User's Manual

RZ/A Group

Application Board for RZ/A Microcontroller Group
MIPI Graphics Expansion Board 2 v1
User's Manual

Renesas RZ Family

RZ/A Series

Renesas Electronics
www.renesas.com

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General Precautions in the Handling of Microprocessing Unit and Microcontroller Unit Products

The following usage notes are applicable to all Microprocessing unit and Microcontroller unit products from Renesas. For detailed usage notes on the products covered by this document, refer to the relevant sections of the document as well as any technical updates that have been issued for the products.

1. Precaution against Electrostatic Discharge (ESD)

   A strong electrical field, when exposed to a CMOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop the generation of static electricity as much as possible, and quickly dissipate it when it occurs. Environmental control must be adequate. When it is dry, a humidifier should be used. This is recommended to avoid using insulators that can easily build up static electricity. Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors must be grounded. The operator must also be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions must be taken for printed circuit boards with mounted semiconductor devices.
2. Processing at power-on

   The state of the product is undefined at the time when power is supplied. The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the time when power is supplied. In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the time when power is supplied until the reset process is completed. In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the time when power is supplied until the power reaches the level at which resetting is specified.
3. Input of signal during power-off state

   Do not input signals or an I/O pull-up power supply while the device is powered off. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Follow the guideline for input signal during power-off state as described in your product documentation.
4. Handling of unused pins

   Handle unused pins in accordance with the directions given under handling of unused pins in the manual. The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of the LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible.
5. Clock signals

   After applying a reset, only release the reset line after the operating clock signal becomes stable. When switching the clock signal during program execution, wait until the target clock signal is stabilized. When the clock signal is generated with an external resonator or from an external oscillator during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Additionally, when switching to a clock signal produced with an external resonator or by an external oscillator while program execution is in progress, wait until the target clock signal is stable.
6. Voltage application waveform at input pin

   Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between V_{IL} (Max.) and V_{IH} (Min.) due to noise, for example, the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between V_{IL} (Max.) and V_{IH} (Min.).
7. Prohibition of access to reserved addresses

   Access to reserved addresses is prohibited. The reserved addresses are provided for possible future expansion of functions. Do not access these addresses as the correct operation of the LSI is not guaranteed.
8. Differences between products

   Before changing from one product to another, for example to a product with a different part number, confirm that the change will not lead to problems. The characteristics of a microprocessing unit or microcontroller unit products in the same group but having a different part number might differ in terms of internal memory capacity, layout pattern, and other factors, which can affect the ranges of electrical characteristics, such as characteristic values, operating margins, immunity to noise, and amount of radiated noise. When changing to a product with a different part number, implement a system-evaluation test for the given product.

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Renesas does not consider the MIPI Graphics Expansion Board to be a finished product and therefore the MIPI Graphics Expansion Board may not comply with some requirements applicable to finished products, including, but not limited to recycling, restricted substances and electromagnetic compatibility regulations. Refer to Certifications section, for information about certifications and compliance information for the MIPI Graphics Expansion Board. It is the kit User's responsibility to make sure the kit meets any local requirements applicable to their region.

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Precautions

This Application Board is only intended for use in a laboratory environment under ambient temperature and humidity conditions. A safe separation distance should be used between this and any sensitive equipment. Its use outside the laboratory, classroom, study area, or similar such area invalidates conformity with the protection requirements of the Electromagnetic Compatibility Directive and could lead to prosecution.

The product generates, uses, and can radiate radio frequency energy and may cause harmful interference to radio communications. There is no guarantee that interference will not occur in a particular installation. If this equipment causes harmful interference to radio or television reception, which can be determined by turning the equipment off or on, you are encouraged to try to correct the interference by one or more of the following measures:

• Ensure attached cables do not lie across the equipment.

• Reorient the receiving antenna.

• Increase the distance between the equipment and the receiver.

• Connect the equipment into an outlet on a circuit different from that which the receiver is connected.

• Power down the equipment when not in use.

• Consult the dealer or an experienced radio/TV technician for help.

Note: It is recommended that wherever possible shielded interface cables are used.

The product is potentially susceptible to certain EMC phenomena. To mitigate against them it is recommended that the following measures be undertaken:

• The user is advised that mobile phones should not be used within 10 m of the product when in use.

• The user is advised to take ESD precautions when handling the equipment.

The Application Board does not represent an ideal reference design for an end product and does not fulfill the regulatory standards for an end product.

Renesas RZ Family

MIPI Graphics Expansion Board 2 v1

Contents

Figures

Tables

1. Kit Overview

The MIPI Graphics Expansion Board 2 Application Kit for RZ/A MCU Group, enables users to add LCD functionality using a 4-lane MIPI DSI interface to seamlessly evaluate the features of the RZ/A MCU group. With a programmable evaluation kit such as the EK-RZ/A3M, users can develop embedded systems applications utilizing Flexible Software Package (FSP) and e^2 studio IDE. Whilst designed for the RZ/A MCU Group, this application board can be applied to any evaluation board with the correct peripheral output and compatible MIPI Graphics Expansion Port.

The key features of the MIPI Graphics Expansion Board 2 are as follows:

Key features:

- Added LCD functionality to Evaluation Kits via a 4-lane MIPI DSI Interface
- 720x1280 5-Inch TFT Display with Capacitive Touch Panel (E50RD-I-MW420-C)
- Compatible with EK-RZ/A3M

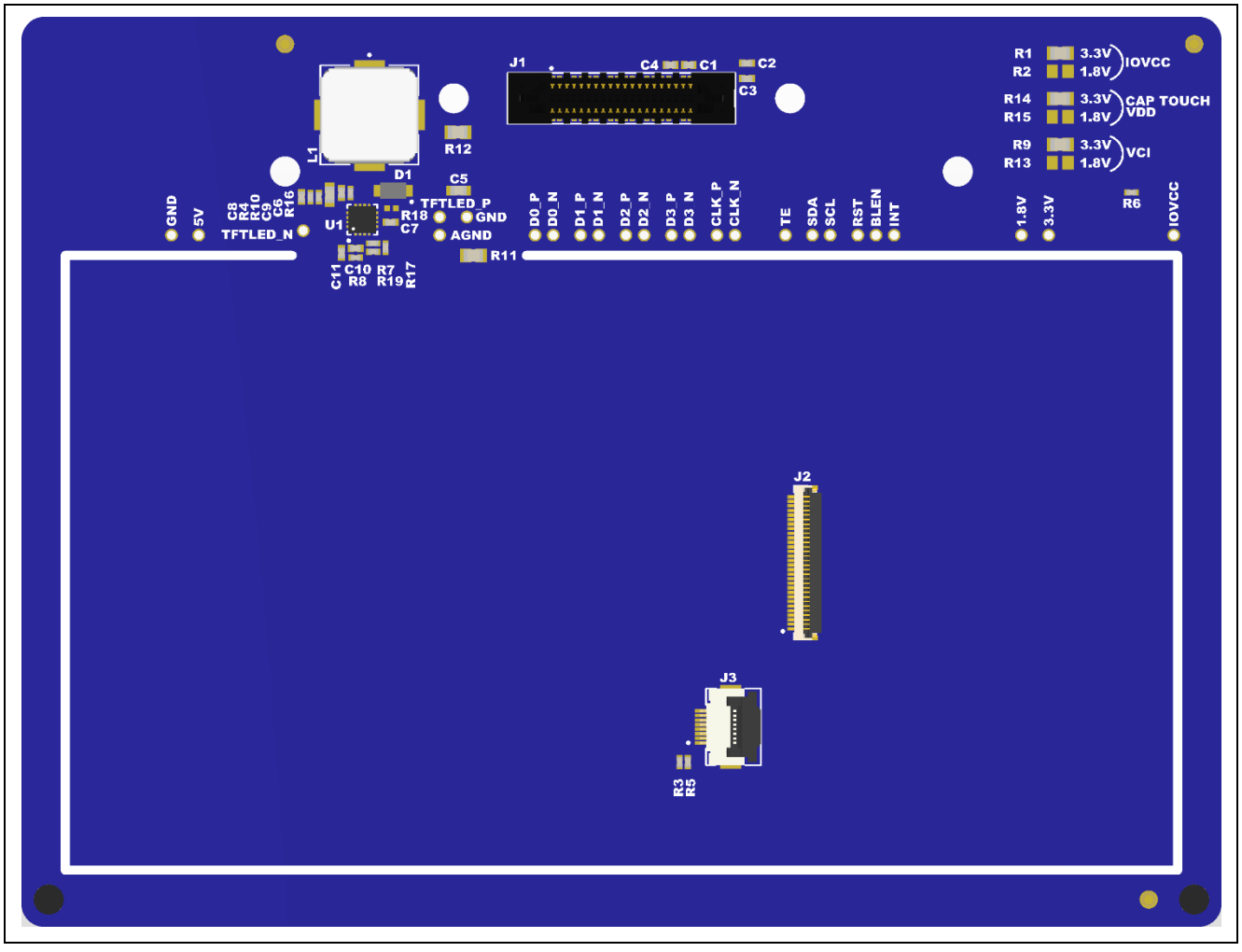

Figure 1. MIPI Graphics Expansion Board 2 Top Side

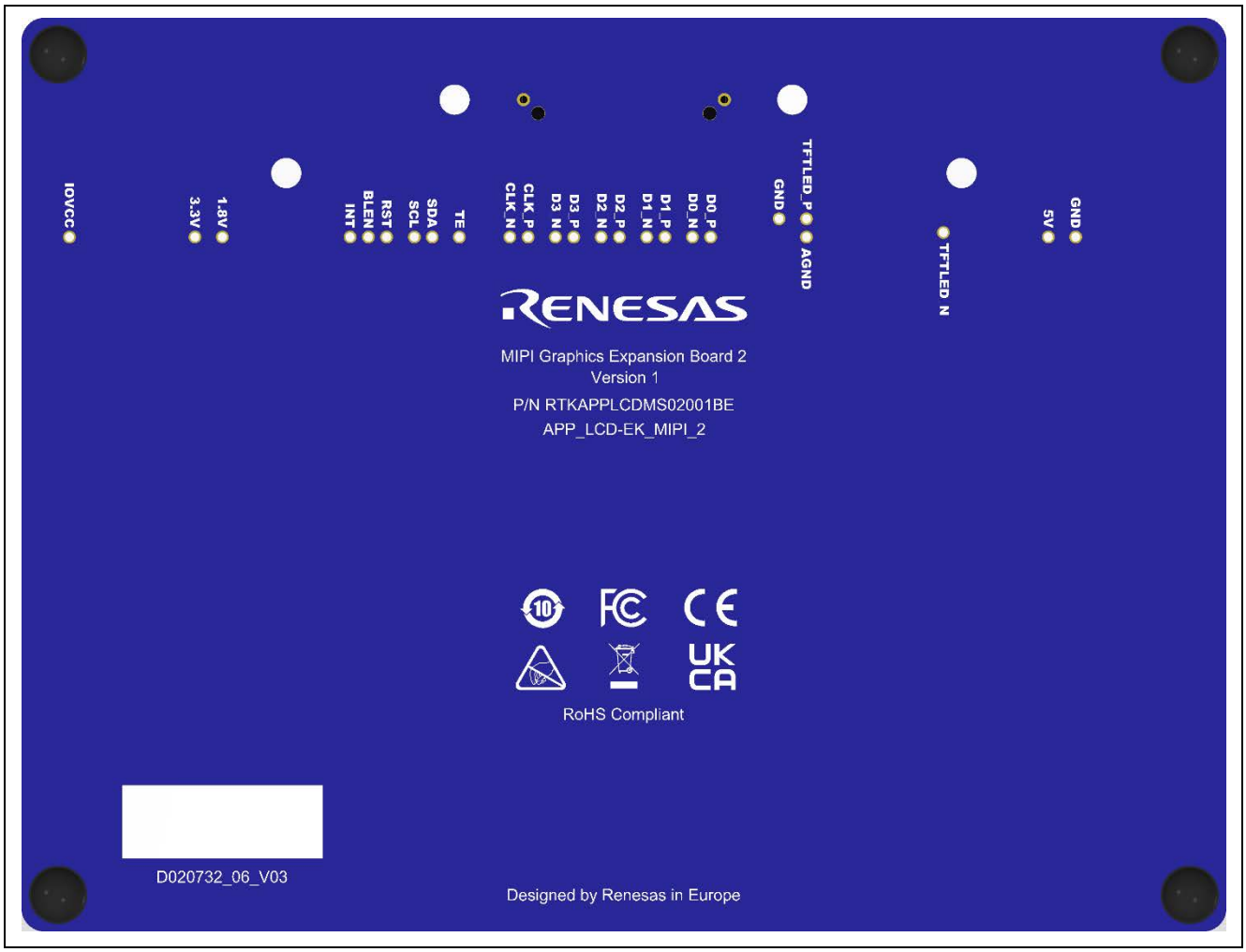

Figure 2. MIPI Graphics Expansion Board 2 Bottom Side

1.1 Assumptions and Advisory Notes

1. It is assumed that the user has a basic understanding of microprocessors and embedded systems hardware.
2. Flexible Software Package (FSP) and Integrated Development Environment (IDE) such as e^2 studio are required to develop embedded applications that apply to the MIPI Graphics Expansion Board 2.
3. It is assumed the user has an EK-RZ/A3M (or similar MCU) to add LCD functionality to, this board cannot be programmed directly.
4. It is recommended that the user refers to the Quick Start Example Project that EK-RZ/A3M board comes pre-programmed with.
5. Instructions to download and install software, import example projects, build them and program the EK-RZ/A3M board are provided in the Quick Start Guide.

2. Kit Contents

The following components are included in the kit:

1. MIPI Graphics Expansion Board 2 fitted with a 5-inch 720x1280 TFT Display
2. Display mounting hardware (spacers and fixing screws)

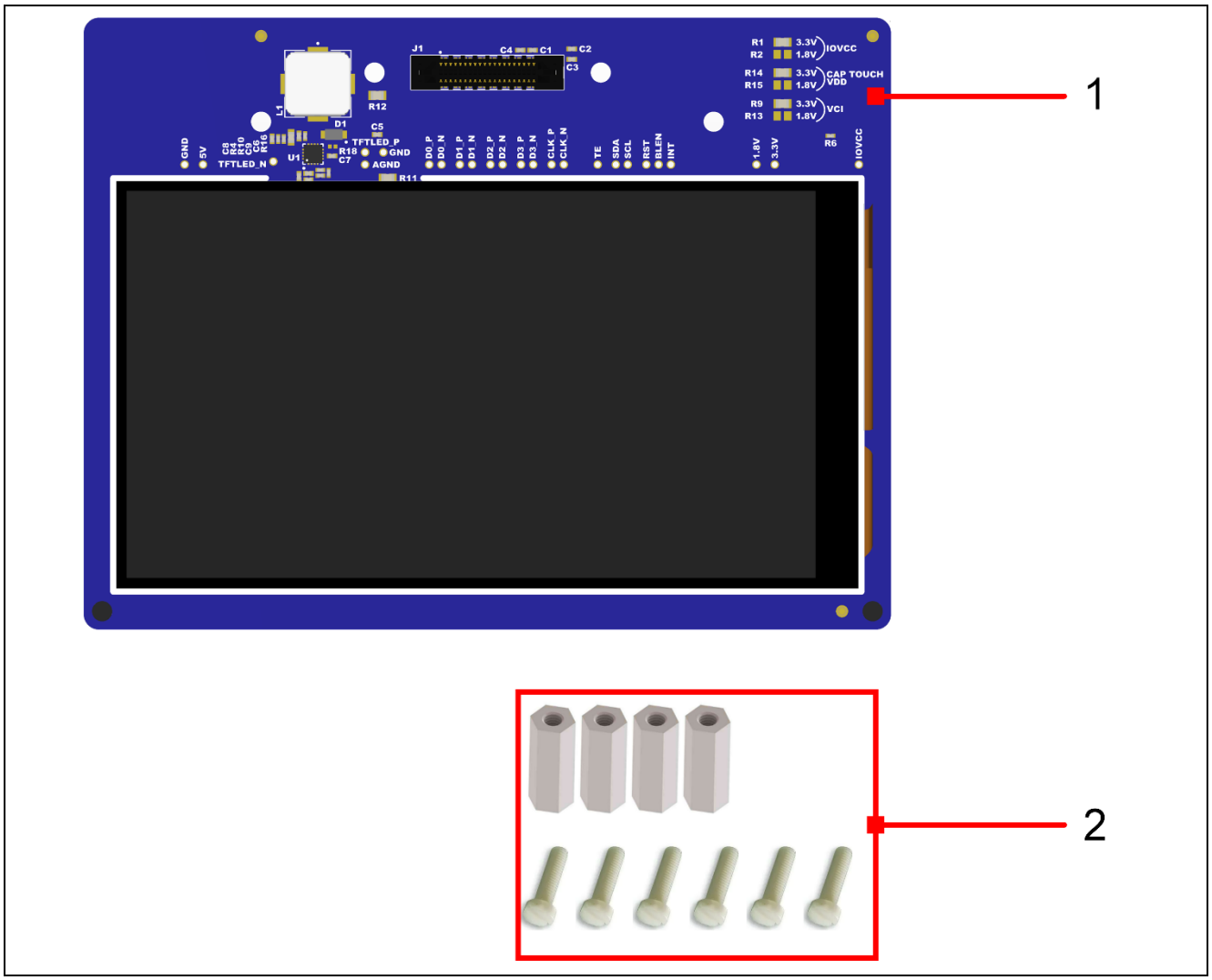

Figure 3. MIPI Graphics Expansion Board 2 Kit Contents

3. Ordering Information

- MIPI Graphics Expansion Board 2 v1 kit orderable part number: RTKAPPLCDMS02001BE

Note: The underlined character in the orderable part number represents the kit version.

Dimensions: 132 mm (length) x 100 mm (width)

4. Connectivity

4.1 MIPI Graphics Expansion Port (J1)

The MIPI Graphics Expansion Board 2 supports a 5-inch 720x1280 TFT LCD with capacitive touchscreen to be connected to RZ/A MCUs via the 40-pin Socket MIPI Graphics Expansion Port (J1). A high-speed connector is used to ensure signal integrity for the differential MIPI signals.

Table 1. MIPI Graphics Expansion Port

J1 Pin	Signal Description	Test Point
1	GND	TP22 and TP25
2	GND	
3	DSI_DATA0_P	TP13
4	DSI_DATA1_P	TP20
5	DSI_DATA0_N	TP12
6	DSI_DATA1_N	TP19
7	GND	TP22 and TP25
8	GND	
9	DSI_DATA2_P	TP11
10	DSI_DATA3_P	TP18
11	DSI_DATA2_N	TP10
12	DSI_DATA3_N	TP17
13	GND	TP22 and TP25
14	GND	
15	DSI_CLK_P	TP9
16	TE	TP8
17	DSI_CLK_N	TP7
18	GND	TP22 and TP25
19	GND	
20	SDA	TP16
21	BLEN	TP6
22	SCL	TP15
23	TP_INT	TP5
24	TP_RESET_L	TP14
25	GND	TP22 and TP25
26	GND	
27	NC	-
28	NC	-
29	NC	-
30	NC	-
31	NC	-
32	NC	-
33	GND	TP22 and TP25
34	GND	
35	P1V8	TP28
36	P1V8	
37	P3V3	TP4
38	P3V3	
39	P5V	TP26
40	P5V	

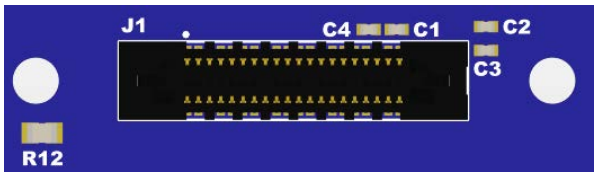

Figure 4. MIPI Graphics Expansion Port

4.2 FPC Connector for LCD Data (J2)

The TFT LCD peripheral, data and power lines connect to the MIPI Graphics Expansion Board 2 via the 30-pin FPC connector (J2).

Table 2. FPC Connector for LCD Data

J2 Pin	Signal Description	LCD Pin	LCD Signal Description	Test Point
1	GND	30	GND	TP22 and TP25
2	GND	29	GND	
3	VCI (P3V3 / P1V8)	28	VCI	TP4 / TP28
4	IOVCC (P3V3 / P1V8)	27	IOVCC	TP27 (TP4 / TP28)
5	RESET_L	26	RESET	TP14
6	TE	25	TE	TP8
7	GND	24	GND	TP22 and TP25
8	NC	23	NC	-
9	GND	22	GND	TP22 and TP25
10	GND	21	GND	
11	DSI_DATA3_P	20	D3P	TP18
12	DSI_DATA3_N	19	D3N	TP17
13	GND	18	GND	TP22 and TP25
14	DSI_DATA2_P	17	D2P	TP11
15	DSI_DATA2_N	16	D2N	TP10
16	GND	15	GND	TP22 and TP25
17	DSI_CLK_P	14	CLKP	TP9
18	DSI_CLK_N	13	CLKN	TP7
19	GND	12	GND	TP22 and TP25
20	DSI_DATA1_P	11	D1P	TP20
21	DSI_DATA1_N	10	D1N	TP19
22	GND	9	GND	TP22 and TP25
23	DSI_DATA0_P	8	D0P	TP13
24	DSI_DATA0_N	7	D0N	TP12
25	GND	6	GND	TP22 and TP25
26	NC	5	NC	-
27	TFTLED_P	4	LEDA	TP21
28	NC	3	NC	-
29	TFTLED_N	2	LEDK	TP23
30	NC	1	NC	-

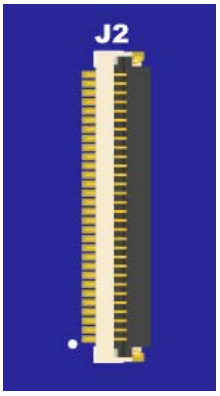

Figure 5. FPC connector for LCD panel (J2)

4.3 FPC Connector for LCD Capacitive Touch (J3)

The TFT LCD capacitive touch panel connects to the Parallel Graphics Expansion Board 2 via the 10-pin FPC connector J3. The capacitive touch controller (GT911) is controlled using I^2C. If INT is held low on power up or reset, the I^2C address is 0x5D (default). If INT is held high on power up or reset the I^2C address is 0x14.

Table 3. FPC Connector for LCD Capacitive Touch

J3 Pin	MIPI Signal Description	LCD Pin	LCD Signal Description	Test Point
1	GND	8	GND	TP22 and TP25
2	RESET_L	7	RST	TP14
3	TP_INT	6	INT	TP5
4	SDA	5	SDA	TP16
5	SCL	4	SCL	TP15
6	VDD_LCD (P3V3 / P1V8)	3	VDD	TP4 / TP28
7	NC	2	NC	-
8	GND	1	GND	TP22 and TP25

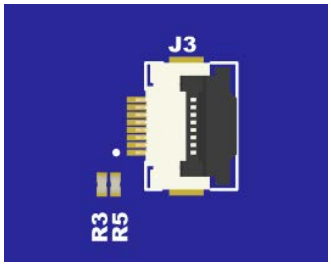

Figure 6. FPC Connector for LCD Capacitive Touch

4.4 LCD Backlight Controller (U1)

The display backlight is controlled by a Renesas ISL97682 backlight controller (U1). This device implements compact 2 channel LED drivers each set to drive a constant current of 20mA. These are in parallel to provide a total of 40mA to the display backlight. The over voltage protection (OVP) pin is set to 22.3V max (19.2V nominal) to protect the LED backlight. Brightness can be controlled by applying a PWM signal to the backlight enable (BLEN) pin.

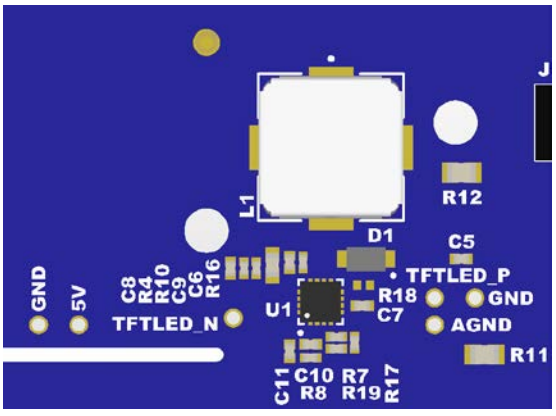

Figure 7. LCD Backlight Controller

5. Certifications

The MIPI Graphics Expansion Board 2 v1 kit meets the following certifications/standards. See page 3 of this user's manual for the disclaimer and precautions.

5.1 EMC/EMI Standards

- FCC Notice (Class A)

  This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

  NOTE- This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
  - Reorient or relocate the receiving antenna.
  - Increase the separation between the equipment and receiver.
  - Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
  - Consult the dealer or an experienced radio/television technician for help.
- Innovation, Science and Economic Development Canada ICES-003 Compliance:

  CAN ICES-3 (A)/NMB-3(A)
- CE Class A (EMC)

  This product is herewith confirmed to comply with the requirements set out in the Council Directives on the Approximation of the laws of the Member States relating to Electromagnetic Compatibility Directive 2014/30/EU.

  Warning – This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures to correct this interference.
- UKCA Class A (EMC)

  This product is in conformity with the following relevant UK Statutory Instrument(s) (and its amendments): 2016 No. 1091 Electromagnetic Compatibility Regulations 2016.

  Warning – This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures to correct this interference.
- Taiwan: Chinese National Standard 13438, C6357 compliance, Class A limits
- Australia/New Zealand AS/NZS CISPR 32:2015, Class A

5.2 Material Selection, Waste, Recycling and Disposal Standards

- EU RoHS
- WEEE
- China SJ/T 113642014, 10-year environmental protection use period.

5.3 Safety Standards

- UL 94V-0

6. Design and Manufacturing Information

The design and manufacturing information for the MIPI Graphics Expansion Board 2 kit is available in the "APP_LCD-EK_MIPI_2 v1 Design Package" available on renesas.com/app_lcd-ek_mipi_2 .

Design package file name: app_lcd-ek_mipi_2-v1-designpackage.zip

Table 4. MIPI Graphics Expansion Board 2 Design Package Contents

File Type	Content	File/Folder Name
File (PDF)	Schematics	app_lcd-ek_mipi_2-v1-schematics
File (PDF)	Mechanical Drawing	app_lcd-ek_mipi_2-v1-mechdwg
File (PDF)	3D Drawing	app_lcd-ek_mipi_2-v1-3d
File (PDF)	BOM	app_lcd-ek_mipi_2-v1-bom
Folder	Manufacturing Files	Manufacturing Files
Folder	Design Files	Design Files - Altium

7. Website and Support

Visit the following URLs to learn about the kit and the RZ family of microcontrollers, download tools and documentation, and get support.

MIPI Graphics Expansion Board 2 Resources	renesas.com/app_lcd-ek_mipi_2
RZ Product Information	renesas.com/rz
RZ Product Support Forum	renesas.com/rz/forum
RZ/A Flexible Software Package (FSP)	renesas.com/fsp
Renesas Support	renesas.com/support

Revision History

Rev.	Date	Description	
		Page	Summary
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