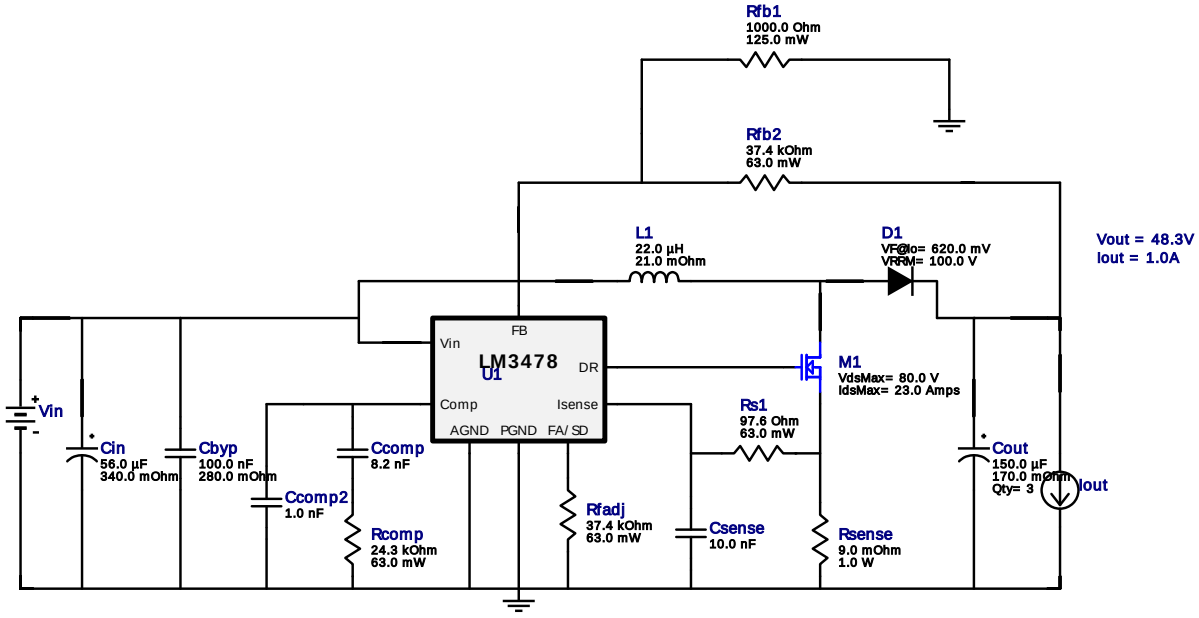
WEBENCH® Design Report

VinMin = 11.1V
VinMax = 16.8V
Vout = 48.3V
Iout = 1.0A

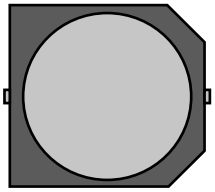
Device = LM3478MMX/NOPB
Topology = Boost
Created = 2018-01-03 20:43:26.661
BOM Cost = $4.90
BOM Count = 1
Total Pd = 3.4W

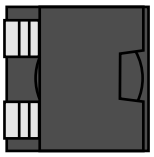
Design : 284889/4 LM3478MMX/NOPB
BEST LM3478 11.1V-16.8V to 48.30V @ 1.0A

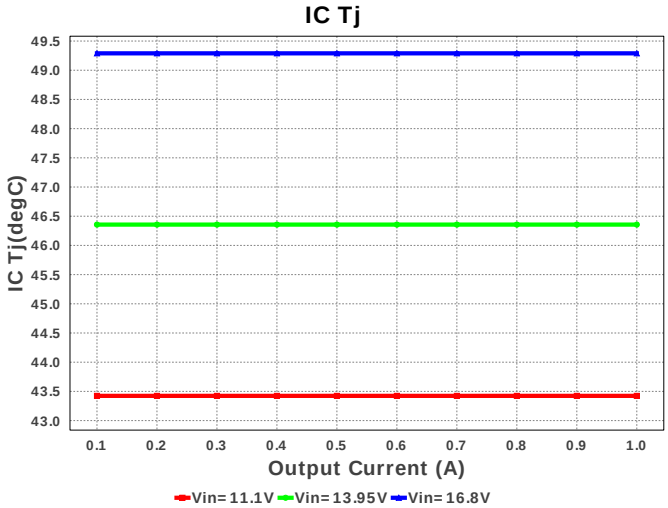


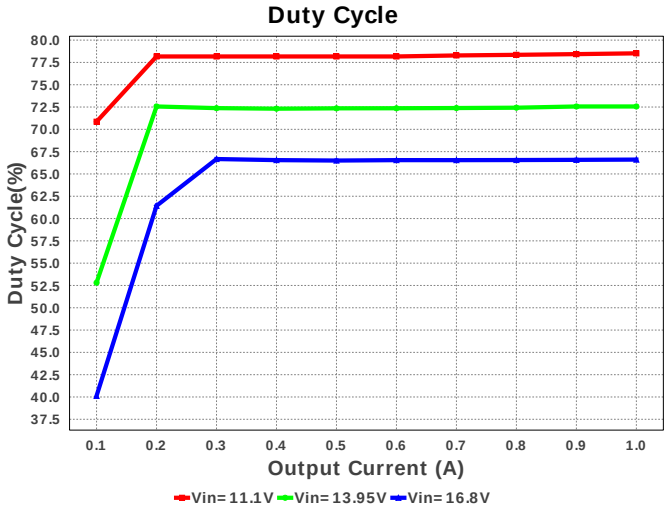
1. With the low turn of voltage of the LM34x8 your power supply may current limit before you reach your working input voltage. If this happens, or to preempt this from happening, you can include a low pass RC filter from input voltage to Vin on the IC. Make sure the rise time on the RC network is slower than your supply's rise time.

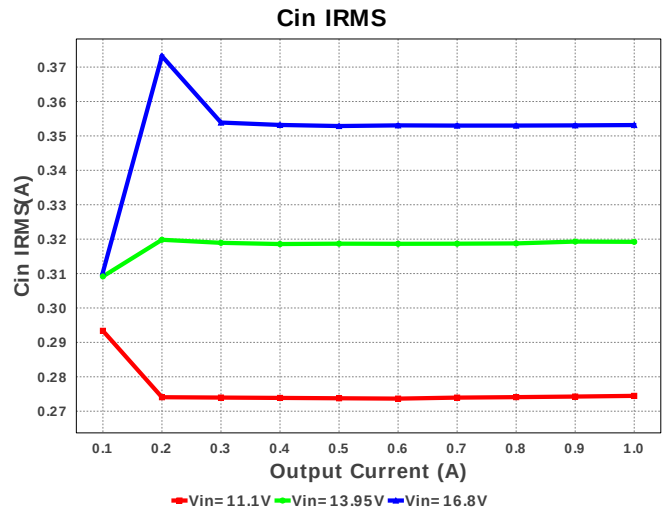
Electrical BOM

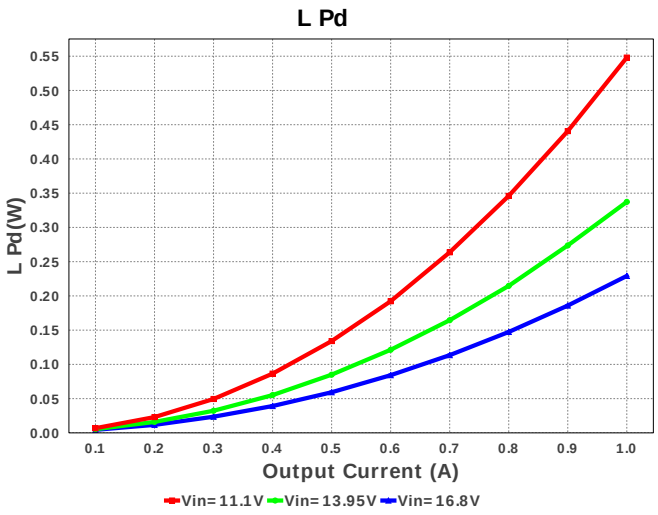
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbyp	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	 0805 7 mm²
2.	Ccomp	Samsung Electro-Mechanics	CL21C822JBFNNNE Series= C0G/NP0	Cap= 8.2 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.02	 0805 7 mm²
3.	Ccomp2	AVX	04025A101JAT2A Series= C0G/NP0	Cap= 1.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	 0402 3 mm²
4.	Cin	Nichicon	UUD1V560MCL1GS Series= uD	Cap= 56.0 uF ESR= 340.0 mOhm VDC= 35.0 V IRMS= 280.0 mA	1	$0.12	 SM_RADIAL_6.3BMM 80 mm²
5.	Cout	Panasonic	EEV-FK2A151M Series= FK	Cap= 150.0 uF ESR= 170.0 mOhm VDC= 100.0 V IRMS= 793.0 mA	3	$0.75	 SM_RADIAL_J16 399 mm²
6.	Csense	AVX	06035A102GAT2A Series= C0G/NP0	Cap= 10.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.02	 0603 5 mm²

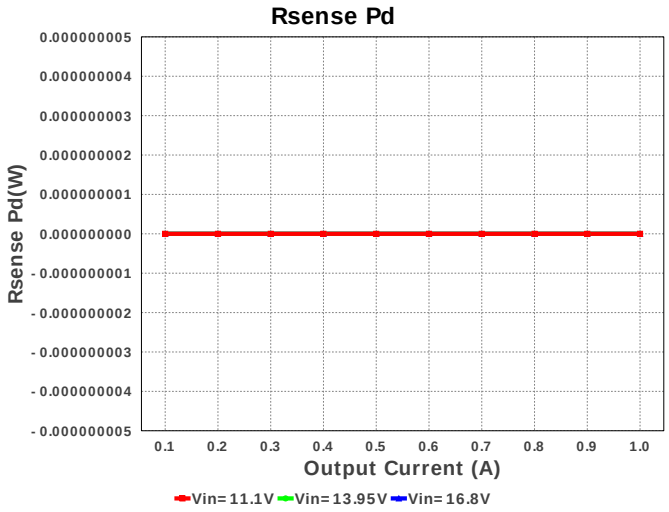
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
7.	D1	ON Semiconductor	MBRS3100T3G	VF@Io= 620.0 mV VRRM= 100.0 V	1	$0.29	 SMC 83 mm^2
8.	L1	Coilcraft	SER1390-223MLB	L= 22.0 µH DCR= 21.0 mOhm	1	$0.95	 SER1390 240 mm^2
9.	M1	Infineon Technologies	BSC340N08NS3 G	VdsMax= 80.0 V IdsMax= 23.0 Amps	1	$0.24	 PG-TDSON-8 55 mm^2
10.	Rcomp	Vishay-Dale	CRCW040224K3FKED Series= CRCW..e3	Res= 24.3 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
11.	Rfadj	Vishay-Dale	CRCW040237K4FKED Series= CRCW..e3	Res= 37.4 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
12.	Rfb1	Vishay-Dale	CRCW08051K00FKEA Series= CRCW..e3	Res= 1000.0 Ohm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm^2
13.	Rfb2	Vishay-Dale	CRCW040237K4FKED Series= CRCW..e3	Res= 37.4 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
14.	Rs1	Vishay-Dale	CRCW040297R6FKED Series= CRCW..e3	Res= 97.6 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
15.	Rsense	Susumu Co Ltd	PRL1632-R009-F-T1 Series= PRL1632	Res= 9.0 mOhm Power= 1.0 W Tolerance= 1.0%	1	$0.19	 0612 11 mm^2
16.	U1	Texas Instruments	LM3478MMX/NOPB	Switcher	1	$0.75	 MUA08A 24 mm^2

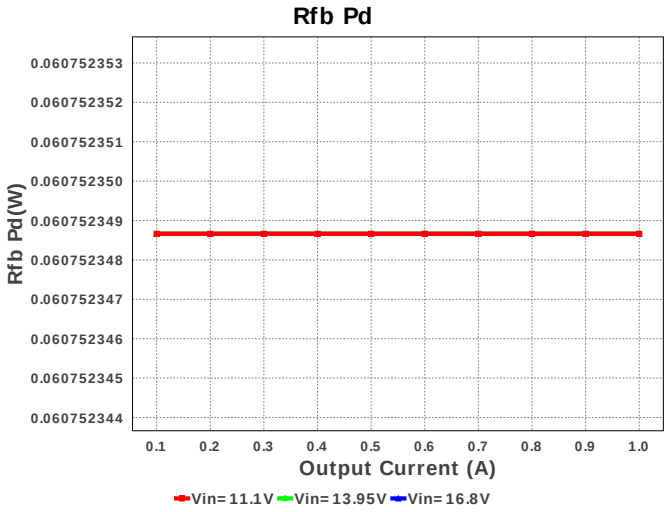


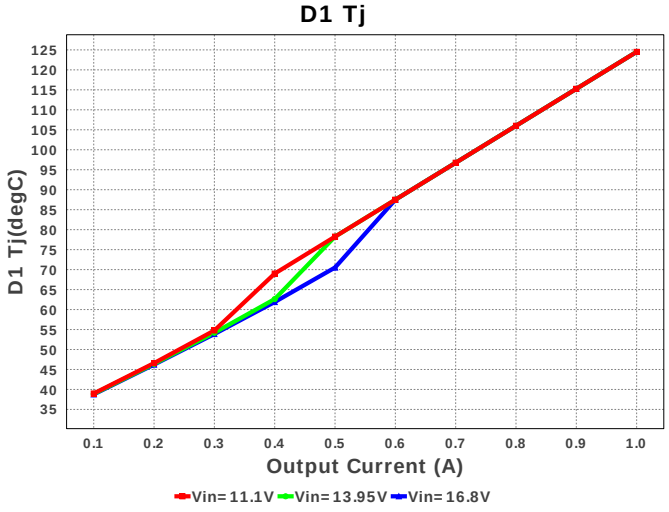


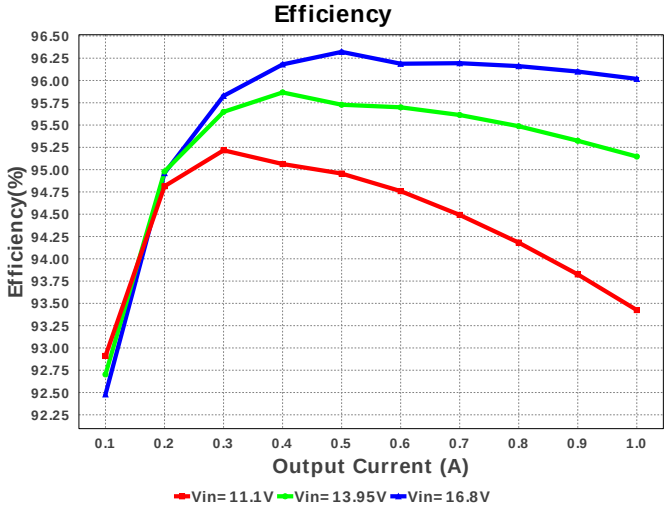


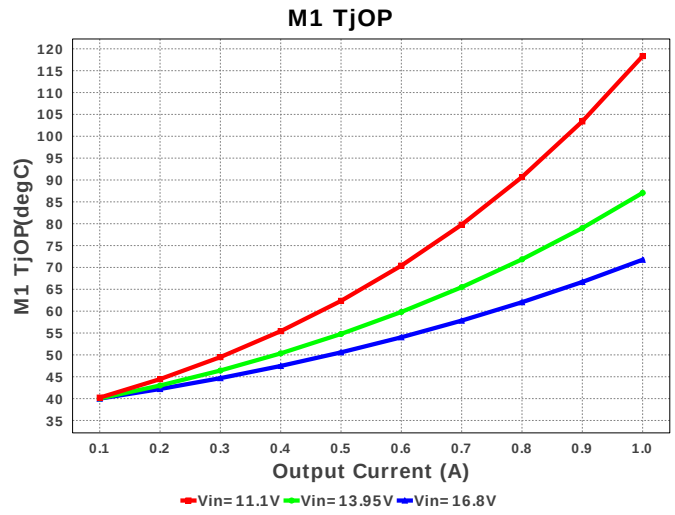


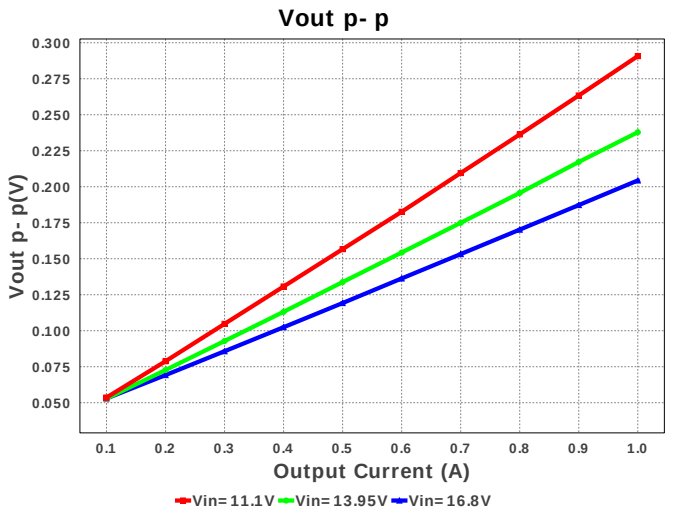


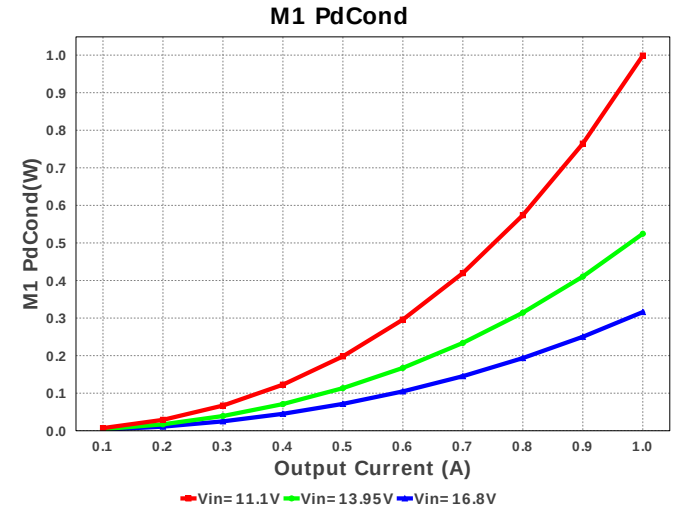


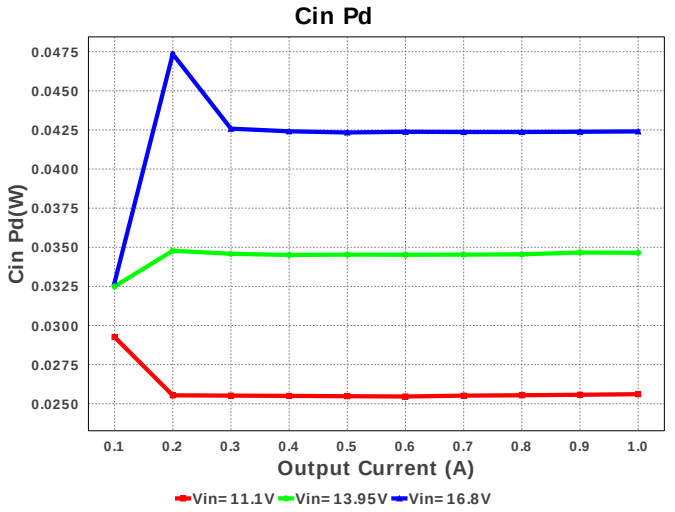


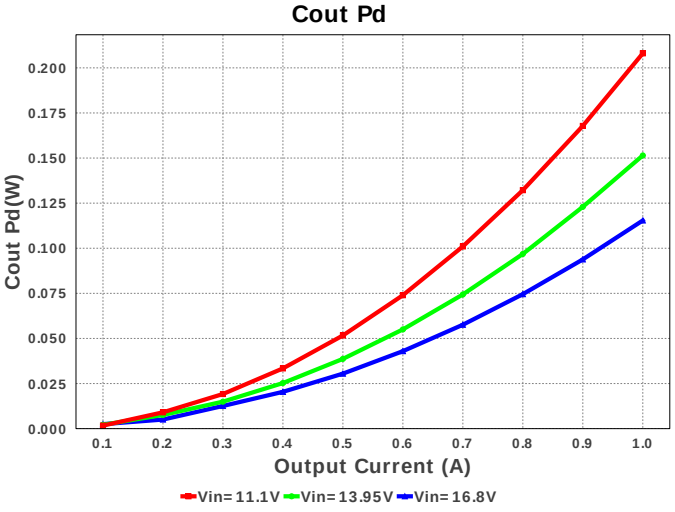


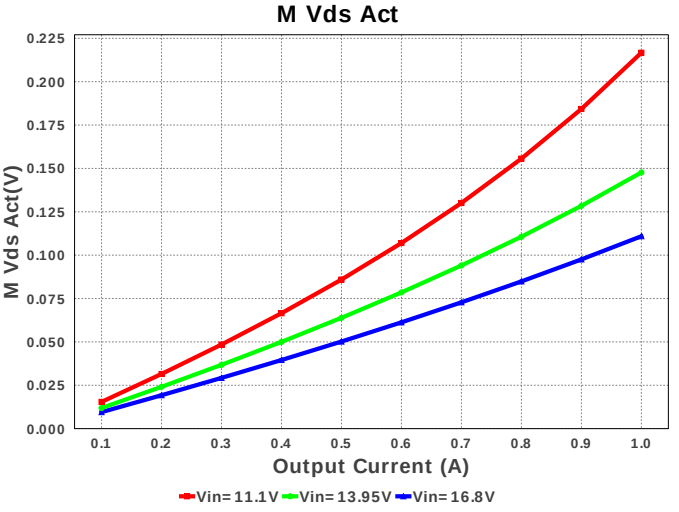


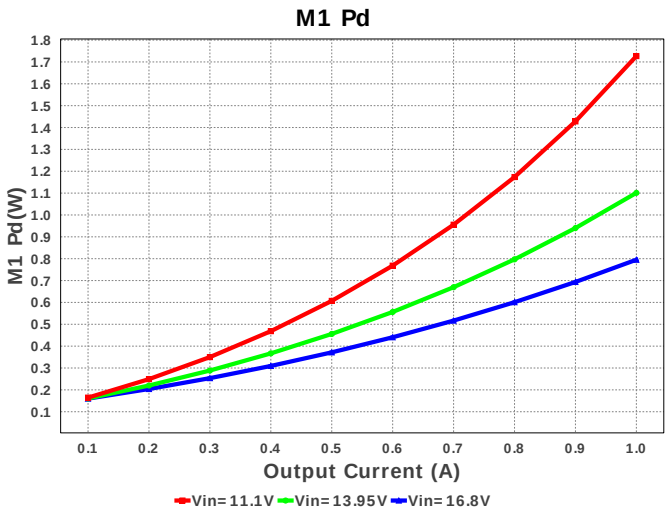


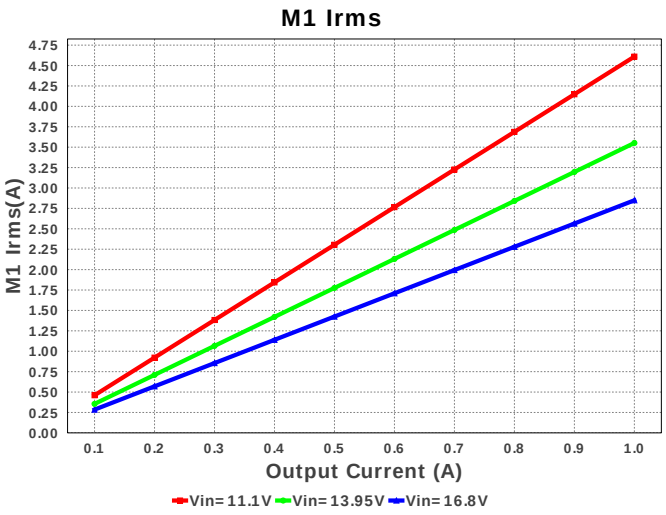


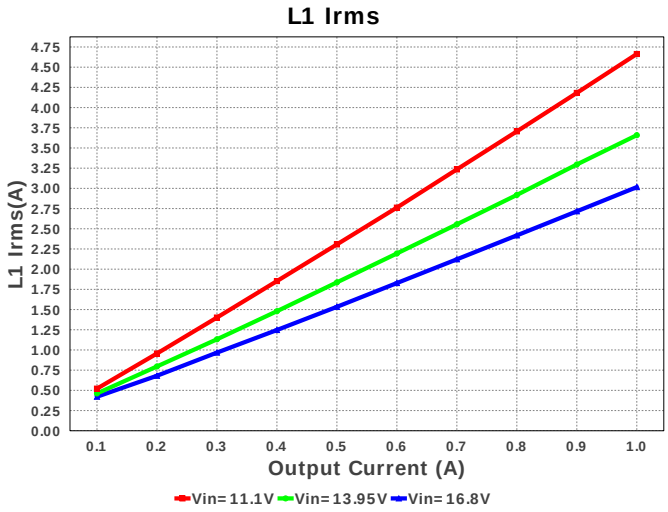


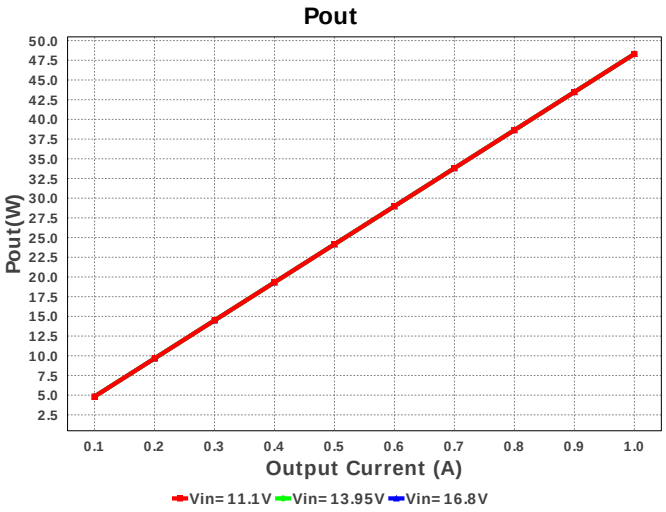


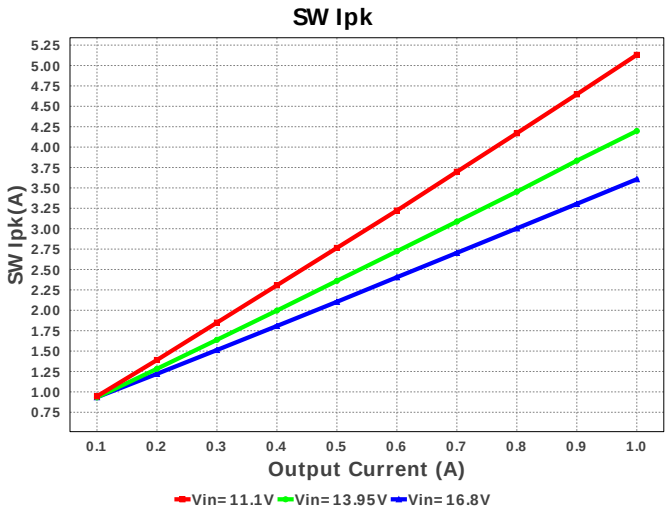


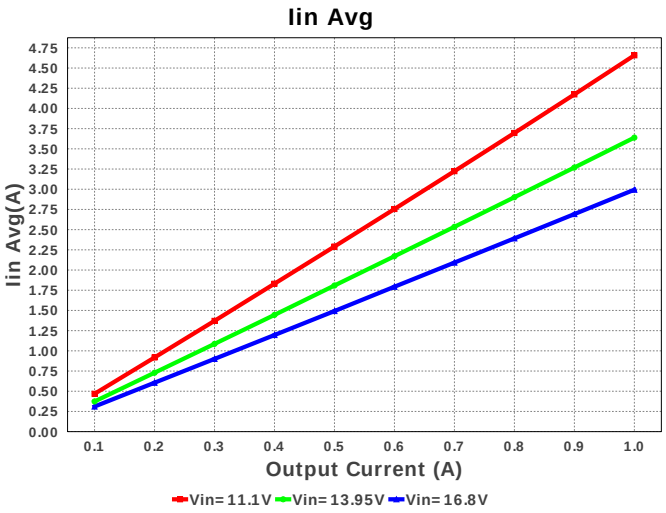


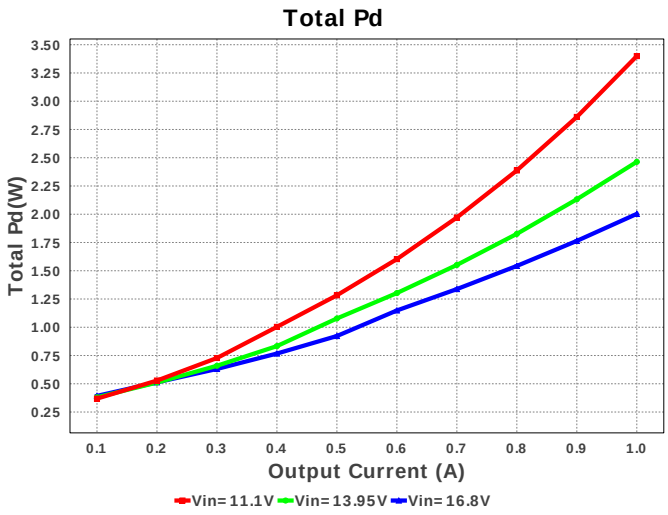


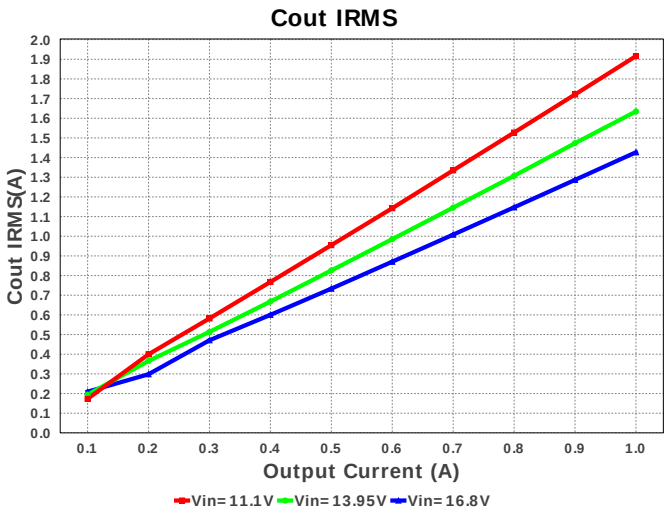


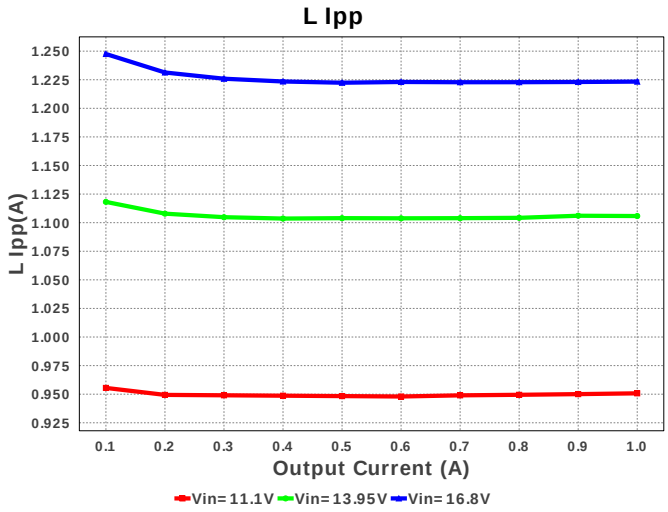


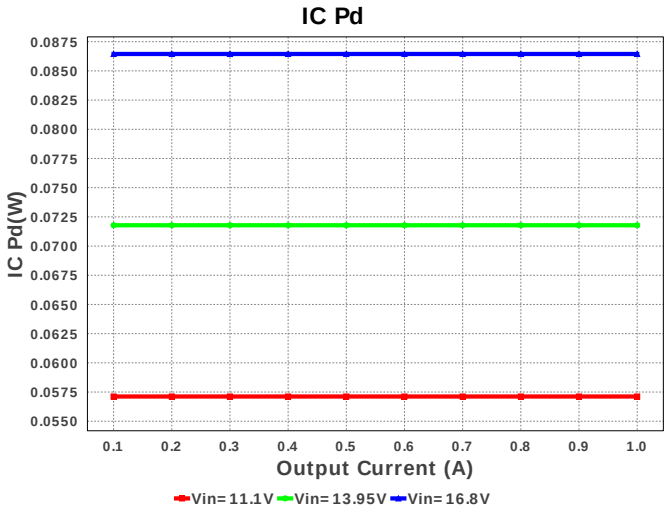


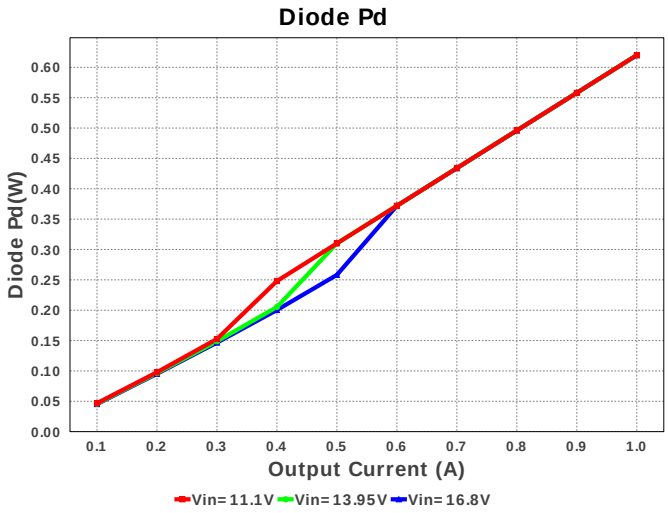


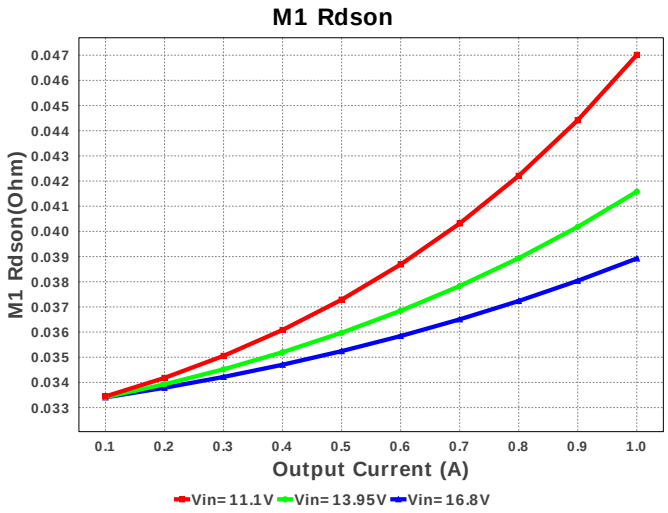


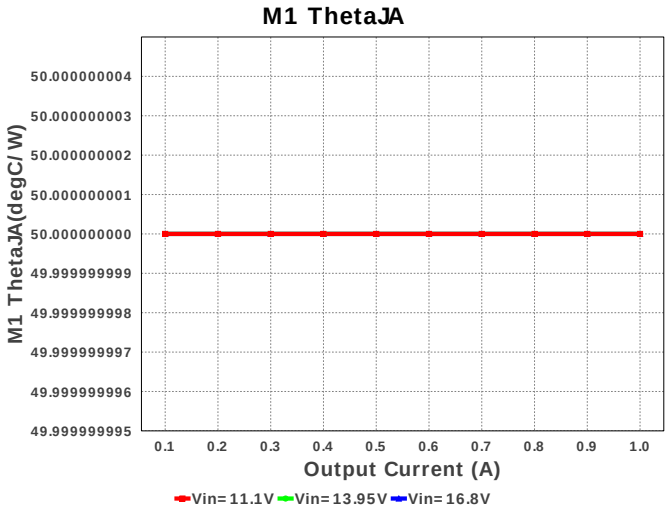


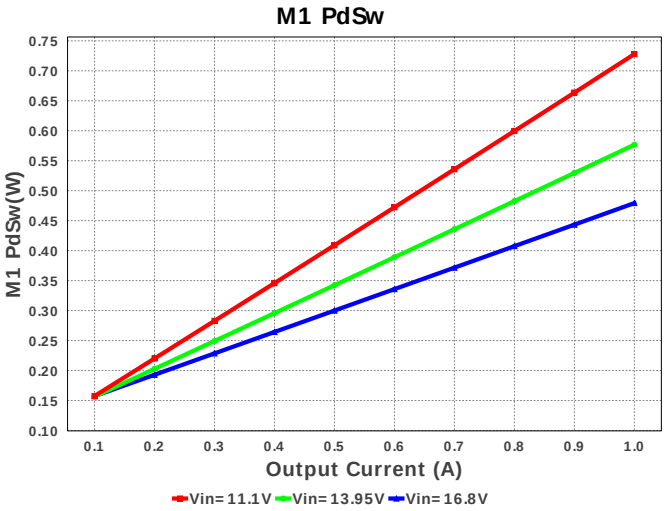


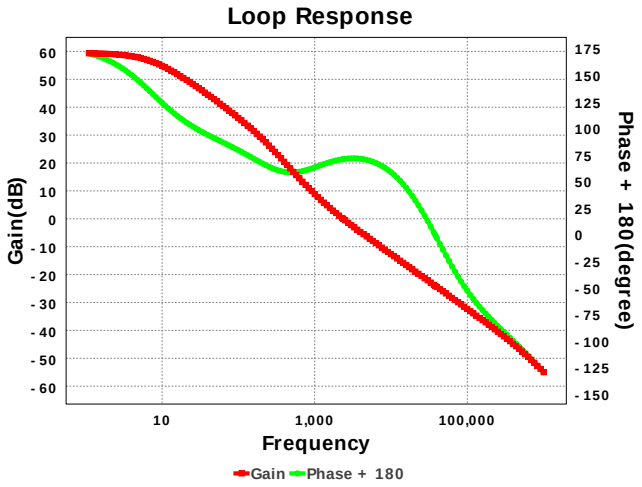












Operating Values

#	Name	Value	Category	Description
1.	Total BOM	$4.9		Total BOM Cost
2.	Cin IRMS	274.459 mA	Current	Input capacitor RMS ripple current
3.	Cout IRMS	1.916 A	Current	Output capacitor RMS ripple current
4.	Iin Avg	4.658 A	Current	Average input current
5.	L Ipp	950.753 mA	Current	Peak-to-peak inductor ripple current
6.	L1 Irms	4.663 A	Current	Inductor ripple current
7.	M1 Irms	4.609 A	Current	M1 MOSFET Irms
8.	SW Ipk	5.131 A	Current	Peak switch current
9.	BOM Count	1	General	Total Design BOM count
10.	FootPrint	1.73 k mm^2	General	Total Foot Print Area of BOM components
11.	Frequency	415.108 kHz	General	Switching frequency
12.	IC Tolerance	24.3 mV	General	IC Feedback Tolerance
13.	M Vds Act	216.698 mV	General	M Vds
14.	M1 Rdson	47.013 mOhm	General	Drain-Source On-resistance
15.	M1 ThetaJA	50.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
16.	Mode	CCM	General	Conduction Mode
17.	Pout	48.3 W	General	Total output power
18.	D1 Tj	124.504 degC	Op_Point	D1 junction temperature
19.	Low Freq Gain	55.488 dB	Op_Point	Gain at 1Hz
20.	Vout Actual	48.384 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
21.	Vout OP	48.3 V	Op_Point	Operational Output Voltage
22.	Cross Freq	1.601 kHz	Op_point	Bode plot crossover frequency
23.	Duty Cycle	78.518 %	Op_point	Duty cycle
24.	Efficiency	93.425 %	Op_point	Steady state efficiency
25.	Gain Marg	-20.399 dB	Op_point	Bode Plot Gain Margin
26.	IC Tj	43.423 degC	Op_point	IC junction temperature
27.	ICThetaJA	200.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
28.	IOUT_OP	1.0 A	Op_point	Iout operating point
29.	M1 TjOP	118.335 degC	Op_point	M1 MOSFET junction temperature
30.	Phase Marg	65.884 deg	Op_point	Bode Plot Phase Margin
31.	VIN_OP	11.1 V	Op_point	Vin operating point

#	Name	Value	Category	Description
32.	Vout p-p	290.729 mV	Op_point	Peak-to-peak output ripple voltage
33.	Cin Pd	25.611 mW	Power	Input capacitor power dissipation
34.	Cout Pd	208.041 mW	Power	Output capacitor power dissipation
35.	Diode Pd	620.0 mW	Power	Diode power dissipation
36.	IC Pd	57.117 mW	Power	IC power dissipation
37.	L Pd	547.988 mW	Power	Inductor power dissipation
38.	M1 Pd	1.727 W	Power	M1 MOSFET total power dissipation
39.	M1 PdCond	998.822 mW	Power	M1 MOSFET conduction losses
40.	M1 PdSw	727.869 mW	Power	M1 MOSFET switching losses
41.	Rfb Pd	60.752 mW	Power	Rfb Power Dissipation
42.	Rsense Pd	0.0 W	Power	LED Current Rsns Power Dissipation
43.	Total Pd	3.399 W	Power	Total Power Dissipation
44.	Vout Tolerance	3.934 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	1.0	Maximum Output Current
2.	VinMax	16.8	Maximum input voltage
3.	VinMin	11.1	Minimum input voltage
4.	Vout	48.3	Output Voltage
5.	base_pn	LM3478	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	32.0	Ambient temperature

Design Assistance

1. **LM3478** Product Folder : http://www.ti.com/product/LM3478 : contains the data sheet and other resources.