Lại Huy Anh 2110725
Nguyễn Trí Tuấn 2151272
Đồng Trinh Hoàng Nguyên 2151124

Trần Quang Minh 2151230

TOPIC: Displaying the pre-save video on TFT LCD with STM32 and applying remote on controlling LCD

Product Requirements

I. Industrial Design

#	Feature/Characteristic	Product Requirements	Priority	Technical/Engineering Specifications	Comments
	Aesthetics	The industrial design should have an appealing and professional appearance.	High	Clean and modern design with minimalistic elements. - Smooth and seamless integration of components. - Harmonious color scheme that aligns with the industrial environment.	
I.1	Ergonomics	should consider ergonomic factors for user comfort and usability.	High	- Optimal viewing angles for comfortable video playback. - Intuitive placement and accessibility of controls for easy operation. - Consideration of user interaction and hand positioning.	
I.2	User Experience	prioritize a positive and user-friendly	High	- Clear and intuitive labeling of controls and	

		experience.		functions. - Visual cues and indicators for status and operation. - Consideration of user feedback and ease of use.	
I.3	Visual Interface	provide a clear and user-friendly visual interface for video display.	High	- Adequate screen size to display video content with sufficient clarity and readability. - Optimal aspect ratio for the intended video format (e.g., 16:9 or 4:3).	
I.5	Connectors	Shall have a USB-C port, USB-B and HDMI	High	- USB-B (2.0): 480 Mbps - USB-C (2.0) - HDMI (1.0)	

II Display Screen

#	Feature/Characteristic	Product Requirements	Priority	Technical/Engineering Specifications	Comments
II.1	Display Size and Resolution	The display screen shall have a specific size and resolution to provide a clear and detailed video playback.	High	- Have a size of 16x2, indicating 16 characters per row and 2 rows.	
II.3	Backlighting	include a backlighting system to ensure visibility in different lighting conditions.	High	- Voltage from 3.3 to 5V	
II.4	Response Time	a fast response time to minimize motion blur	Medium	A lower response time (e.g., 5ms or lower) is generally desirable for smoother video rendering.	

	Power Consumption	designed to be power-efficient to minimize energy consumption during video playback.	Medium	100 mW	

III Connectivity

#	Feature/Characteristic	Product Requirements	Priority	Technical/Engineering Specifications	Comments
2.1	Bluetooth Low Energy (BLE)	Shall utilize BLE during setup and discovery when the toothbrush is activated	High	Using nRF51822 GNU. Using SoC (system on chip) configurations. Connection model.	
2.3	Consumer IR	Shall only work for specific remote control	High	Using STM32, TSOP3123. NEC IR transmission protocol.	
2.4	Channel Support	Shall support USB HDMI channel.	High		

IV Power

#	Feature/Characteristic	Product Requirements	Priority	Technical/Engineering Specifications	Comments
IV.1	Power	The chip run with the mixture input of 3V tolerant and 5v tolerant	High	The source needs to remain constant at 5V standard	Ensure the stable and constant power source for the chip
IV.2	Adapter	Adapter will equip with a USB-C port for supplying	High	2 pin outlet and maximum voltage at 240V	to suitable for the country with high voltage source and multiple type of plugger

IV.3	Power Cable	USB-C power cable shall connect directly to the microchip Satisfied the high-power delivery for the chip	High	The cable must have reversible technology for plugging without worry about orientation.	Protecting the device from being destroyed
IV.4	Idle Power Consumption	Should be remain constant at 12.7mA in run mode	medium	Implementing with suitable power source	Utilize the power consumption of the chip
IV.5	Screen monitor	Contain with a separately power source depend on the type of screen (12-24V)	medium	A special adapter suitable for the screen if the screen type change	For satisfying the demands of bigger screen.

V Durability

#	Feature/Characteristic	Product Requirements	Priority	Technical/Engineering Specifications	Comments
1.1	Humidity	Shall be well functional and operational under 90% humidity	High		
1.2	Weather Resistant	Shall meet a rating of at least IP56	High		
1.3	Operating Temperature Range	Shall be well functional and operational within the range of 32°F (0°C) to 120°F (49°C)	High		
1.4	Touch Discomfort	Shall not cause discomfort (sharp, hot)when touched or held	High		

1.5	Impact Protection	Shall meet a rating of at least IK02	High		
1.6	Lifetime	Shall last for at least 1 years	High	Using single core copper cable	
1.7	Explosive Protection	Shall shut down automatically whenever overheat during operation	High	Using any type of KSD301	Prevent self-destruct
1.8	Drop test	Shall survive and be operational when dropped from at least 1.7ft(52cm) height	Medium		

VI Packaging

#	Feature/Characteristic	Product Requirements	Priority	Technical/Engineering Specifications	Comments
VI.1	In the box	Included in the box are: ● STM32 microchip ● TFT LCD ● Wires ● Adapter ● ST-Link device ● A setting-up instruction ● USB-C cable ● Insurance	High	A cover plastic bags, anti-shock bag and a 250x150mm box	To contain all the compliments and separates individually
VI.2	On the Box	The name of the device The products number A list of all components and the quantities	High	All the data must be printed directly on the cover of the box	For checking and ensuring the box is fully equipped

VII Out of Box Experience (OOBE)

#	Feature/Characteristic	Product Requirements	Priority	Technical/Engineering Specifications	Comments
VII.1	Time to Install (Physical Installation)	Shall be physically installed within 10mins or less	High	The instruction contains with demo picture of each setting-up step of physical installation	Make sure customer assembling the device probably
VII.2	Software/Firmware Setup	Overall software setup shall be done in 5mins or less	High	All the chip must be pre-set with the code and containing video examples. The cellphone app contains example video how the product executes	
VII.3	The cell-phone app	Shall allow for only one user at each time. The device can be operated with any phone if it synchronizes. However, the device acting like an Bluetooth device only allow one app interact at the same time	medium	The device saving the cell-phone IP	To prevent error from displaying multiple videos at the same time.

VII.4	Data Storage	Showing number of videos has been saved The amount of storage left in the device's disk	High	Use the statvfs or statfs system calls to retrieve information about the available and total disk space on a specified path	

VIII. Security & Privacy

#	Feature/Characteristic	Product Requirements	Priority	Technical/Engineering Specifications	Comments
VIII.1	Access Control	Define and enforce access control policies.	Medium	Implement role-based access control (RBAC) to restrict access based on user roles.	Ensure that users have appropriate permissions and access levels.
VIII.2	Audit Trails	Maintain detailed logs of user activities and system events.	Medium	Implement logging mechanisms and storage for audit trails.	Facilitate traceability for security incidents and compliance purposes.
VIII.3	Secure Communication	Ensure secure communication channels between components.	High	Use protocols like TLS/SSL for secure data transmission and	Protect data integrity during communication between devices.

IX. Regulations & Certifications

Assuming this will be launched in the US and Canada first, then the certification tests might be :

#	Region	Compliance/Certifications	Priority	Technical/Engineering Specifications	Comments

IX.1	US	FCC Certification	High	Ensure that the product meets Federal Communications Commission (FCC) standards for electromagnetic interference.	Obtain FCC certification to legally market and sell the product in the United States.
		NIST Cybersecurity Framework	Medium	Align with the National Institute of Standards and Technology (NIST) framework for cybersecurity.	Implement NIST-recommended cybersecurity practices to enhance overall system security.
IX.2	Canada	IC Certification	High	Ensure that the product meets Innovation, Science, and Economic Development Canada (ISED) standards for electromagnetic compatibility.	Obtain IC certification to legally market and sell the product in Canada.
IX.3	EU	CE Marking	High	Affix the CE marking to indicate compliance with European Union (EU) safety and environmental requirements.	Obtain CE marking to demonstrate conformity with EU regulations and enable product distribution in the EU.
		GDPR Compliance	Medium	Comply with General Data Protection Regulation (GDPR) for data protection and privacy.	Implement measures to protect user data and ensure compliance with GDPR regulations.

X. Serviceability & Warranty

#	Feature/Characteristic	Product Requirements	Priority	Technical/Engineering Specifications	Comments
1	Ease of Maintenance	Design the product for easy maintenance and servicing.	High	Use modular components to simplify replacements and repairs.	Facilitate quick and cost-effective maintenance to minimize downtime.

2	User-Replaceable Parts	Identify and specify which components users can replace.	Medium	Ensure that components like batteries or consumables are user-replaceable.	Empower users to perform basic replacements without professional assistance.
3	Diagnostic Features	Include built-in diagnostic tools for issue identification.	High	Implement diagnostic routines accessible to technicians for troubleshooting.	Enable efficient and accurate identification of problems during maintenance.
4	Warranty Period	Define the warranty duration for the product.	High	Specify a warranty period (e.g., 1 year, 2 years) covering manufacturing defects.	Clearly communicate the warranty terms to customers for transparency.
5	Warranty Service	Outline the warranty service process and conditions.	High	Establish a clear procedure for customers to initiate warranty claims.	Provide efficient and customer-friendly warranty service to enhance satisfaction.
6	Remote Diagnostics	Implement remote diagnostic capabilities for support teams.	Medium	Enable remote access to diagnostic data with user consent for troubleshooting.	Facilitate quick and effective support without the need for on-site visits.
7	Documentation	Provide comprehensive documentation for troubleshooting and maintenance.	High	Develop user manuals and technical documentation.	Empower users and technicians with clear instructions for maintaining and troubleshooting the product.
9	Customer Support	Establish a customer support system for technical assistance.	High	Offer multiple support channels (e.g., phone, email, online chat).	Provide responsive and helpful customer support to address user inquiries and issues.