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Abstract : In these paper we are placing forward the highly efficient , cost effective solar micro inverter with single solar panel (15W). The system is consist of solar panel cells, DC-DC convertorswhich will limit the output at the desired rated voltage andcurrent , filters used C , L-C type filters. Our system is closedloop system with feed back input given to the DC-DC convertor, here we are getting sin wave AC with efficiency of 80 %.

Keywords: PV- photovoltaic, OTG- of the gridIntroductionsolar inverter is the type of inverter designed to operate with asingle PV cell , the micro-inverter converts the variable DC outputfrom each panel to AC. Inverter advantages includes single poweroptimization , independent operation of each panel , plug andplay installation, improved installation and fire safety , minimumcost of system design. The inverter we are introducing is solely off grid system , typicallyto provide a smaller community with electricity. By using it onlarge scale even a huge companies can be powered. OTG homes are the autonomous , they do not rely on municipalWater supply , electrical power grid or similar utility services . OurMotive is to at least reduce of dependency of houses overgovernment for electricity or reduce the cost and make housespartially self sustainedThe DC-AC inverters on the market today there are essentially twodifferent forms of AC output generated: modified sine wave, andpure sine wave. A modified sine wave can be seen as more ofsquare wave than a sine wave; it passes the high DC voltage forspecified amounts of time so that the average power and rmsvoltage are the same as if it were a sine wave. These types ofinverters are much cheaper than pure sine wave inverters andtherefore are attractive alternatives . Pure sine wave inverters, onthe other hand, produce a sine wave output identical to thepower coming out of an electrical outlet. These devices areable to run more sensitive devices that a modified sine wave maycause damage to such as: laser printers, computers, powertools, digital clocks and medical equipment. This form of ACpower also reduces audible noise in devices such as fluorescentlights and runs inductive loads, like motors, faster and quieter dueto the less harmonic distortion. MethodologyThe construction of the pure sine wave inverter can be complexwhen thought of as a whole but when broken up into smallerprojects and divisions it becomes a much easier to manageproject. The following sections detail each specific part of theproject as well as how each section is constructed and interactswith other blocks to result in the production of a 240 volt puresine wave power inverter. H-BRIDGE ; Driving four MOSFETs in an H-bridge configurationallows +270, 270, or 0 volts across the load at any time. Toutilize PWM signals and this technology, the left and right sides ofthe bridge will be driven by different signals. The MOSFET driveron the left side of the bridge will receive a square wave at 50Hz, and the right side will receive the 50KHz PWM signal. The 50Hzsquare wave will control the polarity of the output sine wave, while the PWM signal will control the amplitude. The MOSFETs tobe used in the design are the IRFB20N50KPbF Hexfet PowerMOSFET, rated for 500V at 20A with a Rds of . 21ohm. 43mmPVSOLARCELLSFEEDBACKDC-DCBUCKCONVERDRIVERCIRCUITFILTERCIRCUITOUTPUT43mmSine Wave GeneratorWhen the oscillator was first pieced together, all that was beingoutput was a 6 volt signal, all of the calculations were correctlymade and all of the components were correct in their choosing, therefore the team had to understand why the circuit wasn'trunning. In order to understand if the circuit was operating at all, the power to the circuit was turned on and off while attached toan oscilloscope. While doing this the team noticed that there wassome oscillation present but it would attenuate to the 6 voltsignal in under a second. The phase shift oscillator works in such a way that if theamplitude of the inverting amplifier is nothing enough the systemwill continually attenuate the signal until the amplitude is zero, itwas therefore decided to change the amplification power If theinverting amplifier. By increasing the amplificationvalue the circuit eventually oscillated, in a perfect to the nakedeye, sine wave, upon measuring it was seen that the frequencywas not as calculated either, looking for a 50Hz sine wave, theoscillator was producing a 47Hz sine wave. The next tasktherefore was to return this value to 50Hz, the frequency of theoscillator is controlled by the 4 filters comprised of a resistor andcapacitor. The team found that by controlling the size of theresistor in one of the four filters the frequency could be adjusted. Therefore to get the correct size signal, a potentiometer was put inplace of one of the resistors and adjusted while measuring theoutput on an oscilloscope to determine what size resistor shouldbe used to oscillate at 50HzFilter DesignThe other major obstacle in the implementation of this projectwas the design of the filter, the original design was a simple onepole inductor , capacitor low pass filter designed for passing allsignals under 50kHz. When first bread-boarding the circuit theteam used low voltage, low power capacitors and inductors thatwere available in the WPI ECE shop. Using this method the filterworked as it wasdesigned and the only hurdle was to order partsdesigned for the voltage and current needed. The problem arousewhen searching for these parts, because the filter componentsneeded to be capable of handling at least 400volts and 4amps (forreliability reasons) these parts were very large and bulky. Therefore in order to rectify this problem the team went back toscratch in designing the low pass filter, instead of a simple firstorder low pass filter, a two pole low pass filter would be used. Using this approach there would be twice as many componentsin the filter but the size of these components would beconsiderably smaller, lighter and cost less. After first verifyingthat this filter would work with low voltage/current parts fromthe shop, the team bought components that could handle thecurrent and voltage demanded of the filter and tests on the newfilter were conducted. Implementing the DesignTo actually implement the design of this DCACpower inverter, certain steps had to be taken toensure that every block of the project functions correctly. Inorder to do this the entire project was firstplaced on a breadboard to ensure functionality and where anyglitches or inaccuracies due to small uncalculated losses could beaccounted for. The project had to be placed on the breadboard ina specific order so that each block could be tested to see if thedesired output occurred before moving onto the next step . Thefirst function blocks to be constructed were the six volt reference, sine wave and carrier wave generators. The sine and carrier wavegenerators work independently of each other and therefore wereable to be constructed at the same time. Some time was spent onthese two sections of the project because their functionality at theprecise frequency, shape and amplitudes will affect the outcomeof the PWM signal. Putting the Design to WorkAfter the successful debugging of the bread-boarded circuitry itwas time to transfer this work to a PCB board. Using the fullschematic in Appendix B and Eagle PCB program the team wasable to construct the circuitry for a PCB board and have it madeso that the team could piece together the entire circuit on a neatboard. The full plans for the PCB board are located in AppendixD. Putting the circuit onto a board of this kind will get rid of allthe extra wires and the possibility of any extra noise that canbe attributed to the length or crossing of wires typical on abreadboard, thus allowing a neater, more presentable and lessnoisy circuit. The first revision of our PCB board, and the boardour circuit was mounted on, is shown in the picture below. Thisrevision had a few traces that were not drawn correctly and sowires had to be added and some traces cut. The other detail withthis revision was that traces were not made for the final filterdesign and instead space was left for this addition. With thesefew changes to be made, the team went back and redesigned thePCB board, however time was not available to constructthis board againConclusionThe goals for this project were to produce a pure sine wave DC-AC inverter that would output at 50Hz, 240 volts RMS with 690watt output, would be cheap to manufacture, and fairlyefficient in the method in which it produces it. Taking a look atthese goals and the end result it can be said that they weremet, the circuitry and total cost of all the components used inthe construction of the circuit was around $65 as compared tothe $300600 pure sine wave inverters on the market now. This cost however, is when buying parts one at a time, ifmanufactured this price tag would drop greatly due to thequantities of parts that would be bought. The second goal, toproduce a 240volt RMS sine wave with the capability ofproviding 690 watts of power was not actually tested, but theteam is confident in its ability to produce this waveform. Usingparts in the driver portion of the circuit that are rated for atleast twice the operating parameters, 240 volts and 3 amps, theteam can be assured that these devices will work with the samefunctionality as they do at 12 volts. At 12 volts powering, the H-Bridge output is a clean 50 Hz sine wave that can easily becontrolled in size by the size of the sine reference in the controlcircuit. It is in this capability that the option of a closed loopcontrol circuit could be implemented. References600

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