

方案简介

本方案由 VPS8504B 和推挽变压器 VPT85BB-03B 组合, 结合必要的整流二极管以及阻容元件实现 $5V \pm 10\%$ 输入, 5V/600mA 输出的隔离非稳压电源。原副边隔离耐压不小于 3000VDC, 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。

关键词: 输入: 4.5V-5.5V, 输出 5V/3W, 隔离电压: 3000VDC, 反馈方式: 开环

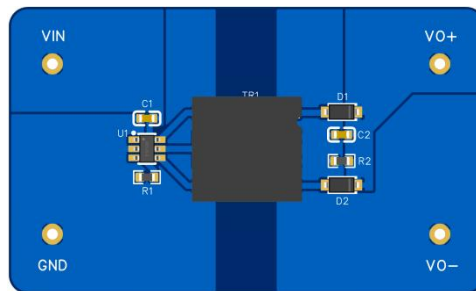
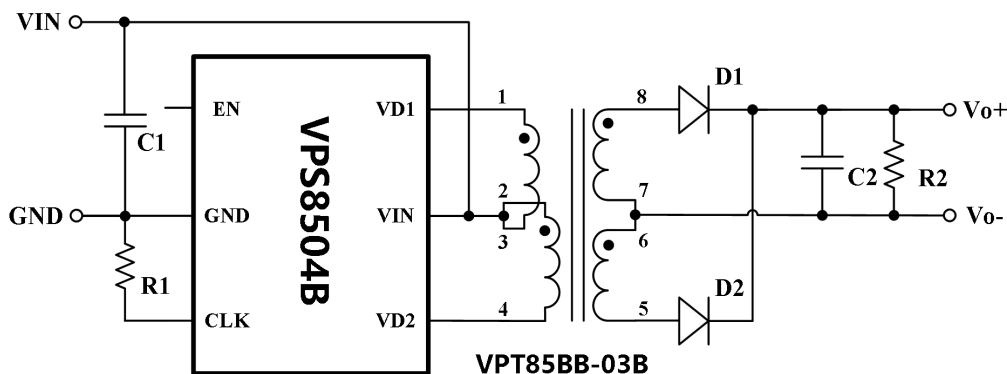


图 1: VPS8504B Demo 板(尺寸:50mm*30mm)

原理图



物料清单

位号	参数	封装	选型建议
IC1	VPS8504B	SOT23-6	---
C1	4.7uF/10V	0603	电容量 4.7uF, 耐压 10V 以上, X7R 材质
C2	10uF/16V	0603	电容量 10uF, 耐压 16V 以上, X7R 材质
R1	---	---	---
R2	4.7KΩ	0603	4.7KΩ, 精度±1%
D1/D2	RB160M-30TR	SOD-123	平均电流 1A, 耐压 30V 以上 不重复浪涌峰值电流 3A 以上 (短路保护)
TR1	VPT85BB-03B	SMD-8	---

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=5V; Io=600mA/0A	3	---	692	mA
转换效率	Typ: VIN=5V, Io=600mA	---	84	---	%
纹波&噪声	VIN=5V; Io=600mA	---	80	120	mV
工作温度	---	-40	---	105	°C
绝缘电压	原边短接 VS 副边短接	3000	---	---	VDC
开关频率	VIN=5V	---	217	---	KHz
短路保护	VIN=5V; Io=600mA	可长期保护, 即时自恢复			

关键性能指标测试结果

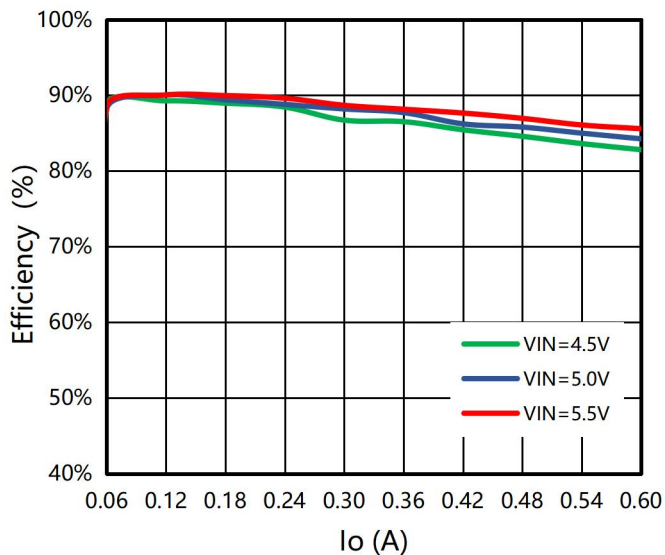


图 2: 效率 VS 输出电流(输出满载)

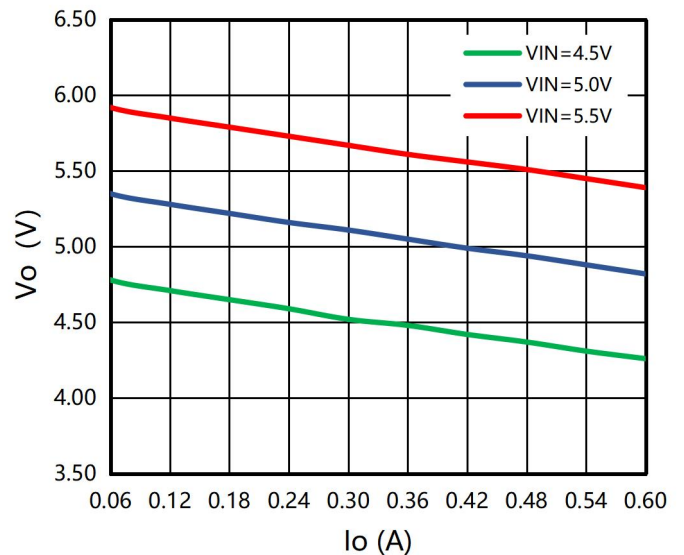


图 3: 输出电压 VS 输出电流

相关波形

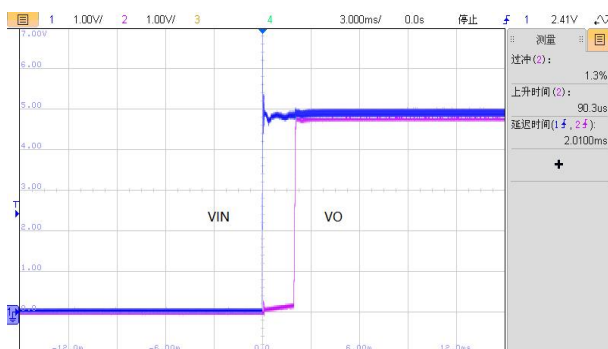


图 4: VIN=5V, 满载启机波形

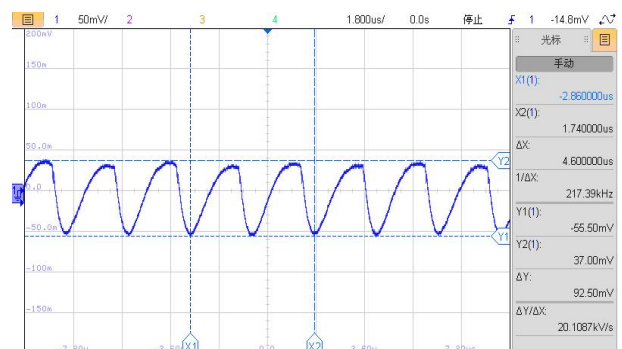
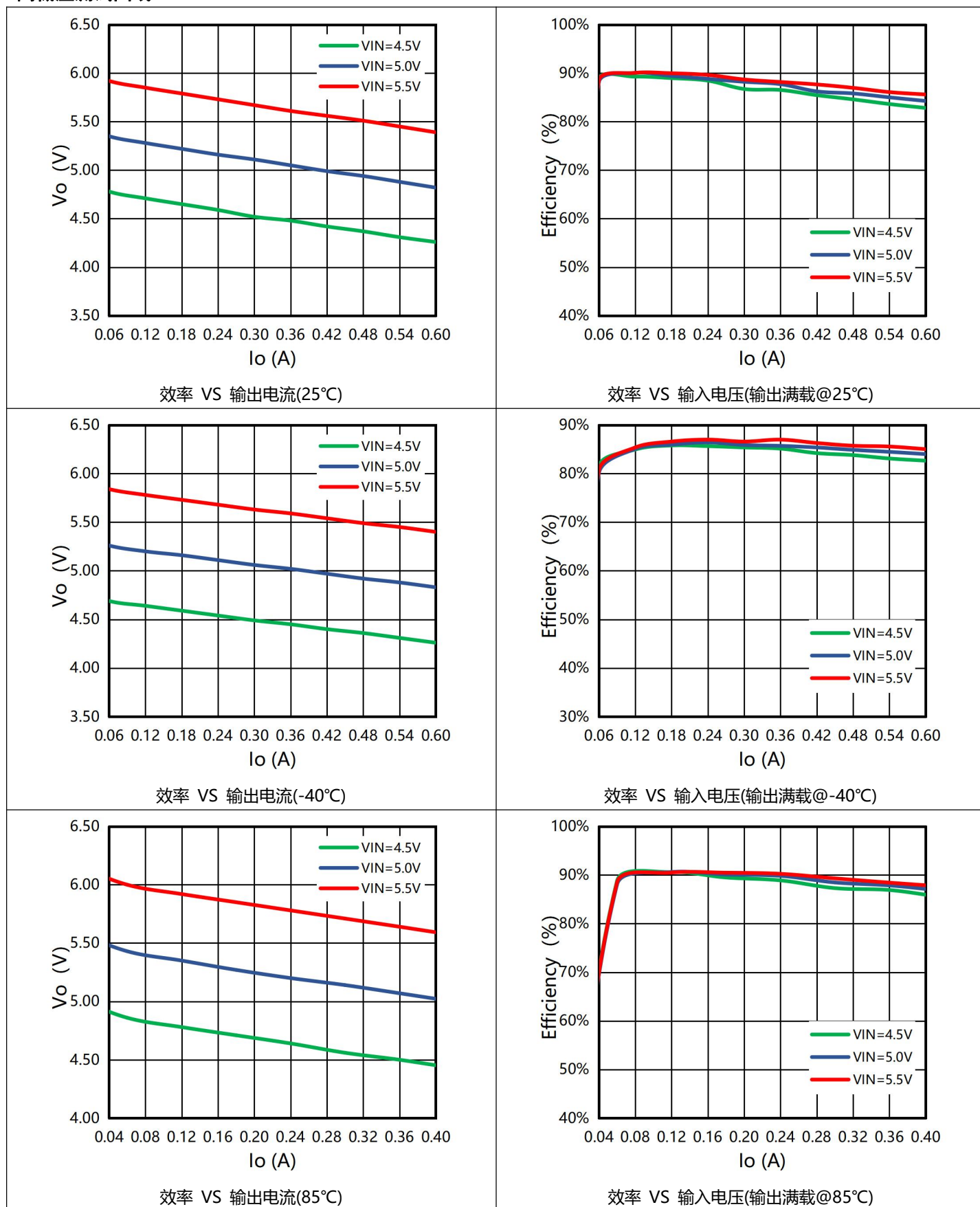


图 5: VIN=5V, 满载输出电压纹波波形

详细测试数据

高低温测试曲线



VIN=5V, Ta=25°C, 输入、输出及效率数据:

VIN(V)	IIN(A)	VO(V)	IO(A)	η(%)
5.00	0.003	5.50	0.000	00.00%
4.99	0.073	5.35	0.060	88.12%
4.99	0.141	5.28	0.120	90.05%
4.98	0.211	5.22	0.180	89.42%
4.98	0.280	5.16	0.240	88.81%
4.98	0.349	5.11	0.300	88.20%
4.97	0.417	5.05	0.360	87.72%
4.97	0.489	4.99	0.420	86.24%
4.97	0.556	4.94	0.480	85.81%
4.96	0.625	4.88	0.540	85.01%
4.96	0.692	4.82	0.600	84.26%

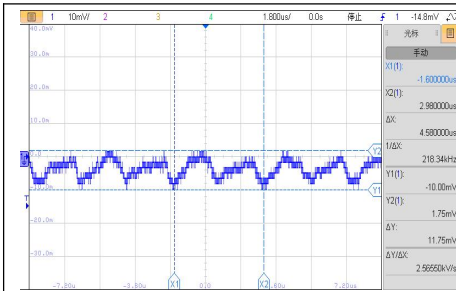
VIN=5V, Ta=-40°C, 输入、输出及效率数据:

VIN(V)	IIN(A)	VO(V)	IO(A)	η(%)
5.00	0.009	5.39	0.000	00.00%
4.99	0.079	5.26	0.060	80.06%
4.99	0.147	5.20	0.120	85.07%
4.98	0.217	5.16	0.180	85.95%
4.98	0.285	5.11	0.240	86.41%
4.98	0.355	5.06	0.300	85.86%
5.00	0.422	5.02	0.360	85.70%
4.97	0.492	4.97	0.420	85.37%
4.96	0.561	4.92	0.480	84.87%
4.96	0.629	4.88	0.540	84.47%
4.95	0.697	4.83	0.600	84.00%

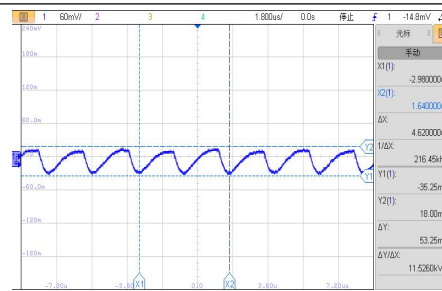
VIN=5V, Ta=85°C, 输入、输出及效率数据:

VIN(V)	IIN(A)	VO(V)	IO(A)	η(%)
5.00	0.004	5.61	0.000	00.00%
5.00	0.074	5.43	0.060	88.05%
4.99	0.142	5.35	0.120	90.60%
4.99	0.211	5.27	0.180	90.09%
4.98	0.279	5.20	0.240	89.82%
4.98	0.350	5.14	0.300	88.47%
4.97	0.418	5.07	0.360	87.86%
4.97	0.487	5.00	0.420	86.76%
4.96	0.556	4.94	0.480	85.98%
4.96	0.625	4.87	0.540	84.83%
4.96	0.693	4.80	0.600	83.79%

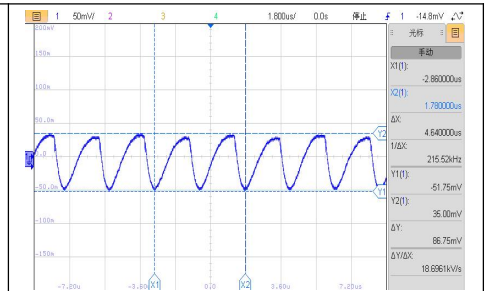
输出电压纹波波形



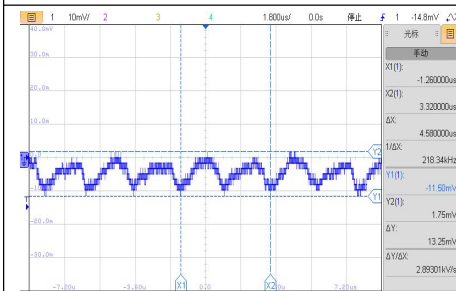
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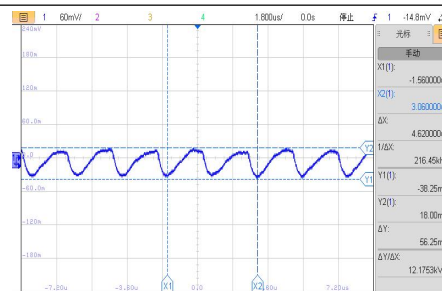
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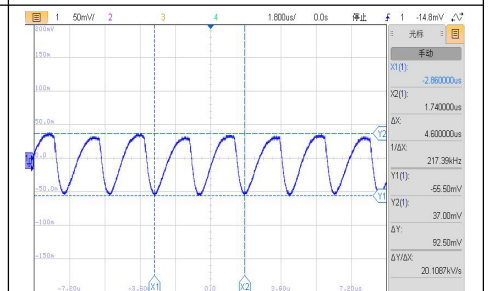
VIN=4.5V, 满载输出电压纹波波形



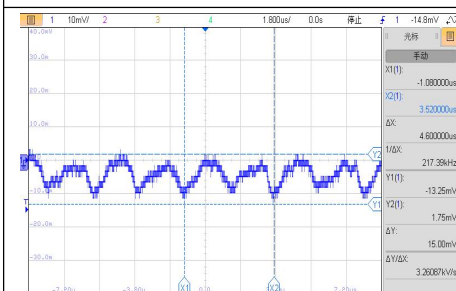
VIN=5.0V, 轻载输出电压纹波波形



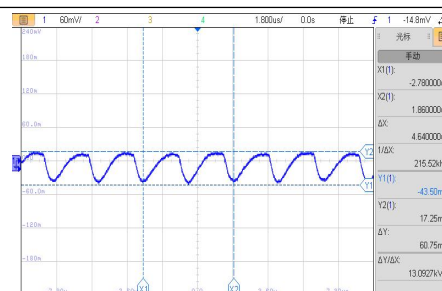
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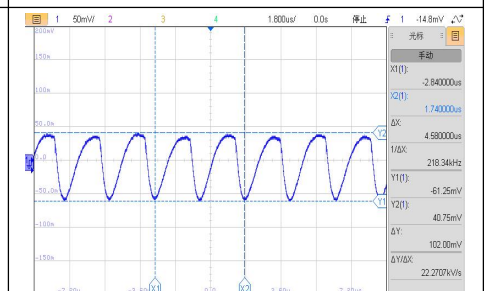
VIN=5.0V, 满载输出电压纹波波形



VIN=5.5V, 轻载输出电压纹波波形



VIN=5.5V, 半载输出电压纹波波形

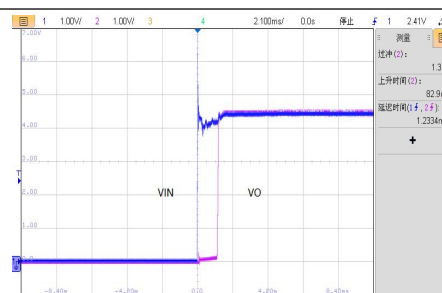


VIN=5.5V, 满载输出电压纹波波形

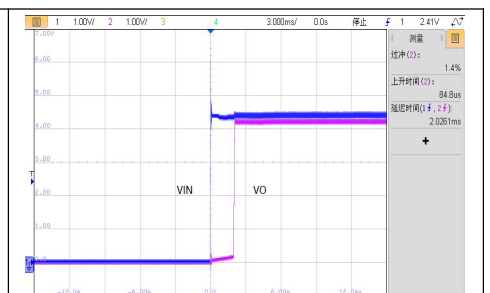
开关机波形



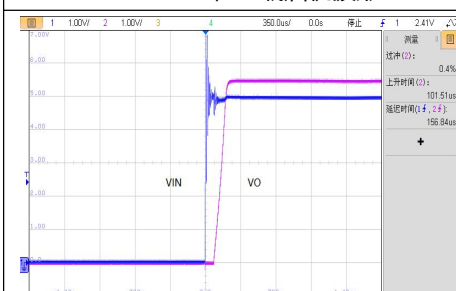
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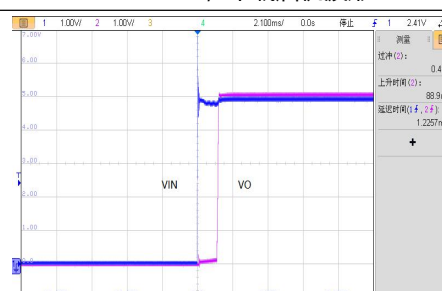
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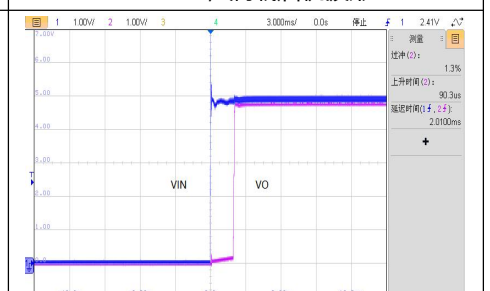
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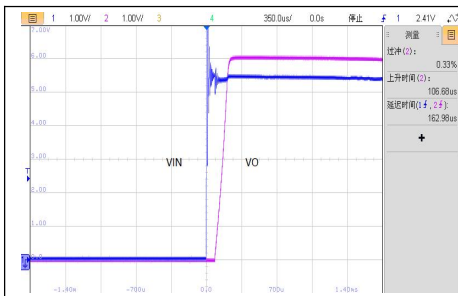
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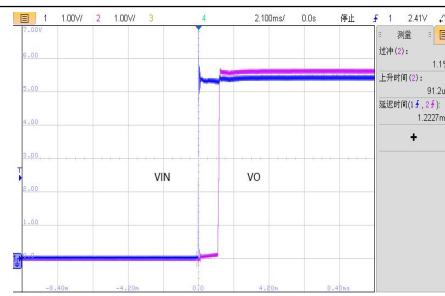
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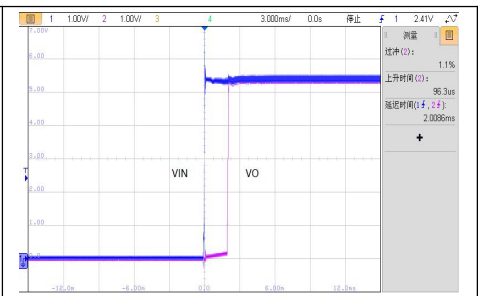
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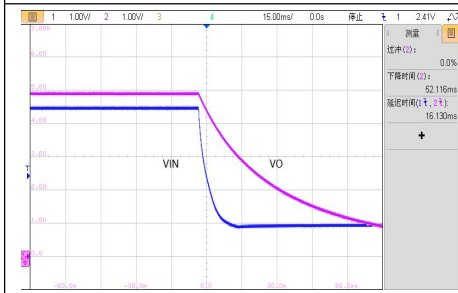
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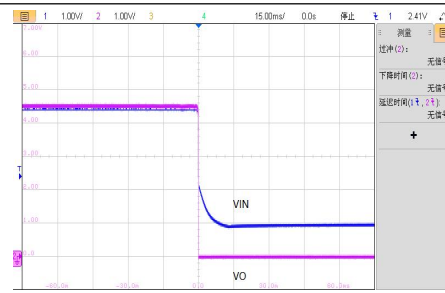
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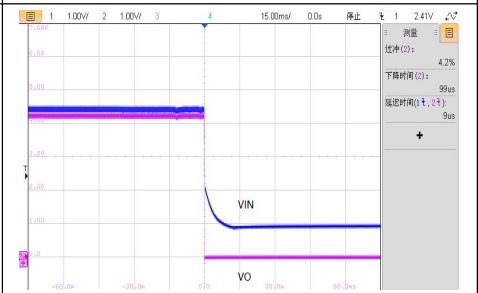
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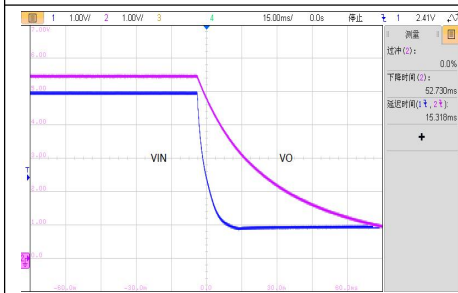
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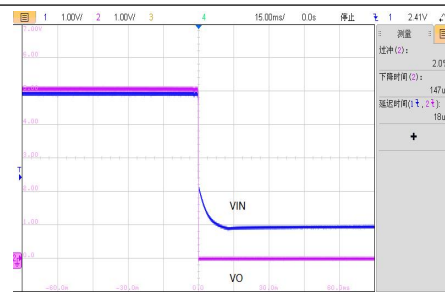
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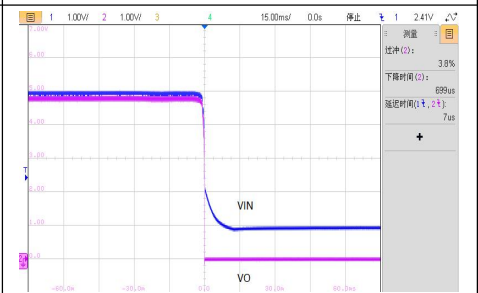
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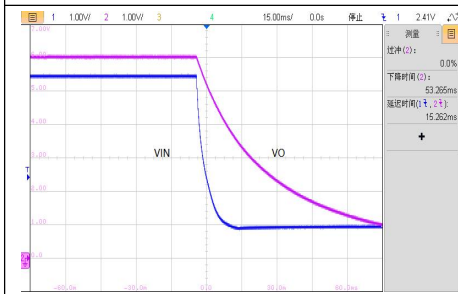
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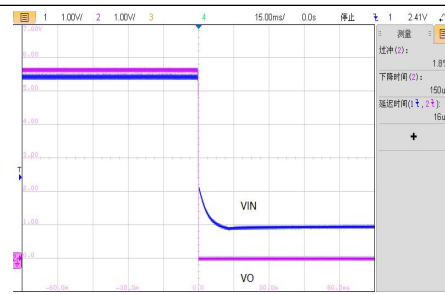
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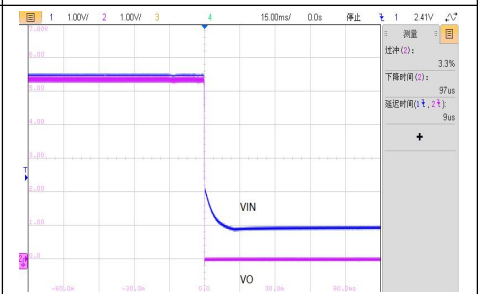
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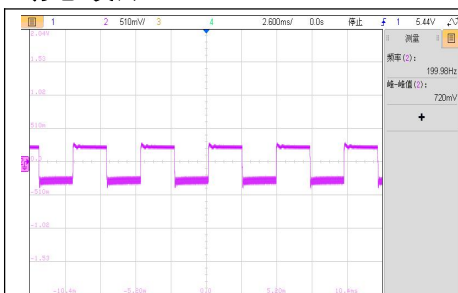


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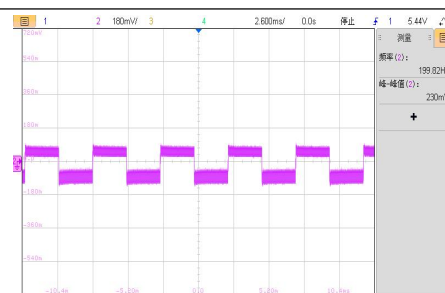


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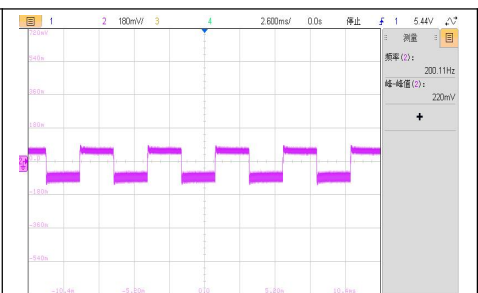
动态波形



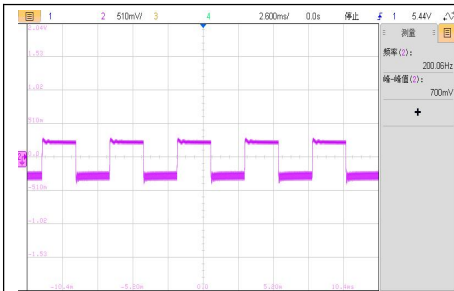
VIN=4.5V, 100%-10%-100%lo 动态波形



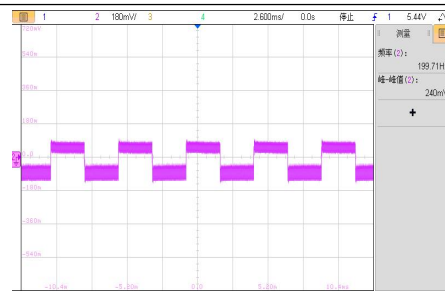
VIN=4.5V, 75%-50%-75%lo 动态波形



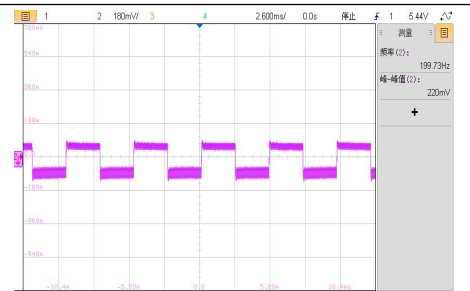
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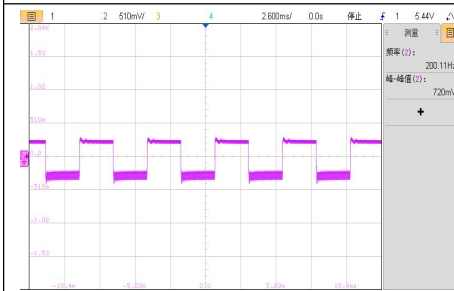
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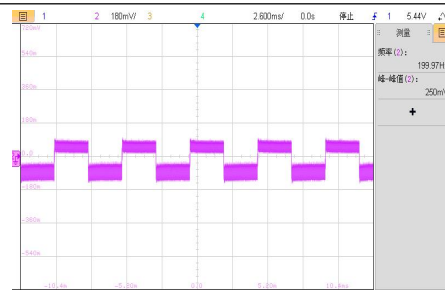
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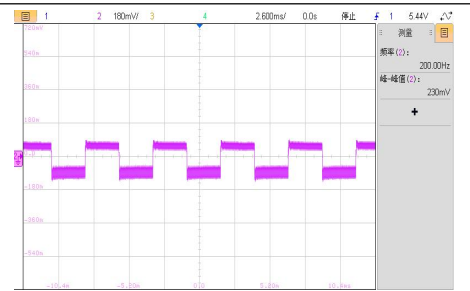
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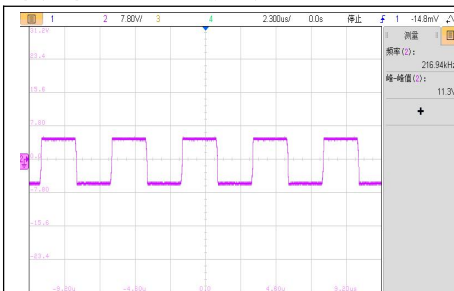


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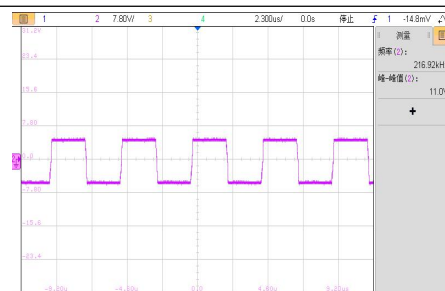


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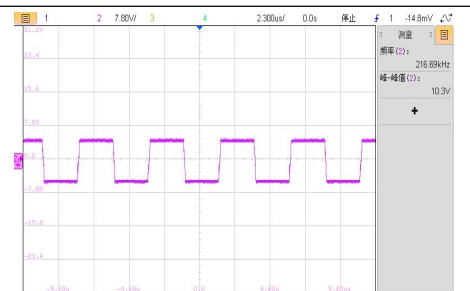
输出二极管应力波形



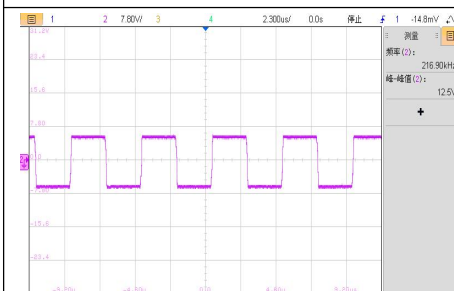
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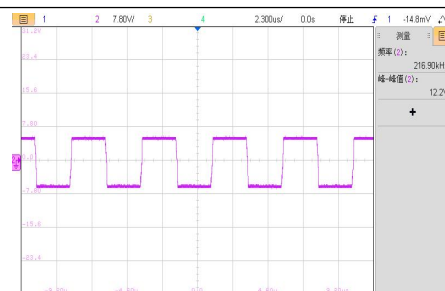
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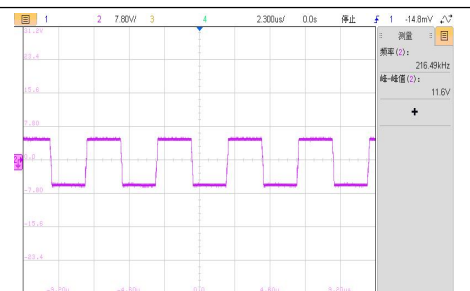
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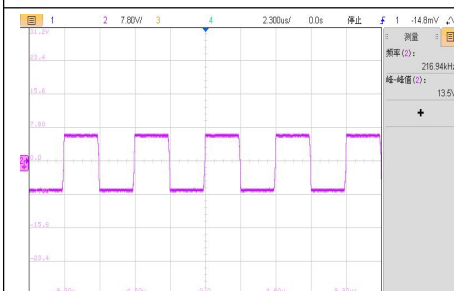
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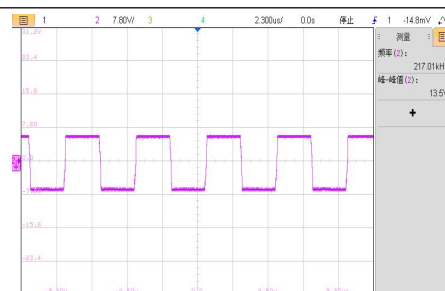
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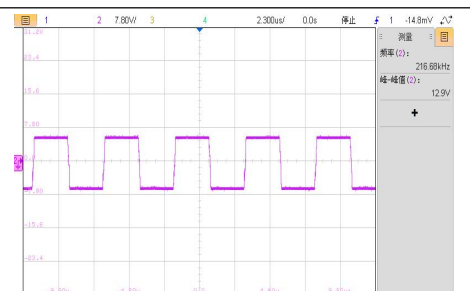
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VIN=5.5V, 空载工作电压波形

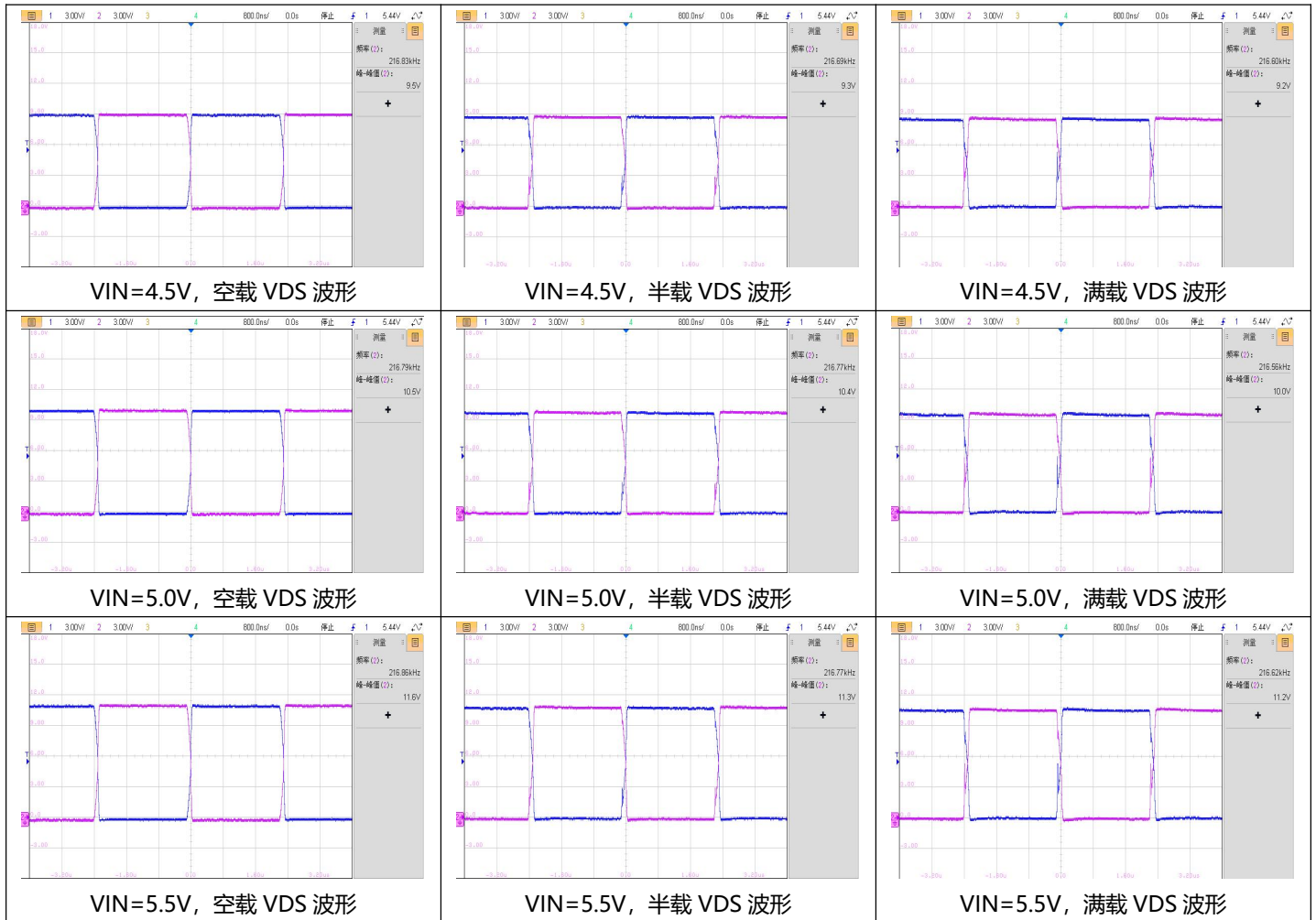


VIN=5.5V, 半载工作电压波形



VIN=5.5V, 满载工作电压波形

MOS 管电压应力波形-VPS8504B



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