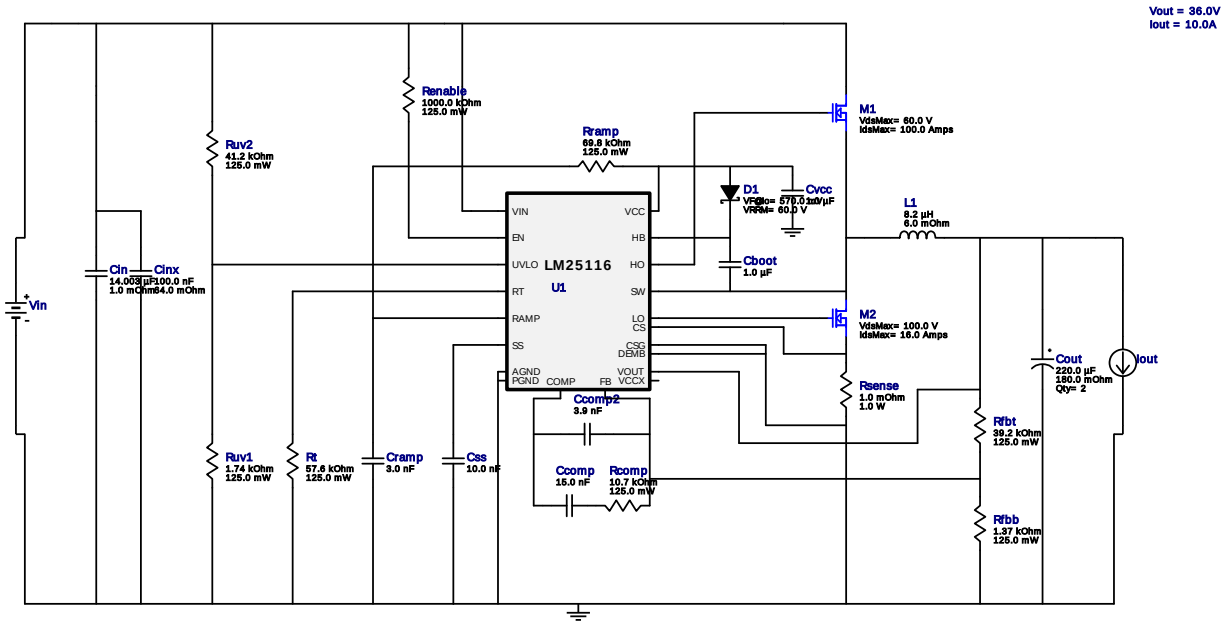
WEBENCH® Design Report

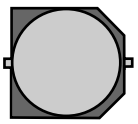
VinMin = 38.0V
VinMax = 38.0V
Vout = 36.0V
Iout = 10.0A

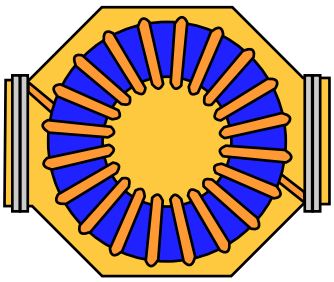
Device = LM25116MHX/NOPB
Topology = Buck
Created = 7/12/16 5:49:48 PM
BOM Cost = $0.00
BOM Count = 24
Total Pd = 2.62W

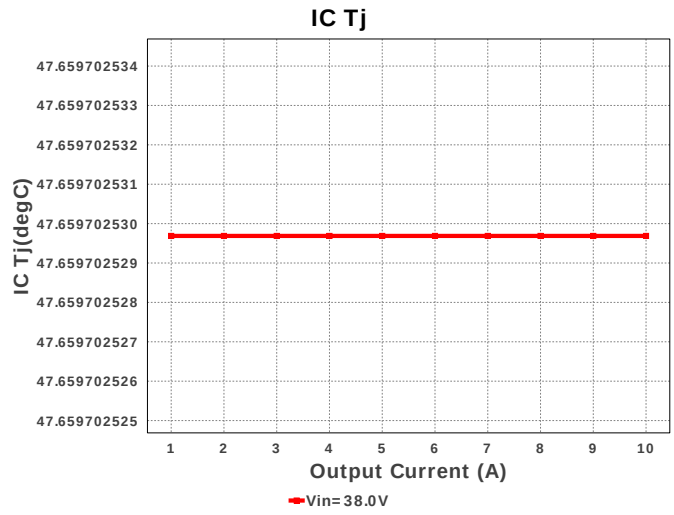
Design : 906020/2226 LM25116MHX/NOPB
LM25116MHX/NOPB 38.0V-38.0V to 36.00V @ 10.0A

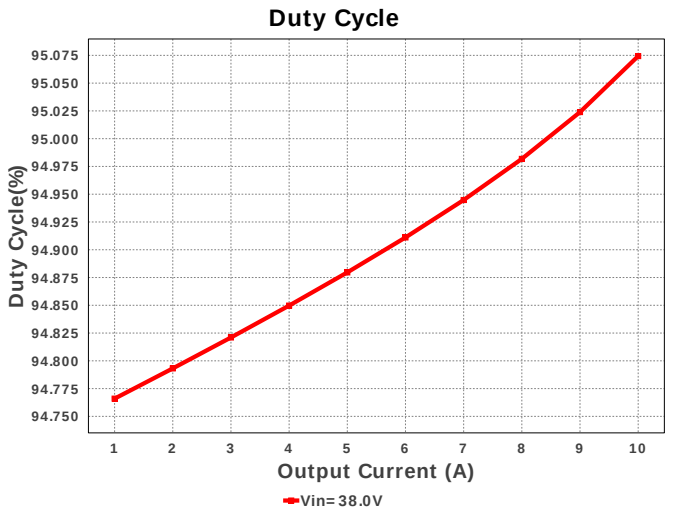


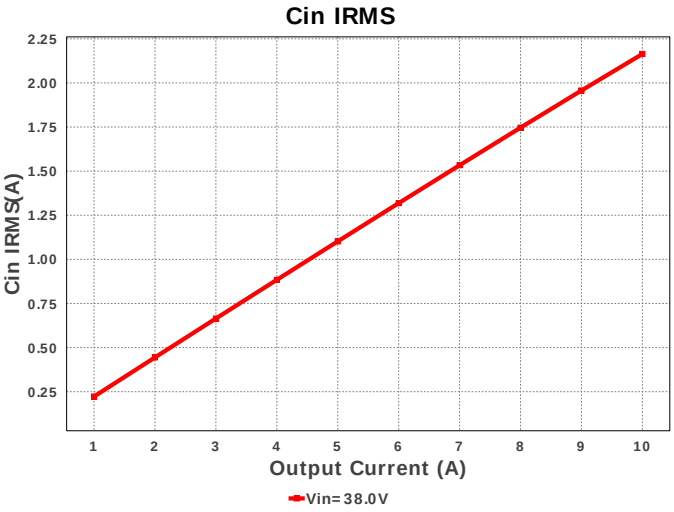
Electrical BOM

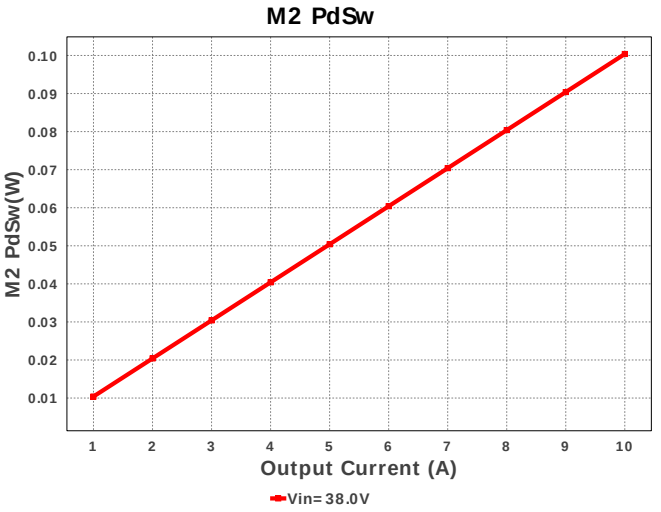
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	Taiyo Yuden	EMK212B7105KG-T Series= X7R	Cap= 1.0 uF VDC= 16.0 V IRMS= 0.0 A	1	$0.02	0805 7 mm²
2.	Ccomp	Yageo America	CC0805KRX7R9BB153 Series= X7R	Cap= 15.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
3.	Ccomp2	Yageo America	CC0805KRX7R9BB392 Series= X7R	Cap= 3.9 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
4.	Cin	CUSTOM	CUSTOM Series= ?	Cap= 14.003 uF ESR= 1.0 mOhm VDC= 47.5 V IRMS= 42.426 A	1	NA	CUSTOM 0 mm²
5.	Cinx	Kemet	C0805C104K5RACTU Series= X7R	Cap= 100.0 nF ESR= 64.0 mOhm VDC= 50.0 V IRMS= 1.64 A	1	$0.01	0805 7 mm²
6.	Cout	Panasonic	EEE-FK1H221P Series= FK	Cap= 220.0 uF ESR= 180.0 mOhm VDC= 50.0 V IRMS= 670.0 mA	2	$0.28	 SM_RADIAL_G 172 mm²
7.	Cramp	MuRata	GRM2165C1H302JA01D Series= C0G/NP0	Cap= 3.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.04	0805 7 mm²
8.	Css	MuRata	GRM216R71H103KA01D Series= X7R	Cap= 10.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²

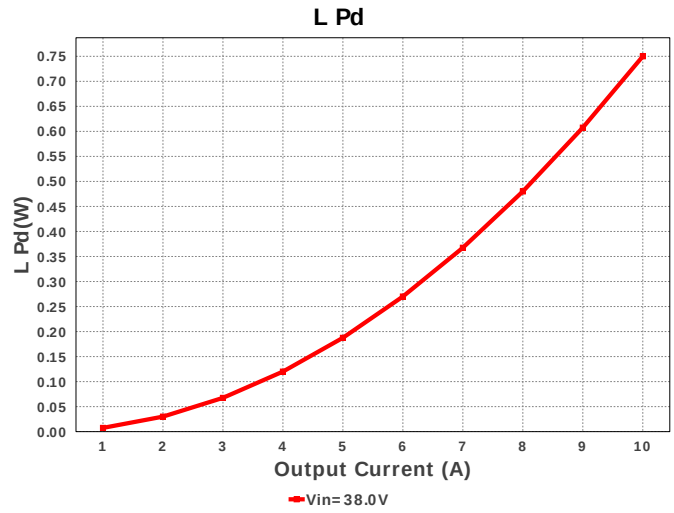
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
9.	Cvcc	Taiyo Yuden	EMK212B7105KG-T Series= X7R	Cap= 1.0 uF VDC= 16.0 V IRMS= 0.0 A	1	$0.02	 0805 7 mm²
10.	D1	NXP Semiconductor	PMEG6010CEH,115	VF@Io= 570.0 mV VRRM= 60.0 V	1	$0.04	 SOD-123F 12 mm²
11.	L1	Bourns	PM2120-8R2M-RC	L= 8.2 µH DCR= 6.0 mOhm	1	$1.33	 PM2120 890 mm²
12.	M1	Texas Instruments	CSD18532Q5B	VdsMax= 60.0 V IdsMax= 100.0 Amps	1	$1.14	 TRANS_NexFET_Q5B 58 mm²
13.	M2	Texas Instruments	CSD19531Q5A	VdsMax= 100.0 V IdsMax= 16.0 Amps	1	$1.01	 TRANS_NexFET_Q5A 55 mm²
14.	Rcomp	Panasonic	ERJ-6ENF1072V Series= ERJ-6E	Res= 10.7 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm²
15.	Renable	Panasonic	ERJ-6ENF1004V Series= ERJ-6E	Res= 1000.0 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm²
16.	Rfbb	Panasonic	ERJ-6ENF1371V Series= ERJ-6E	Res= 1.37 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm²
17.	Rfbt	Panasonic	ERJ-6ENF3922V Series= ERJ-6E	Res= 39.2 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm²
18.	Rramp	Panasonic	ERJ-6ENF6982V Series= ERJ-6E	Res= 69.8 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm²
19.	Rsense	Rohm	PMR25HZPFV1L00 Series= PMR25	Res= 1.0 mOhm Power= 1.0 W Tolerance= 1.0%	1	$0.18	 1210 15 mm²
20.	Rt	Panasonic	ERJ-6ENF5762V Series= ERJ-6E	Res= 57.6 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm²
21.	Ruv1	Panasonic	ERJ-6ENF1741V Series= ERJ-6E	Res= 1.74 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm²
22.	Ruv2	Panasonic	ERJ-6ENF4122V Series= ERJ-6E	Res= 41.2 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm²
23.	U1	Texas Instruments	LM25116MHX/NOPB	Switcher	1	$1.70	 MXA20A 71 mm²

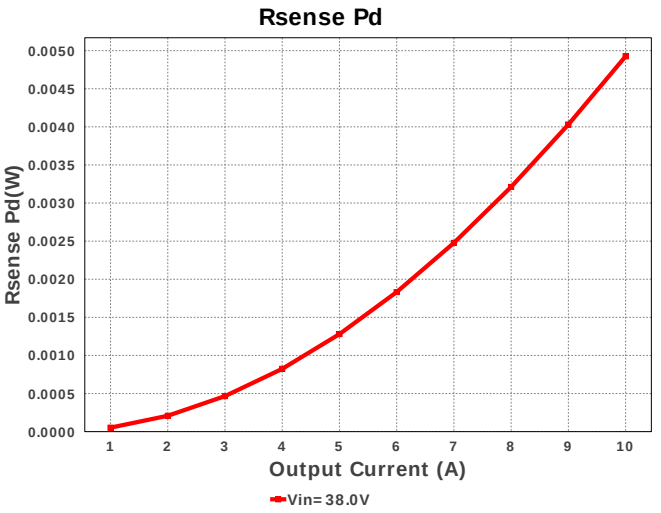


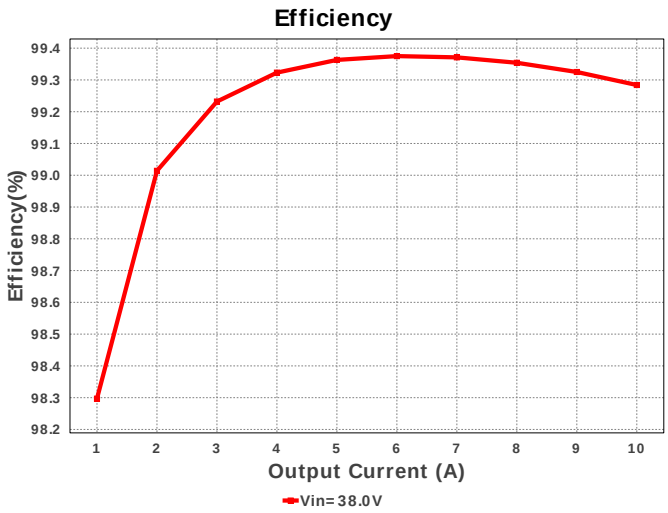


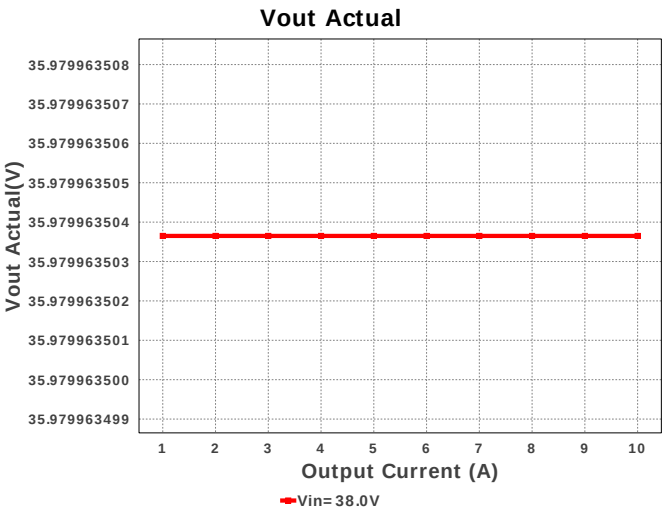


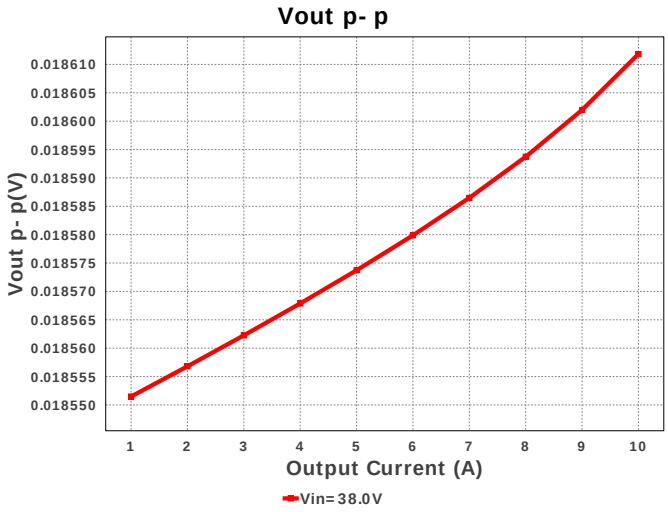


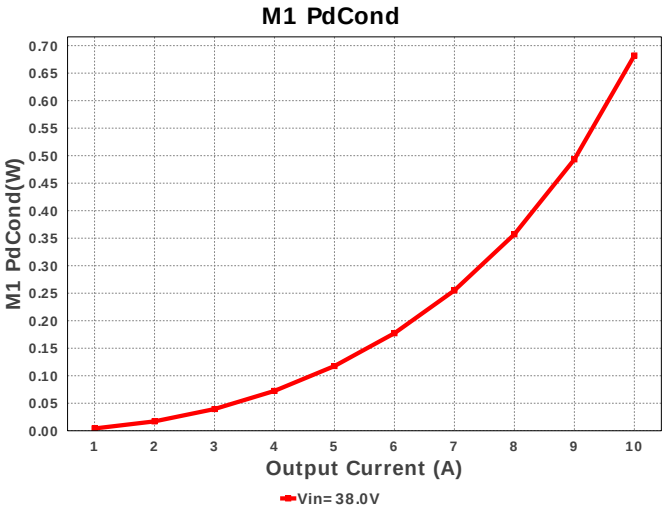


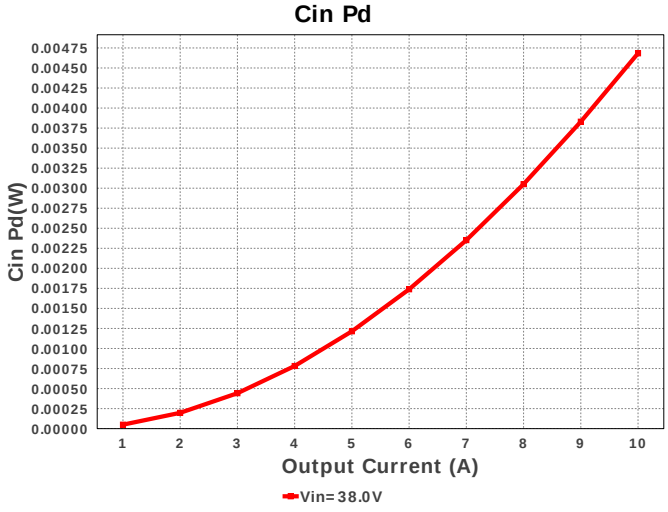


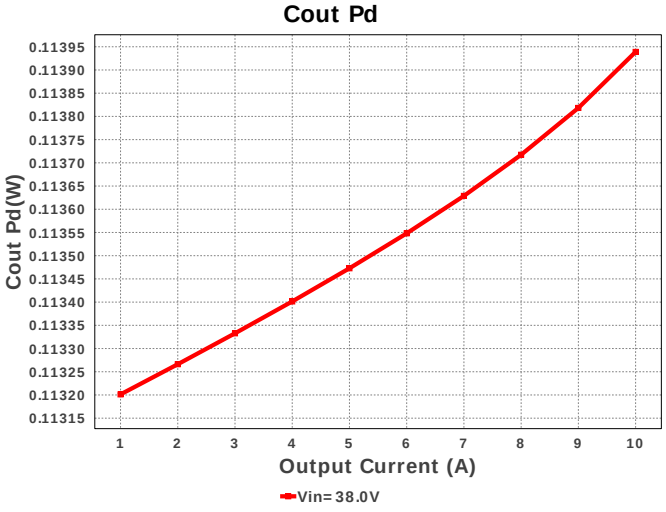


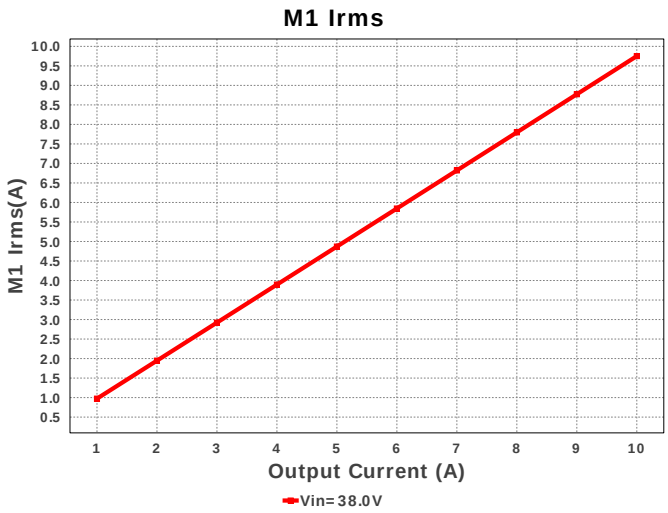


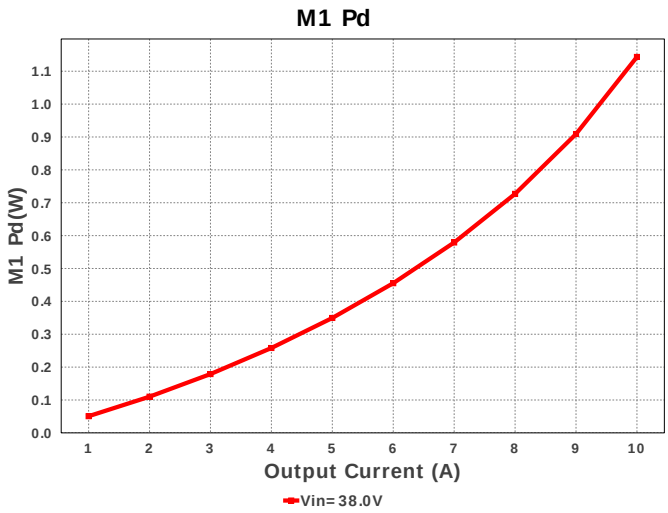


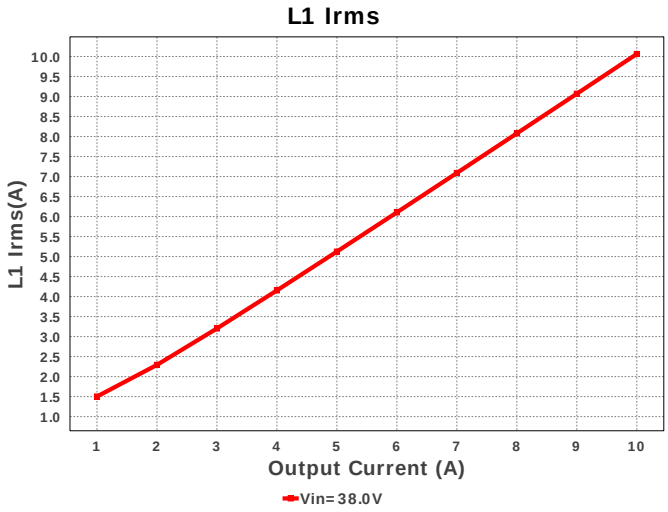


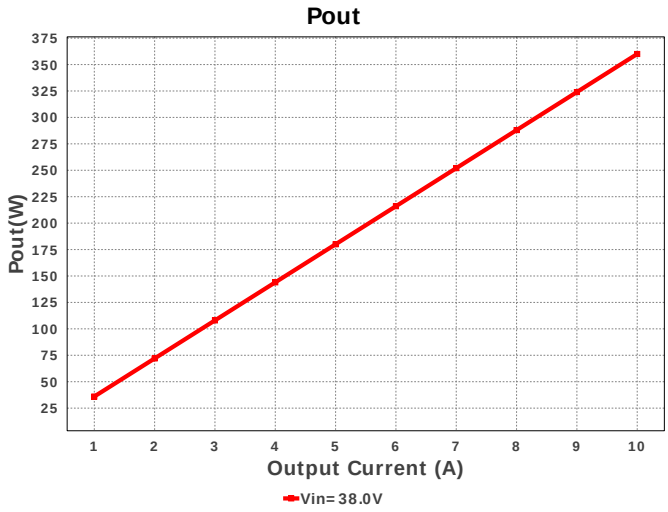


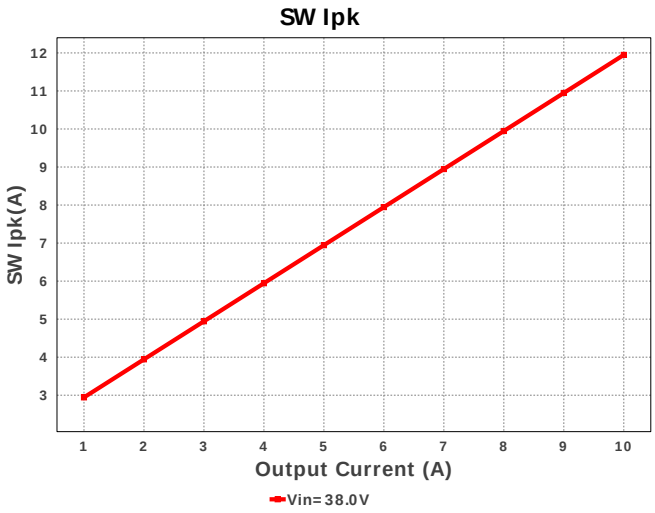


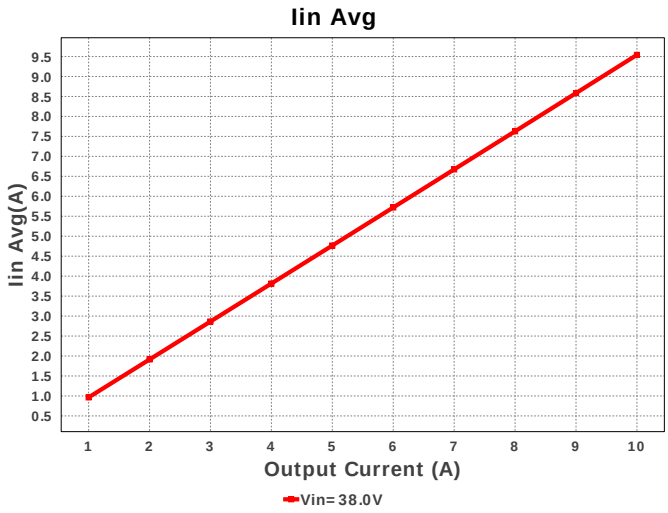


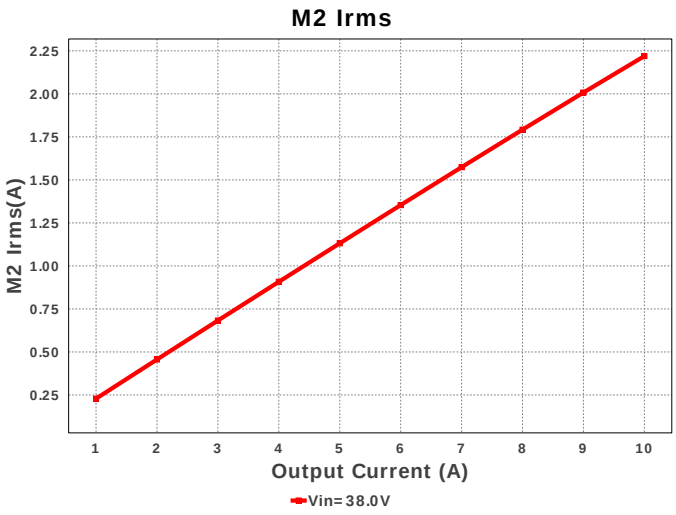


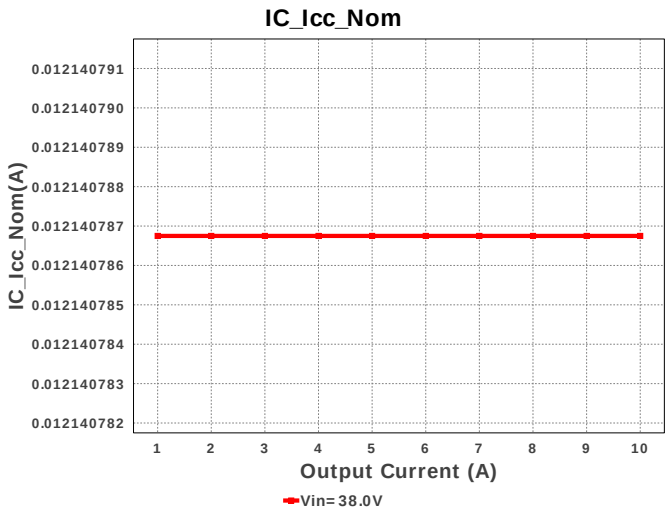


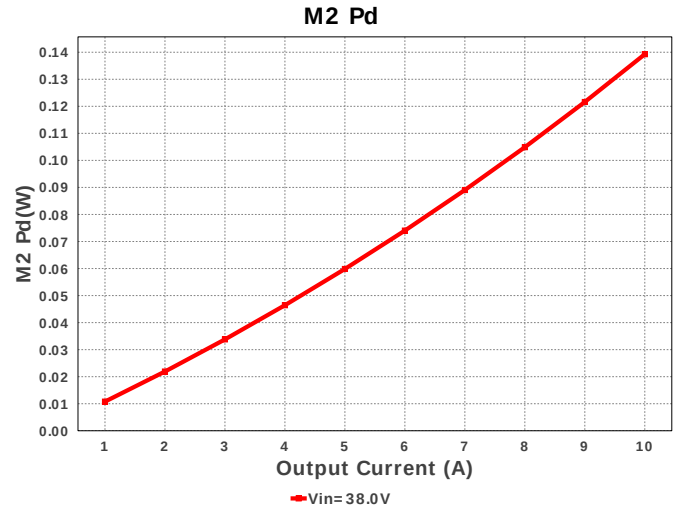


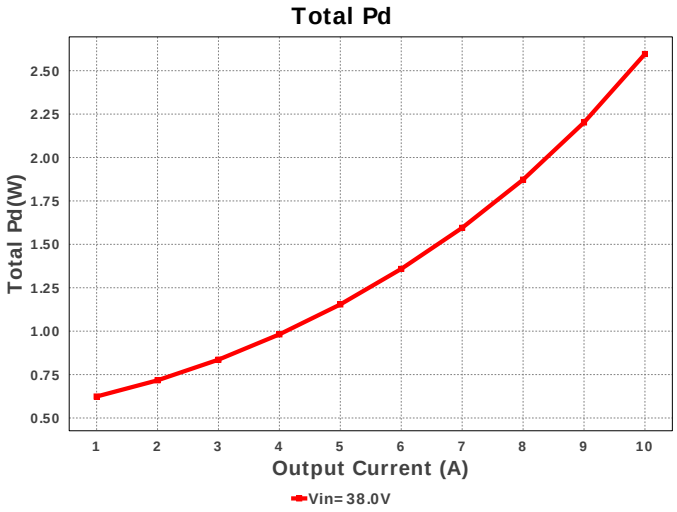


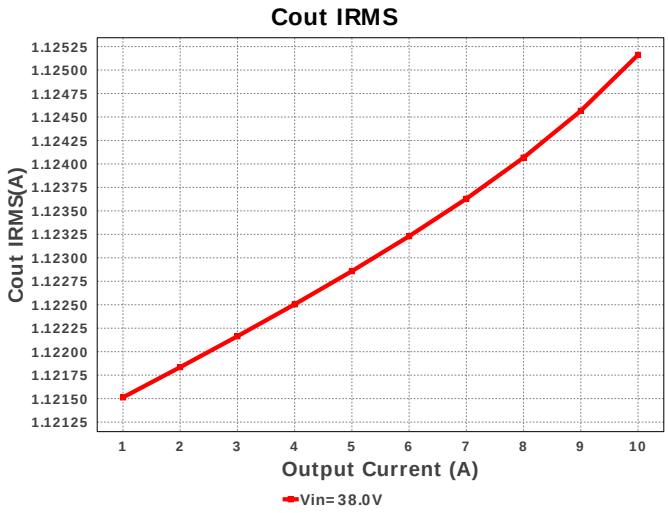


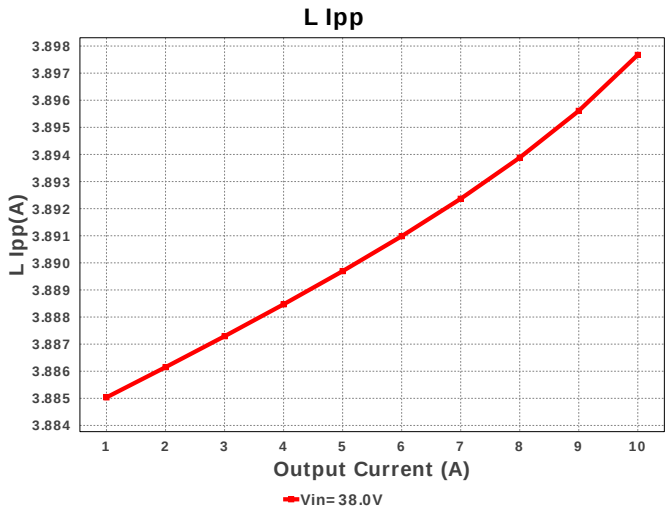


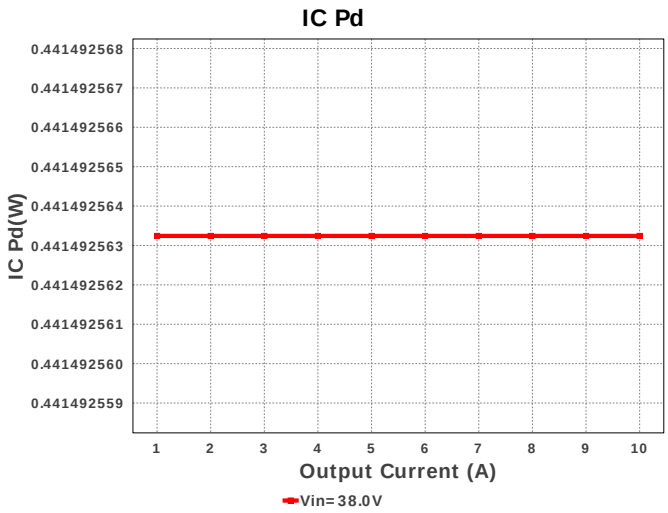


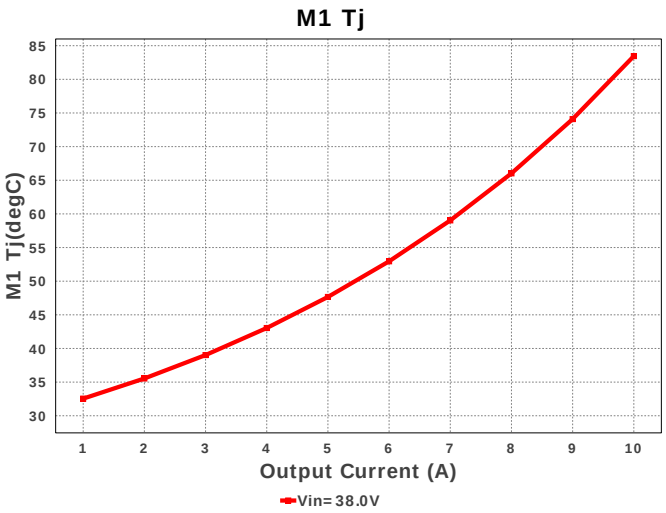


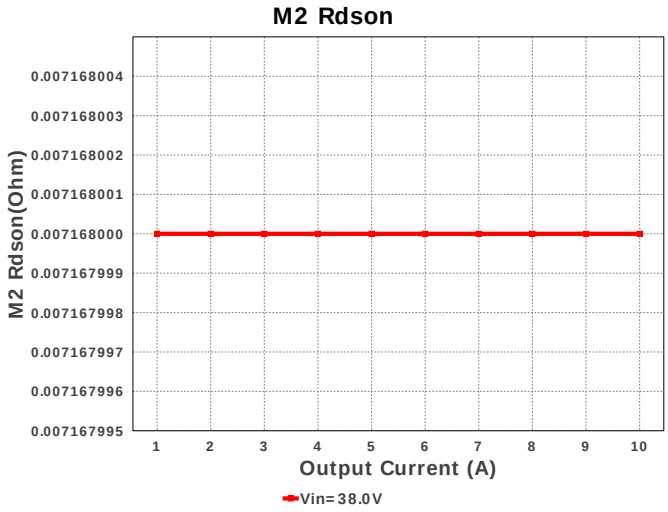


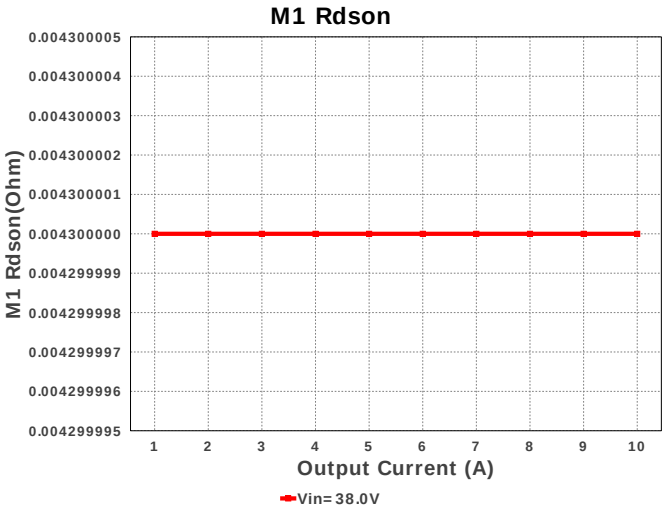


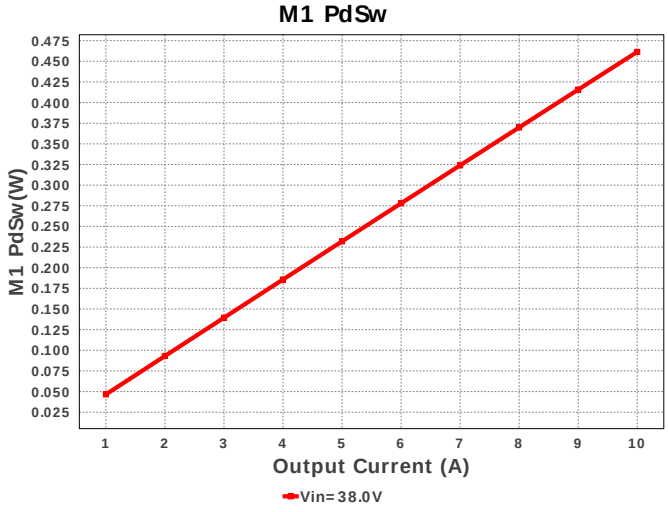


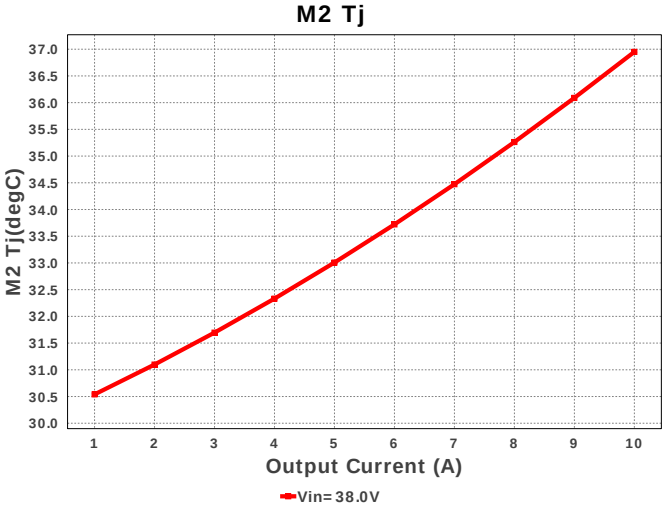


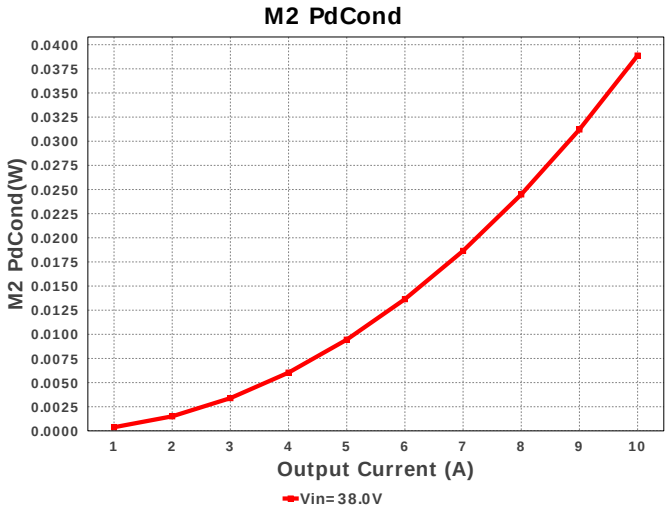












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	2.164 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	1.125 A	Current	Output capacitor RMS ripple current
3.	Iin Avg	9.543 A	Current	Average input current
4.	L Ipp	3.898 A	Current	Peak-to-peak inductor ripple current
5.	L1 Irms	10.063 A	Current	Inductor ripple current
6.	M1 Irms	9.751 A	Current	MOSFET RMS ripple current
7.	M2 Irms	2.219 A	Current	MOSFET RMS ripple current
8.	SW Ipk	11.949 A	Current	Peak switch current
9.	BOM Count	24	General	Total Design BOM count
10.	FootPrint	1.581 k mm^2	General	Total Foot Print Area of BOM components
11.	Frequency	59.494 kHz	General	Switching frequency
12.	IC Tolerance	16.0 mV	General	IC Feedback Tolerance
13.	M1 Rdson	4.3 mOhm	General	Drain-Source On-resistance
14.	M2 Rdson	7.168 mOhm	General	Drain-Source On-resistance
15.	Pout	360.0 W	General	Total output power
16.	Total BOM	$0.0	General	Total BOM Cost
17.	Low Freq Gain	93.268 dB	Op_Point	Gain at 10Hz
18.	Vout Actual	35.98 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
19.	Cross Freq	8.798 kHz	Op_point	Bode plot crossover frequency
20.	Duty Cycle	95.075 %	Op_point	Duty cycle
21.	Efficiency	99.278 %	Op_point	Steady state efficiency
22.	Gain Marg	-223.141 dB	Op_point	Bode Plot Gain Margin
23.	IC Tj	47.66 degC	Op_point	IC junction temperature
24.	IOUT_OP	10.0 A	Op_point	Iout operating point
25.	M1 Tj	84.75 degC	Op_point	M1 MOSFET junction temperature
26.	M2 Tj	36.864 degC	Op_point	M2 MOSFET junction temperature
27.	Phase Marg	111.854 deg	Op_point	Bode Plot Phase Margin
28.	VIN_OP	38.0 V	Op_point	Vin operating point
29.	Vout p-p	18.612 mV	Op_point	Peak-to-peak output ripple voltage
30.	Cin Pd	4.683 mW	Power	Input capacitor power dissipation
31.	Cout Pd	113.94 mW	Power	Output capacitor power dissipation
32.	IC Pd	441.493 mW	Power	IC power dissipation
33.	L Pd	750.0 mW	Power	Inductor power dissipation
34.	M1 Pd	1.166 W	Power	M1 MOSFET total power dissipation
35.	M1 PdCond	682.981 mW	Power	M1 MOSFET conduction losses
36.	M1 PdSw	482.942 mW	Power	M1 MOSFET switching losses
37.	M2 Pd	137.574 mW	Power	M2 MOSFET total power dissipation
38.	M2 PdCond	38.885 mW	Power	M2 MOSFET conduction losses
39.	M2 PdSw	98.689 mW	Power	M2 MOSFET switching losses
40.	Rsense Pd	4.925 mW	Power	Rsense Power Dissipation
41.	Total Pd	2.618 W	Power	Total Power Dissipation
42.	IC_Icc_Nom	12.141 mA		IC Icc gate driver current
43.	Vout Tolerance	3.295 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	10.0	Maximum Output Current
2.	VinMax	38.0	Maximum input voltage
3.	VinMin	38.0	Minimum input voltage
4.	Vout	36.0	Output Voltage

#	Name	Value	Description
5.	base_pn	LM25116	Texas Instruments Base Part Number
6.	source	DC	Input Source Type
7.	ta	30.0	Ambient temperature

Design Assistance

1. LM25116 Product Folder : http://www.ti.com/product/LM25116 : contains the data sheet and other resources.