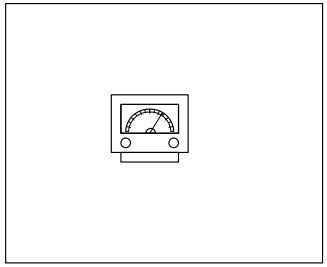
Input Voltage Regulator



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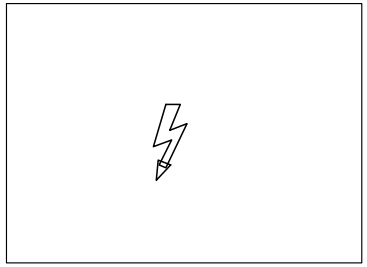
Power Electronics



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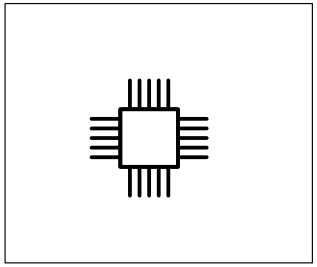
Controller



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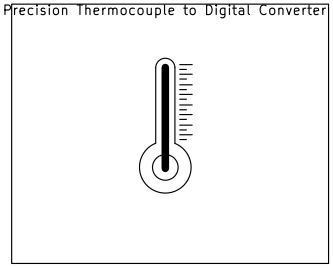
Precision Thermocouple to Digital Converter



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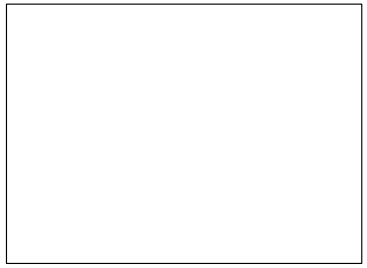
Connectors



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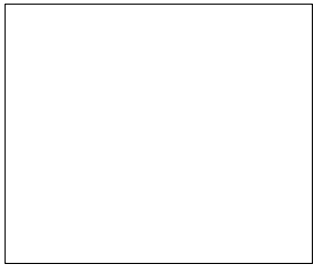
Current_Sensor



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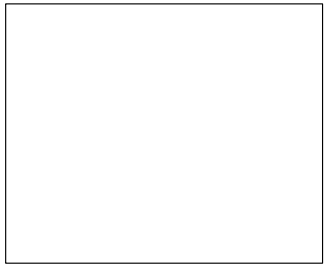
LED



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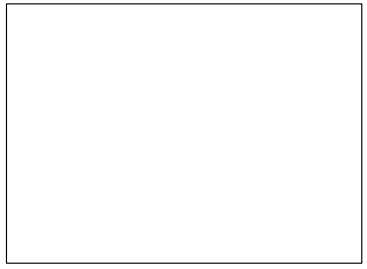
Bypass Capacitors



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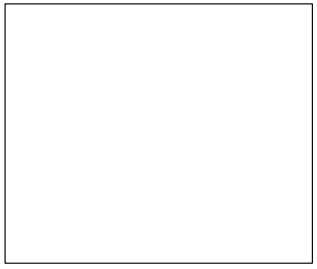
MountingHole_Pad



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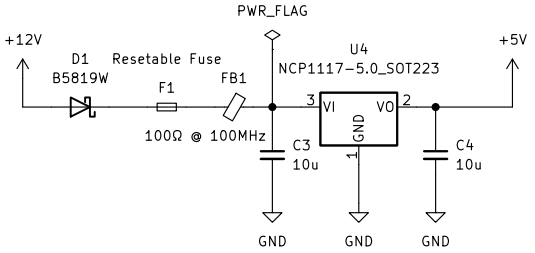
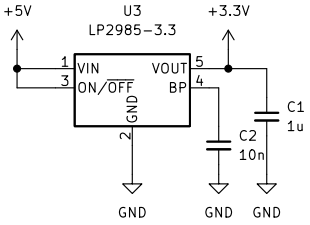
KiCad E.D.A.	kicad 5.99.0-unknown-e950278637~142~ubuntu21.04.1	Id: 1/10

5V Supply



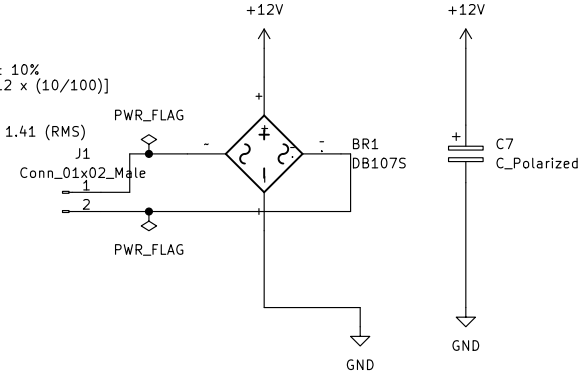
3.3V Supply



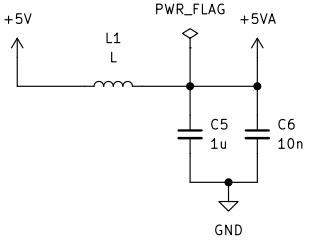
Bridge Rectifier

VCC(MAX) = 12V
= 12V ± 10%
= 12+[12 x (10/100)]
= 13.2V

= 13.2x 1.41 (RMS)
= 18.6V



Filtered fine 5V supply for Analog Pins



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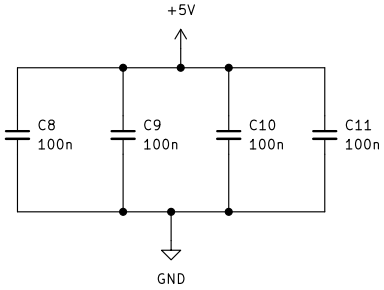
Bypas Capacitors



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Mounting Holes

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File: MountingHole_Pad.kicad_sch

Title:

Size: A4	Date:	**Rev:**
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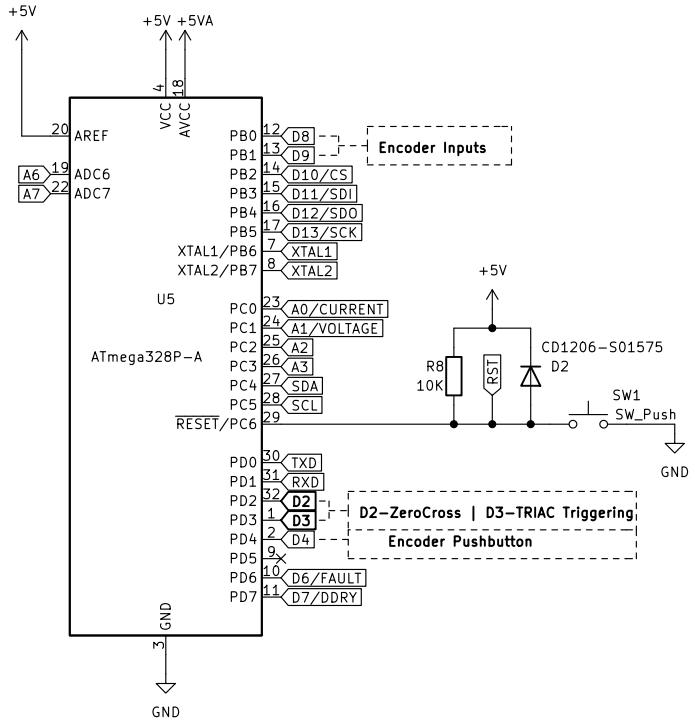
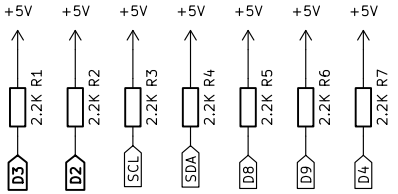
ATMEGA328P

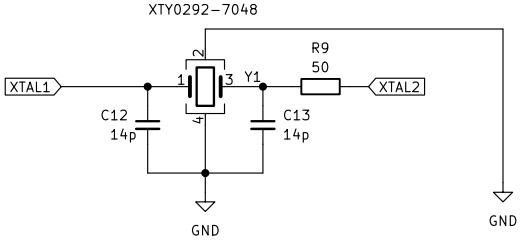


Pull-up Resistors

The pullup-resistors values are obtained from Ohm's Law.
R=V/I
Here the voltage and current to pins are 5V & 2.2mA
so the pullup resistors should be 2.2KΩ.



Oscillator circuit



Cx = 2*(load cap - stray cap)
cx=2*(9p-2p)
cx=2*(7p)
cx= 14p

Sheet: /Controller/
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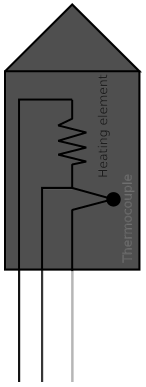
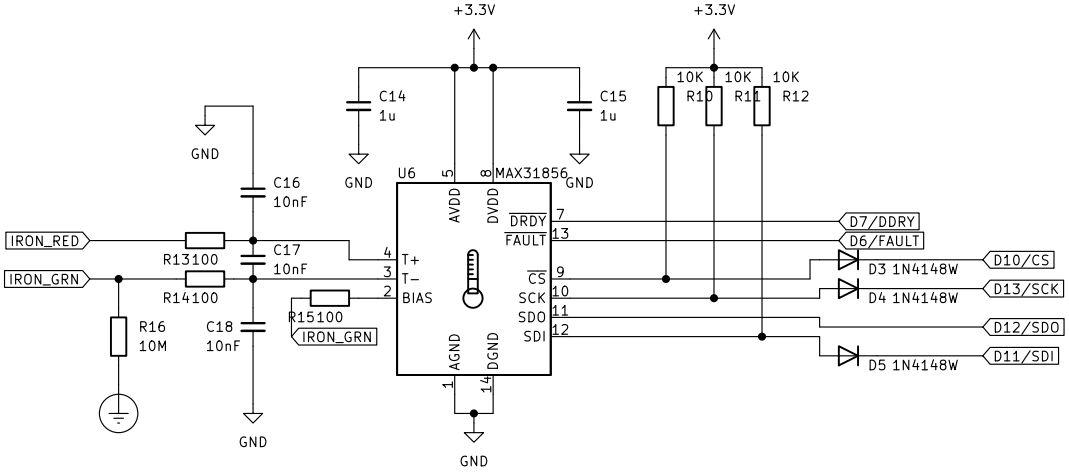
Title:

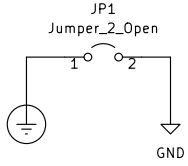
Size: A4	Date:	**Rev:**
KiCad E.D.A. kicad 5.99.0-unknown-e950278637~142~ubuntu21.04.1		Id: 5/10

Precision Thermocouple to Digital Converter with Linearization



Check the thermocouple type
https://gock.net/thermocouple-converter/





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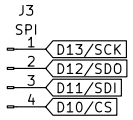
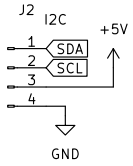
Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A.	kicad 5.99.0-unknown-e950278637~142~ubuntu21.04.1	Id: 6/10

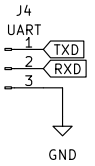
Serial Peripheral Interface



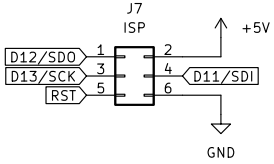
I2C



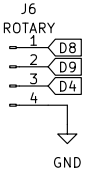
UART



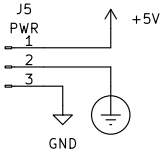
ISP Header



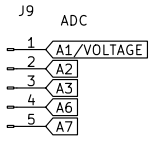
Rotary Encoder Pin



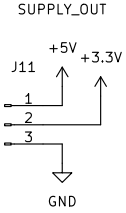
PWR

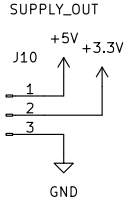


Analog Pins

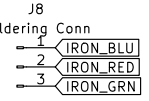


Power supply output





Soldering Connectors



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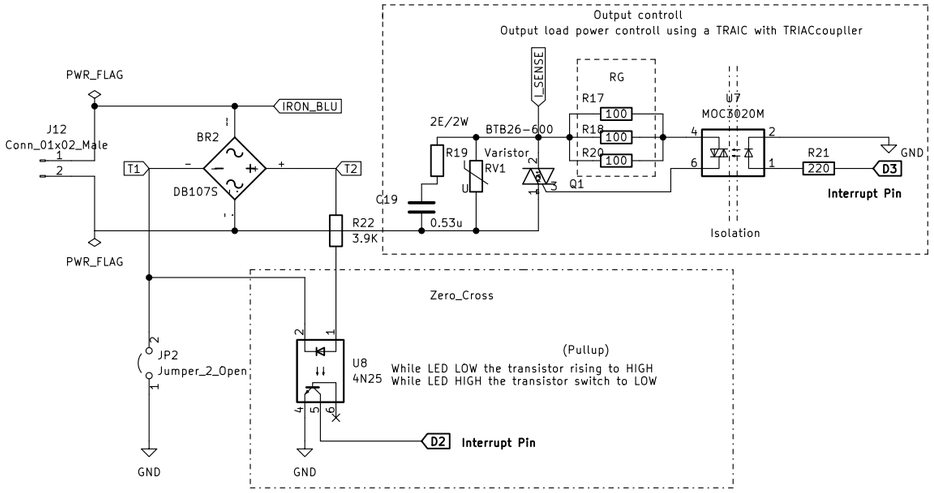
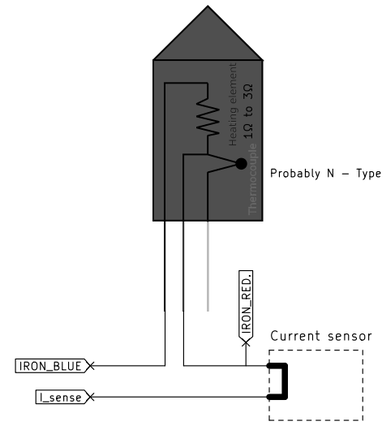
Soldering Iron Power Delevry Unit





Electrical Characteristics of MOC 3020

4.2 ELECTRICAL OPTICAL CHARACTERISTICS at Ta=25°C

PARAMETER			SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS
INPUT	Forward Voltage		VF	—	1.15	1.5	V	IF=20mA
	Reverse Current		IR	—	—	10	μA	VR=6V
OUTPUT	*1 Peak Blocking Current, Either Direction		I_{DRM}	—	10	100	nA	V_{DRM} = 400V
	Peak On-State Voltage, Either Direction		V_{TM}	—	1.7	3	V	I_{TM}=100 mA Peak
	*2 Critical rate of Rise of Off-State Voltage		dv/dt	1000	—	—	V/μs	
COUPLED	*3 Led Trigger Current, Current Required to Latch Output, Either Direction	MOC3020	I_{FT}	—	15	30	mA	Main Terminal Voltage = 3V
		MOC3021		—	8	15		
		MOC3022		—	—	10		
		MOC3023		—	—	5		
	Holding Current, Either Direction		I_H	—	250	—	μA	

Electrical Characteristics of BTA26 800B

Table 3. Electrical characteristics (T_j = 25° C, unless otherwise specified), Standard (4 quadrants), BTB24...B, BTA25...B, BTA26...B

Symbol	Test Conditions	Quadrant		Value	Unit
I_{GT} (1)	V_D = 12 V R_L = 33 Ω	I - II - III - IV	MAX.	50 100	mA
V_{GT}		ALL	MAX.	1.3	V
V_{GD}	$V_D = V_{DRM}$ R_L = 3.3 kΩ T_j = 125° C	ALL	MIN.	0.2	V
I_H(2))	I_T = 500 mA		MAX.	80	mA
I_L	I_G = 1.2 I_{GT}	I - III - IV	MAX.	70	mA
		II		160	
dV/dt(2)	V_D = 67 %V_{DRM} gate open	T_j = 125° C	MIN.	500	V/μs
(dV/dt)c (2)	(dI/dt)c = 13.3 A/ms	T_j = 125° C	MIN.	10	V/μs

1. minimum I_{GT} is guaranted at 5% of I_{GT} max.
2. for both polarities of A2 referenced to A1.

Snubber Circuit Values

VDRM = Non–Repetitive Peak Reverse Voltage
IT(RMS) = RMS On–State Current
di/dt = Rate of Change of On–State Current
ITSM = Peak Surge (Non–Repetitive) On–State Current,
VRMS = Supply RMS Voltage
RL = Load Resistance
dv/dt = Critical Rate of Rise of Off–State Current
ILoad(Peak) = Load Current

VDRM = 800V
IT(RMS) = 26A
di/dt = 50A/uS
ITSM = 300A
VRMS = 38V
RL = 3Ω
dv/dt = 500V/uS
ILoad(Peak) = 25A

CS(Snubber Capacitance)

$$CS = \frac{VDRM}{RL \times [dv/dt]}$$

$$= \frac{800V}{3 \times 500}$$

$$= 0.533\mu F$$

RS (Subber Resistance)

$$RS = \frac{10 \times VRMS \times 1.414}{[ITSM - ILoad(Peak)]}$$

$$= \frac{10 \times 38 \times 1.414}{[300 - 25]}$$

$$= 1.95 \tilde{} 2\Omega$$

FINDING THE VALUE RG

I(TSM) = 1A(optocoupler)Peak repetitive surge current
I(GM) = 6A (TRIAC Peak gate current)
V(PiMAX) = 38.7V
= 24V ± 10%
= 24+[24 x (10/100)]
= 38.7V

$$RG = \frac{V(PiMAX)}{I(TSM)}$$

$$RG = \frac{V(PiMAX)}{Min(ITSM,IGM)}$$

$$RG = \frac{38.7V}{(1A,6A)} \;=\!=\; \frac{38.7}{1} = 38.7\Omega$$

I choose the nearest low value which is
RG = 33.33Ω

4N25M LED Series resistor calculation

Vmax. = 38.7V
Vf = 1.18V
If = 10mA

$$Rx = \frac{Vmax - Vf}{If}$$

$$= \frac{38.7V - 1.18V}{0.01A}$$

= 3752Ω
= 3.9KΩ (standard Value)

MOC 3020 LED Series Resistor

Vmax. = 5V
Vf = 1.15V
If = 15mA

$$Rx = \frac{Vmax - Vf}{If}$$

$$= \frac{5V - 1.15V}{0.015A}$$

= 256.6Ω
= 220/240Ω (standard Value)

Referance

Resistor Standard value calculator
https://daycounter.com/Calculators/Standard–Resistor–Value–Calculator.phtml

Snubber Circuit Design
https://www.youtube.com/watch?v=eZwJgPd7_p4

TRIAC Designing
https://www.youtube.com/watch?v=rLpFtSayZ3Q

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Size: A3	Date:	**Rev:**
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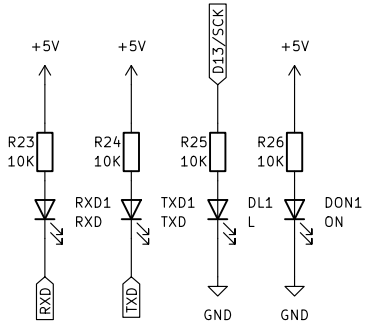
LED Indicators



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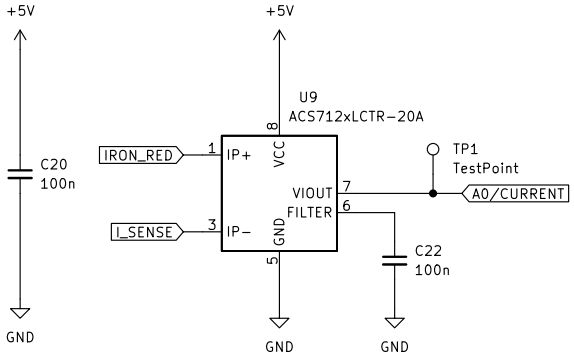
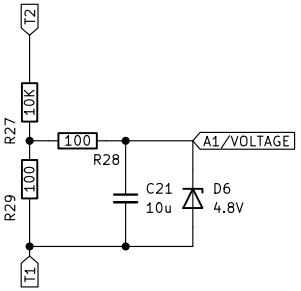
Current Sensor





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