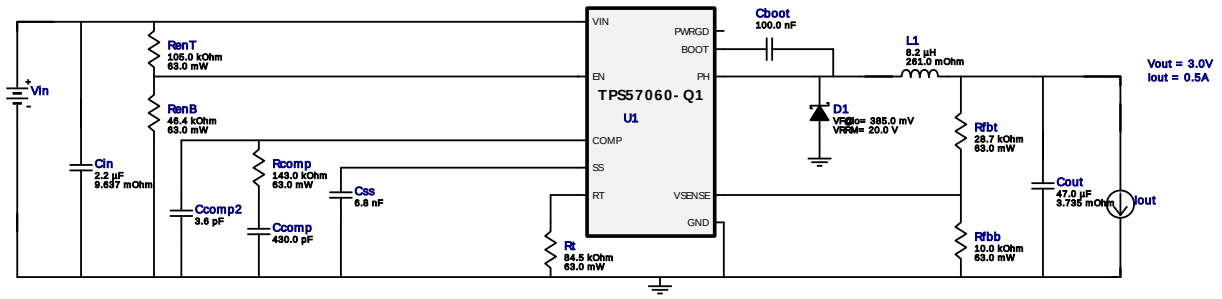
WEBENCH® Design Report

VinMin = 4.5V
VinMax = 5.5V
Vout = 3.0V
Iout = 0.5A

Device = TPS57060QDGQRQ1
Topology = Buck
Created = 7/19/16 6:01:32 AM
BOM Cost = $2.01
BOM Count = 15
Total Pd = 0.24W

Design : 4742013/175 TPS57060QDGQRQ1
TPS57060QDGQRQ1 4.5V-5.5V to 3.00V @ 0.5A

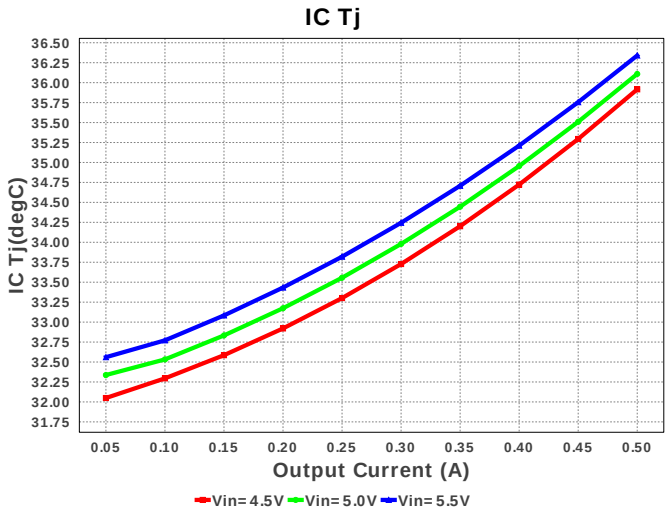


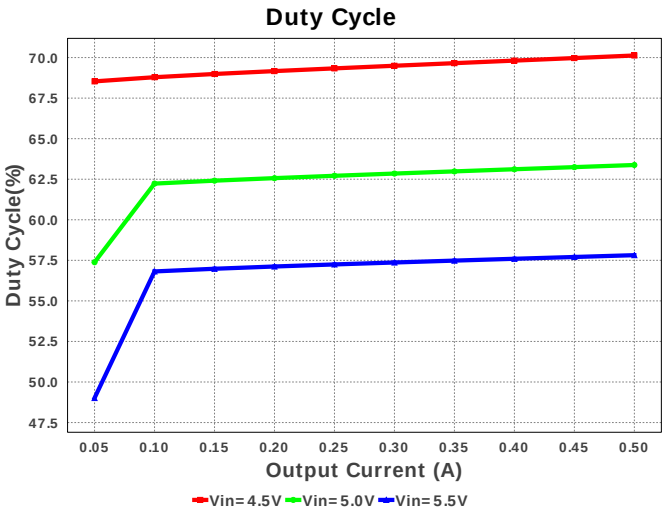
1. This regulator device is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific application.View WEBENCH(R) Disclaimer.

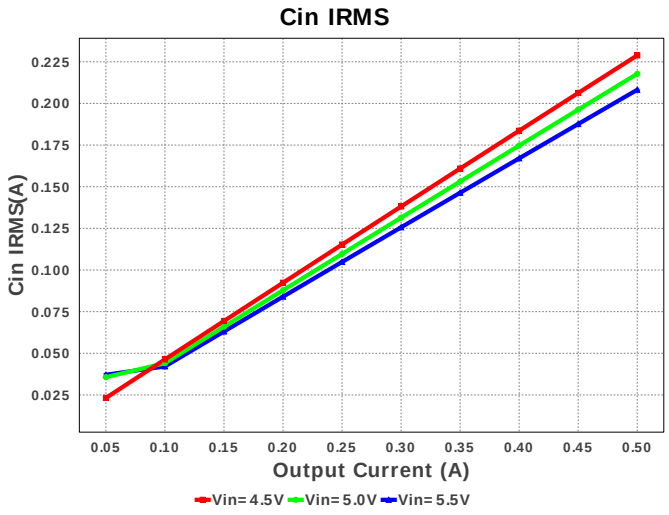
Electrical BOM

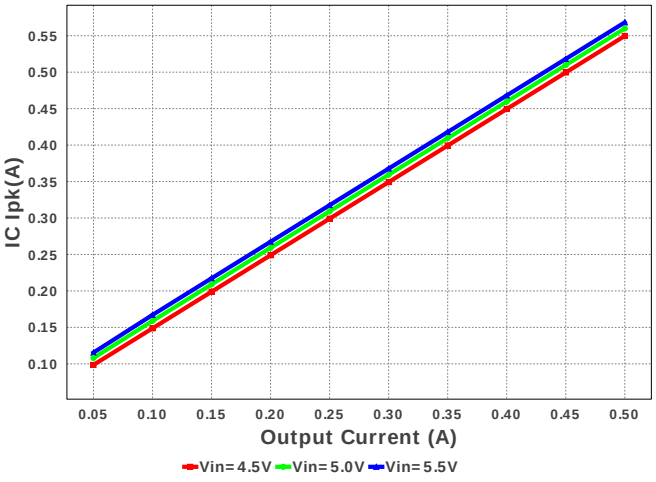
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	MuRata	GRM155R61A104KA01D Series= X5R	Cap= 100.0 nF VDC= 10.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
2.	Ccomp	MuRata	GRM1555C1E431JA01D Series= C0G/NP0	Cap= 430.0 pF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
3.	Ccomp2	MuRata	GRM1555C1H3R6CA01D Series= C0G/NP0	Cap= 3.6 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0402 3 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	MuRata	GRM31CE70G476ME15L Series= X7U	Cap= 47.0 uF ESR= 3.735 mOhm VDC= 4.0 V IRMS= 4.1841 A	1	$0.10	1206_190 11 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	ON Semiconductor	MBR0520LT1G	VF@Io= 385.0 mV VRRM= 20.0 V	1	$0.06	SOD-123 13 mm²
8.	L1	Coilcraft	ME3220-822MLB	L= 8.2 µH DCR= 261.0 mOhm	1	$0.23	ME3220 16 mm²
9.	Rcomp	Vishay-Dale	CRCW0402143KFKED Series= CRCW..e3	Res= 143.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
10.	RenB	Vishay-Dale	CRCW040246K4FKED Series= CRCW..e3	Res= 46.4 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
11.	RenT	Vishay-Dale	CRCW0402105KFKED Series= CRCW..e3	Res= 105.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²

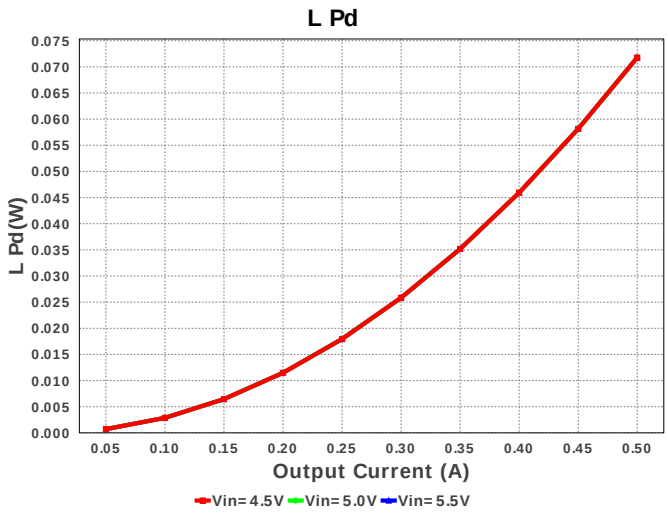
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
12.	Rfbb	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
13.	Rfbt	Vishay-Dale	CRCW040228K7FKED Series= CRCW..e3	Res= 28.7 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
14.	Rt	Vishay-Dale	CRCW040284K5FKED Series= CRCW..e3	Res= 84.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
15.	U1	Texas Instruments	TPS57060QDGQRQ1	Switcher	1	$1.50	S-PDSO-G10 24 mm^2

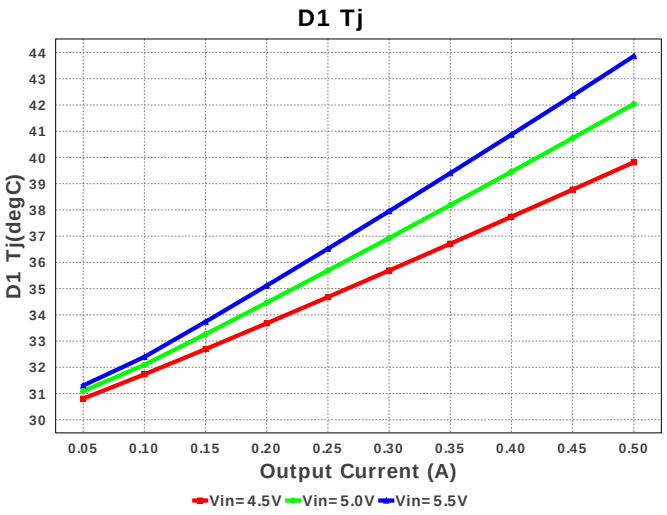


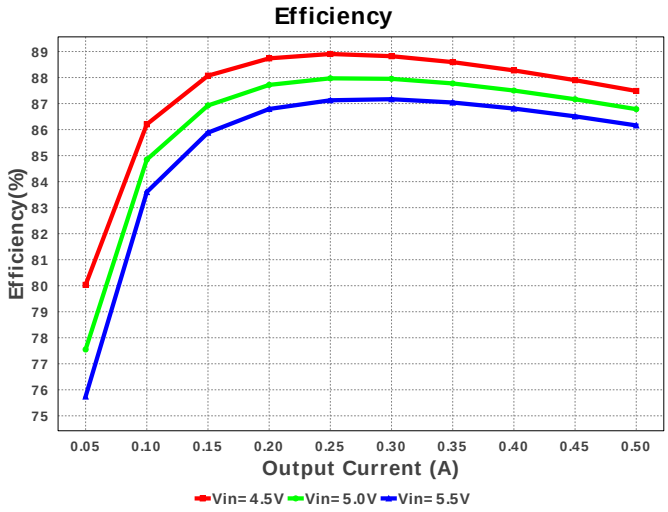


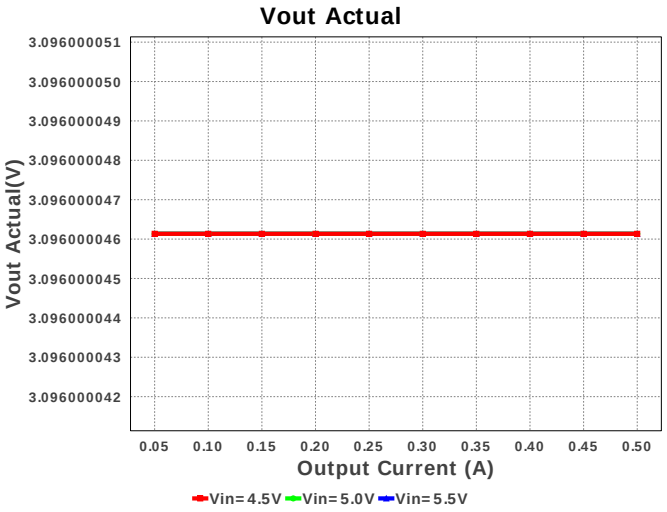


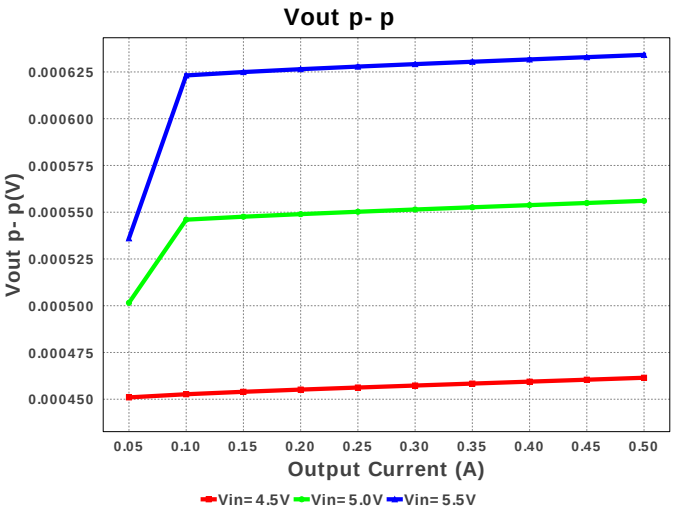


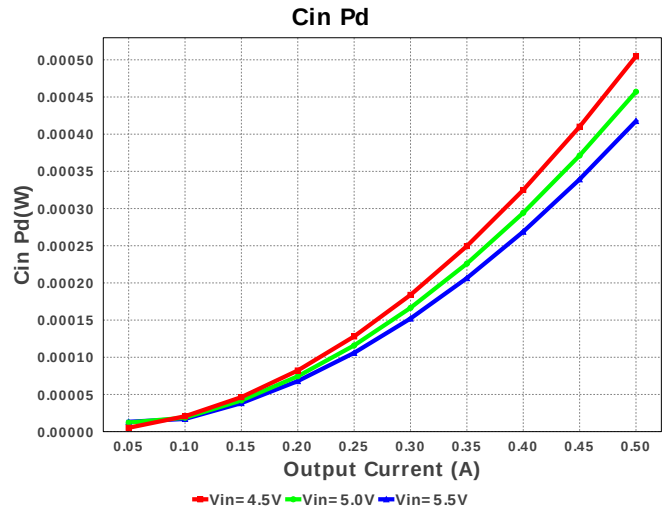


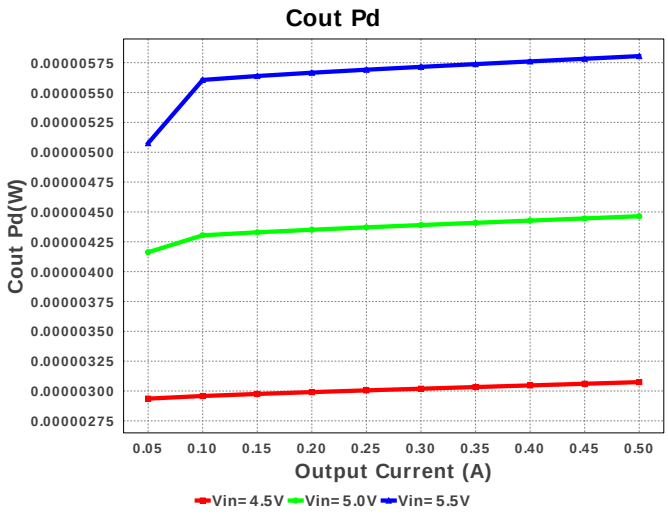


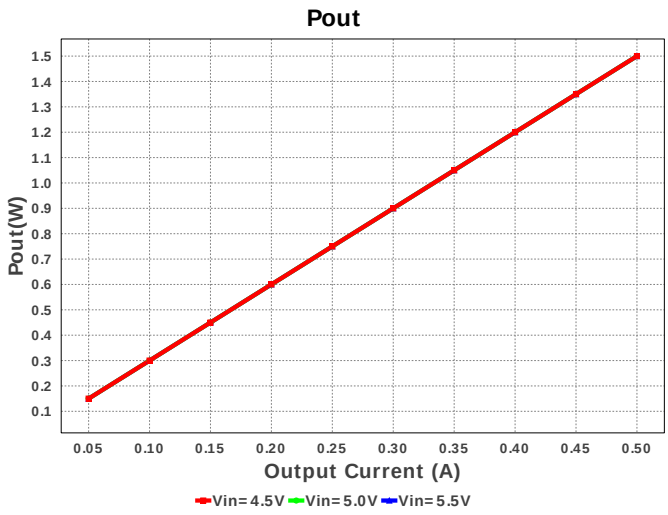


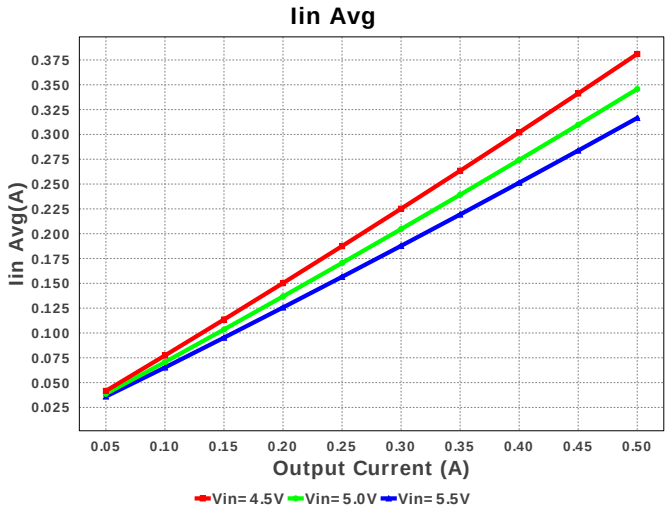


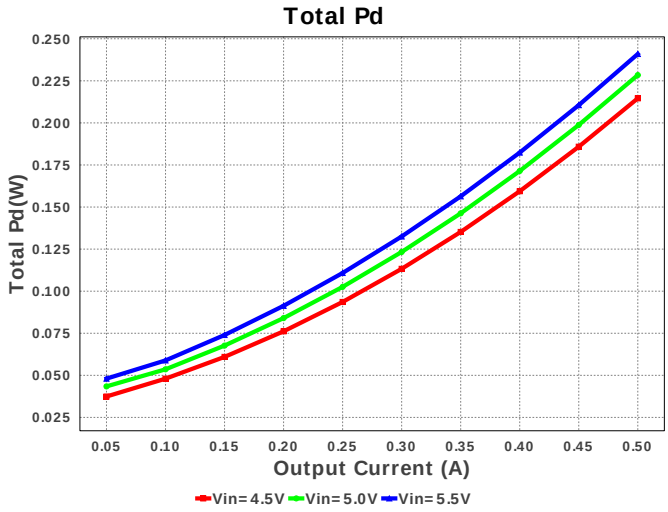


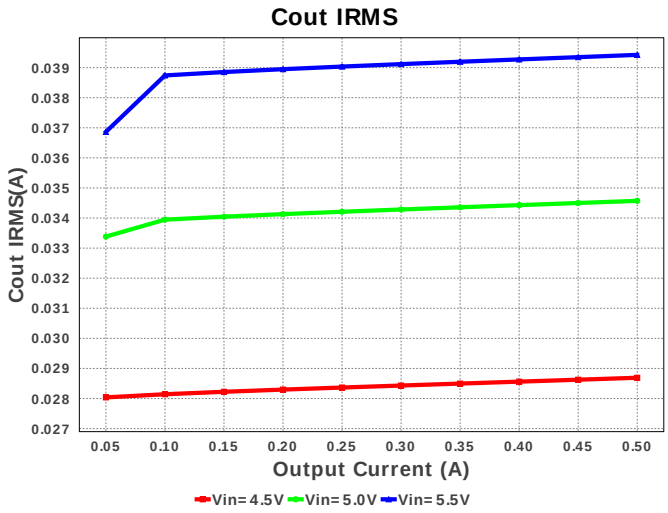


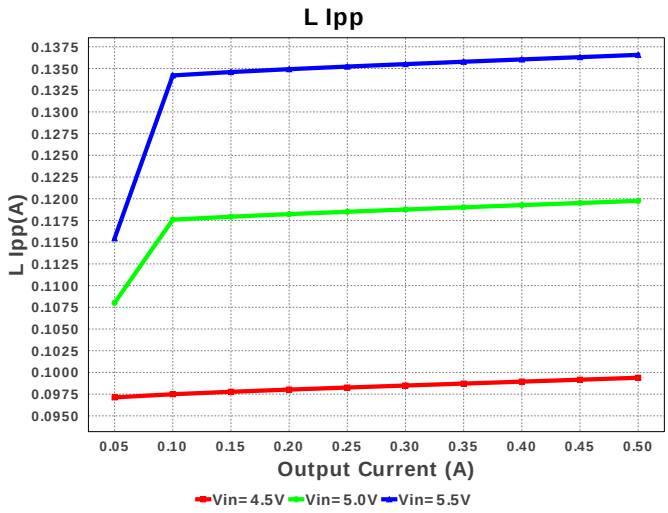


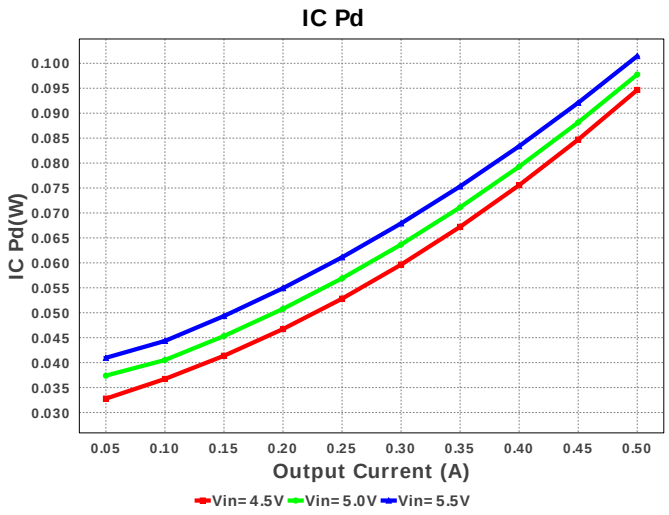


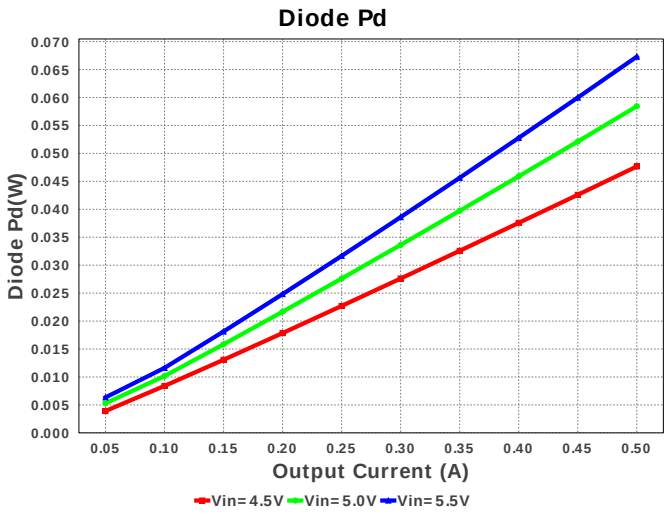


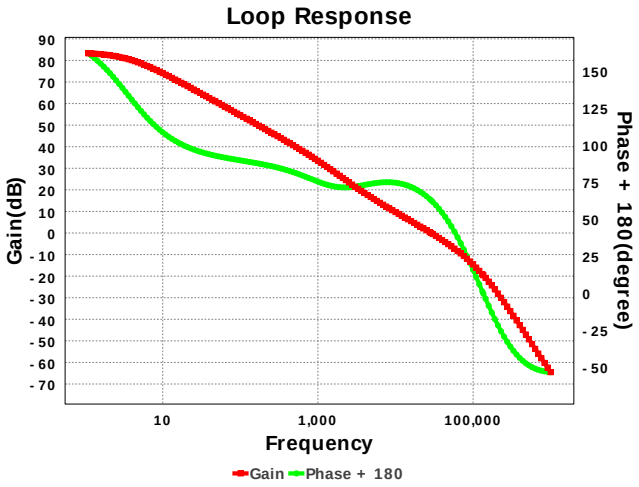












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	208.189 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	39.424 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	500.0 mA	Current	Peak switch current in IC
4.	Iin Avg	316.54 mA	Current	Average input current
5.	L Ipp	136.57 mA	Current	Peak-to-peak inductor ripple current
6.	BOM Count	15	General	Total Design BOM count
7.	FootPrint	102.0 mm^2	General	Total Foot Print Area of BOM components
8.	Frequency	1.291 MHz	General	Switching frequency
9.	Pout	1.5 W	General	Total output power
10.	Total BOM	$2.01	General	Total BOM Cost
11.	D1 Tj	43.864 degC	Op_Point	D1 junction temperature
12.	Low Freq Gain	82.87 dB	Op_Point	Gain at 10Hz
13.	Vout Actual	3.096 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
14.	Vout OP	3.0 V	Op_Point	Operational Output Voltage
15.	Cross Freq	28.508 kHz	Op_point	Bode plot crossover frequency
16.	Duty Cycle	57.818 %	Op_point	Duty cycle
17.	Efficiency	86.16 %	Op_point	Steady state efficiency
18.	Gain Marg	-19.216 dB	Op_point	Bode Plot Gain Margin
19.	IC Tj	36.34 degC	Op_point	IC junction temperature
20.	ICThetaJA	62.5 degC/W	Op_point	IC junction-to-ambient thermal resistance
21.	IOUT_OP	500.0 mA	Op_point	Iout operating point
22.	Phase Marg	62.276 deg	Op_point	Bode Plot Phase Margin
23.	VIN_OP	5.5 V	Op_point	Vin operating point
24.	Vout p-p	634.131 µV	Op_point	Peak-to-peak output ripple voltage
25.	Cin Pd	417.693 µW	Power	Input capacitor power dissipation
26.	Cout Pd	5.805 µW	Power	Output capacitor power dissipation
27.	Diode Pd	67.301 mW	Power	Diode power dissipation
28.	IC Pd	101.444 mW	Power	IC power dissipation
29.	L Pd	71.775 mW	Power	Inductor power dissipation
30.	Total Pd	240.95 mW	Power	Total Power Dissipation

#	Name	Value	Category	Description
31.	Vout Tolerance	2.513 %		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	5.5	Maximum input voltage
3.	VinMin	4.5	Minimum input voltage
4.	Vout	3.0	Output Voltage
5.	base_pn	TPS57060-Q1	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. The TPS57060-Q1 is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific application

2. **TPS57060-Q1** Product Folder : http://www.ti.com/product/TPS57060%2DQ1 : contains the data sheet and other resources.