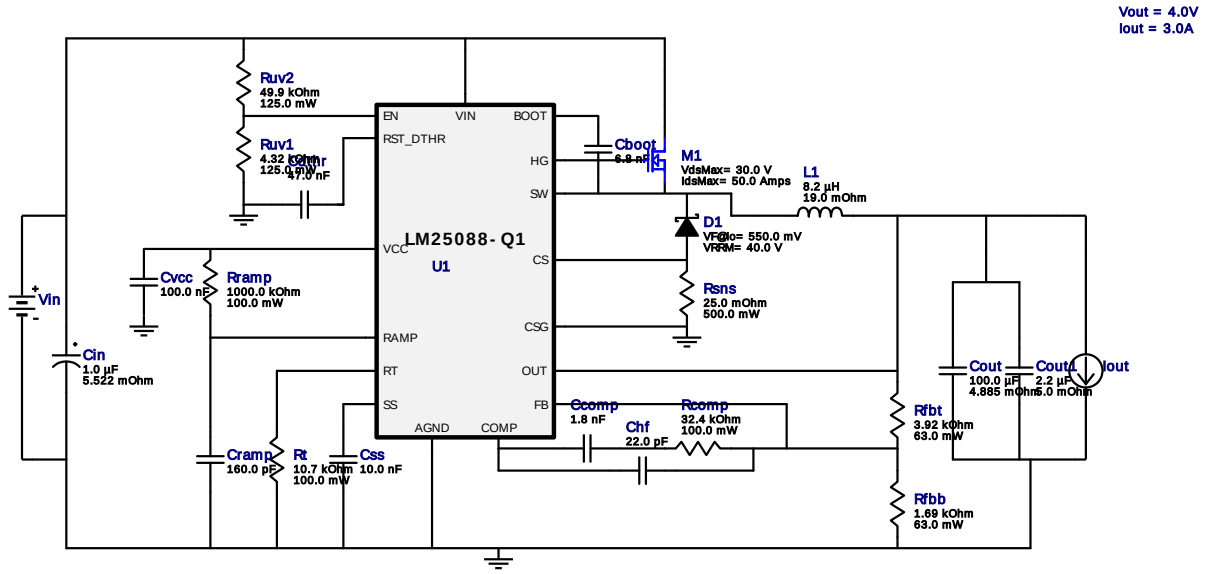
VinMin = 19.0V
VinMax = 22.0V
Vout = 4.0V
Iout = 3.0A

Device = LM25088QMHX-1/NOPB
Topology = Buck
Created = 9/22/16 2:04:00 AM
BOM Cost = $2.70
BOM Count = 22
Total Pd = 1.5W

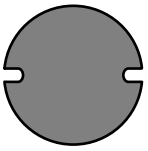
WEBENCH® Design Report

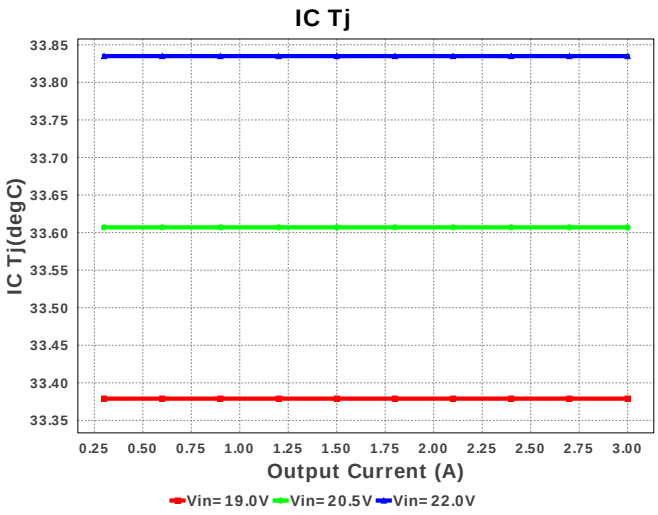
Design : 4770666/24 LM25088QMHX-1/NOPB
LM25088QMHX-1/NOPB 19.0V-22.0V to 4.00V @ 3.0A

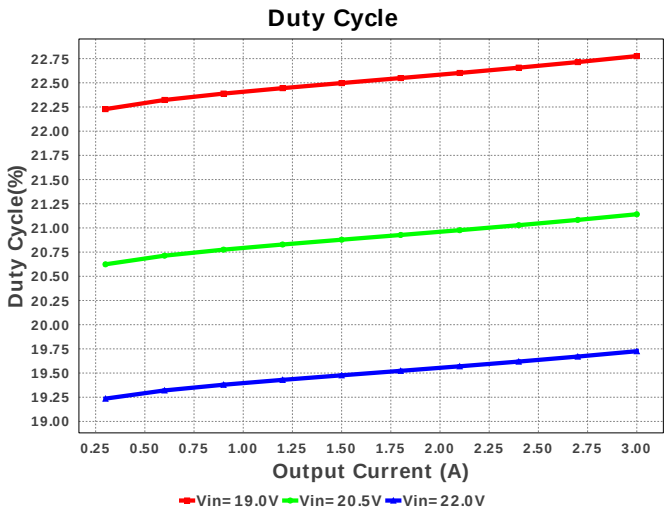


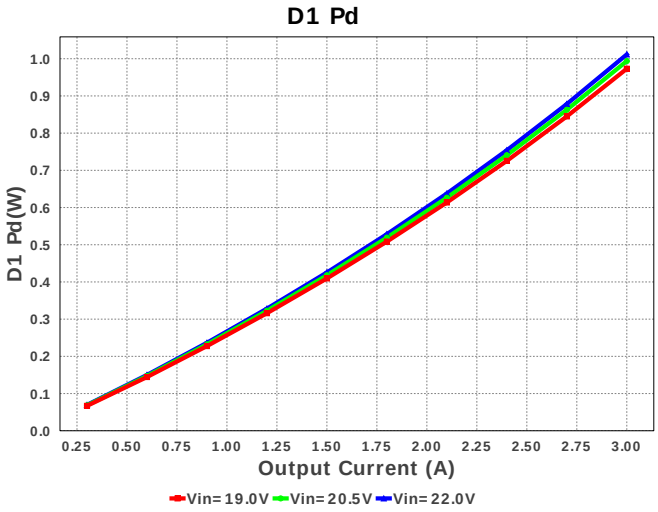
Electrical BOM

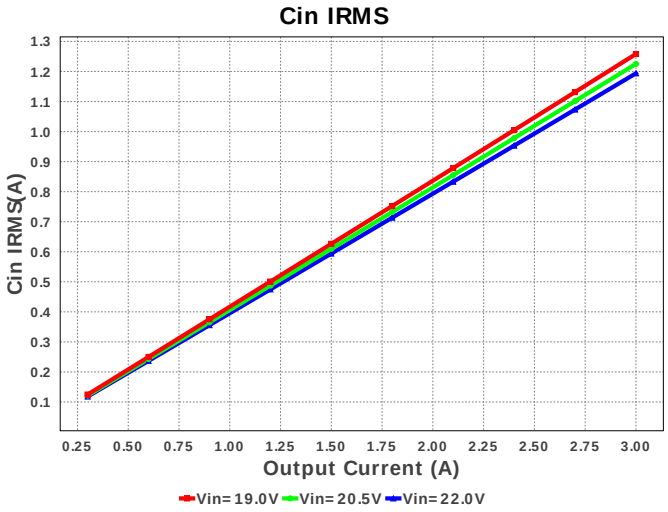
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	Kemet	C0603C682K5RACTU Series= X7R	Cap= 6.8 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0603 5 mm²
2.	Ccomp	MuRata	GRM1885C1H182JA01J Series= C0G/NP0	Cap= 1.8 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0603 5 mm²
3.	Cdthr	MuRata	GRM188R71C473KA01D Series= X7R	Cap= 47.0 nF VDC= 16.0 V IRMS= 0.0 A	1	$0.01	0603 5 mm²
4.	Chf	Kemet	C0603C220K3GACTU Series= C0G/NP0	Cap= 22.0 pF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0603 5 mm²
5.	Cin	TDK	C1608X7R1V105K080AC Series= X7R	Cap= 1.0 uF ESR= 5.522 mOhm VDC= 35.0 V IRMS= 2.2162 A	1	$0.05	0603 5 mm²
6.	Cout	MuRata	GRM31CR60J107ME39L Series= X5R	Cap= 100.0 uF ESR= 4.885 mOhm VDC= 6.3 V IRMS= 4.4118 A	1	$0.14	1206_190 11 mm²
7.	Cout1	MuRata	GRM155R60J225ME15D Series= X5R	Cap= 2.2 uF ESR= 5.0 mOhm VDC= 6.3 V IRMS= 3.67 A	1	$0.02	0402 3 mm²
8.	Cramp	Samsung Electro-Mechanics	CL10C161JB8NNNC Series= C0G/NP0	Cap= 160.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0603 5 mm²
9.	Css	Kemet	C0603C103J5RACTU Series= X7R	Cap= 10.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0603 5 mm²

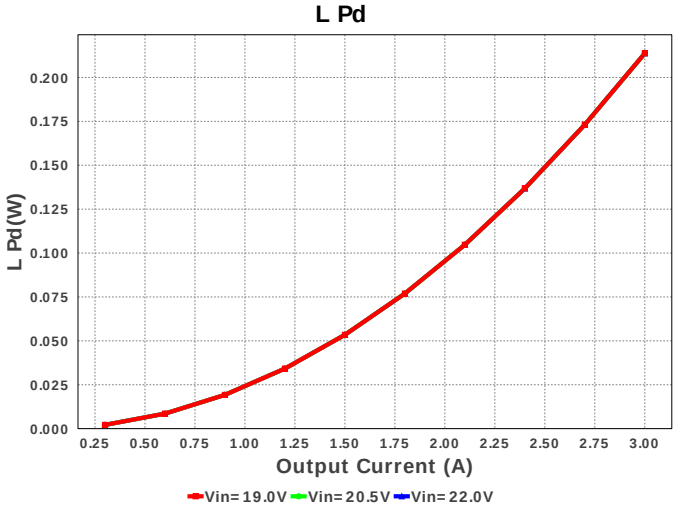
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	Cvcc	Kemet	C0603C104K3RACTU Series= X7R	Cap= 100.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	 0603 5 mm²
11.	D1	Diodes Inc.	B540C-13-F	VF@Io= 550.0 mV VRRM= 40.0 V	1	$0.17	 SMC 83 mm²
12.	L1	Bourns	SDR1307-8R2ML	L= 8.2 µH DCR= 19.0 mOhm	1	$0.35	 SDR1307 227 mm²
13.	M1	Texas Instruments	CSD17308Q3	VdsMax= 30.0 V IdsMax= 50.0 Amps	1	$0.28	 DQG0008A 18 mm²
14.	Rcomp	Vishay-Dale	CRCW060332K4FKEA Series= CRCW..e3	Res= 32.4 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	 0603 5 mm²
15.	Rfbb	Vishay-Dale	CRCW04021K69FKED Series= CRCW..e3	Res= 1.69 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
16.	Rfbt	Vishay-Dale	CRCW04023K92FKED Series= CRCW..e3	Res= 3.92 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
17.	Rramp	Vishay-Dale	CRCW06031M00FKEA Series= CRCW..e3	Res= 1000.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	 0603 5 mm²
18.	Rsns	Stackpole Electronics Inc	CSR1206FK25L0 Series= ?	Res= 25.0 mOhm Power= 500.0 mW Tolerance= 1.0%	1	$0.10	 1206 11 mm²
19.	Rt	Vishay-Dale	CRCW060310K7FKEA Series= CRCW..e3	Res= 10.7 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	 0603 5 mm²
20.	Ruv1	Panasonic	ERJ-6ENF4321V Series= ERJ-6E	Res= 4.32 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm²
21.	Ruv2	Panasonic	ERJ-6ENF4992V Series= ERJ-6E	Res= 49.9 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm²
22.	U1	Texas Instruments	LM25088QMHX-1/NOPB	Switcher	1	$1.45	 MXA16A 59 mm²

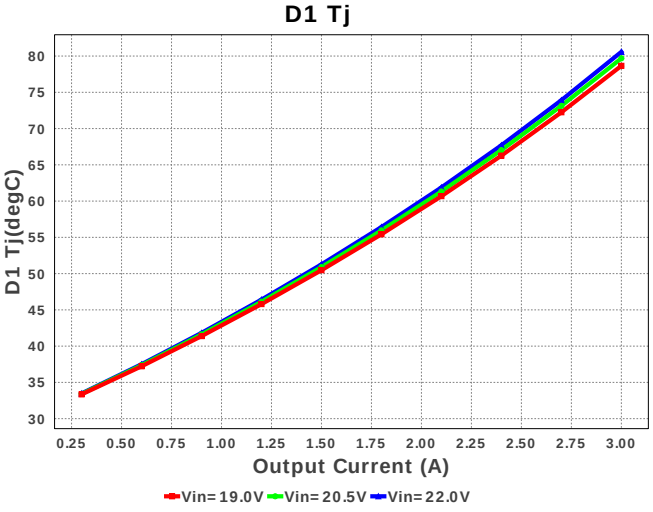




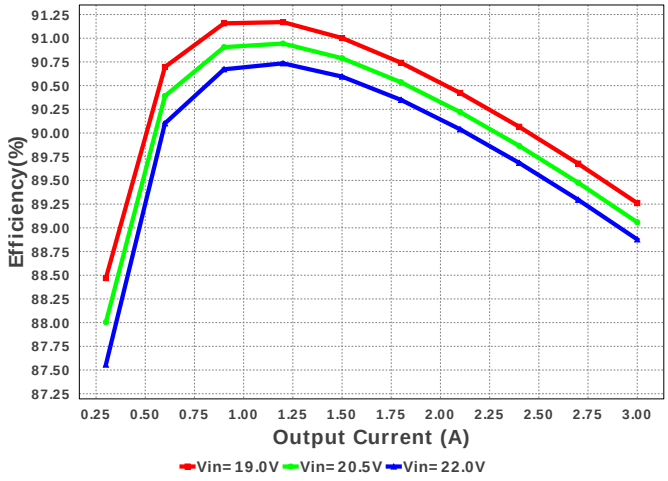




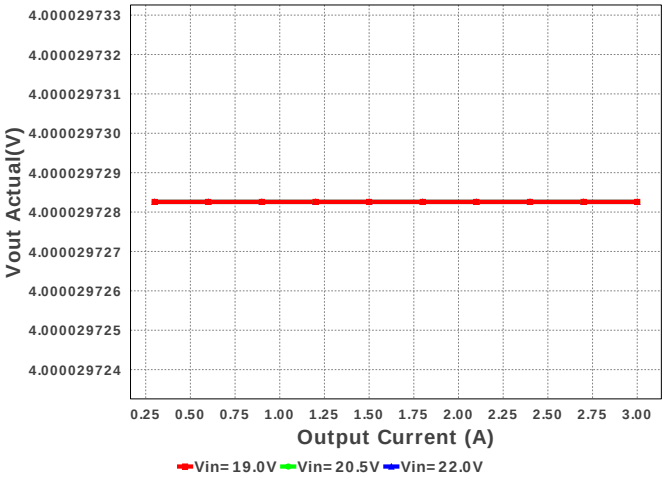




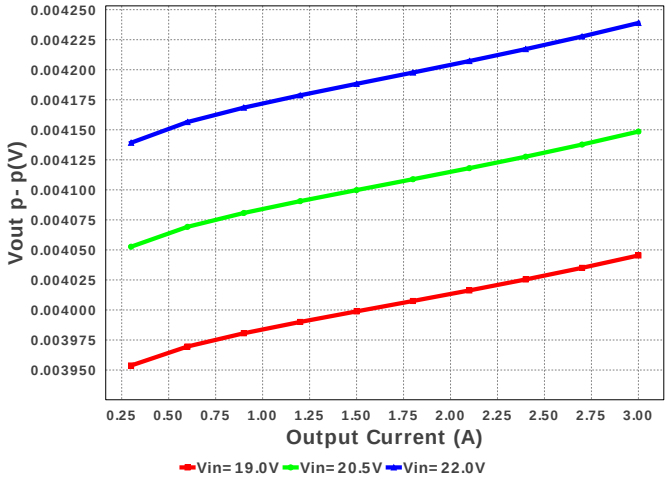
Efficiency



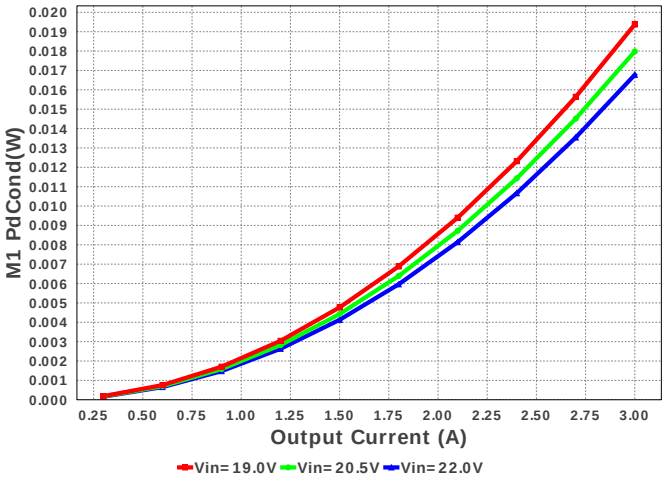
Vout Actual



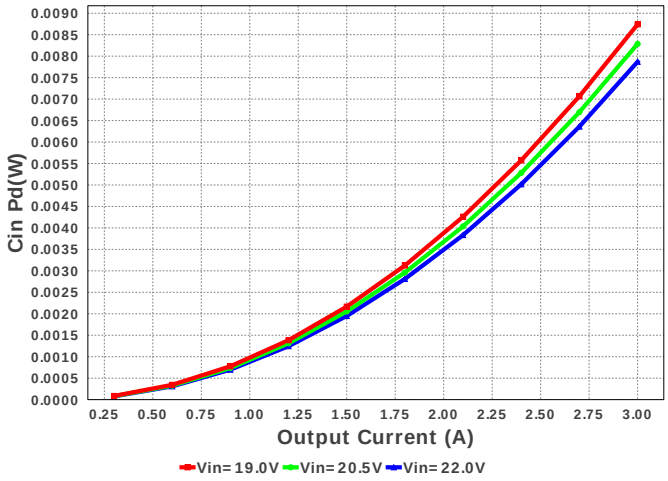
Vout p- p



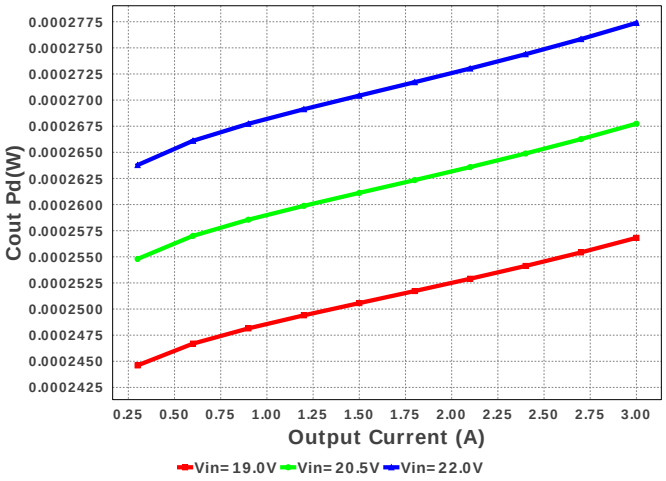
M1 PdCond

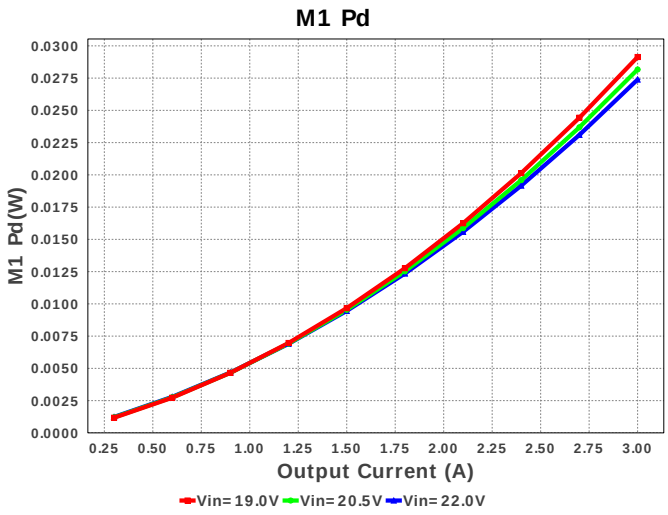


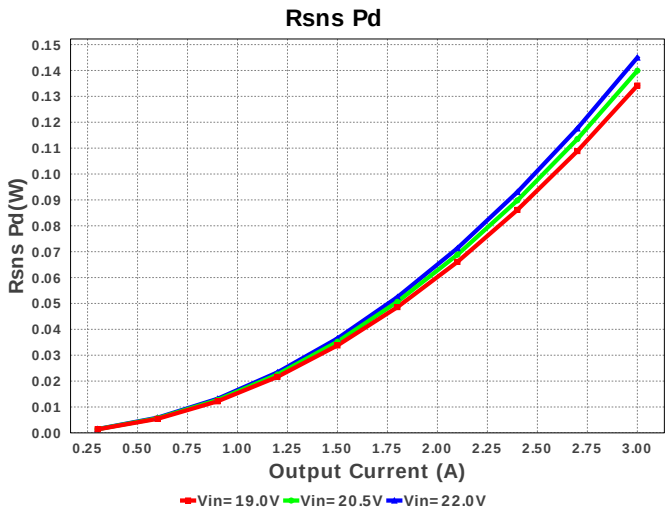
Cin Pd

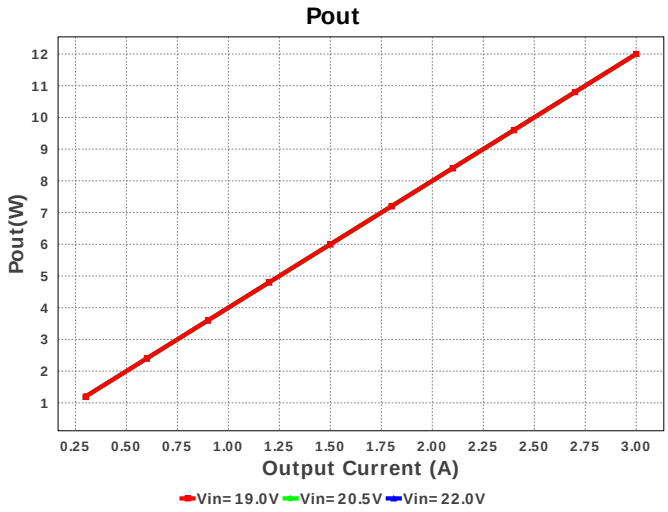


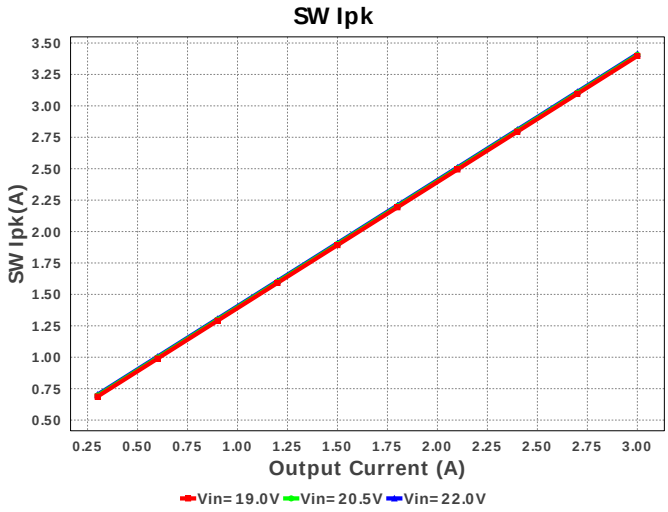
Cout Pd

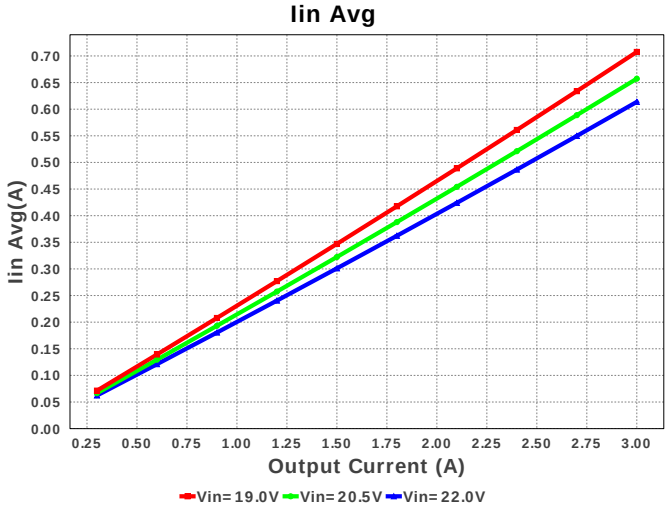


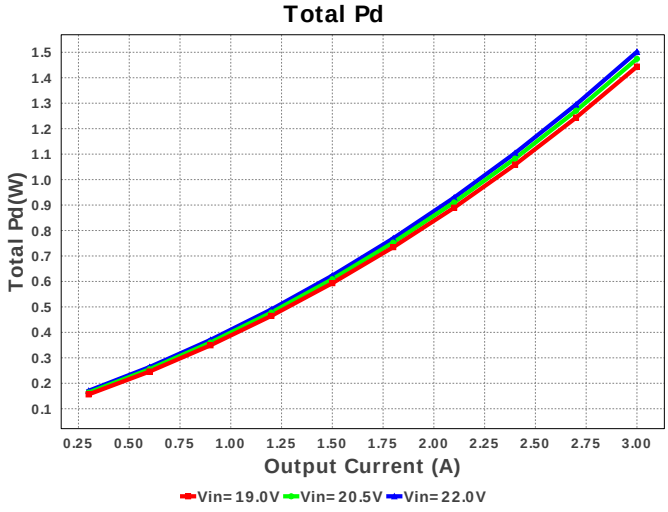


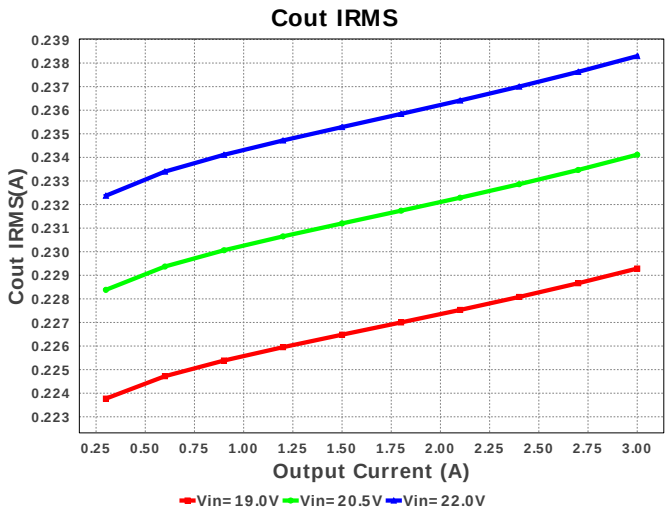


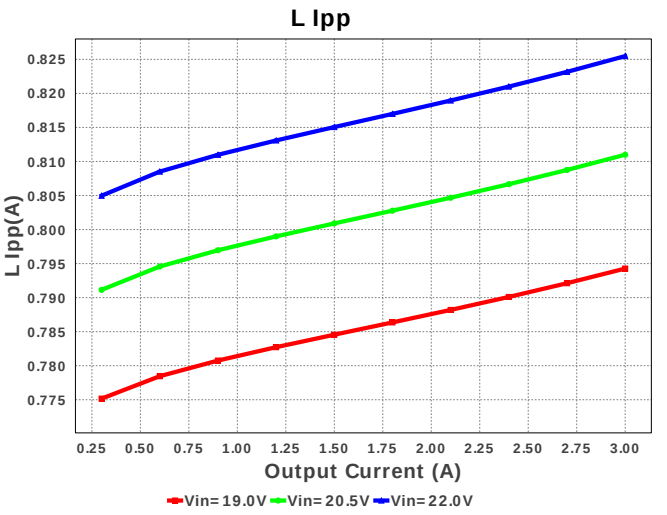


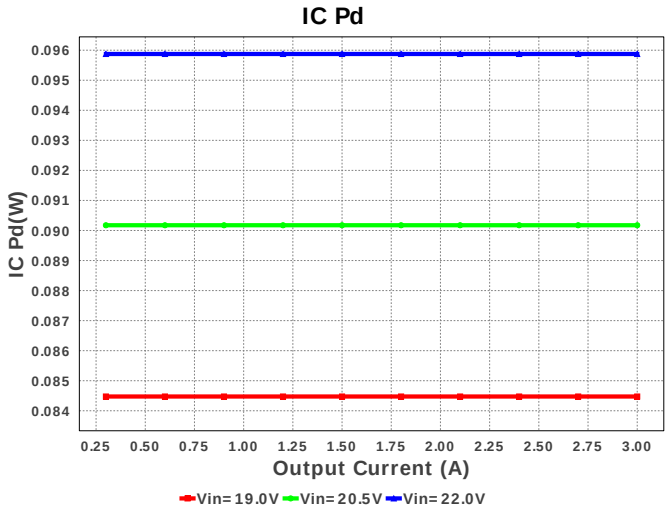


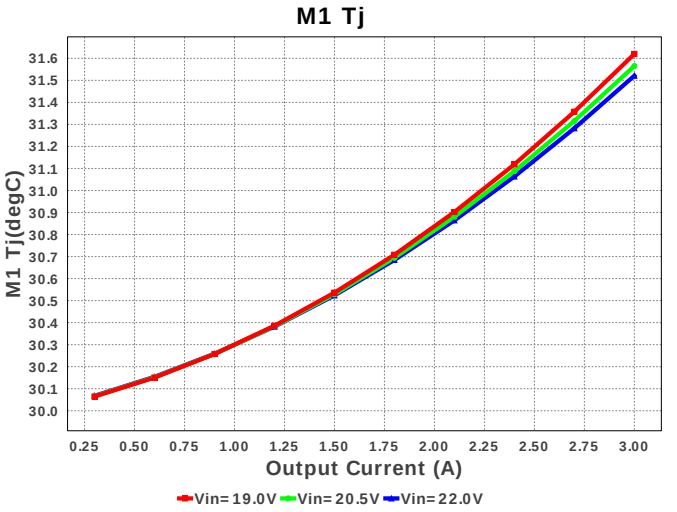


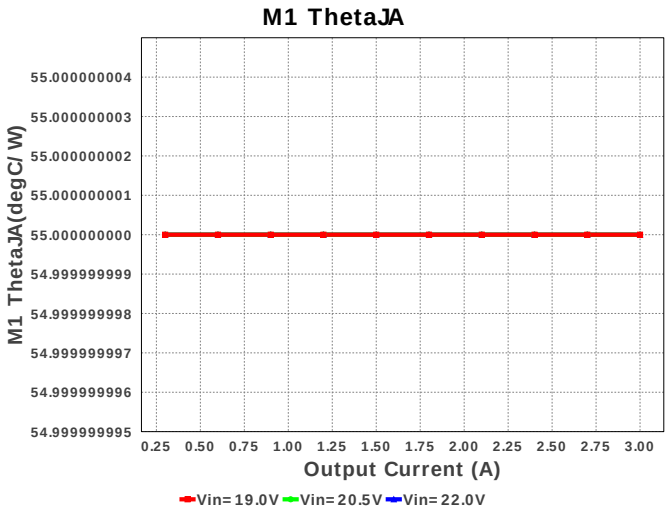


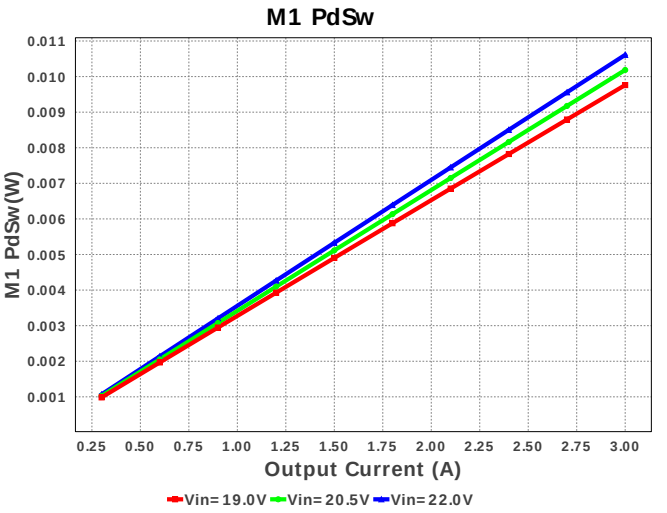


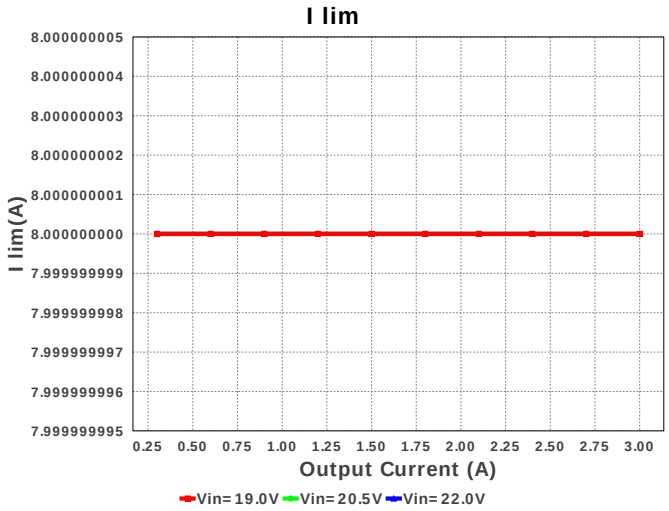












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	1.194 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	238.09 mA	Current	Output capacitor RMS ripple current
3.	I lim	8.0 A	Current	Current limit threshold
4.	Iin Avg	613.71 mA	Current	Average input current
5.	L Ipp	824.77 mA	Current	Peak-to-peak inductor ripple current
6.	SW Ipk	3.412 A	Current	Peak switch current
7.	BOM Count	22	General	Total Design BOM count
8.	FootPrint	483.0 mm^2	General	Total Foot Print Area of BOM components
9.	Frequency	524.549 kHz	General	Switching frequency
10.	IC Tolerance	18.0 mV	General	IC Feedback Tolerance
11.	M1 ThetaJA	55.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
12.	Mode	CCM	General	Conduction Mode
13.	Pout	12.0 W	General	Total output power
14.	Total BOM	$2.7	General	Total BOM Cost
15.	D1 Tj	80.577 degC	Op_Point	D1 junction temperature
16.	Vout Actual	4.0 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
17.	Duty Cycle	19.726 %	Op_point	Duty cycle
18.	Efficiency	88.878 %	Op_point	Steady state efficiency
19.	IC Tj	33.835 degC	Op_point	IC junction temperature
20.	ICThetaJA	40.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
21.	IOUT_OP	3.0 A	Op_point	Iout operating point
22.	M1 Tj	31.521 degC	Op_point	M1 MOSFET junction temperature
23.	VIN_OP	22.0 V	Op_point	Vin operating point
24.	Vout p-p	4.235 mV	Op_point	Peak-to-peak output ripple voltage
25.	Cin Pd	7.87 mW	Power	Input capacitor power dissipation
26.	Cout Pd	276.915 µW	Power	Output capacitor power dissipation
27.	D1 Pd	1.012 W	Power	Diode1 power dissipation
28.	IC Pd	95.874 mW	Power	IC power dissipation
29.	L Pd	213.75 mW	Power	Inductor power dissipation
30.	M1 Pd	27.387 mW	Power	M1 MOSFET total power dissipation
31.	M1 PdCond	16.777 mW	Power	M1 MOSFET conduction losses
32.	M1 PdSw	10.61 mW	Power	M1 MOSFET switching losses
33.	Rsns Pd	144.989 mW	Power	Current Limit Sense Resistor Power Dissipation
34.	Total Pd	1.502 W	Power	Total Power Dissipation
35.	Vout Tolerance	2.926 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	3.0	Maximum Output Current
2.	VinMax	22.0	Maximum input voltage
3.	VinMin	19.0	Minimum input voltage
4.	Vout	4.0	Output Voltage
5.	base_pn	LM25088-Q1	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **LM25088-Q1** Product Folder : http://www.ti.com/product/LM25088%2DQ1 : contains the data sheet and other resources.