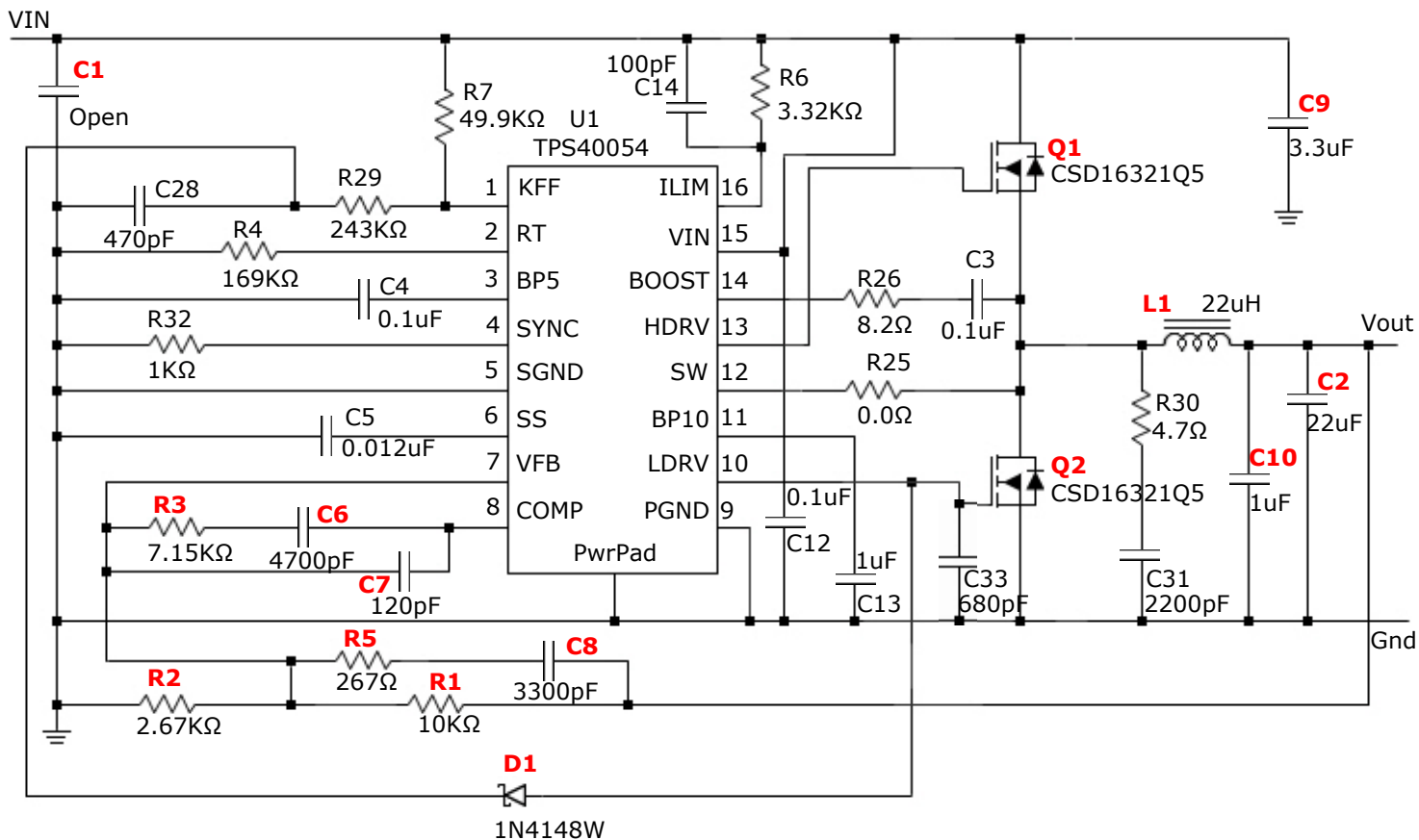


SwitcherPro Design Report Schematic

Design Name: APRS **Part:** TPS40054

VinMin: 8V **VinMax:** 24V **Vout:** 3.3V **Iout:** 1.5A



SwitcherPro Design Report

Analysis - Main

Design Name: APRS **Part:** TPS40054

VinMin: 8V **VinMax:** 24V **Vout:** 3.3V **Iout:** 1.5A

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	8.00	-	24.00	-	-	-	-	-	-
Input Ripple mVp-p - mVp-p	-	-	-	-	-	480	-	-	420.8
UVLO(Start) Volts - V	-	-	-	-	-	-	-	7.50	-
UVLO(Stop) Volts - V	-	-	-	-	-	-	-	7.00	-
Switching Frequency KHz - KHz	-	-	-	-	300	-	-	-	-
Slow Start ms - ms	-	-	-	-	4.00	-	-	-	-
Estimated PCB Area mm ² - mm ²	-	-	-	-	-	-	-	594	-
Max Component Height mm - mm	-	-	-	-	-	25	-	-	5

SwitcherPro Design Report

Analysis - Output1

Design Name: APRS **Part:** TPS40054

VinMin: 8V **VinMax:** 24V **Vout:** 3.3V **Iout:** 1.5A

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	-	3.300	-	-	-	-	3.237	-	3.408
Output Ripple mVp-p - mVp-p	-	-	-	-	-	66	-	-	11.7
Output Current Amps - A	-	-	1.500	0.100	-	-	-	-	-
Inductor Peak to Peak Current Amps - A	-	-	-	-	-	-	0.330	-	0.497
Current Limit Threshold Amps - A	-	-	-	-	1.800	-	-	-	-
Gain Margin dB - dB	-	-	-	-10	-	-	-	-22	-
Phase Margin Deg. - Deg.	-	-	-	60	-	-	-	63	-
Upper FET RDSon mOhms - mΩ	-	-	-	-	-	-	2	-	2
Lower FET RDSon mOhms - mΩ	-	-	-	-	-	-	2	-	2
Duty Cycle % - %	-	-	-	-	-	-	14.4	-	43.1
On Time Min (switch) ns - ns	-	-	-	-	-	-	435.0	-	1595.2
Cross Over Frequency KHz - KHz	-	-	-	-	-	-	-	28	-

SwitcherPro Design Report

Stress Results

Design Name: APRS **Part:** TPS40054

VinMin: 8V **VinMax:** 24V **Vout:** 3.3V **Iout:** 1.5A

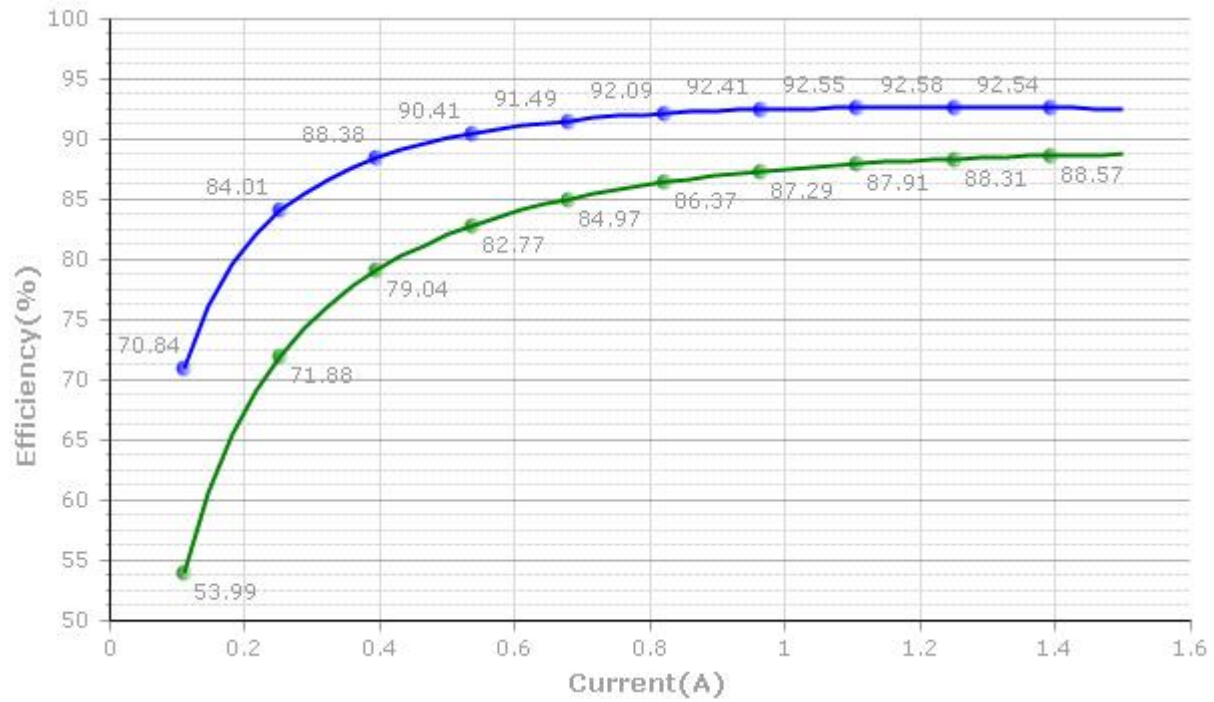
Device	Rated Voltage	Calculated Voltage	Rated Current (RMS)	Calculated Current (RMS)	Error Message	Power	Calculated Max Temp
C9 (High Freq. Input Cap)	50V	24.1V	1.88A	0.75A	-	3mW	-
C2 (Bulk Output Cap)	16V	3.32V	4.5A	0.14A	-	21uW	-
L1 (Output Inductor)	-	-	2A	1.51A	-	216mW	-
Q1 (Power Switch)	25V	24.1V	100A	0.99A	-	295mW	36°C
Q2 (Sync. Rectifier)	25V	24.1V	100A	1.39A	-	83mW	28°C

SwitcherPro Design Report

Efficiency

Design Name: APRS **Part:** TPS40054

VinMin: 8V **VinMax:** 24V **Vout:** 3.3V **Iout:** 1.5A



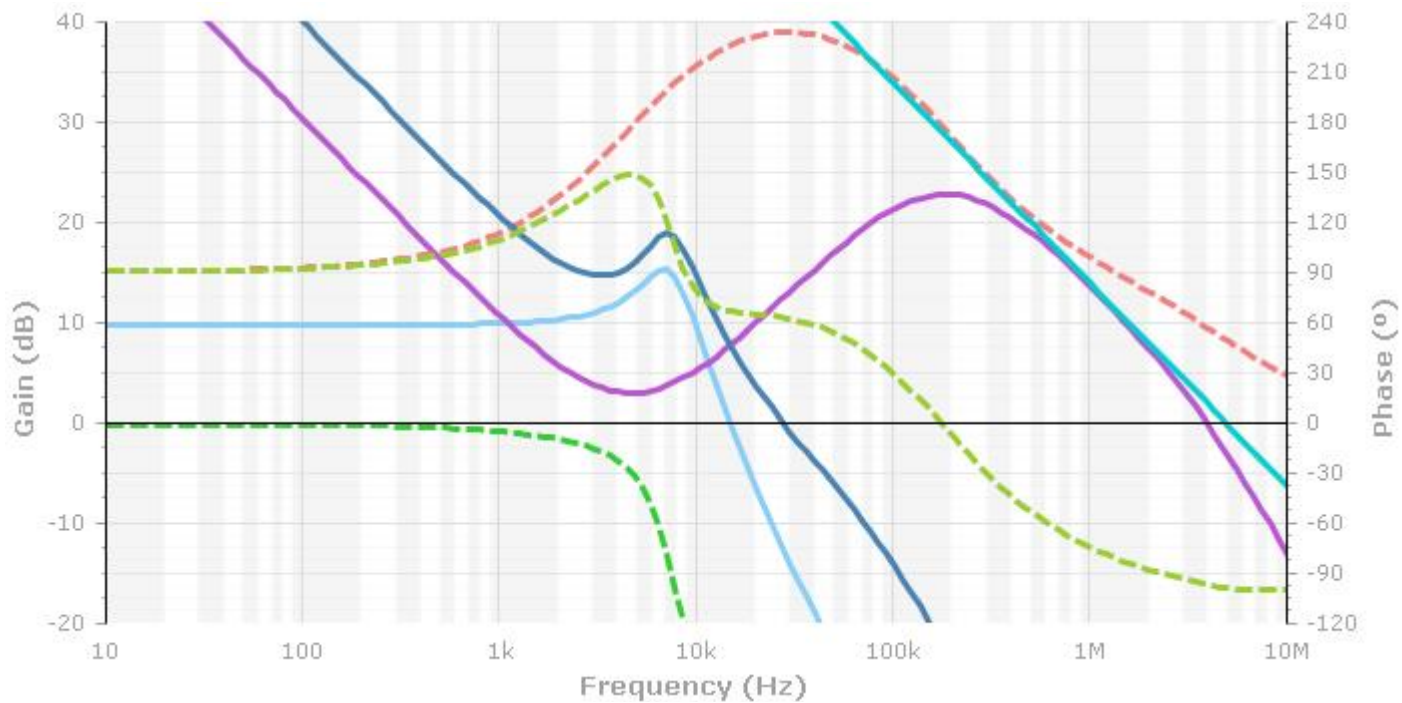
— Efficiency For Vin Max
— Efficiency For Vin Min

SwitcherPro Design Report

Loop Response

Design Name: APRS **Part:** TPS40054

VinMin: 8V **VinMax:** 24V **Vout:** 3.3V **Iout:** 1.5A



This graph was generated using the following conditions: Nominal Switching Freq, Minimum Vin, Maximum Load, and Maximum Capacitor ESR. To customize conditions use the 'What If Analysis' form

- 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: APRS **Part:** TPS40054

VinMin: 8V **VinMax:** 24V **Vout:** 3.3V **Iout:** 1.5A

Name	Quantity	Part Number	Description	Manufacturer	Package	Area(mm ²)	Height(mm)
C10	1	Standard	Capacitor, Ceramic, 1uF, 6.3V, 10%	Standard	0603	2	1
C12	1	Standard	Capacitor, Ceramic, 0.1uF, 35V, 10%	Standard	0603	2	1
C13	1	Standard	Capacitor, Ceramic, 1uF, 16V, 1%	Standard	0603	2	1
C14	1	Standard	Capacitor, Ceramic, 100pF, 50V, 1%	Standard	0603	2	1
C2	1	GRM32ER61C226KE20L	Capacitor, Ceramic, 22uF, 16V, 10%	Murata Manufacturing	1210	10	2
C28	1	Standard	Capacitor, Ceramic, 470pF, 25V, 1%	Standard	0603	2	1
C3	1	Standard	Capacitor, Ceramic, 0.1uF, 50V, 1%	Standard	0603	2	1
C31	1	Standard	Capacitor, Ceramic, 2200pF, 6.3V, 20%	Standard	0603	2	1
C33	1	Standard	Capacitor, Ceramic, 680pF, 35V, 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, 4700pF, 10V, 20%	Standard	0603	2	1
C7	1	Standard	Capacitor, Ceramic, 120pF, 10V, 20%	Standard	0603	2	1
C8	1	Standard	Capacitor, Ceramic, 3300pF, 10V, 20%	Standard	0603	2	1
C9	1	C4532X7R1H335M	Capacitor, Ceramic, 3.3uF, 50V, 20%	TDK	C4532 1812	16	2
D1	1	1N4148W	Diode, Fast, 75V, 0.3A	Diodes Inc	SOD-123	6.545	1.35
L1	1	744 561 22	Inductor, 22uH, 2A, 95mΩ	Würth Elektronik Group	774561	127	5
Q1	1	CSD16321Q5	Transistor, NFET, 25V, 100A, 3mΩ	Texas Instruments, Inc.	QFN 5x6	31	1
Q2	1	CSD16321Q5	Transistor, NFET, 25V, 100A, 3mΩ	Texas Instruments, Inc.	QFN 5x6	31	1
R1	1	Standard	Resistor, SurfaceMount, 10KΩ, 100mW, 1%	Standard	0603	2	1
R2	1	Standard	Resistor, SurfaceMount, 2.67KΩ, 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, 7.15KΩ, 100mW, 1%	Standard	0603	2	1

SwitcherPro Design Report

Bill of Materials

Design Name: APRS **Part:** TPS40054

VinMin: 8V **VinMax:** 24V **Vout:** 3.3V **Iout:** 1.5A

Name	Quantity	Part Number	Description	Manufacturer	Package	Area(mm ²)	Height(mm)
R30	1	Standard	Resistor, SurfaceMount, 4.7Ω, 500mW, 5%	Standard	2010	13	1
R32	1	Standard	Resistor, SurfaceMount, 1KΩ, 100mW, 10%	Standard	0603	2	1
R4	1	Standard	Resistor, SurfaceMount, 169KΩ, 100mW, 1%	Standard	0603	2	1
R5	1	Standard	Resistor, SurfaceMount, 267Ω, 100mW, 1%	Standard	0603	2	1
R6	1	Standard	Resistor, SurfaceMount, 3.32KΩ, 100mW, 1%	Standard	0603	2	1
R7	1	Standard	Resistor, SurfaceMount, 49.9KΩ, 100mW, 1%	Standard	0603	2	1
U1	1	TPS40054	IC, Controller, 16 pins	Texas Instruments, Inc.	HTSSOP-Power PAD	34	2

SwitcherPro Design Report

Layout

Design Name: APRS **Part:** TPS40054

VinMin: 8V **VinMax:** 24V **Vout:** 3.3V **Iout:** 1.5A

Layout Image Not Available For this Part

SwitcherPro Design Report

Layout Notes

Design Name: APRS **Part:** TPS40054

VinMin: 8V **VinMax:** 24V **Vout:** 3.3V **Iout:** 1.5A

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).