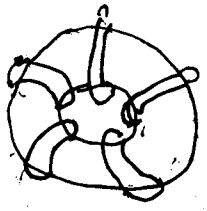
24 APR 13

Roderick

28¢ INDUCTOR FROM HALTED IS MARKED 10MH 10A. SPECS SAY 58% OF INITIAL PERMEABILITY AT 10A. NEED MORE CROSS SECTION ON THE TOROID TO AVOID SATURATION. MAY HAVE TO WIND MY OWN, ON A BIGGER CORE. BAD THING ABOUT SURPLUS CORES, DON'T KNOW WHAT KIND OF FERRITE. COULD BE $\mu = 20$, COULD BE $\mu = 5 \times 10^6$. NEED TO MEASURE INDUCTANCE, BUT DON'T HAVE METER. COULD BUILD ONE?

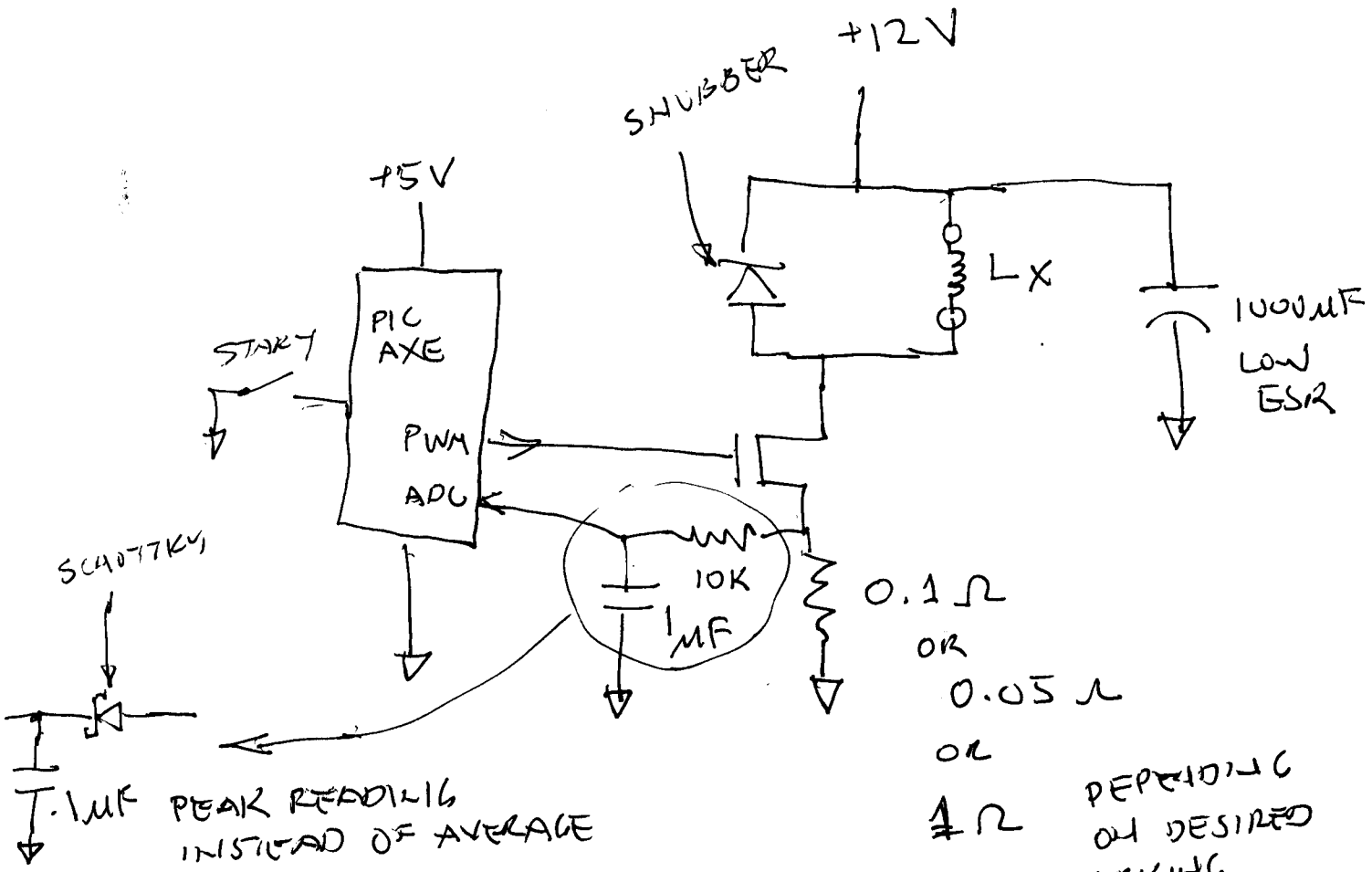


IT'S ABOUT THIS BIG

24 APR 13

Roderick.

MEASURE INDUCTANCE AT ~~th~~ WORKING CURRENT




FIRMWARE STARTS AT HIGH FREQ. ON PWM SWEEPS DOWNWARD UNTIL CERTAIN VOLTAGE ACHIEVED ON ADC. MUST INITIALIZE ADC OUT TO 0 FIRST.

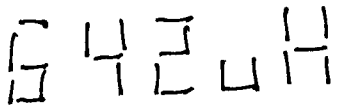
→ OR ELSE, PEAK READING, LOOK FOR ANY VOLTAGE.

INDUCTANCE MEASURE

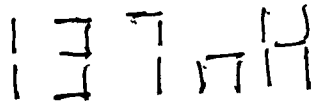
24APR13

Roderick.

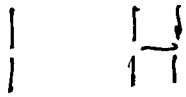
PICAXE COULD DRIVE MULTIPLEXD 7 SEG. LED DISPLAY HP 5-DIGIT DISPLAY?



MICRO

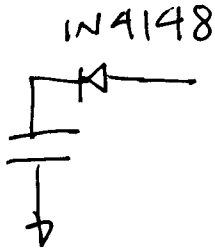


MILLI



HENRY

FOR PROTO, JUST USE SERIAL PORT TO REPORT




SUPPOSE 1 AMP PEAK AVAILABLE.

$i = C\,dV/dt$

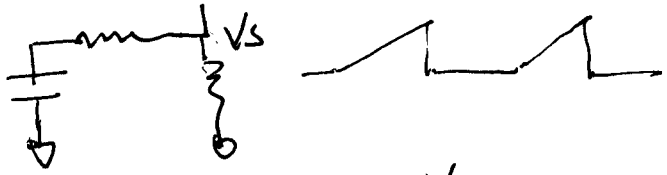
$i\,dt = C\,dV$

$1\ dt = 1^{\mu F} \cdot .5\ \text{volt}$

$dt = .5 \times 10^{-6}$ SEC

1 PULSE SHOULD BE ENOUGH TO CHARGE CAPACITOR, EVEN AT SHORTEST PULSE.

25APR13. NO, PEAK DETECTING INTRODUCES PROBLEMS – DIODE DROP FORCES SOMEWHAT HIGH VOLTAGE (300 mV EVEN IF SCHOTTKY USED). IF USE AVERAGING INTEGRATOR

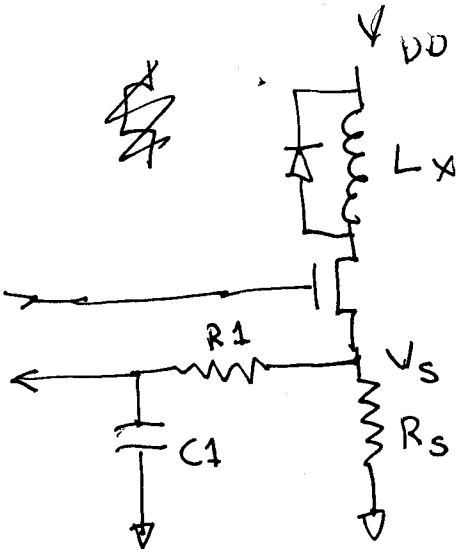



WILL GET ONLY 1/4 THE VOLTAGE W/ 50% DUTY CYCLE, BUT COULD MEASURE RIGHT DOWN TO 1 mV

LOWER Vs = MORE ACCURATE, EXCEPT FOR NOISE.

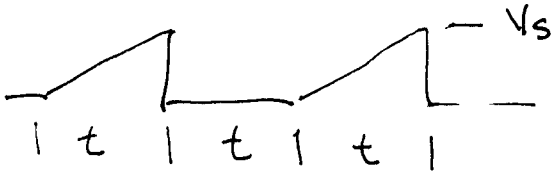
25 APR 13; Roderick

INDUCTANCE MEASURE –




IF USE AVERAGING DETECTOR, NEED TO RUN REPETITIVE WAVEFORM, AND R1C1 MUST HAVE LONG TIME CONSTANT COMPARED TO FREQUENCY.

SUPPOSE $V_S$ = ~~1V ⇒ 0V SQUARE WAVE~~.




DURING DISCHARGE, DON'T WANT TO LOSE MORE THAN 1 BIT OF ADC VALUE. $V_S$ = 1 VOLT IS WORST CASE, MIGHT GO WITH 0.1 VOLT.

SUPPOSE $V_{DD}$ = 12 V  L = 8 μH  $V = L\, di/dt$

$$dt = \frac{L}{V}\, di = \frac{8 \times 10^{-6}}{12} \cdot 40$$

↖ YES, 40 AMPS REALISTIC TEST CASE

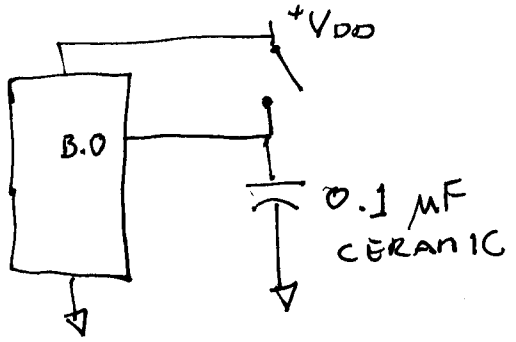
$$dt = \frac{320}{12} \times 10^{-6} = \frac{80}{3} \times 10^{-6} = 27\ \mu S$$

→ @ 24V, HALVE THAT

DO NOT DESIGN TEST EQUIPMENT A CERTAIN WAY JUST BECAUSE IT'S EASY. MUST BE REALISTIC.

25 APR 13; Roderick.

DETERMINE MINIMUM INPUT IMPEDANCE OF PILAXE ADC.




WROTE PROGRAM TO MONITOR VOLTAGE ON CAPACITOR. READ ADC 10 EVERY SECOND.

ASSUME DECAY IS

$V = V_0 e^{-t/RC}$

V STARTS AT 1023, MEASURE ELAPSED TIME TO DROP FROM 1022 TO 646 ← $(1023 \cdot e^{-1})$. MEASURED $t = 1877$ SEC.

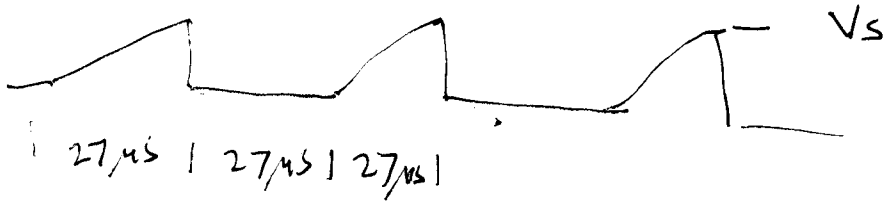
$RC = 1877$ $C = 0.1\,\mu F$ (PROBABLY A LITTLE MORE, IT WAS NOT A TIMING CAP)

$R = 1877 / 10^{-7}$. = ABOUT $19 \times 10^9 = 19\ G\Omega$

EVEN IF CAP IS +80%, THAT'S STILL ~10 GΩ NOT COUNTING ANY SELF-DISCHARGE.

THAT MEANS I CAN USE 100 KΩ SOURCE IMPEDANCE W/ CONFIDENCE, MAYBE EVEN 1 MΩ. NOISE IS ONLY CONSIDERATION

26 APR 13; Rudarock.




$R_S$ MUST BE SMALL, OR POWER DISSIPATION WOULD BE HUGE.

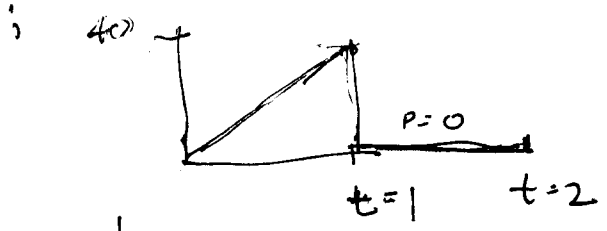
HAVE ~~0.33Ω~~ 0.05Ω, 10W RESISTORS.

9¢ @ HALTED.

@ 40A, MEANS 200mV ACROSS RESISTOR.

P = 8W IF CONSTANT. ~~AVERAGE POWER = 2W~~

RMS POWER = ~~OVERLOOK~~ 2.7W/2 = 1.4W




$$P = \int_0^1 i^2 R\,dt$$

$i = 40t$

$$= \int_0^1 (40t)^2 R\,dt$$

$$= 1600\,\frac{t^3}{3}\cdot R = \frac{1600}{3}R = \frac{1}{3}\text{ OF PEAK POWER}$$

$$\int_0^t i^2 R\,di \qquad i = kt$$

$$= K^2\frac{i^3}{3}R\Big|_0^t$$

$$= i^2 R \cdot K^2\frac{i}{3}$$

FINAL

FINAL

~~1.4W~~ - COULD USE 2W OR 5W CURRENT SENSE RESISTOR

TEST EQT SETUP