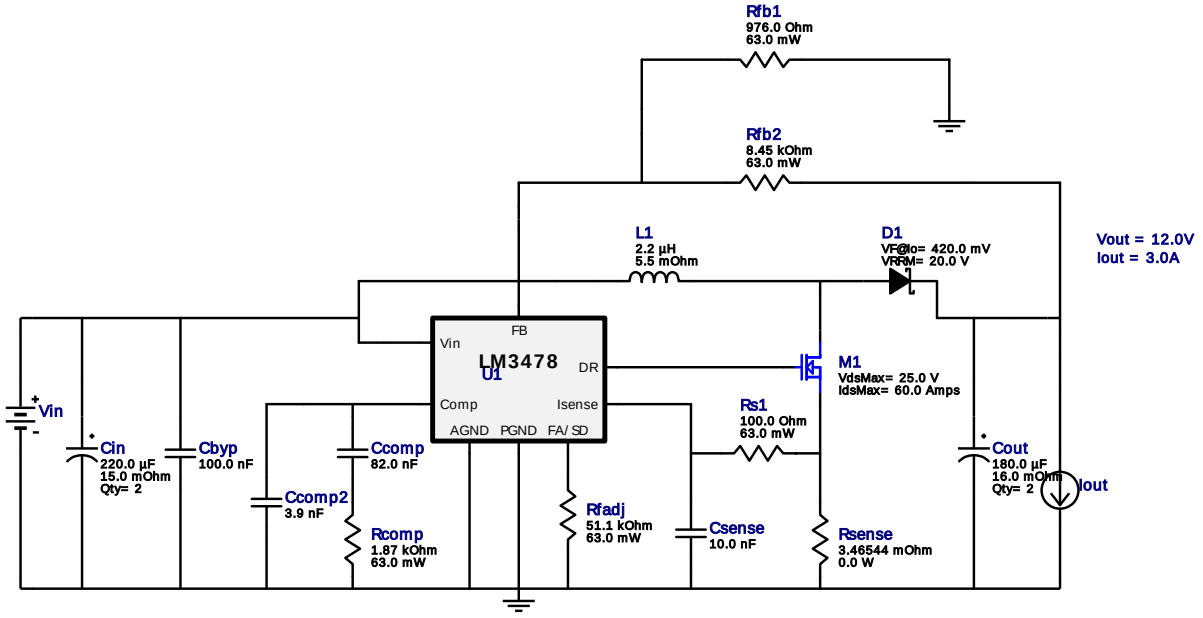
WEBENCH® Design Report

VinMin = 3.3V
VinMax = 4.2V
Vout = 12.0V
Iout = 3.0A

Device = LM3478MMX/NOPB
Topology = Boost
Created = 5/16/17 12:29:02 AM
BOM Cost = $0.00
BOM Count = 18
Total Pd = 4.37W

Design : 4957324/26 LM3478MMX/NOPB
LM3478MMX/NOPB 3.3V-4.2V to 12.00V @ 3.0A



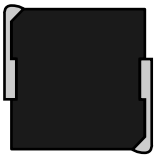
1. With the low turn of voltage of the LM34x8 your power supply may current limit before you reach your working input voltage. If this happens, or to preempt this from happening, you can include a low pass RC filter from input voltage to Vin on the IC. Make sure the rise time on the RC network is slower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

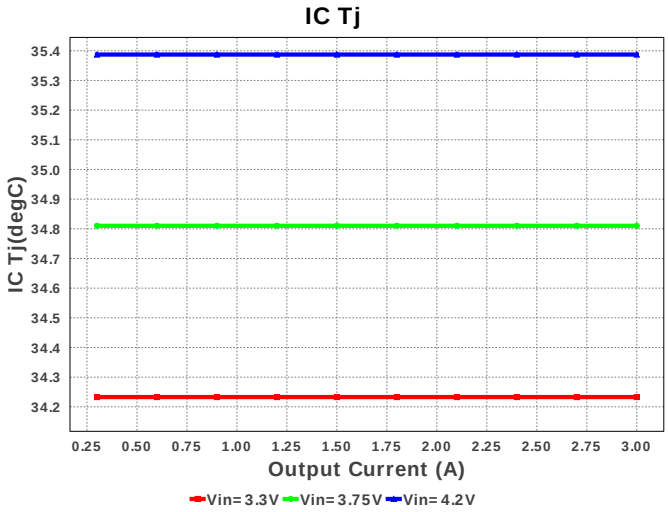
My Comments

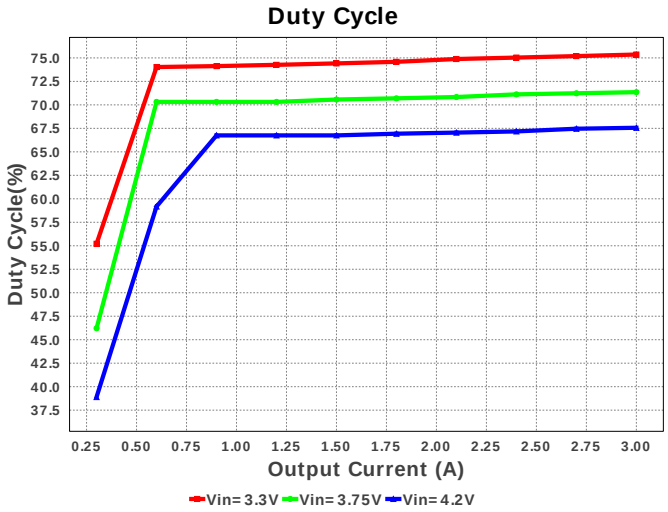
No comments

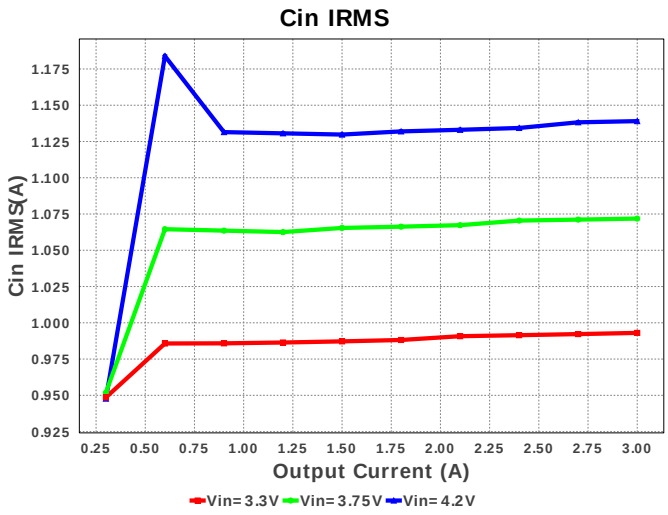
Electrical BOM

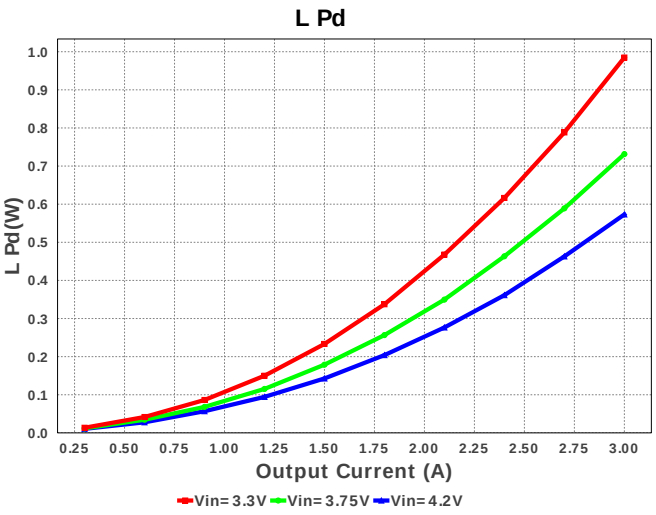
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbyp	MuRata	GRM155R60J104KA01D Series= X5R	Cap= 100.0 nF VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
2.	Ccomp	MuRata	GRM155R61A823KA01D Series= X5R	Cap= 82.0 nF VDC= 10.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
3.	Ccomp2	Yageo America	CC0805KRX7R9BB392 Series= X7R	Cap= 3.9 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
4.	Cin	Panasonic	6SVPE220MW Series= SVPE	Cap= 220.0 uF ESR= 15.0 mOhm VDC= 6.3 V IRMS= 3.15 A	2	$0.21	CAPSMT_62_E61 53 mm²
5.	Cout	Panasonic	25SVPF180M Series= SVPF	Cap= 180.0 uF ESR= 16.0 mOhm VDC= 25.0 V IRMS= 4.65 A	2	$0.64	CAPSMT_62_E12 106 mm²
6.	Csense	Yageo America	CC0805KRX7R9BB103 Series= X7R	Cap= 10.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
7.	D1	Vishay-Semiconductor	SL42-E3/57T	VF@Io= 420.0 mV VRRM= 20.0 V	1	$0.35	SMC 83 mm²

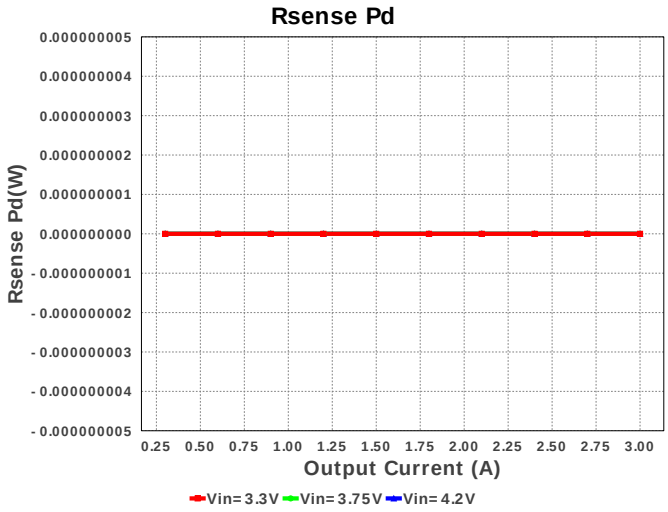
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
8.	L1	Bourns	SRP1250-2R2M	L= 2.2 µH DCR= 5.5 mOhm	1	$0.64	 SRP1250 253 mm²
9.	M1	Texas Instruments	CSD16323Q3	VdsMax= 25.0 V IdsMax= 60.0 Amps	1	$0.36	 DQG0008A 18 mm²
10.	Rcomp	Vishay-Dale	CRCW04021K87FKED Series= CRCW..e3	Res= 1.87 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
11.	Rfadj	Vishay-Dale	CRCW040251K1FKED Series= CRCW..e3	Res= 51.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
12.	Rfb1	Vishay-Dale	CRCW0402976RFKED Series= CRCW..e3	Res= 976.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
13.	Rfb2	Vishay-Dale	CRCW04028K45FKED Series= CRCW..e3	Res= 8.45 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	CUSTOM	CUSTOM Series= ?	Res= 3.46544 mOhm Power= 0.0 W Tolerance= 0.0%	1	NA	CUSTOM 0 mm²
16.	U1	Texas Instruments	LM3478MMX/NOPB	Switcher	1	$0.80	 MUA08A 24 mm²

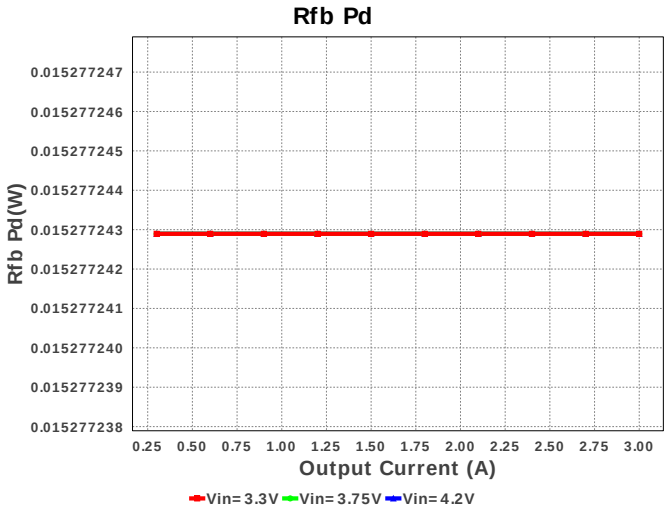


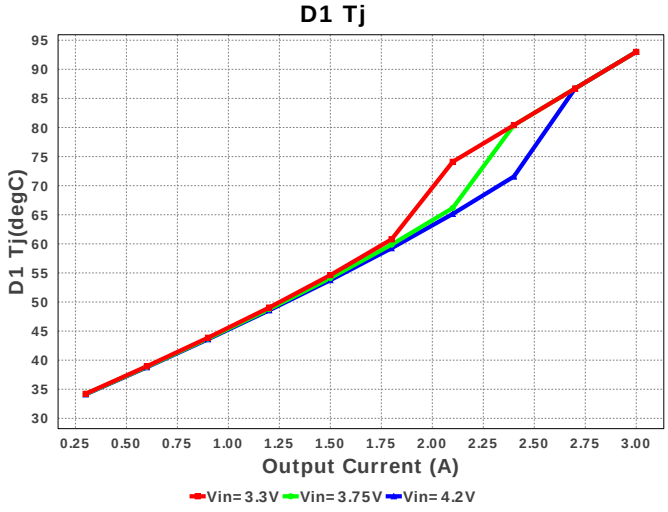


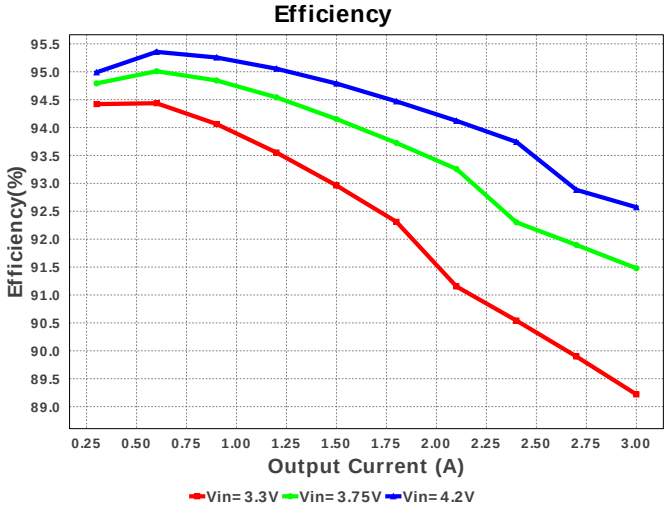




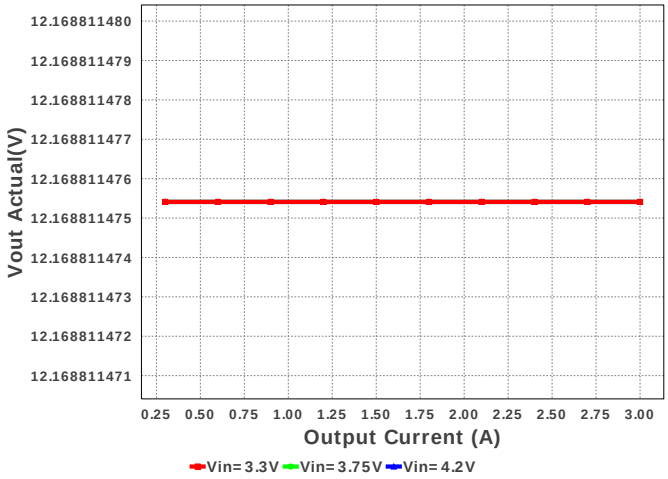




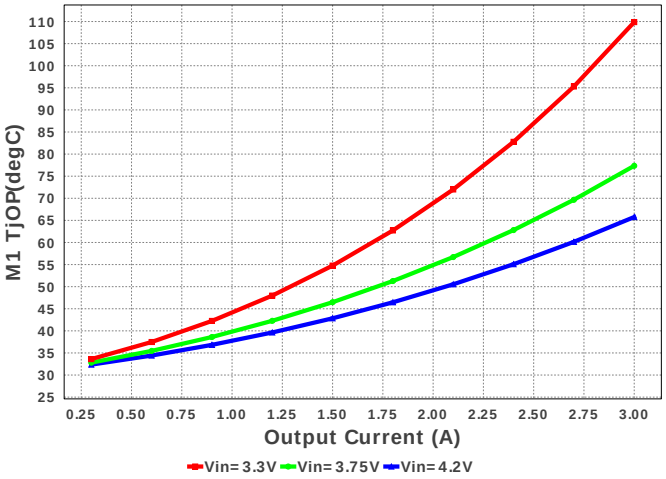




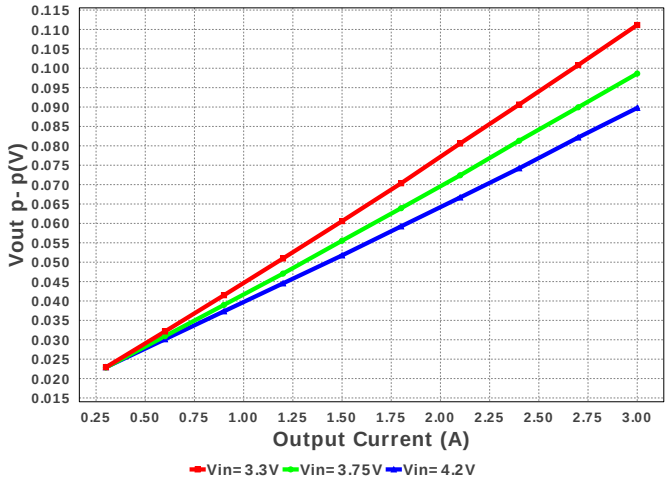
Vout Actual



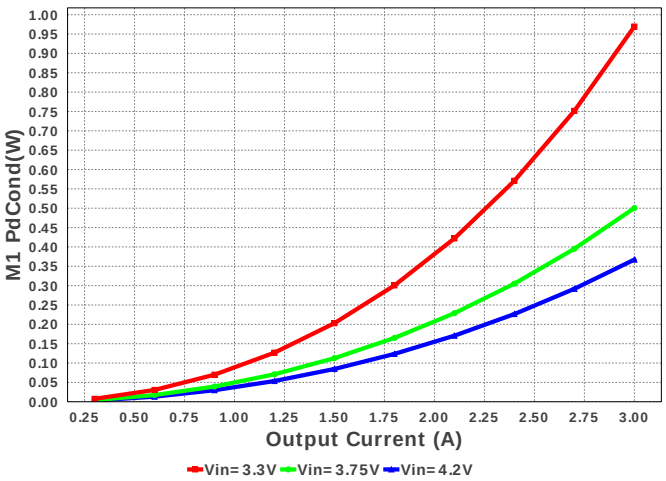
M1 TjOP



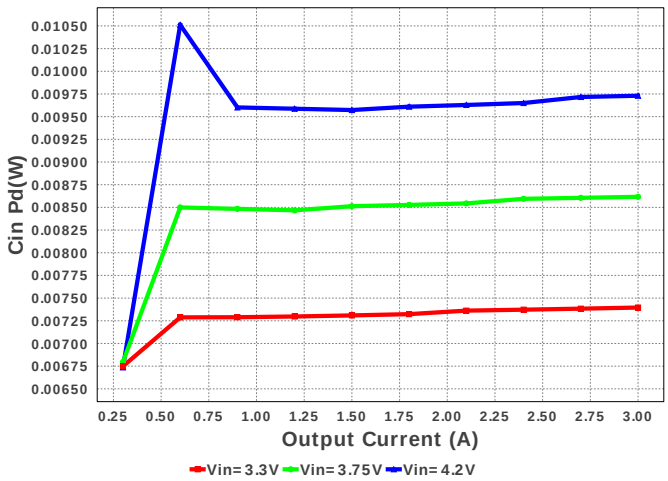
Vout p- p



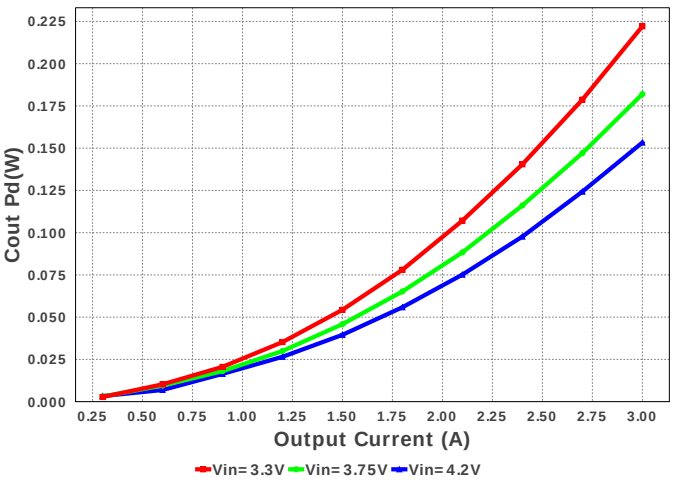
M1 PdCond

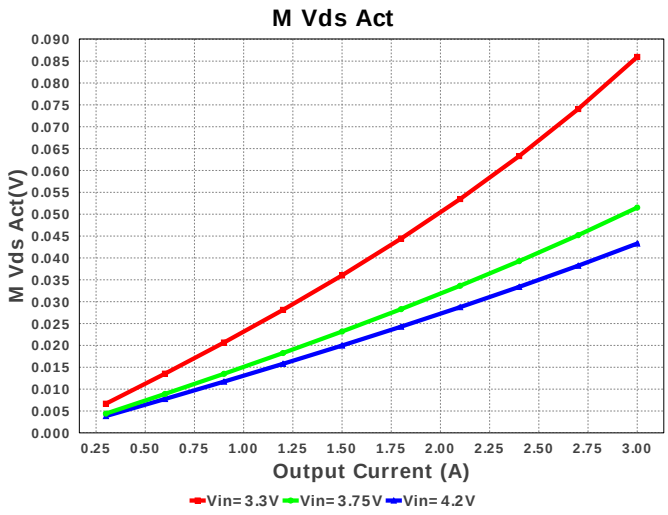


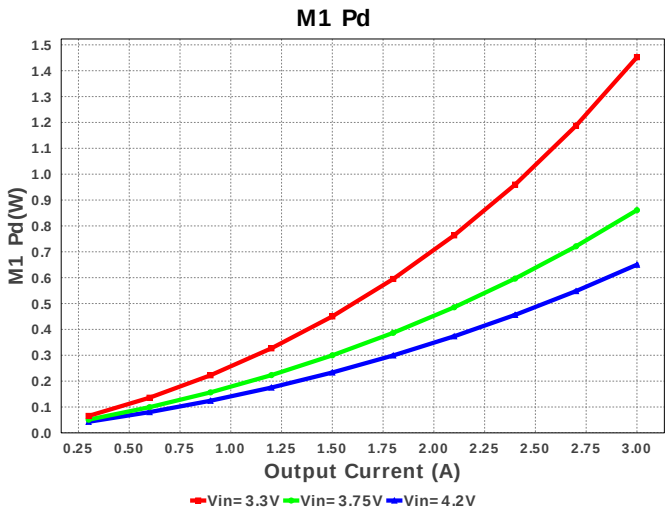
Cin Pd

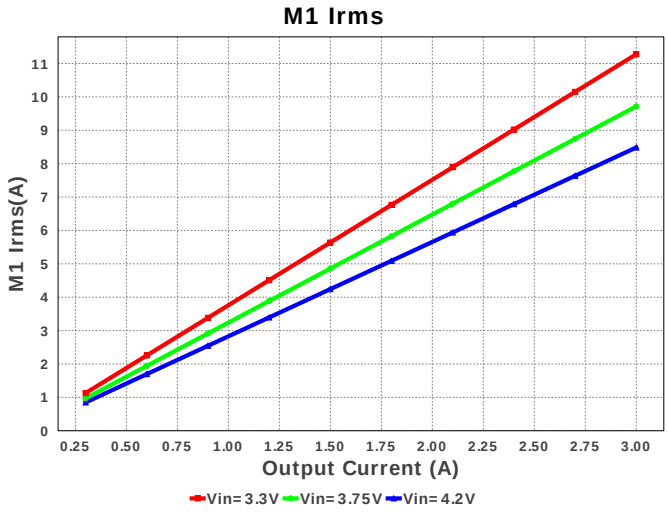


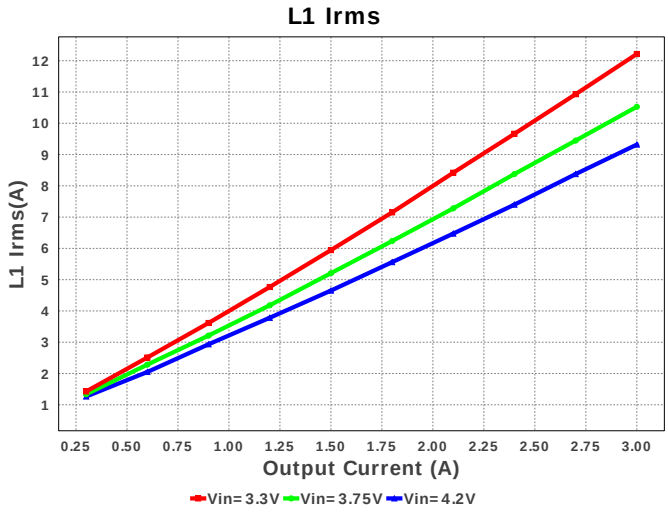
Cout Pd

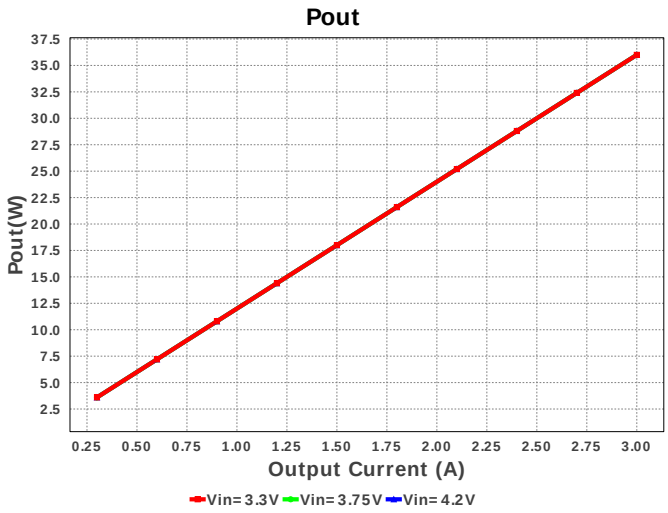


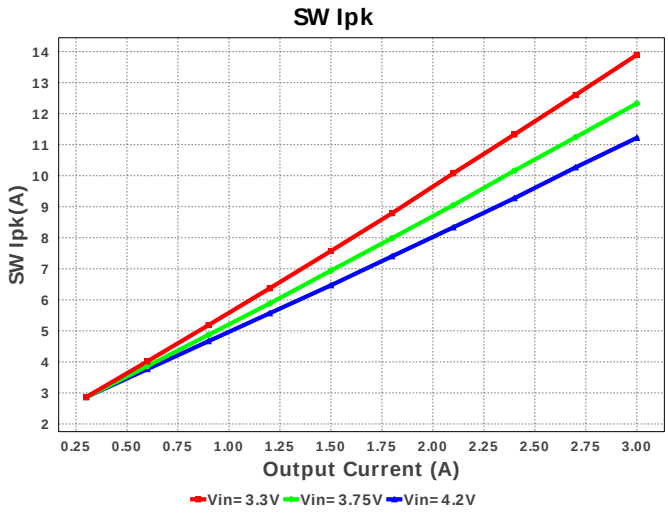


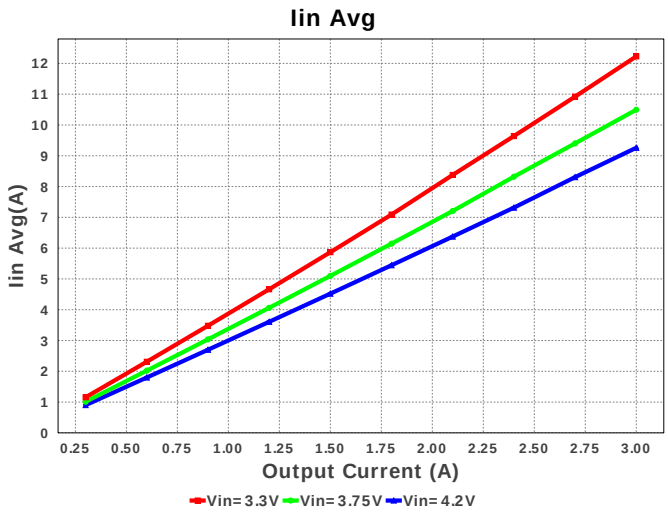


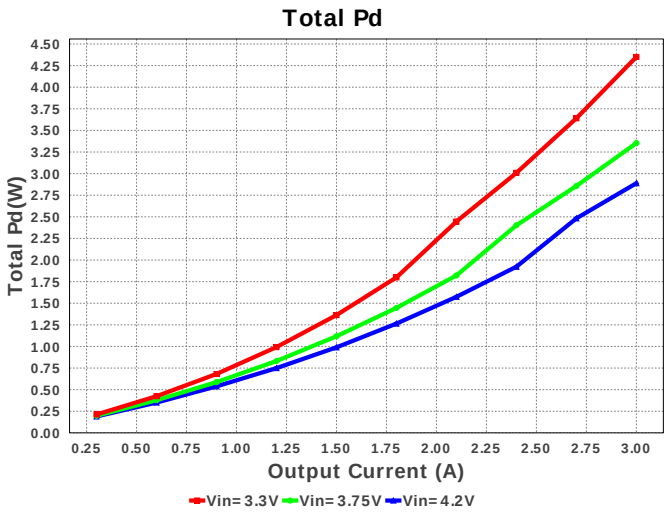


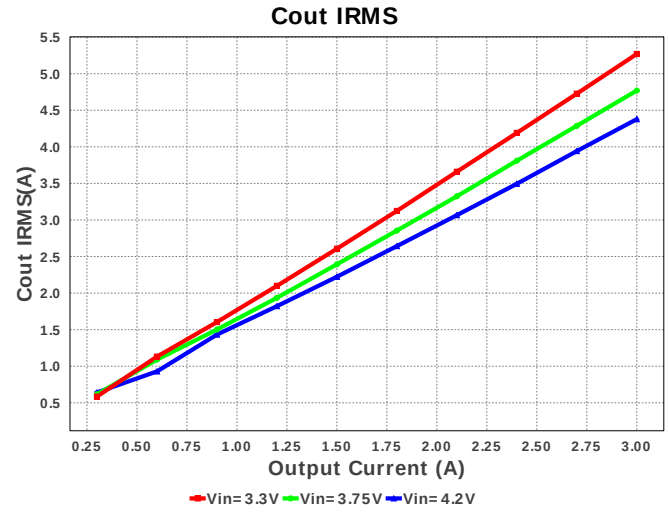


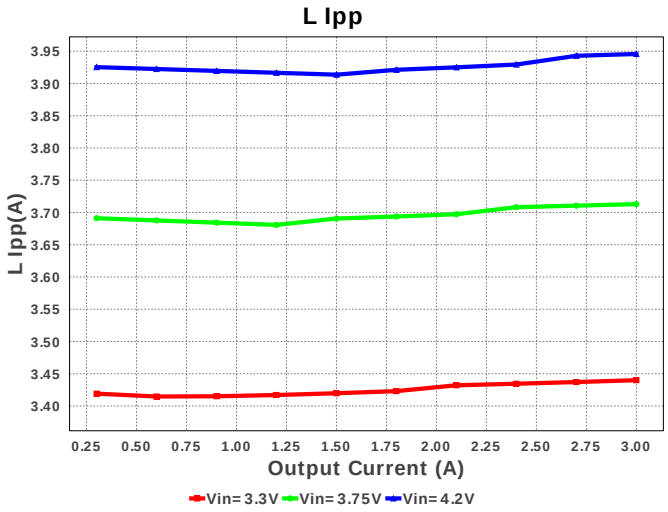


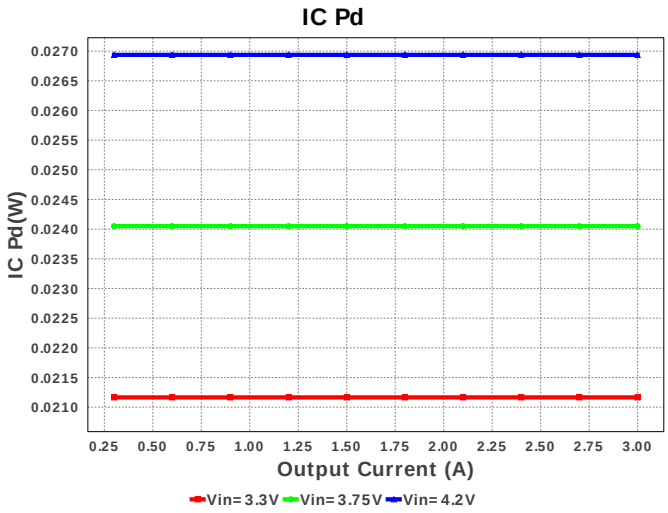


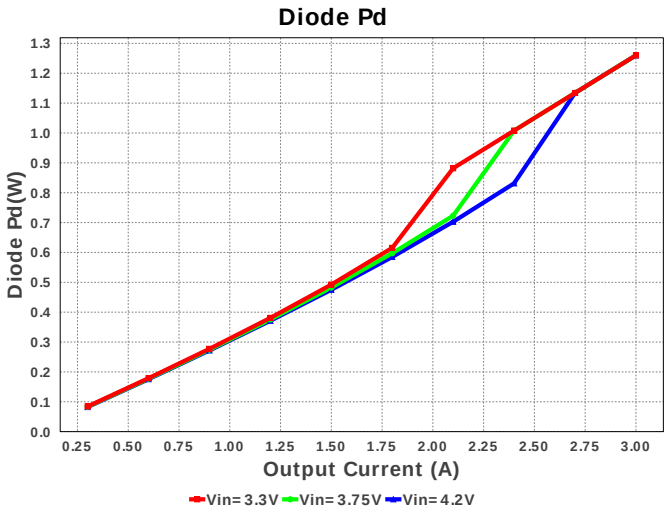


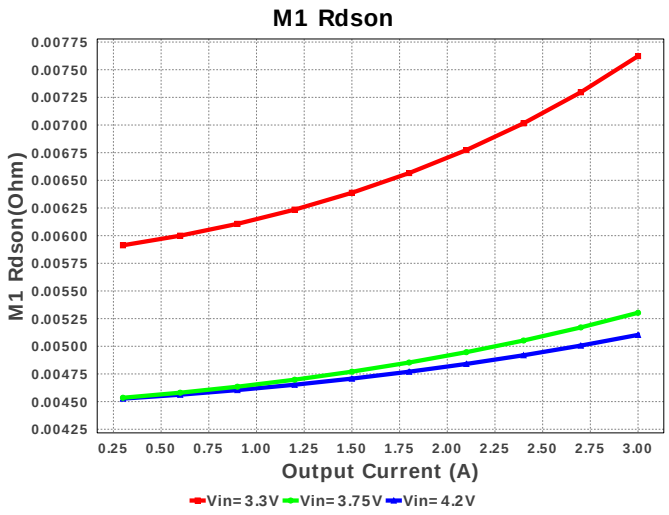


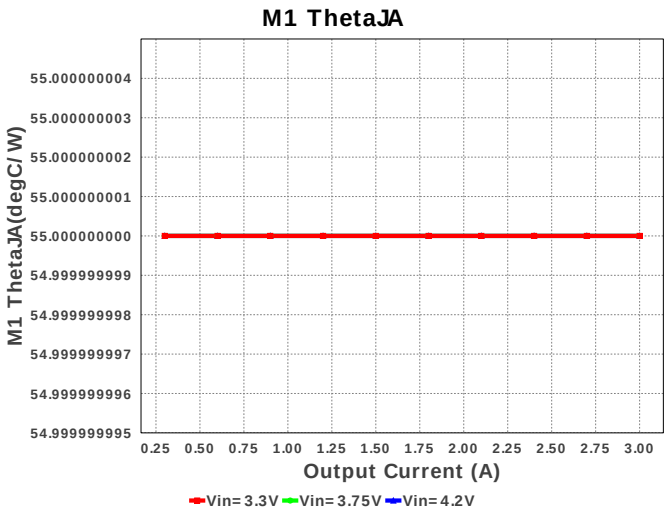


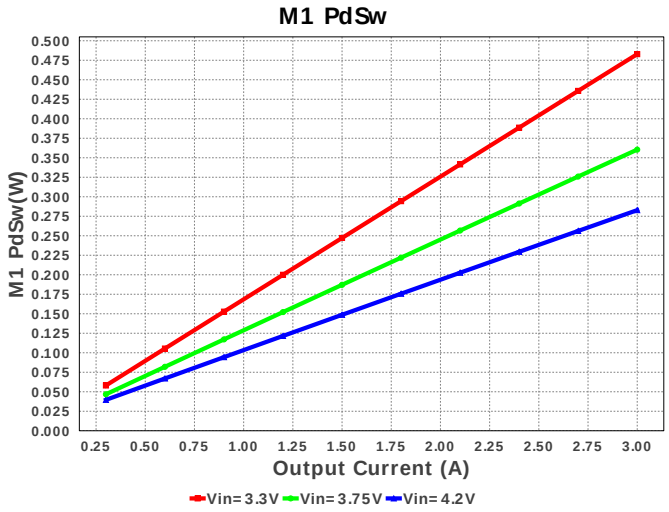


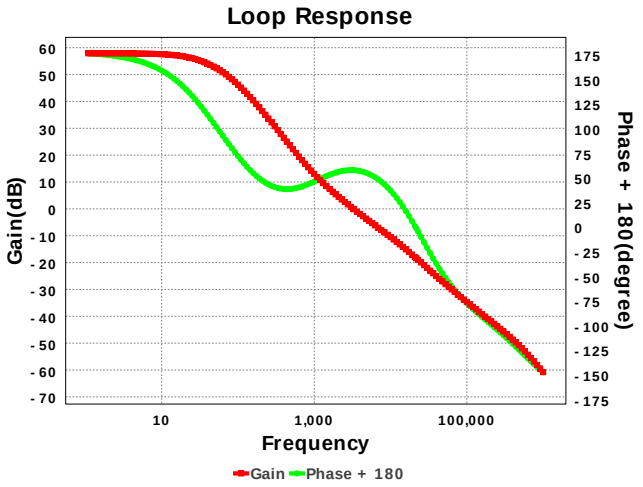












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	993.153 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	5.271 A	Current	Output capacitor RMS ripple current
3.	Iin Avg	12.232 A	Current	Average input current
4.	L Ipp	3.44 A	Current	Peak-to-peak inductor ripple current
5.	L1 Irms	12.219 A	Current	Inductor ripple current
6.	M1 Irms	11.253 A	Current	M1 MOSFET Irms
7.	SW Ipk	13.899 A	Current	Peak switch current
8.	BOM Count	18	General	Total Design BOM count
9.	FootPrint	736.0 mm^2	General	Total Foot Print Area of BOM components
10.	Frequency	324.4 kHz	General	Switching frequency
11.	IC Tolerance	24.3 mV	General	IC Feedback Tolerance
12.	M Vds Act	85.992 mV	General	M Vds
13.	M1 Rdson	7.641 mOhm	General	Drain-Source On-resistance
14.	M1 ThetaJA	55.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
15.	Mode	CCM	General	Conduction Mode
16.	Pout	36.0 W	General	Total output power
17.	Total BOM	$0.0	General	Total BOM Cost
18.	D1 Tj	93.0 degC	Op_Point	D1 junction temperature
19.	Low Freq Gain	55.517 dB	Op_Point	Gain at 10Hz
20.	Vout Actual	12.169 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
21.	Vout OP	12.0 V	Op_Point	Operational Output Voltage
22.	Cross Freq	2.574 kHz	Op_point	Bode plot crossover frequency
23.	Duty Cycle	75.367 %	Op_point	Duty cycle
24.	Efficiency	89.184 %	Op_point	Steady state efficiency
25.	Gain Marg	-16.507 dB	Op_point	Bode Plot Gain Margin
26.	IC Tj	34.236 degC	Op_point	IC junction temperature
27.	ICThetaJA	200.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
28.	IOUT_OP	3.0 A	Op_point	Iout operating point
29.	M1 TjOP	110.7 degC	Op_point	M1 MOSFET junction temperature
30.	Phase Marg	55.618 deg	Op_point	Bode Plot Phase Margin
31.	VIN_OP	3.3 V	Op_point	Vin operating point

#	Name	Value	Category	Description
32.	Vout p-p	111.19 mV	Op_point	Peak-to-peak output ripple voltage
33.	Cin Pd	7.398 mW	Power	Input capacitor power dissipation
34.	Cout Pd	222.238 mW	Power	Output capacitor power dissipation
35.	Diode Pd	1.26 W	Power	Diode power dissipation
36.	IC Pd	21.179 mW	Power	IC power dissipation
37.	L Pd	985.465 mW	Power	Inductor power dissipation
38.	M1 Pd	1.467 W	Power	M1 MOSFET total power dissipation
39.	M1 PdCond	967.683 mW	Power	M1 MOSFET conduction losses
40.	M1 PdSw	499.503 mW	Power	M1 MOSFET switching losses
41.	Rfb Pd	15.277 mW	Power	Rfb Power Dissipation
42.	Rsense Pd	454.792 mW	Power	LED Current Rsns Power Dissipation
43.	Total Pd	4.366 W	Power	Total Power Dissipation
44.	Vout Tolerance	3.774 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	3.0	Maximum Output Current
2.	VinMax	4.2	Maximum input voltage
3.	VinMin	3.3	Minimum input voltage
4.	Vout	12.0	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.