

方案简介

本方案由 VPS8701B 和变压器 VPT87DD-01D 组合，结合必要的整流二极管以及阻容元件实现 $12V \pm 10\%$ 输入， $12V/83mA$ 输出的隔离非稳压电源。原副边爬电距离 $\geq 8mm$ ，隔离耐压不小于 $6000VDC$ ，可长期短路保护并自恢复。主要应用于电路板上分布式电源系统中需要产生一组与输入隔离以达到安全和（或）抗干扰的场合。

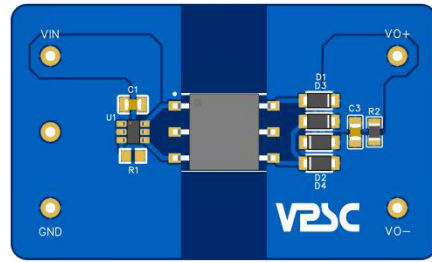
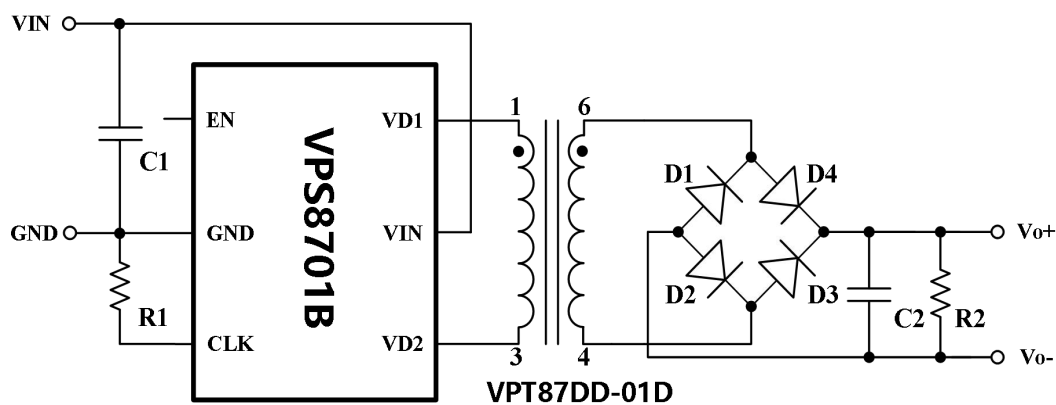


图 1: VPS8701B Demo 板 (50mm*30mm)

关键词：输入：10.8V-13.2V，输出 12V/1W，爬电距离： $\geq 8mm$ ，隔离电压： $6000VDC$ ，反馈方式：开环

原理图



物料清单

位号	参数	封装	选型建议
IC1	VPS8701B	SOT23-6	---
C1	1uF/16V	0603	电容量 1uF，耐压 16V 以上，X7R 材质
C2	4.7uF/25V	0805	电容量 4.7uF，耐压 16V 以上，X7R 材质
R1	---	---	调频引脚，可悬空使用
R2	10KΩ	0805	10KΩ，精度 $\pm 1\%$
D1/D2/D3/D4	MBRX160	SOD-123	平均电流 0.5A，耐压 60V 以上 不重复浪涌峰值电流 1A 以上（短路保护）
TR1	VPT87DD-01D	SMD-6	---

总体性能一览表

性能指标	测试条件	Min	Typ	Max	Unit
输入电流 (满载/空载)	VIN=12V; Io=83mA/0A	3	---	93	mA
转换效率	Typ: VIN=12V, Io=83mA	---	89	---	%
纹波&噪声	VIN=12V; Io=83mA	---	30	70	mV
工作温度	---	-40	---	105	°C
绝缘电压	原边短接 VS 副边短接	6000	---	---	VDC
开关频率	VIN=12V	---	250	---	KHz
短路保护	VIN=12V; Io=83mA	可长期保护，即时自恢复			

关键性能指标测试结果

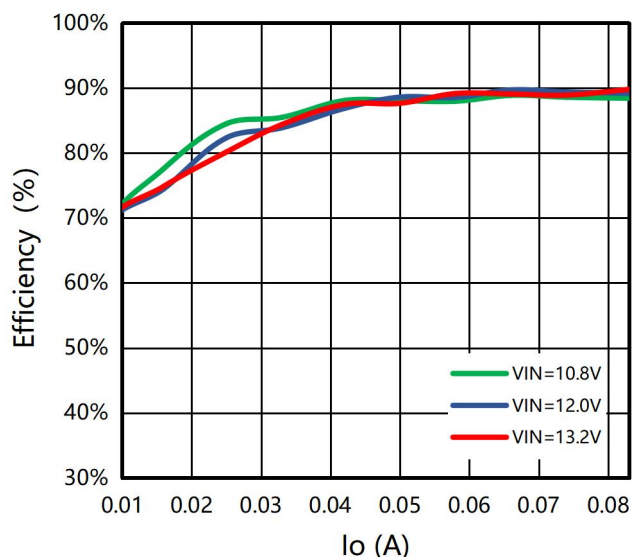


图 2: 效率 VS 输出电流(输出满载)

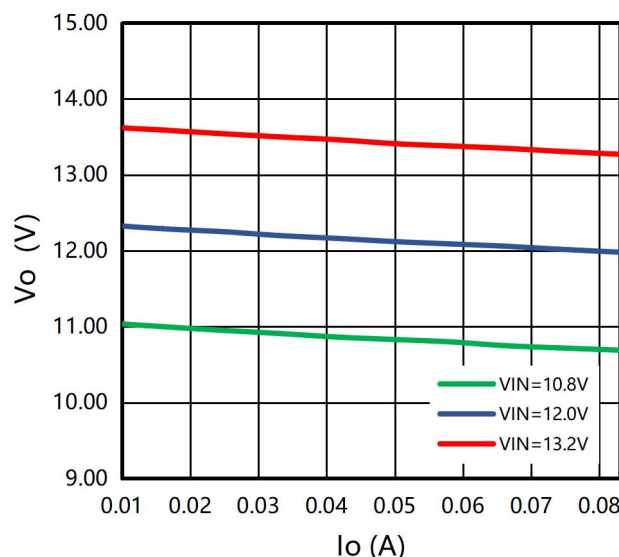


图 3: 输出电压 VS 输出电流

相关波形

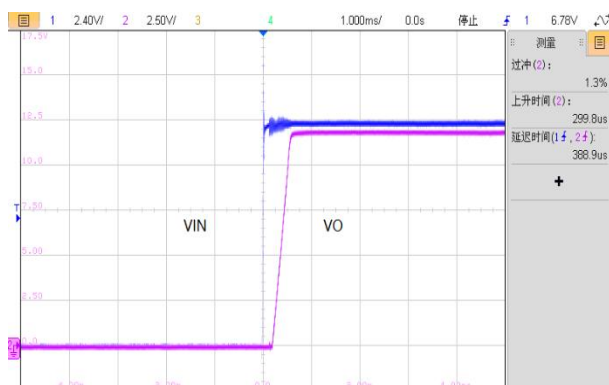


图 4: VIN=12V, 满载启机波形

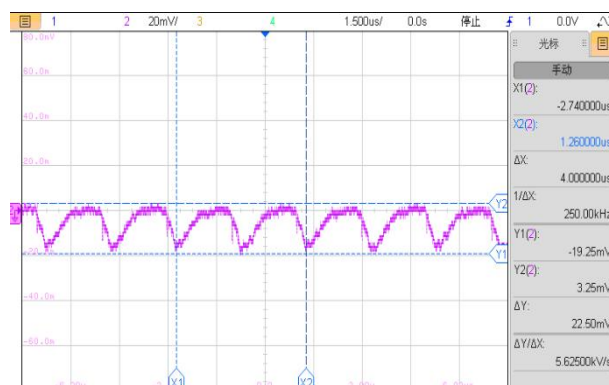
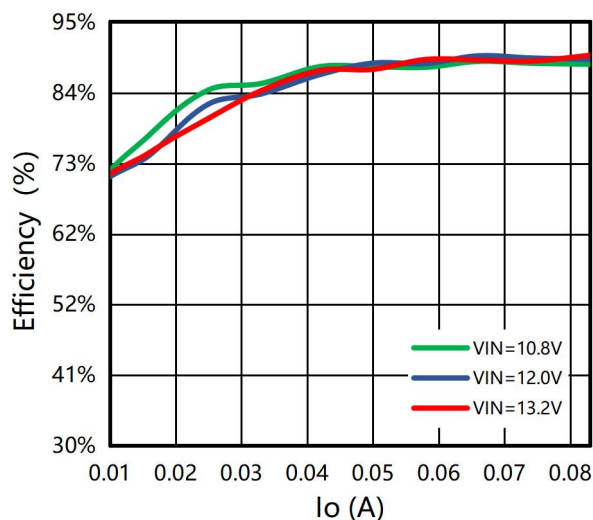


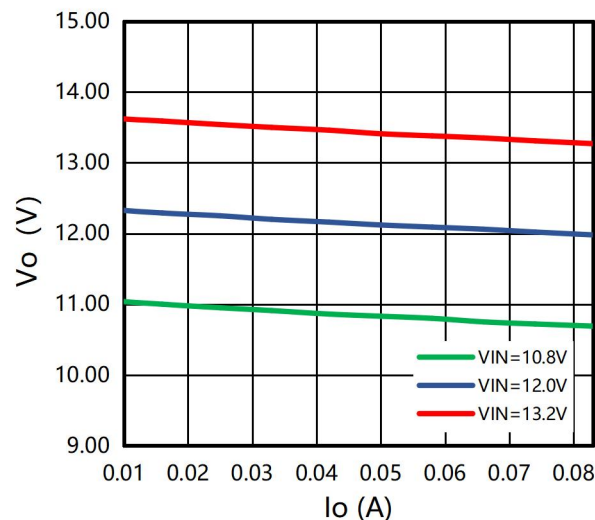
图 5: VIN=12V, 满载输出电压纹波波形

详细测试数据

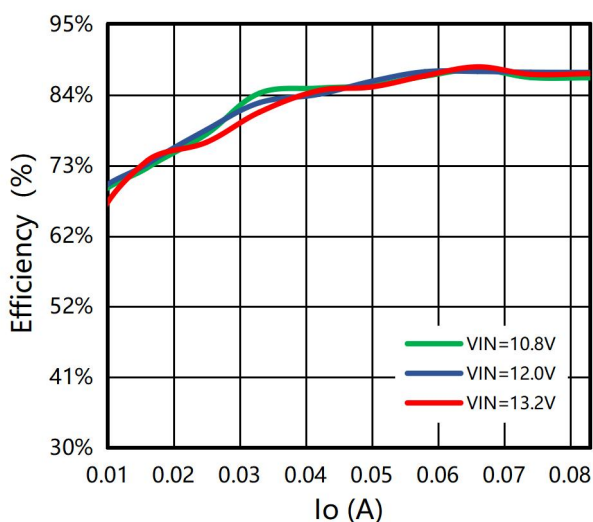
高低温测试曲线



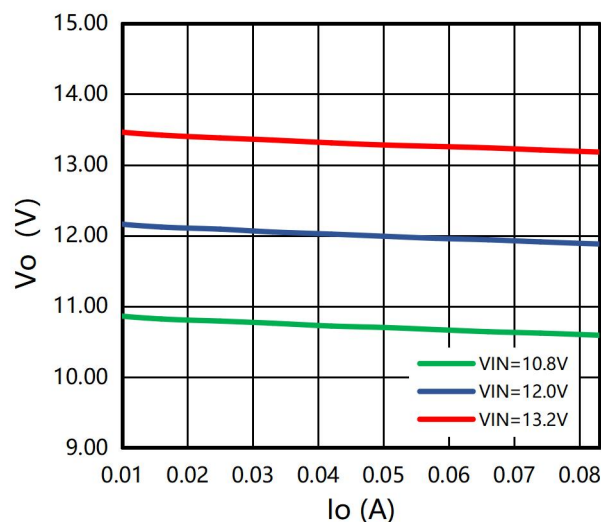
效率 VS 输出电流(25°C)



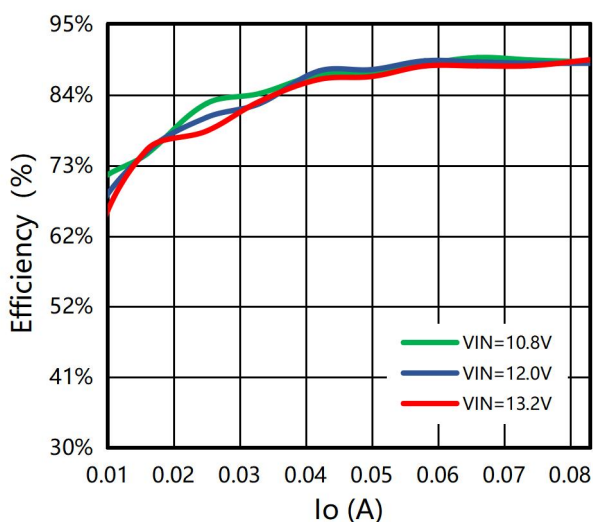
效率 VS 输入电压(输出满载@25°C)



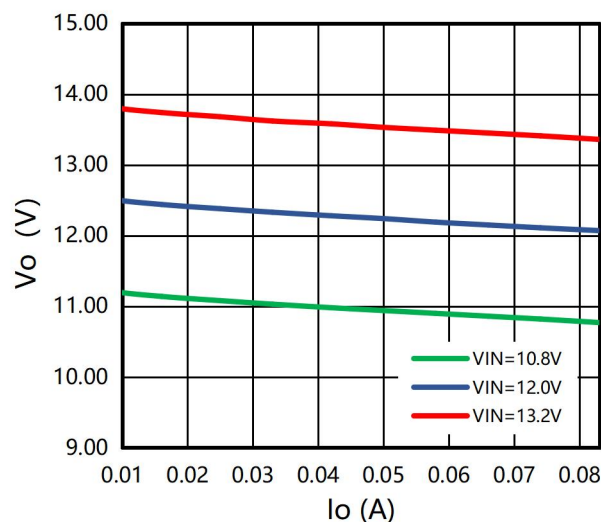
效率 VS 输出电流(-40°C)



效率 VS 输入电压(输出满载@-40°C)



效率 VS 输出电流(85°C)



效率 VS 输入电压(输出满载@85°C)

VIN=12V, Ta=25°C, 输入、输出及效率数据:

VIN(V)	IIN(A)	VO(V)	IO(A)	η(%)
12.00	0.003	12.51	0.000	0.00%
12.00	0.012	12.35	0.008	68.61%
12.00	0.022	12.29	0.016	74.48%
12.00	0.031	12.25	0.025	82.33%
12.00	0.040	12.20	0.033	83.88%
12.00	0.049	12.16	0.042	86.86%
12.00	0.057	12.12	0.050	88.60%
12.00	0.066	12.09	0.058	88.54%
11.99	0.074	12.06	0.066	89.71%
11.99	0.083	12.02	0.074	89.38%
11.99	0.093	11.98	0.083	89.17%

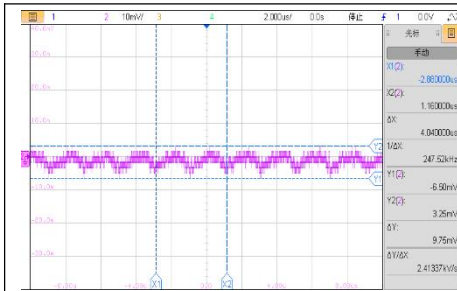
VIN=12V, Ta=-40°C, 输入、输出及效率数据:

VIN(V)	IIN(A)	VO(V)	IO(A)	η(%)
12.00	0.004	12.30	0.000	0.00%
12.00	0.012	12.18	0.008	67.67%
12.00	0.022	12.12	0.016	73.45%
12.00	0.032	12.09	0.025	78.71%
12.00	0.040	12.05	0.033	82.84%
12.00	0.050	12.02	0.042	84.14%
12.00	0.058	11.99	0.050	86.14%
12.00	0.066	11.96	0.058	87.59%
11.99	0.075	11.94	0.066	87.63%
11.99	0.084	11.91	0.074	87.51%
11.99	0.094	11.88	0.083	87.49%

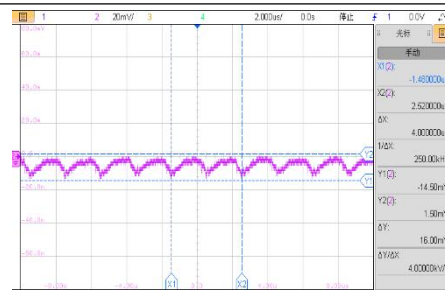
VIN=12V, Ta=85°C, 输入、输出及效率数据:

VIN(V)	IIN(A)	VO(V)	IO(A)	η(%)
12.00	0.003	12.69	0.000	0.00%
12.00	0.013	12.52	0.008	64.21%
12.00	0.022	12.44	0.016	75.39%
12.00	0.032	12.38	0.025	80.60%
12.00	0.041	12.33	0.033	82.70%
12.00	0.049	12.28	0.042	87.71%
12.00	0.058	12.24	0.050	87.93%
12.00	0.066	12.19	0.058	89.27%
12.00	0.075	12.15	0.066	89.10%
12.00	0.084	12.11	0.074	88.90%
11.99	0.094	12.07	0.083	88.89%

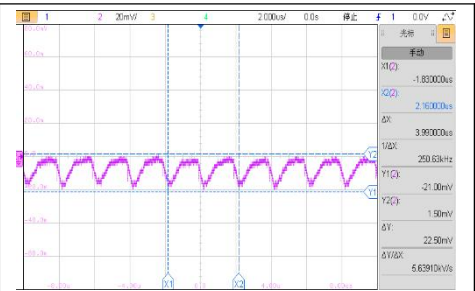
输出电压纹波波形



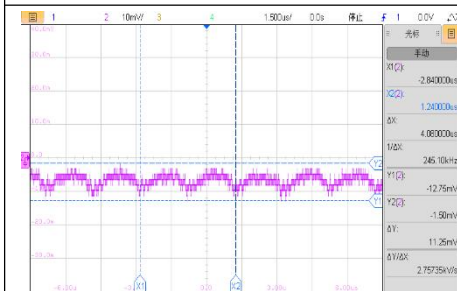
VIN=10.8V, 轻载输出电压纹波波形



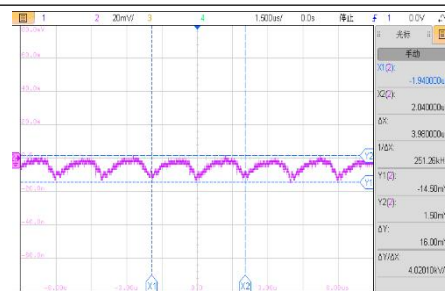
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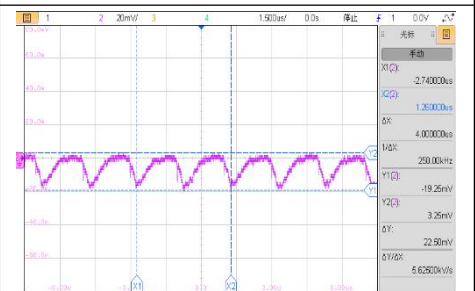
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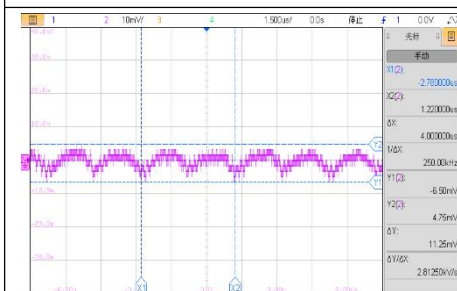
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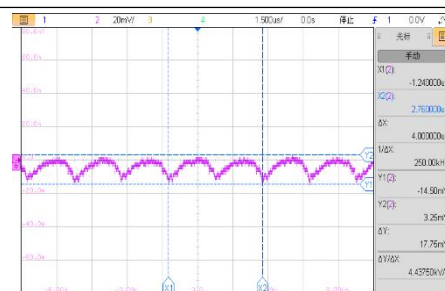
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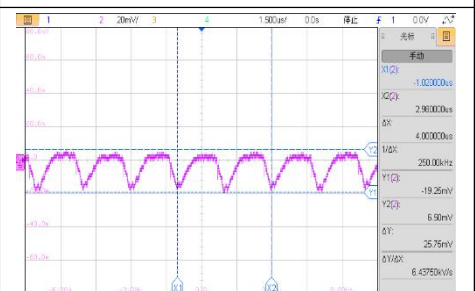
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VIN=13.2V, 轻载输出电压纹波波形

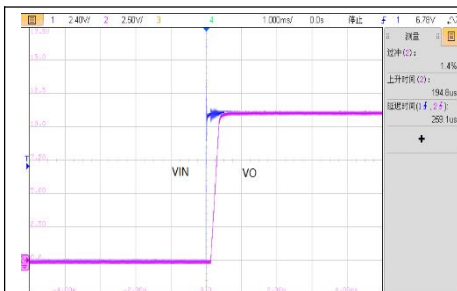


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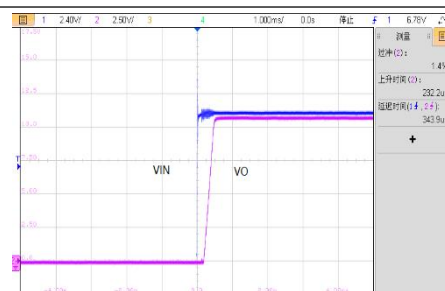


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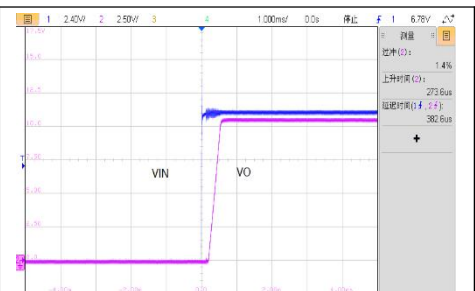
开关机波形



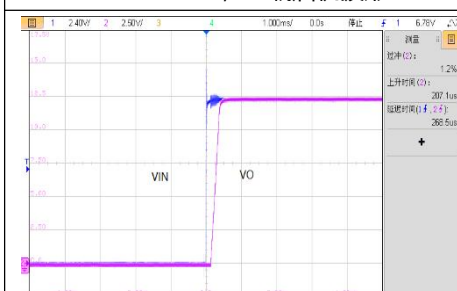
VIN=10.8V, 空载启机波形



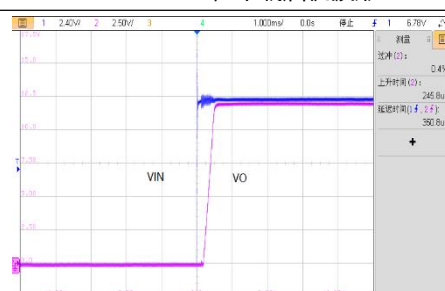
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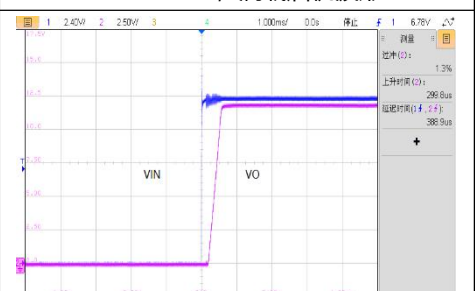
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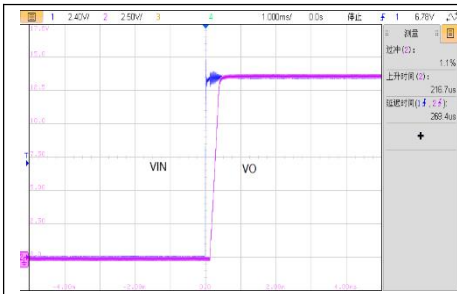
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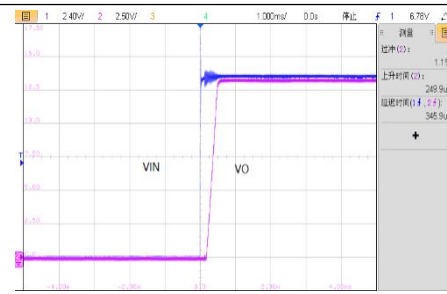
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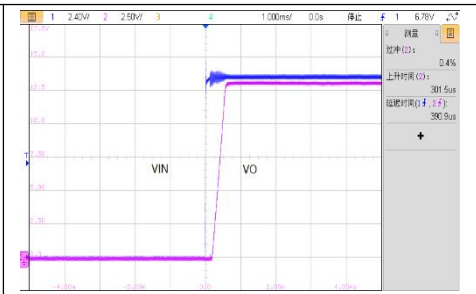
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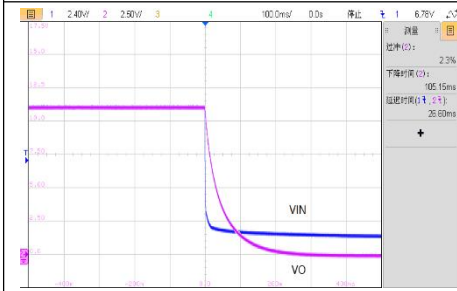
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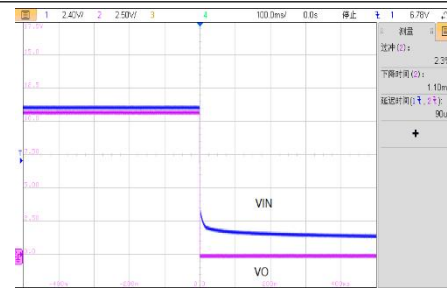
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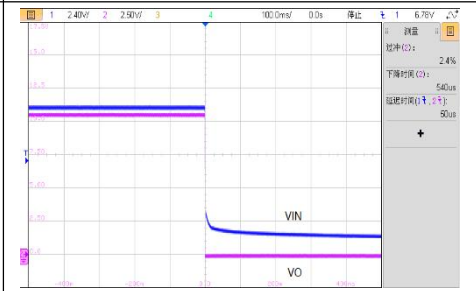
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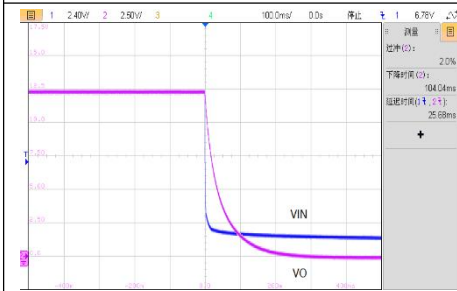
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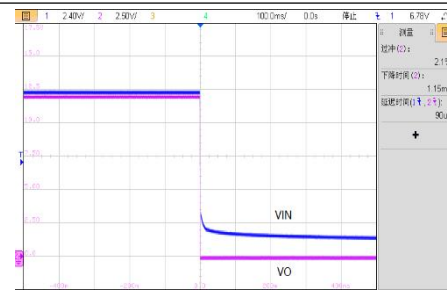
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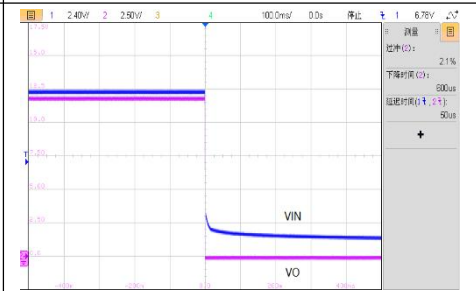
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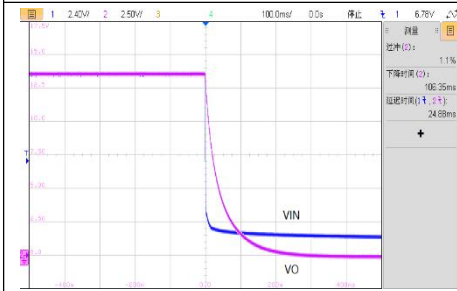
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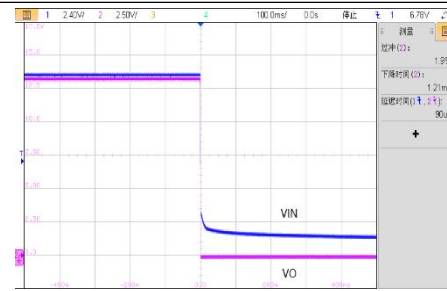
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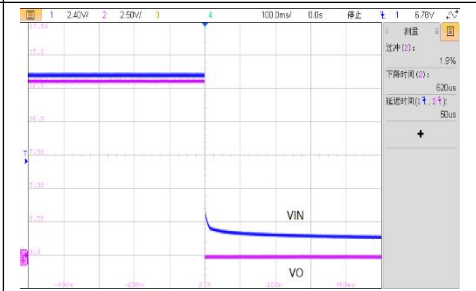
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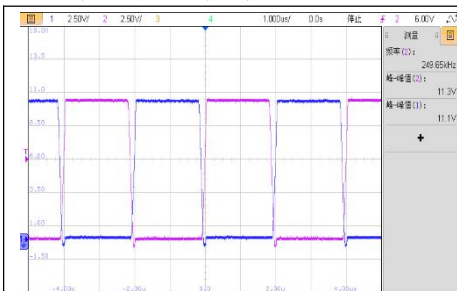


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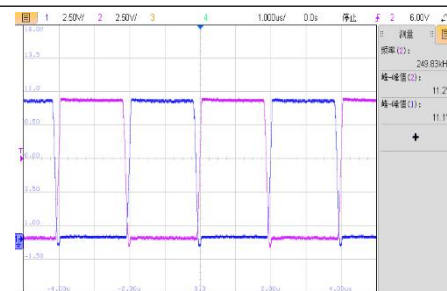


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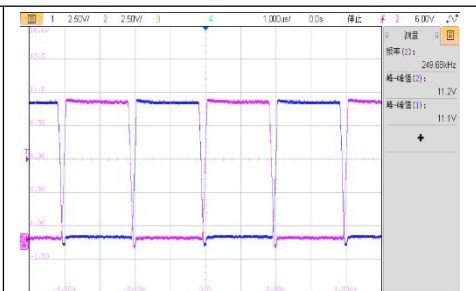
MOS 管电压应力波形-VP8701B



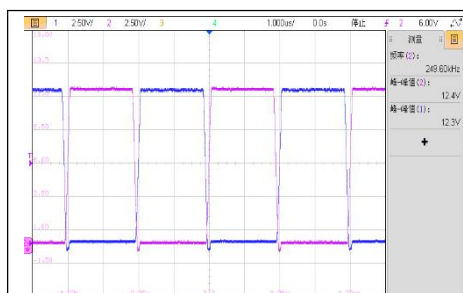
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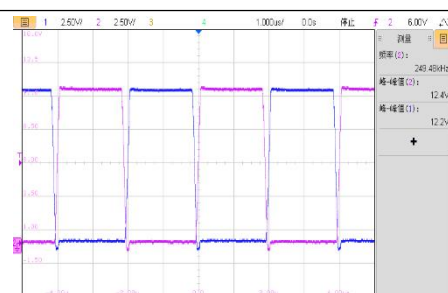
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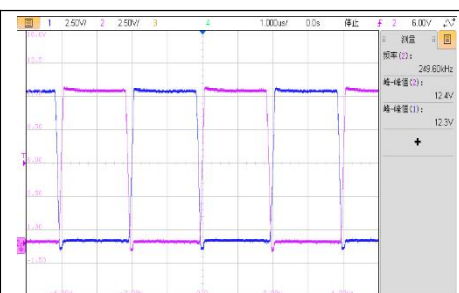
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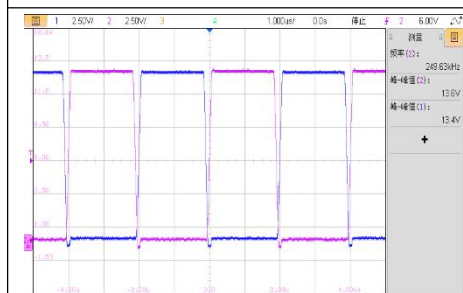
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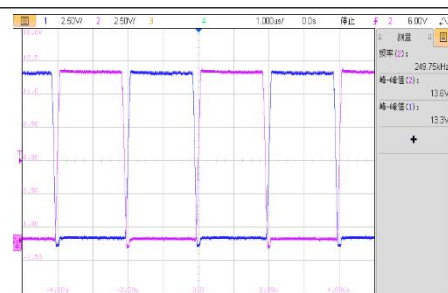
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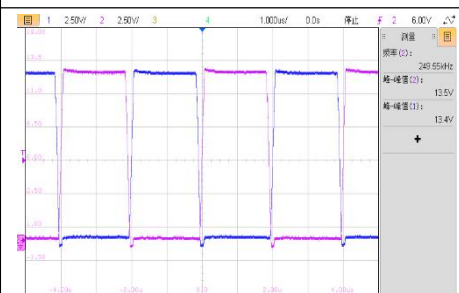
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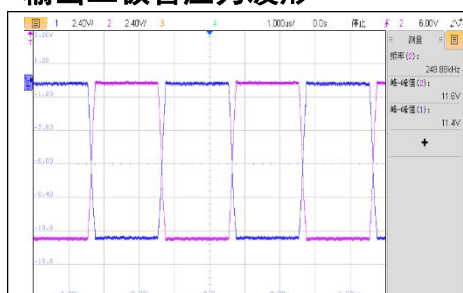


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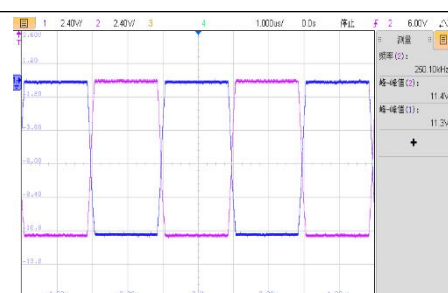


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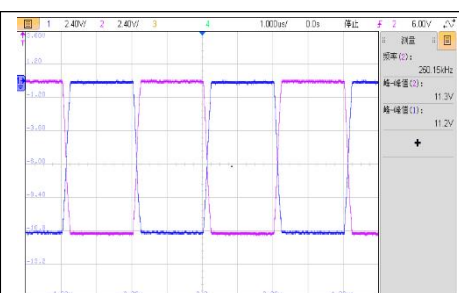
输出二极管应力波形



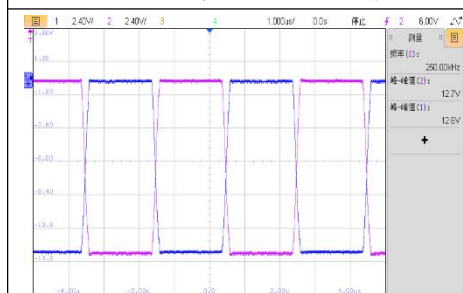
VIN=10.8V, 空载工作电压波形



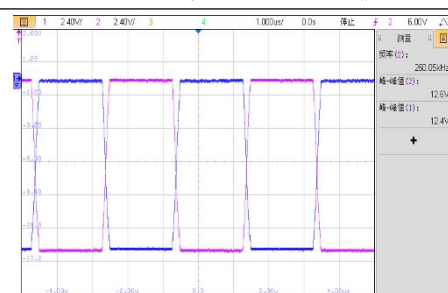
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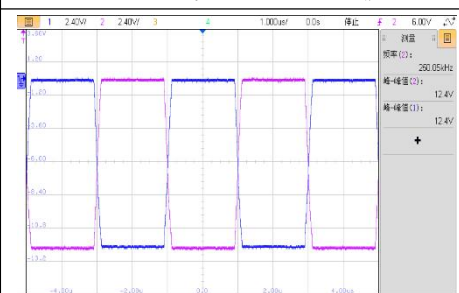
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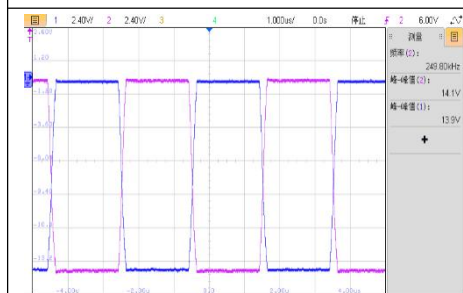
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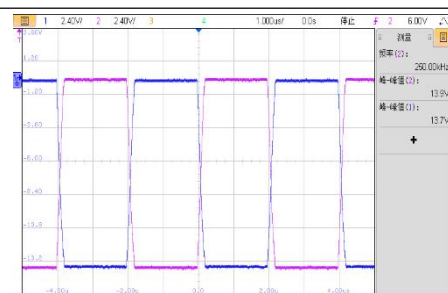
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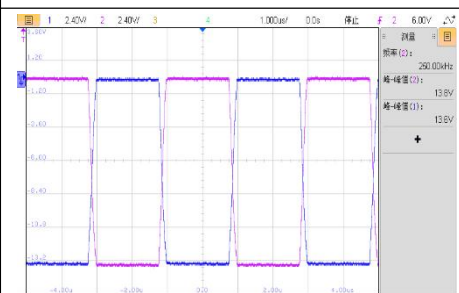
VIN=12.0V, 满载工作电压波形



VIN=13.2V, 空载工作电压波形



VIN=13.2V, 半载工作电压波形



VIN=13.2V, 满载工作电压波形

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