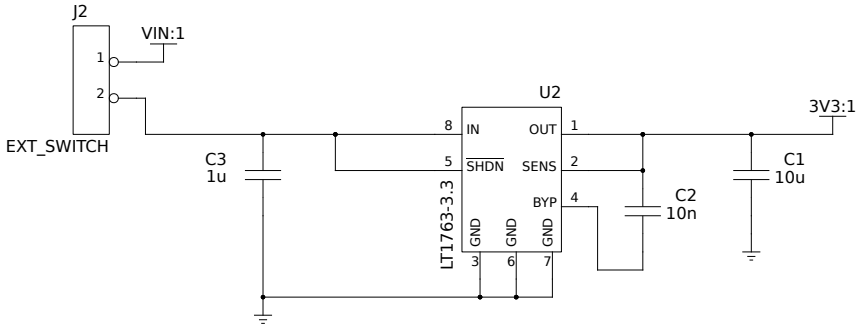
POWER RAIL SLEEP CONTROLLER



LT1723
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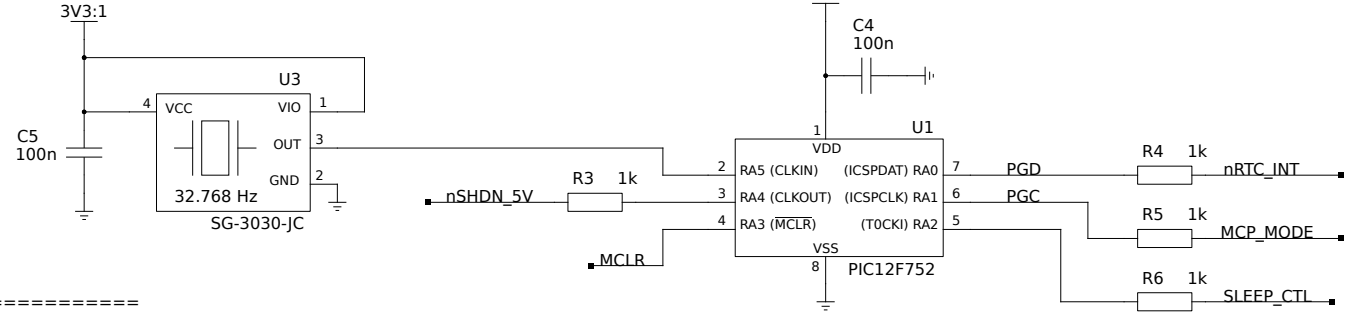
VIN: [3.7, 20]V
Iq: 30uA
I_shutdown < 1uA



Mod. Connections to SMPS V0_1 Board
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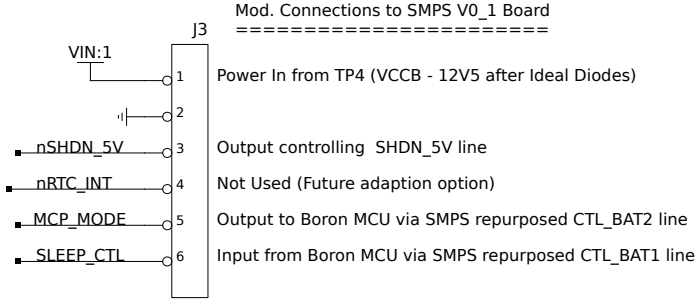

Notes
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The Oct 2020 pace prototype runs for 24h 1-MCP sensing and then switches over to periodic 1h Ethylene / Temp/RH/TVOC measurements. These measurements require one hour of operation. If these are run once per week the Idle time is 167 hours. With this low duty cycle operation the Idle mode power usage needs careful attention.

For a year of operation from one 268 Wh battery the Idle power consumption needs to be << 30 mW. The 5V2 power rail no load power is 50 mW so this rail needs to be shut-off.

The particle.io Boron mcu can turn off the 5V2 rail and sleep powered from a local LiPo battery with wake-up by interrupt from the RTC module. Due to short project deadline it is proposed instead to use a modification to the SMPS board to implement an independent power control module which would be faster to develop.

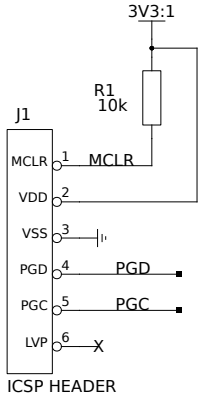
To implement a low power system shutdown an eXtreme Low Power (XLP) PIC microcontroller will be used which will run from the 12V battery power source directly. When it recieves a signal from the particle.io Boron board it will shutdown the 5V2 power rail facilitating a low power Idle mode.

After the specified interval (say 1 week) it will restore power on the 5V2 rail and the Boron system controller will startup fresh and perform the Ethylene measurement and again send the power controller a shutdown signal.

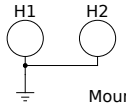
The power controller will hold a particular signal line high when it first powers up. The Boron will read this on startup so it knows if the operator has just turned on the main power switch in which case GSFET measurements should be performed.

After recieving a shutdown command from the Boron the power controller will set this line Low and hence when the Boron subsequently reawakens it can determine by reading that line whether or not it needs to perform GSFET measurments or only the Ethylene measurments.

Alternative 3V3 regulator: MAX1726, not suitable for this paqrticular application (max VIN 12V). It features ultra-low Iq: 2 uA. Maybe useful to consider for a future variation.



ICSP HEADER



Mounting Holes

SLEEP_CTL: Connected to RA2 (T0CLK), the logic can count the number of clk pulses sent during an interval to determine how long to sleep for. This could be sleep for one hour per CLK pulse - One week 7*24 = 168 pulses which fits in an 8-bit counter.

MCP_MODE: Set High when PIC powers up. The Boron reading this as High knows that the power has just been switched on and it needs to perform 1-MCP measurements. After the first command to set SLEEP via SLEEP_CTL this line will be set Low. When the Boron next reawakens it reads this line as Low and knows it only needs to perform Ethylene measurments.

nSHDN_5V: This line is set High when the PIC powers up. It is set low for a period (typ. 1 week) when it recieves a SLEEP command from the Boron.

nRTC_INT: Not used. Later this could be connected to the comms board via repurposed VCC_WPLUG_S line on SMPS board. A mod would also be required on the comms board to hook up to RTC Module U30 pin 29. The PIC could be programmed to wake up the system from the nRTC_INT signal which would be pulled low when the RTC Module programmed alarm event occurs. For robustness the PIC could be be programmed to wake after MAX_INTERVAL e.g. slightly over one week or when the nRTC_INT occurs. RA0 has a programmable weak pull-up option (the nRTC_INT on the RTC module is open-drain).

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