DIGITAL-LOGIC

smart embedded computers

TECHNICAL USER'S MANUAL FOR:

MICROSPACE®

Flatpanel manual

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4.02	Planar EL320.240.36 added	02.98 BL
4.03	Changes on Kyocera KCS3224ASTT-X7 table	03.98 BL
4.04	Sharp LQ panels added	05.98 BL
4.05	Sharp LM32C08P	06.98 BL
4.06	Error on LQ9D340 table corrected	07.98 BL
4.07	Layout review	08.98 JM
4.08	MSM486SV V2.2/V2.4 added	12.98 BL
4.09	MSMP5S V2.0 added	02.99 BL
4.10	MSMP5S V3.1/3.2 added	06.99 BL
4.11	Misc. detail changes	06.99 BL
4.12	MSMP5 V4.0 added	07.99 BL
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4.4	MSM586SEV added	06.2001 STP
4.5	Signal descriptions added/updated, new boards added	07.2001 STP
4.6	smart connectors added, etc	10.2001 STP

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1 PREFACE

This manual is for integrators and programmers of systems based on the MICROSPACE card family. It contains information on hardware requirements, interconnections, and details of how to program the system. The specifications given in this manual were correct at the time of printing; advances mean that some may have changed in the meantime. If errors are found, please notify DIGITAL-LOGIC AG at the address shown on the title page of this document, and we will correct them as soon as possible.

1.1 Trademarks

MICROSPACE, MicroModule	DIGITAL-LOGIC AG
DOS Vx.y, Windows	Microsoft Inc.
PC-AT, PC-XT	IBM
NetWare	Novell Corporation
Ethernet	Xerox Corporation
DR-DOS, PALMDOS	Digital Research Inc. / Novell Inc.
ROM-DOS	Datalight Inc.

1.2 Disclaimer

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1.3 Who should use this Product

- Electronic engineers with know-how in PC- and LCD technology.
- This manual assumes, that you have a general knowledge of PC-electronics.
- Because of the complexity and the variability of PC-technology, we can't give any warranty that the product will work in any particular situation or combination. Our technical support will help you to may find a solution.
- Pay attention to the electrostatic discharges. Use a CMOS protected workplace.
- Power supply OFF when you are working on the board or connecting any cables or devices.

You need know-how in electronics and PC-technology to install a system with a flat panel !

1.4 Technical Support

1. **Contact your local DIGITAL-LOGIC Technical Support in your country first !**

2. Use the Internet Support Request form at
   http://www.digitallogic.com -> Support

3. Send a FAX or an E-mail to DIGITAL-LOGIC AG with a description of your problem.

   DIGITAL-LOGIC AG
   smartModule DesignIn Center
   Nordstr. 11/F
   CH-4542 Luterbach (SWITZERLAND)
   Fax: ++41 32 681 58 01
   E-Mail: support@digitallogic.com
   Internet www.digitallogic.com

➔ Support requests will only be accepted with detailed information of the product (BIOS-, Board- Version) !

1.4.1 For a new LCD type, not available now:

If the LCD BIOS for your LCD is not available, DIGITAL-LOGIC will adapt the LCD and provide you with one working cable. To initialise this, we need the following points from you:

1. An order to adapt the LCD (for the costs ask your sales contact)
2. Send the LCD panel, the datasheet, the mating connector to the LCD and the inverter for the backlight

1.5 Limited Warranty

DIGITAL-LOGIC AG warrants the hardware and software products it manufactures and produces to be free from defects in materials and workmanship for one year following the date of shipment from DIGITAL-LOGIC AG, Switzerland. This warranty is limited to the original purchaser of product and is not transferable.

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2 THE FLAT PANEL INTERFACE SIGNALS

All MICROSPACE products are based on the Chips & Technology VGA / flatpanel controllers 65535, 65540, 65545, 65548, 65554, 65555, 69000 and 69030.
These controllers allow a maximum of flexibility to interface with the most available flatpanels on the market. In this manual, we describe the cable connection using different flatpanels with MICROSPACE computers. The signals on the flatpanel interface are the following:

Signal	Description
DE or M	Panel AC drive control: **D**isplay **E**nable or **M**- clock depending on BIOS
LP	**L**atch **P**ulse, flat panel equivalent of HSYNC.
CLK	**S**hift **C**loc**K**, Pixel clock for flat panel data.
FLM	**F**irst **L**ine **M**arker, flat panel equivalent of VSYNC.
DE	**D**isplay **E**nable (defines active part screen)
P0 – P35	Programmable datalines.
VCC	Unswitched 5 volt supply.
VEE	Onboard generated LCD driving voltage. Level adjustable from +/- 15V to +/- 30V DC.
+12V	Unswitched +12V supply for backlight (if supplied externally)
GND	Ground
EVDD (active H) or VDDSAVE	Enable for onboard or external flat panel logic supply. EVDD is available in TTL Switched +5V / 1A or +12V / 1A Please refer to the connection table of your product. +12V may needs to be fed externally.
EVEE (active H) or VEESAVE	Enable for onboard or external VEE generator. VEE is the driving voltage for STN flat panels. EVEE is available in TTL Switched +5V / 1A. for VEE generator Please refer to the connection table of your product.
EBKL (active H) or VBACKSAVE	ON/OFF signal for backlight switching. EBKL is available in TTL +5V / 1A or +12V / 1A Please refer to the connection table of your product. +12V may needs to be fed externally.
CONT1, CONT2, BACK1, BACK2	Connection to onboard digital potentiometer for contrast and backlight adjustment. This function needs external electronic circuits. Ask Digital-Logic LCD- support for further information.
ACT1	Activity indicator input. Not necessary for flat panel operation.
VGAR	RED data signal for analog CRT
VGAG	GREEN data signal for analog CRT
VGAB	BLUE data signal for analog CRT
VGAH	HSYNC for analog CRT
VGAV	VSYNC for analog CRT

NOTE:
Please note, that not every display supports the signals EVDD, EBKL or EVEE being directly connected to the power+5V as may mentioned in the wiring sheets.
Check first the datasheet and if direct connecting is not possible, use an application as described in chapter 2.1 .

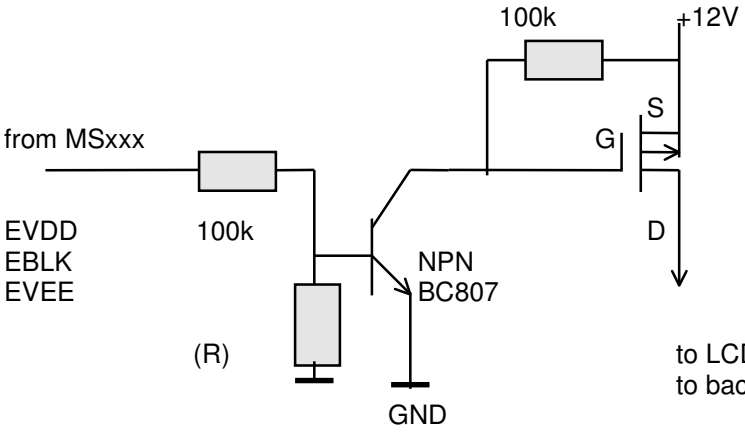
2.1 Attachment tips

This section describes special issues, if you are interfacing an LCD to our products (e.g.MSE-P5AT):

This product has no integrated power switches for the LCD. That means, if you need a controlled power switching in your application, the following circuit must be added externally:

For each power control signal (Enable VDD, Enable BKL, Enable VEE):

If you need all three signals, you should use this circuit three times. Do not use one FET in a mixed design. The timing of each signal is different.



The max. current is 1.0A,
and 0.4 ohms per FET channel.

3 CHECKPOINTS FOR FLAT PANEL INSTALLATION

Please follow this step by step procedure:

1. Refer to the corresponding page of the flat panel manual for a correct wiring.
   Have the corresponding MICROPORT manual available to check the LCD connector with the desired LCD- datasheet.
   Connecting sheets are available in single sheets, which are organized in different folders, sorted after LCD types.
2. Disconnect the flat panel from the cable.
3. Adjust the VEE voltage and **polarity** on the MICROSPACE product or external voltage source (if needed).
4. Measure the VEE voltage with a multimeter, to be sure that the voltage is correct (if needed).
5. Select the corresponding flatpanel BIOS on the MICROSPACE product.
   Ask for other BIOS, if the correct one is not available.
   For adaptations, we need a complete datasheet (no short form) of the display. Ask DLAG for more details.
6. Start the system with a VGA monitor connected and check if the correct flatpanel-BIOS appears (first screen message).
   Note, that some LCD- BIOS do not support CRT and LCD simultaneously.
7. Measure again the VCC, VDD, VEE, +12V voltages on the matching flat panel connector.
8. Shut down the system.
9. Connect the flat panel (backlight and data cable) now and start again.
10. If the flatpanel does not appear simultaneously with the VGA monitor, stop and check the wiring.
11. If the screen is working on the Monitor and the LCD, readjust VEE voltage if necessary.
12. Depending on the used ambient, cables are reacting like an antenna and the pictures on the LCD- screen will might not be shown properly.
    Improvments are given by shielding the cables, using ferrits, etc
13. If a long cable distance is required, then it is better to use our MSLVDS to eliminate bad results. Details see MSLVDS manual.

4 LCD CONNECTORS ON DIGITAL-LOGIC BOARDS

4.1 LCD-Connector on MSM386SV V5.0/5.1x

Board	MSM386SV		**Board Version**	V5.0/ V5.1x
VGA-Controller	65540 / 45		**Connector(s)**	J10
Notes				

Controller signal	Connector J10 pin no.	Voltage Level
M / DE	1	TTL
FLM	2	TTL
P18	3	TTL
LP	4	TTL
VCC	5	5V
GND	6	0V
EVDD	7	TTL
CLK	8	TTL
VBACKSAVE	9	Switched 12V 1A (if supplied externally)
P3	10	TTL
P2	11	TTL
P17	12	TTL
P1	13	TTL
P16	14	TTL
P0	15	TTL
P7	16	TTL
VEESAVE	17	Switched 5V 1A
P6	18	TTL
VCCPAN	19	3,3V/5V (J37)
P5	20	TTL
P4	21	TTL
P19	22	TTL
P8	23	TTL
P9	24	TTL
P10	25	TTL
P11	26	TTL
P12	27	TTL
P13	28	TTL
P14	29	TTL
P15	30	TTL
GND	31	0V
VGAR	32	ANALOG RED
P20	33	TTL
VGAG	34	ANALOG GREEN
P21	35	TTL
VGAB	36	ANALOG BLUE
P22	37	TTL
VGAH	38	ANALOG HS
VGAV	39	ANALOG VS
P23	40	TTL

4.2 LCD-Connector on MSM486SV V1.21/2.0/2.1/2.2/2.4x

Board	MSM486SV		**Board Version**	V1.21/ 2.0/ 2.1/ 2.2/ 2.4x
VGA-Controller	65540 / 45/48		**Connector(s)**	J8
Notes				

Controller signal	Connector J8 pin no.	Voltage Level
M / DE	1	TTL
FLM	2	TTL
P18	3	TTL
LP	4	TTL
VCC	5	5V
GND	6	0V
VDDSAVE	7	Switched 5V 1A
CLK	8	TTL
VBACKSAVE	9	Switched 12V 1A (if supplied externally)
P3	10	TTL
P2	11	TTL
P17	12	TTL
P1	13	TTL
P16	14	TTL
P0	15	TTL
P7	16	TTL
EVEE	17	TTL
P6	18	TTL
VCCPAN	19	3,3V/5V (J7)
P5	20	TTL
P4	21	TTL
P19	22	TTL
P8	23	TTL
P9	24	TTL
P10	25	TTL
P11	26	TTL
P12	27	TTL
P13	28	TTL
P14	29	TTL
P15	30	TTL
GND	31	0V
VGAR	32	ANALOG RED
P20	33	TTL
VGAG	34	ANALOG GREEN
P21	35	TTL
VGAB	36	ANALOG BLUE
P22	37	TTL
VGAH	38	ANALOG HS
VGAV	39	ANALOG VS
P23	40	TTL

4.3 LCD-Connector on MSM486S V1.0

Board	MSM486S		**Board Version**	V1.0
VGA-Controller	65540 / 45		**Connector(s)**	J17
Notes				

Controller signal	Connector J17 pin no.	Voltage Level
M / DE	1	TTL
FLM	2	TTL
P18	3	TTL
LP	4	TTL
VCC	5	5V
GND	6	0V
VDDSAVE	7	Switched 5V 1A
CLK	8	TTL
VBACKSAVE	9	Switched 12V 1A (if supplied externally)
P3	10	TTL
P2	11	TTL
P17	12	TTL
P1	13	TTL
P16	14	TTL
P0	15	TTL
P7	16	TTL
EVEE	17	TTL
P6	18	TTL
VCCPAN	19	3,3V/5V (J16)
P5	20	TTL
P4	21	TTL
P19	22	TTL
P8	23	TTL
P9	24	TTL
P10	25	TTL
P11	26	TTL
P12	27	TTL
P13	28	TTL
P14	29	TTL
P15	30	TTL
GND	31	0V
VGAR	32	ANALOG RED
P20	33	TTL
VGAG	34	ANALOG GREEN
P21	35	TTL
VGAB	36	ANALOG BLUE
P22	37	TTL
VGAH	38	ANALOG HS
VGAV	39	ANALOG VS
P23	40	TTL

Controller signal	Connector J32 pin no.	Voltage Level
P26	1	TTL
P27	2	TTL
P28	3	TTL
P29	4	TTL
P30	5	TTL
P31	6	TTL
P32	7	TTL
P33	8	TTL
P34	9	TTL
P35	10	TTL

4.4 LCD-Connector on MSM486V500 V3.0

Board	MSM486V500		Board Version	V3.0
VGA-Controller	65535		Connector(s)	J9
Notes				

Controller signal	Connector J9 pin no.	Voltage Level
M / DE	1	TTL
FLM	2	TTL
DE	3	TTL
LP	4	TTL
VCC	5	5V
GND	6	0V
VDDSAVE	7	Switched 5V 1A
CLK	8	TTL
VEESAVE	9	Switched 5V 1A
P3	10	TTL
P2	11	TTL
P17	12	TTL
P1	13	TTL
P16	14	TTL
P0	15	TTL
P7	16	TTL
BACK1	17	Digital Resistor IN
P6	18	TTL
BACK2	19	Digital Resistor OUT
P5	20	TTL
P4	21	TTL
GND	22	0V
P8	23	TTL
P9	24	TTL
P10	25	TTL
P11	26	TTL
P12	27	TTL
P13	28	TTL
P14	29	TTL
P15	30	TTL
GND	31	0V
VGAR	32	ANALOG RED
GND	33	0V
VGAG	34	ANALOG GREEN
GND	35	0V
VGAB	36	ANALOG BLUE
GND	37	0V
VGAH	38	ANALOG HS
VGAV	39	ANALOG VS
GND	40	0V

4.5 LCD-Connector on MSM486DX V4.0

Board	MSM486DX		Board Version	V4.0
VGA-Controller	65540 / 45		Connector(s)	J7
Notes				

Controller signal	Connector J7 pin no.	Voltage Level
M / DE	1	TTL
FLM	2	TTL
P18	3	TTL
LP	4	TTL
VCC	5	5V
GND	6	0V
VDDSAVE	7	Switched 5V 1A
CLK	8	TTL
VBACKSAVE	9	Switched 12V 1A (if supplied externally)
P3	10	TTL
P2	11	TTL
P17	12	TTL
P1	13	TTL
P16	14	TTL
P0	15	TTL
P7	16	TTL
CONT1	17	Digital Resistor IN
P6	18	TTL
CONT2	19	Digital Resistor OUT
P5	20	TTL
P4	21	TTL
P19	22	TTL
P8	23	TTL
P9	24	TTL
P10	25	TTL
P11	26	TTL
P12	27	TTL
P13	28	TTL
P14	29	TTL
P15	30	TTL
GND	31	0V
VGAR	32	ANALOG RED
P20	33	TTL
VGAG	34	ANALOG GREEN
P21	35	TTL
VGAB	36	ANALOG BLUE
P22	37	TTL
VGAH	38	ANALOG HS
VGAV	39	ANALOG VS
P23	40	TTL

4.6 LCD-Connector on MSM-P5 V2.0/ V3.0/ V4.0

Board	MSM-P5		**Board Version**	V2.0/ V3.0
VGA-Controller	65554 (<V4.0) 69000 (=>V4.0)		**Connector(s)**	J5 J32(<V3.0) / J45(V4.0)
Notes	V3.0 revision does only support 24bit LCD interface (J32 not available) V4.0 supports up to 36bit LCD interface (bits P26 to P35 on J45)			

Controller signal	Connector J5 pin no.	Voltage Level
M / DE	1	TTL
FLM	2	TTL
P18	3	TTL
LP	4	TTL
VCCPAN	5	3,3V/5V (J31)
GND	6	0V
EVDD	7	TTL
CLK	8	TTL
EBKL	9	TTL
P3	10	TTL
P2	11	TTL
P17	12	TTL
P1	13	TTL
P16	14	TTL
P0	15	TTL
P7	16	TTL
P24	17	TTL
P6	18	TTL
P25	19	TTL
P5	20	TTL
P4	21	TTL
P19	22	TTL
P8	23	TTL
P9	24	TTL
P10	25	TTL
P11	26	TTL
P12	27	TTL
P13	28	TTL
P14	29	TTL
P15	30	TTL
GND	31	0V
VGAR	32	ANALOG RED
P20	33	TTL
VGAG	34	ANALOG GREEN
P21	35	TTL
VGAB	36	ANALOG BLUE
P22	37	TTL
VGAH	38	ANALOG HS
VGAV	39	ANALOG VS
P23	40	TTL

Controller signal	Connector J32(pin no.	Voltage Level
P26	1	TTL
P27	2	TTL
P28	3	TTL
P29	4	TTL
P30	5	TTL
P31	6	TTL
P32	7	TTL
P33	8	TTL
P34	9	TTL
P35	10	TTL

4.7 LCD-Connector on MSMP5S (SV/SN) (SEV/SE) V1.0- 3.5x

Board	MSMP5S		Board Version	V1.0/ 1.2 /2.0/ 3.3- 3.5
VGA-Controller	65554 / 69000 / 69030		Connector(s)	J21
Notes	Since V3.7c are P3 possible (69030)			

Controller signal	Connector J21 pin no.	Supply V3.5x	Supply V2.0/3.2/3.3/3.4
M / DE	1	TTL	TTL
FLM	2	TTL	TTL
EBKL	3	TTL	TTL
LP	4	TTL	TTL
VCCPAN	5	3,3V/5V (J46 or J45)	5V
GND	6	0V	0V
EVEE	7	TTL	TTL
CLK	8	TTL	TTL
EVDD	9	TTL	TTL
P0	10	TTL	TTL
P1	11	TTL	TTL
P2	12	TTL	TTL
P3	13	TTL	TTL
P4	14	TTL	TTL
P5	15	TTL	TTL
P6	16	TTL	TTL
P7	17	TTL	TTL
P8	18	TTL	TTL
P9	19	TTL	TTL
P10	20	TTL	TTL
P11	21	TTL	TTL
P12	22	TTL	TTL
P13	23	TTL	TTL
P14	24	TTL	TTL
P15	25	TTL	TTL
GND	26	0V	0V
P16	27	TTL	TTL
P17	28	TTL	TTL
P18	29	TTL	TTL
P19	30	TTL	TTL
P20	31	TTL	TTL
ACT1	32	TTL	TTL
P21	33	TTL	TTL
P22	34	TTL	TTL
P23	35	TTL	TTL
P24	36	TTL	TTL
P25	37	TTL	TTL
P26	38	TTL	TTL
P27	39	TTL	TTL
P28	40	TTL	TTL
P29	41	TTL	TTL
P30	42	TTL	TTL
P31	43	TTL	TTL

Controller signal	Connector J21 pin no.	Supply V3.5x	Supply V2.0/3.2/3.3/3.4
GND	44	0V	0V
P32	45	TTL	TTL
P33	46	TTL	TTL
P34	47	TTL	TTL
P35	48	TTL	TTL
VCC	49	+5V	+5V
+12V	50	+12V If supplied externally	+12V If supplied externally

4.8 LCD-Connector on MSMP5 / P3 SEN/SEV V3.7x

Board	MSMP5 / P3 SEN/SEV		**Board Version**	V3.7x
VGA-Controller	69000 / 69030		**Connector(s)**	J21
Notes	Since V3.7c are P3 possible (69030)			

Controller signal	Connector J21 pin no.	Supply
M / DE	1	TTL
FLM	2	TTL
EBKL	3	TTL
LP	4	TTL
VCCPAN	5	3,3V/5V (J45)
GND	6	0V
EVEE	7	TTL
CLK	8	TTL
EVDD	9	TTL
P0	10	TTL
P1	11	TTL
P2	12	TTL
P3	13	TTL
P4	14	TTL
P5	15	TTL
P6	16	TTL
P7	17	TTL
P8	18	TTL
P9	19	TTL
P10	20	TTL
P11	21	TTL
P12	22	TTL
P13	23	TTL
P14	24	TTL
P15	25	TTL
GND	26	0V
P16	27	TTL
P17	28	TTL
P18	29	TTL
P19	30	TTL
P20	31	TTL
ACT1	32	TTL
P21	33	TTL
P22	34	TTL
P23	35	TTL
P24	36	TTL
P25	37	TTL
P26	38	TTL
P27	39	TTL
P28	40	TTL
P29	41	TTL
P30	42	TTL
P31	43	TTL
GND	44	0V
P32	45	TTL
P33	46	TTL

Controller signal	Connector J21 pin no.	Supply
P34	47	TTL
P35	48	TTL
VCC	49	+5V
+12V	50	+12V If supplied externally

4.9 LCD-Connector on MSMP5S V3.1/ 3.2

Board	MSMP5S		**Board Version**	V3.1/ 3.2
VGA-Controller	69000		**Connector(s)**	J21
Notes	LCD data and sync signals output level = buffered 5V			

Controller signal	Connector J21 pin no.	Voltage Level
M / DE	1	TTL
FLM	2	TTL
EBKL	3	TTL
LP	4	TTL
VCC3	5	3,3V
GND	6	0V
EVEE	7	TTL
CLK	8	TTL
EVDD	9	TTL
P0	10	TTL
P1	11	TTL
P2	12	TTL
P3	13	TTL
P4	14	TTL
P5	15	TTL
P6	16	TTL
P7	17	TTL
P8	18	TTL
P9	19	TTL
P10	20	TTL
P11	21	TTL
P12	22	TTL
P13	23	TTL
P14	24	TTL
P15	25	TTL
GND	26	0V
P16	27	TTL
P17	28	TTL
P18	29	TTL
P19	30	TTL
P20	31	TTL
ACT1	32	TTL
P21	33	TTL
P22	34	TTL
P23	35	TTL
P24	36	TTL
P25	37	TTL
P26	38	TTL
P27	39	TTL
P28	40	TTL
P29	41	TTL
P30	42	TTL
P31	43	TTL
GND	44	0V
P32	45	TTL
P33	46	TTL
P34	47	TTL
P35	48	TTL
VCC	49	+5V
+12V	50	+12V If supplied externally

4.10 LCD-Connector on MSMV104 V4.0

Board	MSMV104		**Board Version**	V4.0
VGA-Controller	65535		**Connector(s)**	J4
Notes				

Controller signal	Connector J4 pin no.	Voltage Level
M / DE	1	TTL
FLM	2	TTL
DE	3	TTL
LP	4	TTL
VCC	5	5V
GND	6	0V
VDDSAVE	7	Switched 5/12V 1A (J26)
CLK	8	TTL
VEESAVE	9	Switched 5/12V 1A (J25) on/off onboard VEE generator
P3	10	TTL
P2	11	TTL
VBACKSAVE	12	Switched 5V 1A
P1	13	TTL
VEE	14	+/-15V to +/-30V DC
P0	15	TTL
P7	16	TTL
CONT1	17	Digital Resistor IN
P6	18	TTL
CONT2	19	Digital Resistor OUT
P5	20	TTL
P4	21	TTL
GND	22	0V
P8	23	TTL
P9	24	TTL
P10	25	TTL
P11	26	TTL
P12	27	TTL
P13	28	TTL
P14	29	TTL
P15	30	TTL
P16	31	TTL
P17	32	TTL
BACK1	33	Digital Resistor IN
BACK2	34	Digital Resistor OUT

4.11 LCD-Connector on MSE486V500 V2.6

Board	MSE486V500		**Board Version**	V2.6
VGA-Controller	65535		**Connector(s)**	P8
Notes				

Controller signal	Connector P8 pin no.	Voltage Level
M / DE	1	TTL
FLM	2	TTL
DE	3	TTL
LP	4	TTL
VCC	5	5V
GND	6	0V
VDDSAVE	7	Switched 5V 1A
CLK	8	TTL
VEESAVE	9	Switched 12V 1A (if supplied externally)
P3	10	TTL
P2	11	TTL
VBACKSAVE	12	Switched 12V 1A (if supplied externally)
P1	13	TTL
VEE	14	+/-15V to +/-30V
P0	15	TTL
P7	16	TTL
CONT1	17	Digital Resistor IN
P6	18	TTL
CONT2	19	Digital Resistor OUT
P5	20	TTL
P4	21	TTL
GND	22	0V
P8	23	TTL
P9	24	TTL
P10	25	TTL
P11	26	TTL
P12	27	TTL
P13	28	TTL
P14	29	TTL
P15	30	TTL
P16	31	TTL
P17	32	TTL
BACK1	33	Digital Resistor IN
BACK2	34	Digital Resistor OUT

4.12 LCD-Connector on MSE486DX V3.0

Board	MSE486DX		**Board Version**	V3.0
VGA-Controller	65540/ 45		**Connector(s)**	J7/ J37
Notes				

Controller signal	Connector J7 pin no.	Voltage Level
M / DE	1	TTL
FLM	2	TTL
DE	3	TTL
LP	4	TTL
VCC	5	5V
GND	6	0V
VDDSAVE	7	Switched 5V 1A
CLK	8	TTL
EBKL	9	TTL
P3	10	TTL
P2	11	TTL
VBACKSAVE	12	Switched 12V 1A (if supplied externally)
P1	13	TTL
VEESAVE	14	+/-15V to +/-30V
P0	15	TTL
P7	16	TTL
CONT1	17	Digital Resistor IN
P6	18	TTL
CONT2	19	Digital Resistor OUT
P5	20	TTL
P4	21	TTL
GND	22	0V
P8	23	TTL
P9	24	TTL
P10	25	TTL
P11	26	TTL
P12	27	TTL
P13	28	TTL
P14	29	TTL
P15	30	TTL
P16	31	TTL
P17	32	TTL
BACK1	33	Digital Resistor IN
BACK2	34	Digital Resistor OUT

Controller signal	Connector J37 pin no.	Voltage Level
P18	1	TTL
P19	2	TTL
P20	3	TTL
P21	4	TTL
P22	5	TTL
P23	6	TTL

4.13 LCD-Connector on MSEP5-IPCI V1.1

Board	MSEP5-IPCI		**Board Version**	V1.1
VGA-Controller	65548 PCI		**Connector(s)**	J8,J7
Notes				

Controller signal	Connector J8 pin no.	Voltage Level
M / DE	1	TTL
FLM	2	TTL
M	3	TTL
LP	4	TTL
VCC	5	5V
GND	6	0V
EVDD	7	TTL
CLK	8	TTL
EBKL	9	TTL
P3	10	TTL
P2	11	TTL
N.C.	12	N.C
P1	13	TTL
EVEE	14	TTL
P0	15	TTL
P7	16	TTL
N.C.	17	N.C.
P6	18	TTL
N.C.	19	N.C.
P5	20	TTL
P4	21	TTL
VGAV	22	ANALOG VS
P8	23	TTL
P9	24	TTL
P10	25	TTL
P11	26	0V
P12	27	TTL
P13	28	TTL
P14	29	TTL
P15	30	TTL
P16	31	TTL
P17	32	TTL
VGAH	33	ANALOG HS
VGAV	34	ANALOG VS

Controller signal	Connector J7 pin no.	Voltage Level
P18	1	TTL
P19	2	TTL
P20	3	TTL
P21	4	TTL
P22	5	TTL
P23	6	TTL
VGAR	7	ANALOG RED
VGAG	8	ANALOG GREEN
VGAB	9	ANALOG BLUE
VGAR	10	ANALOG RED

4.14 LCD-Connector on MSEP5-AT V2.1

Board	MSEP5-AT		**Board Version**	V2.1
VGA-Controller	65554		**Connector(s)**	J56
Notes				

Controller signal	Connector J56 pin Nr.	Voltage level
M / DE	1	TTL
FLM	2	TTL
EBKL	3	TTL
LP	4	TTL
VCCPAN	5	3,3V/5V (J8)
GND	6	0V
EVEE	7	TTL
CLK	8	TTL
EVDD	9	TTL
P0	10	TTL
P1	11	TTL
P2	12	TTL
P3	13	TTL
P4	14	TTL
P5	15	TTL
P6	16	TTL
P7	17	TTL
P8	18	TTL
P9	19	TTL
P10	20	TTL
P11	21	TTL
P12	22	TTL
P13	23	TTL
P14	24	TTL
P15	25	TTL
GND	26	0V
P16	27	TTL
P17	28	TTL
P18	29	TTL
P19	30	TTL
P20	31	TTL
P20	32	TTL
P21	33	TTL
P22	34	TTL
P23	35	TTL
P24	36	TTL
P25	37	TTL
P26	38	TTL
P27	39	TTL
P28	40	TTL
P29	41	TTL
P30	42	TTL
P31	43	TTL
GND	44	0V
P32	45	TTL
P33	46	TTL
P34	47	TTL
P35	48	TTL
GPIO2	49	TTL
+12V	50	+12V if supplied externally

4.15 LCD-Connector on MSEP5-AT V1.0

Board	MSEP5-AT		**Board Version**	V1.0
VGA-Controller	65554		**Connector(s)**	J56
Notes				

Controller signal	Connector J56 pin Nr.	Voltage level
M / DE	1	TTL
FLM	2	TTL
EBKL	3	TTL
LP	4	TTL
VCCPAN	5	3,3V/5V (J8)
GND	6	0V
EVEE	7	TTL
CLK	8	TTL
EVDD	9	TTL
P0	10	TTL
P1	11	TTL
P2	12	TTL
P3	13	TTL
P4	14	TTL
P5	15	TTL
P6	16	TTL
P7	17	TTL
P8	18	TTL
P9	19	TTL
P10	20	TTL
P11	21	TTL
P12	22	TTL
P13	23	TTL
P14	24	TTL
P15	25	TTL
GND	26	0V
P16	27	TTL
P17	28	TTL
P18	29	TTL
P19	30	TTL
P20	31	TTL
P20	32	TTL
P21	33	TTL
P22	34	TTL
P23	35	TTL
P24	36	TTL
P25	37	TTL
P26	38	TTL
P27	39	TTL
P28	40	TTL
P29	41	TTL
P30	42	TTL
P31	43	TTL
GND	44	0V
P32	45	TTL
P33	46	TTL
P34	47	TTL
P35	48	TTL
VPCLK	49	TTL
+12V	50	+12V if supplied externally

4.16 LCD-Connector on PCC-P5 V2.1(A)

Board	PCC-P5		**Board Version**	V2.1(A)
VGA-Controller	65554		**Connector(s)**	J5
Notes				

Controller signal	Connector J5 pin no.	Voltage Level
M / DE	1	TTL
FLM	2	TTL
VBACKSAVE	3	Switched 12V 1A if supplied externally
LP	4	TTL
VCCPAN	5	3,3V/5V (J54)
GND	6	0V
VEESAVE	7	Switched 5V 1A
CLK	8	TTL
VDDSAVE	9	Switched 5/12V 1A (J55)
P0	10	TTL
P1	11	TTL
P2	12	TTL
P3	13	TTL
P4	14	TTL
P5	15	TTL
P6	16	TTL
P7	17	TTL
P8	18	TTL
P9	19	TTL
P10	20	TTL
P11	21	TTL
P12	22	TTL
P13	23	TTL
P14	24	TTL
P15	25	TTL
GND	26	0V
P16	27	TTL
P17	28	TTL
P18	29	TTL
P19	30	TTL
P20	31	TTL
ACT1	32	TTL
P21	33	TTL
P22	34	TTL
P23	35	TTL
P24	36	TTL
P25	37	TTL
P26	38	TTL
P27	39	TTL
P28	40	TTL
P29	41	TTL
P30	42	TTL
P31	43	TTL
GND	44	0V
P32	45	TTL
P33	46	TTL
P34	47	TTL
P35	48	TTL
VCC	49	+5V
+12V	50	+12V If supplied externally

4.17 LCD-Connector on PCC-P5L V1.0/1.1

Board	PCC-P5L		Board Version	V1.0 / V1.1
VGA-Controller	69000		Connector(s)	J5/J97
Notes				

Controller signal	Connector J5/J97pin no.	Voltage Level J5 (all TTL in 3,3V)	Voltage Level J97 (all TTL in 5V)
M / DE	1	TTL	TTL
FLM	2	TTL	TTL
VBACKSAVE	3	Switched 12V 1A if supplied externally	Switched 12V 1A if supplied externally
LP	4	TTL	TTL
VCCPAN	5	3,3V	5V
GND	6	0V	0V
VEESAVE	7	Switched 5V 1A	Switched 5V 1A
CLK	8	TTL	TTL
VDDSAVE	9	Switched 5/12V 1A (J55)	Switched 5/12V 1A (J55)
P0	10	TTL	TTL
P1	11	TTL	TTL
P2	12	TTL	TTL
P3	13	TTL	TTL
P4	14	TTL	TTL
P5	15	TTL	TTL
P6	16	TTL	TTL
P7	17	TTL	TTL
P8	18	TTL	TTL
P9	19	TTL	TTL
P10	20	TTL	TTL
P11	21	TTL	TTL
P12	22	TTL	TTL
P13	23	TTL	TTL
P14	24	TTL	TTL
P15	25	TTL	TTL
GND	26	0V	0V
P16	27	TTL	TTL
P17	28	TTL	TTL
P18	29	TTL	TTL
P19	30	TTL	TTL
P20	31	TTL	TTL
ACT1	32	TTL	TTL
P21	33	TTL	TTL
P22	34	TTL	TTL
P23	35	TTL	TTL
P24	36	TTL	TTL
P25	37	TTL	TTL
P26	38	TTL	TTL
P27	39	TTL	TTL
P28	40	TTL	TTL
P29	41	TTL	TTL
P30	42	TTL	TTL
P31	43	TTL	TTL
GND	44	0V	0V
P32	45	TTL	TTL
P33	46	TTL	TTL
P34	47	TTL	TTL
P35	48	TTL	TTL
VCC	49	+5V	+5V
+12V	50	+12V If supplied externally	+12V If supplied externally

4.18 LCD-Connector on PCC-P5S/ P3S V1.2a

Board	PCC-P5S / 3S		Board Version	V1.2a
VGA-Controller	69000 / 69030		Connector(s)	J97
Notes				

Controller signal	Connector J97pin no.	Voltage Level J97 (3.3 / 5V)
M / DE	1	TTL
FLM	2	TTL
VBACKSAVE	3	Switched 12V 1A if supplied externally
LP	4	TTL
VCCPAN	5	3.3V / 5V (J126)
GND	6	0V
VEESAVE	7	Switched 5V 1A
CLK	8	TTL
VDDSAVE	9	Switched 5/12V 1A (J55)
P0	10	TTL
P1	11	TTL
P2	12	TTL
P3	13	TTL
P4	14	TTL
P5	15	TTL
P6	16	TTL
P7	17	TTL
P8	18	TTL
P9	19	TTL
P10	20	TTL
P11	21	TTL
P12	22	TTL
P13	23	TTL
P14	24	TTL
P15	25	TTL
GND	26	0V
P16	27	TTL
P17	28	TTL
P18	29	TTL
P19	30	TTL
P20	31	TTL
ACT1	32	TTL
P21	33	TTL
P22	34	TTL
P23	35	TTL
P24	36	TTL
P25	37	TTL
P26	38	TTL
P27	39	TTL
P28	40	TTL
P29	41	TTL
P30	42	TTL
P31	43	TTL
GND	44	0V
P32	45	TTL
P33	46	TTL
P34	47	TTL
P35	48	TTL
VCC	49	+5V
+12V	50	+12V If supplied externally

4.19 LCD-Connector on MSWS2 V2.0

Board	MSWS2		**Board Version**	V2.0
VGA-Controller	65540 / 45		**Connector(s)**	J11/ J58
Notes				

Controller signal	Connector J11 pin no.	Voltage Level
M / DE	1	TTL
FLM	2	TTL
DE	3	TTL
LP	4	TTL
VCC	5	5V
GND	6	0V
EVDD / VDDSAVE	7	Switched 5V 1A
CLK	8	TTL
EBKL	9	TTL
P3	10	TTL
P2	11	TTL
EBKL / VBACKSAVE	12	Switched 12V 1A (if supplied externally)
P1	13	TTL
VEE	14	+/-15V to +/-30V
P0	15	TTL
P7	16	TTL
CONT1	17	Digital Resistor IN
P6	18	TTL
CONT2	19	Digital Resistor OUT
P5	20	TTL
P4	21	TTL
GND	22	0V
P8	23	TTL
P9	24	TTL
P10	25	TTL
P11	26	TTL
P12	27	TTL
P13	28	TTL
P14	29	TTL
P15	30	TTL
P16	31	TTL
P17	32	TTL
BACK1	33	Digital Resistor IN
BACK2	34	Digital Resistor OUT

Controller signal	Connector J58 pin no.	Voltage Level
P18	1	TTL
P19	2	TTL
P20	3	TTL
P21	4	TTL
P22	5	TTL
P23	6	TTL

4.20 LCD-Connector on MSWS3 V3.1

Board	MSWS3		**Board Version**	V3.1
VGA-Controller	65554		**Connector(s)**	J10
Notes				

Controller signal	Connector J10 pin no.	Voltage Level
M / DE	1	TTL
FLM	2	TTL
EBKL / VBACKSAVE	3	Switched 12V / 1A if supplied externally
LP	4	TTL
VCCPAN	5	3,3V/5V (J7)
GND	6	0V
EVEE / VEESAVE	7	Switched 5V / 1A
CLK	8	TTL
EVDD / VDDSAVE	9	Switched 5/12V / 1A (J8)
P0	10	TTL
P1	11	TTL
P2	12	TTL
P3	13	TTL
P4	14	TTL
P5	15	TTL
P6	16	TTL
P7	17	TTL
P8	18	TTL
P9	19	TTL
P10	20	TTL
P11	21	TTL
P12	22	TTL
P13	23	TTL
P14	24	TTL
P15	25	TTL
GND	26	0V
P16	27	TTL
P17	28	TTL
P18	29	TTL
P19	30	TTL
P20	31	TTL
ACT1	32	TTL
P21	33	TTL
P22	34	TTL
P23	35	TTL
P24	36	TTL
P25	37	TTL
P26	38	TTL
P27	39	TTL
P28	40	TTL
P29	41	TTL
P30	42	TTL
P31	43	TTL
GND	44	0V
P32	45	TTL
P33	46	TTL
P34	47	TTL
P35	48	TTL
VCC	49	+5V
+12V	50	+12V If supplied externally

4.21 LCD-Connector on MSM486SEV, V1.1

Board	MSM486SEV		Board Version	V1.1
VGA-Controller	65548		Connector(s)	J17 L/ J17 M
Notes				

Controller signal	Connector J17 L pin no.	Voltage Level
M / DE	1	TTL
FLM	2	TTL
P18	3	TTL
LP	4	TTL
VCC	5	5V
GND	6	0V
EVDD	7	TTL
SCLK	8	TTL
EBKL	9	TTL
P3	10	TTL
P2	11	TTL
P17	12	TTL
P1	13	TTL
P16	14	TTL
P0	15	TTL
P7	16	TTL
EVEE	17	TTL
P6	18	TTL
Vcc	19	3.3V or 5V
P5	20	TTL
P4	21	TTL
P19	22	TTL
P8	23	TTL
P9	24	TTL
P10	25	TTL
P11	26	0V
P12	27	TTL
P13	28	TTL
P14	29	TTL
P15	30	TTL

Controller signal	Connector J17M pin no.	Voltage Level
GND	31	OV
VGAR	32	ANALOG RED
P21	32	TTL
P20	33	TTL
VGAG	34	ANALOG GREEN
P21	35	TTL
VGAB	36	ANALOG BLUE
P22	37	TTL
HSYNCH	38	ANALOG VERTICAL
VSYNCH	39	ANALOG HORIZONTAL
P23	40	TTL
NC	41...44	NC

4.22 LCD-Connector on MSM486SEV, V1.2 / V1.3

Board	MSM486SEV		Board Version	V1.2 / V1.3
VGA-Controller	65548		Connector(s)	J17 / J98
Notes				

Controller signal	Connector J17 pin no.	Voltage Level
M / DE	1	TTL
FLM	2	TTL
P18	3	TTL
LP	4	TTL
VCC	5	5V
GND	6	0V
EVDD	7	TTL
SCLK	8	TTL
EBKL	9	TTL
P3	10	TTL
P2	11	TTL
P17	12	TTL
P1	13	TTL
P16	14	TTL
P0	15	TTL
P7	16	TTL
EVEE	17	TTL
P6	18	TTL
Vcc	19	3.3V or 5V
P5	20	TTL
P4	21	TTL
P19	22	TTL
P8	23	TTL
P9	24	TTL
P10	25	TTL
P11	26	0V
P12	27	TTL
P13	28	TTL
P14	29	TTL
P15	30	TTL
P20	31	TTL
P21	32	TTL
P22	33	TTL
P23	34	TTL

Controller signal	Connector J98 pin no.	Voltage Level
VGAR	2	ANALOG RED
VGAG	4	ANALOG GREEN
VGAB	6	ANALOG BLUE
HSYNCH	8	ANALOG VERTICAL
VSYNCH	9	ANALOG HORIZONTAL

4.23 LCD-Connector on MSEBX– P5 / P3

Board	MSEBX		Board Version	V1.1 / (V1.2x)
VGA-Controller	69000 / 69030		Connector(s)	X4 / X5
Notes				

Controller signal	Connector pin no.	Supply 5V X4 (buffered)	Supply 3.3V X5 (unbuffered)	Supply 3.3V / 5V X4 (V1.2x) (buffered)
M / DE	1	TTL	TTL	TTL
FLM	2	TTL	TTL	TTL
VBACKLSAFE	3	12V / 1A	12V / 1A	12V / 1A
LP	4	TTL	TTL	TTL
VCCPAN	5	5V	3,3V	3,3V / 5V (J140)
GND	6	0V	0V	0V
VEESAFE	7	5V / 1A	5V / 1A	5V / 1A
SCLK	8	TTL	TTL	TTL
VDDSAFE	9	5V / 12V	5V / 12V	5V / 12V (J55)
P0	10	TTL	TTL	TTL
P1	11	TTL	TTL	TTL
P2	12	TTL	TTL	TTL
P3	13	TTL	TTL	TTL
P4	14	TTL	TTL	TTL
P5	15	TTL	TTL	TTL
P6	16	TTL	TTL	TTL
P7	17	TTL	TTL	TTL
P8	18	TTL	TTL	TTL
P9	19	TTL	TTL	TTL
P10	20	TTL	TTL	TTL
P11	21	TTL	TTL	TTL
P12	22	TTL	TTL	TTL
P13	23	TTL	TTL	TTL
P14	24	TTL	TTL	TTL
P15	25	TTL	TTL	TTL
GND	26	0V	0V	0V
P16	27	TTL	TTL	TTL
P17	28	TTL	TTL	TTL
P18	29	TTL	TTL	TTL
P19	30	TTL	TTL	TTL
P20	31	TTL	TTL	TTL
ACT1	32	TTL	TTL	TTL
P21	33	TTL	TTL	TTL
P22	34	TTL	TTL	TTL
P23	35	TTL	TTL	TTL
P24	36	TTL	TTL	TTL
P25	37	TTL	TTL	TTL
P26	38	TTL	TTL	TTL
P27	39	TTL	TTL	TTL
P28	40	TTL	TTL	TTL
P29	41	TTL	TTL	TTL
P30	42	TTL	TTL	TTL
P31	43	TTL	TTL	TTL
GND	44	0V	0V	0V
P32	45	TTL	TTL	TTL
P33	46	TTL	TTL	TTL
P34	47	TTL	TTL	TTL
P35	48	TTL	TTL	TTL
VCC	49	+5V	+5V	+5V
+12V	50	+12V If supplied externally	+12V If supplied externally	+12V If supplied externally

4.24 LCD-Connector on MAS– P5 / P3

Board	MAS-P5 / P3		**Board Version**	V1.3x
VGA-Controller	69000 / 69030		**Connector(s)**	X13
Notes				

Controller signal	Connector pin no.	X13 (buffered)
M / DE	1	TTL
FLM	2	TTL
VBACKSAVE	3	5V / 12V / 1A (J59)
LP	4	TTL
VCCPAN	5	5V / 3.3V (J46)
GND	6	0V
VEESAFE	7	5V / 1A
SCLK	8	TTL
VDDSAFE	9	5V / 3.3V (J46)
P0	10	TTL
P1	11	TTL
P2	12	TTL
P3	13	TTL
P4	14	TTL
P5	15	TTL
P6	16	TTL
P7	17	TTL
P8	18	TTL
P9	19	TTL
P10	20	TTL
P11	21	TTL
P12	22	TTL
P13	23	TTL
P14	24	TTL
P15	25	TTL
GND	26	0V
P16	27	TTL
P17	28	TTL
P18	29	TTL
P19	30	TTL
P20	31	TTL
ACT1	32	TTL
P21	33	TTL
P22	34	TTL
P23	35	TTL
P24	36	TTL
P25	37	TTL
P26	38	TTL
P27	39	TTL
P28	40	TTL
P29	41	TTL
P30	42	TTL
P31	43	TTL
GND	44	0V
P32	45	TTL
P33	46	TTL
P34	47	TTL
P35	48	TTL
VCC	49	+5V
R contrast	50	+5V (R contrast)

4.25 LCD-Connector on MSLVDS-R

Board	MSLVDS-R		**Board Version**	V1.0
VGA-Controller			**Connector(s)**	J1 / J3
Notes				

Controller signal	Connector pin no.	J3 (buffered)	J1 (unbuffered)
M /FPM	1	TTL	TTL
FLM	2	TTL	TTL
EBKL	3	TTL	TTL
LP	4	TTL	TTL
VCCPAN	5		
GND	6		
VEESAFE	7		
SCLK	8	TTL	TTL
VDDSAFE	9		
P0	10	TTL	TTL
P1	11	TTL	TTL
P2	12	TTL	TTL
P3	13	TTL	TTL
P4	14	TTL	TTL
P5	15	TTL	TTL
P6	16	TTL	TTL
P7	17	TTL	TTL
P8	18	TTL	TTL
P9	19	TTL	TTL
P10	20	TTL	TTL
P11	21	TTL	TTL
P12	22	TTL	TTL
P13	23	TTL	TTL
P14	24	TTL	TTL
P15	25	TTL	TTL
GND	26		
P16	27	TTL	TTL
P17	28	TTL	TTL
P18	29	TTL	TTL
P19	30	TTL	TTL
P20	31	TTL	TTL
ACT1	32	TTL	TTL
P21	33	TTL	TTL
P22	34	TTL	TTL
P23	35	TTL	TTL
P24	36	TTL	TTL
P25	37	TTL	TTL
P26	38	TTL	TTL
P27	39	TTL	TTL
P28	40	TTL	TTL
P29	41	TTL	TTL
P30	42	TTL	TTL
P31	43	TTL	TTL
GND	44		
P32	45	TTL	TTL
P33	46	TTL	TTL
P34	47	TTL	TTL
P35	48	TTL	TTL
VCC	49		
+12V	50		

Board	MSLVDS-R		Board Version	V1.0
VGA-Controller			Connector(s)	J2 / J4
Notes				

Controller signal	Connector pin no.	Voltage Level J4 (buffered)	Voltage Level J2 (unbuffered)
M / DE	1	TTL	TTL
FLM	2	TTL	TTL
P18	3	TTL	TTL
LP	4	TTL	TTL
VCC	5		
GND	6		
EVDD	7		
SCLK	8	TTL	TTL
EBKL	9	TTL	TTL
P3	10	TTL	TTL
P2	11	TTL	TTL
P17	12	TTL	TTL
P1	13	TTL	TTL
P16	14	TTL	TTL
P0	15	TTL	TTL
P7	16	TTL	TTL
EVEE	17		
P6	18	TTL	TTL
Vcc	19		
P5	20	TTL	TTL
P4	21	TTL	TTL
P19	22	TTL	TTL
P8	23	TTL	TTL
P9	24	TTL	TTL
P10	25	TTL	TTL
P11	26	0V	0V
P12	27	TTL	TTL
P13	28	TTL	TTL
P14	29	TTL	TTL
P15	30	TTL	TTL
GND	31		
VGAR	32		
P21	32	TTL	TTL
P20	33	TTL	TTL
VGAG	34		
P21	35	TTL	TTL
VGAB	36		
P22	37	TTL	TTL
HSYNCH	38		
VSYNCH	39		
P23	40	TTL	TTL

4.26 LCD-Connector on MSLVDS-T

Board	MSLVDS-T		**Board Version**	V1.1
VGA-Controller			**Connector(s)**	J1 / J3
Notes				

Controller signal	Connector pin no.	J3 (buffered)	J1 (unbuffered)
M / DE	1	TTL	TTL
FLM	2	TTL	TTL
EBKL	3	TTL	TTL
LP	4	TTL	TTL
VCCPAN	5	+5V	+5V
GND	6	0V	0V
VEESAFE	7	+5V	+5V
SCLK	8	TTL	TTL
VDDSAFE	9	+5V	
P0	10	TTL	TTL
P1	11	TTL	TTL
P2	12	TTL	TTL
P3	13	TTL	TTL
P4	14	TTL	TTL
P5	15	TTL	TTL
P6	16	TTL	TTL
P7	17	TTL	TTL
P8	18	TTL	TTL
P9	19	TTL	TTL
P10	20	TTL	TTL
P11	21	TTL	TTL
P12	22	TTL	TTL
P13	23	TTL	TTL
P14	24	TTL	TTL
P15	25	TTL	TTL
GND	26	0V	0v
P16	27	TTL	TTL
P17	28	TTL	TTL
P18	29	TTL	TTL
P19	30	TTL	TTL
P20	31	TTL	TTL
ACT1	32	TTL	TTL
P21	33	TTL	TTL
P22	34	TTL	TTL
P23	35	TTL	TTL
P24	36	TTL	TTL
P25	37	TTL	TTL
P26	38	TTL	TTL
P27	39	TTL	TTL
P28	40	TTL	TTL
P29	41	TTL	TTL
P30	42	TTL	TTL
P31	43	TTL	TTL
GND	44	0V	
P32	45	TTL	TTL
P33	46	TTL	TTL
P34	47	TTL	TTL
P35	48	TTL	TTL
VCC	49	+5V	+5V
+12V	50	+12V	+12V

Board	MSLVDS-T		Board Version	V1.1
VGA-Controller			Connector(s)	J2 /J4
Notes				

Controller signal	Connector pin no.	Voltage Level J4 (buffered)	Voltage Level J2 (unbuffered)
M / DE	1	TTL	TTL
FLM	2	TTL	TTL
P18	3	TTL	TTL
LP	4	TTL	TTL
VCC	5	+5V	+5V
GND	6	0V	0V
EVDD	7	/ TTL	+5V /
SCLK	8	TTL	TTL
EBKL	9	/ TTL	+5V /
P3	10	TTL	TTL
P2	11	TTL	TTL
P17	12	TTL	TTL
P1	13	TTL	TTL
P16	14	TTL	TTL
P0	15	TTL	TTL
P7	16	TTL	TTL
EVEE	17	/ TTL	+5V /
P6	18	TTL	TTL
Vcc	19	+5V	+5V
P5	20	TTL	TTL
P4	21	TTL	TTL
P19	22	TTL	TTL
P8	23	TTL	TTL
P9	24	TTL	TTL
P10	25	TTL	TTL
P11	26	0V	0V
P12	27	TTL	TTL
P13	28	TTL	TTL
P14	29	TTL	TTL
P15	30	TTL	TTL
GND	31	0V	0V
VGAR	32		
P21	32	TTL	TTL
P20	33	TTL	TTL
VGAG	34		
P21	35	TTL	TTL
VGAB	36		
P22	37	TTL	TTL
HSYNCH	38		
VSYNCH	39		
P23	40	TTL	TTL

4.27 LCD-Connector on MSM586SEV V2.x

Board	MSM586SEV		**Board Version**	since V2.1
VGA-Controller	69000		**Connector(s)**	J7L / J7M
Notes				

Controller signal	Connector J7 L pin no.	Voltage Level
M / DE	1	TTL
FLM	2	TTL
P18	3	TTL
LP	4	TTL
VCC	5	3.3/5V / 1A switched selected by J51
GND	6	0V
VEE	7	5V / 1A switched
SCLK	8	TTL
EBKL	9	12V / 1A switched
P3	10	TTL
P2	11	TTL
P17	12	TTL
P1	13	TTL
P16	14	TTL
P0	15	TTL
P7	16	TTL
Contrast pin1	17	TTL
P6	18	TTL
Contrast pin2	19	TTL
P5	20	TTL
P4	21	TTL
P19	22	TTL
P8	23	TTL
P9	24	TTL
P10	25	TTL
P11	26	0V
P12	27	TTL
P13	28	TTL
P14	29	TTL
P15	30	TTL

Controller signal	Connector J7M pin no.	Voltage Level
GND	31	OV
VGAR	32	ANALOG RED
P21	32	TTL
P20	33	TTL
VGAG	34	ANALOG GREEN
P21	35	TTL
VGAB	36	ANALOG BLUE
P22	37	TTL
HSYNCH	38	ANALOG VERTICAL
VSYNCH	39	ANALOG HORIZONTAL
P23	40	TTL
NC	41...44	NC

4.28 LCD-Connector on SMxxPC-DK, V2.x

Board	SMxxPC-DK		**Board Version**	V2.x
VGA-Controller	69000 / 69030 / xx		**Connector(s)**	X11
Notes				

Controller signal	Connector pin no.	X11
M / DE	1	TTL
FLM	2	TTL
VBACKSAVE	3	5V / 12V / 1A (J96)
LP	4	TTL
VCCPAN	5	5V / 3.3V (J83)
GND	6	0V
VEESAFE	7	5V / 1A
SCLK	8	TTL
VDDSAFE	9	5V / 3.3V (J83)
P0	10	TTL
P1	11	TTL
P2	12	TTL
P3	13	TTL
P4	14	TTL
P5	15	TTL
P6	16	TTL
P7	17	TTL
P8	18	TTL
P9	19	TTL
P10	20	TTL
P11	21	TTL
P12	22	TTL
P13	23	TTL
P14	24	TTL
P15	25	TTL
GND	26	0V
P16	27	TTL
P17	28	TTL
P18	29	TTL
P19	30	TTL
P20	31	TTL
ACT1	32	NC
P21	33	TTL
P22	34	TTL
P23	35	TTL
P24	36	TTL
P25	37	TTL
P26	38	TTL
P27	39	TTL
P28	40	TTL
P29	41	TTL
P30	42	TTL
P31	43	TTL
GND	44	0V
P32	45	TTL
P33	46	TTL
P34	47	TTL
P35	48	TTL
VCC	49	+5V
NC	50	NC

4.29 LCD-Connector on SM486PCX- DK V1.x

Board	SM486PCX- DK		Board Version	V1.x
VGA-Controller	65548/50		Connector(s)	J17L / J17M
Notes				

Controller signal	Connector J17 L pin no.	Voltage Level
M / DE	1	TTL
FLM	2	TTL
P18	3	TTL
LP	4	TTL
VCC	5	+5V
GND	6	0V
EVDD	7	TTL
SCLK	8	TTL
EEBKL	9	TTL
P3	10	TTL
P2	11	TTL
P17	12	TTL
P1	13	TTL
P16	14	TTL
P0	15	TTL
P7	16	TTL
EVEE	17	TTL
P6	18	TTL
LCD Vcc	19	5V/3.3V on smartModule (J8)
P5	20	TTL
P4	21	TTL
P19	22	TTL
P8	23	TTL
P9	24	TTL
P10	25	TTL
P11	26	0V
P12	27	TTL
P13	28	TTL
P14	29	TTL
P15	30	TTL

Controller signal	Connector J17M pin no.	Voltage Level
GND	31	OV
VGAR	32	ANALOG RED
P21	32	TTL
P20	33	TTL
VGAG	34	ANALOG GREEN
P21	35	TTL
VGAB	36	ANALOG BLUE
P22	37	TTL
HSYNCH	38	ANALOG VERTICAL
VSYNCH	39	ANALOG HORIZONTAL
P23	40	TTL
NC	41...44	NC

4.30 LCD-Connector on SM486PC- DK, V2.x

Board	SM486PC- DK		**Board Version**	since V2.1
VGA-Controller	65545/48		**Connector(s)**	J17L / J17M
Notes				

Controller signal	Connector J17 L pin no.	Voltage Level
M / DE	1	TTL
FLM	2	TTL
P18	3	TTL
LP	4	TTL
VCC	5	+5V
GND	6	0V
VEESAVE	7	5V / 1A switched
SCLK	8	TTL
VBACKSAVE	9	12V / 1A switched
P3	10	TTL
P2	11	TTL
P17	12	TTL
P1	13	TTL
P16	14	TTL
P0	15	TTL
P7	16	TTL
EVEE	17	TTL
P6	18	TTL
LCD Vcc	19	5V/3.3V selected by J16
P5	20	TTL
P4	21	TTL
P19	22	TTL
P8	23	TTL
P9	24	TTL
P10	25	TTL
P11	26	0V
P12	27	TTL
P13	28	TTL
P14	29	TTL
P15	30	TTL

Controller signal	Connector J17M pin no.	Voltage Level
GND	31	OV
VGAR	32	ANALOG RED
P21	32	TTL
P20	33	TTL
VGAG	34	ANALOG GREEN
P21	35	TTL
VGAB	36	ANALOG BLUE
P22	37	TTL
HSYNCH	38	ANALOG VERTICAL
VSYNCH	39	ANALOG HORIZONTAL
P23	40	TTL
NC	41...44	NC

5 ELAN400 DIRECT CONNECTED ¼ VGA DISPLAY

The ELAN400 does also include an internal LCD-controller. This controller does supports CGA- and ¼-VGA-Displays.
The picture has a CGA (320x200) resolution and will repeat the last 40 lines if the whole screen is filled.

We can adapt displays (textmode), if we receive a complete datasheet (no shortforms):
- 1 or 2- or 4- bits per pixels, **no 3 !**
- 4- or 8 bits datalines

Ask DLAG for a library based driver (graphical mode), which has the whole resolution of 320x240

5.1 LCD-Connector on MSM486SE, V1.3

Board	MSM486SE		**Board Version**	V1.3
VGA-Controller	ELAN400		**Connector(s)**	J51
Notes				

Controller signal	Connector J51 pin no.	Voltage Level
VL0, Data0	1	TTL
VL1, Data1	2	TTL
VL2, Data2	3	TTL
VL3, Data3	4	TTL
VL4, Data4	5	TTL
VL5, Data5	6	TTL
VL6, Data6	7	TTL
VL7, Data7	8	TTL
VL8, Lineclock	9	TTL
VL9, M-Signal	10	TTL
VL10, FLM	11	TTL
VL11, Shiftclock	12	TTL
NC	13	
NC	14	
NC	15	
NC	16	
Ground	17	0V
Vo BIAS for LCD	18	LCD BIAS Voltage -28V to –15V software adjustable
VEE for LCD	19	LCD VEE Voltage - 28v to –15V
Switched 5V/0.5A	20	5V CGA-Graphic LCD VDD Voltage

5.2 LCD-Connector on MSM486SE, V1.2

Board	MSM486SE		**Board Version**	V1.2
VGA-Controller	ELAN400		**Connector(s)**	J51
Notes				

Controller signal	Connector J51 pin no.	Voltage Level
VCC	1	5V
LCD_D0	2	TTL
LCD_D1	3	TTL
LCD_D2	4	TTL
LCD_D3	5	TTL
LCD_D4	6	TTL
LCD_D5	7	TTL
LCD_D6	8	TTL
LCD_D7	9	TTL
LCD_M	10	TTL
LCD_LC	11	TTL
LCD_SHFCLK	12	TTL
LCD_FRM	13	TTL
VEE	14	LCD VEE Voltage - 28v to –15V
VXX	15	LCD BIAS Voltage -28V to –15V software adjustable
GND	16	0V

5.3 LCD-Connector on MSM486SE, V1.1

Board	MSM486SE		**Board Version**	V1.1
VGA-Controller	ELAN400		**Connector(s)**	J51
Notes				

Controller signal	Connector J51 pin no.	Voltage Level
VCC	1	5V
LCD_D0	2	TTL
LCD_D1	3	TTL
LCD_D2	4	TTL
LCD_D3	5	TTL
LCD_D4	6	TTL
LCD_D5	7	TTL
LCD_D6	8	TTL
LCD_D7	9	TTL
LCD_M	10	TTL
LCD_LC	11	TTL
LCD_SHFCLK	12	TTL
LCD_FRM	13	TTL
LCD_VEE_Enable/	14	TTL
LCD_VDD_Enable/	15	TTL
GND	16	0V
NC	17	
VEE	18	LCD BIAS Voltage -28V to –15V software adjustable
VXX	19	LCD VEE Voltage - 28v to –15V
NC	20	

5.4 LCD-Connector on SM486PC- DK, V2.x

Board	SM486PC- DK		**Board Version**	V2.x
VGA-Controller	ELAN400		**Connector(s)**	J51
Notes				

Controller signal	Connector J51 pin no.	Voltage Level
VCC	1	5V
LCD_D0	2	TTL
LCD_D1	3	TTL
LCD_D2	4	TTL
LCD_D3	5	TTL
LCD_D4	6	TTL
LCD_D5	7	TTL
LCD_D6	8	TTL
LCD_D7	9	TTL
LCD_M	10	TTL
LCD_LC	11	TTL
LCD_SHFCLK	12	TTL
LCD_FRM	13	TTL
LCD_VEE_Enable/	14	TTL
LCD_VDD_Enable/	15	TTL
GND	16	0V
NC	17	
VEE	18	LCD BIAS Voltage -28V to –15V software adjustable
VXX	19	LCD VEE Voltage - 28v to –15V
NC	20	

5.5 LCD-Connector on MSM486SL, V1.0

Board	MSM486SL		**Board Version**	V1.0
VGA-Controller	ELAN400		**Connector(s)**	J8
Notes				

Controller signal	Connector J8 pin no.	Voltage Level
VL0, Data0	1	TTL
VL1, Data1	2	TTL
VL2, Data2	3	TTL
VL3, Data3	4	TTL
VL4, Data4	5	TTL
VL5, Data5	6	TTL
VL6, Data6	7	TTL
VL7, Data7	8	TTL
VL8, M-Signal	9	TTL
VL9, Lineclock	10	TTL
VL10, Shiftclock	11	TTL
VL11, FLM	12	TTL
NC	13	
NC	14	
NC	15	
NC	16	
Ground	17	0V
Vo BIAS for LCD	18	LCD BIAS Voltage -28V to –15V
VEE for LCD	19	LCD VEE Voltage - 28v to –15V
Switched 5V/0.5A	20	5V CGA-Graphic LCD VDD Voltage

6 DISPLAY ADAPTIONS FOR THE ELAN400 CGA CONTROLLER

6.1 4bit displays

CGA-init table for LCD **PC067AYE** (160x128 CGA display)

Display	Signal	Board	Signal	Board	Signal	Texture
		MSM486SL	J8	SM486PC-EK	J51	
1	SP+					Speaker Anode
2	SP-					Speaker Cathode
3	VCC	20	VDD	1	[LVDD] (+5V)	Power (3.3V)
4	VCC	20	VDD	1	[LVDD] (+5V)	Enable 3.3V to the entire LCD driver circuit
6	D2	3	VL2	4	[LCDD2]	Display Data D2
7	D1	2	VL1	3	[LCDD1]	Display Data D1
8	VSS	17	GND	16		Ground (0V)
9	D0	1	VL0	2	[LCDD0]	Display Data D0
10	D3	4	VL3	5	[LCDD3]	Display Data D3
11	VSS	17	GND	16		Ground (0V)
12	DP1(LP)	10	VL9	11	[LCD_LC]	Display Line Clock
13	VSS	17	GND	16		Ground (0V)
14	DP2(SCP)	11	VL10	12	[LCD_SC]	Display Panel Shift Data Clock
15	FLM(FR)	12	VL11	13	[LCD_FR]	Display Frame Clock
16	M	9	VL8	10	[LCD_M]	Display AC Modulation
17	LVEE	19	LVEE	18	[VEE] (-2..-32V)	Enable Bias when low
18						Serial Data Input to Bias Supply to set volt
19						When low will put Bias supply in sleep mode
20	VSS	17	GND	16		Ground (0V)

CGA-init table for LCD **SP14Q002**
(320x240 1/4-VGA display)

Display	Signal	Board	Signal	Board	Signal	Texture
		MSM486SL	J8	SM486PC-EK	J51	
1	D0	1	VL0 [LCDD0]	2		Serial row data
3	D2	3	VL2 [LCDD2]	4		Serial row data
4	D3	4	VL3 [LCDD3]	5		Serial row data
5	DISP OFF	20	VDD [LVDD] (+5V)	1		Control display off (0:off / 1:on)
6	FRAME	12	VL11 [LCD_FR]	13		The FLM signal indicates the beginning of each display cycle
7	NC					
8	LOAD	10	VL9 [LCD_LC]	11		The CL1 latches the serial data in shift register
9	CP	11	VL10 [LCD_SC]	12		Clock signal for shifting the serial data
10	VDD (+ 5V)	20	VDD [LVDD] (+5V)	1		Power supply logic CKT
11	VSS (0V)	17	GND	16		Ground
12	VEE (-22V) 1	9	LVEE [VEE] (-2..-32V)	18		Power supply for LC driving
13	V0 (-17V)	18	VXX (+5..-32V)	19		Operating voltage for LC driving
4	FGND	17	GND	16		Ground

6.2 8bit displays

CGA-init table for **LCD KCS3224**
(320x200 1/4-VGA display)

No table available

CGA-init table for **LM6083SGE**
(640x200 CGA display)

No table available

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