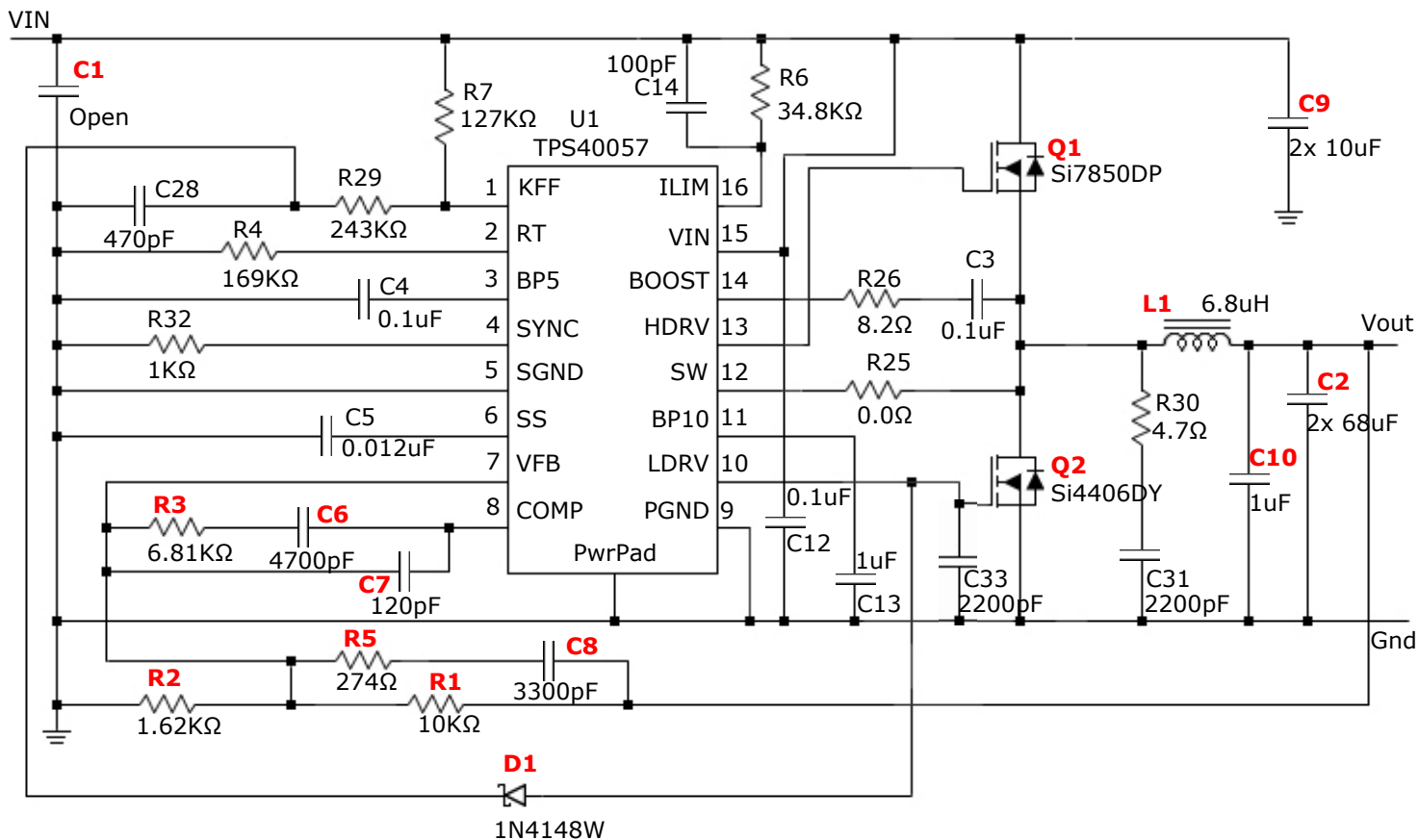


# SwitcherPro Design Report Schematic

**Design Name:** TPS40057 26.4V to 5.2V @ 12A

**Part:** TPS40057

**VinMin:** 15V    **VinMax:** 26.4V    **Vout:** 5V    **Iout:** 12A



# SwitcherPro Design Report

## Analysis - Main

**Design Name:** TPS40057 26.4V to 5.2V @ 12A

**Part:** TPS40057

**VinMin:** 15V    **VinMax:** 26.4V    **Vout:** 5V    **Iout:** 12A

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	15.00	-	26.40	-	-	-	-	-	-
Input Ripple mVp-p - mVp-p	-	-	-	-	-	528	-	-	524.2
UVLO(Start) Volts - V	-	-	-	-	-	-	-	12.00	-
UVLO(Stop) Volts - V	-	-	-	-	-	-	-	12.00	-
Switching Frequency KHz - KHz	-	-	-	-	300	-	-	-	-
Slow Start ms - ms	-	-	-	-	4.00	-	-	-	-
Estimated PCB Area mm <sup>2</sup> - mm <sup>2</sup>	-	-	-	-	-	-	-	1460	-
Max Component Height mm - mm	-	-	-	-	-	25	-	-	20

# SwitcherPro Design Report

## Analysis - Output1

**Design Name:** TPS40057 26.4V to 5.2V @ 12A

**Part:** TPS40057

**VinMin:** 15V    **VinMax:** 26.4V    **Vout:** 5V    **Iout:** 12A

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	-	5.000	-	-	-	-	4.886	-	5.159
Output Ripple mVp-p - mVp-p	-	-	-	-	-	100	-	-	10.5
Output Current Amps - A	-	-	12.000	0.100	-	-	-	-	-
Inductor Peak to Peak Current Amps - A	-	-	-	-	-	-	1.870	-	2.279
Current Limit Threshold Amps - A	-	-	-	-	14.400	-	-	-	-
Gain Margin dB - dB	-	-	-	-10	-	-	-	-22	-
Phase Margin Deg. - Deg.	-	-	-	60	-	-	-	62	-
Upper FET RDSon mOhms - mΩ	-	-	-	-	-	-	23	-	23
Lower FET RDSon mOhms - mΩ	-	-	-	-	-	-	5	-	5
Duty Cycle % - %	-	-	-	-	-	-	19.7	-	34.9
On Time Min (switch) ns - ns	-	-	-	-	-	-	596.8	-	1291.6
Cross Over Frequency KHz - KHz	-	-	-	-	-	-	-	31	-

# SwitcherPro Design Report

## Stress Results

**Design Name:** TPS40057 26.4V to 5.2V @ 12A

**Part:** TPS40057

**VinMin:** 15V    **VinMax:** 26.4V    **Vout:** 5V    **Iout:** 12A

Device	Rated Voltage	Calculated Voltage	Rated Current (RMS)	Calculated Current (RMS)	Error Message	Power	Calculated Max Temp
C9 (High Freq. Input Cap)	250V	26.5V	4A	2.86A	-	49mW	-
C2 (Bulk Output Cap)	10V	5.03V	4.4A	0.33A	-	325uW	-
L1 (Output Inductor)	-	-	18.5A	12A	-	1.2W	-
Q1 (Power Switch)	60V	26.5V	10.3A	7.09A	-	1.9W	66°C
Q2 (Sync. Rectifier)	30V	26.5V	20A	10.8A	-	1W	106°C

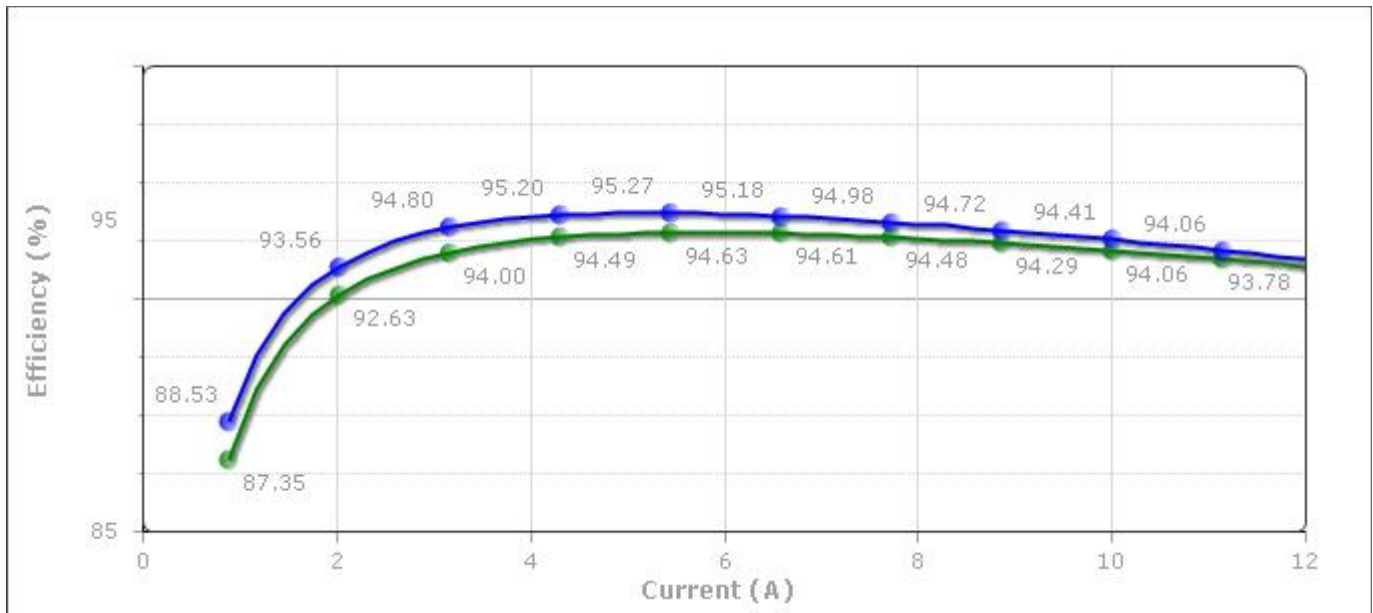
# SwitcherPro Design Report

## Efficiency

**Design Name:** TPS40057 26.4V to 5.2V @ 12A

**Part:** TPS40057

**VinMin:** 15V    **VinMax:** 26.4V    **Vout:** 5V    **Iout:** 12A



— Efficiency For Vin Max  
— Efficiency For Vin Min

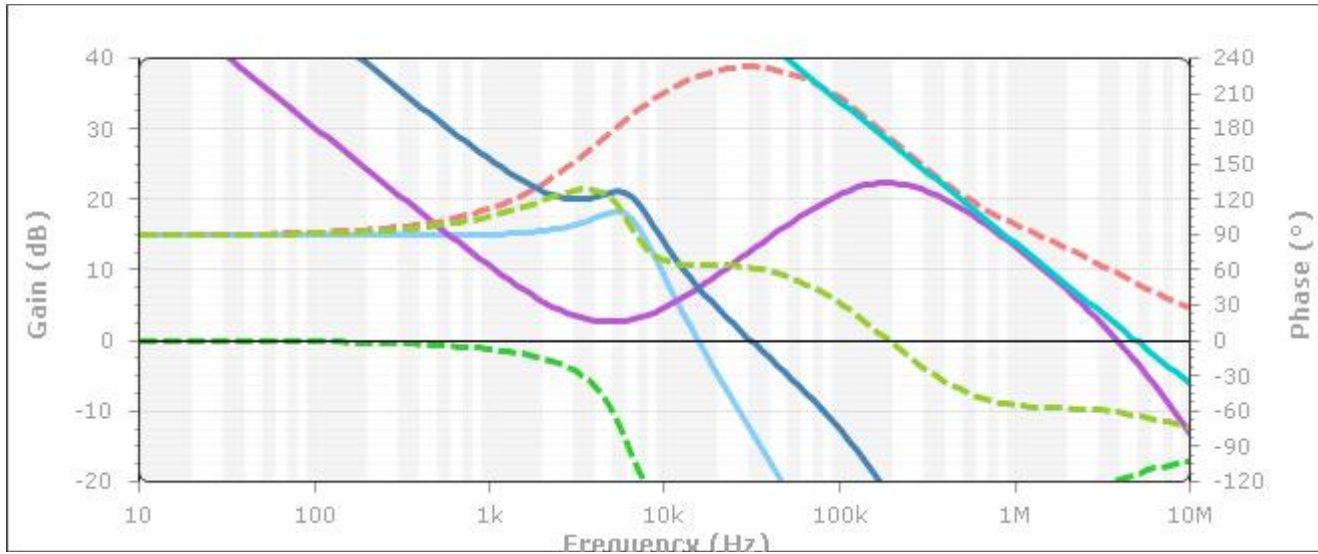
# SwitcherPro Design Report

## Loop Response

**Design Name:** TPS40057 26.4V to 5.2V @ 12A

**Part:** TPS40057

**VinMin:** 15V    **VinMax:** 26.4V    **Vout:** 5V    **Iout:** 12A



- 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:** TPS40057 26.4V to 5.2V @ 12A

**Part:** TPS40057

**VinMin:** 15V    **VinMax:** 26.4V    **Vout:** 5V    **Iout:** 12A

Name	Quantity	Part Number	Description	Manufacturer	Package	Area(mm <sup>2</sup> )	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	2	C5750X5R1A686M	Capacitor, Ceramic, 68uF, 10V, 20%	TDK	C5750 2220	31	2
C28	1	Standard	Capacitor, Ceramic, 470pF, 25V, 1%	Standard	0603	2	1
C3	1	Standard	Capacitor, Ceramic, 0.1uF, 50V, 1%	Standard	1206	6	1
C31	1	Standard	Capacitor, Ceramic, 2200pF, 6.3V, 20%	Standard	0603	2	1
C33	1	Standard	Capacitor, Ceramic, 2200pF, 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	2	KHD251E106M99C0B00	Capacitor, Electrolytic, 10uF, 250V, 20%	NIPPON CHEMI-CON	Radial	213	20
D1	1	1N4148W	Diode, Fast, 75V, 0.3A	Diodes Inc	SOD-123	6	1
L1	1	XAL1010-682MEB	Inductor, 6.8uH, 18.5A, 8.1mΩ	Coilcraft	XAL1010	113	10
Q1	1	Si7850DP	Transistor, NFET, 60V, 10.3A, 18mΩ	Vishay	PG-TDSON-8	32	0
Q2	1	Si4406DY	Transistor, NFET, 30V, 20A, 10Ω	Vishay	SO-8	32	1
R1	1	Standard	Resistor, SurfaceMount, 10KΩ, 100mW, 1%	Standard	0603	2	1
R2	1	Standard	Resistor, SurfaceMount, 1.62KΩ, 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, 6.81KΩ, 100mW, 1%	Standard	0603	2	1

# SwitcherPro Design Report

## Bill of Materials

**Design Name:** TPS40057 26.4V to 5.2V @ 12A

**Part:** TPS40057

**VinMin:** 15V    **VinMax:** 26.4V    **Vout:** 5V    **Iout:** 12A

Name	Quantity	Part Number	Description	Manufacturer	Package	Area(mm <sup>2</sup> )	Height(mm)
R30	1	Standard	Resistor, SurfaceMount, 4.7Ω, 2W, 5%	Standard	2512	21	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, 274Ω, 100mW, 1%	Standard	0603	2	1
R6	1	Standard	Resistor, SurfaceMount, 34.8KΩ, 100mW, 1%	Standard	0603	2	1
R7	1	Standard	Resistor, SurfaceMount, 127KΩ, 100mW, 1%	Standard	0603	2	1
U1	1	TPS40057	IC, Controller, 16 pins	Texas Instruments, Inc.	HTSSOP-Power PAD	34	2



# SwitcherPro Design Report

## Layout

**Design Name:** TPS40057 26.4V to 5.2V @ 12A

**Part:** TPS40057

**VinMin:** 15V   **VinMax:** 26.4V   **Vout:** 5V   **Iout:** 12A

Layout Image Not Available For this Part

# SwitcherPro Design Report

## Layout Notes

**Design Name:** TPS40057 26.4V to 5.2V @ 12A

**Part:** TPS40057

**VinMin:** 15V    **VinMax:** 26.4V    **Vout:** 5V    **Iout:** 12A

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).