Power Delivery

J1
Jack-DC

BZX38450-C18X

U2
NCP1117-3.3

+3V3   +3V3

DZ1
D3 GREEN
Power
RED
D2 Overvolt
R2 1K
10K
R1
GND

C1 10uF   C2 1uF   C3 1uF   C4 10uF
VI   GND   VO
GND

External safe power source is needed for now, until we need mains freq. for control.

Temperature Measurement

U3
MAX6675ISA+
+3V3

K-Thermocouple
TC1

VCC   SCK   5 SCLK   {SPI}
T+   SO   7 MISO
T-   CS   6 TH_CS
C20
10nF
GND

Reads a K-type thermocouple and produces data over SPI.
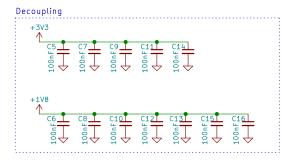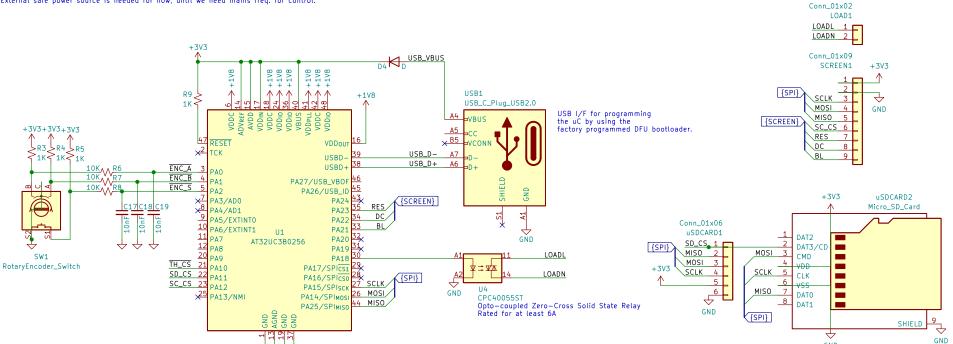Try and ovenize or otherwise protect this chip.

Decoupling

+3V3
C5 100nF C7 100nF C9 100nF C11 100nF C14 100nF

+1V8
C6 100nF C8 100nF C10 100nF C12 100nF C13 100nF C15 100nF C16 100nF

Conn_01x02
LOAD1
LOADL 1
LOADN 2

Conn_01x09
SCREEN1   +3V3
{SPI}   SCLK 3
         MOSI 4
         MISO 5
{SCREEN} SC_CS 6
         RES   7
         DC   8
         BL   9
GND

+3V3
R9 1K

USB_VBUS
D4 D

USB1
USB_C_Plug_USB2.0

USB I/F for programming
the uC by using the
factory programmed DFU bootloader.

+3V3 +3V3 +3V3
R3 R4 R5
1K 1K 1K

R6 10K
R7 10K
R8 10K

ENC_A 3 PA0
ENC_B 4 PA1
ENC_S 5 PA2
       8 PA3/AD0
       9 PA4/AD1
      10 PA5/EXTINT0
          PA6/EXTINT1
      11 PA7
      12 PA8
      20 PA9
TH_CS 21 PA10
SD_CS 22 PA11
SC_CS 23 PA12
      25 PA13/NMI

U1
AT32UC3B0256

RESET 47
TCK   7

USBD- 39
USBD+ 38

PA27/USB_VBOF 46
PA26/USB_ID   45

VDDout 16
+1V8

PA24 43   RES   {SCREEN}
PA23 34   DC
PA22 33   BL
PA21
PA20
PA19
PA18 30   LOADL
PA17/SPI CS1 29
PA16/SPI CS0 28
PA15/SPI SCK 27 SCLK {SPI}
PA14/SPI MOSI 26 MOSI
PA25/SPI MISO 44 MISO

GND AGND GND GND
13 19 37

C17 10nF C18 10nF C19 10nF

S2
SW1
RotaryEncoder_Switch

VBUS   A4
CC   A5
VCONN B5
D-   A7   USB_D-
D+   A6   USB_D+
SHIELD   GND
S1   A1
GND

A1 11 LOADL
A2 14 LOADN
U4
CPC40055ST
Opto-coupled Zero-Cross Solid State Relay
Rated for at least 6A
GND

Conn_01x06
uSDCARD1
{SPI}   SD_CS 1
         MISO 2
         MOSI 3
+3V3   SCLK 4
               5
               6
GND

+3V3
uSDCARD2
Micro_SD_Card
DAT2   1
DAT3/CD 2
CMD   3   MOSI
VDD   4
CLK   5   SCLK
VSS   6
DAT0   7   MISO
DAT1   8
{SPI}
SHIELD 9
GND

Control Scheme

The MCU first needs to know how fast the temperature rises at full power, as a mearsure of thermal mass.
This value is stored in an internal non-volatile memory, like a flash.

The based on this, the MCU turns on the load for a certain number of AC cycles, calculated by scaling
the duration of the calibration to 10 cycles. After this if the temperature is more than
what the calibration curve was, we start reducing the number of cycles. If it is less, we just turn
power on and check again after 10 cycles.

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