LM(2)5116 Quick Start Component Calculator

Version 1.2

Revision date: 20 Feb 2008

Note: The components calculated in this worksheet are reasonable starting values for a desig using the LM(2)5116. They are not optimized for any particular performance attribute.

Step 1 - General Requirements	Vout (V)	24	24
Enter parameters in	Vin(min) (V)	24	24
shaded cells.	Vin(max) (V)	100	100
	Maximum Ave Load Current (A)	4	5
	Ripple Current % of Maximum Load Current	80%	25%
	VCCX voltage (V)	12	0
	Recommended IC	**LM5116**	**LM5116**
Step 2 - Current Limit	Target (% beyond Max Load)	25%	15%
	Average Load Current at Current Limit (A)	5	5.75
	Short Circuit Current (A)	9.2	7.4
	Current Sense Method	**R-sense**	**R-sense**
	Low -side MOSFET Rds (mOhm)	20.0	20.0
	Rs (mOhm)	11.9	14.9
Step 3 - Switching Frequency	Fsw (kHz)	250	250
Decrease Switching Frequency or check Vin range!	Rt (kΩ)	12.50	12.50
Fsw limited by Vin : Vout ratio			
Step 4 - Output Capacitors	Cout1 (µF)	188	188
	Cout2 (µF)	22	22
	Cout (µF)	210	210
	Capacitor ESR (Ω)	0.008	0.008
	ΔVout (mV)	26.7	10.4
Step 5 - Inductor Value	L (µH)	22.8	58.4
Step 6 - Ramp Capacitor	Cramp (pF)	636	1,308
	Rramp (kΩ)	206.2	128.7
Step 7 - VIN Undervoltage Shutdown	Required ?	**Yes**	**Yes**
	VIN Under Voltage Threshold (V)	10	10
	Ruv2 (kOhm)	102.0	102.0
	Ruv1 (kOhm)	13.33	13.33
Step 8 - Current Limit Hiccup Duty Cycle	Cft (µF)	1.00	1.00
	toff (ms)	1.31	1.31
	ton (ms)	1.02	1.02
	Duty Cycle	43.8%	43.8%
Step 9 - Feedback Resistors	Rfb1 (Ω)	1,210	1,210
	Rfb2 (Ω)	22,691	22,691
Step 10 - Diode Emulation Mode	Required ?	**No**	**No**
	Rdem (Ω)	4,837	1,785
Step 11 - Chb & Cvcc Capacitor	Low-side MOSFET Qg at VGS=4.5V (nC)	20.0	20.0
	Low-side MOSFET Qg at VGS=10V (nC)	34.0	34.0
	Cvcc (µF)	0.78	0.55
	Hi-side MOSFET Qg at VGS=4.5V (nC)	20.0	20.0
	Hi-side MOSFET Qg at VGS=10V (nC)	34.0	34.0
	Chb (µF)	0.39	0.27
	VCC Start-Up Current ICC (mA)	14.7	14.7
	VCC Run Current ICC (mA)	20.5	14.7
Step 12 - Input Capacitor	Cin (µF)	10.0	11.5
Step 13 - Compensation Network	Bandwidth Fc (kHz)	25.00	25.00
	Modulator Gm(mod) (A/V)	8.37	6.72
	Modulator cross over frequency Fc(mod) (kHz)	6.35	5.09
	Rcomp (kΩ)	89.4	111.3
	Ccomp (pF)	712	572
	Chf (pF)	19	15
	Error Amp Zero (kHz)	2.50	2.50
Step 14 - Soft Start Capacitor	tss(min) (ms)	5.04	6.72
	tss (ms)	12.10	12.10
	Css (µF)	0.100	0.100

LM(2)5116 List of Components

Kicad Designator	Component	Description	Value	Selected value	Rating	
C8,C9,C10,C11, C22	Cin	Input capacitor	11.5 µF		100 V	2.50 A RMS
C4	Cramp	Ramp capacitor	1,308 pF	1300PF 50V NP0 0805	5 V	5% COG
C3	Css	Soft start capacitor	0.100 µF		5 V	X7R
C17,C18,C19	Cout1	Output capacitor	188 µF		24 V	0.36 A RMS
C20	Cout2	Output capacitor	22.0 µF		24 V	X7R
C7	Cft	UVLO filter capacitor	1.00 µF		16 V	X7R
C6	Ccomp	Compensation capacitor	572 pF	CER 560PF 50V C0G/NP0 0805	5 V	X7R
C5	Chf	Compensation capacitor	15 pF	CAP CER 15PF 50V C0G/NP0 0805	5 V	X7R
C14	Cvcc	VCC bypass capacitor	0.548 µF	0.56UF 50V X7R 0805	16 V	X7R
C1	Chb	HB-SW bypass capacitor	0.274 µF	CAP CER 0.27UF 50V X7R 0805	16 V	X7R
C2	C-vccx					
C_EN	C-EN					
R4	Rfb1	Feedback resistor	1,210 Ω		1/16 W	1%
R3	Rfb2	Feedback resistor	22,691 Ω		1/16 W	1%
R1	Ruv1	UVLO divider resistor	13.33 kΩ		1/16 W	1%
R2	Ruv2	UVLO divider resistor	102.0 kΩ		1/8 W	1%
R11	Rs	Sense resistor	14.9 mΩ	0.015 OHM 1% 2W 2010	1/2 W	1%
Rg1	Rg	Gain resistors	-		-	-
R9	Rt	Oscillator timing resistor	12.50 kΩ		1/16 W	1%
R13	R-EN					
L	L	Inductor	58.4 µH	57.8UH 5A 34.5MOHM	7.4 A	Isat (min)
R8	Rdem	Diode emulation resistor	1,785 Ω		1/16 W	5%
R15	Ramp	Optional ramp resistor	128.7 kΩ	129K OHM 0.1% 1/10W 0603	1/16 W	5%
R10	Rcomp	Compensation resistor	111.3 kΩ	111K OHM 0.1% 1/10W 0603	1/16 W	5%