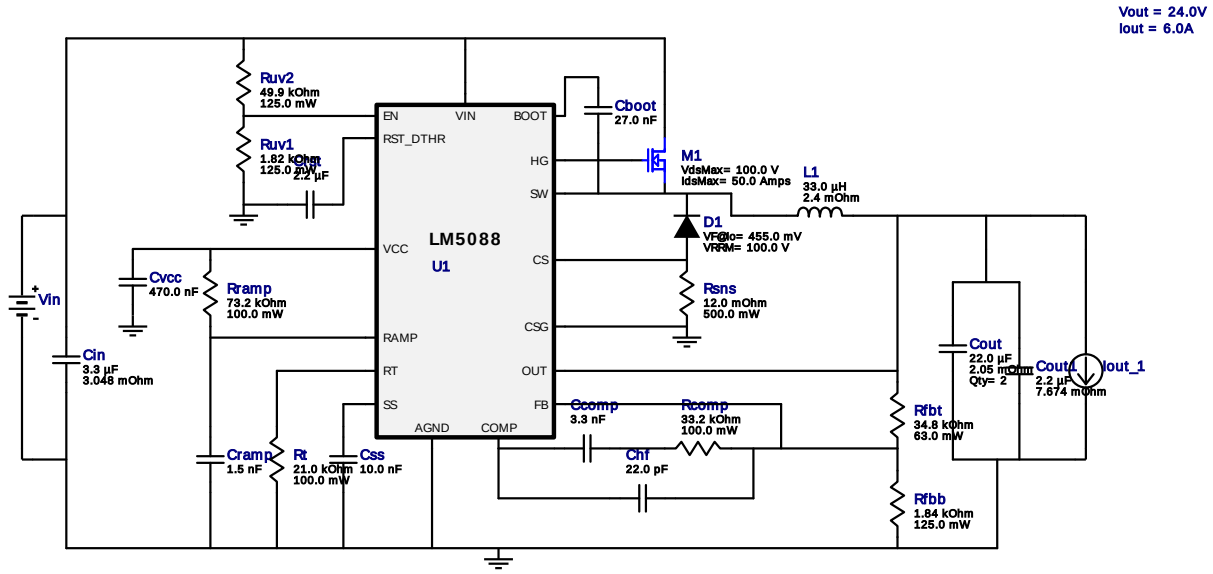
WEBENCH® Design Report

VinMin = 43.0V
VinMax = 58.0V
Vout = 24.0V
Iout = 6.0A

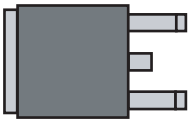
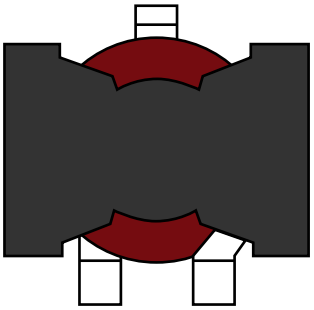
Device = LM5088MH-2/NOPB
Topology = Buck
Created = 2017-06-24 02:54:41.840
BOM Cost = $11.75
BOM Count = 23
Total Pd = 2.88W

Design : 943773/74 LM5088MH-2/NOPB
LM5088MH-2/NOPB 43.0V-58.0V to 24.00V @ 6.0A

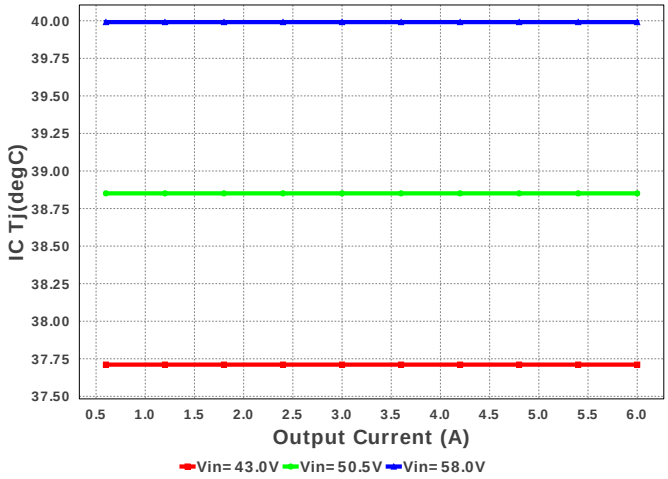


Electrical BOM

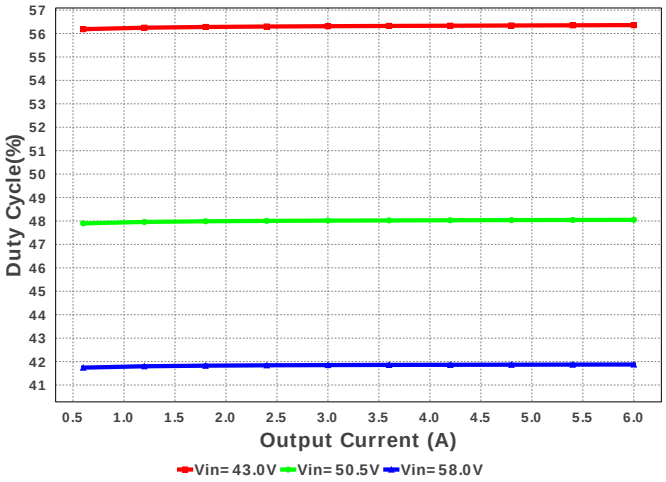
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	MuRata	GRM188R71C273KA01D Series= X7R	Cap= 27.0 nF VDC= 16.0 V IRMS= 0.0 A	1	$0.02	0603 5 mm²
2.	Ccomp	Kemet	C0603C332K5RACTU Series= X7R	Cap= 3.3 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0603 5 mm²
3.	Chf	Kemet	C0603C220K3GACTU Series= C0G/NP0	Cap= 22.0 pF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0603 5 mm²
4.	Cin	TDK	C3216X7S2A335M160AB Series= X7S	Cap= 3.3 uF ESR= 3.048 mOhm VDC= 100.0 V IRMS= 4.157 A	1	$0.39	1206_190 11 mm²
5.	Cout	TDK	C2012X5R1V226M125AC Series= X5R	Cap= 22.0 uF ESR= 2.05 mOhm VDC= 35.0 V IRMS= 4.5559 A	2	$0.33	0805 7 mm²
6.	Cout1	TDK	C1608X5R1V225K080AC Series= X5R	Cap= 2.2 uF ESR= 7.674 mOhm VDC= 35.0 V IRMS= 1.87823 A	1	$0.05	0603 5 mm²
7.	Cramp	Kemet	C0603C152K5RACTU Series= X7R	Cap= 1.5 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0603 5 mm²
8.	Crst	Kemet	C0603C225K8PACTU Series= X5R	Cap= 2.2 uF VDC= 10.0 V IRMS= 0.0 A	1	$0.03	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	STMicroelectronics	STPS20M100SG-TR	VF@Io= 455.0 mV VRRM= 100.0 V	1	$1.39	 DDPAK 210 mm²
12.	L1	Wurth Elektronik	7443643300	L= 33.0 µH DCR= 2.4 mOhm	1	$6.83	 WE-HCF_2818 656 mm²
13.	M1	Texas Instruments	CSD19534Q5A	VdsMax= 100.0 V IdsMax= 50.0 Amps	1	$0.34	 TRANS_NexFET_Q5A 55 mm²
14.	Rcomp	Vishay-Dale	CRCW060333K2FKEA Series= CRCW..e3	Res= 33.2 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	 0603 5 mm²
15.	Rfbb	Yageo America	RT0805BRD071K84L Series= RT0805	Res= 1.84 kOhm Power= 125.0 mW Tolerance= 0.1%	1	$0.05	 0805 7 mm²
16.	Rfbt	Vishay-Dale	CRCW040234K8FKED Series= CRCW..e3	Res= 34.8 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
17.	Rramp	Vishay-Dale	CRCW060373K2FKEA Series= CRCW..e3	Res= 73.2 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	 0603 5 mm²
18.	Rsns	Stackpole Electronics Inc	CSR1206FK12L0 Series= ?	Res= 12.0 mOhm Power= 500.0 mW Tolerance= 1.0%	1	$0.11	 1206 11 mm²
19.	Rt	Vishay-Dale	CRCW060321K0FKEA Series= CRCW..e3	Res= 21.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	 0603 5 mm²
20.	Ruv1	Panasonic	ERJ-6ENF1821V Series= ERJ-6E	Res= 1.82 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	LM5088MH-2/NOPB	Switcher	1	$1.76	 MXA16A 59 mm²

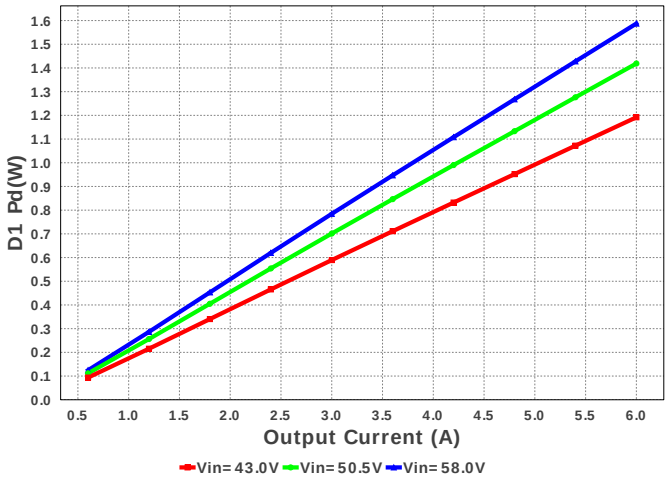
IC Tj



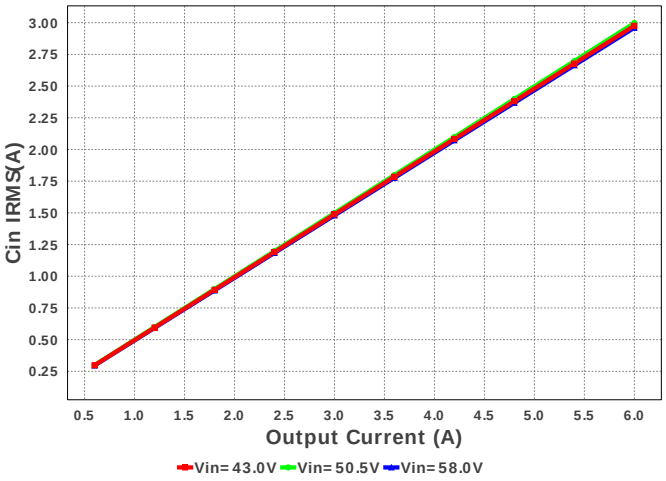
Duty Cycle



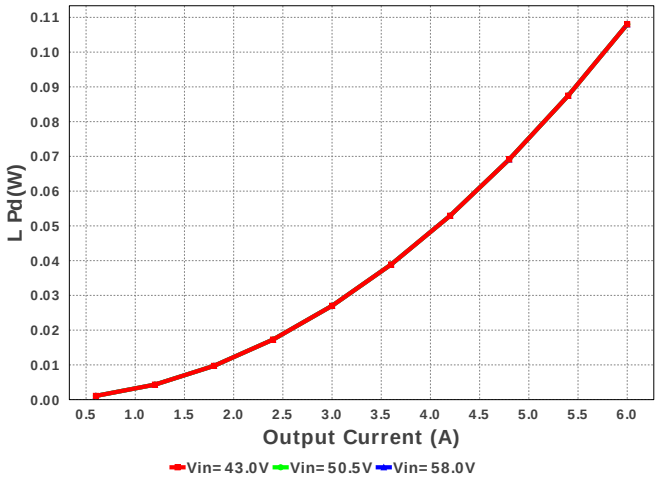
D1 Pd



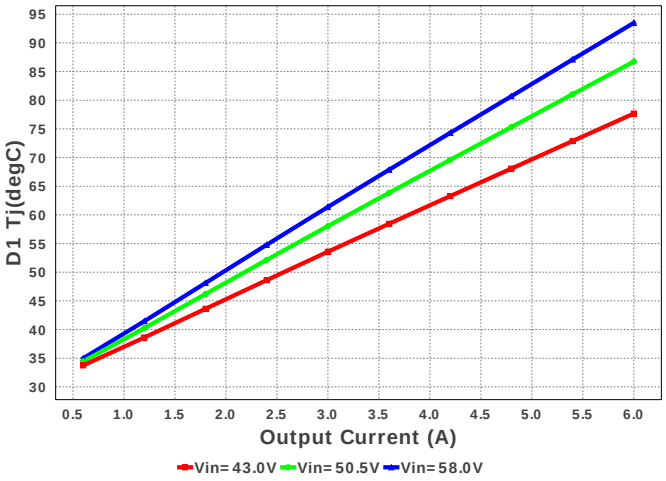
Cin IRMS

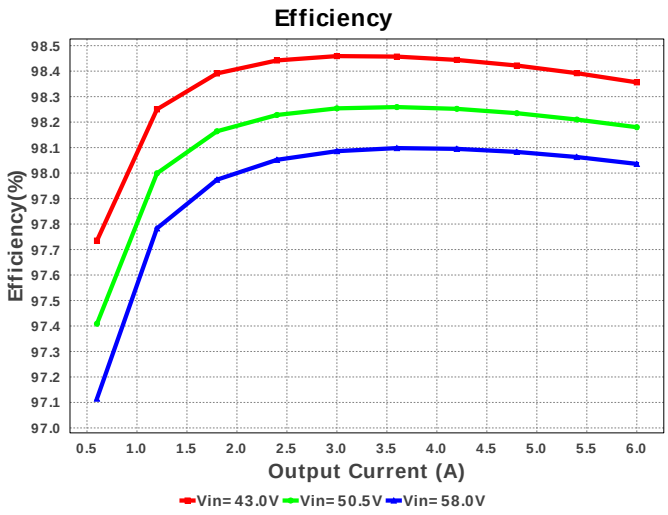


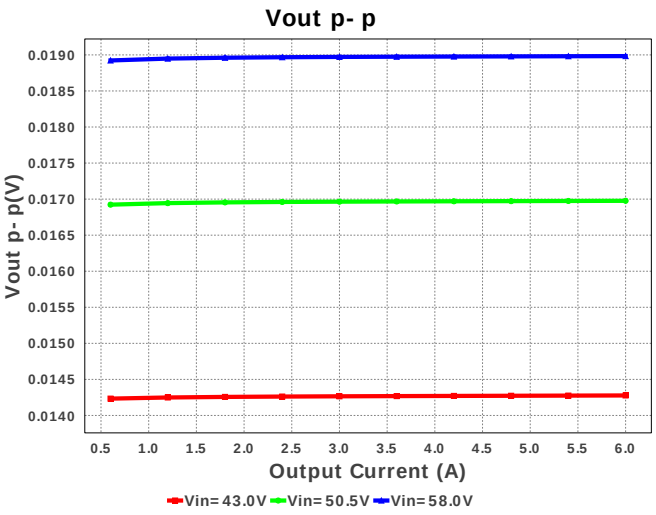
L Pd

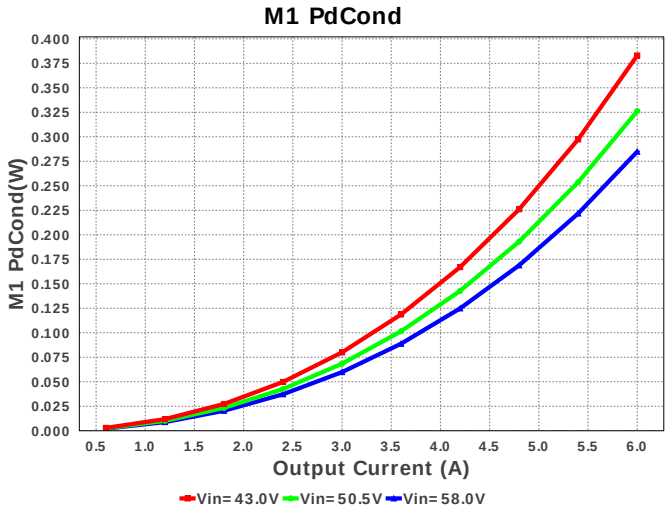


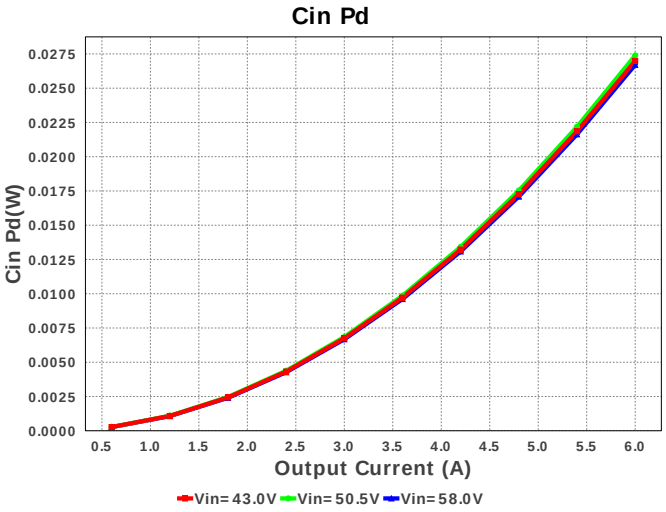
D1 Tj

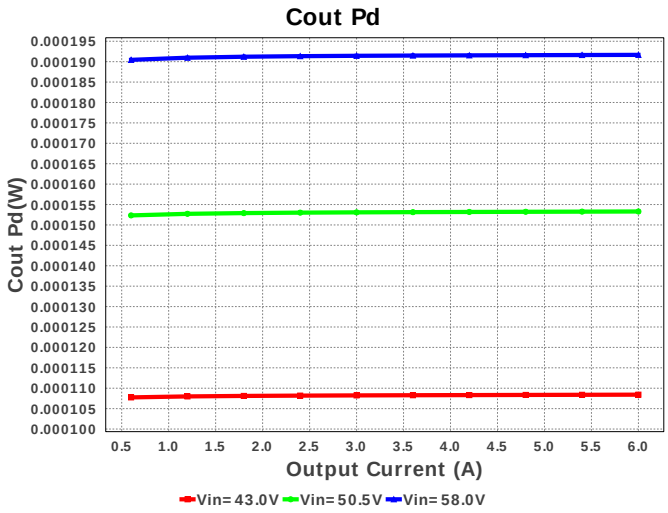


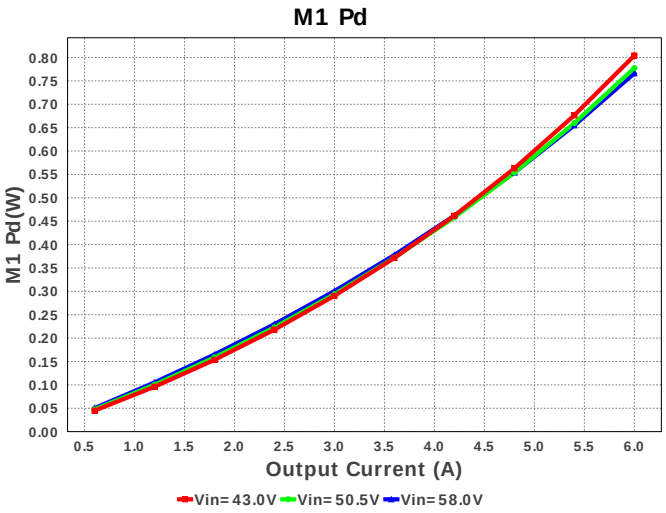


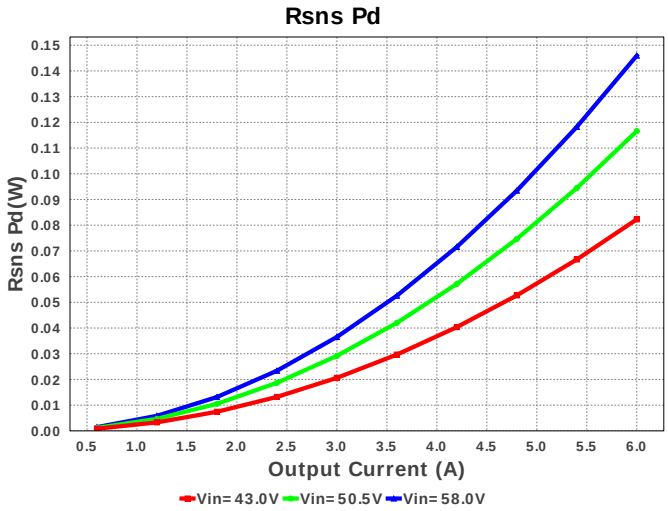


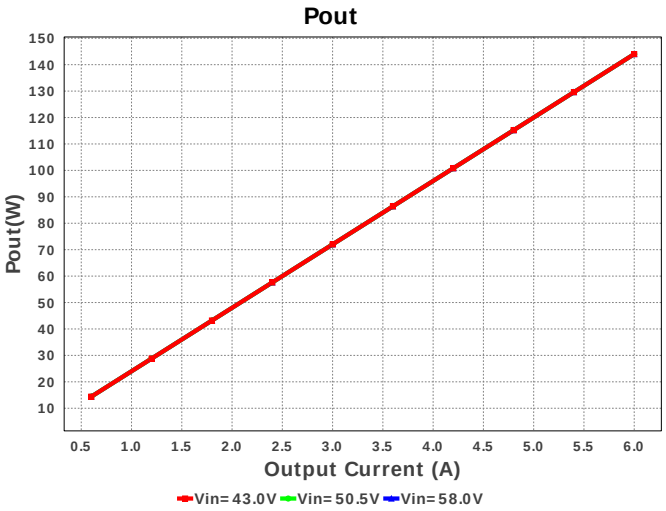


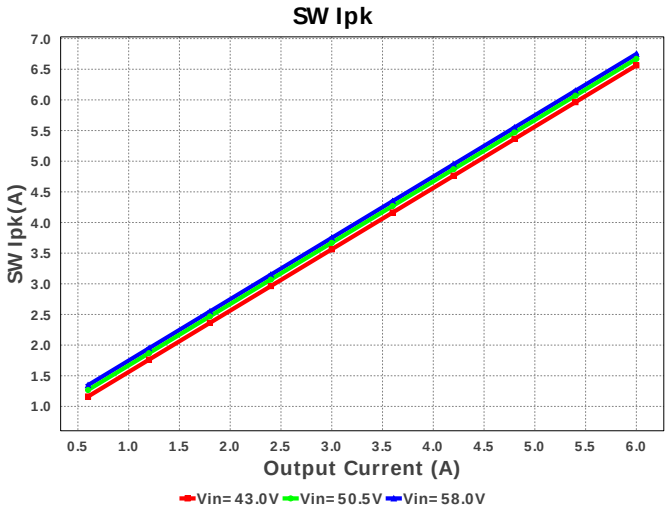


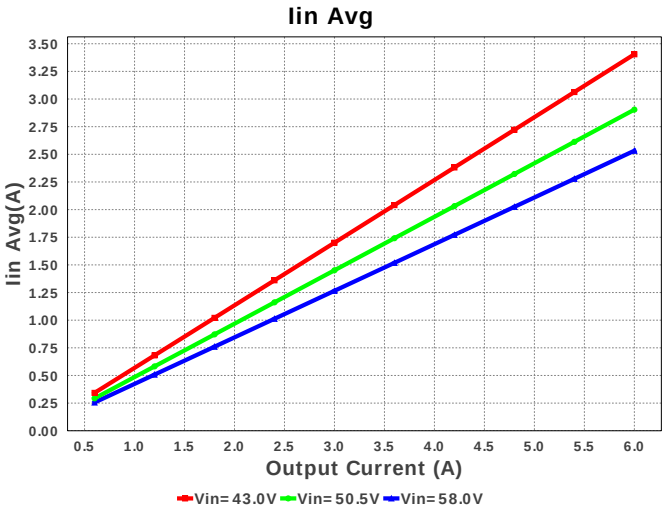


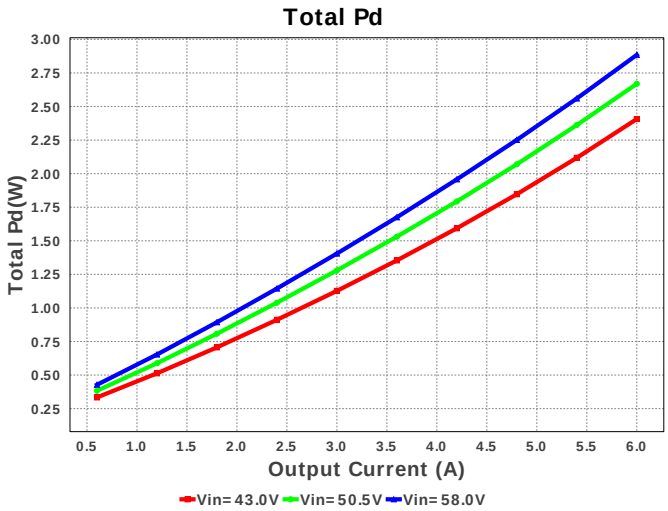


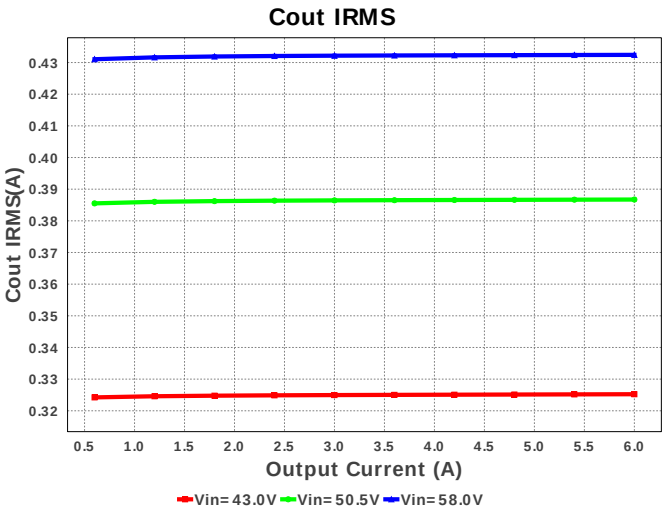


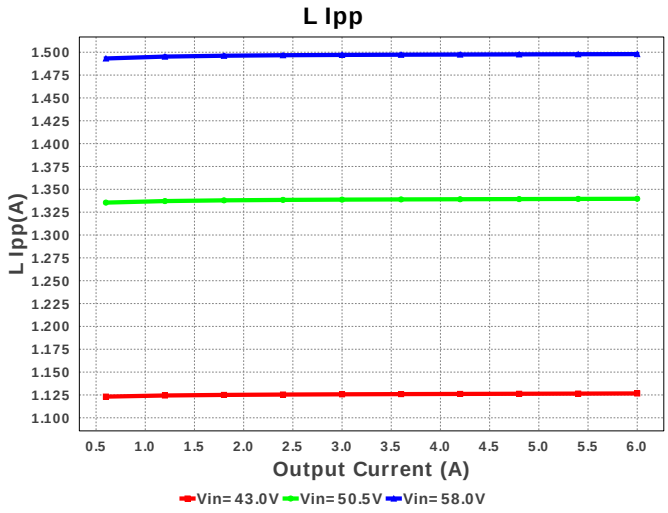


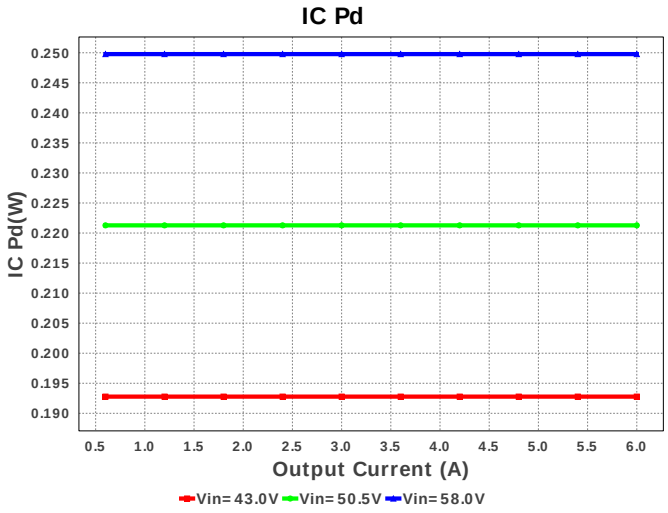


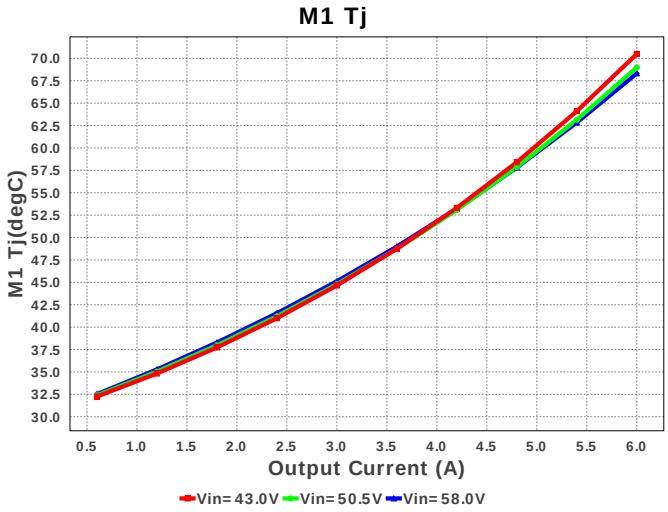


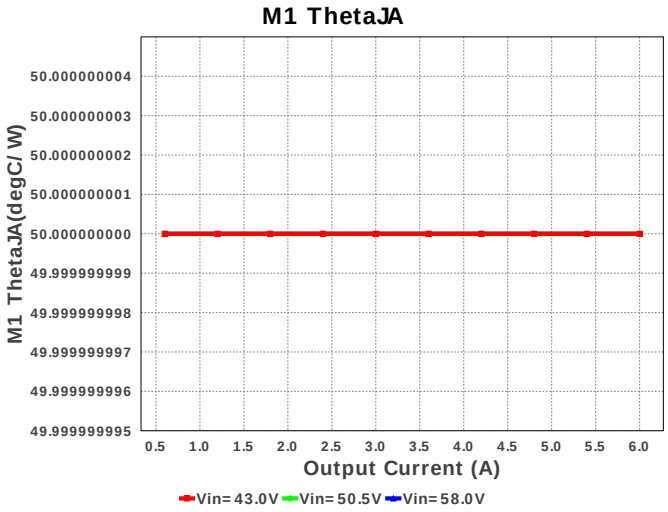


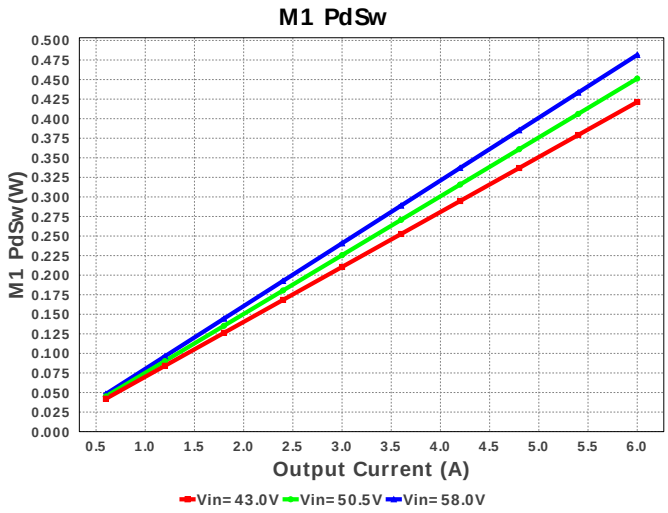


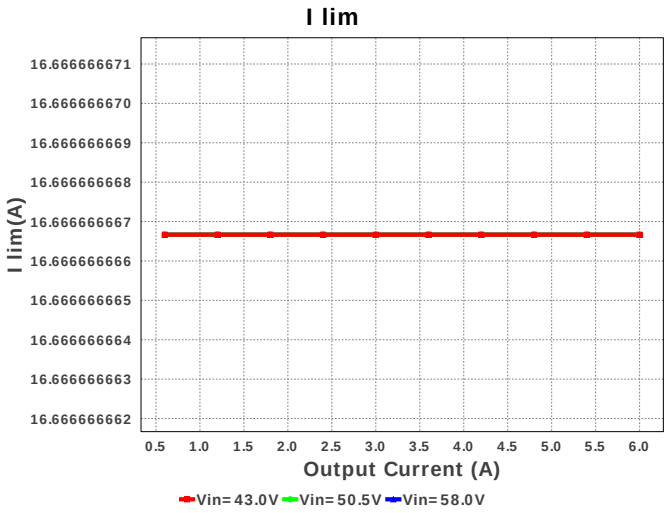












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	2.96 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	433.203 mA	Current	Output capacitor RMS ripple current
3.	I lim	16.667 A	Current	Current limit threshold
4.	Iin Avg	2.532 A	Current	Average input current
5.	L Ipp	1.501 A	Current	Peak-to-peak inductor ripple current
6.	SW Ipk	6.75 A	Current	Peak switch current
7.	BOM Count	23	General	Total Design BOM count
8.	FootPrint	1.09 k mm^2	General	Total Foot Print Area of BOM components
9.	Frequency	288.02 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

#	Name	Value	Category	Description
12.	Mode	CCM	General	Conduction Mode
13.	Pout	144.0 W	General	Total output power
14.	Total BOM	$11.75	General	Total BOM Cost
15.	D1 Tj	93.493 degC	Op_Point	D1 junction temperature
16.	Vout Actual	23.995 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
17.	Duty Cycle	41.875 %	Op_point	Duty cycle
18.	Efficiency	98.036 %	Op_point	Steady state efficiency
19.	IC Tj	39.991 degC	Op_point	IC junction temperature
20.	ICThetaJA	40.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
21.	IOUT_OP	6.0 A	Op_point	Iout operating point
22.	M1 Tj	68.324 degC	Op_point	M1 MOSFET junction temperature
23.	VIN_OP	58.0 V	Op_point	Vin operating point
24.	Vout p-p	14.843 mV	Op_point	Peak-to-peak output ripple voltage
25.	Cin Pd	26.708 mW	Power	Input capacitor power dissipation
26.	Cout Pd	192.356 µW	Power	Output capacitor power dissipation
27.	D1 Pd	1.587 W	Power	Diode1 power dissipation
28.	IC Pd	249.778 mW	Power	IC power dissipation
29.	L Pd	108.0 mW	Power	Inductor power dissipation
30.	M1 Pd	766.322 mW	Power	M1 MOSFET total power dissipation
31.	M1 PdCond	284.837 mW	Power	M1 MOSFET conduction losses
32.	M1 PdSw	481.484 mW	Power	M1 MOSFET switching losses
33.	Rsns Pd	145.952 mW	Power	Current Limit Sense Resistor Power Dissipation
34.	Total Pd	2.885 W	Power	Total Power Dissipation
35.	Vout Tolerance	2.555 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	6.0	Maximum Output Current
2.	VinMax	58.0	Maximum input voltage
3.	VinMin	43.0	Minimum input voltage
4.	Vout	24.0	Output Voltage
5.	base_pn	LM5088	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

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