WORKING DRAFT

LCD backlight DC-DC step-up converter

VLED+
D1
L1 DLG-0403-4R7
+3V3

ZD1 BZX384-B30.115
C1 1u
C2 4u7
PGND
PGND

VLED- Vfb = 0.204 V

IC1
SW — VIN 5
FB — CTRL 4 — X0D11/LCD_BR
— GND 2 — PGND
TPS61169DCKR

R1 10R
R3 10R
PGND

PWM dimming signal frequency: 5 - 100 kHz

Estimated power consumption

Part function / name	+1V	+3.3V	+32V
LCD display	-	33 mA	20 mA
Touch controller AR1021-I/SS	-	17 mA	-
Hi-speed SR SN74VHC595 x 3	-	12 mA	-
SDRAM IS42S16400J	-	100 mA	-
I/O expander MCP23S17-E/SS	-	35 mA	-
MCU XE216-512-TQ128	700 mA	27 mA	-
Mux/Demux SN74CBTLV3257 x 2	-	4 mA	-
Audio amplifier TPA6205A1DGN	-	2 mA	-
Micro SD Card	-	30 mA	-
W5500 Ethernet module (optional)	-	150 mA	-
Riverdi 3.5" LCD (optional)	-	257 mA	-
Total	700 mA	667 mA	20 mA

DC power input

X1 FC68149
F1 SM050-16 (500mA)
Q1 IRLML2246TRPBF VIN
ZD3 P4SMAJ16A-DIO
ZD2
R2 0R
PGND

4.3" LCD 40-pin socket and resistive touchscreen controller

LCD1

VLED- R0
VLED+ R1
VDD R2
NC1 R3
GND-3 R4
GND-29 R5
  R6
  R7
  G0
  G1
  G2
RESET G3
CLK G4
DISP G5
HSYNC G6
VSYNC G7
DE/NC2 B0
  B1
  B2
XR B3
YD B4
XL B5
YU B6
  B7

PCA-6-LA-40-HL-3

R7 10K
RESET
LCD_CLK
LCD_HSYNC
LCD_VSYNC
LCD_DE

LCD display: RFE43BH-AIW-DNS
4.3", 480x272, resistive touch screen
Consumption: +3.3 V, max. 33 mA; +32 V, 20 mA

LCD_0 ... LCD_15
LCD_[0..15]

IC3

Q0/A — SER 14 — SPI0_MOSI
Q1/B — SRCLK 11 — SPI0_CLK
Q2/C — RCLK 12
Q3/D — SRCLR 10
Q4/E
Q5/F — OE 13
Q6/G
Q7/H — Q7/H 9
VCC — GND
74VHC595MTC
C6 100n
PGND

IC5

Q0/A — SER 14
Q1/B — SRCLK 11
Q2/C — RCLK 12 — SPI0_STROBE
Q3/D — SRCLR 10
Q4/E
Q5/F — OE 13
Q6/G
Q7/H — Q7/H 9
VCC — GND
74VHC595MTC
C10 100n
PGND

+3.3V DC-DC step-down converter

+3V3
L2 DLG-0403-2R2
C3 100n

IC2
VBST — VIN 6
SW — EN 5
VFB — GND 1
TPS561208DDCR

PWR_3V3 HSMY-C170
C5 EEEFK1C470UR
R4 34K
Vfb = 0.768 V
R5 180R
R6 10K
PGND
C4 EEEFK1V220R
PGND
PGND

+1V DC-DC step-down converter with sequencer

+1V0
L3 DLG-0403-2R2
C7 100n

IC4
VBST — VIN 3 — VIN
SW — EN 5 — 1V0_EN
VFB — GND 1
TPS561208DDCR

C9 EEEFK1C470UR
R8 5K1
Vfb = 0.768 V
R9 16K
PGND
C8 EEEFK1V220R
PGND

R10 47K
+3V3

IC6
MR — VDD
SENSE — RESET
GND — CT
TPS3808G33DBVR
C11 100n
PGND
t(delay) = 1.2 ms
C14 120p
PGND

IC7

WAKE — VDD 1
X+
Y-
X- — M1
Y+ — M2
SX+ — SCK/SCL/TX 14 — SPI1_CLK
SY- — SDI/SDA/RX 13 — SPI1_MOSI
5WSX- — SDO 9 — SPI1_MISO
SY+ — SS 8 — SPI0_TOUCH
VSS — SIQ
AR1021-I/SS
Consumption: +3.3 V, Typ. 17 mA

R11 20K
C12 100n
C13 1u
PGND
C15 10n
C16 10n
PGND

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More info at http://www.envox.hr/eez
Repository: https://github.com/eez-open

WLED boost, TFT display with touchscreen
Sequenced power supplies +3.3V and +1V

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SDRAM

SD_ADQ[0..15]

IC10

SD_ADQ0 23	A0	DQ0 2 SD_ADQ0
SD_ADQ1 24	A1	DQ1 4 SD_ADQ1
SD_ADQ2 25	A2	DQ2 5 SD_ADQ2
SD_ADQ3 26	A3	DQ3 7 SD_ADQ3
SD_ADQ4 29	A4	DQ4 8 SD_ADQ4
SD_ADQ5 30	A5	DQ5 10 SD_ADQ5
SD_ADQ6 31	A6	DQ6 11 SD_ADQ6
SD_ADQ7 32	A7	DQ7 13 SD_ADQ7
SD_ADQ8 33	A8	DQ8 42 SD_ADQ8
SD_ADQ9 34	A9	DQ9 44 SD_ADQ9
SD_ADQ10 22	A10/AP	DQ10 45 SD_ADQ10
SD_ADQ11 35	A11	DQ11 47 SD_ADQ11
SD_ADQ12 36	A12/NC-36	DQ12 48 SD_ADQ12
		DQ13 50 SD_ADQ13
SD_ADQ13 20	BA0	DQ14 51 SD_ADQ14
SD_ADQ14 21	BA1	DQ15 53 SD_ADQ15
40	NC-40	

VDDQ-3 3 +3V3
VDDQ-9 9
VDDQ-43 43
VDDQ-49 49

IC12A
SN74LVC1G02DBVR

UDQM 39
LDQM 15

VDD-1 1 +3V3
VDD-14 14
VDD-27 27

SD_RAS 18 RAS
SD_CAS 17 CAS
SD_WE 16 WE
19 CS

GND 41
GND-28 28
GND-54 54

R15 10K
PGND

GNDQ-6 6
GNDQ-12 12
GNDQ-46 46
GNDQ-52 52

SD_CLK 38 CLK
+3V3 37 CKE

R16 10K

IS42S16400J
Consumption: +3.3 V, up tp 110 mA

PGND

+3V3 +3V3

IC12B
VDD 5
C23 100n C24 100n C25 100n C26 100n C27 100n C28 100n C29 100n
VSS 3

PGND PGND

QSPI Flash memory

+3V3

VDD 8
IC9B
C19 100n
VSS 4
PGND

SSW-105-02-S-D
X2-2 X2-1
X2-4 X2-3
PGND

+3V3
IC9A
Q 5
PRE 4 D 2
CLK 3
Q 6 CLR 1
74AUP1G74DC.125

R13 10K
LATCH_OUT

IC11
X0D01/QS_CS	1A	1B1 2 SD_CAS
X0D10/QS_CLK 7	2A	1B2 3
		2B1 5 SD_WE
LATCH_IN 9	3A	2B2 6
		3B1 11 SD_RAS
	4A	3B2 10
		4B1 14
		4B2 13
QSPI_SEL 1	S	VCC 16 +3V3
15	OE	GND 8

SN74CBTLV3257
C21 100n
Consumption: +3.3 V, max. 2 mA
PGND

IC14
X0D04/QS_D0 4	1A	1B1 2
X0D05/QS_D1 7	2A	1B2 3
		2B1 5
X0D06/QS_D2 9	3A	2B2 6
		3B1 11 SD_ADQ2
X0D07/QS_D3 12	4A	3B2 10 SD_ADQ3
		4B1 14 SD_ADQ4
		4B2 13 SD_ADQ5
QSPI_SEL 1	S	VCC 16 +3V3
15	OE	GND 8

SN74CBTLV3257
C30 100n
PGND PGND

SD_ADQ[0..15]

R14 10K +3V3

X2-5
X2-6
X2-7
X2-8
X2-9
X2-10

IC13
QSPI_CS	1 CS	VCC 8 +3V3
QSPI_CLK	6 SCK	
QSPI_D0	5 SI/IO0	
QSPI_D1	2 SO/IO1	
QSPI_D2	3 WP/IO2	
QSPI_D3	7 HOLD/IO3	GND 4

C22 100n
AT25SF041-SSHDT
SPI speed: up to 104 MHz
PGND

Reset

+3V3 +3V3 Manual reset
SW1
C17 100n C18 10n 3 1
PGND PGND 4 2 5
1301.9316
PGND

R12 47K
RESET

IC8
6 VDD	MR 3
1 RESET	SENSE 5 +1V0
4 CT	GND 2

TPS3808G09DBVR
C20 120p
t(delay) = 1.2 ms
PGND PGND

SPI boot select / slave connector

X0D00/LATCH X3-1
LATCH_IN X3-2
X0D11/LCD_BR X3-3
+3V3 R17 3K3 X3-4
X0D05/QS_D1 X3-5
X0D10/QS_CLK X3-6
X3-7
X3-8
PGND TSW-104-02-S-D_NN

Pin	S=0 A -> B1	S=1 A -> B2
X0D00	SD_RAS	LATCH
X0D01	SD_CAS	QSPI_CS
X0D04	SD_ADQ2	QSPI_D0
X0D05	SD_ADQ3	QSPI_D1
X0D06	SD_ADQ4	QSPI_D2
X0D07	SD_ADQ5	QSPI_D3
X0D10	SD_WE	QSPI_CLK

	X2
Int.	1 - 2
Ext.	3 - 4

Boot mode	X3
QSPI	1 - 2
Slave SPI	3 - 4

SDRAM, QSPI lines muxing and flash, Reset

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What is a function of USB_ID pin? Does it set e.g. internally bus resistors?

IC15 — TPS2051BDBVR
IC18USB — XE216-512-TQ128-C20
43R2 should be connected as close as possible to the device

FB1 — 60R@100MHz
FB2 — 60R@100MHz
J1 — 678038020 — Mini USB 2.0 Type AB

R19 47K
R67 0R ???
R18 4K7
R21 47K
R22 43R2
R20 47K
C31 100n
C32 2u2
C33 100n
IC16 — TPD2E001DZDR

+5V for USB hosting
IC17 — TPS561208DDCR
C34 100n
L4 — DLG-0403-2R2
C40 — EEEFK1V220R
R23 56K
R24 10K
C41 — EEEFK1C470UR
Vfb = 0.768 V

XO1 — CFPS-73-24M
IC19 — TPD4E001DRLR
IC20 — TPD4E001DRLR
IC21B
IC21A — 74LVC1G07SE-7
C51 100n
R25 33R
R26 47K
R29 33R
R30 33R
IC18-SYSTEM — XE216-512-TQ128-C20
X5 — ZL231-20KG — XSYS connector
RESET

IC18-POWER — XE216-512-TQ128-C20

POWER

OTP_VCC 105
USB_VDD33 44
VDDIOL-6 6
VDDIOL-14 14
VDDIOL-19 19
VDDIOL-29 29
VDDIOL-42 42
VDDIOR-52 52
VDDIOR-67 67
VDDIOR-78 78
VDDIOR-83 83
VDDIOR-92 92
VDDIOT-110 110
VDDIOT-111 111
USB_VDD 49
VDD-11 11
VDD-16 16
VDD-17 17
VDD-24 24
VDD-36 36
VDD-41 41
VDD-56 56
VDD-60 60
VDD-73 73
VDD-80 80
VDD-81 81
VDD-87 87
VDD-101 101
VDD-102 102
VDD-120 120
VDD-126 126
PLL_AVDD 103
PLL_AGND 104
NC-50 50
NC-65 65
VSS PAD

C35 100n, C36 100n, C37 100n, C38 100n, C39 100n
C42 100n, C43 100n, C44 100n, C45 100n
C46 100n, C47 100n, C48 100n, C49 100n, C50 100n
C52 100n, C53 100n, C54 100n, C55 100n
C56 10u
C57 100n
R31 4R7

RC filter (especially the capacitor) is placed close to the PLL_AVDD pin

IC18-TILE0 — XE216-512-TQ128-C20 — TILE 0
TSW-103-07-F-D

X0D00 30 — X0D00/LATCH
X0D01 27 — X0D01/QS_CS
X0D02 37 — SD_ADQ0
X0D03 38 — SD_ADQ1
X0D04 31 — X0D04/QS_D0
X0D05 33 — X0D05/QS_D1
X0D06 34 — X0D06/QS_D2
X0D07 35 — X0D07/QS_D3
X0D08 39 — SD_ADQ6
X0D09 40 — SD_ADQ7
X0D10 28 — X0D10/QS_CLK
X0D11 32 — X0D11/LCD_BR
X0D12 62 — AUDIO_OUT
X0D13 63 — SD_CLK
X0D14 57 — SD_ADQ8
X0D15 58 — SD_ADQ9
X0D16 68 — SD_ADQ10
X0D17 69 — SD_ADQ11
X0D18 70 — SD_ADQ12
X0D19 71 — SD_ADQ13
X0D20 59 — SD_ADQ14
X0D21 61 — SD_ADQ15
X0D22 64 — LCD_VSYNC
X0D23 66 — LCD_DE
X0D24 88 — LCD_CLK
X0D25 89 — LCD_HSYNC
X0D26 93 — SPI0_MOSI
X0D27 94 — SPI1_CLK
X0D28 96 — SPI2_CLK
X0D29 98 — SPI2_MOSI
X0D30 99 — SPI1_MOSI
X0D31 100 — SPI0_CLK
X0D32 95 — SPI0_STROBE
X0D33 97 — SPI1_SELECT
X0D34 92 — SPI2_SELECT
X0D35 91 — SPI1_MISO
X0D36 3 — SPI2_MISO
X0D37 5 — SPI0_TOUCH
X0D38 4 — GPIO38
X0D39 7 — GPIO39
X0D40 8 — XL_DN1
X0D41 9 — XL_DN0
X0D42 10 — R27 33R — XL_UP0
X0D43 12 — R28 33R — XL_UP1

SD_ADQ[0..15]

X4-1, X4-2, X4-3, X4-4, X4-5 +3V3, X4-6 +5V

IC18-SYSTEM signals:
CLK 125
RST_N 124
TCK 128
TMS 127
TDI 1
TDO 126
TRST_N 123
R29 33R TMS
R30 33R TCK

XL_UP1, XL_UP0, XL_DN0, XL_DN1

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MCU Power, USB, Tile 0 and System section

MCU Tile1 & Ethernet PHY

Audio amplifier

IC18-TILE1

X1D00 85
X1D01 86
X1D02 72
X1D03 74
X1D04 75
X1D05 76
X1D06 77
X1D07 79
X1D08 82
X1D09 84
X1D10 121 ETH_MDIO
X1D11 122 ETH_MDC

X1D14 51
X1D15 53
X1D16 22
X1D17 23
X1D18 25
X1D19 26
X1D20 54
X1D21 55

TILE 1

X1D26 112
X1D27 113 ETH_TX_CTL
X1D28 114 ETH_RX_CLK
X1D29 115 ETH_RX_CTL
X1D30 116 ETH_RX0
X1D31 117 ETH_RX1
X1D32 118 ETH_RX2
X1D33 119 ETH_RX3

X1D35 13 SPI_INT
X1D36 15 ETH_RX_ER
X1D37 18 ETH_RST
X1D38 20
X1D39 21
X1D40 106 ETH_TX3
X1D41 107 ETH_TX2
X1D42 108 ETH_TX1
X1D43 109 ETH_TX0

XE216-512-TQ128-C20

R42 22R ETH_TX_CLK

XO2
OUT VDD
GND EN
CFPS-73-25M
+3V3

R39 33R
PGND

IC22A
74LVC1G07SE-7
AUDIO_OUT 2 4

R33 1K   R34 1K

C60 4n7   C61 4n7
PGND

+3V3
VDD 5
IC22B
C63 100n
VSS 3
PGND

C58 1u
+3V3
PGND
C59 470n   R35 10K
C62 470n   R36 10K
AUDIO_SHDN

R37 47K   C64 220n
PGND

R32 20K
22-23-2021
X6-1
X6-2

IC23
VDD 6
IN+ 3
IN- 4
SHDN 1
BYPASS 2
GND 7
TP
TP
VO- 8
VO+ 5

SP1
LD-BZEN-0803

TPA6205A1DGN

R38 20K

Consumption: +3.3 V, max. 2 mA

IC24

MDIO 30
MDC 31
X1 34
X2 33

TX_CLK 1
TX_EN 2
RX_CLK 38
MII_MODE(RX_DV) 39

AN_EN(LED_ACT/COL) 26 LED_ACT
AN_1(LED_SPEED) 27 LED_SPEED
AN_0(LED_LINK) 28 LED_LINK

PHYAD0(COL) 42
MDIX_EN(RX_ER) 41
RESET_N 29
CRS/CRS_DV/LED_CFG 40

PHYAD1(RXD1_0) 43
PHYAD2(RXD1_1) 44
PHYAD3(RXD1_2) 45
PHYAD4(RXD1_3) 46

TXD_0 3
TXD_1 4
TXD_2 5
TXD_3/SNI_MODE 6

TD+ 17
TD- 16
RD+ 14
RD- 13

CLK_OUT 25

RBIAS 24
PFBOUT 23
PFBIN1 18
PFBIN2 37
RESERVED-20 20
RESERVED-21 21

TRST 11
TMS 10
TDO 9
TDI 12
TCK 8

IOGND-35 35
IOGND-47 47
AGND-15 15
AGND-19 19
DGND 36
GND PAD

PWR_DOWN/INT 7
AVDD33 22
IOVDD33-32 32
IOVDD33-48 48

DP83848CVV/NOPB
Consumption: +3.3 V, typ. 92 mA

+3V3 +3V3(A) +3V3 +3V3
FB3
60R@100MHz
C73 100n
C74 100n   C75 100n
PGND

R40 49R9
+3V3(A)
C65 100n   R41 49R9
PGND   PGND
C66 100n
PGND

SPEED
HSMY-C170
R43 2K2
R45 180R
R46 2K2
R48 2K2
R49 180R
R50 180R

R44 49R9
+3V3
C67 100n
R47 49R9
PGND

+3V3(A)
C68 100n
PGND

X7
1 TX+
2 TX-
3 RX+
6 RX-

75R 75R   75R
1 nF   75R

4
5
7
8

R51 2K2   R52 2K2
C69 100n   C70 100n
C71 10u   C72 100n
Tant.
PGND

R53 4K87

+3V3
4*4
PGND
12
11
9
10

Right LED (Yellow)
Left LED (Green)

LMJTAB881243M-L

MCU Tile 1, Ethernet PHY, Audio amplifier

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SPI#1 Chip select demultiplexer

IC26

SER	14	Q0/A	15	SPI1_RTC
SRCLK	11	Q1/B	1	SPI1_IOEXP
RCLK	12	Q2/C	2	SPI1_W5500
SRCLR	10	Q3/D	3	SPI1_SDCARD

SPI1_MOSI
SPI1_CLK
SPI1_SELECT
+3V3

Q4/E 4 SPI1_EEPROM
Q5/F 5 RIVERDI_PD
Q6/G 6 AUDIO_SHDN
Q7/H 7 VBUS_EN

OE 13
Q7/H 9
GND 8 VCC 16 +3V3

C80 100n

74VHC595MTC
PGND PGND

EEPROM

IC25

SPI1_EEPROM	1	CS	VCC	8	+3V3
SPI1_CLK	6	SCK			
SPI1_MOSI	5	SI	WP	3	
SPI1_MISO	2	SO	HOLD	7	
			GND	4	

C76 100n

M95256-WMN6P
SPI_MODE0 SPI speed: 5 MHz
PGND

Micro SD card socket

J2

+3V3
C77 10u

SPI1_SDCARD	1	DAT2	SH	
SPI1_MOSI	2	CD/DAT3		
	3	CMD		GND
SPI1_CLK	4	VDD		
		CLK		
	5	VSS		
SPI1_MISO	6	DAT0		
	7	DAT1		
	8			

SD_DETECT

5033981892

GND

Consumption: +3.3 V, up tp 30 mA
GND

Real time clock with supercapacitor backup

+3V3
D2 BAS316
C78 100n
GND
R54 180R
C79

IC27

SPI1_RTC	6	CE	VDD	14
SPI1_CLK	10	SCL		
SPI1_MOSI	9	SDI	OSCI	1
SPI1_MISO	8	SDO		
RTC_INT	5	INT	OSCO	2
			CLKOUT	13
			VSS	7

Y1 XTAL016178-85SMX
EECS0HD334H

PCA21125T/Q900/1,1
SPI_MODE0
SPI speed: 4 MHz @ 2.7 V
Consumption: +3.3 V, 0.5 mA; backup current: typ. 0.55 µA
PGND PGND

LED1 HSMY-C170 R55 470R
LED2 HSMY-C170 R56 470R
LED3 HSMY-C170 R57 470R
PGND

R58 470R X8-1
R59 470R X8-2 X8-3 X8-4
R60 470R X8-5 X8-6

SSW-107-02-S-D

ZD4 ZD5 ZD6
P4SMAJ5.0A-DIO
PGND

I/O expander and interrupts collector

IC28

RESET	18	RESET	GPA0	21	IOEXP_LED1
SPI1_MOSI	13	SI	GPA1	22	IOEXP_LED2
SPI1_MISO	14	SO	GPA2	23	IPEXP_LED3
SPI1_CLK	12	SCK	GPA3	24	IOEXP_DINP1
SPI1_IOEXP	11	CS	GPA4	25	IOEXP_DINP2
			GPA5	26	IOEXP_DINP3
	15	A0	GPA6	27	IOEXP_OCO1
	16	A1	GPA7	28	IOEXP_OCO2
	17	A2			
			GPB0	1	IOEXP_OCI1
SPI_INT	20	INTA	GPB1	2	IOEXP_OCI2
	19	INTB	GPB2	3	RTC_INT
+3V3	9	VDD	GPB3	4	W5500_INT
			GPB4	5	RIVERDI_INT
C81 100n			GPB5	6	SD_DETECT
	10	VSS	GPB6	7	USB_OC
			GPB7	8	USB_ID

PGND

MCP23S17-E/SS
SPI_MODE0
SPI speed: max. 10 MHz
Consumption: +3.3 V, up to 35 mA

R61 220R OK1A 8 X8-10 Vce(max) = 16 V
ZD7 P4SMAJ16A-DIO X8-9
OK1B MOCD217M
R62 220R
ZD8 P4SMAJ16A-DIO X8-8 X8-7
OK2A MOCD217M
D3 BAS316 R63 470R X8-12 5 V logic level
X8-11
OK2B
D4 BAS316 R64 470R X8-14
MOCD217M X8-13

R65 1K R66 1K
+3V3 PGND

W5500 Ethernet module (optional)

MOD1 ZL262-10DG

SPI1_MISO	2	MISO	
SPI1_MOSI	3	MOSI	
SPI1_W5500	4	SCS	
SPI1_CLK		SCLK	
W5500_INT	9	INT	
ETH_RST	8	RST	
	6	5V0	
+3V3	1	3V3	
	7	GND	

W5500 Ethernet module
SPI_MODE0
Consumption: +3.3 V, 150 mA
PGND

Riverdi LCD 20-pin connector (optional)

PCA-6G-20-HL-3 or 52746-2071

+3V3
X9-1
X9-17
X9-18
X9-2
X9-19
X9-20
X9-9
PGND

SPI2_CLK	X9-3
SPI2_MISO	X9-4
SPI2_MOSI	X9-5
SPI2_SELECT	X9-6
RIVERDI_INT	X9-7
RIVERDI_PD	X9-8
AUDIO_OUT	X9-10

SPI_MODE0
SPI speed: up to 30 MHz
Consumption: +3.3 V, max. 257 mA

TITLE: EEZ XMOS eval r1B4
SPI0 CS demux, EEPROM, Micro SD card, RTC
I/O Expander, W5500 Ethernet, Riverdi LCD

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