

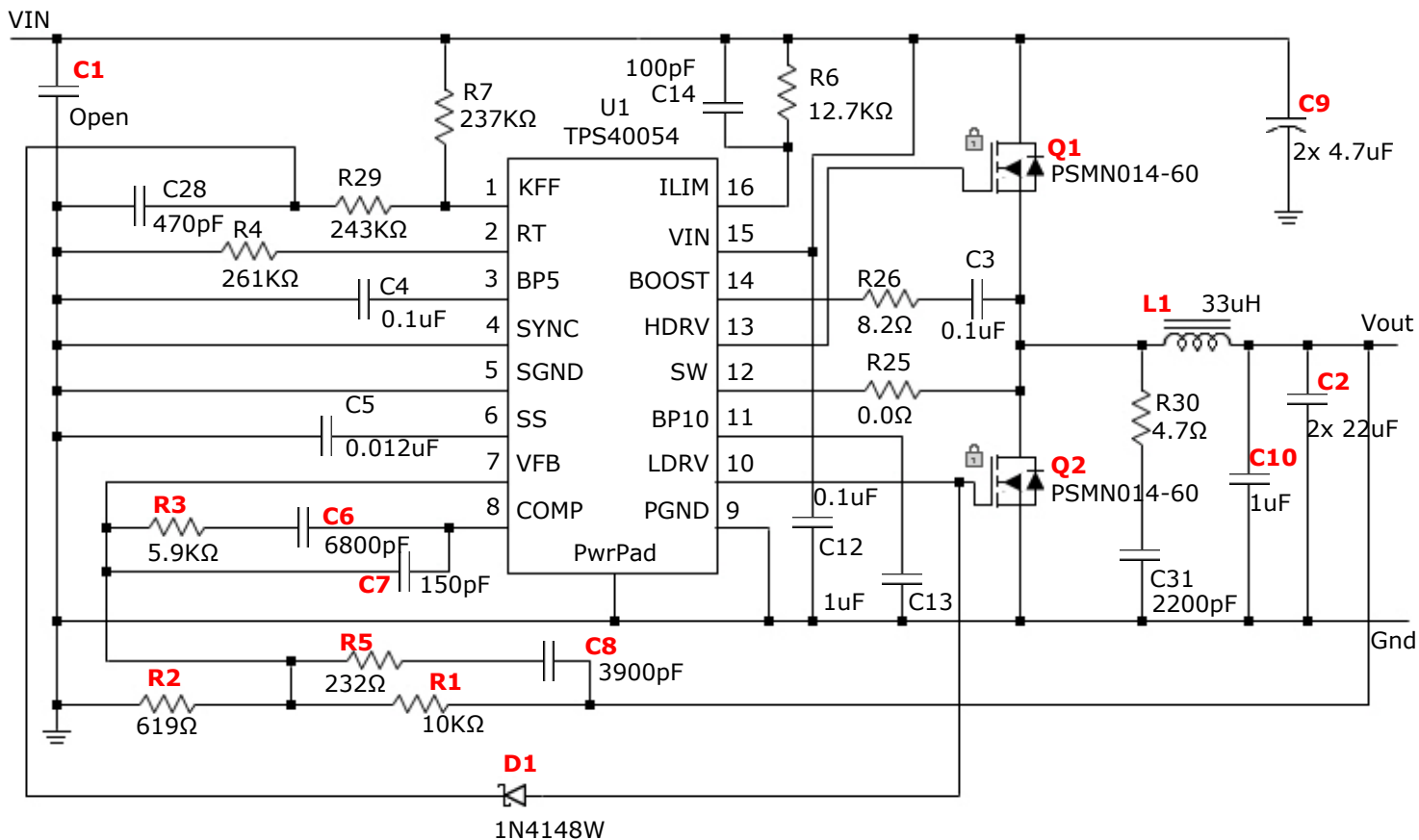
SwitcherPro Design Report

Schematic

Design Name: Squire 12V Impl

Part: TPS40054

VinMin: 18V **VinMax:** 40V **Vout:** 12V **Iout:** 6A



SwitcherPro Design Report

Analysis - Main

Design Name: Squire 12V Impl

Part: TPS40054

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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	18.00	-	40.00	-	-	-	-	-	-
Input Ripple mVp-p - mVp-p	-	-	-	-	-	800	-	-	897.3
UVLO(Start) Volts - V	-	-	-	-	-	-	-	14.40	-
UVLO(Stop) Volts - V	-	-	-	-	-	-	-	14.40	-
Switching Frequency KHz - KHz	-	200	-	-	-	-	180	200	220
Slow Start ms - ms	-	-	-	-	4.00	-	-	-	-
Estimated PCB Area mm ² - mm ²	-	-	-	-	-	-	-	947	-
Max Component Height mm - mm	-	-	-	-	-	25	-	-	7

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Analysis - Output1

Design Name: Squire 12V Impl

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VinMin: 18V **VinMax:** 40V **Vout:** 12V **Iout:** 6A

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	-	-	-	-	11.667	-	12.359
Output Ripple mVp-p - mVp-p	-	-	20	-	-	240	-	-	36.2
Output Current Amps - A	-	-	6.000	0.100	-	-	-	-	-
Inductor Peak to Peak Current Amps - A	-	-	-	-	-	-	0.656	-	1.434
Current Limit Threshold Amps - A	-	-	-	-	7.200	-	-	-	-
Gain Margin dB - dB	-	-	-	-10	-	-	-	-22	-
Phase Margin Deg. - Deg.	-	-	-	60	-	-	-	62	-
Upper FET RDSon mOhms - mΩ	-	-	-	-	-	-	14	-	14
Lower FET RDSon mOhms - mΩ	-	-	-	-	-	-	13	-	14
Duty Cycle % - %	-	-	-	-	-	-	30.8	-	68.3
On Time Min (switch) ns - ns	-	-	-	-	-	-	1398.2	-	3796.9
Cross Over Frequency KHz - KHz	-	-	-	-	-	-	-	29	-

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Stress Results

Design Name: Squire 12V Impl

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Device	Rated Voltage	Calculated Voltage	Rated Current (RMS)	Calculated Current (RMS)	Error Message	Power	Calculated Max Temp
C9 (High Freq. Input Cap)	50V	40.2V	2A	1.5A	-	14mW	-
C2 (Bulk Output Cap)	16V	12V	3.5A	0.21A	-	171uW	-
L1 (Output Inductor)	-	-	10.7A	6.01A	-	1.3W	-
Q1 (Power Switch)	60V	40.2V	40A	4.96A	-	488mW	51°C
Q2 (Sync. Rectifier)	60V	40.2V	40A	5A	-	497mW	51°C

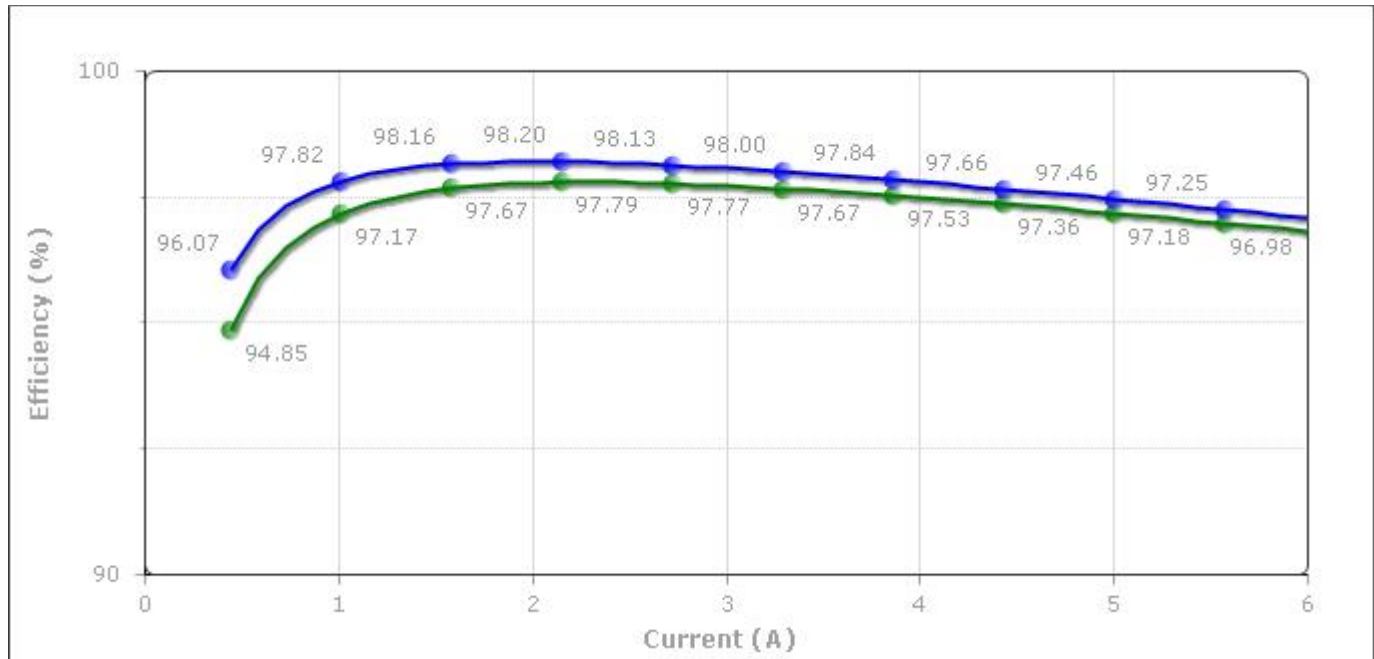
SwitcherPro Design Report

Efficiency

Design Name: Squire 12V Impl

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— Efficiency For Vin Max
— Efficiency For Vin Min

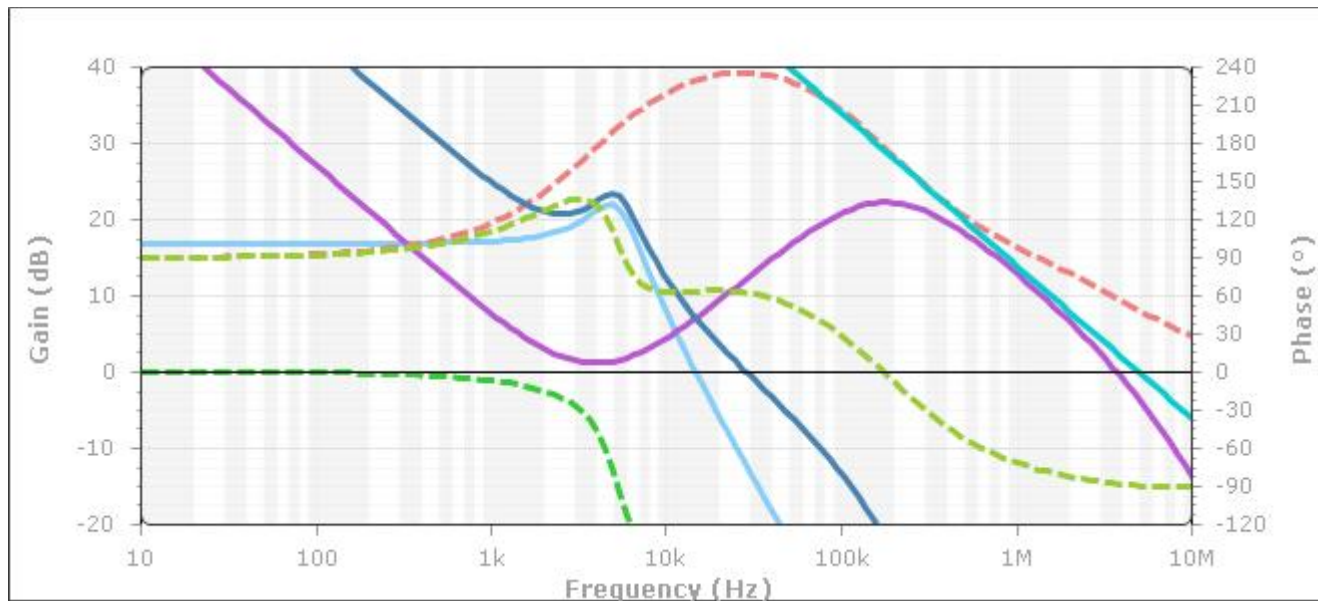
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Loop Response

Design Name: Squire 12V Impl

Part: TPS40054

VinMin: 18V **VinMax:** 40V **Vout:** 12V **Iout:** 6A



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

SwitcherPro Design Report

Bill of Materials

Design Name: Squire 12V Impl

Part: TPS40054

VinMin: 18V **VinMax:** 40V **Vout:** 12V **Iout:** 6A

Name	Quantity	Part Number	Description	Manufacturer	Package	Area(mm ²)	Height(mm)
C10	1	Standard	Capacitor, Ceramic, 1uF, 16V, 10%	Standard	0603	2	1
C12	1	Standard	Capacitor, Ceramic, 0.1uF, 35V, 10%	Standard	0805	3	1
C13	1	Standard	Capacitor, Ceramic, 1uF, 16V, 1%	Standard	0603	2	1
C14	1	Standard	Capacitor, Ceramic, 100pF, 50V, 1%	Standard	0805	3	1
C2	2	C3225X7R1C226M	Capacitor, Ceramic, 22uF, 16V, 20%	TDK	C3225	8	2
C28	1	Standard	Capacitor, Ceramic, 470pF, 25V, 1%	Standard	0805	3	1
C3	1	Standard	Capacitor, Ceramic, 0.1uF, 63V, 1%	Standard	2820	36	3
C31	1	Standard	Capacitor, Ceramic, 2200pF, 16V, 20%	Standard	0603	2	1
C4	1	Standard	Capacitor, Ceramic, 0.1uF, 6.3V, 1%	Standard	0603	2	1
C5	1	Standard	Capacitor, Ceramic, 0.012uF, 4V, 20%	Standard	0603	2	1
C6	1	Standard	Capacitor, Ceramic, 6800pF, 20V, 20%	Standard	0805	3	1
C7	1	Standard	Capacitor, Ceramic, 150pF, 20V, 20%	Standard	0805	3	1
C8	1	Standard	Capacitor, Ceramic, 3900pF, 20V, 20%	Standard	0805	3	1
C9	2	C4532X7R1H475M	Capacitor, NA, 4.7uF, 50V, 20%	TDK	C4532	14	2
D1	1	1N4148W	Diode, Fast, 75V, 0.3A	Diodes, Inc.	SOD-123	6	1
L1	1	IHLP6767GZER330M11	Inductor, 33uH, 10.7A, 37mΩ	Vishay	Shielded	299	7
Q1	1	PSMN014-60	Transistor, NFET, 60V, 40A, 10Ω	NXP	qfn3333	8	1
Q2	1	PSMN014-60	Transistor, NFET, 60V, 40A, 10Ω	NXP	qfn3333	8	1
R1	1	Standard	Resistor, SurfaceMount, 10KΩ, 100mW, 1%	Standard	0603	2	1
R2	1	Standard	Resistor, SurfaceMount, 619Ω, 100mW, 1%	Standard	0603	2	1
R25	1	Standard	Resistor, SurfaceMount, 0.0Ω, 100mW, 1%	Standard	0603	2	1
R26	1	Standard	Resistor, SurfaceMount, 8.2Ω, 100mW, 1%	Standard	0603	2	1
R29	1	Standard	Resistor, SurfaceMount, 243KΩ, 100mW, 1%	Standard	0603	2	1
R3	1	Standard	Resistor, SurfaceMount, 5.9KΩ, 100mW, 1%	Standard	0603	2	1

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Bill of Materials

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Name	Quantity	Part Number	Description	Manufacturer	Package	Area(mm ²)	Height(mm)
R30	1	Standard	Resistor, SurfaceMount, 4.7Ω, 1W, 5%	Standard	2512	21	1
R4	1	Standard	Resistor, SurfaceMount, 261KΩ, 100mW, 1%	Standard	0603	2	1
R5	1	Standard	Resistor, SurfaceMount, 232Ω, 100mW, 1%	Standard	0603	2	1
R6	1	Standard	Resistor, SurfaceMount, 12.7KΩ, 100mW, 1%	Standard	0603	2	1
R7	1	Standard	Resistor, SurfaceMount, 237KΩ, 100mW, 1%	Standard	0603	2	1
U1	1	TPS40054	IC, Controller, 16 pins	Texas Instruments, Inc.	HTSSOP-Power PAD	34	2

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Layout

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Layout Image Not Available For this Part

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Layout Notes

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Part: TPS40054

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The TPS4005x provides separate signal ground (SGND) and power ground (PGND) pins. It is important that circuit grounds are properly separated. Each ground should consist of a plane to minimize its impedance if possible. The high power noisy circuits such as the output, synchronous rectifier, MOSFET driver decoupling capacitor (BP10), and the input capacitor should be connected to PGND plane at the input capacitor. Sensitive nodes such as the FB resistor divider, RT, and ILIM should be connected to the SGND plane. The SGND plane should only make a single point connection to the PGND plane. Component placement should ensure that bypass capacitors (BP10 and BP5) are located as close as possible to their respective power and ground pins. Also, sensitive circuits such as FB, RT and ILIM should not be located near high dv/dt nodes such as HDRV, LDRV, BOOST, and the switch node (SW).