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"Smart phone screen to data show and TV transferring"

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اسم المشروع

Smart phone screen to data show and TV transferring

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بناء على نظام كلية الهندسة والتكنولوجيا و إشراف ومتابعة المشرف المباشر على المشروع و موافقة أعضاء اللجة الممتحنة ، تم تقديم هذا المشروع إلى دائرة الهندسة الكهربائية و ذلك للوفاء بمتطلبات درجة البكالوريوس في الهندسة تخصص الاتصالات و الالكترونيات

توقيع المشرف

....

توقيع اللجنة الممتحنة

....

توقيع رئيس الدائرة

....

الإهداء

بسم الله الرحمن الرحيم

(قل إعملوا فسيرى الله عملكم ورسوله والمؤمنون)

صدق الله العظيم

إلهي لايطيب الليل إلا بشكرك ولايطيب النهار إلى بطاعتك .. ولاتطيب اللحظات إلا بذكرك .. ولا تطيب الآخرة إلا بعفوك .. ولا تطيب الجنة إلا برؤيتك الله جل جلاله

إلى من بلغ الرسالة وأدى الأمانة .. ونصح الأمة .. إلى نبي الرحمة ونور العالمين ..
سيدنا محمد صلى الله عليه وسلم

إلي من كلله الله بالهيبة والوقار .. إلى من علمني العطاء بدون انتظار .. إلى من أحمل أسمه بكل افتخار .. أرجو من الله أن يمد في عمرك لترى ثماراً قد حان قطافها بعد طول انتظار وستبقى كلماتك نجوم أهتدي بها اليوم وفي الغد وإلى الأبد ..(والدي العزيز)

إلى ملاكي في الحياة .. إلى معنى الحب وإلى معنى الحنان والتفاني .. إلى بسمة الحياة وسر الوجود إلى من كان دعائها سر نجاحي وحنانها بلسم جراحي إلى أغلى الحبايب (أمي الحبيبة).

الى اخوتي
هل يستطيع أحد أن يشكر الشمس لأنها أضاءت الدنيا
لكني سأحاول رد جزء من جميلكم بأن أكون كما أردتموني(شكرا لكم).

إلى من زرعوا التفاؤل في دربنا وقدموا لنا المساعدات والتسهيلات والأفكار والمعلومات، ربما دون ان يشعروا بدورهم بذلك فلهم منا كل الشكر. (أصدقائي)

إلى هذه الصرح العلمي الفتي والجبار جامعة بوليتكنك فلسطين.

كلمة شكر

لابد لنا ونحن نخطو خطواتنا الأخيرة في الحياة الجامعية من وقفة نعود إلى أعوام قضيناها في رحاب الجامعة مع أساتذتنا الكرام الذين قدموا لنا الكثير باذلين بذلك جهودا كبيرة في بناء جيل الغد لتبعث الأمة من جديد ...
وقبل أن نمضي تقدم أسمى آيات الشكر والامتنان والتقدير والمحبة إلى الذين حملوا أقدس رسالة في الحياة ...
إلى الذين مهدوا لنا طريق العلم والمعرفة ...
إلى جميع أساتذتنا الأفاضل.......

"كن عالما .. فإن لم تستطع فكن متعلما ، فإن لم تستطع فأحب العلماء ،فإن لم تستطع فلا تبغضهم"
وأخص بالتقدير والشكر:الاستاذ أيمن وزوز
الذي نقول له بشراك قول رسول الله صلى الله عليه وسلم:
"إن الحوت في البحر ، والطير في السماء ، ليصلون على معلم الناس الخير"

كما أنني أتوجه بخاص الشكر إلى من علمنا التفاؤل والمضي إلى الأمام, إلى من رعانا وحافظ علينا, إلى من وقف إلى جانبنا عندما ضللنا الطريق ، الدكتور مراد ابو صبيح .

Abstract:

Many people like students and lecturers need to show their data, presentations and lectures using projectors. However, when they do, they are compelled to bring their laptops to present their work.

Our project goal is to make the presentations and showing presentations easier; by sending the data from smart phone directly to the data show and to TVs using wireless techniques.

This project is based on a software that includes a smart phones' application that connects the smart phone with the projector by a mediator device. The TV transmitter that represent the hardware design will broadcast the data to the TVs screens using a VHF transmitter.

الملخص

المشروع عبارة عن محطه بث ارضي صغيرة ذات نطاق ارسال صغير حيث تم الاستفادة من هذا الجهاز (جهاز البث) في عمليه الربط بين أجهزة الهواتف الذكية مع أجهزة التلفاز وأجهزة العرض.

حيث أن كثير من الناس وخصوصا الطلاب والأساتذة والأشخاص الذين يقومون بعمل عرض للمعلومات أو المحاضرات باستخدام عارض البيانات، ولكنهم مضطرون دائما لإحضار حواسيبهم الشخصية لذلك الغرض، حيث انه من الأفضل استخدام الأجهزة الذكية لعرض المعلومات لما في ذلك من سهوله للمستخدم.

هدف المشروع هو تسهيل عرض البيانات من خلال استخدام الهاتف الذكي بدلا من الحاسوب لعرض البيانات عن طريق ربط الهاتف بعارض البيانات مباشرة، وكذلك بث البيانات الى شاشات التلفاز.

المشروع يتمثل أولا في تطبيق يعمل على أنظمة تشغيل الهواتف الذكية سيقوم بربط الهاتف بجهاز وسيط ومن ثم نقل المعلومات الى عارض البيانات .

وثانيا بجهاز بث تلفازي يقوم بإرسال المعلومات الى أجهزة التلفاز في نطاق قاعة العرض.

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ABBREVIATIONS	STAND FOR
Wi Fi	Wireless fidelity
RF	Radio frequency
AF	Audio frequency
TV	Television
VHF	Very high frequency
UHF	Ultra high frequency
HF	High frequency
VGA	Video graphics array
LCD	Liquid crystal display
OS	Operating system
SDK	Software developer kit
VPN	Virtual private network
WPA	Wi fi protected access

CHAPTER 1: INTRODUCTION

1.1 OVERVIEW

A brief description for our project will be shown, in this chapter. Starting with the objectives and the target goals by this project. Then, looking on hardware and software requirements, and challenges that we will face. At the end, we will show the approach and scenario of the project.

1.2 PROJECT OBJECTIVES

Our main goal is to make the presentation and showing data more easy, in an efforts to overcome the time wasting and put some kind of technological upgrades into lecture room, and to be more specified the presentation and showing data in general will become more:

- Mobility: the user will be able to move with his mobile through the presentation without disconnection with data show.
- Flexibility: since no cables and heavy hardware's are used to show data.
- Easiness: just connect the mobile to the network that includes a mediator device, which is sensing for requests all times.
- Faster: Especially if there multiple –users want to present their data simultaneously by connect and disconnect different data source or laptops.

1.3 MOTIVATION

Projector (data show) is a very important device that are used by many people like students and lecturers, but they still need to bring their laptops to make their presentations. The idea of our project came from using smart phone's instead, since most of them have smart handheld devices.

1.4 REQUIREMENT'S

This project needs both hardware and software requirements. We need tablet, android application, electric components for VHF, FM transmitter and cables.

1.4.1 Hardware requirements:

- Tablet with android platform.
- VGA , video cables and converters cables
- Electric components for building a VHF, FM transmitters.
- Smartphone with android platform.
- Projector (data show).
- LCD TV.
- Sound system.

1.4.2 Software requirements:

Programming an android application that will be setup on both smart phone and tablet.

1.5 CHALLENGES

There is some challenges that we must put in mind in an efforts to make the project more efficient:

- Frequency calibration in VHF, FM transmitters to have an accurate system.
- Transmit a high-resolution graphics, noiseless sound (as much as we can) will be a very important matter.
- High bandwidth required especially in a high dense number of wifi users.
- Power consumption in smart phone.
- Hardware and software compatibility
- Learning android programming language.

1.6 APPROACH

This project will use a tablet to receive data from the smart phone, both are operating on android platform, the video signal which from tablet video- out will divide through two paths one will connect directly to the projector, the other path will source the VHF transmitter video-input that will send the images(video) to the LCD TV's.

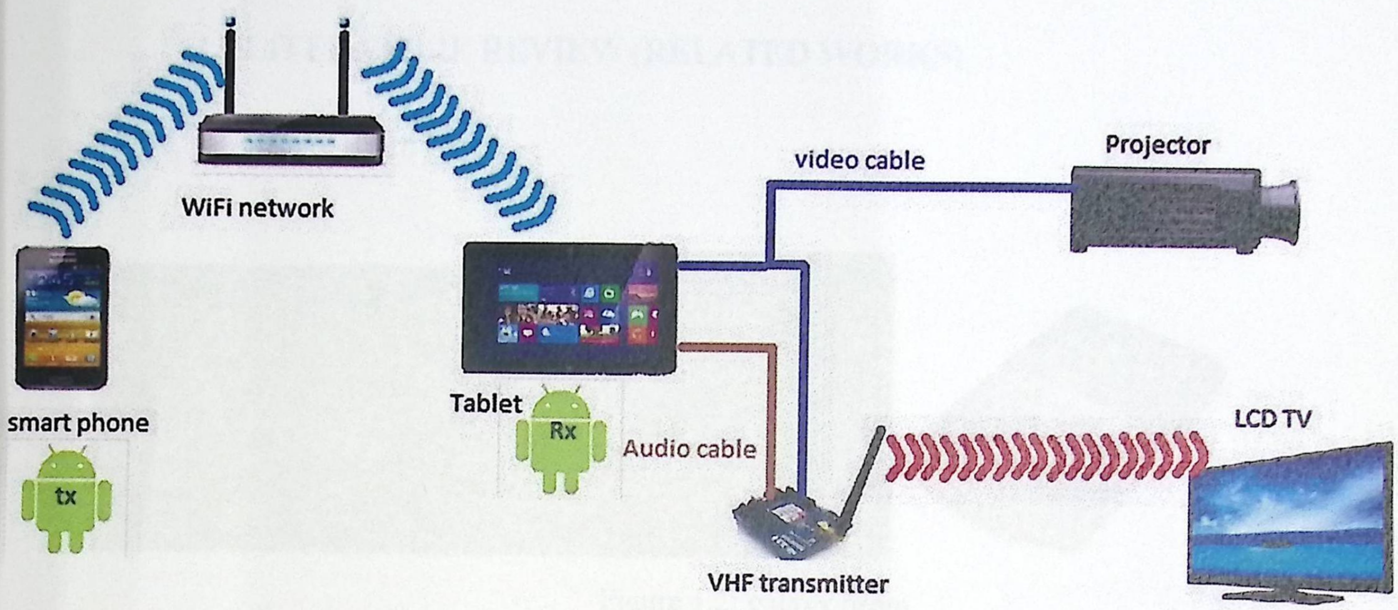

Figure 1.1 :- General system block digram

Step by step description

- An android application will be installed on smart phone as transmitter of screen data, the application will also installed on tablet as a receiver of smart phone screen data.
- The building network will used to connect smart phone with the tablet via (Wi-Fi) network.
- Video signal will be taken from video-out port of the tablet.
- Video cable will be adapted to VGA cable by using a converter circuit and cable, then sourcing the projector.
- The same video signal that comes out of tablet will be connected to the input port of the VHF transmitter.
- The video signal now on the projector and on the LCD TV.
- The audio signal from tablet will be connected to the audio-input of VHF transmitter; the sound will be supported in the receiver side (TV).

1.7 LITERATURE REVIEW (RELATED WORKS)

1 Galaxy Beam [1]

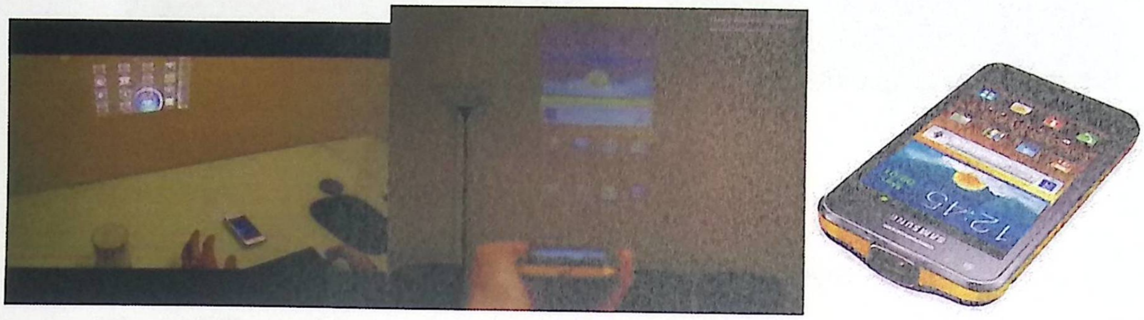

Figure 1.2: galaxy beam

A smart phone from Samsung Company, it is has a build-in projector. Although it abridges the whole system into one-piece small smart phone but:

Disadvantages

- It work with a short distance does not extend a few feet's.

- You need one for each lecturer, so you are wasting your own resources (the building old projectors), and that does not solve our problem.

** Our project most important advantage is to utilize the building old equipment's (projectors) and its networks.

2 Wireless Projectors [2]

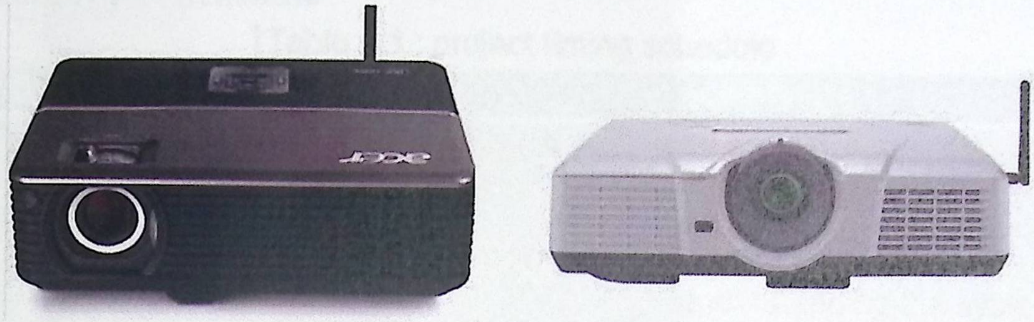

Figure 1.3: Wireless projector

There different kinds of projectors that work on wireless technology .It is perfect solution when you are want to dispose cables.

Disadvantages:

- Wasting source (building old projectors) will be not useful any more.

3 Handheld projector [3]

A Handheld projector (also known as a pocket projector, mobile projector, Pico projector or mini beamer) is technology that applies the use of an image projector in a handheld device. It is a response to the emergence/development of compact portable devices such as mobile, personal digital assistants, and digital cameras, which have sufficient storage capacity to handle presentation materials but little space to accommodate an attached display screen. Handheld projectors involve miniaturized hardware and software that can project digital images onto any nearby viewing surface.

4 screen mirroring applications:

Screenshare: an android application that allow to share your smart phone screen with other smart devices like tablets and smart TVs.

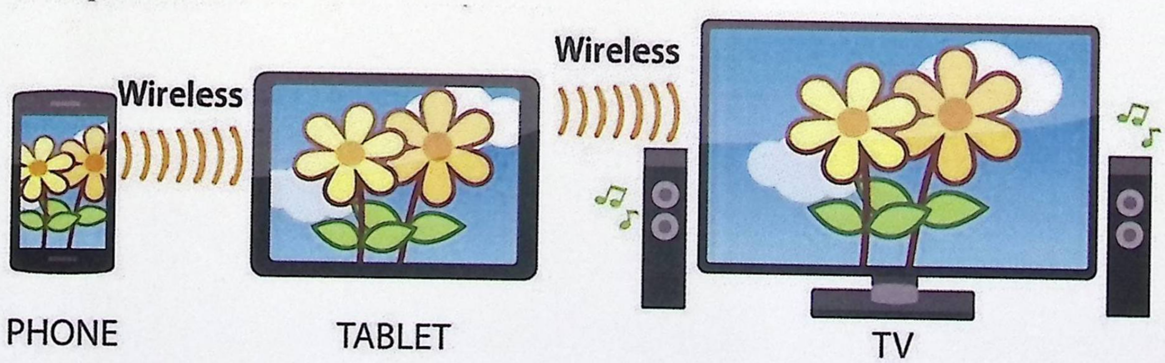

Figure 1.4 :- phone to tablet to TV

1.8 Project Schedule

Table 1.1 : project timing schedule

activity	Time	activity
A	1st SEP 2014 - 20th SEP 2014	Ideas surveying , searching reference , set a group and supervisor , and preparing proposal.
B	21th SEP 2014 - 25th OCT 2014	Draw the general block diagram and understanding the system's components and technologies.
C	15th OCT 2014 -30th OCT 2014	Collecting theory information.
D	1st NOV 2014 - 30th NOV 2014	Understanding system block diagram (Hardware and Software Design).
E	23th NOV 2014 - 20th DEC 2014	Analyze system design and interfacing between components and devices.
F	1st FEB 2015 - 26th FEB 2015	Learning software language for android . By all components and device .
G	23th FEB 2015 - 15th APR 2015	Programming hardware , setup the whole system and testing it.
H	16th APR 2015 - 5th MAY 2015	Finishing documentation .
I	6th MAY 2015 - 14th MAY 2015	Deliver documentation for supervisor. Documentation for the electrical department .

Summary for project plan:

Table 1.2: summery of project plan for the first semester

Week Activity	1	2	3	4	5	6	7	8	9	10	11	12	13	14
A		###	###	###										
B			###	###	###	###								
C				###	###	###	###							
D						###	###	###	###	###				
E									###	###	###	###	###	###

Table 1.3: summery of project plan for the second semester

Week Activity	1	2	3	4	5	6	7	8	9	10	11	12	13	14
F	###	###	###	###	###									
G					###	###	###	###						
H							###	###	###	###	###			
I								###	###	###	###	###	###	###

1.9 budget

Table 1.4 : Budget

Price	Quantity	Equipment
100$	1	Tablet
200$		Electric components for building a VHF, FM transmitters
100$		Video cables and converters cables
300 $ (available)		Data show
500$ (available)		Personal phone

Chapter 2: Theoretical background (Theory)

2.1 Wi-Fi Technology

2.1.1 Advantage and limitations

2.1.2 Range

2.1.3 Interference

2.2 Android (operating system)

2.2.1 Developments

2.3 Very high frequency

2.3.1Propagation characteristics

2.3.2 Universal use

2.4 VGA connector

2.5 Tablet computer

2.5.1 Feature

2.5.2 Operating system

2.6 Projector

2.1 Wi-Fi Technology

Wi-Fi is the popular term for a high-frequency wireless local area network (WLAN) technology and standard that has gained acceptance in many companies as an alternative to a wired LAN.

Wi-Fi is a term for certain types of wireless local area networks (WLAN) that use specifications in the 802.11 family. Products that pass the Wi-Fi Alliance tests for interoperability, security and application-specific protocols are labeled "Wi-Fi CERTIFIED," a registered trademark of the Alliance.

Originally, Wi-Fi certification was applicable only to products using the 802.11b standard. Today, Wi-Fi can apply to products that use any 802.11 standard. The 802.11 specifications are part of an evolving set of wireless network standards known as the 802.11 family. The particular specification under which a Wi-Fi network operates is called the "flavor" of the network.

Wi-Fi is widely used in businesses, agencies, schools, and homes as an alternative to a wired LAN. Many airports, hotels, and fast-food facilities offer public access to Wi-Fi networks. These locations are known as hot spots. Many charge a daily or hourly rate for access, but some are free. An interconnected area of hot spots and network access points is known as ahot zone.

Unless adequately protected, a Wi-Fi network can be susceptible to access by unauthorized users who use the access as a free Internet connection. The activity of locating and exploiting security-exposed wireless LANs is called war driving. An identifying iconography, called war chalking, has evolved. Any entity that has a wireless LAN should use security safeguards such as the Wired Equivalent Privacy (WEP) encryption standard, the more recent Wi-Fi Protected Access (WPA), Internet Protocol Security (IPsec), or a virtual private network (VPN).

The term Wi-Fi was created the Wi-Fi Alliance as a play on "Hi-Fi," an abbreviation for "high fidelity," which referred to high-quality audio reproduction. Similarly, Wi-Fi is often thought to be short for wireless fidelity. However, according to the Wi-Fi Alliance, "Wi-Fi" is not an abbreviation. The confusion may stem from the fact that the Alliance briefly used "The standard for wireless fidelity" as a slogan for Wi-Fi.

2.1.1: Advantages and limitations [4]

2.1.1.1 Advantages

Wi-Fi allows cheaper deployment of local area networks (LANs). In addition, spaces where cables cannot be run, such as outdoor areas and historical buildings, can host wireless LANs.

Manufacturers are building wireless network adapters into most laptops. The price of chipsets for Wi-Fi continues to drop, making it an economical networking option included in even more devices.

Different competitive brands of access points and client network-interfaces can inter-operate at a basic level of service. Products designated as "Wi-Fi Certified" by the Wi-Fi Alliance are backwards compatible. Unlike mobile phones, any standard Wi-Fi device will work anywhere in the world.

Wi-Fi Protected Access encryption (WPA2) is considered secure, provided a strong passphrase is used. New protocols for quality-of-service (WMM) make Wi-Fi more suitable for latency-sensitive applications (such as voice and video). Power saving mechanisms (WMM Power Save) extend battery life.

2.1.1.2 Limitations

Spectrum assignments and operational limitations are not consistent worldwide: Australia and Europe allow for an additional two channels beyond those permitted in the US for the 2.4 GHz band (1–13 vs. 1–11), while Japan has one more on top of that (1–14).

A Wi-Fi signal occupies five channels in the 2.4 GHz band. Any two channel numbers that differ by five or more, such as two and seven, do not overlap. The oft-repeated adage that channels 1, 6, and 11 are the *only* non-overlapping channels is, therefore, not accurate. Channels 1, 6, and 11 are the only *group of three* non-overlapping channels in North America and the United Kingdom. In Europe and Japan using Channels 1, 5, 9, and 13 for 802.11g and 802.11n is recommended.

Equivalent isotropic ally radiated power (EIRP) in the EU is limited to 20 dBm (100 mW).

The current 'fastest' norm, 802.11n, uses double the radio spectrum/bandwidth (40 MHz) compared to 802.11a or 802.11g (20 MHz). This means there can be only one 802.11n network on the 2.4 GHz band at a given location, without interference to/from other WLAN traffic. 802.11n can also be set to use 20 MHz bandwidth only to prevent interference in dense community.

Many newer consumer devices support the latest 802.11ac standard, which uses the 5 GHz band and is capable of multi-station WLAN throughput of at least 1 gigabit per second. According to a study, devices with the 802.11ac specification are expected to be common by 2015 with an estimated one billion spread around the world.

2.1.2: Range

Table2.1:-Wi-Fi standard [5]

Wi-Fi Standard	Frequency	Wireless Speed (Max)	Wireless Distance (Max)
802.11a (1999)	5.0 GHz	54 Mbps	390 ft
802.11b (1999)	2.4 GHz	11 Mbps	460 ft
802.11g (2003)	2.4 GHz	54 Mbps	460 ft
802.11n (2009)	2.4/5.0 GHz	300 Mbps - 900 Mbps (Combined)	820 ft (2.4GHz) / 460 ft (5.0GHz)
802.11ac (Draft - 2012)	5.0 GHz	433Mbps - 1.3Gbps	Up to 820 ft (Amplified)

Wi-Fi networks have limited range. A typical wireless access point using 802.11b or 802.11g with a stock antenna might have a range of 35 m (115 ft.) indoors and 100 m (330 ft.) outdoors. IEEE 802.11n, however, can more than double the range.[42] Range also varies with frequency band. Wi-Fi in the 2.4 GHz frequency block has slightly better range than Wi-Fi in the 5 GHz frequency block used by 802.11a (and optionally by 802.11n). On wireless routers with detachable antennas, it is possible to improve range by fitting upgraded antennas, which have higher gain in particular, directions. Outdoor ranges can be improved to many kilometers with high gain directional antennas at the router and remote device(s). In general, the maximum amount of power that a Wi-Fi device can transmit is limited by local regulations.

Due to reach requirements for wireless LAN applications, Wi-Fi has high power consumption compared to some other standards. Technologies such as Bluetooth (designed to support wireless PAN applications) provide a much shorter propagation range between 1 and 100m and so in general have a lower power consumption. Other low-power technologies such as ZigBee have long range, but much lower data rate. The high power consumption of Wi-Fi makes battery life in mobile devices a concern.

Due to the complex nature of radio propagation at typical Wi-Fi frequencies, particularly the effects of signal reflection off trees and buildings, algorithms can only approximately predict Wi-Fi signal strength for any given area in relation to a transmitter. This effect does not apply equally to long-range Wi-Fi, since longer links typically operate from towers that transmit above the surrounding foliage.

2.1.3: Interference

Wi-Fi connections can be disrupted or the internet speed lowered by having other devices in the same area. Many 2.4 GHz 802.11b and 802.11g access-points default to the same channel on initial startup, contributing to congestion on certain channels. Wi-Fi pollution, or an excessive number of access points in the area, especially on the neighboring channel, can prevent access and interfere with other devices' use of other access points, caused by overlapping channels in the 802.11g/b spectrum, as well as with decreased signal (SNR) between access points. This can become a problem in high-density areas, such as large apartment complexes or office buildings with many Wi-Fi access points.

Additionally, other devices use the 2.4 GHz band: microwave ovens, ISM band devices, security cameras, ZigBee devices, Bluetooth devices, video senders, cordless phones , all of which can cause significant additional interference.

2.2 Android (operating system) [6]

Android is a mobile operating system (OS) based on the Linux kernel and currently developed by Google. With an interface based on direct manipulation, Android is designed primarily for touchscreen mobile devices such as smartphones and tablet computers, with specialized user interfaces for televisions (Android TV), cars (Android Auto), and wrist watches (Android Wear). The OS uses touch inputs that loosely correspond to real-world actions, as swiping, tapping, pinching, and reverse pinching to manipulate on-screen objects, and a virtual keyboard. Despite being primarily designed for touchscreen input, it also has been used in game consoles, digital cameras, regular PCs and other electronics.

Unlike the iPhone OS, Android is open source, meaning developers can modify and customize the OS for each phone. Therefore, different Android-based phones may have different graphical user interfaces GUIs even though they use the same OS.

Android phones typically come with several built-in applications and also support third-party programs. Developers can create programs for Android using the free Android SDK (Software Developer Kit). Android programs are written in Java and run through Google's "Davlik" virtual machine, which is optimized for mobile devices. Users can download Android "apps" from the online Android Market.

Since several manufacturers make Android-based phones, it is not always easy to tell if a phone is running the Android operating system. If you are unsure what operating system a phone uses, you can often find the system information by selecting "About" in the Settings menu. The name "Android" comes from the term android, which refers to a robot designed to look and act like a human

Android is popular with technology companies which require a ready-made, low-cost and customizable operating system for high-tech devices. Android's open nature has encouraged a large community of developers and enthusiasts to use the open-source code as a foundation for community-driven projects, which add new features for advanced users or bring Android to devices, which were officially, released running other operating systems. The operating system's success has made it a target for patent litigation as part of the so-called "smartphone wars" between technology companies

2.2.1: Development

Figure 2.1 Android Development

Google develops android in private until the latest changes and updates are ready to be released, at which point the source code is made available publicly. This source code will only run without modification on select devices, usually the Nexus series of devices. The source code is, in turn, adapted by OEMs to run on their hardware. Android's source code does not contain the often-proprietary device drivers that are needed for certain hardware components.

2.3 Very high frequency

Table 2.2: VHF rang

Very high frequency	
Frequency range	30 to 300 MHz
Wavelength range	10 to 1 m

Very high frequency (VHF) is the ITU designation for the range of radio frequency electromagnetic waves from 30 MHz to300 MHz, with corresponding wavelengths of ten to one meters. Frequencies immediately below VHF are denoted high frequency (HF), and the next higher frequencies are known as ultra high frequency (UHF).

Common uses for VHF are FM radio broadcasting, television broadcasting, land mobile stations (emergency, business, private use and military), long range data communication up to several tens of kilometer's with radio modems, amateur radio, and marine communications. Air traffic control communications and air navigation systems (e.g. VOR, DME & ILS) work at distances of 100 kilometer's or more to aircraft at cruising altitude.

VHF was previously used for analog television stations in the US, and continues to be used, but not as much due to signal problems, for digital television

2.3.1: Propagation characteristics

VHF propagation characteristics are suited for short-distance terrestrial communication, with a range generally somewhat farther than line from the transmitter. Unlike high frequencies (HF), the ionosphere does not usually reflect VHF waves (called sky wave propagation) so transmissions are restricted to the local radio horizon less than 100 miles. VHF is also less affected by atmospheric noise and interference from electrical equipment than lower frequencies. While land features such as hills and mountains block it, it is less affected by buildings and can be received indoors, although multipath television reception due to reflection from buildings can be a problem in urban areas.

2.3.2: Universal use

Certain subparts of the VHF band have the same use around the world. Some national uses are detailed below.

- 108–118 MHz: Air navigation beacons VOR and Instrument Landing System localizer.
- 118–137 MHz: Air band for air traffic control, AM, 121.5 MHz is emergency frequency
- 144–146 MHz: Amateur radio. In some countries 144–148 MHz

2.4 VGA connector

A Video Graphics Array (VGA) connector is a three-row 15-pin DE-15 connector. The 15-pin VGA connector is found on many video cards, computer monitors, and high definition television sets. On laptop computers or other small devices, a mini-VGA port is sometimes used in place of the full-sized VGA connector.

VGA connectors and cables carry analog component RGBHV (red, green, blue, horizontal sync, vertical sync) video signals, and VESA Display Data Channel (VESA DDC) data..

The VGA interface is not engineered to be hot pluggable (so that the user can connect or disconnect the output device while the host is running), although in practice this can be done and usually does not cause damage to the hardware or other problems. However, nothing in the design ensures that the ground pins make a connection first and break last, so hot plugging may introduce surges in signal lines, which may or may not be adequately protected against. In addition, depending on the hardware and software, detecting a monitor being connected might not work properly in all cases.

2.5 Tablet computer

A tablet computer, or simply tablet, is a mobile computer with display, circuitry and battery in a single unit. Tablets come equipped with sensors, including cameras, a microphone, an accelerometer and a touchscreen, with finger or stylus gestures substituting for the use of computer mouse and keyboard. Tablets may include physical buttons (for example: to control basic features such as speaker volume and power) and ports (for network communications and to charge the battery). They usually feature on-screen, pop-up virtual keyboards for typing. Tablets are typically larger than smart phones or personal digital assistants at 7 inches (18 cm) or larger, measured diagonally. One can classify tablets into several categories according to the presence and physical appearance of keyboards. Slates and booklets do not have a physical keyboard and typically feature text input performed through the use of a virtual keyboard projected on a touchscreen-enabled display. Hybrids and convertibles do have physical keyboards, although these devices typically also make virtual keyboards available.

2.5.1 Features

Hardware

- High-definition, anti-glare display
- Wireless local area and internet connectivity (usually with Wi-Fi standard and optional mobile broadband)
- Front- and/or back- facing camera(s) for photographs and video
- Lower weight and longer battery life than a comparably-sized laptop
- Bluetooth for connecting peripherals and communicating with local devices
- Early devices had IR support and could work as a TV remote controller.
- Docking station: Keyboard and USB port(s)

Special hardware: The tablets can be equipped with special hardware to provide functionality, such as camera, GPS and local data storage.

Software

- Mobile web browser
- Reader for digital books, periodicals and other content
- Downloadable apps such as games, education and utilities

- Portable media player function including video playback
- Email and social media
- Mobile phone functions (messaging, speakerphone, address book)
- Video-teleconferencing

Data storage

- On-board flash memory
- Ports for removable storage
- Various cloud storage services for backup and syncing data across devices
- Local storage on a LAN

Additional inputs

Besides a touchscreen and keyboard, some tablets can also use these input methods:

- Proximity sensor to detect if the device is close to something, in particular, to your ear, and can block unintended touches
- Accelerometer: Detects the physical movement and orientation of the tablet. This allows the touchscreen display to shift to either portrait or landscape mode. In addition, tilting the tablet may be used as an input (for instance to steer in a driving game)
- Ambient light and proximity sensors, which help distinguish between intentional and unintentional touches
- Speech recognition
- Gesture recognition
- Character recognition to allow you to write text on the tablet that can be stored as any other text in the intended storage, instead of using a keyboard.
- Near field, communication allows communication with other compatible devices including ISO/IEC 14443 RFID tags.

2.5.2 Operating system

Tablets, like conventional PCs, run multiple operating systems (though dual booting on tablets is relatively rare). These operating systems come in two classes, desktop-based and mobile-based ("phone-like") OS. Desktop-based tablets have been are thicker and heavier, require more storage, more cooling and give less battery life, but can run processor-intensive applications such as Adobe Photoshop in addition to mobile apps and have more ports while mobile-based tablets are the reverse, only run mobile apps. Those that focus more so on mobile apps use battery life conservatively because the processor is significantly smaller. This allows the battery to last much longer than the common laptop. Android is a Linux-based operating system that Google offers as open source under the Apache license. It is designed primarily for mobile devices such as smartphones and tablet computers. Android supports low-cost ARM systems. Many such systems were announced in 2010 .However; much of Android's tablet initiative came from manufacturers, while Google primarily focused on smartphones and restricted the App Market from non-phone devices.

2.6 Projectors

Figure 2.2:- Projector

A projector or image projector is an optical device that projects an image (or moving images) onto a surface, commonly a projection screen.

Most projectors create an image by shining a light through a small transparent lens, but some newer types of projectors can project the image directly, by using lasers. A virtual retinal display, or retinal projector, is a projector that projects an image directly on the retina instead of using an external projection screen.

The most common type of projector used today is called a video projector. Video projectors are digital replacements for earlier types of projectors such as slide projectors and overhead projectors. These earlier types of projectors were mostly replaced with digital video projectors throughout the 1990s and early 2000s (decade), but old analog projectors are still used at some places. The newest types of projectors are handheld projectors that use lasers or LEDs to project images. Their projections are hard to see if there is too much ambient light.

Movie theaters use a type of projector called a movie projector. Another type of projector is the enlarger, a device used to produce photographic prints from negatives.

Chapter 3: Conceptual design

3.1 System function and block diagram.

3.2 Software design

- 3.2.1 Android application interface
- 3.2.2 Android application as transmitter
- 3.2.3 Android application as receiver
- 3.2.4 Similar android application

3.3 Hardware design

- 3.3.1 TV (VHF) transmitter
- 3.3.2 VHF transmitter block diagram
- 3.3.3 VHF transmitter circuit

Chapter 3: Conceptual design

3.1 System function and block diagram.

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- 3.3.1 TV (VHF) transmitter
- 3.3.2 VHF transmitter block diagram
- 3.3.3 VHF transmitter circuit

3.1 SYSTEM FUNCTION AND BLOCK DIAGRAM

The system is consist of several subsystems shown in figure 3.1 below:

Smart phone, tablet, Wi-Fi network, projector, TV transmitter and TV.

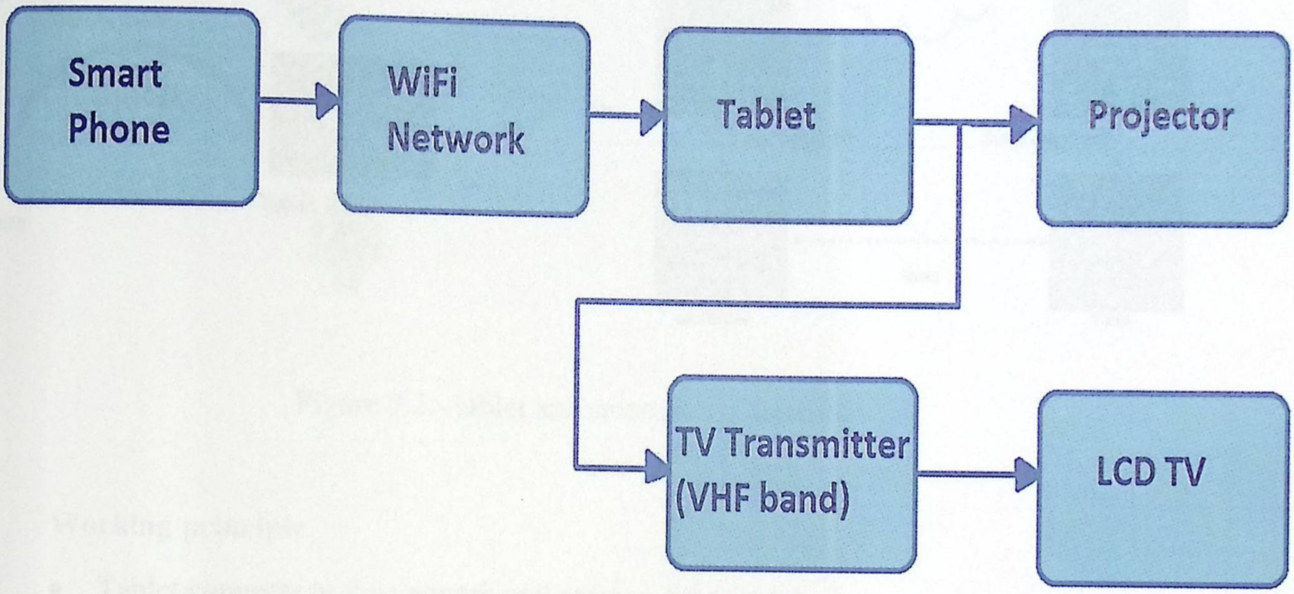


Figure 3.1 Main block diagram

The system design consist of software and hardware components, in a chapter the details of each one will be shown as block diagram, circuit and specifications.

3.2 SOFTWARE DESIGN

This system require a software application to connect the smart phone with tablet using Wi-Fi network and surely this application work on operating system that the smart phone and tablet based on.

In this system we decide to make an application that work on android operating system, the application will installed on smart phone as transmitter of data and installed in tablet as receiver.

3.2.1 Android application interface:

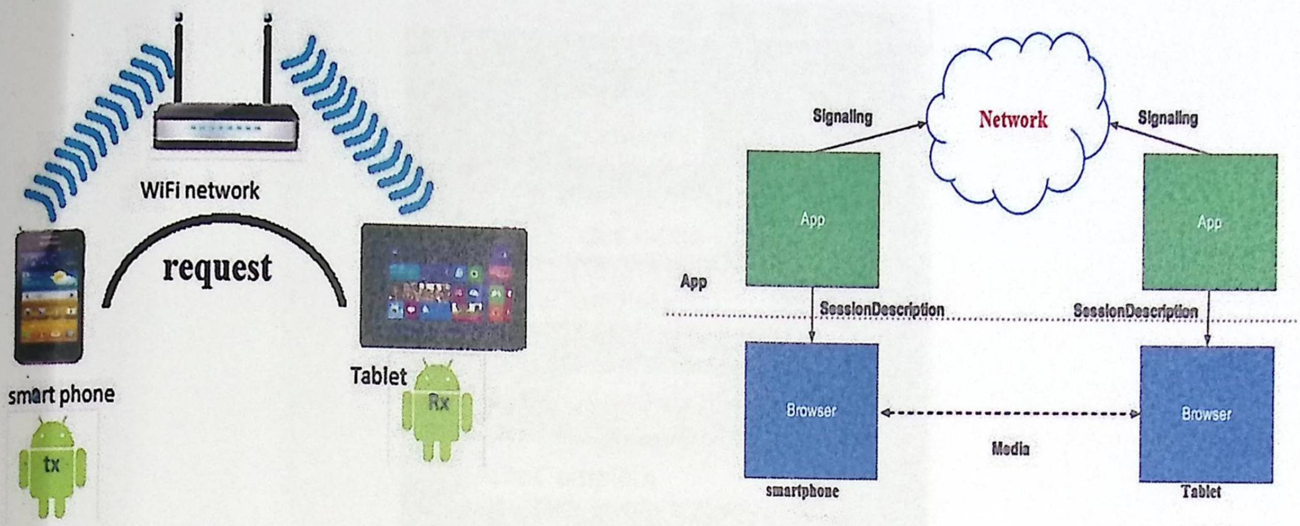


Figure 3.2:- tablet and smartphone network

Working principle

- Tablet connects to the network and sensing for request.
- Smart phone search and connecting to network, (Mobile sends a request for Tablet through the network and then connect with it).

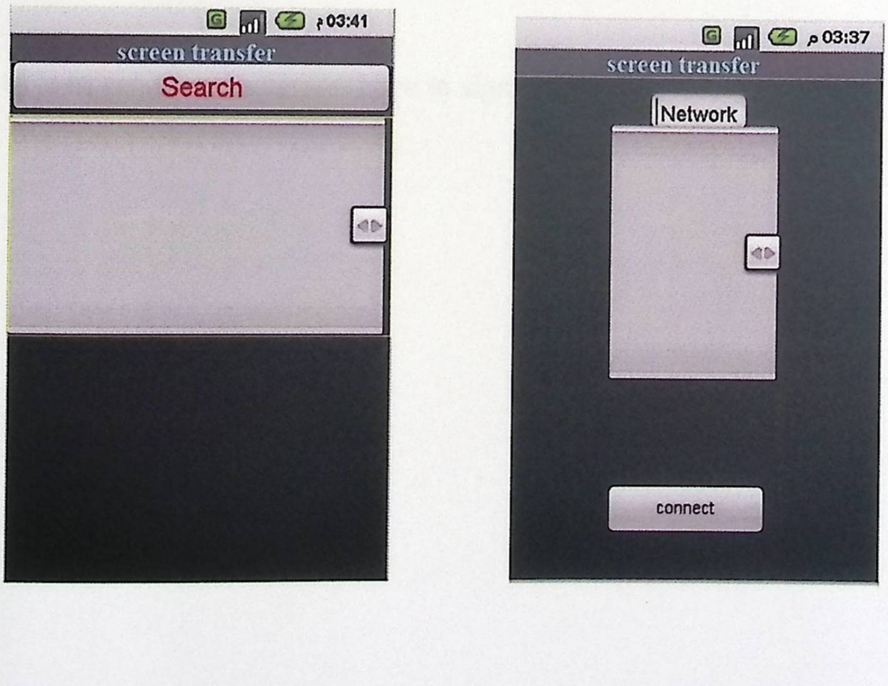


Figure 3.3:- search and connect the network

- Starting the android program in the smart phone, and start searching the networks, to choose the tablet network and connect with it.

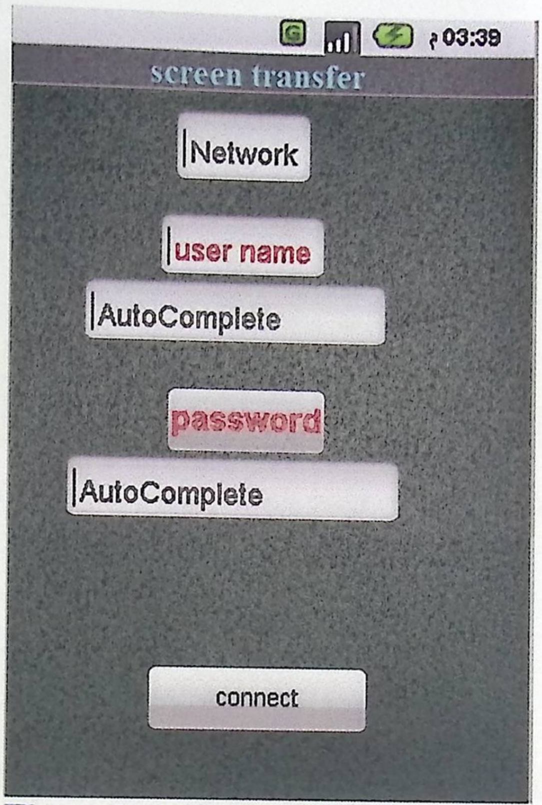


Figure 3.4 ;- Enter the password

- To be able to send your data you have to sign in by a correct password.

Android application design:

The application divided into for main modules as shown below:

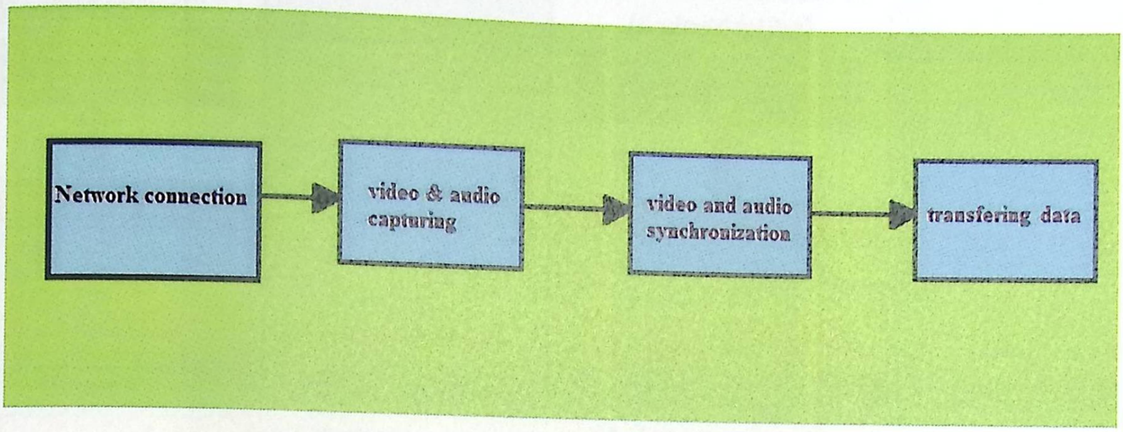


Figure 3.5:- main block diagram of application android

- screen capturing and screen sharing is by android.media.projection functionality .
- createVirtualDisplay() method allows our app to capture the contents of the main screen (the default display) into a Surface object, which our app can then send across the network. To begin screen capturing, your app must first request the user's permission by launching a screen capture dialog using an Intent obtained through the createScreenCaptureIntent()method.

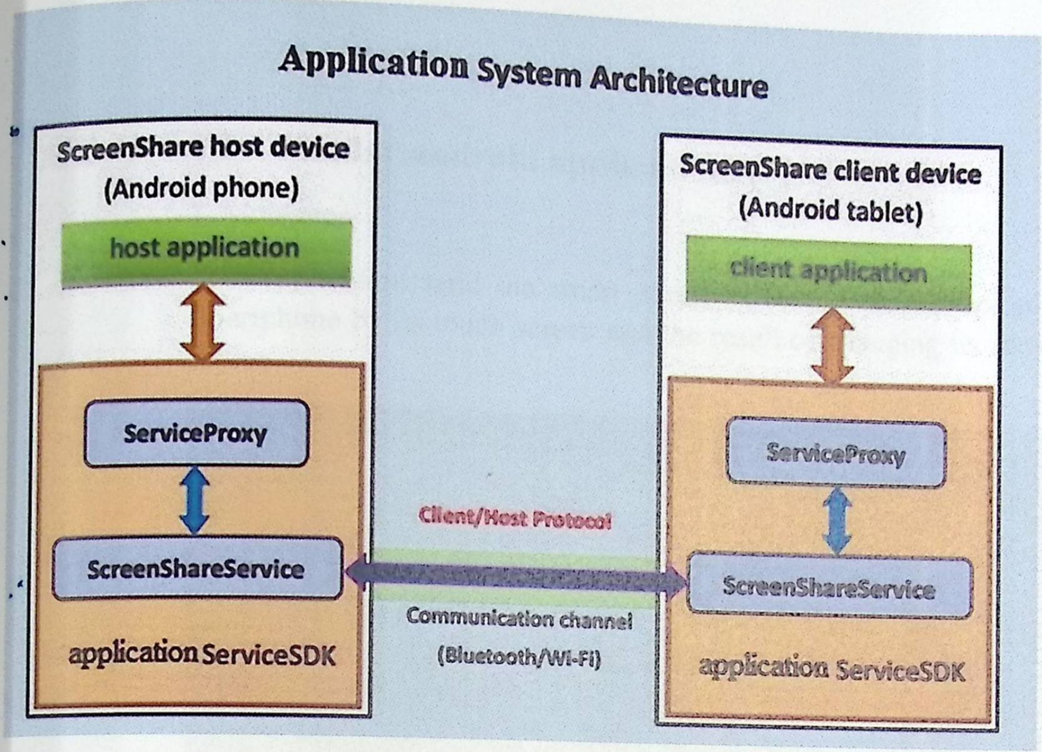


Figure 3.6:- Application system architecture

Description for main classes

a) Service Application

In the onCreate function of application class of our application, it needs to call the onCreate function of service Application class to initialize project Service.

b) Service Configuration.

Our applications need to call the set function of Service Configuration class to set the port number used by project application Service (TCP/UDP port).

Different applications cannot use the same port number. The port number must be assigning.

c) Our project Service Proxy (Service Proxy)

Service Proxy class provides external project Service function calls, including the enable/disable AppConnection, send Data, send File and other functions.

Our applications need to instantiate this class to call its functions transfer data.

d) Application Service Callback Listener

Application Service callback listener interface. Application Service Proxy will notify this interface for all data sent from application Service.

Our applications need to implement this interface to receive data sent from application Service.

3.2.4 Similar android application: [7]

1. Mobizene

This application send the smart phone screen to the laptop, so you can access your smartphone by its touch screen and the result of changing its screen is appear on laptop screen.

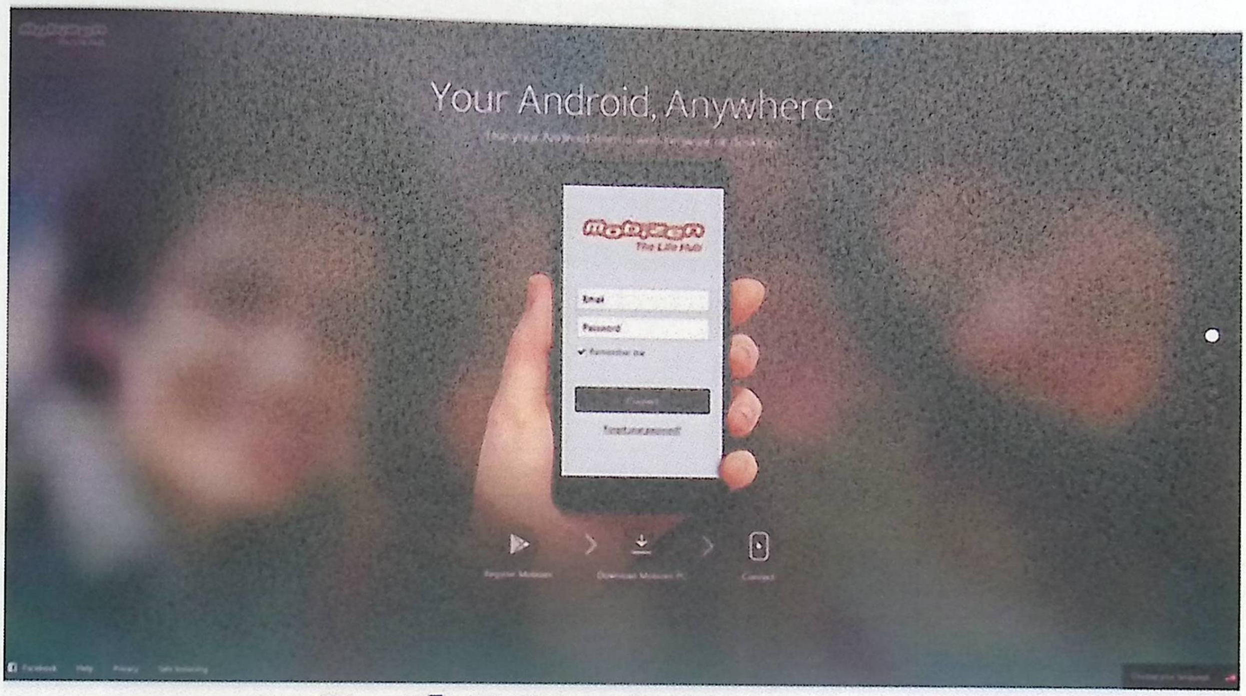


Figure 3.7 :- Mobizen application

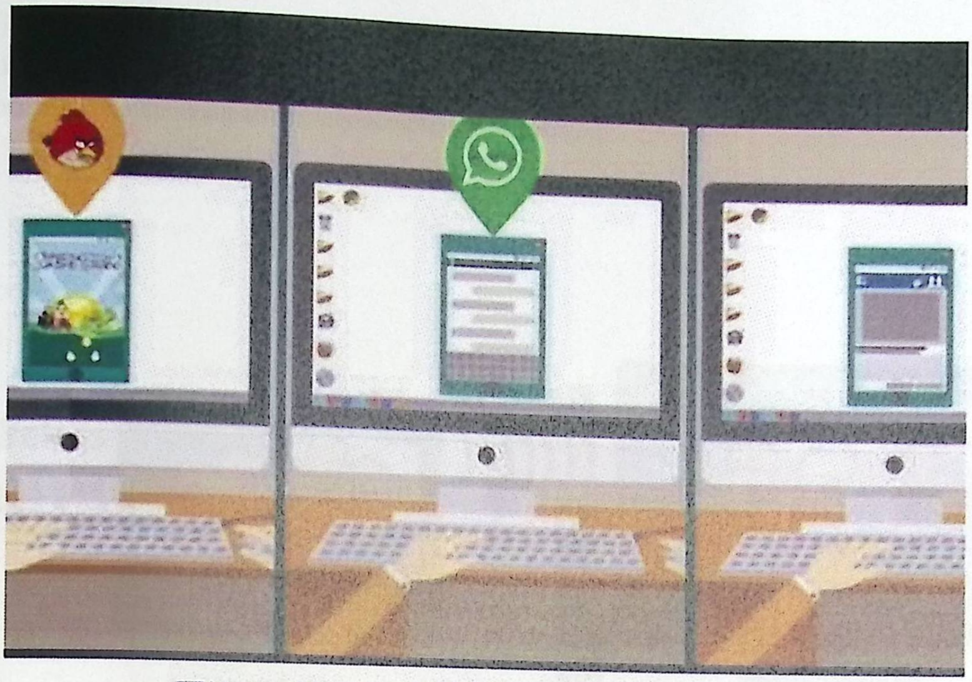


Figure3. 8 :- Mobizen in laptop

Description

- Mobizen allows you to use your mobile phone easily from your PC. You can connect to Mobizen via USB, Wi-Fi, 3G or LTE on PC, Mac, iPad or Tablet. Mobizen will connect to your mobile devices with various networks.
- Smartphone-mirroring
  Real time mirroring on your PC is supported. With Mobizen, you can seamlessly continue gameplay and use of all other Android apps at full functionality on your PC. Continue to use Kik Messenger, WhatsApp on your PC with Mobizen.
- SCREEN.RECORDING?
  You can easily take screen shots and record your mobile screen without rooting. This is the easiest way to record and share mobile gameplay.
- MOBILE.PRESENTATION
  Mobizen works as an effective presentation tool allowing you to mirror your mobile device to a large screen. Tools such as on-screen drawing can enhance the effectiveness of any presentation.
- SMARTPHONE.NOTIFICATION
  easily receive all smartphone notifications on your PC discreetly and choose which ones you would like to respond to at the click of your mouse.
- VIDEO.STREAMING
  Mobizen allows you to stream music and videos to your PC with ease. Transferring files is no longer necessary as you can easily stream mobile multimedia to a large screen to share with friends and colleagues.

- DRAG-AND-DROP.FIL. TRANSFER .Drag and Drop when you want to transfer photos and other media files to your PC from your mobile. You can also move contents from your PC to your mobile device with this easy-to-use function.

2. Screenshare:

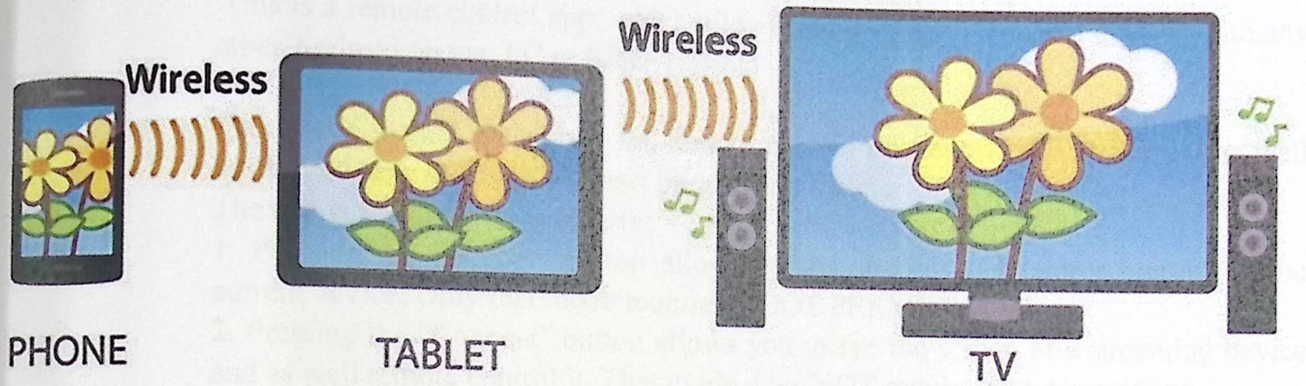


Figure 3.9 :- phone to tablet to TV

Description

ScreenShare uses ScreenShare technology to allow a smartphone and a tablet to share data and user interface. With this sharing, user can have better viewing experience and can access internet on tablet browser through the phone cellular network. ScreenShare includes ScreenShare browser, ScreenShare organizer and ScreenShare service that manages Bluetooth or Wi-Fi connection and data exchange between a phone and a tablet. ScreenSahre organizer can let you share and play your phone content (photos, videos, music, documents, etc.) to your tablet and export your phone contents to your tablet storage. ScreenShare organizer can also let you directly stream the music and videos stored on your phone to your tablet or TV (via HDMI cable).

Requirements

- a tablet running Android
- a smartphone running Android

Note:-This application is similar to our application in our project. But if we have to use it, some features will be added such as security (username, password) for connection, and application must working automatically all the time after turning on the device in the receiver side . Also programming additions to make the application linking the phone with the tablet by a Wi-Fi network instead of peer to peer technique for some kind of long range connections.

- Through our working to design and programming the software we face some problems that need high professional programing experiences, and to not start from zero we use a ready software application which is very useful and meets the required needs for our project named (remodroid).

Remodroid application :

- Description:

This is a remote control app, which allows you to control Android devices with any other Android phone, PC or Mac.

The app is mainly developed for remote control of Android TV sticks but as well works with a wide range of smart phones and tablets.
The app is separated in two parts:
1. Pressing the "Stream" button allows screen sharing and remote control of the current device. Only that mode requires ROOT PERMISSIONS
2. Pressing the "Connect" button allows you to see the screen of a streaming device and as well remote control it. That mode does NOT require root permissions.

The importance and objectives of the application.

- Introducing a presentation (the App supports multiple users connected to one device at the same time)

- Supporting friends and people in need f.E. by remote configuring an app or by showing what actions need to be proceed

- Showing videos or pics to friends without even downloading them.

Features:

- Screen sharing
- Remote control (Android device and PC)
- Multiple user support
- Connection Management
- Wi-Fi and 3G (Local Network and Internet)

- Main function of remodriod app:

1. Network connection – using Wi-Fi network to be connected with tablet, the application requests connection command.

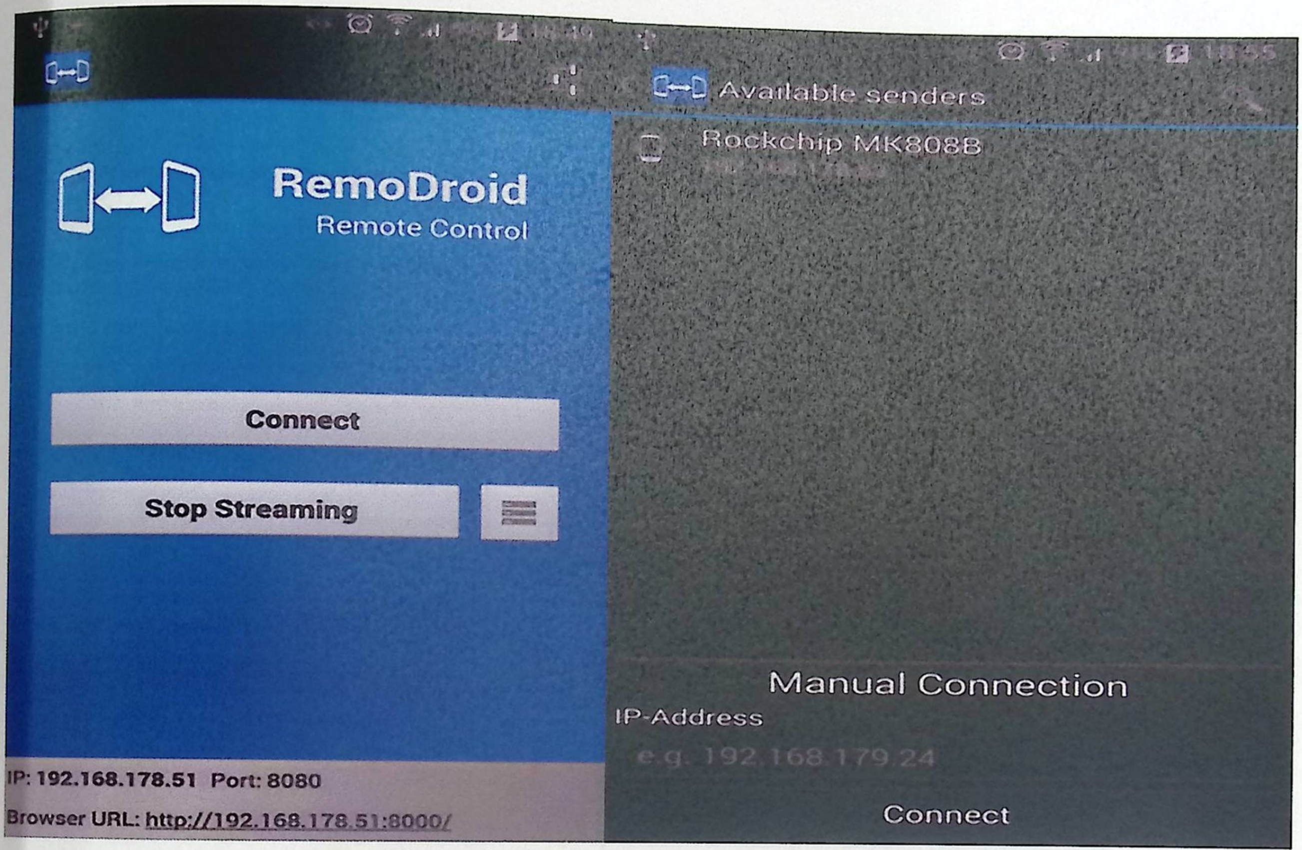


Figure 3.10 : Network connection

- After starting the android application in the smart phone and pressing (connect) the application will start searching the networks, to choose the tablet network and connect with it.

2 IP address :

The application detrmines the IP address to make a connection through it.

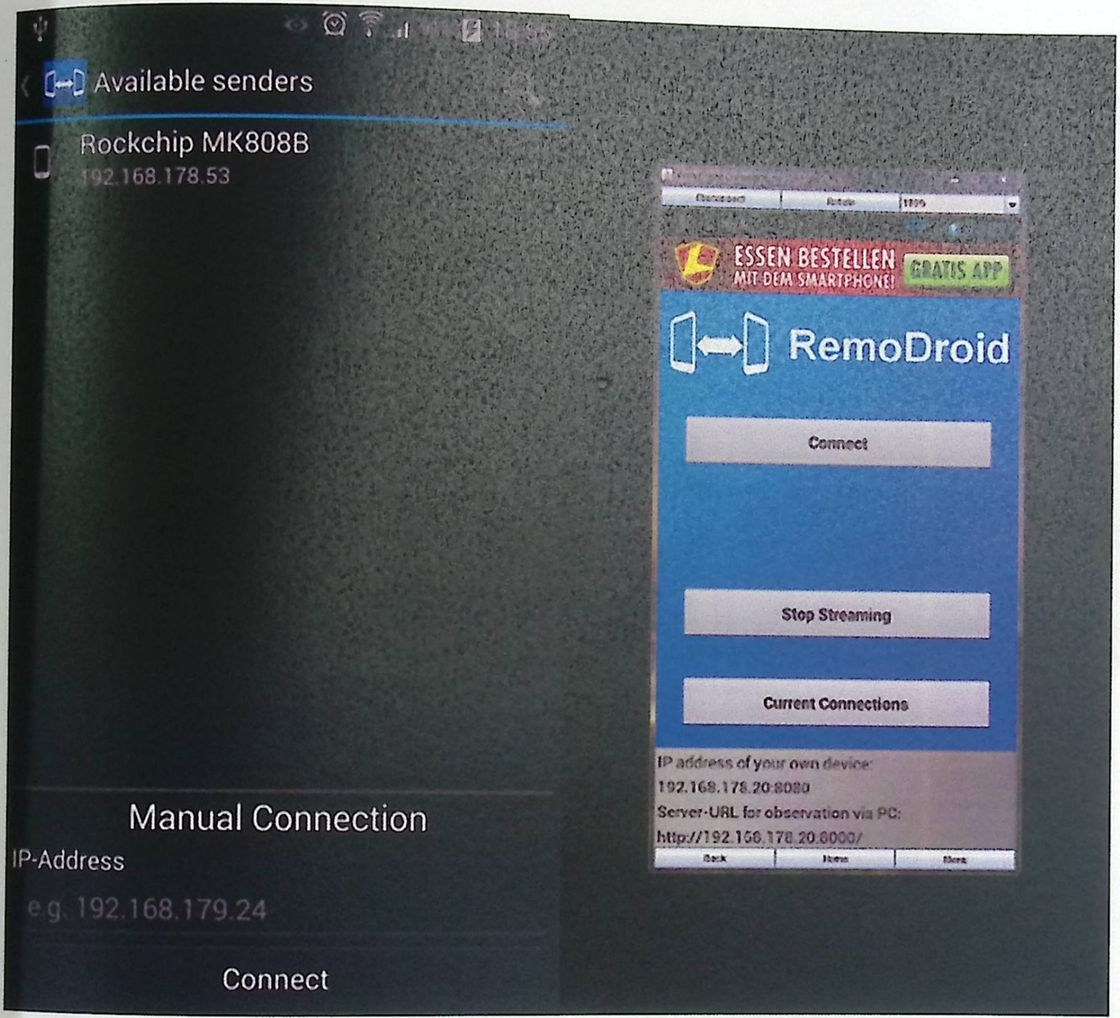


Figure 3.11 : IP determination

3 Video streaming.
After entering the IP in tablet, the smart phone will start video sending process by pressing (start streaming).

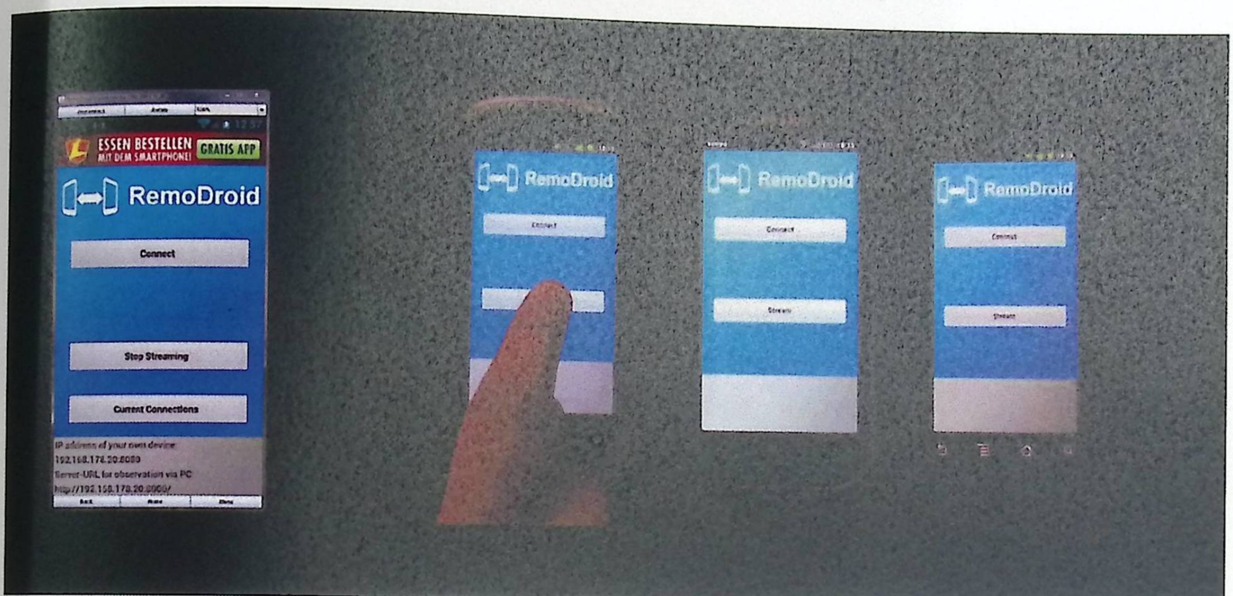


Figure 3.12 : Video streaming

3.3 HARDWARE DESIGN

This system which linking the smart phone with projector and TV's is consist of two main hardware's or devices. The first one is the tablet that will received the video signal ,other one is the TV transmitter (VHF Transmitter) that will send the video signal to the TV's.

3.3.1 TV Transmitter (VHF transmitter):

There are many types of transmitters depending on:

- The system standard.
- Output power.
- Back up facility, usually the Modulator, Multiplexer and Power Amplifier.
- Stereophonic (or dual sound) facility, for analog TV systems.
- Aural and visual power combining principal, for analog TV systems.
- Active circuit element in the final amplifier stage.

Input stage of a transmitter:

The video (VF) input is a composite video signal (video information with sync) of maximum 1 volt on 75 Ω impedance. After buffer and 1 V clipping circuits the signal is applied to the modulator where it modulates an intermediate frequency signal (which is different from the one used for aural signal). The modulator is an amplitude modulator, which modulates the IF, signal in a manner where 1 V VF corresponds to low level IF and 0 volt VF corresponds to high-level IF. AM modulator produces two symmetrical side bands in the modulated signals. Thus IF bandwidth is two times the video bandwidth. (If the VF bandwidth is 4.2 MHz, the IF bandwidth is 8.4 MHz) However, a special filter known as vestigial sideband (VSB) filter follows the modulator. This filter is used to suppress a portion of one side band, thus bandwidth is reduced. (Since both side bands contain identical information, this suppression does not cause a loss in information.) Although the suppression causes phase delay problems the VSB stage also includes correction circuits to equalize the phase.

The audio (AF) input (or inputs in case of stereophonic broadcasting) is usually a signal with 15 kHz maximum bandwidth and 0 dBm maximum level. The signal after passing buffer stages is applied to a modulator where it modulates an intermediate frequency carrier (IF). The modulation technique is usually frequency modulation (FM)
.

Output stages:

The modulated signal is applied to a mixer (also known as frequency converter). Another input to the mixer which is usually produced in a crystal oscillator is known as subcarrier. The two outputs of the mixer are the sum and difference of two signals. Unwanted signal (usually the sum) is filtered out and the remaining signal is the radio frequency (RF) signal. Then the signal is applied to the amplifier stages. The number of series amplifiers depends on the required output power. The final stage is usually an amplifier consisting of many parallel power transistors.

In modern solid-state VHF and UHF transmitters, LDMOS power transistors are the device of choice for the output stage.

3.3.2 VHF Transmitter block diagram & circuit:

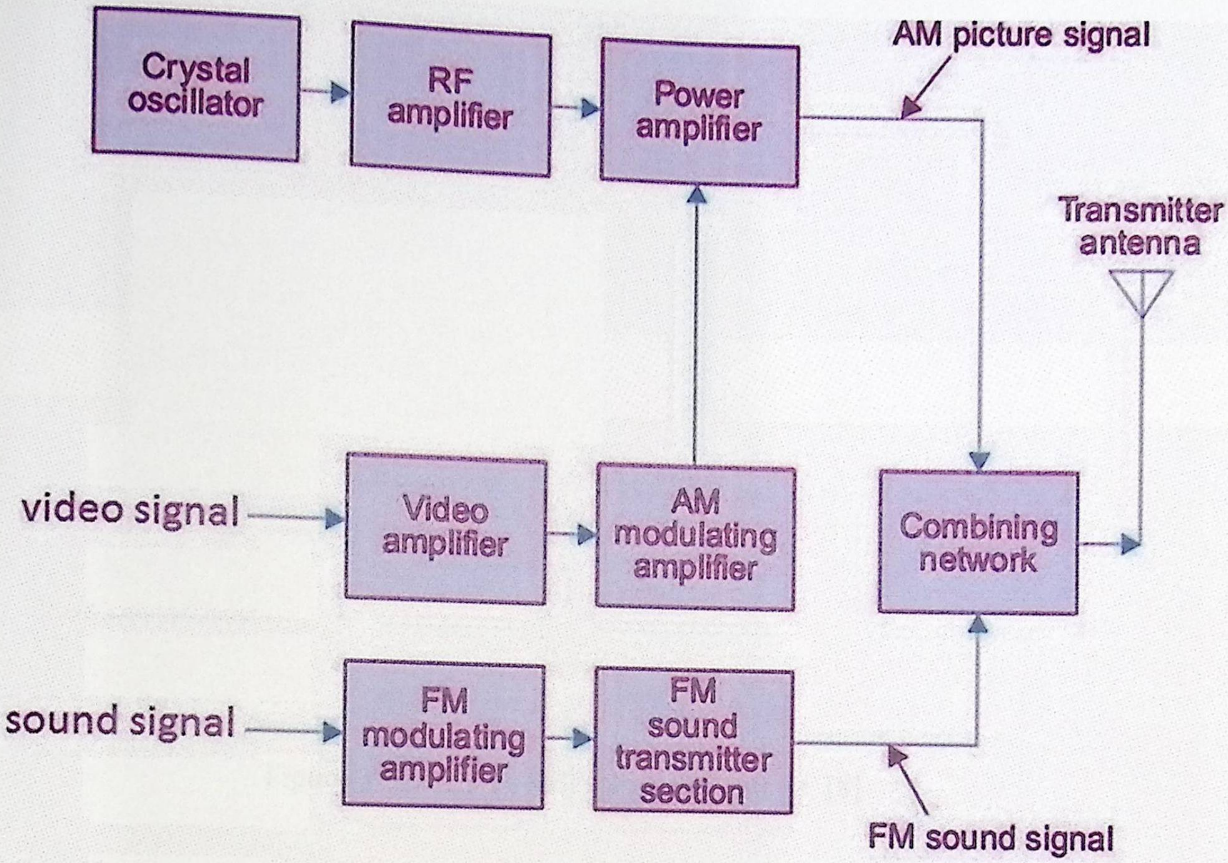


Figure 3.13:-block diagram of a television transmitter.

As shown in figure the video signal will enter to the video amplifier then the amplified signal will modulated by AM modulator then send to carrier circuit.

The sound signal will be amplified then inter the FM modulator then send to its own carrier to be transmitted.

The carrier frequency that carry the AM signal and the carrier frequency that carry the FM signals will transmit by the same antenna.

3.3.3 VHF transmitter circuit:

Figure 3.14:- TV (VHF) transmitter circuit. [8]

Referring to the circuit above, Q1 is configured as a preamplifier for amplifying the audio input to be modulated.

Q2 is fundamentally responsible for conducting a couple of important functions: It amplifies the carrier frequency generated by the tank circuit, and modulates the input over these carrier waves.

The preamplifier audio signals from the Q1 stage is fed to the Q2 stage at its base for the intended modulation actions.

As we know all transmitter circuits require a conventional "tank" circuit involving an inductor and few capacitors for generating carrier waves.

Here is a tank circuit becomes imperative and is formed by the insertion of C5, L1. This network essentially generates the crucial carrier waves.

The video signal, which needs to be superimposed with the audio signal, is applied to the emitter of Q2 through the variable resistor R7 for implementing the intended modulation process.

The composite signal (audio/video) after modulation via the Q2 and the tank circuit stages is further applied to the connected antenna A1 for the final transmission into the atmosphere so that it can be received by a particular TV set in the vicinity.

The proposed TV transmitter circuit requires a well - regulated stabilized 12V supply for operating.

Preferably, a 12v battery would give better results due to a much cleaner DC free from all possible ripples and noises.

Things we need to consider while building this TV transmitter circuit:

For the inductor L1 use a super enameled copper wire of 24SWG and wind 4 turns with 6mm diameter over any non-conducting former such as paper or plastic.
T1 may be replaced with any standard audio transformer the type which were commonly used in olden transistor sets and radios at the output amplifier stage.
The antenna is not much critical, can be any good conductor of electricity, around a foot long, such as a copper wire. You may try different lengths until you get the optimal response from the TV transmitter circuit.
The operating frequency of this unit could be within 50 and 210MHz.
The compatibility of this circuit is well with PAL B/C systems.
You may have some fun with C8 which may be tweaked a bit for acquiring extreme accuracy with the performance of the circuit.

Table 3.1:-TV and white space frequency [9]

Power supply

The power supply of the circuit can be made with tensions of 12 (7812) or 15(7815) Volts of a source with at least 1A and excellent filter. A deficient filter in this type of so much circuit can provoke snores in the sound, as undulations in the image.

Suggestion of power supply for circuit using the ic 7812 (for minimize the noise) :

Figure 3.15:- low noise power supply

- Through the second semester we try the first circuit (figure 8) and have unsatisfactory result, so we use another circuit shown below:

VHF transmitter circuit 2 []

Figure 3.16: project final circuit

The working principle:

Block diagram of wireless audio video sender consists of as follows.

1. A main frequency generator acts to produced the signal carrier of the television signal. And is the main frequency of this project.
2. A signal amplifier will amplify signal come from the frequency generator circuit to up enough to can drive a power amplifier circuit.
3. A frequency generator in VCO form, will produce a center frequency 5.5 MHz Which this frequency will change by a input signal, contributes to the FM modulated by a television signal system.
4. This power amplifiers in addition to the high-power amplifier is the last time before it was broadcast. Also acts as a modulated video signal and audio. (Through the FM modulation) mixes with Signal carrier frequency of the video signal in the AM as well.

The main frequency generator circuit in form of LC in a ground-base configure type. By has L1 and trimmer C4(3-12pF) together to into a tuning circuit at output.

For adjust the video signal carrier frequency as you need in range of 450MHz-550MHz. The R1, R2, R3 are a bias circuits to Q1(C9018). By has C1 cut a high frequency at pin base. Both capacitors C2 and C3 are connected as divider circuit to determine rate of signal that feedback from collector to emitter. The C3 so is not the bypass signal capacitor as general case.
This frequency is send to amplify up by through coupling capacitor C5 to transistor Q2(C9018) that is the signal amplifier circuit, The resistors R4,R5,R6 are set to the bias circuit to Q2, a capacitor C6 is capacitor bypass frequency to the ground, to protect the loss of power at the R6.
The inductor L2 send the DC voltage to Q2 At the same time, it was a RF Shock, prevent visual Signal carrier frequency, output to supply it.
Since we want to have a frequency stability over power. We make regulation the power supply circuit to this the second input sector. With R9 is limit current and filter to smooth with two capacitors C8 and C9, The signal is amplified through the link on the capacitor C7 ,to Q4 that is power amplifier circuit and AM modulation circuit with the same time, by will be reduce by the resistor R8 to the appropriate size for the audio signal to pass through the base pin of Q4. The same R7 and R8 are the bias resistors to Q4 . The inductor L3 act same as L2 and because this sector we want the best power than others , The power supply for this ,so come direct from the main power supply. By have capacitors C10,C11 and C23 are filter current for the signal that is modulated with the video carrier wave, ready with the sound signal in AM form that will be coupling and adjust the amplitude of signal suitably with C13,C14,C15 and R10, by has the VR1 is used to adjust percentage of modulation. The audio signal will be coupling through C14 and C17 go to the Q3, by has VR2 adjust the range frequency deviation
Both R11,R12 are the bias resistors. The C18 is cut off high frequency on pin base. C19 and C20 are the divider capacitors as same C2,C3, that is set as the generator circuit on LC ground, base and configure same with Q1. But the circuit is determined as VCO(voltage control oscillator) to modulated the audio signal that into the FM input, by Center frequency of 5.5MHz, which is the frequency difference between the Signal carrier frequency video signal with audio carrier signal. The set of values of T1 and C21.
The audio signals through the FM modulation through T1 and C12 are the coupling pin to the base of Q4. The power supply that entered to this section will be regulated as 5 volts voltage regulator, has R3 is limiter current and filter to smoothed do not the high frequency within by C22. The television signal is completed form output of Q4 will be sensed Will be spread broadcast antenna, the capacitors C24 and C25 act as the matching circuits. For the status of the device is indicated by LED1, with limit current by R14.

Our upgrades on the circuit:

We note that the transistor c 548 has a high noise figure when it works on 213MHz so we replace it by the low noise RF amplifier transistor c 9018 and we really get higher resolution received signal.

Chapter 4: Test and result:-

4.1 Overview

4.2 Problems and solutions

4.1 Overview

In this chapter, we will show the testing and results of the system, and the system hardware consist of the VHF transmitter, RF amplifier, antennas, HDMI to AV converter, tablet and power supply.

4.2 problems and solutions

The project is almost over , and obviously the system is consist of many parts and components and we will show the problems we face and the solution progress of some parts as follow:

*** Hardware:**

The system hardware consist of the VHF transmitter, RF amplifier, antennas, HDMI to AV converter, tablet and power supply. The system designed to be small and fit to hanging on wall.

VHF transmitter was designed and constructed to broadcasts video and audio to TV at frequency of 213 MHz ,the transmitter use PAL system or (SECAM).The output signal is about 80mW which is amplified by the RF amplifier to increase by the factor of ten (800mW).

The transmitter working as a small TV station with external video and audio input jacks and it's able to deal with both analog and digital video systems so working with wide number of different video sources. (figures next page)

Figure 4.1: TV transmitter circuit

After testing the circuit, there was some problems:

Although we build different circuits in an effort to reach the good quality there, always some kind of distortion or annoying noise appears on TV screen. To overcome this problem we use a RF modulator and amplifier transistor c9018, which have noise figure of 1.2dB at 300MHz operating frequency and using noiseless power supply.

The short range, sensitivity to moving object and signal dying after walls, all these problems are solved by the component in the next step.

- ✓ RF amplifier :

Figure 4.2: RF amplifier

The VHF transmitter output power is low and it's transmit with a short range about (less than 5 meters) and this is very short distance in addition the low power signal is sensitive to moving objects around and that's clearly appears specially when we are dealing with video transmitting, so using the RF amplifier is very necessary.

The amplifier we used is RF amplifier which amplifies the signals that have frequency in the range of (54-1000 MHz) ,and has a gain of 10dB.

If there needing for transmit in longer range or indoor (inside the whole building) the multi RF stages can used.

The video signal received before and after the RF amplifier shown below:

Figure 4.3: signal without RF amplifier

Figure 4.4: signal after amplifier

As it shown we used a HD camera to test the VHF transmitter.

✓ Antenna:

The final stage of completely overcome the noise (increasing signal to noise ratio) is by utilizing the transmitted power and repeal the moving object effects and antenna polarization problems using "rabbit ears" antenna instead of one element antenna.

The video signal received at TV using "rabbit ears" (20 meter far from transmitter) have a good quality even when there are moving objects and also behind the wall is shown below:

Figure 4.5: received signal using rabbit ears antenna

The figure below show the TV transmitter using HD camera as video source and the receiver(TV) with separated by 6 meters (about 0.2 the maximum distance before the receiver start have noteworthy noise using one amplification stage).

Figure 4.6: TV broadcasting

The system now is able to connect the smart phone to data show and TVs by using a tablet as video source for TV transmitter .the tablet is an intermediate device that receives the video signal from the mobile by android application (remodroid) through Wi-Fi network then the HDMI to AV converter will link the tablet with TV transmitter. Gathering the whole system is in progress but not finished until now, and figures will be included in the final version of our project documents.

Chapter 5: conclusion:-

5.1 Overview

5.2 Achievements

5.3 Conclusion

5.4 Future work

5.1 Overview:

In the chapter we will what we achieved in this project, overall conclusion, and future work and suggestions and recommendation for even better implementation.

5.2 Achievements:

Through past mounts, we achieve different points according to our project plan:

1. Building a VHF transmitter broadcast video and audio in Avery good quality signals, and coverage the floor area.

The VHF transmitter has the availability of increasing the rang of coverage area by increasing the number of RF amplifiers stages.

2. Implementing a small dimensions project and fit to hanging on wall.

3. Mirroring the smartphone screen on tablet that work as intermediate device that linking smartphone with VHF transmitter.

4. Broadcasting as a small TV station whatever the video sources and TV numbers.

5.3 Conclusion:

At the end of our project, we conclude some ideas as follows:

Working with a team is very important thing, and give a power and meaning the project.

The fact that two students in this project helped everyone in his project load, because of cooperation of different suggestions, and ideas and solutions that taken from everyone in our group, and this help us a lot especially when we faced some challenges. Because of that cooperation, our project succeed.

Video streaming is one of widely used techniques for much useful application; in our project, we use streaming video to make the presentation and showing data from smartphone.

We hope to make the presentation and showing data more easily by overcoming the using of heavy hardware and wires, by using smartphone and wireless technologies.

We deals with electronic component and we successes to transmitted video and audio signal and we know now the problems of transmit in AM circuits and the solution of the most problems to reduce as much the annoying noise.

5.4 Future work:

We hope that our project will be valuable and useful reference for other future projects related to broadcasting video and audio signal from different device.

In our project, we use the tablet as an intermediate device, so we use a small number of it function. Replacement it by another device that has a main function of linking the VHF with smartphone by wireless technique will be more suitable.

Developing HDMI to AV convertor to make high quality video is very needed in future work.

finally our project can be used as a small TV station that can have an extended rang to broadcast video inside a building or even university area by increasing the RF amplifier stages, also the use is not restricted by using only the smartphone since the project have external video, audio and HDMI jack.

References

[1] Galaxy beam

- http://www.gsmarena.com/samsung_i8530_galaxy_beam-4566.php

[2]Wireless projector

- http://panasonic.net/avc/projector/ios/
- Needham, Joseph (1986). *Science and Civilization in China: Volume 4, Physics and Physical Technology, Part 1, Physics*. Taipei: Caves Books Ltd. Page 82.
- Eds. Crangle, Richard, Heard, Mervyn, and van Dooren, Ine. "Devices and Desires." Realms of Light. London, England: The Magic Lantern Society, 2005. 11-45. Print.

[3] Handheld projector

- http://www.projectorreviews.com/projector-categories/handheld-projectors/
- US Patent #6,275,214, "[1]" Computer presentation system and method with optical tracking of wireless pointer
- C. Harrison, H. Benko, and A. Wilson. "OmniTouch: Wearable Multitouch Interaction Everywhere", In Proceedings of the 24th Annual ACM Symposium on User interface Software and Technology (ACM UIST), 2011.

[4] introduction to Wi-Fi networks, advantage and limitation of Wi fi . white paper .

- http://www.crutchfield.com/swjrnf1g5oyg/learn/learningcenter/home/wifi.html
- Phil Mercer (August 11, 2012). "Wi-fi, dual-flush loos and eight more Australian inventions". BBC News.
- "Wireless Fidelity' Debunked". Wi-Fi Planet. 2007-04-27. Retrieved 2007-08-31.

[5] ***Wi-Fi standard***

- http://www.ampedwireless.com/learningcenter/default2.html
- *Wireless Networking in the Developing World: A practical guide to planning and building low-cost telecommunications infrastructure* (PDF) (2nd ed.). Hacker Friendly LLC. 2007. p. 425. page 14
- Jump up^ IEEE 802.11-2007
- Jump up^ "IEEE-SA - News & Events". Standards.ieee.org. Retrieved 2012-05-24.
- Jump up^ "IEEE 802.11n-2009—Amendment 5: Enhancements for Higher Throughput". IEEE-SA. 29 October 2009. doi:10.1109/IEEESTD.2009.5307322.

[6] Android (operating system)

- "Android Code Analysis". Retrieved June 6, 2012.
- **Jump up^** "The Android Source Code: Governance Philosophy". *source.android.com*. December 17, 2014. Retrieved January 25, 2015.
- http://en.wikipedia.org/wiki/Android_%28operating_system%29

[7]Same android application (mobizen)

- https://play.google.com/store/apps/details?id=com.rsupport.mvagent&hl=en
- http://www.springdesign.com/index.html
- https://code.google.com/p/red5-screenshare/issues/list

[8] VHF transmitter circuit

- http://circuit-zone.com/?cat=tv-transmitters
- Analogue TV Broadcast Systems by Paul Schlyter

[9] TV and white space frequency

- http://electronics.howstuffworks.com/cable-tv1.htm

[10] VHF transmitter circuit 2

- http://www.eleccircuit.com/diy-the-wireless-video-audio-signal-sender-circuit/

Appendix

Appendix A

Transistor

Datasheet

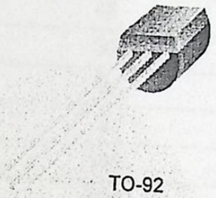
FAIRCHILD™

November 2014

BC546 / BC547 / BC548 / BC549 / BC550
NPN Epitaxial Silicon Transistor

Features

- Switching and Amplifier
- High-Voltage: BC546, V_{CEO} = 65 V
- Low-Noise: BC549, BC550
- Complement to BC556, BC557, BC558, BC559, and BC560



1 TO-92
1. Collector 2. Base 3. Emitter

Ordering Information

Part Number	Marking	Package	Packing Method
BC546ABU	BC546A	TO-92 3L	Bulk
BC546ATA	BC546A	TO-92 3L	Ammo
BC546BTA	BC546B	TO-92 3L	Ammo
BC546BTF	BC546B	TO-92 3L	Tape and Reel
BC546CTA	BC546C	TO-92 3L	Ammo
BC547ATA	BC547A	TO-92 3L	Ammo
BC547B	BC547B	TO-92 3L	Bulk
BC547BBU	BC547B	TO-92 3L	Bulk
BC547BTA	BC547B	TO-92 3L	Ammo
BC547BTF	BC547B	TO-92 3L	Tape and Reel
BC547CBU	BC547C	TO-92 3L	Bulk
BC547CTA	BC547C	TO-92 3L	Ammo
BC547CTFR	BC547C	TO-92 3L	Tape and Reel
BC548BU	BC548	TO-92 3L	Bulk
BC548BTA	BC548B	TO-92 3L	Ammo
BC548CTA	BC548C	TO-92 3L	Ammo
BC549BTA	BC549B	TO-92 3L	Ammo
BC549BTF	BC549B	TO-92 3L	Tape and Reel
BC549CTA	BC549C	TO-92 3L	Ammo
BC550CBU	BC550C	TO-92 3L	Bulk
BC550CTA	BC550C	TO-92 3L	Ammo

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only. Values are at T_A = 25°C unless otherwise noted.

Symbol	Parameter		Value	Unit
V_{CBO}	Collector-Base Voltage	BC546	80	V
		BC547 / BC550	50	
		BC548 / BC549	30	
V_{CEO}	Collector-Emitter Voltage	BC546	65	V
		BC547 / BC550	45	
		BC548 / BC549	30	
V_{EBO}	Emitter-Base Voltage	BC546 / BC547	6	V
		BC548 / BC549 / BC550	5	
I_C	Collector Current (DC)		100	mA
P_C	Collector Power Dissipation		500	mW
T_J	Junction Temperature		150	°C
T_{STG}	Storage Temperature Range		-65 to +150	°C

Electrical Characteristics

Values are at T_A = 25°C unless otherwise noted.

Symbol	Parameter		Conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector Cut-Off Current		V_{CB} = 30 V, I_E = 0			15	nA
h_{FE}	DC Current Gain		V_{CE} = 5 V, I_C = 2 mA	110		800	
$V_{CE}(sat)$	Collector-Emitter Saturation Voltage		I_C = 10 mA, I_B = 0.5 mA		90	250	mV
			I_C = 100 mA, I_B = 5 mA		250	600	
$V_{BE}(sat)$	Base-Emitter Saturation Voltage		I_C = 10 mA, I_B = 0.5 mA		700		mV
			I_C = 100 mA, I_B = 5 mA		900		
$V_{BE}(on)$	Base-Emitter On Voltage		V_{CE} = 5 V, I_C = 2 mA	580	660	700	mV
			V_{CE} = 5 V, I_C = 10 mA			720	
f_T	Current Gain Bandwidth Product		V_{CE} = 5 V, I_C = 10 mA, f = 100 MHz		300		MHz
C_{ob}	Output Capacitance		V_{CB} = 10 V, I_E = 0, f = 1 MHz		3.5	6.0	pF
C_{ib}	Input Capacitance		V_{EB} = 0.5 V, I_C = 0, f = 1 MHz		9		pF
NF	Noise Figure	BC546 / BC547 / BC548	V_{CE} = 5 V, I_C = 200 μA, f = 1 kHz, R_G = 2 kΩ		2.0	10.0	dB
		BC549 / BC550			1.2	4.0	
		BC549	V_{CE} = 5 V, I_C = 200 μA, R_G = 2 kΩ, f = 30 to 15000 MHz		1.4	4.0	
		BC550			1.4	3.0	

h_{FE} Classification

Classification	A	B	C
h_{FE}	110 ~ 220	200 ~ 450	420 ~ 800

Typical Performance Characteristics

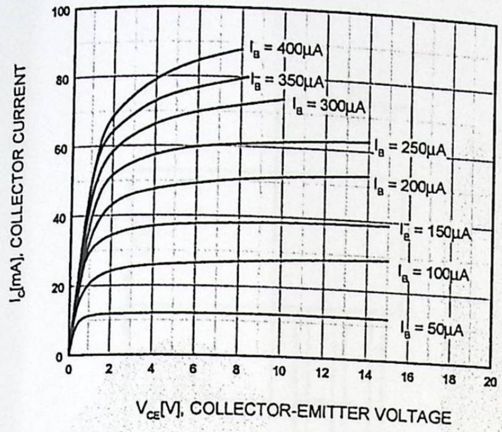


Figure 1. Static Characteristic

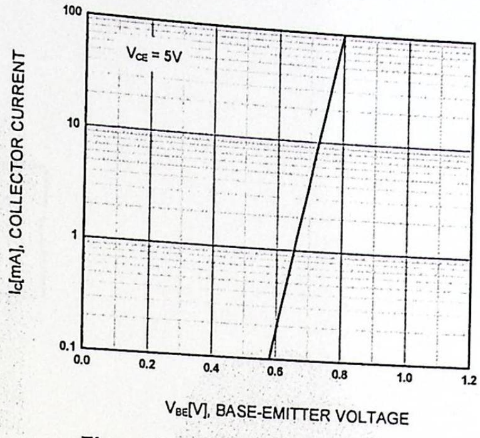


Figure 2. Transfer Characteristic

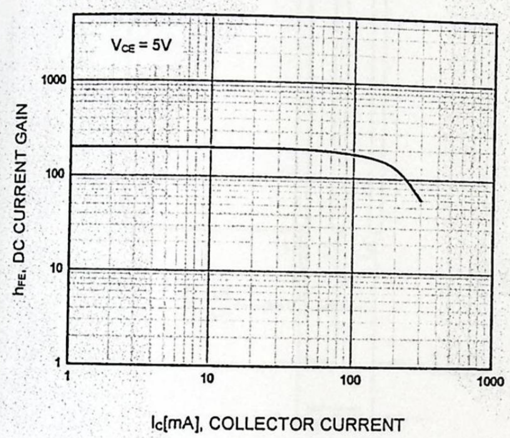


Figure 3. DC Current Gain

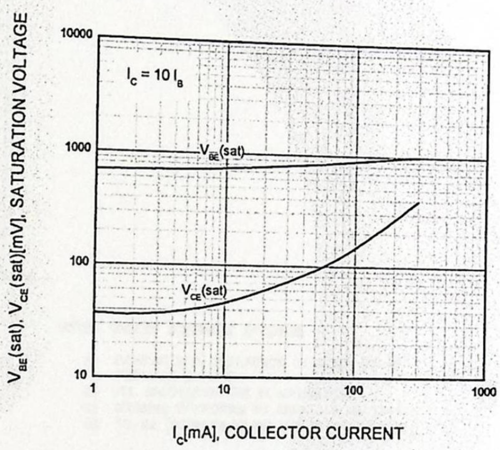


Figure 4. Base-Emitter Saturation Voltage and Collector-Emitter Saturation Voltage

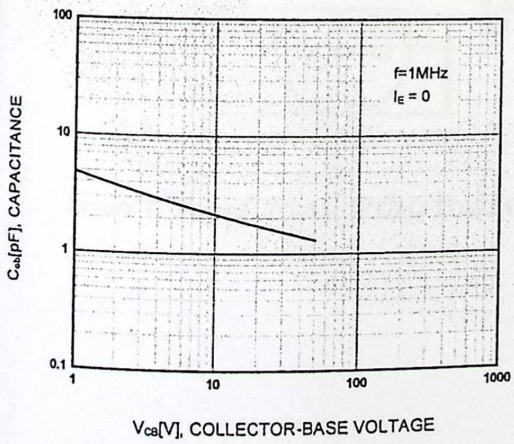


Figure 5. Output Capacitance

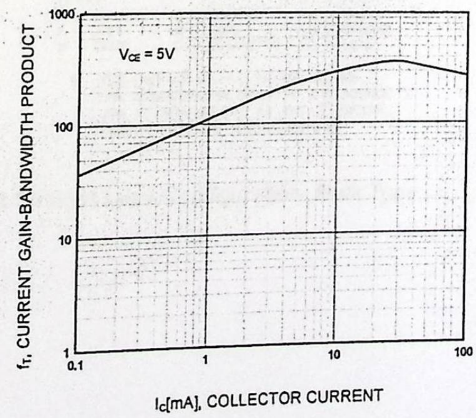
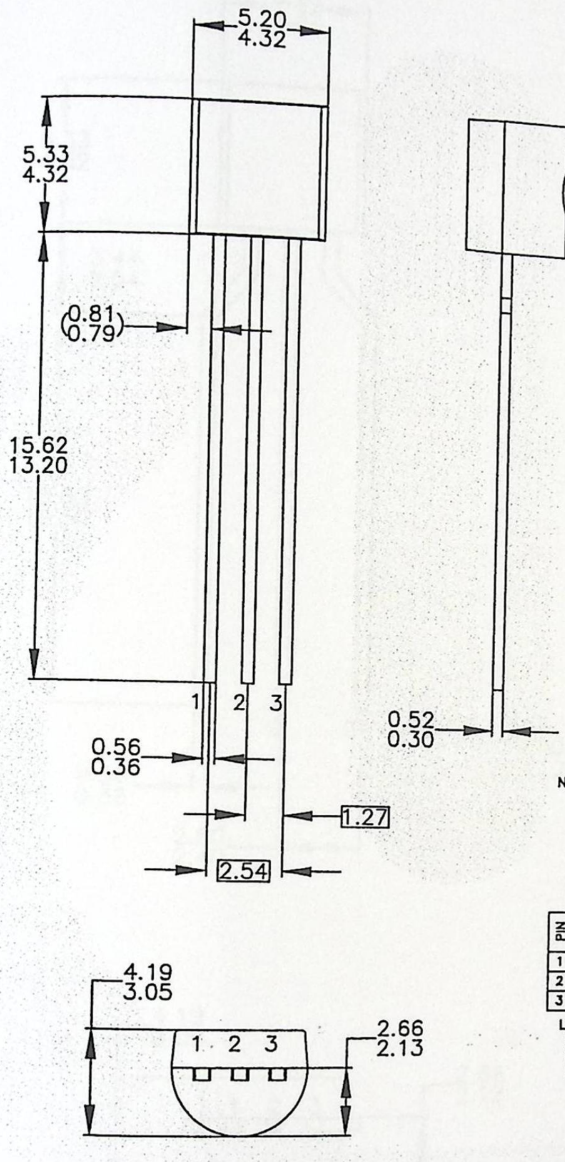


Figure 6. Current Gain Bandwidth Product

Physical Dimensions



NOTES: UNLESS OTHERWISE SPECIFIED

A) DRAWING WITH REFERENCE TO JEDEC TO-92 RECOMMENDATIONS.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DRAWING CONFORMS TO ASME Y14.5M-1994.
D) TO-92 (92,94,96,97,98) PIN CONFIGURATION:

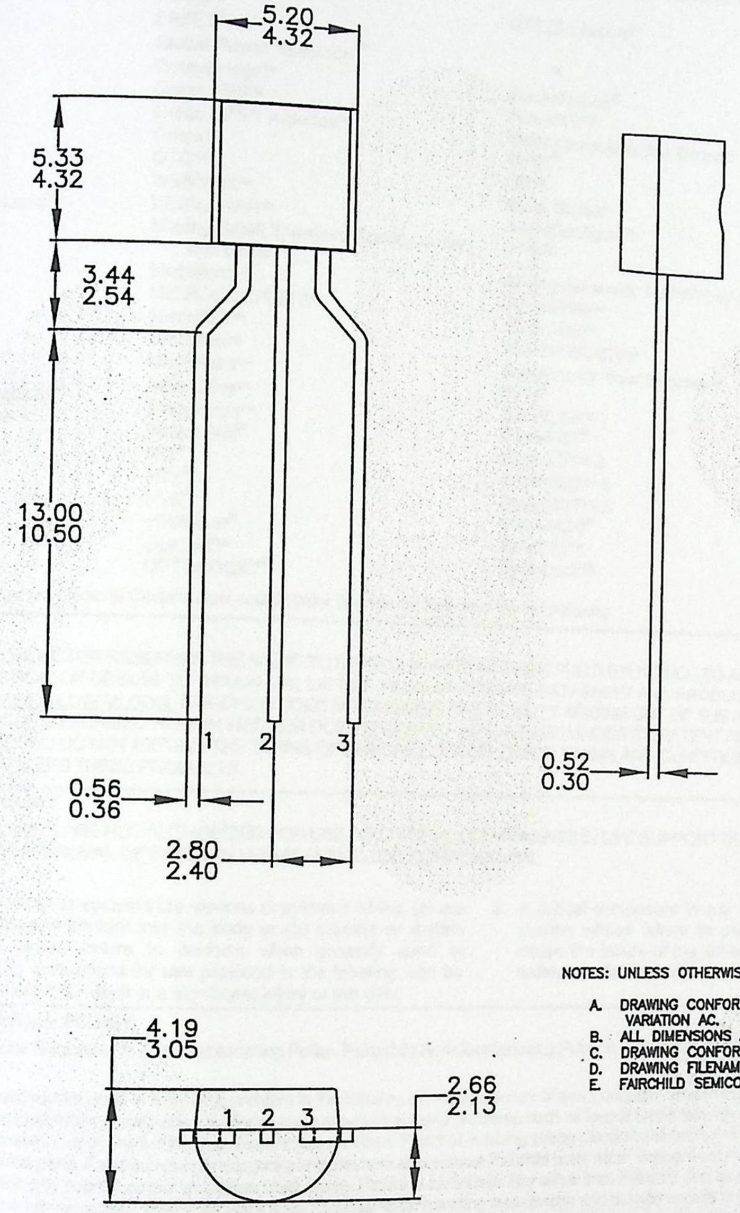
PIN	92			94			96			97			98		
	P	F	M	P	F	M	B	F	M	P	F	M	P	F	M
1	E	S	S	E	S	S	B	D	G	C	G	D	C	G	D
2	B	D	G	C	G	D	E	S	S	B	D	G	E	S	S
3	C	G	D	B	D	G	C	G	D	E	S	S	B	D	G

LEGEND:
P – BIPOLAR E – EMITTER D – DRAIN
F – JFET B – BASE S – SOURCE
M – DMOS C – COLLECTOR G – GATE

E) FOR PACKAGE 92, 94, 96, 97 AND 98: PIN CONFIGURATION DRAIN "D" AND SOURCE "S" ARE INTERCHANGEAGLE AT JFET "F" OPTION.
F) DRAWING FILENAME: MKT-ZA03DREV3.

Figure 7. 3-Lead, TO-92, JEDEC TO-92 Compliant Straight Lead Configuration, Bulk Type

Physical Dimensions (Continued)



NOTES: UNLESS OTHERWISE SPECIFIED

A. DRAWING CONFORMS TO JEDEC MS-013, VARIATION AC.
B. ALL DIMENSIONS ARE IN MILLIMETERS.
C. DRAWING CONFORMS TO ASME Y14.5M-2009.
D. DRAWING FILENAME: MKT-ZA03FREV3.
E. FAIRCHILD SEMICONDUCTOR.

Figure 8. 3-Lead, TO-92, Molded, 0.2 In Line Spacing Lead Form, Ammo, Tape and Reel Type

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PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

Rev. I72

Appendix B

LM1889 TV video modulator

Data sheet

National Semiconductor

PRELIMINARY
April 1987

LM1889 TV Video Modulator

General Description

The LM1889 is designed to interface audio, color difference, and luminance signals to the antenna terminals of a TV receiver. It consists of a sound subcarrier oscillator, chroma subcarrier oscillator, quadrature chroma modulators, and RF oscillators and modulators for two low-VHF channels.

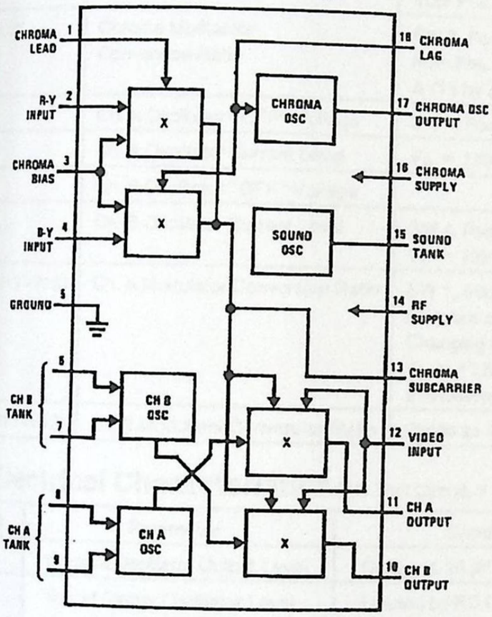
The LM1889 allows video information from VTR's, games, test equipment, or similar sources to be displayed on black and white or color TV receivers. When used with the MM57100 and MM53104, a complete TV game is formed.

Features

- dc channel switching
- 12V to 18V supply operation
- Excellent oscillator stability
- Low intermodulation products
- 5 Vp-p chroma reference signal
- May be used to encode composite video

Block Diagram

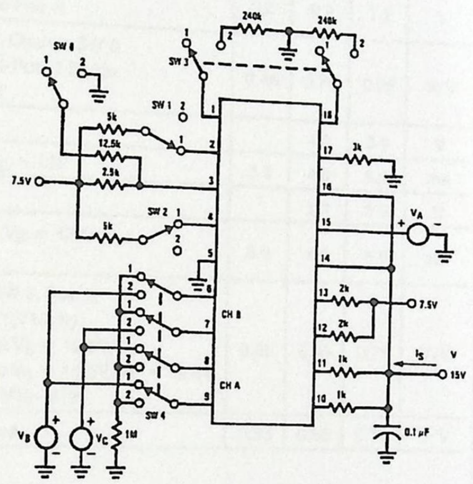
Dual-In-Line Package



TL/H/7917-1

Order Number LM1889N
See NS Package Number N18A

DC Test Circuit



TL/H/7917-2

RRD-B30M115/Printed in U. S. A.

Absolute Maximum Ratings

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage V14, V16 max	19 V_{DC}
Power Dissipation Package (Note 1)	1800 mW
Operating Temperature Range	0°C to +70°C
Storage Temperature Range	−55°C to +150°C
Chroma Osc Current I_{17} max	10 mA_{DC}
(V16−V15) max	±5 V_{DC}
(V14−V10) max	7V
(V14−V11) max	7V
Lead Temperature (Soldering, 10 sec.)	260°C

DC Electrical Characteristics (dc Test Circuit, All SW Normally Pos. 1, V_A = 15V, V_B = V_C = 12V)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
I_S	Supply Current		20	35	45	mA
ΔI_{15}	Sound Oscillator, Current Change	Change V_A from 12.5 to 17.5V	0.3	0.6	0.9	mA
V17	Chroma Oscillator Balance		9.5	11.0	12.5	V
V13	Chroma Modulator Balance		7.0	7.4	7.8	V
ΔV13	R-Y Modulator Output Level	SW 3, Pos. 2, Change SW 1 from Pos. 1 to Pos. 2	0.6	0.9	1.2	V
ΔV13	B-Y Modulator Output Level	SW 3, Pos. 2, Change SW 2 from Pos. 1 to Pos. 2	0.6	0.9	1.2	V
ΔV13/ΔV3	Chroma Modulator Conversion Ratio	SW 3, Pos. 2, Change SW 0 from Pos. 1 to Pos. 2 Divide ΔV13 by ΔV3	0.45	0.70	0.95	V/V
V8, V9	Ch. A Oscillator "OFF" Voltage	SW 4, Pos. 2		1.0	3.0	V
I_9	Ch. A Oscillator Current Level	V_B = 12V, V_C = 13V	3.0	4.0	5.5	mA
V6, V7	Ch. B Oscillator "OFF" Voltage			1.0	3.0	V
I_6	Ch. B Oscillator Current Level	SW 4, Pos. 2, V_B = 12V, V_C = 13V	3.0	4.0	5.5	mA
ΔV11/(V13−V12)	Ch. A Modulator Conversion Ratio	SW 1, SW2, SW 3, Pos. 2, Measure ΔV11(V10) by Changing from V_B = 12.5V, V_C = 11.5V to V_B = 11.5V, V_C = 12.5V and Divide by V13−V12	0.35	0.55	0.75	V/V
ΔV10/(V13−V12)	Ch. B Modulator Conversion Ratio	Divide as Above	0.35	0.55	0.75	V/V

AC Electrical Characteristics (AC Test Circuit, V = 15V)

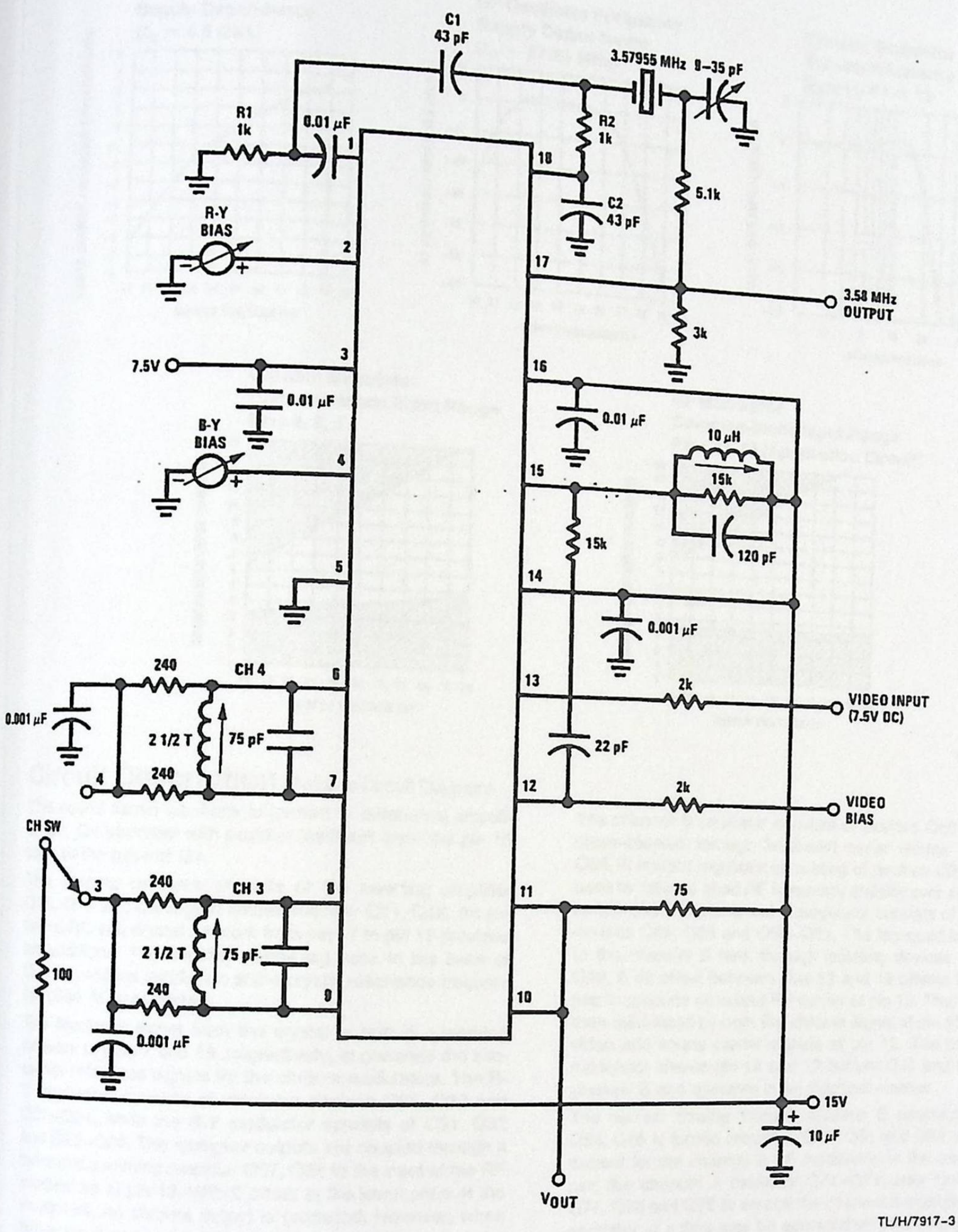
Symbol	Parameter	Conditions	Min	Typ	Max	Units
V17	Chroma Oscillator Output Level	$C_{LOAD} \leq$ 20 pF	4	5		Vp-p
V15	Sound Carrier Oscillator Level	Loaded by RC Coupling Network	2	3	4	Vp-p
V8, V9	Ch. 3 RF Oscillator Level	Ch. SW. Pos. 3, f = 61.25 MHz, Use FET Probe	200	350		mVp-p
V6, V7	Ch. 4 RF Oscillator Level	Ch. Sw. Pos. 4, f = 67.25 MHz Use FET Probe	200	350		mVp-p

Note 1: For operation in ambient temperatures above 25°C, the device must be derated based on a 150° maximum junction temperature and a thermal resistance of 70°C C/W junction to ambient.

Design Characteristics (AC Test Circuit, V = 15V)

Parameter	Typ	Units
Oscillator Supply Dependence		
Chroma, f_o = 3.579545 MHz	3	Hz/V
Sound Carrier, RF	See Curves	
Oscillator Temperature Dependence (IC Only)		
Chroma	0.05	ppm/°C
Sound Carrier	−15	ppm/°C
RF	−50	ppm/°C
Chroma Oscillator Output, Pin 17		
t_{RISE}, 10–90%	20	ns
t_{FALL}, 90–10%	30	ns
Duty Cycle (+) Half Cycle	51	%
(−) Half Cycle	49	%
RF Oscillator Maximum Operating Frequency (Temperature Stability Degraded)	100	MHz
Chroma Modulator (f = 3.58 MHz)		
B-Y Conversion Gain V13/(V4−V3)	0.6	Vp-p/V
R-Y Conversion Gain V13/(V2−V3)	0.6	Vp-p/V
Gain Balance	±0.5	dB
Bandwidth	See Curve	
RF Modulator		
Conversion Gain, f = 61.25 MHz, V_{OUT}/(V13−V12)	10	mVrms/V
3.58 MHz Differential Gain	5	%
Differential Phase	3	degrees
2.5 Vp-p Video, 87.5% mod.		
Output Harmonics below Carrier		
2nd, 3rd	−12	dB
4th and above	−20	dB
Input Impedances		
Chroma Modulator, Pins 2, 4	500k//2 pF	
RF Modulator, Pin 12	1M//2 pF	
Pin 13	250k//3.5 pF	

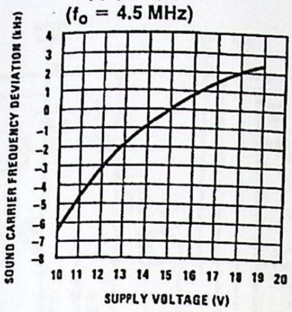
AC Test Circuit



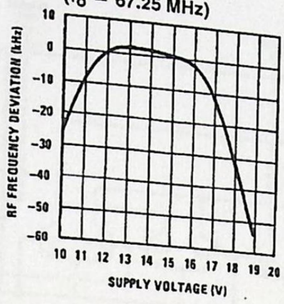
TL/H/7917–3

Typical Performance Characteristics

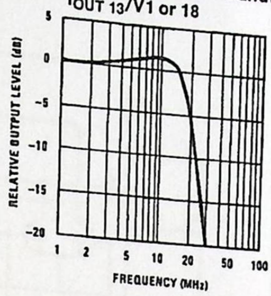
Sound Carrier Oscillator Supply Dependence (f_o = 4.5 MHz)



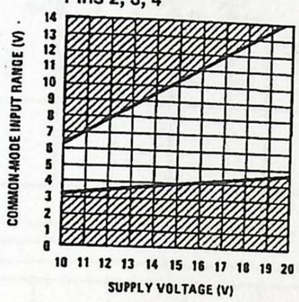
RF Oscillator Frequency Supply Dependence (f_o = 67.25 MHz)



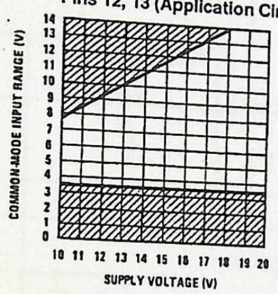
Chroma Modulator Transconductance Bandwidth $I_{OUT\ 13}/V1$ or 18



Chroma Modulator Common-Mode Input Range Pins 2, 3, 4



RF Modulator Common-Mode Input Range Pins 12, 13 (Application Circuit)



TL/H/7917–4

Circuit Description (Refer to Circuit Diagram)

The sound carrier oscillator is formed by differential amplifier Q3, Q4 operated with positive feedback from the pin 15 tank to the base of Q4.

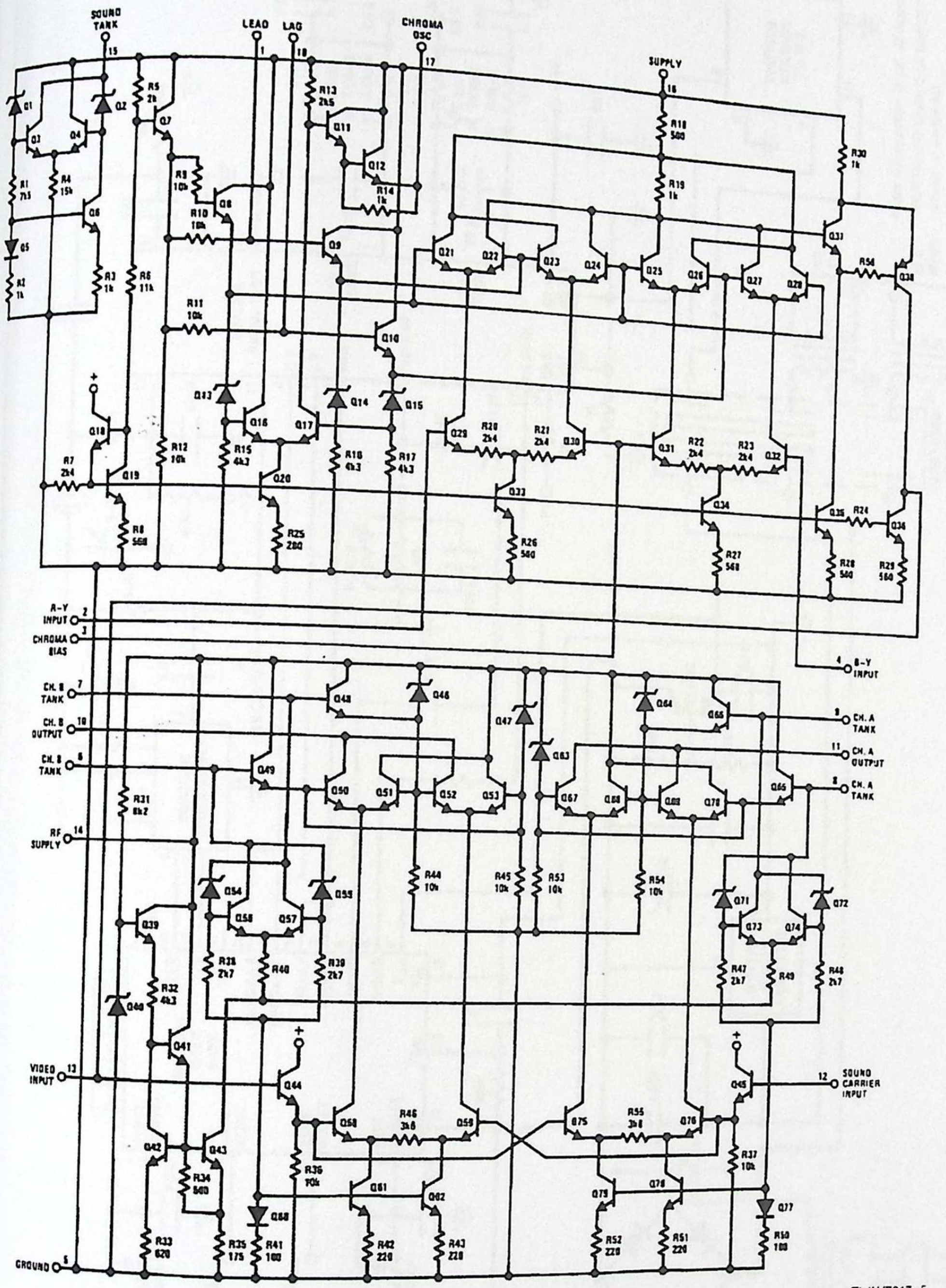
The chroma oscillator consists of the inverting amplifier Q16, Q17 and Darlington emitter follower Q11, Q12. An external RC and crystal network from pin 17 to pin 18 provides an additional 180 degrees phase lag back to the base of Q17 to produce oscillation at the crystal resonance frequency. (See AC test circuit).

The feedback signal from the crystal is split in a lead-lag network to pins 1 and 18, respectively, to generate the subcarrier reference signals for the chroma modulators. The R-Y modulator consists of multiplier devices Q29, Q30 and Q21–Q24, while the B-Y modulator consists of Q31, Q32 and Q25–Q28. The multiplier outputs are coupled through a balanced summing amplifier Q37, Q38 to the input of the RF modulators at pin 13. With 0 offset at the lower pairs of the multipliers, no chroma output is produced. However, when either pin 2 or pin 4 is offset relative to pin 3 a subcarrier output current of the appropriate phase is produced at pin 13.

The channel B oscillator consists of devices Q56 and Q57 cross-coupled through level-shift zener diodes Q54 and Q55. A current regulator consisting of devices Q39–Q43 is used to achieve good RF frequency stability over supply and temperature. The channel B modulator consists of multiplier devices Q58, Q59 and Q50–Q53. The top quad is coupled to the channel B tank through isolating devices Q48 and Q49. A dc offset between pins 12 and 13 offsets the lower pair to produce an output RF carrier at pin 10. That carrier is then modulated by both the chroma signal at pin 13 and the video and sound carrier signals at pin 12. The channel A modulator shares pin 12 and 13 buffers Q45 and Q44 with channel B and operates in an identical manner.

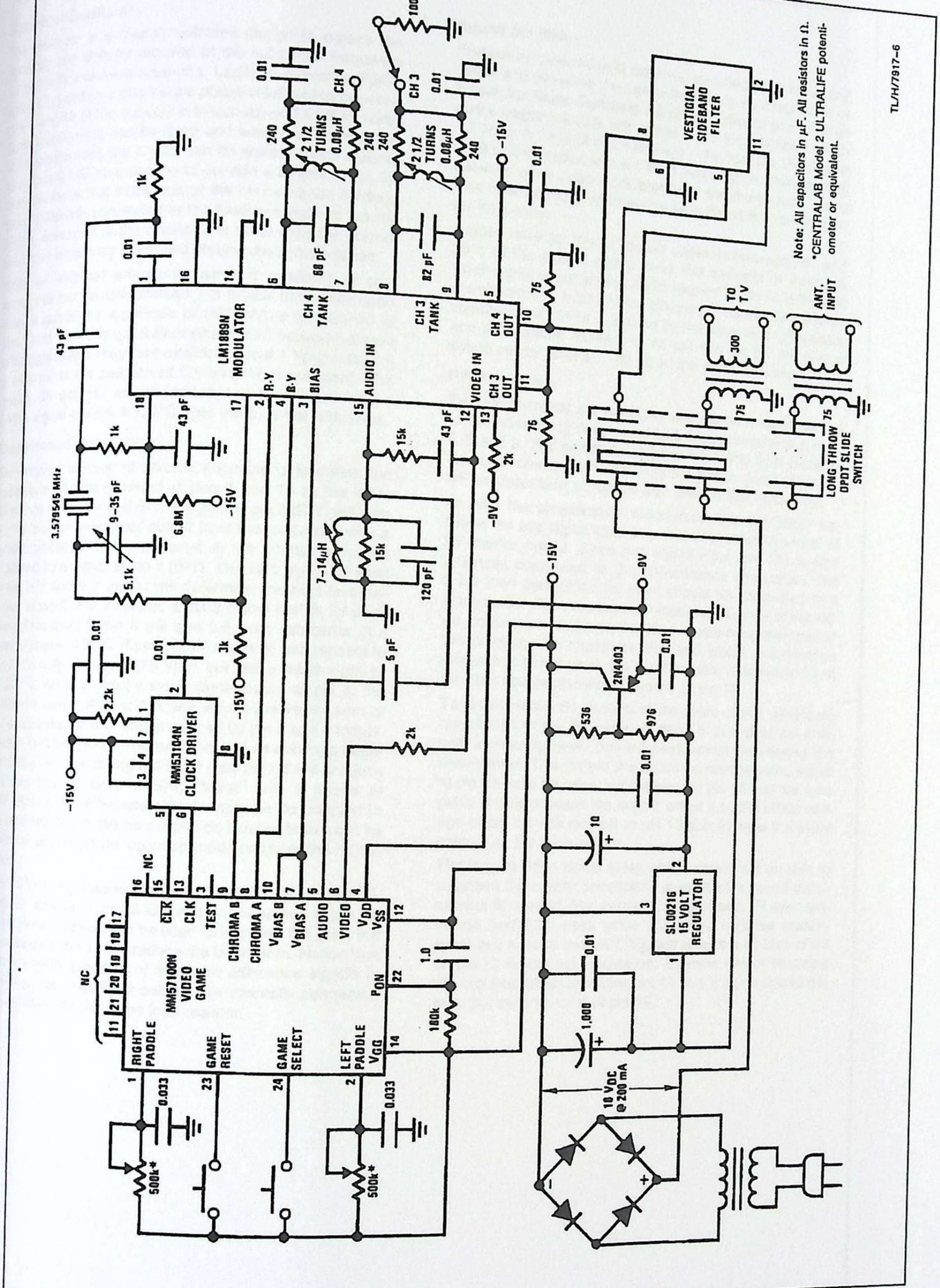
The current flowing through channel B oscillator diodes Q54, Q55 is turned around in Q60, Q61 and Q62 to source current for the channel B RF modulator. In the same manner, the channel A oscillator Q71–Q74 uses turn around Q77, Q78 and Q79 to source the channel A modulator. One oscillator at a time may be activated by connecting its tank to supply (see ac test circuit). The corresponding modulator is then activated by its current turn-around, and the other oscillator/modulator combination remains "OFF".

Circuit Diagram



TL/H/7917-5

TV Game Schematic



Applications Information

Subcarrier Oscillator

The oscillator is a crystal-controlled design to ensure the accuracy and stability required of the subcarrier frequency for use with television receivers. Lag-lead networks (R2C2 and C1R1) define a quadrature phase relationship between pins 1 and 18 at the subcarrier frequency of 3.579545 MHz. Other frequencies can be used and where high stability is not a requirement, the crystal can be replaced with a parallel resonant L-C tank circuit—to provide a 2 MHz clock, for example. Note that since one of the chrominance modulators is internally connected to the feedback path of the oscillator, operation of the oscillator at other than the correct subcarrier frequency precludes chrominance modulation.

When an external subcarrier source is available or preferred, this can be used instead. For proper modulator operation, a subcarrier amplitude of 500 mVp-p is required at pins 1 and 18. If the quadrature phase shift networks shown in the application circuit are retained, about 1 Vp-p subcarrier injected at the junction of C1 and R2 is sufficient. The crystal, C4 and R3 are eliminated and pin 17 provides a 5 Vp-p signal shifted +125°C from the external reference.

Chrominance Modulation

The simplest method of chroma encoding is to define the quadrature phases provided at pins 1 and 18 as the color difference axes R-Y and B-Y. A signal at pin 2 (R-Y) will give a chrominance subcarrier output from the modulator with a relative phase of 90°C compared to the subcarrier output produced by a signal at pin 4 (B-Y). The zero signal dc level of the R-Y and B-Y inputs will determine the bias level required at pin 3. For example, a pin 2 signal that is 1V positive with respect to pin 3 will give 0.6 Vp-p subcarrier at a relative phase of 90°C. If pin 2 is 1V negative with repsect to pin 3, the output is again 0.6 Vp-p, but with a relative phase of 270°C. When a simultaneous signal exists at pin 4, the subcarrier output level and phase will be the vector sum of the quadrature components produced by pin 2 and 4 inputs. Clearly, with the modulation axes defined as above, a negative pulse on pin 4 during the burst gate period will produce the chrominance synchronizing "burst" with a phase of 180°. Both color difference signals must be dc coupled to the modulators and the zero signal dc level of both must be the same and within the common-mode range of the modulators.

The 0.6 Vp-p/V_{dc} conversion gain of the chrominance modulators is obtained with a 2 kΩ resistor connected at pin 13. Larger resistor values can be used to increase the gain, but capacitance at pin 13 will reduce the bandwidth. Notice that equi-bandwidth encoding of the color difference signals is implied as both modulator outputs are internally connected and summed into the same load resistor.

Sound Oscillator

Frequency modulation is achieved by using a 4.5 MHz tank circuit and deviating the center frequency via a capacitor or a varactor diode. Switching a 5 pF capacitor to ground at an audio frequency rate will cause a 50 kHz deviation from 4.5 MHz. A 1N5447 diode biassed −4V from pin 16 will give ±20 kHz deviation with a 1 Vp-p audio signal. The coupling network to the video modulator input and the varactor diode bias must be included when the tank circuit is tuned to center frequency.

A good level for the RF sound carrier is between 2% and 20% of the picture carrier level. For example, if the peak video signal offset of pin 12 with respect to pin 13 is 3V, this corresponds to a 30 mVrms picture RF carrier. The source impedance at pin 12 is defined by the external 2 kΩ resistor and so a series network of 15 kΩ and 24 pF will give a sound carrier level at −32 dB to the picture carrier.

RF Modulation

Two RF channels are available, with carrier frequencies up to 100 MHz being determined by L-C tank circuits at pins 6, 7, 8 and 9. The signal inputs (pins 12, 13) to both modulators are common, but removing the power supply from an RF oscillator tank circuit will also disable that modulator.

As with the chrominance modulators, it is the offset between the two signal input pins that determines the level of RF carrier output. Since one signal input (pin 13) is also internally connected to the chrominance modulators, the 2 kΩ load resistor at this point should be connected to a bias source within the common-mode input range of the video modulators. However, this bias source is independent of the chrominance modulator bias and where chrominance modulation is not used, the 2 kΩ resistor is eliminated and the bias source connected directly to pin 13.

To preserve the dc content of the video signal, amplitude modulation of the RF carrier is done in one direction only, with increasing video (toward peak white) decreasing the carrier level. This means the active composite video signal at pin 12 must be offset with respect to pin 13 and the sync pulse should produce the largest offset (i.e., the offset voltage of pin 12 with respect to pin 13 should have the same polarity as the sync pulses.

The largest video signal (peak white) should not be able to suppress the carrier completely, particularly if sound transmission is needed. For example, a signal with 1V sync amplitude and 2.5V peak white (3.5 Vp-p, negative polarity sync) and a black level at 5 V_{dc} will require a dc bias of 8V on pin 13 for correct modulation. A simple way of obtaining the required offset is to bias pin 13 at 4 x (sync amplitude) from the sync tip level at pin 12.

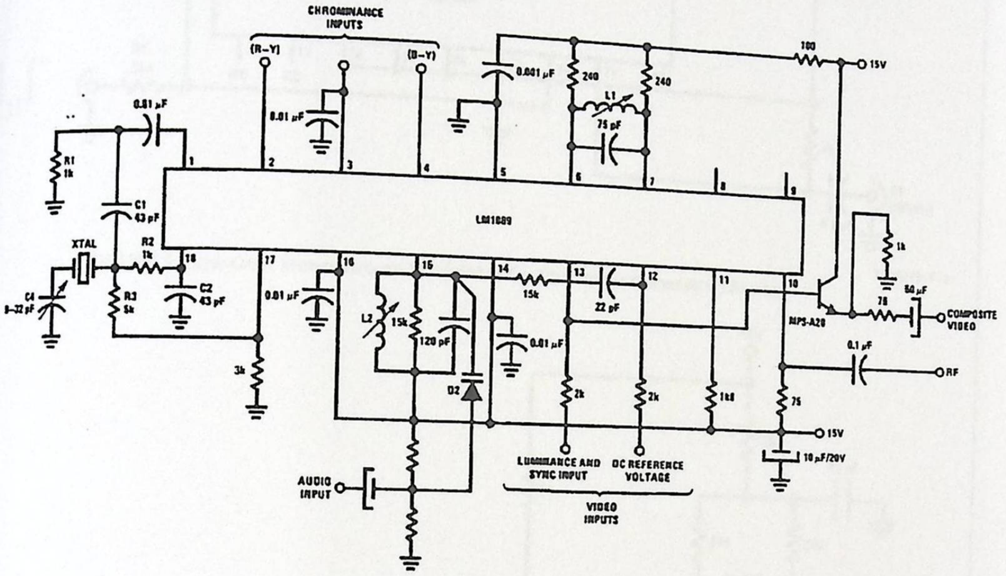
Applications Information (Continued)

Split Power Supplies

The LM1889 is designed to operate over a wide range of supply voltages so that much of the time it can utilize the signal source power supplies. An example of this is shown in *Figure 2* where the composite video signal from a character generator is modulated onto an RF carrier for display on a conventional home TV receiver. The LM1889 is biased between the −12V and +5V supplies and pin 13 is put at ground. A 9.1 kΩ resistor from pin 12 to −12V dc offsets the video input signal (which has sync tips at ground) to establish the proper modulation depth − $R1/R2 = V_{IN}/12 \times 0.875$. This design is for monochrome transmission and features an extremely low external parts count.

DC Clamped Inputs

Utilizing a DC clamp will make matching the LM1889 to available signal generator outputs a simple process. *Figure 3* shows the LM1889 configured to accept the composite video patterns available from a Tektronix Type 144 generator that has black level at ground and negative polarity syncs. In this application, the chroma oscillator amplifier is used to provide a gain of two. The 100k pot adjusts the overall DC level of the amplified signal which determines the modulation depth of the RF output. Clamping the input requires a minimum of DC correction to obtain the correct DC output level. This allows the adjustment to be a high impedance that will have minimum effect on the amplifier closed loop gain.



TL/H/7917–7

FIGURE 1. Luminance and Chrominance Encoding Composite Video or RF Output

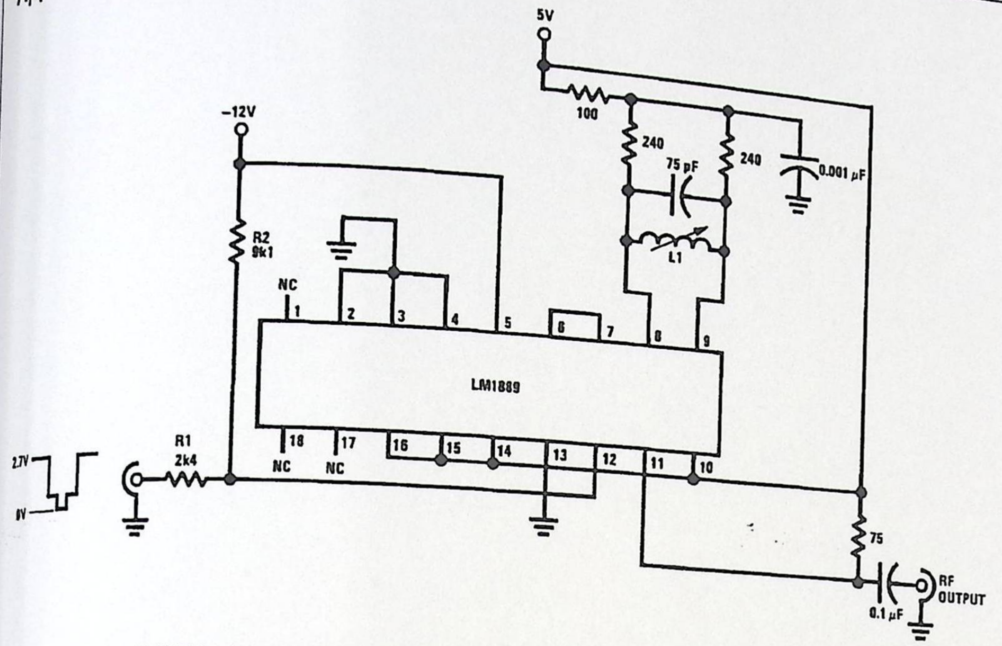


FIGURE 2. Low-Cost Monochrome Modulator for Character Generator Display

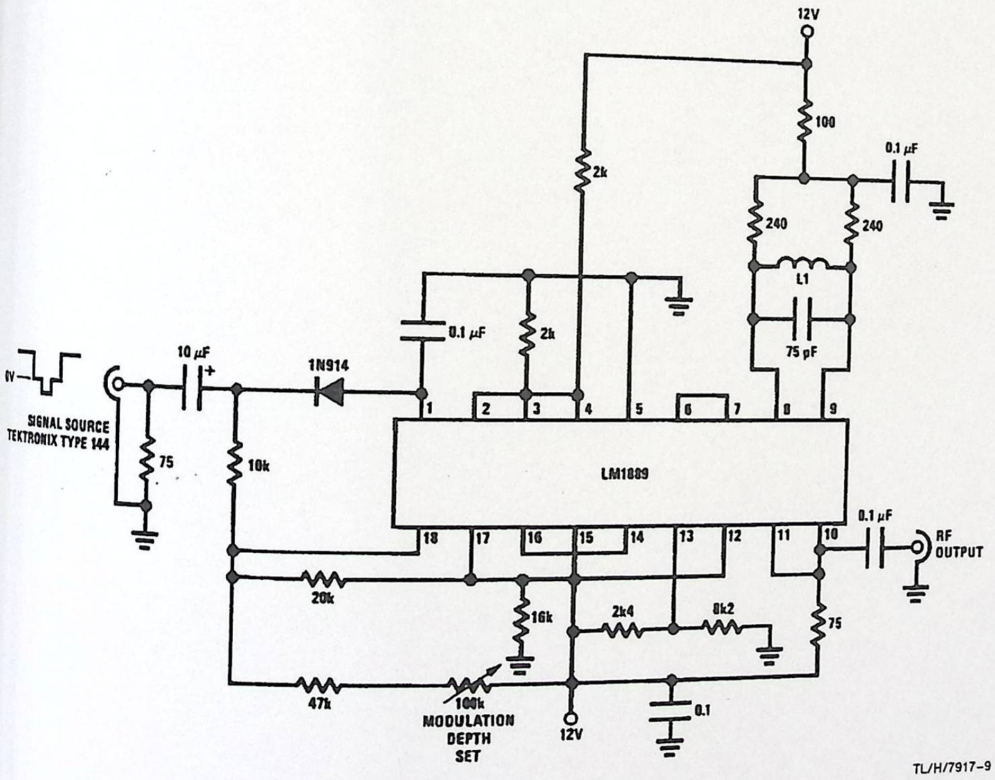
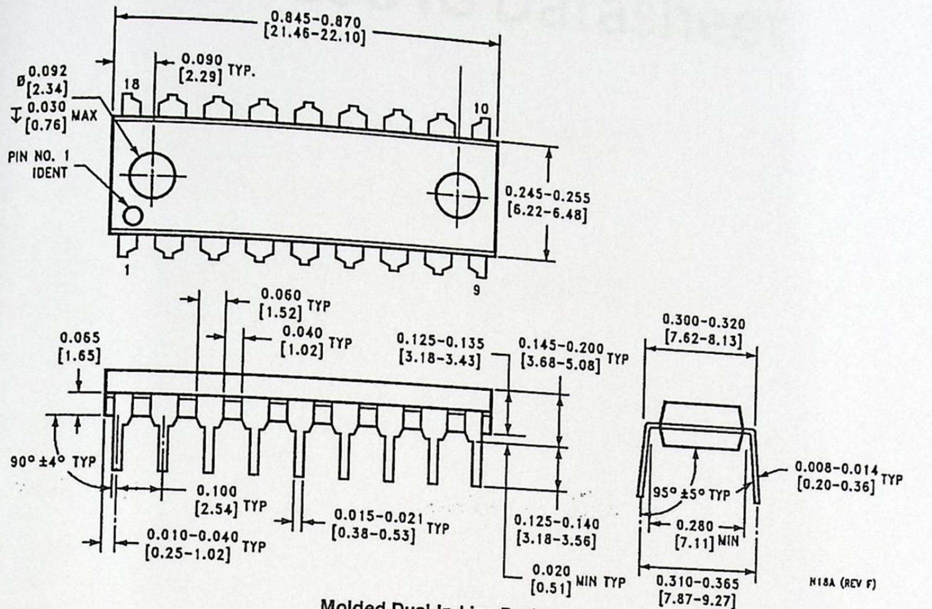


FIGURE 3. DC Clamped Modulator for NTSC Pattern Generators

Physical Dimensions inches (millimeters)



Molded Dual-In-Line Package (N)
Order Number LM1889N
See NS Package Number N18A

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Appendix C
C9018 Datasheet

Transistors

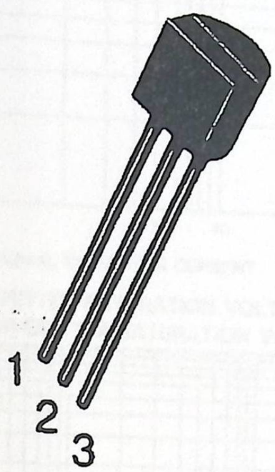
2SC9018

USHA (INDIA) LTD

AM/FM IF AMPLIFIER, LOCAL OSCILLATOR OF FM/VHF TUNER

• High Current Gain Bandwidth Product f_T=1,100 MHz (Typ)

TO-92



1. Emitter 2. Base 3. Collector

ABSOLUTE MAXIMUM RATINGS (T_a=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Base Voltage	V_{CBO}	30	V
Collector-Emitter Voltage	V_{CEO}	15	V
Emitter-Base Voltage	V_{EBO}	5	V
Collector Current	I_C	50	mA
Collector Dissipation	P_C	400	mW
Junction Temperature	Tj	150	°C
Storage Temperature	Tstg	−55~150	°C

ELECTRICAL CHARACTERISTICS (T_a=25°C)

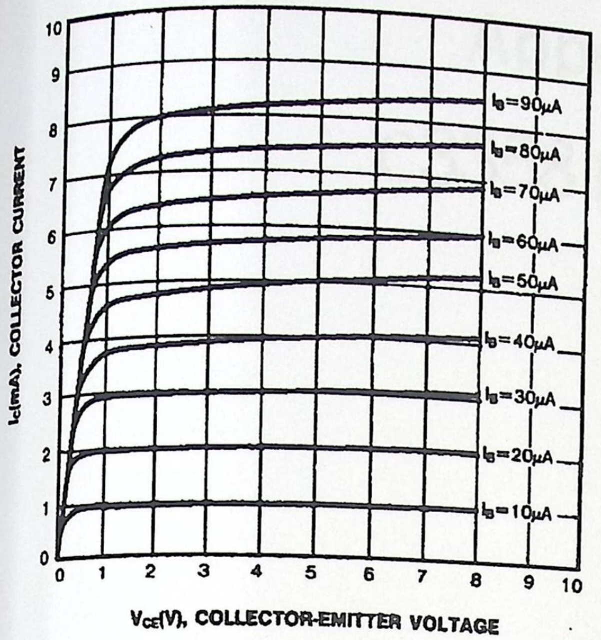
Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Collector-Base Breakdown Voltage	BV_{CBO}	I_C=100μA, I_E=0	30			V
Collector-Emitter Breakdown Voltage	BV_{CEO}	I_C=1.0mA, I_B=0	15			V
Emitter-Base Breakdown Voltage	BV_{EBO}	I_E=100μA, I_C=0	5			V
Collector Cutoff Current	I_{CBO}	V_{CB}=12V, I_E=0			50	nA
DC Current Gain	h_{FE}	V_{CE}=5V, I_C=1.0mA	28	100	198	
Collector-Emitter Saturation Voltage	V_{CE}(sat)	I_C=10mA, I_B=1mA			0.5	V
Output Capacitance	C_{ob}	V_{CB}=10V, I_E=0 f=1MHz		1.3	1.7	pF
Current Gain-Bandwidth Product	f_T	V_{CE}=5V, I_C=5mA	700	1100		MHz

h_{FE} CLASSIFICATION

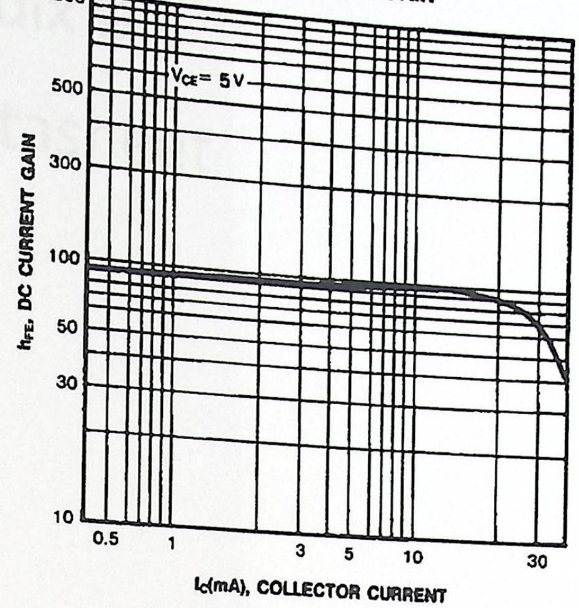
Classification	D	E	F	G	H	I
h_{FE}	28-45	39-60	54-80	72-108	97-146	132-198

ISO 14001 CERTIFIED

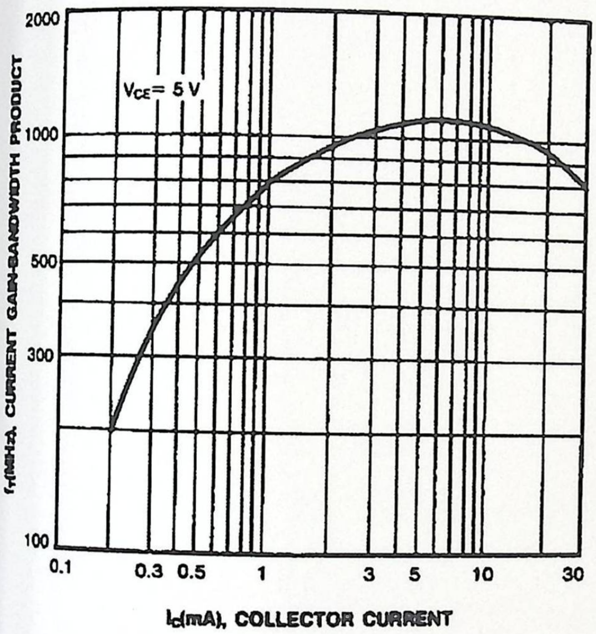
STATIC CHARACTERISTIC



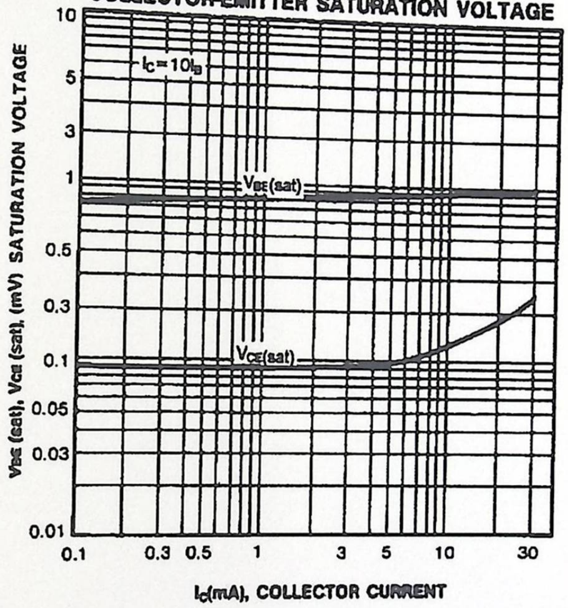
DC CURRENT GAIN



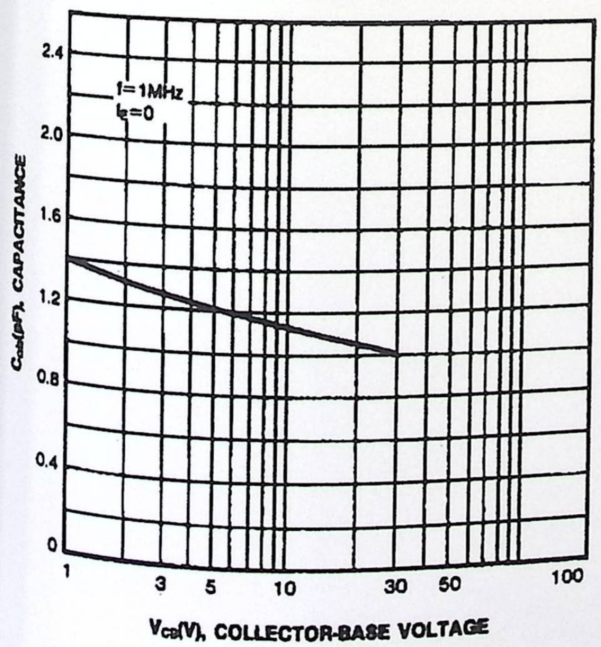
CURRENT GAIN-BANDWIDTH PRODUCT



BASE-EMITTER SATURATION VOLTAGE
COLLECTOR-EMITTER SATURATION VOLTAGE



OUTPUT CAPACITANCE



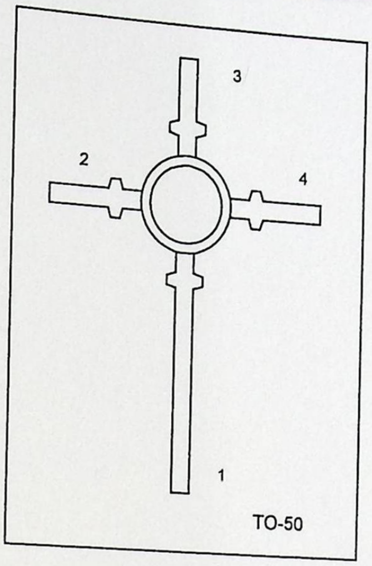
Appendix D
C3358 Datasheet

UTC 2SC3358 NPN SILICON EPITAXIALTRANSISTOR

HIGH FREQUENCY LOW NOISE AMPLIFIER

FEATURES

*Low Noise and High Gain
*High Power Gain



1:COLLECTOR 2:EMITTER 3:BASE 4:EMITTER

ABSOLUTE MAXIMUM RATINGS (T_A=25°C, unless otherwise specified)

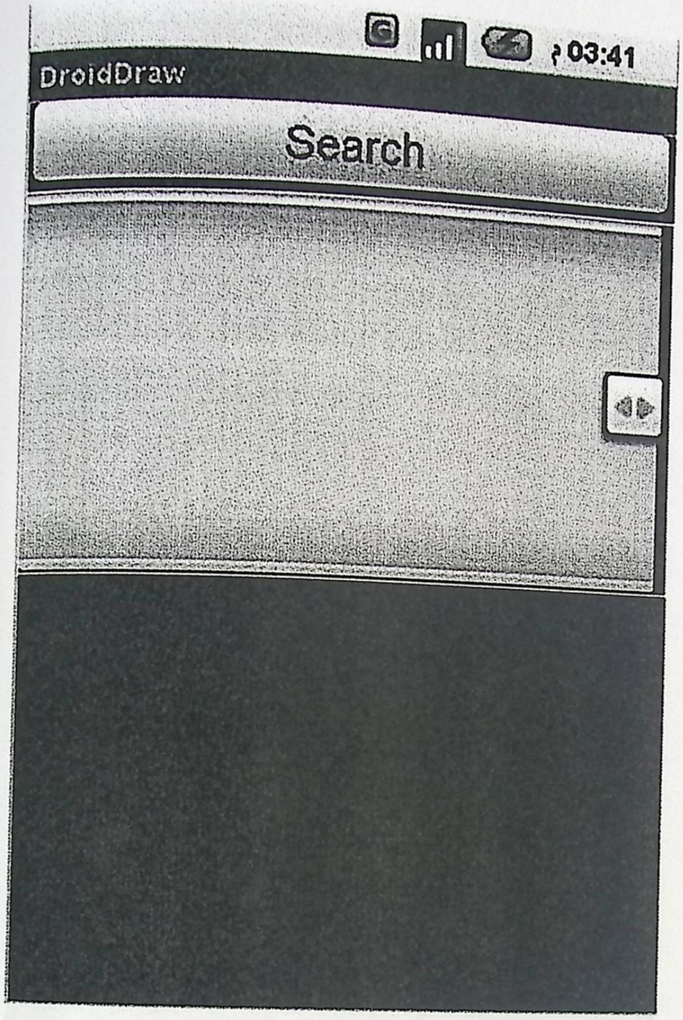
PARAMETER	SYMBOL	RATING	UNIT
Collector-base voltage	V_{CBO}	20	V
Collector-emitter voltage	V_{CEO}	12	V
Emitter-base voltage	V_{EBO}	3	V
Collector current	I_C	100	mA
Total power dissipation	P_T	250	mW
Junction Temperature	T_j	150	°C
Storage Temperature	T_{stg}	-65 ~ +150	°C

ELECTRICAL CHARACTERISTICS (Ta=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Collector Cutoff Current	I_{CBO}	V_{CB}=10V, I_E=0			1.0	μA
Emitter Cutoff Current	I_{EBO}	V_{EB}=1V, I_C=0			1.0	μA
DC Current Gain	h_{FE}	V_{CE}=10V, I_C=20mA	50		300	
Gain bandwidth Product	fT	V_{CE}=10V, I_C=20mA		7		GHz
Feed-Back Capacitance	Cre	V_{CB}=10V, I_E=0, f=1.0MHz			1.0	pF
Noise figure	NF	V_{CE}=10V, I_C=7mA, f=1.0GHz			2.0	dB

Appendix E
Android application interface codes

Andriod application interface

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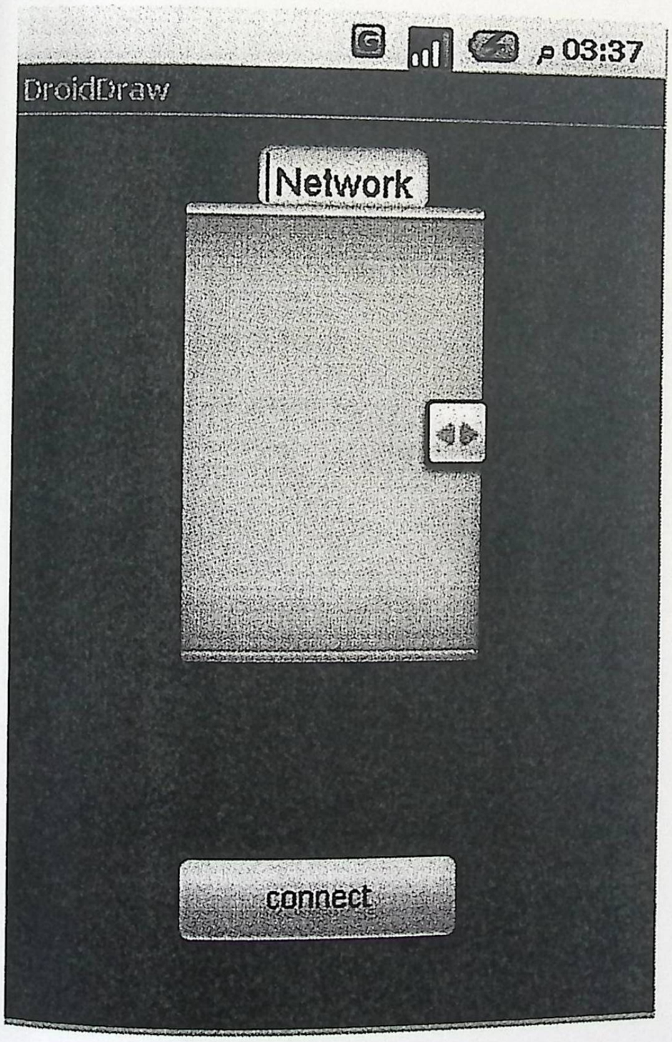


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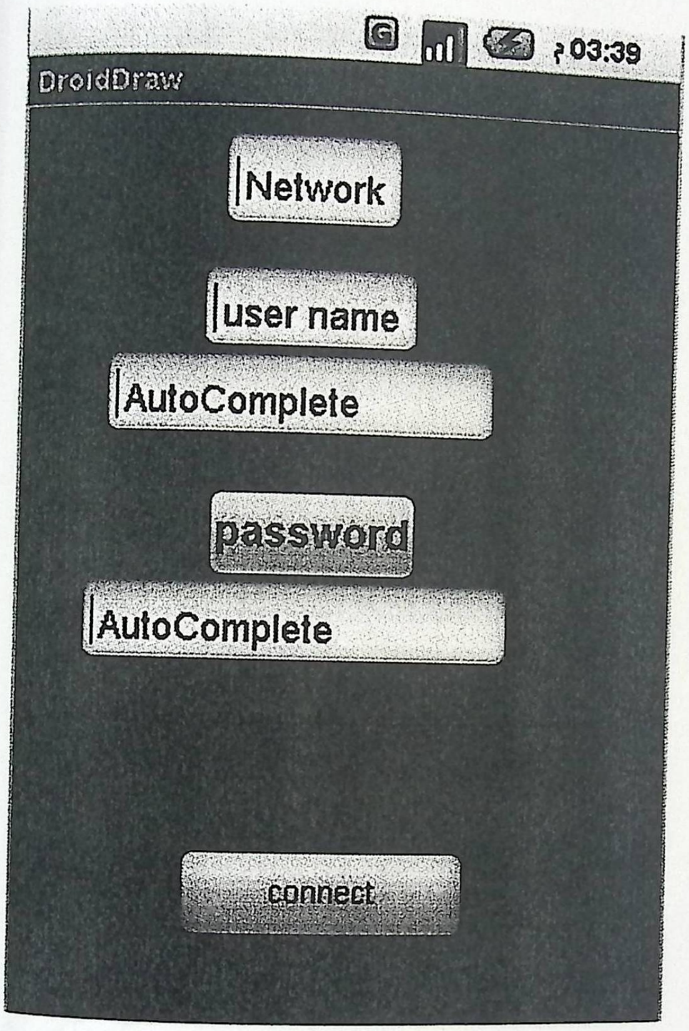


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