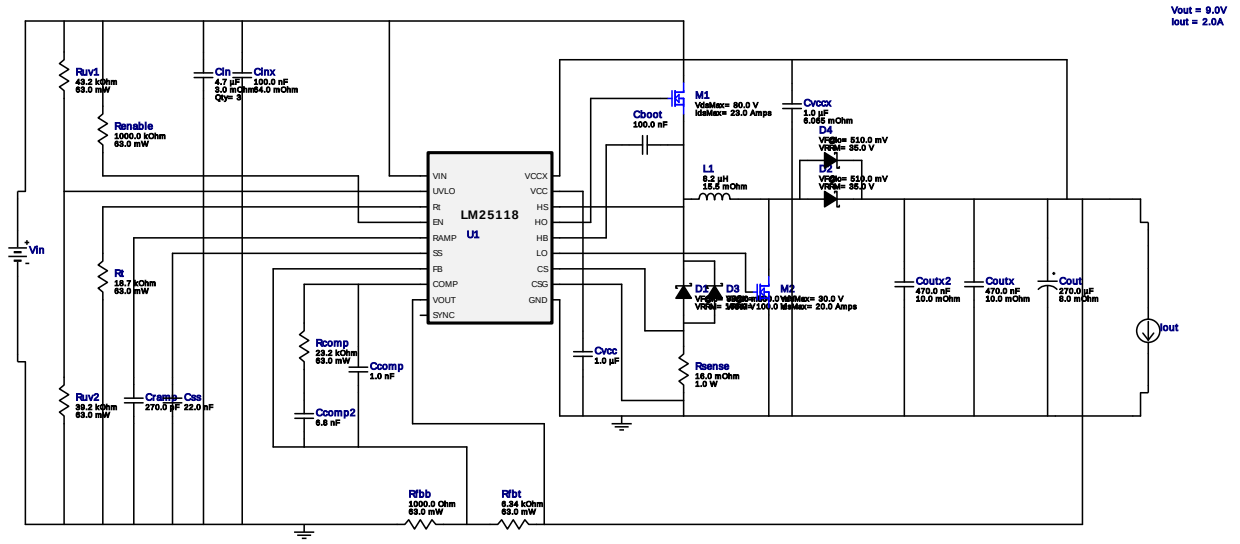
WEBENCH® Design Report

VinMin = 3.0V
VinMax = 40.0V
Vout = 9.0V
Iout = 2.0A

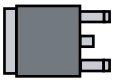
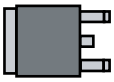
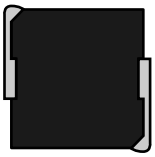
Device = LM25118MH/NOPB
Topology = Buck_Boost
Created = 8/2/16 12:04:03 AM
BOM Cost = $5.80
BOM Count = 30
Total Pd = 2.71W

Design : 4704250/26 LM25118MH/NOPB
LM25118MH/NOPB 3.0V-40.0V to 9.00V @ 2.0A

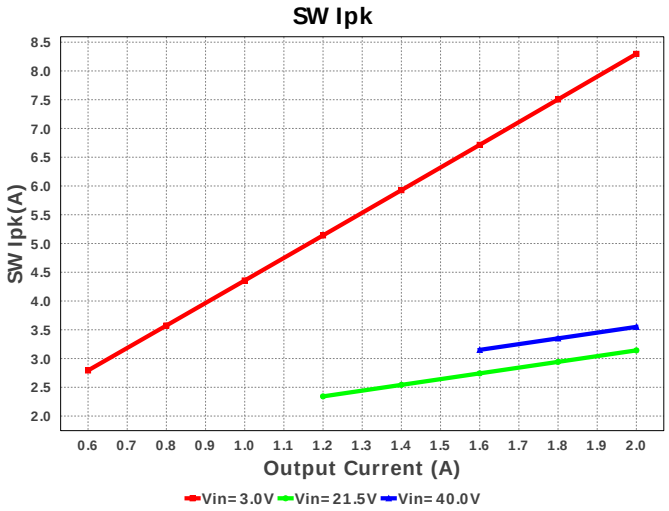


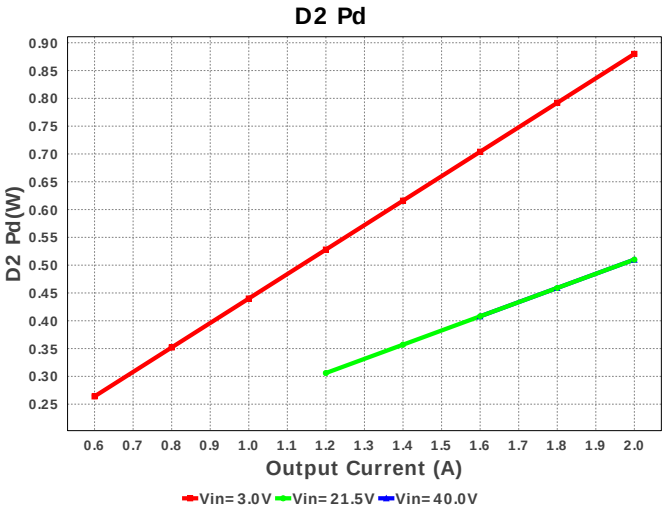
Electrical BOM

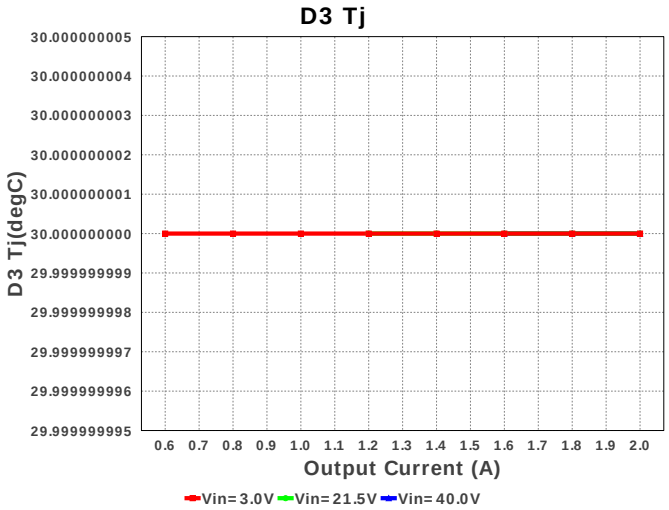
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	MuRata	GRM21BR71E104KA01L Series= X7R	Cap= 100.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
2.	Ccomp	Samsung Electro-Mechanics	CL21C102JBCNFNC Series= C0G/NP0	Cap= 1.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
3.	Ccomp2	Yageo America	CC0805KRX7R9BB682 Series= X7R	Cap= 6.8 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
4.	Cin	MuRata	GRM31CR71H475KA12L Series= X7R	Cap= 4.7 uF ESR= 3.0 mOhm VDC= 50.0 V IRMS= 4.98 A	3	$0.07	1206 11 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	16SVPG270M Series= ?	Cap= 270.0 uF ESR= 8.0 mOhm VDC= 16.0 V IRMS= 5.8 A	1	$0.70	CAPSMT_62_C10 74 mm²
7.	Coutx	MuRata	GRM188R71C474KA88D Series= X7R	Cap= 470.0 nF ESR= 10.0 mOhm VDC= 16.0 V IRMS= 0.0 A	1	$0.02	0603 5 mm²
8.	Coutx2	MuRata	GRM188R71C474KA88D Series= X7R	Cap= 470.0 nF ESR= 10.0 mOhm VDC= 16.0 V IRMS= 0.0 A	1	$0.02	0603 5 mm²
9.	Cramp	Yageo America	CC0805KRX7R9BB271 Series= X7R	Cap= 270.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²

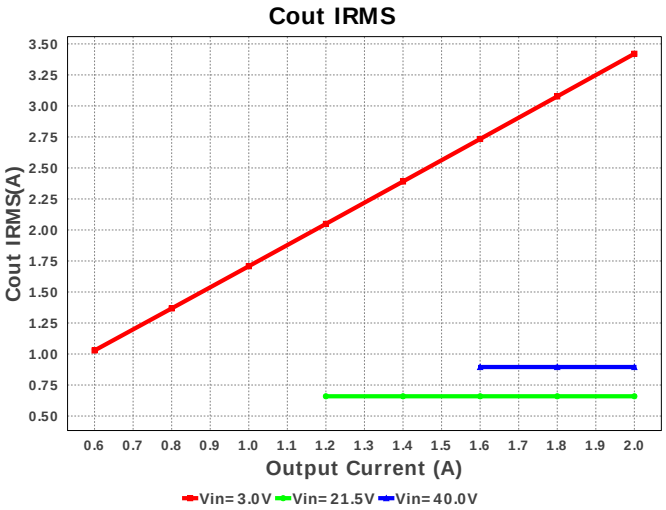
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	Css	Yageo America	CC0805KRX7R9BB223 Series= X7R	Cap= 22.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	 0805 7 mm²
11.	Cvcc	Taiyo Yuden	EMK212B7105KG-T Series= X7R	Cap= 1.0 uF VDC= 16.0 V IRMS= 0.0 A	1	$0.02	 0805 7 mm²
12.	Cvccx	MuRata	GRM188R61A105KA61D Series= X5R	Cap= 1.0 uF ESR= 6.065 mOhm VDC= 10.0 V IRMS= 1.30675 A	1	$0.01	 0603 5 mm²
13.	D1	Vishay-Semiconductor	SS10PH10-M3/86A	VF@Io= 880.0 mV VRRM= 100.0 V	1	$0.29	 TO-277A 56 mm²
14.	D2	ON Semiconductor	MBRD835LT4G	VF@Io= 510.0 mV VRRM= 35.0 V	1	$0.25	 DPAK 102 mm²
15.	D3	Vishay-Semiconductor	SS10PH10-M3/86A	VF@Io= 880.0 mV VRRM= 100.0 V	1	$0.29	 TO-277A 56 mm²
16.	D4	ON Semiconductor	MBRD835LT4G	VF@Io= 510.0 mV VRRM= 35.0 V	1	$0.25	 DPAK 102 mm²
17.	L1	Bourns	SRP1270-8R2M	L= 8.2 µH DCR= 15.5 mOhm	1	$0.60	 SRP1270 246 mm²
18.	M1	Infineon Technologies	BSC340N08NS3 G	VdsMax= 80.0 V IdsMax= 23.0 Amps	1	$0.19	 PG-TDSON-8 55 mm²
19.	M2	Texas Instruments	CSD17579Q3A	VdsMax= 30.0 V IdsMax= 20.0 Amps	1	$0.23	 TRANS_NexFET_Q3A 18 mm²
20.	Rcomp	Vishay-Dale	CRCW040223K2FKED Series= CRCW..e3	Res= 23.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
21.	Renable	Vishay-Dale	CRCW04021M00FKED Series= CRCW..e3	Res= 1000.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
22.	Rfbb	Vishay-Dale	CRCW04021K00FKED Series= CRCW..e3	Res= 1000.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
23.	Rfbt	Vishay-Dale	CRCW04026K34FKED Series= CRCW..e3	Res= 6.34 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
24.	Rsense	Susumu Co Ltd	PRL1632-R016-F-T1 Series= PRL1632	Res= 16.0 mOhm Power= 1.0 W Tolerance= 1.0%	1	$0.19	 0612 11 mm²
25.	Rt	Vishay-Dale	CRCW040218K7FKED Series= CRCW..e3	Res= 18.7 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
26.	Ruv1	Vishay-Dale	CRCW040243K2FKED Series= CRCW..e3	Res= 43.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²

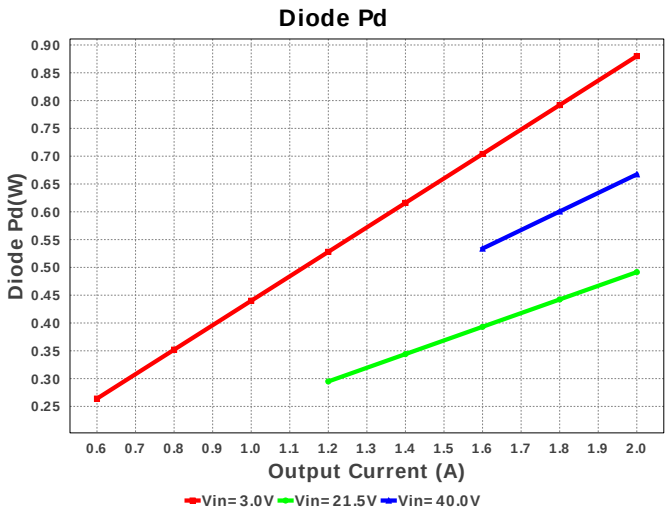
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
27.	Ruv2	Vishay-Dale	CRCW040239K2FKED Series= CRCW..e3	Res= 39.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
28.	U1	Texas Instruments	LM25118MH/NOPB	Switcher	1	$2.40	MXA20A 71 mm^2

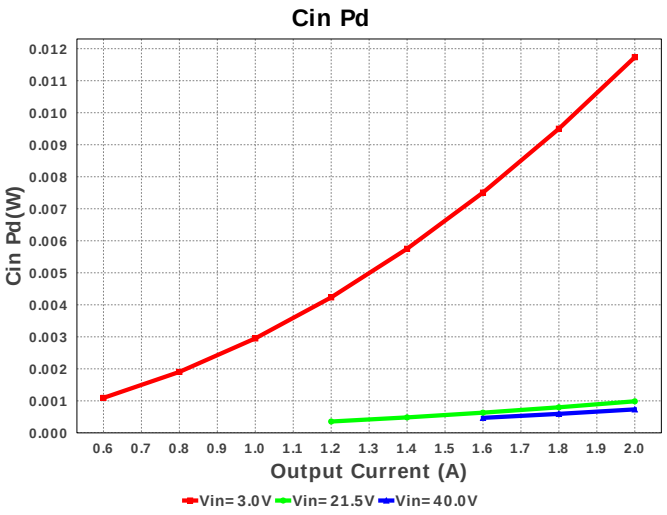


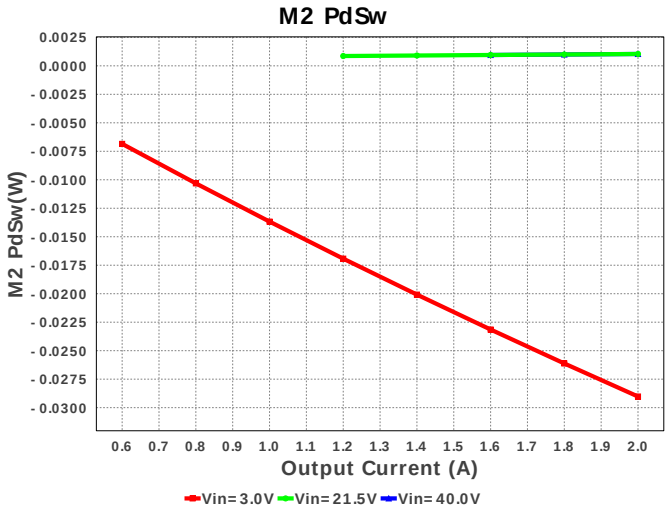


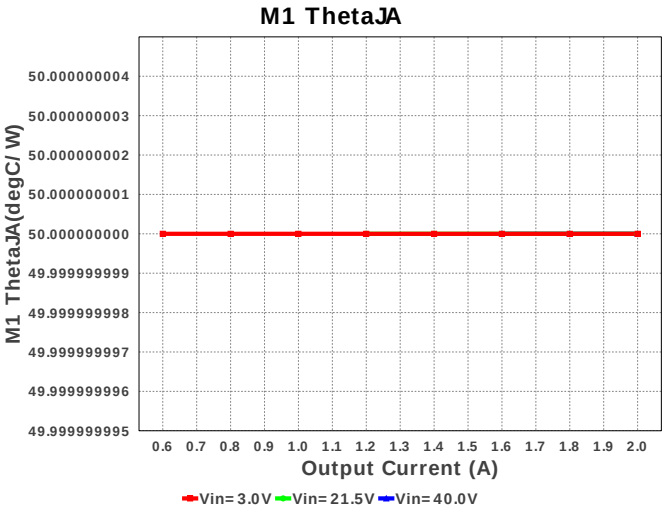


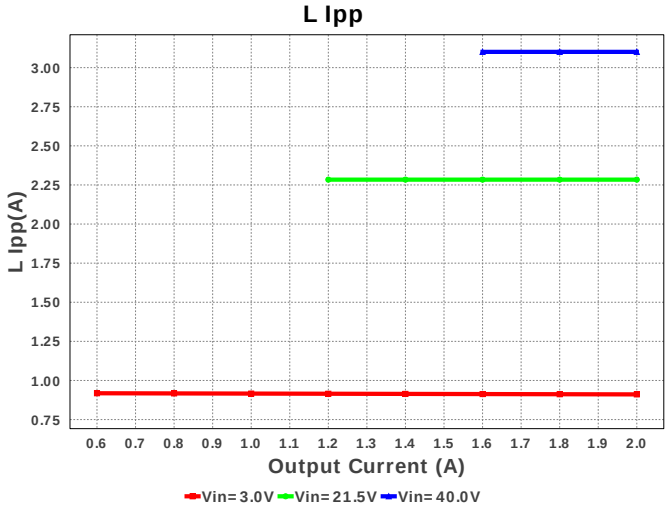


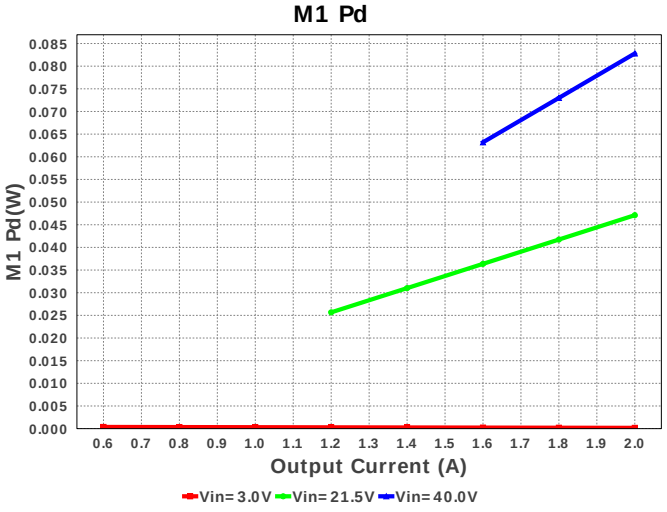


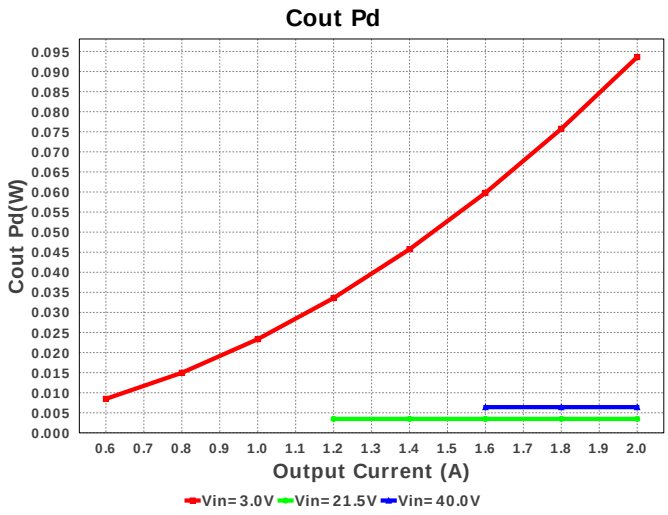


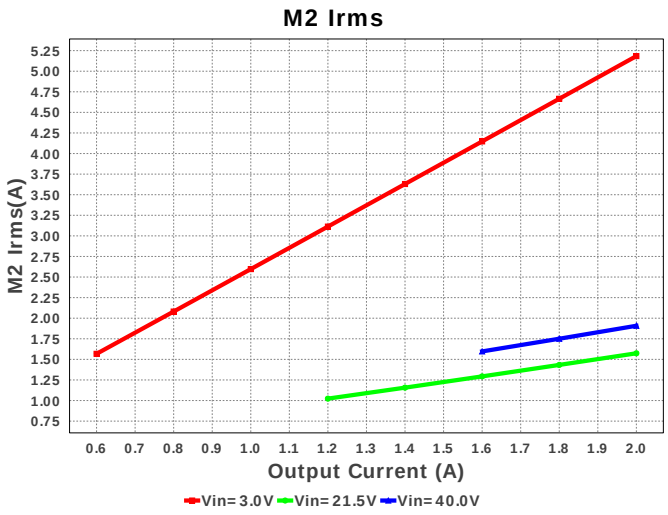


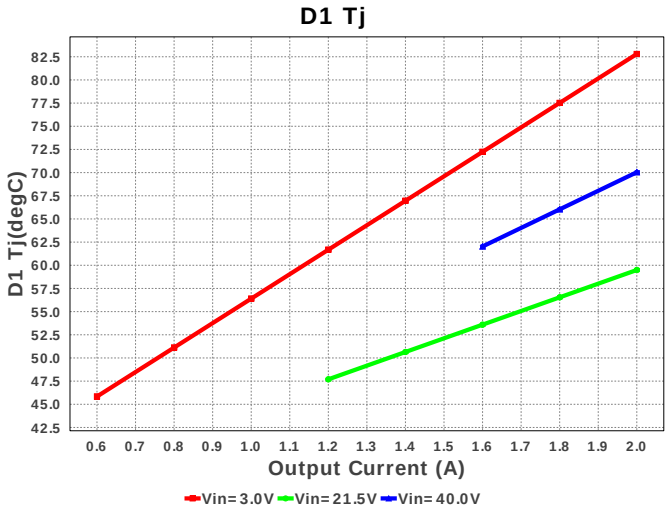


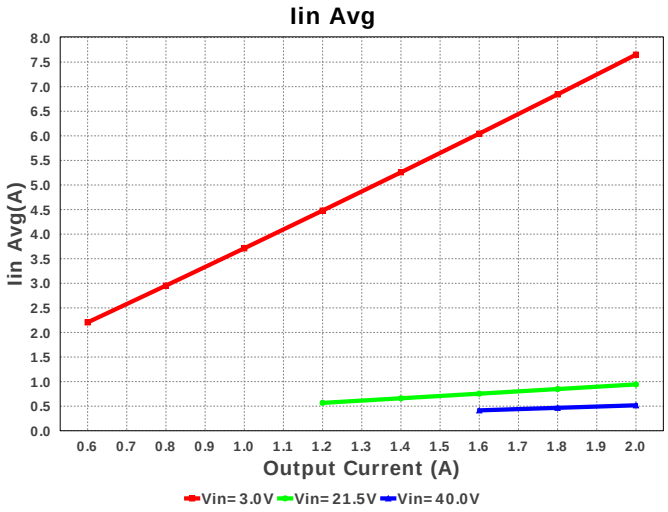


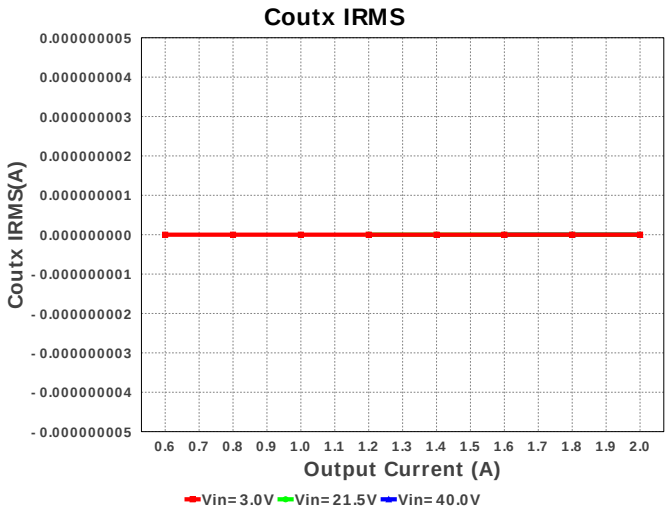


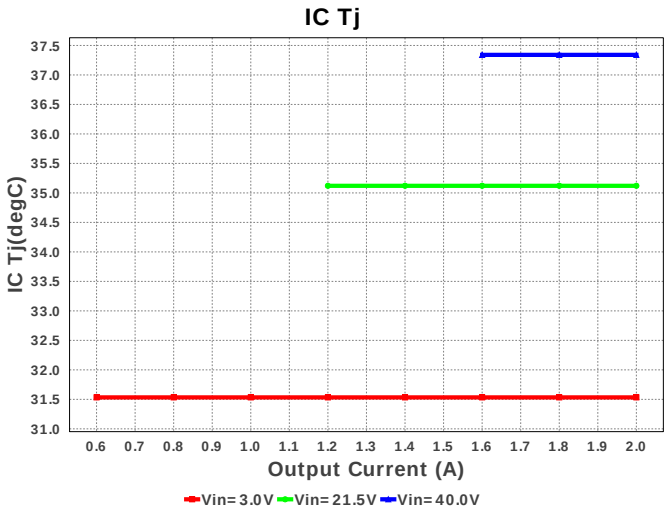


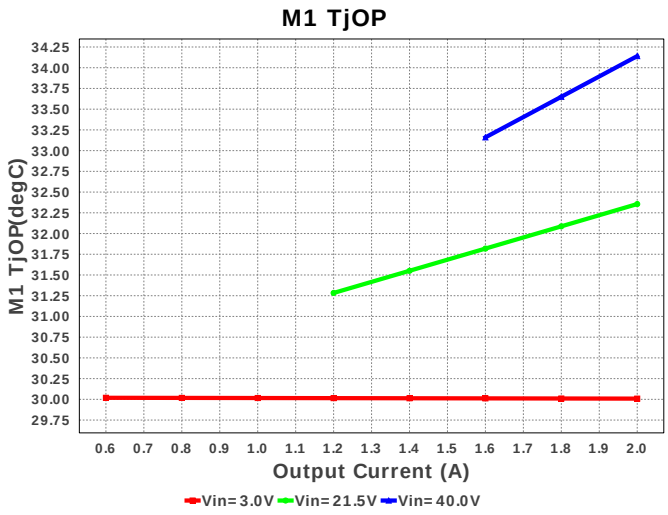


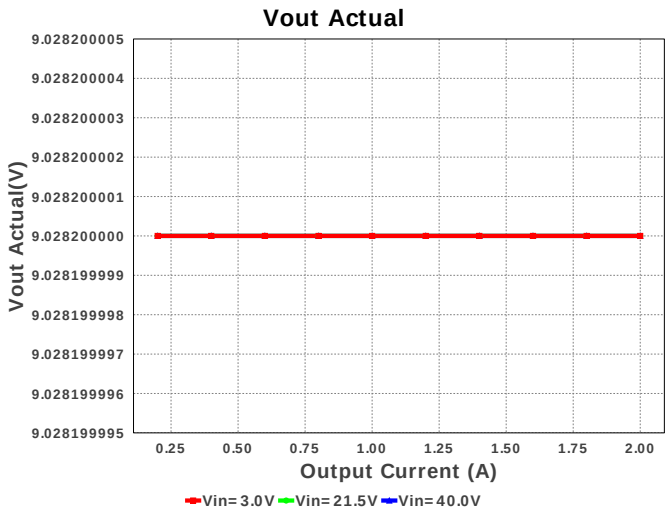


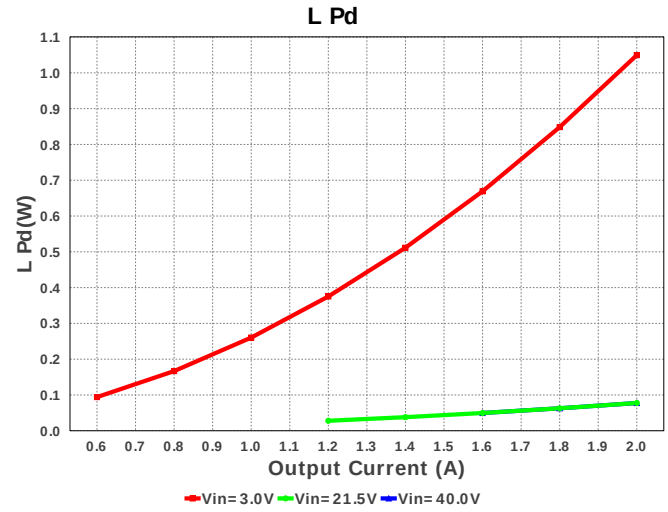


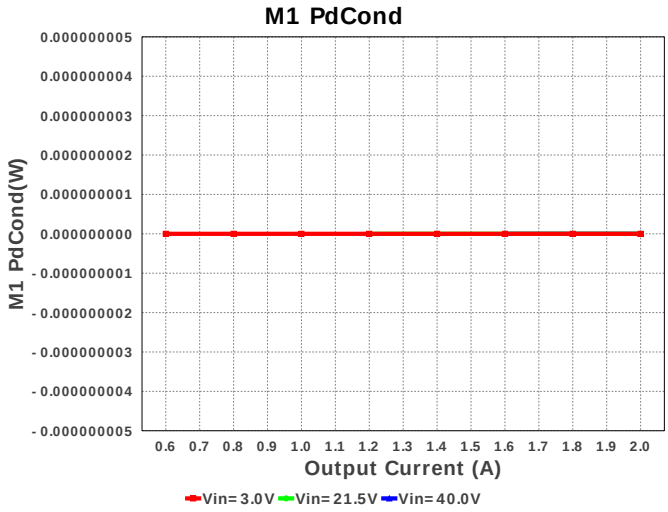


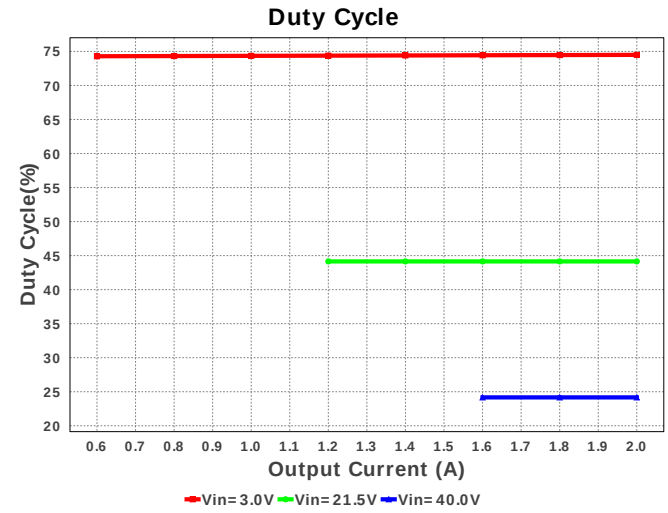


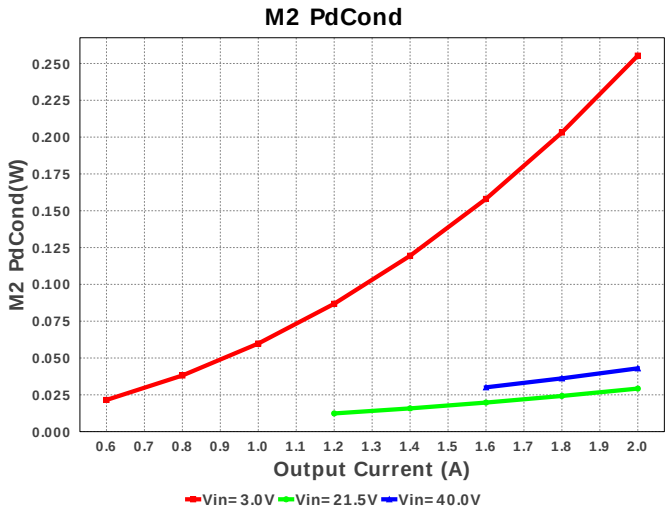


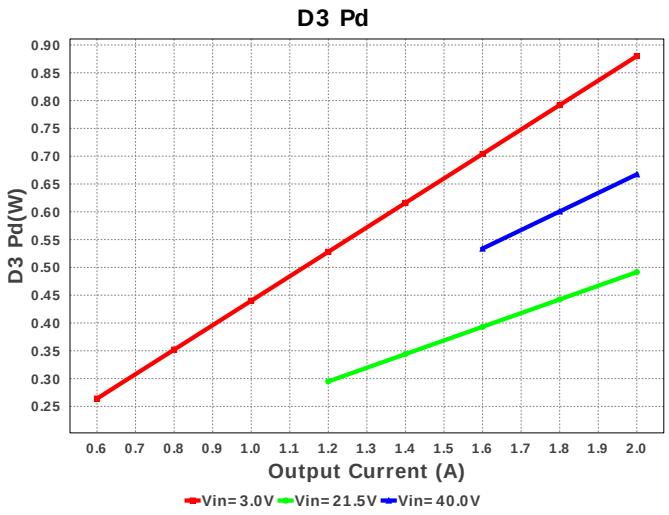


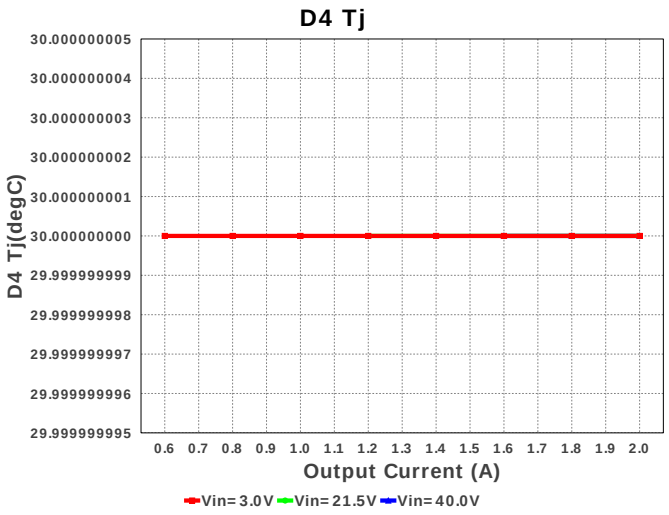


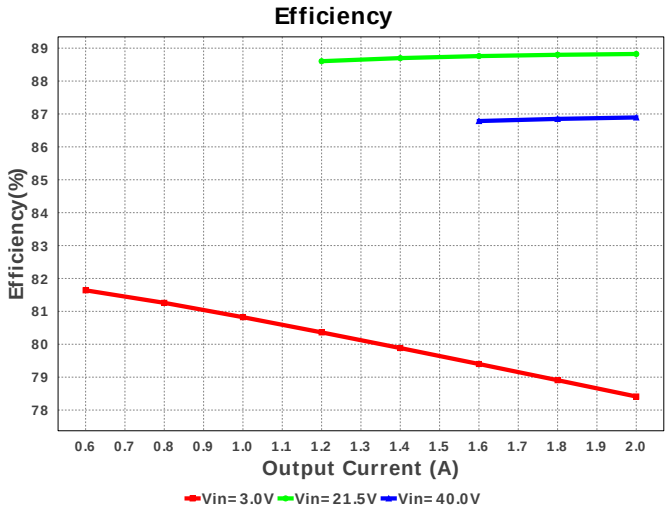


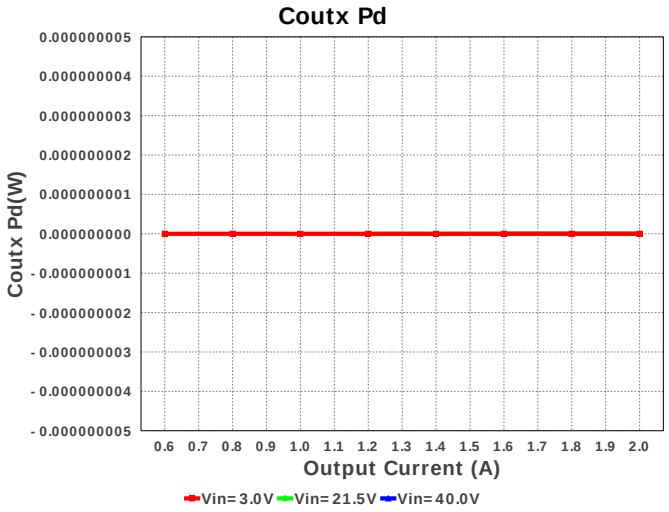


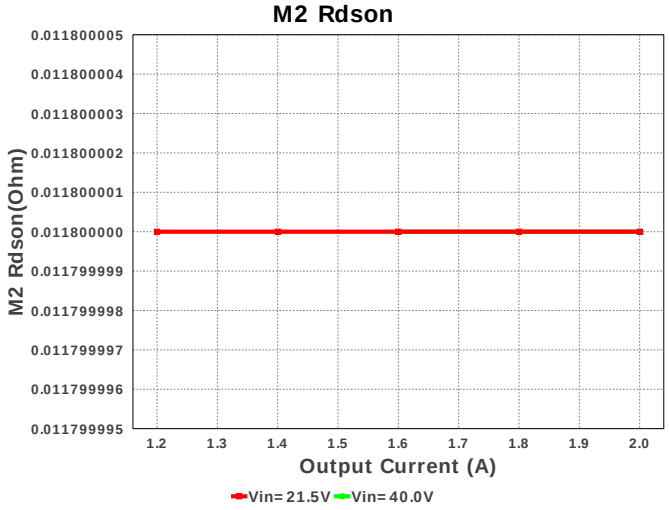


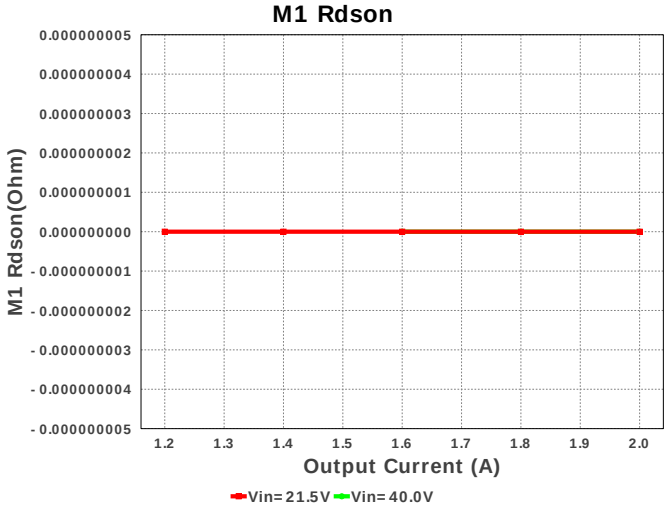


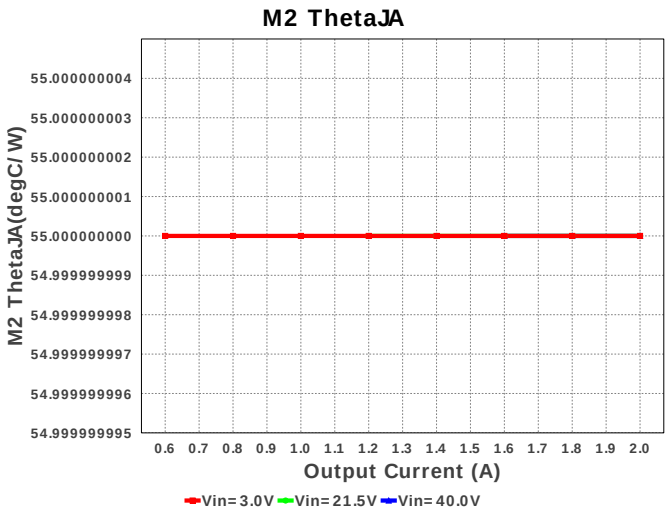


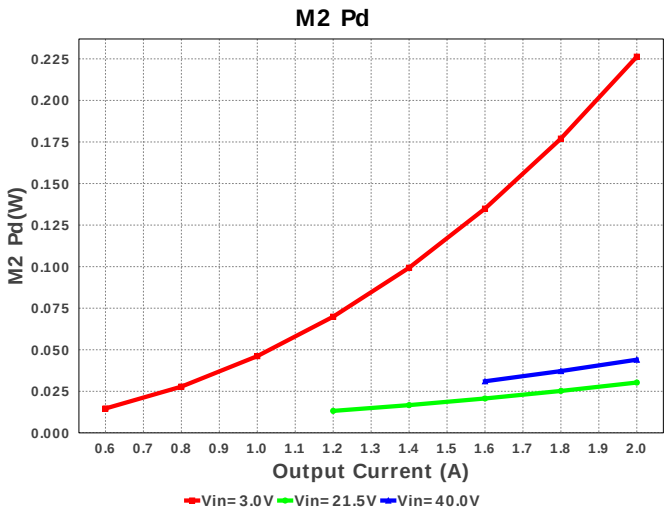


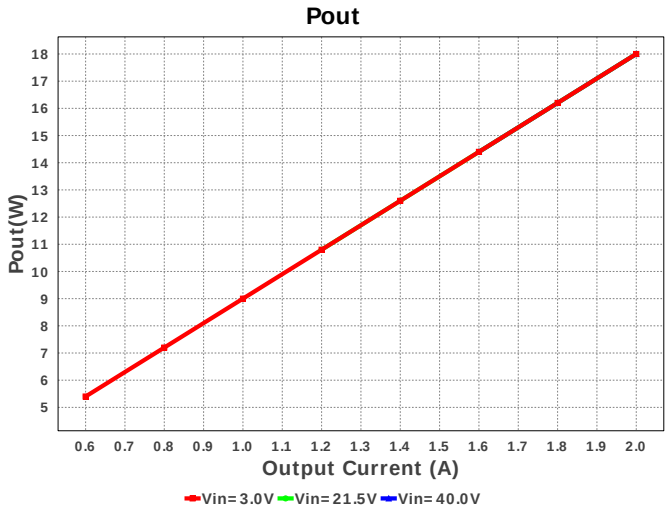


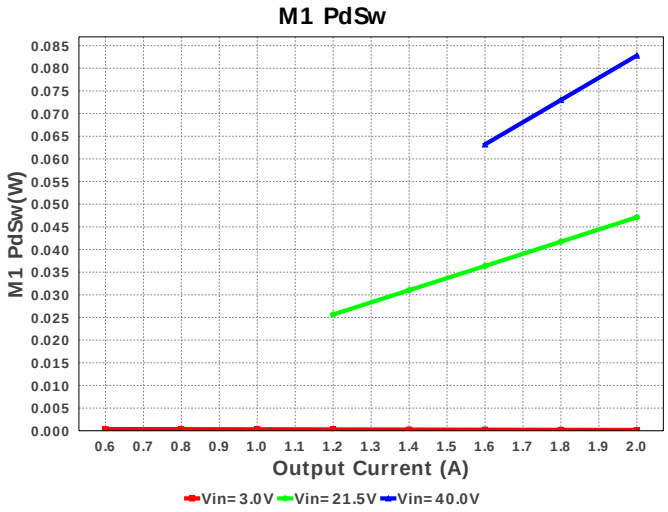


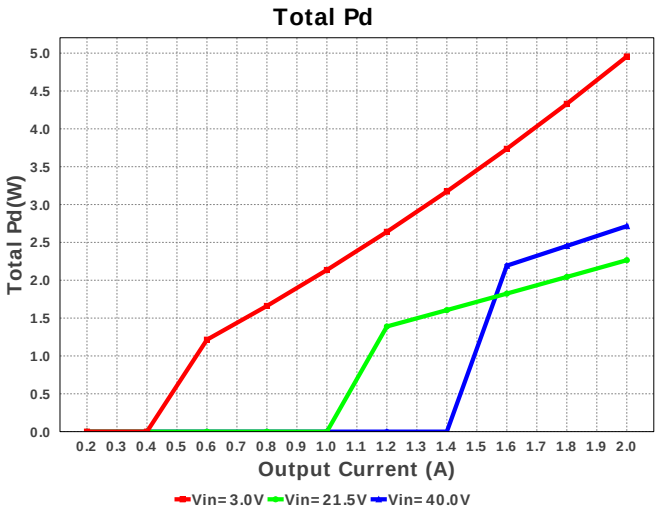


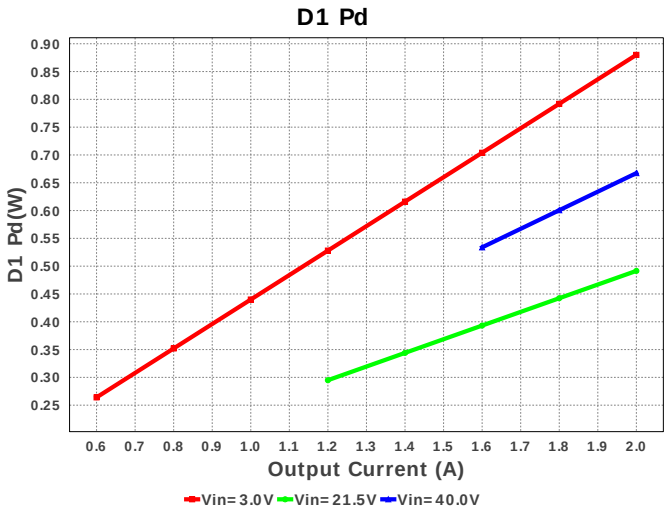


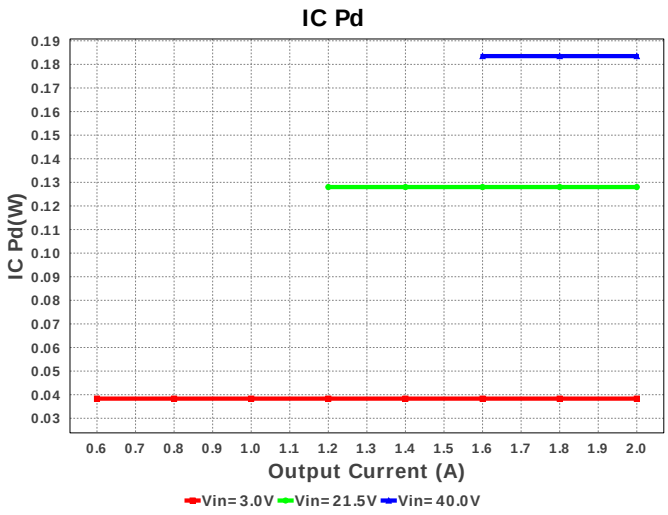


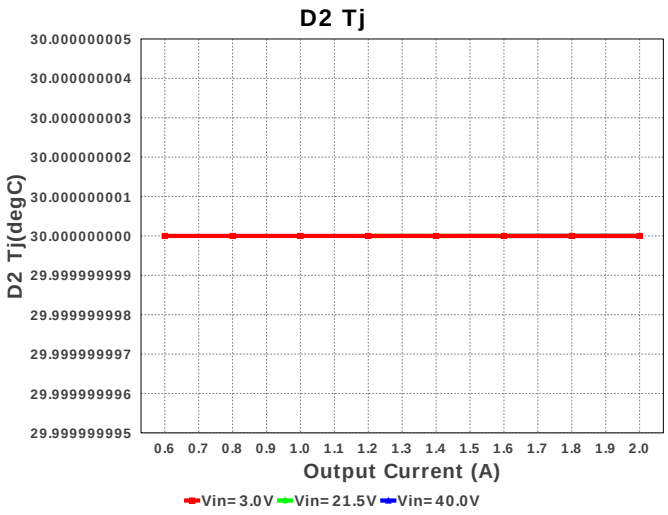


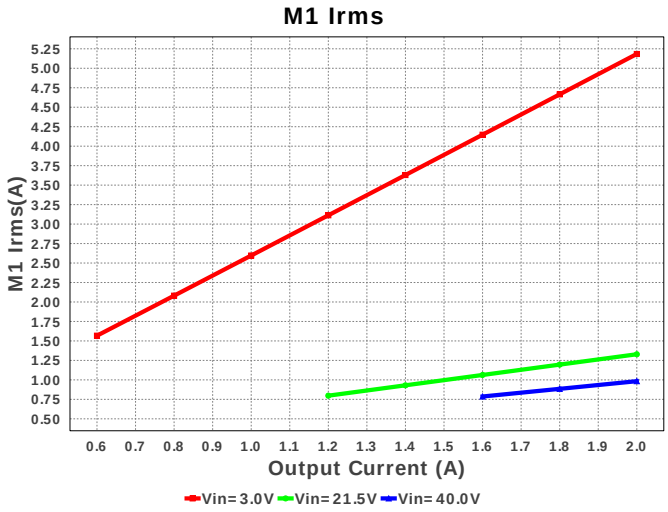


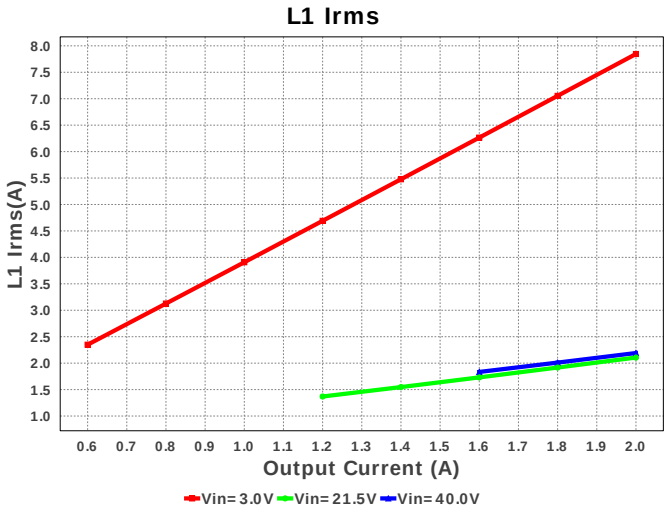


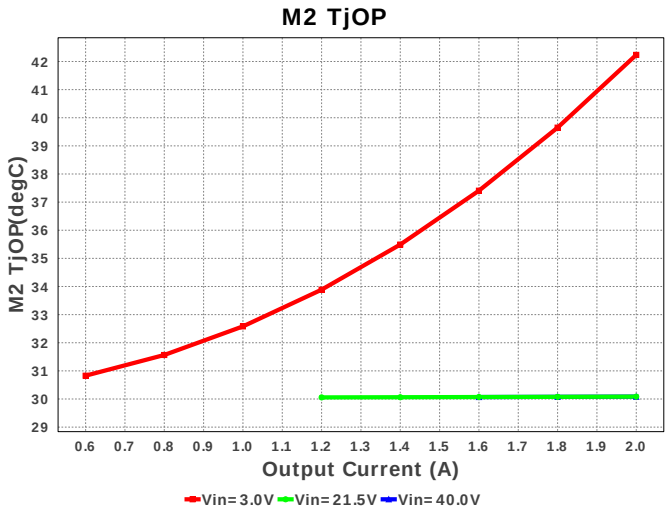


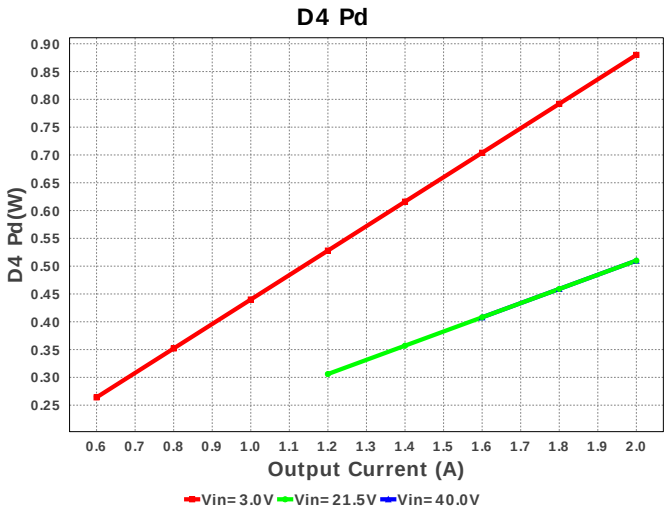


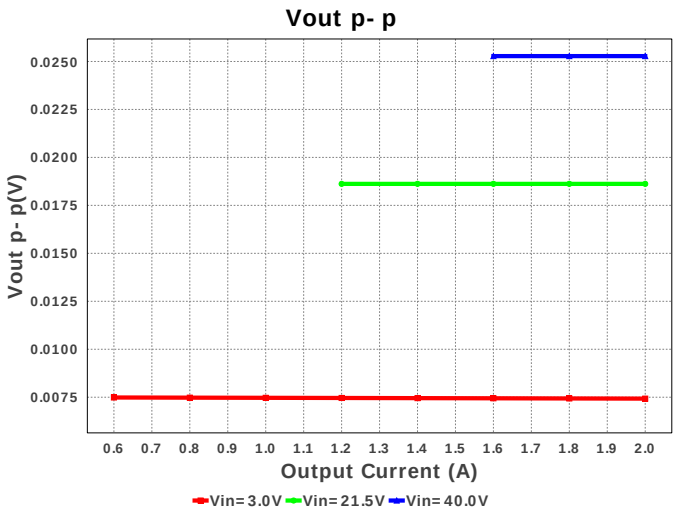


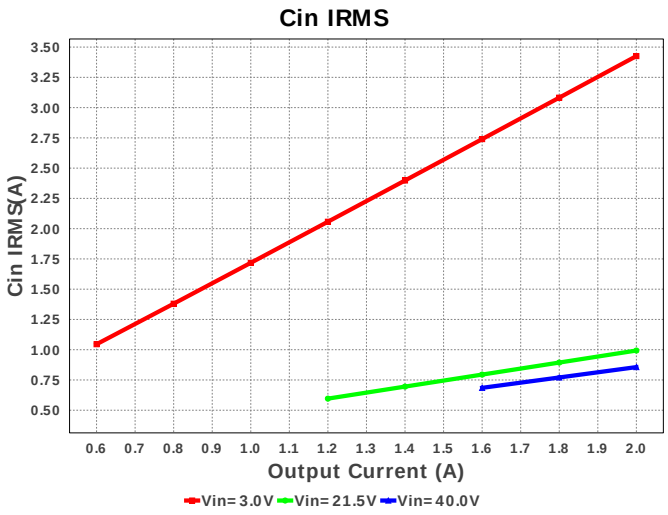


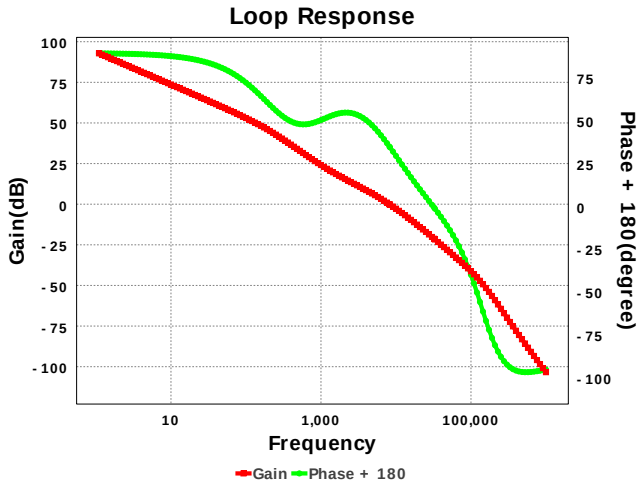












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	856.206 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	895.124 mA	Current	Output capacitor RMS ripple current
3.	Coutx IRMS	0.0 A	Current	Output capacitor_x RMS ripple current
4.	Iin Avg	517.87 mA	Current	Average input current
5.	L Ipp	3.101 A	Current	Peak-to-peak inductor ripple current
6.	L1 Irms	2.191 A	Current	Inductor ripple current
7.	M1 Irms	983.225 mA	Current	MOSFET RMS ripple current
8.	M2 Irms	1.908 A	Current	MOSFET RMS ripple current
9.	SW Ipk	3.55 A	Current	Peak switch current
10.	BOM Count	30	General	Total Design BOM count
11.	FootPrint	907.0 mm^2	General	Total Foot Print Area of BOM components
12.	Frequency	294.659 kHz	General	Switching frequency
13.	IC Tolerance	18.0 mV	General	IC Feedback Tolerance
14.	M1 Rdson	0.0 Ohm	General	Drain-Source On-resistance
15.	M1 ThetaJA	50.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
16.	M2 Rdson	11.8 mOhm	General	Drain-Source On-resistance
17.	M2 ThetaJA	55.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
18.	Pout	18.0 W	General	Total output power
19.	Total BOM	$5.8	General	Total BOM Cost
20.	D1 Tj	70.039 degC	Op_Point	D1 junction temperature
21.	D1 Tj	70.039 degC	Op_Point	D1 junction temperature
22.	D2 Tj	70.8 degC	Op_Point	D2 junction temperature
23.	D3 Tj	70.039 degC	Op_Point	D3 junction temperature
24.	D4 Tj	70.8 degC	Op_Point	D4 junction temperature
25.	Low Freq Gain	92.851 dB	Op_Point	Gain at 10Hz
26.	Vout Actual	9.028 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
27.	Vout OP	9.0 V	Op_Point	Operational Output Voltage
28.	Cross Freq	8.186 kHz	Op_point	Bode plot crossover frequency
29.	Duty Cycle	24.168 %	Op_point	Duty cycle
30.	Efficiency	86.894 %	Op_point	Steady state efficiency
31.	Gain Marg	-21.241 dB	Op_point	Bode Plot Gain Margin

#	Name	Value	Category	Description
32.	IC Tj	37.34 degC	Op_point	IC junction temperature
33.	ICThetaJA	40.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
34.	IOUT_OP	2.0 A	Op_point	Iout operating point
35.	M1 TjOP	34.14 degC	Op_point	MOSFET junction temperature
36.	M2 TjOP	92.741 degC	Op_point	MOSFET junction temperature
37.	Phase Marg	35.473 deg	Op_point	Bode Plot Phase Margin
38.	VIN_OP	40.0 V	Op_point	Vin operating point
39.	Vout p-p	25.28 mV	Op_point	Peak-to-peak output ripple voltage
40.	Cin Pd	733.089 µW	Power	Input capacitor power dissipation
41.	Cout Pd	6.41 mW	Power	Output capacitor power dissipation
42.	Coutx Pd	0.0 W	Power	Output capacitor_x power loss
43.	D1 Pd	667.319 mW	Power	Diode power dissipation
44.	D2 Pd	510.0 mW	Power	Diode2 power dissipation
45.	D3 Pd	667.319 mW	Power	Diode3 power dissipation
46.	D4 Pd	510.0 mW	Power	Diode4 power dissipation
47.	Diode Pd	667.319 mW	Power	Diode power dissipation
48.	IC Pd	183.511 mW	Power	IC power dissipation
49.	L Pd	77.5 mW	Power	Inductor power dissipation
50.	M1 Pd	82.803 mW	Power	MOSFET power dissipation
51.	M1 PdCond	0.0 W	Power	M1 MOSFET conduction losses
52.	M1 PdSw	82.803 mW	Power	M1 MOSFET switching losses
53.	M2 Pd	70.229 mW	Power	MOSFET power dissipation
54.	M2 PdCond	54.822 mW	Power	M2 MOSFET conduction losses
55.	M2 PdSw	15.406 mW	Power	M2 MOSFET switching losses
56.	Total Pd	2.715 W	Power	Total Power Dissipation
57.	Vout Tolerance	3.234 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	2.0	Maximum Output Current
2.	VinMax	40.0	Maximum input voltage
3.	VinMin	3.0	Minimum input voltage
4.	Vout	9.0	Output Voltage
5.	base_pn	LM25118	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. The LM25118 is a wide range buck-boost controller which is operable in an ultra wide input range of 3 to 75V. A buck-boost regulator can maintain regulation for input voltages either higher or lower than the output voltage. The challenge is that buck-boost power converters are not as efficient as buck regulators. The LM5118 has been designed as a dual mode controller whereby the power converter acts as a buck regulator while the input voltage is above the output. As the input voltage approaches the output voltage, a gradual transition to the buck-boost mode occurs. This gradual transition between modes eliminates disturbances at the output during transitions.

2. **LM25118** Product Folder : http://www.ti.com/product/LM25118 : contains the data sheet and other resources.