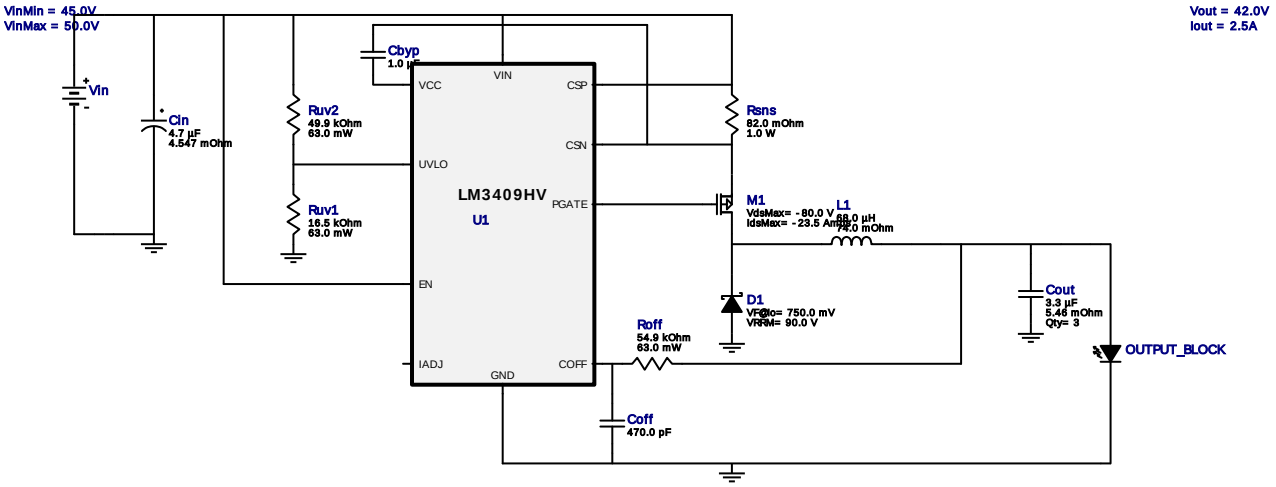
WEBENCH® Design Report

VinMin = 45.0V
VinMax = 50.0V
Vout = 42.0V
Iout = 2.5A

Device = LM3409HVMY/NOPB
Topology = Buck
Created = 7/2/14 6:34:50 PM
BOM Cost = $0.00
Footprint = 585.0mm2
BOM Count = 15
Total Pd = 5.83W

Design : 1195951/247 LM3409HVMY/NOPB
LM3409HVMY/NOPB 45.0V-50.0V to 42.0V @ 2.5A

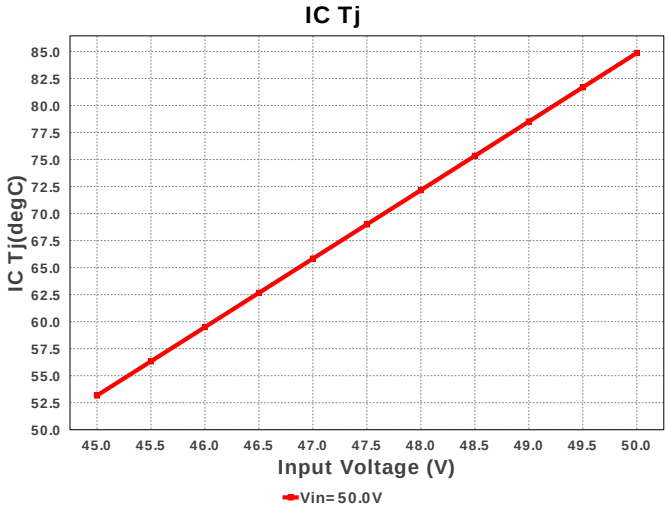


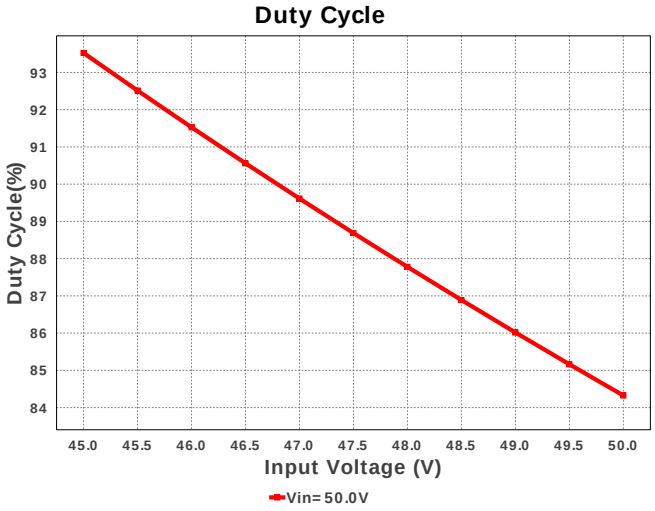
1. Bypass Capacitor Connection : WEBENCH schematic configured for the selected PFET's total gate charge (Qg). If the Qg value is > 30 nC, the Bypass Capacitor(Cbyp or CF) is connected from the VCC pin to CSN pin instead of the typically connected from VCC to Vin when Qg < 30nC.

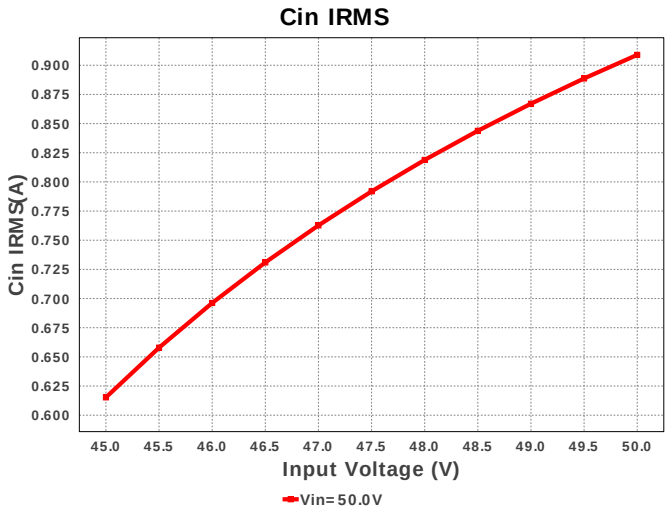
Electrical BOM

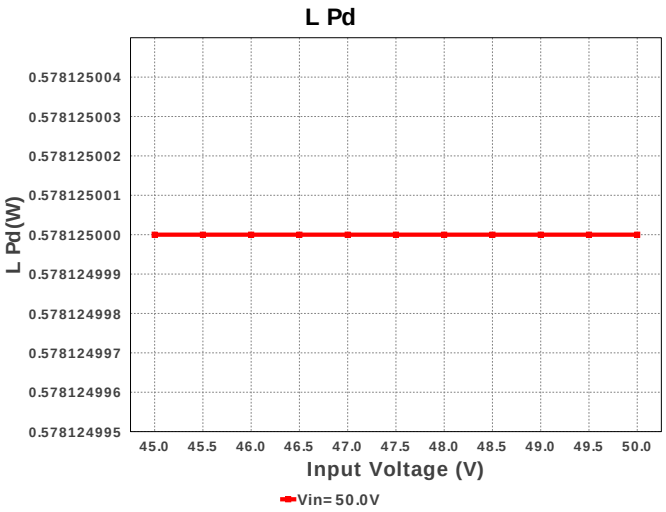
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbyp	MuRata	GRM155R61A105KE15D Series= X5R	Cap= 1.0 µF VDC= 10.0 V IRMS= 0.0 A	1	$0.01	0402 3mm2
2.	Cin	TDK	C3225X7S2A475M Series= 285	Cap= 4.7 µF ESR= 4.547 mOhm VDC= 100.0 V IRMS= 0.0 A	1	$0.42	1210 15mm2
3.	Coff	Yageo America	CC0805KRX7R9BB471 Series= X7R	Cap= 470.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7mm2
4.	Cout	TDK	C3225X7S2A335K200AB Series= X7R	Cap= 3.3 µF ESR= 5.46 mOhm VDC= 100.0 V IRMS= 7.036 A	3	$0.24	1210 15mm2
5.	D1	Vishay-Semiconductor	BYS12-90-E3/TR	VF@Io= 750.0 mV VRRM= 90.0 V	1	$0.08	SMA 37mm2
6.	D_LED	CUSTOM	CUSTOM	LED	1	NA	CUSTOM 0mm2
7.	L1	Coilcraft	MSS1210-683MEB	L= 68.0 µH DCR= 74.0 mOhm	1	$0.81	MSS1210 204mm2
8.	M1	Vishay-Siliconix	SUM110P08-11L	VdsMax= -80.0 V IdsMax= -23.5 Amps	1	$2.27	DDPAK 210mm2

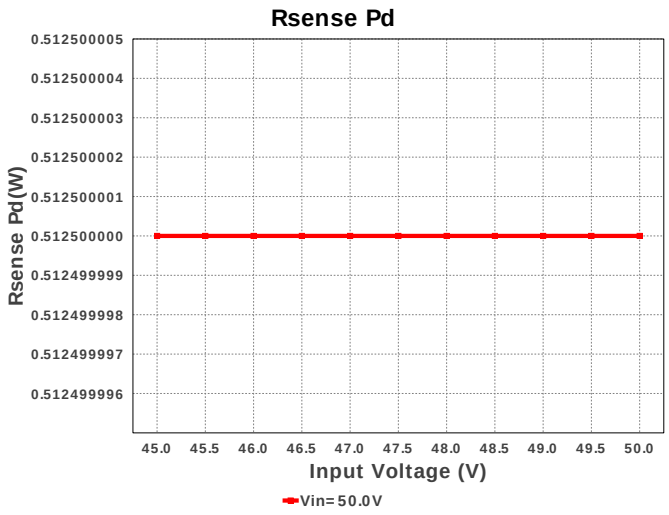
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
9.	Roff	Vishay-Dale	CRCW040254K9FKED Series= CRCW..e3	Res= 54.9 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3mm2
10.	Rsns	Bourns	CRM2010-FZ-R082ELF Series= ?	Res= 82.0 mOhm Power= 1.0 W Tolerance= 1.0%	1	$0.17	2010 32mm2
11.	Ruv1	Vishay-Dale	CRCW040216K5FKED Series= CRCW..e3	Res= 16.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3mm2
12.	Ruv2	Vishay-Dale	CRCW040249K9FKED Series= CRCW..e3	Res= 49.9 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3mm2
13.	U1	Texas Instruments	LM3409HVMY/NOPB	Switcher	1	$0.75	MUC10A 24mm2

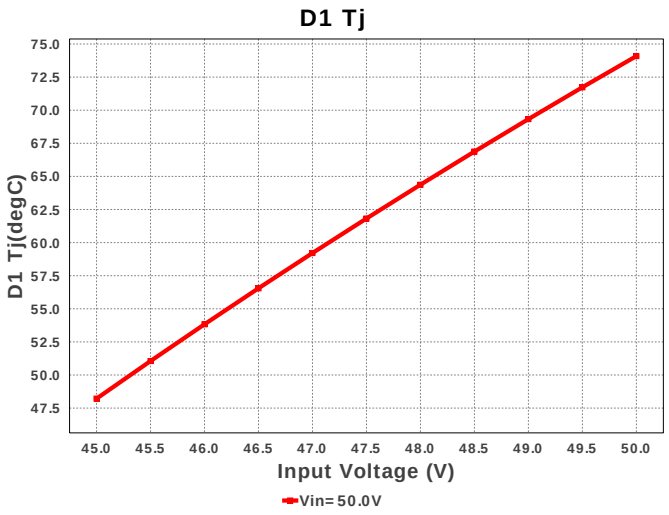


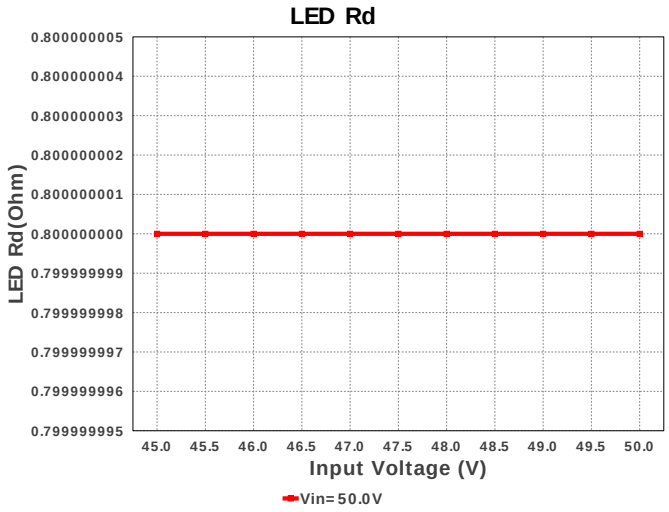


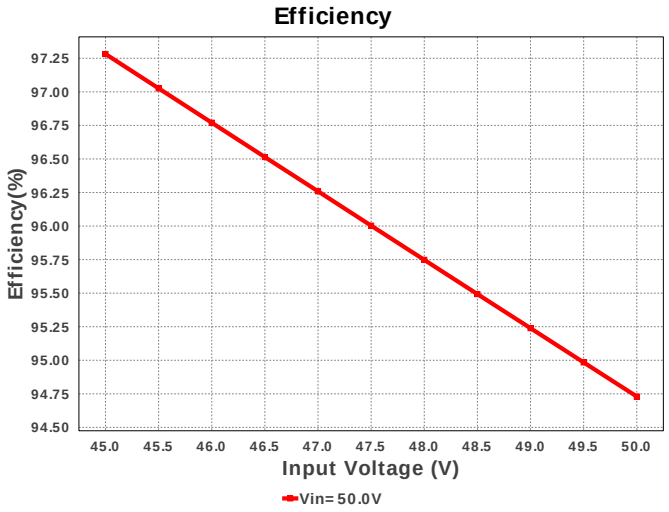


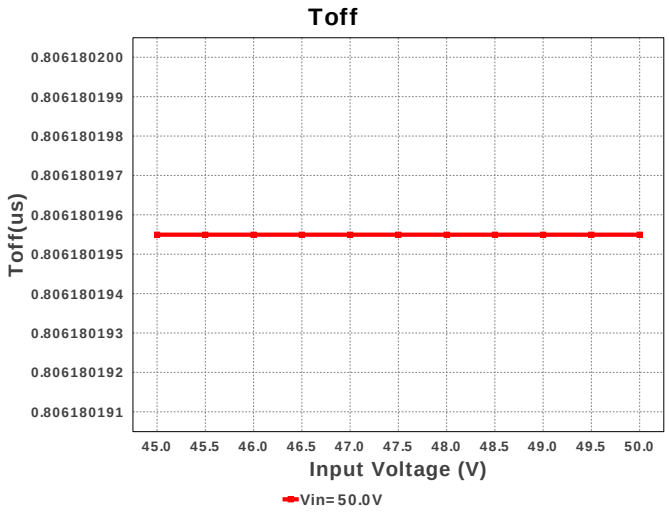


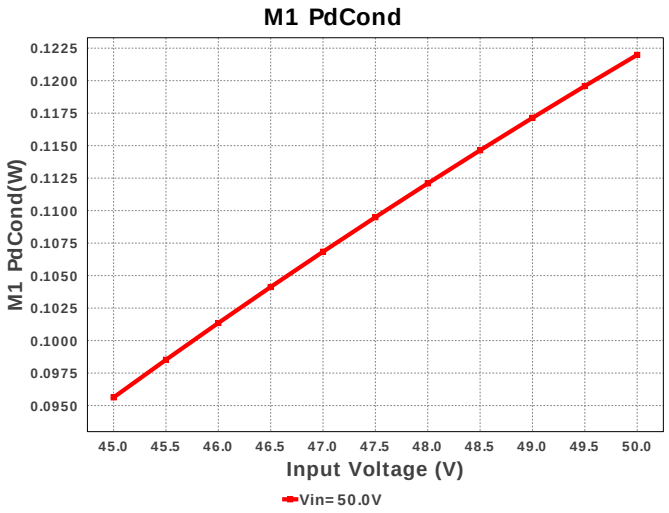


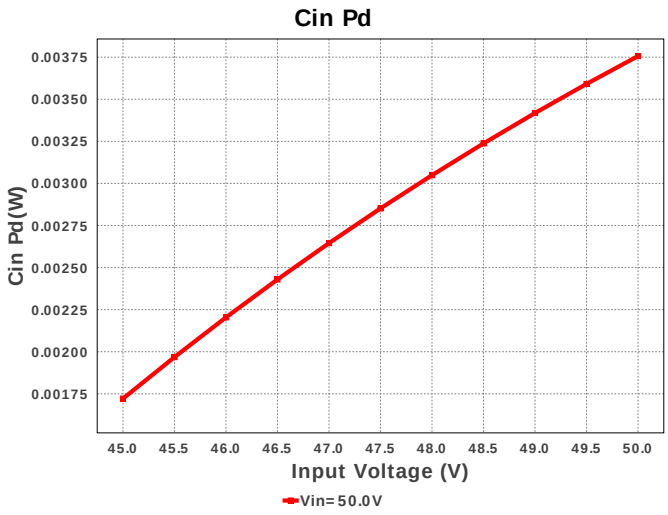


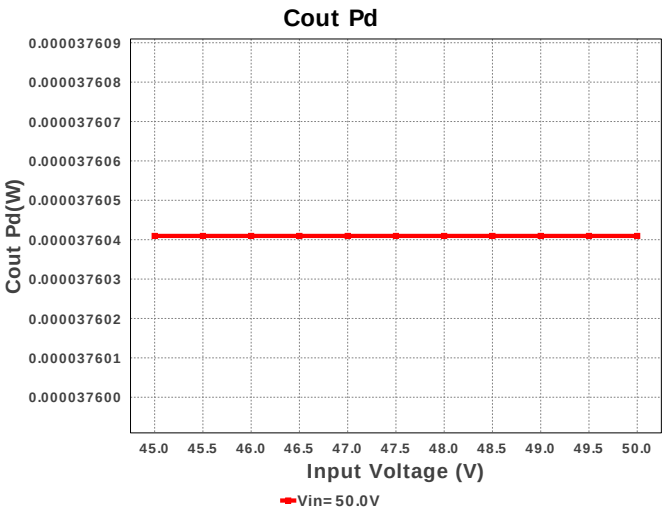


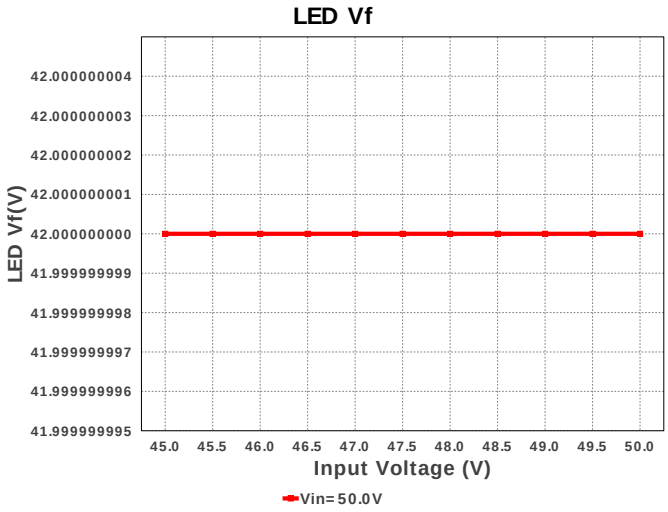


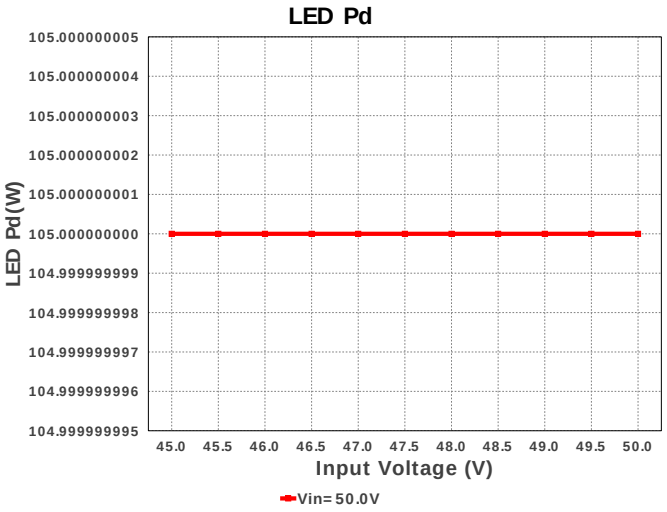


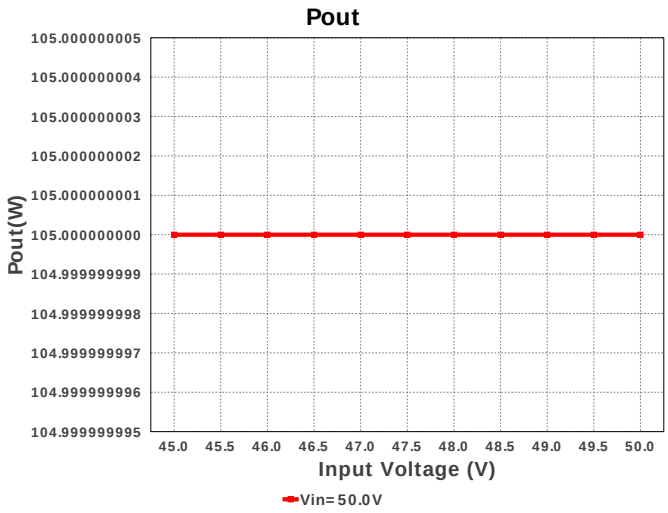


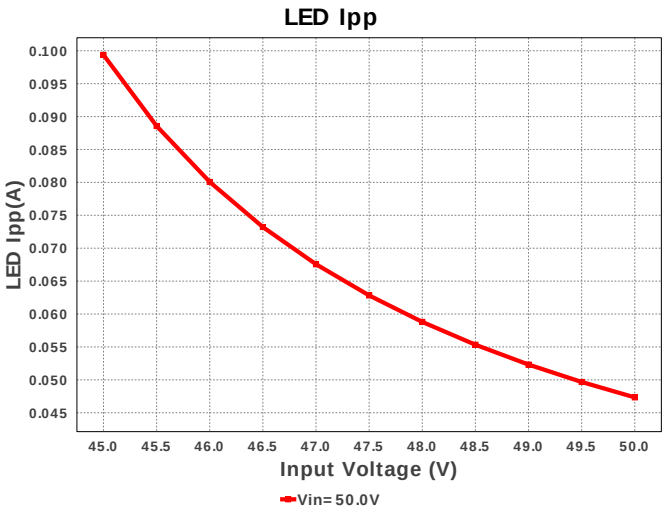


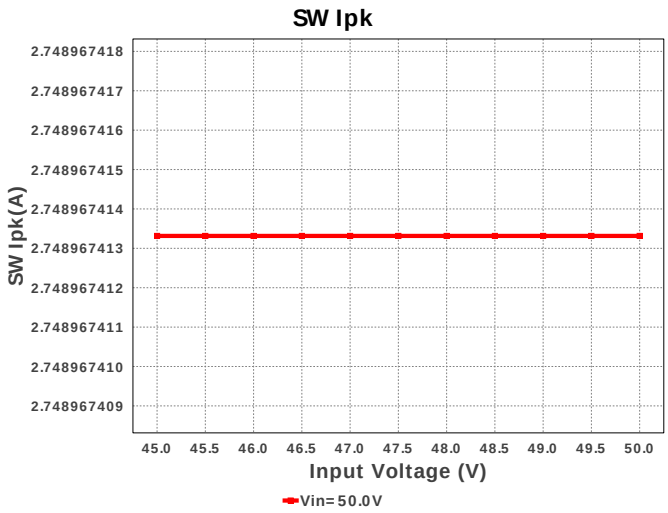


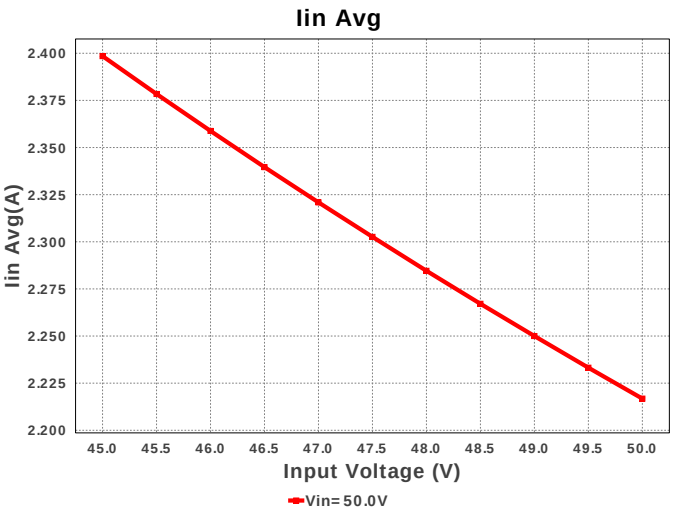


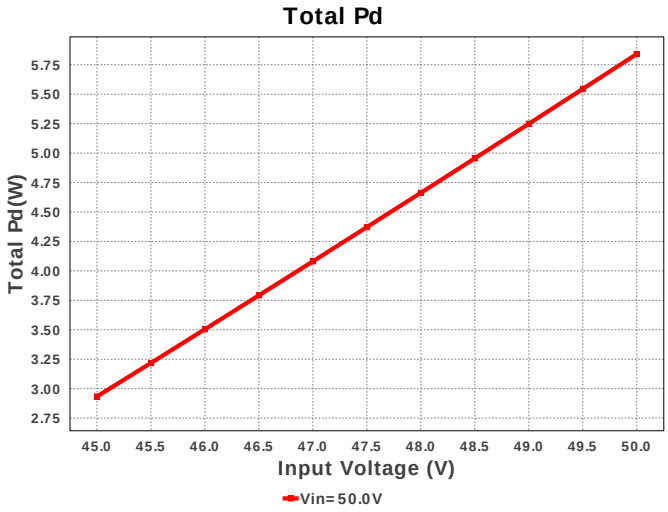


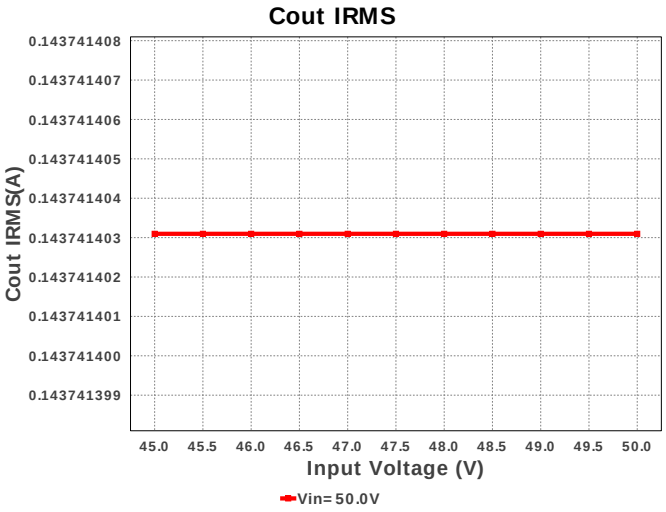


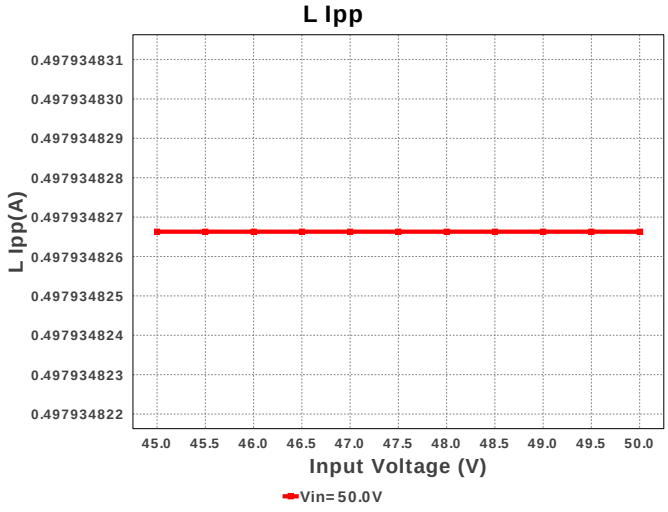


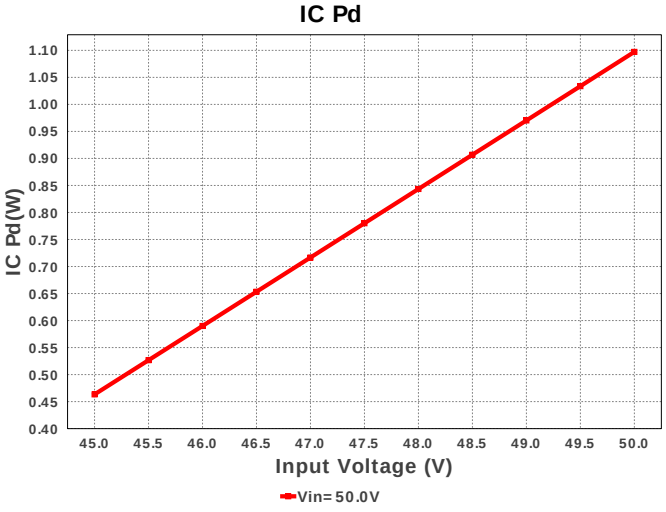


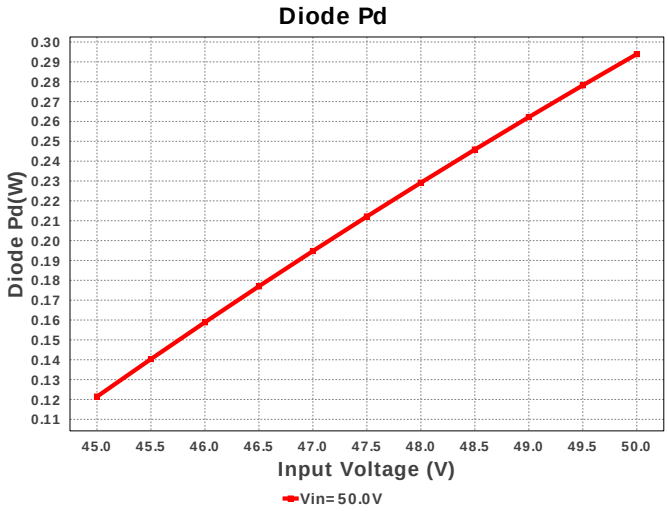


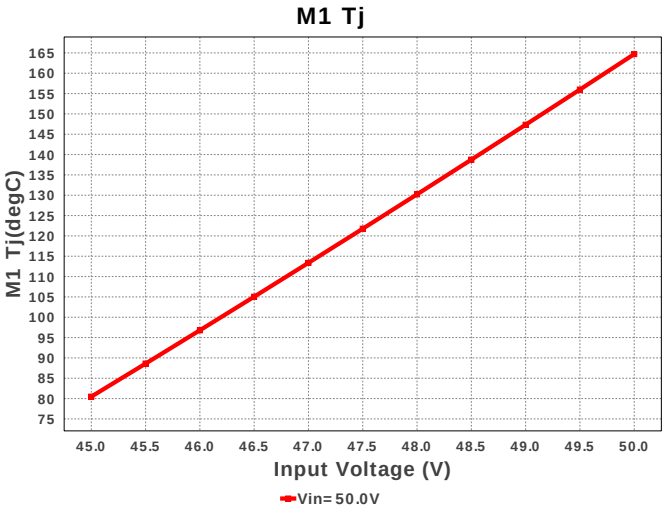


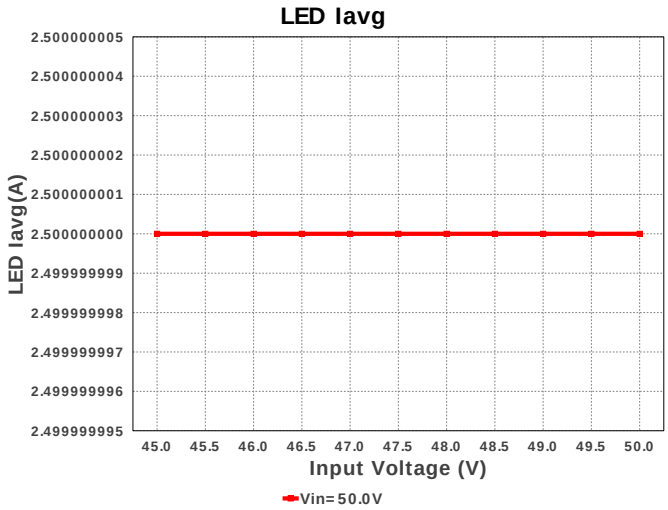


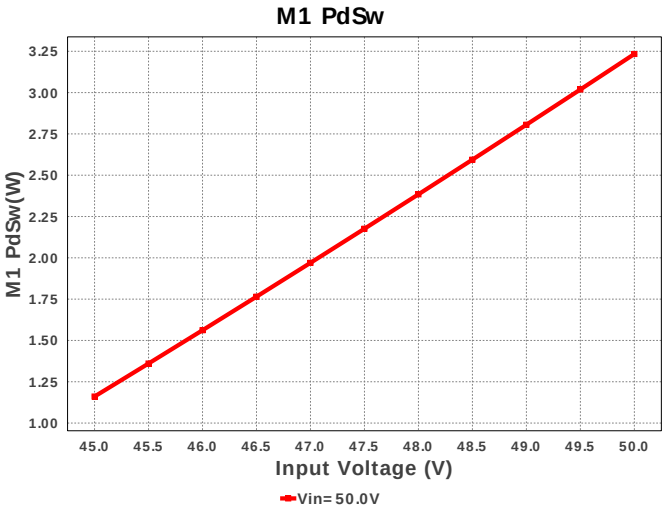


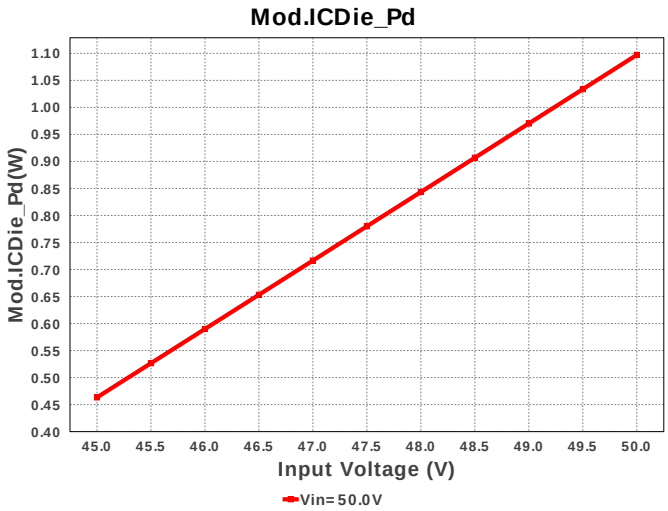












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	908.994 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	143.741 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	2.216 A	Current	Average input current
4.	L Ipp	497.935 mA	Current	Peak-to-peak inductor ripple current
5.	LED Iavg	2.5 A	Current	LED Average Current
6.	LED Ipp	47.446 mA	Current	LED Ripple Current
7.	SW Ipk	2.749 A	Current	Peak switch current
8.	BOM Count	15	General	Total Design BOM count
9.	FootPrint	585.0 mm2	General	Total Foot Print Area of BOM components
10.	Frequency	195.015 kHz	General	Switching frequency
11.	IC Tolerance	54.0 mV	General	IC Feedback Tolerance

#	Name	Value	Category	Description
12.	Pout	105.0 W	General	Total output power
13.	Total BOM	$0.0	General	Total BOM Cost
14.	D1 Tj	74.096 degC	Op_Point	D1 junction temperature
15.	Vout OP	42.0 V	Op_Point	Operational Output Voltage
16.	Duty Cycle	84.322 %	Op_point	Duty cycle
17.	Efficiency	94.743 %	Op_point	Steady state efficiency
18.	IC Tj	84.729 degC	Op_point	IC junction temperature
19.	ICThetaJA	50.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
20.	IOUT_OP	2.5 A	Op_point	Iout operating point
21.	LED Rd	800.0 mOhm	Op_point	LED DynamicResistance
22.	LED Vf	42.0 V	Op_point	Total LED Forward Calculated Voltage
23.	M1 Tj	164.378 degC	Op_point	MOSFET junction temperature
24.	VIN_OP	50.0 V	Op_point	Vin operating point
25.	Cin Pd	3.757 mW	Power	Input capacitor power dissipation
26.	Cout Pd	37.604 µW	Power	Output capacitor power dissipation
27.	Diode Pd	293.971 mW	Power	Diode power dissipation
28.	IC Pd	1.095 W	Power	IC power dissipation
29.	L Pd	578.125 mW	Power	Inductor power dissipation
30.	LED Pd	105.0 W	Power	LED Power Dissipation
31.	M1 PdCond	117.58 mW	Power	M1 MOSFET conduction losses
32.	M1 PdSw	3.226 W	Power	M1 MOSFET switching losses
33.	Rsense Pd	512.5 mW	Power	LED Power Dissipation
34.	Total Pd	5.826 W	Power	Total Power Dissipation
35.	Toff	806.18 mus	Unknown	Fixed Off Time

Design Inputs

#	Name	Value	Description
1.	Iout	2.5 A	Maximum Output Current
2.	Iout1	2.5 Amps	Output Current #1
3.	VinMax	50.0 V	Maximum input voltage
4.	VinMin	45.0 V	Minimum input voltage
5.	Vout	42.0 V	Output Voltage
6.	Vout1	42.0 Volt	Output Voltage #1
7.	application	LED_DRIVER	LED Application
8.	base_pn	LM3409HV	Base Product Number
9.	LED_Architect	N	LED Architect Project
10.	ledparallel	1.0	Number of LED in parallel
11.	ledpartnumber	Custom	LED Part number
12.	ledseries	1.0	Number of LED in series
13.	line_fsw	60.0	AC Line Frequency
14.	source	DC	Input Source Type
15.	Ta	30.0 degC	Ambient temperature

Design Assistance

1. Application Hints Bypass Capacitor Connection WEBENCH schematic configured for the selected PFET's total gate charge (Qg)If the Qg value is > 30 nC, the Bypass Capacitor(Cbyp or CF) is connected from the VCC pin to CSN pin instead of typically connected from VCC to Vin when Qg < 30nC. Please see the datasheet for further design guidance. http://www.ti.com/lit/ds/symlink/LM3409HV.pdf

2. **LM3409HV** Product Folder : http://www.ti.com/product/lm3409hv : contains the data sheet and other resources.