

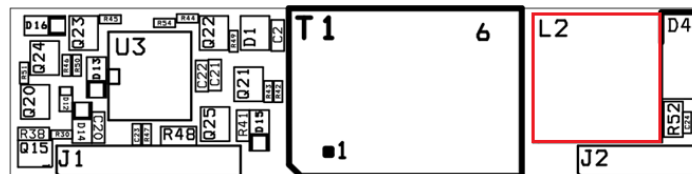
The following document details the thermal performance of the Ag5400 series for use with designing thermal management of the Ag5400 range when integrating into designs.

The Ag5400 module is a compact power component and as a result will generate heat in the small footprint. The amount of heat generated by the module will depend on the load it is required to drive and the input voltage supplied by the PSE. To obtain maximum power it is important that any enclosure used has sufficient ventilation and airflow over the Ag5400, It is also highly recommended that heat is drawn away from the module and into a larger thermal mass, by use of soldering the module into a host PCB containing copper pours.

The Ag5400 series is capable of supplying up to 30W of power. The module will shut down as a result of the thermal protection if the additional heat generated is not removed from the device.

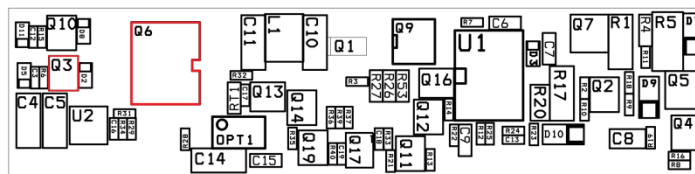
The hottest components on the Ag5400 series are dependent on the output voltage variant. Highlighted below are the hottest components on the front and the rear of the module for each variant.

The hottest component on the front side of the board for all variant of the Ag5400 is L2.

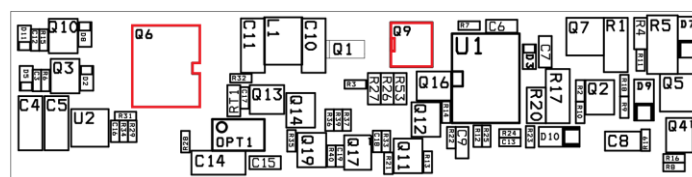


Ag5400 Front side

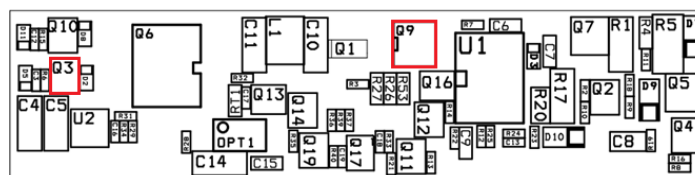
On the rear side of the module a combination of Q3, Q6 or Q9 are the hottest components.



Ag5405 Rear side



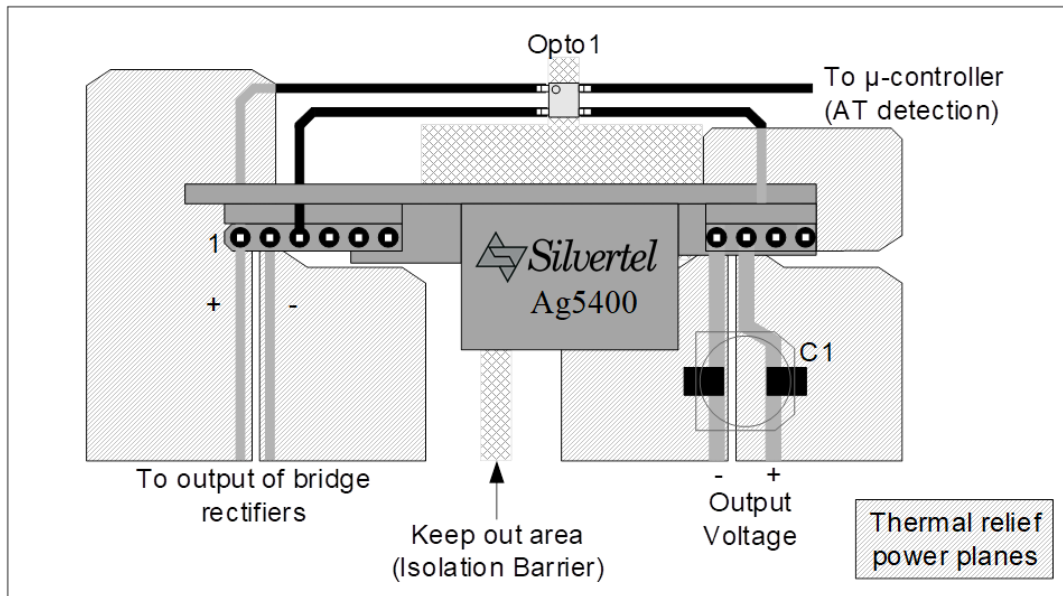
Ag5412 Rear side



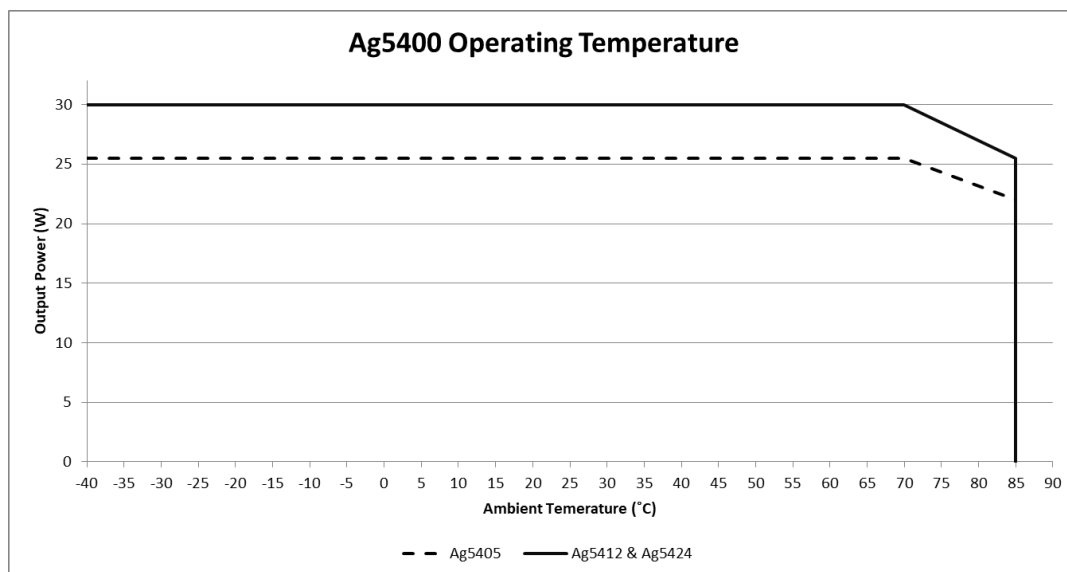
Ag5424 Rear side

The Ag5400 is only a single component in a system, and any enclosure that is to house should be designed to dissipate the highest average power demand of the whole system. The Ag5400 is a high efficiency series, so will contribute up to 1.7W- 2.8W of heat operating at the maximum guaranteed power level of 25.5W for a Type 2 (at) application.

It is always preferential to have enough airflow in a system to remove any pockets of higher than ambient air surrounding the components on the module. Additionally thermal planes can be used to draw heat out of the module through the pins, into a larger surface area to assist in heat dissipation.



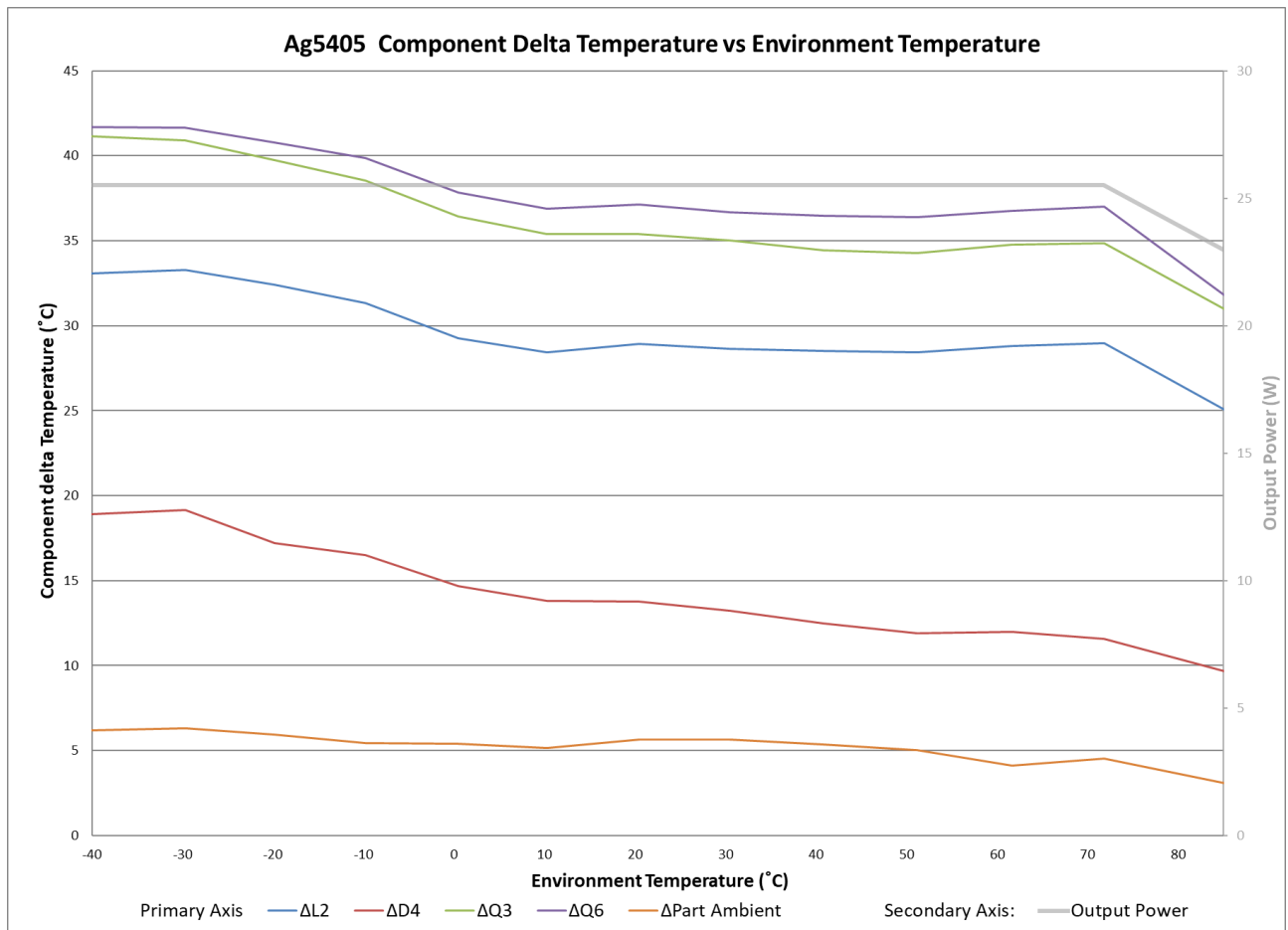
The following tests show typical component temperatures while operating in ambient temperatures between -40°C and 85°C . These tests were performed in a Temperature Applied Sciences Ltd ECO MT135 Environmental chamber with circulating air at a rate of approximately 0.5m/s over the Ag5400 module while socketed into an evaluation board.



Ag5400 Operating Profile

Ag5405

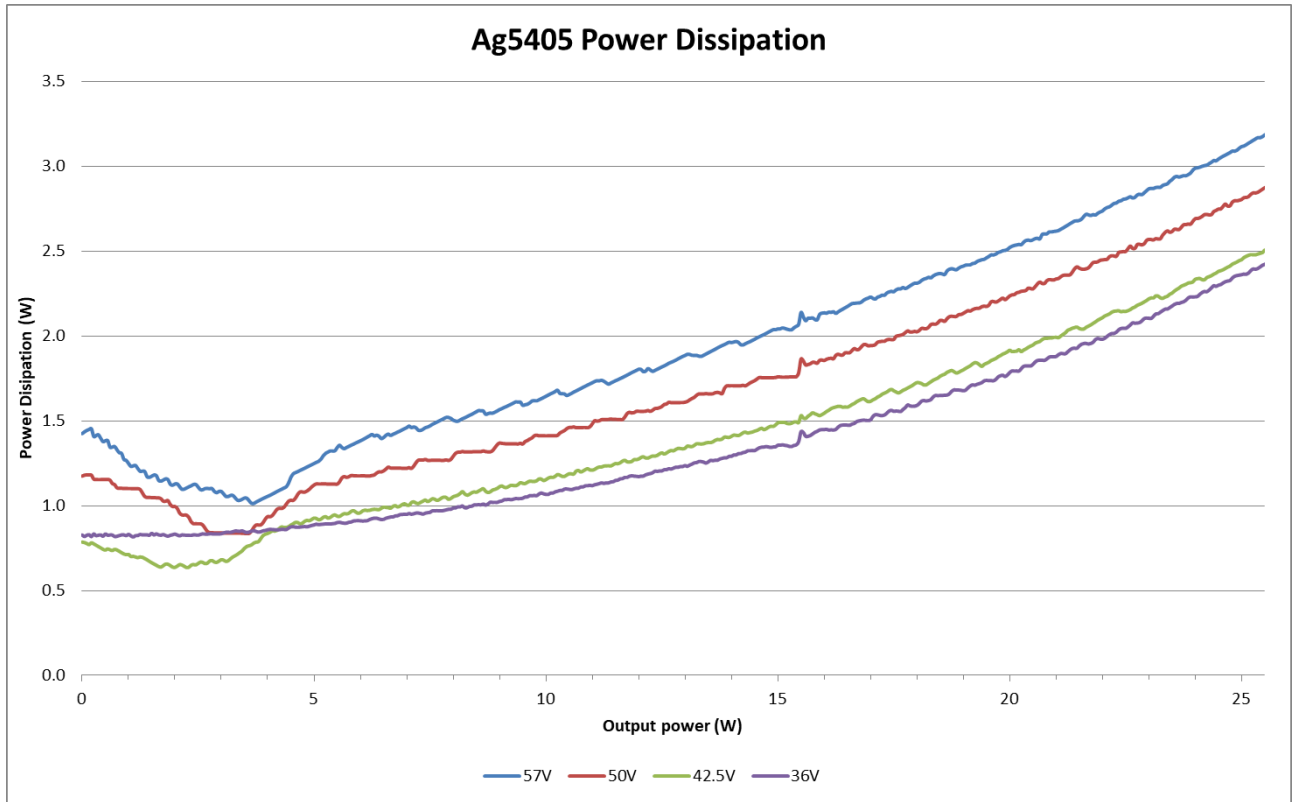
While the hottest components on the Ag5405 are Q3 and Q6, the majority of the heat generation is in the output inductor L2 due to the high output current which heats the PCB reducing the ability for Q3 and Q6 to dissipate heat energy as effectively.



Ag5405 delta component temperature

Chamber Set Temperature (°C)	L2 Temperature (°C)	D4 Temperature (°C)	Q3 Temperature (°C)	Q6 Temperature (°C)	Supply Voltage (V)	Output Current (A)	Output Power (W)
-40	-7.19	-21.33	0.89	1.45	56.93	5.1	25.5
-30	3.58	-10.52	11.22	11.95	56.93	5.1	25.5
-20	12.64	-2.57	19.97	21.00	56.93	5.1	25.5
-10	21.56	6.73	28.77	30.07	56.92	5.1	25.5
0	29.79	15.21	36.95	38.38	56.92	5.1	25.5
10	38.70	24.05	45.66	47.12	56.92	5.1	25.5
20	49.40	34.23	55.85	57.59	56.9	5.1	25.5
30	59.16	43.76	65.56	67.21	56.84	5.1	25.5
40	69.33	53.33	75.27	77.30	56.84	5.1	25.5
50	79.62	63.06	85.43	87.56	56.81	5.1	25.5
60	90.49	73.65	96.47	98.45	56.8	5.1	25.5
70	100.80	83.40	106.68	108.82	56.81	5.1	25.5
85	111.86	96.82	117.77	118.36	56.88	4.5	22.5

Ag5405 component temperature

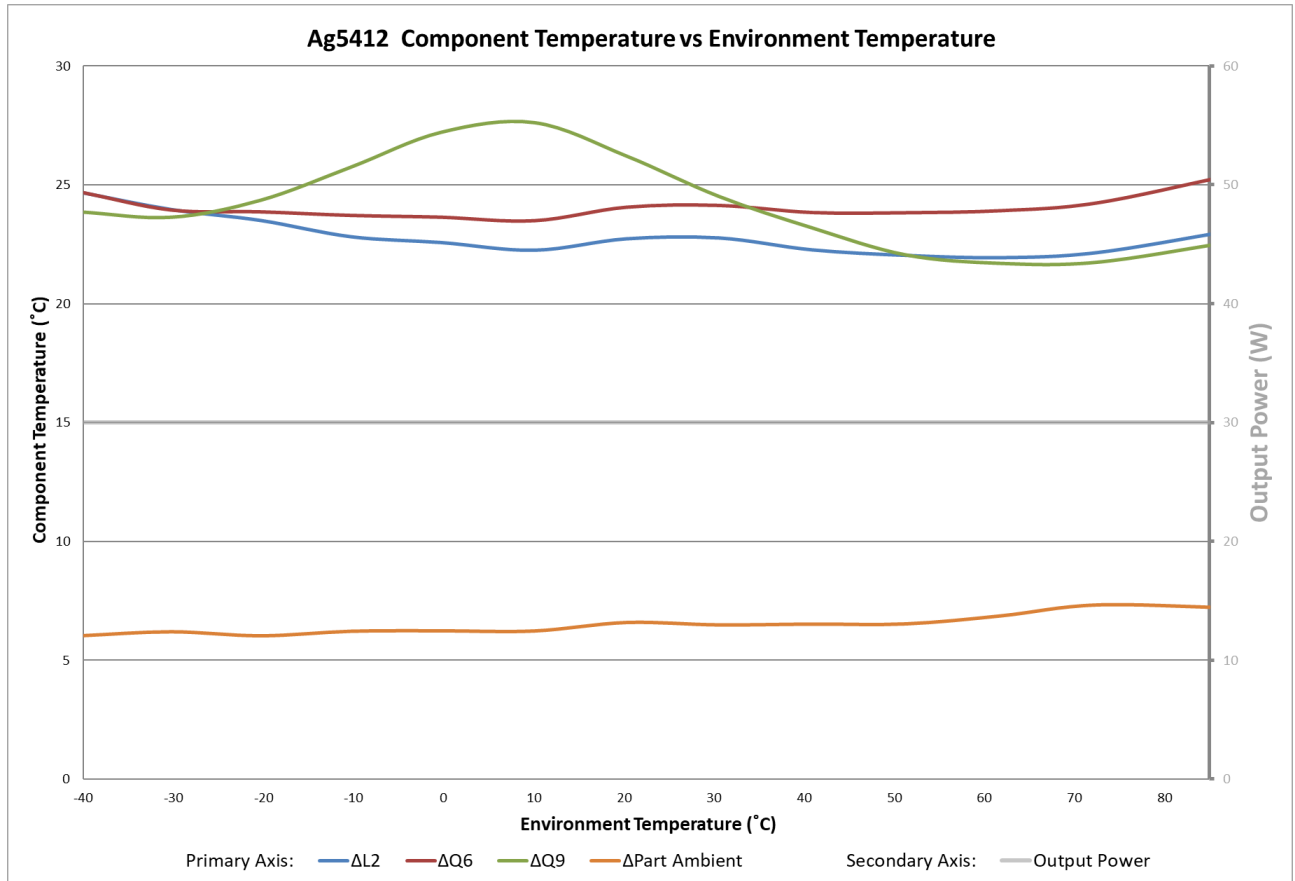


Ag5405 power dissipation vs load

*Derived from efficiency of the module.

Ag5412

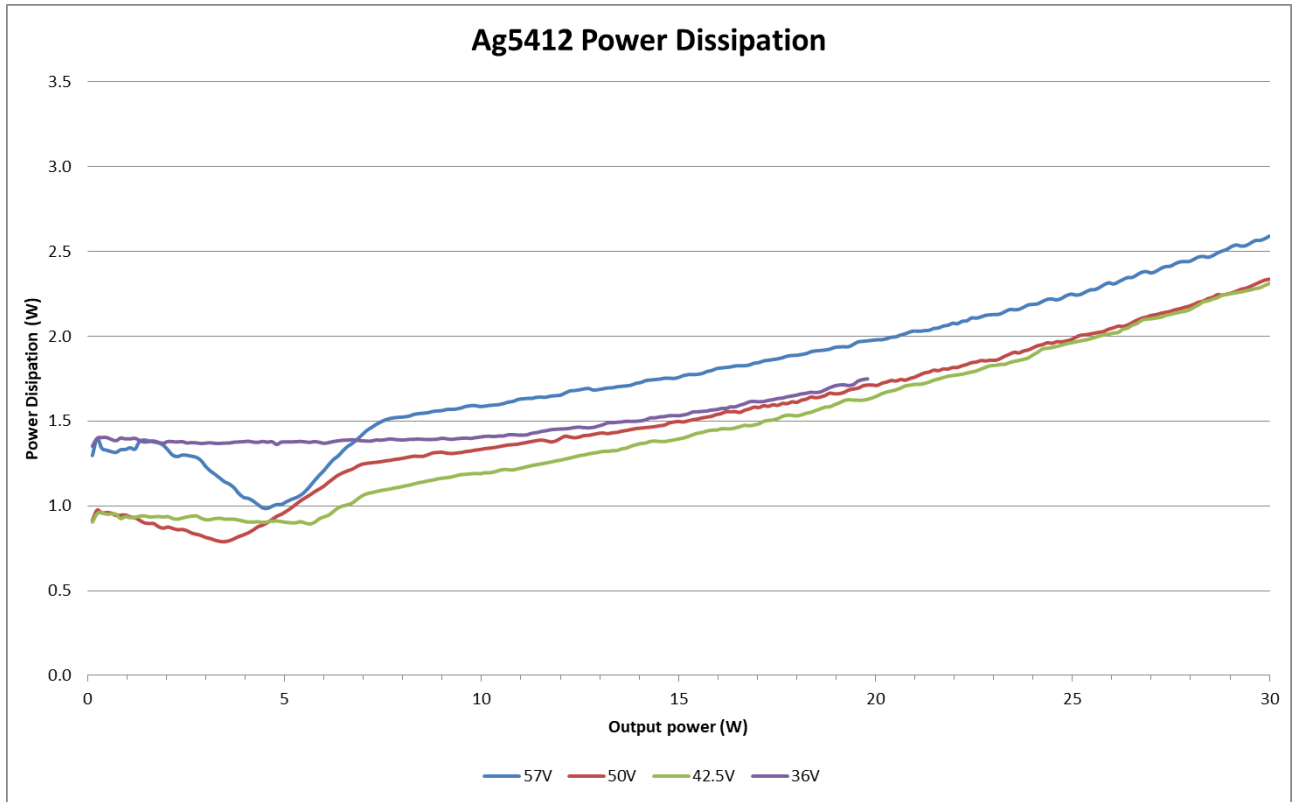
The heat is generated evenly across the three primary heat generation components.



Ag5412 delta component temperature

Chamber Set Temperature (°C)	L2 Temperature (°C)	Q6 Temperature (°C)	Q9 Temperature (°C)	Supply Voltage (V)	Output Current (A)	Output Power (W)
-40	-15.6733	-15.6578	-16.4956	56.86	2.5	29.3
-30	-6.297	-6.316	-6.6202	56.87	2.5	29.3
-20	3.172	3.5361	4.0241	56.87	2.5	29.3
-10	12.5308	13.4301	15.4627	56.88	2.5	29.4
0	22.2701	23.3371	26.9023	56.88	2.5	29.4
10	32.3126	33.555	37.6756	56.89	2.5	29.4
20	43.0181	44.3487	46.4987	56.89	2.5	29.4
30	53.3492	54.7203	55.0955	56.89	2.5	29.4
40	63.1995	64.7722	64.1259	56.91	2.5	29.4
50	73.3599	75.1545	73.385	56.91	2.5	29.4
60	83.7815	85.7599	83.5481	56.91	2.5	29.4
70	94.6145	96.7057	94.215	56.91	2.5	29.4
85	110.3325	112.6746	109.869	56.91	2.5	29.3

Ag5412 component temperature

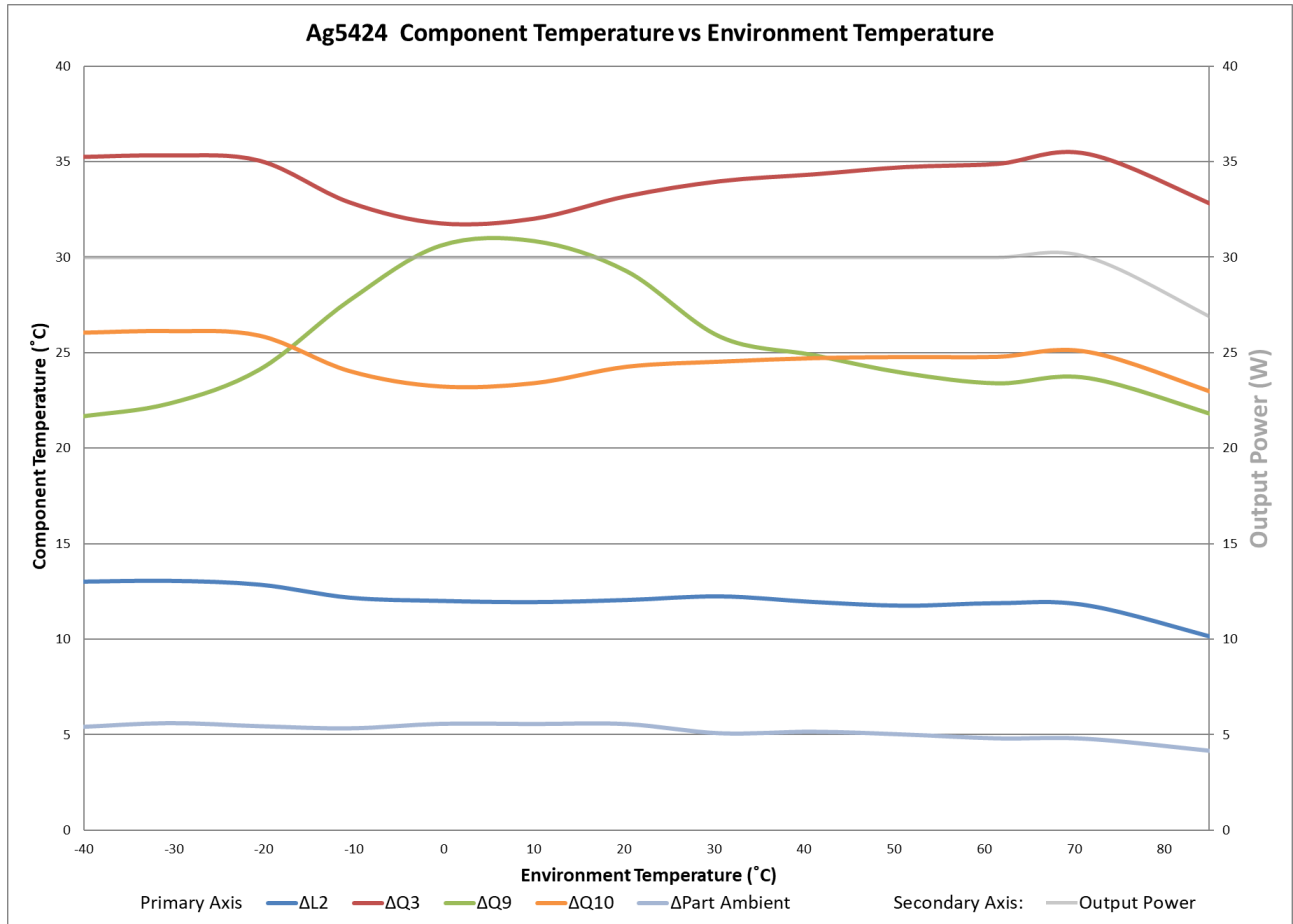


Ag5412 power dissipation vs load

*Derived from efficiency of the module.

Ag5424

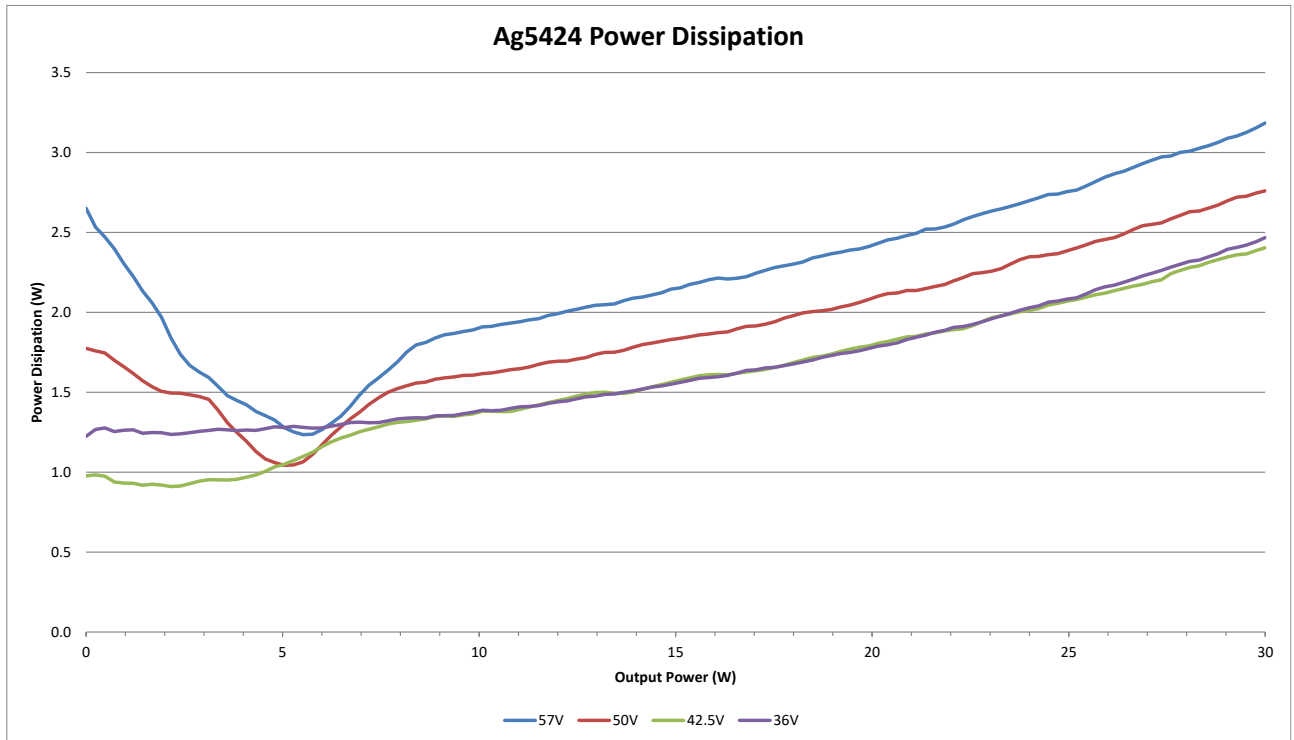
The output rectification drive transistor Q3 is the hottest component on the Ag5424.



Ag5424 delta component temperature

Chamber Set Temperature (°C)	L2 Temperature (°C)	Q9 Temperature (°C)	Q3 Temperature (°C)	Q10 Temperature (°C)	Supply Voltage (V)	Output Current (A)	Output Power (W)
-40	-27.82	-19.20	-5.57	-14.78	56.52	1.25	29.6
-30	-17.47	-8.19	4.82	-4.39	56.48	1.25	29.6
-20	-7.62	3.64	14.59	5.42	56.4	1.25	29.6
-10	1.70	17.26	22.39	13.57	56.39	1.25	29.6
0	11.60	30.18	31.36	22.84	56.38	1.25	29.6
10	21.91	40.80	41.98	33.39	56.35	1.25	29.6
20	32.33	49.53	53.47	44.55	56.31	1.25	29.7
30	42.91	56.50	64.66	55.21	56.26	1.25	29.7
40	52.98	65.90	75.37	65.75	56.21	1.25	29.6
50	62.94	75.11	85.91	75.97	56.17	1.25	29.6
60	73.31	84.82	96.32	86.22	56.12	1.25	29.6
70	83.37	95.28	107.02	96.65	56.07	1.25	29.6
85	96.95	108.56	119.45	109.72	55.3	1.1	26.1

Ag5424 component temperature



Ag5424 power dissipation vs load

*Derived from efficiency of the module.