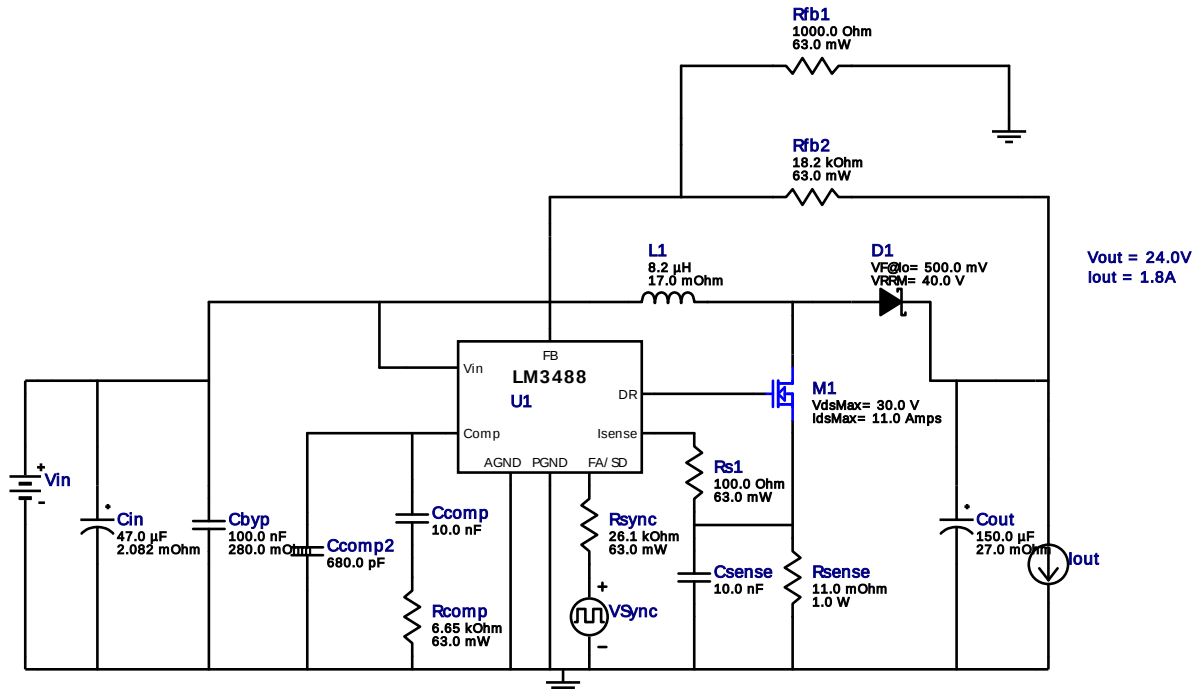


WEBENCH® Design Report

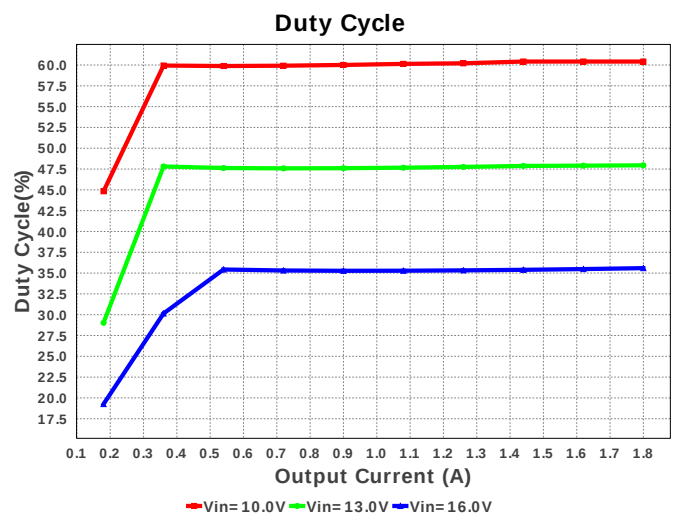
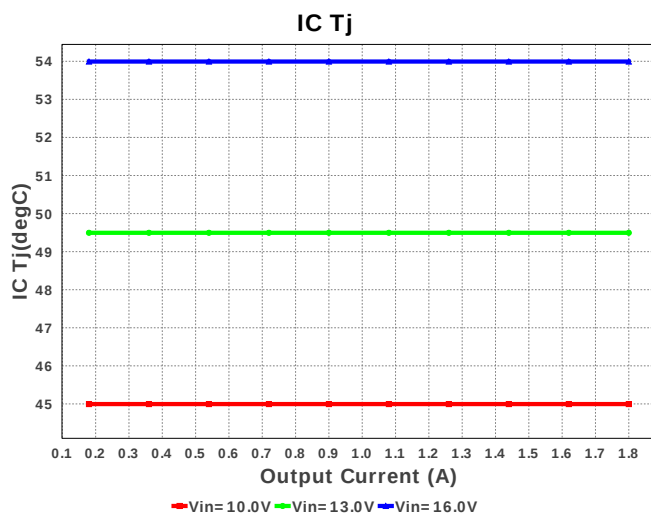
Design : 4502117/165 LM3488MMX/NOPB
LM3488MMX/NOPB 10.0V-16.0V to 24.00V @ 1.8A


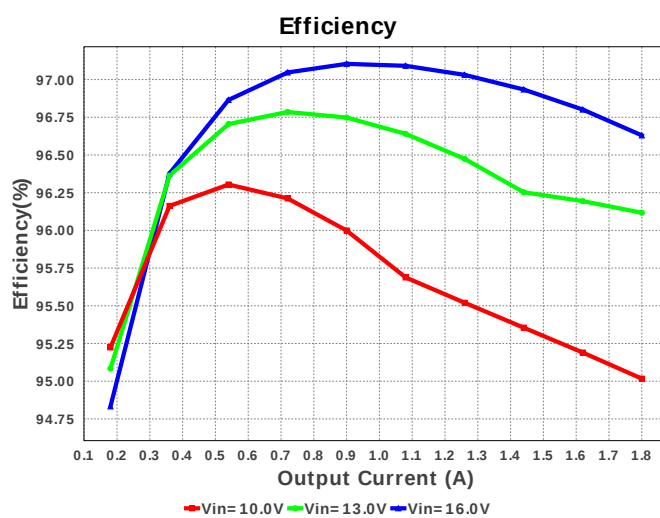
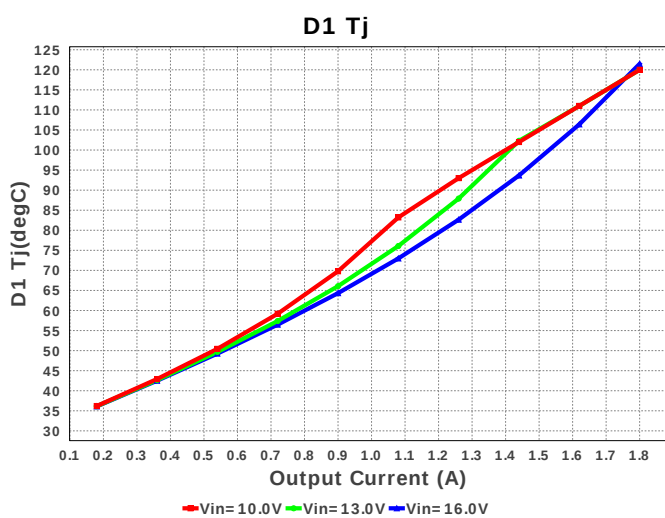
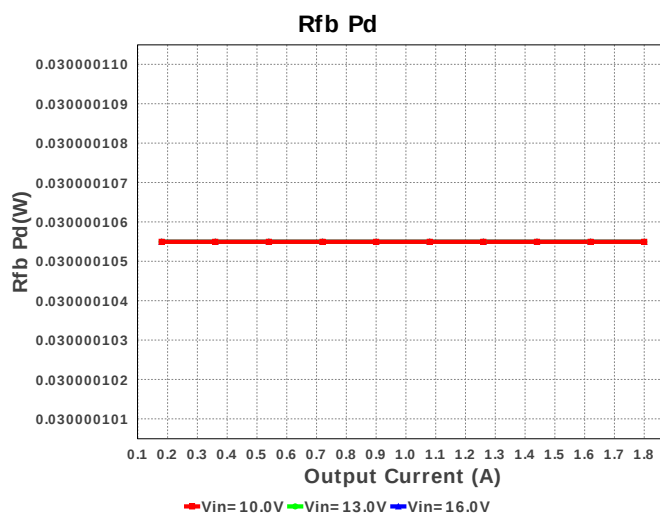
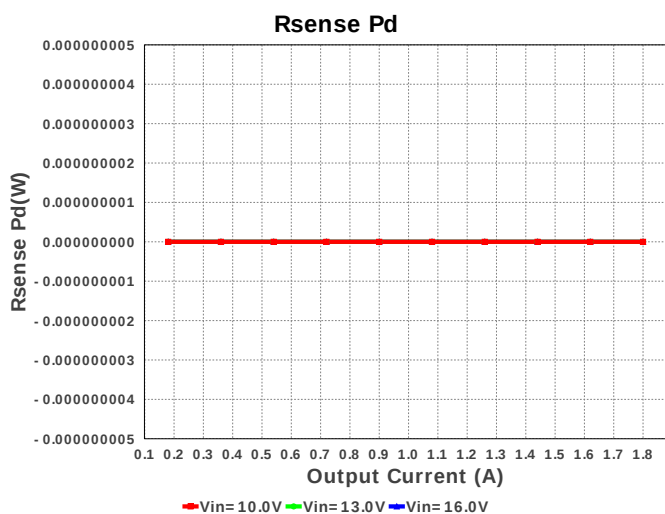
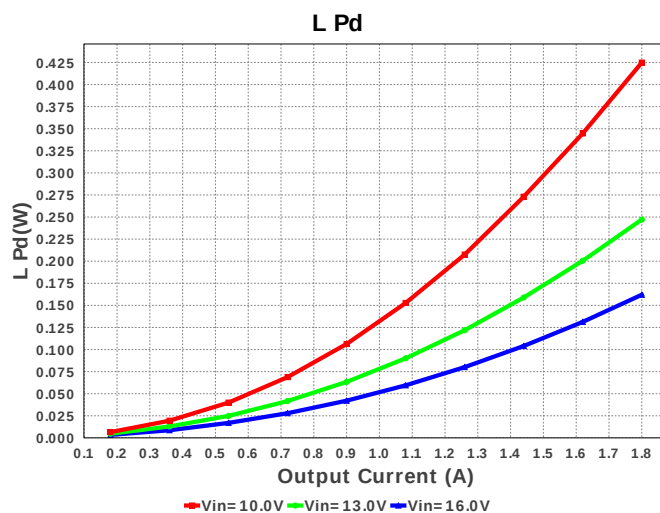
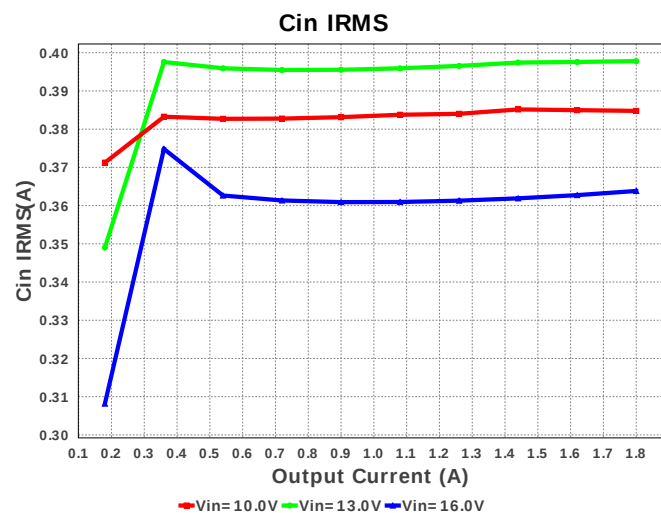
1. With the low turn of voltage of the LM34x8 your power supply may current limit before you reach your working input voltage. If this happens, or to preempt this from happening, you can include a low pass RC filter from input voltage to Vin on the IC. Make sure the rise time on the RC network is slower than your supply's rise time. If you are not using the synchronization feature of the part use the LM3478.

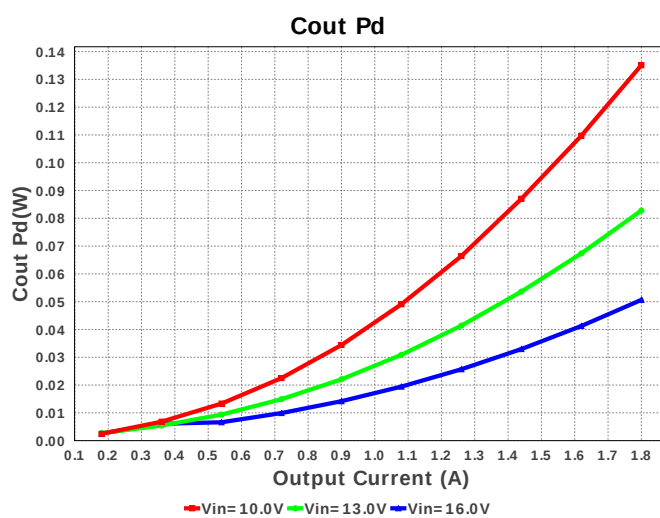
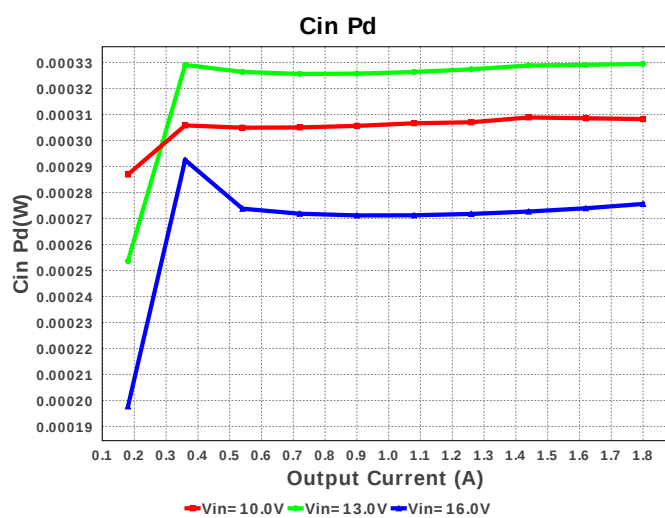
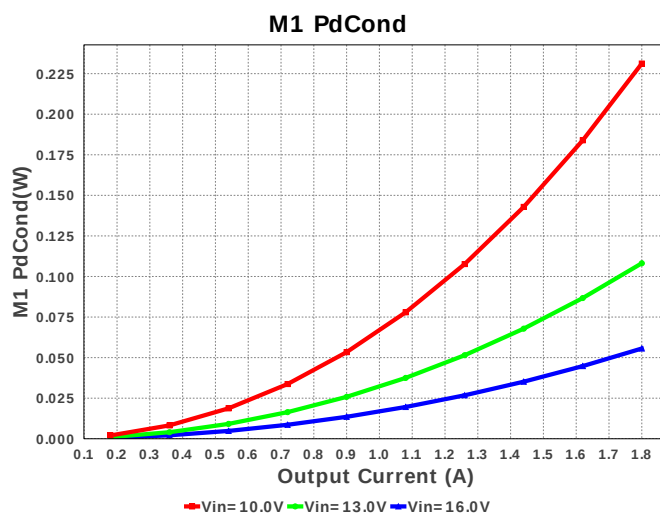
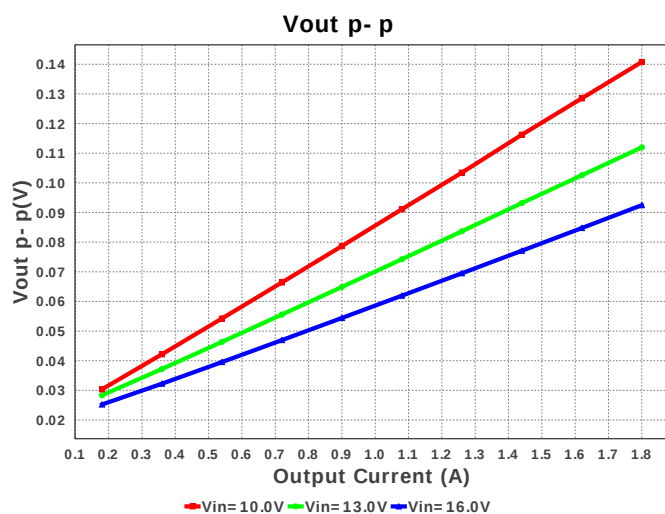
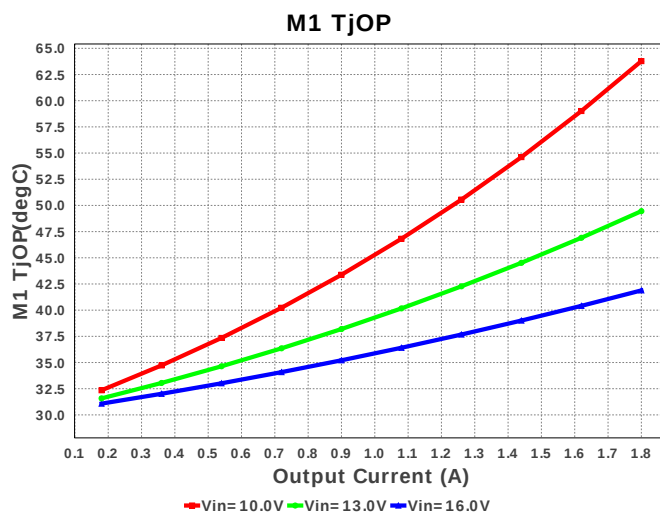
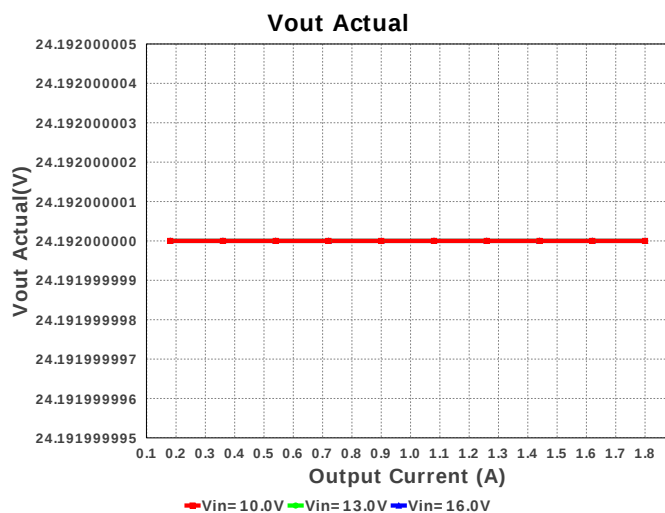
Electrical BOM

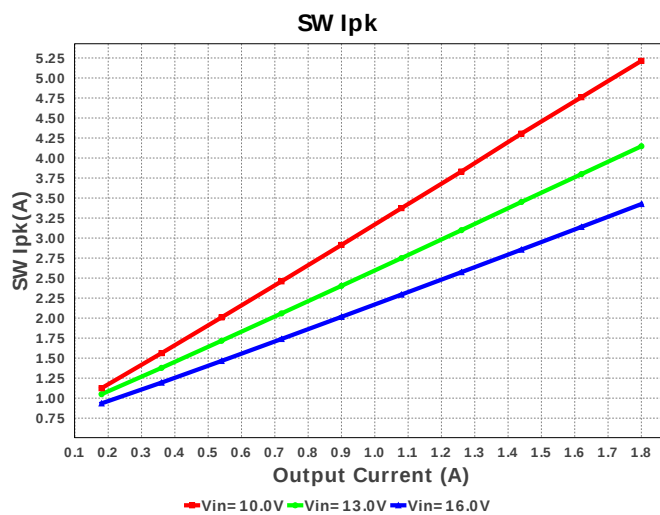
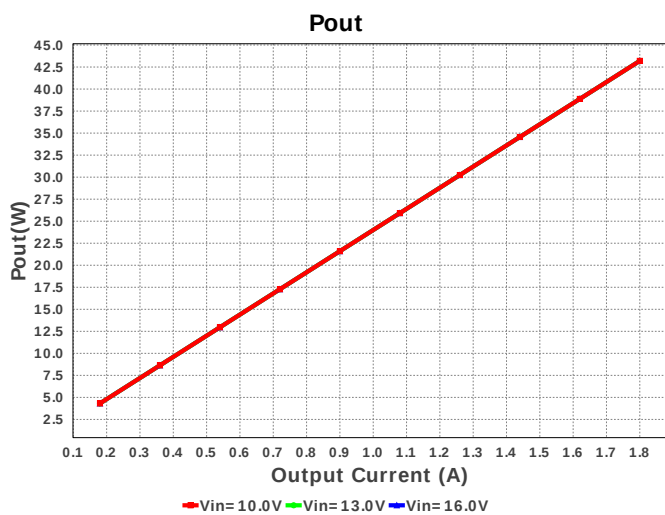
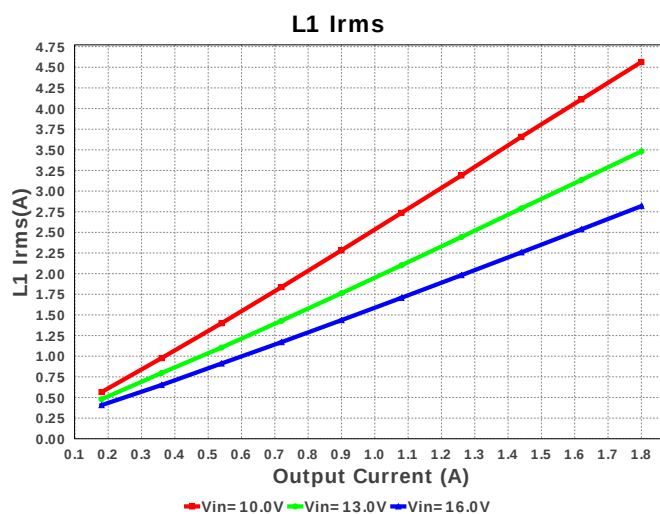
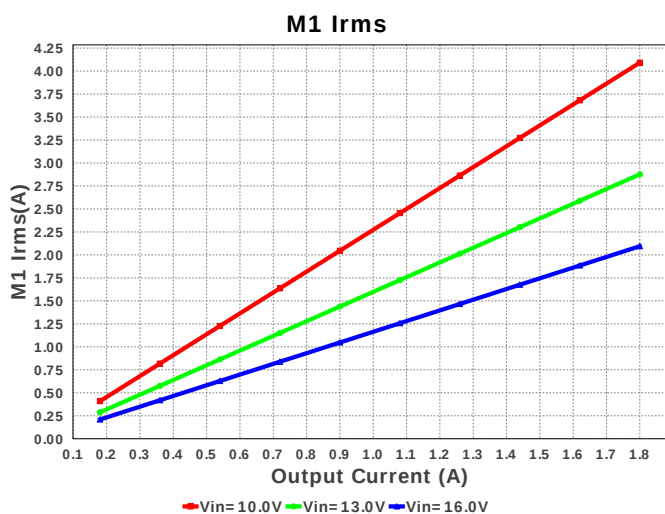
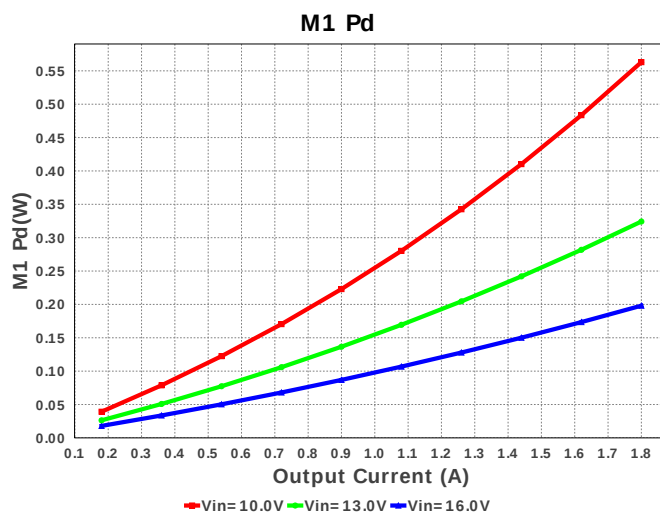
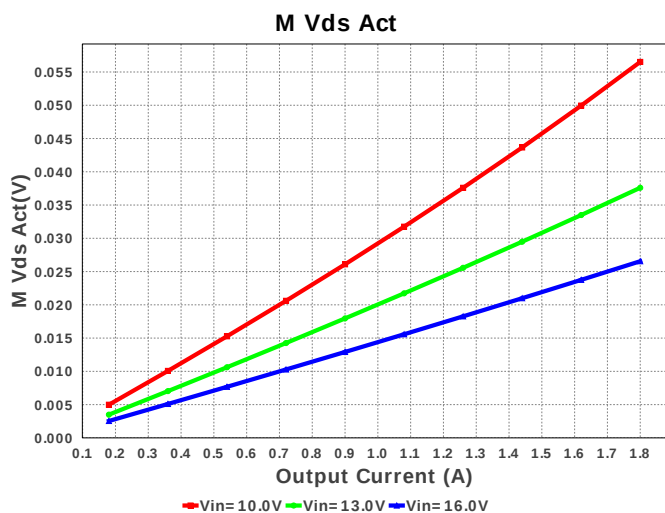
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbyp	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
2.	Ccomp	MuRata	GRM216R71H103KA01D Series= X7R	Cap= 10.0 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
3.	Ccomp2	Yageo America	CC0805KRX7R9BB681 Series= X7R	Cap= 680.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
4.	Cin	TDK	C3216X5R1E476M160AC Series= X5R	Cap= 47.0 uF ESR= 2.082 mOhm VDC= 25.0 V IRMS= 5.0279 A	1	\$0.35	1206 11 mm ²
5.	Cout	Panasonic	EEHZA1V151P Series= ?	Cap= 150.0 uF ESR= 27.0 mOhm VDC= 35.0 V IRMS= 2.3 A	1	\$0.97	SM_RADIAL_8MM 113 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	Diodes Inc.	B340A-13-F	Vf@Io= 500.0 mV VRRM= 40.0 V	1	\$0.11	SMA 37 mm ²

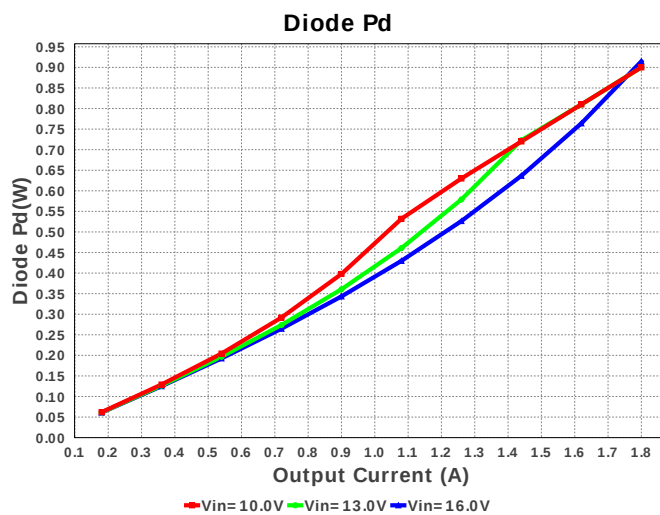
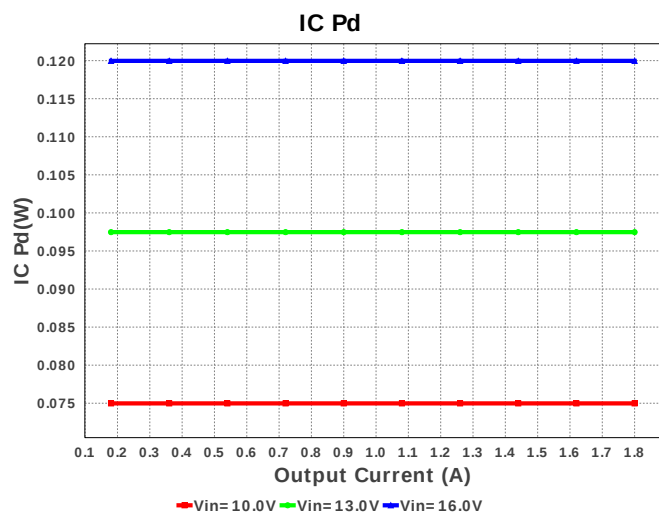
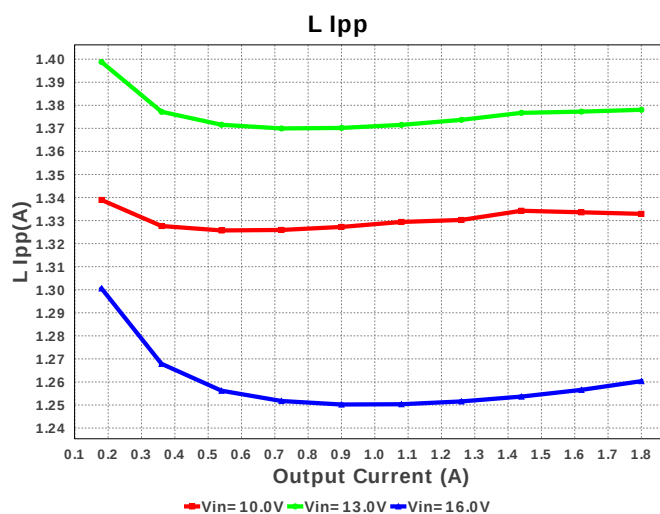
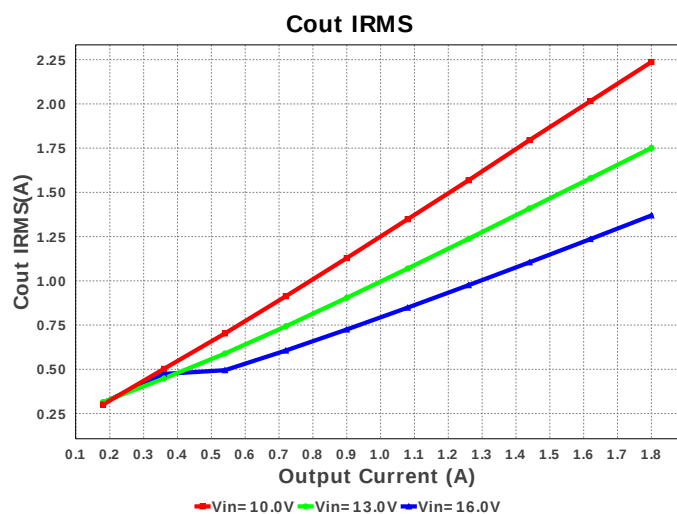
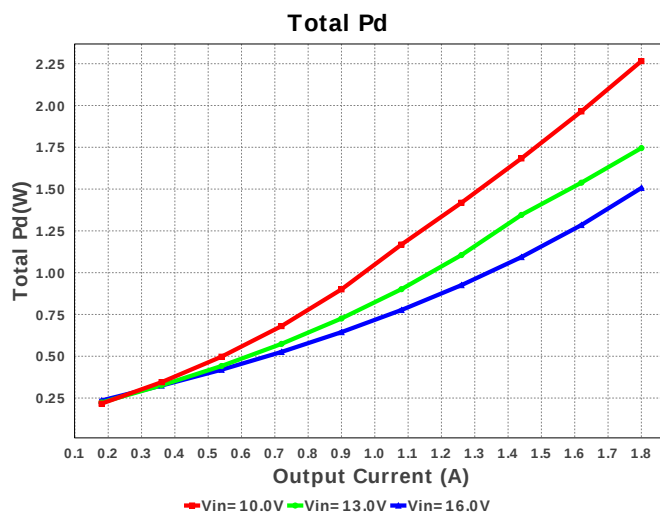
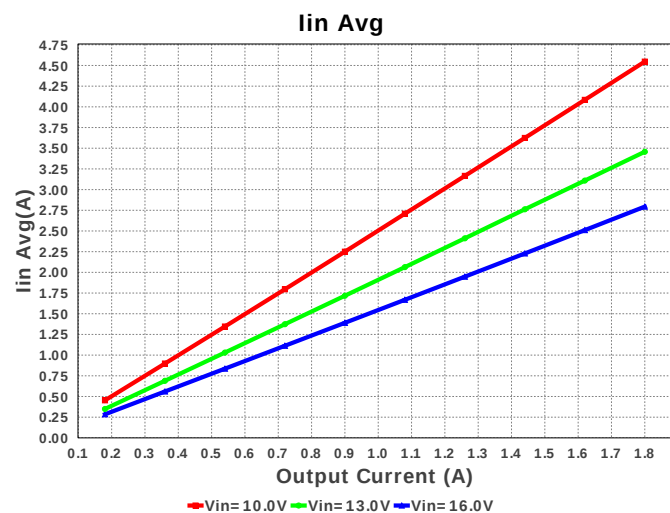
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
8.	L1	Bourns	SRR1210-8R2Y	L= 8.2 μ H DCR= 17.0 mOhm	1	\$0.44	 SRR1210 196 mm ²
9.	M1	Texas Instruments	CSD17579Q3A	VdsMax= 30.0 V IdsMax= 11.0 Amps	1	\$0.23	 TRANS_NexFET_Q3A 18 mm ²
10.	Rcomp	Vishay-Dale	CRCW04026K65FKED Series= CRCW..e3	Res= 6.65 kOhm Power= 63.0 mW Tolerance= 1.0%	1	NA	 0402 3 mm ²
11.	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
12.	Rfb2	Vishay-Dale	CRCW040218K2FKED Series= CRCW..e3	Res= 18.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	NA	 0402 3 mm ²
13.	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
14.	Rsense	Susumu Co Ltd	PRL1632-R011-F-T1 Series= PRL1632	Res= 11.0 mOhm Power= 1.0 W Tolerance= 1.0%	1	NA	 0612 11 mm ²
15.	Rsync	Vishay-Dale	CRCW040226K1FKED Series= CRCW..e3	Res= 26.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
16.	U1	Texas Instruments	LM3488MMX/NOPB	Switcher	1	\$0.80	 MUA08A 24 mm ²

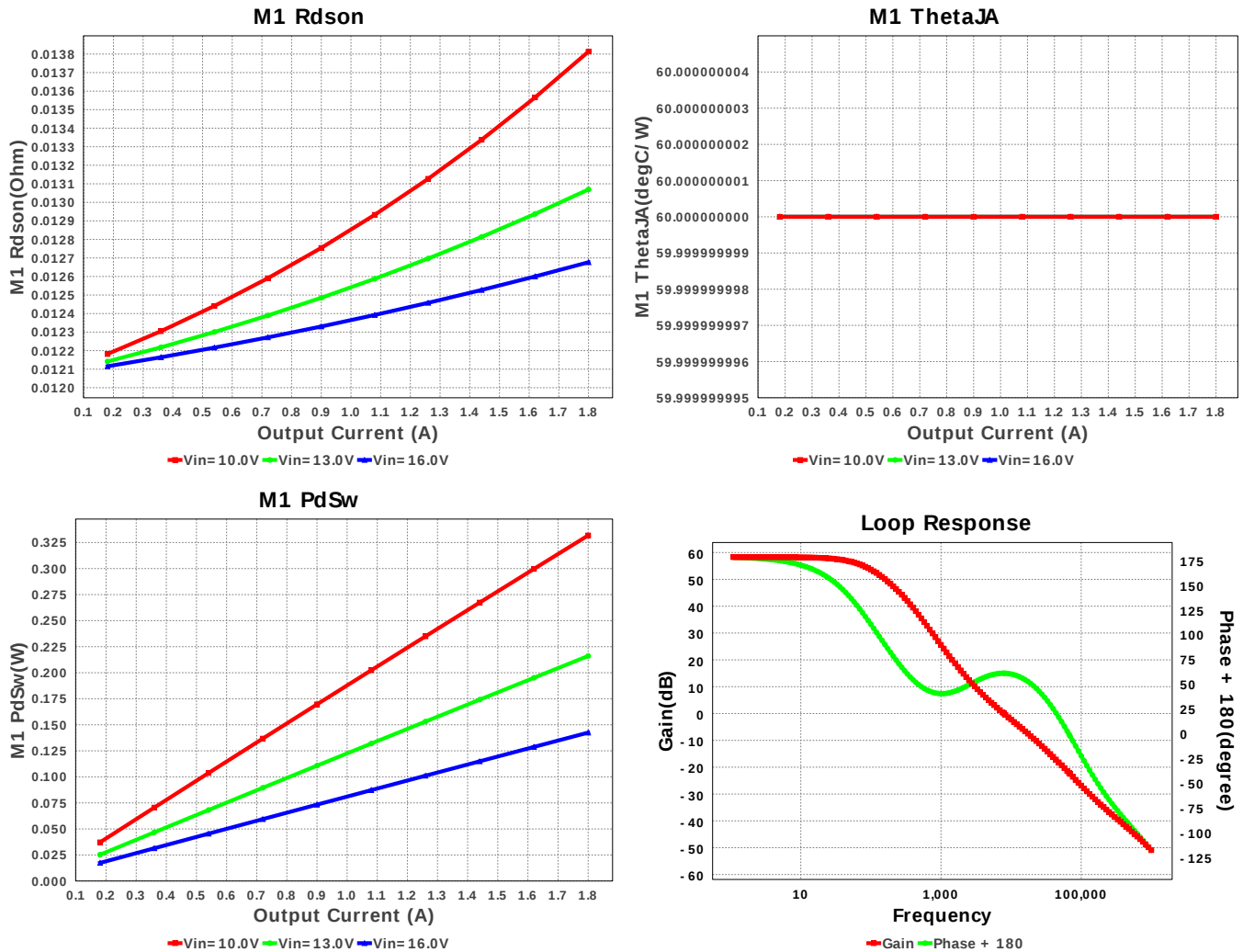












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	384.779 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	2.237 A	Current	Output capacitor RMS ripple current
3.	Iin Avg	4.547 A	Current	Average input current
4.	L Ipp	1.333 A	Current	Peak-to-peak inductor ripple current
5.	L1 Irms	4.564 A	Current	Inductor ripple current
6.	M1 Irms	4.091 A	Current	M1 MOSFET Irms
7.	SW Ipk	5.214 A	Current	Peak switch current
8.	BOM Count	16	General	Total Design BOM count
9.	FootPrint	453.0 mm ²	General	Total Foot Print Area of BOM components
10.	Frequency	550.0 kHz	General	Switching frequency
11.	IC Tolerance	15.3 mV	General	IC Feedback Tolerance
12.	M Vds Act	56.513 mV	General	M Vds
13.	M1 Rdson	13.814 mOhm	General	Drain-Source On-resistance
14.	M1 ThetaJA	60.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
15.	Pout	43.2 W	General	Total output power
16.	Total BOM	\$0.0	General	Total BOM Cost
17.	D1 Tj	120.0 degC	Op_Point	D1 junction temperature
18.	Low Freq Gain	54.044 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	5.193 kHz	Op_point	Bode plot crossover frequency
22.	Duty Cycle	60.417 %	Op_point	Duty cycle
23.	Efficiency	95.017 %	Op_point	Steady state efficiency
24.	Gain Marg	-18.331 dB	Op_point	Bode Plot Gain Margin
25.	IC Tj	44.996 degC	Op_point	IC junction temperature
26.	ICThetaJA	200.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
27.	IOUT_OP	1.8 A	Op_point	Iout operating point
28.	M1 TjOP	63.781 degC	Op_point	M1 MOSFET junction temperature
29.	Phase Marg	56.355 deg	Op_point	Bode Plot Phase Margin
30.	VIN_OP	10.0 V	Op_point	Vin operating point
31.	Vout p-p	140.773 mV	Op_point	Peak-to-peak output ripple voltage

#	Name	Value	Category	Description
32.	Cin Pd	308.251 μ W	Power	Input capacitor power dissipation
33.	Cout Pd	135.104 mW	Power	Output capacitor power dissipation
34.	Diode Pd	900.0 mW	Power	Diode power dissipation
35.	IC Pd	74.98 mW	Power	IC power dissipation
36.	L Pd	424.863 mW	Power	Inductor power dissipation
37.	M1 Pd	563.014 mW	Power	M1 MOSFET total power dissipation
38.	M1 PdCond	231.206 mW	Power	M1 MOSFET conduction losses
39.	M1 PdSw	331.808 mW	Power	M1 MOSFET switching losses
40.	Rfb Pd	30.0 mW	Power	Rfb Power Dissipation
41.	Rsense Pd	215.159 mW	Power	LED Current Rsns Power Dissipation
42.	Total Pd	2.266 W	Power	Total Power Dissipation
43.	Vout Tolerance	3.153 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	1.8	Maximum Output Current
2.	VinMax	16.0	Maximum input voltage
3.	VinMin	10.0	Minimum input voltage
4.	Vout	24.0	Output Voltage
5.	base_pn	LM3488	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature
8.	UserFsw	550.0 k	Customer Selected Frequency

Design Assistance

1. **LM3488** Product Folder : <http://www.ti.com/product/LM3488> : contains the data sheet and other resources.

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