HP Z3801A Outer Oven Controller

Circuit Description

The controller's purpose is to maintain the outer oven at a constant temperature, typically 50C. Circuitry in the SE corner of the Z3801A PSU board, with component references 101 onwards (e.g. R101 etc), performs this function.

A thermistor inside the oven senses temperature and via amplifiers, power is applied to the heater until the temperature has caused the thermistor resistance fall and become equal to the value of R101+R102, about 16.2k Ohm. Power to the heater is then reduced as the temperature stabilises.

U101 is a voltage reference, and provides a highly stable supply for the bridge network comprising R101 to 104 and the external thermistor.

Op-amp **U102** senses imbalance in the bridge, and its output voltage is used to drive U104. This 'demand' voltage is available at TP102, and also to an external processor via connector P2 pin 9.

U104, together with L102,CR102 and C110 is a switching regulator, which in this context behaves as a power op-amp, providing output of 5-18V at up to 1 Amp. The output voltage is fed back to the input via R109 and R113 in parallel, and is summed with the demand voltage via R110. The regulator output voltage adjusts so that the input voltage at U104 pin 2 is exactly 1.24V, the same as its internal reference zener diode. The relationship between the control voltage at TP102 and the heater voltage at TP104 is approximately: $V_{TP104} = 18.0 - V_{TP102} \times 1.125$

U103 is an interface to an external processor. Applying 0V to connector P2 pin 8 disables the oven controller by saturating U102; a voltage greater than 2.4V opens the analogue switch and the oven controller operates normally.

Test points

TP101 Precision reference 5.000V +/-5mV
TP102 Control voltage, typically 3.5V. During warm-up, the value is 0.1V. A maximum of 14.2V equates to no current to the oven heater.
TP103 Heater 5V supply from Datel DC-DC converter.
TP104 Heater controlled supply, typically 14V.

Data Sheets

LT1170 : Regulator	`http://www.linear.com` and use Search
LT1077 : Op-amp	`http://www.linear.com` and use Search
AD596 : 5V reference	`http://www.analog.com/productSelection/pdf/AD586_d.pdf`
DG211 : Analog switch	`http://www.intersil.com/data/fn/fn3/fn3118/FN3118.pdf`

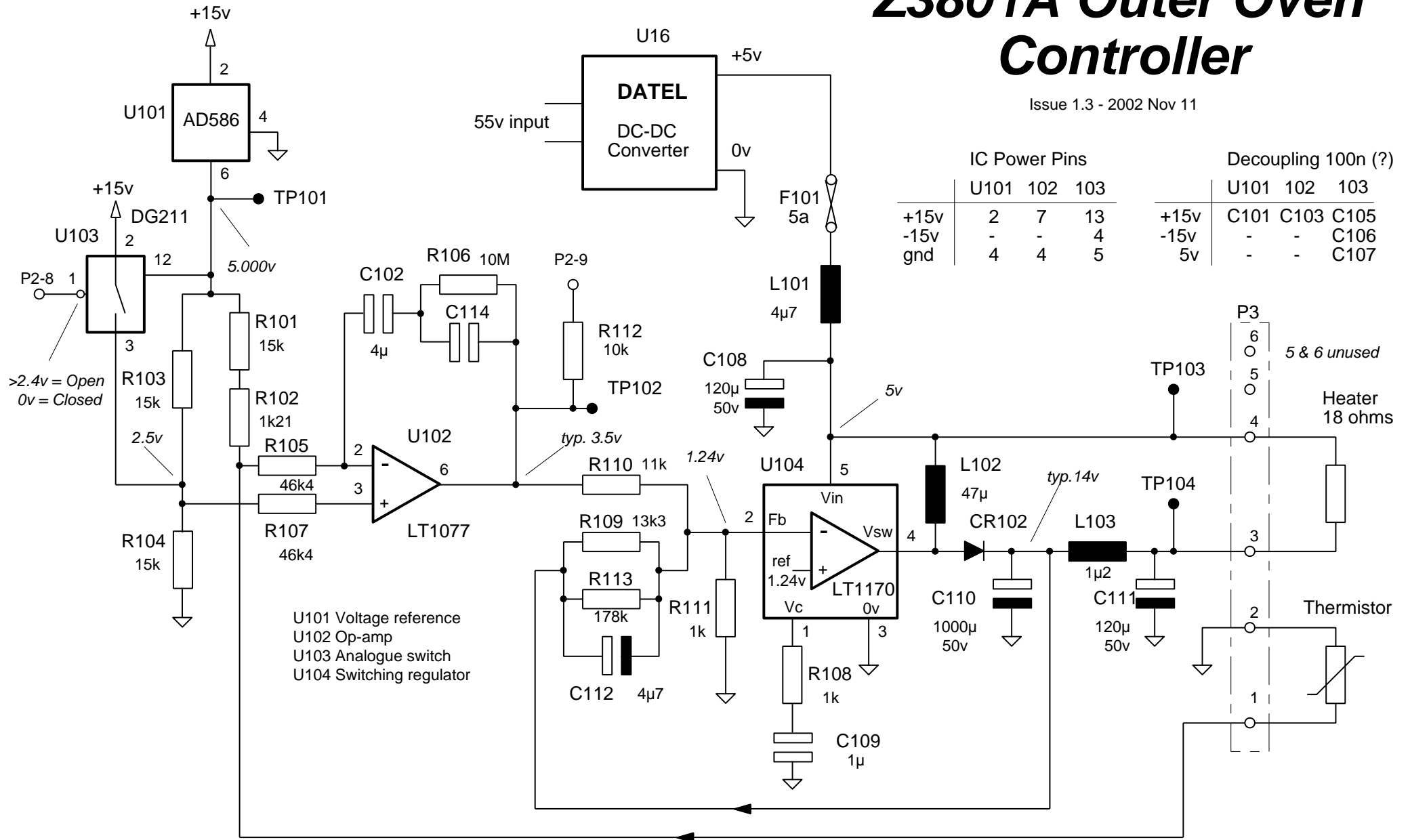## Disclaimer
This information was deduced by continuity testing, voltage measurements and inspection of an actual PCB. It is not based on any proprietary documentation, such as might be available from the manufacturer, or from any other work. It is offered in good faith, and believed to be accurate. Rights in the design are probably owned by *Symmetricom Inc.*, 2300 Orchard Parkway, San Jose, CA 95131-1017, USA.

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+15v

U101 AD586
2
4
6
TP101
5.000v

U16 DATEL DC-DC Converter
55v input
+5v
0v

+15v

DG211
U103
2
12
3
P2-8 1

>2.4v = Open
0v = Closed

2.5v

R103 15k
R101 15k
R102 1k21
R104 15k
R105 46k4
R107 46k4

C102 4µ
R106 10M
C114

P2-9
R112 10k
TP102

U102
2
3
6
LT1077

typ. 3.5v

R110 11k
1.24v

R109 13k3
R113 178k
C112 4µ7
R111 1k

U104
Vin
5
Fb 2
ref 1.24v
Vc 1
Vsw 4
0v 3
LT1170

R108 1k
C109 1µ

F101 5a

L101 4µ7

C108 120µ 50v

5v

L102 47µ
CR102
C110 1000µ 50v

typ.14v
L103 1µ2
C111 120µ 50v

TP103
TP104

P3
6
5 5 & 6 unused
4 Heater 18 ohms
3
2 Thermistor
1

U101 Voltage reference
U102 Op-amp
U103 Analogue switch
U104 Switching regulator

IC Power Pins	U101	102	103
+15v	2	7	13
-15v	-	-	4
gnd	4	4	5

Decoupling 100n (?)	U101	102	103
+15v	C101	C103	C105
-15v	-	-	C106
5v	-	-	C107