# TECHNICAL DOCUMENTATION

| | |
|---|---|
| ***Project:*** | X-NUCLEO-SPINAND-MAC |
| ***Customer:*** | ARROW ELECTRONICS s.r.l. |
| ***FAE++ code:*** | 2016-3025 |
| ***Date:*** | 03/10/2016 |
| ***Revision:*** | 001 |
| ***Author:*** | Andrés Valda |
| ***Customer contact:*** | Amir Sherman |

**DOCUMENT REVISION**

| Revision | Date | Description |
|---|---|---|
| 001 | 03/10/216 | First draft |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

**INDICE**

## 1   INTRODUCTION

This document provides detailed hardware requirements and board connections for the MX35LF1GE4AB-Z4I Spi Nand Flash evaluation board based on chip MX35LF1G"4AB-Z4I from MACONIX. This board is part of Arrows' offering of evaluation boards designed around the Spi Nand Flash
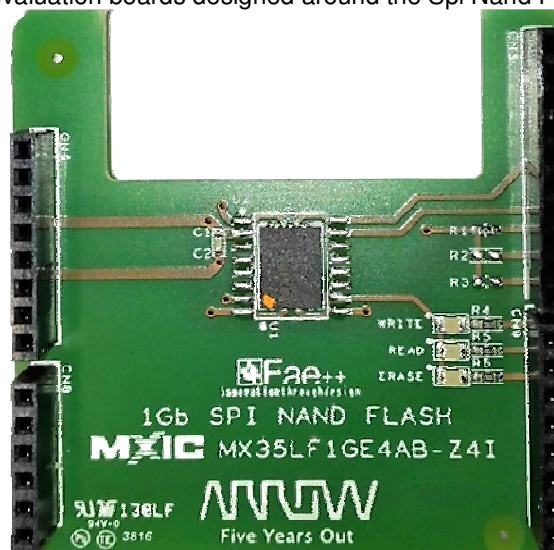
## 2   BOARD DESCRIPTION AND GETTING STARTED

The X-NUCLEO-SPINAND-MAC board is the Macronix MX35LF1GE4AB-Z4I 1Gb SPI NAND Flash evaluation board (shield) for STM32 Nucleo boards. It is compatible with the Arduino UNO R3 connector layout.
The X-NUCLEO-SPINAND-MAC interfaces the memory with the STM32 MCU via SPI pin, and the user can change the default SPI clock.

## 3   HARDWARE REQUIREMENTS

The X-NUCLEO-SPINAND-MAC is an expansion board intended for use with STM32 Nucleo boards.
This shield have to be plugged on STM32 Nucleo (NUCLEO-F401RE) board as shown in Figure below
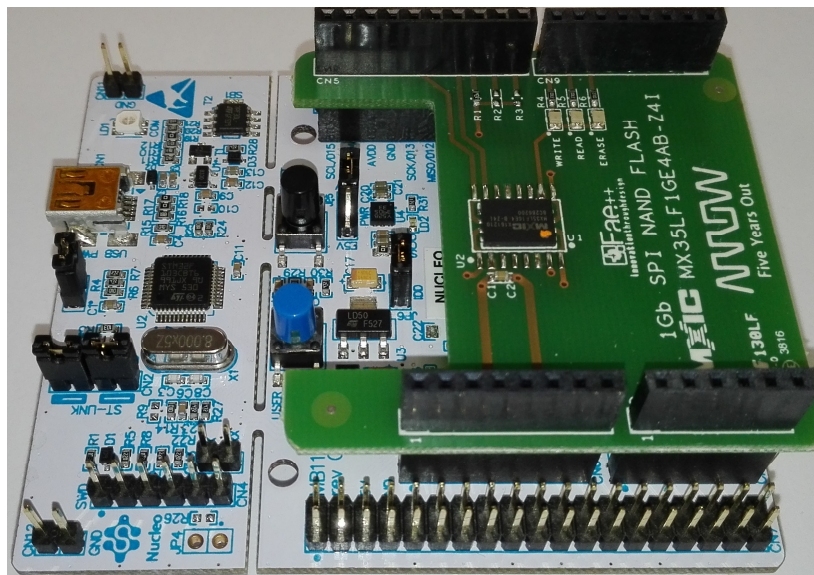


## 4   BOARD DRIVER

We provide a basic open source driver to read and write to the memory.
Additional functions to drive the LEDs are provided too.

The driver is provided inside a firmware example built with STM32CubeMX, developed for the following platform:
   • IAR Workbench

Using STM32CubeMX you should be able to migrate to other platforms such as:
   • MDK 5
   • MDK 4
   • TRUEStudio
   • SW4STM32

The files of the driver are:
   • MX35_FPP_CMD.c
   • MX35_FPP_CMD.h
   • MX35_FPP_DEF.h
It depends on the ST HAL Libraries and it does not initialize the SPI peripheral (the code generated from the STM32CubeMX does that).

## 5   DRIVER CONFIGURATION

The driver can be customized through the following preprocessor directives:

| DEFINE | VALUE | DESCRIPTION |
|---|---|---|
| FlashID | 0xc212 | Memory identification value |
| FlashSize | 0x10000000 | Total size of the memory (128Mbyte) |
| FlashBlockNum | 1024 | Number of block in total |
| FlashBlockSize | 0x20000 | Size of a single block |
| FlashPageNum | 64 | Number of pages per block |
| FlashPageSize | 2048 | Size of the page data region |
| GPIO_SPI | NOT_DEFINED | If defined does not use any SPI pheripheral but GPIO toggling |
| FLASH_TIMEOUT_VALUE | 1000 | Maximum time to wait for an operation in microseconds |

## 6   BASIC OPERATIONS

Inizialization can be performed with the following function:

***void Initial_Spi().***

Internally it sets WP and CS of the SPI peripheral and waits for a short delay to be sure that the memory is ready.

ID check operation can be formed by calling:

**ReturnMsg  CMD_RDID((uint16*)&flash_id );**

Read operation can be performed by calling:

**ReturnMsg CMD_READ(flash_addr);**

**ReturnMsg CMD_READ_CACHE(0, buffer, FlashPageSize, 0);**

This sequence reads a page starting at flash_addr.

Note that all address must be multiple of 4096 (FlashPageSize * 2) because between every page is left space for additional metdata (ex. ECC Data).

Erease operation can be performed by calling:

**ReturnMsg CMD_BE(flash_addr);**

Write operation can be performed by calling:

**ReturnMsg CMD_PP_LOAD(0, buffer, FlashPageSize, 0);**

**ReturnMsg CMD_PROGRAM_EXEC(flash_addr);**

Check MX35LF1GE4AB datasheet for additional informations.

# 7 FIRMWARE EXAMPLE

The firmware example provived performs:

- Initial scan of bad blocks (**SearchBadBlock function**)
- Erase,Write,Read and data check of every non-bad block (**FlashTest function**)
- Read and data check for every non-bad-block from the previously written data (**VerifyTest function**)

Every LED on the board turns on according to the active operation.

You can also check the status of the operations by watching these global variables:

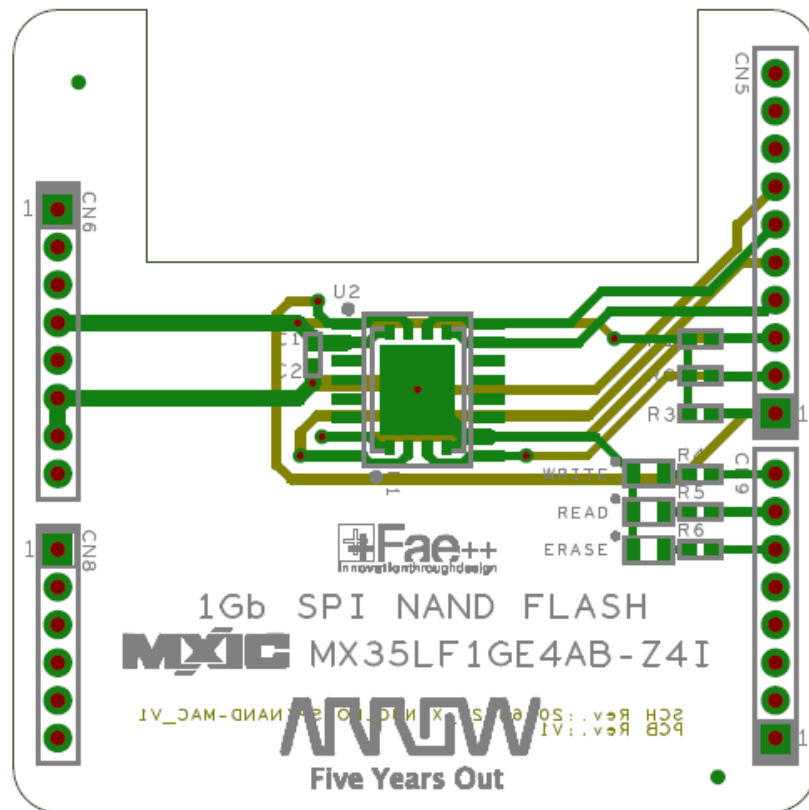| BadBlockCnt | Number of bad blocks detected |
|---|---|
| BlockNum | Current block that is being wirtten or read |
| error_cnt | How many errors we have met so far, should be always 0 |

# 8 BOARD SCHEMATIC AND PCB

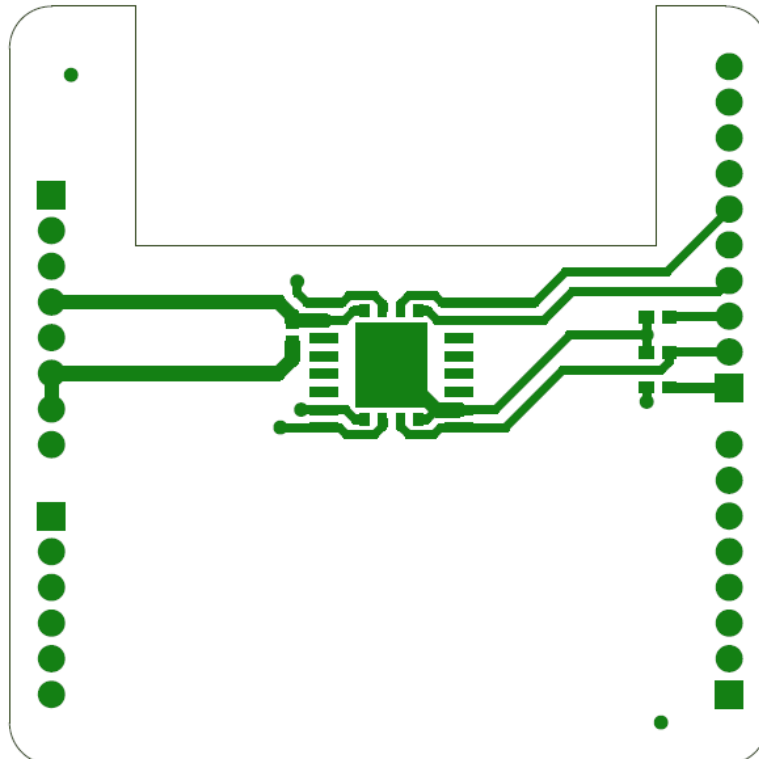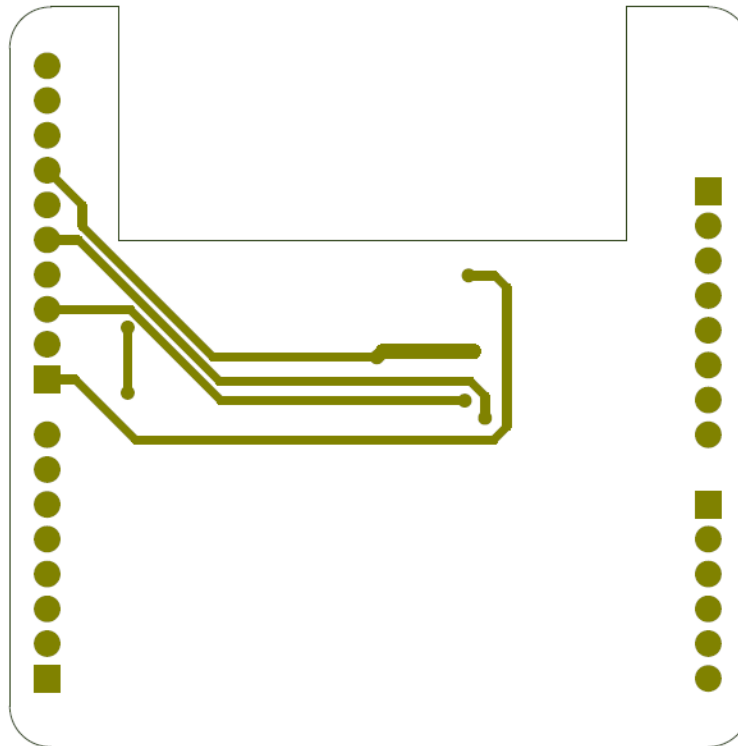

STM32 NUCLEO SHIELD
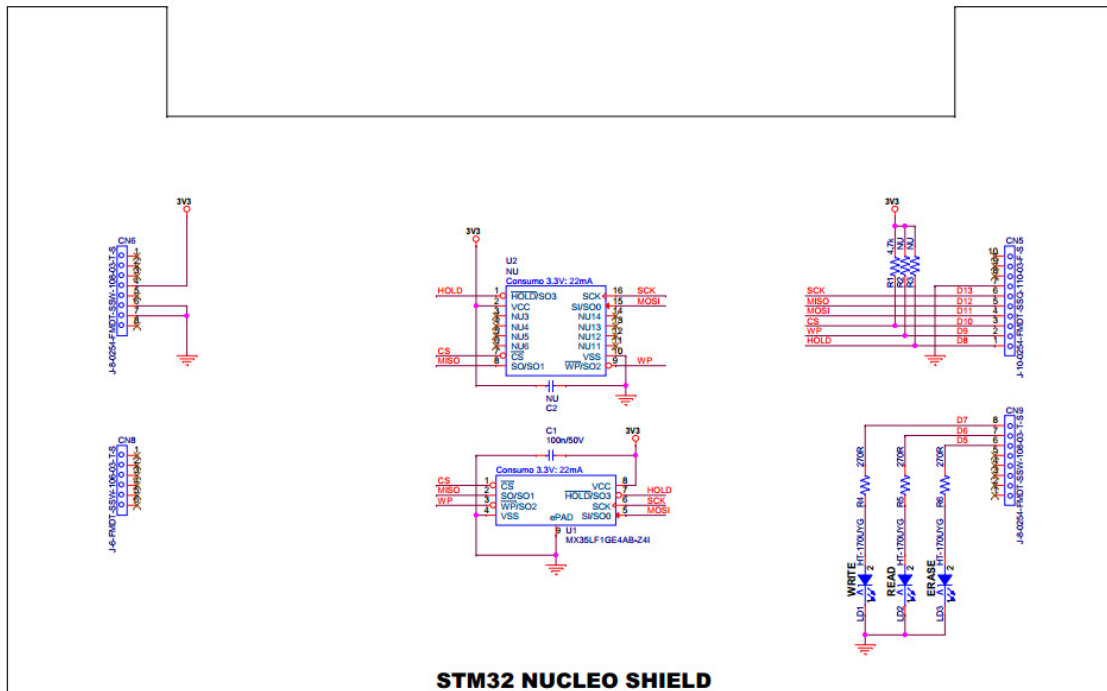
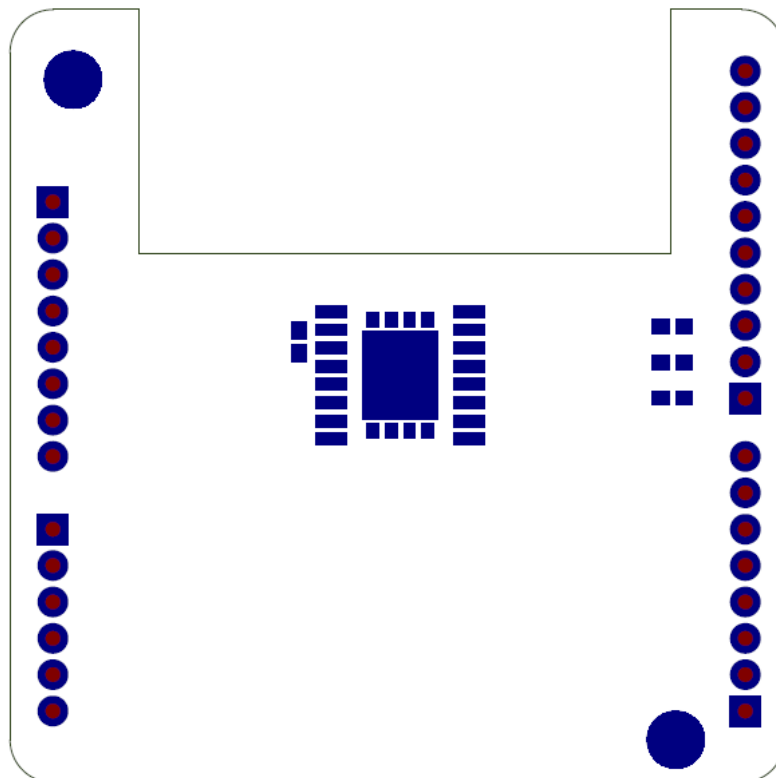## 8.1 STACKUP
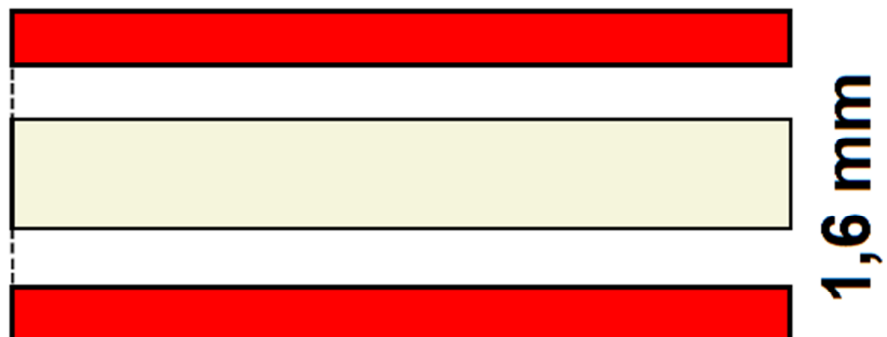
## 8.2    PCB - GLOBAL VIEW
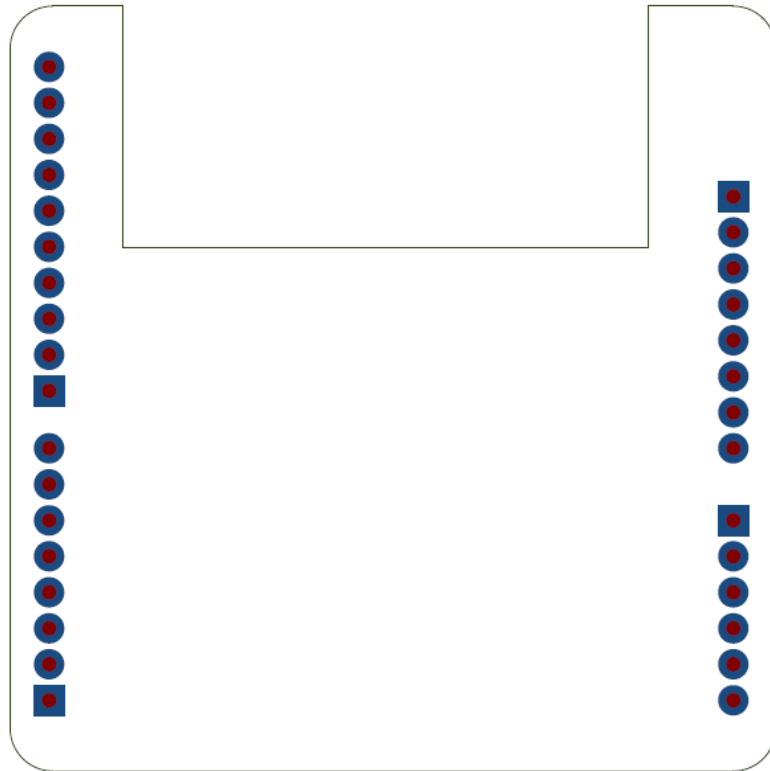


## 8.3    PCB – TOP VIEW
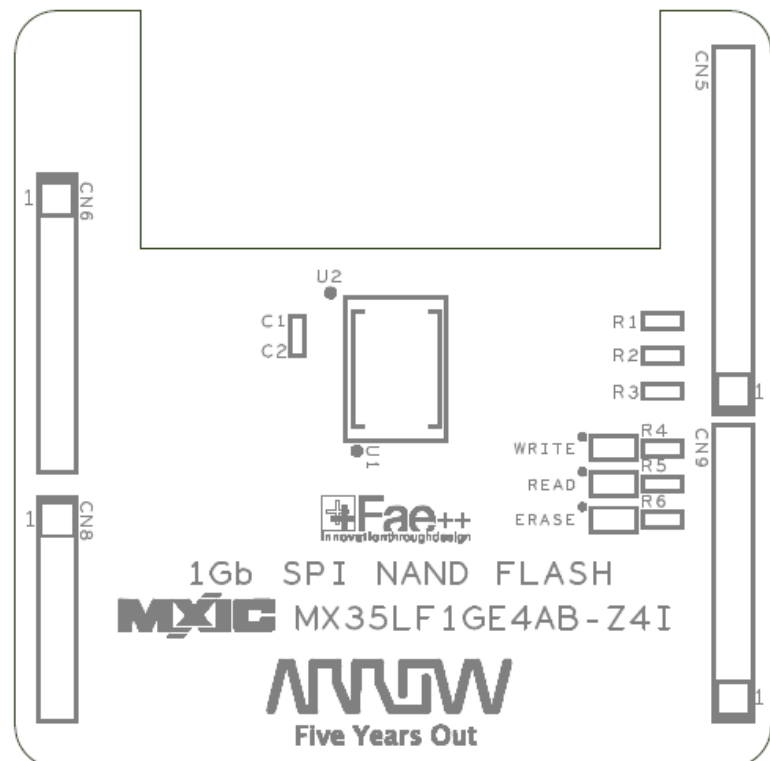
## 8.4    PCB - BOTTOM FLIP VIEW

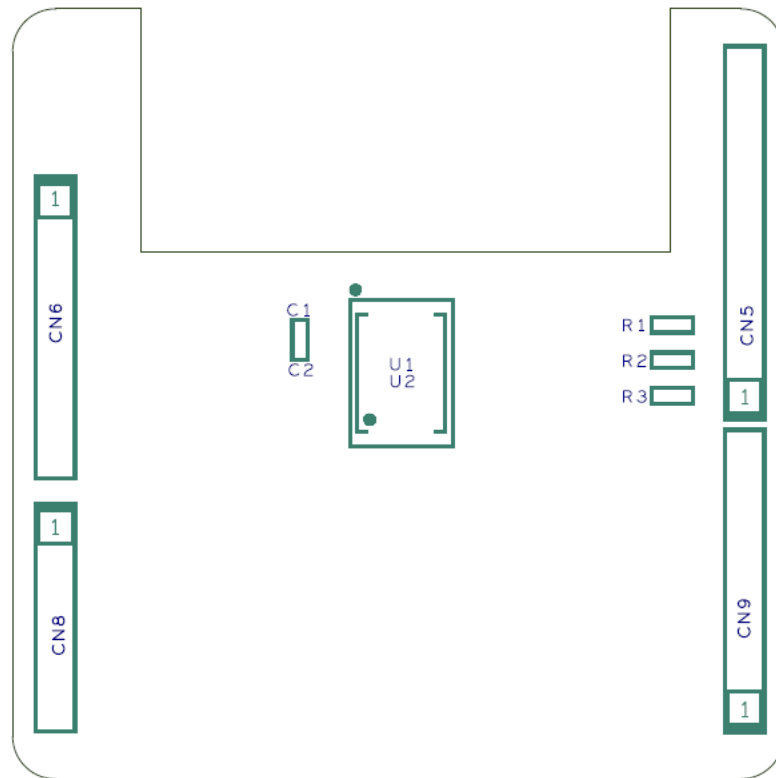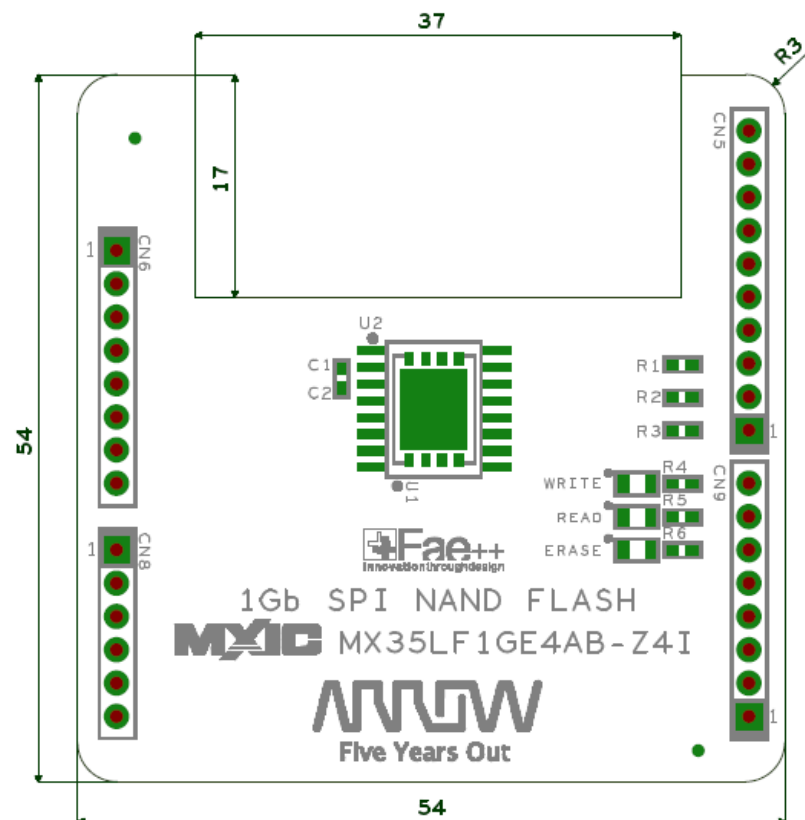## 8.5    PCB – SOLDER TOP VIEW

## 8.6 PCB – SOLDER BOTTOM FLIP VIEW

## 8.7 PCB – SILKSCREEN TOP VIEW

## 8.8 PCB – TOPOGRAPHIC TOP VIEW



## 8.9 PCB – MECHANICAL VIEW

## 9    BILL OF MATERIALS

| Item | Quantity | Reference | Part | Description |
|---|---|---|---|---|
| 1 | 1 | CN5 | J-10-0254-FMDT-SSQ-110-03-F-S | STRIP 10P F/D P=2.54 SSQ-110-03-F-S |
| 2 | 2 | CN6,CN9 | J-8-0254-FMDT-SSW-108-03-T-S | STRIP 8P F/D P=2.54 SSW-108-03-T-S |
| 3 | 1 | CN8 | J-6-FMDT-SSW-106-03-T-S | STRIP 6P F/D P=2.54 SSW-106-03-T-S |
| 4 | 1 | CS1 | CS V1 2L 35um | C.S. X-NUCLEO-SPINAND-MAC V1 (54x54)mm 2L/SO/SR sp=1.6mm Cu=35um |
| 5 | 1 | C1 | 100n/50V | CHIP CAP.CER. 100nF 50V 10% X7R 0603 |
| 6 | 3 | LD1,LD2,LD3 | HT-170UYG | GREEN LED DIODE HT-170UYG-DT HARVATEK 0805 SMT |
| 7 | 1 | R1 | 4.7k | CHIP RES. 4K7 0603 1/16W 1% |
| 8 | 3 | R4,R5,R6 | 270R | CHIP RES. 270R 0603 1/16W 1% |
| 9 | 1 | U1 | MX35LF1GE4AB-Z4I | SPI NAND FLASH MX35LF1GE4AB-Z4I WSON8 MACRONIX SMT |

## NOT MOUNTED

| 1 | 1 | C2 | NU | CHIP CAP.CER. 100nF 50V 10% X7R 0603 |
|---|---|---|---|---|
| 2 | 2 | R2,R3 | NU | CHIP RES. 4K7 0603 1/16W 1% |
| 3 | 1 | U2 | NU | SPI NAND FLASH MX35LF2GE4AB-MI SOP16 MACRONIX SMT |