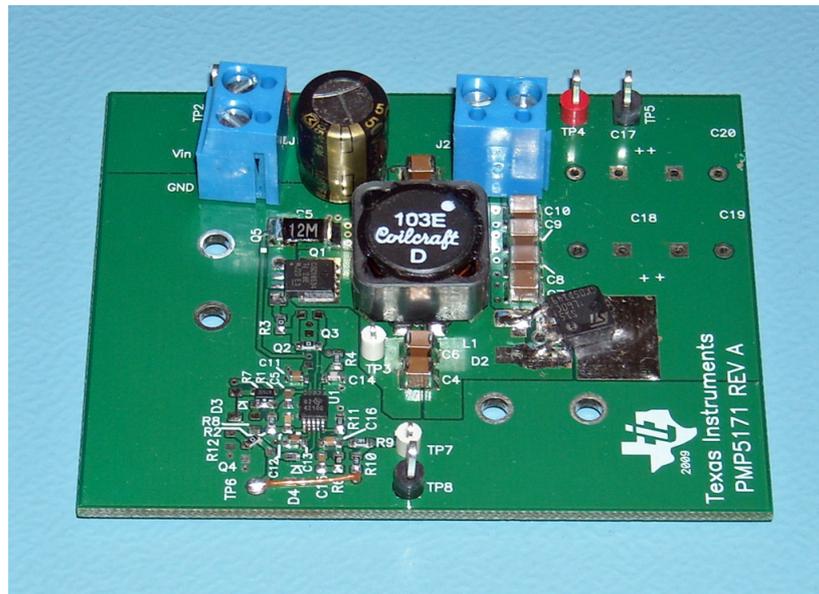


## Automotive Sepic with 8.0V @ 2.0A

- Input 3 ..35V DC
- Output 8.0V @ 2.0A
- Controller TPS40210-Q1
- Free-Running switching frequency of 300 kHz
- Built on PCB 5171 Rev.A



## 1 Startup

The startup waveform is shown in Figure 1. The input voltage is set at 14V, with no load on the 8V output.

- Channel C2: **14V Input voltage**  
5V/div, 5ms/div
- Channel C1: **8V Output voltage**  
2V/div, 5ms/div

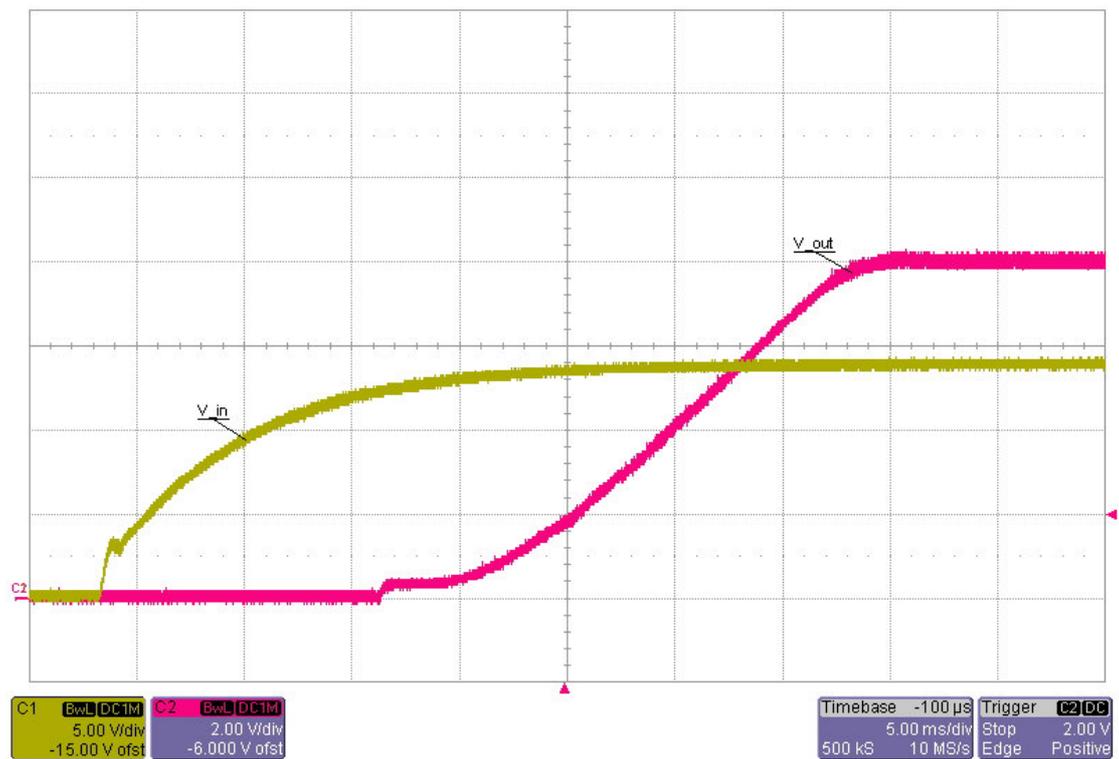


Figure 1

## 2 Shutdown

The shutdown waveform is shown in Figure 2. The input voltage is set at 14V with a 2.0A load on the 8V output.

Channel C2: **14V Input voltage**  
5V/div, 2ms/div

Channel C1: **8V Output voltage**  
2V/div, 2ms/div

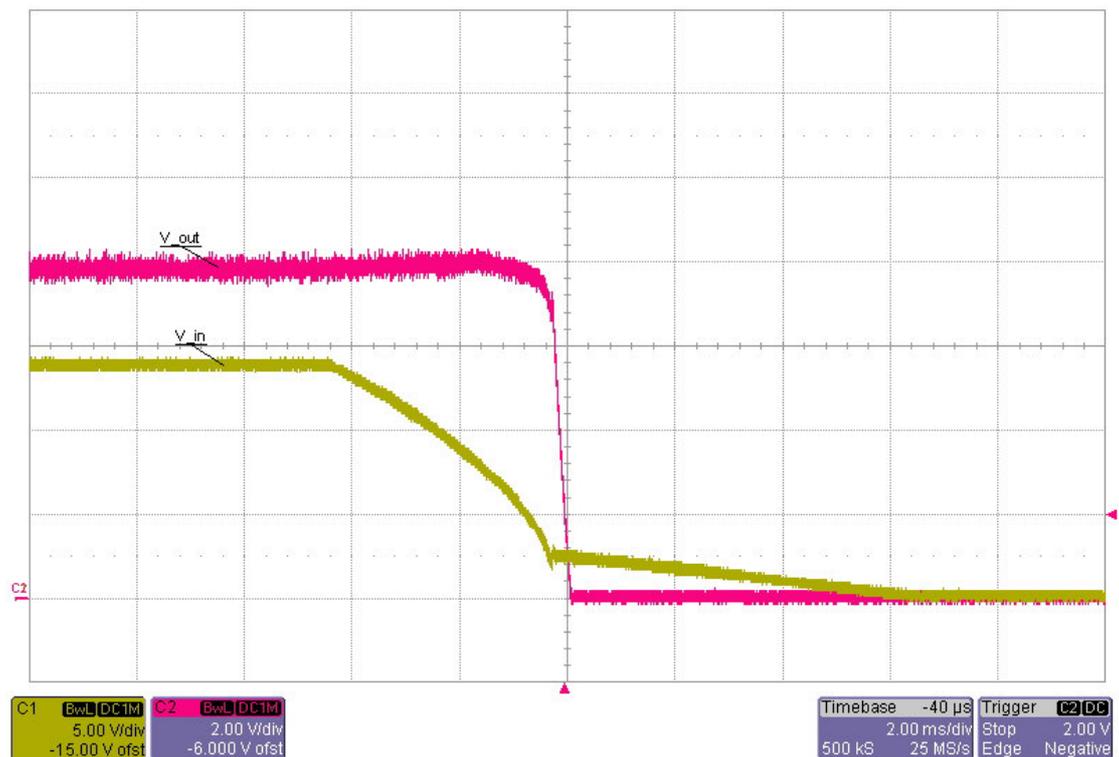


Figure 2

### 3 Efficiency

The efficiency and load regulation for 3..35V input voltage range are shown in Figure 3 and Figure 4.

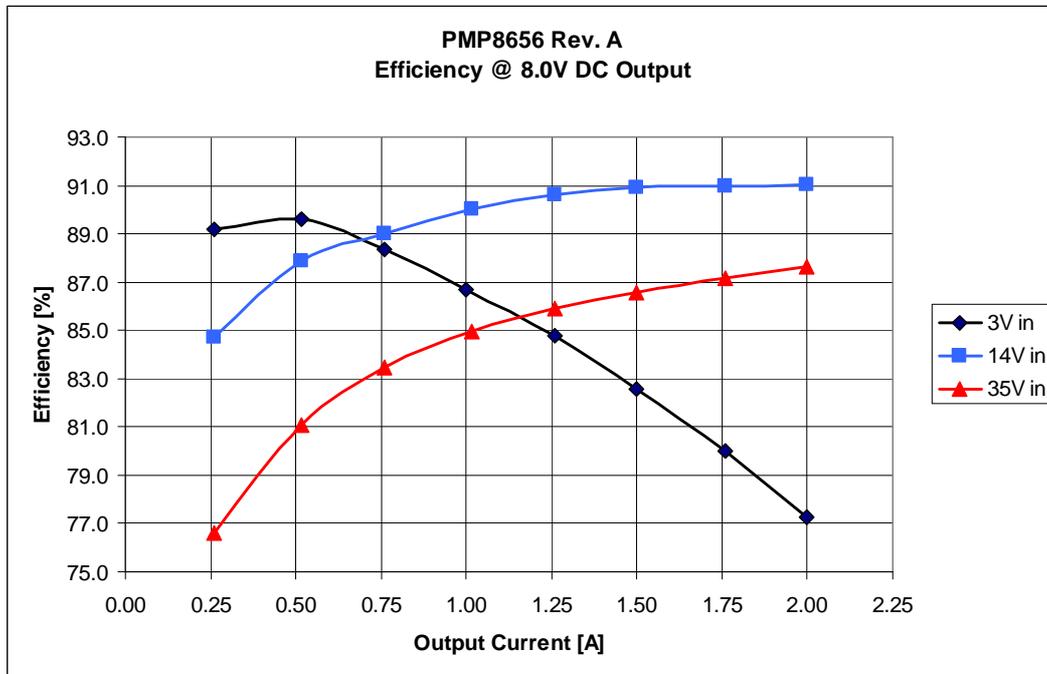


Figure 3

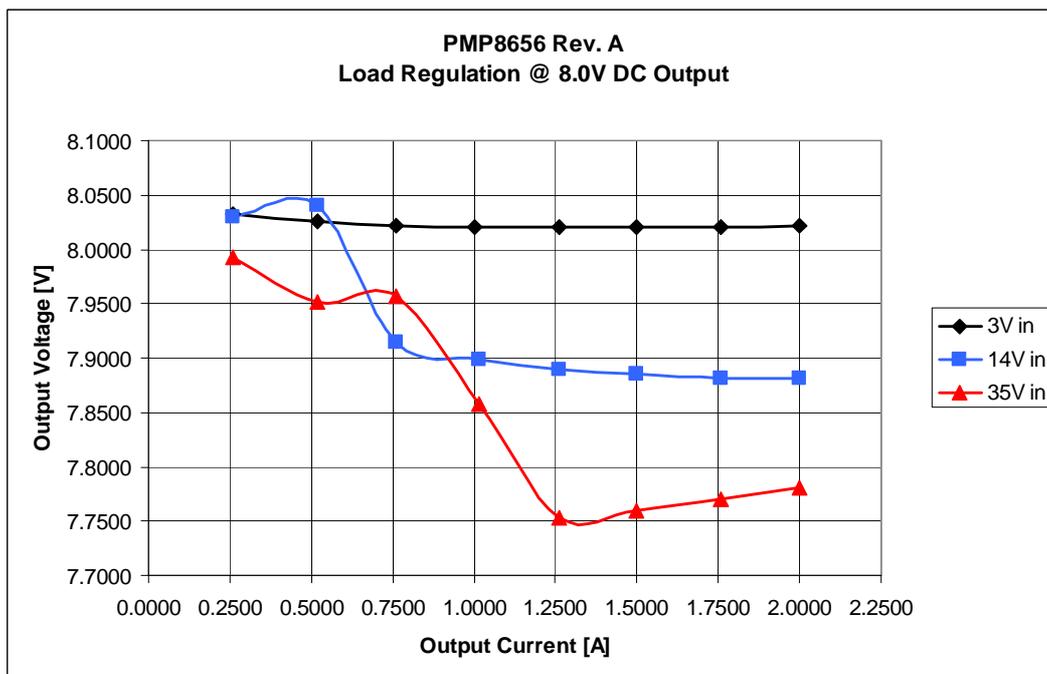


Figure 4

## 4 Load step

The response to a load step and a load dump for the 8V output at an input voltage of 14V is shown in Figure 5.

Channel C2: **Output voltage**, -680mV undershoot, 664mV overshoot  
500mV/div, 1ms/div, AC coupled

Channel C1: **Load current**, load step 1.0A to 2.0A and vice versa  
1A/div, 1ms/div

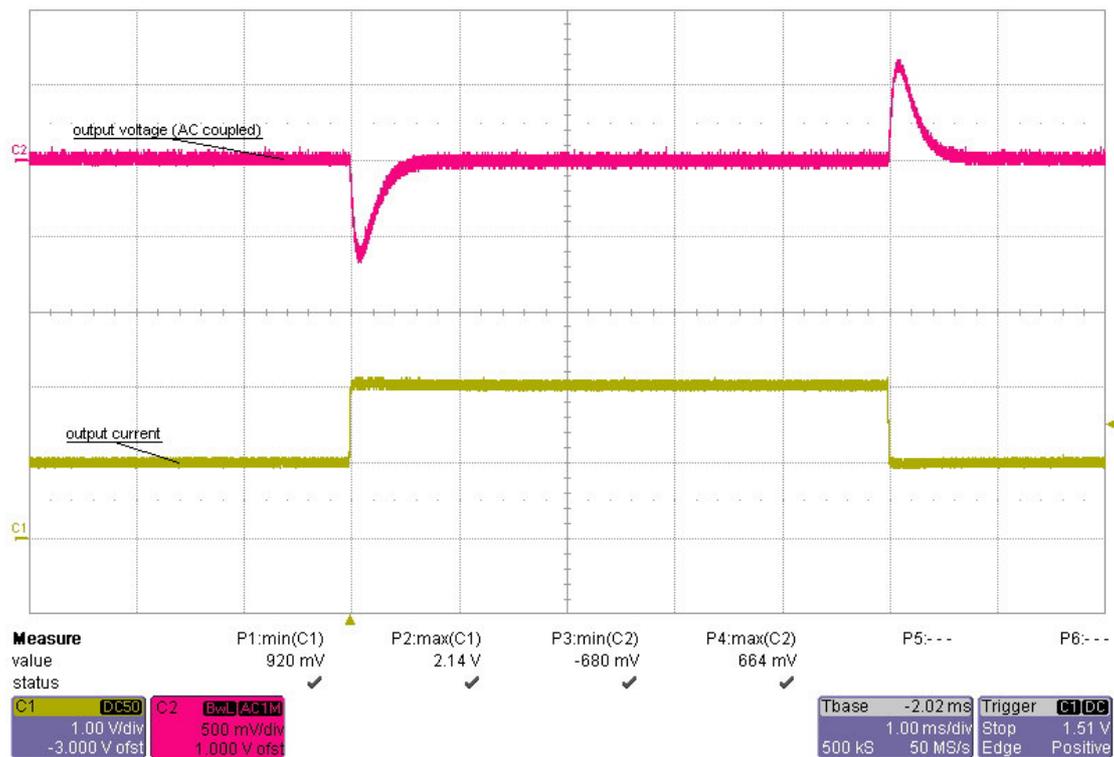


Figure 5

## 5 Frequency response

Figure 6 shows the loop response at 3V, 6V, 12V, 24V and 35V input voltage and a load of 2.0A.

### 3V input

- 66 deg phase margin @ crossover frequency 845 Hz
- -13 db gain margin

### 6V input

- 81 deg phase margin @ crossover frequency 1.8 kHz
- -20 db gain margin

### 12V input

- 71 deg phase margin @ crossover frequency 2.5 kHz
- -23 db gain margin

### 24V input

- 73 deg phase margin @ crossover frequency 3.1 kHz
- -23 db gain margin

### 35V input

- 70 deg phase margin @ crossover frequency 4.0 kHz
- -21 db gain margin

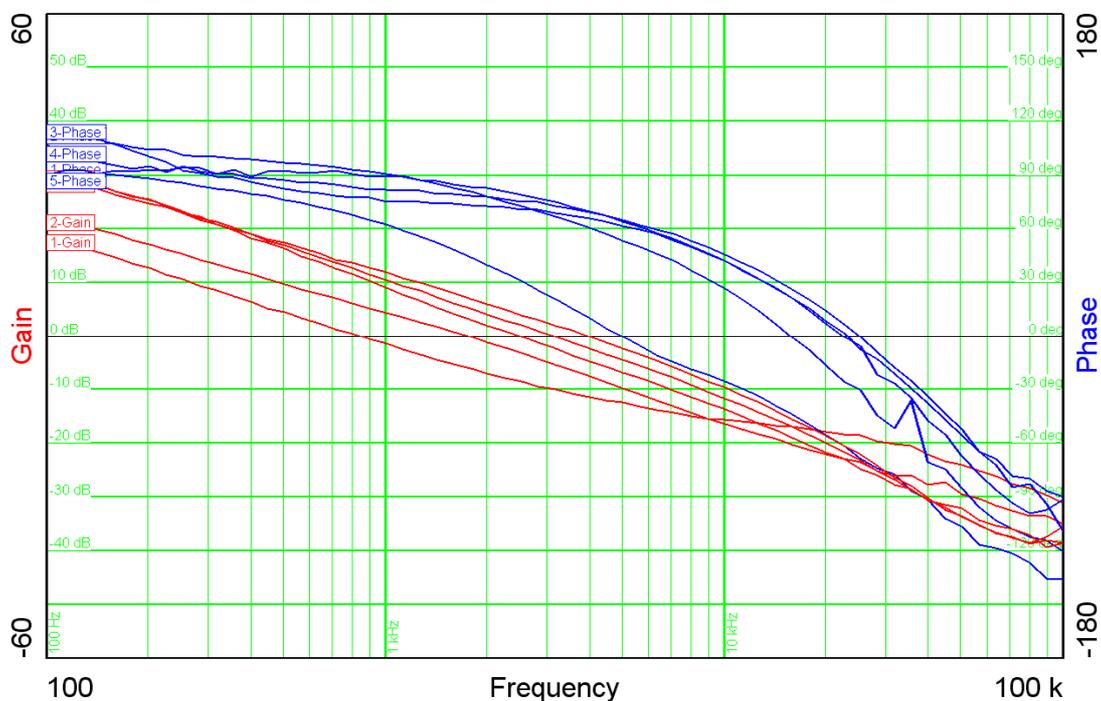


Figure 6

## 6 Switching Node

The drain-source voltage on the switching node is shown in Figure 7. The image was captured with 35V input and 2.0A load.

Channel C2: **Drain-source voltage**, -3.3V minimum voltage, 47.9V maximum voltage  
10V/div, 2us/div

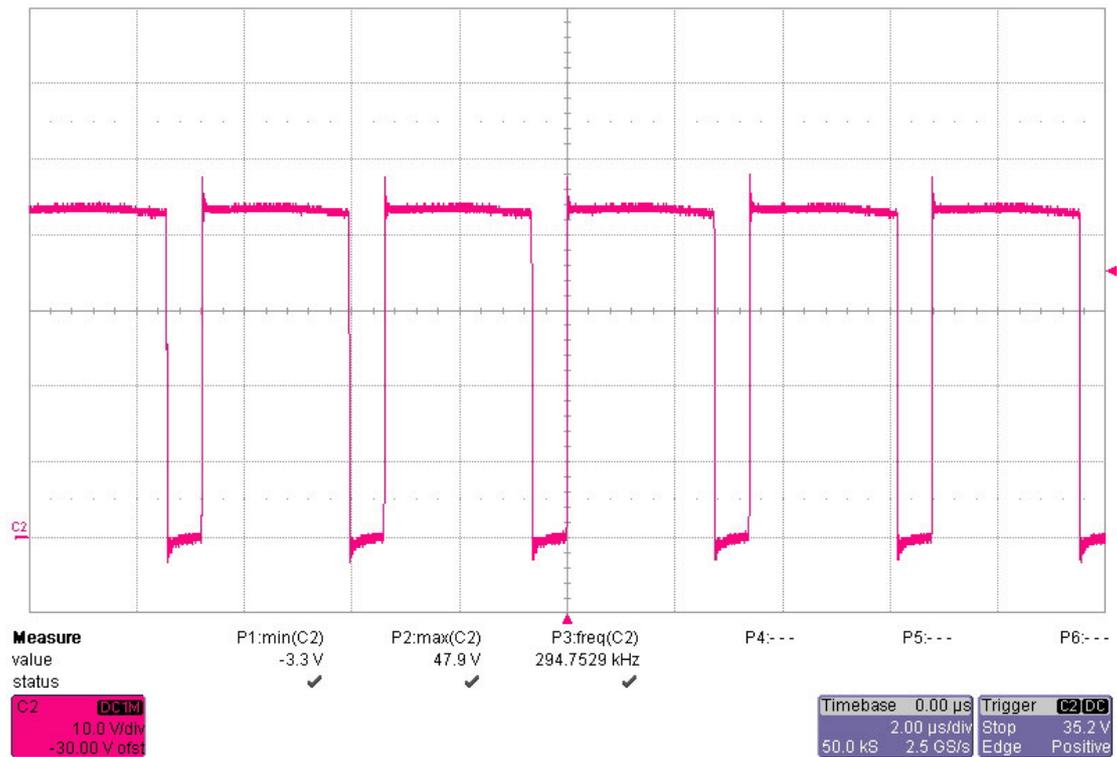


Figure 7

## 7 Thermal measurement

The thermal image (Figure 8) shows the circuit at an ambient temperature of 21 °C with an input voltage of 14V and a load of 2.0A.

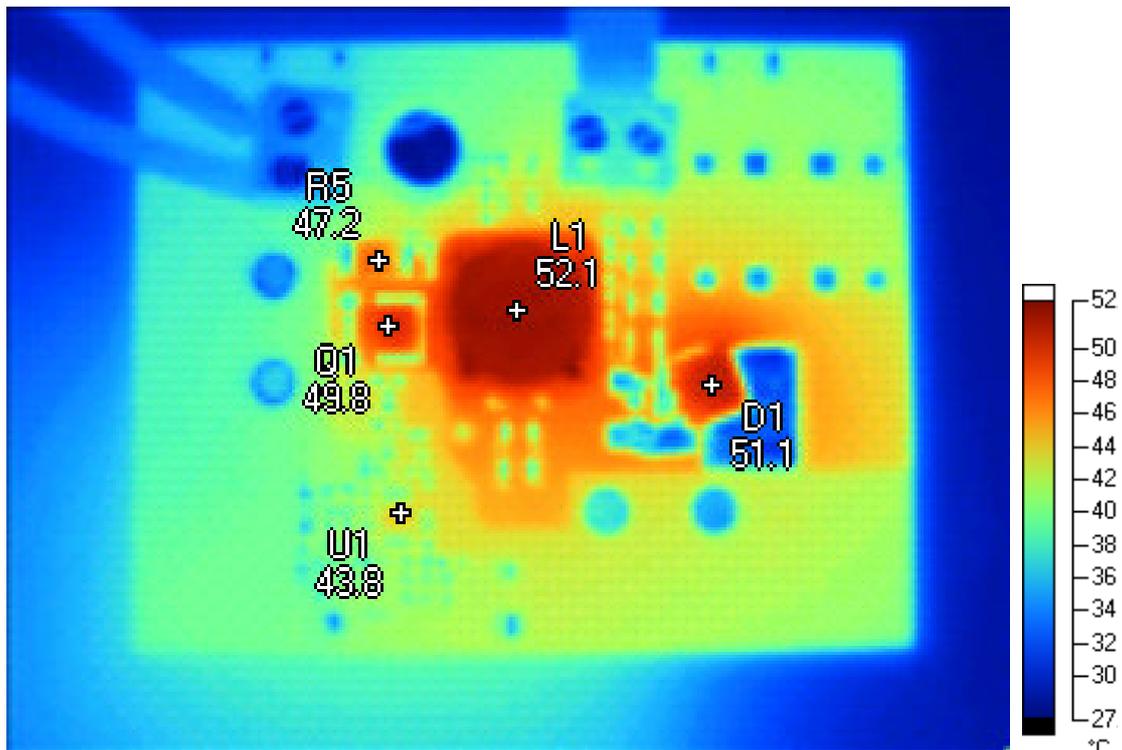


Figure 8

### Markers

Label	Temperature	Emissivity	Background
D1	51.1 °C	0.95	21.0 °C
L1	52.1 °C	0.95	21.0 °C
Q1	49.8 °C	0.95	21.0 °C
R5	47.2 °C	0.95	21.0 °C
U1	43.8 °C	0.95	21.0 °C

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