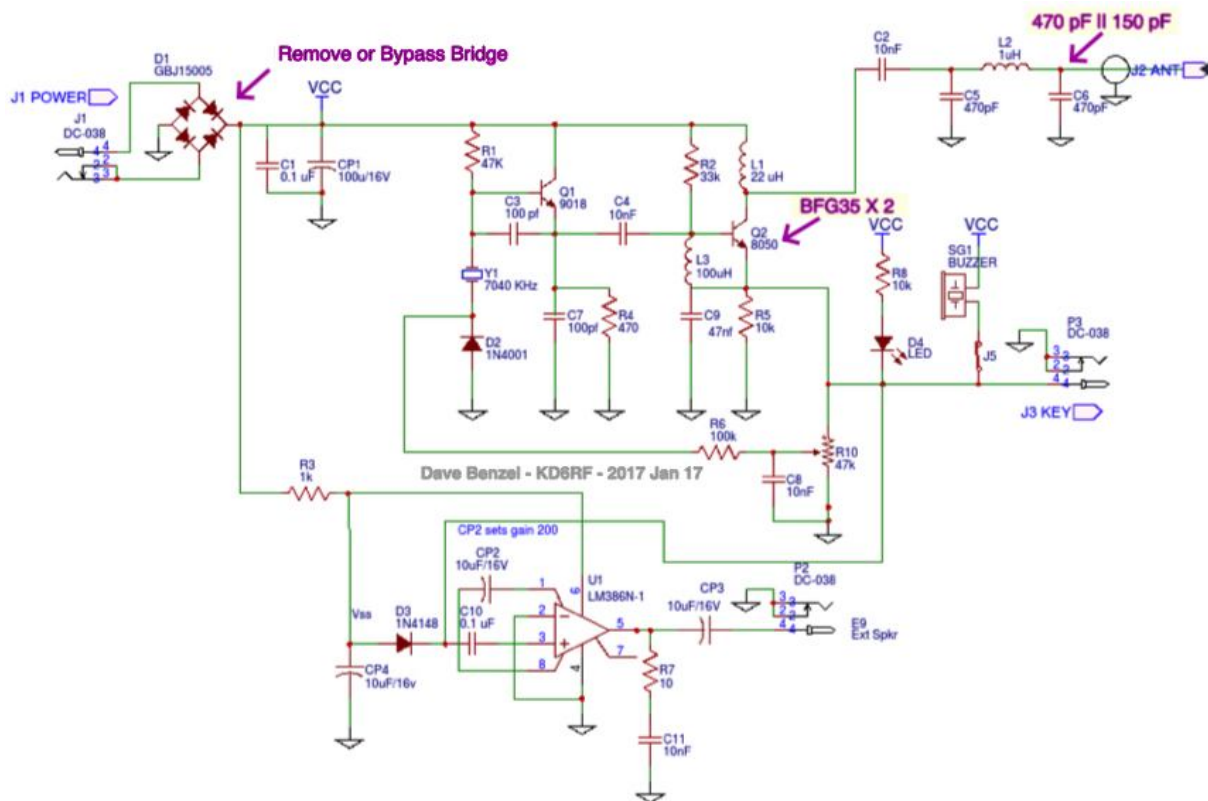
Parallel in the new 150 pF capacitor across the pi-network output capacitor, and that's it for this mod.

Output power and overall efficiency for this mod alone ended up at **1.6 Watts** / (0.26 Amp x **12 Volts**) = **51%**.

POWER SUPPLY BRIDGE RECTIFIER

In some versions of the Pixie, such as my units, a bridge rectifier is used in the power supply feed to protect the circuitry and presumably allow for operation on AC.

This, of course, uses up 2 diode-drops = 1.4 Volts of VCC which significantly reduces output power. Wire directly to the power source instead of going through the bridge, and output power pops up to **over 2 Watts!** Since the bridge rectifier is a relatively low current device, add a hefty reversed diode, like the bottom schematic, to protect the circuitry.



When this mod is added to the transistor mod above, output power and overall efficiency ended up at **2.3 Watts / (0.33 Amp x 12 Volts) = 58%**.

Naturally, output power increases even more, to around 3 Watts, if the supply is taken up to the 13+ Volts available with lead-acid batteries. Conversely, if you want to retain the spirit or QRpp at the commonly defined 1 Watt level, you can run the

Pixie on a 9 Volt battery and be putting out almost 1 Watt, which is still close to an S-Unit better than the original.

No time was spent optimizing – it may very well be the case that more power and higher efficiency can be attained with a bit more consideration. In the mean time, enjoy that S-Unit or more increase in power!

Dave Benzel – KD6RF – 2017-Jan-17

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One thought on “\$3 to Quintuple the Output Power of a 40 M Pixie Transceiver”



Angel Cintron

February 7, 2017 at 9:32 pm

I am interested in having these mods performed on a 40m pixie I ordered tonight. What would you charge me to perform the”operation” on my pixi
