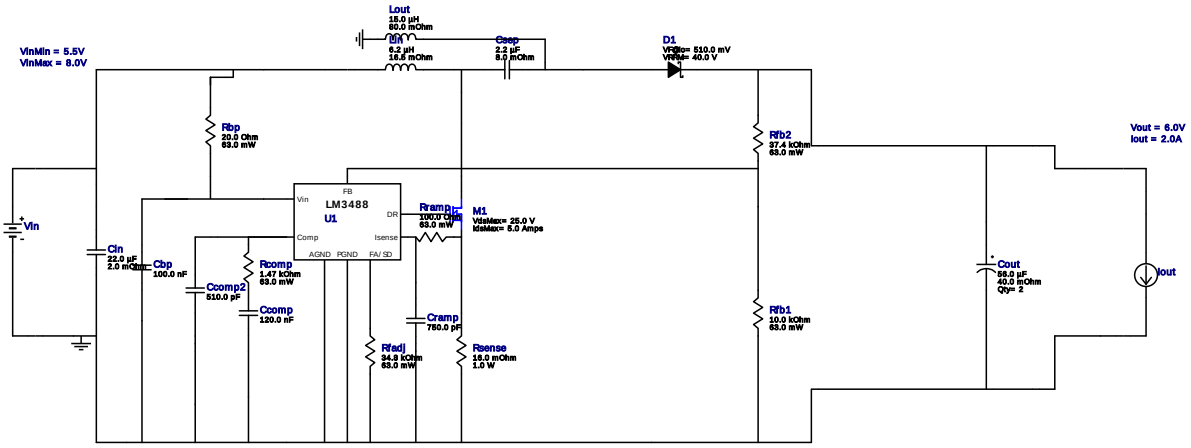
WEBENCH® Design Report

VinMin = 5.5V
VinMax = 8.0V
Vout = 6.0V
Iout = 2.0A

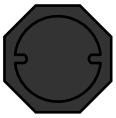
Device = LM3488MM/NOPB
Topology = SEPIC
Created = 6/11/13 11:55:44 AM
BOM Cost = $4.07
Total Pd = 2.21W
Footprint = 615.0mm2
BOM Count = 20

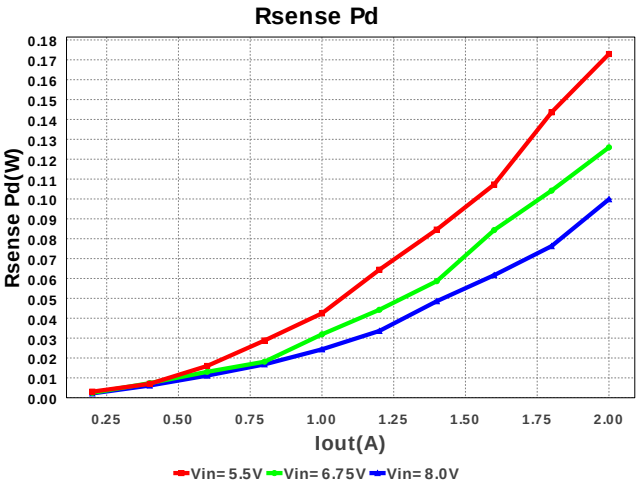
Design : 3729827/3 LM3488MM/NOPB
LM3488MM/NOPB 5.5V-8.0V to 6.0V @ 2.0A

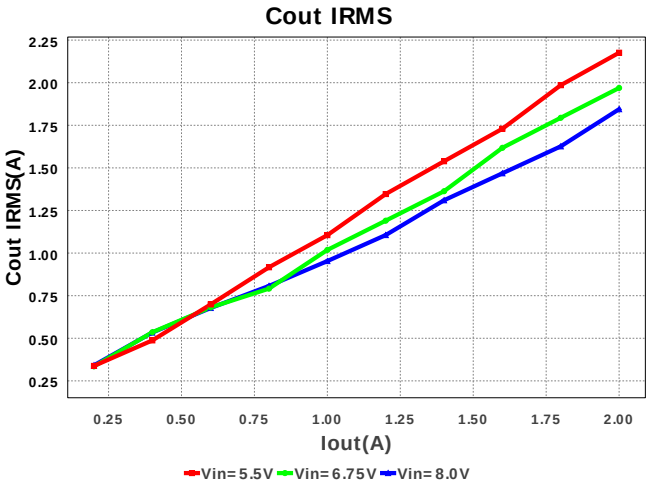


Electrical BOM

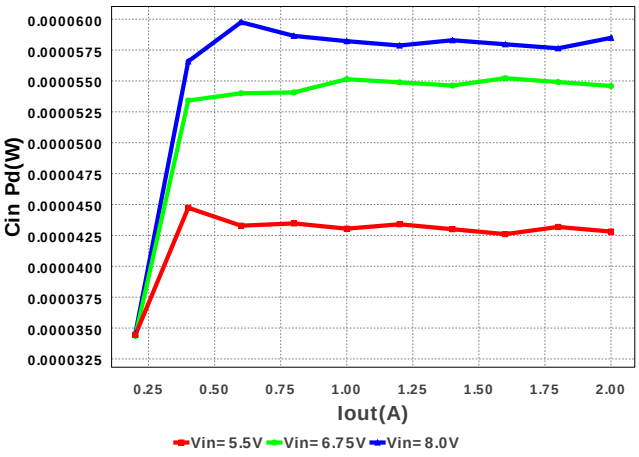
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbp	Kemet	C0603C104Z4VACTU Series= Y5V	Cap= 100.0 nF VDC= 16.0 V IRMS= 0.0 A	1	$0.01	0603 10mm2
2.	Ccomp	MuRata	GRM155R61A124KE19D Series= X5R	Cap= 120.0 nF VDC= 10.0 V IRMS= 0.0 A	1	$0.01	0402 8mm2
3.	Ccomp2	MuRata	GRM1555C1H511JA01D Series= C0G/NP0	Cap= 510.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0402 8mm2
4.	Cin	TDK	C3225X7R1C226M Series= X7R	Cap= 22.0 µF ESR= 2.0 mOhm VDC= 16.0 V IRMS= 8.11 A	1	$0.22	1210 23mm2
5.	Cout	Nippon Chemi-Con	APXC100ARA560ME60G Series= PXC	Cap= 56.0 µF ESR= 40.0 mOhm VDC= 10.0 V IRMS= 1.66 A	2	$0.60	CAPSMT_62_E60 53mm2
6.	Cramp	MuRata	GRM1555C1E751JA01D Series= C0G/NP0	Cap= 750.0 pF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0402 8mm2
7.	Csep	Kemet	C0805C225K4RACTU Series= X7R	Cap= 2.2 µF ESR= 8.0 mOhm VDC= 16.0 V IRMS= 15.55 A	1	$0.08	0805 13mm2
8.	D1	Vishay-Semiconductor	50WQ04FNPBF	VF@Io= 510.0 mV VRRM= 40.0 V	1	$0.40	DPAK 102mm2

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
9.	Lin	Bourns	SRU1038-6R2Y	L= 6.2 µH DCR= 16.5 mOhm	1	$0.07	 SRU1038 144mm2
10.	Lout	Coilcraft	XAL5050-153MEB	L= 15.0 µH DCR= 80.0 mOhm	1	$0.83	 XAL5050 54mm2
11.	M1	Texas Instruments	CSD16301Q2	VdsMax= 25.0 V IdsMax= 5.0 Amps	1	$0.17	 TRANS_NexFET_Q2 16mm2
12.	Rbp	Vishay-Dale	CRCW040220R0FKED Series= CRCW..e3	Res= 20.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 8mm2
13.	Rcomp	Vishay-Dale	CRCW04021K47FKED Series= CRCW..e3	Res= 1.47 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 8mm2
14.	Rfadj	Vishay-Dale	CRCW040234K8FKED Series= CRCW..e3	Res= 34.8 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 8mm2
15.	Rfb1	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 8mm2
16.	Rfb2	Vishay-Dale	CRCW040237K4FKED Series= CRCW..e3	Res= 37.4 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 8mm2
17.	Rramp	Vishay-Dale	CRCW0402100RFKED Series= CRCW..e3	Res= 100.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 8mm2
18.	Rsense	Panasonic	ERJ-M1WSF16MU Series= 1119	Res= 16.0 mOhm Power= 1.0 W Tolerance= 1.0%	1	$0.15	 2512 43mm2
19.	U1	Texas Instruments	LM3488MM/NOPB	Switcher	1	$0.85	 MUA08A 34mm2

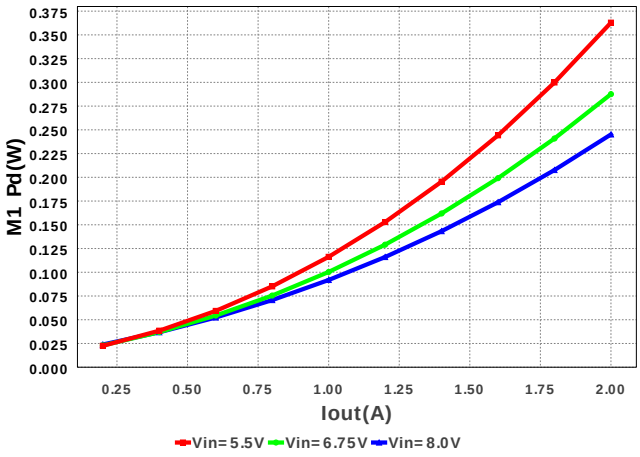




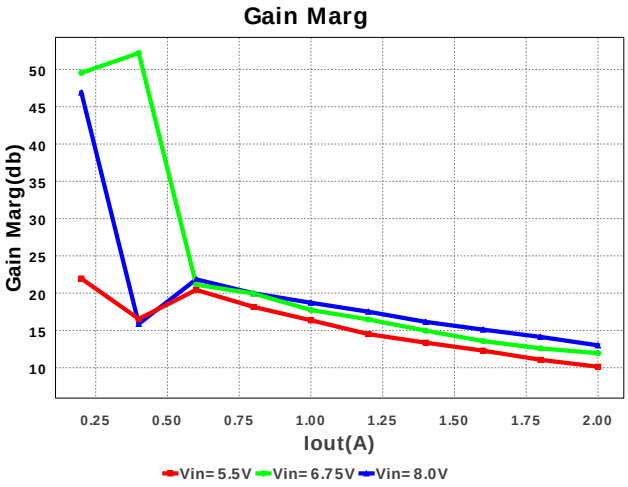
Cin Pd



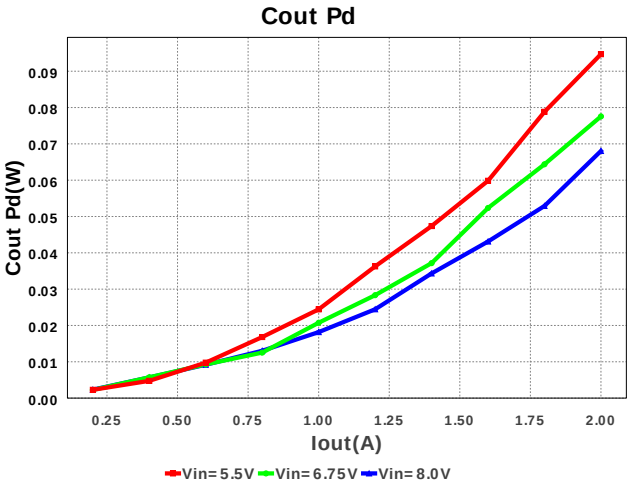
M1 Pd



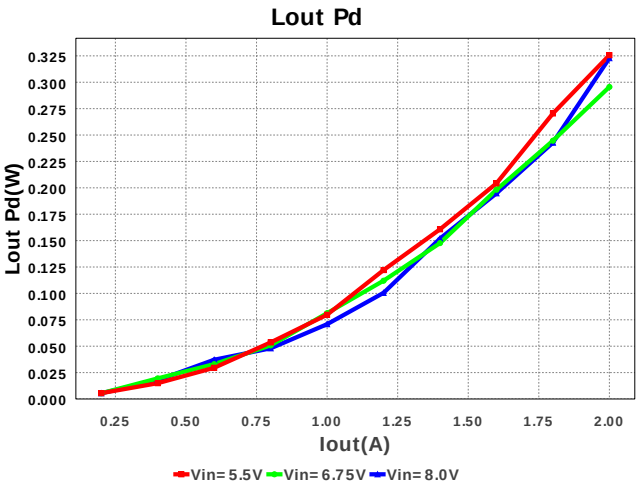
Gain Marg



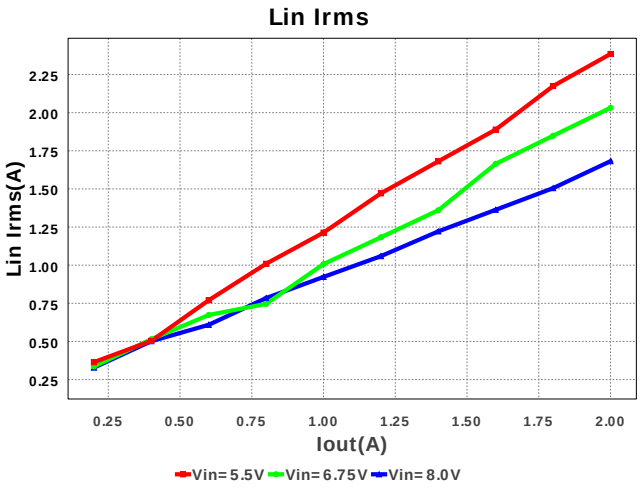
Cout Pd

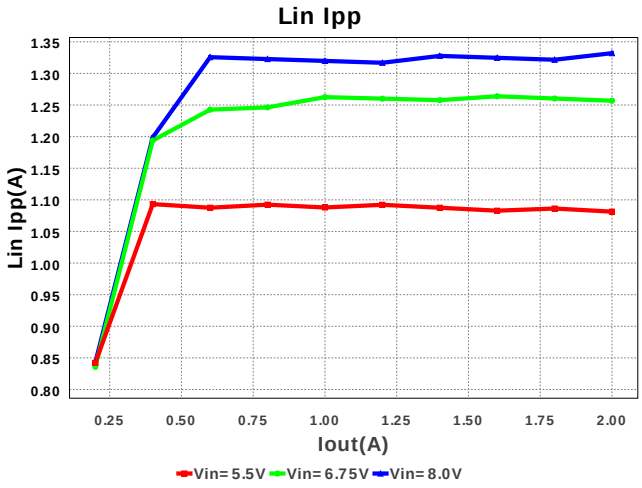


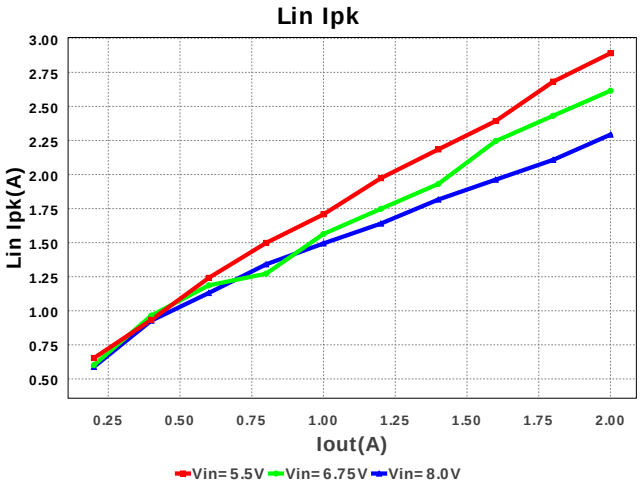
Lout Pd

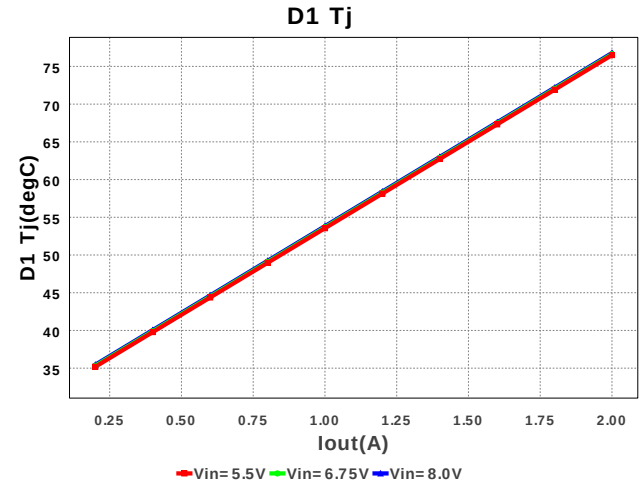


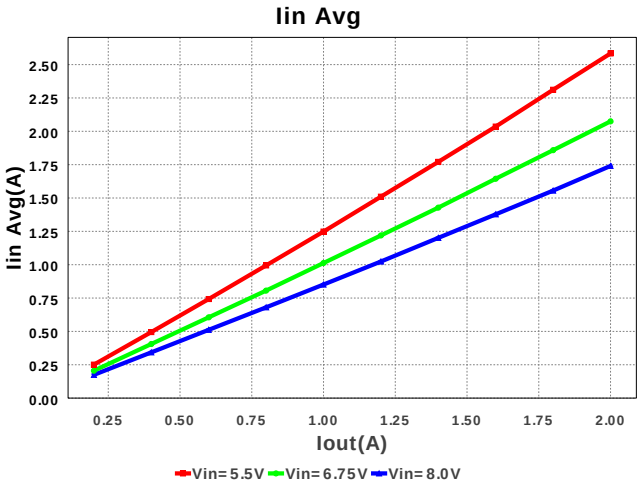
Lin Irms

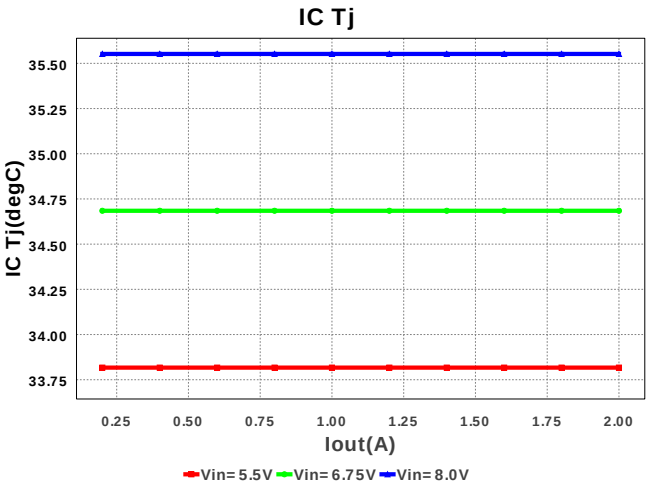


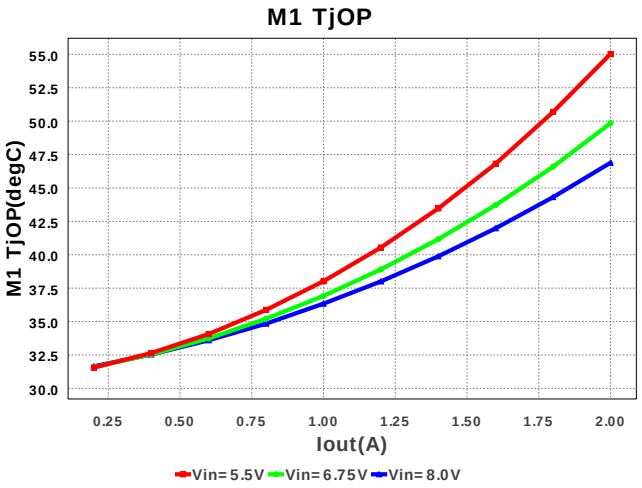




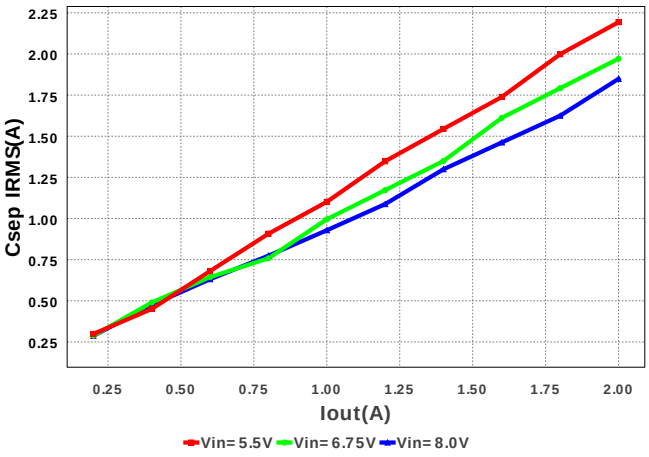




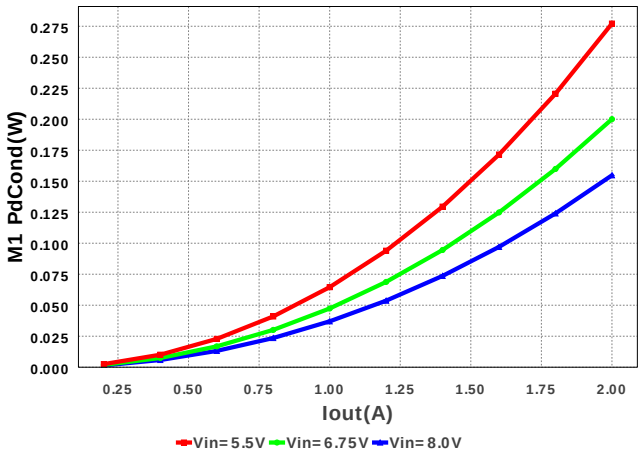




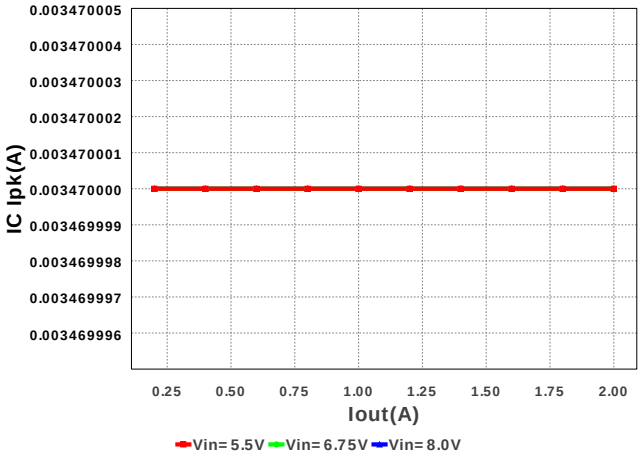
Csep IRMS



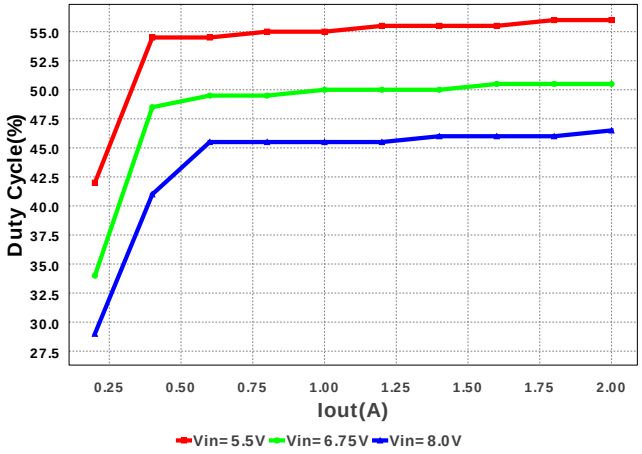
M1 PdCond



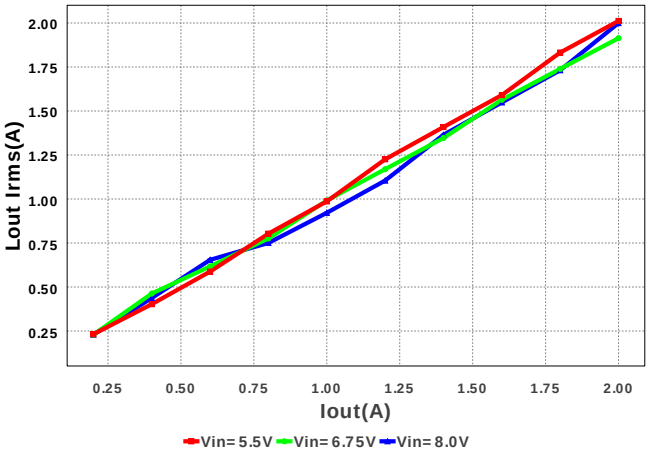
IC Ipk



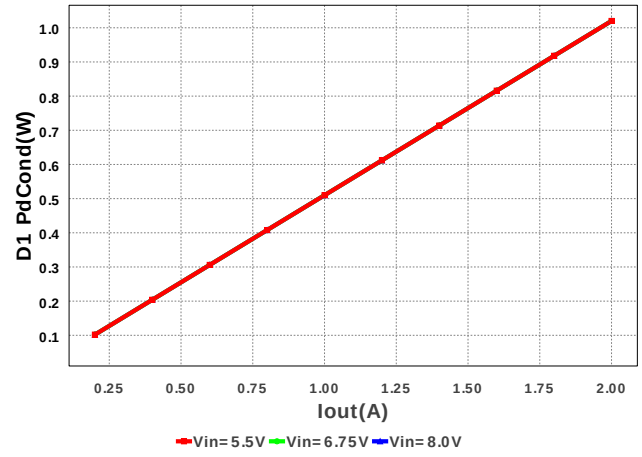
Duty Cycle



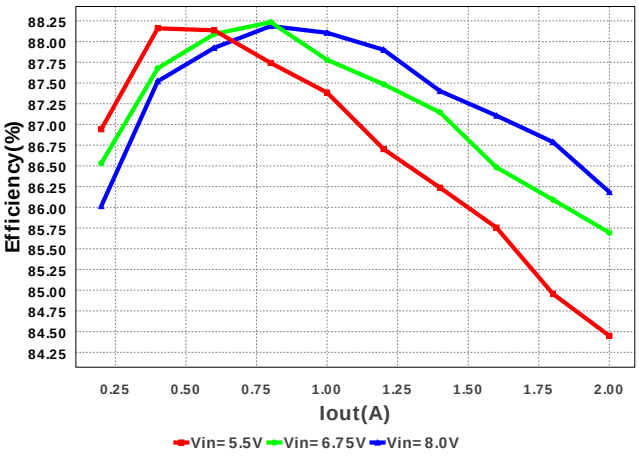
Lout Irms



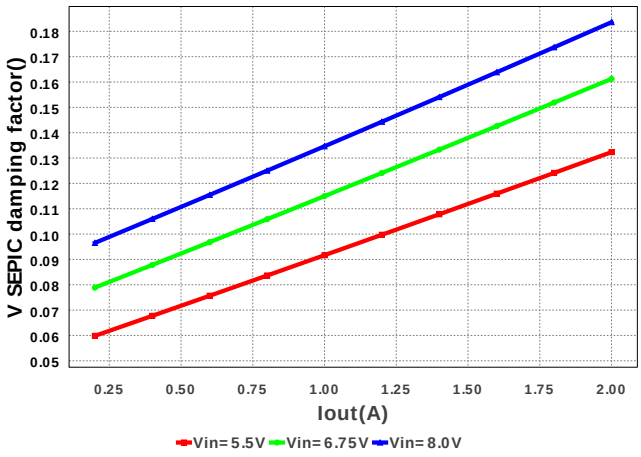
D1 PdCond



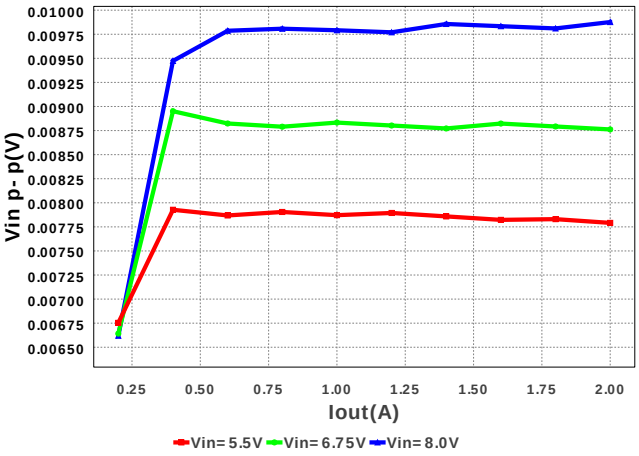
Efficiency



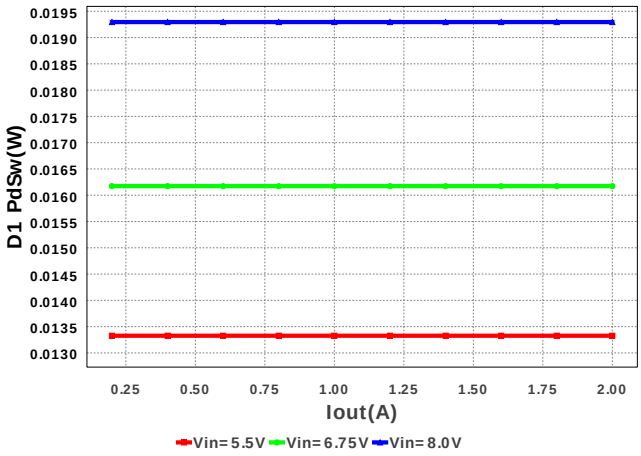
V SEPIC damping factor



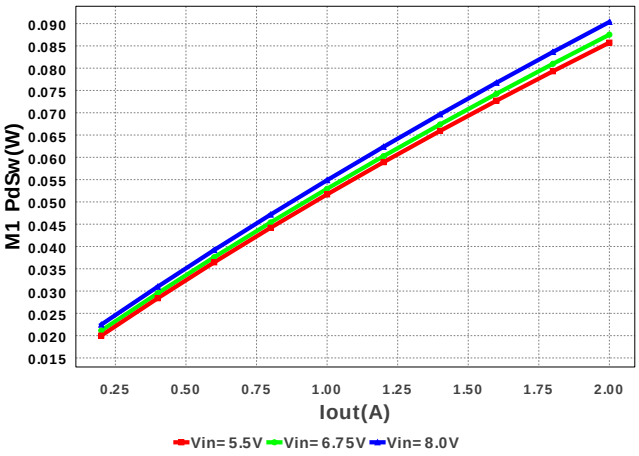
Vin p- p



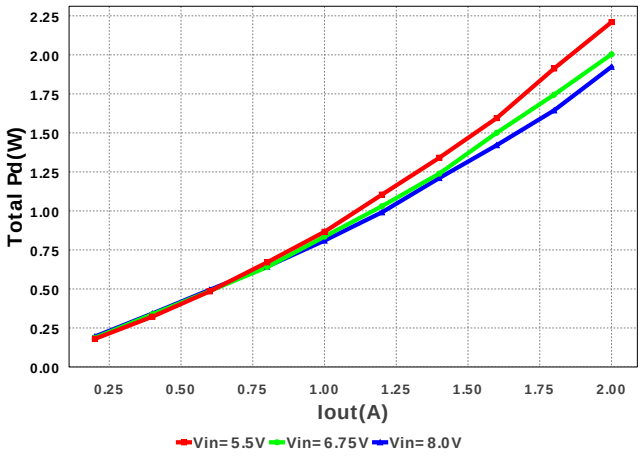
D1 PdSw



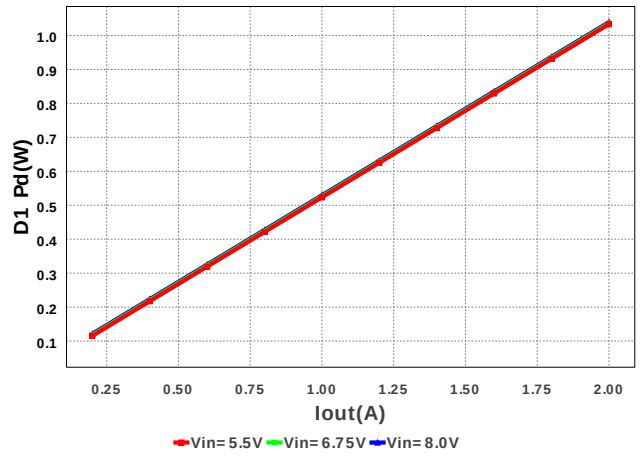
M1 PdSw



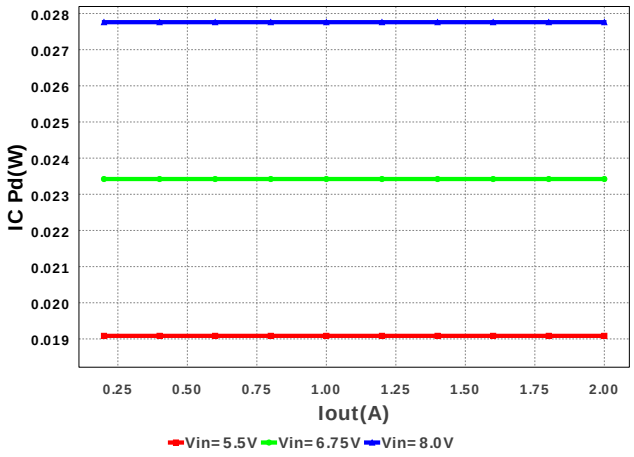
Total Pd



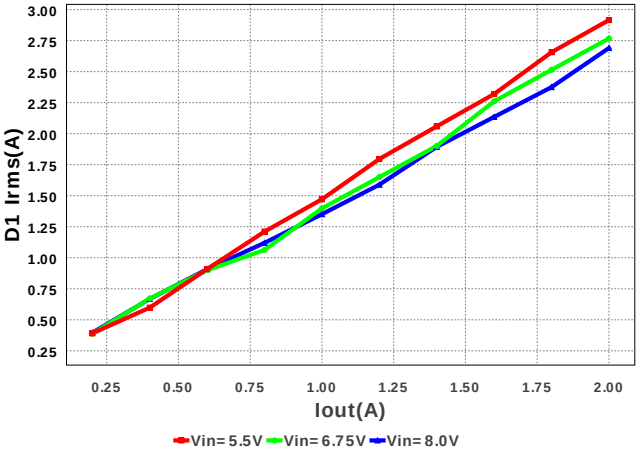
D1 Pd



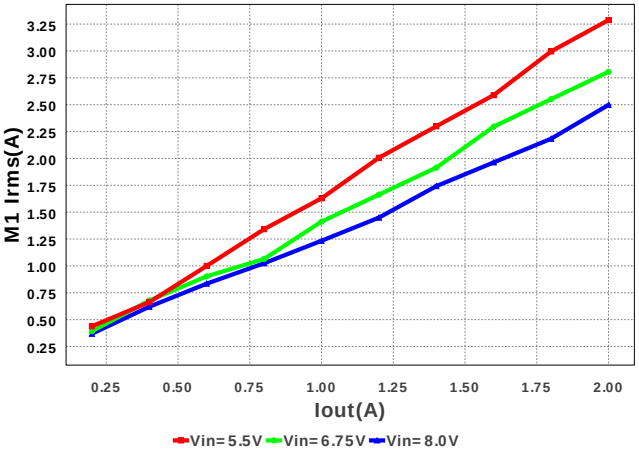
IC Pd



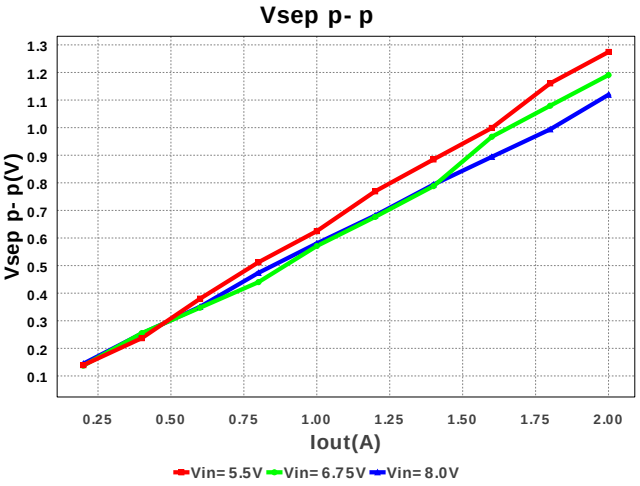
D1 Irms



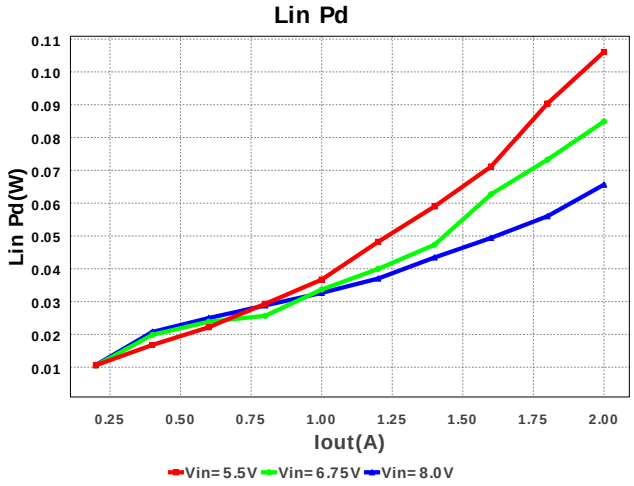
M1 Irms



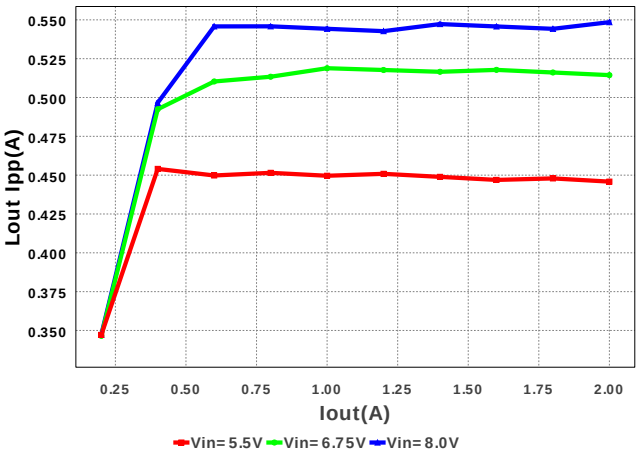
Vsep p- p



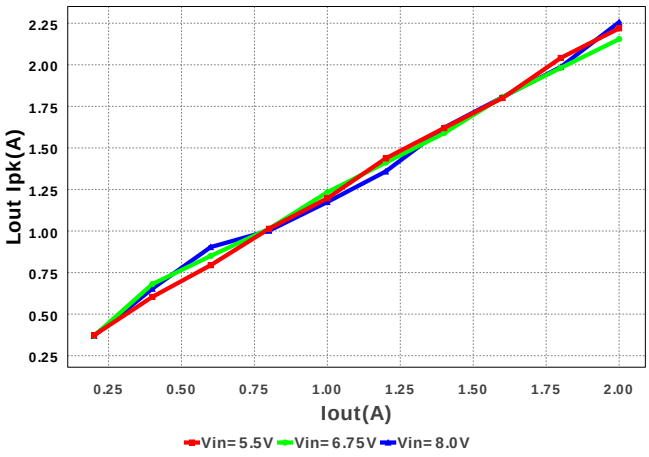
Lin Pd



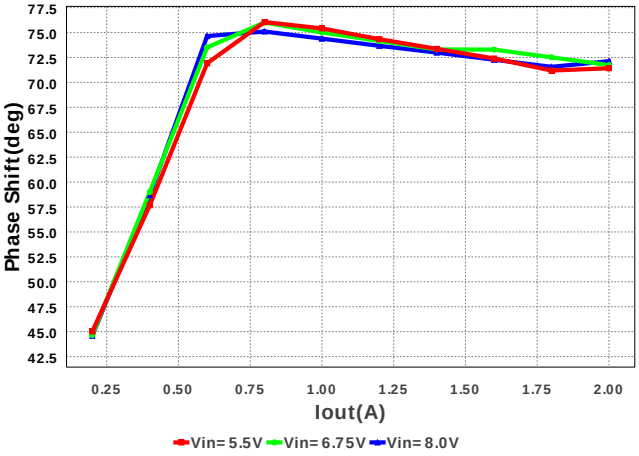
Lout Ipp



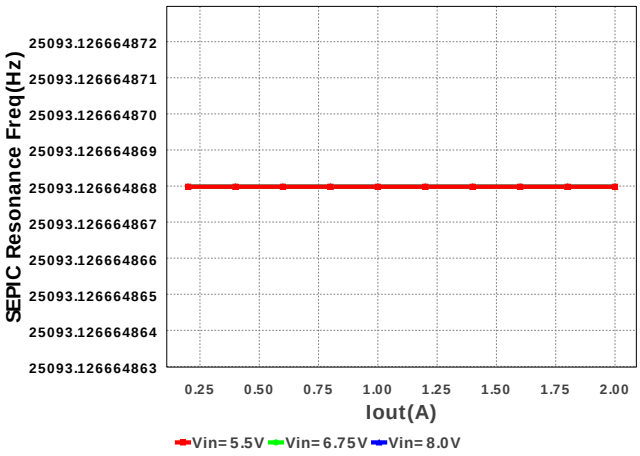
Lout Ipk



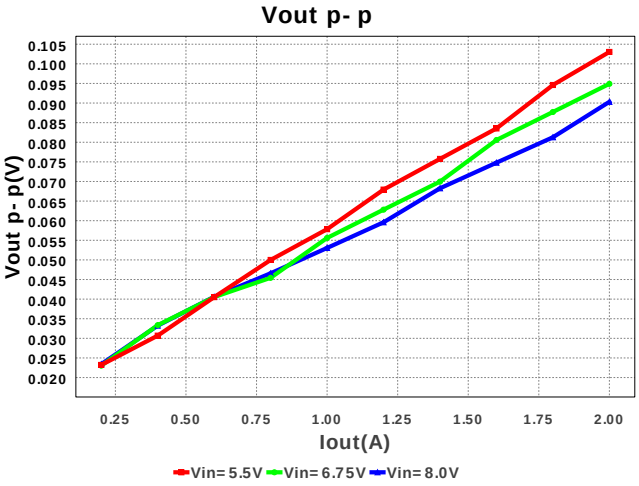
Phase Shift



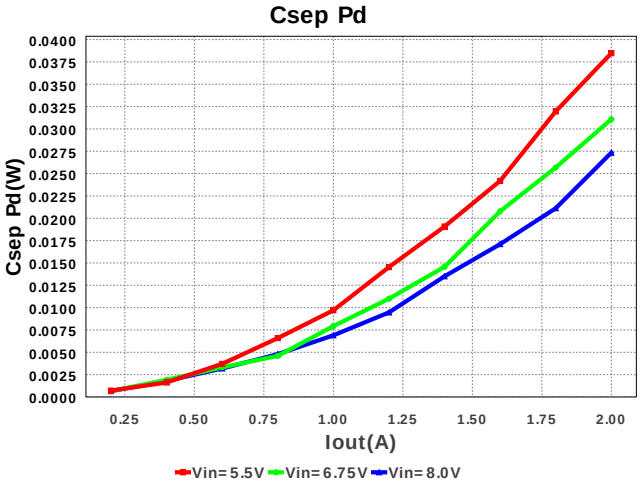
SEPIC Resonance Freq

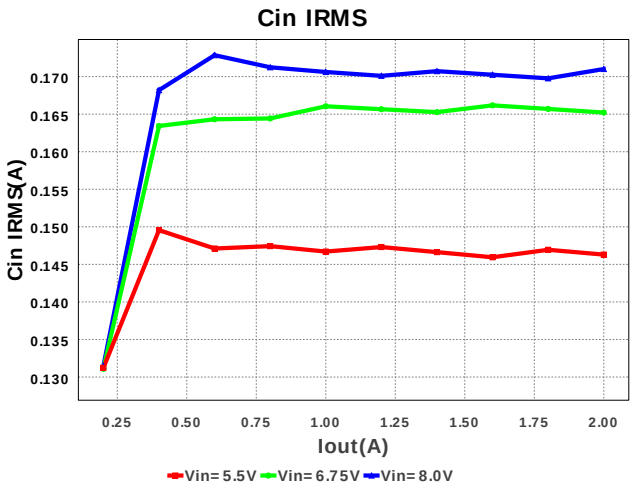


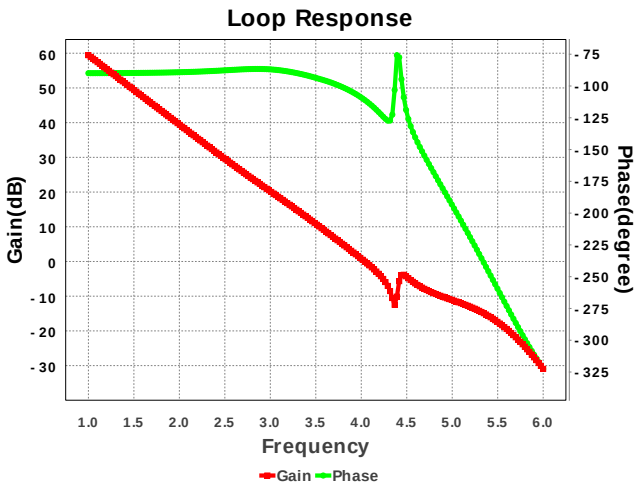
Vout p- p



Csep Pd







Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	146.303 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	2.176 A	Current	Output capacitor RMS ripple current
3.	Csep IRMS	2.193 A	Current	SEPIC capacitor RMS ripple current
4.	D1 Irms	2.915 A	Current	D1 Irms
5.	IC Ipk	3.47 mA	Current	Peak switch current in IC
6.	Iin Avg	2.584 A	Current	Average input current
7.	Lin Ipk	2.891 A	Current	Lin peak current
8.	Lin Ipp	1.081 A	Current	Peak-to-peak input inductor ripple current
9.	Lin Irms	2.385 A	Current	Lin ripple current
10.	Lout Ipk	2.219 A	Current	Lout peak current
11.	Lout Ipp	445.836 mA	Current	Peak-to-peak output inductor ripple current
12.	Lout Irms	2.012 A	Current	Lout ripple current
13.	M1 Irms	3.287 A	Current	M1 MOSFET Irms
14.	BOM Count	20	General	Total Design BOM count
15.	FootPrint	615.0 mm2	General	Total Foot Print Area of BOM components
16.	Frequency	435.0 kHz	General	Switching frequency
17.	IC Tolerance	15.3 mV	General	IC Feedback Tolerance
18.	Mode	CCM	General	Conduction Mode
19.	Total BOM	$4.07	General	Total BOM Cost
20.	D1 Tj	76.5 degC	Op_Point	D1 junction temperature
21.	SEPIC Resonance Freq	25.093 kHz	Op_Point	SEPIC Resonance Frequency
22.	V SEPIC damping factor	132.33 m	Op_Point	V SEPIC damping factor
23.	Vin p-p	7.791 mV	Op_Point	Peak-to-peak input voltage
24.	Vsep p-p	1.274 V	Op_Point	Peak-to-peak sepic voltage
25.	Cross Freq	10.353 kHz	Op_point	Bode plot crossover frequency
26.	Duty Cycle	56.0 %	Op_point	Duty cycle
27.	Efficiency	84.449 %	Op_point	Steady state efficiency
28.	Gain Marg	10.13 db	Op_point	Bode Plot Gain Margin
29.	IC Tj	35.552 degC	Op_point	IC junction temperature
30.	IOUT_OP	2.0 A	Op_point	Iout operating point
31.	M1 TjOP	55.029 degC	Op_point	M1 MOSFET junction temperature
32.	Phase Marg	70.195 deg	Op_point	Bode Plot Phase Margin
33.	Phase Shift	71.42 deg	Op_point	Bode Plot Phase Shift
34.	VIN_OP	5.5 V	Op_point	Vin operating point
35.	Vout p-p	103.029 mV	Op_point	Peak-to-peak output ripple voltage
36.	Cin Pd	42.809 µW	Power	Input capacitor power dissipation
37.	Cout Pd	94.695 mW	Power	Output capacitor power dissipation
38.	Csep Pd	38.478 mW	Power	SEPIC capacitor power dissipation
39.	D1 Pd	1.033 W	Power	Diode power dissipation
40.	D1 PdCond	1.02 W	Power	Diode conduction losses
41.	D1 PdSw	13.327 mW	Power	Diode switching losses
42.	IC Pd	27.76 mW	Power	IC power dissipation
43.	Lin Pd	106.081 mW	Power	Lin power dissipation
44.	Lout Pd	325.649 mW	Power	Lout power dissipation
45.	M1 Pd	362.88 mW	Power	M1 MOSFET total power dissipation
46.	M1 PdCond	277.15 mW	Power	M1 MOSFET conduction losses
47.	M1 PdSw	85.729 mW	Power	M1 MOSFET switching losses
48.	Rsense Pd	172.922 mW	Power	LED Current Rsns Power Dissipation
49.	Total Pd	2.21 W	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	2.0 A	Maximum Output Current
2.	Iout1	2.0 Amps	Output Current #1
3.	VinMax	8.0 V	Maximum input voltage
4.	VinMin	5.5 V	Minimum input voltage
5.	Vout	6.0 V	Output Voltage
6.	Vout1	6.0 Volt	Output Voltage #1
7.	base_pn	LM3488	Base Product Number
8.	source	DC	Input Source Type
9.	Ta	30.0 degC	Ambient temperature

Design Assistance

1. **LM3488** Product Folder : http://www.ti.com/product/lm3488 : contains the data sheet and other resources.