

PRODUCT INFORMATION

18.0 Inch Active Matrix TFT-LCD (LG_Philips & 5120 controller card)



E048-LCD18-1
REVISION: original Rev.
DATE: 06 / 03 / 2003





Table of Contents

1. ELECTRICAL PERFORMANCE
2. PICTURE PERFORMANCE
3. LUMINANCE OUTPUT
4. APPROVALS
5. RELIABILITY
6. MECHANICAL SPECIFICATIONS
7. EXTERNAL CONTROLS
8. PLUG & PLAY
9. DISPLAY POWER MANAGEMENT
10. ATTACHMENTS TIMING



1. ELECTRICAL PERFORMANCE

All items must be performed under "standard test conditions" unless otherwise specified.

1.1 STANDARD TEST CONDITIONS

- Warm up time: 30 minutes
- AC supply voltage: 100 ~ 240 VAC universal
- Ambient temperature: 25 °C +/- 5 °C
- Humidity: 10 ~ 90 %
- Display mode : 1280x1024/ 75Hz
- Input signal : 0.7 Vpp TTL level: Hsync & Vsync / DVI
- External controls for picture position and size : Preset condition
- Video generator : QUANTUM 801 SL or equivalent

1.2 LCD PANEL GENERAL SPECIFICATIONS

- Model name :LG.PHILIPS LM181E06
- Screen diagonal :459.74mm(18.1")
- Display Area :359.040(H)x287.232(V)mm
- Pixel HxV :1280x1024 (RGB)
- Pixel Pitch: 0.2805(per one triad)x0.2805
- Driver Element: a-Si TFT active matrix
- Support Colors: 16,777,216 colors (8-bit for R,G,B)
- Typical white luminance: 250 cd/m² (type. Center 1 Point)
- Contrast Ratio: 350:1
- Viewing Angle: min. 60 (left),60(right),60(up),60(down) CR=200 (min.)
- Signal Frequency: 80KHz max
- Frame rate: 60Hz typ , 75Hz max
- Response Time:15 ms typ.
- Surface treatment: :Anti-glare,hard coating (3H)



1.3 POWER SUPPLY

1.3.1 AC INPUT RANGE

- Voltage: 100 ~ 240 VAC universal
- Frequency: 60 / 50 Hz

1.3.2 POWER CONSUMPTION

- < 45 W max. at the specified voltage and frequency

1.3.3 INRUSH CURRENT

- Will not exceed 60A at 264V input for a cold start at 25°c

1.3.4 DC INPUT JACK

- PIN (+12V, GND) (5.5Φ x 2.5 x 9.5 plug)

1.4 PULL-IN RANGE OF SYNCHRONIZATION

- Horizontal frequency: 30 KHz ~ 80 KHz
- Vertical frequency: 50 Hz ~ 75 Hz

1.5 INPUT SIGNAL:

DVI (Digital Visual Interface)

Video R.B.G. input Level: Analog 0.7 Vpp

Polarity: Positive

Impedance: 75 ohm

Synchronization Input H.V. Separate Sync. TTL compatible.

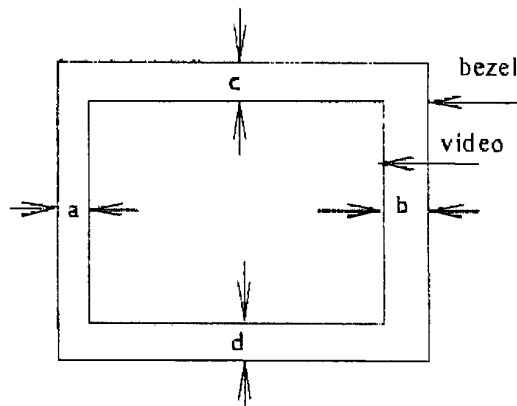
1.6 PICTURE PERFORMANCE

- Implies "standard test conditions" unless otherwise specified.
- Values were measured after 10 minutes warm-up period.

1.6.1 NORMAL DISPLAY SIZE

- H=359.040mm
- V=287.232mm

2. PICTURE SIZE AND POSITION OFFSET



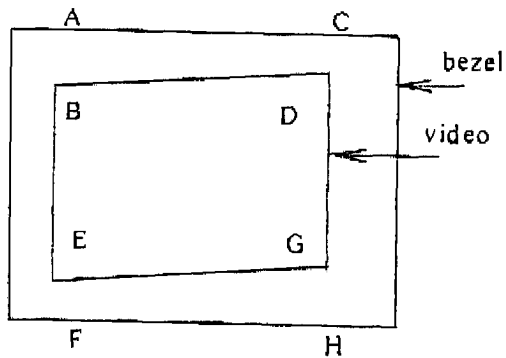
H-size 359.040mm

V-size 287.232mm

$$\text{H-offset } |a - b| < = 1 \text{ mm}$$

$$\text{V-offset } |c - d| < = 1 \text{ mm}$$

2.1 TILT



$/AB-CD/$ = Tilt on top ≤ 0.5 mm

$/EF-GH/$ = Tilt on bottom ≤ 0.5 mm

2.2 DISPLAY QUALITY

- Line defect: can't be seen
- Bright dots: bright pixel defects = 2 max.pixel
- Dark dots: dark pixel defects = 3 max.pixel
- Total dots defects: ≤ 5 pixel

Continuous defects:

Two continuous bright dots: ≤ 1 pair

Over three continuous bright dots (vertical, horizontal, oblique): No

Two continuous dark dots (vertical, horizontal, oblique): ≤ 0 pair

Over three continuous dark dots (vertical, horizontal, oblique): ≤ 0 pair

Distance between 2 bright dots: ≥ 15 mm

Distance between 2 dark dots: ≥ 5 mm

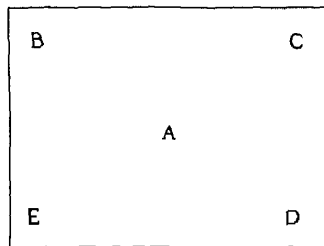
3. LUMINANCE OUTPUT

Under standard test conditions

3.1 BRIGHTNESS LEVEL

Input full white pattern. More than 250 cd/m^2 at center of screen with brightness and contrast at max.

3.2 BRIGHTNESS UNIFORMITY



359.040x287.232mm

-Brightness uniformity of these 5 points is defined as below.

$-(\text{Min. brightness} / \text{Max. brightness}) \times 100\% \geq 80\%$

3.3 COLOR TEMPERATURE

-x= 0.281 +/- 10%

-y= 0.311 +/- 10%

-Test at 9300⁰K Preset 200 cd/m^2

-x= 0.313 +/- 10%

-y= 0.329 +/- 10%

-Test at 6500⁰K Preset 250 cd/m^2

3.4 SETUP

-Light output setup: Pattern: full white

Contrast: 50%

Brightness: 200 cd/m^2

-Test pattern: NOKIA

4. APPROVALS

4.1 SAFETY UL and CE

4.2 EMI FCC Class B and CE



5. RELIABILITY

5.1 MONITOR MTBF

The MTBF of the monitor / per LG_Philips (...E06) specification: 40,000hrs.

5.2 ENVIRONMENTAL

Operating temperature : 0 ~ 50 °C
 Storage temperature : -20 ~ 60 °C
 Humidity: 10 ~ 90%

5.3 VIBRATION TEST & DROP TEST

TBD

6. MECHANICAL SPECIFICATIONS: open frame

6.1 CONNECTOR HD15 Input Connector

Pin No	Signal	Pin No	Signal
1	Red Input	9	NC
2	Green Input	10	GND
3	Blue Input	11	NC
4	NC	12	SDA
5	GND	13	Horizontal Sync.
6	RED Return	14	Vertical Sync.
7	Green Return	15	SCL
8	Blue Return		



DVI Input Connector

Pin	Signal Assignment	Pin	Signal Assignment	Pin	Signal Assignment
1	T.M.D.S Date 2-	9	T.M.D.S Date 1-	17	T.M.D.S Date 0-
2	T.M.D.S Date 2+	10	T.M.D.S Date 1+	18	T.M.D.S Date 0+
3	T.M.D.S Date 2/4 Shield	11	T.M.D.S Date 1/3 Shield	19	T.M.D.S Date 0/5 Shield
4	T.M.D.S Date 4-	12	T.M.D.S Date 3-	20	T.M.D.S Date 5-
5	T.M.D.S Date 4+	13	T.M.D.S Date 3+	21	T.M.D.S Date 5+
6	DDC Clock	14	+5V Power	22	T.M.D.S Clock Shield
7	DDC Data	15	Ground(return for +5V, H Sync, V Sync)	23	T.M.D.S Clock+
8	Analog Vertical Sync	16	Hot Plug Detect	24	T.M.D.S Clock-
C1	Analog Red	C2	Analog Green	C3	Analog Blue

INVERTER CONNECTOR

- Pin 1 : vcc
- Pin 2 : vcc
- Pin 3 : backlight_enable
- Pin 4 : bkacklight_adjustment
- Pin 5 : gnd
- Pin 6 : gnd



7. EXTERNAL CONTROLS

Front Controls:

- 7.1. Power LED
- 7.2. Power Switch
- 7.3. function key
- 7.4. OSD Menu: Select signal, Video, Audio, Color, Image , Language Tool, Exit.
 - Select signal : VGA, DVI
 - Video Control : Contrast , Brightness , Black Level
 - Audio Control : Volume, Balance
 - Color Control : 9300⁰K, 6500⁰K, User(R-Gain, G-Gain, B-Gain)
 - Flesh Tone, Hue, Saturation
 - Image Control : Auto-tune, H-sizs, H-phase, H-position, V-position
 - Language : English, Francais, Deutsch, Italiano, Espanol,

(NOTE: Flash ROM with the language will comming soon!)

Tools: OSD Control, Recall, Sharpness

OSD Control: OSD Time, OSD H_position, OSD V_position

8. PLUG & PLAY

The Display Data Channel "DDC" function will allow the monitor the monitor to inform the host about it's identity and depending on the level of DDC used , communicate additional level of display capabilities.

DDC1: One uni-directional data channel
DDC2: One bi-directional data channel

9. DEFINITION OF MODES

There are three mode of operation for the VT-18AE
These are ON, STAND-BY/ SUSPEND and OFF

ON : Both Horizontal and Vertical syncs are present and the monitor is in normal operation

STAND-BY: Horizontal or Vertical sync is inactive per VESA DPMS and not operational.

All parts & SUSPEND : The monitor is able to perform a quick start when both Horizontal and Vertical signals are active again.



OFF : Both Horizontal and Vertical sync are inactive per VESA DPMS and all parts of the monitor are disabled . This is the lowest possible power state of the monitor that maintains an automatic on when both the Horizontal and Vertical signals are active again. Recovery time will take longer than Stand-by / Suspend mode.

10. POWER CONSUMPTION

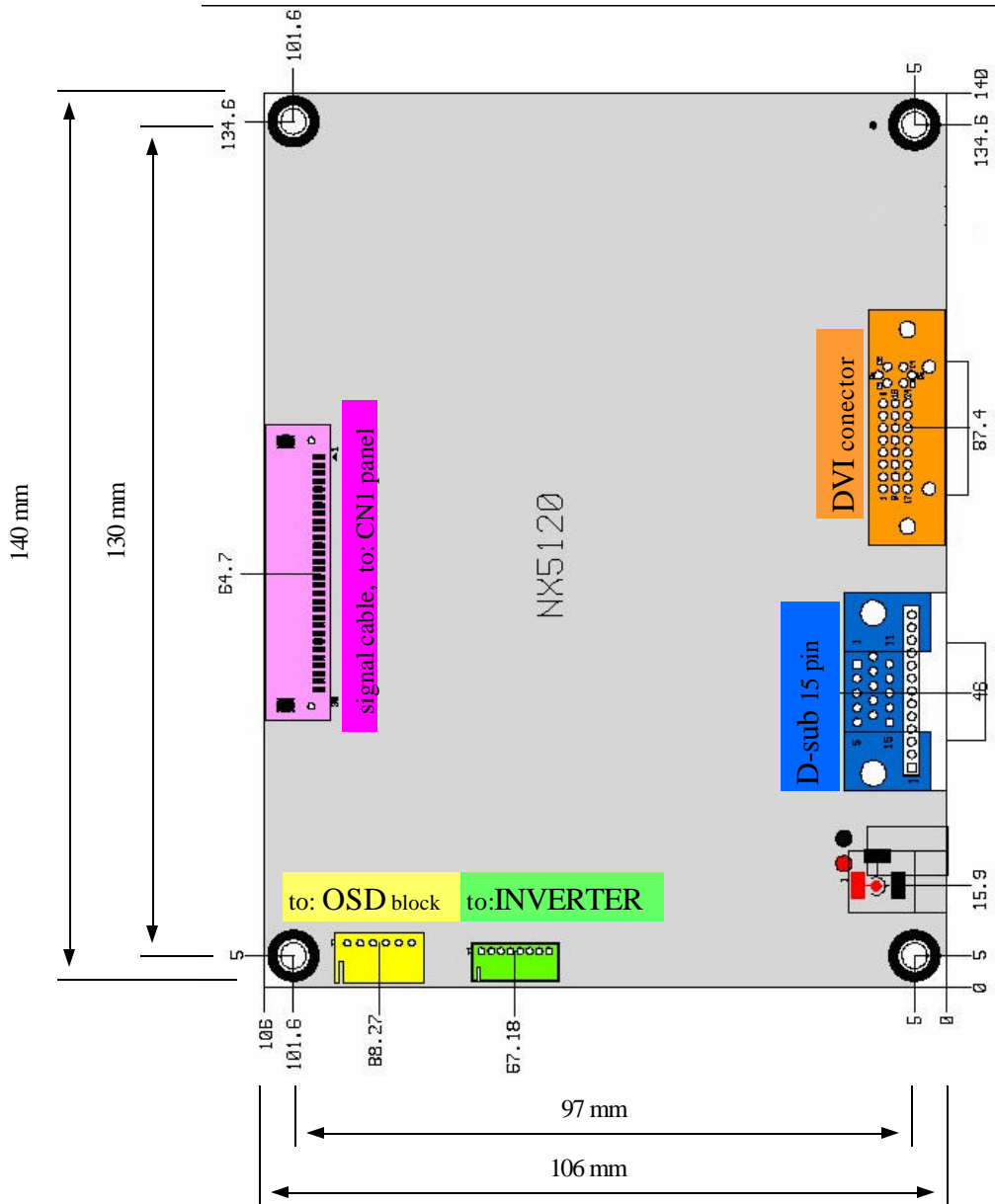
Normal operation: ~ 45W (max.)
 Stand-by/Suspend mode:3W
 Off Mode: <3W

11. TIMING

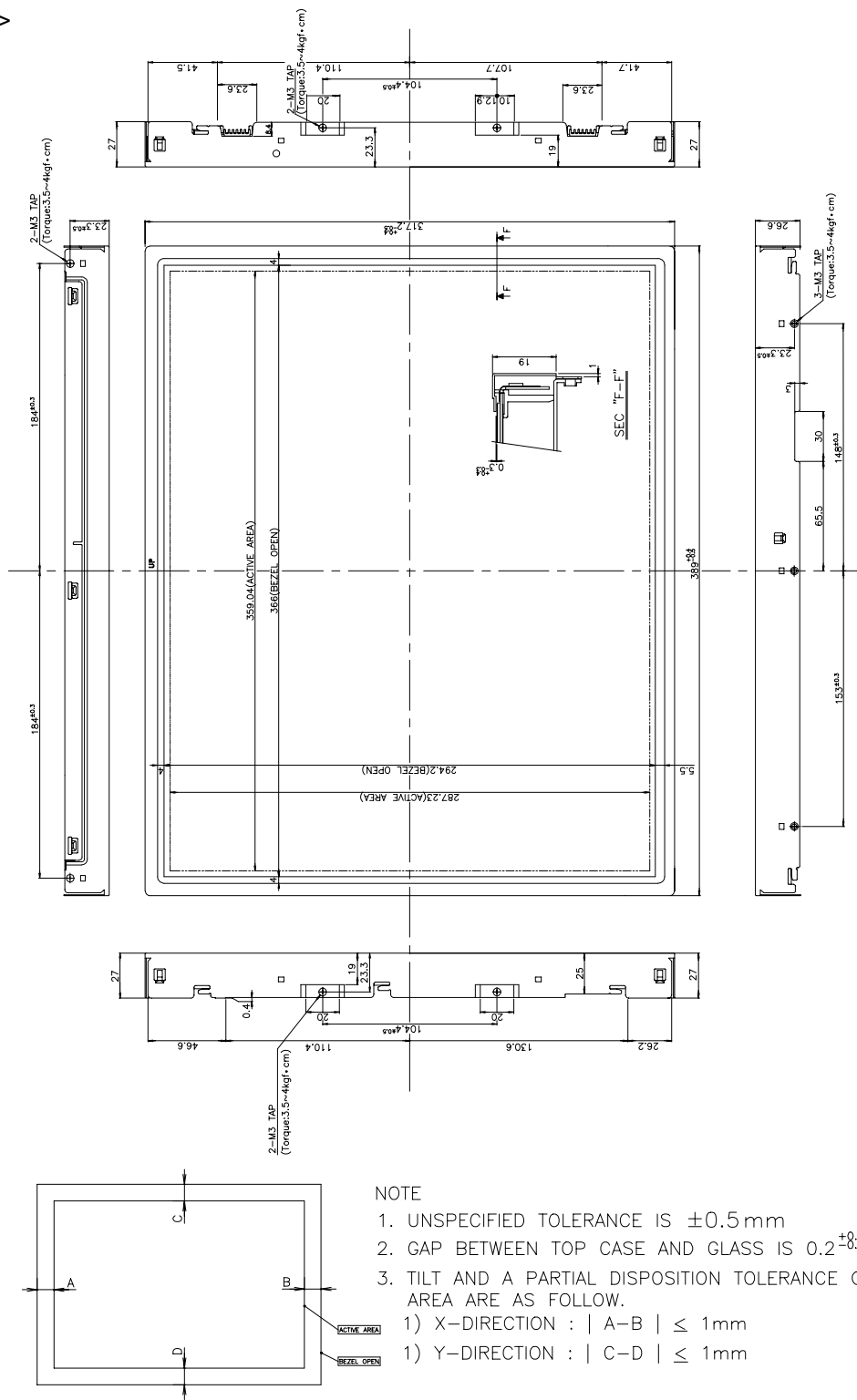
NAME	VGA640X350-70	VGA720X400-70	VGA640X480-60	640X480-75	VESA800X600-60	VESA800X600-72
PIXEL RATE	25.175 MHz	28.322 MHz	25.175 MHz	31.500 MHz	40.000 MHz	50.000 MHz
INTERLACE	NO	NO	NO	NO	NO	NO
VIDEO	ANALOG-COLOR	ANALOG-COLOR	ANALOG-COLOR	ANALOG-COLOR	ANALOG-COLOR	ANALOG-COLOR
SYNC ON G?	NO	NO	NO	NO	NO	NO
SYNC LEVEL	.	.	.	.	.	.
VIDEO LEVEL	700mv	700mv	700mv	700mv	700mv	700mv
WHITE LEVEL	700mv	700mv	700mv	700mv	700mv	700mv
BLACK LEVEL	0 IRE	0 IRE	0 IRE	0 IRE	0 IRE	0 IRE
16 BIT DATA	0000	0000	0000	0000	0000	0000
H TOTAL	800 =31.778 us	900 =31.777 us	800 =31.778 us	840 =26.667 us	1056 =26.400 us	1040 =20.800 us
H DISPLAY	640 =25.422 us	720 =25.422 us	640 =25.422 us	640 =20.317 us	800 =20.000 us	800 =16.000 us
H B-PORCH	48 =1.907 us	54 =1.907 us	48 =1.907 us	48 =1.907 us	88 =2.200 us	64 =1.280 us
HS WIDTH	96 =3.813 us	108 =3.813 us	96 =3.813 us	120 =3.810 us	128 =3.200 us	120 =2.400 us
H BORDER	8 =0.318 us	9 =0.318 us	8 =0.318 us	8 =0.000 us	0 =0.000 us	0 =0.000 us
H SIZE	4.000mm	4.000mm	4.000mm	4.000mm	4.000mm	4.000mm
V TOTAL	449 =14.268 ms	449 =14.268 ms	525 =16.683 ms	500 =13.333 ms	628 =16.579 ms	666 =13.853 ms
V DISPLAY	350 =11.122 ms	400 =12.711 ms	480 =15.253 ms	480 =12.800 ms	600 =15.840 ms	600 =12.480 ms
V B-PORCH	60 =1.907 ms	35 =1.112 ms	33 =1.049 ms	16 =0.427 ms	23 =0.607 ms	23 =0.478 ms
VS WIDTH	2 =0.064 ms	2 =0.064 ms	2 =0.064 ms	3 =0.080 ms	4 =0.106 ms	6 =0.125 ms
V BORDER	5 =0.191 ms	7 =0.222 ms	8 =0.254 ms	0 =0.000 ms	0 =0.000 ms	0 =0.000 ms
V SIZE	3.000mm	3.000mm	3.000mm	3.000mm	3.000mm	3.000mm
HS OUTPUT	ON(+)	ON(-)	ON(-)	ON(-)	ON(+)	ON(+)
VS OUTPUT	ON(-)	ON(+)	ON(-)	ON(+)	ON(+)	ON(+)
XS OUTPUT	ON(+)	ON(+)	ON(-)	ON(-)	ON(+)	ON(+)
XS SELECT	SERR	SERR	SERR	SERR	SERR	SERR
Fh	=31.469 KHz	=31.469 KHz	=31.469 KHz	=37.500 KHz	=37.879 KHz	=48.077 KHz
V	=70.087 Hz	=70.087 Hz	=59.941 Hz	=75.000 Hz	=60.317 Hz	=72.188 Hz



NAME	900X600-75	MESA1024X768-60	MESA1024X768-70	1024X768-75	NEC 1280X1024-60	1280X1024-75
PIXEL RATE	49.500 MHz	65.000 MHz	75.000 MHz	78.750 MHz	107.012 MHz	135.000 MHz
INTERLACE	NO	NO	NO	NO	NO	NO
VIDEO	ANALOG-COLOR	ANALOG-COLOR	ANALOG-COLOR	ANALOG-COLOR	ANALOG-COLOR	ANALOG-COLOR
SYNC ON G?	NO	NO	NO	NO	YES	NO
SYNC LEVEL	.	.	.	.	300mv	.
VIDEO LEVEL	700mv	700mv	700mv	700mv	700mv	700mv
WHITE LEVEL	700mv	700mv	700mv	700mv	700mv	700mv
BLACK LEVEL	0 IRE	0 IRE	0 IRE	0 IRE	0 IRE	0 IRE
16 BIT DATA	0000	0000	0000	0000	0000	0000
H TOTAL		1344 =20.677 us	1328 =17.707 us	1312 =16.660 us	1664 =15.550 us	1688 =12.504 us
H DISPLAY	1056 =21.333 us	1024 =15.754 us	1024 =13.653 us	1024 =13.003 us	1280 =11.961 us	1280 =9.481 us
H B-PORCH	300 =16.162 us	160 =2.462 us	144 =1.920 us	176 =2.235 us	240 =2.243 us	248 =1.837 us
HS WIDTH	160 =3.232 us	136 =2.092 us	144 =1.920 us	96 =1.219 us	104 =0.972 us	144 =1.067 us
H BORDER	30 =1.616 us	0 =0.000 us	136 =1.813 us	0 =0.000 us	104 =0.972 us	0 =0.000 us
H SIZE	0 =0.000 us	4.000mm	0 =0.000 us	4.000mm	0 =0.000 us	4.000mm
V TOTAL	4.000mm	306 =16.666 ms	306 =14.272 ms	300 =13.328 ms	1065 =16.560 ms	1066 =13.329 ms
V DISPLAY	625 =13.333 ms	768 =15.880 ms	768 =13.599 ms	768 =12.795 ms	1024 =15.923 ms	1024 =12.804 ms
V B-PORCH	600 =12.800 ms	29 =0.600 ms	29 =0.513 ms	28 =0.466 ms	32 =0.498 ms	38 =0.475 ms
VS WIDTH	21 =0.448 ms	6 =0.124 ms	6 =0.106 ms	3 =0.050 ms	3 =0.047 ms	3 =0.038 ms
V BORDER	3 =0.064 ms	0 =0.000 ms	0 =0.000 ms	0 =0.000 ms	0 =0.000 ms	0 =0.000 ms
V SIZE	0 =0.000 ms	3.000mm	3.000mm	3.000mm	3.000mm	3.000mm
HS OUTPUT	ON(+)	ON(-)	ON(-)	ON(+)	ON(+)	ON(+)
VS OUTPUT	ON(+)	ON(-)	ON(-)	ON(+)	ON(+)	ON(+)
XS OUTPUT	ON(+)	ON(+)	ON(+)	ON(+)	ON(+)	ON(+)
XS SELECT	SERR	SERR	SERR	SERR	SERR	SERR
Fh	=46.875 KHz	=48.363 KHz	=56.476 KHz	=60.023 KHz	=64.310 KHz	=79.976 KHz
Fv	=75.000 Hz	=60.004 Hz	=70.069 Hz	=75.029 Hz	=60.385 Hz	=75.024 Hz



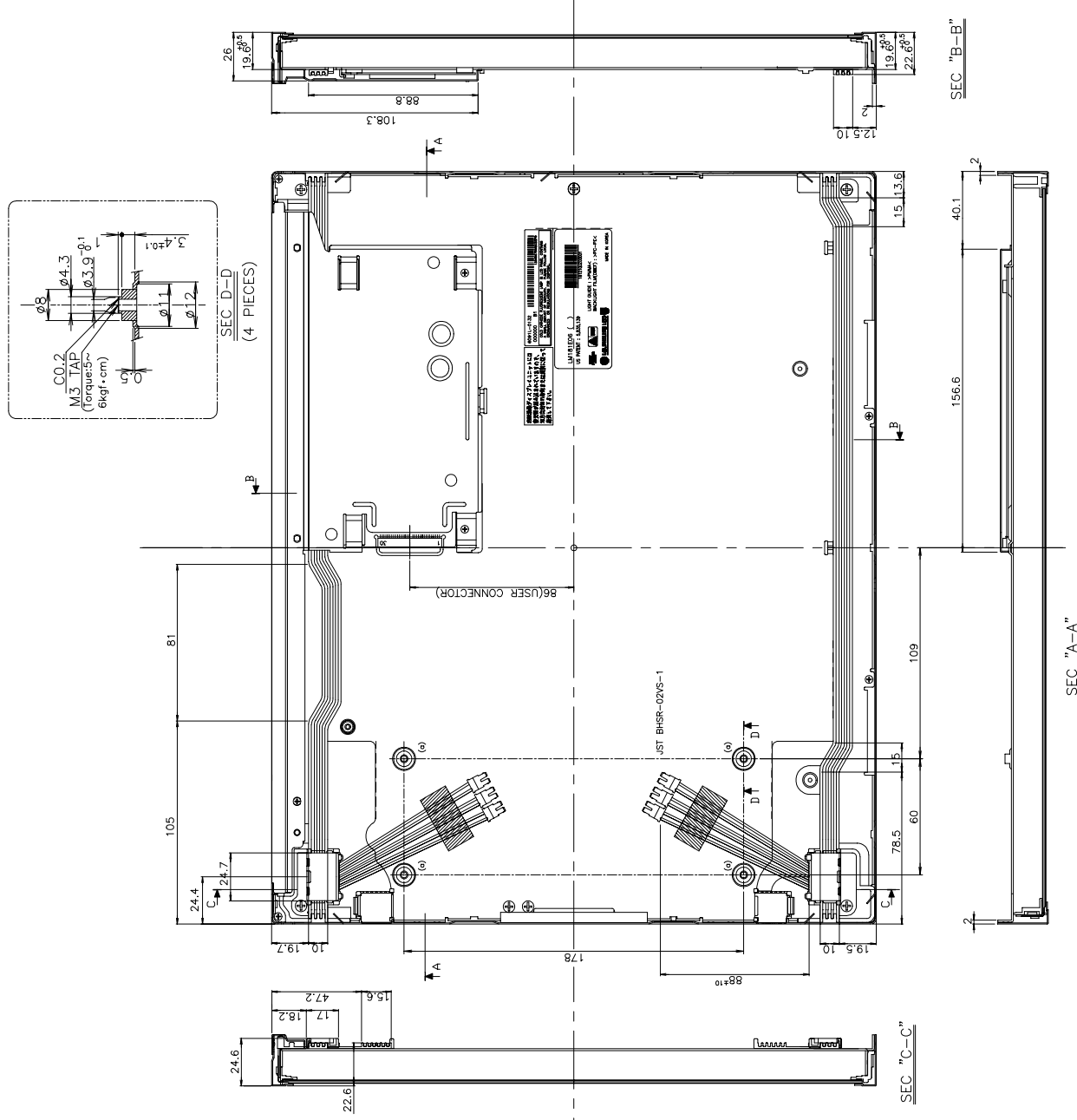
<FRONT VIEW>

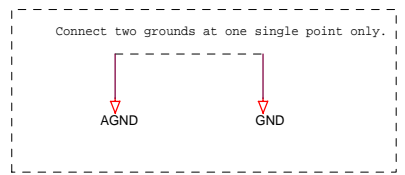
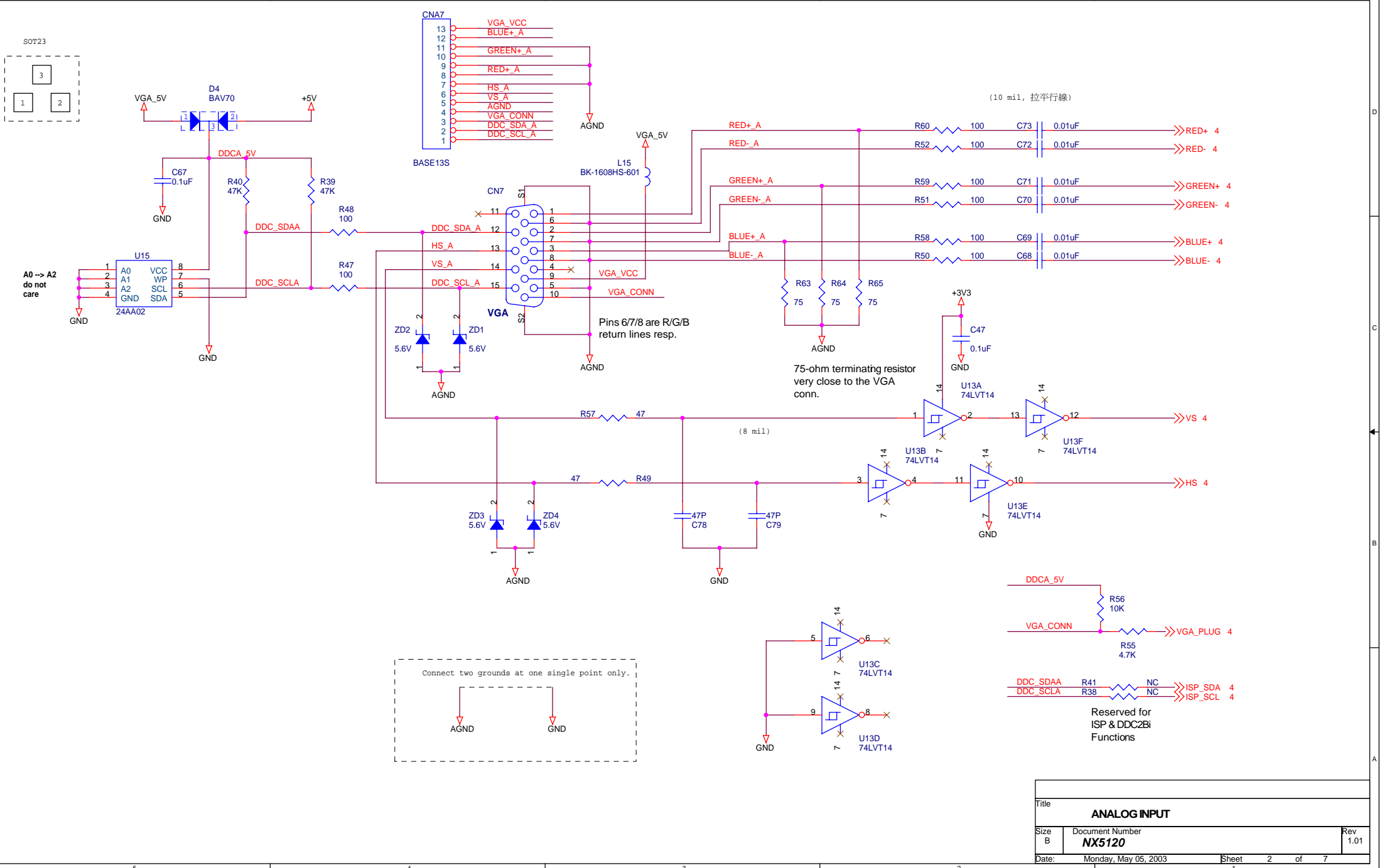
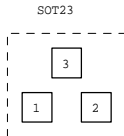


NOTE

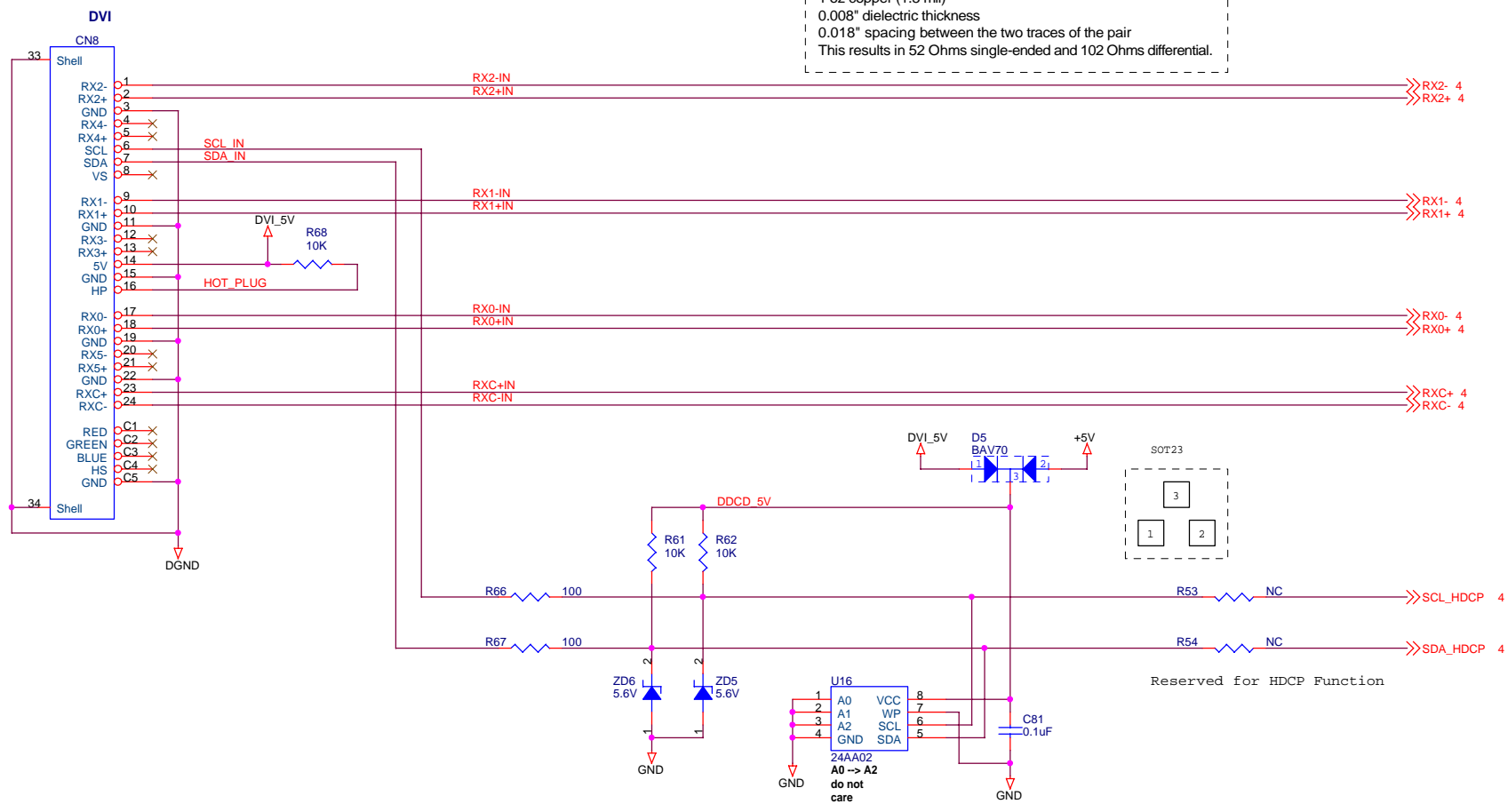
1. UNSPECIFIED TOLERANCE IS ± 0.5 mm
2. GAP BETWEEN TOP CASE AND GLASS IS $0.2^{+0.2}$
3. TILT AND A PARTIAL DISPOSITION TOLERANCE OF DISPLAY AREA ARE AS FOLLOW.
 - 1) X-DIRECTION : $| A-B | \leq 1$ mm
 - 1) Y-DIRECTION : $| C-D | \leq 1$ mm

<REAR VIEW>

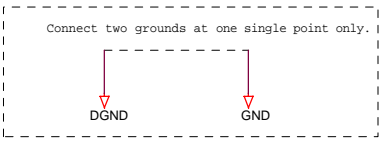




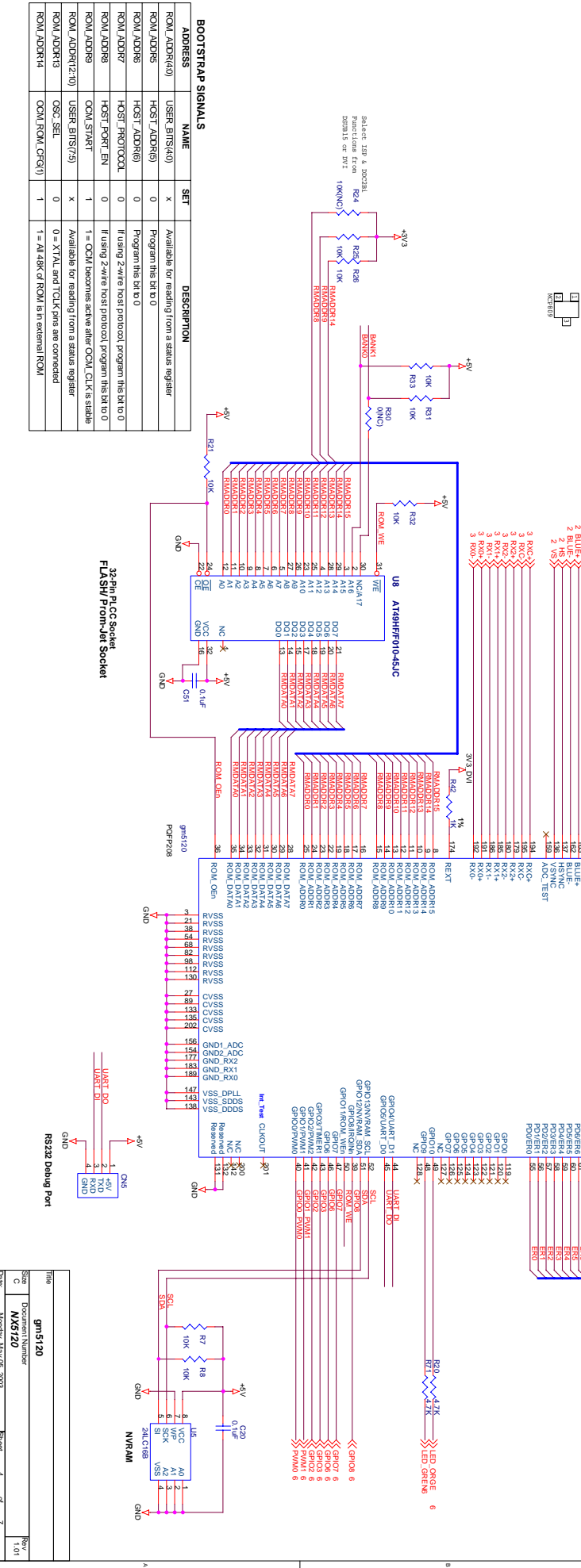
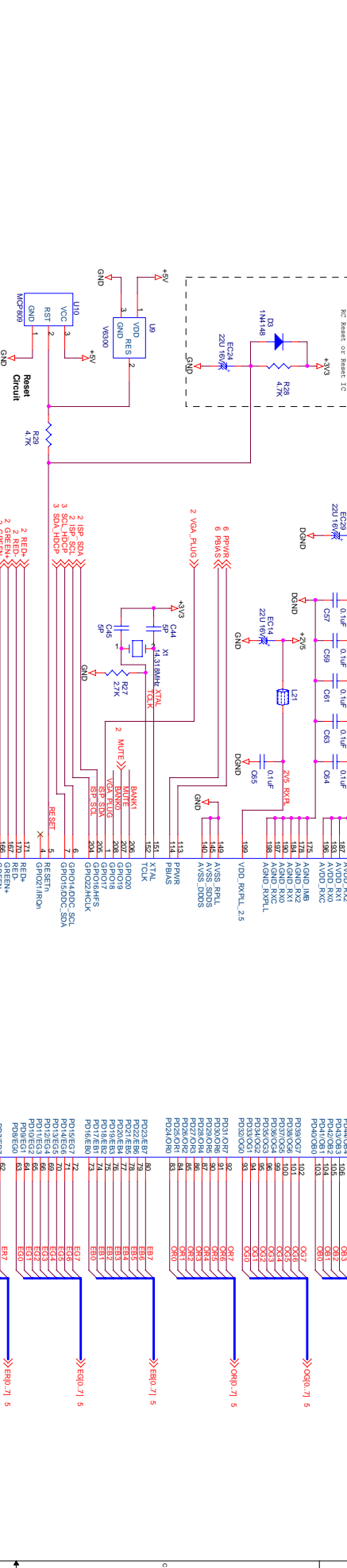
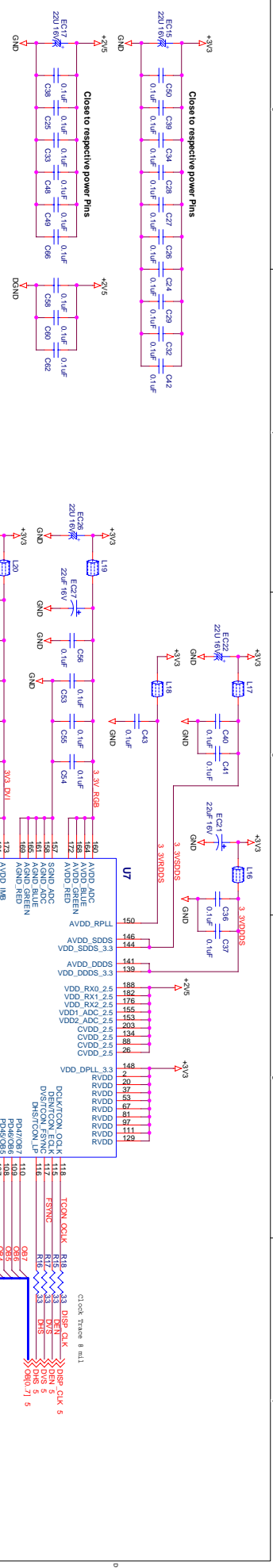
Title		
ANALOG INPUT		
Size	Document Number	Rev
B	NX5120	1.01
Date:	Monday, May 05, 2003	Sheet 2 of 7



For TMDS input trace:
 Relative Dielectric Constant (permittivity) 4.8
 0.012" wide trace width
 1 oz copper (1.5 mil)
 0.008" dielectric thickness
 0.018" spacing between the two traces of the pair
 This results in 52 Ohms single-ended and 102 Ohms differential.



Title		
DIGITAL INPUT		
Size	Document Number	Rev
B	NX5120	1.01
Date:	Monday, May 05, 2003	Sheet 3 of 7



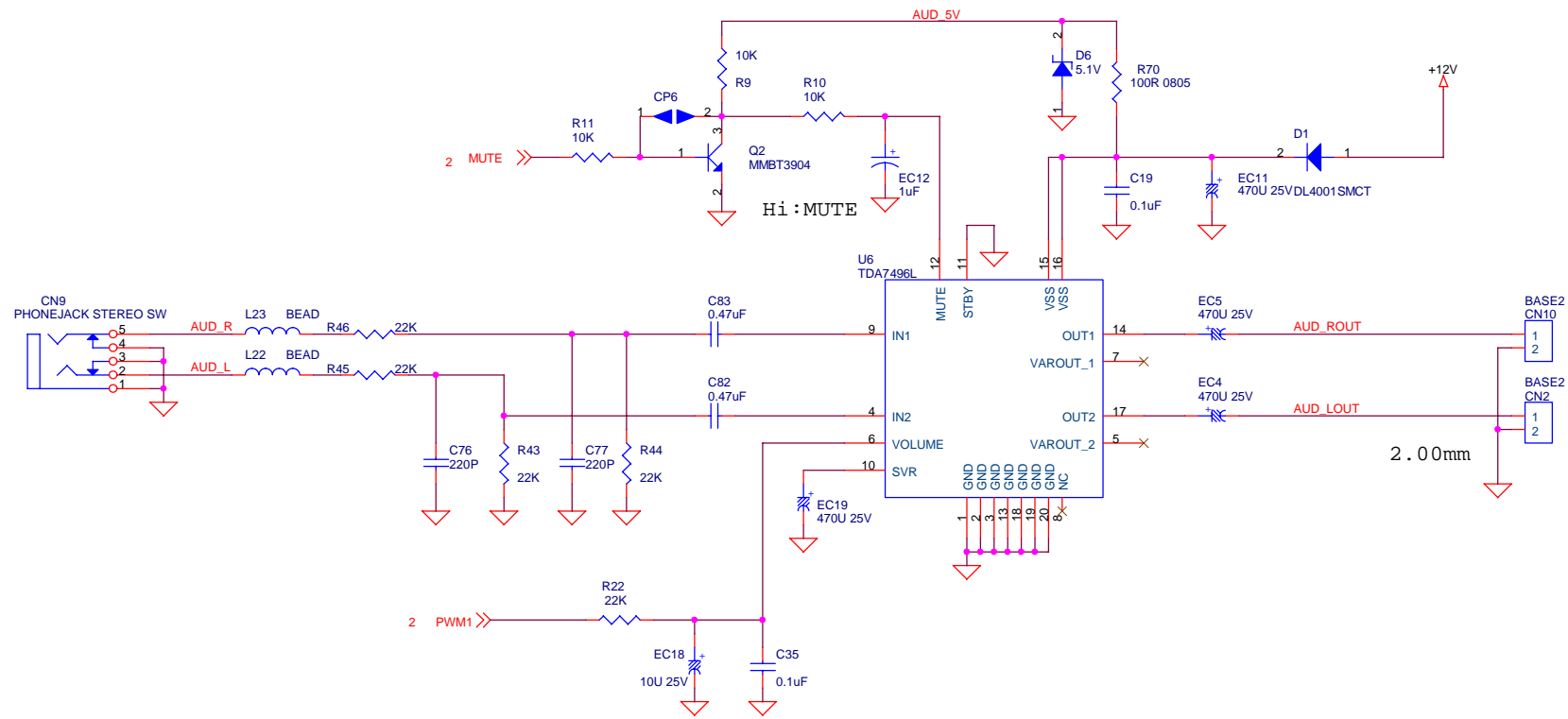
BOOTSTRAP SIGNALS

ADDRESS	NAME	SET	DESCRIPTION
ROM_ADDR(40)	USER_BRS(40)	x	Available for reading from a status register
ROM_ADDR5	HOST_ADDR(5)	0	Program this bit to 0
ROM_ADDR6	HOST_ADDR(6)	0	Program this bit to 0
ROM_ADDR7	HOST_PROT(0)	0	If using 2-wire host protocol program this bit to 0
ROM_ADDR8	HOST_PROT_EN	0	If using 2-wire host protocol program this bit to 0
ROM_ADDR9	OCM_START	1	1 = OCM becomes active after OCM_CLK is stable
ROM_ADDR(2:0)	USER_BRS(5)	x	Available for reading from a status register
ROM_ADDR13	OSC_SEL	0	0 = XTAL and CLK pins are connected
ROM_ADDR14	OCM_ROM_CFG(1)	1	1 = All 14K and 10K is external ROM

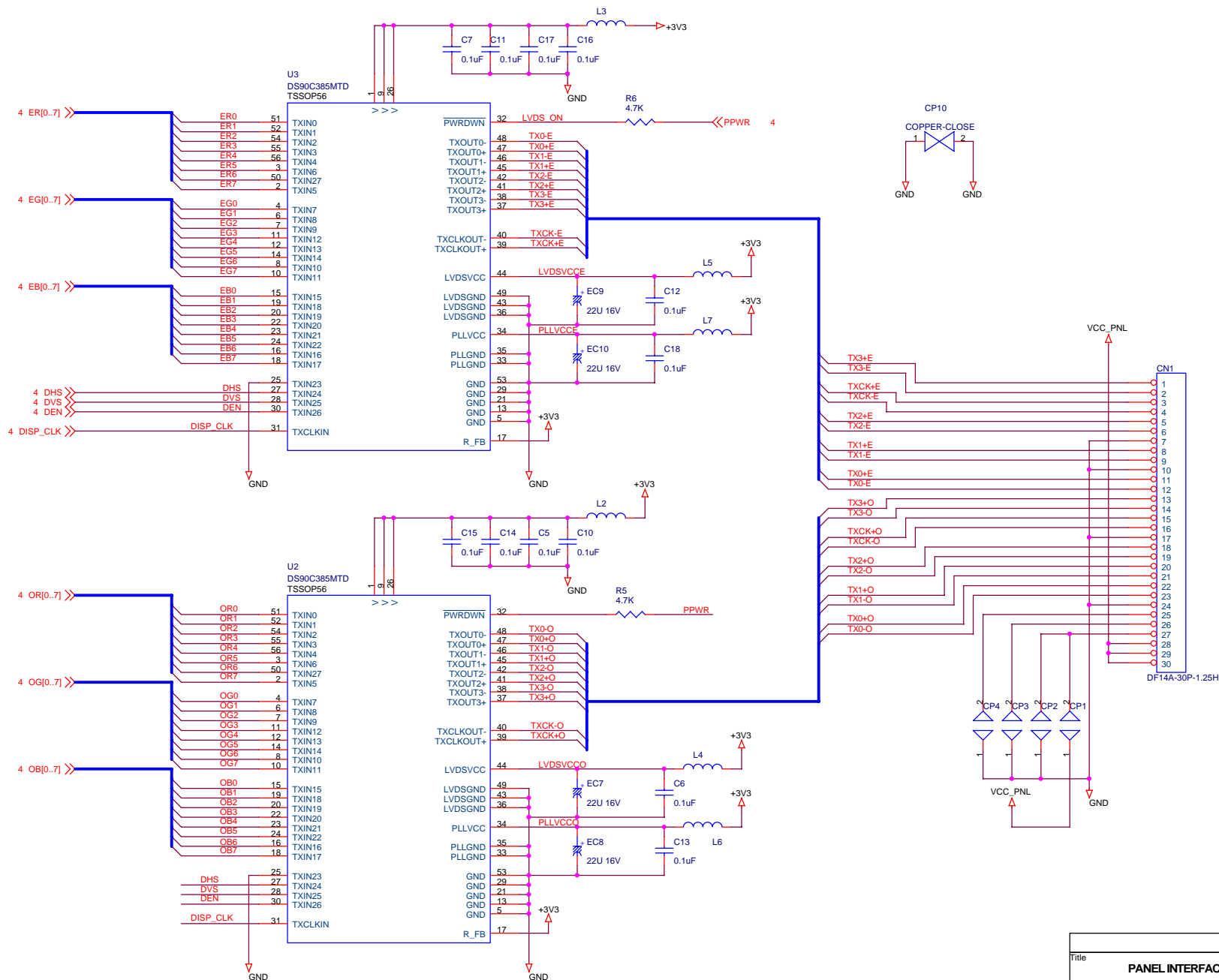
**32 Pin PLCC Socket
FLA/SH/Prom-Jet Socket**

RS232 Debug Port

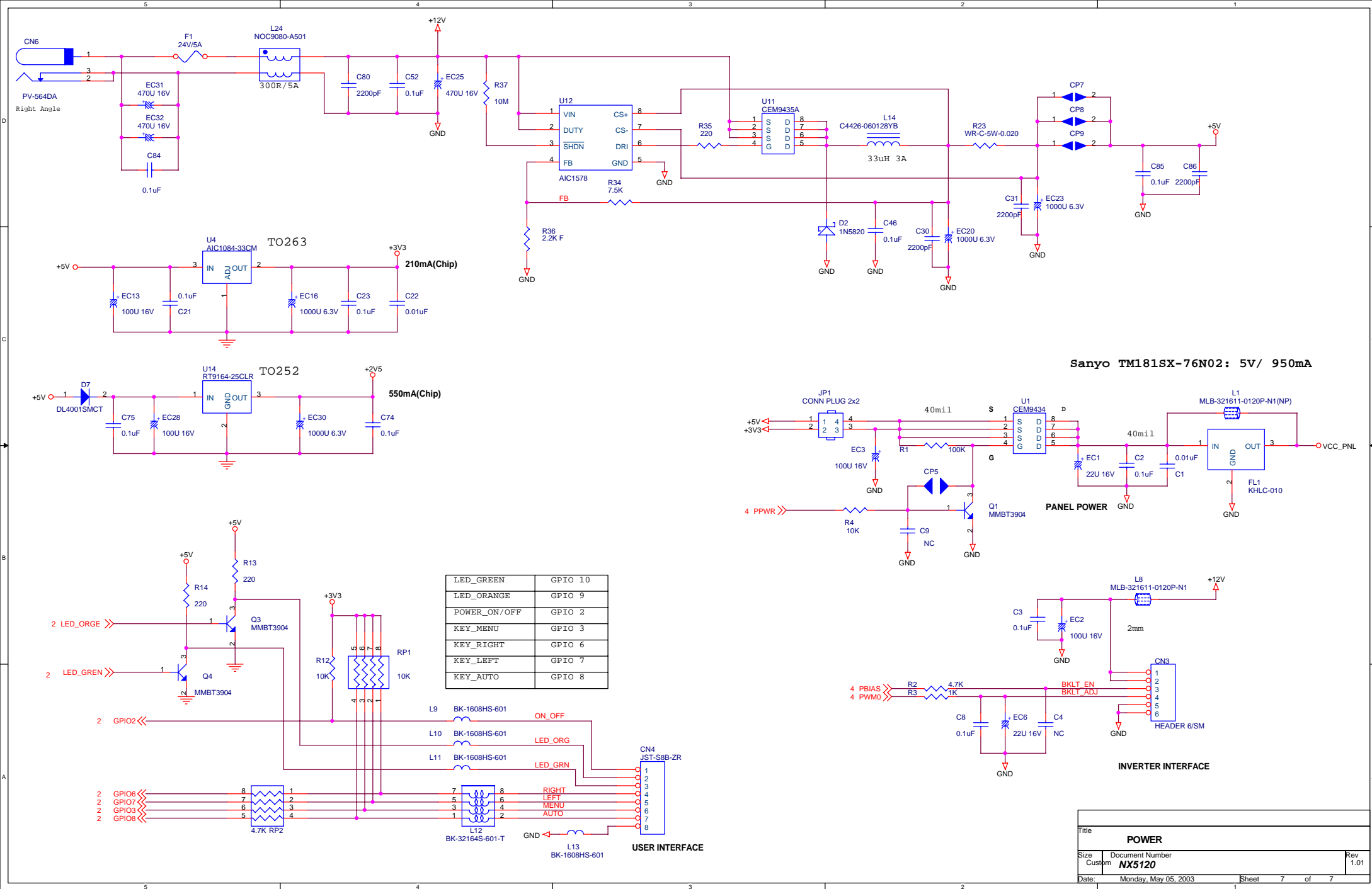
Title	Size	Document Number	Rev
gms120	C	MX5120	1.01



Title		
AUDIO AMP		
Size	Document Number	Rev
B	NX5120	1.01
Date:	Monday, May 05, 2003	Sheet 5 of 7



Title		
PANEL INTERFACE		
Size	Document Number	Rev
Custom	NX5120	1.01
Date:	Monday, May 05, 2003	Sheet 6 of 7



Sanyo TM181SX-76N02: 5V/ 950mA

Title		
POWER		
Size	Document Number	Rev
Custom	NX5120	1.01
Date:	Monday, May 05, 2003	Sheet 7 of 7