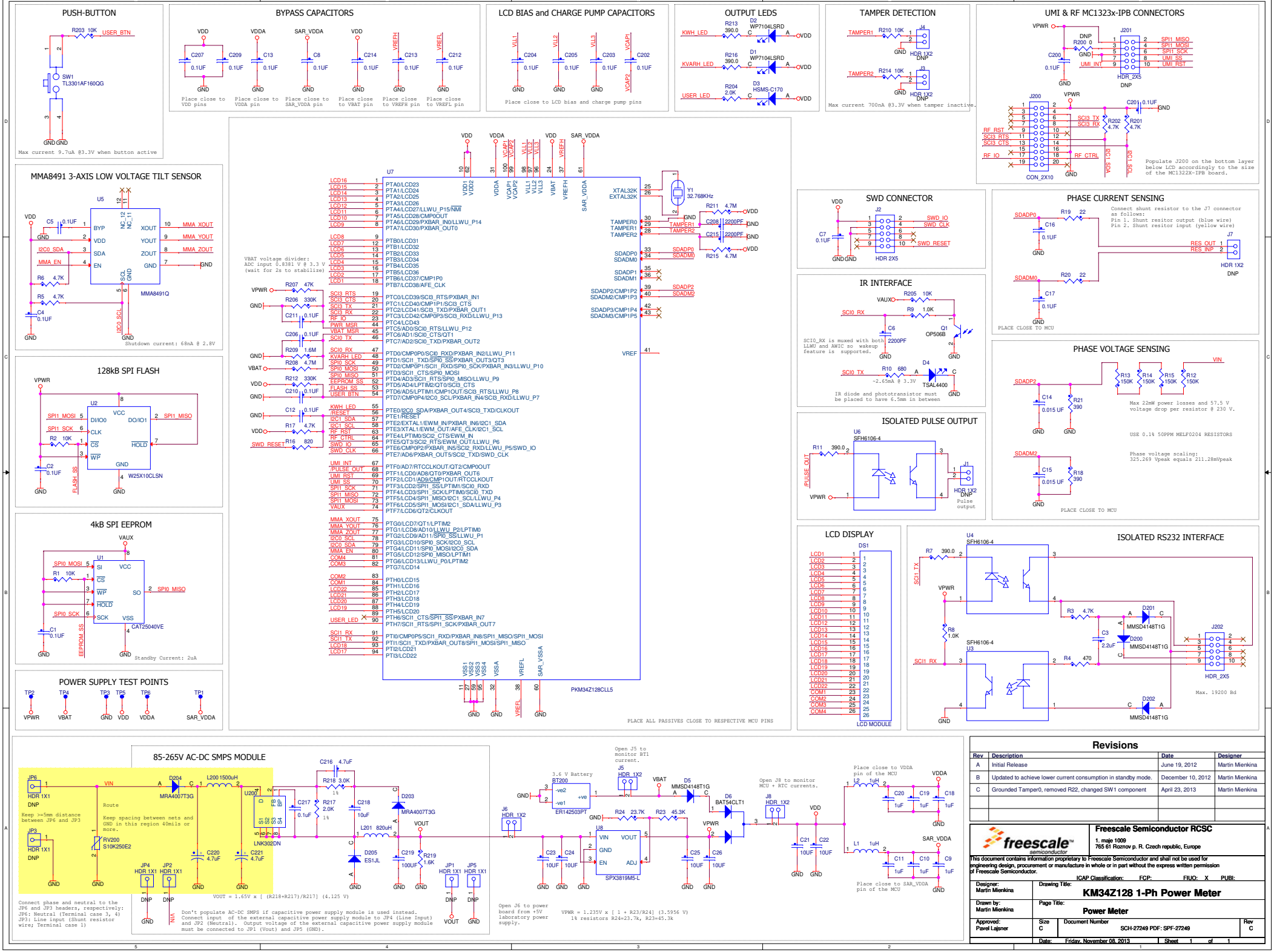
PUSH-BUTTON
R203 10K
USER_BTN
SW1
TL3301AF160QG
GND GND
Max current 9.7uA @3.3V when button active
BYPASS CAPACITORS
VDD
VDDA
SAR_VDDA
VDD
VREFH
VREFL
C207 0.1UF
C209 0.1UF
C13 0.1UF
C8 0.1UF
C214 0.1UF
C213 0.1UF
C212 0.1UF
GND
Place close to VDD pins
Place close to VDDA pin
Place close to SAR_VDDA pin
Place close to VBAT pin
Place close to VREFH pin
Place close to VREFL pin
LCD BIAS and CHARGE PUMP CAPACITORS
VLL1
VLL2
VLL3
VCAP1
VCAP2
C204 0.1UF
C205 0.1UF
C203 0.1UF
C202 0.1UF
Place close to LCD bias and charge pump pins
OUTPUT LEDS
KWH_LED
KVARH_LED
USER_LED
R213 390.0
R216 390.0
R204 2.0K
D2 WP7104LSRD
D1 WP7104LSRD
D3 HSMS-C170
VDD
TAMPER DETECTION
TAMPER1
TAMPER2
R210 10K
R214 10K
J4
J3
HDR 1X2
DNP
Max current 700nA @3.3V when tamper inactive.
UMI & RF MC1323x-IPB CONNECTORS
VPWR
DNP
R200 0
C200 0.1UF
J201
SPI1_MISO
SPI1_MOSI
SPI1_SCK
UMI_SS
UMI_INT
UMI_RST
HDR_2X5
J200
C201 0.1UF
R202 4.7K
R201 4.7K
SCI3_TX
SCI3_RX
RF_RST
SCI3_RTS
SCI3_CTS
RF_IO
RF_CTRL
SDA I2C0
SCL I2C0
CON_2X10
Populate J200 on the bottom layer below LCD accordingly to the size of the MC1322X-IPB board.
MMA8491 3-AXIS LOW VOLTAGE TILT SENSOR
U5
BYP
VDD
SDA
EN
XOUT
YOUT
ZOUT
GND
MMA_XOUT
MMA_YOUT
MMA_ZOUT
MMA_EN
I2C0_SDA
I2C0_SCL
R6 4.7K
R5 4.7K
C4 0.1UF
C5 0.1UF
MMA8491Q
Shutdown current: 68nA @ 2.8V
128kB SPI FLASH
U2
VCC
DI/IO0
DO/IO1
CLK
CS
HOLD
WP
SPI1_MOSI
SPI1_SCK
SPI1_MISO
FLASH_SS
R2 10K
C2 0.1UF
W25X10CLSN
4kB SPI EEPROM
VAUX
U1
SI
SO
SCK
VSS
SPI0_MOSI
SPI0_SCK
SPI0_MISO
EEPROM_SS
R1 10K
C1 0.1UF
CAT25040VE
Standby Current: 2uA
POWER SUPPLY TEST POINTS
TP2 VPWR
TP4 VBAT
TP3 GND
TP5 VDD
TP6 VDDA
TP1 SAR_VDDA
U7
PKM34Z128CLL5
VBAT voltage divider:
ADC input 0.8381 V @ 3.3 V
(wait for 2s to stabilize)
R207 47K
R206 330K
R209 1.6M
R208 4.7M
R212 330K
R17 4.7K
R16 820
C211 0.1UF
C206 0.1UF
C210 0.1UF
C12 0.1UF
SWD_RESET
LCD16
LCD15
LCD14
LCD13
LCD12
LCD11
LCD10
LCD9
LCD8
LCD7
LCD6
LCD5
LCD4
LCD3
LCD2
LCD1
SCI3_RTS
SCI3_CTS
SCI3_TX
SCI3_RX
RF_IO
PWR_MSR
VBAT_MSR
SCI0_TX
SCI0_RX
KVARH_LED
SPI0_SCK
SPI0_MOSI
SPI0_MISO
EEPROM_SS
FLASH_SS
USER_BTN
KWH_LED
RESET
I2C1_SDA
I2C1_SCL
RF_RST
RF_CTRL
SWD_IO
SWD_CLK
UMI_INT
PULSE_OUT
UMI_RST
UMI_SS
SPI1_SCK
SPI1_MISO
SPI1_MOSI
VAUX
MMA_XOUT
MMA_YOUT
MMA_ZOUT
I2C0_SCL
I2C0_SDA
MMA_EN
COM4
COM3
COM2
COM1
LCD22
LCD21
LCD20
LCD19
USER_LED
SCI1_RX
SCI1_TX
LCD18
LCD17
PTA0/LCD23
PTA1/LCD24
PTA2/LCD25
PTA3/LCD26
PTA4/LCD27/LLWU_P15/NMI
PTA5/LCD28/CMP0OUT
PTA6/LCD29/PXBAR_IN0/LLWU_P14
PTA7/LCD30/PXBAR_OUT0
PTB0/LCD31
PTB1/LCD32
PTB2/LCD33
PTB3/LCD34
PTB4/LCD35
PTB5/LCD36
PTB6/LCD37/CMP1P0
PTB7/LCD38/AFE_CLK
PTC0/LCD39/SCI3_RTS/PXBAR_IN1
PTC1/LCD40/CMP1P1/SCI3_CTS
PTC2/LCD41/SCI3_TXD/PXBAR_OUT1
PTC3/LCD42/CMP0P3/SCI3_RXD/LLWU_P13
PTC4/LCD43
PTC5/AD0/SCI0_RTS/LLWU_P12
PTC6/AD1/SCI0_CTS/QT1
PTC7/AD2/SCI0_TXD/PXBAR_OUT2
PTD0/CMP0P0/SCI0_RXD/PXBAR_IN2/LLWU_P11
PTD1/SCI1_TXD/SPI0_SS/PXBAR_OUT3/QT3
PTD2/CMP0P1/SCI1_RXD/SPI0_SCK/PXBAR_IN3/LLWU_P10
PTD3/SCI1_CTS/SPI0_MOSI
PTD4/AD3/SCI1_RTS/SPI0_MISO/LLWU_P9
PTD5/AD4/LPTIM2/QT0/SCI3_CTS
PTD6/AD5/LPTIM1/CMP1OUT/SCI3_RTS/LLWU_P8
PTD7/CMP0P4/I2C0_SCL/PXBAR_IN4/SCI3_RXD/LLWU_P7
PTE0/I2C0_SDA/PXBAR_OUT4/SCI3_TXD/CLKOUT
PTE1/RESET
PTE2/EXTAL1/EWM_IN/PXBAR_IN6/I2C1_SDA
PTE3/XTAL1/EWM_OUT/AFE_CLK/I2C1_SCL
PTE4/LPTIM0/SCI2_CTS/EWM_IN
PTE5/QT3/SCI2_RTS/EWM_OUT/LLWU_P6
PTE6/CMP0P2/PXBAR_IN5/SCI2_RXD/LLWU_P5/SWD_IO
PTE7/AD6/PXBAR_OUT5/SCI2_TXD/SWD_CLK
PTF0/AD7/RTCCLKOUT/QT2/CMP0OUT
PTF1/LCD0/AD8/QT0/PXBAR_OUT6
PTF2/LCD1/AD9/CMP1OUT/RTCCLKOUT
PTF3/LCD2/SPI1_SS/LPTIM1/SCI0_RXD
PTF4/LCD3/SPI1_SCK/LPTIM0/SCI0_TXD
PTF5/LCD4/SPI1_MISO/I2C1_SCL/LLWU_P4
PTF6/LCD5/SPI1_MOSI/I2C1_SDA/LLWU_P3
PTF7/LCD6/QT2/CLKOUT
PTG0/LCD7/QT1/LPTIM2
PTG1/LCD8/AD10/LLWU_P2/LPTIM0
PTG2/LCD9/AD11/SPI0_SS/LLWU_P1
PTG3/LCD10/SPI0_SCK/I2C0_SCL
PTG4/LCD11/SPI0_MOSI/I2C0_SDA
PTG5/LCD12/SPI0_MISO/LPTIM1
PTG6/LCD13/LLWU_P0/LPTIM2
PTG7/LCD14
PTH0/LCD15
PTH1/LCD16
PTH2/LCD17
PTH3/LCD18
PTH4/LCD19
PTH5/LCD20
PTH6/SCI1_CTS/SPI1_SS/PXBAR_IN7
PTH7/SCI1_RTS/SPI1_SCK/PXBAR_OUT7
PTI0/CMP0P5/SCI1_RXD/PXBAR_IN8/SPI1_MISO/SPI1_MOSI
PTI1/SCI1_TXD/PXBAR_OUT8/SPI1_MOSI/SPI1_MISO
PTI2/LCD21
PTI3/LCD22
XTAL32K
EXTAL32K
Y1
32.768KHz
R211 4.7M
R215 4.7M
C208 2200PF
C215 2200PF
TAMPER0
TAMPER1
TAMPER2
SDADP0
SDADM0
SDADP1
SDADM1
SDADP2/CMP1P2
SDADM2/CMP1P3
SDADP3/CMP1P4
SDADM3/CMP1P5
VREF
PLACE ALL PASSIVES CLOSE TO RESPECTIVE MCU PINS
SWD CONNECTOR
J2
SWD_IO
SWD_CLK
SWD_RESET
HDR 2X5
C7 0.1UF
IR INTERFACE
VAUX
SCI0_RX
SCI0_TX
R205 10K
R9 1.0K
R10 680
C6 2200PF
Q1 OP506B
D4 TSAL4400
-2.65mA @ 3.3V
SCI0_RX is muxed with both LLWU and AWIC so wakeup feature is supported.
IR diode and phototransistor must be placed to have 6.5mm in between
ISOLATED PULSE OUTPUT
U6 SFH6106-4
R11 390.0
PULSE_OUT
J1
HDR 1X2
DNP
Pulse output
LCD DISPLAY
DS1
LCD MODULE
PHASE CURRENT SENSING
SDADP0
SDADM0
R19 22
R20 22
C16 0.1UF
C17 0.1UF
J7
RES_OUT
RES_INP
HDR 1X2
DNP
Connect shunt resistor to the J7 connector as follows:
Pin 1. Shunt resistor output (blue wire)
Pin 2. Shunt resistor input (yellow wire)
PLACE CLOSE TO MCU
PHASE VOLTAGE SENSING
VIN
SDADP2
SDADM2
R13 150K
R14 150K
R15 150K
R12 150K
R21 390
R18 390
C14 0.015 UF
C15 0.015 UF
Max 22mW power losses and 57.5 V voltage drop per resistor @ 230 V.
USE 0.1% 50PPM MELF0204 RESISTORS
Phase voltage scaling:
325.269 Vpeak equals 211.28mVpeak
PLACE CLOSE TO MCU
ISOLATED RS232 INTERFACE
U4 SFH6106-4
U3 SFH6106-4
R7 390.0
R8 1.0K
R3 4.7K
R4 470
C3 2.2uF
D201 MMSD4148T1G
D200 MMSD4148T1G
D202 MMSD4148T1G
J202
HDR_2X5
Max. 19200 Bd
85-265V AC-DC SMPS MODULE
JP6 HDR 1X1 DNP
VIN
D204 MRA4007T3G
L200 1500uH
U200 LNK302DN
C216 4.7uF
R218 3.0K
R217 2.0K
C217 0.1uF
C218 10uF
D203 MRA4007T3G
L201 820uH
VOUT
D205 ES1JL
C219 100UF
R219 1.6K
C220 4.7uF
C221 4.7uF
RV200 S10K250E2
JP3 HDR 1X1 DNP
JP4 HDR 1X1 DNP
JP2 HDR 1X1 DNP
JP1 HDR 1X1 DNP
JP5 HDR 1X1 DNP
Keep >=5mm distance between JP6 and JP3
Route
Keep spacing between nets and GND in this region 40mils or more.
VOUT = 1.65V x [ (R218+R217)/R217] (4.125 V)
Connect phase and neutral to the JP6 and JP3 headers, respectively:
JP6: Neutral (Terminal case 3, 4)
JP3: Line input (Shunt resistor wire; Terminal case 1)
Don't populate AC-DC SMPS if capacitive power supply module is used instead. Connect input of the external capacitive power supply module to JP4 (Line Input) and JP2 (Neutral). Output voltage of the external capacitive power supply module must be connected to JP1 (Vout) and JP5 (GND).
Open J5 to monitor BT1 current.
3.6 V Battery
BT200
ER142503PT
J5 HDR_1X2
J6 HDR_1X2
D5 MMSD4148T1G
D6 BAT54CLT1
Open J8 to monitor MCU + RTC currents.
J8 HDR_1X2
U8 SPX3819M5-L
R24 23.7K
R23 45.3K
C23 10UF
C24 10UF
C25 10UF
C26 10UF
C21 10UF
C22 10UF
Place close to VDDA pin of the MCU
L2 1uH
C20 1uF
C19 1uF
C18 1uF
Place close to SAR_VDDA pin of the MCU
L1 1uH
C11 1uF
C10 1uF
C9 1uF
Open J6 to power board from +5V laboratory power supply.
VPWR = 1.235V x [ 1 + R23/R24] (3.5956 V)
1% resistors R24=23.7k, R23=45.3k
Revisions
Rev | Description | Date | Designer
A | Initial Release | June 19, 2012 | Martin Mienkina
C | Grounded Tamper0, removed R22, changed SW1 component | April 23, 2013 | Martin Mienkina
Freescale Semiconductor RCSC
1. maje 1009
765 61 Roznov p. R. Czech republic, Europe
This document contains information proprietary to Freescale Semiconductor and shall not be used for engineering design, procurement or manufacture in whole or in part without the express written permission of Freescale Semiconductor.
ICAP Classification: FCP: FIUO: X PUBI:
Designer: Martin Mienkina
Drawing Title: KM34Z128 1-Ph Power Meter
Drawn by: Martin Mienkina
Page Title: Power Meter
Approved: Pavel Lajsner
Size C
Document Number SCH-27249 PDF: SPF-27249
Rev C
Date: Friday, November 08, 2013
Sheet 1 of 1