



Analog Semiconductor IC

VRR 系列

高速度, 低压差, $\pm 1\%$ 高输出精度
CMOS稳压器配ON/OFF开关功能

Rev. C09-08

AnaSem Inc.
..... *Future of the analog world*



高速度， 低压差， $\pm 1\%$ 高输出精度， 配ON/OFF功能 CMOS稳压器

VRR 系列

概述

VRR系列乃高速度， 低压差， 高输出电压精度稳压器， 以低压差来达到高输出电压精度的规格。VRH系列的电压输出能在指定的温度范围内保证 $\pm 1\%$ 的精度， 而集成电路内以温度系数调整的高准确率参考电压值来做基准。VRH系列以低ESR电容来作输出的稳定作用。而已冲好的ESR电容能由VRH系列在 $C_E=V_{SS}$ 的情况下由内置的开关来放电， 能助 V_{OUT} 迅速回复到 V_{SS} 水平。另外， VRH系列也备有电流过高的保护电路， 能防止电流量超越输出三极管的限制电流量。



RoHS
符合标准

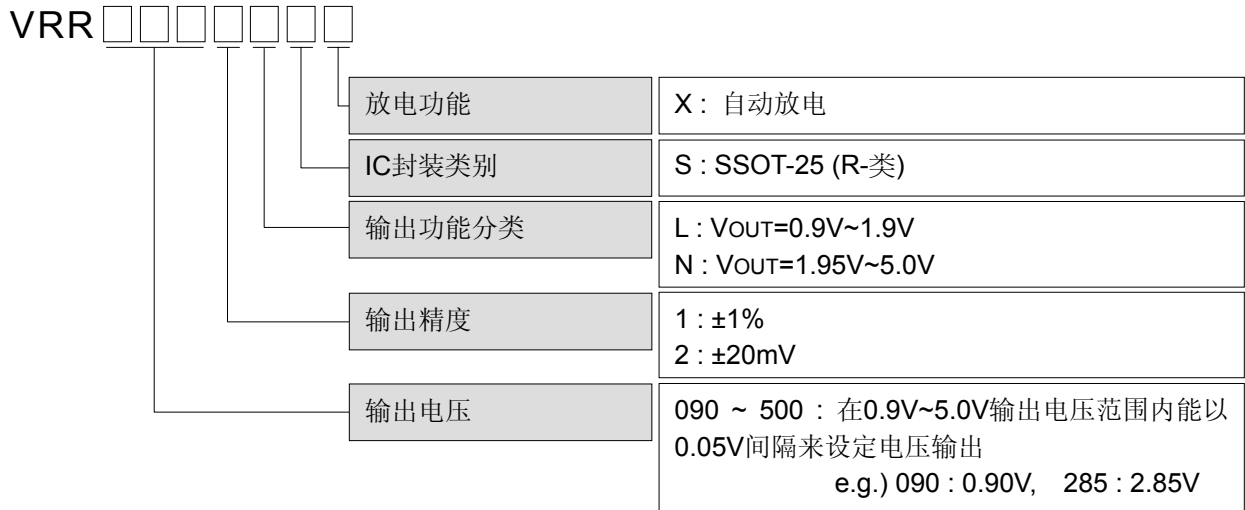
特点

- 输出电压范围 0.9V~5.0V (能以每0.05V间隔设定输出电压)
- 工作电压范围 1.6V~6.0V
- 高精度电压输出 $\pm 1\%$ ($V_{OUT}=1.95V \sim 5.0V$) / $\pm 20mV$ ($V_{OUT}=0.9V \sim 1.9V$)
- 高电流输出 250mA
- 输入输出压差 Typ. 90mV (output=3.0V, $I_{OUT}=100mA$)
- 低电流功耗 Typ. 25 μA
- 高噪音抑制比 Typ. 75dB at 1KHz
- 低ESR电容 1.0 μF ceramic capacitor
- 工作温度范围 $-40^{\circ}C \sim +85^{\circ}C$
- 内置电流限制保护 电流限制 : 300mA
- CL 高速自动放电
- 内置ON/OFF开关电路
- 小型封装 SSOT-25 : R-类 (350mW)

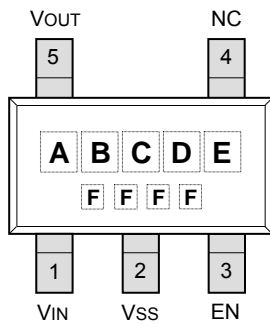
应用范围

- 电池驱动之产品
- 手机
- 数码相机或摄像机
- 手提式电玩产品
- 手提式电子产品仪器

产品型号定义



PIN脚排位 / IC封装记号 (SSOT-25 : R-类)



(顶视图)

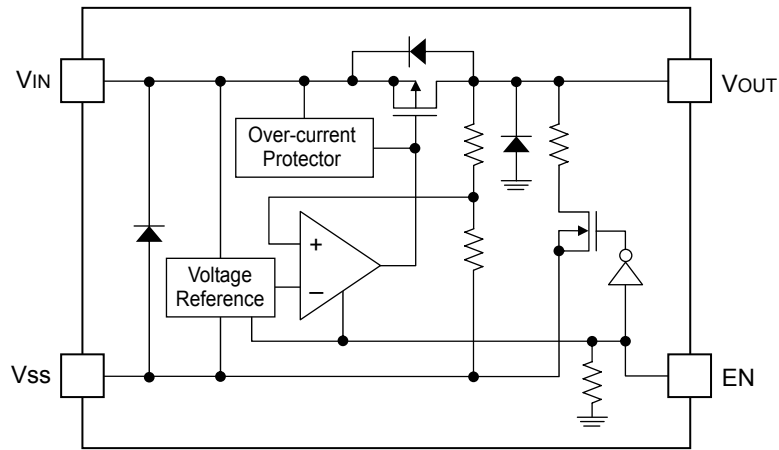
● Pin脚排位

位置	记号	解说
1	VIN	电压输入
2	VSS	接地
3	EN	ON/OFF检测
4	NC	不接 (开通)
5	VOUT	电压输出

● IC封装记号

位置	记号	解说
A	R	产品系列标记
BCD	090~500	电压输出
E	X	电容放电功能
F	厂方设定	生产批号

IC电路图



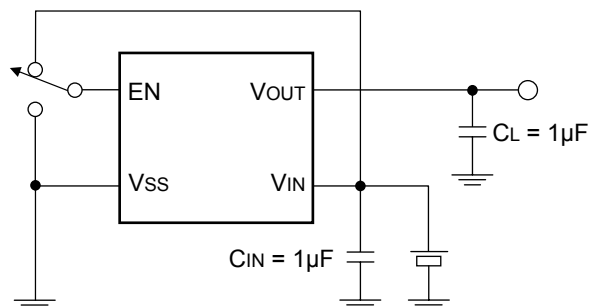
绝对最大工作范围

项目	符号	规格	单位
输入电压范围	VIN	-0.3 ~ +7.0	V
输出电流	IOUT	500	mA
输出电压范围	VOUT	VSS -0.3 ~ VIN +0.3	V
功率耗散 ※1)	SSOT-25 PD	350 (on PCB)	mW
工作温度范围	TOPR	-40 ~ +85	°C
储存温度范围	TSTG	-55 ~ +125	°C

注：

※1) 功率耗散规格是依照IC已上PCB板的条件来定。
而PCB板的尺寸为 50mm×50mm×1.6mm.

典型应用电路



电子规格

(Ta=25°C 除非另有注明)

项目	符号	条件	最低	一般	最高	单位	测试电路	
输出电压范围	V _{OUT}	V _{OUT} +1.0V ≤ V _{IN} ≤ 6.0V I _{OUT} =30mA Ta=-40°C ~ +85°C	V _{OUT} ≥ 1.95V	V _{OUT} × 0.99	V _{OUT} × 1.01	V	1	
			V _{OUT} ≤ 1.90V	-20	-	+20		mV
输出电流	I _{OUT}	V _{IN} ≥ V _{OUT} +1.0V	0.9V ≤ V _{OUT} ≤ 1.15V	-	250	-	mA	1
			1.2V ≤ V _{OUT} ≤ 1.65V	-	250	-		
			1.7V ≤ V _{OUT} ≤ 2.25V	-	250	-		
			2.3V ≤ V _{OUT} ≤ 2.85V	-	250	-		
			2.9V ≤ V _{OUT} ≤ 3.45V	-	250	-		
			3.5V ≤ V _{OUT} ≤ 4.05V	-	250	-		
			4.0V ≤ V _{OUT} ≤ 5.00V	-	250	-		
输入输出压差	V _{DROP}	I _{OUT} =100mA	0.9V ≤ V _{OUT} ≤ 1.15V	-	480	730	mV	1
			1.2V ≤ V _{OUT} ≤ 1.65V	-	210	340		
			1.7V ≤ V _{OUT} ≤ 2.25V	-	130	205		
			2.3V ≤ V _{OUT} ≤ 2.85V	-	100	150		
			2.9V ≤ V _{OUT} ≤ 3.45V	-	90	137		
			3.5V ≤ V _{OUT} ≤ 4.05V	-	85	115		
			4.0V ≤ V _{OUT} ≤ 5.00V	-	80	85		

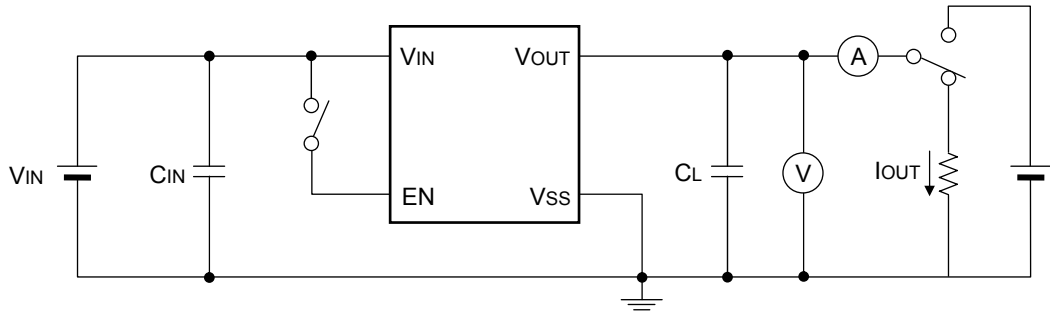
电子规格 (续)

(Ta=25°C 除非另有注明)

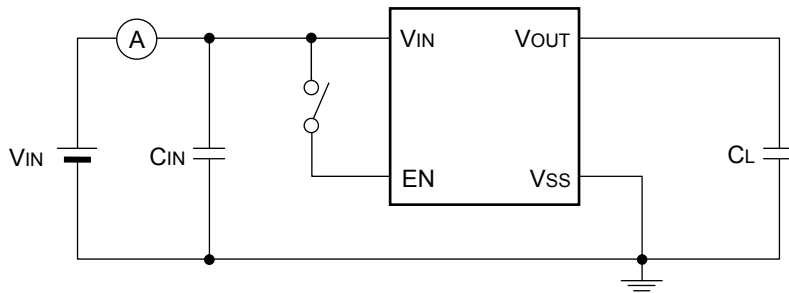
项目	符号	条件	最低	一般	最高	单位	测试电路
电流功耗	I _{DD}	V _{IN} =V _{OUT} +1.0V, V _{OUT} =Open, I _{OUT} =0mA	-	25	40	μA	2
静态电流消耗	I _{STB}	EN=V _{SS}	-	0.01	0.1	μA	2
输入电压范围	V _{IN}		1.6	-	6.0	V	1
负载调节	ΔV _{OUT}	V _{IN} =V _{OUT} +1.0V, I _{OUT} =0.1mA ~ 100mA	-	10	40	mV	1
交流电源电压变化	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	V _{OUT} +1.0V ≤ V _{IN} ≤ 6.0V, I _{OUT} =30mA	-	0.01	0.1	%/V	1
噪音抑制比	R _r	V _{IN} =V _{OUT} +1.0V, f=1KHz, ΔV _{RIP} =0.5VP-P, I _{OUT} =30mA	-	75	-	dB	3
电流限制	I _{LIMIT}	EN=V _{IN}	300	-	-	mA	1
短路电流	I _{SHORT}	V _{IN} =V _{OUT} +1.0V, V _{OUT} =0V	-	40	-	mA	1
电压输出-温度稳定性	$\frac{\Delta V_{OUT}}{\Delta T_a \cdot V_{OUT}}$	V _{EN} =V _{IN} , I _{OUT} =300mA T _a =-40°C ~ +85°C		±20		ppm /°C	1
EN 高端电压	V _{ENH}		1.2	-	6.0	V	4
EN 低端电压	V _{ENL}		-	-	0.3	V	4
EN 高端电流	I _{ENH}	V _{EN} = V _{IN}	-0.1	-	0.1	μA	4
EN 低端电流	I _{ENL}	V _{EN} = V _{SS}	-0.1	-	0.1	μA	4
CL 自动放电阻抗值	R _{DIS}	V _{IN} =6.0V, V _{OUT} =4.0V, V _{EN} = V _{SS}	-	160	-	Ω	1

测试电路

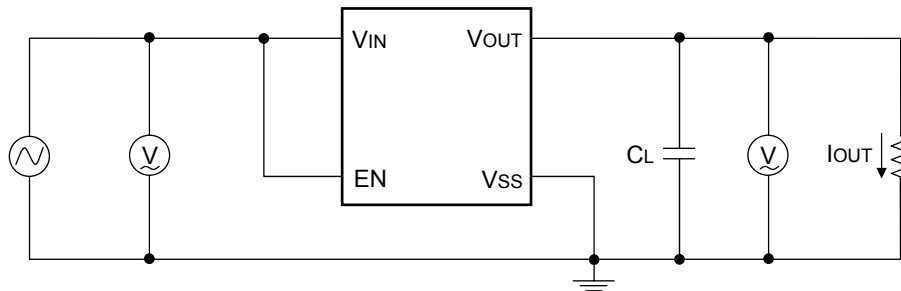
- **电路 (1)** – 输出电压, 输出电流, 输入输出压差, 输入电压, 负载调节, 线性调节, 电流限制, 短路电流, 电压输出温度范围, CL 自动放电阻抗值



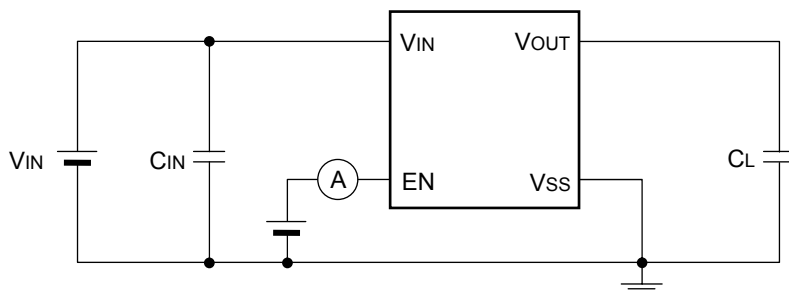
- **电路 (2)** – 电流功耗, 静态电流消耗



- **电路 (3)** – 输出噪音抑制比



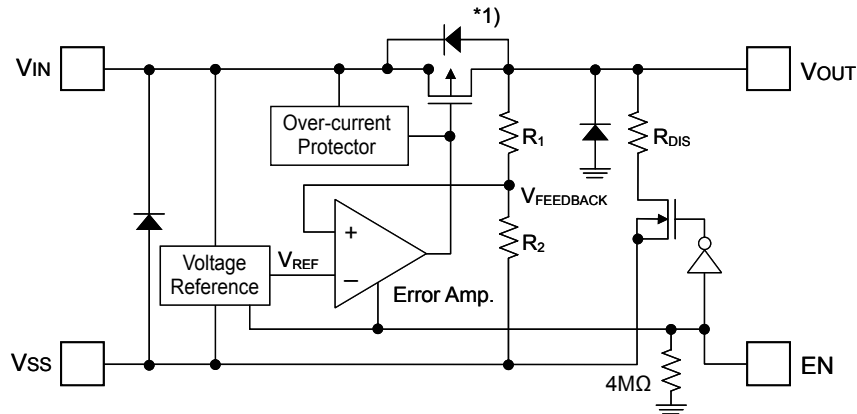
- **电路 (4)** – EN 高端电压, EN 低端电压, EN 高端电流, EN 低端电流



工作原理解说

● 一般运作

请参考以下VRR系列的电压控制电路图;



运用电路图内的 **Error Amplifier**, 参考电压(V_{REF})能与 $V_{FEEDBACK}$ 作比较, 而参数电压侧由回输电阻 R_1 和 R_2 除开。这样电压供应到输出的三极管(请参考注*1)来保持稳定的电压输出避免其他从电压输入因负极回输电路而产生的不稳定影响。

注 *1)

VRR系列以内置有连接着P-沟道三极管为输出三极管。为了避免VRD系列稳压器因反向电流从VOUT端经过寄生二极管通至VIN端而损坏, VOUT值应设至不高于 $V_{IN}+0.3V$ 。

● EN端 (稳压器电路运作开关功能) 和 CL自动放电功能

VRR系列能以EN端来作关闭动作。此时, 当在EN端的信号成关闭水平时, 内置的P-极三极管是在OFF的状态, 所有稳压器的内部电路运作会被停止来节省电流功耗。在关闭的模式时, VRR系列能自动放电阻抗(R_{Dis} ; 160Ω)来把存留在CL 的电荷放出, 如此VOUT端的电压能迅速地回到VSS的水平。

● 输出端电容 (CL)

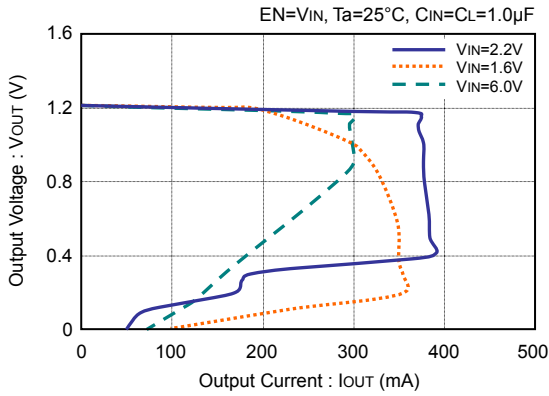
基于相位补偿的功能, 输出端电容(CL)需要尽量靠近地连接与VOUT端与VSS端。 建议的电容为最少是 $1.0\mu F$ 值的陶瓷式电容。当然, 电容值是基于个别不一的应用方式。此外, 为了保持稳定的电源供应, 建议采用一颗最少为 $1.0\mu F$ 的输入端电容(C_{IN})接于VIN端与VSS端之间。

● 过量电流限制和短路保护

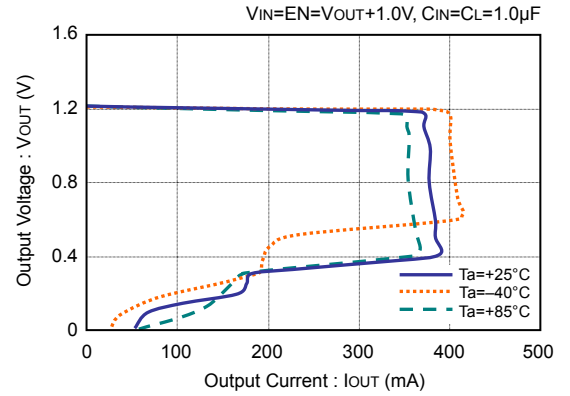
VRR系列以内置的电流限制电路来达成过量电流保护的功用。当负载电流达到限制的电流水平, 输出电压会下降, 同时间输出电流也会相应地减低。在输出端短路的情况下一般的电流值为40mA。

一般特征 – 输出电压 vs. 输出电流

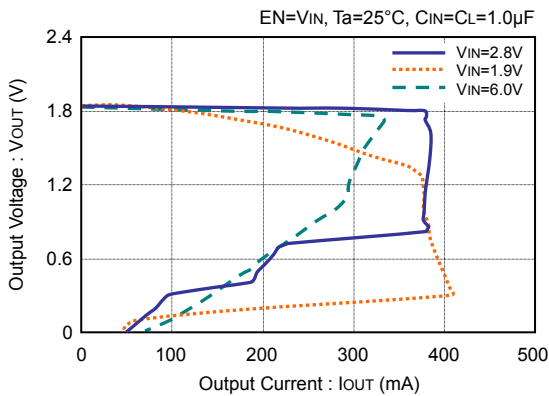
● VRR1202xxx (VOUT=1.2V)



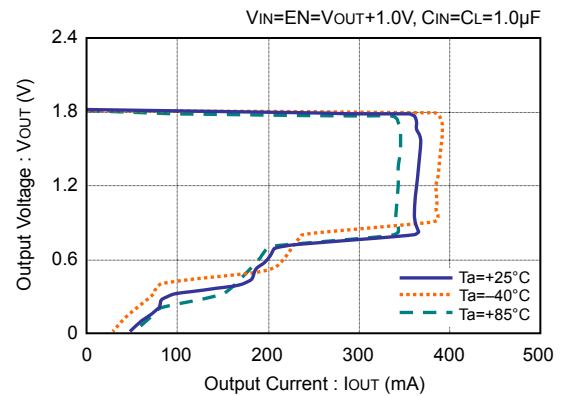
● VRR1202xxx (VOUT=1.2V)



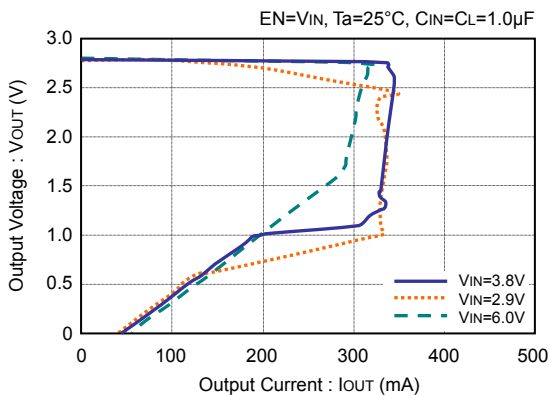
● VRR1802xxx (VOUT=1.8V)



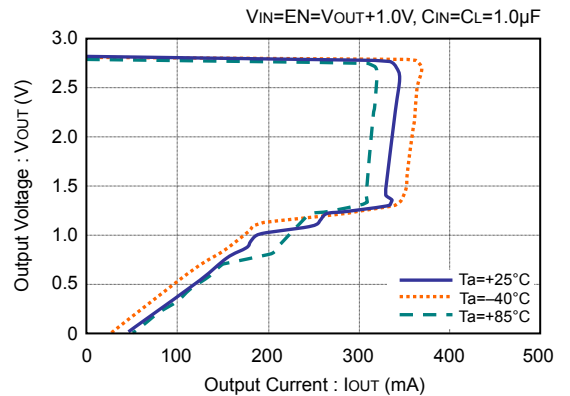
● VRR1802xxx (VOUT=1.8V)



● VRR2801xxx (VOUT=2.8V)

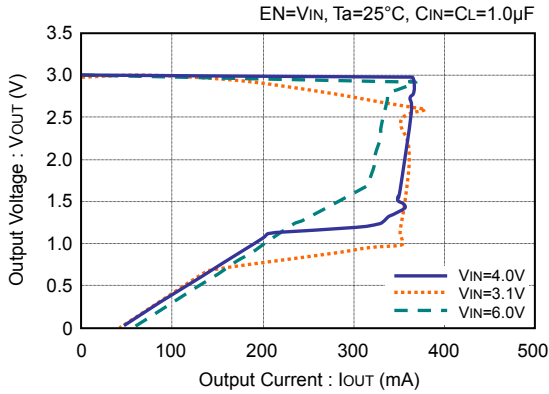


● VRR2801xxx (VOUT=2.8V)

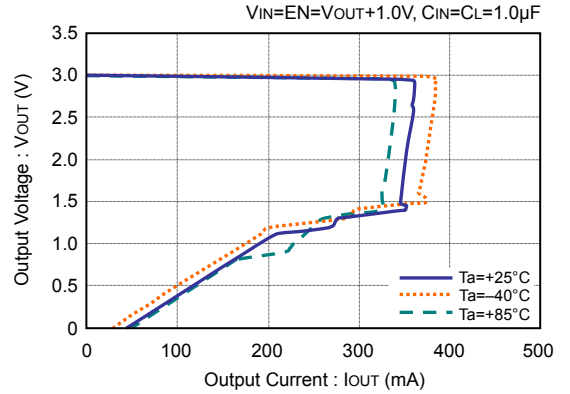


一般特征 – 输出电压 vs. 输出电流 (续)

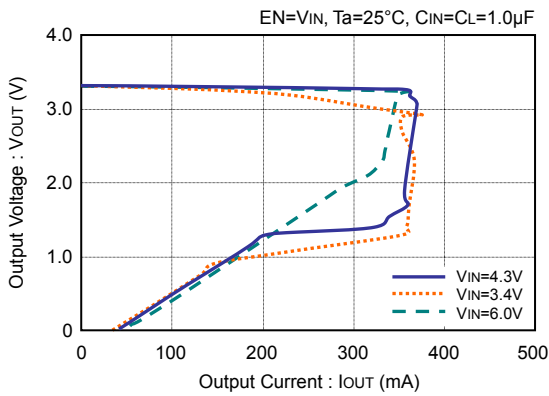
● VRR3001xxx (VOUT=3.0V)



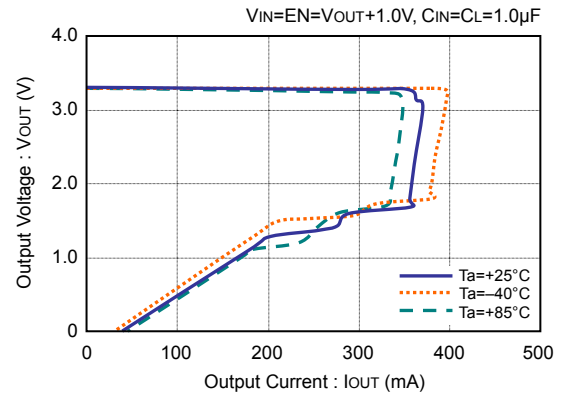
● VRR3001xxx (VOUT=3.0V)



● VRR3301xxx (VOUT=3.3V)

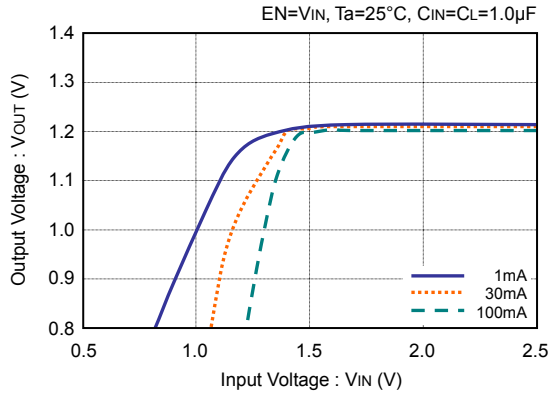


● VRR3301xxx (VOUT=3.3V)

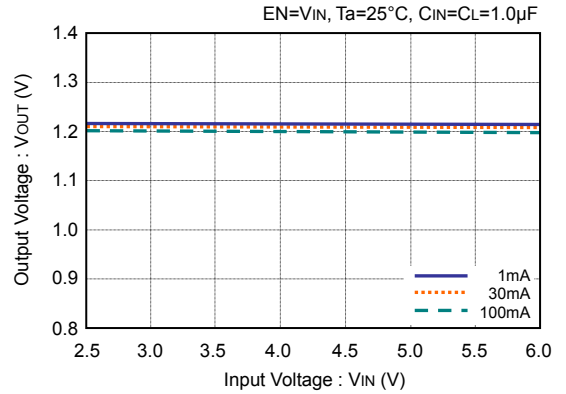


一般特征 – 输出电压 vs. 输入电压

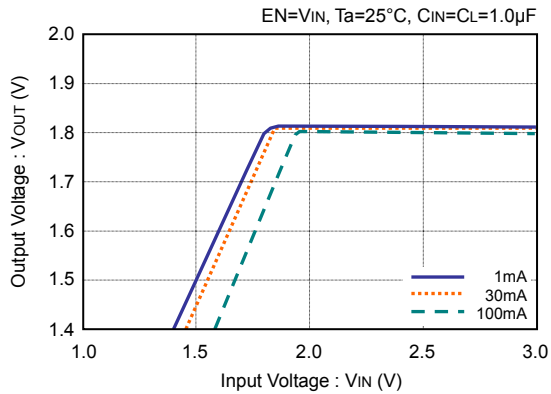
● VRR1202xxx (VOUT=1.2V)



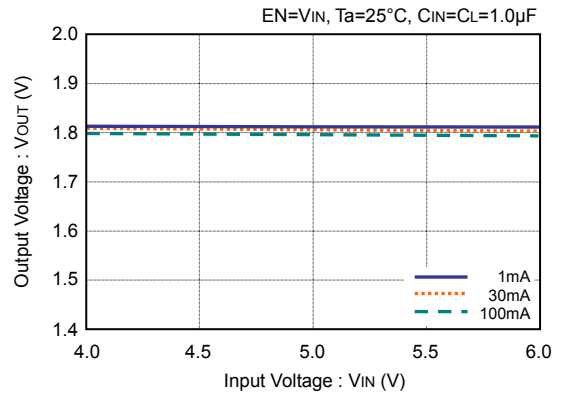
● VRR1202xxx (VOUT=1.2V)



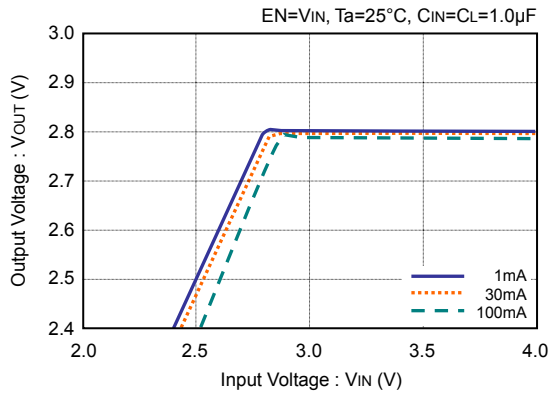
● VRR1802xxx (VOUT=1.8V)



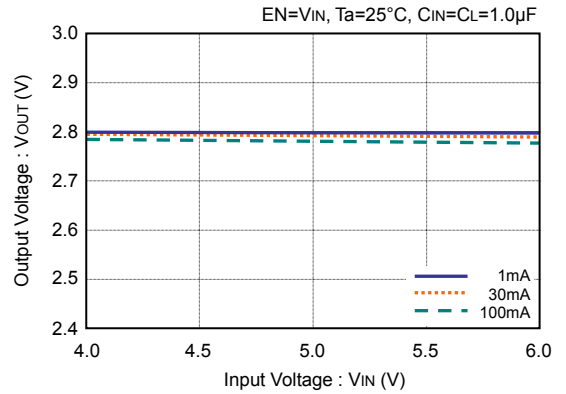
● VRR1802xxx (VOUT=1.8V)



● VRR2801xxx (VOUT=2.8V)

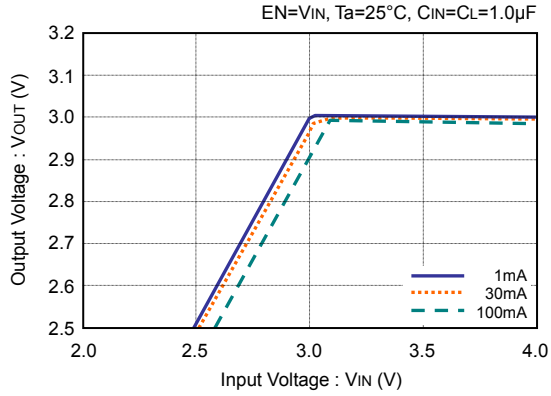


● VRR2801xxx (VOUT=2.8V)

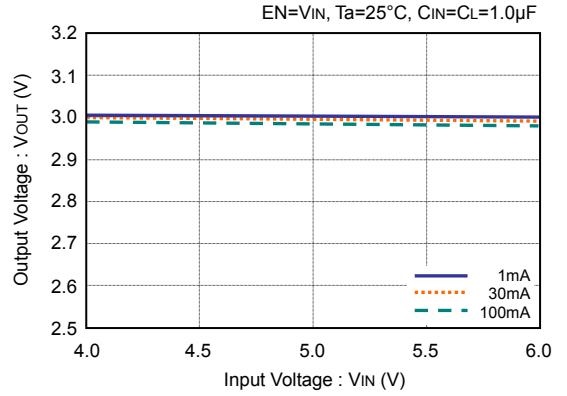


一般特征 – 输出电压 vs. 输入电压 (续)

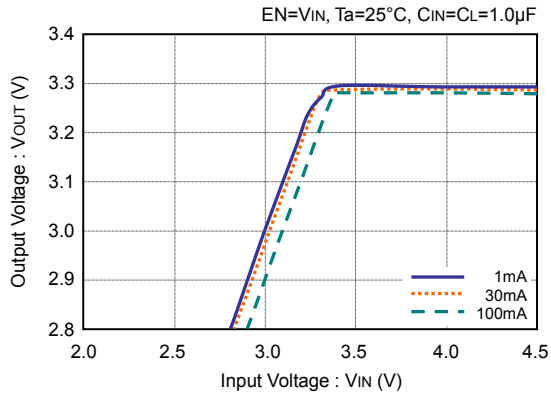
● VRR3001xxx (VOUT=3.0V)



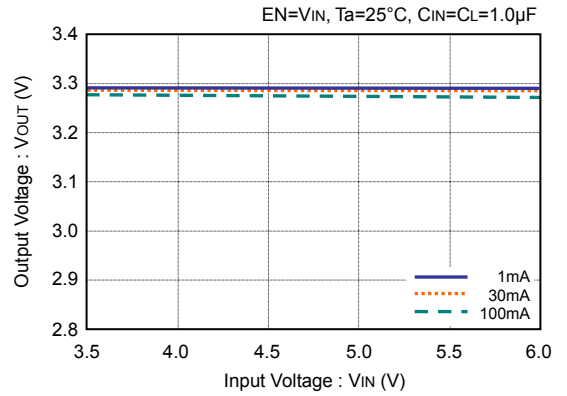
● VRR3001xxx (VOUT=3.0V)



● VRR3301xxx (VOUT=3.3V)

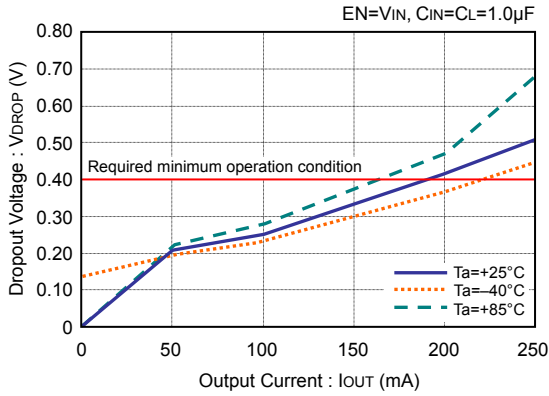


● VRR3301xxx (VOUT=3.3V)

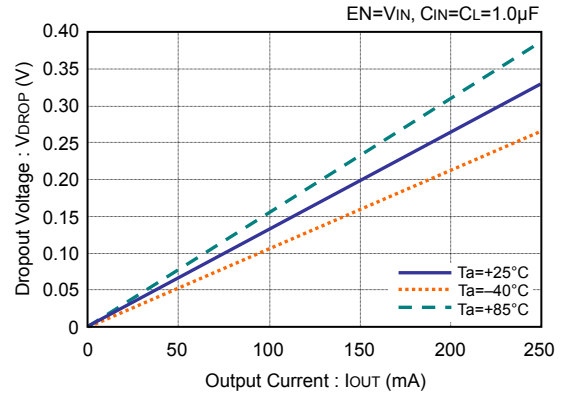


一般特征 – 压差 vs. 输出电流

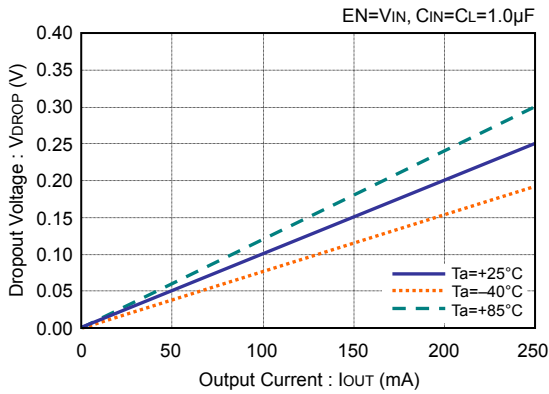
● VRR1202xxx (VOUT=1.2V)



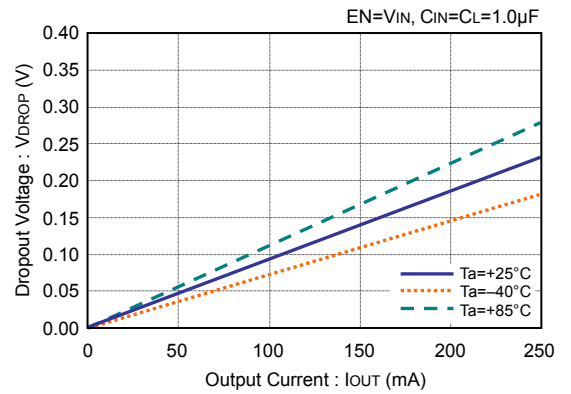
● VRR1802xxx (VOUT=1.8V)



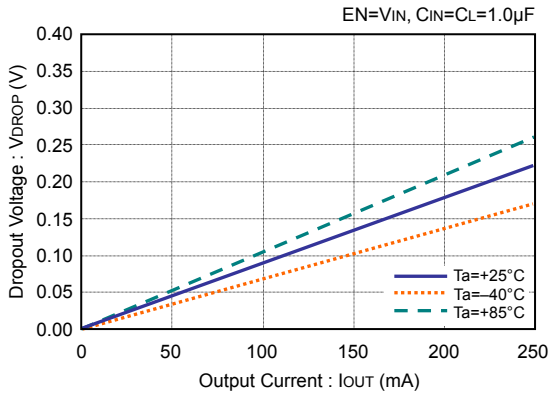
● VRR2801xxx (VOUT=2.8V)



● VRR3001xxx (VOUT=3.0V)

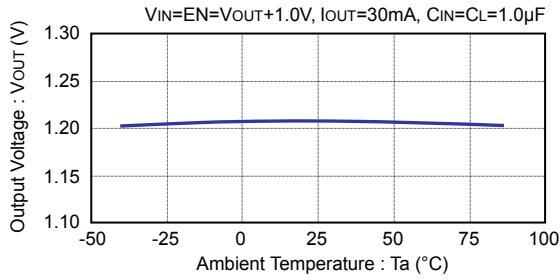


● VRR3301xxx (VOUT=3.3V)

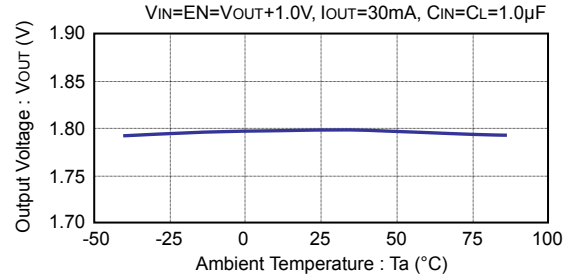


一般特征 – 输出电压 vs. 工作温度参数

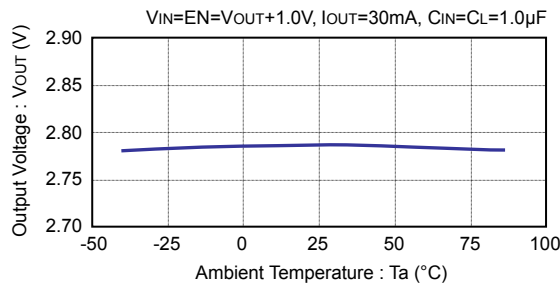
● VRR1202xxx (VOUT=1.2V)



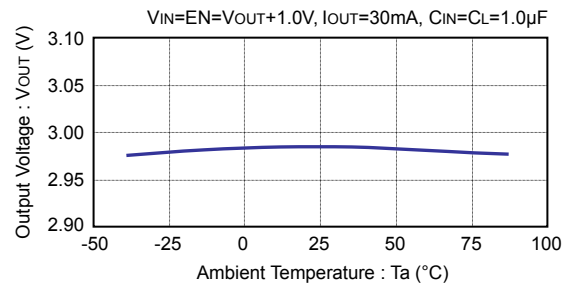
● VRR1802xxx (VOUT=1.8V)



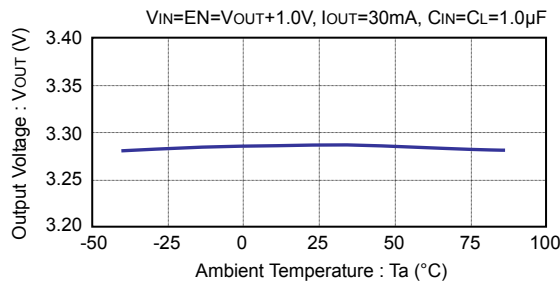
● VRR2801xxx (VOUT=2.8V)



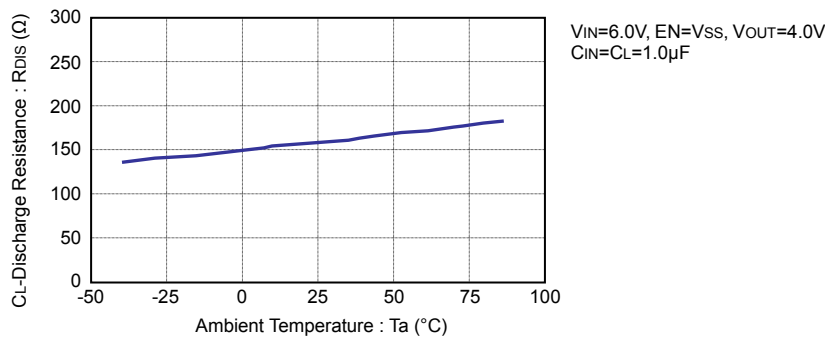
● VRR3001xxx (VOUT=3.0V)



● VRR3301xxx (VOUT=3.3V)

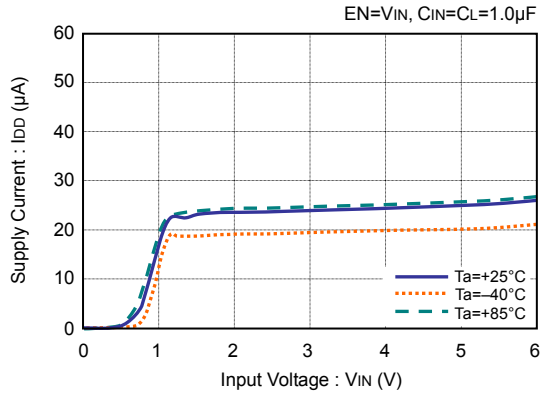


TYPICAL CHARACTERISTICS – CL-Discharge Resistance vs. Ambient Temperature

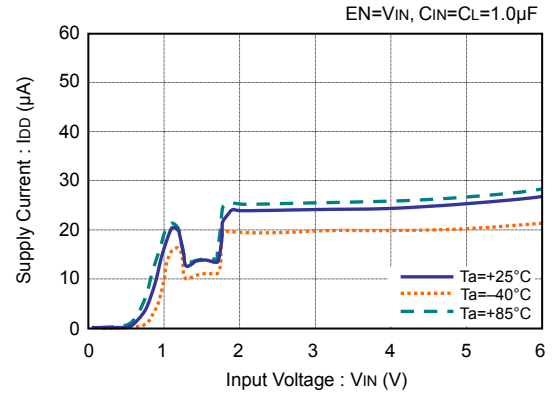


一般特征 – 电源电流 vs. 工作温度参数

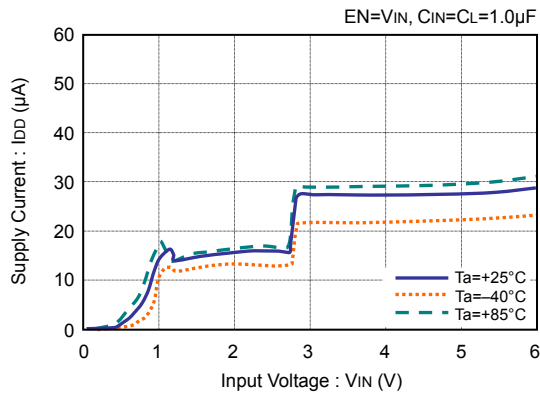
● VRR1202xxx (VOUT=1.2V)



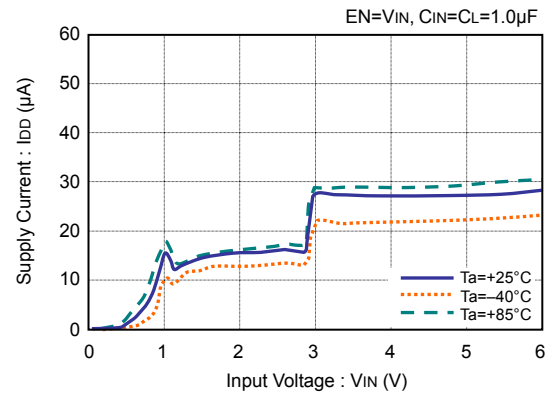
● VRR1802xxx (VOUT=1.8V)



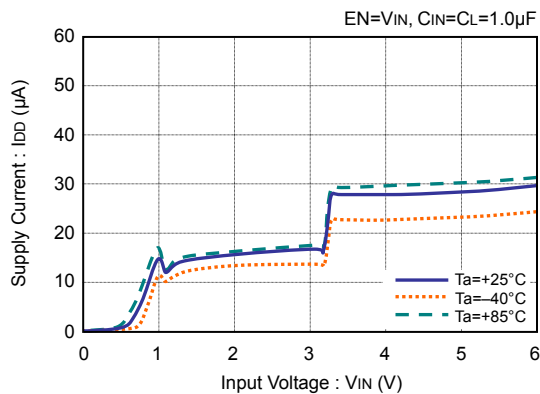
● VRR2801xxx (VOUT=2.8V)



● VRR3001xxx (VOUT=3.0V)

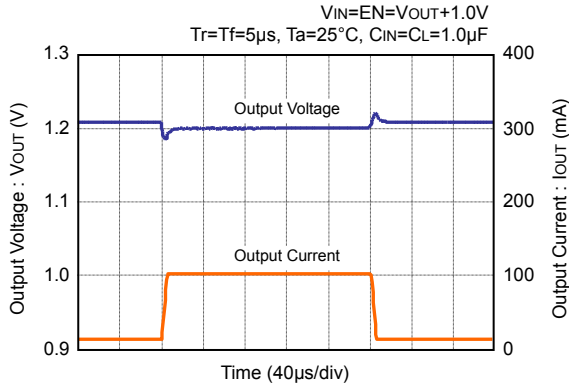


● VRR3301xxx (VOUT=3.3V)

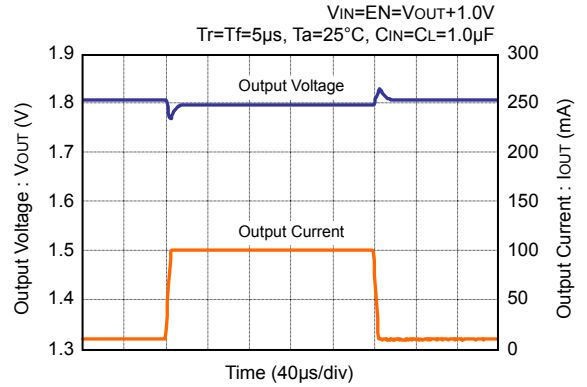


一般特征 – 负载瞬态响应

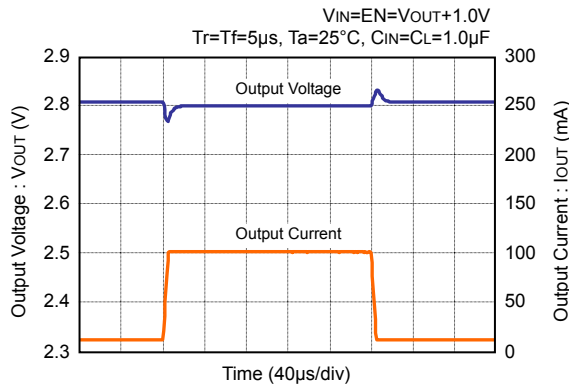
● VRR1202xxx (VOUT=1.2V)



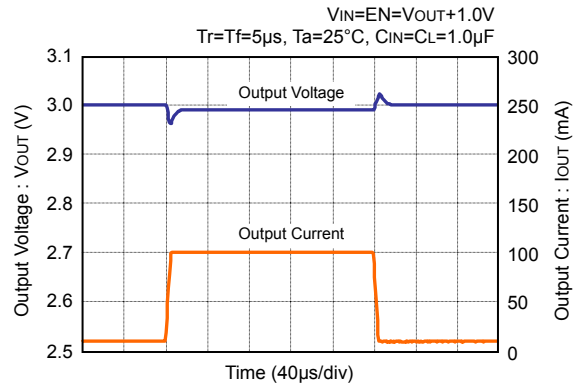
● VRR1802xxx (VOUT=1.8V)



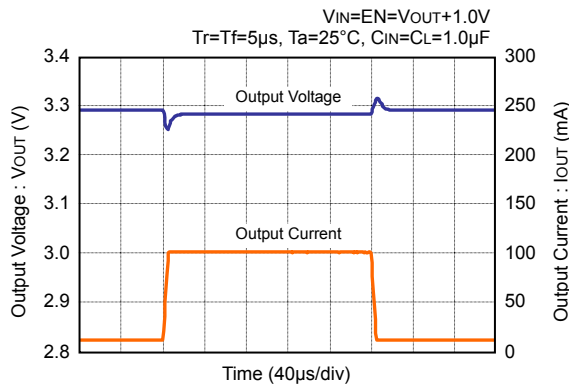
● VRR2801xxx (VOUT=2.8V)



● VRR3001xxx (VOUT=3.0V)

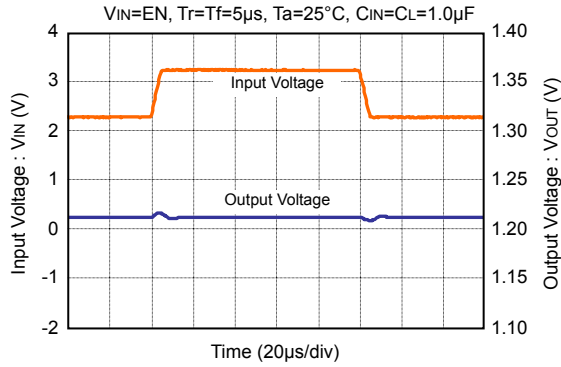


● VRR3301xxx (VOUT=3.3V)

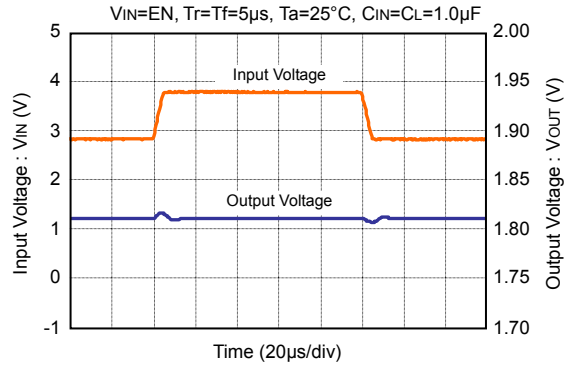


一般特征 – 输入瞬态响应 ($I_{OUT}=1mA$)

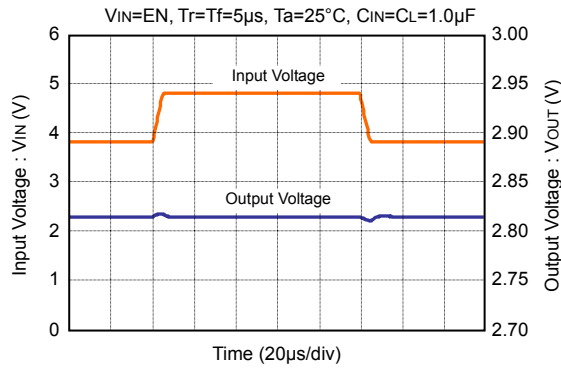
● VRR1202xxx ($V_{OUT}=1.2V$)



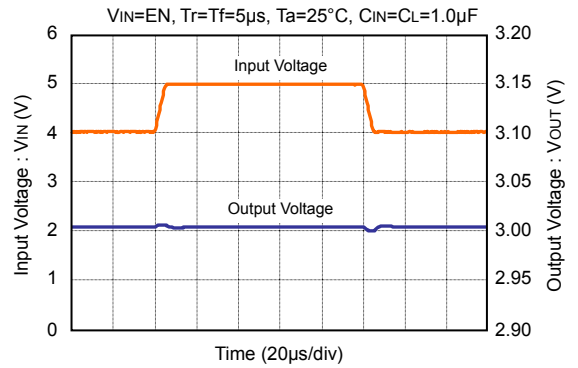
● VRR1802xxx ($V_{OUT}=1.8V$)



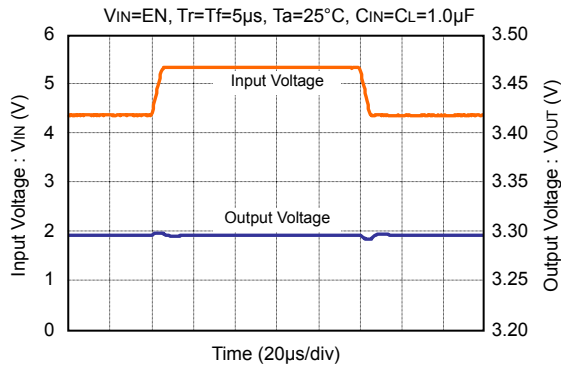
● VRR2801xxx ($V_{OUT}=2.8V$)



● VRR3001xxx ($V_{OUT}=3.0V$)

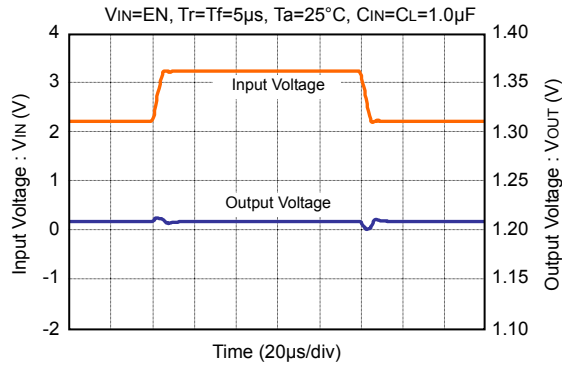


● VRR3301xxx ($V_{OUT}=3.3V$)

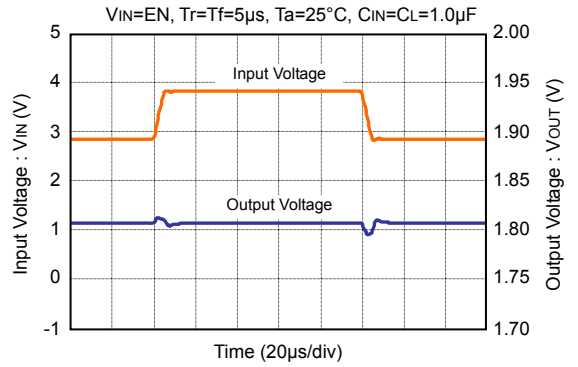


一般特征 – 输入瞬态响应 ($I_{OUT}=30mA$)

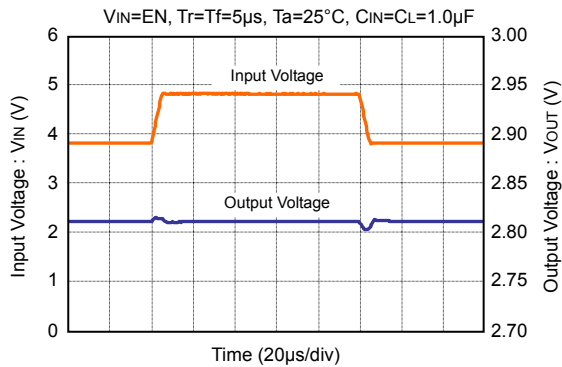
● VRR1202xxx ($V_{OUT}=1.2V$)



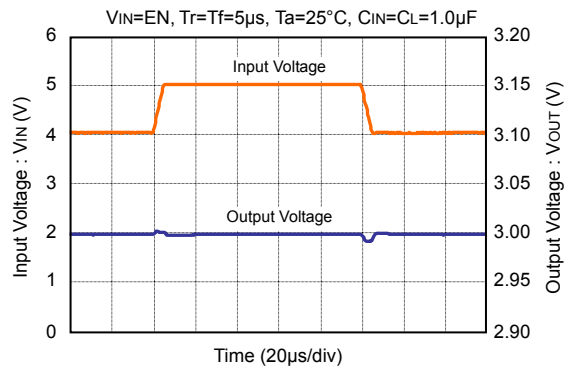
● VRR1802xxx ($V_{OUT}=1.8V$)



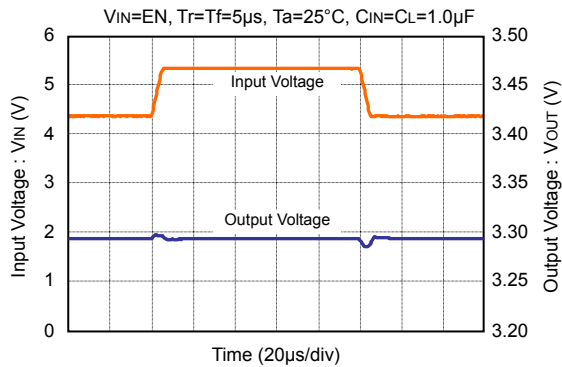
● VRR2801xxx ($V_{OUT}=2.8V$)



● VRR3001xxx ($V_{OUT}=3.0V$)

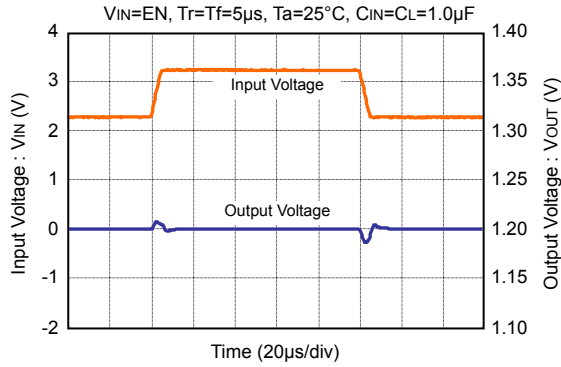


● VRR3301xxx ($V_{OUT}=3.3V$)

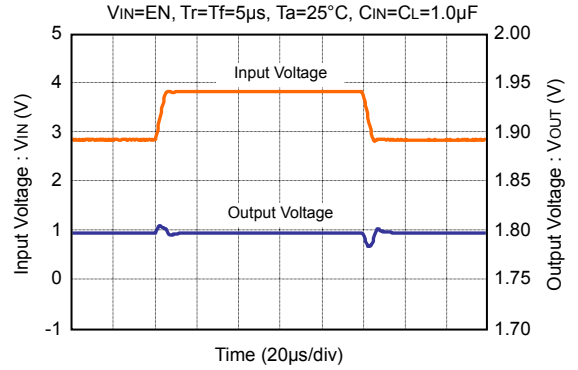


一般特征 – 输入瞬态响应 ($I_{OUT}=100mA$)

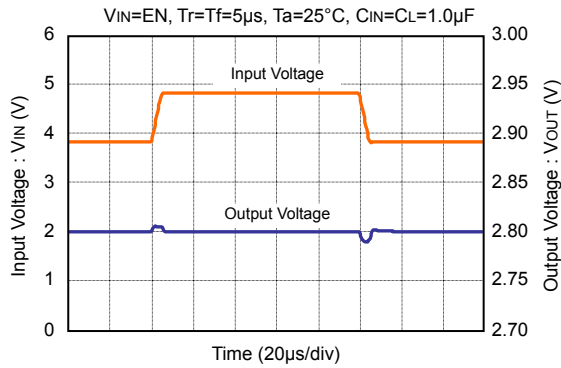
● VRR1202xxx ($V_{OUT}=1.2V$)



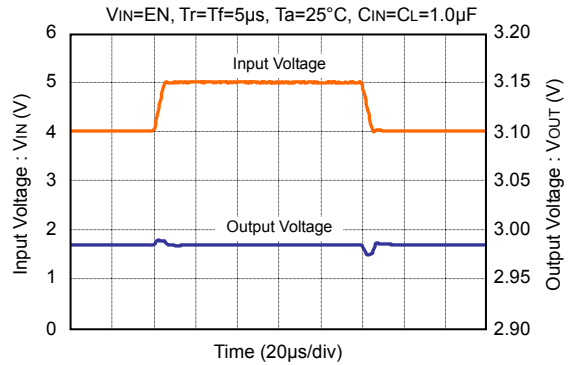
● VRR1802xxx ($V_{OUT}=1.8V$)



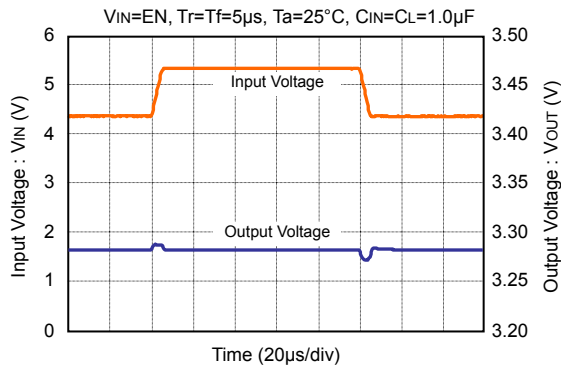
● VRR2801xxx ($V_{OUT}=2.8V$)



● VRR3001xxx ($V_{OUT}=3.0V$)

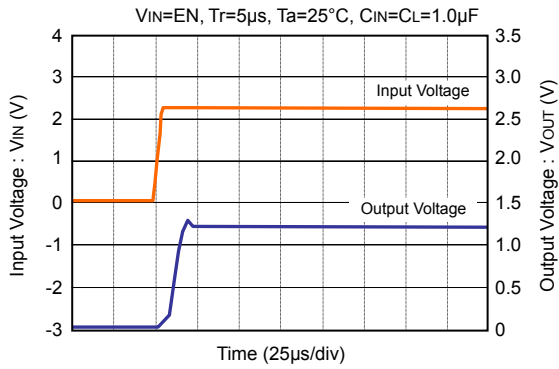


● VRR3301xxx ($V_{OUT}=3.3V$)

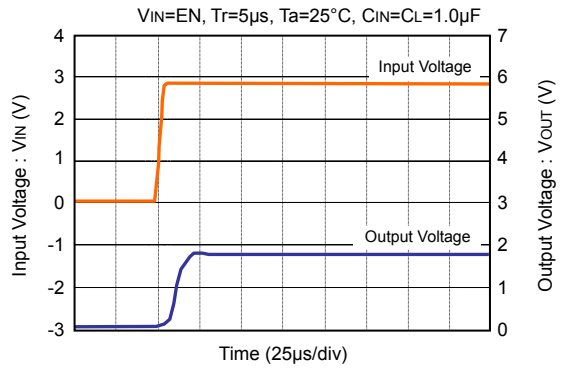


一般特征 – 输入上升时间 ($I_{OUT}=1mA$)

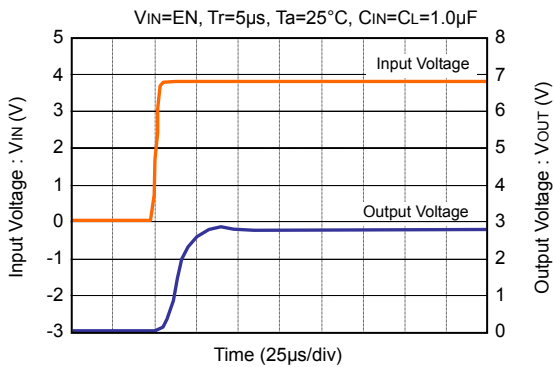
● VRR1202xxx ($V_{OUT}=1.2V$)



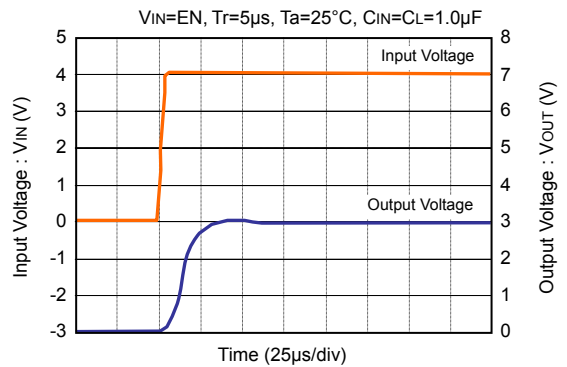
● VRR1802xxx ($V_{OUT}=1.8V$)



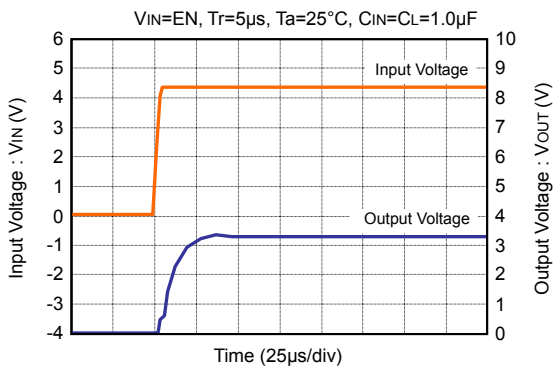
● VRR2801xxx ($V_{OUT}=2.8V$)



● VRR3001xxx ($V_{OUT}=3.0V$)

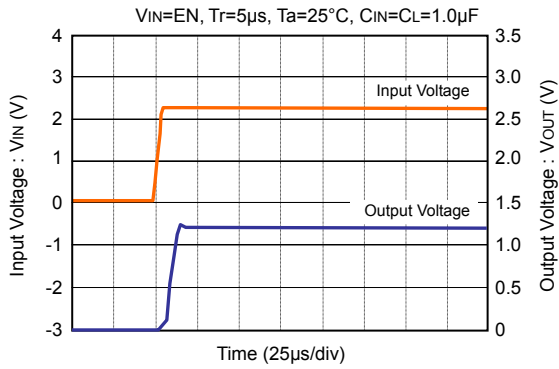


● VRR3301xxx ($V_{OUT}=3.3V$)

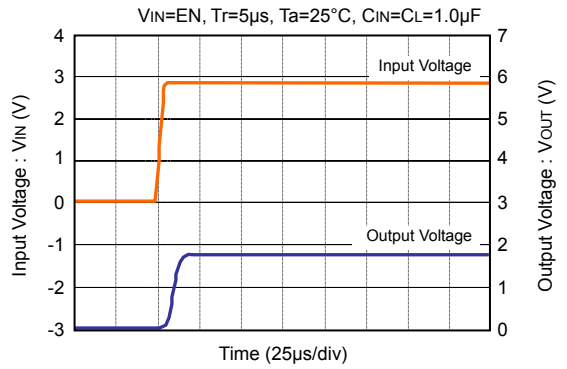


一般特征 – 输入上升时间 ($I_{OUT}=30mA$)

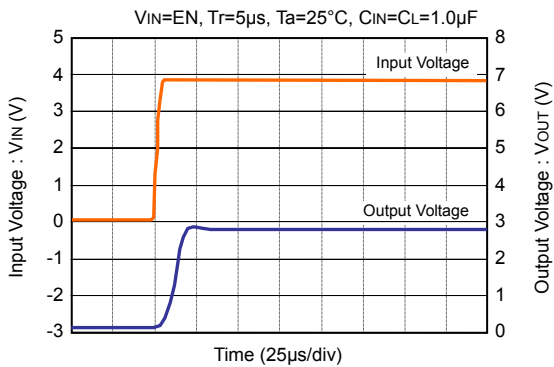
● VRR1202xxx ($V_{OUT}=1.2V$)



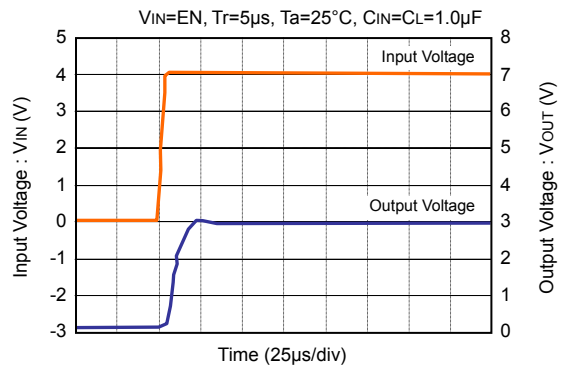
● VRR1802xxx ($V_{OUT}=1.8V$)



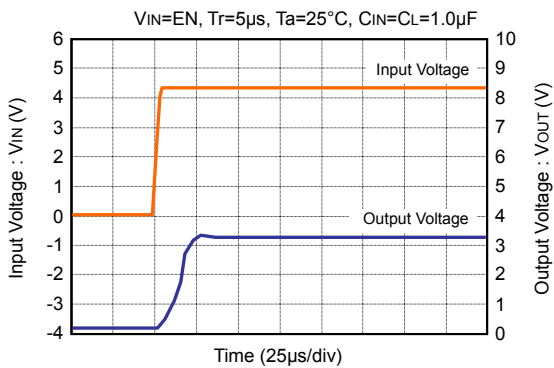
● VRR2801xxx ($V_{OUT}=2.8V$)



● VRR3001xxx ($V_{OUT}=3.0V$)

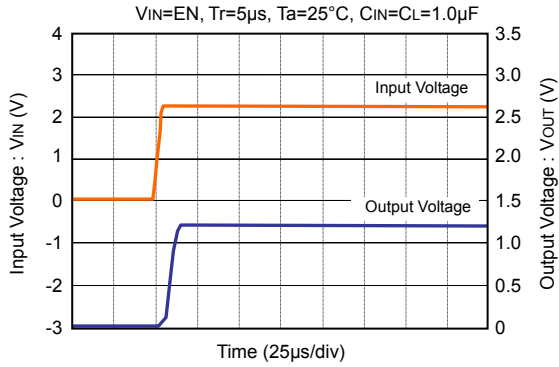


● VRR3301xxx ($V_{OUT}=3.3V$)

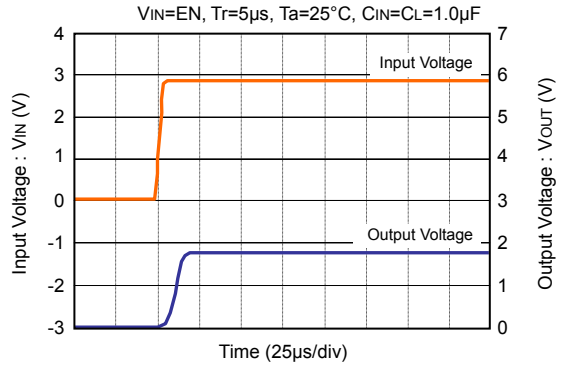


一般特征 – 输入上升时间 ($I_{OUT}=100mA$)

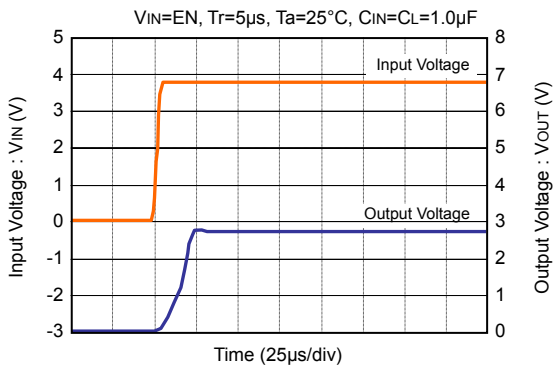
● VRR1202xxx ($V_{OUT}=1.2V$)



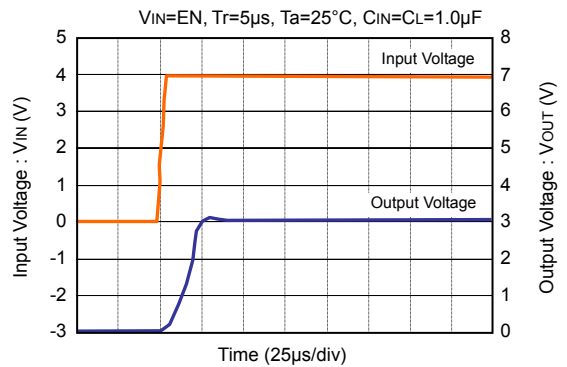
● VRR1802xxx ($V_{OUT}=1.8V$)



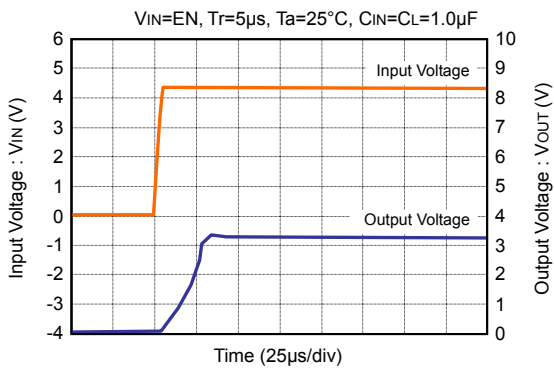
● VRR2801xxx ($V_{OUT}=2.8V$)



● VRR3001xxx ($V_{OUT}=3.0V$)

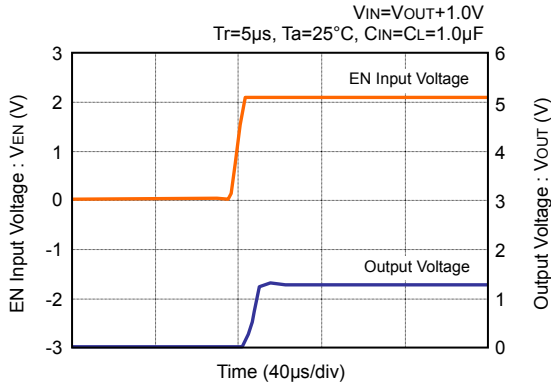


● VRR3301xxx ($V_{OUT}=3.3V$)

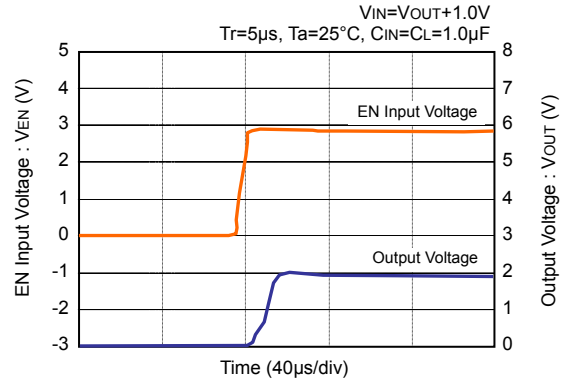


一般特征 – EN开关上升时间 ($I_{OUT}=1mA$)

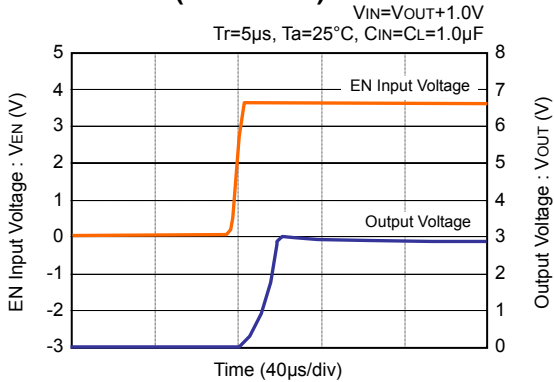
● VRR1202xxx ($V_{OUT}=1.2V$)



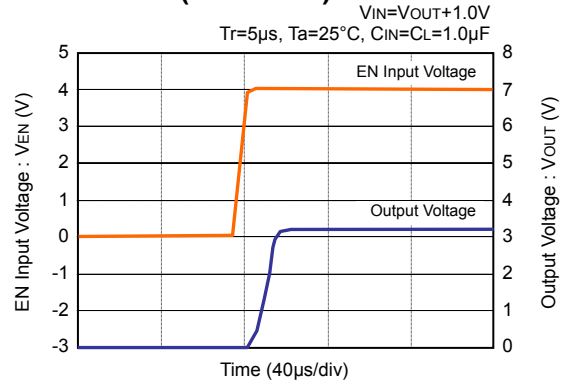
● VRR1802xxx ($V_{OUT}=1.8V$)



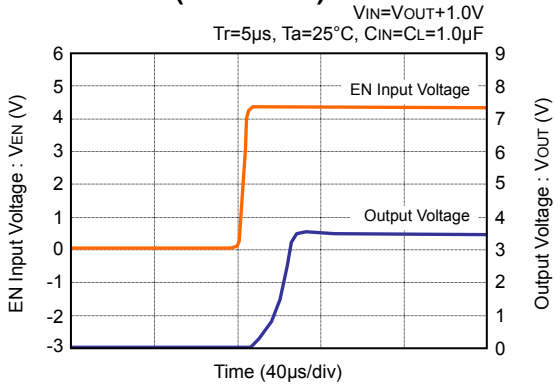
● VRR2801xxx ($V_{OUT}=2.8V$)



● VRR3001xxx ($V_{OUT}=3.0V$)

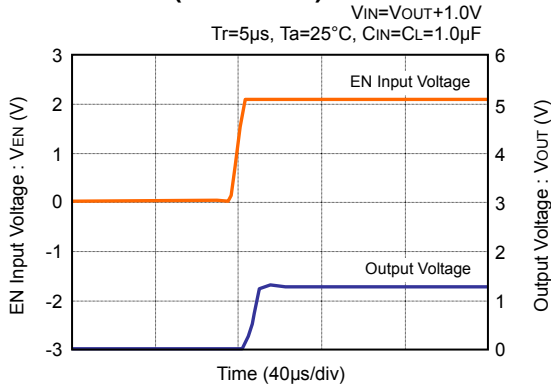


● VRR3301xxx ($V_{OUT}=3.3V$)

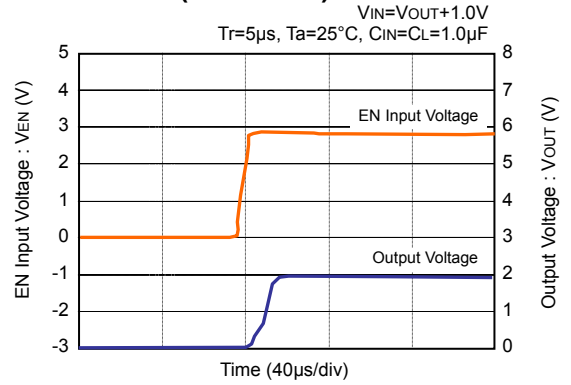


一般特征 – EN开关上升时间 ($I_{OUT}=30mA$)

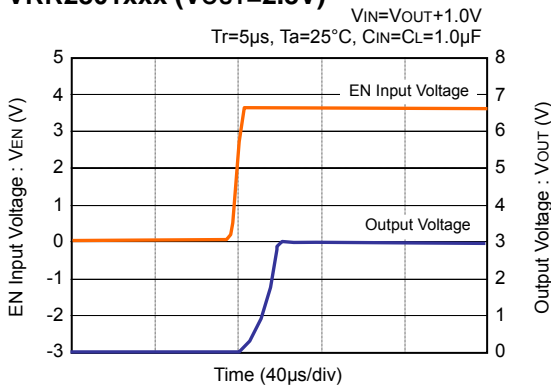
● VRR1202xxx ($V_{OUT}=1.2V$)



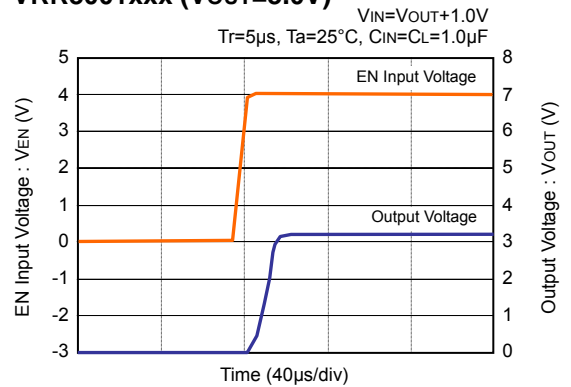
● VRR1802xxx ($V_{OUT}=1.8V$)



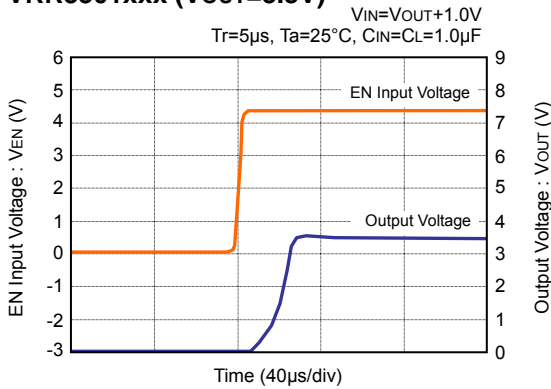
● VRR2801xxx ($V_{OUT}=2.8V$)



● VRR3001xxx ($V_{OUT}=3.0V$)

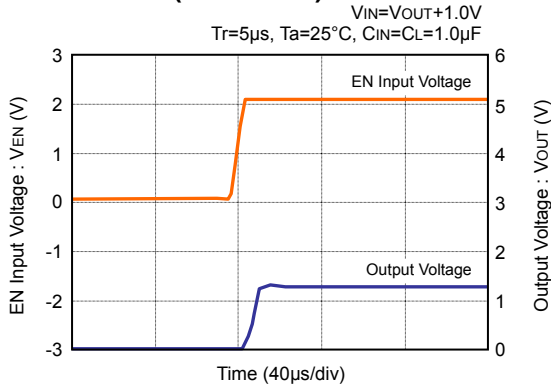


● VRR3301xxx ($V_{OUT}=3.3V$)

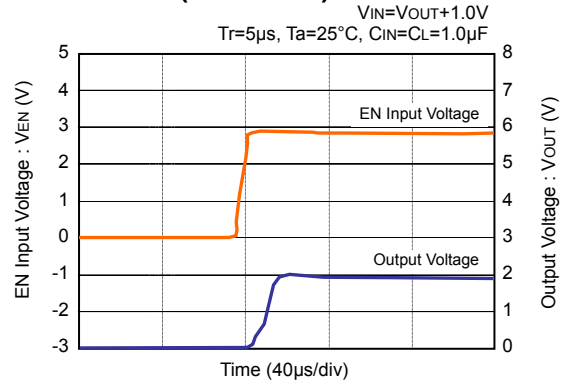


一般特征 – EN开关上升时间 ($I_{OUT}=100mA$)

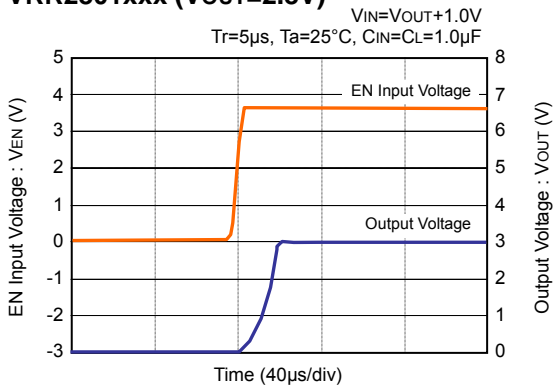
● VRR1202xxx ($V_{OUT}=1.2V$)



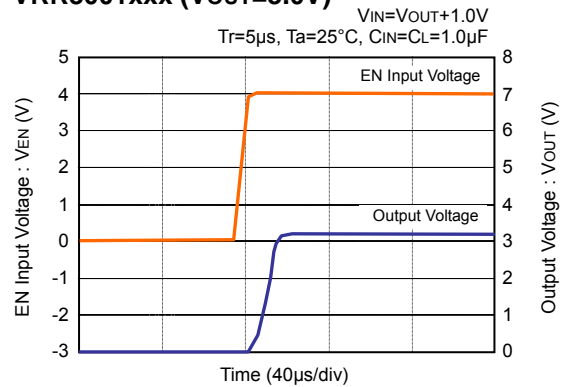
● VRR1802xxx ($V_{OUT}=1.8V$)



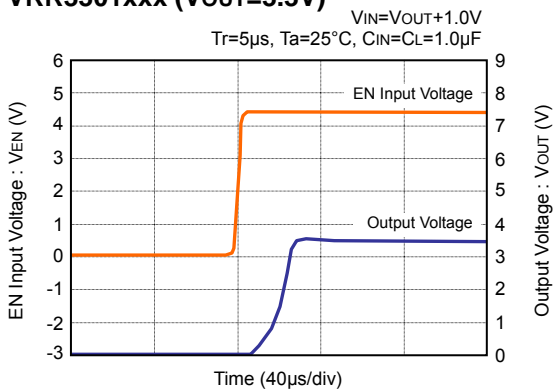
● VRR2801xxx ($V_{OUT}=2.8V$)



● VRR3001xxx ($V_{OUT}=3.0V$)

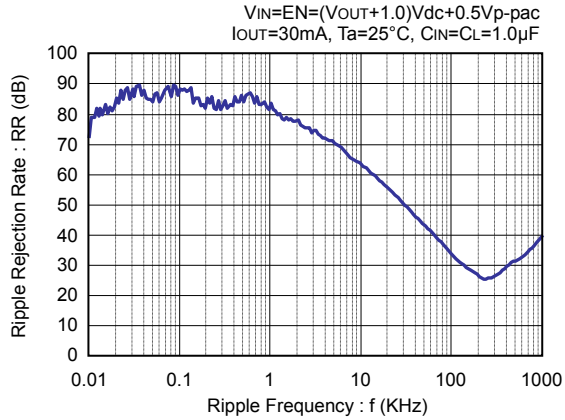


● VRR3301xxx ($V_{OUT}=3.3V$)

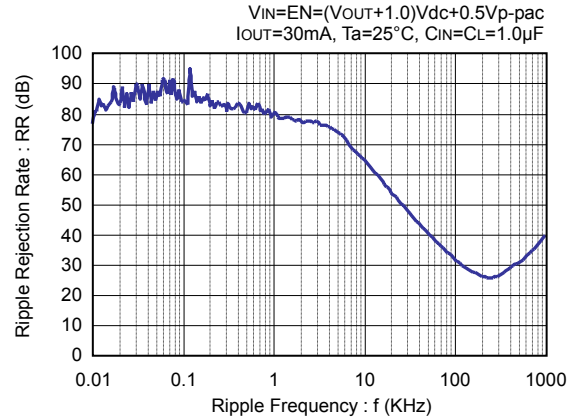


一般特征 – 输出噪音抑制比

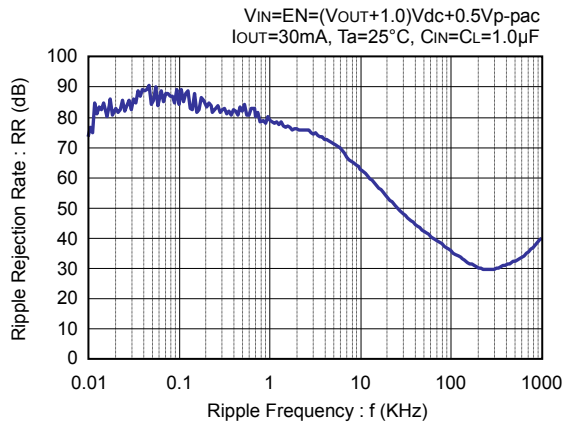
● VRR1202xxx (VOUT=1.2V)



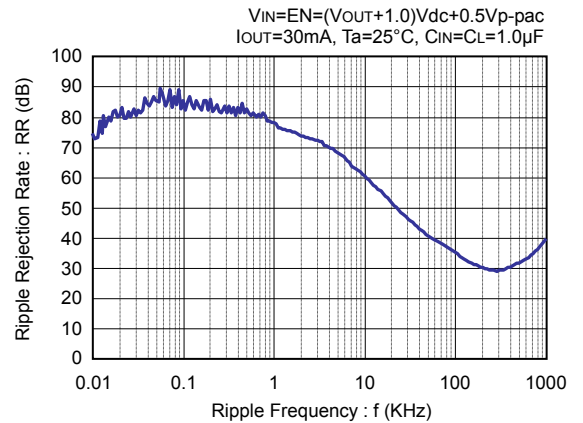
● VRR1802xxx (VOUT=1.8V)



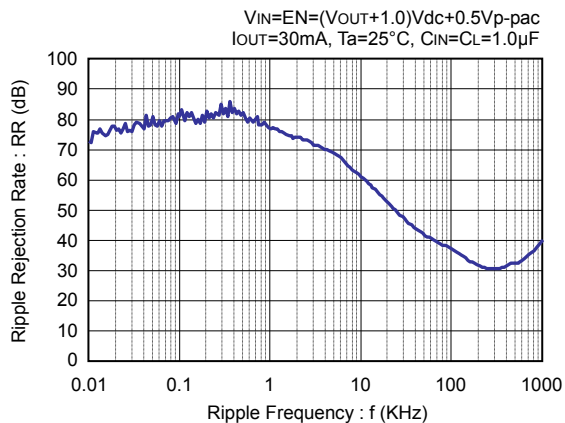
● VRR2801xxx (VOUT=2.8V)



● VRR3001xxx (VOUT=3.0V)

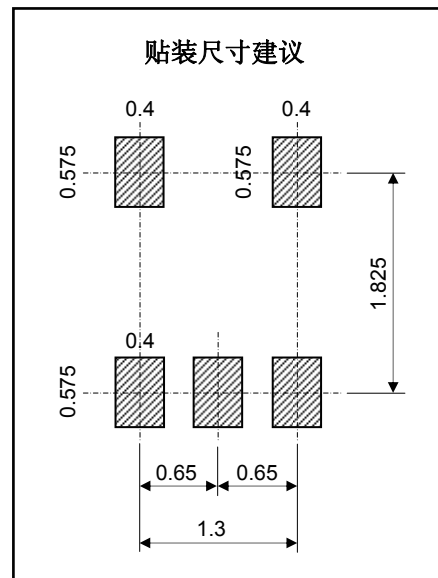
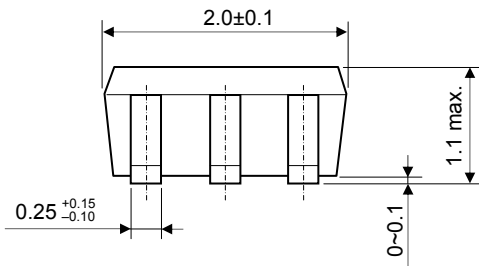
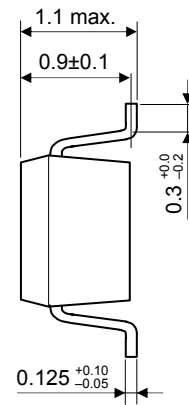
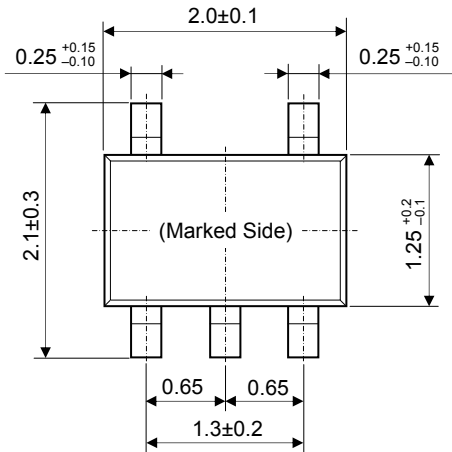


● VRR3301xxx (VOUT=3.3V)



IC封装尺寸 (SSOT-25 : R-类)

(单位 : mm)





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