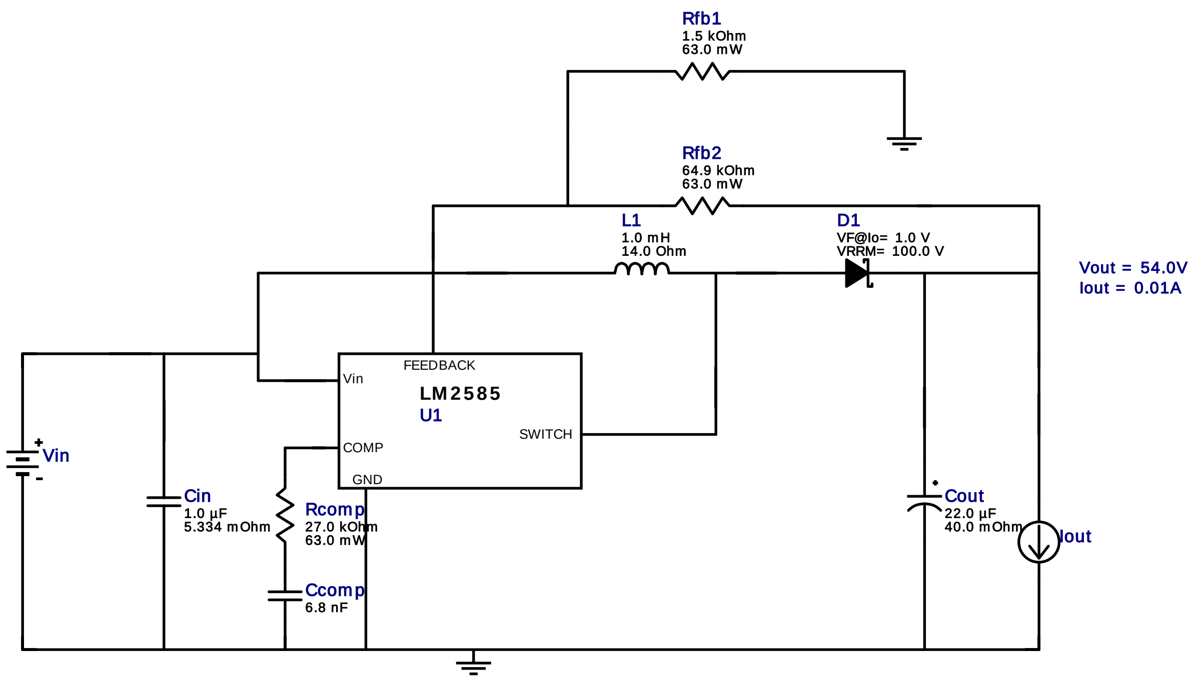
TEXAS INSTRUMENTS

WEBENCH ® Design Report

VinMin = 18.0V
VinMax = 26.0V
Vout = 54.0V
Iout = 0.01A

Device = LM2585S-ADJ/NOPB
Topology = Boost
Created = 2025-01-02 18:34:23.845
BOM Cost = NA
BOM Count = 9
Total Pd = 0.11W

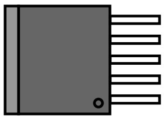
Design : 115 LM2585S-ADJ/NOPB
LM2585S-ADJ/NOPB 18V-26V to 54.00V @ 0.01A

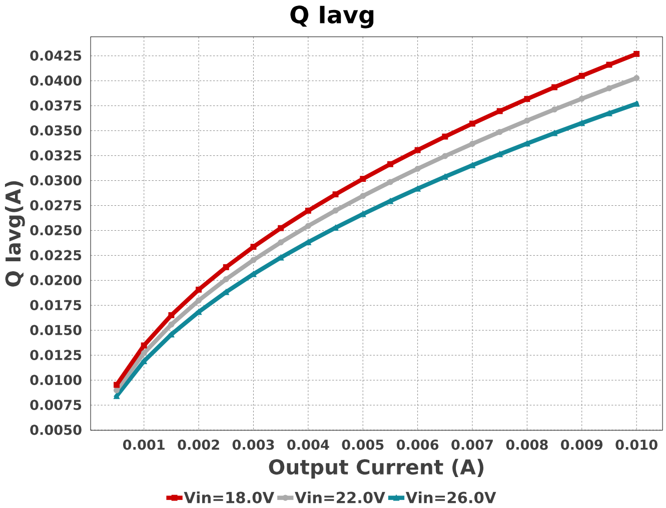


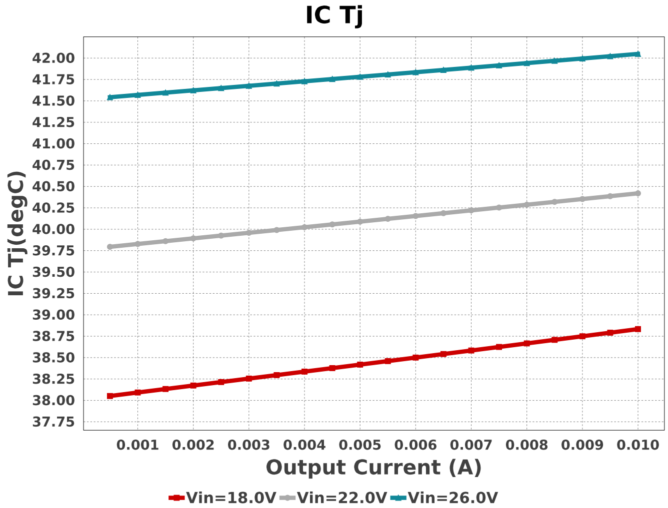
Electrical BOM

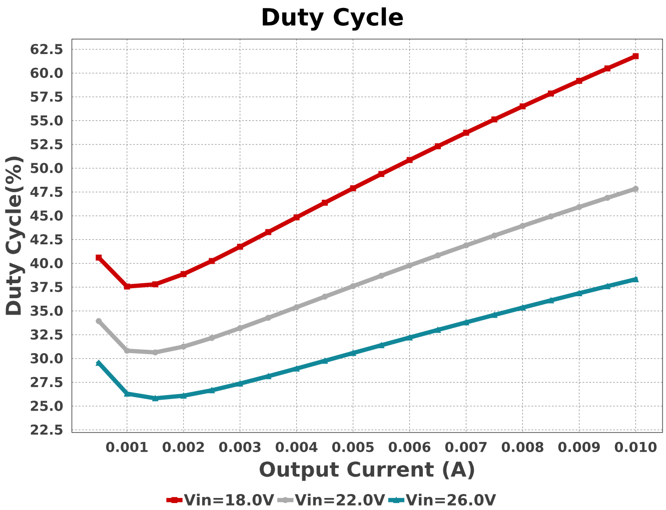
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Ccomp	TDK	C2012C0G1H682J060AA Series= C0G/NP0	Cap= 6.8 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.04	0805 7 mm²
Cin	MuRata	GRM31CR72A105KA01L Series= X7R	Cap= 1.0 uF ESR= 5.334 mOhm VDC= 100.0 V IRMS= 1.55432 A	1	$0.11	1206_190 11 mm²
Cout	CUSTOM	CUSTOM Series= MZA	Cap= 22.0 uF ESR= 40.0 mOhm VDC= 80.0 V IRMS= 60.0 mA	1	NA	CAPSMT_62_F80 0 mm²
D1	Comchip Technology	CDBW46-G	VF@Io= 1.0 V VRRM= 100.0 V	1	$0.04	SOD-123 13 mm²
L1	Bourns	SDR0403-102KL	L= 1.0 mH 14.0 Ohm	1	$0.27	SDR0403 28 mm²
Rcomp	CUSTOM	CUSTOM Series= CRCW..e3	Res= 27.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	NA	0402 0 mm²
Rfb1	Vishay-Dale	CRCW04021K50FKED Series= CRCW..e3	Res= 1.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
Rfb2	Vishay-Dale	CRCW040264K9FKED Series= CRCW..e3	Res= 64.9 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²

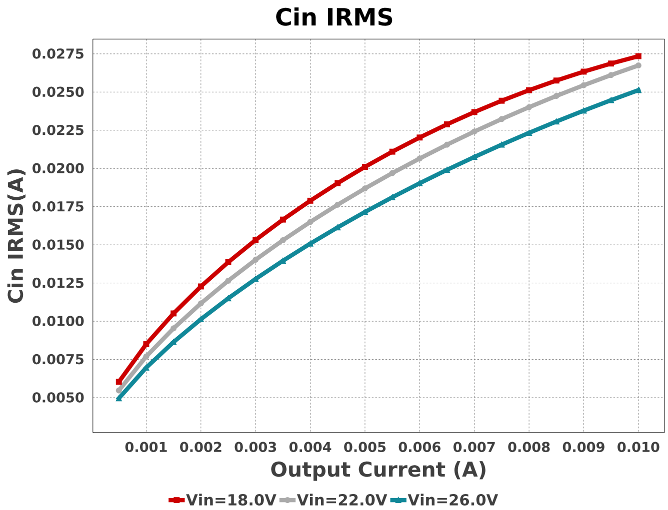
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
U1	Texas Instruments	LM2585S-ADJ/NOPB	Switcher	1	$4.13	TS5B 199 mm^2

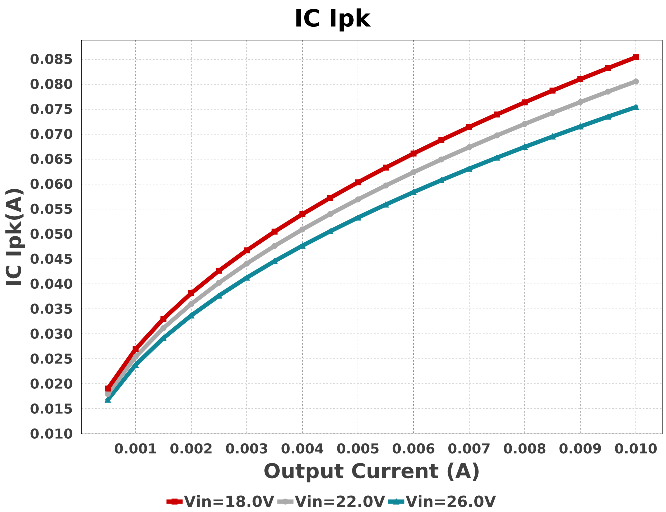


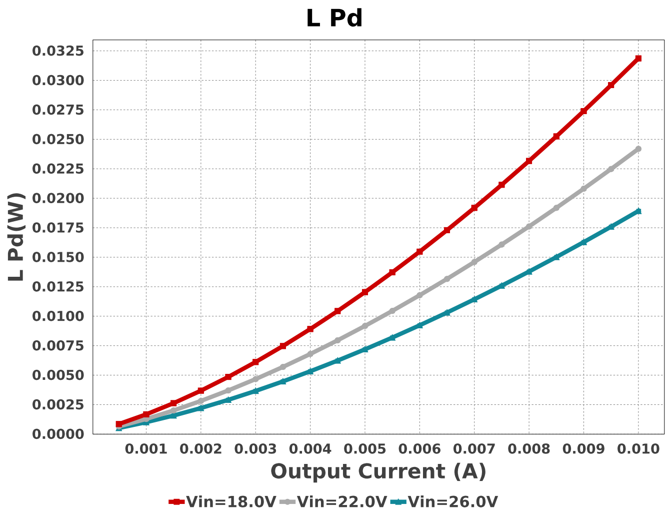




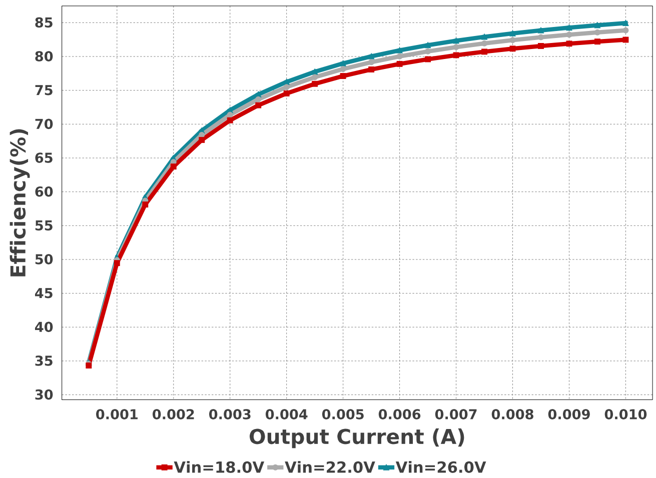




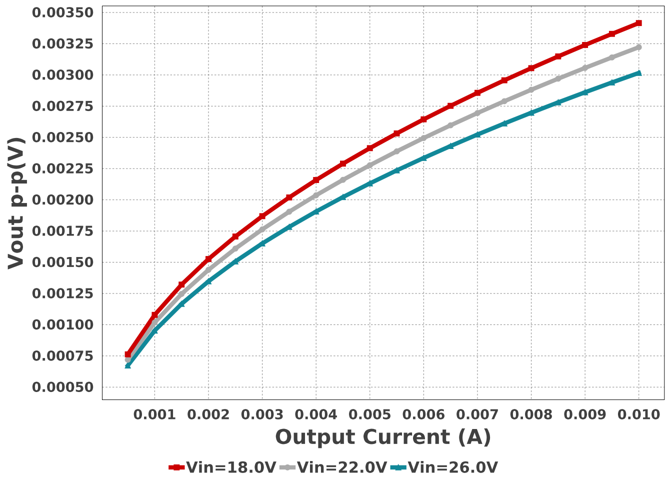




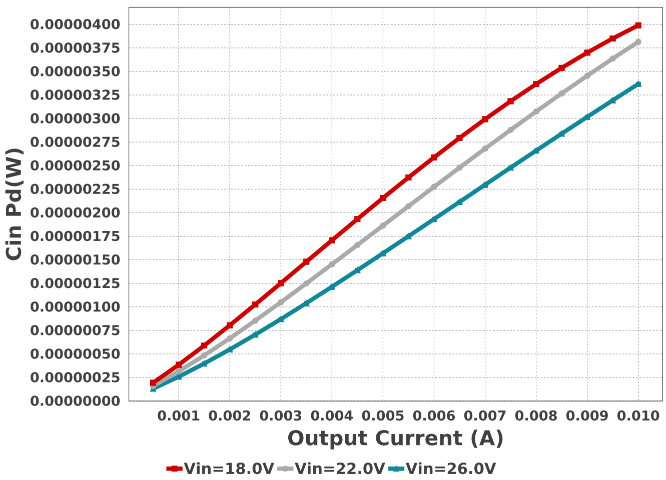
Efficiency



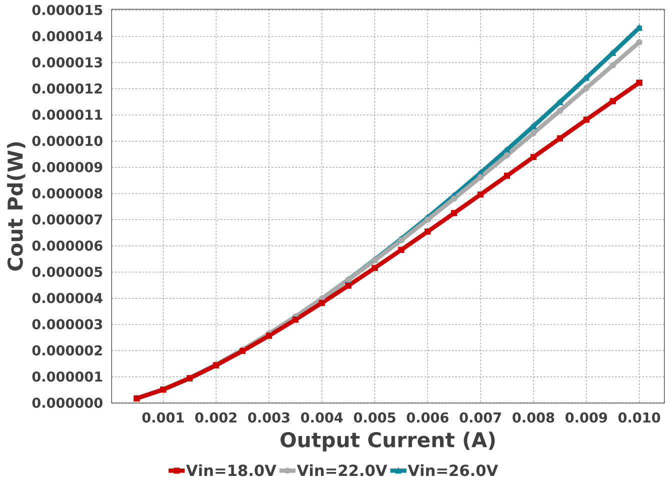
Vout p-p



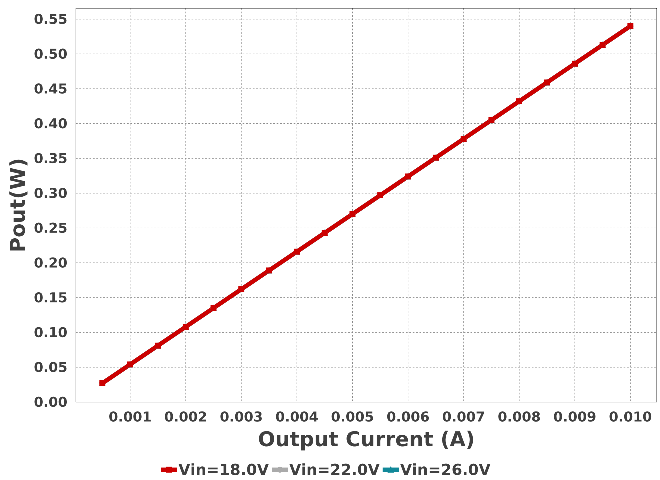
Cin Pd



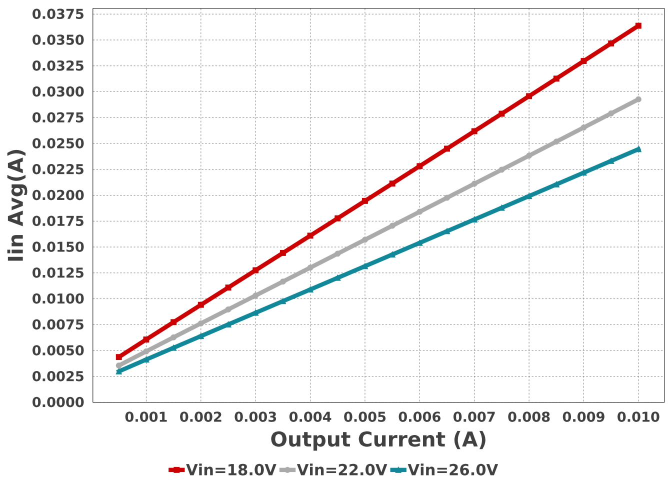
Cout Pd

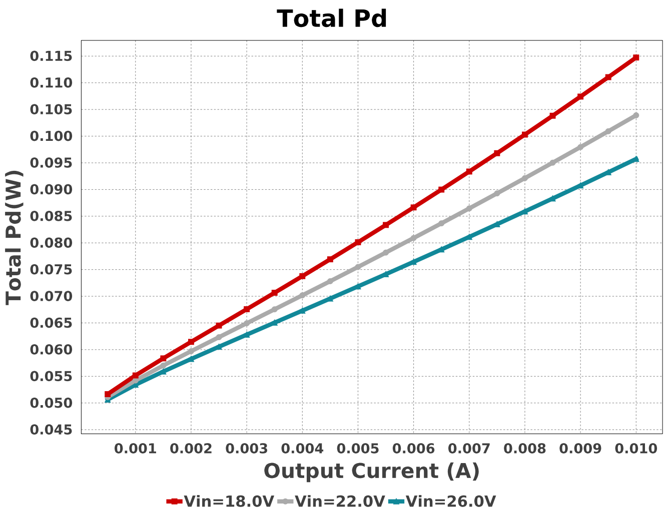


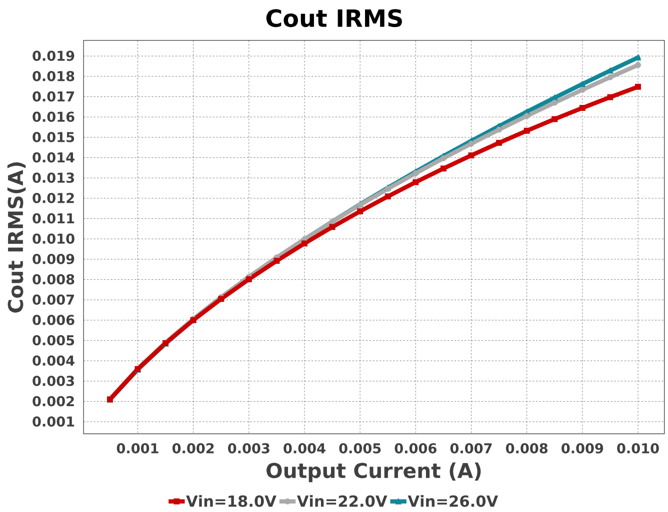
Pout

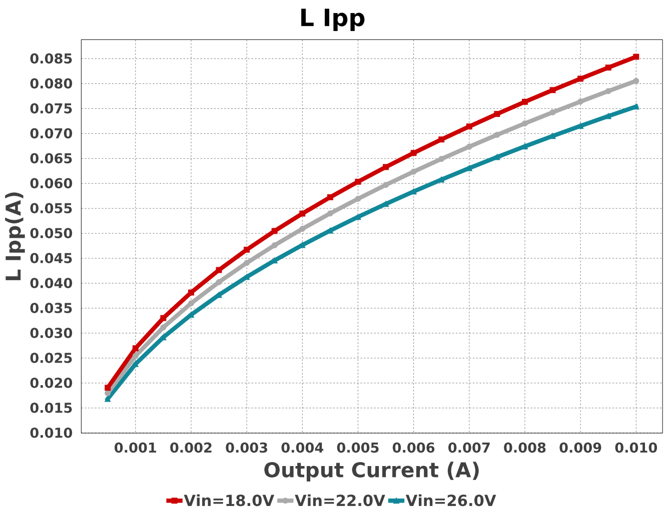


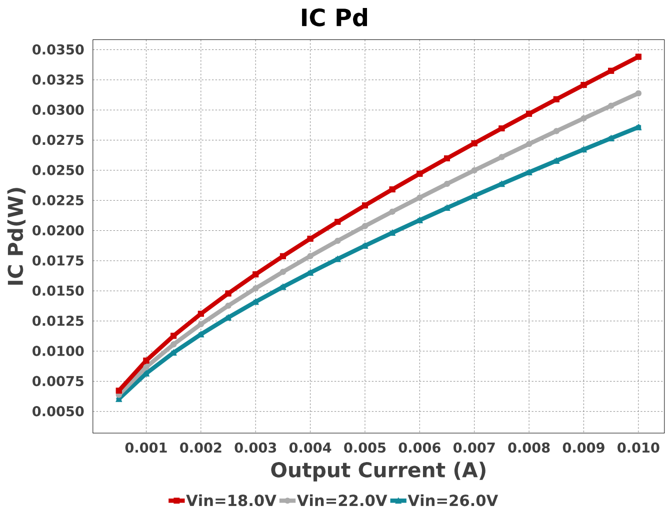
Iin Avg

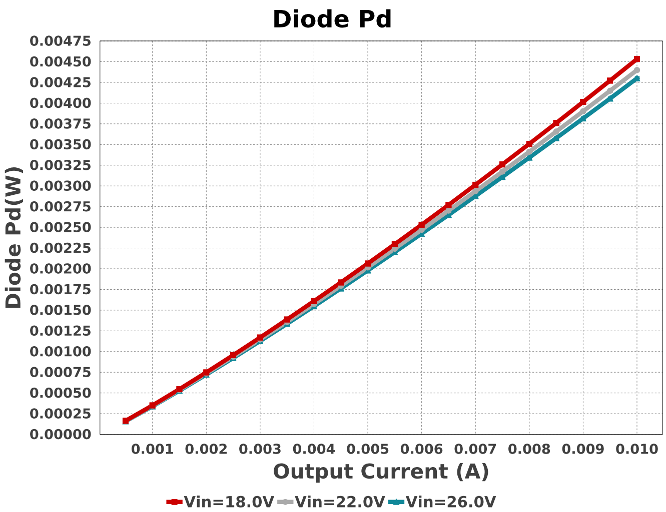


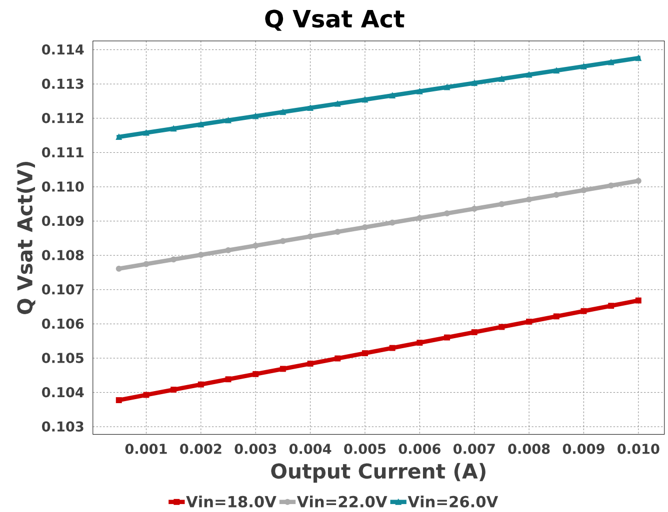

Total Pd
Total Pd(W)
0.115 0.110 0.105 0.100 0.095 0.090 0.085 0.080 0.075 0.070 0.065 0.060 0.055 0.050 0.045
0.001 0.002 0.003 0.004 0.005 0.006 0.007 0.008 0.009 0.010
Output Current (A)
Vin=18.0V Vin=22.0V Vin=26.0V

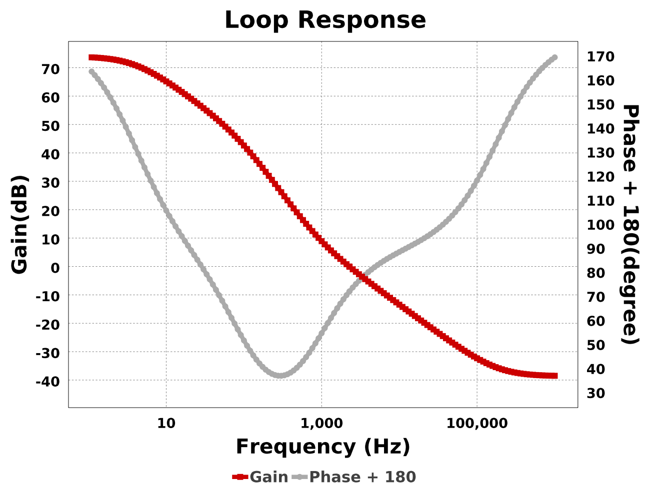

Cout IRMS
Cout IRMS(A)
0.019 0.018 0.017 0.016 0.015 0.014 0.013 0.012 0.011 0.010 0.009 0.008 0.007 0.006 0.005 0.004 0.003 0.002 0.001
0.001 0.002 0.003 0.004 0.005 0.006 0.007 0.008 0.009 0.010
Output Current (A)
Vin=18.0V Vin=22.0V Vin=26.0V


L Ipp
L Ipp(A)
0.085 0.080 0.075 0.070 0.065 0.060 0.055 0.050 0.045 0.040 0.035 0.030 0.025 0.020 0.015 0.010
0.001 0.002 0.003 0.004 0.005 0.006 0.007 0.008 0.009 0.010
Output Current (A)
Vin=18.0V Vin=22.0V Vin=26.0V


IC Pd
IC Pd(W)
0.0350 0.0325 0.0300 0.0275 0.0250 0.0225 0.0200 0.0175 0.0150 0.0125 0.0100 0.0075 0.0050
0.001 0.002 0.003 0.004 0.005 0.006 0.007 0.008 0.009 0.010
Output Current (A)
Vin=18.0V Vin=22.0V Vin=26.0V


Diode Pd
Diode Pd(W)
0.00475 0.00450 0.00425 0.00400 0.00375 0.00350 0.00325 0.00300 0.00275 0.00250 0.00225 0.00200 0.00175 0.00150 0.00125 0.00100 0.00075 0.00050 0.00025 0.00000
0.001 0.002 0.003 0.004 0.005 0.006 0.007 0.008 0.009 0.010
Output Current (A)
Vin=18.0V Vin=22.0V Vin=26.0V


Q Vsat Act
Q Vsat Act(V)
0.114 0.113 0.112 0.111 0.110 0.109 0.108 0.107 0.106 0.105 0.104 0.103
0.001 0.002 0.003 0.004 0.005 0.006 0.007 0.008 0.009 0.010
Output Current (A)
Vin=18.0V Vin=22.0V Vin=26.0V



Operating Values

#	Name	Value	Category	Description
1.	BOM Count	9		Total Design BOM count
2.	Total BOM	NA		Total BOM Cost
3.	Cin IRMS	27.348 mA	Capacitor	Input capacitor RMS ripple current
4.	Cin Pd	3.989 µW	Capacitor	Input capacitor power dissipation
5.	Cout IRMS	17.486 mA	Capacitor	Output capacitor RMS ripple current
6.	Cout Pd	12.231 µW	Capacitor	Output capacitor power dissipation
7.	Diode Pd	4.532 mW	Diode	Diode power dissipation
8.	IC Ipk	85.385 mA	IC	Peak switch current in IC
9.	IC Pd	34.413 mW	IC	IC power dissipation
10.	IC Tj	38.833 degC	IC	IC junction temperature
11.	IC Tolerance	0.0 V	IC	IC Feedback Tolerance
12.	ICThetaJA	40.0 degC/W	IC	IC junction-to-ambient thermal resistance
13.	Iin Avg	36.374 mA	IC	Average input current
14.	L Ipp	85.385 mA	Inductor	Peak-to-peak inductor ripple current
15.	L Pd	31.862 mW	Inductor	Inductor power dissipation
16.	Q Iavg	42.693 mA	Mosfet	Q Iavg
17.	Cin Pd	3.989 µW	Power	Input capacitor power dissipation
18.	Cout Pd	12.231 µW	Power	Output capacitor power dissipation
19.	Diode Pd	4.532 mW	Power	Diode power dissipation
20.	IC Pd	34.413 mW	Power	IC power dissipation
21.	L Pd	31.862 mW	Power	Inductor power dissipation
22.	Total Pd	114.735 mW	Power	Total Power Dissipation
23.	Cross Freq	1.536 kHz	System Information	Bode plot crossover frequency
24.	Duty Cycle	61.777 %	System Information	Duty cycle
25.	Efficiency	82.476 %	System Information	Steady state efficiency
26.	FootPrint	340.0 mm^2	System Information	Total Foot Print Area of BOM components
27.	Frequency	100.0 kHz	System Information	Switching frequency
28.	Gain Marg	-42.615 dB	System Information	Bode Plot Gain Margin
29.	Iout	10.0 mA	System Information	Iout operating point
30.	Low Freq Gain	70.921 dB	System Information	Gain at 1Hz
31.	Mode	DCM	System Information	Conduction Mode
32.	Phase Marg	64.664 deg	System Information	Bode Plot Phase Margin
33.	Pout	540.0 mW	System Information	Total output power
34.	Vin	18.0 V	System Information	Vin operating point
35.	Vout Actual	54.448 V	System Information	Vout Actual calculated based on selected voltage divider resistors
36.	Vout Tolerance	1.975 %	System Information	Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
37.	Vout p-p	3.415 mV	System Information	Peak-to-peak output ripple voltage

#	Name	Value	Category	Description
38.	Q Vsat Act	106.683 mV	Transistor	Q Vsat

Design Inputs

Name	Value	Description
Iout	10.0 m	Maximum Output Current
VinMax	26.0	Maximum input voltage
VinMin	18.0	Minimum input voltage
VinTyp	24.0	Typical input voltage
Vout	54.0	Output Voltage
base_pn	LM2585	Base Product Number
source	DC	Input Source Type
Ta	30.0	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

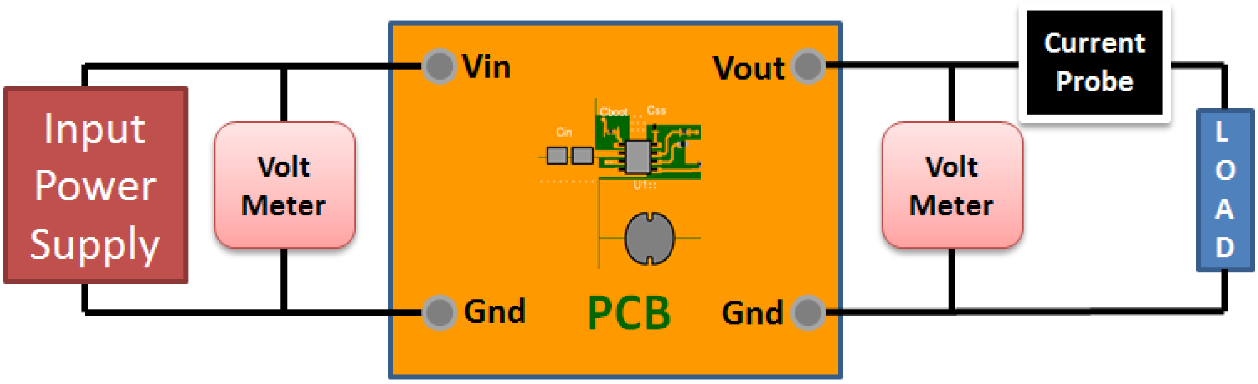
If board assembly is done in house it is best to tack down one terminal of a component on the board then solder the other terminal. For surface mount parts with large tabs, such as the DPAK, the tab on the back of the package should be pre-tinned with solder, then tacked into place by one of the pins. 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 18.0V 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 : AF34874385A8BFF3[v1]

2. **LM2585** Product Folder : http://www.ti.com/product/LM2585 : contains the data sheet and other resources.

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