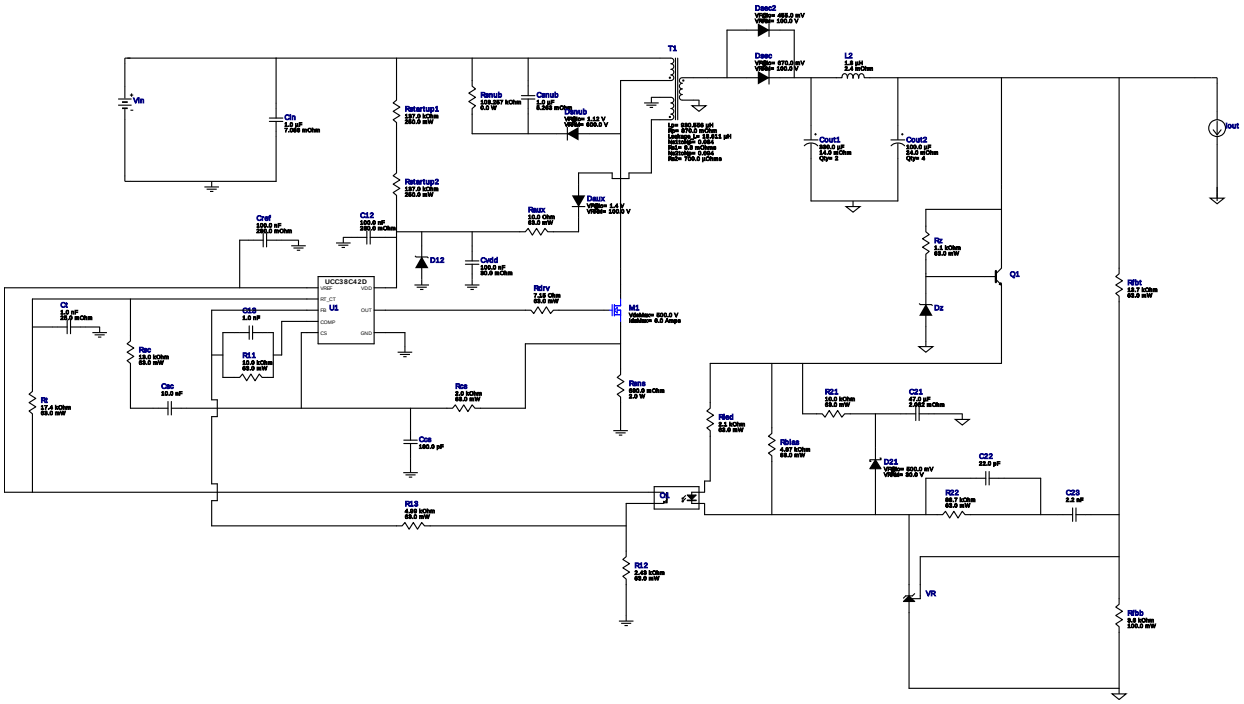
WEBENCH® Design Report

VinMin = 105.0V
VinMax = 115.0V
Vout = 12.0V
Iout = 3.0A

Device = UCC38C42DR
Topology = Flyback
Created = 8/10/16 7:25:04 PM
BOM Cost = $0.00
BOM Count = 51
Total Pd = 0.0W

Design : 3943027/10 UCC38C42DR
UCC38C42DR 105.0V-115.0V to 12.00V @ 3.0A



Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	C12	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 mm²
2.	C13	Samsung Electro-Mechanics	CL21C102JBCNFNC Series= C0G/NP0	Cap= 1.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
3.	C21	TDK	C3216X5R1E476M160AC Series= X5R	Cap= 47.0 uF ESR= 2.082 mOhm VDC= 25.0 V IRMS= 5.0279 A	1	$0.35	1206 11 mm²
4.	C22	Kemet	C0805C220K3GACTU Series= C0G/NP0	Cap= 22.0 pF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
5.	C23	Yageo America	CC0805KRX7R9BB222 Series= X7R	Cap= 2.2 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
6.	Ccs	Kemet	C0805C181K5GACTU Series= C0G/NP0	Cap= 180.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
7.	Cin	MuRata	GRM55DR72E105KW01L Series= X7R	Cap= 1.0 uF ESR= 7.086 mOhm VDC= 250.0 V IRMS= 2.0605 A	1	$0.26	2220_200 54 mm²

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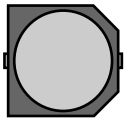
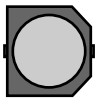
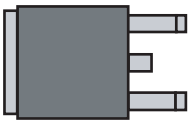
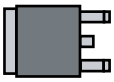
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
8.	Cout1	Panasonic	25SVPF330M Series= ?	Cap= 330.0 uF ESR= 14.0 mOhm VDC= 25.0 V IRMS= 5.0 A	2	$0.70	 CAPSMT_62_F12 151 mm²
9.	Cout2	Panasonic	25SVPF100M Series= ?	Cap= 100.0 uF ESR= 24.0 mOhm VDC= 25.0 V IRMS= 3.2 A	4	$0.50	 CAPSMT_62_E7 106 mm²
10.	Cref	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 mm²
11.	Csc	MuRata	GRM216R71H103KA01D Series= X7R	Cap= 10.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	 0805 7 mm²
12.	Csnub	TDK	C5750X6S2W105K Series= X6S	Cap= 1.0 uF ESR= 5.263 mOhm VDC= 400.0 V IRMS= 0.0 A	1	$1.19	 2220 54 mm²
13.	Ct	Kemet	C0805C102J5GACTU Series= C0G/NP0	Cap= 1.0 nF ESR= 25.0 mOhm VDC= 50.0 V IRMS= 1.71 A	1	$0.01	 0805 7 mm²
14.	Cvdd	MuRata	GRM188R71E104KA01D Series= X7R	Cap= 100.0 nF ESR= 30.0 mOhm VDC= 25.0 V IRMS= 1.51 A	1	$0.01	 0603 5 mm²
15.	D12	Diodes Inc.	MMSZ5248B-7-F	Zener	1	$0.04	 SOD-123 13 mm²
16.	D21	Diodes Inc.	B230A-13-F	VF@Io= 500.0 mV VRRM= 30.0 V	1	$0.09	 SMA 37 mm²
17.	Daux	NXP Semiconductor	BAS316,115	VF@Io= 1.4 V VRRM= 100.0 V	1	$0.02	 SOD-323 9 mm²
18.	Dsec	Fairchild Semiconductor	FSV8100V	VF@Io= 670.0 mV VRRM= 100.0 V	1	$0.21	 TO-277A 56 mm²
19.	Dsec2	STMicroelectronics	STPS20M100SG-TR	VF@Io= 455.0 mV VRRM= 100.0 V	1	$1.33	 DDPAK 210 mm²
20.	Dsnub	Bourns	CD214C-F3600	VF@Io= 1.12 V VRRM= 600.0 V	1	$0.18	 SMC 83 mm²
21.	Dz	ON Semiconductor	BZX84C9V1LT1G	Zener	1	$0.02	 SOT-23 14 mm²
22.	L2	Coilcraft	SER1360-182KLB	L= 1.8 µH DCR= 2.4 mOhm	1	$0.72	 SER1360 225 mm²
23.	M1	Fairchild Semiconductor	FDD6N50TM	VdsMax= 500.0 V IdsMax= 6.0 Amps	1	$0.47	 DPAK 102 mm²

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#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
24.	O1	Vishay-Semiconductor	TCMT1107	Optocoupler	1	$0.21	SOP-4 44 mm²
25.	Q1	ON Semiconductor	BC846BLT1G	Bipolar Transistor	1	$0.02	SOT-23 14 mm²
26.	R11	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
27.	R12	Vishay-Dale	CRCW04022K43FKED Series= CRCW..e3	Res= 2.43 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
28.	R13	Vishay-Dale	CRCW04024K99FKED Series= CRCW..e3	Res= 4.99 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
29.	R21	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
30.	R22	Vishay-Dale	CRCW040288K7FKED Series= CRCW..e3	Res= 88.7 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
31.	Raux	Vishay-Dale	CRCW040210R0FKED Series= CRCW..e3	Res= 10.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
32.	Rbias	Vishay-Dale	CRCW04024K87FKED Series= CRCW..e3	Res= 4.87 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
33.	Rcs	Vishay-Dale	CRCW04022K00FKED Series= CRCW..e3	Res= 2.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
34.	Rdrv	Vishay-Dale	CRCW04027R15FKED Series= CRCW..e3	Res= 7.15 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
35.	Rfbb	Yageo America	RC0603FR-073K6L Series= ?	Res= 3.6 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm²
36.	Rfbt	Vishay-Dale	CRCW040213K7FKED Series= CRCW..e3	Res= 13.7 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
37.	Rled	Vishay-Dale	CRCW04022K10FKED Series= CRCW..e3	Res= 2.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
38.	Rsc	Vishay-Dale	CRCW040213K0FKED Series= CRCW..e3	Res= 13.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
39.	Rsns	Stackpole Electronics Inc	CSRN2512FKR680 Series= ?	Res= 680.0 mOhm Power= 2.0 W Tolerance= 1.0%	1	$0.09	2512 43 mm²
40.	Rsnub	CUSTOM	CUSTOM Series= ?	Res= 103.257 kOhm Power= 0.0 W Tolerance= 0.0%	1	NA	CUSTOM 0 mm²
41.	Rstartup1	Panasonic	ERJ-8ENF1373V Series= ERJ-8E	Res= 137.0 kOhm Power= 250.0 mW Tolerance= 1.0%	1	$0.01	1206 11 mm²
42.	Rstartup2	Panasonic	ERJ-8ENF1373V Series= ERJ-8E	Res= 137.0 kOhm Power= 250.0 mW Tolerance= 1.0%	1	$0.01	1206 11 mm²
43.	Rt	Vishay-Dale	CRCW040217K4FKED Series= CRCW..e3	Res= 17.4 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
44.	Rz	Vishay-Dale	CRCW04021K10FKED Series= CRCW..e3	Res= 1.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²

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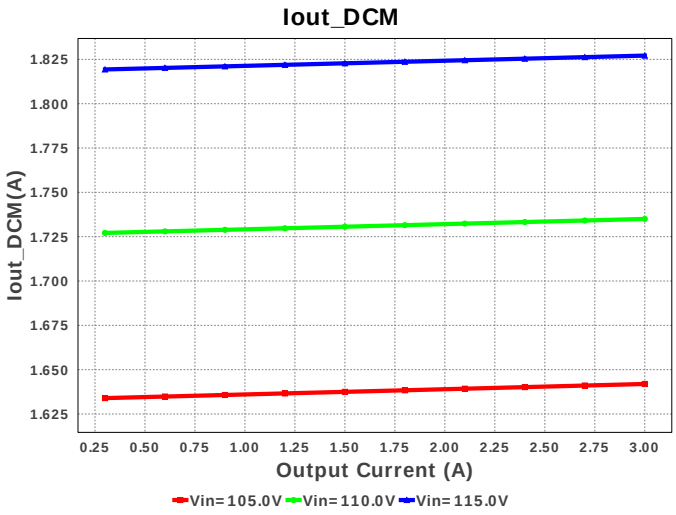
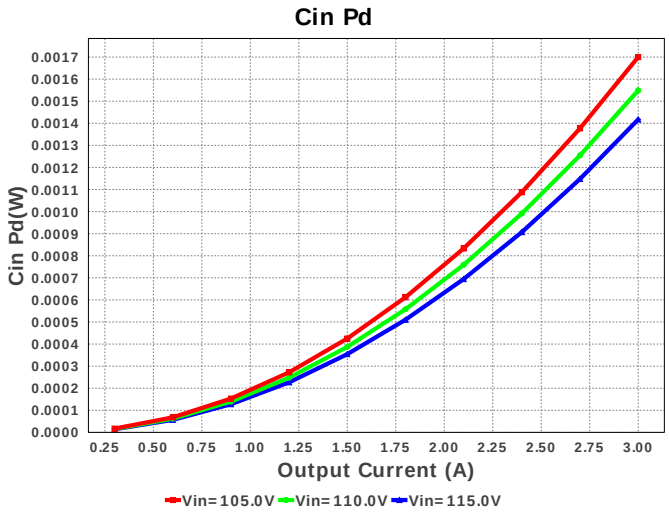
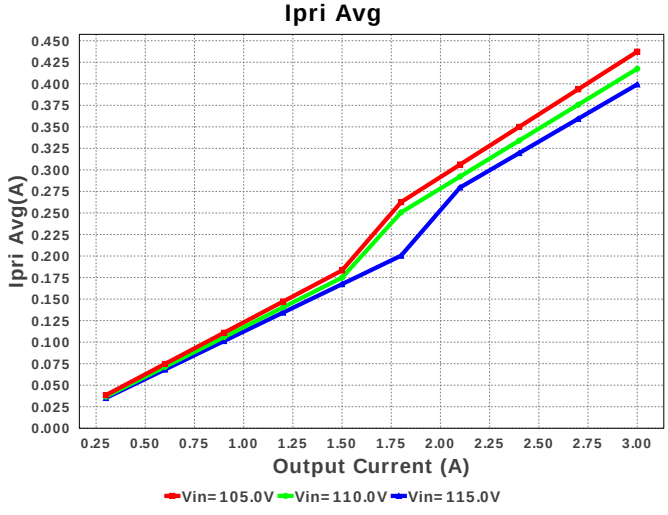
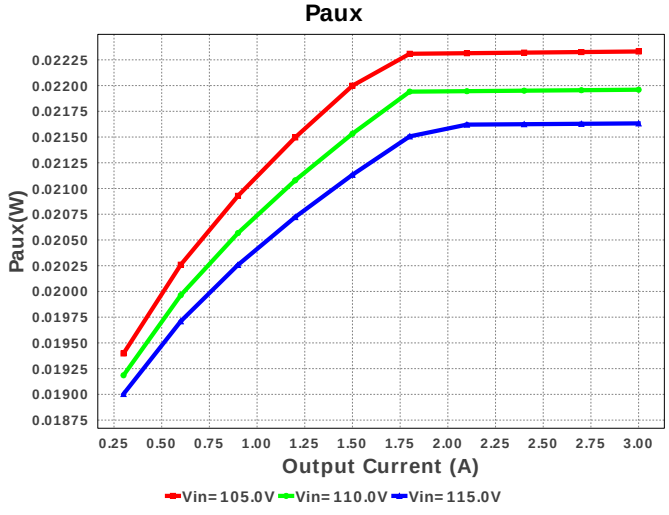
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
45.	T1	CUSTOM	CUSTOM	Lp= 930.556 µH Rp= 870.0 mOhm Leakage_L= 18.611 µH Ns1toNp= 0.084 Rs1= 8.6 mOhms Ns2toNp= 0.094 Rs2= 700.0 µOhms	1	NA	CUSTOM 0 mm^2
46.	U1	Texas Instruments	UCC38C42DR	Switcher	1	$0.60	 D0008A 57 mm^2
47.	VR	Texas Instruments	TL431AIDBZR	Voltage References	1	$0.08	 DBZ0003A 14 mm^2









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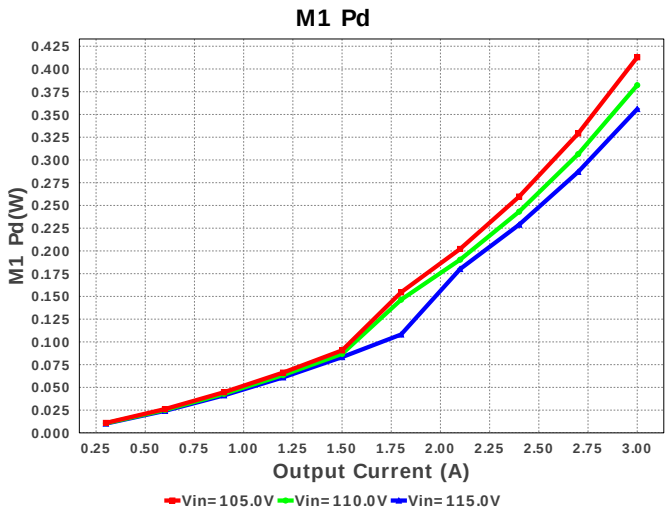

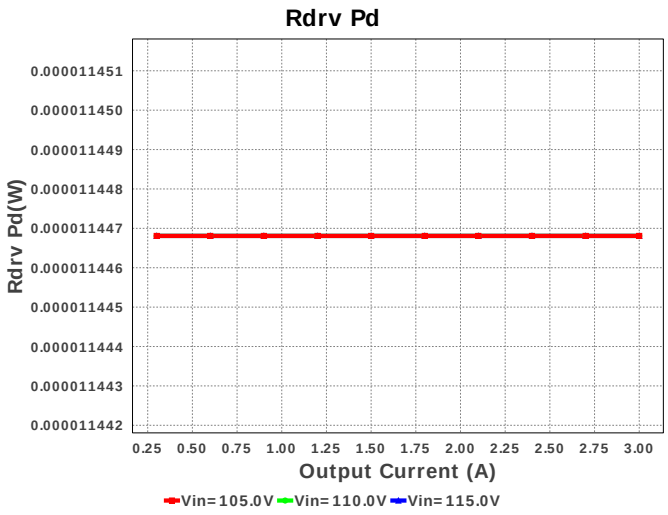

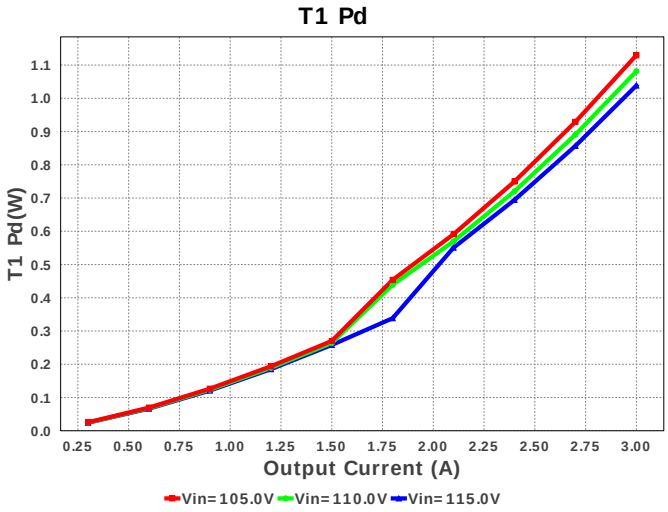

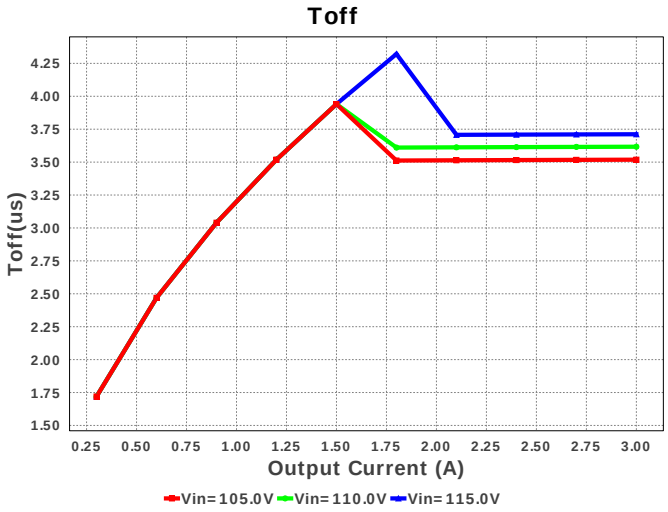

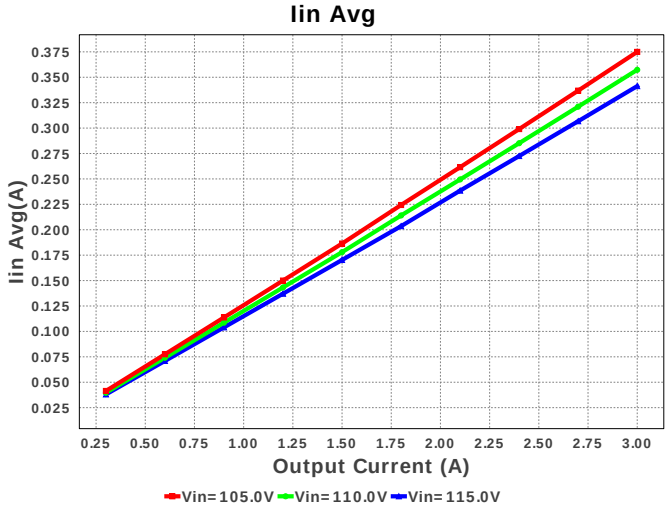

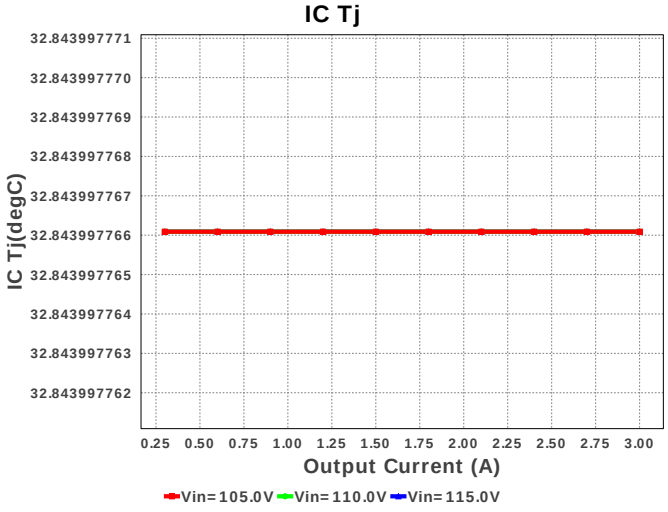

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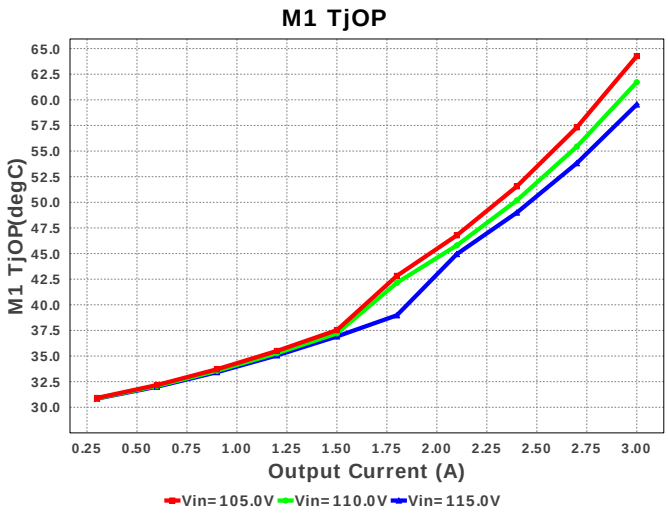

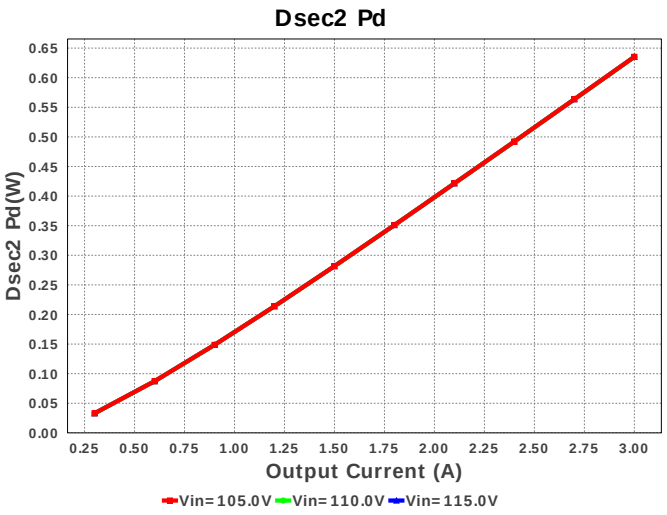

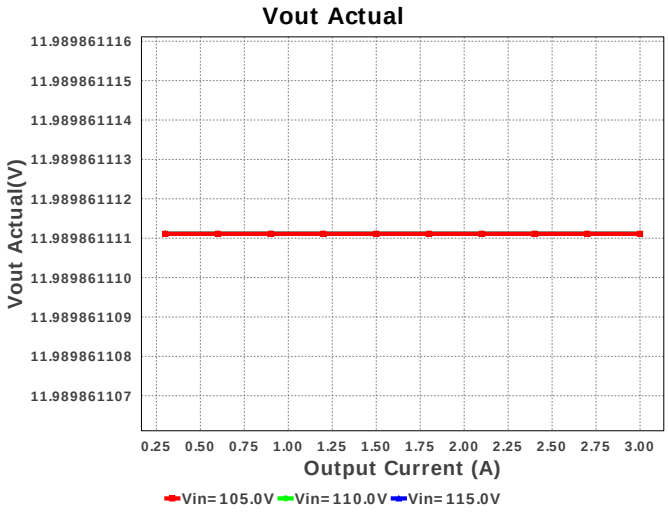

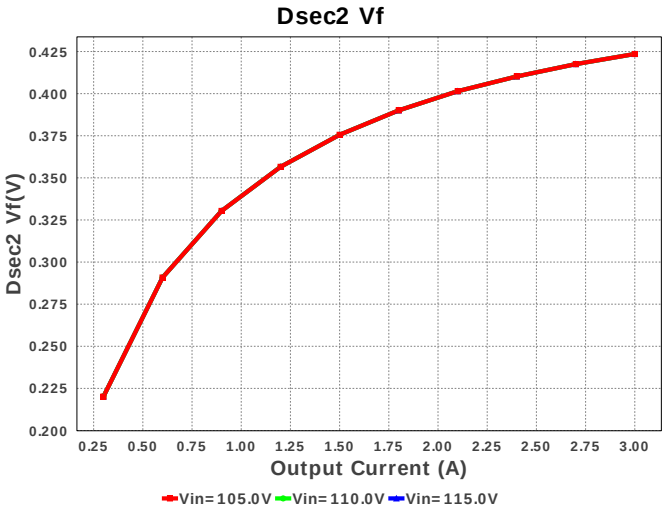

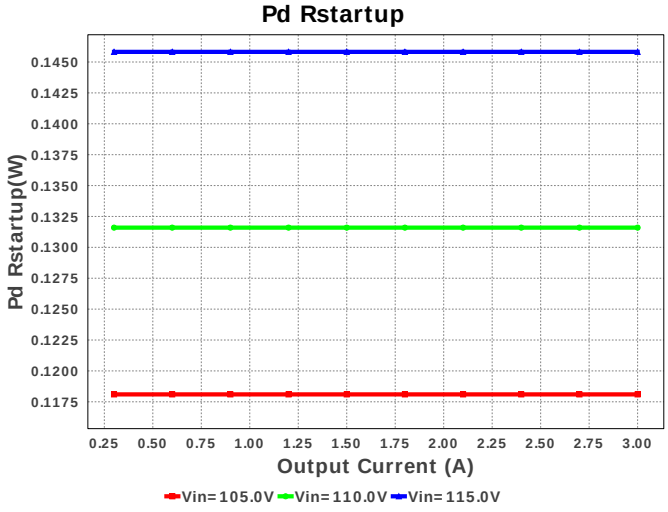

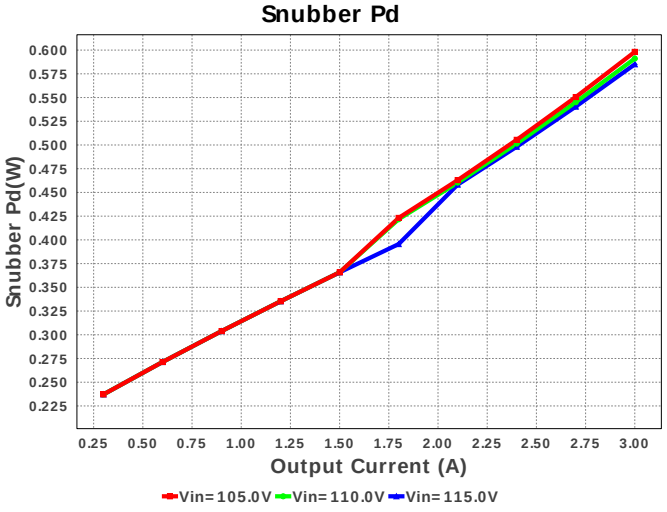

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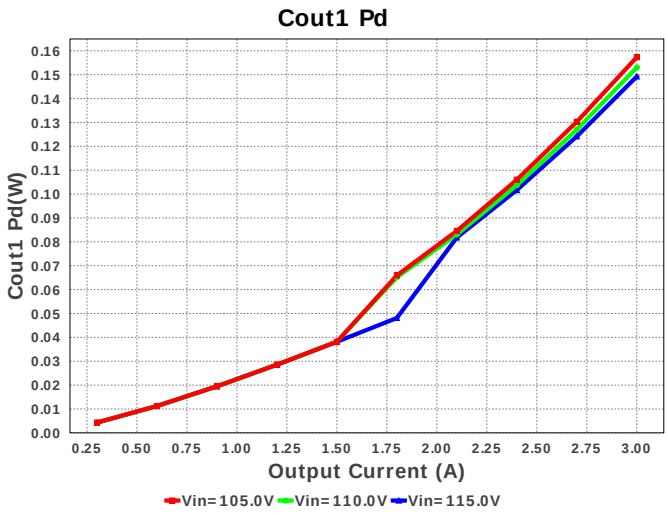

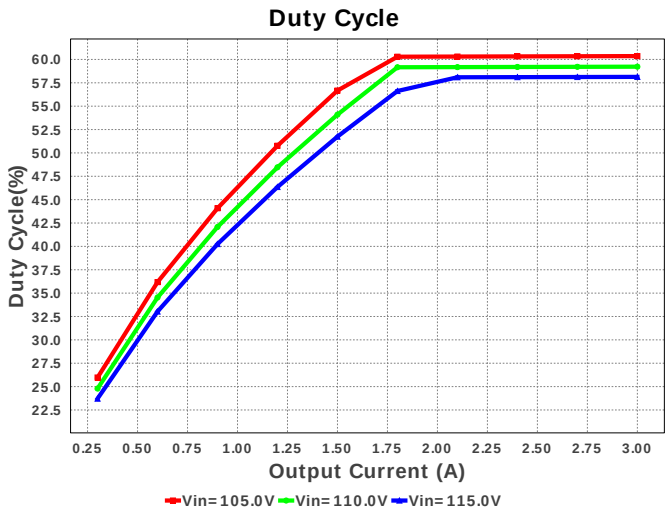

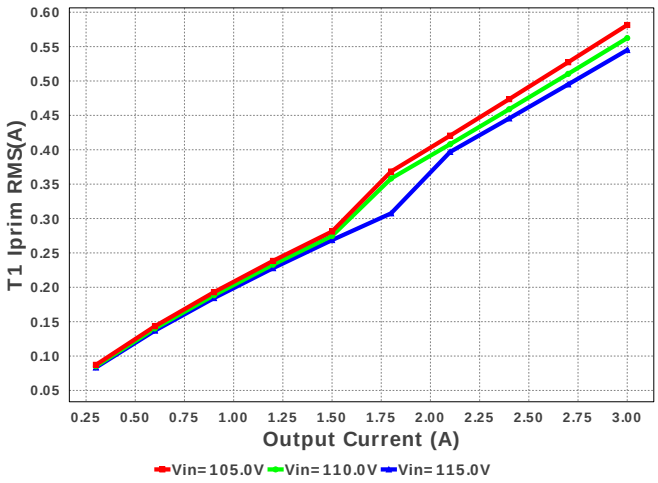

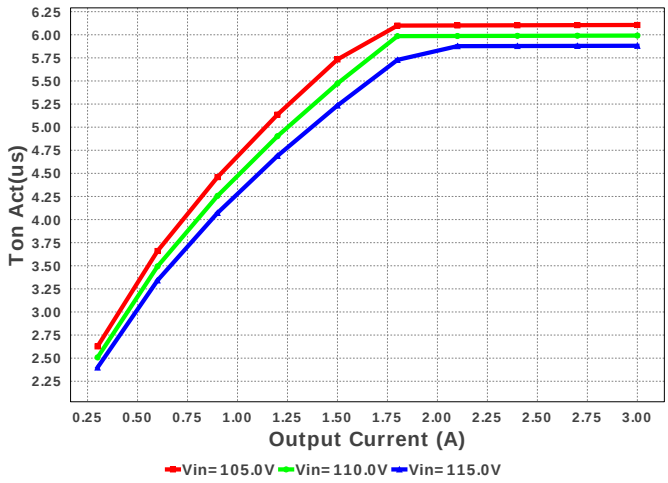

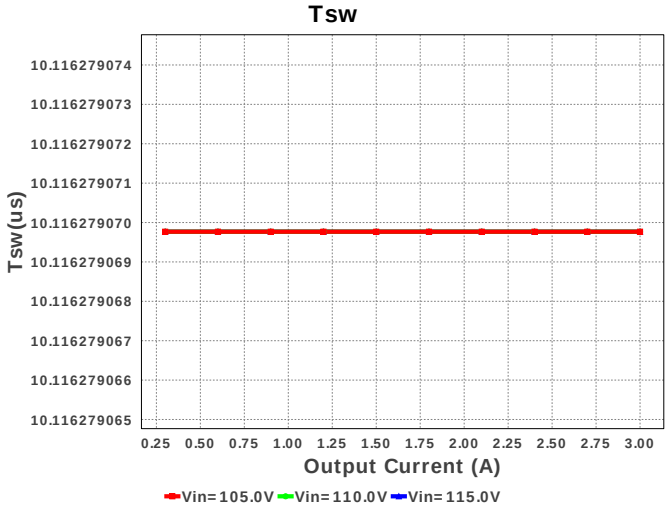

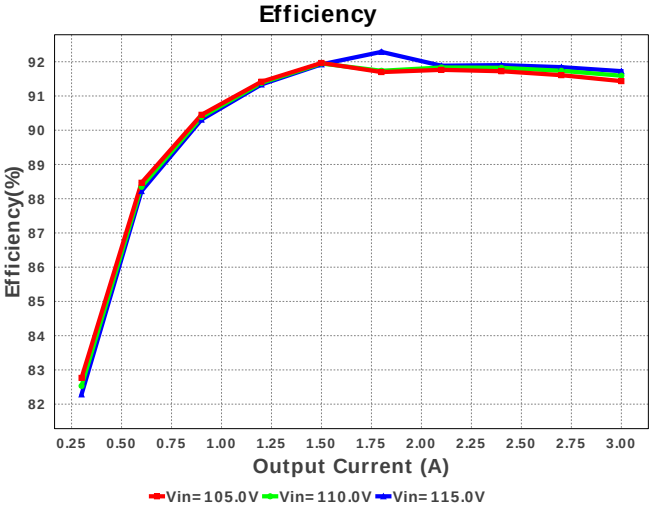

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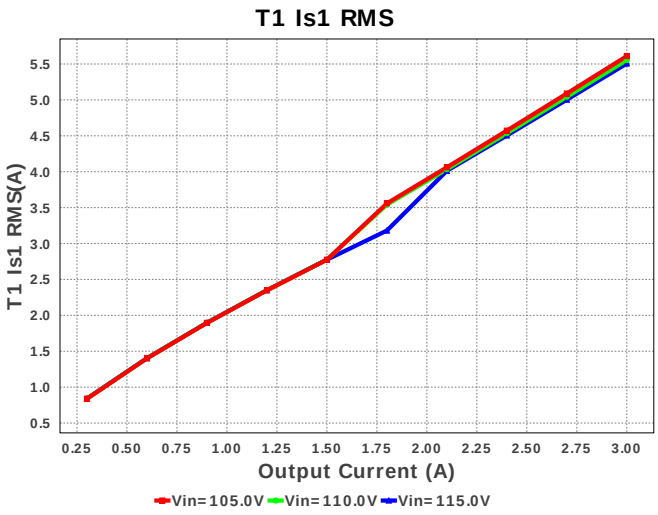

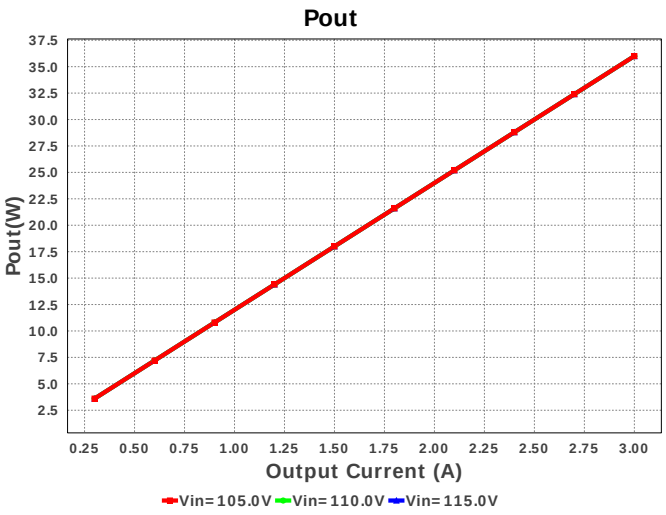

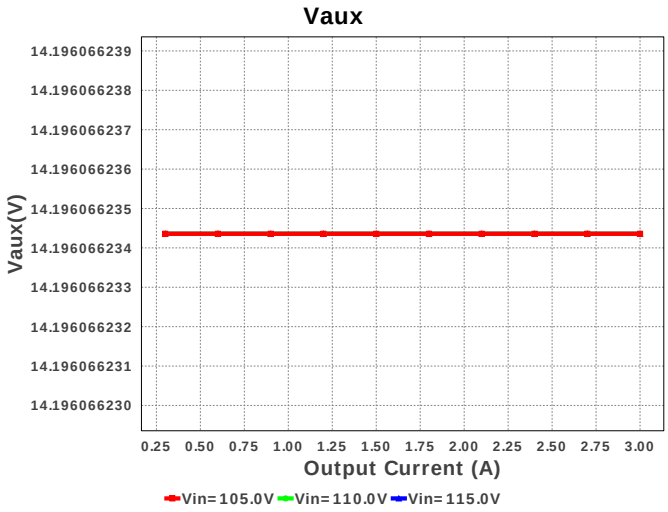

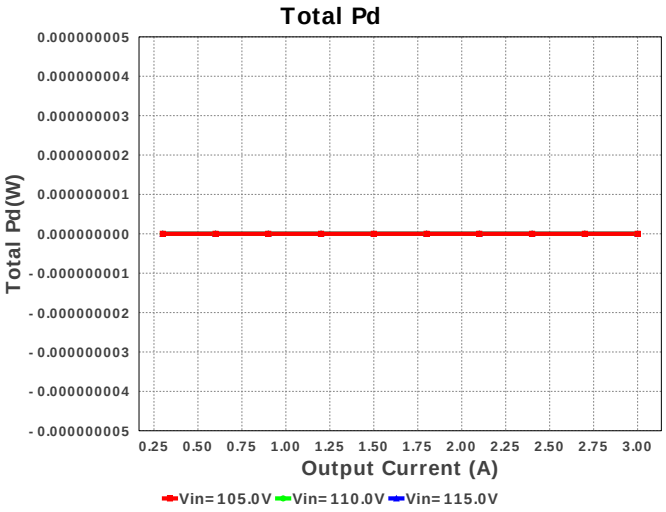

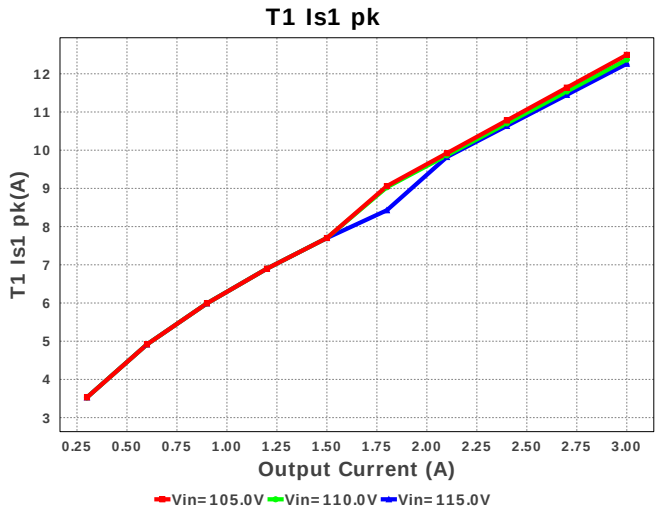

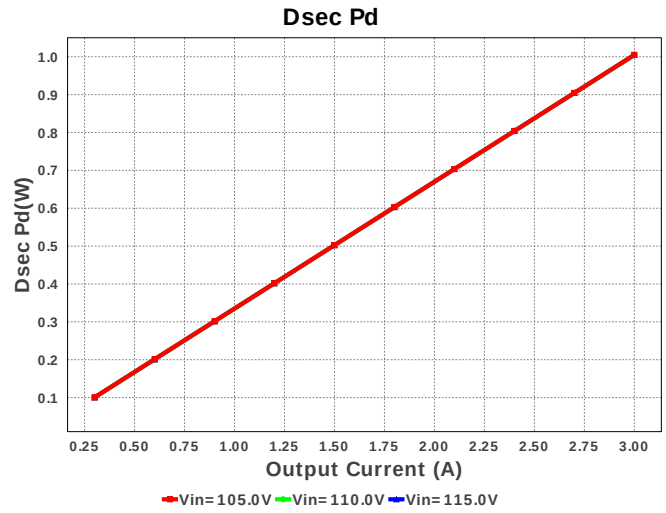

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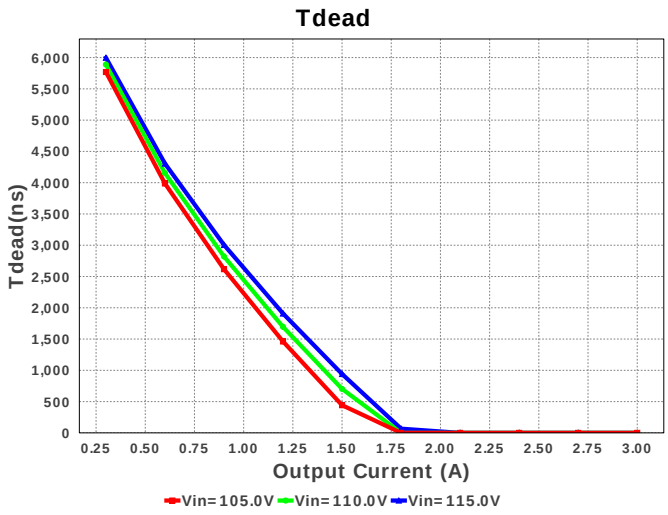

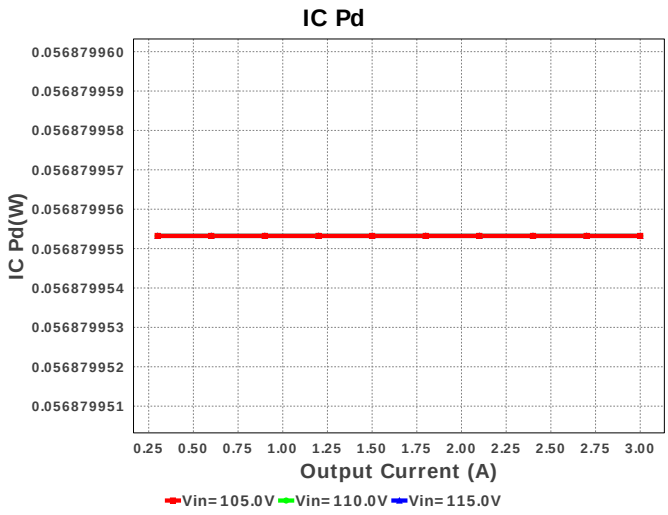

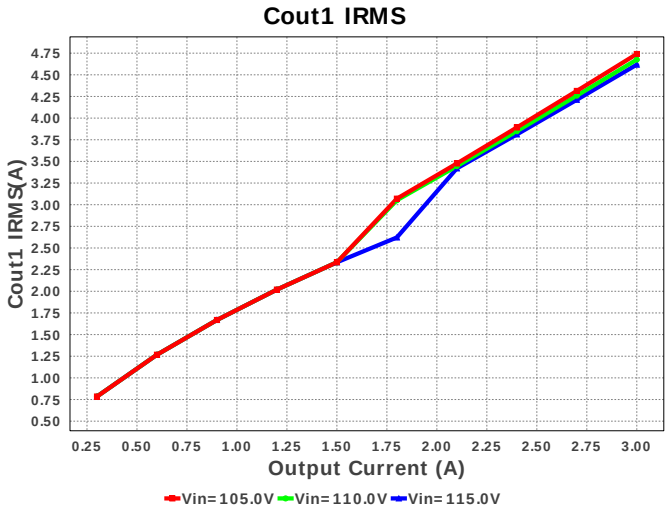

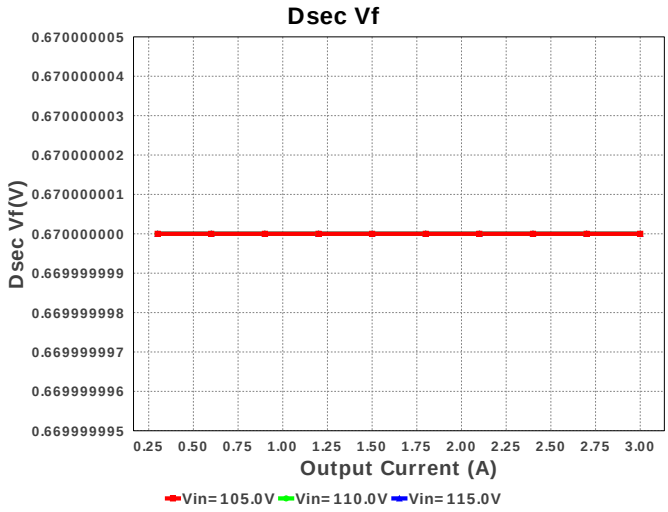

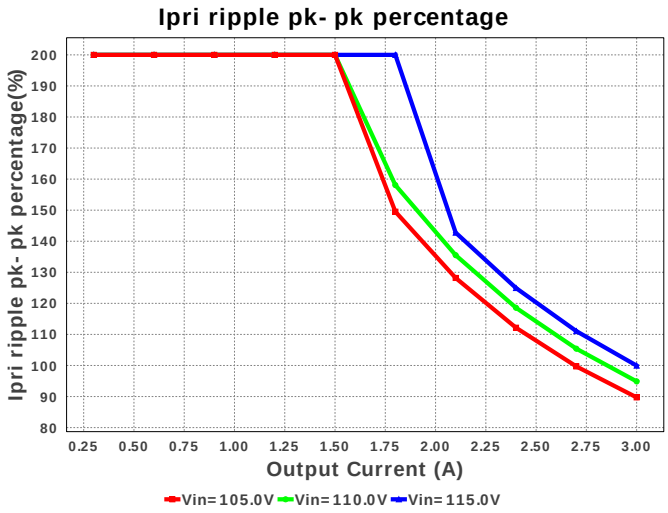

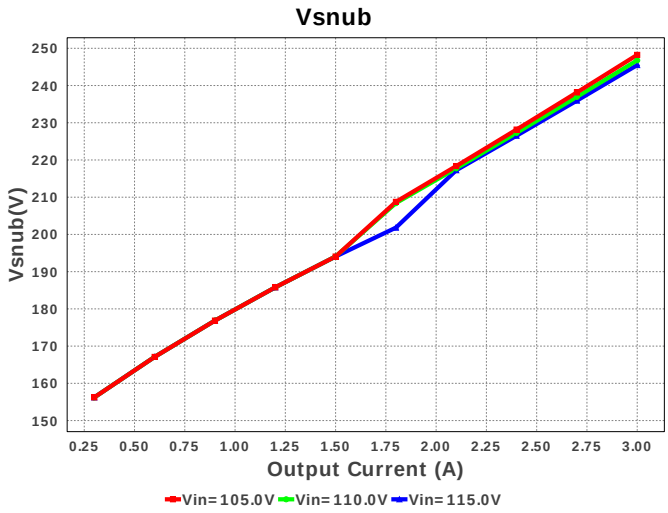

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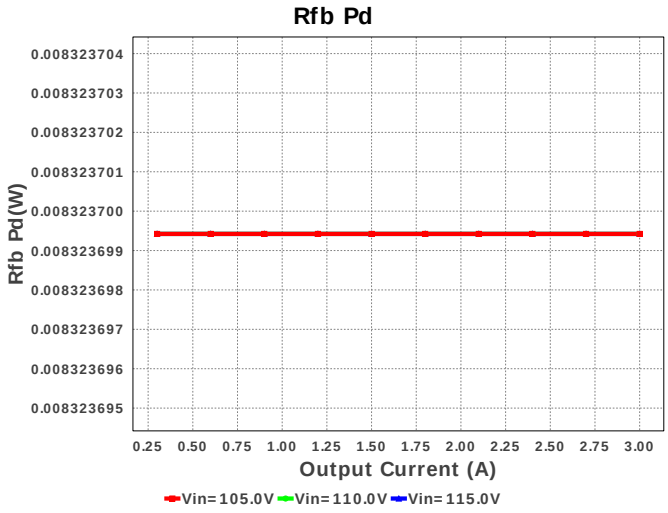

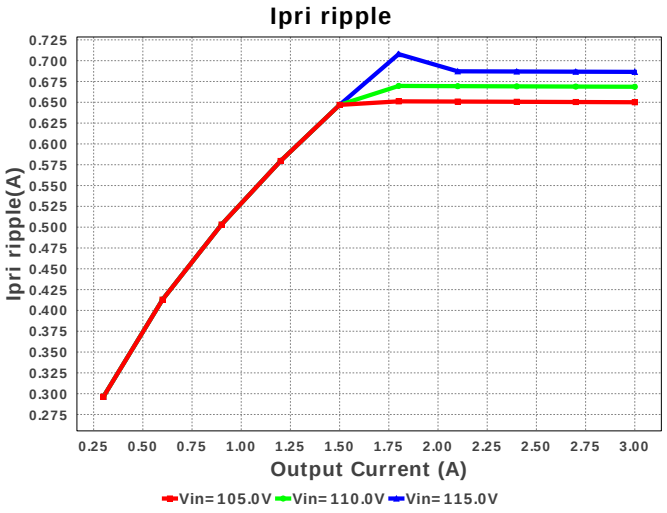

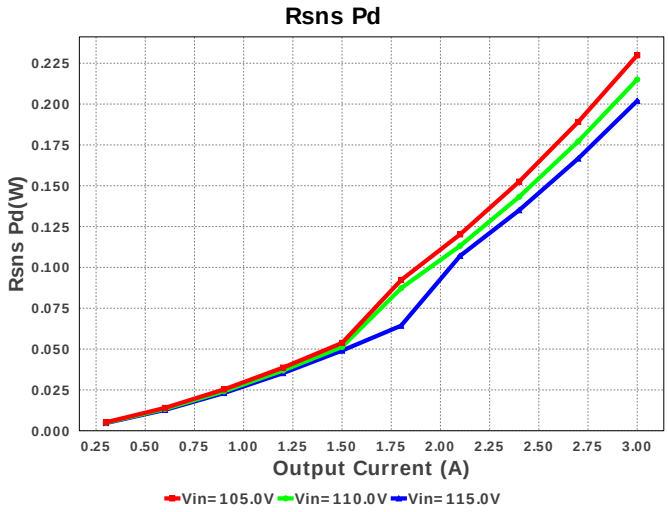

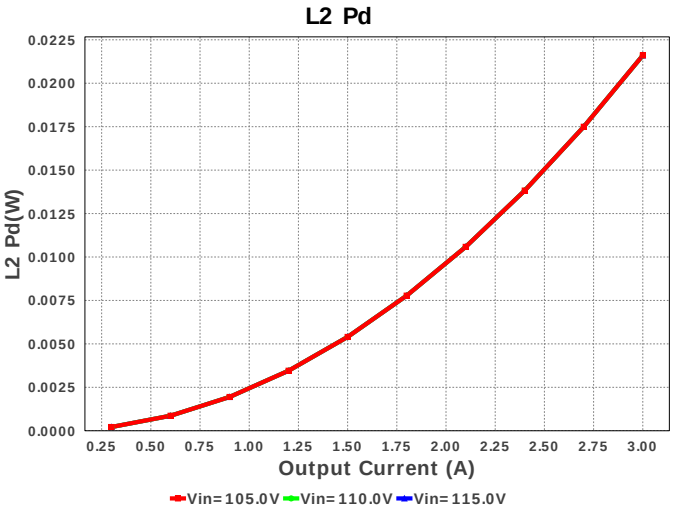

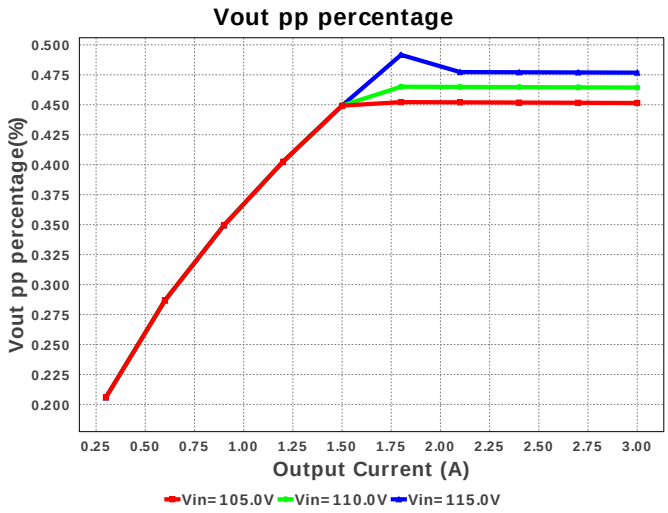

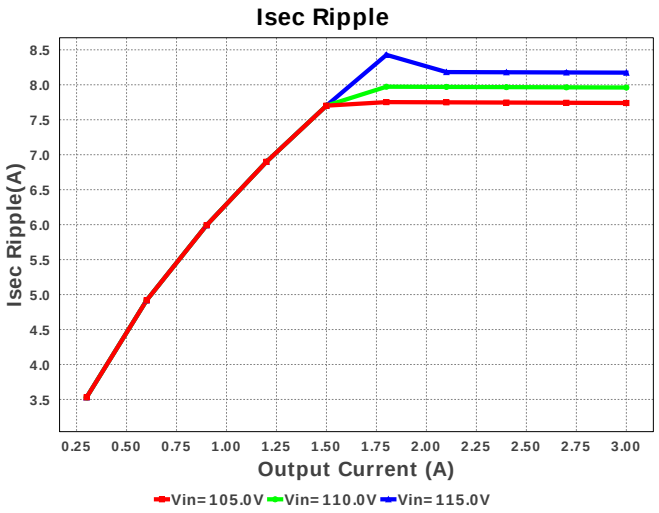

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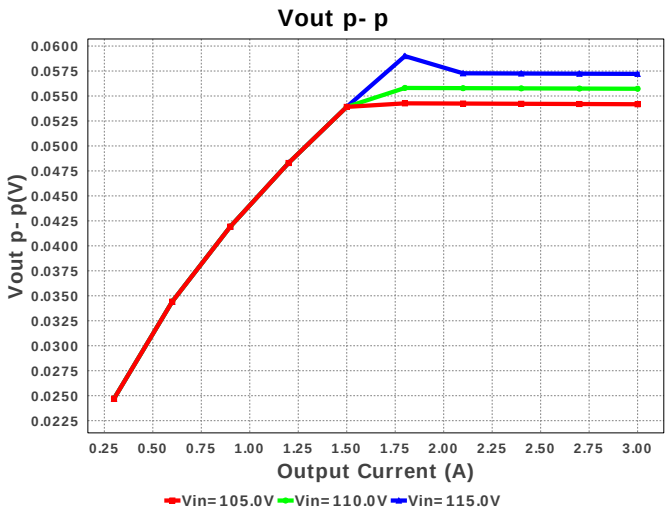

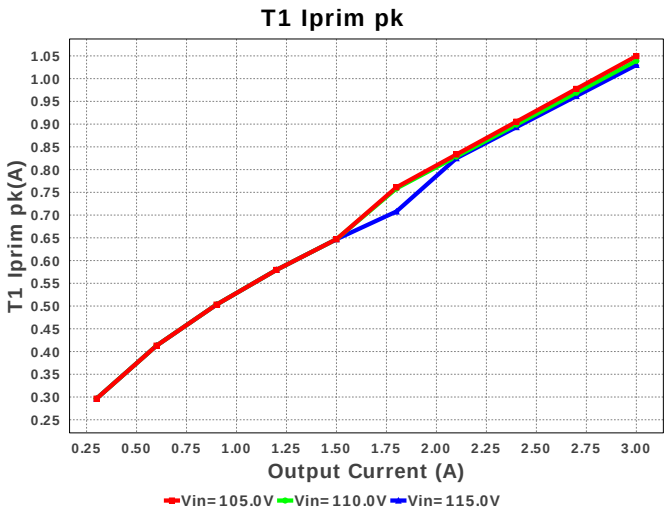

Operating Values

#	Name	Value	Category	Description
1.	Cout1 IRMS	4.741 A	Current	Output capacitor1 RMS ripple current
2.	Iin Avg	374.978 mA	Current	Average input current
3.	Iout_DCM	1.642 A	Current	Approximate Current below which DCM mode of operation will begin
4.	Ipri Avg	437.292 mA	Current	Average Current in Primary Winding over the complete Switching Period
5.	Ipri ripple	650.071 mA	Current	Ripple Current in the Primary Winding
6.	Ipri ripple pk-pk percentage	89.726 %	Current	Primary Current pk-pk ripple percentage(of Ipri avg during ton only)
7.	Isec Ripple	7.739 A	Current	Ripple Current in the Secondary Winding
8.	T1 Iprim RMS	581.442 mA	Current	Transformer Primary RMS Current
9.	T1 Iprim pk	1.05 A	Current	Transformer Primary Peak Current
10.	T1 Is1 RMS	5.61 A	Current	Transformer Secondary1 RMS Current
11.	T1 Is1 pk	12.495 A	Current	Transformer Secondary1 Peak Current
12.	BOM Count	51	General	Total Design BOM count
13.	Daux trr	4.0 ns	General	Auxiliary Diode Reverse Recovery Time
14.	Dsec Vf	670.0 mV	General	Effective Forward Voltage Drop at the Operating Current
15.	Dsec trr	19.64 ns	General	Output Diode Reverse Recovery Time
16.	Dsec2 Vf	423.539 mV	General	Effective Forward Voltage Drop at the Operating Current
17.	Dsnub trr	30.0 ns	General	Snubber Diode Reverse Recovery Time
18.	FootPrint	1.903 k mm^2	General	Total Foot Print Area of BOM components
19.	Frequency	98.851 kHz	General	Switching frequency
20.	Mode	CCM	General	Conduction Mode
21.	Pout	36.0 W	General	Total output power
22.	Tdead	0.0 ns	General	Approximate Dead Time of the Regulator
23.	Toff	3.518 us	General	Approximate Converter Off Time
24.	Ton Act	6.106 us	General	Approximate Converter On Time
25.	Total BOM	$0.0	General	Total BOM Cost
26.	Tsw	10.116 us	General	Switching Time Period
27.	Vaux	14.196 V	General	Auxiliary Voltage
28.	Vsnub	248.235 V	General	Voltage Across the Snubber
29.	Vout Actual	11.99 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
30.	Vout OP	12.0 V	Op_Point	Operational Output Voltage
31.	Duty Cycle	60.357 %	Op_point	Duty cycle
32.	Efficiency	91.434 %	Op_point	Steady state efficiency
33.	IC Tj	32.844 degC	Op_point	IC junction temperature
34.	ICThetaJA	50.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
35.	IOUT_OP	3.0 A	Op_point	Iout operating point
36.	M1 TjOP	64.266 degC	Op_point	M1 MOSFET junction temperature
37.	Vout p-p	54.175 mV	Op_point	Peak-to-peak output ripple voltage
38.	Cin Pd	1.7 mW	Power	Input capacitor power dissipation
39.	Cout1 Pd	157.308 mW	Power	Output capacitor1 power dissipation
40.	Dsec Pd	1.005 W	Power	Secondary Diode Power Dissipation
41.	Dsec2 Pd	635.309 mW	Power	Secondary Diode Power Dissipation
42.	IC Pd	56.88 mW	Power	IC power dissipation
43.	L2 Pd	21.6 mW	Power	Average Power Dissipation in the Inductor Over the AC Line Period
44.	M1 Pd	412.847 mW	Power	M1 MOSFET total power dissipation
45.	Paux	22.331 mW	Power	Power Dissipation in Raux and Daux
46.	Pd Rstartup	118.1 mW	Power	Power Dissipation in Rstartup1 and Rstartup2
47.	Rdrv Pd	11.447 µW	Power	Power Dissipation in Gate Drive Resistor
48.	Rfb Pd	8.324 mW	Power	Rfb Power Dissipation
49.	Rsns Pd	229.891 mW	Power	Current Limit Sense Resistor Power Dissipation
50.	Snubber Pd	598.131 mW	Power	Snubber Power Dissipation

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#	Name	Value	Category	Description
51.	T1 Pd	1.13 W	Power	Estimated Losses in Transformer
52.	Total Pd	0.0 W	Power	Total Power Dissipation
53.	Vout Tolerance	1.926 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
54.	Vout pp percentage	451.462 m%		Output Voltage ripple percentage

Design Inputs

#	Name	Value	Description
1.	Iout	3.0	Maximum Output Current
2.	VinMax	115.0	Maximum input voltage
3.	VinMin	105.0	Minimum input voltage
4.	Vout	12.0	Output Voltage
5.	base_pn	UCC38C42	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **UCC38C42** Product Folder : http://www.ti.com/product/UCC38C42 : contains the data sheet and other resources.

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