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RT9078N-08GJ5-MS

产品手册

产品描述

RT9078N-08GJ5-MS 系列是一组低压差（LDO）转换器，具有 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。

RT9078N-08GJ5-MS 低至 40uA 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。

RT9078N-08GJ5-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低至 1uA（典型值）。RT9078N-08GJ5-MS 系列支持输出电容采用陶瓷电容器，在 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。

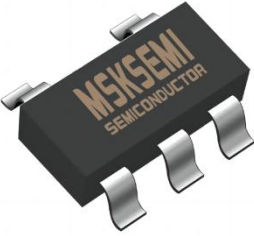
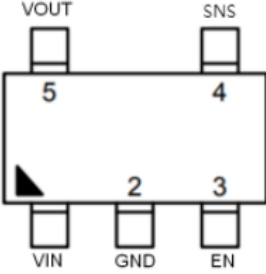

产品特性

- 40uA 静态电流（无负载）
- $\pm 2\%$ 输出电压精度
- 300mA 输出电流能力
- 1uA 关断电流（可选版本）
- 宽范围输入电压：2V 至 5.5V
- 低压差：0.18V（ $V_o=3.3V/I_o=300mA$ 条件下）
- 支持可调输出电压：0.8V至4.6V
- 支持陶瓷电容或者钽电容
- 限流保护
- 过温保护

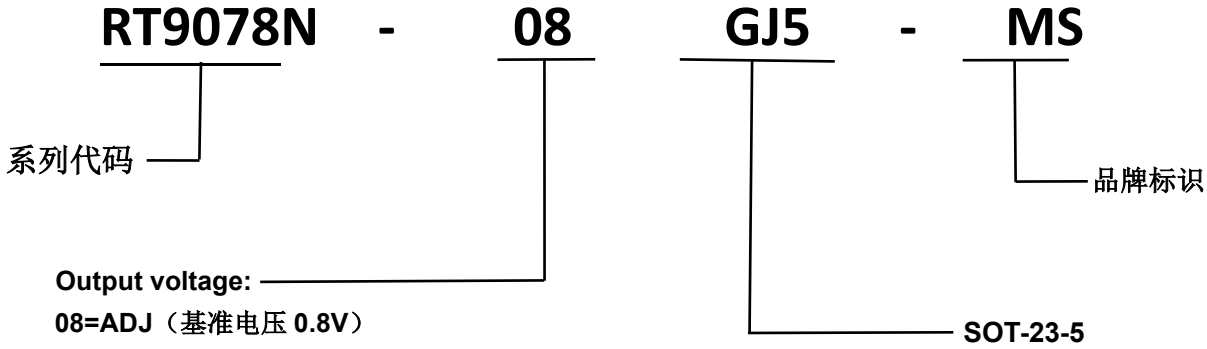
产品应用

- 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

Reference News&Marking

SOT-23-5	Pin Configurations	Marking
		

Part Number Code



引脚功能描述

脚位号	名称	功能描述
1	VIN	电源输入端口
2	GND	接地
3	EN	使能控制
4	SNC	输出电压感测
5	VOUT	电压输出端口

订购信息

订单型号	封装形式	包装/数量
RT9078N-08GJ5-MS	SOT-23-5	盘装/3000pcs

典型应用电路

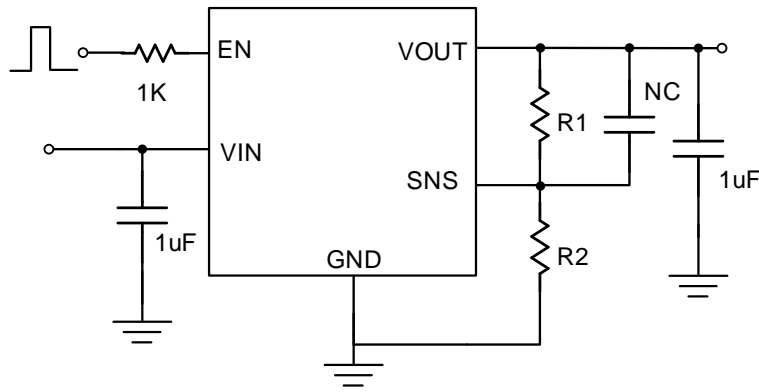
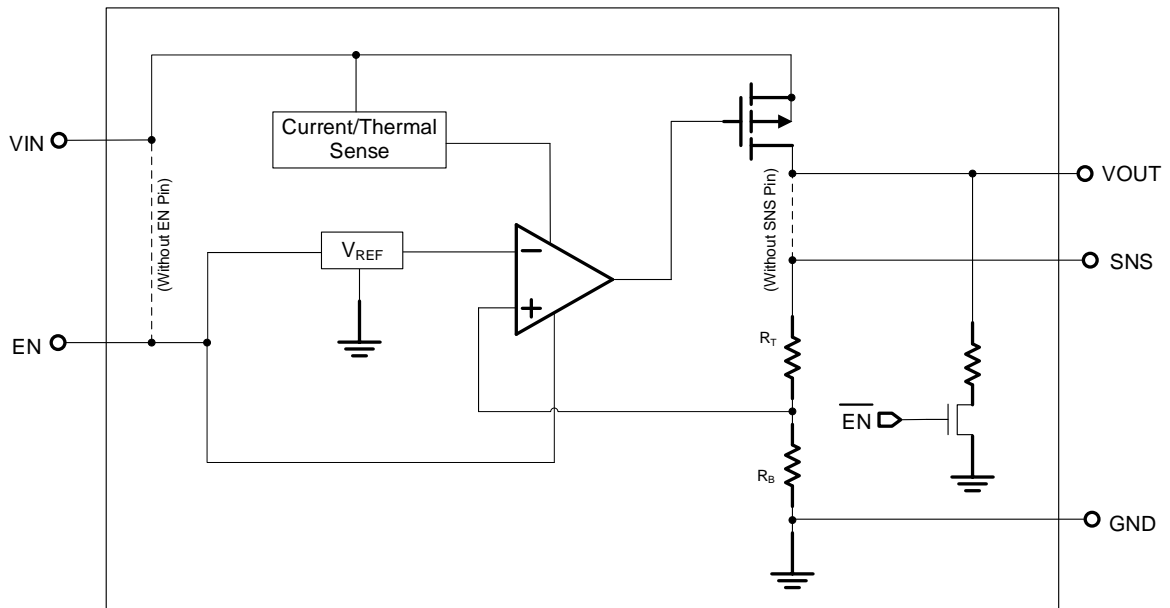


图 4: 带使能脚和输出电压检测可调电压输出应用电路

产品功能框图



最大耐压值 (Note 1)

VIN 至 GND	-----	-0.3V to 6V
VOUT, EN 至 GND	-----	-0.3V to 6V
VOUT 至 VIN	-----	-6V to 0.3V
封装热阻 (Note 2)		
θ_{JA}	-----	200 °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	-----	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

($V_{IN} = 5V$, $V_{EN} = 5V$ $T_A = 25^\circ C$ 除另有说明外)

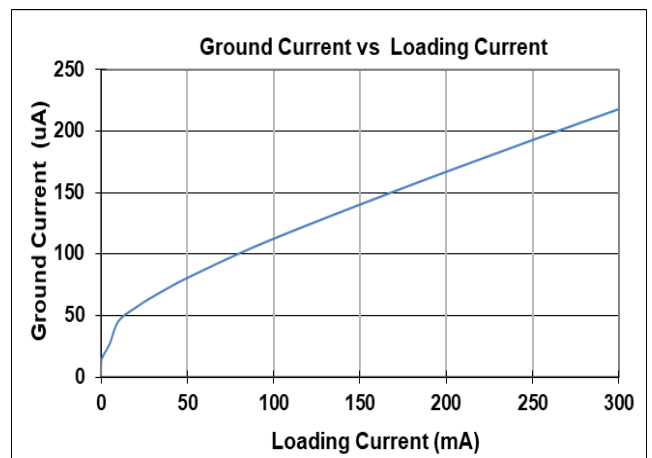
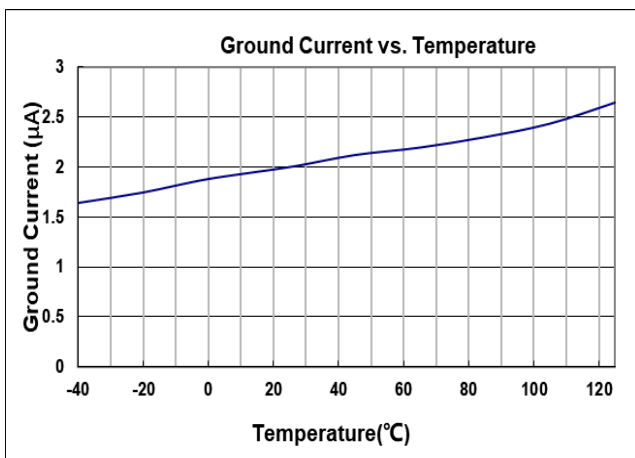
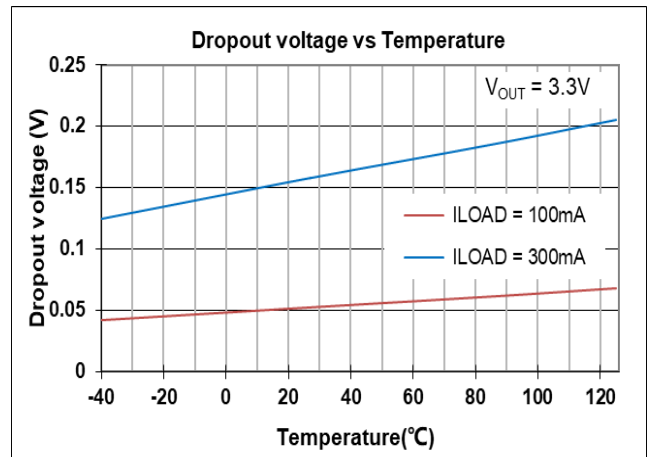
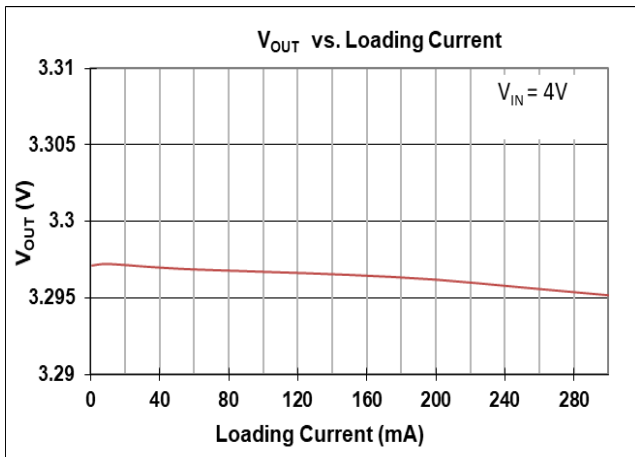
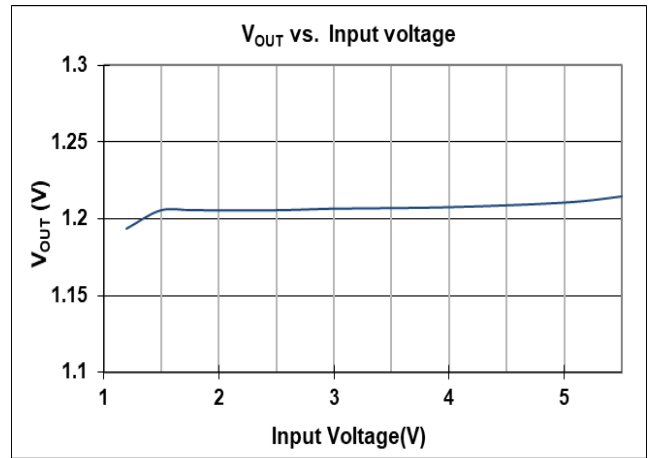
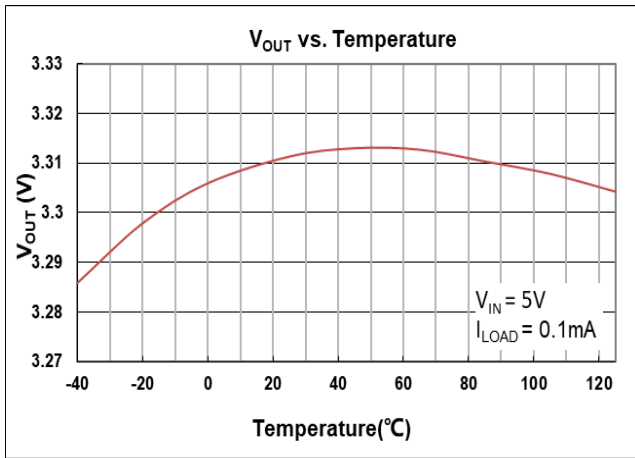
参数	符号	测试条件	最小值	典型值	最大值	单位	
输入电压	V_{IN}		2	--	5.5	V	
输出电压精度		$I_{LOAD} = 0.1mA$	-2		2	%	
SNS 输入电流	I_{SNS}	$SNS = V_{OUT}$		0.5		μA	
Dropout 电压 ($I_{LOAD} = 300mA$) (Note 3)	V_{DROP_3V}	$V_{OUT} \geq 3V$		0.18		V	
	$V_{DROP_2.8V}$	$V_{OUT} = 2.8V$		0.23			
	$V_{DROP_2.5V}$	$V_{OUT} = 2.5V$		0.23			
	$V_{DROP_1.8V}$	$V_{OUT} = 1.8V$		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	$\Delta LINE$	$I_{LOAD} = 30mA$, $1.5V \leq V_{IN} \leq 5.5V$ or $(V_{OUT} + 0.2V) \leq V_{IN} \leq 5.5V$		0.2		%	
负载电压调整率	$\Delta LOAD$	$10mA \leq I_{LOAD} \leq 0.3A$		0.2		%	
输出电流限流值	I_{LIM}	$V_{OUT} = 0V$		300		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 $100kHz$, $C_{OUT} = 1\mu F$.)		$V_{IN} = 3.5V$ $I_{LOAD} = 0.1A$	$V_{OUT} = 1.2V$	--	80	--	μV_{RMS}
			$V_{OUT} = 2.8V$	--	120	--	
过温度关断温度	T_{SD}	$I_{LOAD} = 10mA$		--	155	--	$^\circ C$
过温度关断迟滞	ΔT_{SD}			--	15	--	$^\circ C$
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，但不保证所有性能指标都正常，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。

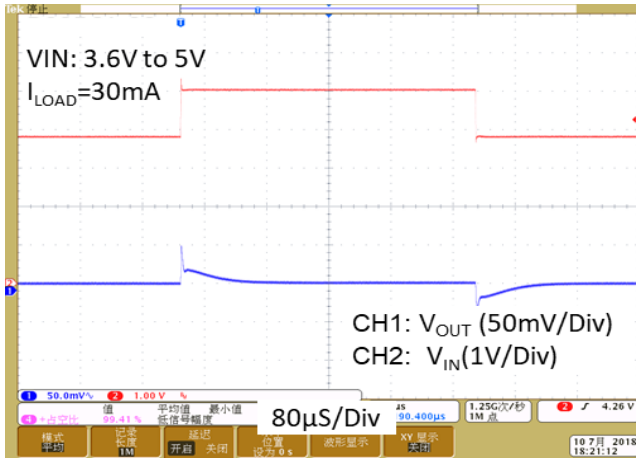
Note 2. θ_{JA} 测量条件： $T_A = 25^\circ C$ ，使用 EVB 板。

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

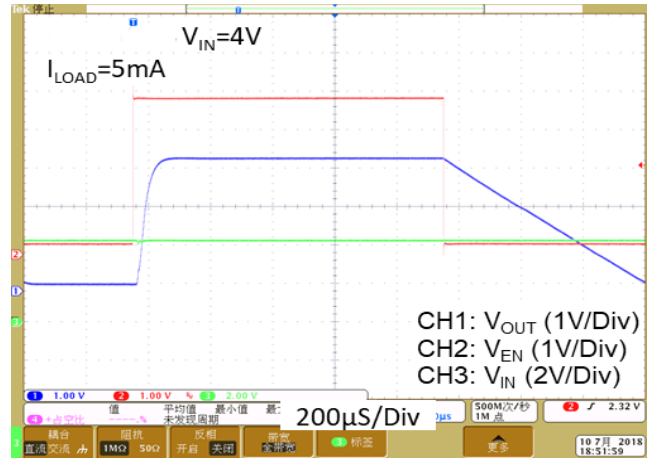
典型电气特性



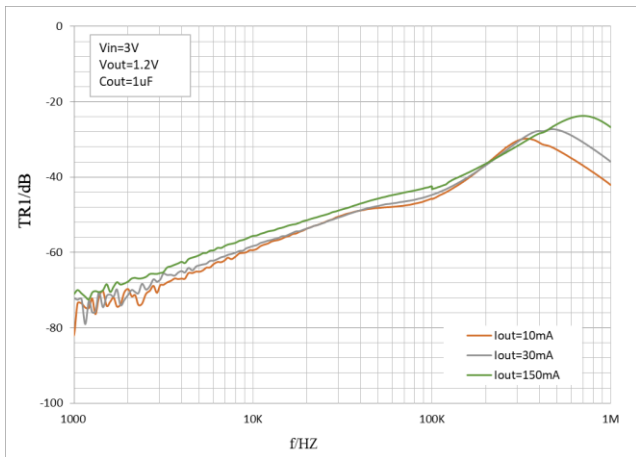
Line Transient Response



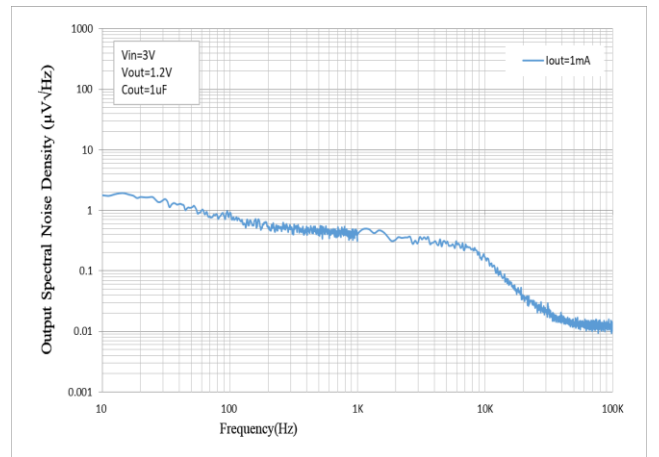
V_{OUT} Turn On/Off by EN



PSRR vs. Frequency



Noise Density Spectrum



应用指导

输入和输出电容

RT9078N-08GJ5-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 GNDpin 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

RT9078N-08GJ5-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_{DRO P} 和输出电流近似成比例。和其他线性电压转换器一样, RT9078N-08GJ5-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

RT9078N-08GJ5-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, RT9078N-08GJ5-MS会关闭P-MOS关闭输出。当结点温度往回降大约15°C时, RT9078N-08GJ5-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 M S K S E M I PCB,

$$PD (Max) = (125^{\circ}C - 25^{\circ}C) / (200^{\circ}C/W) = 0.5W$$

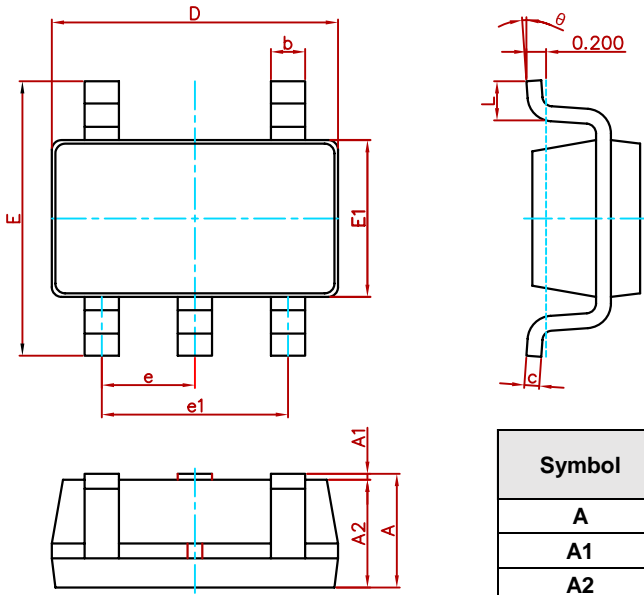
热散功率(PD)等于输出电流和 LDO 上的压降的乘积, 计算公式如下:

$$PD = (V_{IN} - V_{OUT}) \times I_{OUT}$$

Layout 注意事项

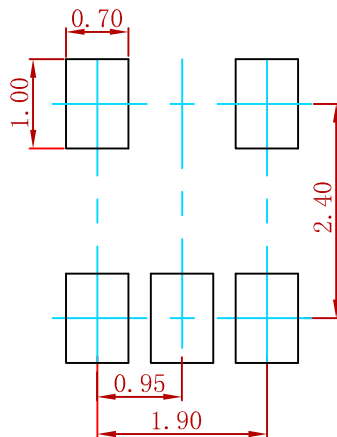
将输入电容、输出电容和 LDO 放置在 PCB 的同一面, 并尽量将电容器靠近 IC 的输入输出脚摆放, 可实现电路最佳性能。输入电容和输出电容的接地连接必须拉回到 RT9078N-08GJ5-MS 的接地引脚, 并使用短而粗的铺线连接。避免使用长走线、窄走线、或者通过过孔走线, 这些会增加寄生电感和电阻, 导致电路性能变差, 特别是在瞬态工作条件下。

Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	2.650	2.950	0.104	0.116
E1	1.500	1.700	0.059	0.067
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

Suggested Pad Layout



- Note:
1. Controlling dimension: in millimeters.
 2. General tolerance: $\pm 0.05\text{mm}$.
 3. The pad layout is for reference purposes only.

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