

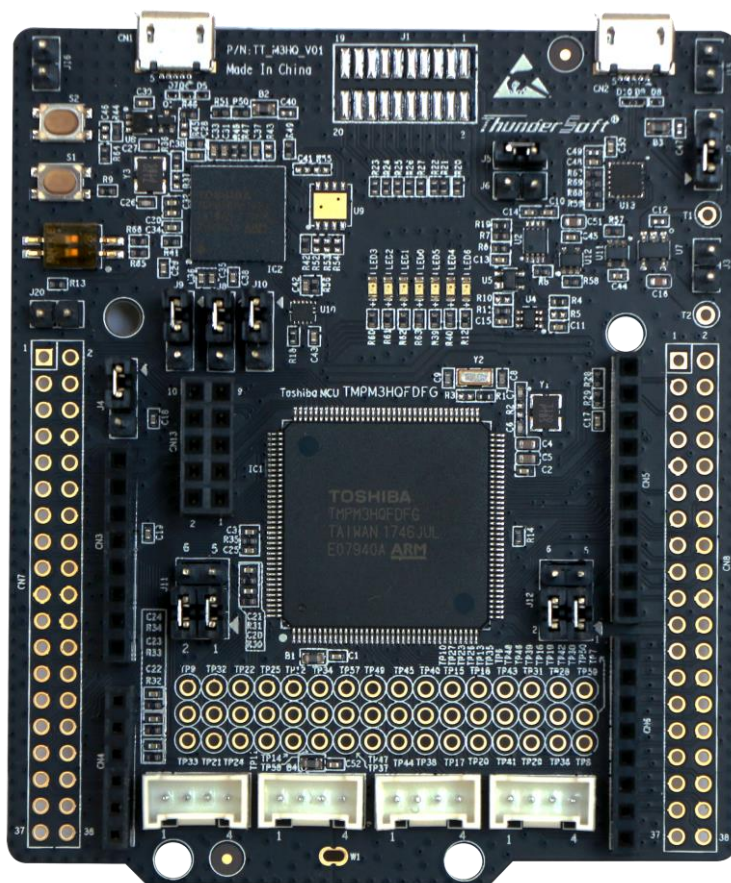
## User manual

### TT\_M3HQ board

#### Introduction

The TT\_M3HQ board provides easy, quick and flexible way for user application development and build prototypes with Toshiba Electronic Devices & Storage Corporation (“Toshiba”) TXZ™ microcontrollers TMPM3HQ LQFP144 package, choose from various function, memory ROM/RAM, performance, and features. The Arduino™<sup>1</sup> Uno compatibility connectivity, expansion headers allow to be expanding the functionality for connecting to several open development platform, the SeeedGrove connectors and dedicated the Motor control header are supported. The TT\_M3HQ board no require any separate probe as they integrate the debugger and programmer and with Toshiba TXZ software which various packaged examples, as well as access to Arm®<sup>2</sup> Mbed™<sup>3</sup> online resources.

Figure 1 TT\_M3HQ board



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<sup>2</sup> Arm and Cortex are registered trademarks of Arm Limited (or its subsidiaries) in the US and/or elsewhere.

<sup>3</sup> Mbed is a trademark of Arm Limited (or its subsidiaries) in the US and/or elsewhere.

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## 1. Features

The TT\_M3HQ board offers following features:

- Toshiba TMPM3HQ microcontroller  
Arm Cortex-M3  
LQFP144 package
- Flexible power supply  
USB, VBUS or external source 5 V
- Power LED, 2 LEDs for DAP and 4 LEDs for user
- 4 extension – Arduino™ Uno connectivity, Extension headers, Motor connection header, SeeedGrove connection header
- 2 Push-Switches: Reset and User
- 2 DIP-Switches for User
- DAP-LINK debugger and programmer with SWD connector
- USB Interfaces supported:
- Arm® Mbed™ (refer <http://mbed.org>)

## 2. Specification

Operating environment	Temperature 5 to 35°C
	Humidity: 20 to 80% RH
	*without condensation
External dimensions	Approx. 82.5 mm (L) x 70.0 mm (W) x 20.0 mm (H)
	*excluding protrusions
Weight	100 g max.
Rated voltage	4.4~5.25 V
Current	500mA max.
Connector	Micro USB connector (2)
	Arduino Compatible interface connector (4)
Part Number	TT_M3HQ
Mounted MCU	TMPM366 for DAP
	TMPM3HQ for Target application
Origin	Made in China

### 3. Quick start

Please refer to [TT\_M3HQ Quick Start\_en.pdf]

#### 4. Hardware System, DAP and Configuration

**Figure 2 Hardware block diagram**

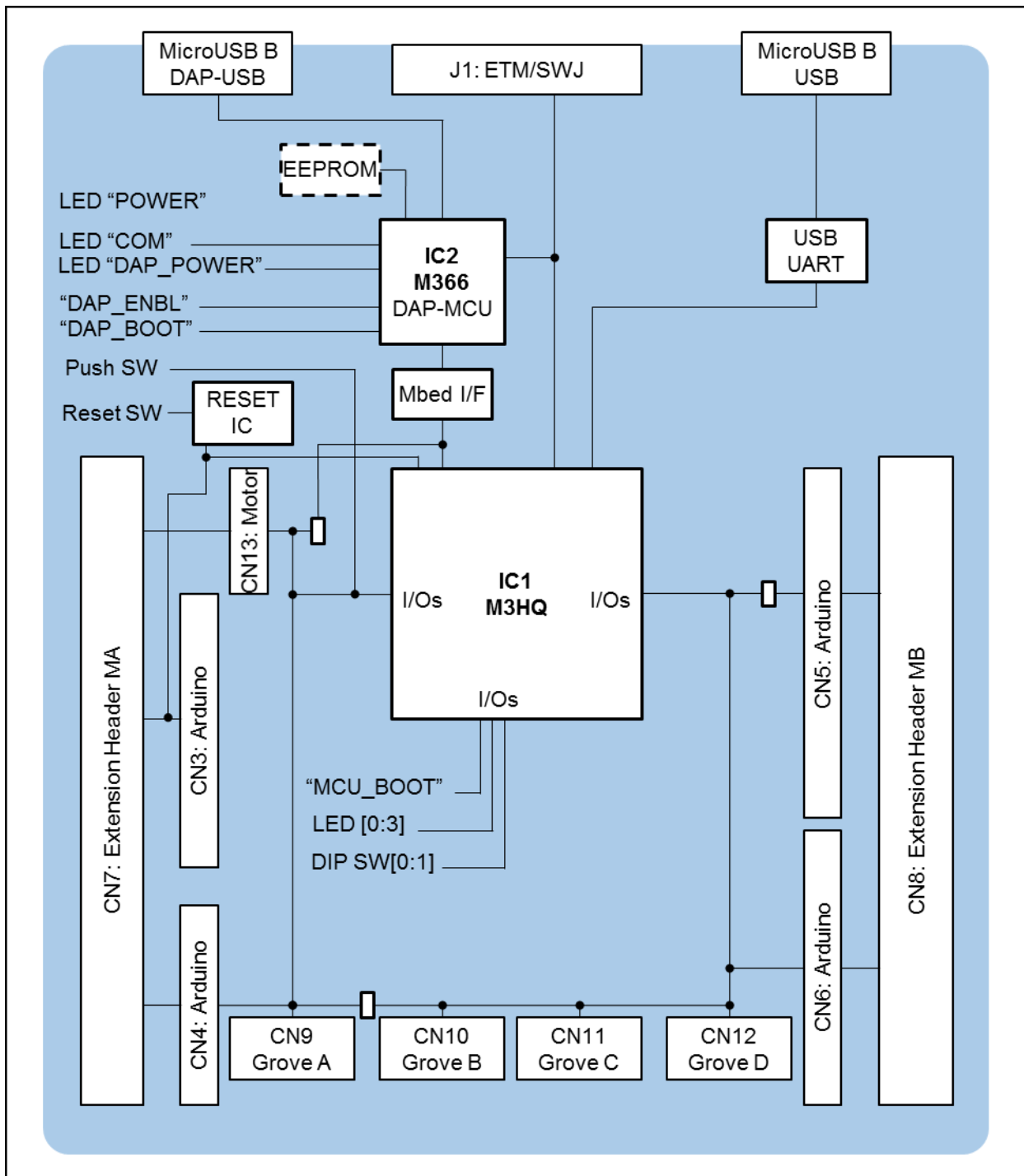


Figure 3 Place: Top

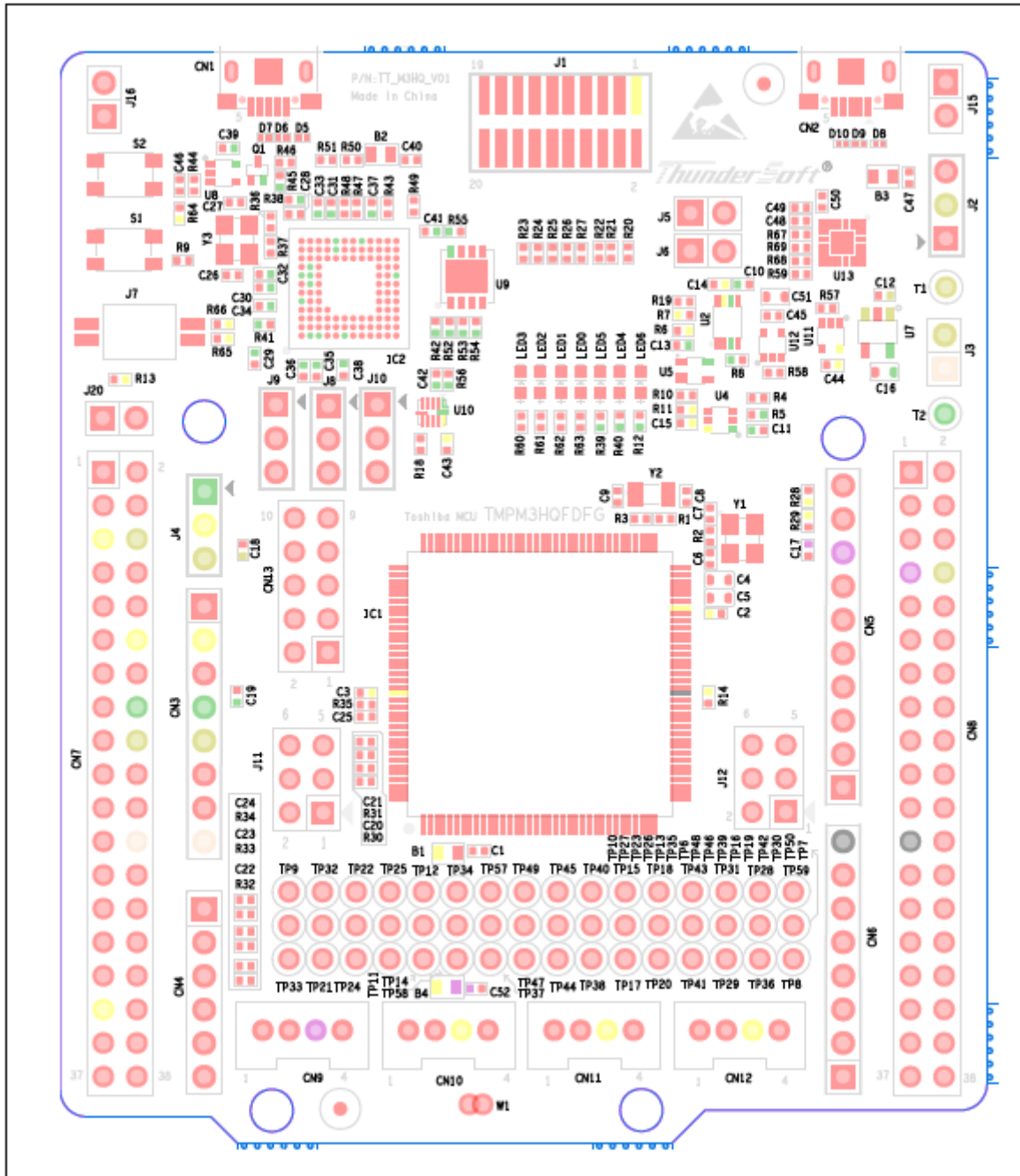




Figure 4 Place: Bottom

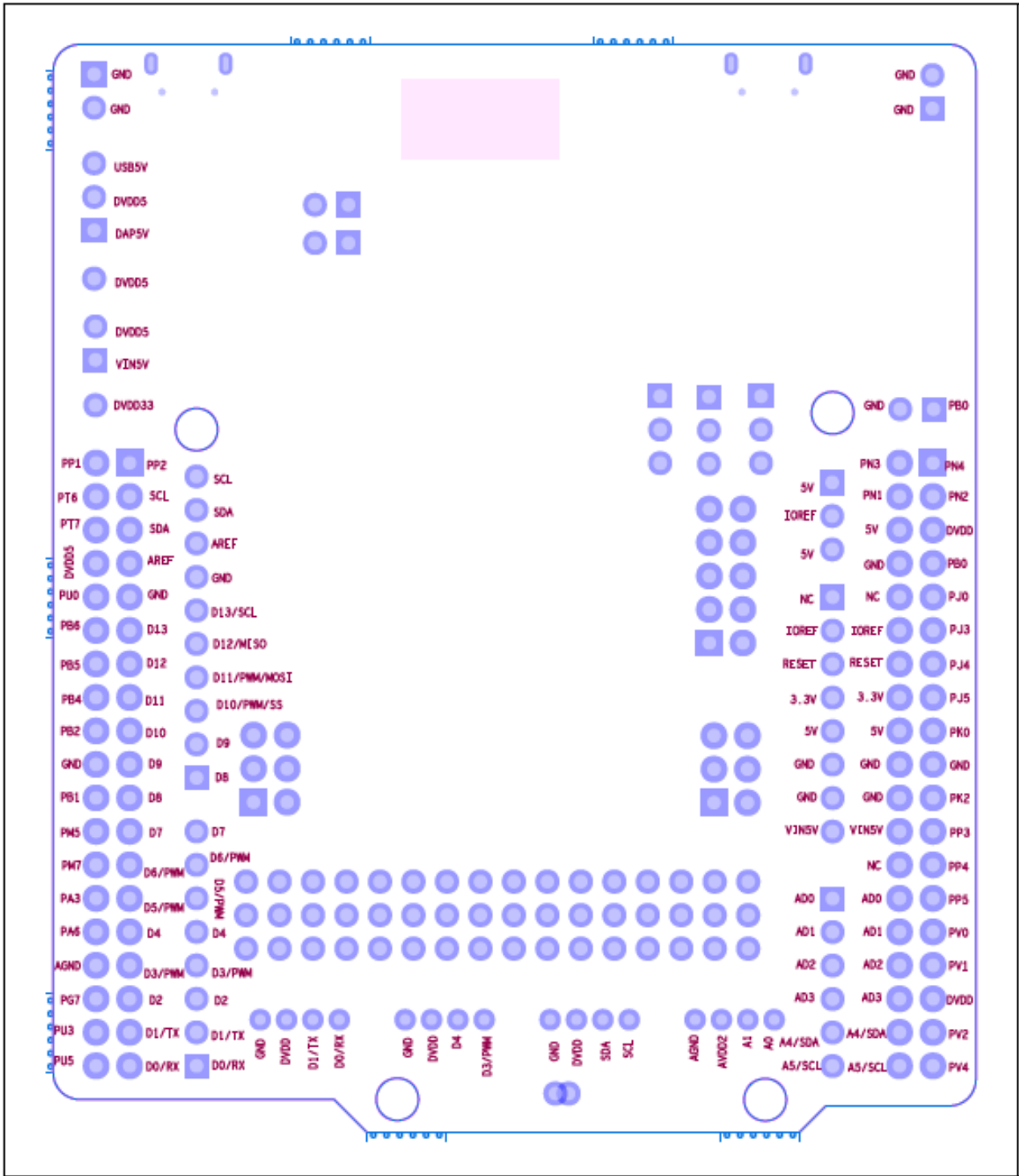
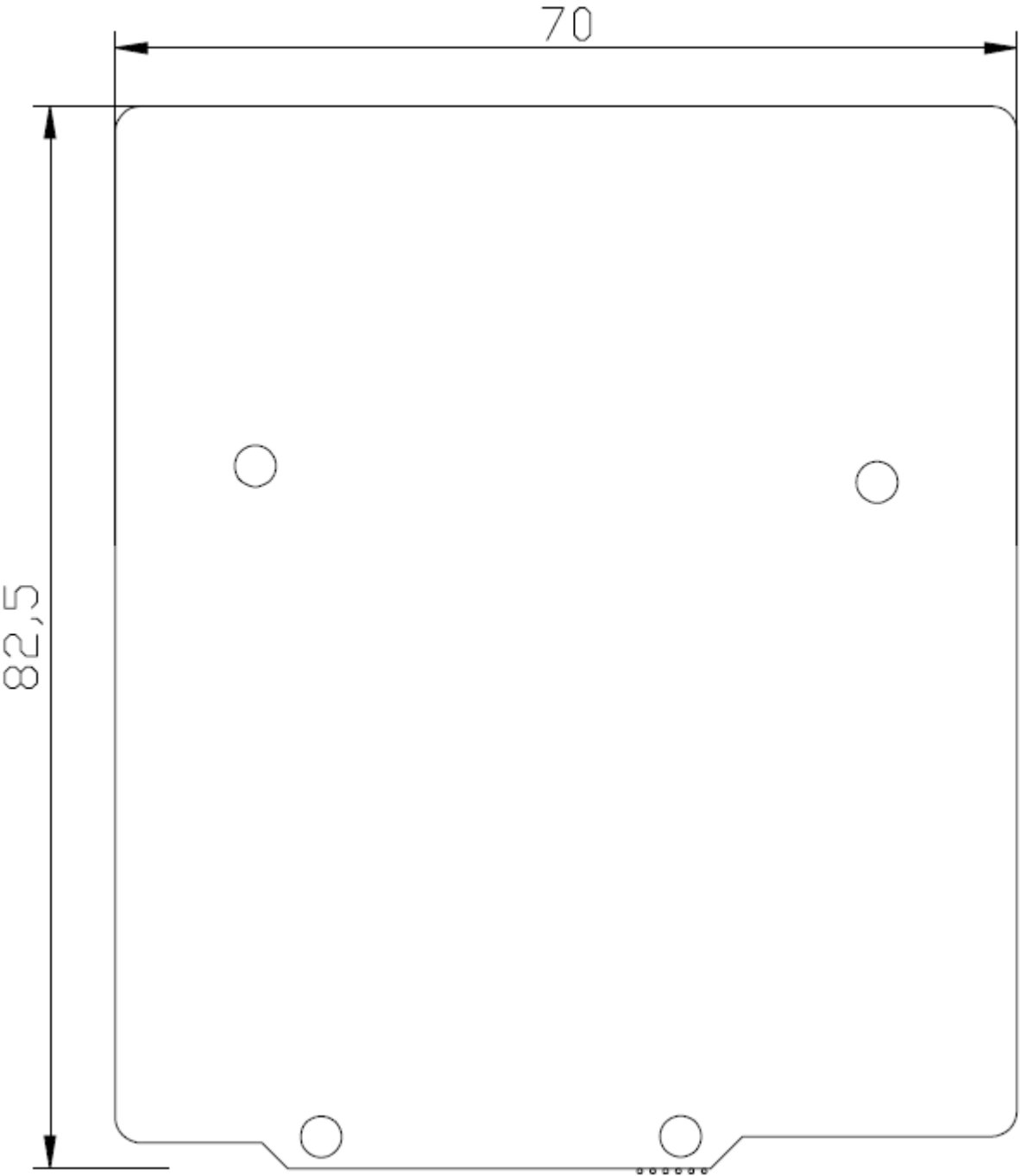


Figure 5 Mechanical dimensions



1	MCU M3HQ	IC1	MCU TPM3HQFDFG, this is target MCU on the board which runs application executes.
2	DAP-MCU	IC2	DAP-MCU TPM366FYXBG, this is DAP MCU on the board debug interface to MCU thru DAP-USB.
3	MicroUSB port USB	CN2	Port used to interface USB-UART from MCU.
4	MicroUSB port DAP-USB	CN1	Debug Port used to connect board and PC.
5	ETM/SWJ	J1	Debug / Trace for MCU and DAP-MCU SW debug.
6	LEDs	LED[0:3]	MCU ports output
		LED4, LED5	DAP-MCU ports output
		LED6	DVDD33 indicates
7	Push switches	S1	Reset switch for MCU.
		S2	Port switch for MCU.
8	DIP switches	J7	MCU 2 bit input port
9	DAP-MCU Port	J5	Assigned "DAP_ENBL" port for DAP-MCU.
		J6	Assigned "DAP_BOOT" for DAP-MCU.
10	MCU Port	J20	Assigned "MCU_BOOT" for MCU.
11	Arduino Compatibility Connectors	CN3	Arduino Power
		CN4	Arduino Analog input and I2C
		CN5	Arduino Digital, PWM, TX/RX
		CN6	Arduino Digital, PWM, SPI and I2C
12	Extension Headers	CN7, CN8	Same signal assignment with Arduino and MCU IOs are assigned.
13	SeeedGrove connectors	CN9	Grove Analog input A0 and A1.
		CN10	Grove I2C interface.
		CN11	Grove Digital D3 and D4.
		CN12	Grove Digital D0 and D1.
14	Motor connectors	CN13	MCU 8 signals for Motor control is assigned.
15	Power supply select	J2	Select DVDD5, +5V input USB or DAP-USB.
		J3	Valid +5V input from external VIN.
		J4	Select DVDD, DVDD5 or DVDD33.
16	Motor control select	J8, J9, J10	Select connection DAP interface or Motor control.
17	UserIOs select	J11, J12	Select signaling Analog input or I2C, PWM or SPI.
18	Test Pads (Power supply)	T1	DVDD5 +5V
		T2	DVDD3 +3.3V.
19	Test Pads	Many	MCU IOs are assigned, excluded CN7 and CN8 assigned IOs.

#### 4.1. DAP-LINK

The DAP-LINK programming and debugging tool is integrated in the TT\_M3HQ board. The embedded DAP-LINK supports JTAG for TT\_M3HQ devices.

Arm Mbed DAPLINK is an open-source software project that enables programming and debugging application software on running on Arm Cortex CPUs. Commonly referred to as interface firmware, DAPLink runs on a secondary MCU that is attached to the SWD or JTAG port of the application MCU. This configuration is found on nearly all development boards. It creates a bridge between your development computer and the CPU debug access port.

##### Features

DAPLINK interface firmware provides developers with:

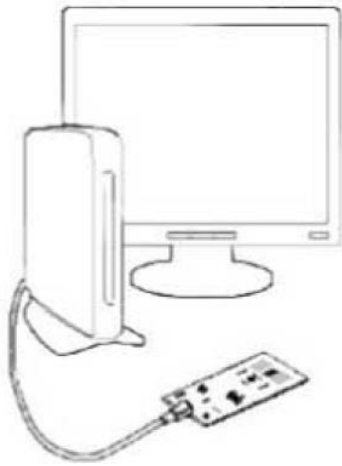
- Drag-and-drop programming(MSC)
- a virtual serial port(CDC)
- CMSIS-DAP based debugging(HID)

DAPLINK debug probes also appear on the host computer as a USB disk. Program files in binary(.bin) and (.hex) formats can be copied onto the USB disk which then program them into the memory of the target system. This is accomplished by embedded the flash programming algorithm into the interface firmware, for drag-and-drop programming to work it's important that the version of the DAPLINK firmware being used is specifically built for the target system.

The DAPLINK can be bridged through to a TTL UART on the target system. The USB Serial port will appear on a Windows machine as a COM port, or on a Linux machine as a dev/tty interface and on Mac OS as a dev/usbmodem.

#### 4.1.1. Using the DAP-LINK to program and debug Target MCU

Figure 6 Connecting board to program target MCU



Hardware requirements:

- Computer with Windows® 7, 8 or 10
- USB cable Type-A to Mini-B

Development toolchain:

- IAR™ EWARM
- Keil® MDK-ARM
- GCC-based IDE

## 4.2. Reset system

DAP-MCU:

Power ON reset by DVDD33

TT\_M3HQ:

Reset IC: ADM6713

Push-Switch: S1

DAP-Reset: DAP\_RESETO with DIRCNT

From SWJ/ETM: J1

TT\_M3HQ reset signal output to Arduino connector CN3 and Extension Header CN7.

Figure 7 shows Reset system and Figure 8 shows Reset sequence as an example.

**Figure 7 Reset system**

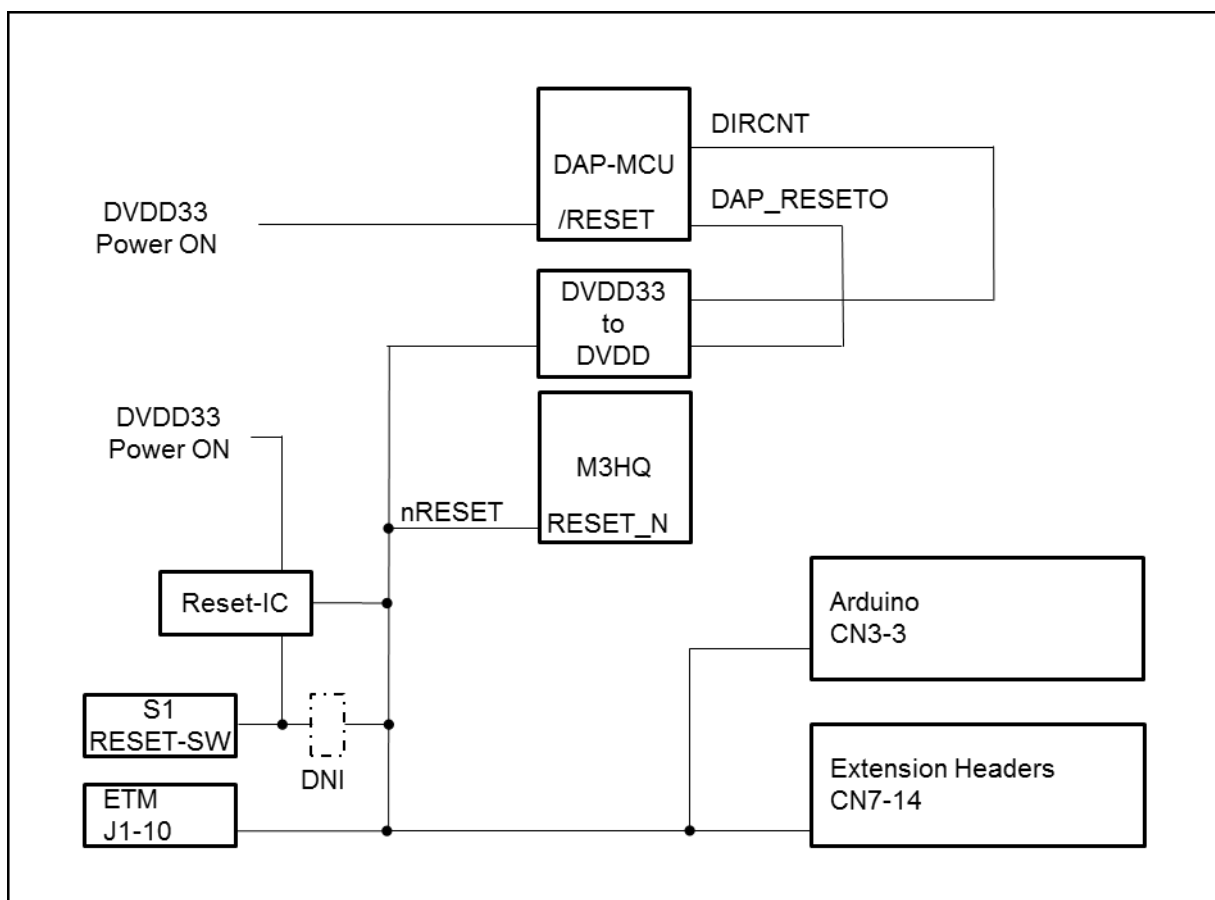
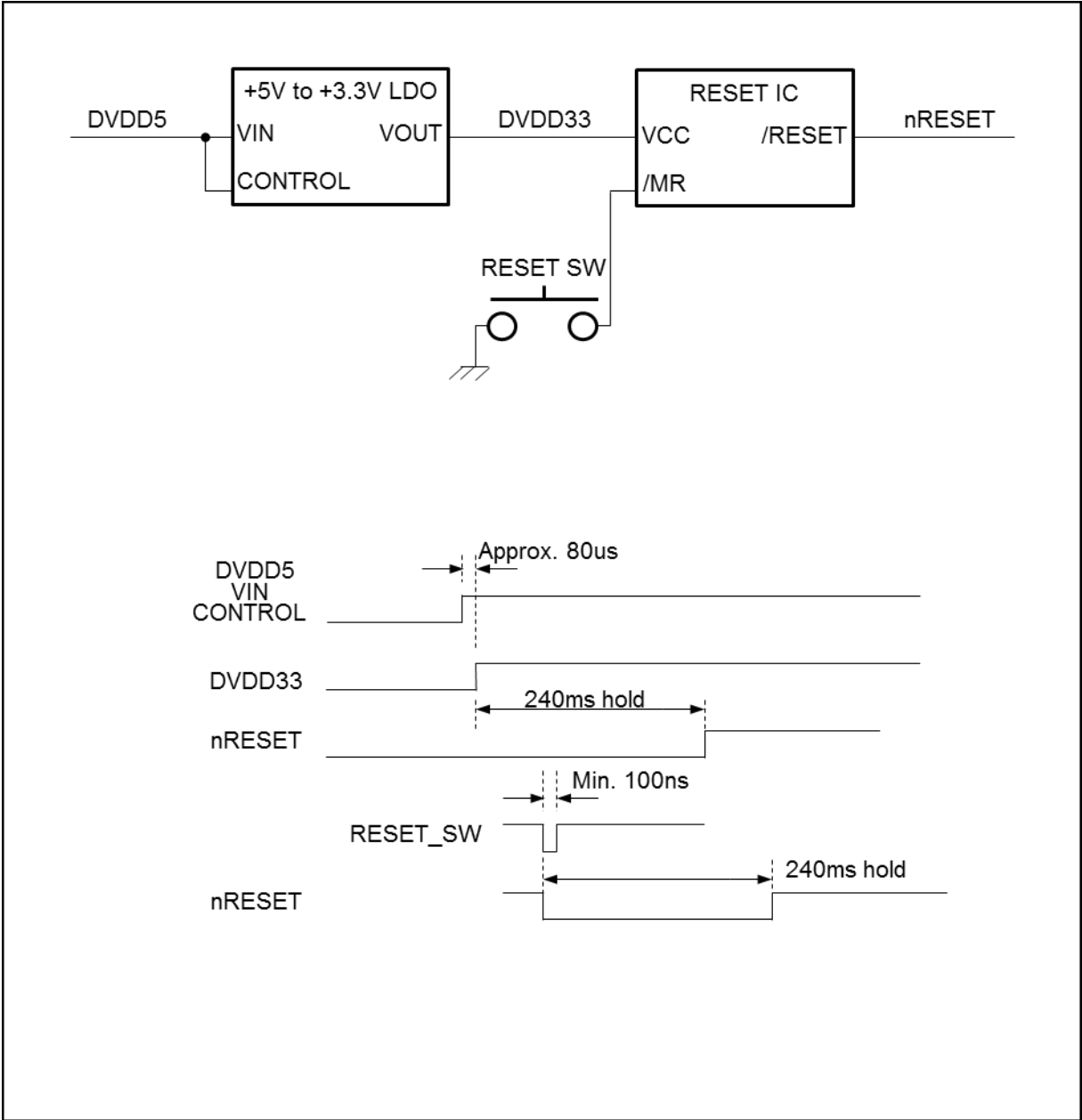


Figure 8 Reset sequence



## 4.3. OSCs

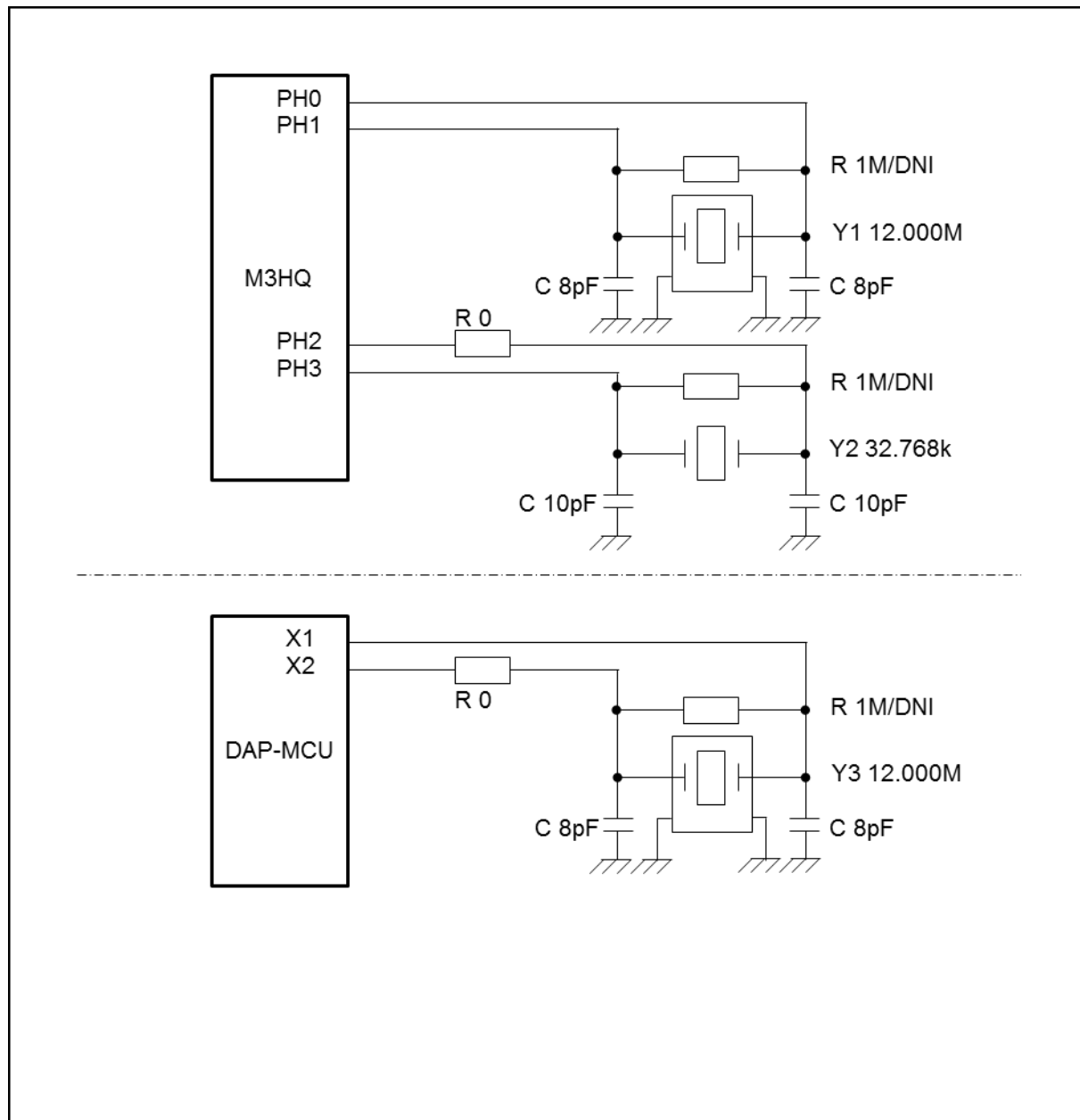
Y1: 12.000 MHz, Crystal, 12MHz, 20ppm, CL=8pF, 3.2\*2.5\*0.7mm

Y2: 32.768 kHz, Crystal, 32.768k, 20ppm, 7pf, 3215 package, ROHS

Y3: 12.000 MHz, Crystal, 12MHz, 20ppm, CL=8pF, 3.2\*2.5\*0.7mm

Figure 9 shows OSCs on the board.

**Figure 9 OSCs on the board**

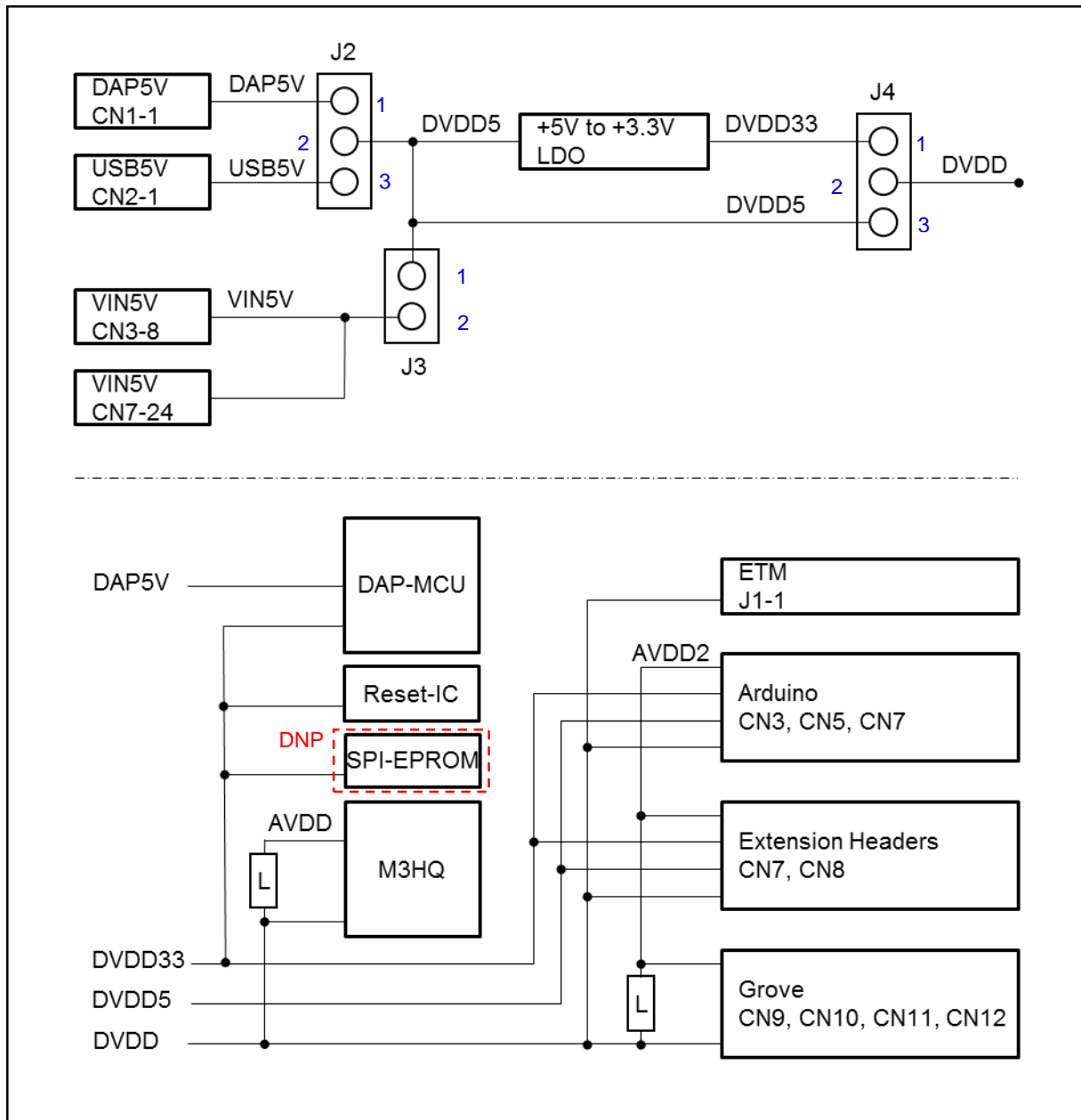




## 4.4. Power supply System

Figure 10 shows Power supply system.

**Figure 10 Power supply system**



#### 4.4.1. Power supply input from DAP-USB and USB and External power

TT\_M3HQ has 4 way +5V power supply input route that from CN1:DAP-USB, CN2:USB, CN3 Arduino connector or CN7 External header.

Table 1 shows power supply input assignment.

**Table 1 Power Supply input**

Power Category	Connector	Pin	Power voltage
DAP5V	CN1	1	DAP-USB VBUS power +5V
USB5V	CN2	1	USB VBUS power +5V
VIN5V	CN3	8	Arduino VIN, +5V
	CN7	24	+5V

#### 4.4.2. Power output to External

TT\_M3HQ has several power output interface on each connectors that contains +5V, +3.3V and Analog +5V that is supplied to connected shields, Grove module and devices. Please note that available supply current is limited to connected board and devices thru TT\_M3HQ.

Table 2 shows power output pin assignment.

**Table 2 Power output**

Power Category	Connector	Pin	Name	Power voltage
DVDD5	CN3	5	5V	+5V
	CN7	6	DVDD5	
		18	5V	
	CN8	8	DVDD5	
DVDD33	CN3	4	3.3V	+3.3V
	CN7	16	3.3V	
DVDD	J1	1	DVDD	+5V or +3.3V
	CN3	2	IOREF	
	CN7	5	DVDD	
		12	IOREF	
		33	DVDD	
	CN10	3	DVDD	
	CN11	3	DVDD	
	CN12	3	DVDD	
AVDD2	CN5	8	AREF	Analog +5V
	CN8	7	AREF	
	CN9	3	AVDD2	

#### 4.5. LEDs

TT\_M3HQ has total 7 LEDs on board including power ON. LED0 to LED3 are connecting to M3HQ IOs then they can use for general purpose monitor.

LED0, LED1, LED2, LED3, LED5, LED6: LTST-C193KGKT-5A, Green, 30mA, 0603, SMT

LED4: LTST-C193KRKT-5A, Red, 30mA, 0603, SMT

Table 3 shows pin assignment of TT\_M3HQ on LEDs.

**Table 3 LEDs**

LEDs	Color	M3HQ pin	Function
LED0	Green	PK4	General purpose monitor
LED1	Green	PK5	General purpose monitor
LED2	Green	PK6	General purpose monitor
LED3	Green	PK7	General purpose monitor
LED4	Red	-	DVDD33 means power ON
LED5	Green	-	DAP-MCU L4 "COM"
LED6	Green	-	DAP-MCU M4 "DAP_POWER"

#### 4.6. Push-Switches

TT\_M3HQ has Push-Switches one is used for Reset for M3HQ connecting to RESET\_N and another one is used for Push-Switch its function is general purpose input.

S1: ST-1188U, 4Pin, 4.2mm x 3.3mm x 2.5mm, SMT

S2: ST-1188U, 4Pin, 4.2mm x 3.3mm x 2.5mm, SMT

Table 4 shows pin assignment of TT\_M3HQ on Push-Switches.

**Table 4 Push-Switches**

Switches	Name	M3HQ pin	Function
S1	RESET-SW	RESET_N	Reset
S2	P-SW	PV3	General purpose input

#### 4.7. DIP-Switch

TT\_M3HQ has 2 general purpose input by DIP-Switch.

J7: KM127B-2P-GTR, Slide Switch, SMT

Table 5 shows pin assignment of TT\_M3HQ on DIP-Switch.

**Table 5 DIP-Switches**

Switch	Name	Pin	M3HQ pin	Function
J7	DIP-SW	1	PP6	General purpose input
		2	PP7	General purpose input

#### 4.8. Jumpers

TT\_M3HQ has following Jumpers which are used for power supply select, mode configuration and interface signal select and switching function.

J2, J4, J8, J9, J10:	SPH-254010325-116A, 3Pin, Height 11.6mm
J3, J5, J6, J20:	SPH-254010225-116A, 2 Pin, Height 11.6mm
J11, J12:	SPH-254020625-116A, 2x3 Pin, Height 11.6mm
J15, J16:	SPH-254010225-185A, 2Pin, Height 18.5mm

Table 6, Table 7, Table 8 show pin assignment of TT\_M3HQ and its function on each Jumpers.

**Table 6 Jumpers 1/3**

Switches	Pin	Name	M3HQ pin	Function
J2	1	DAP5V	-	+5V Power Supply from DAP USB
	2	DVDD5	-	Selected DAP5V or USB5V
	3	USB5V	-	+5V Power Supply from USB
J3	1	VIN5V	-	+5V Power Supply from external pins CN3 Pin 8 and CN7 Pin 24
	2	DVDD5	-	Connect VIN5V and DVDD5
J4	1	DVDD33	-	+3.3V Power Supply made by U6, from DVDD5 to DVDD3
	2	DVDD	-	Power Supply for TT_M3HQ, selected DVDD33 or DVDD5
	3	DVDD5	-	+5V Power Supply

Power Supply selection:

1. Power Supply from DAP-USB  
J2: Short 1-2, J3: Open
2. Use case: Power Supply from USB  
J2: Short 2-3, J3: Open
3. Use case: Power Supply from external pin  
J2: Open, J3: Short 1-2

TT\_M3HQ voltage selection:

1. +5V operation  
J4: Short 2-3
2. +3.3V  
J4: Short 1-2

**Table 7 Jumpers 2/3**

Switches	Pin	Name	M3HQ pin	Function
J5	1	DAP PE7	-	"DAP_ENBL"
	2	GND	-	
J6	1	DAP PF0 / BOOT	-	"DAP_BOOT"
	2	GND	-	
J20	1	PB0	PB0	"MCU_BOOT"
	2	GND	-	
J11	1	PA5	PA5	Select Analog input or I2C Connection from/to Arduino and Grove
	2	PA4	PA4	
	3	Arduino A4 / SDA	-	
	4	Arduino A5 / SCL	-	
	5	PF3	PF3	
	6	PF2	PF2	
J12	1	PT1	PT1	Select PWM output or SPI function from/to Arduino D10, D11
	2	PT3	PT3	
	3	Arduino D10	-	
	4	Arduino D11	-	
	5	PC0	PC0	
	6	PN0	PN0	

Function select use case:

1. Analog input:  
J11: Short 3-5, Short 4-6
2. I2C connection  
J11: Short 1-3, Short 2-4
3. PWM output:  
J12: Short 3-5, Short 4-6
4. SPI function:  
J12: Short 1-3, Short 2-4

**Table 8 Jumpers 3/3**

Switches	Pin	Name	M3HQ pin	Function
J8	1	PJ1S	-	Select
	2	PJ1	PJ1	DAP mbed_TXD or
	3	XO0	-	Motor connection XO0
J9	1	PJ2S	-	Select
	2	PJ2	PJ2	DAP mbed_RXD or
	3	VO0	-	Motor connection VO0
J10	1	PK1S	-	Select
	2	PK1	PK1	DAP mbed_IO0 or
	3	OVV0	-	Motor connection OVV0
J15	1	GND	-	Ground
	2	GND	-	Ground
J16	1	GND	-	Ground
	2	GND	-	Ground

DAP connection use case:

J8: Short 1-2

J9: Short 1-2

J10: Short 1-2

Motor connection use case:

J8: Short 2-3

J9: Short 2-3

J10: Short 2-3

#### 4.9. GND Pins

TT\_M3HQ has following GND Pins for signal monitoring which are total 4 pins.

**Table 9 GND Pins**

Jumpers	Pins	Connecting
J15	1	Ground
	2	
J16	1	Ground
	2	

## 4.10. TP: Test Point

TT\_M3HQ has following TP including Power voltage monitoring. All I/Os of M3HQ are assigned to the TP and Arduino Compatibility Connectors and Extension Headers.

**Table 10 Test Point**

Test Point	M3HQ pin	Function
T1	-	DVDD5: +5V
T2	-	DVDD33: +3.3V

Test Point	M3HQ pin		Test Point	M3HQ pin	
TP6	PA7		TP30	PH6	
TP7	PB3		TP31	PH7	
TP8	PB7		TP32	PF0	
TP9	PD5		TP33	PF1	
TP10	PD4		TP34	PG0	
TP11	PD3		TP35	PG1	
TP12	PD2		TP36	PL7	
TP13	PD1		TP37	PM6	
TP14	PD0		TP38	PR0	
TP15	PC6		TP39	PR1	
TP16	PC5		TP40	PR2	
TP17	PC4		TP41	PV5	
TP18	PC3		TP42	PV6	
TP19	PC2		TP43	PV7	
TP20	PC1		TP44	PR3	
TP21	PE5		TP45	PR4	
TP22	PE4		TP46	PR5	
TP23	PE3		TP47	PR6	
TP24	PE2		TP48	PR7	
TP25	PE1		TP49	PN5	
TP26	PE0		TP50	PT5	
TP27	PE6		TP57	PU2	
TP28	PH4		TP58	PU4	
TP29	PH5		TP59	PU1	

#### 4.11. UART-USB

The UART-USB debugging tool is integrated in the TT\_M3HQ board with CP2102. And it provide connectivity between USB and serial UART interfaces. The CP2102 USB to UART Bridge Virtual COM Port(VCP) drivers are required for TT\_M3HQ as a Virtual COM Port to facilitate host communication with CP2102 products.TT\_M3HQ can interface to a host using the direct access driver.

The UART-USB port will appear on a Windows machine as a COM port,or on a Linux machine as a dev/tty interface and on Mac OS as a/dev/usbmodem. Windows version older than Windows 10 will require a serial port driver.

Before connecting the TT\_M3HQ board to a windows 7, windows 8 or windows XP via USB, a driver for UART-USB driver must be installed. It can be downloaded from the <https://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers> website.

In case the TT\_M3HQ board is connected to the PC before installing the driver,the PC device manager may report some TT\_M3HQ interfaces as “unknown”

**Table 11 UART signal pin**

USB signal name	Pin NO.	TT_M3HQ signal name
RXD	PA1	UTOTXD
TXD	PA2	UTORXD



#### 4.12. Connectors and Headers

TT\_M3HQ has following connectors and headers on board what for assigned Use IOs. They are Arduino Compatibility Connectors, Extension Headers, SeeedGrove connectors and a Motor connector.

Connectors and Headers	Description
CN3, CN4, CN5, CN6	Arduino Compatibility Connectors
CN7, CN8,	Extension Headers
CN9, CN10, CN11, CN12	SeeedGrove connectors
CN13	Motor connector.

## 4.12.1. Extension Headers

CN7, CN8 are headers for interface with extension boards which assigned IOs of M3HQ.

Note: The TT\_M3HQ I/Os are 3.3 V or 5V.

CN7: SPH-254013825-185A, 2x19Pin, Pitch 2.54mm, Height 18.5mm

CN8: SPH-254013825-185A, 2x19Pin, Pitch 2.54mm, Height 18.5mm

Table 12 and Table 13 shows pin assignment of TT\_M3HQ on Extension Headers.

**Table 12 Extension Headers 1/2**

Connector	Pin	M3HQ pin	Function	Pin	M3HQ pin	Function
Left side						
CN7	1	PN4	-	2	PN3	-
	3	PN2	-	4	PN1	-
	5	DVDD	-	6	DVDD5	-
	7	PB0		8	GND	Ground
	9	PJ0	-	10	NC	-
	11	PJ3	-	12	IOREF	-
	13	PJ4	-	14	RESET	-
	15	PJ5	-	16	DVDD33	-
	17	PK0	-	18	DVDD5	-
	19	GND	Ground	20	GND	Ground
	21	PK2	-	22	GND	Ground
	23	PP3	-	24	VIN	-
	25	PP4	-	26	NC	-
	27	PP5	-	28	PF7	Arduino A0
	29	PV0	-	30	PF6	Arduino A1
	31	PV1	-	32	PF5	Arduino A2
	33	DVDD	-	34	PF4	Arduino A3
	35	PV2	-	36	PF3 or PA5	Arduino A4 / SDA*
	37	PV4	-	38	PF2 or PA4	Arduino A5 / SCL*

\*1: PF2 and PF3 are switched connection via J4, for PA4 and PA5.

**Table 13 Extension Headers 2/2**

Connector	Pin	M3HQ pin	Function	Pin	M3HQ pin	Function
Right side						
CN8	1	PP2	-	2	PP1	-
	3	PA4	D15 / SCL	4	PT6	-
	5	PA5	D14 / SDA	6	PT7	-
	7	AREF	-	8	DVDD5	-
	9	GND	Ground	10	PU0	-
	11	PT2	Arduino D13 / PWM / SPI_CLK	12	PB6	-
	13	PT4	Arduino D12 / SPI_MISO	14	PB5	-
	15	PT3 or PN0	Arduino D11 / SPI_MOSI *1	16	PB4	-
	17	PT1 or PC0	Arduino D10 / SPI_CS *1	18	PB2	-
	19	PP0	Arduino D9 / PWM	20	GND	Ground
	21	PT0	Arduino D8	22	PB1	-
	23	PL6	Arduino D7	24	PM5	-
	25	PL5	Arduino D6	26	PM7	-
	27	PA0	Arduino D5	28	PA3	-
	29	PG6	Arduino D4	30	PA6	-
	31	PG2	Arduino D3	32	AGND	Amalog Ground
	33	PG5	Arduino D2	34	PG7	-
	35	PG4	Arduino D1 / TX	36	PU3	-
	37	PG3	Arduino D0 / RX	38	PU5	-

\*1: PT3 and PT1 are switched connection via J12, for PN0 and PC0.

#### 4.12.2. Arduino Compatibility Connectors

CN3, CN4, CN5 and CN6 are female connectors compatible with Arduino standard and support Arduino Uno interface. The shields which designed for Arduino can make sure have interface with TT\_M3HQ.

Note: The TT\_M3HQ I/Os are 3.3 V or 5V.

CN3: SFH-254108H85A, 8Pin, Pitch 2.54mm, Height 8.5mm

CN4: SFH-254106H85A, 6Pin, Pitch 2.54mm, Height 8.5mm

CN5: SFH-254110H85A, 10Pin, Pitch 2.54mm, Height 8.5mm

CN6: SFH-254108H85A, 8Pin, Pitch 2.54mm, Height 8.5mm

Table 14 shows pin assignment of TT\_M3HQ on Arduino Compatibility Connectors.

**Table 14 Arduino Compatibility Connectors**

Connector	Pin	Pin Name	M3HQ pin	Function
Left side				
CN3 Power	1	NC	-	-
	2	IOREF	-	+5V reference same with output
	3	RESET	RESET_N	RESET
	4	3.3V	-	+3.3V output
	5	5V	-	+5V output
	6	GND	-	Ground
	7	GND	-	Ground
	8	VIN	-	Power input
CN4 Analog	1	A0	PF7	ADC input
	2	A1	PF6	ADC input
	3	A2	PF5	ADC input
	4	A3	PF4	ADC input
	5	A4 / SDA	PF3 or PA5	ADC input or I2C SDA *1
	6	A5 / SCL	PF2 or PA4	ADC input or I2C SCL*1
Right side				
CN5 Digital	10	D15 / SCL	PA4	I2C SCL *1
	9	D14 / SDA	PA5	I2C SDA *1
	8	AREF	-	AVDD
	7	GND	-	Ground
	6	D13 / PWM / SPI_CLK	PT2	PWM or SPI_CLK
	5	D12 / SPI_MISO	PT4	SPI_MISO
	4	D11 / SPI_MOSI	PT3 or PN0	SPI_MOSI *2
	3	D10 / SPI_CS	PT1 or PC0	SPI_CS *2
	2	D9 / PWM	PP0	PWM
	1	D8	PT0	-
CN6 Digital	8	D7	PL6	-
	7	D6 / PWM	PL5	PWM
	6	D5 / PWM	PA0	PWM
	5	D4	PG6	-
	4	D3 / PWM	PG2	PWM
	3	D2	PG5	-
	2	D1 / TX	PG4	TX
	1	D0 / RX	PG3	RX

\*1: PF2 and PF3 are switched connection via J11, for PA4 and PA5.

\*2: PT3 and PT1 are switched connection via J12, for PN0 and PC0.

## 4.12.3. SeeedGrove Connectors

CN9, CN10, CN11 and CN12 are connecting for Grove standard and support. The Grove support modules can make sure have interface with TT\_M3HQ.

CN9: 1125S-4P, 4Pin, Pitch 2.0mm

CN10: 1125S-4P, 4Pin, Pitch 2.0mm

CN11: 1125S-4P, 4Pin, Pitch 2.0mm

CN12: 1125S-4P, 4Pin, Pitch 2.0mm

Table 15 shows pin assignment of TT\_M3HQ on SeeedGrove Connectors.

**Table 15 SeeedGrove Connectors**

Connector	Pin	Pin Name	M3HQ pin	Function
CN9 GA Grove A	1	A0	PF7	ADC input
	2	A1	PF6	ADC input
	3	AVDD	-	DVDD
	4	GND	-	Ground
CN10 GB Grove B	1	SCL	PF2 or PA4	I2C SCL *1
	2	SDA	PF3 or PA5	I2C SDA *1
	3	DVDD	-	DVDD
	4	GND	-	Ground
CN11 GC Grove D	1	D3 / PWM	PG2	PWM
	2	D4	PG6	-
	3	DVDD	-	DVDD
	4	GND	-	Ground
CN12 GD Grove D	1	D0 / RX	PG3	RX
	2	D1 / TX	PG4	TX
	3	DVDD	-	DVDD
	4	GND	-	Ground

\*1: PF2 and PF3 are switched connection via J4, for PA4 and PA5.

## 4.12.4. Motor Connector

CN13 is connecting for Motor control which assigned M3HQ.

CN13: SFH-254210H85A, 2x5Pin, Pitch 2.54mm, Height 8.5mm

Table 16 shows pin assignment of TT\_M3HQ on a Motor Connection Header.

**Table 16 Motor Connection Header**

Connector	Pin	Pin Name	M3HQ pin	Function
CN13	1	OVV0	PK1	OVV0
	2	EMG0	PK0	EMG0
	3	ZO0	PJ5	ZO0
	4	WO0	PJ4	WO0
	5	YO0	PJ3	YO0
	6	VO0	PJ2	VO0
	7	XO0	PJ1	XO0
	8	UO0	PJ0	UO0
	9	GMD	-	Ground
	10	NC	-	-

## Appendix A: Schematics

### Figure 11 SCH: Top Sheet

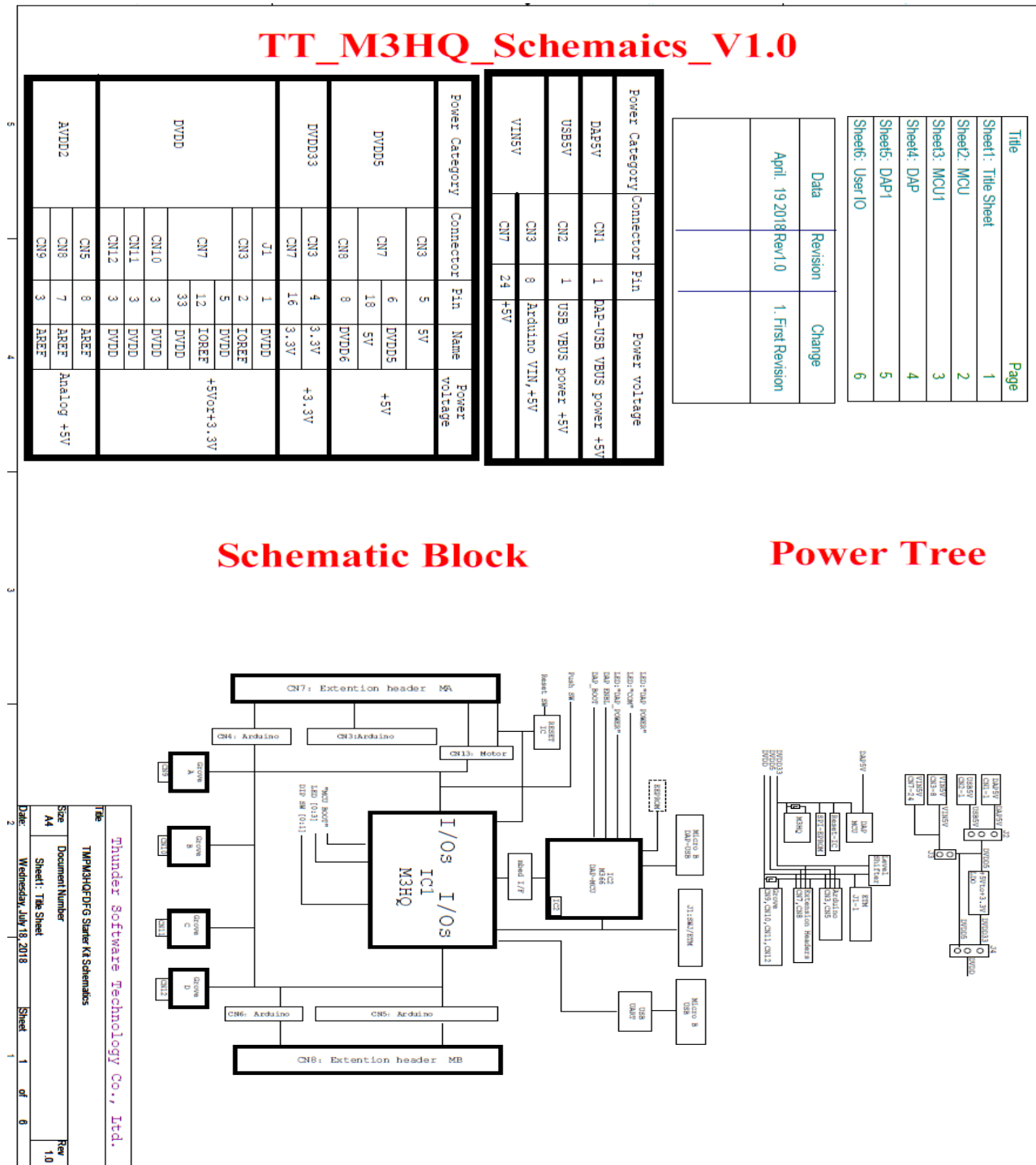




Figure 12 SCH: MCU

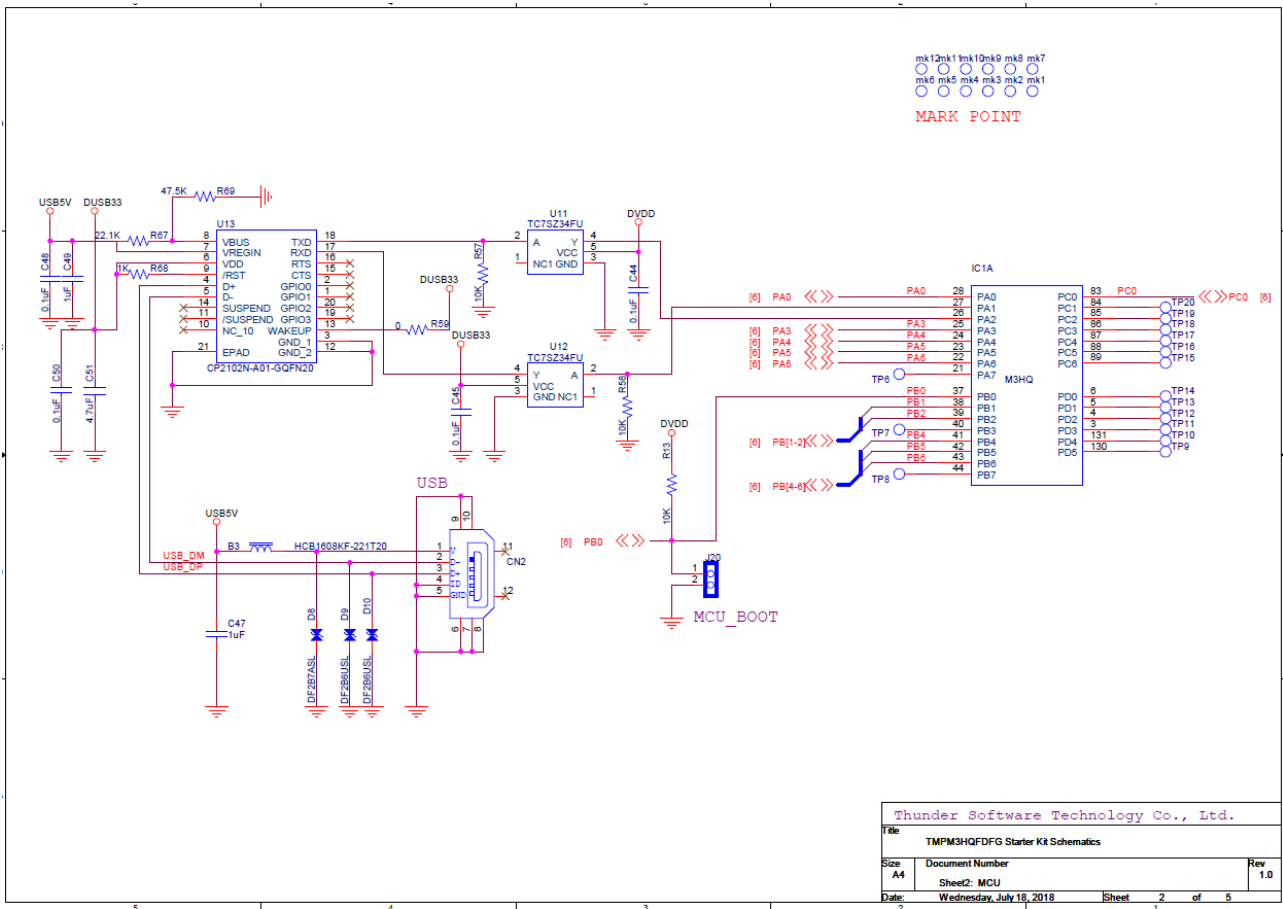
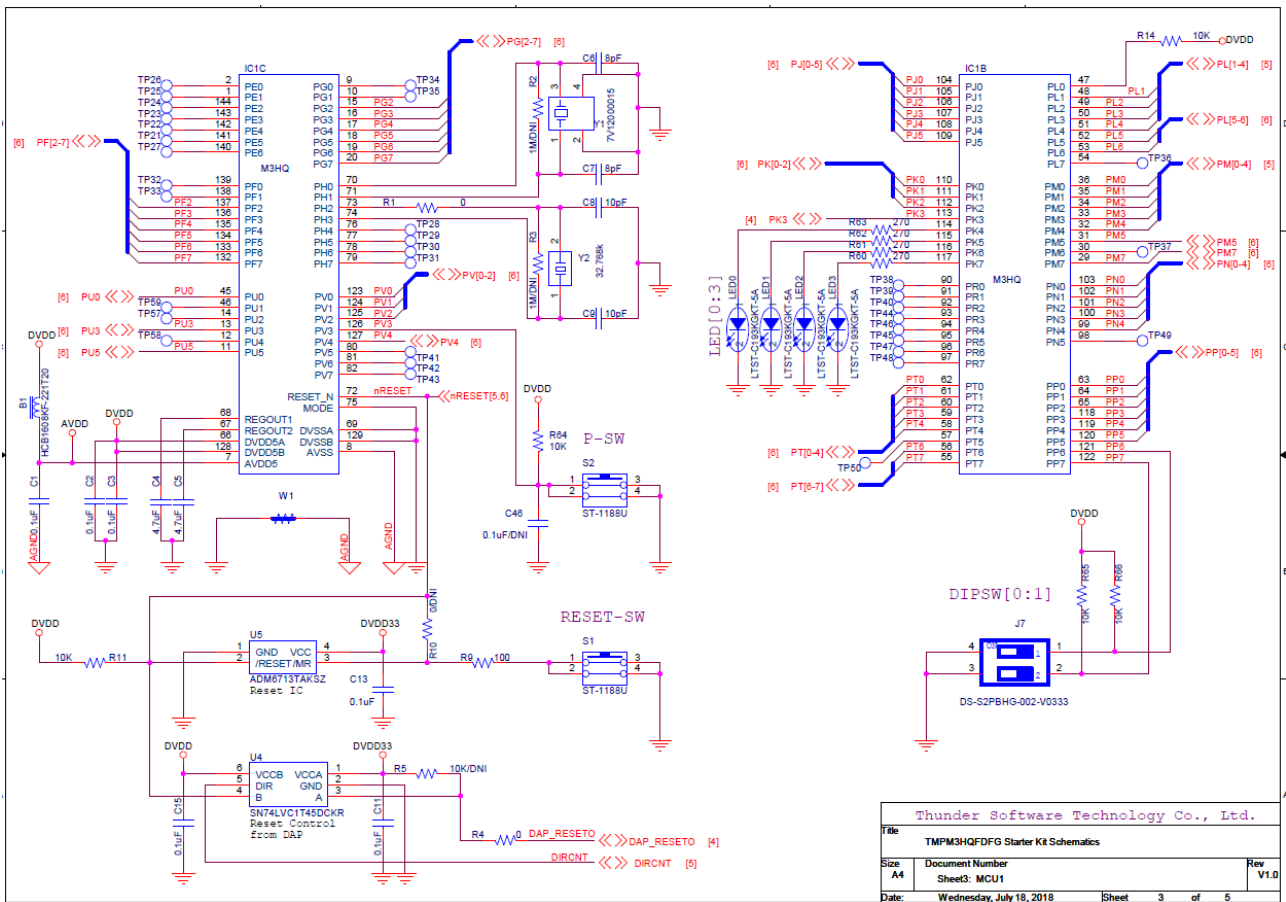
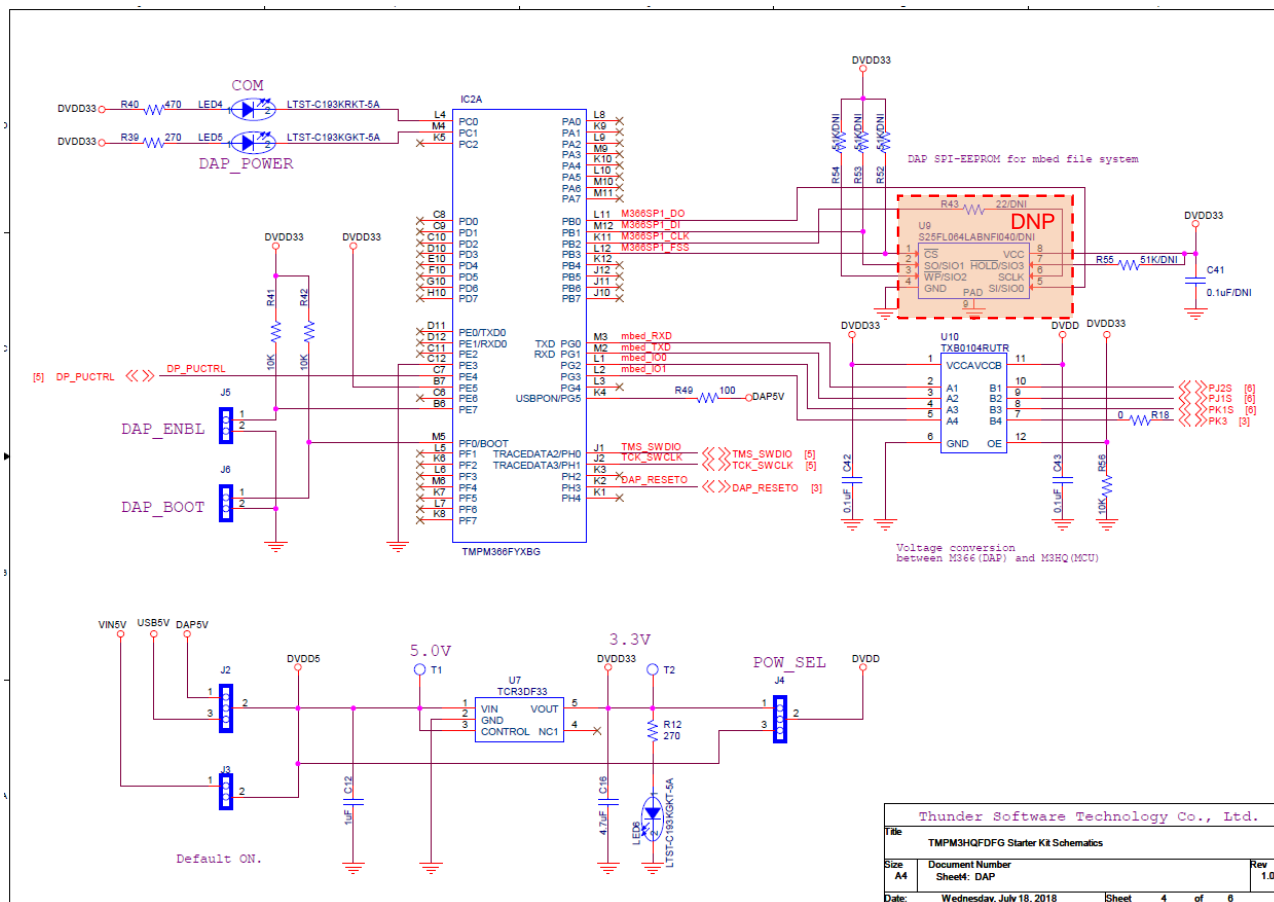


Figure 13 SCH: MCU1



### Figure 14 SCH: DAP



### Figure 15 SCH: DAP1

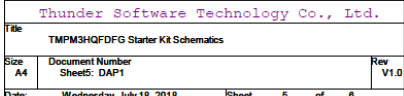
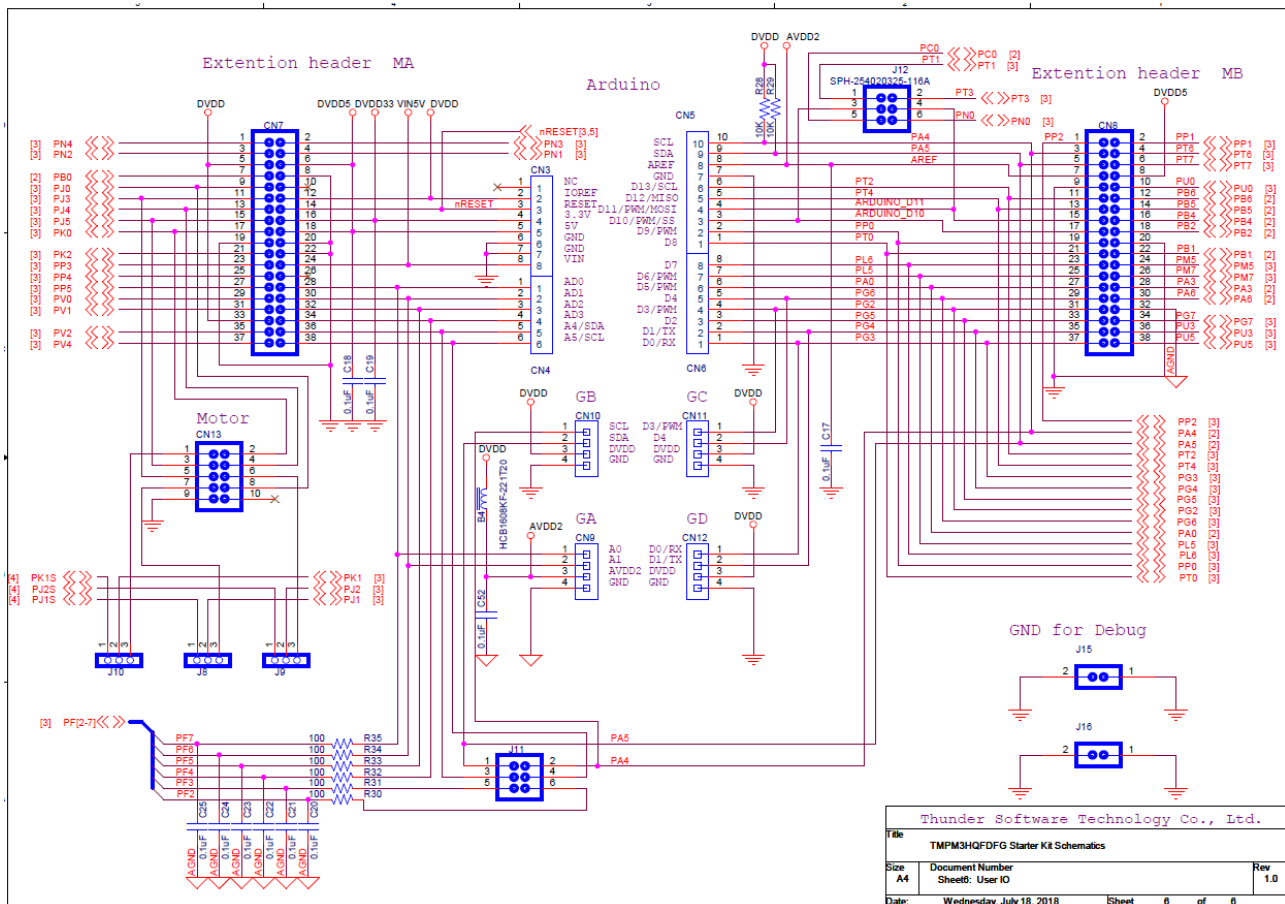


Figure 16 SCH: User IO



## Appendix B: Art

Figure 17 Art: Silk Top

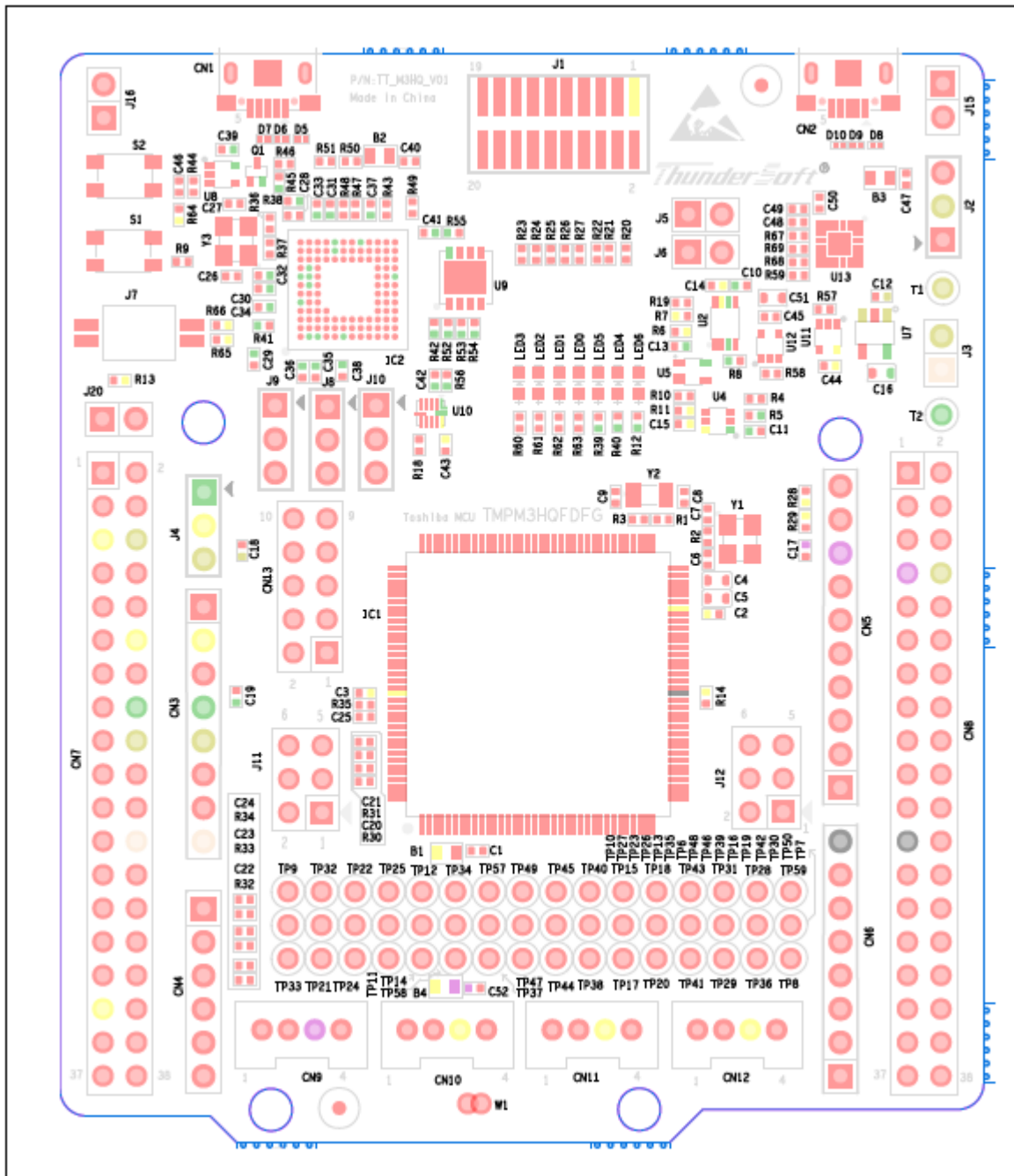


Figure 18 Art: Silk Bottom

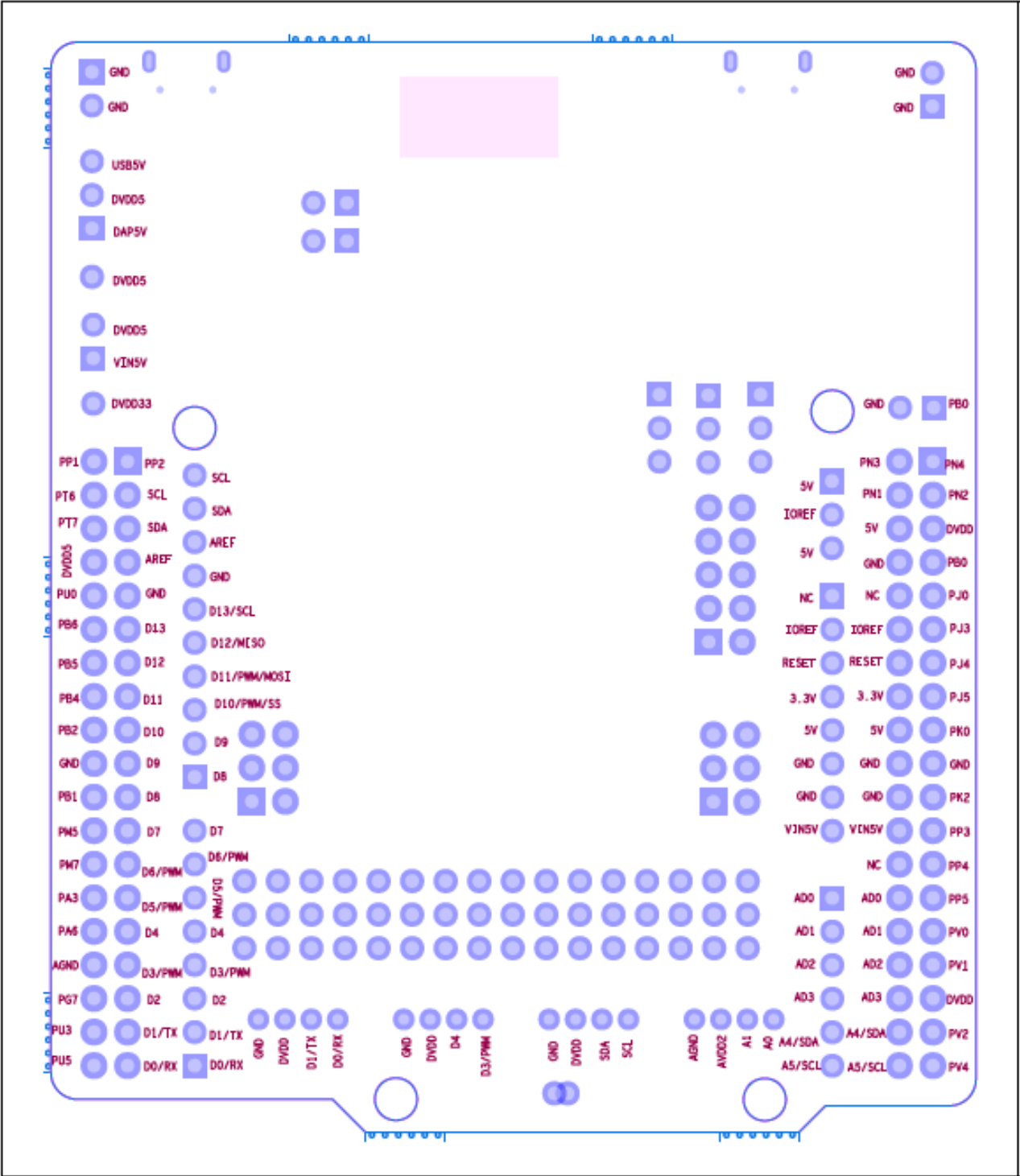


Figure 19 Art: L1 TOP

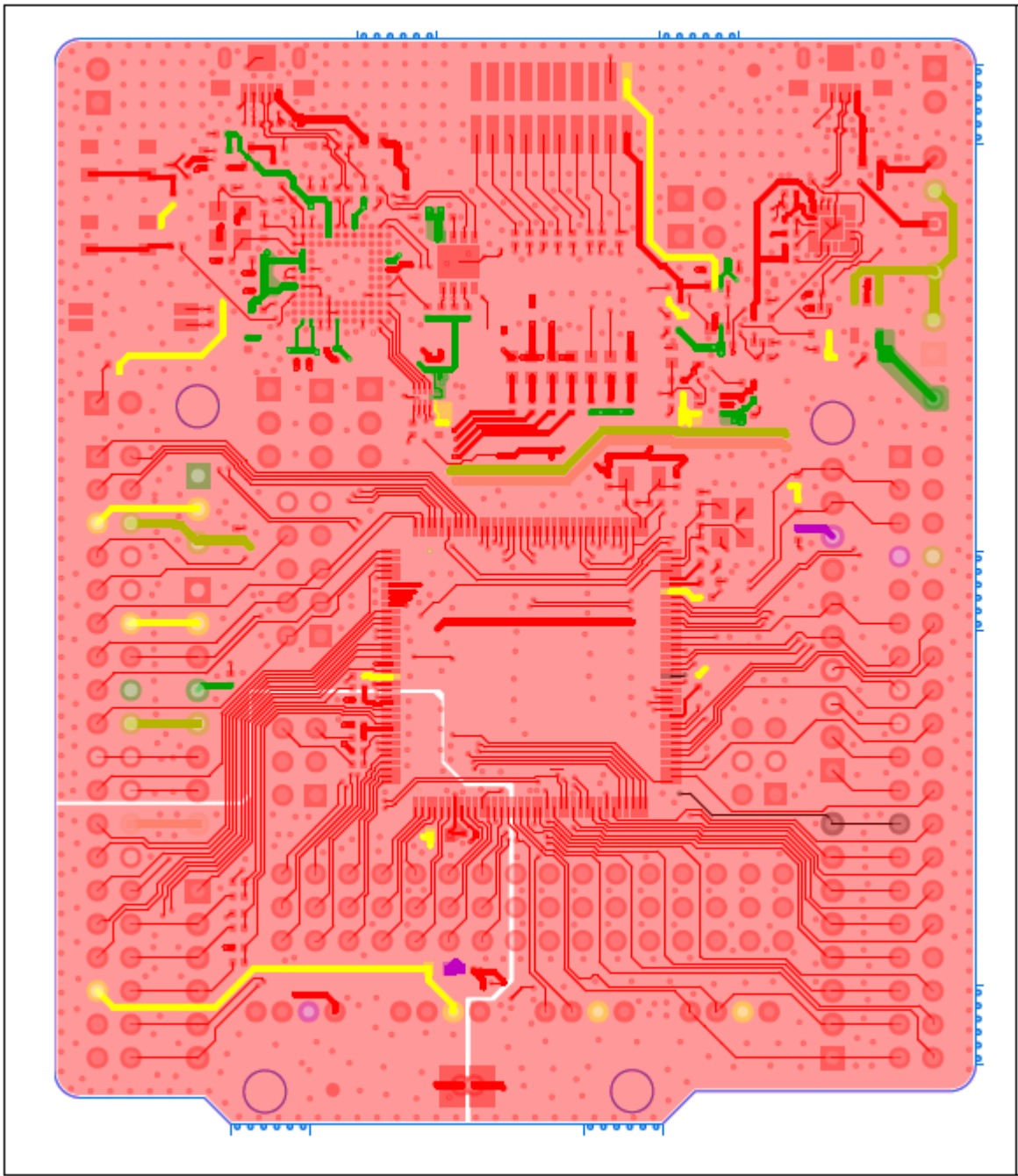




Figure 20 Art: L2

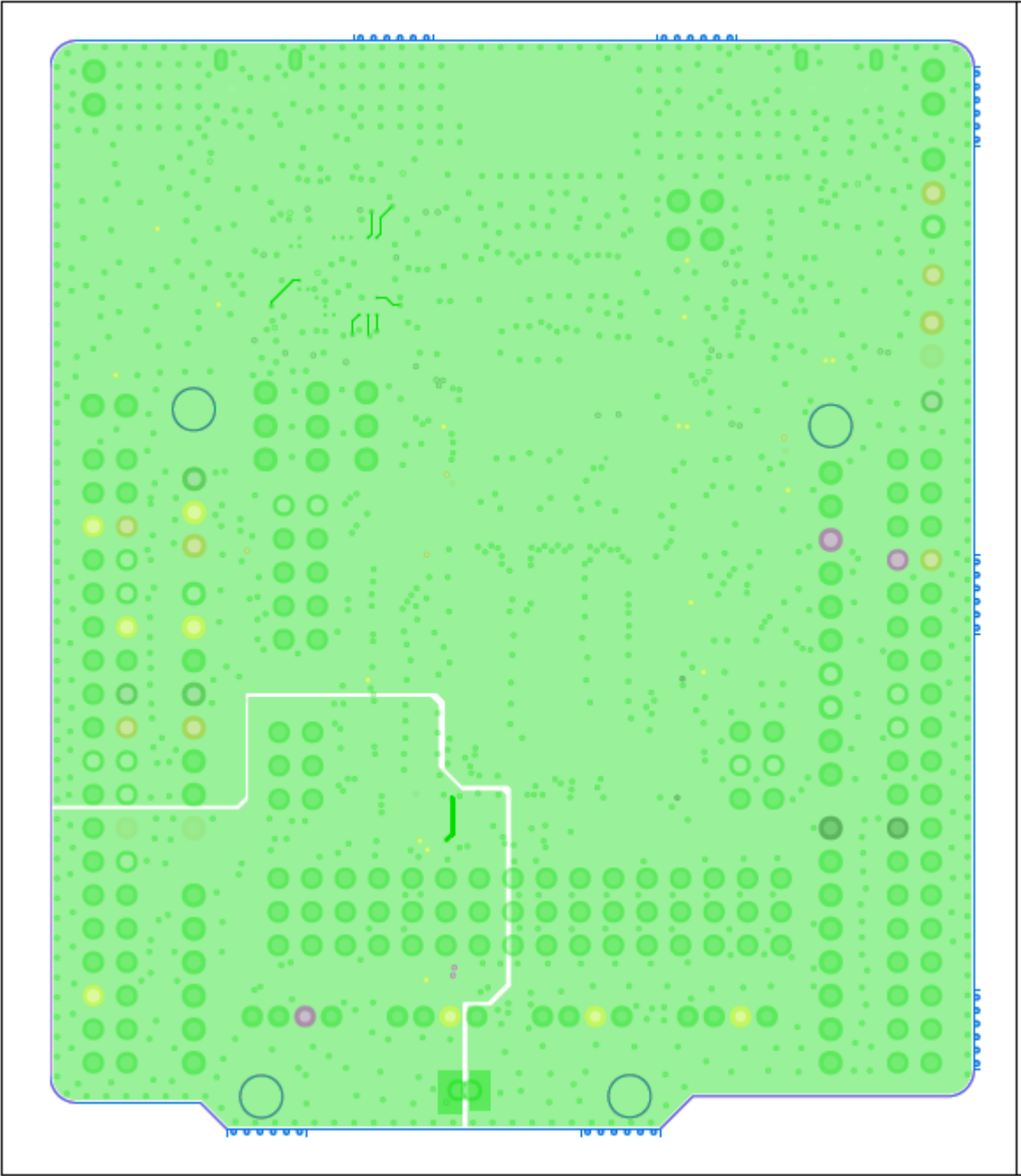


Figure 21 Art L3

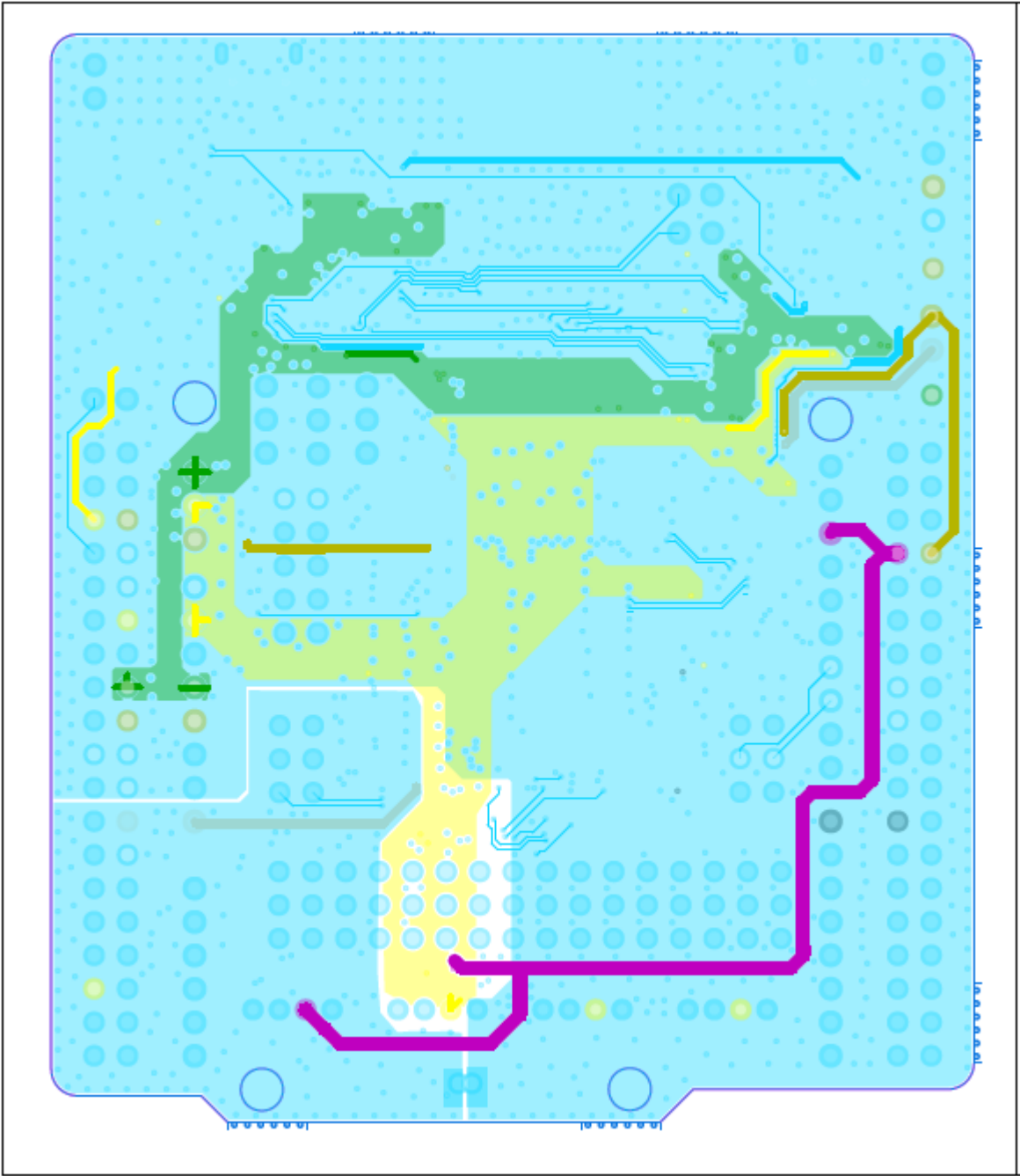
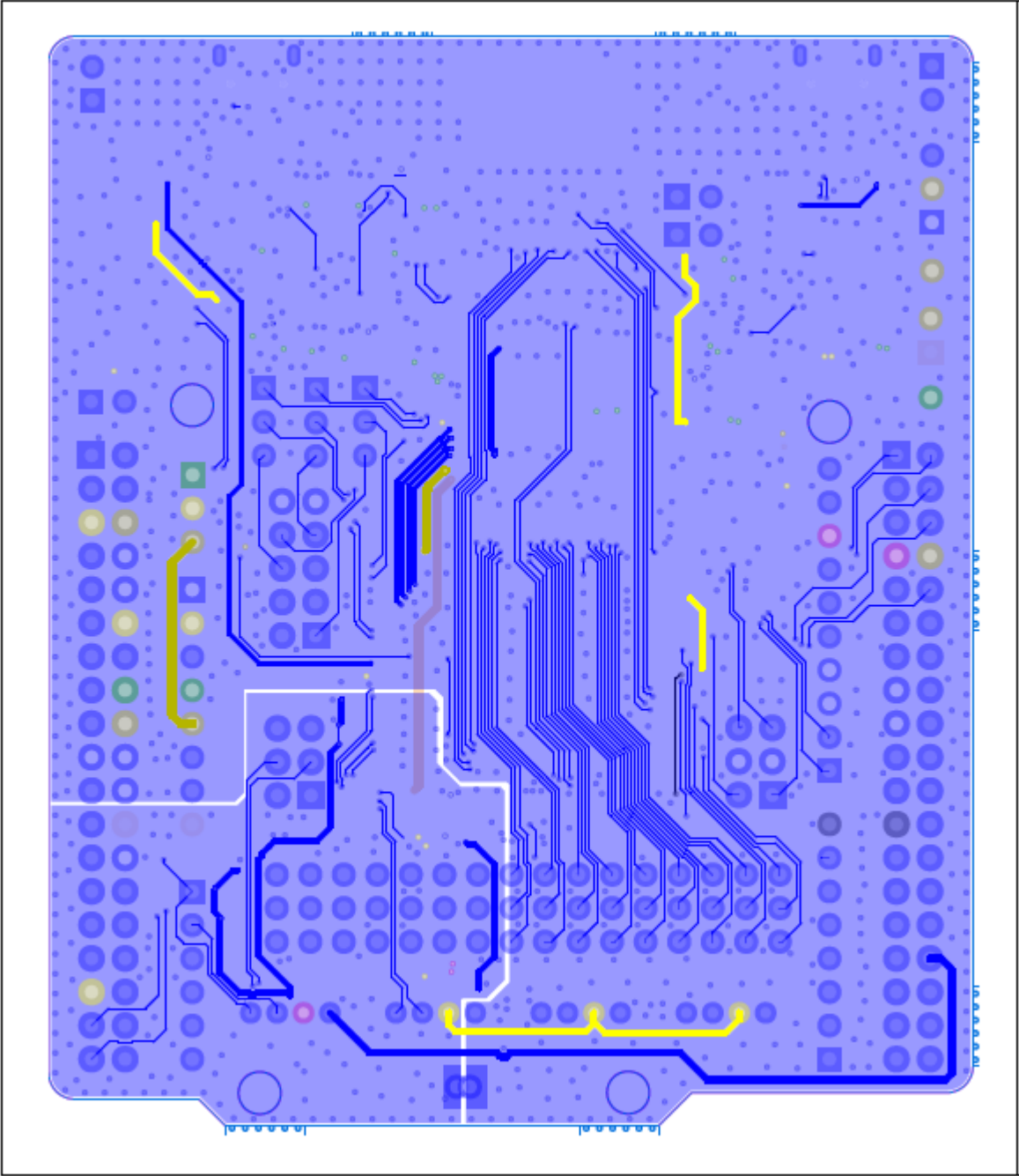


Figure 22 Art: L4 Bottom



## Appendix C: Bill of Materials

Table 17 Bill of Materials

Item	Value	Description	Reference	Quantity	Manufacturer PN.	Manufacturer	Environmental Protection
1	PCBA	PCBA, TT_M3HQ BOARD, Q07, EVT1, Ruize, HRR		1			Y
2	PCB	HD14L(1-2-1), T=1.2mm, Q07, V01, TT_M3HQ+M4G9 BOARD, Ruize HRR		1		勝達翔	Y
3	22 1k	RES, 22 1KΩ, ±1%, 1/16w, 0402	R67	1	RC0402FR-0722K1L	Yageo	Y
4	47.5k	RES, 47.5KΩ, ±1%, 1/16w, 0402	R69	1	RC0402FR-0747K5L	Yageo	Y
5	0_2	RES, 0Ω, ±5%, 1/16w, 0402	R1, R4, R18, R19, R20, R21, R22, R23, R24, R25, R26, R27, R3, R5, R9	14	RC0402JR-070RL	Yageo	Y
6	10K_2	RES, 10KΩ, ±5%, 1/16w, 0402	R8, R11, R13, R14, R28, R29, R38, R41, R42, R56, R57, R58, R64, R65, R66	15	RC0402JR-0710KL	Yageo	Y
7	27_2	RES, 27Ω, ±5%, 1/16w, 0402	R47, R48	2	RC0402JR-0727RL	Yageo	Y
8	51K_2	RES, 51KΩ, ±5%, 1/16w, 0402	R6, R7	2	RC0402JR-0751KL	Yageo	Y
9	100K_2	RES, 100KΩ, ±5%, 1/16w, 0402	R44	1	RC0402JR-07100KL	Yageo	Y
10	100_2	RES, 100Ω, ±5%, 1/16w, 0402	R9, R30, R31, R32, R33, R34, R35, R49	8	RC0402JR-07100RL	Yageo	Y
11	1K	Res, 1K, ±5%, 0402, 1/16W	R68	1	RC0402JR-071KL	Yageo	Y
12	1.5K_2	RES, 1.5KΩ, ±5%, 1/16w, 0402	R46	1	RC0402JR-071K5L	Yageo	Y
13	270_2	RES, 270Ω, ±5%, 1/16w, 0402	R12, R39, R60, R61, R62, R63	6	RC0402JR-07270RL	Yageo	Y
14	470	RES, 470Ω, ±5%, 1/16w, 0402	R40	1	RC0402JR-07470RL	Yageo	Y
15	510K_2	RES, 510KΩ, ±5%, 1/16w, 0402	R50, R51	2	RC0402JR-07510KL	Yageo	Y
16	1uF/10V_2	C-CAP, 1uF, ±10%, 10V, XSR, 0402	C12, C40, C47, C49	4	CL05A105KP5NNIN	SAMSUNG	Y
17	100nF/16V_2	C-CAP, 100nF, ±10%, 16V, XSR, 0402	C1, C2, C3, C10, C11, C13, C14, C15, C17, C18, C19, C20, C21, C22, C23, C24, C25, C28, C29, C30, C31, C32, C33, C34, C35, C36, C37, C38, C39, C42, C43, C44, C45, C46, C50, C52	36	C1005XSR104KETS	DARFON	Y
18	10pF/50V_2	C-CAP, 10pF, ±5%, 50V, NPO, 0402	C8, C9	2	C1005NPO100JGTS	DARFON	Y
19	8pF	C-CAP, 8pF, ±0.5pF, 50V, NPO, 0402	C6, C7, C26, C27	4	CC0402DRNPO9BN8R0	Yageo	Y
20	4.7uF/10V_3	C-CAP, 4.7uF, ±10%, 10V, XSR, 0603	C4, C5, C16, C51	4	CL10A475KP5NNIN	SAMSUNG	Y
21	HCB1608KF-221T20	FILTER BEAD HCB1608KF-221T20, 22Ω@100MHz, ±25%, 2A, 0.05Q, 0603	B1, B2, B3, B4	4	HCB1608KF-221T20	TAI-TECH	Y
22	7V12000015	Crystal, 12MHz, ±10ppm, -40/+85°C, 12pF, 3.2'x5.0'x0.7mm, SMT	Y1, Y3	2	7V12000015	TXC	Y
23	32.768k	Crystal, 32.768k, ±20ppm, -40/+85°C, 7pF, 1.5'x2.0'x0.75mm, SMT	Y2	1	9H03200034	TXC	Y
24	DF2B6USL	TVS, DF2B6USL, Vdrm=5.5V, SURGE RATING=10KV, 0.62'x0.32mm, H=0.33, SL2, SMB	D6, D7, D9, D10	4	DF2B6USL	Toshiba	Y
25	DF2B7ASL	TVS, DF2B7ASL, Vdrm=5.5V, SURGE RATING=30KV, 0.62'x0.32mm, H=0.33, SL2, SMB	D5, D8	2	DF2B7ASL	Toshiba	Y
26	LTST-C193K9KT-5A	LED DIODE, RED, 1.7~2.3V, 7.1~45mcd, 5mA, 0603	LED4	1	LTST-C193K9KT-5A	Iltron	Y
27	LTST-C193K9KT-5A	LED DIODE, BRILLIANT YELLOW GREEN, 1.7~2.3V, 4.5~28mcd, 5mA, 0603	LED0, LED1, LED2, LED3, LED5, LED6	6	LTST-C193K9KT-5A	Iltron	Y
28	SSM3J36FS	MOS-P, RLML6401TRPBF, -20V, 3.6Q, -330mA, 150mW, SOT23	Q1	1	SSM3J36FS	Toshiba	Y
29	TXB0102DCUR	IC, TXB0102DCUR, DUAL SUPPLY, NON-INVERTING TRANSLATOR, DCU8	U2	1	TXB0102DCUR	TI	Y
30	TCR30F33	IC, TCR30F33, LDO, 3.3V, 200mA, SOT-25, SMT	U7	1	TCR30F33	Toshiba	Y
31	TC7SZ34FU	IC, TC7SZ34FU, CMOS DIGITAL, INTEGRATED CIRCUITS, 1.65-5.5V, SOT-353, SMT	U11, U12	2	TC7SZ34FU	Toshiba	Y
32	TC7SH14FU	IC, TC7SH14FU, CMOS DIGITAL, INTEGRATED CIRCUITS, 2.0-5.5V, SOT-353, SMT	U8	1	TC7SH14FU	Toshiba	Y
33	TXB0104RUTR	IC, TXB0104RUTR, 4-BIT VOLTAGE LEVEL TRANSLATOR, UQFN12, SMT	U10	1	TXB0104RUTR	TI	Y
34	CP2102N-A01-GQFN20	IC, CP2102N-A01-GQFN20, USB TO UART DEVICES, QFN-20, SMT	U13	1	CP2102N-A01-GQFN20	Silabs	Y
35	ADM6713TAKSZ	IC, ADM6713TAKSZ, MICROPROCESSOR SUPERVISORY, 4PIN, SMT	U5	1	ADM6713TAKSZ	ADI	Y
36	SN74LVC1T45DCKR	IC, SN74LVC1T45DCKR, DUAL SUPPLY SINGLE BIT BUS TRANSCEIVER WITH CONFIG-VOLTAGE, 1.65-5.5V, SC70, SMT	U4	1	SN74LVC1T45DCKR	TI	Y
37	TMPM3HQDFG	IC, CORTEX-M3, 512KB FLASH, 64KB RAM, 20'x20'x1.2mm, LQFP-144, SMT	IC1	1	TMPM3HQDFG	Toshiba	Y
38	TMPM366FYXBG	IC, TMPM366FYXBG, CORTEX-M3, 256KB FLASH, 48KB RAM, 9'x9.1.2mm, TFBGA-109, SMT	IC2	1	TMPM366FYXBG	Toshiba	Y
39	DS-S2PBHG-002-V0333	SWITCH, SLIDE SWITCHES, 2 1/2, DS-S2PBHG-002-V0333, HESSMT, 2'x29mm, PH1.27, 4.14'x5.4mm, H=2.3, SMT	J7	1	DS-S2PBHG-002-V0333	正合	Y
40	ST-1188U	TACT SWITCH, RISEHNGTE, ST-1188U, 4PIN, 4.2mm'x3.3mm'x2.5mm, SMT	S1, S2	2	ST-1188U	深圳市日昇特科技有限公司	Y
41	SPH-254010225-116A	HEADER CONNECTOR, SMARTCONN, SPH-254010225-116A, 2PIN, PH2.54, H8.64mm, DIP	J3, J5, J6, J20, J15, J16	6	SPH-254010225-116A	SMARTCONN	Y
42	SPH-254010325-116A	HEADER CONNECTOR, SMARTCONN, SPH-254010325-116A, 3PIN, PH2.54, H8.64mm, DIP	J2, J4, J8, J9, J10	5	SPH-254010325-116A	SMARTCONN	Y
43	SWF-PH2004180	HEADER CONNECTOR, SMARTCONN, SWF-PH2004180, 4PIN, PH2.0, H7.5mm, DIP	CN9, CN10, CN11, CN12	4	SWF-PH2004180	勝誠興	Y
44	SFH-254205H85A	HEADER CONNECTOR, SMARTCONN, SFH-254205H85A, 2'x5PIN, PH2.54, H8.5mm, FEMALE, DIP	CN13	1	SFH-254205H85A	SMARTCONN	Y
45	SFH-254106H85A	HEADER CONNECTOR, SMARTCONN, SFH-254106H85A, 6PIN, PH2.54, H8.5mm, FEMALE, DIP	CN4	1	SFH-254106H85A	SMARTCONN	Y
46	SFH-254108H85A	HEADER CONNECTOR, SMARTCONN, SFH-254108H85A, 8PIN, PH2.54, H8.5mm, FEMALE, DIP	CN3, CN6	2	SFH-254108H85A	SMARTCONN	Y
47	SFH-254110H85A	HEADER CONNECTOR, SMARTCONN, SFH-254110H85A, 10PIN, PH2.54, H8.5mm, FEMALE, DIP	CN5	1	SFH-254110H85A	SMARTCONN	Y
48	SPH-254021925-185A	HEADER CONNECTOR, SMARTCONN, SPH-254021925-185A, 2'x19PIN, PH2.54mm, H18.5mm, DIP	CN7, CN8	2	SPH-254021925-185A	SMARTCONN	Y
49	SPH-254020325-116A	HEADER CONNECTOR, SMARTCONN, SPH-254020325-116A, 2'x3PIN, PH2.54mm, H8.64mm, DIP	J11, J12	2	SPH-254020325-116A	SMARTCONN	Y
50	UA31T05GAAZL2	MIRCO USB CONNECTOR, JHEC, UA31T05GAAZL2, 5PIN, PH0.65mm, H2.35mm, SMT	CN1, CN2	2	UA31T05GAAZL2	JHEC	Y
51	SMJ-25402	JUMPER CONNECTOR, SMARTCONN, SMJ-25402, 2PIN, PH2.54MM, 插接件, BLACK		10	SMJ-25402	勝誠興	Y

Revision history




Date	Revision	Changes
2018/07/27	V1.0	

## RESTRICTIONS ON PRODUCT USE

### SAFETY PRECAUTIONS



This section lists important precautions which users of the Product (and anyone else) should observe in order to avoid injury to human body and damage to property, and to ensure safe and correct use of our products. Please be sure that you understand the meanings of the labels and graphic symbols described below before you move on to the detailed descriptions of the precautions, and comply with the precautions stated.

#### Explanation of Labels





 <b>DANGER</b>	 <b>WARNING</b>	 <b>CAUTION</b>	<b>NOTICE</b>
Indicates a hazardous situation which, if not avoided, will result in death	Indicates a hazardous situation which, if not avoided, could result in	Indicates a potentially hazardous situation which, if not avoided, may result in	Indicates practices that may cause property damage <sup>3</sup> and other

1. Serious injury includes blindness, wounds, burns (low and high temperature), electric shock, fractures, and poisoning, etc. with long-lasting effects or that require hospitalization and/or long-term hospital visits for treatment.
2. Minor or moderate injury includes wounds, burns, electric shock, etc. not requiring hospitalization and/or long-term hospital visits for treatment.
3. Property damage means damage to customer or third party machines and equipment.


#### Explanation of Graphic Symbols

 Prohibited	 Instructions
Indicates prohibited actions.	Indicates actions that must be undertaken for safety purposes.

## ⚠ WARNING

 <b>Instructions</b>	<p>•<b>Keep the Product out of reach of children and pets.</b></p> <p>Misuse of the Product including without limitation accidental swallowing may cause suffocation or other injury. Contact a doctor immediately if you suspect a child has swallowed the Product.</p>
 <b>Prohibited</b>	<p>Failure to follow the instructions below could result in fire, damage to the Product and/or personal injury including burns and electric shock.</p> <p>•<b>Do not disassemble or modify the Product.</b></p> <p>•<b>Do not bend, drop, place heavy objects upon the Product,</b> or otherwise expose the Product to strong force or impact.</p>
 <b>Instructions</b>	<p>•<b>If the Product produces an odor, overheats or smokes, immediately turn off the device with which the Product is used, including the computer and peripherals, and disconnect the power cord from the outlet.</b> Do not use the Product again. Please contact the store that you purchased the Product from.</p>
 <b>Prohibited</b>	<p>•<b>Do not contact the Product for a long time.</b></p> <p>If the Product is used for a long time, the surface may become hot. Do not contact the Product for a long time to prevent skin irritation and/or heat injury.</p>

## ⚠ CAUTION

 <b>Prohibited</b>	<p>Failure to follow the instructions below may also cause malfunction or corruption:</p> <p>•<b>Do not touch the terminals (connection surface) directly, with metal objects or hard objects, because it may cause surges, including static electricity. Keep the terminals clean.</b></p> <p>•<b>Do not place in bathrooms or otherwise expose the Product to moisture or humidity.</b></p>
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### LIMITED WARRANTY

The Product is warranted against defects in materials and workmanship for one (1) month from the date of purchase. Retain the original dated sales receipt. Proof of the date of purchase will be required with any request for warranty replacement.

Thundersoft's sole liability in the event of such defects is to replace the Product.

## LIMITATIONS

This warranty does not cover circumstances beyond Thundersoft's control, nor problems caused by failure to follow the operation instructions for the Product.

Thundersoft does not warrant that the use or operation of the Product will be error free. To protect against accidental data loss, back up your data frequently on multiple types of storage media.

Thundersoft does not warrant that Product will be compatible with all software except the operating software explicitly specified by Thundersoft.

THIS WARRANTY DOES NOT APPLY TO FAILURES DUE TO SHIPPING DAMAGE, ACCIDENT, ALTERATION, MODIFICATION, UNAUTHORIZED SERVICE, MISUSE, ABUSE, USE WITH INCOMPATIBLE DEVICES OR SOFTWARE, ACCESSORIES OR ATTACHMENTS, FAILURE TO USE ITEMS SUPPLIED BY THUNDERSOFT, OR TO CLAIMS MADE AFTER THE EXPIRATION OF THIS WARRANTY. THUNDERSOFT EXPRESSLY DISCLAIMS ANY WARRANTIES, EXPRESS OR IMPLIED, OTHER THAN THOSE SET FORTH HEREIN, INCLUDING BUT NOT LIMITED TO WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE. THUNDERSOFT SHALL NOT BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL, SPECIAL, OR INDIRECT DAMAGES, WHETHER OR NOT TOSHIBA HAD BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, INCLUDING LOSS OF DATA, LOSS OF BUSINESS, OR OTHER LOSSES.

In the event that the exclusion of any implied warranty is ineffective under the law, the duration of the implied warranty will be one (1) month from the purchase date. Thundersoft's only obligation will be the replacement of this Product. Thundersoft will not be responsible for any special, consequential, incidental or indirect damages resulting from the sale, purchase, use or malfunction of this Product, regardless of the cause. Such damages for which Thundersoft will not be liable include, but are not limited to, loss of or inability to capture images, loss of revenue or profit, downtime costs, loss of the use of equipment, cost of substitute equipment, facilities or services, and claims by your customers for such damages.

## YOUR RIGHTS

Some states or provinces do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights, and you may have other rights which may vary from state to state or province to province. If the applicable law does not permit such limitations or exclusions, this warranty will be deemed modified to the extent permitted, but the rest of the warranty remains in full force and effect.

## UNINTENDED USAGE

The Product is intended for usage in general electronics applications. The Product is neither intended nor warranted for usage in equipment or system that requires extraordinarily high levels of quality and/or system reliability or in equipment the malfunction or failure of which may cause loss of human life, bodily injury, property damage or serious effect to the public. UNLESS OTHERWISE AGREED IN WRITING BY Thundersoft, Thundersoft SHALL ASSUME NO RESPONSIBILITIES OR LIABILITIES WHATSOEVER FOR ANY DAMAGES RESULTING FROM OR RELATING TO CUSTOMER'S UNINTENDED USAGE OF THE PRODUCT.



#### PRIVACY DATA

The Product, once directly or indirectly returned Thundersoft may be analyzed for quality purposes by Thundersoft or a company that provides components or services for the Product. Data that may still be remaining on the Product will be treated in confidence and will not be shared with any other third party. The returned Product and the data will be destroyed after the analysis.

#### EXPORT CONTROL

Unless written notice to the contrary is provided to the authorized reseller, you represent and warrant that any Product returned under warranty or otherwise does not contain any software or technology that is subject to export controls of your country.