



WEBENCH[®] Power Architect

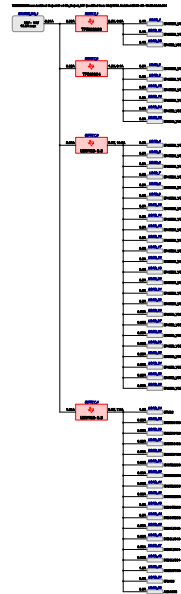
Project Report

Project : 714569/5 : PA_Project_307 (modified from 304)
 Created : 2015-08-18 23:16:19.581
 Optimize project optFactor=3

Project Summary

1. Total System Efficiency	92.227 %
2. Total System BOM Count	51.0
3. Total System Footprint	1.383 kmm ²
4. Total System BOM Cost	\$9.69
5. Total System Power Dissipation	5.668 W

--> Launch WEBENCH Power Architect.



Power Supplies

#	Name	NSID	Description	Vout	Iout	Efficiency	Foot-print	Cost	Design	Page
1.	SUPPLY_1	TPS562200	Switcher : 17V, 2A,6-pin, Low Iq Synchronous buck converter with Advanced Eco-mode	2.5 V	0.3 A	88.4%	82	\$1.03	17	5
2.	SUPPLY_2	TPS40304	Switcher : Synchronous Buck Controller	1.2 V	8.1 A	84.3%	223	\$2.66	18	10
3.	SUPPLY_3	LM3152-3.3	Switcher : SIMPLE SWITCHER(r) Controller	3.3 V	10.0 A	93.7%	569	\$3.12	19	17
4.	SUPPLY_4	LM3152-3.3	Switcher : SIMPLE SWITCHER(r) Controller	3.3 V	7.205 A	93.9%	509	\$2.88	20	23

Power Loads

#	Name	VLoad	Iload	Description
1.	EP4CE55_VCCA	2.5 V	0.1 A	VoutRipple=6%, SoftStart delay=1.0 mSec
2.	EP4CE55_VCCA	2.5 V	0.1 A	VoutRipple=6%, SoftStart delay=1.0 mSec
3.	EP4CE6_VCCA	2.5 V	0.1 A	VoutRipple=6%, SoftStart delay=1.0 mSec
4.	EP4CE55_VCCD_PLL	1.2 V	0.5 A	VoutRipple=6%, SoftStart delay=1.0 mSec
5.	EP4CE55_VCCINT	1.2 V	3 A	VoutRipple=6%, SoftStart delay=1.0 mSec
6.	EP4CE55_VCCD_PLL	1.2 V	0.5 A	VoutRipple=6%, SoftStart delay=1.0 mSec
7.	EP4CE55_VCCINT	1.2 V	3 A	VoutRipple=6%, SoftStart delay=1.0 mSec
8.	EP4CE6_VCCD_PLL	1.2 V	0.5 A	VoutRipple=6%, SoftStart delay=1.0 mSec
9.	EP4CE6_VCCINT	1.2 V	0.6 A	VoutRipple=6%, SoftStart delay=1.0 mSec
10.	EP4CE55_VCCIO# 1	3.3 V	0.5 A	VoutRipple=10%, SoftStart delay=1.0 mSec
11.	EP4CE55_VCCIO# 2	3.3 V	0.5 A	VoutRipple=10%, SoftStart delay=1.0 mSec
12.	EP4CE55_VCCIO# 3	3.3 V	0.5 A	VoutRipple=10%, SoftStart delay=1.0 mSec
13.	EP4CE55_VCCIO# 4	3.3 V	0.5 A	VoutRipple=10%, SoftStart delay=1.0 mSec
14.	EP4CE55_VCCIO# 5	3.3 V	0.5 A	VoutRipple=10%, SoftStart delay=1.0 mSec
15.	EP4CE55_VCCIO# 6	3.3 V	0.5 A	VoutRipple=10%, SoftStart delay=1.0 mSec
16.	EP4CE55_VCCIO# 7	3.3 V	0.5 A	VoutRipple=10%, SoftStart delay=1.0 mSec
17.	EP4CE55_VCCIO# 8	3.3 V	0.5 A	VoutRipple=10%, SoftStart delay=1.0 mSec
18.	EP4CE55_VCCIO# 1	3.3 V	0.5 A	VoutRipple=10%, SoftStart delay=1.0 mSec
19.	EP4CE55_VCCIO# 2	3.3 V	0.5 A	VoutRipple=10%, SoftStart delay=1.0 mSec
20.	EP4CE55_VCCIO# 3	3.3 V	0.5 A	VoutRipple=10%, SoftStart delay=1.0 mSec
21.	EP4CE55_VCCIO# 4	3.3 V	0.5 A	VoutRipple=10%, SoftStart delay=1.0 mSec
22.	EP4CE55_VCCIO# 5	3.3 V	0.5 A	VoutRipple=10%, SoftStart delay=1.0 mSec
23.	EP4CE55_VCCIO# 6	3.3 V	0.5 A	VoutRipple=10%, SoftStart delay=1.0 mSec
24.	EP4CE55_VCCIO# 7	3.3 V	0.5 A	VoutRipple=10%, SoftStart delay=1.0 mSec
25.	EP4CE55_VCCIO# 8	3.3 V	0.5 A	VoutRipple=10%, SoftStart delay=1.0 mSec
26.	EP4CE6_VCCIO# 1	3.3 V	0.25 A	VoutRipple=10%, SoftStart delay=1.0 mSec
27.	EP4CE6_VCCIO# 2	3.3 V	0.25 A	VoutRipple=10%, SoftStart delay=1.0 mSec
28.	EP4CE6_VCCIO# 3	3.3 V	0.25 A	VoutRipple=10%, SoftStart delay=1.0 mSec
29.	EP4CE6_VCCIO# 4	3.3 V	0.25 A	VoutRipple=10%, SoftStart delay=1.0 mSec
30.	EP4CE6_VCCIO# 5	3.3 V	0.25 A	VoutRipple=10%, SoftStart delay=1.0 mSec
31.	EP4CE6_VCCIO# 6	3.3 V	0.25 A	VoutRipple=10%, SoftStart delay=1.0 mSec
32.	EP4CE6_VCCIO# 7	3.3 V	0.25 A	VoutRipple=10%, SoftStart delay=1.0 mSec
33.	EP4CE6_VCCIO# 8	3.3 V	0.25 A	VoutRipple=10%, SoftStart delay=1.0 mSec
34.	STM32	3.3 V	1 A	VoutRipple=10%
35.	IS45S16100-1	3.3 V	0.33 A	VoutRipple=10%
36.	IS45S16100-2	3.3 V	0.33 A	VoutRipple=10%

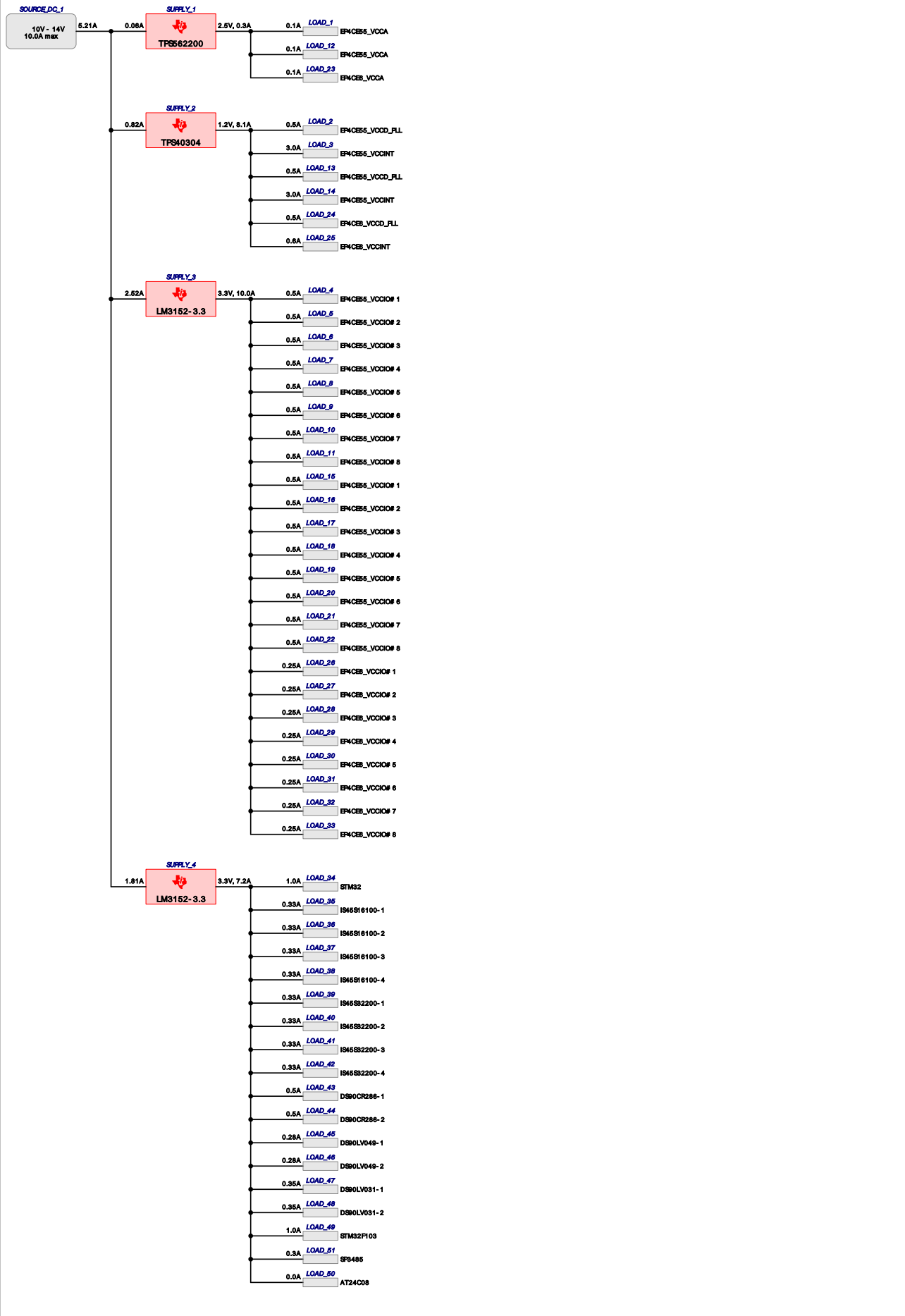
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37.	IS45S16100-3	3.3 V	0.33 A	VoutRipple=10%
38.	IS45S16100-4	3.3 V	0.33 A	VoutRipple=10%
39.	IS45S32200-1	3.3 V	0.33 A	VoutRipple=10%
40.	IS45S32200-2	3.3 V	0.33 A	VoutRipple=10%
41.	IS45S32200-3	3.3 V	0.33 A	VoutRipple=10%
42.	IS45S32200-4	3.3 V	0.33 A	VoutRipple=10%
43.	DS90CR286-1	3.3 V	0.5 A	VoutRipple=10%
44.	DS90CR286-2	3.3 V	0.5 A	VoutRipple=10%
45.	DS90LV049-1	3.3 V	0.28 A	VoutRipple=10%
46.	DS90LV049-2	3.3 V	0.28 A	VoutRipple=10%
47.	DS90LV031-1	3.3 V	0.35 A	VoutRipple=10%
48.	DS90LV031-2	3.3 V	0.35 A	VoutRipple=10%
49.	STM32F103	3.3 V	1 A	VoutRipple=10%
50.	SP3485	3.3 V	0.3 A	VoutRipple=10%
51.	AT24C08	3.3 V	0.005 A	VoutRipple=10%

FPGAs, Processors

#	Manufacturer	Part Number	Name	Series	Description
1.	Altera	EP4CE55	FPGA_1	Cyclone-IV E	FPGA Altera Cyclone-IV E EP4CE55
		http://www.altera.com/literature/hb/cyclone-iv/cyiv-53001.pdf			
2.	Altera	EP4CE55	FPGA_1	Cyclone-IV E	FPGA Altera Cyclone-IV E EP4CE55
		http://www.altera.com/literature/hb/cyclone-iv/cyiv-53001.pdf			
3.	Altera	EP4CE6	FPGA_1	Cyclone-IV E	FPGA Altera Cyclone-IV E EP4CE6
		http://www.altera.com/literature/hb/cyclone-iv/cyiv-53001.pdf			

Project Diagram

WEBENCH® Power Architect Project ID : 5 PA_Project_307 (modified from 304) FPGA Archited 2015-08-18 23:16:19.681



Electrical Procurement BOM

Manufacturer	Part Number	Description	Quantity	Budgetary Price	Footprint (mm ²)
AVX	08053C104KAT2A	0805	4	\$0.01	27
Panasonic	6SVPE220MW	CAPSMT_62_E61	4	\$0.14	107
Infineon Technologies	BSC057N03MS G	PG- TDSO-8	1	\$0.28	55
Infineon Technologies	BSC080N03MS G	PG- TDSO-8	1	\$0.26	55
TDK	C3216X5R0J226K	1206	1	\$0.11	11
Yageo America	CC0805JRNPO9BN221	0805	1	\$0.01	7
Yageo America	CC0805KRX7R9BB153	0805	2	\$0.01	14
Yageo America	CC0805KRX7R9BB222	0805	1	\$0.01	7
Yageo America	CC0805KRX7R9BB682	0805	1	\$0.01	7
Vishay-Dale	CRCW0402100KFKED	0402	1	\$0.01	3
Vishay-Dale	CRCW040210K0FKED	0402	3	\$0.01	9
Vishay-Dale	CRCW040222K6FKED	0402	1	\$0.01	3
Vishay-Dale	CRCW0402309RFKED	0402	1	\$0.01	3
Vishay-Dale	CRCW04023K16FKED	0402	1	\$0.01	3
Vishay-Dale	CRCW04023K74FKED	0402	1	\$0.01	3
Texas Instruments	CSD17302Q5A	TRANS_NexFET_Q5A	1	\$0.36	55
Texas Instruments	CSD17308Q3	TRANS_NexFET_Q3	1	\$0.34	19
Texas Instruments	CSD17507Q5A	TRANS_NexFET_Q5A	1	\$0.34	55
Texas Instruments	CSD17577Q3A	TRANS_NexFET_Q3A	1	\$0.28	18
Taiyo Yuden	EMK212B7225KG-T	0805	2	\$0.03	14
Taiyo Yuden	EMK212B7474KD-T	0805	2	\$0.02	14
MuRata	GRM155R71C183KA01D	0402	1	\$0.01	3
MuRata	GRM188R61A225KE34D	0603	1	\$0.02	5
MuRata	GRM188R61E105KA12D	0603	1	\$0.01	5
MuRata	GRM21BR61E475MA12L	0805	3	\$0.06	20
MuRata	GRM31CR60J107ME39L	1206	2	\$0.20	11
MuRata	GRM32ER61E226KE15L	1210	1	\$0.16	15
Texas Instruments	LM3152MHX-3.3/NOPB	MXA14A	2	\$1.35	118
Bourns	SRP1270-1R5M	SRP1270	1	\$0.60	246
Bourns	SRP1270-2R2M	SRP1270	1	\$0.60	246
Bourns	SRP6540-R82M	SRP6540	1	\$0.49	83
Bourns	SRR4028-3R3Y	SRR4028	1	\$0.26	34
Texas Instruments	TPS40304DRCR	S-PVSON- N10	1	\$0.95	17
Texas Instruments	TPS562200DDCR	DDC0006A	1	\$0.47	10
Total			49	\$9.65	1302

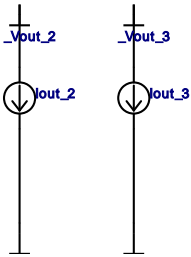
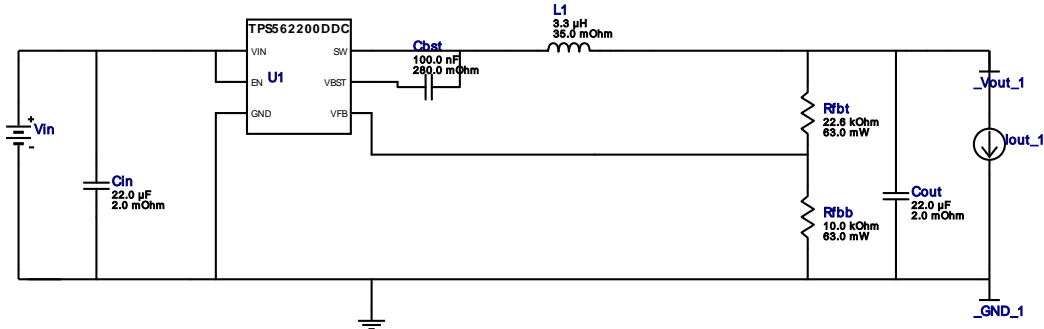


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 VinMax = 14.0V
 Vout = 2.5V
 Iout = 0.3A

Device = TPS562200DDCR
 Topology = Buck
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 Footprint = 82.0 mm²
 BOM Count = 7
 Total Pd = 0.1W

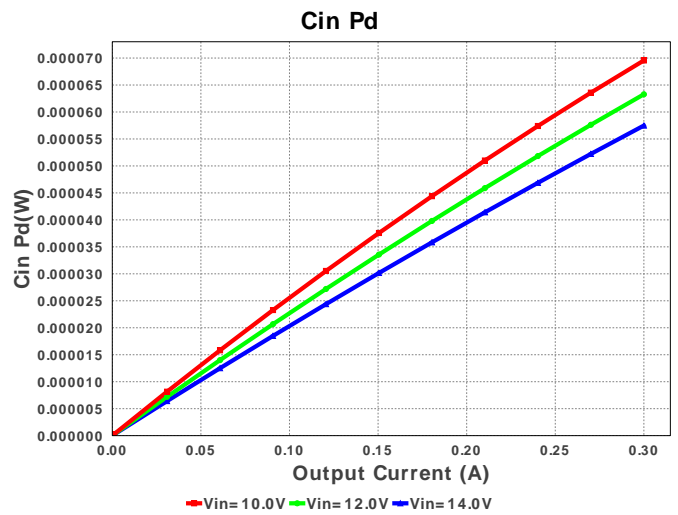
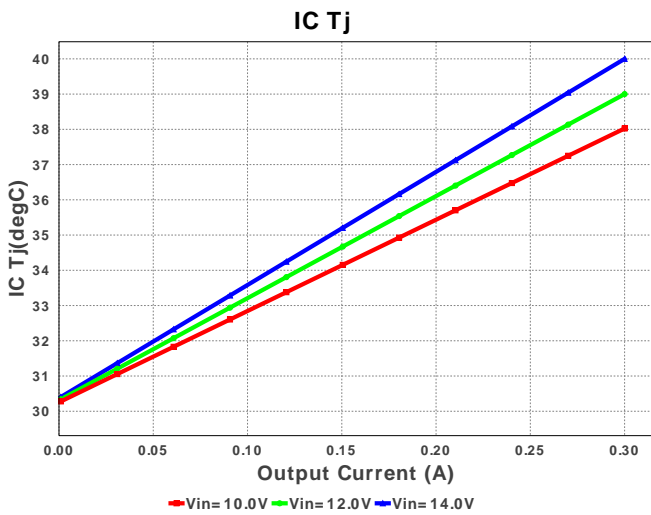
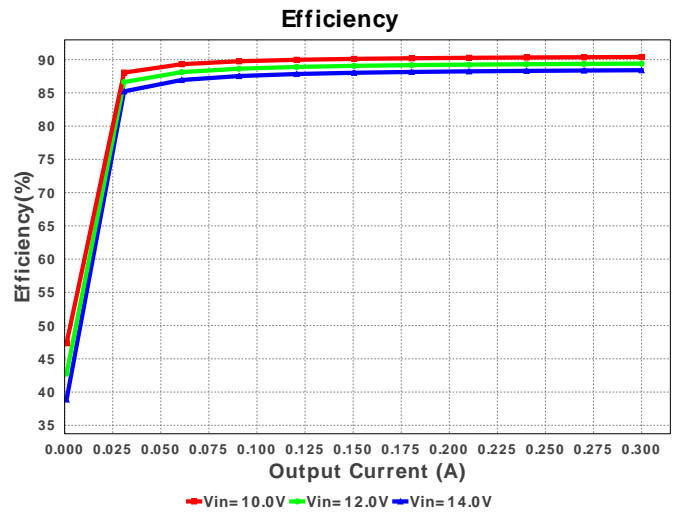
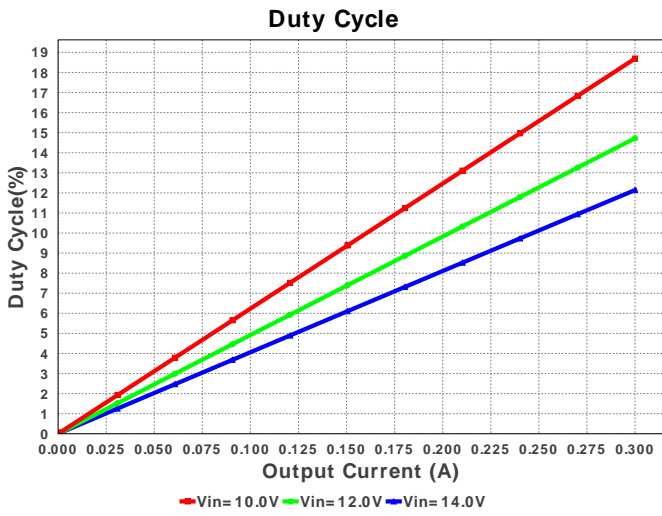
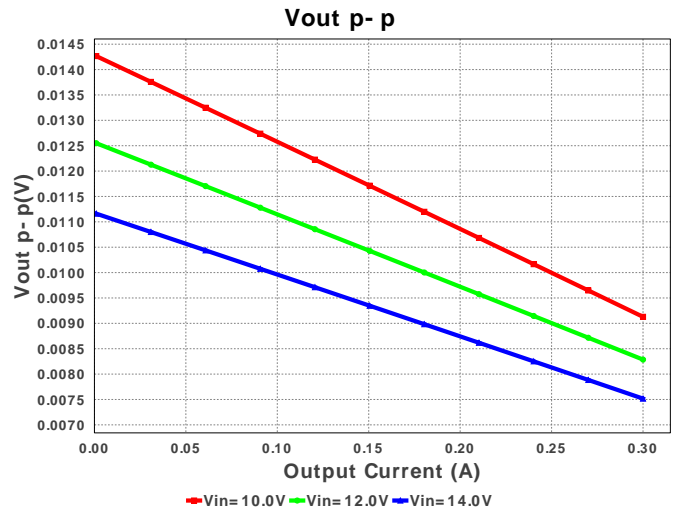
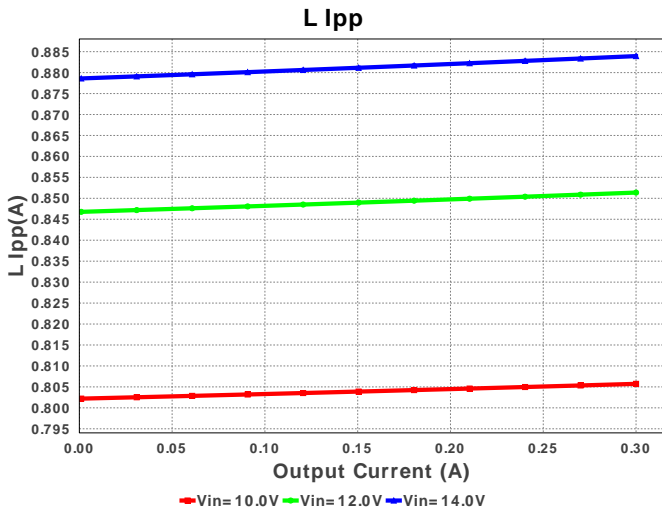
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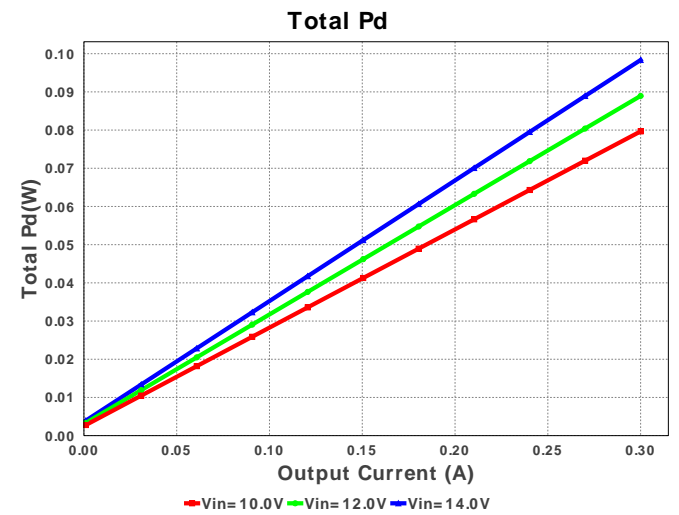
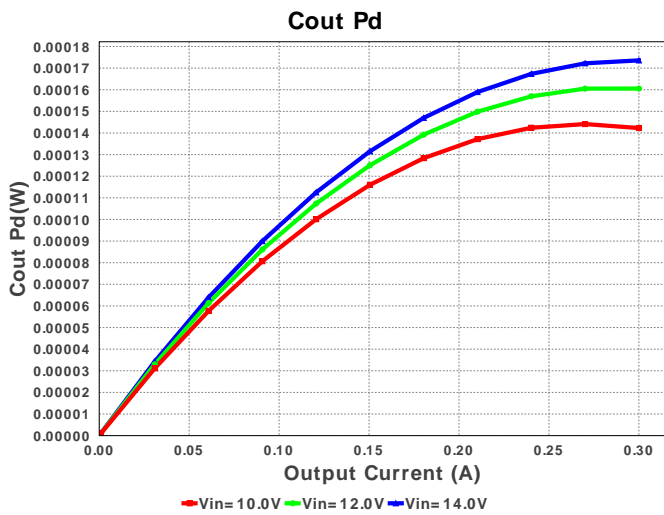
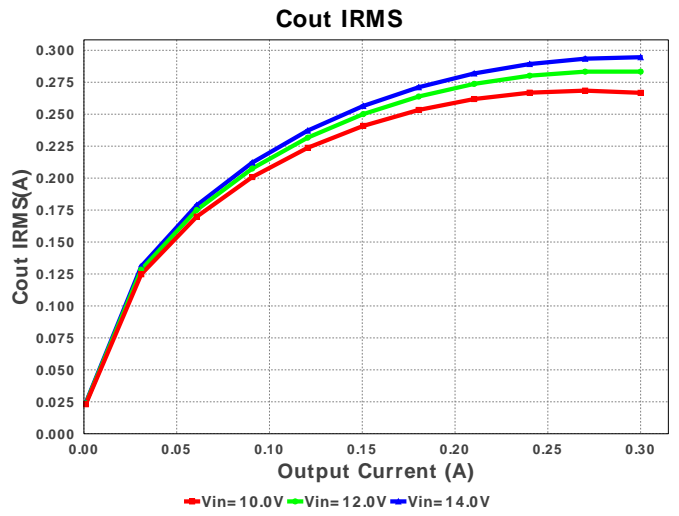
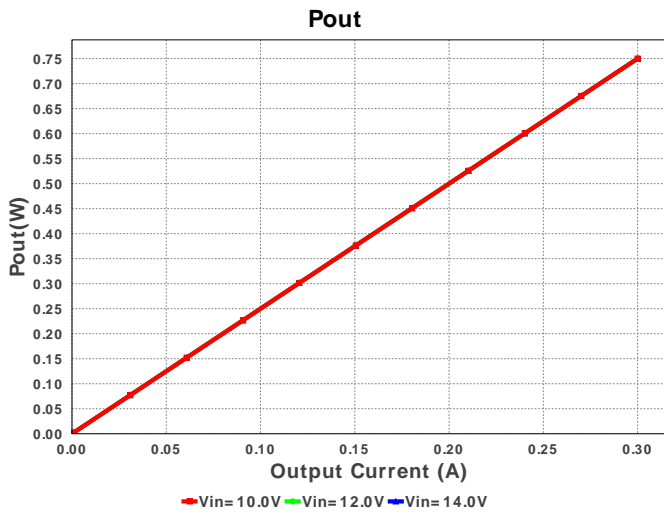
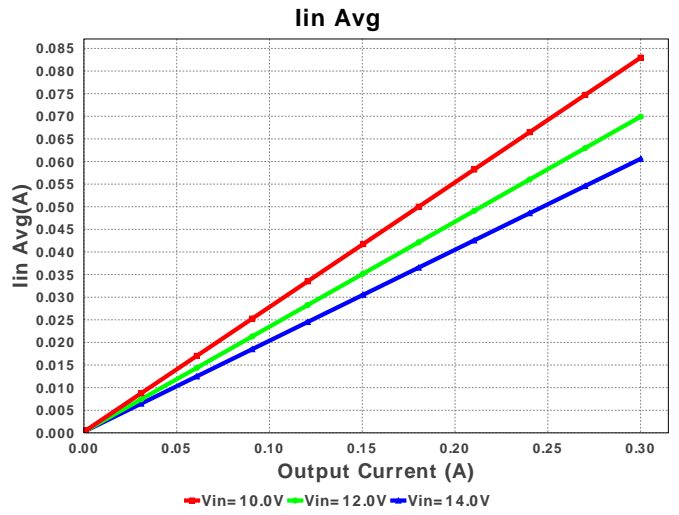
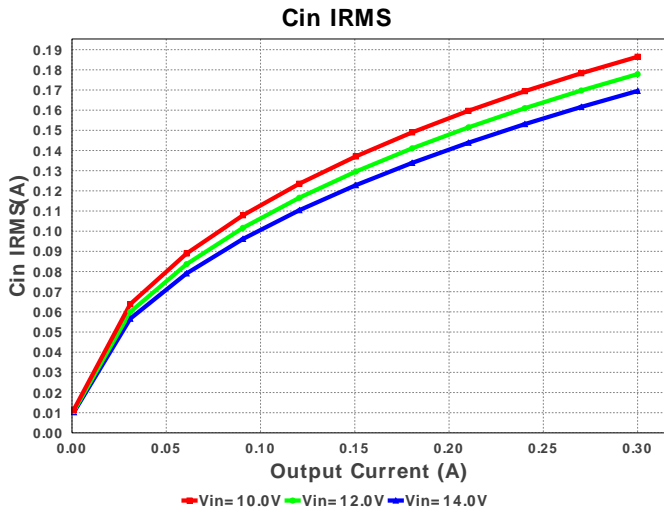
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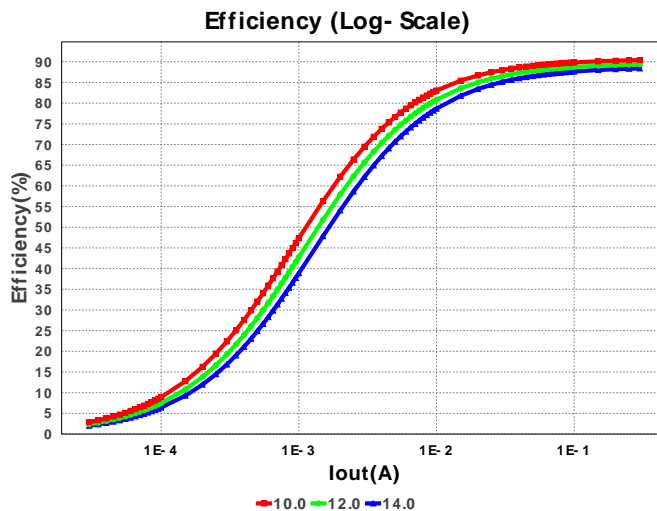
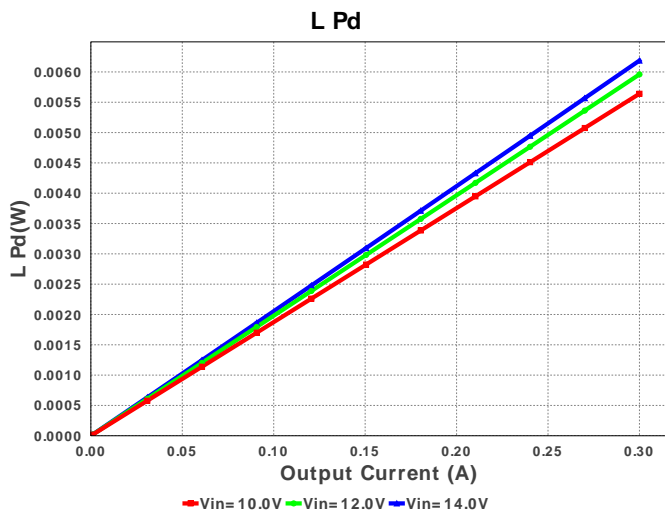
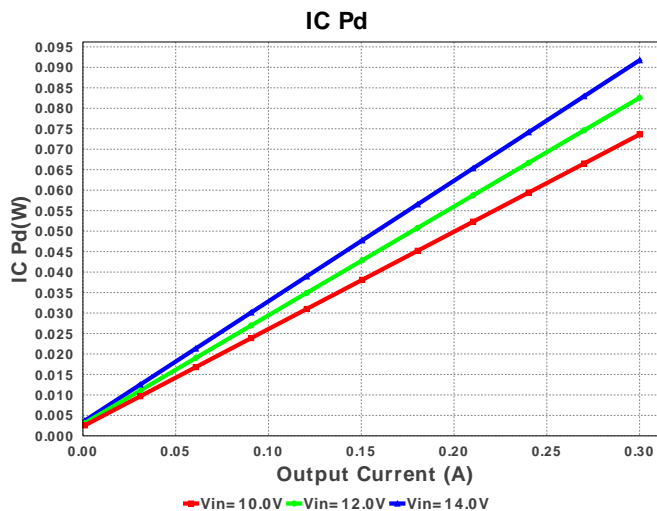
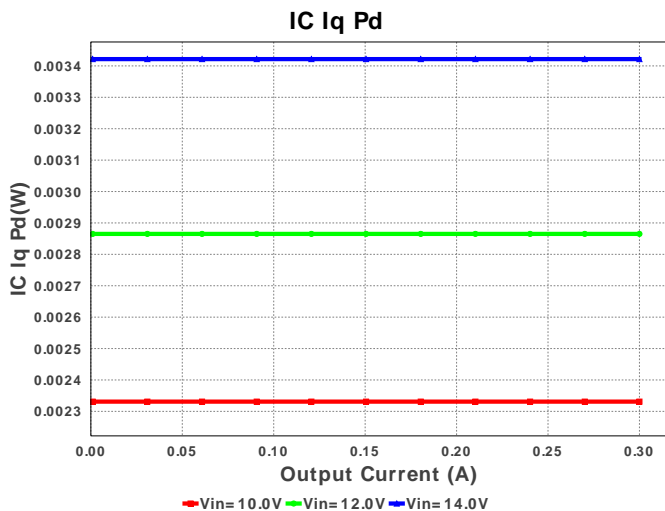


Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
2.	Cin	MuRata	GRM32ER61E226KE15L Series= X5R	Cap= 22.0 uF ESR= 2.0 mOhm VDC= 25.0 V IRMS= 3.67 A	1	\$0.16	1210 15 mm ²
3.	Cout	TDK	C3216X5R0J226K Series= X5R	Cap= 22.0 uF ESR= 2.0 mOhm VDC= 6.3 V IRMS= 3.62 A	1	\$0.11	1206 11 mm ²
4.	L1	Bourns	SRR4028-3R3Y	L= 3.3 uH DCR= 35.0 mOhm	1	\$0.26	SRR4028 34 mm ²
5.	Rfbb	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
6.	Rfbt	Vishay-Dale	CRCW040222K6FKED Series= CRCW..e3	Res= 22.6 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
7.	U1	Texas Instruments	TPS562200DDCR	Switcher	1	\$0.47	DDC0006A 10 mm ²







Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	169.532 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	294.597 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	60.596 mA	Current	Average input current
4.	L Ipp	883.94 mA	Current	Peak-to-peak inductor ripple current
5.	BOM Count	7	General	Total Design BOM count
6.	FootPrint	82.0 mm ²	General	Total Foot Print Area of BOM components
7.	Frequency	475.736 kHz	General	Switching frequency
8.	Pout	750.0 mW	General	Total output power
9.	Total BOM	\$1.03	General	Total BOM Cost
10.	Vout OP	2.5 V	Op_Point	Operational Output Voltage
11.	Duty Cycle	12.141 %	Op_point	Duty cycle
12.	Efficiency	88.407 %	Op_point	Steady state efficiency
13.	IC Tj	40.0 degC	Op_point	IC junction temperature
14.	ICThetaJA	109.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
15.	IOUT_OP	300.0 mA	Op_point	Iout operating point
16.	VIN_OP	14.0 V	Op_point	Vin operating point
17.	Vout p-p	11.379 mV	Op_point	Peak-to-peak output ripple voltage
18.	Cin Pd	57.482 μW	Power	Input capacitor power dissipation
19.	Cout Pd	173.575 μW	Power	Output capacitor power dissipation
20.	IC Iq Pd	3.422 mW	Power	IC Iq Pd
21.	IC Pd	91.74 mW	Power	IC power dissipation
22.	L Pd	6.188 mW	Power	Inductor power dissipation
23.	Total Pd	98.349 mW	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	300.0 m	Maximum Output Current
2.	Iout1	300.0 m	Output Current #1
3.	SoftStart	1.0 ms	Soft Start Time (ms)
4.	VinMax	14.0	Maximum input voltage

#	Name	Value	Description
5.	VinMin	10.0	Minimum input voltage
6.	Vout	2.5	Output Voltage
7.	Vout1	2.5	Output Voltage #1
8.	base_pn	TPS562200	Texas Instruments Base Part Number
9.	source	DC	Input Source Type
10.	ta	30.0	Ambient temperature

Design Assistance

1. TPS562200 Product Folder : <http://www.ti.com/product/TPS562200> : contains the data sheet and other resources.

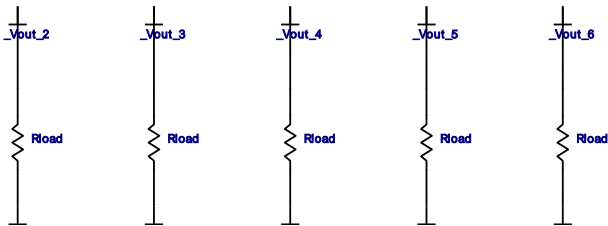
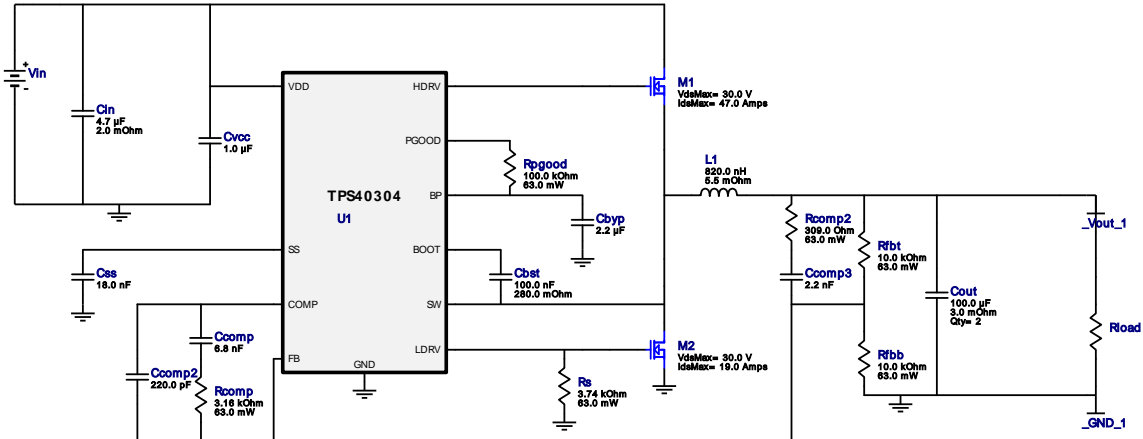


VinMin = 10.0V
 VinMax = 14.0V
 Vout = 1.2V
 Iout = 8.1A

Device = TPS40304DRCR
 Topology = Buck
 Created = 8/18/15 11:16:16 PM
 BOM Cost = \$2.66
 Footprint = 223.0 mm²
 BOM Count = 20
 Total Pd = 1.81W














WEBENCH® Design Report

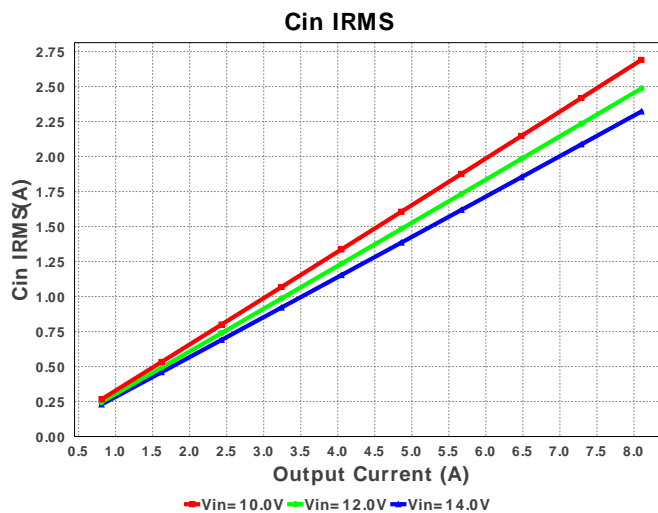
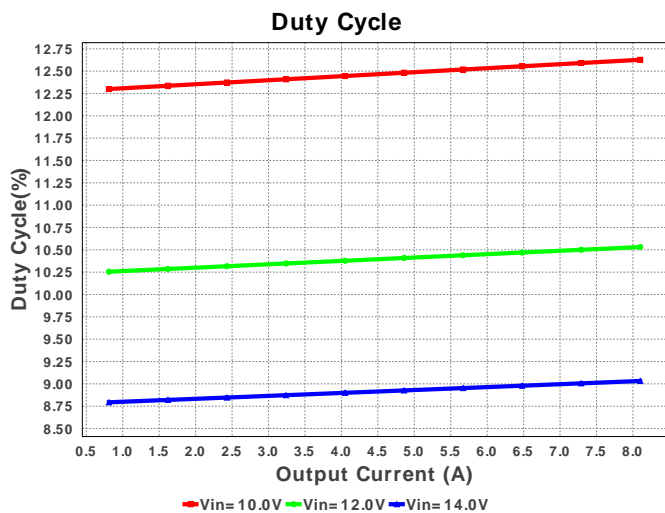
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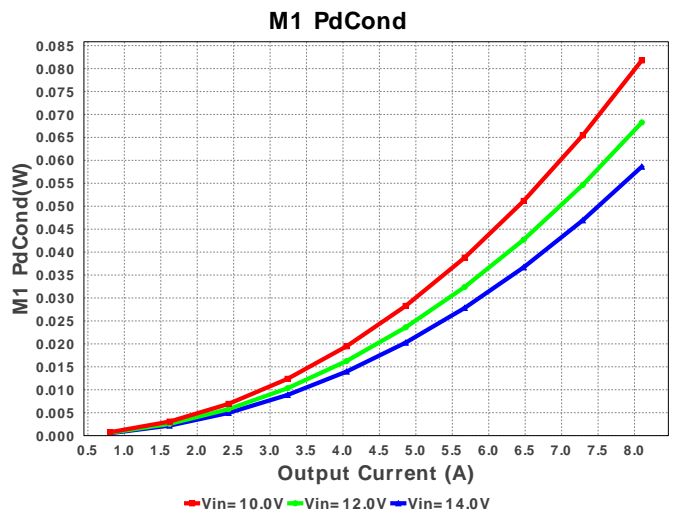
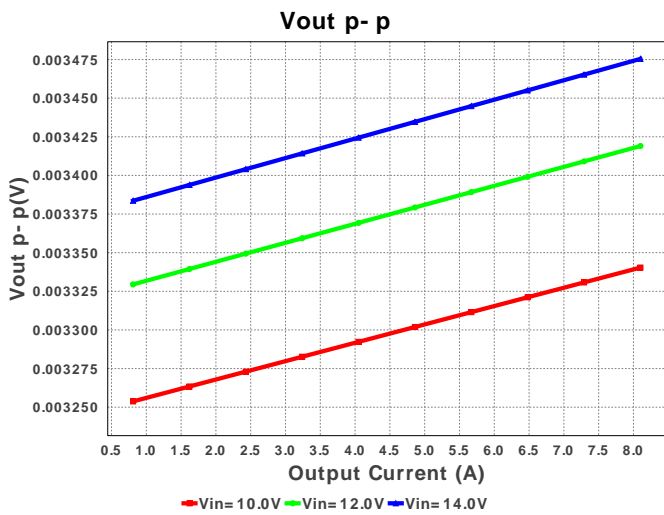
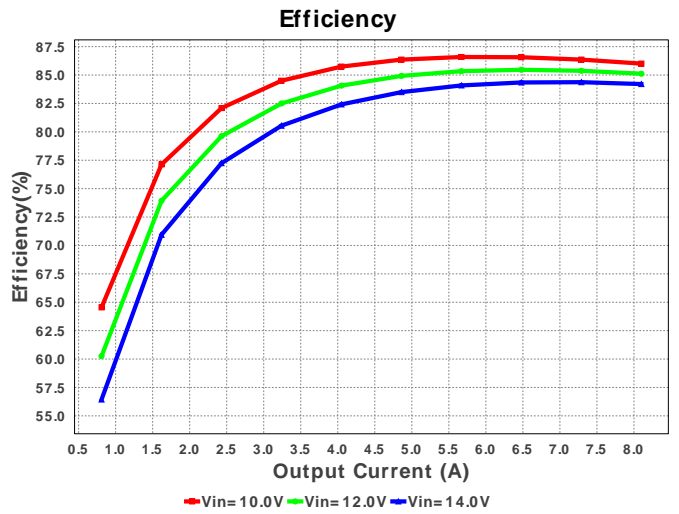
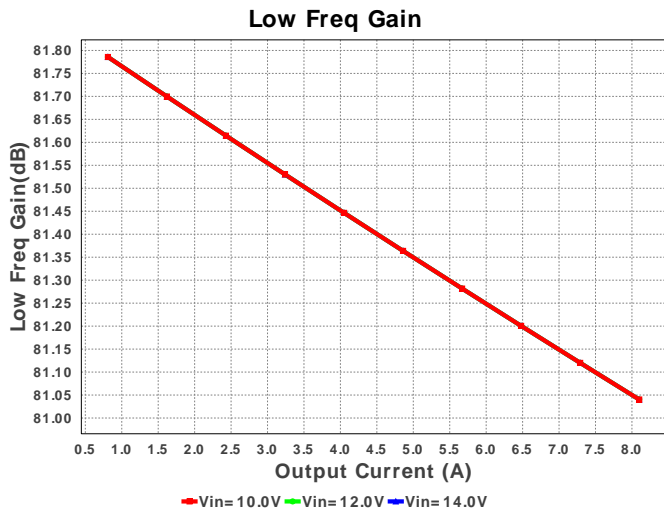
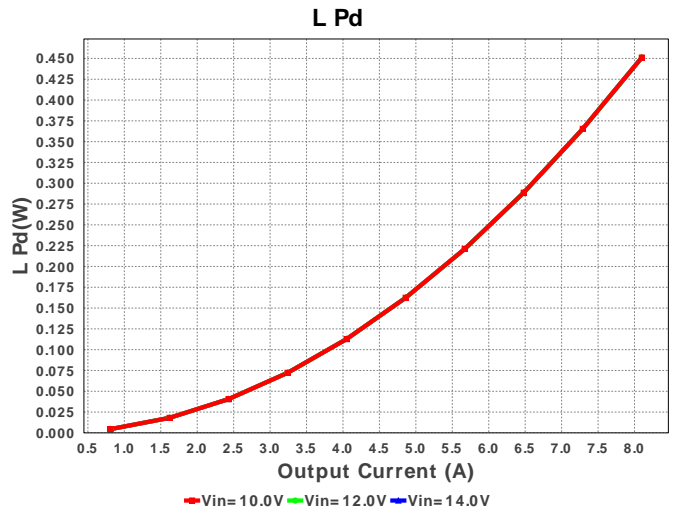
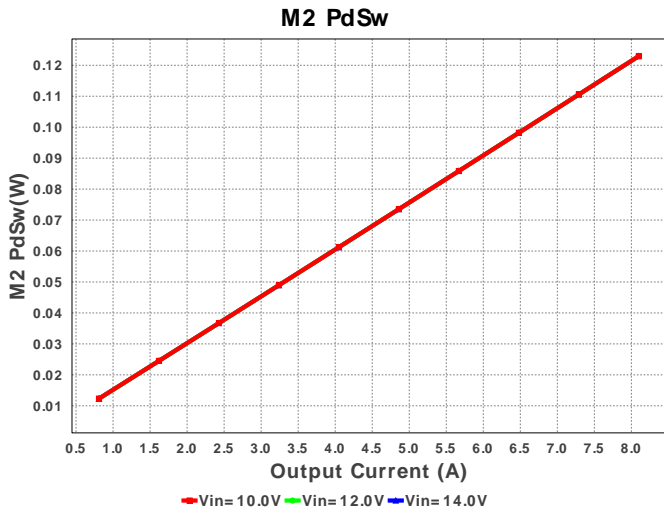


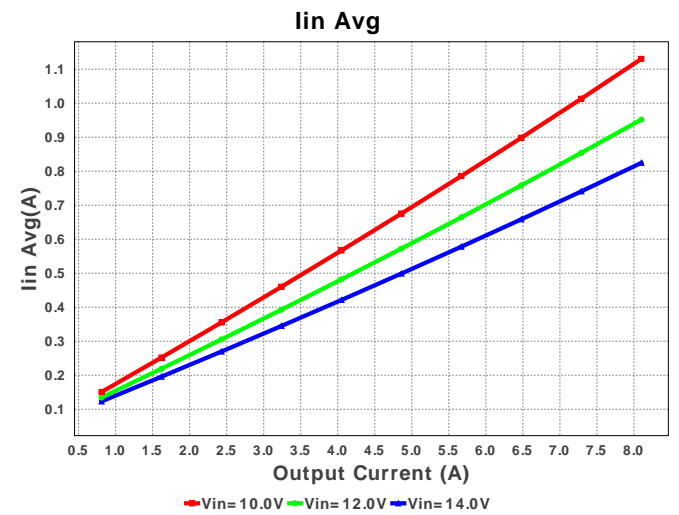
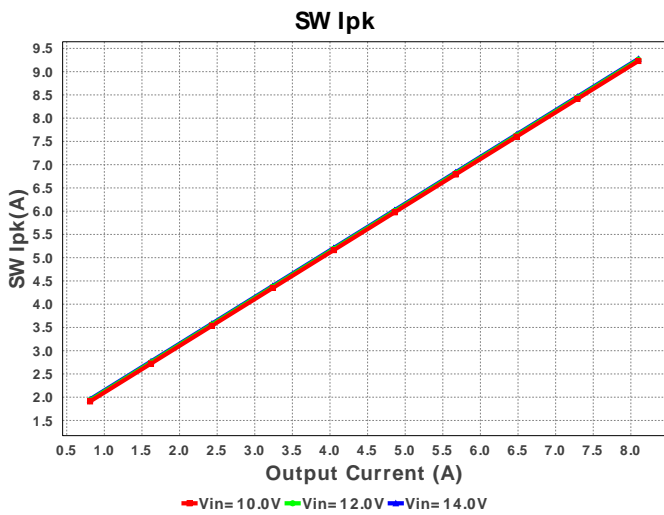
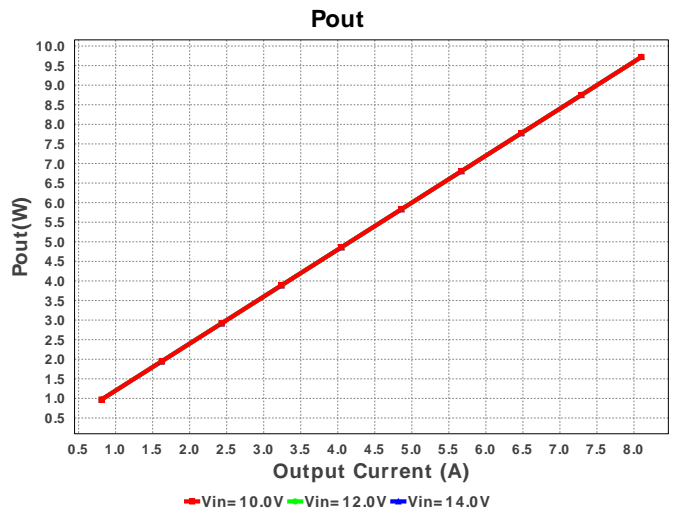
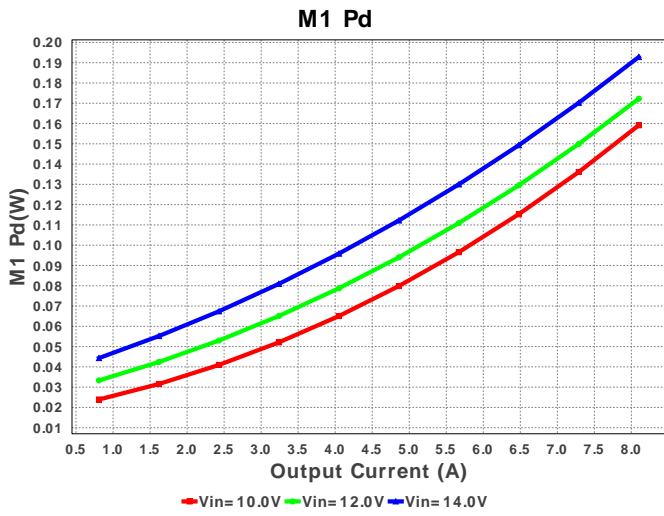
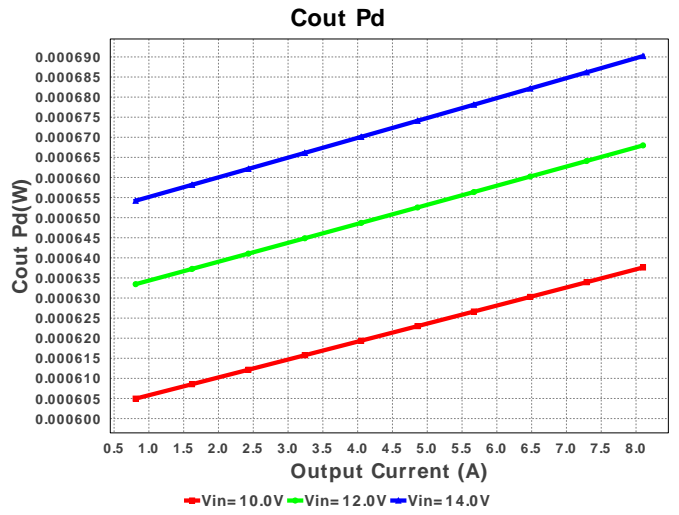
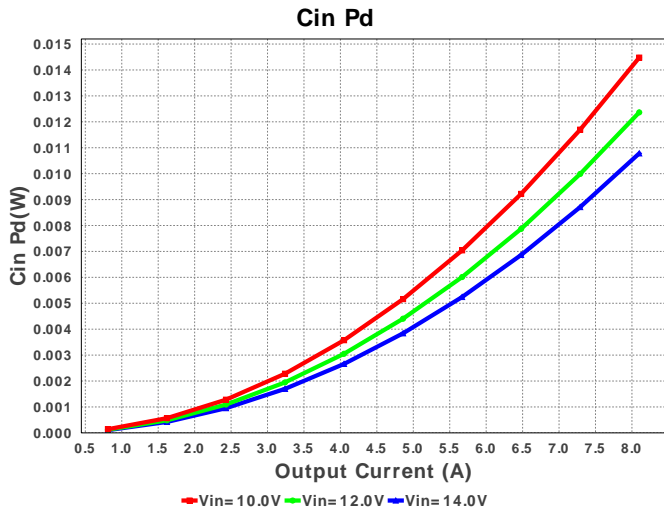
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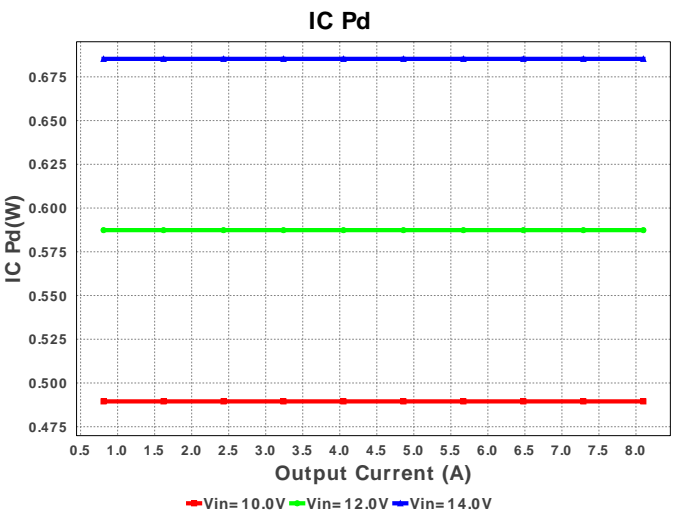
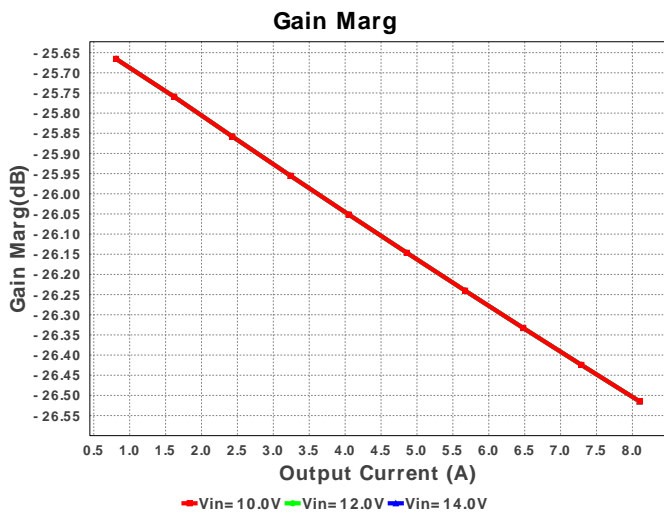
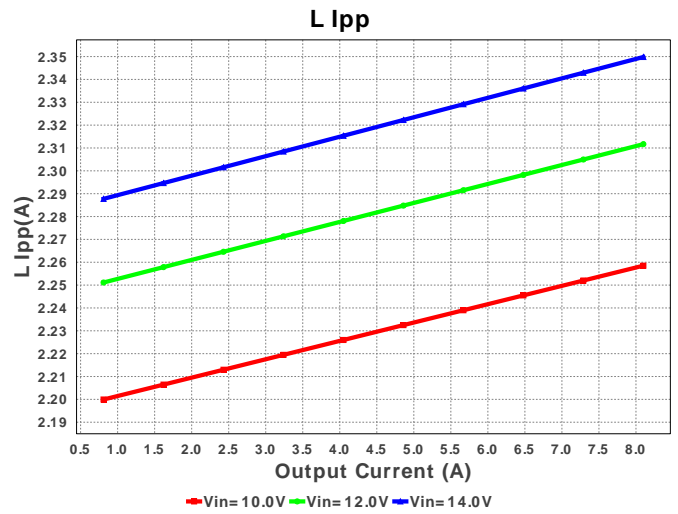
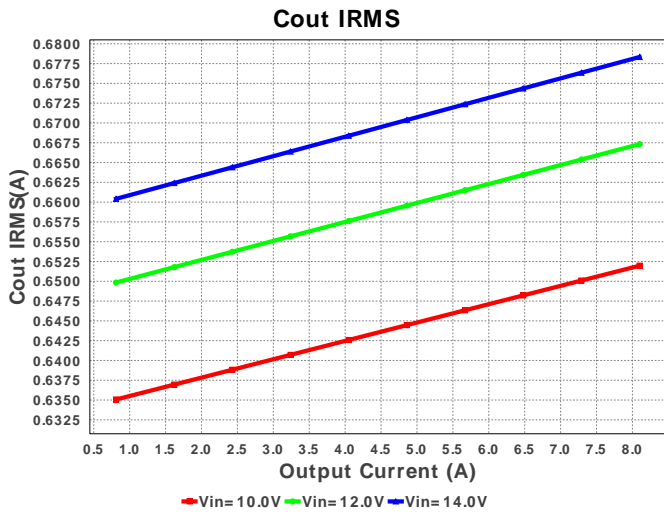
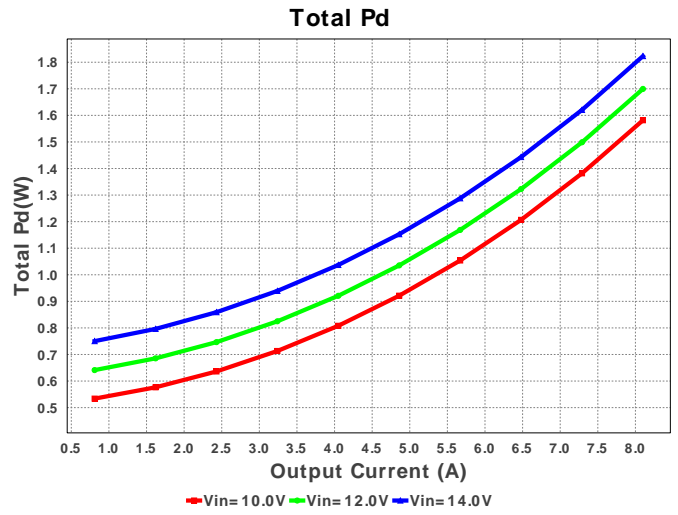
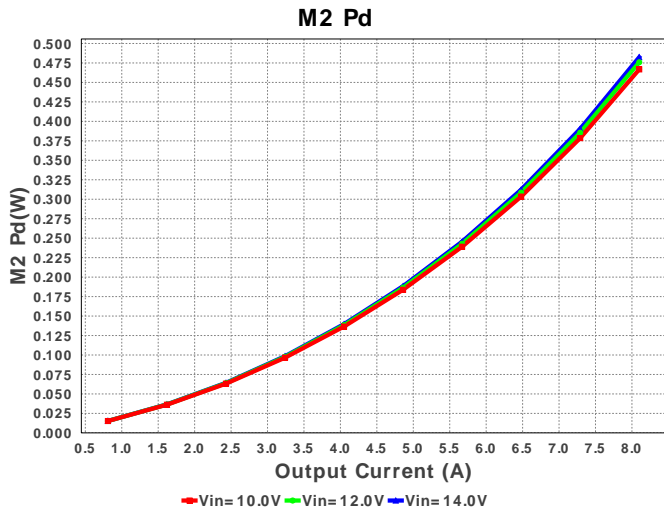
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
2.	Cbyp	MuRata	GRM188R61A225KE34D Series= X5R	Cap= 2.2 uF VDC= 10.0 V IRMS= 0.0 A	1	\$0.02	0603 5 mm ²
3.	Ccomp	Yageo America	CC0805KRX7R9BB682 Series= X7R	Cap= 6.8 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
4.	Ccomp2	Yageo America	CC0805JRNPO9BN221 Series= C0G/NP0	Cap= 220.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
5.	Ccomp3	Yageo America	CC0805KRX7R9BB222 Series= X7R	Cap= 2.2 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
6.	Cin	MuRata	GRM21BR61E475MA12L Series= X5R	Cap= 4.7 uF ESR= 2.0 mOhm VDC= 25.0 V IRMS= 7.29 A	1	\$0.06	0805 7 mm ²

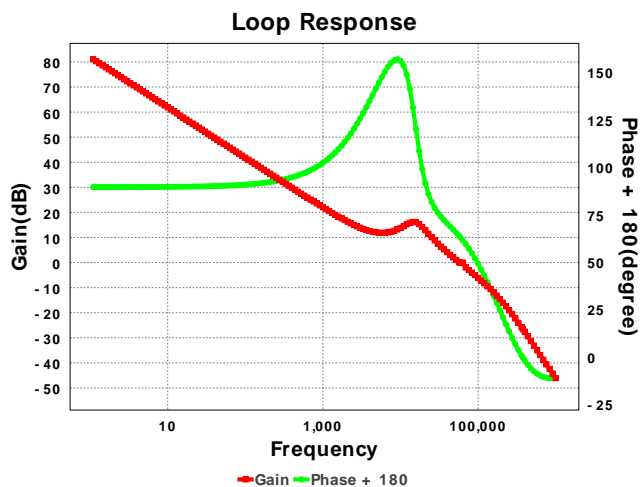
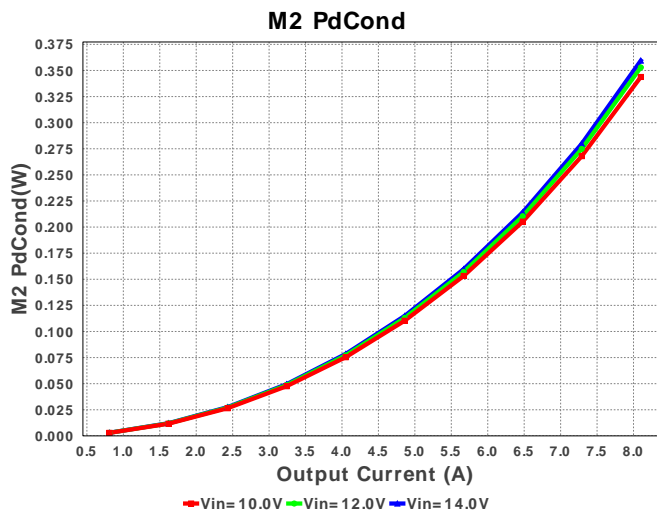
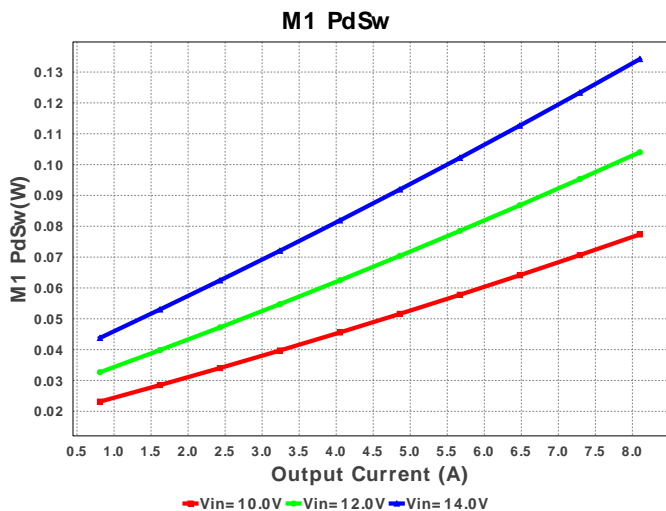
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7.	Cout	MuRata	GRM31CR60J107ME39L Series= X5R	Cap= 100.0 uF ESR= 3.0 mOhm VDC= 6.3 V IRMS= 0.0 A	2	\$0.20	 1206 11 mm ²
8.	Css	MuRata	GRM155R71C183KA01D Series= X7R	Cap= 18.0 nF VDC= 16.0 V IRMS= 0.0 A	1	\$0.01	 0402 3 mm ²
9.	Cvcc	MuRata	GRM188R61E105KA12D Series= X5R	Cap= 1.0 uF VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	 0603 5 mm ²
10.	L1	Bourns	SRP6540-R82M	L= 820.0 nH DCR= 5.5 mOhm	1	\$0.49	 SRP6540 83 mm ²
11.	M1	Texas Instruments	CSD17308Q3	VdsMax= 30.0 V IdsMax= 47.0 Amps	1	\$0.34	 TRANS_NexFET_Q3 19 mm ²
12.	M2	Texas Instruments	CSD17577Q3A	VdsMax= 30.0 V IdsMax= 19.0 Amps	1	\$0.28	 TRANS_NexFET_Q3A 18 mm ²
13.	Rcomp	Vishay-Dale	CRCW04023K16FKED Series= CRCW..e3	Res= 3.16 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
14.	Rcomp2	Vishay-Dale	CRCW0402309RFKED Series= CRCW..e3	Res= 309.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
15.	Rfbb	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
16.	Rfbt	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
17.	Rpgood	Vishay-Dale	CRCW0402100KFKED Series= CRCW..e3	Res= 100.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
18.	Rs	Vishay-Dale	CRCW04023K74FKED Series= CRCW..e3	Res= 3.74 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
19.	U1	Texas Instruments	TPS40304DRCR	Switcher	1	\$0.95	 S-PVSON-N10 17 mm ²











Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	2.322 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	678.334 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	823.35 mA	Current	Average input current
4.	L Ipp	2.35 A	Current	Peak-to-peak inductor ripple current
5.	SW Ipk	9.275 A	Current	Peak switch current
6.	BOM Count	20	General	Total Design BOM count
7.	FootPrint	223.0 mm ²	General	Total Foot Print Area of BOM components
8.	Frequency	600.0 kHz	General	Switching frequency
9.	IC Tolerance	10.0 mV	General	IC Feedback Tolerance
10.	Pout	9.72 W	General	Total output power
11.	Total BOM	\$2.66	General	Total BOM Cost
12.	Low Freq Gain	81.556 dB	Op_Point	Gain at 10Hz
13.	Cross Freq	43.088 kHz	Op_point	Bode plot crossover frequency
14.	Duty Cycle	9.032 %	Op_point	Duty cycle
15.	Efficiency	84.325 %	Op_point	Steady state efficiency
16.	Gain Marg	-38.733 dB	Op_point	Bode Plot Gain Margin
17.	IOUT_OP	8.1 A	Op_point	Iout operating point
18.	Phase Marg	64.49 deg	Op_point	Bode Plot Phase Margin
19.	VIN_OP	14.0 V	Op_point	Vin operating point
20.	Vout p-p	2.448 mV	Op_point	Peak-to-peak output ripple voltage
21.	Cin Pd	10.781 mW	Power	Input capacitor power dissipation
22.	Cout Pd	690.206 μW	Power	Output capacitor power dissipation
23.	IC Pd	685.272 mW	Power	IC power dissipation
24.	L Pd	451.069 mW	Power	Inductor power dissipation
25.	M1 Pd	192.487 mW	Power	M1 MOSFET total power dissipation
26.	M1 PdCond	58.287 mW	Power	M1 MOSFET conduction losses
27.	M1 PdSw	134.2 mW	Power	M1 MOSFET switching losses
28.	M2 Pd	466.571 mW	Power	M2 MOSFET total power dissipation
29.	M2 PdCond	343.605 mW	Power	M2 MOSFET conduction losses
30.	M2 PdSw	122.966 mW	Power	M2 MOSFET switching losses
31.	Total Pd	1.807 W	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	8.1	Maximum Output Current
2.	Iout1	8.1	Output Current #1
3.	SoftStart	1.0 ms	Soft Start Time (ms)
4.	VinMax	14.0	Maximum input voltage
5.	VinMin	10.0	Minimum input voltage
6.	Vout	1.2	Output Voltage
7.	Vout1	1.2	Output Voltage #1
8.	base_pn	TPS40304	Texas Instruments Base Part Number
9.	source	DC	Input Source Type
10.	ta	30.0	Ambient temperature

Design Assistance

1. TPS40304 Product Folder : <http://www.ti.com/product/TPS40304> : contains the data sheet and other resources.

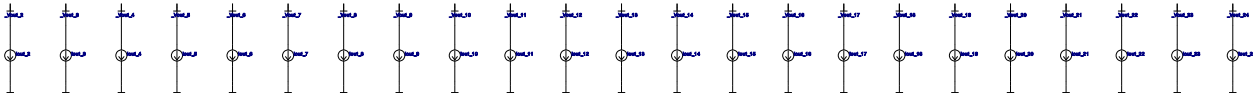
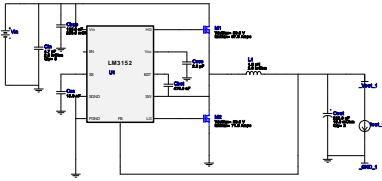


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 Vout = 3.3V
 Iout = 10.0A

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
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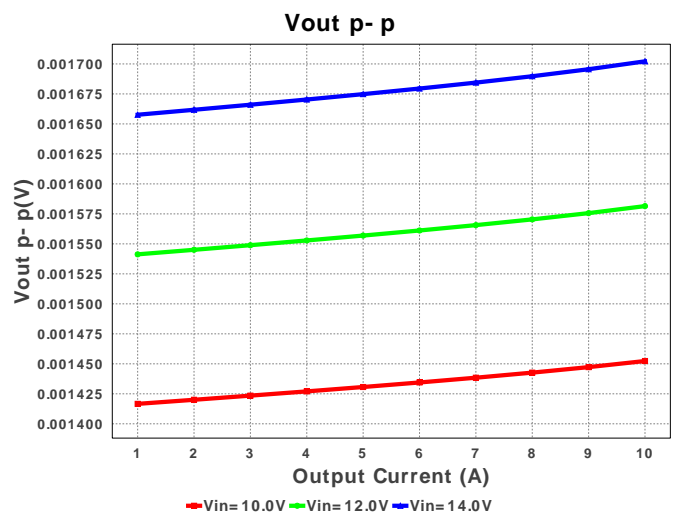
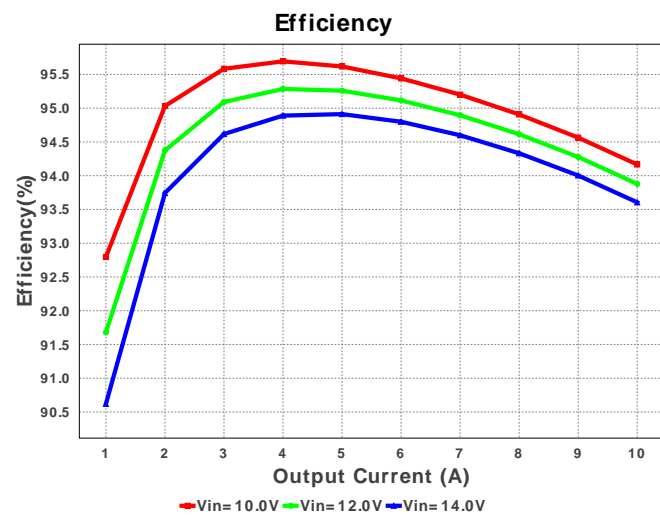
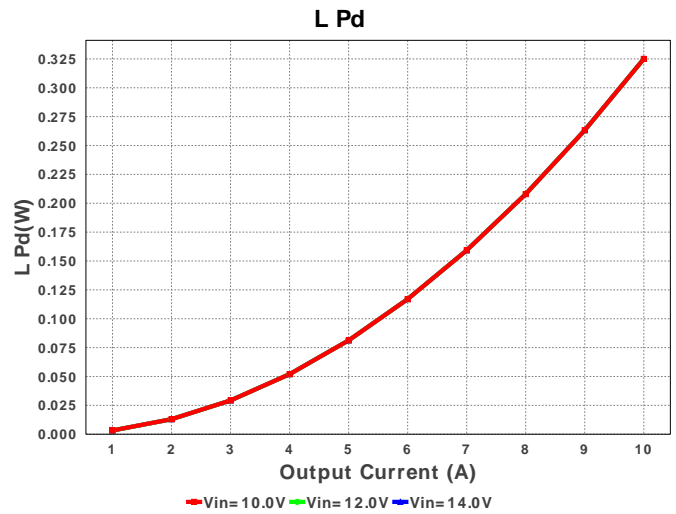
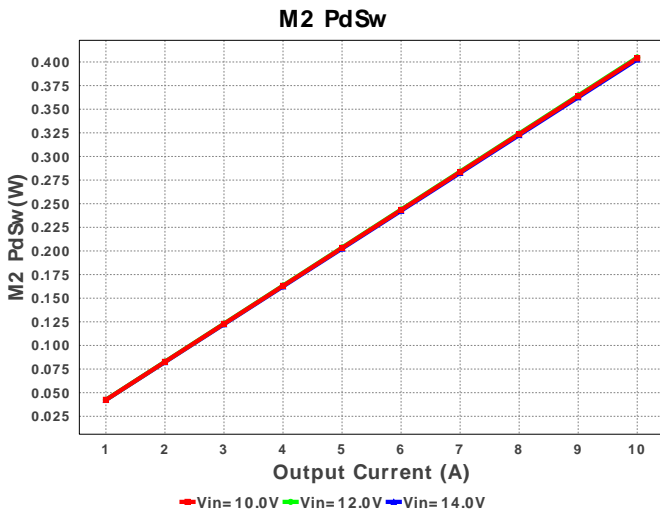
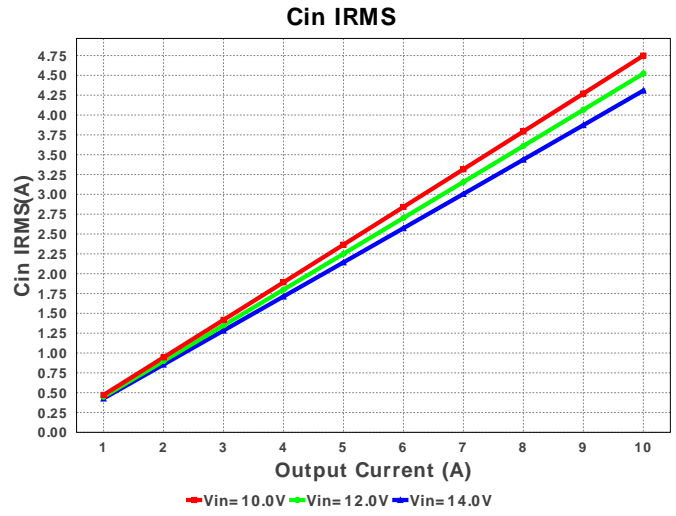
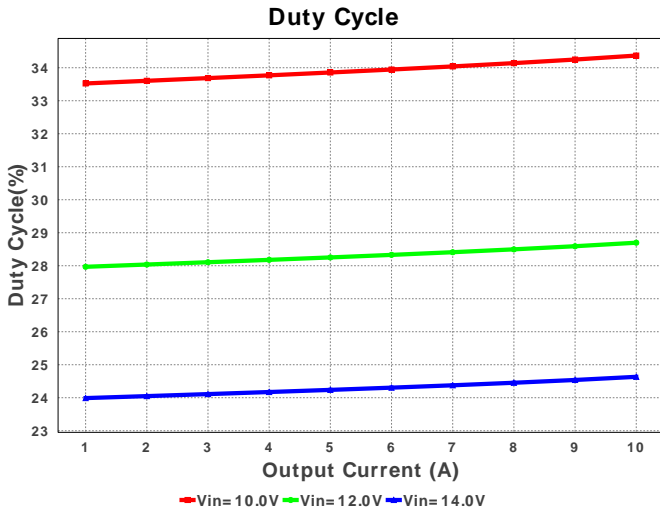
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 LM3152MHX-3.3/NOPB 10.0V-14.0V to 3.30V @ 10.0A

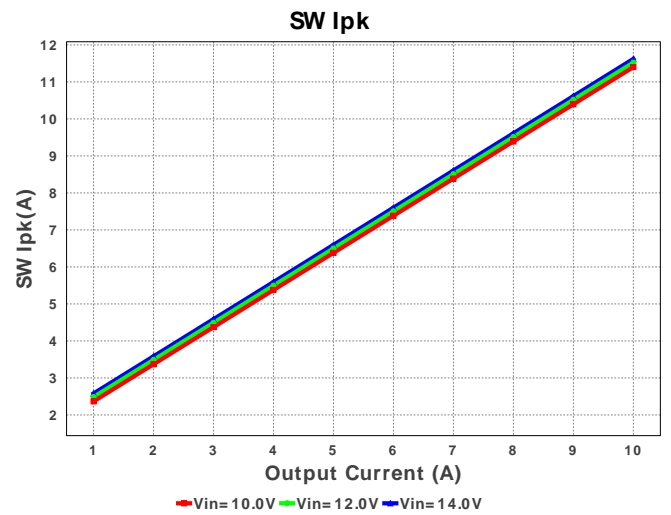
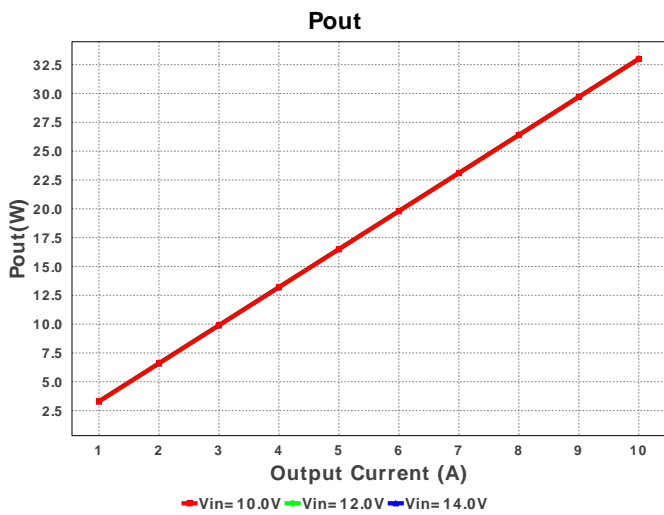
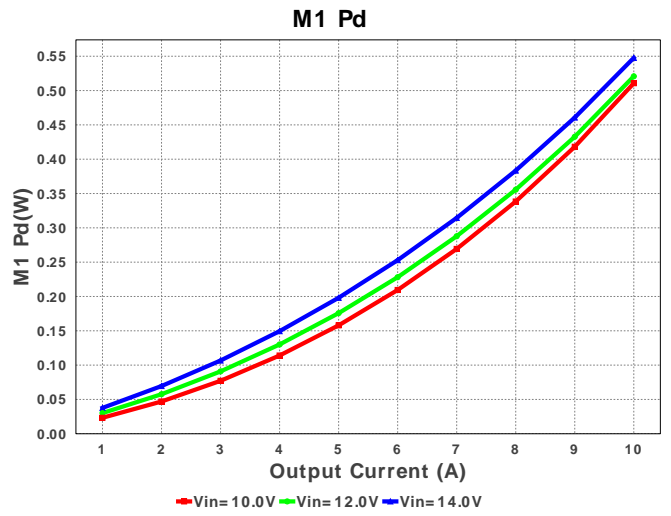
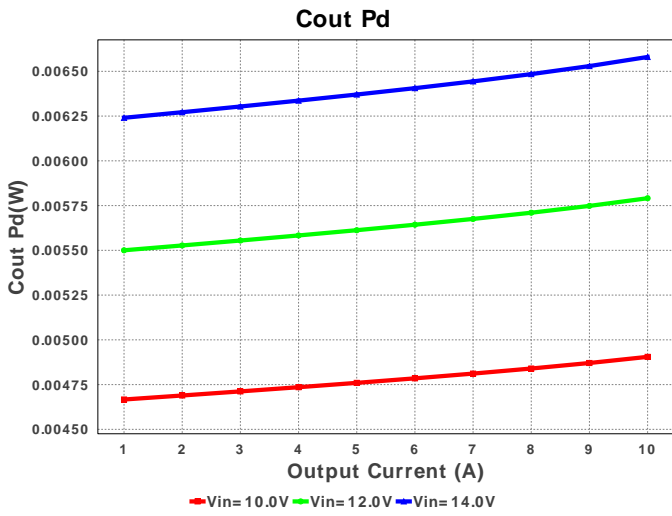
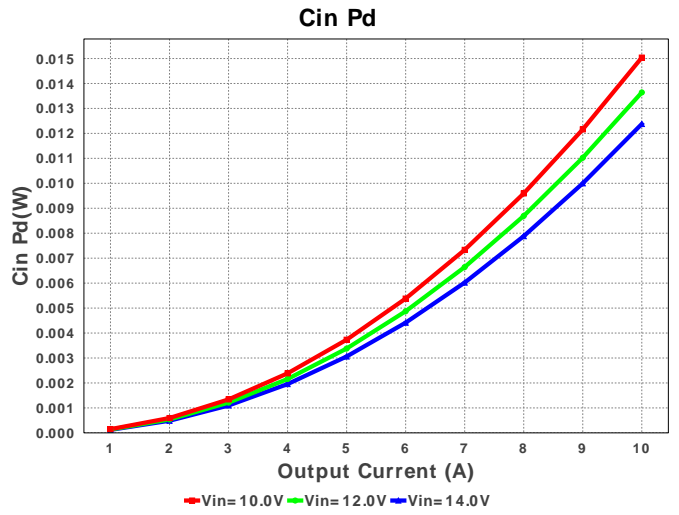
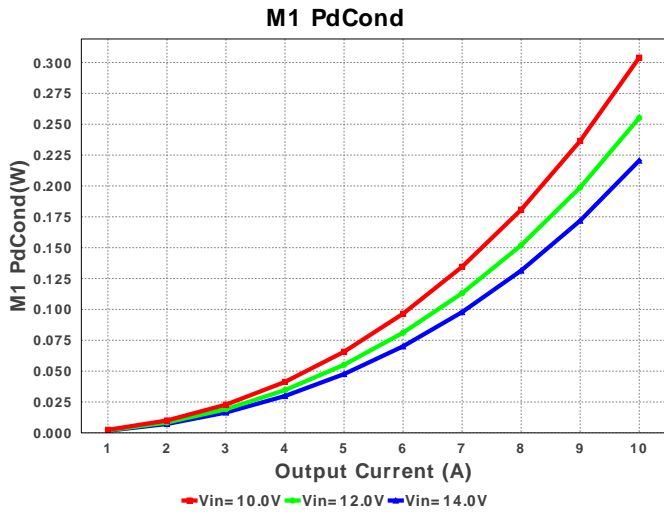


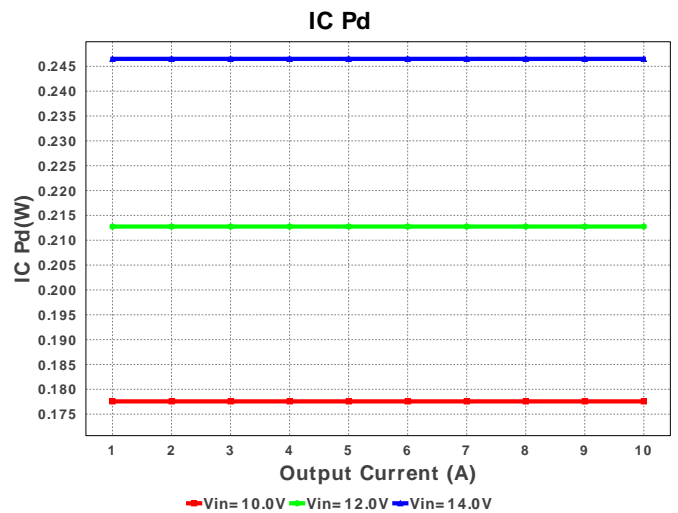
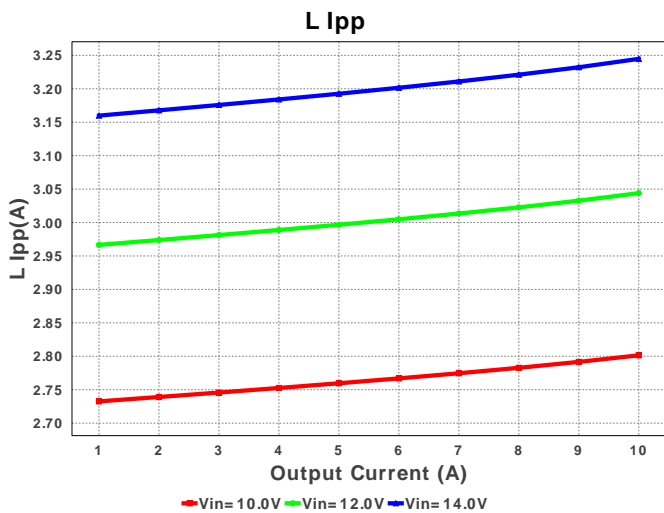
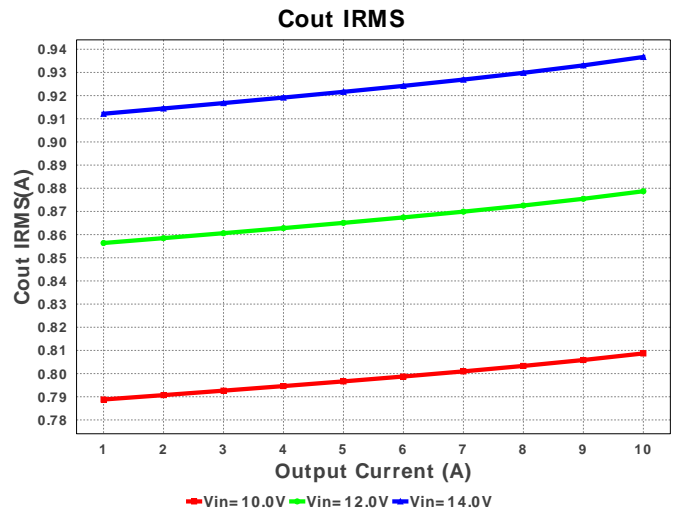
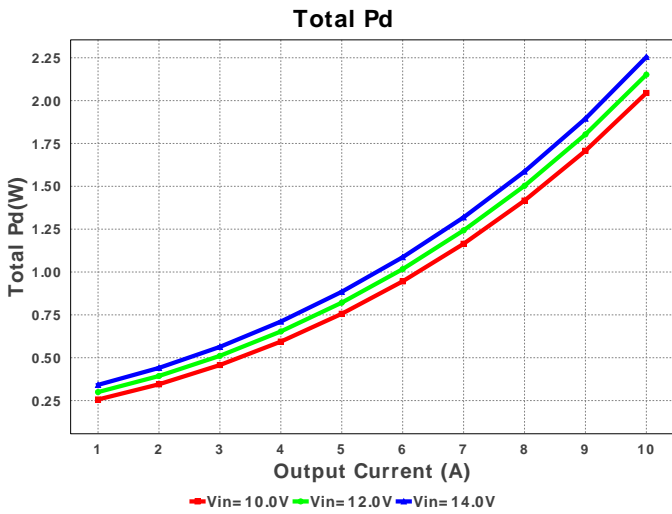
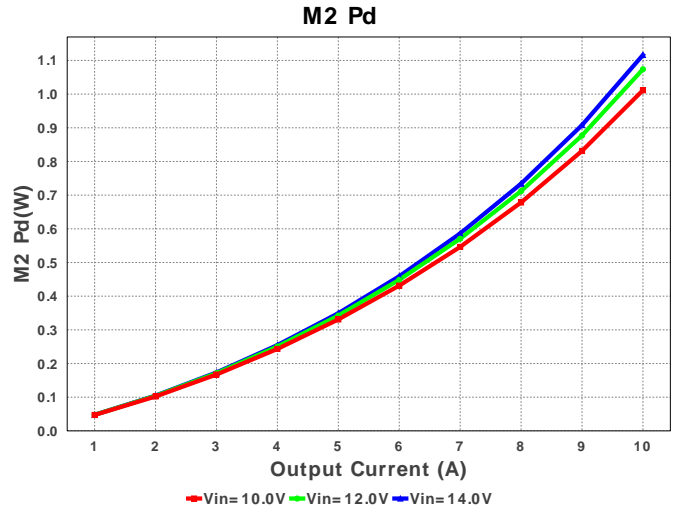
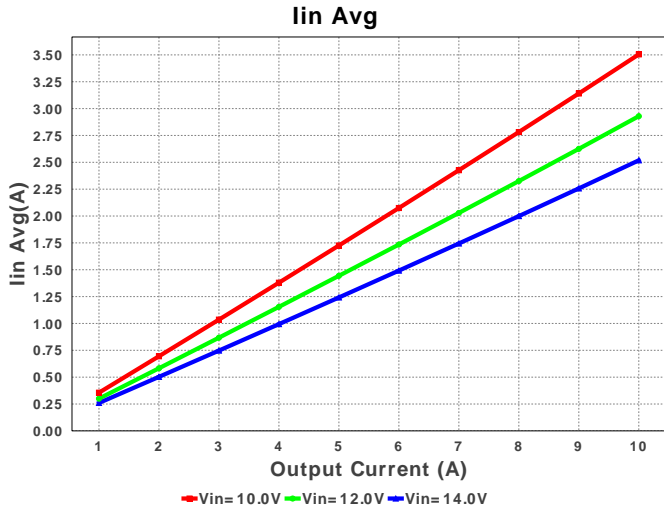
Electrical BOM

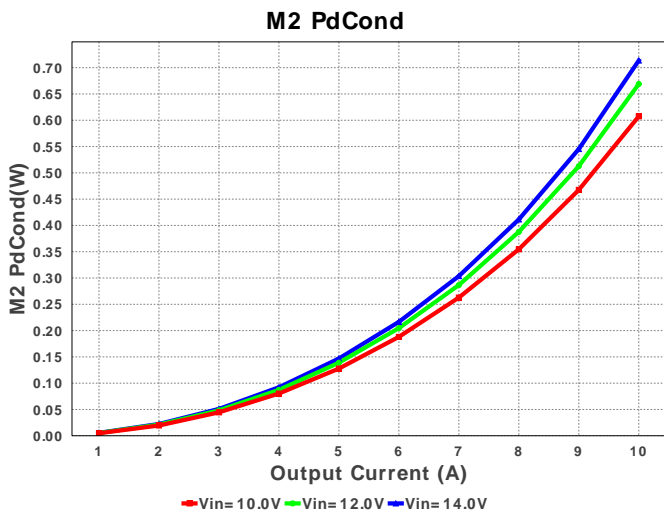
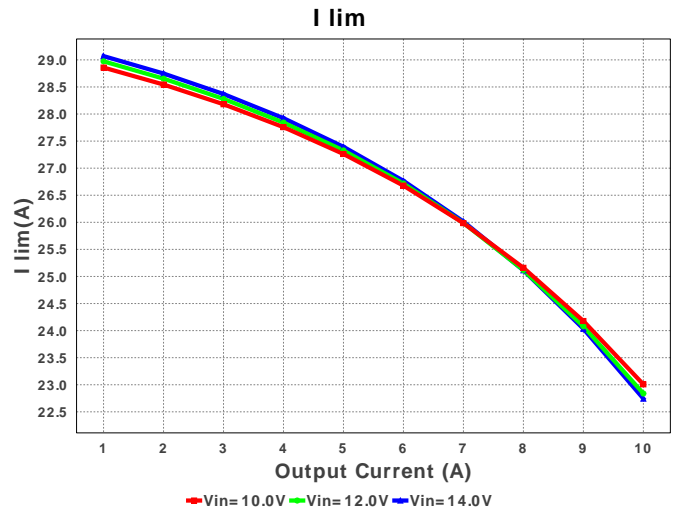
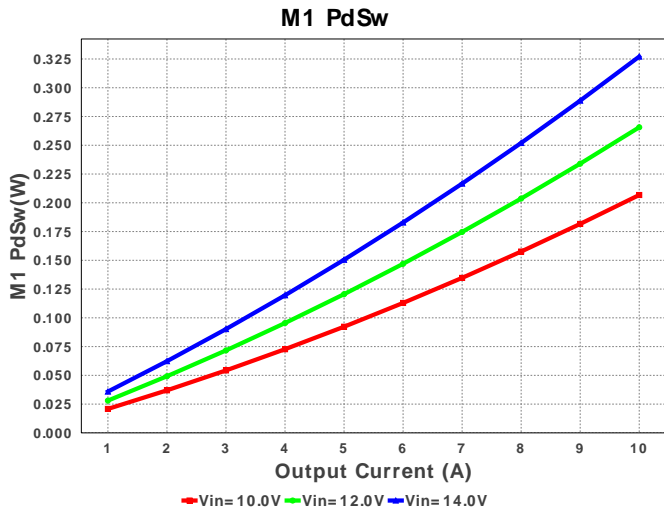
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst	Taiyo Yuden	EMK212B7474KD-T Series= X7R	Cap= 470.0 nF VDC= 16.0 V IRMS= 0.0 A	1	\$0.02	 0805 7 mm ²
2.	Cbyp	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm ²
3.	Cin	MuRata	GRM21BR61E475MA12L Series= X5R	Cap= 4.7 uF ESR= 2.0 mOhm VDC= 25.0 V IRMS= 7.29 A	3	\$0.06	 0805 7 mm ²
4.	Cout	Panasonic	6SVPE220MW Series= SVPE	Cap= 220.0 uF ESR= 15.0 mOhm VDC= 6.3 V IRMS= 3.15 A	2	\$0.14	 CAPSMT_62_E61 53 mm ²
5.	Css	Yageo America	CC0805KRX7R9BB153 Series= X7R	Cap= 15.0 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm ²
6.	Cvcc	Taiyo Yuden	EMK212B7225KG-T Series= X7R	Cap= 2.2 uF VDC= 16.0 V IRMS= 0.0 A	1	\$0.03	 0805 7 mm ²
7.	L1	Bourns	SRP1270-1R5M	L= 1.5 uH DCR= 2.6 mOhm	1	\$0.60	 SRP1270 246 mm ²
8.	M1	Texas Instruments	CSD17302Q5A	VdsMax= 30.0 V IdsMax= 87.0 Amps	1	\$0.36	 TRANS_NexFET_Q5A 55 mm ²
9.	M2	Infineon Technologies	BSC057N03MS G	VdsMax= 30.0 V IdsMax= 71.0 Amps	1	\$0.28	 PG-TDSON-8 55 mm ²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	U1	Texas Instruments	LM3152MHX-3.3/NOPB	Switcher	1	\$1.35	 MXA14A 59 mm ²









Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	4.309 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	936.537 mA	Current	Output capacitor RMS ripple current
3.	I lim	22.882 A	Current	Current limit threshold
4.	Iin Avg	2.515 A	Current	Average input current
5.	L Ipp	3.244 A	Current	Peak-to-peak inductor ripple current
6.	SW Ipk	11.622 A	Current	Peak switch current
7.	BOM Count	13	General	Total Design BOM count
8.	FootPrint	569.0 mm ²	General	Total Foot Print Area of BOM components
9.	Frequency	541.545 kHz	General	Switching frequency
10.	IC Tolerance	66.0 mV	General	IC Feedback Tolerance
11.	Pout	33.0 W	General	Total output power
12.	Total BOM	\$3.12	General	Total BOM Cost
13.	Duty Cycle	24.63 %	Op_point	Duty cycle
14.	Efficiency	93.707 %	Op_point	Steady state efficiency
15.	IOUT_OP	10.0 A	Op_point	Iout operating point
16.	VIN_OP	14.0 V	Op_point	Vin operating point
17.	Vout p-p	1.702 mV	Op_point	Peak-to-peak output ripple voltage
18.	Cin Pd	12.376 mW	Power	Input capacitor power dissipation
19.	Cout Pd	6.578 mW	Power	Output capacitor power dissipation
20.	IC Pd	246.5 mW	Power	IC power dissipation
21.	L Pd	325.0 mW	Power	Inductor power dissipation
22.	M1 Pd	545.759 mW	Power	M1 MOSFET total power dissipation
23.	M1 PdCond	218.677 mW	Power	M1 MOSFET conduction losses
24.	M1 PdSw	327.082 mW	Power	M1 MOSFET switching losses
25.	M2 Pd	1.08 W	Power	M2 MOSFET total power dissipation
26.	M2 PdCond	709.03 mW	Power	M2 MOSFET conduction losses
27.	M2 PdSw	370.737 mW	Power	M2 MOSFET switching losses
28.	Total Pd	2.216 W	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	10.0	Maximum Output Current
2.	Iout1	10.0	Output Current #1
3.	SoftStart	1.0 ms	Soft Start Time (ms)
4.	VinMax	14.0	Maximum input voltage
5.	VinMin	10.0	Minimum input voltage
6.	Vout	3.3	Output Voltage
7.	Vout1	3.3	Output Voltage #1
8.	base_pn	LM3152	Texas Instruments Base Part Number
9.	source	DC	Input Source Type
10.	ta	30.0	Ambient temperature

Design Assistance

1. LM3152 Product Folder : <http://www.ti.com/product/LM3152> : contains the data sheet and other resources.

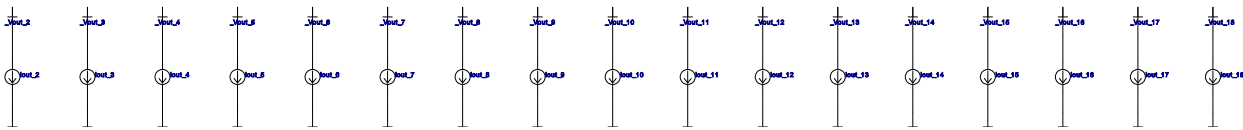
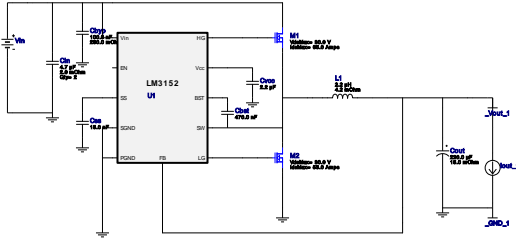


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 VinMax = 14.0V
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 Iout = 7.2A

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 Total Pd = 1.55W


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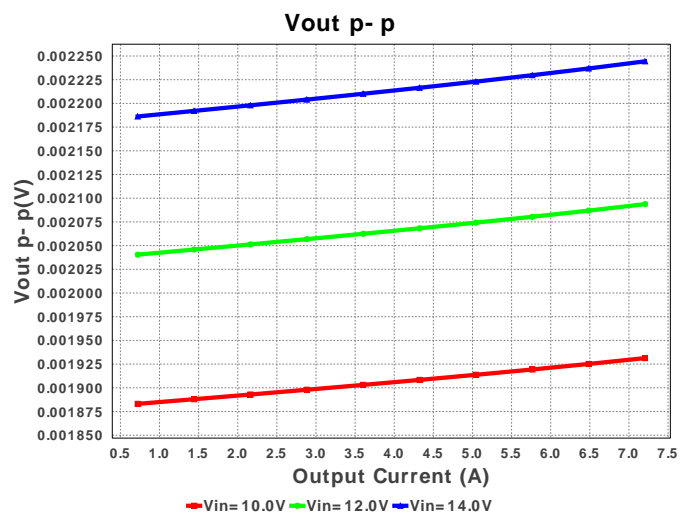
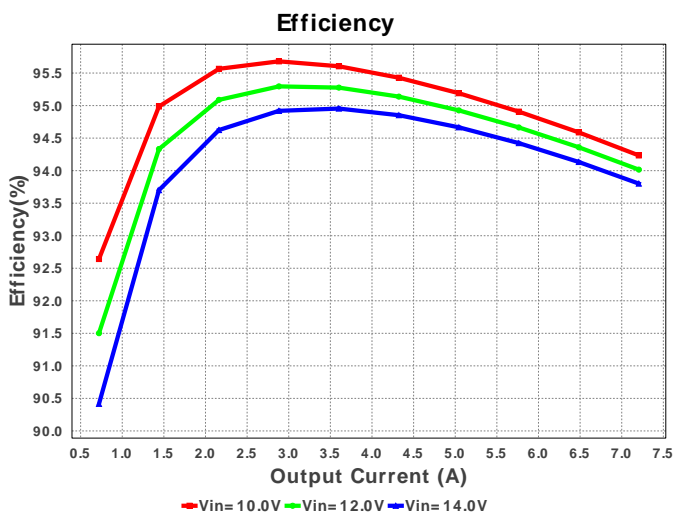
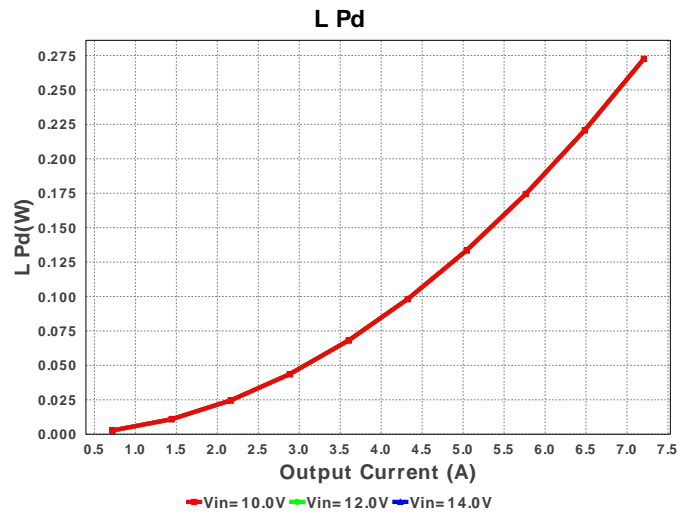
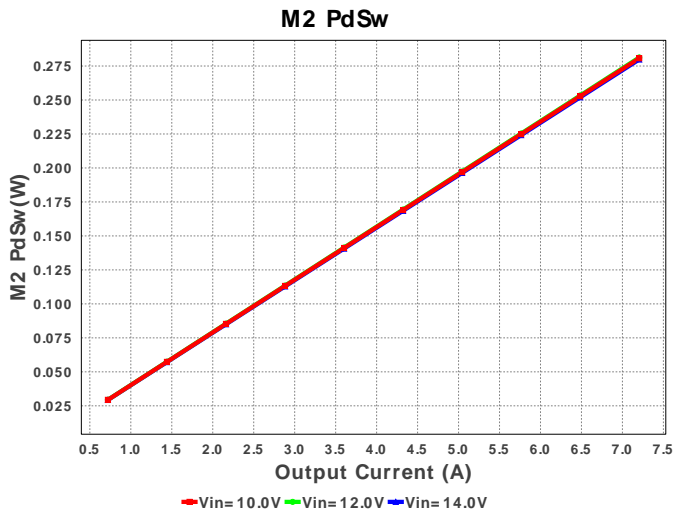
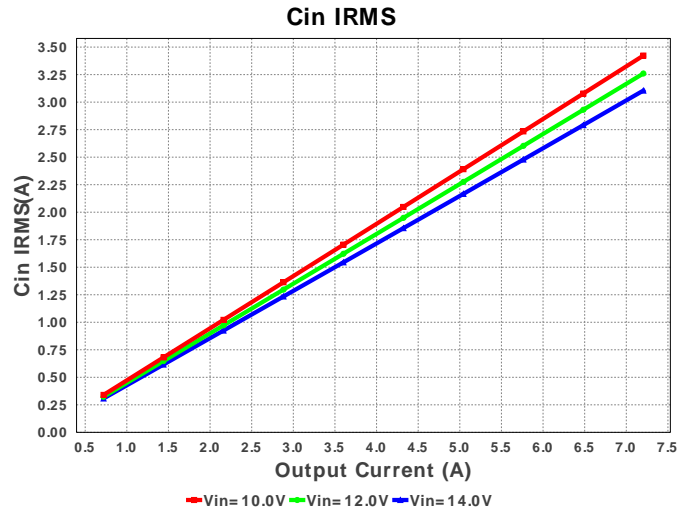
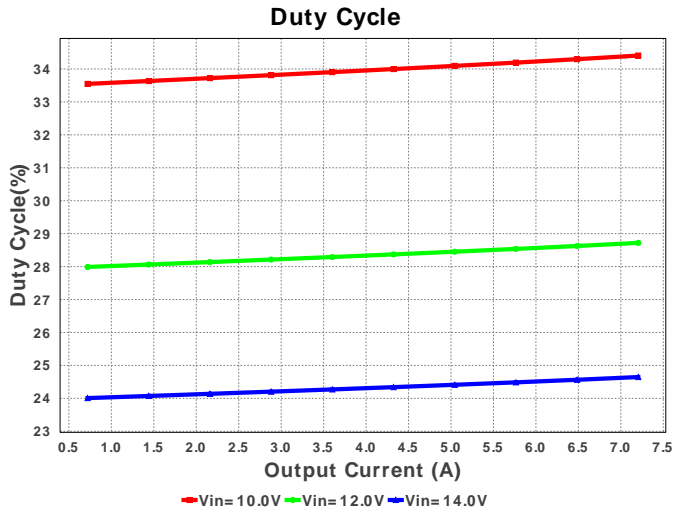
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 LM3152MHX-3.3/NOPB 10.0V-14.0V to 3.30V @ 7.205A

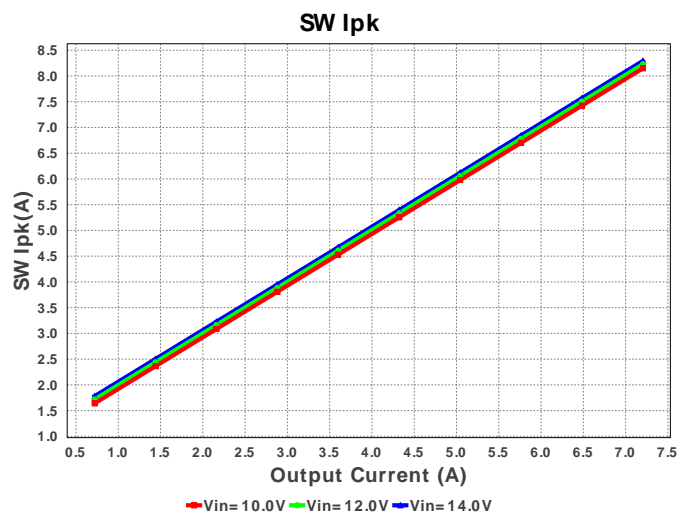
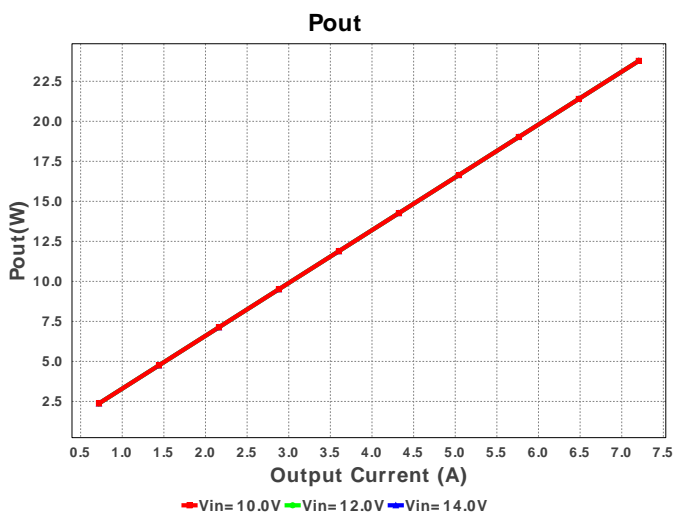
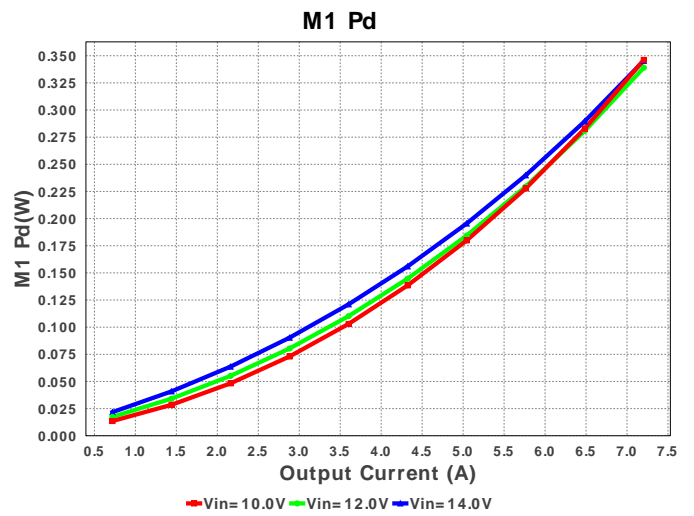
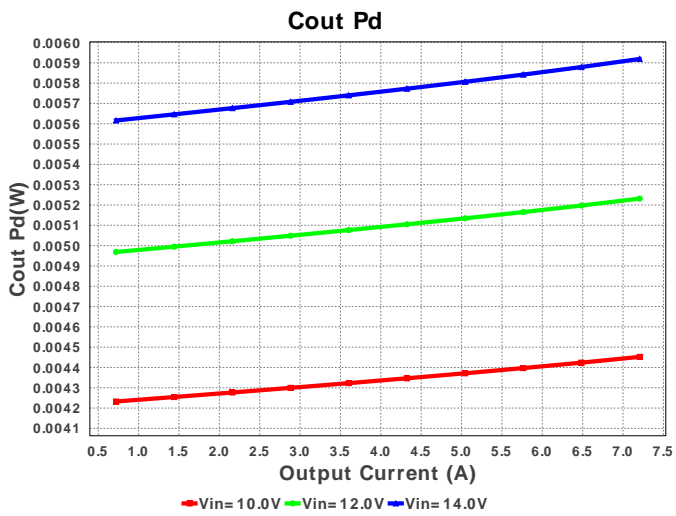
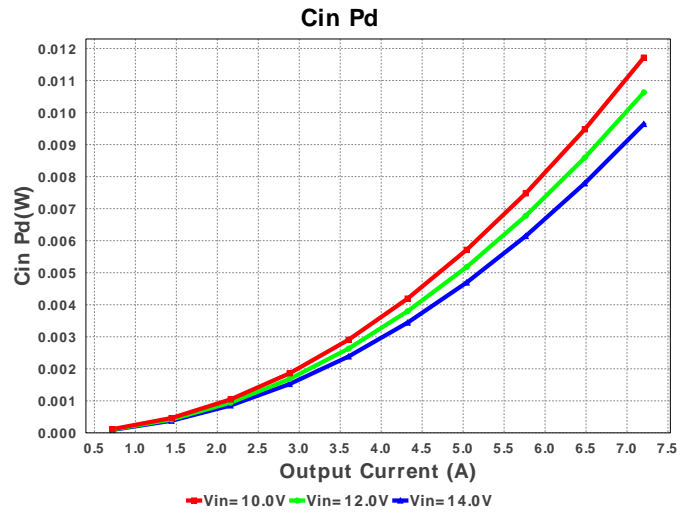
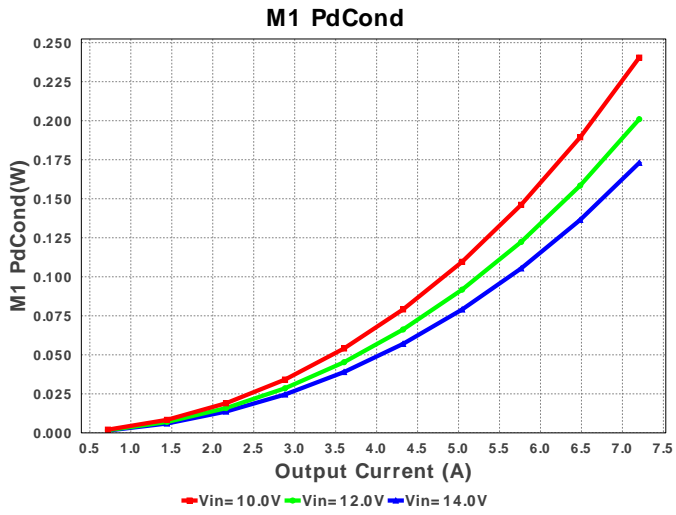


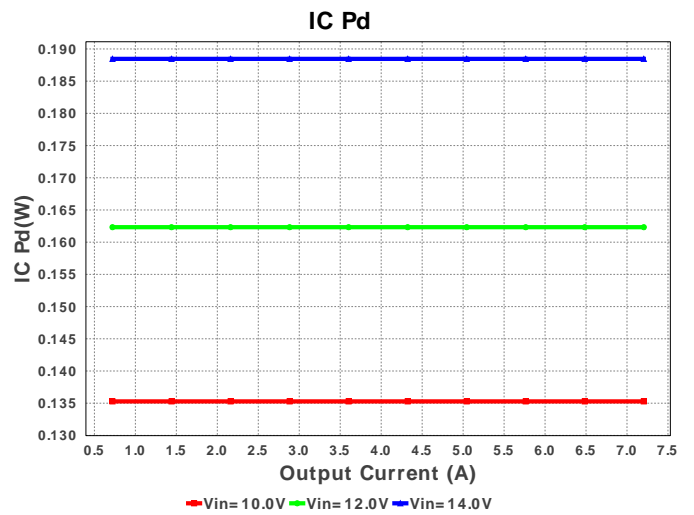
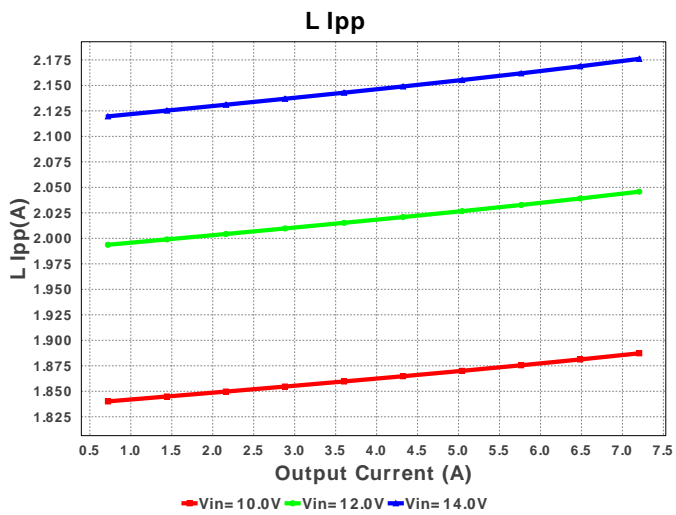
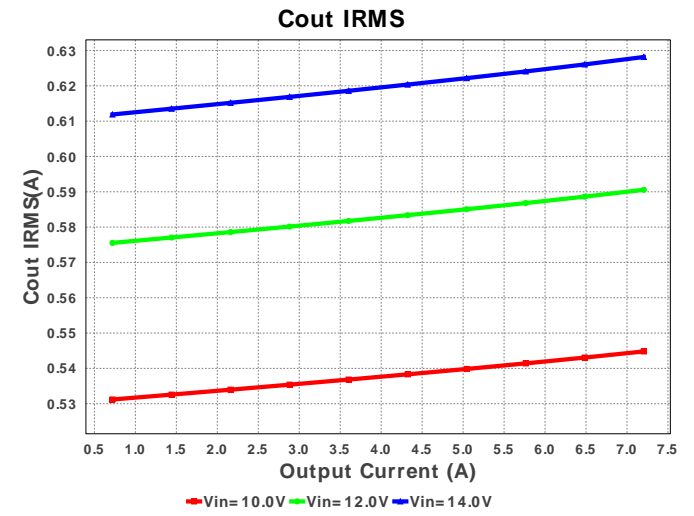
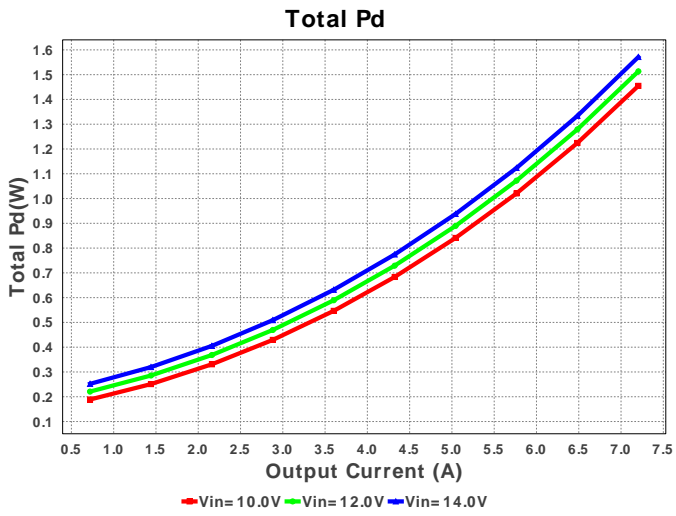
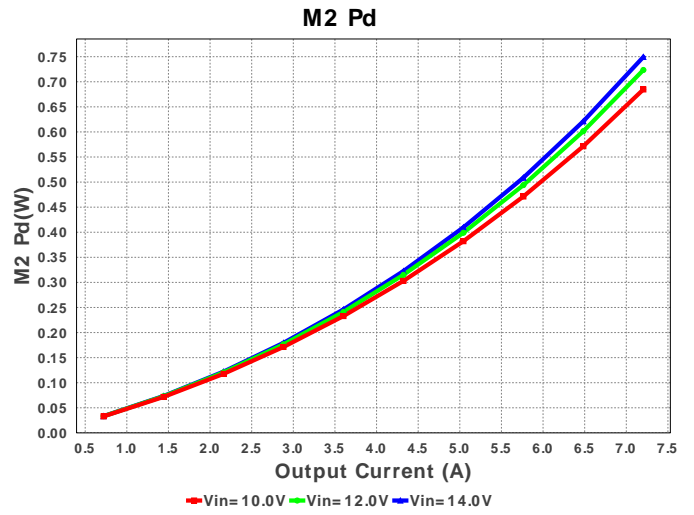
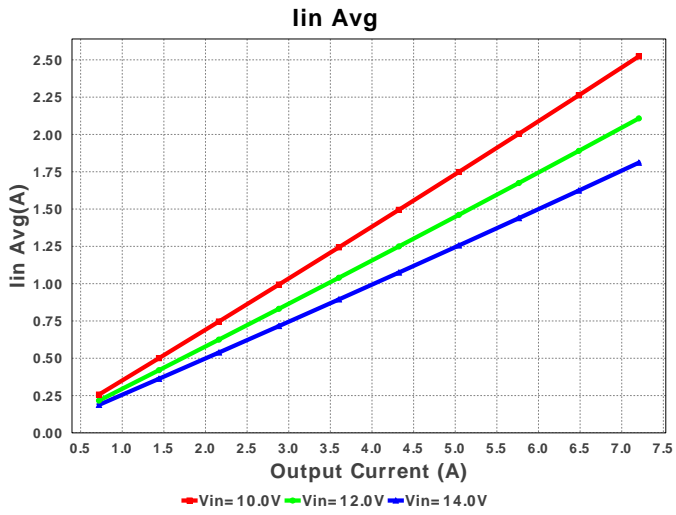
Electrical BOM

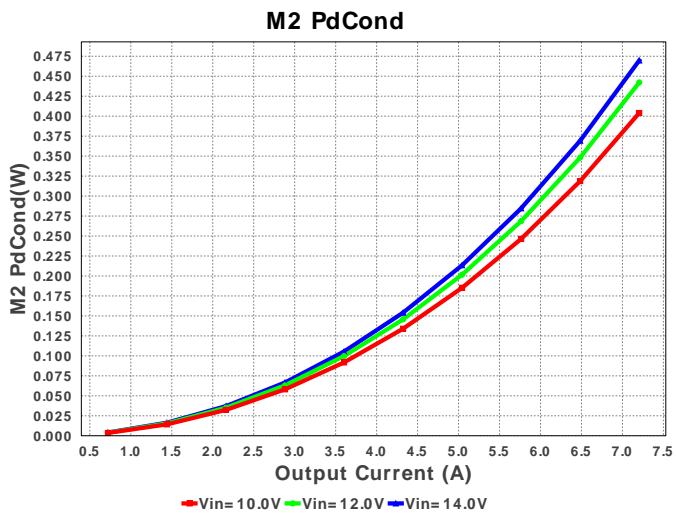
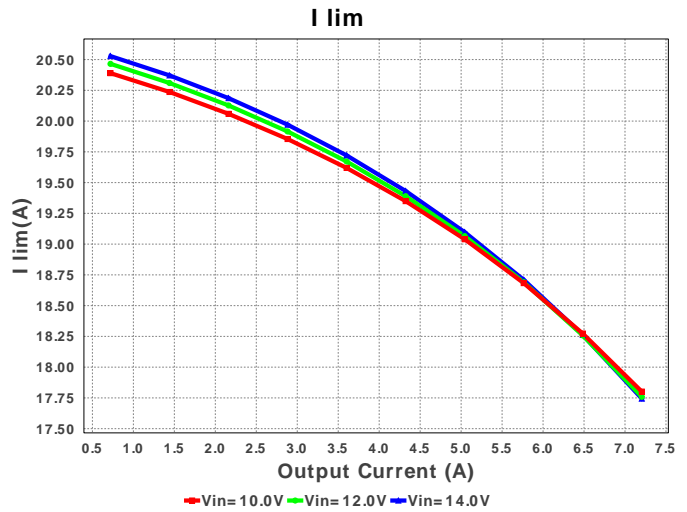
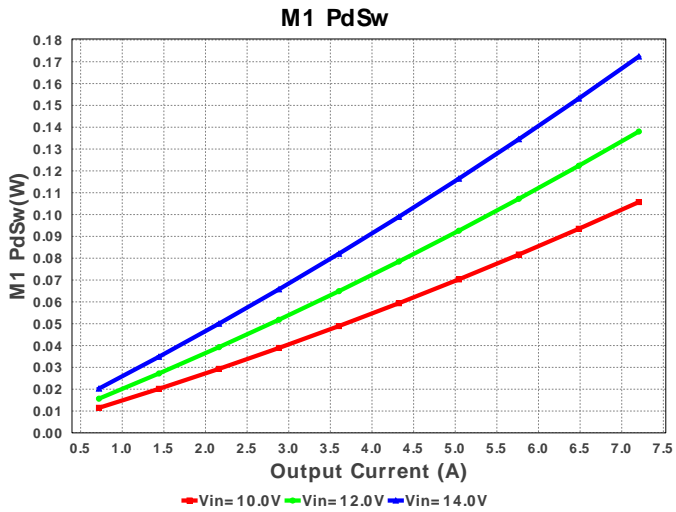
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst	Taiyo Yuden	EMK212B7474KD-T Series= X7R	Cap= 470.0 nF VDC= 16.0 V IRMS= 0.0 A	1	\$0.02	0805 7 mm ²
2.	Cbyp	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
3.	Cin	MuRata	GRM21BR61E475MA12L Series= X5R	Cap= 4.7 uF ESR= 2.0 mOhm VDC= 25.0 V IRMS= 7.29 A	2	\$0.06	0805 7 mm ²
4.	Cout	Panasonic	6SVPE220MW Series= SVPE	Cap= 220.0 uF ESR= 15.0 mOhm VDC= 6.3 V IRMS= 3.15 A	1	\$0.14	CAPSMT_62_E61 53 mm ²
5.	Css	Yageo America	CC0805KRX7R9BB153 Series= X7R	Cap= 15.0 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
6.	Cvcc	Taiyo Yuden	EMK212B7225KG-T Series= X7R	Cap= 2.2 uF VDC= 16.0 V IRMS= 0.0 A	1	\$0.03	0805 7 mm ²
7.	L1	Bourns	SRP1270-2R2M	L= 2.2 uH DCR= 4.2 mOhm	1	\$0.60	SRP1270 246 mm ²
8.	M1	Texas Instruments	CSD17507Q5A	VdsMax= 30.0 V IdsMax= 65.0 Amps	1	\$0.34	TRANS_NexFET_Q5A 55 mm ²
9.	M2	Infineon Technologies	BSC080N03MS G	VdsMax= 30.0 V IdsMax= 53.0 Amps	1	\$0.26	PG-TDSON-8 55 mm ²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10. U1		Texas Instruments	LM3152MHX-3.3/NOPB	Switcher	1	\$1.35	 MXA14A 59 mm ²









Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	3.105 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	628.104 mA	Current	Output capacitor RMS ripple current
3.	I lim	17.821 A	Current	Current limit threshold
4.	Iin Avg	1.809 A	Current	Average input current
5.	L Ipp	2.176 A	Current	Peak-to-peak inductor ripple current
6.	SW Ipk	8.293 A	Current	Peak switch current
7.	BOM Count	11	General	Total Design BOM count
8.	FootPrint	509.0 mm ²	General	Total Foot Print Area of BOM components
9.	Frequency	550.875 kHz	General	Switching frequency
10.	IC Tolerance	66.0 mV	General	IC Feedback Tolerance
11.	Pout	23.776 W	General	Total output power
12.	Total BOM	\$2.88	General	Total BOM Cost
13.	Duty Cycle	24.644 %	Op_point	Duty cycle
14.	Efficiency	93.894 %	Op_point	Steady state efficiency
15.	IOUT_OP	7.205 A	Op_point	Iout operating point
16.	VIN_OP	14.0 V	Op_point	Vin operating point
17.	Vout p-p	2.244 mV	Op_point	Peak-to-peak output ripple voltage
18.	Cin Pd	9.64 mW	Power	Input capacitor power dissipation
19.	Cout Pd	5.918 mW	Power	Output capacitor power dissipation
20.	IC Pd	188.46 mW	Power	IC power dissipation
21.	L Pd	272.538 mW	Power	Inductor power dissipation
22.	M1 Pd	344.489 mW	Power	M1 MOSFET total power dissipation
23.	M1 PdCond	172.111 mW	Power	M1 MOSFET conduction losses
24.	M1 PdSw	172.379 mW	Power	M1 MOSFET switching losses
25.	M2 Pd	725.211 mW	Power	M2 MOSFET total power dissipation
26.	M2 PdCond	467.569 mW	Power	M2 MOSFET conduction losses
27.	M2 PdSw	257.642 mW	Power	M2 MOSFET switching losses
28.	Total Pd	1.546 W	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	7.205	Maximum Output Current
2.	Iout1	7.205	Output Current #1
3.	VinMax	14.0	Maximum input voltage
4.	VinMin	10.0	Minimum input voltage
5.	Vout	3.3	Output Voltage
6.	Vout1	3.3	Output Voltage #1
7.	base_pn	LM3152	Texas Instruments Base Part Number
8.	source	DC	Input Source Type
9.	ta	30.0	Ambient temperature

Design Assistance

1. LM3152 Product Folder : <http://www.ti.com/product/LM3152> : contains the data sheet and other resources.

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