Technical Specification
iLCD JPro

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iLCD JPro Specification
Version 1.0

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Contents

Introduction

Welcome to the iLCD JPro document. Here you will find information regarding our intelligent LCD Java Programmable series. These are microcontrollers connected to a display, which can be easily programmed using Java 1 and our free custom App, the iLCD Manager.

The series is subdivided into two categories:

- **The F Series:** The F stands for "fast" as this series is much more potent in terms of processing power that its predecessor.

- **Legacy Series:** This is the first generation of iLCD JPro panels, which is not recommended for new designs.

Please visit our documentation page for more information regarding our software infrastructure.

Should any questions remain unanswered please don't hesitate to contact us via support@demmel.com or via +43-1-689470-0

F-Series

The iLCD modules are intelligent LCD panels which allow the user to carry out all graphic and font needs in a convenient way without having to deal with pixel addressing, low level functions or hardware details. Controlling the screen contents is done either via a serial port, I2C port, SPI port, USB or with an optional board via Ethernet.

The iLCD Manager is a free-to-use software with which the panels can be controlled easily.

1.1 DPP-FHx43

1.1.1 LCD

Item	DPP-FH43	DPP-FHT43	DPP-FHC43
Screen Size		4.3 inch	
Display Resolution		800 x RGB x 480 dots	
Active Area		95.04 (H) x 53.858 (V) mm	
Display Mode		Normally black / Transmissive	
Pixel Arrangement		RGB-Strip	
Display Color		16.7 M (Display) / 64k (Controller)	
Backlight 1)		White LED, typical lifetime 20.000 hours	
Brightness typ.		1000 cd/m2	
Contrast ratio typ.		1200	
Viewing Direction		ALL O'clock / IPS-Display	
Touch Screen	No	4-wire resistive	PCAP 5 Fingers

Note:

1) Brightness decreased to 50% of the initial value. Life time; mean time before failure at normal temperature (25°C) and normal humidity (60%)

1.1.2 Features

Item	DPP-FHC43
Connectivity	USB 2.0 / 1 x RS232 3.3V / I2C / SPI / Ethernet with optional board
Keyboard	matrix scanning for up to 128 keys
Outputs	up to 16 outputs/LEDs (on/off/blink with user selectable blink frequency) 1)
Inputs	up to 16 1
ADC	up to 4 (12 bit with range of 0 .. 3.3V) 1
Relays/PWM	up to 2 1
Real-Time Clock	Yes
Flash Memory	30 MByte for fonts, graphics, macros and text templates
RAM	32 MByte RAM for frame buffer and for screen saving
iLCD controller	DPM5050 operating at 528 MHz

Note:

1) Fully customizable assignments of inputs, outputs, ADCs, Relays, PWMs and keyboard columns
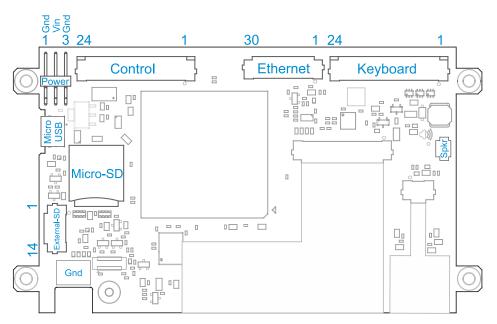
1.1.3 Electrical Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage	VCC	3.2	5.0	5.25	V
Input Voltage H Level 1)	VIH	2.4	-	3.3	V
Input Voltage L Level 1)	VIL	0.0	-	0.8	V
Output current for digital outputs	IOUT			3.5	mA
Vbatt current	IVbatt		1		µA
Current consumption display on, backlight off @ VCC = 5V 2)3)	ICC		180		mA
Current consumption with display+backlight @ VCC = 5V 2)3)4)	ICC		420		mA

Notes:

1) For digital inputs only

2) No I/O ports active

3) All pixel set to white color
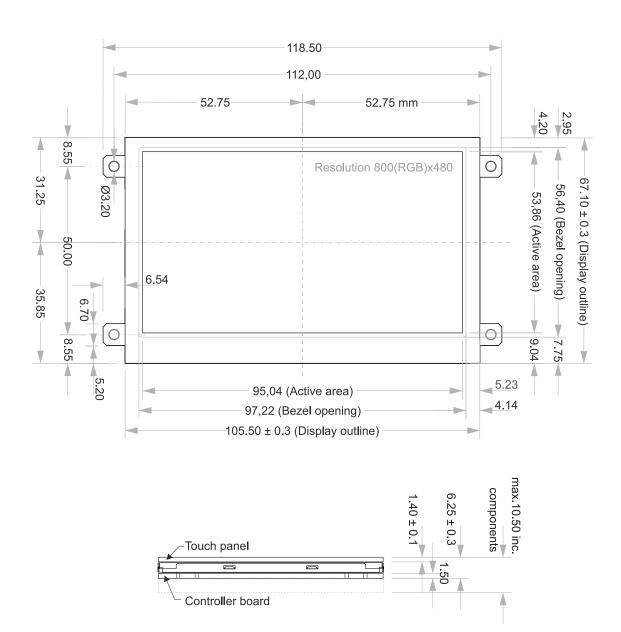
4) Backlight intensity 100%

1.1.4 Circuit Board

See *Pin Descriptions* (page 23) for more information.

1.1.5 Mechanical Specification

1.2 DPP-FHx50

1.2.1 LCD

Item	DPP-FH50	DPP-FHT50	DPP-FHC50
Screen Size		5.0 inch	
Display Resolution		800 x RGB x 480 dots	
Active Area		108.00 (H) x 64.80 (V) mm	
Display Mode		Normally black / Transmissive	
Pixel Arrangement		RGB-Strip	
Display Color		16.7 M (Display) / 64k (Controller)	
Backlight 1)		White LED, typical lifetime 20.000 hours	
Brightness typ.		1000 cd/m2	
Contrast ratio typ.		800	
Viewing Direction		ALL O'clock	
Touch Screen	No	4-wire resistive	PCAP 5 Fingers

Note:

1) Brightness decreased to 50% of the initial value. Life time; mean time before failure at normal temperature (25°C) and normal humidity (60%)

1.2.2 Features

Item	DPP-FHx50
Connectivity	USB 2.0 / 1 x RS232 3.3V / I2C / SPI / Ethernet with optional board
Keyboard	matrix scanning for up to 128 keys
Outputs	up to 16 outputs/LEDs (on/off/blink with user selectable blink frequency) 1)
Inputs	up to 16 1)
ADC	up to 4 (12 bit with range of 0 .. 3.3V) 1)
Relays/PWM	up to 2 1)
Real-Time Clock	Yes
Flash Memory	30 MByte for fonts, graphics, macros and text templates
RAM	32 MByte RAM for frame buffer and for screen saving
iLCD controller	DPM5050 operating at 528 MHz

Note:

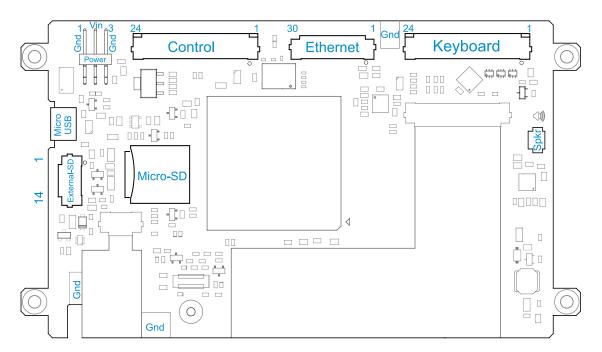1) Fully customizable assignments of inputs, outputs, ADCs, Relays, PWMs and keyboard columns

1.2.3 Electrical Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage	VCC	3.2	5.0	5.25	V
Input Voltage H Level 1)	VIH	2.4	-	3.3	V
Input Voltage L Level 1)	VIL	0.0	-	0.8	V
Output current for digital outputs	IOUT			3.5	mA
Vbatt current	IVbatt		1		µA
Current consumption display on, backlight off @ VCC = 5V 2)3)	ICC		225		mA
Current consumption with display+backlight @ VCC = 5V 2)3)4)	ICC		545		mA

Notes:

1) For digital inputs only 3) All pixel set to white color

2) No I/O ports active 4) Backlight intensity 100%

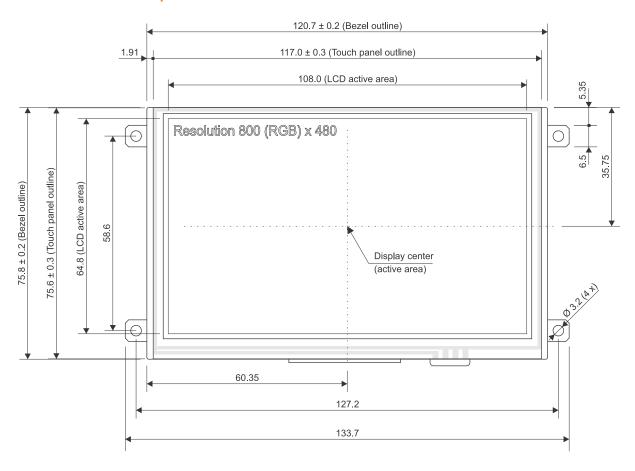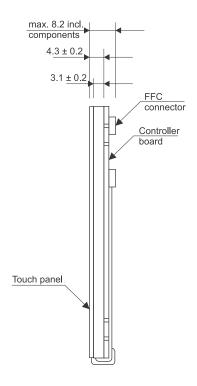### 1.2.4 Circuit Board

DPP-FHx50 connections (view from PCB side), see *Pin Descriptions* (page 23)

1.2.5 Mechanical Specification

1.3 DPP-Fx57

1.3.1 LCD

Item	DPP-F57	DPP-FT57	DPP-FC57
Screen Size		5.7 inch	
Display Resolution		640 x RGB x 480 dots	
Active Area		112.896 (H) x 84.672 (V) mm	
Display Mode		Normally white / Transmissive	
Pixel Arrangement		RGB-Strip	
Display Color		262 k (Display) / 64k (Controller)	
Backlight 1)		White LED, typical lifetime 20.000 hours	
Brightness typ.	350 cd/m2	300 cd/m2	350 cd/m2
Contrast ratio typ.		500	
Viewing Direction		6 O'clock	
Touch Screen	No	4-wire resistive	PCAP 5 Fingers

Note:

1) Brightness decreased to 50% of the initial value. Life time; mean time before failure at normal temperature (25°C) and normal humidity (60%)

1.3.2 Features

Item	DPP-Fx57
Connectivity	USB 2.0 / 1 x RS232 3.3V / I2C / SPI / Ethernet with optional board
Keyboard	matrix scanning for up to 128 keys
Outputs	up to 16 outputs/LEDs (on/off/blink with user selectable blink frequency) 1)
Inputs	up to 16 1)
ADC	up to 4 (12 bit with range of 0 .. 3.3V) 1)
Relays/PWM	up to 2 1)
Real-Time Clock	Yes
Flash Memory	30 MByte for fonts, graphics, macros and text templates
RAM	32 MByte RAM for frame buffer and for screen saving
iLCD controller	DPM5050 operating at 528 MHz

Note:

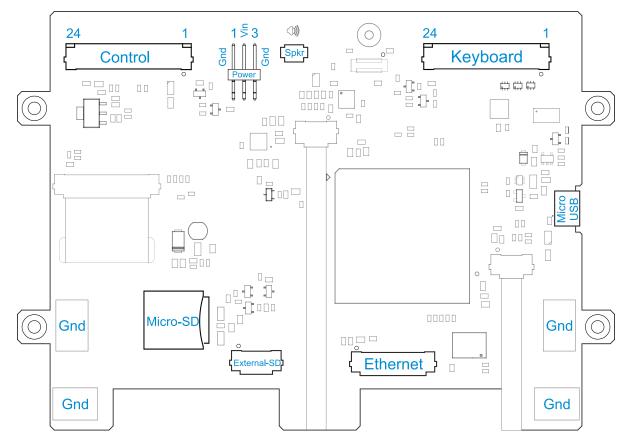1) Fully customizable assignments of inputs, outputs, ADCs, Relays, PWMs and keyboard columns

1.3.3 Electrical Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage	VCC	3.2	5.0	5.25	V
Input Voltage H Level 1)	VIH	2.4	-	3.3	V
Input Voltage L Level 1)	VIL	0.0	-	0.8	V
Output current for digital outputs	IOUT			3.5	mA
Vbatt current	IVbatt		1		µA
Current consumption display on, backlight off @ VCC = 5V 2)3)	ICC		305		mA
Current consumption with display+backlight @ VCC = 5V 2)3)4)	ICC		665		mA

Notes:

\1) For digital inputs only 3) All pixel set to white color

\2) No I/O ports active 4) Backlight intensity 100%

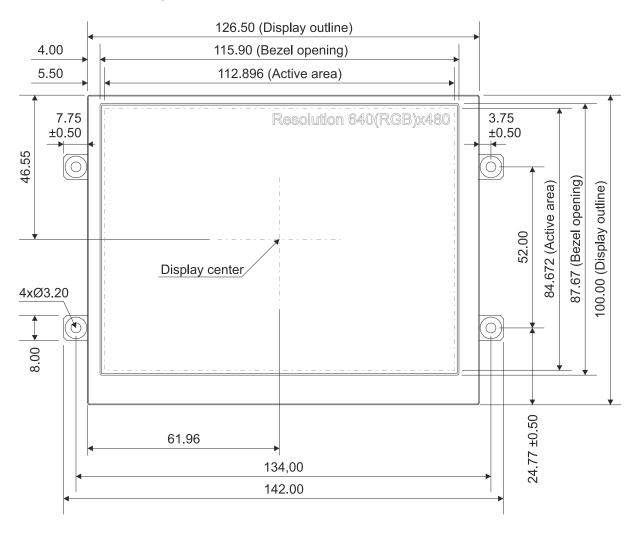### 1.3.4 Circuit Board

DPP-Fx57 connections (view from PCB side), see *Pin Descriptions* (page 23)

1.3.5 Mechanical Specification

8.80/9.00±0.30

1.40/1.60
(Touch-
screen)

1.60

FFC
Connector

Controller
Board

11.50/11.70
max. thickness

1.4 DPP-FHx70

1.4.1 LCD

Item	DPP-FH70	DPP-FHT70	DPP-FHC70
Screen Size		7.0 inch	
Display Resolution		1024 x RGB x 600 dots	
Active Area		154.2144 (H) x 85.92 (V) mm	
Display Mode		Normally black / Transmissive	
Pixel Arrangement		RGB-Strip	
Display Color		16.7 M (Display) / 64k (Controller)	
Backlight 1)		27 white LEDs, typical lifetime 50.000 hours	
Brightness typ.		600 cd/m2	
Contrast ratio typ.		800	
Viewing Direction		ALL O'clock	
Touch Screen	No	4-wire resistive	PCAP 5 Fingers

Note:

1) Brightness decreased to 50% of the initial value. Life time; mean time before failure at normal temperature (25°C) and normal humidity (60%)

1.4.2 Features

Item	DPP-FHx70
Connectivity	USB 2.0 / 1 x RS232 3.3V / I2C / SPI / Ethernet with optional board
Keyboard	matrix scanning for up to 128 keys
Outputs	up to 16 outputs/LEDs (on/off/blink with user selectable blink frequency) 1)
Inputs	up to 16 1)
ADC	up to 4 (12 bit with range of 0 .. 3.3V) 1)
Relays/PWM	up to 2 1)
Real-Time Clock	Yes
Flash Memory	30 MByte for fonts, graphics, macros and text templates
RAM	32 MByte RAM for frame buffer and for screen saving
iLCD controller	DPM5050 operating at 528 MHz

Note:

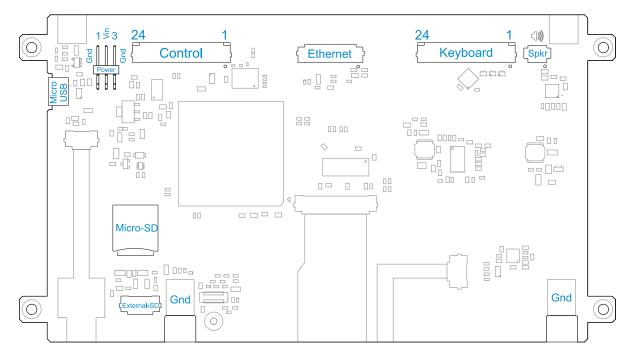1) Fully customizable assignments of inputs, outputs, ADCs, Relays, PWMs and keyboard columns

1.4.3 Electrical Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage	VCC	3.2	5.0	5.25	V
Input Voltage H Level 1)	VIH	2.4	-	3.3	V
Input Voltage L Level 1)	VIL	0.0	-	0.8	V
Output current for digital outputs	IOUT			3.5	mA
Vbatt current	IVbatt		1		µA
Current consumption display on, backlight off @ VCC = 5V 2)3)	ICC		210		mA
Current consumption with display+backlight @ VCC = 5V 2)3)4)	ICC		800		mA

Notes:

\1) For digital inputs only 3) All pixel set to white color
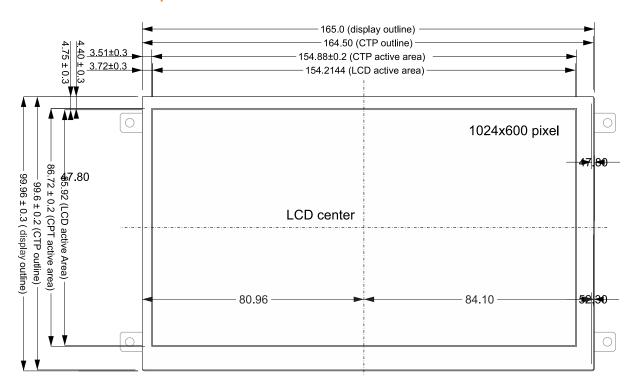
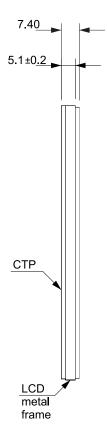\2) No I/O ports active 4) Backlight intensity 100%

1.4.4 Circuit Board

see *Pin Descriptions* (page 23) for more information

1.4.5 Mechanical Specification

1.5 DPP-Fx102

1.5.1 LCD

Item	DPP-F102	DPP-FT102	DPP-FC102
Screen Size		10.1 inch	
Display Resolution		1024 x RGB x 600 dots	
Active Area		222.72 (H) x 125.28 (V) mm	
Display Mode		Normally black / Transmissive	
Pixel Arrangement		RGB-Strip	
Display Color		16.7 M (Display) / 64k (Controller)	
Backlight 1)		42 white LEDs, typical lifetime 50.000 hours	
Brightness typ.		1000 cd/m2	
Contrast ratio typ.		800	
Viewing Direction		ALL O'clock	
Touch Screen	No	4-wire resistive	PCAP 5 Fingers

Note:

1) Brightness decreased to 50% of the initial value. Life time; mean time before failure at normal temperature (25°C) and normal humidity (60%)

1.5.2 Features

Item	DPP-Fx102
Connectivity	USB 2.0 / 1 x RS232 3.3V / I2C / SPI / Ethernet with optional board
Keyboard	matrix scanning for up to 128 keys
Outputs	up to 16 outputs/LEDs (on/off/blink with user selectable blink frequency) 1)
Inputs	up to 16 1)
ADC	up to 4 (12 bit with range of 0 .. 3.3V) 1)
Relays/PWM	up to 2 1)
Real-Time Clock	Yes
Flash Memory	30 MByte for fonts, graphics, macros and text templates
RAM	32 MByte RAM for frame buffer and for screen saving
iLCD controller	DPM5050 operating at 528 MHz

Note:

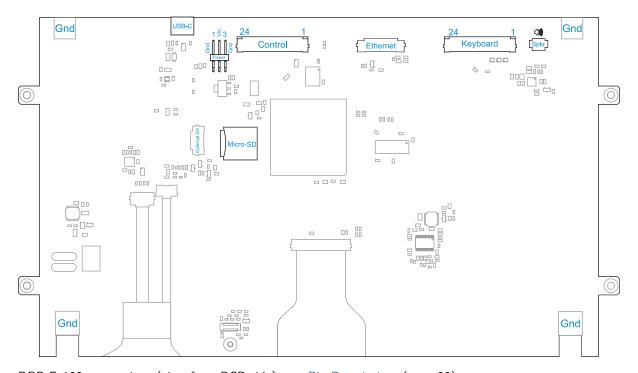1) Fully customizable assignments of inputs, outputs, ADCs, Relays, PWMs and keyboard columns

1.5.3 Electrical Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage	VCC	3.2	5.0	5.25	V
Input Voltage H Level 1)	VIH	2.4	-	3.3	V
Input Voltage L Level 1)	VIL	0.0	-	0.8	V
Output current for digital outputs	IOUT			3.5	mA
Vbatt current	IVbatt		1		µA
Current consumption display on, backlight off @ VCC = 5V 2)3)	ICC		280		mA
Current consumption with display+backlight @ VCC = 5V 2)3)4)	ICC		1.30		A

Notes:

1) For digital inputs only 2) No I/O ports active

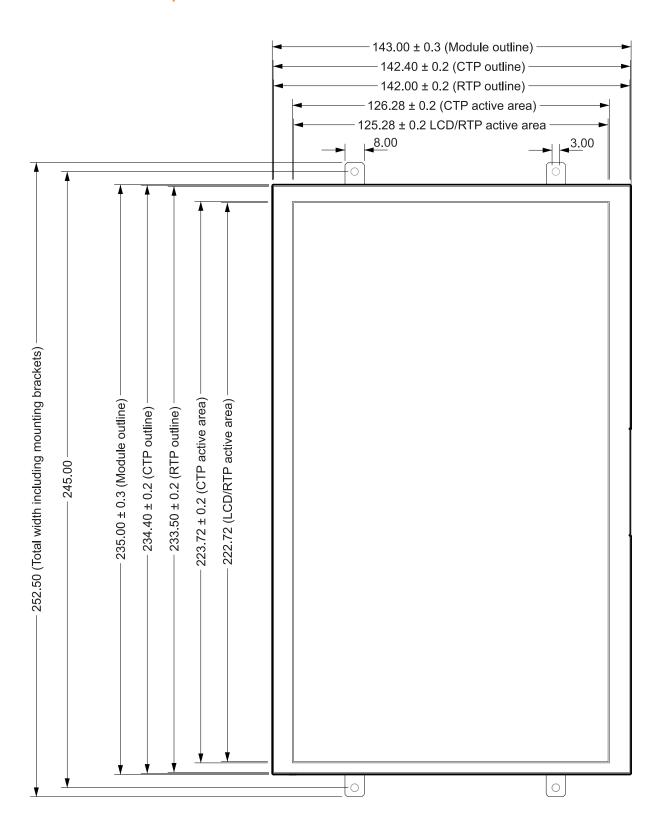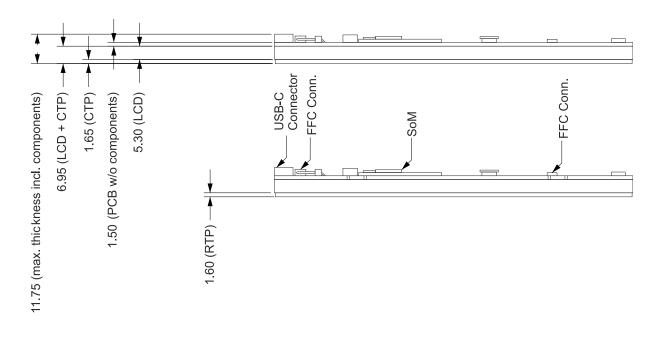3) All pixel set to white color 4) Backlight intensity 100%

1.5.4 Circuit Board

DPP-Fx102 connections (view from PCB side), see *Pin Descriptions* (page 23)

1.5.5 Mechanical Specification

The diagram shows a side-view cross-section of the display assembly with the following dimension labels (left side, vertical):

- 11.75 (max. thickness incl. components)
- 6.95 (LCD + CTP)
- 1.65 (CTP)
- 1.50 (PCB w/o components)
- 5.30 (LCD)
- 1.60 (RTP)

Component labels (right side):
- USB-C Connector
- FFC Conn.
- SoM
- FFC Conn.

1.6 DPP-FHx101

1.6.1 LCD

Item	DPP-FH101	DPP-FHT101	DPP-FHC101
Screen Size		10.1 inch	
Display Resolution		1280 x RGB x 800 dots	
Active Area		216.96 (H) x 135.60 (V) mm	
Display Mode		Normally black / Transmissive	
Pixel Arrangement		RGB-Strip	
Display Color		16.7 M (Display) / 64k (Controller)	
Backlight 1)		42 white LEDs, typical lifetime 50.000 hours	
Brightness typ.		1000 cd/m2	
Contrast ratio typ.		1000	
Viewing Direction		ALL O'clock (80°)	
Touch Screen	No	4-wire resistive	PCAP 5 Fingers

Note:

1) Brightness decreased to 50% of the initial value. Life time; mean time before failure at normal temperature (25°C) and normal humidity (60%)

1.6.2 Features

Item	DPP-FHx101
Connectivity	USB 2.0 / 1 x RS232 3.3V / I2C / SPI / Ethernet with optional board
Keyboard	matrix scanning for up to 128 keys
Outputs	up to 16 outputs/LEDs (on/off/blink with user selectable blink frequency) 1)
Inputs	up to 16 1)
ADC	up to 4 (12 bit with range of 0 .. 3.3V) 1)
Relays/PWM	up to 2 1)
Real-Time Clock	Yes
Flash Memory	30 MByte for fonts, graphics, macros and text templates
RAM	32 MByte RAM for frame buffer and for screen saving
iLCD controller	DPM5050 operating at 528 MHz

Note:

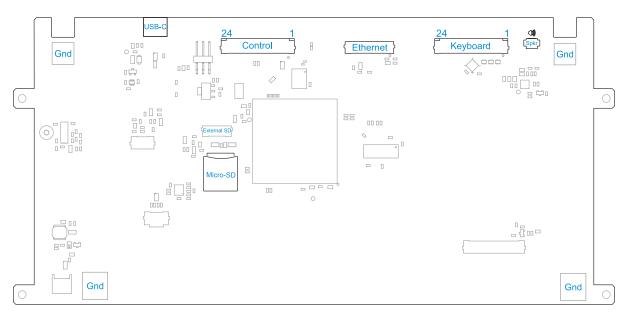1) Fully customizable assignments of inputs, outputs, ADCs, Relays, PWMs and keyboard columns

1.6.3 Electrical Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage	VCC	3.2	5.0	5.25	V
Input Voltage H Level 1)	VIH	2.4	-	3.3	V
Input Voltage L Level 1)	VIL	0.0	-	0.8	V
Output current for digital outputs	IOUT			3.5	mA
Vbatt current	IVbatt		1		µA
Current consumption display on, backlight off @ VCC = 5V 2)3) 5)	ICC		280 - 320		mA
Current consumption with display+backlight @ VCC = 5V 2)3)4) 5)	ICC		1.90 2.10	-	A

Notes:

1) For digital inputs only 2) No I/O ports active

3) All pixel set to white color 4) Backlight intensity 100%

5) Needs to be re-evaluated

1.6.4 Circuit Board

DPP-FHx101 connections (view from PCB side), see *Pin Descriptions* (page 23)

1.6.5 Mechanical Specification

Resolution 1280x(RGB)x800

228.30 (Module outline)
217.56 (PCAP active area)
216.96 (active area)
5.05
113.53
5.20
73.00
3.20
150.05 (Module outline)
136.20 (PCAP active area)
135.60 (active area)
8.00
33.00
80.00
238.00
245.00

12.7 max. thickness
incl. components

7.60 ± 0.3

5.00

USB-C Conn.

FFC Conn.

SoM

PCAP
Touch

P.C.B.

1.7 Important Information about USB and Serial Ports

The JPro modules contain two USB ports, a micro USB connector on the PCB and another available on Pins 2 and 3 of the Control Port FFC connector. Only one USB port may be used at any given time. Power may be supplied via USB connector. When using the Micro-USB connector please note the current consumption of the module in use and make sure the USB outlet can supply enough power.

There are two 3.3V serial ports. As of the current series the Keyboard FFC connector has been expanded to 24 Pins allowing for simultaneous use of both a USB connector and Serial Port 0. Serial Port 0 is available on Pins 21 and 22 the Keyboard Port FFC connector. Serial Port 1 is available on Pins 5 and 6 the Control Port FFC connector. These are available by default and may be disabled in the iLCD Manager.

The USB port is implemented in two ways:

- HID device requiring no extra drivers, as all major operating systems use this system-driver for supporting mice and keyboards

- WinUSB device which requires an additional driver and is faster

Setting Baud rates deviating from 115200 Baud can be done via the "Set Baud Rate" command (see the iLCD Command Set documentation) for the serial port currently in use until the next power up or reboot of the iLCD panel. In order to permanently change the Baud rate, go to the iLCD Manager XE's "Settings" page, check the "Hardware Settings" checkbox and set the Baud rate of Serial Port 1. After downloading this new setup data via the USB port to the iLCD panel, the Baud rate is changed automatically according to the new setting, a message box appears.

The Baud rate of Serial Port 0 can be set in the same way. In case of any misconfiguration possibly further disabling the communication via the serial port, the evaluation board's "Erase" jumper can be set during power up (pulling the RX1 port low) to completely erase the flash user data. The default value of 115200 Baud is reset on both serial ports and the user data has to be re-written via the iLCD Manager XE.
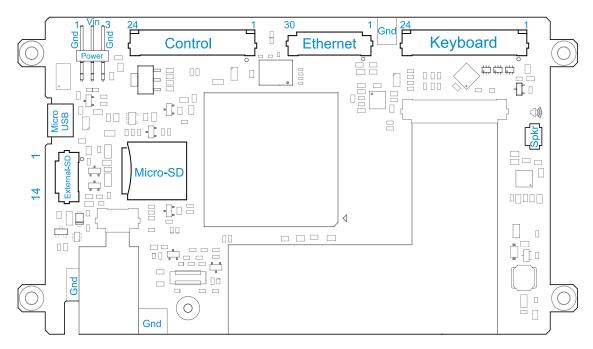
1.8 General Information about Port Pins

Most port pins can be used as outputs (push/pull or pull down only outputs), as keyboard column outputs or as digital inputs besides of their primary function. The assignment of these port pins must be done once via the iLCD Manager XE under the "Settings page" after checking the "I/O Settings" checkbox. The names of the pins described below refer to the primary function only, the notes show the alternative functionality.

As the DPM5050 iLCD controller works with a power supply of 3.3V (a voltage-regulator for this voltage is on-board allowing the board to work with single 5V supply), push/pull outputs have a voltage swing of 0V … 3.3V.

Outputs and digital inputs are not 5V tolerant.

1.9 Pin Descriptions

The following paragraphs each refer to a connector on the PCB of the iLCD JPro Series. The name of the respective connector is given in brackets. The schematic for DPP-FHx50 is given for reference.

DPP-FHx50 dimensions in mm

1.9.1 Power Connector (Power)

The iLCD panels can either be supplied via the Power Connector, via the Control Port or via the USB Port. If supplied via the 24-pin Control Port, all three GND pins must be connected and all three VCC pins must be connected to not exceed the maximum allowed current per pin of the FFC/FPC connector. Please note that if the iLCD panel is supplied via USB, its output current must at least fulfill the requirements listed in the electrical characteristics of the panel. Furthermore, ensure that the USB port delivers a stable and sufficient voltage level according to the iLCD specifications.

Pin#	PinName	Direction	Primary Function Description
1	GND 1)	-	Ground pin
2	VCC 2)	-	5V power supply
3	GND 1)	-	Ground pin

Notes:

1) The GND pin is connected to pin 4, 23 and 24 of the Control Port FFC/FPC connector.

2) The VCC pin is connected to pin 1, 21 and 22 of the Control Port FFC/FPC connector.

> **Warning:** Reversed power supply connections (Vcc and Gnd) made to the iLCD module or invalid power supply voltage greater than 5.5V will cause module damage.

1.9.2 Control Port (Control)

Connection to the control port is made via a 24-pin FFC/FPC cable with 1.0 mm pitch. The FFC/FPC connector on the board is a top-contact model.

If one wants to connect an evaluation kit of the former color iLCD panels to the 24-pin FFC/FPC connector, this can be done by using a 20-pin FFC/FPC cable, if the cable is orientated at pin 1 (pin 21 ~ 24 kept free then) and a 5V power supply is applied to the Power port then. The Vsel jumper of the evaluation board must be removed in this case!

Please note that the pin names of the serial port connections are seen from the driving PC / application side, which means a pin with name TX is in fact the output of the PC and an input of the iLCD panel. "Direction" is valid only when the primary function is enabled.

Pin#	Pin-Name	Direc-tion	Primary Function Description
1	VCC 10	-	5V power supply
2	USB-	In/Out	USB-, can be directly connected to pin 2 of a USB-Jack B
3	USB+	In/Out	USB+, can be directly connected to pin 3 of a USB-Jack B
4	GND	-	Ground pin
5	**TX1** 3	In	Serial port 1, transmit line from PC, receive input of iLCD controller. Can be used for RS422/RS485 in conjunction with ALERT pin
6	**RX1** 38	Out	Serial port 1, receive line to PC, transmit output of iLCD controller.Can be used for RS422/RS485 in conjunction with ALERT pin
7	CTS	Out	Output to avoid input buffer overflow, connect to RS232 driver's CTS of the PC. Common for both serial ports.
8	**SDA** 47	In/Out	I2C data pin. Note, that there is no pull up resistor on the iLCD panel, so an external resistor may be necessary depending on the I2C bus structure.
9	**SCL** 47	In/Out	I2C clock pin. Note, that there is no pull up resistor on the iLCD panel, so an external resistor may be necessary depending on the I2C bus structure.
10	**ALERT** 312	Out	Output pin to indicate I2C data availability (= low) to the I2C master.When using the RS422/RS485 mode on the second serial port, pin goes low during data transmit.
11	**SCK** 3	In	Clock for SPI
12	**MISO** 3	Out	Serial output line for SPI
13	**MOSI** 3	In	Serial input line for SPI
14	**SSEL** 36	In/Out	Must be tied to GND when using SPI
15	REL0	Out	Relay output 0 / PWM0 output
16	REL1	Out	Relay output 1 / PWM1 output
17	**GP0** 512	In/Out	General purpose I/O pin 0. Use serial resistor when driving a LED.
18	**GP1** 5	In/Out	General purpose I/O pin 1. Use serial resistor when driving a LED.
19	**I/O5** 39RE-SET	In/OutIn	Digital I/O pin/RESET – Pulling this pin low resets the iLCD module
20	Vbatt	-	Backup input voltage for real-time clock, should be between 2.5V and 3.3V
21	VCC 10	-	5V power supply
22	VCC 10	-	5V power supply
23	GND 11	-	Ground pin
24	GND 11	-	Ground pin

Pins configurable in the iLCD Manager XE I/O Settings are **bold**

Note:

3) This pin can be used as a digital input, a push/pull or pull down output or a keyboard column output when the primary function is not enabled.

4) This pin can be used as a digital input, a pull down output or keyboard column output when the primary function is not enabled.

5) This pin can be used as a digital input, an analog input, a push/pull or pull down output or a keyboard column output. The voltage on this pin is not allowed to exceed 3.3V, even if it is used as a digital input or a pull-down output.

6) When using SPI, this pin must be used as SSEL for selecting the SPI via attaching a low signal.

7) When using the I2C port, this pin must be terminated with a resistor (usually 3k3) to 3.3V if the iLCD panel is the last device on the I2C bus. Please note, that the evaluation board has this pull-up resistor populated on the board.

8) When pulling low this pin via a 1k resistor during power-up, the flash memory's user data is erased.

9) The functionality of this pin depends on the setting of the jumpers for external RESET function. If configured as /RESET pin, the board's internal power up reset signal can be seen on this pin as well.

10) Connect all VCC pins together in case you supply the iLCD panel via the FFC/FPC connector. VCC is connected to Pin 2 of the Power Connector as well.

11) Connect all GND pins together in case you supply the iLCD panel via the FFC/FPC connector. GND is connected to Pin 1 and 3 of the Power Connector as well.

12) The ALERT Pin is connected to a 10k pull-up resistor. If used as a pull-down output or input, low impedance must be used.

Warning: Reversed power supply connections (Vcc and Gnd) made to the iLCD module or invalid power supply voltage greater than 5.5V will cause module damage.

1.9.3 Keyboard Port (Keyboard)

Connection to the keyboard port is made via a 24-pin FFC/FPC cable with 1.0 mm pitch. The FFC/FPC connector on the board is a top-contact model.

If one wants to connect an evaluation kit of the former color iLCD panels to the 24-pin FFC/FPC connector, this can be done by using a 20-pin FFC/FPC cable, if the cable is orientated at pin 1 (pin 21 ~ 24 kept free then). All pins except TX0, RX0, Vout 3V3 and GND will be available.

Pin#	PinName	Direction	Primary Function Description
1	KBR0	In	Keyboard row 0
2	KBR1	In	Keyboard row 1
3	KBR2	In	Keyboard row 2
4	KBR3	In	Keyboard row 3
5	KBR4	In	Keyboard row 4
6	KBR5	In	Keyboard row 5
7	KBR6	In	Keyboard row 6
8	KBR7	In	Keyboard row 7
9	**KBC0** 1)	Out	Keyboard column 0, optionally I/O pin
10	**KBC1** 1)	Out	Keyboard column 1, optionally I/O pin
11	**KBC2** 1)	Out	Keyboard column 2, optionally I/O pin
12	**KBC3** 1)	Out	Keyboard column 3, optionally I/O pin
13	**KBC4** 1)	Out	Keyboard column 4, optionally I/O pin
14	**KBC5** 1)	Out	Keyboard column 5, optionally I/O pin
15	**KBC6** 1)	Out	Keyboard column 6, optionally I/O pin
16	**KBC7** 1)	Out	Keyboard column 7, optionally I/O pin
17	**KBC8** 1)	Out	Keyboard column 8, optionally I/O pin
18	**GP2** 2)	In/Out	General purpose I/O pin 0. Use serial resistor when driving a LED.
19	**GP3** 2)	In/Out	General purpose I/O pin 1. Use serial resistor when driving a LED.
20	**I/O6** 1)	In/Out	Digital I/O pin
21	TX0	In	Serial port 0, transmit line from PC, receive input of iLCD controller.
22	RX0	Out	Serial port 0, receive line to PC, transmit output of iLCD controller.
23	Vout 3V3	Out	3.3V limited to 100 mA
24	GND	-	Ground pin

Pins configurable in the iLCD Manager XE I/O Settings are **bold**

Note:

1) This pin can be used as a digital input, a push/pull or pull down output or a keyboard column output when the primary function is not enabled.

2) This pin can be used as a digital input, an analog input, a push/pull or pull down output or a keyboard column output. The voltage on this pin is not allowed to exceed 3.3V, even if it is used as a digital input or a pull-down output.
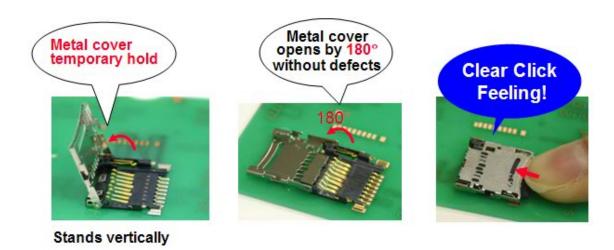
1.9.4 USB-Micro-B Port (Micro USB)

The iLCD panels can be connected via USB either via the onboard USB-Micro-B connector or via the control port's USB pins, limited to one connection at a time. Additionally, the iLCD panel can be supplied via USB, whereby its output current must at least fulfill the requirements listed in the electrical characteristics of the panel. Furthermore, ensure that the USB port delivers a stable and sufficient voltage level according to the iLCD specifications.

1.9.5 MicroSD Connector (Micro-SD)

All iLCD panels have a MicroSD card holder on-board. A MicroSD card with up to 32 GBytes may be inserted for memory extension. Please note that MicroSD and MicroSDHC are supported.

To insert a MicroSD card, slide the connector in the direction of the OPEN-arrow engraved in the metal plate and lift it. Insert the card with the contact area facing down, then fold the connector back in and push carefully in the direction of the LOCK-arrow until it makes a click sound.

1.9.6 External SD Card Connector (External SD)

The External SD Card Connector provides the option to connect a standard SD card to the iLCD display. demmel products' DPA-SD-EXT boards is available to interface to the External SD Card Connector.

1.9.7 Speaker Port (Spkr)

The speaker output may be connected directly to a 4 or 8 Ohm speaker to play sound files.

1.9.8 Jumpers for External Reset Function

If the external reset function is required, please contact demmel products to learn more about the option to use I/O5 pin as a reset pin instead of a normal I/O5 port.

1.10 Maximum Ratings & Power Supply

Item	Symbol	Minimum	Maximum	Unit
Supply Voltage	VCC	-0.3	5.5	V
Input Voltage	VIN	-0.3	3.3	V
Operating Temperature 1)	TOPR	-20	70	°C
Storage Temperature	TSTR	-20	80	°C
Humidity 2)		10	90	%RH

Notes:

- 1) Lifetime of backlight LEDs will be decreased for temperatures   50°C

- 2) Temp.   60°C, 90% RH MAX.

- 3) Temp.   60°C, absolute humidity shall be less than 90% RH at 60°C

The ground connection to the display should be as good as possible. Especially for iLCDs with projected capacitive touch panel the ground connection to the display and the power supply is crucial for a trouble-free function. If it is not possible or not wanted to connect the power supply with protective earth, this shall be done via a 20 nF capacitor.

Note: The mounting brackets on the iLCD panels are also connected with the PCB's GND plane.

1.11 Quality Standards

1.11.1 Dust Particles

The TFT display modules are assembled under clean room conditions. The following table specifies the allowed number and size of particles incorporated.

Dimension (Diameter D)	Acceptance (Qty N)
D 0.25 mm	Ignored
0.25 D 0.50	N 5
D 0.50	0
Total	N 5

1.11.2 Pixel Failures

For our iLCD Panels we deploy A-grade TFT display modules. We accept a maximum of sub-pixel failures as follows:

Defect Type	Acceptance (Qty N)
Bright Dots	N = 0
Dark Dots	N 3
Total	N 3

1.12 Assembly

1.12.1 Treatment of the Touch Panel Tail

The touch panel is connected to the iLCD processor via an FPC tail. It is mounted already on iLCDs with touch functionality. In order to guarantee correct function and to prevent physical damages, please observe the following notes when taking out the iLCD panels from the package and during manufacturing:

- Do not exert lateral or shearing forces on the tail. This can happen when fitting the iLCD panel into a housing through a narrow aperture.

- Do not crease, twist or pull the tail.

- Do not touch the tail conductors.

1.12.2 Treatment of the FFC Tail

The FFC cable connects the iLCD to the application electronics.

- The FFC cable bending radius must be 3 mm.

- Do not exert lateral or shearing forces on the FFC cable.

- Do not crease or twist the FFC cable.

1.12.3 iLCD Rear Mount Integration

One integration method is mounting the iLCD behind a bezel with a rectangular cut out. Rubber or foamed rubber gaskets (cushion) hereby ensure a balancing of tolerances and an environmental sealing. The bezel edge shall be positioned between the LCD Active Area and the View Area. If the bezel edge touches the LCD Active Area, it may press the resistive touch panel unintendedly and cause activation. A gap of approximately 0.5 mm is needed between the bezel and the top electrode. It may cause unexpected activation if the gap is too narrow. There shall be a distance from the panel edge of minimum 1.0 mm for TPC tail protection.

Legacy Series

This is our series of legacy displays, most of which have been successively replaced by the iLCD JPro F-Series. Please contact us regarding availability of these models.

2.1 DPP-CTS2432

2.1.1 LCD

Item	DPP-CTS2432
Screen Size	2.8 inch
Display Resolution	240 x RGB x 320 dots
Dot Pitch	0.06 (H) x 0.18 (V) mm
Active Area	43.2 (H) x 57.6 (V) mm
Display Mode	Normally white / Transmissive
Pixel Arrangement	RGB-Strip
Display Color	262 k (Display) / 64k (Controller)
Backlight 1)	White LED, typical lifetime 20.000 hours
Brightness typ.	300 cd/m2
Contrast ratio typ.	400
Viewing Direction	6 O'clock
Touch Screen	4-wire resistive

Note:

1) Brightness decreased to be 50% of the initial value. Life time; mean time before failure at normal temperature (25°C) and normal humidity (60%)

2.1.2 Features

Item	DPP-CTS2432
Connectivity	USB 2.0 / 1 x RS232 3.3V / I2C / SPI
Keyboard	matrix scanning for up to 128 keys
Outputs	up to 16 outputs/LEDs (on/off/blink with user selectable blink frequency) 1)
Inputs	up to 16 1)
ADC	up to 4 (12 bit with range of 0 .. 3.0V) 1)
Relays/PWM	up to 2 1)
Real-Time Clock	Yes
Flash Memory	2 Mbyte for fonts, graphics, macros and text templates
iLCD controller	DPC3050 operating at 100 MHz

Note:

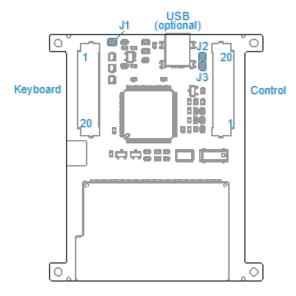1) Fully customizable assignments of inputs, outputs, ADCs, Relays, PWMs and keyboard columns

2.1.3 Electrical Characteristics

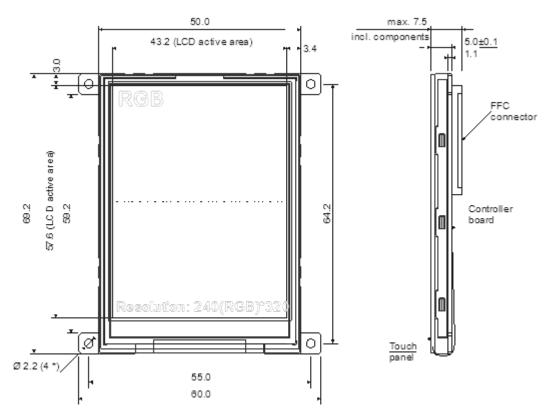| Item	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage	VCC	3.2	5.0	5.25	V
Input Voltage H Level 1)2)	VIH	2.4	-	3.3	V
Input voltage L Level 1)	VIL	0.0	-	0.8	V
Output current for digital outputs	IOUT			3.5	mA
Vbatt current	IVbatt		28		µA
Current consumption display switched off @ VCC = 5V 3)	ICC		70		mA
Current consumption display on, backlight off @ VCC = 5V 3)4)	ICC		71		mA
Current consumption with display+backlight @ VCC = 5V 3)4)5)	ICC		185		mA

Notes:

1) For digital inputs only

2) Digital inputs are 5-volt tolerant

3) No I/O ports active

4) All pixel set to white color

5) Backlight intensity 100%

2.1.4 Circuit Board (Ports)

Pin Descriptions (page 57)

2.1.5 Mechanical Specification

DPP-CTS2432 dimensions in mm

2.2 DPP-CTS2440

2.2.1 LCD

Item	DPP-CTS2440
Screen Size	3.0 inch
Display Resolution	240 x RGB x 400 dots
Dot Pitch	0.0545 (H) x 0.1635 (V) mm
Active Area	39.24 (H) x 65.40 (V) mm
Display Mode	Normally white / Transmissive
Pixel Arrangement	RGB-Strip
Display Color	262 k (Display) / 64k (Controller)
Backlight 1)	White LED, typical lifetime 20.000 hours
Brightness typ.	250 cd/m2
Contrast ratio typ.	400
Viewing Direction	3 O'clock
Touch Screen	4-wire resistive

Note:

1) Brightness decreased to be 50% of the initial value. Life time; mean time before failure at normal temperature (25°C) and normal humidity (60%)

2.2.2 Features

Item	DPP-CTS2440
Connectivity	USB 2.0 / 1 x RS232 3.3V / I2C / SPI
Keyboard	matrix scanning for up to 128 keys
Outputs	up to 16 outputs/LEDs (on/off/blink with user selectable blink frequency) 1)
Inputs	up to 16 1)
ADC	up to 4 (12 bit with range of 0 .. 3.0V) 1)
Relays/PWM	up to 2 1)
Real-Time Clock	Yes
Flash Memory	2 MByte for fonts, graphics, macros and text templates
iLCD controller	DPC3050 operating at 100 MHz

Note:

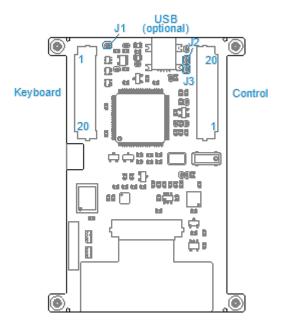1) Fully customizable assignments of inputs, outputs, ADCs, Relays, PWMs and keyboard columns

2.2.3 Electrical Characteristics

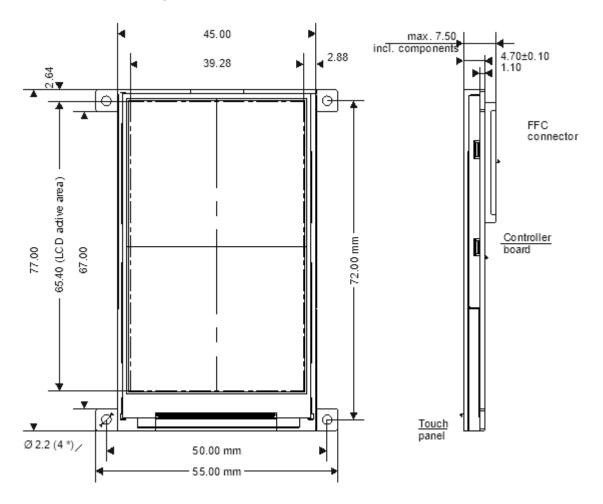| Item	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage	VCC	3.2	5.0	5.25	V
Input Voltage H Level 1)2)	VIH	2.4	-	3.3	V
Input voltage L Level 1)	VIL	0.0	-	0.8	V
Output current for digital outputs	IOUT			3.5	mA
Vbatt current	IVbatt		28		µA
Current consumption display switched off @ VCC = 5V 3)	ICC		76		mA
Current consumption display on, backlight off @ VCC = 5V 3)4)	ICC		76		mA
Current consumption with display+backlight @ VCC = 5V 3)4)5)	ICC		260		mA

Notes:

1) For digital inputs only

2) Digital inputs are 5-volt tolerant

3) No I/O ports active

4) All pixel set to white color

5) Backlight intensity 100%

2.2.4 Circuit Board

2.2.5 Mechanical Specification

DPP-CTS2440 dimensions in mm

2.3 DPP-CxP3224A

2.3.1 LCD

Item	DPP-CP3224A		DPP-CTP3224A
Screen Size	3.5 inch		
Display Resolution		320 x RGB x 240 dots	
Dot Pitch		0.073 (H) x 0.219 (V) mm	
Active Area		70.08 (H) x 52.56 (V) mm	
Display Mode		Normally white / Transmissive	
Pixel Arrangement		RGB-Strip	
Display Color		16.7 M (Display) / 64k (Controller)	
Backlight 1)		White LED	
Brightness typ.	600 cd/m²		480 cd/m²
Contrast ratio typ.		350	
Viewing Direction		6 O'clock	
Touch Screen	No	4-wire resistive	

Note:

1) Brightness decreased to be 50% of the initial value. Life time; mean time before failure at normal temperature (25°C) and normal humidity (60%): 20.000 hours

2.3.2 Features

Item	DPP-CxP3224A
Connectivity	USB 2.0 / 1 x RS232 3.3V / I2C / SPI / Ethernet with optional board
Keyboard	matrix scanning for up to 128 keys
Outputs	up to 16 outputs/LEDs (on/off/blink with user selectable blink frequency) 1)
Inputs	up to 16 1)
ADC	up to 4 (12 bit with range of 0 … 3.3V) 1)
DAC	1(10 bit with range of 0 … 3.3V)
Relays/PWM	up to 2 1)
Real-Time Clock	Yes
Flash Memory	128 MByte for fonts, graphics, macros and text templates
RAM	8 Mbyte RAM for frame buffer and for screen saving
iLCD controller	DPC3090 operating at 120 MHz

Note:

1) Fully customizable assignments of inputs, outputs, ADCs, Relays, PWMs and keyboard columns
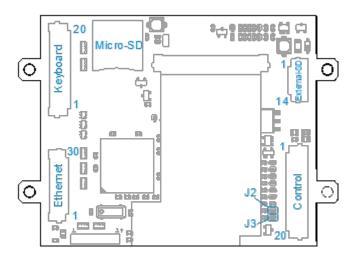
2.3.3 Electrical Characteristics

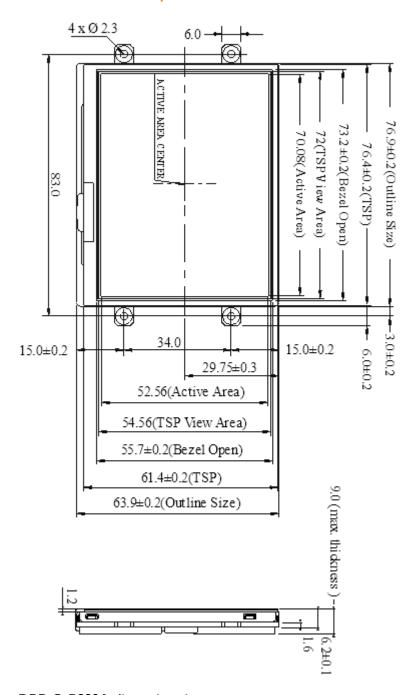| Item	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage	VCC	4.75	5.0	5.25	V
Input Voltage H Level 1)2)	VIH	2.4	-	3.3	V
Input voltage L Level 1)	VIL	0.0	-	0.8	V
Output current for digital outputs	IOUT			3.5	mA
DAC output voltage	VDAC	0.0	-	3.3	V
DAC output current	IDAC	-	-	0.7	µA
Vbatt current	IVbatt		1		µA
Current consumption display switched off @ VCC = 5V 3)	ICC		122		mA
Current consumption display on, backlight off @ VCC = 5V 3)4)	ICC		142		mA
Current consumption with display+backlight @ VCC = 5V 3)4)5)	ICC		248		mA

Notes:

1) For digital inputs only

2) Digital inputs are 5-volt tolerant

3) No I/O ports active, Firmware Version 4.05 and newer

4) All pixel set to white color

5) Backlight intensity 100%

2.3.4 Circuit Board

2.3.5 Mechanical Specification

DPP-CxP322A dimensions in mm

2.4 DPP-x43

2.4.1 LCD

Item	DPP-43		DPP-T43
Screen Size		4.3 inch	
Display Resolution		480 x RGB x 272 dots	
Dot Pitch		0.066 (H) x 0.198 (V) mm	
Active Area		95.04 (H) x 53.856 (V) mm	
Display Mode		Normally white / Transmissive	
Pixel Arrangement		RGB-Strip	
Display Color		16.7 M (Display) / 64k (Controller)	
Backlight 1)		White LED	
Brightness typ.	500 cd/m2		400 cd/m2
Contrast ratio typ.		500	
Viewing Direction		6 O'clock	
Touch Screen	No	4-wire resistive	

Note:

1) Brightness decreased to be 50% of the initial value. Life time; mean time before failure at normal temperature (25°C) and normal humidity (60%): 20.000 hours

2.4.2 Features

Item	DPP-x43
Connectivity	USB 2.0 / 1 x RS232 3.3V / I2C / SPI / Ethernet with optional board
Keyboard	matrix scanning for up to 128 keys
Outputs	up to 16 outputs/LEDs (on/off/blink with user selectable blink frequency) 1)
Inputs	up to 16 1)
ADC	up to 4 (12 bit with range of 0 .. 3.3V) 1)
DAC	1(10 bit with range of 0 … 3.3V)
Relays/PWM	up to 2 1)
Real-Time Clock	Yes
Flash Memory	128 MByte for fonts, graphics, macros and text templates
RAM	8 MByte RAM for frame buffer and for screen saving
iLCD controller	DPC3090 operating at 120 MHz

Note:

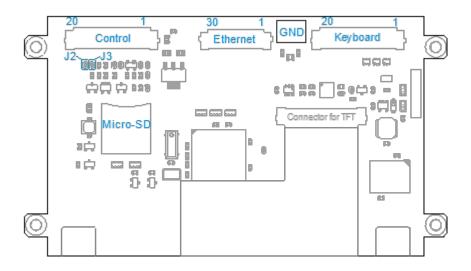1) Fully customizable assignments of inputs, outputs, ADCs, Relays, PWMs and keyboard columns

2.4.3 Electrical Characteristics

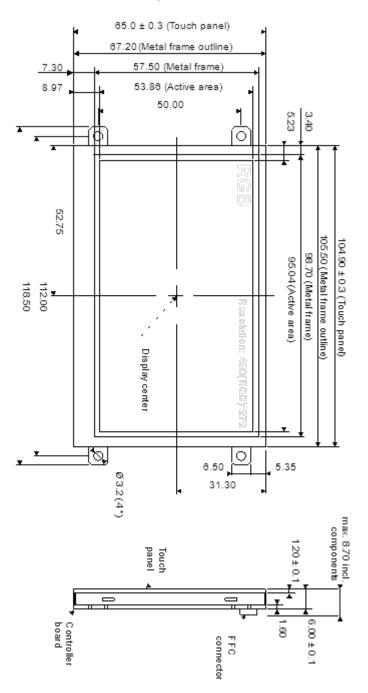| Item	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage	VCC	4.75	5.0	5.25	V
Input Voltage H Level 1)2)	VIH	2.4	-	3.3	V
Input voltage L Level 1)	VIL	0.0	-	0.8	V
Output current for digital outputs	IOUT			3.5	mA
DAC output voltage	VDAC	0.0	-	3.3	V
DAC output current	IDAC	-	-	0.7	µA
Vbatt current	IVbatt		1		µA
Current consumption display switched off @ VCC = 5V 3)	ICC		120		mA
Current consumption display on, backlight off @ VCC = 5V 3)4)	ICC		145		mA
Current consumption with display+backlight @ VCC = 5V 3)4)5)	ICC		275		mA

Notes:

1) For digital inputs only

2) Digital inputs are 5-volt tolerant

3) No I/O ports active

4) All pixel set to white color

5) Backlight intensity 100%

2.4.4 Circuit Board

2.4.5 Mechanical Specification

DPP-x43 dimensions in mm

2.5 DPP-Hx50

2.5.1 LCD

Item	DPP-H50	DPP-HT50	DPP-HC50
Screen Size		5.0 inch	
Display Resolution		800 x RGB x 480 dots	
Dot Pitch		0.045 (H) x 0.135 (V) mm	
Active Area		108.00 (H) x 64.80 (V) mm	
Display Mode		Normally white / Transmissive	
Pixel Arrangement		RGB-Strip	
Display Color		16.7 M (Display) / 64k (Controller)	
Backlight 1)		White LED, typical lifetime 20.000 hours	
Brightness typ.	600 cd/m2	500 cd/m2	600 cd/m2
Contrast ratio typ.		600	
Viewing Direction		6 O'clock	
Touch Screen	No	4-wire resistive	Projected capacitive

Note:

1) Brightness decreased to be 50% of the initial value. Life time; mean time before failure at normal temperature (25°C) and normal humidity (60%)

2.5.2 Features

Item	DPP-Hx50
Connectivity	USB 2.0 / 1 x RS232 3.3V / I2C / SPI / Ethernet with optional board
Keyboard	matrix scanning for up to 128 keys
Outputs	up to 16 outputs/LEDs (on/off/blink with user selectable blink frequency) 1)
Inputs	up to 16 1)
ADC	up to 4 (12 bit with range of 0 .. 3.3V) 1)
DAC	1(10 bit with range of 0 … 3.3V)
Relays/PWM	up to 2 1)
Real-Time Clock	Yes
Flash Memory	128 MByte for fonts, graphics, macros and text templates
RAM	8 MByte RAM for frame buffer and for screen saving
iLCD controller	DPC3090 operating at 120 MHz

Note:

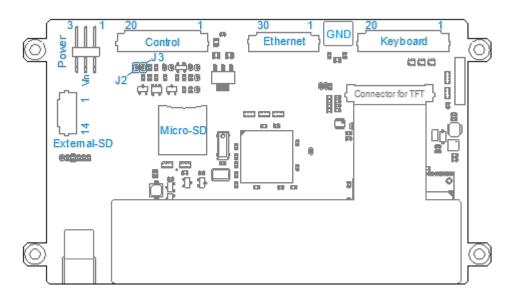1) Fully customizable assignments of inputs, outputs, ADCs, Relays, PWMs and keyboard columns

2.5.3 Electrical Characteristics

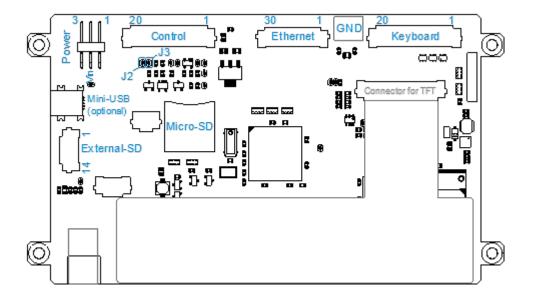| Item	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage	VCC	4.75	5.0	5.25	V
Input Voltage H Level 1)2)	VIH	2.4	-	3.3	V
Input voltage L Level 1)	VIL	0.0	-	0.8	V
Output current for digital outputs	IOUT			3.5	mA
DAC output voltage	VDAC	0.0	-	3.3	V
DAC output current	IDAC	-	-	0.7	µA
Vbatt current	IVbatt		1		µA
Current consumption display switched off @ VCC = 5V 3)	ICC		121 1556)	/	mA
Current consumption display on, backlight off @ VCC = 5V 3)4)	ICC		189 2256)	/	mA
Current consumption with display+backlight @ VCC = 5V 3)4)5)	ICC		508 5456)	/	mA

Notes:

1) For digital inputs only

2) Digital inputs are 5-volt tolerant

3) No I/O ports active

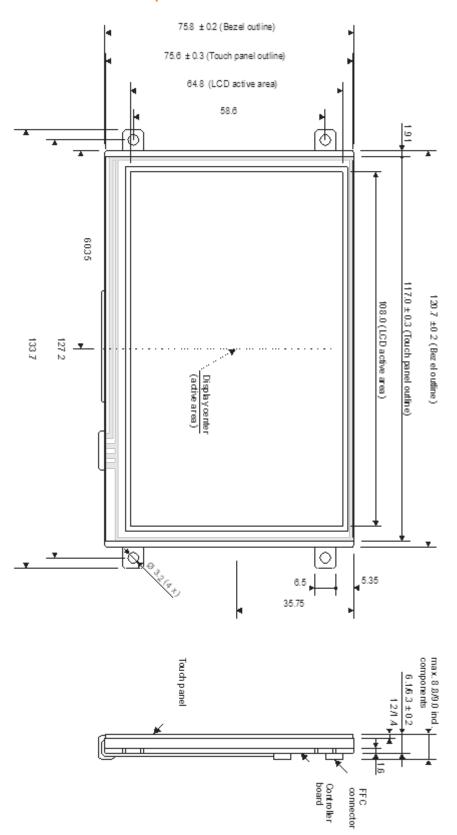4) All pixel set to white color

5) Backlight intensity 100%

6) DPP-HC50

2.5.4 Circuit Board

2.5.5 Mechanical Specification

DPP-Hx50 dimensions in mm

2.6 DPP-x57

2.6.1 LCD

Item	DPP-57	DPP-T57	DPP-C57
Screen Size		5.7 inch	
Display Resolution		640 x RGB x 480 dots	
Dot Pitch		0.0588 (H) x 0.1764 (V) mm	
Active Area		112.896 (H) x 84.672 (V) mm	
Display Mode		Normally white / Transmissive	
Pixel Arrangement		RGB-Strip	
Display Color		262 k (Display) / 64k (Controller)	
Backlight 1)		White LED, typical lifetime 20.000 hours	
Brightness typ.	350 cd/m2	300 cd/m2	350 cd/m2
Contrast ratio typ.		500	
Viewing Direction		6 O'clock	
Touch Screen	No	4-wire resistive	Projected capacitive

Note:

1) Brightness decreased to be 50% of the initial value. Life time; mean time before failure at normal temperature (25°C) and normal humidity (60%)

2.6.2 Features

Item	DPP-x57
Connectivity	USB 2.0 / 1 x RS232 3.3V / I2C / SPI / Ethernet with optional board
Keyboard	matrix scanning for up to 128 keys
Outputs	up to 16 outputs/LEDs (on/off/blink with user selectable blink frequency) 1)
Inputs	up to 16 1)
ADC	up to 4 (12 bit with range of 0 .. 3.3V) 1)
DAC	1(10 bit with range of 0 … 3.3V)
Relays/PWM	up to 2 1)
Real-Time Clock	Yes
Flash Memory	128 MByte for fonts, graphics, macros and text templates
RAM	8 MByte RAM for frame buffer and for screen saving
iLCD controller	DPC3090 operating at 120 MHz

Note:

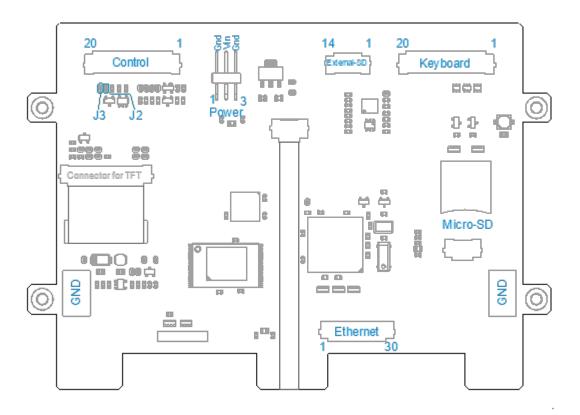1) Fully customizable assignments of inputs, outputs, ADCs, Relays, PWMs and keyboard columns

2.6.3 Electrical Characteristics

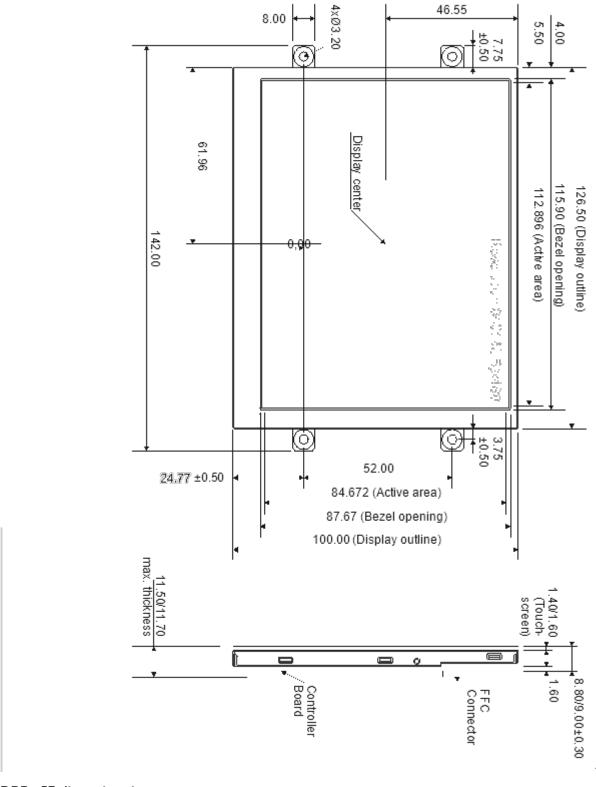| Item	Symbol	Min.	Typ.		Max.	Unit
Supply Voltage	VCC	4.75	5.0		5.25	V
Input Voltage H Level 1)2)	VIH	2.4	-		3.3	V
Input voltage L Level 1)	VIL	0.0	-		0.8	V
Output current for digital outputs	IOUT				3.5	mA
DAC output voltage	VDAC	0.0	-		3.3	V
DAC output current	IDAC	-	-		0.7	µA
Vbatt current	IVbatt		1			µA
Current consumption display switched off @ VCC = 5V 3)	ICC		120 1556)	/		mA
Current consumption display on, backlight off @ VCC = 5V 3)4)	ICC		270 3056)	/		mA
Current consumption with display+backlight @ VCC = 5V 3)4)5)	ICC		630 6656)	/		mA

Notes:

1) For digital inputs only

2) Digital inputs are 5-volt tolerant

3) No I/O ports active

4) All pixel set to white color

5) Backlight intensity 100%

6) DPP-C57

2.6.4 Circuit Board

2.6.5 Mechanical Specification

DPP-x57 dimensions in mm

2.7 DPP-x70

2.7.1 LCD

Item	DPP-70	DPP-T70	DPP-C70
Screen Size		7.0 inch	
Display Resolution		800 x RGB x 480 dots	
Dot Pitch		0.0635 (H) x 0.1905 (V) mm	
Active Area		152.4 (H) x 91.44 (V) mm	
Display Mode		Normally white / Transmissive	
Pixel Arrangement		RGB-Strip	
Display Color		262 k (Display) / 64k (Controller)	
Backlight 1)		White LED, typical lifetime 20.000 hours	
Brightness typ.		350 cd/m2	300 cd/m2
Contrast ratio typ.		500	
Viewing Direction		6 O'clock	
Touch Screen	No	4-wire resistive	Projected capacitive

Note:

1) Brightness decreased to be 50% of the initial value. Life time; mean time before failure at normal temperature (25°C) and normal humidity (60%)

2.7.2 Features

Item	DPP-x70
Connectivity	USB 2.0 / 1 x RS232 3.3V / I2C / SPI / Ethernet with optional board
Keyboard	matrix scanning for up to 128 keys
Outputs	up to 16 outputs/LEDs (on/off/blink with user selectable blink frequency) 1)
Inputs	up to 16 1)
ADC	up to 4 (12 bit with range of 0 .. 3.3V) 1)
DAC	1(10 bit with range of 0 … 3.3V)
Relays/PWM	up to 2 1)
Real-Time Clock	Yes
Flash Memory	128 MByte for fonts, graphics, macros and text templates
RAM	8 MByte RAM for frame buffer and for screen saving
iLCD controller	DPC3090 operating at 120 MHz

Note:

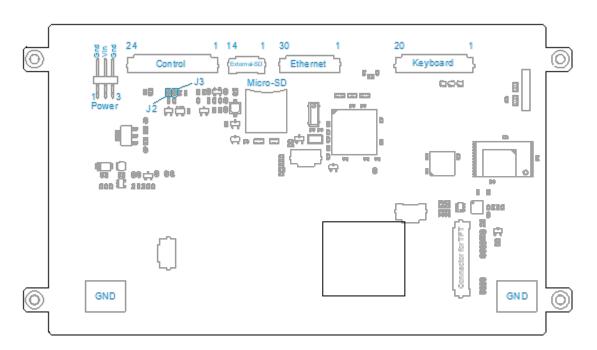1) Fully customizable assignments of inputs, outputs, ADCs, Relays, PWMs and keyboard columns

2.7.3 Electrical Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage	VCC	4.75	5.0	5.25	V
Input Voltage H Level 1)2)	VIH	2.4	-	3.3	V
Input voltage L Level 1)	VIL	0.0	-	0.8	V
Output current for digital outputs	IOUT			3.5	mA
DAC output voltage	VDAC	0.0	-	3.3	V
DAC output current	IDAC	-	-	0.7	µA
Vbatt current	IVbatt		1		µA
Current consumption display switched off @ VCC = 5V 3)	ICC		120 / 1556)		mA
Current consumption display on, backlight off @ VCC = 5V 3)4)	ICC		270 / 3056)		mA
Current consumption with display+backlight @ VCC = 5V 3)4)5)	ICC		765 / 8006)		mA

Notes:
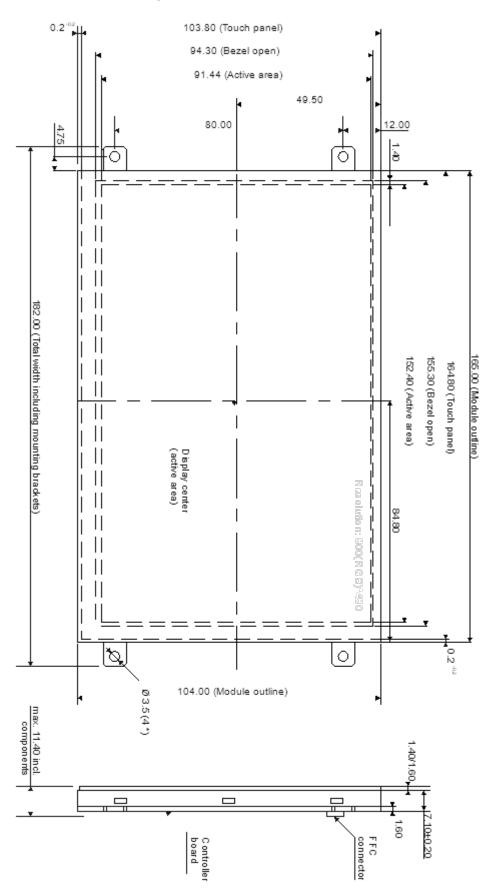
1) For digital inputs only

2) Digital inputs are 5-volt tolerant

3) No I/O ports active

4) All pixel set to white color

5) Backlight intensity 100%

6) DPP-C70

2.7.4 Circuit Board

2.7.5 Mechanical Specification

DPP-x70 dimensions in mm

2.8 DPP-Cx1060A / DPP-C102

2.8.1 LCD

Item	DPP-C1060A	DPP-CT1060A	DPP-C102
Screen Size		10.2 inch	
Display Resolution		1024 x RGB x 600 dots	
Dot Pitch		0.0725 (H) x 0.2088 (V) mm	
Active Area		222.72 (H) x 125.28 (V) mm	
Display Mode		Normally white / Transmissive	
Pixel Arrangement		RGB-Strip	
Display Color		16.7 M (Display) / 64k (Controller)	
Backlight 1)		White LED, typical lifetime 20.000 hours	
Brightness typ.	400 cd/m2	300 cd/m2	400 cd/m2
Contrast ratio typ.		500	
Viewing Direction		6 O'clock	
Touch Screen	No	4-wire resistive	Projected capacitive

Note:

1) Brightness decreased to be 50% of the initial value. Life time; mean time before failure at normal temperature (25°C) and normal humidity (60%)

2.8.2 Features

Item	DPP-Cx1060A / DPP-C102
Connectivity	USB 2.0 / 1 x RS232 3.3V / I2C / SPI / Ethernet with optional board
Keyboard	matrix scanning for up to 128 keys
Outputs	up to 16 outputs/LEDs (on/off/blink with user selectable blink frequency) 1)
Inputs	up to 16 1)
ADC	up to 4 (12 bit with range of 0 .. 3.3V) 1)
DAC	1(10 bit with range of 0 … 3.3V)
Relays/PWM	up to 2 1)
Real-Time Clock	Yes
Flash Memory	128 MByte for fonts, graphics, macros and text templates
RAM	8 MByte RAM for frame buffer and for screen saving
iLCD controller	DPC3090 operating at 120 MHz

Note:

1) Fully customizable assignments of inputs, outputs, ADCs, Relays, PWMs and keyboard columns
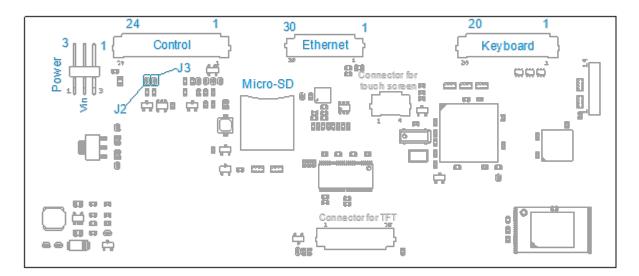
2.8.3 Electrical Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage	VCC	4.75	5.0	5.25	V
Input Voltage H Level 1)2)	VIH	2.4	-	3.3	V
Input voltage L Level 1)	VIL	0.0	-	0.8	V
Output current for digital outputs	IOUT			3.5	mA
DAC output voltage	VDAC	0.0	-	3.3	V
DAC output current	IDAC	-	-	0.7	µA
Vbatt current	IVbatt		1		µA
Current consumption display switched off @ VCC = 5V 3)	ICC		130		mA

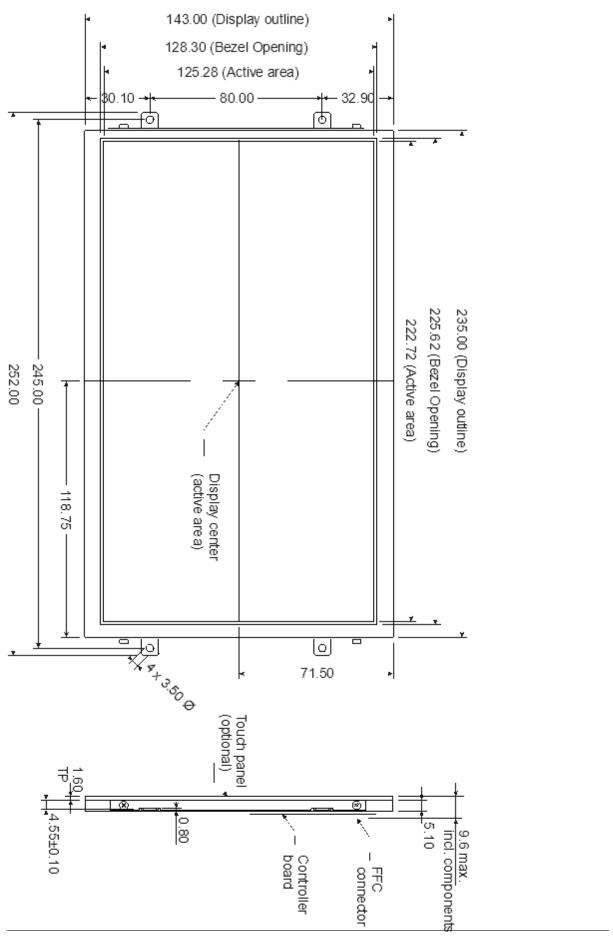| Item	Symbol	Min.	Typ.	Max.	Unit
Current consumption display on, backlight off @ VCC = 5V 3)4)	ICC		230		mA
Current consumption with display+backlight @ VCC = 5V 3)4)5)	ICC		1150		mA

Notes:

1) For digital inputs only

2) Digital inputs are 5-volt tolerant

3) No I/O ports active, Firmware Version 4.05 and newer

4) All pixel set to white color

5) Backlight intensity 100%

2.8.4 Circuit Board

2.8.5 Mechanical Specification

DPP-Cx1060A dimensions in mm

2.9 Important Information about USB and Serial Ports

The above mentioned modules contain two USB ports, a micro USB connector on the PCB and another available on Pins 2 and 3 of the Control Port FFC connector. Only one USB port may be used at any given time. Power may be supplied via USB connector. When using the Micro-USB connector please note the current consumption of the module in use and make sure the USB outlet can supply enough power.

There are two 3.3V serial ports. As of the current series the Keyboard FFC connector has been expanded to 24 Pins allowing for simultaneous use of both a USB connector and Serial Port 0. Serial Port 0 is available on Pins 21 and 22 the Keyboard Port FFC connector. Serial Port 1 is available on Pins 5 and 6 the Control Port FFC connector. These are available by default and may be disabled in the iLCD Manager.

The USB port is implemented in two ways:

- HID device requiring no extra drivers, as all major operating systems use this system-driver for supporting mice and keyboards
- WinUSB device which requires an additional driver and is faster

Setting Baud rates deviating from 115200 Baud can be done via the "Set Baud Rate" command (see the iLCD Command Set documentation) for the serial port currently in use until the next power up or reboot of the iLCD panel. In order to permanently change the Baud rate, go to the iLCD Manager XE's "Settings" page, check the "Hardware Settings" checkbox and set the Baud rate of Serial Port 1. After downloading this new setup data via the USB port to the iLCD panel, the Baud rate is changed automatically according to the new setting, a message box appears.

The Baud rate of Serial Port 0 can be set in the same way. In case of any misconfiguration possibly further disabling the communication via the serial port, the evaluation board's "Erase" jumper can be set during power up (pulling the RX1 port low) to completely erase the flash user data. The default value of 115200 Baud is reset on both serial ports and the user data has to be re-written via the iLCD Manager XE.

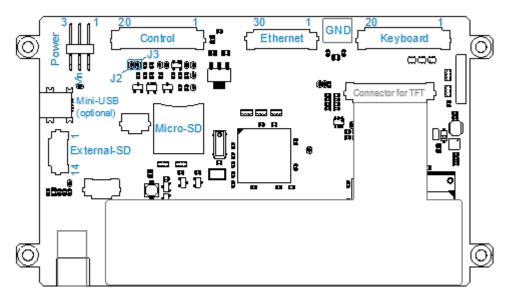## 2.10 General Information about Port Pins

Most port pins can be used as outputs (push/pull or pull down only outputs), as keyboard column outputs or as digital inputs besides of their primary function. The assignment of these port pins must be done once via the iLCD Manager XE under the "Settings page" after checking the "I/O Settings" checkbox. The names of the pins described below refer to the primary function only, the notes show the alternative functionality.

As the DPM5050 iLCD controller works with a power supply of 3.3V (a voltage-regulator for this voltage is on-board allowing the board to work with single 5V supply), push/pull outputs have a voltage swing of 0V … 3.3V.

Outputs and digital inputs are not 5V tolerant.

2.11 Pin Descriptions

The following paragraphs each refer to a connector on the PCB of the iLCD JPro Series. The name of the respective connector is given in brackets. The schematic for DPP-FHx50 is given for reference.

DPP-Hx50 connectors

2.11.1 Power Connector (Power)

The iLCD panels can either be supplied via the Power Connector, via the Control Port or via the USB Port. If supplied via the 24-pin Control Port, all three GND pins must be connected and all three VCC pins must be connected to not exceed the maximum allowed current per pin of the FFC/FPC connector. Please note that if the iLCD panel is supplied via USB, its output current must at least fulfill the requirements listed in the electrical characteristics of the panel. Furthermore, ensure that the USB port delivers a stable and sufficient voltage level according to the iLCD specifications.

Pin#	PinName	Direction	Primary Function Description
1	GND 1)	-	Ground pin
2	VCC 2)	-	5V power supply
3	GND 1)	-	Ground pin

Note:

1) The GND pin is connected to pin 4, 23 and 24 of the Control Port FFC/FPC connector.

2) The VCC pin is connected to pin 1, 21 and 22 of the Control Port FFC/FPC connector.

> **Warning:** Reversed power supply connections (Vcc and Gnd) made to the iLCD module or invalid power supply voltage greater than 5.5V will cause module damage.

2.11.2 Control Port (Control)

Connection to the control port is made via a 24-pin FFC/FPC cable with 1.0 mm pitch. The FFC/FPC connector on the board is a top-contact model.

If one wants to connect an evaluation kit of the former color iLCD panels to the 24-pin FFC/FPC connector, this can be done by using a 20-pin FFC/FPC cable, if the cable is orientated at pin 1 (pin 21 ~ 24 kept free then) and a 5V power supply is applied to the Power port then. The Vsel jumper of the evaluation board must be removed in this case!

Please note that the pin names of the serial port connections are seen from the driving PC / application side, which means a pin with name TX is in fact the output of the PC and an input of the iLCD panel. "Direction" is valid only when the primary function is enabled.

Pin#	Pin-Name	Direc-tion	Primary Function Description
1	VCC 10	-	5V power supply
2	USB-	In/Out	USB-, can be directly connected to pin 2 of a USB-Jack B
3	USB+	In/Out	USB+, can be directly connected to pin 3 of a USB-Jack B
4	GND	-	Ground pin
5	**TX1** 3	In	Serial port 1, transmit line from PC, receive input of iLCD controller. Can be used for RS422/RS485 in conjunction with ALERT pin
6	**RX1** 38	Out	Serial port 1, receive line to PC, transmit output of iLCD controller.Can be used for RS422/RS485 in conjunction with ALERT pin
7	CTS	Out	Output to avoid input buffer overflow, connect to RS232 driver's CTS of the PC. Common for both serial ports.
8	**SDA** 47	In/Out	I2C data pin. Note, that there is no pull up resistor on the iLCD panel, so an external resistor may be necessary depending on the I2C bus structure.
9	**SCL** 47	In/Out	I2C clock pin. Note, that there is no pull up resistor on the iLCD panel, so an external resistor may be necessary depending on the I2C bus structure.
10	**ALERT** 312	Out	Output pin to indicate I2C data availability (= low) to the I2C master.When using the RS422/RS485 mode on the second serial port, pin goes low during data transmit.
11	**SCK** 3	In	Clock for SPI
12	**MISO** 3	Out	Serial output line for SPI
13	**MOSI** 3	In	Serial input line for SPI
14	**SSEL** 36	In/Out	Must be tied to GND when using SPI
15	REL0	Out	Relay output 0 / PWM0 output
16	REL1	Out	Relay output 1 / PWM1 output
17	**GP0** 512	In/Out	General purpose I/O pin 0. Use serial resistor when driving a LED.
18	**GP1** 5	In/Out	General purpose I/O pin 1. Use serial resistor when driving a LED.
19	**I/O5** 39RE-SET	In/Outl	Digital I/O pin/RESET - Pulling this pin low resets the iLCD module
20	Vbatt	-	Backup input voltage for real-time clock, should be between 2.5V and 3.3V
21	VCC 10	-	5V power supply
22	VCC 10	-	5V power supply
23	GND 11	-	Ground pin
24	GND 11	-	Ground pin

Pins configurable in the iLCD Manager XE I/O Settings are **bold**

Note:

3) This pin can be used as a digital input, a push/pull or pull down output or a keyboard column output when the primary function is not enabled.

4) This pin can be used as a digital input, a pull down output or keyboard column output when the primary function is not enabled.

5) This pin can be used as a digital input, an analog input, a push/pull or pull down output or a keyboard column output. The voltage on this pin is not allowed to exceed 3.3V, even if it is used as a digital input or a pull-down output.

6) When using SPI, this pin must be used as SSEL for selecting the SPI via attaching a low signal.

7) When using the I2C port, this pin must be terminated with a resistor (usually 3k3) to 3.3V if the iLCD panel is the last device on the I2C bus. Please note, that the evaluation board has this pull-up resistor populated on the board.

8) When pulling low this pin via a 1k resistor during power-up, the flash memory's user data is erased.

9) The functionality of this pin depends on the setting of the jumpers for external RESET function. If configured as /RESET pin, the board's internal power up reset signal can be seen on this pin as well.

10) Connect all VCC pins together in case you supply the iLCD panel via the FFC/FPC connector. VCC is connected to Pin 2 of the Power Connector as well.

11) Connect all GND pins together in case you supply the iLCD panel via the FFC/FPC connector. GND is connected to Pin 1 and 3 of the Power Connector as well.

12) The ALERT Pin is connected to a 10k pull-up resistor. If used as a pull-down output or input, low impedance must be used.

> **Warning:** Reversed power supply connections (Vcc and Gnd) made to the iLCD module or invalid power supply voltage greater than 5.5V will cause module damage.

2.11.3 Keyboard Port (Keyboard)

Connection to the keyboard port is made via a 24-pin FFC/FPC cable with 1.0 mm pitch. The FFC/FPC connector on the board is a top-contact model.

If one wants to connect an evaluation kit of the former color iLCD panels to the 24-pin FFC/FPC connector, this can be done by using a 20-pin FFC/FPC cable, if the cable is orientated at pin 1 (pin 21 ~ 24 kept free then). All pins except TX0, RX0, Vout 3V3 and GND will be available.

Pin#	PinName	Direction	Primary Function Description
1	KBR0	In	Keyboard row 0
2	KBR1	In	Keyboard row 1
3	KBR2	In	Keyboard row 2
4	KBR3	In	Keyboard row 3
5	KBR4	In	Keyboard row 4
6	KBR5	In	Keyboard row 5
7	KBR6	In	Keyboard row 6
8	KBR7	In	Keyboard row 7
9	**KBC0** 1)	Out	Keyboard column 0, optionally I/O pin
10	**KBC1** 1)	Out	Keyboard column 1, optionally I/O pin
11	**KBC2** 1)	Out	Keyboard column 2, optionally I/O pin
12	**KBC3** 1)	Out	Keyboard column 3, optionally I/O pin
13	**KBC4** 1)	Out	Keyboard column 4, optionally I/O pin
14	**KBC5** 1)	Out	Keyboard column 5, optionally I/O pin
15	**KBC6** 1)	Out	Keyboard column 6, optionally I/O pin
16	**KBC7** 1)	Out	Keyboard column 7, optionally I/O pin
17	**KBC8** 1)	Out	Keyboard column 8, optionally I/O pin
18	**GP2** 2)	In/Out	General purpose I/O pin 0. Use serial resistor when driving a LED.
19	**GP3** 2)	In/Out	General purpose I/O pin 1. Use serial resistor when driving a LED.
20	**I/O6** 1)	In/Out	Digital I/O pin
21	TX0	In	Serial port 0, transmit line from PC, receive input of iLCD controller.
22	RX0	Out	Serial port 0, receive line to PC, transmit output of iLCD controller.
23	Vout 3V3	Out	3.3V limited to 100 mA
24	GND	-	Ground pin

Pins configurable in the iLCD Manager XE I/O Settings are **bold**

Note:

1) This pin can be used as a digital input, a push/pull or pull down output or a keyboard column output when the primary function is not enabled.

2) This pin can be used as a digital input, an analog input, a push/pull or pull down output or a keyboard column output. The voltage on this pin is not allowed to exceed 3.3V, even if it is used as a digital input or a pull-down output.
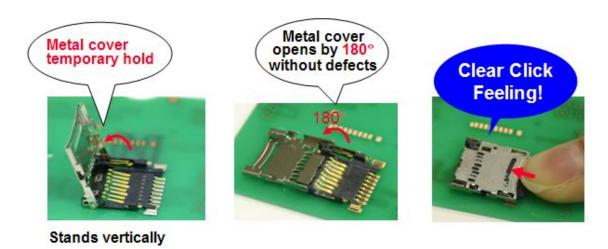
2.11.4 USB-Micro-B Port (Micro USB)

The iLCD panels can be connected via USB either via the onboard USB-Micro-B connector or via the control port's USB pins, limited to one connection at a time. Additionally, the iLCD panel can be supplied via USB, whereby its output current must at least fulfill the requirements listed in the electrical characteristics of the panel. Furthermore, ensure that the USB port delivers a stable and sufficient voltage level according to the iLCD specifications.

2.11.5 MicroSD Connector (Micro-SD)

All iLCD panels have a MicroSD card holder on-board. A MicroSD card with up to 32 GBytes may be inserted for memory extension. Please note that MicroSD and MicroSDHC are supported.

To insert a MicroSD card, slide the connector in the direction of the OPEN-arrow engraved in the metal plate and lift it. Insert the card with the contact area facing down, then fold the connector back in and push carefully in the direction of the LOCK-arrow until it makes a click sound.

2.11.6 External SD Card Connector (External SD)

The External SD Card Connector provides the option to connect a standard SD card to the iLCD display. demmel products' DPA-SD-EXT boards is available to interface to the External SD Card Connector.

2.11.7 Speaker Port (Spkr)

The speaker output may be connected directly to a 4 or 8 Ohm speaker to play sound files.

2.11.8 Jumpers for External Reset Function

If the external reset function is required, please contact demmel products to learn more about the option to use I/O5 pin as a reset pin instead of a normal I/O5 port.