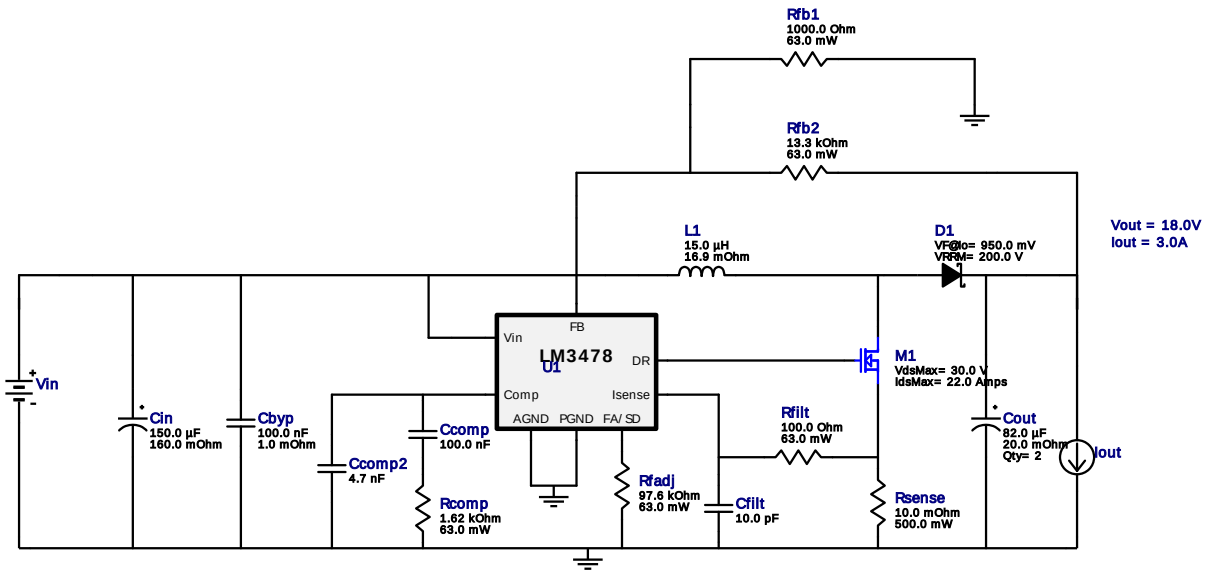
WEBENCH® Design Report

VinMin = 10.0V
VinMax = 17.0V
Vout = 18.0V
Iout = 3.0A

Device = LM3478MMX/NOPB
Topology = Boost
Created = 2020-09-29 08:05:10.274
BOM Cost = $4.42
BOM Count = 17
Total Pd = 3.88W

LM3478MMX/NOPB 10V-17V to 18.00V @ 3A

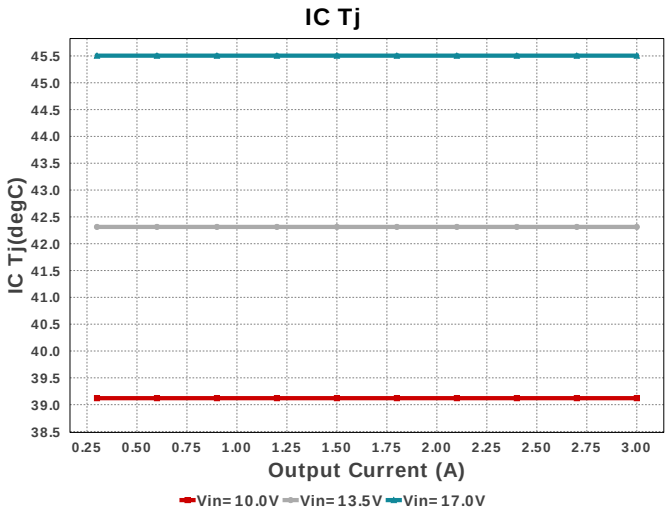


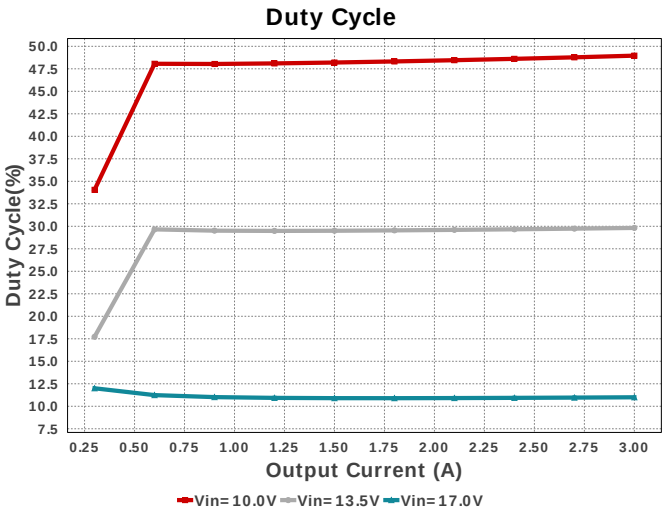
1. With the low turn of voltage of the LM34x8 your power supply may current limit before you reach your working input voltage. If this happens, or to preempt this from happening, you can include a low pass RC filter from input voltage to Vin on the IC. Make sure the rise time on the RC network is slower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

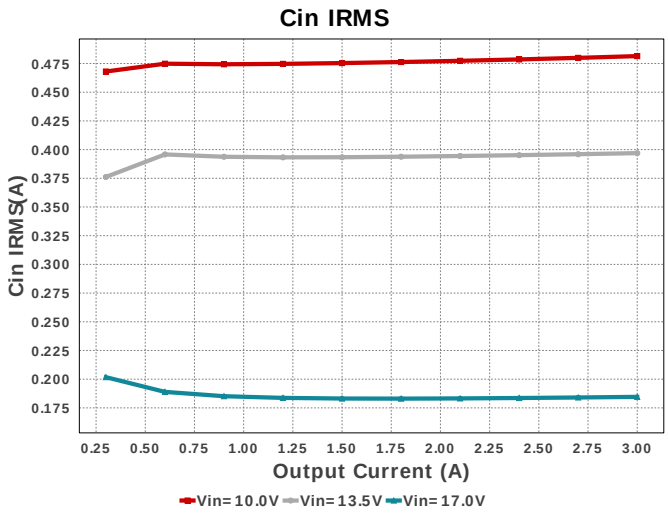
Electrical BOM

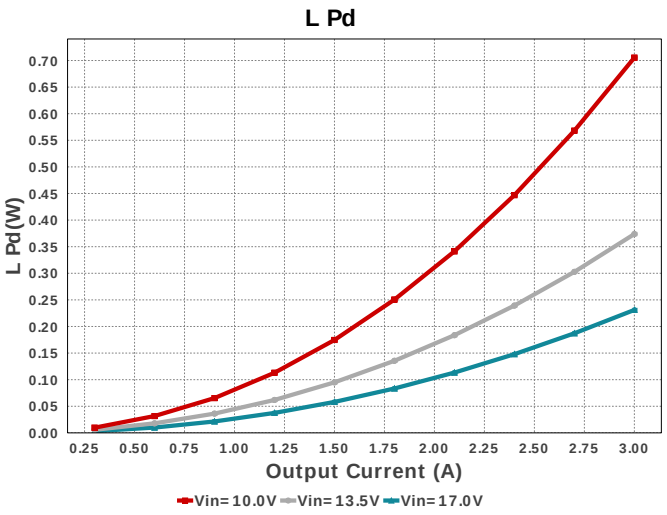
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbyp	Kemet	C0603C104Z3VACTU Series= Y5V	Cap= 100.0 nF ESR= 1.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0603 5 mm²
2.	Ccomp	AVX	08053C104JAZ2A Series= X7R	Cap= 100.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.06	0805 7 mm²
3.	Ccomp2	TDK	CGA4C2C0G1H472J060AA Series= C0G/NP0	Cap= 4.7 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.04	0805 7 mm²
4.	Cfilt	Samsung Electro-Mechanics	CL21C100JBANNNC Series= C0G/NP0	Cap= 10.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
5.	Cin	Panasonic	EEE-FK1E151P Series= FK	Cap= 150.0 uF ESR= 160.0 mOhm VDC= 25.0 V IRMS= 600.0 mA	1	$0.21	SM_RADIAL_F 124 mm²
6.	Cout	Panasonic	35SVPF82M Series= SVPF	Cap= 82.0 uF ESR= 20.0 mOhm VDC= 35.0 V IRMS= 4.0 A	2	$0.63	CAPSMT_62_E12 106 mm²
7.	D1	SMC Diode Solutions	SBRD10200TR	VF@Io= 950.0 mV VRRM= 200.0 V	1	$0.12	DPAK 102 mm²

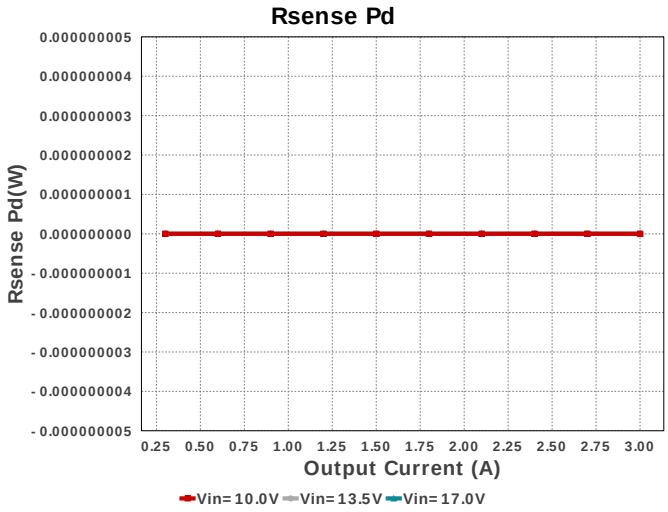
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
8.	L1	Coilcraft	XAL1010-153MEB	L= 15.0 µH DCR= 16.9 mOhm	1	$1.71	 XAL1010 160 mm^2
9.	M1	Texas Instruments	CSD17571Q2	VdsMax= 30.0 V IdsMax= 22.0 Amps	1	$0.10	DQK0006C 9 mm^2
10.	Rcomp	Vishay-Dale	CRCW04021K62FKED Series= CRCW..e3	Res= 1620.0Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
11.	Rfadj	Vishay-Dale	CRCW040297K6FKED Series= CRCW..e3	Res= 97600.0Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
12.	Rfb1	Vishay-Dale	CRCW04021K00FKED Series= CRCW..e3	Res= 1000.0Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
13.	Rfb2	Vishay-Dale	CRCW040213K3FKED Series= CRCW..e3	Res= 13300.0Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
14.	Rfilt	Vishay-Dale	CRCW0402100RFKED Series= CRCW..e3	Res= 100.0Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
15.	Rsense	Stackpole Electronics Inc	CSR1206FK10L0 Series= ?	Res= 0.01Ohm Power= 500.0 mW Tolerance= 1.0%	1	$0.12	1206 11 mm^2
16.	U1	Texas Instruments	LM3478MMX/NOPB	Switcher	1	$0.73	 MUA08A 24 mm^2

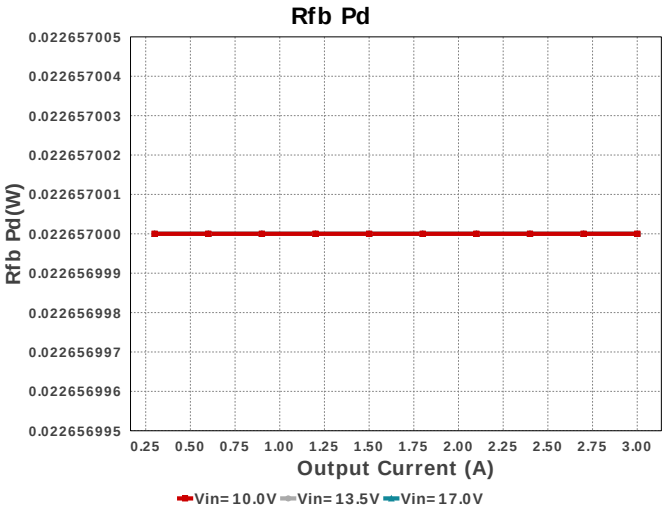


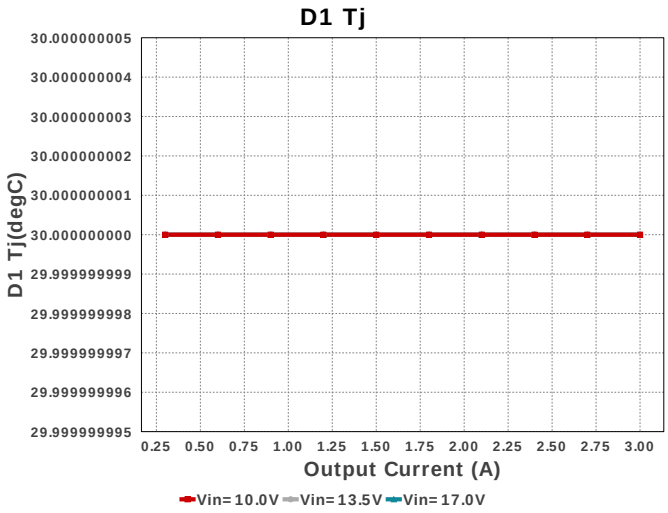


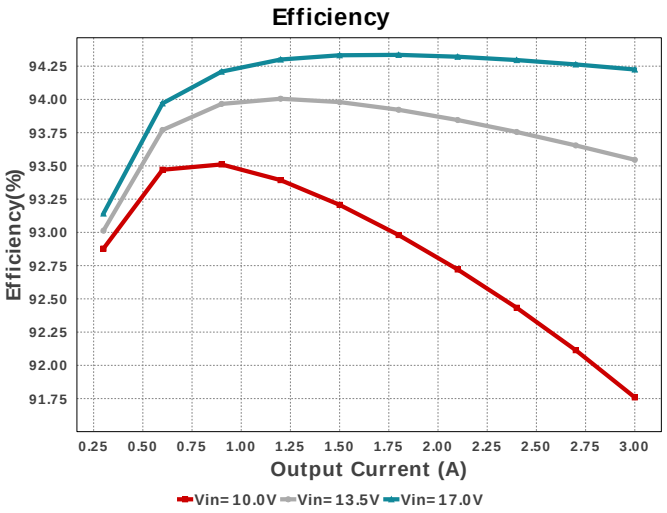


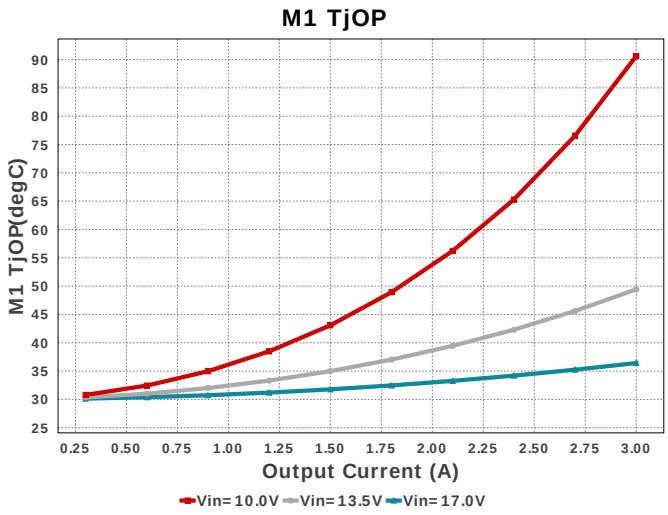


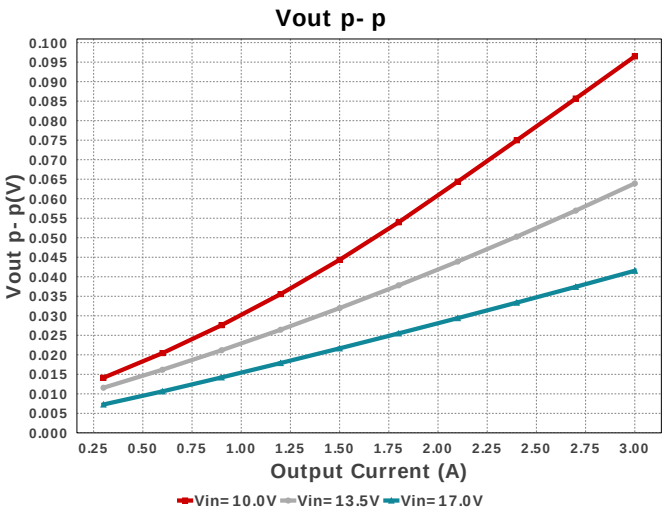


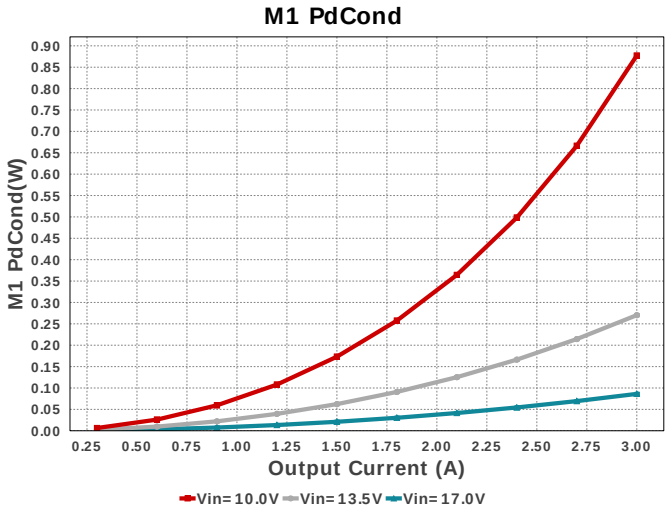


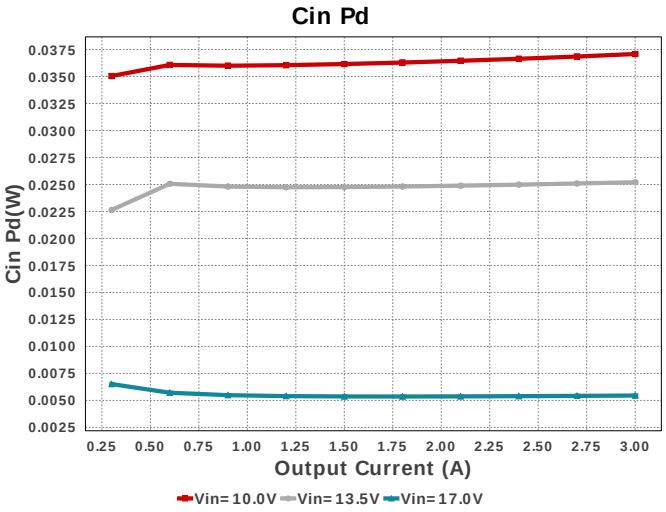


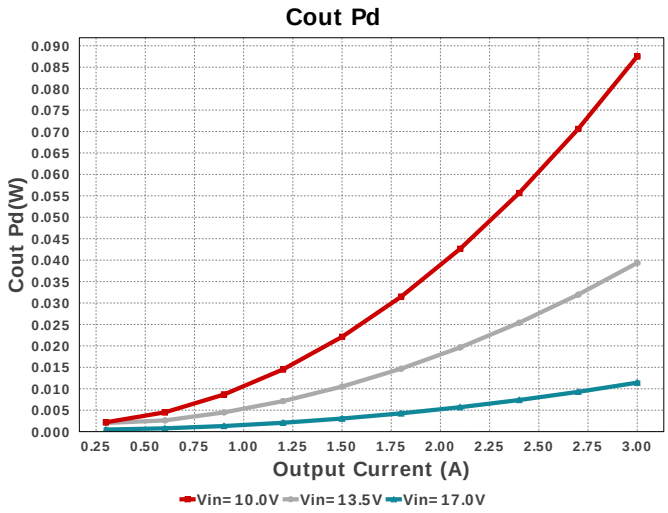


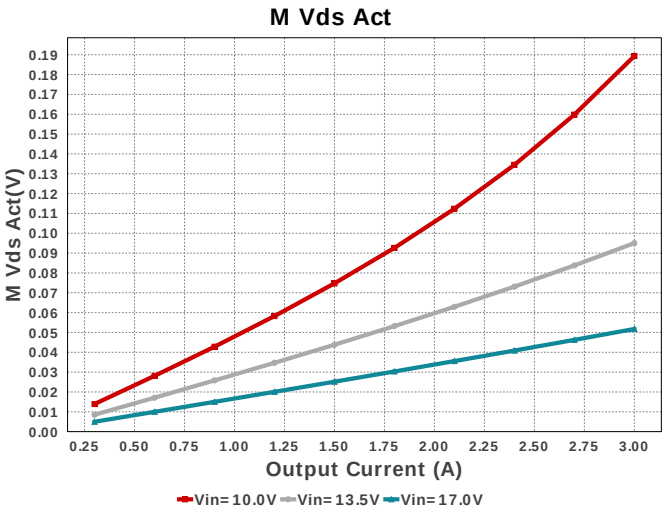


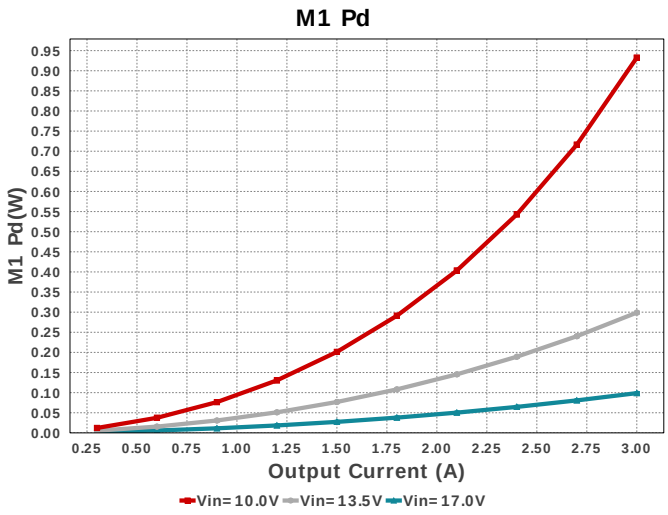


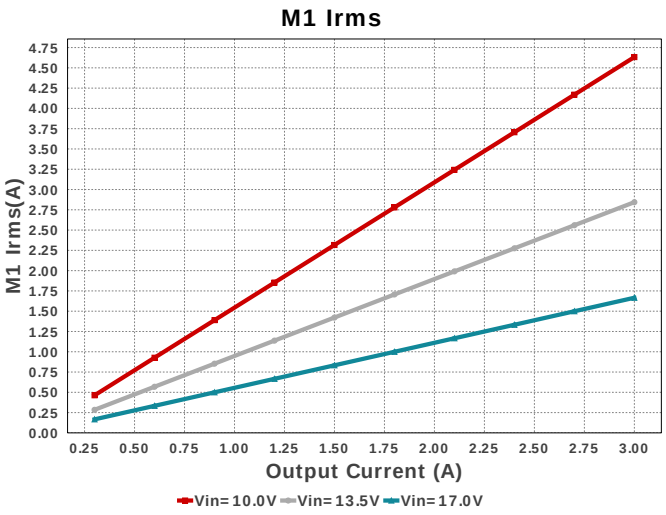


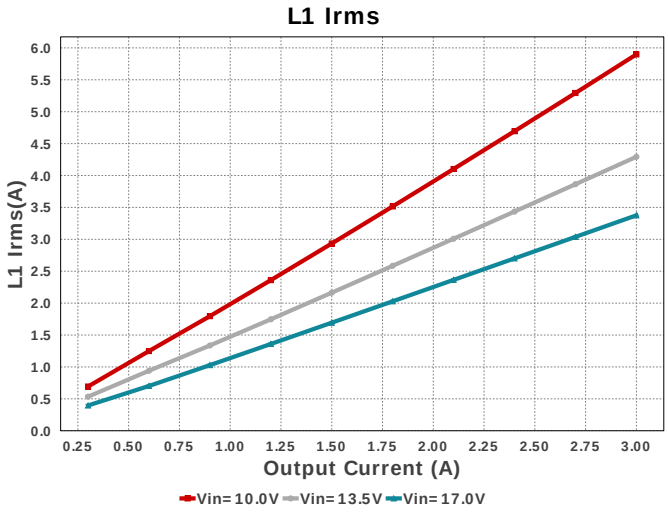


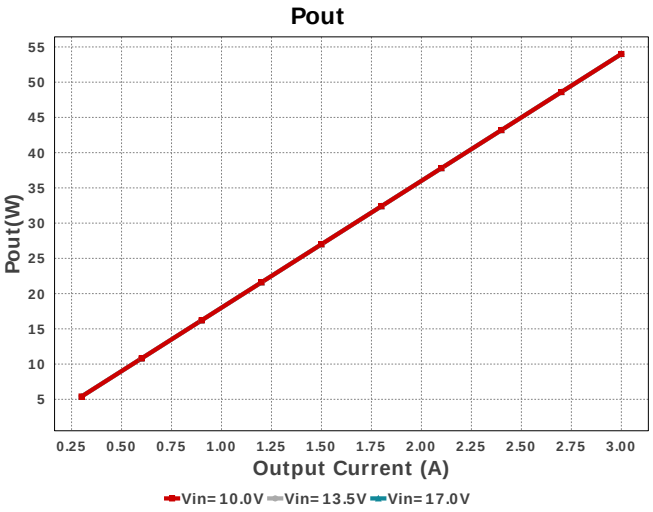


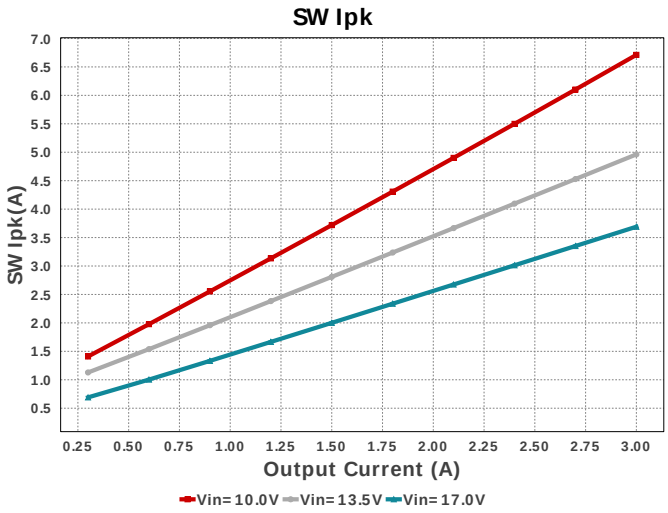


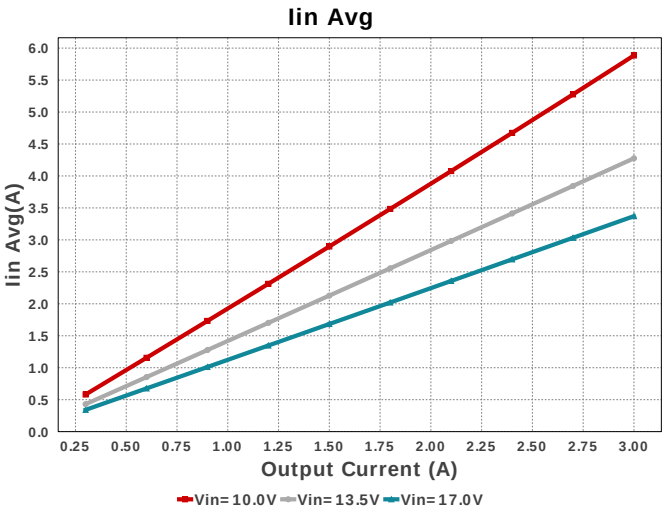


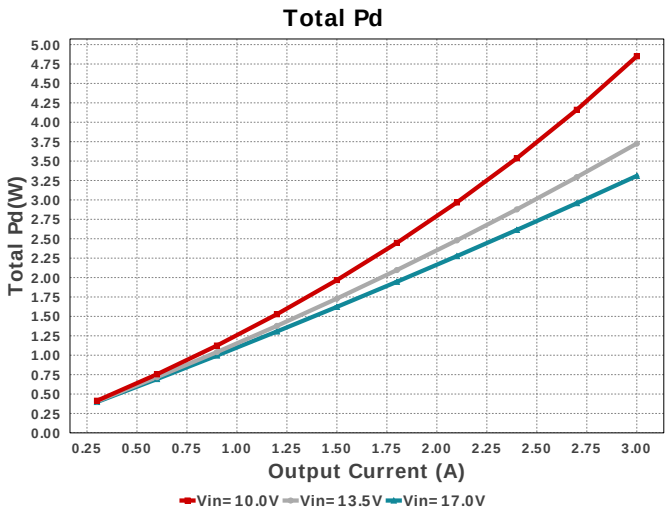


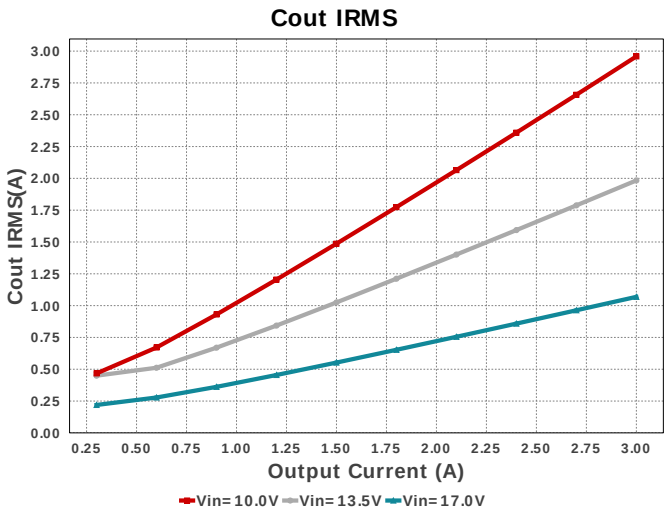


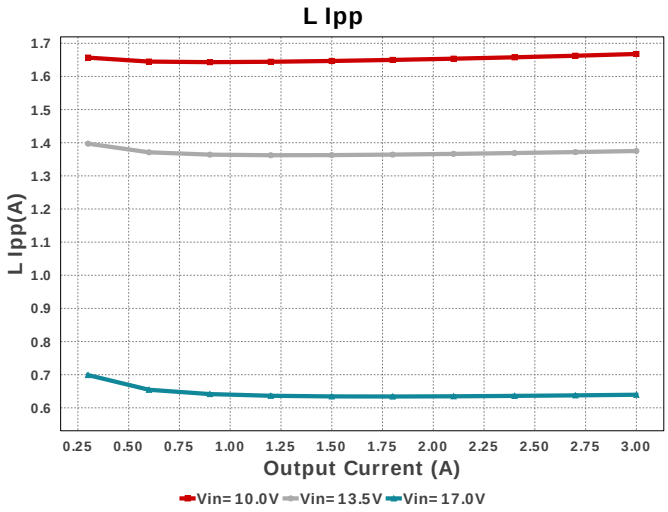


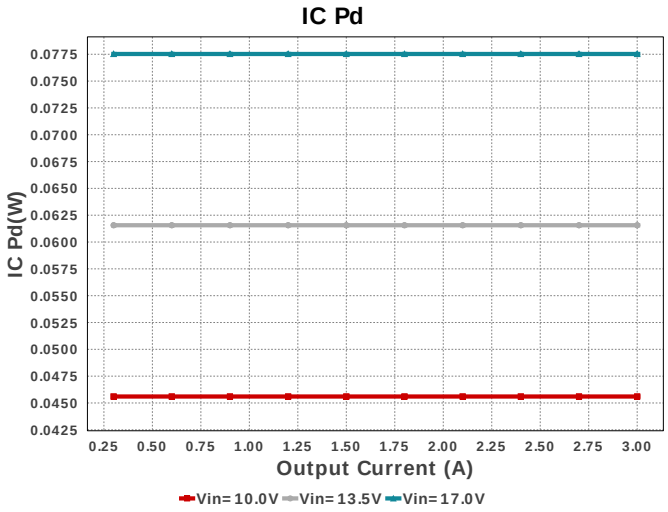


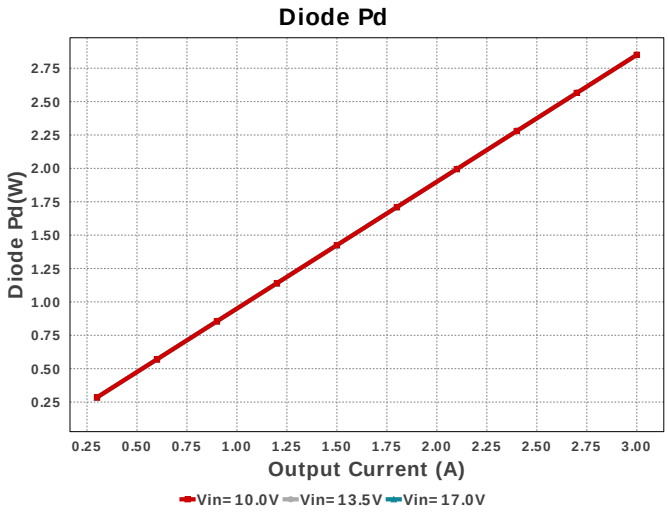


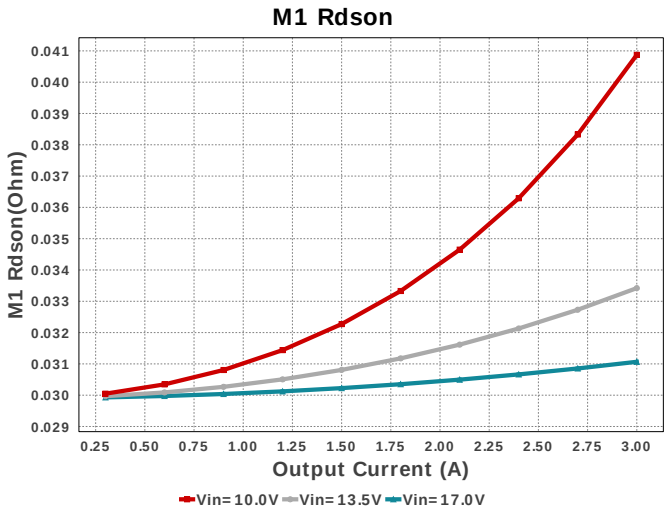


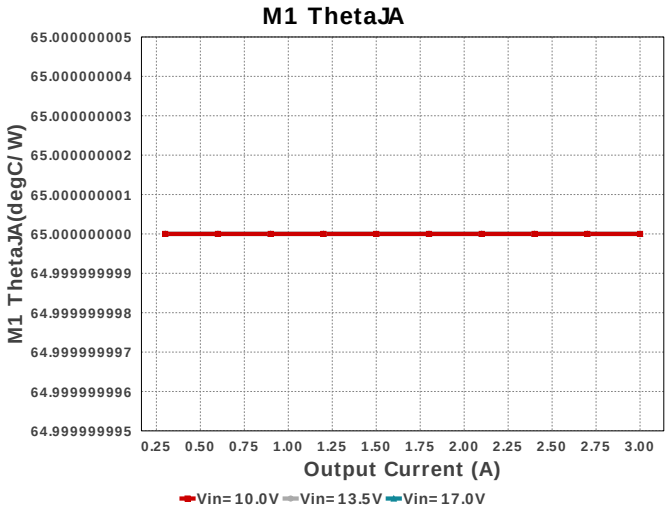


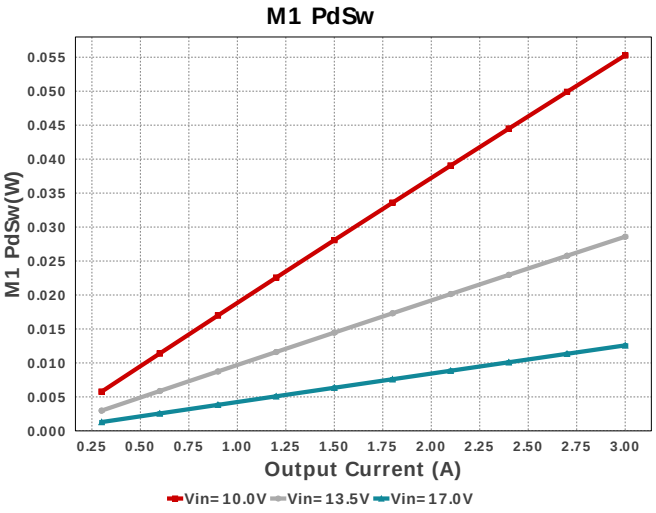


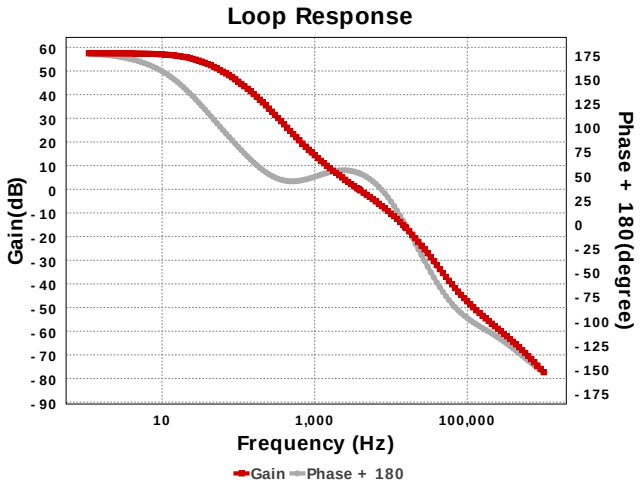












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	473.401 mA	Capacitor	Input capacitor RMS ripple current
2.	Cin Pd	35.857 mW	Capacitor	Input capacitor power dissipation
3.	Cout IRMS	2.91 A	Capacitor	Output capacitor RMS ripple current
4.	Cout Pd	84.702 mW	Capacitor	Output capacitor power dissipation
5.	D1 Tj	30.0 degC	Diode	D1 junction temperature
6.	Diode Pd	2.85 W	Diode	Diode power dissipation
7.	IC Pd	45.625 mW	IC	IC power dissipation
8.	IC Tj	39.125 degC	IC	IC junction temperature
9.	IC Tolerance	24.3 mV	IC	IC Feedback Tolerance
10.	ICThetaJA	200.0 degC/W	IC	IC junction-to-ambient thermal resistance
11.	Iin Avg	5.788 A	IC	Average input current
12.	L Ipp	1.64 A	Inductor	Peak-to-peak inductor ripple current
13.	L Pd	683.16 mW	Inductor	Inductor power dissipation
14.	L1 Irms	5.804 A	Inductor	Inductor ripple current
15.	M Vds Act	189.36 mV	Mosfet	M Vds
16.	M1 Irms	4.633 A	Mosfet	M1 MOSFET Irms
17.	M1 Pd	932.72 mW	Mosfet	M1 MOSFET total power dissipation
18.	M1 PdCond	877.23 mW	Mosfet	M1 MOSFET conduction losses
19.	M1 PdSw	55.489 mW	Mosfet	M1 MOSFET switching losses
20.	M1 Rdson	40.876 mOhm	Mosfet	Drain-Source On-resistance
21.	M1 ThetaJA	65.0 degC/W	Mosfet	MOSFET junction-to-ambient thermal resistance
22.	M1 TjOP	90.626 degC	Mosfet	M1 MOSFET junction temperature
23.	Cin Pd	35.857 mW	Power	Input capacitor power dissipation
24.	Cout Pd	84.702 mW	Power	Output capacitor power dissipation
25.	Diode Pd	2.85 W	Power	Diode power dissipation
26.	IC Pd	45.625 mW	Power	IC power dissipation
27.	L Pd	683.16 mW	Power	Inductor power dissipation
28.	M1 Pd	932.72 mW	Power	M1 MOSFET total power dissipation
29.	M1 PdCond	877.23 mW	Power	M1 MOSFET conduction losses
30.	M1 PdSw	55.489 mW	Power	M1 MOSFET switching losses
31.	Rfb Pd	22.657 mW	Power	Rfb Power Dissipation
32.	Rsense Pd	323.19 mW	Power	LED Current Rsns Power Dissipation

#	Name	Value	Category	Description
33.	Total Pd	3.883 W	Power	Total Power Dissipation
34.	Rfb Pd	22.657 mW	Resistor	Rfb Power Dissipation
35.	Rsense Pd	323.19 mW	Resistor	LED Current Rsns Power Dissipation
36.	BOM Count	17	System Information	Total Design BOM count
37.	Cross Freq	2.385 kHz	System Information	Bode plot crossover frequency
38.	Duty Cycle	48.139 %	System Information	Duty cycle
39.	Efficiency	93.292 %	System Information	Steady state efficiency
40.	FootPrint	681.0 mm^2	System Information	Total Foot Print Area of BOM components
41.	Frequency	194.565 kHz	System Information	Switching frequency
42.	Gain Marg	-15.04 dB	System Information	Bode Plot Gain Margin
43.	Iout	3.0 A	System Information	Iout operating point
44.	Low Freq Gain	52.777 dB	System Information	Gain at 1Hz
45.	Mode	CCM	System Information	Conduction Mode
46.	Phase Marg	52.995 deg	System Information	Bode Plot Phase Margin
47.	Pout	54.0 W	System Information	Total output power
48.	SW Ipk	6.605 A	System Information	Peak switch current
49.	Total BOM	$4.42	System Information	Total BOM Cost
50.	Vin	10.0 V	System Information	Vin operating point
51.	Vout	18.0 V	System Information	Operational Output Voltage
52.	Vout Actual	18.018 V	System Information	Vout Actual calculated based on selected voltage divider resistors
53.	Vout Tolerance	3.844 %	System Information	Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
54.	Vout p-p	94.906 mV	System Information	Peak-to-peak output ripple voltage

Design Inputs

#	Name	Value	Description
1.	Iout	3.0	Maximum Output Current
2.	VinMax	17.0	Maximum input voltage
3.	VinMin	10.0	Minimum input voltage
4.	Vout	18.0	Output Voltage
5.	acFrequency	60.0	AC Frequency
6.	base_pn	LM3478	Base Product Number
7.	source	DC	Input Source Type
8.	Ta	30.0	Ambient temperature

Design Assistance

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

