



# From Boolean Algebra to Smart Glass

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2014/03





# Boolean Algebra

Why mathematics is the base for today's computer technology?

In mathematics and mathematical logic, **Boolean algebra** is the subarea of algebra in which the values of the variables are the truth values *true* and *false*, usually denoted 1 and 0 respectively. The main operations of Boolean algebra are the conjunction ***and***, the disjunction ***or*** and the negation ***not***.



# Logic Circuits Design

The efficient implementation of Boolean functions is a fundamental problem in the design of combinatorial logic circuits.

Digital logic is the application of the Boolean algebra of 0 and 1 to electronic hardware consisting of logic gates connected to form a circuit diagram. Each gate implements a Boolean operation associated with the gates for conjunction (AND-gates), disjunction (OR-gates), and complement (inverters).



# Physical Implementation

A logic gate is an arrangement of **controlled switches** used to calculate operations using Boolean logic in digital circuits. They are primarily implemented electronically but can also be constructed using electromagnetic relays, electronic diodes, optical or even mechanical elements.

The CMOS semiconductor is the major implementation of today's logic gate in IC.



# Semiconductor Gate

We can define the ideal Digital Logic Gate to the ideal logic Voltage Levels as one that has a "LOW" level logic "0" of 0 volts (ground) and a "HIGH" level logic "1" of +5 volts for example. Where the opening or closing of the **Switch** produces either a logic level "1" or a logic level "0".



# IC Design

Modern electronic design automation tools for million gates circuits often rely on an efficient representation of Boolean functions known as (reduced ordered) binary decision diagrams for logic synthesis and formal verification.



# Computer

Modern computer is built from semiconductor IC, e.g. CPU processor, DRAM memory, NAND flash memory, peripheral controller, communications, power circuit, camera, display...

**It's in our daily life!**



# The Paradigm Shift

## The Trend is Smaller!

- Computer Room Mainframe; Serial/Parallel IO
- Working Room Mini-computer; Modem
- Desk Top PC; Ethernet
- Portable Notebook; Wireless WiFi
- Hand-held DSC, DV and Smart Phone; 3G/4G & WiFi
- What's Next ?





# Go Much Smaller

**The Next Generation is in the Wearable Products.**

**It let us free of our hand.**

**It's more smart to improve our life style.**

**The Wearable products want much smaller solution!**



# Wearable DV

GoPro got success very quickly due to its vision on sporty wearable DV. It uses ChipSiP's Multiple Chip Package to get size down.





# Google Glass

Google Glass gives a good product direction.





# Smart Glass

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**The Smart Glass will need display, camera, application processor, wireless communications and user interface.**



# Glass Weapon Required

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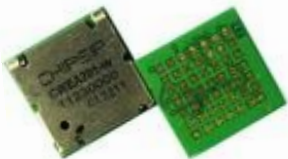
**More demand on the System in Package (SiP) integration.**

**Much lower power and highly integrated System on Chip (SoC).**

**Transparent Projector Display Glass.**



# ChipSiP System in Package



## 5-in-1 System SiP

14mm x 14mm

Dual Core AP + NANDx2 + DDR3Lx2

## 7-in-1 System SiP

18mm x 18mm

AP + NANDx2 + DDR3x2+WiFi +BT

## PoP SiP

15mm x 15mm

DSP + MCP( NAND + DDR2)

## RF SiP

9mm x 9mm

WiFi + Bluetooth

## Memory MCP

10.5mm x 13.5mm

DDR3 x 4 Stack

DDR3 + NAND 4 Stack



Wearable Devices



Compact High-Speed DSC



Wearable DV



Smart TV Dongle  
Tablet

simple way to smart life





# Technology 1 : System in Package

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**The most important thing for small wearable product is the size. The SiP is the heart of the key to reduce the circuit board size to let us handle the challenge for wearable required space.**



## Technology 2 : Projector Display Glass

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**It's the key for the smart glass.**

**It need very small projector display with good resolution on the transparent glass.**





## Technology 3 : System on Chip (SoC)

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**Integrate most system logic in a SoC is the major factor for smaller form factor design.**



## Technology 4 : Whole System Design

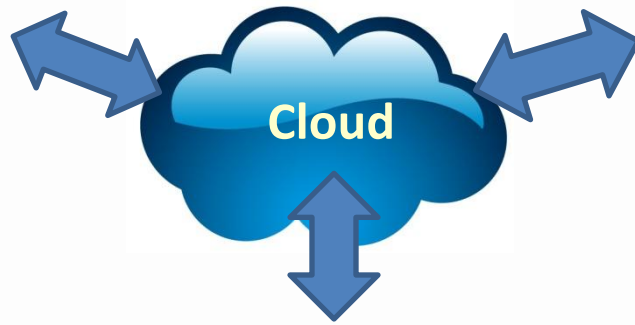
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**The engineering design work includes the system solution with highly integrated SoC, SiP, system board, transparent projector glass, camera, wireless communications, touch control, Android system and real-time communications in the cloud environment.**

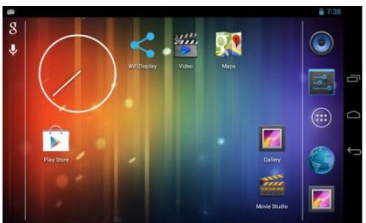


# Smart Glass Function

Cloud Service



Android Environment



Smart Connection



Wi-Fi Miracast

Entertainment



Environment Sensing

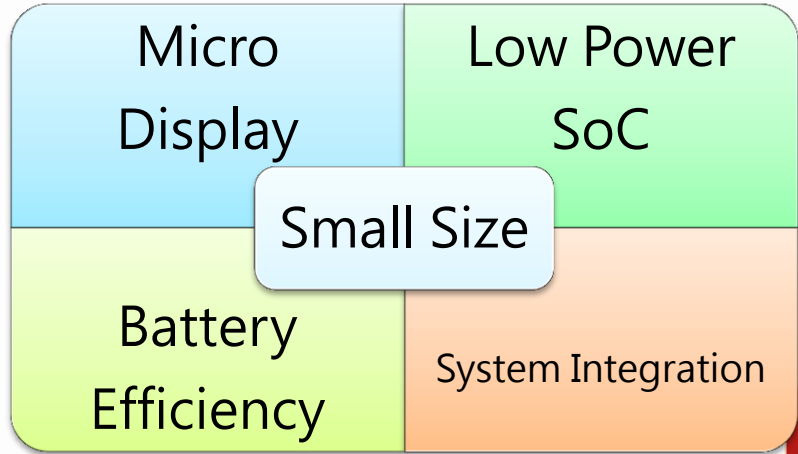
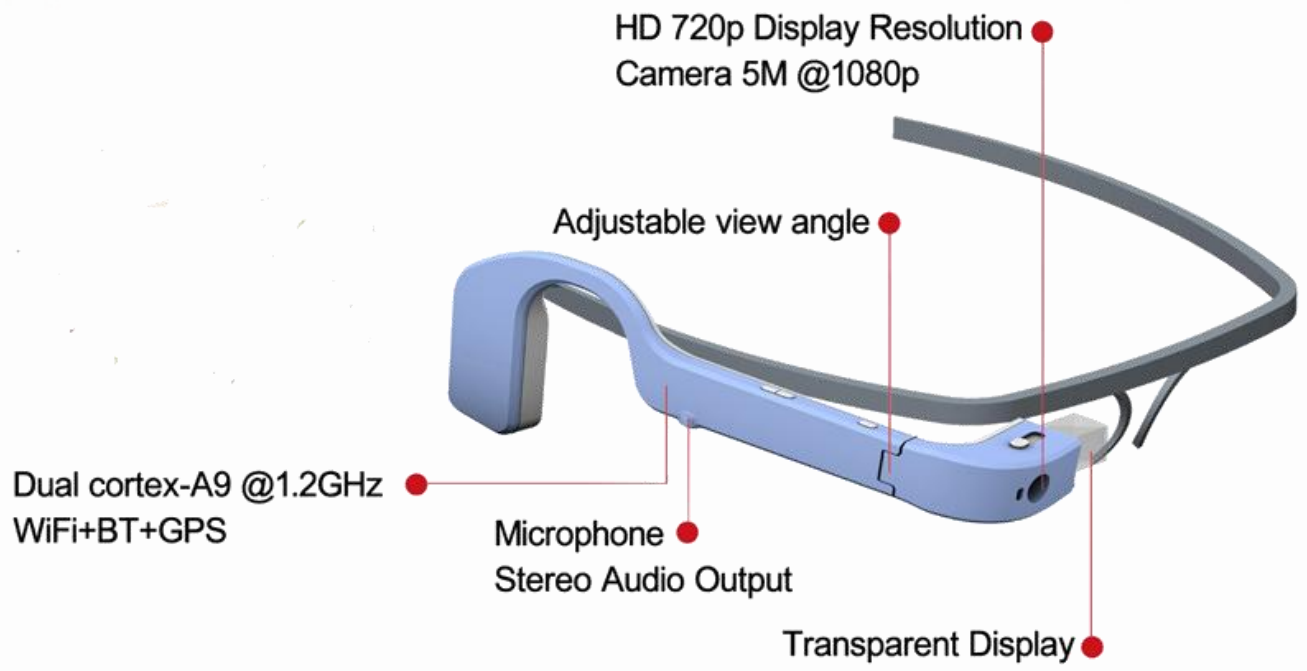


simple way to smart life





# Smart Glass Design





# HD Display Resolution

Smart Glass runs HD 720p display resolution with Tablet features



Google Glass: 360p display resolution



# Mobile Phone Operation

**Mirror your mobile phone's screen and operate the phone without picking up it.**

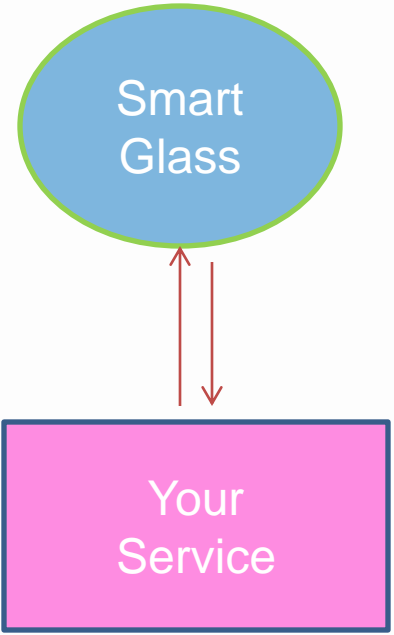


Wi-Fi Miracast

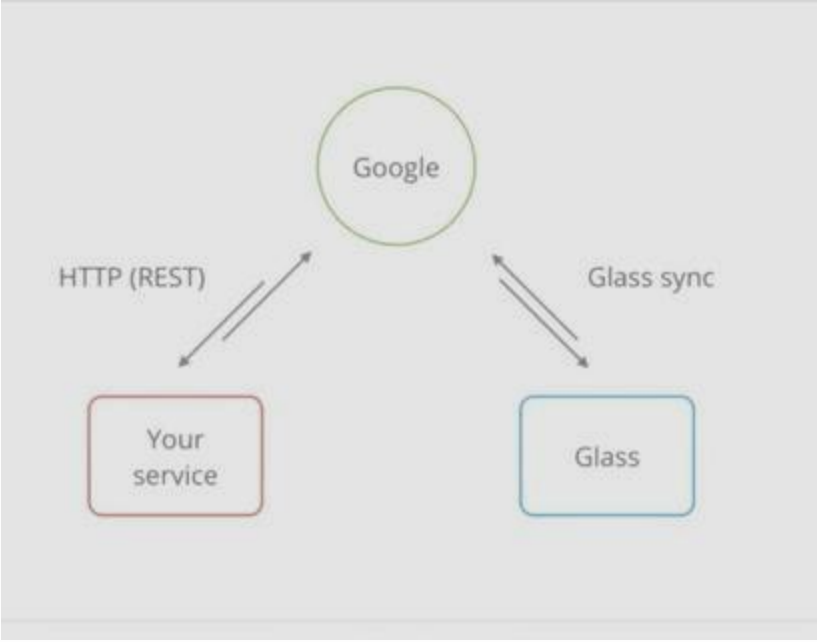


# A Single Tablet Device

**Smart Glass works like a Android tablet**



Google Glass needs new API supports from Google to run its services





# Standard Android Platform

Smart Glass runs a standard Android platform. Users can download over 70 thousands Android apps.

Google Apps Marketplace



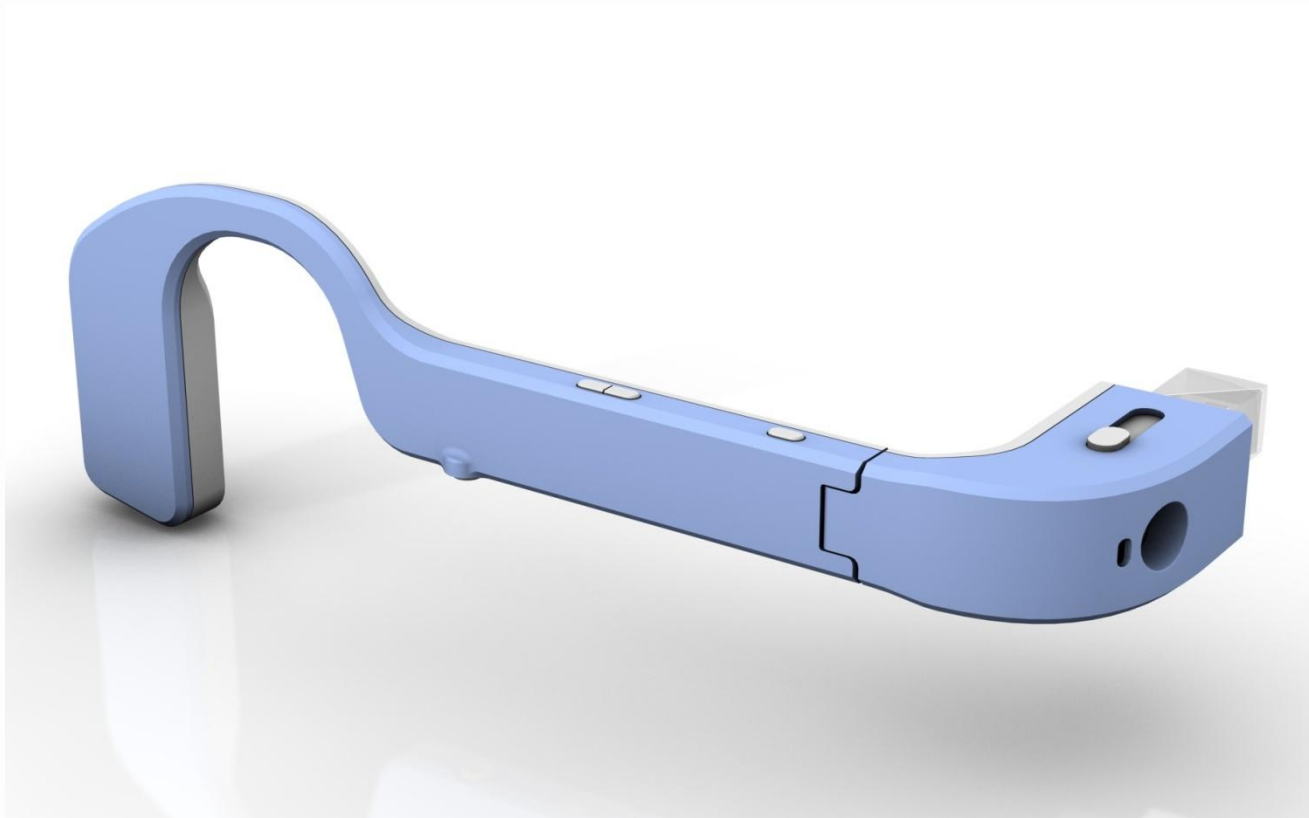
ANDROID 4.2





# Small Size

A small, lightweight and wearable glasses design similar to





# Smart Glass vs. Google Glass

Specs	ChipSiP Smart Glass	Google Glass
Display Resolution	HD 720p	360p
O.S.	Android 4.2.2	Android 4.0.4
CPU	dual core@1.6GHz	dual core @1.0GHz
Audio	Stereo earphone	Monaural bone conduction Transducer
Camera	5M/ 1080p	5M/ 720p
WiFi	150M WLAN card 802.11 b/g/n	54M WLAN card 802.11 b/g
MEMS	9 axis	9 axis
Operation	Full function Android system	Google Cloud
price	US\$500	US\$1500





# Smart Glass Apps

The Smart Glass along is just an excellent product. It need special applications to make it great.

## Our Smart Glass Apps:

- Mirror the smart phone screen and touch control, so we can use the phone without take it out.
- Live view of your eye to share with your friends in local group and/or remote internet social group.
- Live view chat like you are together.
- Data for your current activity like shopping, sight seeing, road condition, field environment ...



# Smart Glass Live Cloud

**The smart glass special Apps will need new Cloud Software and Server to support the live activities.**

**e.g. :**

- **Live Chat with eye view. (Live view of LINE?)**
- **Live Eye view video sharing. (Live YouTube?)**
- **Auto-tracking the eye focus point to show the related information and interact with the user. (Live Point of Sale)**



# Algorithm for Smart Glass App

The smart glass will use special algorithm to build applications for wearable environment. e.g. :

- Hand Gesture
- Voice Search
- Image Pattern Recognition for object, face
- Augmented Reality and Virtual Reality

Just like the 2G/3G/4G algorithm in the mobile phone, Mathematical Logic is the foundation.



# Thank You !!

