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**Department of ECE, Adhiyamaan College of Engineering, Hosur, Tamilnadu, India**

# Removable Mass Memory Unit in Docking Station

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**ABSTRACT:** Removable mass memory unit (RMMU) is a docking station which converts SATA 3.0 to USB 3.0 and vice versa. Docking Station is used by the pilot during the flight and all data of flight is stored in the docking station. The storage device is connected and data also recovered. The docking station also store machine planning operations. The storage device has one USB connector and SATA connector and one power connector. This storage device is fabricated on PCB with microcontroller and voltage conversion circuit. The memory unit is qualified to store all action of flight.

## I. INTRODUCTION

A flight recorder is an electronic recording device placed specifically in fighter aircraft for storing the data. These generally fall into two categories, removable and internal and have been manufactured to withstand harsher environmental condition than would be encountered for consumer grade electronics. Removable memory devices are typically used in quick access recorders and multi role recorders which allow personal to remove the storage device for data download at an analysis station and insert a new one. Data stored on recorder with internal storage can be accessed using standard communication interfaces. Encryption of data is typically in sensitive operation where there is a security risk of data is intercepted. In docking station there are multiple storage device in that we take single memory storage unit for our project.

## II. LITERATURE SURVEY

[1] Hotswappable Multi-Cartridge Docking Module, Steven L. Kaczeus, Sr., San Jose; Thomas McKnight; Roy J. Edwards, Nov 1993. [2] Enhanced three factor security protocol, T. Jenitha, S. Amutha, I. Shri Ram, Feb 2019. [3] A Novel NAND Flash Memory Architecture for Maximally Exploiting Plane-Level Parallelism, Myeongjin kim, Wontaeck jung, Hyuk-jun lee, Eul-young chung, Aug 2019. [4] Wireless Flight Data Recorder (FDR) for airplanes, Ankan-Ashish, S-Chougule, Jan 2012. [5] JET AIRCRAFT DATA ACQUISITION SYSTEMS, Adam Rojewski, Jarosław Bartoszewicz, 2018.

## III. OBJECTIVE

The main objective is to fabricate a memory docking station in printed circuit board (PCB). The microcontroller is programmed to work as the interface between personal computer and storage device. The stored data in the storage device get analysed by loading the drive in memory docking station. The design also includes external appearance.

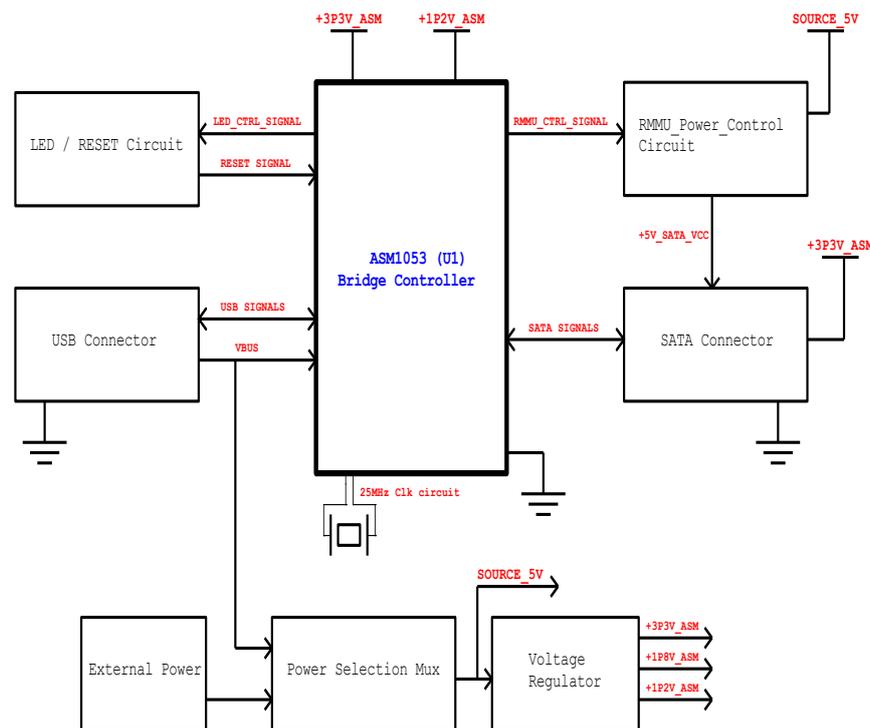
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#### IV. WORKING PRINCIPLES

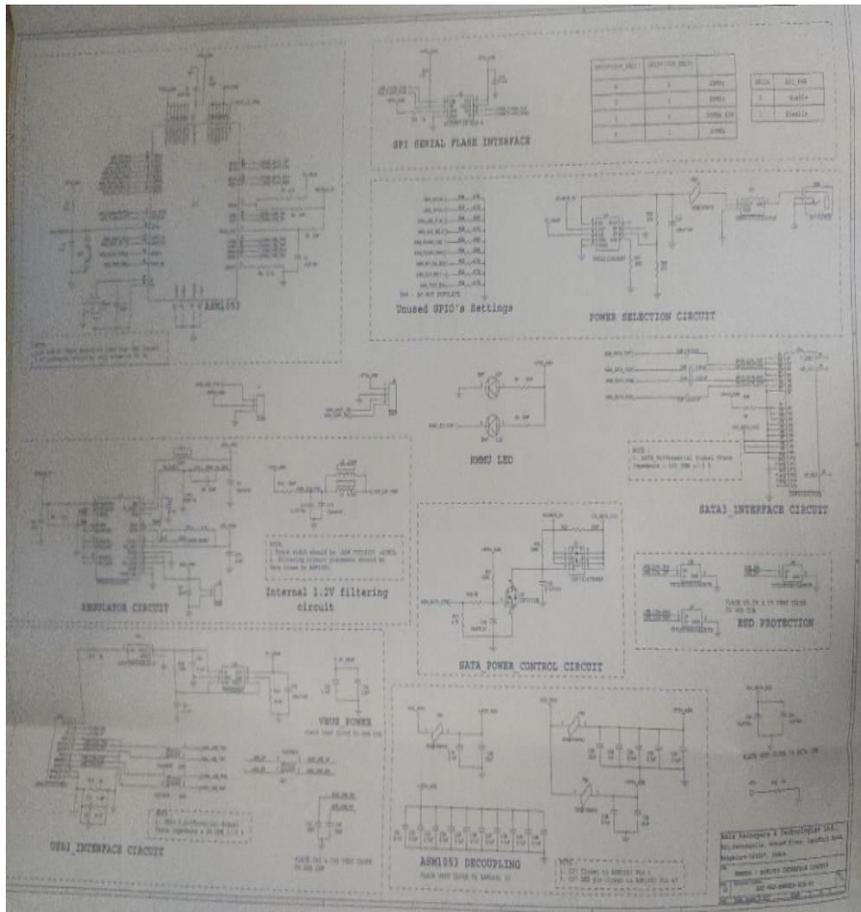
- This memory docking station will be only used by the pilot of fighter jet. The pilot carry the storage device and insert in a docking station.
- The memory storage device is connected SATA 3.0 which will collect all type of data like airbase communication altitude, speed, GPS, radar, etc. (ref.no.[8], [9])
- The solid state drive (SSD) is a storage device and it is connected manually in the docking station via SATA.
- After the SSD connected recording indication is shown in LED. Yellow LED (LD2) will glow during data transfer (Bus activity) activity on memory unit.
- The fighter jet make scouting, fighting over warzone and all data of the jet records and stored in SSD.
- The pilot get the docking station to the airbase for data analysing procedure.
- The data is analysed in personal computer by connecting USB 3.0.

#### V. BLOCK DIAGRAM



**Figure 1:** Block Diagram of Removable mass memory unit docking station

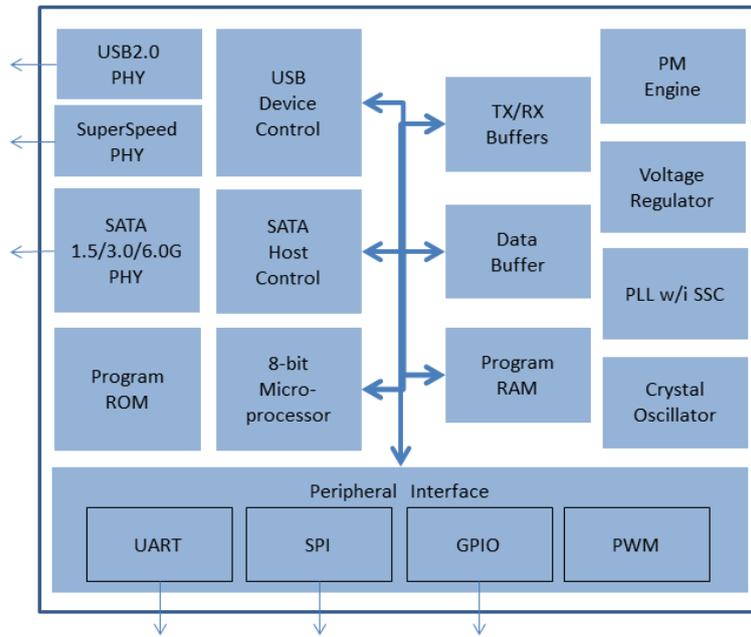
### VI. CIRCUIT SCHEMATICS



**Figure 2:** Circuit Schematics of Removable mass memory unit docking station

### VII.ASM 1053-6G BRIDGE CONTROLLER

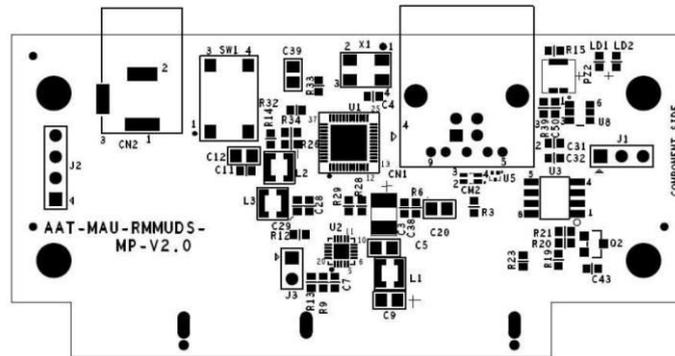
- It is a bridge controller provides a turnkey way to integrate a USB interface design and operate in 5V.
- This controller is used to work as an interface between storage device and personal computer.
- Using the USB pin it has high speed and full speed operation like read and transferring the data.
- It transfer bulk of data simultaneously and supports 20/25/30 MHZ external crystal mode.
- ASM1053-6G chip from ASMedia requires 3.3V and 1.2V supply voltages for its operation.
- VBUS is extended to the chip as a signal which helps the docking station to be detected by windows OS with or without storage device.



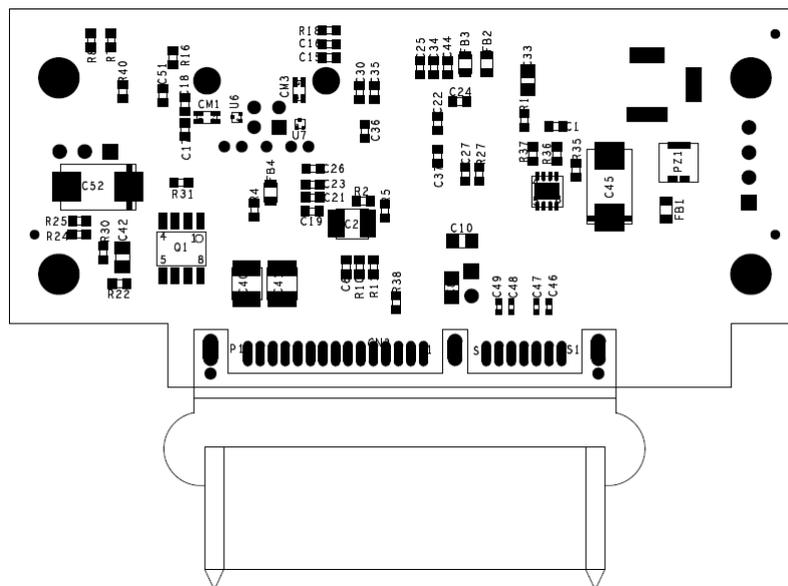
**Figure 3:** Architecture of ASM 1053-6G

### VIII. PCB DESIGN & ELECTRIC DESIGN

The multilayer printed circuit board used to fabricate the memory docking station. It has more circuit route for mapping in PCB. PCB consists of bridge controller ASM1053 6G (SATA to USB) voltage regulator, voltage selection MUX, flash, USB 3.0 type B connector, 3.5mm power connector and other associated electronics. Using OrCAD software we design a circuit schematics diagram with standardized symbol used for docking station circuit. With the help of circuit schematics we assign footprints to the components. Once the PCB design completed next step is to fabricate the PCB. The fabricated circuit board is assembled with electronic components as per schematic diagram and tested for working process. External power supply is given to the docking station the power selection MUX is switch that distributed the power to microcontroller and control circuit. Following the power selection MUX voltage regulator distribute the voltage over microcontroller and other electronics blocks. The bridge controller programmed to collect the data from the jet via SATA 3.0 connector (ref.no. [7]). For indication of loading the storage device in docking station the LED is connected. Clock circuit maintain the signal in constant frequency. The USB 3.0 B type connector used to read the data from storage device which is connected in SATA by personal computer.



**Figure 4: Main PCB Component placement (Top Side)**



**Figure 5: Bottom side of the main PCB**

## **IX. MECHANICAL DESIGN**

This developed memory unit docking station is fixed within a metal shell made of aluminium alloy HE20. It is heat resistive and all external parts are painted with black polyurethane to avoid corrosion of metal. All the plates have electromagnetic indication (EMI) gaskets, when all the plates are assembled together these gaskets will get compressed and provide the proper continuity between the plates to provide the protection from EMI/EMC. When memory units are inserted, spring loaded guide will be with tension and provides the required amount of pressure to eject when memory unit is unlocked. The opening (window in the front plate) will have a transparent polycarbonate transparent sheet placed to view the inserted storage device.



**Figure 6:** Mechanical appearance of removable mass memory unit docking station

## X. RESULT

Removable mass memory unit docking station is tested by transferring data from storage device and vice versa. The data from the jet like radar, altitude, speed, GPS, airbase communication and other action of the aircraft. The removable storage device stores all data via SATA. The device is connected through USB and the data is transferred and get analysed by the PC.

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