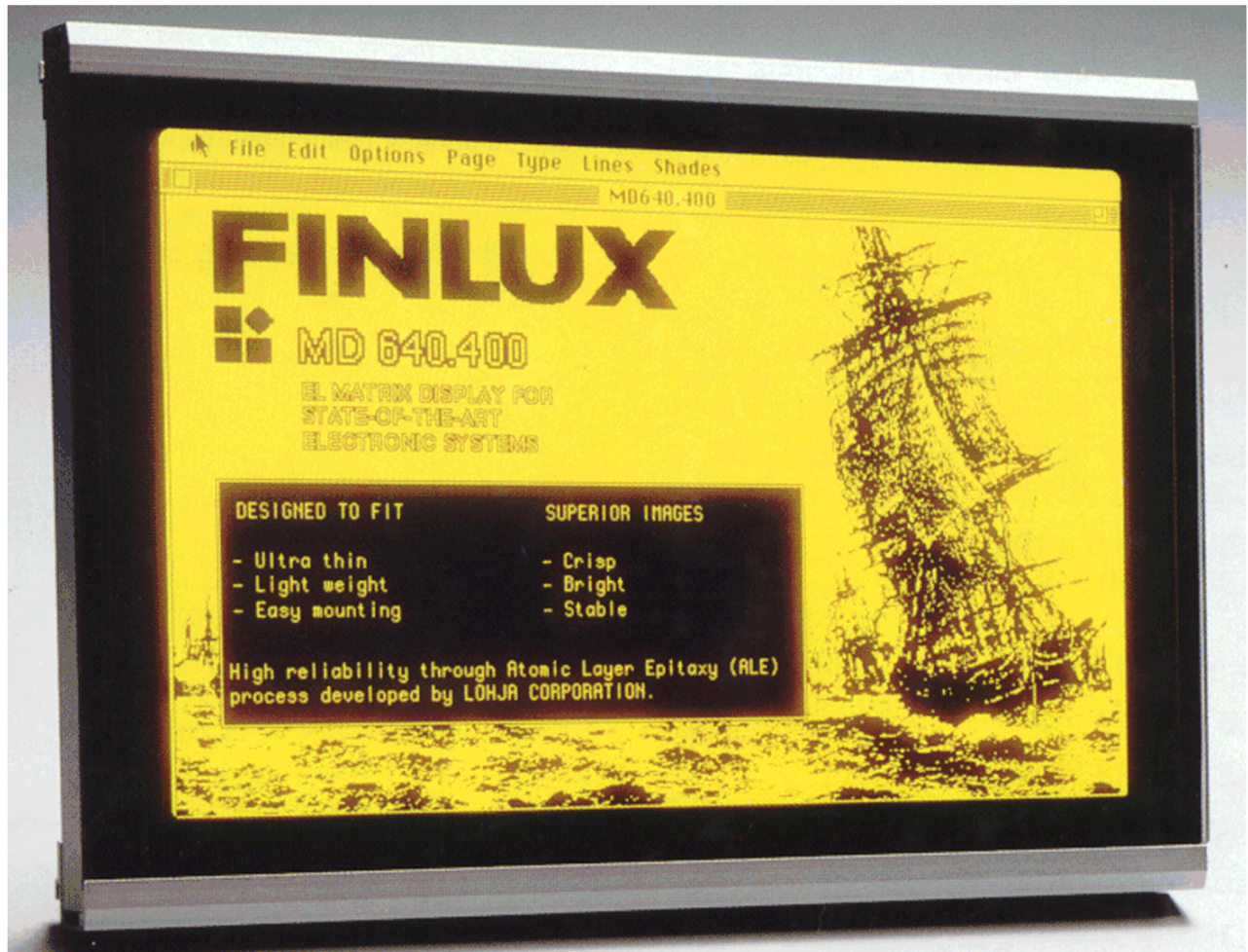


FINLUX

DATA SHEET FINLUX MD640.400

ELECTROLUMINESCENT DISPLAYS
FOR STATE-OF-THE-ART
ELECTRONIC SYSTEMS



1. PRODUCT OVERVIEW

The Finlux MD640.400 is a lightweight, flat, electroluminescent matrix display designed for easy logic interfacing to most computer systems. It offers superior picture quality and is intended for use in high-end portable computers and instruments, factory terminals and process controllers that will benefit from its high resolution.

The Finlux MD640.400 Matrix Display is based on a fully solid-state thin-film electroluminescent (EL) panel mounted with an elastic spacer to an electronic board. The board contains high-voltage driver and controller circuits with timing logic and waveform generators.

Lead frames are used to connect the EL panel to the driver-controller board, and a standard flat cable connects the display to the power unit. The power unit converts input DC voltages into operating DC voltages required for the display.

Operating conditions

This product is designed to be operated within the conditions specified in section 4 of this document. Operation of the product outside the specified limits may cause temporary malfunction or failures, or may affect the product reliability.



2. ELECTRICAL INTERFACE

Controlling the MD640.400

The EL panel has 640 transparent column electrodes crossing 400 row electrodes in an X-Y fashion. Light is emitted when an AC voltage is applied at a row-column intersection. Drive logic signals are processed and drive voltage pulses are generated and controlled on the Driver-Controller board. The power supply input voltages are +5 V and either +12 V, +15 V or +24 V DC.

The four input signals required for the display are at the 5 V TTL logic levels, and include the video data (VID), Video Clock (VCLK), Horizontal Synchronization (HS), and Vertical Synchronization (VS) signals. VID data loaded during the last 640 VCLK pulses preceding the falling edge of the HS signal will be displayed on the selected line. The lines to be displayed are selected sequentially by the first 400 HS pulses following the rising edge of the VS pulse.

WARNING!

The product generates potentially dangerous voltages capable of causing personal injury (high voltage pulses up to 195 V AC). Do not touch the display electronics during operation !

Interfacing to the display power unit

The MD640.400 is delivered standard with Power Unit PU-81b (+5 V, +12 V) , PU-82b (+5 V, +15 V) or PU-83b (+5 V, +24 V). The standard input connector J3 is 16-pin header, type ODU 511.065.003.016 (or equivalent).

Connections between the Power Unit and the Driver-Controller Board are made with flat, flexible cable between identical 20-pin headers (J1 on the Power Unit and Driver-Controller Board), type ODU 511.065.003.020 or equivalent (see Figs. 1 and 2).

Handling and Installation

The product should be mounted by supporting it at the grooves of the mounting frame. Before touching the display, necessary precaution must be taken to prevent application of static charges on the display from the operator or tools.

The display is made of glass material and should be handled with proper care. Avoid dropping the display or dropping hard objects on its surface.

NOTE 1: To avoid damages to the display electronics, the controller-power unit cable must not be connected or disconnected when supply voltages are applied to the power unit. Allow a period of 1 minute for decay of supply voltages.

NOTE 2: Each Matrix Display requires a Power Unit with the write voltage (VWR) adjusted for the specific display. Interchanging Power Supply unit from one display to another is discouraged. If the Power Supply unit must be replaced, consult the factory for adjustment instructions.

NOTE 3: For troublefree data transfer a maximum cable length of 300 mm (12 in.) from data transmitter to controller input connector is recommended. If longer cables up to 2 m (80 in.) length are needed, a 100 ohm series resistor must be placed at each of the four data line outputs of the transmitter in order to avoid signal reflections.

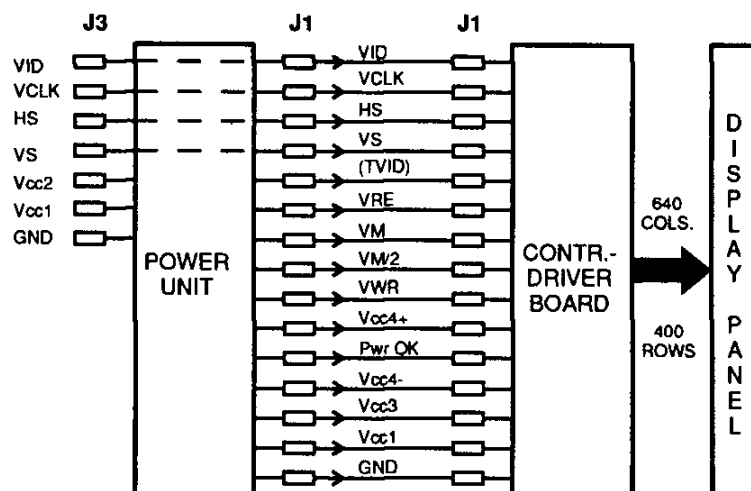


Figure 1 Block diagram of MD640.400 Display



Input signal descriptions

Signal	Symbol	Description
Video data	VID	Signal that supplies the pixel information to the system. A logic 1 at the VID input corresponds to a lit pixel on the display.
Video clock	VCLK	The VCLK signal shifts data present on the VID line into the display system. VCLK is active on the rising edge.
Horizontal sync	HS	The horizontal sync signal HS selects the 640 bits of data from the VID line(s).
Vertical sync	VS	Data of the first 400 lines after VS rising edge will be shown on the display.
Logic supply voltage	Vcc1	Supply voltage for interface logic.
Display supply voltage	Vcc2	Supply voltage converted to required internal supply voltages.

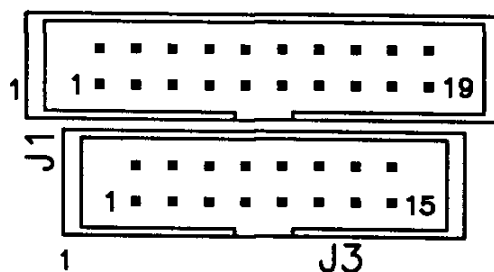


Figure 2 Power Unit connections.

Connector configurations

J 3 (Input connector)			
1	Vcc2	9	VS
2	Vcc2	10	GND
3	Vcc1	11	HS
4	Vcc1	12	GND
5	NC	13	VCLK
6	NC	14	GND
7	GND	15	VID
8	GND	16	GND

J 1 (Output to controller)			
1	Vcc3	11	VID
2	Vcc1	12	GND
3	VS	13	Power OK
4	GND	14	GND
5	HS	15	VM
6	GND	16	VM/2
7	VCLK	17	VRE
8	GND	18	Vcc4+
9	TVID	19	Vcc4-
10	GND	20	VWR

3. ELECTRICAL SPECIFICATIONS

Input specifications

Parameter	Symbol	min.	typ.	max.
Logic supply voltage	Vcc1	4.75 V	5.0 V	5.25 V
Logic supply current at 5 V	Icc1	-	-	200 mA
Display supply voltage (PU-81b)	Vcc2	11.4 V	12.0 V	13.2 V
(PU-82b)	Vcc2	13.5 V	15.0 V	16.5 V
(PU-83b)	Vcc2	21.4 V	24.0 V	26.4 V
Supply at 12 V (PU-81b)	Icc2	-	-	1.8 A
15 V (PU-82b)	Icc2	-	-	1.5 A
24 V (PU-83b)	Icc2	-	-	1.0 A

Operating conditions: Frame rate 60 Hz, T_a = 25 °C

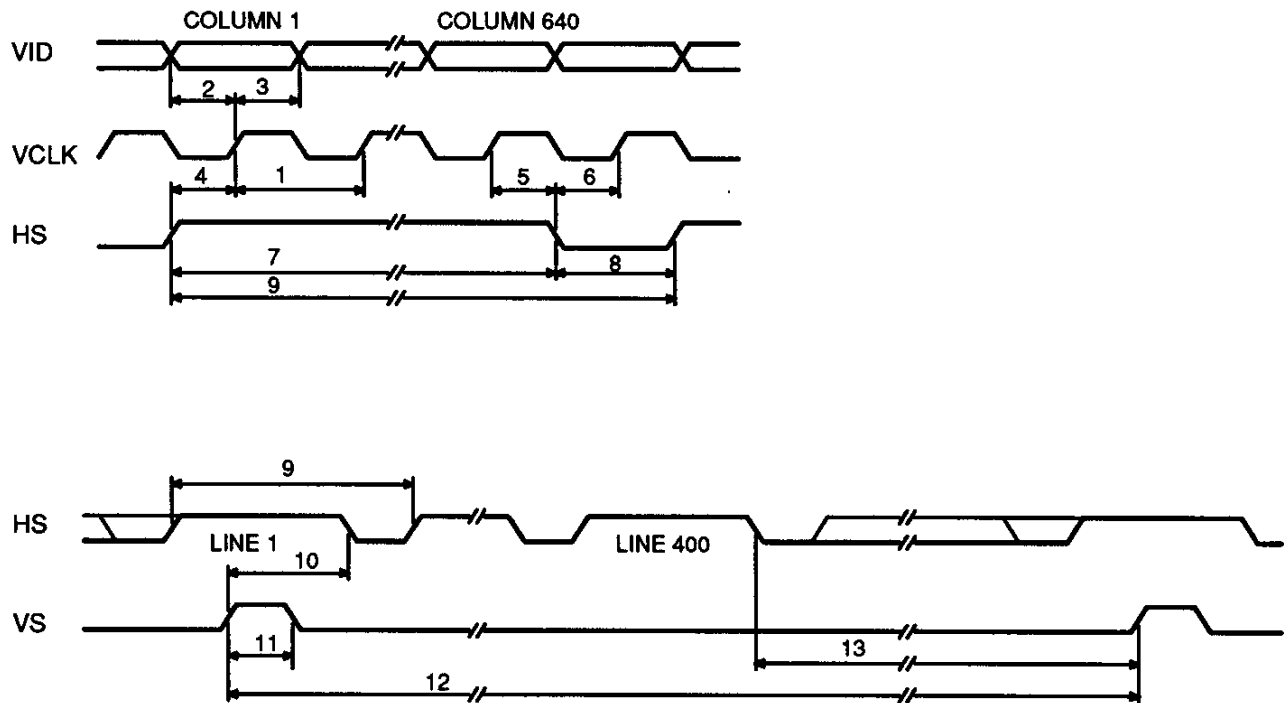


Figure 3 Timing diagram of input signals. (Numbers refer to the timing characteristics table.)

Timing characteristics

Ref. no.	Parameter	Symbol	min.	max.	note
	Video clock frequency	$1/t_{VCLK}$		16.5 MHz	
1	Video clock period	t_{VCLK}	60.6 ns		
2	Video data setup time	t_{DS}	20 ns		1
3	Video data hold time	t_{DH}	20 ns		
4,6	HS setup time	t_{HSS}	20 ns		
5	HS hold time	t_{HSH}	20 ns		
7	HS high time	$t_{HS\ high}$	$640 \times t_{VCLK}$		2
8	HS low time	$t_{HS\ low}$	$4 \times t_{VCLK}$		3
9	HS period		39 μ s		4
	HS pulses per frame		400		
10	Time from active edge of VS to falling edge of HS		600 ns		5
11	VS pulse time	t_{VS}	30 ns		
12	VS period		15.9 ms		
12	VS frame frequency			63 Hz	
13	Time from 400th HS to VS active edge		160 μ s		6

NOTES:

1. The rising edge of video clock is active. Change of polarity is jumper selectable.
2. If there are more than 640 VCLK pulses, only those 640 clock pulses just preceding the HS falling edge are valid. The number of VCLK pulses must always be even.
3. A minimum of 4 VCLK pulses is needed during HS low.

4. Only the first 400 HS pulses just after the VS rising edge are valid.
5. The rising edge of VS is active. Change of polarity is jumper selectable.
6. A period of 160 μ s is needed to display the last row and for refresh pulse.



Controller Input specifications

Signal descriptions

Signal	Symbol	Description	Typical value (V)
Logic input voltage		Control and data signal inputs.	
Logic supply voltage	Vcc1	Supply voltage for interface logic.	+5
Column logic supply voltage	Vcc3	Supply voltage for column driver logic.	+12
Row logic supply voltage	Vcc4	Floating supply voltage for row driver logic.	14
Modulation supply voltage	VM	Supply voltage used to generate column drive pulses.	+70
Modulation supply half voltage	VM/2	Voltage for energy recovery.	+35
Write supply voltage	VWR	Adjustable supply voltage used to generate row scan pulses.	-90
Reset supply voltage	VRE	Supply voltage used to generate the reset pulse.	+185
Power OK		Control signal indicating correct supply voltages and inhibiting operation of drive voltage pulsers at power fail (generated by the power unit).	

4. OPERATIONAL SPECIFICATIONS

Optical characteristics

Display area (HxW)	122x195 mm (4.80x7.68 in.)	Luminance stability: with time with temperature	change <20% in 10 000 h change <10% over 0...+55 °C
Matrix configuration	640x400 pixels	Luminance variation within the display	<35%
Pixel pitch	0.3 mm (12 mil)	Color	broadband yellow, peak at 580 nm
Pixel size	0.22 mm (8.5 mil) square	Viewing angle	>140°
Pixel luminance	110 cd/m ² (32 fL) typical 80 cd/m ² (23 fL) min.*		

Operating conditions: Frame rate 60 Hz, T_a = 25 °C

* Minimum value of 30 points measured across the display active area.

Environmental performance

All display module specifications are met during and after the following environmental tests unless otherwise indicated.

Temperature range specifications

Non-operating	-40...+75 °C (-40...+167 °F)
Operating	0...+55 °C (32...+131 °F)
Operating survival	-20...+65 °C (-4...+149 °F) (no permanent damage will occur) Test duration: 24 h at - 20 °C (-4 °F) 24 h at +65 °C (+149 °F) (without condensation)

Vibration specifications

IEC 68-2-6

5...55 Hz frequency range

Sweep time	15 min each axis
Dwell at resonance	10 min each resonance
Peak-to-peak amplitude	3.17 mm over 5...10 Hz range 1.52 mm over 10...25 Hz range 0.38 mm over 25...55 Hz range

55...500 Hz frequency range

Sweep time	120 min each axis
Dwell at resonance	30 min each resonance
Peak-to-peak amplitude	3g peak acceleration

Humidity specifications

Non-operating	65 °C (149 °F) at 90% RH Test duration: 24 h
Operating	40 °C (104 °F) at 95% RH (w/o cond.) Test duration: 120 h
Condensation	Unit stabilized at room temperature, then placed in 40 °C (104 °F) and 95% RH environment and performance tested after 5 minutes. Unit must operate normally and continue to operate normally for 30 minutes at 40 °C (104 °F) and 95% RH.
Long-term	Module is expected to operate at 25 °C (77 °F) and 80% RH for a minimum of 10 000 h.

Shock specifications

IEC 68-2-27

Magnitude	100g
Duration	4 ms (half sine wave)
Number of shocks	18 (3 on each of the 6 surfaces)

Note: Unit is not operating during shock or vibration tests.

**Altitude specifications**

Operating	15 000 m (50 000 ft)
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Absolute maximum ratings

Parameter	Max. Rating
Logic input voltage	-1.0...Vcc1+1.0 V
Vcc1	+7.0 V
Vcc2 (with PU-81b)	+15.0 V
Vcc2 (with PU-82b)	+18.0 V
Vcc2 (with PU-83b)	+30.0 V

5. MECHANICAL SPECIFICATIONS

The display panel is shockproof-mounted in a grooved, extruded aluminum profile frame. With this frame, it is possible to secure the display to the casing of computer, terminal or similar equipment without distorting the panel.

In highly vibrating conditions it is recommended to mount the module by the threaded holes and nuts at the rear of the display.

Mechanical dimensions

Dimension	MD640.400		PU-81b/-82b/-83b	
<i>External dimensions</i>				
Height	158.5 mm	(6.24 in.)	50.8 mm	(2.00 in.)
Width	228.5 mm	(9.00 in.)	139.0 mm	(5.47 in.)
Depth	18.3 mm	(0.72 in.)	21 mm.	(0.83 in.)
	35.0 mm*	(1.38 in.) *		
Weight	565 g*	(19.95 oz.) *	85 g	(3.0 oz.)
<i>Display area</i>				
Height	122 mm	(4.80 in.)		
Width	195 mm	(7.68 in.)		

* with mounted Power Unit.

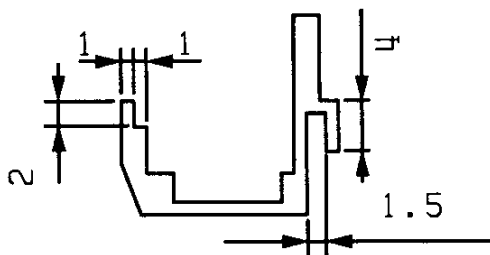


Figure 4 Mounting frame, detail.

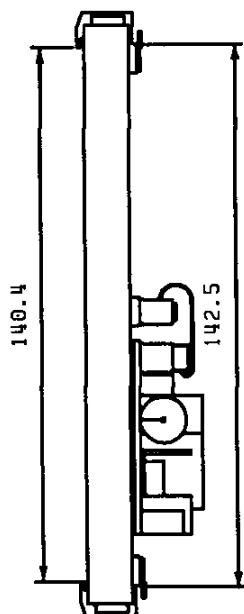


Figure 5 MD640.400, side view.

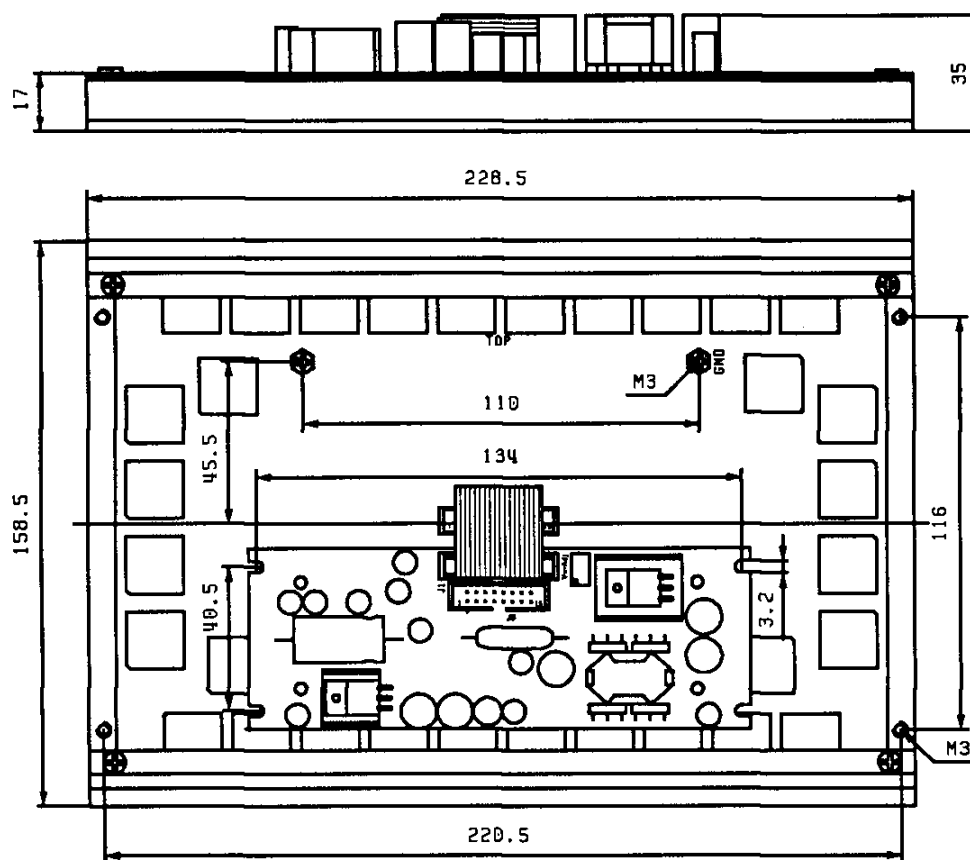


Figure 6 MD640.400, back and side view.



6. ACCESSORIES AND PRODUCT SUPPORT

FINLUX EL display panels are widely supported with compatible power supplies, display controllers, polarizing and neutral density filters, touch input systems, and other accessories to help in integrating the display unit into a product. Data sheets, application notes, and other supplementary documentation are available on request.

7. ORDERING INFORMATION

The product is available as three different versions with different input voltages:

MD640.400-52 with 5 V / 12 V Power Unit
MD640.400-50 with 5 V / 15 V Power Unit
MD640.400-54 with 5 V / 24 V Power Unit