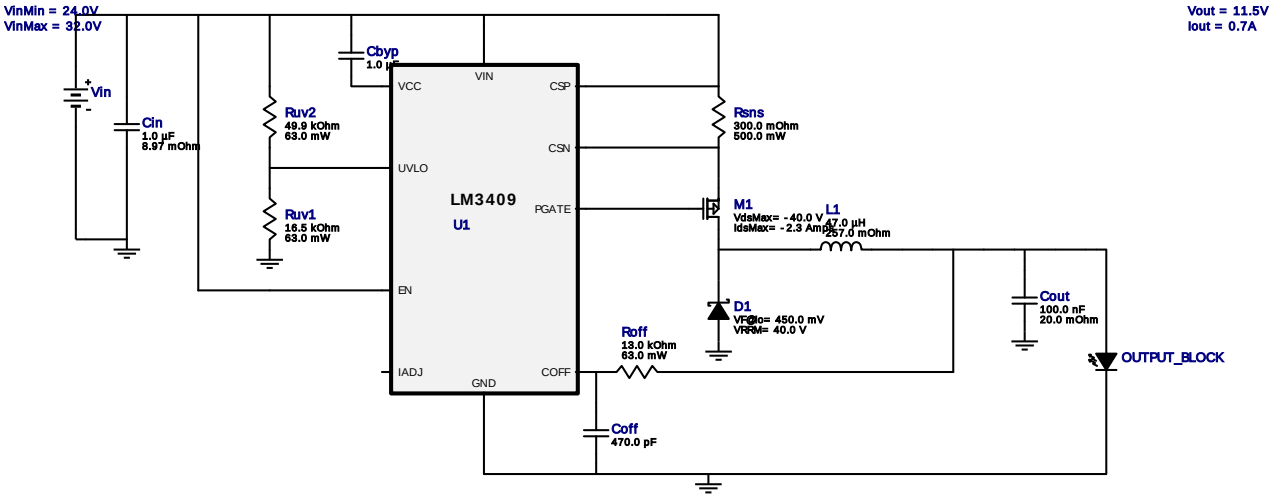
WEBENCH® Design Report

VinMin = 24.0V
VinMax = 32.0V
Vout = 11.5V
Iout = 0.7A

Device = LM3409MY/NOPB
Topology = Buck
Created = 7/15/15 12:22:26 AM
BOM Cost = $7.90
Footprint = 167.0 mm²
BOM Count = 13
Total Pd = 1.08W

Design : 4427995/2 LM3409MY/NOPB
LM3409MY/NOPB 24.0V-32.0V to 11.50V @ 0.7A

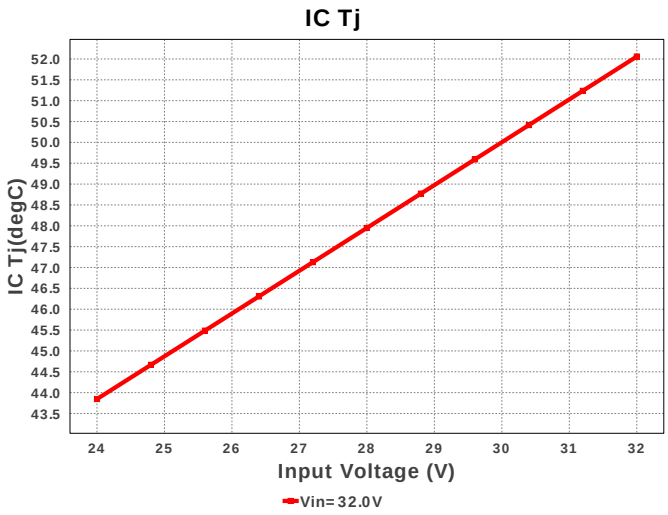


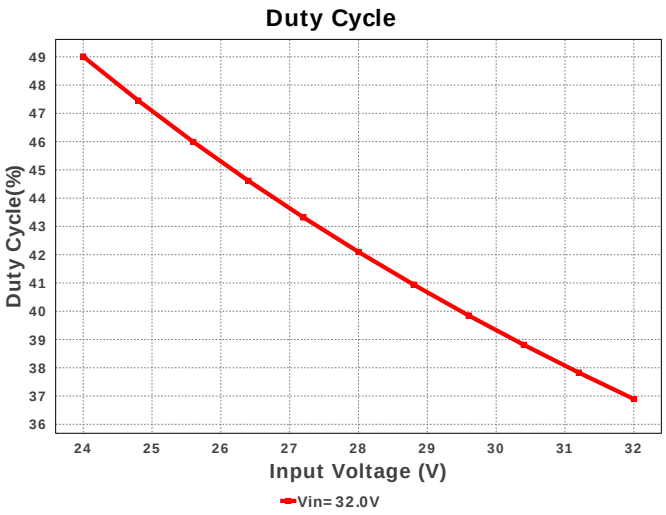
1. Bypass Capacitor Connection : WEBENCH schematic configured for the selected PFET's total gate charge (Qg). If the Qg value is > 30 nC, the Bypass Capacitor(Cbyp or CF) is connected from the VCC pin to CSN pin instead of the typically connected from VCC to Vin when Qg < 30nC.

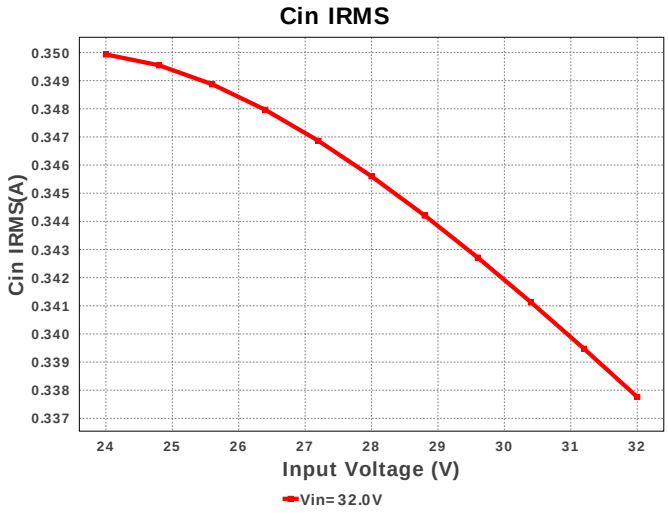
Electrical BOM

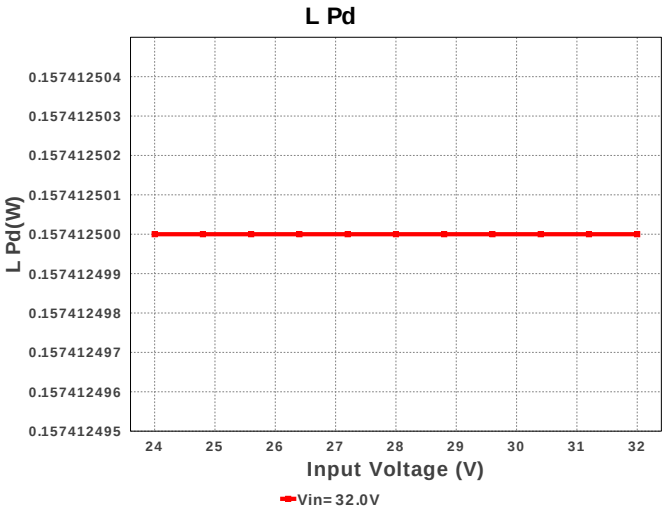
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbyp	MuRata	GRM21BR61C105KA01L Series= X5R	Cap= 1.0 uF VDC= 16.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
2.	Cin	TDK	C3216X5R1H105K Series= X5R	Cap= 1.0 uF ESR= 8.97 mOhm VDC= 50.0 V IRMS= 0.0 A	1	$0.04	1206 11 mm²
3.	Coff	Yageo America	CC0805KRX7R9BB471 Series= X7R	Cap= 470.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
4.	Cout	MuRata	GCM188R71H104KA57B Series= X7R	Cap= 100.0 nF ESR= 20.0 mOhm VDC= 50.0 V IRMS= 1.84 A	1	$0.02	0603 5 mm²
5.	D1	Diodes Inc.	1N5819HW-7-F	VF@Io= 450.0 mV VRRM= 40.0 V	1	$0.08	SOD-123 13 mm²
6.	D_LED	Cree	XHP50A-00-0000-0D00J40E2	LED	1	$6.54	xlampxhp 0 mm²
7.	L1	Bourns	SRN6045-470M	L= 47.0 µH DCR= 257.0 mOhm	1	$0.16	SRN6045 64 mm²
8.	M1	Vishay-Siliconix	SI2319DS-T1-E3	VdsMax= -40.0 V IdsMax= -2.3 Amps	1	$0.28	SOT-23 14 mm²
9.	Roff	Vishay-Dale	CRCW040213K0FKED Series= CRCW..e3	Res= 13.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²

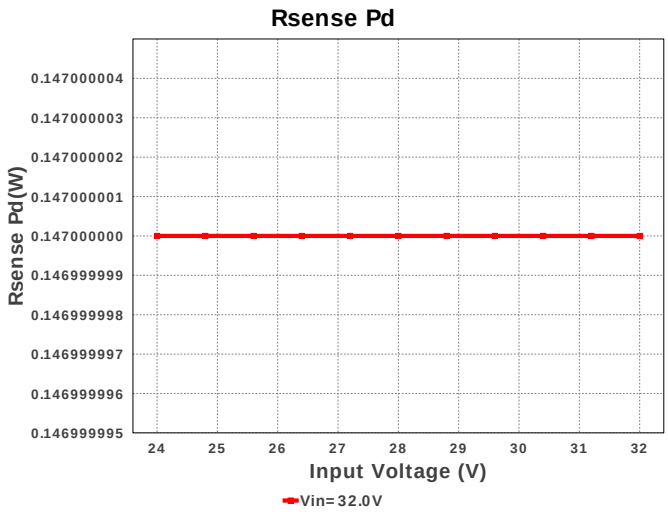
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	Rsns	Rohm	MCR25JZHFLR300 Series= MCR25	Res= 300.0 mOhm Power= 500.0 mW Tolerance= 1.0%	1	$0.03	1210 15 mm^2
11.	Ruv1	Vishay-Dale	CRCW040216K5FKED Series= CRCW..e3	Res= 16.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
12.	Ruv2	Vishay-Dale	CRCW040249K9FKED Series= CRCW..e3	Res= 49.9 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
13.	U1	Texas Instruments	LM3409MY/NOPB	Switcher	1	$0.70	MUC10A 24 mm^2

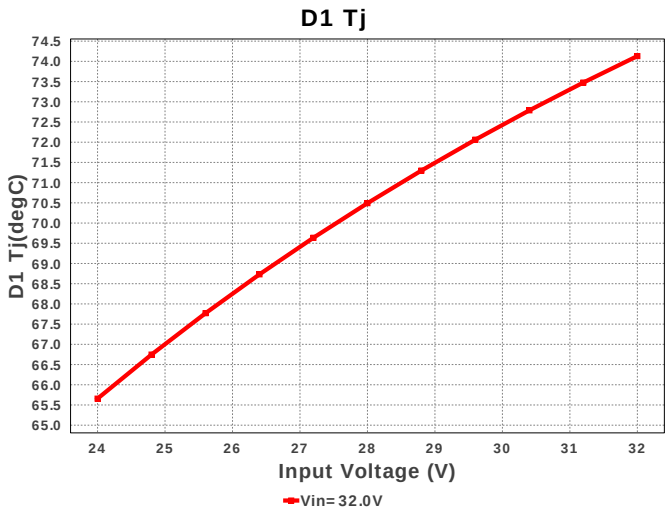


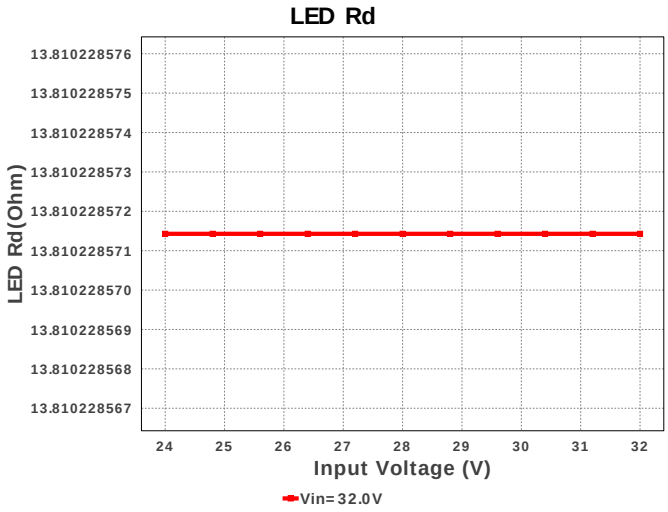


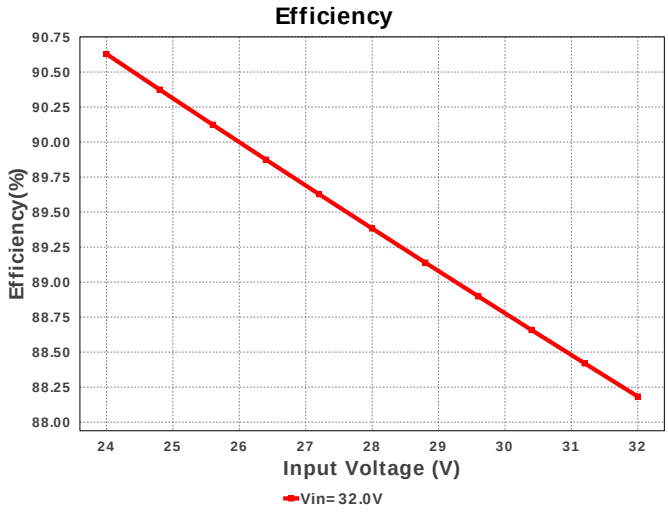


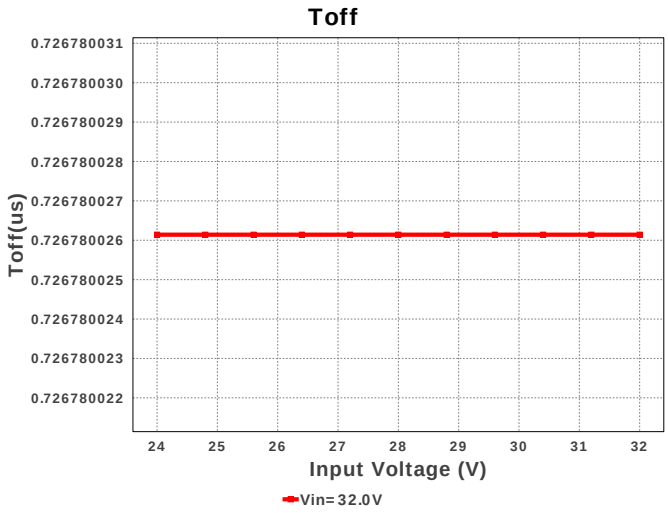


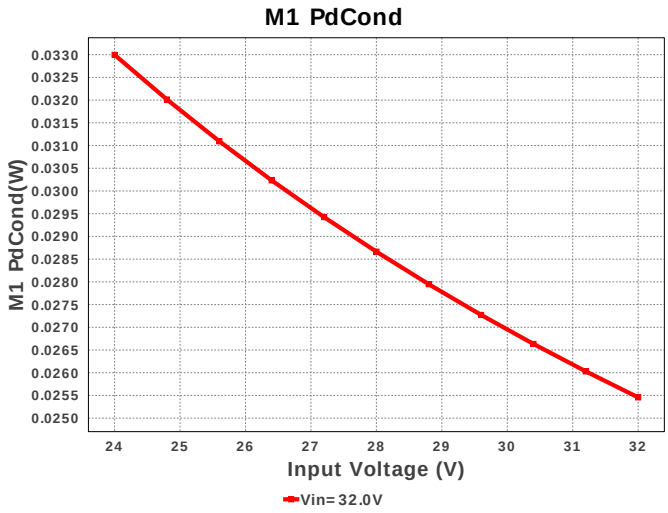


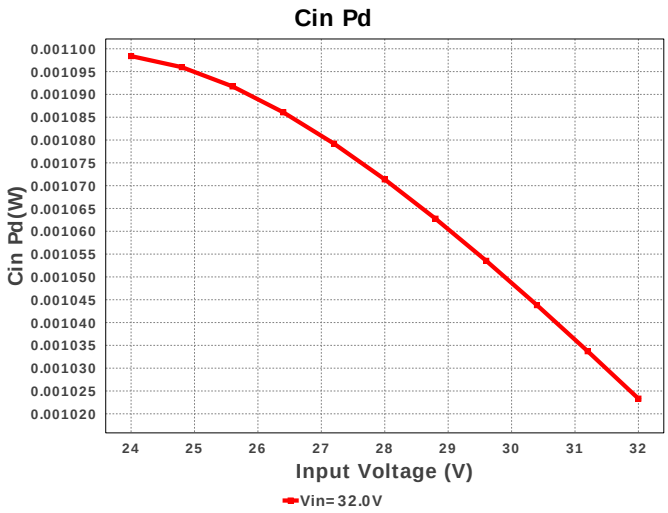


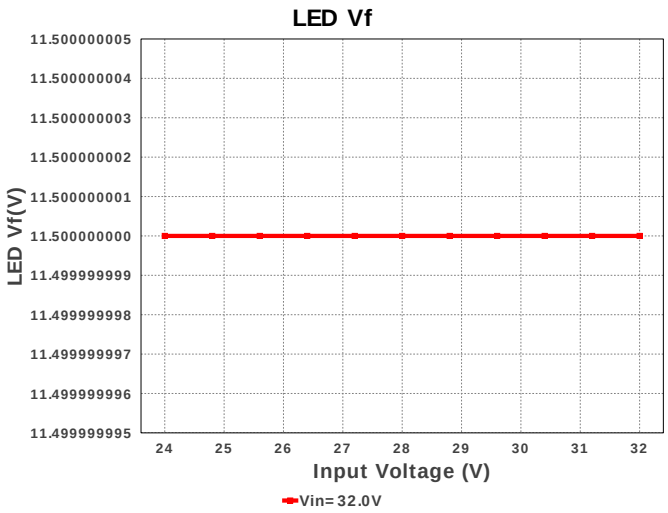


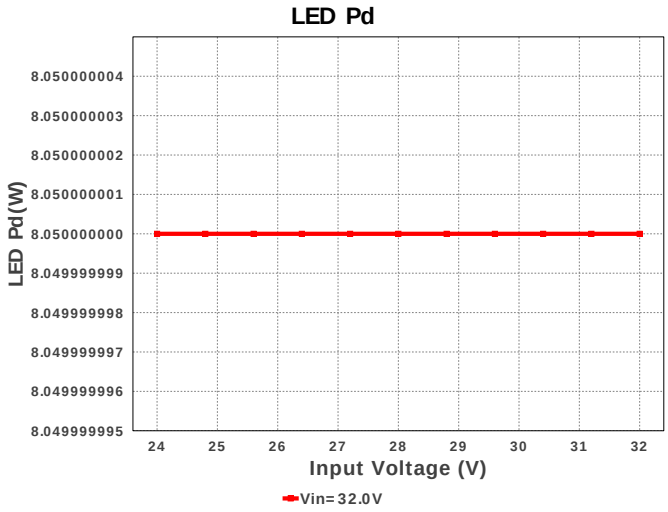


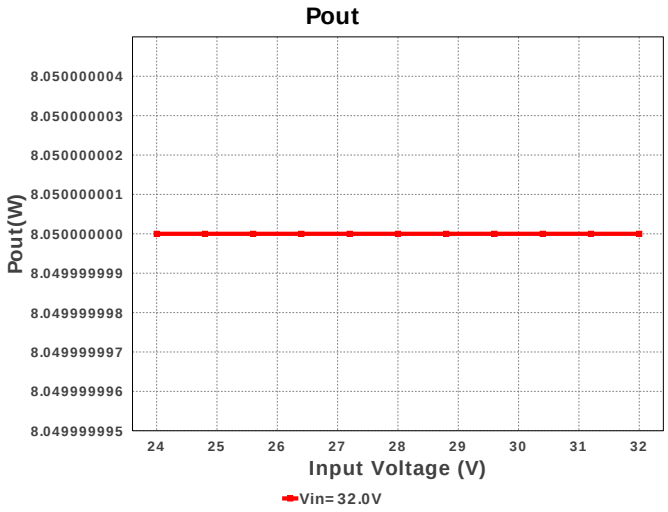


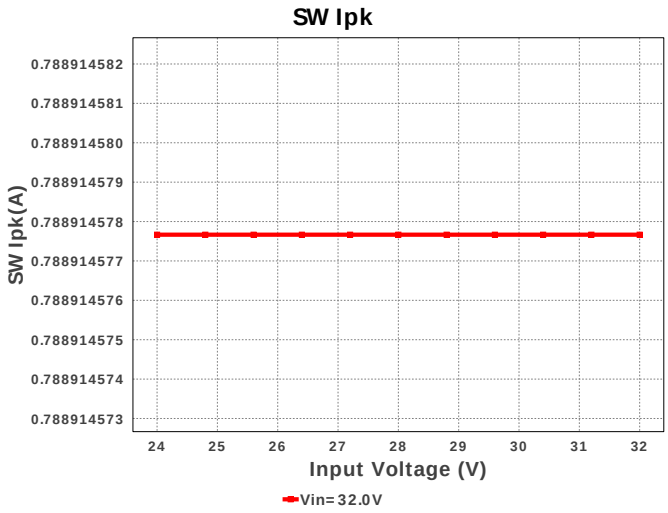


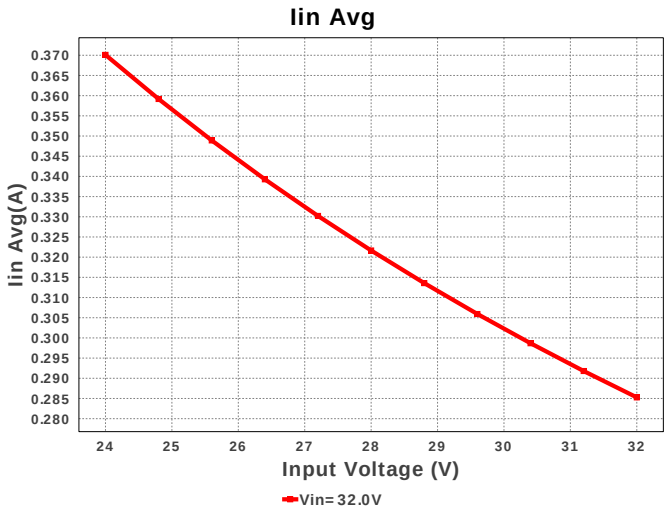


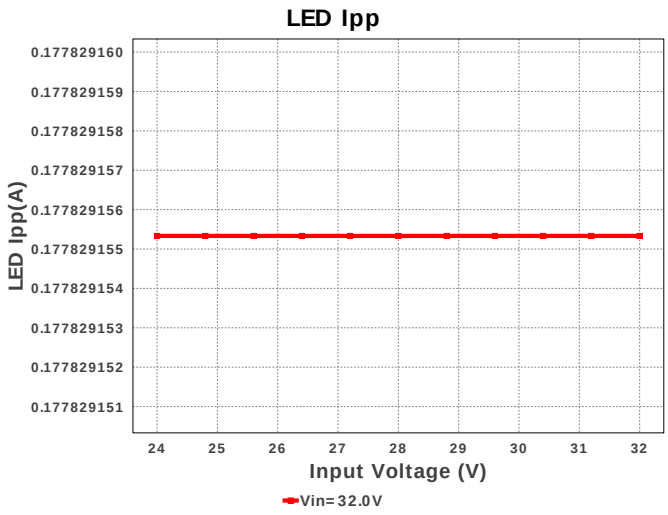


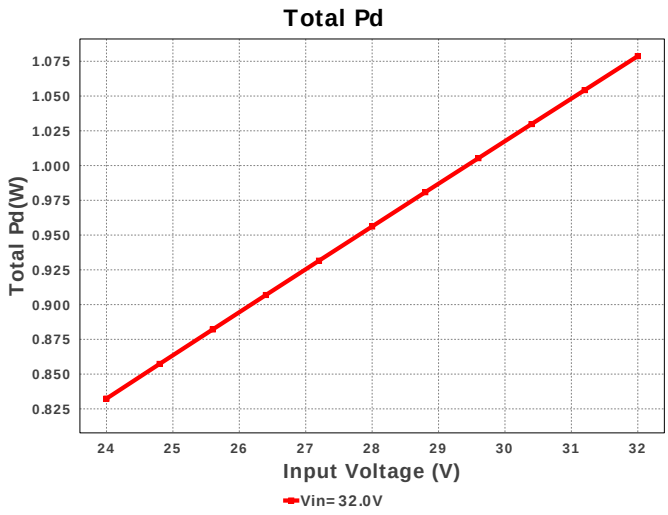


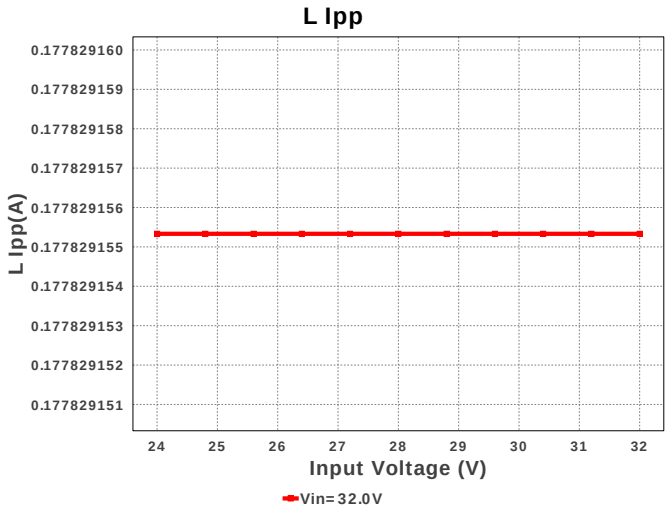


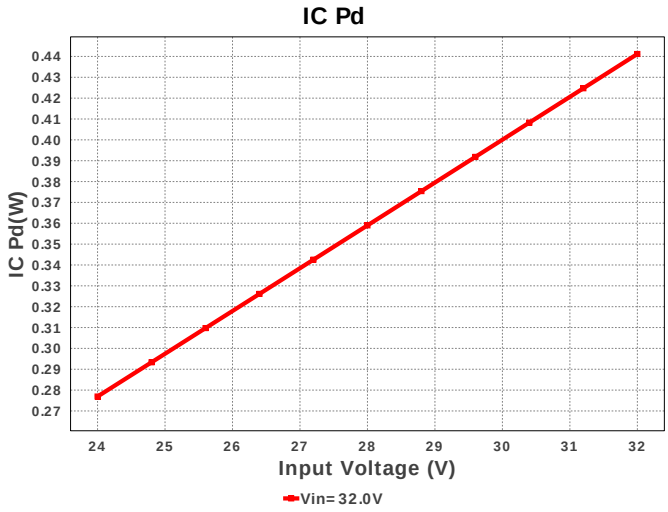


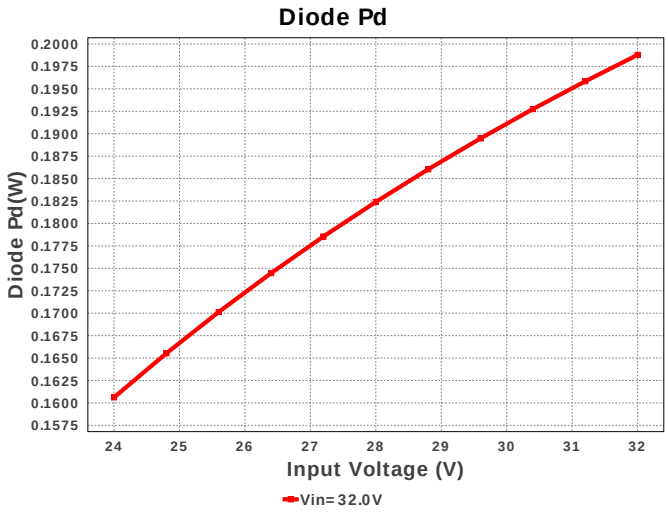


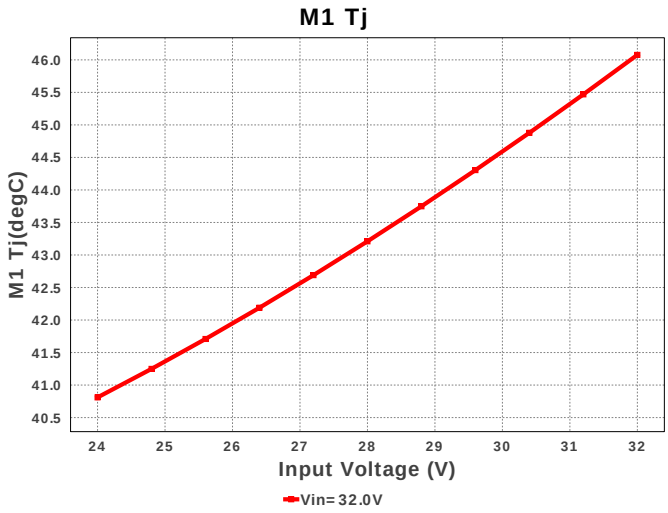


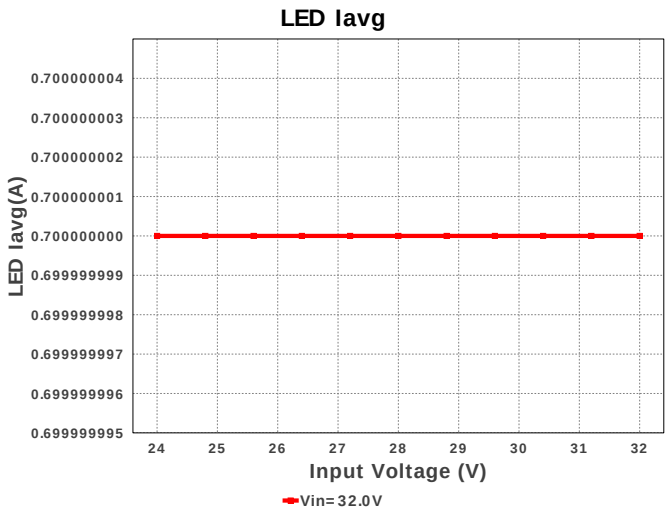


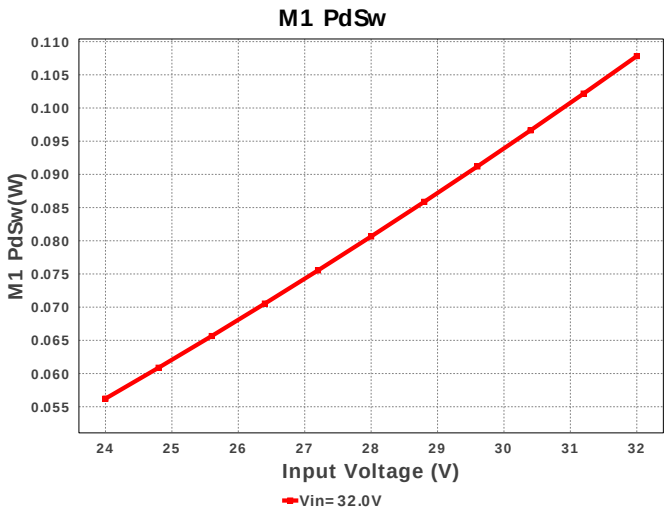












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	337.762 mA	Current	Input capacitor RMS ripple current
2.	Iin Avg	285.27 mA	Current	Average input current
3.	L Ipp	177.83 mA	Current	Peak-to-peak inductor ripple current
4.	LED Iavg	700.0 mA	Current	LED Average Current
5.	LED Ipp	21.028 mA	Current	LED Ripple Current
6.	SW Ipk	788.915 mA	Current	Peak switch current
7.	BOM Count	13	General	Total Design BOM count
8.	FootPrint	167.0 mm^2	General	Total Foot Print Area of BOM components
9.	Frequency	868.722 kHz	General	Switching frequency
10.	IC Tolerance	54.0 mV	General	IC Feedback Tolerance
11.	Pout	8.05 W	General	Total output power
12.	Total BOM	$7.9	General	Total BOM Cost
13.	D1 Tj	74.13 degC	Op_Point	D1 junction temperature
14.	Vout OP	11.5 V	Op_Point	Operational Output Voltage
15.	Duty Cycle	36.894 %	Op_point	Duty cycle
16.	Efficiency	88.185 %	Op_point	Steady state efficiency
17.	IC Tj	52.048 degC	Op_point	IC junction temperature
18.	ICThetaJA	50.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
19.	IOUT_OP	700.0 mA	Op_point	Iout operating point
20.	LED Rd	13.81 Ohm	Op_point	LED DynamicResistance
21.	LED Vf	11.5 V	Op_point	Total LED Forward Calculated Voltage
22.	M1 Tj	46.076 degC	Op_point	MOSFET junction temperature
23.	VIN_OP	32.0 V	Op_point	Vin operating point
24.	Cin Pd	1.023 mW	Power	Input capacitor power dissipation
25.	Diode Pd	198.784 mW	Power	Diode power dissipation
26.	IC Pd	440.956 mW	Power	IC power dissipation
27.	L Pd	157.412 mW	Power	Inductor power dissipation
28.	LED Pd	8.05 W	Power	LED Power Dissipation
29.	M1 PdCond	25.469 mW	Power	M1 MOSFET conduction losses
30.	M1 PdSw	107.814 mW	Power	M1 MOSFET switching losses
31.	Rsense Pd	147.0 mW	Power	LED Power Dissipation
32.	Total Pd	1.079 W	Power	Total Power Dissipation
33.	Toff	726.78 mus	Unknown	Fixed Off Time

Design Inputs

#	Name	Value	Description
1.	Iout	700.0 m	Maximum Output Current
2.	Iout1	700.0 m	Output Current #1
3.	VinMax	32.0	Maximum input voltage
4.	VinMin	24.0	Minimum input voltage
5.	Vout	11.5	Output Voltage
6.	Vout1	11.5	Output Voltage #1
7.	application	LED_DRIVER	LED Application
8.	base_pn	LM3409	Base Product Number
9.	LED_Architect	N	LED Architect Project
10.	ledparallel	1.0	Number of LED in parallel
11.	ledpartnumber	XHP50A-00-0000-0D00140E2	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	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. **LM3409** Product Folder : http://www.ti.com/product/LM3409 : contains the data sheet and other resources.