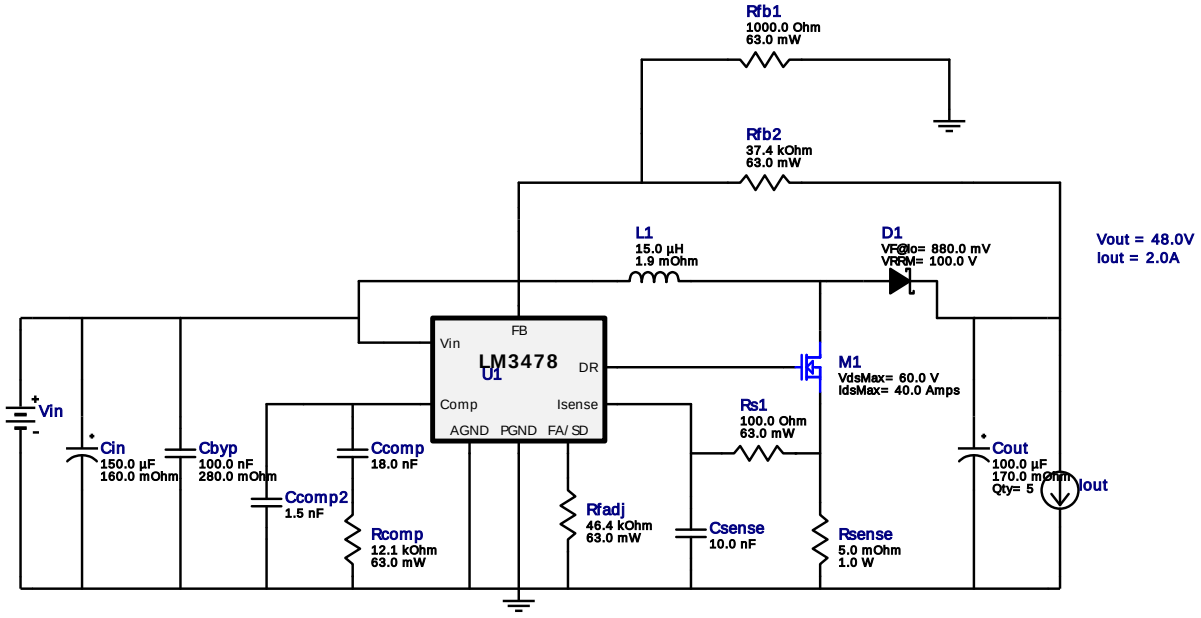
WEBENCH® Design Report

VinMin = 12.0V
VinMax = 24.0V
Vout = 48.0V
Iout = 2.0A

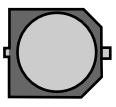
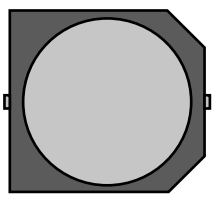
Device = LM3478MMX/NOPB
Topology = Boost
Created = 7/19/16 4:15:58 AM
BOM Cost = $7.87
BOM Count = 20
Total Pd = 7.35W

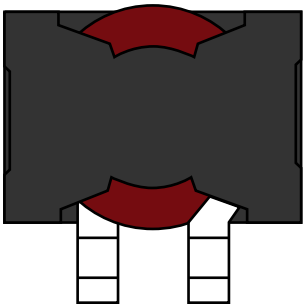
Design : 4077713/23 LM3478MMX/NOPB
LM3478MMX/NOPB 12.0V-24.0V to 48.00V @ 2.0A

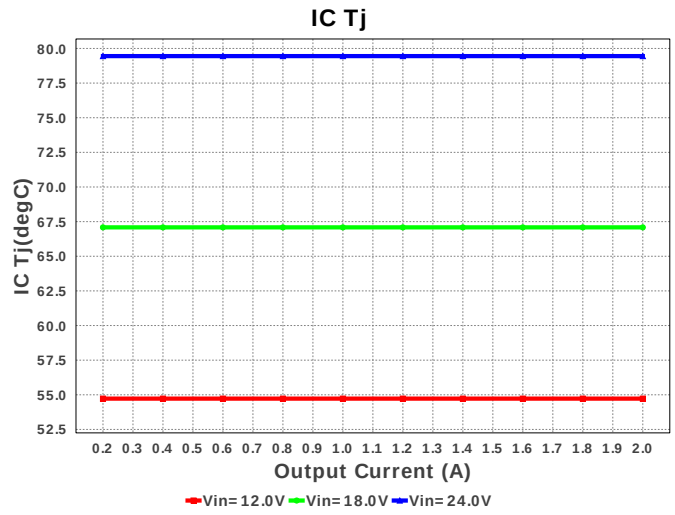


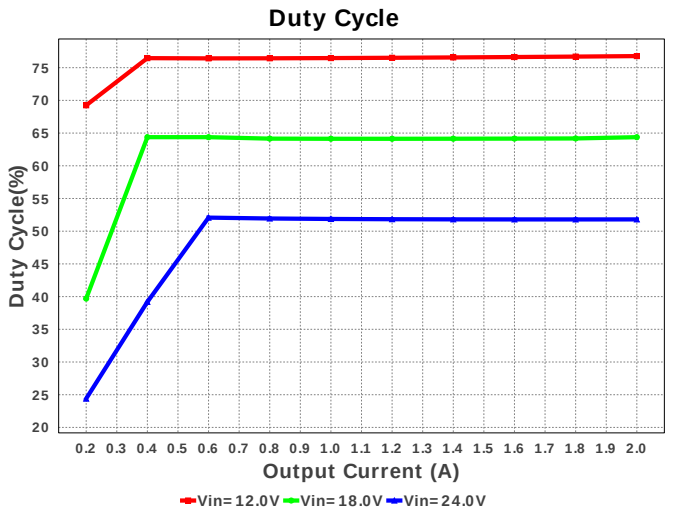
1. With the low turn of voltage of the LM34x8 your power supply may current limit before you reach your working input voltage. If this happens, or to preempt this from happening, you can include a low pass RC filter from input voltage to Vin on the IC. Make sure the rise time on the RC network is slower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

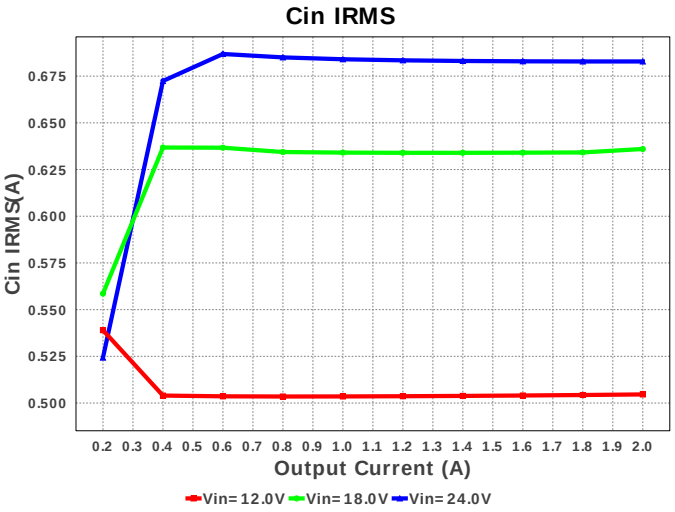
Electrical BOM

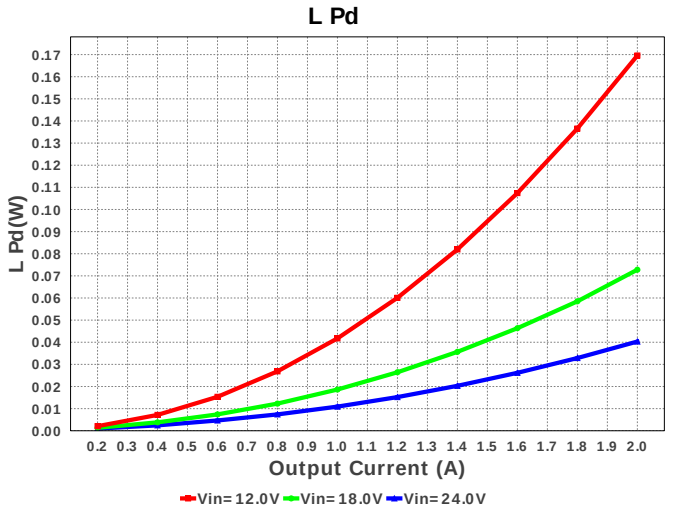
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbyp	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
2.	Ccomp	Yageo America	CC0805KRX7R9BB183 Series= X7R	Cap= 18.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
3.	Ccomp2	Yageo America	CC0805KRX7R9BB152 Series= X7R	Cap= 1.5 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
4.	Cin	Panasonic	EEE-FK1V151P Series= FK	Cap= 150.0 uF ESR= 160.0 mOhm VDC= 35.0 V IRMS= 600.0 mA	1	$0.21	 SM_RADIAL_F 124 mm²
5.	Cout	Panasonic	EEV-FK2A101M Series= FK	Cap= 100.0 uF ESR= 170.0 mOhm VDC= 100.0 V IRMS= 793.0 mA	5	$0.79	 SM_RADIAL_J16 399 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

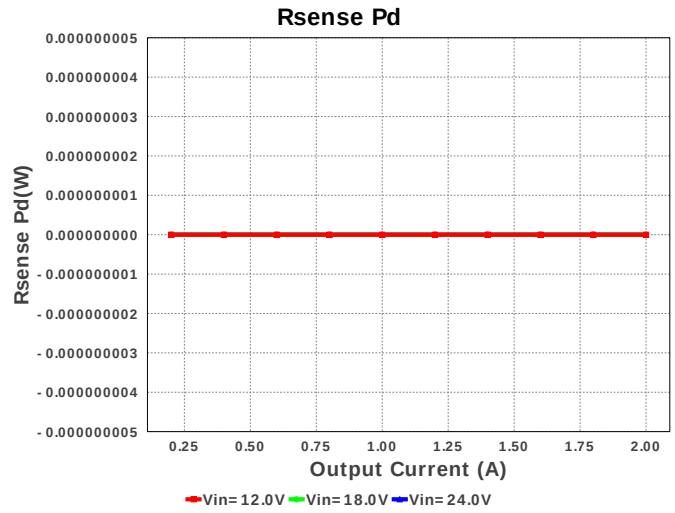
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
7.	D1	Vishay-Semiconductor	SS10PH10-M3/86A	VF@Io= 880.0 mV VRRM= 100.0 V	1	$0.29	 TO-277A 56 mm^2
8.	L1	Coilcraft	SER2915H-153KL	L= 15.0 µH DCR= 1.9 mOhm	1	$1.95	 SER2915H 652 mm^2
9.	M1	Infineon Technologies	BSZ100N06LS3 G	VdsMax= 60.0 V IdsMax= 40.0 Amps	1	$0.39	 PG-TSDSON-8 19 mm^2
10.	Rcomp	Vishay-Dale	CRCW040212K1FKED Series= CRCW..e3	Res= 12.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
11.	Rfadj	Vishay-Dale	CRCW040246K4FKED Series= CRCW..e3	Res= 46.4 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
12.	Rfb1	Vishay-Dale	CRCW04021K00FKED Series= CRCW..e3	Res= 1000.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 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	CRCW0402100RFKED Series= CRCW..e3	Res= 100.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
15.	Rsense	Susumu Co Ltd	PRL1632-R005-F-T1 Series= PRL1632	Res= 5.0 mOhm Power= 1.0 W Tolerance= 1.0%	1	$0.19	 0612 11 mm^2
16.	U1	Texas Instruments	LM3478MMX/NOPB	Switcher	1	$0.80	 MUA08A 24 mm^2

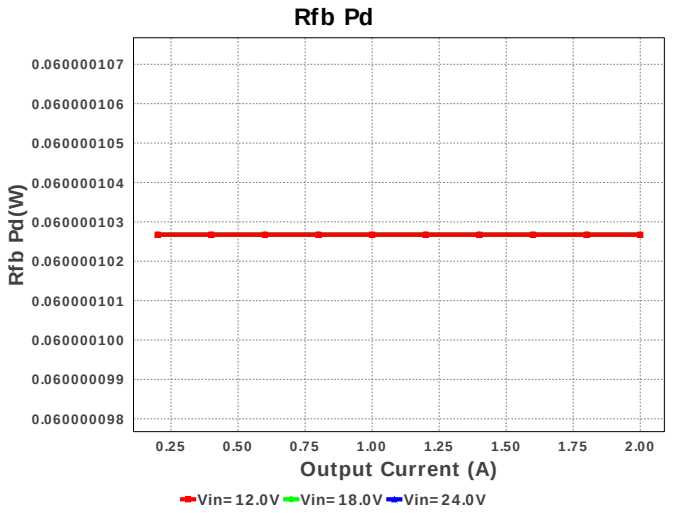


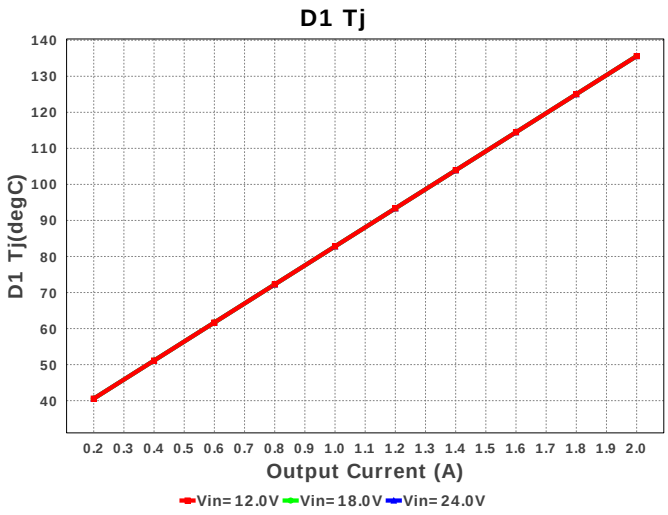


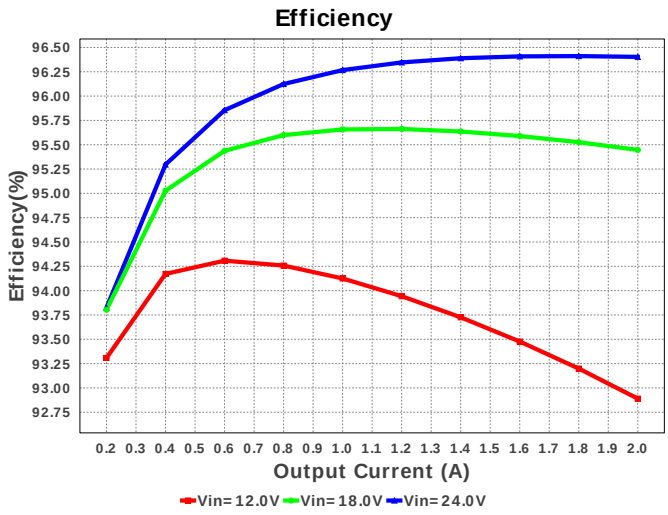


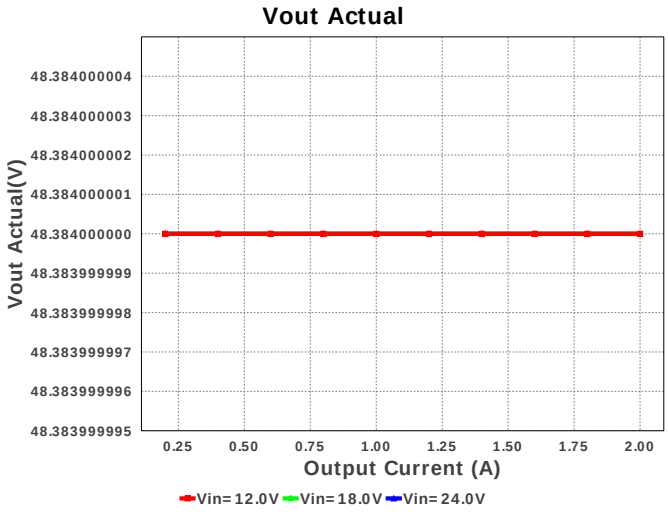


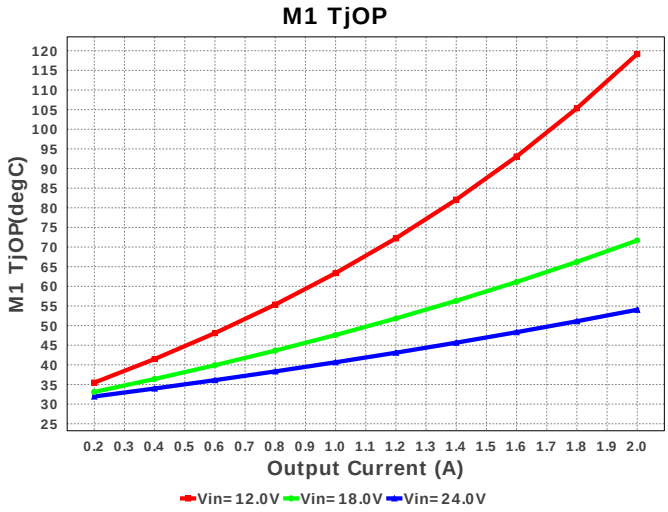


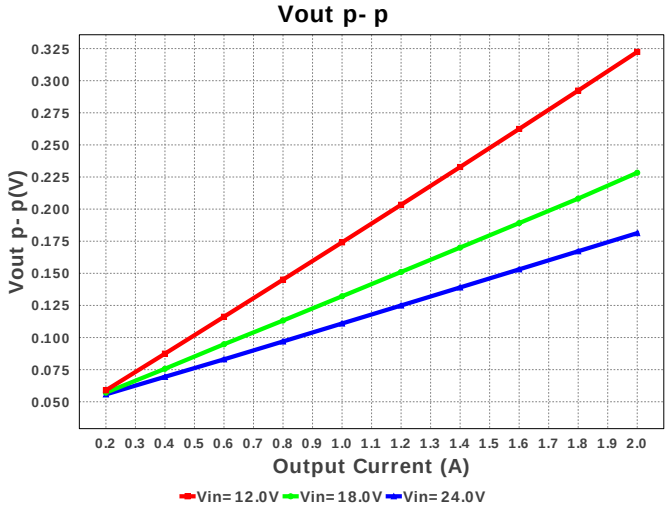


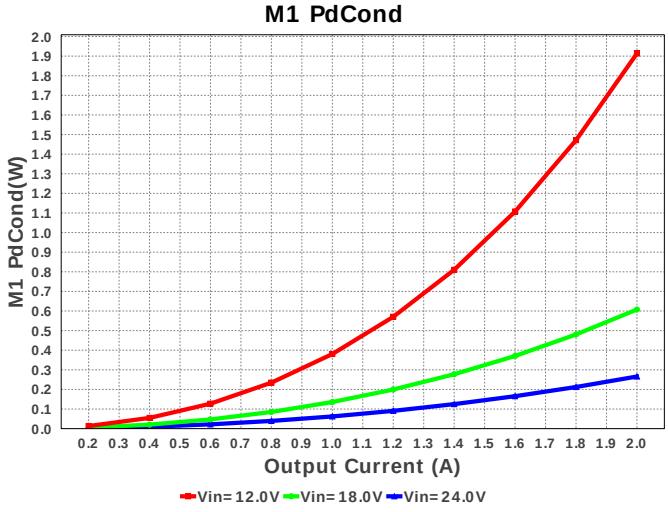


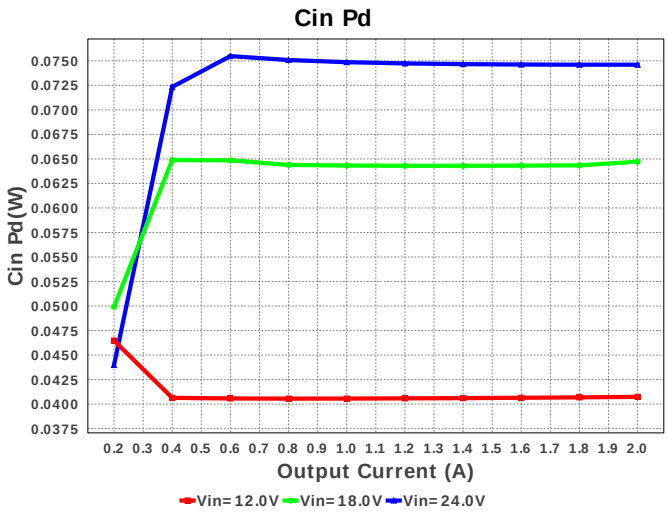


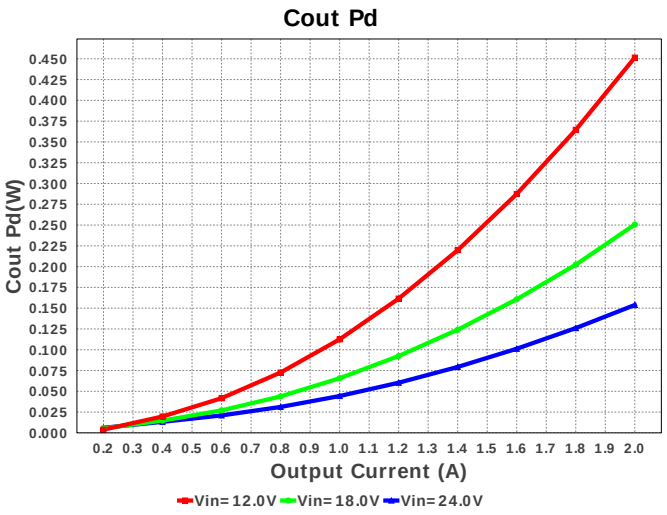


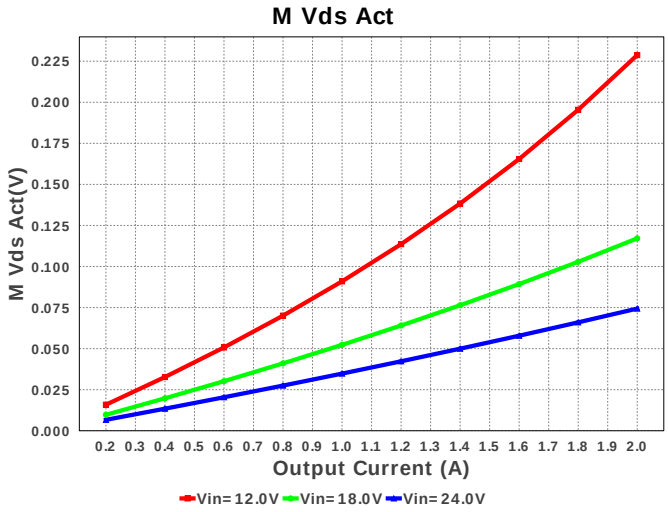


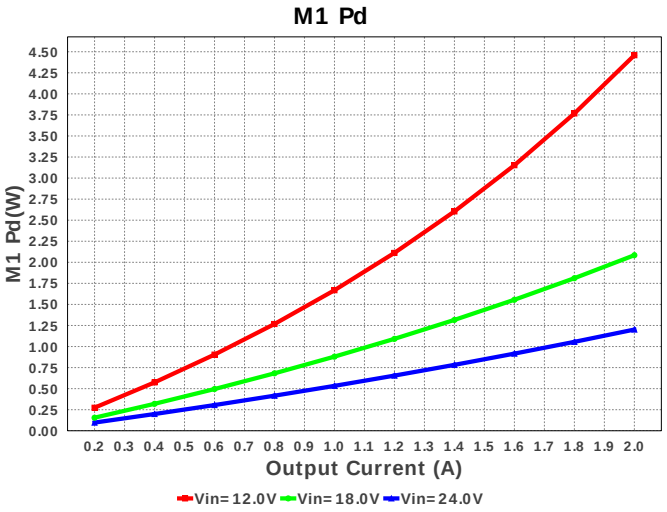


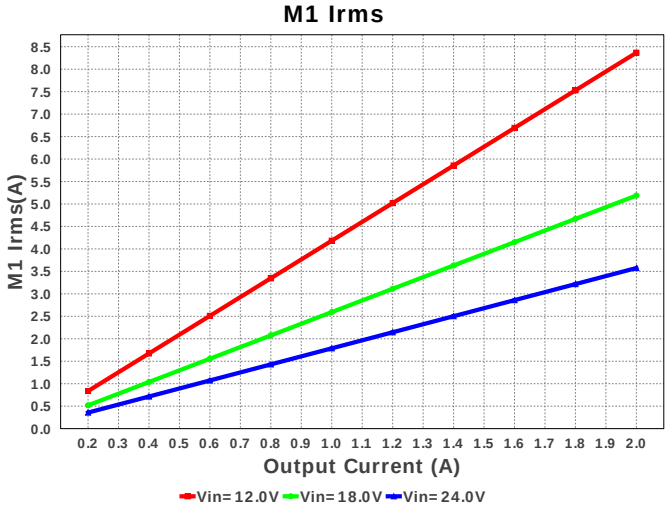


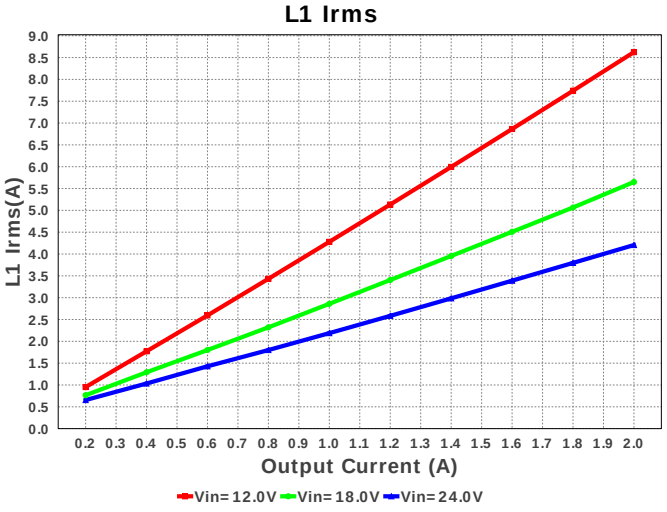


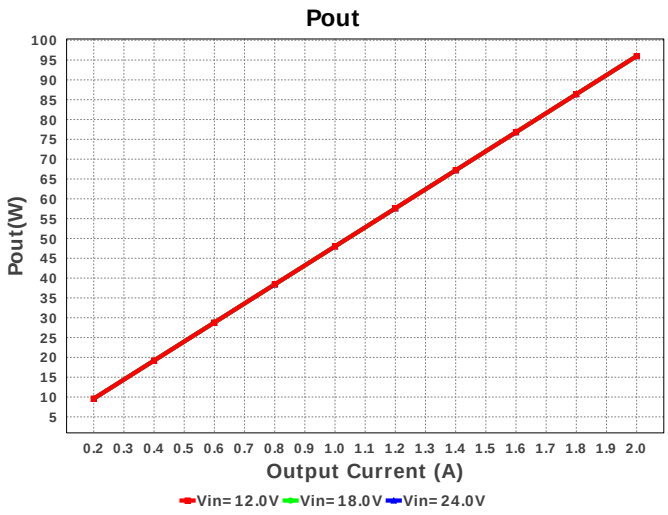


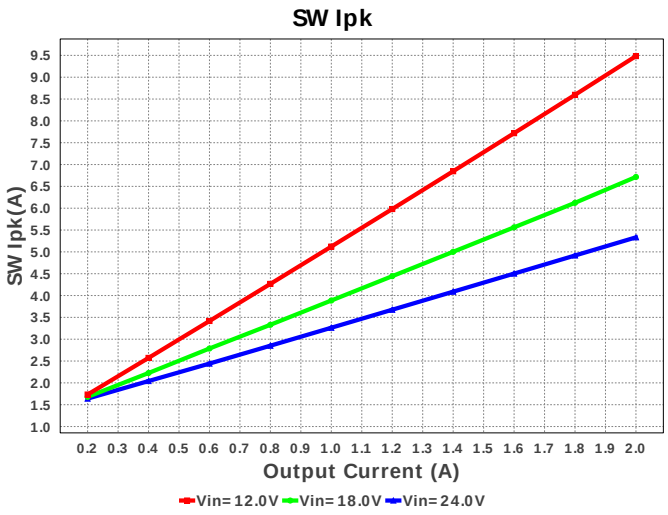


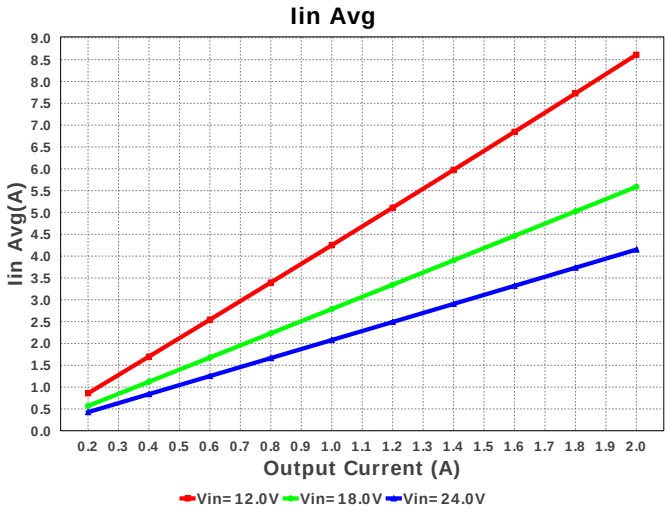


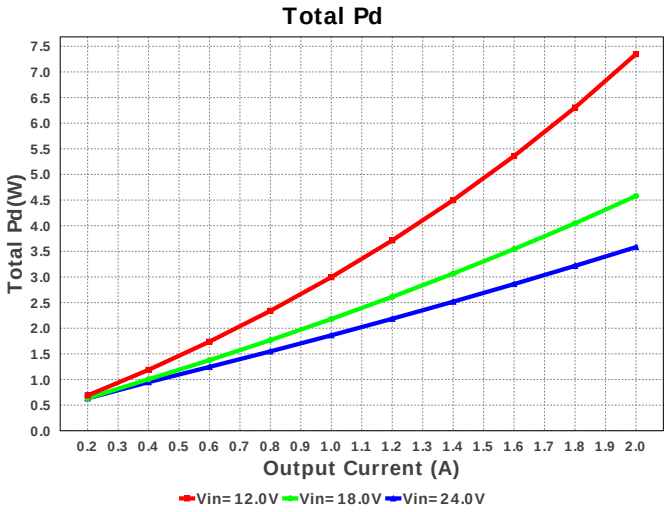


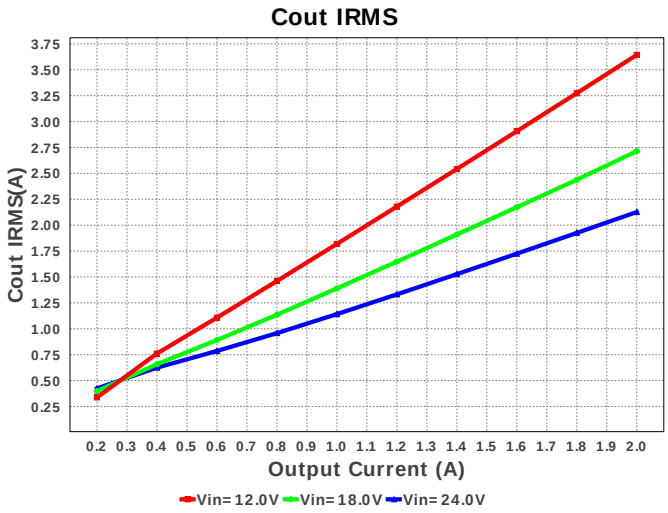


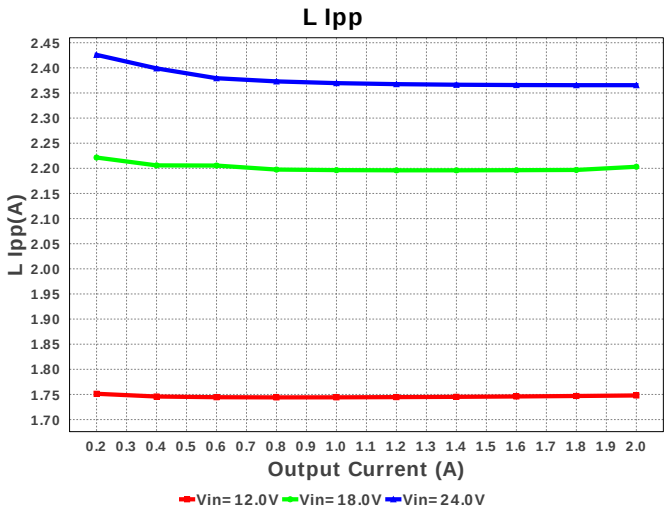


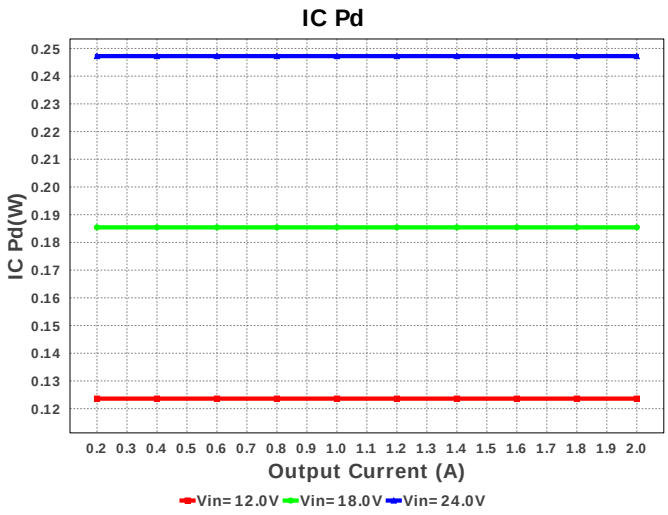


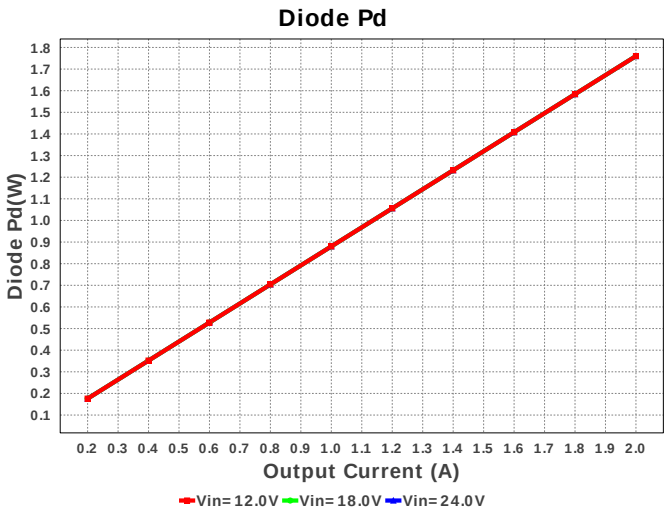


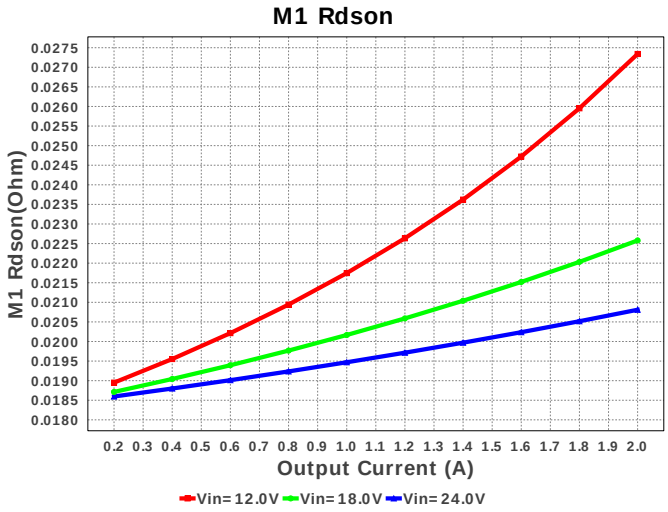


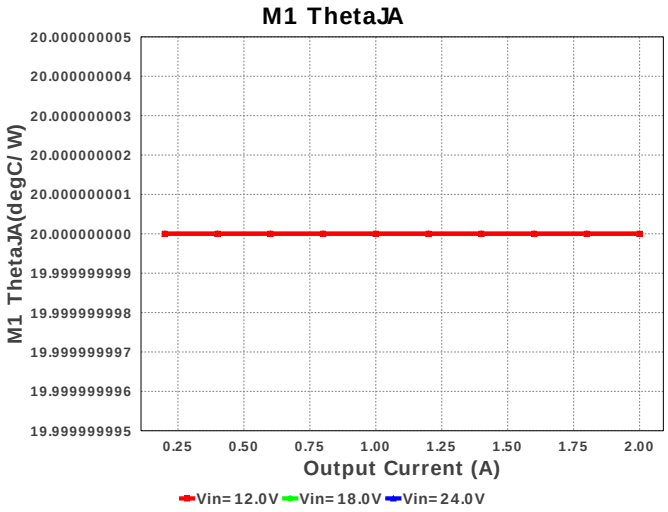


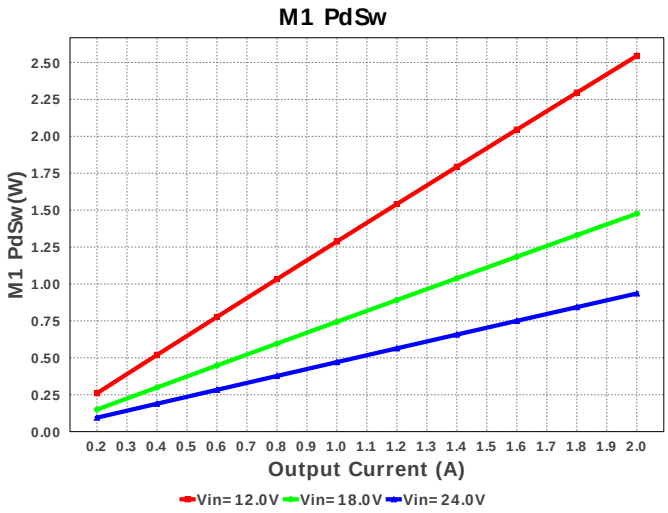


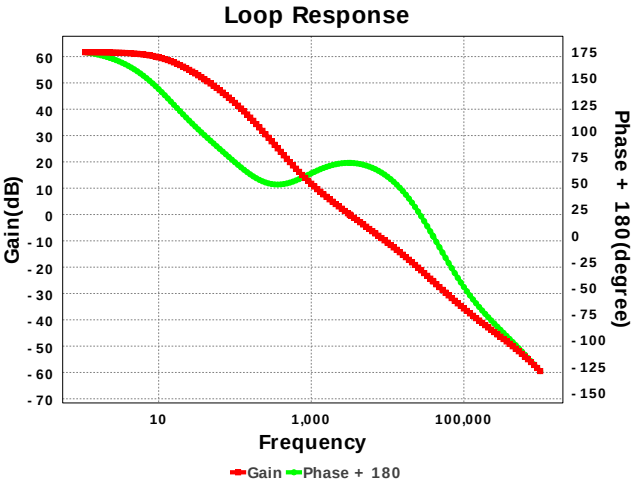












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	504.6 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	3.644 A	Current	Output capacitor RMS ripple current
3.	Iin Avg	8.612 A	Current	Average input current
4.	L Ipp	1.748 A	Current	Peak-to-peak inductor ripple current
5.	L1 Irms	8.624 A	Current	Inductor ripple current
6.	M1 Irms	8.366 A	Current	M1 MOSFET Irms
7.	SW Ipk	9.483 A	Current	Peak switch current
8.	BOM Count	20	General	Total Design BOM count
9.	FootPrint	2.922 k mm^2	General	Total Foot Print Area of BOM components
10.	Frequency	350.091 kHz	General	Switching frequency
11.	IC Tolerance	24.3 mV	General	IC Feedback Tolerance

#	Name	Value	Category	Description
12.	M Vds Act	228.713 mV	General	M Vds
13.	M1 Rdson	27.338 mOhm	General	Drain-Source On-resistance
14.	M1 ThetaJA	20.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
15.	Pout	96.0 W	General	Total output power
16.	Total BOM	$7.87	General	Total BOM Cost
17.	D1 Tj	135.6 degC	Op_Point	D1 junction temperature
18.	Low Freq Gain	55.319 dB	Op_Point	Gain at 10Hz
19.	Vout Actual	48.384 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
20.	Vout OP	48.0 V	Op_Point	Operational Output Voltage
21.	Cross Freq	1.657 kHz	Op_point	Bode plot crossover frequency
22.	Duty Cycle	76.77 %	Op_point	Duty cycle
23.	Efficiency	92.89 %	Op_point	Steady state efficiency
24.	Gain Marg	-19.231 dB	Op_point	Bode Plot Gain Margin
25.	IC Tj	54.72 degC	Op_point	IC junction temperature
26.	ICThetaJA	200.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
27.	IOUT_OP	2.0 A	Op_point	Iout operating point
28.	M1 TjOP	119.157 degC	Op_point	M1 MOSFET junction temperature
29.	Phase Marg	61.302 deg	Op_point	Bode Plot Phase Margin
30.	VIN_OP	12.0 V	Op_point	Vin operating point
31.	Vout p-p	322.436 mV	Op_point	Peak-to-peak output ripple voltage
32.	Cin Pd	40.739 mW	Power	Input capacitor power dissipation
33.	Cout Pd	451.451 mW	Power	Output capacitor power dissipation
34.	Diode Pd	1.76 W	Power	Diode power dissipation
35.	IC Pd	123.6 mW	Power	IC power dissipation
36.	L Pd	169.579 mW	Power	Inductor power dissipation
37.	M1 Pd	4.458 W	Power	M1 MOSFET total power dissipation
38.	M1 PdCond	1.913 W	Power	M1 MOSFET conduction losses
39.	M1 PdSw	2.544 W	Power	M1 MOSFET switching losses
40.	Rfb Pd	60.0 mW	Power	Rfb Power Dissipation
41.	Rsense Pd	338.199 mW	Power	LED Current Rsns Power Dissipation
42.	Total Pd	7.348 W	Power	Total Power Dissipation
43.	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	2.0	Maximum Output Current
2.	VinMax	24.0	Maximum input voltage
3.	VinMin	12.0	Minimum input voltage
4.	Vout	48.0	Output Voltage
5.	base_pn	LM3478	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

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