

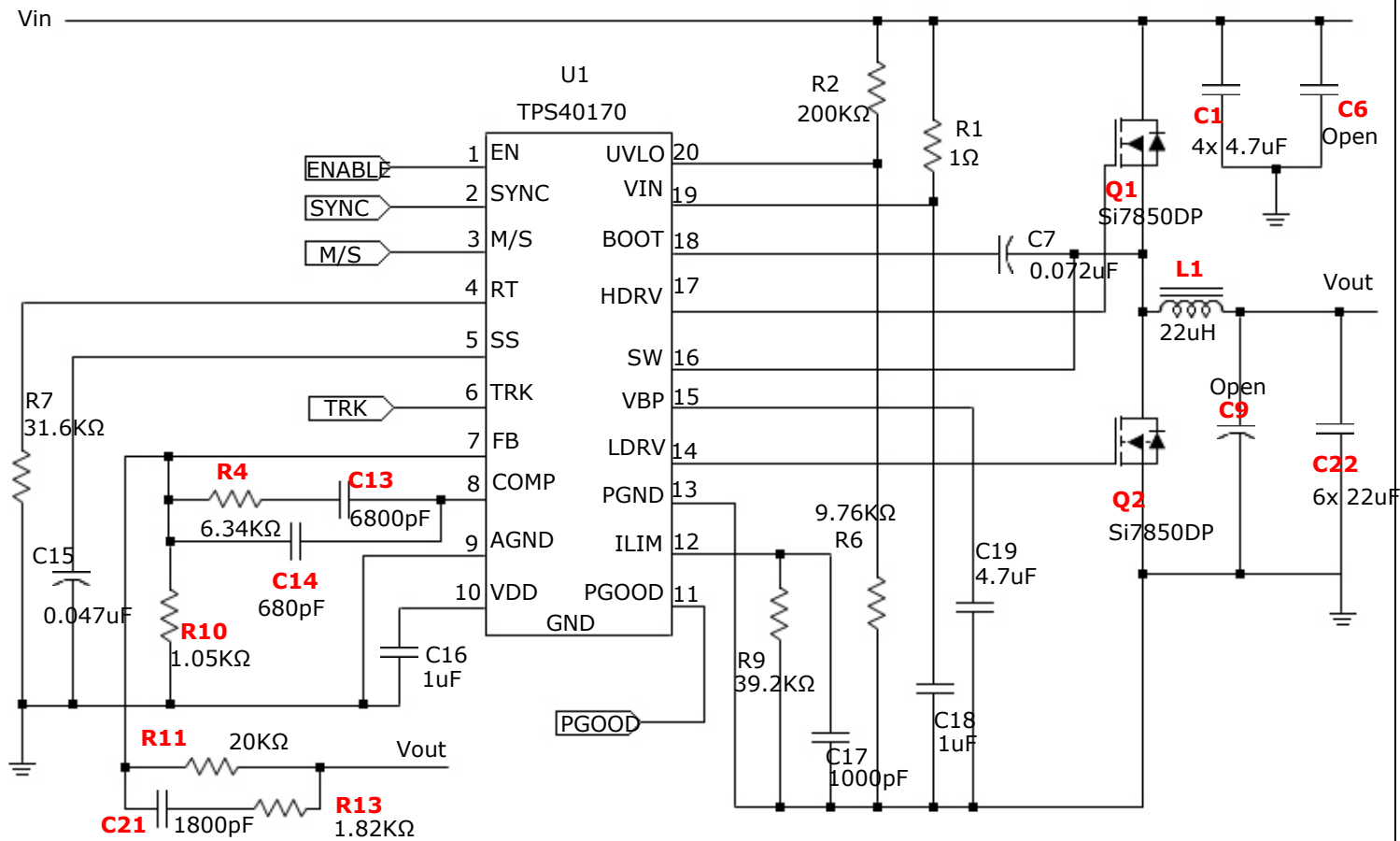
SwitcherPro Design Report

Schematic

Design Name: U82_48Vto12V_9A

Part: TPS40170

VinMin: 24V **VinMax:** 48V **Vout:** 12V **Iout:** 9A



SwitcherPro Design Report

Analysis - Main

Design Name: U82_48Vto12V_9A

Part: TPS40170

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Parameter Units-Symbol	User Input Minimum	User Input Nominal	User Input Maximum	Default Input Minimum	Default Input Nominal	Default Input Maximum	Calculated Minimum	Calculated Nominal	Calculated Maximum
Input Voltage Volts - V	24.00	-	48.00	-	-	-	-	-	-
Input Ripple mVp-p - mVp-p	-	-	-	-	-	960	-	-	462.1
UVLO(Start) Volts - V	-	-	-	-	-	-	-	19.34	-
UVLO(Stop) Volts - V	-	-	-	-	-	-	-	18.34	-
Switching Frequency KHz - KHz	-	-	-	-	300	-	-	-	-
Slow Start ms - ms	-	-	-	-	4.00	-	-	-	-
Estimated PCB Area mm ² - mm ²	-	-	-	-	-	-	-	1365	-
Max Component Height mm - mm	-	-	-	-	-	25	-	-	9

SwitcherPro Design Report

Analysis - Output1

Design Name: U82_48Vto12V_9A

Part: TPS40170

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Parameter Units-Symbol	User Input Minimum	User Input Nominal	User Input Maximum	Default Input Minimum	Default Input Nominal	Default Input Maximum	Calculated Minimum	Calculated Nominal	Calculated Maximum
Output Voltage Volts - V	-	12.000	-	-	-	-	11.625	-	12.443
Output Ripple mVp-p - mVp-p	-	-	-	-	-	240	-	-	7.2
Output Current Amps - A	-	-	9.000	0.060	-	-	-	-	-
Inductor Peak to Peak Current Amps - A	-	-	-	-	-	-	1.010	-	1.543
Current Limit Threshold Amps - A	-	-	-	-	1.100	-	-	-	-
Gain Margin dB - dB	-	-	-	-10	-	-	-	-14	-
Phase Margin Deg. - Deg.	-	-	-	30	-	-	-	31	-
Upper FET RDSon mOhms - mΩ	-	-	-	-	-	-	23	-	24
Lower FET RDSon mOhms - mΩ	-	-	-	-	-	-	21	-	23
Duty Cycle % - %	-	-	-	-	-	-	25.7	-	51.4
On Time Min (switch) ns - ns	-	-	-	-	-	-	779.0	-	1902.8
Cross Over Frequency KHz - KHz	-	-	-	-	-	-	-	13	-

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Stress Results

Design Name: U82_48Vto12V_9A

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Device	Rated Voltage	Calculated Voltage	Rated Current (RMS)	Calculated Current (RMS)	Error Message	Power	Calculated Max Temp
C1 (High Freq. Input Cap)	100V	48.5V	2A	1.13A	-	41mW	-
C22 (Bulk Output Cap)	25V	12.1V	10A	74mA	-	66uW	-
L1 (Output Inductor)	-	-	11A	9.01A	-	1.2W	-
Q1 (Power Switch)	60V	48.5V	10.3A	6.45A	-	2.2W	73°C
Q2 (Sync. Rectifier)	60V	48.5V	10.3A	7.77A	-	1.8W	65°C

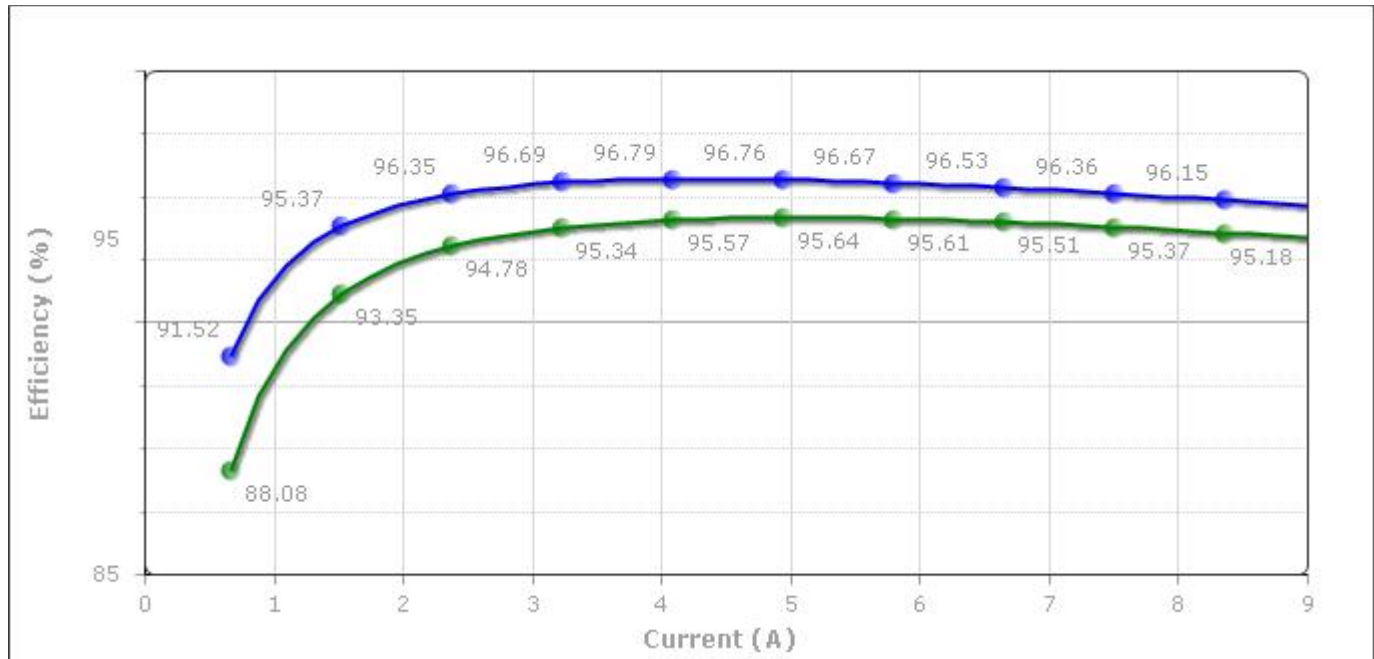
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Efficiency

Design Name: U82_48Vto12V_9A

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— Efficiency For Vin Max
— Efficiency For Vin Min

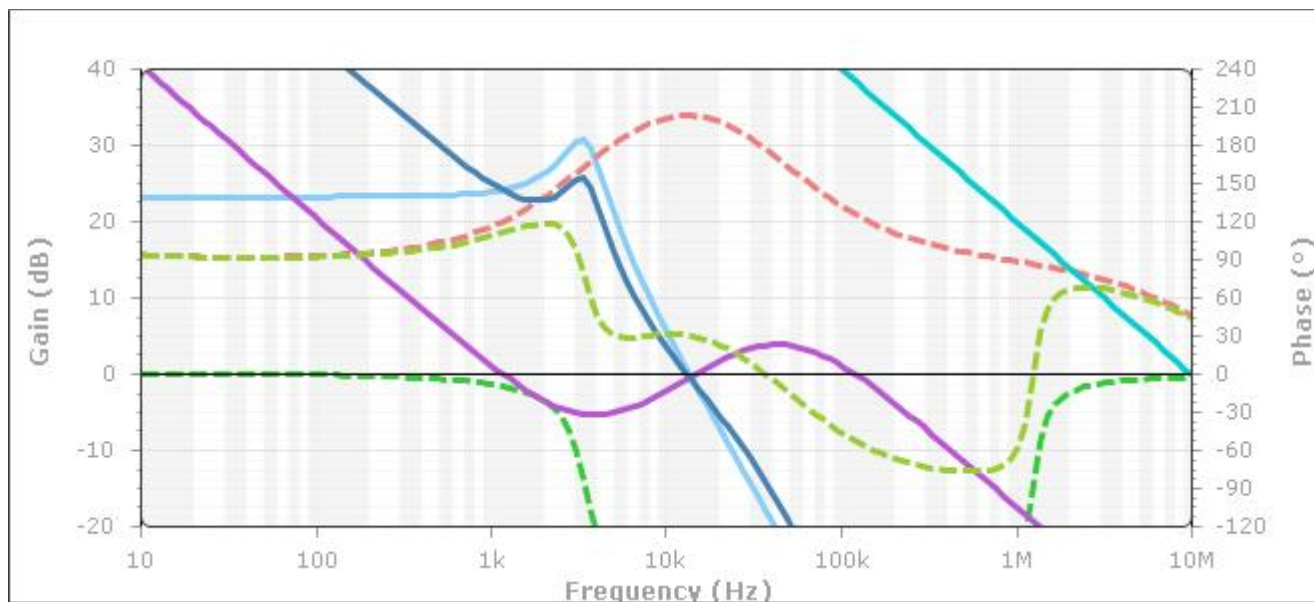
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Loop Response

Design Name: U82_48Vto12V_9A

Part: TPS40170

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- Power Stage Gain
- Power Stage Phase
- Compensation Gain
- Compensation Phase
- Error Amp Gain
- Total Gain
- Total Phase

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Bill of Materials

Design Name: U82_48Vto12V_9A

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Name	Quantity	Part Number	Description	Manufacturer	Package	Area(mm ²)	Height(mm)
C1	4	GRM55ER72A475KA01L	Capacitor, Ceramic, 4.7uF, 100V, 15%	Murata Manufacturing	GRM55E 2220	31	2
C13	1	Standard	Capacitor, Ceramic, 6800pF, 25V, 20%	Standard	0805	3	1
C14	1	Standard	Capacitor, Ceramic, 680pF, 25V, 20%	Standard	0603	2	1
C15	1	Standard	Capacitor, Ceramic, 0.047uF, 63V, 20%	Standard	2820	36	3
C16	1	Standard	Capacitor, Ceramic, 1uF, 20V, 10%	Standard	0603	2	1
C17	1	Standard	Capacitor, Ceramic, 1000pF, 63V, 10%	Standard	2820	36	3
C18	1	Standard	Capacitor, Ceramic, 1uF, 100V, 10%	Standard	1210	8	1
C19	1	Standard	Capacitor, Ceramic, 4.7uF, 20V, 10%	Standard	0805	3	1
C21	1	Standard	Capacitor, Ceramic, 1800pF, 25V, 20%	Standard	0603	2	1
C22	6	GRM32ER71E226KE15L	Capacitor, 8, 22uF, 25V, 10%	Murata Manufacturing	1210	8	2
C7	1	Standard	Capacitor, Ceramic, 0.072uF, 100V, 10%	Standard	2820	36	3
L1	1	74435572200	Inductor, 22uH, 11A, 14.6mΩ	WURTH	74435572200	331	8
Q1	1	Si7850DP	Transistor, NFET, 60V, 10.3A, 18mΩ	Vishay	PG-TDSON-8	32	0
Q2	1	Si7850DP	Transistor, NFET, 60V, 10.3A, 18mΩ	Vishay	PG-TDSON-8	32	0
R1	1	Standard	Resistor, SurfaceMount, 1Ω, 100mW, 1%	Standard	0603	2	1
R10	1	Standard	Resistor, SurfaceMount, 1.05KΩ, 50mW, 1%	Standard	0201	1	1
R11	1	Standard	Resistor, SurfaceMount, 20KΩ, 100mW, 1%	Standard	0603	2	1
R13	1	Standard	Resistor, SurfaceMount, 1.82KΩ, 100mW, 1%	Standard	0603	2	1
R2	1	Standard	Resistor, SurfaceMount, 200KΩ, 100mW, 1%	Standard	0603	2	1
R4	1	Standard	Resistor, SurfaceMount, 6.34KΩ, 100mW, 1%	Standard	0603	2	1
R6	1	Standard	Resistor, SurfaceMount, 9.76KΩ, 100mW, 1%	Standard	0603	2	1
R7	1	Standard	Resistor, SurfaceMount, 31.6KΩ, 100mW, 1%	Standard	0603	2	1
R9	1	Standard	Resistor, SurfaceMount, 39.2KΩ, 100mW, 1%	Standard	0603	2	1
U1	1	TPS40170	IC, Controller, 20 pins	Texas Instruments, Inc.	20-Pin QFN	15	1

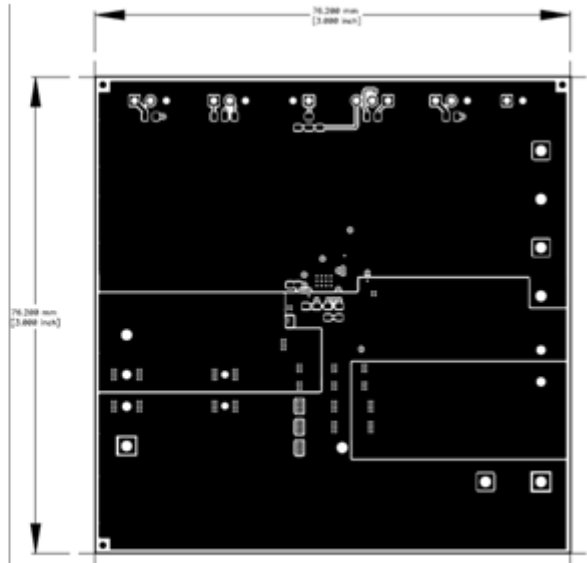
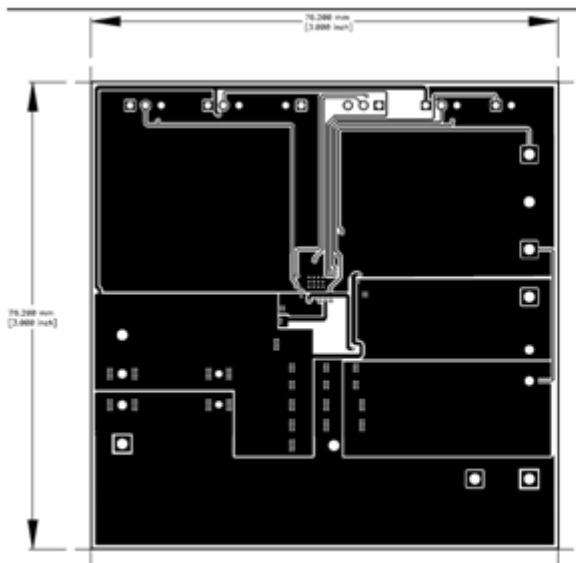
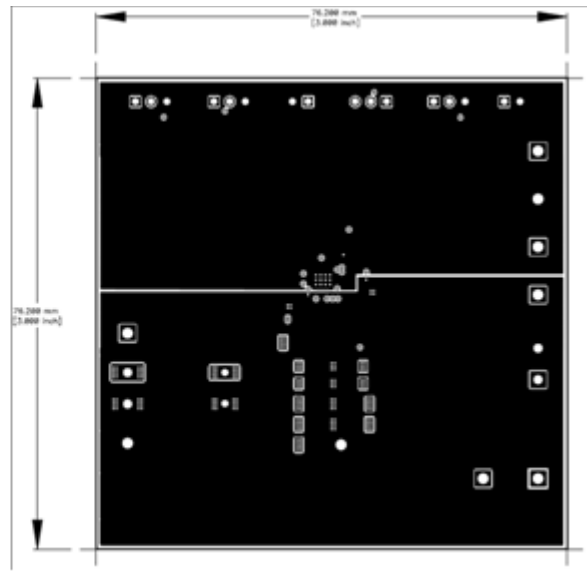
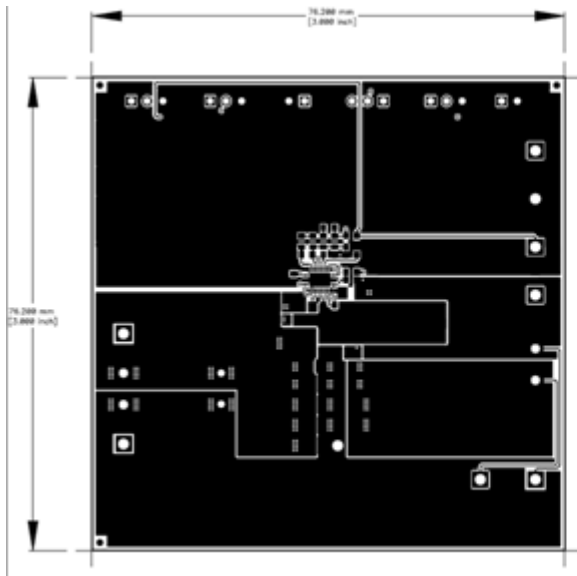
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Layout

Design Name: U82_48Vto12V_9A

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Layout Notes

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TPS40170

LayoutThe board layout for the TPS40170EVM-608 is shown in Figure.