

750 Watts

- 200 - 425 VDC Input Range
- Single Output
- Industry Standard Full Brick
- -40 °C to +85 °C Operation
- 3000 VAC Isolation
- Output Trim -40% to +10%
- Remote On/Off
- Current Share and Power Good Signals
- 3 Year Warranty



Dimensions:

QHL750:

4.6 x 2.4 x 0.5" (116.8 x 61.0 x 12.7 mm)

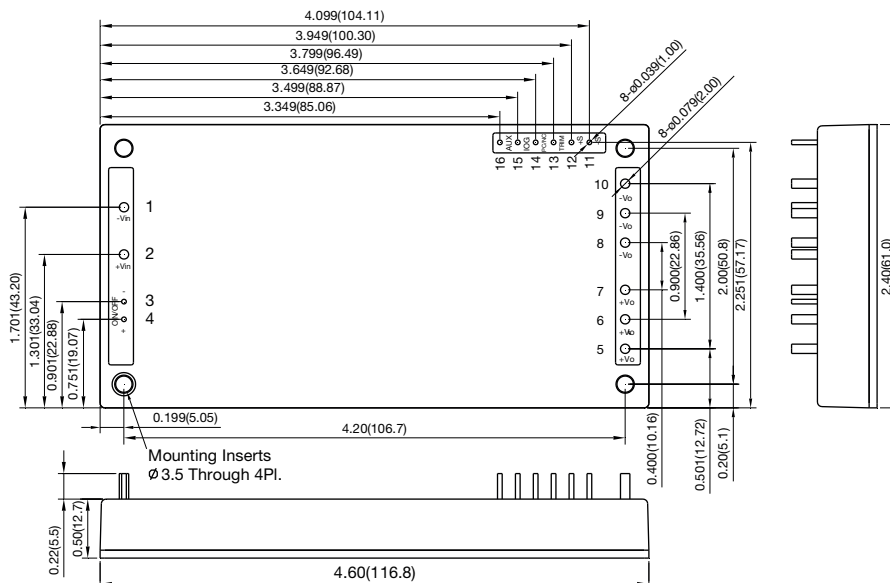
Models & Ratings

Input Voltage	Output Voltage	Output Current	Input Current ⁽¹⁾		Ripple & noise ⁽²⁾	Efficiency ⁽¹⁾	Max. capacitive load ⁽³⁾	Model Number
			No Load	Full Load				
200-425 V	12 V	62.5 A	10 mA	2.79 A	300 mV	89.5%	10000 µF	QHL750300S12
	15 V	50.0 A	10 mA	2.81 A	300 mV	89.0%	10000 µF	QHL750300S15
	24 V	31.2 A	10 mA	2.78 A	400 mV	90.0%	10000 µF	QHL750300S24
	28 V	26.7 A	10 mA	2.73 A	400 mV	90.5%	10000 µF	QHL750300S28
	48 V	15.6 A	10 mA	2.75 A	650 mV	91.0%	8000 µF	QHL750300S48

Notes

1. Measured at 300 VDC input.
2. Peak to peak measured at 20MHz bandwidth and 1000 µF electrolytic/1 µF ceramic capacitors.
3. Minimum capacitive load of 1000 µF required to maintain regulation.

Mechanical Details



Pin Connections

Pin	Function
1	-Vin
2	+Vin
3	REM-
4	REM+
5-7	+Vout
8-10	-Vout
11	-Sense
12	+Sense
13	Trim
14	Current Share
15	Power Good
16	Auxilliary, 7-13 V/20 mA

Notes

1. All dimensions are in inches (mm)
2. Weight: 0.51 lbs (230 g) approx.
3. Tolerance: x.xx = ±0.02 (x.x = ±0.5)
x.xxx = ±0.01 (x.xx = ±0.25)

Input

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Input Voltage Range	200		425	VDC	
Input Current	1.8		3.9	A	200-425 VDC input
Input Surge			475	VDC	For 100 ms
Undervoltage Lockout	>185 V	190	195	VDC	On
	<175 V	480	185		Off
Lockout Hysteresis		10		VDC	
Input Transient Voltage			475	VDC	For 100 ms
Input Overvoltage Lockout		480/500		VDC	Module On / Module Off
Idle Current		10		mA	When output is remotely turned off
Inrush Current			0.1	A ² s	
Recommended Input Fuse		10		A	Fast acting type
Input Reflected Ripple Current			50	mA pk-pk	Through 10 µH inductor

Output

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Output Voltage	12		48	VDC	See Models and Ratings table
Output Trim	-40		+10	%	See Application Note
Initial Set Accuracy			±1.0	%	At full load and 36 V input
Minimum Load	0			%	No minimum load required
Line Regulation			±0.2	%	From minimum to maximum input at full load
Load Regulation			±0.5	%	From 0% to full load
Transient Response		±3.0	±5.0	%	Maximum deviation, recovering to less than 1% in 500 µs for 25% step load change.
Start Up Time			700	ms	
Output Voltage Rise Time		40		ms	
Ripple & Noise				mV pk-pk	See models and ratings table
Overload Protection	105		125	%	
Short Circuit Protection					Continuous hiccup mode, with auto recovery
Maximum Capacitive Load					See Models and Ratings table. Minimum capacitance of 1000 µF required to meet specified regulations
Temperature Coefficient			0.03	%/°C	
Overvoltage Protection	115	125	140	%	
Remote On/Off	Output is on if REM+ (pin 4) is open or high (3.5-75 VDC) WRT REM- (pin 3) or -Vin Output turns off if REM+ (pin 4) is low (<1.2 VDC max) WRT REM- (pin 3) or -Vin				

General

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Efficiency		90		%	See Models and Ratings table
Isolation: Input to Output	3000			VAC	60 s
Isolation: Input to Case	2500			VAC	60 s
Isolation: Output to Case	500			VAC	60 s
Switching Frequency		200		kHz	Fixed, ±15%
Isolation Resistance	10 ⁹			Ω	
Power Density			135	W/in ³	
Mean Time Between Failure		370		kHrs	MIL-HDBK-217F, +25 °C GB
Weight		0.51 (230.0)		lb (g)	

Environmental

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Operating Base Plate Temperature	-40		+85	°C	
Storage Temperature	-55		+105	°C	
Thermal Protection		+95		°C	Auto recovery at 75 °C typical
Humidity			95	%RH	Non-condensing
Cooling					Baseplate-cooled

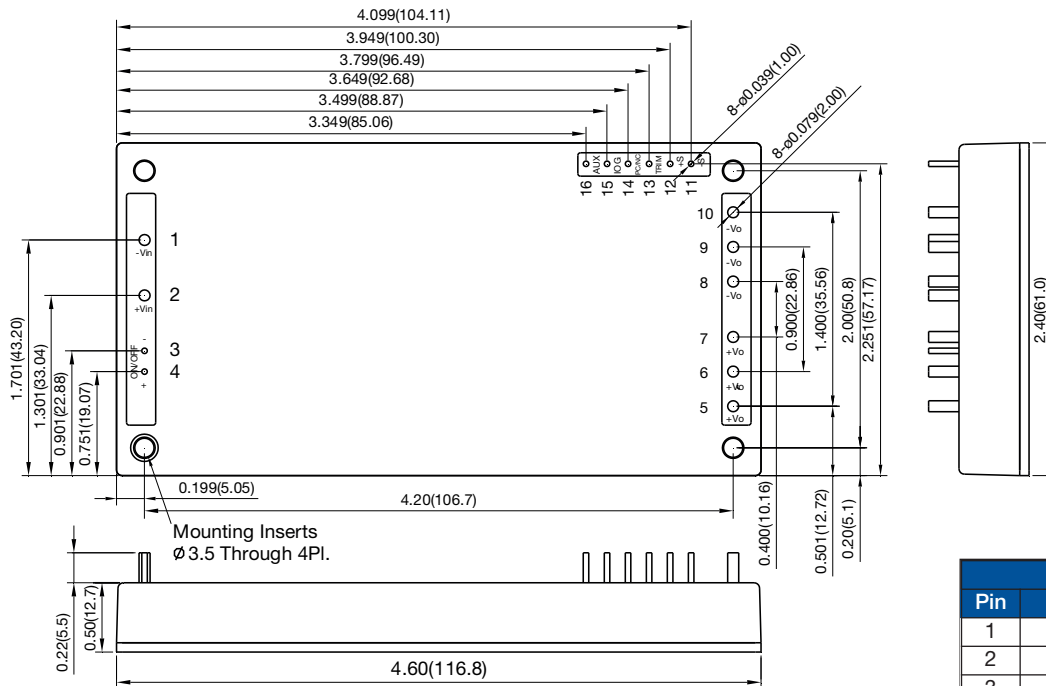
EMC: Emissions

Phenomenon	Standard	Test Level	Notes & Conditions
Conducted	EN55032	Class A	See Application Notes
Radiated	EN55032	Class A	

EMC: Immunity

Phenomenon	Standard	Test Level	Criteria	Notes & Conditions
ESD Immunity	EN61000-4-2	± 4 kV/ ± 8 kV	A	Contact Discharge/Air Discharge
Radiated Immunity	EN61000-4-3	3 V rms	A	
EFT/Burst	EN61000-4-4	1 kV	A	Requires VZ1, VZ2, GT1 & GT2 as shown in conducted emission circuit
Surge	EN61000-4-5	0.5 kV	A	Requires VZ1, VZ2, GT1 & GT2 as shown in conducted emission circuit
Conducted Immunity	EN61000-4-6	3 V rms	A	
Magnetic Fields	EN61000-4-8	3 A/m	A	

Mechanical Details



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11	-Sense
12	+Sense
13	Trim
14	Current Share
15	Power Good
16	Auxiliary, 7-13 V/20 mA

Notes

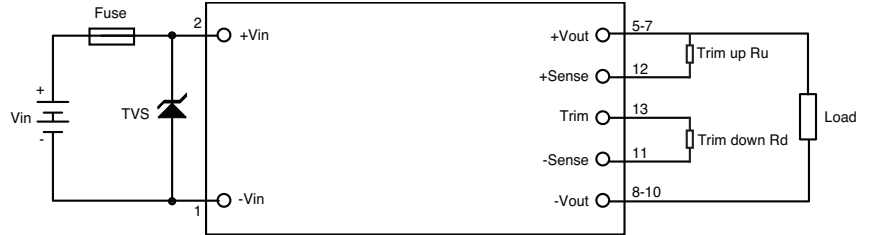
1. All dimensions are in inches (mm)
2. Weight: 0.51 lbs (230 g) approx.

3. Tolerance: x.xx = ± 0.02 (x.x = ± 0.5)
x.xxx = ± 0.01 (x.xx = ± 0.25)

Application Notes

Input Fusing and Safety Considerations

The QHL750 series converters have no internal fuse. In order to achieve maximum safety and system protection, always use an input line fuse. We recommended a 30 A fast acting fuse. It is also recommended that the circuit has a transient voltage suppressor diode (TVS) across the input terminals to protect the unit against surge or spike voltages and input reverse voltage (as shown). A suitable part would be SMCJ78A.



Output Voltage Adjustment

The Trim input permits the user to adjust the output voltage up by 10% or down by 40%. This is accomplished by connecting an external resistor between the Trim pin and either the Vout (+) pin or the Vout(-) pin (COM pin).

To Trim Down

Connecting an external resistor (R_d) between the Trim pin and the -Sense pin decreases the output voltage. The following equations determine the required external resistor value to obtain a percentage output voltage change of $\Delta\%$.

Trim Down %	12 V	15 V	24 V	28 V	48 V
	Rtrim_down (k Ω)				
1	10.63	13.29	21.26	24.80	42.51
2	10.40	13.00	20.80	24.27	41.60
3	10.17	12.71	20.34	23.73	40.69
4	9.943	12.43	19.89	23.20	39.77
5	9.714	12.14	19.43	22.67	38.86
6	9.486	11.86	18.97	22.13	37.94
7	9.257	11.57	18.51	21.60	37.03
8	9.029	11.29	18.06	21.07	36.11
9	8.800	11.00	17.60	20.53	35.20
10	8.571	10.71	17.14	20.00	34.29
11	8.343	10.43	16.69	19.47	33.37
12	8.114	10.14	16.23	18.93	32.46
13	7.886	9.857	15.77	18.40	31.54
14	7.657	9.571	15.31	17.87	30.63
15	7.429	9.286	14.86	17.33	29.71
16	7.200	9.000	14.40	16.80	28.80
17	6.971	8.714	13.94	16.27	27.89
18	6.743	8.429	13.49	15.73	26.97
19	6.514	8.143	13.03	15.20	26.06
20	6.286	7.857	12.57	14.67	25.14
21	6.057	7.571	12.11	14.13	24.23
22	5.829	7.286	11.66	13.60	23.31
23	5.600	7.000	11.20	13.07	22.40
24	5.371	6.714	10.74	12.53	21.49
25	5.143	6.429	10.29	12.00	20.57
26	4.914	6.143	9.829	11.47	19.66
27	4.686	5.857	9.371	10.93	18.74
28	4.457	5.571	8.914	10.40	17.83
29	4.229	5.286	8.457	9.867	16.91
30	4.000	5.000	8.000	9.333	16.00
31	3.771	4.714	7.543	8.800	15.09
32	3.543	4.429	7.086	8.267	14.17
33	3.314	4.143	6.629	7.733	13.26
34	3.086	3.857	6.171	7.200	12.34
35	2.857	3.571	5.714	6.667	11.43
36	2.629	3.286	5.257	6.133	10.51
37	2.400	3.000	4.800	5.600	9.600
38	2.171	2.714	4.343	5.067	8.686
39	1.943	2.429	3.886	4.533	7.771
40	1.714	2.143	3.429	4.000	6.857

To Trim Up

Connecting an external resistor (R_u) between the +Vout pin and the +Sense pin increases the output voltage. The following equations determine the required external resistor value to obtain a percentage output voltage change of $\Delta\%$.

Trim Up %	12 V	15 V	24 V	28 V	48 V
	Rtrim_up (k Ω)				
1	11.09	13.86	22.17	25.87	44.34
2	11.31	14.14	22.63	26.40	45.26
3	11.54	14.43	23.09	26.93	46.17
4	11.77	14.71	23.54	27.47	47.09
5	12.00	15.00	24.00	28.00	48.00
6	12.23	15.29	24.46	28.53	48.91
7	12.46	15.57	24.91	29.07	49.83
8	12.69	15.86	25.37	29.60	50.74
9	12.91	16.14	25.83	30.13	51.66
10	13.14	16.43	26.29	30.67	52.57

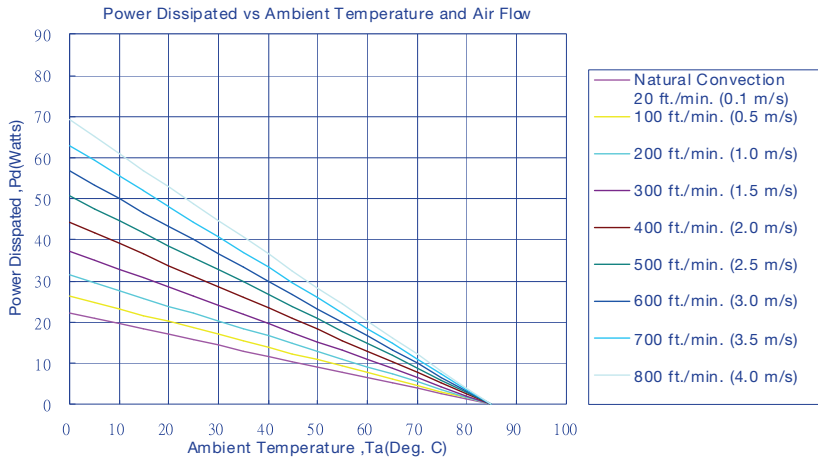
Power Good Signal

Open collector output, referenced to -Sense Pin. Output is pulled low if DC/DC is operating normally and floating if DC/DC is remotely turned off or operating abnormally.

Application Notes

Thermal Resistance Information

Airflow Derating Graph – Without Heatsink



Air Flow Rate	Typical Rca
Natural Convection 20 ft/min (0.1 m/s)	3.82 °C/W
100 ft/min (0.5 m/s)	3.23 °C/W
200 ft/min (1.0 m/s)	2.71 °C/W
300 ft/min (1.5 m/s)	2.28 °C/W
400 ft/min (2.0 m/s)	1.92 °C/W
500 ft/min (2.5 m/s)	1.68 °C/W
600 ft/min (2.5 m/s)	1.50 °C/W
700 ft/min (2.5 m/s)	1.35 °C/W
800 ft/min (2.5 m/s)	1.23 °C/W

Example (Without Heatsink)

To determine the minimum airflow necessary for a QHL750300S48 operating at an input voltage of 300 V, an output current of 11 A, and a maximum ambient temperature of 25°C:

Determine Power dissipation (Pd): $P_d = P_i - P_o = P_o(1-\eta)/\eta$,

$$P_d = 48 \text{ V} \times 11 \text{ A} \times (1-0.91)/0.91 = 47.47$$

Where P_i = Input power, P_o = Output Power and η = Efficiency

Determine airflow from airflow derating graph using data points for $P_d=47.47 \text{ W}$ and $T_a = 25^\circ\text{C}$

Minimum airflow= 800 ft./min.

To check that the maximum case temp of 85 °C is not exceeded:

Maximum temperature rise is

$$\Delta T = P_d \times R_{ca} = 47.47 \times 1.23 = 58.38^\circ\text{C}.$$

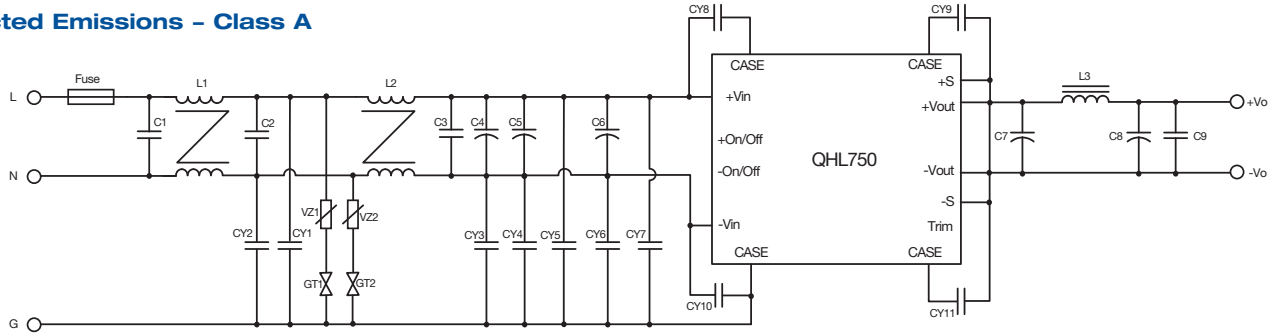
Maximum case temperature is

$$T_c = T_a + \Delta T = 83.38^\circ\text{C} < 85^\circ\text{C}.$$

Where: R_{ca} is the thermal resistance from case to ambient environment. T_a is ambient temperature and T_c is case temperature.

Application Notes

Conducted Emissions – Class A



Model Number	C1	C2	C3	C4	C5	C6	C7	C8	C9	CY1	CY2	CY3	CY4	CY5
QHL750300S12	0.68 μ F/ 305 V	0.68 μ F/ 305 V	0.68 μ F/ 305 V	330 μ F/ 450 V	330 μ F/ 450 V	330 μ F/ 450 V	820 μ F/ 63 V	820 μ F/ 63 V	1 μ F/ 100 V	2200 pF	3300 pF	100 pF	220 pF	220 pF
	CY6	CY7	CY8	CY9	CY10	CY11	L1	L2	L3					
	330 pF	N.C.	4700 pF	3300 pF	4700 pF	4700 pF	3.8 mH	3.8 mH	Short					
Model Number	C1	C2	C3	C4	C5	C6	C7	C8	C9	CY1	CY2	CY3	CY4	CY5
QHL750300S15	0.68 μ F/ 305 V	0.68 μ F/ 305 V	0.68 μ F/ 305 V	330 μ F/ 450 V	330 μ F/ 450 V	330 μ F/ 450 V	820 μ F/ 63 V	820 μ F/ 63 V	1 μ F/ 100 V	2200 pF	2200 pF	N.C.	330 pF	100 pF
	CY6	CY7	CY8	CY9	CY10	CY11	L1	L2	L3					
	220 pF	N.C.	4700 pF	2200 pF	4700 pF	2200 pF	3.8 mH	3.8 mH	Short					
Model Number	C1	C2	C3	C4	C5	C6	C7	C8	C9	CY1	CY2	CY3	CY4	CY5
QHL750300S24	0.68 μ F/ 305 V	0.68 μ F/ 305 V	0.68 μ F/ 305 V	330 μ F/ 450 V	330 μ F/ 450 V	330 μ F/ 450 V	820 μ F/ 63 V	820 μ F/ 63 V	1 μ F/ 100 V	2200 pF	2200 pF	N.C.	330 pF	100 pF
	CY6	CY7	CY8	CY9	CY10	CY11	L1	L2	L3					
	220 pF	N.C.	4700 pF	100 pF	4700 pF	3300 pF	3.8 mH	3.8 mH	1 μ H					
Model Number	C1	C2	C3	C4	C5	C6	C7	C8	C9	CY1	CY2	CY3	CY4	CY5
QHL750300S28	0.68 μ F/ 305 V	0.68 μ F/ 305 V	0.68 μ F/ 305 V	330 μ F/ 450 V	330 μ F/ 450 V	330 μ F/ 450 V	820 μ F/ 63 V	820 μ F/ 63 V	1 μ F/ 100 V	2200 pF	3300 pF	N.C.	330 pF	N.C.
	CY6	CY7	CY8	CY9	CY10	CY11	L1	L2	L3					
	680 pF	150 pF	4700 pF	470 pF	4700 pF	3300 pF	3.6 mH	3.6 mH	1 μ H					
Model Number	C1	C2	C3	C4	C5	C6	C7	C8	C9	CY1	CY2	CY3	CY4	CY5
QHL750300S48	0.68 μ F/ 305 V	0.68 μ F/ 305 V	0.68 μ F/ 305 V	330 μ F/ 450 V	330 μ F/ 450 V	330 μ F/ 450 V	820 μ F/ 63 V	820 μ F/ 63 V	1 μ F/ 100 V	2200 pF	2200 pF	N.C.	330 pF	100 pF
	CY6	CY7	CY8	CY9	CY10	CY11	L1	L2	L3					
	220 pF	100 pF	4700 pF	4700 pF	4700 pF	4700 pF	3.8 mH	3.8 mH	2.2 μ H					

Notes

C1, C2, C3: metallized polypropylene film capacitors, C4, C5, C6, C7, C8: aluminum capacitors C9, CY1, CY2, CY3, CY4, CY5, CY6, CY7, CY8, CY9, CY10, CY11: ceramic capacitors.

C1, C2, C3: 0.68 μ F/305V (FARATRONIC MKP62 Series C42Q2684M6HC000) or equivalent.

C4, C5, C6: 330 μ F/450V (NIPPON CHEMI-CON KMR Series EKMR451VSN331MR35S) or equivalent.

C7, C8: 820 μ F/63V (Rubycon ZLH Series 63ZLH820MEFC16X25) or equivalent.

L1, L2, L3:

3.6 mH (VAKOS T25*15*13 R8K Series 0.8 mm/19T) or equivalent.

3.8 mH (VAKOS T25*15*13 R8K Series 0.8 mm/20T) or equivalent.

0.56 μ H (3L UPIA1004-R56M) or equivalent.

1.0 μ H (3L SPI-130-50-1R0) or equivalent.

2.2 μ H (Würth Power Inductor 7443310220) or equivalent.

CY1, CY2, CY3, CY4, CY5, CY6, CY7, CY8, CY9, CY10:

100 pF (MURATA KX Series DC1B3KX101MA4BN01F) or equivalent.

150 pF (MURATA KX Series DC1B3KX151MA4BN01F) or equivalent.

220 pF (MURATA KX Series DC1B3KX221MA4BN01F) or equivalent.

330 pF (MURATA KX Series DC1B3KX331MA4BN01F) or equivalent.

680 pF (MURATA KX Series DC1B3KX681MA4BN01F) or equivalent.

1000 pF (MURATA KX Series DC1B3KX102MA4BN01F) or equivalent.

2200 pF (MURATA KX Series DC1B3KX222MA4BN01F) or equivalent.

4700 pF (MURATA KX Series DC1B3KX472MA4BN01F) or equivalent.

10000 pF (TDK CS Series CS17-F2GA103MYAS) or equivalent.

1 μ F/100V (TDK CGA Series CGA8N2X7R2A105K230KA) or equivalent.

VZ1 & VZ2: TVR10471KSV TKS

GT1 & GT2: B5G3000 BENCENT