



# **LCM Daughterboard V10 for LinkIt 2523 HDK User's Guide**

Version: 1.0

Release date: 2 May 2016

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## Document Revision History

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Revision	Date	Description
1.0	2 May 2016	Initial version.

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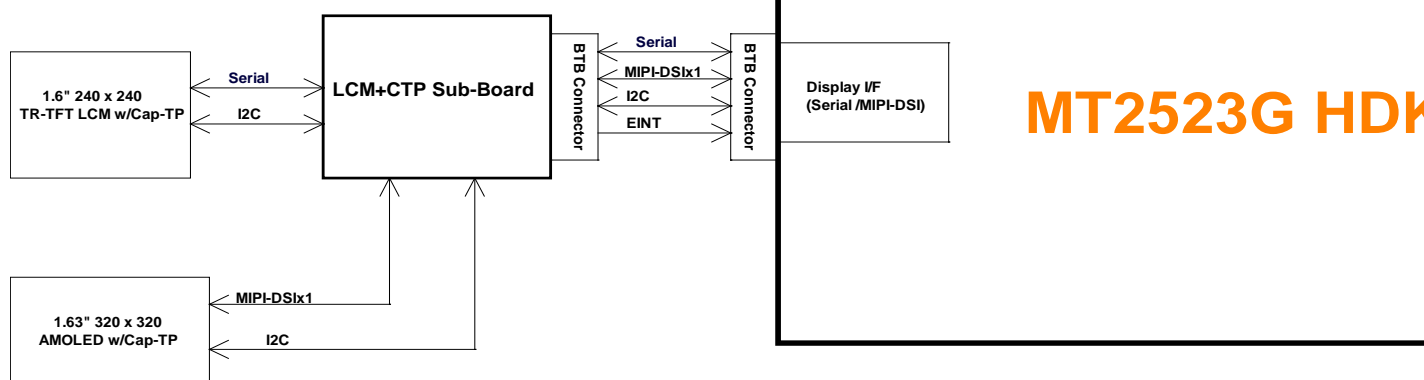
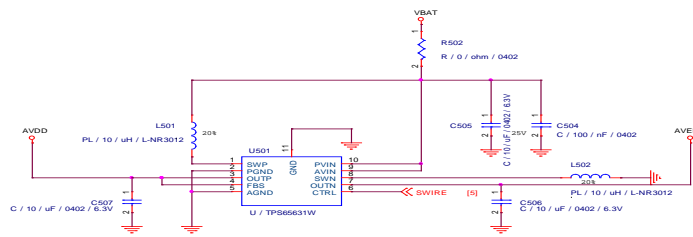


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## AMOLED Power



## AMOLED

Model : AUO  
Driver : RM6903  
Spec : 320 X 320  
Interface : MIPI D  
Touch panel : N/A  
3D Display : N/A

## ITE+Jinfu CTP (at Bottom)

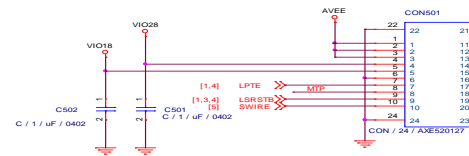
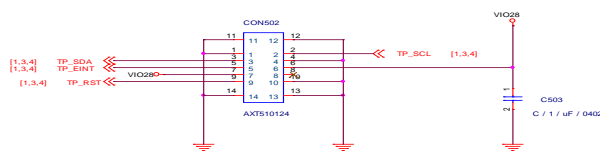
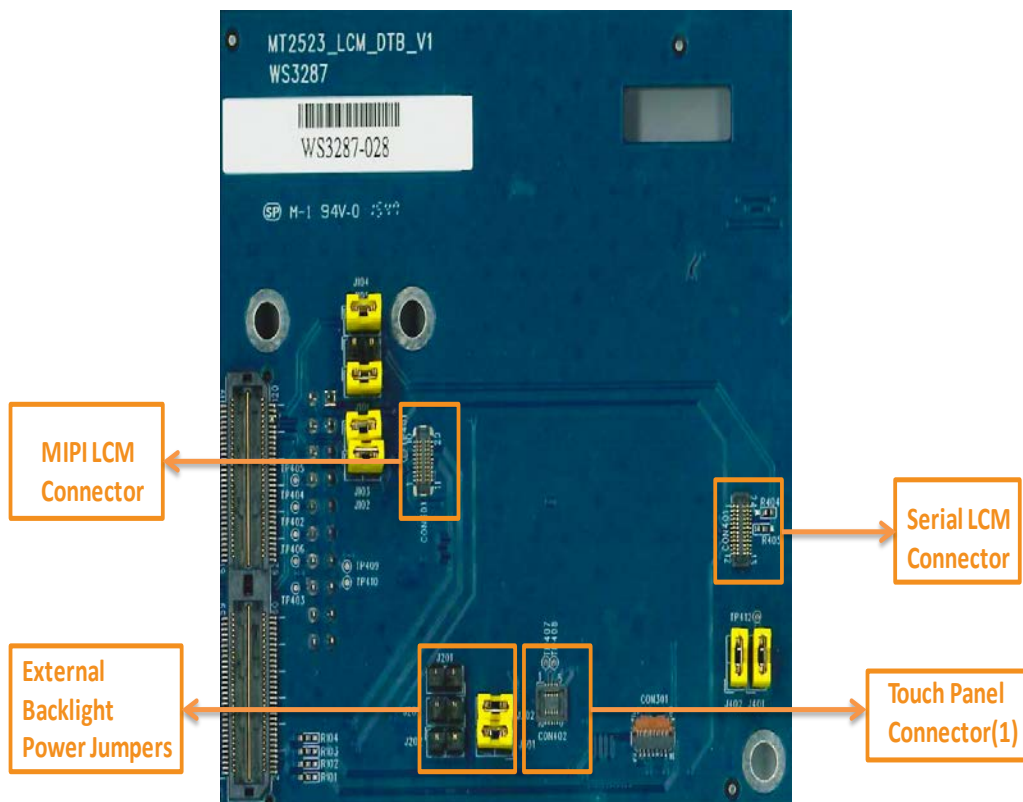


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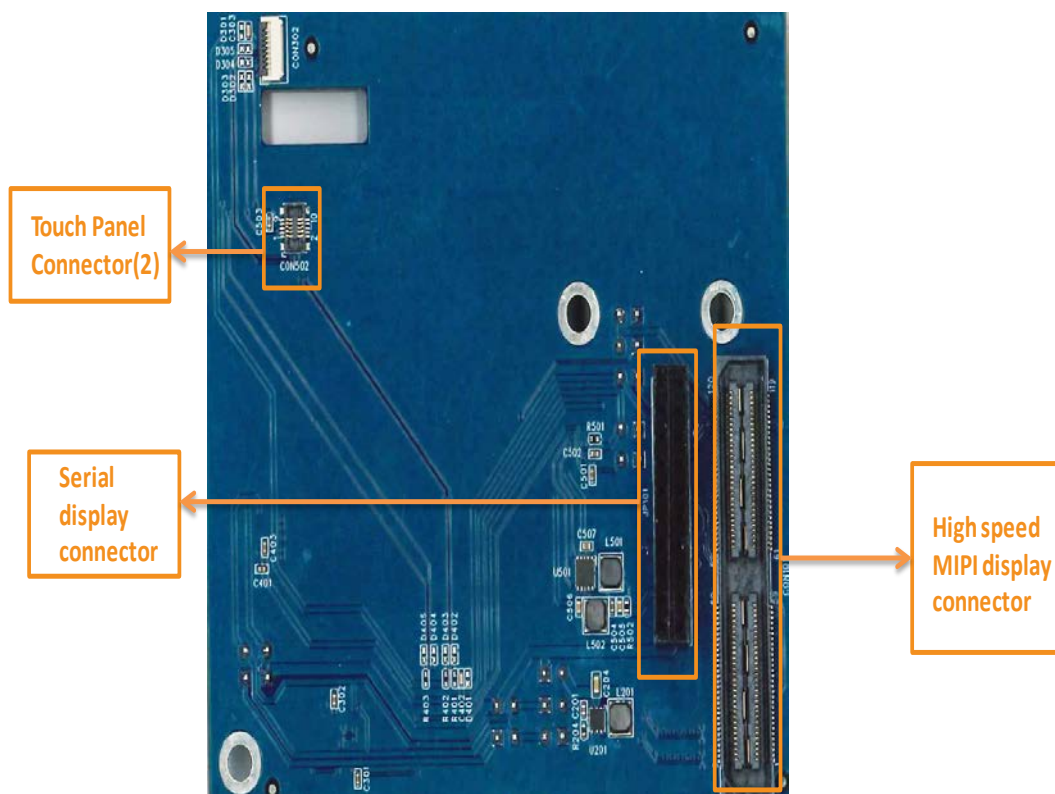
## 1. Introduction

This document is the MT2523 LCM daughterboard's operation guide. The daughterboard is designed as an extension for LinkIt 2523 HDK by SAC, which includes a number of peripheral devices to evaluate applications.

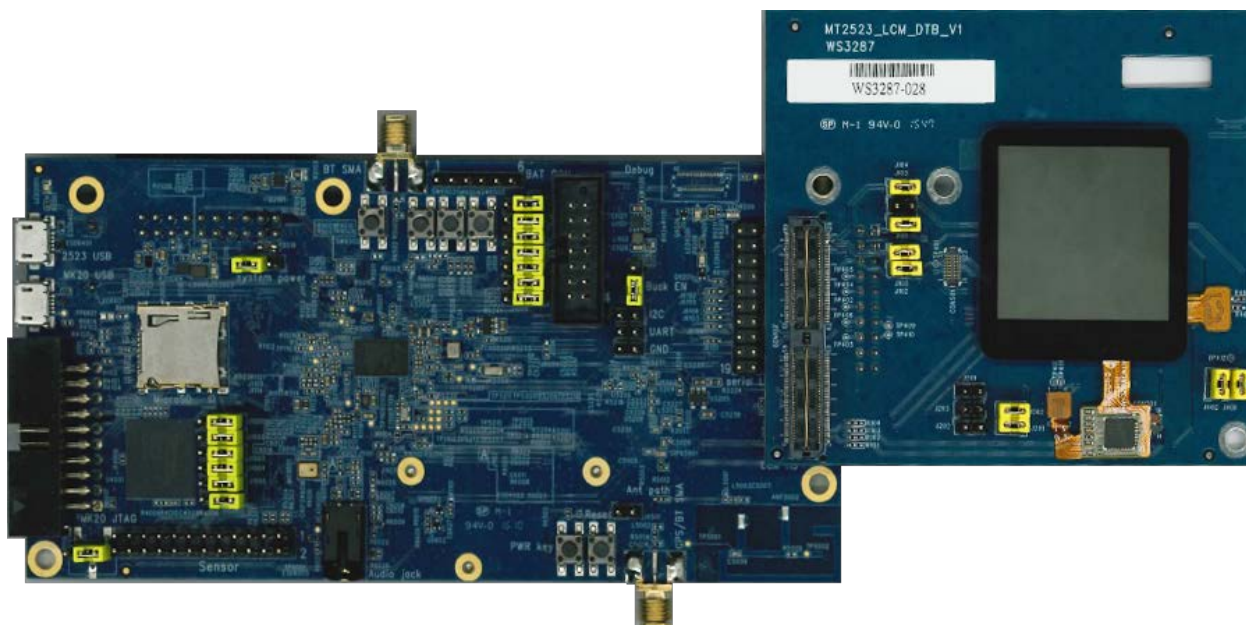
The daughterboard includes a display module, as shown in Figure 1 and Figure 2. The daughterboard is connected to the development board through a physical hardware connection, as shown in Figure 3.



**Figure 1. Daughterboard top view**



**Figure 2. Daughterboard bottom view**



**Figure 3. Physical hardware connection**

The user guide covers the following.

- Describing the hardware features of the daughterboard.
- Configuring the daughterboard with specific pin and jumper assignments to achieve various functionalities.



- Providing the hardware schematics for more detailed configuration and reference design.
- Listing the bill of materials (BOM) for the daughterboard.

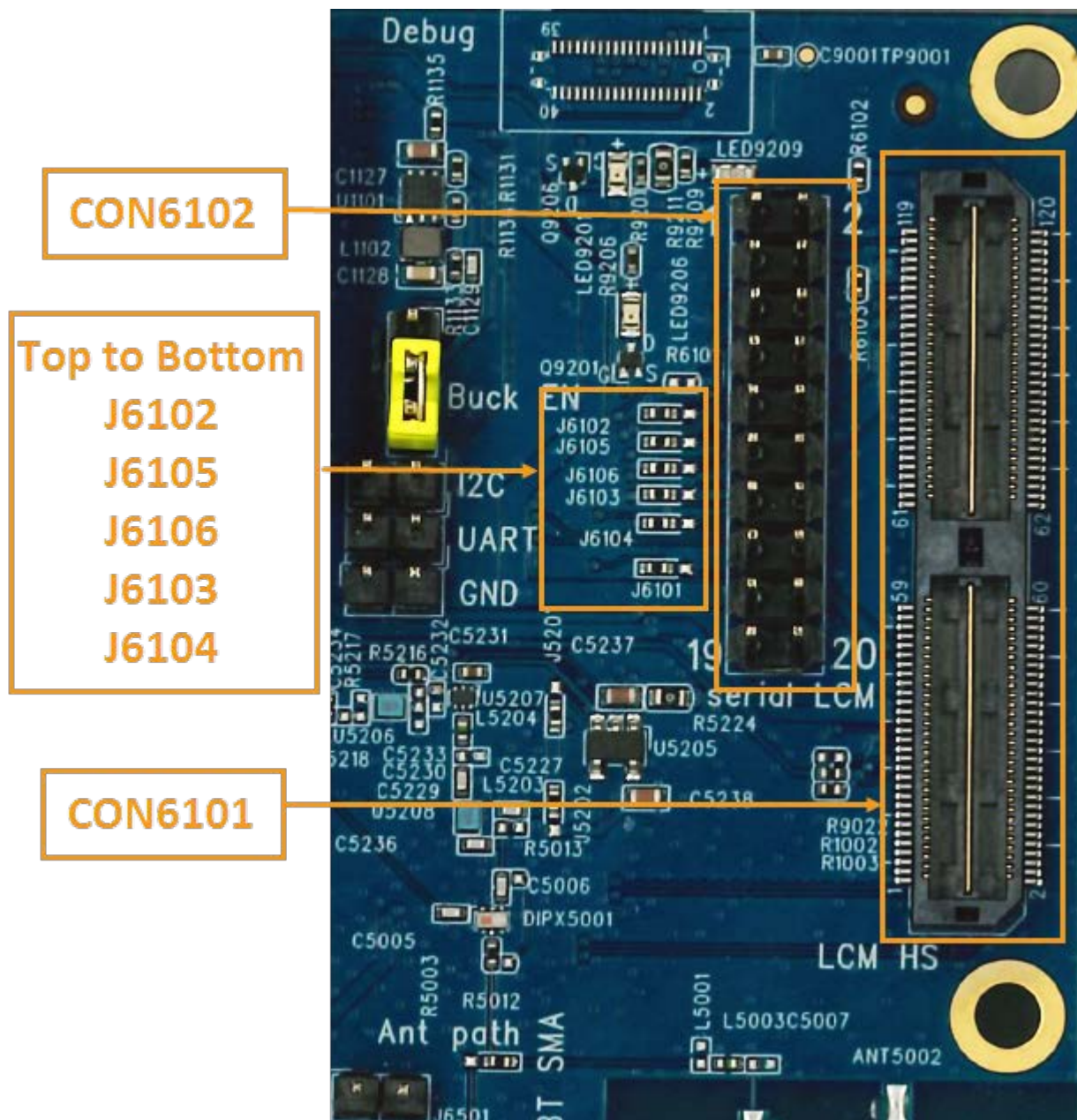
## **2. Hardware Configuration of the Daughterboard**

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The LinkIt 2523 HDK supports two types of display topologies: MIPI DSI and serial interface. MIPI DSI supports maximum display resolution of up to 320\*320 pixel hyper RGB 1.63inch AMOLED display, which also has an I2C interface touch panel module. The LCM display with serial interface is a 240 x 240 pixel graphical RGB 1.6inch transfective (TFT) display, with an I2C interface touch panel module and LED backlight for simple SPI interface to send and receive commands and data.

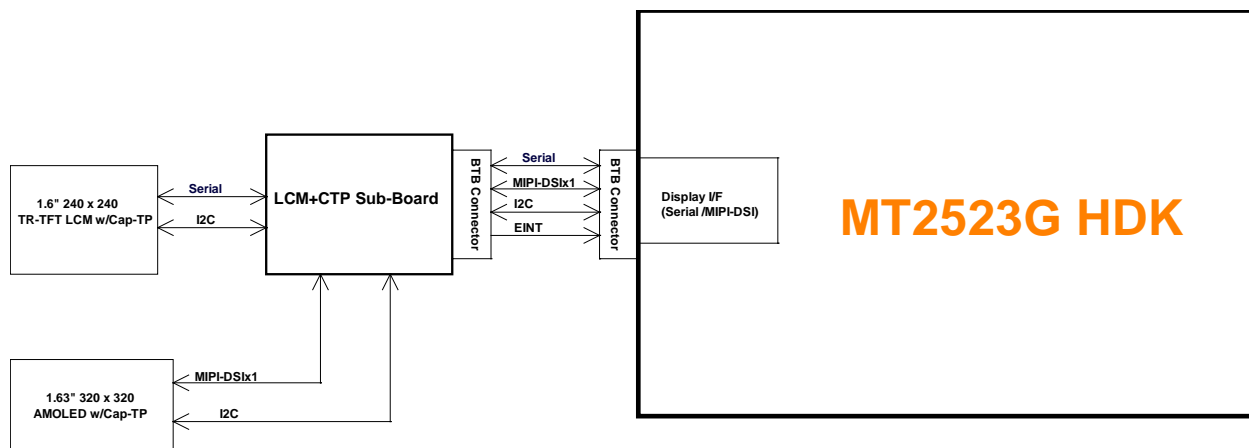
The connectors CON6101 and CON6102 on the HDK are reserved for the LCM. CON6101 supports both MIPI DSI and serial interface. The connector CON6102 supports the serial display interface only, as shown in Figure 4.

Jumpers J6101 to J6106 are designed for high speed connector and serial pin header switching, that could be used as default settings for MIPI or serial interface display connected through CON6101, or could be modified for only serial interface display connected through CON6102. Before connecting the daughterboard to the LinkIt 2523 HDK by serial LCM connector CON6102, set the jumper settings of the following components, as shown in Figure 4 and described in detail in section 4 of LinkIt 2523 user's guide.



**Figure 4. LinkIt 2523 HDK's serial interface LCM jumper settings**

The daughterboard is designed to facilitate the application development on LinkIt 2523 HDK. The board block diagram is shown in Figure 5.



**Figure 5. Daughterboard block diagram**

For more details on the daughterboard schematics see section 6, “Schematics”.

## 2.1. Feature Configuration

The LCM daughterboard has the following modules.

- 1.6" 240x240 TFT Transflective LCM module with Serial interface.
- 1.63" 320x320 AMOLED module with MIPI-DSI interface.
- Touch Panel module with the TFT Transflective LCM module.
- Touch Panel module with the AMOLED display module.



Note: The LCM daughterboard doesn't allow assembling two types of display modules at the same time.

## 2.2. Jumpers and test points

The daughterboard offers flexible jumper settings and test points for customization and evaluation of MT2523 based applications. Table 1 summarizes the functions associated with different jumpers.

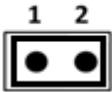
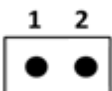
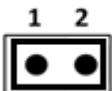
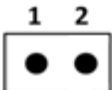
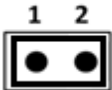
**Table 1. Daughterboard jumpers and test points**

Jumpers	Purpose	Features	Type
TP401 TP402 TP403 TP404 TP405 TP406 TP407 TP408 TP409 TP410 TP412	For testing	<ul style="list-style-type: none"> <li>• Test points</li> <li>• GND pin</li> </ul>	Test point
J101 J102 J103 J104	MT2523 LCM power consumption evaluation	<ul style="list-style-type: none"> <li>• MT2523 LCM power source</li> </ul>	Power supply selection
J201 J202 J203 J401 J402	External Backlight output power selection	<ul style="list-style-type: none"> <li>• External Backlight output power selection</li> </ul>	Backlight selection
J105	External Backlight enable control pin	<ul style="list-style-type: none"> <li>• Reserved for external power control pin</li> </ul>	Reserved

## 2.3. Backlight settings

For display functionality, there is an LED driving current sink for LCM backlight function named as ISINK. Users are able to adjust the current and voltage through the settings. The LCM daughterboard has a reserved backlight boost circuit. To use the backlight boost circuit, modify the jumper setting, as shown in Table 2.

**Table 2. Jumper pin settings to enable or disable the boost**

Change the backlight LED anode input power source	Connect the jumper J203 pins to set the power rail LEDA and VOUT, as shown below.	
	Remove the jumper J402 pins to disconnect VBAT and LEDA, as shown below.	
Change the backlight LED cathode current sink	Connect the jumper J202 pins to set the power rail LEDK and FB, as shown below.	
	Remove the jumper J401 pins to disconnect ISINK and LEDK, as shown below.	
External boost backlight power source	Connect the jumper J201 pins to set the power rail VBAT and VIN, as shown below.	



**Figure 6. The jumper positions to enable or disable the LCM boost**

### 2.4. Connectors

The following connectors are used for the daughterboard.

- High speed MIPI display connector.
- Serial display connector.
- Touch-Panel connector(1) with the Transflective TFT LCM module.
- Touch-Panel connector(2) with the AMOLED module.

#### 2.4.1. High speed MIPI display connector CON101

CON101 connector (see Figure 7) follows the MIPI standard for high speed display. Users can connect the daughterboard to LinkIt 2523 HDK connector CON6101 which is compatible with MIPI high speed standard and serial standard on both sides. Description of the pins can be found in Table 3.

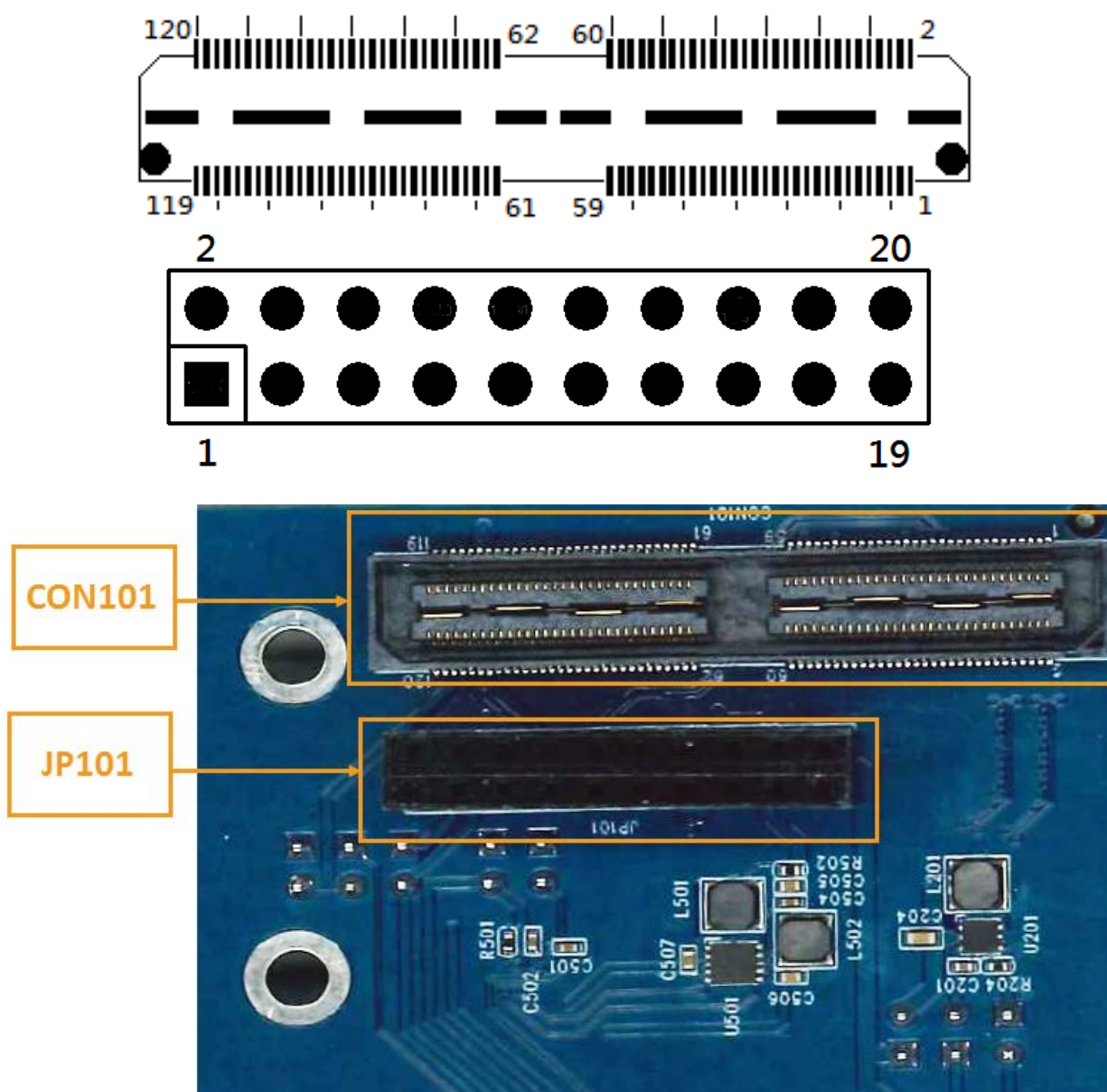


Figure 7. Daughterboard high speed and Serial display connectors



**Table 3. Daughterboard high speed connector**

PIN number	Description	PIN number	Description
1	GND	2	GND
4	MIPI TCP	6	MIPI TCN
8	MIPI TDP	10	MIPI TDN
25	I2C_SCL	27	I2C_SDA
29	Touch panel EINT	33	LPTE
49	LSRSTB	51	Touch panel reset pin
55	LCM backlight current sink	57	LCM backlight current sink
99	LSCK	103	LSDA
105	LSA0	107	LSCE_B
108	VIO28	109	VBAT
110	VIO28	112	VSWMP
114	VSWDP	116	VIO18
117	LCM backlight PWM	118	VIO18
121	GND	122	GND
123	GND	124	GND
125	GND	126	GND
127	GND	128	GND

## 2.4.2. Serial display connector JP101

The connector JP101 can be connected to LinkIt 2523 HDK connector CON6102, which supports serial LCM feature with its touch panel module. JP101 connector is mounted on the bottom side of LCM daughterboard. Before using this connector, users need to change the jumper J6101 to J6105 from (1-2) to (2-3) position of the LinkIt 2523 HDK, as shown in Figure 7 and described in Table 4.

**Table 4. Daughterboard serial display connector**

Pin number	Description	Pin number	Description
1	VIO18	2	LCM backlight current sink
3	VIO28	4	LCM backlight PWM
5	VIO28	6	LPTE
7	I2C_SCL	8	LSDA
9	I2C_SDA	10	LSA0
11	GND	12	LSCK
13	Touch panel EINT	14	LSCE_B
15	Touch panel reset pin	16	LSRSTB
17	GND	18	VBAT
19	GND	20	VBAT

## 2.4.3. Touch-panel connector (1)

The connector CON402 can be connected to the LinkIt 2523 HDK of the Capacitance Touch Panel (CTP) module which is using the touch screen controller IC by GT9137. The CON402 connector is mounted on the top of the daughterboard, as shown in Figure 1 and described in Table 5.

**Table 5. Touch panel connector (1) of the daughterboard**

PIN number	Description
1	VIO28
2	I2C_SCL



PIN number	Description
3	I2C_SDA
4	Touch panel EINT
5	Touch panel reset pin
6	GND
7	GND
8	NC
9	GND
10	GND

#### 2.4.4. Touch-panel connector (2)

The connector CON502 can be connected to the LCM daughterboard of the CTP module which is using the touch screen controller IC by ITE7258. The CON502 connector is mounted on the bottom of the daughterboard, as shown in Figure 2 and described in Table 6.

**Table 6. Touch panel connector (2) of the daughterboard**

Pin number	Description
1	GND
2	I2C_SCL
3	I2C_SDA
4	GND
5	Touch panel EINT
6	VIO28
7	Touch panel EINT
8	NC
9	Touch panel reset pin
10	GND

### 3. Layout (V10)

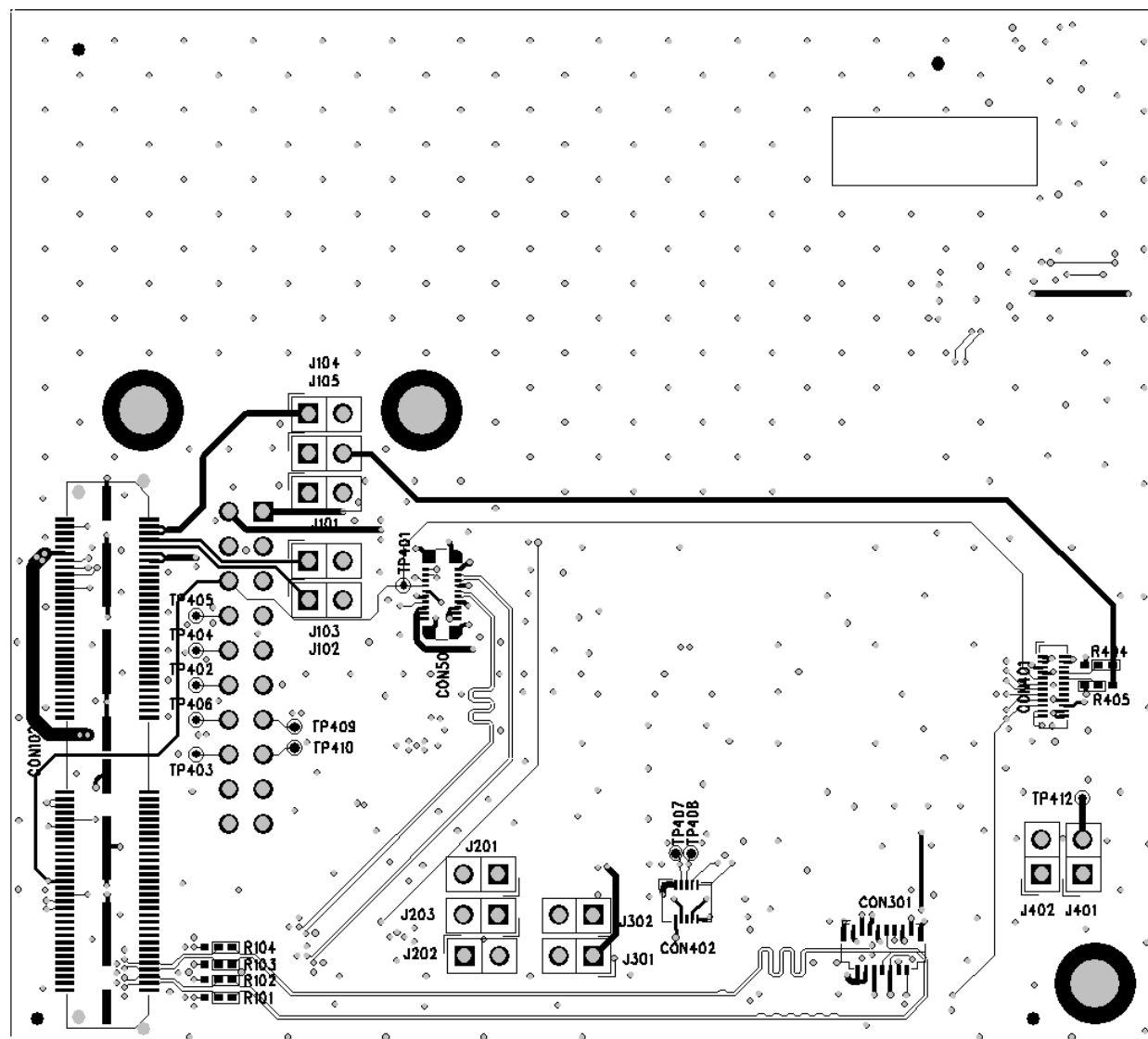
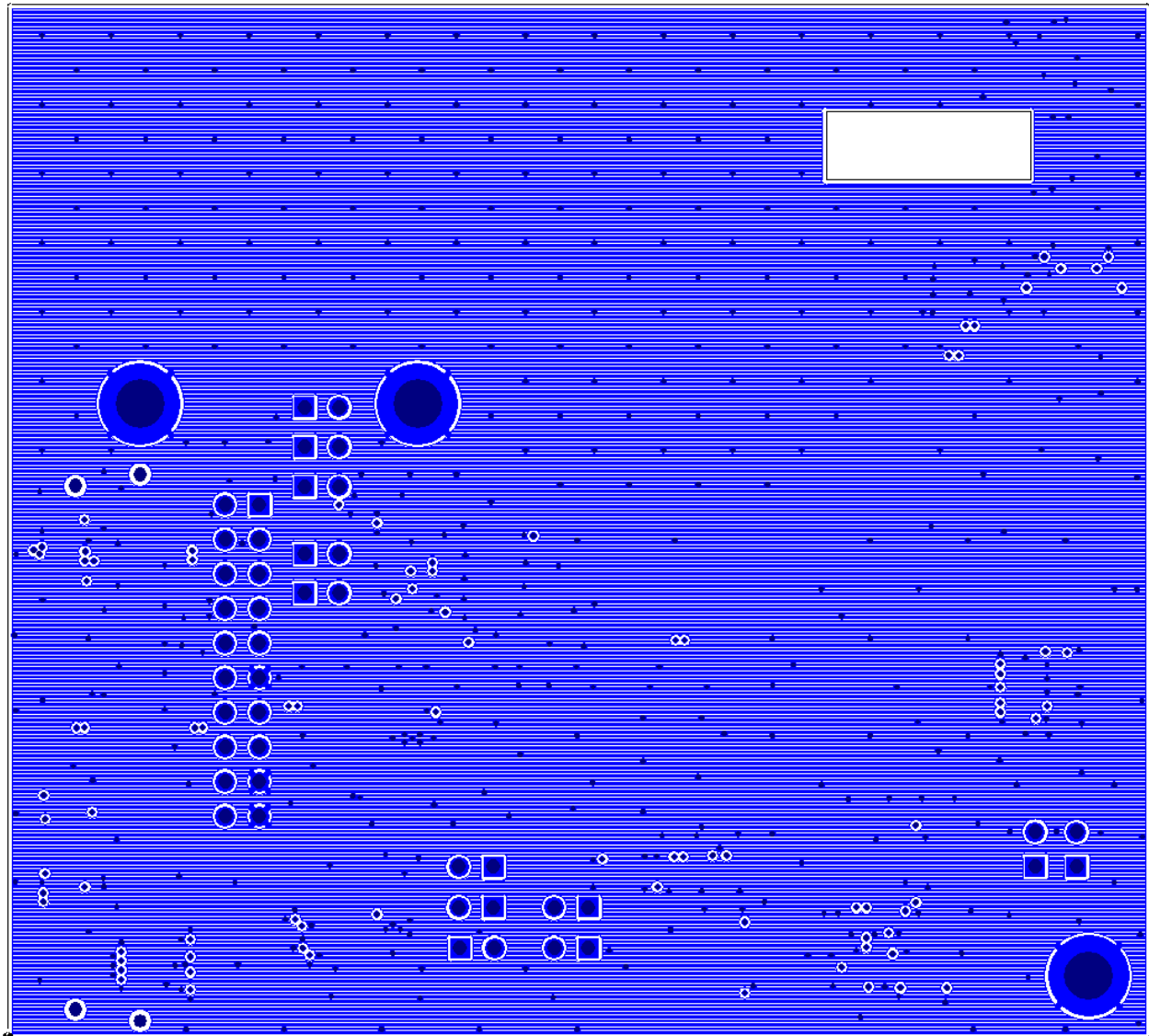
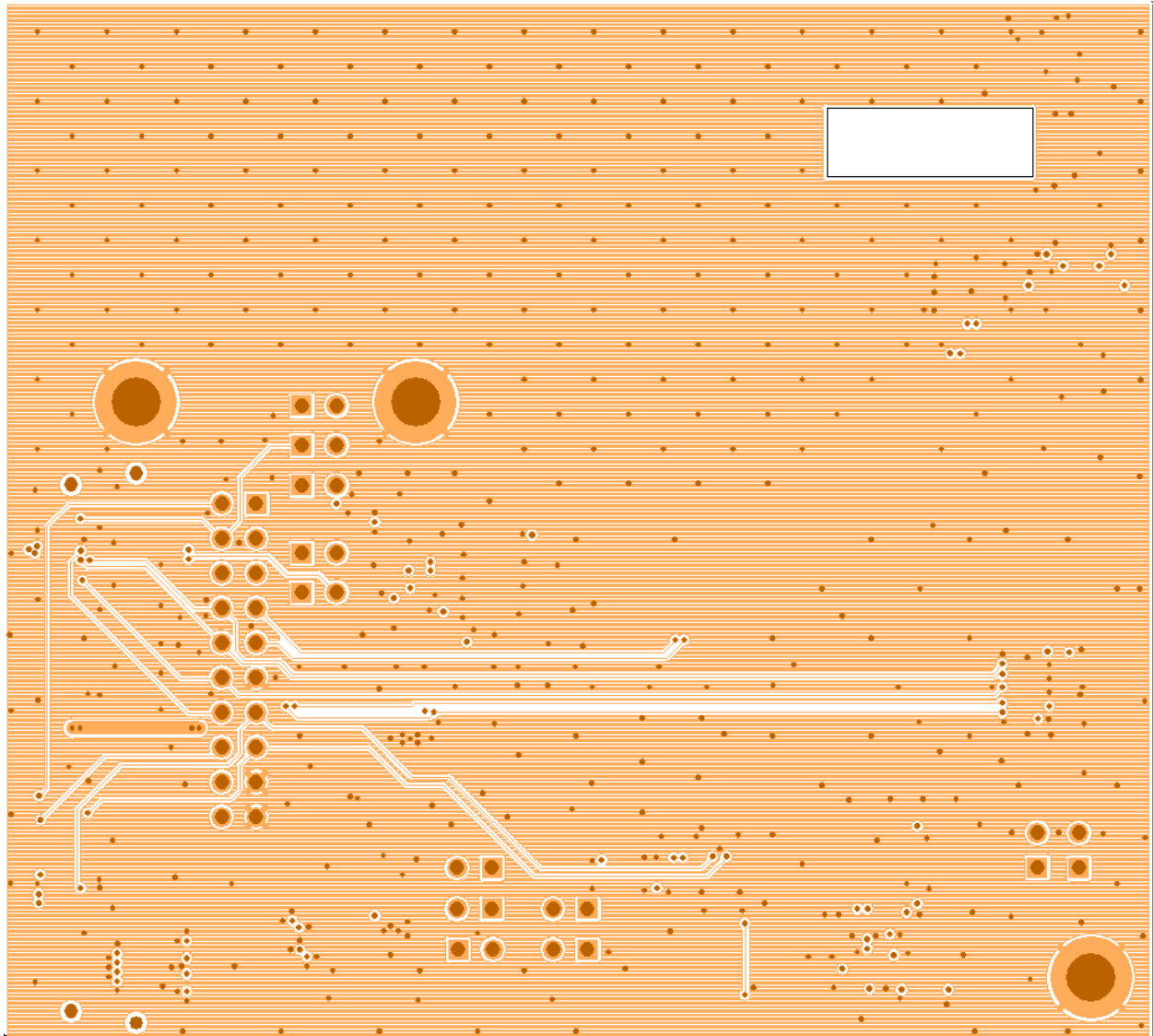


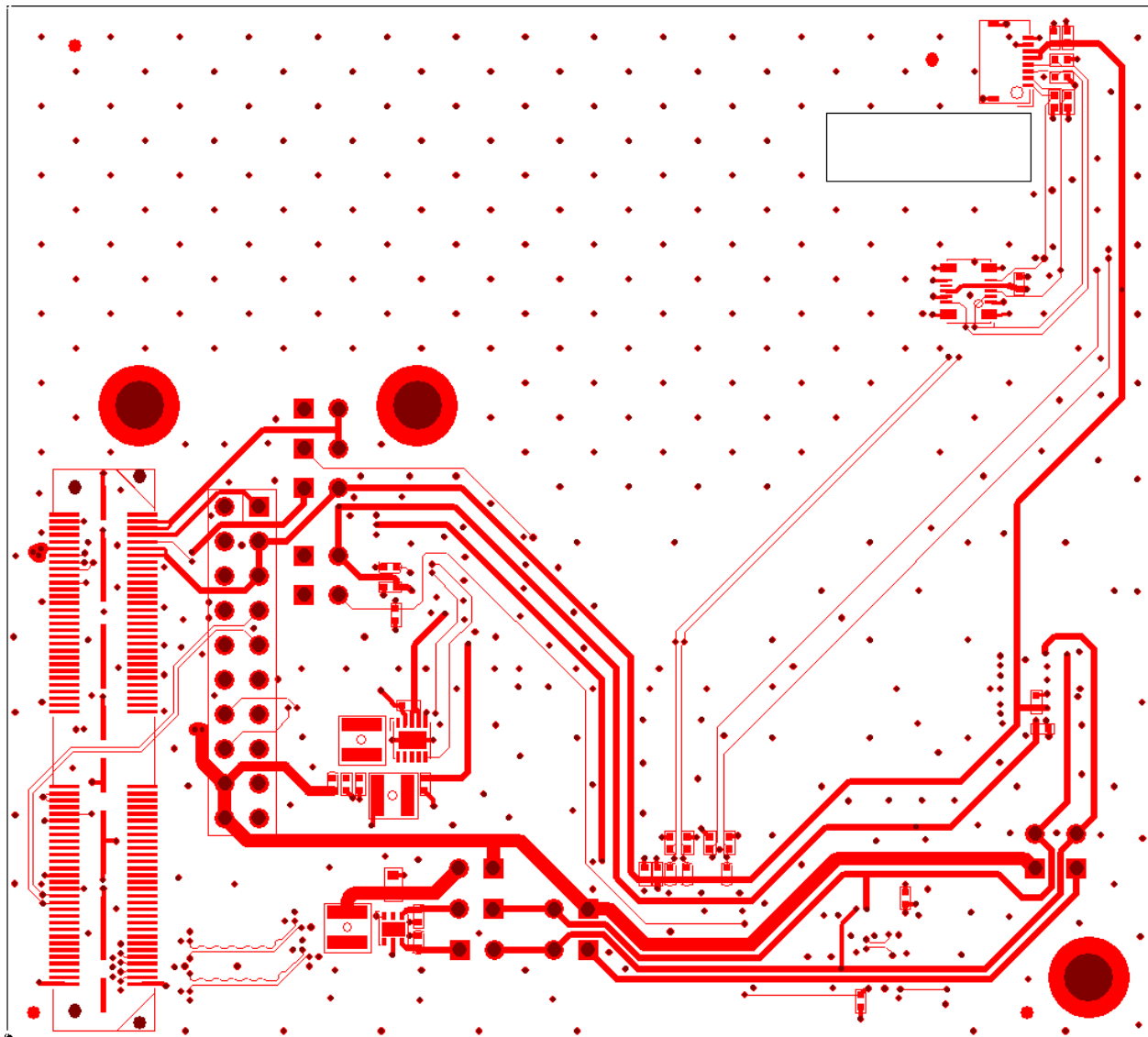
Figure 8. Daughterboard layout (Layer 1)



*Figure 9. Daughterboard layout (Layer 2)*



**Figure 10. Daughterboard layout (Layer 3)**



*Figure 11 .Daughterboard layout (Layer 4)*

## 4. BOM of the LCM Daughterboard

Table 7 shows the bill of material details of the daughterboard. Users can refer this table to understand the components used on Board as well as to customize and change parts as needed.

**Table 7. Bill of materials**

Item	Quantity	Reference	Part	Footprint
1	1	CON101	QSH-060-01-L-D-A (Header 120 pin)	QSH-060-01-L-D-A
2	1	CON102	QTH-060-01-FDA (120 pin)	QTH-060-01-F-D-A
3	1	CON301	CON / FH26W-15S- 0.3SHW	H15/SMD/P0.3/FH26-15S- 0.3SHW
4	1	CON302	CON / BL509-08G31- TAHx	H8/SMD/P0.5/BL509-08G31- TH1
5	1	CON401	CON / 24 / OK-03F024- 04	CON12X4/SMD/F/OK-03F024- 04/WS3287
6	1	CON402	CON / 10 / OK-20F010- 04	CON5X2/SMD/P0.4/F/OK- 20F010-04/WS3287
7	1	CON501	CON / 24 / AXE520127	CON10X2/SMD/P0.4/F/AXE52 0127/WS3287
8	1	CON502	AXT510124	CON5X2/SMD/P0.4/F/AXT510 124/WS3287
9	1	C201	C / 470 / nF / 0402	C0402
10	1	C204	C / 10 / uF / 0603	C0603
11	5	C301,C302,C501,C502,C503	C / 1 / uF / 0402	C0402
12	2	C303,C402	C / 2.2 / uF / 0402	C0402
13	3	C401,C403,C504	C / 100 / nF / 0402	C0402
14	3	C505,C506,C507	C / 10 / uF / 0402 / 6.3V	C0402
15	1	JP101	HE10X2 FEMALE_BOTTOM	DIP10X2/P2.54
16	12	J101,J102,J103,J104,J105,J201,J2 02,J203,J301,J302,J401,J402	HE2	DIP2/P2.54
17	3	L201,L501,L502	PL / 10 / uH / L-NR3012	L-NR3012
18	6	R101,R102,R103,R104,R404,R40 5	OR	R0402/(1-2)
19	1	R204	R / 3.3 / ohm / 0402	R0402
20	2	R501,R502	R / 0 / ohm / 0402	R0402
21	1	U201	U / KTD2898 / TDFN22- 6	TDFN22/6P/SMD/P0.65/KTD2 898
22	1	U501	U / TPS65631W	SON10/SMD/P0.5/TPS65631 W

## 5. Appendix A: Acronyms and Abbreviations

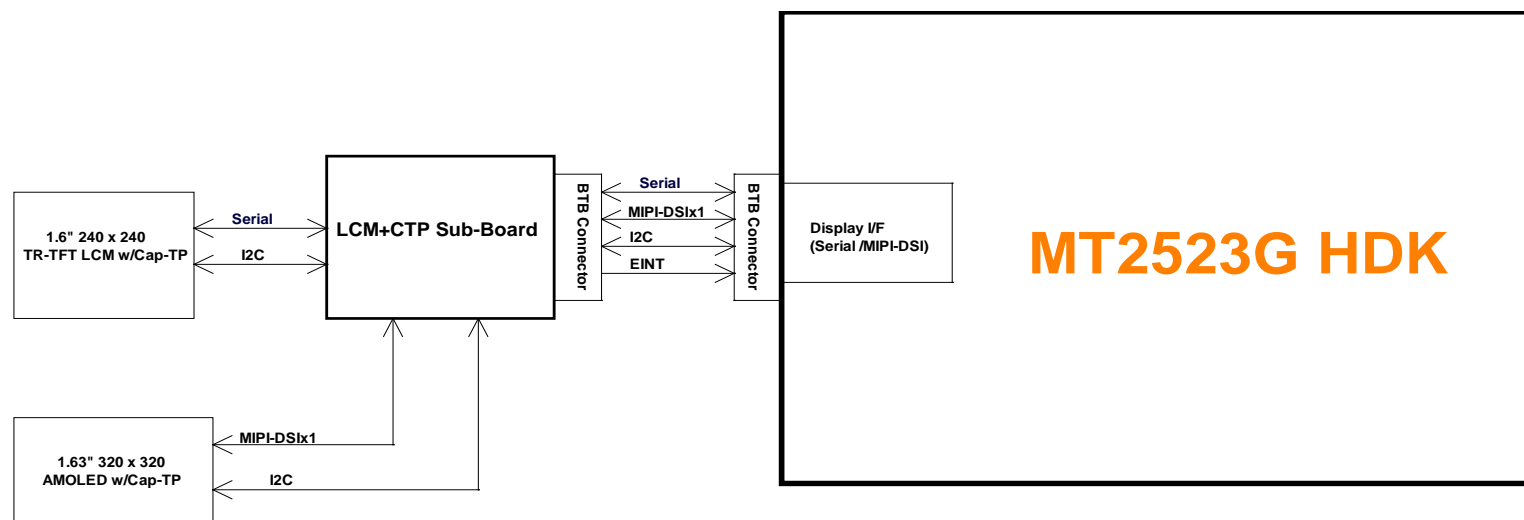
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The acronyms and abbreviations used in this user manual are listed in Table 8.

**Table 8. Acronyms and abbreviations**

Acronym	Description	Acronym	Description
LCM	LCD (Liquid XTAL Display) Module	HDK	Hardware Development Kit
I2C	Inter-Integrated Circuit	USB	Universal Serial Bus
CTP	Capacitance Touch Panel	MIPI	Mobile Industry Processor Interface
EINT	External interrupt	GPIO	General Purpose I/O
VIO18	The power rail of digital LDO output 1.8V	VIO28	The power rail of digital LDO output 2.8V
TFT	Thin-Film Transistor	TR	Transflective
LED	Light Emitting Diode	ISINK	LCM backlight current sink source
VBAT	The main power rail for battery charging and system operating power source		

## 6. Schematics (V10)



MEDIATEK labs	
Title	Block_Diagram
Size	LCM Daughterboard
Date	Thursday, April 28, 2016
Sheet	1 of 5

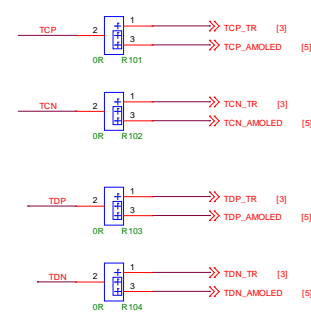
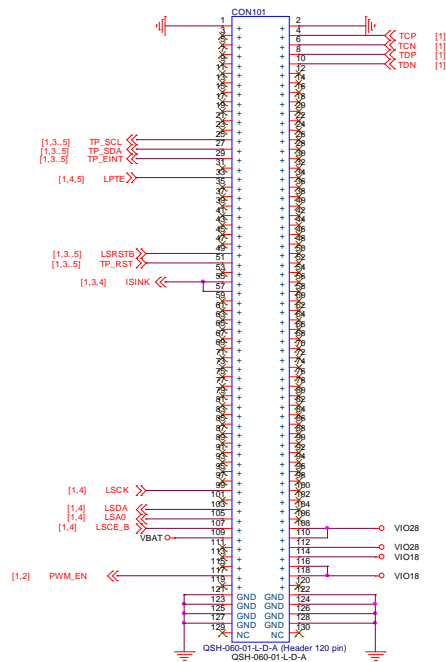
**Figure 12 .Daughterboard schematics (1/5)**

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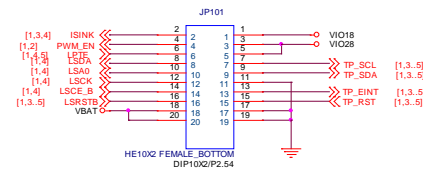
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## MIPI/Serial LCM+CTP\_Conn(Bottom)

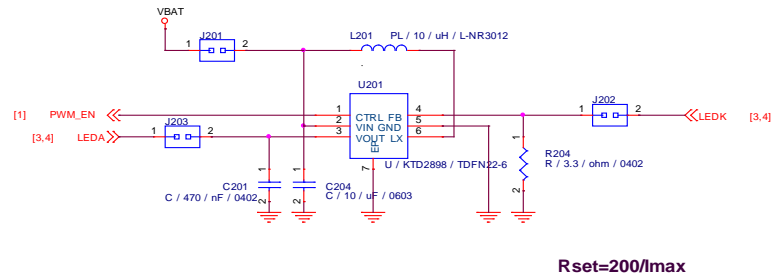



## Serial LCM+CTP\_Conn(Bottom)



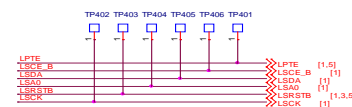
MEDIATEK Labs	
Title	01_CONNECTOR
Sub C	LCM Daughterboard
Date	Thursday, April 28, 2016
Sheet	2 of 5

Figure 13. Daughterboard schematics (2/5)

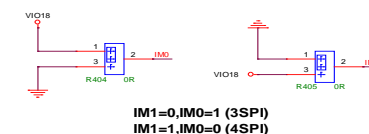
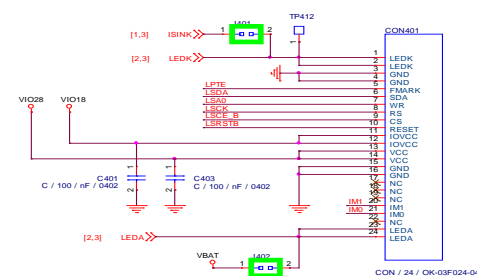


<b>MEDIATEK</b> labs 	
Title	<b>02_BACKLIGHT</b>
Size	<b>LCM Daughterboard</b>
Date:	Thursday, April 28, 2016
Sheet	3 of 5

**Figure 14. Daughterboard schematics (3/5)**



Model : Truly 1.6" Square  
Driver : ST7789H2-G4  
Spec : 240 X 240  
Interface : Serial  
Touch panel : Truly  
Backlight types: 1S3P (3 LEDs)



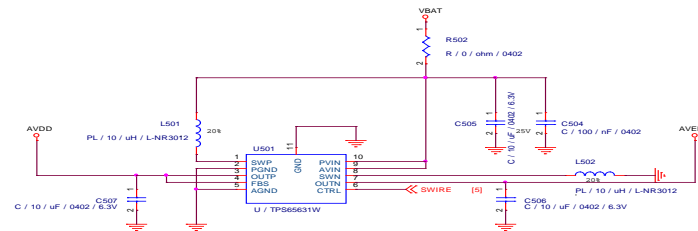
	
Title	04_Serial_TR-TFT_CTP
Size	LCM Daughterboard

**Figure 15. Daughterboard schematics (4/5)**

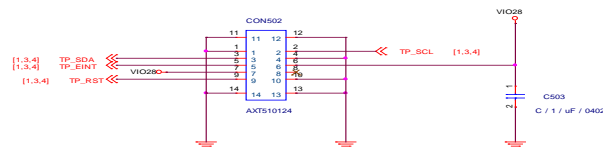
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## AMOLED Power



## ITE+Jinfu CTP (at Bottom)



## AMOLED

Model : AUO  
Driver : RM69032  
Spec : 320 X 320  
Interface : MIPI DSI, 1-Lane  
Touch panel : N/A  
3D Display : N/A

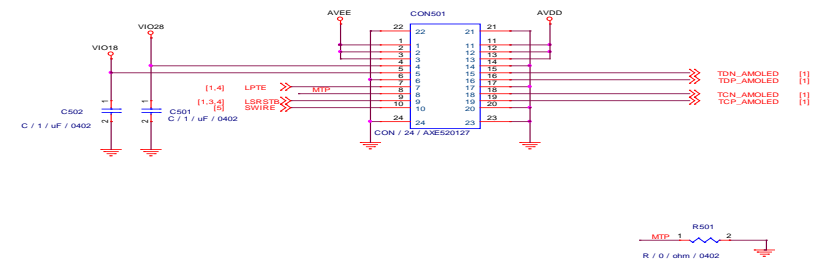


Figure 16. Daughterboard schematics (5/5)

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Title	05_MIPI_AMOLED_CTP
Doc	LCM Daughterboard
Date	Thursday, April 28, 2016
Page	5 of 5