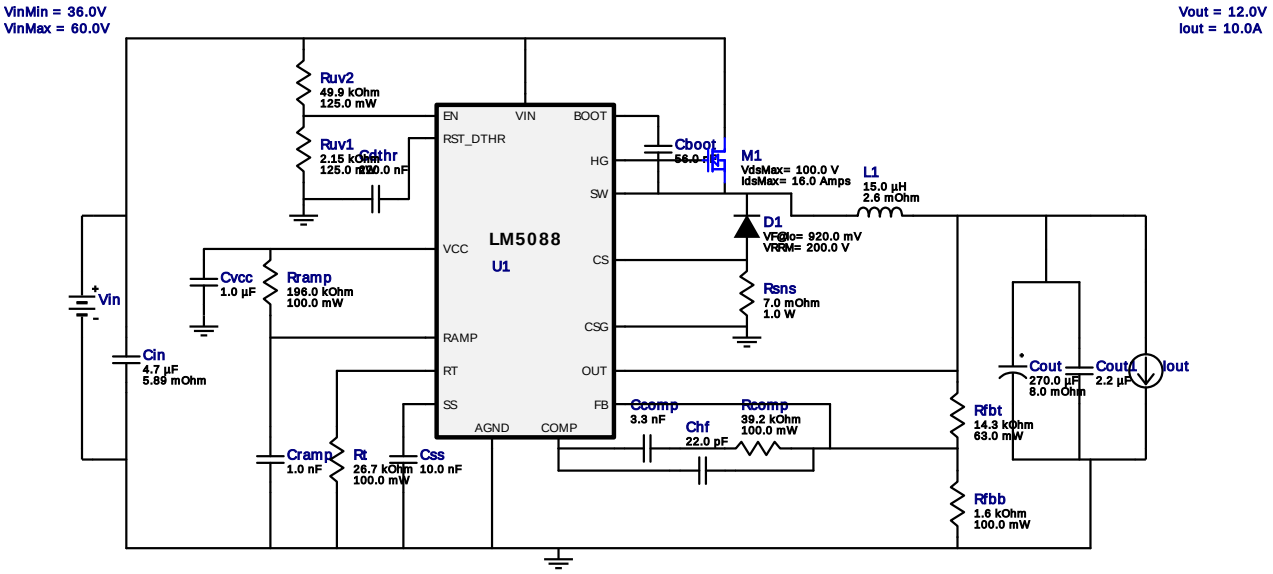
WEBENCH® Design Report

VinMin = 36.0V
VinMax = 60.0V
Vout = 12.0V
Iout = 10.0A

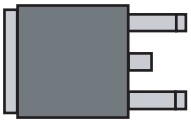
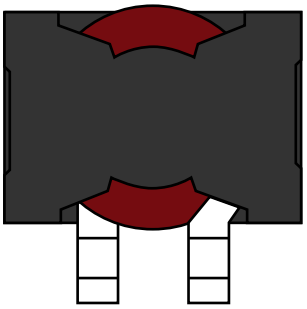
Device = LM5088MH-1/NOPB
Topology = Buck
Created = 3/17/15 8:10:38 PM
BOM Cost = $8.01
Footprint = 1,152.0 mm²
BOM Count = 22
Total Pd = 10.21W

Design : 1083449/47 LM5088MH-1/NOPB
LM5088MH-1/NOPB 36.0V-60.0V to 12.00V @ 10.0A

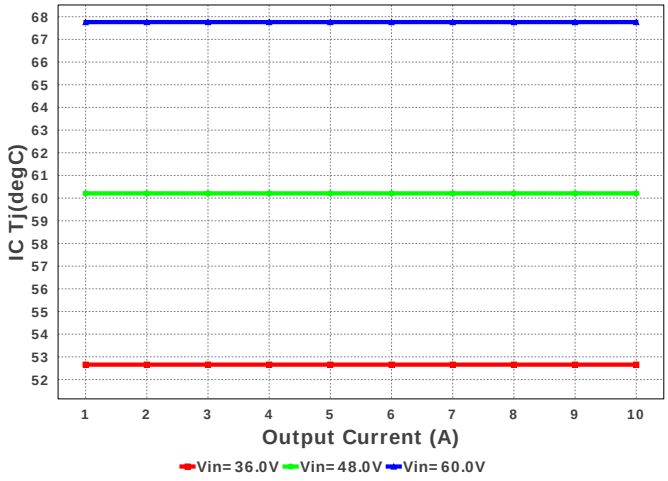


Electrical BOM

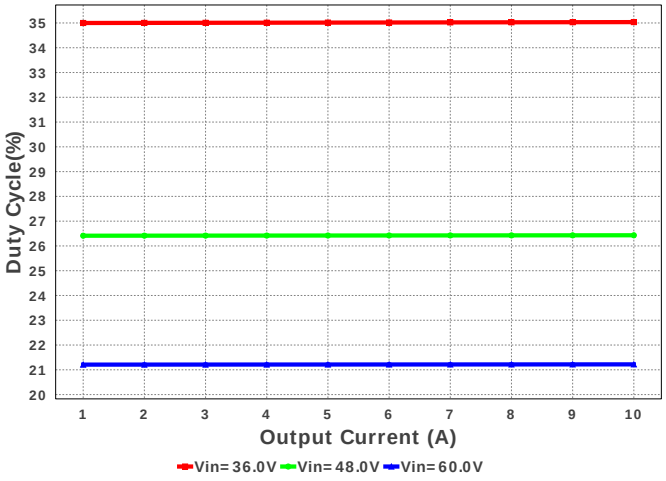
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	MuRata	GRM188R71E563KA01D Series= X7R	Cap= 56.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.02	0603 5 mm²
2.	Ccomp	Kemet	C0603C332K5RACTU Series= X7R	Cap= 3.3 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0603 5 mm²
3.	Cdthr	Kemet	C0603C224Z4VACTU Series= Y5V	Cap= 220.0 nF VDC= 16.0 V IRMS= 0.0 A	1	$0.01	0603 5 mm²
4.	Chf	Kemet	C0603C220K3GACTU Series= C0G	Cap= 22.0 pF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0603 5 mm²
5.	Cin	TDK	C3225X7S2A475M200AB Series= 479	Cap= 4.7 uF ESR= 5.89 mOhm VDC= 100.0 V IRMS= 6.7739 A	1	$0.42	1210 15 mm²
6.	Cout	Panasonic	16SVPG270M Series= ?	Cap= 270.0 uF ESR= 8.0 mOhm VDC= 16.0 V IRMS= 5.8 A	1	$0.70	CAPSMT_62_C10 74 mm²
7.	Cout1	Taiyo Yuden	EMK212B7225KG-T Series= X7R	Cap= 2.2 uF VDC= 16.0 V IRMS= 0.0 A	1	$0.03	0805 7 mm²
8.	Cramp	Kemet	C0603C102J3GACTU Series= C0G	Cap= 1.0 nF VDC= 25.0 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	C0603C105K8PACTU Series= X5R	Cap= 1.0 uF VDC= 10.0 V IRMS= 0.0 A	1	$0.01	 0603 5 mm²
11.	D1	Vishay-Semiconductor	30CTH02SPBF	VF@Io= 920.0 mV VRRM= 200.0 V	1	$1.21	 DDPAK 210 mm²
12.	L1	Coilcraft	SER2918H-153KL	L= 15.0 µH DCR= 2.6 mOhm	1	$2.40	 SER2918H 652 mm²
13.	M1	Texas Instruments	CSD19531Q5A	VdsMax= 100.0 V IdsMax= 16.0 Amps	1	$1.15	 TRANS_NexFET_Q5A 55 mm²
14.	Rcomp	Vishay-Dale	CRCW060339K2FKEA Series= CRCW..e3	Res= 39.2 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	 0603 5 mm²
15.	Rfbb	Susumu Co Ltd	RR1220P-162-D Series= 264	Res= 1.6 kOhm Power= 100.0 mW Tolerance= 0.5%	1	$0.01	 0805 7 mm²
16.	Rfbt	Vishay-Dale	CRCW040214K3FKED Series= CRCW..e3	Res= 14.3 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
17.	Rramp	Vishay-Dale	CRCW0603196KFKEA Series= CRCW..e3	Res= 196.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	 0603 5 mm²
18.	Rsns	Susumu Co Ltd	PRL1632-R007-F-T1 Series= 237	Res= 7.0 mOhm Power= 1.0 W Tolerance= 1.0%	1	$0.19	 1206 11 mm²
19.	Rt	Vishay-Dale	CRCW060326K7FKEA Series= CRCW..e3	Res= 26.7 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	 0603 5 mm²
20.	Ruv1	Panasonic	ERJ-6ENF2151V Series= 225	Res= 2.15 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm²
21.	Ruv2	Panasonic	ERJ-6ENF4992V Series= 225	Res= 49.9 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm²
22.	U1	Texas Instruments	LM5088MH-1/NOPB	Switcher	1	$1.76	 MXA16A 59 mm²

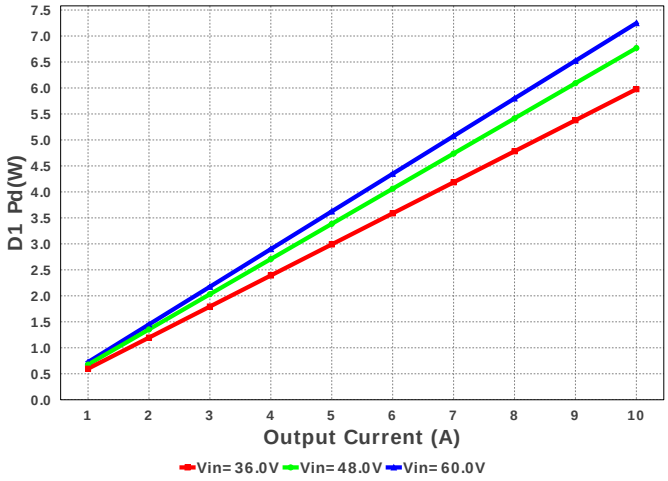
IC Tj



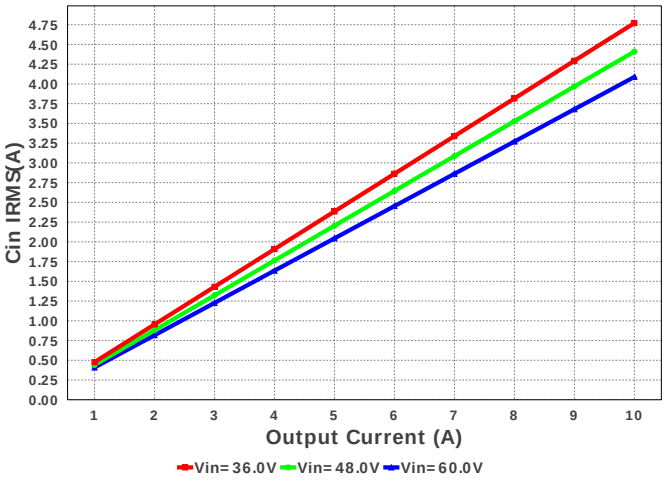
Duty Cycle



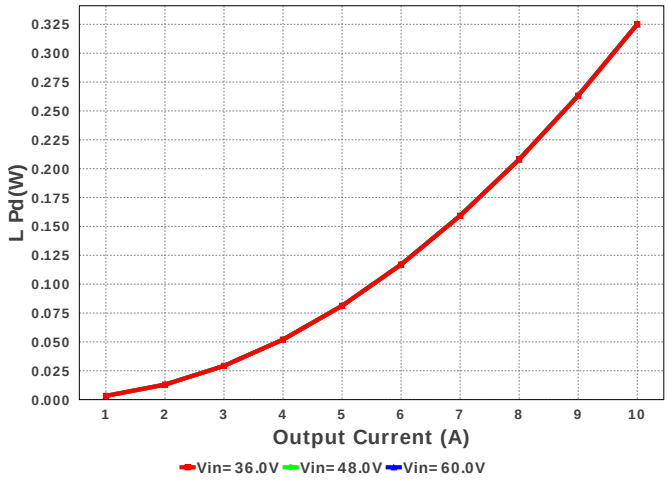
D1 Pd



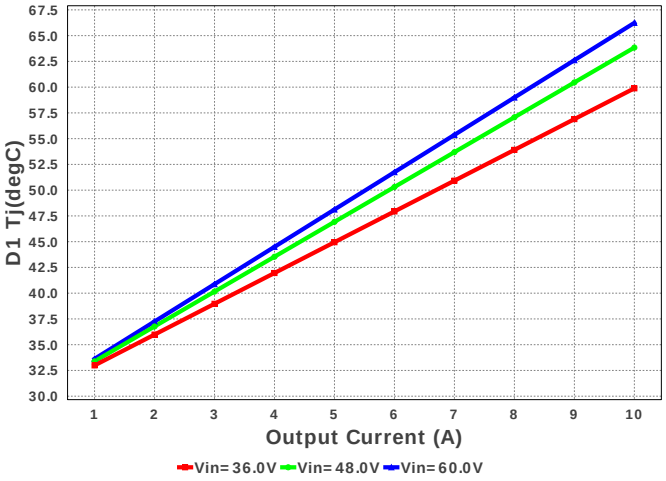
Cin IRMS

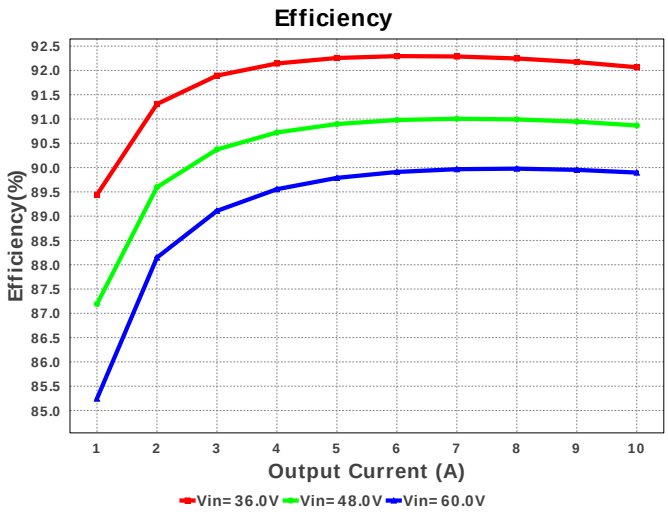


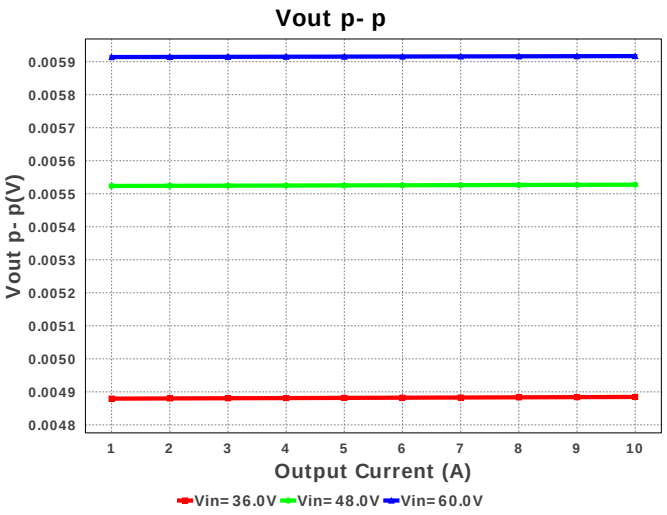
L Pd

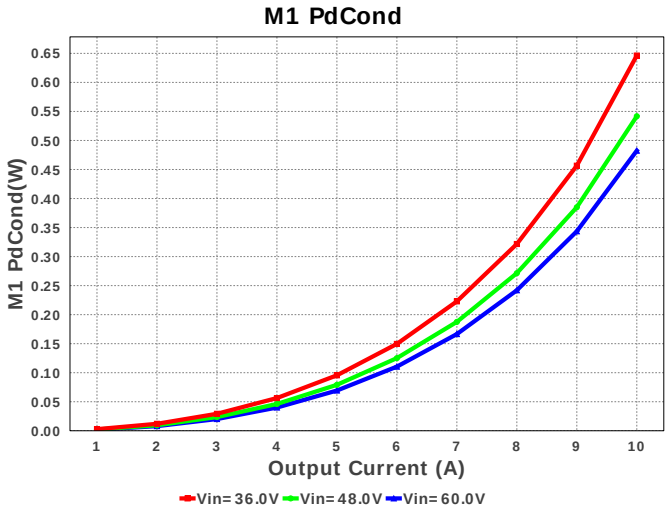


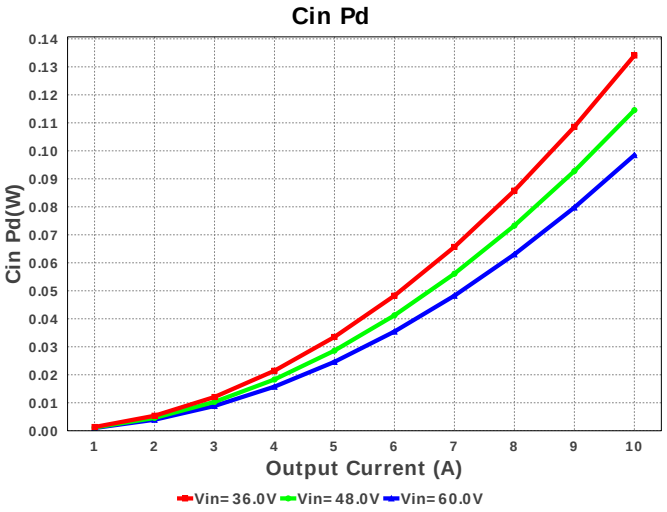
D1 Tj

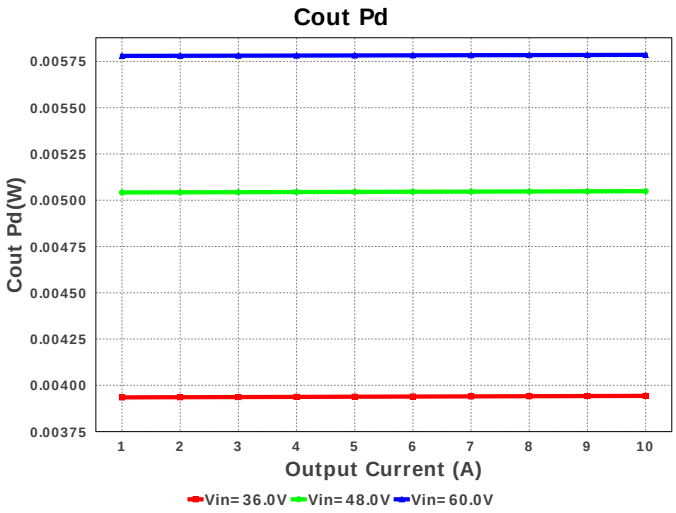


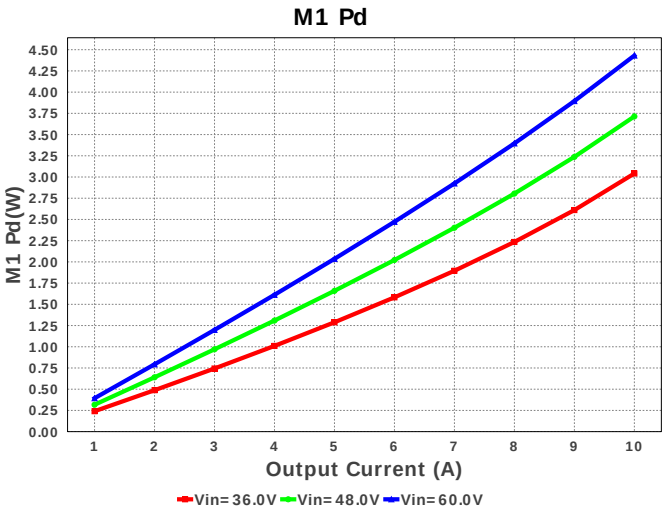


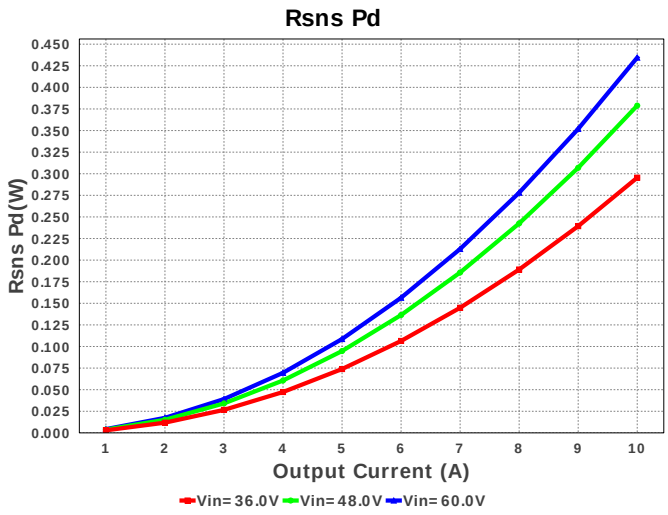


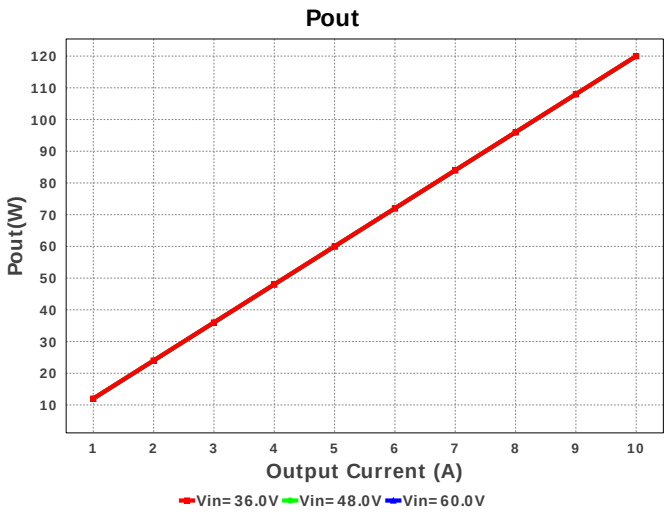


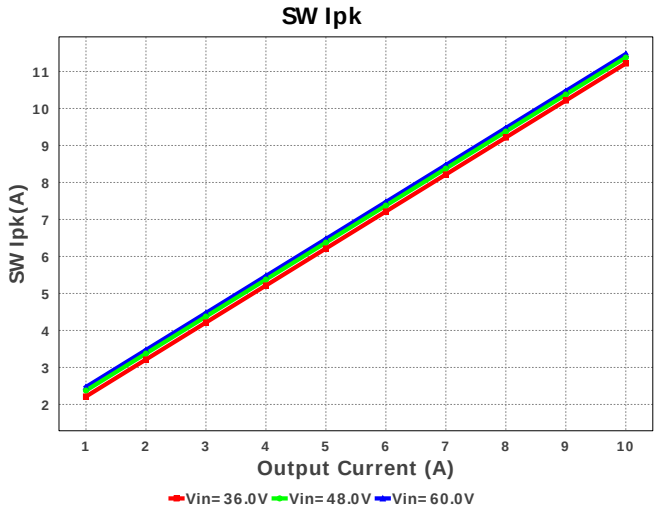


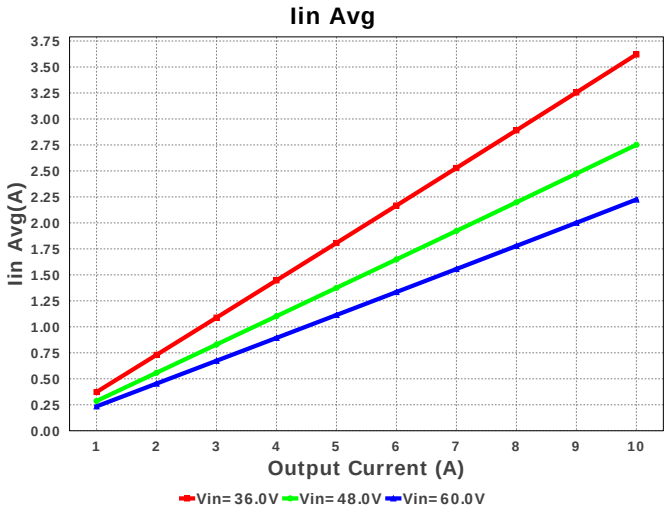


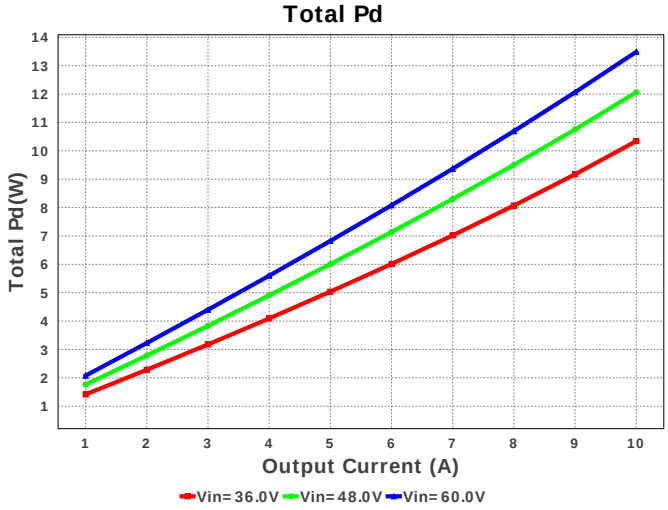


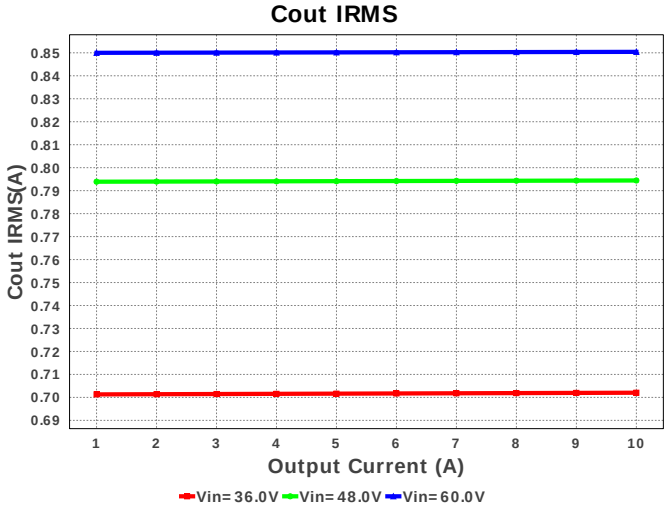


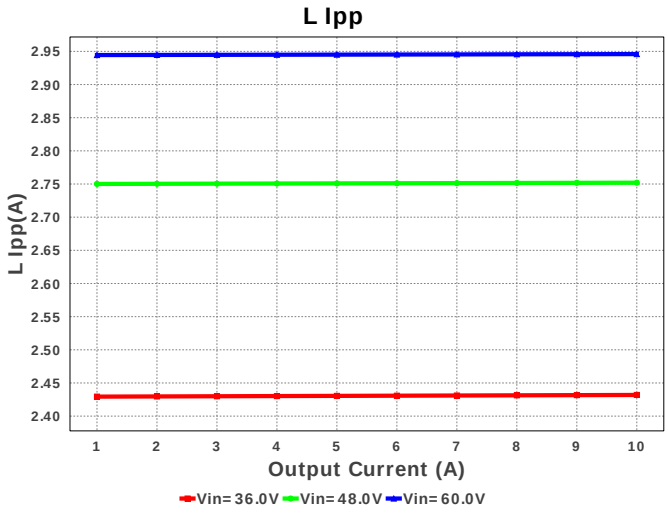


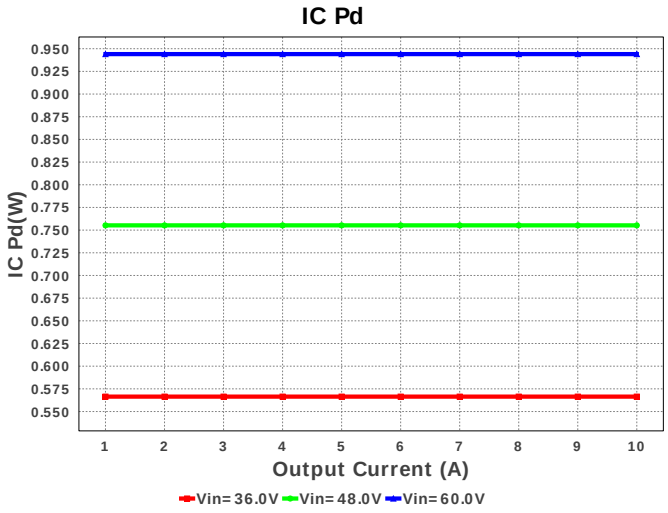


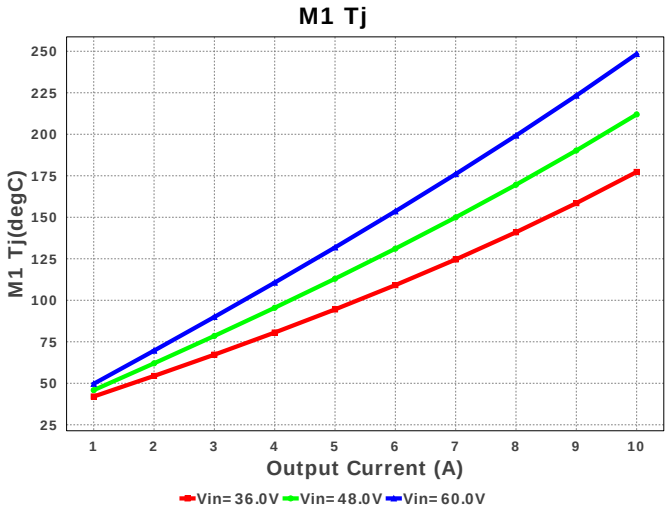


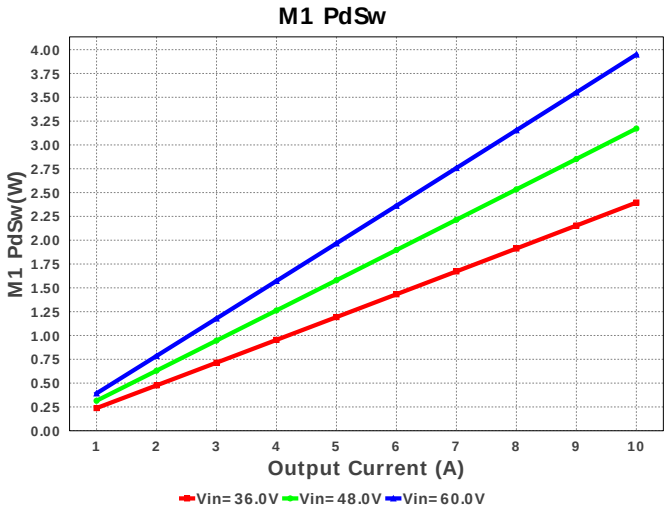


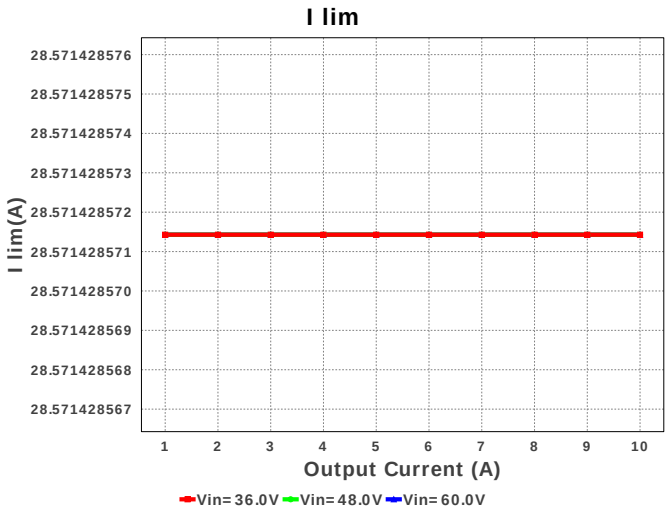












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	4.089 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	859.26 mA	Current	Output capacitor RMS ripple current
3.	I lim	28.571 A	Current	Current limit threshold
4.	Iin Avg	2.17 A	Current	Average input current
5.	L Ipp	2.977 A	Current	Peak-to-peak inductor ripple current
6.	SW Ipk	11.488 A	Current	Peak switch current
7.	BOM Count	22	General	Total Design BOM count
8.	FootPrint	1.152 k mm^2	General	Total Foot Print Area of BOM components
9.	Frequency	230.5 kHz	General	Switching frequency
10.	IC Tolerance	18.0 mV	General	IC Feedback Tolerance
11.	Pout	120.0 W	General	Total output power

#	Name	Value	Category	Description
12.	Total BOM	$8.01	General	Total BOM Cost
13.	D1 Tj	66.239 degC	Op_Point	D1 junction temperature
14.	Duty Cycle	21.22 %	Op_point	Duty cycle
15.	Efficiency	92.156 %	Op_point	Steady state efficiency
16.	IC Tj	67.762 degC	Op_point	IC junction temperature
17.	IOUT_OP	10.0 A	Op_point	Iout operating point
18.	M1 Tj	86.301 degC	Op_point	M1 MOSFET junction temperature
19.	VIN_OP	60.0 V	Op_point	Vin operating point
20.	Vout p-p	5.978 mV	Op_point	Peak-to-peak output ripple voltage
21.	Cin Pd	98.463 mW	Power	Input capacitor power dissipation
22.	Cout Pd	5.907 mW	Power	Output capacitor power dissipation
23.	D1 Pd	7.248 W	Power	Diode1 power dissipation
24.	IC Pd	944.051 mW	Power	IC power dissipation
25.	L Pd	325.0 mW	Power	Inductor power dissipation
26.	M1 Pd	1.158 W	Power	M1 MOSFET total power dissipation
27.	M1 PdCond	256.872 mW	Power	M1 MOSFET conduction losses
28.	M1 PdSw	900.822 mW	Power	M1 MOSFET switching losses
29.	Rsns Pd	434.444 mW	Power	Current Limit Sense Resistor Power Dissipation
30.	Total Pd	10.214 W	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	10.0	Maximum Output Current
2.	Iout1	10.0	Output Current #1
3.	VinMax	60.0	Maximum input voltage
4.	VinMin	36.0	Minimum input voltage
5.	Vout	12.0	Output Voltage
6.	Vout1	12.0	Output Voltage #1
7.	base_pn	LM5088	Base Product Number
8.	source	DC	Input Source Type
9.	Ta	30.0	Ambient temperature

Design Assistance

1. **LM5088** Product Folder : http://www.ti.com/product/lm5088 : contains the data sheet and other resources.