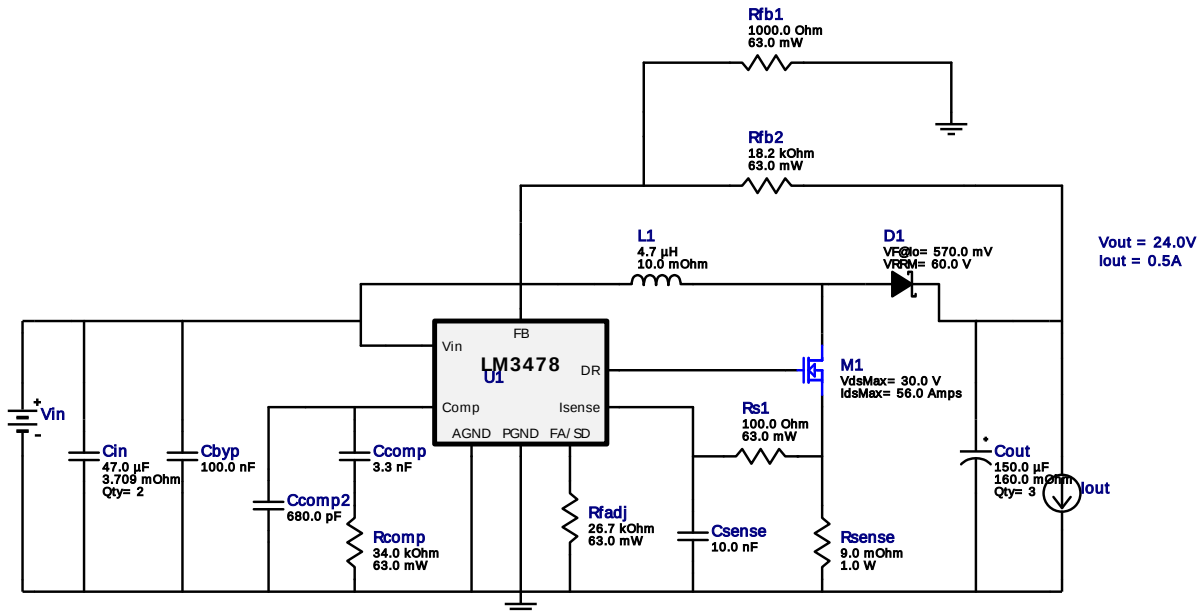


WEBENCH® Design Report

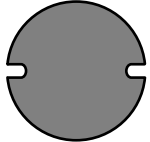
Design : 4738422/1 LM3478MMX/NOPB
LM3478MMX/NOPB 3.3V-5.0V to 24.00V @ 0.5A

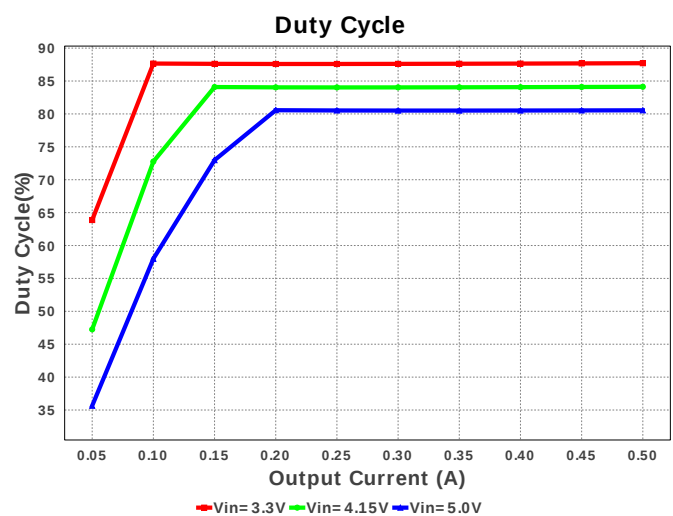
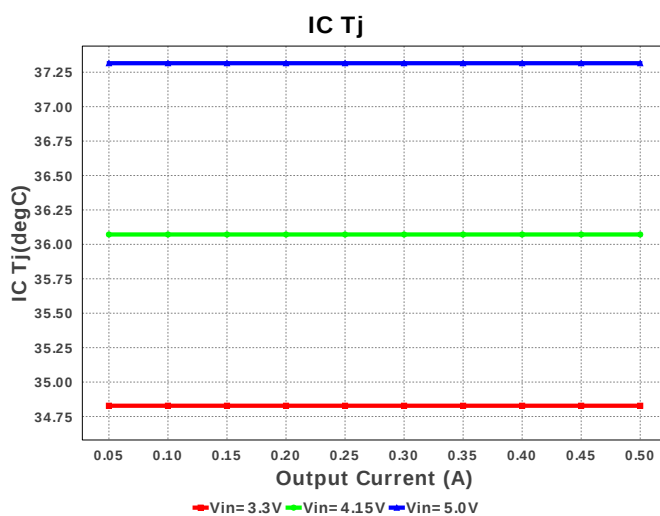


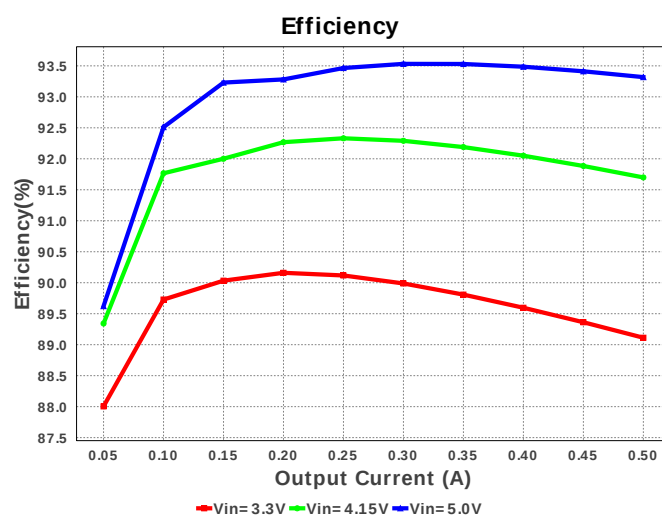
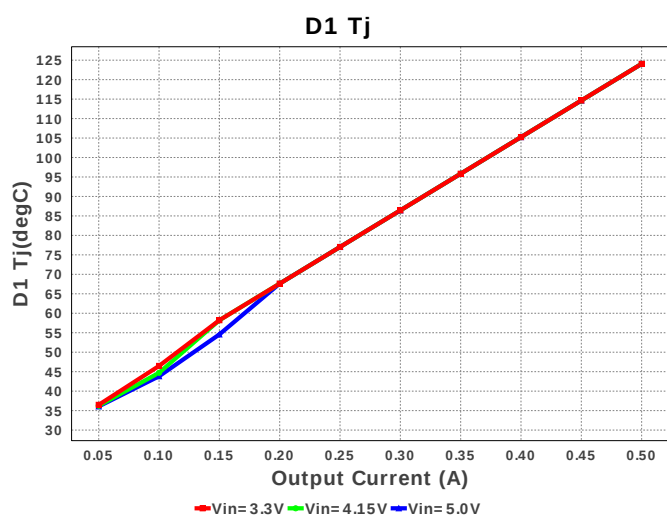
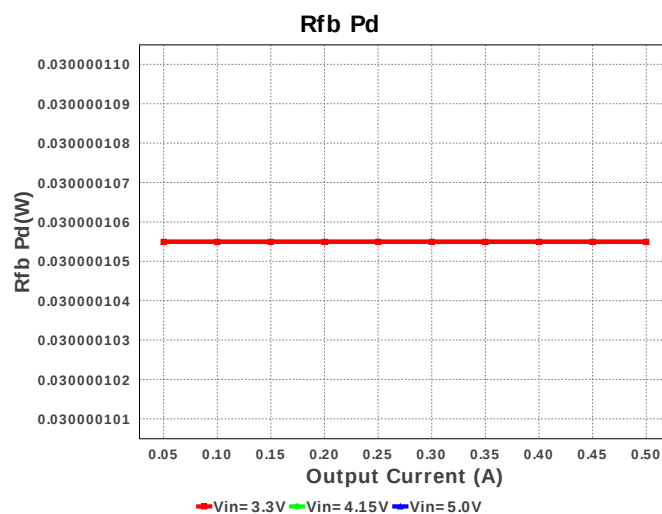
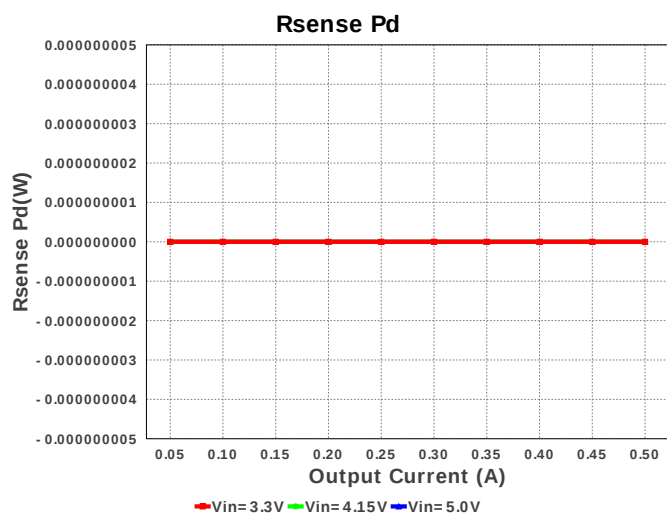
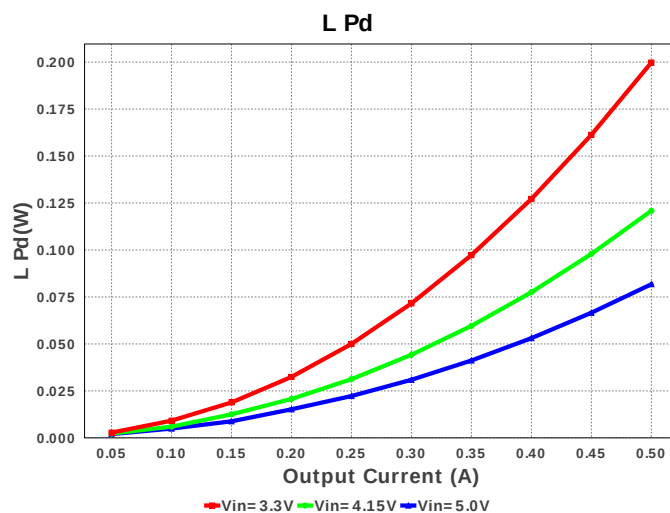
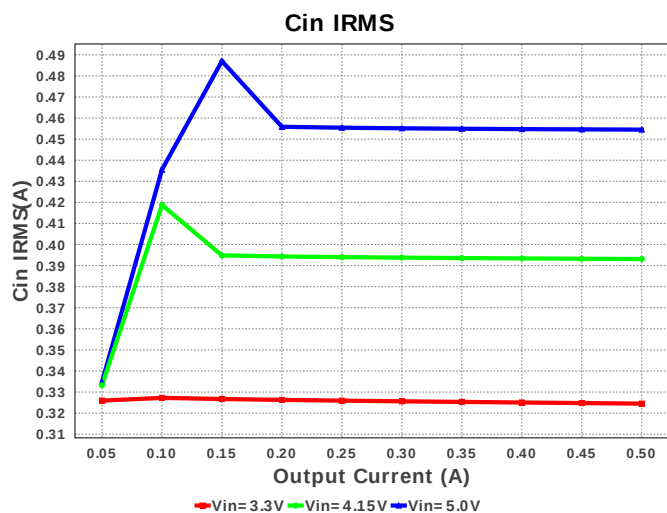
1. With the low turn of voltage of the LM34x8 your power supply may current limit before you reach your working input voltage. If this happens, or to preempt this from happening, you can include a low pass RC filter from input voltage to Vin on the IC. Make sure the rise time on the RC network is slower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

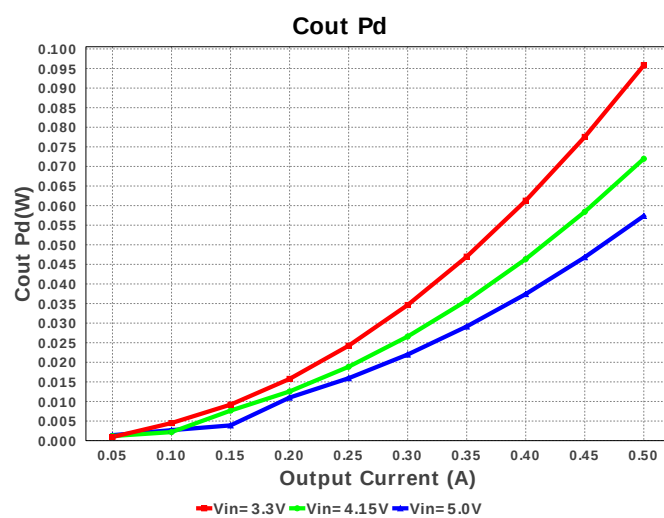
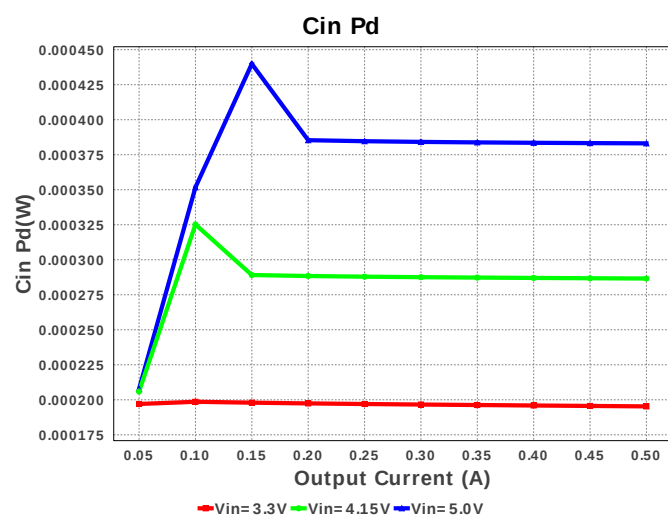
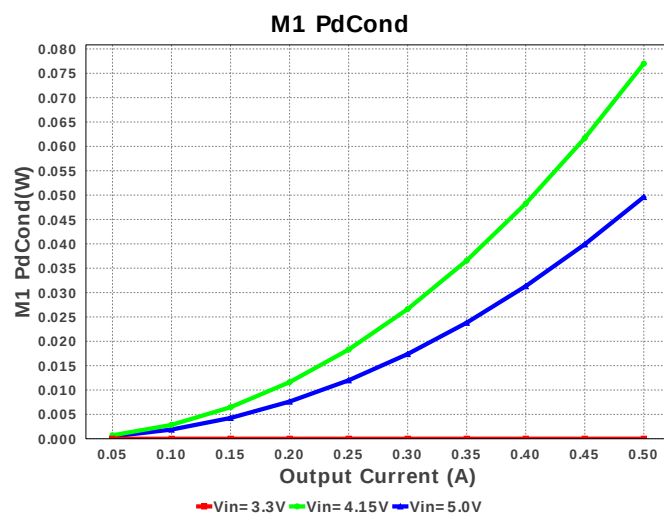
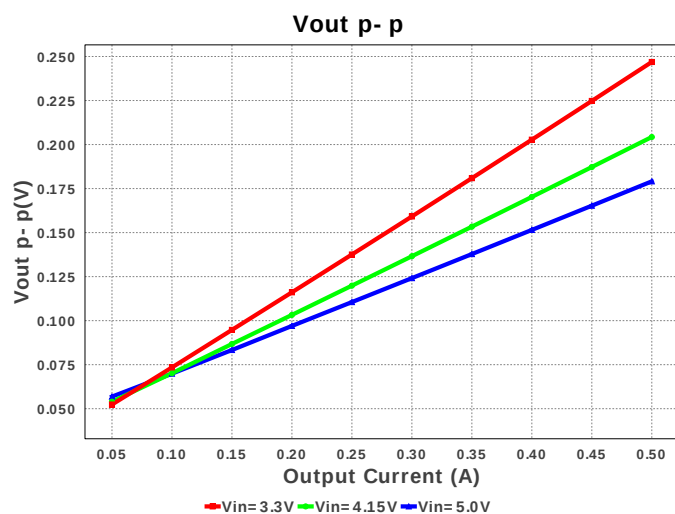
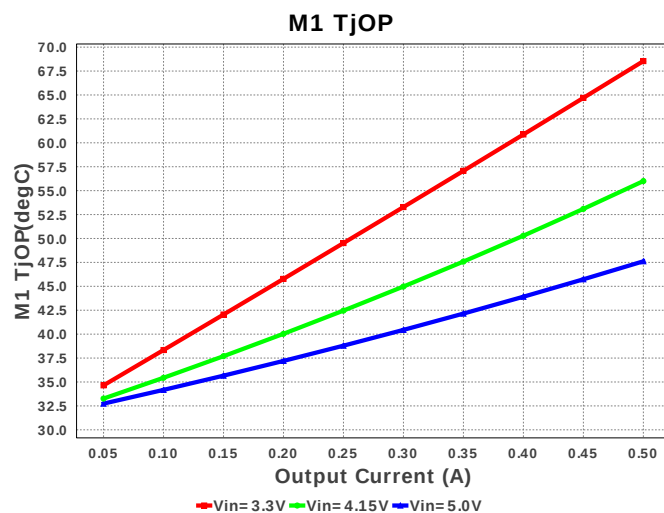
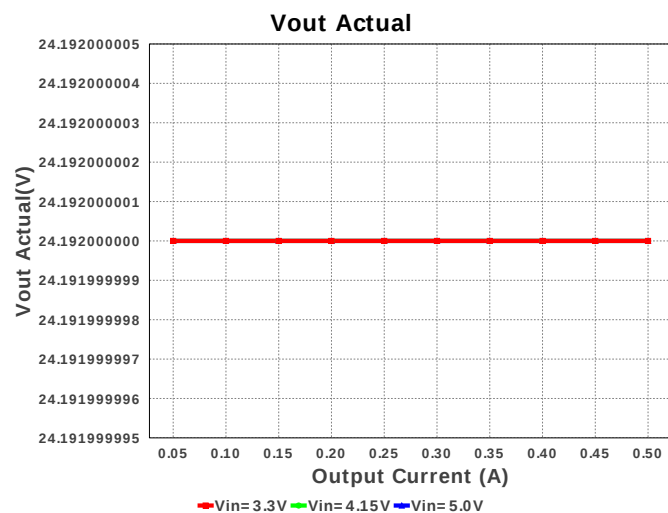
Electrical BOM

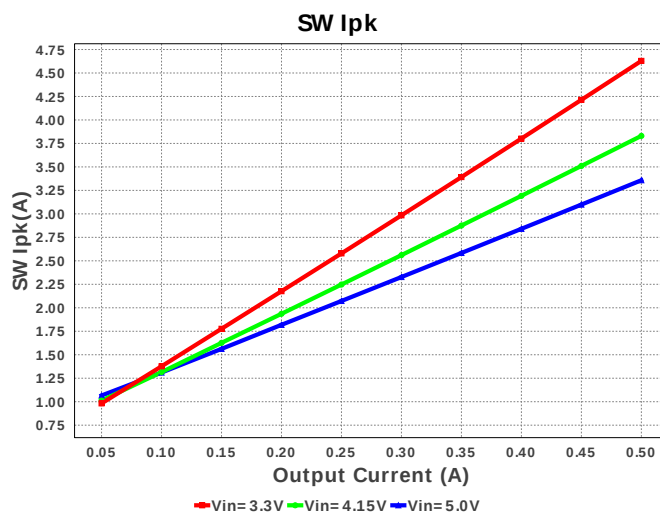
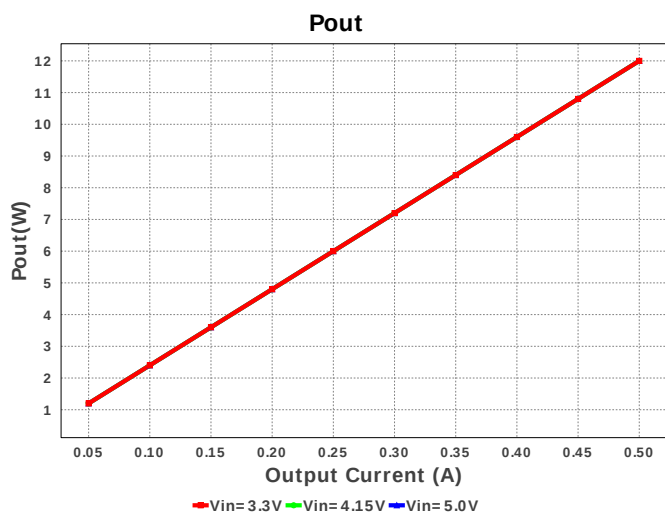
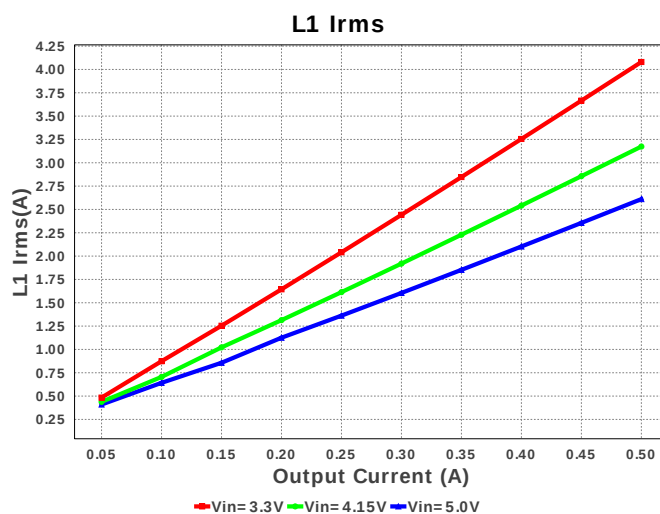
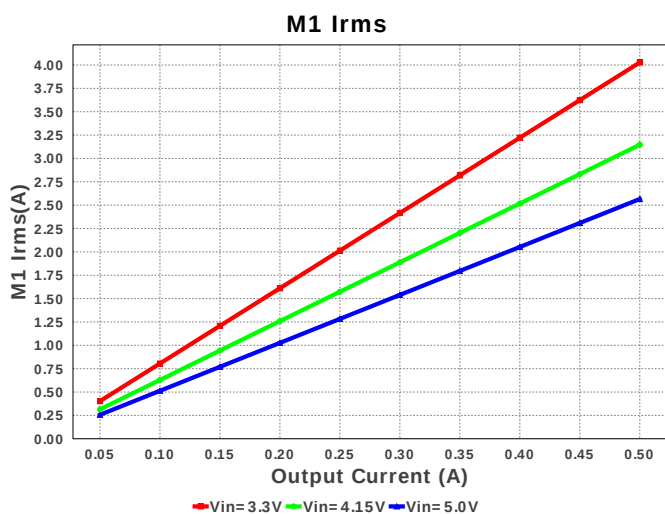
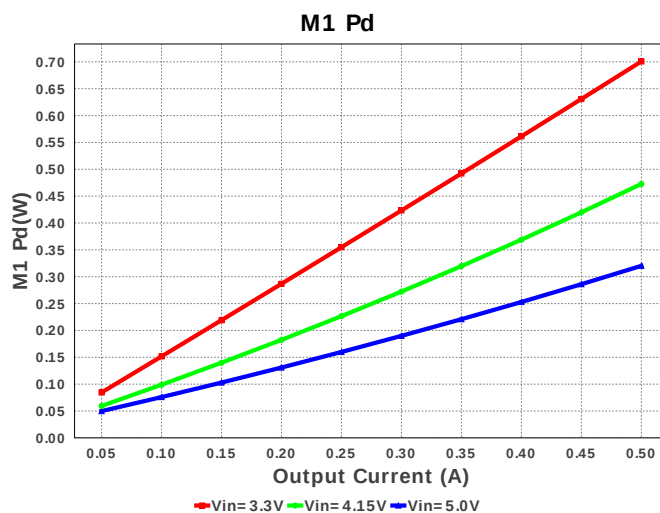
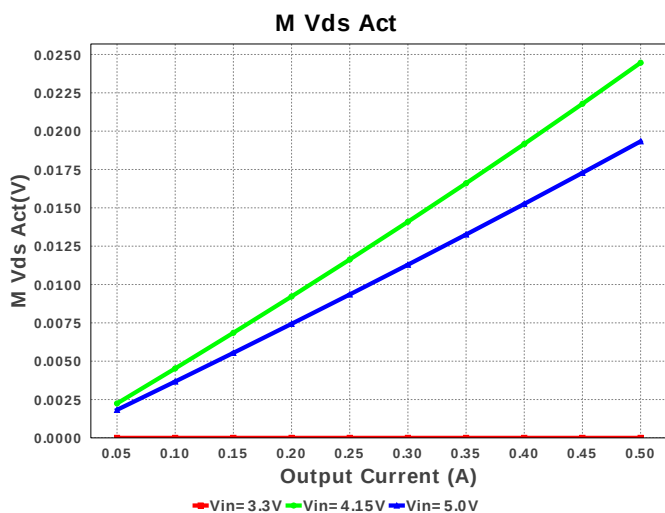
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbyp	MuRata	GRM155R60J104KA01D Series= X5R	Cap= 100.0 nF VDC= 6.3 V IRMS= 0.0 A	1	\$0.01	0402 3 mm ²
2.	Ccomp	MuRata	GRM216R71E332KA01D Series= X7R	Cap= 3.3 nF VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
3.	Ccomp2	Yageo America	CC0805KRX7R9BB681 Series= X7R	Cap= 680.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
4.	Cin	MuRata	GRM31CR61A476KE15L Series= X5R	Cap= 47.0 uF ESR= 3.709 mOhm VDC= 10.0 V IRMS= 4.2862 A	2	\$0.15	1206_190 11 mm ²
5.	Cout	Panasonic	EEE-FK1V151P Series= FK	Cap= 150.0 uF ESR= 160.0 mOhm VDC= 35.0 V IRMS= 600.0 mA	3	\$0.21	SM_RADIAL_F 124 mm ²
6.	Csense	MuRata	GRM216R71H103KA01D Series= X7R	Cap= 10.0 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
7.	D1	NXP Semiconductor	PMEG6010CEH,115	VF@Io= 570.0 mV VRRM= 60.0 V	1	\$0.04	SOD-123F 12 mm ²

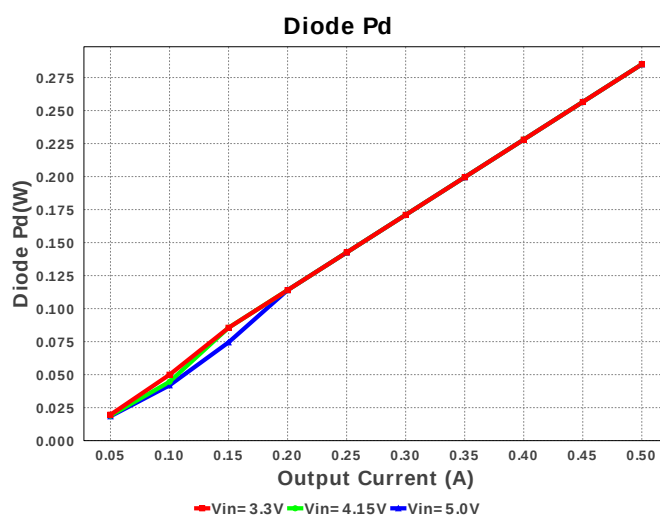
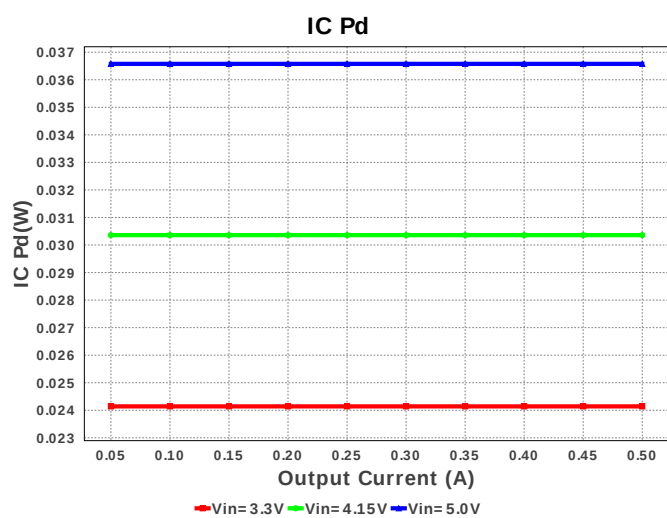
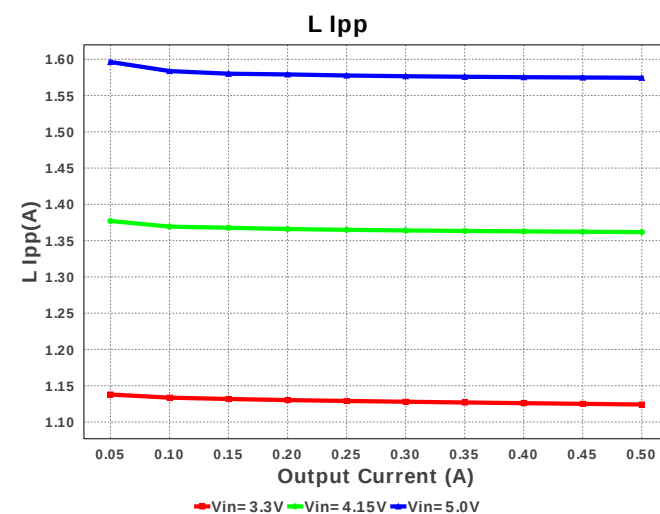
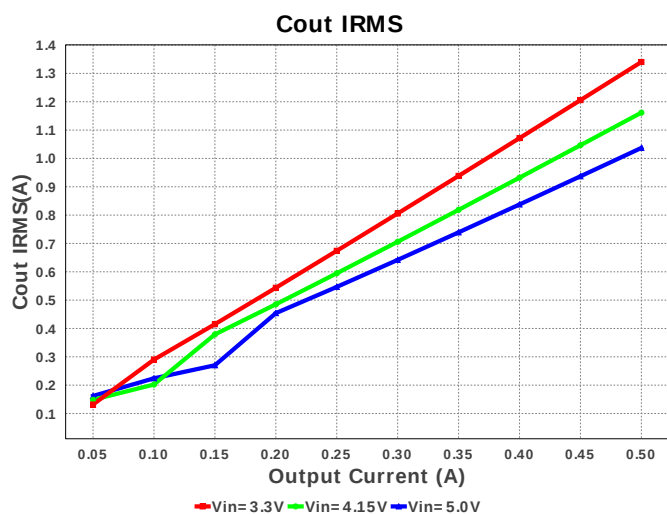
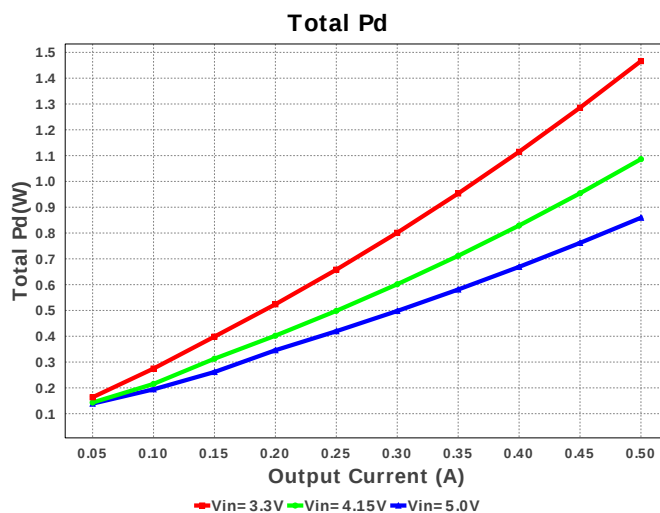
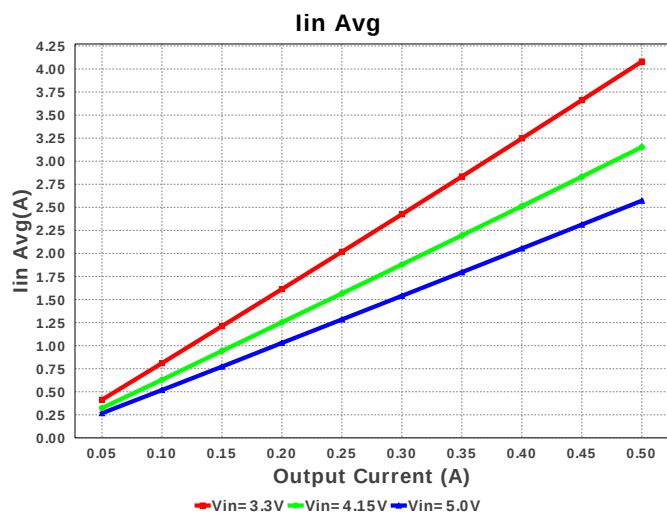
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
8.	L1	Bourns	SDR1307-4R7ML	L= 4.7 μ H DCR= 10.0 mOhm	1	\$0.35	 SDR1307 227 mm ²
9.	M1	Texas Instruments	CSD17304Q3	VdsMax= 30.0 V IdsMax= 56.0 Amps	1	\$0.32	 TRANS_NexFET_Q3 18 mm ²
10.	Rcomp	Vishay-Dale	CRCW040234K0FKED Series= CRCW..e3	Res= 34.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
11.	Rfadj	Vishay-Dale	CRCW040226K7FKED Series= CRCW..e3	Res= 26.7 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	CRCW040218K2FKED Series= CRCW..e3	Res= 18.2 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-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	\$0.80	 MUA08A 24 mm ²

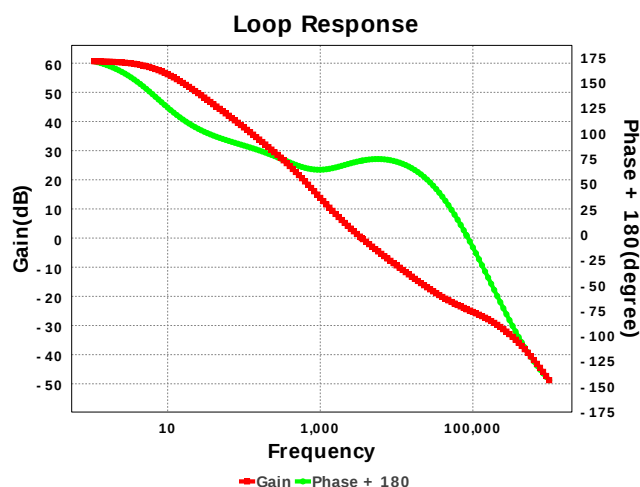
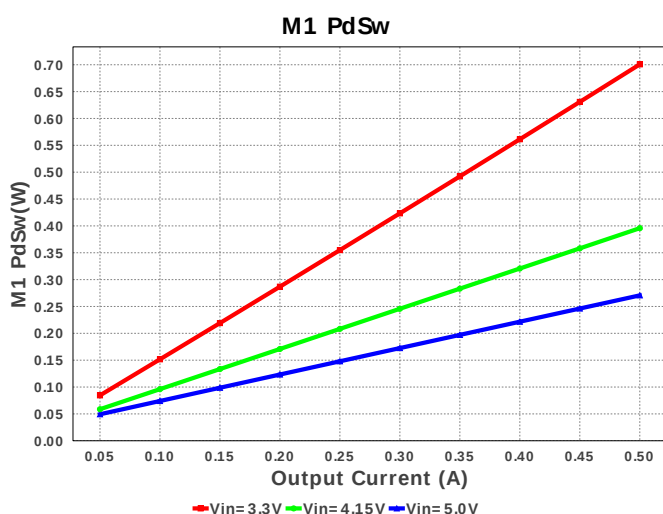
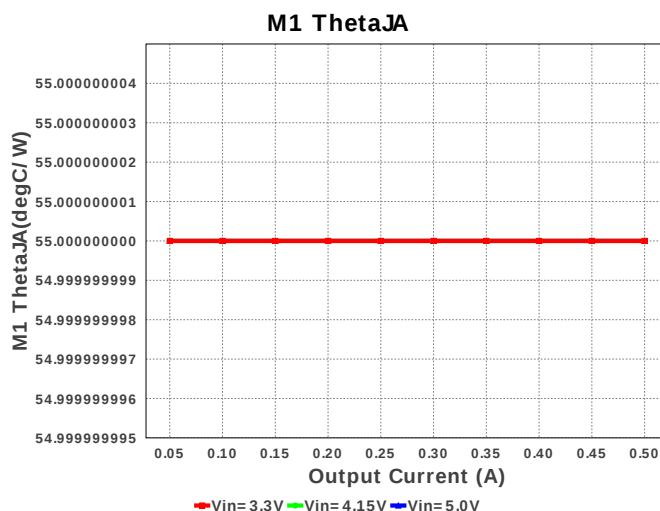
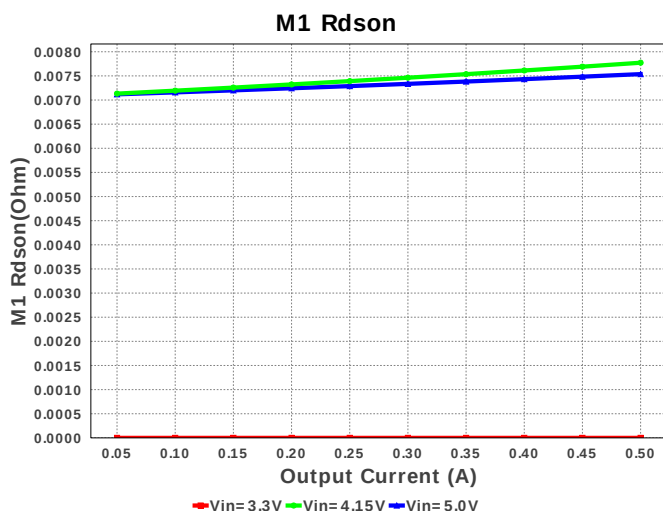












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	324.542 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	1.341 A	Current	Output capacitor RMS ripple current
3.	Iin Avg	4.084 A	Current	Average input current
4.	L Ipp	1.124 A	Current	Peak-to-peak inductor ripple current
5.	L1 Irms	4.083 A	Current	Inductor ripple current
6.	M1 Irms	4.027 A	Current	M1 MOSFET Irms
7.	SW Ipk	4.632 A	Current	Peak switch current
8.	BOM Count	19	General	Total Design BOM count
9.	FootPrint	722.0 mm ²	General	Total Foot Print Area of BOM components
10.	Frequency	541.734 kHz	General	Switching frequency
11.	IC Tolerance	24.3 mV	General	IC Feedback Tolerance
12.	M Vds Act	0.0 V	General	M Vds
13.	M1 Rdson	0.0 Ohm	General	Drain-Source On-resistance
14.	M1 ThetaJA	55.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
15.	Pout	12.0 W	General	Total output power
16.	Total BOM	\$2.72	General	Total BOM Cost
17.	D1 Tj	124.05 degC	Op_Point	D1 junction temperature
18.	Low Freq Gain	56.655 dB	Op_Point	Gain at 10Hz
19.	Vout Actual	24.192 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
20.	Vout OP	24.0 V	Op_Point	Operational Output Voltage
21.	Cross Freq	2.351 kHz	Op_point	Bode plot crossover frequency
22.	Duty Cycle	87.716 %	Op_point	Duty cycle
23.	Efficiency	89.036 %	Op_point	Steady state efficiency
24.	Gain Marg	-20.79 dB	Op_point	Bode Plot Gain Margin
25.	IC Tj	34.862 degC	Op_point	IC junction temperature
26.	ICThetaJA	200.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
27.	IOUT_OP	500.0 mA	Op_point	Iout operating point
28.	M1 TJOP	69.128 degC	Op_point	M1 MOSFET junction temperature
29.	Phase Marg	67.062 deg	Op_point	Bode Plot Phase Margin
30.	VIN_OP	3.3 V	Op_point	Vin operating point
31.	Vout p-p	247.064 mV	Op_point	Peak-to-peak output ripple voltage

#	Name	Value	Category	Description
32.	Cin Pd	195.329 μ W	Power	Input capacitor power dissipation
33.	Cout Pd	95.899 mW	Power	Output capacitor power dissipation
34.	Diode Pd	285.0 mW	Power	Diode power dissipation
35.	IC Pd	24.308 mW	Power	IC power dissipation
36.	L Pd	200.075 mW	Power	Inductor power dissipation
37.	M1 Pd	711.426 mW	Power	M1 MOSFET total power dissipation
38.	M1 PdCond	0.0 W	Power	M1 MOSFET conduction losses
39.	M1 PdSw	711.426 mW	Power	M1 MOSFET switching losses
40.	Rfb Pd	30.0 mW	Power	Rfb Power Dissipation
41.	Rsense Pd	124.728 mW	Power	LED Current Rsns Power Dissipation
42.	Total Pd	1.478 W	Power	Total Power Dissipation
43.	Vout Tolerance	3.88 %		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	5.0	Maximum input voltage
3.	VinMin	3.3	Minimum input voltage
4.	Vout	24.0	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.

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