

方案简介

本应用方案基于一款高集成度的峰值电流型反激电源控制器 VPS2103，结合隔离功率变压器 VPP23PBB06A、输出整流二极管以及必要的阻容元件，实现 9V-36V 输入，5V 输出的隔离稳压电源方案。本方案可实现全输入电压范围最大功率 6W 的输出能力，原副边隔离耐压不小于 1500VDC，同时具备远程控制关断、可长期短路保护并自恢复等功能。本方案可应用在系统板需要实施电气隔离以达到安全和（或）抗干扰目的相关场合。

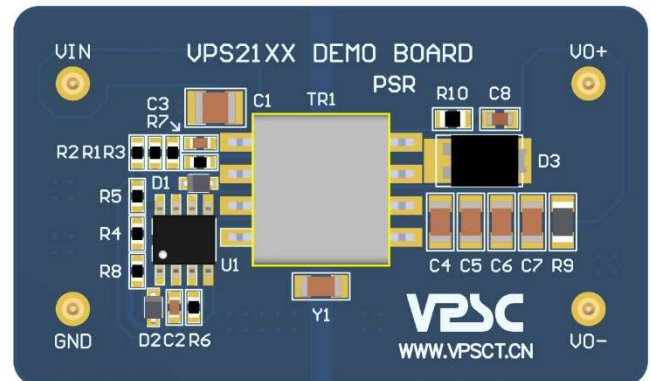
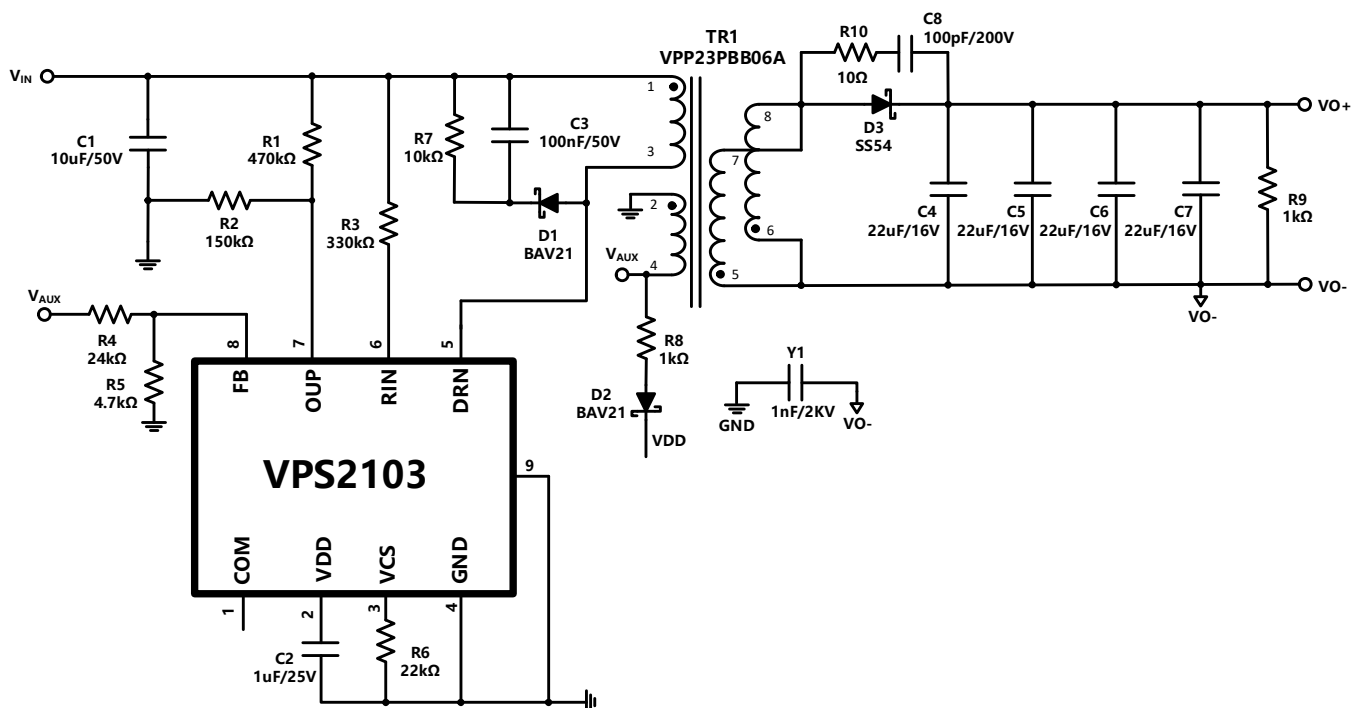


图 1: VPS2103 Demo 板(尺寸:50mm*30mm)

关键词：输入：9V-36V，输出 5V/6W，隔离电压：1500VDC，反馈方式：原边反馈-PSR

原理图



引脚功能说明

编号	功能	功能描述
1	VIN	电源输入端
2	GND	电源接地端
3	VO+	电源输出正
4	VO-	电源输出负

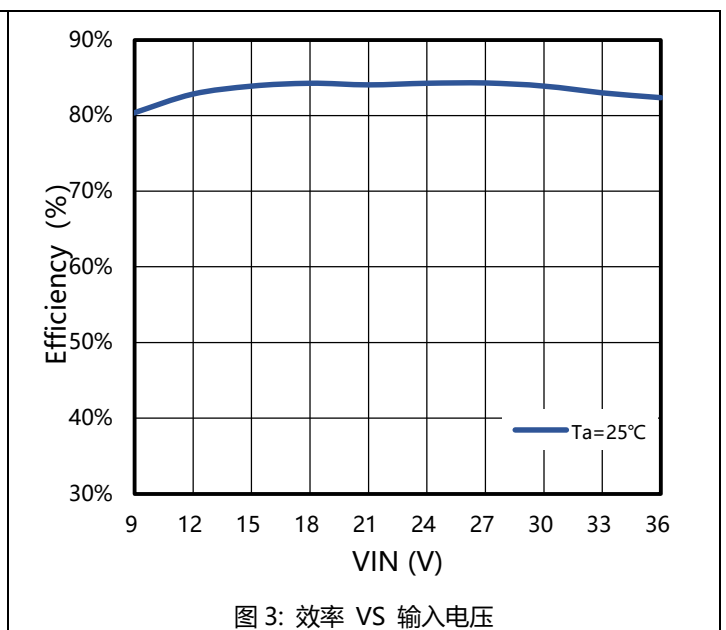
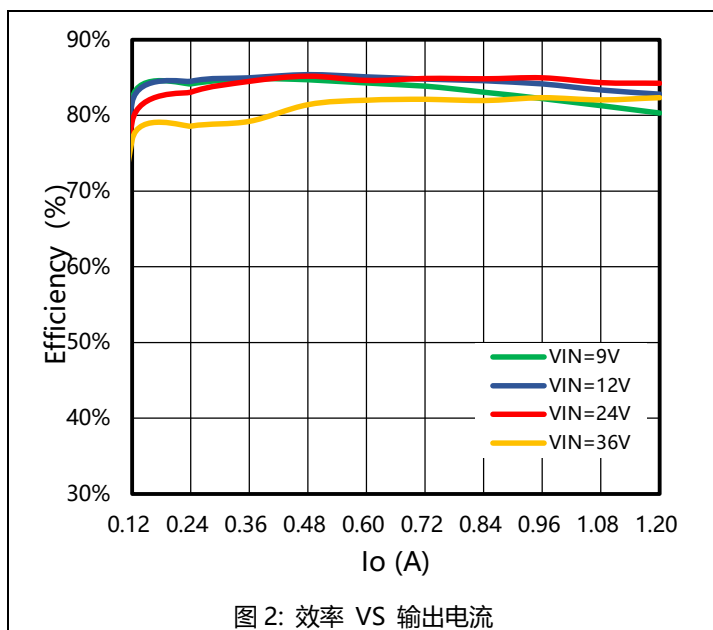
物料清单

位号	参数	封装	型号	品牌
C1	10uF/50V-X7R	1210	CC1210KKX7R9BB106	YAGEO
C2	1uF/25V-X7R	0603	CC0603KRX7R8BB105	YAGEO
C3	100nF/50V-X7R	0603	CC0603KRX7R9BB104	YAGEO
C4	22uF/16V-X5R	1206	CC1206KKX5R7BB226	YAGEO
C5	22uF/16V-X5R	1206	CC1206KKX5R7BB226	YAGEO
C6	22uF/16V-X5R	1206	CC1206KKX5R7BB226	YAGEO
C7	22uF/16V-X5R	1206	CC1206KKX5R7BB226	YAGEO
C8	100pF/200V-NP0	0805	CC0805JRNPOABN101	YAGEO
Y1	1nF/2KV-X7R	1206	CC1206KKX7RDBB102	YAGEO
R1	470K Ω ±1%	0603	RC0603FR-07470KL	YAGEO
R2	150K Ω ±1%	0603	RC0603FR-07150KL	YAGEO
R3	330K Ω ±1%	0603	RC0603FR-07330KL	YAGEO
R4	24K Ω ±1%	0603	RC0603FR-0724KL	YAGEO
R5	4.7K Ω ±1%	0603	RC0603FR-074K7L	YAGEO
R6	22K Ω ±1%	0603	RC0603FR-0722KL	YAGEO
R7	10K Ω ±1%	0603	RC0603FR-0710KL	YAGEO
R8	1K Ω ±1%	0603	RC0603FR-071KL	YAGEO
R9	1K Ω ±1%	1206	RC1206FR-071KL	YAGEO
R10	10 Ω ±1%	0805	RC0805FR-0710RL	YAGEO
TR1	NP:NS:NA=20:12:27 Lp=20uH	EP10	VPP23PBB06A	VPSC
D1	200V/0.2A	SOD323	BAV21WS	CJ
D2	200V/0.2A	SOD323	BAV21WS	CJ
D3	40V/5A	SMA	SS54	MDD
U1	4-50VIN/90V/0.1 Ω 电流模式 PWM 控制器	ESOP-8	VPS2103	VPSC

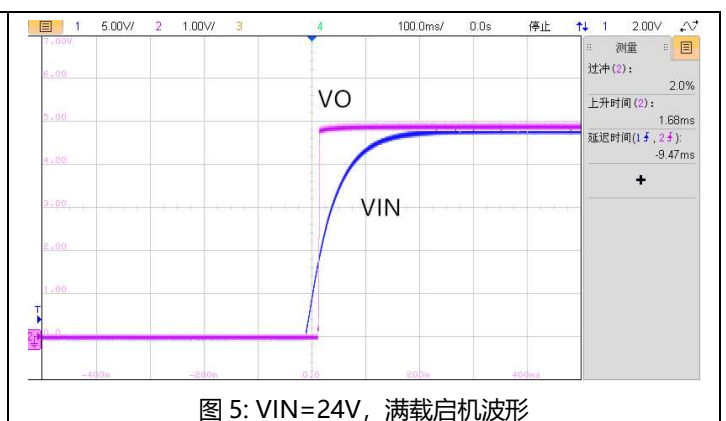
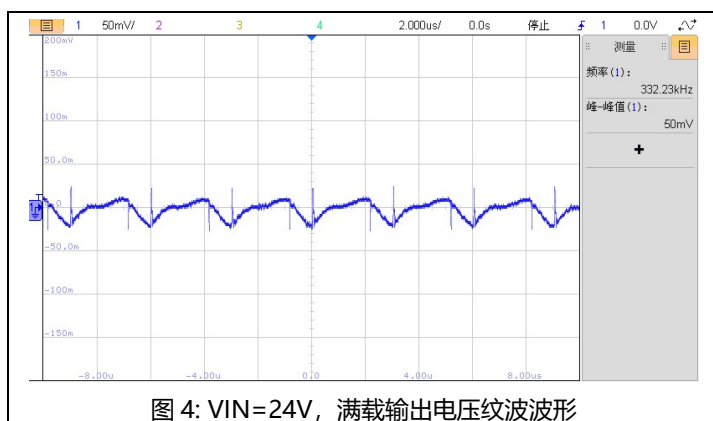
总体性能一览表

性能指标	测试条件	Min	Typ	Max	Unit
输入电流 (满载/空载)	VIN=24V	6	---	292	mA
转换效率	VIN=24V, IO=1.2A	---	84	---	%
纹波&噪声	VIN=24V, IO=1.2A	---	50	80	mV
输出电压精度	VIN=24V, IO=1.2A	---	-1.6	---	%
线性调节率	VIN=9V-36V, IO=1.2A	---	-2.4	---	%
负载调整率	VIN=24V, IO=1.2A	---	-1.8	---	%
输入欠压保护	锁定电压	---	7.2	---	V
	恢复电压	---	8.3	---	V
短路保护	VIN=9V-36V	可长期保护, 自恢复			
工作温度	大于 70°C需降额使用	-40	---	85	°C
绝缘电压	原边短接 VS 副边短接	1500	---	---	VDC

关键性能指标测试结果

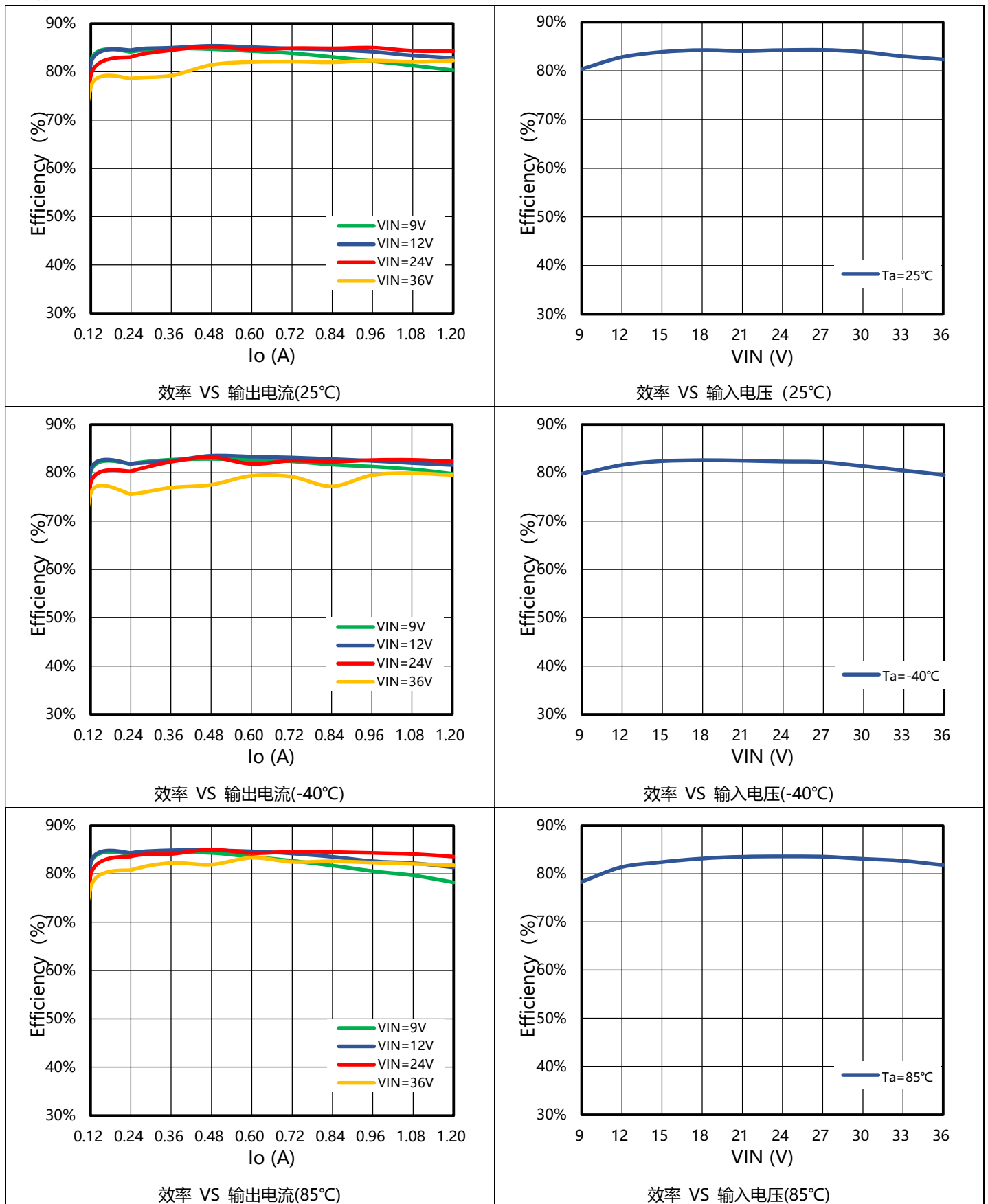


相关波形



详细测试数据

高低温测试曲线



VIN=24V, Ta=25°C, 输入、输出及效率数据:

VIN(V)	IIN(A)	VO(V)	IO(A)	IO-max%	η(%)
24.01	0.003	5.08	0	0%	0.00%
24.01	0.032	5.07	0.120	10%	79.19%
24.01	0.061	5.07	0.240	20%	83.08%
24	0.090	5.07	0.360	30%	84.50%
24	0.119	5.07	0.480	40%	85.21%
24	0.148	5.01	0.600	50%	84.63%
24	0.176	4.98	0.720	60%	84.89%
24	0.205	4.97	0.840	70%	84.85%
24	0.233	4.95	0.960	80%	84.98%
24	0.263	4.93	1.080	90%	84.35%
23.99	0.292	4.92	1.200	100%	84.28%

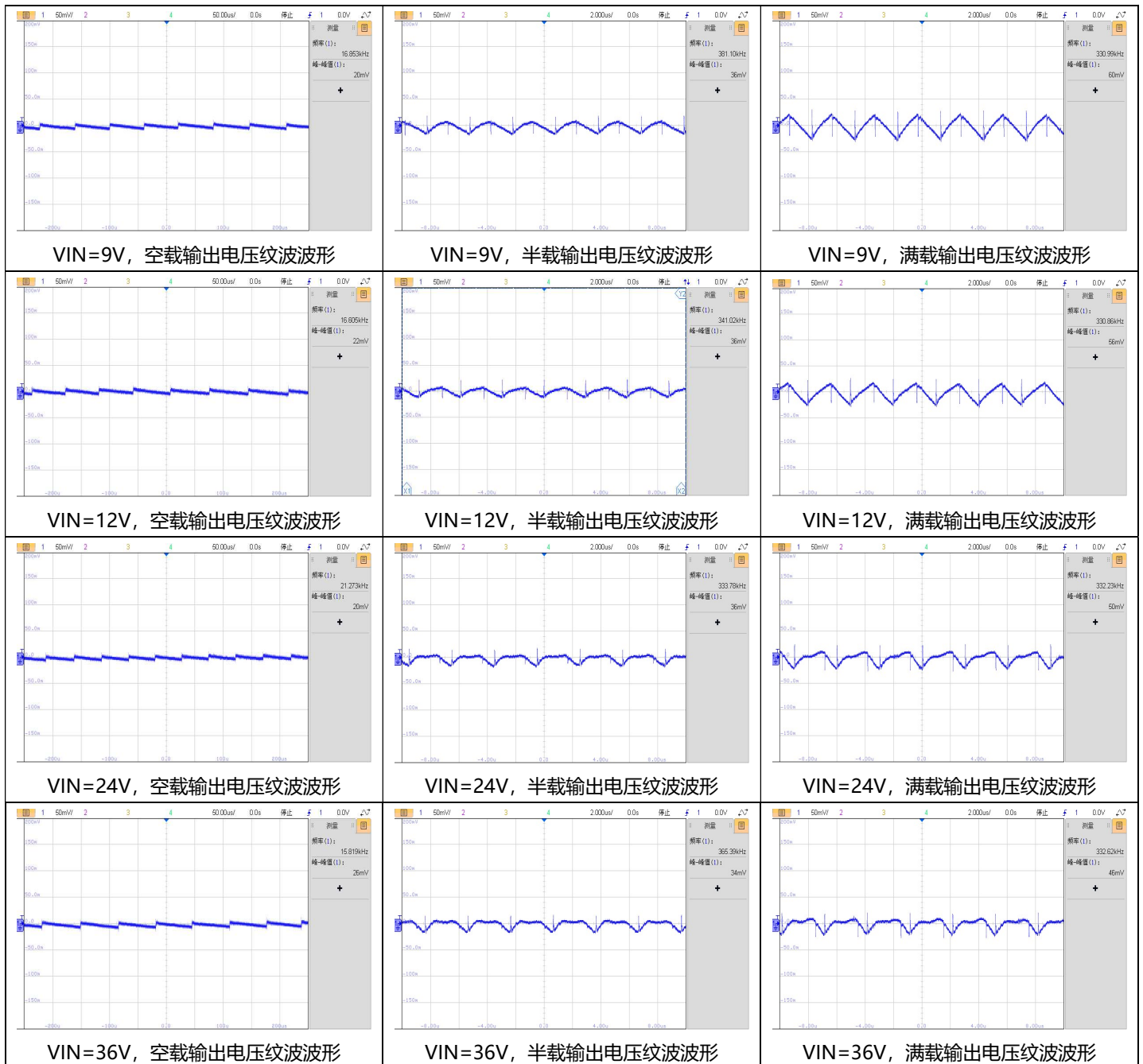
VIN=24V, Ta=-40°C, 输入、输出及效率数据:

VIN(V)	IIN(A)	VO(V)	IO(A)	IO-max%	η(%)
24	0.003	4.99	0	0%	0.00%
24	0.032	4.98	0.120	10%	77.81%
23.99	0.062	4.98	0.240	20%	80.36%
23.99	0.091	4.99	0.360	30%	82.29%
23.98	0.120	4.99	0.480	40%	83.24%
23.98	0.151	4.94	0.600	50%	81.86%
23.98	0.179	4.92	0.720	60%	82.53%
23.98	0.209	4.91	0.840	70%	82.29%
23.97	0.237	4.89	0.960	80%	82.63%
23.97	0.266	4.88	1.080	90%	82.66%
23.97	0.296	4.87	1.200	100%	82.37%

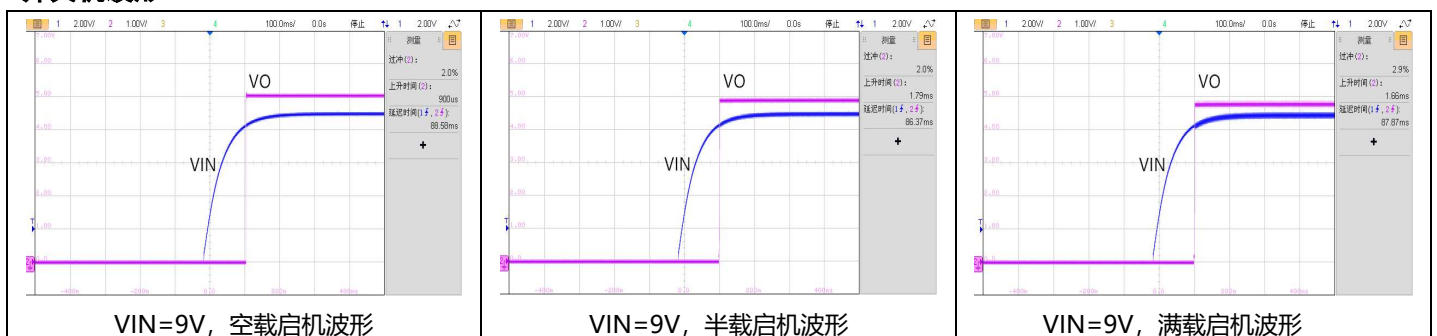
VIN=24V, Ta=85°C, 输入、输出及效率数据:

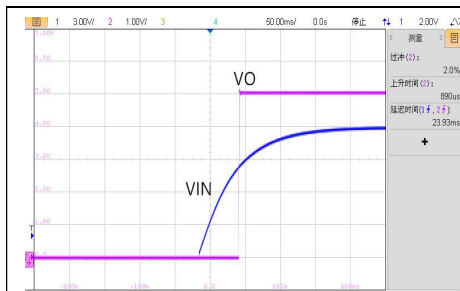
VIN(V)	IIN(A)	VO(V)	IO(A)	IO-max%	η(%)
23.99	0.003	5.1	0	0%	0.00%
23.99	0.032	5.1	0.120	10%	79.72%
23.99	0.061	5.1	0.240	20%	83.64%
23.98	0.091	5.1	0.360	30%	84.14%
23.98	0.120	5.1	0.480	40%	85.07%
23.98	0.149	5.02	0.600	50%	84.30%
23.98	0.177	4.99	0.720	60%	84.65%
23.97	0.206	4.97	0.840	70%	84.55%
23.97	0.235	4.95	0.960	80%	84.36%
23.97	0.264	4.93	1.080	90%	84.14%
23.97	0.294	4.91	1.200	100%	83.61%

输出电压纹波波形

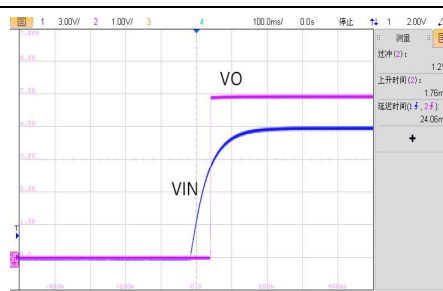


开关机波形

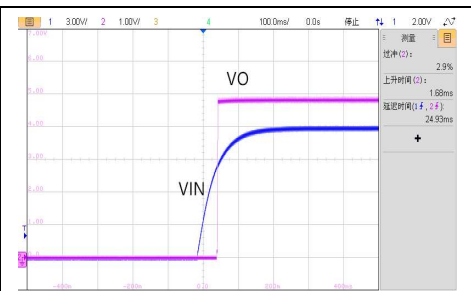




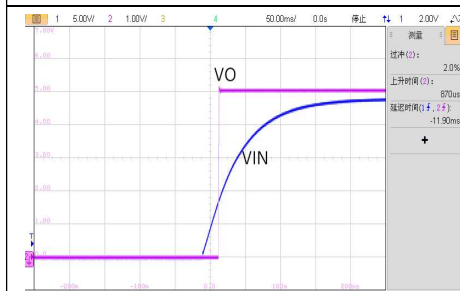
VIN=12V, 空载启机波形



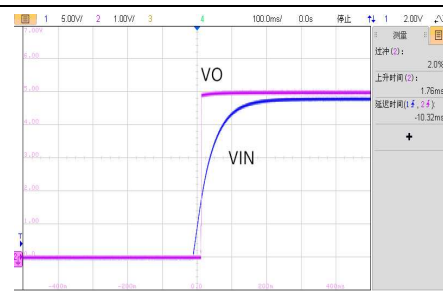
VIN=12V, 半载启机波形



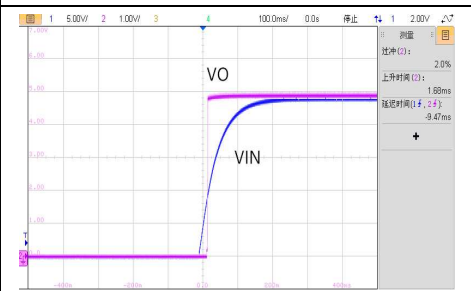
VIN=12V, 满载启机波形



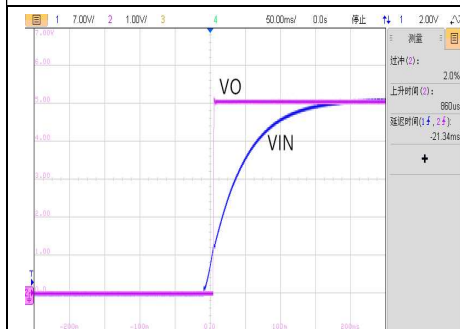
VIN=24V, 空载启机波形



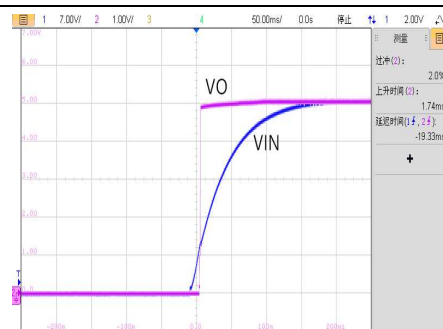
VIN=24V, 半载启机波形



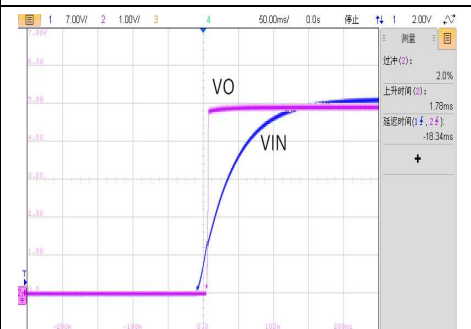
VIN=24V, 满载启机波形



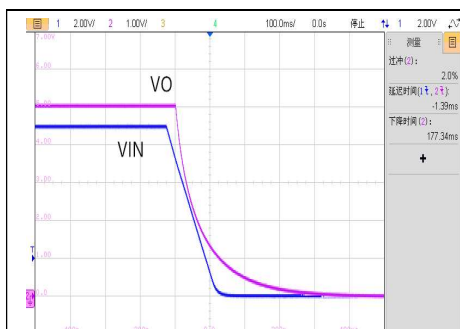
VIN=36V, 空载启机波形



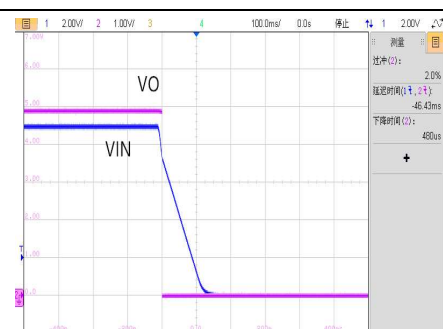
VIN=36V, 半载启机波形



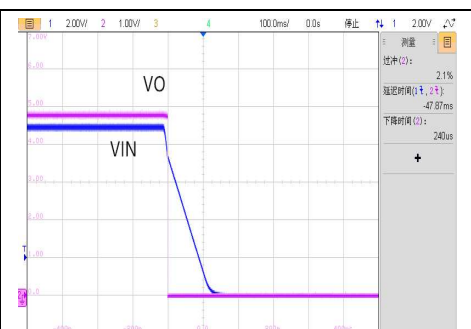
VIN=36V, 满载启机波形



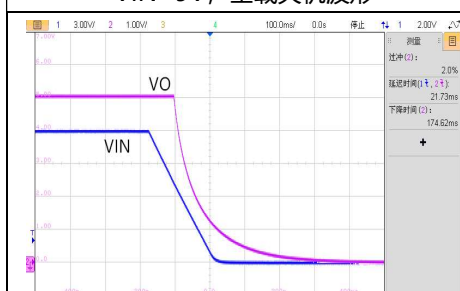
VIN=9V, 空载关机波形



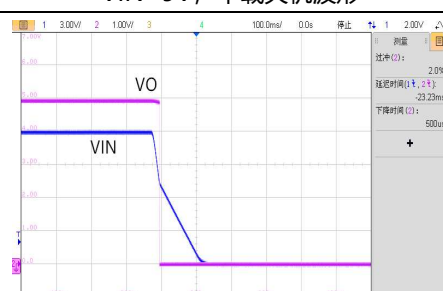
VIN=9V, 半载关机波形



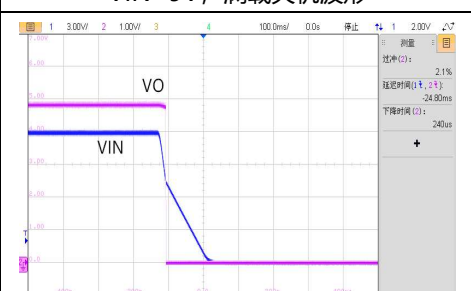
VIN=9V, 满载关机波形



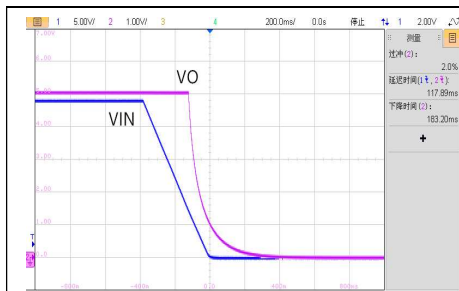
VIN=12V, 空载关机波形



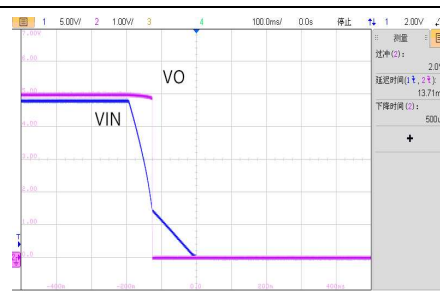
VIN=12V, 半载关机波形



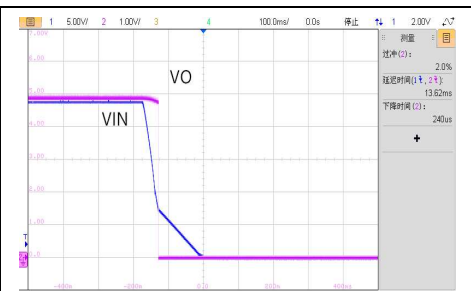
VIN=12V, 满载关机波形



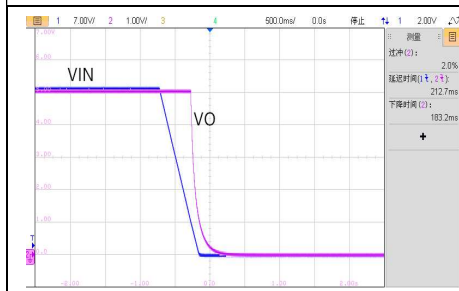
VIN=24V, 空载关机波形



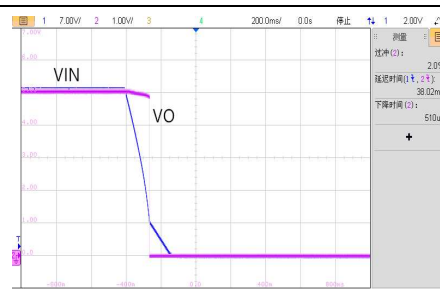
VIN=24V, 半载关机波形



VIN=24V, 满载关机波形



VIN=36V, 空载关机波形

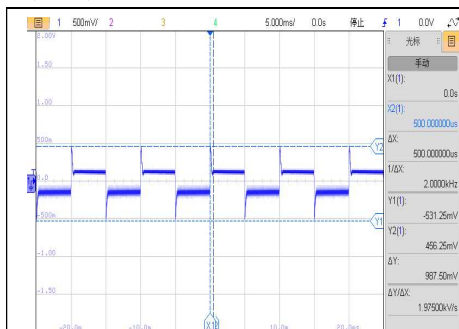


VIN=36V, 半载关机波形

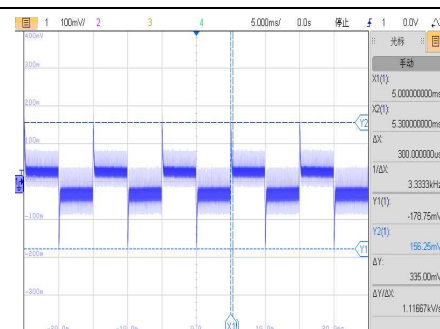


VIN=36V, 满载关机波形

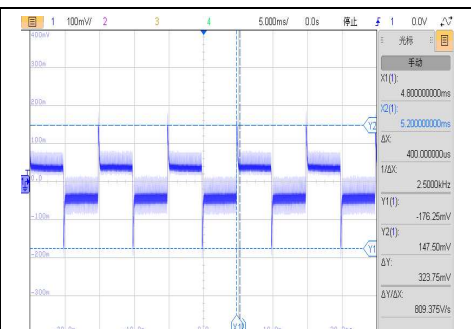
动态波形



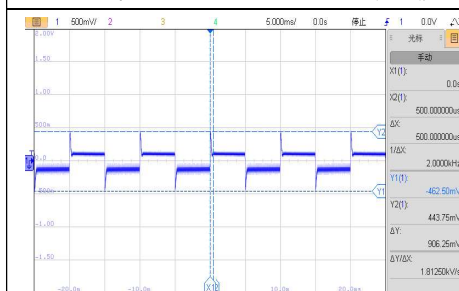
VIN=9V, 100%-10%-100%Io 动态波形



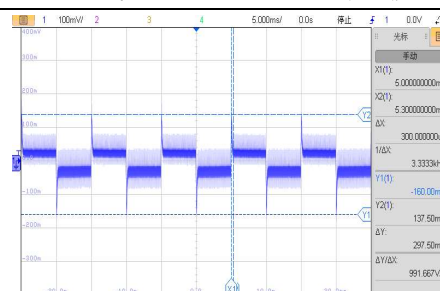
VIN=9V, 75%-50%-75%Io 动态波形



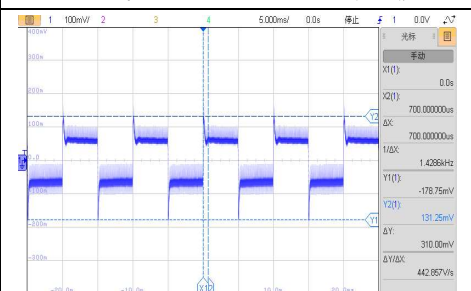
VIN=9V, 50%-25%-50%Io 动态波形



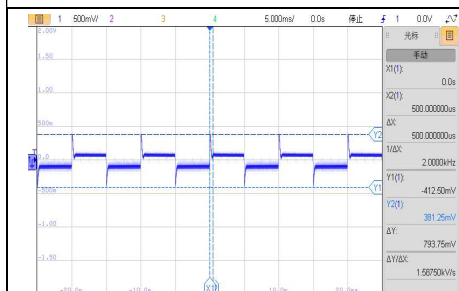
VIN=12V, 100%-10%-100%Io 动态波形



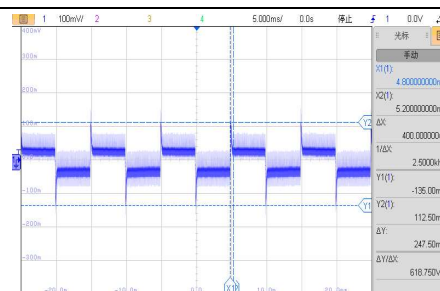
VIN=12V, 75%-50%-75%Io 动态波形



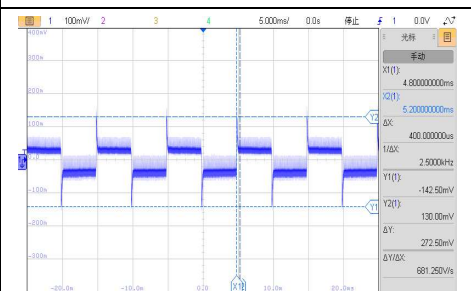
VIN=12V, 50%-25%-50%Io 动态波形



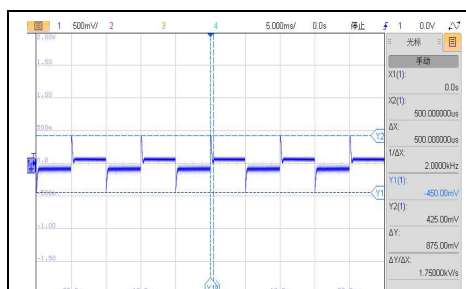
VIN=24V, 100%-10%-100%Io 动态波形



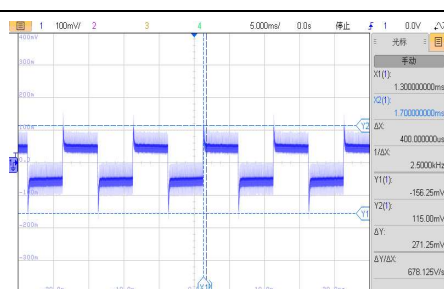
VIN=24V, 75%-50%-75%Io 动态波形



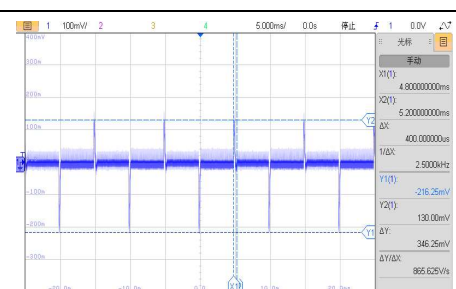
VIN=24V, 50%-25%-50%Io 动态波形



VIN=36V, 100%-10%-100%Io 动态波形

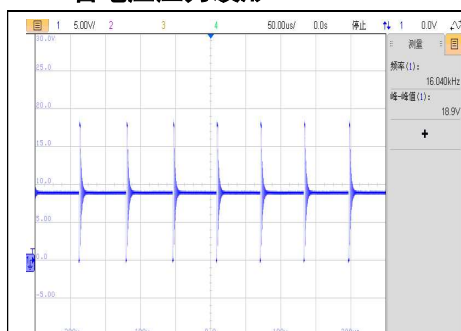


VIN=36V, 75%-50%-75%Io 动态波形

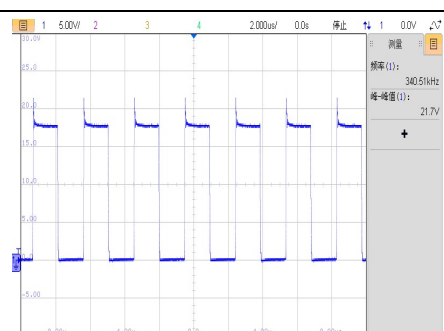


VIN=36V, 50%-25%-50%Io 动态波形

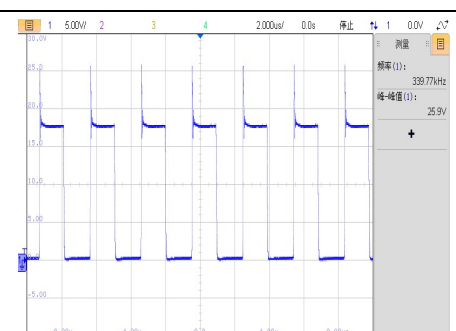
MOS 管电压应力波形



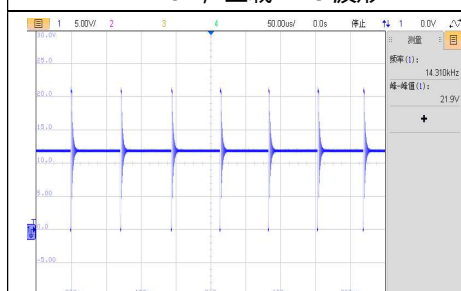
VIN=9V, 空载 VDS 波形



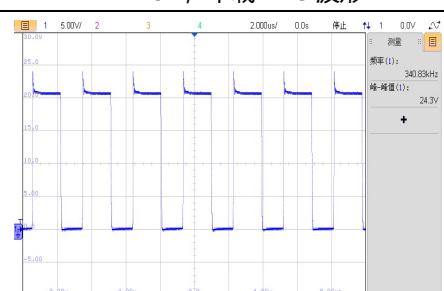
VIN=9V, 半载 VDS 波形



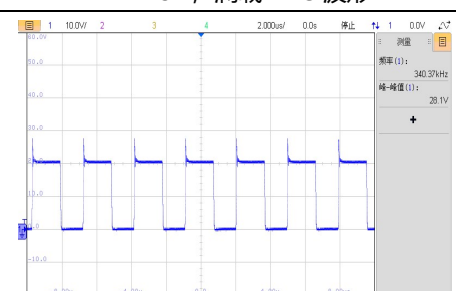
VIN=9V, 满载 VDS 波形



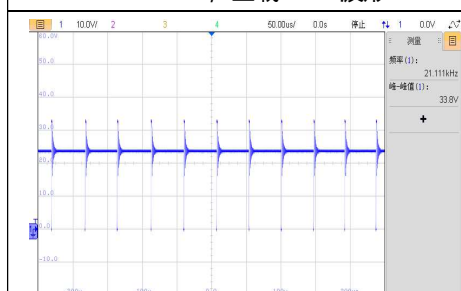
VIN=12V, 空载 VDS 波形



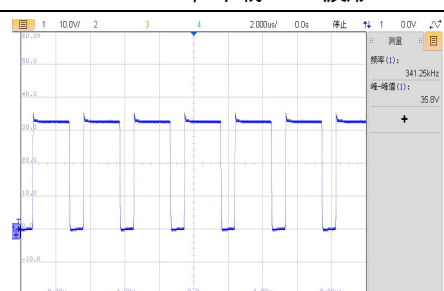
VIN=12V, 半载 VDS 波形



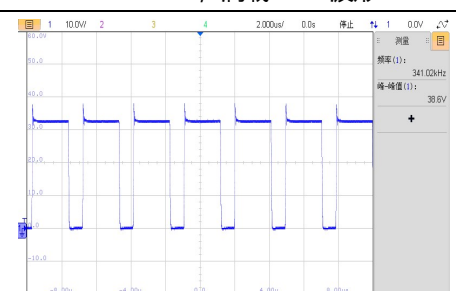
VIN=12V, 满载 VDS 波形



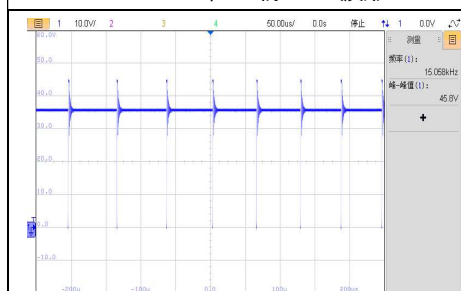
VIN=24V, 空载 VDS 波形



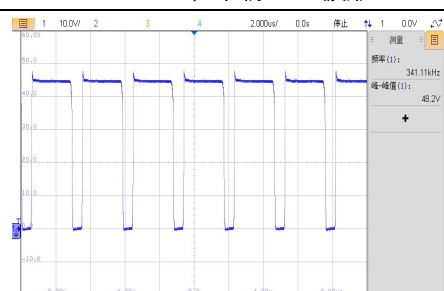
VIN=24V, 半载 VDS 波形



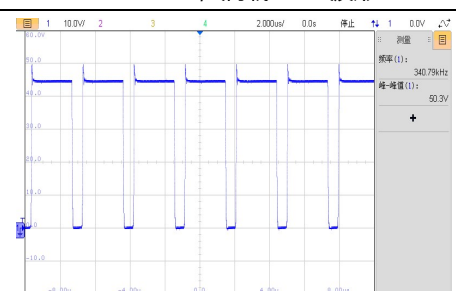
VIN=24V, 满载 VDS 波形



VIN=36V, 空载 VDS 波形



VIN=36V, 半载 VDS 波形



VIN=36V, 满载 VDS 波形

副边输出整流二极管 D3 应力波形



免责声明

本文的主要目的是为了让客户更好地理解与应用源特相关产品。所涉及技术信息提供的所有参数、数值、数据都是基于源特对于部分标准的理解得到的, 所提供的信息并不能保证所有假设情况和工作条件。客户在使用源特产品设计开发时, 需进行充分的设计验证以确保设计方案能满足特定的应用场合。本文所提供的测试数据是基于有限数量样品测试的典型值, 源特不能保证所有数据的准确性和完整性, 也不对本文所提供的任何参数、数值、数据、建议、观点的准确性和充分性承担任何责任, 不对由本文所造成的直接、间接损失承担任何责任。