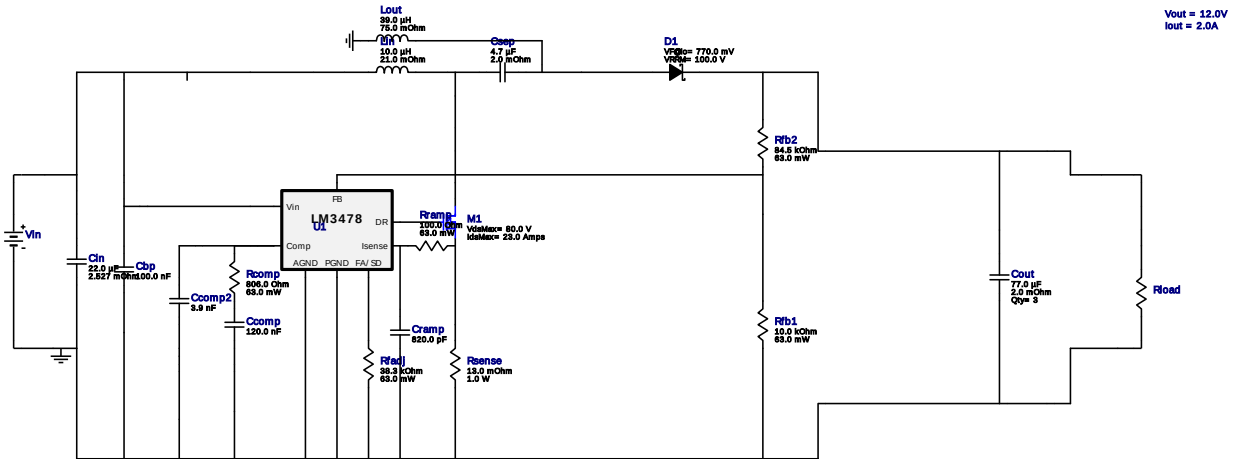
WEBENCH® Design Report

VinMin = 8.0V
VinMax = 16.0V
Vout = 12.0V
Iout = 2.0A

Device = LM3478MMX/NOPB
Topology = SEPIC
Created = 9/26/16 5:13:07 AM
BOM Cost = $3.42
BOM Count = 20
Total Pd = 3.47W

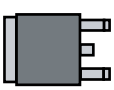
Design : 4148234/161 LM3478MMX/NOPB
LM3478MMX/NOPB 8.0V-16.0V to 12.00V @ 2.0A

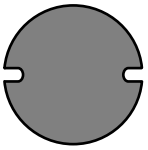
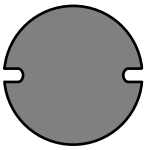


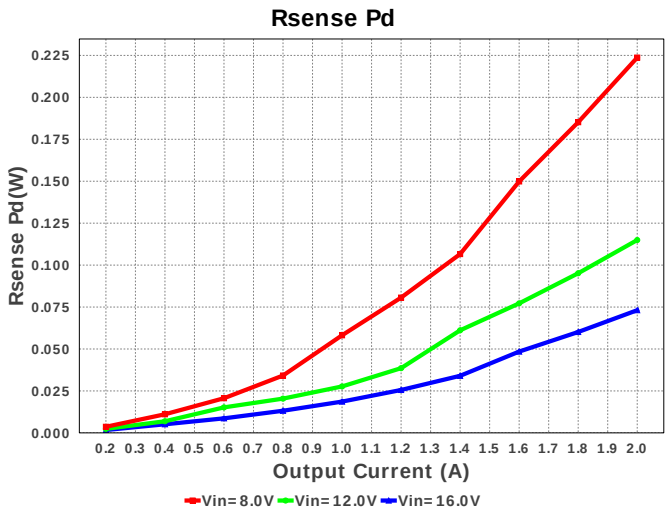
My Comments

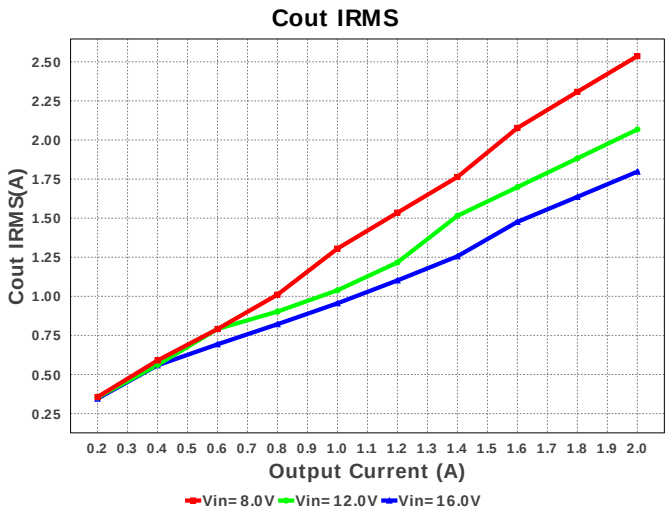
No comments

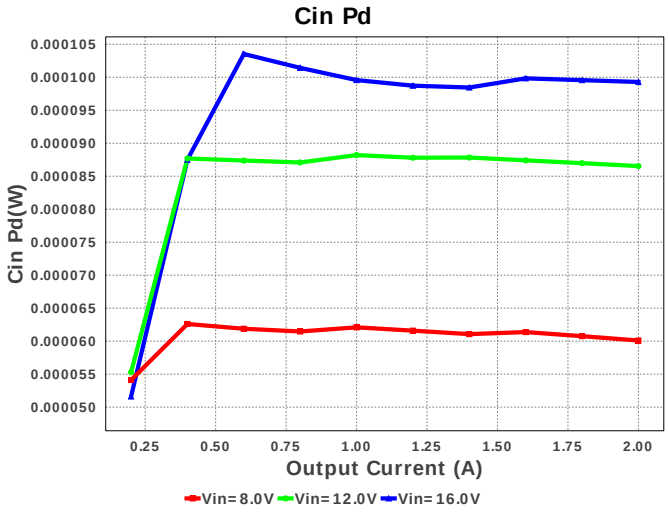
Electrical BOM

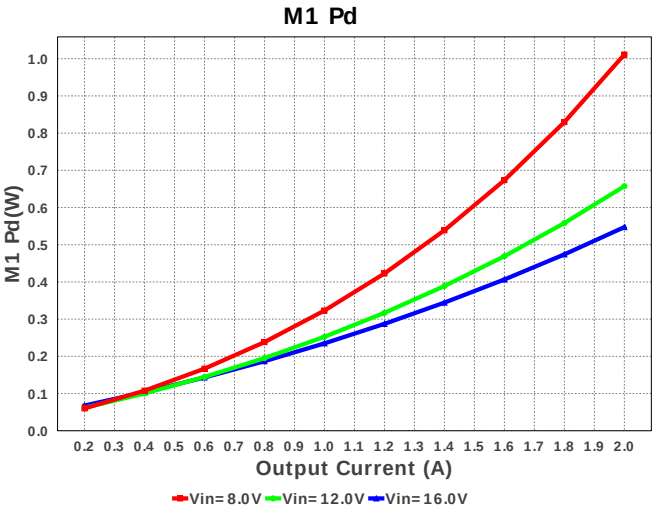
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbp	Kemet	C0603C104K3RACTU Series= X7R	Cap= 100.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0603 5 mm²
2.	Ccomp	MuRata	GRM155C80J124KE01D Series= X6S	Cap= 120.0 nF VDC= 6.3 V IRMS= 0.0 A	1	$0.02	0402 3 mm²
3.	Ccomp2	Yageo America	CC0805KRX7R9BB392 Series= X7R	Cap= 3.9 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
4.	Cin	MuRata	GRM32EC81E226KE15L Series= X6S	Cap= 22.0 uF ESR= 2.527 mOhm VDC= 25.0 V IRMS= 4.2743 A	1	$0.23	1210_280 15 mm²
5.	Cout	MuRata	GRM32ER61C226ME20L Series= X5R	Cap= 77.0 uF ESR= 2.0 mOhm VDC= 16.0 V IRMS= 3.68 A	3	$0.12	1210 15 mm²
6.	Cramp	Yageo America	CC0805KRX7R9BB821 Series= X7R	Cap= 820.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
7.	Csep	MuRata	GRM21BR61E475MA12L Series= X5R	Cap= 4.7 uF ESR= 2.0 mOhm VDC= 25.0 V IRMS= 7.29 A	1	$0.02	0805 7 mm²
8.	D1	Vishay-Semiconductor	50WQ10FNPBF	VF@Io= 770.0 mV VRRM= 100.0 V	1	$0.83	 DPAK 102 mm²

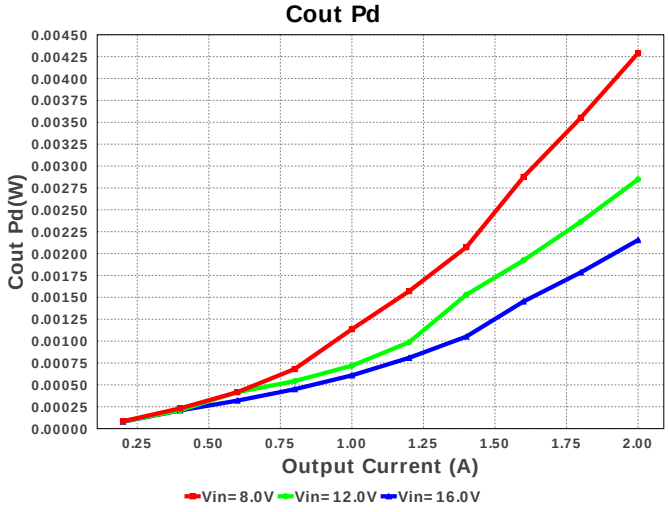
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
9.	Lin	Bourns	SDR1307-100ML	L= 10.0 µH DCR= 21.0 mOhm	1	$0.35	 SDR1307 227 mm²
10.	Lout	Bourns	SDR1307-390KL	L= 39.0 µH DCR= 75.0 mOhm	1	$0.35	 SDR1307 227 mm²
11.	M1	Infineon Technologies	BSC340N08NS3 G	VdsMax= 80.0 V IdsMax= 23.0 Amps	1	$0.19	 PG-TDSON-8 55 mm²
12.	Rcomp	Vishay-Dale	CRCW0402806RFKED Series= CRCW..e3	Res= 806.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
13.	Rfadj	Vishay-Dale	CRCW040238K3FKED Series= CRCW..e3	Res= 38.3 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
14.	Rfb1	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
15.	Rfb2	Vishay-Dale	CRCW040284K5FKED Series= CRCW..e3	Res= 84.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
16.	Rramp	Vishay-Dale	CRCW0402100RFKED Series= CRCW..e3	Res= 100.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
17.	Rsense	Susumu Co Ltd	PRL1632-R013-F-T1 Series= PRL1632	Res= 13.0 mOhm Power= 1.0 W Tolerance= 1.0%	1	$0.19	 0612 11 mm²
18.	U1	Texas Instruments	LM3478MMX/NOPB	Switcher	1	$0.80	 MUA08A 24 mm²

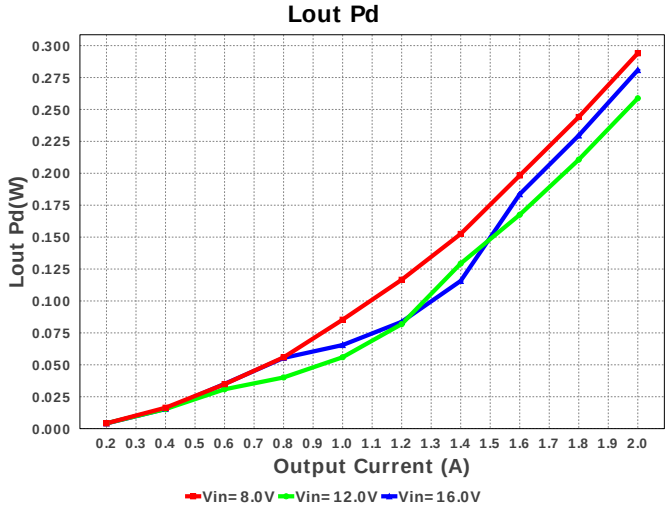




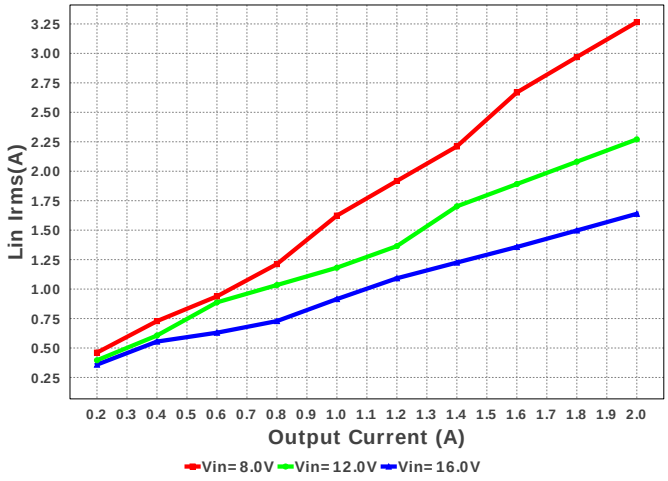




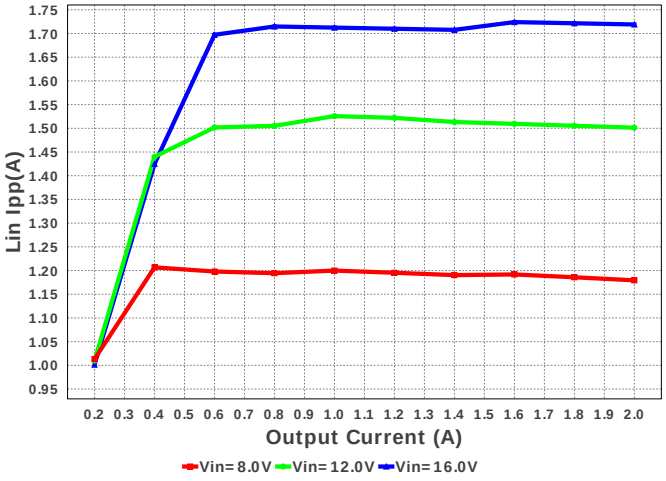




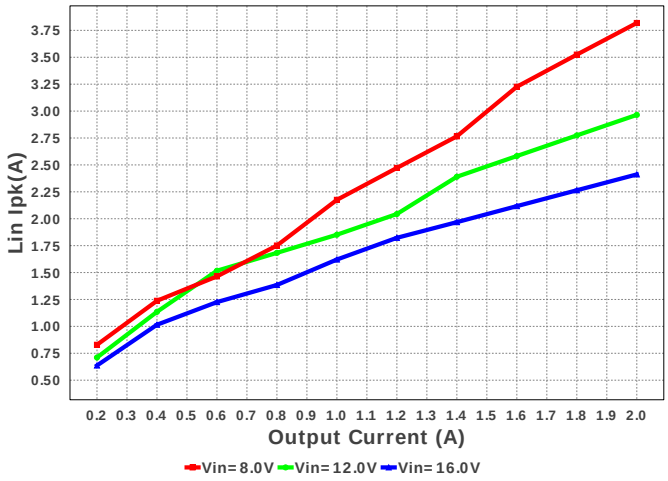
Lin Irms



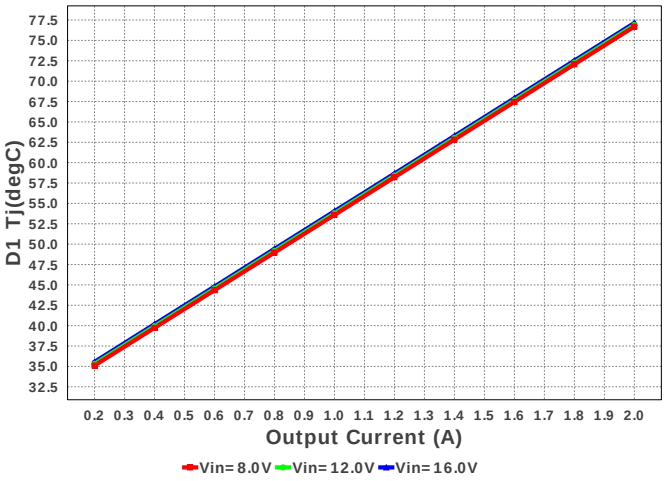
Lin Ipp



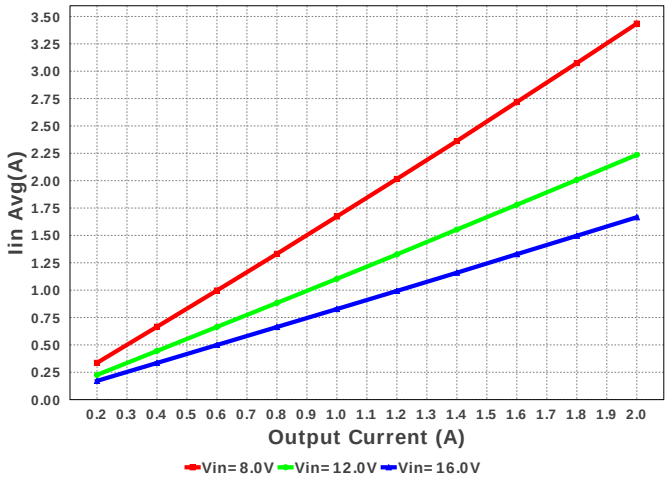
Lin Ipk



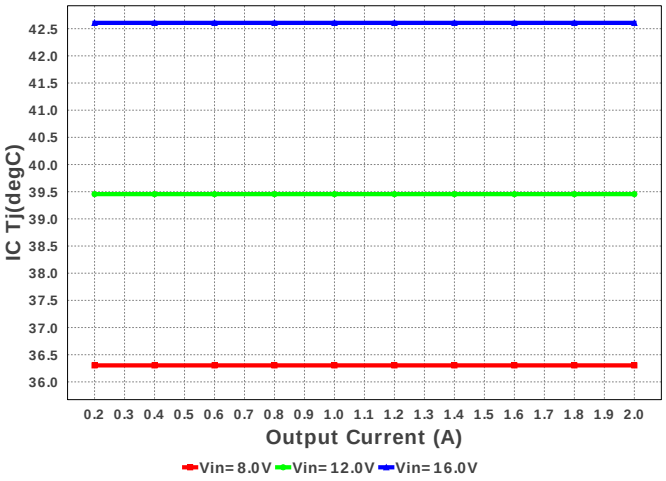
D1 Tj

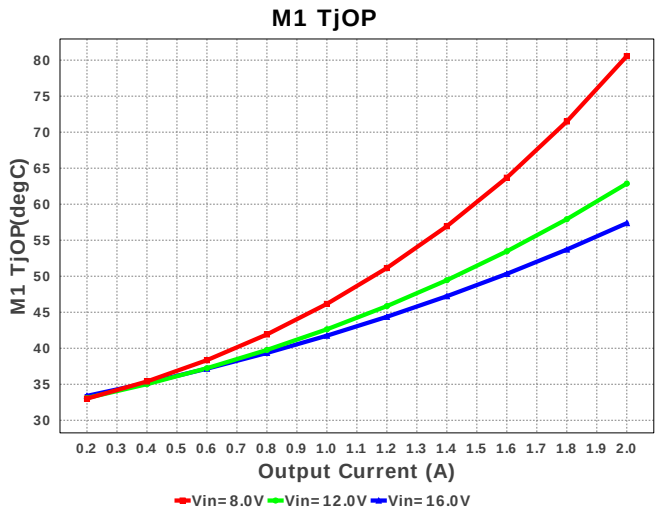


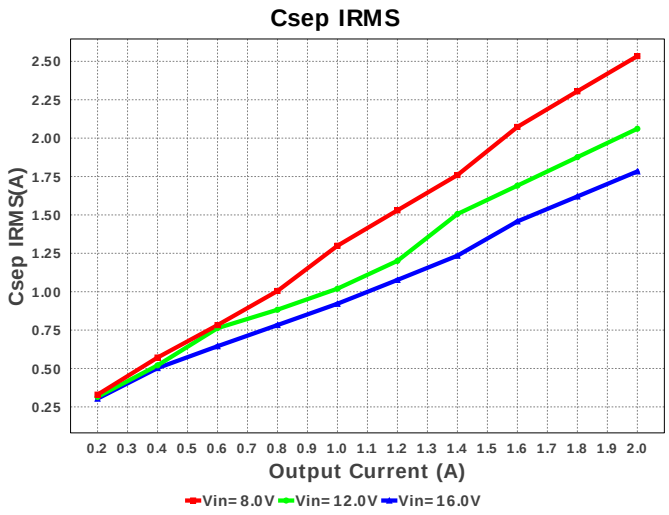
Iin Avg

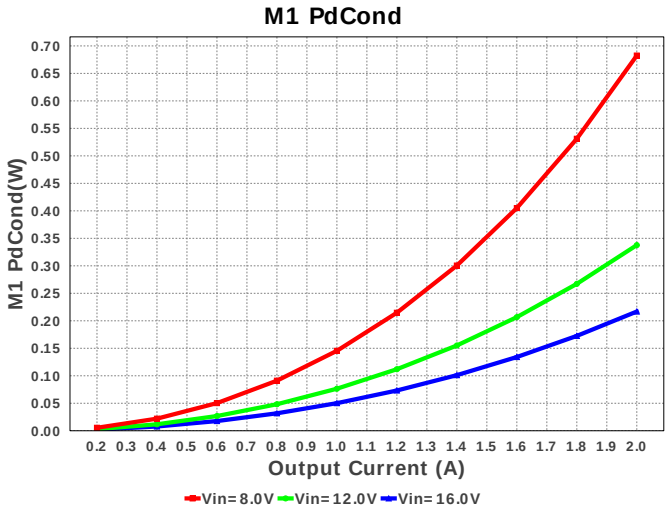


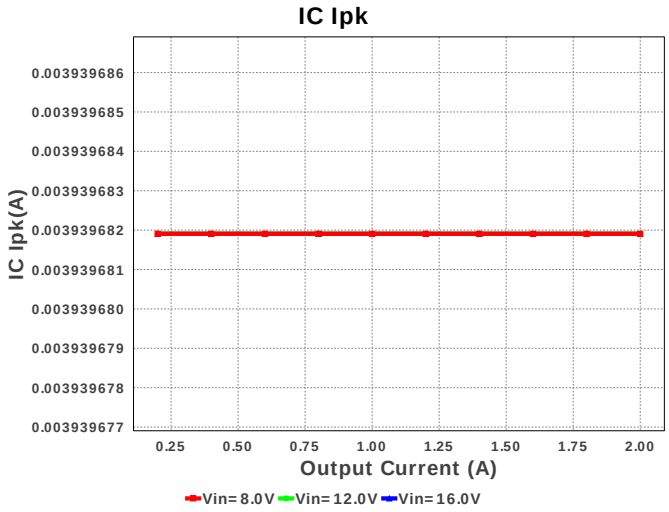
IC Tj

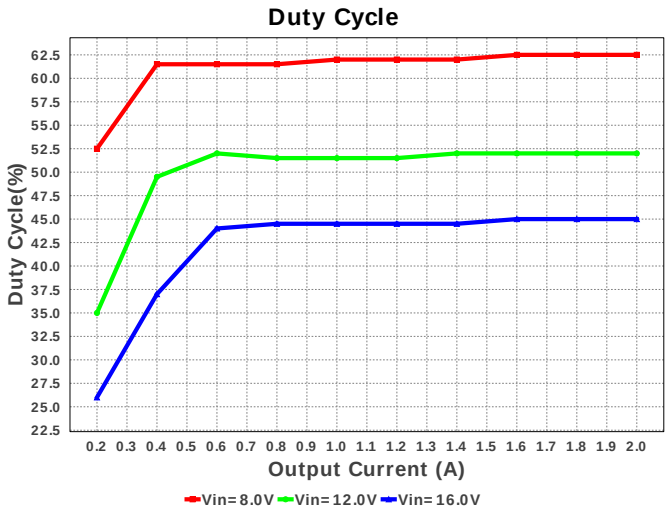


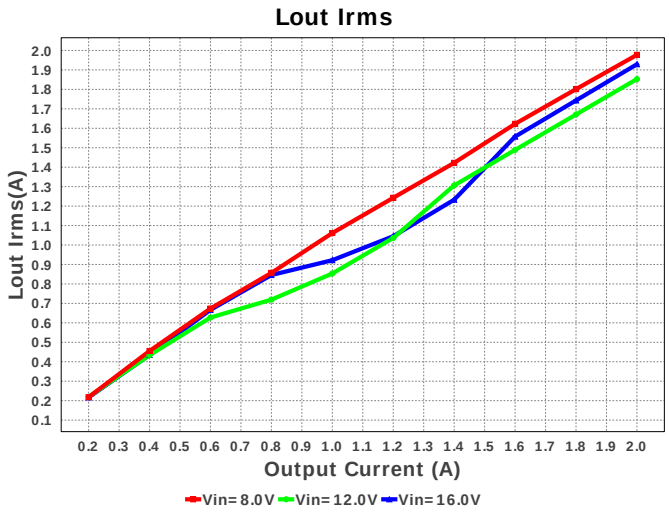


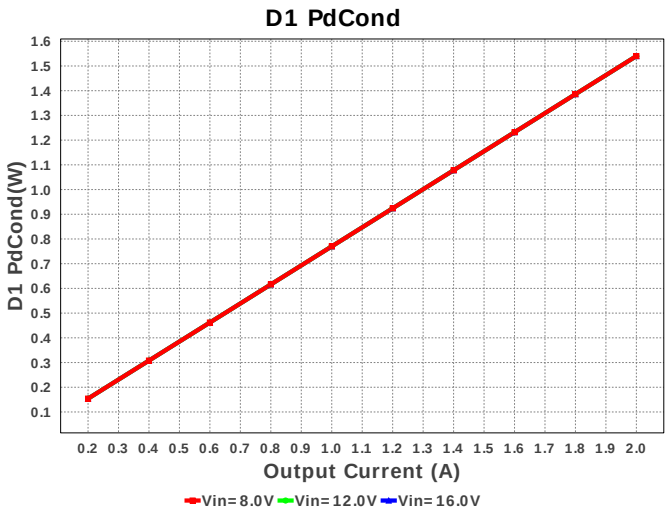


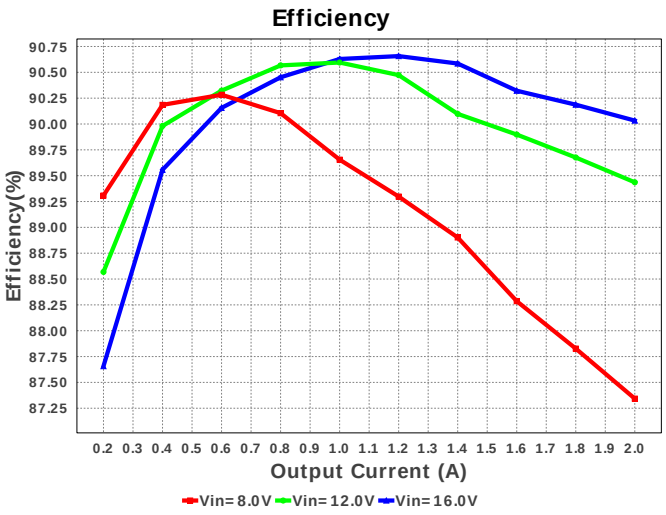


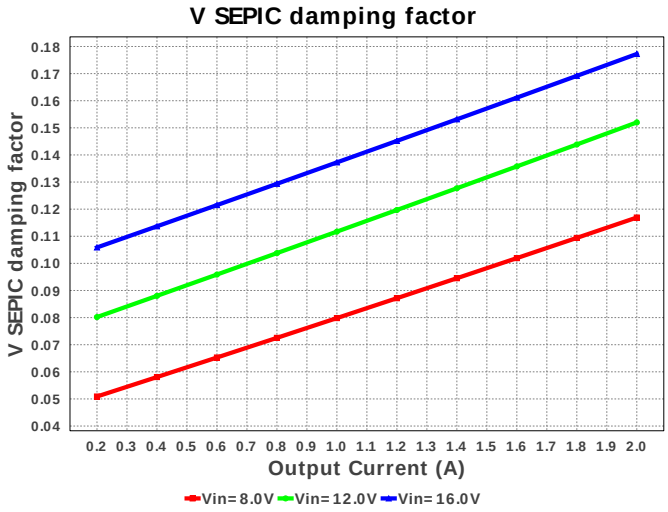


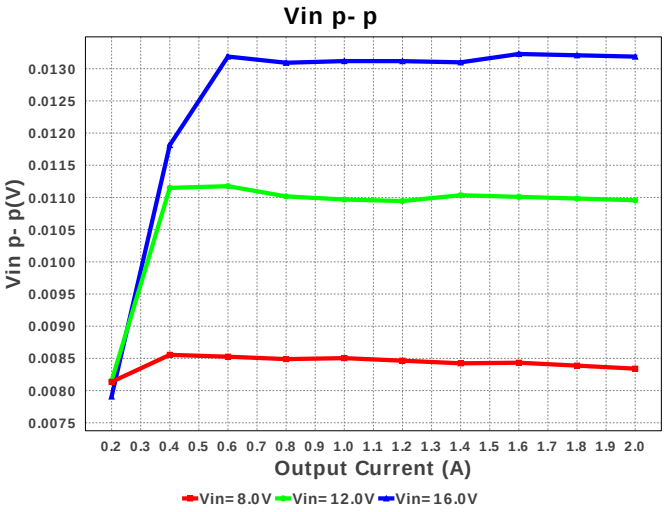


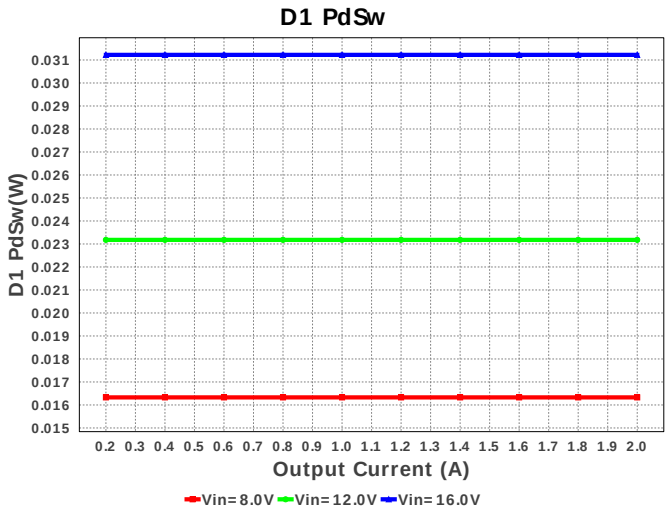


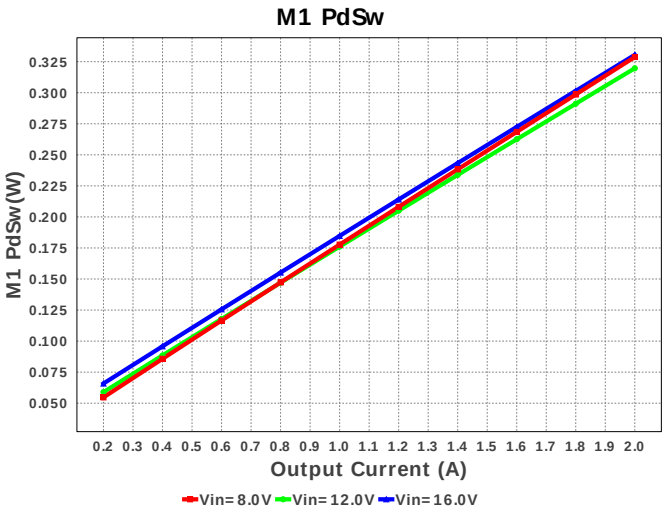


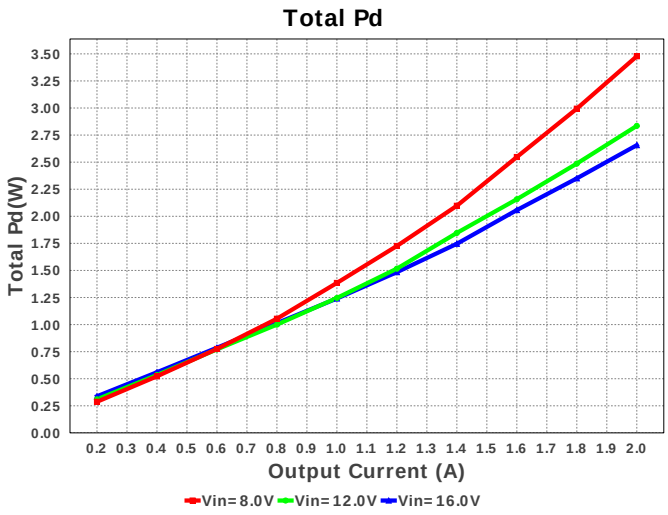


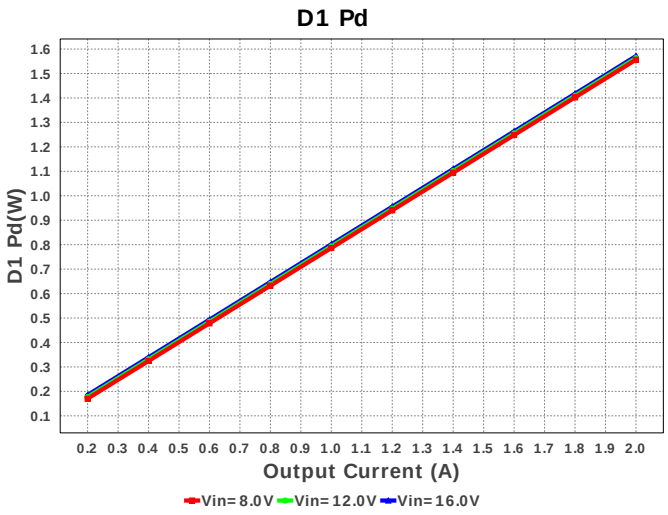


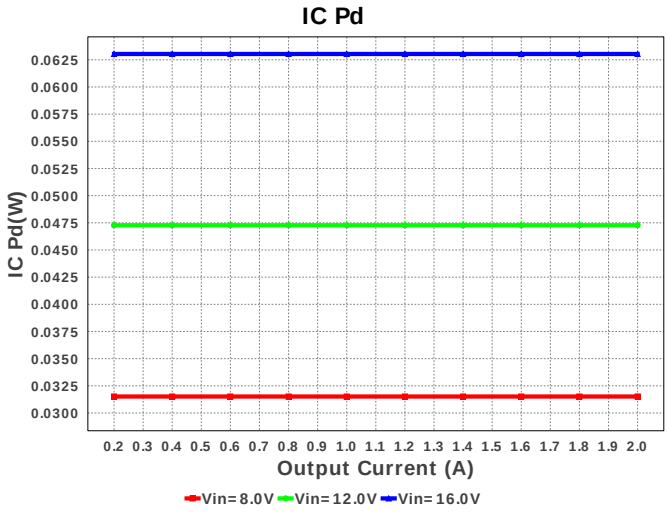


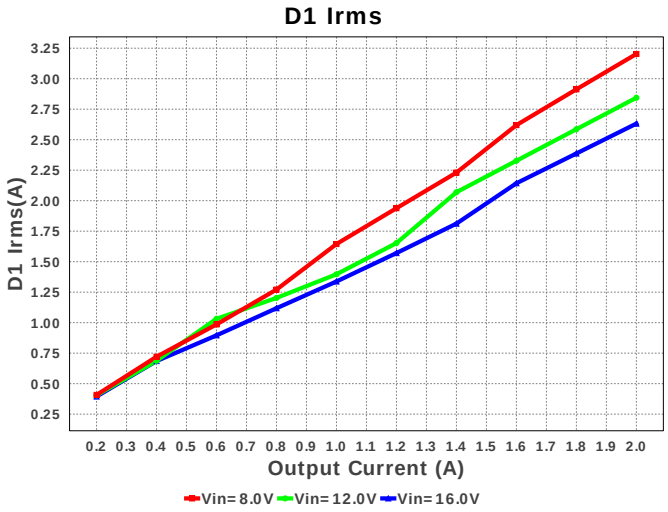


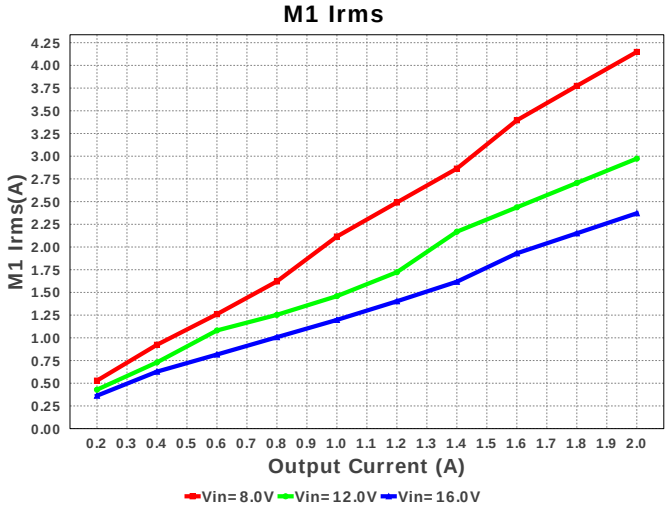


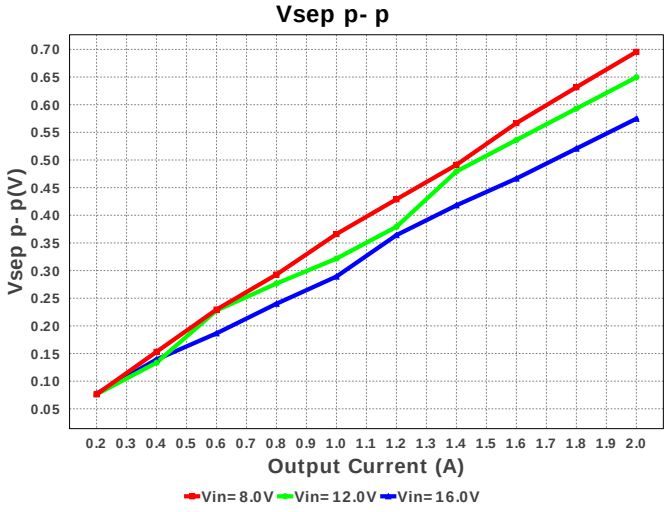


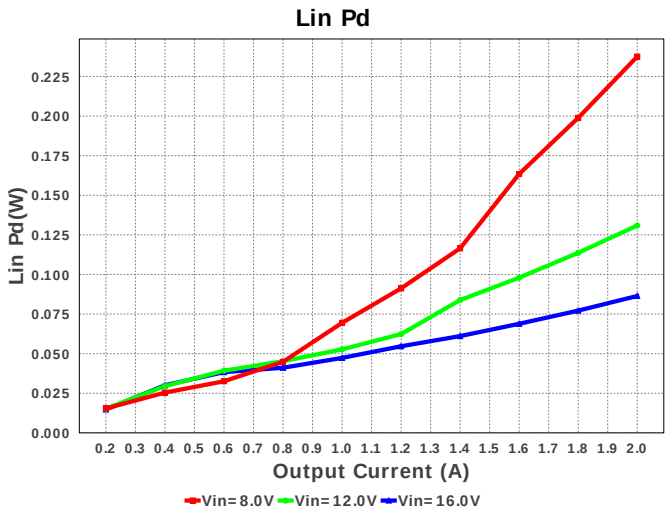


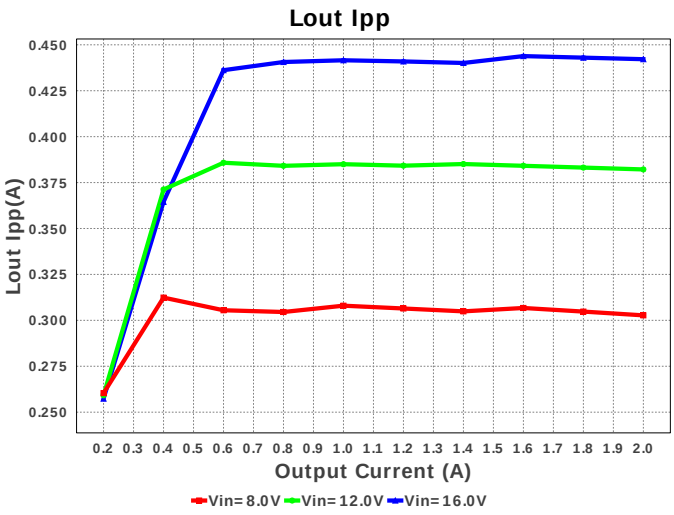


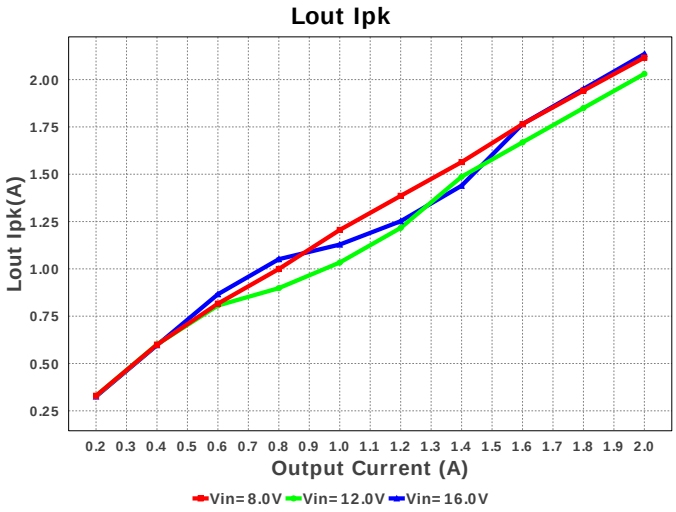


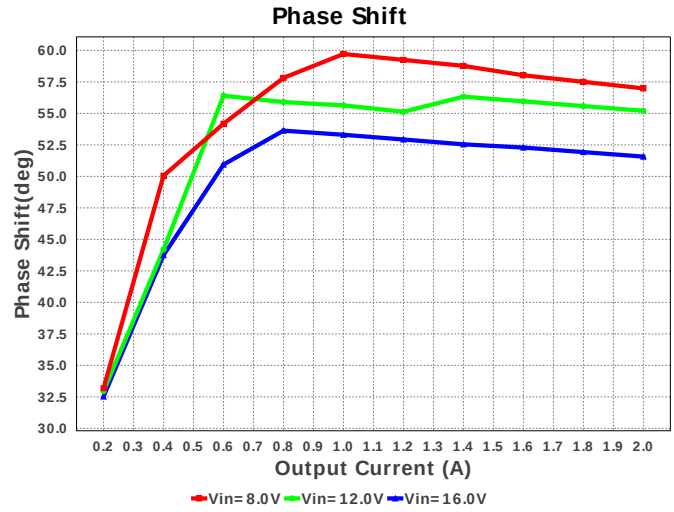


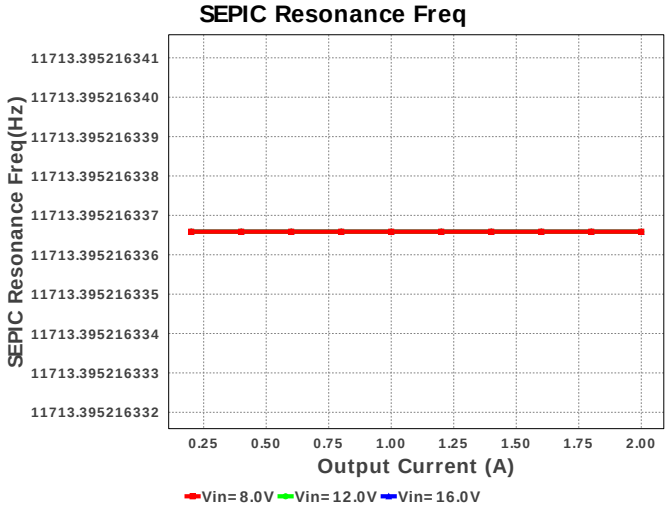


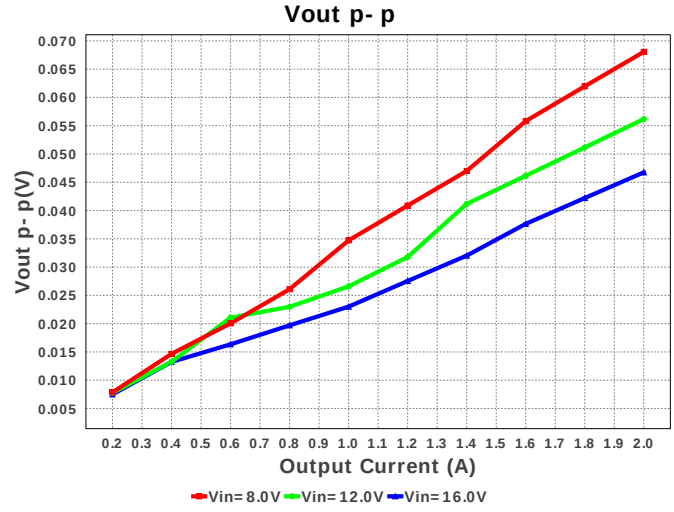


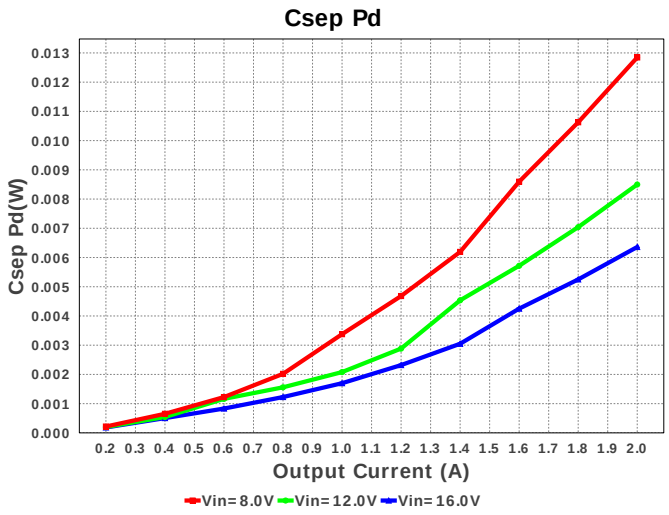


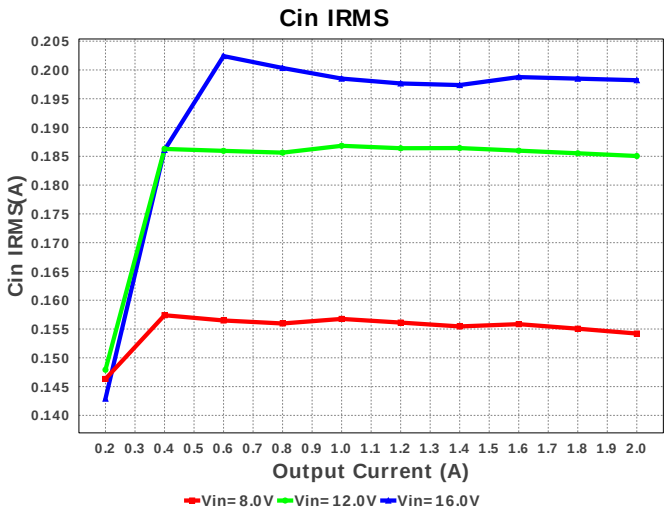


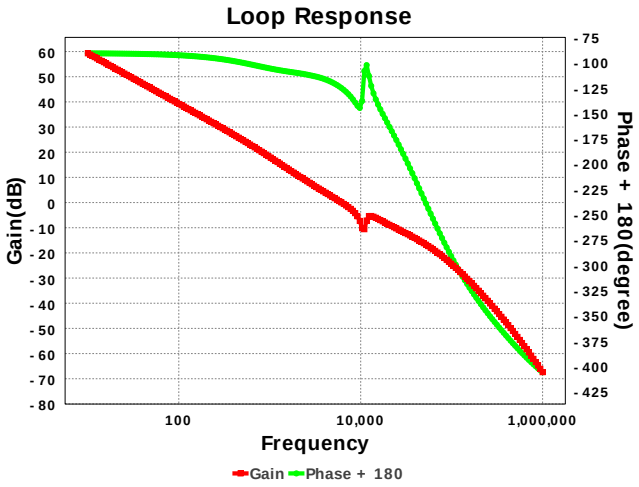












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	154.632 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	2.526 A	Current	Output capacitor RMS ripple current
3.	Csep IRMS	2.523 A	Current	SEPIC capacitor RMS ripple current
4.	D1 Irms	3.189 A	Current	D1 Irms
5.	IC Ipk	3.932 mA	Current	Peak switch current in IC
6.	Iin Avg	3.434 A	Current	Average input current
7.	Lin Ipk	3.794 A	Current	Lin peak current
8.	Lin Ipp	1.189 A	Current	Peak-to-peak input inductor ripple current
9.	Lin Irms	3.237 A	Current	Lin ripple current
10.	Lout Ipk	2.124 A	Current	Lout peak current
11.	Lout Ipp	305.294 mA	Current	Peak-to-peak output inductor ripple current
12.	Lout Irms	1.984 A	Current	Lout ripple current
13.	M1 Irms	4.13 A	Current	M1 MOSFET Irms
14.	BOM Count	20	General	Total Design BOM count
15.	FootPrint	746.0 mm^2	General	Total Foot Print Area of BOM components
16.	Frequency	405.0 kHz	General	Switching frequency
17.	IC Tolerance	24.3 mV	General	IC Feedback Tolerance
18.	Mode	CCM	General	Conduction Mode
19.	Total BOM	$3.42	General	Total BOM Cost
20.	D1 Tj	76.686 degC	Op_Point	D1 junction temperature
21.	SEPIC Resonance Freq	11.713 kHz	Op_Point	SEPIC Resonance Frequency
22.	V SEPIC damping factor	116.973 m	Op_Point	V SEPIC damping factor
23.	Vin p-p	8.443 mV	Op_Point	Peak-to-peak input voltage
24.	Vsep p-p	697.195 mV	Op_Point	Peak-to-peak sepic voltage
25.	Cross Freq	6.151 kHz	Op_point	Bode plot crossover frequency
26.	Duty Cycle	62.5 %	Op_point	Duty cycle
27.	Efficiency	87.373 %	Op_point	Steady state efficiency
28.	Gain Marg	10.725 db	Op_point	Bode Plot Gain Margin
29.	IC Tj	42.581 degC	Op_point	IC junction temperature

#	Name	Value	Category	Description
30.	IOUT_OP	2.0 A	Op_point	Iout operating point
31.	M1 TjOP	80.392 degC	Op_point	M1 MOSFET junction temperature
32.	Phase Marg	55.447 deg	Op_point	Bode Plot Phase Margin
33.	Phase Shift	57.04 deg	Op_point	Bode Plot Phase Shift
34.	VIN_OP	8.0 V	Op_point	Vin operating point
35.	Vout p-p	68.146 mV	Op_point	Peak-to-peak output ripple voltage
36.	Cin Pd	60.423 µW	Power	Input capacitor power dissipation
37.	Cout Pd	4.253 mW	Power	Output capacitor power dissipation
38.	Csep Pd	12.735 mW	Power	SEPIC capacitor power dissipation
39.	D1 Pd	1.556 W	Power	Diode power dissipation
40.	D1 PdCond	1.54 W	Power	Diode conduction losses
41.	D1 PdSw	16.187 mW	Power	Diode switching losses
42.	IC Pd	62.904 mW	Power	IC power dissipation
43.	Lin Pd	233.678 mW	Power	Lin power dissipation
44.	Lout Pd	295.87 mW	Power	Lout power dissipation
45.	M1 Pd	1.008 W	Power	M1 MOSFET total power dissipation
46.	M1 PdCond	681.944 mW	Power	M1 MOSFET conduction losses
47.	M1 PdSw	325.883 mW	Power	M1 MOSFET switching losses
48.	Rsense Pd	221.741 mW	Power	Rsense Power Dissipation
49.	Total Pd	3.468 W	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	2.0	Maximum Output Current
2.	VinMax	16.0	Maximum input voltage
3.	VinMin	8.0	Minimum input voltage
4.	Vout	12.0	Output Voltage
5.	base_pn	LM3478	Texas Instruments Base Part 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.