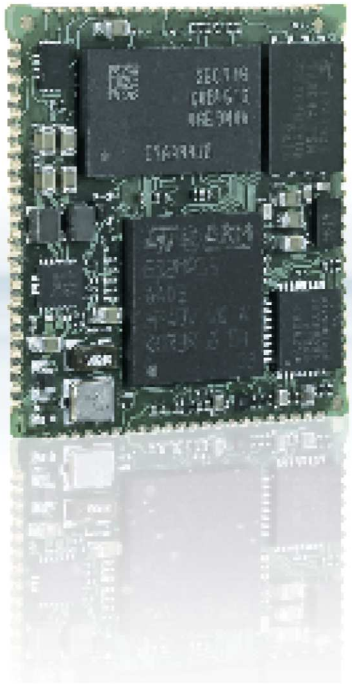
▶ USER GUIDE



SL STM32MP157

Doc. Rev. 1.2

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SL STM32MP157 - USER GUIDE

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Kontron Electronics GmbH

Kantstr. 10
72663 Großbettlingen
Germany
www.kontron-electronics.de

Kontron Europe GmbH

Gutenbergstr. 2
85737 Ismaning
Germany
www.kontron.com

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Revision History

Revision	Brief Description of Changes	Date of Issue	Author /Editor
0.1	Basic draft	2019-September-06	Gb
0.2	Adding Thermal considerations	2019-September-20	Gb
0.3	Modification general sections; 3.1 OPT added	2019-October-17	Kl
1.0	Release Version Table2: memory types added	2019-November-08	Kl
1.1	Added information about programming pins in chapter 5.3	2020-August-06	Gb
1.2	New address Kontron Headquarter	2021-January-27	Kl

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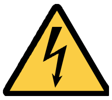
Symbols

The following symbols may be used in this user guide

⚠DANGER	DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.
⚠WARNING	WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.
NOTICE	NOTICE indicates a property damage message.
⚠CAUTION	CAUTION indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.
	**Electric Shock!** This symbol and title warn of hazards due to electrical shocks (> 60 V) when touching products or parts of products. Failure to observe the precautions indicated and/or prescribed by the law may endanger your life/health and/or result in damage to your material.
	**ESD Sensitive Device!** This symbol and title inform that the electronic boards and their components are sensitive to static electricity. Care must therefore be taken during all handling operations and inspections of this product in order to ensure product integrity at all times.
	**HOT Surface!** Do NOT touch! Allow to cool before servicing.
	**Laser!** This symbol informs of the risk of exposure to laser beam and light emitting devices (LEDs) from an electrical device. Eye protection per manufacturer notice shall review before servicing.
	This symbol indicates general information about the product and the user guide. This symbol also indicates detail information about the specific product configuration.
	This symbol precedes helpful hints and tips for daily use.

Special Handling and Unpacking Instruction

NOTICE

ESD Sensitive Device!

Electronic boards and their components are sensitive to static electricity. Therefore, care must be taken during all handling operations and inspections of this product, in order to ensure product integrity at all times.

Do not handle this product out of its protective enclosure while it is not used for operational purposes unless it is otherwise protected.

Whenever possible, unpack or pack this product only at EOS/ESD safe work stations. Where a safe work station is not guaranteed, it is important for the user to be electrically discharged before touching the product with his/her hands or tools. This is most easily done by touching a metal part of your system housing.

It is particularly important to observe standard anti-static precautions when changing piggybacks, ROM devices, jumper settings etc. If the product contains batteries for RTC or memory backup, ensure that the product is not placed on conductive surfaces, including anti-static plastics or sponges. They can cause short circuits and damage the batteries or conductive circuits on the product.

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List of Figures

1/ Introduction

This user guide describes the 25,5mmx25,5mm SoM form factor module – SL STM32MP157. The Advanced RISC Machines (ARM) based module is equipped with a ST STM32MP157 processor. The triple core SoC takes advantage of the optimized power consumption and performance ratio.

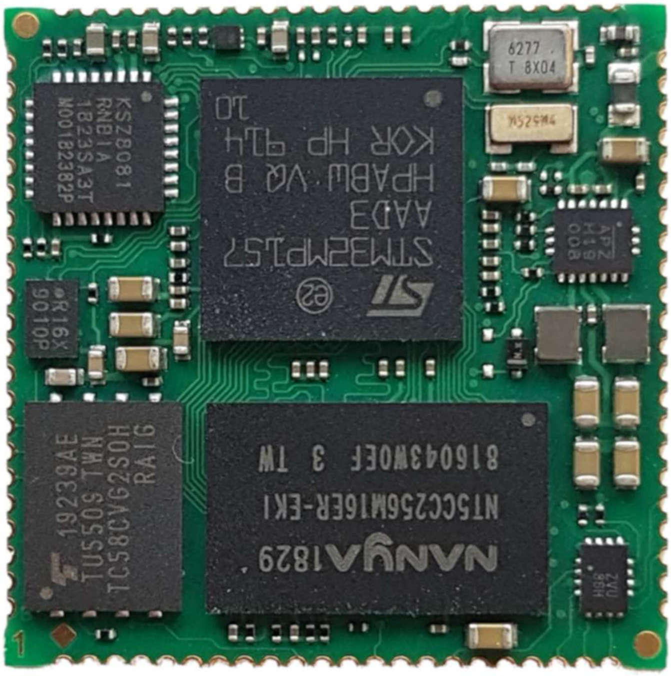
The use of this user guide implies a basic knowledge of PC hardware and software. This user guide is focused on describing the special features and is not intended to be a standard PC textbook. New users are recommended to study the short installation procedure, before switching on the power.

Latest revision of this user guide, datasheet, and BSPs (Board Support Packages) can be downloaded from Kontron Electronics Web Page.

2/ Description

The SL STM32MP157 is a very small System-on-Module (SoM) using STs STM32MP157 processor with ARM Dual Cortex A7 and Cortex M4. The SL STM32MP157 is a highly integrated, small sized module for integration in embedded systems with 25,5mmx25,5mm footprint.
The complexity of the DDR3 memory, power management and processor connection are contained in the 8-layer SOM and simplifies baseboard development.

Figure 1: 25,5x25,5mm SoM with castellation and LGA Pads



Main characteristics of the SL STM32MP157 are:

- Dual Cortex A7-Core with 650 MHz and Cortex M4 with 209 MHz based on ST's processor STM32MP157AAD with less than 1 W max power
- Up to 1 GB DDR3L memory down
- 256 to 512 MB SLC NAND-Flash
- 2 MB QSPI boot flash
- LCD-TFT controller up to 24-bit RGB with up to WXGA (1366 x 768) @60 fps
- MIPI® DSI 2 data lanes up to 1 GHz each
- 2x USB 2.0 interface (1x Host, 1x OTG)
- 6x SPI (including 3 with full duplex I2S)
- 1x Ethernet 100Mbit with integrated phy
- **78**x GPIOs
- 8x UART
- 1x CAN Bus interface (supporting CAN FD)
- 17x analog IN
- 2x DAC
- 8x GPIO via I/O-Expander

Please keep in mind, that not all interfaces are available simultaneously due to the amount of port pins and multiple multiplexing possibilities.

2.1. Product Variants and Accessories

Following variants are planned:

Table 1: Product Variants of SL STM32MP157

Board	Description	Product Number
SL STM32MP157 256/256	SoM with ST dual core STM32MP157 processor, 256 MB DDR3L and 256 MB SLC NAND Flash	40099 168
SL STM32MP157 512/512	SoM with ST dual core STM32MP157 processor, 512 MB DDR3L and 512 MB SLC NAND Flash	40099 167

The following accessories are available:

▶ STM32MP157 Evaluation Kit without display	(product no. 50099 045)
▶ STM32MP157 Evaluation Kit with 5” TFT (800x480)	(product no. 50099 044)

3/ System Specifications

3.1. Component Main Data

The table below summarizes the SoM’s features.

Table 2: Component Main Data

SL STM32MP157	
Form factor	25,5x25,5mm with 88 castellated pads and 38 LGA pads
Weight	2g
Processor	ST’s STM32MP157 with 10mm x 10mm BGA package in 0.5mm pitch (industrial version)
Memory	**528** MHz 16-bit DDR3L ▶ 256 MByte: 1x 2 Gbit density 128 M x16 DDR3L parts ▶ 512 MByte: 1x 4 Gbit density 256 M x16 DDR3L parts The following memory types are used: 256MByte: Samsung: K4B2G1646F-BMMA Nanya: NT5CC128M16JR-EKI Winbond: W632GU6NB11I Micron: MT41K128M16JT-125 IT:K 512MByte: Samsung: K4B4G1646E-BMMA Nanya: NT5CC256M16ER-EKI Intelligent Memory: IM4G16D3FABG-125I Micron: MT41K256M16TW-107 XIT:P
Boot Flash	2 MB SPI NOR flash in USON (2x3mm) package
Bootloader/BIOS	U-Boot Bootloader, Flash for Bootloader connected on QUADSPI_BK1
SLC NAND Flash	QSPI NAND Flash in WSON 8x6mm package connected on QUADSPI_BK2
OTP	The STM32MP1 has 96 words of internal OTP memory. The addresses 67 to 95 are for customer purpose.
Display	▶ 18/24-bit RGB ▶ MIPI® DSI 2 data lanes up to 1 GHz each ▶ Resolution: up to WXGA (1366 × 768) @60 fps
Onboard Controllers	
Ethernet Controller	1x 100Mbit PHY KSZ8081RNBIA
Watchdog Timer	3x CPU internal watchdog (2 x independent and window), configurable timeout counter with 12-bit down-counter
Real Time Clock (RTC)	CPU internal RTC with sub-second accuracy and hardware calendar
System Management Controller	No dedicated System Management Controller on module System settings can be arranged in U-Boot environment variables
H/W Status Monitor	CPU internal temperature monitoring sensor
Security	No security chip on module

Power management	No PMIC is on module. Discrete power supply is used
Operating System Support	Linux Yocto
Default Interfaces	
I2C	2x I2C interfaces which are derived from the SoC ▶ I2C2: also used for I/O Expander on the SoM (I2C address: 0x20) ▶ I2C4 General Purpose Use
LAN, USB	1x 100Mbit-Ethernet 1x USB2.0 OTG and 1x USB2.0 Host
Display	Two display interfaces are available ▶ 24Bit RGB with up to up to WXGA (1366 × 768) @60 fps ▶ MIPI® DSI 2 data lanes up to 1 GHz each
SD-Card	2x SDIO 4Bit
UART	3x UART, one is used for serial console by default
GPIO	17x General Purpose Inputs/Outputs (GPIO) ▶ 8x from I/O Expander TCA6408A ▶ 9x from SoC
PWM	2x from SoC ▶ TIM1_CH2: used for Buzzer on baseboard ▶ TIM4_CH3: used for TFT backlight on baseboard
other Connectivity	1x CAN
Power	
Consumption	Maximum Power consumption of the board is measured to 0.75 W
Input Voltage	Single supply +3.3V

NOTICE

Addresses 59 to 66 of MP1s internal OTP memory are reserved for Kontron use only. Writing to these addresses may affect the functionality of the SoM irreversible.

3.2. Environmental Conditions

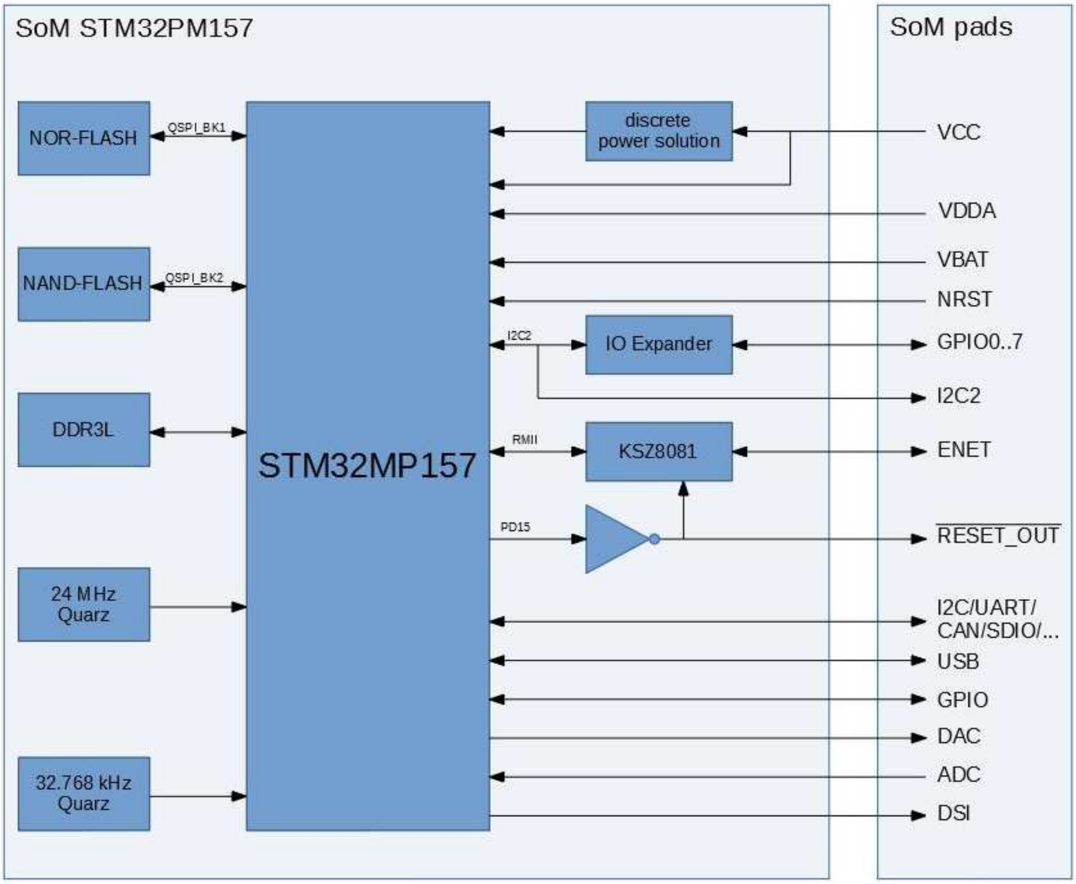
Table 3: Environmental Conditions

Operating	▶ industrial: -40°C to 85°C ▶ relative humidity (non-condensing) 10 % to 93 % at 40°C
Storage	▶ commercial grade: -40°C to +85°C ▶ relative humidity (non-condensing) 10 % to 93 % at 40°C

3.3. Functional Block Diagram

The block diagram shows a detailed structure of the SL STM32MP157 module.

Figure 2: Block Diagram



4/ Board and Connectors

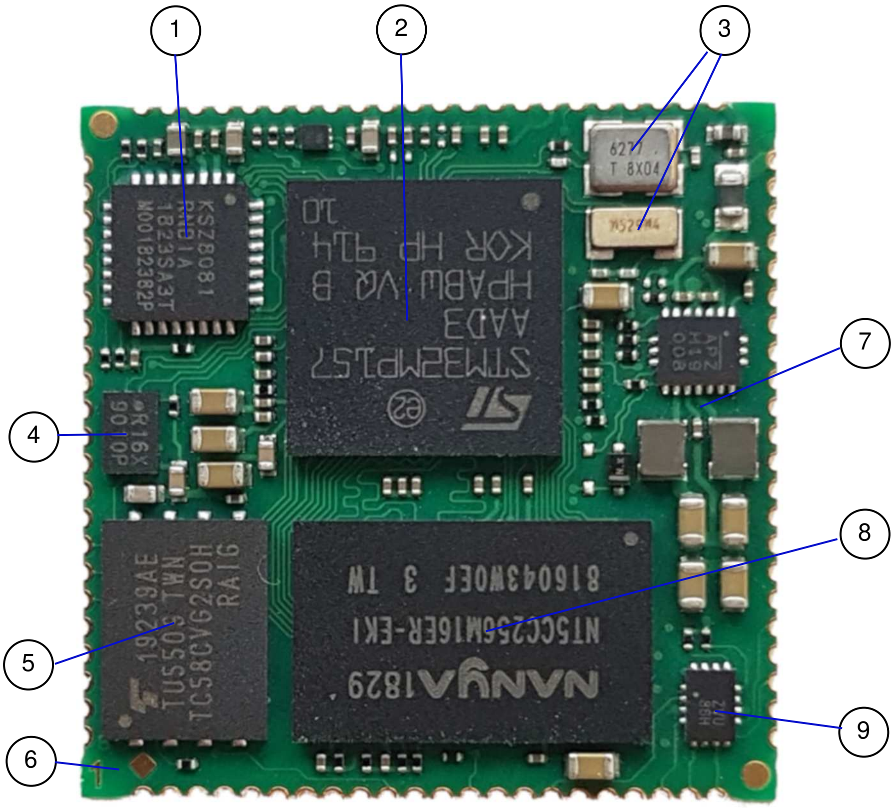
4.1.1. Connectors

Table 4: Connectors of SL STM32MP157

Connector	Function	Remark
Castellated pads and LGA pads	Central Interface	solderable

4.2. Mainboard view and I/O locations

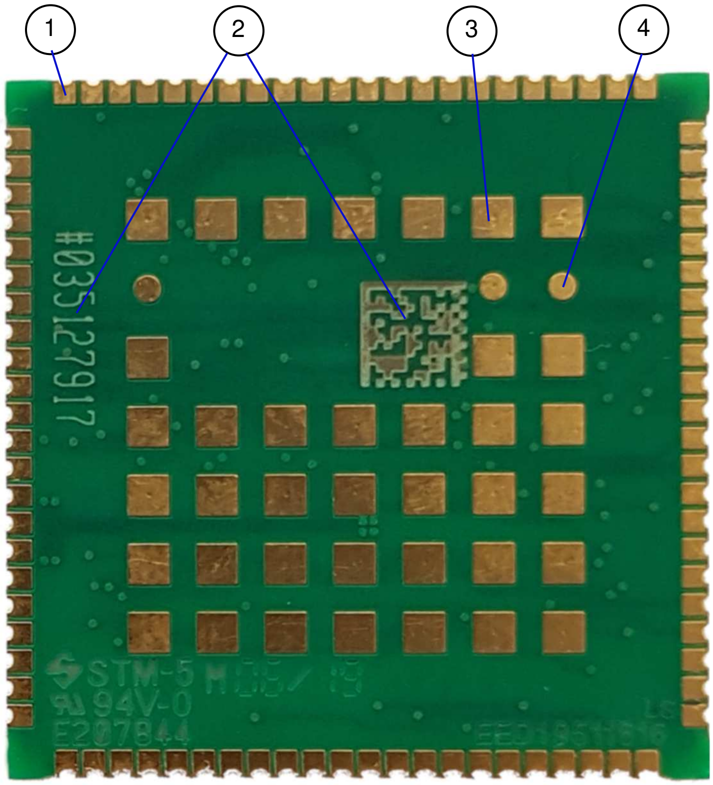
Figure 3: Top View



1. Ethernet Phy
2. STM32MP157 (processor)
3. Quartz
4. NOR-Flash
5. NAND-Flash
6. Pin 1 marking
7. Power
8. DDR3L
9. I/O expander

4.3. Bottom Side

Figure 4: Bottom View



1. Castellation pads
2. Unique ID
3. LGA pads
4. Test points (factory use only)

4.4. Mechanical Drawings

Figure 5: Dimensions of SL STM32MP157

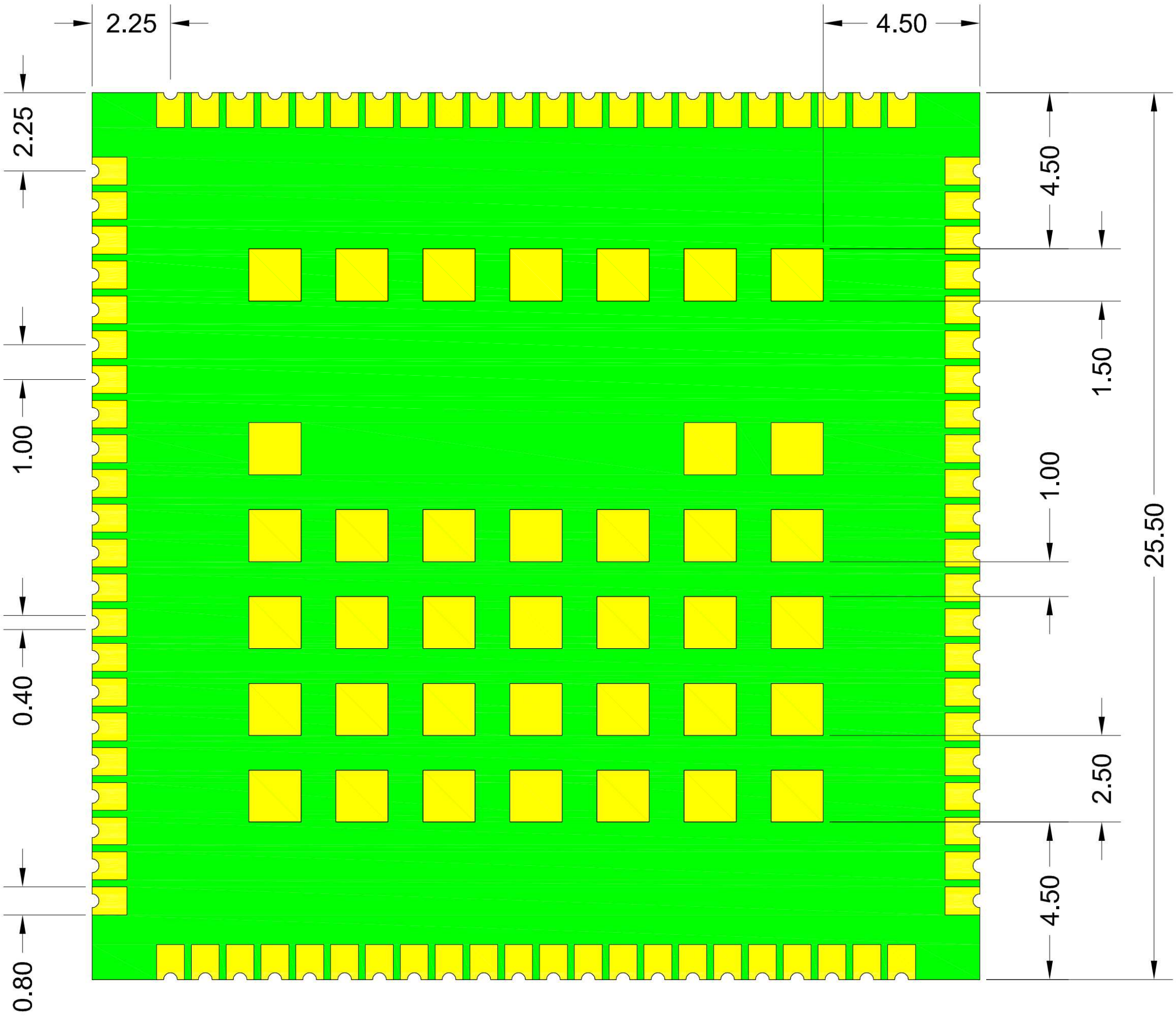


Figure 6: Thickness from side view

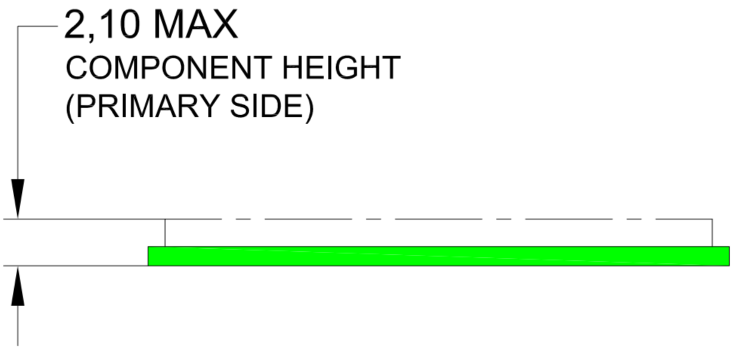
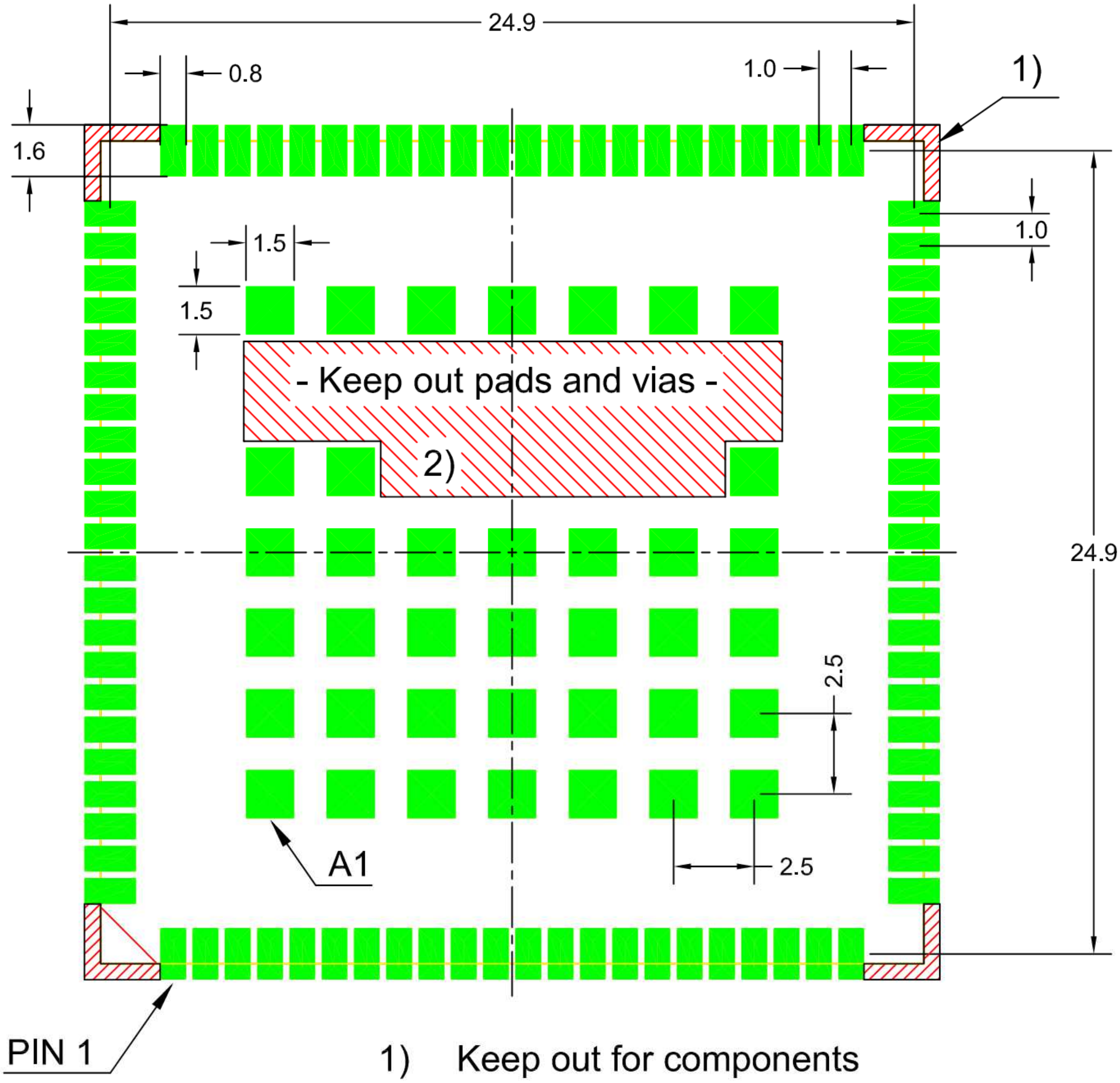


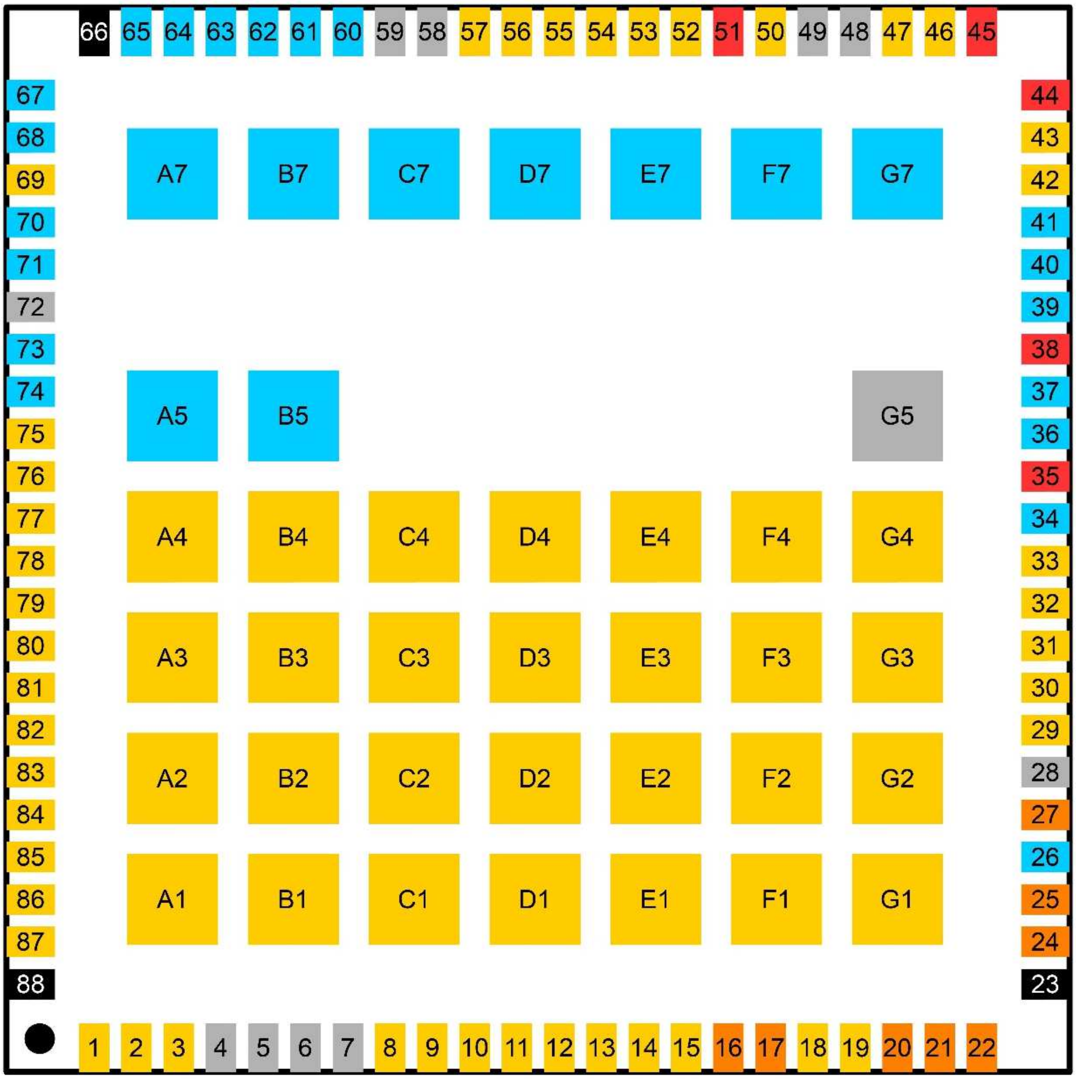
Figure 7: PCB land pattern



1) Keep out for components
2) Keep out for pads and vias

4.5. Pinout of SL STM32MP157

Figure 8: pin assignment



🟨 configurable pins

🟧 pins of I2C IO-expander

🟦 dedicated pins

🟥 supply

⬛ GND

4.5.1. Pinout of SL STM32MP157

Table 5: Pinout of SL STM32MP157 castellated pads

Pin	Signal	Module Direction	Module Termination	Type/ Tolerance	Controller	Controller Pin Name	STM32MP157 Port
1	SDMMC1_D0	Bi-Dir	-	CMOS 3.3V	STM32MP157	PC8	PC8
2	SDMMC1_CMD	Bi-Dir	-	CMOS 3.3V	STM32MP157	PD2	PD2
3	SDMMC1_CK	Out	-	CMOS 3.3V	STM32MP157	PC12	PC12
4	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-
8	PE1	GPIO	-	CMOS 3.3V	STM32MP157	PE1	PE1
9	PE0	GPIO	-	CMOS 3.3V	STM32MP157	PE0	PE0
10	PG7	GPIO	-	CMOS 3.3V	STM32MP157	PG7	PG7
11	TIM4_CH3	Out	-	CMOS 3.3V	STM32MP157	PD14	PD14
12	USART2_TX	Out	-	CMOS 3.3V	STM32MP157	PD5	PD5
13	USART2_RX	In	-	CMOS 3.3V	STM32MP157	PD6	PD6
14	USART2_RTS	Out	-	CMOS 3.3V	STM32MP157	PD4	PD4
15	PD3	GPIO	-	CMOS 3.3V	STM32MP157	PD3	PD3
16	GPIO0	GPIO	-	CMOS 3.3V	TCA6408A	P0	I2C2
17	GPIO1	GPIO	-	CMOS 3.3V	TCA6408A	P1	I2C2
18	PA13 1)	GPIO	-	CMOS 3.3V	STM32MP157	PA13	PA13
19	PA14	GPIO	-	CMOS 3.3V	STM32MP157	PA14	PA14
20	GPIO2	GPIO	-	CMOS 3.3V	TCA6408A	P2	I2C2
21	GPIO3	GPIO	-	CMOS 3.3V	TCA6408A	P3	I2C2
22	GPIO4	GPIO	-	CMOS 3.3V	TCA6408A	P4	I2C2
23	GND	-	-	-	-	-	
24	GPIO7	GPIO	-	CMOS 3.3V	TCA6408A	P7	I2C2
25	GPIO5	GPIO	-	CMOS 3.3V	TCA6408A	P5	I2C2
26	__RESET_OUT	Out	-	CMOS 3.3V	74AUP2G04FW3-7	2Y	PD15
27	GPIO6	GPIO	-	CMOS 3.3V	TCA6408A	P6	I2C2
28	-	-	-	-	-		
29	I2C2_SCL	Out	PU-2k21	CMOS 3.3V	STM32MP157	PD7	PD7
30	I2C2_SDA	Bi-Dir	PU-2k21	CMOS 3.3V	STM32MP157	PG15	PG15
31	FDCAN1_TX	Out	-	CMOS 3.3V	STM32MP157	PD1	PD1
32	FDCAN1_RX	In	-	CMOS 3.3V	STM32MP157	PD0	PD0
33	ADC1_IN5	In	-	Analog	STM32MP157	PB1	PB1
34	NRST	In	PU-25..55k	CMOS 3.3V	STM32MP157	NRST	NRST
35	OTG_VBUS	In	-		STM32MP157	OTG_VBUS	OTG_VBUS
36	USBH_HS1_DM	Bi-Dir	-	USB	STM32MP157	USBH_HS1_DM	USBH_HS1_DM
37	USBH_HS1_DP	Bi-Dir	-	USB	STM32MP157	USBH_HS1_DP	USBH_HS1_DP
38	OTG_VBUS	In	-		STM32MP157	OTG_VBUS	OTG_VBUS
39	USB_OTG_HS_DM	Bi-Dir	-	USB	STM32MP157	USB_OTG_HS_DM	USB_OTG_HS_DM
40	USB_OTG_HS_DP	Bi-Dir	-	USB	STM32MP157	USB_OTG_HS_DP	USB_OTG_HS_DP
41	USB_OTG_HS_ID	In	PU	CMOS 3.3V	STM32MP157	PA10	PA10
42	I2C4_SCL	Out	PU-2k21	CMOS 3.3V	STM32MP157	PE2	PE2

Pin	Signal	Module Direction	Module Termination	Type/ Tolerance	Controller	Controller Pin Name	STM32MP157 Port
43	I2C4_SDA	Bi-Dir	PU-2k21	CMOS 3.3V	STM32MP157	PB7	PB7
44	VCC	PWR	-	-	STM32MP157	VDD	VDD
45	VDDA	PWR	-	-	STM32MP157	VDDA	VDDA
46	PG14	GPIO	-	CMOS 3.3V	STM32MP157	PG14	PG14
47	PG9	GPIO	-	CMOS 3.3V	STM32MP157	PG9	PG9
48	-	-	-	-	-	-	-
49	-	-	-	-	-	-	-
50	ADC1_IN16	In	-	Analog	STM32MP157	PA0	PA0
51	VBAT	PWR	-	-	STM32MP157	VBAT	VBAT
52	UART4_TX	Out	-	CMOS 3.3V	STM32MP157	PG11	PG11
53	UART4_RX	In	-	CMOS 3.3V	STM32MP157	PB2	PB2
54	USART3_TX	Out	-	CMOS 3.3V	STM32MP157	PD8	PD8
55	USART3_RX	In	-	CMOS 3.3V	STM32MP157	PD9	PD9
56	USART3_RTS	Out	-	CMOS 3.3V	STM32MP157	PD12	PD12
57	USART3_CTS	In	-	CMOS 3.3V	STM32MP157	PD11	PD11
58	-	-	-	-	-	-	-
59	-	-	-	-	-	-	-
60	ETH1_RXN	Bi-Dir	-	PHY	KSZ8081RNB	RXM	RMII
61	ETH1_RXP	Bi-Dir	-	PHY	KSZ8081RNB	RXP	RMII
62	ETH1_TXN	Bi-Dir	-	PHY	KSZ8081RNB	TXM	RMII
63	ETH1_TXP	Bi-Dir	-	PHY	KSZ8081RNB	TXP	RMII
64	ETH1_LED0	Out/OD	-	CMOS 3.3V	KSZ8081RNB	LED0/NWAYEN	RMII
65	ETH1_LED1	Out/OD	-	CMOS 3.3V	KSZ8081RNB	LED1/SPEED	RMII
66	GND	-	-	-	-	-	-
67	DSI_CKN	Out	-	D-PHY	STM32MP157	DSI_CKN	DSI_CKN
68	DSI_CKP	Out	-	D-PHY	STM32MP157	DSI_CKP	DSI_CKP
69	PD13	GPIO	-	CMOS 3.3V	STM32MP157	PD13	PD13
70	DSI_D0N	Out	-	D-PHY	STM32MP157	DSI_D0N	DSI_D0N
71	DSI_D0P	Out	-	D-PHY	STM32MP157	DSI_D0P	DSI_D0P
72	-	-	-	-	-	-	-
73	DSI_D1N	Out	-	D-PHY	STM32MP157	DSI_D1N	DSI_D1N
74	DSI_D1P	Out	-	D-PHY	STM32MP157	DSI_D1P	DSI_D1P
75	SDMMC2_D3	Bi-Dir	-	CMOS 3.3V	STM32MP157	PB4	PB4
76	SDMMC2_D2	Bi-Dir	-	CMOS 3.3V	STM32MP157	PB3	PB3
77	SDMMC2_D1	Bi-Dir	-	CMOS 3.3V	STM32MP157	PB15	PB15
78	SDMMC2_D0	Bi-Dir	-	CMOS 3.3V	STM32MP157	PB14	PB14
79	SDMMC2_CMD	Bi-Dir	-	CMOS 3.3V	STM32MP157	PG6	PG6
80	SDMMC2_CK	Out	-	CMOS 3.3V	STM32MP157	PE3	PE3
81	PA11	GPIO	-	CMOS 3.3V	STM32MP157	PA11	PA11
82	PC2	GPIO	-	CMOS 3.3V	STM32MP157	PC2	PC2
83	PC3	GPIO	-	CMOS 3.3V	STM32MP157	PC3	PC3
84	TIM1_CH2	Out	-	CMOS 3.3V	STM32MP157	PA9	PA9
85	SDMMC1_D3	Bi-Dir	-	CMOS 3.3V	STM32MP157	PC11	PC11
86	SDMMC1_D2	Bi-Dir	-	CMOS 3.3V	STM32MP157	PC10	PC10
87	SDMMC1_D1	Bi-Dir	-	CMOS 3.3V	STM32MP157	PC9	PC9
88	GND	-	-	-	-	-	-

1) PA13 is an output in serial loader mode

Table 6: Pinout of SL STM32MP157 LGA pads

Pin	Signal	Module Direction	Module Termination	Type/ Tolerance	Controller	Controller Pin Name	STM32MP157 Port
A1	LCD_B6	Out	-	CMOS 3.3V	STM32MP157	PB8	PB8
A2	LCD_G5	Out	-	CMOS 3.3V	STM32MP157	PF11	PF11
A3	LCD_R4	Out	-	CMOS 3.3V	STM32MP157	PA5	PA5
A4	LCD_VSYNC	Out	-	CMOS 3.3V	STM32MP157	PA4	PA4
A5	BOOT1	In	PD	CMOS 3.3V	STM32MP157	BOOT1	BOOT1
A7	BOOT0	In	PU-1k	CMOS 3.3V	STM32MP157	BOOT0	BOOT0
B1	LCD_B5	Out	-	CMOS 3.3V	STM32MP157	PA3	PA3
B2	LCD_G4	Out	-	CMOS 3.3V	STM32MP157	PB10	PB10
B3	LCD_R3	Out	-	CMOS 3.3V	STM32MP157	PB0	PB0
B4	LCD_HSYNC	Out	-	CMOS 3.3V	STM32MP157	PC6	PC6
B5	BOOT2	In	PD	CMOS 3.3V	STM32MP157	BOOT2	BOOT2
B7	NJTRST	In	PU	CMOS 3.3V	STM32MP157	NJTRST	NJTRST
C1	LCD_B4	Out	-	CMOS 3.3V	STM32MP157	PE12	PE12
C2	LCD_G3	Out	-	CMOS 3.3V	STM32MP157	PE11	PE11
C3	LCD_R2	Out	-	CMOS 3.3V	STM32MP157	PA1	PA1
C4	LCD_CLK	Out	-	CMOS 3.3V	STM32MP157	PE14	PE14
C7	JTCK-SWCLK	In	PD	CMOS 3.3V	STM32MP157	JTCK-SWCLK	JTCK-SWCLK
D1	LCD_B3	Out	-	CMOS 3.3V	STM32MP157	PD10	PD10
D2	LCD_G2	Out	-	CMOS 3.3V	STM32MP157	PA6	PA6
D3	LCD_R1	Out	-	CMOS 3.3V	STM32MP157	PA15	PA15
D4	LCD_DE	Out	-	CMOS 3.3V	STM32MP157	PE13	PE13
D7	JTDI	In	PU	CMOS 3.3V	STM32MP157	JTDI	JTDI
E1	LCD_B2	Out	-	CMOS 3.3V	STM32MP157	PG10	PG10
E2	LCD_G1	Out	-	CMOS 3.3V	STM32MP157	PE6	PE6
E3	LCD_R0	Out	-	CMOS 3.3V	STM32MP157	PG13	PG13
E4	LCD_R7	Out	-	CMOS 3.3V	STM32MP157	PE15	PE15
E7	JTDO-TRACESWO	Out	PU	CMOS 3.3V	STM32MP157	JTDO-TRACESWO	JTDO-TRACESWO
F1	LCD_B1	Out	-	CMOS 3.3V	STM32MP157	PG12	PG12
F2	LCD_G0	Out	-	CMOS 3.3V	STM32MP157	PE5	PE5
F3	LCD_G7	Out	-	CMOS 3.3V	STM32MP157	PB5	PB5
F4	LCD_R6	Out	-	CMOS 3.3V	STM32MP157	PA8	PA8
F7	JTMS-SWDIO	Bi-Dir	PU	CMOS 3.3V	STM32MP157	JTMS-SWDIO	JTMS-SWDIO
G1	LCD_B0	Out	-	CMOS 3.3V	STM32MP157	PE4	PE4
G2	LCD_B7	Out	-	CMOS 3.3V	STM32MP157	PB9	PB9
G3	LCD_G6	Out	-	CMOS 3.3V	STM32MP157	PC7	PC7
G4	LCD_R5	Out	-	CMOS 3.3V	STM32MP157	PA12	PA12
G5	-	-	-		-	-	-
G7	PWR_LP	Out	-	CMOS 3.3V	STM32MP157	PWR_LP	PWR_LP

5/ Installation

5.1. Power Control

5.1.1. Power Supply

The SoM can be powered from a single 3.3V power Source at VCC pin. The VBAT pin can be connected to an external battery (1.2 V < VBAT < 3.6 V). If no external battery is used, it is mandatory to connect this pin to VCC. The VDDA pin is the analog (ADC/DAC/VREF) supply voltage.

DAC can only be used when VDDA is above or equal 1.8 V. Using Internal VREF+ requires VDDA equal to or higher than VREF+ + 0.3 V.

The analog supply VDDA can be filtered and shielded from noise on the PCB to improve the ADC and DAC conversion accuracy.

Small decoupling capacitors like 100nF should be used for each supply pin an should be placed as close as possible,

The following parameters should be delivered from the carrier board:

- Voltage Ripple maximum 100 mV peak to peak 0-20 MHz, 20 ms rise time from input voltage <10% to nominal VCC

5.1.2. Supply voltage

Table 7: Supply voltage

Voltage	nominal	min	max
VCC	3.3 V	3.0 V	3.6 V
VDDA	3.3 V	1.71 V	3.6 V
VBAT	3.3 V	1.2 V	3.6 V

5.1.3. Supply current

Table 8: Supply current

Use case	mean	max peak
Linux running	195 mA	225 mA
1x A7 heavy load	250 mA	280 mA
2x A7 heavy load	300 mA	340 mA
2x A7 + GPU heavy load	340 mA	365 mA
2x A7 + GPU + M4 heavy load	345 mA	370 mA

5.2. Reset pin

A low level at NRST triggers a reset. The module will stay in reset as long as NRST is grounded. If unused, this pin can be left floating. No external components are required.

5.3. Boot Mode

The following table shows the possible boot sources

Table 9: Boot Options on the carrier board

	Carrier Connection			Boot Source	Comments
	BOOT2	**BOOT1**	**BOOT0**		
0	GND	GND	GND	UART and USB	Wait incoming connection on: ▶ USART2/3/6 and UART4/5/7/8 on default pins ▶ USB High-Speed device on OTG_HS_DP/DM pins
1	GND	GND	VCC	Serial NOR-Flash	Serial NOR-Flash on QUADSPI
2	GND	VCC	GND	eMMC	eMMC™ on SDMMC2 (default)
3	GND	VCC	VCC	NAND-Flash	SLC NAND-Flash on FMC
4	VCC	GND	GND	Reserved	Used to get debug access without boot from Flash
5	VCC	GND	VCC	SD-Card	SD-Card on SDMMC1 (default)
6	VCC	VCC	GND	UART and USB	Wait incoming connection on: ▶ USART2/3/6 and UART4/5/7/8 on default pins USB High-Speed device on OTG_HS_DP/DM pins
7	VCC	VCC	VCC	Serial NAND-Flash	Serial NAND-Flash on QUADSPI

BOOT0 has a 1k pull up and BOOT1 and BOOT2 has pull downs. So, if the BOOT pins have no other external connection on the baseboard, the SoM will boot from the internal NOR-Flash. To set the MP1 to boot from SD Card add a 1k Pull-Up to BOOT2 or directly connect it to BOOT0.

A simple external connection can be used to realize all necessary boot modes with two switches.

Figure 9: example connection of BOOT pins

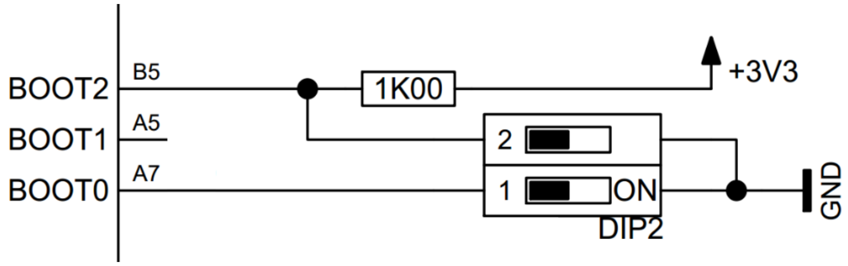


Table 10: simplified boot options

	SW2	SW1	BOOT pins	BOOT Mode
0	close	close	000	UART and USB
1	close	open	001	Serial NOR-Flash
2	open	close	100	debug
3	open	open	101	SD-Card

It is recommended to have the boot pins and the OTG_HS_DP/DM pins available on the baseboard to recover the SoM in case of a broken image. In addition, also the SD-Card pins and the pins for the Linux console should be accessible.

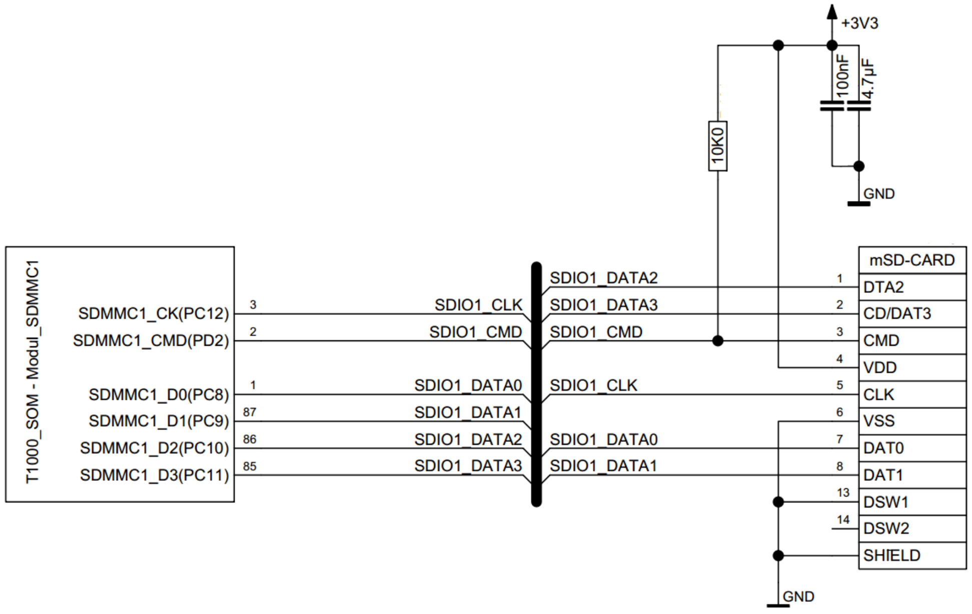
5.4. SD card

When the BOOT pins are set to 101 the MP1 will boot from SD card on SDMMC1. Therefor it is recommended to connect a SD-Card slot to SDMMC1 to use this feature at least during development.

Table 11: external connection for SD-Card

SoM Pin	STM32MP157	Pin function
1	PC8	SDMMC1_D0
2	PD2	SDMMC1_CMD
3	PC12	SDMMC1_CK
85	PC11	SDMMC1_D3
86	PC10	SDMMC1_D2
87	PC9	SDMMC1_D1

Figure 10: SD-Card connection example

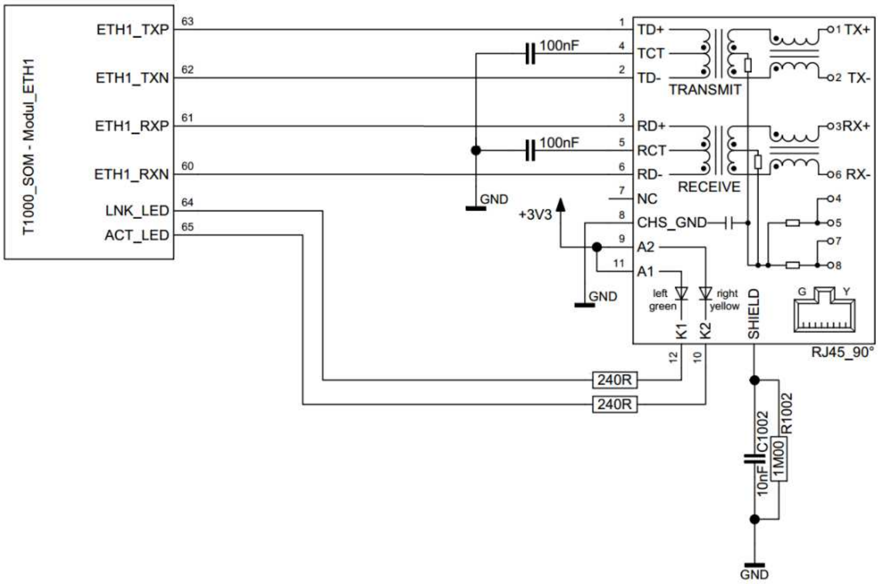


If UHS-I mode is required an additional external level shifter is required as card IO voltage is 1.8V in this mode. For detailed description, please refer to chapter 10.1.8 of ST`s application note AN5031.

5.5. Ethernet

The SL STM32MP157 includes the 100Mbit Phy KSZ8081RNBIA. This makes the ethernet implementation on the baseboard quite simple. Only an appropriate connector with magnetics has to be connected.

Figure 11: Ethernet connection example



6/ Thermal considerations

The temperature rise of the CPU depends on the use case and varies from 20°C for “Linux running” up to approximately 45°C for “2x A7 + GPU + M4 heavy load”.

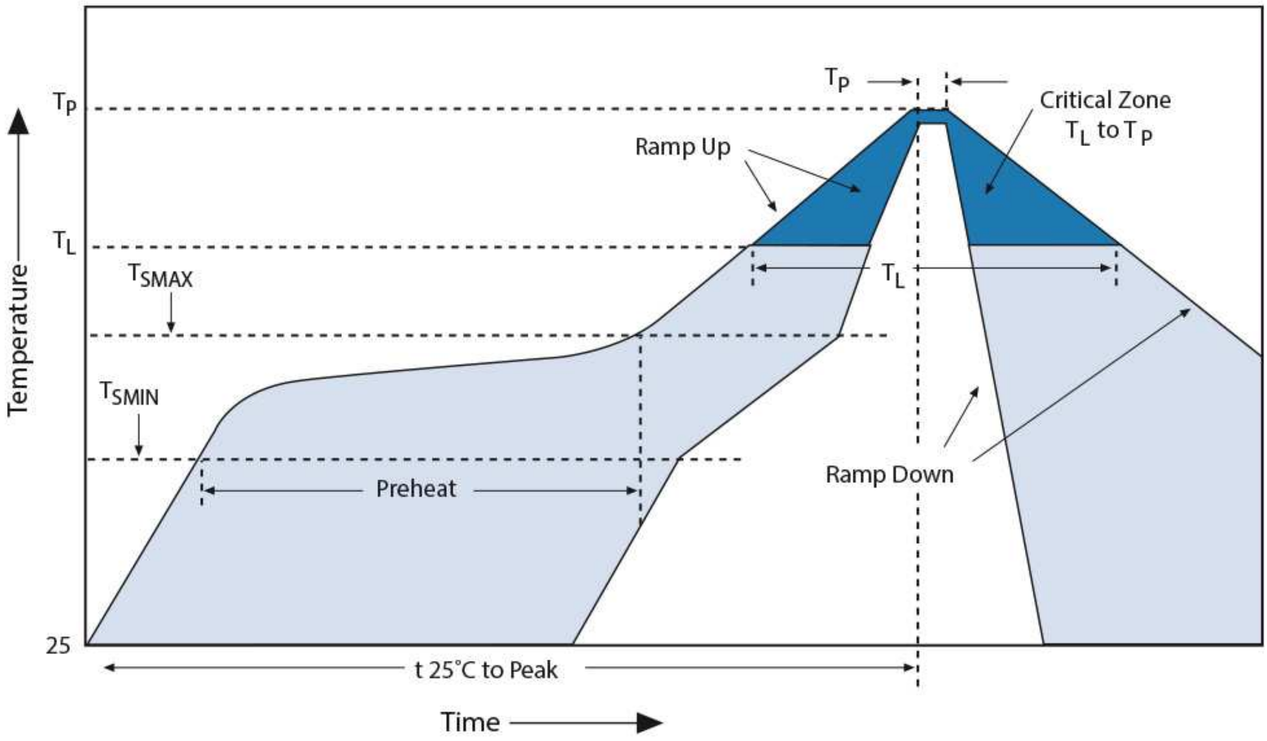
Due to the maximum junction temperature of 125°C of the MP1 passive cooling should be considered depending on the CPU load and the maximum ambient temperature.

7/ Reflow profile

Table 12: Reflow profile

Profile Feature	Pb-Free Assembly
Average Ramp-Up Rate (T_{SMAX} to T_P)	3°C/second max.
Preheat Temperature Min (T_{SMIN}) Temperature Max (T_{SMAX}) Time (t_s) from (T_{SMIN} to T_{SMAX})	 150 °C 200 °C 60-120 seconds
Liquidous temperature (T_L) Time (t_L) maintained above T_L	217 °C 60-80 seconds
Peak/Classification Temperature (T_P)	250 °C
Time within 5 °C of actual peak temperature (t_P)	20 seconds
Ramp-down rate	6°C/second max
Time 25 °C to peak temperature	8 minutes max

Figure 12: Reflow Classification Profile



To minimize the stress for the components, it is strongly recommended to solder the SoM during the last reflow cycle of the carrier board manufacturing process.

8/ Technical Support

8.1. First Steps – Startup-Information Baseboard

For the first startup of your Board, which includes the SL STM32MP157 SoM, you will find more information about the Software / BSP and additional hardware information at the online documentation.

Please follow the link https://docs.kontron-electronics.de/stm32mp/build-stm32mp/

The online documentation is primarily intended for our Eval-Kit / Evalboard, but will help you also to put your board into operation. Additionally, you will find information how to get access to the Yocto based GitLab software repository and how to make your own software images.

8.2. Extended Support

For detailed technical support please contact:

- E-Mail: support@kontron-electronics.de

8.3. Disclaimer & License Information

The software contained in the device (BSP) contains parts which were licensed as free respectively open source software under the GNU General Public License, version 2 and/or 3, respectively the GNU Lesser General Public License, versions 2.1 and/or 3.0.

You can obtain a copy of the source code of the BSP by following the instructions in the manual at https://docs.kontron-electronics.de/build-system or contact:

Kontron Electronics GmbH
Kantstr. 10
72663 Großbettlingen
Germany
Web: www.kontron-electronics.de
E-Mail: support@kontron-electronics.de

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Kontron Electronics
GmbH

Kantstraße 10
72663 Großbettlingen
Germany
Tel.: +49 7022 4057-0
Fax: +49 7022 4057-22
info@kontron-electronics.de