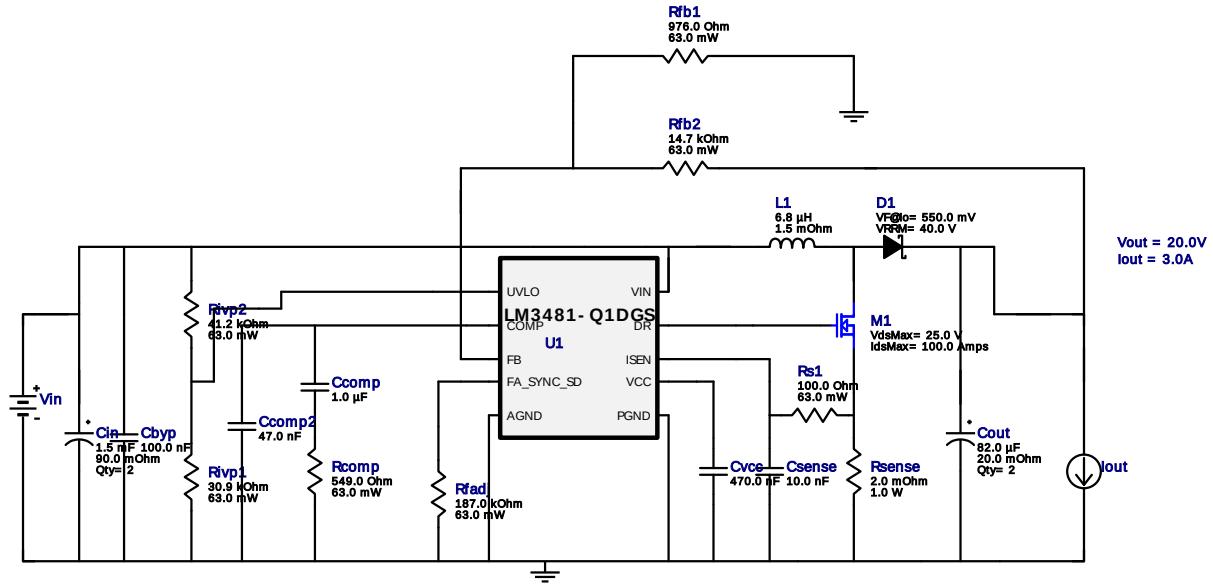
TEXAS INSTRUMENTS

WEBENCH® Design Report

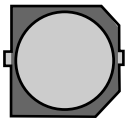
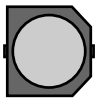
VinMin = 3.7V
VinMax = 4.2V
Vout = 20.0V
Iout = 3.0A

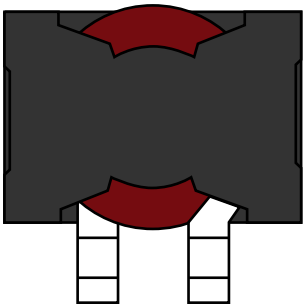
Device = LM3481QMMX/NOPB
Topology = Boost
Created = 7/12/16 12:11:29 AM
BOM Cost = $5.80
BOM Count = 21
Total Pd = 5.1W

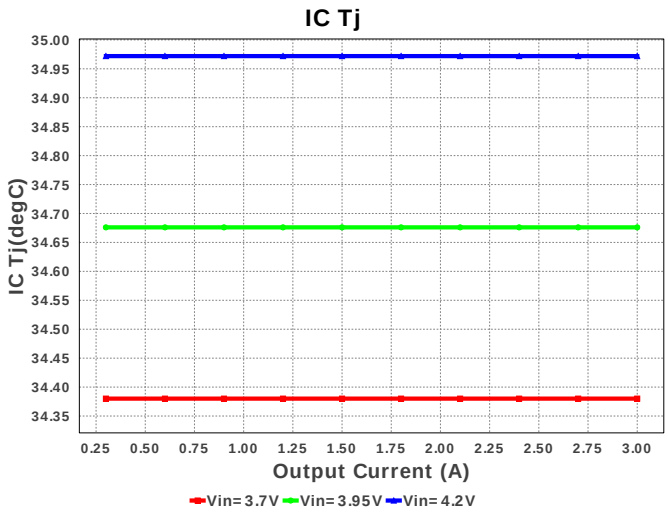
Design : 4737466/2 LM3481QMMX/NOPB
LM3481QMMX/NOPB 3.7V-4.2V to 20.00V @ 3.0A

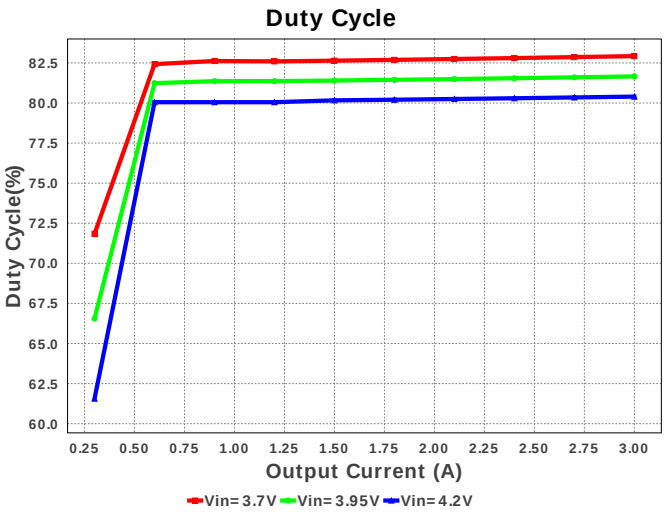


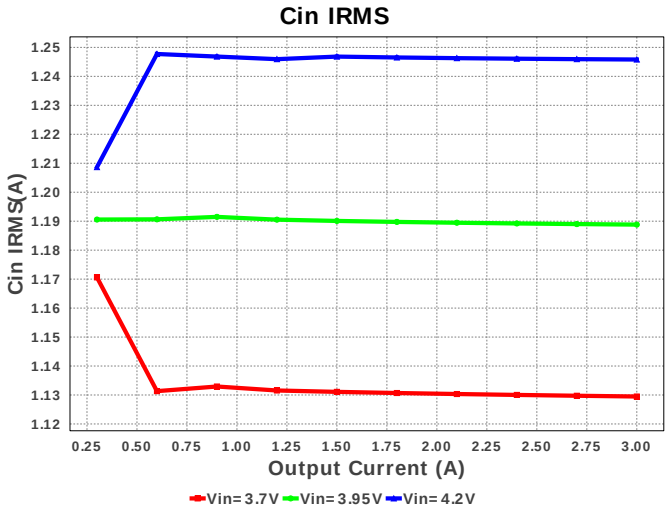
Electrical BOM

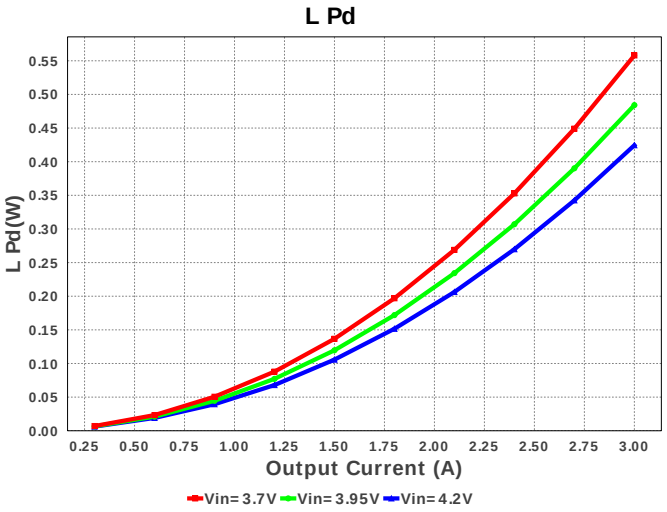
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbyp	MuRata	GRM155R60J104KA01D Series= X5R	Cap= 100.0 nF VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
2.	Ccomp	Taiyo Yuden	EMK212B7105KG-T Series= X7R	Cap= 1.0 uF VDC= 16.0 V IRMS= 0.0 A	1	$0.02	0805 7 mm²
3.	Ccomp2	Taiyo Yuden	TMK212B7473KD-T Series= X7R	Cap= 47.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
4.	Cin	Nichicon	UUD0J152MNL1GS Series= uD	Cap= 1.5 mF ESR= 90.0 mOhm VDC= 6.3 V IRMS= 670.0 mA	2	$0.26	 SM_RADIAL_10BMM 160 mm²
5.	Cout	Panasonic	35SVPF82M Series= ?	Cap= 82.0 uF ESR= 20.0 mOhm VDC= 35.0 V IRMS= 4.0 A	2	$0.61	 CAPSMT_62_E12 106 mm²
6.	Csense	MuRata	GRM216R71H103KA01D Series= X7R	Cap= 10.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
7.	Cvcc	MuRata	GRM155C80J474KE19D Series= X6S	Cap= 470.0 nF VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
8.	D1	Diodes Inc.	B540C-13-F	VF@Io= 550.0 mV VRRM= 40.0 V	1	$0.17	 SMC 83 mm²

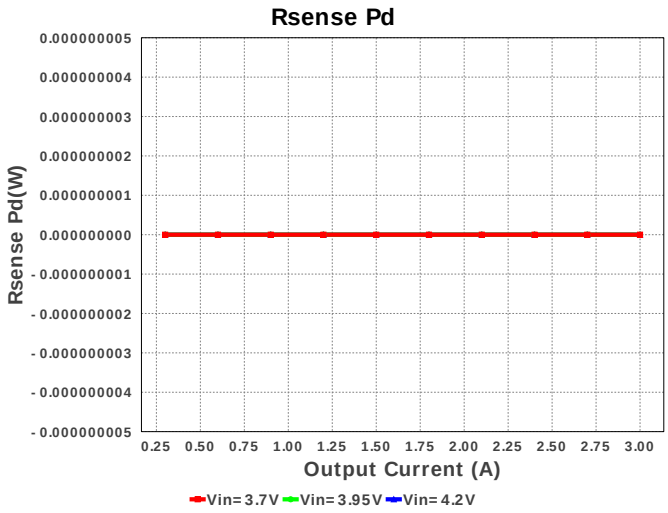
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
9.	L1	Coilcraft	SER2915L-682KL	L= 6.8 µH DCR= 1.5 mOhm	1	$1.88	 SER2915L 652 mm^2
10.	M1	Texas Instruments	CSD16321Q5	VdsMax= 25.0 V IdsMax= 100.0 Amps	1	$0.73	 TRANS_NexFET_Q5 55 mm^2
11.	Rcomp	Vishay-Dale	CRCW0402549RFKED Series= CRCW..e3	Res= 549.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
12.	Rfadj	Vishay-Dale	CRCW0402187KFKED Series= CRCW..e3	Res= 187.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
13.	Rfb1	Vishay-Dale	CRCW0402976RFKED Series= CRCW..e3	Res= 976.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
14.	Rfb2	Vishay-Dale	CRCW040214K7FKED Series= CRCW..e3	Res= 14.7 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
15.	Rivp1	Vishay-Dale	CRCW040230K9FKED Series= CRCW..e3	Res= 30.9 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
16.	Rivp2	Vishay-Dale	CRCW040241K2FKED Series= CRCW..e3	Res= 41.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
17.	Rs1	Vishay-Dale	CRCW0402100RFKED Series= CRCW..e3	Res= 100.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
18.	Rsense	Stackpole Electronics Inc	CSNL1206FT2L00 Series= CSNL	Res= 2.0 mOhm Power= 1.0 W Tolerance= 1.0%	1	$0.19	 1206 11 mm^2
19.	U1	Texas Instruments	LM3481QMMX/NOPB	Switcher	1	$0.96	 MUB10A 24 mm^2

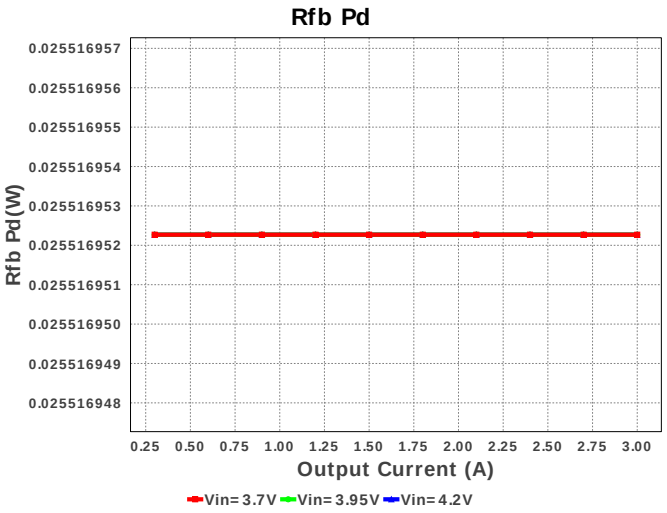


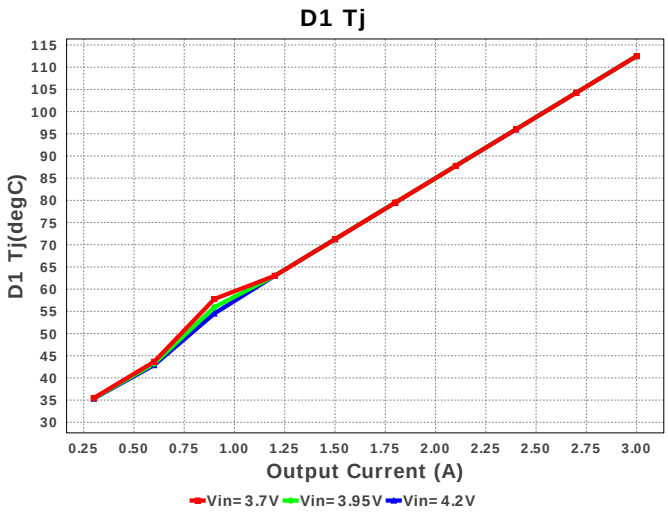


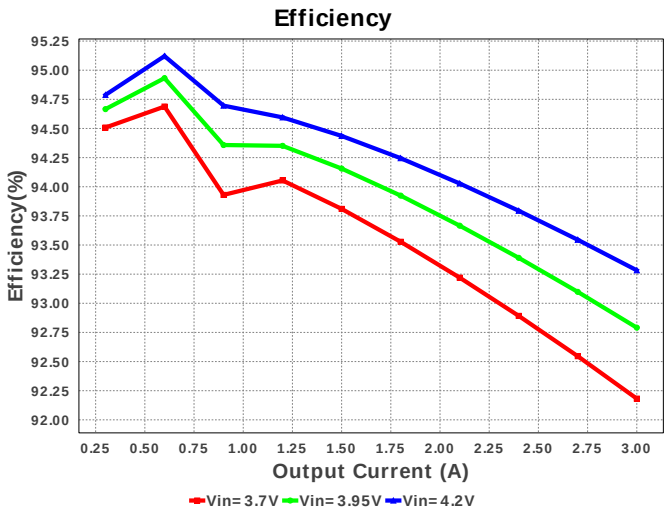


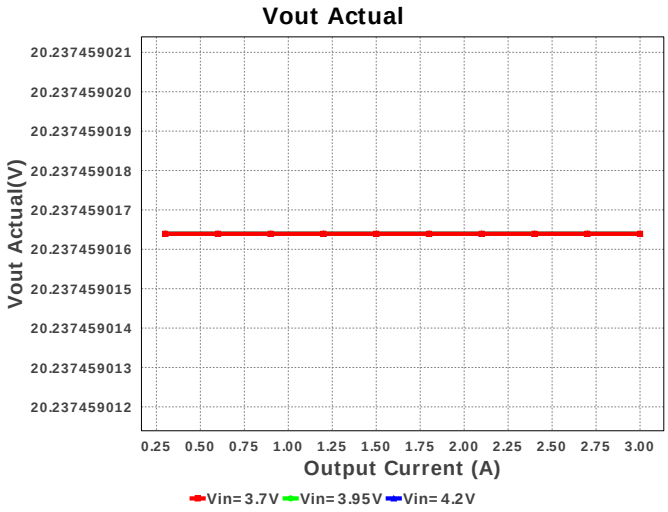


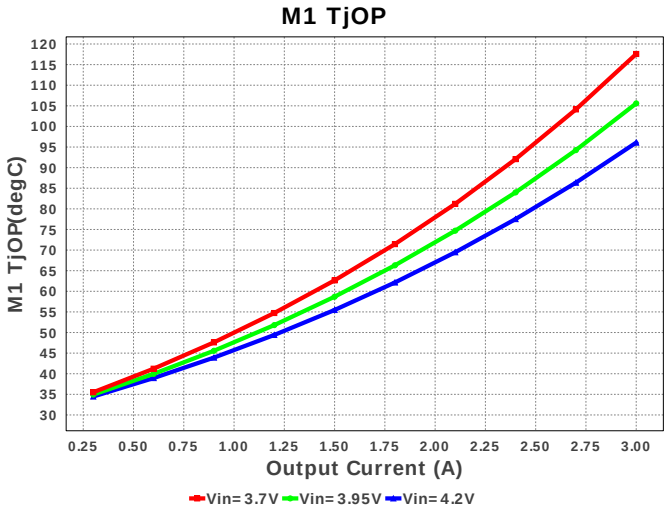


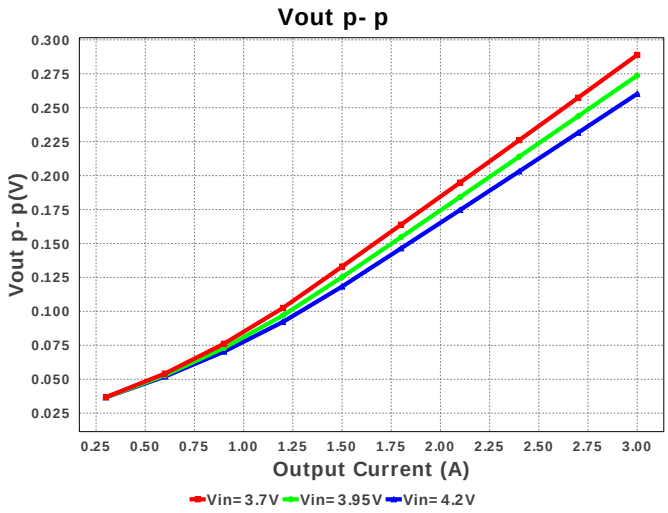


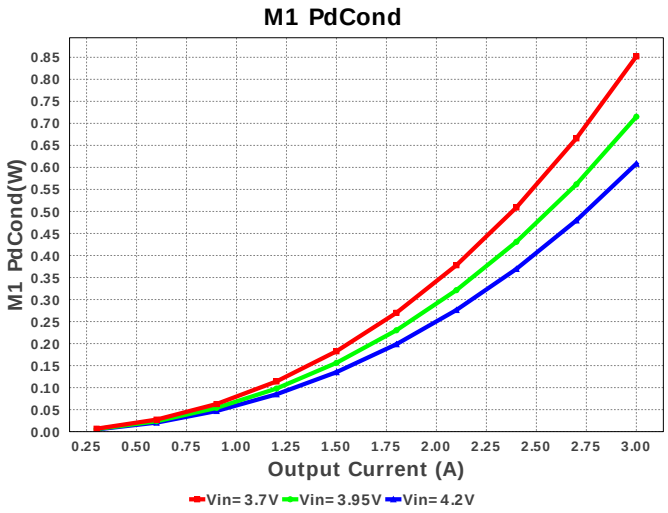


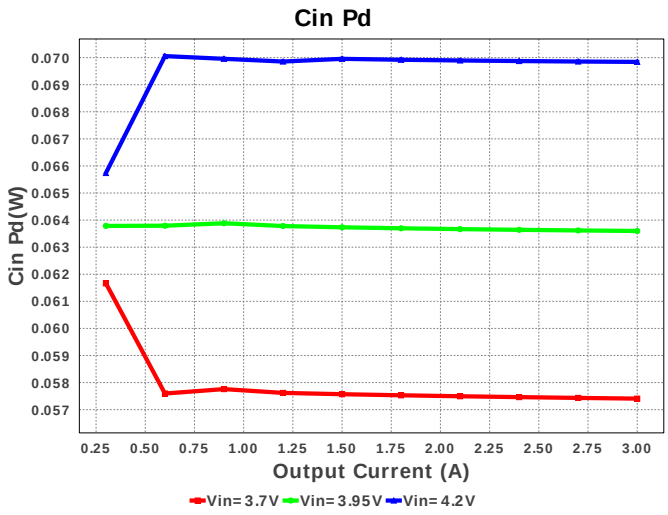


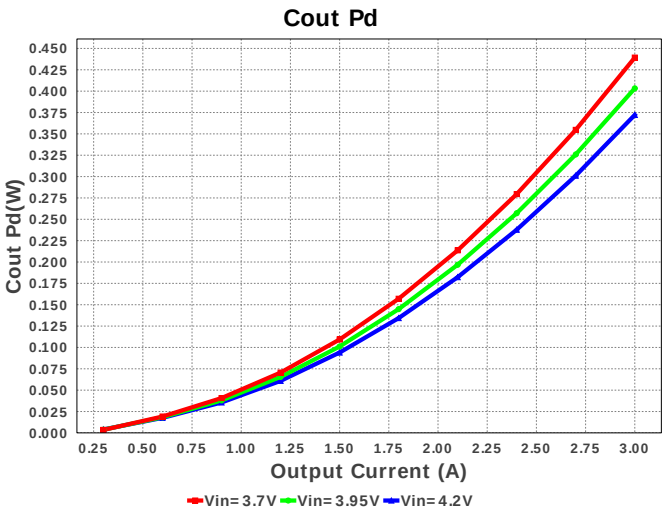


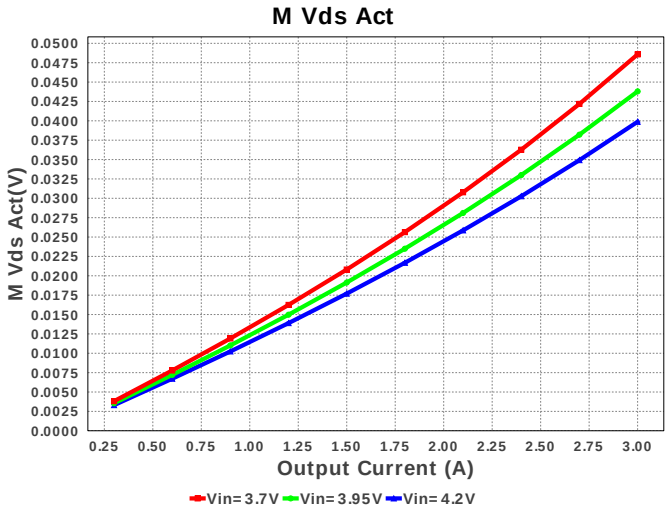


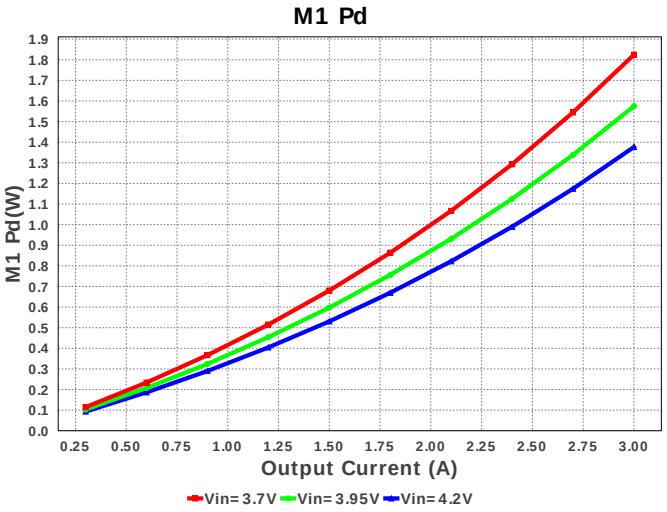


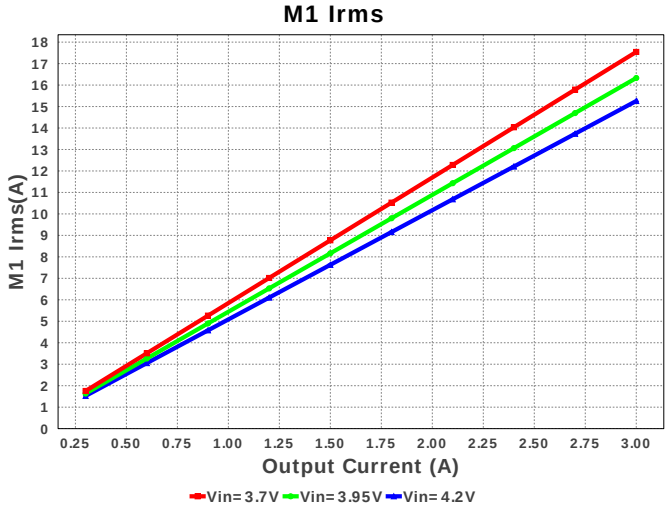


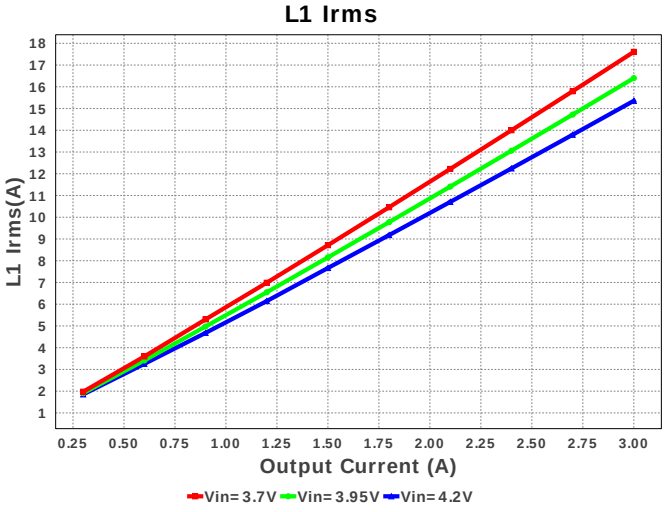


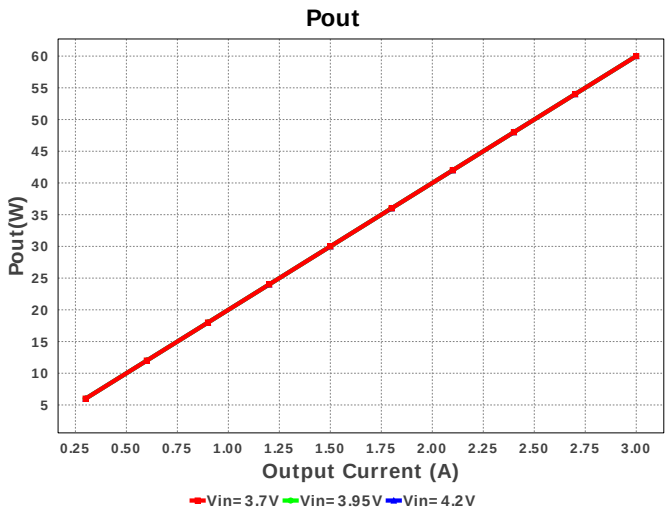


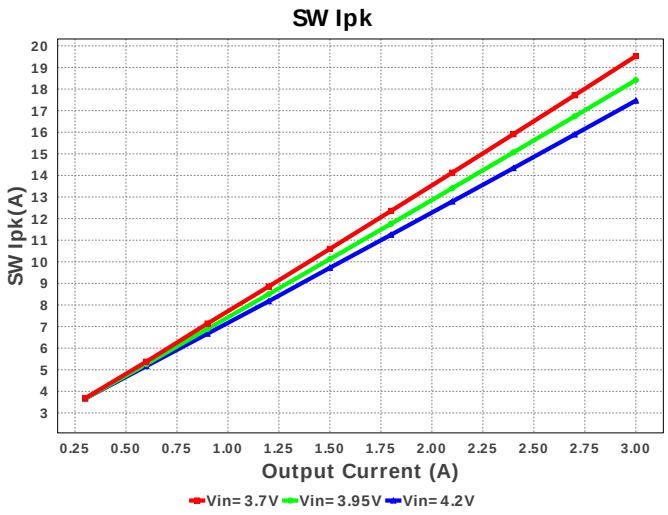


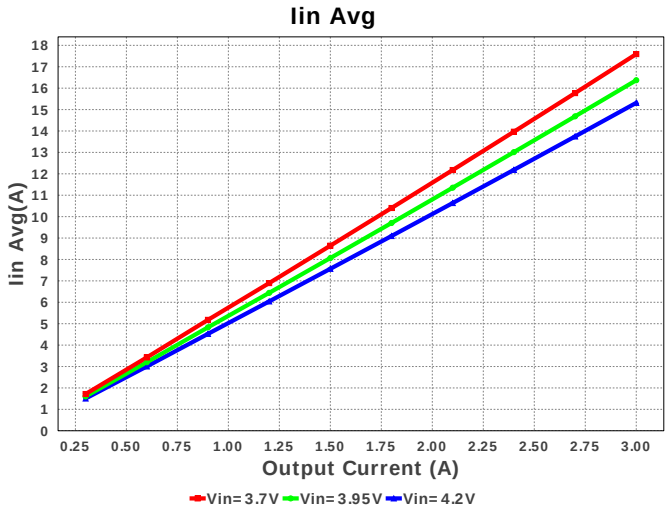


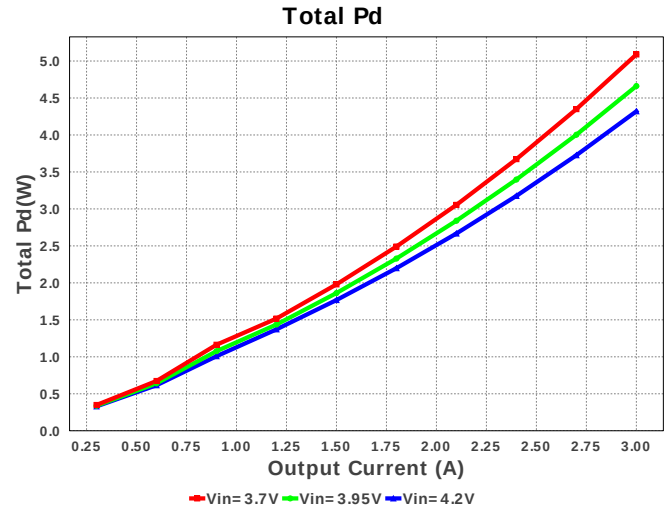


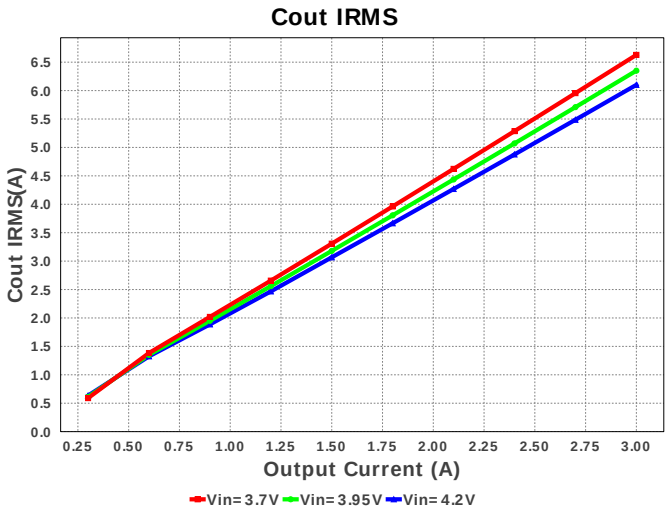


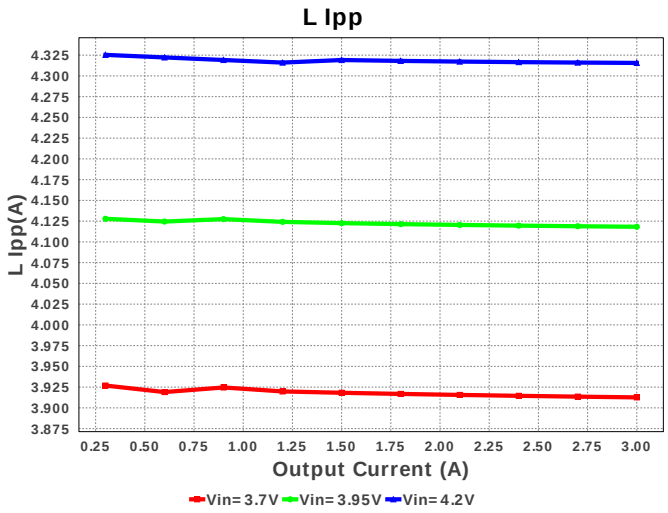


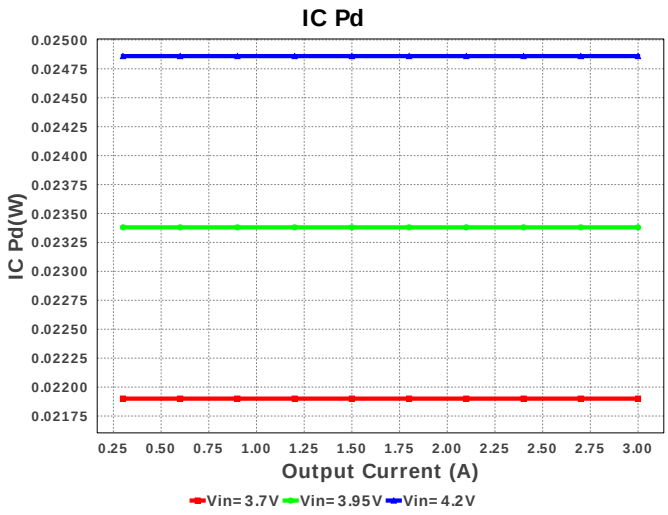


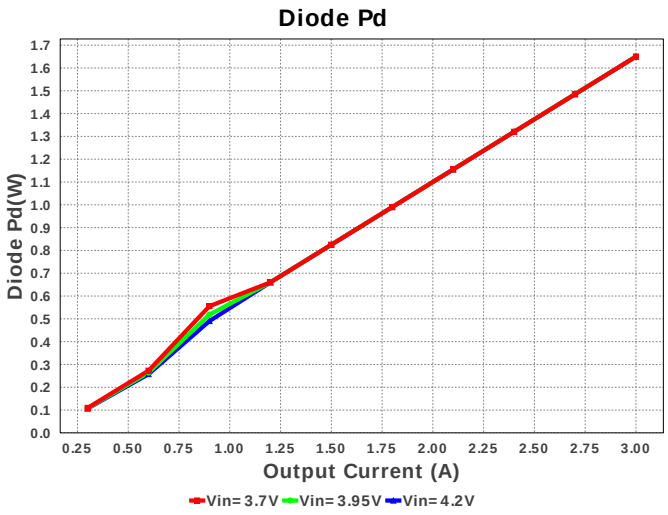


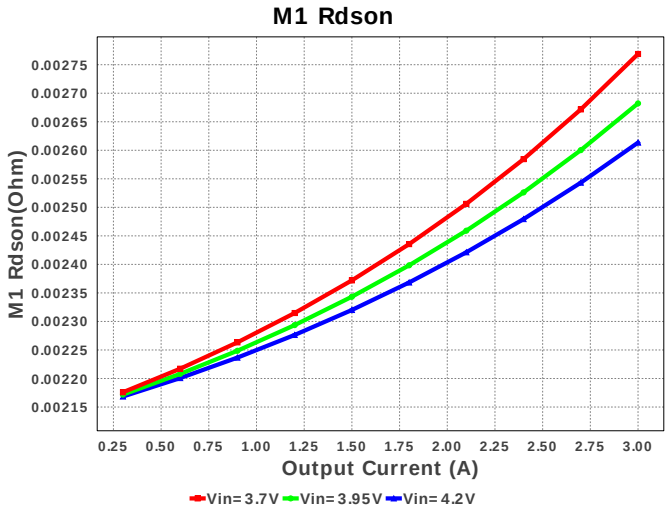


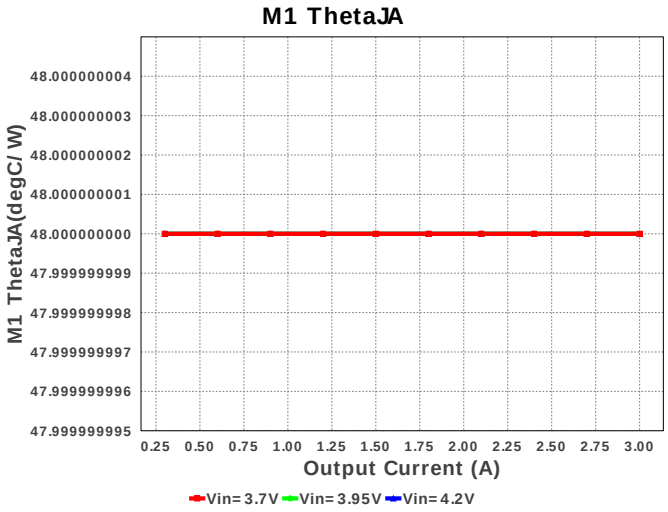


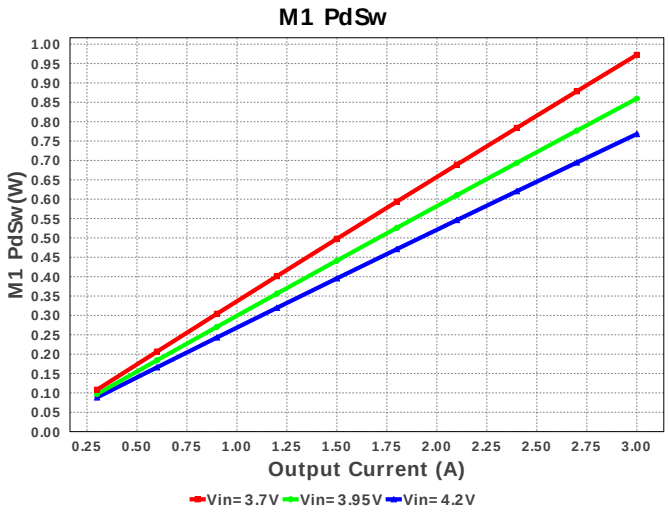


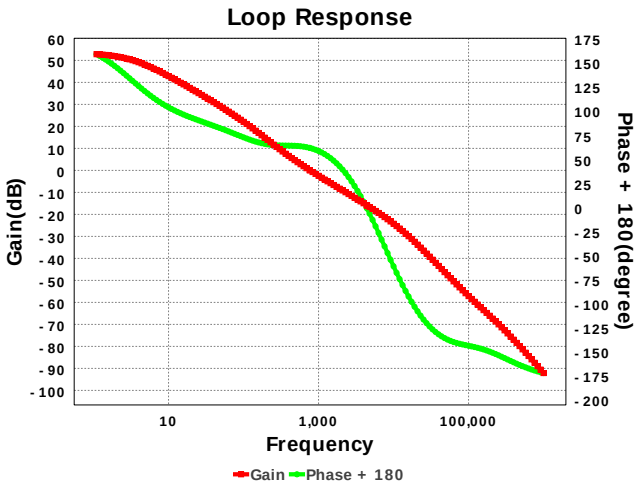












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	1.13 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	6.628 A	Current	Output capacitor RMS ripple current
3.	Iin Avg	17.594 A	Current	Average input current
4.	L Ipp	3.913 A	Current	Peak-to-peak inductor ripple current
5.	L1 Irms	17.609 A	Current	Inductor ripple current
6.	M1 Irms	17.543 A	Current	M1 MOSFET Irms
7.	SW Ipk	19.529 A	Current	Peak switch current
8.	BOM Count	21	General	Total Design BOM count
9.	FootPrint	1.404 k mm^2	General	Total Foot Print Area of BOM components
10.	Frequency	114.227 kHz	General	Switching frequency
11.	IC Tolerance	19.0 mV	General	IC Feedback Tolerance

#	Name	Value	Category	Description
12.	M Vds Act	48.617 mV	General	M Vds
13.	M1 Rdson	2.771 mOhm	General	Drain-Source On-resistance
14.	M1 ThetaJA	48.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
15.	Pout	60.0 W	General	Total output power
16.	Total BOM	$5.8	General	Total BOM Cost
17.	D1 Tj	112.5 degC	Op_Point	D1 junction temperature
18.	Low Freq Gain	51.616 dB	Op_Point	Gain at 10Hz
19.	Vout Actual	20.237 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
20.	Vout OP	20.0 V	Op_Point	Operational Output Voltage
21.	Cross Freq	680.964 Hz	Op_point	Bode plot crossover frequency
22.	Duty Cycle	82.928 %	Op_point	Duty cycle
23.	Efficiency	92.171 %	Op_point	Steady state efficiency
24.	Gain Marg	-15.247 dB	Op_point	Bode Plot Gain Margin
25.	IC Tj	34.39 degC	Op_point	IC junction temperature
26.	ICThetaJA	200.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
27.	IOUT_OP	3.0 A	Op_point	Iout operating point
28.	M1 TjOP	117.931 degC	Op_point	M1 MOSFET junction temperature
29.	Phase Marg	62.027 deg	Op_point	Bode Plot Phase Margin
30.	VIN_OP	3.7 V	Op_point	Vin operating point
31.	Vout p-p	288.962 mV	Op_point	Peak-to-peak output ripple voltage
32.	Cin Pd	57.41 mW	Power	Input capacitor power dissipation
33.	Cout Pd	439.347 mW	Power	Output capacitor power dissipation
34.	Diode Pd	1.65 W	Power	Diode power dissipation
35.	IC Pd	21.948 mW	Power	IC power dissipation
36.	L Pd	558.11 mW	Power	Inductor power dissipation
37.	M1 Pd	1.832 W	Power	M1 MOSFET total power dissipation
38.	M1 PdCond	852.892 mW	Power	M1 MOSFET conduction losses
39.	M1 PdSw	979.006 mW	Power	M1 MOSFET switching losses
40.	Rfb Pd	25.517 mW	Power	Rfb Power Dissipation
41.	Rsense Pd	564.451 mW	Power	Rsense Power Dissipation
42.	Total Pd	5.097 W	Power	Total Power Dissipation
43.	Vout Tolerance	3.431 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	3.0	Maximum Output Current
2.	VinMax	4.2	Maximum input voltage
3.	VinMin	3.7	Minimum input voltage
4.	Vout	20.0	Output Voltage
5.	base_pn	LM3481-Q1	Texas Instruments Base Part Number
6.	source	DC	Input Source Type
7.	ta	30.0	Ambient temperature

Design Assistance

1. Feature Highlights: Automotive Qualified, Wide supply voltage range Operation of 2.97V to 48V, 1A High Frequency Low side N-FET versatile High Performance Controller

2. LM3481-Q1 Product Folder : http://www.ti.com/product/LM3481%2DQ1 : contains the data sheet and other resources.