National Semiconductor
The Sight & Sound of Information

WEBENCH® Design Document

Design 4 - LM5118

Introduction

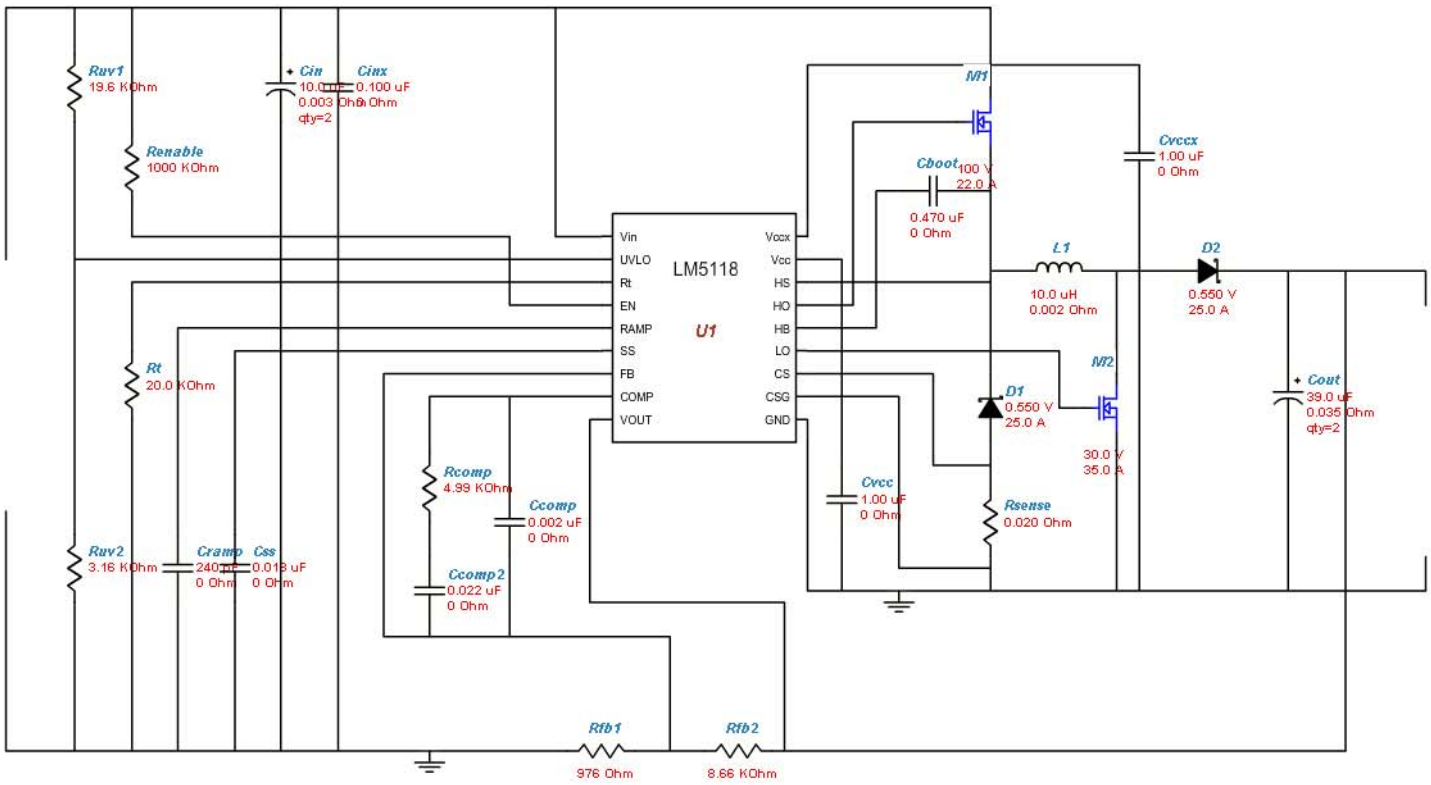
Design Specifications

IC	LM5118
VinMin	11 V
VinMax	18 V

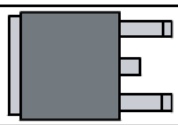
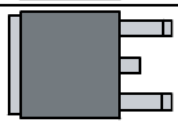
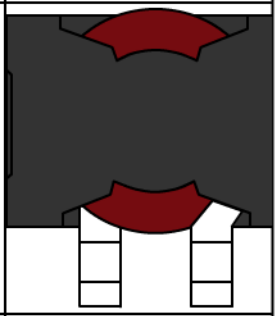
Vout	12 V
Iout	5 A
ta	60

Optimization Factor	3
SoftStart Time	0 mili second

Schematic



Bill of Materials

Part	Manufacturer	Part Number	Quant	Price	Attributes	Top View
Cboot	Taiyo Yuden	TMK212BJ474KD-T	1	0.03	Cap=470nF, ESR=0Ohm, VDC=20V	
Ccomp	Yageo America	CC0805KRX7R9BB222	1	0.01	Cap=2.2nF, ESR=0Ohm, VDC=50V	
Ccomp2	Panasonic	ECJ-2VB1H223K	1	0.01	Cap=22nF, ESR=0Ohm, VDC=50V	
Cin	TDK	C3225X7R1E106M	2	0.41	Cap=10uF, ESR=2.7mOhm, VDC=25V	
Cinx	Panasonic	ECJ-2VB1E104K	1	0.01	Cap=100nF, ESR=0Ohm, VDC=25V	
Cout	Nippon Chemi-Con	APXE160ARA390ME61G	2	0.68	Cap=39uF, ESR=0.035Ohm, VDC=16V	
Cramp	MuRata	GRM2165C2A241JA01D	1	0.03	Cap=240pF, ESR=0Ohm, VDC=100V	
Css	Yageo America	CC0805KRX7R9BB183	1	0.01	Cap=18nF, ESR=0Ohm, VDC=50V	
Cvcc	Taiyo Yuden	TMK212BJ105KG-T	1	0.03	Cap=1uF, ESR=0Ohm, VDC=20V	
Cvccx	CUSTOM	CUSTOM	1	0	Cap=1uF, ESR=0Ohm, VDC=12V	
D1	ON Semiconductor	MBRB2535CTLT4G	1	1.25	VFatIo=0.55V, Io=25A, VRRM=35V	
D2	ON Semiconductor	MBRB2535CTLT4G	1	1.25	VFatIo=0.55V, Io=25A, VRRM=35V	
L1	Coilcraft Inc.	SER2915L-103KL	1	2.54	L=10uH, DCR=1.5mOhm, IDC=13A	
M1	Toshiba	TPCA8022-H	1	0	VdsMax=100V, IdsMax=22A, Rdson45=0.019Ohm	
M2	Renesas	RJK0332DPB	1	0.68	VdsMax=30V, IdsMax=35A, Rdson45=5mOhm	
Rcomp	Vishay-Dale	CRCW04024k99FKED	1	0.02	Resistance=4.99KOhm, Tolerance=1%, Power=0.063W	

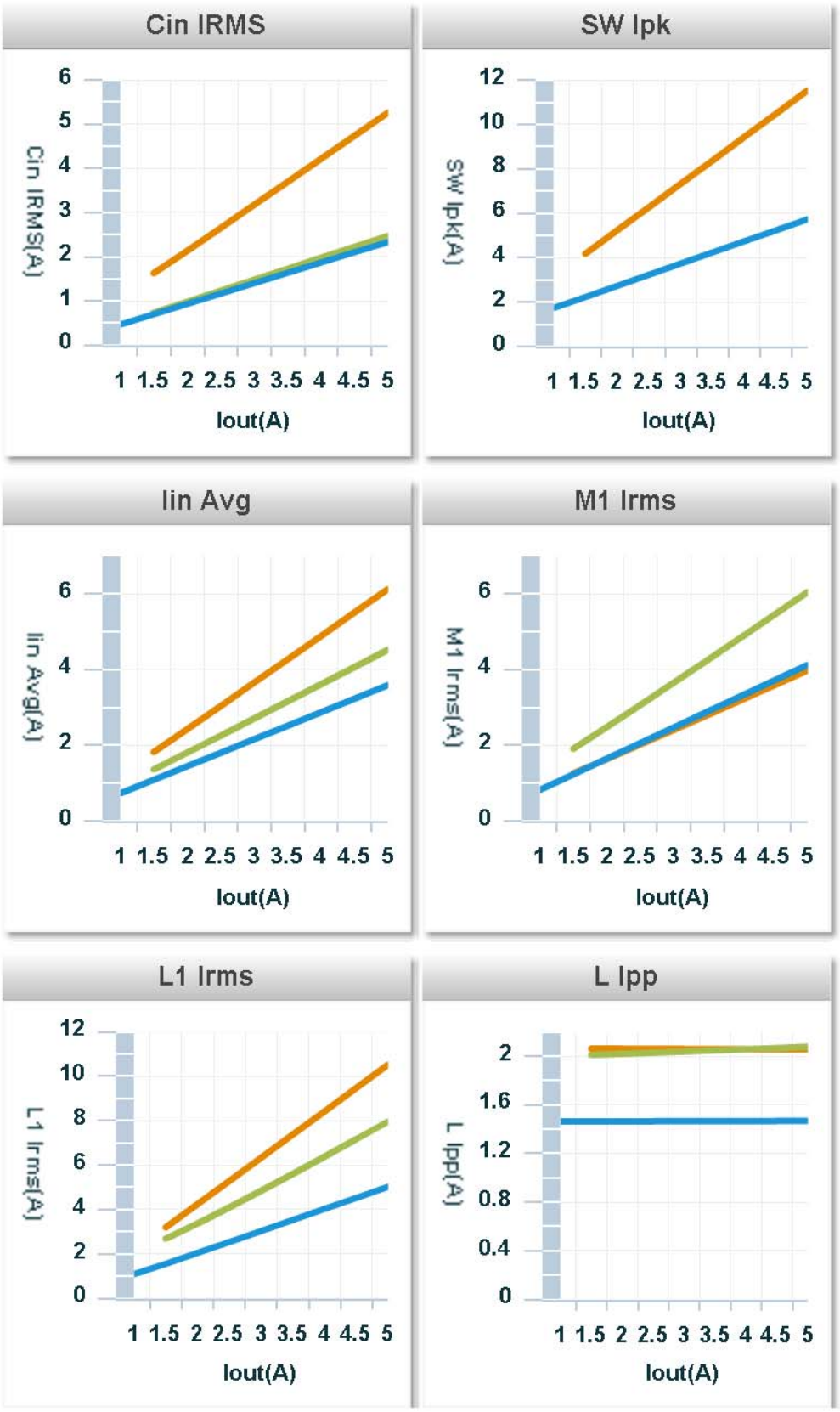
Part	Manufacturer	Part Number	Quant	Price	Attributes	Top View
Rfb1	Vishay-Dale	CRCW0402976RFKED	1	0.02	Resistance=976Ohm, Tolerance=1%, Power=0.063W	
Rfb2	Vishay-Dale	CRCW04028k66FKED	1	0.02	Resistance=8.66KOhm, Tolerance=1%, Power=0.063W	
Rsense	Susumu Co Ltd	RL7520WT-R020-F	1	0.42	Resistance=0.02Ohm, Tolerance=1%, Power=2W	
Rt	Vishay-Dale	CRCW040220k0FKED	1	0.02	Resistance=20KOhm, Tolerance=1%, Power=0.063W	
Ruv1	Vishay-Dale	CRCW040219k6FKED	1	0.02	Resistance=19.6KOhm, Tolerance=1%, Power=0.063W	
Ruv2	Vishay-Dale	CRCW04023k16FKED	1	0.02	Resistance=3.16KOhm, Tolerance=1%, Power=0.063W	
IC	National Semiconductor Inc.	LM5118MH	1	2.92		

Operating Values

Name	Value	Category	Description
Cin IRMS	2.33A	Current	Input capacitor RMS ripple current
SW Ipk	5.73A	Current	Peak switch current
Iin Avg	3.59A	Current	Average input current
M1 Irms	4.12A	Current	MOSFET RMS ripple current
L1 Irms	5.02A	Current	Inductor ripple current
L Ipp	1.45A	Current	Peak-to-peak inductor ripple current
Cout IRMS	0.41A	Current	Output capacitor RMS ripple current
FootPrint	1.28Kmm2	General	Total Foot Print Area of BOM components
M1 Rdson	0.01Ohm	General	Drain-Source On-resistance
Frequency	281KHz	General	Switching frequency
Mode	CCM	General	Conduction Mode
M1 ThetaJA	44.6degC/W	General	MOSFET junction-to-ambient thermal resistance
Pout	60W	General	Total output power
Total BOM	0$	General	Total BOM price
ICThetaJA	40degC/W	Op_point	IC junction-to-ambient thermal resistance
Duty Cycle	68.0%	Op_point	Duty cycle
Efficiency	92.9%	Op_point	Steady state efficiency
IOUT_OP	5A	Op_point	Iout operating point
VIN_OP	18V	Op_point	Vin operating point
Cross Freq	5.17KHz	Op_point	Bode plot crossover frequency, indication of bandwidth
IC Tj	76.7degC	Op_point	IC junction temperature
Vout p-p	0.02V	Op_point	Peak-to-peak output ripple voltage
Operating Topology	Buck	Op_point	The current operating topology of the device
Phase Marg	68.5deg	Op_point	Bode Plot Phase Margin
M1 TjOP	79.8degC	Op_point	MOSFET junction temperature
M1 Pd	0.44W	Power	MOSFET power dissipation
L Pd	0.04W	Power	Inductor power dissipation
Cout Pd	3.07mW	Power	Output capacitor power dissipation
IC Pd	0.41W	Power	IC power dissipation
M1 PdCond	0.32W	Power	Mosfet Conduction Loss
M1 PdSw	0.11W	Power	Mosfet Switching Loss
Cin Pd	7.35mW	Power	Input capacitor power dissipation
Diode Pd	0.88W	Power	Diode power dissipation

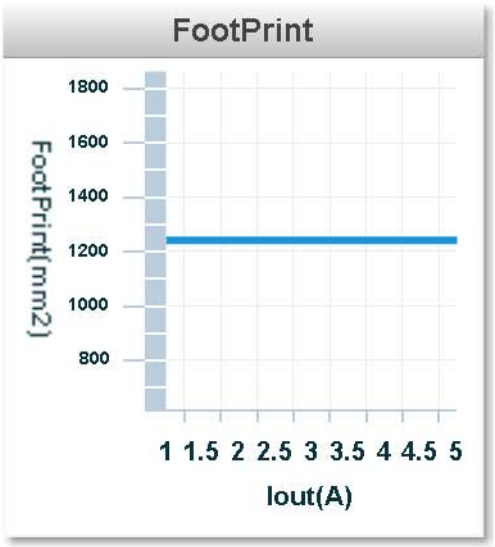
Charts

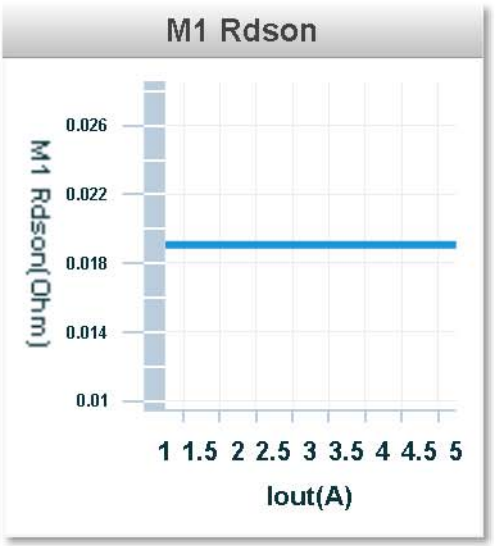
Current

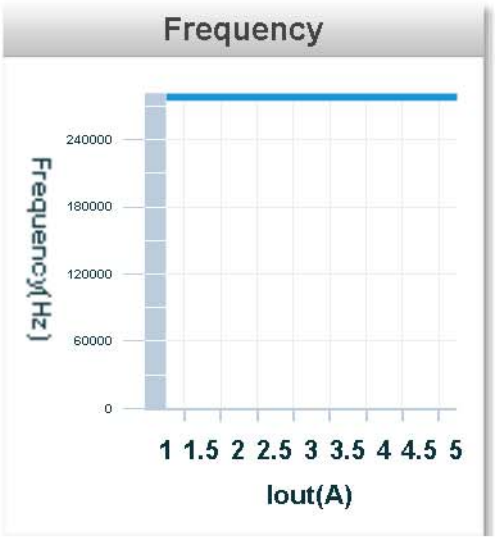


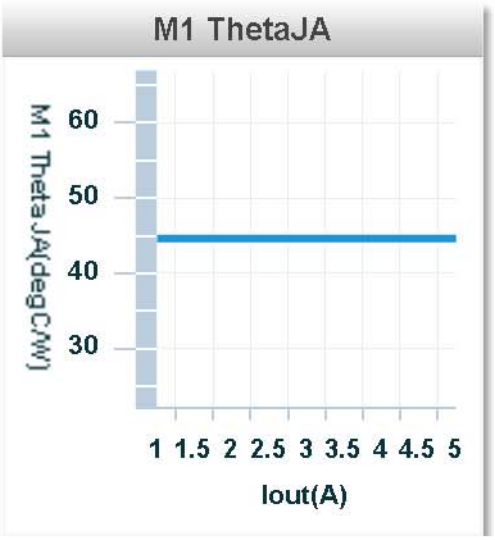
Charts (Continued)

General





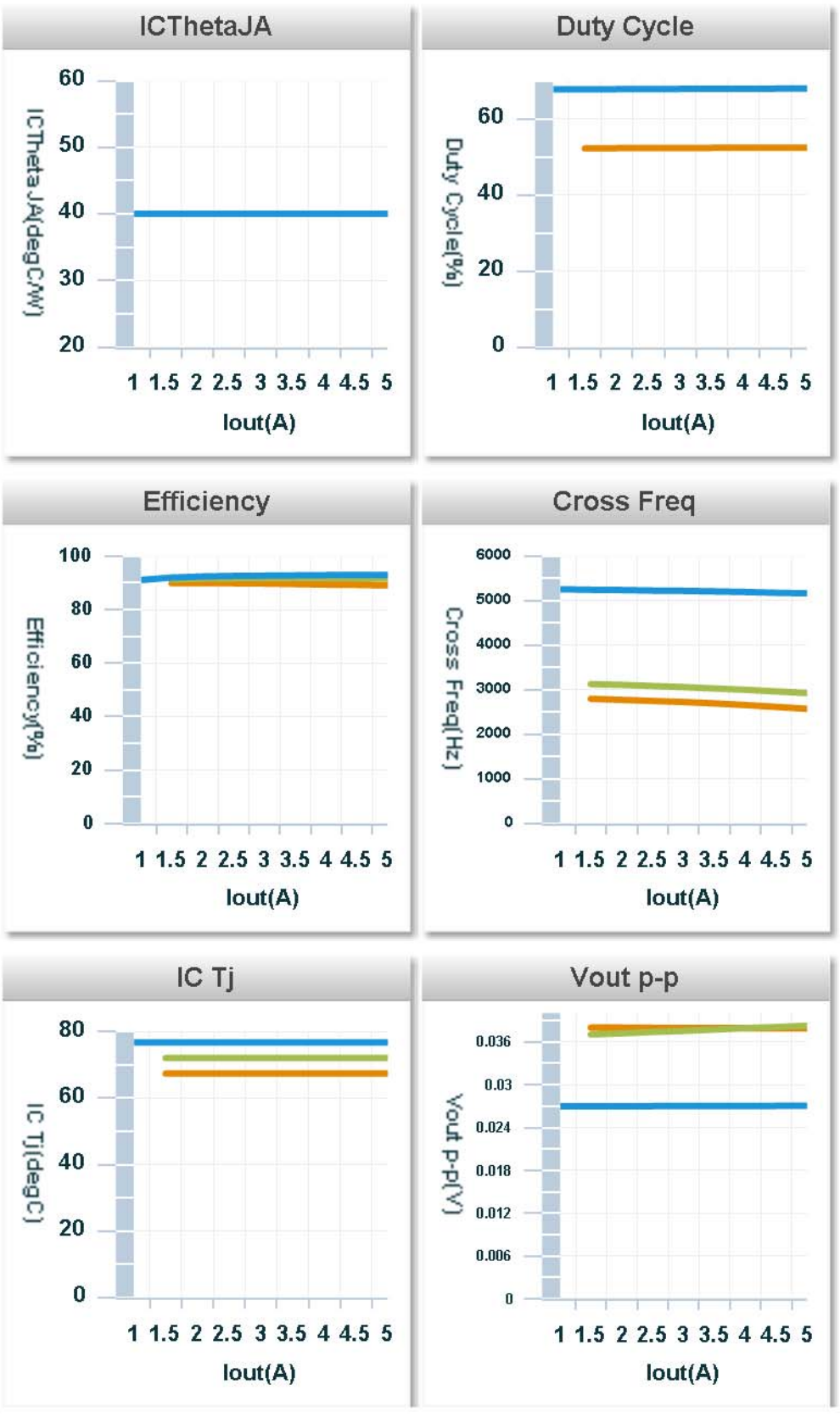




Charts (Continued)

Op_point

Vin=11.00V Vin=14.50V Vin=18.00V



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Power