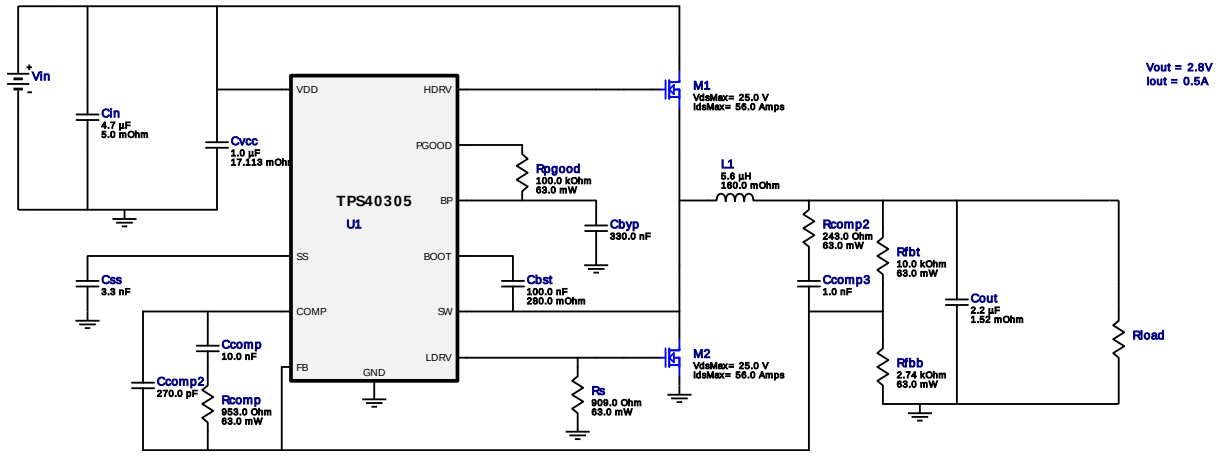
WEBENCH® Design Report

VinMin = 3.7V
VinMax = 4.2V
Vout = 2.8V
Iout = 0.5A

Device = TPS40305DRCR
Topology = Buck
Created = 7/5/16 1:31:57 AM
BOM Cost = $0.00
BOM Count = 19
Total Pd = 0.18W

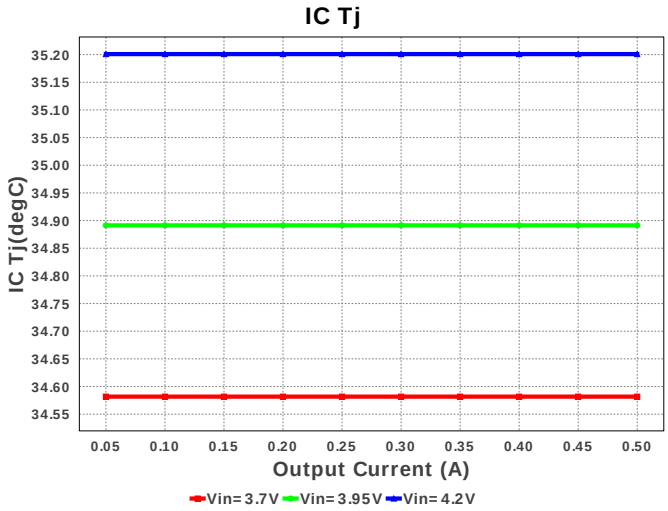
Design : 4406513/25 TPS40305DRCR
TPS40305DRCR 3.7V-4.2V to 2.80V @ 0.5A

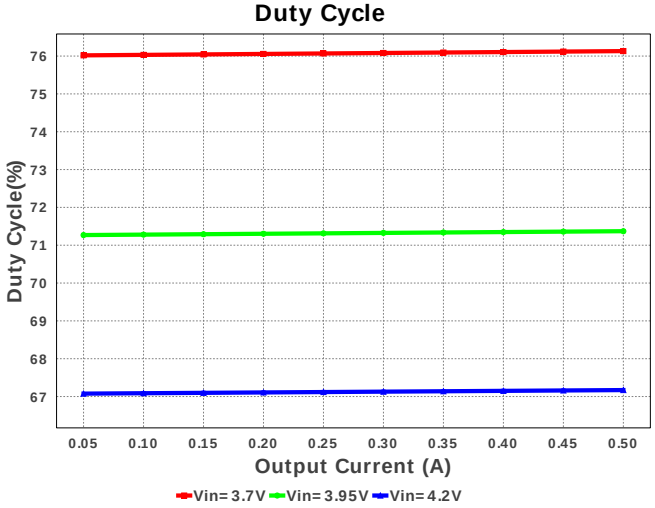


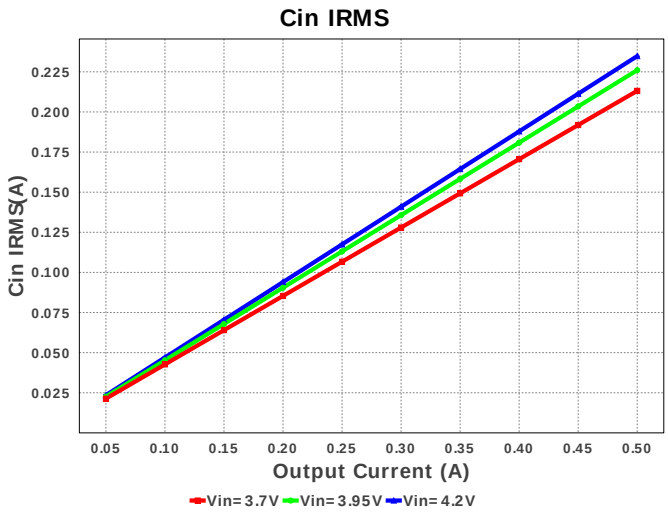
Electrical BOM

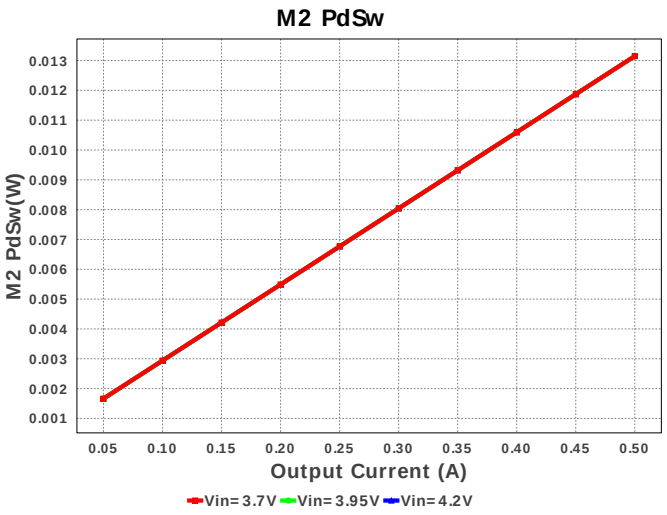
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
2.	Cbyp	Kemet	C0603C334K8RACTU Series= X7R	Cap= 330.0 nF VDC= 10.0 V IRMS= 0.0 A	1	$0.02	0603 5 mm²
3.	Ccomp	MuRata	GRM216R71H103KA01D Series= X7R	Cap= 10.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
4.	Ccomp2	MuRata	GRM033R71C271KA01D Series= X7R	Cap= 270.0 pF VDC= 16.0 V IRMS= 0.0 A	1	$0.01	0201 2 mm²
5.	Ccomp3	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
6.	Cin	MuRata	GRM188R60J475KE19D Series= X5R	Cap= 4.7 uF ESR= 5.0 mOhm VDC= 6.3 V IRMS= 2.0 A	1	$0.01	0603 5 mm²
7.	Cout	Taiyo Yuden	JMK105BJ225MV-F Series= X5R	Cap= 2.2 uF ESR= 1.52 mOhm VDC= 6.3 V IRMS= 0.0 A	1	$0.03	0402 3 mm²
8.	Css	MuRata	GRM216R71E332KA01D Series= X7R	Cap= 3.3 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
9.	Cvcc	MuRata	GRM188R61E105KA12D Series= X5R	Cap= 1.0 uF ESR= 17.113 mOhm VDC= 25.0 V IRMS= 979.39 mA	1	$0.01	0603 5 mm²
10.	L1	Bourns	SDR0302-5R6ML	L= 5.6 µH DCR= 160.0 mOhm	1	$0.18	SDR0302 15 mm²

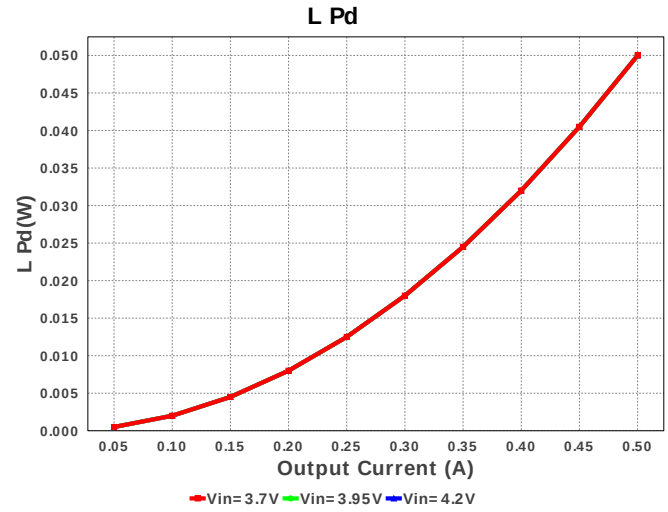
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
11.	M1	Texas Instruments	CSD16411Q3	VdsMax= 25.0 V IdsMax= 56.0 Amps	1	$0.34	TRANS_NexFET_Q3 18 mm^2
12.	M2	Texas Instruments	CSD16411Q3	VdsMax= 25.0 V IdsMax= 56.0 Amps	1	$0.34	TRANS_NexFET_Q3 18 mm^2
13.	Rcomp	Vishay-Dale	CRCW0402953RFKED Series= CRCW..e3	Res= 953.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
14.	Rcomp2	Vishay-Dale	CRCW0402243RFKED Series= CRCW..e3	Res= 243.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
15.	Rfbb	Vishay-Dale	CRCW04022K74FKED Series= CRCW..e3	Res= 2.74 kOhm Power= 63.0 mW Tolerance= 1.0%	1	NA	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	CRCW0402909RFKED Series= CRCW..e3	Res= 909.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
19.	U1	Texas Instruments	TPS40305DRCR	Switcher	1	$0.95	S-PVSON-N10 17 mm^2

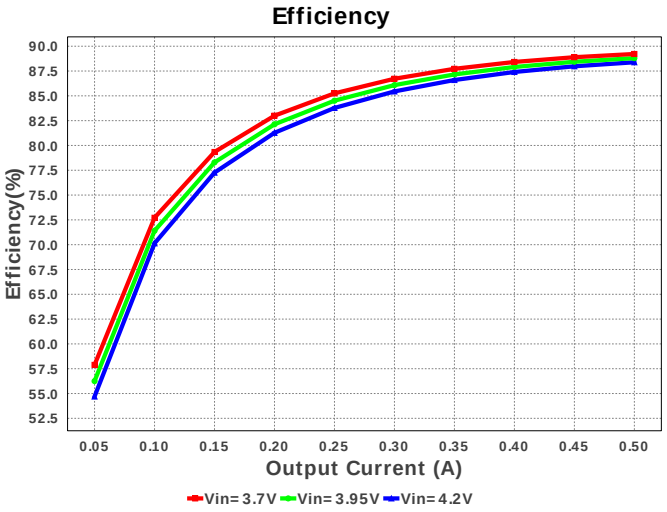


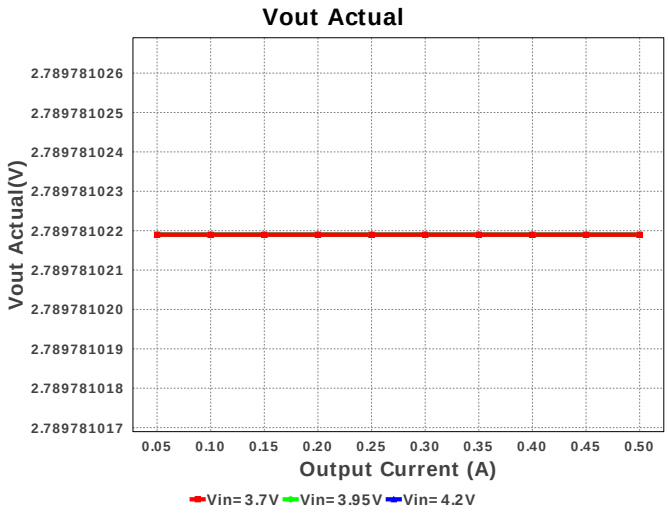


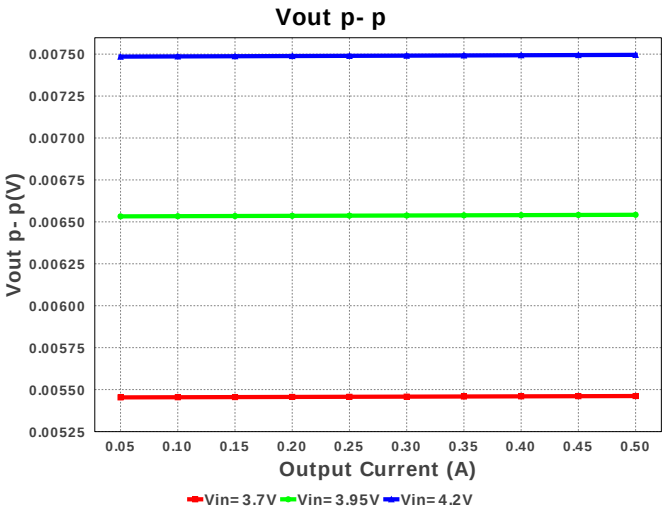


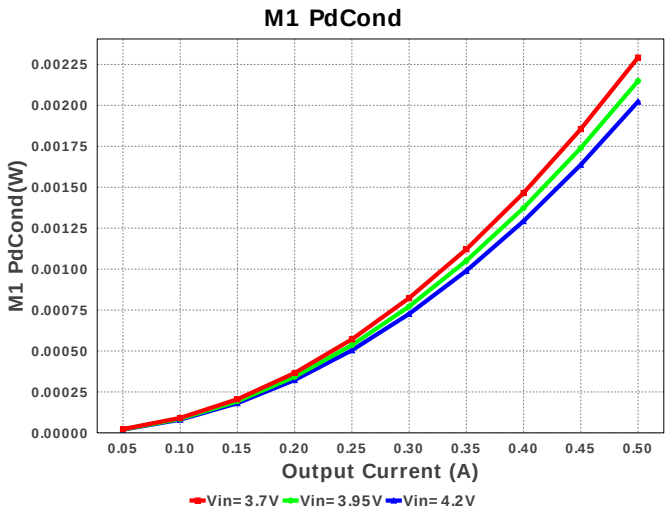


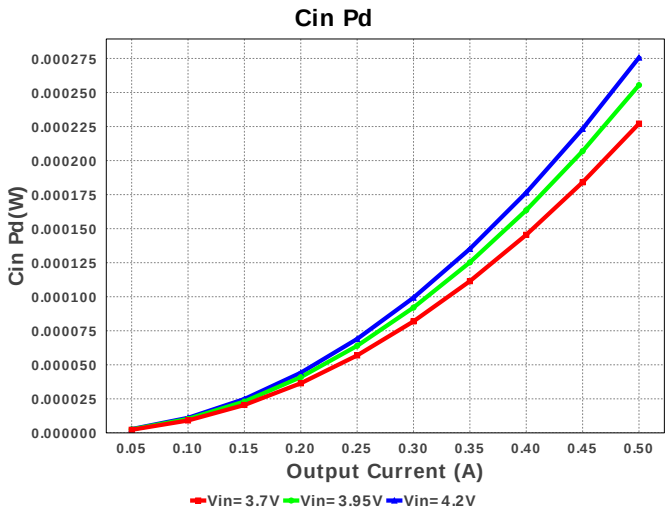


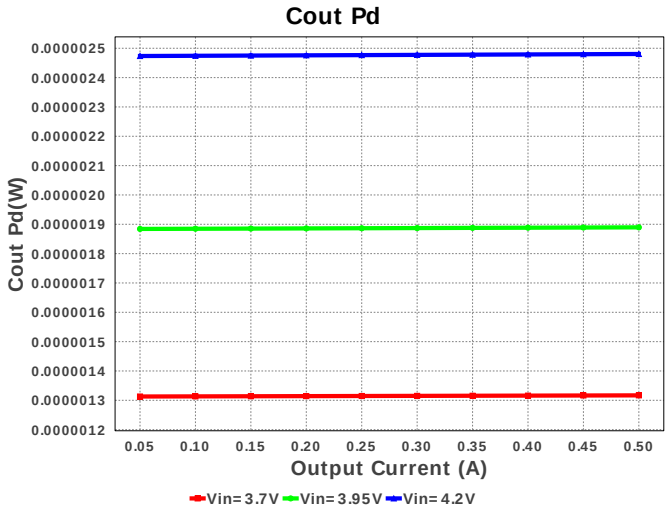


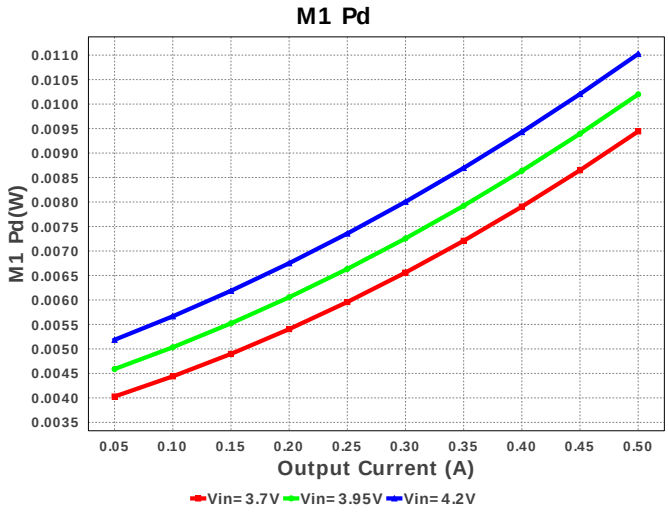


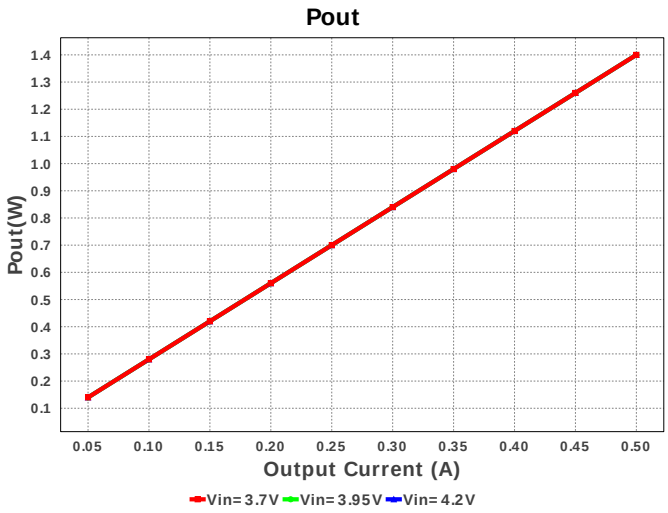


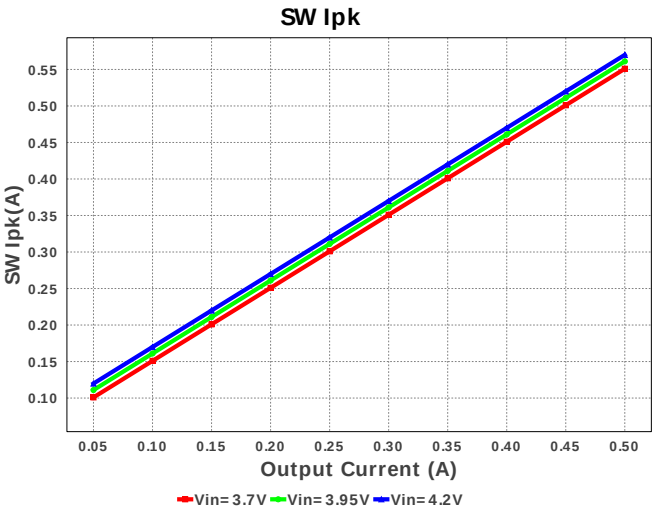


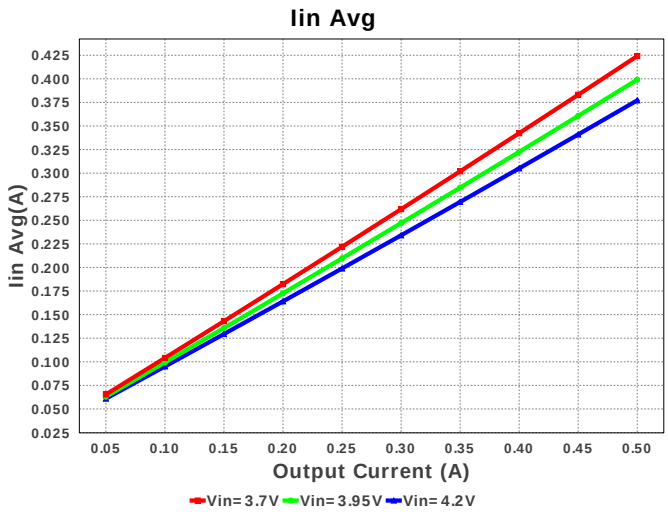


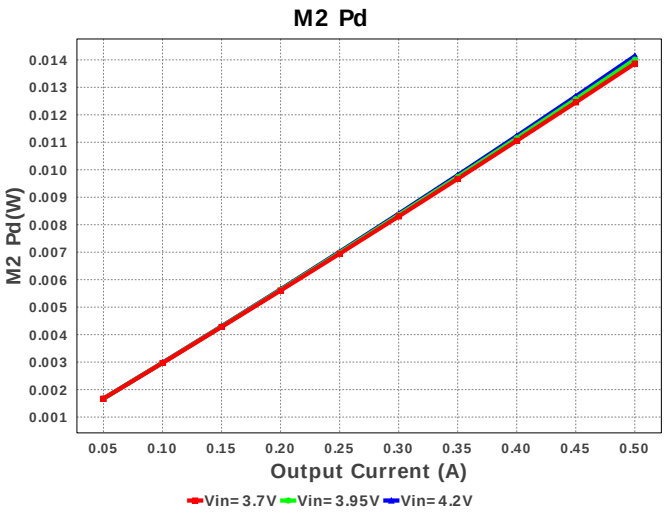


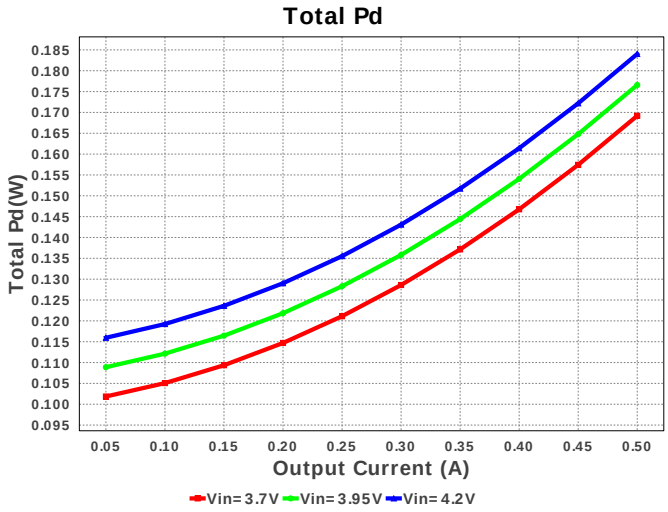


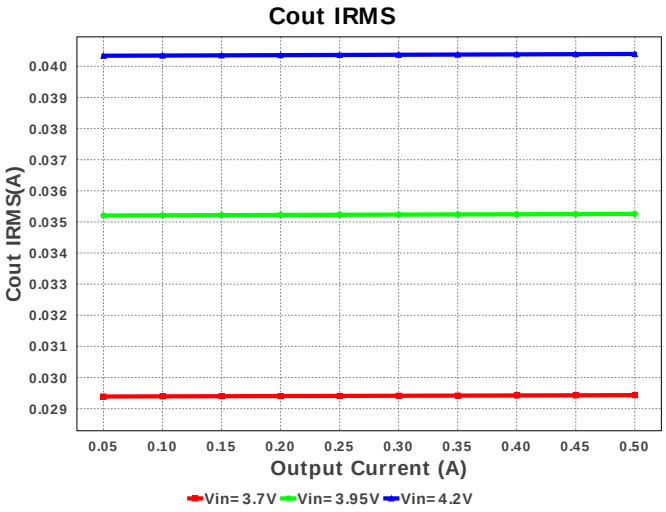


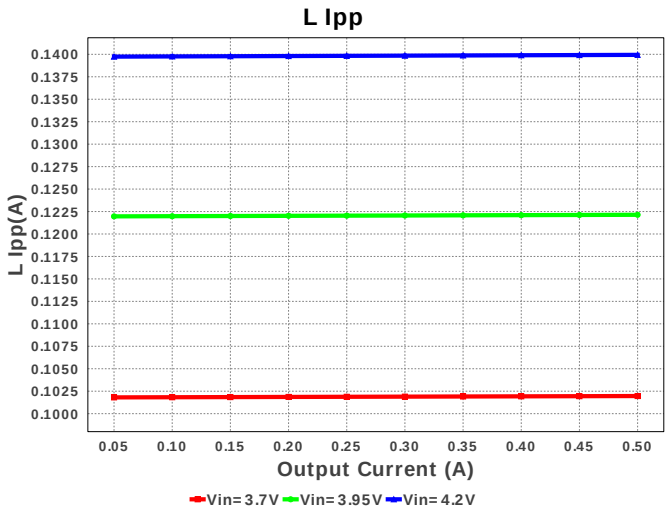


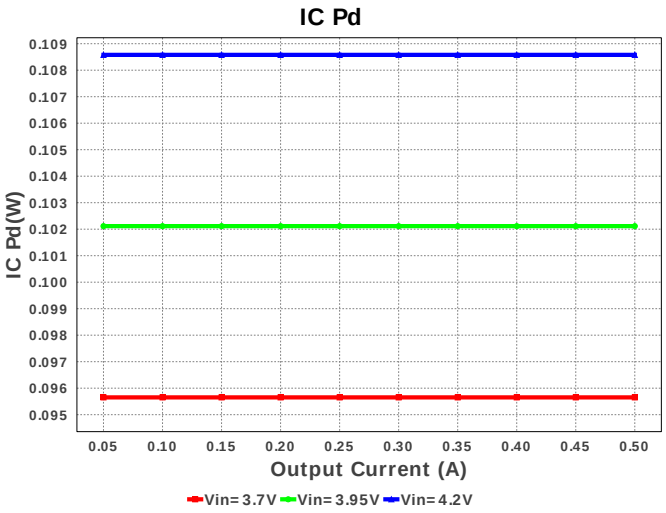


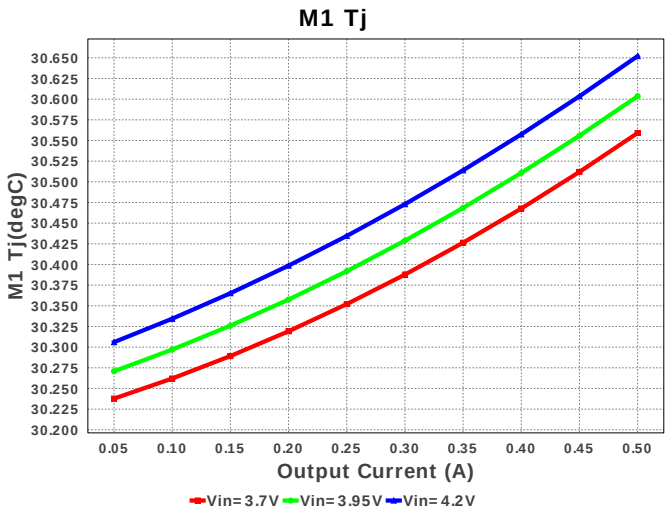


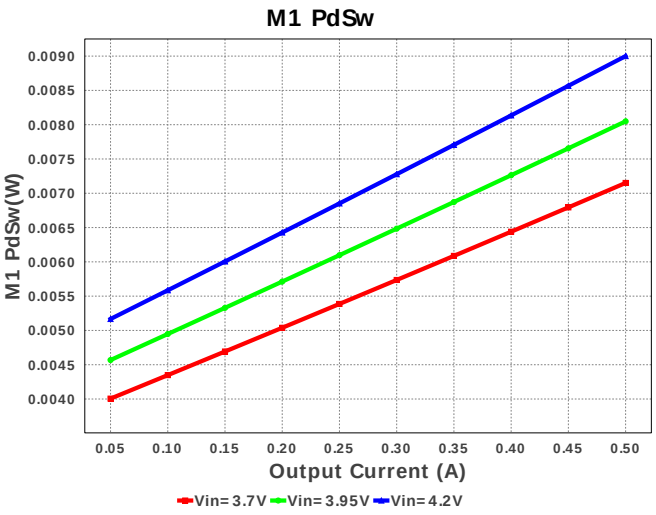


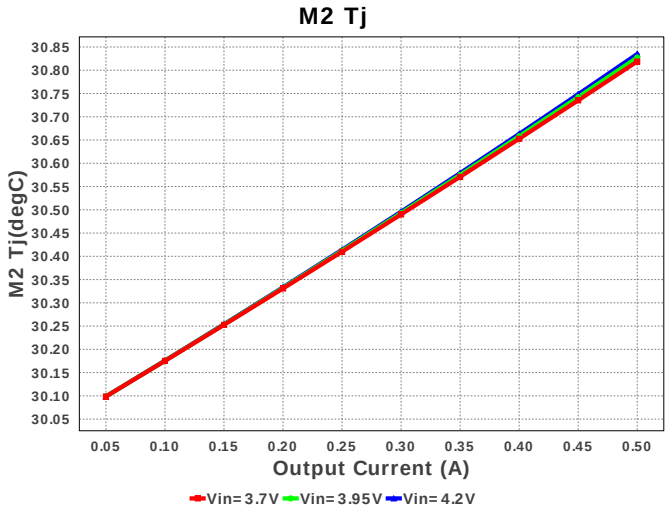


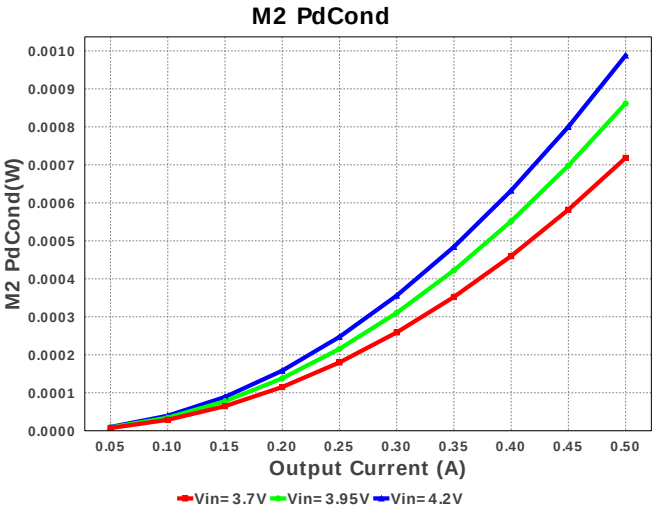


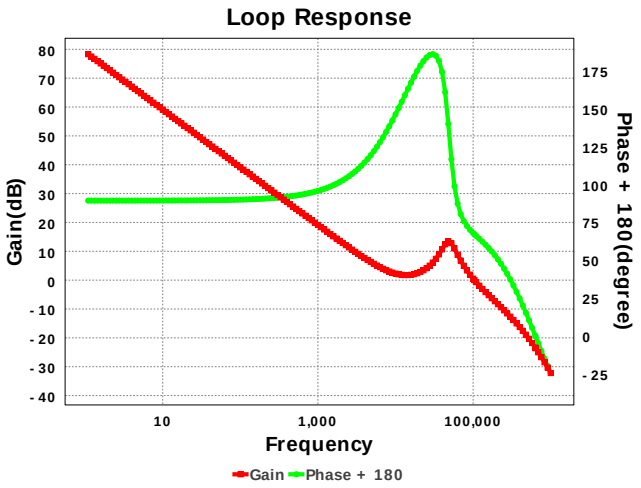












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	234.796 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	40.397 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	377.15 mA	Current	Average input current
4.	L Ipp	139.94 mA	Current	Peak-to-peak inductor ripple current
5.	SW Ipk	569.97 mA	Current	Peak switch current
6.	BOM Count	19	General	Total Design BOM count
7.	FootPrint	133.0 mm^2	General	Total Foot Print Area of BOM components
8.	Frequency	1.2 MHz	General	Switching frequency
9.	IC Tolerance	10.0 mV	General	IC Feedback Tolerance
10.	Pout	1.4 W	General	Total output power
11.	Total BOM	$0.0	General	Total BOM Cost

#	Name	Value	Category	Description
12.	Low Freq Gain	78.323 dB	Op_Point	Gain at 10Hz
13.	Vout Actual	2.79 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
14.	Cross Freq	94.658 kHz	Op_point	Bode plot crossover frequency
15.	Duty Cycle	67.171 %	Op_point	Duty cycle
16.	Efficiency	88.383 %	Op_point	Steady state efficiency
17.	Gain Marg	-24.666 dB	Op_point	Bode Plot Gain Margin
18.	IC Tj	35.201 degC	Op_point	IC junction temperature
19.	IOUT_OP	500.0 mA	Op_point	Iout operating point
20.	M1 Tj	30.652 degC	Op_point	M1 MOSFET junction temperature
21.	M2 Tj	30.835 degC	Op_point	M2 MOSFET junction temperature
22.	Phase Marg	67.694 deg	Op_point	Bode Plot Phase Margin
23.	VIN_OP	4.2 V	Op_point	Vin operating point
24.	Vout p-p	6.626 mV	Op_point	Peak-to-peak output ripple voltage
25.	Cin Pd	275.645 µW	Power	Input capacitor power dissipation
26.	Cout Pd	2.481 µW	Power	Output capacitor power dissipation
27.	IC Pd	108.578 mW	Power	IC power dissipation
28.	L Pd	50.0 mW	Power	Inductor power dissipation
29.	M1 Pd	11.023 mW	Power	M1 MOSFET total power dissipation
30.	M1 PdCond	2.023 mW	Power	M1 MOSFET conduction losses
31.	M1 PdSw	9.0 mW	Power	M1 MOSFET switching losses
32.	M2 Pd	14.136 mW	Power	M2 MOSFET total power dissipation
33.	M2 PdCond	987.882 µW	Power	M2 MOSFET conduction losses
34.	M2 PdSw	13.148 mW	Power	M2 MOSFET switching losses
35.	Total Pd	184.017 mW	Power	Total Power Dissipation
36.	Vout Tolerance	3.279 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	500.0 m	Maximum Output Current
2.	VinMax	4.2	Maximum input voltage
3.	VinMin	3.7	Minimum input voltage
4.	Vout	2.8	Output Voltage
5.	base_pn	TPS40305	Texas Instruments Base Part Number
6.	source	DC	Input Source Type
7.	ta	30.0	Ambient temperature

Design Assistance

1. TPS40305 Product Folder : http://www.ti.com/product/TPS40305 : contains the data sheet and other resources.