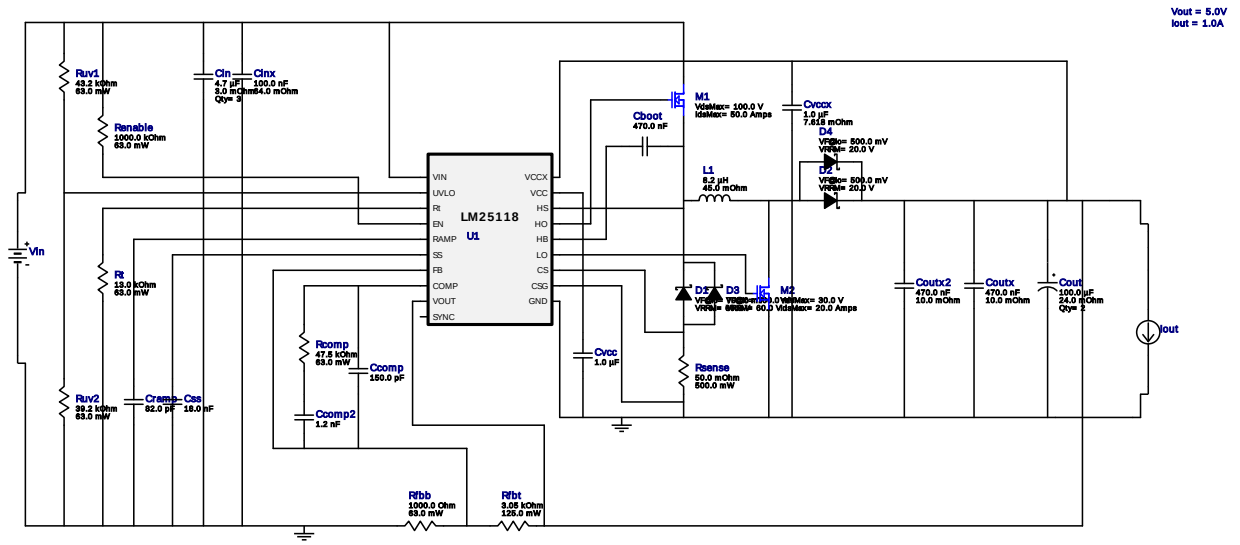
WEBENCH® Design Report

VinMin = 3.0V
VinMax = 40.0V
Vout = 5.0V
Iout = 1.0A

Device = LM25118MH/NOPB
Topology = Buck_Boost
Created = 8/12/16 3:21:17 AM
BOM Cost = $4.96
BOM Count = 31
Total Pd = 1.22W

Design : 1754593/7 LM25118MH/NOPB
LM25118MH/NOPB 3.0V-40.0V to 5.00V @ 1.0A



My Comments

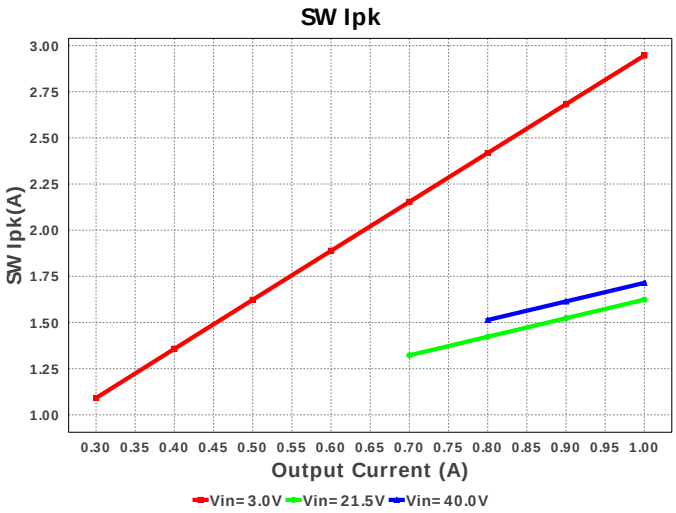
No comments

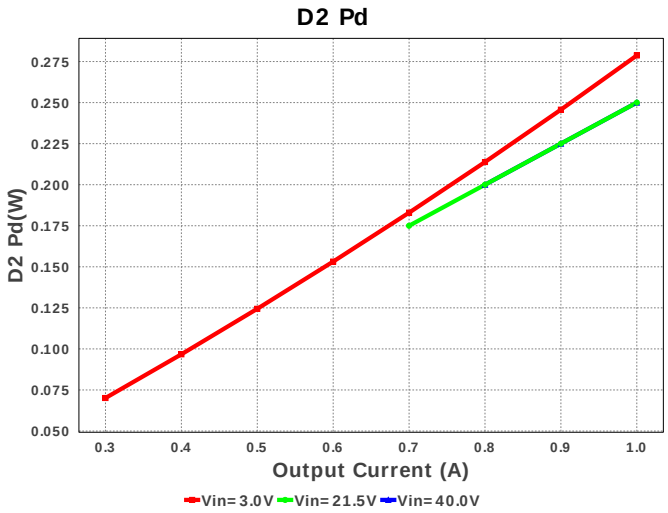
Electrical BOM

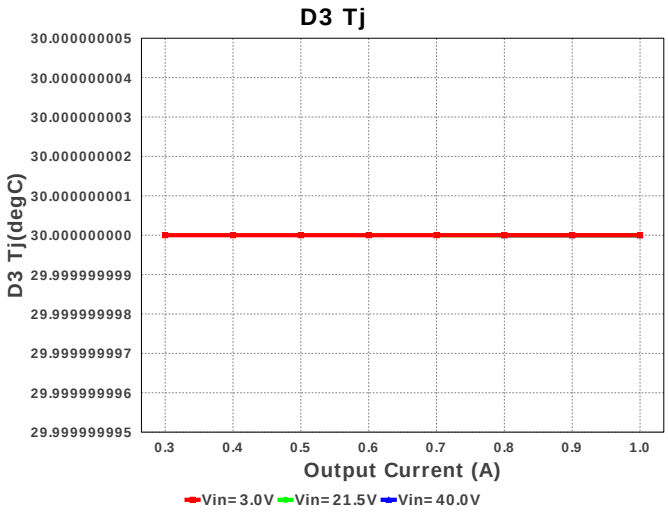
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	MuRata	GRM155C80J474KE19D Series= X6S	Cap= 470.0 nF VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
2.	Ccomp	TDK	C2012C0G1H151J Series= C0G/NP0	Cap= 150.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
3.	Ccomp2	MuRata	GRM033R71C122KA01D Series= X7R	Cap= 1.2 nF VDC= 16.0 V IRMS= 0.0 A	1	$0.01	0201 2 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	Chemi-Con	APXE6R3ARA101ME61G Series= PXE	Cap= 100.0 uF ESR= 24.0 mOhm VDC= 6.3 V IRMS= 2.5 A	2	$0.39	CAPSMT_62_E61 53 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

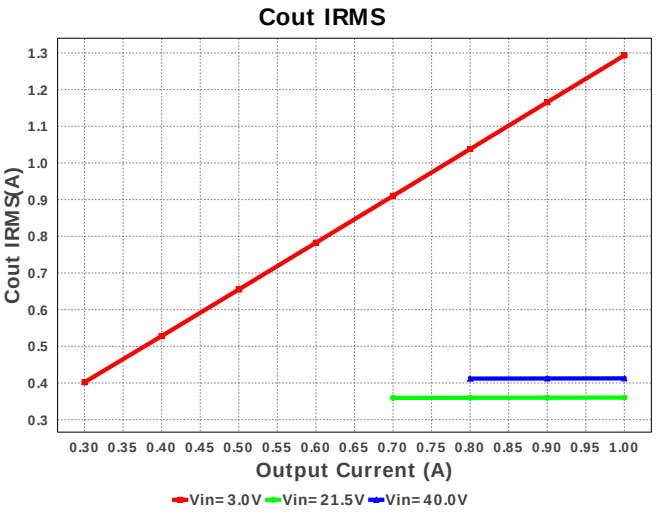
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
9.	Cramp	Yageo America	CC0805JRNPO9BN820 Series= C0G/NP0	Cap= 82.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	 0805 7 mm²
10.	Css	Yageo America	CC0805KRX7R9BB183 Series= X7R	Cap= 18.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	 0805 7 mm²
11.	Cvcc	Kemet	C0603C105K8PACTU Series= X5R	Cap= 1.0 uF VDC= 10.0 V IRMS= 0.0 A	1	$0.01	 0603 5 mm²
12.	Cvccx	TDK	C1005X5R0J105M Series= X5R	Cap= 1.0 uF ESR= 7.618 mOhm VDC= 6.3 V IRMS= 0.0 A	1	$0.01	 0402 3 mm²
13.	D1	Diodes Inc.	B260A-13-F	VF@Io= 700.0 mV VRRM= 60.0 V	1	$0.09	 SMA 37 mm²
14.	D2	Diodes Inc.	B220-13-F	VF@Io= 500.0 mV VRRM= 20.0 V	1	$0.08	 SMB 44 mm²
15.	D3	Diodes Inc.	B260A-13-F	VF@Io= 700.0 mV VRRM= 60.0 V	1	$0.09	 SMA 37 mm²
16.	D4	Diodes Inc.	B220-13-F	VF@Io= 500.0 mV VRRM= 20.0 V	1	$0.08	 SMB 44 mm²
17.	L1	Bourns	SRN8040-8R2Y	L= 8.2 µH DCR= 45.0 mOhm	1	$0.22	 SRN8040 100 mm²
18.	M1	Texas Instruments	CSD19537Q3	VdsMax= 100.0 V IdsMax= 50.0 Amps	1	$0.50	 TRANS_NexFET_Q3 18 mm²
19.	M2	Texas Instruments	CSD17579Q3A	VdsMax= 30.0 V IdsMax= 20.0 Amps	1	$0.19	 TRANS_NexFET_Q3A 18 mm²
20.	Rcomp	Vishay-Dale	CRCW040247K5FKED Series= CRCW..e3	Res= 47.5 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	Yageo America	RT0805BRD073K05L Series= ?	Res= 3.05 kOhm Power= 125.0 mW Tolerance= 0.1%	1	$0.04	 0805 7 mm²
24.	Rsense	Stackpole Electronics Inc	CSR1206FK50L0 Series= ?	Res= 50.0 mOhm Power= 500.0 mW Tolerance= 1.0%	1	$0.10	 1206 11 mm²
25.	Rt	Vishay-Dale	CRCW040213K0FKED Series= CRCW..e3	Res= 13.0 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
27.	Ruv2	Vishay-Dale	CRCW040239K2FKED Series= CRCW..e3	Res= 39.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²

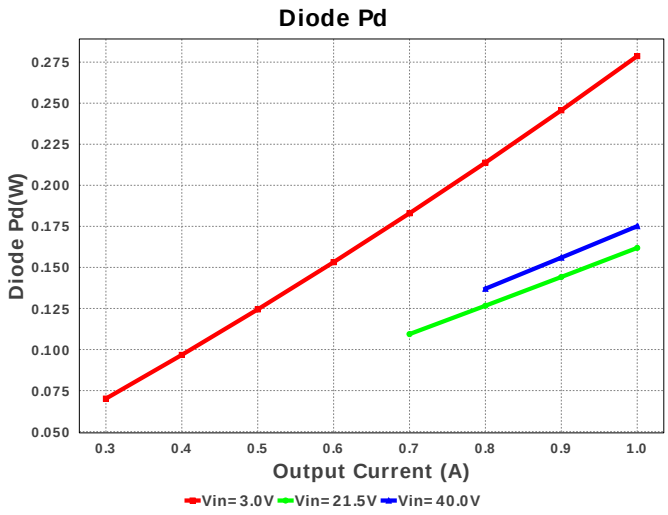
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
28.	U1	Texas Instruments	LM25118MH/NOPB	Switcher	1	$2.40	 MXA20A 71 mm²

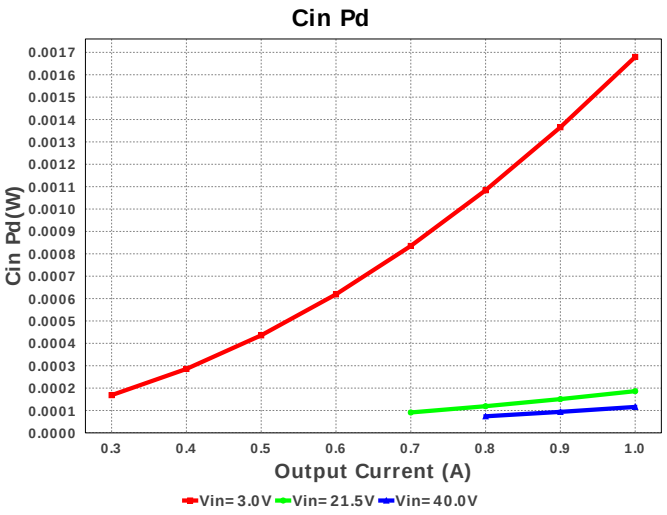


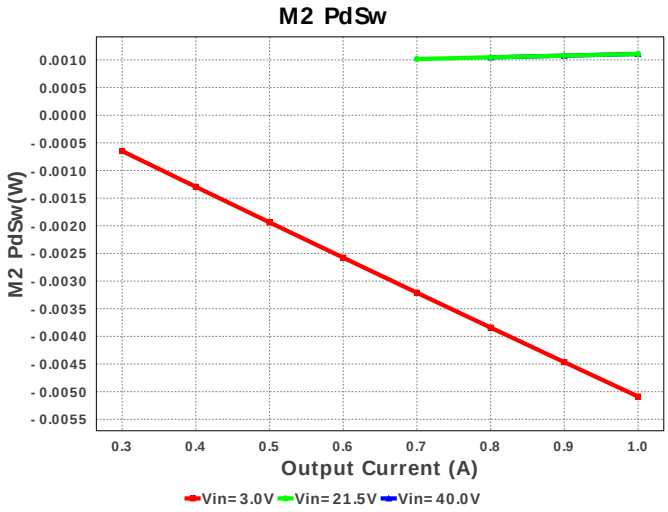


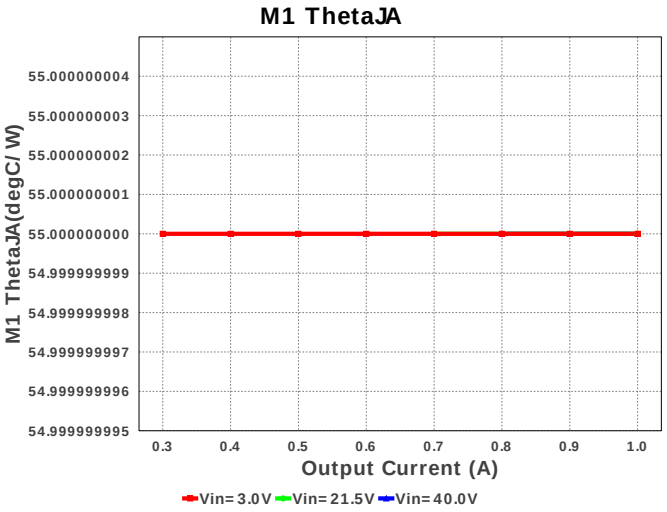


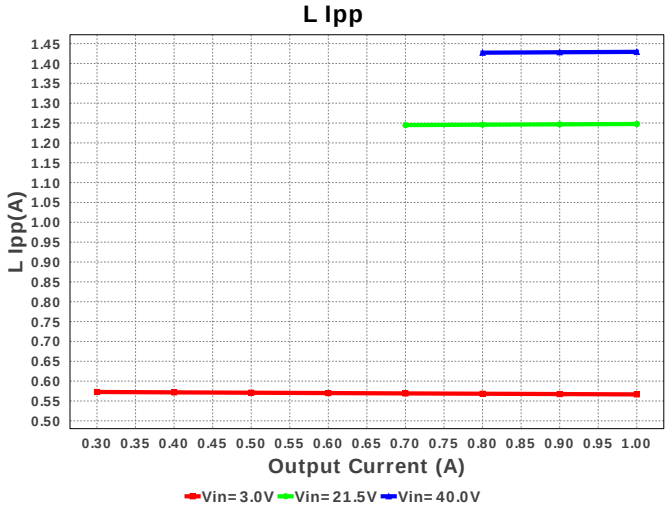


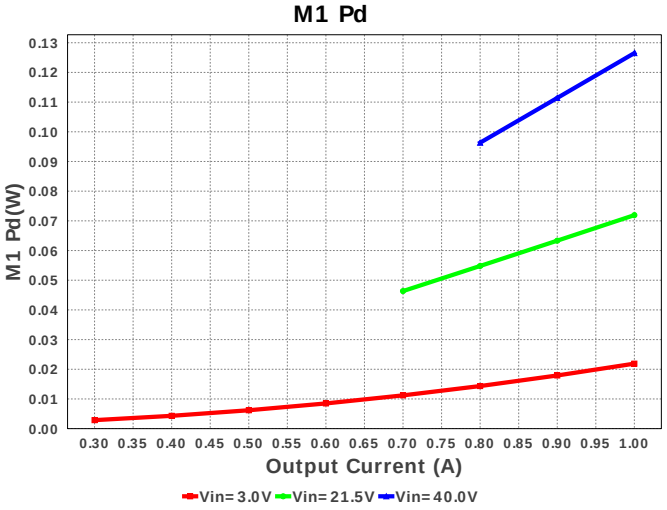


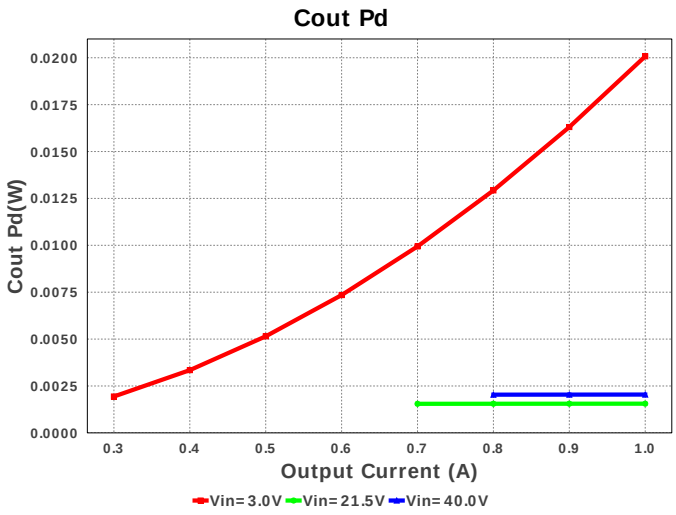


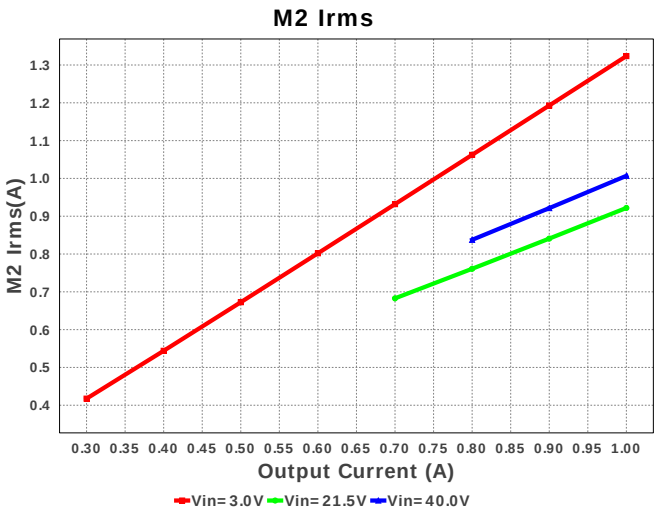


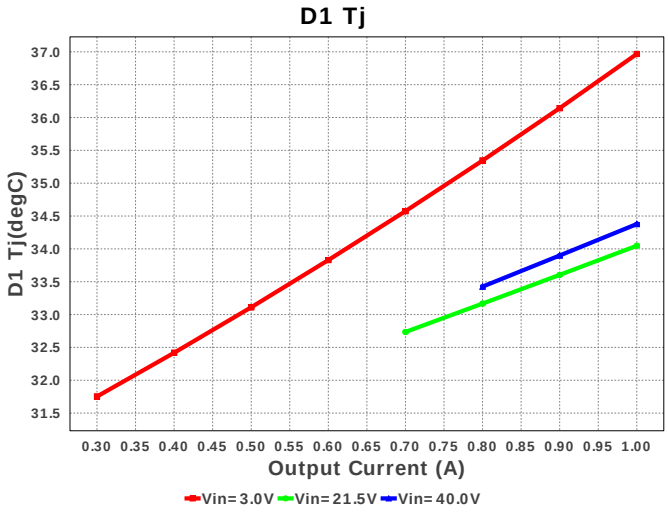


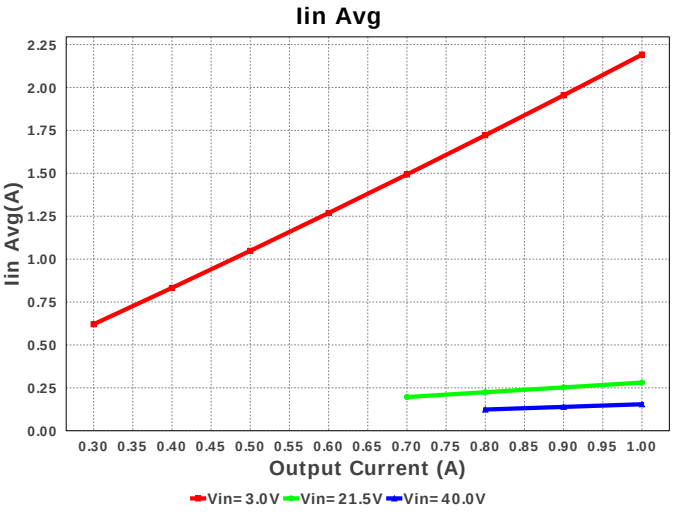


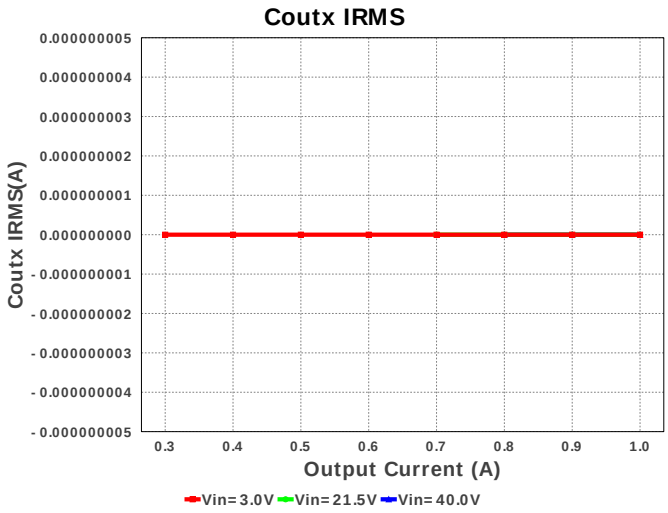


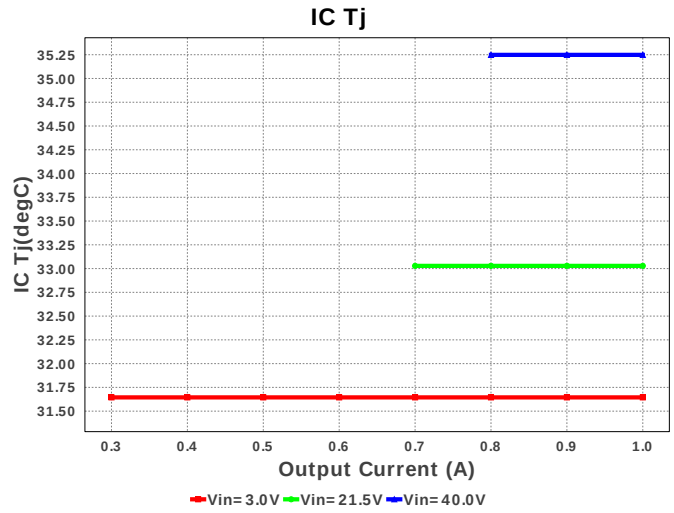


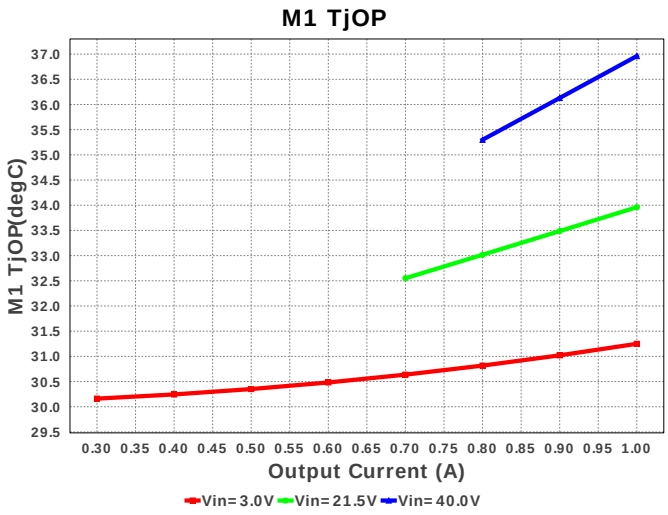


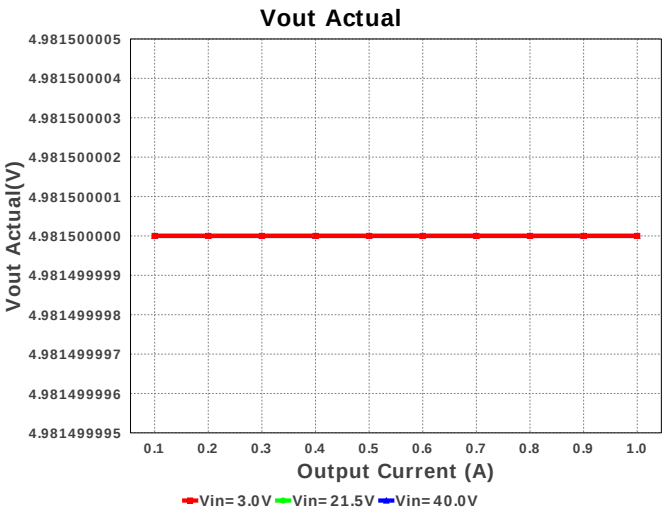


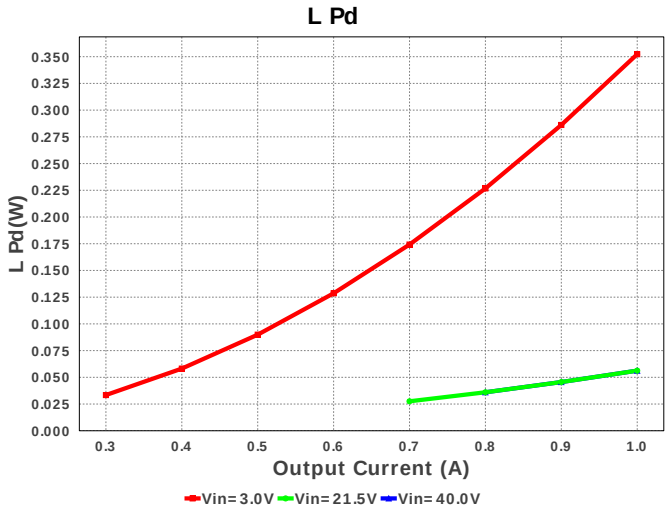


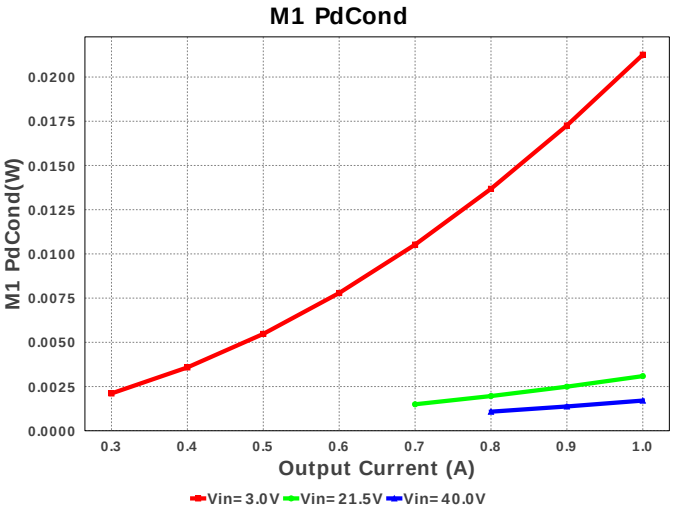


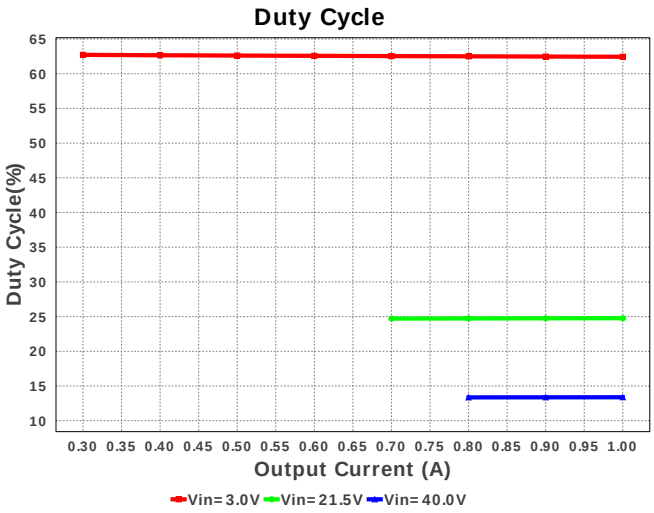


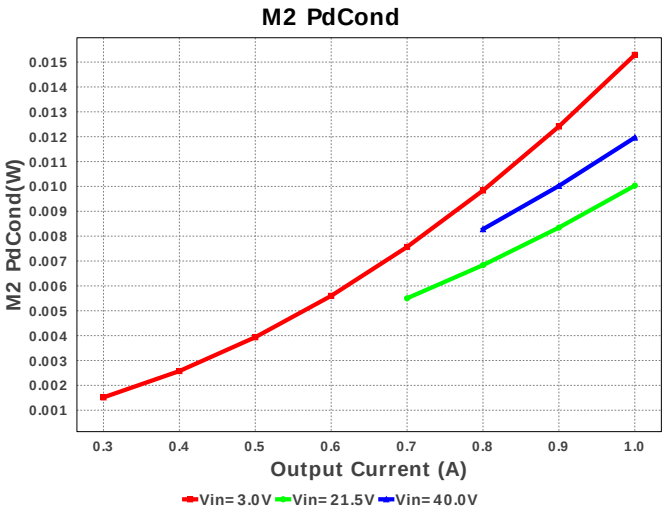


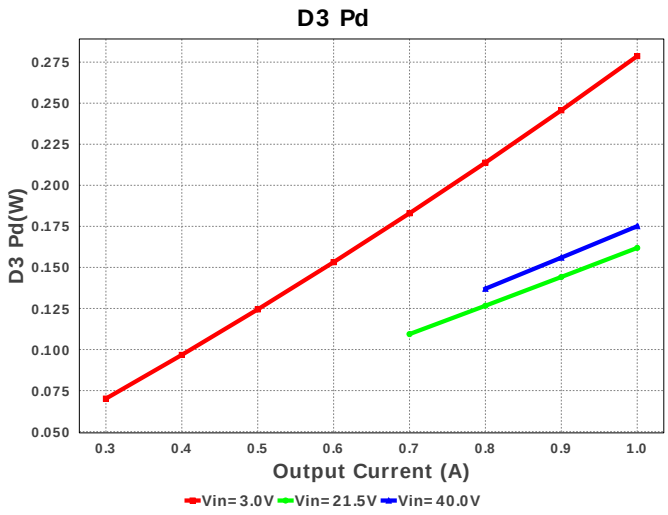


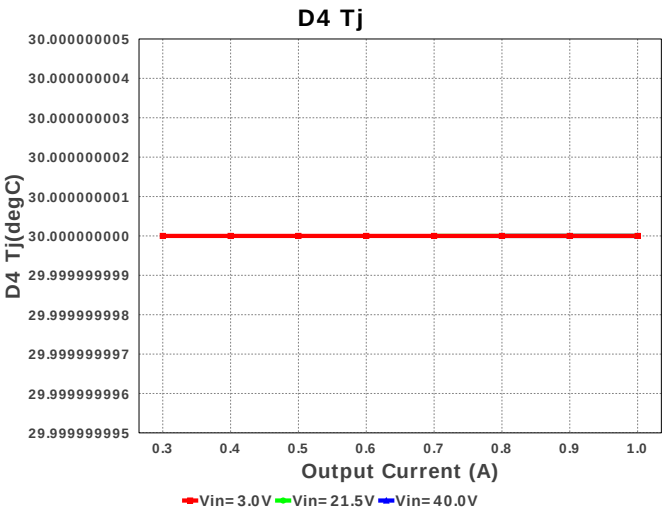


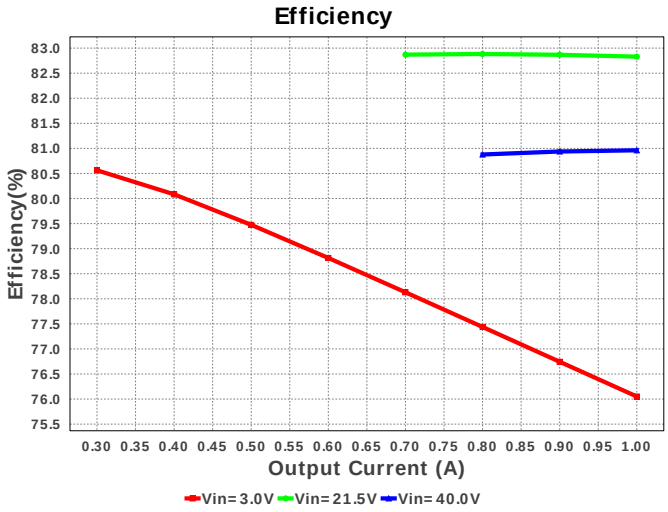


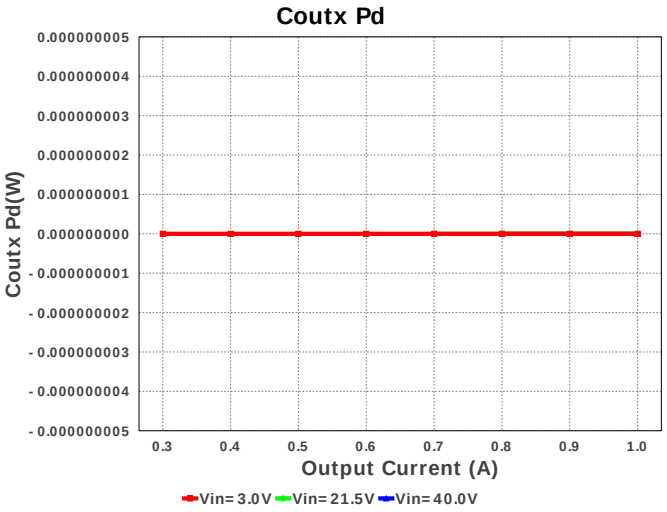


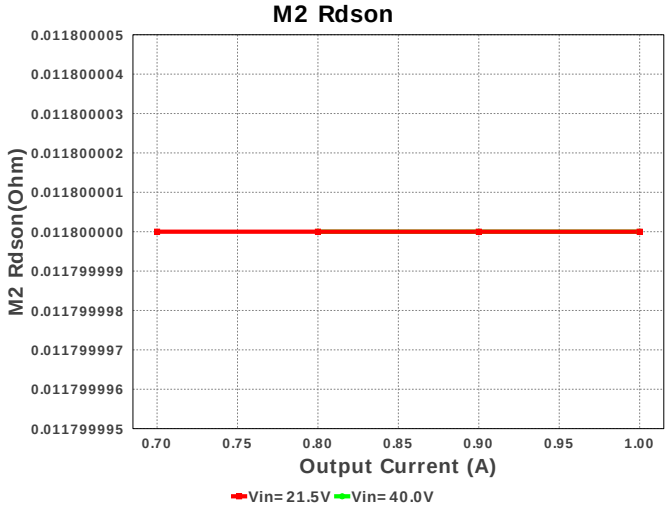


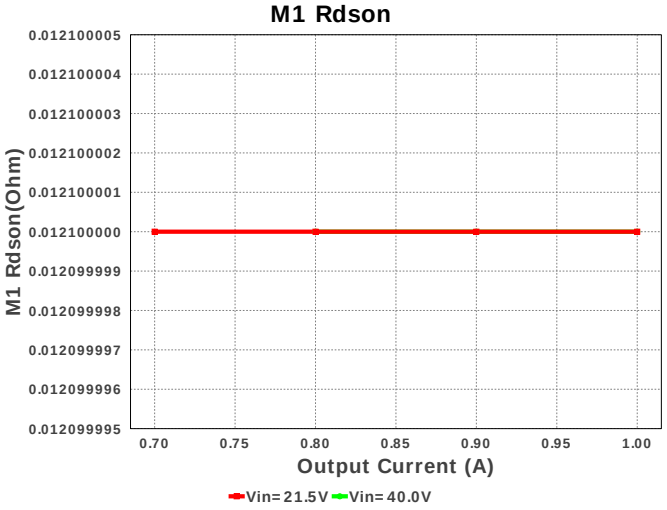


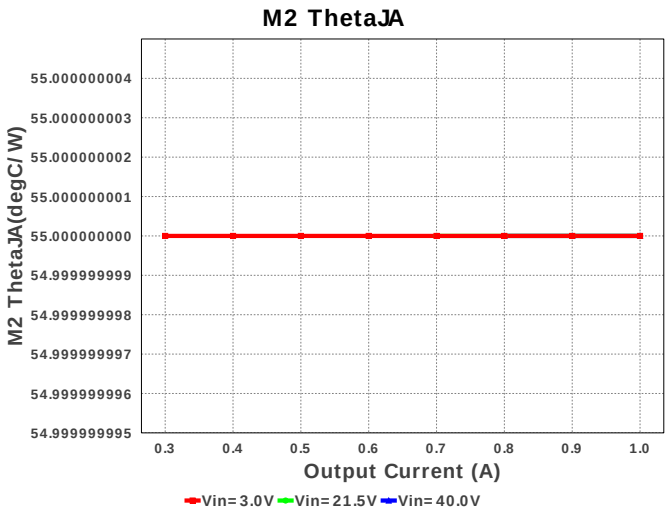


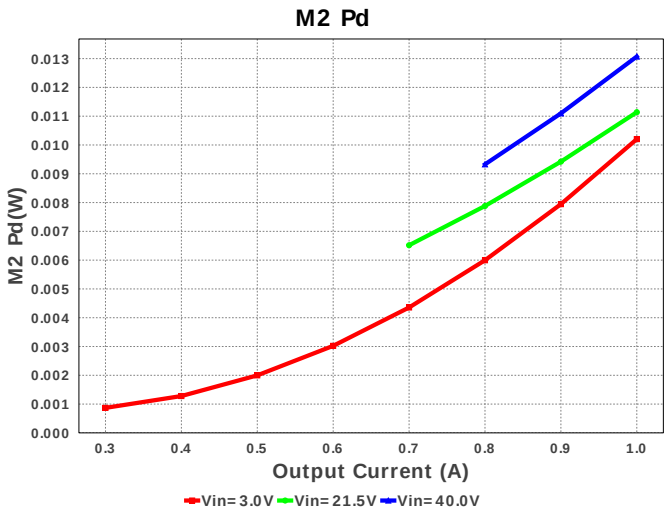


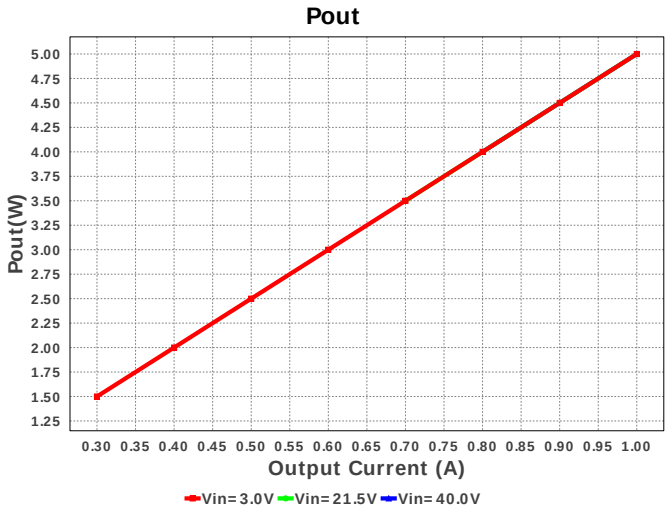


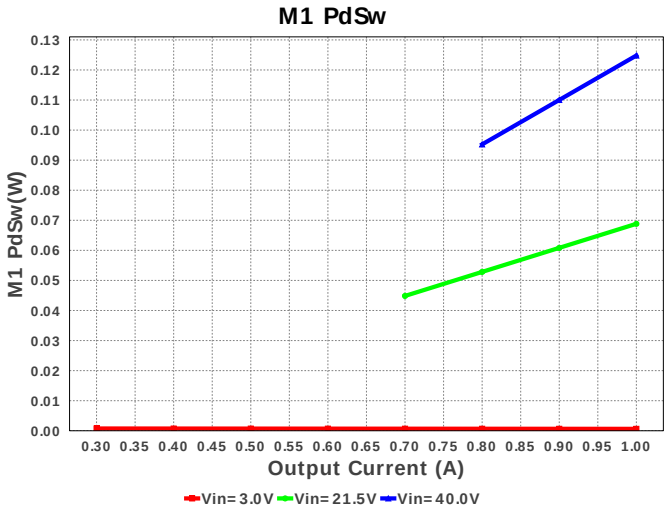


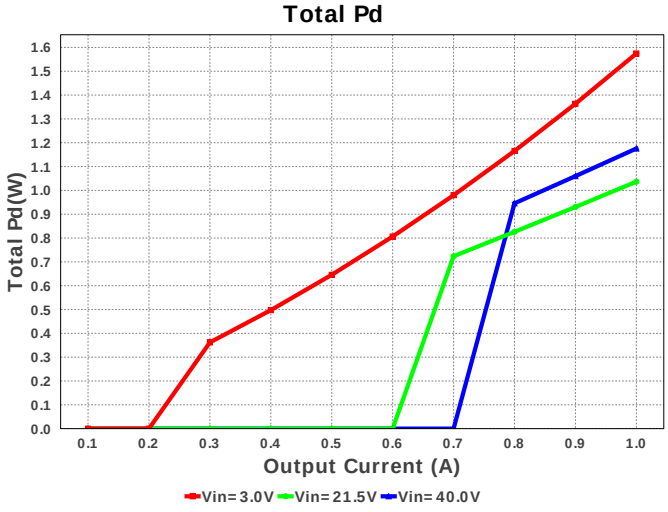


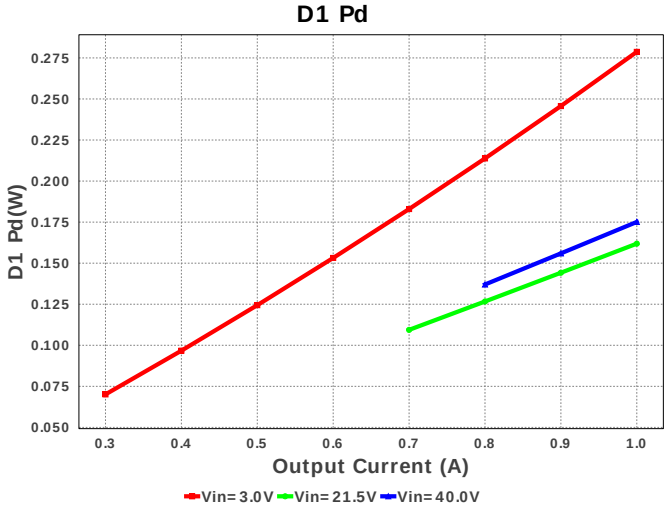


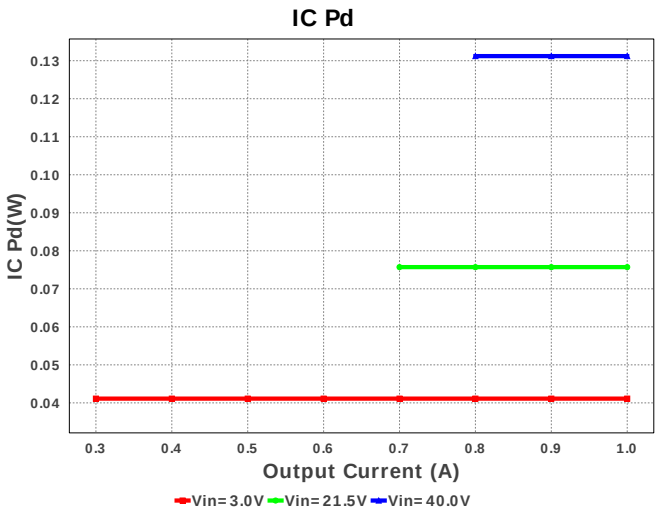


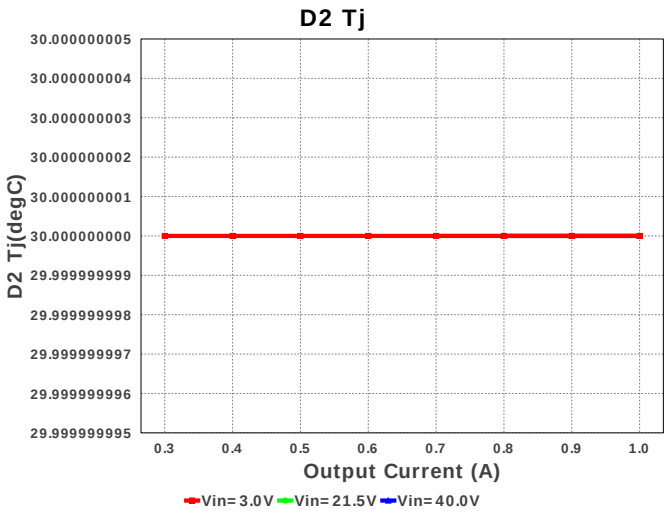


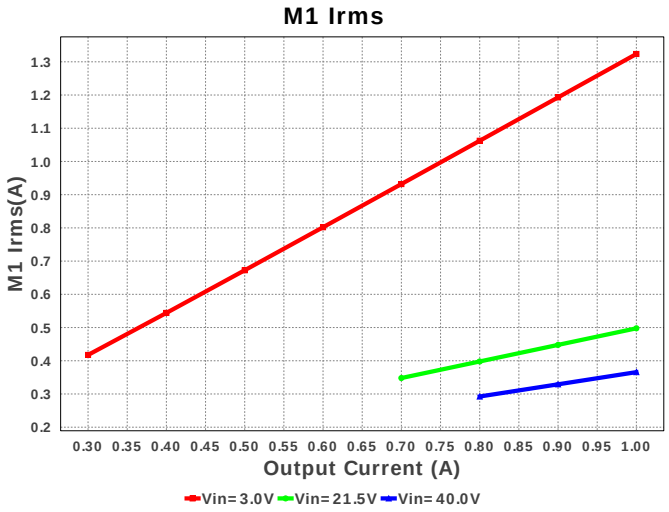


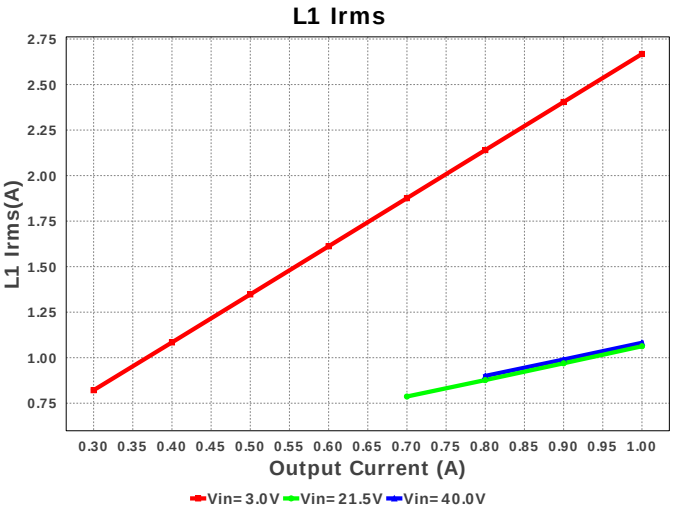


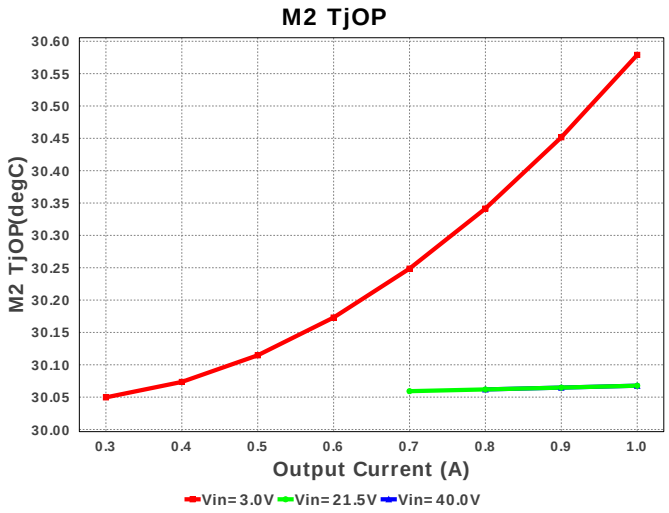


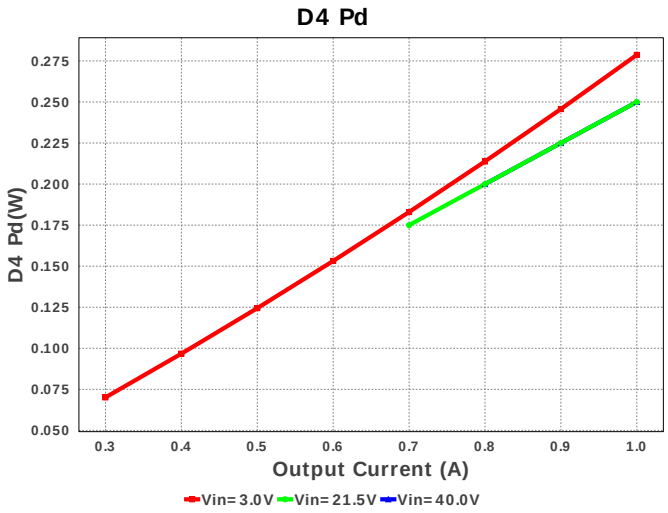


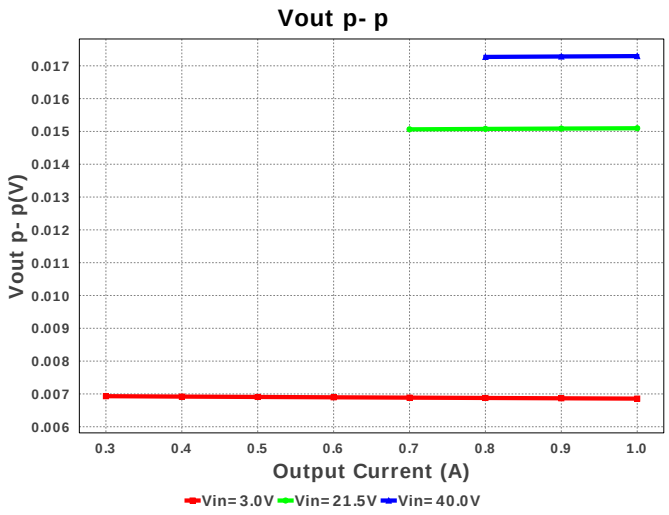


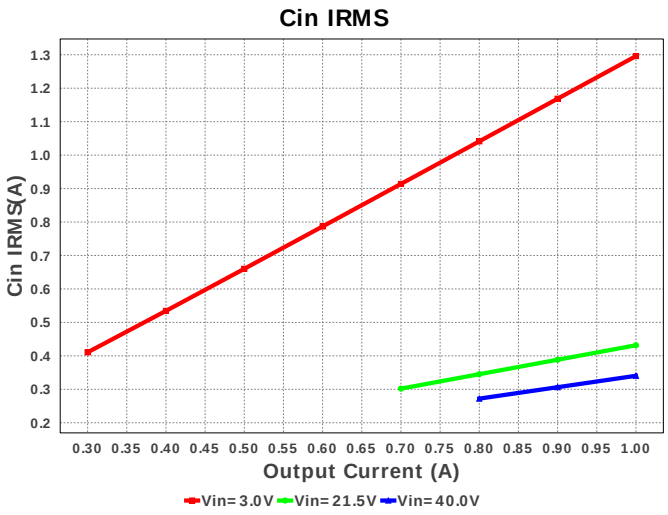


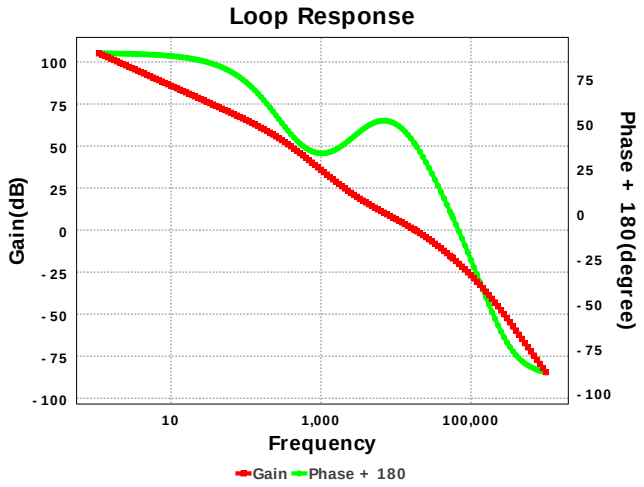












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	343.893 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	422.672 mA	Current	Output capacitor RMS ripple current
3.	Coutx IRMS	0.0 A	Current	Output capacitor_x RMS ripple current
4.	Iin Avg	155.53 mA	Current	Average input current
5.	L Ipp	1.464 A	Current	Peak-to-peak inductor ripple current
6.	L1 Irms	1.086 A	Current	Inductor ripple current
7.	M1 Irms	370.193 mA	Current	MOSFET RMS ripple current
8.	M2 Irms	1.009 A	Current	MOSFET RMS ripple current
9.	SW Ipk	1.732 A	Current	Peak switch current
10.	BOM Count	31	General	Total Design BOM count
11.	FootPrint	596.0 mm^2	General	Total Foot Print Area of BOM components
12.	Frequency	399.501 kHz	General	Switching frequency
13.	IC Tolerance	18.0 mV	General	IC Feedback Tolerance
14.	M1 Rdson	12.1 mOhm	General	Drain-Source On-resistance
15.	M1 ThetaJA	55.0 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.	Mode	CCM	General	Conduction Mode
19.	Pout	5.0 W	General	Total output power
20.	Total BOM	$4.96	General	Total BOM Cost
21.	D1 Tj	36.012 degC	Op_Point	D1 junction temperature
22.	D1 Tj	36.012 degC	Op_Point	D1 junction temperature
23.	D2 Tj	35.178 degC	Op_Point	D2 junction temperature
24.	D3 Tj	36.012 degC	Op_Point	D3 junction temperature
25.	D4 Tj	35.178 degC	Op_Point	D4 junction temperature
26.	Low Freq Gain	105.184 dB	Op_Point	Gain at 10Hz
27.	Vout Actual	4.982 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
28.	Vout OP	5.0 V	Op_Point	Operational Output Voltage
29.	Cross Freq	17.966 kHz	Op_point	Bode plot crossover frequency
30.	Duty Cycle	13.704 %	Op_point	Duty cycle
31.	Efficiency	80.371 %	Op_point	Steady state efficiency

#	Name	Value	Category	Description
32.	Gain Marg	-16.157 dB	Op_point	Bode Plot Gain Margin
33.	IC Tj	35.248 degC	Op_point	IC junction temperature
34.	ICThetaJA	40.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
35.	IOUT_OP	1.0 A	Op_point	Iout operating point
36.	M1 TjOP	36.969 degC	Op_point	MOSFET junction temperature
37.	M2 TjOP	34.229 degC	Op_point	MOSFET junction temperature
38.	Operating Topology	Buck	Op_point	The current operating topology of the device
39.	Phase Marg	39.312 deg	Op_point	Bode Plot Phase Margin
40.	VIN_OP	40.0 V	Op_point	Vin operating point
41.	Vout p-p	17.719 mV	Op_point	Peak-to-peak output ripple voltage
42.	Cin Pd	118.262 µW	Power	Input capacitor power dissipation
43.	Cout Pd	2.144 mW	Power	Output capacitor power dissipation
44.	Coutx Pd	0.0 W	Power	Output capacitor_x power loss
45.	D1 Pd	240.489 mW	Power	Diode power dissipation
46.	D2 Pd	207.124 mW	Power	Diode2 power dissipation
47.	D3 Pd	240.489 mW	Power	Diode3 power dissipation
48.	D4 Pd	207.124 mW	Power	Diode4 power dissipation
49.	Diode Pd	240.489 mW	Power	Diode power dissipation
50.	IC Pd	131.21 mW	Power	IC power dissipation
51.	L Pd	56.25 mW	Power	Inductor power dissipation
52.	M1 Pd	126.93 mW	Power	MOSFET power dissipation
53.	M1 PdCond	2.009 mW	Power	M1 MOSFET conduction losses
54.	M1 PdSw	124.92 mW	Power	M1 MOSFET switching losses
55.	M2 Pd	19.502 mW	Power	MOSFET power dissipation
56.	M2 PdCond	12.225 mW	Power	M2 MOSFET conduction losses
57.	M2 PdSw	7.277 mW	Power	M2 MOSFET switching losses
58.	Total Pd	1.221 W	Power	Total Power Dissipation
59.	Vout Tolerance	2.312 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	1.0	Maximum Output Current
2.	SoftStart	2.0 ms	Soft Start Time (ms)
3.	VinMax	40.0	Maximum input voltage
4.	VinMin	3.0	Minimum input voltage
5.	Vout	5.0	Output Voltage
6.	base_pn	LM25118	Texas Instruments Base Part Number
7.	source	DC	Input Source Type
8.	ta	30.0	Ambient temperature
9.	userfsw	294.659 k	Customer Selected Frequency

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.