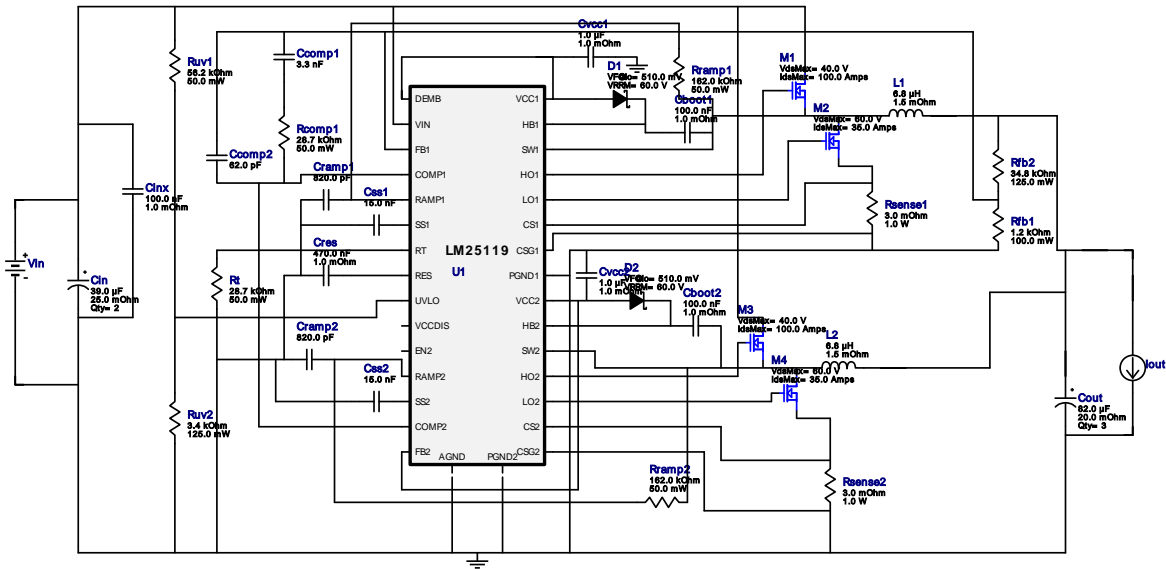










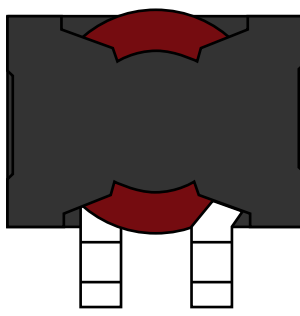
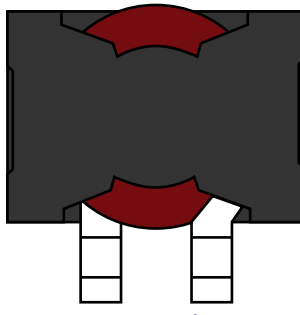







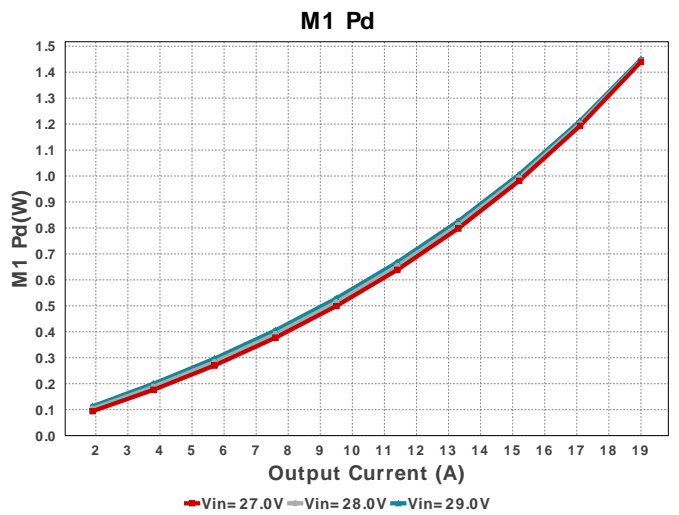
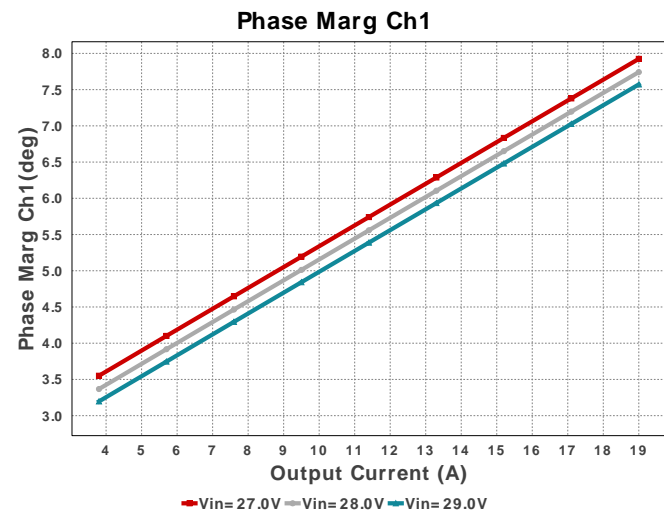
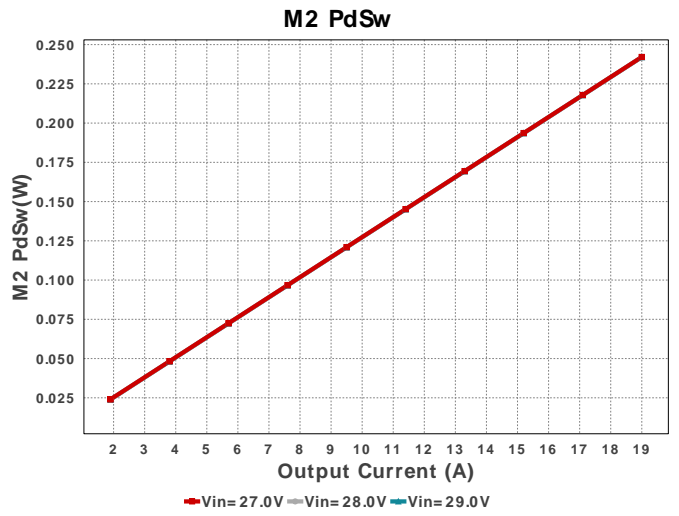
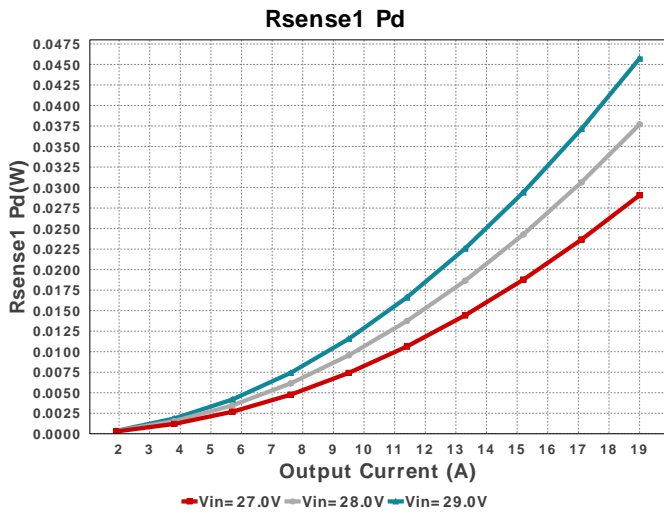
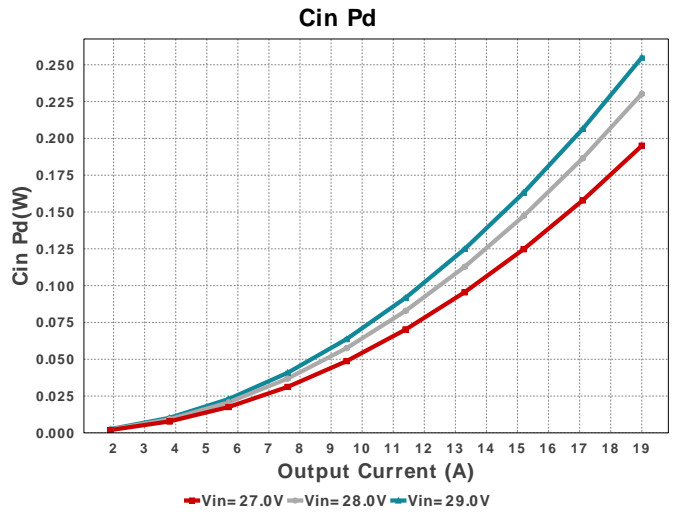
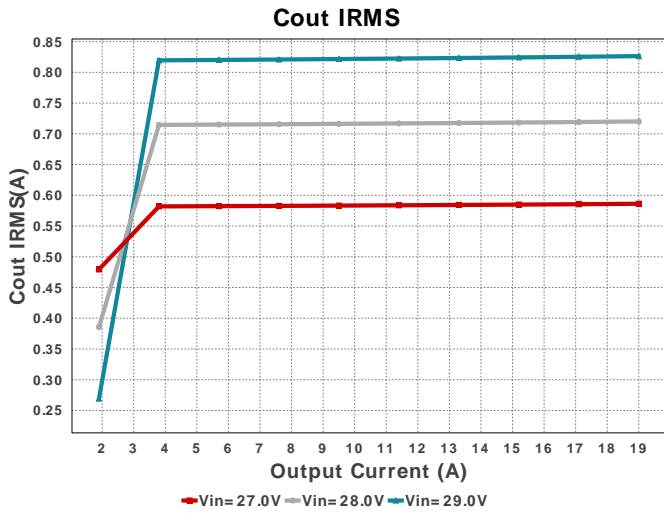
WEBENCH® Design Report

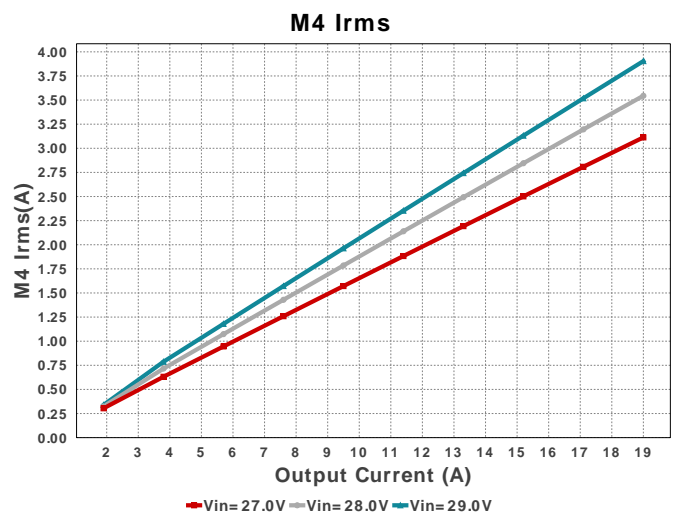
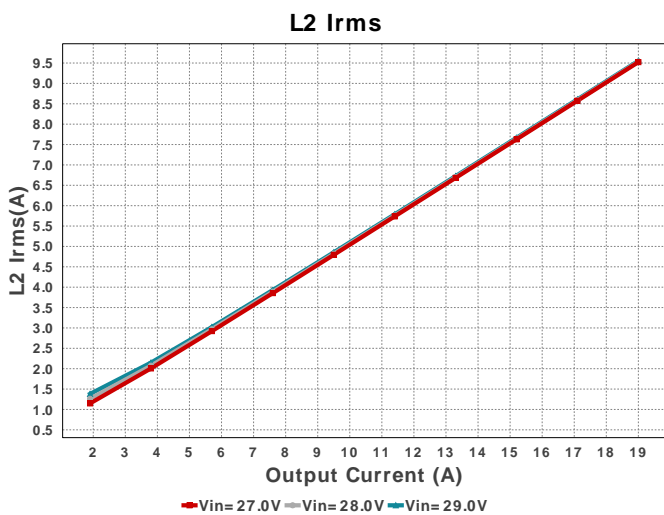
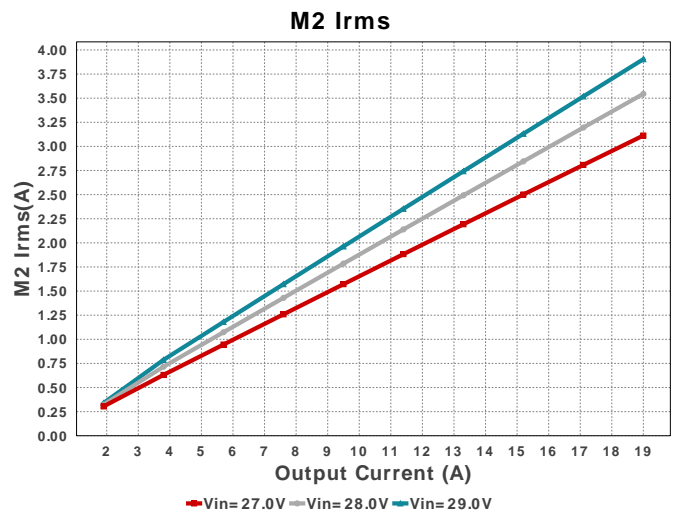
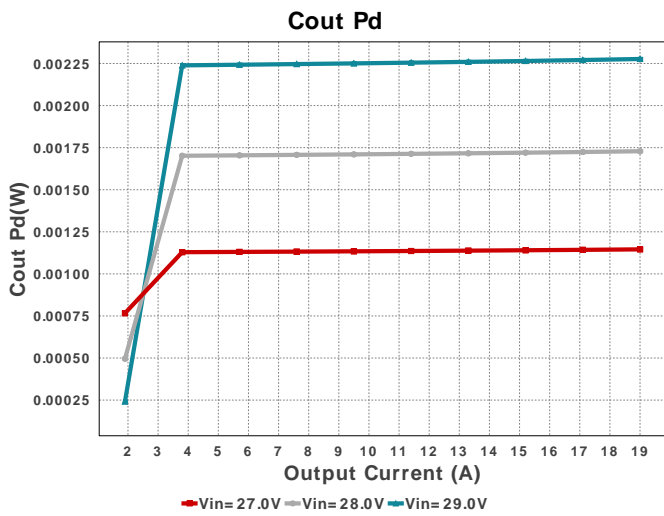
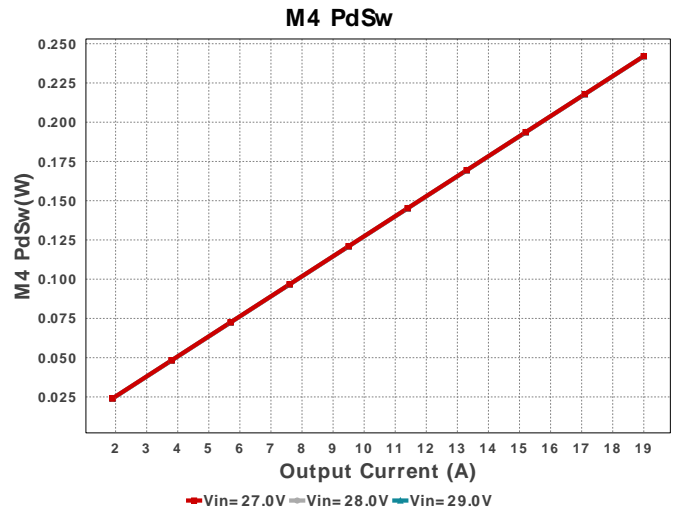
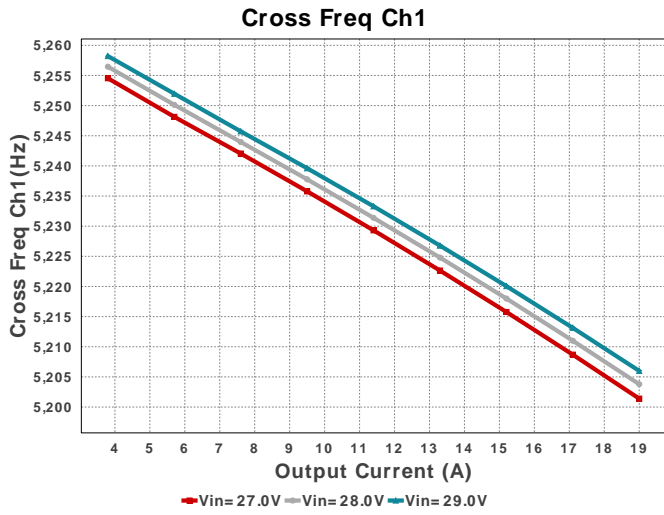
 Design : LM25119PSQ/NOPB
 LM25119PSQ/NOPB 27V-29V to 24.00V @ 19A

Electrical BOM

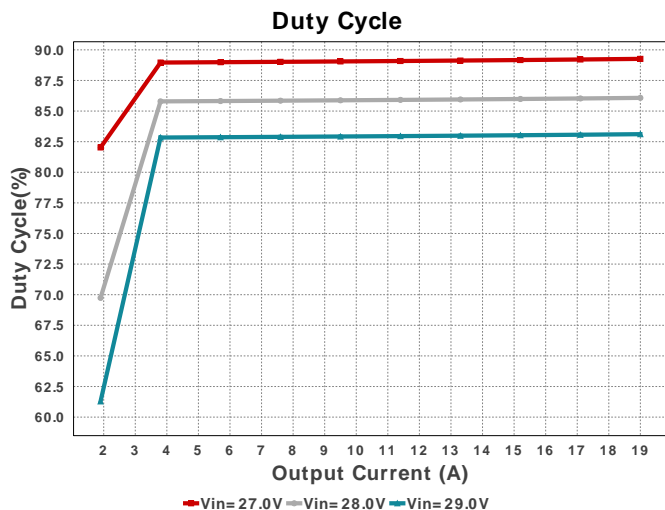
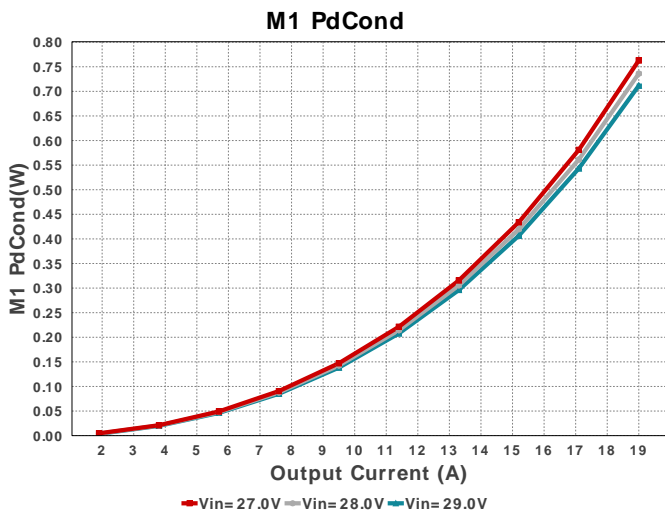
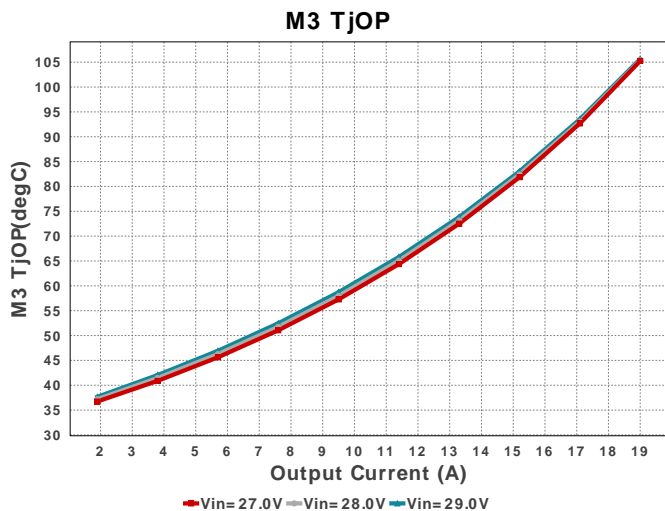
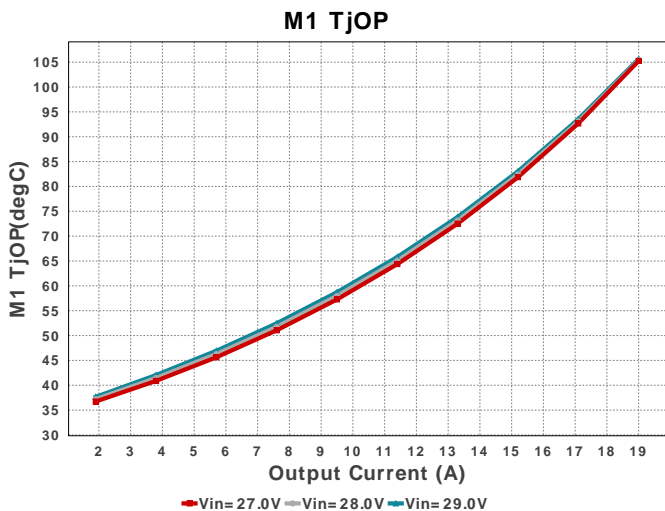
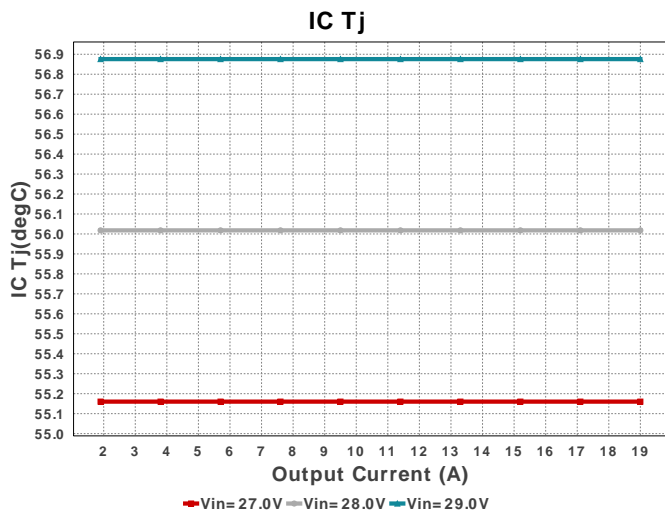
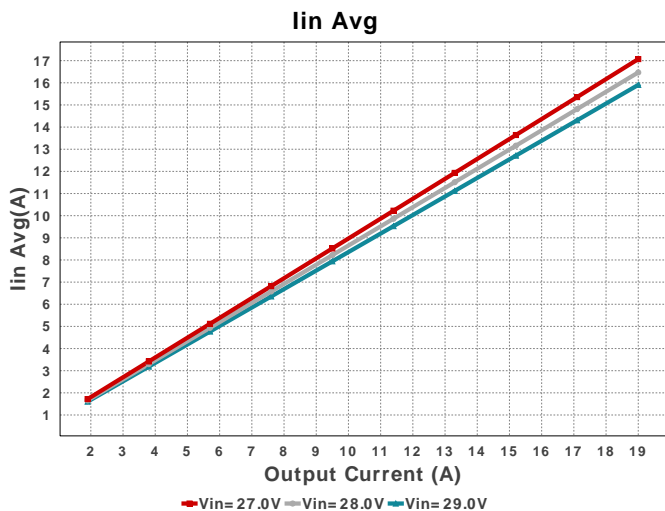
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot1	MuRata	GRM155R71A104KA01D Series= X7R	Cap= 100.0 nF ESR= 1.0 mOhm VDC= 10.0 V IRMS= 0.0 A	1	\$0.01	0402 3 mm ²
2.	Cboot2	MuRata	GRM155R71A104KA01D Series= X7R	Cap= 100.0 nF ESR= 1.0 mOhm VDC= 10.0 V IRMS= 0.0 A	1	\$0.01	0402 3 mm ²
3.	Ccomp1	TDK	CGA4C2C0G1H332J060AA Series= C0G/NP0	Cap= 3.3 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.04	0805 7 mm ²
4.	Ccomp2	Samsung Electro-Mechanics	CL21C620JBANNNC Series= C0G/NP0	Cap= 62.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
5.	Cin	Panasonic	50SVPF39M Series= SVPF	Cap= 39.0 uF ESR= 25.0 mOhm VDC= 50.0 V IRMS= 3.8 A	2	\$0.78	 CAPSMT_62_E12 106 mm ²
6.	Cinx	Taiyo Yuden	UMK212B7104KG-T Series= X7R	Cap= 100.0 nF ESR= 1.0 mOhm VDC= 50.0 V IRMS= 0.0 A	1	\$0.02	0805 7 mm ²
7.	Cout	Panasonic	35SVPF82M Series= SVPF	Cap= 82.0 uF ESR= 20.0 mOhm VDC= 35.0 V IRMS= 4.0 A	3	\$0.66	 CAPSMT_62_E12 106 mm ²
8.	Cramp1	Samsung Electro-Mechanics	CL05C821JB5NNNC Series= C0G/NP0	Cap= 820.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0402 3 mm ²

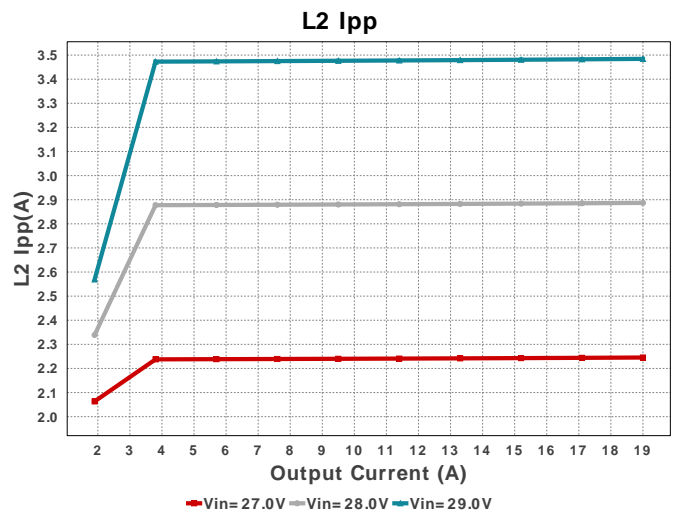
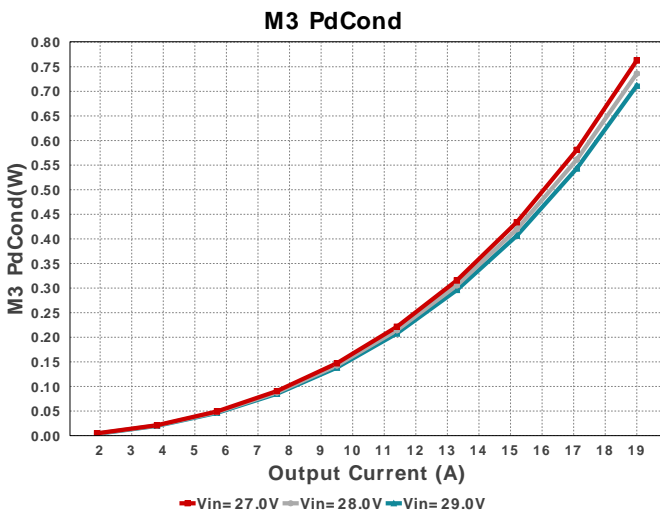
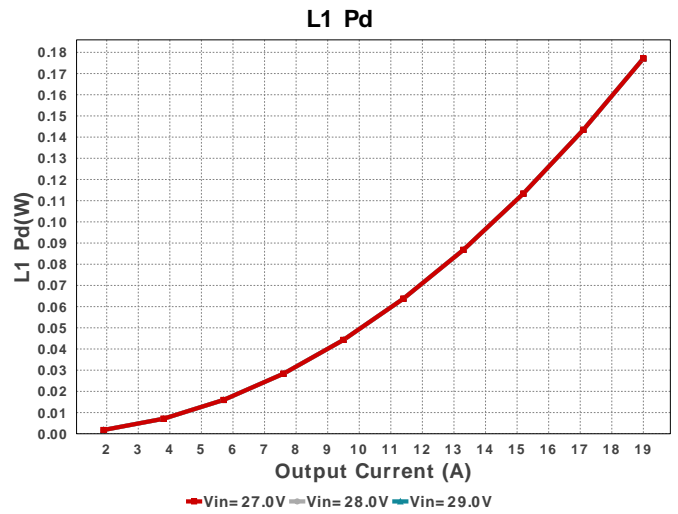
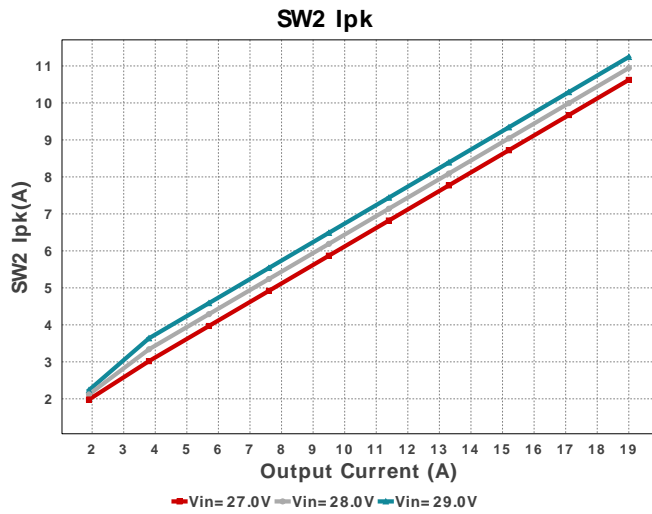
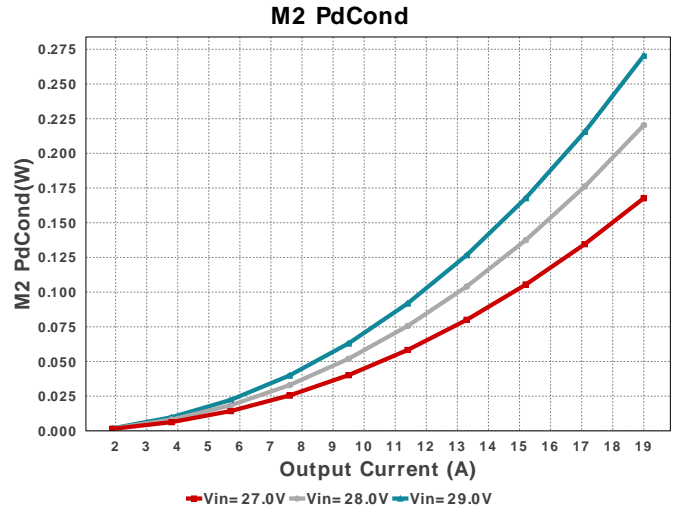
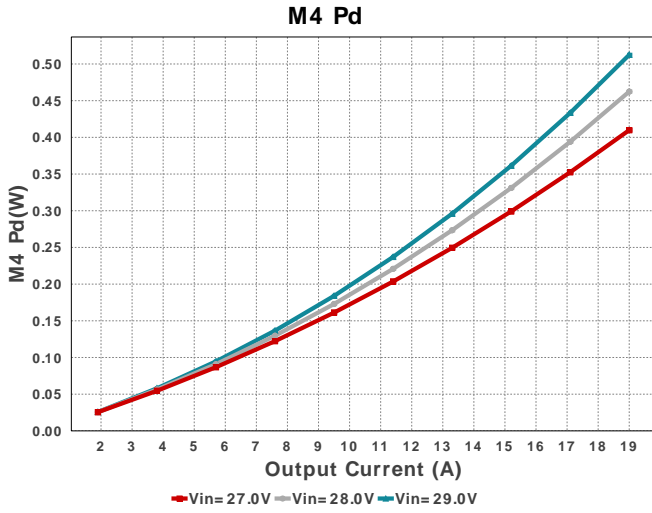
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
9.	Cramp2	Samsung Electro-Mechanics	CL05C821JB5NNNC Series= C0G/NP0	Cap= 820.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0402 3 mm ²
10.	Cres	Taiyo Yuden	GMK212BJ474KG-T Series= X5R	Cap= 470.0 nF ESR= 1.0 mOhm VDC= 35.0 V IRMS= 0.0 A	1	\$0.04	 0805 7 mm ²
11.	Css1	TDK	CGA4F2C0G1H153J085AA Series= C0G/NP0	Cap= 15.0 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.08	 0805 7 mm ²
12.	Css2	TDK	CGA4F2C0G1H153J085AA Series= C0G/NP0	Cap= 15.0 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.08	 0805 7 mm ²
13.	Cvcc1	Kemet	C0603C105Z8VACTU Series= Y5V	Cap= 1.0 uF ESR= 1.0 mOhm VDC= 10.0 V IRMS= 0.0 A	1	\$0.01	 0603 5 mm ²
14.	Cvcc2	Kemet	C0603C105Z8VACTU Series= Y5V	Cap= 1.0 uF ESR= 1.0 mOhm VDC= 10.0 V IRMS= 0.0 A	1	\$0.01	 0603 5 mm ²
15.	D1	ON Semiconductor	MBRA160T3G	VF@Io= 510.0 mV VRRM= 60.0 V	1	\$0.12	 SMA 37 mm ²
16.	D2	ON Semiconductor	MBRA160T3G	VF@Io= 510.0 mV VRRM= 60.0 V	1	\$0.12	 SMA 37 mm ²
17.	L1	Coilcraft	SER2915L-682KL	L= 6.8 uH DCR= 1.5 mOhm	1	\$1.88	 SER2915L 652 mm ²
18.	L2	Coilcraft	SER2915L-682KL	L= 6.8 uH DCR= 1.5 mOhm	1	\$1.88	 SER2915L 652 mm ²
19.	M1	Texas Instruments	CSD18503Q5A	VdsMax= 40.0 V IdsMax= 100.0 Amps	1	\$0.46	 TRANS_NexFET_Q5A 55 mm ²
20.	M2	Texas Instruments	CSD18543Q3A	VdsMax= 60.0 V IdsMax= 35.0 Amps	1	\$0.27	 DNH0008A 18 mm ²
21.	M3	Texas Instruments	CSD18503Q5A	VdsMax= 40.0 V IdsMax= 100.0 Amps	1	\$0.46	 TRANS_NexFET_Q5A 55 mm ²

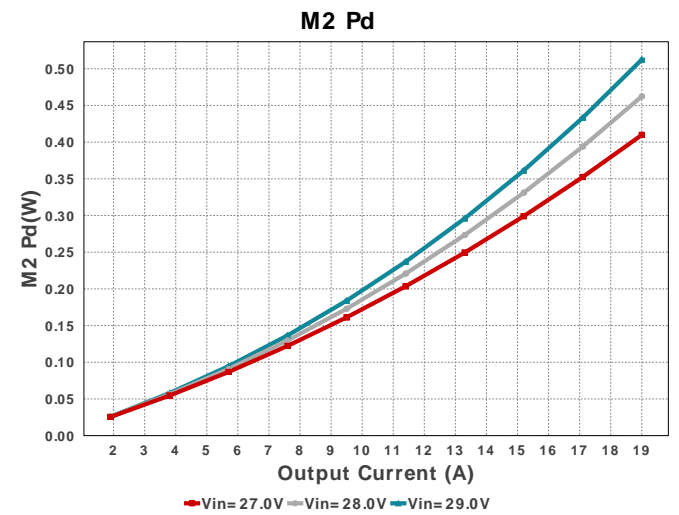
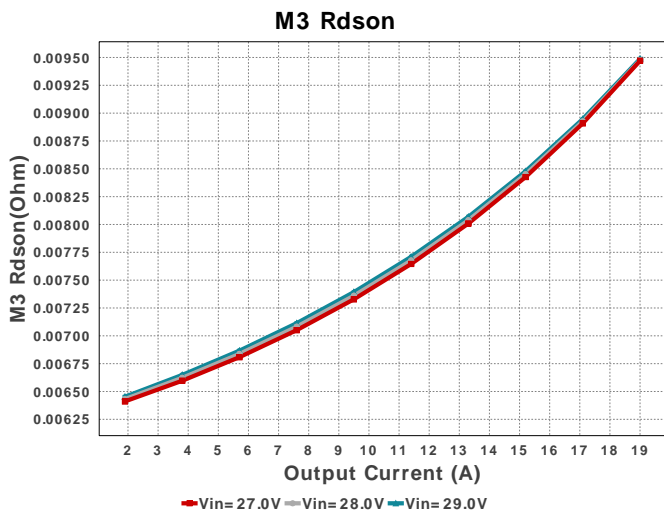
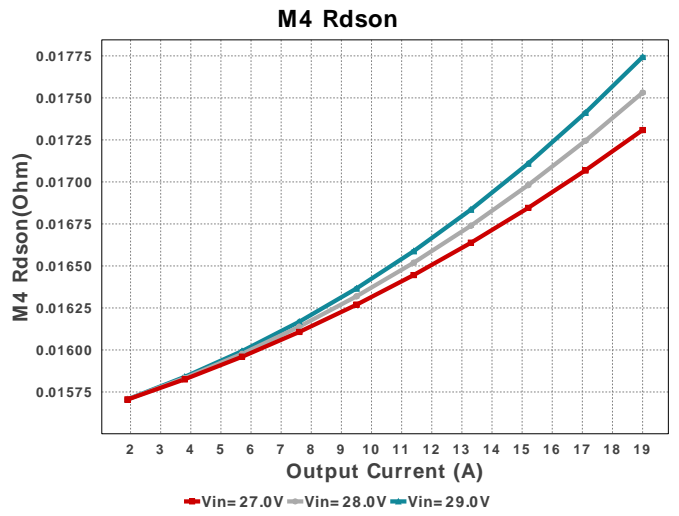
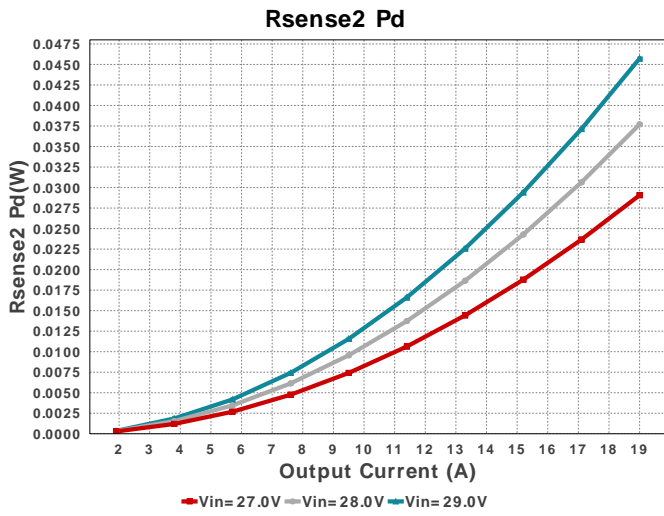
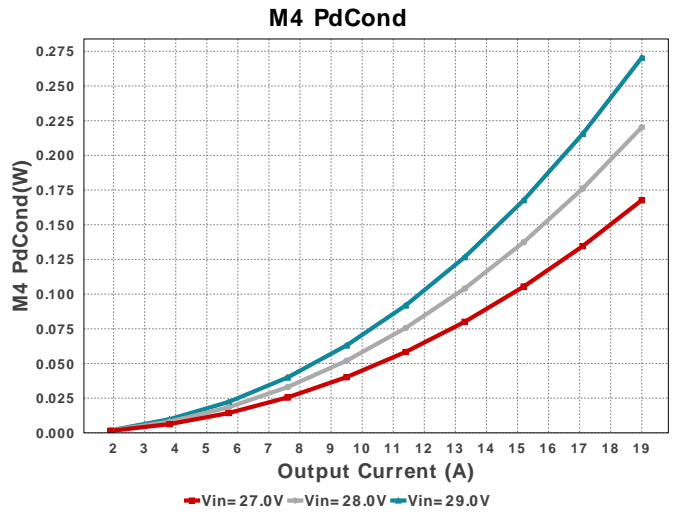
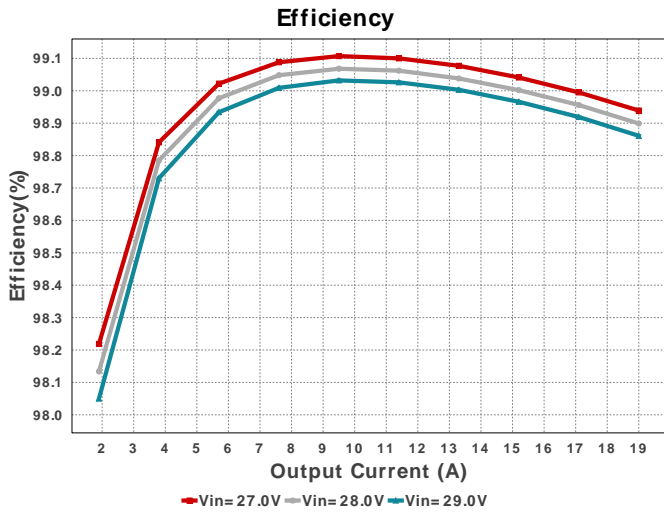
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
22.	M4	Texas Instruments	CSD18543Q3A	VdsMax= 60.0 V IdsMax= 35.0 Amps	1	\$0.27	 DNH0008A 18 mm ²
23.	Rcomp1	Yageo	RC0201FR-0728K7L Series= ?	Res= 28700.0Ohm Power= 50.0 mW Tolerance= 1.0%	1	\$0.01	 0201 2 mm ²
24.	Rfb1	Susumu Co Ltd	RR1220P-122-D Series= RR12	Res= 1200.0Ohm Power= 100.0 mW Tolerance= 0.5%	1	\$0.01	 0805 7 mm ²
25.	Rfb2	Vishay-Dale	CRCW080534K8FKEA Series= CRCW..e3	Res= 34800.0Ohm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm ²
26.	Rramp1	Yageo	RC0201FR-07162KL Series= ?	Res= 162000.0Ohm Power= 50.0 mW Tolerance= 1.0%	1	\$0.01	 0201 2 mm ²
27.	Rramp2	Yageo	RC0201FR-07162KL Series= ?	Res= 162000.0Ohm Power= 50.0 mW Tolerance= 1.0%	1	\$0.01	 0201 2 mm ²
28.	Rsense1	Stackpole Electronics Inc	CSNL1206FT3L00 Series= CSNL	Res= 0.003Ohm Power= 1.0 W Tolerance= 1.0%	1	\$0.20	 1206 11 mm ²
29.	Rsense2	Stackpole Electronics Inc	CSNL1206FT3L00 Series= CSNL	Res= 0.003Ohm Power= 1.0 W Tolerance= 1.0%	1	\$0.20	 1206 11 mm ²
30.	Rt	Yageo	RC0201FR-0728K7L Series= ?	Res= 28700.0Ohm Power= 50.0 mW Tolerance= 1.0%	1	\$0.01	 0201 2 mm ²
31.	Ruv1	Yageo	RC0201FR-0756K2L Series= ?	Res= 56200.0Ohm Power= 50.0 mW Tolerance= 1.0%	1	\$0.01	 0201 2 mm ²
32.	Ruv2	Panasonic	ERJ-6ENF3401V Series= ERJ-6E	Res= 3400.0Ohm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm ²
33.	U1	Texas Instruments	LM25119PSQ/NOPB	Switcher	1	\$2.60	 SQA32A 49 mm ²

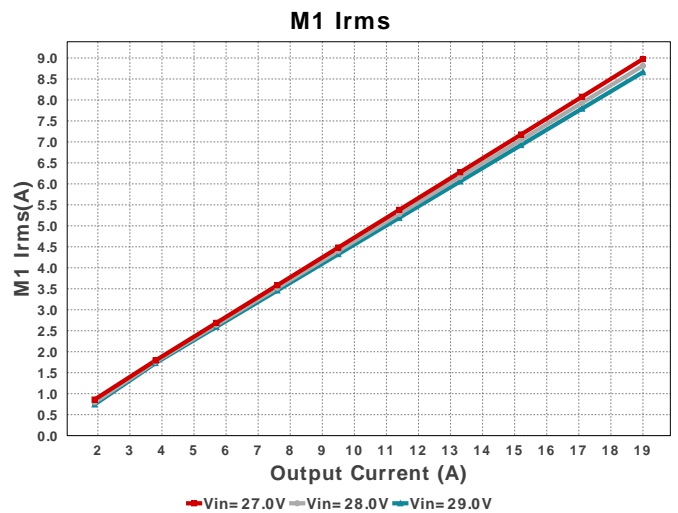
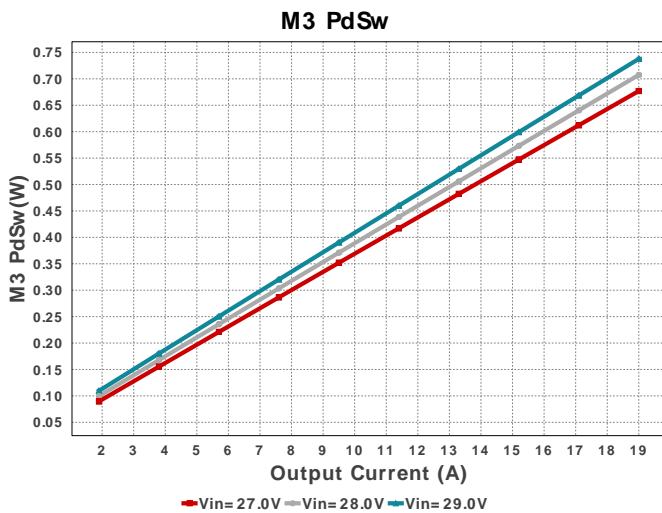
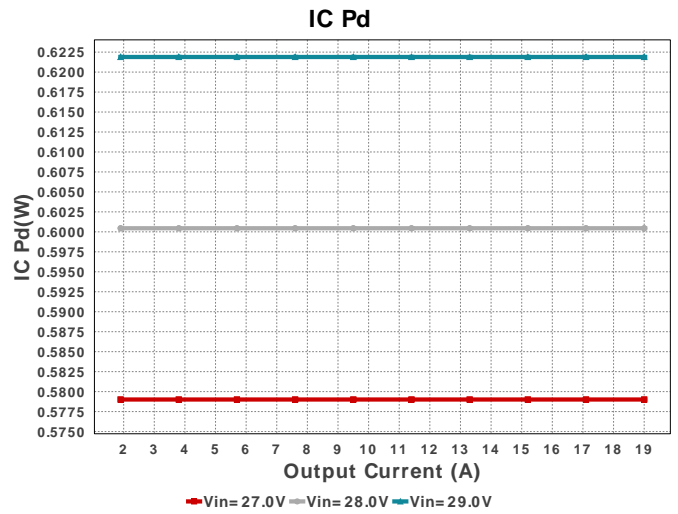
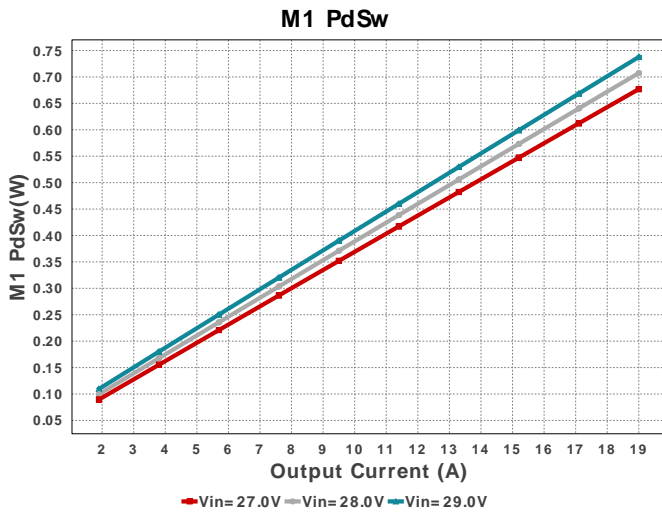
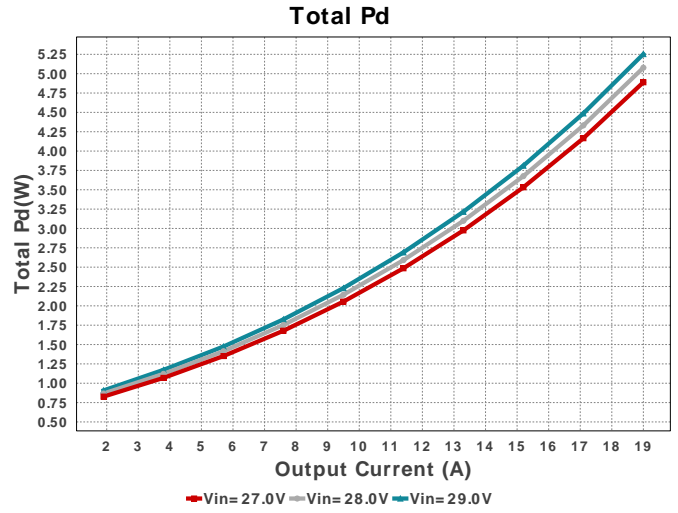
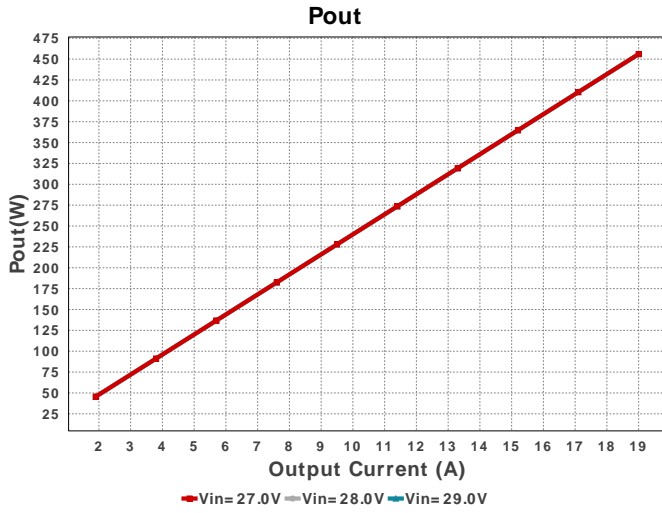


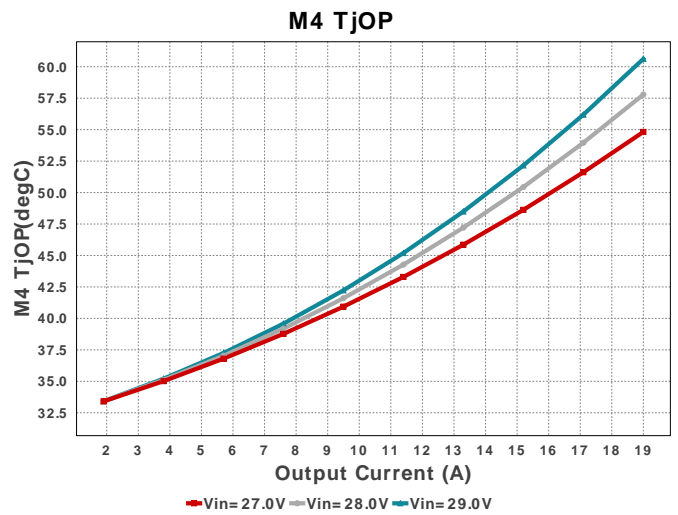
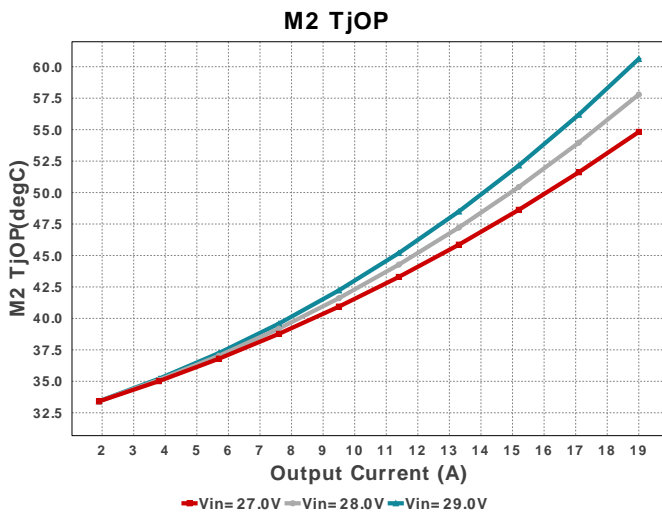
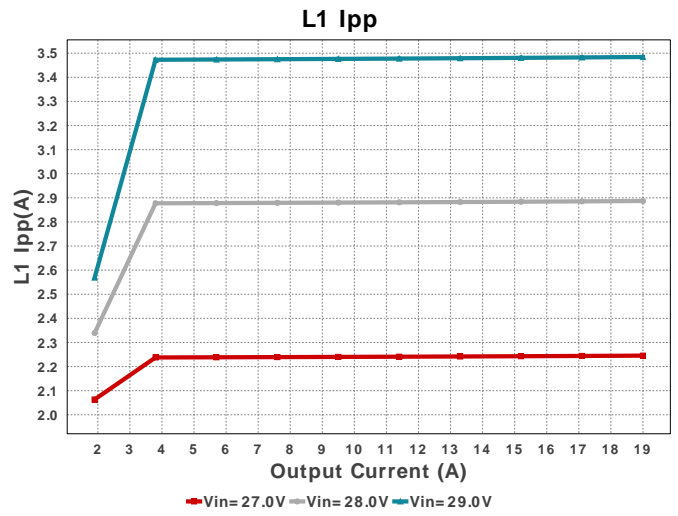
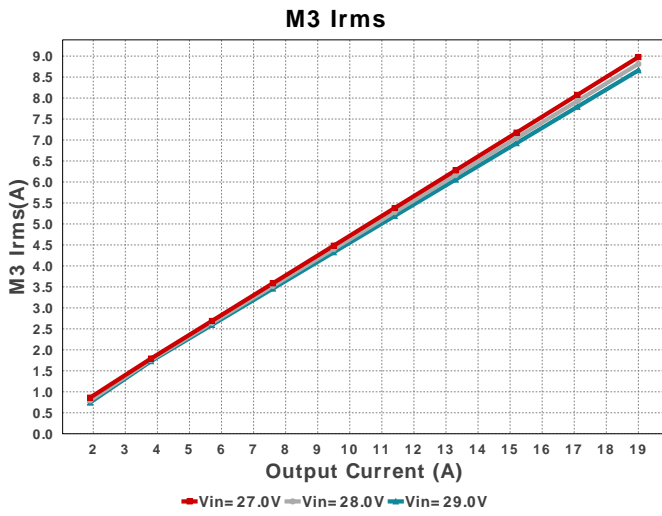
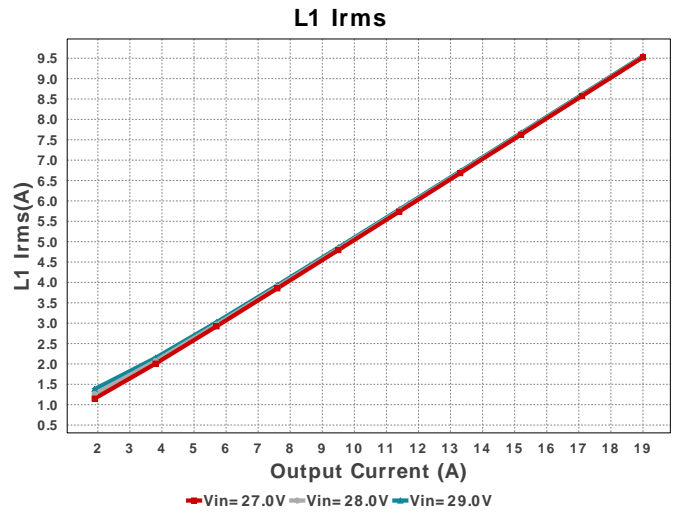
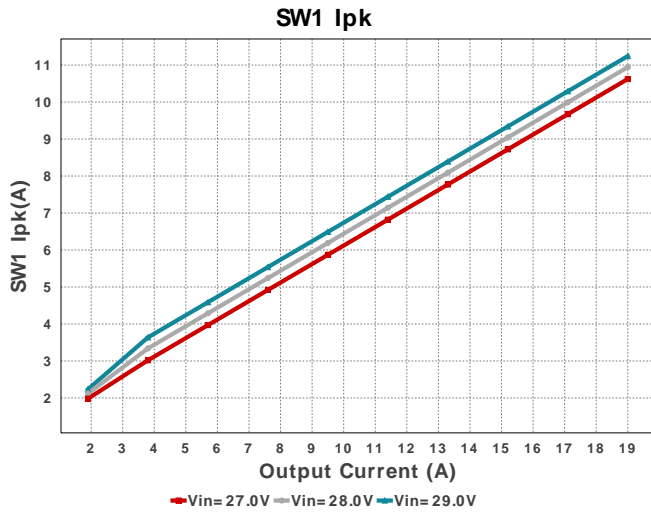


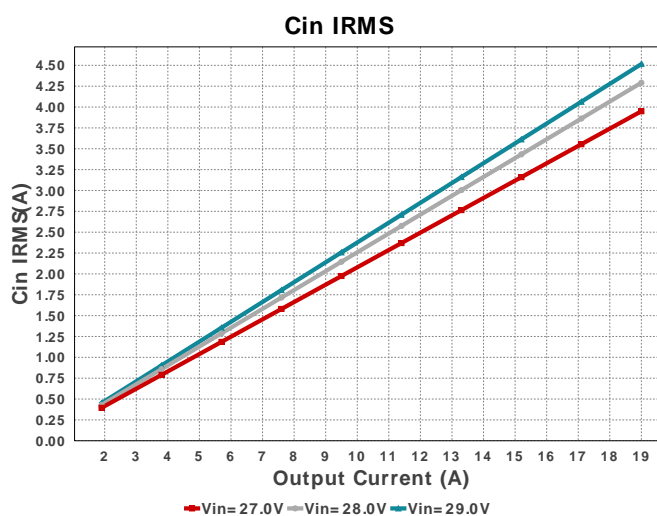
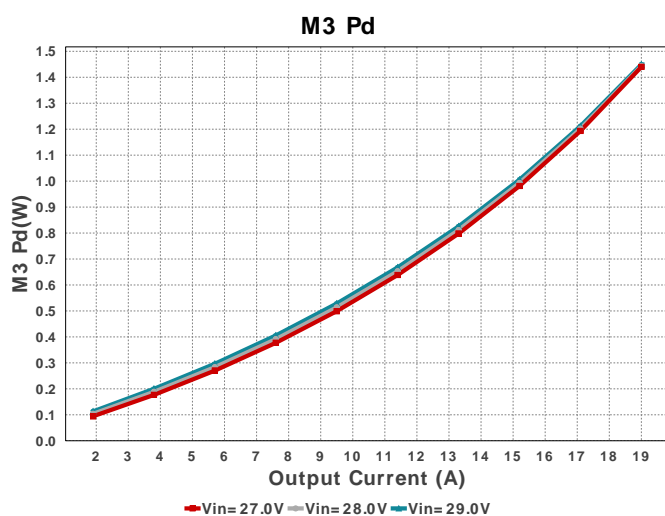
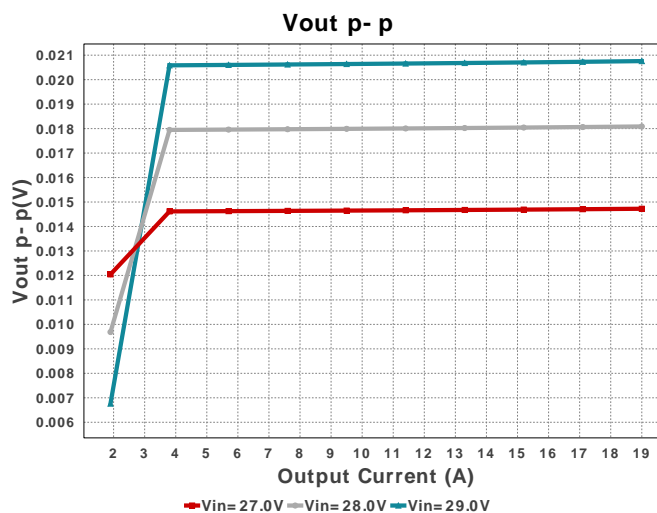
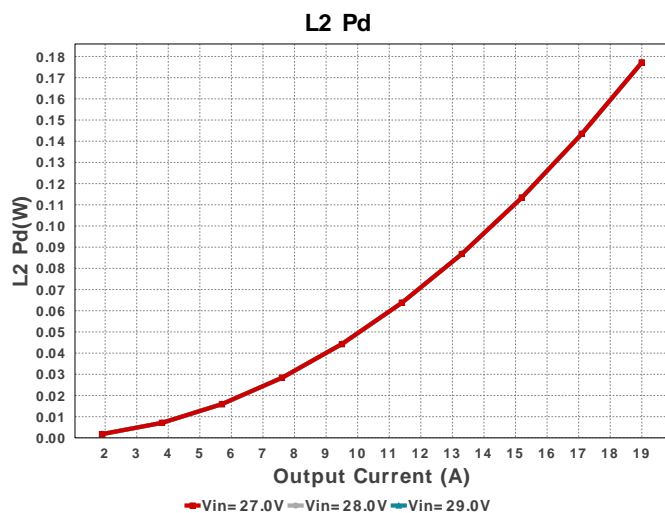












Operating Values

#	Name	Value	Category	Description
1.	BOM Count	36		Total Design BOM count
2.	Total BOM	\$12.41		Total BOM Cost
3.	Cin IRMS	4.515 A	Capacitor	Input capacitor RMS ripple current
4.	Cin Pd	254.87 mW	Capacitor	Input capacitor power dissipation
5.	Cout IRMS	826.464 mA	Capacitor	Output capacitor RMS ripple current
6.	Cout Pd	2.277 mW	Capacitor	Output capacitor power dissipation
7.	SW1 Ipk	11.242 A	Current	Peak switch current
8.	SW2 Ipk	11.242 A	Current	Peak switch current
9.	IC Pd	621.89 mW	IC	IC power dissipation
10.	IC Tj	56.876 degC	IC	IC junction temperature
11.	IC Tolerance	12.0 mV	IC	IC Feedback Tolerance
12.	Iin Avg	15.905 A	IC	Average input current
13.	L1 Ipp	3.484 A	Inductor	Peak-to-peak inductor ripple current
14.	L1 Irms	9.553 A	Inductor	Inductor ripple current
15.	L1 Pd	177.13 mW	Inductor	Inductor power dissipation
16.	L2Ipp	3.484 A	Inductor	Channel 2 Inductor Peak to peak Current
17.	L2 Irms	9.553 A	Inductor	Inductor ripple current
18.	L2 Pd	177.13 mW	Inductor	Inductor power dissipation
19.	M1 Irms	8.661 A	Mosfet	MOSFET RMS ripple current
20.	M1 Pd	1.449 W	Mosfet	M1 MOSFET total power dissipation
21.	M1 PdCond	711.64 mW	Mosfet	M1 MOSFET conduction losses
22.	M1 PdSw	737.79 mW	Mosfet	M1 MOSFET switching losses
23.	M1 TjOP	105.644 degC	Mosfet	M1 MOSFET junction temperature
24.	M2 Irms	3.904 A	Mosfet	MOSFET RMS ripple current
25.	M2 Pd	512.46 mW	Mosfet	M2 MOSFET total power dissipation
26.	M2 PdCond	270.43 mW	Mosfet	M2 MOSFET conduction losses
27.	M2 PdSw	242.02 mW	Mosfet	M2 MOSFET switching losses
28.	M2 TjOP	60.624 degC	Mosfet	M2 MOSFET junction temperature
29.	M3 Irms	8.661 A	Mosfet	MOSFET RMS ripple current
30.	M3 Pd	1.449 W	Mosfet	M3 MOSFET total power dissipation
31.	M3 PdCond	711.64 mW	Mosfet	M3 MOSFET conduction losses
32.	M3 PdSw	737.79 mW	Mosfet	M3 MOSFET switching losses

#	Name	Value	Category	Description
33.	M3 TjOP	105.644 degC	Mosfet	M3 MOSFET junction temperature
34.	M4 Irms	3.904 A	Mosfet	MOSFET RMS ripple current
35.	M4 Pd	512.46 mW	Mosfet	M4 MOSFET total power dissipation
36.	M4 PdCond	270.43 mW	Mosfet	M4 MOSFET conduction losses
37.	M4 PdSw	242.02 mW	Mosfet	M4 MOSFET switching losses
38.	M4 TjOP	60.624 degC	Mosfet	M4 MOSFET junction temperature
39.	Cin Pd	254.87 mW	Power	Input capacitor power dissipation
40.	Cout Pd	2.277 mW	Power	Output capacitor power dissipation
41.	IC Pd	621.89 mW	Power	IC power dissipation
42.	L1 Pd	177.13 mW	Power	Inductor power dissipation
43.	L2 Pd	177.13 mW	Power	Inductor power dissipation
44.	M1 Pd	1.449 W	Power	M1 MOSFET total power dissipation
45.	M1 PdCond	711.64 mW	Power	M1 MOSFET conduction losses
46.	M1 PdSw	737.79 mW	Power	M1 MOSFET switching losses
47.	M2 Pd	512.46 mW	Power	M2 MOSFET total power dissipation
48.	M2 PdCond	270.43 mW	Power	M2 MOSFET conduction losses
49.	M2 PdSw	242.02 mW	Power	M2 MOSFET switching losses
50.	M3 Pd	1.449 W	Power	M3 MOSFET total power dissipation
51.	M3 PdCond	711.64 mW	Power	M3 MOSFET conduction losses
52.	M3 PdSw	737.79 mW	Power	M3 MOSFET switching losses
53.	M1 Rdson	9.487 mOhm	Power	Drain-Source On-resistance
54.	M3 Rdson	9.487 mOhm	Power	Drain-Source On-resistance
55.	M4 Pd	512.46 mW	Power	M4 MOSFET total power dissipation
56.	M4 PdCond	270.43 mW	Power	M4 MOSFET conduction losses
57.	M4 PdSw	242.02 mW	Power	M4 MOSFET switching losses
58.	M2 Rdson	17.743 mOhm	Power	Drain-Source On-resistance
59.	M4 Rdson	17.743 mOhm	Power	Drain-Source On-resistance
60.	Rsense1 Pd	45.724 mW	Power	Current Limit Sense Resistor Power Dissipation
61.	Rsense2 Pd	45.724 mW	Power	Current Limit Sense Resistor Power Dissipation
62.	Total Pd	5.253 W	Power	Total Power Dissipation
63.	Rsense1 Pd	45.724 mW	Resistor	Current Limit Sense Resistor Power Dissipation
64.	Rsense2 Pd	45.724 mW	Resistor	Current Limit Sense Resistor Power Dissipation
65.	Cross Freq Ch1	5.206 kHz	System	Bode plot crossover frequency
			Information	
66.	Duty Cycle	83.112 %	System	Duty cycle
			Information	
67.	Efficiency	98.861 %	System	Steady state efficiency
			Information	
68.	FootPrint	2.22 k mm ²	System	Total Foot Print Area of BOM components
			Information	
69.	Frequency	175.391 kHz	System	Switching frequency
			Information	
70.	Iout	19.0 A	System	Iout operating point
			Information	
71.	Mode	CCM	System	Conduction Mode
			Information	
72.	Phase Marg Ch1	7.572 deg	System	Bode Plot Phase Margin
			Information	
73.	Pout	456.0 W	System	Total output power
			Information	
74.	Vin	29.0 V	System	Vin operating point
			Information	
75.	Vout	24.0 V	System	Operational Output Voltage
			Information	
76.	Vout Actual	24.0 V	System	Vout Actual calculated based on selected voltage divider resistors
			Information	
77.	Vout Tolerance	2.979 %	System	Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
			Information	
78.	Vout p-p	20.758 mV	System	Peak-to-peak output ripple voltage
			Information	

Design Inputs

#	Name	Value	Description
1.	Iout	19.0	Maximum Output Current
2.	VinMax	29.0	Maximum input voltage
3.	VinMin	27.0	Minimum input voltage
4.	Vout	24.0	Output Voltage
5.	base_pn	LM25119	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	32.0	Ambient temperature

Design Assistance

1. Outline The LM5119 is a dual synchronous buck controller intended for step-down regulator applications from a high voltage or widely varying input supply. The control method is based upon current mode control utilizing an emulated current ramp. Current mode control provides inherent line feed-forward, cycle-by-cycle current limiting and ease of loop compensation. The use of an emulated control ramp reduces noise sensitivity of the pulse-width modulation circuit, allowing reliable control of very small duty cycles necessary in high input voltage applications. Interleaved Operation Interleaved operation can offer many advantages in single output, high current applications. The output power path is split between two identical channels reducing the current in each channel by one-half. Ripple current reduction in the output capacitors is reduced significantly since each channel operates 180 degrees out of phase from the other. Diode Emulation A fully synchronous buck regulator implemented with a freewheel MOSFET rather than a diode has the capability to sink current from the output in certain conditions such as light load, over-voltage or pre-bias startup. The LM(2)5119 provides a diode emulation feature that can be enabled to prevent reverse (drain to source) current flow in the low side free-wheel MOSFET.

2. **LM25119** Product Folder : <http://www.ti.com/product/LM25119> : contains the data sheet and other resources.

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