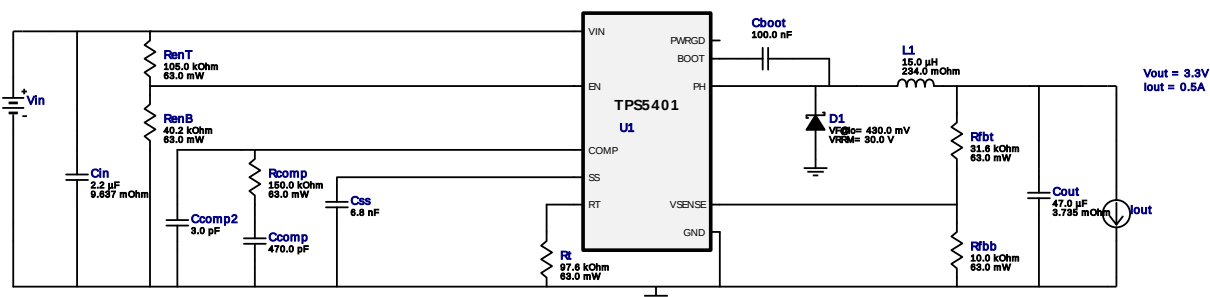


WEBENCH® Design Report

Design : 4372614/35 TPS5401DGQR
TPS5401DGQR 5.0V-12.0V to 3.30V @ 0.5A

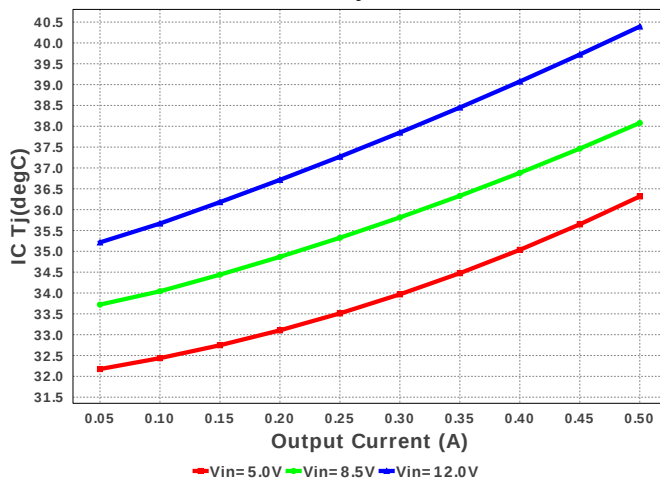


Electrical BOM

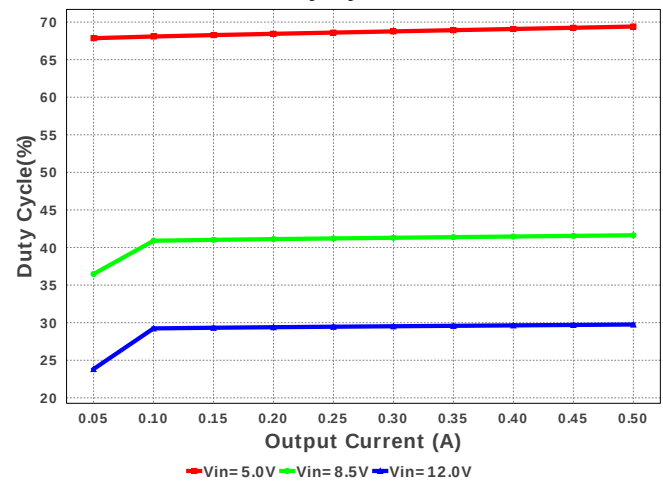
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	MuRata	GRM155R61A104KA01D Series= X5R	Cap= 100.0 nF VDC= 10.0 V IRMS= 0.0 A	1	\$0.01	0402 3 mm ²
2.	Ccomp	Yageo America	CC0805KRX7R9BB471 Series= X7R	Cap= 470.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
3.	Ccomp2	MuRata	GRM1555C1H3R0CA01D Series= C0G/NP0	Cap= 3.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0402 3 mm ²
4.	Cin	MuRata	GRM188R61C225KE15D Series= X5R	Cap= 2.2 uF ESR= 9.637 mOhm VDC= 16.0 V IRMS= 1.20373 A	1	\$0.02	0603 5 mm ²
5.	Cout	MuRata	GRM31CC80J476KE18L Series= X6S	Cap= 47.0 uF ESR= 3.735 mOhm VDC= 6.3 V IRMS= 4.0522 A	1	\$0.10	1206_190 11 mm ²
6.	Css	Yageo America	CC0805KRX7R9BB682 Series= X7R	Cap= 6.8 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
7.	D1	ON Semiconductor	MBR0530T1G	Vf@Io= 430.0 mV VRRM= 30.0 V	1	\$0.06	SOD-123 13 mm ²
8.	L1	Coilcraft	LPS4018-153MRB	L= 15.0 uH DCR= 234.0 mOhm	1	\$0.35	LPS4018 24 mm ²
9.	Rcomp	Vishay-Dale	CRCW0402150KFKED Series= CRCW..e3	Res= 150.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
10.	RenB	Vishay-Dale	CRCW040240K2FKED Series= CRCW..e3	Res= 40.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
11.	RenT	Vishay-Dale	CRCW0402105KFKED Series= CRCW..e3	Res= 105.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
12.	Rfbb	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
13.	Rfbt	Vishay-Dale	CRCW040231K6FKED Series= CRCW..e3	Res= 31.6 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
14.	Rt	Vishay-Dale	CRCW040297K6FKED Series= CRCW..e3	Res= 97.6 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
15.	U1	Texas Instruments	TPS5401DGQR	Switcher	1	\$0.85	 S-PDSO-G10 24 mm ²

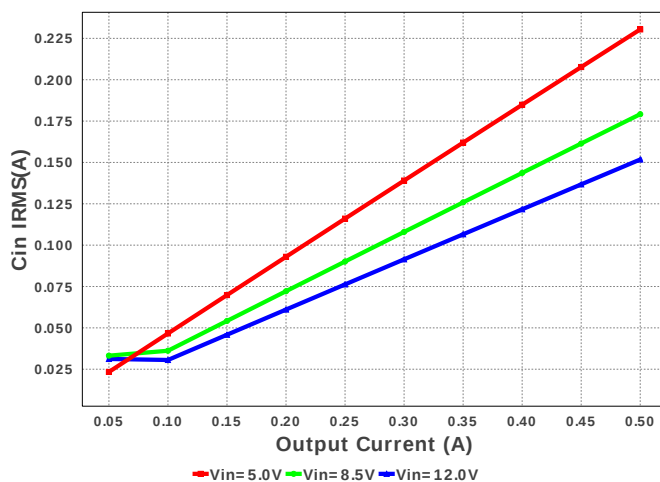
IC Tj



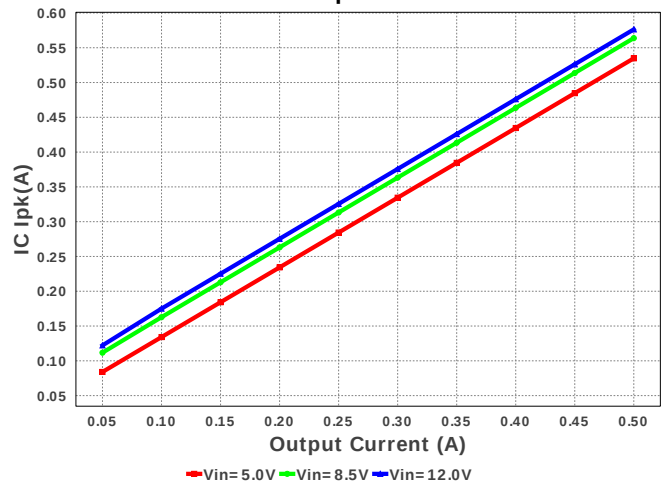
Duty Cycle

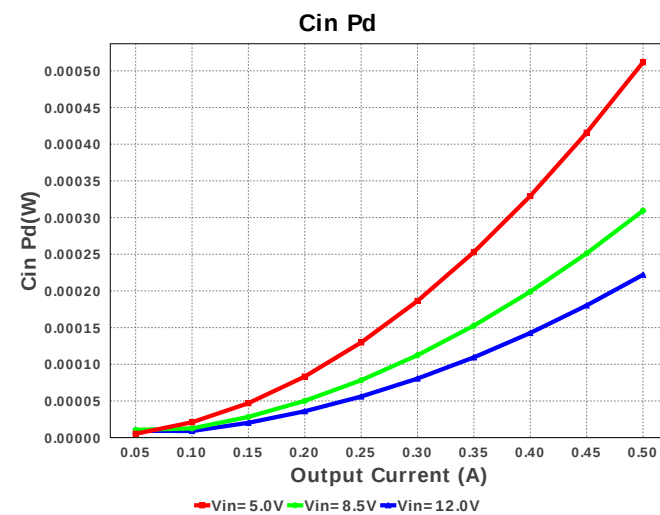
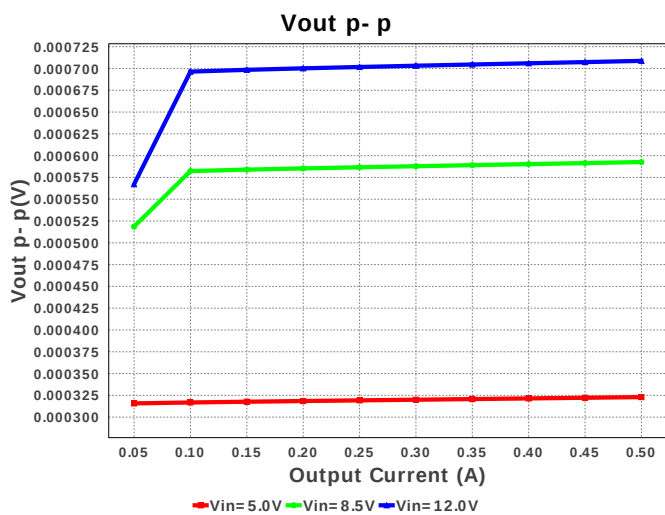
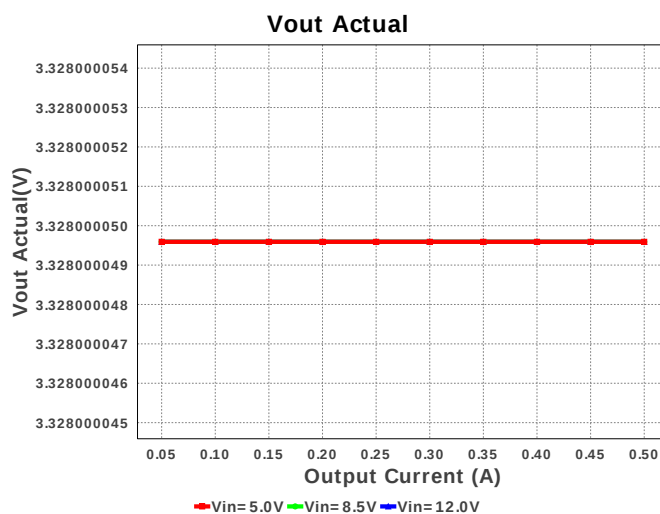
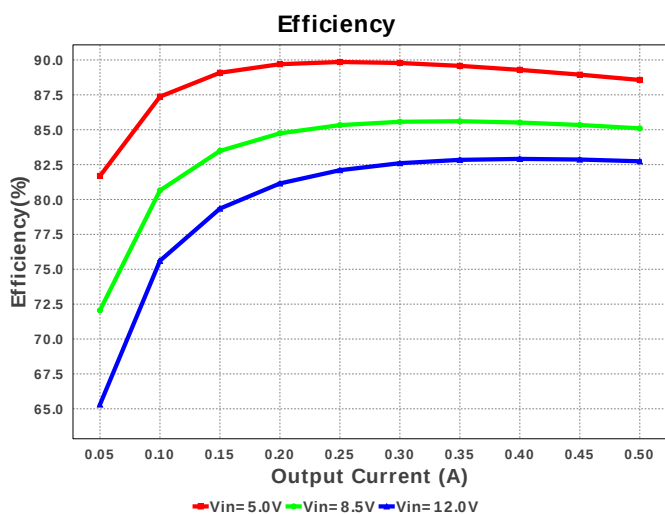
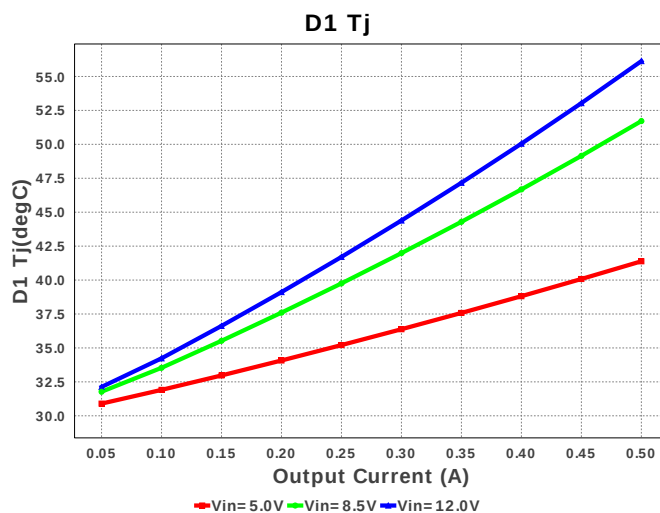
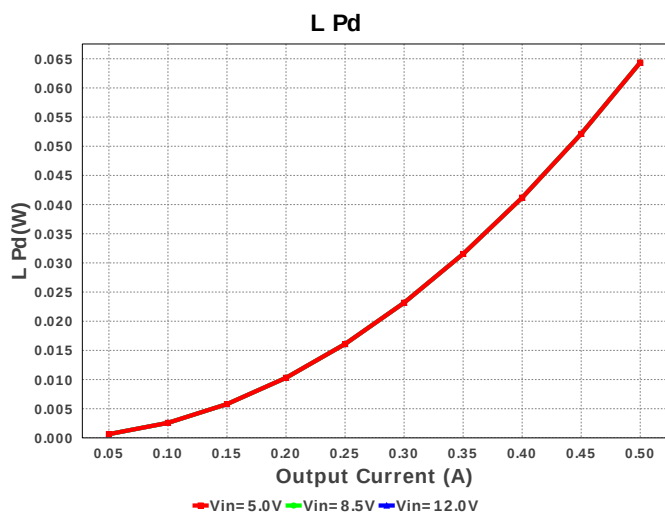


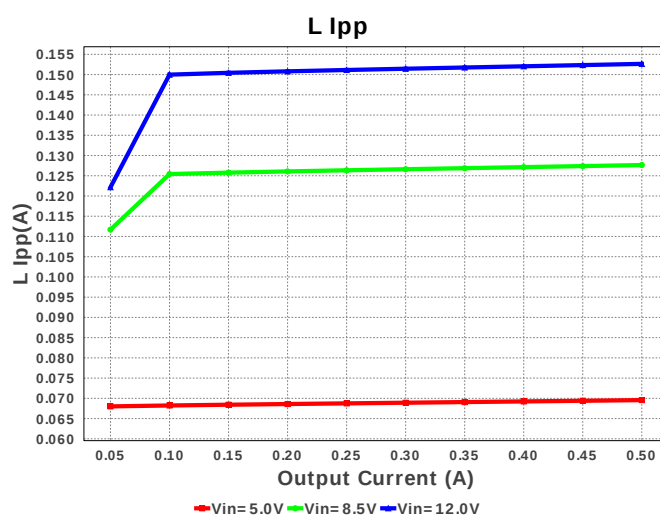
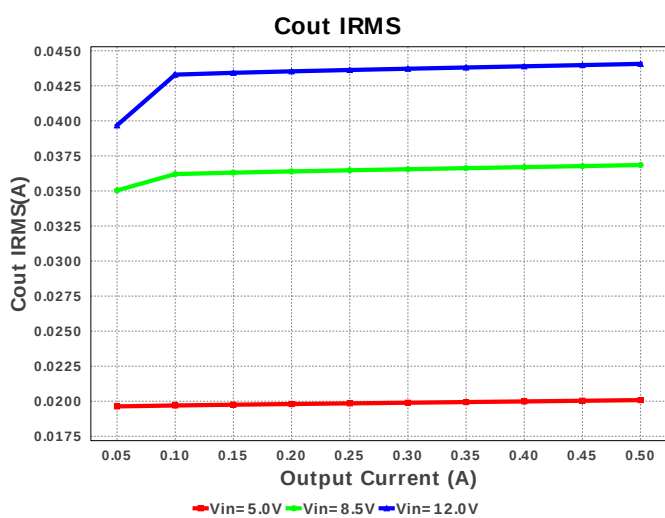
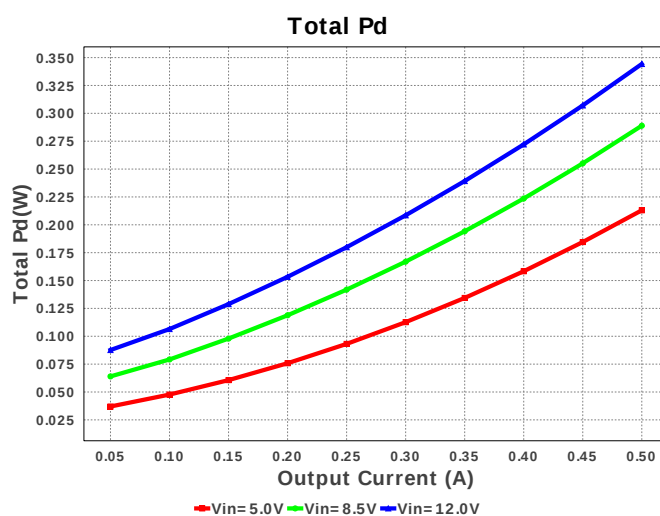
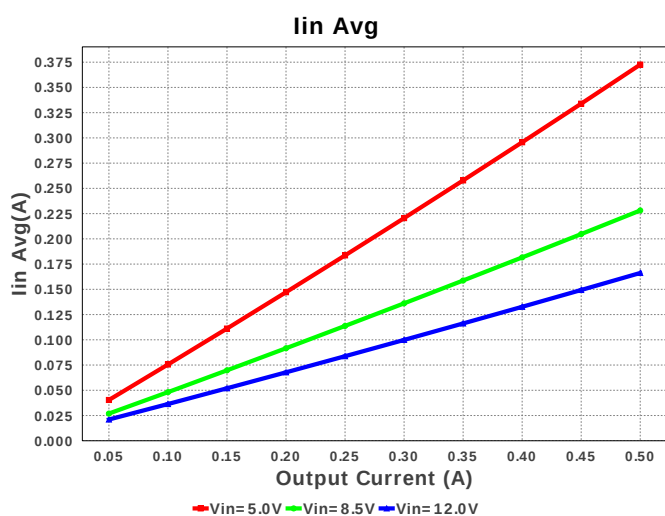
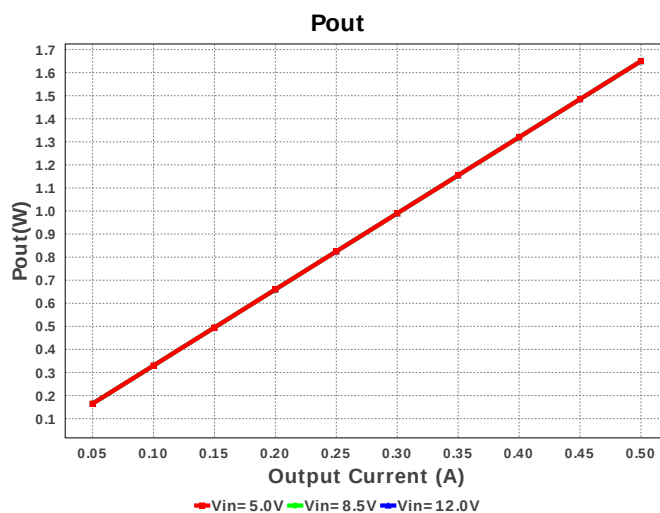
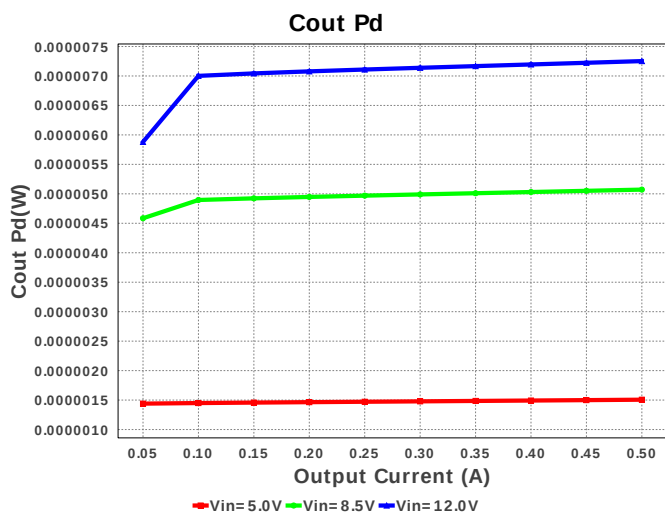
Cin IRMS

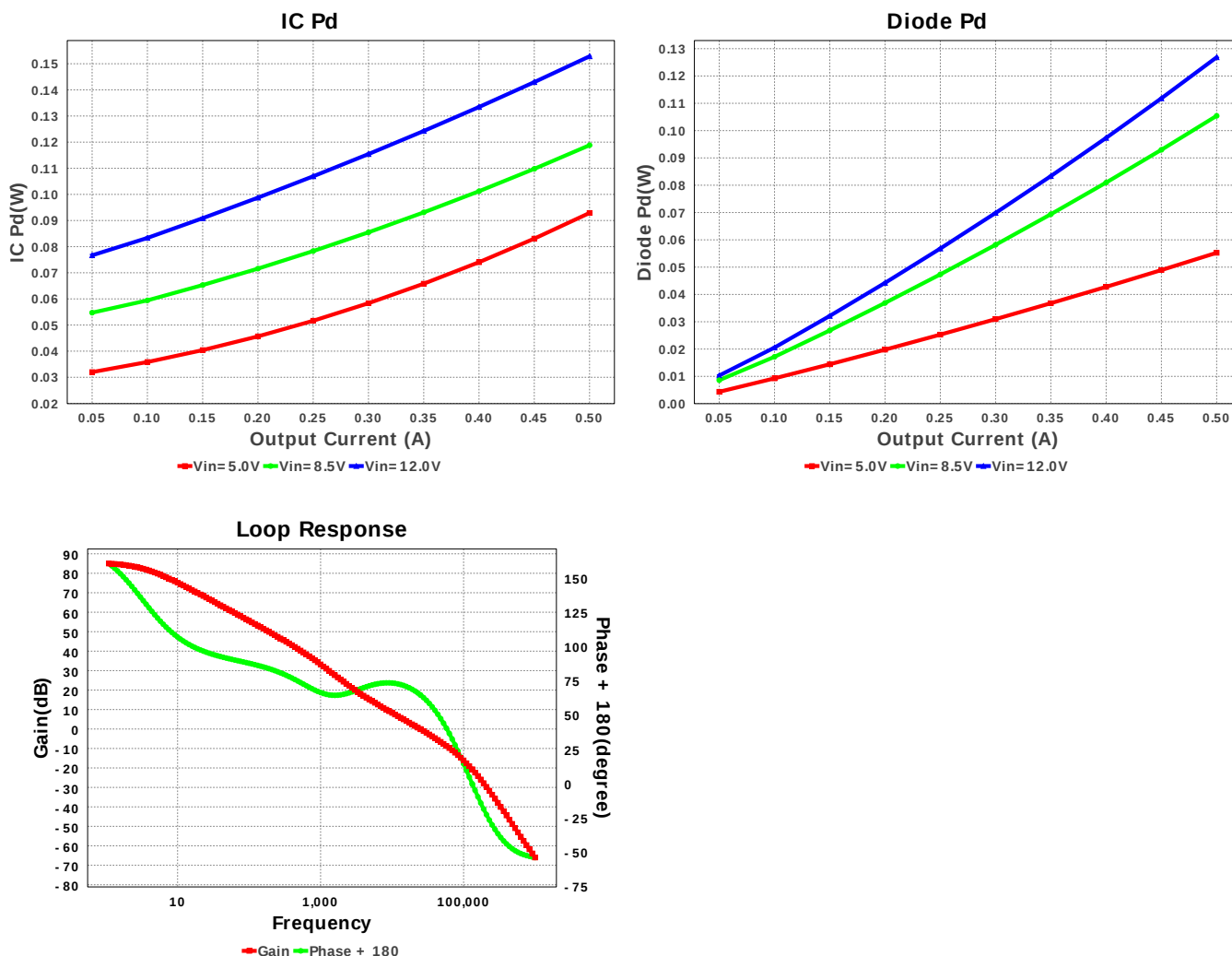


IC Ipk









Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	151.77 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	44.065 mA	Current	Output capacitor RMS ripple current
3.	IC IpK	500.0 mA	Current	Peak switch current in IC
4.	Iin Avg	166.19 mA	Current	Average input current
5.	L Ipp	152.65 mA	Current	Peak-to-peak inductor ripple current
6.	BOM Count	15	General	Total Design BOM count
7.	FootPrint	114.0 mm ²	General	Total Foot Print Area of BOM components
8.	Frequency	1.131 MHz	General	Switching frequency
9.	Pout	1.65 W	General	Total output power
10.	Total BOM	\$1.48	General	Total BOM Cost
11.	D1 Tj	56.133 degC	Op_Point	D1 junction temperature
12.	Low Freq Gain	84.849 dB	Op_Point	Gain at 10Hz
13.	Vout Actual	3.328 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
14.	Vout OP	3.3 V	Op_Point	Operational Output Voltage
15.	Cross Freq	24.688 kHz	Op_point	Bode plot crossover frequency
16.	Duty Cycle	29.758 %	Op_point	Duty cycle
17.	Efficiency	82.737 %	Op_point	Steady state efficiency
18.	Gain Marg	-20.647 dB	Op_point	Bode Plot Gain Margin
19.	IC Tj	40.393 degC	Op_point	IC junction temperature
20.	ICThetaJA	68.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
21.	IOUT_OP	500.0 mA	Op_point	Iout operating point
22.	Phase Marg	64.895 deg	Op_point	Bode Plot Phase Margin
23.	VIN_OP	12.0 V	Op_point	Vin operating point
24.	Vout p-p	708.719 μV	Op_point	Peak-to-peak output ripple voltage
25.	Cin Pd	221.98 μW	Power	Input capacitor power dissipation
26.	Cout Pd	7.252 μW	Power	Output capacitor power dissipation
27.	Diode Pd	126.858 mW	Power	Diode power dissipation
28.	IC Pd	152.839 mW	Power	IC power dissipation
29.	L Pd	64.35 mW	Power	Inductor power dissipation
30.	Total Pd	344.273 mW	Power	Total Power Dissipation

#	Name	Value	Category	Description
31.	Vout Tolerance	1.535 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	500.0 m	Maximum Output Current
2.	VinMax	12.0	Maximum input voltage
3.	VinMin	5.0	Minimum input voltage
4.	Vout	3.3	Output Voltage
5.	base_pn	TPS5401	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **TPS5401** Product Folder : <http://www.ti.com/product/TPS5401> : contains the data sheet and other resources.

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