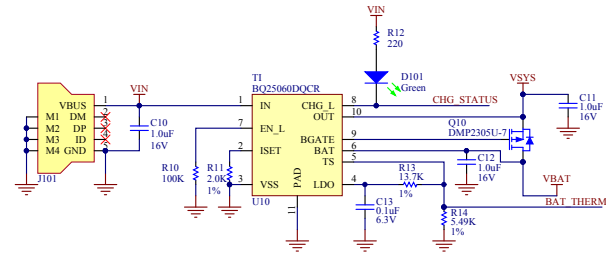


## Battery and Charge Controller



Max charge will default to 500 mA if EN\_L is left floating. EN\_L must be set low to allow charge at Iset current.

Iset = 1000 / Rset (A)  
Rset must be within 1k <= Rset <= 10k.

Max charge current recommended is C/3, where C is battery capacity in mAh. Rset is shown for C = 1500 mAh: 1500 mAh / 3 hours = 500 mA, so Rset = 2k.

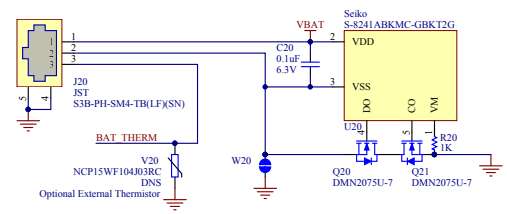
R13 and R14 set operating temperature range.  
Let RHOT = resistance of battery pack thermistor at max temp.  
Let RCOLD = resistance of battery pack thermistor at min temp.

R14 =  $[0.125 * RHOT * RCOLD] / [(0.09375 * RCOLD) - (0.21875 * RHOT)]$   
R13 =  $[0.875 * RHOT * R14] / [0.125 * (R14 + RHOT)]$

Example: NTC Murata NXFT15XH103FA2B025  
Operating range: 0C to 60C  
At 0C, Rthermistor = 27.445k (RCOLD)  
At 60C, Rthermistor = 3.024k (RHOT)

R14 = 5.4k  
R13 = 13.6k

## Over-Discharge Protection



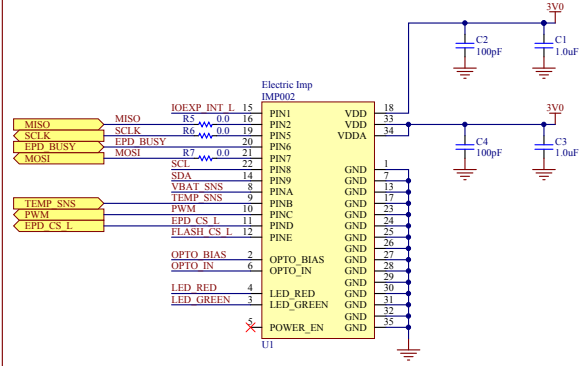
Over-discharge of a lithium-ion or lithium-polymer battery will result in decreased capacity and service life, and can cause serious damage to the battery.

The system rail is "locked out" if the battery drops below the threshold voltage (2.5V). The rail remains locked out until the battery voltage exceeds 2.9V.

White lock-out threshold is well below minimum operating voltage of the battery, this condition will occur on transients near the end of battery life. Hysteresis on the system lock-out prevents boot-looping at the end of battery life.

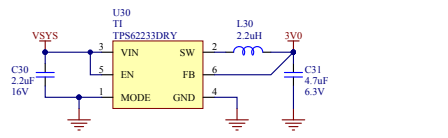
If your battery pack includes on-board overdischarge protection, exclude U20, C20, Q20, Q21, and R20, and short W20 with solder to bypass this block.

## Imp Module



IOEXP\_INT\_L 15  
PIN1 VDD 33  
PIN2 VDD 34  
PINS VDDA 34  
MISO MISO 16  
SCL SCL 19  
EPD\_BUSY EPD\_BUSY 20  
MOSI MOSI 21  
SDA SDA 14  
VBAT\_SNS VBAT\_SNS 8  
TEMP\_SNS TEMP\_SNS 9  
PWM PWM 10  
EPD\_CS\_L EPD\_CS\_L 11  
FLASH\_CS\_L FLASH\_CS\_L 12  
PINE PINE 26  
GND GND 7  
GND GND 13  
GND GND 17  
GND GND 24  
GND GND 23  
GND GND 25  
GND GND 26  
GND GND 27  
OPTO\_BIAS OPTO\_BIAS 2  
OPTO\_IN OPTO\_IN 6  
GND GND 28  
GND GND 29  
LED\_RED LED\_RED 4  
LED\_GREEN LED\_GREEN 3  
POWER\_EN GND 35

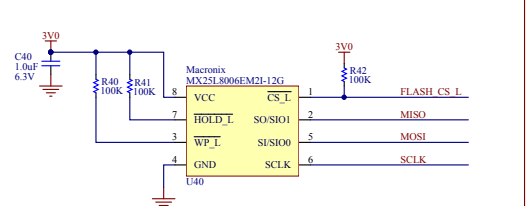
## Power Supply



By running the system below the minimum battery voltage (3.2), this solution leaves enough headroom to run the system with just a buck converter, instead of requiring an expensive buck-boost converter.

Further headroom can be acquired by running the system voltage even lower (The TPS622316 can be used for a system rail of 2.7V).

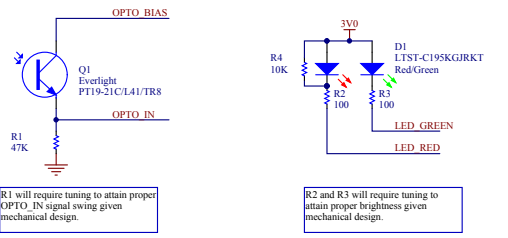
## SPI Flash



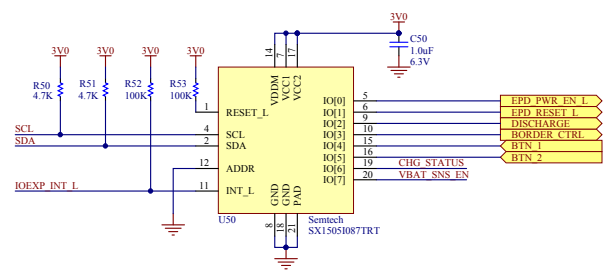
R1 will require tuning to attain proper OPTO\_IN signal swing given mechanical design.

R2 and R3 will require tuning to attain proper brightness given mechanical design.

## BlinkUp Components

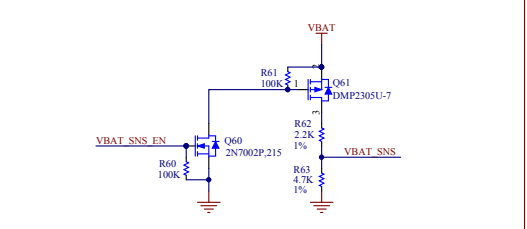


## I/O Expander



R63 and R64 are used to step down the battery voltage to ensure VBAT\_SNS does not exceed VDD. The resistive divider is switched off when not in use to save power.

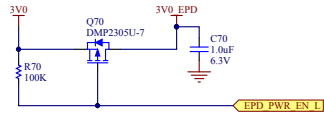
## Battery Monitoring



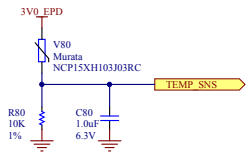
R63 and R64 are used to step down the battery voltage to ensure VBAT\_SNS does not exceed VDD. The resistive divider is switched off when not in use to save power.

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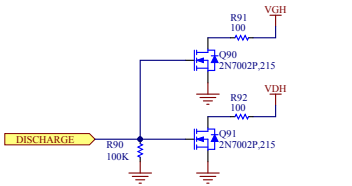
### Panel Power Enable



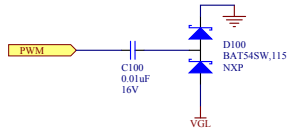
### Temperature Sensor



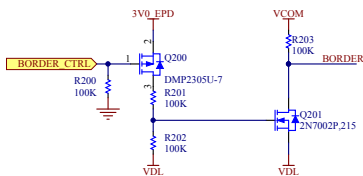
### VGH and VDH Discharge



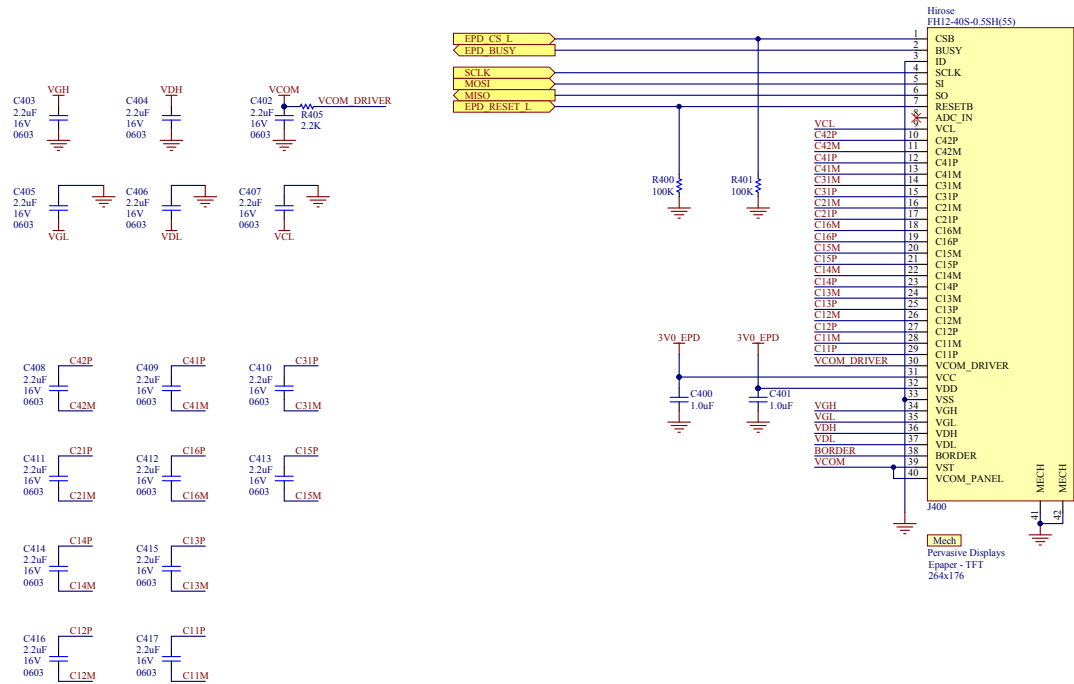
### Negative Supply Charge Pump



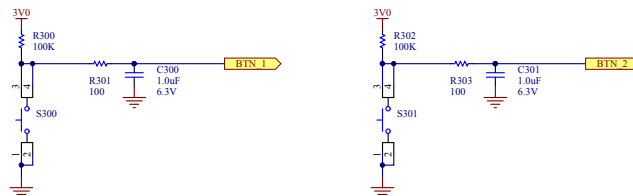
### Border Control



### Display Connector and Charge Pump Capacitors



### User Buttons



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