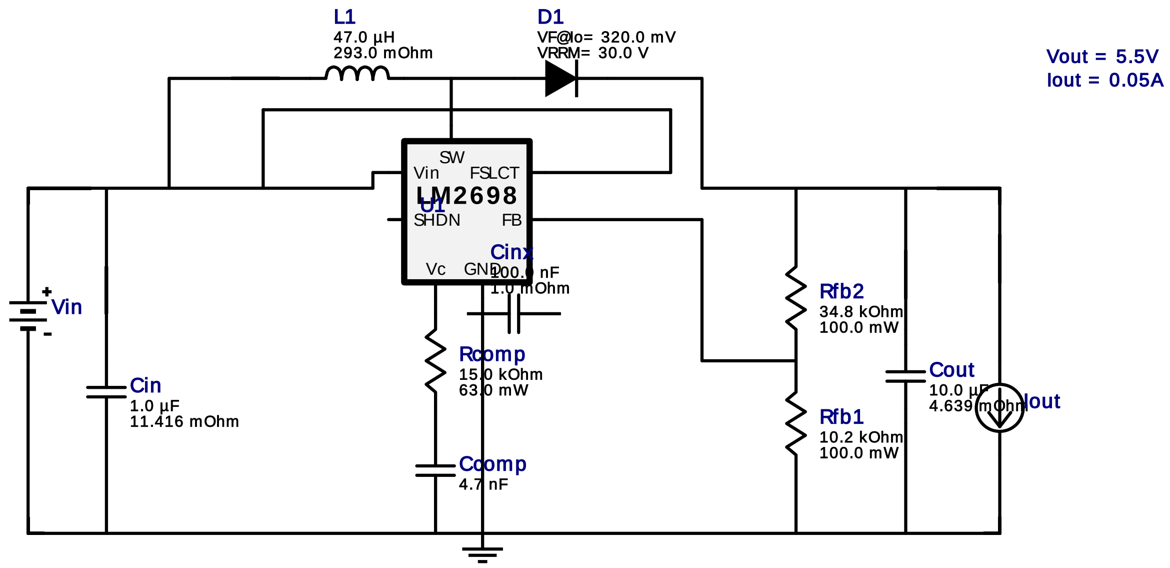
TEXAS INSTRUMENTS

VinMin = 3.0V
VinMax = 3.7V
Vout = 5.5V
Iout = 0.05A

Device = LM2698MM-ADJ/NOPB
Topology = Boost
Created = 2020-08-10 21:47:01.815
BOM Cost = $2.86
BOM Count = 10
Total Pd = 0.02W

WEBENCH ® Design Report

Design : 27 LM2698MM-ADJ/NOPB
LM2698MM-ADJ/NOPB 3V-3.7V to 5.50V @ 0.05A

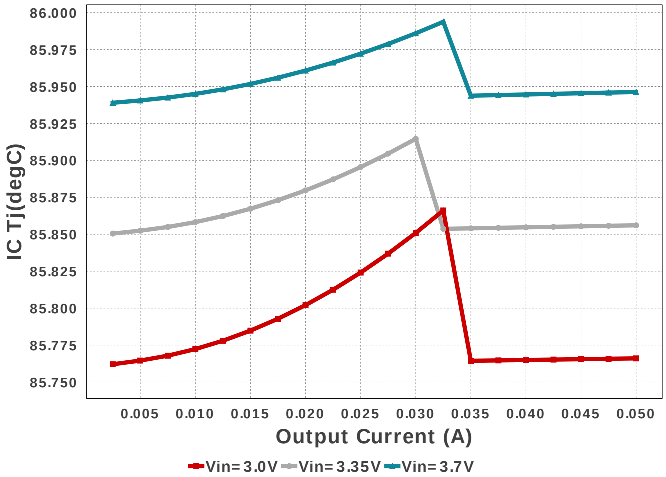


Electrical BOM

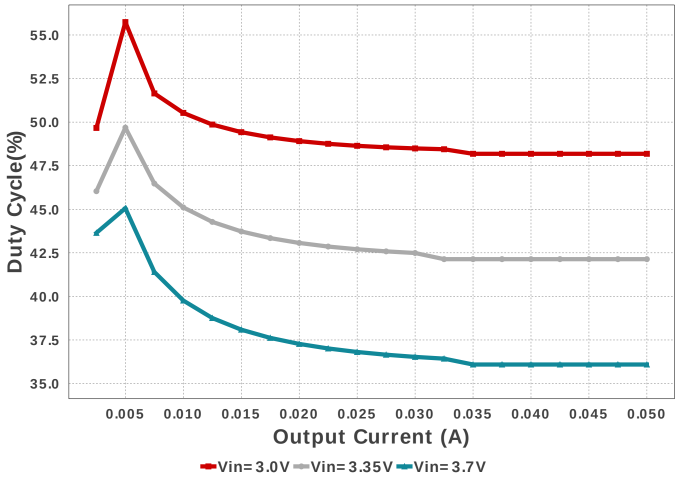
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Ccomp	Kemet	C0603C472F3GACTU Series= C0G/NP0	Cap= 4.7 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.44	0603 5 mm²
Cin	TDK	C1005X5R1V105K050BC Series= X5R	Cap= 1.0 uF ESR= 11.416 mOhm VDC= 35.0 V IRMS= 1.483 A	1	$0.03	0402 3 mm²
Cinx	Kemet	C0603C104M4RACTU Series= X7R	Cap= 100.0 nF ESR= 1.0 mOhm VDC= 16.0 V IRMS= 0.0 A	1	$0.01	0603 5 mm²
Cout	TDK	C1608X5R1A106K080AC Series= X5R	Cap= 10.0 uF ESR= 4.639 mOhm VDC= 10.0 V IRMS= 2.4141 A	1	$0.11	0603 5 mm²
D1	Toshiba	CMS06	VF@Io= 320.0 mV VRRM= 30.0 V	1	$0.19	M-FLAT 19 mm²
L1	Sumida	CDPH4D19FNP-470MC	L= 47.0 µH 293.0 mOhm	1	$0.45	CDPH4D19F 52 mm²
Rcomp	Vishay-Dale	CRCW040215K0FKED Series= CRCW..e3	Res= 15.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
Rfb1	Susumu Co Ltd	RG1608P-1022-B-T5 Series= RG1608	Res= 10.2 kOhm Power= 100.0 mW Tolerance= 0.1%	1	$0.06	0603 5 mm²
Rfb2	Susumu Co Ltd	RG1608P-3482-B-T5 Series= RG1608	Res= 34.8 kOhm Power= 100.0 mW Tolerance= 0.1%	1	$0.06	0603 5 mm²

Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
U1	Texas Instruments	LM2698MM-ADJ/NOPB	Switcher	1	$1.50	 MUA08A 24 mm²

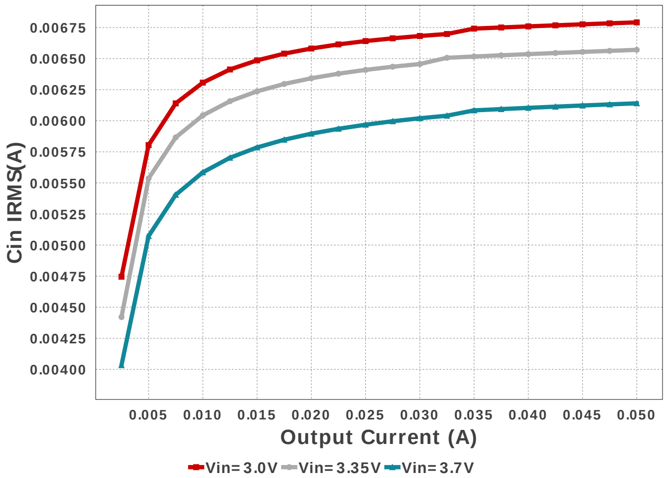
IC Tj



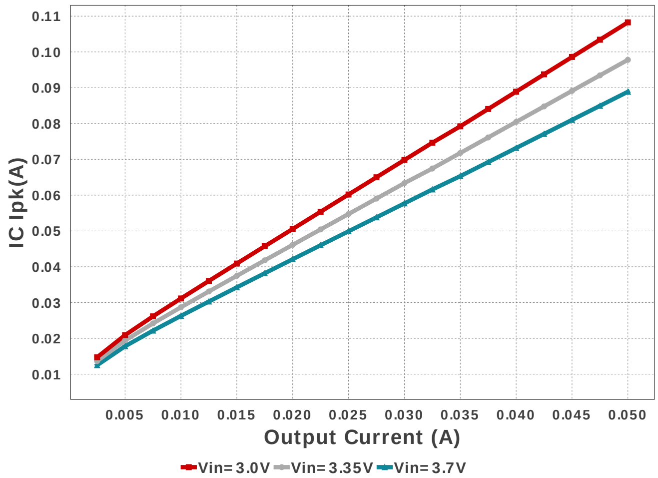
Duty Cycle



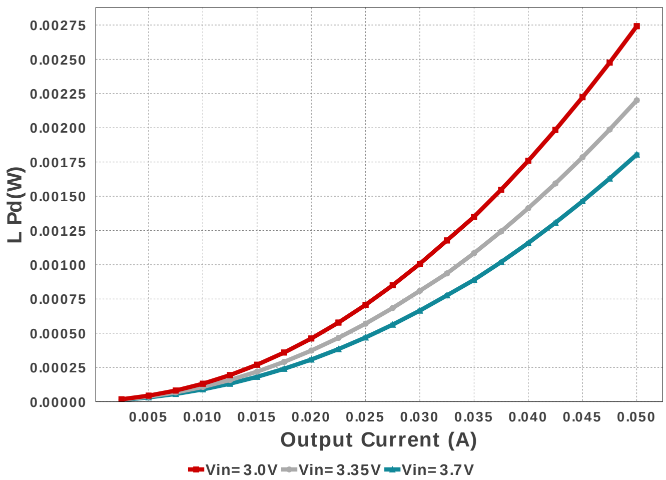
Cin IRMS



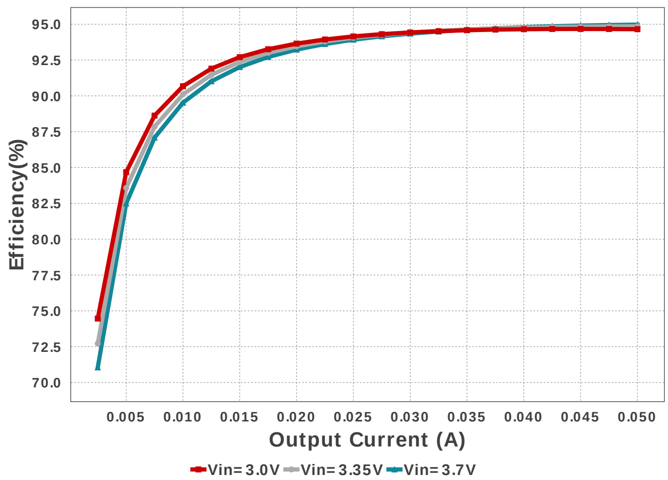
IC Ipk

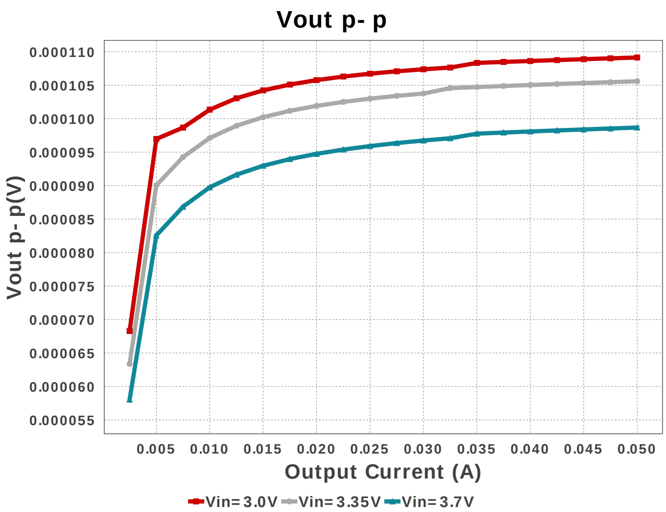


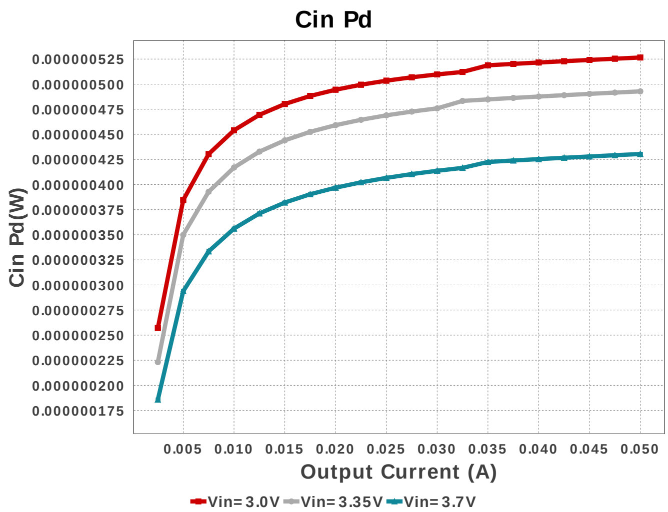
L Pd

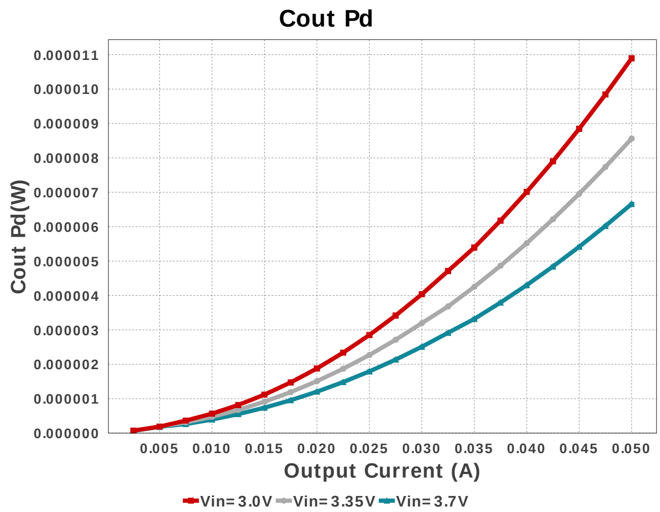


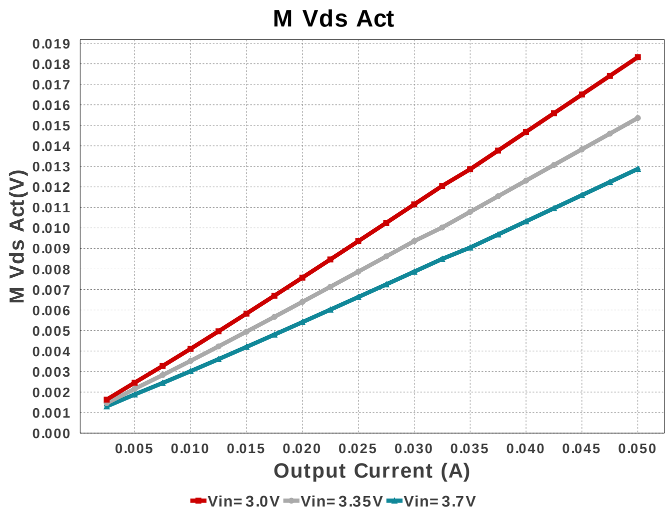
Efficiency

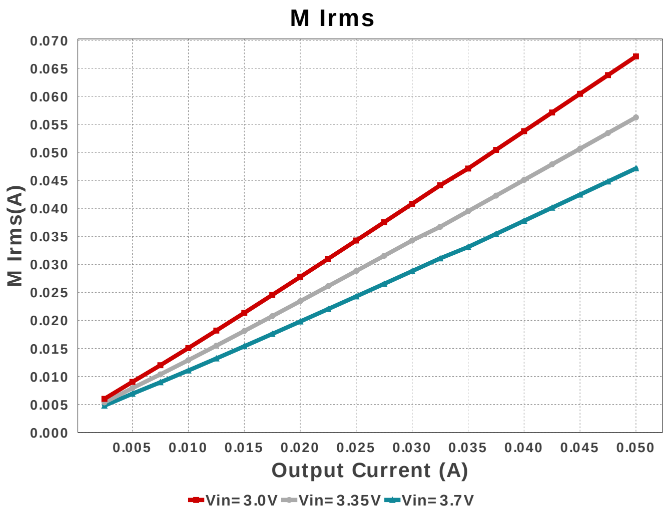


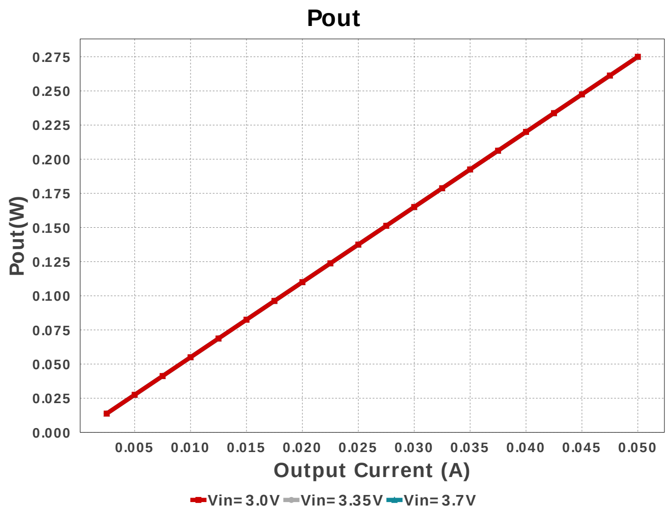

Vout p- p
Vout p- p(V)
Output Current (A)
Vin= 3.0V
Vin= 3.35V
Vin= 3.7V

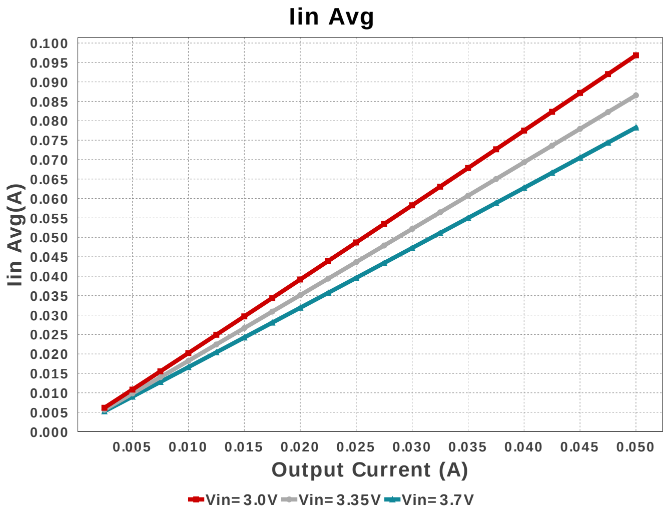

Cin Pd
Cin Pd(W)
Output Current (A)
Vin= 3.0V
Vin= 3.35V
Vin= 3.7V

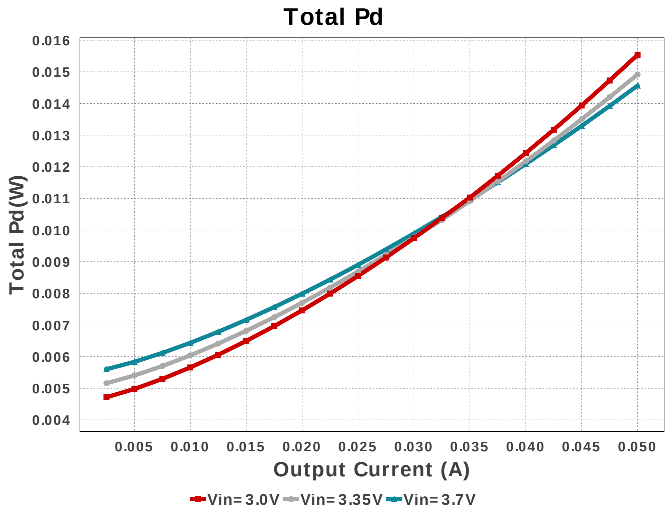

Cout Pd
Cout Pd(W)
Output Current (A)
Vin= 3.0V
Vin= 3.35V
Vin= 3.7V

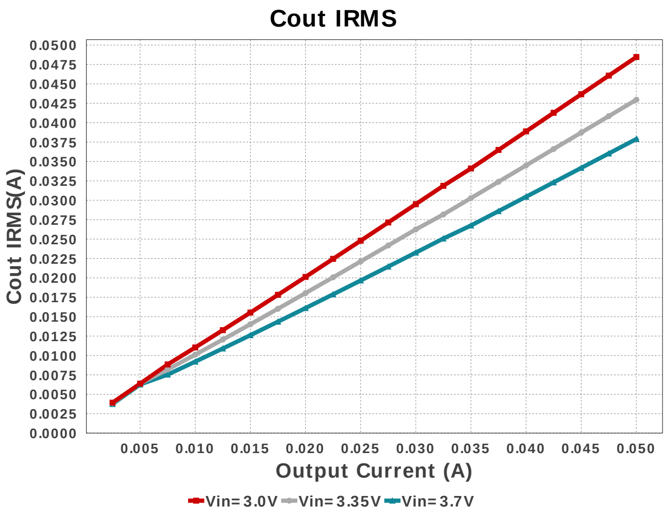

M Vds Act
M Vds Act(V)
Output Current (A)
Vin= 3.0V
Vin= 3.35V
Vin= 3.7V

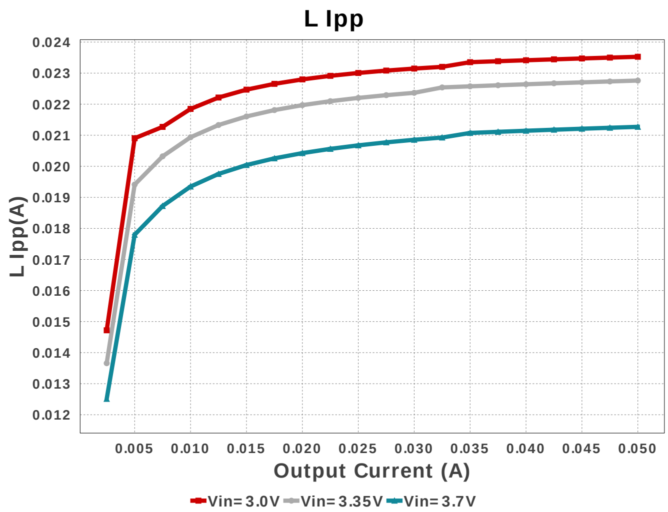

M Irms
M Irms(A)
Output Current (A)
Vin= 3.0V
Vin= 3.35V
Vin= 3.7V

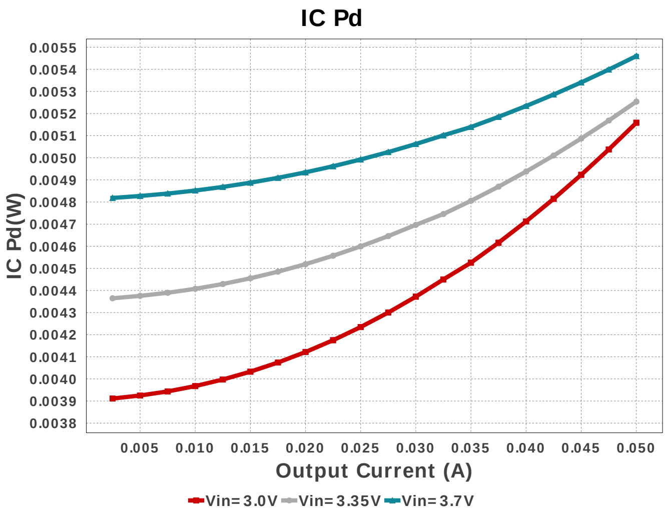

Pout
Pout(W)
Output Current (A)
Vin= 3.0V
Vin= 3.35V
Vin= 3.7V

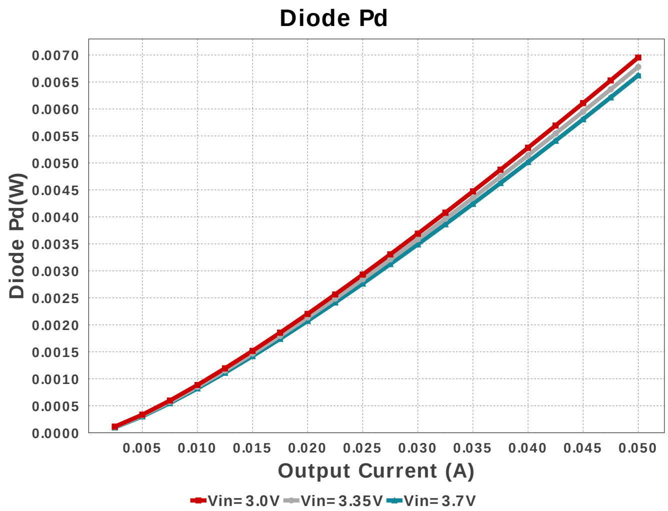












Operating Values

#	Name	Value	Category	Description
1.	BOM Count	10		Total Design BOM count
2.	Total BOM	$2.86		Total BOM Cost
3.	Cin IRMS	6.791 mA	Capacitor	Input capacitor RMS ripple current
4.	Cin Pd	526.55 nW	Capacitor	Input capacitor power dissipation
5.	Cout IRMS	48.461 mA	Capacitor	Output capacitor RMS ripple current
6.	Cout Pd	10.895 µW	Capacitor	Output capacitor power dissipation
7.	Diode Pd	6.954 mW	Diode	Diode power dissipation
8.	IC Ipk	108.254 mA	IC	Peak switch current in IC
9.	IC Pd	5.158 mW	IC	IC power dissipation
10.	IC Tj	85.766 degC	IC	IC junction temperature
11.	IC Tolerance	31.5 mV	IC	IC Feedback Tolerance

#	Name	Value	Category	Description
12.	ICThetaJA	195.0 degC/W	IC	IC junction-to-ambient thermal resistance
13.	Iin Avg	96.846 mA	IC	Average input current
14.	L Ipp	23.526 mA	Inductor	Peak-to-peak inductor ripple current
15.	L Pd	2.742 mW	Inductor	Inductor power dissipation
16.	M Irms	67.143 mA	Mosfet	MOSFET RMS ripple current
17.	M Vds Act	18.325 mV	Mosfet	
18.	Cin Pd	526.55 nW	Power	Input capacitor power dissipation
19.	Cout Pd	10.895 µW	Power	Output capacitor power dissipation
20.	Diode Pd	6.954 mW	Power	Diode power dissipation
21.	IC Pd	5.158 mW	Power	IC power dissipation
22.	L Pd	2.742 mW	Power	Inductor power dissipation
23.	Total Pd	15.538 mW	Power	Total Power Dissipation
24.	Cross Freq	21.941 kHz	System Information	Bode plot crossover frequency
25.	Duty Cycle	48.182 %	System Information	Duty cycle
26.	Efficiency	94.652 %	System Information	Steady state efficiency
27.	FootPrint	124.0 mm^2	System Information	Total Foot Print Area of BOM components
28.	Frequency	1.25 MHz	System Information	Switching frequency
29.	Iout	50.0 mA	System Information	Iout operating point
30.	Mode	CCM	System Information	Conduction Mode
31.	Phase Marg	51.664 deg	System Information	Bode Plot Phase Margin
32.	Pout	275.0 mW	System Information	Total output power
33.	Vin	3.0 V	System Information	Vin operating point
34.	Vout Actual	5.559 V	System Information	Vout Actual calculated based on selected voltage divider resistors
35.	Vout Tolerance	2.659 %	System Information	Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
36.	Vout p-p	109.139 µV	System Information	Peak-to-peak output ripple voltage

Design Inputs

Name	Value	Description
Iout	50.0 m	Maximum Output Current
VinMax	3.7	Maximum input voltage
VinMin	3.0	Minimum input voltage
Vout	5.5	Output Voltage
base_pn	LM2698	Base Product Number
source	DC	Input Source Type
Ta	85.0	Ambient temperature

WEBENCH® Assembly

Component Testing

Some published data on components in datasheets such as Capacitor ESR and Inductor DC resistance is based on conservative values that will guarantee that the components always exceed the specification. For design purposes it is usually better to work with typical values. Since this data is not always available it is a good practice to measure the Capacitance and ESR values of Cin and Cout, and the inductance and DC resistance of L1 before assembly of the board. Any large discrepancies in values should be electrically simulated in WEBENCH to check for instabilities and thermally simulated in WebTHERM to make sure critical temperatures are not exceeded.

Soldering Component to Board

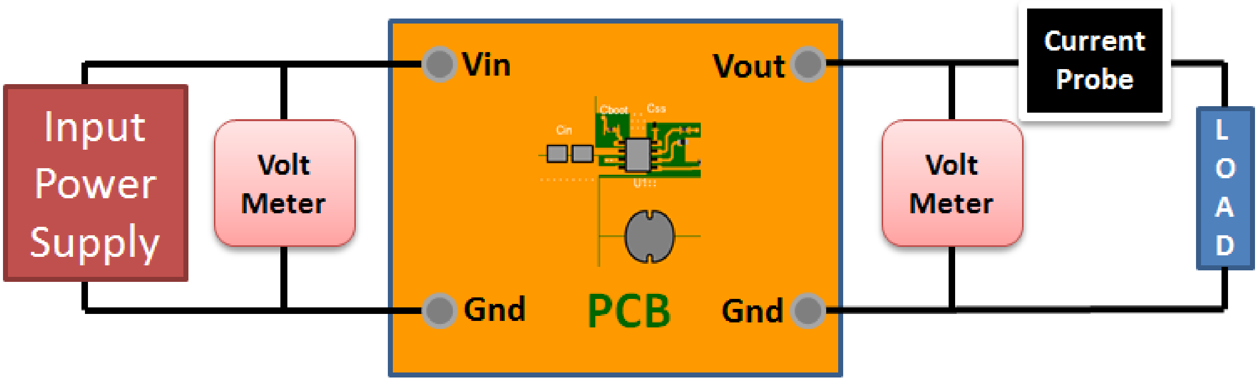
If board assembly is done in house it is best to tack down one terminal of a component on the board then solder the other terminal. For surface mount parts with large tabs, such as the DPAK, the tab on the back of the package should be pre-tinned with solder, then tacked into place by one of the pins. To solder the tab town to the board place the iron down on the board while resting against the tab, heating both surfaces simultaneously. Apply light pressure to the top of the plastic case until the solder flows around the part and the part is flush with the PCB. If the solder is not flowing around the board you may need a higher wattage iron (generally 25W to 30W is enough).

Initial Startup of Circuit

It is best to initially power up the board by setting the input supply voltage to the lowest operating input voltage 3.0V and set the input supply's current limit to zero. With the input supply off connect up the input supply to Vin and GND. Connect a digital volt meter and a load if needed to set the minimum Iout of the design from Vout and GND. Turn on the input supply and slowly turn up the current limit on the input supply. If the voltage starts to rise on the input supply continue increasing the input supply current limit while watching the output voltage. If the current increases on the input supply, but the voltage remains near zero, then there may be a short or a component misplaced on the board. Power down the board and visually inspect for solder bridges and recheck the diode and capacitor polarities. Once the power supply circuit is operational then more extensive testing may include full load testing, transient load and line tests to compare with simulation results.

Load Testing

The setup is the same as the initial startup, except that an additional digital voltmeter is connected between Vin and GND, a load is connected between Vout and GND and a current meter is connected in series between Vout and the load. The load must be able to handle at least rated output power + 50% (7.5 watts for this design). Ideally the load is supplied in the form of a variable load test unit. It can also be done in the form of suitably large power resistors. When using an oscilloscope to measure waveforms on the prototype board, the ground leads of the oscilloscope probes should be as short as possible and the area of the loop formed by the ground lead should be kept to a minimum. This will help reduce ground lead inductance and eliminate EMI noise that is not actually present in the circuit.



Design Assistance

1. Master key : 202DDE02F07E0483[v1]

2. **LM2698** Product Folder : http://www.ti.com/product/LM2698 : contains the data sheet and other resources.

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