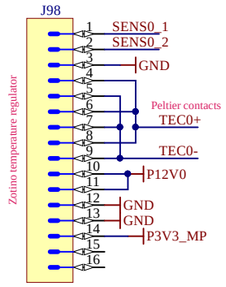

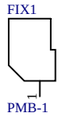

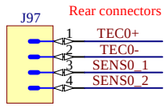

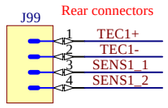

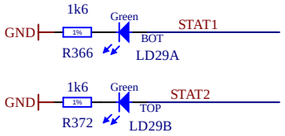

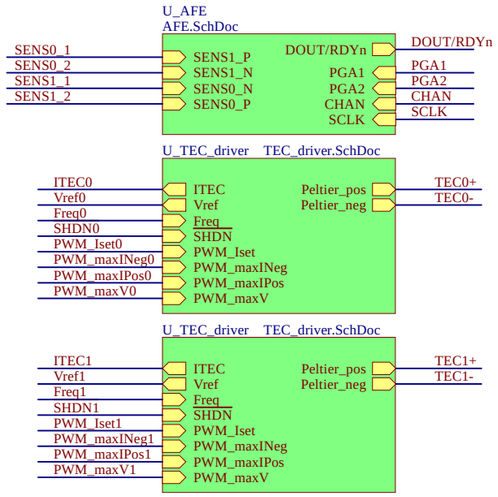

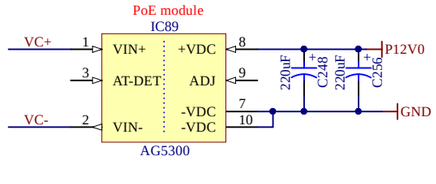

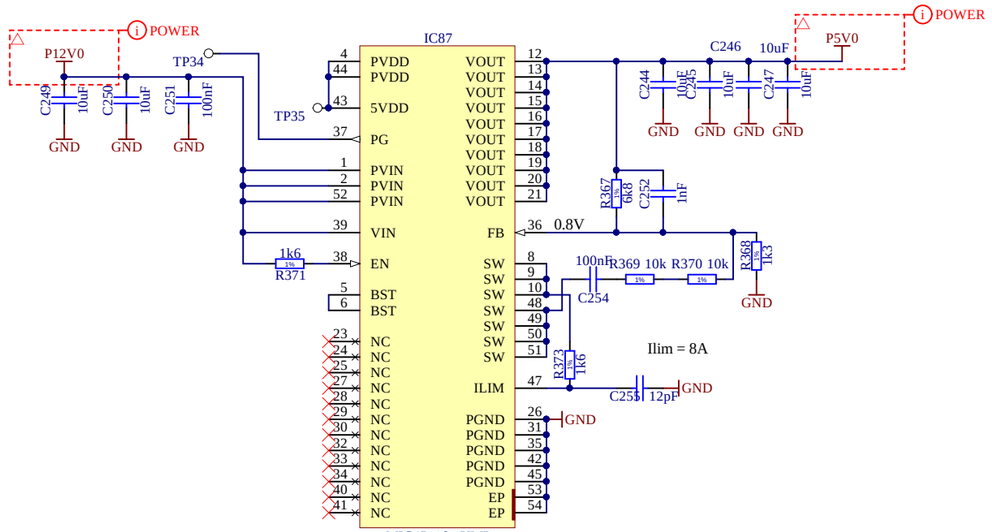

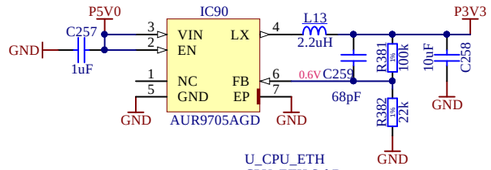

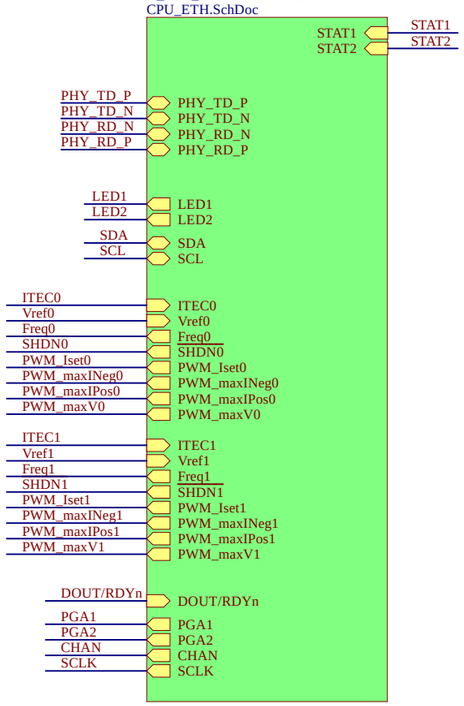

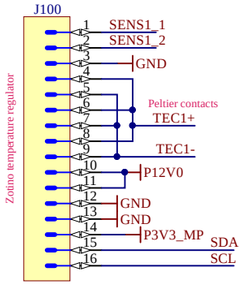

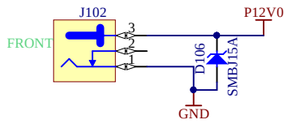

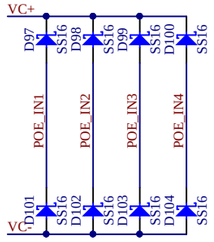

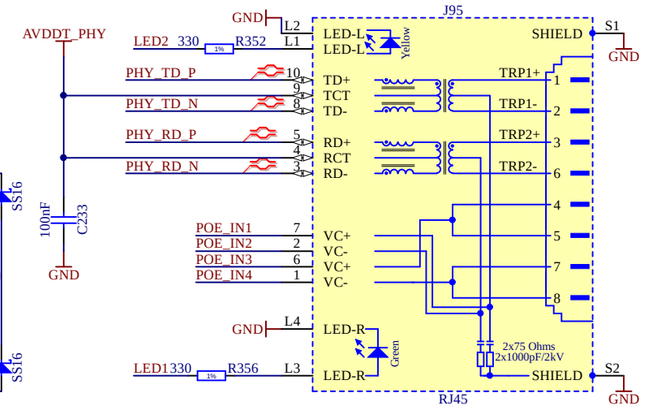

FTG1
FTG2
FTG3
FTG4

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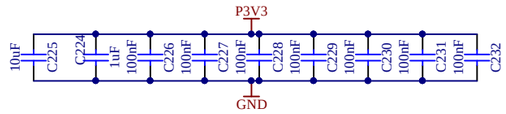
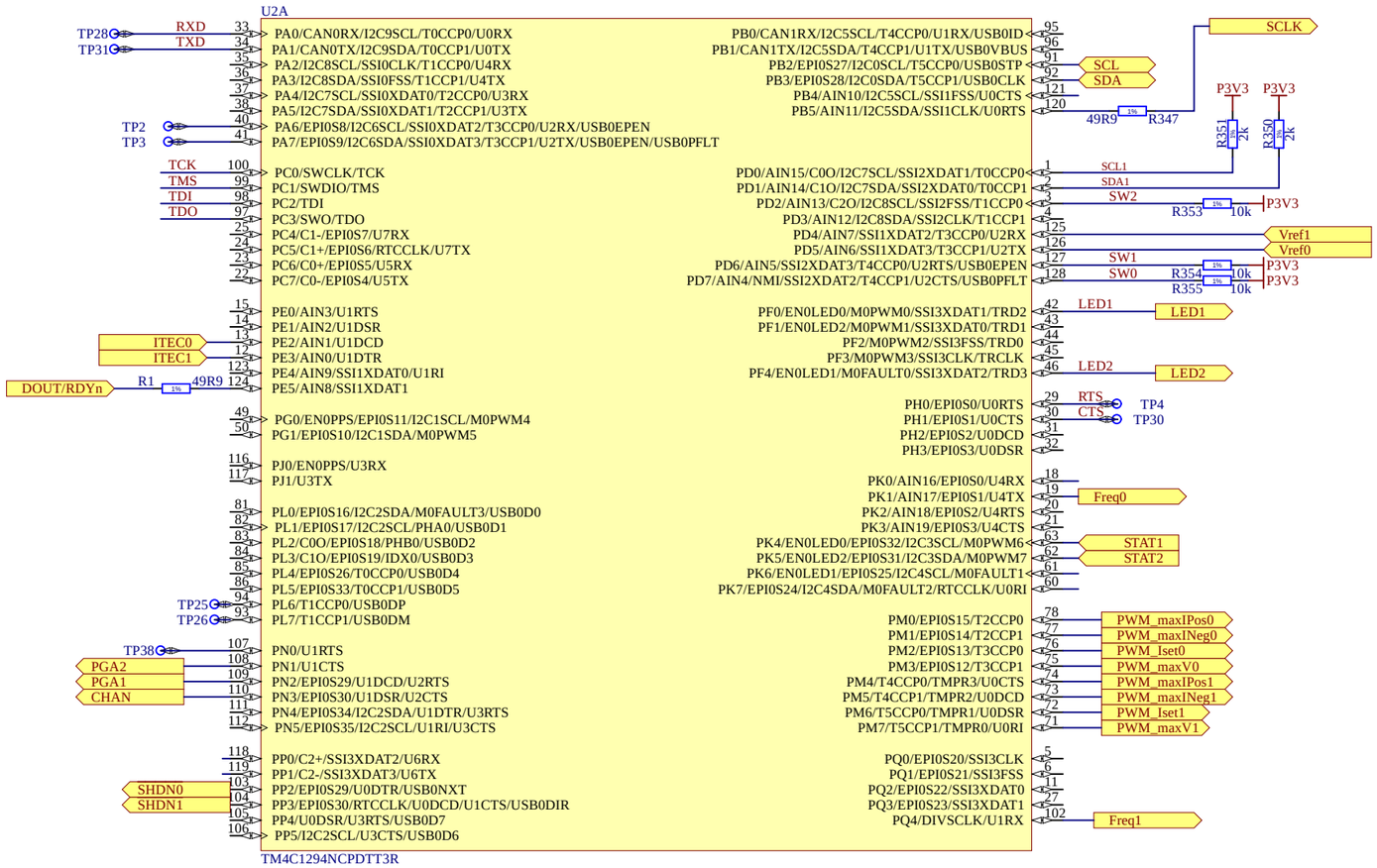
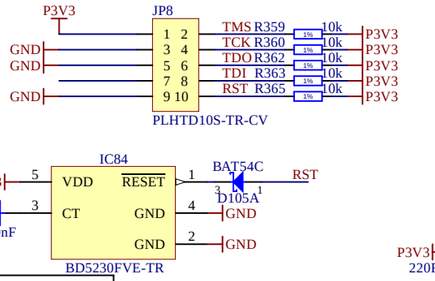
Project/Equipment	Thermostat.PrjPCB		
Document	**Thermostat Top v1.0**	Designer G.Kasprowicz	
		Drawn by G.Kasprowicz	
		Check.by	-
		Last Mod. -	07/11/2018
		File Thermostat.schdoc	
		Print Date 07/11/2018 22:50:03	Sheet 1 of 2
PW ISE	Contact gkasprow@gmail.com	Size A3	Rev 1.0

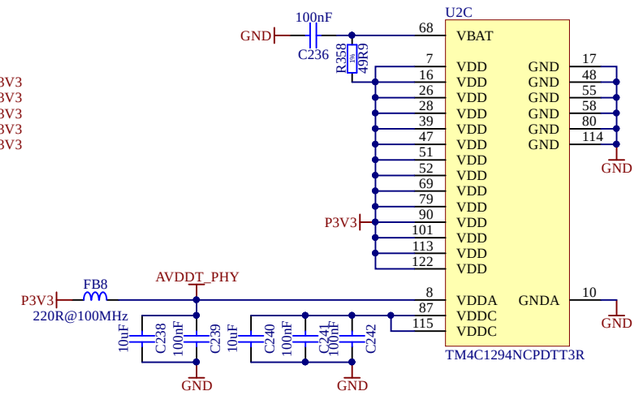


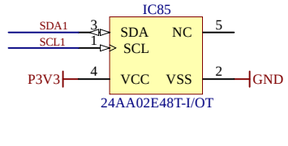
Port pins PM[7:4] operate as Fast GPIO pads but support only 2-, 4-, 6-, and 8-mA drive
capability.
Port pins PL6 and PL7 operate as Fast GPIO pads, but have 4-mA drive capability only

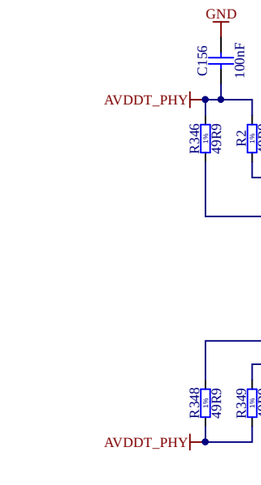
Slow GPIO : PJ1

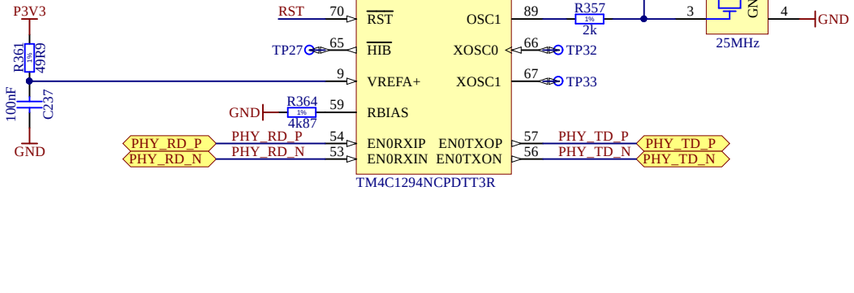












Project/Equipment Thermostat.PrjPCB

Document

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Thermostat CPU v1.0

Designer	G.Kasprowicz
Drawn by	G.Kasprowicz
Check.by	-
Last Mod.	- 07/11/2018
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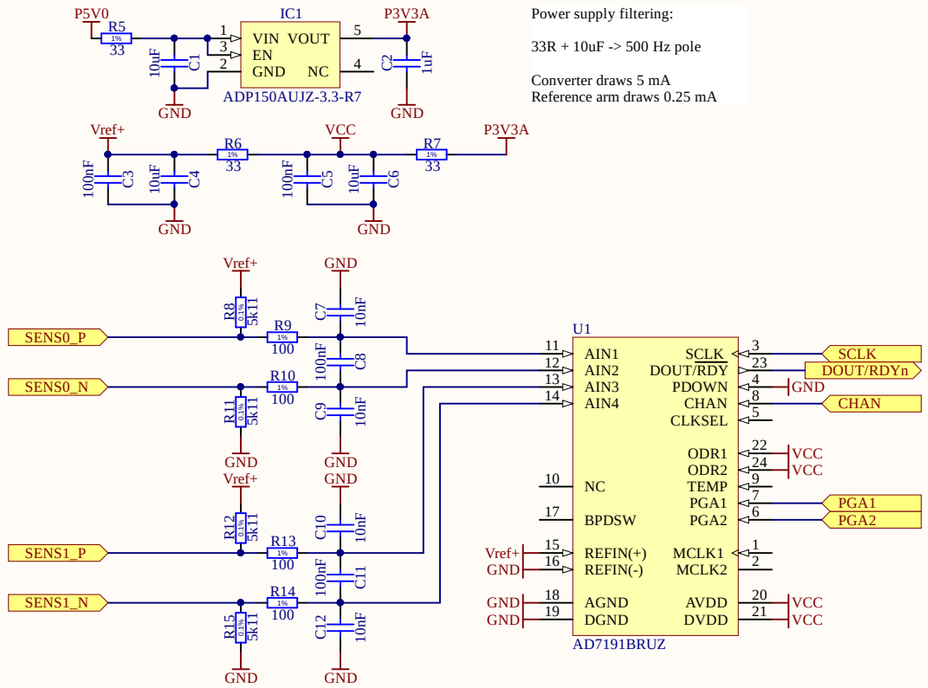
Print Date	07/11/2018 22:50:03 Sheet 2 of 2

PW ISE

Contact gkasprow@gmail.com

Size A3 Rev 1.0



Performance with a typical thermistor (R25 = 10K) :

Resolution at the gain=1, rate=10 Hz, RMS noise floor of 500 nV:
-50 degC to +120 degC : < 0.1 mK
0 degC to 35 degC : < 10 uK

Error in measured T from tempCo (5ppm) of bridge resistors:
0.07 mK / K @ -50 degC (thermistor)
0.1 mK / K @ 20 degC (thermistor)
0.2 mK / K @ 120 degC (thermistor)

Error from converter offset drift (150 nV / K @ gain=1):
< 35 uK / K (-50 degC to +120 degC thermistor)
2 uK / K @ 20 degC (thermistor)

Error from converter gain drift (1ppm / K):
1 mK / K @ -50 degC (very fast drop off to this value below -20 degC)
< 0.1 mK / K @ Troom > 0 degC

Total error from ambient drifts @ thermistor = 20 degC: 0.2 mK / K
(note that a large part of this could be removed by applying a correction calculated from the internal temperature sensor of the AD7191)

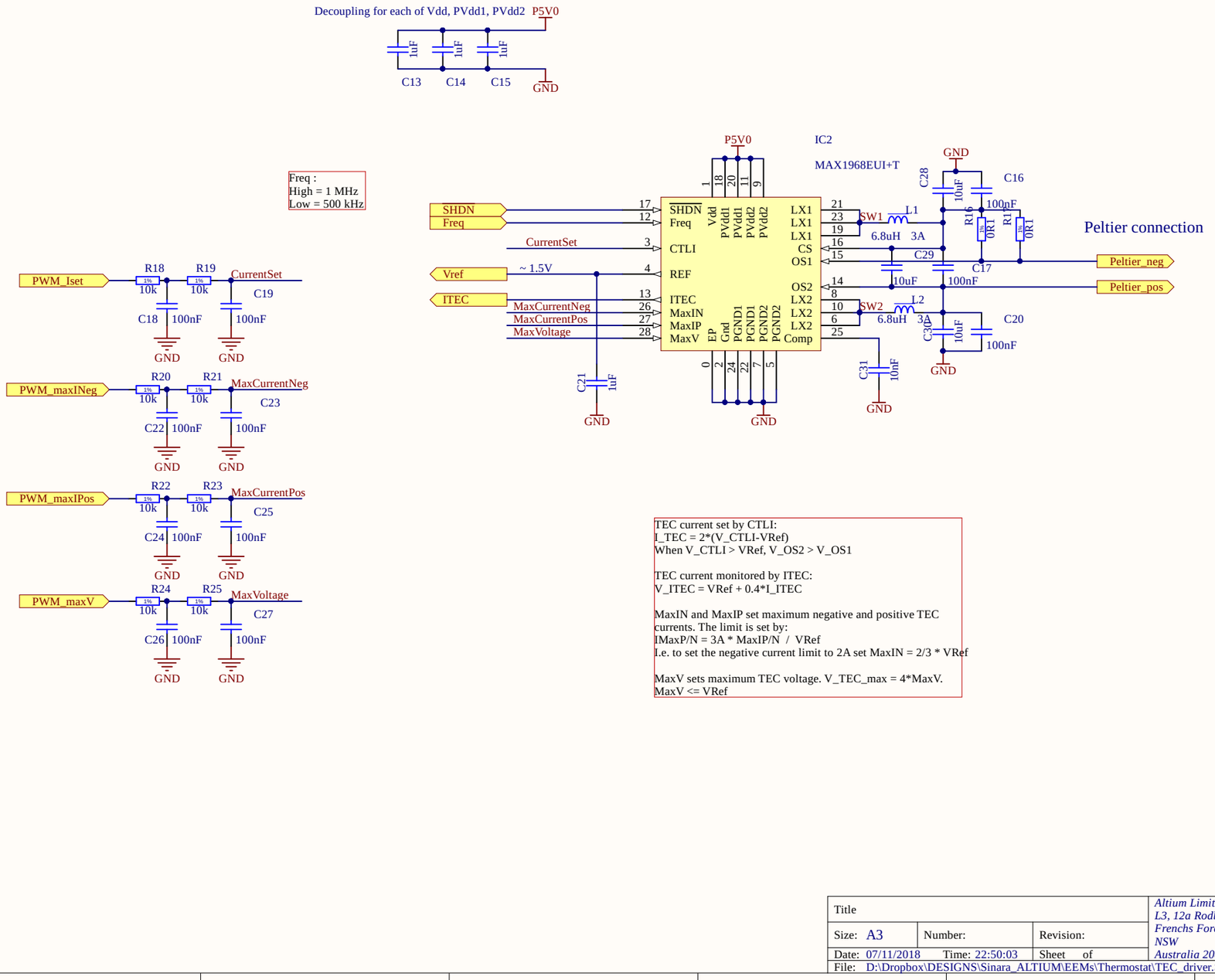
Gain drift over time: 10 ppm / 1000 hours gives < 1 mK @ Troom > 0 degC over 1000 hours

Errors from power supply noise and drift:

Supply rejection:
90 dB -> 30 uV / V
Thus 10 mV noise gives 300 nV shift -> 4 uK (nothing)

Common mode input rejection (rate=10Hz):
120 dB -> 1 uV / V
So 100 mV of 50 Hz / 60 Hz noise -> 1 uK

Title			*Altium Limited* *L3, 12a Rodborough Rd* *Frenchs Forest* *NSW* *Australia 2086*
Size: A3	Number:	Revision:	
Date: 07/11/2018	Time: 22:50:03	Sheet of	
File: D:\Dropbox\DESIGNS\Sinara_ALTIUM\EEMs\Thermostat\AFE.SchDoc			



TEC current set by CTLI:
I_TEC = 2*(V_CTLI-VRef)
When V_CTLI > VRef, V_OS2 > V_OS1

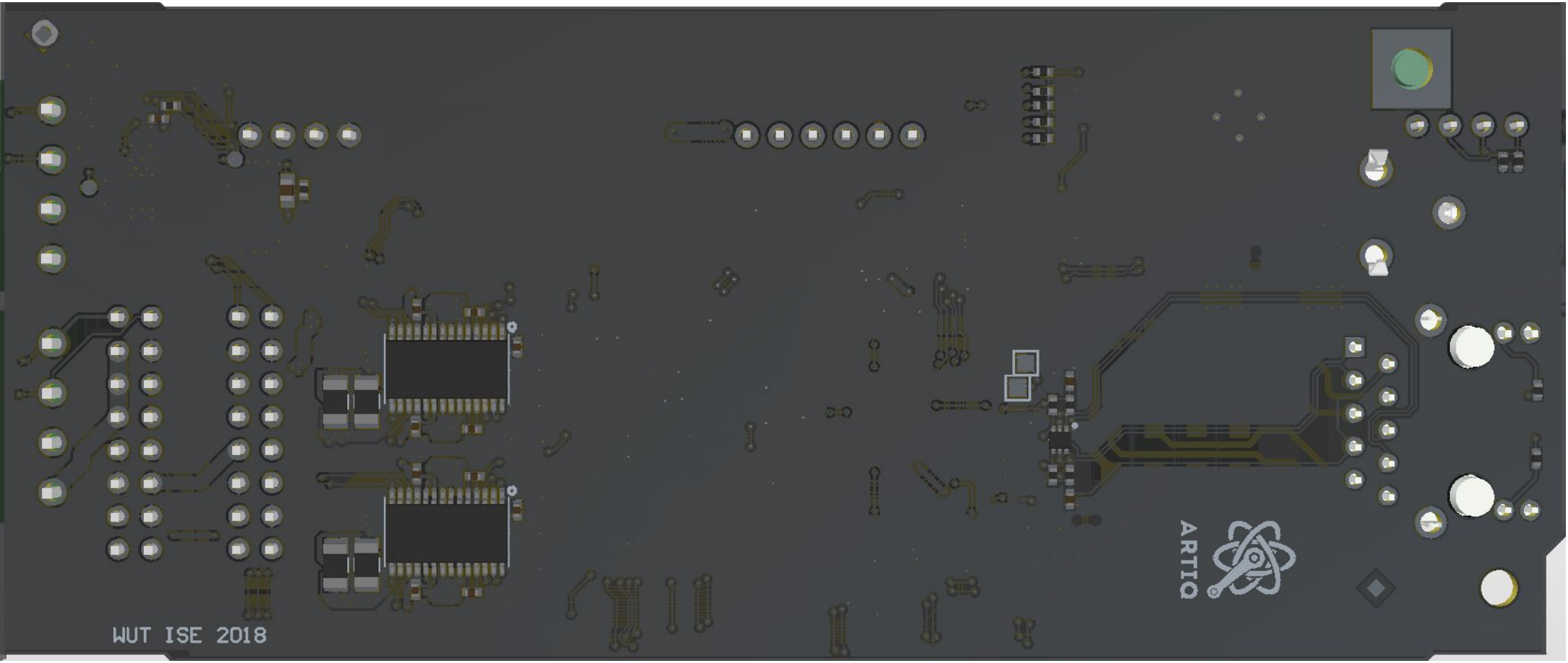
TEC current monitored by ITEC:
V_ITEC = VRef + 0.4*I_ITEC

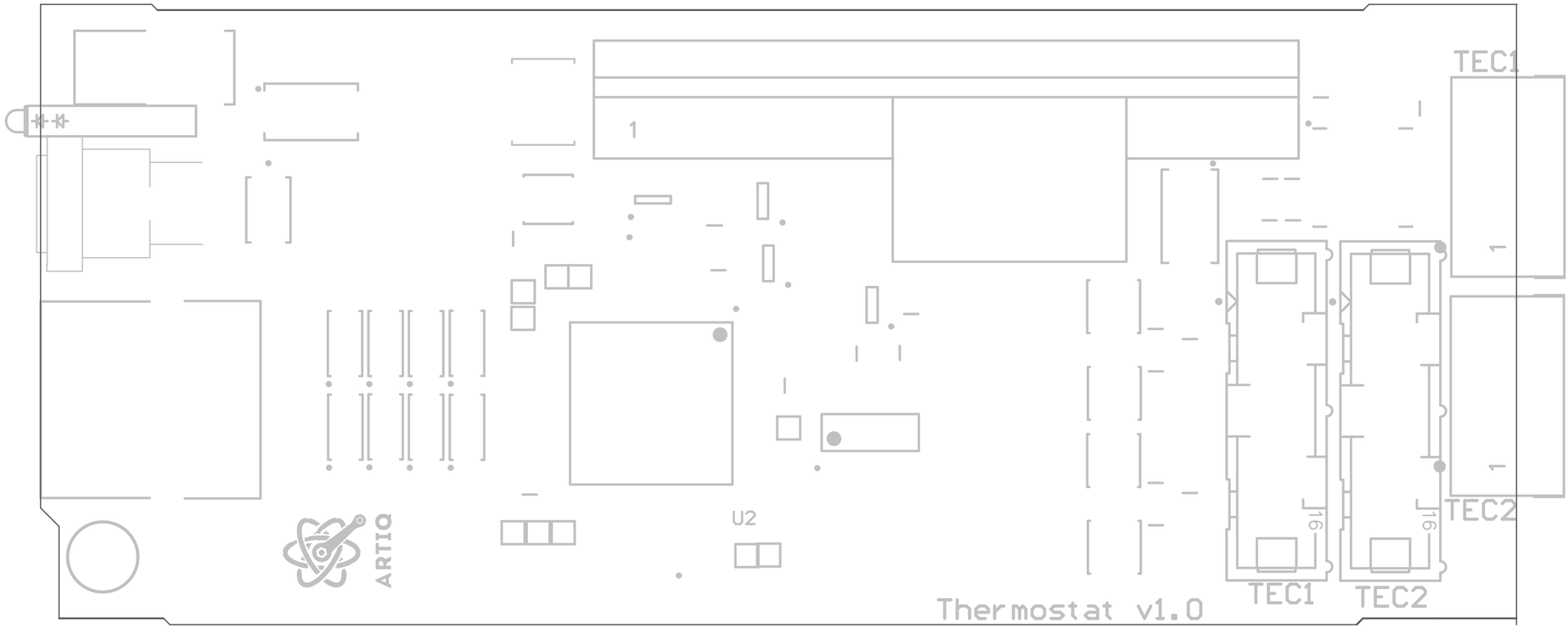
MaxIN and MaxIP set maximum negative and positive TEC currents. The limit is set by:
IMaxP/N = 3A * MaxIP/N / VRef
I.e. to set the negative current limit to 2A set MaxIN = 2/3 * VRef

MaxV sets maximum TEC voltage. V_TEC_max = 4*MaxV.
MaxV <= VRef

Title			*Altium Limited* *L3, 12a Rodborough Rd* *Frenchs Forest* *NSW* *Australia 2086*
Size: A3	Number:	Revision:	
Date: 07/11/2018	Time: 22:50:03	Sheet of	
File: D:\Dropbox\DESIGNS\Sinara_ALTIUM\EEMs\Thermostat\TEC_driver.SchDoc			

ARJ11C-MBSAT-A-B-3MU2
ARTIQ
U2
Thermostat v1.0


WUT ISE 2018
ARTIQ


TEC1
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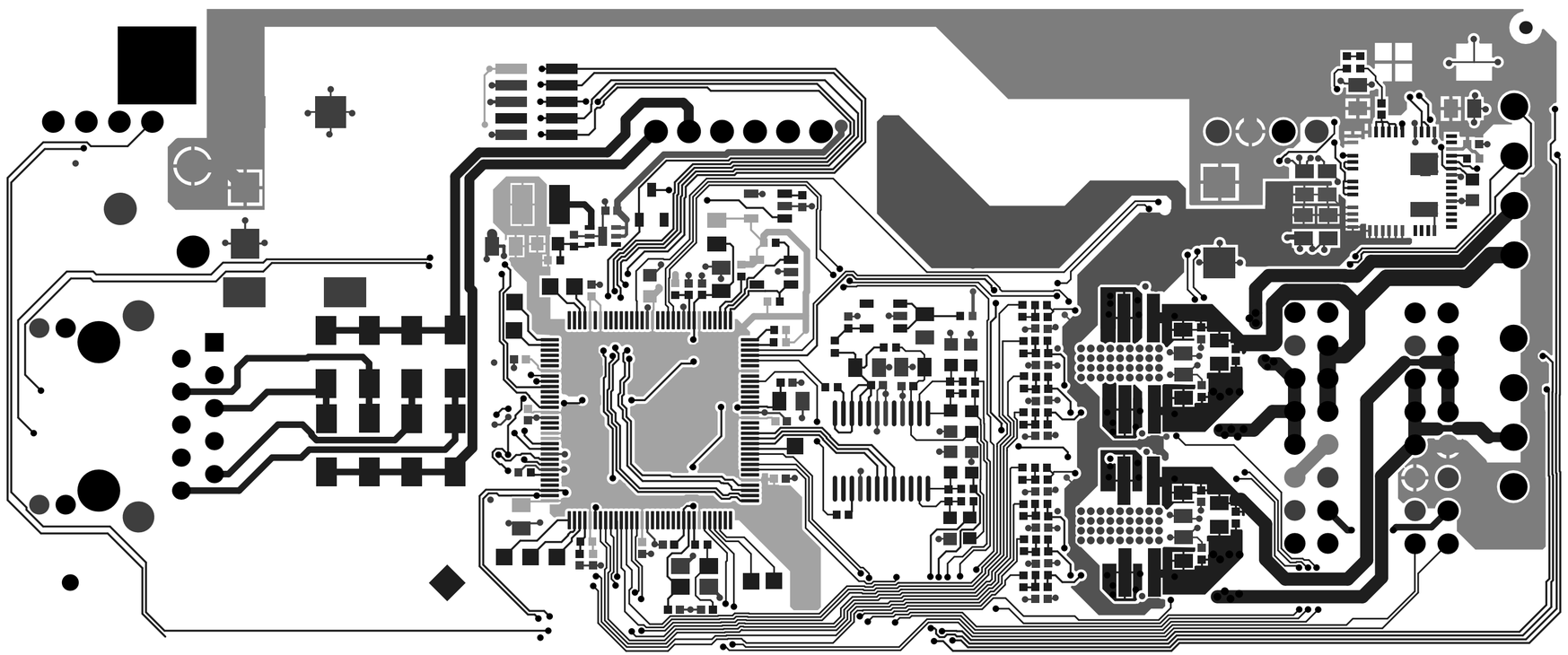
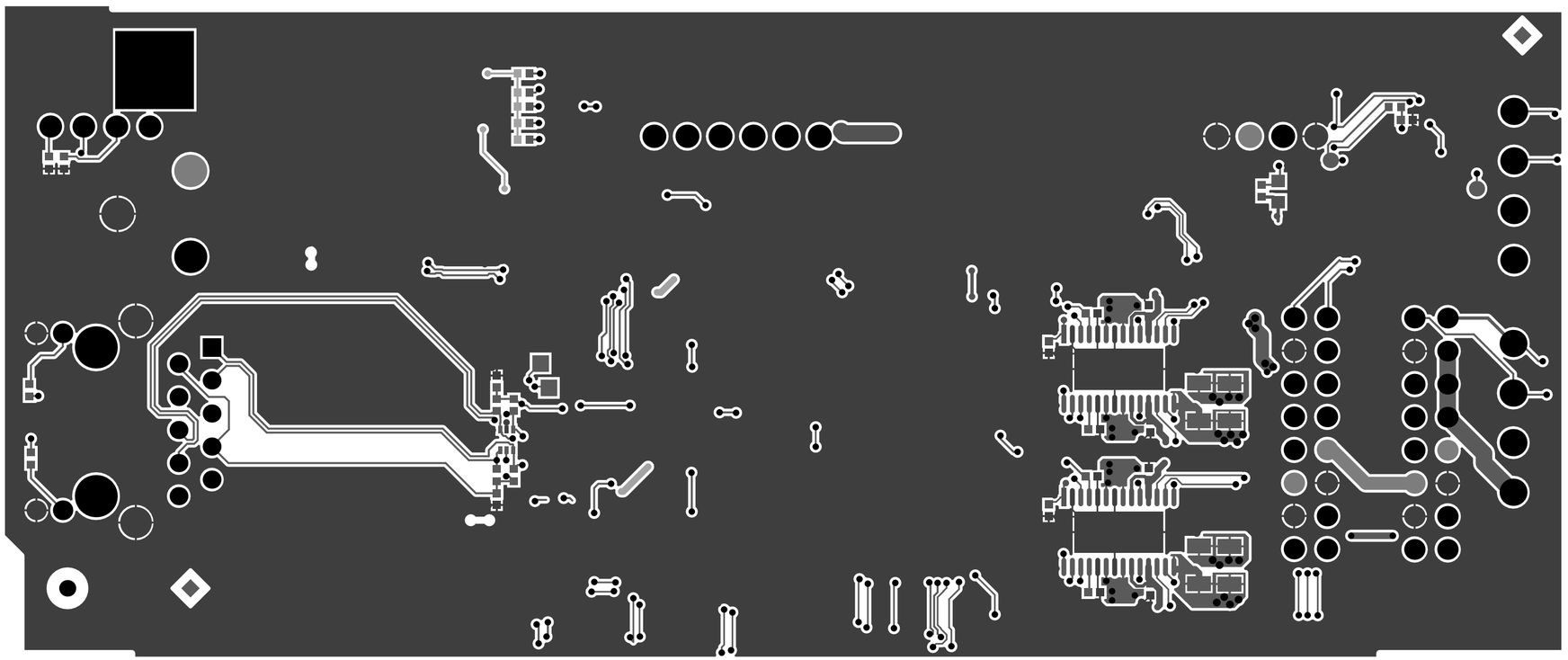
TEC2
1
U2
16
16
ARTIQ
Thermostat v1.0
TEC1
TEC2





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