

WEBENCH[®] Power Architect

Project Report

Project : 622148/1 : PA_Project_303 (modified from 301)
 Created : 2013-09-25 01:23:12.266
 Optimize project optFactor=3

Project Summary

- | | |
|-----------------------------------|------------------------|
| 1. Total System Efficiency | 82.84 % |
| 2. Total System BOM Count | 40.0 |
| 3. Total System Footprint | 1.289 kmm ² |
| 4. Total System BOM Cost | \$8.76 |
| 5. Total System Power Dissipation | 2.984 W |

--> Launch WEBENCH Power Architect.

Power Supplies

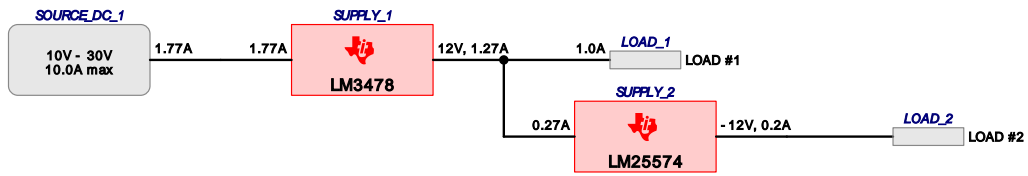
#	Name	NSID	Description	Vout	Iout	Efficiency	Foot-print	Cost	Design	Page
1.	SUPPLY_1	LM3478	Switcher : Uncoupled inductors SEPIC	12 V	1.271 A	86.3%	819	\$3.38	25	12
2.	SUPPLY_2	LM25574	Switcher : Positive to negative inverting buck boost converter	-12 V	0.2 A	81.9%	343	\$2.63	24	4

Power Loads

#	Name	VLoad	Iload	Description
1.	LOAD #1	12 V	1 A	VoutRipple=10%
2.	LOAD #2	-12 V	0.2 A	VoutRipple=10%

Project Diagram

WEBENCH® Power Architect Project ID : 1 PA_Project_303 (modified from 301) POWER_ARCHITECT 2013-09-25 01:23:12.266



Electrical Procurement BOM

Manufacturer	Part Number	Description	Quantity	Budgetary Price	Footprint (mm ²)
AVX	08053C104KAT2A	0805	1	\$0.01	13
Vishay-Sprague	293D685X9050D2TE3	7343-31	1	\$0.38	59
Nippon Chemi-Con	APXE160ARA820MF80G	CAPSMT_62_F80	1	\$0.52	74
Diodes Inc.	B370-13-F	SMC	1	\$0.22	83
Infineon Technologies	BSC340N08NS3 G	PG-TDSON-8	1	\$0.30	55
Kemet	C0603C104K5RACTU	0603	1	\$0.01	10
Kemet	C1206C105K3RACTU	1206	1	\$0.04	19
TDK	C3216X7R1H105K	1206	1	\$0.04	19
TDK	C4532X7R1H475M	1812	1	\$0.35	39
Yageo America	CC0805JRNP09BN120	0805	1	\$0.01	13
Yageo America	CC0805JRNP09BN820	0805	1	\$0.01	13
Yageo America	CC0805KRX7R9BB271	0805	1	\$0.01	13
Yageo America	CC0805KRX7R9BB471	0805	1	\$0.01	13
Vishay-Dale	CRCW0402100KFKED	0402	2	\$0.01	15
Vishay-Dale	CRCW0402100RFKED	0402	1	\$0.01	8
Vishay-Dale	CRCW040210K0FKED	0402	1	\$0.01	8
Vishay-Dale	CRCW040214K7FKED	0402	1	\$0.01	8
Vishay-Dale	CRCW04021K65FKED	0402	1	\$0.01	8
Vishay-Dale	CRCW04021K82FKED	0402	1	\$0.01	8
Vishay-Dale	CRCW04022K21FKED	0402	1	\$0.01	8
Vishay-Dale	CRCW040266K5FKED	0402	1	\$0.01	8
Vishay-Dale	CRCW040284K5FKED	0402	1	\$0.01	8
Vishay-Dale	CRCW04029K09FKED	0402	1	\$0.01	8
Stackpole Electronics Inc	CSR1206FK25L0	1206	1	\$0.10	19
MuRata	GRM033R60J333KE01D	0201	1	\$0.01	6
MuRata	GRM1555C1E621JA01D	0402	1	\$0.01	8
MuRata	GRM155C80G224KE01D	0402	1	\$0.01	8
MuRata	GRM155R61A124KE19D	0402	1	\$0.01	8
MuRata	GRM155R61C223KA01D	0402	1	\$0.01	8
MuRata	GRM1885C1H112JA01D	0603	1	\$0.02	10
MuRata	GRM188R61E105KA12D	0603	1	\$0.02	10
MuRata	GRM32ER71C226ME18L	1210	1	\$0.81	23
Texas Instruments	LM25574MT/NOPB	MTC16	1	\$1.35	59
Texas Instruments	LM3478MM/NOPB	MUA08A	1	\$0.80	34
ON Semiconductor	MBR0540T1G	SOD-123	1	\$0.06	22
Bourns	SDR0604-560KL	SDR0604	1	\$0.17	61
Bourns	SDR1105-330KL	SDR1105	1	\$0.27	157
Bourns	SDR1307-101KL	SDR1307	1	\$0.34	227
Total			39	\$6.01	1,162

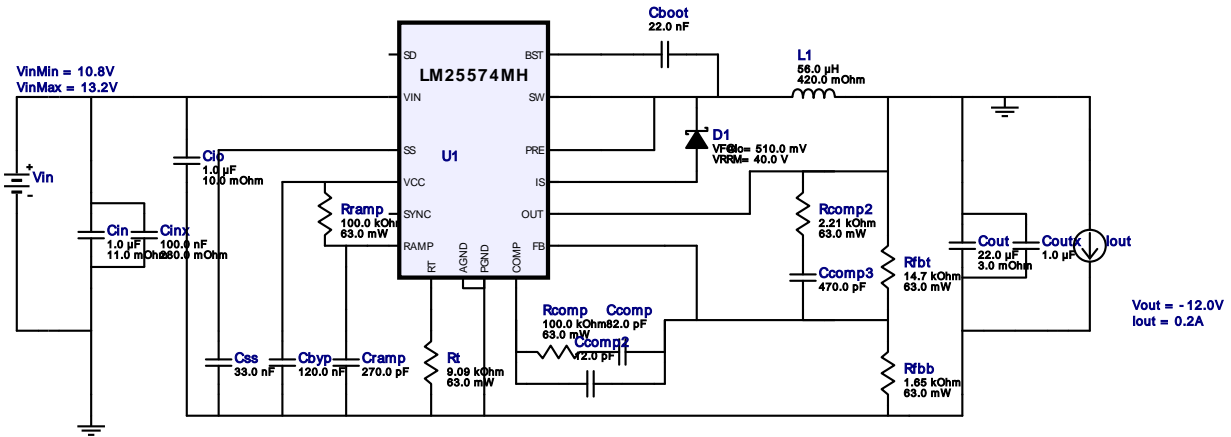


VinMin = 10.8V
 VinMax = 13.2V
 Vout = -12.0V
 Iout = 0.2A

Device = LM25574MT/NOPB
 Topology = Inverting_Buck_Boost
 Created = 9/25/13 1:22:24 AM
 BOM Cost = \$2.63
 Total Pd = 0.53W
 Footprint = 343.0mm2
 BOM Count = 21

WEBENCH® Design Report

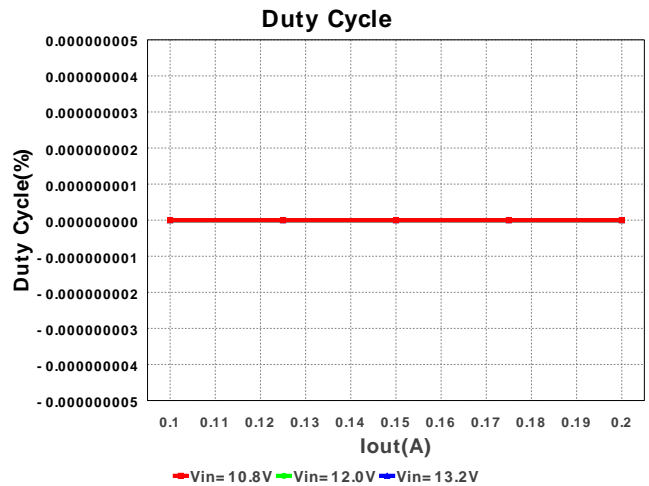
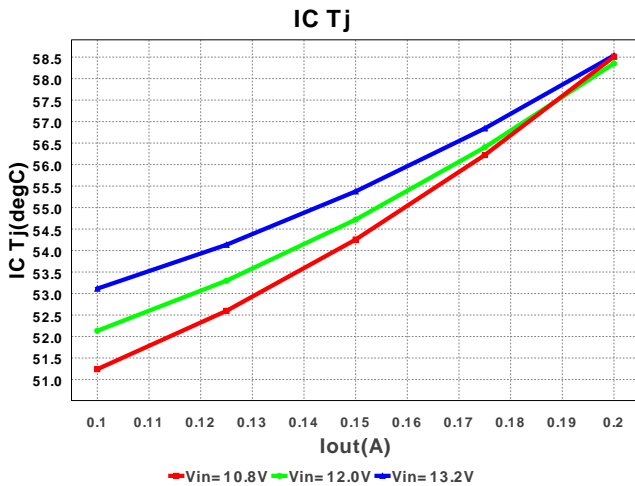
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 LM25574MT/NOPB 10.8V-13.2V to -12.0V @ 0.2A

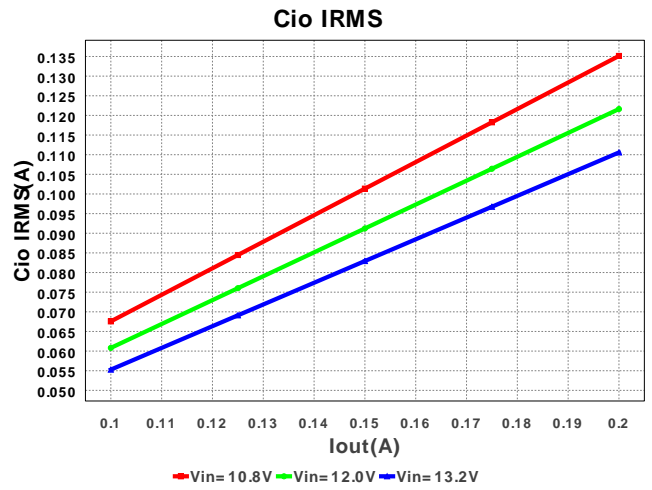
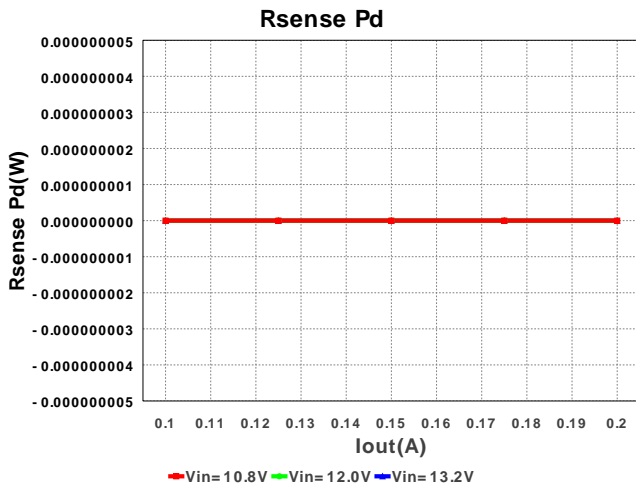
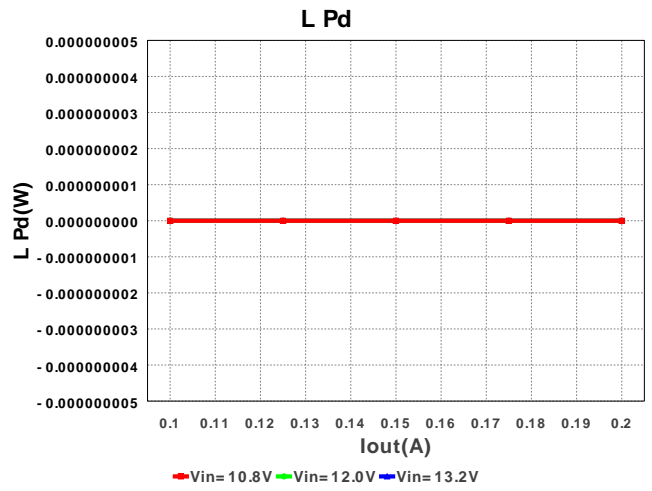
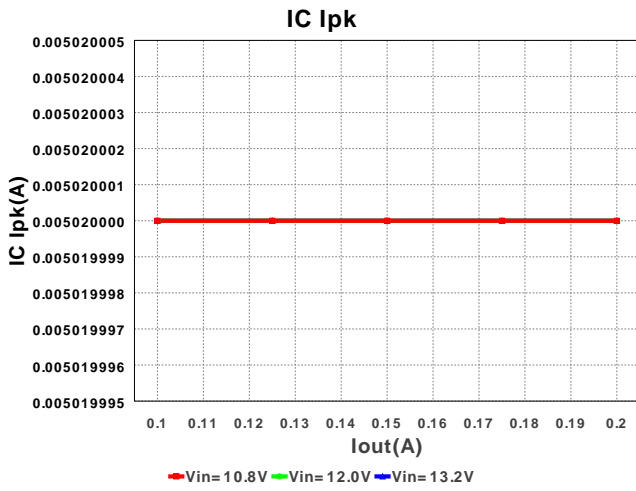
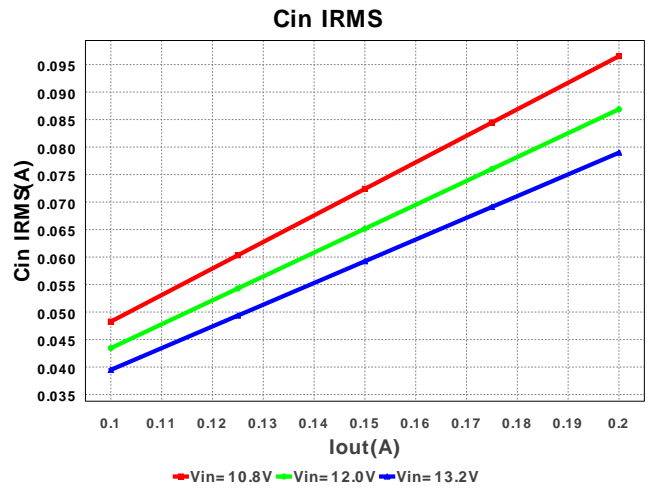
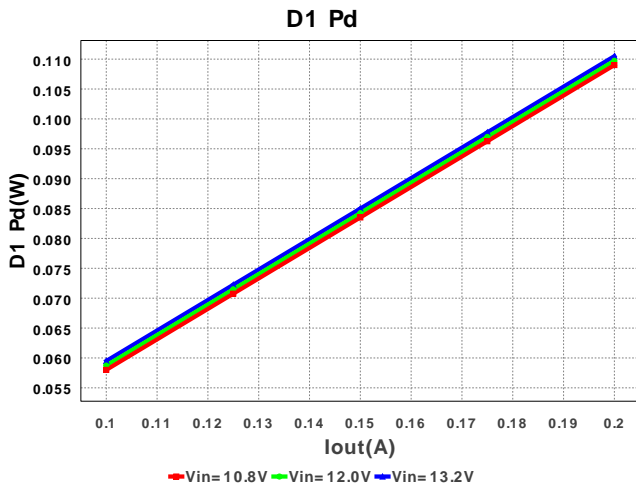


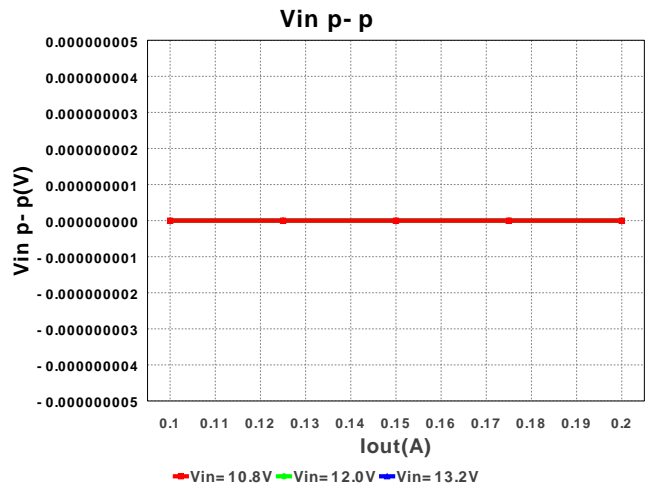
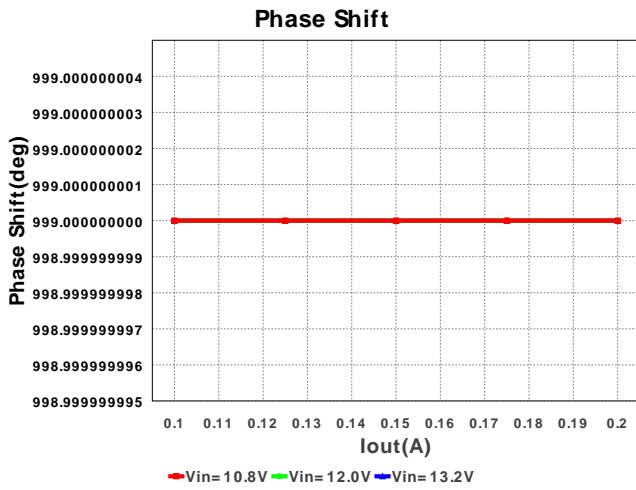
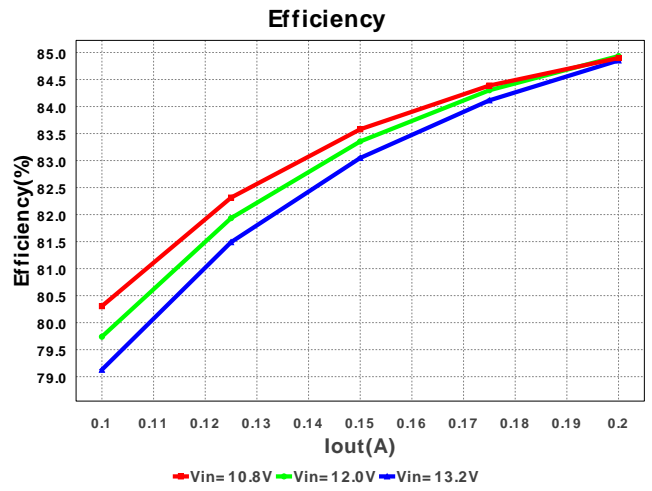
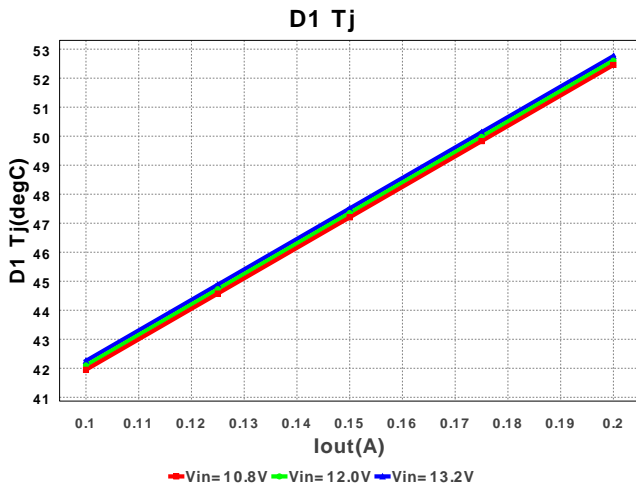
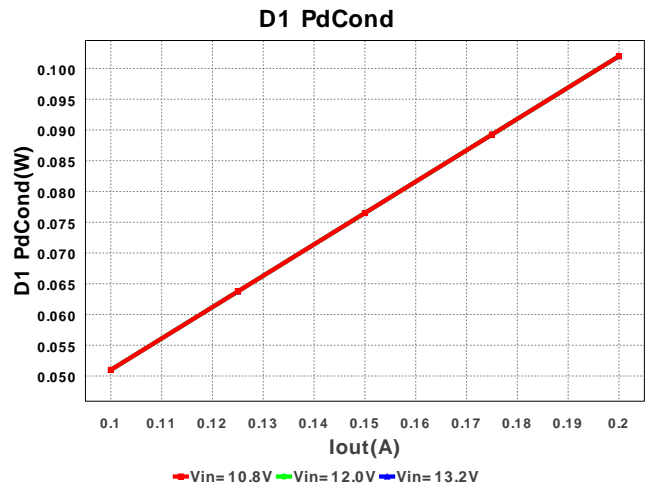
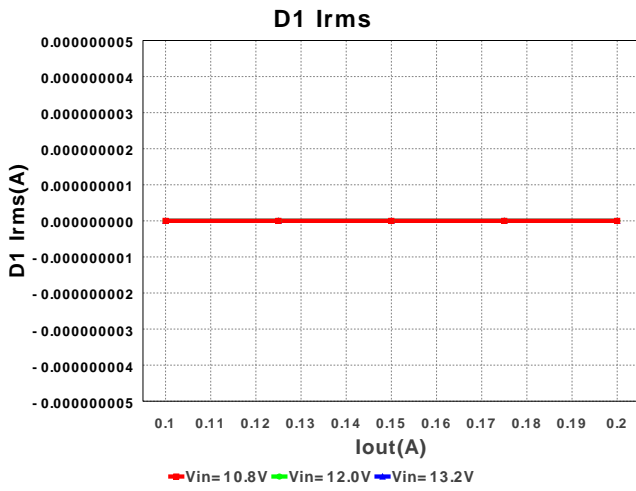
Electrical BOM

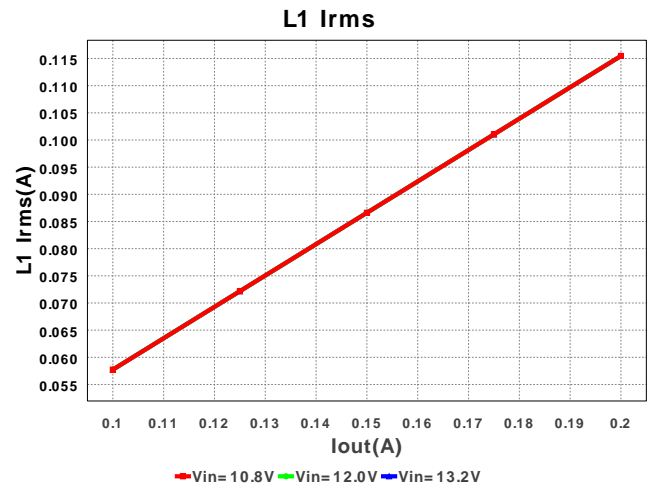
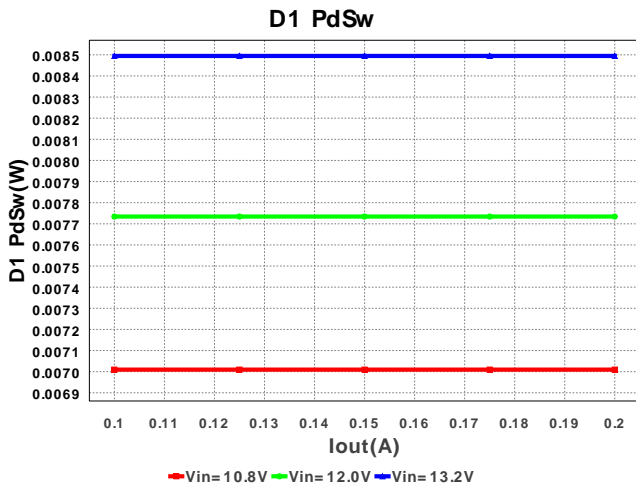
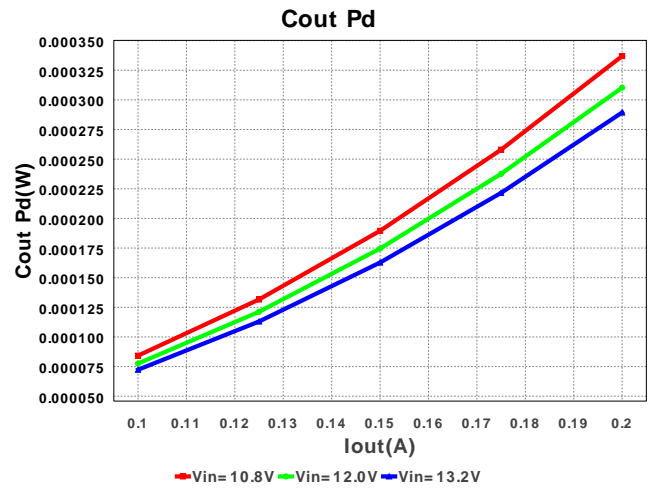
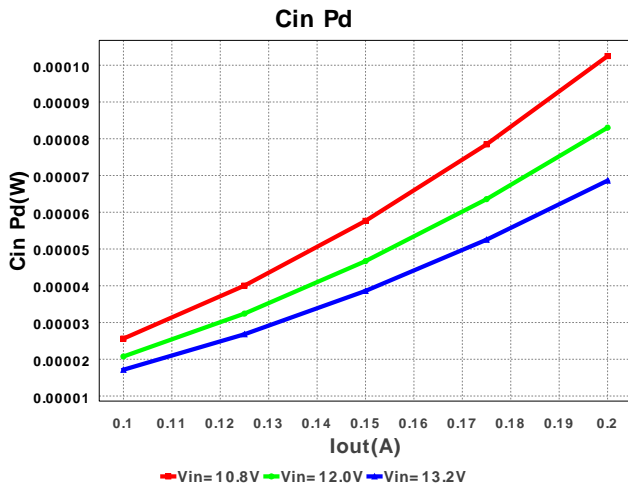
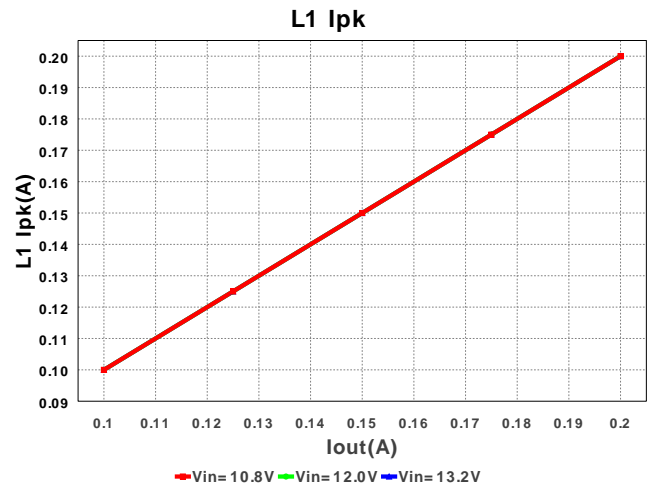
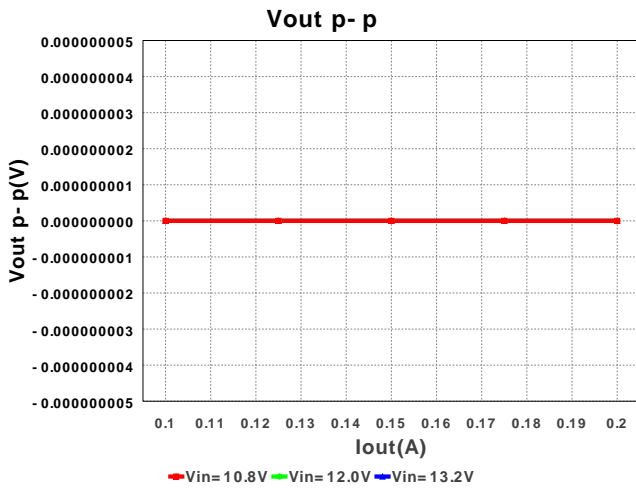
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	MuRata	GRM155R61C223KA01D Series= X5R	Cap= 22.0 nF VDC= 16.0 V IRMS= 0.0 A	1	\$0.01	0402 8mm2
2.	Cbyp	MuRata	GRM155R61A124KE19D Series= X5R	Cap= 120.0 nF VDC= 10.0 V IRMS= 0.0 A	1	\$0.01	0402 8mm2
3.	Ccomp	Yageo America	CC0805JRNP09BN820 Series= C0G/NP0	Cap= 82.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 13mm2
4.	Ccomp2	Yageo America	CC0805JRNP09BN120 Series= C0G/NP0	Cap= 12.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 13mm2
5.	Ccomp3	Yageo America	CC0805KRX7R9BB471 Series= X7R	Cap= 470.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 13mm2
6.	Cin	Kemet	C1206C105K3RACTU Series= X7R	Cap= 1.0 µF ESR= 11.0 mOhm VDC= 25.0 V IRMS= 3.55 A	1	\$0.04	1206 19mm2
7.	Cinx	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	0805 13mm2
8.	Cio	TDK	C3216X7R1H105K Series= X7R	Cap= 1.0 µF ESR= 10.0 mOhm VDC= 50.0 V IRMS= 3.2 A	1	\$0.04	1206 19mm2
9.	Cout	MuRata	GRM32ER71C226ME18L Series= X7R	Cap= 22.0 µF ESR= 3.0 mOhm VDC= 16.0 V IRMS= 3.2 A	1	\$0.81	1210 23mm2
10.	Coutx	MuRata	GRM188R61E105KA12D Series= X5R	Cap= 1.0 µF VDC= 25.0 V IRMS= 0.0 A	1	\$0.02	0603 10mm2

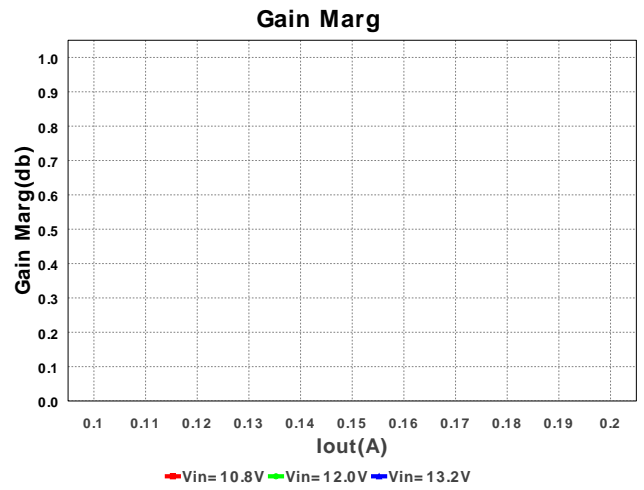
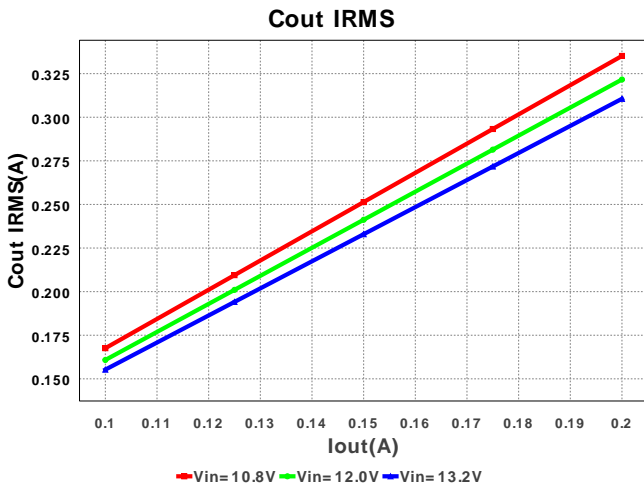
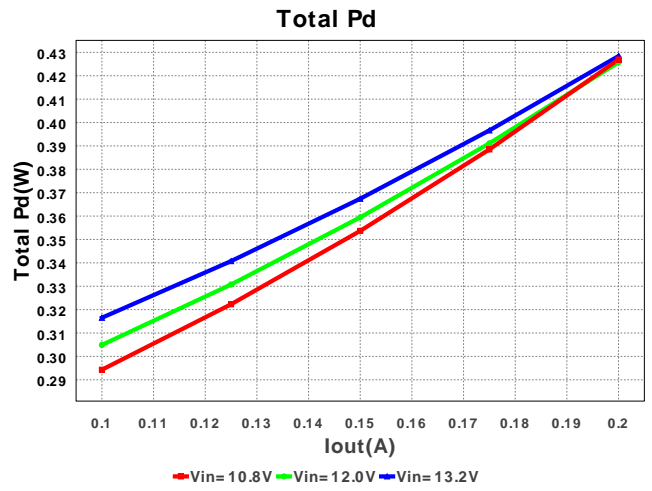
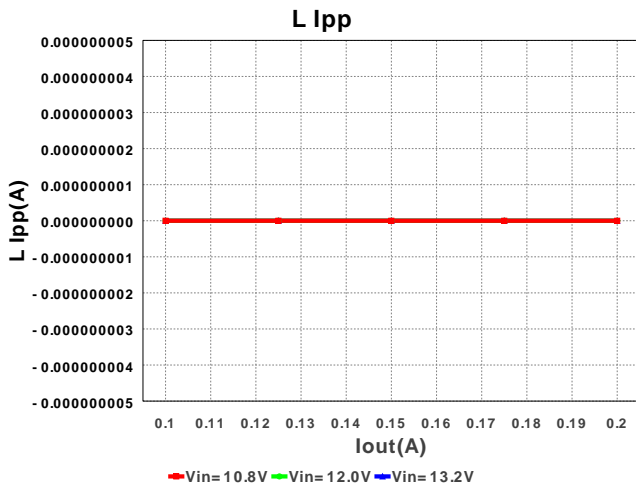
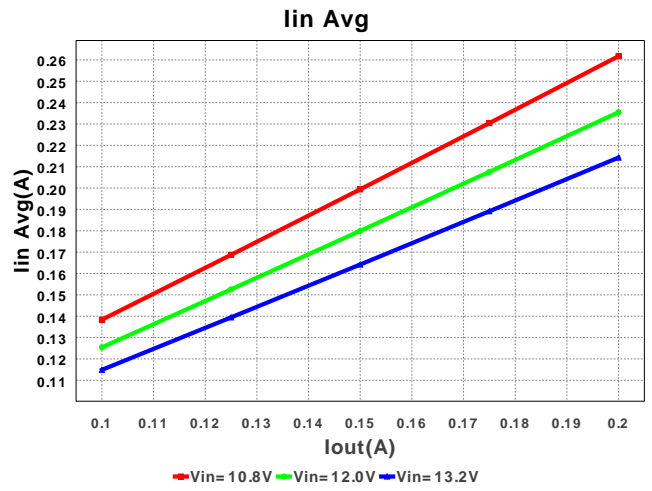
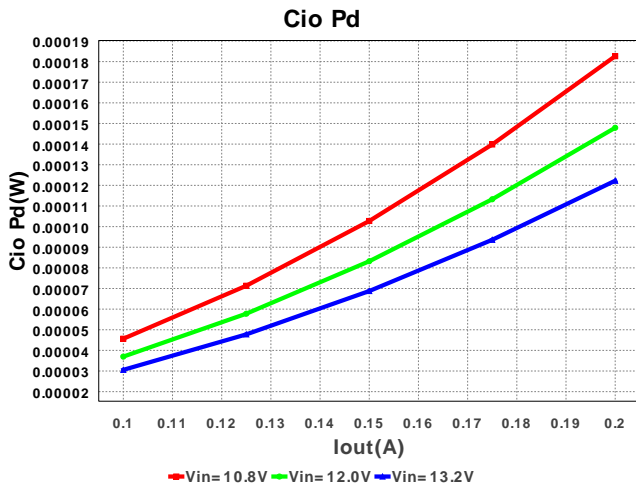
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
11.	Cramp	Yageo America	CC0805KRX7R9BB271 Series= X7R	Cap= 270.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0805 13mm2
12.	Css	MuRata	GRM033R60J333KE01D Series= X5R	Cap= 33.0 nF VDC= 6.3 V IRMS= 0.0 A	1	\$0.01	 0201 6mm2
13.	D1	ON Semiconductor	MBR0540T1G	VF@Io= 510.0 mV VRRM= 40.0 V	1	\$0.06	 SOD-123 22mm2
14.	L1	Bourns	SDR0604-560KL	L= 56.0 µH DCR= 420.0 mOhm	1	\$0.17	 SDR0604 61mm2
15.	Rcomp	Vishay-Dale	CRCW0402100KFKED Series= CRCW..e3	Res= 100.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 8mm2
16.	Rcomp2	Vishay-Dale	CRCW04022K21FKED Series= CRCW..e3	Res= 2.21 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 8mm2
17.	Rfbb	Vishay-Dale	CRCW04021K65FKED Series= CRCW..e3	Res= 1.65 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 8mm2
18.	Rfbb	Vishay-Dale	CRCW040214K7FKED Series= CRCW..e3	Res= 14.7 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 8mm2
19.	Rramp	Vishay-Dale	CRCW0402100KFKED Series= CRCW..e3	Res= 100.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 8mm2
20.	Rt	Vishay-Dale	CRCW04029K09FKED Series= CRCW..e3	Res= 9.09 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 8mm2
21.	U1	Texas Instruments	LM25574MT/NOPB	Switcher	1	\$1.35	 MTC16 59mm2

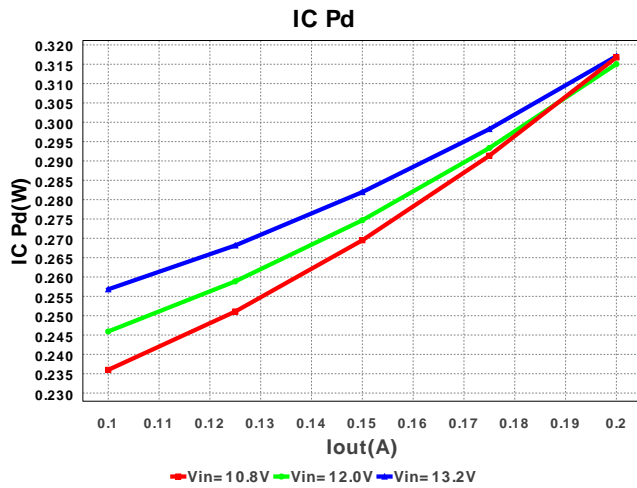












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	105.59 mA	Current	Input capacitor RMS ripple current
2.	Cio IRMS	85.176 mA	Current	Input to output capacitor RMS ripple current
3.	Cout IRMS	219.341 mA	Current	Output capacitor RMS ripple current
4.	D1 Irms	235.993 mA	Current	D1 Irms
5.	IC Ipk	5.02 mA	Current	Peak switch current in IC
6.	Iin Avg	271.28 mA	Current	Average input current
7.	L Ipp	183.345 mA	Current	Peak-to-peak output inductor ripple current
8.	L1 Ipk	546.218 mA	Current	Inductor peak current
9.	L1 Irms	315.359 mA	Current	Inductor ripple current
10.	BOM Count	21	General	Total Design BOM count
11.	FootPrint	343.0 mm2	General	Total Foot Print Area of BOM components
12.	Frequency	550.0 kHz	General	Switching frequency
13.	IC Tolerance	18.0 mV	General	IC Feedback Tolerance
14.	Total BOM	\$2.63	General	Total BOM Cost
15.	D1 Tj	52.456 degC	Op_Point	D1 junction temperature
16.	Vin p-p	62.244 mV	Op_Point	Peak-to-peak input voltage
17.	Cross Freq	18.464 kHz	Op_point	Bode plot crossover frequency
18.	Duty Cycle	56.0 %	Op_point	Duty cycle
19.	Efficiency	81.918 %	Op_point	Steady state efficiency
20.	Gain Marg	44.497 db	Op_point	Bode Plot Gain Margin
21.	IC Tj	58.537 degC	Op_point	IC junction temperature
22.	IOUT_OP	200.0 mA	Op_point	Iout operating point
23.	Phase Marg	46.168 deg	Op_point	Bode Plot Phase Margin
24.	Phase Shift	20.819 deg	Op_point	Bode Plot Phase Shift
25.	VIN_OP	10.8 V	Op_point	Vin operating point
26.	Vout p-p	14.217 mV	Op_point	Peak-to-peak output ripple voltage
27.	Cin Pd	122.642 μW	Power	Input capacitor power dissipation
28.	Cio Pd	72.549 μW	Power	Input to output capacitor power dissipation
29.	Cout Pd	144.332 μW	Power	Output capacitor power dissipation
30.	D1 Pd	109.01 mW	Power	Diode power dissipation
31.	D1 PdCond	102.0 mW	Power	Diode conduction losses
32.	D1 PdSw	7.01 mW	Power	Diode switching losses
33.	IC Pd	317.083 mW	Power	IC power dissipation
34.	L Pd	81.211 mW	Power	Inductor power dissipation
35.	Rsense Pd	21.081 mW	Power	LED Current Rsns Power Dissipation
36.	Total Pd	529.771 mW	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	200.0 mA	Maximum Output Current
2.	Iout1	200.0 mAmps	Output Current #1
3.	VinMax	13.2 V	Maximum input voltage
4.	VinMin	10.8 V	Minimum input voltage
5.	Vout	-12.0 V	Output Voltage
6.	Vout1	-12.0 Volt	Output Voltage #1
7.	base_pn	LM25574	Base Product Number
8.	source	DC	Input Source Type
9.	Ta	30.0 degC	Ambient temperature

Design Assistance

1. **LM25574** Product Folder : <http://www.ti.com/product/lm25574> : contains the data sheet and other resources.

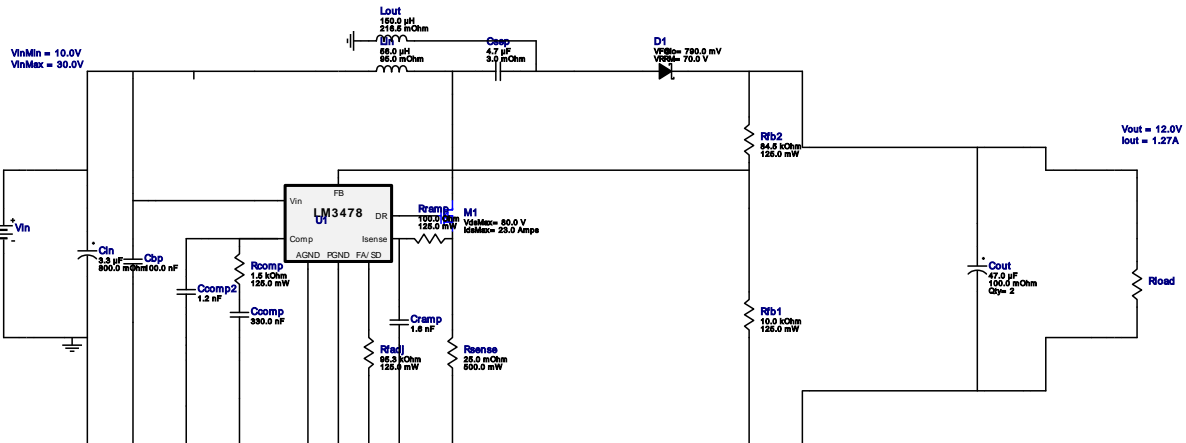


VinMin = 10.0V
 VinMax = 30.0V
 Vout = 12.0V
 Iout = 1.27A

Device = LM3478MM/NOPB
 Topology = SEPIC
 Created = 9/25/13 1:29:21 AM
 BOM Cost = \$6.13
 Total Pd = 2.45W
 Footprint = 946.0mm2
 BOM Count = 19

WEBENCH® Design Report

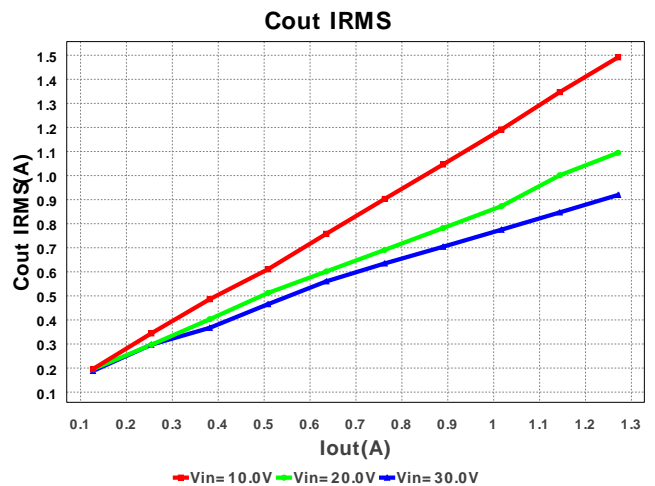
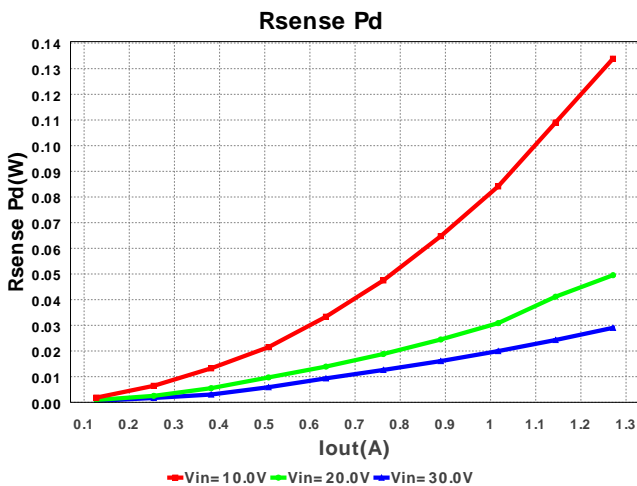
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 LM3478MM/NOPB 10.0V-30.0V to 12.0V @ 1.271A

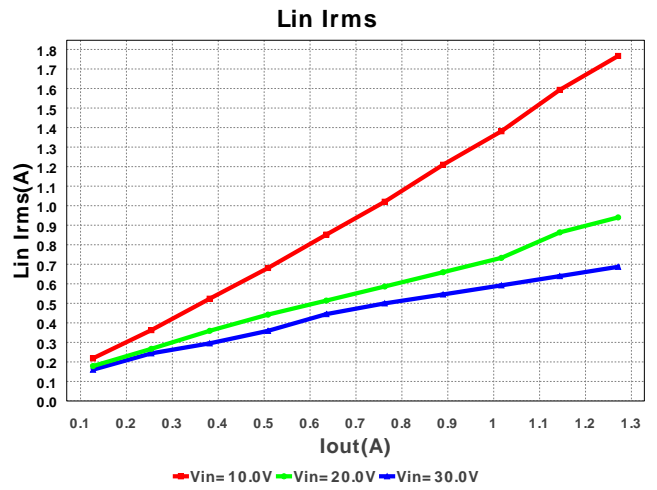
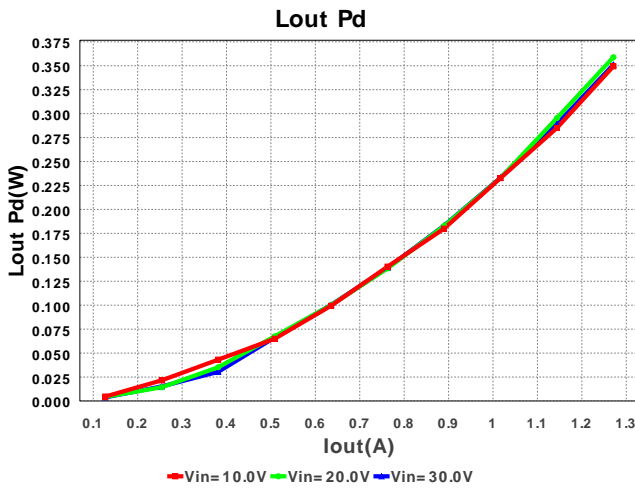
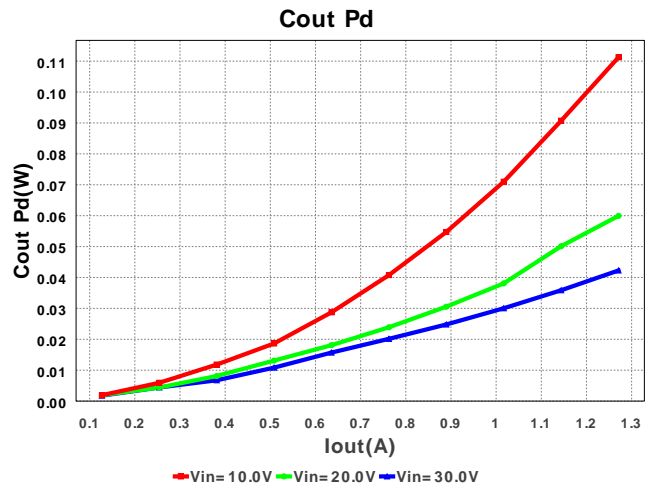
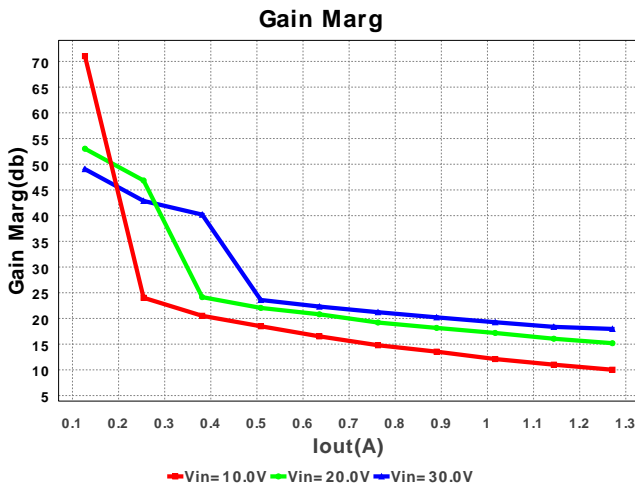
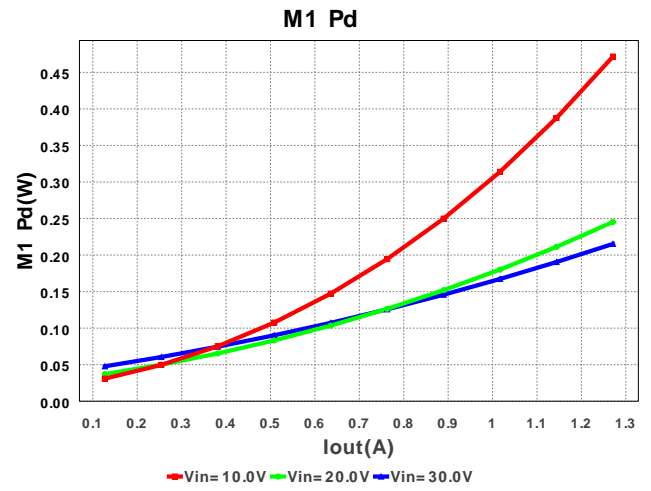
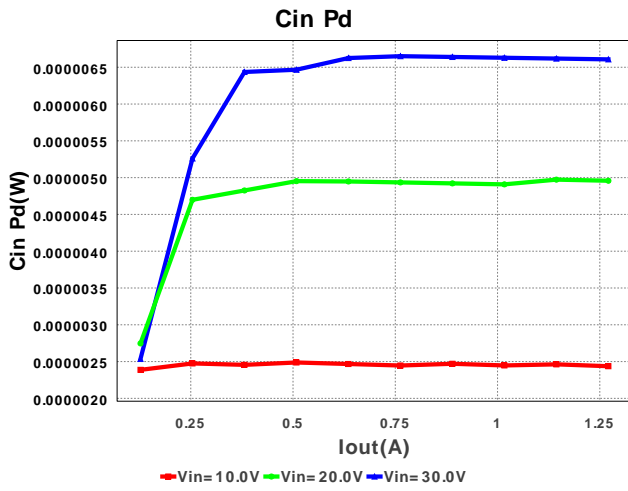


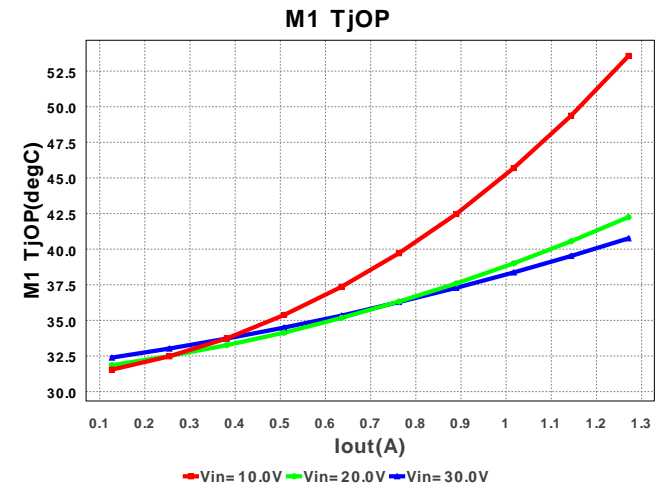
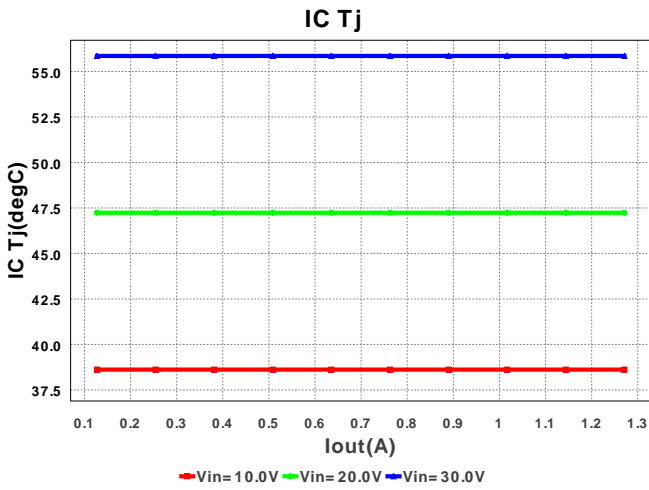
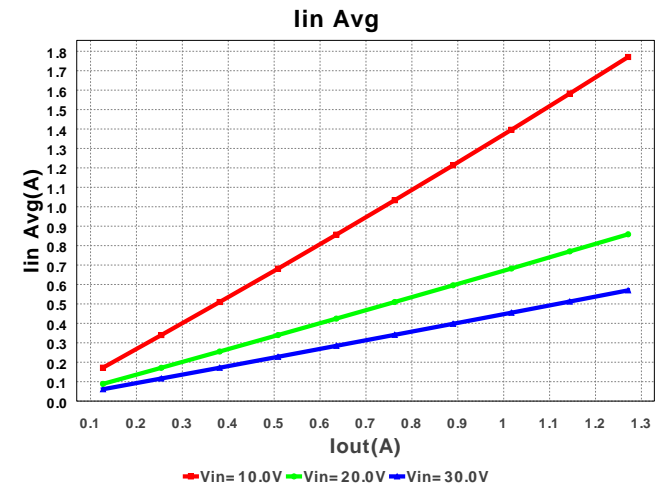
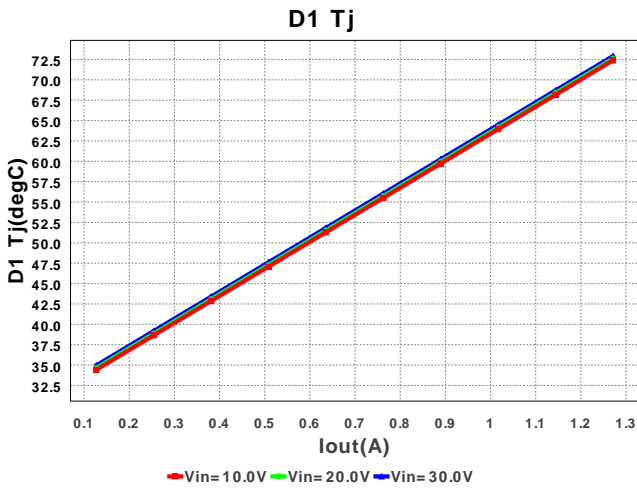
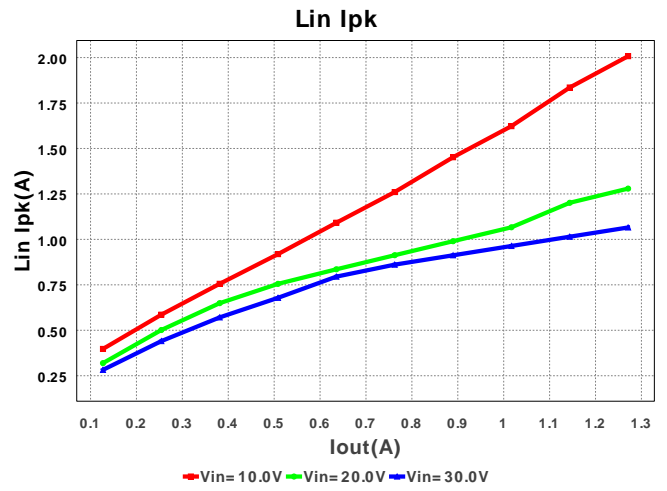
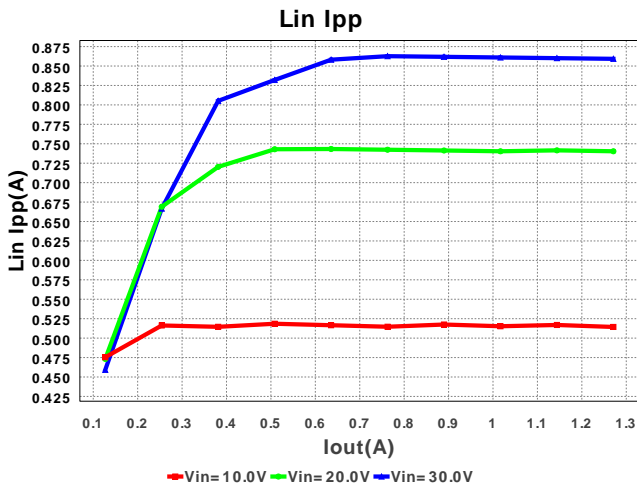
Electrical BOM

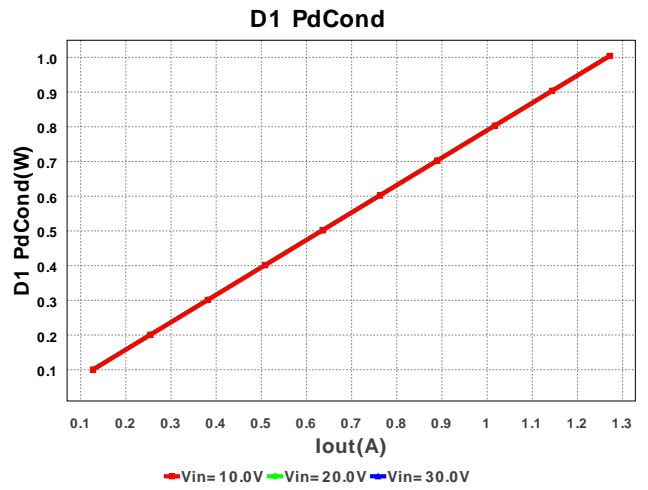
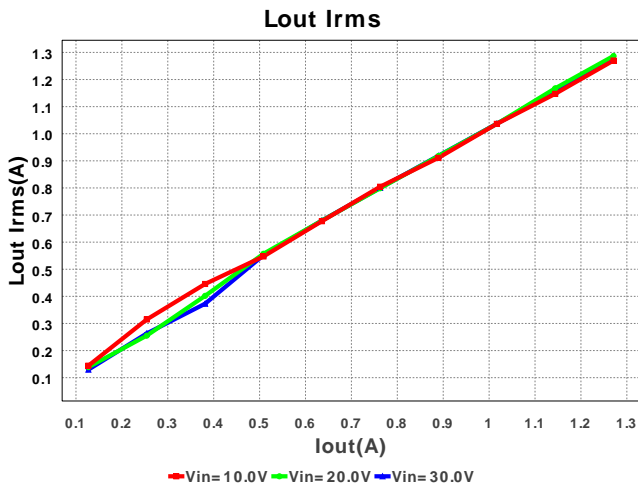
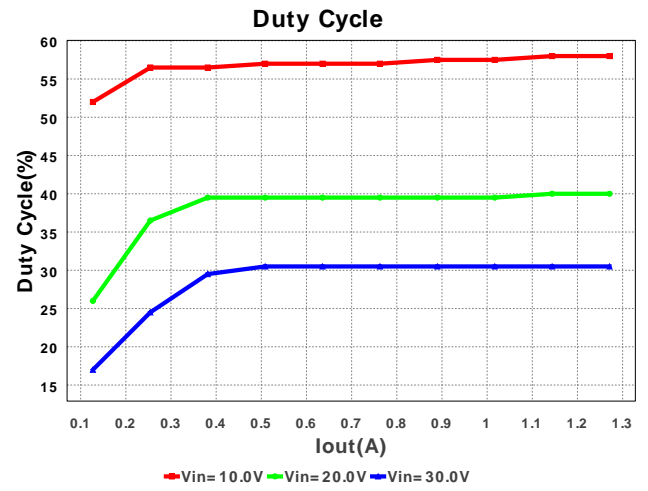
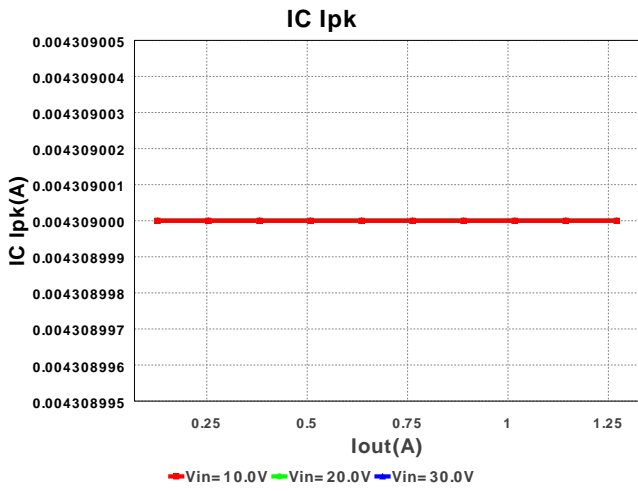
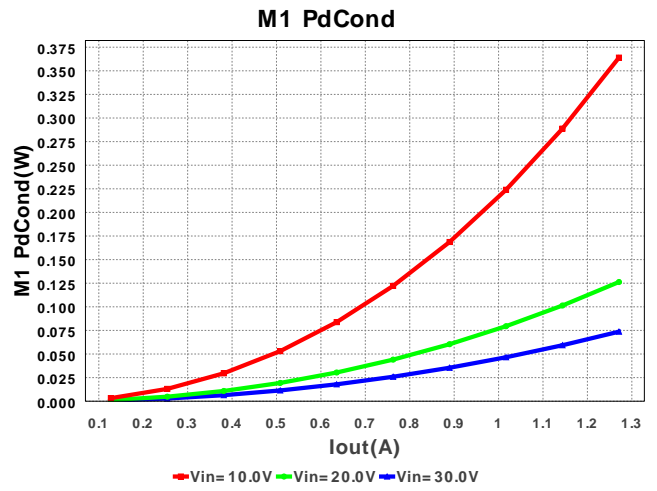
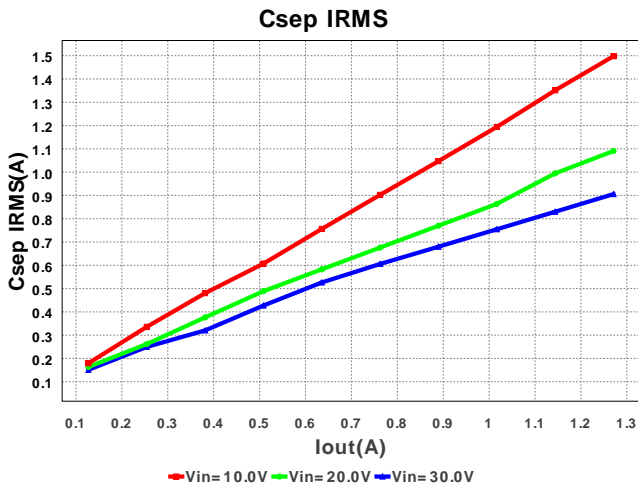
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbp	Kemet	C0603C104K5RACTU Series= X7R	Cap= 100.0 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0603 10mm2
2.	Ccomp	MuRata	GRM155C80J334KE01D Series= 379	Cap= 330.0 nF VDC= 6.3 V IRMS= 0.0 A	1	\$0.01	0402 8mm2
3.	Ccomp2	MuRata	GRM216R71E122KA01D Series= X7R	Cap= 1.2 nF VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	0805 13mm2
4.	Cin	AVX	TPSD335K050R0800 Series= TPS	Cap= 3.3 µF ESR= 800.0 mOhm VDC= 50.0 V IRMS= 390.0 mA	1	\$2.10	7343-31 59mm2
5.	Cout	Kemet	T495D476K020ATE100 Series= T495	Cap= 47.0 µF ESR= 100.0 mOhm VDC= 20.0 V IRMS= 1.102 A	2	\$0.56	7343-31 59mm2
6.	Cramp	MuRata	GRM2165C1H162JA01D Series= C0G/NP0	Cap= 1.6 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.03	0805 13mm2
7.	Csep	TDK	C4532X7R1H475M Series= X7R	Cap= 4.7 µF ESR= 3.0 mOhm VDC= 50.0 V IRMS= 2.9 A	1	\$0.35	1812 39mm2
8.	D1	Diodes Inc.	B370-13-F	VF@Io= 790.0 mV VRRM= 70.0 V	1	\$0.22	SMC 83mm2

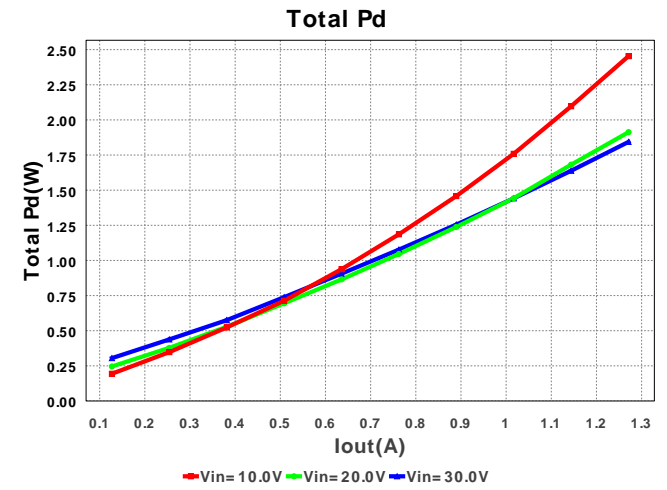
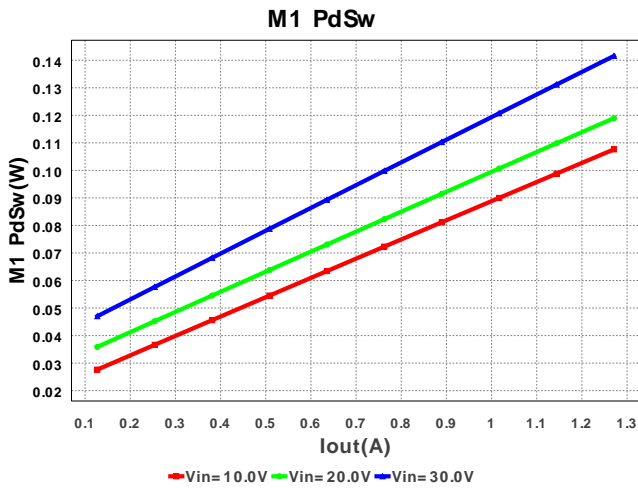
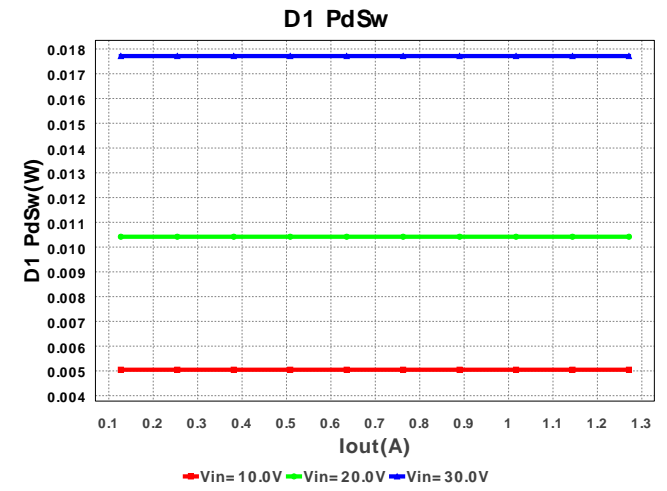
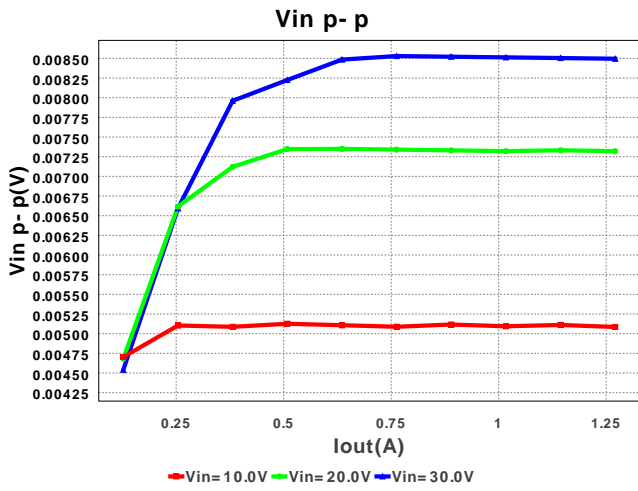
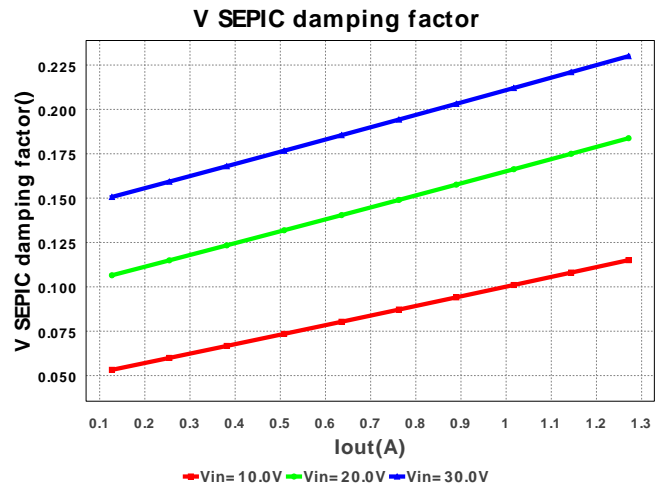
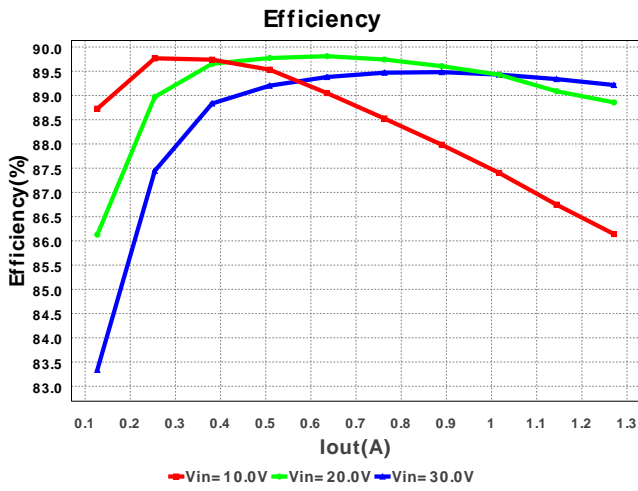
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
9.	Lin	Bourns	SDR1307-560KL	L= 56.0 μ H DCR= 95.0 mOhm	1	\$0.34	 SDR1307 227mm2
10.	Lout	Coilcraft	MSS1278-154KLB	L= 150.0 μ H DCR= 216.5 mOhm	1	\$0.69	 MSS1278 204mm2
11.	M1	Infineon Technologies	BSC340N08NS3 G	VdsMax= 80.0 V IdsMax= 23.0 Amps	1	\$0.30	 PG-TDSON-8 55mm2
12.	Rcomp	Vishay-Dale	CRCW08051K50FKEA Series= CRCW..e3	Res= 1.5 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 13mm2
13.	Rfadj	Vishay-Dale	CRCW080595K3FKEA Series= CRCW..e3	Res= 95.3 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 13mm2
14.	Rfb1	Vishay-Dale	CRCW080510K0FKEA Series= CRCW..e3	Res= 10.0 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 13mm2
15.	Rfb2	Vishay-Dale	CRCW080584K5FKEA Series= CRCW..e3	Res= 84.5 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 13mm2
16.	Rramp	Vishay-Dale	CRCW0805100RFKEA Series= CRCW..e3	Res= 100.0 Ohm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 13mm2
17.	Rsense	Stackpole Electronics Inc	CSR1206FK25L0 Series= ?	Res= 25.0 mOhm Power= 500.0 mW Tolerance= 1.0%	1	\$0.10	 1206 19mm2
18.	U1	Texas Instruments	LM3478MM/NOPB	Switcher	1	\$0.80	 MUA08A 34mm2

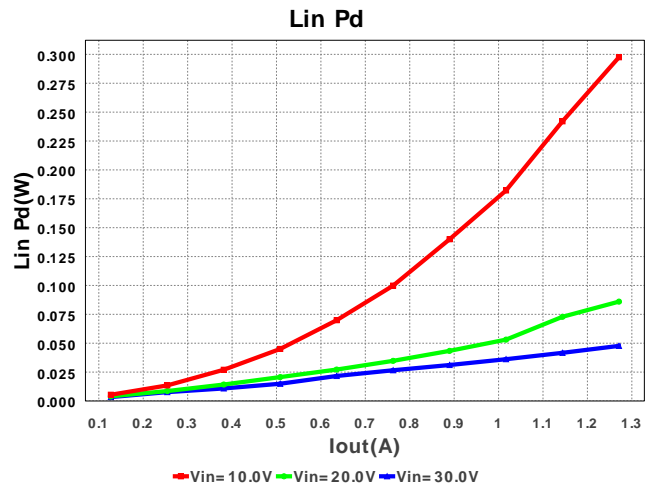
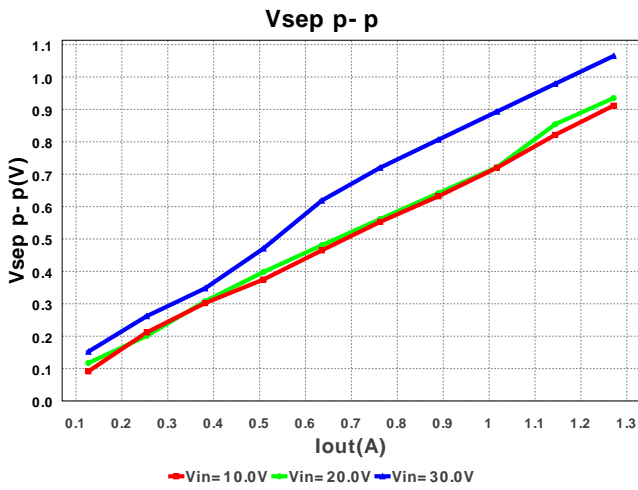
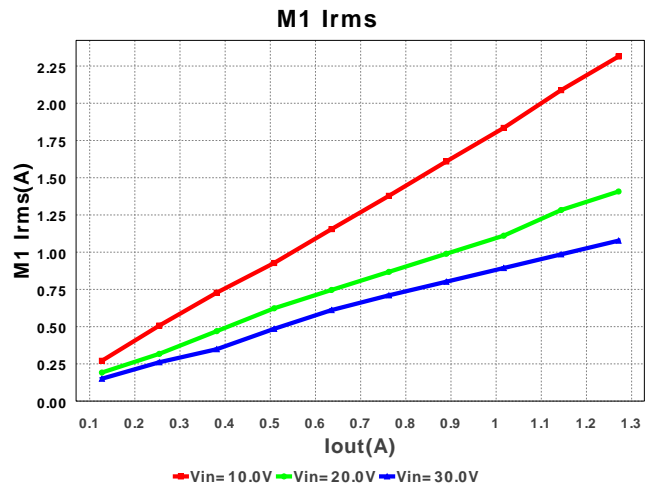
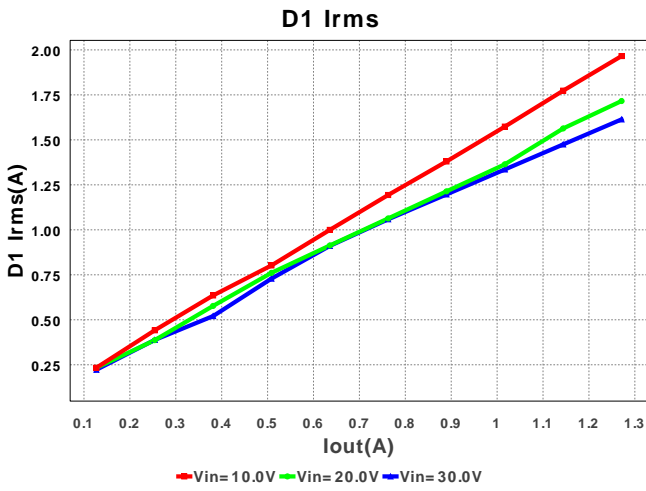
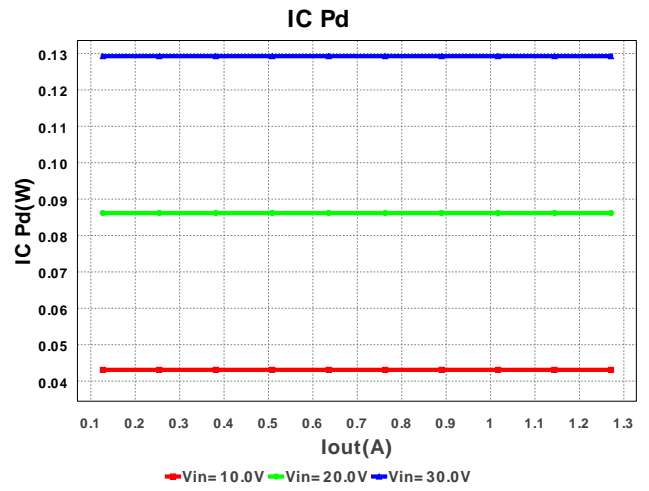
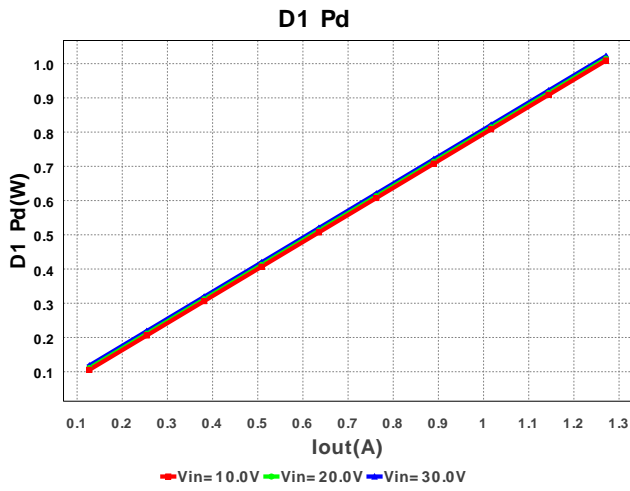


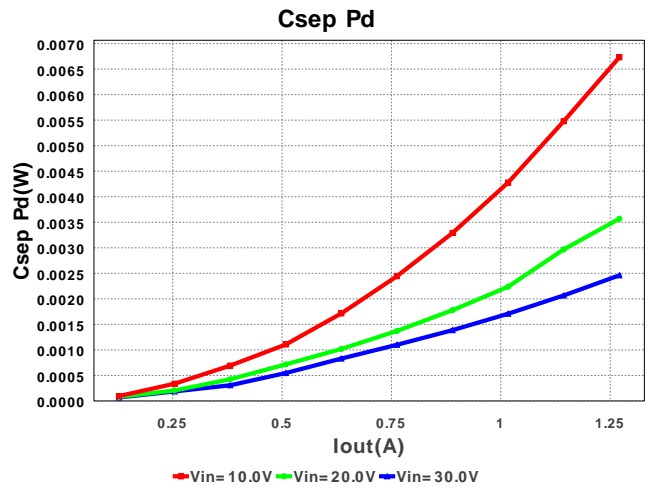
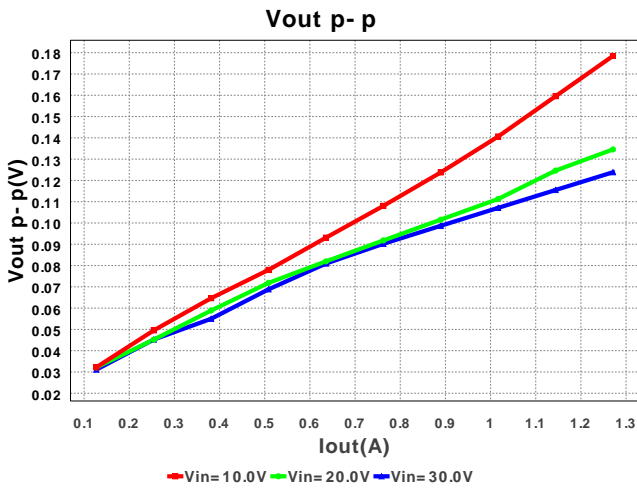
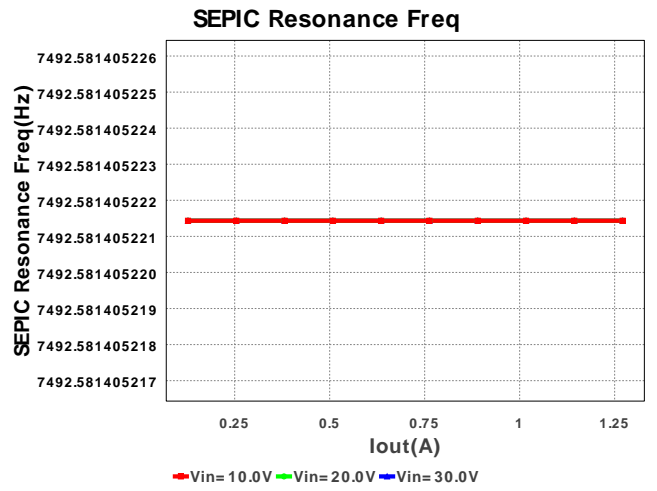
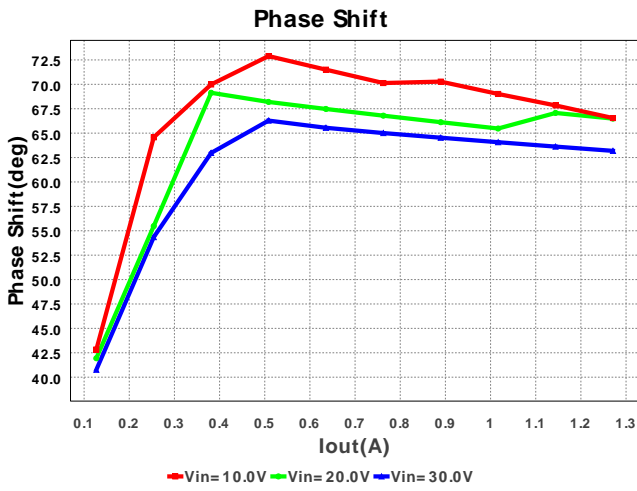
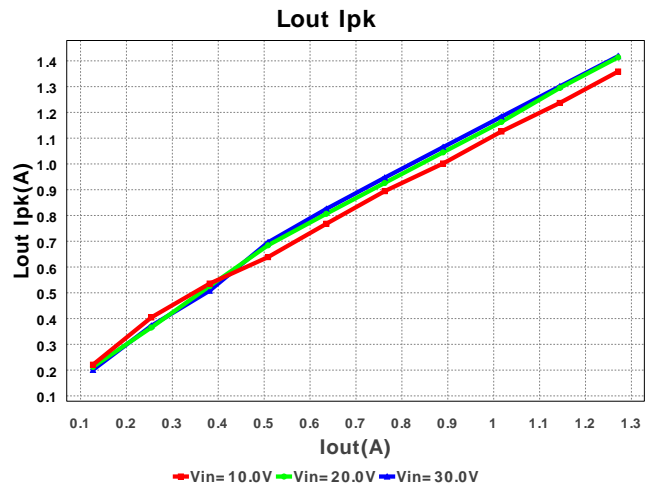
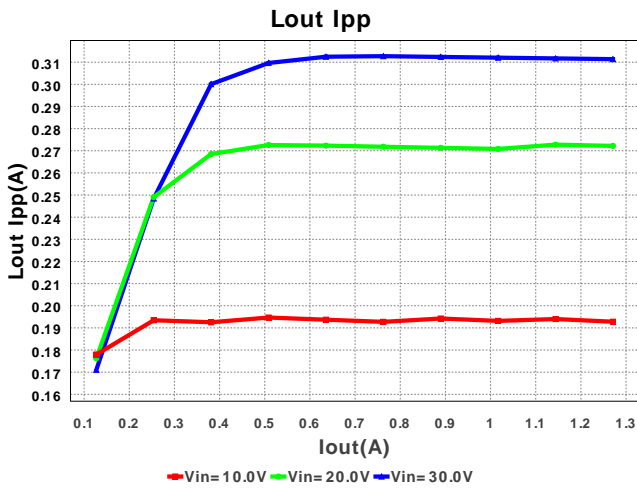


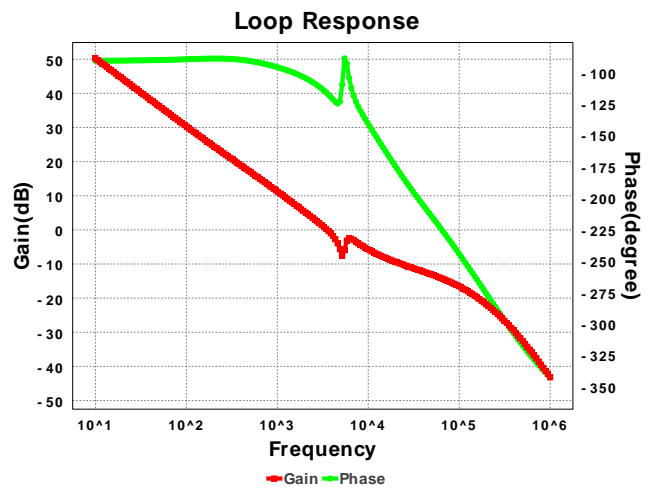
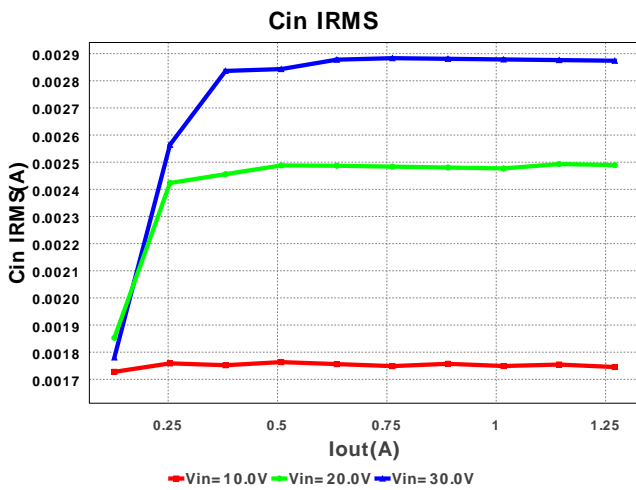












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	1.745 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	1.492 A	Current	Output capacitor RMS ripple current
3.	Csep IRMS	1.498 A	Current	SEPIC capacitor RMS ripple current
4.	D1 Irms	1.966 A	Current	D1 Irms
5.	IC Ipk	4.309 mA	Current	Peak switch current in IC
6.	Iin Avg	1.771 A	Current	Average input current
7.	Iin Ipk	2.008 A	Current	Iin peak current
8.	Iin Ipp	514.364 mA	Current	Peak-to-peak input inductor ripple current
9.	Iin Irms	1.767 A	Current	Iin ripple current
10.	Iout Ipk	1.359 A	Current	Iout peak current
11.	Iout Ipp	192.789 mA	Current	Peak-to-peak output inductor ripple current
12.	Iout Irms	1.27 A	Current	Iout ripple current
13.	M1 Irms	2.314 A	Current	M1 MOSFET Irms
14.	BOM Count	19	General	Total Design BOM count
15.	FootPrint	946.0 mm2	General	Total Foot Print Area of BOM components
16.	Frequency	192.5 kHz	General	Switching frequency
17.	IC Tolerance	24.3 mV	General	IC Feedback Tolerance
18.	Total BOM	\$6.13	General	Total BOM Cost
19.	D1 Tj	72.384 degC	Op_Point	D1 junction temperature
20.	SEPIC Resonance Freq	7.493 kHz	Op_Point	SEPIC Resonance Frequency
21.	V SEPIC damping factor	115.052 m	Op_Point	V SEPIC damping factor
22.	Vin p-p	5.085 mV	Op_Point	Peak-to-peak input voltage
23.	Vsep p-p	911.646 mV	Op_Point	Peak-to-peak sepic voltage
24.	Cross Freq	3.449 kHz	Op_point	Bode plot crossover frequency
25.	Duty Cycle	58.0 %	Op_point	Duty cycle
26.	Efficiency	86.141 %	Op_point	Steady state efficiency
27.	Gain Marg	10.024 db	Op_point	Bode Plot Gain Margin
28.	IC Tj	55.854 degC	Op_point	IC junction temperature
29.	IOUT_OP	1.271 A	Op_point	Iout operating point
30.	M1 TjOP	53.564 degC	Op_point	M1 MOSFET junction temperature
31.	Phase Marg	64.93 deg	Op_point	Bode Plot Phase Margin
32.	Phase Shift	66.546 deg	Op_point	Bode Plot Phase Shift
33.	VIN_OP	10.0 V	Op_point	Vin operating point
34.	Vout p-p	178.477 mV	Op_point	Peak-to-peak output ripple voltage
35.	Cin Pd	2.437 μW	Power	Input capacitor power dissipation
36.	Cout Pd	111.242 mW	Power	Output capacitor power dissipation
37.	Csep Pd	6.731 mW	Power	SEPIC capacitor power dissipation
38.	D1 Pd	1.009 W	Power	Diode power dissipation
39.	D1 PdCond	1.004 W	Power	Diode conduction losses
40.	D1 PdSw	5.047 mW	Power	Diode switching losses
41.	IC Pd	129.27 mW	Power	IC power dissipation
42.	Iin Pd	297.496 mW	Power	Iin power dissipation
43.	Iout Pd	349.402 mW	Power	Iout power dissipation
44.	M1 Pd	471.577 mW	Power	M1 MOSFET total power dissipation
45.	M1 PdCond	363.946 mW	Power	M1 MOSFET conduction losses
46.	M1 PdSw	107.632 mW	Power	M1 MOSFET switching losses
47.	Rsense Pd	133.879 mW	Power	LED Current Rns Power Dissipation
48.	Total Pd	2.454 W	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	1.271 A	Maximum Output Current
2.	Iout1	1.271 Amps	Output Current #1
3.	VinMax	30.0 V	Maximum input voltage
4.	VinMin	10.0 V	Minimum input voltage
5.	Vout	12.0 V	Output Voltage
6.	Vout1	12.0 Volt	Output Voltage #1
7.	base_pn	LM3478	Base Product Number
8.	source	DC	Input Source Type
9.	Ta	30.0 degC	Ambient temperature
10.	UserFsw	285.0 kHz	Customer Selected Frequency

Design Assistance

1. **LM3478** Product Folder : <http://www.ti.com/product/lm3478> : contains the data sheet and other resources.

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