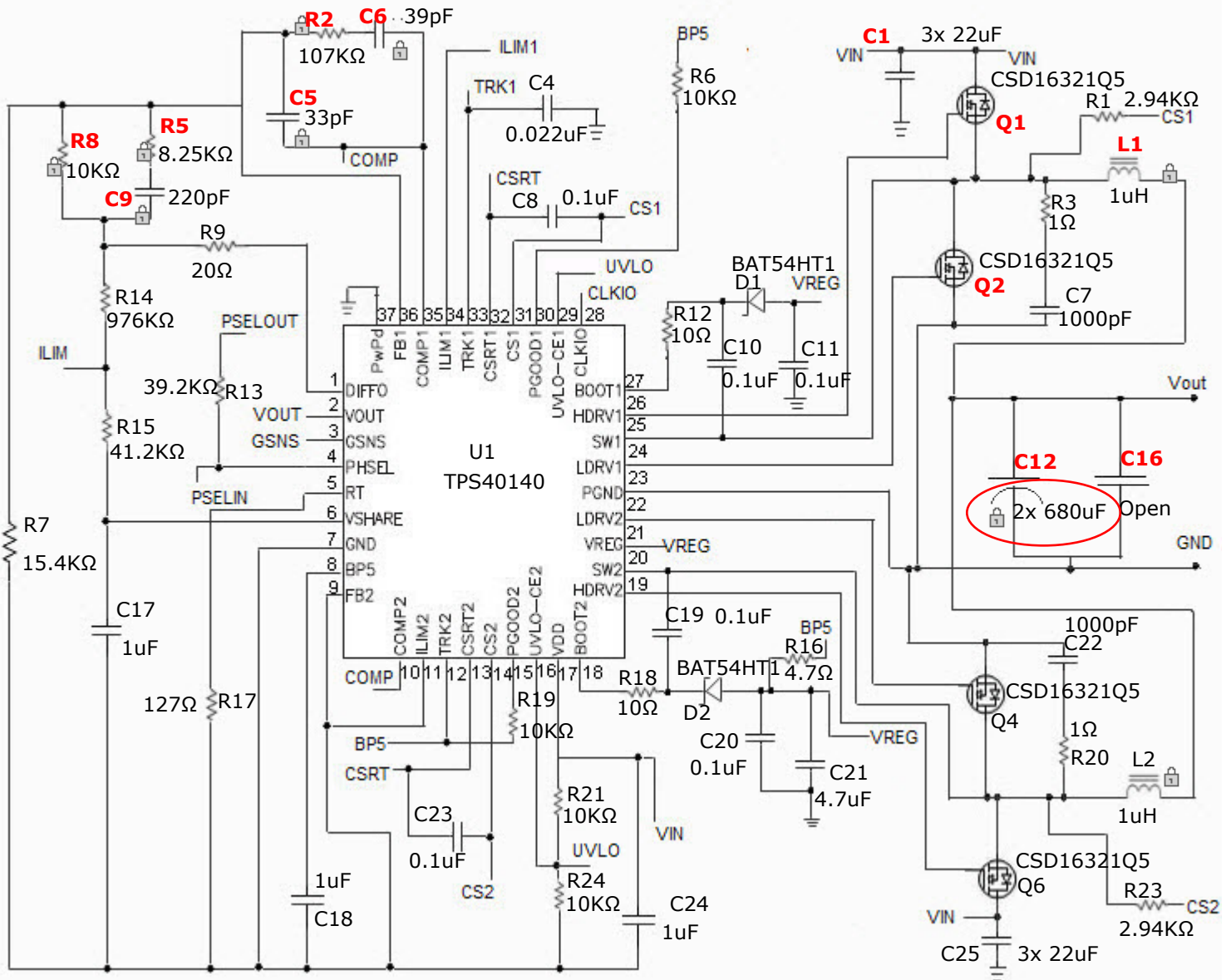


# SwitcherPro Design Report Schematic

**Design Name:** tps40140\_dual phase\_1.15v@44a

**Part:** TPS40140

**VinMin:** 10V    **VinMax:** 14V    **Vout:** 1.15V    **Iout:** 44A    **Phases:** 2



- ⊗ Gain margin for this design, 0dB, is greater than 1 db! Low Gain Margin Warning!
- ⊗ Phase margin for this design, 2°, is lower than the overall recommended phase margin of 30°. Low phase warning!

# SwitcherPro Design Report

## Analysis - Main

**Design Name:** tps40140\_dual phase\_1.15v@44a

**Part:** TPS40140

**VinMin:** 10V    **VinMax:** 14V    **Vout:** 1.15V    **Iout:** 44A    **Phases:** 2

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	10.00	-	14.00	-	-	-	-	-	-
Input Ripple mVp-p - mVp-p	-	-	-	-	-	280	-	-	225.9
UVLO(Start) Volts - V	-	-	-	-	-	-	-	-	-
UVLO(Stop) Volts - V	-	-	-	-	-	-	-	0.50	-
Switching Frequency KHz - KHz	-	-	-	-	300	-	-	-	-
Slow Start ms - ms	-	-	-	-	8.00	-	-	-	-
Estimated PCB Area mm <sup>2</sup> - mm <sup>2</sup>	-	-	-	-	-	-	-	2167	-
Max Component Height mm - mm	-	-	-	-	-	25	-	-	13

# SwitcherPro Design Report

## Analysis - Output1

**Design Name:** tps40140\_dual phase\_1.15v@44a

**Part:** TPS40140

**VinMin:** 10V    **VinMax:** 14V    **Vout:** 1.15V    **Iout:** 44A    **Phases:** 2

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	-	1.150	-	-	-	-	1.088	-	1.222
Output Ripple mVp-p - mVp-p	-	-	-	-	-	23	-	-	14.1
Output Current Amps - A	-	-	22.000	0.001	-	-	-	-	-
Inductor Peak to Peak Current Amps - A	-	-	-	-	-	-	4.503	-	4.692
Current Limit Threshold Amps - A	-	-	-	-	10.000	-	-	-	-
Gain Margin dB - dB	-	-	-	-10	-	-	-	0	-
Phase Margin Deg. - Deg.	-	-	-	60	-	-	-	2	-
Upper FET RDSon mOhms - mΩ	-	-	-	-	-	-	2	-	2
Lower FET RDSon mOhms - mΩ	-	-	-	-	-	-	2	-	2
Duty Cycle % - %	-	-	-	-	-	-	8.8	-	12.4
On Time Min (switch) ns - ns	-	-	-	-	-	-	245.8	-	516.1
Cross Over Frequency KHz - KHz	-	-	-	-	-	-	-	111	-

## SwitcherPro Design Report Stress Results

**Design Name:** tps40140\_dual phase\_1.15v@44a

**Part:** TPS40140

**VinMin:** 10V    **VinMax:** 14V    **Vout:** 1.15V    **Iout:** 44A    **Phases:** 2

Device	Rated Voltage	Calculated Voltage	Rated Current (RMS)	Calculated Current (RMS)	Error Message	Power	Calculated Max Temp
C1 (High Freq. Input Cap)	25V	14.1V	10A	2.42A	-	35mW	-
C12 (Bulk Output Cap)	2.5V	1.16V	5.6A	0.68A	-	6mW	-
L1 (Output Inductor)	-	-	30A	22A	-	875mW	-
Q1 (Power Switch)	25V	14.1V	100A	7.76A	-	1.1W	66°C
Q2 (Sync. Rectifier)	25V	14.1V	100A	21A	-	1.1W	65°C
Rsns (Current Sense Resistor)	-	-	-	0A	-	0W	-
L2 (Output Inductor)	-	-	30A	22A	-	875mW	-
Q6 (Power Switch)	25V	14.1V	100A	7.76A	-	1.1W	66°C
Q4 (Sync. Rectifier)	25V	14.1V	100A	21A	-	1.1W	65°C
C25 (High Freq. Input Cap)	25V	14.1V	10A	2.42A	-	35mW	-

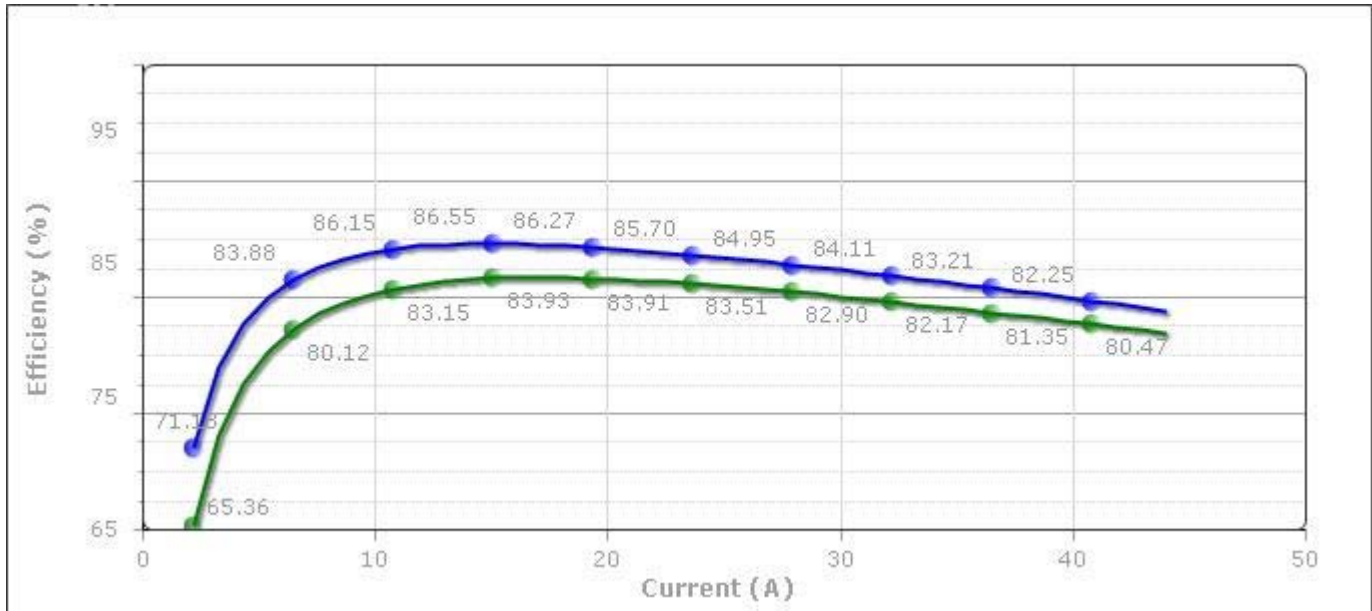
# SwitcherPro Design Report

## Efficiency

**Design Name:** tps40140\_dual phase\_1.15v@44a

**Part:** TPS40140

**VinMin:** 10V   **VinMax:** 14V   **Vout:** 1.15V   **Iout:** 44A   **Phases:** 2



— Efficiency For Vin Max  
— Efficiency For Vin Min

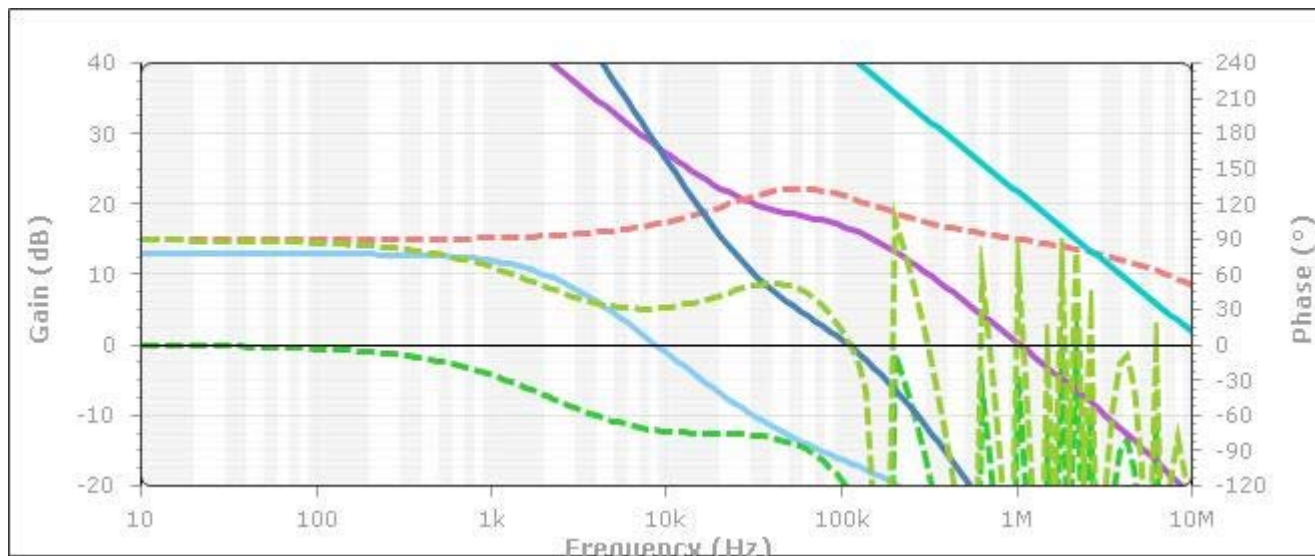
# SwitcherPro Design Report

## Loop Response

**Design Name:** tps40140\_dual phase\_1.15v@44a

**Part:** TPS40140

**VinMin:** 10V **VinMax:** 14V **Vout:** 1.15V **Iout:** 44A **Phases:** 2



- 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:** tps40140\_dual phase\_1.15v@44a

**Part:** TPS40140

**VinMin:** 10V    **VinMax:** 14V    **Vout:** 1.15V    **Iout:** 44A    **Phases:** 2

Name	Quantity	Part Number	Description	Manufacturer	Package	Area(mm <sup>2</sup> )	Height(mm)
C1	3	GRM32ER71E226KE15L	Capacitor, 8, 22uF, 25V, 10%	Murata Manufacturing	1210	8	2
C10	1	Standard	Capacitor, Ceramic, 0.1uF, 20V, 10%	Standard	0603	2	1
C11	1	Standard	Capacitor, Ceramic, 0.1uF, 20V, 10%	Standard	0603	2	1
C12	2	2R5TPD680M6	Capacitor, POSCAP, 680uF, 2.5V, 20%	SANYO Electric	TPD-D4D	31	3
C17	1	Standard	Capacitor, Ceramic, 1uF, 20V, 10%	Standard	0603	2	1
C18	1	Standard	Capacitor, Ceramic, 1uF, 20V, 10%	Standard	0603	2	1
C19	1	Standard	Capacitor, Ceramic, 0.1uF, 20V, 10%	Standard	0603	2	1
C20	1	Standard	Capacitor, Ceramic, 0.1uF, 20V, 10%	Standard	0603	2	1
C21	1	Standard	Capacitor, Ceramic, 4.7uF, 10V, 10%	Standard	0805	3	1
C22	1	Standard	Capacitor, Ceramic, 1000pF, 2.5V, 20%	Standard	0603	2	1
C23	1	Standard	Capacitor, Ceramic, 0.1uF, 20V, 10%	Standard	0603	2	1
C24	1	Standard	Capacitor, Ceramic, 1uF, 20V, 10%	Standard	0603	2	1
C25	3	GRM32ER71E226KE15L	Capacitor, 8, 22uF, 25V, 10%	Murata Manufacturing	1210	8	2
C4	1	Standard	Capacitor, Ceramic, 0.022uF, 20V, 1%	Standard	0805	3	1
C5	1	Standard	Capacitor, Ceramic, 33pF, 4V, 20%	Standard	0603	2	1
C6	1	Standard	Capacitor, Ceramic, 39pF, 4V, 20%	Standard	0603	2	1
C7	1	Standard	Capacitor, Ceramic, 1000pF, 2.5V, 20%	Standard	0603	2	1
C8	1	Standard	Capacitor, Ceramic, 0.1uF, 20V, 10%	Standard	0603	2	1
C9	1	Standard	Capacitor, Ceramic, 220pF, 4V, 20%	Standard	0603	2	1
D1	1	BAT54HT1	Diode, Schottky, 30V, 0.2A	On Semiconductor	SOD-323	2	0
D2	1	BAT54HT1	Diode, Schottky, 30V, 0.2A	On Semiconductor	SOD-323	2	0
L1	1	SER2013-102	Inductor, 1uH, 30A, 1.8mΩ	Coilcraft	Standard	392	12
L2	1	SER2013-102	Inductor, 1uH, 30A, 1.8mΩ	Coilcraft	Standard	392	12
Q1	1	CSD16321Q5	Transistor, NFET, 25V, 100A, 3mΩ	Texas Instruments, Inc.	QFN 5x6	31	1

# SwitcherPro Design Report

## Bill of Materials

**Design Name:** tps40140\_dual phase\_1.15v@44a

**Part:** TPS40140

**VinMin:** 10V    **VinMax:** 14V    **Vout:** 1.15V    **Iout:** 44A    **Phases:** 2

Name	Quantity	Part Number	Description	Manufacturer	Package	Area(mm <sup>2</sup> )	Height(mm)
Q2	1	CSD16321Q5	Transistor, NFET, 25V, 100A, 3mΩ	Texas Instruments, Inc.	QFN 5x6	31	1
Q4	1	CSD16321Q5	Transistor, NFET, 25V, 100A, 3mΩ	Texas Instruments, Inc.	QFN 5x6	31	1
Q6	1	CSD16321Q5	Transistor, NFET, 25V, 100A, 3mΩ	Texas Instruments, Inc.	QFN 5x6	31	1
R1	1	Standard	Resistor, SurfaceMount, 2.94KΩ, 100mW, 1%	Standard	0603	2	1
R12	1	Standard	Resistor, SurfaceMount, 10Ω, 100mW, 1%	Standard	0603	2	1
R13	1	Standard	Resistor, SurfaceMount, 39.2KΩ, 100mW, 1%	Standard	0603	2	1
R14	1	Standard	Resistor, SurfaceMount, 976KΩ, 100mW, 1%	Standard	0603	2	1
R15	1	Standard	Resistor, SurfaceMount, 41.2KΩ, 100mW, 1%	Standard	0603	2	1
R16	1	Standard	Resistor, SurfaceMount, 4.7Ω, 100mW, 1%	Standard	0603	2	1
R17	1	Standard	Resistor, SurfaceMount, 127Ω, 100mW, 1%	Standard	0603	2	1
R18	1	Standard	Resistor, SurfaceMount, 10Ω, 100mW, 1%	Standard	0603	2	1
R19	1	Standard	Resistor, SurfaceMount, 10KΩ, 100mW, 1%	Standard	0603	2	1
R2	1	Standard	Resistor, SurfaceMount, 107KΩ, 100mW, 1%	Standard	0603	2	1
R20	1	Standard	Resistor, SurfaceMount, 1Ω, 250mW, 1%	Standard	1210	8	1
R21	1	Standard	Resistor, SurfaceMount, 10KΩ, 100mW, 1%	Standard	0603	2	1
R23	1	Standard	Resistor, SurfaceMount, 2.94KΩ, 100mW, 1%	Standard	0603	2	1
R24	1	Standard	Resistor, SurfaceMount, 10KΩ, 100mW, 1%	Standard	0603	2	1
R3	1	Standard	Resistor, SurfaceMount, 1Ω, 250mW, 1%	Standard	1210	8	1
R5	1	Standard	Resistor, SurfaceMount, 8.25KΩ, 100mW, 1%	Standard	0603	2	1
R6	1	Standard	Resistor, SurfaceMount, 10KΩ, 100mW, 1%	Standard	0603	2	1
R7	1	Standard	Resistor, SurfaceMount, 15.4KΩ, 50mW, 1%	Standard	0201	1	1
R8	1	Standard	Resistor, SurfaceMount, 10KΩ, 100mW, 1%	Standard	0603	2	1
R9	1	Standard	Resistor, SurfaceMount, 20Ω, 100mW, 10%	Standard	0603	2	1



# SwitcherPro Design Report

## Bill of Materials

**Design Name:** tps40140\_dual phase\_1.15v@44a

**Part:** TPS40140

**VinMin:** 10V **VinMax:** 14V **Vout:** 1.15V **Iout:** 44A **Phases:** 2

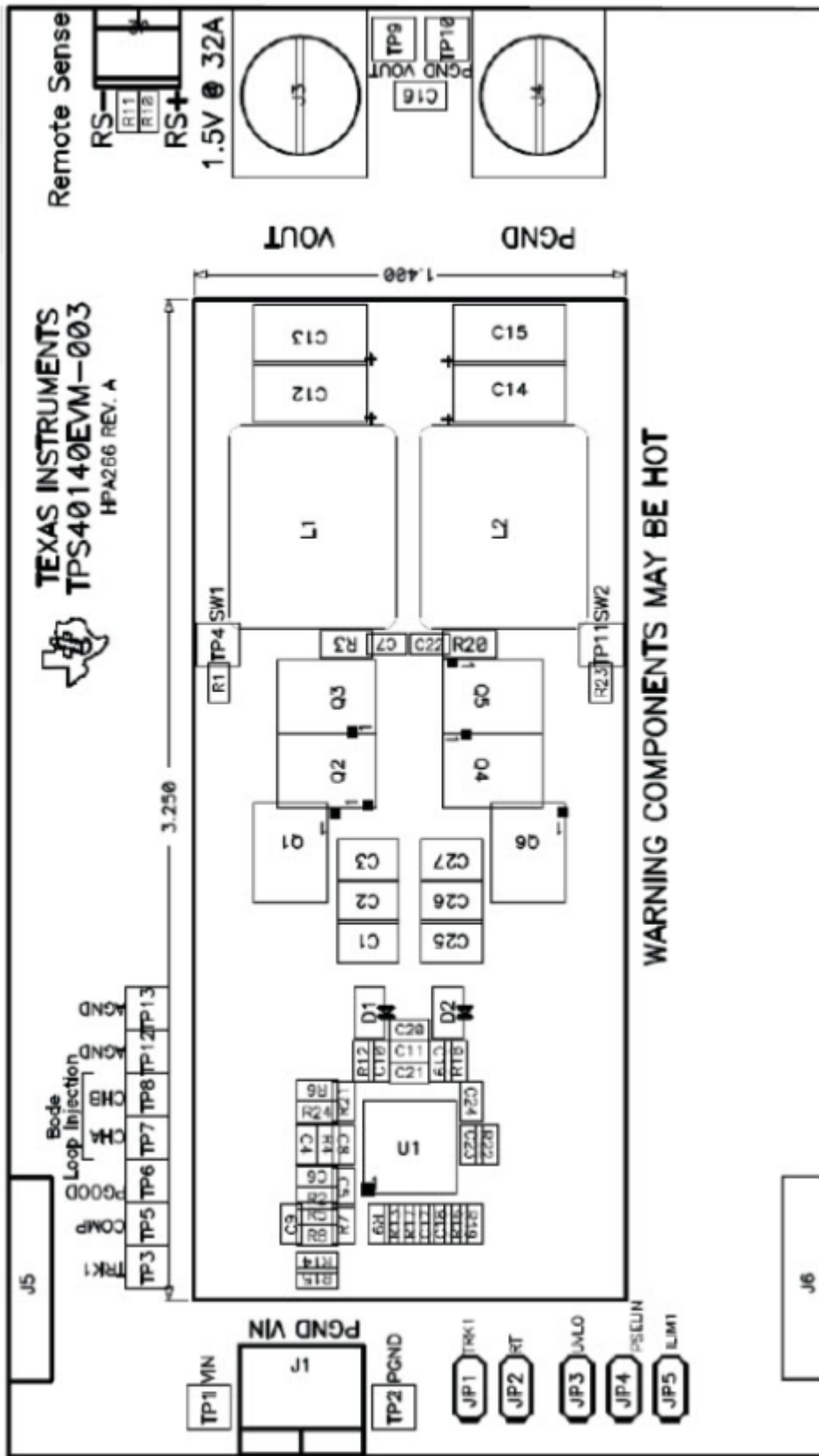
Name	Quantity	Part Number	Description	Manufacturer	Package Area(mm <sup>2</sup> )	Height(mm)	
Rsns	0	Standard	Resistor, SurfaceMount, 1.6mΩ, 100mW, 1%	Standard	0603	2	1
U1	1	TPS40140	IC, Controller, 36 pins	Texas Instruments, Inc.	PQFP	45	1

# SwitcherPro Design Report Layout

**Design Name:** tps40140\_dual phase\_1.15v@44a

**Part:** TPS40140

**VinMin:** 10V    **VinMax:** 14V    **Vout:** 1.15V    **Iout:** 44A    **Phases:** 2



TPS40140EVM-003 Component Placement (Viewed from Top)

# SwitcherPro Design Report

## Layout Notes

**Design Name:** tps40140\_dual phase\_1.15v@44a

**Part:** TPS40140

**VinMin:** 10V   **VinMax:** 14V   **Vout:** 1.15V   **Iout:** 44A   **Phases:** 2

TPS40140

Figure below show the design of the TPS40140EVM-003 printed circuit board. The EVM has been designed using a four layer, 2 oz copper-clad circuit board with all components on the top side to allow the user to easily view, probe and evaluate the TPS40140 control IC in a practical application. Moving components to both sides of the PCB or using additional internal layers can offer additional size reduction for space constrained systems.