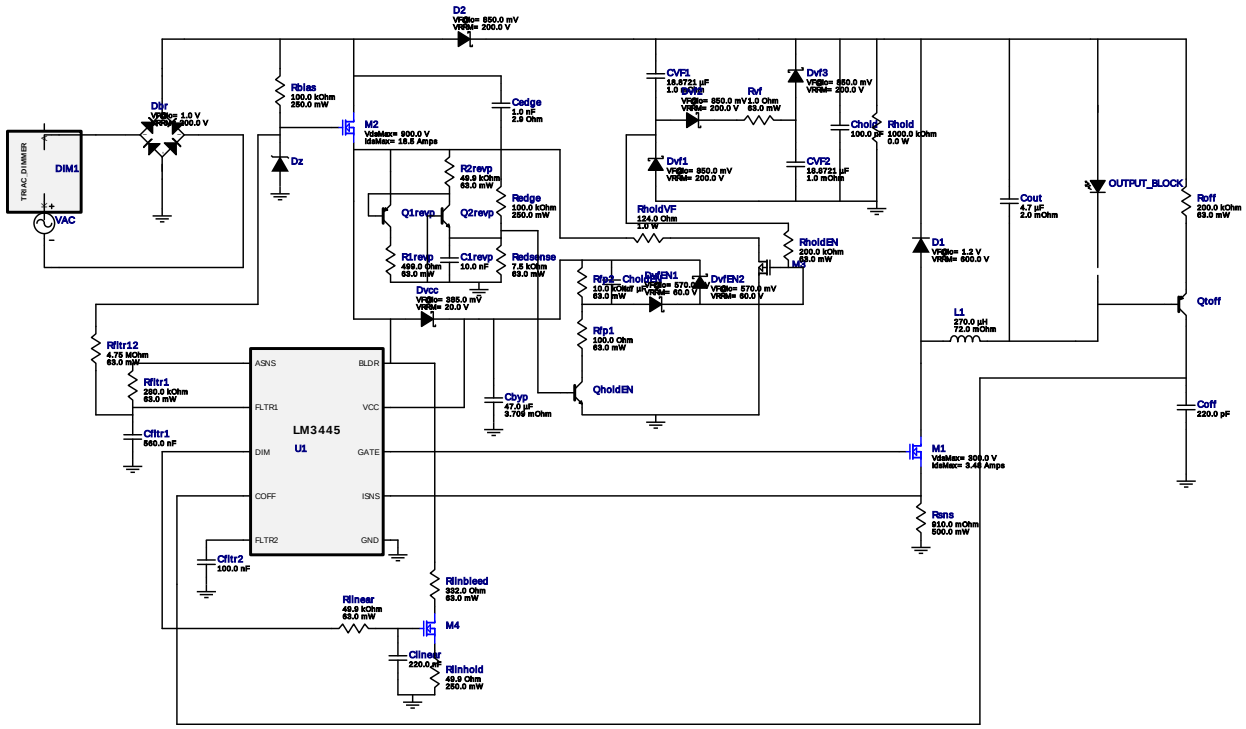
WEBENCH® Design Report

VinMin = 110.0V
VinMax = 130.0V
Vout = 7.0V
Iout = 0.7A

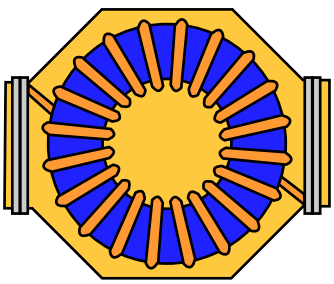
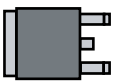
Device = LM3445MM/NOPB
Topology = Buck
Created = 8/10/16 11:03:12 PM
BOM Cost = $0.00
BOM Count = 54
Total Pd = 0.0W

Design : 4765128/2 LM3445MM/NOPB
LM3445MM/NOPB 110.0V-130.0V to 7.00V @ 0.7A



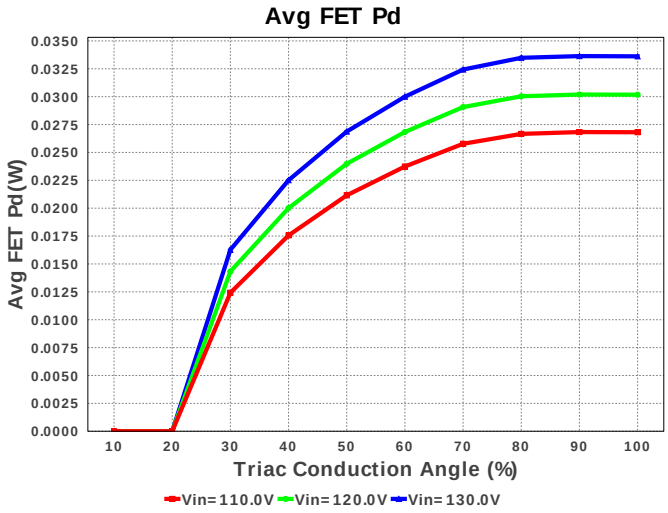
Electrical BOM

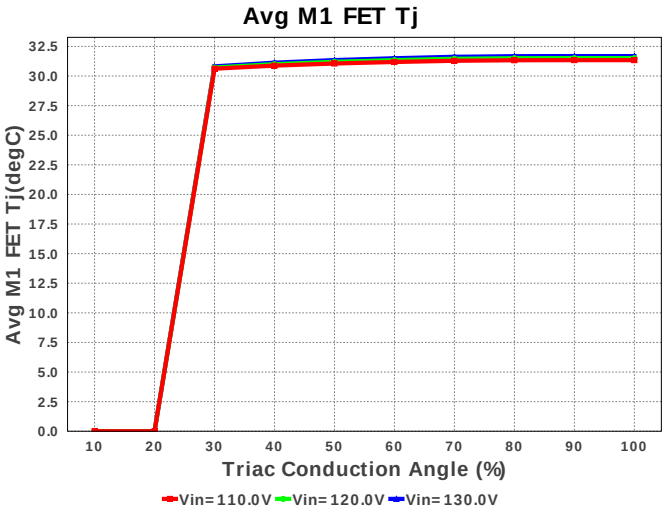
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	C1revp	MuRata	GRM216R71H103KA01D Series= X7R	Cap= 10.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm^2
2.	CVF1	CUSTOM	CUSTOM Series= ?	Cap= 18.8721 uF ESR= 1.0 mOhm VDC= 147.078 V IRMS= 887.46 mA	1	NA	CUSTOM 0 mm^2
3.	CVF2	CUSTOM	CUSTOM Series= ?	Cap= 18.8721 uF ESR= 1.0 mOhm VDC= 147.078 V IRMS= 887.46 mA	1	NA	CUSTOM 0 mm^2
4.	Cbyp	MuRata	GRM31CR61A476KE15L Series= X5R	Cap= 47.0 uF ESR= 3.709 mOhm VDC= 10.0 V IRMS= 4.2862 A	1	$0.15	1206_190 11 mm^2
5.	Cedge	MuRata	GRM188R72E102KW07D Series= X7R	Cap= 1.0 nF ESR= 2.9 Ohm VDC= 250.0 V IRMS= 90.0 mA	1	$0.01	0603 5 mm^2
6.	Cfltr1	MuRata	GRM155R61A564KE15D Series= X5R	Cap= 560.0 nF VDC= 10.0 V IRMS= 0.0 A	1	$0.03	0402 3 mm^2
7.	Cfltr2	MuRata	GRM21BR71E104KA01L Series= X7R	Cap= 100.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm^2

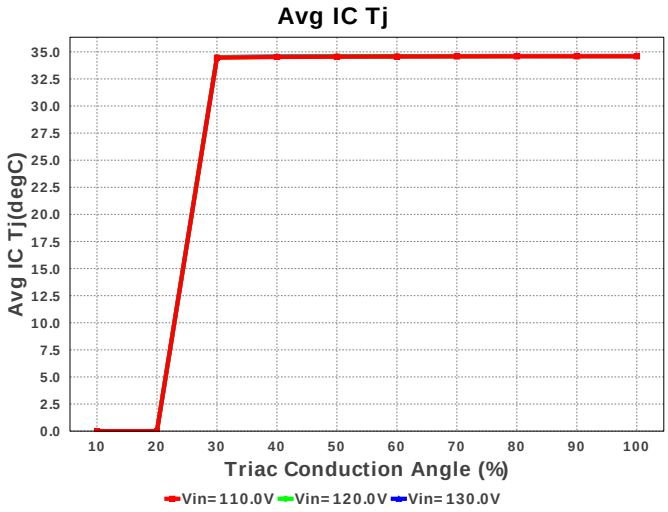
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
8.	Chold	MuRata	GRM31CR72E104KW03L Series= X7R	Cap= 100.0 nF VDC= 250.0 V IRMS= 0.0 A	1	$0.06	 1206 11 mm²
9.	CholdEN	Taiyo Yuden	LMK212BJ475KD-T Series= X5R	Cap= 4.7 uF VDC= 10.0 V IRMS= 0.0 A	1	$0.03	 0805 7 mm²
10.	Clinear	MuRata	GRM155C80G224KE01D Series= X6S	Cap= 220.0 nF VDC= 4.0 V IRMS= 0.0 A	1	$0.01	 0402 3 mm²
11.	Coff	Yageo America	CC0805JRNPO9BN221 Series= C0G/NP0	Cap= 220.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	 0805 7 mm²
12.	Cout	MuRata	GRM21BR61E475MA12L Series= X5R	Cap= 4.7 uF ESR= 2.0 mOhm VDC= 25.0 V IRMS= 7.29 A	1	$0.02	 0805 7 mm²
13.	D1	Bourns	CD214B-F3600	VF@Io= 1.2 V VRRM= 600.0 V	1	$0.14	 SMB 44 mm²
14.	D2	Diodes Inc.	DFLS1200-7	VF@Io= 850.0 mV VRRM= 200.0 V	1	$0.21	 PowerDI123 13 mm²
15.	D_LED	CUSTOM	CUSTOM	LED	4	NA	CUSTOM 0 mm²
16.	Dbr	Diodes Inc.	HD02-T	VF@Io= 1.0 V VRRM= 200.0 V	1	$0.12	 MiniDIP 62 mm²
17.	Dvcc	ON Semiconductor	MBR0520LT1G	VF@Io= 385.0 mV VRRM= 20.0 V	1	$0.06	 SOD-123 13 mm²
18.	Dvf1	Diodes Inc.	DFLS1200-7	VF@Io= 850.0 mV VRRM= 200.0 V	1	$0.21	 PowerDI123 13 mm²
19.	Dvf2	Diodes Inc.	DFLS1200-7	VF@Io= 850.0 mV VRRM= 200.0 V	1	$0.21	 PowerDI123 13 mm²
20.	Dvf3	Diodes Inc.	DFLS1200-7	VF@Io= 850.0 mV VRRM= 200.0 V	1	$0.21	 PowerDI123 13 mm²
21.	DvfEN1	NXP Semiconductor	PMEG6010CEH,115	VF@Io= 570.0 mV VRRM= 60.0 V	1	$0.04	 SOD-123F 12 mm²
22.	DvfEN2	NXP Semiconductor	PMEG6010CEH,115	VF@Io= 570.0 mV VRRM= 60.0 V	1	$0.04	 SOD-123F 12 mm²
23.	Dz	ON Semiconductor	BZX84C15LT1G	Zener	1	$0.02	 SOT-23 14 mm²
24.	L1	Bourns	PM2120-271K-RC	L= 270.0 µH DCR= 72.0 mOhm	1	$1.33	 PM2120 890 mm²
25.	M1	Fairchild Semiconductor	FQD7N30TM	VdsMax= 300.0 V IdsMax= 3.48 Amps	1	$0.40	 DPAK 102 mm²
26.	M2	STMicroelectronics	STW21N90K5	VdsMax= 900.0 V IdsMax= 18.5 Amps	1	$3.94	 TO-247 123 mm²

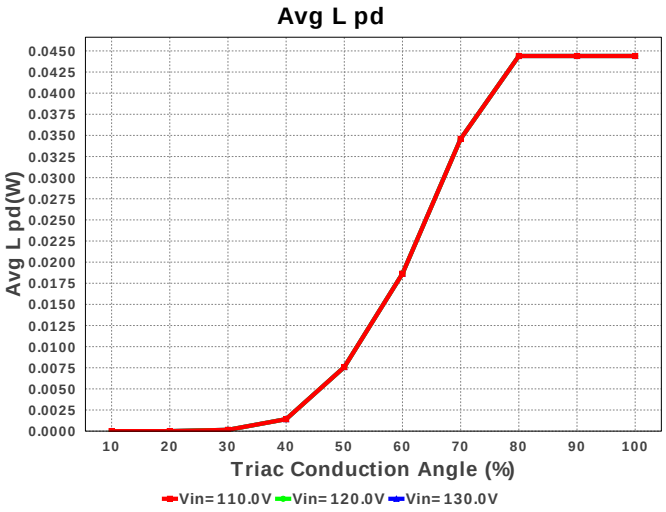
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
27.	M3	unknown		unknown		NA	
28.	M4	unknown		unknown		NA	
29.	Q1revp	Diodes Inc.	BC858C-7-F	Bipolar Transistor	1	$0.03	 SOT-23 14 mm²
30.	Q2revp	Diodes Inc.	MMBT4401-7-F	Bipolar Transistor	1	$0.02	 SOT-23 14 mm²
31.	QholdEN	Diodes Inc.	MMBT4401-7-F	Bipolar Transistor	1	$0.02	 SOT-23 14 mm²
32.	Qtoff	Fairchild Semiconductor	MMBTA92	Bipolar Transistor	1	$0.05	 SOT-23 14 mm²
33.	R1revp	Vishay-Dale	CRCW0402499RFKED Series= CRCW..e3	Res= 499.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
34.	R2revp	Vishay-Dale	CRCW040249K9FKED Series= CRCW..e3	Res= 49.9 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
35.	Rbias	Panasonic	ERJ-8ENF1003V Series= ERJ-8E	Res= 100.0 kOhm Power= 250.0 mW Tolerance= 1.0%	1	$0.01	 1206 11 mm²
36.	Redge	Panasonic	ERJ-8ENF1003V Series= ERJ-8E	Res= 100.0 kOhm Power= 250.0 mW Tolerance= 1.0%	1	$0.01	 1206 11 mm²
37.	Redsense	Vishay-Dale	CRCW04027K50FKED Series= CRCW..e3	Res= 7.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
38.	Rfltr1	Vishay-Dale	CRCW0402280KFKED Series= CRCW..e3	Res= 280.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
39.	Rfltr12	Vishay-Dale	CRCW04024M75FKED Series= CRCW..e3	Res= 4.75 MOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
40.	Rfp1	Vishay-Dale	CRCW0402100RFKED Series= CRCW..e3	Res= 100.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
41.	Rfp2	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
42.	Rhold	CUSTOM	CUSTOM Series= ?	Res= 1000.0 kOhm Power= 0.0 W Tolerance= 0.0%	1	NA	CUSTOM 0 mm²
43.	RholdEN	Vishay-Dale	CRCW0402200KFKED Series= CRCW..e3	Res= 200.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
44.	RholdVF	Panasonic	ERJ-1TNF1240U Series= ERJ-1T	Res= 124.0 Ohm Power= 1.0 W Tolerance= 1.0%	1	$0.13	 2512 43 mm²
45.	Rlinbleed	Vishay-Dale	CRCW0402332RFKED Series= CRCW..e3	Res= 332.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
46.	Rlinear	Vishay-Dale	CRCW040249K9FKED Series= CRCW..e3	Res= 49.9 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
47.	Rlinhold	Panasonic	ERJ-8ENF49R9V Series= ERJ-8E	Res= 49.9 Ohm Power= 250.0 mW Tolerance= 1.0%	1	$0.01	 1206 11 mm²
48.	Roff	Vishay-Dale	CRCW0402200KFKED Series= CRCW..e3	Res= 200.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²

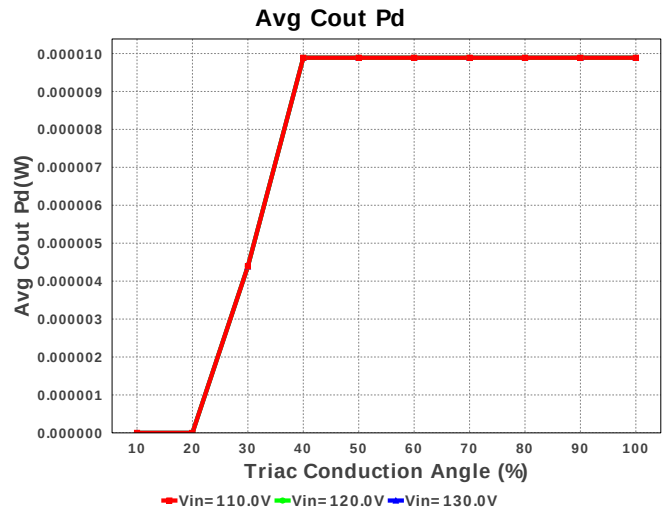
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
49.	Rsns	Bourns	CRM1206-FX-R910ELF Series= ?	Res= 910.0 mOhm Power= 500.0 mW Tolerance= 1.0%	1	$0.03	 1206 11 mm^2
50.	Rvf	Vishay-Dale	CRCW04021R00FKED Series= CRCW..e3	Res= 1.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
51.	U1	Texas Instruments	LM3445MM/NOPB	Switcher	1	$0.40	 MUB10A 24 mm^2

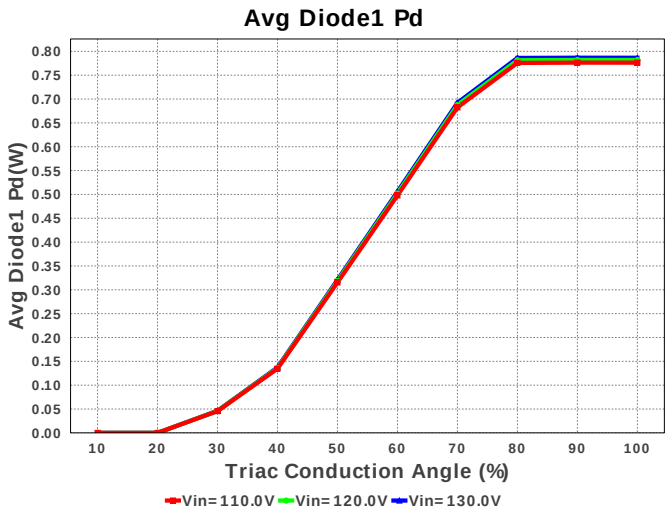


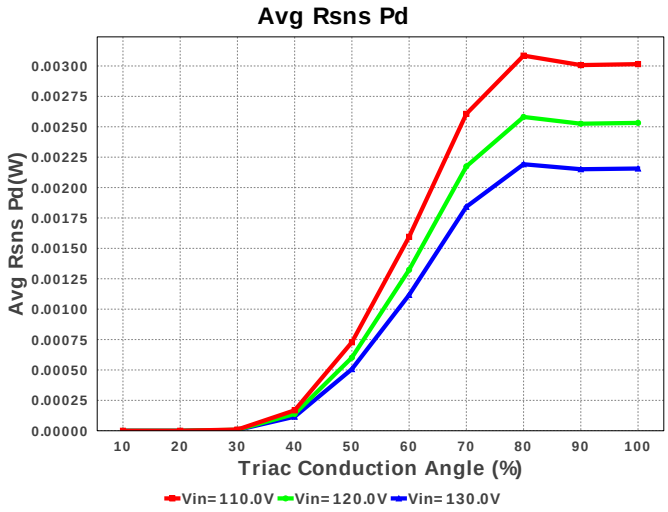


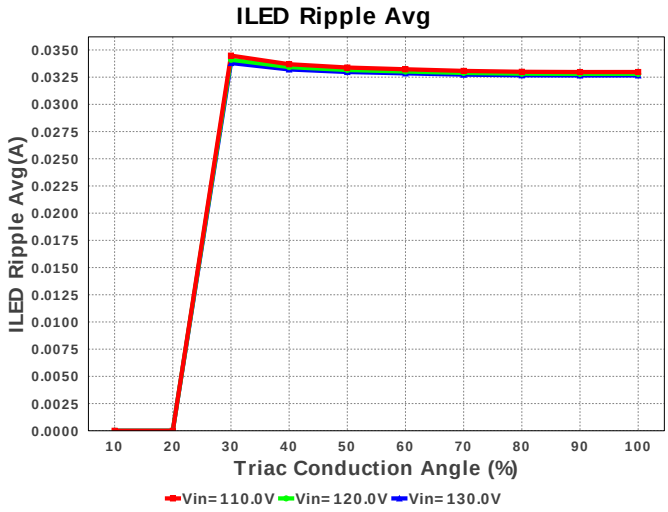


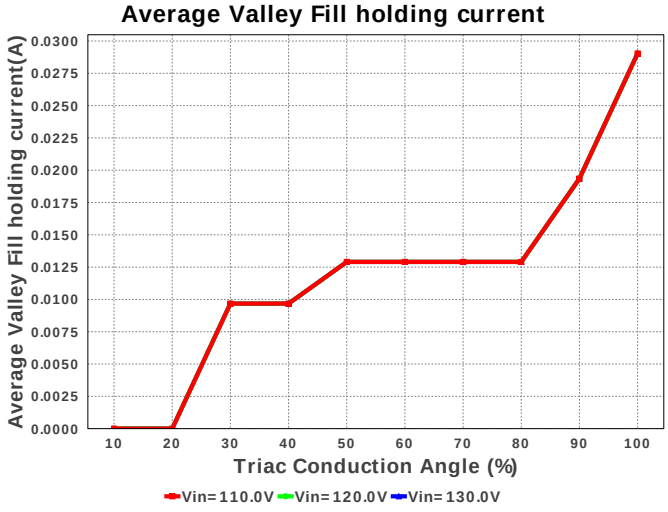


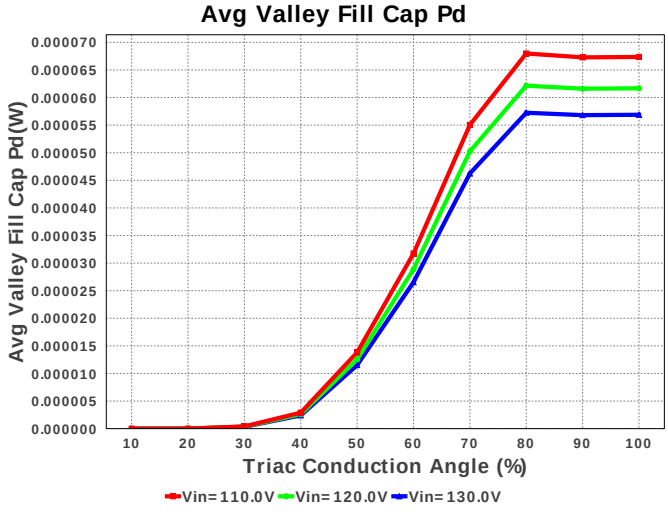


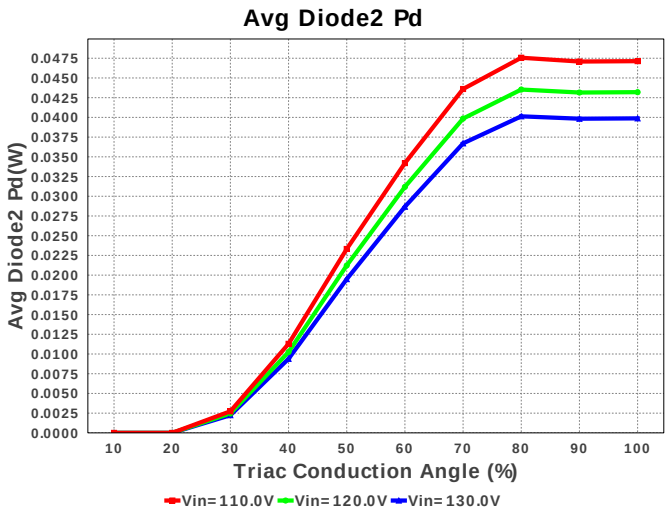


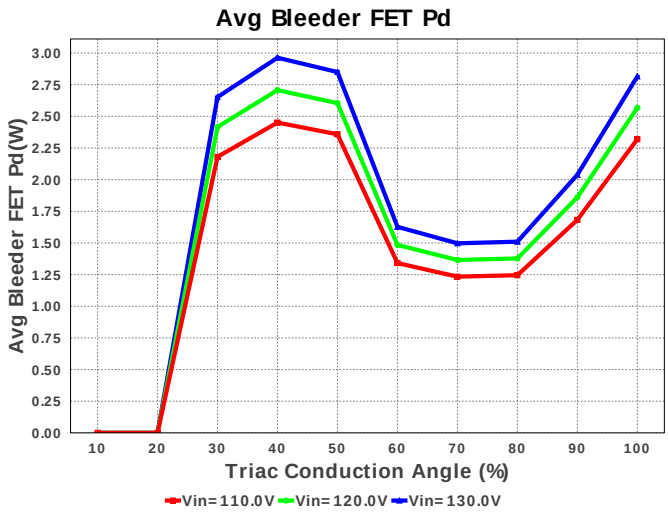


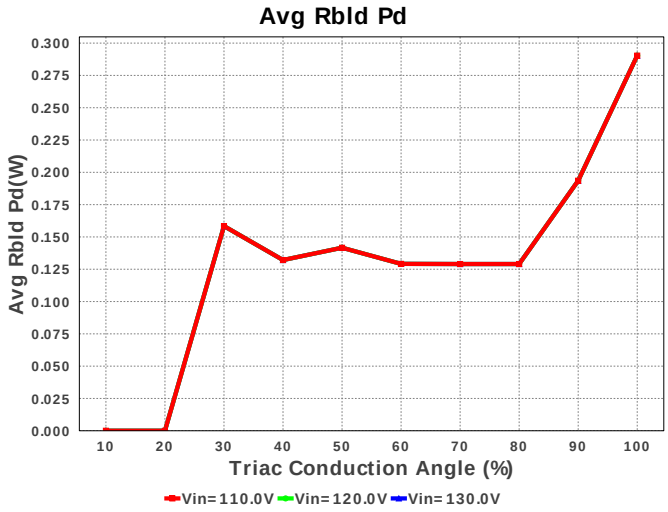


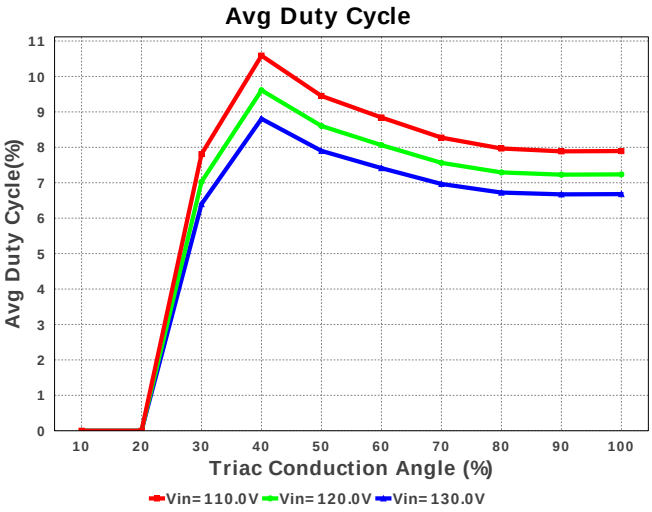


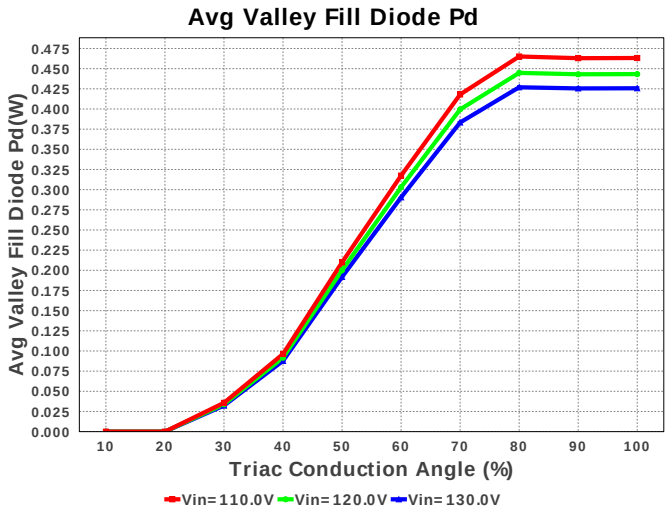


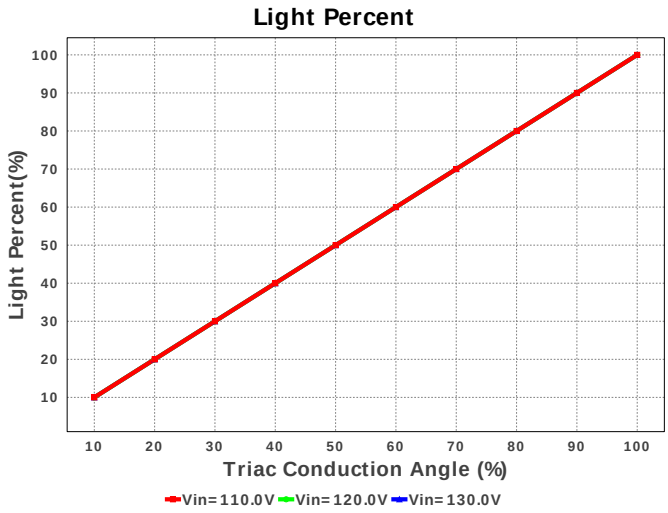


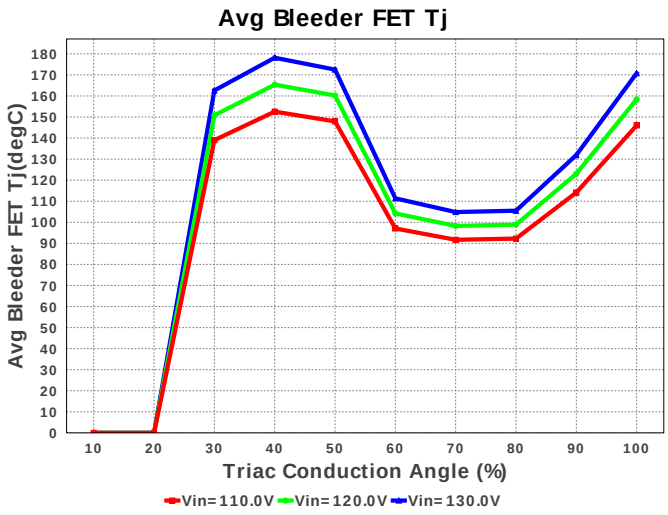


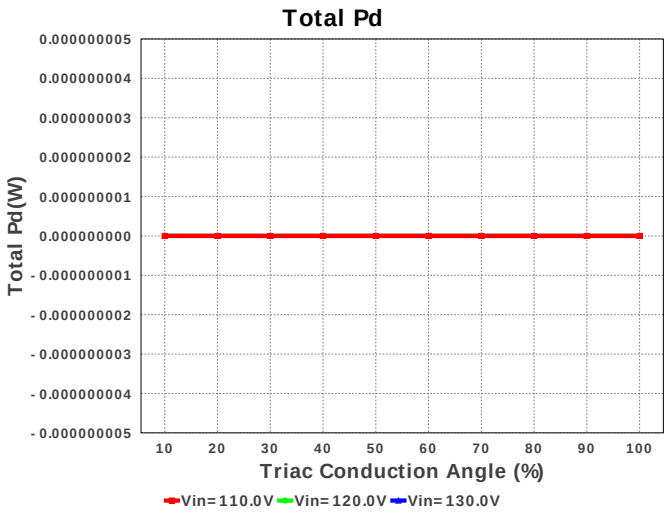


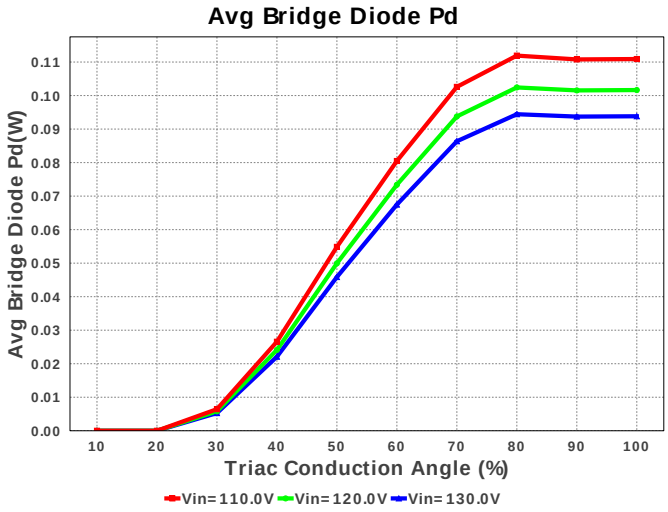


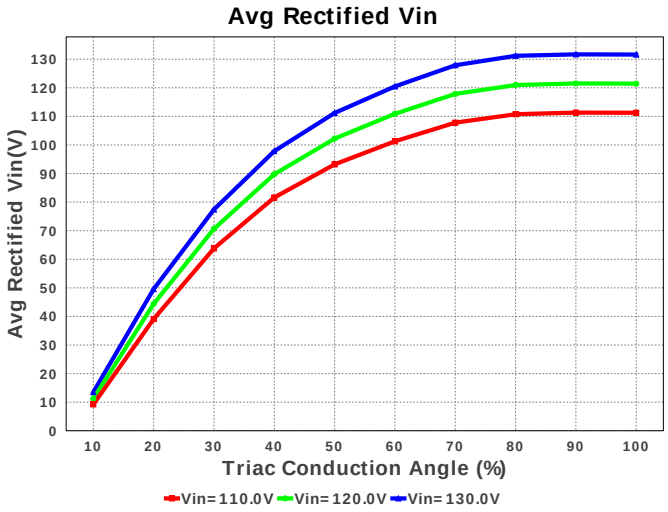


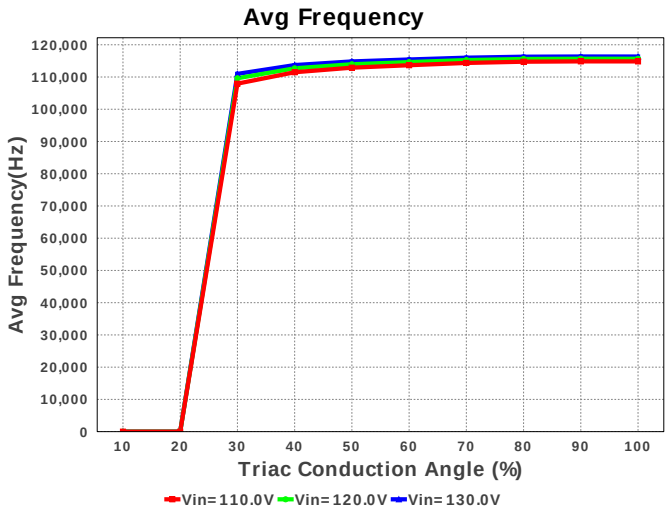


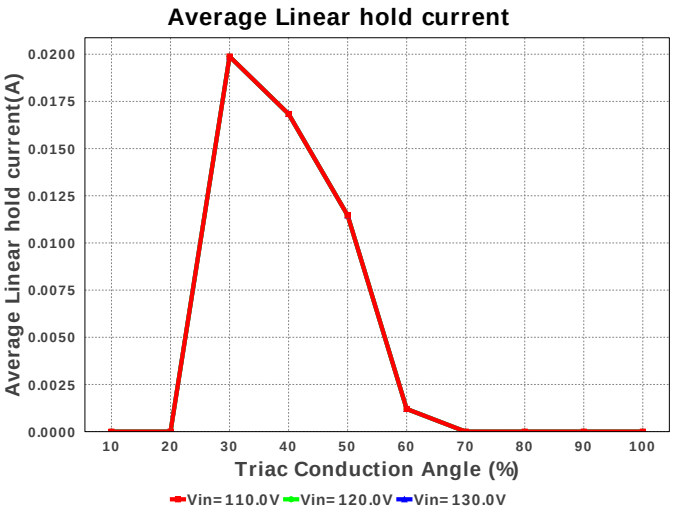


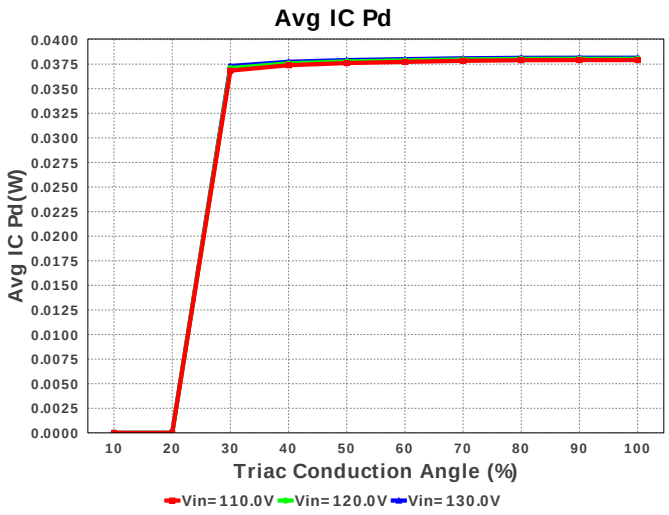


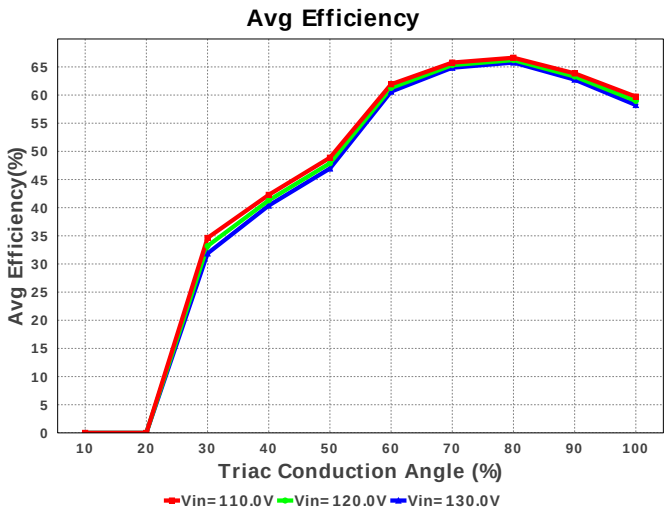


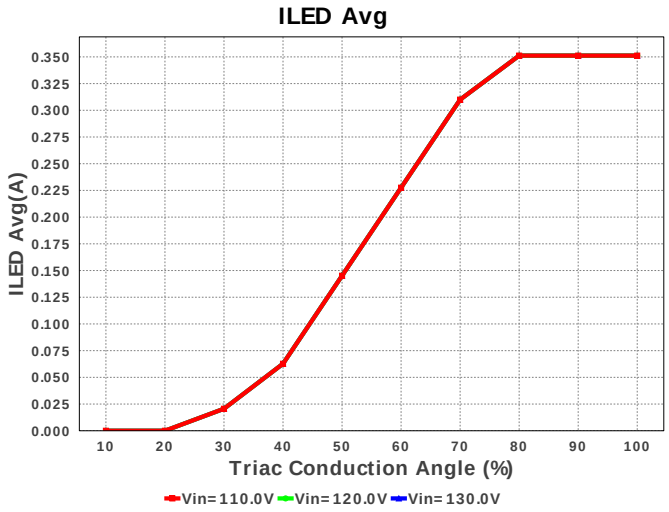












Operating Values

#	Name	Value	Category	Description
1.	ILED Avg	351.187 mA	Current	Average Current per LED for the AC line period
2.	ILED Ripple Avg	32.694 mA	Current	Average LED Ripple Current for the AC line period
3.	Avg Rectified Vin	130.112 V	General	Average Rectified Voltage for the AC Line Period
4.	BOM Count	54	General	Total Design BOM count
5.	FootPrint	1.608 k mm^2	General	Total Foot Print Area of BOM components
6.	Total BOM	$0.0	General	Total BOM Cost
7.	Avg Bleeder FET Tj	105.293 degC	Op_Point	Bleeder MOSFET average junction temperature over the AC Line Period
8.	Avg M1 FET Tj	31.657 degC	Op_Point	M1 MOSFET average junction temperature over the AC Line Period
9.	Avg Duty Cycle	6.811 %	Op_point	Average Duty Cycle over the AC Line Period
10.	Avg Efficiency	67.298 %	Op_point	Average Efficiency over the AC Line Period
11.	Avg Frequency	116.188 kHz	Op_point	Average Switching Frequency over the AC Line Period
12.	Avg IC Tj	34.613 degC	Op_point	Average IC junction temperature for the AC line period
13.	VIN_OP	130.0 V	Op_point	AC Input RMS Voltage
14.	Avg Bleeder FET Pd	1.506 W	Power	Average power dissipation in the bleeder FET over the AC line period
15.	Avg Bridge Diode Pd	66.069 mW	Power	Average Power Dissipation in the Bridge Diode over the AC Line Period
16.	Avg Cout Pd	9.889 µW	Power	Average Power Dissipation in the Output Capacitor over the AC Line Period
17.	Avg Diode1 Pd	785.446 mW	Power	Average Power Dissipation in D1 over the AC Line Period
18.	Avg Diode2 Pd	29.454 mW	Power	Average Power Dissipation in D1 over the AC Line Period
19.	Avg FET Pd	33.147 mW	Power	Average power dissipation in the switching FET over the AC line period
20.	Avg IC Pd	38.125 mW	Power	Average Power Dissipation in the IC over the AC line period
21.	Avg L pd	44.4 mW	Power	Average Inductor power disspation over the AC line period
22.	Avg Rbld Pd	129.032 mW	Power	Average power dissipation in the bleeder resistor over the AC line period
23.	Avg Rsns Pd	2.257 mW	Power	Average power dissipation in the Current limit resistor over the AC line period
24.	Avg Valley Fill Cap Pd	58.008 µW	Power	Average Power Dissipation in the Valley Fill Capacitors over the AC Line Period
25.	Avg Valley Fill Diode Pd	305.789 mW	Power	Average Power Dissipation in the Valley Fill Diodes over the AC Line Period

#	Name	Value	Category	Description
26.	Total Pd	0.0 W	Power	Total Power Dissipation
27.	Average Linear hold current	0.0 A		Average Linear hold current over the AC Line Period
28.	Average Valley Fill holding current	12.903 mA		Average Valley Fill holding current over the AC Line Period
29.	Light Percent	75.0 %		Percentage light from dimming
30.	Vout Tolerance	428.57 m%		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	700.0 m	Maximum Output Current
2.	VinMax	130.0	Maximum input voltage
3.	VinMin	110.0	Minimum input voltage
4.	Vout	7.0	Output Voltage
5.	line_fsw	60.0	Light Output in Lumen
6.	application	LED_DRIVER	LED Application
7.	base_pn	LM3445	Base Product Number
8.	LED_Architect	N	LED Architect Project
9.	ledparallel	2.0	Number of LED in parallel
10.	ledpartnumber	Custom	LED Part number
11.	ledseries	2.0	Number of LED in series
12.	line_fsw	60.0	AC Line Frequency
13.	source	AC	Input Source Type
14.	Ta	30.0	Ambient temperature

Design Assistance

1. **LM3445** Product Folder : http://www.ti.com/product/LM3445 : contains the data sheet and other resources.