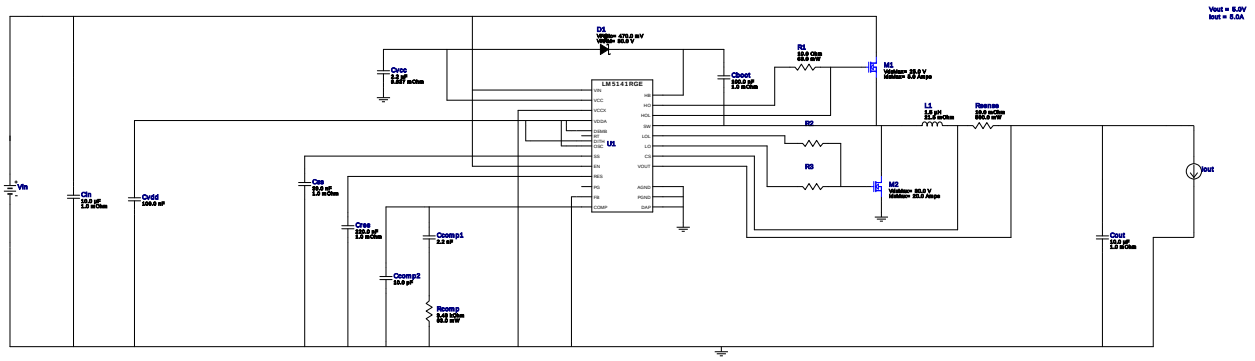
VinMin = 8.0V
VinMax = 18.0V
Vout = 5.0V
Iout = 5.0A

Device = LM5141RGER
Topology = Buck
Created = 2023-08-22 03:17:45.154
BOM Cost = $4.31
BOM Count = 17
Total Pd = 2.71W

WEBENCH® Design Report

Design : 8853 LM5141RGER
LM5141RGER 8V-18V to 5.00V @ 5A



1. Low side gate resistors, R2 and R3 in schematic are place holders (zero ohm resistors) and do not bear any values.

Design Alerts

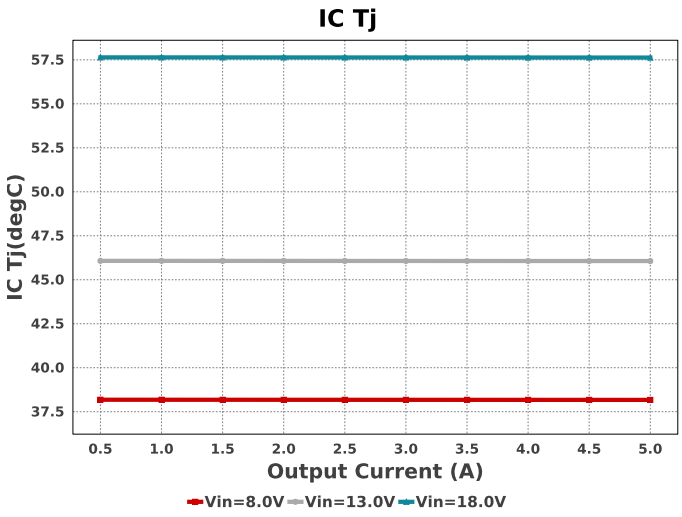
Component Selection Information

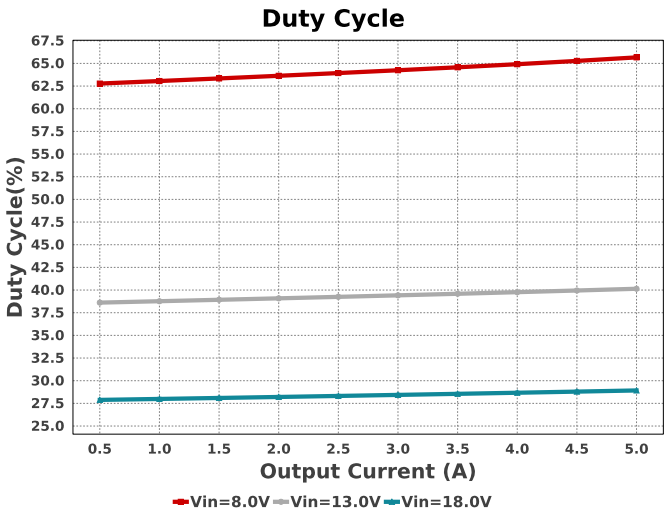
As light load performance of the device is not modelled for diode emulation mode, Efficiency and power disspiation charts are disabled for Iout les than 0.5A

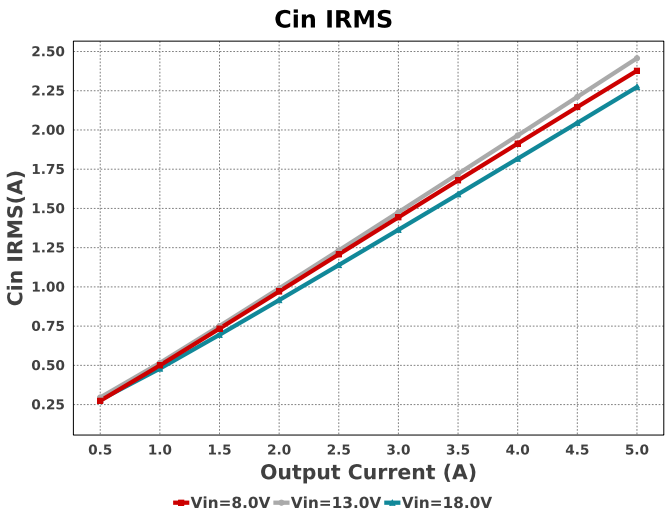
Electrical BOM

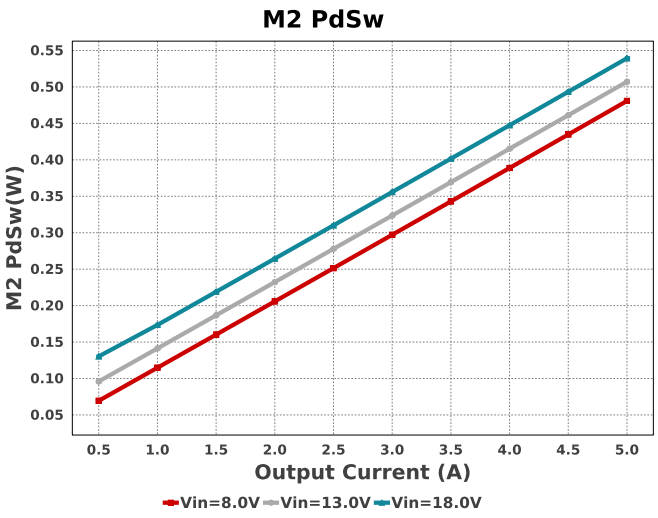
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Cboot	MuRata	GRM155R71A104KA01D Series= X7R	Cap= 100.0 nF ESR= 1.0 mOhm VDC= 10.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm^2
Ccomp1	Samsung Electro-Mechanics	CL21C222JBFNNNE Series= C0G/NP0	Cap= 2.2 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.02	0805 7 mm^2
Ccomp2	Kemet	C0805C100M4GACTU Series= C0G/NP0	Cap= 10.0 pF VDC= 16.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm^2
Cin	MuRata	GRM32ER71H106KA12L Series= X7R	Cap= 10.0 uF ESR= 1.0 mOhm VDC= 50.0 V IRMS= 6.0 A	1	$0.47	1210_270 15 mm^2
Cout	TDK	C3225X7R1H106M250AC Series= X7R	Cap= 10.0 uF ESR= 1.0 mOhm VDC= 50.0 V IRMS= 5.0 A	1	$0.27	1210 15 mm^2
Cres	MuRata	GRM155R71C224KA12D Series= X7R	Cap= 220.0 nF ESR= 1.0 mOhm VDC= 16.0 V IRMS= 0.0 A	1	$0.02	0402 3 mm^2
Css	MuRata	GRM188R71C393KA01D Series= X7R	Cap= 39.0 nF ESR= 1.0 mOhm VDC= 16.0 V IRMS= 0.0 A	1	$0.02	0603 5 mm^2
Cvcc	MuRata	GRM188C81A225KE34D Series= X6S	Cap= 2.2 uF ESR= 9.637 mOhm VDC= 10.0 V IRMS= 1.24659 A	1	$0.03	0603 5 mm^2
Cvdd	AVX	08053C104JAZ2A Series= X7R	Cap= 100.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.07	0805 7 mm^2

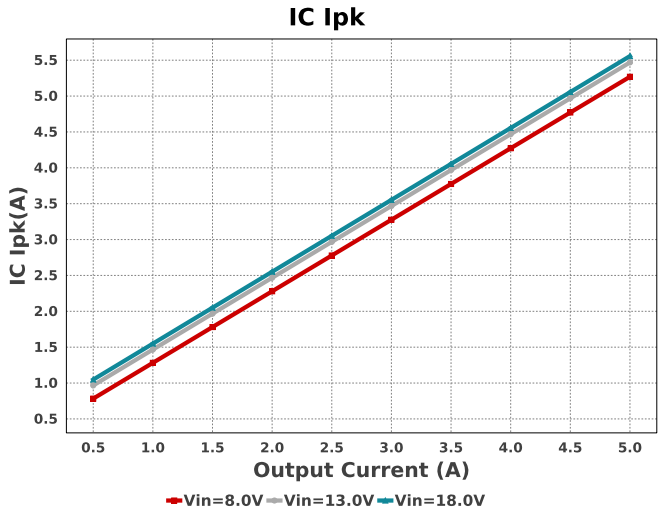
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
D1	Torex USA Corporation	XBS053V13R-G	VF@Io= 470.0 mV VRRM= 30.0 V	1	$0.15	SOD-323 9 mm²
L1	Coilcraft	XEL4020-152MEB	L= 1.5 µH 21.5 mOhm	1	$1.08	XEL4020 25 mm²
M1	Texas Instruments	CSD16301Q2	VdsMax= 25.0 V IdsMax= 5.0 Amps	1	$0.11	DQK0006C 9 mm²
M2	Texas Instruments	CSD17578Q3A	VdsMax= 30.0 V IdsMax= 20.0 Amps	1	$0.15	DNH0008A 18 mm²
R1	Vishay-Dale	CRCW040210R0FKED Series= CRCW..e3	Res= 10.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
Rcomp	Vishay-Dale	CRCW04023K48FKED Series= CRCW..e3	Res= 3.48 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
Rsense	Stackpole Electronics Inc	CSR1206FK10L0 Series= ?	Res= 10.0 mOhm Power= 500.0 mW Tolerance= 1.0%	1	$0.11	1206 11 mm²
U1	Texas Instruments	LM5141RGER	Switcher	1	$1.77	RGE0024J 25 mm²

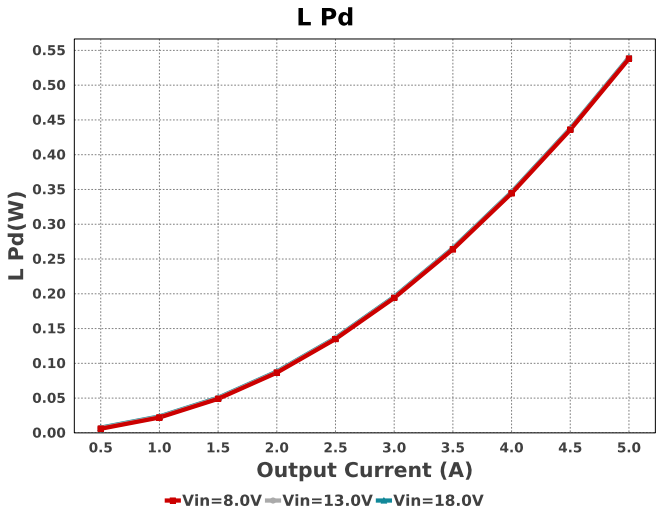


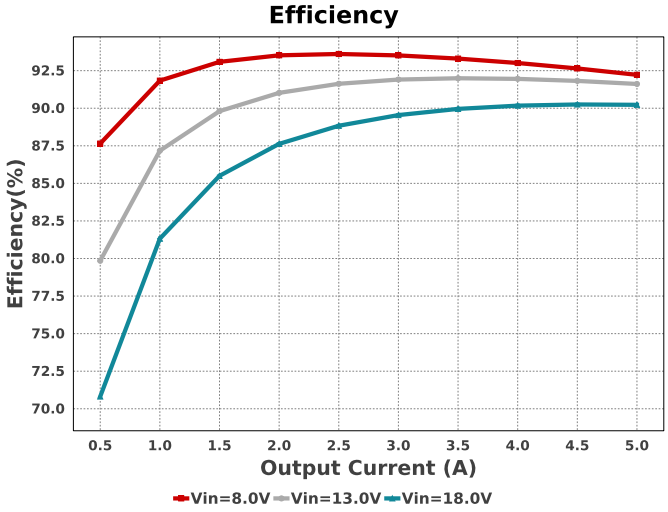


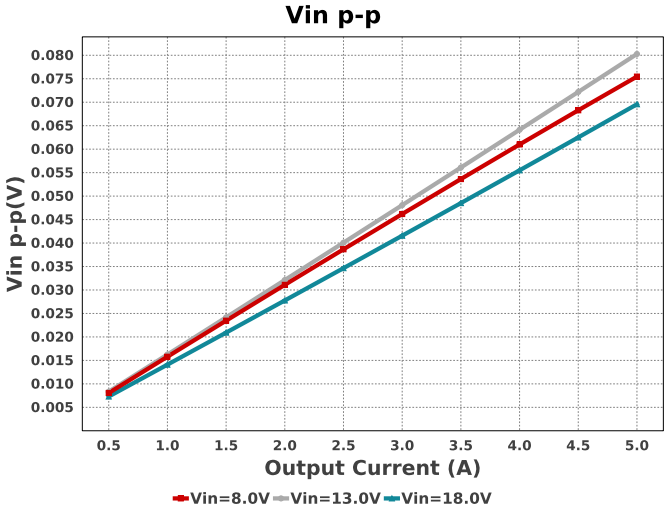


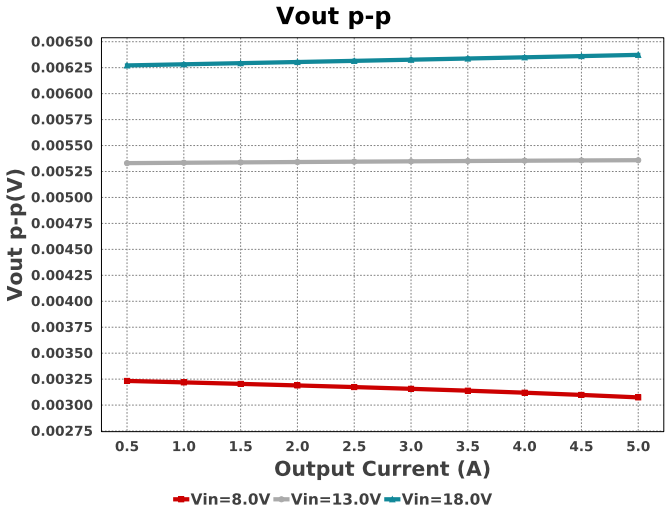


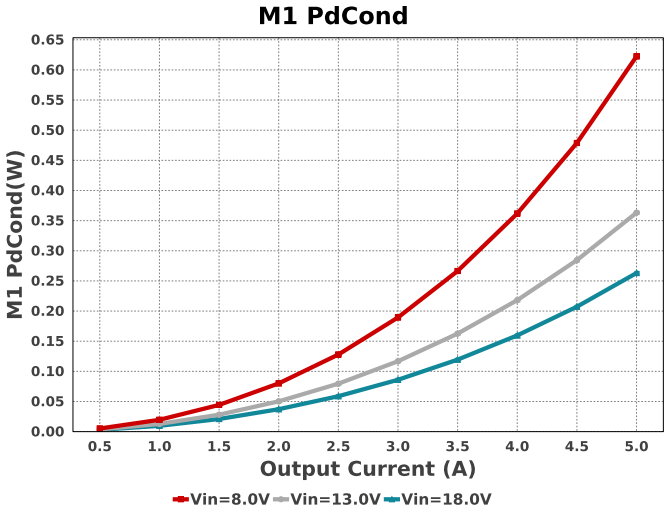


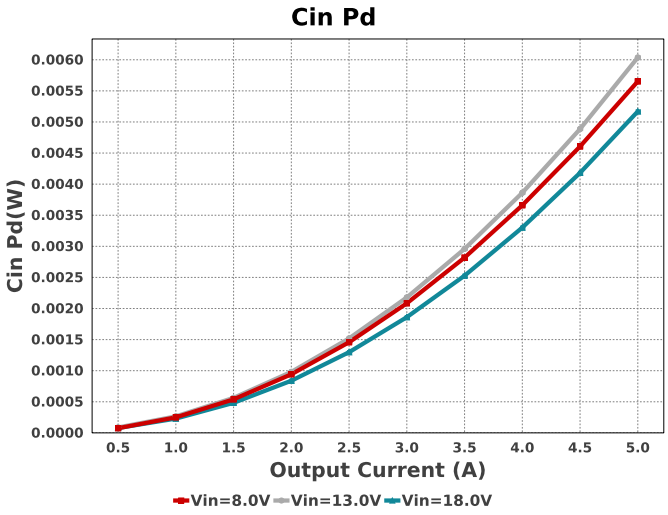


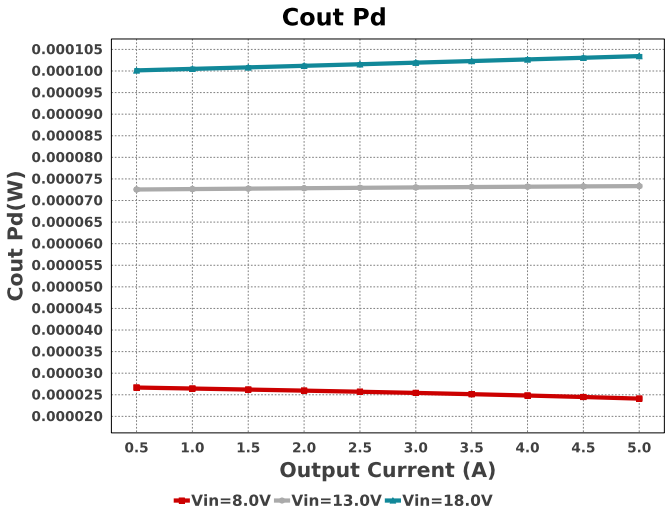


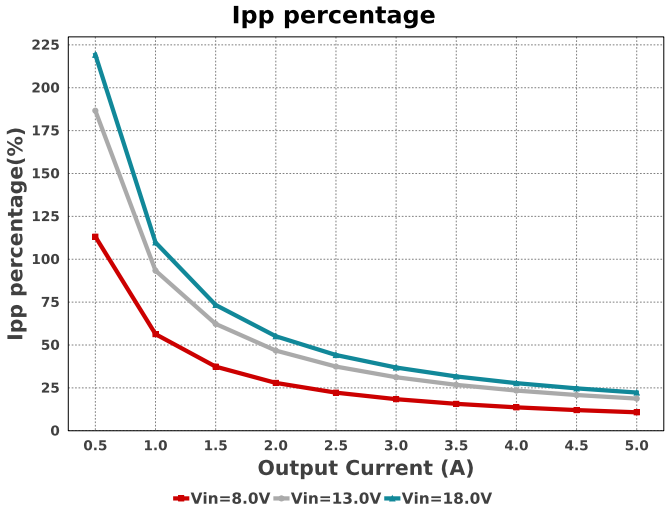


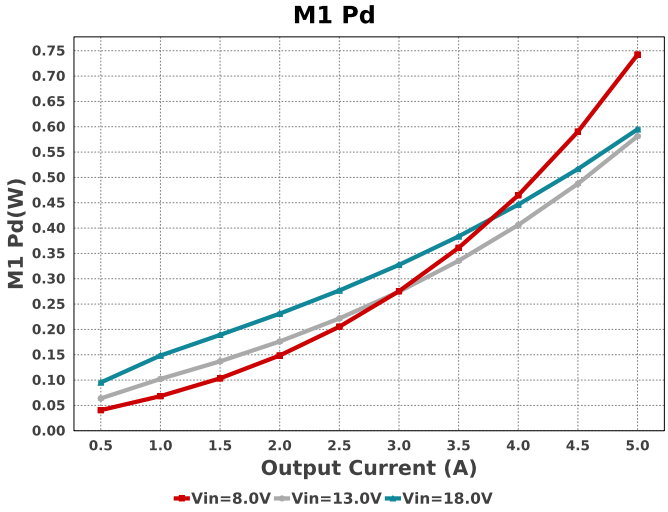


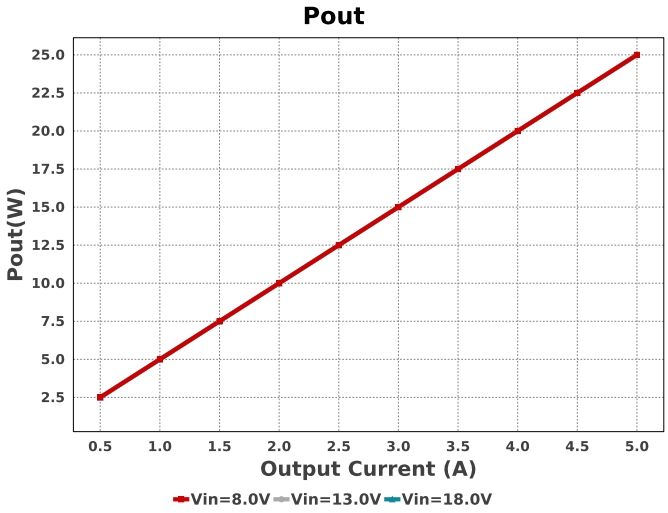


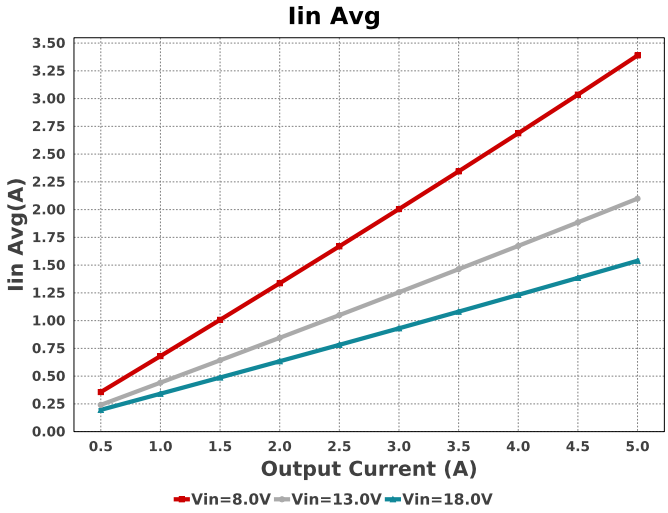


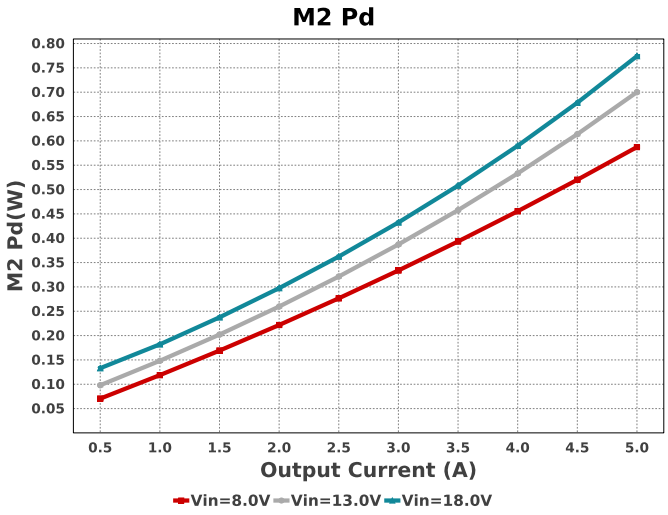


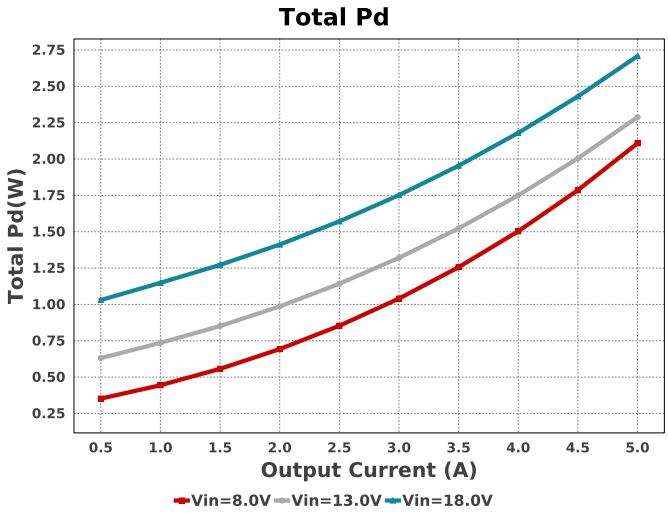


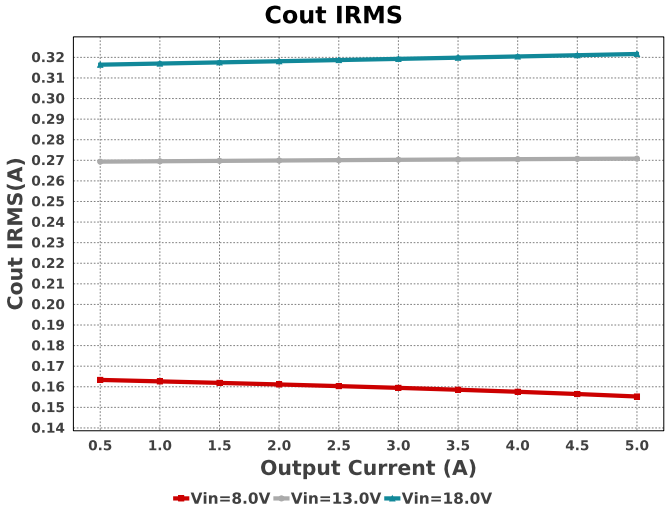


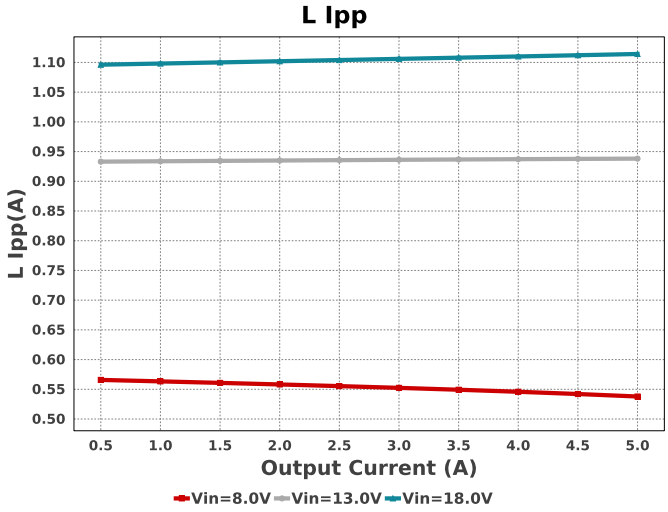


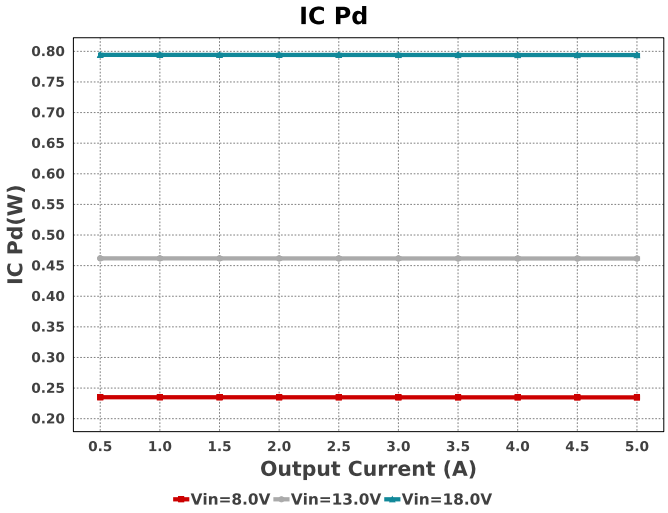


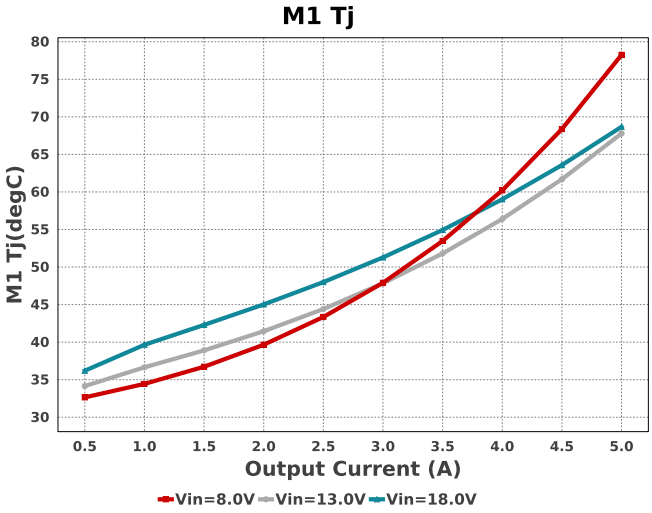


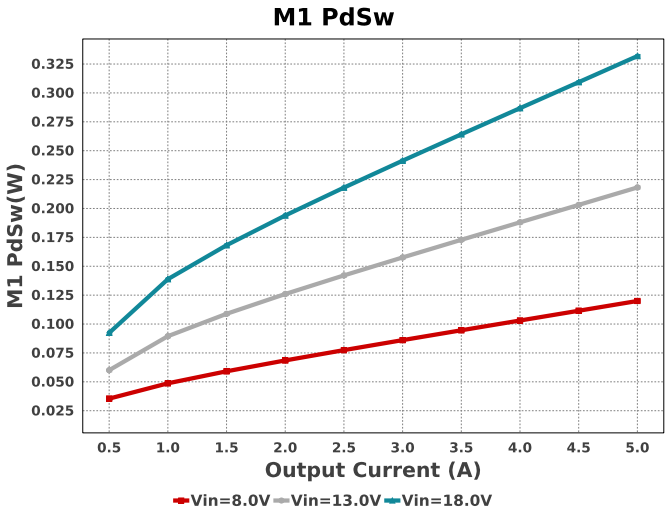


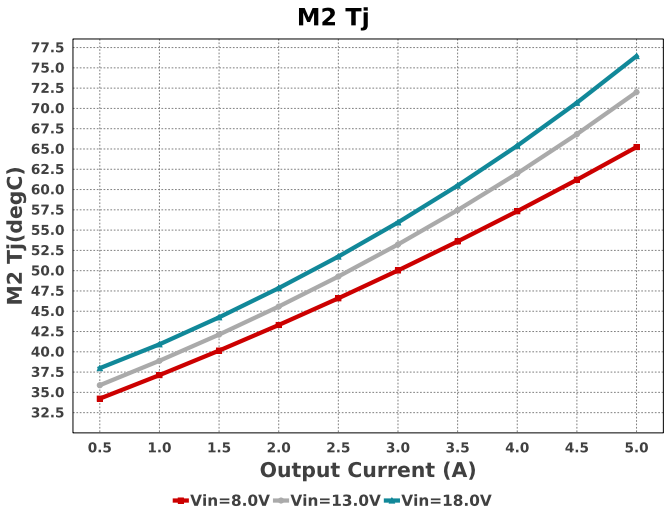


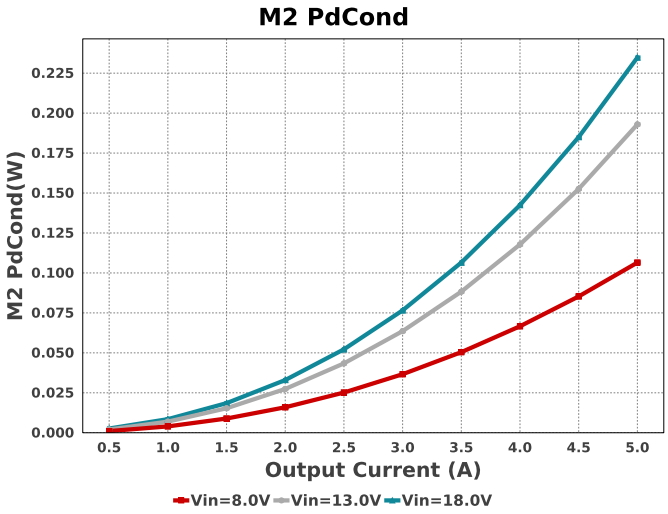


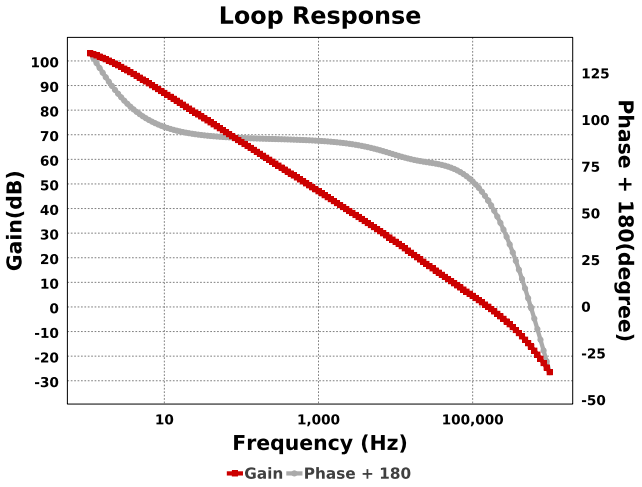












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	2.274 A	Capacitor	Input capacitor RMS ripple current
2.	Cin Pd	5.17 mW	Capacitor	Input capacitor power dissipation
3.	Cout IRMS	321.643 mA	Capacitor	Output capacitor RMS ripple current
4.	Cout Pd	103.45 µW	Capacitor	Output capacitor power dissipation
5.	IC Ipk	5.557 A	IC	Peak switch current in IC
6.	IC Pd	793.94 mW	IC	IC power dissipation
7.	IC Tj	53.818 degC	IC	IC junction temperature
8.	IC Tolerance	12.0 mV	IC	IC Feedback Tolerance
9.	ICThetaJA	30.0 degC/W	IC	IC junction-to-ambient thermal resistance
10.	Iin Avg	1.539 A	IC	Average input current
11.	Ipp percentage	22.284 %	Inductor	Inductor ripple current percentage (with respect to average inductor current)
12.	L Ipp	1.114 A	Inductor	Peak-to-peak inductor ripple current
13.	L Pd	539.72 mW	Inductor	Inductor power dissipation
14.	M1 Pd	594.96 mW	Mosfet	M1 MOSFET total power dissipation
15.	M1 PdCond	263.09 mW	Mosfet	M1 MOSFET conduction losses
16.	M1 PdSw	331.86 mW	Mosfet	M1 MOSFET switching losses
17.	M1 Tj	68.672 degC	Mosfet	M1 MOSFET junction temperature
18.	M2 Pd	774.14 mW	Mosfet	M2 MOSFET total power dissipation
19.	M2 PdCond	234.78 mW	Mosfet	M2 MOSFET conduction losses
20.	M2 PdSw	539.35 mW	Mosfet	M2 MOSFET switching losses
21.	M2 Tj	76.448 degC	Mosfet	M2 MOSFET junction temperature
22.	Cin Pd	5.17 mW	Power	Input capacitor power dissipation
23.	Cout Pd	103.45 µW	Power	Output capacitor power dissipation
24.	IC Pd	793.94 mW	Power	IC power dissipation
25.	L Pd	539.72 mW	Power	Inductor power dissipation
26.	M1 Pd	594.96 mW	Power	M1 MOSFET total power dissipation
27.	M1 PdCond	263.09 mW	Power	M1 MOSFET conduction losses
28.	M1 PdSw	331.86 mW	Power	M1 MOSFET switching losses
29.	M2 Pd	774.14 mW	Power	M2 MOSFET total power dissipation
30.	M2 PdCond	234.78 mW	Power	M2 MOSFET conduction losses
31.	M2 PdSw	539.35 mW	Power	M2 MOSFET switching losses

#	Name	Value	Category	Description
32.	Total Pd	2.708 W	Power	Total Power Dissipation
33.	BOM Count	17	System Information	Total Design BOM count
34.	Cross Freq	159.462 kHz	System Information	Bode plot crossover frequency
35.	Duty Cycle	28.926 %	System Information	Duty cycle
36.	Efficiency	90.227 %	System Information	Steady state efficiency
37.	FootPrint	168.0 mm^2	System Information	Total Foot Print Area of BOM components
38.	Frequency	2.2 MHz	System Information	Switching frequency
39.	Gain Marg	-16.032 dB	System Information	Bode Plot Gain Margin
40.	Iout	5.0 A	System Information	Iout operating point
41.	Low Freq Gain	103.093 dB	System Information	Gain at 1Hz
42.	Mode	FCCM	System Information	Conduction Mode
43.	Phase Marg	56.913 deg	System Information	Bode Plot Phase Margin
44.	Pout	25.0 W	System Information	Total output power
45.	Total BOM	$4.31	System Information	Total BOM Cost
46.	Vin	18.0 V	System Information	Vin operating point
47.	Vin p-p	69.527 mV	System Information	Peak-to-peak input voltage
48.	Vout	5.0 V	System Information	Operational Output Voltage
49.	Vout Tolerance	240.0 m%	System Information	Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
50.	Vout p-p	6.373 mV	System Information	Peak-to-peak output ripple voltage

Design Inputs

Name	Value	Description
Iout	5.0	Maximum Output Current
VinMax	18.0	Maximum input voltage
VinMin	8.0	Minimum input voltage
Vout	5.0	Output Voltage
base_pn	LM5141	Base Product Number
source	DC	Input Source Type
Ta	30.0	Ambient temperature

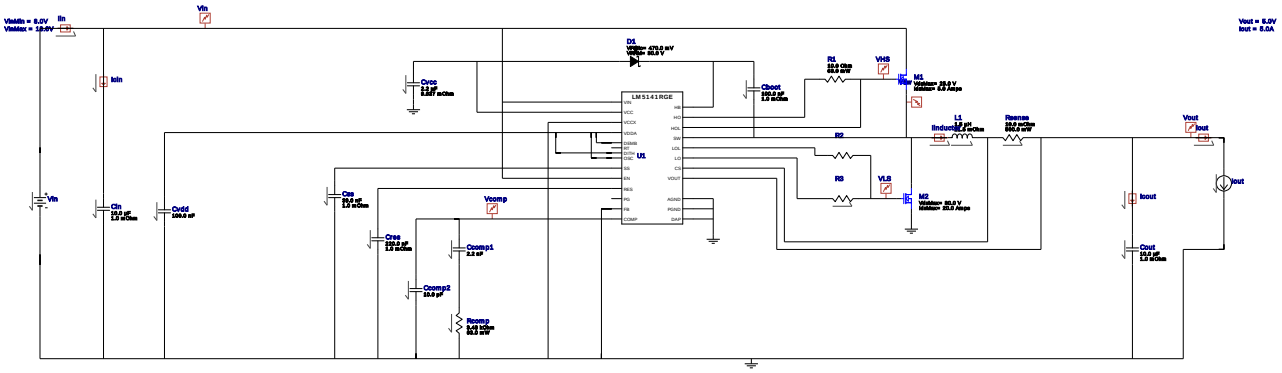
WEBENCH® Assembly

WEBENCH® Electrical Simulation Report

Design Id = 8853

sim_id = 1

Simulation Type = Steady State



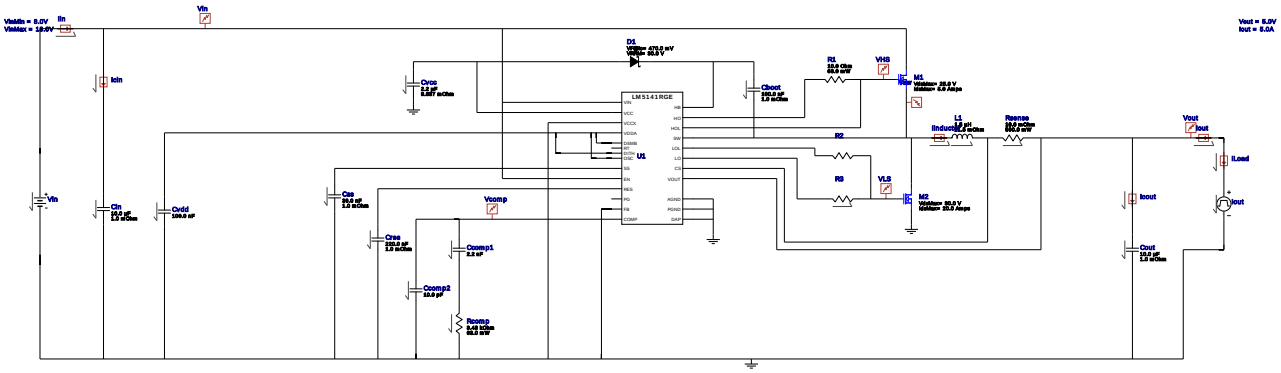
Simulation Parameters

#	Name	Parameter Name	Description	Values
1.	Iout	I	Load Current	5.0 A

Design Id = 8853

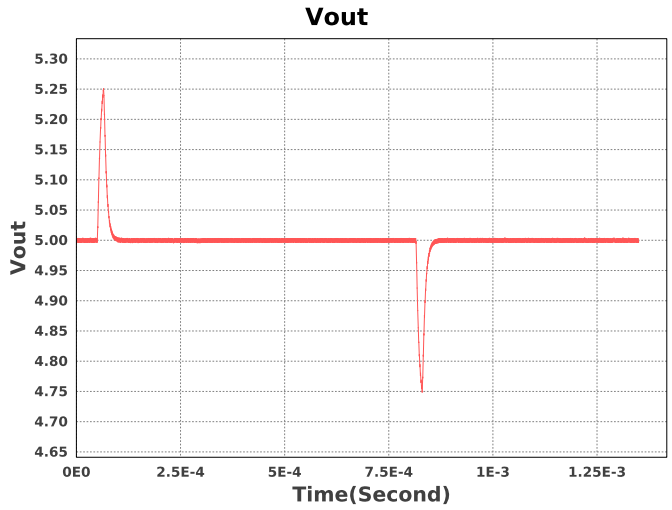
sim_id = 2

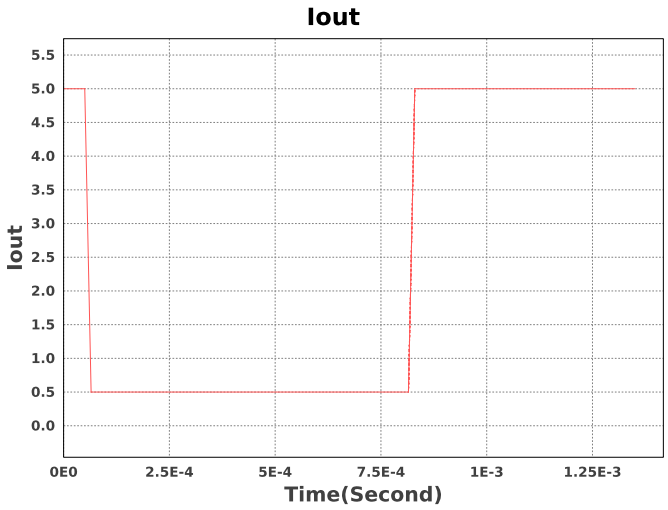
Simulation Type = Load Transient



Simulation Parameters

#	Name	Parameter Name	Description	Values
1.	Iout	signal_type	Signal Type	PULSE
		I1	Initial Load Current	5.0 A
		I2	Minimum Load Current	0.5 A
		Td	Initial Time Delay	5.0E-5 s
		Tf	Fall Time	15u s
		Tr	Rise Time	15u s
		Pw	Pulse Width	7.5E-4 s





Design Assistance

1. Master key : AE3011FD2EE8F4EB[v1]
2. **LM5141** Product Folder : http://www.ti.com/product/LM5141 : contains the data sheet and other resources.