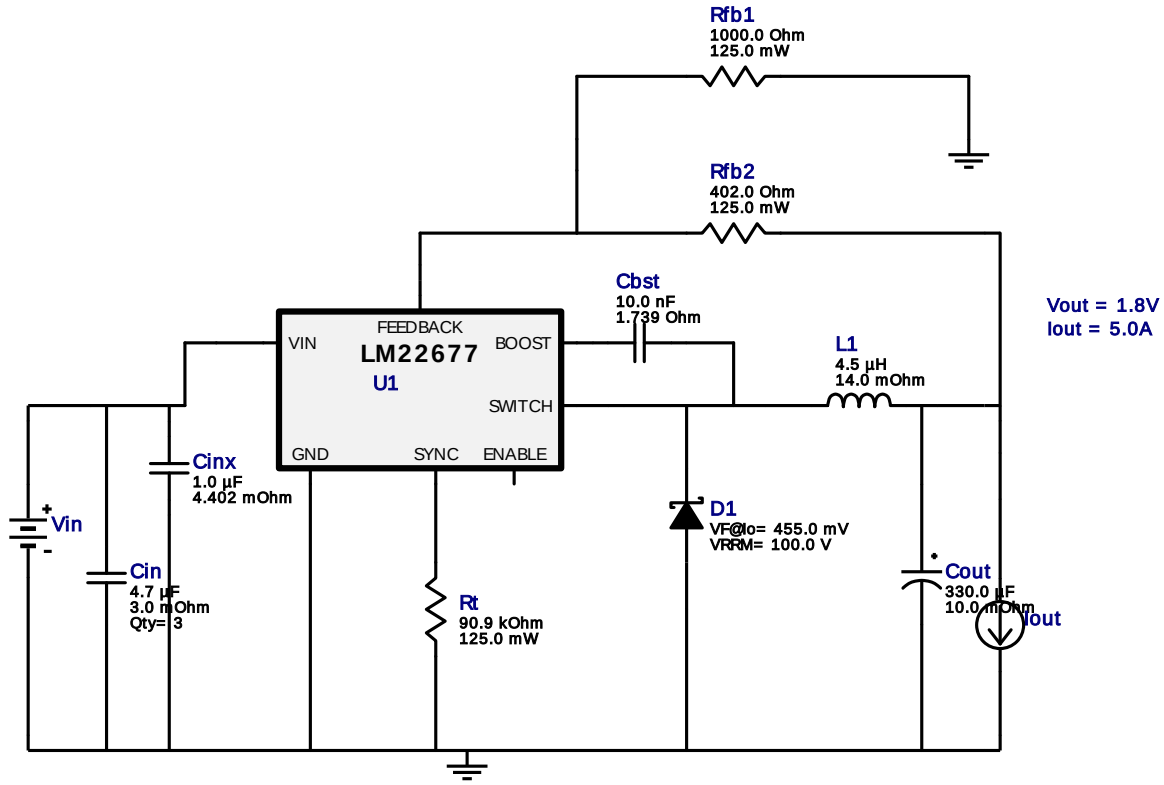
WEBENCH® Design Report

VinMin = 24.0V
VinMax = 36.0V
Vout = 1.8V
Iout = 5.0A

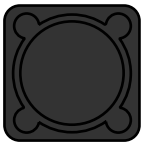
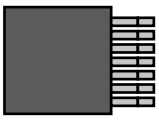
Device = LM22677TJE-ADJ/NOPB
Topology = Buck
Created = 7/17/16 9:09:10 AM
BOM Cost = $5.10
BOM Count = 12
Total Pd = 4.28W

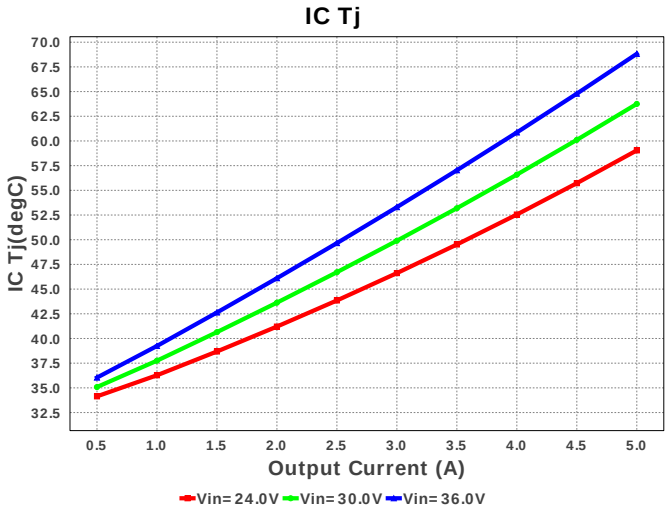
Design : 4466246/76 LM22677TJE-ADJ/NOPB
LM22677TJE-ADJ/NOPB 24.0V-36.0V to 1.80V @ 5.0A

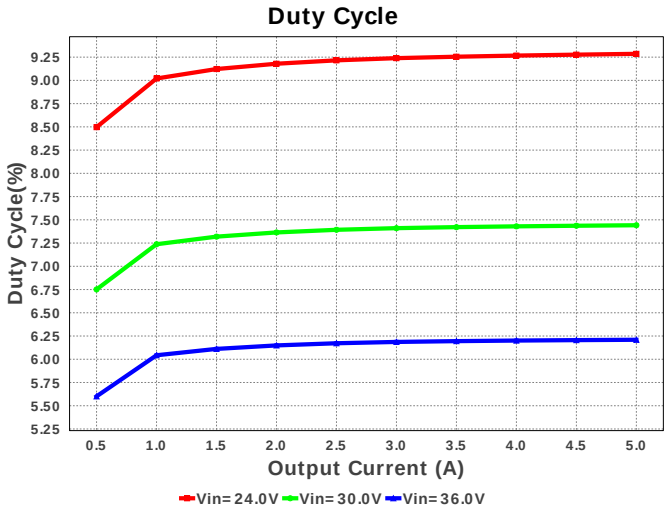


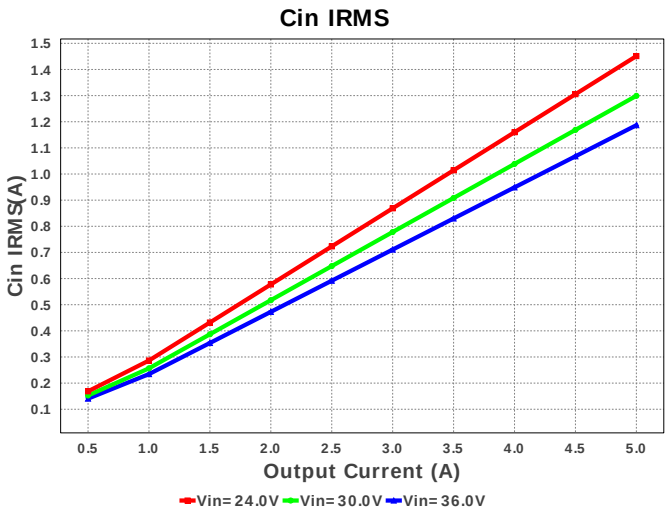
Electrical BOM

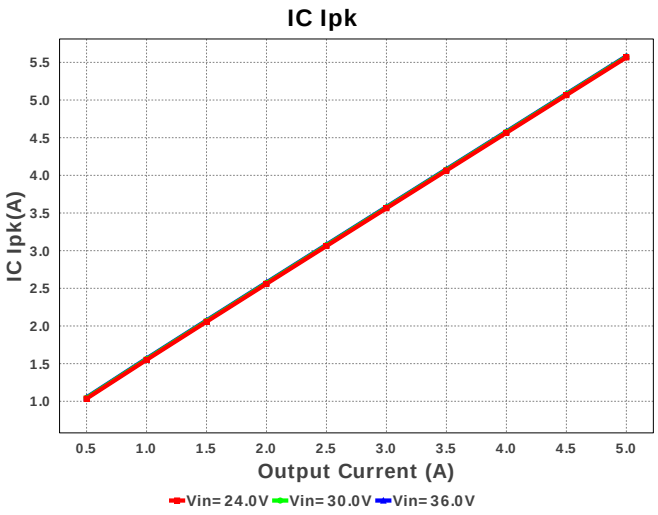
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst	Kemet	C0805C103K5RACTU Series= X7R	Cap= 10.0 nF ESR= 1.739 Ohm VDC= 50.0 V IRMS= 411.0 mA	1	$0.01	0805 7 mm²
2.	Cin	MuRata	GRM31CR71H475KA12L Series= X7R	Cap= 4.7 uF ESR= 3.0 mOhm VDC= 50.0 V IRMS= 4.98 A	3	$0.07	1206 11 mm²
3.	Cinx	MuRata	GRM21BR71H105KA12L Series= X7R	Cap= 1.0 uF ESR= 4.402 mOhm VDC= 50.0 V IRMS= 1.677 A	1	$0.05	0805 7 mm²
4.	Cout	Panasonic	2R5SVPE330MY Series= SVPE	Cap= 330.0 uF ESR= 10.0 mOhm VDC= 2.5 V IRMS= 3.86 A	1	$0.22	CAPSMT_62_E61 53 mm²
5.	D1	STMicroelectronics	STPS20M100SG-TR	VF@Io= 455.0 mV VRRM= 100.0 V	1	$1.33	DDPAK 210 mm²

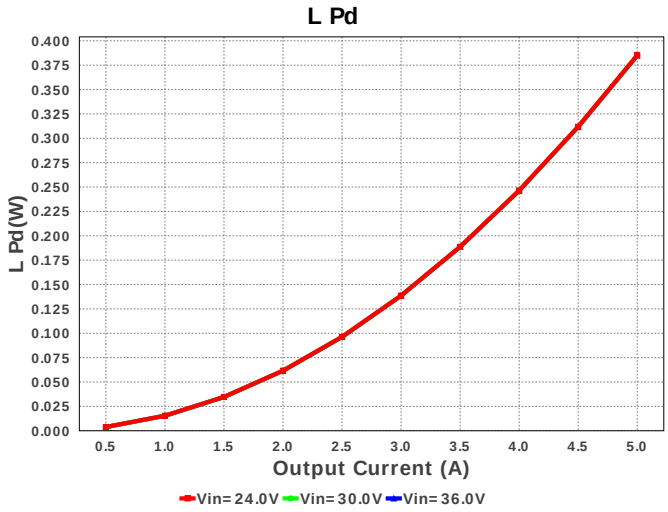
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
6.	L1	Bourns	SRR1208-4R5ML	L= 4.5 µH DCR= 14.0 mOhm	1	$0.37	 SRR1208 216 mm^2
7.	Rfb1	Panasonic	ERJ-6ENF1001V Series= ERJ-6E	Res= 1000.0 Ohm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm^2
8.	Rfb2	Vishay-Dale	CRCW0805402RFKEA Series= CRCW..e3	Res= 402.0 Ohm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm^2
9.	Rt	Panasonic	ERJ-6ENF9092V Series= ERJ-6E	Res= 90.9 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm^2
10.	U1	Texas Instruments	LM22677TJE-ADJ/NOPB	Switcher	1	$2.88	 TJ7A 199 mm^2

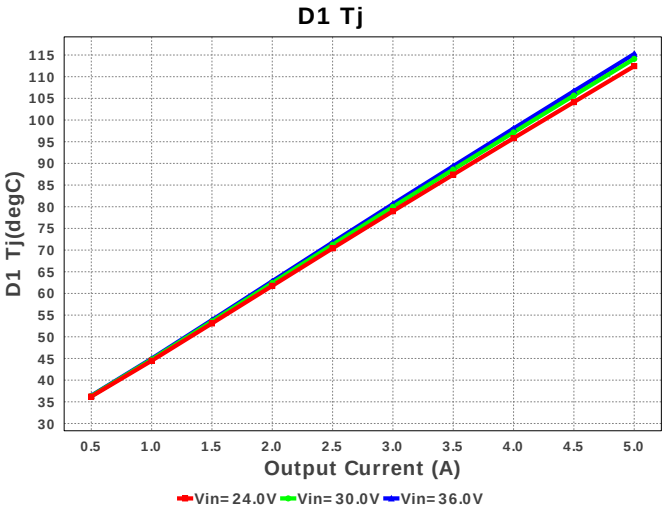


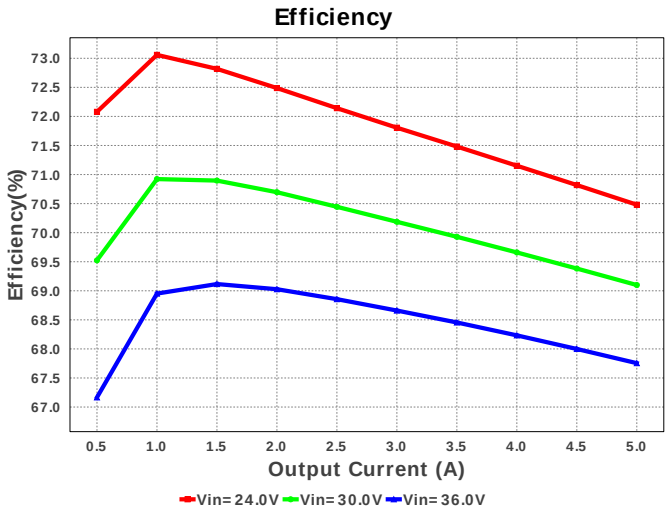


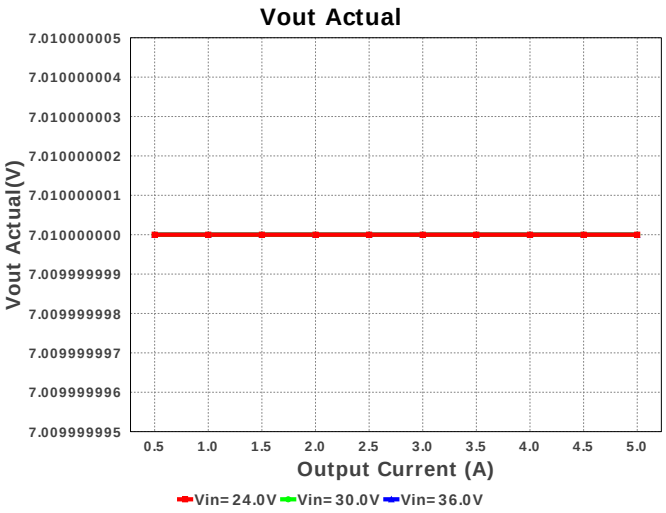


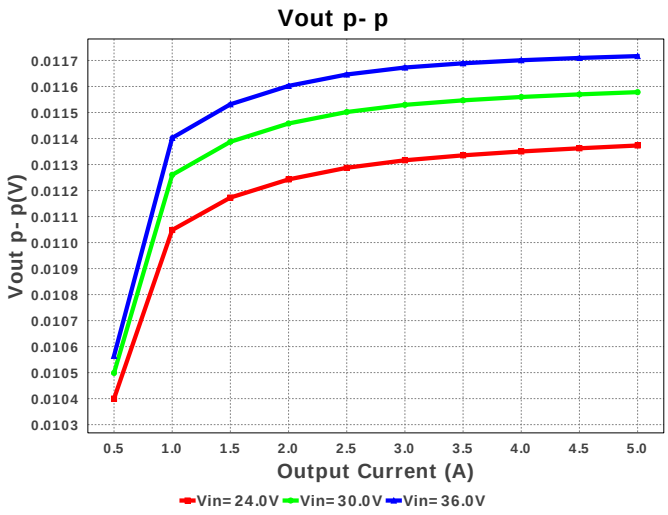


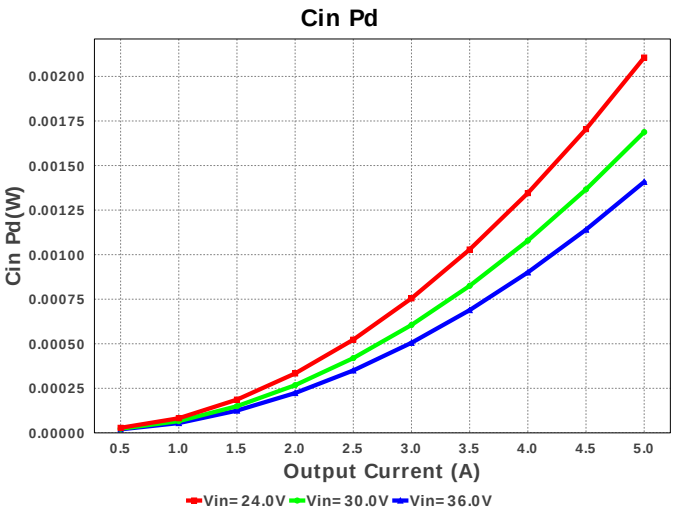


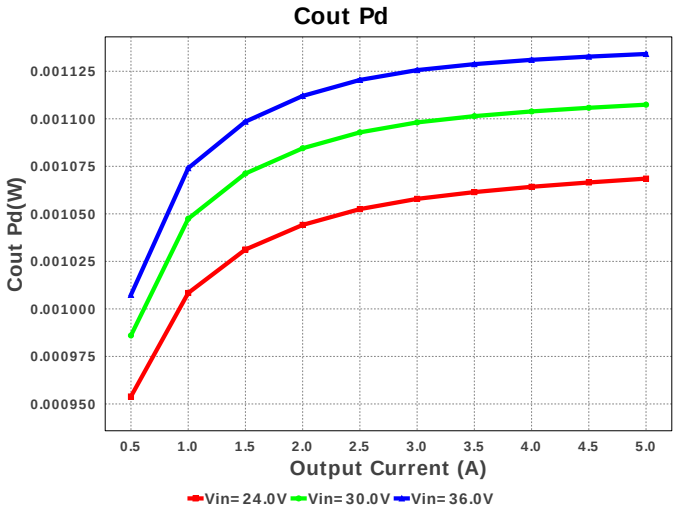


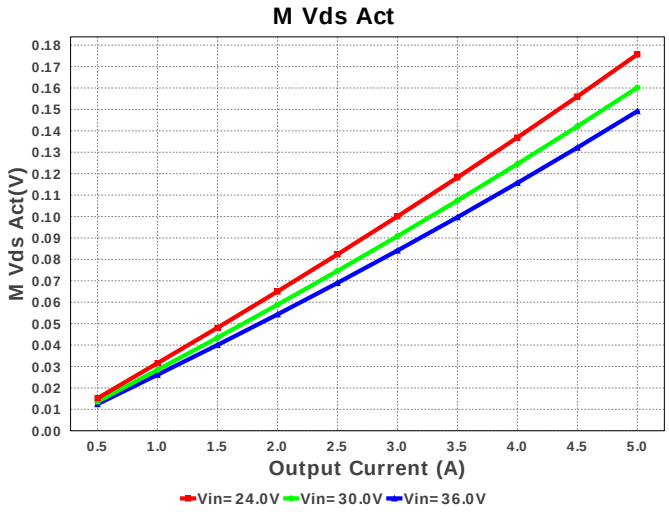


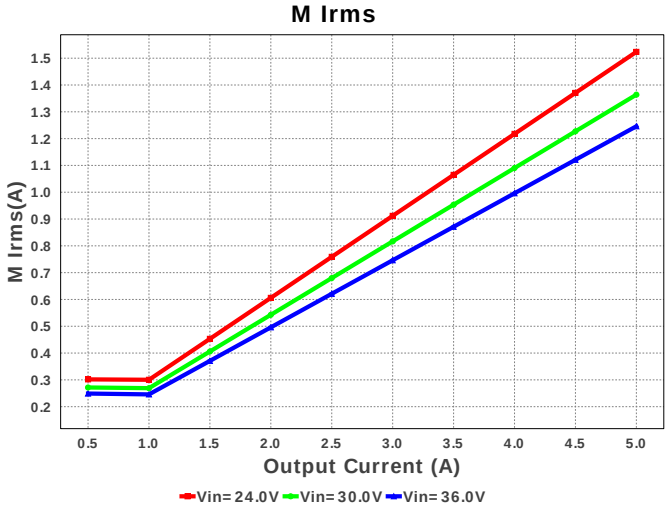


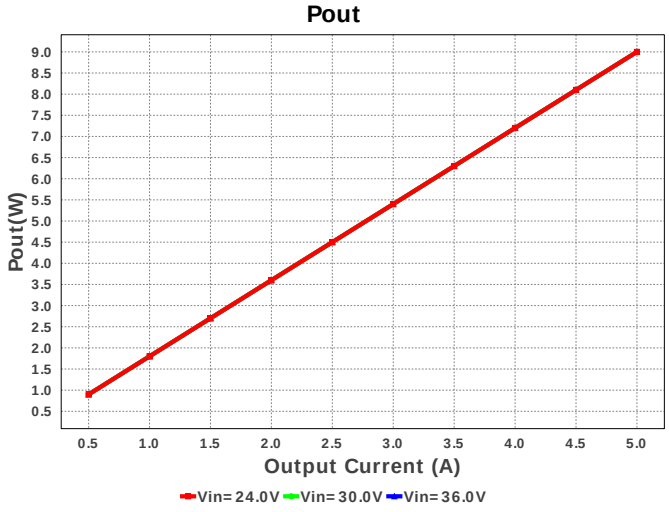


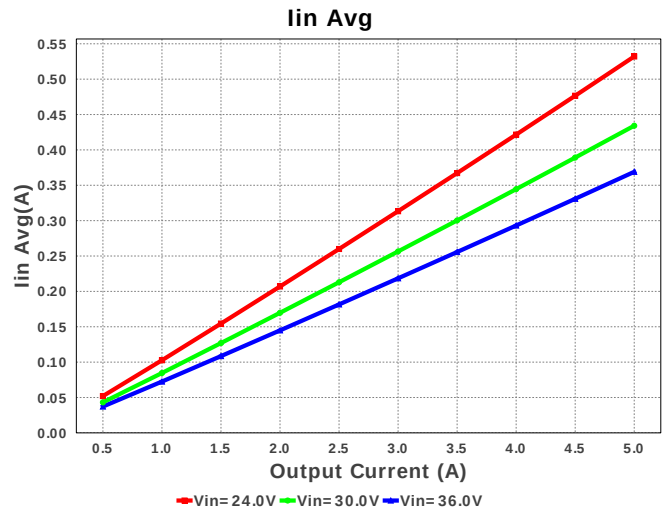


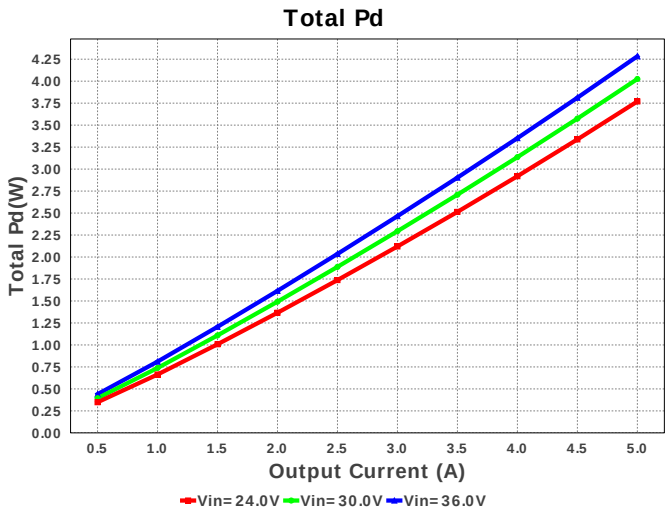


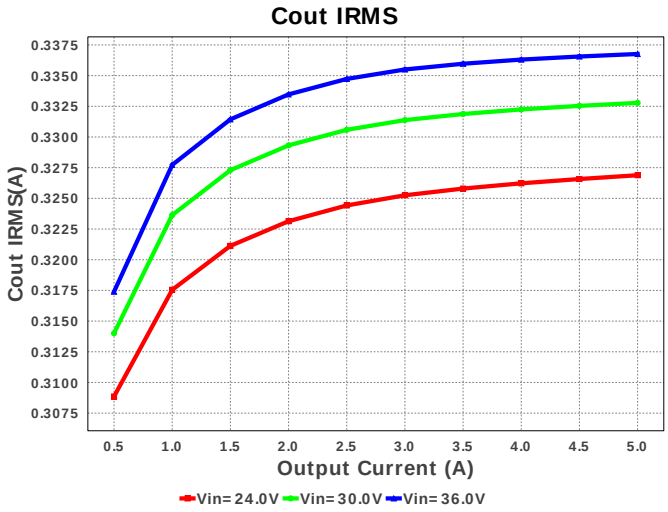


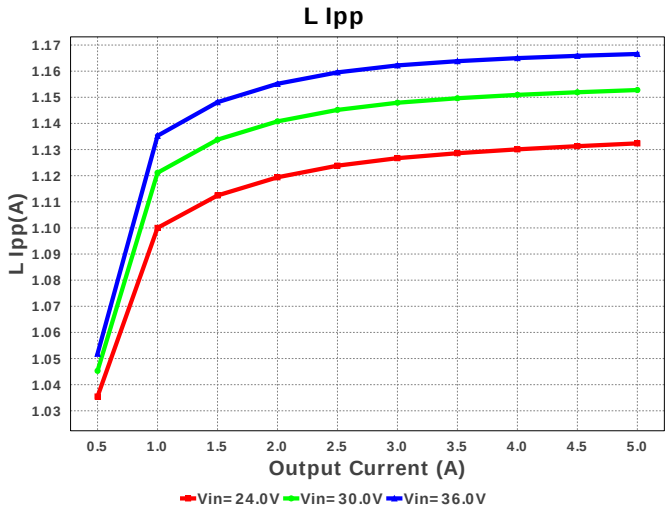


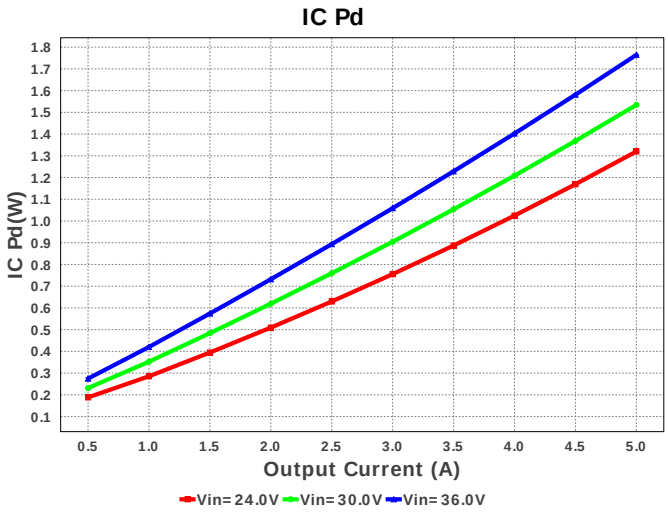


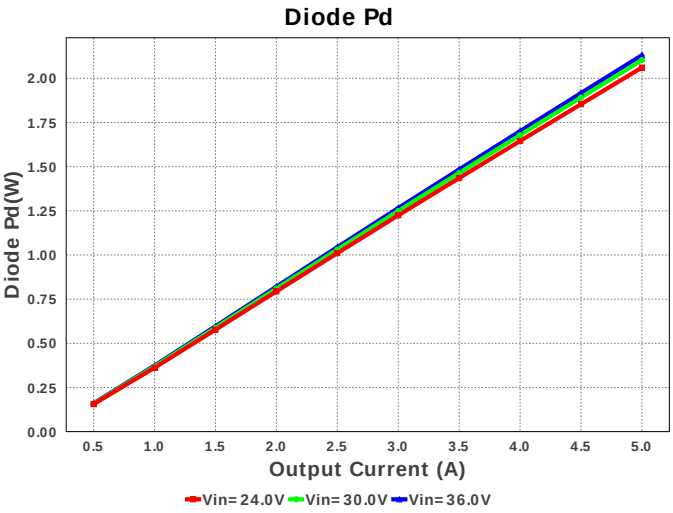












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	1.187 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	336.763 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	5.583 A	Current	Peak switch current in IC
4.	Iin Avg	368.98 mA	Current	Average input current
5.	L Ipp	1.167 A	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	1.246 A	Current	Q Iavg
7.	BOM Count	12	General	Total Design BOM count
8.	FootPrint	744.0 mm^2	General	Total Foot Print Area of BOM components
9.	Frequency	404.541 kHz	General	Switching frequency
10.	IC Tolerance	19.0 mV	General	IC Feedback Tolerance
11.	M Vds Act	149.165 mV	General	Voltage drop across the MosFET

#	Name	Value	Category	Description
12.	Pout	9.0 W	General	Total output power
13.	Total BOM	$5.1	General	Total BOM Cost
14.	D1 Tj	115.238 degC	Op_Point	D1 junction temperature
15.	Vout Actual	1.802 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
16.	Vout OP	1.8 V	Op_Point	Operational Output Voltage
17.	Cross Freq	50.47 kHz	Op_point	Bode plot crossover frequency
18.	Duty Cycle	6.21 %	Op_point	Duty cycle
19.	Efficiency	67.755 %	Op_point	Steady state efficiency
20.	IC Tj	68.821 degC	Op_point	IC junction temperature
21.	ICThetaJA	22.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
22.	IOUT_OP	5.0 A	Op_point	Iout operating point
23.	Phase Marg	91.567 deg	Op_point	Bode Plot Phase Margin
24.	VIN_OP	36.0 V	Op_point	Vin operating point
25.	Vout p-p	11.717 mV	Op_point	Peak-to-peak output ripple voltage
26.	Cin Pd	1.408 mW	Power	Input capacitor power dissipation
27.	Cout Pd	1.134 mW	Power	Output capacitor power dissipation
28.	Diode Pd	2.131 W	Power	Diode power dissipation
29.	IC Pd	1.765 W	Power	IC power dissipation
30.	L Pd	385.0 mW	Power	Inductor power dissipation
31.	Total Pd	4.283 W	Power	Total Power Dissipation
32.	Vout Tolerance	2.066 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	5.0	Maximum Output Current
2.	VinMax	36.0	Maximum input voltage
3.	VinMin	24.0	Minimum input voltage
4.	Vout	1.8	Output Voltage
5.	base_pn	LM22677	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. Due to the short on-time requirement for this particular design, the circuit does not have an effective built-in current limit function. This might cause damage to the circuit during startup, over current or short circuit condition. Reducing the maximum input voltage requirement may bring the design into the safe operating area. For more information on this topic, please refer to the Current Limit section of the regulator's datasheet.

2. Part Description The LM22677 is a monolithic integrated circuit that provides all of the active functions for a step-down (buck) switching regulator capable of driving up to 5.0A loads with excellent line and load regulation characteristics. High efficiency (>90%) is obtained through the use of a low ON-resistance N-channel MOSFET.

3. **LM22677** Product Folder : http://www.ti.com/product/LM22677 : contains the data sheet and other resources.