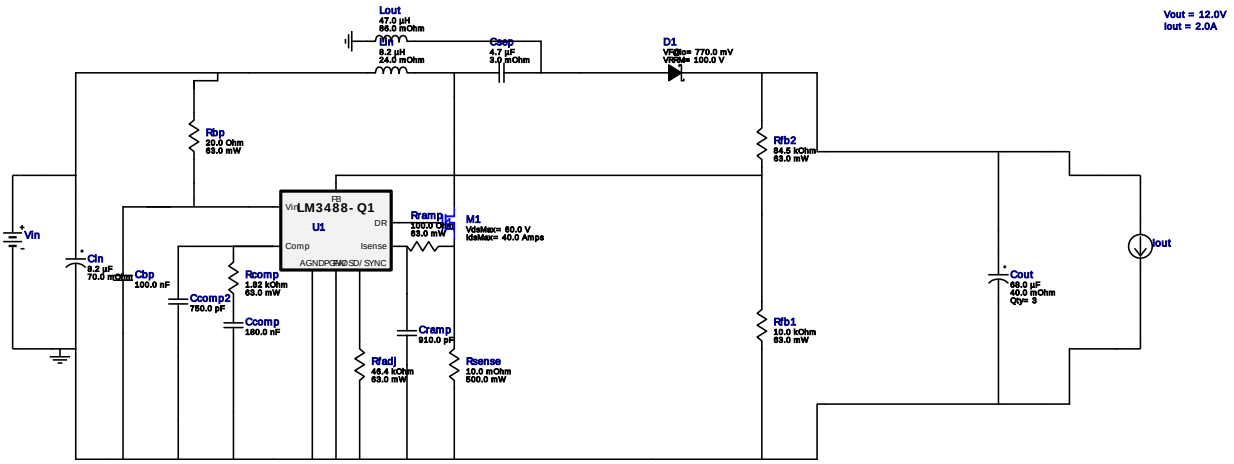
WEBENCH® Design Report

VinMin = 5.0V
VinMax = 24.0V
Vout = 12.0V
Iout = 2.0A

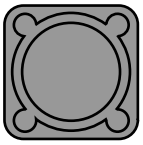
Device = LM3488QMMX/NOPB
Topology = SEPIC
Created = 7/21/16 10:49:22 PM
BOM Cost = $6.00
BOM Count = 21
Total Pd = 5.61W

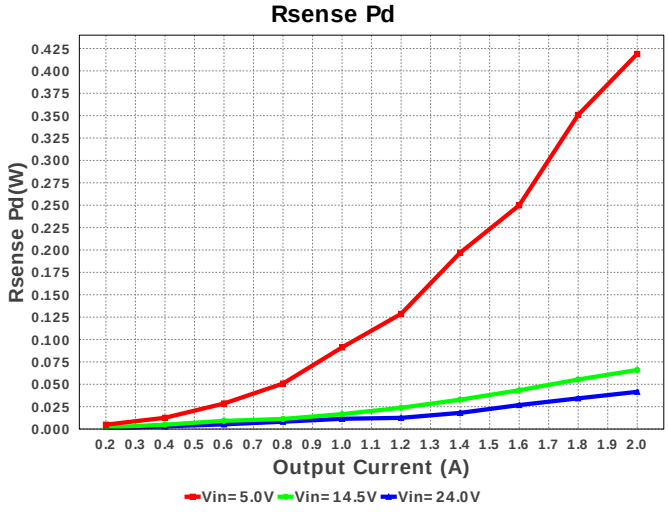
Design : 4748600/1 LM3488QMMX/NOPB
LM3488QMMX/NOPB 5.0V-24.0V to 12.00V @ 2.0A

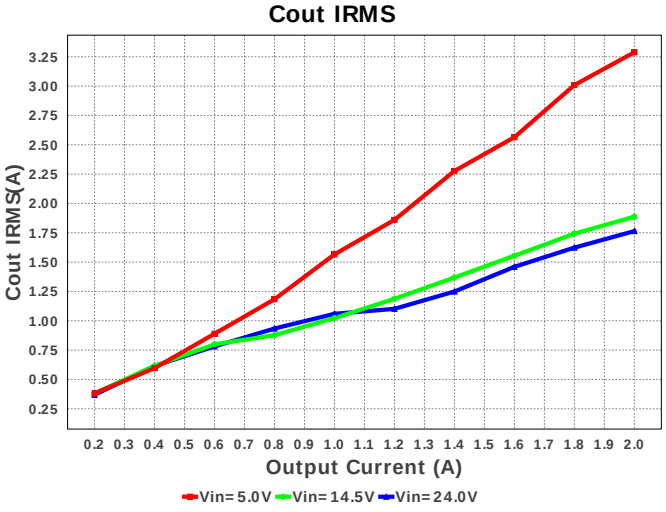


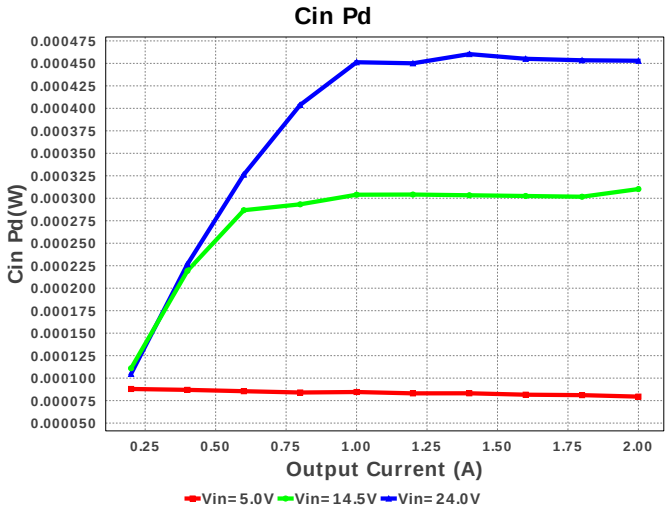
Electrical BOM

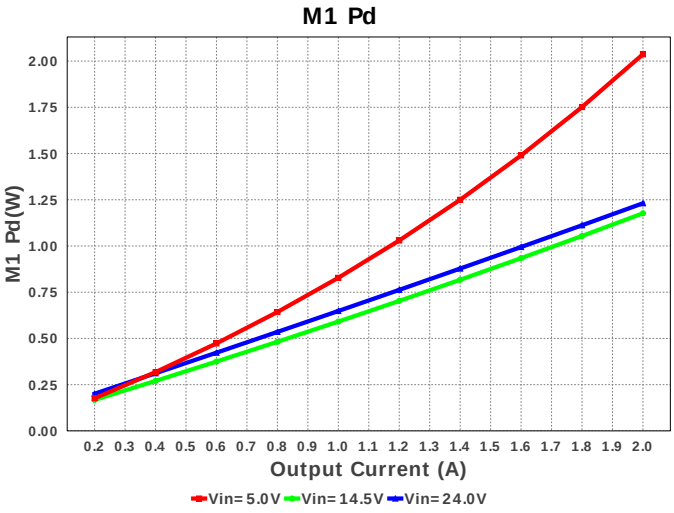
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbp	Kemet	C0603C104K5RACTU Series= X7R	Cap= 100.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0603 5 mm²
2.	Ccomp	MuRata	GRM155R61A184KE19D Series= X5R	Cap= 180.0 nF VDC= 10.0 V IRMS= 0.0 A	1	$0.02	0402 3 mm²
3.	Ccomp2	Samsung Electro-Mechanics	CL21C751JBCNNNC Series= C0G/NP0	Cap= 750.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.03	0805 7 mm²
4.	Cin	Panasonic	35SVPD8R2M Series= SVPD	Cap= 8.2 uF ESR= 70.0 mOhm VDC= 35.0 V IRMS= 1.3 A	1	$0.60	SM_RADIAL_8MM 113 mm²
5.	Cout	Panasonic	20SVP68M Series= SVP	Cap= 68.0 uF ESR= 40.0 mOhm VDC= 20.0 V IRMS= 2.4 A	3	$0.56	SM_RADIAL_10AMM 160 mm²
6.	Cramp	Samsung Electro-Mechanics	CL21C911JBCNNNC Series= C0G/NP0	Cap= 910.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.03	0805 7 mm²
7.	Csep	MuRata	GRM31CR71H475KA12L Series= X7R	Cap= 4.7 uF ESR= 3.0 mOhm VDC= 50.0 V IRMS= 4.98 A	1	$0.07	1206 11 mm²
8.	D1	Vishay-Semiconductor	50WQ10FNPBF	VF@Io= 770.0 mV VRRM= 100.0 V	1	$0.74	DPAK 102 mm²
9.	Lin	Coilcraft	XAL6060-822MEB	L= 8.2 µH DCR= 24.0 mOhm	1	$0.82	XAL6060 72 mm²

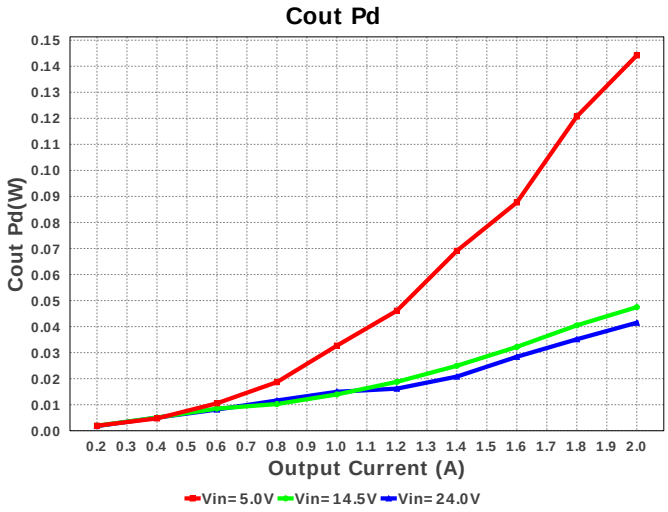
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	Lout	Bourns	SRF1260-470M	L= 47.0 µH DCR= 86.0 mOhm	1	$0.48	 SRF1260 210 mm²
11.	M1	Infineon Technologies	BSZ100N06LS3 G	VdsMax= 60.0 V IdsMax= 40.0 Amps	1	$0.39	 PG-TSDSON-8 19 mm²
12.	Rbp	Vishay-Dale	CRCW040220R0FKED Series= CRCW..e3	Res= 20.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
13.	Rcomp	Vishay-Dale	CRCW04021K82FKED Series= CRCW..e3	Res= 1.82 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
14.	Rfadj	Vishay-Dale	CRCW040246K4FKED Series= CRCW..e3	Res= 46.4 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
15.	Rfb1	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
16.	Rfb2	Vishay-Dale	CRCW040284K5FKED Series= CRCW..e3	Res= 84.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
17.	Rramp	Vishay-Dale	CRCW0402100RFKED Series= CRCW..e3	Res= 100.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
18.	Rsense	Stackpole Electronics Inc	CSR1206FK10L0 Series= ?	Res= 10.0 mOhm Power= 500.0 mW Tolerance= 1.0%	1	$0.11	 1206 11 mm²
19.	U1	Texas Instruments	LM3488QMMX/NOPB	Switcher	1	$0.96	 MUA08A 24 mm²

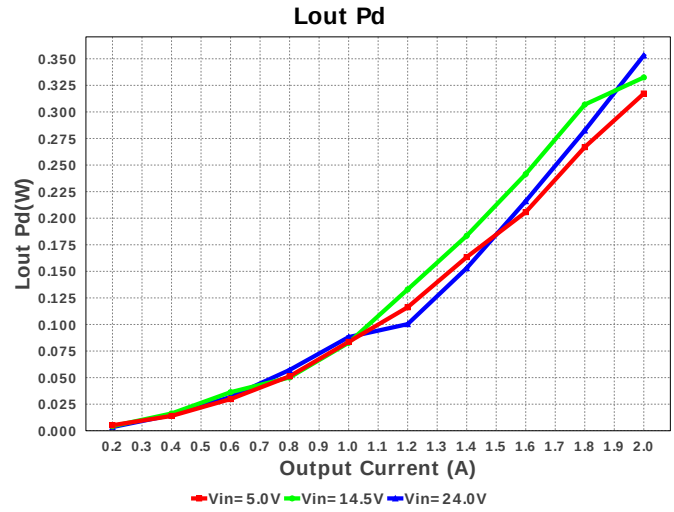


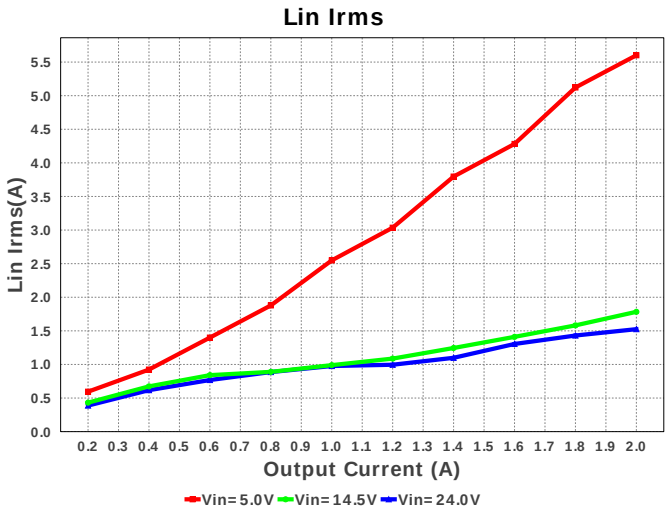


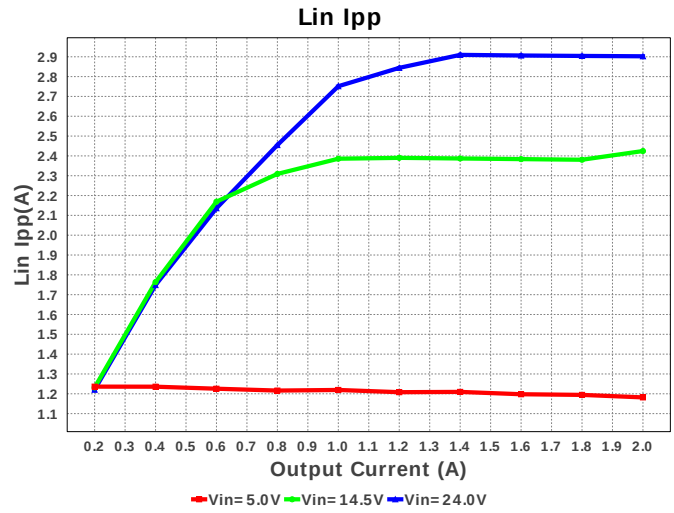


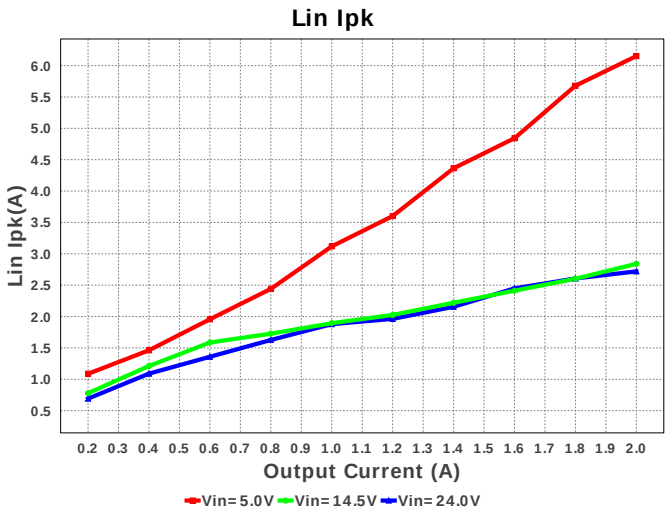


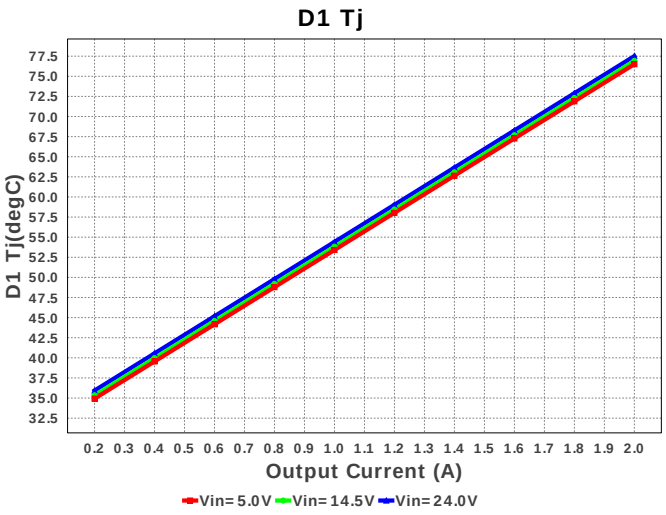


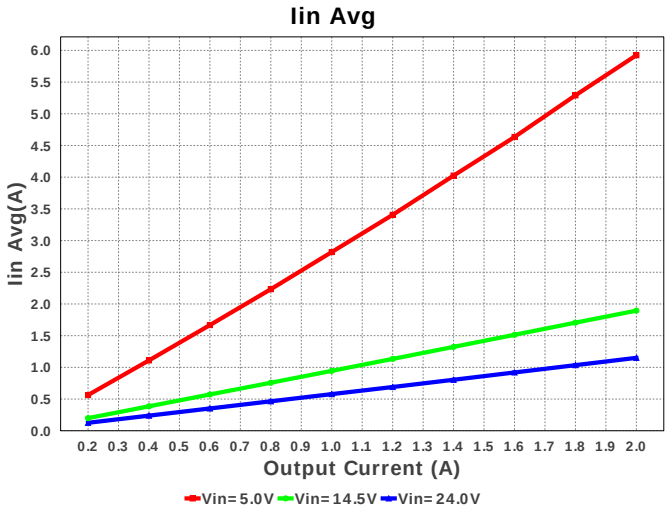


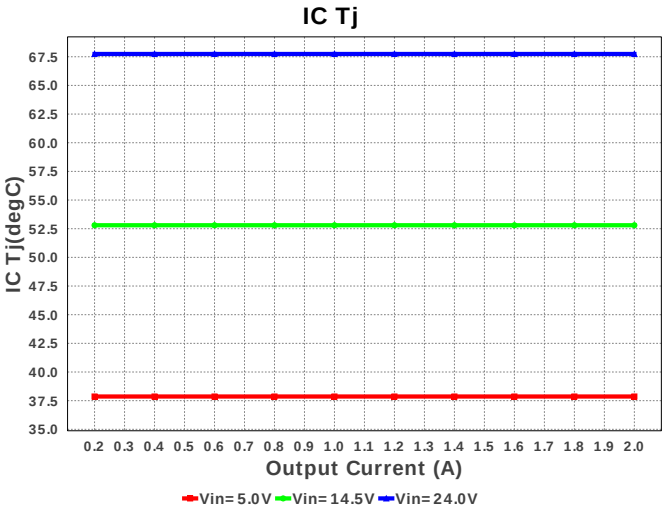


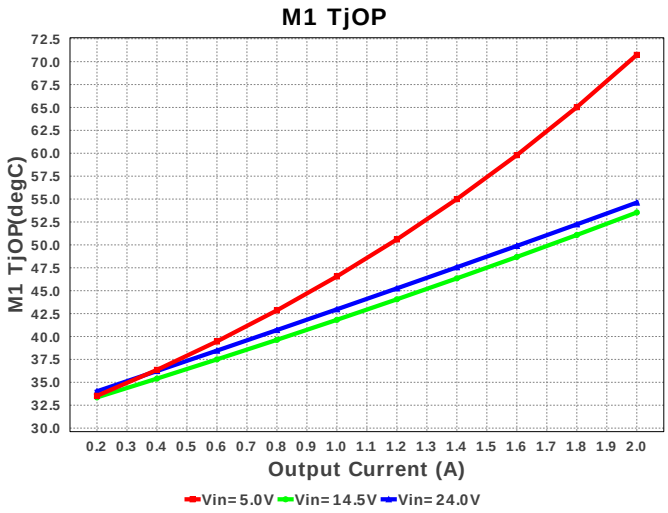


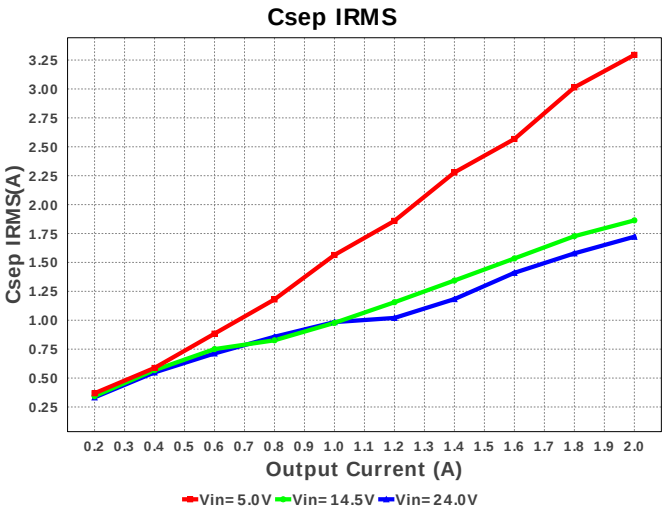


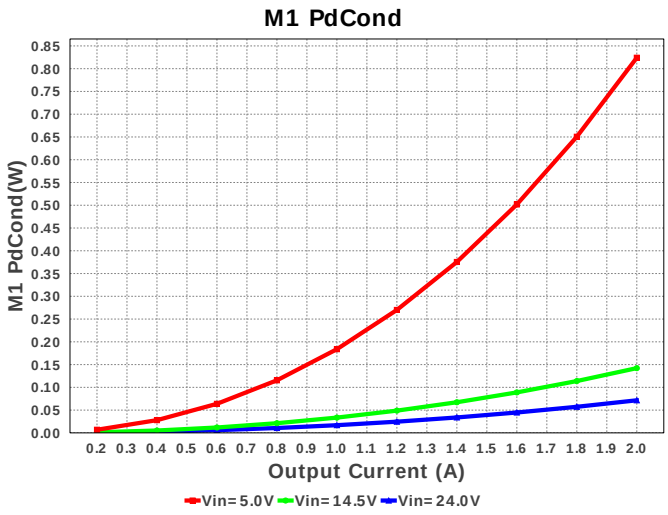


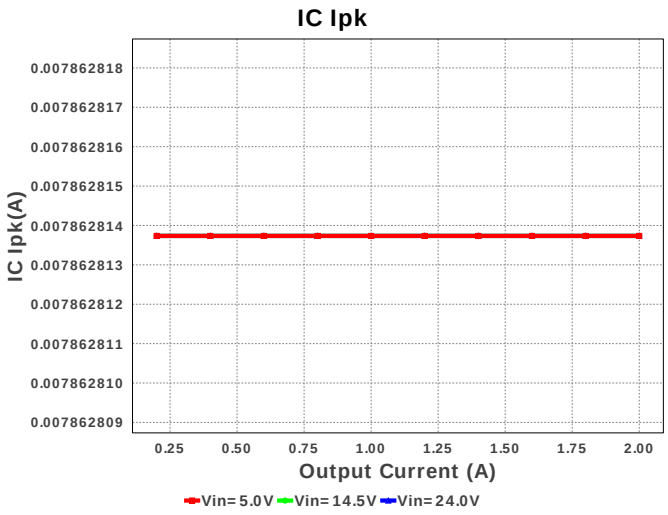


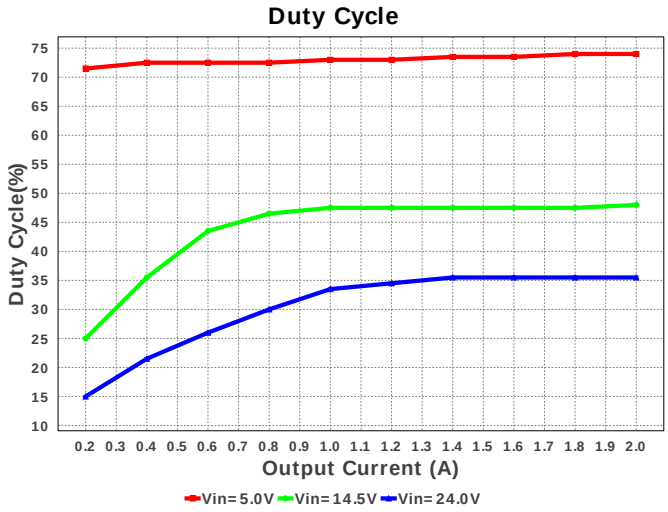


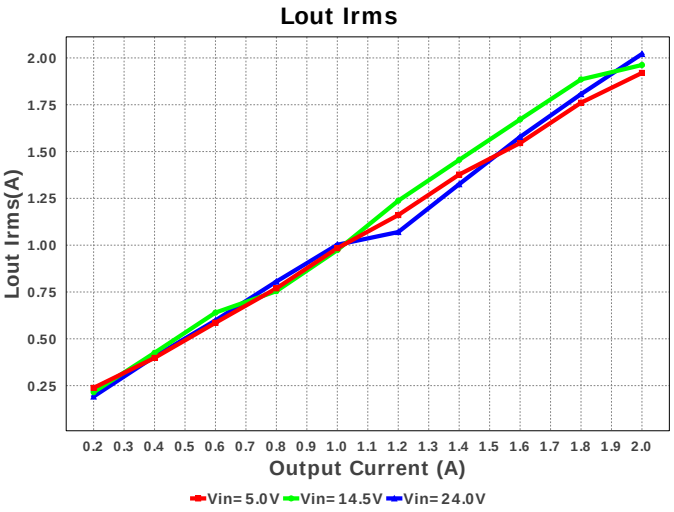


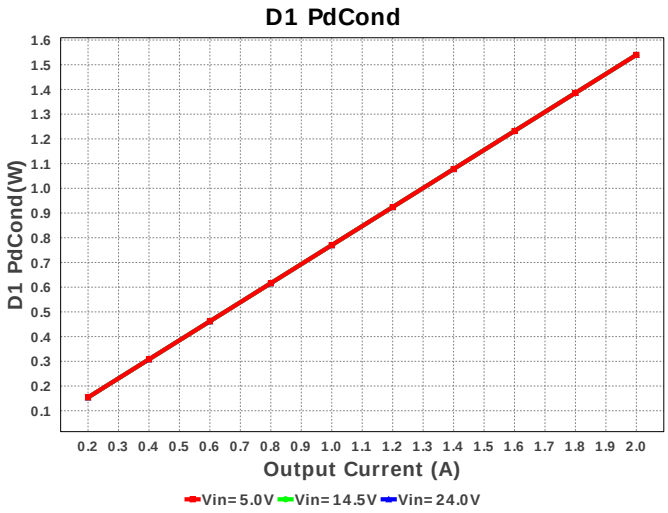


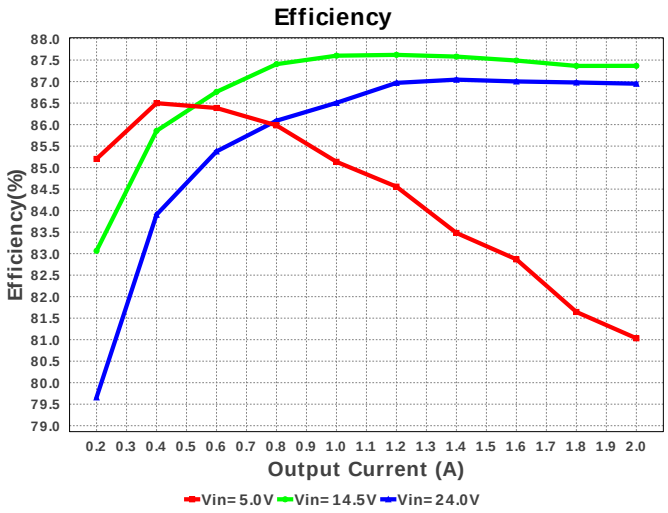


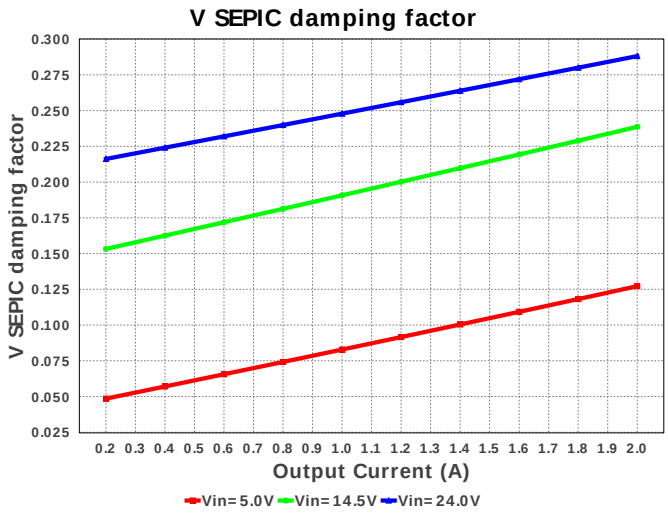


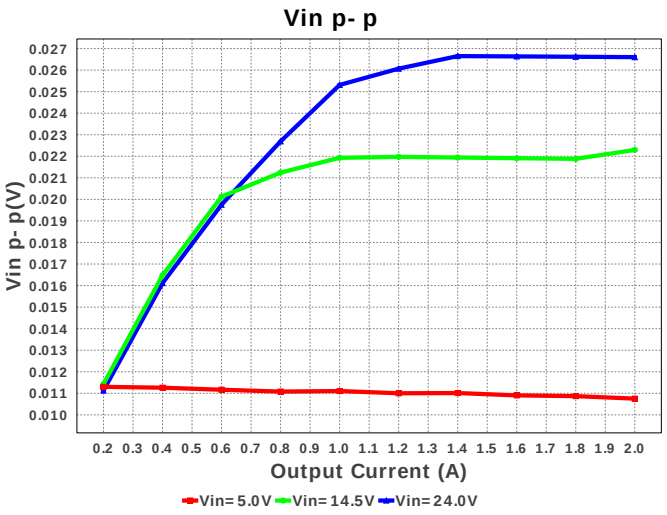


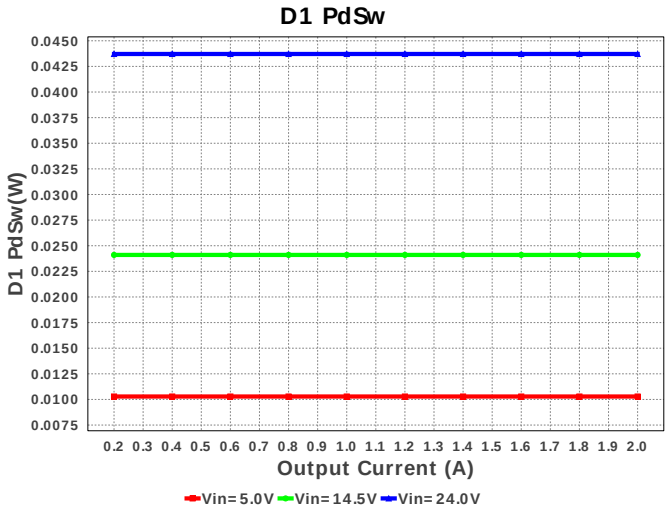


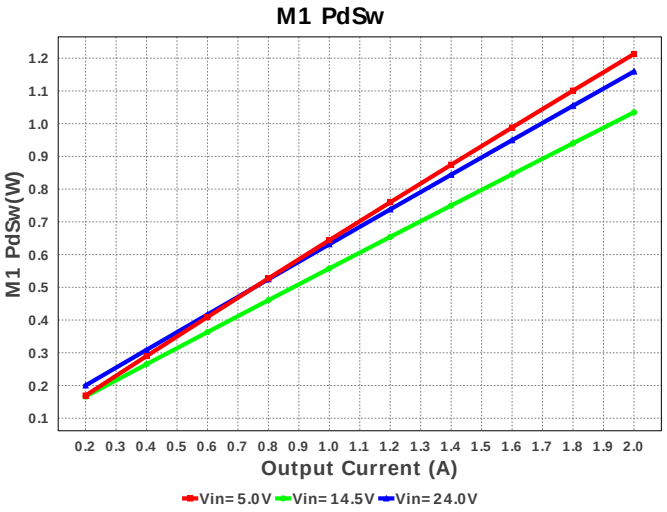


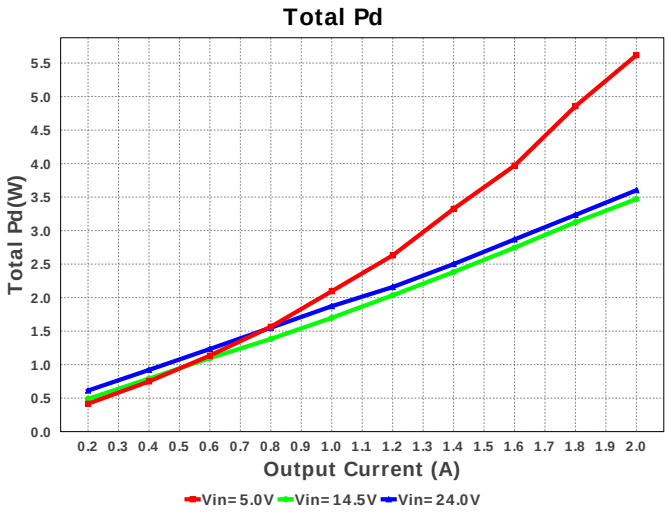


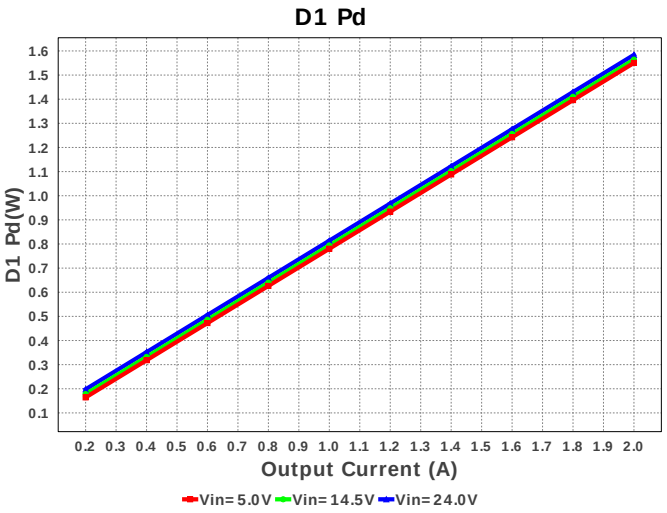


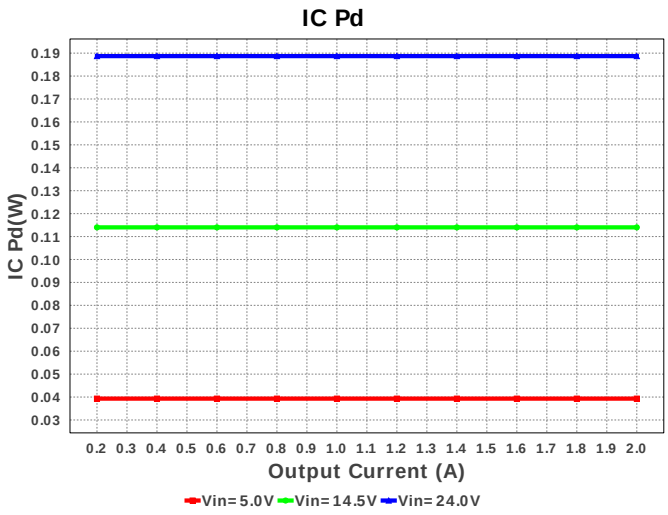


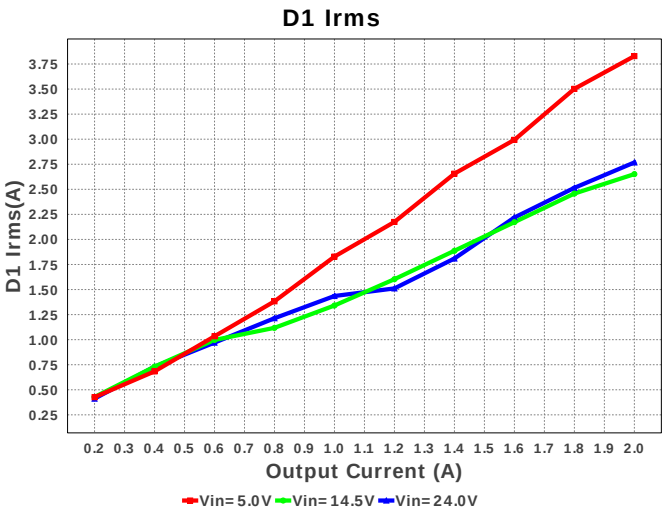


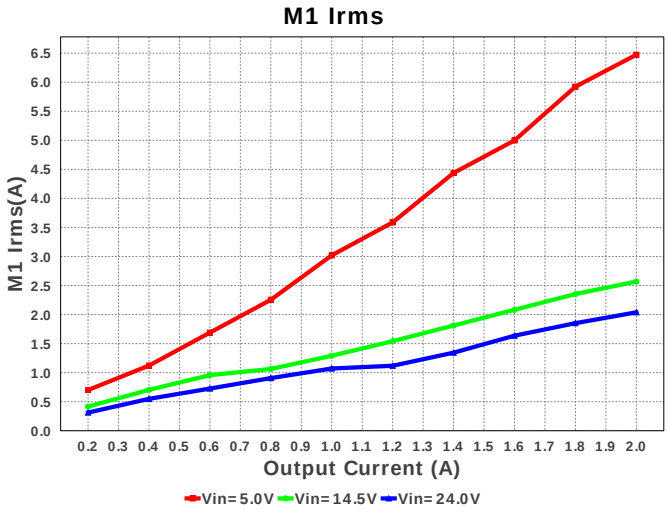


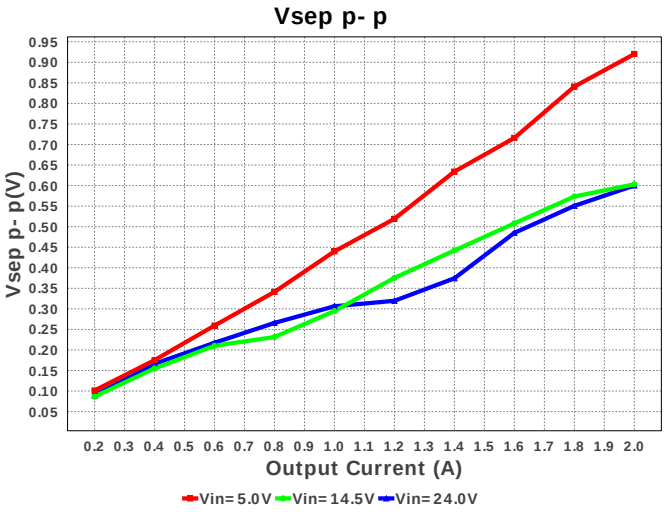


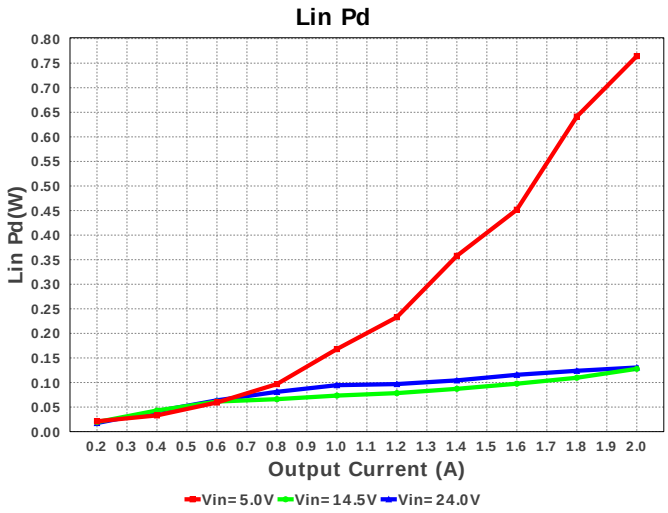


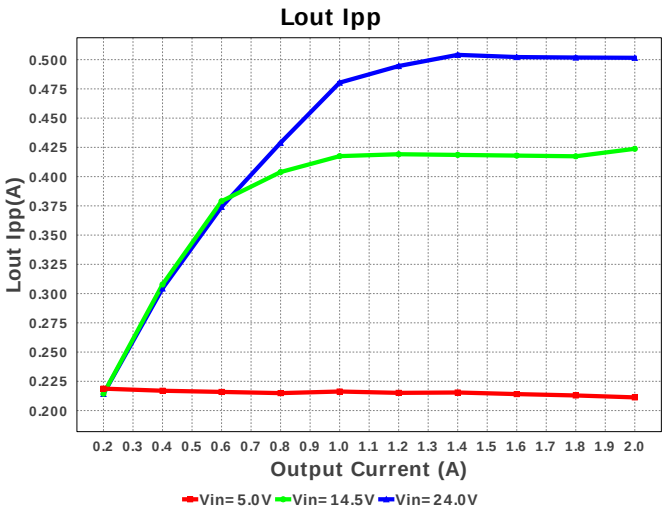


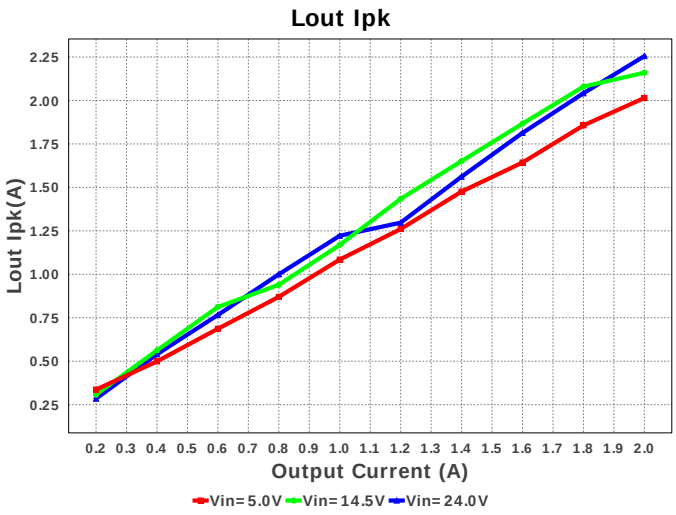


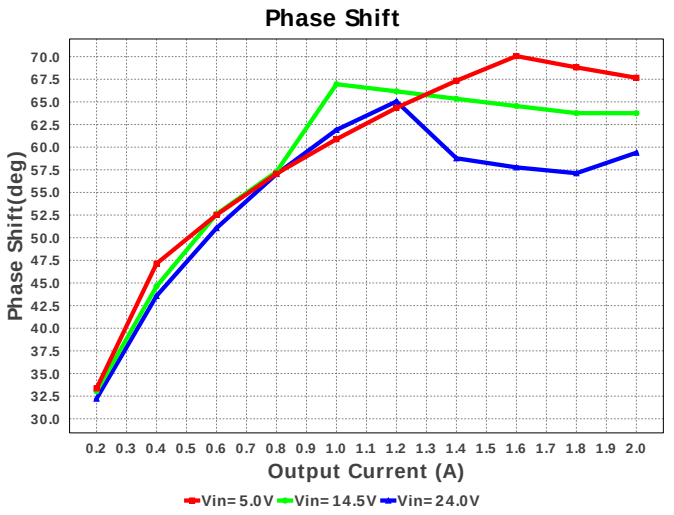


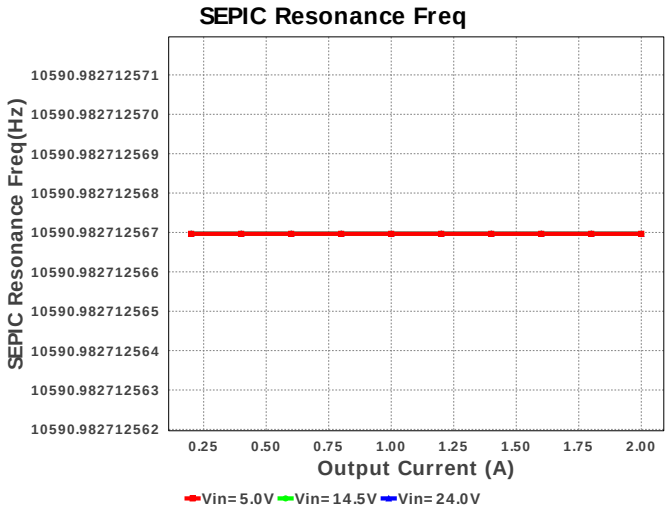


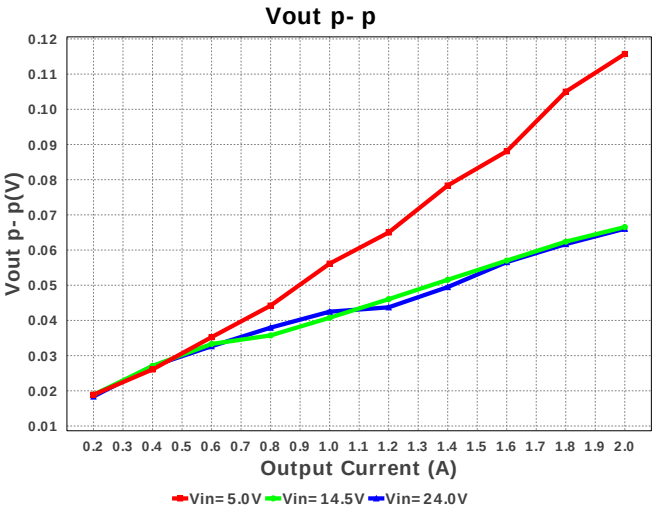


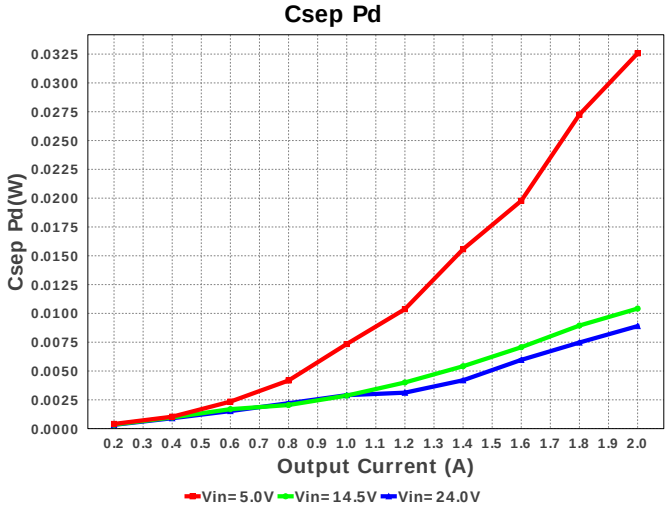


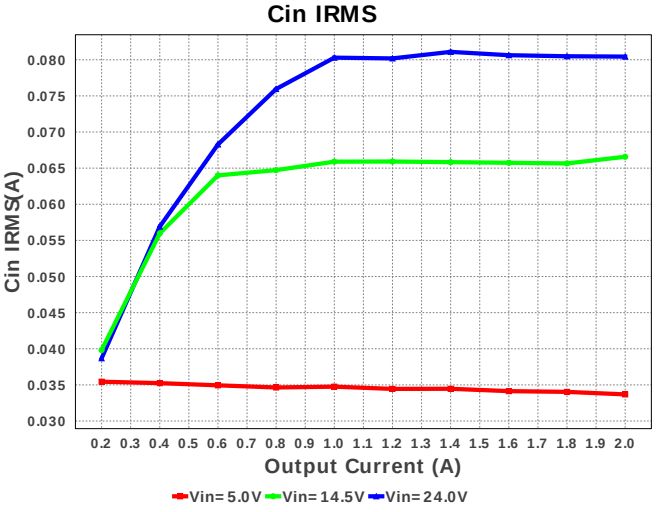


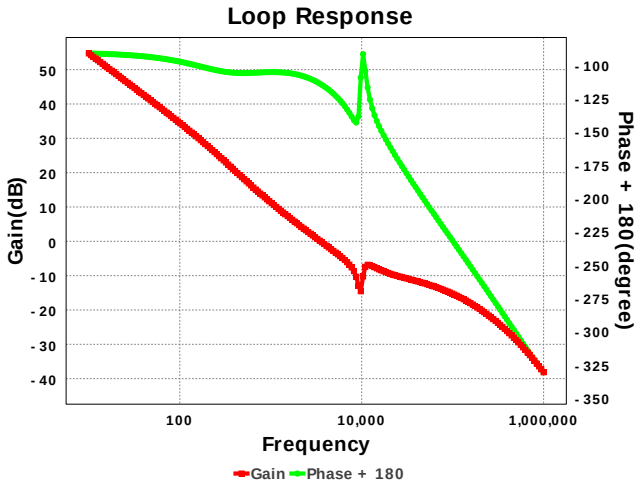












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	33.759 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	3.287 A	Current	Output capacitor RMS ripple current
3.	Csep IRMS	3.294 A	Current	SEPIC capacitor RMS ripple current
4.	D1 Irms	3.828 A	Current	D1 Irms
5.	IC Ipk	7.85 mA	Current	Peak switch current in IC
6.	Iin Avg	5.923 A	Current	Average input current
7.	Lin Ipk	6.147 A	Current	Lin peak current
8.	Lin Ipp	1.186 A	Current	Peak-to-peak input inductor ripple current
9.	Lin Irms	5.596 A	Current	Lin ripple current
10.	Lout Ipk	2.018 A	Current	Lout peak current
11.	Lout Ipp	212.268 mA	Current	Peak-to-peak output inductor ripple current
12.	Lout Irms	1.923 A	Current	Lout ripple current
13.	M1 Irms	6.471 A	Current	M1 MOSFET Irms
14.	BOM Count	21	General	Total Design BOM count
15.	FootPrint	1.081 k mm^2	General	Total Foot Print Area of BOM components
16.	Frequency	350.0 kHz	General	Switching frequency
17.	IC Tolerance	15.3 mV	General	IC Feedback Tolerance
18.	Total BOM	$6.0	General	Total BOM Cost
19.	D1 Tj	76.508 degC	Op_Point	D1 junction temperature
20.	SEPIC Resonance Freq	10.591 kHz	Op_Point	SEPIC Resonance Frequency
21.	V SEPIC damping factor	127.165 m	Op_Point	V SEPIC damping factor
22.	Vin p-p	10.79 mV	Op_Point	Peak-to-peak input voltage
23.	Vsep p-p	921.478 mV	Op_Point	Peak-to-peak sepic voltage
24.	Cross Freq	3.449 kHz	Op_point	Bode plot crossover frequency
25.	Duty Cycle	74.0 %	Op_point	Duty cycle
26.	Efficiency	81.045 %	Op_point	Steady state efficiency
27.	Gain Marg	10.806 db	Op_point	Bode Plot Gain Margin
28.	IC Tj	67.68 degC	Op_point	IC junction temperature
29.	IOUT_OP	2.0 A	Op_point	Iout operating point
30.	M1 TjOP	70.676 degC	Op_point	M1 MOSFET junction temperature
31.	Phase Marg	66.698 deg	Op_point	Bode Plot Phase Margin
32.	Phase Shift	67.67 deg	Op_point	Bode Plot Phase Shift
33.	VIN_OP	5.0 V	Op_point	Vin operating point
34.	Vout p-p	115.706 mV	Op_point	Peak-to-peak output ripple voltage
35.	Cin Pd	79.776 µW	Power	Input capacitor power dissipation
36.	Cout Pd	144.068 mW	Power	Output capacitor power dissipation
37.	Csep Pd	32.543 mW	Power	SEPIC capacitor power dissipation
38.	D1 Pd	1.55 W	Power	Diode power dissipation
39.	D1 PdCond	1.54 W	Power	Diode conduction losses
40.	D1 PdSw	10.261 mW	Power	Diode switching losses
41.	IC Pd	188.4 mW	Power	IC power dissipation
42.	Lin Pd	762.941 mW	Power	Lin power dissipation
43.	Lout Pd	318.351 mW	Power	Lout power dissipation
44.	M1 Pd	2.034 W	Power	M1 MOSFET total power dissipation
45.	M1 PdCond	823.843 mW	Power	M1 MOSFET conduction losses
46.	M1 PdSw	1.21 W	Power	M1 MOSFET switching losses
47.	Rsense Pd	418.735 mW	Power	LED Current Rsns Power Dissipation
48.	Total Pd	5.613 W	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	2.0	Maximum Output Current
2.	VinMax	24.0	Maximum input voltage
3.	VinMin	5.0	Minimum input voltage
4.	Vout	12.0	Output Voltage
5.	base_pn	LM3488-Q1	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **LM3488-Q1** Product Folder : http://www.ti.com/product/lm3488q%2Dq1 : contains the data sheet and other resources.