Software Design Notes

What is a miniPCB?

A miniPCB is a printed circuit board that contains a layout of an electronic circuit.

A miniPCB has a mechanical design that is consistent with numerous similar miniPCBs.

A miniPCB has an interface connector that is simple and economical.

A miniPCB has educational documentation that is approved by an engineer.

A miniPCB is sold in minimum-order-quantities determined by the PCB panel size.

www.minipcb.com

This document is available for free as a download from the GitHub repository:

https://github.com/miniPCB

This document is associated with the miniPCB Channel on YouTube:

https://www.youtube.com/@minipcb

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Introduction

Purpose

The purpose of this document is to record software design notes for the 13A-777 miniPCB.

Scope

The scope of this document is limited to specifications and requirements, source code, and firmware releases.

File Locations

FILE NAME	FILE LOCATION
[ALL]	https://github.com/miniPCB/EAGLE/tree/main/miniPCB/13/A/13A-777

Definitions and Abbreviations

- Convitae, the ratio of a response per input behavior.
- DHM, device histogram matrix, used to organize and access data.
- HPC, histogram program counter, used to track most recent game.
- HVC, histogram vector counter, used to track most recent entry.

Specification Requirements

SSR1 – Hardware Abstraction

No text (title)

SSR1.1 – Power

Manage power mode with these functions:

FUNCTION	DESCRIPTION
sleepDeep	Minimal power consumption mode.
sleepActive	Low power consumption mode without sleeping.
activeGame	High power consumption mode.
batteryVoltage	Reads the current battery voltage.

SSR1.2 – LCD

Control the 2x16 LCD with these functions:

FUNCTION	DESCRIPTION
setContrast	Controls the voltage controlling the LCD contrast.
setBacklight	Controls the voltage controlling the LCD backlight.
refreshScreen	Writes the full screen to the LCD module.

SSR1.3 – LED

Control the LED indicator with these functions:

FUNCTION	DESCRIPTION
setLED	Turns an LED indicator on.
clearLED	Turns an LED indicator off.
toggleLED	Toggles an LED indicator from off to on, or on to off.

SSR1.4 – Primary Select Button

Interface with the primary select button with this function:

FUNCTION	DESCRIPTION
readSelectButton	Signals include: (1) wake, (2) confirm, (3) select.

SSR1.5 – Rotary Encoder

Interface with a rotary encoder with these functions:

FUNCTION	DESCRIPTION
setEncoderRGB	Sets color of the RGB LED on the encoder.
readEncoderButton	Reads the encoder button switch.
readEncoderRotation	Reads the encoder rotation count.

SSR1.6 – Device Clock

Maintain a device clock with 1 second resolution with these functions:

FUNCTION	DESCRIPTION
setTimer	Sets value in timer counter.
getTimer	Reads value in timer counter.
incTimer	Increments value in timer counter.
spareTime	Returns with the counts available in the long (8 bytes).
secondsRatio	Returns with the ratio of current_count per max_count.

SSR1.7 – Device Histogram

No text (title)

SSR1.7.1 – Histogram Programming Interface

Maintain a device histogram with these functions:

FUNCTION	DESCRIPTION
recordHistogram	Adds a new record to the device histogram. Clears user interaction counters: buttonpress, encoderpress, and rotation.
playHistogram	Moves each value of the device histogram through the working register.
readHistorgram	Reads the histogram matrix.
readHistogramValue	Reads a value from the histogram matrix.

SSR1.7.2 – Game Results

Memory available for recording whatever game result is available.

SSR1.7.3 – Count Ratios

Device count ratios are computed by dividing a count-value by the max-count-value.

SSR1.7.4 – Rolling Memory

Write over the oldest data in the matrix to accommodate new data.

SSR1.7.5 – Histogram Program Counter (HPC)

Use a histogram counter to keep track of the most recent histogram entry.

SSR1.7.6 – Histogram Vector Counter (HVC)

Use a histogram counter to keep track of the most recent vector entry.

SSR1.7.7 – Device Histogram Matrix (DHM)

Use the histogram counters to form a matrix.

    Eq. 1. $DHM(HPC, HVC)$

SSR1.7.8 – Histogram Vector

Device histogram will be comprised of a matrix of vectors defined below.

#	DATA NAME	TYPE	INTUITIVE FOCUS
0	GAME RESULT 0	char	GAME CONVITAE * USER CONVITAE
1	GAME RESULT 1	char	
2	GAME RESULT 3	char	
3	GAME RESULT 4	char	
4	GAME RESULT 5	char	
5	GAME RESULT 6	char	
6	GAME RESULT 7	char	
7	GAME RESULT 8	char	
8	SECOND COUNT RATIO	char	DEVICE CONVITAE
9	BUTTONPRESS COUNT RATIO	char	
10	ROTATION COUNT RATIO	char	
11	ENCODERPRESS COUNT RATIO	char	
12	BATTERY VOLTAGE RATIO	char	
13	USER SIGNAL 0 (LIVE)	char	DEVICE CONVITAE * USER CONVITAE
14	USER SIGNAL 1 (LOVE)	char	
15	USER SIGNAL 2 (LEARN)	char	

SSR1.7.9 – Histogram Memory Map

Device histogram will be mapped according to the memory map defined below.

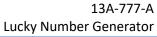| #	HPC	HVC = 0 MEMORY ADDRESS	HVC = 15 MEMORY ADDRESS
0	0	2A0h	2AFh
1	1	2B0h	2BFh
2	2	2C0h	2CFh
3	3	2D0h	2DFh
4	4	2E0h	2EFh
5	5	320h	32Fh
6	6	330h	33Fh
7	7	340h	34Fh
8	8	350h	35Fh
9	9	360h	36Fh
10	10	3A0h	3AFh
11	11	3B0h	3BFh
12	12	3C0h	3CFh
13	13	3D0h	3DFh
14	14	3E0h	3EFh

SSR2 – Game Functionality

No text (title)

SSR2.1 – Core Functionality

Selects catalog entries according to three variables: (1) the user control of the button input, (2) the game being played, and (3) the state of game being played.

Source Code

Table 1 – \FilePath\FileName1.ext

INSERT CODE HERE

Table 2 – \FilePath\FileName2.ext

INSERT CODE HERE

Table 3 – \FilePath\FileName3.ext

INSERT CODE HERE

Table 4 – \FilePath\FileName4.ext

INSERT CODE HERE

Firmware Release History

Table 5 – Release 000-000-0-NM.DDMMMYYYY

File Name	
File Size	
File Location	
Target Hardware	
Maturity Level	
Compiler Notes	

Change and Liability Notice

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WORDMARK	FIGUREMARK	FIGUREMARK
miniPCB™		

Revision History

REV	DESCRIPTION	ECO	DATE
A	Initial Release	N/A	DDMMMYYYY

Related Content

#	TYPE	DESCRIPTION	LOCATION
1	Sale Posting	eBay	
2	Sale Posting	Mouser	
3	Repository	Engineering Files	https://github.com/miniPCB/EAGLE/tree/main/miniPCB/13/A/13A-777
4	Video	Preparation	https://youtu.be/YeX36dg0lwk
5	Video	Design	https://youtu.be/6YcOx_vTpKk
6	Video	Documentation	https://youtu.be/-dhOiV1X4uM
7	Video	Development	
8	Video	Testing	
	Video	Engineering Release	