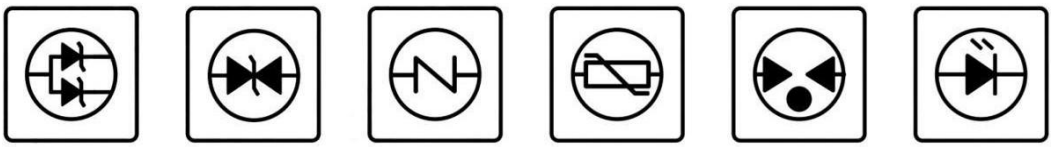
MSKSEMI 美森科
SEMICONDUCTOR



MCP1700T-XX02E/TT(MS)

Product specification

产品描述

MCP1700T-XX02E/TT(MS) 系列是一组低压差（LDO）转换器，具有 1.2V 至 5.5V 宽电压输入范围、低压差、低功耗和小型化封装的等特性。

MCP1700T-XX02E/TT(MS) 低至 2uA 低静态电流特性，特别适合用于电池供电、长时间待机系统设备应用，能帮助降低系统设备的 待机功耗，有效延长待机时间和电池使用寿命。

MCP1700T-XX02E/TT(MS) 有带 EN 使能引脚的版本可选，将 EN 脚拉低可进入关断模式，此关断模式下静态电流可降至仅 100nA （典型值）。MCP1700T-XX02E/TT(MS) 系列支持输出电容采用陶瓷电容器 ，在 1.2V 至 5.5V 的宽输入电压范围内和整个输出负载电流 0mA-300mA 范围内稳定工作。

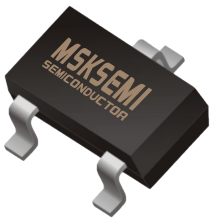
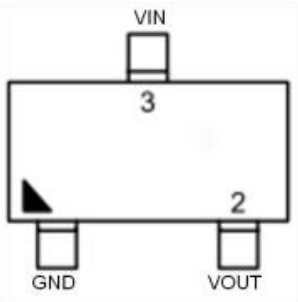
产品特性

- 2uA 静态电流（无负载）
- ±2%输出电压精度
- 300mA 输出电流能力
- 100nA 关断电流(可选版本)
- 宽范围输入电压：1.2V 至 5.5V
- 低压差：0.18V（Vo=3.3V/Io=300mA 条件下）
- 支持固定输出电压：1.2V，1.5V，1.8V，2.5V，2.8V，3.0V，3.3V
- 支持陶瓷电容或者钽电容
- 限流保护
- 过温保护

产品应用

- 手持式、电池供电设备
- 低功耗微处理器
- 笔记本电脑、掌上型电脑和 PDA
- 无线通讯设备
- 音频/视频设备
- 车载导航系统

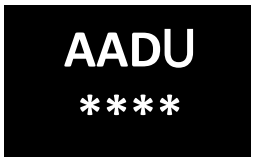
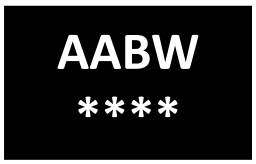
封装脚位图

SOT-23	Pin Configurations
	

引脚功能描述

脚位号	名称	功能描述
1	GND	接地
2	VOUT	电压输出端口
3	VIN	电源输入端口

产品信息

MCP1700T-1202E/TT(MS)	MCP1700T-1502E/TT(MS)
	
MCP1700T-1802E/TT(MS)	**MCP1700T-2502E/TT(MS)**
	
MCP1700T-2802E/TT(MS)	**MCP1700T-3002E/TT(MS)**
	
MCP1700T-3302E/TT(MS)	
	

订单型号	封装形式	包装/数量
MCP1700T-1202E/TT(MS)	SOT-23	盘装/3000pcs
MCP1700T-1502E/TT(MS)	SOT-23	盘装/3000pcs
MCP1700T-1802E/TT(MS)	SOT-23	盘装/3000pcs
MCP1700T-2502E/TT(MS)	SOT-23	盘装/3000pcs
MCP1700T-2802E/TT(MS)	SOT-23	盘装/3000pcs
MCP1700T-3002E/TT(MS)	SOT-23	盘装/3000pcs
MCP1700T-3302E/TT(MS)	SOT-23	盘装/3000pcs

典型应用电路

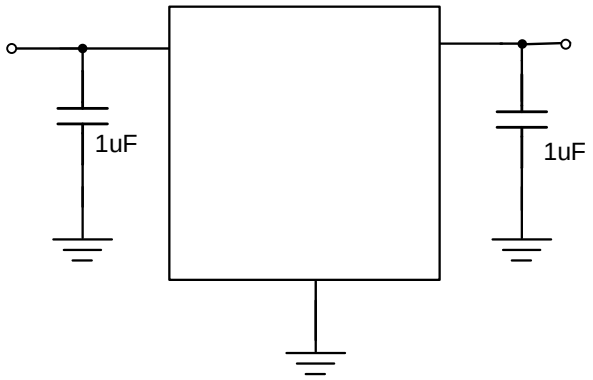


图 1: 固定输出应用电路

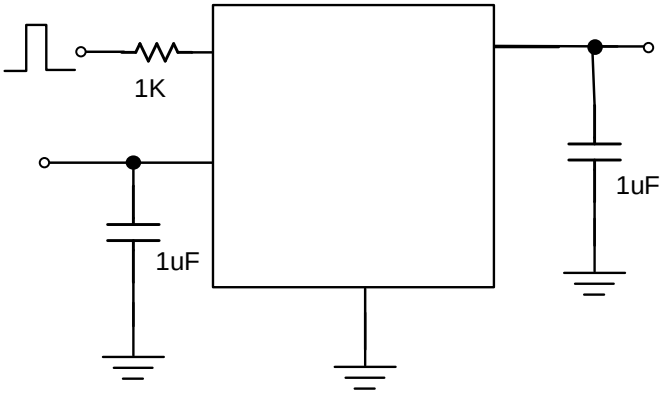


图 2: 带使能脚的固定输出应用电路

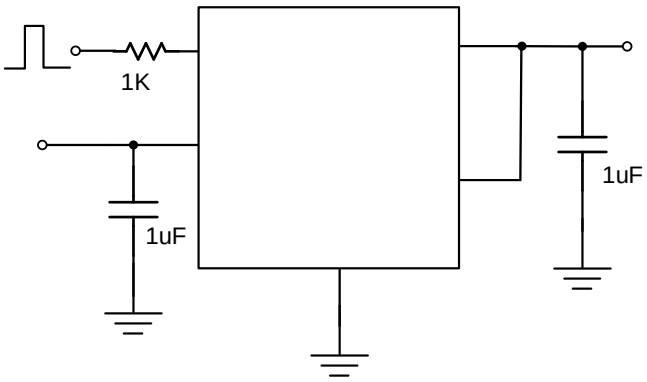


图 3: 固定输出带使能功能和输出电压检测功能之应用电路

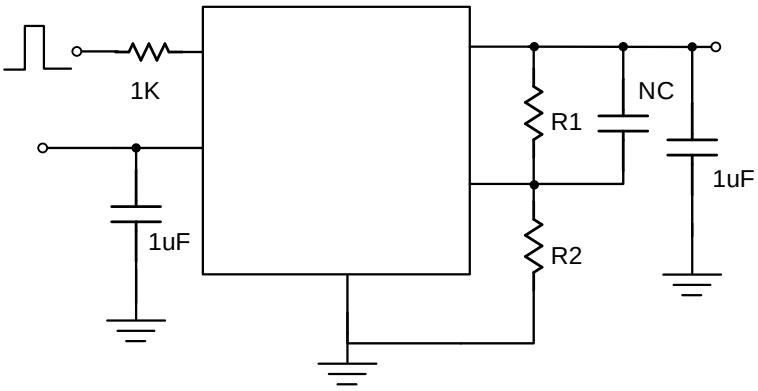
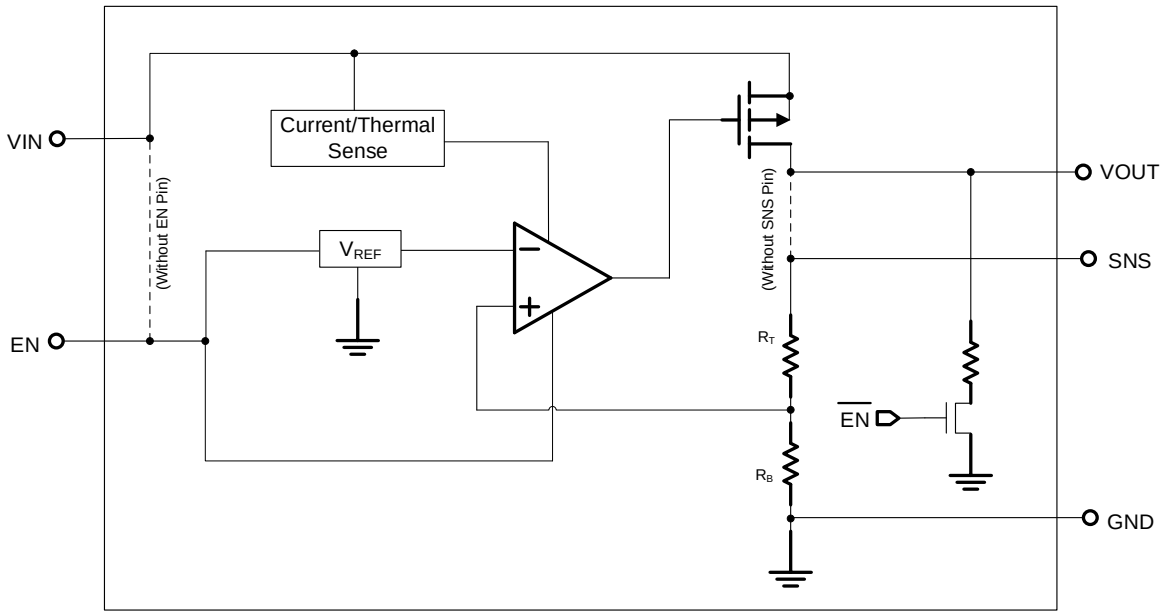


图 4: 带使能脚和输出电压检测可调电压输出应用电路

产品功能框图



最大耐压值 (Note 1)

VIN 至 GND ---------- -0.3V to 7V
VOUT, EN 至 GND ---------- -0.3V to 6V
VOUT 至 VIN ---------- -6V to 0.3V
封装热阻 (Note 2)
θ_{JA} ---------- 250 °C /W
引脚焊锡温度 (Soldering, 10 sec.) ---------- 260 °C
结点温度 ---------- 150 °C
存储温度范围 ---------- -60 °C to 150 °C
ESD 静电
HBM ---------- 2KV
MM ---------- 200V
CDM ---------- 2KV

建议应用条件

输入电压 VIN ---------- 1.2V to 5.5V
应用结温范围 ---------- -40 °C to 125 °C
应用环温范围 ---------- -40 °C to 85 °C

电气特性

(V_{IN} =5V, V_{EN} = 5V T_A=25°C 除另有说明外)

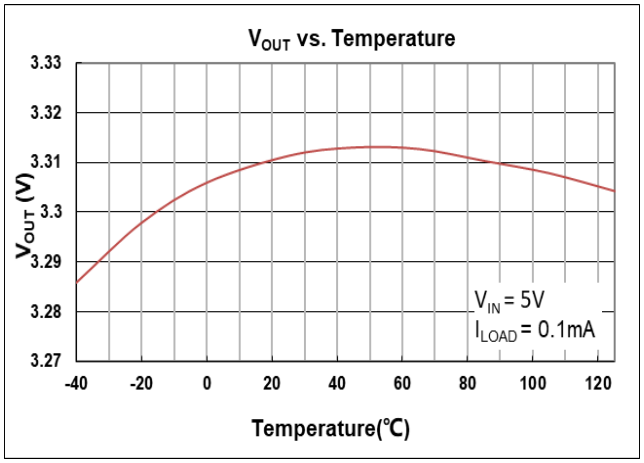
参数	符号	测试条件		最小值	典型值	最大值	单位
输入电压	V_{IN}			1.2	--	5.5	V
输出电压精准度		I_{LOAD} =0.1mA		-2		2	%
SNS 输入电流	I_{SNS}	SNS = V_{OUT}			0.5		μA
Dropout 电压 (I_{LOAD} =300mA) (Note 3)	V_{DROP_3V}	V_{OUT} ≥ 3V			0.18		V
	$V_{DROP\_2.8V}$	V_{OUT} = 2.8V			0.23		
	$V_{DROP\_2.5V}$	V_{OUT} = 2.5V			0.23		
	$V_{DROP\_1.8V}$	V_{OUT} = 1.8V			0.28		
	$V_{DROP\_1.5V}$	V_{OUT} = 1.5V			0.36		
	$V_{DROP\_1.2V}$	V_{OUT} = 1.2V			0.45		
静态电流	I_Q	I_{LOAD} = 0mA			2		μA
关闭电流	I_{SD}	V_{EN} = 0V, V_{OUT} = 0V			0.1	0.5	μA
使能电压阈值	V_{IH}	EN Rising		1.0			V
	V_{IL}	EN Falling				0.4	
EN 输入电流	I_{EN}	V_{EN} = 5V			10	100	nA
输入电压调整率	ΔLINE	I_{LOAD} =30mA, 1.5V ≤ V_{IN} ≤ 5.5V or (V_{OUT} + 0.2V) ≤ V_{IN} ≤ 5.5V			0.2		%
负载电压调整率	ΔLOAD	10mA ≤ I_{LOAD} ≤ 0.3A			0.2		%
输出电流限流值	I_{LIM}	V_{OUT} = 0V		301	600		mA
电源抑制比 (I_{LOAD} =5mA)	PSRR	V_{OUT} =1.2V, V_{IN} = 2V	f = 100Hz	--	80	--	dB
			f = 1kHz	--	75	--	
输出电流噪声 (BW = 10Hz to 100kHz, C_{OUT} =1μF,)		V_{IN} = 3.5V I_{LOAD} =0.1A	V_{OUT} =1.2V	--	80	--	μV_{RMS}
			V_{OUT} =2.8V	--	120	--	
过温度关断温度	T_{SD}	I_{LOAD} =10mA		--	155	--	°C
过温度关断迟滞	ΔT_{SD}			--	15	--	°C
放电电阻	R_{DC}	EN = 0V , V_{OUT} = 0.1V		--	30	--	Ω

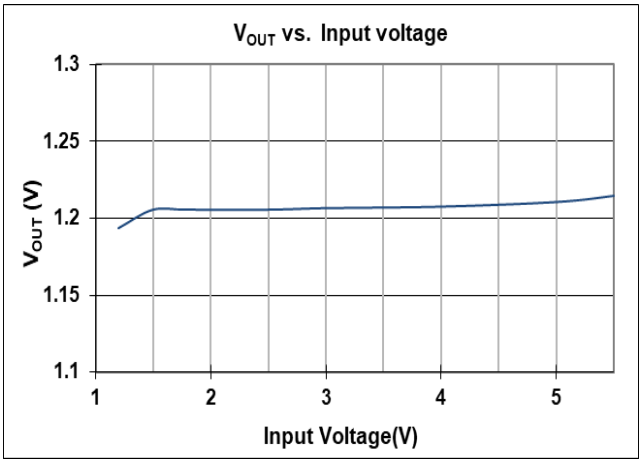
Note 1. 任何超过"最大耐压值"的应用可能会导致芯片遭受永久性损坏。这些是额定最大耐压值，仅表示在这个范围内芯片不会损伤，但不保证所有性指标都正常，在任何超过"最大耐压值"的场合使用，都可能导致芯片永久性损坏。在接近或等于最大耐压值情况下使用，可能会影响产品可靠性。

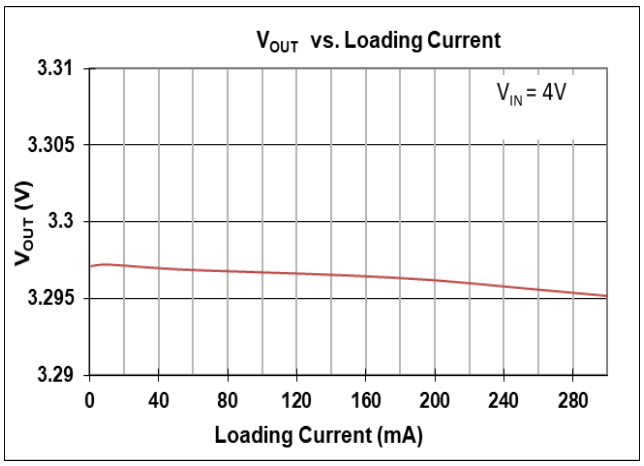
Note 2. θ_{JA} 测量条件： T_A = 25°C，使用 EVB 板。

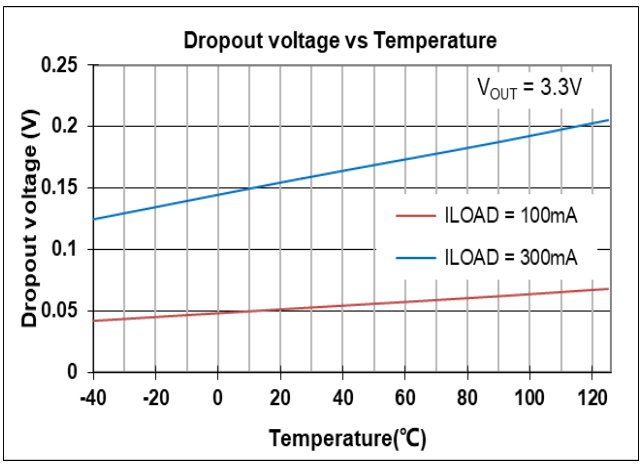
Note 3. V_{DROP} = V_{IN} − V_{OUT} （V_{OUT} 达到 98%标准值）。

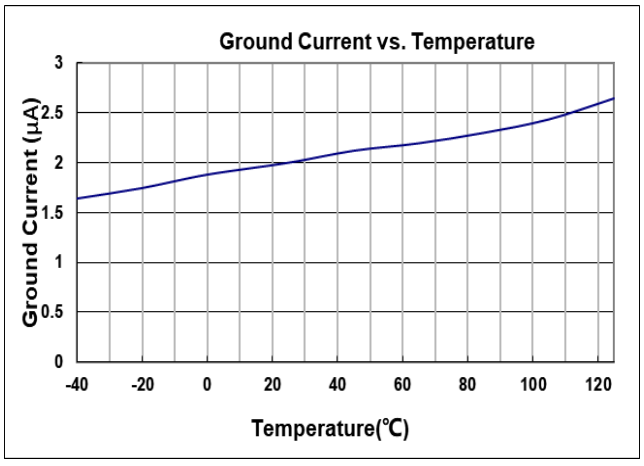
典型电气特性

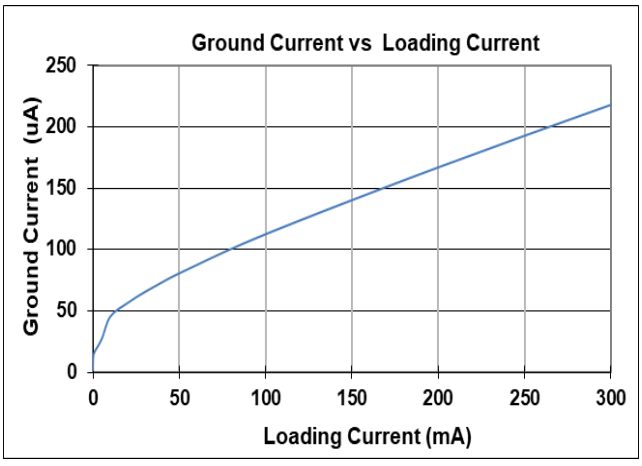


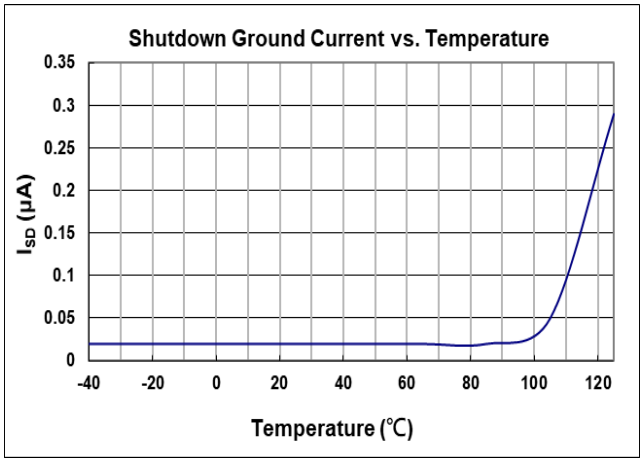


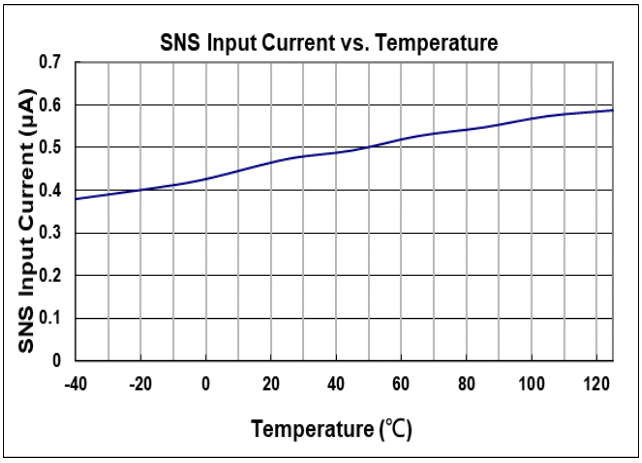


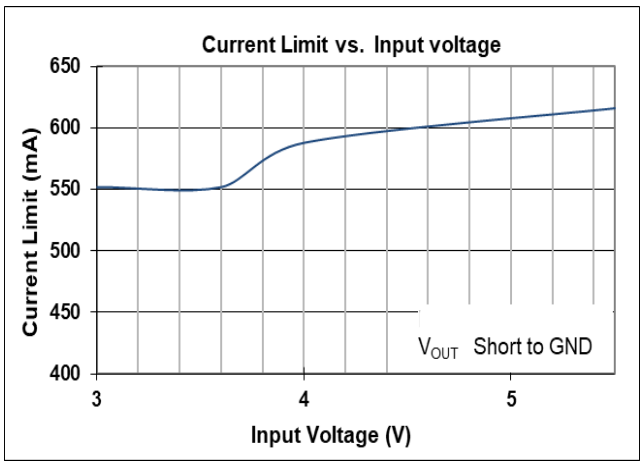




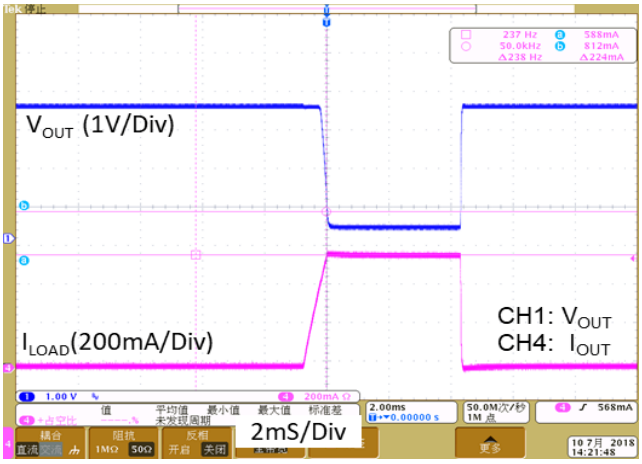




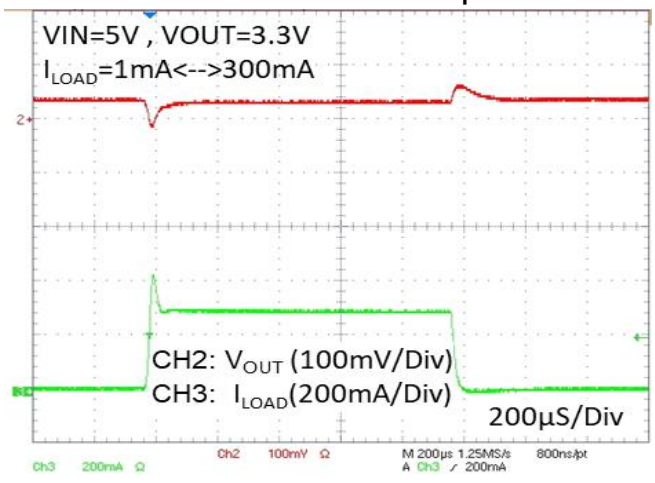




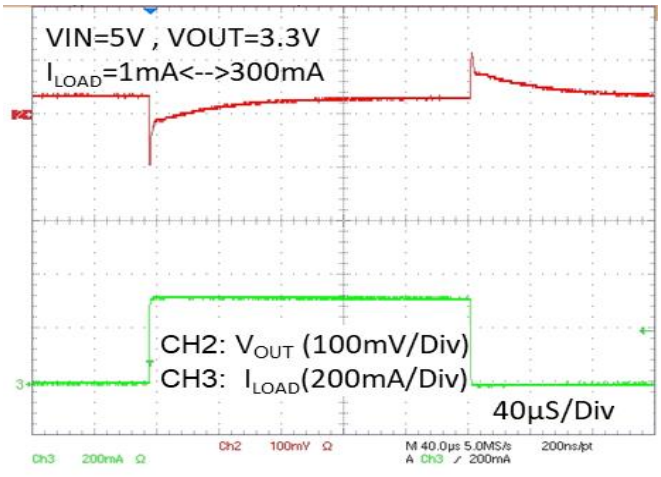
Current Limit Response



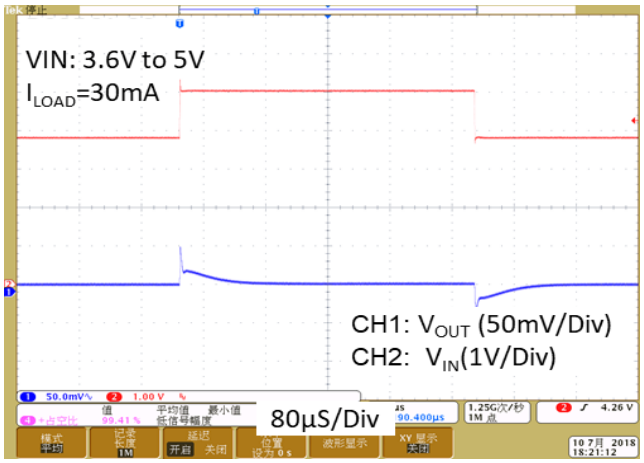
Load Transient Response I



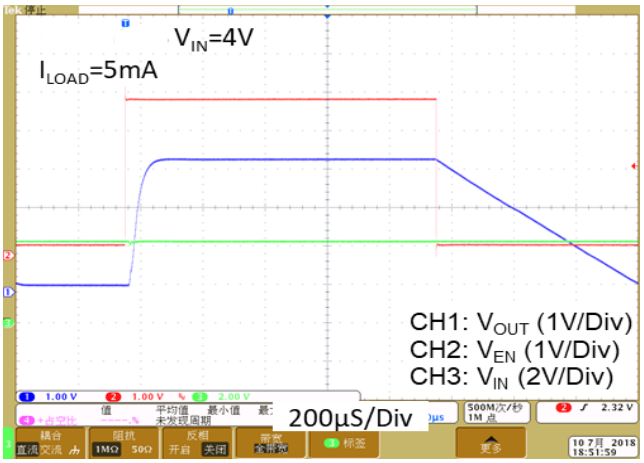
Load Transient Response II



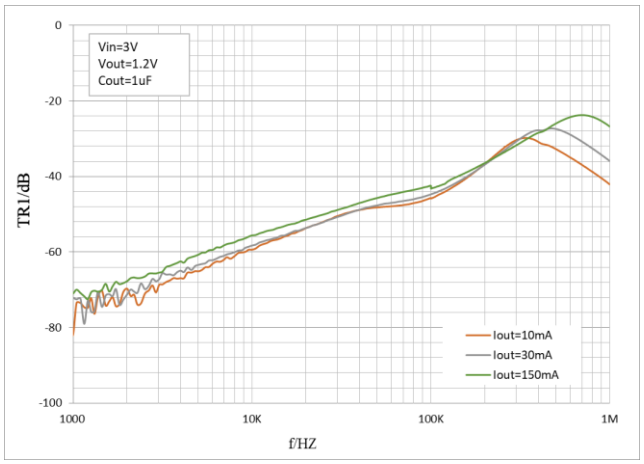
Line Transient Response



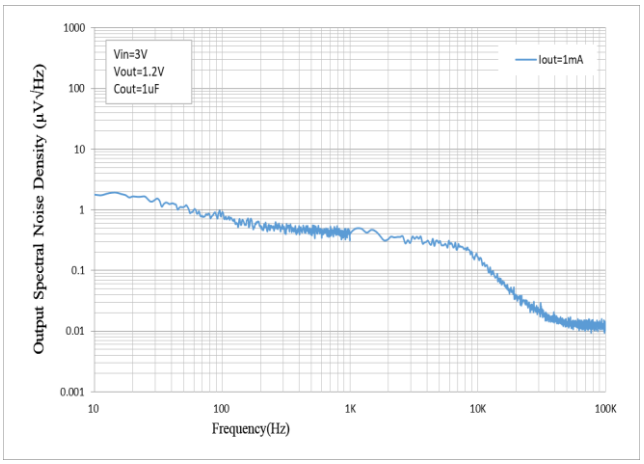
V_{OUT} Turn On/Off by EN



PSRR vs. Frequency



Noise Density Spectrum



应用指导

输入和输出电容

MCP1700T-XX02E/TT(MS) 系列产品应用，需要选择合适的输入电容和输出电容，以确保产品应用获得稳定可靠的性能。使用 1uF 或者更大容值的输入电容，并将其靠近 IC 的VIN 和 GND pin 脚摆放。输出电容可选用 1mΩ以上 ESR （等效串联阻抗），有效容值 1uF 至 22uF 的电容。并将输出电容靠近IC 的 V_{OUT} 和 GND 脚摆放。增加输出电容的容值和降低ESR 能够提升电路的 PSRR 和瞬态响应能力。

Dropout 电压

MCP1700T-XX02E/TT(MS) 系列采用 PMOS 传输晶体管来实现低压差。当(V_{IN} – V_{OUT}) 小于 (V_{DROP})时，PMOS 晶体管处于线性工作区域，输入至输出阻抗即为 PMOS 的$R_{DS(ON)}$，在此状态下，PMOS 等效于一颗电阻，V_{DROP} 和输出电流近似成比例。和其他线性电压转换器一样，TLV702XXDBVR(MS) 系列的PSRR和瞬态响应能力会随着(V_{IN} – V_{OUT})压差接近V_{DROP} 而下降。

电流限制功能

MCP1700T-XX02E/TT(MS) 系列产品内部的电流限制器可持续监控及控制输出功率晶体管，将输出电流限制至600mA (典型值)。限流功能确保输出可以短路至地，器件不会损坏。

OTP (过温度保护)

当产品的结点温度超过 155°C （典型值）时,MCP1700T-XX02E/TT(MS) 会关闭 P-MOS 关闭输出。当结点温度往回降大约 15°C 时，TLV702XXDBVR(MS) 会重新自动重启工作。

热散功率

持续工作时，IC 的结点温度不应超过其额定值。最大的热散功率取决于 IC 封装的热阻、PCB 布图、周围气流速率以及结点和环境温度的差异。最大热散功率计算如下:

环温 T_A=25°C，使用 MSKSEMI PCB,

PD (Max) = (125°C − 25°C) / (200°C/W) = 0.5W

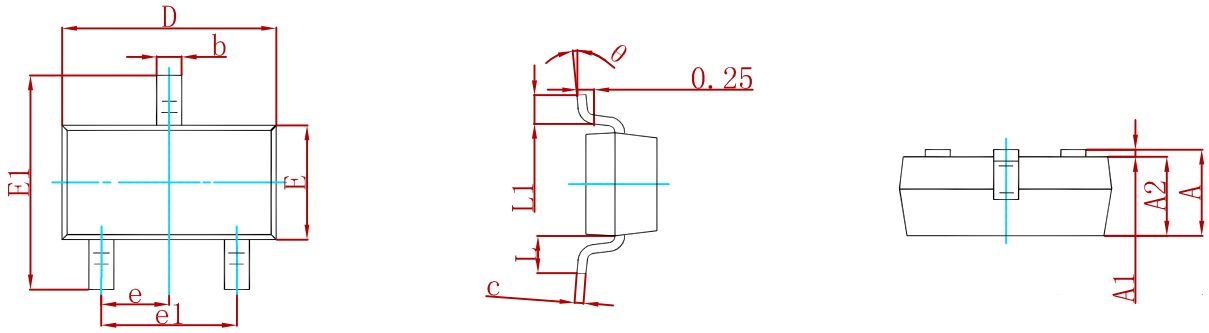
热散功率(PD)等于输出电流和 LDO 上的压降的乘积，计算公式如下:

PD = (VIN – VOUT) × IOUT

Layout 注意事项

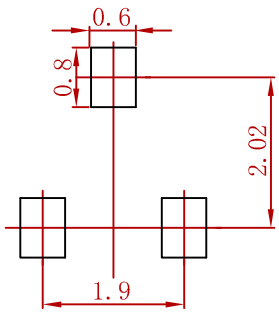
将输入电容、输出电容和 LDO 放置在 PCB 的同一面，并尽量将电容器靠近 IC 的输入输出脚摆放，可实现电路最佳性能。输入电容和输出电容的接地连接必须拉回到 MCP1700T-XX02E/TT(MS) 的接地引脚，并使用短而粗的铺线连接。避免使用长走线、窄走线、或者通过过孔走线，这些会增加寄生电感和电阻，导致电路性能变差，特别是在瞬态工作条件下。

PACKAGE MECHANICAL DATA



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP		0.037 TYP	
e1	1.800	2.000	0.071	0.079
L	0.550 REF		0.022 REF	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	8°

Suggested Pad Layout



Note:
1.Controlling dimension:in millimeters.
2.General tolerance:± 0.05mm.
3.The pad layout is for reference purposes only.

Attention

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