

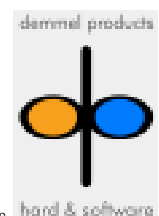
Next Generation Intelligent LCD Panels

DPP-2412 and DPP-T2412 Series Specification
DPP-2416 and DPP-T2416 Series Specification
DPP-3224 and DPP-T3224 Series Specification
DPP-P3224 and DPP-TP3224 Series Specification

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General Description

The iLCD modules are intelligent LCD panels which allow the user to carry out all graphic and font needs via an easy and comfortable 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 or via USB.

Numbering System

Example:

DP	P	-	TP3224	Z	5	5	5	1	1	-	B	F	H
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Description:

No.	Description	Explanation
1	Brand	demmel products
2	Product	P = iLCD Panel
3	Separator	
4	Format	2412 = 240 x 128 dots T2412 = 240 x 128 dots /w touch 3224 = 320 x 240 dots T3224 = 320 x 240 dots /w touch 2412 = 240 x 128 dots P3224 = 320 x 240 dots, PDA size T2412 = 240 x 128 dots /w touch TP3224 = 320 x 240 dots, PDA size, /w touch
5	Display Type	B = Chip on board /w pin headers Z = Chip on board /w FCC connector
6	iLCD Controller	1 = DPC1010 3 = DPC1030 5 = DPC1050
7	Control ports ¹⁾	0 = 5 Volt serial + I ² C 1 = RS-232 port 2 = USB port 4 = RS-422/RS-485 port
8	I/O Ports ¹⁾	0 = No I/O ports 1 = General purpose I/O 2 = ATX power outputs 4 = Relay outputs
9	Options ¹⁾	0 = No options 1 = Keyboard inputs 2 = Micro power reference 2.5 Volt 4 = Micro power reference 4.0 Volt
10	Power Supply ¹⁾	0 = Jumper only 1 = Floppy disk power supply 2 = Built in regulator
11	Separator ²⁾	
12	LCD manufacturer ²⁾	B = Bolymin E = EDT
13	LCD Color ²⁾	G = STN/gray Y = STN/yellow green B = STN/blue F = FSTN
14	Backlight type/color ²⁾	L = LED array/yellow green H = LED edge/white R = LED array/red G = LED edge/yellow-green D = LED edge/blue E = EL/white B = EL/blue C = CCFL/white

Note:

1. The resulting number is calculated by adding the options' numbers.
2. These positions are omitted when the numbering system is used for iLCD controller boards.

Features

Display Specific Data

Item	DPP-2412xxxxx-BFH	DPP-T2412xxxxx-BFH	DPP-P2416xxxxx-BFH	DPP-TP2416xxxxx-BFH	DPP-(P)3224xxxxx-BFH	DPP-T(P)3224xxxxx-BFH
LCD Controller	T6963C		S1D13305 / RA8835			
Display Format	Transflective and positive type graphic LCD 240 × 128 dot-matrix		Transflective and positive type graphic LCD 240 × 160 dot-matrix		Transflective and positive type graphic LCD 320 × 240 dot-matrix	
Touch Panel	No	Yes	No	Yes	No	Yes
Display Mode	Black/White Mode FSTN LCD					
Backlight	White LED					
Viewing Direction	6 O'clock					

Electrical Specific Data

Item	All models without touch panel (depending on installed options)	All models with touch panel (depending on installed options)
Connectivity	USB 1.1 / RS-232 / RS-232 5 Volt / RS-422 / RS-485 / I ² C	
I/O Ports	4 general purpose ports (8 bit ADC 0..5 Volt or digital input or LED output), 2 LED outputs, keyboard with max. 32 keys, 2 relays outputs with 100 mA	2 general purpose ports (8 bit ADC 0..5 Volt or digital input or LED output), 2 LED outputs, keyboard with max. 32 keys, 2 relays outputs with 100 mA, touch panel interface

Mechanical Specification

Item	Specification				Unit
	DPP-x2412xxxxx-BFH	DPP-xP2416xxxxx-BFH	DPP-x3224xxxxx-BFH	DPP-xP3224xxxxx-BFH	
Module Dimension	144 x 104	89 x 59	165 x 109	105 x 85	mm
View Area	114 x 64	67.6 x 47.5	122 x 92	81.8 x 62.0	mm
Dot Size	0.43 x 0.43	0.225x 0.225	0.34 x 0.34	0.225 x 0.225	mm
Dot Pitch	0.45 x 0.45	0.24 x 0.24	0.36 x 0.36	0.24 x 0.24	mm

Maximum Ratings

Item	Symbol	Minimum	Maximum	Unit
Supply Voltage	V _{CC}	-0.3	5.5	V
Supply Voltage Unregulated ¹⁾	V _{UNREG}	-50.0	15.0	V
Input Voltage	V _{IN}	-0.3	V _{CC} + 0.3	V
Operating Temperature	T _{OPR}	0	50	°C
Storage Temperature	T _{STR}	-10	60	°C
Humidity			90	%RH

Note:

1. Only available when the built in regulator option is installed. The maximum input voltage depends also on the maximum current drawn by the iLCD module (limited by the maximum power dissipation of the built in regulator).

Electrical Characteristics

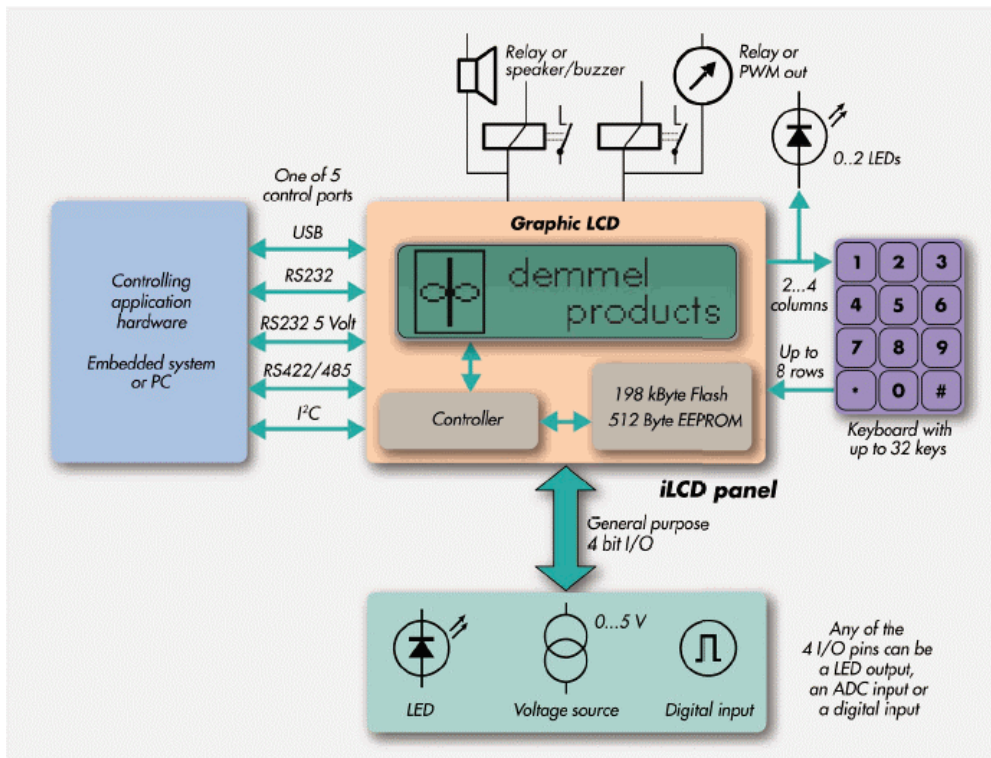
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply Voltage	V_{CC}	-	4.75	5.0	5.25	V
Supply Voltage Unregulated ¹⁾	V_{UNREG}	-	6.0	-	15.0	V
Input Voltage H Level ²⁾	V_{IH}	-	$0.7 V_{CC}$	-	V_{CC}	V
Input voltage L Level ²⁾	V_{IL}	-	0.0	-	0.8	V
RS-232 Input Voltage Operating Range					± 30	V
RS-232 Input Threshold Low	V_{IRL}	$V_{CC} = 5V$	0.8	1.3		V
RS-232 Input Threshold High	V_{IRH}	$V_{CC} = 5V$		1.8	2.4	V
RS-232 Input Hysteresis	V_{IRH}	$V_{CC} = 5V$	0.2	0.5	1	V
RS-485/RS-422 Driver Differential V_{OUT}	V_{OD2}	$R_{LOAD} = 50 \Omega$	2	3		V
RS-485/RS-422 Receiver Differential Threshold Voltage	V_{TH}	$-7V \leq V_{CM} \leq 12V$	-0.2		0.2	V
Current Consumption	I_{DD}	No ports active, B/L off		120 ³⁾ 50 ³⁾ 50 ³⁾ 50 ³⁾		mA
B/L LED Current Consumption	I_{LED}	$V_{CC} = 5V$		120 ³⁾ 65 ³⁾ 150 ³⁾ 80 ³⁾		mA

Note:

1. Only available when the built in regulator option is installed. The maximum input voltage depends also on the maximum current drawn by the iLCD module (limited by the maximum power dissipation of the built in regulator which is 500 mW).
2. For digital inputs only
3. First value is for DPP-x2412xxxxx-BFH, 2nd for DPP-xP2416xxxxx-BFH, 3rd for DPP-x3224xxxxx-BFH, 4th for DPP-xP3224xxxxx-BFH

Module Function Description

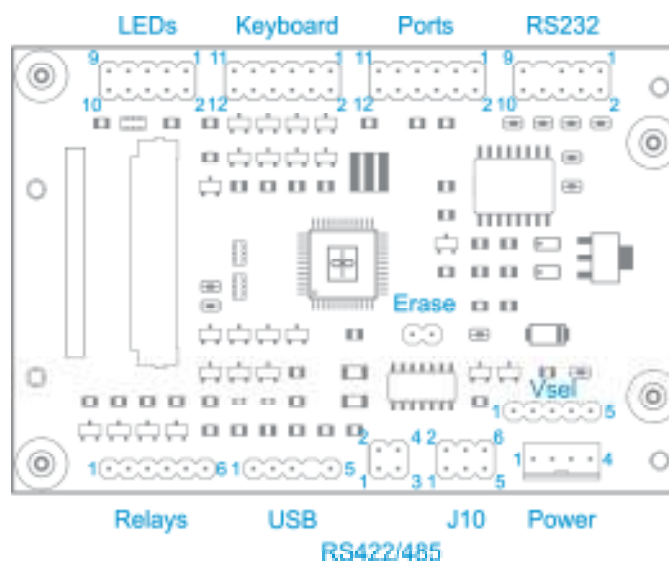
Block Diagram



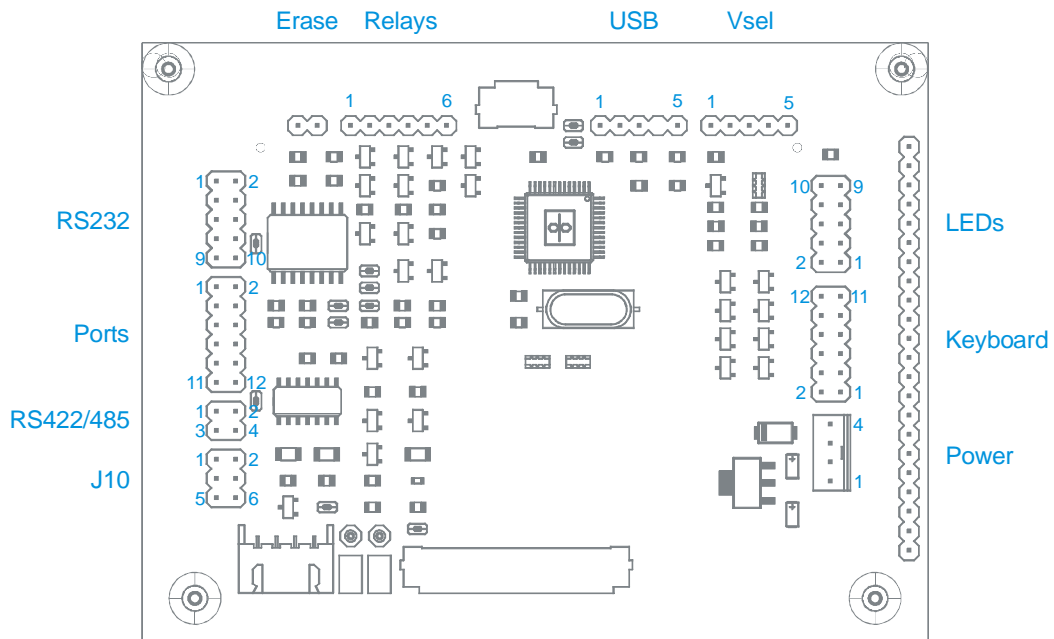
Connectors and Jumpers

This section describes and illustrates the connectors and jumpers of the iLCD modules.

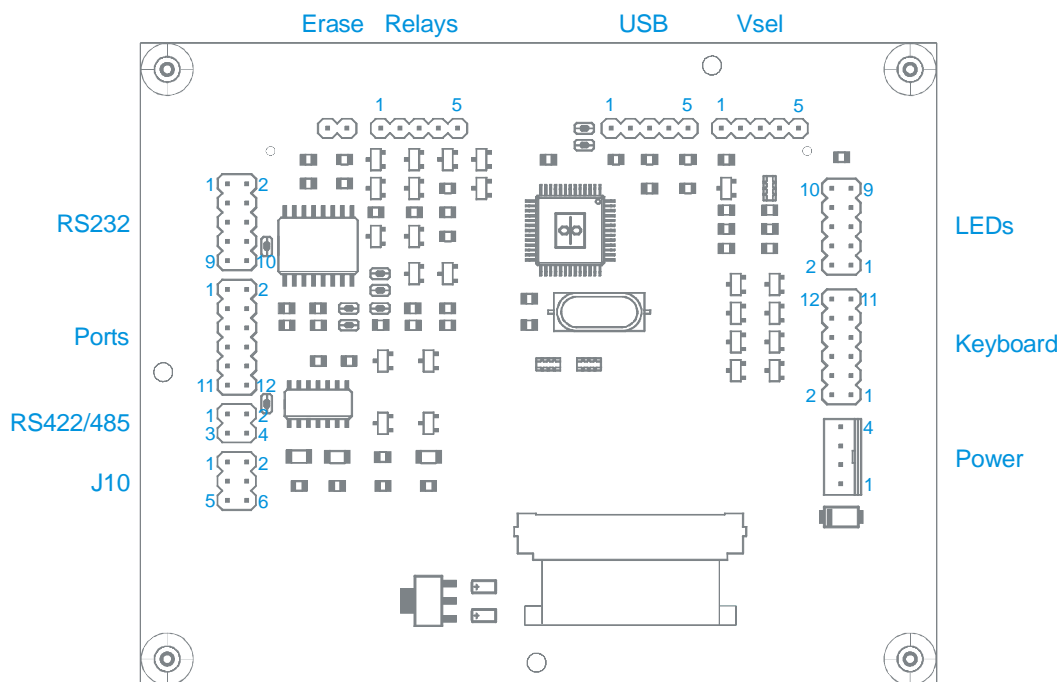
WARNING! Reversed power supply connections (Vcc and Gnd) made to the iLCD module or invalid power supply voltage greater than 5.5 Volt will cause module damage.



DPP-xP2416 series connector and jumper locations



DPP-x2412 and DPP-x3224 series connector and jumper locations



DPP-xP3224 series connector and jumper locations

Power Supply Connector (Power)

This connector applies the 5 Volt power supply to the iLCD module if there is no USB port connected to the module. The connector used for this connection is the same as the power supply connector for a 3 1/2" floppy disk drive, and has the same pinning.

Pin	Description
1	V_{UNREG} Unregulated power supply 6 ... 12 Volt (save against reverse polarity) ¹⁾
2	Ground
3	Ground
4	V_{CC} (+5 Volt)

Note:

1. Only connected when the built in regulator option is installed.

Power Supply Configuration Connector (Vsel)

Only one jumper is allowed to be set to select the power source for the iLCD module as follows:

Jumper Location		Description
Pin	Pin	
1	2	Enables the power supply connector's pin 4 (V_{CC})
2	3	Enables supplying the iLCD module via the USB port
3	4	Enables supplying the iLCD module via the USB port ¹⁾
4	5	Enables the power supply connector's pin 1 (V_{UNREG}) ¹⁾

Note:

1. Only connected when the built in regulator option is installed.

Serial Port Connector (RS232)

This connector allows the driving application or PC to send and receive data from and to the iLCD module via standard RS232 signals. A cable can be made by simply using a straight flat cable connection between a 10 pin flat cable connector to a 9 pin female Sub-D (10th wire of the flat cable removed at the Sub-D side). The pinning will match the standard layout of a PC's serial port then.

Pin On Board	Pin On Sub-D	Direction	Description
1	1	-	Not connected
2	6	-	Not connected
3	2	Out	RX - data sent from the iLCD module to the controlling application / PC
4	7	In	RTS – not in use, but connected to the iLCD's RS232 driver
5	3	In	TX - data sent from the controlling application / PC to the iLCD module
6	8	Out	CTS – iLCD's output for hardware flow control ¹⁾
7	4	-	Not connected
8	9	-	Not connected
9	5	-	Signal ground
10	-	-	Not connected

Note:

1. See iLCD's command description about why you should connect this pin and when it is not necessary to use hardware flow control.

General Port Connector (Ports)

This connector enables you to connect the second RS232 port (**5 Volt signals only, no standard RS232 signal level of ± 9 Volt**), the I²C, and some other signals described below.

Pin	Direction	Description
1	-	Vcc (+5 Volt)
2	In/Out	I ² C Data ¹⁾
3	Out	RX2 - data sent from the iLCD module to the controlling application / PC
4	In/Out	I ² C Clock ¹⁾
5	In	TX2 - data sent from the controlling application / PC to the iLCD module
6	Out	I ² C Alert – signals unexpected data to be sent to the application (e.g. a keystroke)
7	Out	CTS - iLCD's output for hardware flow control – see iLCD's command description ²⁾
8	-	Used for production programming – DO NOT USE THIS PIN
9	In/Out	/RESET – Pulling this pin low resets the iLCD module ³⁾
10	-	Used for production programming – DO NOT USE THIS PIN
11	-	Ground
12		Used for production programming – DO NOT USE THIS PIN

Note:

1. This pin is pulled high via a 3k3 resistor on the iLCD board to match the I²C specification.
2. The 5 Volt CTS output connected to this pin is connected to the CTS port driver of primary RS232 port internally. This means that the iLCD's hardware flow control pin CTS is common for both RS232 ports.
3. The board's internal power up reset signal can be seen on this pin as well.

RS422/RS485 Data Connector (RS422/RS485)

This connector enables you to connect the second RS232 port via RS422 or RS485. The 5 Volt RS232 port and the RS422/RS485 port cannot be active at the same time. RS422 and RS485 do not use hardware flow control. Please read the iLCD's command description about when it is not necessary to use hardware flow control.

When the iLCD module shall be controlled via RS485, RX+ must be connected with TX+ and RX- must be connected with TX-.

Pin	Direction	Description
1	In	TX- - data sent from the controlling application to the iLCD module
2	In	TX+ - data sent from the controlling application to the iLCD module
3	Out	RX- - data sent from the iLCD module to the controlling application
4	Out	RX+ - data sent from the iLCD module to the controlling application

Please note that using RS422 or RS485 requires setting the jumpers as shown below.

RS422/RS485 Configuration Connector (J10)

Pin	Pin	Description
1	2	A jumper must be set between pin 1 and 2 to enable RS422 or RS485. When using the 5 volt mode for the secondary RS232 port, the jumper must be removed.
3	4	Set a jumper between pin 3 and 4 to use the on-board terminating 100E resistor for RX+ / RX-
4	5	Set a jumper between pin 3 and 4 to use the on-board terminating 100E resistor for TX+ / TX-

USB Connector (USB)

This connector enables you to connect iLCD's USB port to a USB port on a PC. The board is supplied via the USB connector as well.

Pin	Direction	Description
1	In/Out	USB+
2	-	Ground
3	In/Out	USB-
4	-	Pin does not exist. Used as a polarization key.
5	-	Vcc +5 Volt

General Purpose I/O Connector (LEDs)

Depending on the settings in the iLCD's setup software the four general purpose I/O ports can be a digital input, a LED output or an ADC input.

Pin	Direction	Description
1	-	Vcc +5 Volt
2	Out	LED 4 (Power LED)
3	Out	LED 5
4	In/Out	LED 0 output / ADC 0 input / General purpose input 0 ¹⁾ ²⁾
5	-	Reserved for future use – DO NOT USE THIS PIN
6	In/Out	LED 1 output / ADC 1 input / General purpose input 1 ¹⁾ ²⁾
7	-	Reserved for future use – DO NOT USE THIS PIN
8	In/Out	LED 2 output / ADC 2 input / General purpose input 2 ¹⁾
9	-	Ground
10	In/Out	LED 3 output / ADC 3 input / General purpose input 3 ¹⁾

Note:

1. The functionality of this pin is set via the iLCD's setup software.
2. Do not use this pin when the board has the touch panel option installed.

Please note that LED 4 and LED 5 share the same controller outputs as column 2 and 3 of the keyboard. Although there is no visual effect when using LEDs, there are short glitches on the corresponding outputs when the keyboard is scanned, therefore it is not recommended to use this outputs for something other than LEDs. If column 2 / 3 of the keyboard is in use, LED 4 / 5 should not be turned on, as pressing a key can collide with iLCD's internal display processing routines.

Keyboard Connector ([Keyboard](#))

The iLCD module supports up to 32 keys, which are connected in a matrix with 4 columns and 8 rows. The scan code / key code sent by the iLCD module can be set via the setup software for any of the 32 keys.

Pin	Direction	Description
1	In	Row 0
2	In	Row 1
3	In	Row 2
4	In	Row 3
5	In	Row 4
6	In	Row 5
7	In	Row 6
8	In	Row 7
9	Out	Column 0
10	Out	Column 1
11	Out	Column 2
12	Out	Column 3

Please note that LED 4 and LED 5 share the same controller outputs as column 2 and 3 of the keyboard. Although there is no visual effect when using LEDs, there are short glitches on the corresponding outputs when the keyboard is scanned, therefore it is not recommended to use this outputs for something other than LEDs. If column 2 / 3 of the keyboard is in use, LED 4 / 5 should not be turned on, as pressing a key can collide with iLCD's internal display processing routines.

Relays Connector ([Relays](#))

The two relays, which may be connected to the iLCD board, can be supplied using up to 24 Volts. The iLCD module contains a diode for any of the two relays outputs to protect the switching transistor against reverse voltage. To enable the diodes to protect the transistors, the relay supply voltages must be connected to the board too.

Pin	Direction	Description
1	-	Relay 1 positive supply voltage
2	Out	Relay 1 output (minus pin of relay)
3	-	Ground
4	Out	Relay 0 output (minus pin of relay)
5	-	Relay 0 positive supply voltage
6	-	Vcc +5 Volt (not available on all boards)

Relay 0 can also be used to drive a speaker or buzzer and relay 1 can be used to generate a pulse-width modulated output voltage when the iLCD controller chip hardware release is ≥ 3.0 . Please have a look to the extra document "iLCD Commands" to learn more about how to control these output ports in this case.

Erase Jumper ([Erase](#))

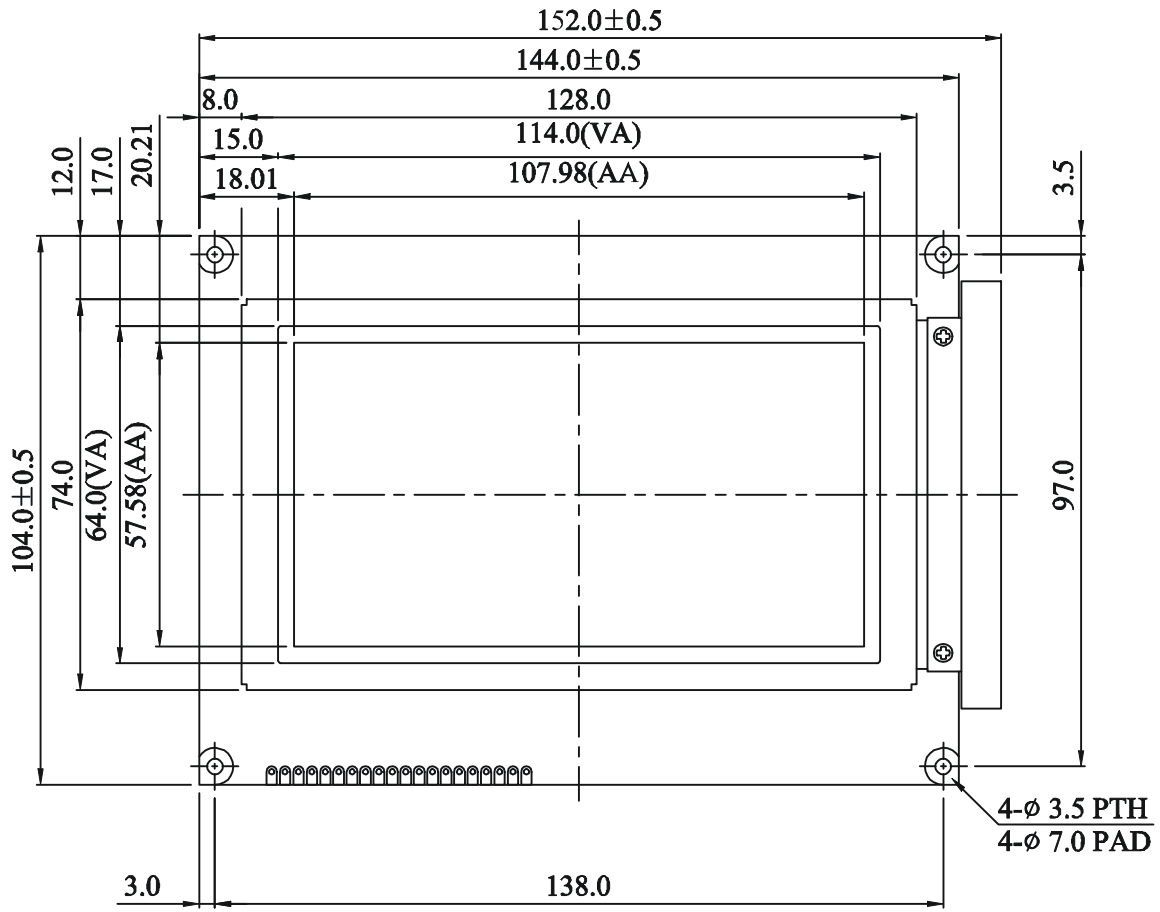
When a jumper is connected to this connector, the iLCD module erases all user data from the Flash memory at boot time. A corresponding message is shown on the LCD. Please remove the jumper after startup to avoid consecutive erasing of Flash contents at the next startup.

Command Set

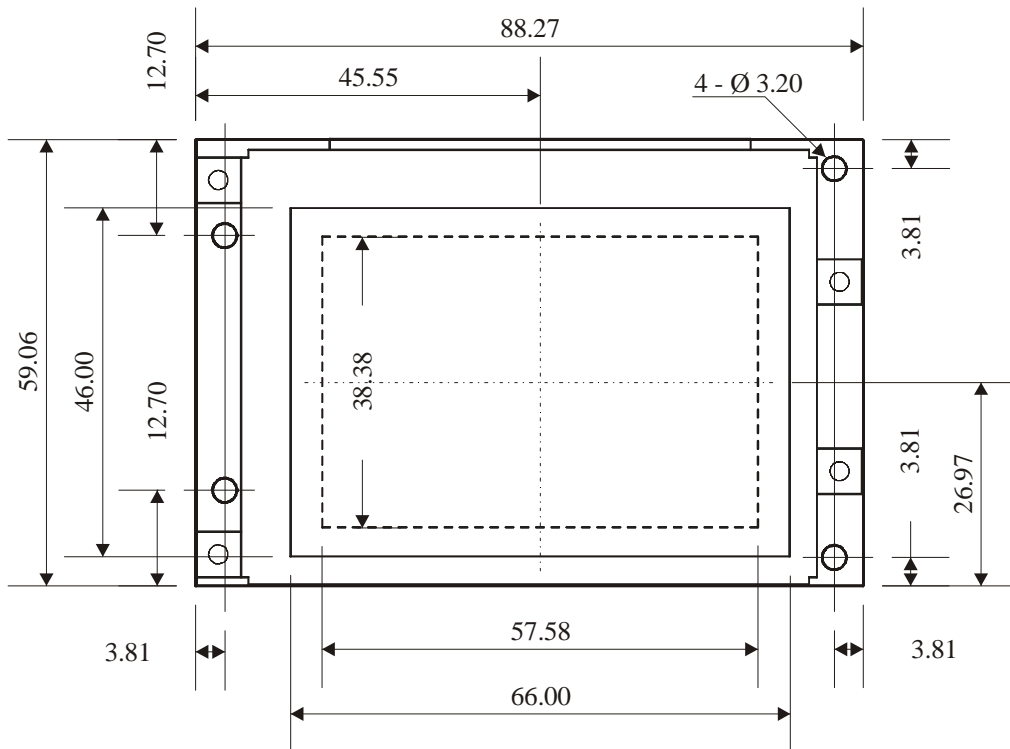
Please see the extra document "iLCD Commands" which describes the common command set available for all iLCD modules.

Outline Dimensions

DPP-x2412xxxxx-xxx Series



DPP-xP2416xxxxxx-xxx Series



DPP-x3224xxxxxx-xxx Series

