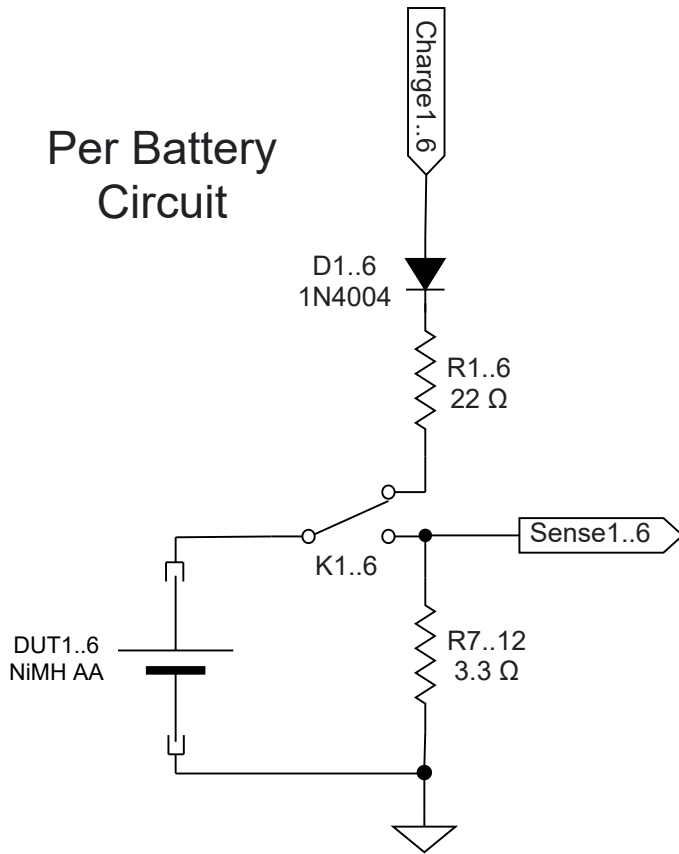
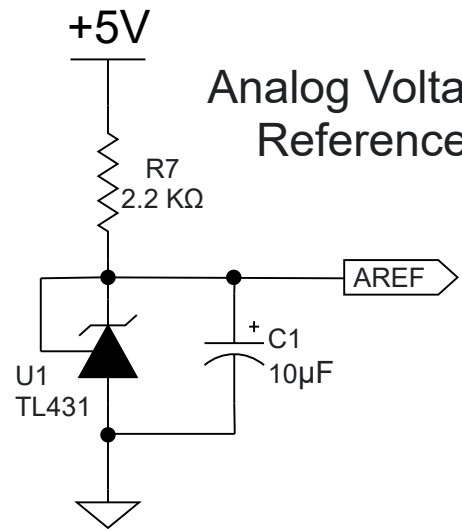


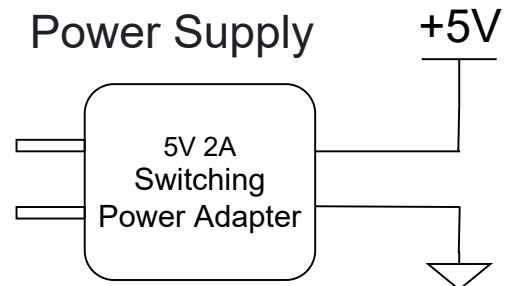
## Per Battery Circuit



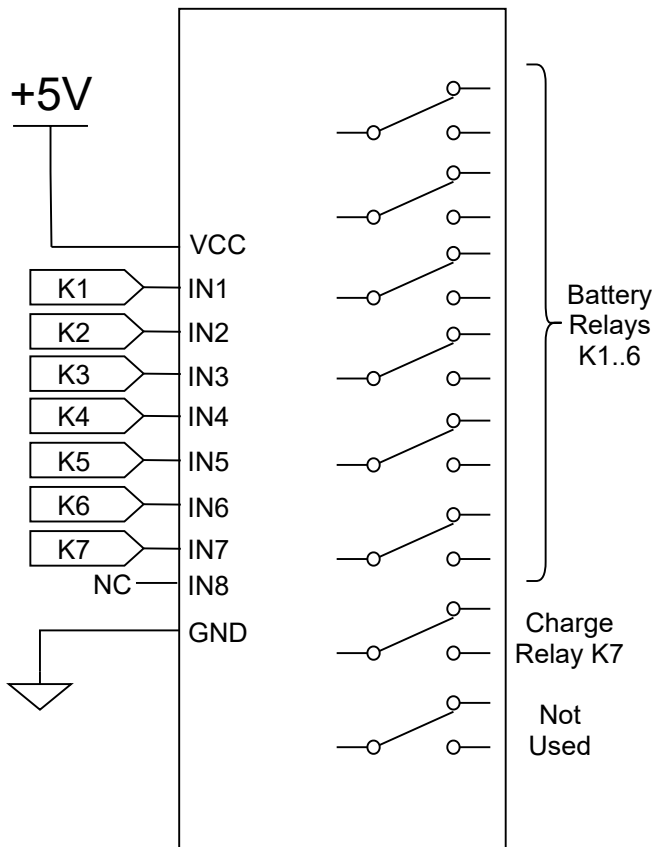
## Analog Voltage Reference



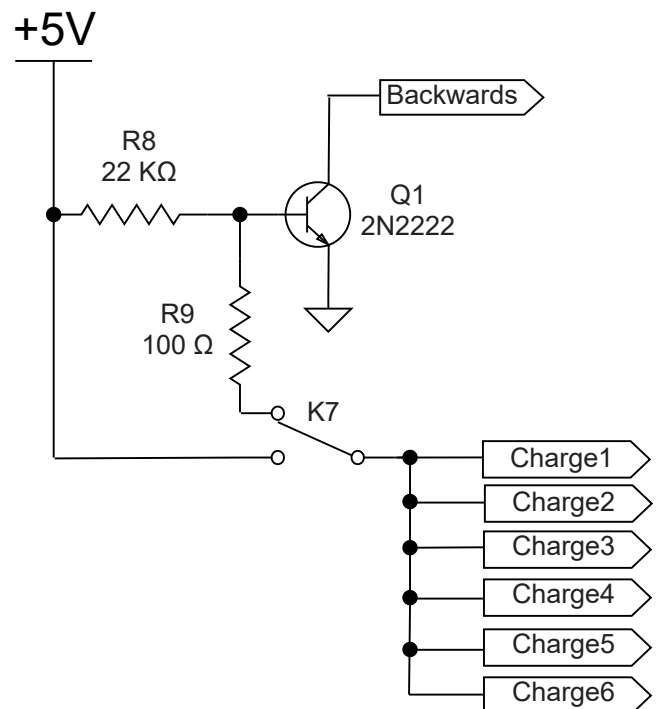
## Power Supply



## Relay Module



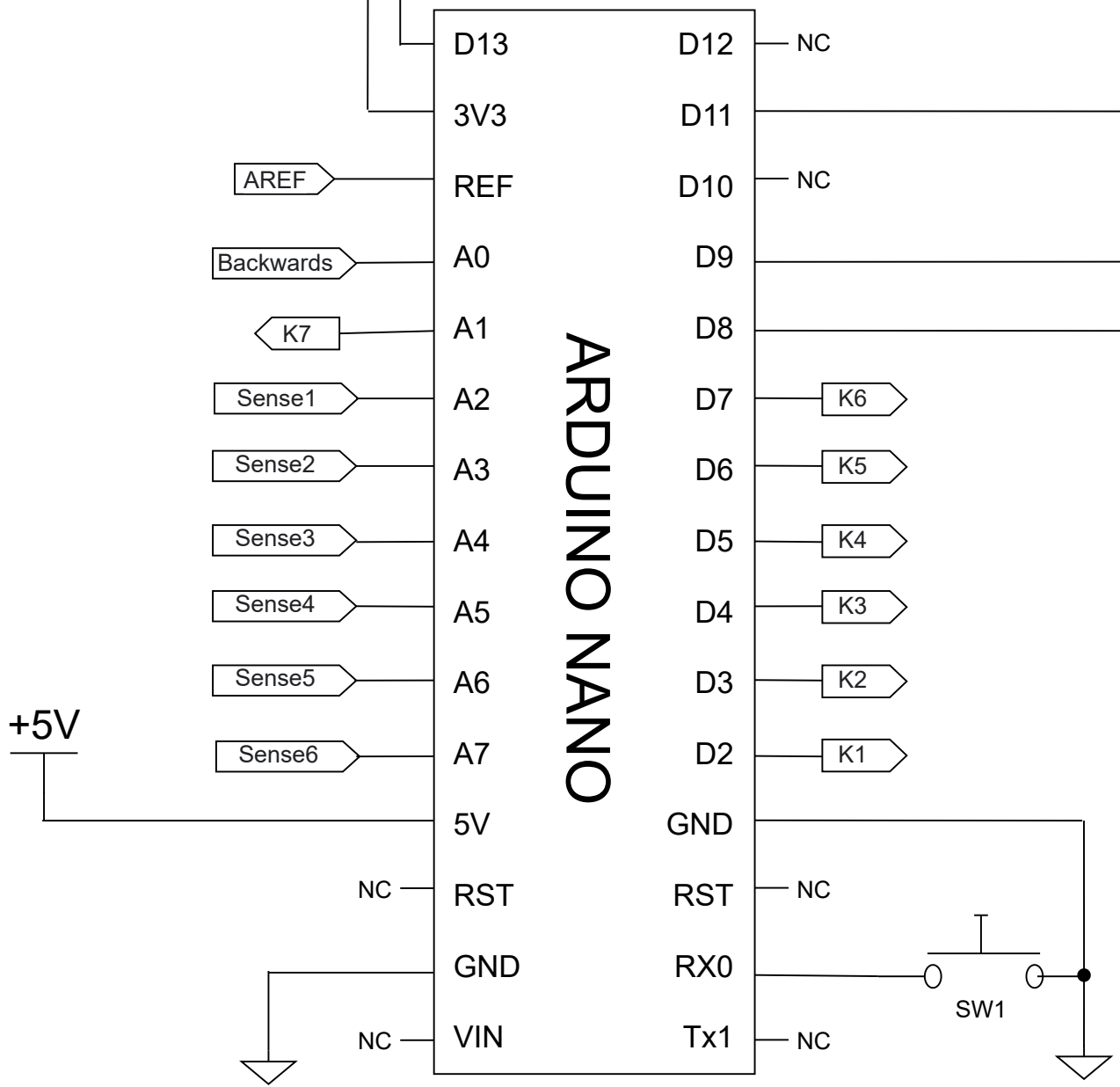
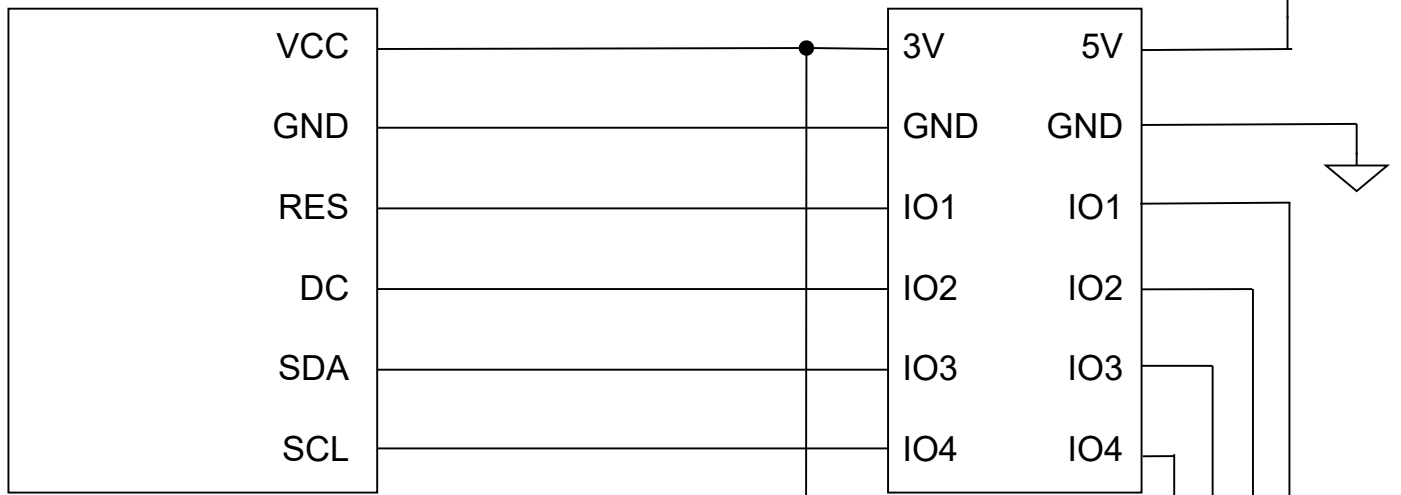
## Charge Relay & Backward Battery Detector



240x240 1.3" IPS LCD

I<sup>2</sup>C LEVEL SHIFTER

+5V



# List of Electronic Materials

Component	Qty	Description
8 Relay Module	1	Generic 8-relay 5V coil module "for Arduino" from Ali Express.
Arduino Nano	1	Genuine or generic Arduino Nano
I <sup>2</sup> C Level Shifter	1	4 Channel I <sup>2</sup> C Voltage Converter from Ali Express
240x240 1.3" Display	1	ST7789 based 240x240 pixel IPS Colour Display, 1.3" from Ali Express
Battery Holders	3	2AA Battery Holders, good quality with heavy duty, low impedance contacts. Found on Ali Express as "SMT AA Battery Holder"
3.3 $\Omega$ Discharge Resistor	6	Wirewound power resistors rated 6W. Purchase as a pack of 10 to get matching ones. Only need to dissipate less than 1 watt, but the 6W ones can do it easily without overheating.
22 $\Omega$ Charge Resistor	6	Wirewound power resistors rated 6W. Only need to dissipate less than 1 watt but the 6W ones can do it easily without overheating.
TL431	1	2.5V Reference. Buy new or salvage out of almost any junked switching power supply
2N2222	1	Plastic TO92 Package. Almost any NPN transistor would probably do, possibly with tweaking of R9 to get the right voltage threshold.
5V 2A Switching Power Supply	1	Salvage from an obsolete D-Link Router; most came with 5V, 2.5A power adapters
1N4004	6	1A Rated Rectifier Diode. Substitute any other rectifier diode that you have, needs to tolerate about 175mA of continuous current. Matching set preferred, so the "battery backward" threshold is the same for all sockets.
Pushbutton Switch	1	Any normally open pushbutton switch
22K $\Omega$ Resistor	1	Generic 1/4W resistor
100 $\Omega$ Resistor	1	Generic 1/4W resistor
2.2K $\Omega$ Resistor	1	Generic 1/4W resistor
10 $\mu$ F Electrolytic	1	Generic 10 $\mu$ F electrolytic capacitor. Only needs to tolerate 2.5V.