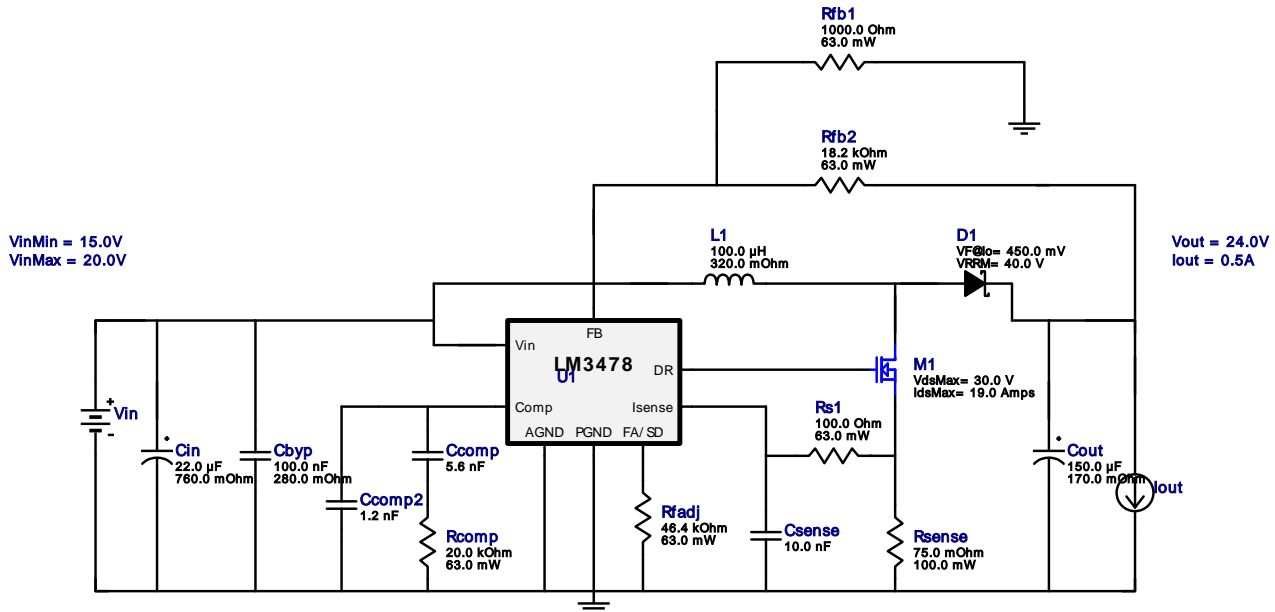








**WEBENCH<sup>®</sup> Design Report**

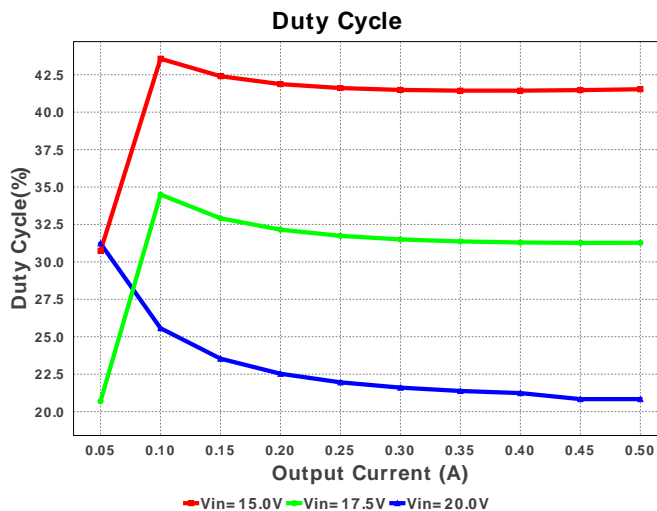
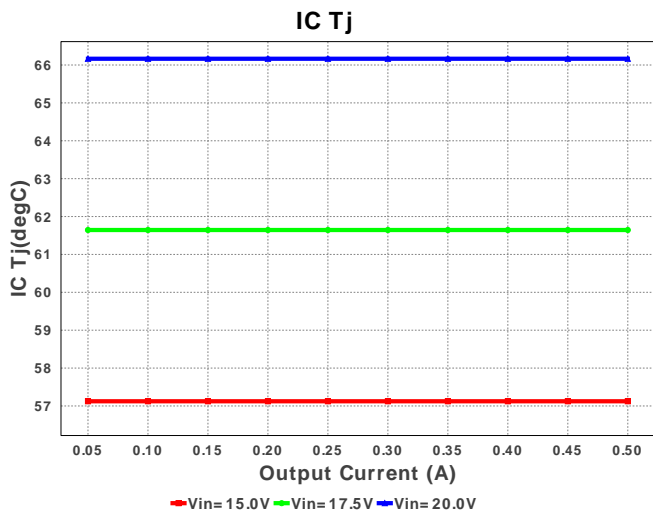
 Design : 4320088/9 LM3478MM/NOPB  
 LM3478MM/NOPB 15.0V-20.0V to 24.00V @ 0.5A


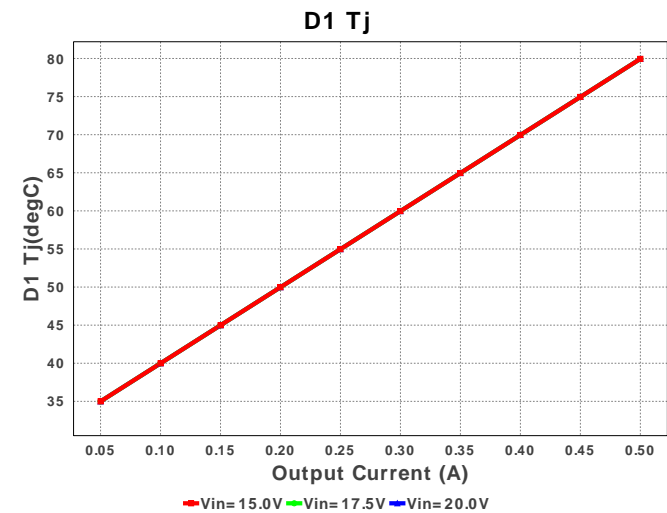
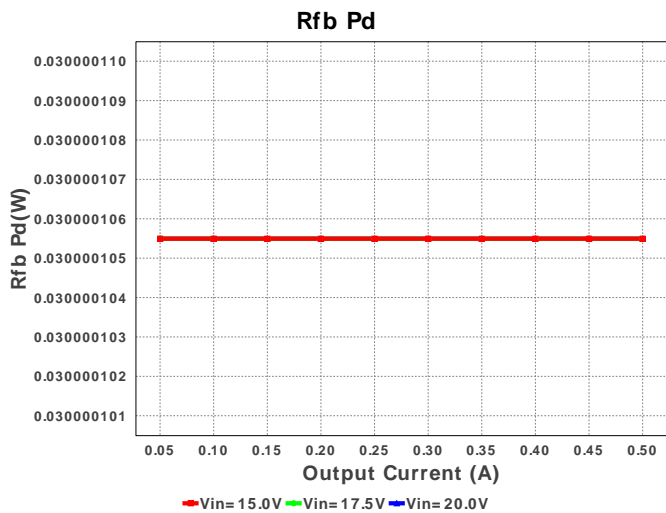
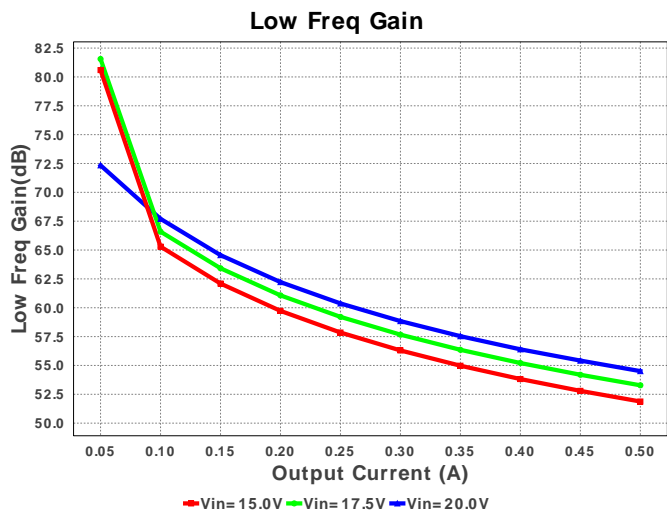
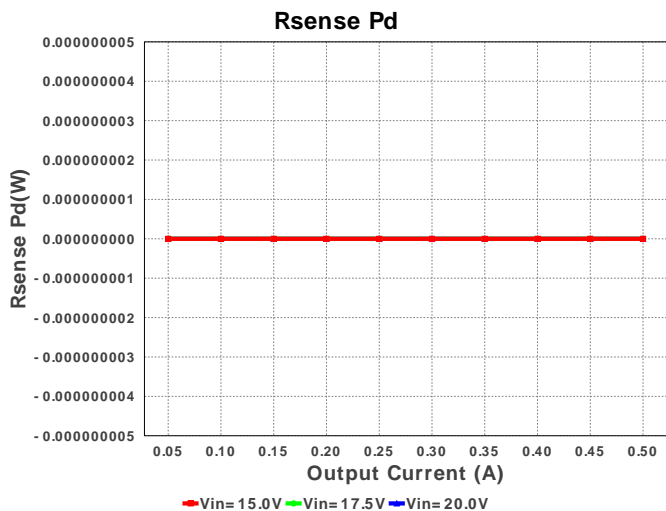
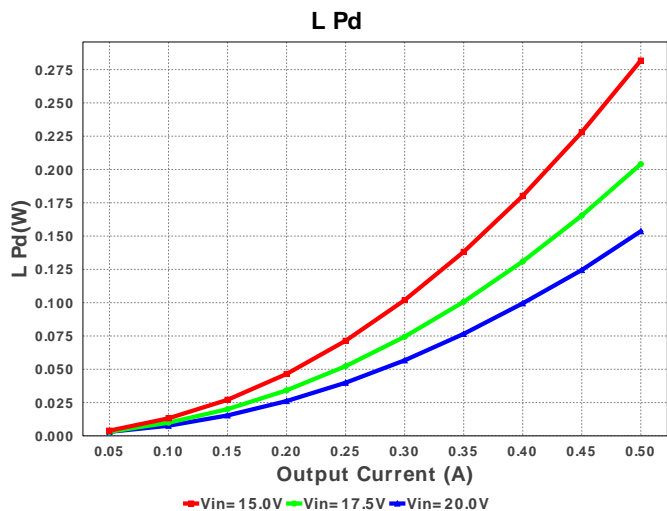
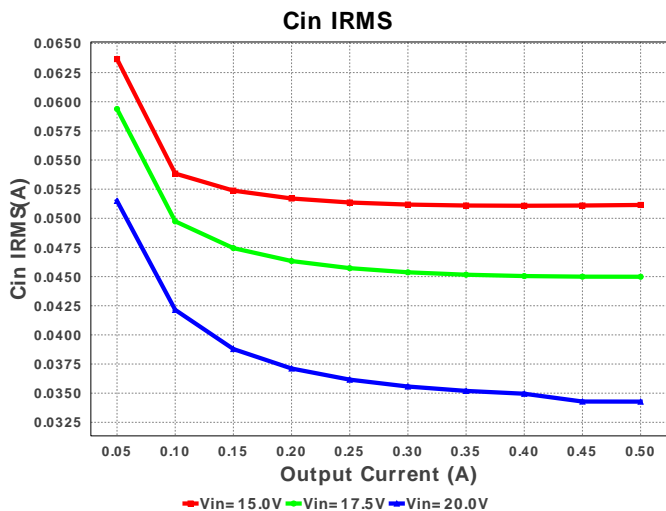
1. With the low turn of voltage of the LM34x8 your power supply may current limit before you reach your working input voltage. If this happens, or to preempt this from happening, you can include a low pass RC filter from input voltage to Vin on the IC. Make sure the rise time on the RC network is slower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

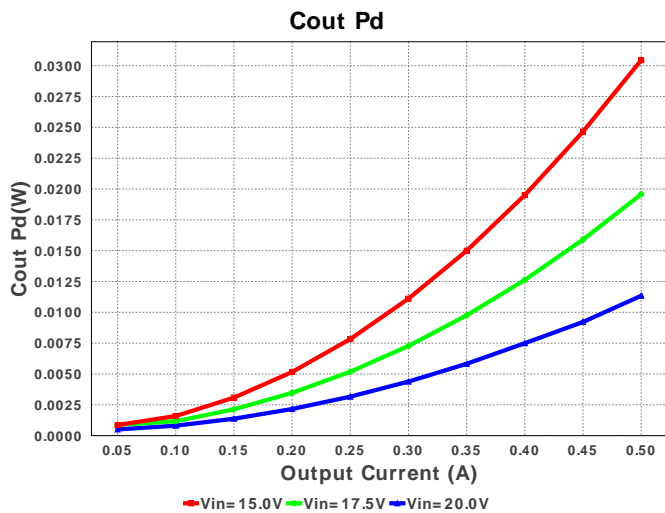
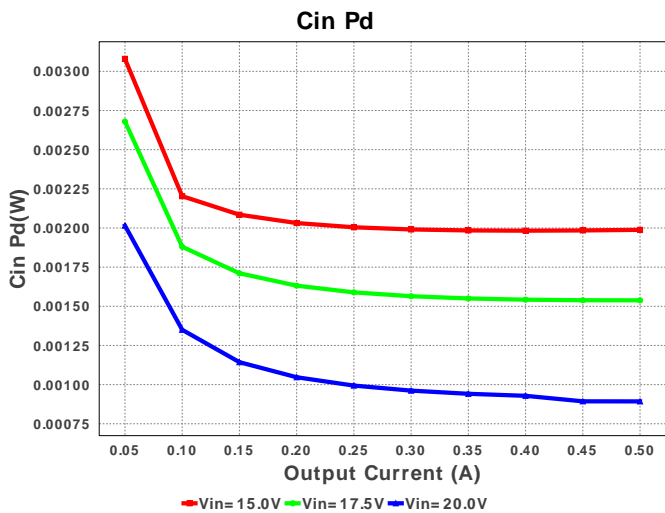
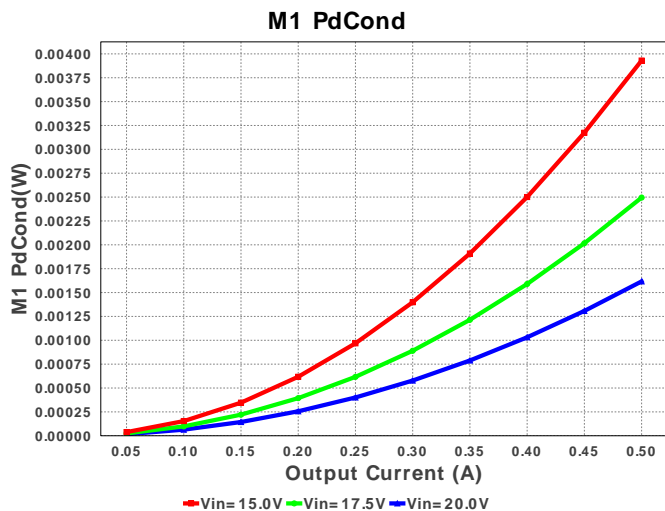
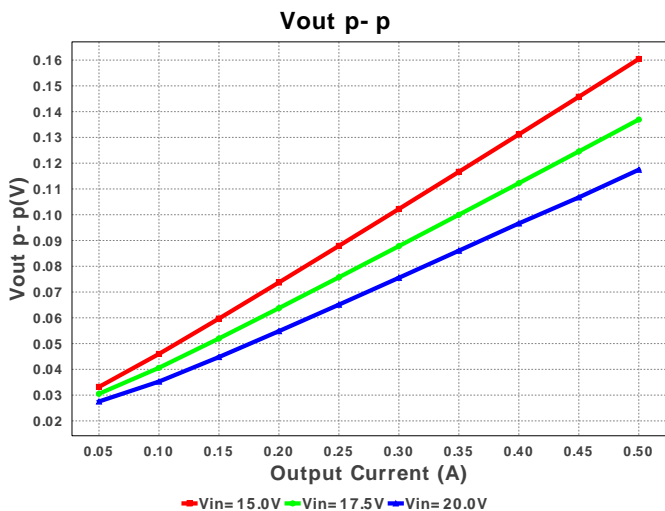
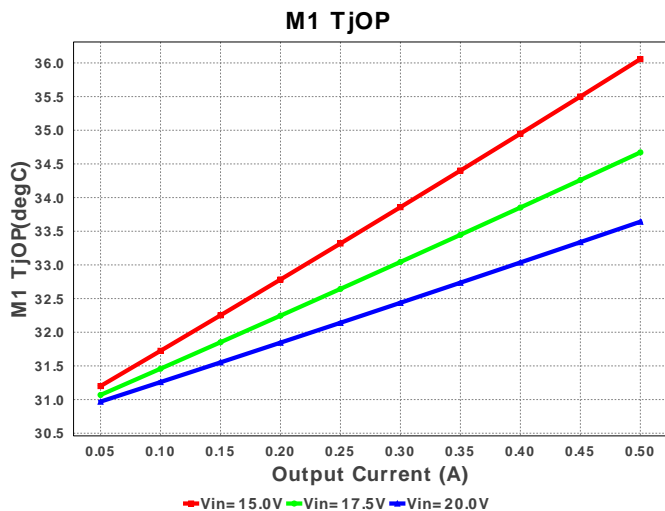
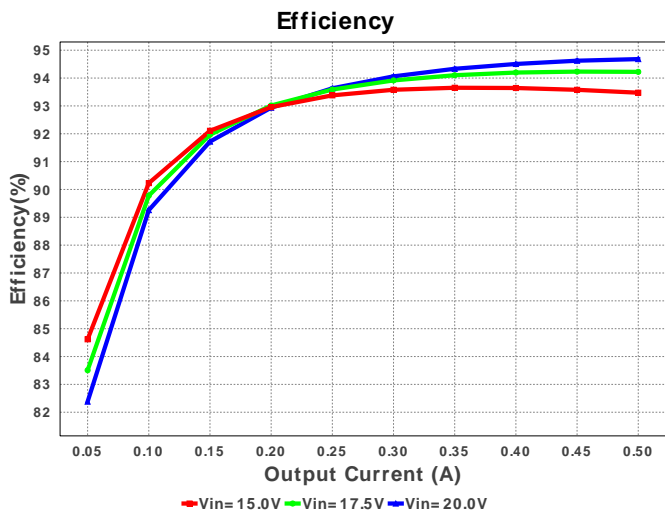
**Electrical BOM**

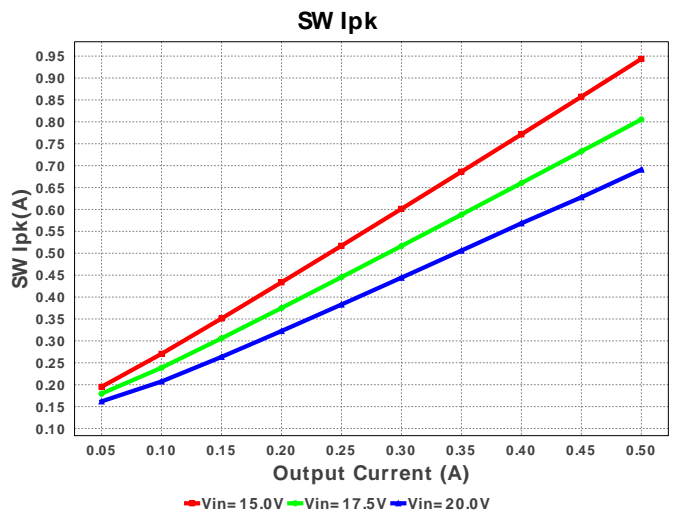
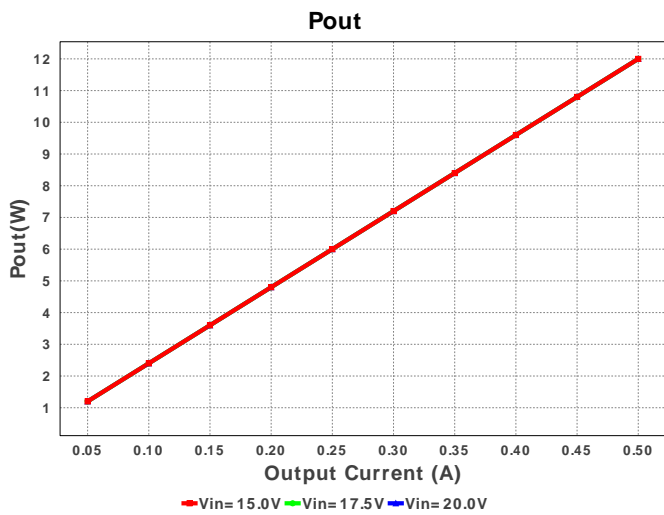
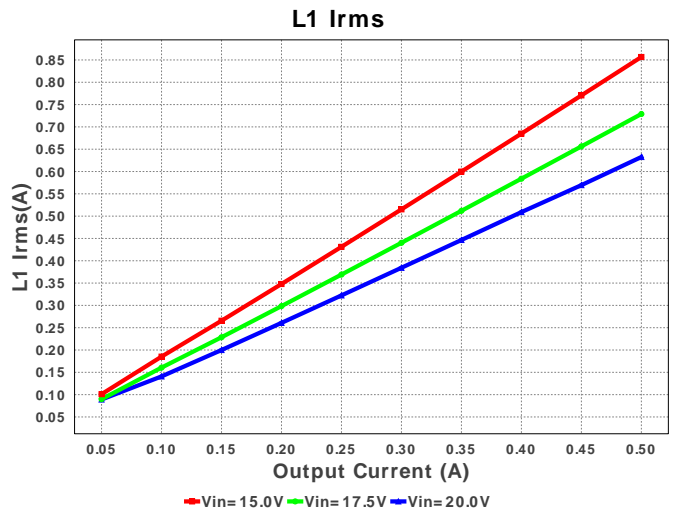
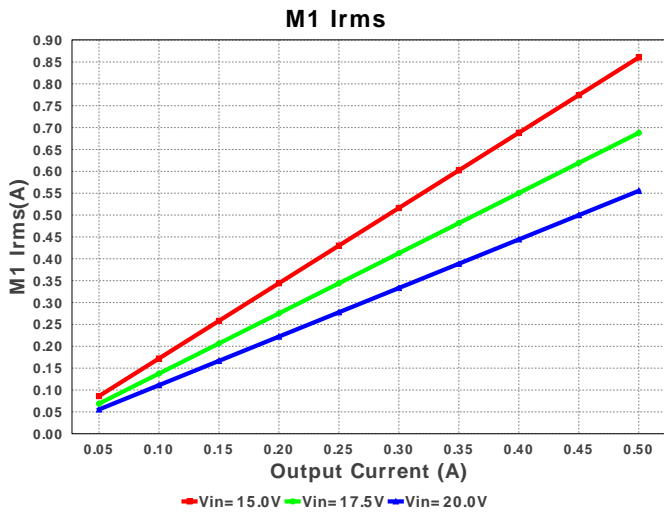
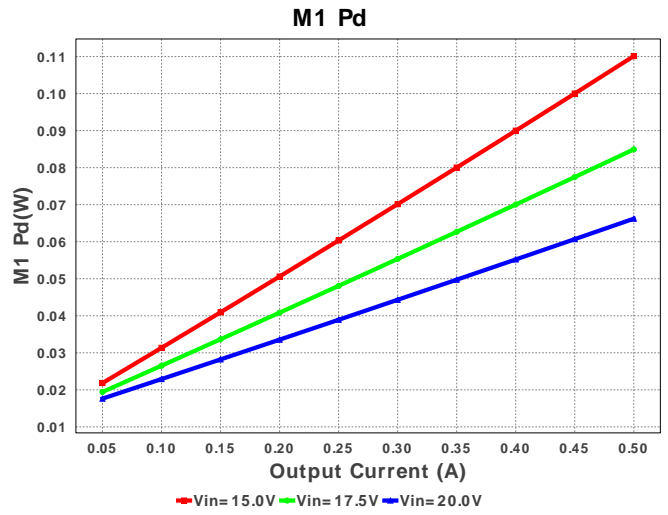
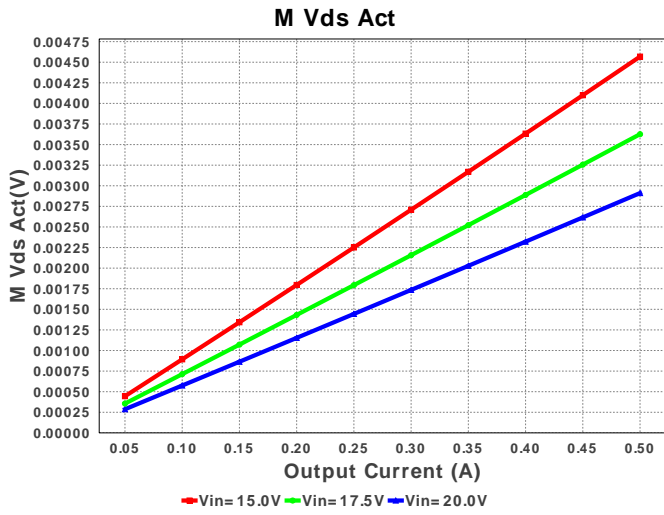
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbyp	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm <sup>2</sup>
2.	Ccomp	Yageo America	CC0805KRX7R9BB562 Series= X7R	Cap= 5.6 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm <sup>2</sup>
3.	Ccomp2	Samsung Electro-Mechanics	CL21C122JBFNNWE Series= C0G/NP0	Cap= 1.2 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm <sup>2</sup>
4.	Cin	Nichicon	UUD1V220MCL1GS Series= uD	Cap= 22.0 uF ESR= 760.0 mOhm VDC= 35.0 V IRMS= 150.0 mA	1	\$0.10	 SM_RADIAL_5MM 58 mm <sup>2</sup>
5.	Cout	Nichicon	UUD1V151MNL1GS Series= uD	Cap= 150.0 uF ESR= 170.0 mOhm VDC= 35.0 V IRMS= 450.0 mA	1	\$0.20	 SM_RADIAL_8MM 113 mm <sup>2</sup>
6.	Csense	MuRata	GRM216R71H103KA01D Series= X7R	Cap= 10.0 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm <sup>2</sup>
7.	D1	Diodes Inc.	1N5819HW-7-F	VF@Io= 450.0 mV VRRM= 40.0 V	1	\$0.08	 SOD-123 13 mm <sup>2</sup>

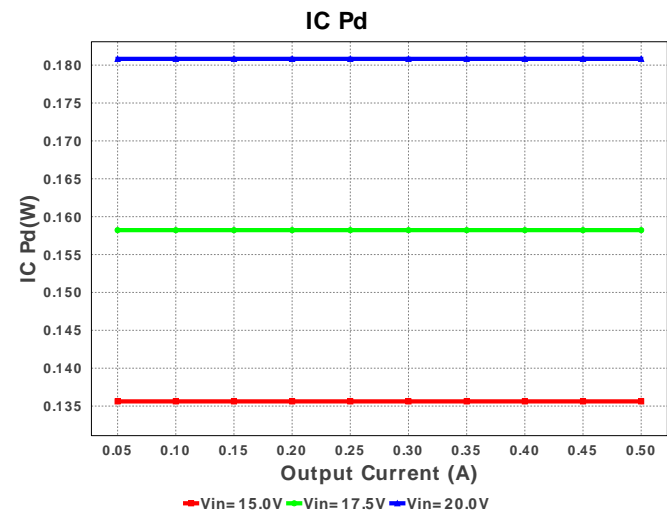
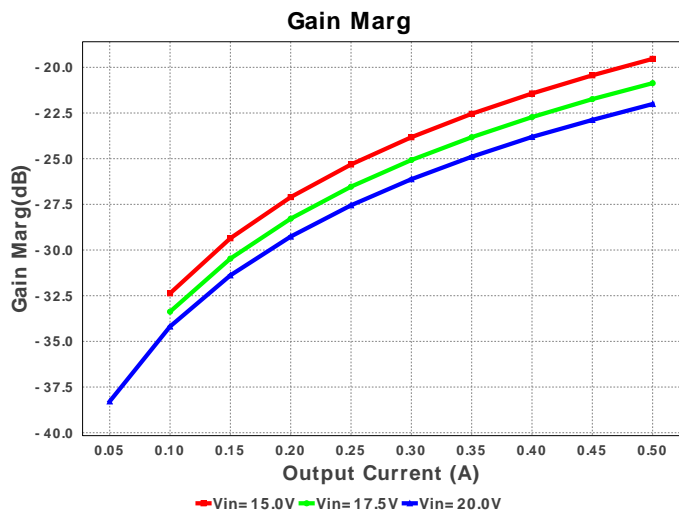
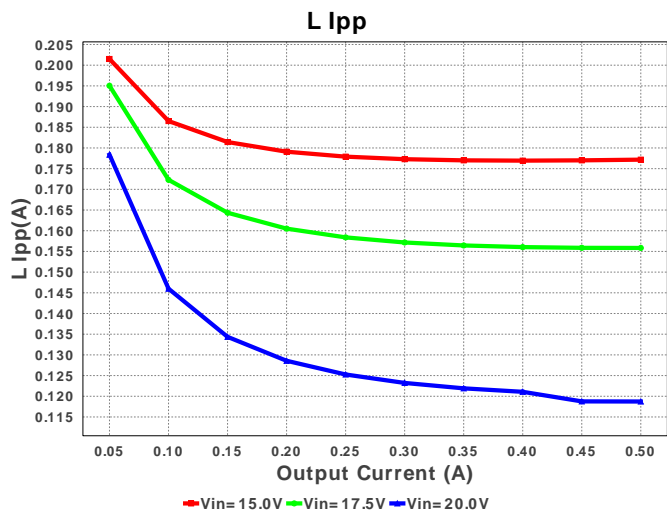
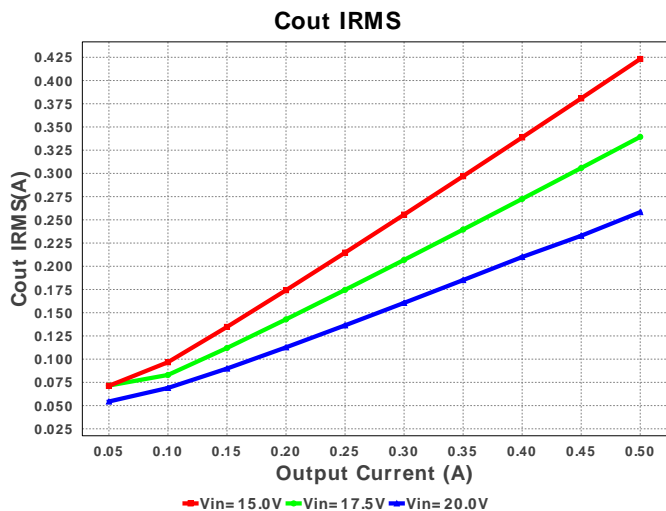
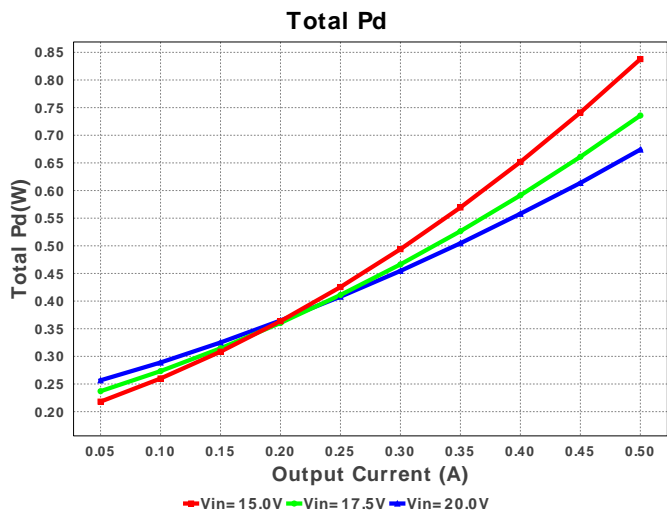
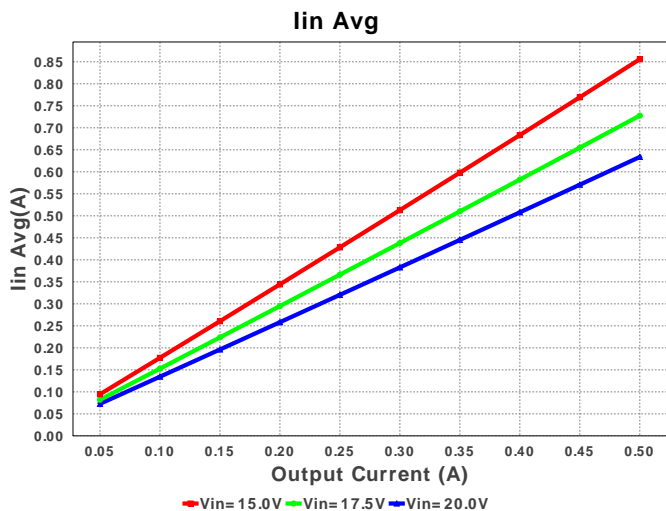
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
8.	L1	Bourns	SDR1105-101KL	L= 100.0 µH DCR= 320.0 mOhm	1	\$0.29	 SDR1105 157 mm²
9.	M1	Texas Instruments	CSD17577Q3A	VdsMax= 30.0 V IdsMax= 19.0 Amps	1	\$0.28	 TRANS_NexFET_Q3A 18 mm²
10.	Rcomp	Vishay-Dale	CRCW040220K0FKED Series= CRCW..e3	Res= 20.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
11.	Rfadj	Vishay-Dale	CRCW040246K4FKED Series= CRCW..e3	Res= 46.4 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
12.	Rfb1	Vishay-Dale	CRCW04021K00FKED Series= CRCW..e3	Res= 1000.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
13.	Rfb2	Vishay-Dale	CRCW040218K2FKED Series= CRCW..e3	Res= 18.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
14.	Rs1	Vishay-Dale	CRCW0402100RFKED Series= CRCW..e3	Res= 100.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
15.	Rsense	Panasonic	ERJ-L03UF75MV Series= ERJ-L03	Res= 75.0 mOhm Power= 100.0 mW Tolerance= 1.0%	1	\$0.09	 0603 5 mm²
16.	U1	Texas Instruments	LM3478MM/NOPB	Switcher	1	\$0.80	 MUA08A 24 mm²

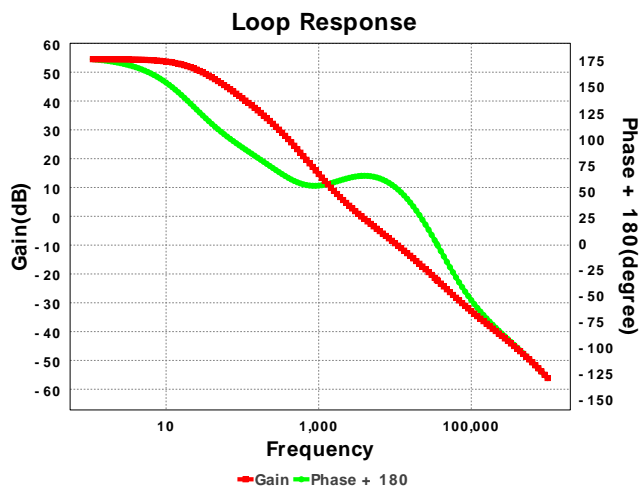
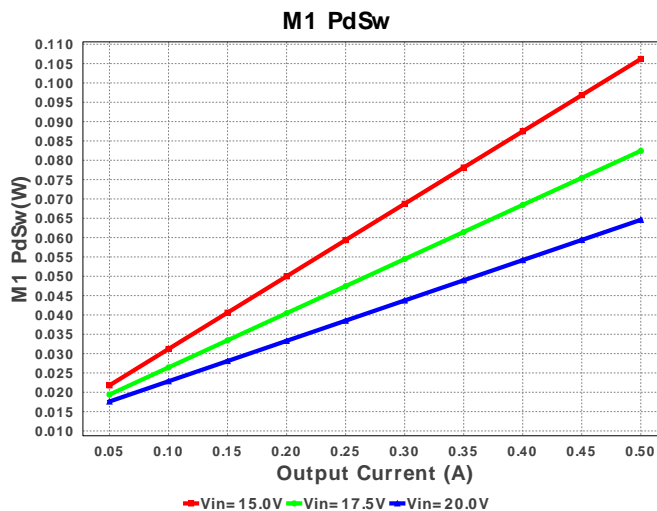
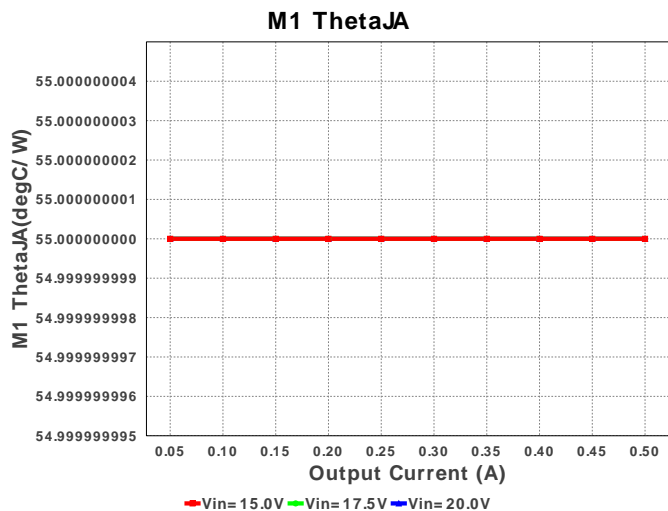
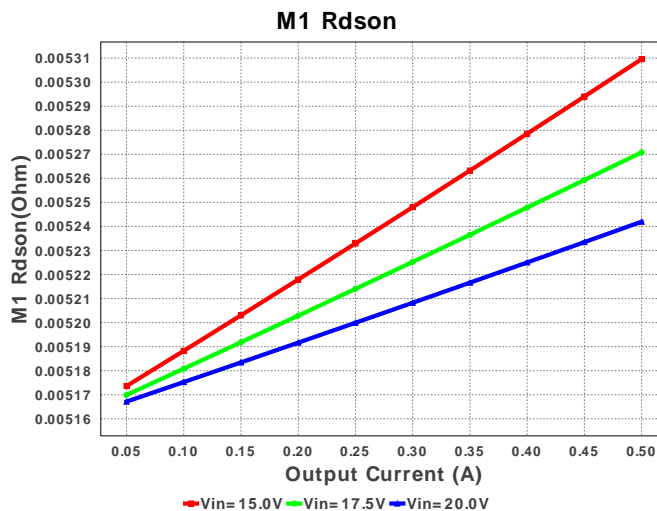
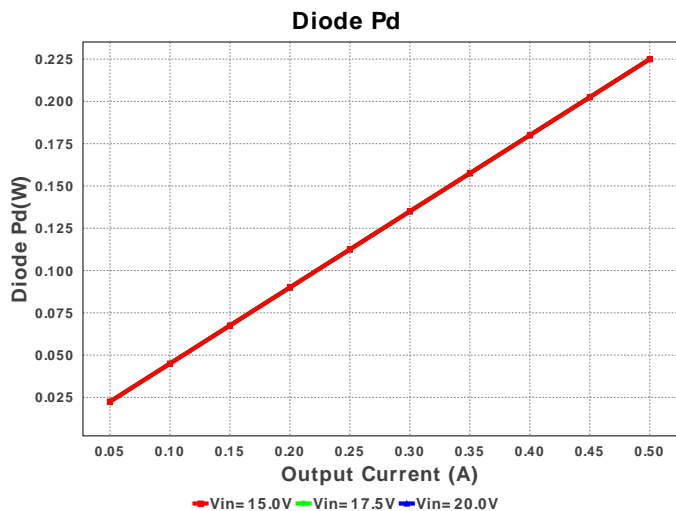












### Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	51.149 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	423.215 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	855.89 mA	Current	Average input current
4.	L Ipp	177.19 mA	Current	Peak-to-peak inductor ripple current
5.	L1 Irms	856.691 mA	Current	Inductor ripple current
6.	M1 Irms	858.57 mA	Current	M1 MOSFET Irms
7.	SW Ipk	943.756 mA	Current	Peak switch current
8.	BOM Count	16	General	Total Design BOM count
9.	FootPrint	431.0 mm <sup>2</sup>	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	4.559 mV	General	M Vds
13.	M1 Rdson	5.31 mOhm	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	\$1.93	General	Total BOM Cost
17.	D1 Tj	79.95 degC	Op_Point	D1 junction temperature
18.	Low Freq Gain	51.875 dB	Op_Point	Gain at 10Hz
19.	Vout OP	24.0 V	Op_Point	Operational Output Voltage
20.	Cross Freq	2.79 kHz	Op_point	Bode plot crossover frequency
21.	Duty Cycle	41.532 %	Op_point	Duty cycle
22.	Efficiency	93.47 %	Op_point	Steady state efficiency
23.	Gain Marg	-19.536 dB	Op_point	Bode Plot Gain Margin
24.	IC Tj	57.175 degC	Op_point	IC junction temperature
25.	ICThetaJA	200.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
26.	IOUT_OP	500.0 mA	Op_point	Iout operating point
27.	M1 TjOP	36.075 degC	Op_point	M1 MOSFET junction temperature
28.	Phase Marg	61.879 deg	Op_point	Bode Plot Phase Margin
29.	VIN_OP	15.0 V	Op_point	Vin operating point
30.	Vout p-p	160.438 mV	Op_point	Peak-to-peak output ripple voltage
31.	Cin Pd	1.988 mW	Power	Input capacitor power dissipation
32.	Cout Pd	30.449 mW	Power	Output capacitor power dissipation
33.	Diode Pd	225.0 mW	Power	Diode power dissipation
34.	IC Pd	135.877 mW	Power	IC power dissipation
35.	L Pd	281.825 mW	Power	Inductor power dissipation
36.	M1 Pd	110.456 mW	Power	M1 MOSFET total power dissipation
37.	M1 PdCond	3.914 mW	Power	M1 MOSFET conduction losses
38.	M1 PdSw	106.542 mW	Power	M1 MOSFET switching losses
39.	Rfb Pd	30.0 mW	Power	Rfb Power Dissipation
40.	Rsense Pd	49.828 mW	Power	Rsense Power Dissipation
41.	Total Pd	838.344 mW	Power	Total Power Dissipation

## Design Inputs

#	Name	Value	Description
1.	Iout	500.0 m	Maximum Output Current
2.	Iout1	500.0 m	Output Current #1
3.	VinMax	20.0	Maximum input voltage
4.	VinMin	15.0	Minimum input voltage
5.	Vout	24.0	Output Voltage
6.	Vout1	24.0	Output Voltage #1
7.	base_pn	LM3478	Texas Instruments Base Part Number
8.	source	DC	Input Source Type
9.	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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