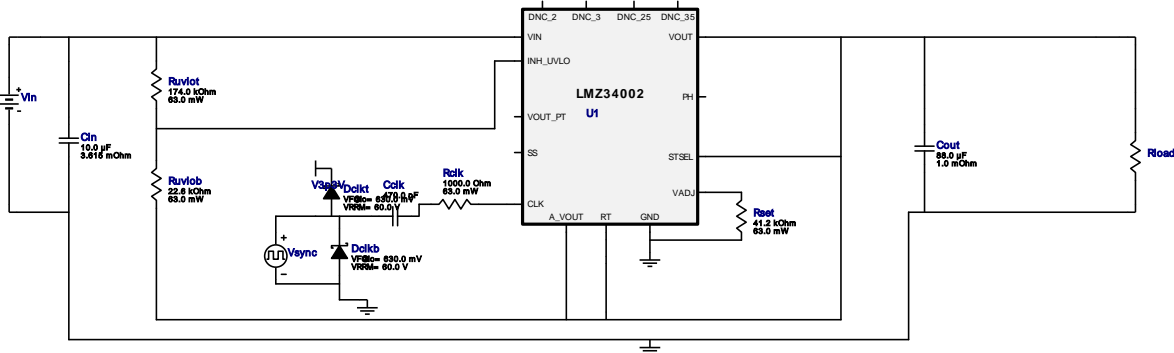
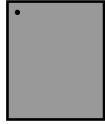


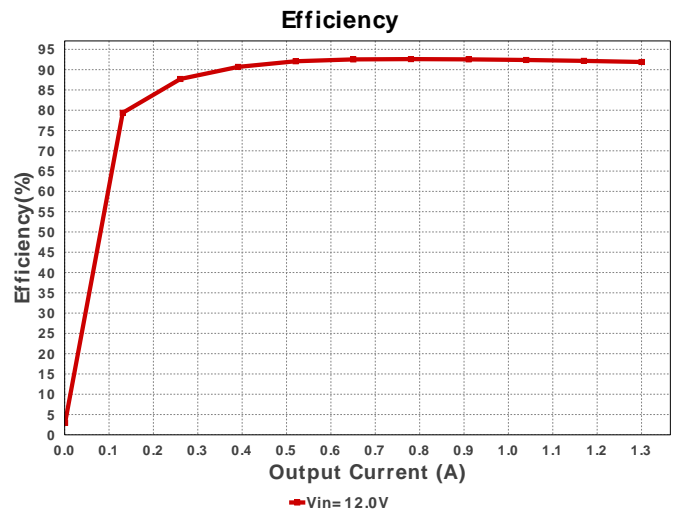
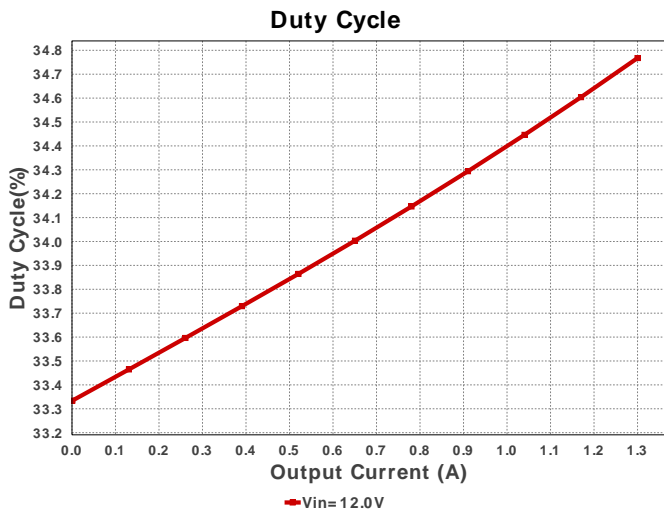
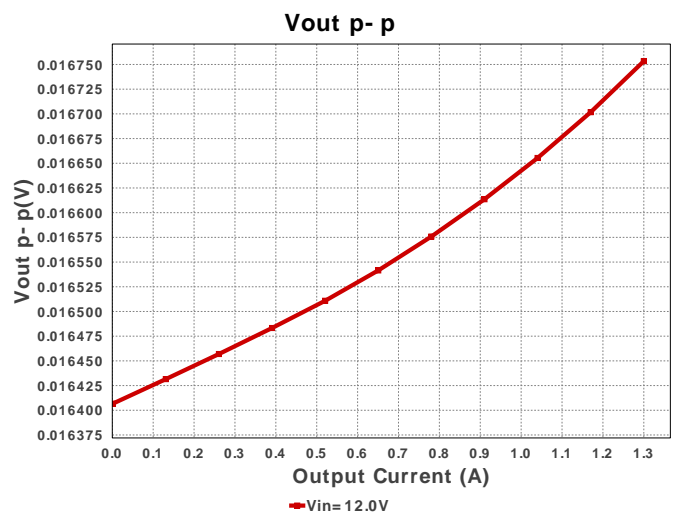
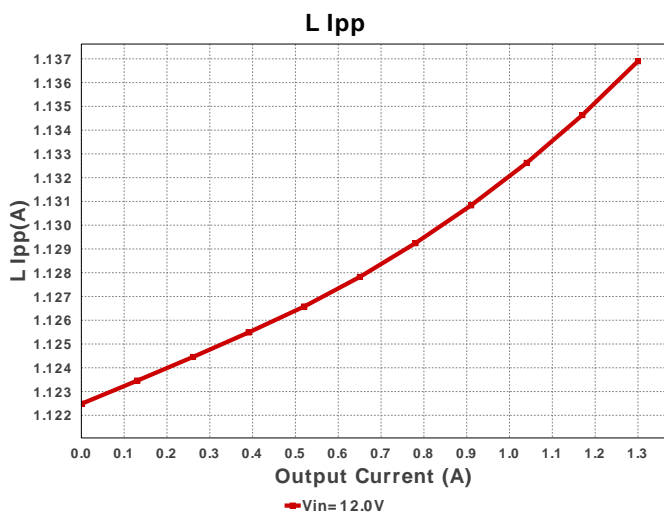
**WEBENCH® Design Report**

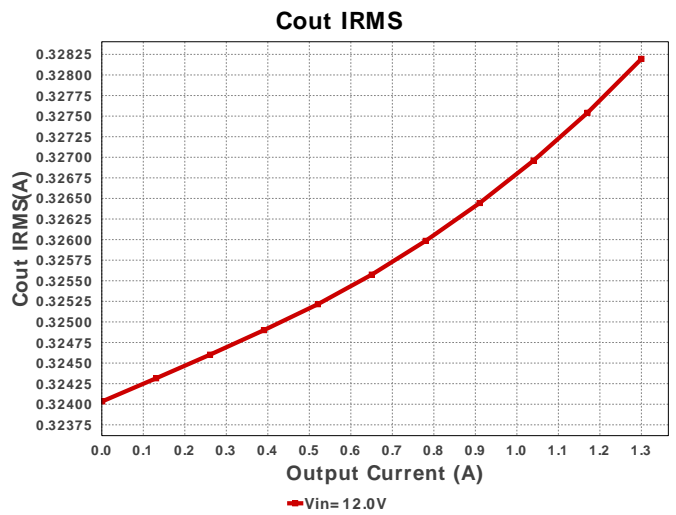
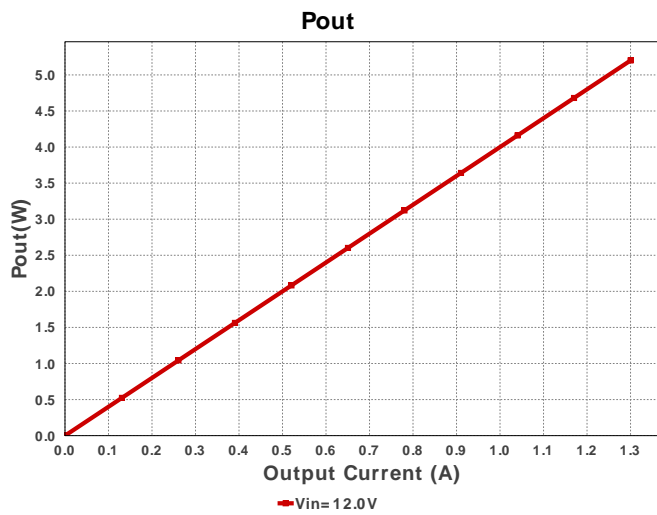
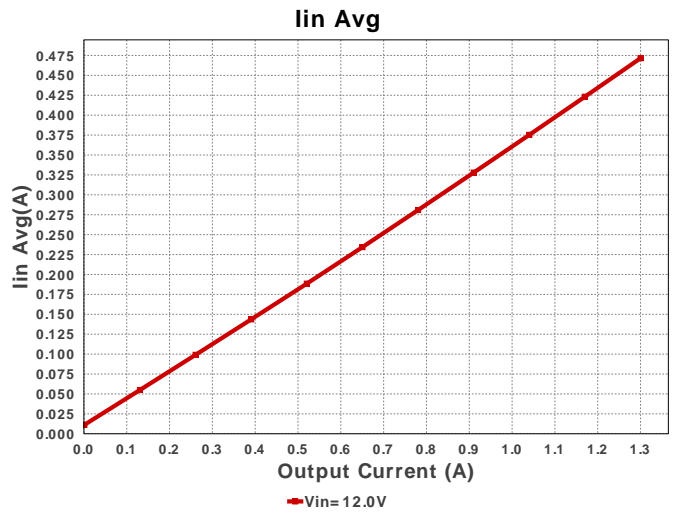
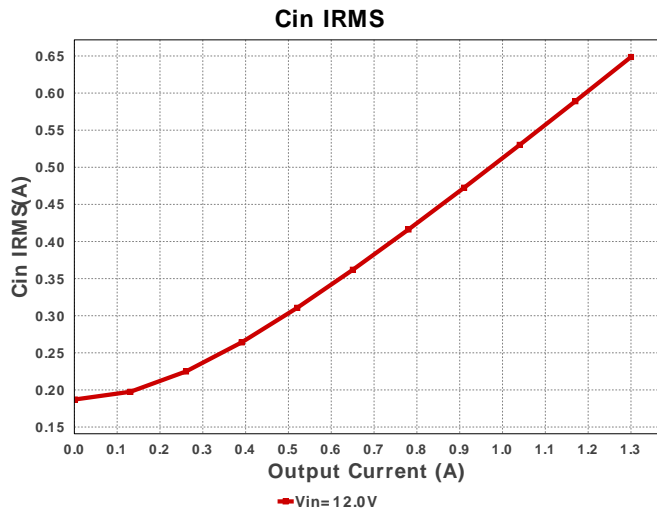
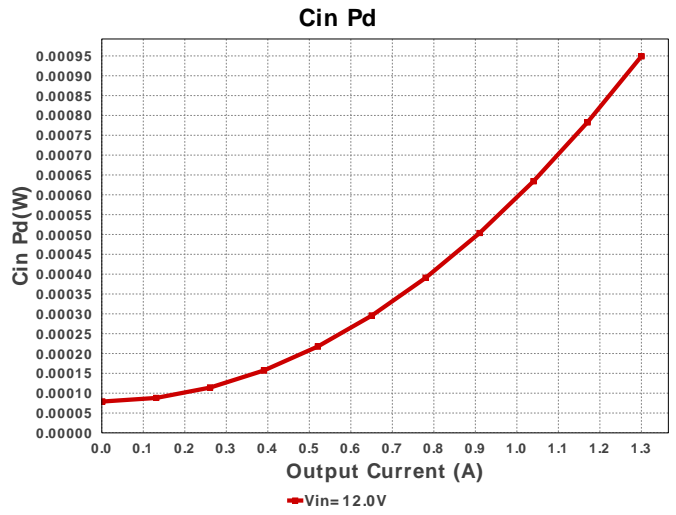
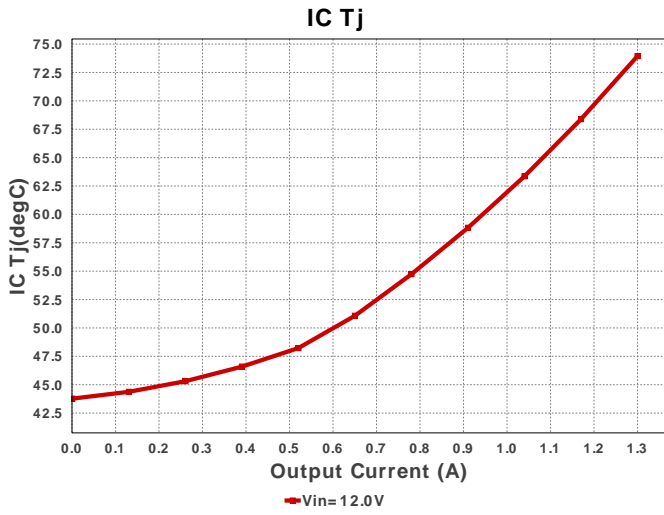
LMZ34002RKGR 12V-12V to -4.00V @ 1.3A

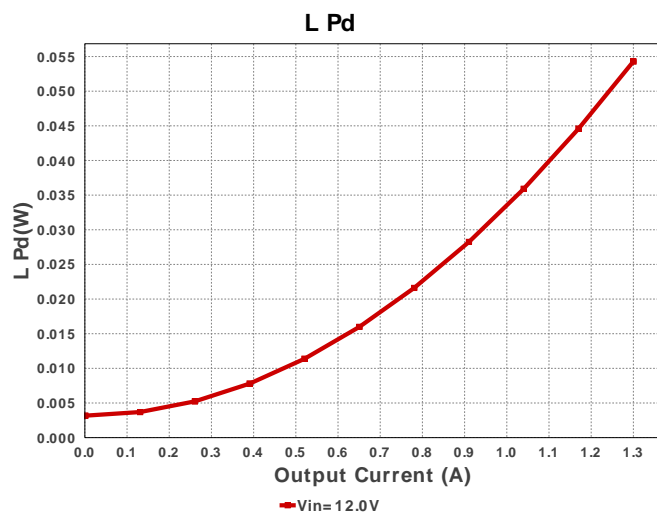
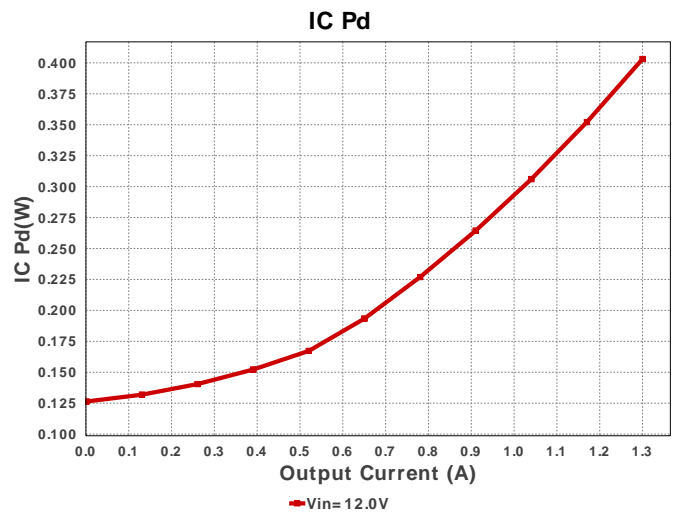
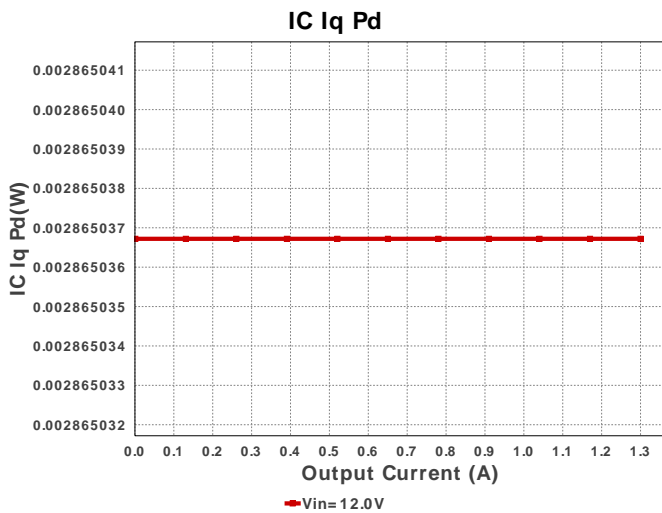
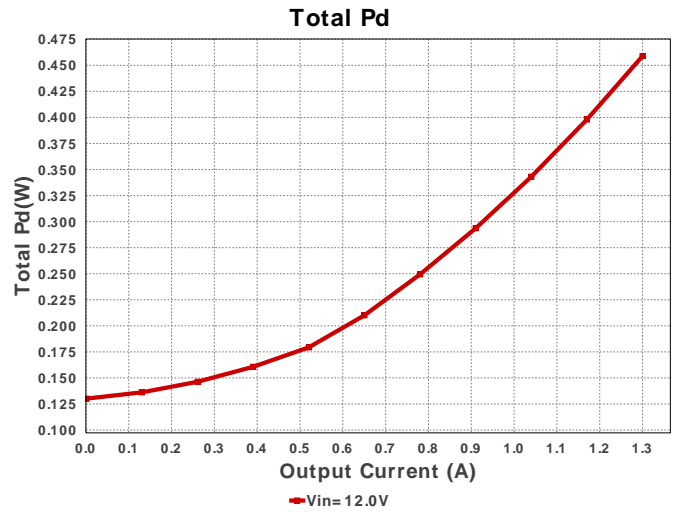
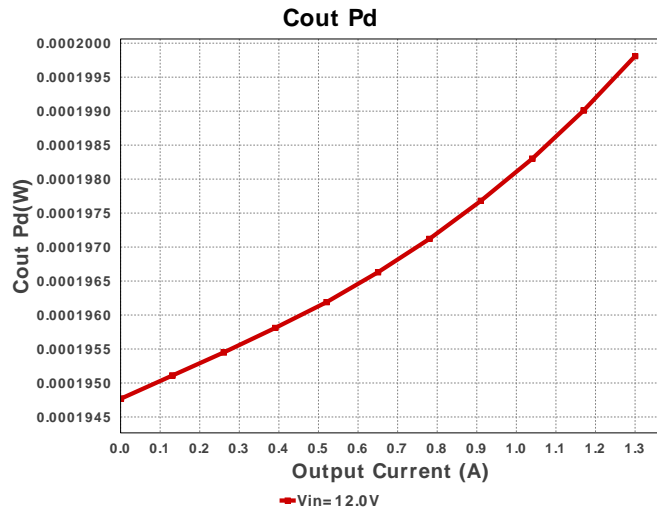

**Electrical BOM**

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cclk	Samsung Electro-Mechanics	CL21C471KBANNNC Series= C0G/NP0	Cap= 470.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm <sup>2</sup>
2.	Cin	MuRata	GRM31CR61C106KA88L Series= X5R	Cap= 10.0 uF ESR= 3.615 mOhm VDC= 16.0 V IRMS= 3.8281 A	1	\$0.08	1206_190 11 mm <sup>2</sup>
3.	Cout	CUSTOM	CUSTOM Series= ?	Cap= 88.0 uF ESR= 1.0 mOhm VDC= 4.1006 V IRMS= 17.471 uA	1	NA	CUSTOM 0 mm <sup>2</sup>
4.	Dclkb	ON Semiconductor	SS26T3G	VF@Io= 630.0 mV VRRM= 60.0 V	1	\$0.09	SMB 44 mm <sup>2</sup>
5.	Dclkt	ON Semiconductor	SS26T3G	VF@Io= 630.0 mV VRRM= 60.0 V	1	\$0.09	SMB 44 mm <sup>2</sup>
6.	Rclk	Vishay-Dale	CRCW04021K00FKED Series= CRCW..e3	Res= 1000.0Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm <sup>2</sup>
7.	Rset	Vishay-Dale	CRCW040241K2FKED Series= CRCW..e3	Res= 41200.0Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm <sup>2</sup>
8.	Ruvlob	Vishay-Dale	CRCW040222K6FKED Series= CRCW..e3	Res= 22600.0Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm <sup>2</sup>
9.	Ruvlot	Vishay-Dale	CRCW0402174KFKED Series= CRCW..e3	Res= 174000.0Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm <sup>2</sup>

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	U1	Texas Instruments	LMZ34002RKGR	Switcher	1	\$5.94	 RKG0041A 143 mm <sup>2</sup>







## Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	829.077 mA	Capacitor	Input capacitor RMS ripple current
2.	Cin Pd	2.485 mW	Capacitor	Input capacitor power dissipation
3.	Cout IRMS	850.136 mA	Capacitor	Output capacitor RMS ripple current
4.	Cout Pd	722.73 μW	Capacitor	Output capacitor power dissipation
5.	D1 Tj	30.0 degC	Diode	D1 junction temperature
6.	Diode Pd	806.0 mW	Diode	Diode power dissipation
7.	IC Ipk	0.0 A	IC	Peak switch current in IC
8.	IC Pd	515.3 mW	IC	IC power dissipation
9.	IC Pd	1.622 W	IC	IC power dissipation
10.	IC Tj	52.707 degC	IC	IC junction temperature
11.	IC Tolerance	16.0 mV	IC	IC Feedback Tolerance

#	Name	Value	Category	Description
12.	ICThetaJA	14.0 degC/W	IC	IC junction-to-ambient thermal resistance
13.	Iin Avg	568.76 mA	IC	Average input current
14.	M Irms	973.967 mA	Mosfet	MOSFET RMS ripple current
15.	M Vds Act	249.336 mV	Mosfet	Voltage drop across the MosFET
16.	Cin Pd	2.485 mW	Power	Input capacitor power dissipation
17.	Cout Pd	722.73 μW	Power	Output capacitor power dissipation
18.	Diode Pd	806.0 mW	Power	Diode power dissipation
19.	IC Pd	515.3 mW	Power	IC power dissipation
20.	IC Pd	1.622 W	Power	IC power dissipation
21.	Total Pd	1.625 W	Power	Total Power Dissipation
22.	BOM Count	10	System	Total Design BOM count
23.	Cross Freq	25.282 kHz	System Information	Bode plot crossover frequency
24.	Duty Cycle	27.798 %	System Information	Duty cycle
25.	Efficiency	76.189 %	System Information	Steady state efficiency
26.	FootPrint	301.0 mm <sup>2</sup>	System Information	Total Foot Print Area of BOM components
27.	Frequency	730.0 kHz	System Information	Switching frequency
28.	Iout	1.3 A	System Information	Iout operating point
29.	Mode	CCM	System Information	Conduction Mode
30.	Phase Marg	64.64 deg	System Information	Bode Plot Phase Margin
31.	Pout	5.2 W	System Information	Total output power
32.	Total BOM	NA	System Information	Total BOM Cost
33.	Vin	12.0 V	System Information	Vin operating point
34.	Vout	-4.0 V	System Information	Operational Output Voltage
35.	Vout Tolerance	400.0 m%	System Information	Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
36.	Vout p-p	2.159 mV	System Information	Peak-to-peak output ripple voltage

## Design Inputs

#	Name	Value	Description
1.	Iout	1.3	Maximum Output Current
2.	VinMax	12.0	Maximum input voltage
3.	VinMin	12.0	Minimum input voltage
4.	VinTyp	12.0	Typical input voltage
5.	Vout	-4.0	Output Voltage
6.	acFrequency	60.0	AC Frequency
7.	base_pn	LMZ34002	Base Product Number
8.	source	DC	Input Source Type
9.	Ta	30.0	Ambient temperature
10.	UserFsw	730.0 k	Customer Selected Frequency

## Design Assistance

1. **LMZ34002** Product Folder : <http://www.ti.com/product/LMZ34002> : contains the data sheet and other resources.

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