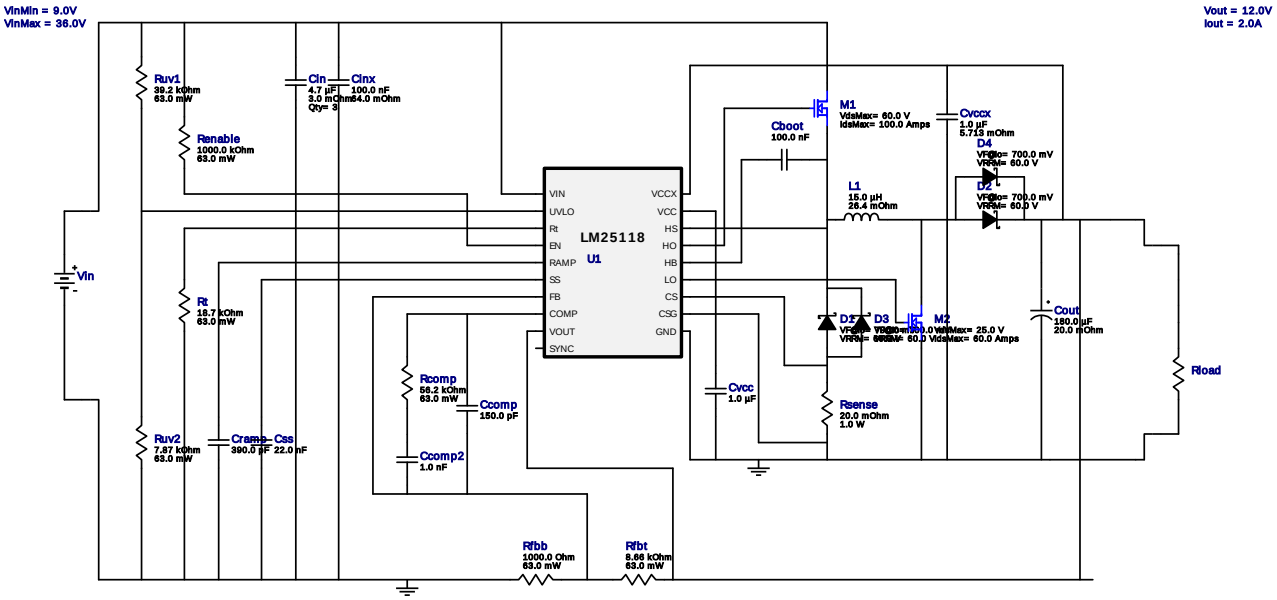
WEBENCH® Design Report

VinMin = 9.0V
VinMax = 36.0V
Vout = 12.0V
Iout = 2.0A

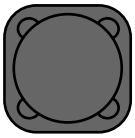
Device = LM25118MH/NOPB
Topology = Buck_Boost
Created = 9/17/14 8:11:53 AM
BOM Cost = $5.81
Footprint = 901.0mm2
BOM Count = 28
Total Pd = 2.93W

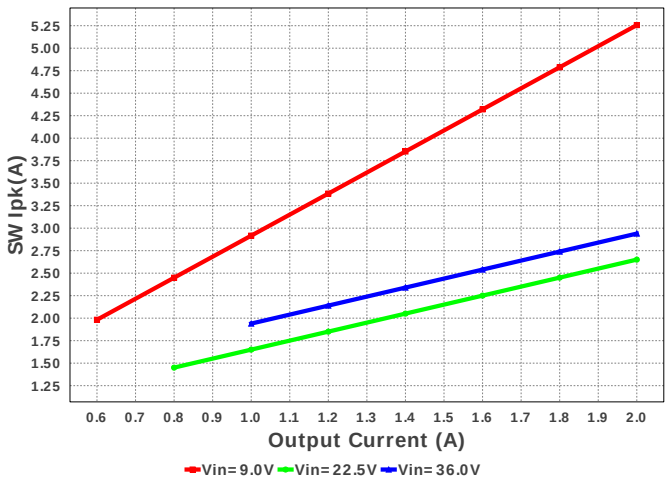
Design : 3779120/651 LM25118MH/NOPB
LM25118MH/NOPB 9.0V-36.0V to 12.0V @ 2.0A

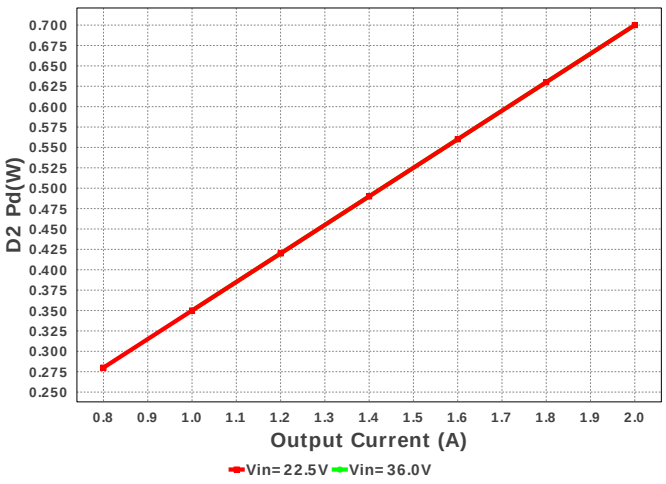


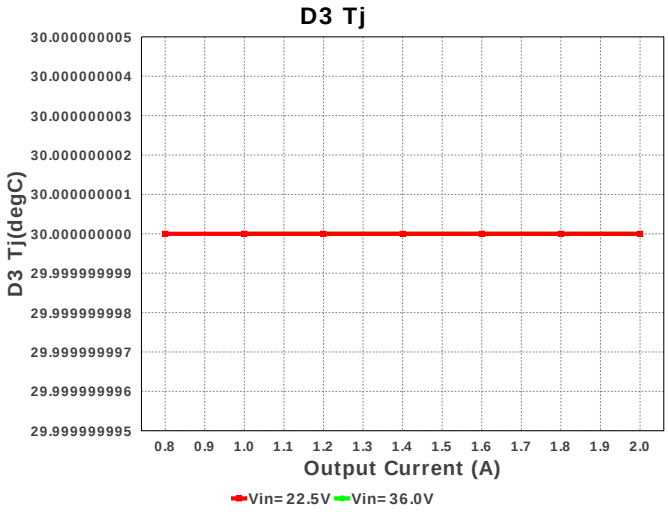
Electrical BOM

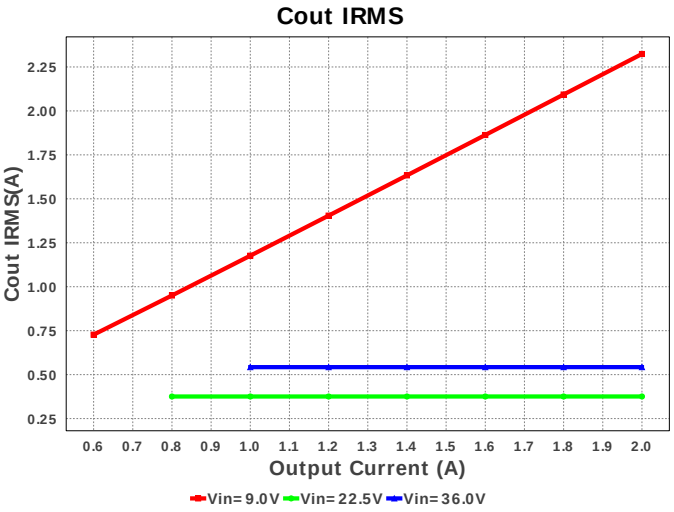
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	Yageo America	CC0805KRX7R9BB104 Series= X7R	Cap= 100.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7mm2
2.	Ccomp	Yageo America	CC0805JRNP09BN151 Series= C0G/NP0	Cap= 150.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7mm2
3.	Ccomp2	Yageo America	CC0805KRX7R9BB102 Series= X7R	Cap= 1.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7mm2
4.	Cin	MuRata	GRM31CR71H475KA12L Series= X7R	Cap= 4.7 uF ESR= 3.0 mOhm VDC= 50.0 V IRMS= 4.98 A	3	$0.10	1206 11mm2
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 7mm2
6.	Cout	Panasonic	16SVP180M Series= 261	Cap= 180.0 uF ESR= 20.0 mOhm VDC= 16.0 V IRMS= 3.64 A	1	$0.29	SM_RADIAL_8MM 113mm2
7.	Cramp	Yageo America	CC0805KRX7R9BB391 Series= X7R	Cap= 390.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7mm2
8.	Css	Yageo America	CC0805KRX7R9BB223 Series= X7R	Cap= 22.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7mm2
9.	Cvcc	MuRata	GRM155R61A105KE15D Series= X5R	Cap= 1.0 uF VDC= 10.0 V IRMS= 0.0 A	1	$0.01	0402 3mm2

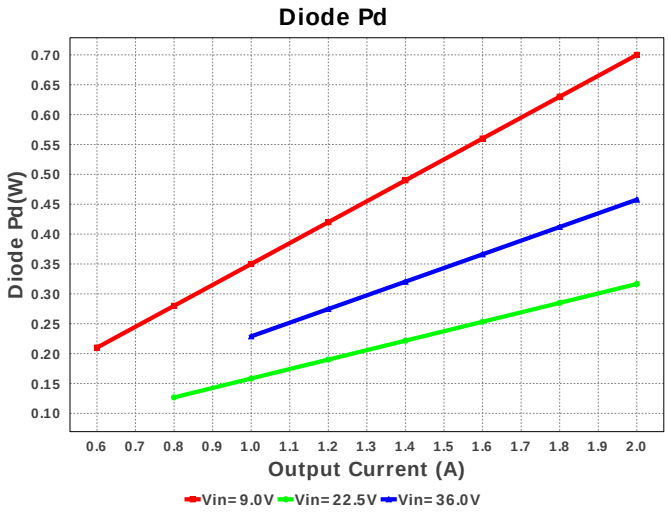
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	Cvccx	TDK	C1608X5R1C105K Series= 285	Cap= 1.0 uF ESR= 5.713 mOhm VDC= 16.0 V IRMS= 0.0 A	1	$0.01	 0603 5mm2
11.	D1	Diodes Inc.	B560C-13-F	VF@Io= 700.0 mV VRRM= 60.0 V	1	$0.19	 SMC 83mm2
12.	D2	Diodes Inc.	B560C-13-F	VF@Io= 700.0 mV VRRM= 60.0 V	1	$0.19	 SMC 83mm2
13.	D3	Diodes Inc.	B560C-13-F	VF@Io= 700.0 mV VRRM= 60.0 V	1	$0.19	 SMC 83mm2
14.	D4	Diodes Inc.	B560C-13-F	VF@Io= 700.0 mV VRRM= 60.0 V	1	$0.19	 SMC 83mm2
15.	L1	Sumida	CDRH127/LDNP-150MC	L= 15.0 µH DCR= 26.4 mOhm	1	$0.61	 CDRH127 196mm2
16.	M1	Texas Instruments	CSD18563Q5A	VdsMax= 60.0 V IdsMax= 100.0 Amps	1	$0.68	 TRANS_NexFET_Q5A 55mm2
17.	M2	Texas Instruments	CSD16340Q3	VdsMax= 25.0 V IdsMax= 60.0 Amps	1	$0.44	 TRANS_NexFET_Q3 19mm2
18.	Rcomp	Vishay-Dale	CRCW040256K2FKED Series= CRCW..e3	Res= 56.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3mm2
19.	Renable	Vishay-Dale	CRCW04021M00FKED Series= CRCW..e3	Res= 1000.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3mm2
20.	Rfbb	Vishay-Dale	CRCW04021K00FKED Series= CRCW..e3	Res= 1000.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3mm2
21.	Rfbt	Vishay-Dale	CRCW04028K66FKED Series= CRCW..e3	Res= 8.66 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3mm2
22.	Rsense	Susumu Co Ltd	PRL1632-R020-F-T1 Series= 237	Res= 20.0 mOhm Power= 1.0 W Tolerance= 1.0%	1	$0.19	 1206 11mm2
23.	Rt	Vishay-Dale	CRCW040218K7FKED Series= CRCW..e3	Res= 18.7 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3mm2
24.	Ruv1	Vishay-Dale	CRCW040239K2FKED Series= CRCW..e3	Res= 39.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3mm2
25.	Ruv2	Vishay-Dale	CRCW04027K87FKED Series= CRCW..e3	Res= 7.87 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3mm2
26.	U1	Texas Instruments	LM25118MH/NOPB	Switcher	1	$2.40	 MXA20A 71mm2

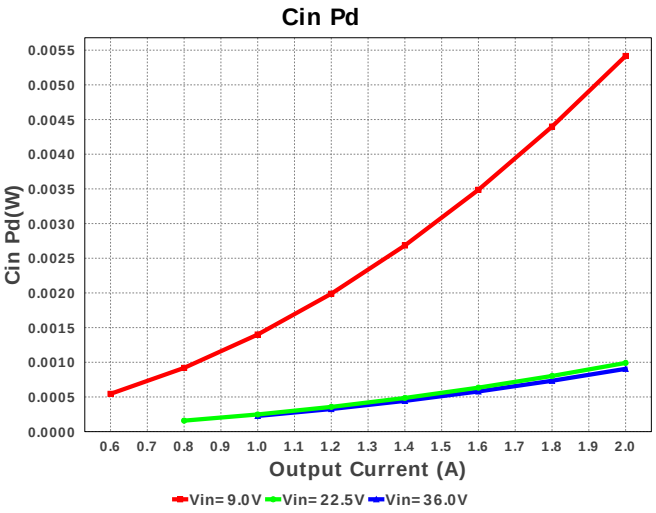


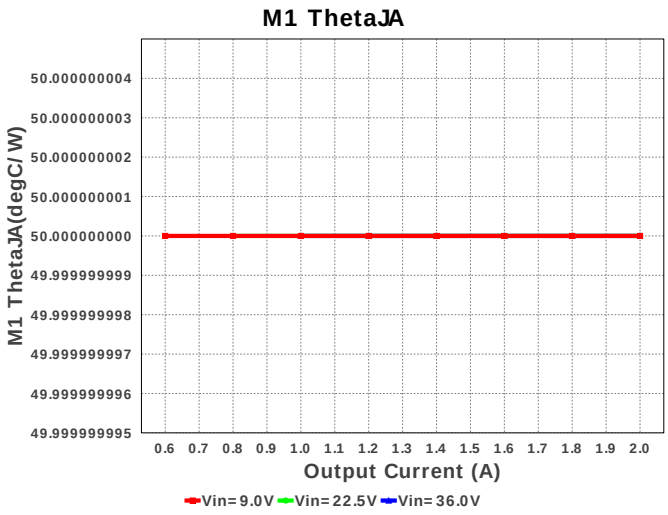


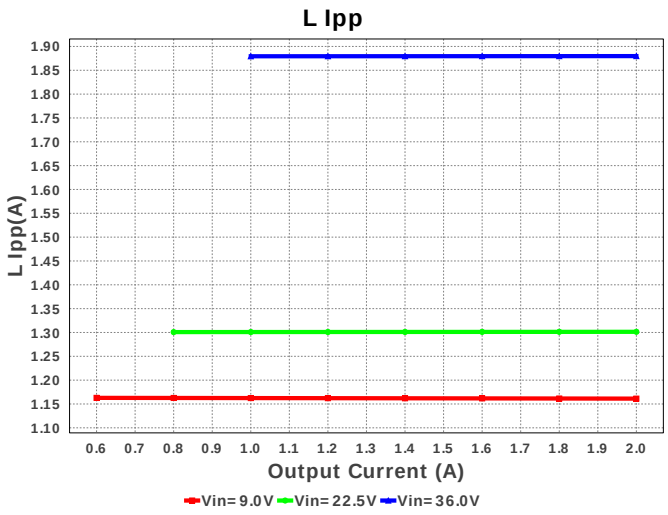


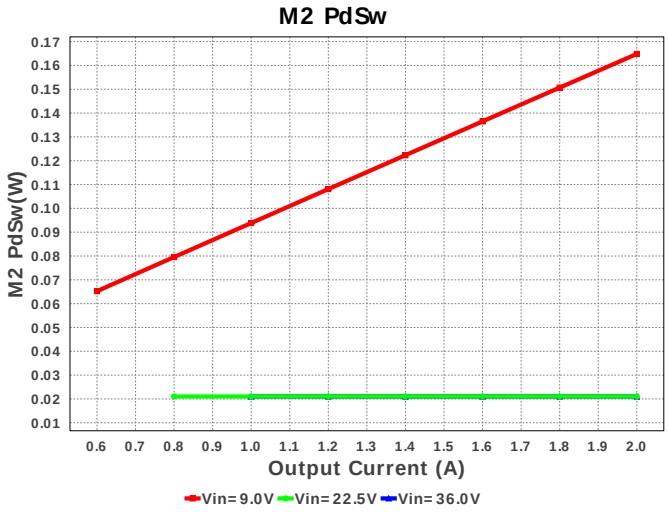


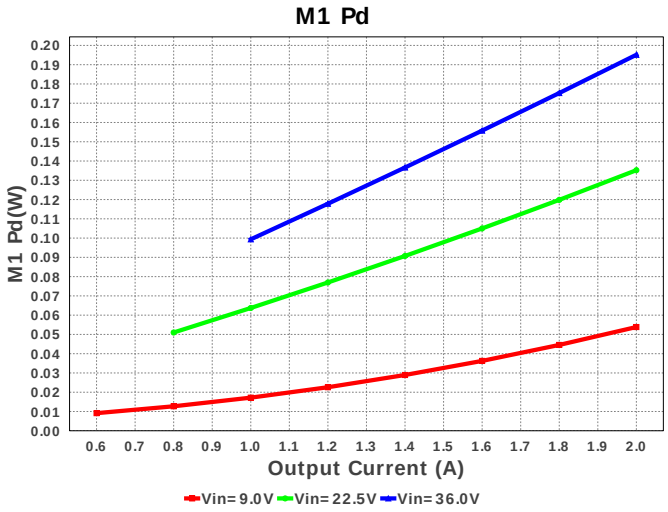


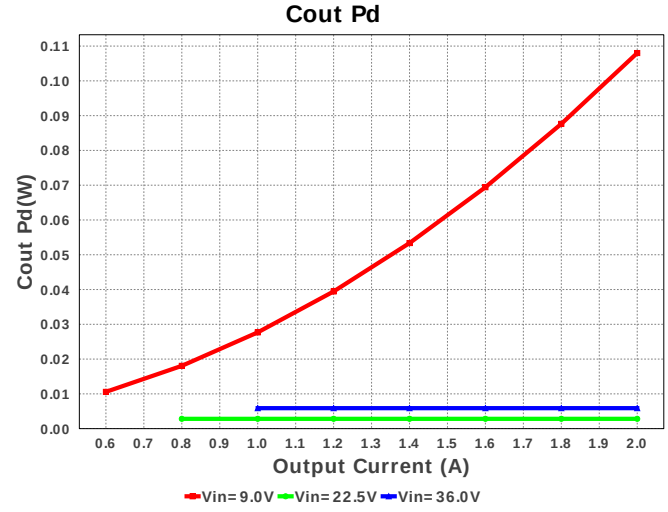


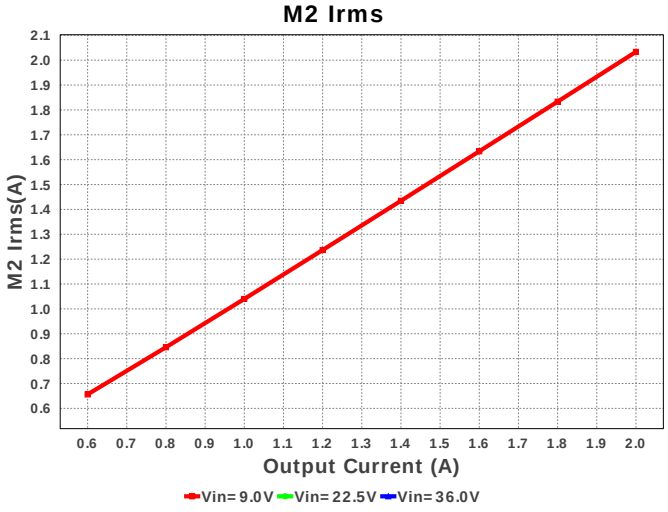


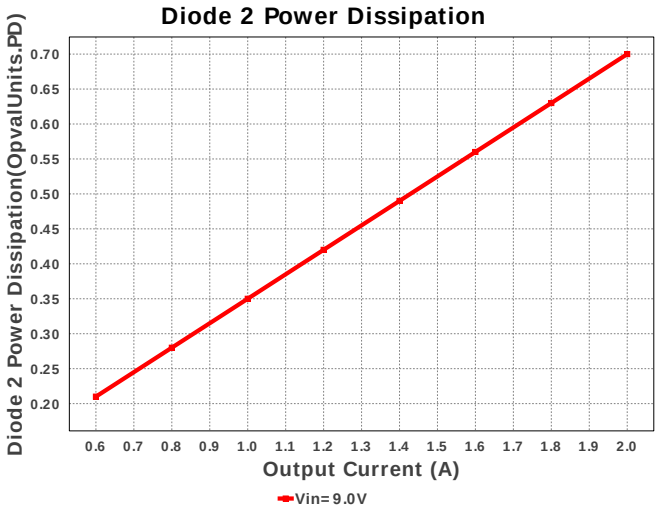


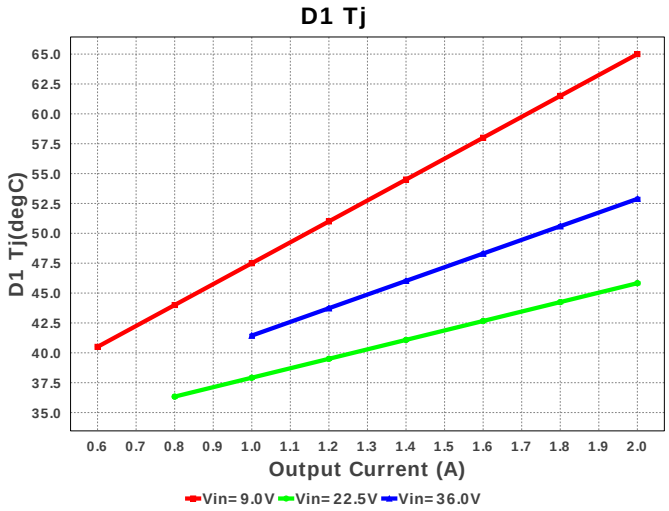


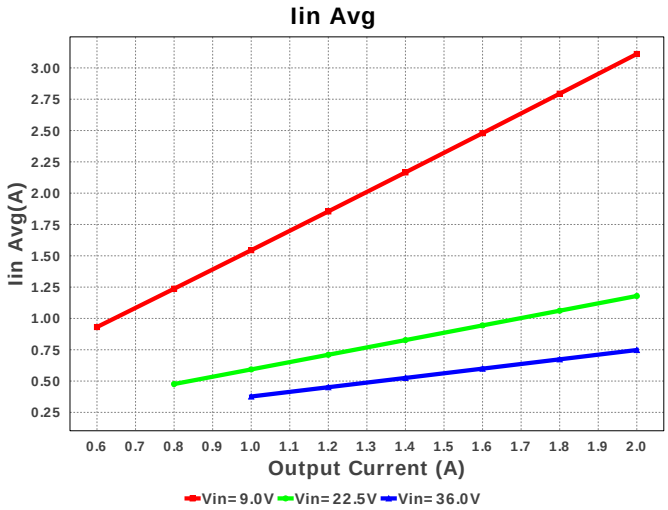


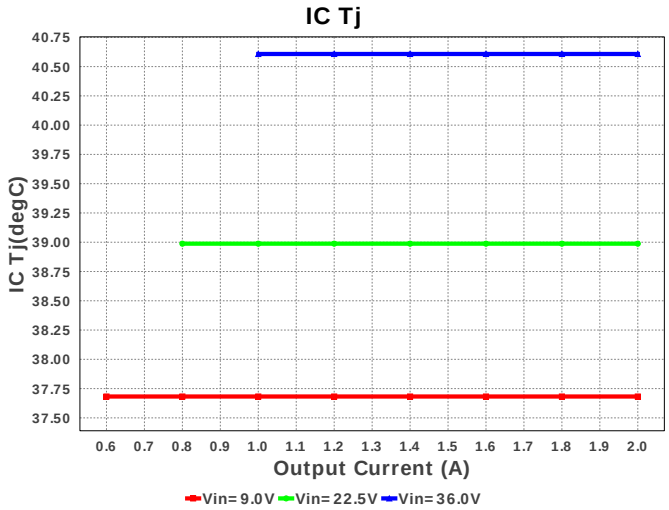


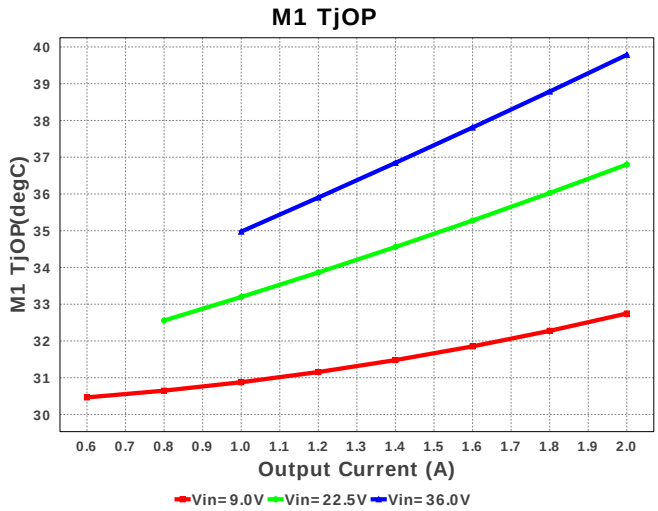


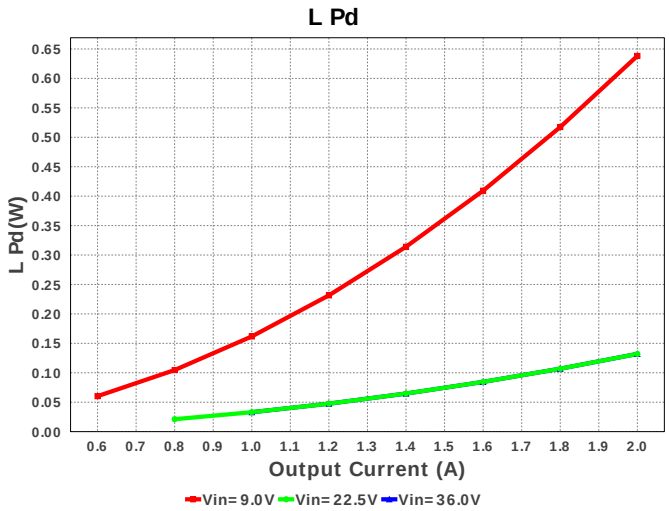


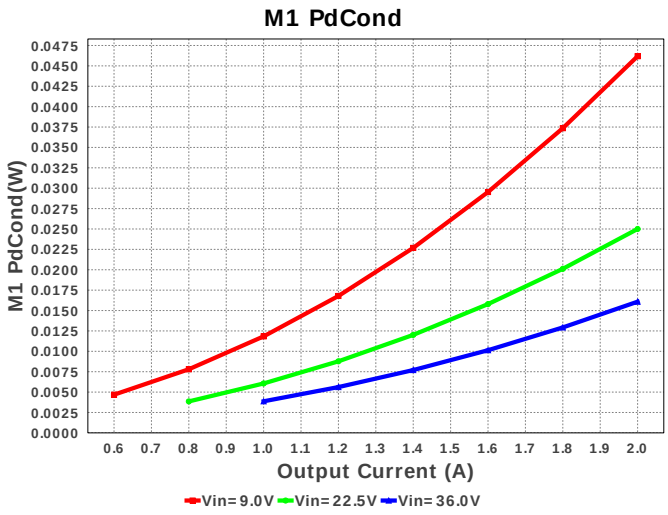


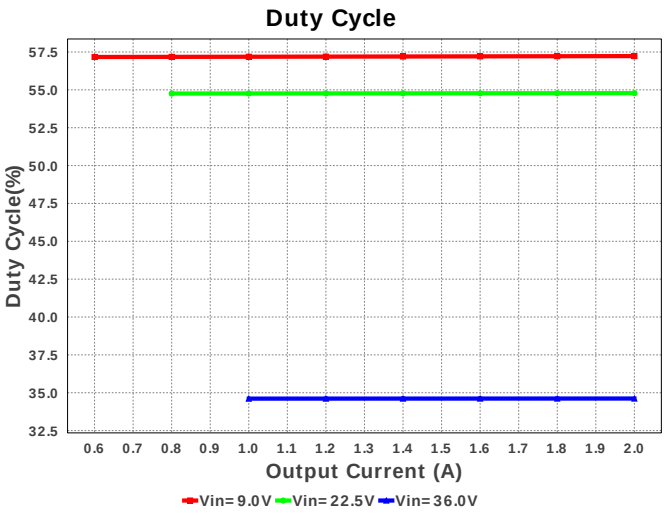


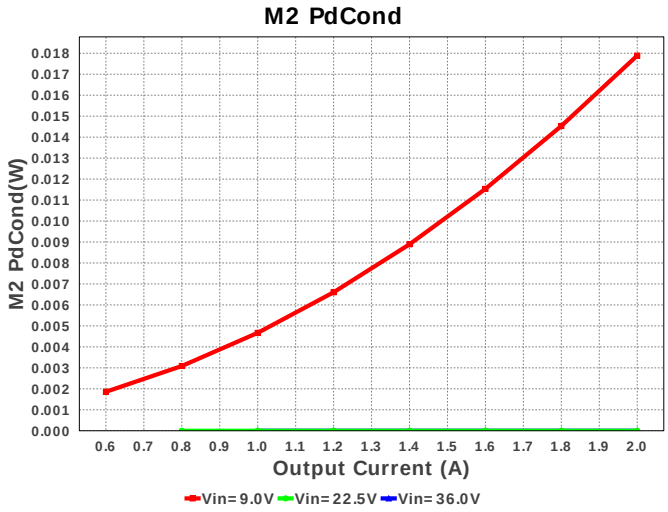


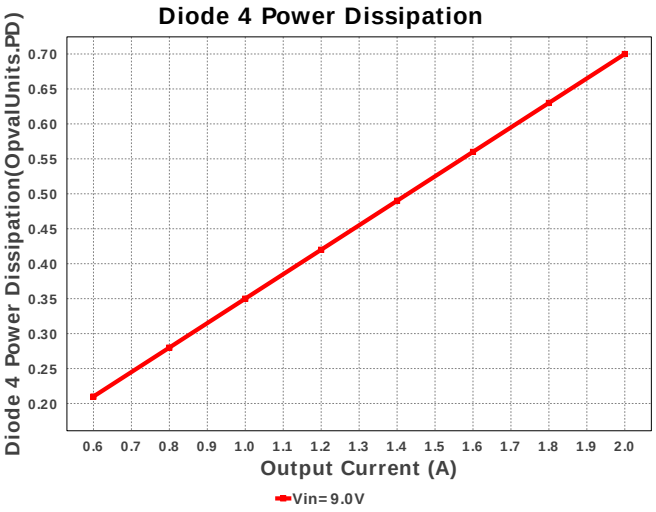


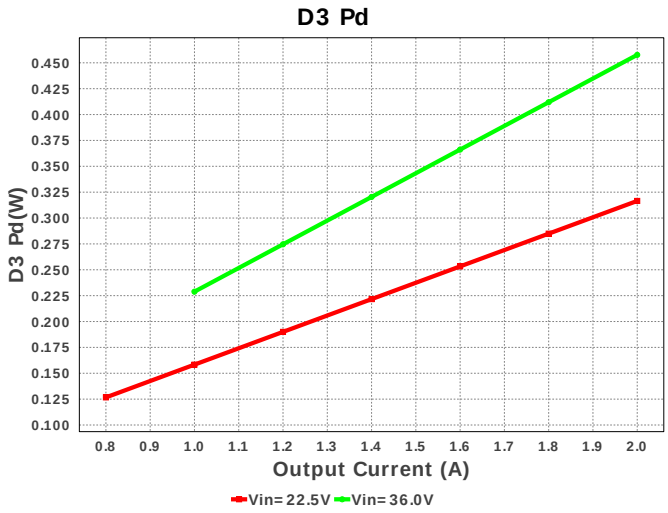


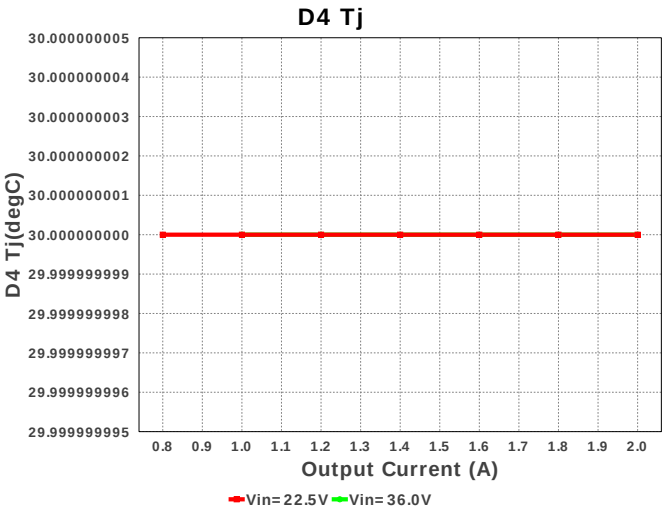


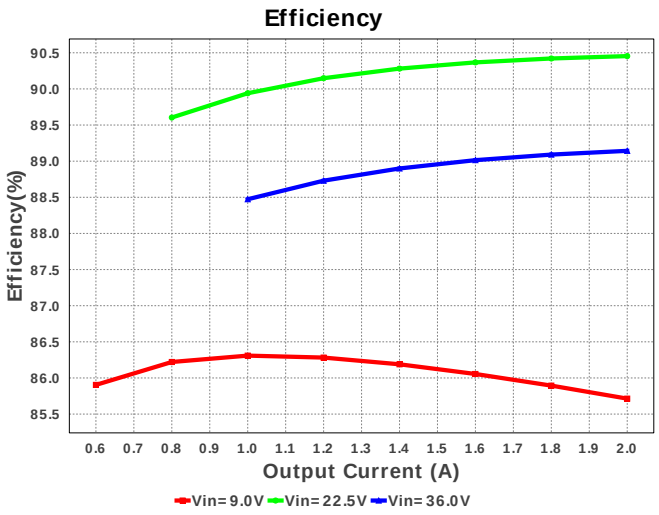


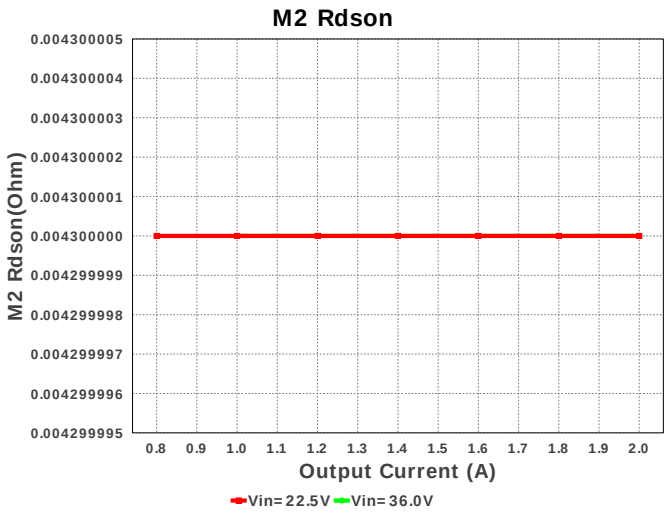


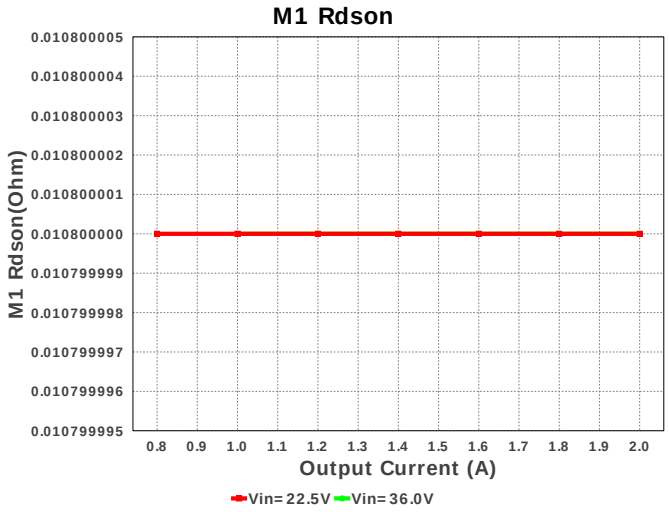


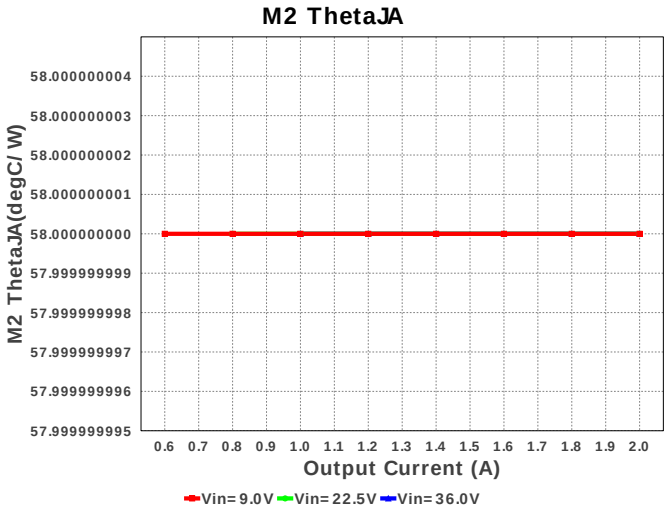


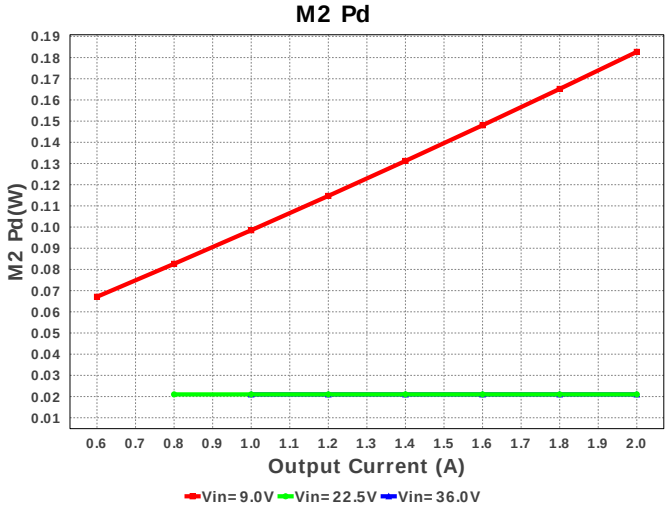


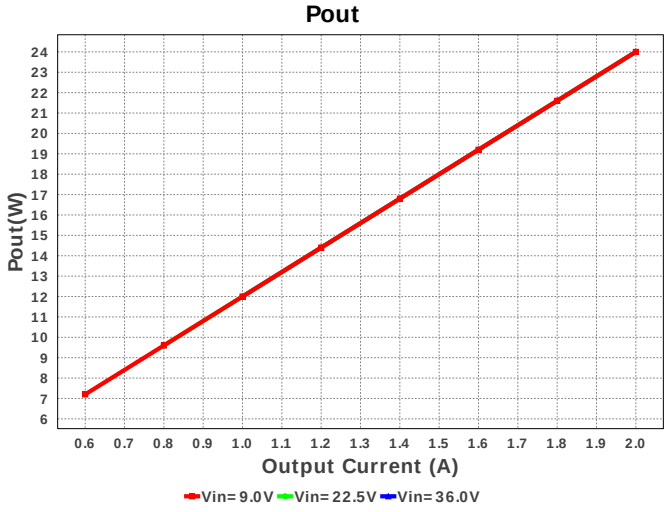


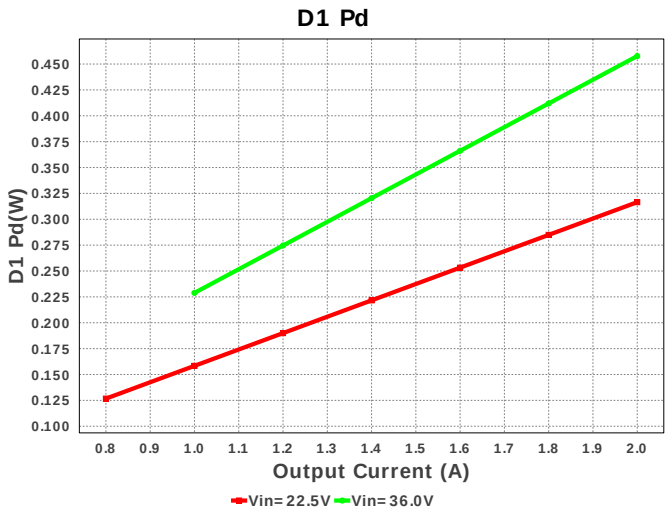


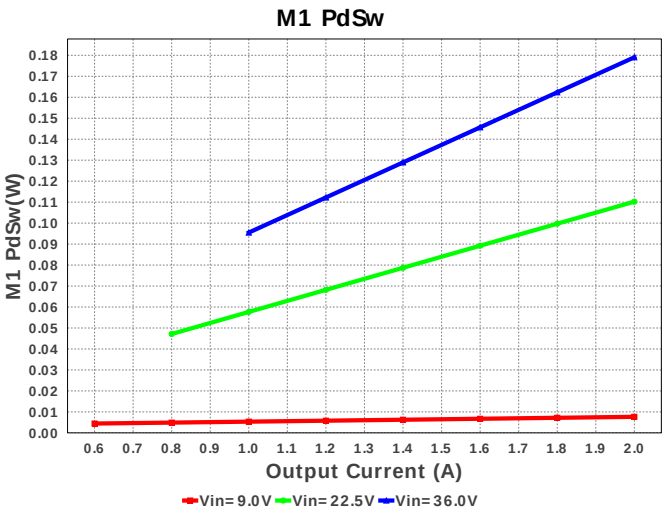


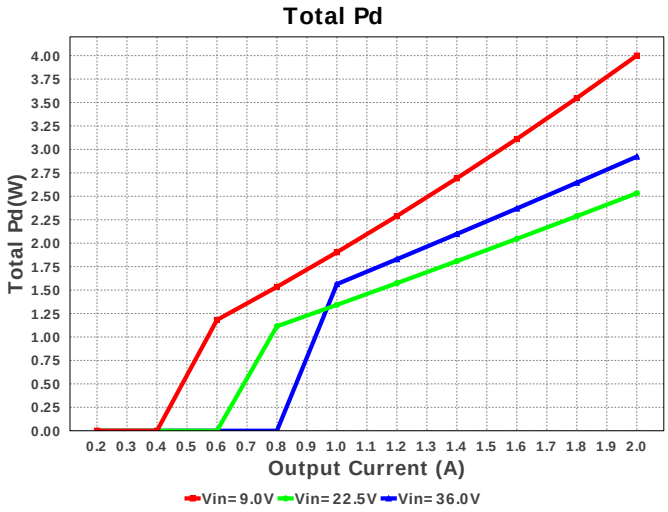


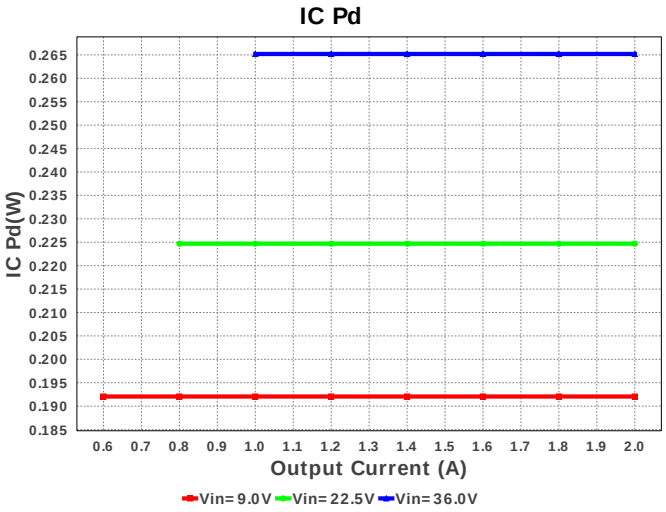


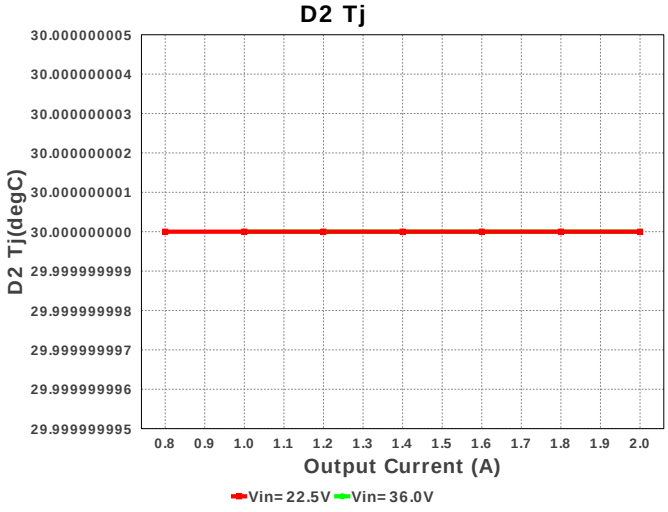


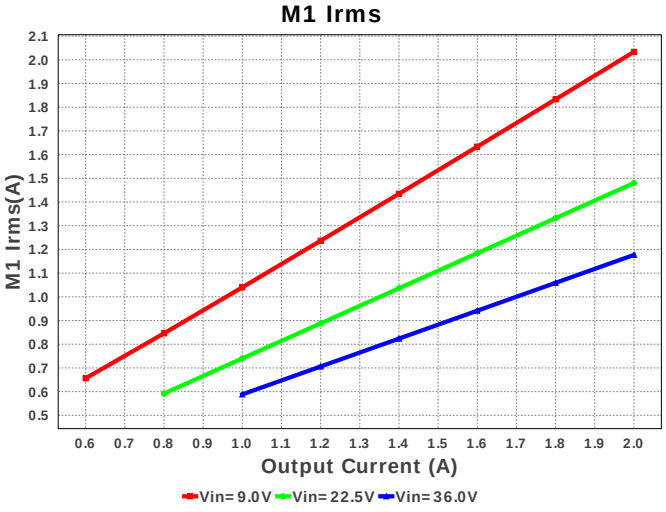


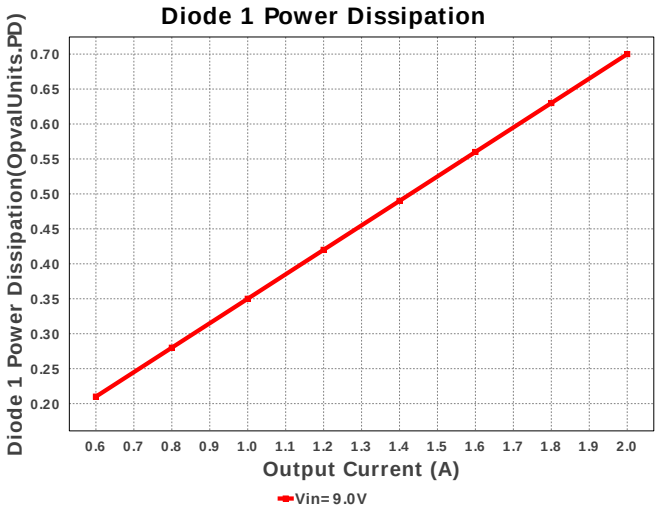


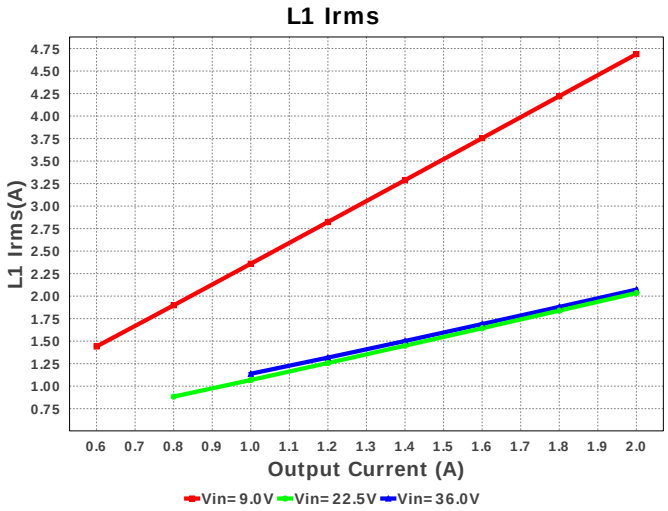


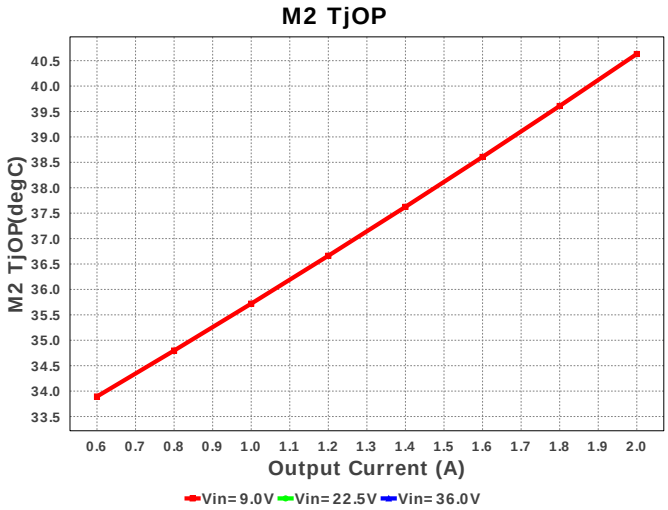


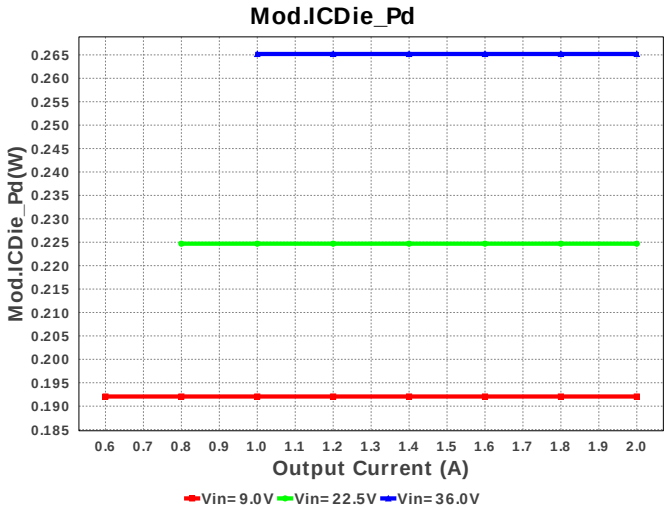


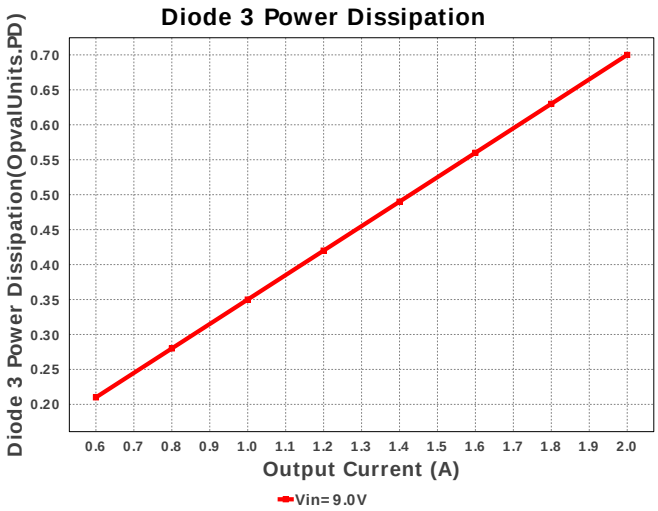


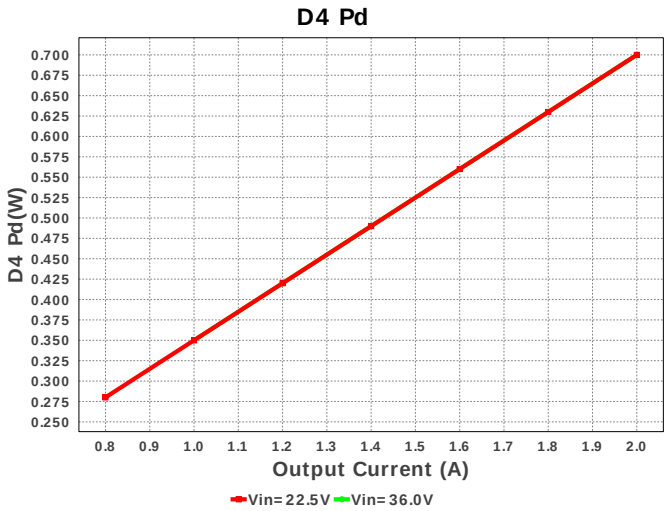


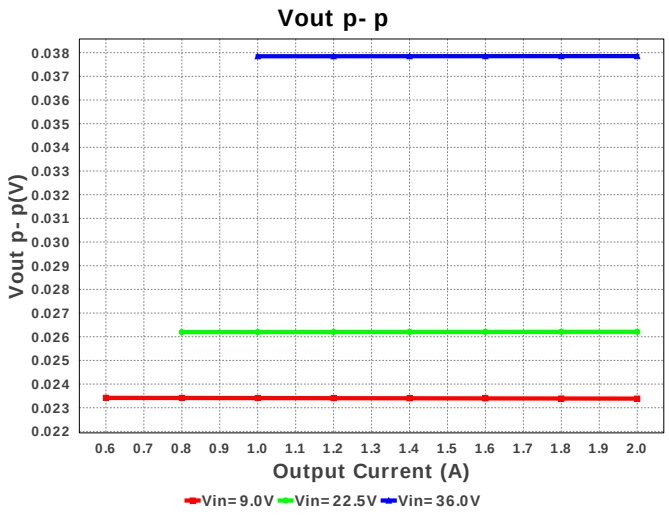


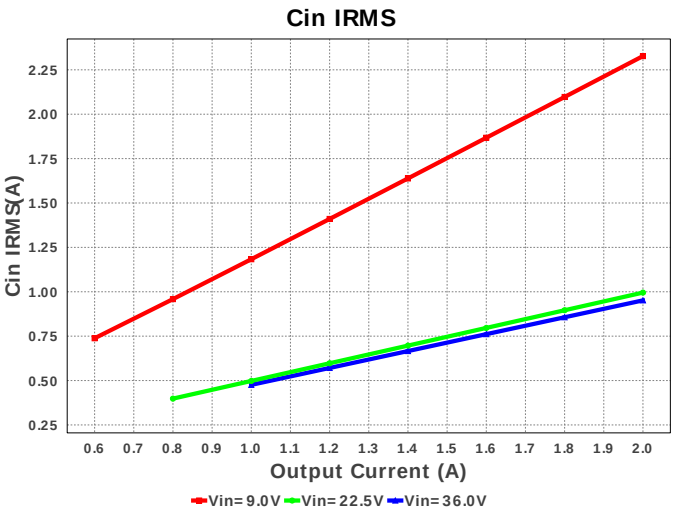


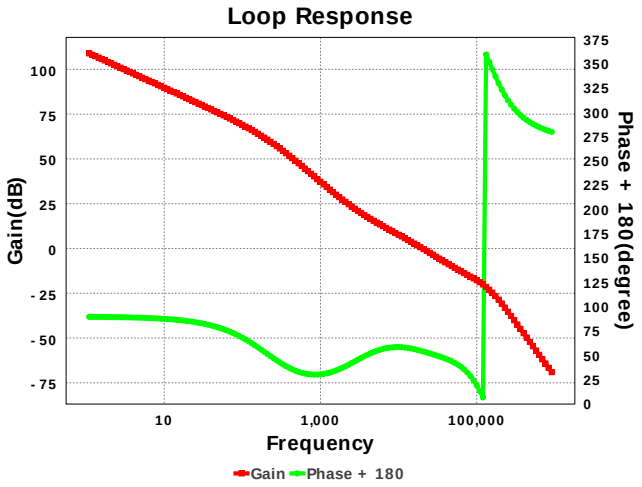












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	951.517 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	533.012 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	748.03 mA	Current	Average input current
4.	L Ipp	1.846 A	Current	Peak-to-peak inductor ripple current
5.	L1 Irms	2.07 A	Current	Inductor ripple current
6.	M1 Irms	1.177 A	Current	MOSFET RMS ripple current
7.	M2 Irms	3.81 A	Current	MOSFET RMS ripple current
8.	SW Ipk	2.923 A	Current	Peak switch current
9.	BOM Count	28	General	Total Design BOM count
10.	FootPrint	901.0 mm2	General	Total Foot Print Area of BOM components
11.	Frequency	300.0 kHz	General	Switching frequency
12.	IC Tolerance	18.0 mV	General	IC Feedback Tolerance
13.	M1 Rdson	10.8 mOhm	General	Drain-Source On-resistance
14.	M1 ThetaJA	50.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
15.	M2 Rdson	4.3 mOhm	General	Drain-Source On-resistance
16.	M2 ThetaJA	58.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
17.	Pout	24.0 W	General	Total output power
18.	Total BOM	$5.81	General	Total BOM Cost
19.	D1 Tj	52.883 degC	Op_Point	D1 junction temperature
20.	D1 Tj	52.883 degC	Op_Point	D1 junction temperature
21.	D2 Tj	65.0 degC	Op_Point	D1 junction temperature
22.	D3 Tj	52.883 degC	Op_Point	D1 junction temperature
23.	D4 Tj	65.0 degC	Op_Point	D1 junction temperature
24.	Vout OP	12.0 V	Op_Point	Operational Output Voltage
25.	Cross Freq	20.332 kHz	Op_point	Bode plot crossover frequency
26.	Duty Cycle	34.62 %	Op_point	Duty cycle
27.	Efficiency	89.123 %	Op_point	Steady state efficiency
28.	IC Tj	40.613 degC	Op_point	IC junction temperature
29.	ICThetaJA	40.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
30.	IOUT_OP	2.0 A	Op_point	Iout operating point
31.	M1 TjOP	39.938 degC	Op_point	MOSFET junction temperature
32.	M2 TjOP	34.953 degC	Op_point	MOSFET junction temperature

#	Name	Value	Category	Description
33.	Phase Marg	54.465 deg	Op_point	Bode Plot Phase Margin
34.	VIN_OP	36.0 V	Op_point	Vin operating point
35.	Vout p-p	37.175 mV	Op_point	Peak-to-peak output ripple voltage
36.	Cin Pd	905.384 µW	Power	Input capacitor power dissipation
37.	Cout Pd	5.682 mW	Power	Output capacitor power dissipation
38.	D1 Pd	457.659 mW	Power	Diode power dissipation
39.	D2 Pd	700.0 mW	Power	Diode power dissipation
40.	D3 Pd	457.659 mW	Power	Diode power dissipation
41.	D4 Pd	700.0 mW	Power	Diode power dissipation
42.	Diode Pd	457.659 mW	Power	Diode power dissipation
43.	IC Pd	265.323 mW	Power	IC power dissipation
44.	L Pd	132.0 mW	Power	Inductor power dissipation
45.	M1 Pd	201.158 mW	Power	MOSFET power dissipation
46.	M1 PdCond	19.052 mW	Power	M1 MOSFET conduction losses
47.	M1 PdSw	182.106 mW	Power	M1 MOSFET switching losses
48.	M2 Pd	21.404 mW	Power	MOSFET power dissipation
49.	M2 PdCond	0.0 W	Power	M2 MOSFET conduction losses
50.	M2 PdSw	21.404 mW	Power	M2 MOSFET switching losses
51.	Total Pd	2.929 W	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	2.0 A	Maximum Output Current
2.	Iout1	2.0 Amps	Output Current #1
3.	VinMax	36.0 V	Maximum input voltage
4.	VinMin	9.0 V	Minimum input voltage
5.	Vout	12.0 V	Output Voltage
6.	Vout1	12.0 Volt	Output Voltage #1
7.	base_pn	LM25118	Base Product Number
8.	source	DC	Input Source Type
9.	Ta	30.0 degC	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.