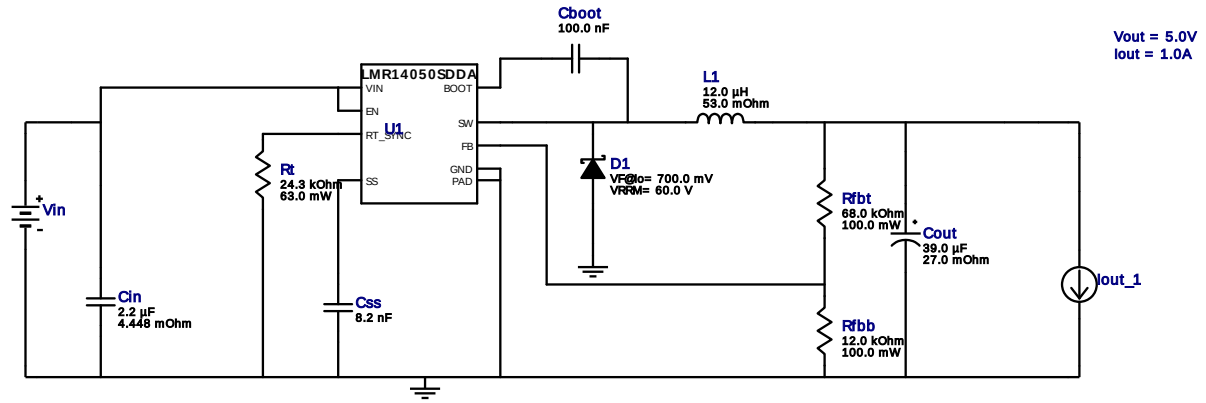
WEBENCH® Design Report

VinMin = 30.0V
VinMax = 37.0V
Vout = 5.0V
Iout = 1.0A

Device = LMR14050SDDAR
Topology = Buck
Created = 7/16/16 1:41:17 AM
BOM Cost = $2.70
BOM Count = 10
Total Pd = 0.99W

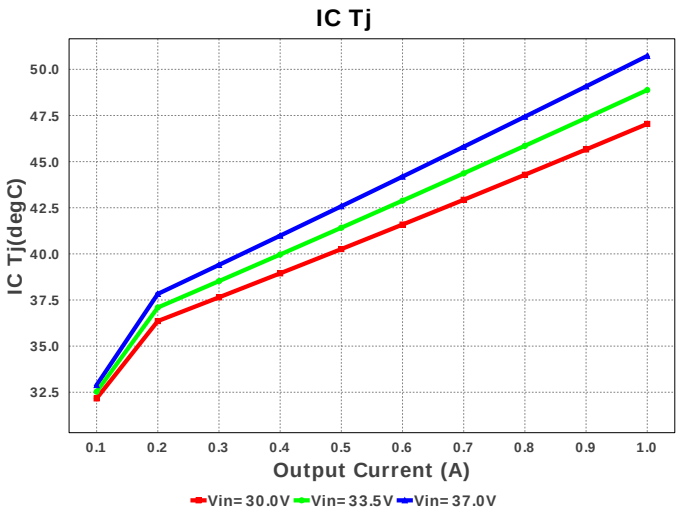
Design : 4742013/101 LMR14050SDDAR
LMR14050SDDAR 30.0V-37.0V to 5.00V @ 1.0001875000000002A

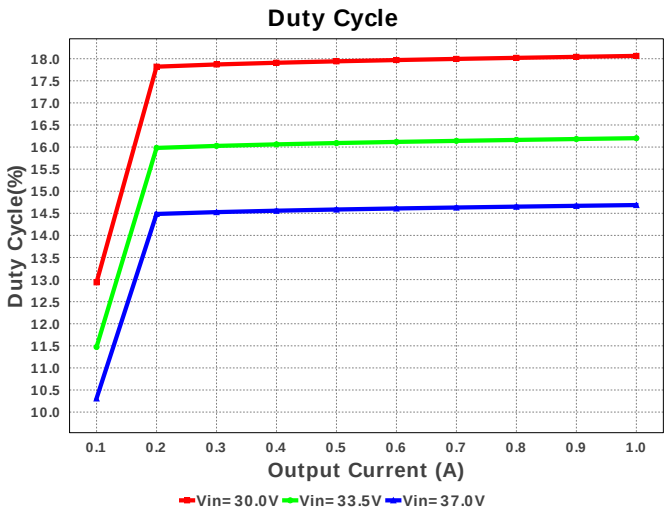


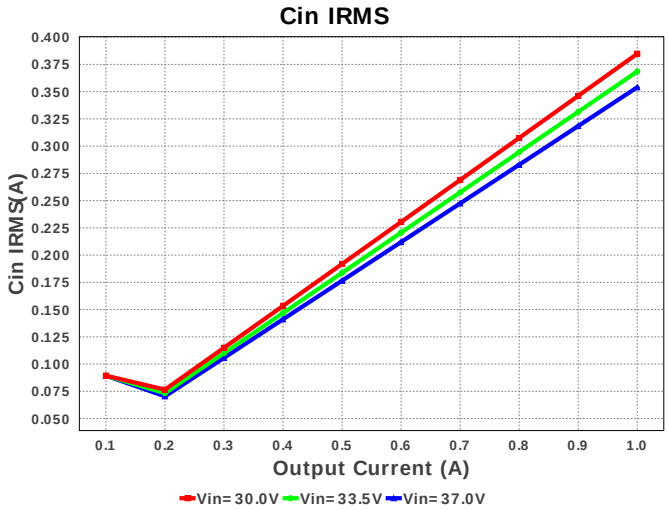
Electrical BOM

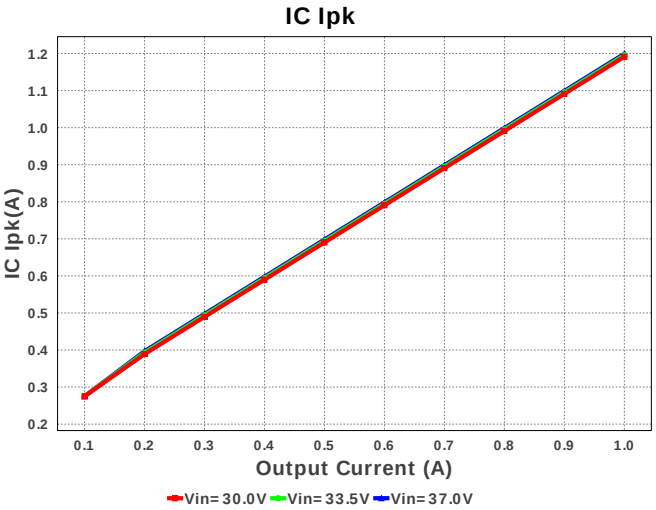
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	Taiyo Yuden	HMK212B7104KG-T Series= X7R	Cap= 100.0 nF VDC= 100.0 V IRMS= 0.0 A	1	$0.03	0805 7 mm²
2.	Cin	MuRata	GRM31CR71H225KA88L Series= X7R	Cap= 2.2 uF ESR= 4.448 mOhm VDC= 50.0 V IRMS= 2.2252 A	1	$0.05	1206_190 11 mm²
3.	Cout	Panasonic	16SVPC39MV Series= SVPC	Cap= 39.0 uF ESR= 27.0 mOhm VDC= 16.0 V IRMS= 2.35 A	1	$0.28	SM_RADIAL_5MM 58 mm²
4.	Css	MuRata	GRM155R71C822KA01D Series= X7R	Cap= 8.2 nF VDC= 16.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
5.	D1	Diodes Inc.	B260A-13-F	VF@Io= 700.0 mV VRRM= 60.0 V	1	$0.09	SMA 37 mm²
6.	L1	Bourns	SRR6038-120Y	L= 12.0 µH DCR= 53.0 mOhm	1	$0.26	SRR6038 77 mm²
7.	Rfbb	Yageo America	RC0603FR-0712KL Series= ?	Res= 12.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm²
8.	Rfbt	Yageo America	RC0603FR-0768KL Series= ?	Res= 68.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm²
9.	Rt	Vishay-Dale	CRCW040224K3FKED Series= CRCW..e3	Res= 24.3 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²

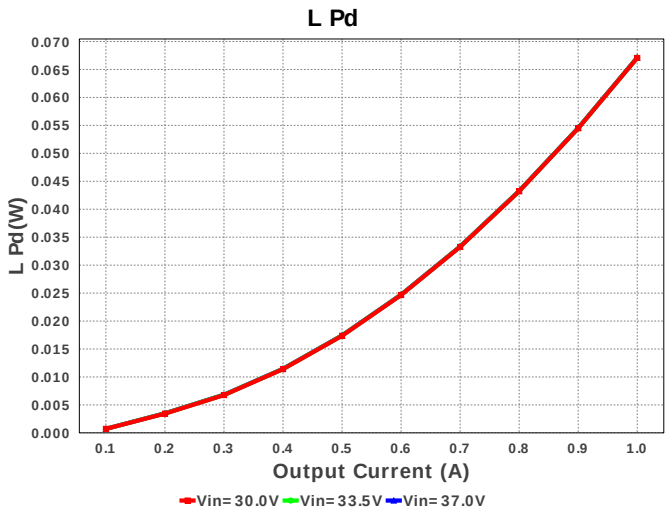
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	U1	Texas Instruments	LMR14050SDDAR	Switcher	1	$1.95	DDA0008E_N 57 mm^2

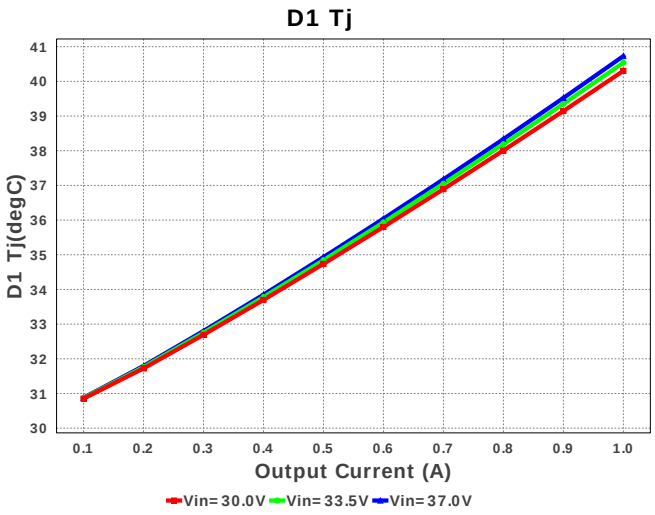


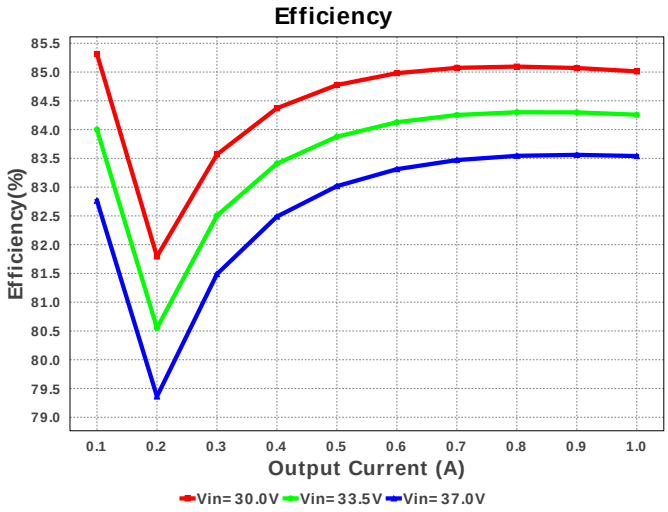


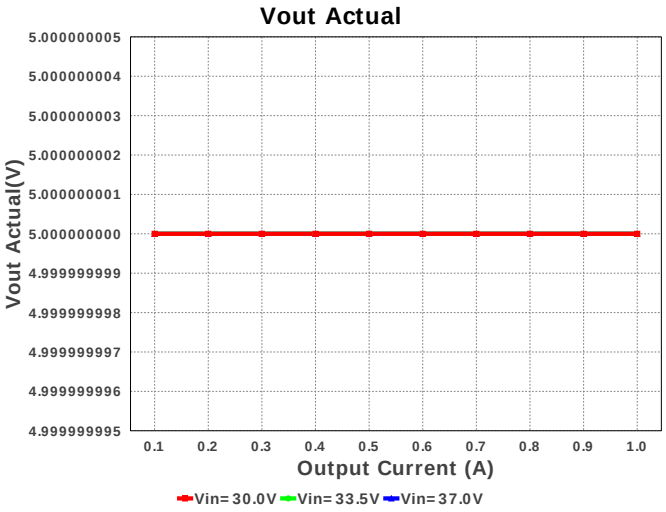


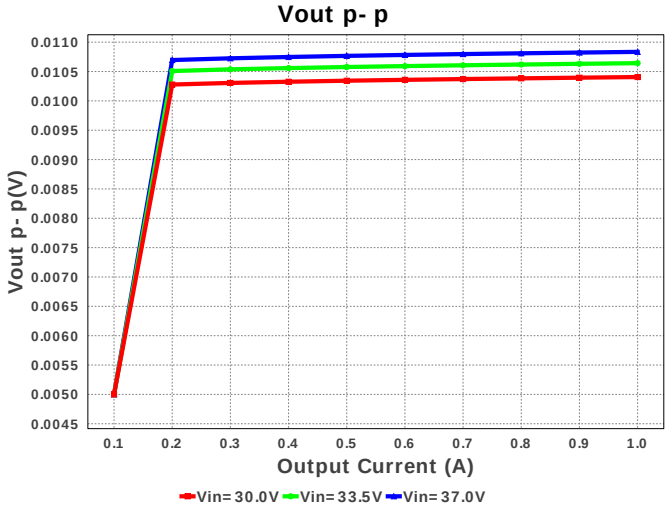


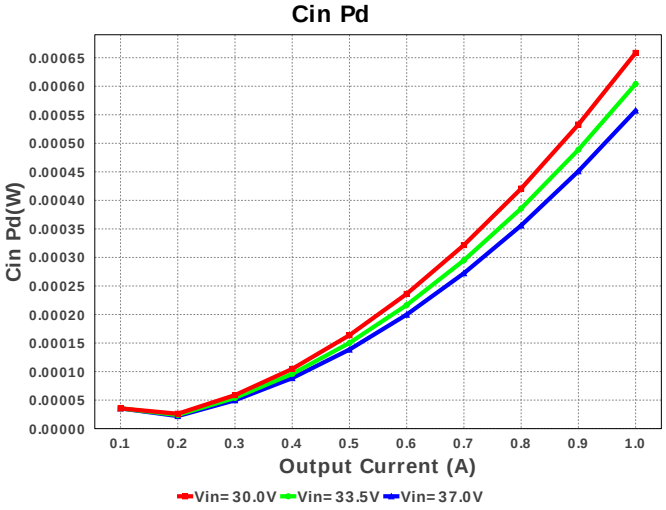


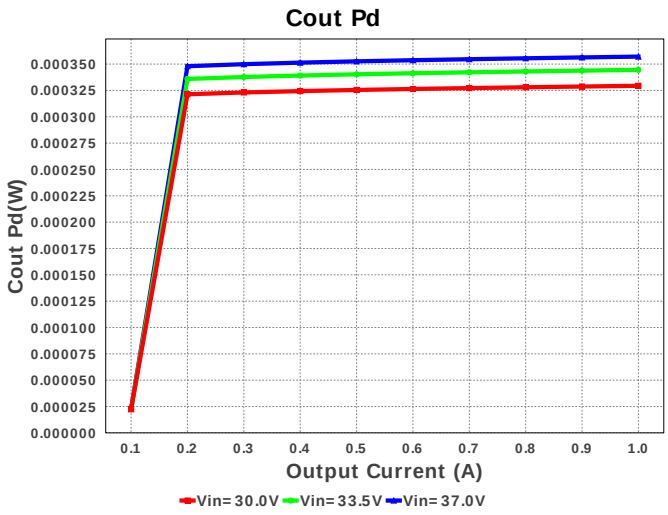


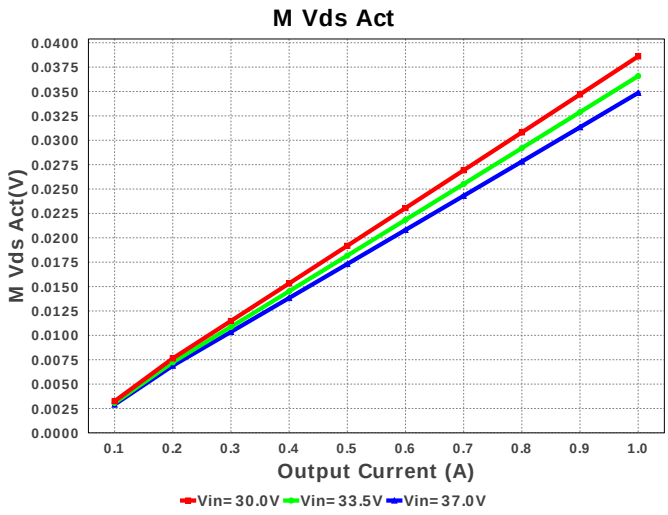


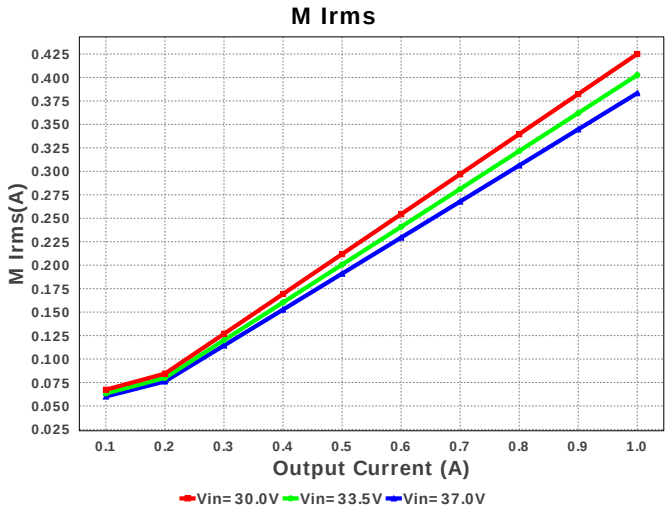


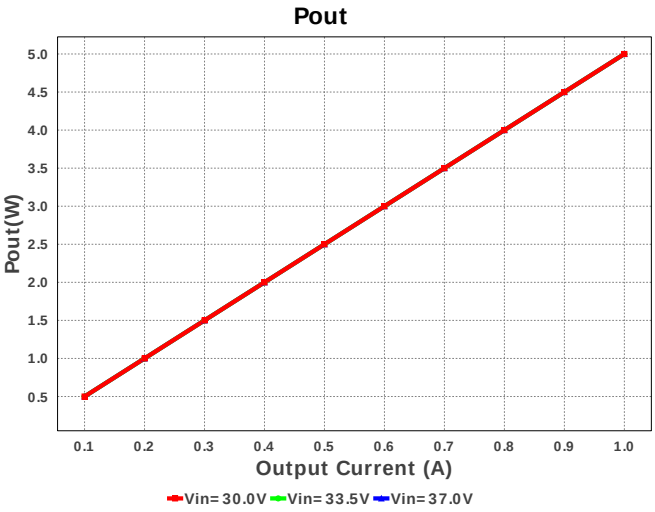


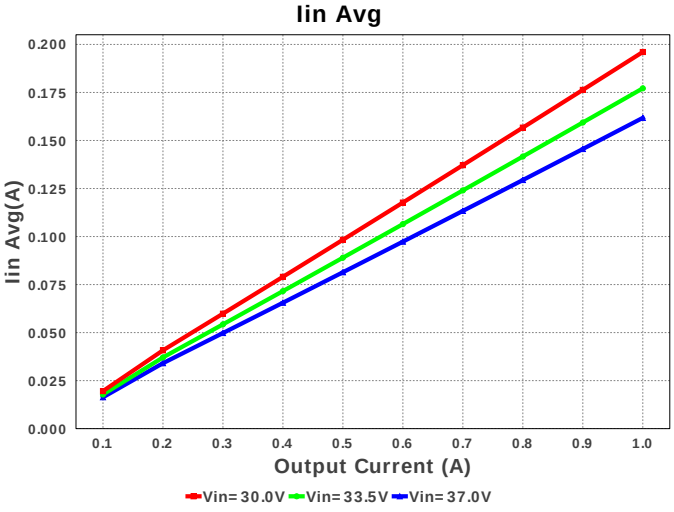


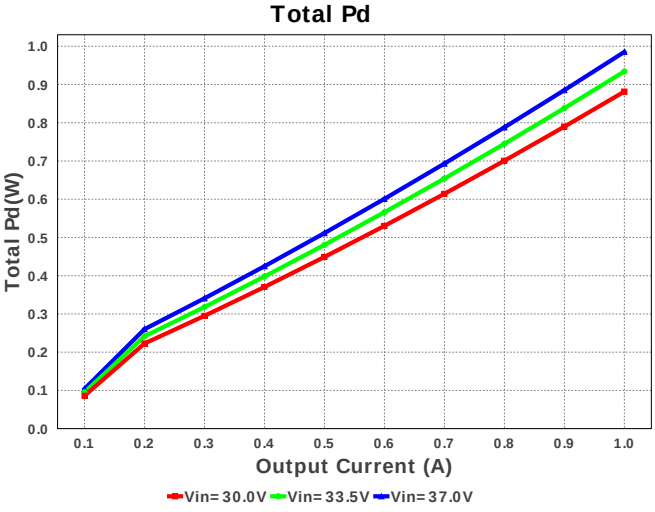


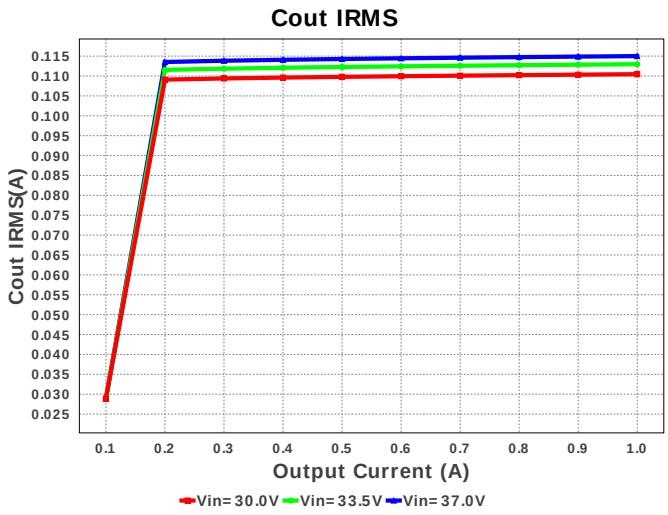


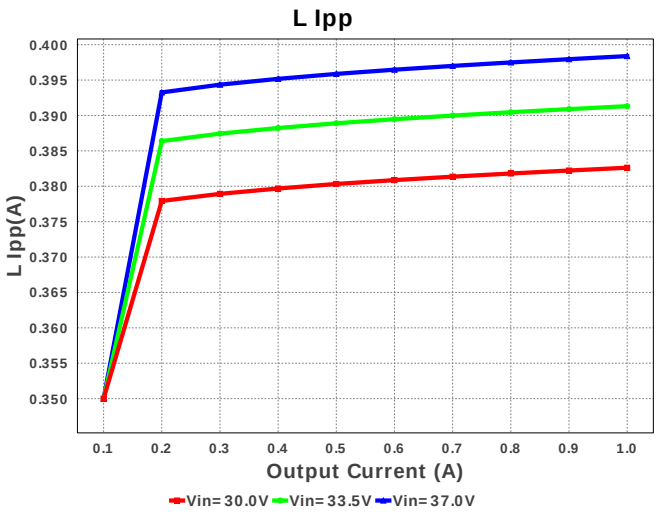


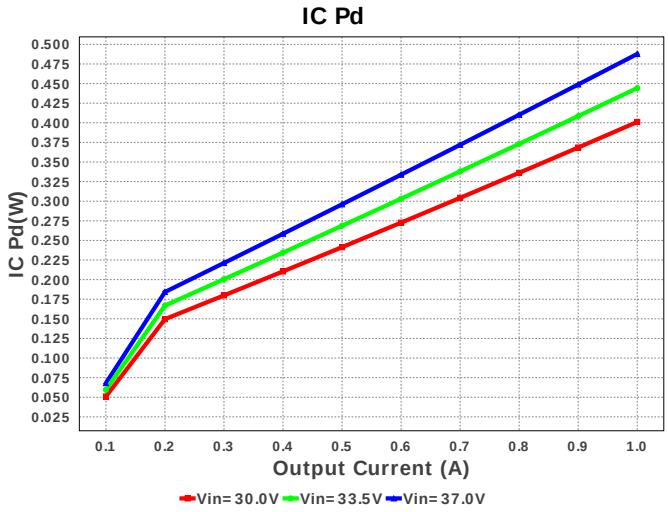


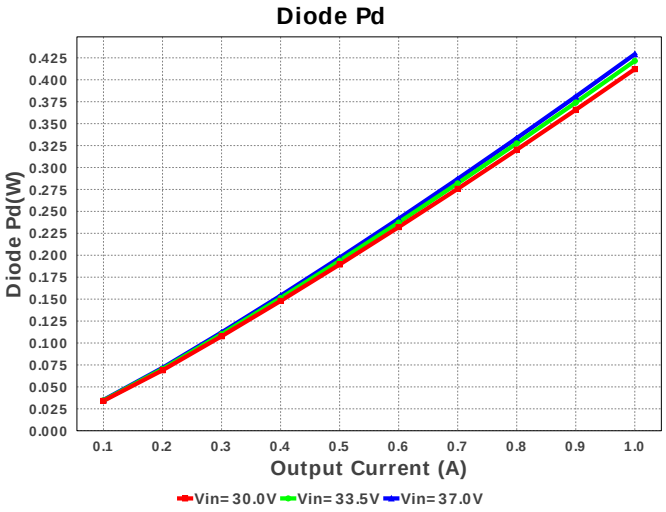


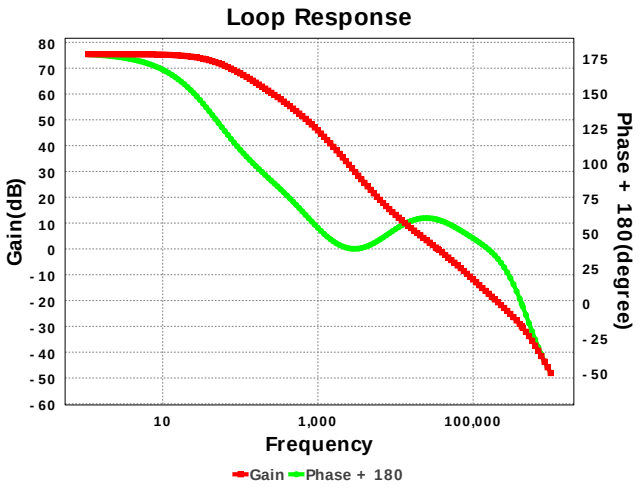












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	354.0 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	115.005 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	1.199 A	Current	Peak switch current in IC
4.	Iin Avg	161.77 mA	Current	Average input current
5.	L Ipp	398.39 mA	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	383.262 mA	Current	Q Iavg
7.	BOM Count	10	General	Total Design BOM count
8.	FootPrint	264.0 mm^2	General	Total Foot Print Area of BOM components
9.	Frequency	982.032 kHz	General	Switching frequency
10.	IC Tolerance	18.0 mV	General	IC Feedback Tolerance
11.	M Vds Act	34.855 mV	General	Voltage drop across the MosFET

#	Name	Value	Category	Description
12.	Pout	5.0 W	General	Total output power
13.	Total BOM	$2.7	General	Total BOM Cost
14.	D1 Tj	40.729 degC	Op_Point	D1 junction temperature
15.	Vout Actual	5.0 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
16.	Vout OP	5.0 V	Op_Point	Operational Output Voltage
17.	Cross Freq	34.947 kHz	Op_point	Bode plot crossover frequency
18.	Duty Cycle	14.687 %	Op_point	Duty cycle
19.	Efficiency	83.54 %	Op_point	Steady state efficiency
20.	IC Tj	50.485 degC	Op_point	IC junction temperature
21.	ICThetaJA	42.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
22.	IOUT_OP	1.0 A	Op_point	Iout operating point
23.	Phase Marg	60.208 deg	Op_point	Bode Plot Phase Margin
24.	VIN_OP	37.0 V	Op_point	Vin operating point
25.	Vout p-p	10.835 mV	Op_point	Peak-to-peak output ripple voltage
26.	Cin Pd	557.405 µW	Power	Input capacitor power dissipation
27.	Cout Pd	357.105 µW	Power	Output capacitor power dissipation
28.	Diode Pd	429.145 mW	Power	Diode power dissipation
29.	IC Pd	487.733 mW	Power	IC power dissipation
30.	L Pd	67.135 mW	Power	Inductor power dissipation
31.	Total Pd	985.212 mW	Power	Total Power Dissipation
32.	Vout Tolerance	4.158 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	1.0	Maximum Output Current
2.	VinMax	37.0	Maximum input voltage
3.	VinMin	30.0	Minimum input voltage
4.	Vout	5.0	Output Voltage
5.	base_pn	LMR14050S	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **LMR14050S** Product Folder : http://www.ti.com/product/LMR14050 : contains the data sheet and other resources.