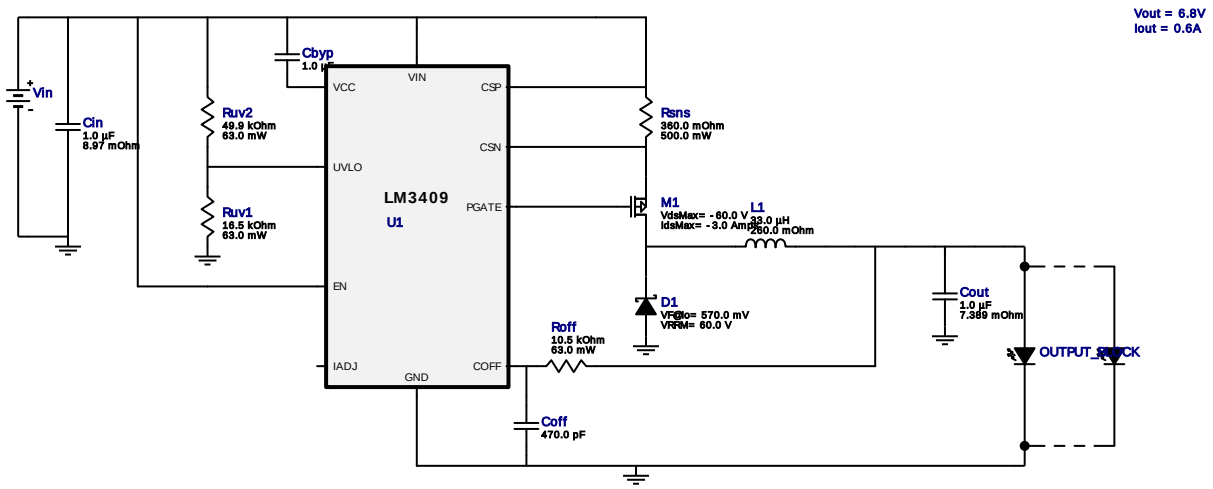
WEBENCH® Design Report

VinMin = 24.0V
VinMax = 32.0V
Vout = 6.8V
Iout = 0.6A

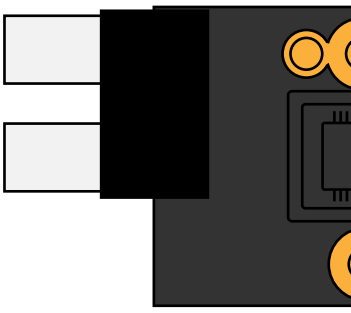
Device = LM3409MY/NOPB
Topology = Buck
Created = 9/11/16 7:45:03 AM
BOM Cost = $1.19
BOM Count = 18
Total Pd = 1.03W

Design : 4790845/3 LM3409MY/NOPB
LM3409MY/NOPB 24.0V-32.0V to 6.81V @ 0.6A



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	Kemet	C0603C105K8PACTU Series= X5R	Cap= 1.0 uF VDC= 10.0 V IRMS= 0.0 A	1	$0.01	0603 5 mm²
2.	Cin	TDK	C3216X5R1H105K Series= X5R	Cap= 1.0 uF ESR= 8.97 mOhm VDC= 50.0 V IRMS= 0.0 A	1	$0.02	1206 11 mm²
3.	Coff	MuRata	GRM033R71C471KA01D Series= X7R	Cap= 470.0 pF VDC= 16.0 V IRMS= 0.0 A	1	$0.01	0201 2 mm²
4.	Cout	MuRata	GRM31MR71H105KA88L Series= X7R	Cap= 1.0 uF ESR= 7.389 mOhm VDC= 50.0 V IRMS= 979.22 mA	1	$0.03	1206 11 mm²
5.	D1	NXP Semiconductor	PMEG6010CEH,115	VF@Io= 570.0 mV VRRM= 60.0 V	1	$0.04	SOD-123F 12 mm²
6.	D_LED	Luminus Devices	CBT120RC11BNR5	LED	6	NA	 cbt120 1320 mm²

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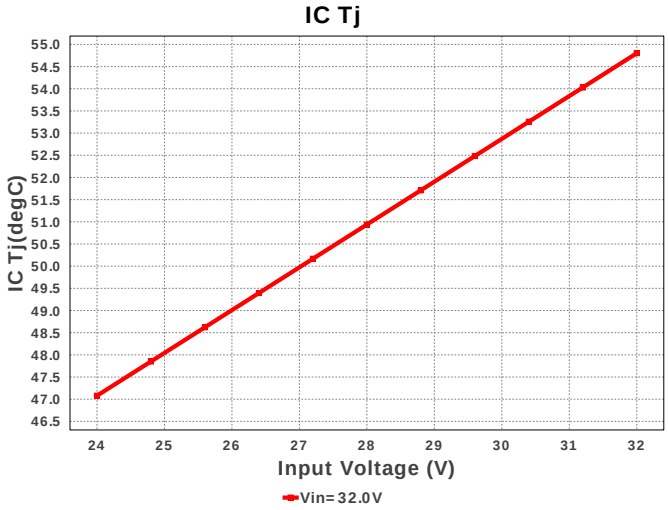
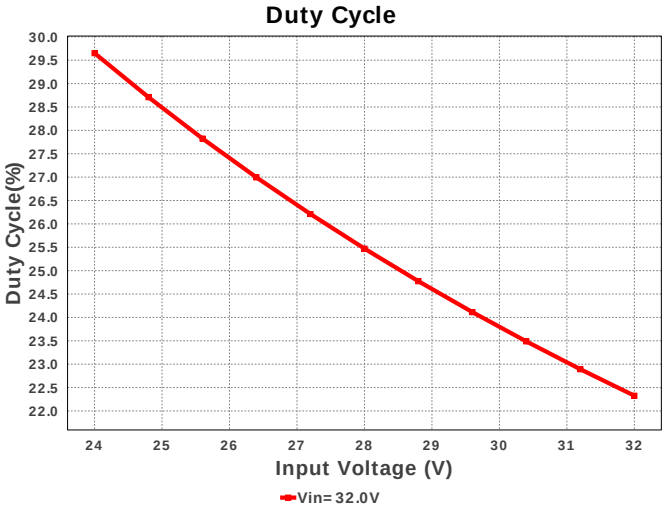
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
7.	L1	NIC Components	NPI54C330KTRF	L= 33.0 µH DCR= 260.0 mOhm	1	$0.09	IND_NPI54C 61 mm²
8.	M1	Fairchild Semiconductor	FDC5614P	VdsMax= -60.0 V IdsMax= -3.0 Amps	1	$0.23	SOT-23-6 15 mm²
9.	Roff	Vishay-Dale	CRCW040210K5FKED Series= CRCW..e3	Res= 10.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
10.	Rsns	Rohm	MCR25JZHFLR360 Series= MCR25	Res= 360.0 mOhm Power= 500.0 mW Tolerance= 1.0%	1	$0.03	1210 15 mm²
11.	Ruv1	Vishay-Dale	CRCW040216K5FKED Series= CRCW..e3	Res= 16.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
12.	Ruv2	Vishay-Dale	CRCW040249K9FKED Series= CRCW..e3	Res= 49.9 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
13.	U1	Texas Instruments	LM3409MY/NOPB	Switcher	1	$0.70	MUC10A 24 mm²





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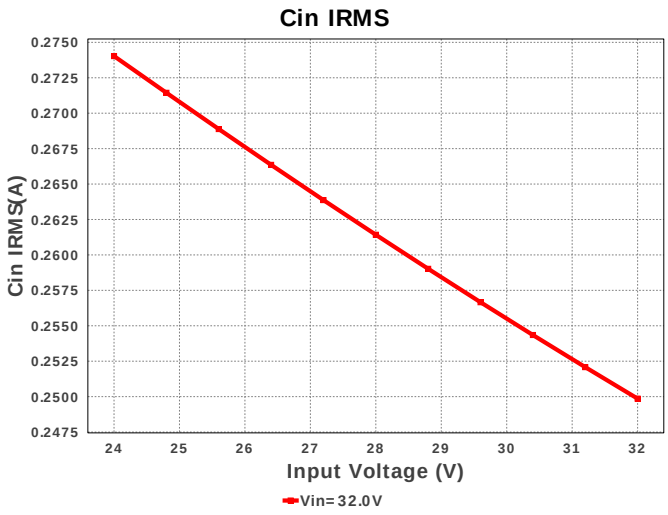

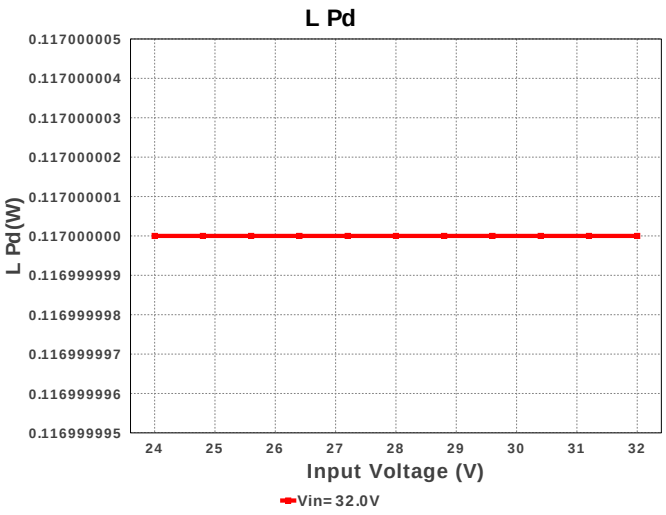

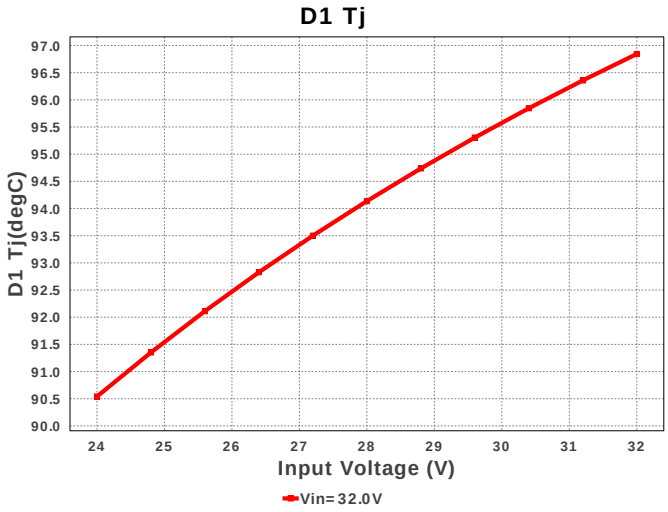

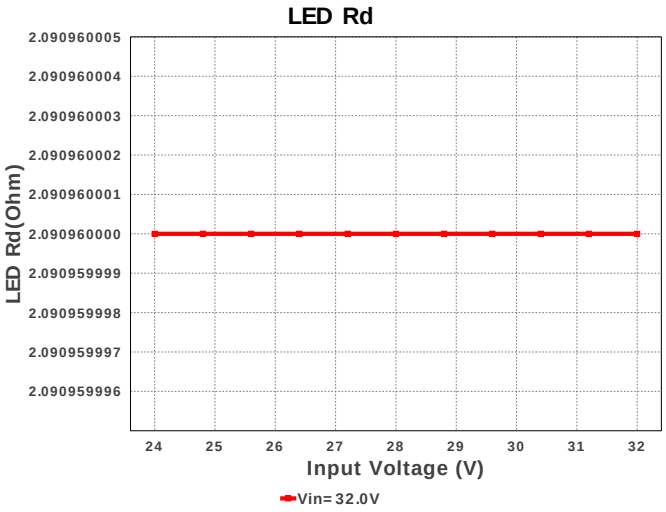

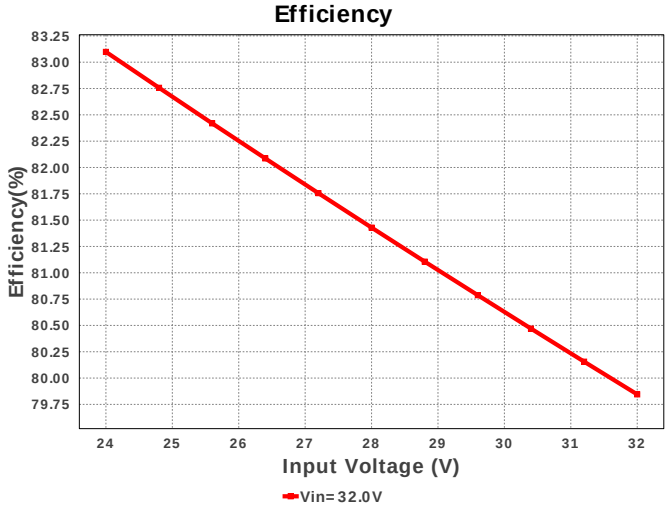

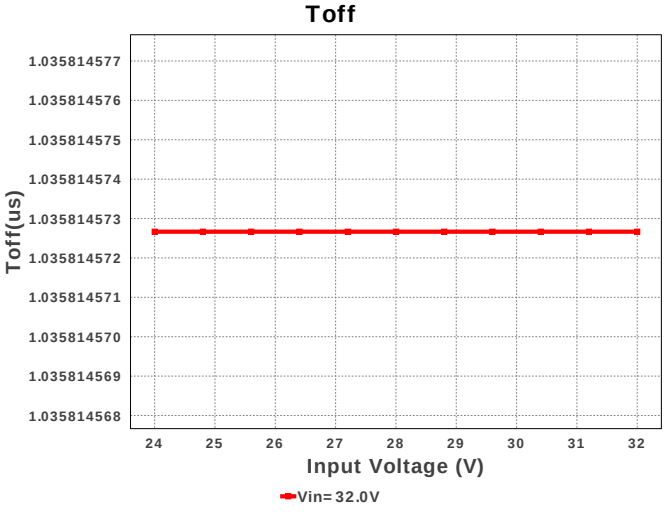

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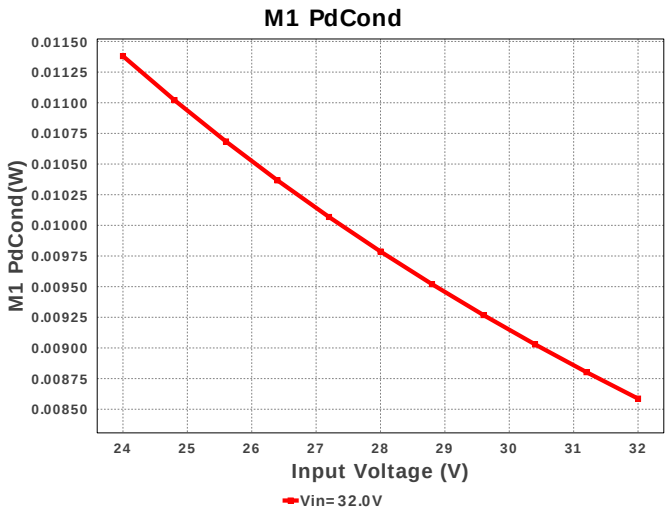

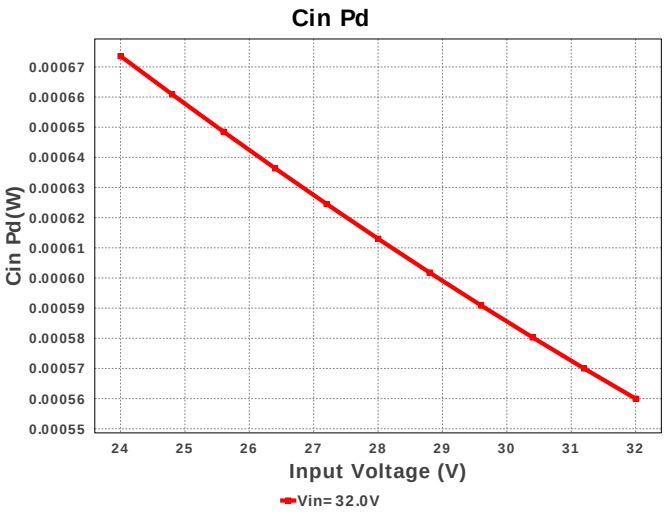

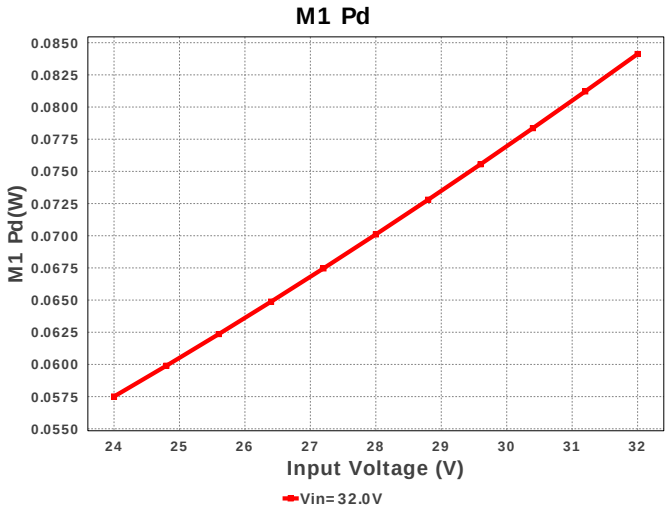

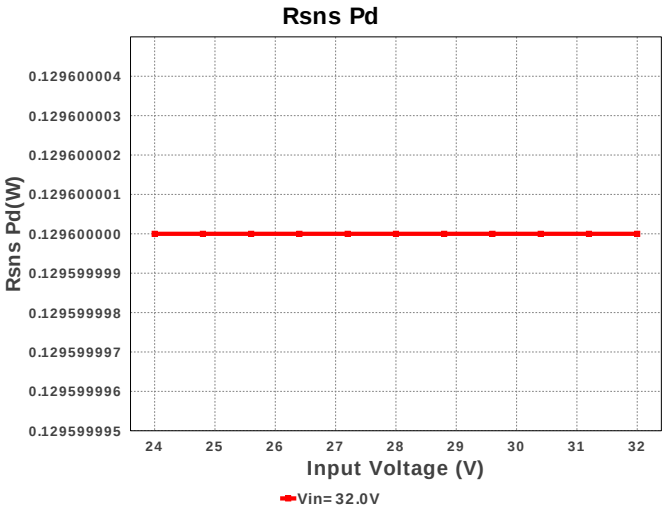

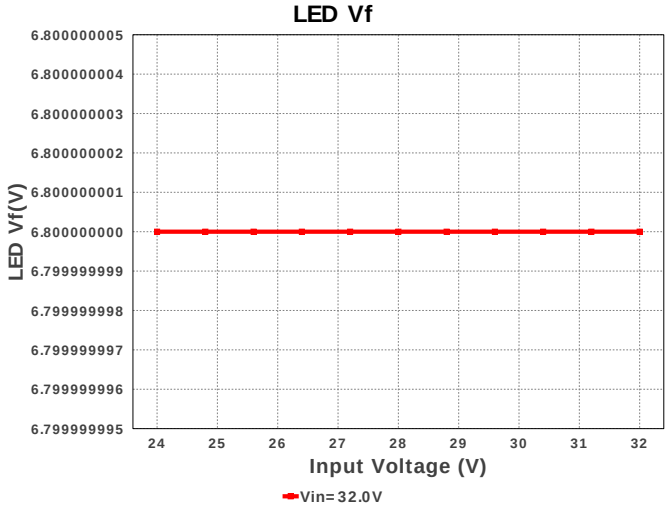

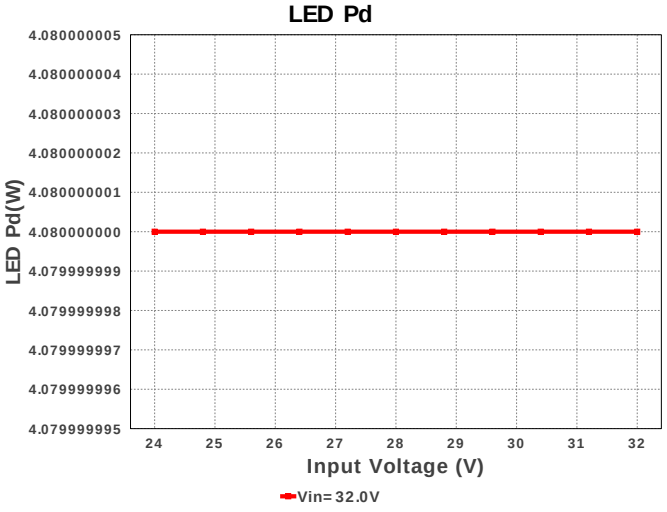

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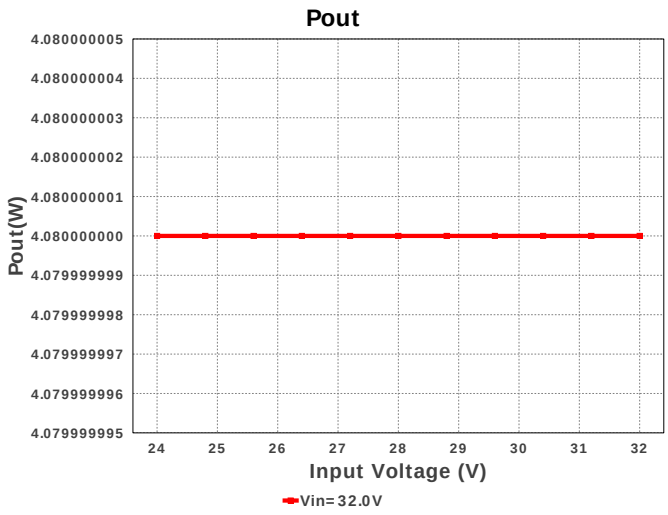

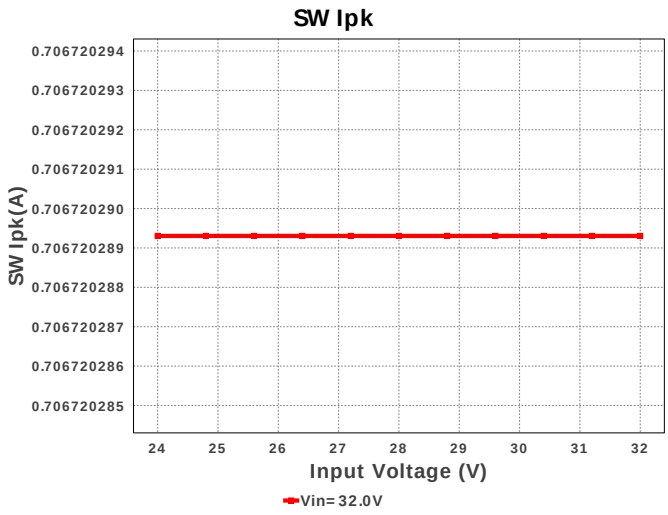

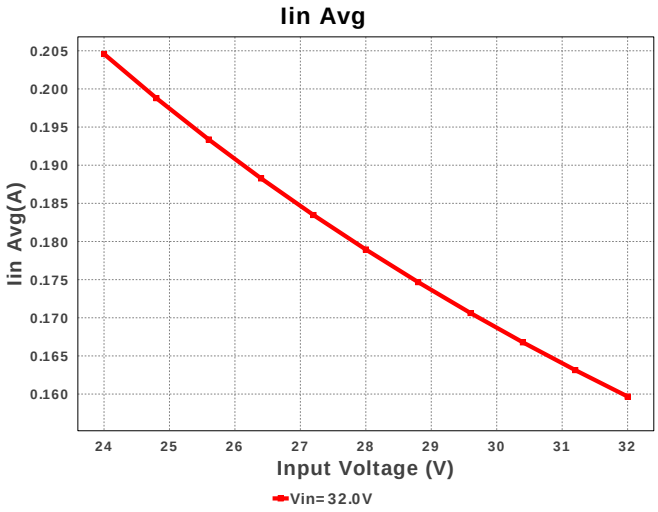

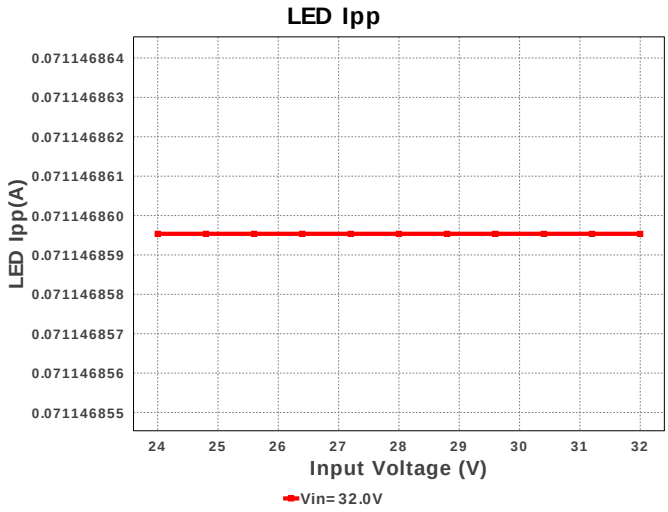

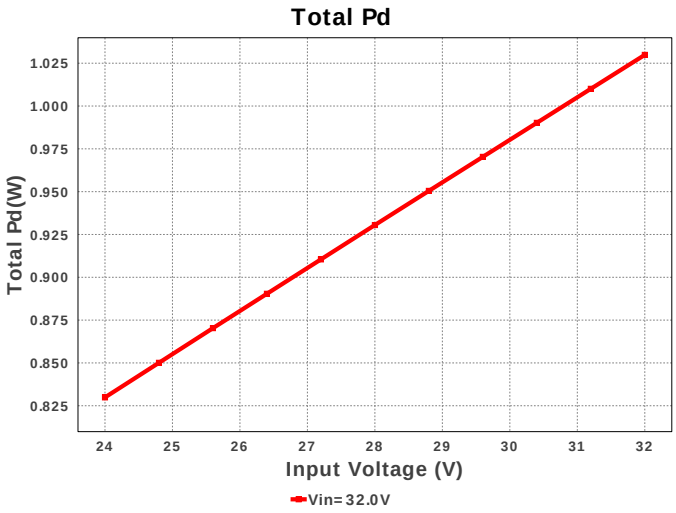

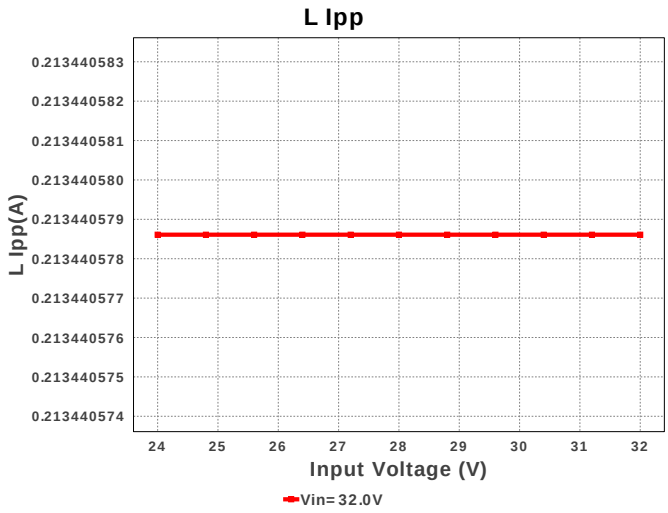

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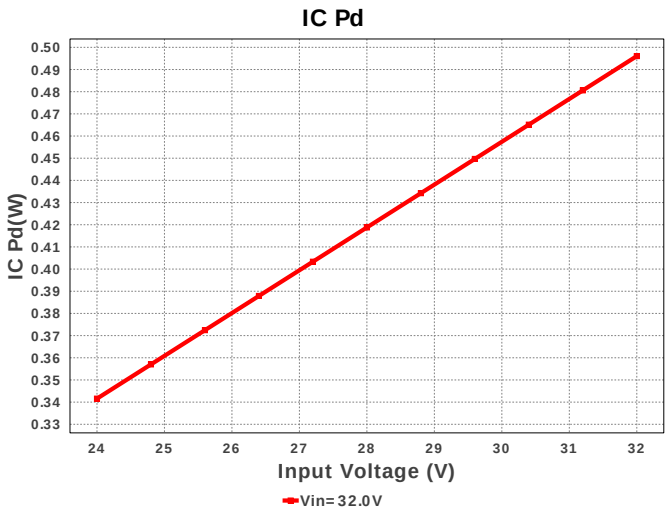

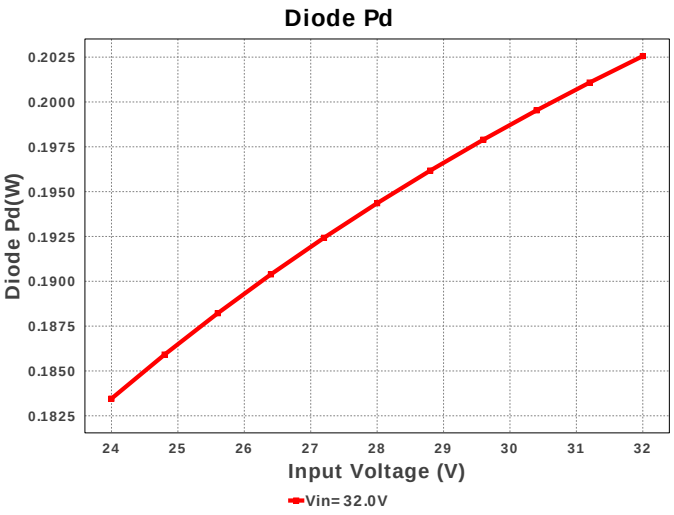

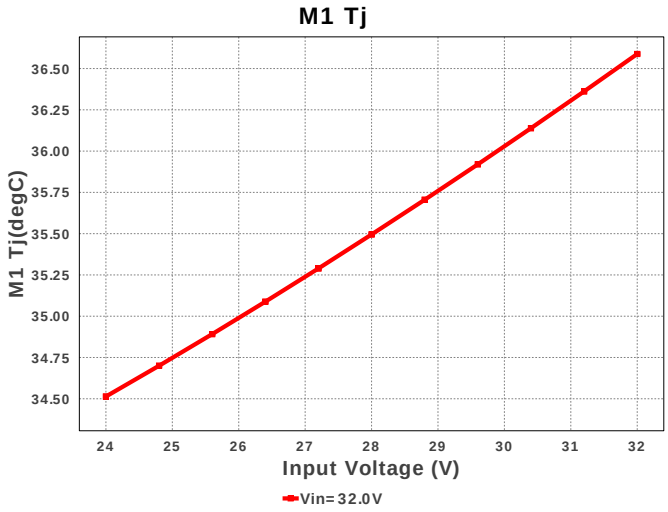

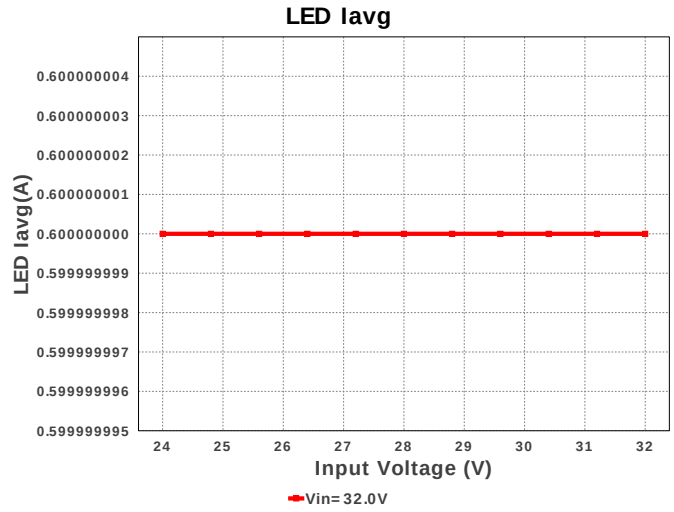

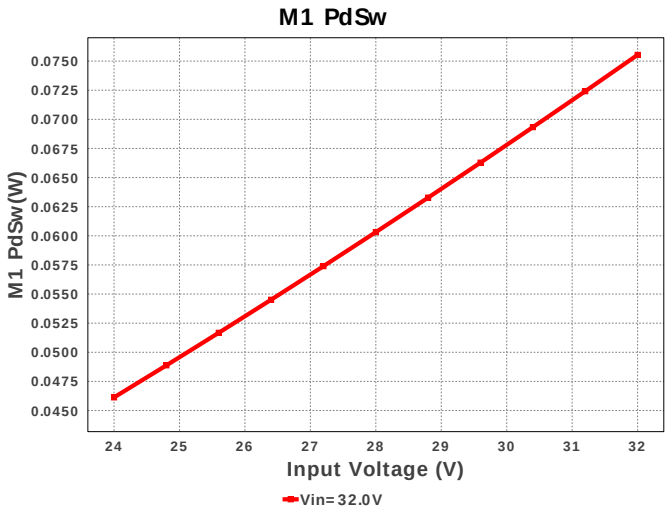

Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	249.97 mA	Current	Input capacitor RMS ripple current
2.	Iin Avg	159.87 mA	Current	Average input current
3.	L Ipp	213.41 mA	Current	Peak-to-peak inductor ripple current
4.	LED Iavg	600.0 mA	Current	LED Average Current
5.	LED Ipp	9.672 mA	Current	LED Ripple Current
6.	SW Ipk	706.705 mA	Current	Peak switch current
7.	BOM Count	18	General	Total Design BOM count
8.	FootPrint	163.0 mm^2	General	Total Foot Print Area of BOM components
9.	Frequency	750.826 kHz	General	Switching frequency
10.	IC Tolerance	54.0 mV	General	IC Feedback Tolerance
11.	Mode	CCM	General	Conduction Mode

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#	Name	Value	Category	Description
12.	Pout	4.085 W	General	Total output power
13.	Toff	1.034 us	General	Fixed Off Time
14.	Total BOM	$1.19	General	Total BOM Cost
15.	D1 Tj	96.82 degC	Op_Point	D1 junction temperature
16.	Vout OP	6.809 V	Op_Point	Operational Output Voltage
17.	Duty Cycle	22.354 %	Op_point	Duty cycle
18.	Efficiency	79.858 %	Op_point	Steady state efficiency
19.	IC Tj	54.824 degC	Op_point	IC junction temperature
20.	ICThetaJA	50.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
21.	IOUT_OP	600.0 mA	Op_point	Iout operating point
22.	LED Rd	2.091 Ohm	Op_point	LED DynamicResistance
23.	LED Vf	6.809 V	Op_point	Total LED Forward Calculated Voltage
24.	M1 Tj	36.603 degC	Op_point	MOSFET junction temperature
25.	M1 Tj	36.603 degC	Op_point	MOSFET junction temperature
26.	VIN_OP	32.0 V	Op_point	Vin operating point
27.	Cin Pd	560.49 µW	Power	Input capacitor power dissipation
28.	Diode Pd	202.485 mW	Power	Diode power dissipation
29.	IC Pd	496.476 mW	Power	IC power dissipation
30.	L Pd	117.0 mW	Power	Inductor power dissipation
31.	LED Pd	4.085 W	Power	LED Power Dissipation
32.	M1 Pd	84.309 mW	Power	M1 MOSFET total power dissipation
33.	M1 PdCond	8.6 mW	Power	M1 MOSFET conduction losses
34.	M1 PdSw	75.709 mW	Power	M1 MOSFET switching losses
35.	Rsns Pd	129.6 mW	Power	LED Power Dissipation
36.	Total Pd	1.03 W	Power	Total Power Dissipation
37.	Vout Tolerance	793.07 m%		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	600.0 m	Maximum Output Current
2.	VinMax	32.0	Maximum input voltage
3.	VinMin	24.0	Minimum input voltage
4.	Vout	6.8	Output Voltage
5.	application	LED_DRIVER	LED Application
6.	base_pn	LM3409	Texas Instruments Base Part Number
7.	isLEDArchitect	N	LED Architect Project
8.	ledparallel	3.0	Number of LED in parallel
9.	ledpartnumber	CBT120RC11BNR5	LED Part number
10.	ledseries	2.0	Number of LED in series
11.	line_fsw	60.0	AC Line Frequency
12.	source	DC	Input Source Type
13.	ta	30.0	Ambient temperature
14.	userfsw	525.578 k	Customer Selected Frequency

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.

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