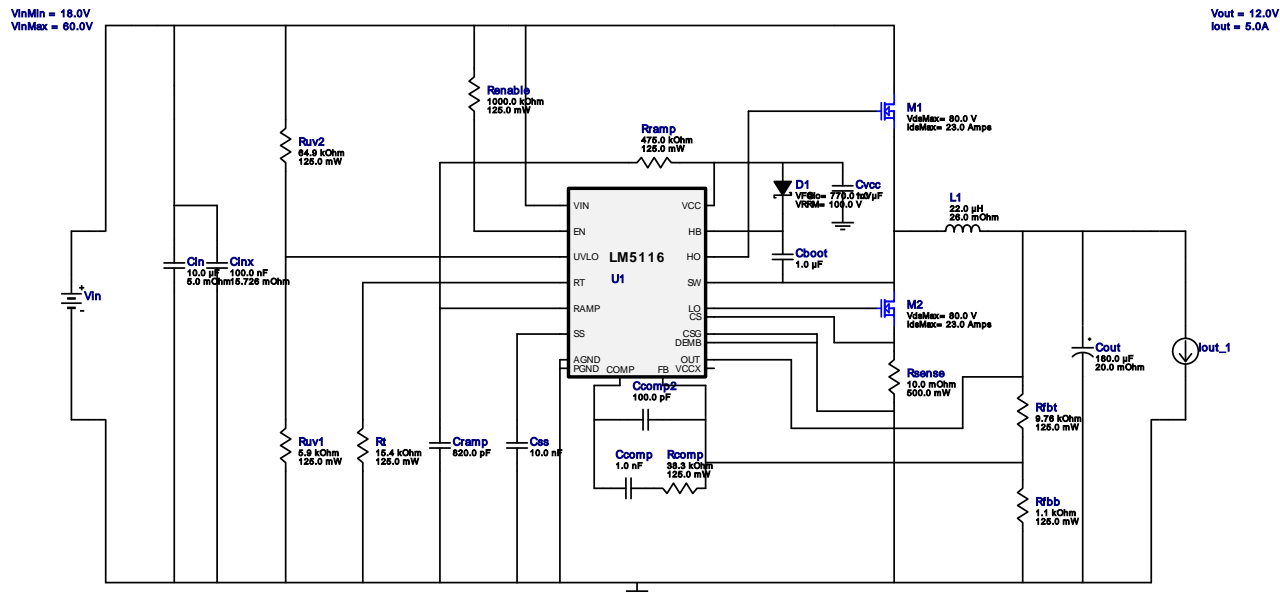





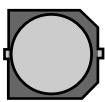




## WEBENCH® Design Report

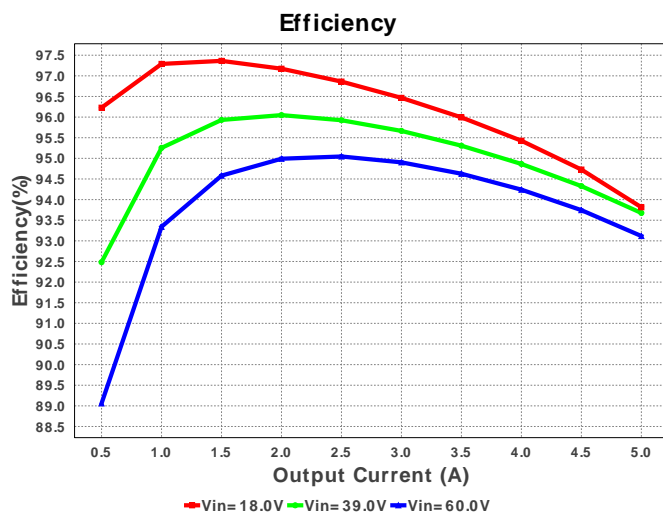
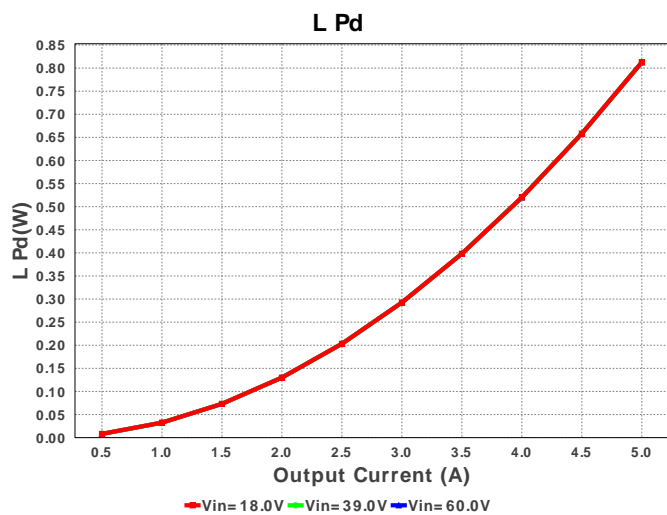
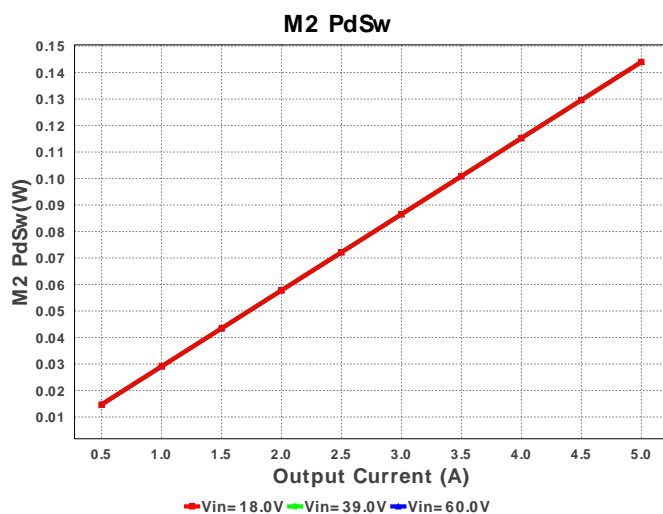
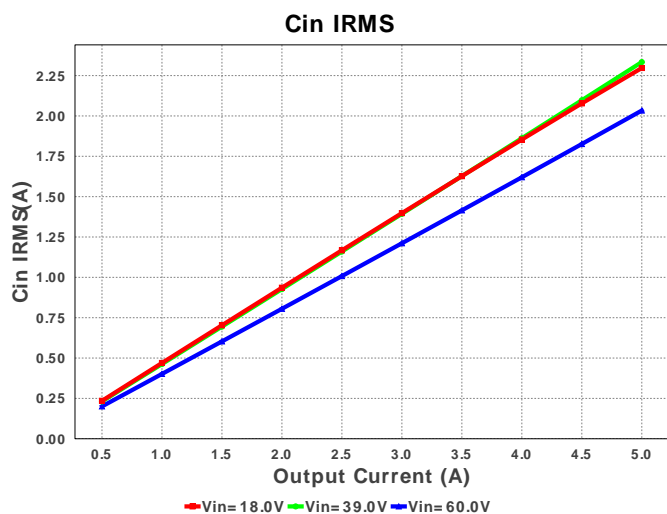
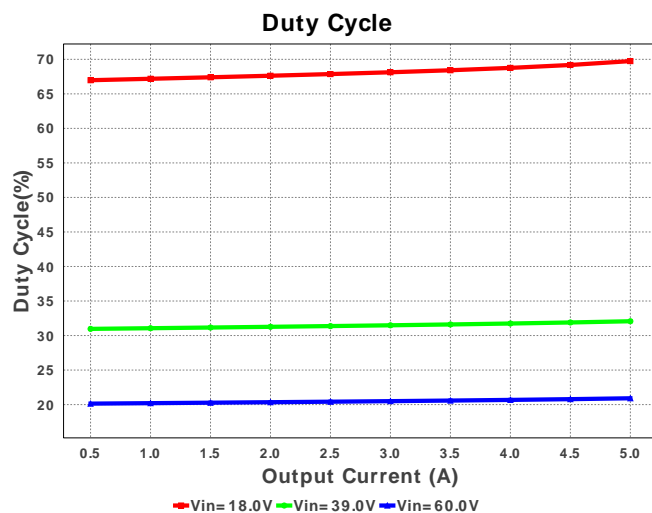
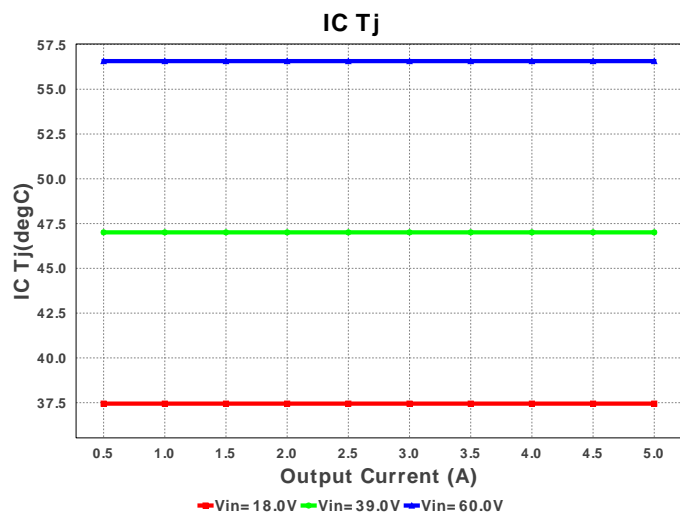
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LM5116MHX/NOPB 18.0V-60.0V to 12.00V @ 5.0A

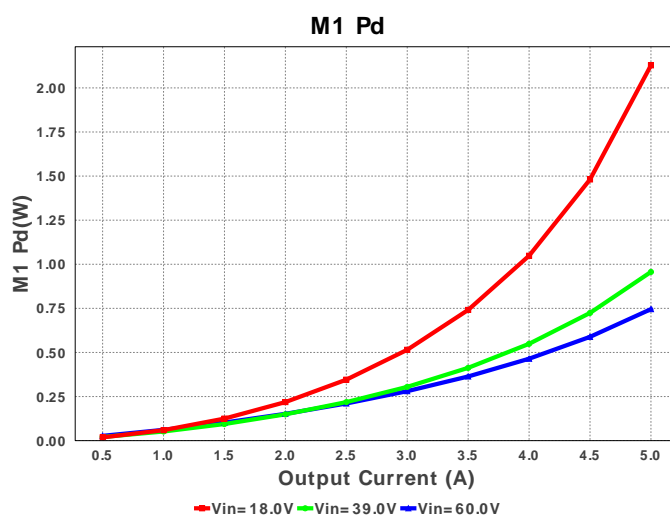
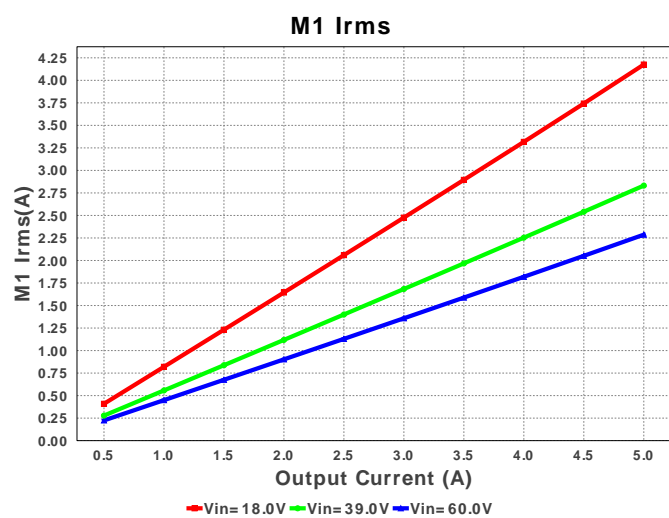
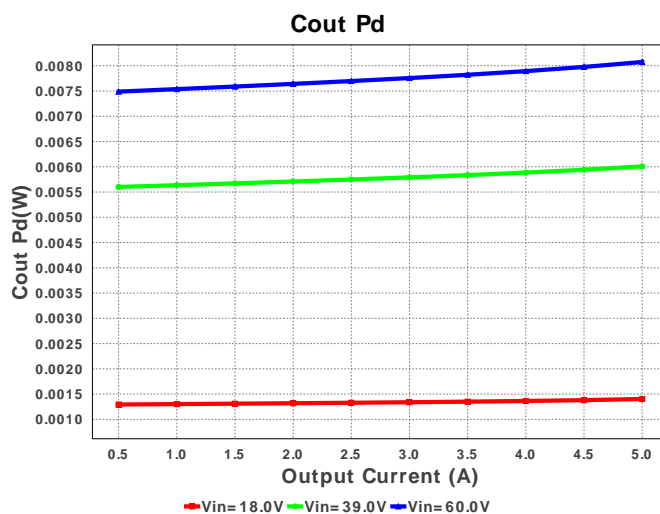
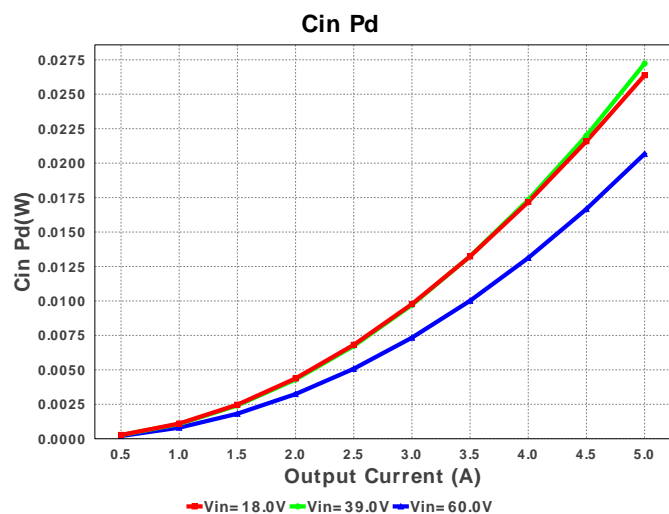
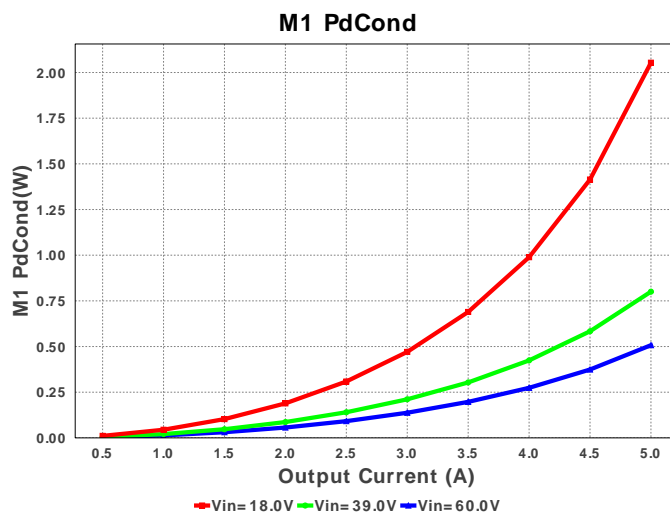
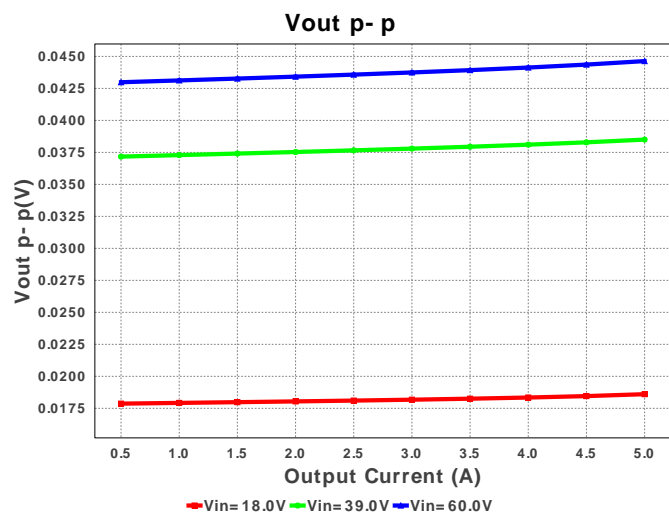


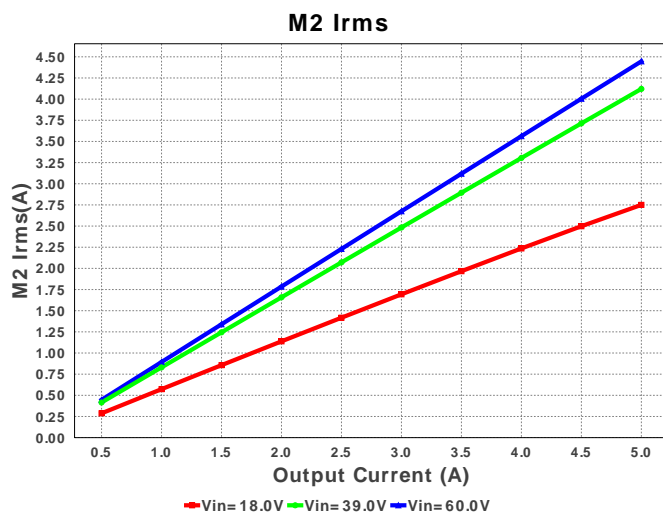
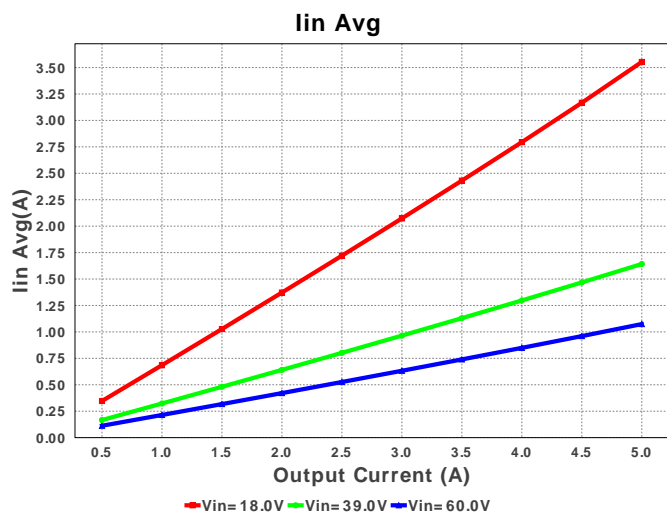
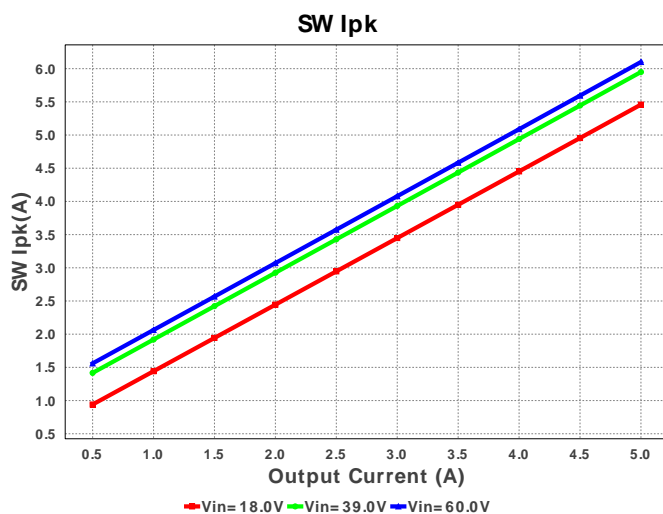
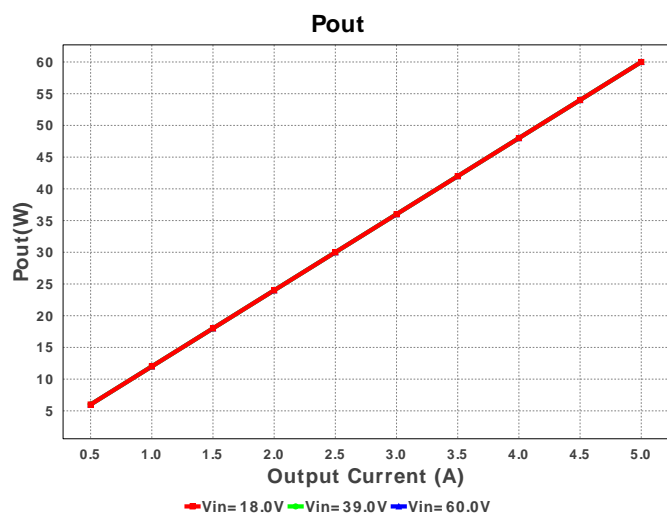
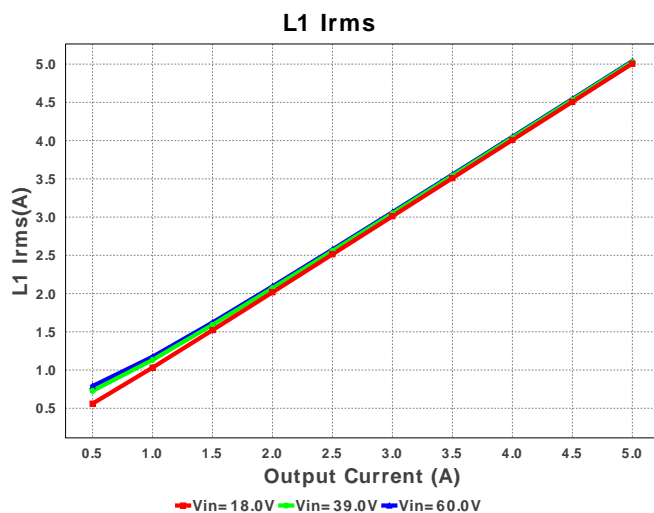
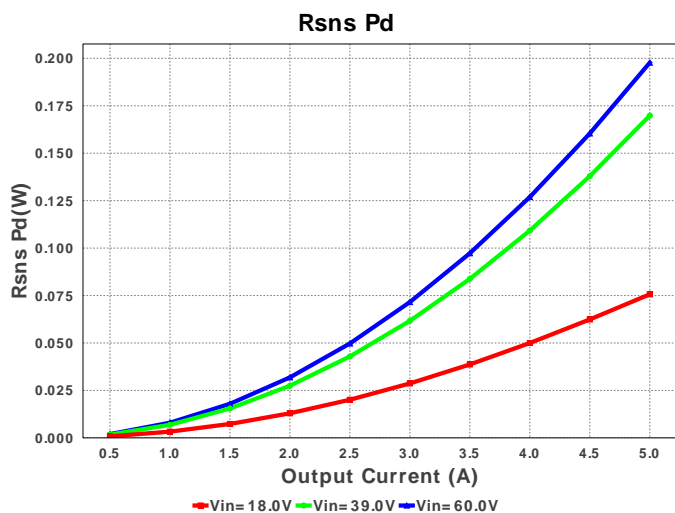
## Electrical BOM

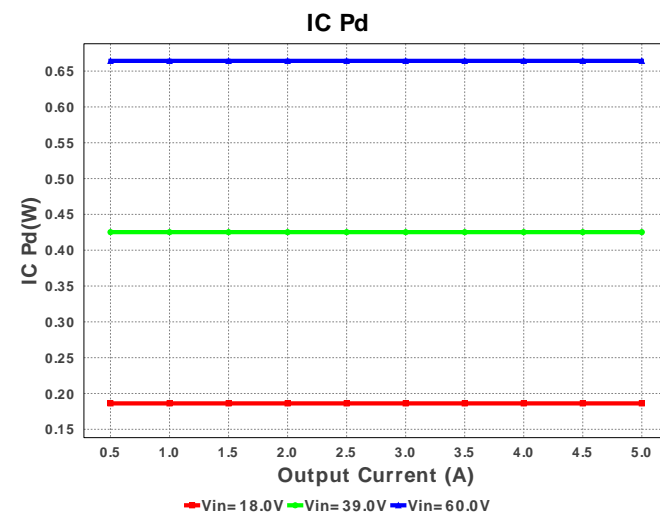
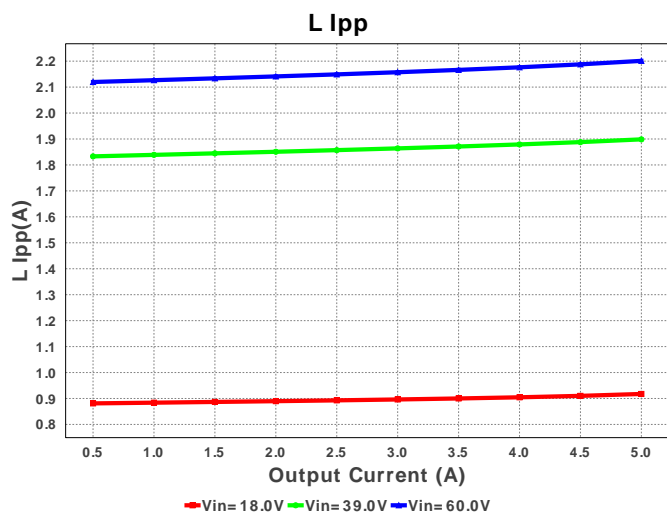
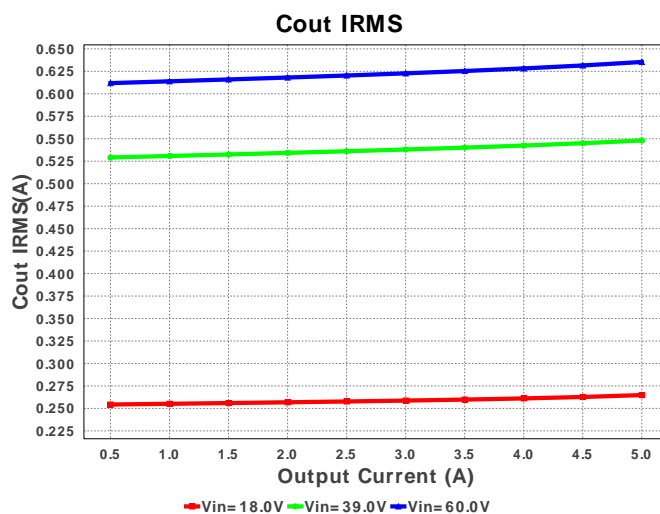
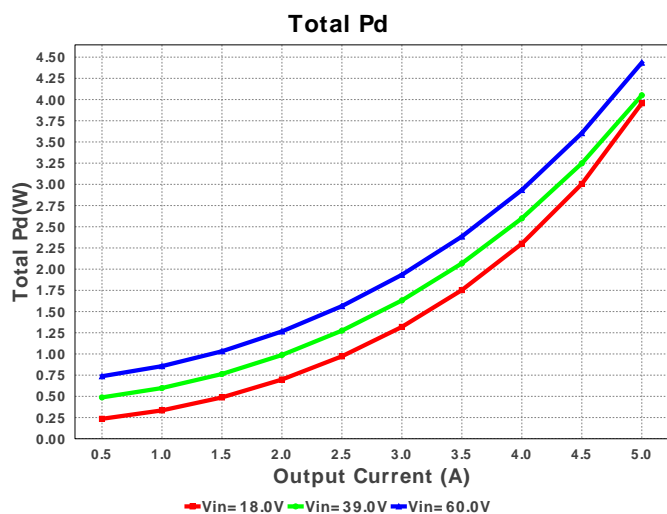
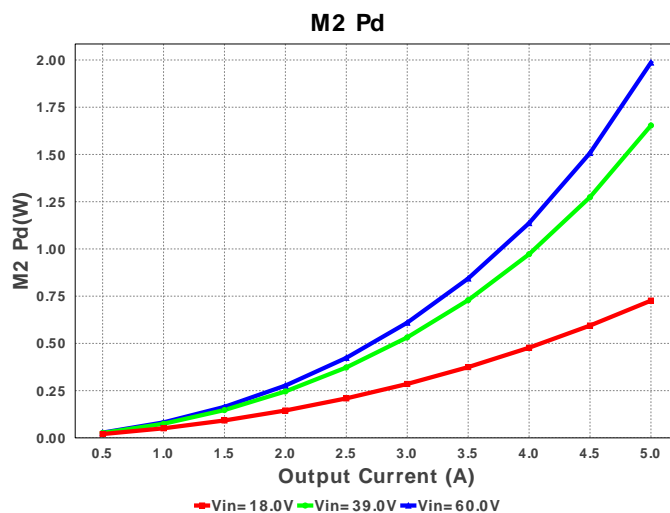
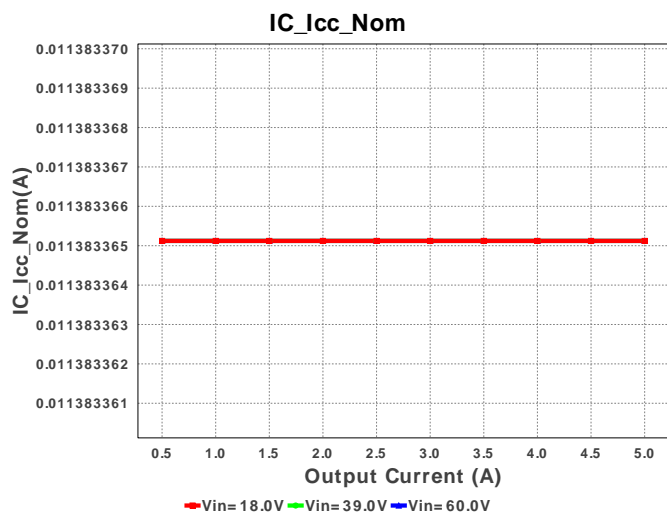
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	Taiyo Yuden	EMK212B7105KG-T Series= X7R	Cap= 1.0 uF VDC= 16.0 V IRMS= 0.0 A	1	\$0.02	 0805 7 mm <sup>2</sup>
2.	Ccomp	Yageo America	CC0805KRX7R9BB102 Series= X7R	Cap= 1.0 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm <sup>2</sup>
3.	Ccomp2	Yageo America	CC0805JRNP09BN101 Series= C0G/NP0	Cap= 100.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm <sup>2</sup>
4.	Cin	TDK	C5750X7S2A106M Series= 479	Cap= 10.0 uF ESR= 5.0 mOhm VDC= 100.0 V IRMS= 6.45 A	1	\$0.84	 2220 60 mm <sup>2</sup>
5.	Cinx	TDK	C2012X7R2A104K Series= 285	Cap= 100.0 nF ESR= 15.726 mOhm VDC= 100.0 V IRMS= 0.0 A	1	\$0.03	 0805 7 mm <sup>2</sup>
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 113 mm <sup>2</sup>
7.	Cramp	Yageo America	CC0805KRX7R9BB821 Series= X7R	Cap= 820.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm <sup>2</sup>
8.	Css	MuRata	GRM216R71H103KA01D Series= X7R	Cap= 10.0 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm <sup>2</sup>

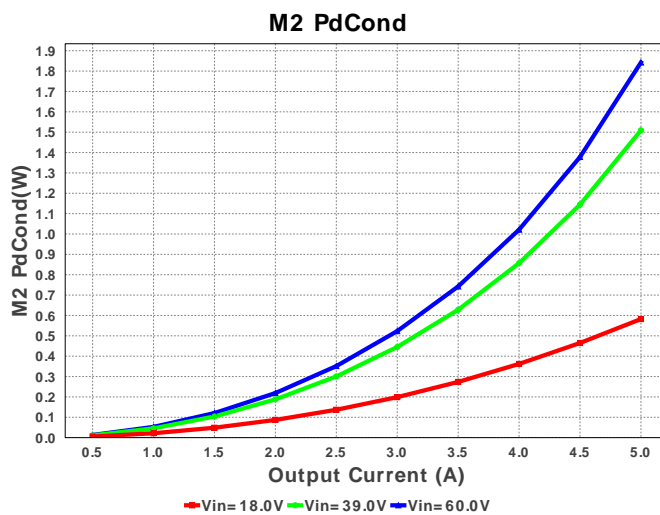
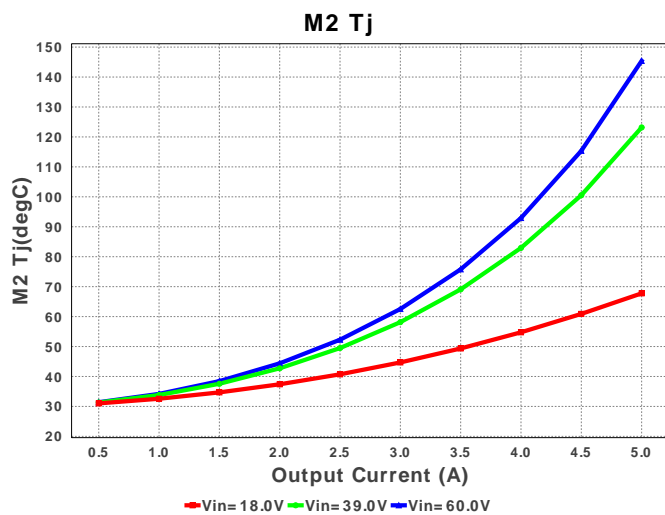
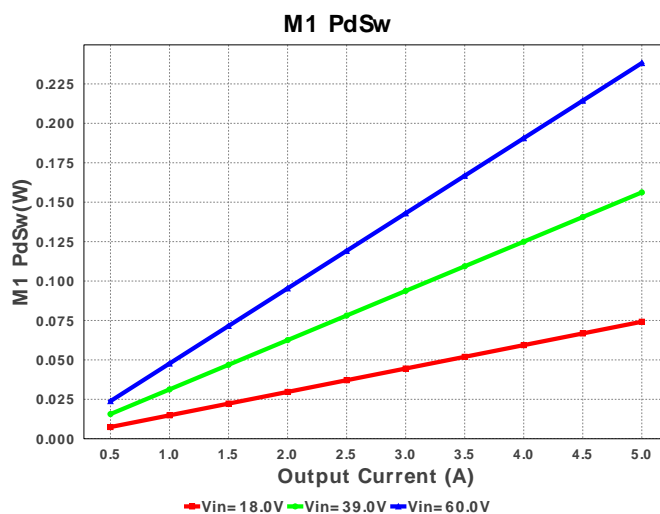
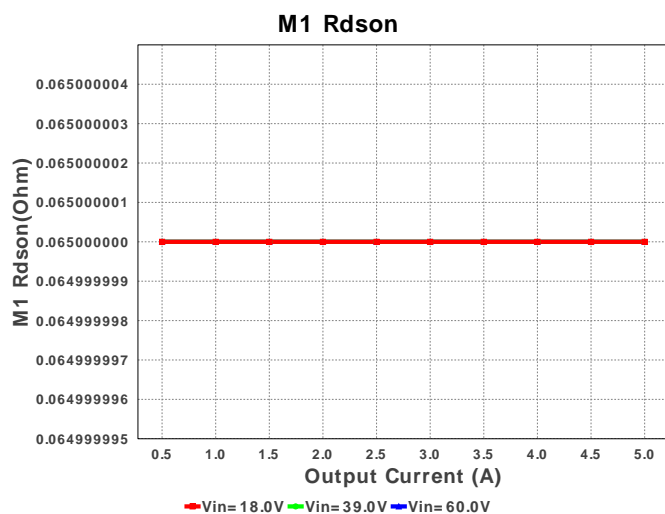
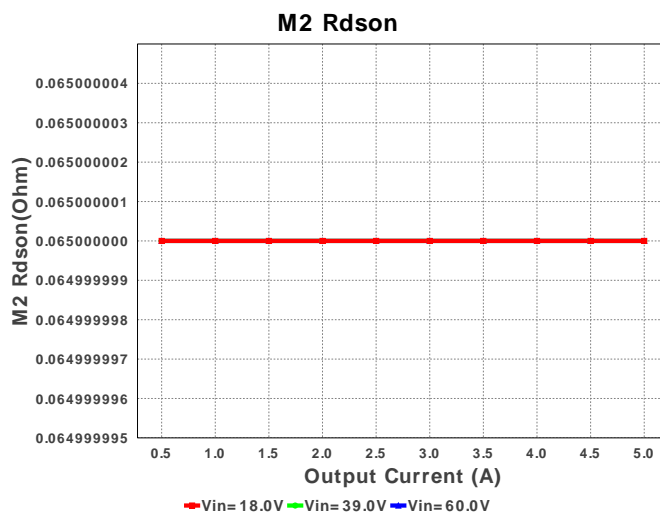
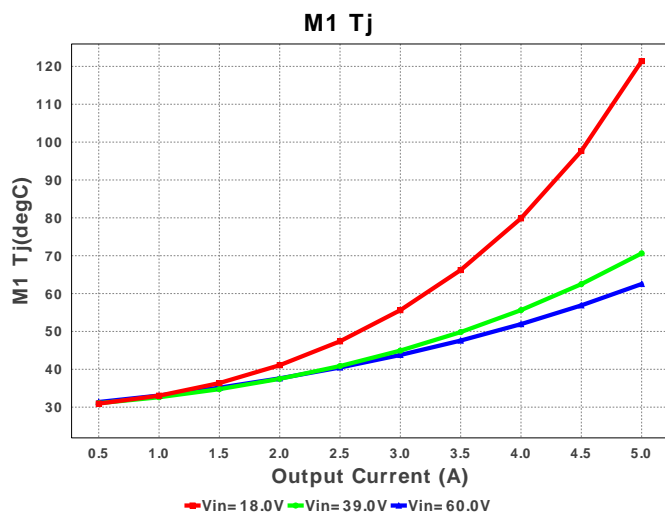
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
9.	Cvcc	Taiyo Yuden	EMK212B7105KG-T Series= X7R	Cap= 1.0 uF VDC= 16.0 V IRMS= 0.0 A	1	\$0.02	 0805 7 mm <sup>2</sup>
10.	D1	Diodes Inc.	DFLS1100-7	VF@Io= 770.0 mV VRRM= 100.0 V	1	\$0.19	 PowerDI123 13 mm <sup>2</sup>
11.	L1	Coilcraft	MSS1210-223MEB	L= 22.0 uH DCR= 26.0 mOhm	1	\$0.81	 MSS1210 204 mm <sup>2</sup>
12.	M1	Infineon Technologies	BSC340N08NS3 G	VdsMax= 80.0 V IdsMax= 23.0 Amps	1	\$0.28	 PG-TDSON-8 55 mm <sup>2</sup>
13.	M2	Infineon Technologies	BSC340N08NS3 G	VdsMax= 80.0 V IdsMax= 23.0 Amps	1	\$0.28	 PG-TDSON-8 55 mm <sup>2</sup>
14.	Rcomp	Panasonic	ERJ-6ENF3832V Series= 225	Res= 38.3 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm <sup>2</sup>
15.	Renable	Panasonic	ERJ-6ENF1004V Series= 225	Res= 1000.0 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm <sup>2</sup>
16.	Rfbb	Panasonic	ERJ-6ENF1101V Series= 225	Res= 1.1 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm <sup>2</sup>
17.	Rfbt	Panasonic	ERJ-6ENF9761V Series= 225	Res= 9.76 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm <sup>2</sup>
18.	Rramp	Panasonic	ERJ-6ENF4753V Series= 225	Res= 475.0 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm <sup>2</sup>
19.	Rsense	Stackpole Electronics Inc	CSR1206FK10L0 Series= ?	Res= 10.0 mOhm Power= 500.0 mW Tolerance= 1.0%	1	\$0.11	 1206 11 mm <sup>2</sup>
20.	Rt	Panasonic	ERJ-6ENF1542V Series= 225	Res= 15.4 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm <sup>2</sup>
21.	Ruv1	Panasonic	ERJ-6ENF5901V Series= 225	Res= 5.9 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm <sup>2</sup>
22.	Ruv2	Panasonic	ERJ-6ENF6492V Series= 225	Res= 64.9 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm <sup>2</sup>
23.	U1	Texas Instruments	LM5116MHX/NOPB	Switcher	1	\$2.42	 MXA20A 71 mm <sup>2</sup>











## Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	2.033 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	635.383 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	1.074 A	Current	Average input current
4.	L Ipp	2.201 A	Current	Peak-to-peak inductor ripple current
5.	L1 Irms	5.039 A	Current	Inductor ripple current
6.	M1 Irms	2.287 A	Current	MOSFET RMS ripple current
7.	M2 Irms	4.447 A	Current	MOSFET RMS ripple current
8.	SW Ipk	6.101 A	Current	Peak switch current
9.	BOM Count	23	General	Total Design BOM count
10.	FootPrint	685.0 mm <sup>2</sup>	General	Total Foot Print Area of BOM components
11.	Frequency	207.314 kHz	General	Switching frequency



#	Name	Value	Category	Description
12.	IC Tolerance	16.0 mV	General	IC Feedback Tolerance
13.	M1 Rdson	65.0 mOhm	General	Drain-Source On-resistance
14.	M2 Rdson	65.0 mOhm	General	Drain-Source On-resistance
15.	Pout	60.0 W	General	Total output power
16.	Total BOM	\$5.41	General	Total BOM Cost
17.	Cross Freq	24.694 kHz	Op_point	Bode plot crossover frequency
18.	Duty Cycle	20.914 %	Op_point	Duty cycle
19.	Efficiency	93.116 %	Op_point	Steady state efficiency
20.	IC Tj	56.571 degC	Op_point	IC junction temperature
21.	IOUT_OP	5.0 A	Op_point	Iout operating point
22.	M1 Tj	62.659 degC	Op_point	M1 MOSFET junction temperature
23.	M2 Tj	145.335 degC	Op_point	M2 MOSFET junction temperature
24.	Phase Marg	57.657 deg	Op_point	Bode Plot Phase Margin
25.	VIN_OP	60.0 V	Op_point	Vin operating point
26.	Vout p-p	44.634 mV	Op_point	Peak-to-peak output ripple voltage
27.	Cin Pd	20.675 mW	Power	Input capacitor power dissipation
28.	Cout Pd	8.074 mW	Power	Output capacitor power dissipation
29.	IC Pd	664.284 mW	Power	IC power dissipation
30.	L Pd	812.5 mW	Power	Inductor power dissipation
31.	M1 Pd	747.533 mW	Power	M1 MOSFET total power dissipation
32.	M1 PdCond	506.909 mW	Power	M1 MOSFET conduction losses
33.	M1 PdSw	240.624 mW	Power	M1 MOSFET switching losses
34.	M2 Pd	1.985 W	Power	M2 MOSFET total power dissipation
35.	M2 PdCond	1.842 W	Power	M2 MOSFET conduction losses
36.	M2 PdSw	143.15 mW	Power	M2 MOSFET switching losses
37.	Rsns Pd	197.715 mW	Power	Current Limit Sense Resistor Power Dissipation
38.	Total Pd	4.436 W	Power	Total Power Dissipation
39.	IC_Icc_Nom	11.383 mA	Unknown	IC Icc gate driver current

## Design Inputs

#	Name	Value	Description
1.	Iout	5.0 A	Maximum Output Current
2.	Iout1	5.0 Amps	Output Current #1
3.	VinMax	60.0 V	Maximum input voltage
4.	VinMin	18.0 V	Minimum input voltage
5.	Vout	12.0 V	Output Voltage
6.	Vout1	12.0 Volt	Output Voltage #1
7.	base_pn	LM5116	Texas Instruments Base Part Number
8.	source	DC	Input Source Type
9.	ta	30.0 degC	Ambient temperature

## Design Assistance

1. LM5116 Product Folder : <http://www.ti.com/product/lm5116> : contains the data sheet and other resources.

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