Sheet: ABE Power and I/O

ABE Power Supply, I/O, LED and Driver

File: AbePower.sch

Sheet: ABE MCU

ABE MSP430 MCU

File: AbeMicrocontroller.sch

Sheet: ABE VFD Display

ABE VFD and Filament Driver

File: AbeVfdDisplay.sch

Sheet: ABE Keypad

Keypad Matrix

File: AbeKeypad.sch

+3.3V

D?
BAV99

D?
BAV99

D?
BAV99

D?
BAV99

C?
0.1u

DCOM

FpSerialData

VfdLatch

VfdBlank

FpSerialClock

+40V

RP211C
10k

RP211B
10k

RP211A
10k

Q?
Q_PNP_BCE

+40V

D?
BAV99

DCOM

+3.3V

U?
AbeVfd

ABE
VFD
34980-89301

FilDriveA

F1
F1
F1

CLK
DI
STB
BLK
DO

FpSerialData
FpSerialClock
VfdLatch
VfdBlank

FilDriveB

F2
F2
F2

Q?
Q_NMOS_GDS

TurnOn40V

RP211D
10k

DCOM

Vdd1

Vdd2

Vss Vss

DCOM

FilDriveA

+12V

D?
BAV99

C?
0.1u

D?
BAV99

FilLogicA
FilLogicB

IN1
IN2

VM

OUT1

OUT2

DCOM

FilDriveB

+12V

C?
10u

C?
0.1u

DCOM

VREF

GND

ISEN

D_Small

D?

C?
0.1u

U?
DRV8870DDA

DCOM

Bulk and bypass capacitor for DRV8870

TP?
TestPoint

TP?
TestPoint

TP?
TestPoint

DCOM

DCOM

DCOM

Sheet: /ABE VFD Display/
File: AbeVfdDisplay.sch

Title:

Size: A4   Date:
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Rev:

Id: 2/5

FB? 100 +5V

5vFp — PWR_FLAG

FB? 100 +40V

40vFp

C? 0.068u

DCOM

FB? 100

12vFp

R? 1.21
R? 1.21
R? 1.21

R? 1.21
C? 47u
R? 1.21
C? 47u
R? 1.21
C? 47u

+12V

DCOM DCOM DCOM

J?
Conn_02x12_Odd_Even_MountingPin

1	2
3	4
5	6
7	8
9	10
11	12
13	14
15	16
17	18
19	20
21	22
23	24

knob1Fp — 13
DCOM — 15
DCOM — 17
5vFp — 19
serialToFp — 21
serialFromFp — 23

12 — knob2Fp
14 — 12vFp
16 — 40vFp
18 — stbyFp
20 — rstFp
22 — stbyFp
24 — srqFp

MP

SW?
SW_DIP_x01

stbyFp — 1   2 — Zap

FB?
Ferrite_Bead_Small

DCOM   Zap

U?
MC33269D-3.3

+12V

1 GND/ADJ   NC 8
2 VOUT   VOUT 7
3 VOUT   VOUT 6
4 VIN   NC 5

R? 1   +3.3V

C? 10u C? 0.1u C? 0.1u

C? 10u C? 10u

DCOM

U?
SN74ACT14D

+5V

C? 0.1u

DCOM

RP104C 150

knob1 — 1 1A
2 1Y
Beeper — 3 2A
BeeperOut — 4 2Y
FP_SRQ* — 5 3A
srqFp — 6 3Y
7 GND

150 RP104B

DCOM

VCC 14 — +5V
6A 13 — TXD
6Y 12 — FP_TXD
5A 11 — FP_TXD
5Y 10
4A 9 — knob2
4Y 8

RP?A 150
serialFromFp

RP?C 150
knob1Fp

U?
TLC59284DBQ

+3.3V C? 0.1u

DCOM
R? 2.7k

LED_SDA
LED_SCLK
LED_LAT

1 GND   VCC 24
2 SIN   IREF 23
3 SCLK   SOUT 22
4 LAT   BLANK 21 — LED_BLANK
5 OUT0   OUT15 20 — LED15
6 OUT1   OUT14 19 — LED14
7 OUT2   OUT13 18 — LED13
8 OUT3   OUT12 17 — LED12
9 OUT4   OUT11 16 — LED11
10 OUT5   OUT10 15 — LED10
11 OUT6   OUT9 14 — LED9
12 OUT7   OUT8 13 — LED8

LED0 — 5
LED1 — 6
LED2 — 7
LED3 — 8
LED4 — 9
LED5 — 10
LED6 — 11
LED7 — 12

DCOM

DCOM

+5V

C? 10u

DCOM

store/recall Sequence Utility Module DMM View Channel Advanced Scan Alarm DMM ExitMenu Channel Read Scan Enter

D? LED_ALT (×16)

LED0 LED1 LED2 LED3 LED4 LED5 LED6 LED7

LED8 LED9 LED10 LED11 LED12 LED13 LED14 LED15

Zap

H? MountingHole_Pad (multiple)

Zap

Pull-up resistors

- +3.3V — 150 RP111B — FP_SRQ*
- +3.3V — R? 10k — LED_SDA
- +3.3V — R? 10k — LED_SCLK

Bypass/Decoupling Cap
Place near to DVCC

- +3.3V — C? 10u — C? 0.1u — DCOM

U?
MSP430FR2475TRHAR

Pin	Signal
1	DVCC
25	VREG
10	P1-0_UCB0STE_TA0CLK_A0_VEREF+
11	P1-1_UCB0CLK_TA0-1_COMP0-0_A1
12	P1-2_UCB0SIMO_UCB0SDA_TA0-2_A2_VEREF-
13	P1-3_UCB0SOMI_UCB0SCL_MCLK_A3
4	P1-4_UCA0TXD_UCA0SIMO_TA1-2_TCK_A4_VREF+
5	P1-5_UCA0RXD_UCA0SOMI_TA1-1_TMS_A5
6	P1-6_UCA0CLK_TA1CLK_TDI_TCLK_A6
7	P1-7_UCA0STE_SMCLK_TDO_A7
17	P3-0_TA2-2_CAP0-0
21	P3-1_UCA1STE_CAP1-0
32	P3-2_UCB1SIMO_UCB1SDA_CAP3-2
18	P3-3_TA2-1_CAP0-1
20	P3-4_TA2CLK_COMP0OUT_CAP0-3
31	P3-5_UCB1CLK_TB0TRG_CAP3-1
33	P3-6_UCB1SOMI_UCB1SCL_CAP3-3
26	P3-7_TA3-2_CAP2-0
35	P5-0_UCA0CLK_TB0-2
36	P5-1_UCA0RXD_UCA0SOMI_TB0-3
37	P5-2_UCA0TXD_UCA0SIMO_TB0-4

Signal	Pin
P2-0_XOUT	38
P2-1_XIN	39
P2-2_SYNC_ACLK_COMP0-1	14
P2-3_TA2-0_CAP0-2	19
P2-4_UCA1CLK_CAP1-1	22
P2-5_UCA1RXD_UCA1SOMI_CAP1-2	23
P2-6_UCA1TXD_UCA1SIMO_CAP1-3	24
P2-7_UCB1STE_CAP3-0	30
P4-0_TA3-1_CAP2-1	27
P4-1_TA3-0_CAP2-2	28
P4-2_TA3CLK_CAP2-3	29
P4-3_UCB1SOMI_UCB1SCL_TB0-5_A8	8
P4-4_UCB1SIMO_UCB1SDA_TB0-6_A9	9
P4-5_UCB0SOMI_UCB0SCL_TA3-2	15
P4-6_UCB0SIMO_UCB0SDA_TA3-1	16
P4-7_UCA0STE_TB0-1	34
RST_NMI_SBWTDIO_N	2
TEST_SBWTCK	3
DVSS	40
PAD	41

Labels (left): LED_LAT, LED_SDA, LED_SCLK, TXD, serialToFp, FP_SRQ*, KeyCol1, KeyRow0, FpSerialData, KeyCol2, KeyCol4, FpSerialClk, KeyRow4, FilLogicB, VfdLatch, VfdBlank

Labels (right): KeyCol3, KeyRow1, KeyRow2, KeyRow3, TurnOn40V, KeyRow5, KeyRow6, KeyRow7, KeyCol0, FilLogicA, rstFp*

Resistors: RP104A 150, RP118B 150, RP116A 150, RP?A 150, RP?A 150, RP111D 150, RP105A 150, R? 100k

C? 0.1u — DCOM

J? Conn_01x04 (pins 1,2,3,4)

+3.3V, DCOM

KeyRow0
KeyRow1
KeyRow2
KeyRow3
KeyRow4
KeyRow5
KeyRow6
KeyRow7

RP107A 150
RP107B 150
RP107C 150
RP107D 150
RP106A 150
RP106B 150
RP106C 150
RP106D 150

KeyCol0

| S101 SW_DIP_x02 | S102 SW_DIP_x02 | S103 SW_DIP_x02 | S104 SW_DIP_x02 | S105 SW_DIP_x02 | S106 SW_DIP_x02 | S107 SW_DIP_x01 | S108 SW_DIP_x01 |
| store/recall | DMM | DMM | Sequence | Advanced | not used | Right Arrow | Left Arrow |

KeyCol1

| S109 SW_DIP_x02 | S110 SW_DIP_x02 | S111 SW_DIP_x02 | S112 SW_DIP_x02 | S113 SW_DIP_x02 | S114 SW_DIP_x01 | S? SW_DIP_x02 | S? SW_DIP_x02 |
| Utility | Channel | Channel | Module | Alarm | +/− | Cancel | Exp |

KeyCol2

| S118 SW_DIP_x02 | S119 SW_DIP_x02 | S120 SW_DIP_x02 | S121 SW_DIP_x02 | S122 SW_DIP_x01 | S123 SW_DIP_x01 | S124 SW_DIP_x01 |
| Scan | Scan | View | ExitMenu | Number 3 | Number 6 | Number 9 |

KeyCol3

| S126 SW_DIP_x02 | S127 SW_DIP_x02 | S128 SW_DIP_x02 | S129 SW_DIP_x01 | S130 SW_DIP_x01 | S131 SW_DIP_x01 | S132 SW_DIP_x01 |
| Open | Read | Start | dot | Number 2 | Number 5 | Number 8 |

KeyCol4

| S133 SW_DIP_x02 | S134 SW_DIP_x02 | S135 SW_DIP_x02 | SW136 SW_DIP_x02 | S137 SW_DIP_x01 | S138 SW_DIP_x01 | S139 SW_DIP_x01 | S140 SW_DIP_x01 |
| Enter | Close | Write | Stop | Number 0 | Number 1 | Number 4 | Number 7 |

Sheet: /ABE Keypad/
File: AbeKeypad.sch

Title:

Size: A4   Date:
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Rev:
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