SAN BERNARDINO MICROWAVE SOCIETY, Incorporated

FOUNDED IN 1955

A NON-PROFIT AMATEUR TECHNICAL ORGANIZATION DEDICATED TO THE ADVANCEMENT OF COMMUNICATIONS ABOVE 1000 MC.

W6IFE Newsletter

October 2006 Edition

President Dennis Kidder W6DO 2509 East Second St Long Beach, CA 90803 562-858-2883
Vice President John Oppen KJ6HZ 4705 Ninth St Riverside, CA 92501 joppen6115@aol.com
Recording Sec Mel Swanberg, WA6JBD 231 E Alessandro Blvd Riverside, CA 92508 909-369-6515 wa6jbd@verizon.net
Corresponding Sec Kurt Geitner, K6RRA1077 E Pacific Coast Hwy TMB142 Seal Beach, CA 90740 310-718-4910 k6rra@gte.net
Treasurer Dick Kolbly, K6HIJ 26335 Community Barstow, CA 92311 760-253-2477 dick@eventhorizons.com
Editor Bill Burns, WA6QYR 247 Rebel Rd Ridgecrest, CA 93555 760-375-8566 bburns@ridgecrest.ca.us
Webmaster Chip Angle, N6CA 25309 Andreo Lomita, CA 90717 310-539-5395 chip@anglelinear.com
ARRL Interface Frank Kelly, WB6CWN PO Box 1246, Thousand Oaks, CA 91358 805 558-6199 fmkelly@verizon.net
W6IFE License Trustee Ed Munn, W6OYJ 6255 Radcliffe Dr. San Diego, CA 92122 858-453-4563 w6oyj@amsat.org.

At the **5 October 2006** meeting is to be something yet to be defined. The SBMS meets at the American Legion Hall 1024 Main Street (south of the 91 freeway) in Corona, CA at 1900 hours local time on the first Thursday of each month. Check out the SBMS web site at http://www.ham-radio.com/sbms/.

REMINDER- NO PARKING IN THE CHURCH LOT UNTIL CLAIRIFICATION IS MADE.

Last meeting-John KJ6HZ presided at the meeting**.** Frank, WB6CWN had some 2.4 GHz wireless devices that his company builds. It was noted that there were more "police" folks out looking at our activities during the contest. It might be better to have with you a copy of QST describing the contest, your amateur license, SBMS badge, Having a ham call plate does hurt either. Discussion of places to go and where we were going to be covered the meeting. 26 people present

Scheduling.
TBD

Activity reported at the 7 September SBMS meeting—Dug K6JEY reported having his 1296 amp repaired; Dave, WA6CGR helped folk repair radios; Larry, K6HLH changed dishes on his 65 ft tower from a DSS to a 4 fter, built the QEX GPS kit; Juno, KG6MQShad a W1GHZ 24/10 GHz feed to show and some 76 GHz mixer; Glenn, KE6HPZ had warble on his 10 GHz signal; Chip, N6CA building beacons for Mt Harbor and High Potosi; Larry KG6EG had a 10 w 10 GHz amp; Bob, WA6VHS now has 10 w on 10 GHz and has his 24 GHz LO locked to GPS and has been testing 47 GHz amps; Wayne, KH6WZ has his 24 GHz rig working and collecting 47 GHz parts; Mike, W6YLZ had fun in Mexico working lots of long haul 997 KM contest stations; Gene, K6BNN finished his 10 GHz rig and worked the contest; Pat, N6RMJ has repaired his 10 GHz and it is ready for Mexico loan; Paul N6DN has a working 10 GHz rig now; Jeff, KN6VR found a new location but it didn't work out; John, N6AX was out for

the contest on both 10 and 24 GHz; Tom, WB6UZZ has his 10 GHz rig working; Bill, WA6QYR had two rigs in the contest (one for his cousin Ernie W7ERN for first 10 GHz contacts) and is building two more Qualcomm rigs; Kerry, N6IZW had fun with laser contacts, has a sodium lamp beacon running at 130 Hz 150w and using Jason software to look for signals below noise on optical rig; Ed W6OYJ is testing Jason software and can hear signals 45 dB below noise levels, will be speaking at the ARRL SW convention along with W6DQ; Dick, WB6DNX was out in the contest; Frank, WB6CWN got back into satellites thanks to Bernardo using AO-51 during the contest, tracked down a 450 repeater QRM source to a RV active antenna that was on during home time and mismatch made a low oscillator for several miles; Mel, WA6JBD had lots of stops during the contest but most proved to be bad sites for contacts; John. KJ6HZ has a pyrojoe LNA on 10 GHz.

Juno's 10/24 GHz feed and his DB6NT 76 GHz mixer assembly.

Amateur Radio Expo 2006 – looking for individuals or groups to provide information and staffing for a Ham Radio Exhibition at the 2006 LA County Fair from 9 September to 1 October on weekends. Visit http://lafair.b2v.org. Contact Joy Matlack KD6FJV rbcom1@b2v.org or Rich Whited KG6JKJ kg6jkj@sbcglobal.net or Carl Gardenias WU6D wu6d@scdx.org.

Items from the Internet world-

This is an interim report about the Hittite HMC487LP5 power amplifier (2 watt). I had received one of the above devices on the Hittite evaluation board about 2 weeks ago. Tom, K7NII and myself have spent a couple of days evaluating the Hittite amplifier and we present this report. A final report will be made after we build our own amplifier design with the Hittite device.

1, After "snow flaking" we achieved a power output of 1.75 watts while running the device at 7 volts and 1300 ma (9.1 watts). The drive power was 10 mw "plus" (saturation level). About 2 DB above the saturation point.

2, I believe that we should call the type of operation "saturated Class A". SSB operation shouldn't be considered. The amplifier supply current did not change when input driving power was applied or removed.

3, As received, the input return loss was only 5 DB. We were able to improve this to better than 20 DB return loss trough "snow flaking". Snow flaking on the output microstrip also did improve the maximum power out.

4, Again, we were running the amplifier at 7 volts at 1.3 amps (9.1 watts) and dissipating about 7.5 watts in the device and heat sink. The Hittite evaluation board uses plated through holes that are filled with solder, for heat sinking to their "aluminum" heat spreader. We were not very well impressed by this method (plated through holes filled with solder) of coupling the MMIC to the heat spreader but the highest temperature that we measured (on the top surface of the device was 111 degrees Fahrenheit (44 degrees centigrade) which is well within the 85 degrees centigrade maximum operating temperatur3

5, We believe that our temperature measuring devices gave us accurate measurement values as the 2 different heat measuring guns gave the same results. One gun was a "contact probe" type and the other was a non-contact infrared sensing gun.

6, One concern that bothers us is that the "bias connection" which requires about -.2 volt, measured the very low resistance of 100 ohms. We applied bias from a variable voltage power supply through a 2400 ohm resistor. This seemed to work out FB. I haven't talked to the factory about this yet.

Addendum to note # 1, After rearranging our attenuators which brings the power level down to that which is acceptable to the HP 435 and HP 8485, It appears that we are actually closer to the 2 watt output level. We could not

raise the B+ voltage above 7 volts due to the power supply being used. The indications are that we could expect as much as 3 watts or so output power in an optimized circuit and PCB design. In order to do it efficiently, replies to your questions and comments will NOT be done on an individual basis. I will answer a bunch of your emails in several days. Thanks for your patience.
The Hittite HMC487LP5 is available from Hittite for $59.66 in quantities of 10.
The data sheet can be viewed here:
http://www.hittite.com/product_info/product_specs/amplifiers/hmc487lp5.pdf
73 Jerry W7QX

I have posted on my MSN Webpage, the design the PCB for my next amplifier using the Hittite HMC487LP5 device. My goal is for 3 watts output (20 DB gain):
http://groups.msn.com/W7QX
Look in the "PICTURES" folder and open it.
There are 2 pictures of the PCB. One is a PDF file which will be "to scale" The other is a JPG file which may or may not be to scale. The actual board length is 1.2 inches. A 4X actual length would be 4.8 inches.
Only group members can see the PDF file but anybody can access the JPG file.
I hope to have this board tested within a week.
My method of heat sinking the device is tentative and proprietary at this time.
I welcome all comments and input about this device and also if you have any personal experience with the HMC487LP5 yourself.

More info as it is developed. TNX, GL, es 73,Jerry W7QX
Look in the "DOCUMENT" section for the "HMC487-3 PCB.PDF" file.
http://groups.msn.com/W7QX
OR (if you are a group member):
http://www.msnusers.com/W7QX/Documents/HMC487LP5%20PDF%20FILES%2FHMC487%2D3%20PCB.PDF
73,Jerry W7QX
I guess you don't have to be a member to get the scaled PDF file.
Just go to:
http://www.msnusers.com/W7QX/Documents/HMC487LP5%20PDF%20FILES%2FHMC487%2D3%20PCB.PDF
73 es GL, Jerry W7QX
YOU DO NO HAVE TO BE A MEMBER!
If you click on this address:
http://groups.msn.com/W7QX
and look on the tight hand side of the page, under "NEW PHOTOS", you should see a small picture of the PCB titled "HMC487-3 PCB". You can then click on it and enlarge it or you can copy it. There is only one picture at the present time....the PCB.
OR
Just click on this address:
http://groups.msn.com/W7QX/hmc487lp5pcbfor10ghz.msnw?action=ShowPhoto&PhotoID=69
Please let me know if you still have a problem viewing the PCB.
73 es GLJerry W7QX
Hi Dan, Not quite THAT simple.
The board requires four 100 pf chip caps, four 2.2 mfd electrolytic chip caps, a heat sink, the HMC487LP5 MMIC, two SMA connectors and a power supply that provides +7 VDC and -.2 VDC. THAT'S IT!
73,Jerry W7QX
By the way Dan, I didn't receive any attachment.
Hi Jerry, I've been watching at your progress on the 2-Watt X-Band amplifier. After seeing your PCB, I'm concerned that you don't have ground via's right under the device at the ground paddle. My experience with this device dictates serious low thermal resistance right at the ground paddle. This device dissipates 7 to 9 watts. The only way I could get this device to survive was to machine a copper plateau slightly smaller than the ground paddle onto which the device is reflow soldered. The PCB (two pieces) is also machined (routered) and slide under the device which is now floating on the copper island. The copper piece also is machined to permit the 0.015" PCB to rest on the copper piece onto which the plateau is machined. This piece is in turn socked to the aluminum mounting plate.

Once I tamed the thermals, the device played very nice up to 50 degrees C ambient. Even with all this mechanical stuff the device is questionable up to 70 degrees C ambient (but then not too many hams operate in a 70 degree C environment).
Good luck with the project...Bill - N6GHz

Hi Grant, Thanks for your input. RE the connection of VDD1, 2,3 and VDD4, 5.... the "soundness" of this approach will be determined when we "fire it up".
Thanks again es 73,Jerry W7QX

Couple of comments :-
1) I'm not sure if you can simply connect the VDD1,VDD2 and VDD3 pins and the VDD4 and VDD5 pins together. The Hittite evaluation board has these pins individually de-coupled before being connected; the traces act as a transmission line, which helps to isolate the individual stages from each other as well as the supply lines. And at 10GHz these traces are close to a quarter wavelength, which may be optimum for isolation.
2) I'm not sure how you de-couple the VDD2 pin - the evaluation board has a 100pF cap very close to this pin.
3) Some form of 'active' bias/sequencing would be highly desirable to do two things - turn on the drain supply after the gate supply, and regulate the gate voltage to ensure constant drain current with temperature etc.
The first is mandatory, and of course the drain supply needs to be removed before the gate supply is removed. And it shouldn't just be a timer - the best way is to monitor the gate supply such that the drain supply is only enabled when the gate supply is present, and removes (or current limits) the drain supply in the event of gate supply failure.
The second is highly desirable as the transfer characteristics of the MMIC's FETs could change with temperature, and possibly time. Maybe these requirements are 'external' to the PA, but if/when the PA is mounted remotely at the masthead then it pays dividends to have all the protection circuitry you can get.
Regards Grant G8UBN
Hi Bill,
I understand what you did for the heat sink. Thanks for the info. I was thinking about something similar to what you have. I don't have a milling machine so I would have to improvise. I was going to make a copper pellet that would act as a plateau and fit between the device and the copper heat sink. There is a possibility that I might even use the "pellet" in the procedure below. After I tested the Hittite Evaluation Board, which uses an aluminum heat spreader, and I found that the device temperature only reached 44 degrees C with 2 watts output (using the solder filled VIA approach), I have decided to
Try the following:
1, Use a copper heat spreader the same size as my PCB (1.2" X 78"). The spreader is .100" thick.
2, Punch a .150" round hole in the PCB at the center of the heat sink area. The PCB is .010" thick.
3, UNDER A CONTROLLED HEAT ENVIRONMENT....solder the PCB/heat spreader together. Place a pool of solder in the .150" round hole of the PCB. Put the Hittite device in place with the paddle touching the pool of solder.
4, Remember that my PCB is only .010" thick.
5, I have 4 vias which are used to provide grounding for the capacitors and to hold the "sandwich" together during the soldering step using 2-56 screws. The sandwich parts will be pre-tinned. What do you think about this approach?
How much power output do you get at 7volts, at 7.5 volts?
I have a couple of the Eudyna FMM5061 devices to evaluate also. Have you looked at them?
73 es TNX, Jerry W7QX

Frank's, WB6CWN Hittite demo board 10 GHz 2w amp and the Eudyna similar device

"**Wants and Gots for sale.**

For Sale: 30W 1296 amplifier kit. Cost $45, plus $5 if sent by mail to cover cost of shipping and packaging. In So Cal, can arrange for pickup. Email 1296Amp@cox.net for more info. Chris Shoaff n9rin
For Sale HP 8414a phase display for 8410 Larry K6HLH 661-264-3126
Want WR-22 Directional coupler for 47 GHz John N6AX 714-9930435
Want 47 GHz parts for activating the band Wayne KH6WZ 310-357-2396.
For Sale 10 MHz OCXO's tested, various types and voltage requirements priced from $35-40 each. Ask for list Wayne KH6WZ 310-357-2396.kh6kine@earthlink.net
Want- WR22 pieces and parts for 47 GHz. Wayne KH6WZ 310-357-2396.kh6kine@earthlink.net

Owens Valley Radio Observatory Project
KJ6HZ and WA6QYR had a great time operating W6IFE at the Owens Valley Radio Observatory (OVRO) 40M dish this weekend. We had planned to work both 10 GHz and 1296 but had trouble receiving on 10 GHz. Sorry to all those who were looking for us on X band. We spent most of the first EU window trying to sort out the 10 GHz problems. We got back on 1296 for NA and JA/VK but heard nothing. Sunday we worked nearly the entire pass with a 2-hour sleep break during the NA window. Successful skeds with two VK stations made the weekend complete. The smallest station we know that we worked was 2.3M dish and 100W. We would like to hear details of other QRP stations that worked us or tried to work us. Thanks to everyone that called. Thanks also to Mark, Chuck, Doug and Dennis who worked so hard to make this possible.

9-Sep-06 OZ6OL SSB, IK2MMB SSB, VA7MM CW, LA9NEA CW, F2TU CW
10-Sep-06 K5JL CW, G3LTF CW, IK3COJ CW, LA8LF CW, N2UO CW, DL1YMK CW, RW3BP CW, RW1AW CW, K2UYH SSB, IW2FZR CW, LA8AVL CW, DF9QX CW, G3LTF SSB, DL1YMK SSB, DK7LJ SSB, ES5PC

CW, G4CCH CW, G4CCH SSB, JA8ERE CW, VK7MO CW, JA6AHB CW, JA4LJB CW, VK4AFL CW, VK4AFL SSB
Heard but not worked: 9H1ES
73,John KJ6HZ for the W6IFE crew Ops: KJ6HZ, WA6QYR 40M dish, 60W
www.ham-radio.com/sbms/ovro/
http://www.ovro.caltech.edu/

10 GHz and Up Contest First Half.

Due to a computer glitch at the editors, all these comments were lost to the bit bucket. Reloading software some how lost the previously "saved" 10 pages of newsletter.

Chuck, N6EQ had some of these boards at one of the SBMS meetings some time back. Check out the web site www.w6pql.com.

This boost regulator is for those times when you have a 28v relay, but want to use it with a 12v source. The circuit is built around the National Semiconductor LM2585, and uses the energy stored in an inductor to boost the 12v to 28. Output voltage can be varied by adjusting the ratio of resistor values on the feedback pin.

The circuit does it's switching around 100 Khz, but generates no noise if SMT components are used. Output is good for about half an amp continuous, enough to power two or three large microwave relays. The board measures 1.5"x2".

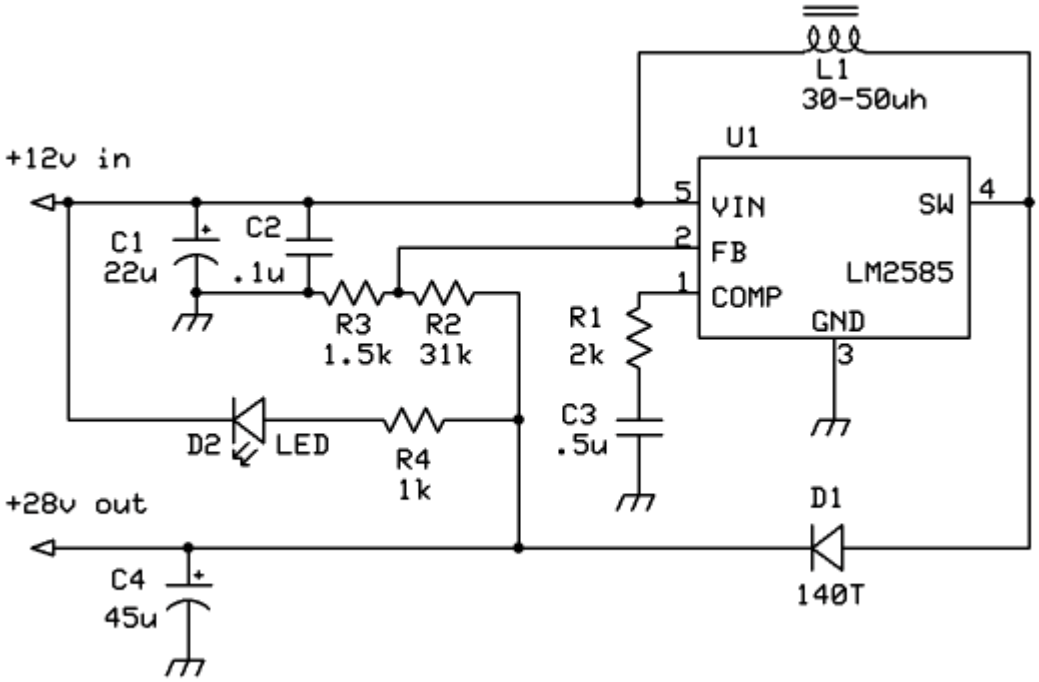
It is important to note at least these three cautions before powering up the board:

1. A short-circuit on the output will kill U1 and D1. Always use a 1 ohm 5w resistor, or a 2.5A fast fuse on the 12v input lead.

2. Do not omit the LED (D2); It provides a visual indicator of a properly operating boost condition, but more importantly, it also provides a minimum load for the output, preventing an output "spike" which will otherwise appear when the load is disconnected abruptly.

3. Keep the ratio of r2 and r3 to 22 or less to keep the output voltage within the ratings of C4 (C4 on my board is rated at 35wvdc). This ratio plus 1, multiplied times 1.25v, determines the output voltage.

If you are using a PC board I supplied, please refer to this component identification picture, and the schematic below. A close-up picture, to assist with component placement, can be seen here.



Chip, N6CA, Frank, WB6CWN and Larry, KG6EG looking at Frank's demo boards of the 10 GHz 2w amplifiers.

The **San Bernardino Microwave Society** is a technical amateur radio club affiliated with the ARRL having a membership of over 90 amateurs from Hawaii and Alaska to the east coast and beyond. Dues are $15 per year, which includes a badge and monthly newsletter. Your mail label indicates your call followed by when your dues are due. Dues can be sent to the treasurer as listed under the banner on the front page. If you have material you would like in the newsletter please send it to Bill WA6QYR at 247 Rebel Road Ridgecrest, CA 93555, bburns@ridgecrest.ca.us, or phone 760-375-8566. The newsletter is generated about the 15th of the month and put into the mail at least the week prior to the meeting. This is your newsletter. SBMS Newsletter material can be copied as long as SBMS is identified as source.

San Bernardino Microwave Society newsletter
247 Rebel Road
Ridgecrest, CA
93555
USA