

方案简介

本方案由 VPS8703B 和 VPR87DRV80C 组合，结合必要的整流二极管以及阻容元件实现 15V±10%输入，15V/-3V，120mA 输出的隔离非稳压电源。原副边隔离耐压不小于 3200VAC，可持续短路保护。主要应用于 SiC MOSFET 驱动器专用电源。

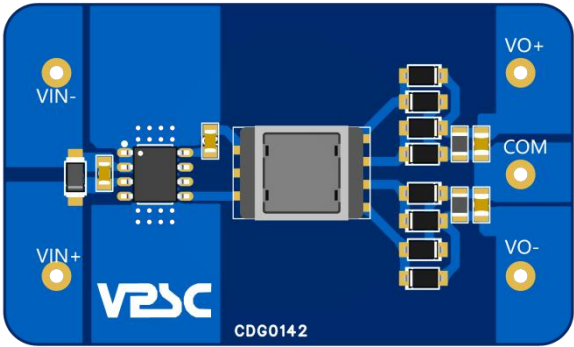
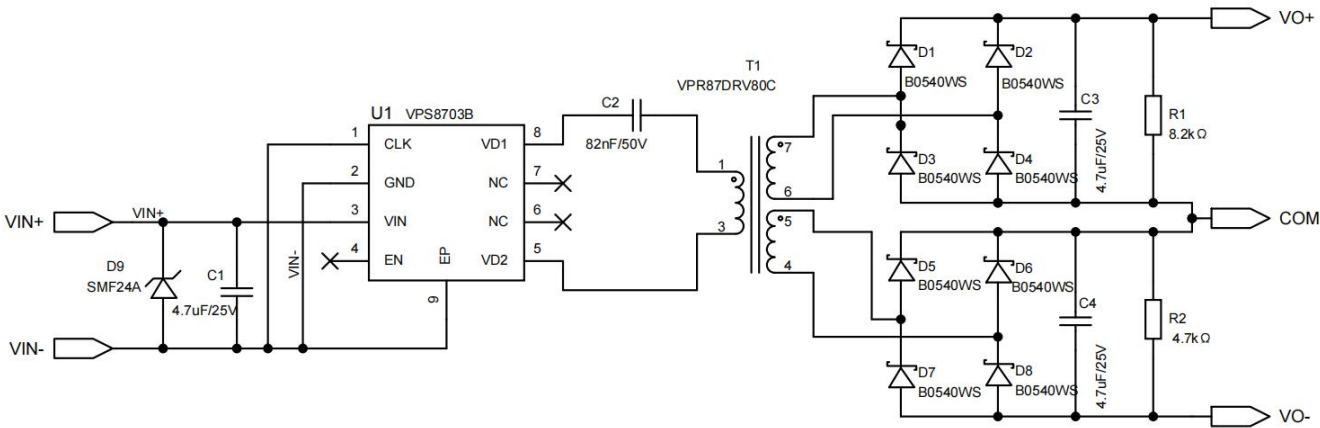


图 1: VPS8703B Demo 板 (尺寸 50mm*30mm)

关键词：输入：13.5V-16.5V，输出：15V/ -3V，120mA，隔离电压：3200VAC，反馈方式：开环

原理图



引脚功能说明



编号	功能	功能描述
1	VIN-	电源输入负
2	VIN+	电源输入正
3	VO-	电源输出负
4	COM	电源输出公共端 (0V)
5	VO+	电源输出正

物料清单

位号	参数	封装	型号	品牌	数量
C1,C3,C4	4.7uF/25V-X7R	0805	CC0805KKX7R8BB475	YAGEO(国巨)	3
C2	82nF/50V-X7R	0805	CC0805KRX7R9BB823	YAGEO(国巨)	1
R1	8.2kΩ±1%	0805	RC0805FR-078K2L	YAGEO(国巨)	1
R2	4.7kΩ±1%	0805	RC0805FR-074K7L	YAGEO(国巨)	1
T1	变压器	见规格书	VPR87DRV80C	VPSC	1
D1,D2,D3,D4, D5,D6,D7,D8	肖特基二极管	SOD-323	B0540WS	CJ(江苏长电/长晶)	8
D9	TVS瞬态抑制二极管	SOD-123	SMF24A	YANGJIE(扬杰)	1
U1	电源管理芯片	ESOP8	VPS8703B	VPSC	1

总体性能一览表

测试结果均在两路输出同时带相同负载下测得

性能指标	测试条件	Min	Typ	Max	Unit
输入电流 (满载/空载)	VIN=15V; Io=120mA/0A	13	---	170	mA
转换效率	Typ: VIN=15V; Io=120mA	---	82.5	---	%
纹波&噪声	VIN=15V; Io=120mA; VO+	---	94	110	mV
	VIN=15V; Io=120mA; VO-	---	15	20	mV
交叉调整率	VIN=15V; Io=120mA/12mA; VO+	---	1.78	---	%
	VIN=15V; Io=120mA/12mA; VO-	---	2.46	---	%
线性调节率	VIN=13.5V/16.5V; Io=120mA; VO+	---	1.07	---	%
	VIN=13.5V/16.5V; Io=120mA; VO-	---	1.8	---	%
工作温度	---	-40	---	85	°C
绝缘电压	原边短接 VS 副边短接	3200	---	---	VAC
开关频率	VIN=15V	---	250	---	kHz
短路保护	VIN=15V, Io=120mA	可长期保护, 即时自恢复			

关键性能指标测试结果

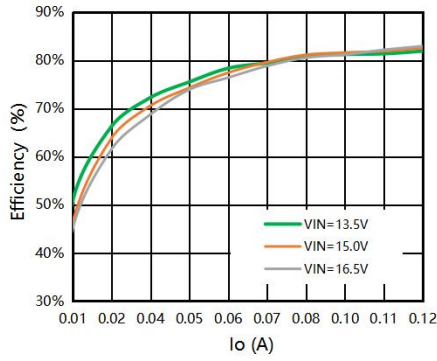


图 2: $I_O=0-120\text{mA}$, 效率 VS 输出电流

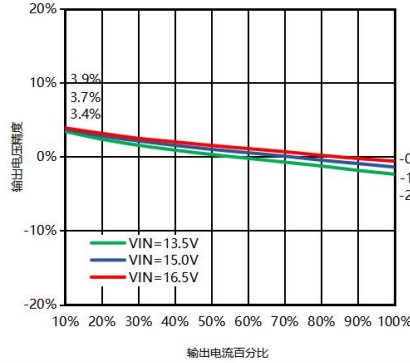


图 3: $I_O=0-120\text{mA}$, VO+调整率曲线

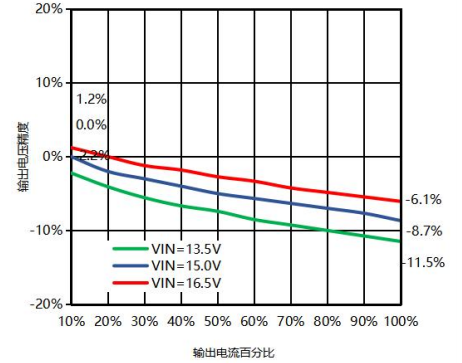


图 4: $I_O=0-120\text{mA}$, VO-调整率曲线

相关波形

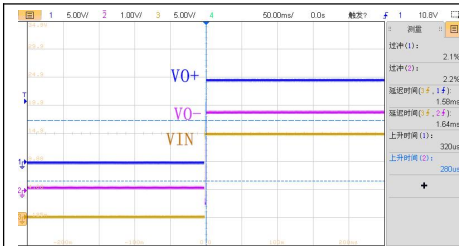


图 5: $V_{IN}=15\text{V}$, $I_O=120\text{mA}$, 输出启机波形

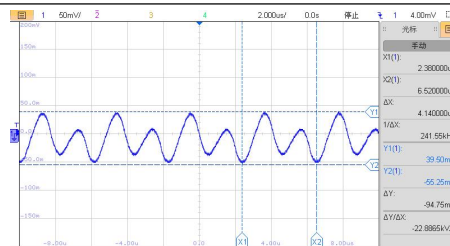


图 6: $V_{IN}=15\text{V}$, $I_O=120\text{mA}$, VO+输出电压纹波

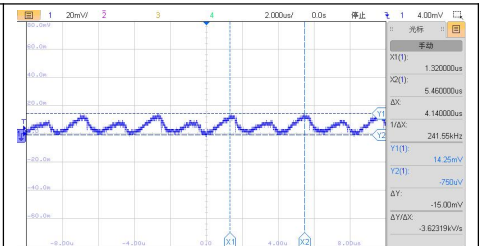
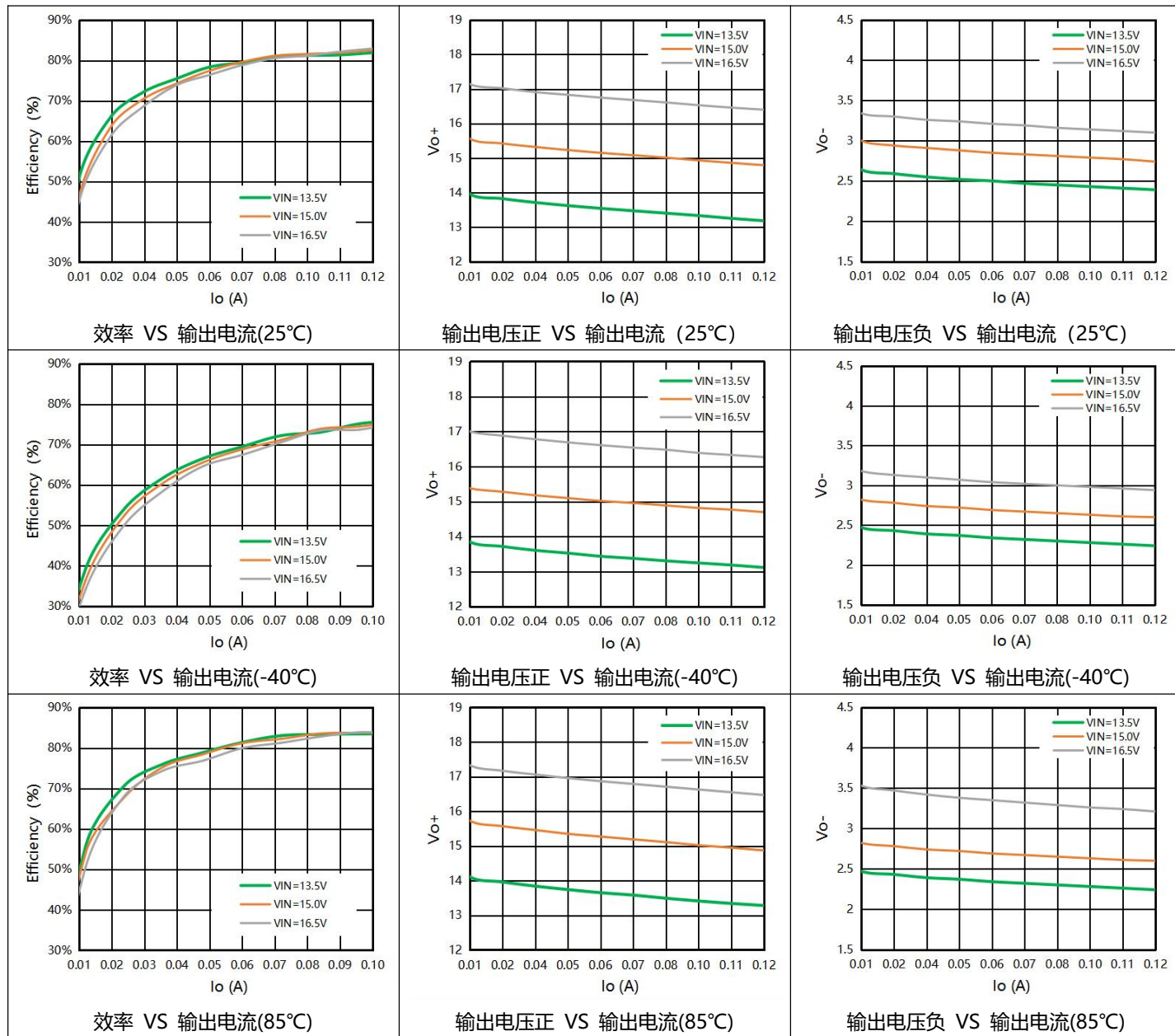


图 7: $V_{IN}=15\text{V}$, $I_O=120\text{mA}$, VO-输出电压纹波

详细测试数据

高低温测试曲线



VIN=15V, Ta=25°C, 输入、输出及效率数据:

VIN(V)	IIN(A)	VO1(V)	VO2(V)	IO(A)	η(%)
15.00	0.013	16.48	3.26	0.000	0.00%
15.00	0.032	15.56	3.00	0.012	46.40%
15.00	0.046	15.42	2.94	0.024	63.86%
15.00	0.062	15.32	2.91	0.036	70.57%
15.00	0.078	15.23	2.88	0.048	74.30%
15.00	0.093	15.15	2.85	0.060	77.42%
15.00	0.108	15.08	2.83	0.072	79.60%
15.00	0.123	15.01	2.81	0.084	81.13%
15.00	0.139	14.93	2.79	0.096	81.59%
15.00	0.155	14.86	2.77	0.108	81.89%
15.00	0.170	14.79	2.74	0.120	82.49%

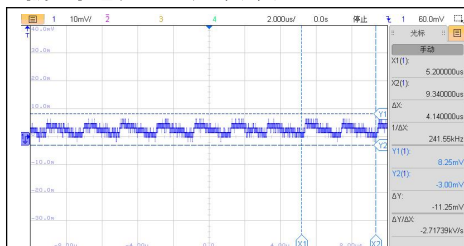
VIN=15V, Ta=-40°C, 输入、输出及效率数据:

VIN(V)	IIN(A)	VO1(V)	VO2(V)	IO(A)	η(%)
15.00	0.022	15.67	2.97	0.000	0.00%
15.00	0.040	15.38	2.82	0.012	36.40%
15.00	0.055	15.28	2.78	0.024	52.54%
15.00	0.071	15.18	2.74	0.036	60.57%
15.00	0.087	15.10	2.72	0.048	65.54%
15.00	0.103	15.02	2.69	0.060	68.78%
15.00	0.119	14.96	2.67	0.072	71.11%
15.00	0.133	14.89	2.65	0.084	73.85%
15.00	0.150	14.82	2.63	0.096	74.45%
15.00	0.165	14.77	2.61	0.108	75.84%
15.00	0.181	14.70	2.60	0.120	76.46%

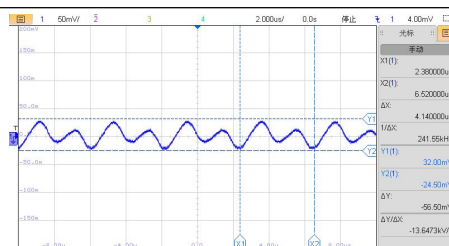
VIN=15V, Ta=85°C, 输入、输出及效率数据:

VIN(V)	IIN(A)	VO1(V)	VO2(V)	IO(A)	η(%)
15.00	0.011	16.64	3.46	0.000	0.00%
15.00	0.028	15.73	3.18	0.012	54.03%
15.00	0.044	15.57	3.11	0.024	67.93%
15.00	0.059	15.46	3.07	0.036	75.38%
15.00	0.075	15.35	3.03	0.048	78.42%
15.00	0.090	15.27	2.99	0.060	81.16%
15.00	0.106	15.19	2.97	0.072	82.23%
15.00	0.121	15.11	2.94	0.084	83.54%
15.00	0.137	15.02	2.91	0.096	83.76%
15.00	0.153	14.95	2.88	0.108	83.91%
15.00	0.168	14.87	2.86	0.120	84.43%

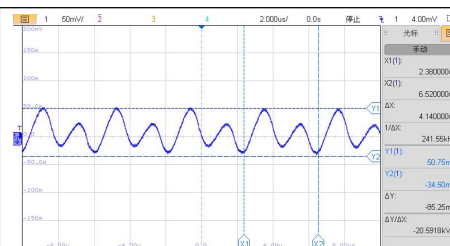
输出电压正纹波波形



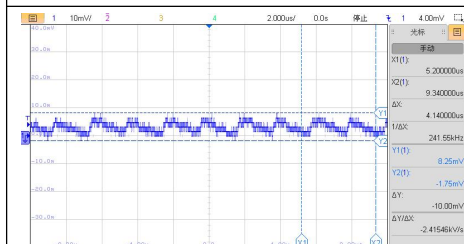
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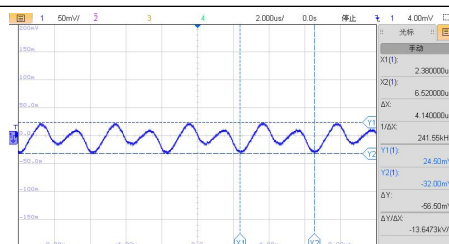
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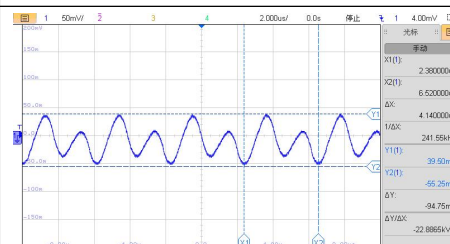
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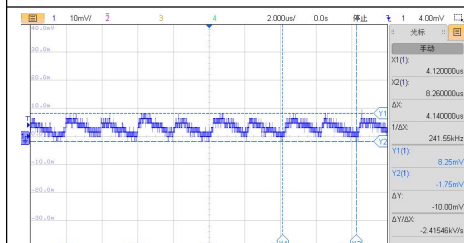
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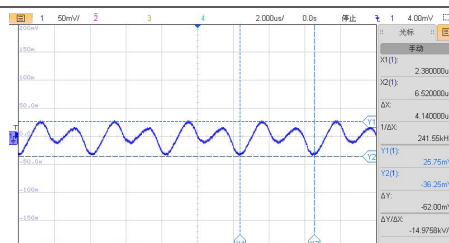
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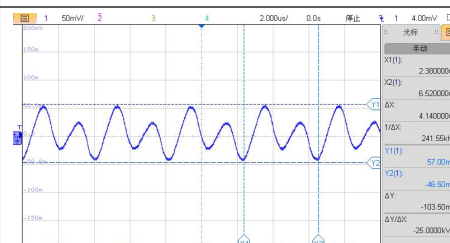
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VIN=16.5V, 轻载输出电压纹波波形

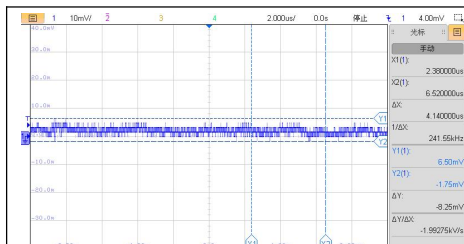


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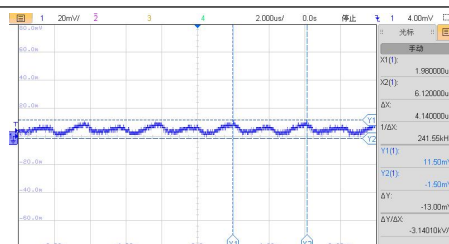


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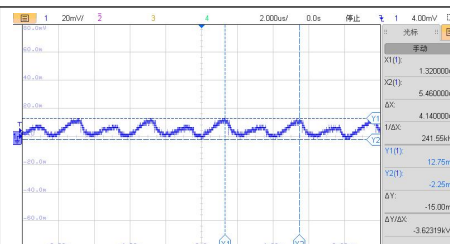
输出电压负纹波波形



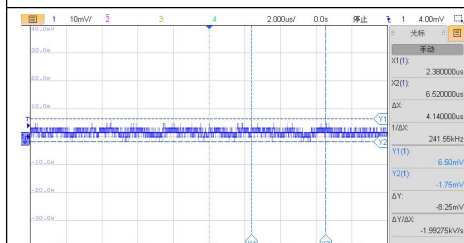
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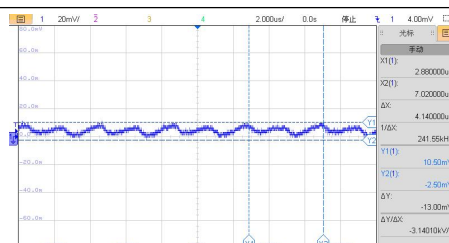
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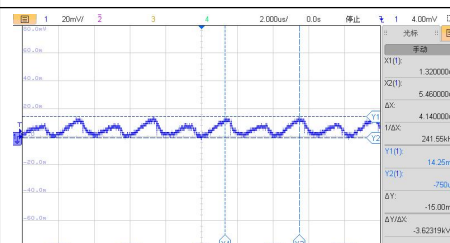
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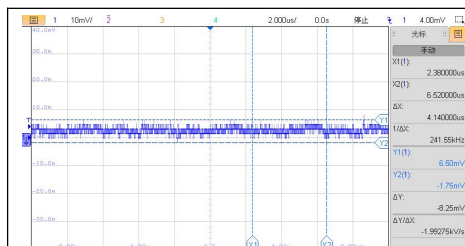
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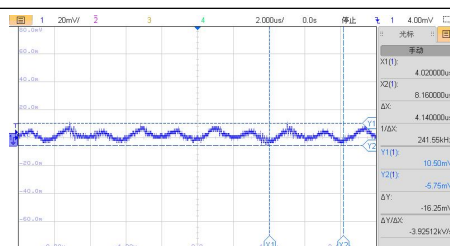
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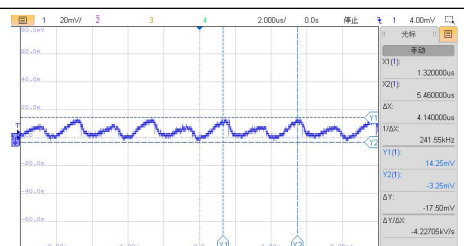
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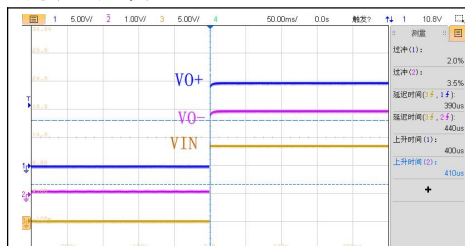


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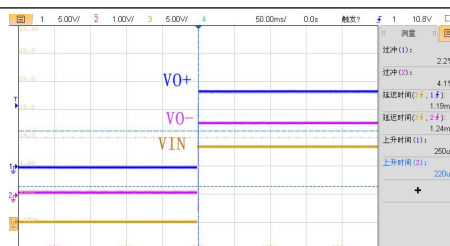


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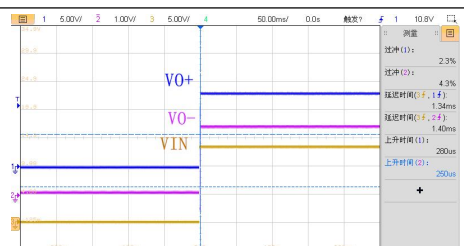
开关机波形



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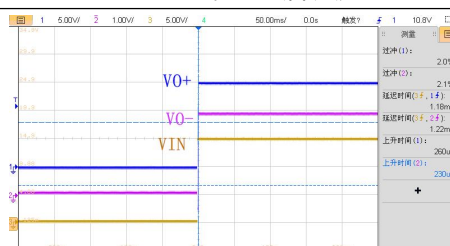
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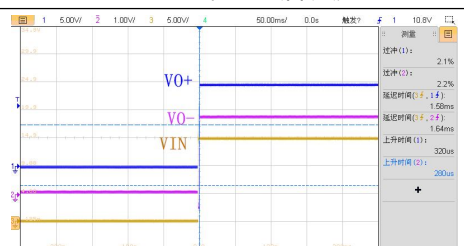
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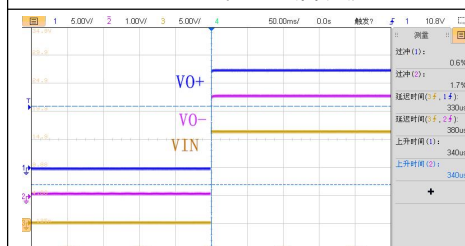
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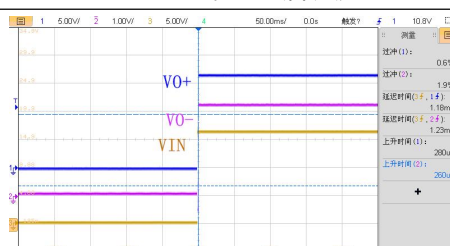
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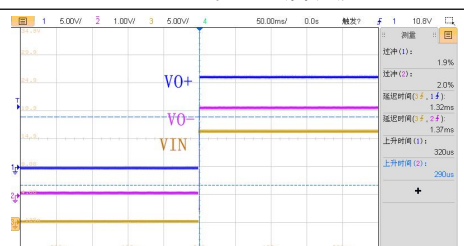
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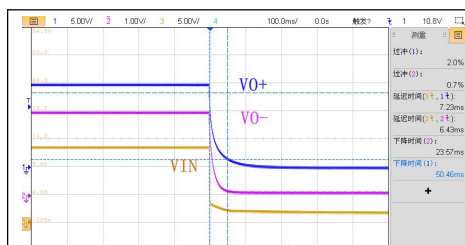
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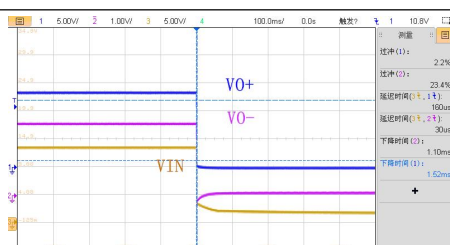
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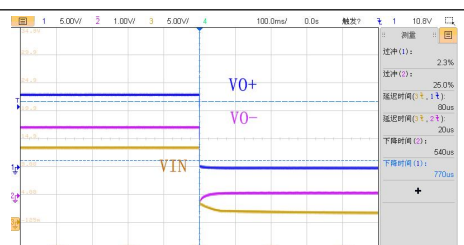
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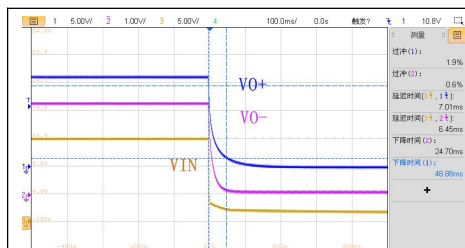
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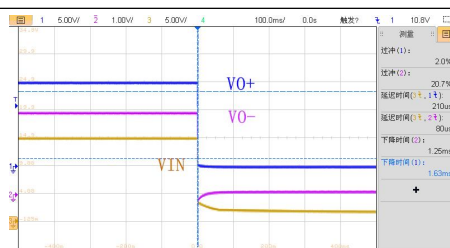
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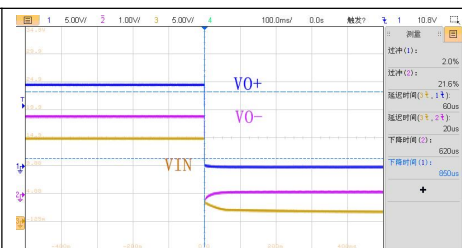
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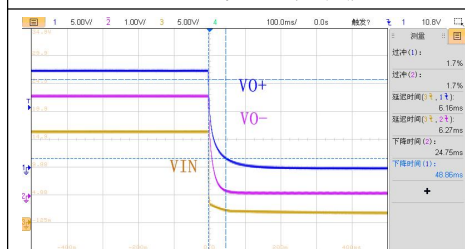
VIN=15.0V, 空载关机波形



VIN=15.0V, 半载关机波形



VIN=15.0V, 满载关机波形



VIN=16.5V, 空载关机波形

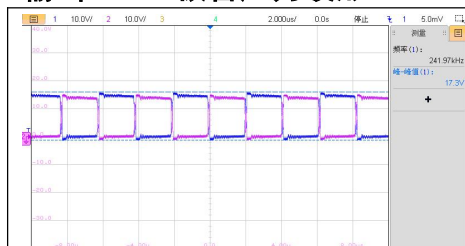


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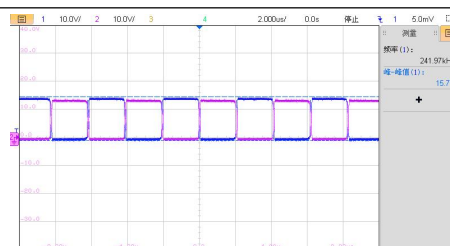


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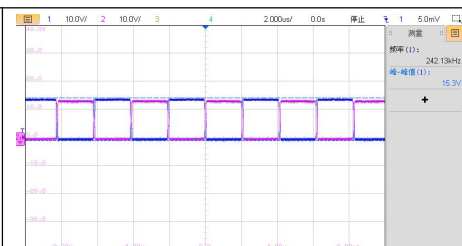
输出 V0+ 二极管应力波形



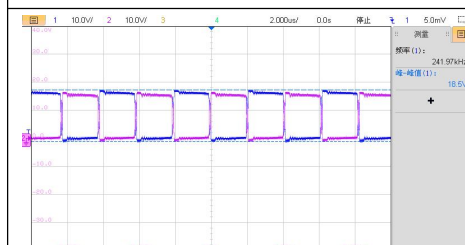
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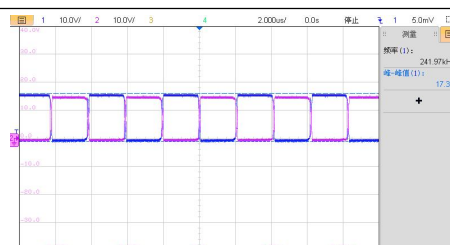
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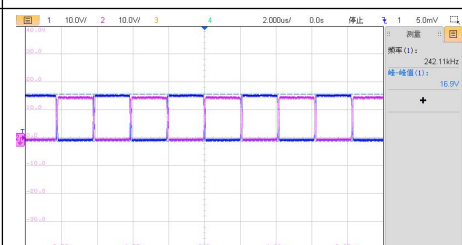
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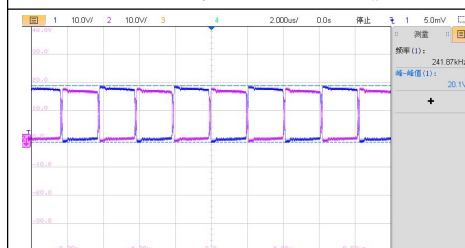
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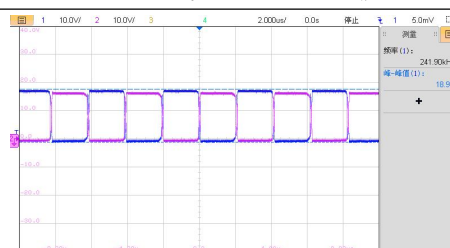
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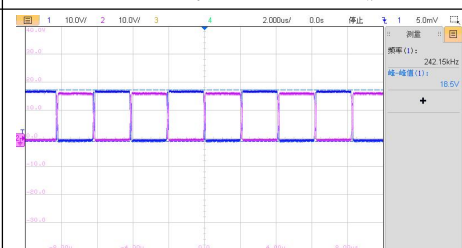
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VIN=16.5V, 空载工作电压波形

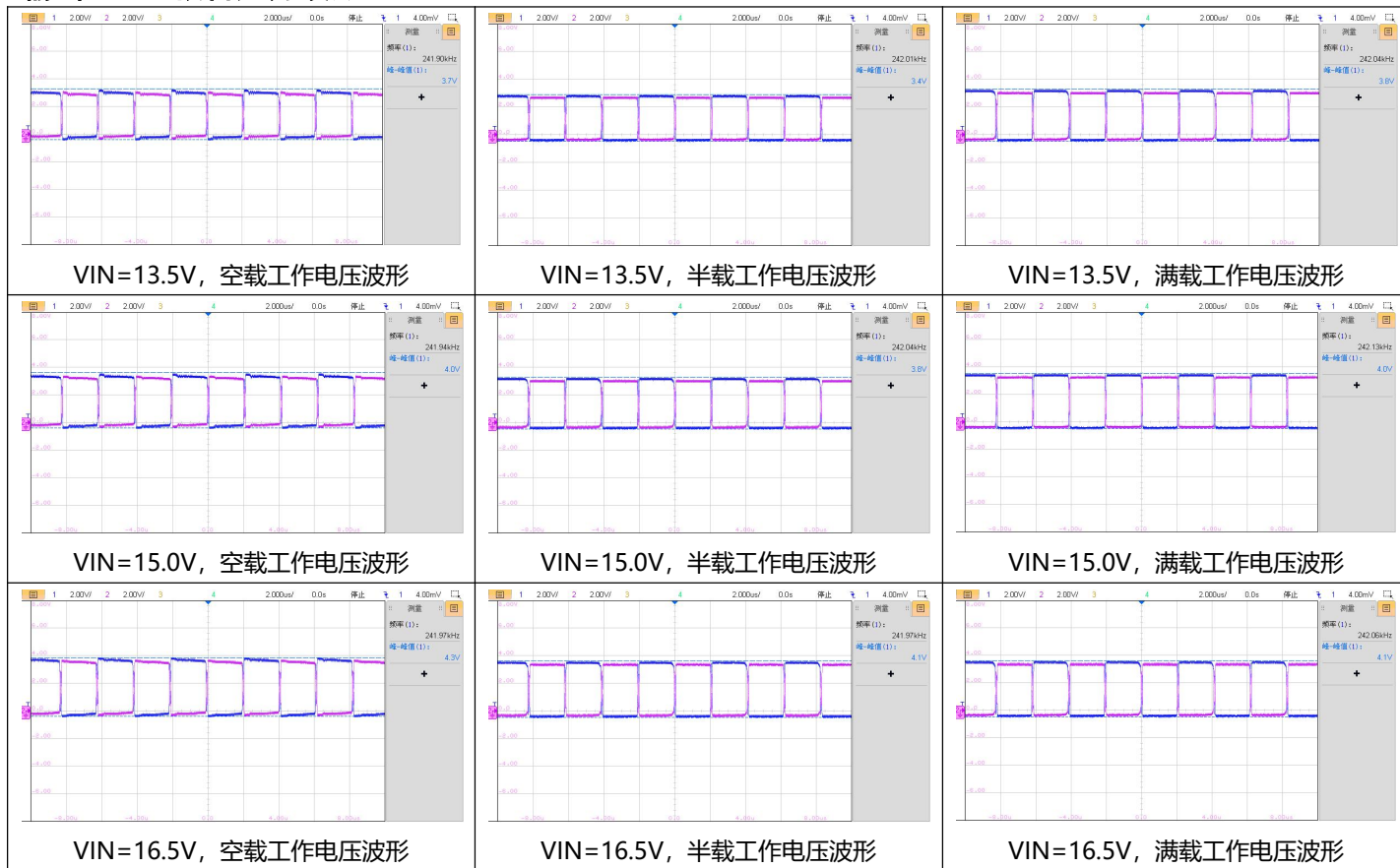


VIN=16.5V, 半载工作电压波形



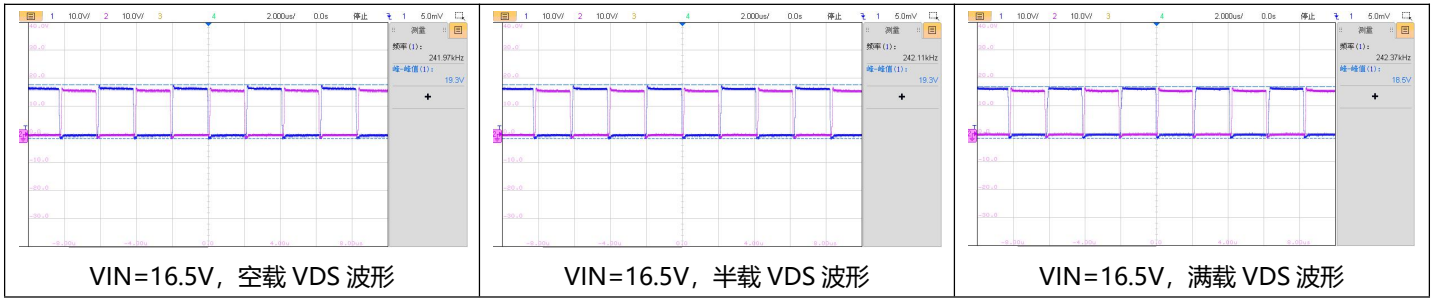
VIN=16.5V, 满载工作电压波形

输出 V0-二极管应力波形



MOS 管电压应力波形——VPS8703B





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