

MSKSEMI 美森科

SEMICONDUCTOR



ESD



TVS



TSS



MOV



GDT



PLED

MSTPS562201DDCR

Product specification

概述

MSTPS562201DDCR是一款采用固定导通时间控制技术（COT）的同步降压转换器。

MSTPS562201DDCR的主控制环路采用 COT 模式控制，可使用低 ESR 的陶瓷电容，无需外部补偿组件便可实现快速瞬态响应，1.2V 输出情况下，0 到 2A 瞬态值仅 35mV。固定导通时间控制技术可在更高负载状态下的 PWM 模式与轻负载工作之间实现无缝转换，使 MSTPS562201DDCR能够在较轻负载状况下保持高效率。

MSTPS562201DDCR的工作输入电压范围为 4.5V 至 16V。输出电压可在 0.8 V 与 6 V 之间进行设置。此外，该芯片软启动时间可调。内部具有过温保护、欠压保护及逐周期限流等功能。

MSTPS562201DDCR采用 6 引脚 SOT23-6 封装，设计工作温度范围为 -40°C 到 85°C。

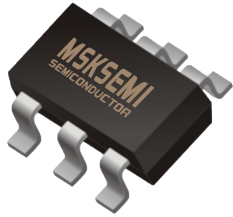
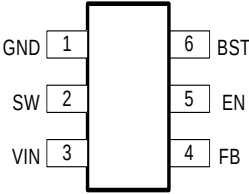
特性

- COT 工作模式
- 超快速瞬态响应
- 可使用低 ESR 陶瓷电容
- 低输出纹波
- 参考电压 0.8V
- 输出电压范围：0.8V 至 6 V
- 2A 电流输出
- 700KHz 伪固定频率（5V 输出）
- 轻载模式切换
- 4.5V-16V 输入电压
- 内部软启动
- 逐周期谷值限流
- 集成内部补偿
- 采用 SOT23-6 封装

应用场合

- 数字电视
- 家庭网络终端
- 数字机顶盒
- DSL 调制器

引脚描述和标记

SOT-23-6	引脚说明	管体标记
	TOP VIEW  6-LEAD PLASTIC SOT-23 T_{JMAX} = 150°C, θ_{JA} = 250°C/W, θ_{JC} = 130°C/W	

引脚定义

名称	顺序	描述
GND	1	地引脚。
SW	2	开关引脚。
VIN	3	电源输入引脚。
FB	4	通过外部电阻分压网络来设定输出电压的反馈连接端口。
EN	5	使能引脚，高电平时芯片开启，低电平时芯片进入关断模式。EN 引脚如果与 VIN 连接，需串联一个 100K Ω 以上的电阻。
BST	6	自举电容引脚。

订货信息

料号	封装	包装
MSTPS562201DDCR	SOT-23-6	3000PCS

绝对最大额定值

参数		最小值	最大值	单位
输入电压范围	VIN	-0.3	17	V
	VBST	-0.3	20	
	VBST (10 ns transient)	-0.3	21	
	VBST (vs SW)	-0.3	6	
	VEN, VFB	-0.3	6	
	SW	-2	17	
	SW (10 ns transient)	-3	18	
ESD	人体模式(HBM)		2	kV
	带器件模式(CDM)		500	V
结温, T _J		-40	150	°C
储存温度, T _{stg}		-55	150	

典型应用

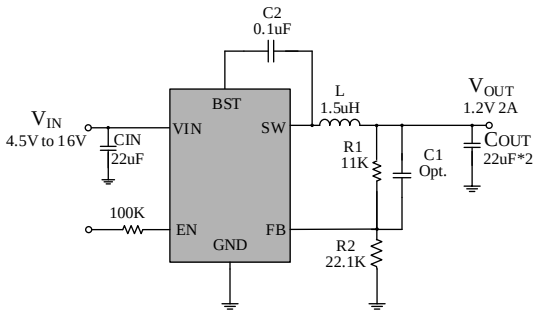
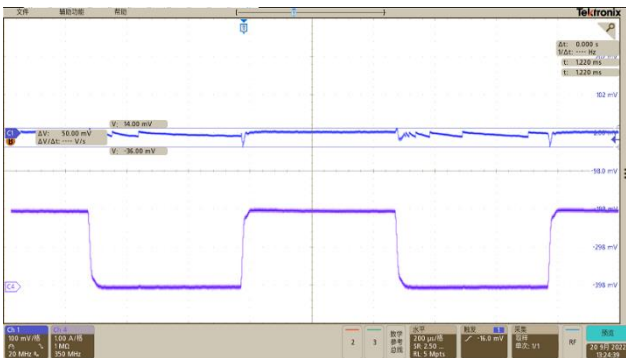


图 1. 典型应用电路



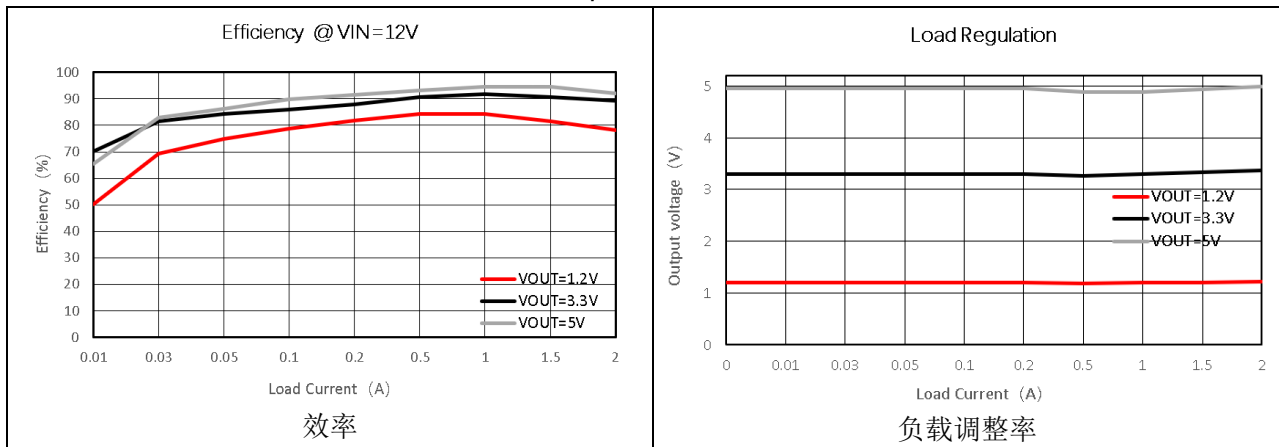
瞬态响应 @ V_{IN}=12V, V_{OUT}=1.2V,
I_{LOAD}=0A-2A

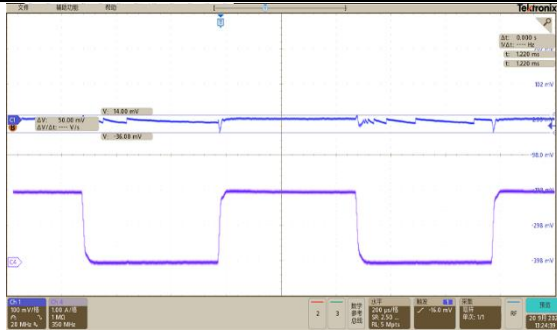
电气特性

(V_{IN} = 12V, 除特殊说明外, T_J=+25°C)

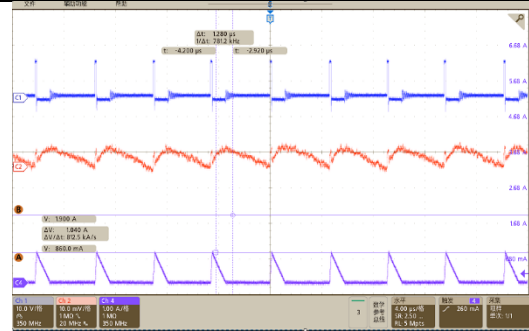
参数		测试条件	最小	典型	最大	单位
I _{VIN}	静态电流	V _{IN} 电流, T _A = 25°C, EN = 5 V, V _{FB} = 0.9 V		350	600	uA
I _{VINSDN}	关断电流	V _{IN} 电流, T _A = 25°C, EN = 0 V		3.6	10	uA
V _{EN}	EN 高电平	EN	1.6			V
	EN 低电平	EN			0.6	V
V _{FB}	V _{FB} 电压	T _A = 25°C, I _{out} =0mA, 断续模式		807		mV
		T _A = 25°C, 连续模式	784	800	816	mV
I _{VFB}	V _{FB} 漏电流	V _{FB} =0.9V, T _A =25°C		0	±0.15	uA
R _{DS(on)}	高侧开关	25°C, V _{BST} -SW=5.5V		100		mΩ
	低侧开关	25°C		50		mΩ
T _{soft}	软启动时间			1.0		mS
I _{ocl}	谷值电流限制	L=1.5uH		2.5		A
t _{ON}	导通时间	V _{IN} = 12 V, V _O = 1.2 V		120		nS
t _{OFF(MIN)}	最小关断时间	T _A = 25°C, V _{FB} = 0.7 V		260	330	
T _{SDN}	热关断阈值	热关断点		165		°C
		迟滞		25		
UVLO	欠压保护阈值	上升开启电压		4.15		V
		迟滞电压		0.1		

典型工作特征

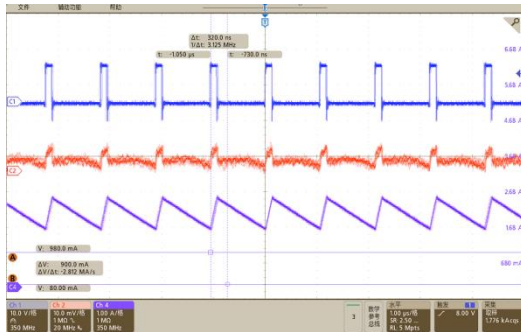
除特别说明外, V_{IN} = 12V, V_{OUT} = 1.2V, L = 1.5μH, T_A = +25°C。



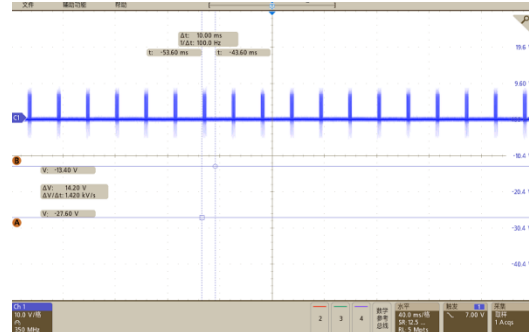
瞬态响应 $I_{LOAD}=0A-2A$



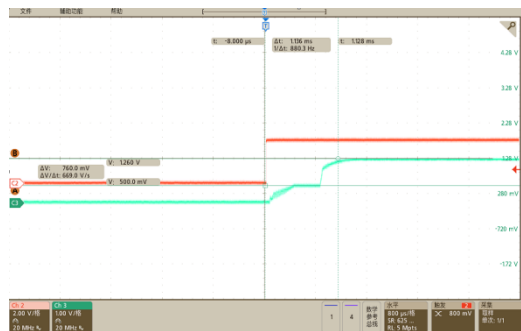
工作波形@ $I_{LOAD}=0.1A$



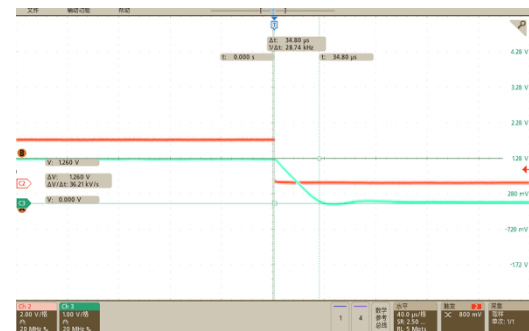
工作波形@ $I_{LOAD}=2A$



短路波形



启动波形@ $I_{LOAD}=2A$



关断波形@ $I_{LOAD}=2A$

内部框图

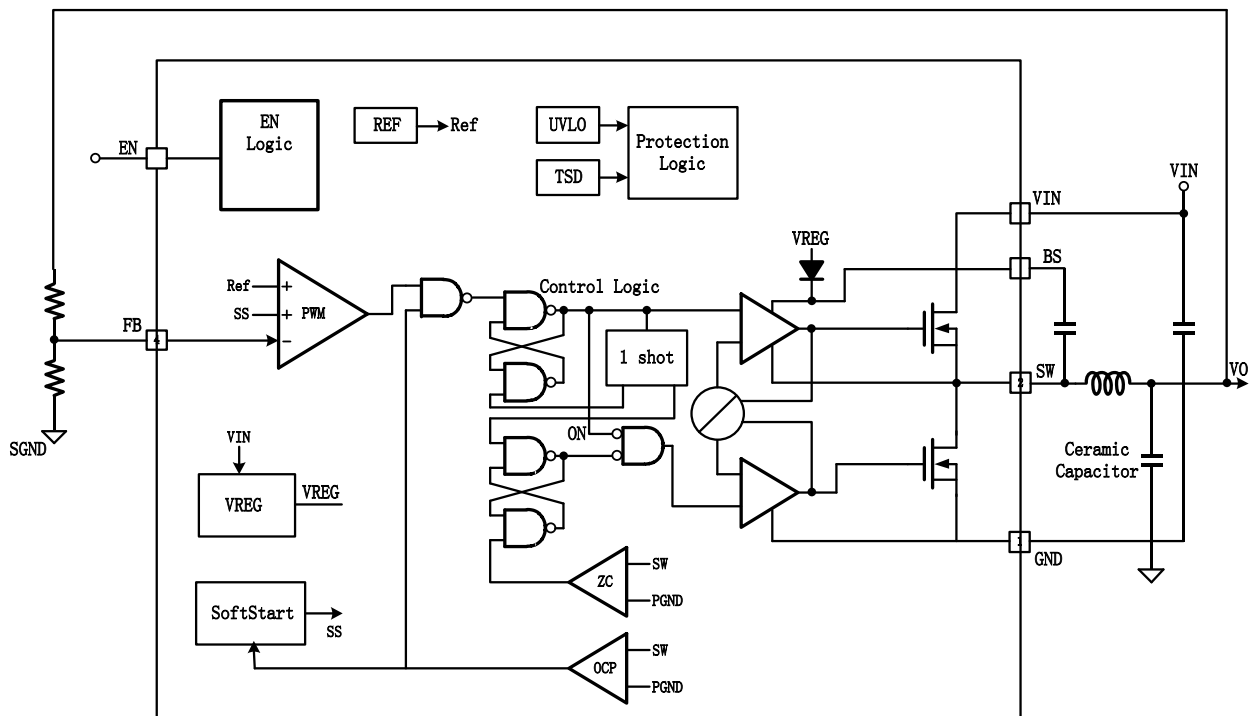


图 2. MSTPS562201DDCR 内部框图

功能描述

MSTPS562201DDCR 是一种 COT 模式的 2A 同步降压转换器，内部集成了两个 N 型 MOSFET，COT 控制模式具有极优秀的瞬态响应能力，同时芯片不需要额外的外部补偿器件。专用的内部电路设计允许外围使用低 ESR 的陶瓷电容。芯片采用伪恒定频率控制，工作在近似 700KHz 的工作频率。

EN 控制

EN 引脚是一个数字控制引脚，高电平时芯片启动，低电平时芯片进入关断模式。EN 是一个低压引脚，内部用一个 Zener 进行钳位，如果需要 EN 脚与 VIN 连接，需串联一个 100K 以上的电阻。

过流保护及短路保护

MSTPS562201DDCR 具有过流保护和短路保护功能，采用谷值电流限制的控制方式。在下管 LS MOSFET 打开的情况下，监控电感电流，当电感电流达到谷值设定值时，器件进入过电流保护模式。同时，输出电压下降，当 V_{FB} 电压低于参考值的 75% 时，芯片进行短路保护状态，即进入打嗝模式，芯片将禁用输出功率级，软启动重启。

输出电压设定

输出电压可利用如下公式 2 进行设定，可参考表 1，为保证输出精度，电阻精度需选用 1%。

$$V_{OUT} = 0.8 \times \left(1 + \frac{R1}{R2}\right) \quad (2)$$

外围器件建议值

MSTPS562201DDCR的输出电路是一个 LC 滤波器。该 COT 控制模式在 LC 处具有双极点：

$$F_P = \frac{1}{2\pi\sqrt{L_{out}*C_{out}}} \quad (3)$$

在双极点处，增益以-40dB 的速率下降，相位极速下降。为了保证环路的稳定性，提供足够的相位裕度。建议使用表 1 中的数值：

表1. 外围器件建议值

V _{OUT} (V)	R1 (kΩ)	R2 (kΩ)	C1(pF)	L1 (μH)	C8 + C9 (μF)
1	5.5	22.1		1.0 - 1.5	22 - 68
1.05	6.9	22.1		1.0 - 1.5	22 - 68
1.2	11	22.1		1.0 - 1.5	22 - 68
1.5	19.3	22.1		1.5	22 - 68
1.8	27.6	22.1	22 (Opt.)	1.5	22 - 68
2.5	46.9	22.1	22 (Opt.)	2.2	22 - 68
3.3	69	22.1	22 (Opt.)	2.2	22 - 68
5	116	22.1	22 (Opt.)	3.3	22 - 68

自举电容选择

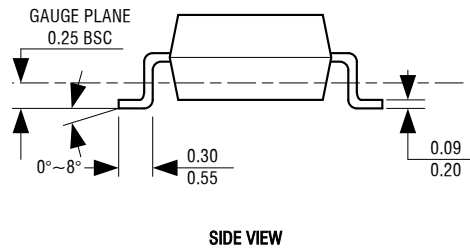
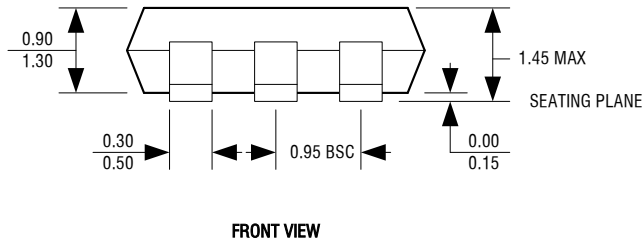
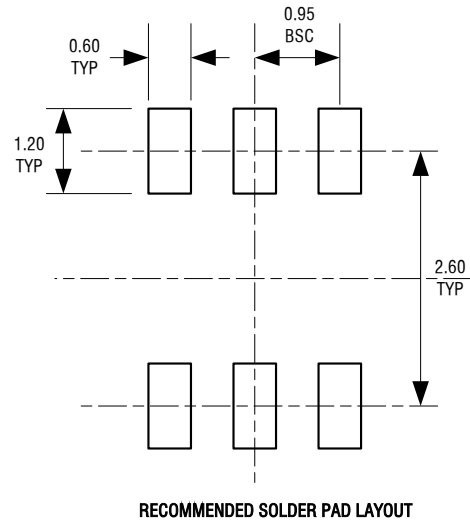
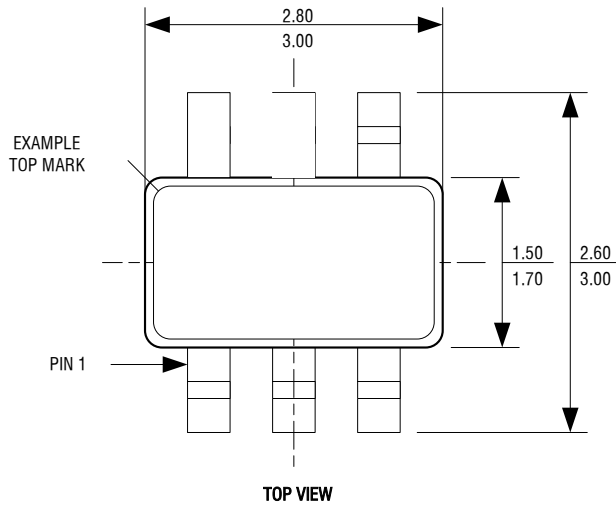
VBST 至 SW 引脚之间必须连接一个 0.1μF 陶瓷电容器，以便正常工作。

PCB 布局

1. 输入输出电容地必须靠近 IC 的 GND 引脚以减小电流环路面积。
2. 大的交流电流会流过 VIN, SW 和 VOUT 走线，所以要保证这些走线短且宽。
3. SW 脚处铜皮，因其上有交变电压，为预防 EMI，需要控制在一个比较小的面积。
4. FB 引脚是一个高阻抗节点，应当使 FB 走线足够短以避免拾取噪声导致输出电压波动，将反馈电阻尽可能靠近 IC 放置，同时 R2 的 GND 应尽量靠近 IC 的 GND 引脚放置，VOUT 到 R1 的布线应该远离电感和开关节点。

封装信息

SOT23-6



- NOTE:
- 1.DIMENSIONS ARE IN MILLIMETERS.
 - 2.DRAWING NOT TO SCALE.
 - 3.DIMENSIONS ARE INCLUSIVE OF PLATING.
 - 4.DIMENSIONS ARE EXCLUSIVE OF MOLD FLASH AND METAL BURR.

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