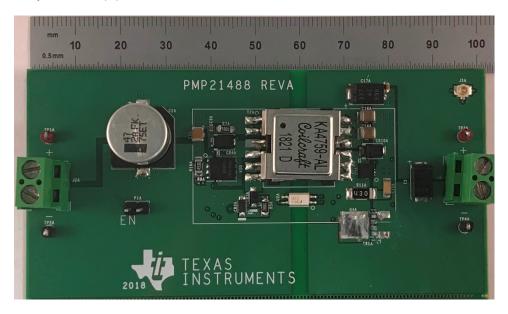
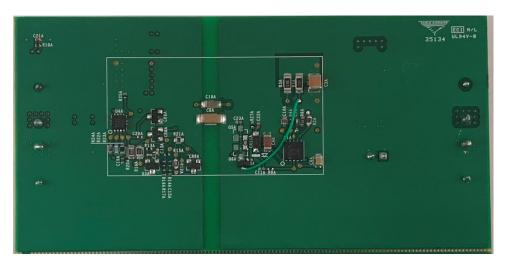
Test Report: PMP21488 A high efficiency 3.3-V/4-A synchronous flyback with hiccup protection reference design

Texas Instruments

Description

This flyback was designed for an isolated 15W low voltage rail. It features LM5020—100V wide input flyback controller. A synchronous secondary rectifier UCC24610 was used for high efficiency. It further enhances LM5020 with hiccup protection by using a simply discrete circuitry. It is good for low voltage isolated supplies where high efficiency and hiccup protection are needed.







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1 Test Prerequisites

1.1 Voltage and Current Requirements

PARAMETER	SPECIFICATIONS
Input voltage, Vin	44V~57V
Output Voltage, Vo1	3.3V/4A

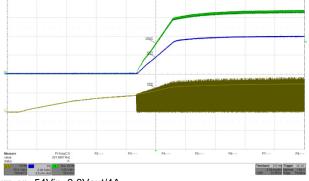
Table 1. Voltage and Current Requirements

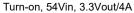
1.2 Required Equipment*

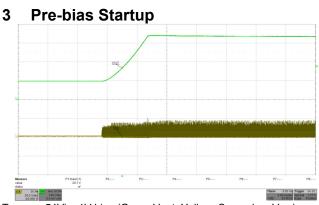
- Power Supply, 0~60V, 0~2A
- Load: 3.3V/4A



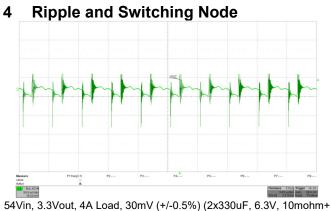
2 Startup and shutdown



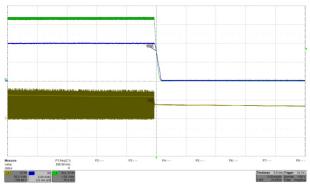


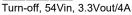


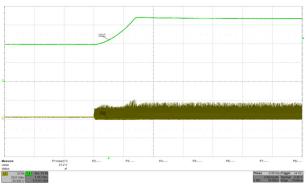
Turn-on, 54Vin, 1V bias (Green:Vout, Yellow: Secondary Vsw)



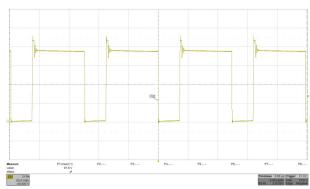
4Vin, 3.3Vout, 4A Load, 30mV (+/-0.5%) (2x330uF, 6.3V, 10mohm 2x 100uF,6.3V,1210)







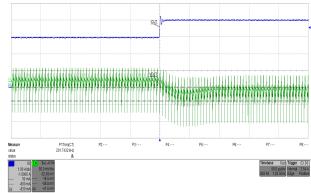
Turn-on, 54Vin, 2V bias (Green:Vout, Yellow: Secondary Vsw)



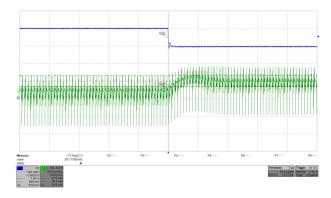
54Vin, 3.3Vout, 4A Load, Vmax=91.9V



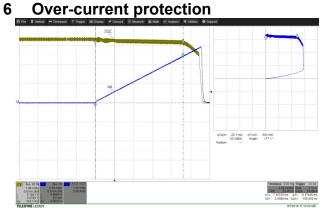
5 Transient



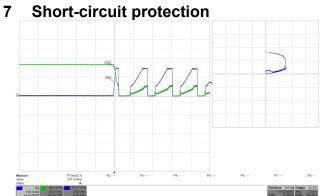
54Vin, 3.3Vout, 3A to 4A Load Step, -41.5mV (-1.3%)



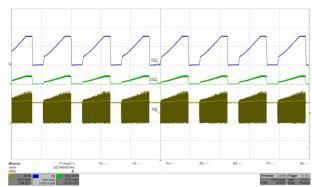
54Vin, 3.3Vout, 4A to 3A Load Step, +30.5mV (+0.9%)

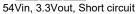


54Vin, 3.3Vout, Over-load applied, OCP=4.65A.



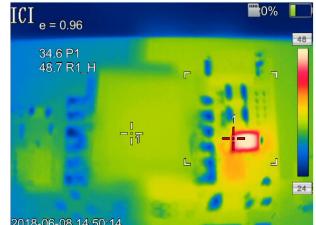




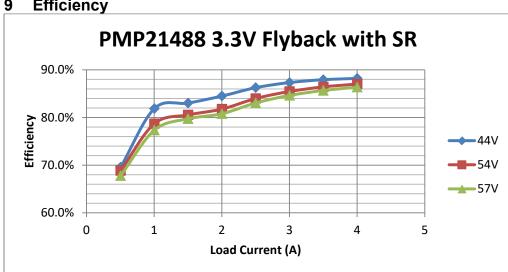




Short-circuit thermal 8



2018-06-08 14:50:14 54Vin, 76mAin, 0Vout, 3.71A short circuit average current, T_{FET(SEC)}=48.7C



Efficiency 9

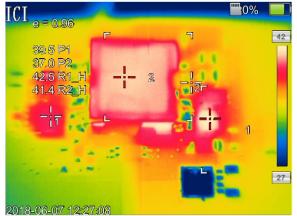
Test conditions: 3.3Vout, 200kHz.

323 322 320	A) 0.013 0.055 0.093 0.137	lout(A) 0.018 0.504 1.004 1.502	Effciency 10.2% 69.6% 81.9%	P _{LOSS} (W) 0.53 0.73 0.74
323 322 320	0.055 0.093	0.504 1.004	69.6% 81.9%	0.73
322 320	0.093	1.004	81.9%	
320				0.74
	0.137	1.502	02.00/	
19		1.502	83.0%	1.02
,1,5	0.179	2.002	84.5%	1.22
818	0.219	2.501	86.3%	1.32
817	0.260	3.002	87.3%	1.44
816	0.301	3.501	87.9%	1.59
814	0.343	4.002	88.2%	1.77
327	0.013	0.018	8.7%	0.62
324	0.045	0.504	68.9%	0.76
322	0.078	1.004	78.7%	0.90
	18 17 16 14 27 24	18 0.219 17 0.260 16 0.301 14 0.343 27 0.013 24 0.045	18 0.219 2.501 17 0.260 3.002 16 0.301 3.501 14 0.343 4.002 27 0.013 0.018 24 0.045 0.504	18 0.219 2.501 86.3% 17 0.260 3.002 87.3% 16 0.301 3.501 87.9% 14 0.343 4.002 88.2% 27 0.013 0.018 8.7% 24 0.045 0.504 68.9%



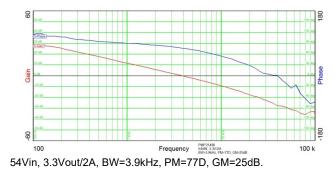
53.984	3.321	0.115	1.501	80.5%	1.20
53.964	3.319	0.151	2.002	81.8%	1.48
53.947	3.318	0.183	2.501	84.0%	1.58
53.928	3.317	0.216	3.002	85.5%	1.69
53.909	3.316	0.249	3.501	86.4%	1.82
53.890	3.315	0.283	4.002	87.0%	1.98
57.030	3.327	0.013	0.018	8.3%	0.66
57.014	3.323	0.043	0.504	67.8%	0.80
56.996	3.322	0.076	1.003	77.4%	0.98
56.978	3.321	0.110	1.501	79.7%	1.27
56.959	3.319	0.144	2.002	80.8%	1.58
56.942	3.318	0.175	2.501	83.1%	1.69
56.924	3.317	0.207	3.002	84.6%	1.81
56.907	3.316	0.238	3.501	85.7%	1.94
56.889	3.315	0.270	4.002	86.4%	2.09

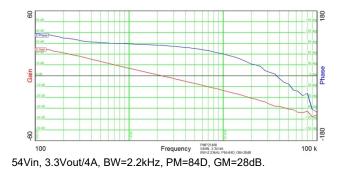
10 Thermal



Test conditions: 54Vin, 3.3V/4Aout, 200 kHz, Room Temperature, Natural convection. T_{FET(SEC)}=42.5C, T_{XFMR}=41.4C, T_{FET(PRI)}=39.5C.

11 Bode Plot





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