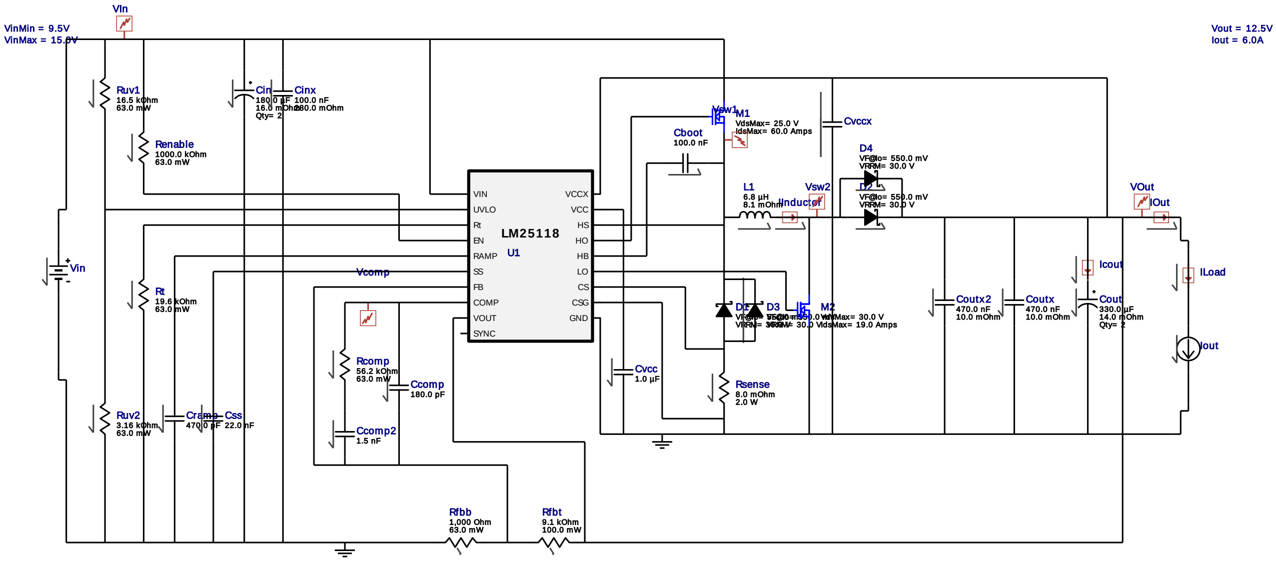
TEXAS INSTRUMENTS

WEBENCH ® Electrical Simulation Report

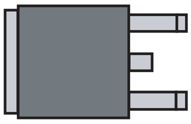
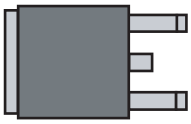
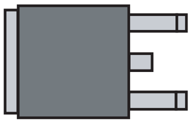
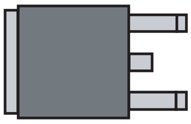
VinMin = 9.5V
VinMax = 15.0V
Vout = 12.5V
Iout = 6.0A

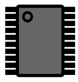
Device = LM25118MH/NOPB
Topology = Buck_Boost
Created = 3/29/16 1:30:34 AM
User ID = 3804983
Design Id = 14
eSim Id = 1
Simulation Type = Steady State



Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	MuRata	GRM21BR71E104KA01L Series= X7R	Cap= 100.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm^2
2.	Ccomp	Kemet	C0805C181K5GACTU Series= C0G/NP0	Cap= 180.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm^2
3.	Ccomp2	Yageo America	CC0805KRX7R9BB152 Series= X7R	Cap= 1.5 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm^2
4.	Cin	Panasonic	25SVPF180M Series= SVPF	Cap= 180.0 µF ESR= 16.0 mOhm VDC= 25.0 V IRMS= 4.65 A	2	$0.61	CAPSMT_62_E12 106 mm^2
5.	Cinx	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm^2
6.	Cout	Chemi-Con	APXA160ARA331MJC0G Series= PXA	Cap= 330.0 µF ESR= 14.0 mOhm VDC= 16.0 V IRMS= 5.05 A	2	$1.12	CAPSMT_62_JC0 156 mm^2
7.	Coutx	MuRata	GRM188R71C474KA88D Series= X7R	Cap= 470.0 nF ESR= 10.0 mOhm VDC= 16.0 V IRMS= 0.0 A	1	$0.02	0603 5 mm^2
8.	Coutx2	MuRata	GRM188R71C474KA88D Series= X7R	Cap= 470.0 nF ESR= 10.0 mOhm VDC= 16.0 V IRMS= 0.0 A	1	$0.02	0603 5 mm^2
9.	Cramp	Yageo America	CC0805KRX7R9BB471 Series= X7R	Cap= 470.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm^2

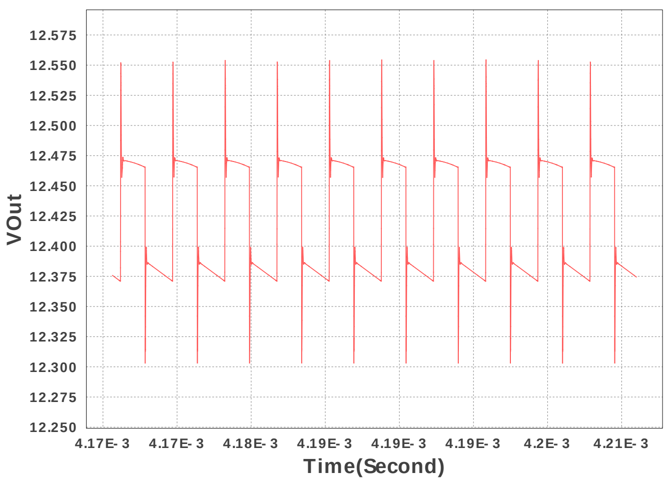
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	Css	Yageo America	CC0805KRX7R9BB223 Series= X7R	Cap= 22.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm^2
11.	Cvcc	Taiyo Yuden	EMK212B7105KG-T Series= X7R	Cap= 1.0 µF VDC= 16.0 V IRMS= 0.0 A	1	$0.02	0805 7 mm^2
12.	D1	ON Semiconductor	MBRB4030T4G	VF@Io= 550.0 mV VRRM= 30.0 V	1	$1.43	 DDPAK 210 mm^2
13.	D2	ON Semiconductor	MBRB4030T4G	VF@Io= 550.0 mV VRRM= 30.0 V	1	$1.43	 DDPAK 210 mm^2
14.	D3	ON Semiconductor	MBRB4030T4G	VF@Io= 550.0 mV VRRM= 30.0 V	1	$1.43	 DDPAK 210 mm^2
15.	D4	ON Semiconductor	MBRB4030T4G	VF@Io= 550.0 mV VRRM= 30.0 V	1	$1.43	 DDPAK 210 mm^2
16.	L1	Coilcraft	XAL1010-682MEB	L= 6.8 µH DCR= 8.1 mOhm	1	$1.71	 XAL1010 160 mm^2
17.	M1	Texas Instruments	CSD16323Q3	VdsMax= 25.0 V IdsMax= 60.0 Amps	1	$0.44	 TRANS_NexFET_Q3 18 mm^2
18.	M2	Texas Instruments	CSD17577Q3A	VdsMax= 30.0 V IdsMax= 19.0 Amps	1	$0.28	 TRANS_NexFET_Q3A 18 mm^2
19.	Rcomp	Vishay-Dale	CRCW040256K2FKED Series= CRCW..e3	Res= 56.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
20.	Renable	Vishay-Dale	CRCW04021M00FKED Series= CRCW..e3	Res= 1000.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
21.	Rfbb	Vishay-Dale	CRCW04021K00FKED Series= CRCW..e3	Res= 1,000 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
22.	Rfbt	Yageo America	RC0603FR-079K1L Series= ?	Res= 9.1 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm^2
23.	Rsense	Rohm	PMR100HZPFU8L00 Series= PMR100	Res= 8.0 mOhm Power= 2.0 W Tolerance= 1.0%	1	$0.16	 2512 43 mm^2
24.	Rt	Vishay-Dale	CRCW040219K6FKED Series= CRCW..e3	Res= 19.6 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
25.	Ruv1	Vishay-Dale	CRCW040216K5FKED Series= CRCW..e3	Res= 16.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
26.	Ruv2	Vishay-Dale	CRCW04023K16FKED Series= CRCW..e3	Res= 3.16 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
27.	U1	Texas Instruments	LM25118MH/NOPB	Switcher	1	$2.40	 MXA20A 71 mm^2

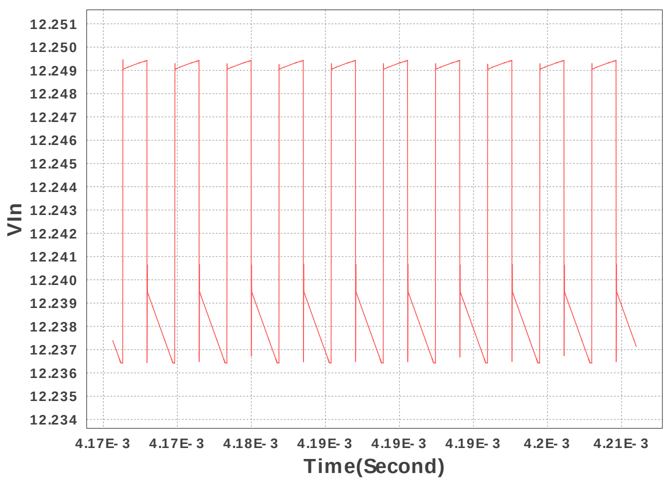
Simulation Parameters

#	Name	Parameter Name	Description	Values
1.	Cboot	IC	no description	12.25
2.	Cout	IC	Initial Voltage	12.5 V
3.	L1	IC	no description	6.0
4.	Iout	I	Load Current	6.0 A

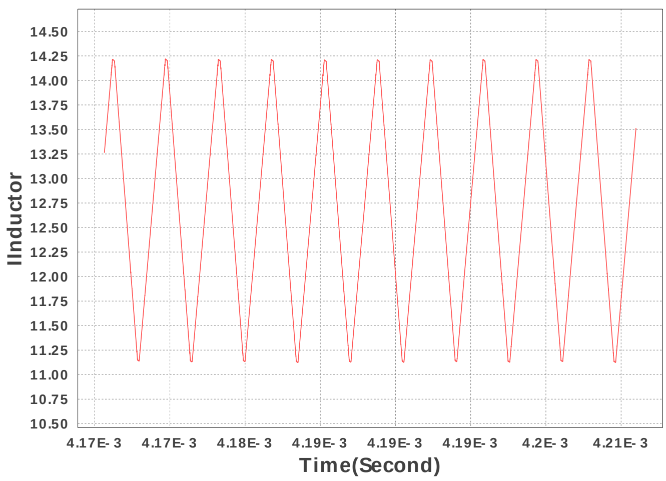
VOut



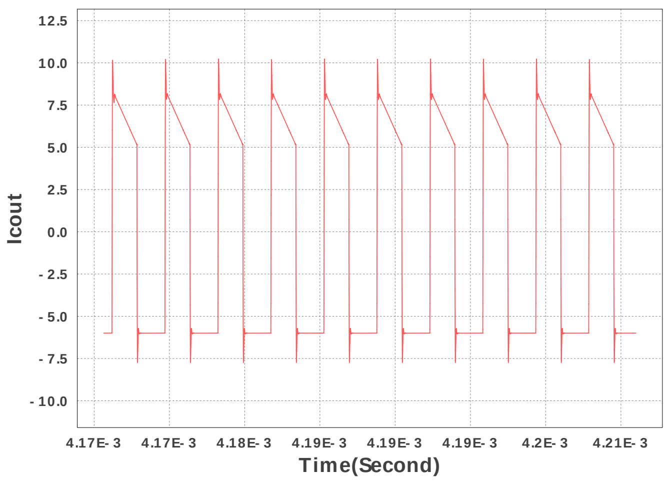
VIn

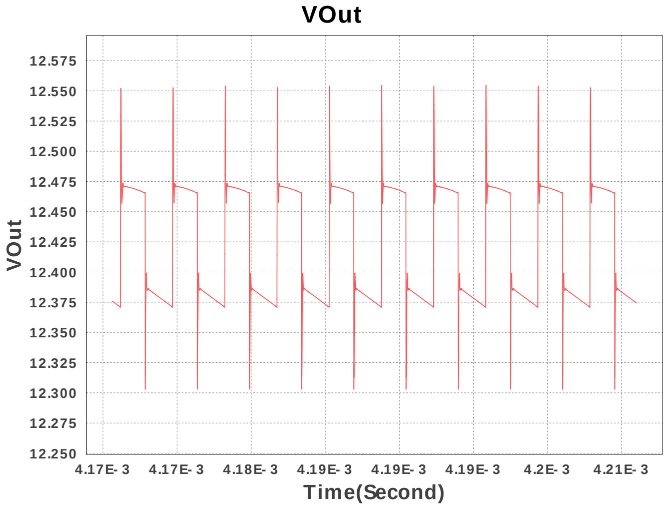


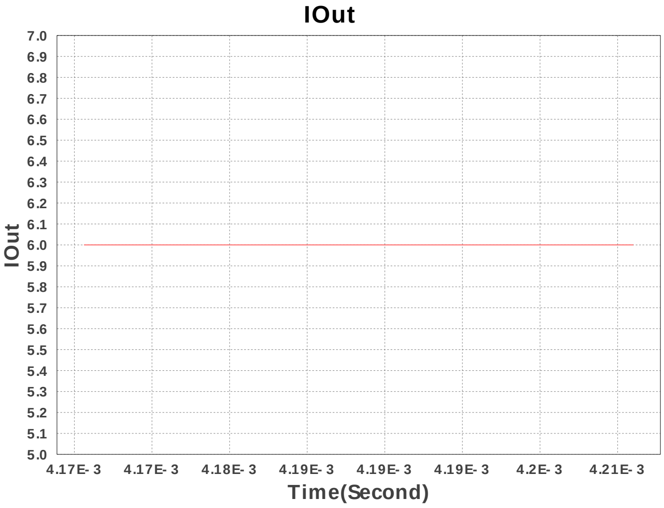
IInductor

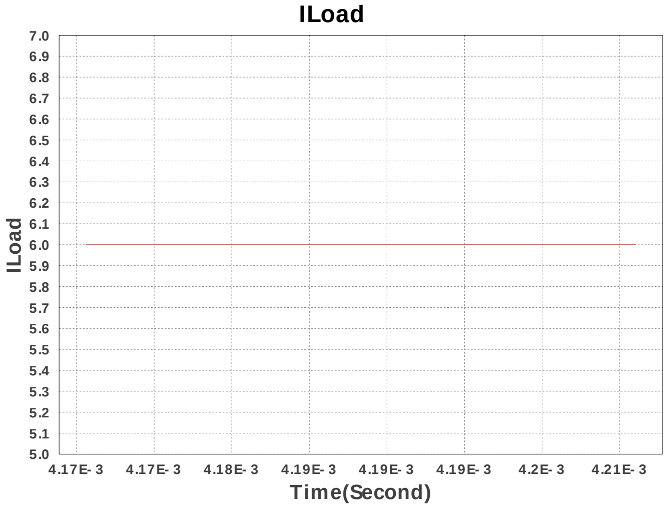


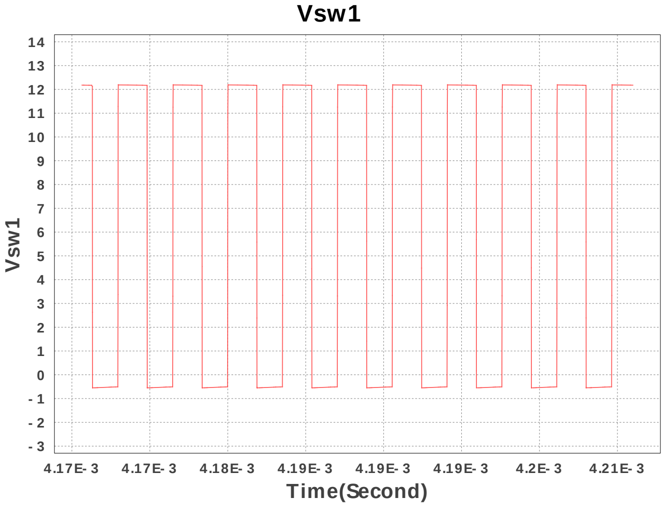
Icout

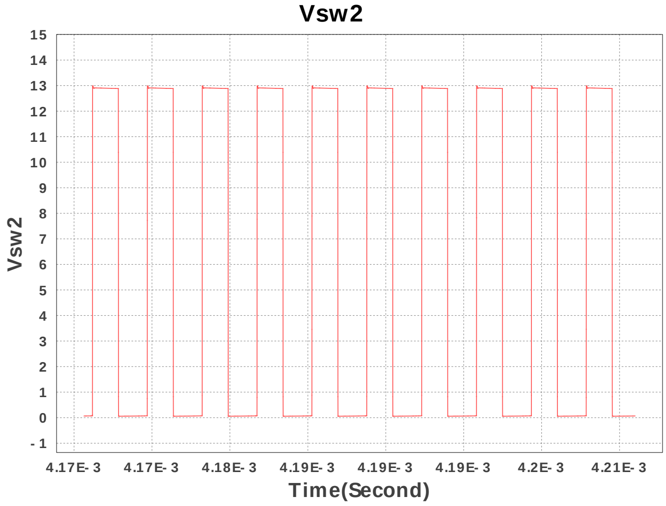












Design Inputs

#	Name	Value	Description
1.	Iout	6.0 A	Maximum Output Current
2.	VinMax	15.0 V	Maximum input voltage
3.	VinMin	9.5 V	Minimum input voltage
4.	Vout	12.5 V	Output Voltage
5.	base_pn	LM25118	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	50.0 degC	Ambient temperature

Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	2.978 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	875.411 mA	Current	Output capacitor RMS ripple current
3.	HS Ipk	10.574 A	Current	Peak switch current in IC
4.	Iin Avg	5.306 A	Current	Average input current
5.	L Ipp	3.032 A	Current	Peak-to-peak inductor ripple current
6.	L1 Irms	9.54 A	Current	Inductor ripple current
7.	LS Ipk	10.306 A	Current	Peak switch current in IC
8.	M1 Irms	7.139 A	Current	MOSFET RMS ripple current
9.	M2 Irms	5.335 A	Current	MOSFET RMS ripple current
10.	BOM Count	29	General	Total Design BOM count
11.	FootPrint	1.754 k mm^2	General	Total Foot Print Area of BOM components
12.	Frequency	282.935 kHz	General	Switching frequency
13.	IC Tolerance	18.0 mV	General	IC Feedback Tolerance
14.	M1 ThetaJA	58.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
15.	M2 ThetaJA	55.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
16.	Pout	75.0 W	General	Total output power
17.	Total BOM	$14.36	General	Total BOM Cost
18.	D1 Tj	61.402 degC	Op_Point	D1 junction temperature
19.	D2 Tj	77.241 degC	Op_Point	D2 junction temperature
20.	D3 Tj	61.402 degC	Op_Point	D3 junction temperature
21.	D4 Tj	77.241 degC	Op_Point	D4 junction temperature
22.	Low Freq Gain	96.023 dB	Op_Point	Gain at 10Hz
23.	Vout Actual	12.423 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
24.	Boost Duty Cycle	35.455 %	Op_point	Boost Duty cycle
25.	Buck Duty Cycle	56.102 %	Op_point	Buck Duty cycle
26.	Cross Freq	7.536 kHz	Op_point	Bode plot crossover frequency
27.	Efficiency	94.237 %	Op_point	Steady state efficiency
28.	Gain Marg	-5.977 dB	Op_point	Bode Plot Gain Margin
29.	IC Tj	62.229 degC	Op_point	IC junction temperature
30.	ICThetaJA	40.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
31.	IOUT_OP	6.0 A	Op_point	Iout operating point
32.	M1 TjOP	77.402 degC	Op_point	MOSFET junction temperature
33.	M2 TjOP	64.703 degC	Op_point	MOSFET junction temperature
34.	Operating Topology	Transition	Op_point	The current operating topology of the device
35.	Phase Marg	29.393 deg	Op_point	Bode Plot Phase Margin
36.	VIN_OP	15.0 V	Op_point	Vin operating point
37.	Vout p-p	21.324 mV	Op_point	Peak-to-peak output ripple voltage
38.	Cin Pd	70.928 mW	Power	Input capacitor power dissipation
39.	Cout Pd	5.364 mW	Power	Output capacitor power dissipation
40.	D1 Pd	380.072 mW	Power	Diode power dissipation
41.	D2 Pd	908.03 mW	Power	Diode2 power dissipation
42.	D3 Pd	380.072 mW	Power	Diode3 power dissipation
43.	D4 Pd	908.03 mW	Power	Diode4 power dissipation
44.	IC Pd	305.736 mW	Power	IC power dissipation
45.	L Pd	810.996 mW	Power	Inductor power dissipation
46.	M1 Pd	483.546 mW	Power	MOSFET power dissipation
47.	M1 PdCond	281.42 mW	Power	M1 MOSFET conduction losses
48.	M1 PdSw	202.126 mW	Power	M1 MOSFET switching losses
49.	M2 Pd	278.009 mW	Power	MOSFET power dissipation
50.	M2 PdCond	184.624 mW	Power	M2 MOSFET conduction losses
51.	M2 PdSw	93.385 mW	Power	M2 MOSFET switching losses
52.	Total Pd	4.587 W	Power	Total Power Dissipation
53.	Vout Tolerance	1.743 %	Unknown	Vout Tolerance based on IC Tolerance and voltage divider resistors if applicable

Design Assistance

1. The LM25118 is a wide range buck-boost controller which is operable in an ultra wide input range of 3 to 75V. A buck-boost regulator can maintain regulation for input voltages either higher or lower than the output voltage. The challenge is that buck-boost power converters are not as efficient as buck regulators. The LM5118 has been designed as a dual mode controller whereby the power converter acts as a buck regulator while the input voltage is above the output. As the input voltage approaches the output voltage, a gradual transition to the buck-boost mode occurs. This gradual transition between modes eliminates disturbances at the output during transitions.

2. **LM25118** Product Folder : http://www.ti.com/product/LM25118 : contains the data sheet and other resources.