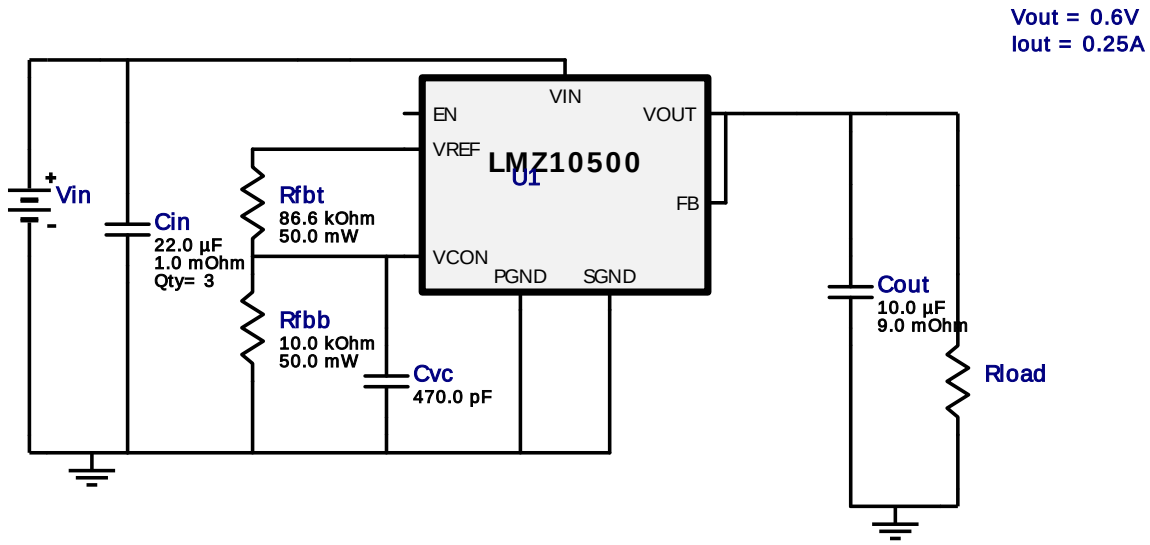
WEBENCH® Design Report

VinMin = 5.0V
VinMax = 5.0V
Vout = 0.6V
Iout = 0.25A

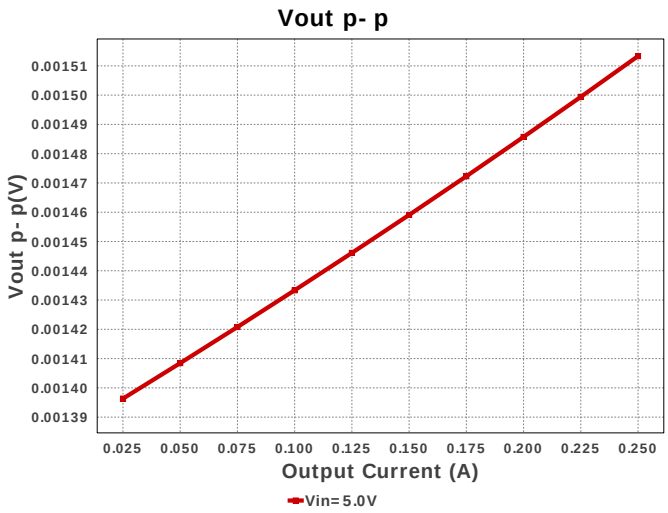
Device = LMZ10500SILR
Topology = Buck
Created = 2019-06-19 09:38:18.168
BOM Cost = $1.56
BOM Count = 8
Total Pd = 0.05W

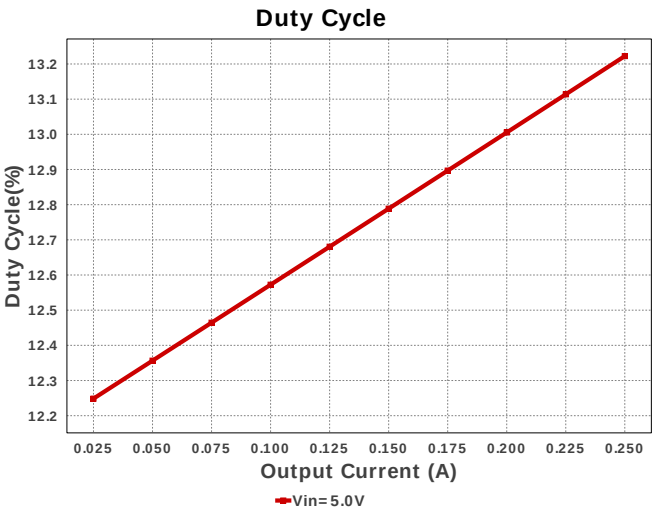
Design : 992 LMZ10500SILR
LMZ10500SILR 5V-5V to .60V @ 0.25A

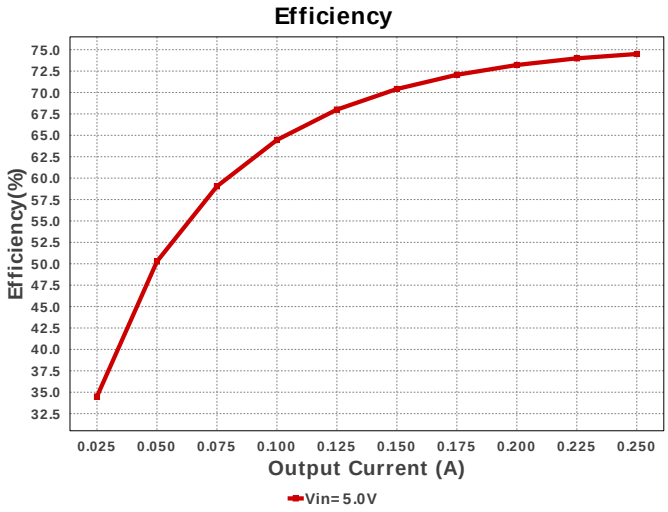


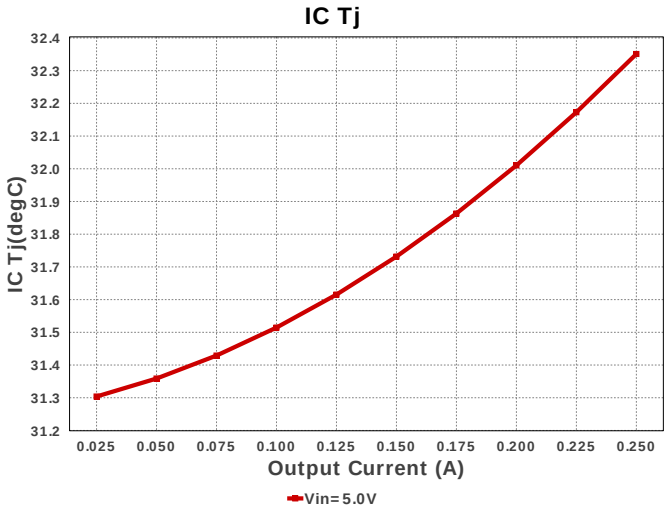
Electrical BOM

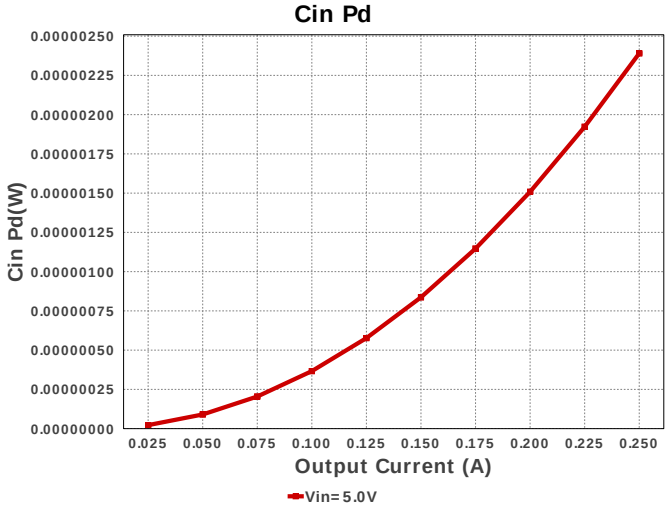
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Cin	MuRata	GRM188R60J226MEA0D Series= X5R	Cap= 22.0 uF ESR= 1.0 mOhm VDC= 6.3 V IRMS= 6.0 A	3	$0.05	0603 5 mm²
Cout	MuRata	GRM188R60J106ME47D Series= X5R	Cap= 10.0 uF ESR= 9.0 mOhm VDC= 6.3 V IRMS= 2.74 A	1	$0.08	0603 5 mm²
Cvc	AVX	04025A471JAT2A Series= C0G/NP0	Cap= 470.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
Rfbb	Yageo	RC0201FR-0710KL Series= ?	Res= 10.0 kOhm Power= 50.0 mW Tolerance= 1.0%	1	$0.01	0201 2 mm²
Rfbt	Yageo	RC0201FR-0786K6L Series= ?	Res= 86.6 kOhm Power= 50.0 mW Tolerance= 1.0%	1	$0.01	0201 2 mm²
U1	Texas Instruments	LMZ10500SILR	Switcher	1	$1.30	SIL0008A 14 mm²

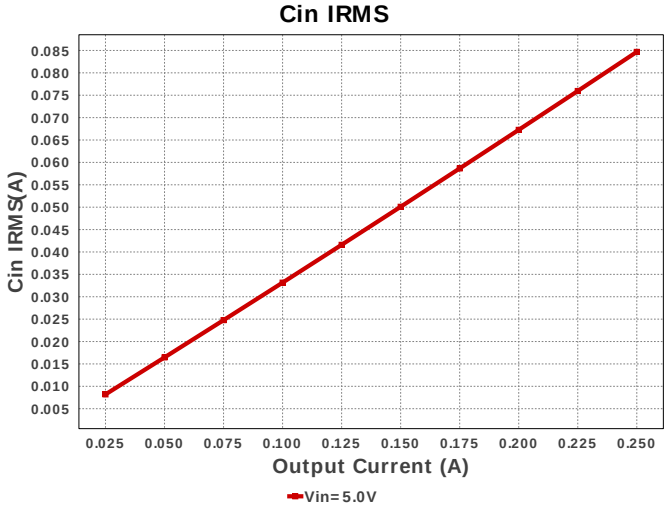


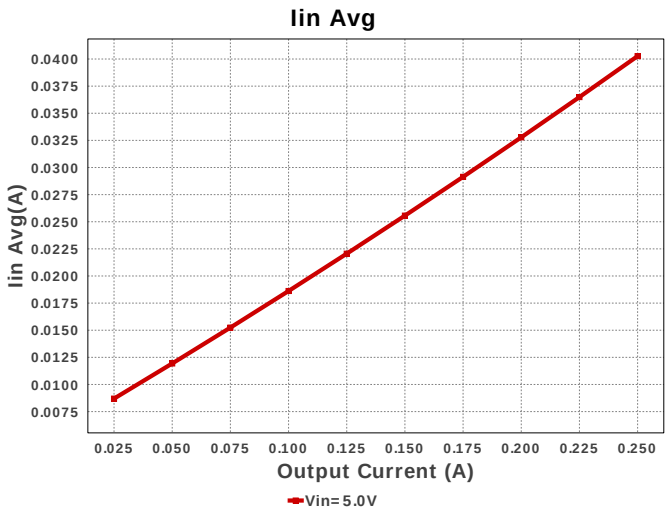


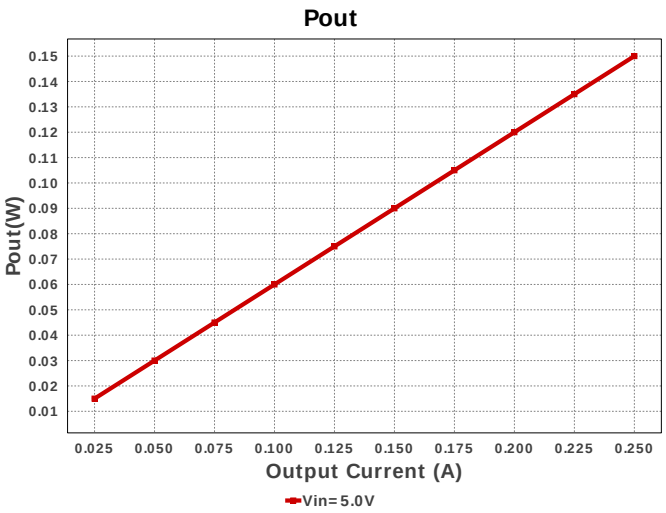


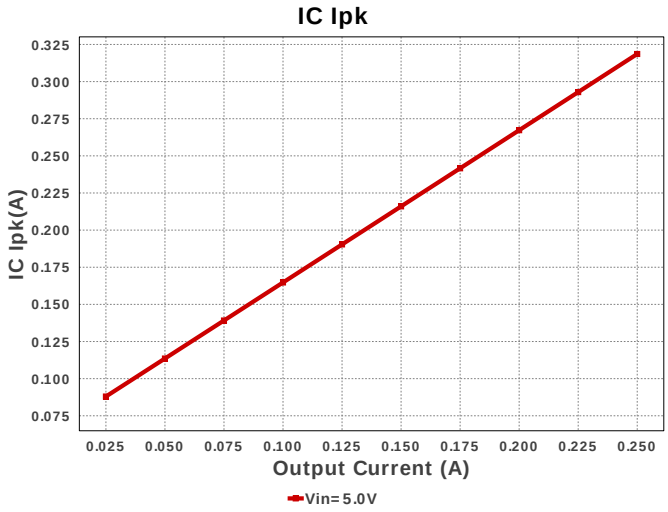


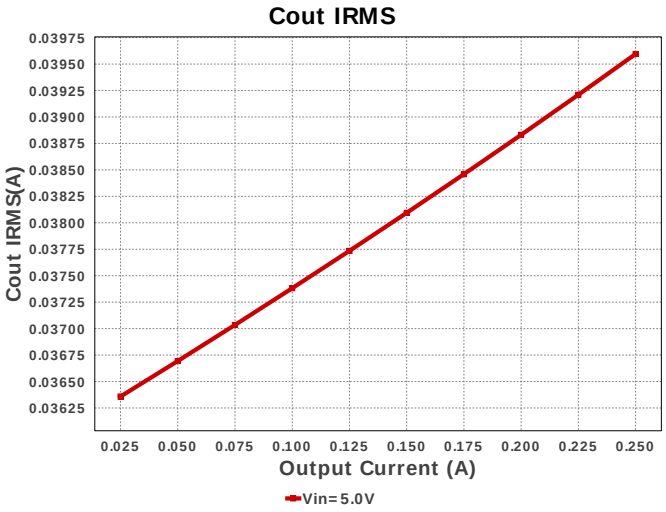


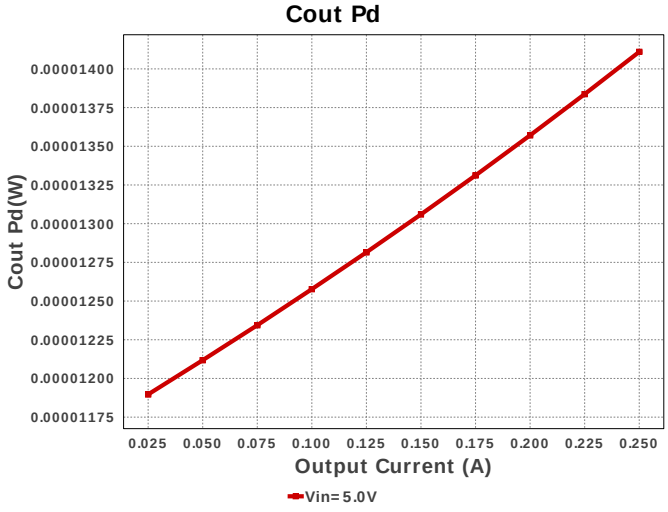


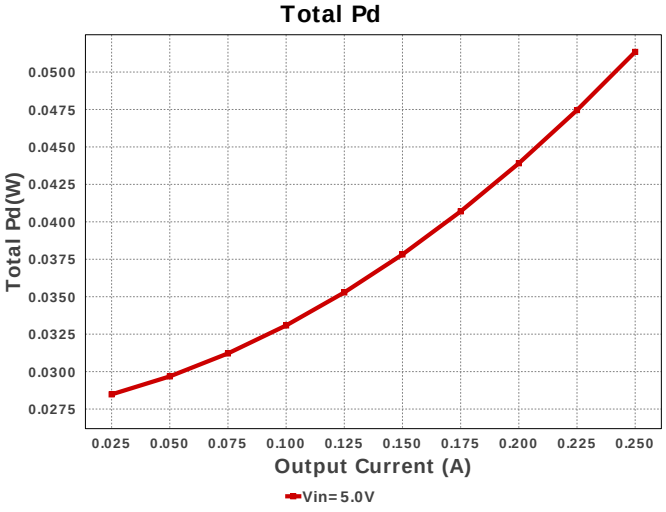


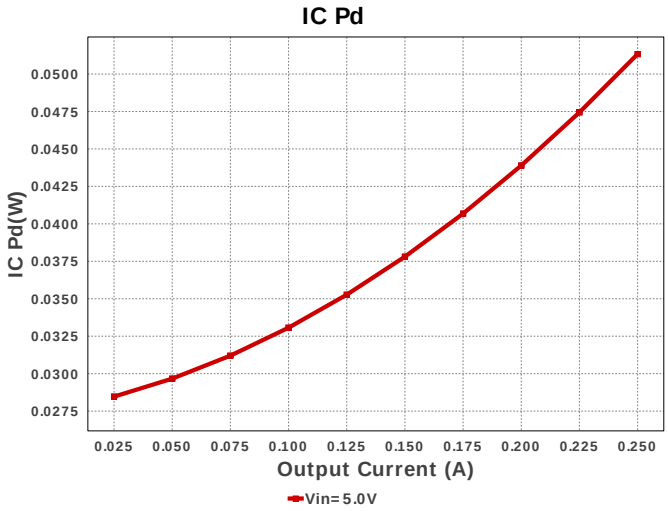












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	84.684 mA	Capacitor	Input capacitor RMS ripple current
2.	Cin Pd	2.39 µW	Capacitor	Input capacitor power dissipation
3.	Cout IRMS	39.595 mA	Capacitor	Output capacitor RMS ripple current
4.	Cout Pd	14.11 µW	Capacitor	Output capacitor power dissipation
5.	IC Ipk	318.581 mA	IC	Peak switch current in IC
6.	IC Pd	51.331 mW	IC	IC power dissipation
7.	IC Tj	32.351 degC	IC	IC junction temperature
8.	ICThetaJA	45.8 degC/W	IC	IC junction-to-ambient thermal resistance
9.	Iin Avg	40.269 mA	IC	Average input current
10.	Cin Pd	2.39 µW	Power	Input capacitor power dissipation
11.	Cout Pd	14.11 µW	Power	Output capacitor power dissipation
12.	IC Pd	51.331 mW	Power	IC power dissipation
13.	Total Pd	51.347 mW	Power	Total Power Dissipation
14.	BOM Count	8	System Information	Total Design BOM count
15.	Duty Cycle	13.222 %	System Information	Duty cycle
16.	Efficiency	74.498 %	System Information	Steady state efficiency
17.	FootPrint	40.0 mm^2	System Information	Total Foot Print Area of BOM components
18.	Frequency	2.0 MHz	System Information	Switching frequency
19.	Iout	250.0 mA	System Information	Iout operating point
20.	Pout	150.0 mW	System Information	Total output power
21.	Total BOM	$1.56	System Information	Total BOM Cost
22.	Vin	5.0 V	System Information	Vin operating point
23.	Vout	600.0 mV	System Information	Operational Output Voltage
24.	Vout Act	608.2 mV	System Information	Achieved Vout with feedback resistor pair
25.	Vout Actual	608.178 mV	System Information	Vout Actual calculated based on selected voltage divider resistors
26.	Vout Tolerance	67.6 %	System Information	Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
27.	Vout p-p	1.513 mV	System Information	Peak-to-peak output ripple voltage

Design Inputs

Name	Value	Description
Iout	250.0 m	Maximum Output Current
VinMax	5.0	Maximum input voltage
VinMin	5.0	Minimum input voltage
Vout	600.0 m	Output Voltage
base_pn	LMZ10500	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

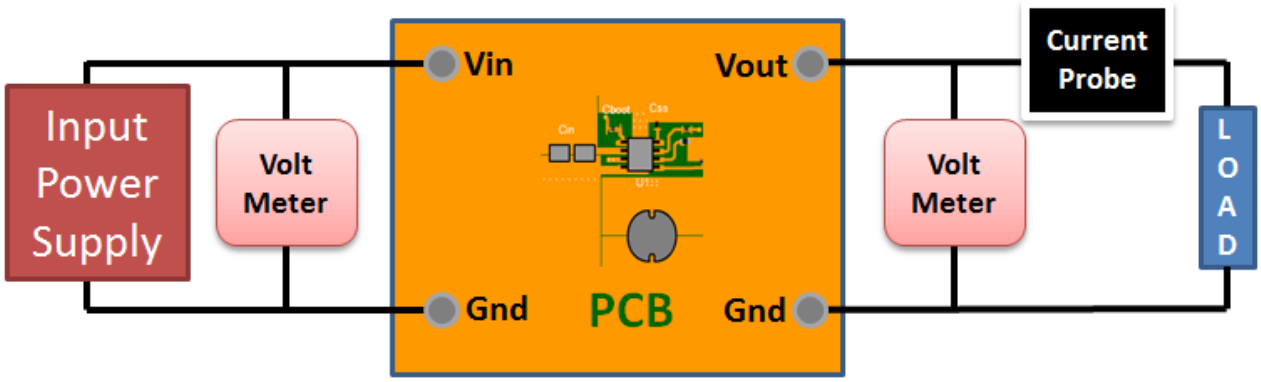
If board assembly is done in house it is best to tack down one terminal of a component on the board then solder the other terminal. For surface mount parts with large tabs, such as the DPAK, the tab on the back of the package should be pre-tinned with solder, then tacked into place by one of the pins. 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 5.0V 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. The LMZ10500 SIMPLE SWITCHER nano module is an easy-to-use step-down DC-DC solution capable of driving up to 0.65A load in space-constrained applications. Only an input capacitor, an output capacitor, a small VCON filter capacitor, and two resistors are required for basic operation. The nano module comes in 8-pin LLP footprint package with an integrated inductor.

2. Master key : A151F3A33880F935[v1]

3. **LMZ10500** Product Folder : http://www.ti.com/product/LMZ10500 : contains the data sheet and other resources.