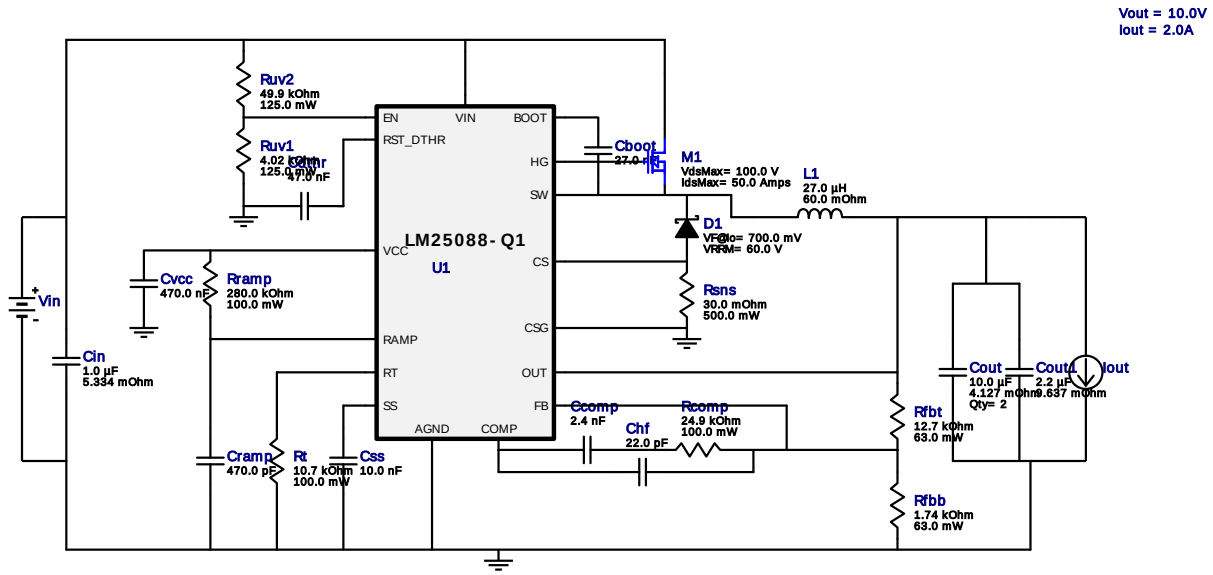
TEXAS INSTRUMENTS

WEBENCH® Design Report

VinMin = 20.0V
VinMax = 40.0V
Vout = 10.0V
Iout = 2.0A

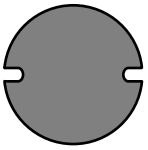
Device = LM25088QMHX-1/NOPB
Topology = Buck
Created = 8/9/16 1:58:05 AM
BOM Cost = $2.72
BOM Count = 23
Total Pd = 1.65W

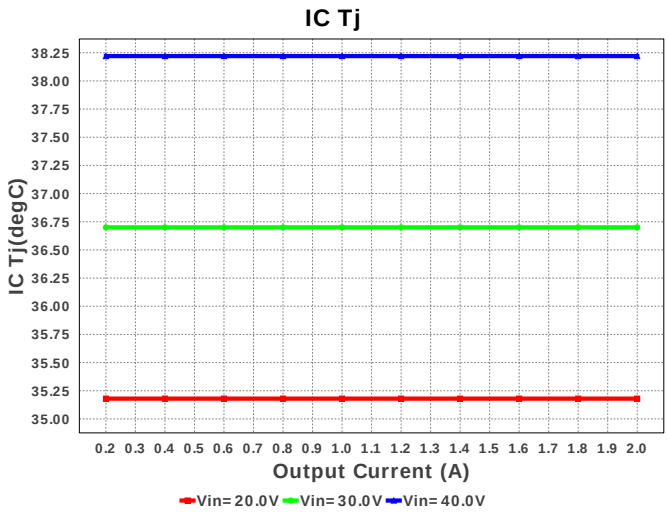
Design : 4352199/64 LM25088QMHX-1/NOPB
LM25088QMHX-1/NOPB 20.0V-40.0V to 10.00V @ 2.0A

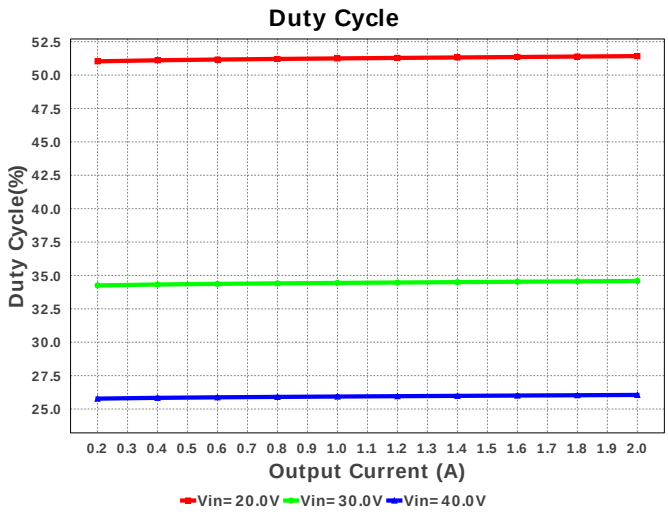


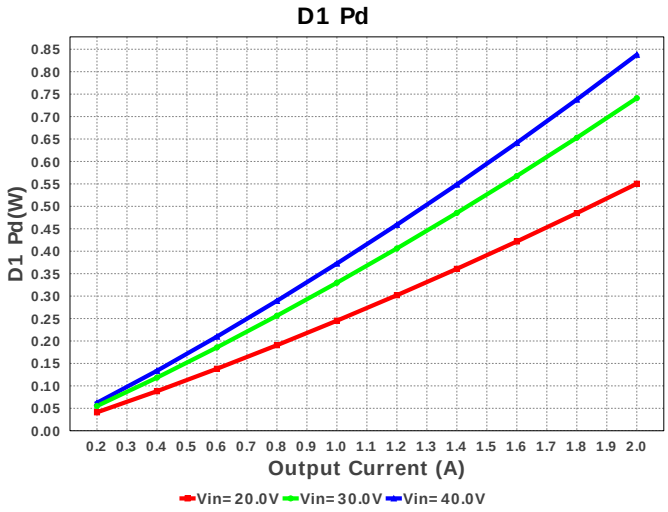
Electrical BOM

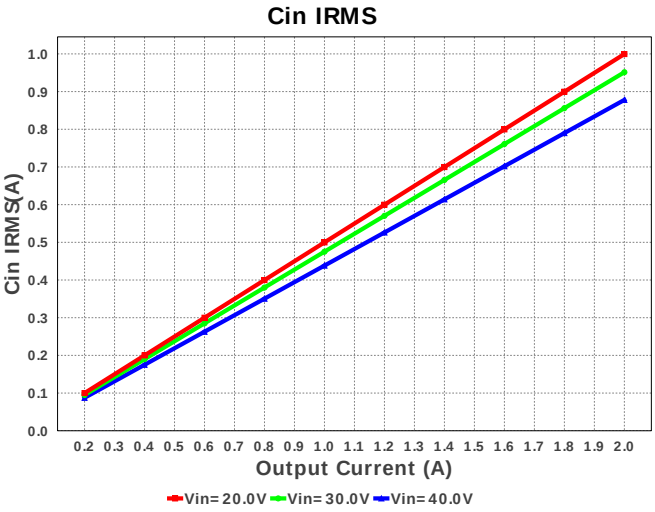
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	MuRata	GRM188R71C273KA01D Series= X7R	Cap= 27.0 nF VDC= 16.0 V IRMS= 0.0 A	1	$0.02	0603 5 mm²
2.	Ccomp	MuRata	GRM1885C1H242JA01D Series= C0G/NP0	Cap= 2.4 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0603 5 mm²
3.	Cdthr	MuRata	GRM188R71C473KA01D 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	MuRata	GRM31CR72A105KA01L Series= X7R	Cap= 1.0 uF ESR= 5.334 mOhm VDC= 100.0 V IRMS= 1.55432 A	1	$0.11	1206_190 11 mm²
6.	Cout	MuRata	GRM21BR61C106KE15L Series= X5R	Cap= 10.0 uF ESR= 4.127 mOhm VDC= 16.0 V IRMS= 2.46634 A	2	$0.03	0805 7 mm²
7.	Cout1	MuRata	GRM188R61C225KE15D Series= X5R	Cap= 2.2 uF ESR= 9.637 mOhm VDC= 16.0 V IRMS= 1.20373 A	1	$0.02	0603 5 mm²
8.	Cramp	AVX	06035A470KAT2A Series= C0G/NP0	Cap= 470.0 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

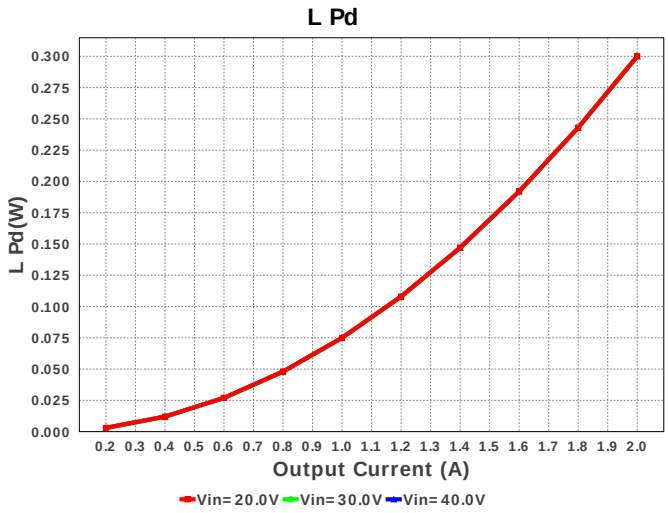
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	Cvcc	Kemet	C0603C474K4RACTU Series= X7R	Cap= 470.0 nF VDC= 16.0 V IRMS= 0.0 A	1	$0.02	 0603 5 mm²
11.	D1	Diodes Inc.	B260A-13-F	VF@Io= 700.0 mV VRRM= 60.0 V	1	$0.09	 SMA 37 mm²
12.	L1	Bourns	SDR1307-270ML	L= 27.0 µH DCR= 60.0 mOhm	1	$0.35	 SDR1307 227 mm²
13.	M1	Texas Instruments	CSD19534Q5A	VdsMax= 100.0 V IdsMax= 50.0 Amps	1	$0.38	 TRANS_NexFET_Q5A 55 mm²
14.	Rcomp	Vishay-Dale	CRCW060324K9FKEA Series= CRCW..e3	Res= 24.9 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	 0603 5 mm²
15.	Rfbb	Vishay-Dale	CRCW04021K74FKED Series= CRCW..e3	Res= 1.74 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
16.	Rfbt	Vishay-Dale	CRCW040212K7FKED Series= CRCW..e3	Res= 12.7 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
17.	Rramp	Vishay-Dale	CRCW0603280KFKEA Series= CRCW..e3	Res= 280.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	 0603 5 mm²
18.	Rsns	Stackpole Electronics Inc	CSR1206FK30L0 Series= ?	Res= 30.0 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-6ENF4021V Series= ERJ-6E	Res= 4.02 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

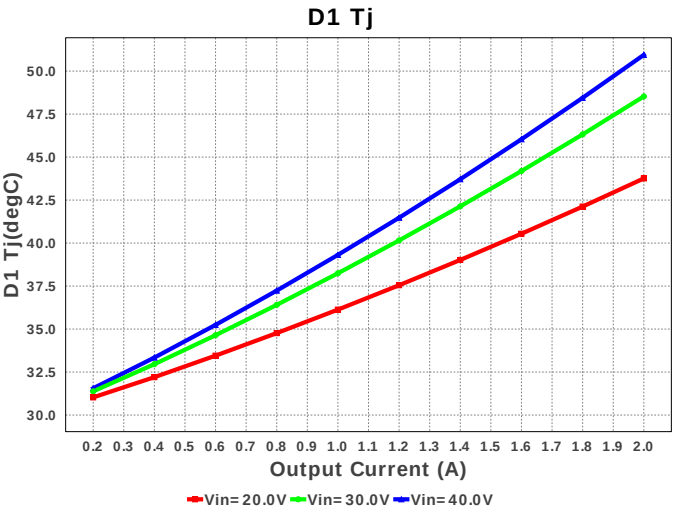


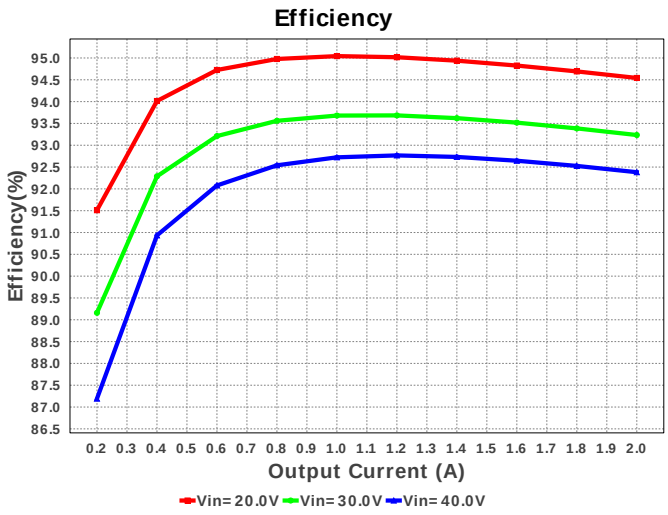


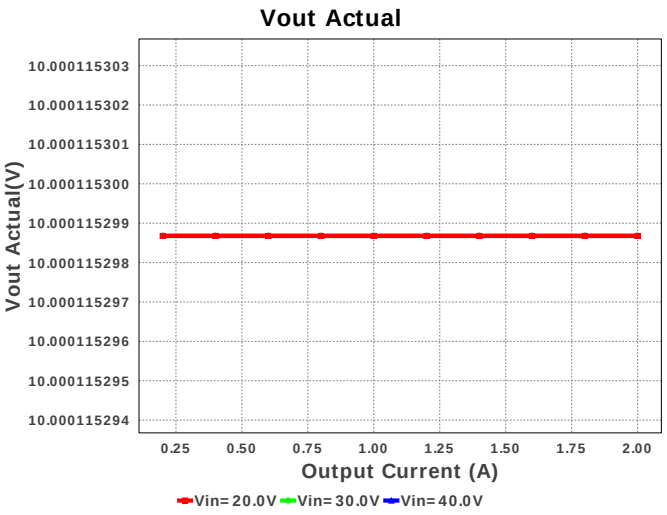


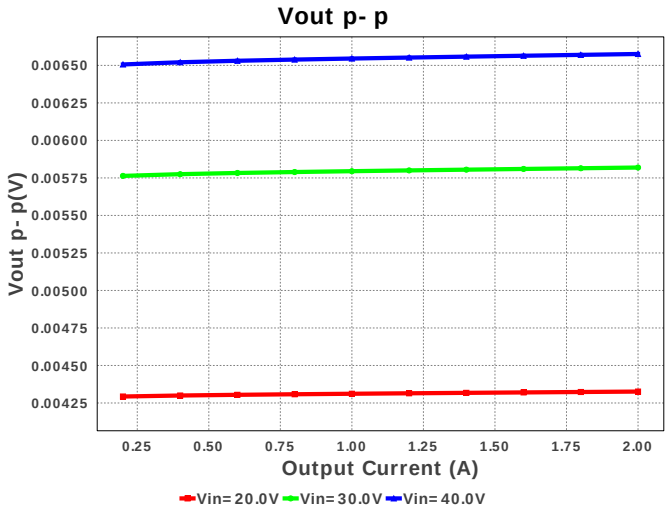


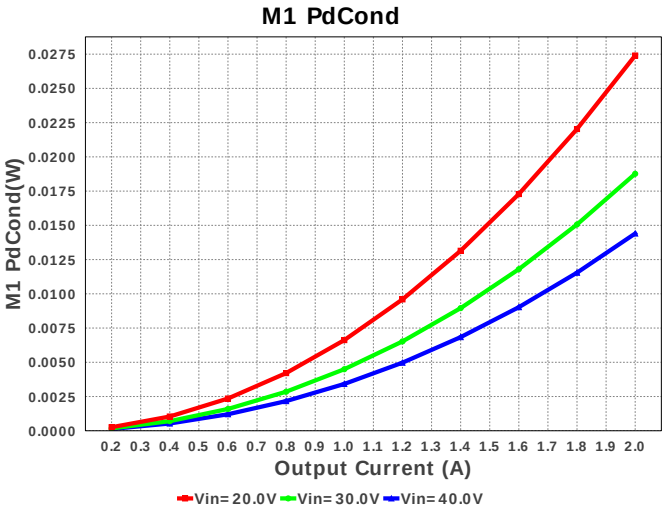


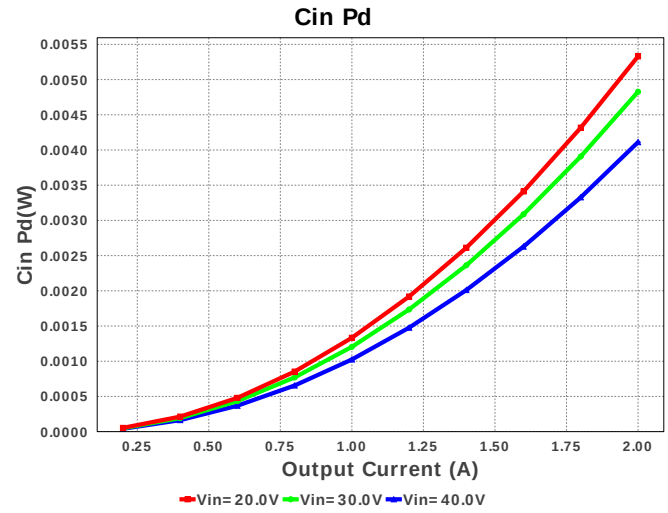


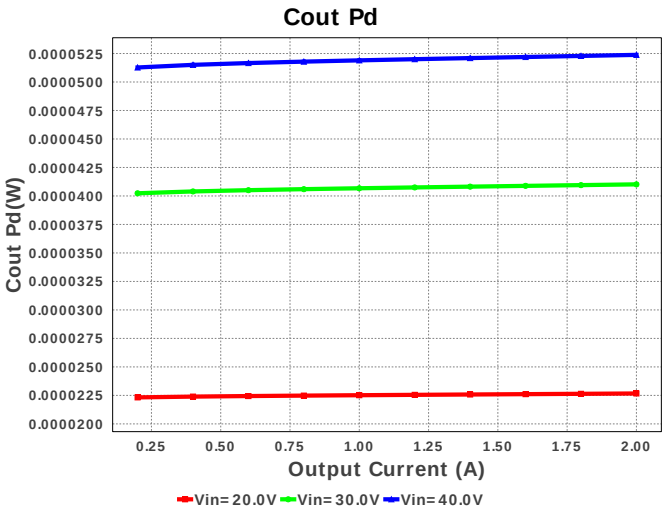


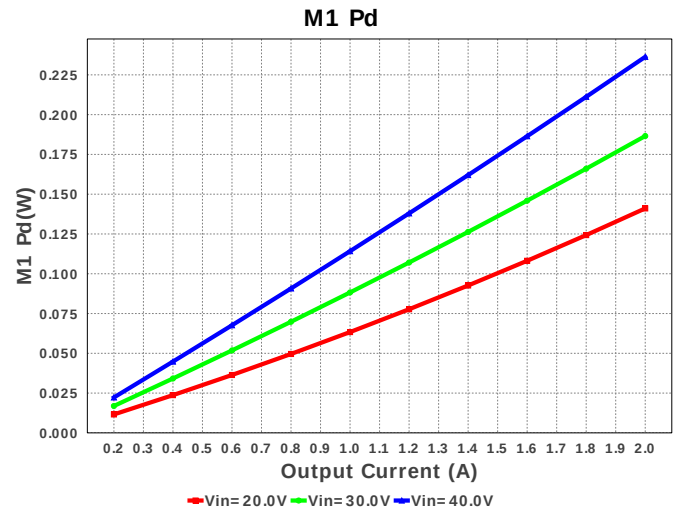


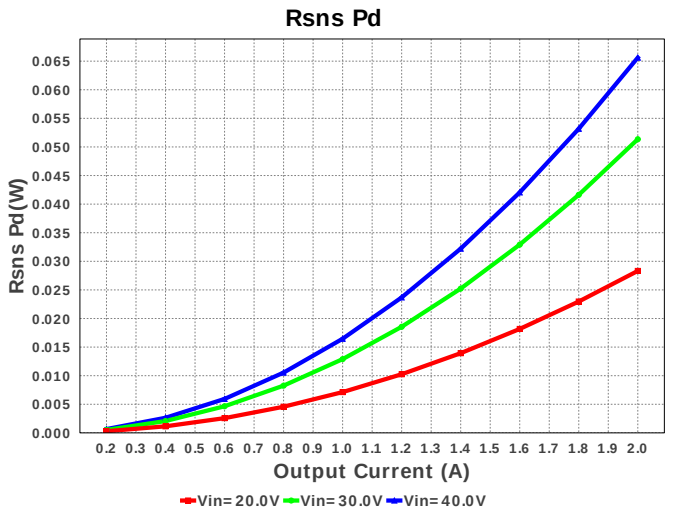


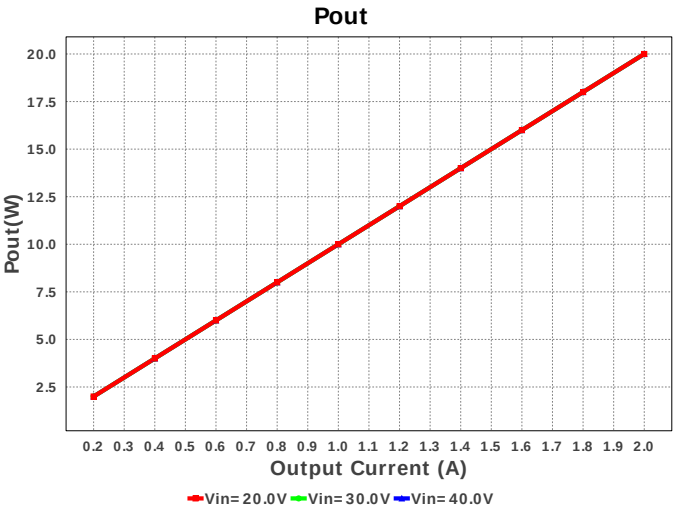


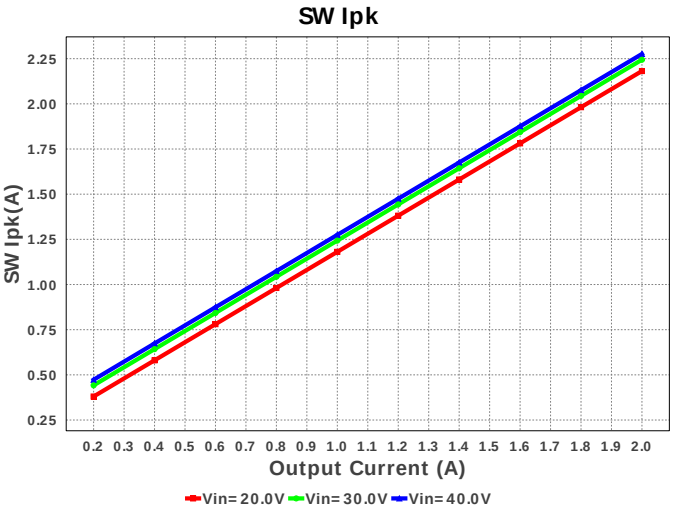


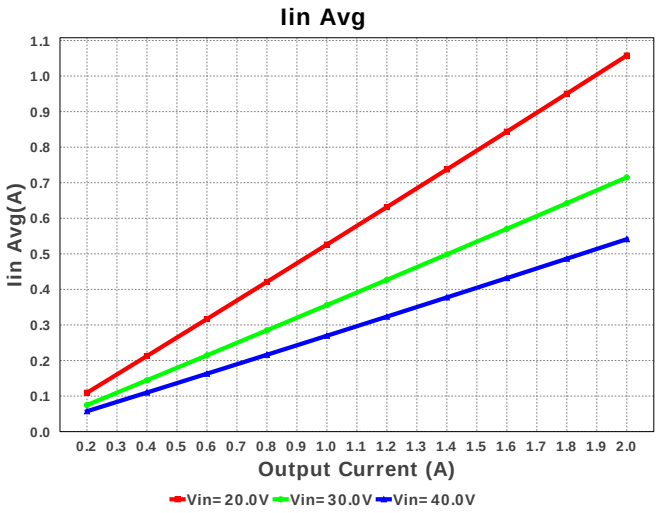


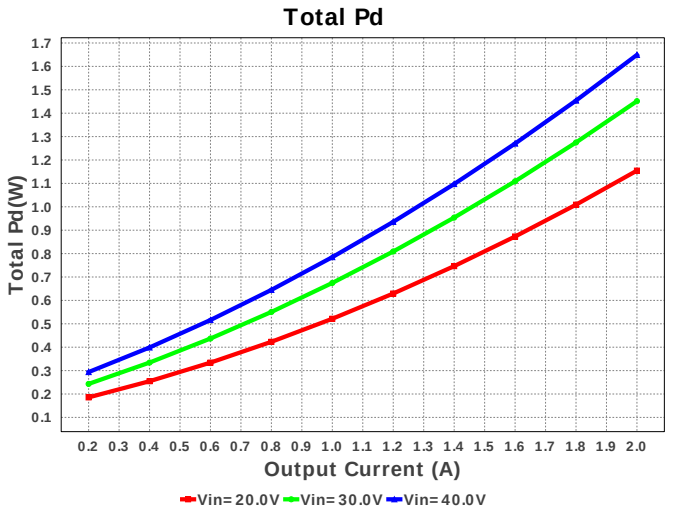


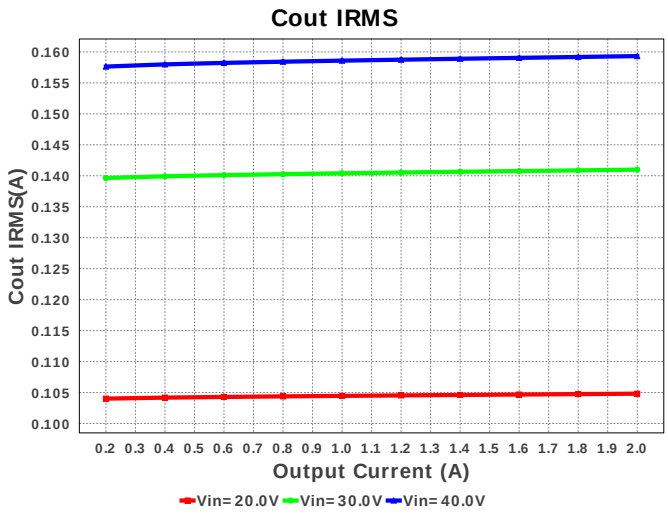


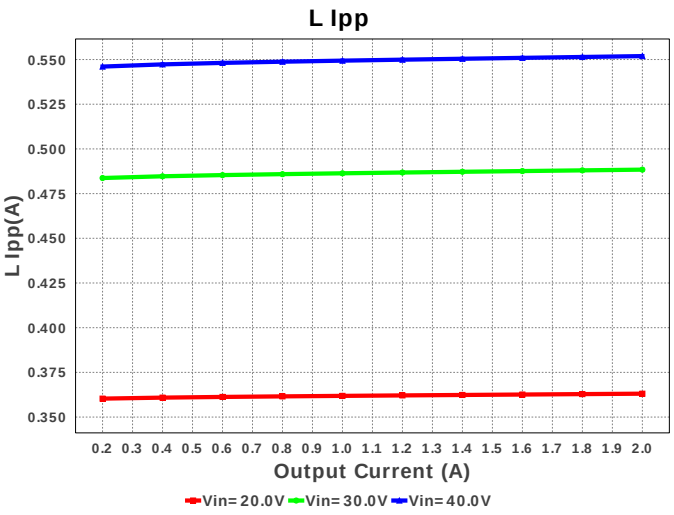


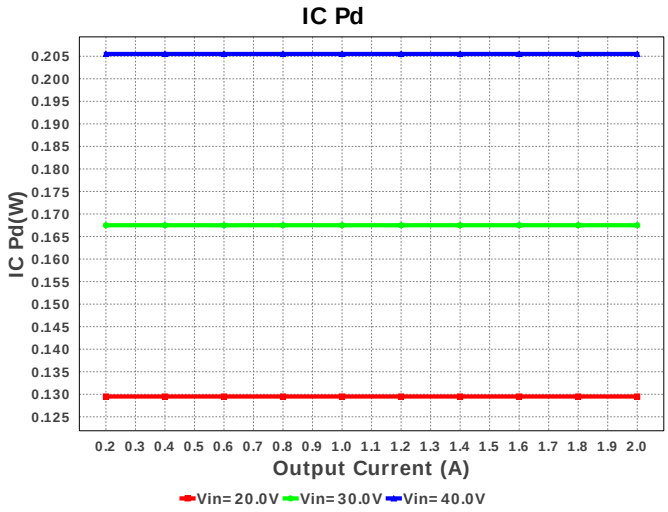


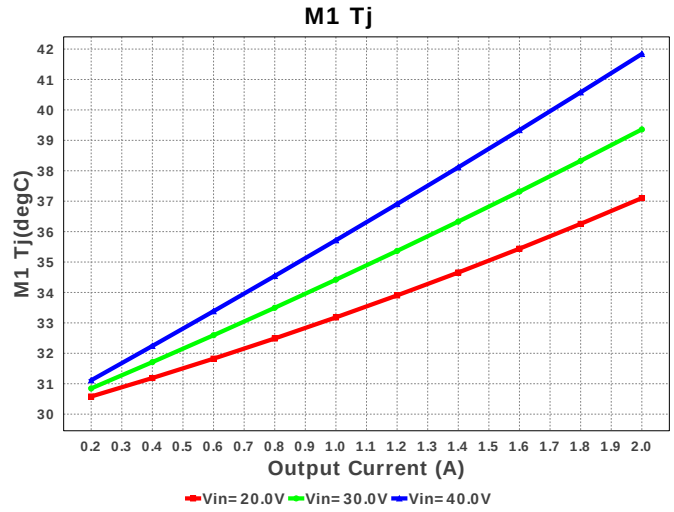


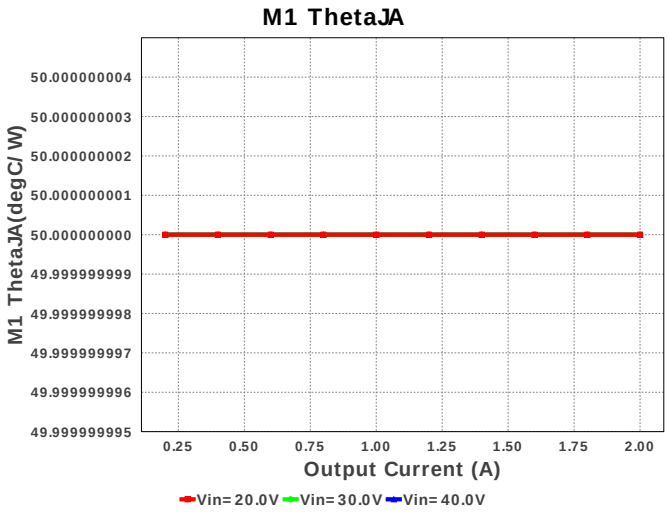


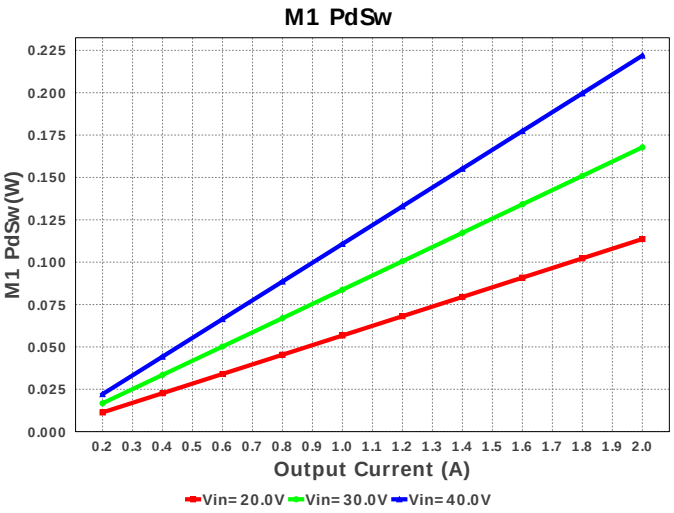


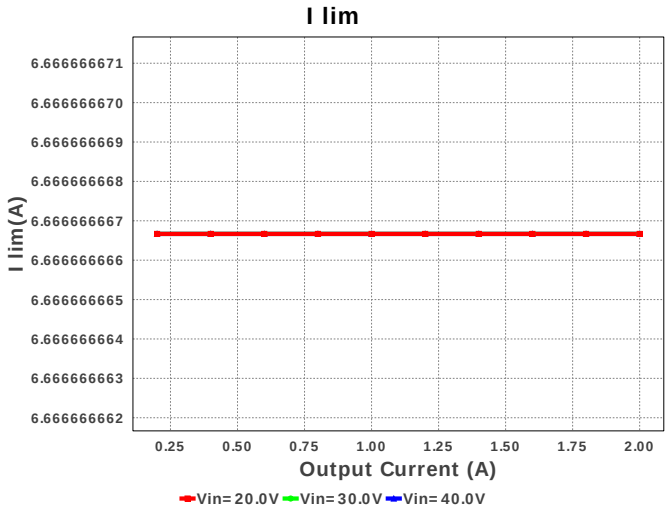












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	877.876 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	159.187 mA	Current	Output capacitor RMS ripple current
3.	I lim	6.667 A	Current	Current limit threshold
4.	Iin Avg	541.23 mA	Current	Average input current
5.	L Ipp	551.44 mA	Current	Peak-to-peak inductor ripple current
6.	SW Ipk	2.276 A	Current	Peak switch current
7.	BOM Count	23	General	Total Design BOM count
8.	FootPrint	484.0 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	50.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
12.	Pout	20.0 W	General	Total output power
13.	Total BOM	$2.72	General	Total BOM Cost
14.	D1 Tj	50.944 degC	Op_Point	D1 junction temperature
15.	Vout Actual	10.0 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
16.	Duty Cycle	26.056 %	Op_point	Duty cycle
17.	Efficiency	92.382 %	Op_point	Steady state efficiency
18.	IC Tj	38.22 degC	Op_point	IC junction temperature
19.	ICThetaJA	40.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
20.	IOUT_OP	2.0 A	Op_point	Iout operating point
21.	M1 Tj	41.839 degC	Op_point	M1 MOSFET junction temperature
22.	VIN_OP	40.0 V	Op_point	Vin operating point
23.	Vout p-p	6.57 mV	Op_point	Peak-to-peak output ripple voltage
24.	Cin Pd	4.111 mW	Power	Input capacitor power dissipation
25.	Cout Pd	52.29 µW	Power	Output capacitor power dissipation
26.	D1 Pd	837.764 mW	Power	Diode1 power dissipation
27.	IC Pd	205.504 mW	Power	IC power dissipation
28.	L Pd	300.0 mW	Power	Inductor power dissipation
29.	M1 Pd	236.311 mW	Power	M1 MOSFET total power dissipation
30.	M1 PdCond	14.404 mW	Power	M1 MOSFET conduction losses
31.	M1 PdSw	221.908 mW	Power	M1 MOSFET switching losses
32.	Rsns Pd	65.613 mW	Power	Current Limit Sense Resistor Power Dissipation
33.	Total Pd	1.649 W	Power	Total Power Dissipation
34.	Vout Tolerance	3.297 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	2.0	Maximum Output Current
2.	VinMax	40.0	Maximum input voltage
3.	VinMin	20.0	Minimum input voltage
4.	Vout	10.0	Output Voltage
5.	base_pn	LM25088-Q1	Texas Instruments Base Part 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.