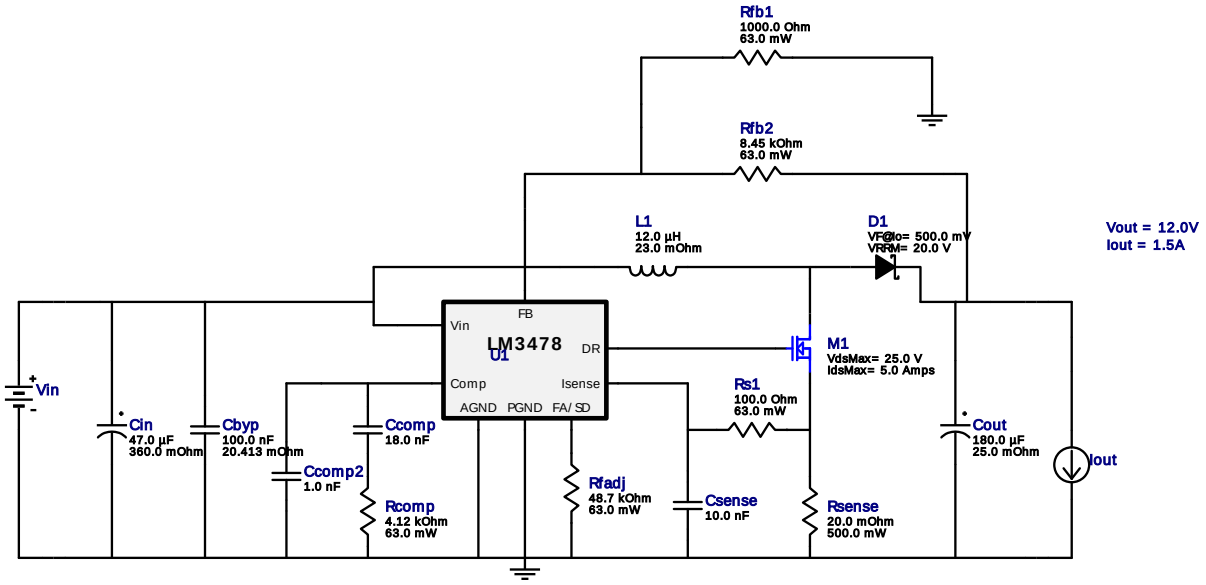
WEBENCH® Design Report

VinMin = 7.0V
VinMax = 8.0V
Vout = 12.0V
Iout = 1.5A

Device = LM3478MM/NOPB
Topology = Boost
Created = 6/26/14 7:14:07 PM
BOM Cost = $2.28
BOM Count = 16
Total Pd = 1.38W

Design : 1177446/79 LM3478MM/NOPB
LM3478MM/NOPB 7.0V-8.0V to 12.0V @ 1.5A



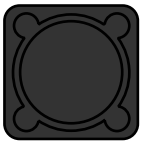
1. With the low turn of voltage of the LM34x8 your power supply may current limit before you reach your working input voltage. If this happens, or to preempt this from happening, you can include a low pass RC filter from input voltage to Vin on the IC. Make sure the rise time on the RC network is slower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

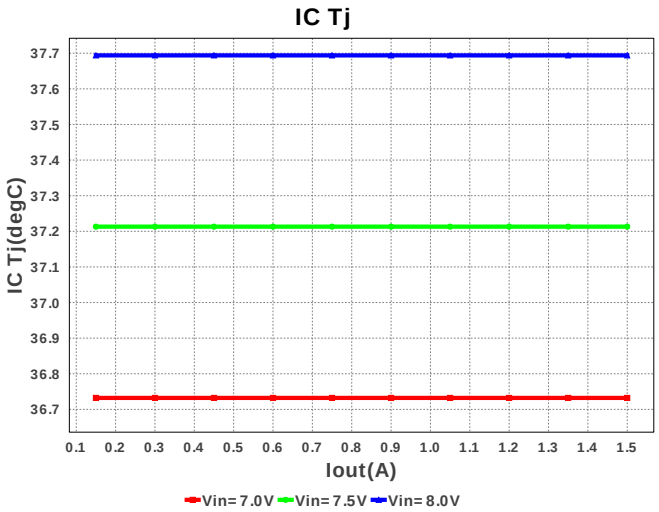
My Comments

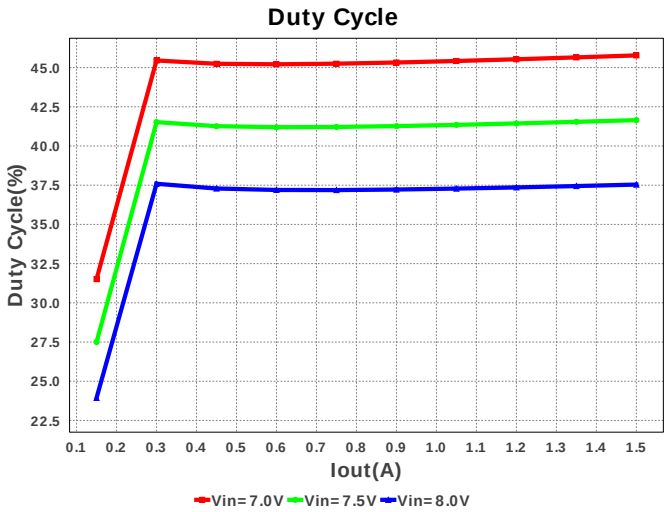
No comments

Electrical BOM

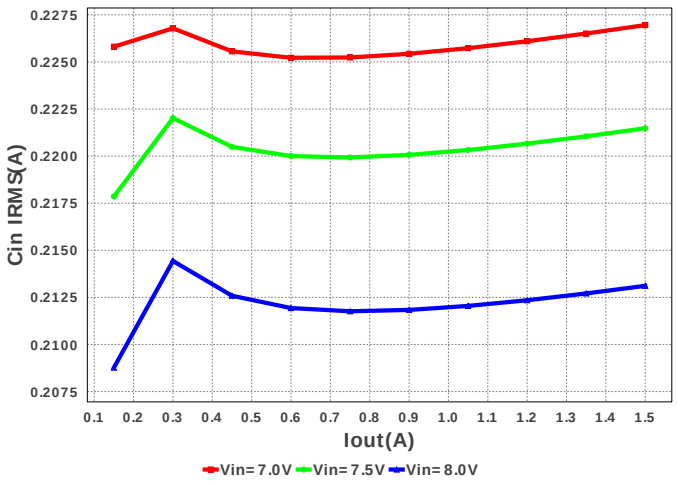
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbyp	TDK	C1005X5R1A104K Series= 285	Cap= 100.0 nF ESR= 20.413 mOhm VDC= 10.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
2.	Ccomp	Yageo America	CC0805KRX7R9BB183 Series= X7R	Cap= 18.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
3.	Ccomp2	Yageo America	CC0805KRX7R9BB102 Series= X7R	Cap= 1.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
4.	Cin	Panasonic	EEE-FK1C470P Series= FK	Cap= 47.0 uF ESR= 360.0 mOhm VDC= 16.0 V IRMS= 240.0 mA	1	$0.12	SM_RADIAL_D 84 mm²
5.	Cout	Panasonic	20SVPF180M Series= 1273	Cap= 180.0 uF ESR= 25.0 mOhm VDC= 20.0 V IRMS= 3.2 A	1	$0.50	CAPSMT_62_E7 106 mm²
6.	Csense	MuRata	GRM216R71H103KA01D Series= X7R	Cap= 10.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
7.	D1	Diodes Inc.	B220A-13-F	VF@Io= 500.0 mV VRRM= 20.0 V	1	$0.09	SMA 37 mm²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
8.	L1	Bourns	SRR1260-120M	L= 12.0 µH DCR= 23.0 mOhm	1	$0.41	 SRR1260 210 mm²
9.	M1	Texas Instruments	CSD16301Q2	VdsMax= 25.0 V IdsMax= 5.0 Amps	1	$0.17	 TRANS_NexFET_Q2 9 mm²
10.	Rcomp	Vishay-Dale	CRCW04024K12FKED Series= CRCW..e3	Res= 4.12 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
11.	Rfadj	Vishay-Dale	CRCW040248K7FKED Series= CRCW..e3	Res= 48.7 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	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	Stackpole Electronics Inc	CSR1206FK20L0 Series= ?	Res= 20.0 mOhm Power= 500.0 mW Tolerance= 1.0%	1	$0.10	 1206 11 mm²
16.	U1	Texas Instruments	LM3478MM/NOPB	Switcher	1	$0.80	 MUA08A 24 mm²

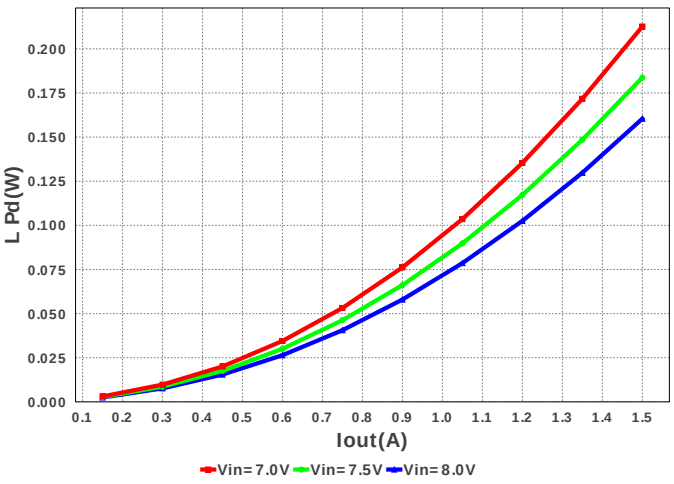




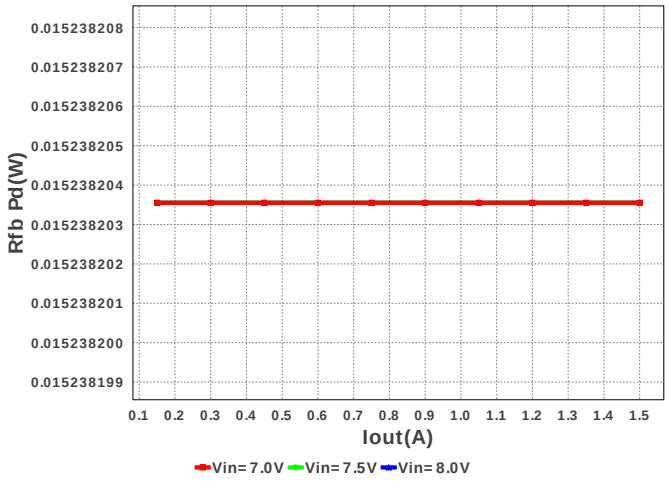
Cin IRMS



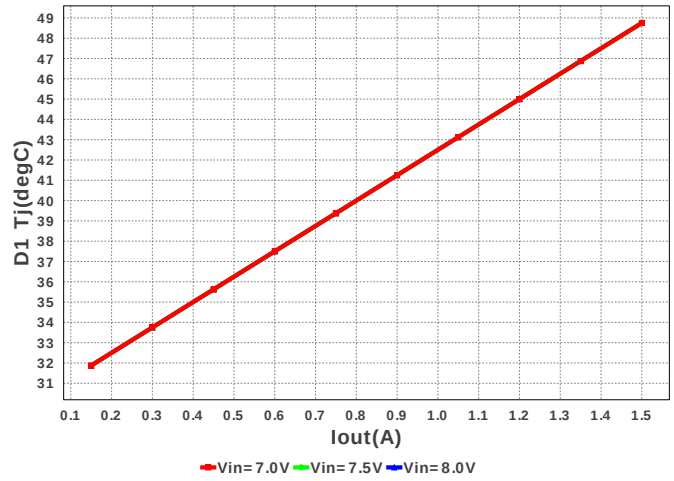
L Pd



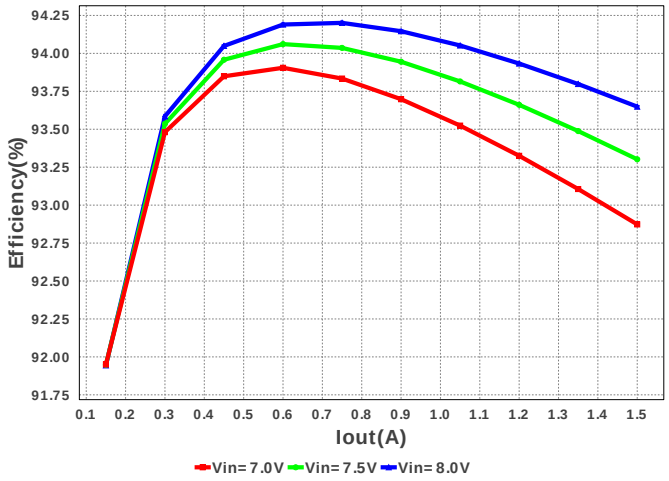
Rfb Pd



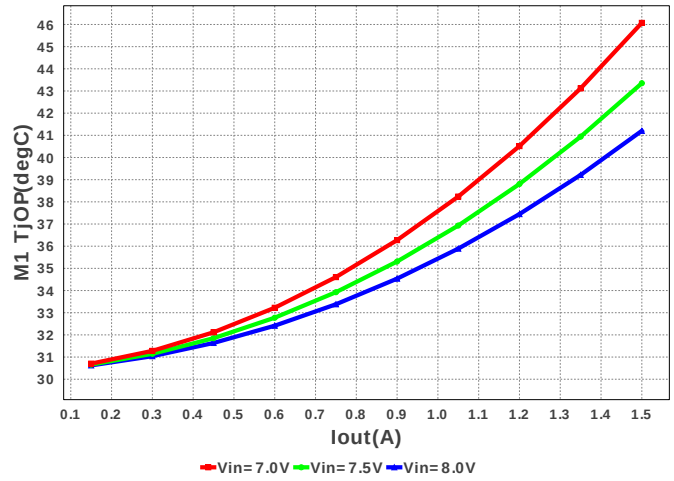
D1 Tj

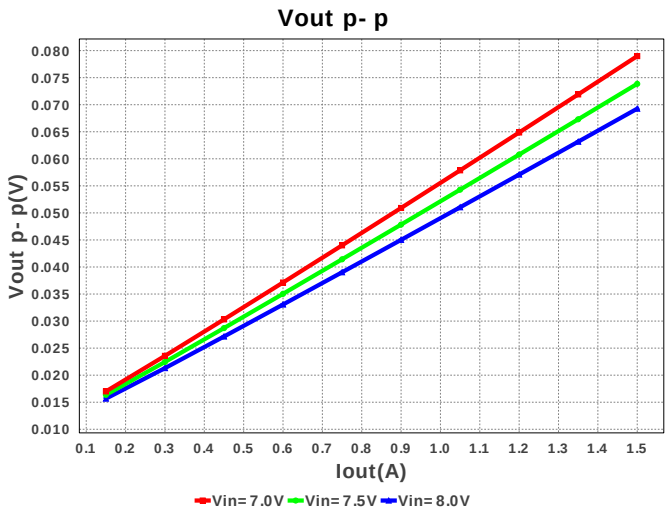


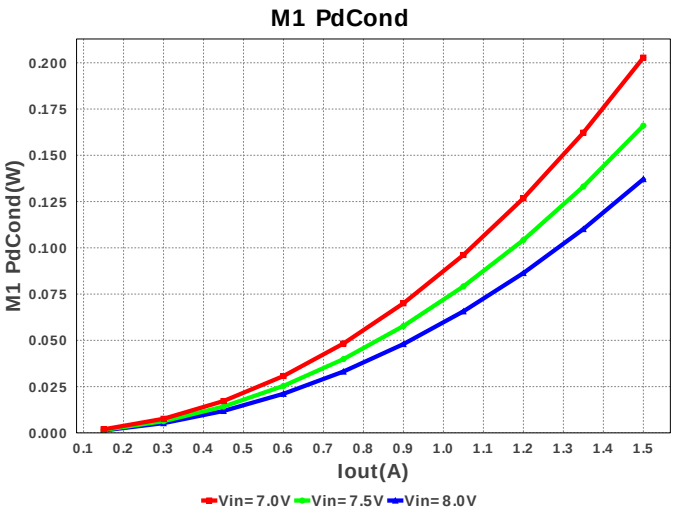
Efficiency

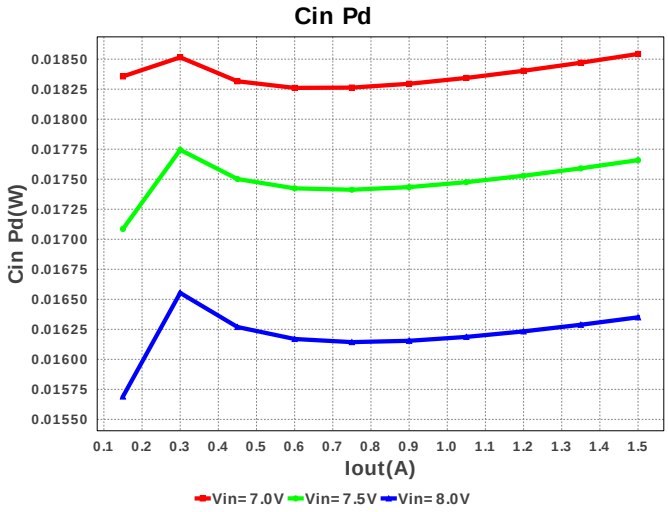


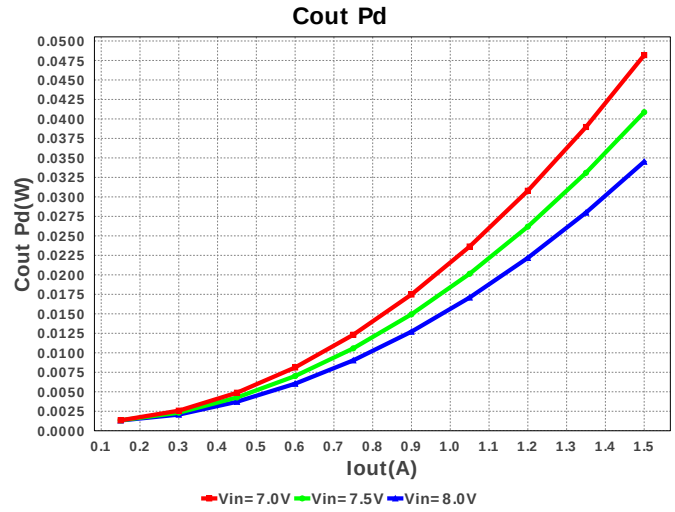
M1 TjOP

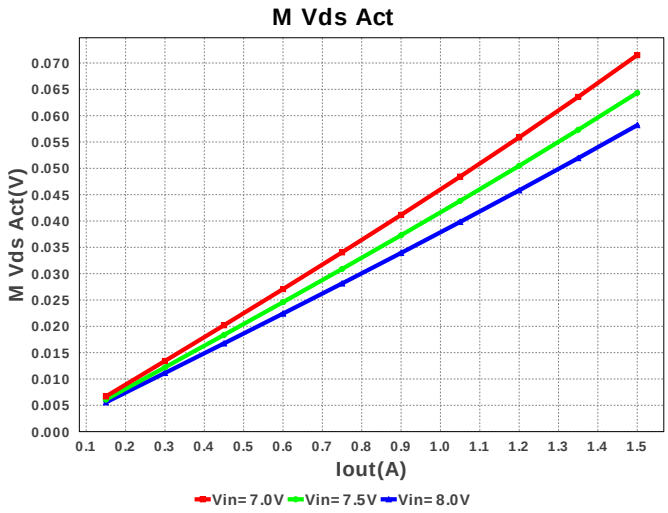


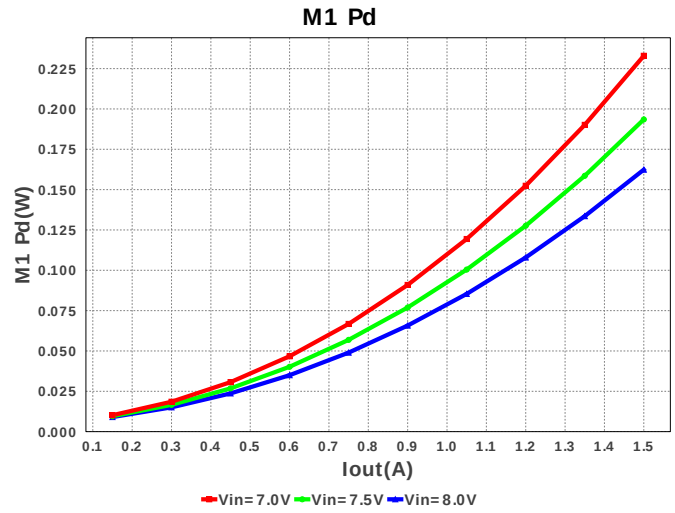


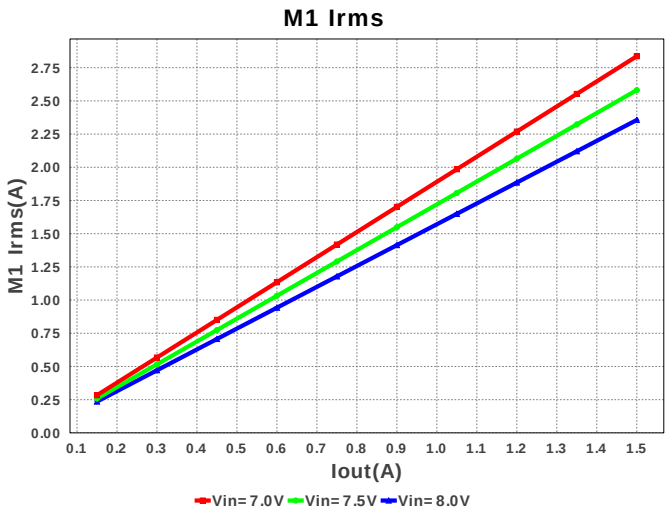


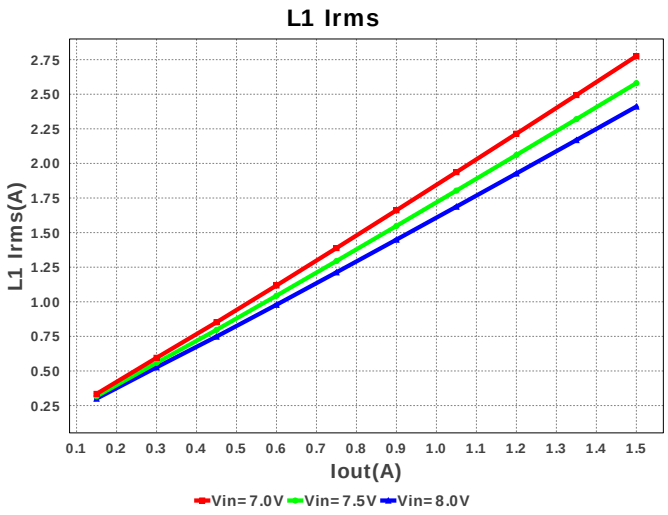


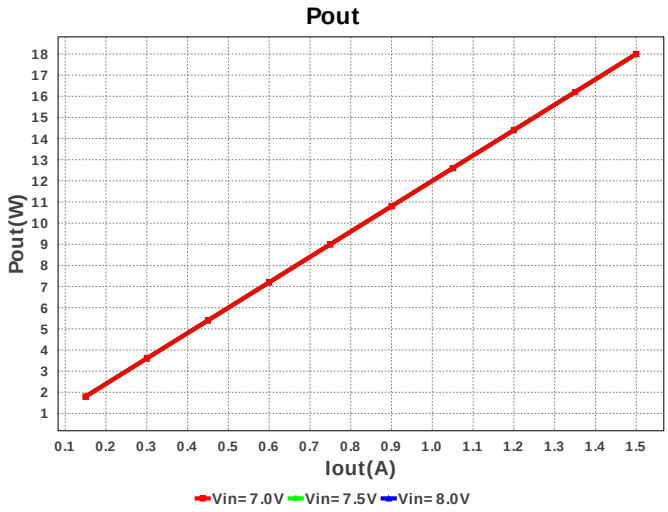


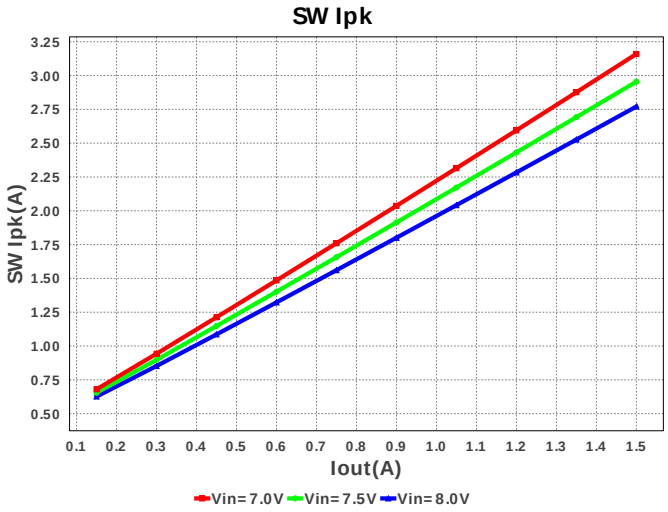


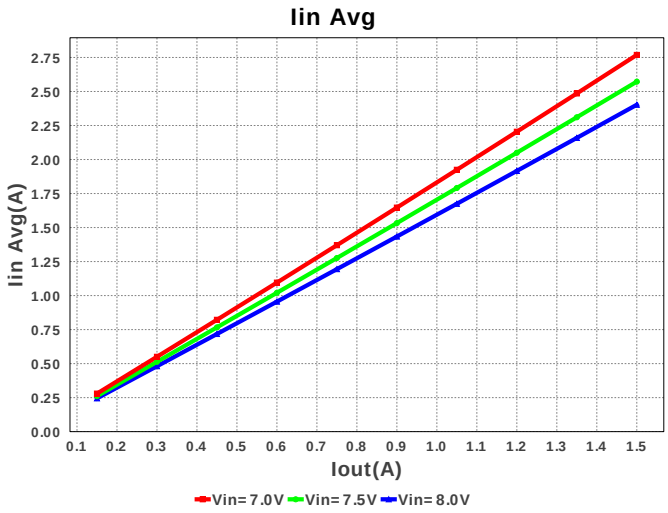


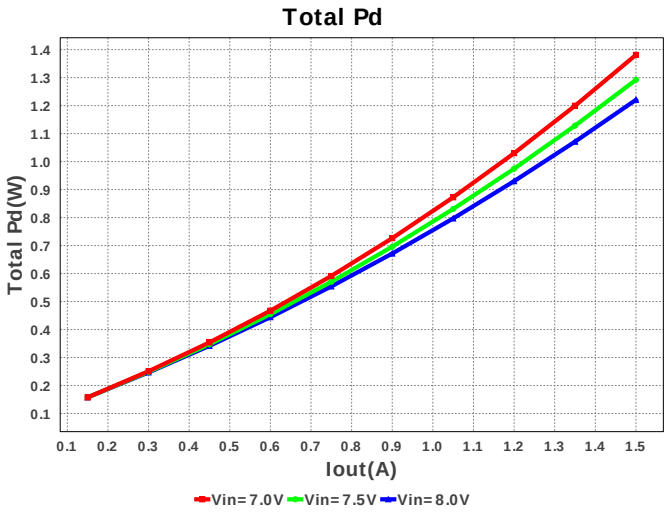




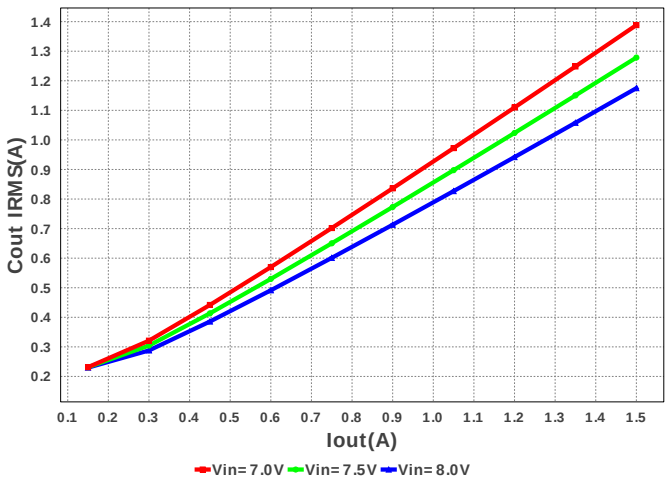




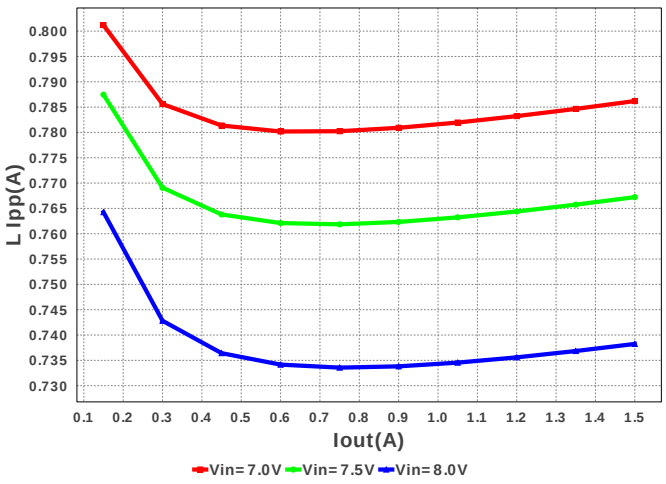




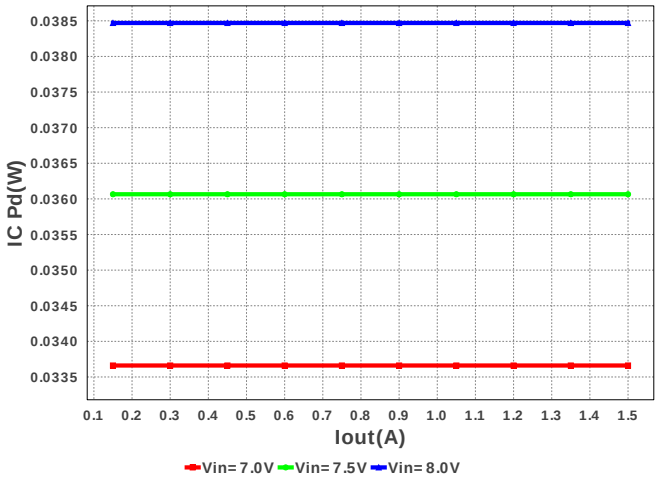
Cout IRMS



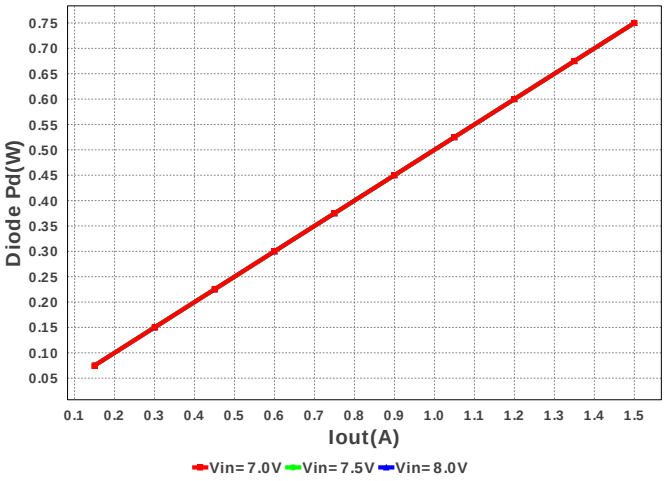
L Ipp



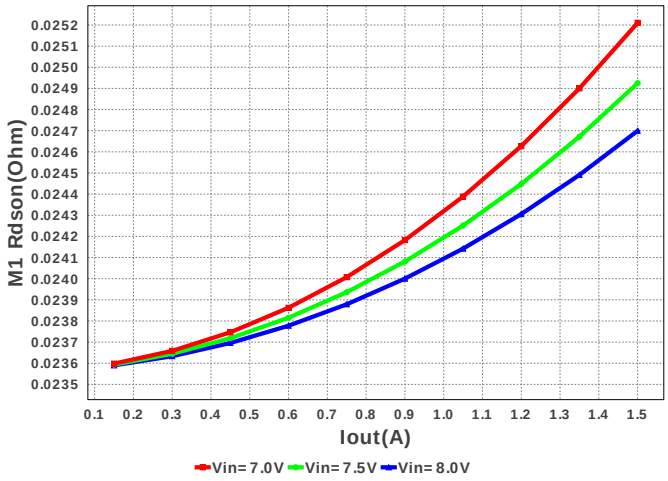
IC Pd



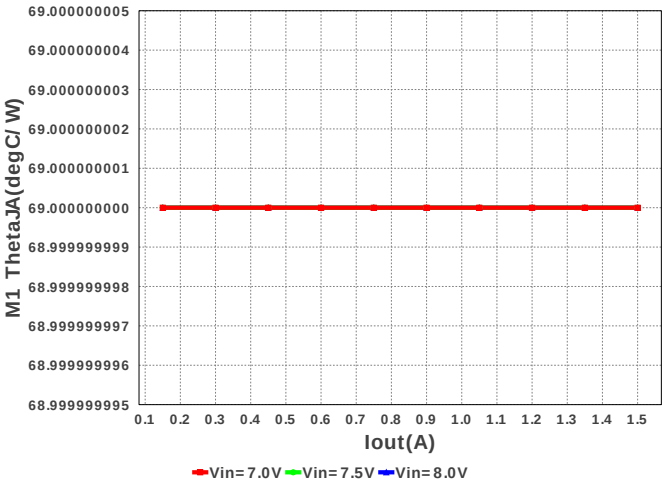
Diode Pd

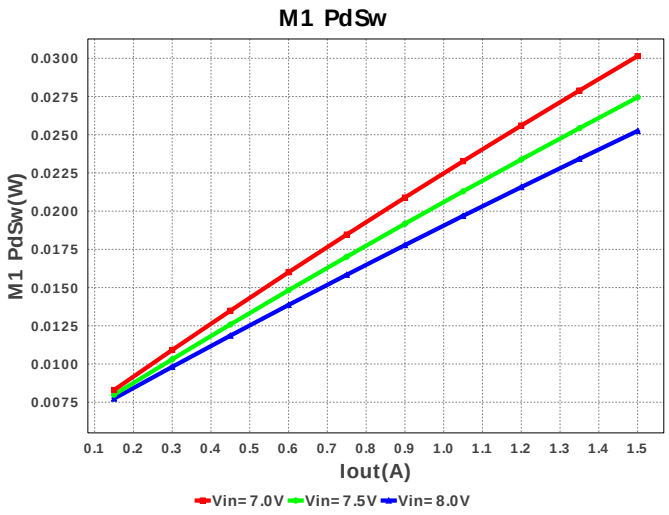


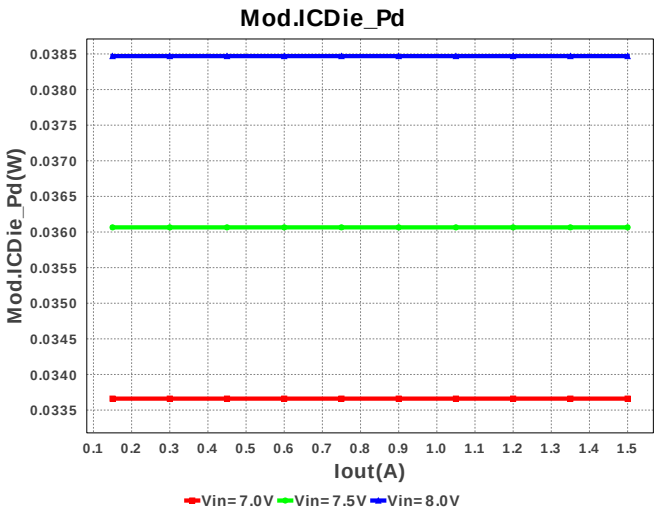
M1 Rdson



M1 ThetaJA







Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	226.946 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	1.388 A	Current	Output capacitor RMS ripple current
3.	Iin Avg	2.769 A	Current	Average input current
4.	L Ipp	786.164 mA	Current	Peak-to-peak inductor ripple current
5.	L1 Irms	2.776 A	Current	Inductor ripple current
6.	M1 Irms	2.83 A	Current	M1 MOSFET Irms
7.	SW Ipk	3.159 A	Current	Peak switch current
8.	BOM Count	16	General	Total Design BOM count
9.	FootPrint	520.0 mm^2	General	Total Foot Print Area of BOM components
10.	Frequency	336.963 kHz	General	Switching frequency
11.	IC Tolerance	24.3 mV	General	IC Feedback Tolerance
12.	M Vds Act	71.338 mV	General	M Vds
13.	M1 Rdson	25.205 mOhm	General	Drain-Source On-resistance
14.	M1 ThetaJA	69.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
15.	Mode	CCM	General	Conduction Mode
16.	Pout	18.0 W	General	Total output power
17.	Total BOM	$2.28	General	Total BOM Cost
18.	D1 Tj	48.75 degC	Op_Point	D1 junction temperature
19.	Vout OP	12.0 V	Op_Point	Operational Output Voltage
20.	Cross Freq	4.301 kHz	Op_point	Bode plot crossover frequency
21.	Duty Cycle	45.775 %	Op_point	Duty cycle
22.	Efficiency	92.876 %	Op_point	Steady state efficiency
23.	IC Tj	36.748 degC	Op_point	IC junction temperature
24.	ICThetaJA	200.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
25.	IOUT_OP	1.5 A	Op_point	Iout operating point
26.	M1 TjOP	46.023 degC	Op_point	M1 MOSFET junction temperature
27.	Phase Marg	53.072 deg	Op_point	Bode Plot Phase Margin
28.	VIN_OP	7.0 V	Op_point	Vin operating point
29.	Vout p-p	78.983 mV	Op_point	Peak-to-peak output ripple voltage
30.	Cin Pd	18.542 mW	Power	Input capacitor power dissipation
31.	Cout Pd	48.182 mW	Power	Output capacitor power dissipation
32.	Diode Pd	750.0 mW	Power	Diode power dissipation
33.	IC Pd	33.74 mW	Power	IC power dissipation
34.	L Pd	212.618 mW	Power	Inductor power dissipation
35.	M1 Pd	232.216 mW	Power	M1 MOSFET total power dissipation
36.	M1 PdCond	201.911 mW	Power	M1 MOSFET conduction losses
37.	M1 PdSw	30.305 mW	Power	M1 MOSFET switching losses
38.	Rfb Pd	15.238 mW	Power	Rfb Power Dissipation
39.	Total Pd	1.381 W	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	1.5	Maximum Output Current
2.	Iout1	1.5	Output Current #1
3.	VinMax	8.0	Maximum input voltage
4.	VinMin	7.0	Minimum input voltage
5.	Vout	12.0	Output Voltage
6.	Vout1	12.0	Output Voltage #1
7.	base_pn	LM3478	Base Product 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.