Volume 2, No. 3, May-June 2011
International Journal of Advanced Research in Computer Science
RESEARCH PAPER
Available Online at www.ijarcs.info
ISSN No. 0976-5697

Wireless Charging In Mobile Devices through Amplitude Modulated Waves

R.Pratik
Department Of ECE,
V.M.K.V. Engineering College,
Salem, India.
pratikjet@gmail.com

M.B.Prem Anand*
Department Of ECE,
V.M.K.V. Engineering College,
Salem, India.
premece08@gmail.com

C.Pandia Raja
Department Of ECE,
V.M.K.V. Engineering College,
Salem, India.
pandiaraja91@gmail.com

Abstract: The next generation of mobile devices is on the horizon. Moving well beyond the voice centric model, the mobile devices allow consumers to enjoy features as robust web- browsing, audio and video playback and streaming, rich gaming, video conferencing and mobile access to e-mail and personal information. The mobile device as such is compact, but the charging of battery makes the mobile device immobile in critical situation, it emphasis a lot. This paper makes the fact false and emerges a technique for automatic charging making use of AM waves.

Keywords: AM-amplitude modulation, automatic charging, voltage converter, mobile devices, frequency, bandwidth.

I. INTRODUCTION

As wireless communications continue to grow in both popularity and variety of application, the RF spectrum has become a scarce resource. One way to better utilize this scarce resource is to use the existing allocated frequency bands more efficiently. Because of lack of clarity and clearness in the signal demodulated, the people don't like to hear AM stations. In order to recover the AM from their death and to make the mobile devices as mobile one, we introduce a new type of charging method for mobile devices. Actually the strength of the signal from a AM vertical antenna is about 9V and it decreases as the distance decreases. This signal is received first. After reducing the frequency, it is then converted into direct current which is used for charging. The frequency ranges from 550 KHz-1600 KHz [1]. The bandwidth of the signal is about 5 KHz. But the allocated frequency is 10 KHz. So we use this unused band of frequency for sub carrier modulation.

II. AMPLITUDE MODULATION

Amplitude modulation produces a signal with power concentrated at the carrier frequency and in two adjacent sidebands. Each side band is equal in bandwidth to that of the modulating signal and is a mirror image of the other. Thus, most of the power output by an AM transmitter is effectively wasted: half the power is concentrated at the carrier frequency, which carries no useful information (beyond the fact that a signal is present); the remaining power is split between two identical sidebands, only one of which is needed. We make use of this wasted power for charging.

The formula for $y(t)$ above may be written

$$y(t) = C\sin(\omega_c t) + M\frac{\cos(\phi - (\omega_m - \omega_c)t)}{2} - M\frac{\cos(\phi + (\omega_m + \omega_c)t)}{2}$$

Where C→ amplitude of the carrier signal which is used in our application [2].

We are going to demodulate this carrier signal present in the modulated signal. This is the basic technique involved in this paper.

III. DEMODULATOR

The amplitude modulated signal is converted into 6v using a special demodulator circuit. This circuit does not demodulate the message signal which is associated with the AM signal. In this special demodulator we are using receiver, frequency divider, DC converter [3], voltage regulator and finally the charging circuit which is internally present in the mobile device. The block diagram of this modulator is shown in figure.

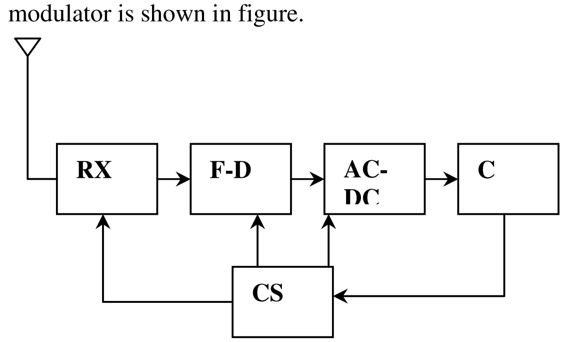

Figure 1:Block Diagram of Demodulator

Where,

RX → receiver
F-D →frequencydivider
AC-DC →AC to DC converter along with regulator
C →charging circuit
CS →control system

IV. FREQUENCY DIVIDER

The clock inputs of a logic family respond to frequencies well above the frequency that the devices can successfully divide. The output becomes a chaotic jumble of unpredictable sub-harmonics below the expected frequency due to the internal circuitry's inability to keep up with the fast clock. By adding a delay line to the common D flip-flop divide-by-two circuit, the internal frequency of the device can be lowered to an acceptable range. After one of the high frequency pulses triggers the flip-flop all following input pulses are ignored until the effect of the trigger propagates through the flip-flop and the delay line back to the D input (see the schematic below). The flip-flop will trigger predictably if this delay is longer than the amount of time required for the flip-flop's internal circuitry to settle and the edge is not close to an input edge [4]. Obviously, the circuit must divide by more than two but a flip-flop capable of only dividing 50 MHz (by two) may be able to divide frequencies well above 100 MHz (by four or more). The circuit is frequency specific due to the fixed delay but the technique can allow low power, slow devices to prescale surprisingly high fixed frequencies

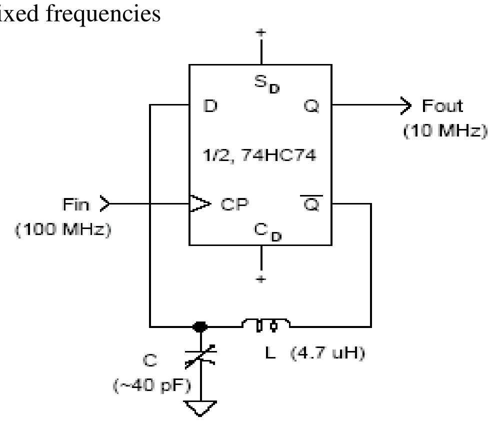

Figure 2

The schematic shows the values to convert a 74HC74 into a divide-by-ten 100 MHz prescaler handling frequencies about three times higher than the specified maximum input frequency (30 MHz). The current consumption is only about 10 mA. The circuit may be adjusted to work with frequencies approaching 150 MHz but the performance becomes unreliable and temperature sensitive. An experimental circuit was constructed with a 74F74 which has a toggle frequency near 100 MHz. Using a 0.47 uH inductor for L and a 20 pF trimmer, the circuit was able to divide 400 MHz by 8 to give a 50 MHz output. (The circuit was not particularly stable. A prescaler is probably best for handling frequencies above 300 MHz.) The circuit should work well with slower devices including 4000 series CMOS and the older 74L74s. Since the device is toggling at the output frequency, the power consumption will be lower than an ordinary divider from the same family.

V. VOLTAGE AMPLIFIER

The amplifier used here is of low voltage precision amplifier. There are lots of ICs available**.** The CS3011 single amplifier and the CS3012 dual amplifier are designed for precision amplification of low level signals and are ideally suited to applications that require very high closed-loop gains. These amplifiers achieve excellent offset stability, super-high open-loop gain, and low noise over time and temperature [5]. The devices also exhibit excellent CMRR and PSRR. The common mode input range includes the negative supply rail. The amplifiers operate with any total supply voltage from 2.7 V to 6.7 V (±1.35 V to ±3.35 V). We can use any type of precision amplifier which supports our requirement.

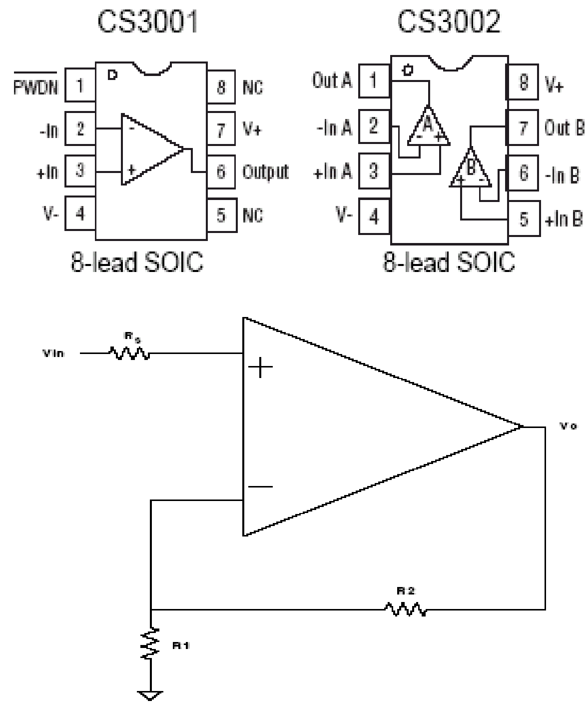

Figure 3

VI. RECTIFIER

The rectifier circuit is a ordinary alternating square wave to direct current [6]. We can make use of precision full wave rectifier for the conversion of AC to DC.

VII. VOLTAGE REGULATOR

The LM2936 ultra-low quiescent current regulator features low dropout voltage and low current in the standby mode. With less than 15 µA quiescent current at a 100 µA load, the LM2936 is ideally suited for automotive and other battery operated systems [7]. The LM2936 retains all of the features that are common to low dropout regulators including a low dropout PNP pass device, short circuit protection, reverse battery protection, and thermal shutdown. The LM2936 has a 40V maximum operating voltage limit, a −40°C to +125°C operating temperature range, and ±3% output voltage tolerance over the entire output current, input voltage, and temperature range. Fixed 3.0V, 3.3V or 5.0V with 50 mA output.

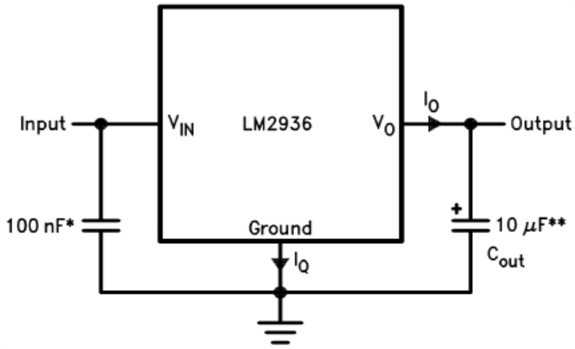

Figure 4

VIII. CONTROL SYSTEM

The control system just makes the gate function. Initially the supply to the circuits is all open. After making this initiating, the control unit stops the supply from the battery and makes the feedback concept. After making this, the supply is now from the output of the demodulator circuit. We are designing this control system according to this function stated above.

IX. PROOF OF POSSIBILITY

Texas Instruments recently introduced the advanced very-low-voltage CMOS (AVC) logic family [8], which operates on supplies of 3.3, 2.5, or 1.8V with propagation delays of approximately 2 nsec. Also a special type of radio sets was in usage during olden days namely crystal radio [9], which was being operated with the radio signal instead of a battery or any external power supply. So our proposal is possible and this leaves the proof for you.

X. CONTRADICTION

The only disadvantage in this paper is, the signal strength is going on low accordingly the distance increases. So we may have the restriction in area. So we may avoid this by increasing the AM stations or its broadcasting area by increasing the signal strength.

XI. ADVANTAGES

A. No need to charge the mobile devices manually.
B. A new boom to AM stations.
C. Low cost technology.
D. Use of VLSI make the size compatible within the mobile device.

XII. CONCLUSION

The circuit shown in this paper may have the operating voltage of about 3v. We can reduce it further by use of VLSI technique and the use of CMOS components. Only one default is the area limitation only. We hope this paper will make the mobile device as a real mobile one.

XIII. REFERENCES

[1] Mobile Communications 2nd Edition, 2001, Pearson Education by Jochen H Schiller. pp. 25,26.
[2] Communication System 4th Edition Wiley Student Edition by Simon Haykin. pp. 90-92.
[3] Power Electronics: Principles & Applications, 2002, Delmar Cengage Learning by J. Michal Jacob. pp. 455 to 476.
[4] Paper presented by Charles Wenzel on “UNUSUAL Frequency Dividers”, Wenzel associates technical library on 17/19/2010.
[5] Paper presented by Yanyu Jin Sanduleanu, M.A.T. Long J.R., Delft university of technology, Delft on “A Wideband millimeter wave power amplifier with 20db linear power gain and+8dbm maximum saturated output power” Solid state circuits, IEEE journal volume 43 issue 7, July 2008. pp. 1553-1562.
[6] Power Electronics: Circuits, Devices & Applications 3rd Edition Prentice Hall of India Pvt. Ltd. 2008. pp. 190-203.
[7] Paper presented on “LM ULTRA low quiescent current LDO voltage regulator in “National semiconductors type conference”.
[8] “Advanced very Low Voltage CMOS” Texas Instruments type.
[9] http://en.wikipedia.org/wiki/Crystal_radio.
[10] Introduction to Wireless & Mobile System 2nd Edition 2006 Cenage Learning by Dharma Prakash Agarwal and Qing An zeng. pp. 61-64.
[11] Wireless & Cellular Communications, S.K. Kataria & Sons publication, 2006 by Sanjay Sharma. pp. 101-104