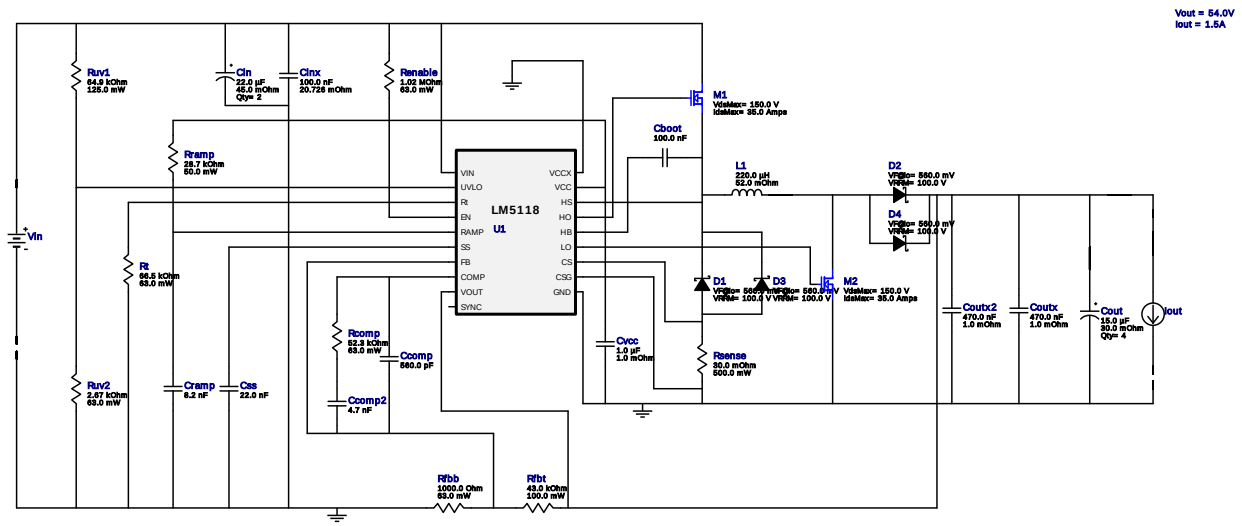
VinMin = 40.0V
VinMax = 60.0V
Vout = 54.0V
Iout = 1.5A

Device = LM5118MH/NOPB
Topology = Buck_Boost
Created = 2018-10-17 20:41:55.958
BOM Cost = $10.37
BOM Count = 1
Total Pd = 2.97W

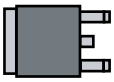
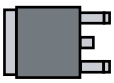
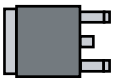
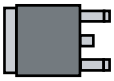
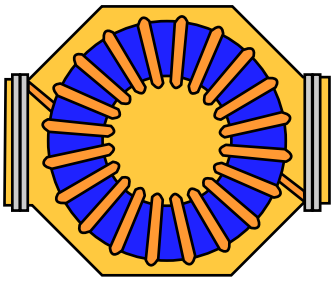
WEBENCH® Design Report

Design : LM5118MH/NOPB
LM5118MH/NOPB 40V-60V to 54.00V @ 1.5A

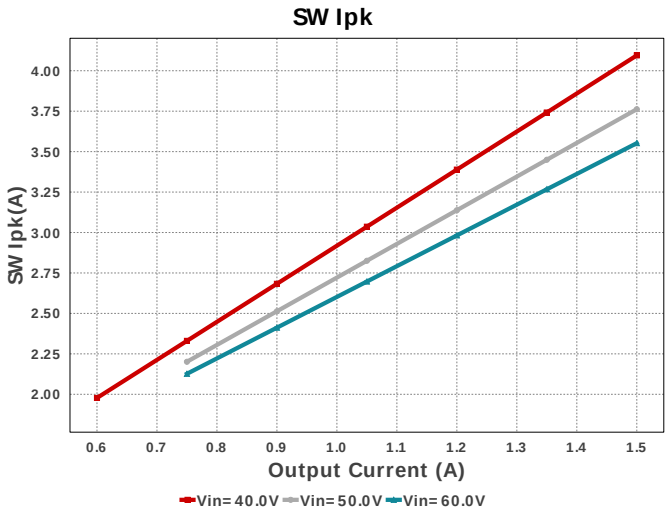


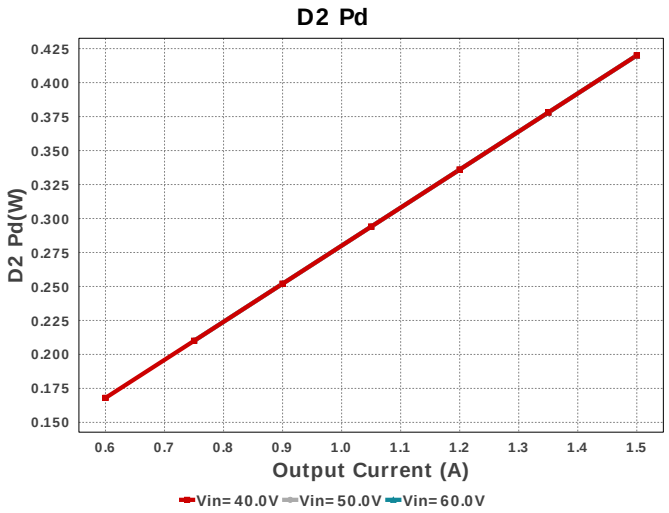
Electrical BOM

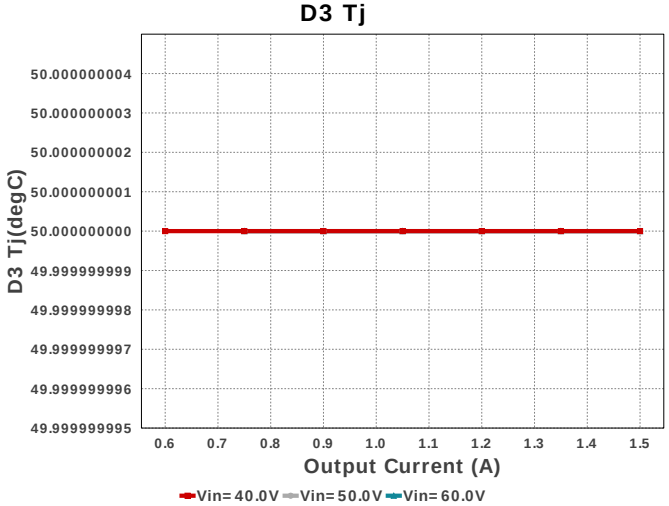
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	AVX	08053C104JAZ2A Series= X7R	Cap= 100.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.10	0805 7 mm²
2.	Ccomp	Samsung Electro-Mechanics	CL05C561JB5NNNC Series= C0G/NP0	Cap= 560.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
3.	Ccomp2	TDK	C2012C0G1H472K060AA Series= C0G/NP0	Cap= 4.7 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.04	0805 7 mm²
4.	Cin	Panasonic	EEHZA1K220P Series= ZA	Cap= 22.0 uF ESR= 45.0 mOhm VDC= 80.0 V IRMS= 1.55 A	2	$0.97	SM_RADIAL_8MM 113 mm²
5.	Cinx	TDK	CGA4J2X7R2A104K125AA Series= X7R	Cap= 100.0 nF ESR= 20.726 mOhm VDC= 100.0 V IRMS= 1.456 A	1	$0.04	0805 7 mm²
6.	Cout	OSCON	CUSTOM_CAP_LG Series= CUSTOM	Cap= 15.0 uF ESR= 30.0 mOhm VDC= 100.0 V IRMS= 2.3 A	4	$0.10	CAPSMT_62_F61 100 mm²
7.	Coutx	MuRata	GRM21BR72A474KA73L Series= X7R	Cap= 470.0 nF ESR= 1.0 mOhm VDC= 100.0 V IRMS= 0.0 A	1	$0.17	0805 7 mm²
8.	Coutx2	MuRata	GRM21BR72A474KA73L Series= X7R	Cap= 470.0 nF ESR= 1.0 mOhm VDC= 100.0 V IRMS= 0.0 A	1	$0.17	0805 7 mm²
9.	Cramp	Samsung Electro-Mechanics	CL21C822JBFNNNE Series= C0G/NP0	Cap= 8.2 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.02	0805 7 mm²

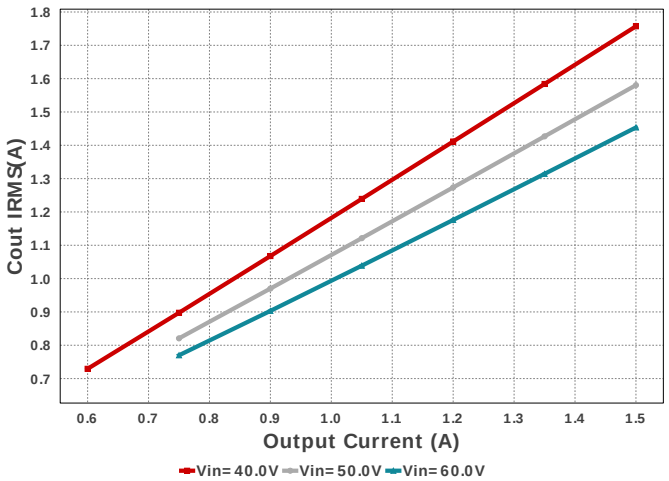
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	Css	TDK	C2012C0G1H223K125AA Series= C0G/NP0	Cap= 22.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.09	 0805 7 mm²
11.	Cvcc	TDK	C5750JB2E105K230KA Series= JB	Cap= 1.0 uF ESR= 1.0 mOhm VDC= 250.0 V IRMS= 0.0 A	1	$0.59	 2220_250 54 mm²
12.	D1	Others	CUSTOM_DIODE_LG	VF@Io= 560.0 mV VRRM= 100.0 V	1	$0.10	 DPAK 155 mm²
13.	D2	Others	CUSTOM_DIODE_LG	VF@Io= 560.0 mV VRRM= 100.0 V	1	$0.10	 DPAK 155 mm²
14.	D3	Others	CUSTOM_DIODE_LG	VF@Io= 560.0 mV VRRM= 100.0 V	1	$0.10	 DPAK 155 mm²
15.	D4	Others	CUSTOM_DIODE_LG	VF@Io= 560.0 mV VRRM= 100.0 V	1	$0.10	 DPAK 155 mm²
16.	L1	Bourns	PM2120-221K-RC	L= 220.0 µH DCR= 52.0 mOhm	1	$1.38	 PM2120 890 mm²
17.	M1	Fairchild Semiconductor	FDMS86200	VdsMax= 150.0 V IdsMax= 35.0 Amps	1	$0.99	 TRANS_Fairchild_PQFN08A 56 mm²
18.	M2	Fairchild Semiconductor	FDMS86200	VdsMax= 150.0 V IdsMax= 35.0 Amps	1	$0.99	 TRANS_Fairchild_PQFN08A 56 mm²
19.	Rcomp	Vishay-Dale	CRCW040252K3FKED Series= CRCW..e3	Res= 52.3 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
20.	Renable	Vishay-Dale	CRCW04021M02FKED Series= CRCW..e3	Res= 1.02 MOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
21.	Rfbb	Vishay-Dale	CRCW04021K00FKED Series= CRCW..e3	Res= 1000.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
22.	Rfbt	Susumu Co Ltd	RR1220P-433-D Series= RR12	Res= 43.0 kOhm Power= 100.0 mW Tolerance= 0.5%	1	$0.01	 0805 7 mm²
23.	Rramp	Yageo	RC0201FR-0728K7L Series= ?	Res= 28.7 kOhm Power= 50.0 mW Tolerance= 1.0%	1	$0.01	 0201 2 mm²
24.	Rsense	Stackpole Electronics Inc	CSR1206FK30L0 Series= ?	Res= 30.0 mOhm Power= 500.0 mW Tolerance= 1.0%	1	$0.10	 1206 11 mm²

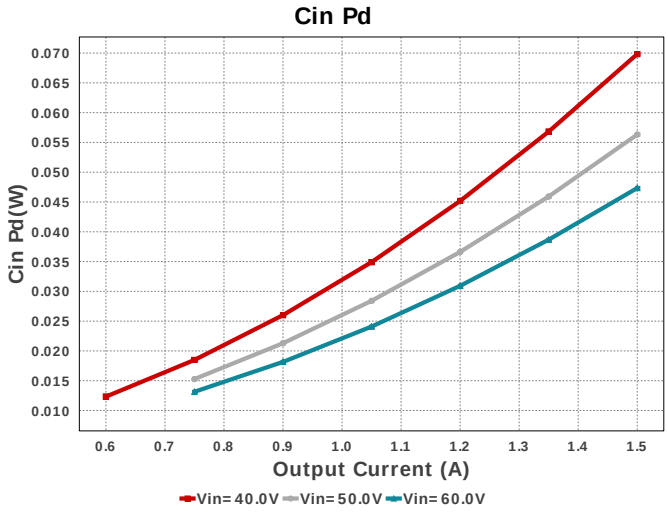
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
25.	Rt	Vishay-Dale	CRCW040266K5FKED Series= CRCW..e3	Res= 66.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
26.	Ruv1	Panasonic	ERJ-6ENF6492V Series= ERJ-6E	Res= 64.9 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	0805 7 mm^2
27.	Ruv2	Vishay-Dale	CRCW04022K67FKED Series= CRCW..e3	Res= 2.67 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
28.	U1	Texas Instruments	LM5118MH/NOPB	Switcher	1	$2.86	MXA20A 71 mm^2

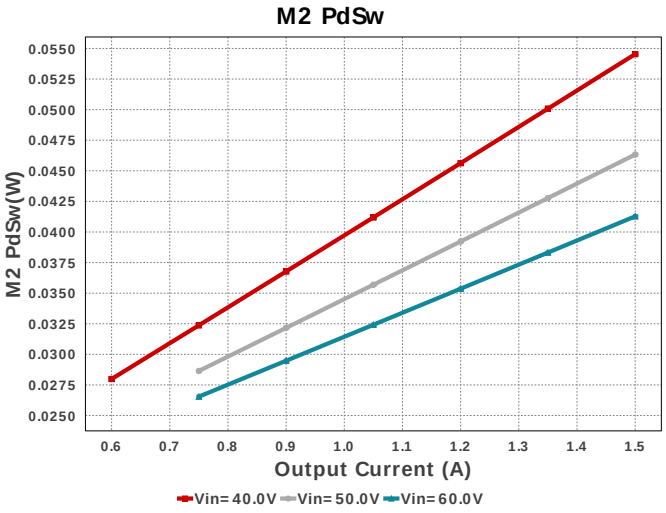


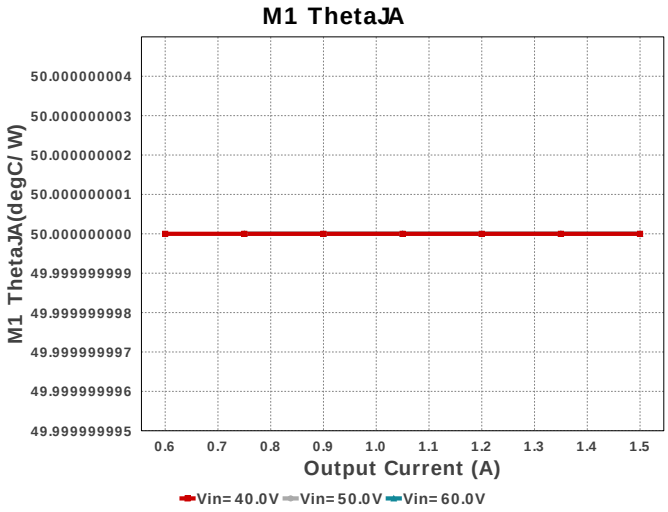


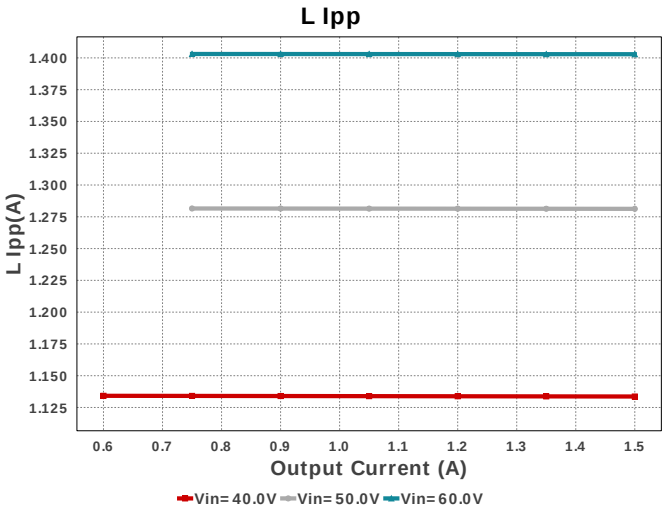


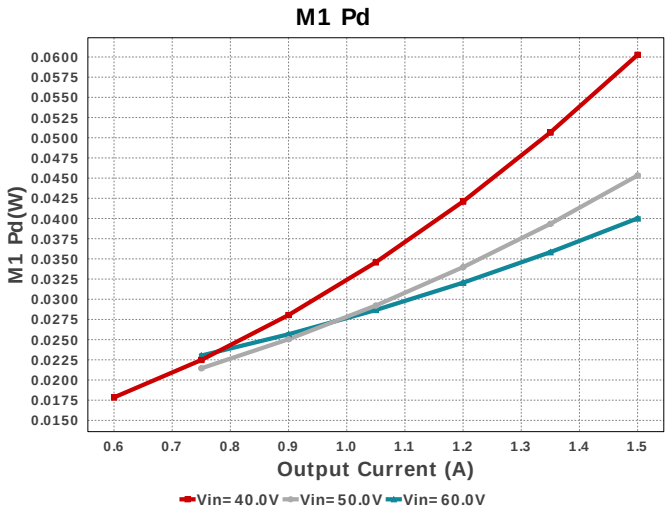


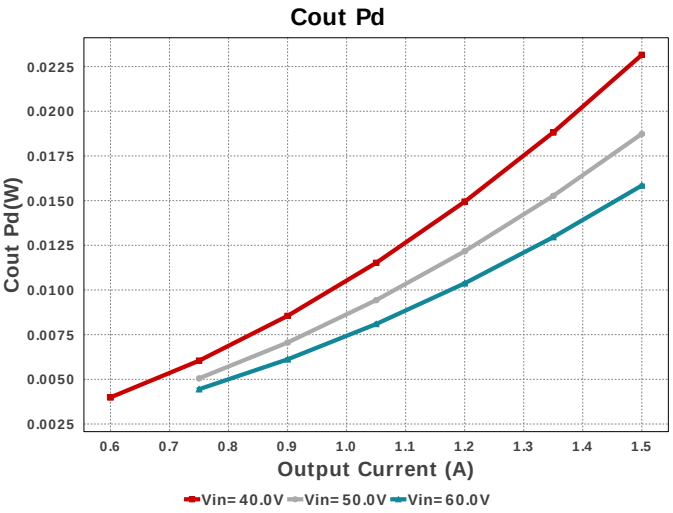


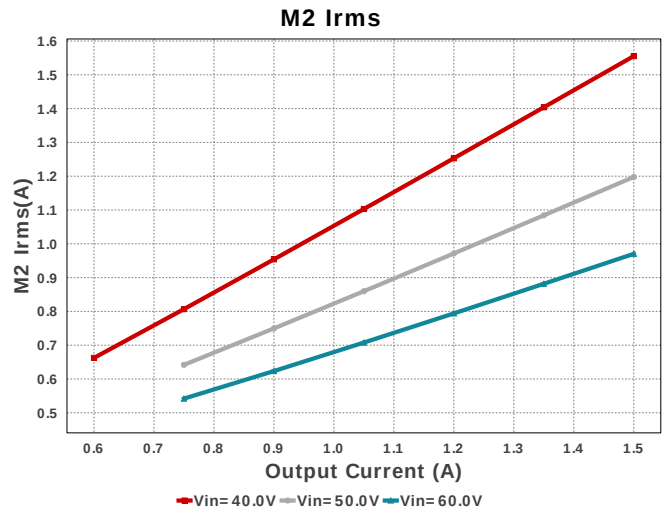


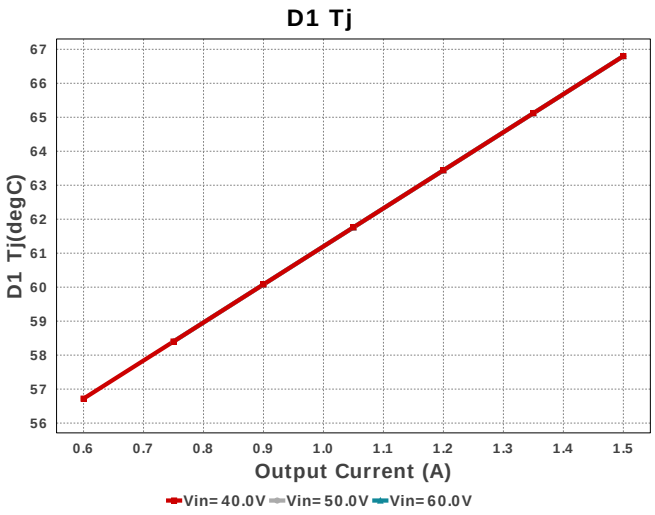


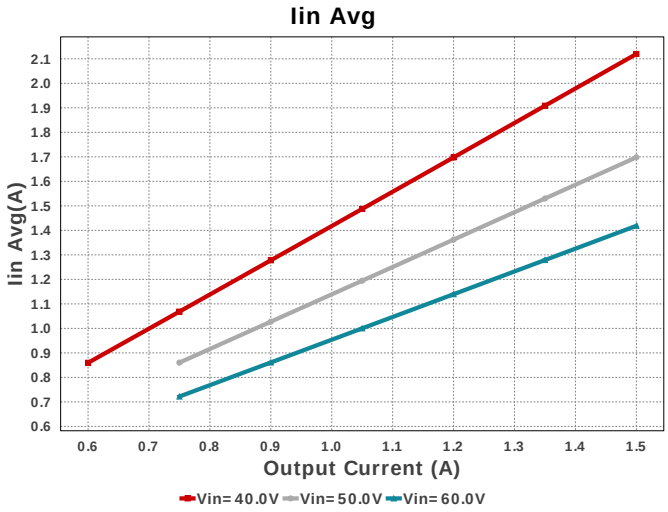


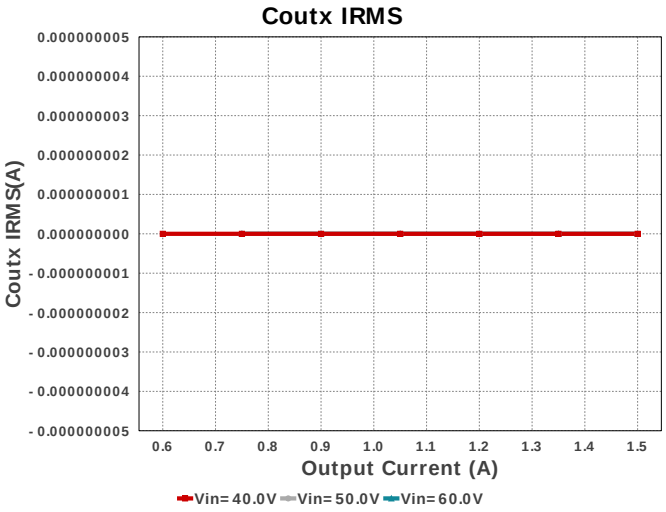


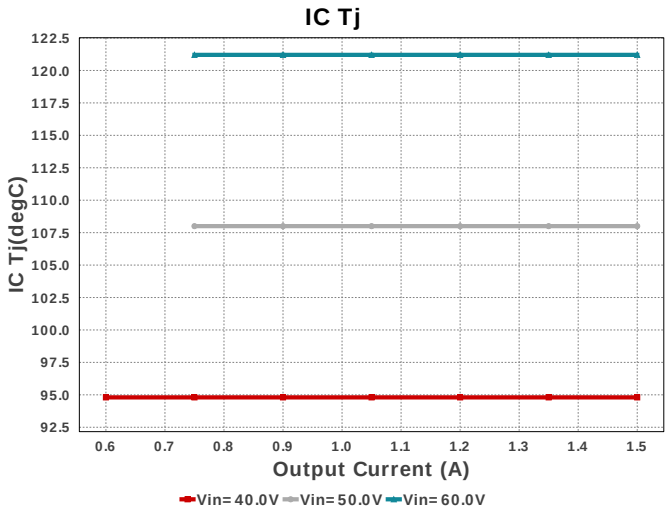


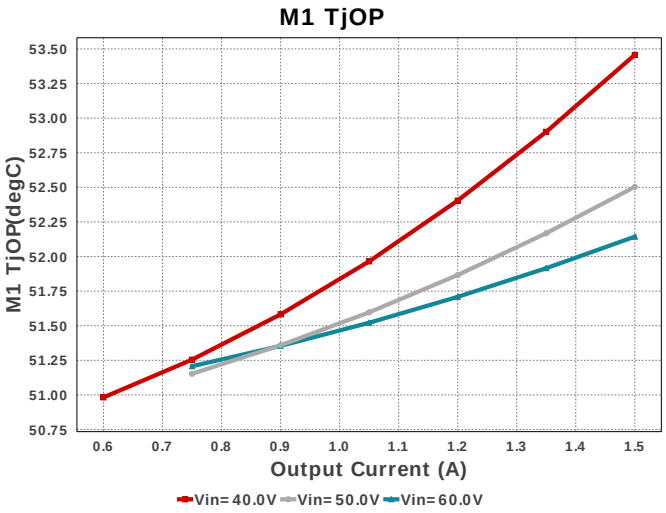


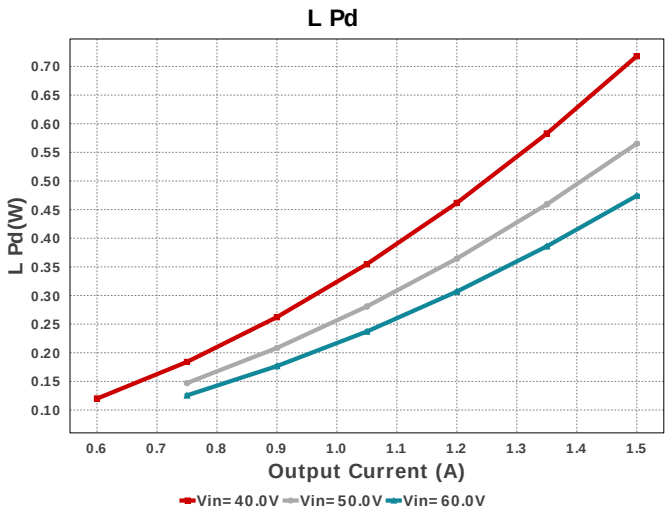


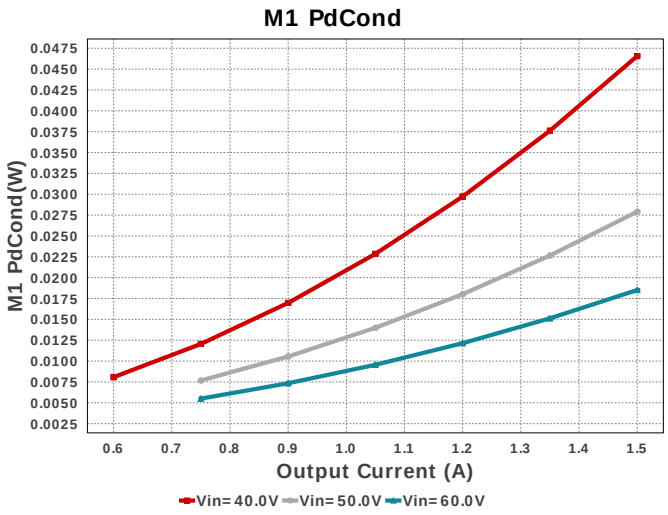


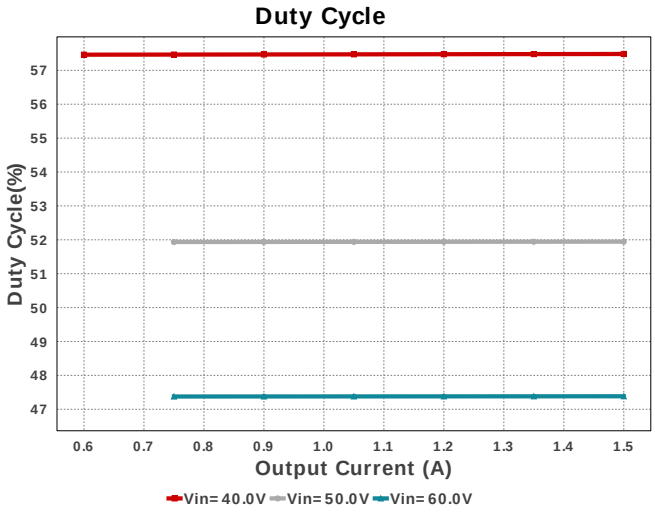


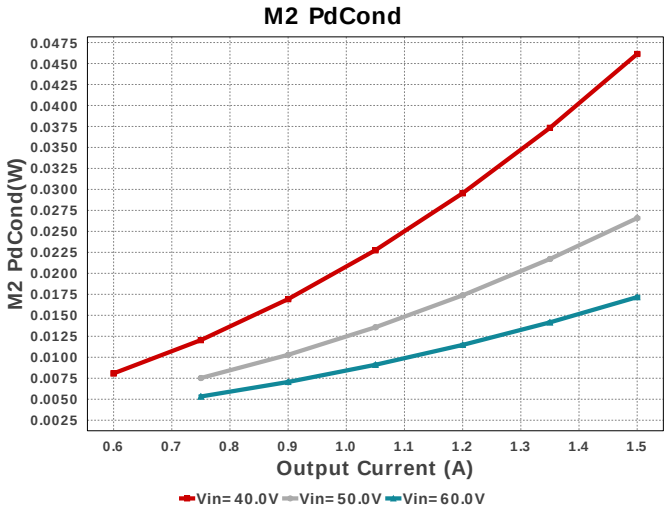


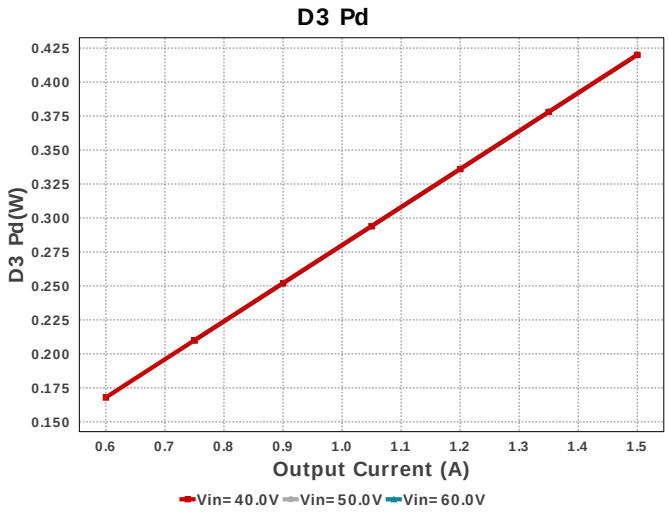


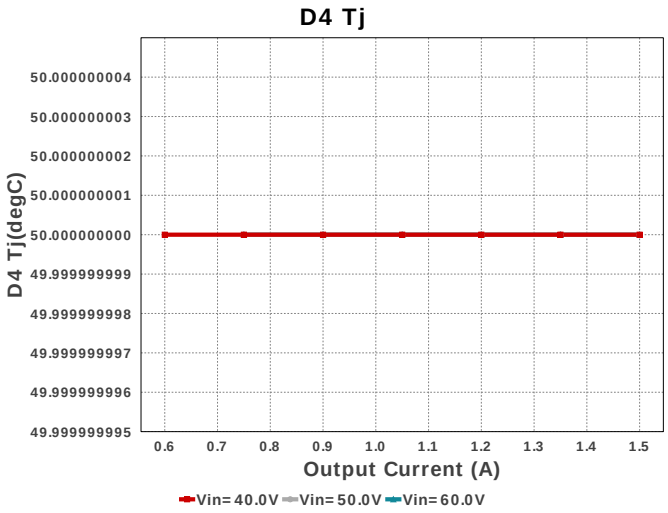


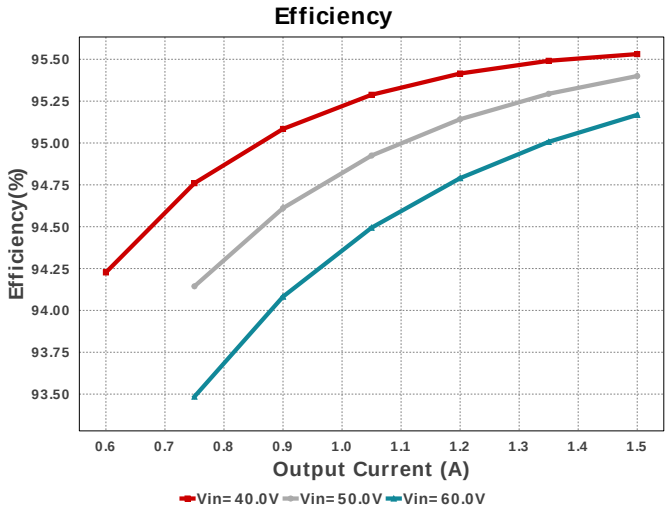


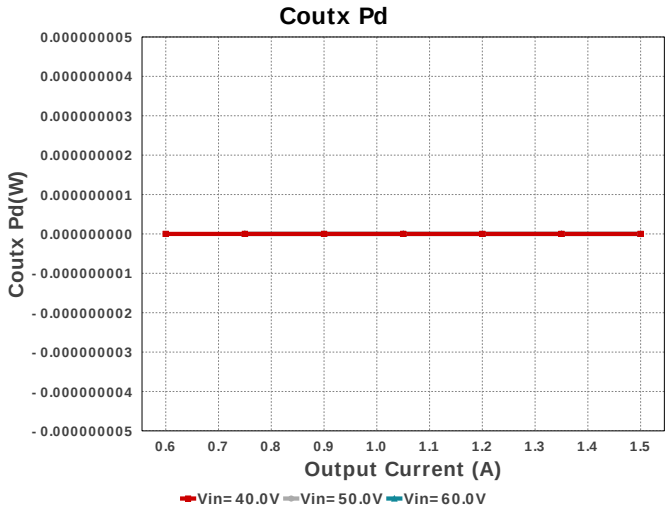


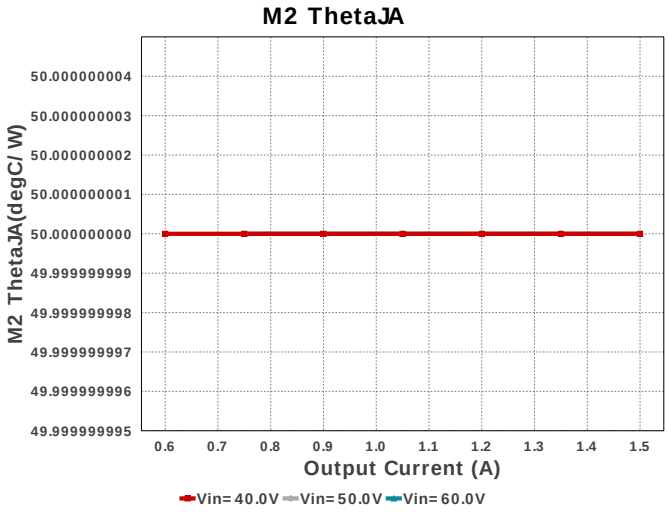


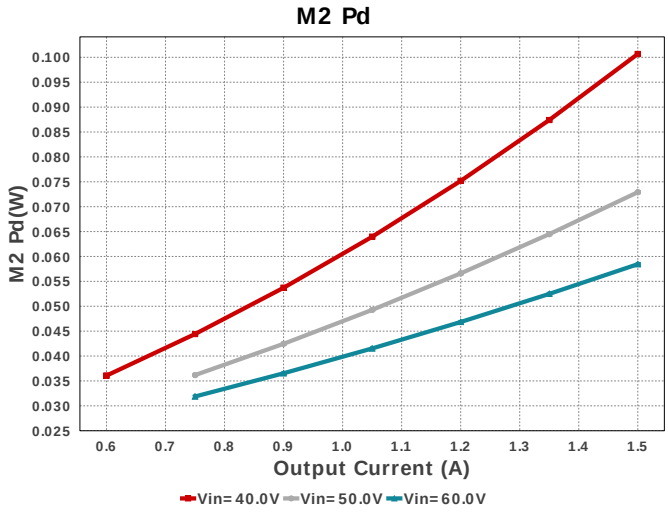


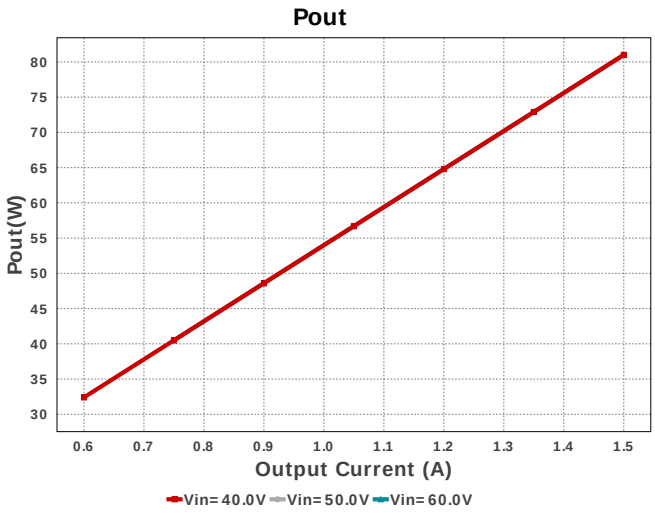


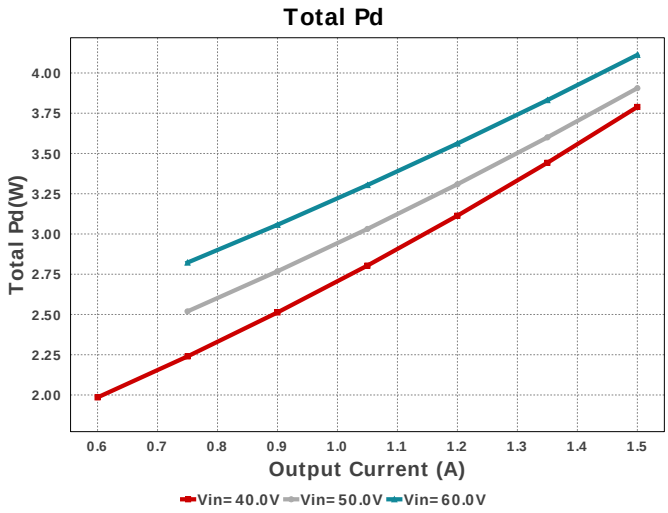


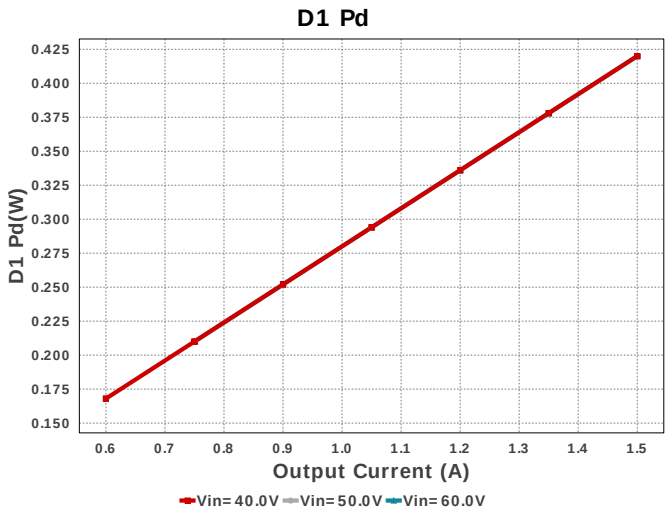


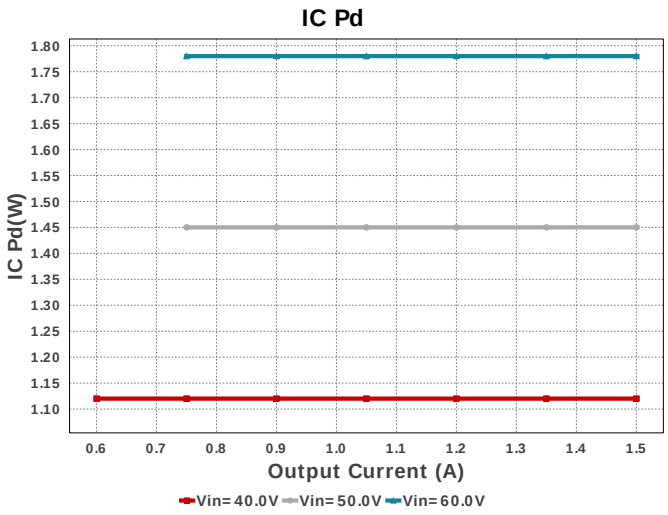


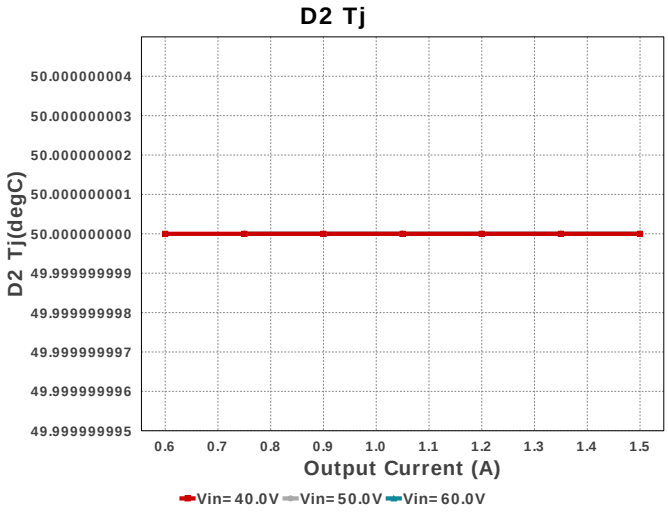


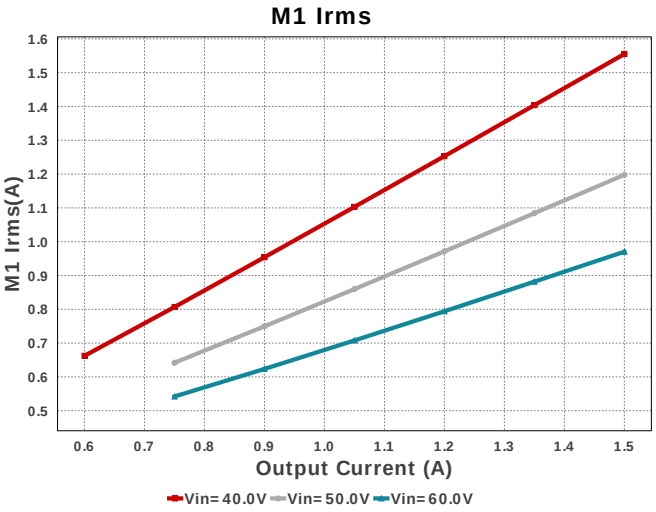


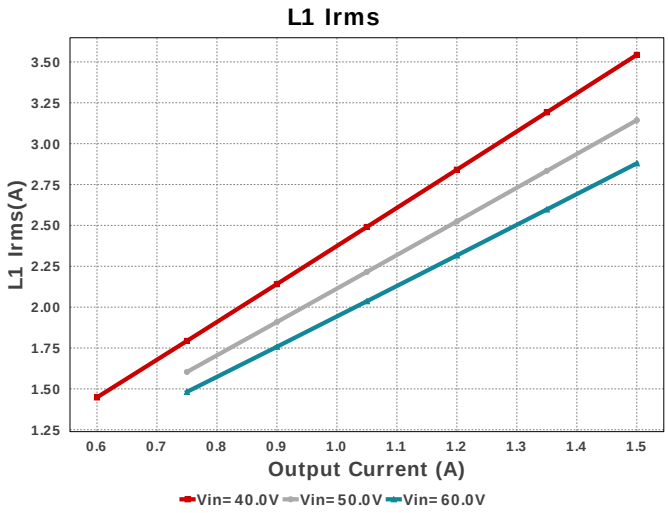


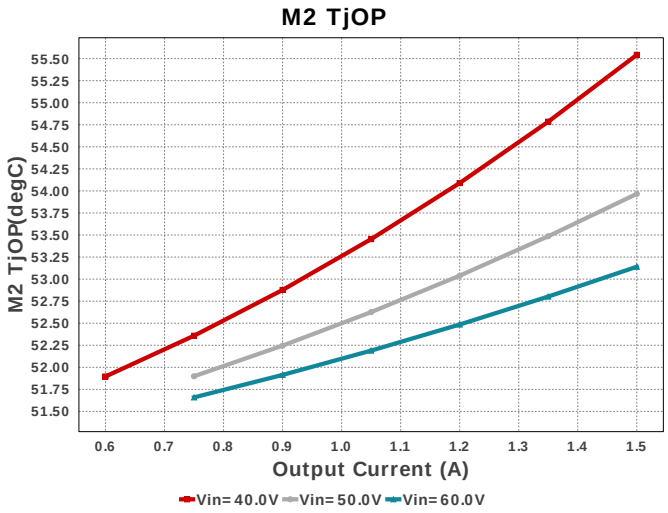


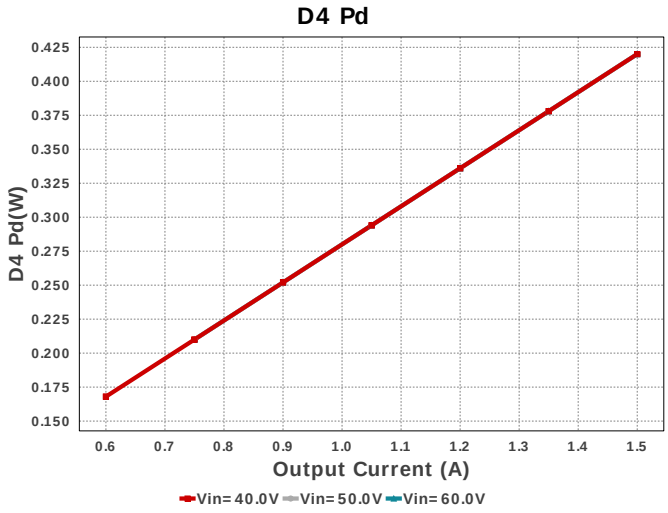


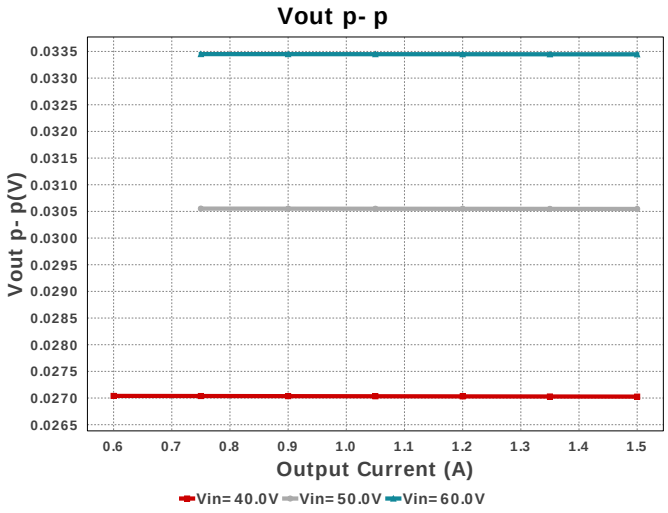


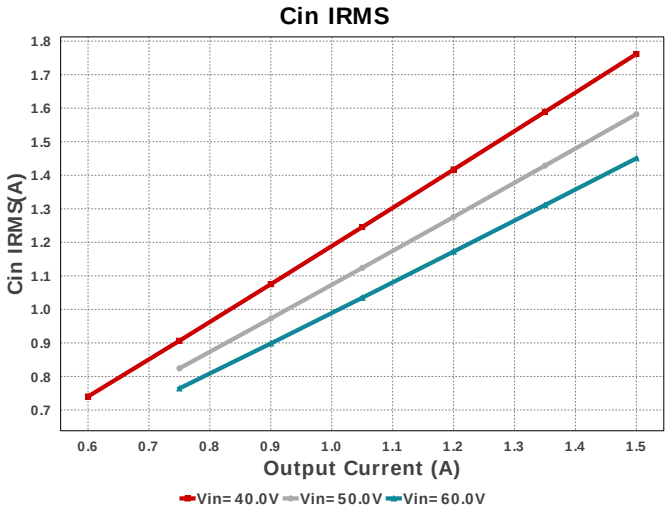


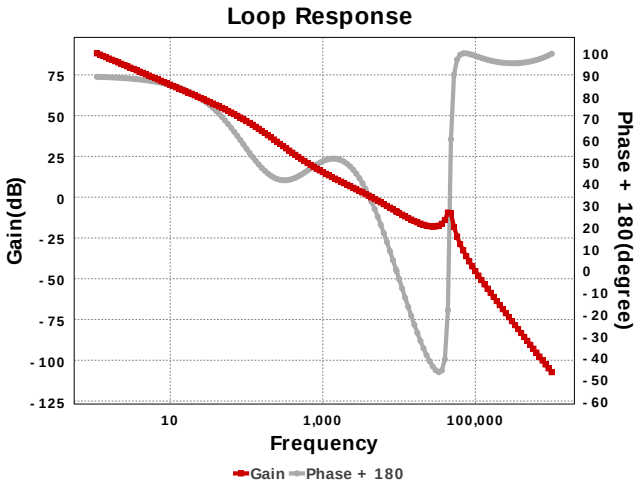












Operating Values

#	Name	Value	Category	Description
1.	Total BOM	$10.37		Total BOM Cost
2.	Cin IRMS	1.762 A	Capacitor	Input capacitor RMS ripple current
3.	Cin Pd	69.829 mW	Capacitor	Input capacitor power dissipation
4.	Cout IRMS	1.757 A	Capacitor	Output capacitor RMS ripple current
5.	Cout Pd	23.156 mW	Capacitor	Output capacitor power dissipation
6.	Coutx IRMS	0.0 A	Capacitor	Output capacitor_x RMS ripple current
7.	Coutx Pd	0.0 W	Capacitor	Output capacitor_x power loss
8.	D1 Pd	420.0 mW	Diode	Diode power dissipation
9.	D1 Tj	66.8 degC	Diode	D1 junction temperature
10.	D2 Pd	420.0 mW	Diode	Diode2 power dissipation
11.	D3 Pd	420.0 mW	Diode	Diode3 power dissipation
12.	D4 Pd	420.0 mW	Diode	Diode4 power dissipation
13.	IC Pd	1.78 W	IC	IC power dissipation
14.	IC Tj	121.202 degC	IC	IC junction temperature
15.	IC Tolerance	18.0 mV	IC	IC Feedback Tolerance
16.	ICThetaJA	40.0 degC/W	IC	IC junction-to-ambient thermal resistance
17.	Iin Avg	1.424 A	IC	Average input current
18.	L Ipp	1.134 A	Inductor	Peak-to-peak inductor ripple current
19.	L Pd	718.07 mW	Inductor	Inductor power dissipation
20.	L1 Irms	3.543 A	Inductor	Inductor ripple current
21.	M1 Irms	1.555 A	Mosfet	MOSFET RMS ripple current
22.	M1 Pd	61.268 mW	Mosfet	MOSFET power dissipation
23.	M1 PdCond	47.565 mW	Mosfet	M1 MOSFET conduction losses
24.	M1 ThetaJA	50.0 degC/W	Mosfet	MOSFET junction-to-ambient thermal resistance
25.	M1 TjOP	53.457 degC	Mosfet	MOSFET junction temperature
26.	M2 Irms	1.555 A	Mosfet	MOSFET RMS ripple current
27.	M2 Pd	100.67 mW	Mosfet	MOSFET power dissipation
28.	M2 PdCond	46.135 mW	Mosfet	M2 MOSFET conduction losses
29.	M2 PdSw	54.539 mW	Mosfet	M2 MOSFET switching losses
30.	M2 ThetaJA	50.0 degC/W	Mosfet	MOSFET junction-to-ambient thermal resistance
31.	M2 TjOP	55.542 degC	Mosfet	MOSFET junction temperature
32.	Cin Pd	69.829 mW	Power	Input capacitor power dissipation

#	Name	Value	Category	Description
33.	Cout Pd	23.156 mW	Power	Output capacitor power dissipation
34.	Coutx Pd	0.0 W	Power	Output capacitor_x power loss
35.	D1 Pd	420.0 mW	Power	Diode power dissipation
36.	D2 Pd	420.0 mW	Power	Diode2 power dissipation
37.	D3 Pd	420.0 mW	Power	Diode3 power dissipation
38.	D4 Pd	420.0 mW	Power	Diode4 power dissipation
39.	IC Pd	1.78 W	Power	IC power dissipation
40.	L Pd	718.07 mW	Power	Inductor power dissipation
41.	M1 Pd	61.268 mW	Power	MOSFET power dissipation
42.	M1 PdCond	47.565 mW	Power	M1 MOSFET conduction losses
43.	M2 Pd	100.67 mW	Power	MOSFET power dissipation
44.	M2 PdCond	46.135 mW	Power	M2 MOSFET conduction losses
45.	M2 PdSw	54.539 mW	Power	M2 MOSFET switching losses
46.	Total Pd	2.967 W	Power	Total Power Dissipation
47.	BOM Count	1	System Information	Total Design BOM count
48.	Cross Freq	3.868 kHz	System Information	Bode plot crossover frequency
49.	D2 Tj	50.0 degC	System Information	D2 junction temperature
50.	D3 Tj	50.0 degC	System Information	D3 junction temperature
51.	D4 Tj	50.0 degC	System Information	D4 junction temperature
52.	Duty Cycle	57.483 %	System Information	Duty cycle
53.	Efficiency	94.792 %	System Information	Steady state efficiency
54.	FootPrint	2.861 k mm^2	System Information	Total Foot Print Area of BOM components
55.	Frequency	92.06 kHz	System Information	Switching frequency
56.	Gain Marg	-5.257 dB	System Information	Bode Plot Gain Margin
57.	Iout	1.5 A	System Information	Iout operating point
58.	Low Freq Gain	85.922 dB	System Information	Gain at 1Hz
59.	Mode	CCM	System Information	Conduction Mode
60.	Operating Topology	Buck-Boost	System Information	The current operating topology of the device
61.	Phase Marg	25.1 deg	System Information	Bode Plot Phase Margin
62.	Pout	81.0 W	System Information	Total output power
63.	SW Ipk	4.095 A	System Information	Peak switch current
64.	Vin	40.0 V	System Information	Vin operating point
65.	Vout	54.0 V	System Information	Operational Output Voltage
66.	Vout Actual	54.12 V	System Information	Vout Actual calculated based on selected voltage divider resistors
67.	Vout Tolerance	2.966 %	System Information	Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
68.	Vout p-p	27.026 mV	System Information	Peak-to-peak output ripple voltage

Design Inputs

#	Name	Value	Description
1.	Iout	1.5	Maximum Output Current
2.	VinMax	60.0	Maximum input voltage
3.	VinMin	40.0	Minimum input voltage
4.	Vout	54.0	Output Voltage
5.	base_pn	LM5118	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	50.0	Ambient temperature

Design Assistance

1. The LM5118 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. **LM5118** Product Folder : http://www.ti.com/product/lm5118 : contains the data sheet and other resources.