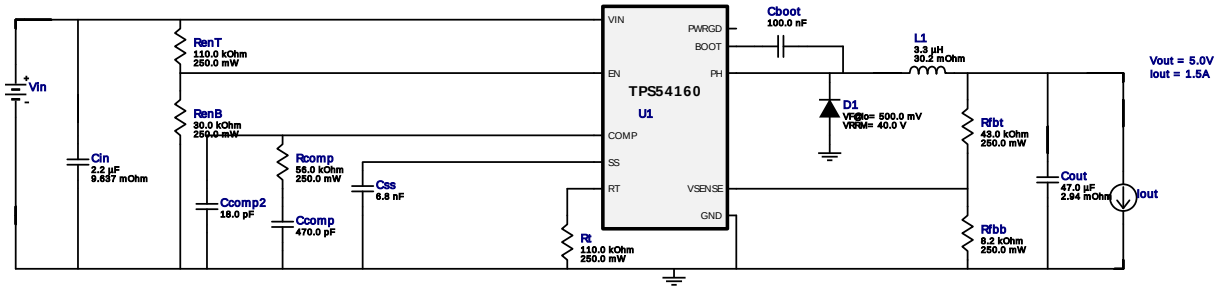
WEBENCH® Design Report

VinMin = 6.5V
VinMax = 7.5V
Vout = 5.0V
Iout = 1.5A

Device = TPS54160DGQR
Topology = Buck
Created = 2017-08-22 00:35:42.199
BOM Cost = $2.05
BOM Count = 15
Total Pd = 1.04W

Design : 5085009/5 TPS54160DGQR
TPS54160DGQR 6.5V-7.5V to 5.00V @ 1.5A



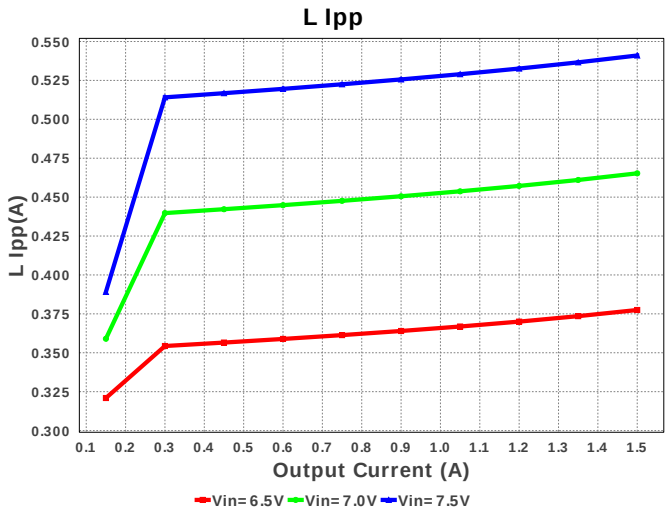
My Comments

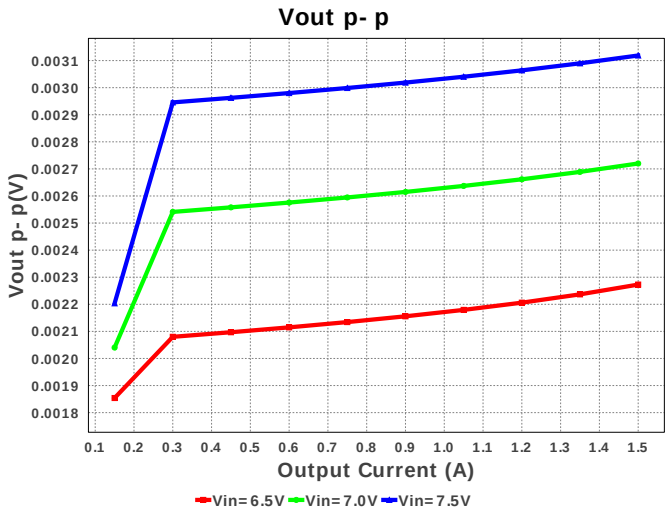
No comments

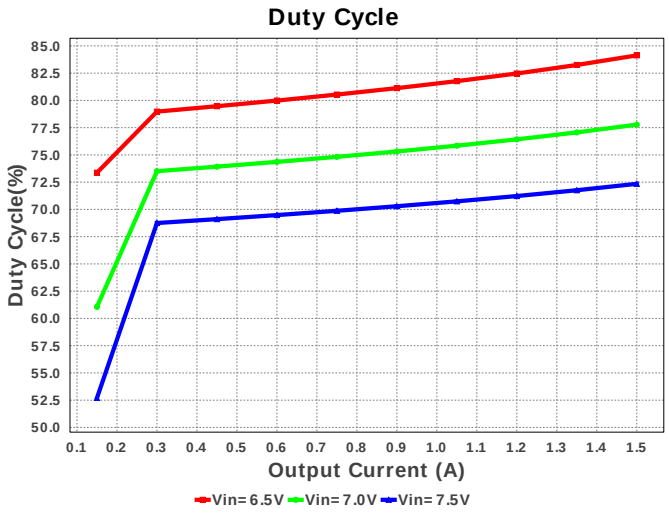
Electrical BOM

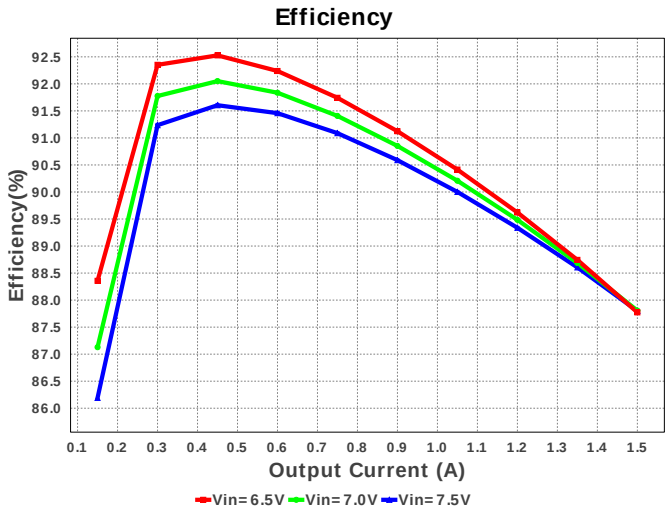
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	MuRata	GRM155R61A104KA01D Series= X5R	Cap= 100.0 nF VDC= 10.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
2.	Ccomp	Yageo America	CC0805KRX7R9BB471 Series= X7R	Cap= 470.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
3.	Ccomp2	Kemet	C0805C180K5GACTU Series= C0G/NP0	Cap= 18.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
4.	Cin	MuRata	GRM188R61A225KE34D Series= X5R	Cap= 2.2 uF ESR= 9.637 mOhm VDC= 10.0 V IRMS= 1.24283 A	1	$0.02	0603 5 mm²
5.	Cout	TDK	C2012X5R1A476M125AC Series= X5R	Cap= 47.0 uF ESR= 2.94 mOhm VDC= 10.0 V IRMS= 3.80451 A	1	$0.29	0805 7 mm²
6.	Css	Yageo America	CC0805KRX7R9BB682 Series= X7R	Cap= 6.8 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
7.	D1	Diodes Inc.	B340A-13-F	VF@Io= 500.0 mV VRRM= 40.0 V	1	$0.12	SMA 37 mm²
8.	L1	Bourns	SRN6045-3R3Y	L= 3.3 µH DCR= 30.2 mOhm	1	$0.17	SRN6045 64 mm²
9.	Rcomp	Yageo America	RC1206FR-0756KL Series= ?	Res= 56.0 kOhm Power= 250.0 mW Tolerance= 1.0%	1	$0.01	1206 11 mm²
10.	RenB	Yageo America	RC1206FR-0730KL Series= ?	Res= 30.0 kOhm Power= 250.0 mW Tolerance= 1.0%	1	$0.01	1206 11 mm²
11.	RenT	Panasonic	ERJ-8ENF1103V Series= ERJ-8E	Res= 110.0 kOhm Power= 250.0 mW Tolerance= 1.0%	1	$0.01	1206 11 mm²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
12.	Rfbb	Yageo America	RC1206FR-078K2L Series= ?	Res= 8.2 kOhm Power= 250.0 mW Tolerance= 1.0%	1	$0.01	1206 11 mm²
13.	Rfbt	Yageo America	RC1206FR-0743KL Series= ?	Res= 43.0 kOhm Power= 250.0 mW Tolerance= 1.0%	1	$0.01	1206 11 mm²
14.	Rt	Vishay-Dale	CRCW1206110KFKEA Series= CRCW..e3	Res= 110.0 kOhm Power= 250.0 mW Tolerance= 1.0%	1	$0.01	1206 11 mm²
15.	U1	Texas Instruments	TPS54160DGQR	Switcher	1	$1.35	S-PDSO-G10 24 mm²

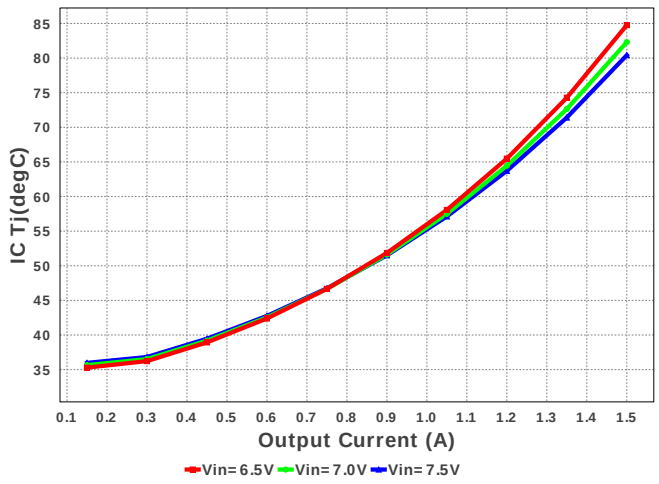




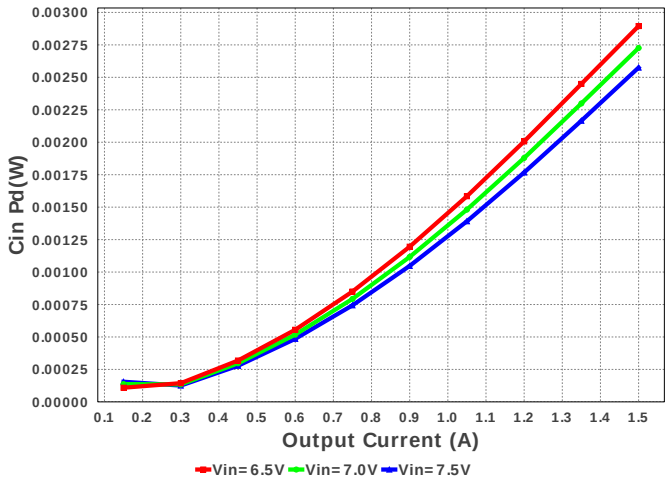




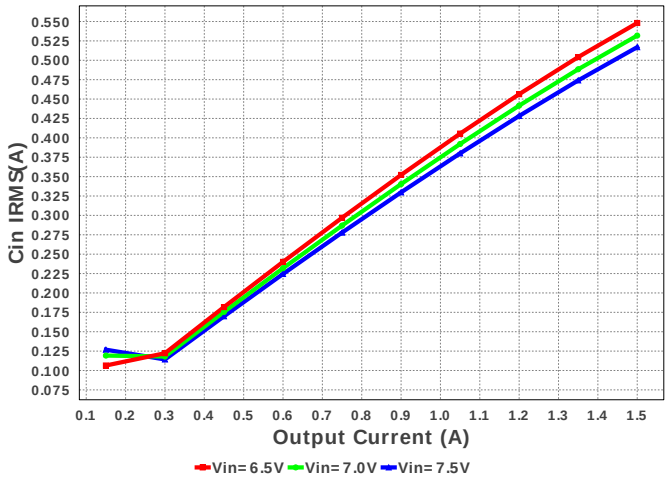
IC Tj



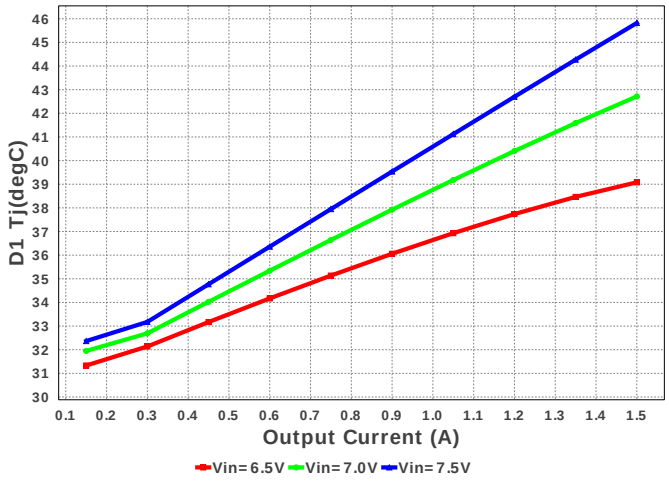
Cin Pd



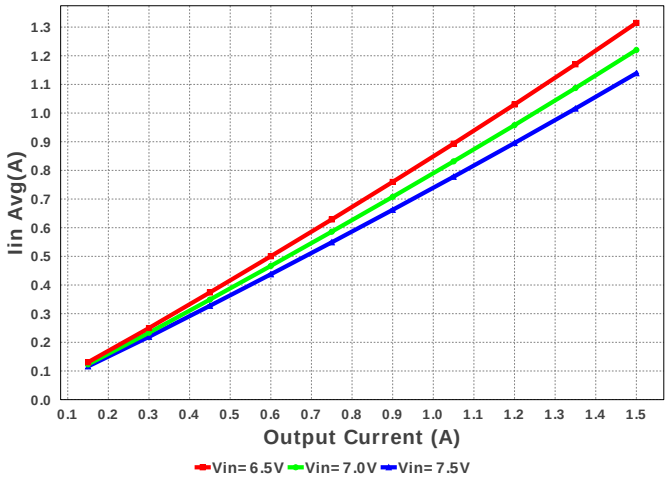
Cin IRMS



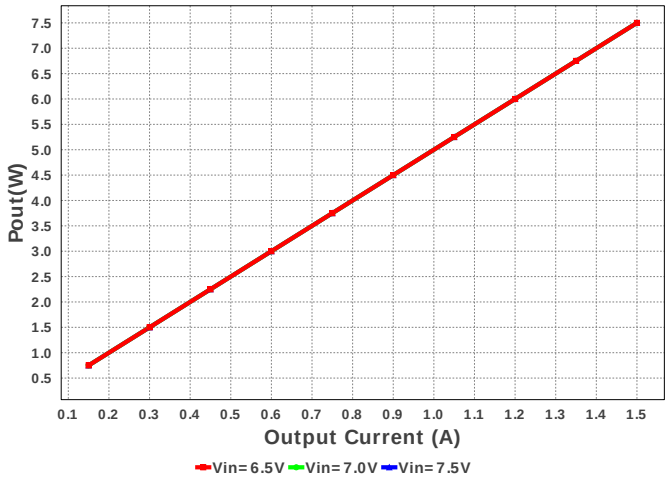
D1 Tj



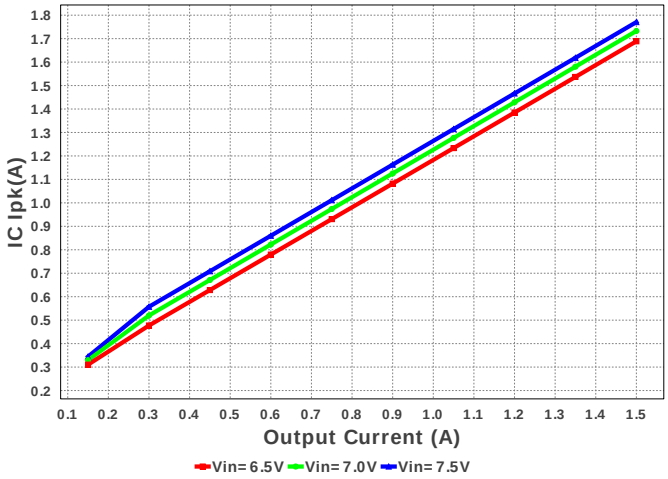
Iin Avg



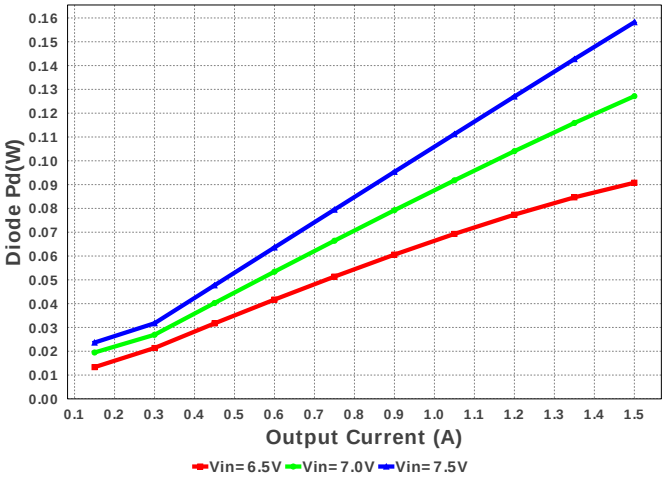
Pout



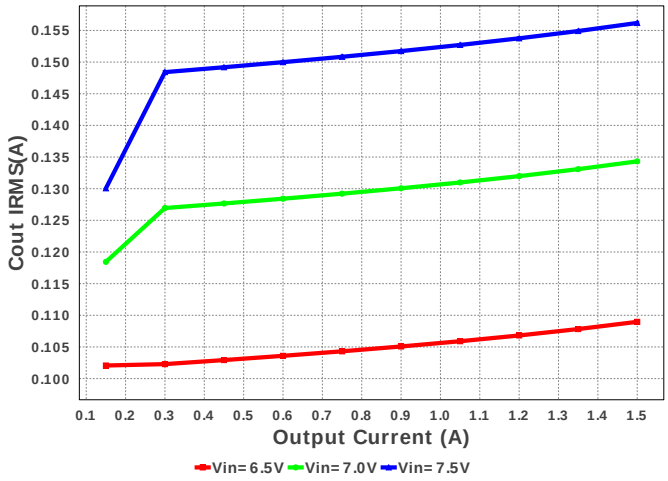
IC Ipk



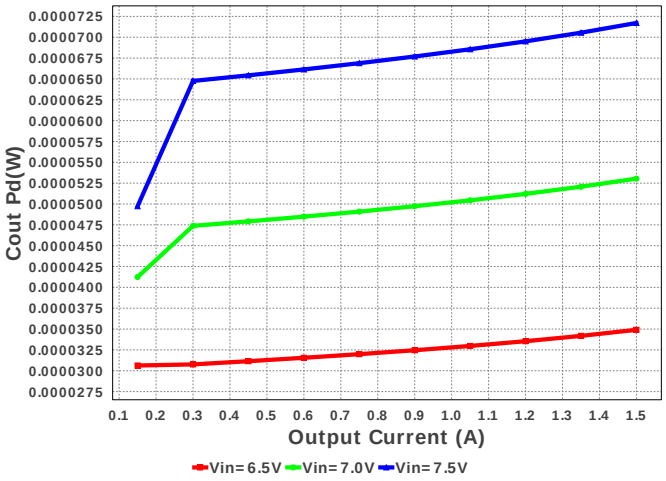
Diode Pd



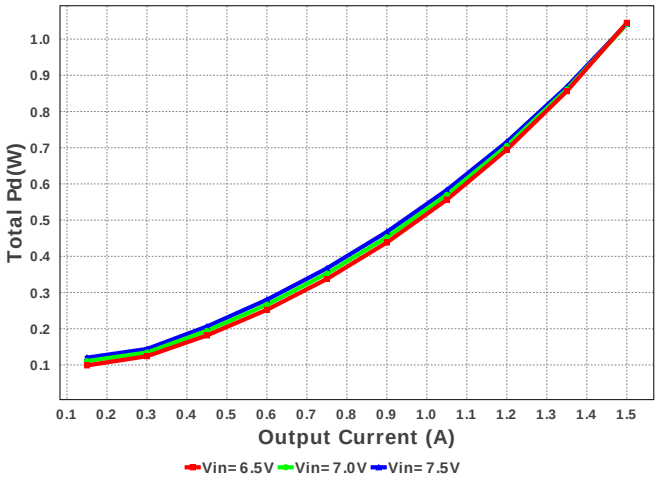
Cout IRMS



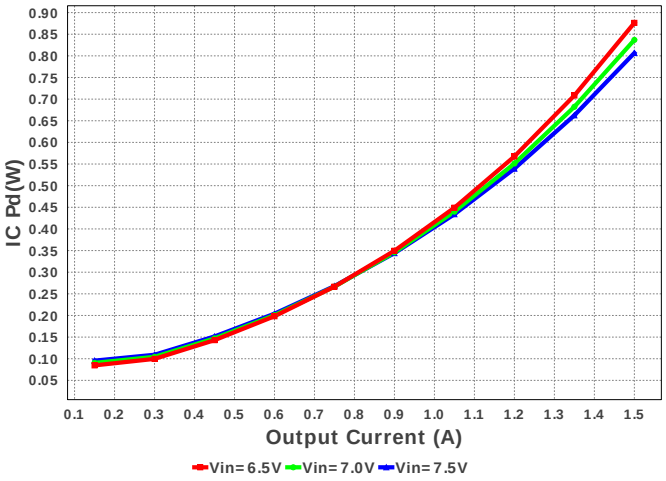
Cout Pd

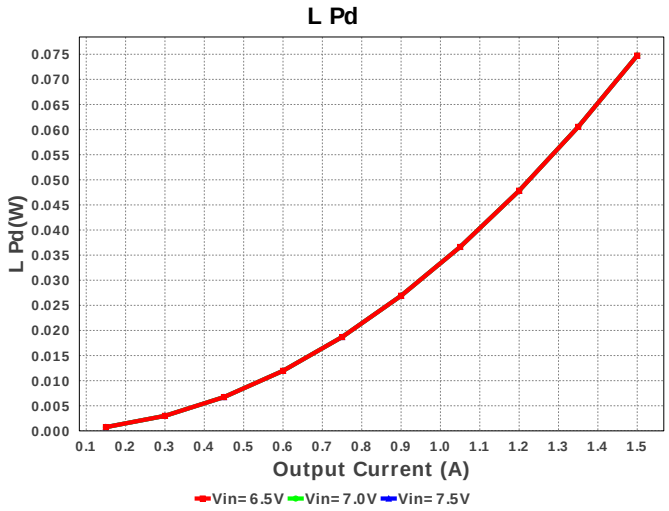


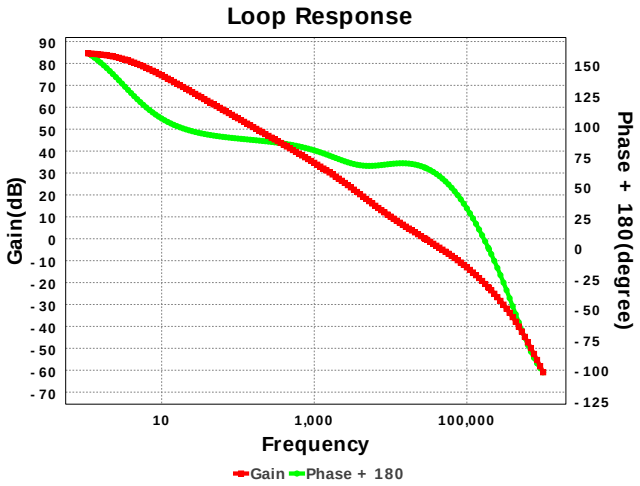
Total Pd



IC Pd







Operating Values

#	Name	Value	Category	Description
1.	BOM Count	15		Total Design BOM count
2.	Total BOM	$2.05		Total BOM Cost
3.	Cin IRMS	516.931 mA	Current	Input capacitor RMS ripple current
4.	Cout IRMS	156.176 mA	Current	Output capacitor RMS ripple current
5.	IC Ipk	1.771 A	Current	Peak switch current in IC
6.	Iin Avg	1.139 A	Current	Average input current
7.	L Ipp	541.01 mA	Current	Peak-to-peak inductor ripple current
8.	FootPrint	225.0 mm^2	General	Total Foot Print Area of BOM components
9.	Frequency	1.013 MHz	General	Switching frequency
10.	Mode	CCM	General	Conduction Mode
11.	Pout	7.5 W	General	Total output power
12.	D1 Tj	45.821 degC	Op_Point	D1 junction temperature
13.	Low Freq Gain	84.563 dB	Op_Point	Gain at 1Hz
14.	Vout Actual	4.995 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
15.	Vout OP	5.0 V	Op_Point	Operational Output Voltage
16.	Cross Freq	28.534 kHz	Op_point	Bode plot crossover frequency
17.	Duty Cycle	72.347 %	Op_point	Duty cycle
18.	Efficiency	87.799 %	Op_point	Steady state efficiency
19.	Gain Marg	-22.44 dB	Op_point	Bode Plot Gain Margin
20.	IC Tj	80.418 degC	Op_point	IC junction temperature
21.	ICThetaJA	62.5 degC/W	Op_point	IC junction-to-ambient thermal resistance
22.	IOUT_OP	1.5 A	Op_point	Iout operating point
23.	Phase Marg	66.847 deg	Op_point	Bode Plot Phase Margin
24.	VIN_OP	7.5 V	Op_point	Vin operating point
25.	Vout p-p	3.119 mV	Op_point	Peak-to-peak output ripple voltage
26.	Cin Pd	2.575 mW	Power	Input capacitor power dissipation
27.	Cout Pd	71.709 µW	Power	Output capacitor power dissipation
28.	Diode Pd	158.209 mW	Power	Diode power dissipation
29.	IC Pd	806.681 mW	Power	IC power dissipation
30.	L Pd	74.745 mW	Power	Inductor power dissipation
31.	Total Pd	1.042 W	Power	Total Power Dissipation
32.	Vout Tolerance	2.714 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	1.5	Maximum Output Current
2.	VinMax	7.5	Maximum input voltage
3.	VinMin	6.5	Minimum input voltage
4.	Vout	5.0	Output Voltage
5.	base_pn	TPS54160	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **TPS54160** Product Folder : http://www.ti.com/product/TPS54160 : contains the data sheet and other resources.