

# 译文

## TB9021FNG

本资料是为了参考的目的由原始文档翻译而来。

使用本资料时，请务必确认原始文档关联的最新信息，并遵守其相关指示。

原本：“TB9021FNG” 2014-10-17

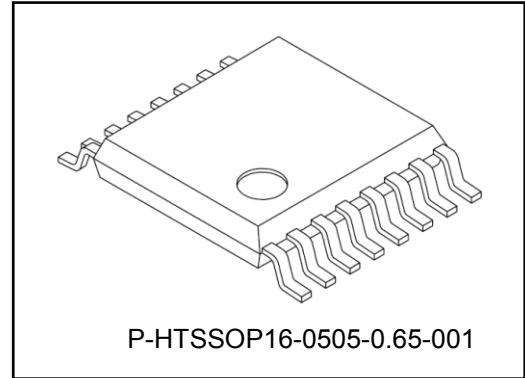
翻译日：2015-01-09

东芝Bi-CMOS集成电路硅单片电路

**TB9021FNG**

## 带看门狗定时器的低压差稳压器

TB9021FNG是汽车微控制器用的5V稳压器。内置外部MCU用的5V稳压器电路和看门狗定时器，可以200mA电流实现高精度输出电压（5V±0.1V），有助于减少外部零件；并内置限流器和过温检测等异常检测功能。

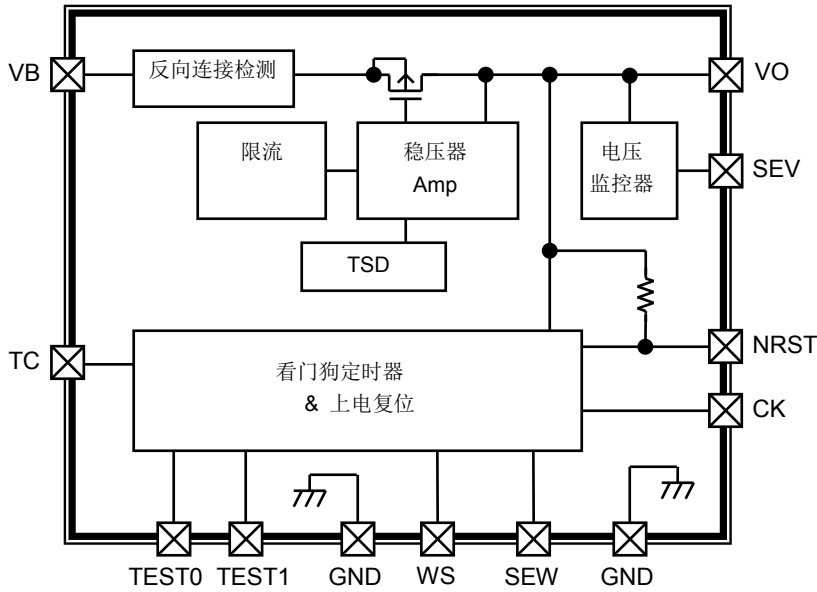


重量：0.062g （典型值）

**特征**

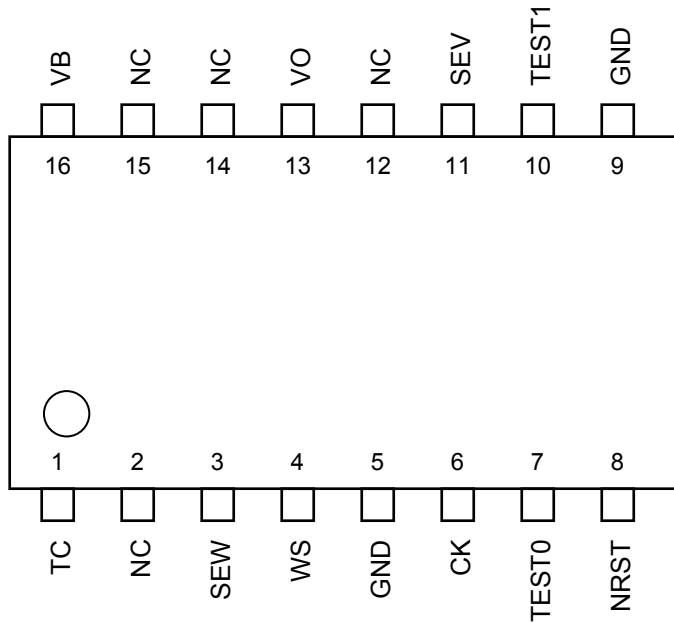
- 高精度输出电压 : 5V±0.1V
- 输出电流 : 200mA（限流器 300mA（典型值））
- 输入-输出压降 : 0.25V（ILOAD=200mA）
- 低待机电流 : 30μA（典型值）
- 各种异常检测 : 过温/限流器/反向连接
- 低压检测 : 4.2V（典型值）& 4.7V（典型值）可选
- 上电复位 : 复位信号时间长度可以调节
- 看门狗定时器 : WINDOW 型 低频检测：“CK”频率低于“CT”设定时间  
高频检测：10ms内“CK”频率高于1ms（典型值）
- 本产品符合 RoHS 规范（欧盟 2011 / 65 / EU 指令），见包装标签（如有）（“[[G]]/RoHS COMPATIBLE”、“[[G]]/RoHS [[受控物质的化学符号]]”、“RoHS COMPATIBLE”或“RoHS COMPATIBLE, [[受控物质的化学符号]]>MCV”）。

### 内部方框图和引脚布局



【注意】 为了便于说明，方框图中可能略去或简化了部分功能框、电路或常数。

### 引脚布局



## 引脚连接

引脚编号	引脚名称	定义
1	TC	复位定时器复位信号宽度和看门狗定时器设置引脚。 将电容器 (CT) 连接到 GND。欲了解定时器信号宽度的详细信息, 请参考电气规范。
3	SEW	看门狗定时器类型选择 SEW=GND: WINDOW型。请参考章节看门狗定时器-2。 SEW=VO: 在CK>TWD (由“CT”设定) 时复位。请参考章节看门狗定时器-1。 此设定应固定用于PCB。(运行过程中, 不能修改“SEW”)
4	WS	看门狗定时器启用/禁用 WS=GND: 看门狗定时器启用 WS=VO: 看门狗定时器禁用
5	GND	GND
6	CK	看门狗定时器的时钟输入
7	TEST0	测试引脚。连接到PCB上的GND。
8	NRST	复位信号输出。内置上拉电阻10kΩ至VO。
9	GND	GND
10	TEST1	测试引脚。连接到GND
11	SEV	复位检测电压选择器 SEV=GND : 复位检测电压: 4.7V (典型值) SEV=VO : " : 4.2V (典型值)
13	VO	5V稳压器输出。电流容量200mA.
16	VB	电源输入
2,12, 14,15	NC	无连接

## 可选功能表

## 低压检测电压

SEV	检测电压VTH (典型值)
L (GND)	4.7V
H (VO)	4.2V

## 看门狗定时器时钟异常高频检测

SEW	WDT CK高频检测
L (GND)	启用
H (VO)	禁用

## 看门狗定时器激活

WS	WDT
L (GND)	启用
H (VO)	禁用

功能描述

看门狗定时器 -1

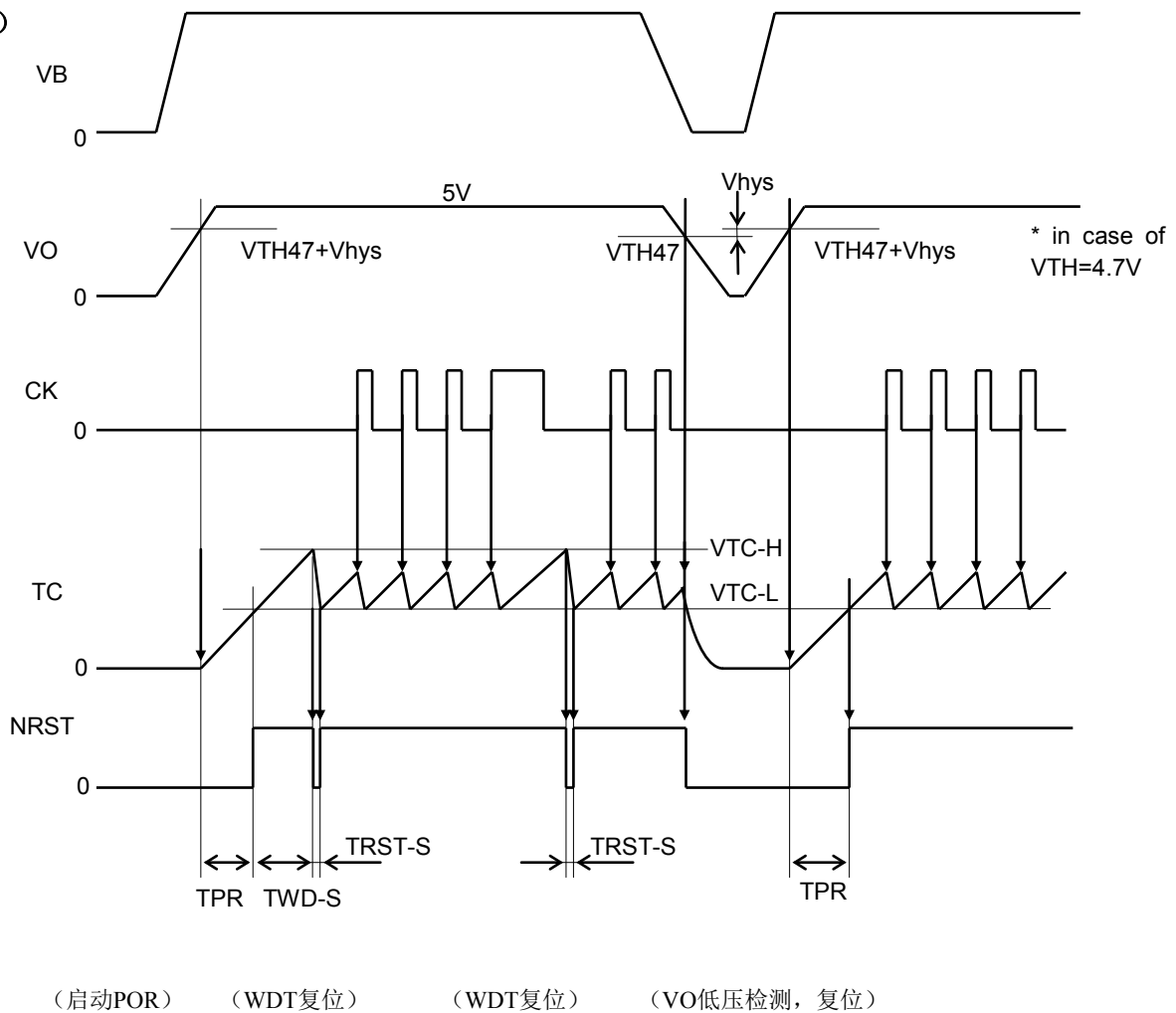
对于TB9021FNG内置看门狗定时器功能，需要将外部MCU软件产生的信号时钟输入到引脚“CK”。连接到引脚“TC”的外部电容持续且有选择性地执行内部设置电压VTC-H和VTC-L之间的充放电。当在电压充电状态下检测到信号引脚“CK”的上升边缘时，则其切换至放电。因此，当外部MCU工作正常时，引脚“TC”的电压没有达到VTC-H。当MCU出现问题而且软件没有正常工作时，引脚“CK”的信号消失，引脚“TC”的电压到达VTC-H，而引脚“NRST”输出“L”直至引脚“TC”的电压降至VTC-L。此电压下降到VTC-L之后，引脚“NRST”将恢复至“H（正常）”而引脚“TC”将再次对电压进行充电。引脚“NRST”的信号可以用于外部MCU复位。每次的时间都由连接到引脚“TC”的外部电容确定，如下所示。

- TPR（上电复位信号：POR） (s) = 2 x CT (μF)（典型值）
- TWD-S（WDT的检测时间） (s) = 2 x CT (μF)（典型值）
- TRST-S（复位信号持续时间） (ms) = 7 x CT (μF)（典型值）

TB9021FNG的功能如下所示：

- 启动VO（5V）
- 上电复位：POR
- 看门狗定时器复位操作：WDT
- VO低压检测和恢复复位操作

时序图（1）

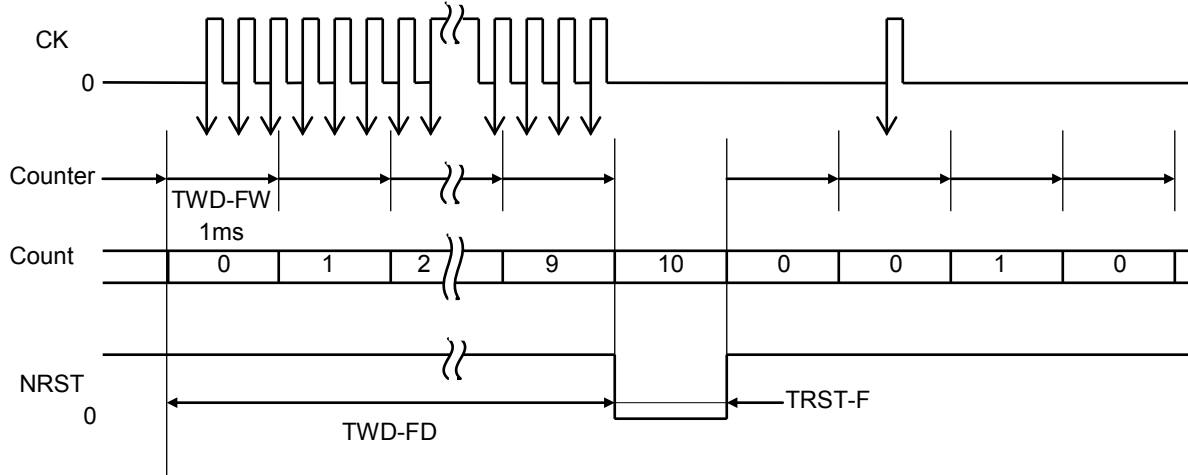


看门狗定时器 -2

TB9021FNG看门狗定时器可以对输入“CK”频率进行异常检测。

当引脚“CK”的输入时钟频率快于1毫秒（典型值）而且持续输入10毫秒时，TB9021FNG将在1毫秒（典型值）内检测到“CK”高速输入以及来自引脚“NRST”的输出“L”异常。（请参考一下时序图（2））

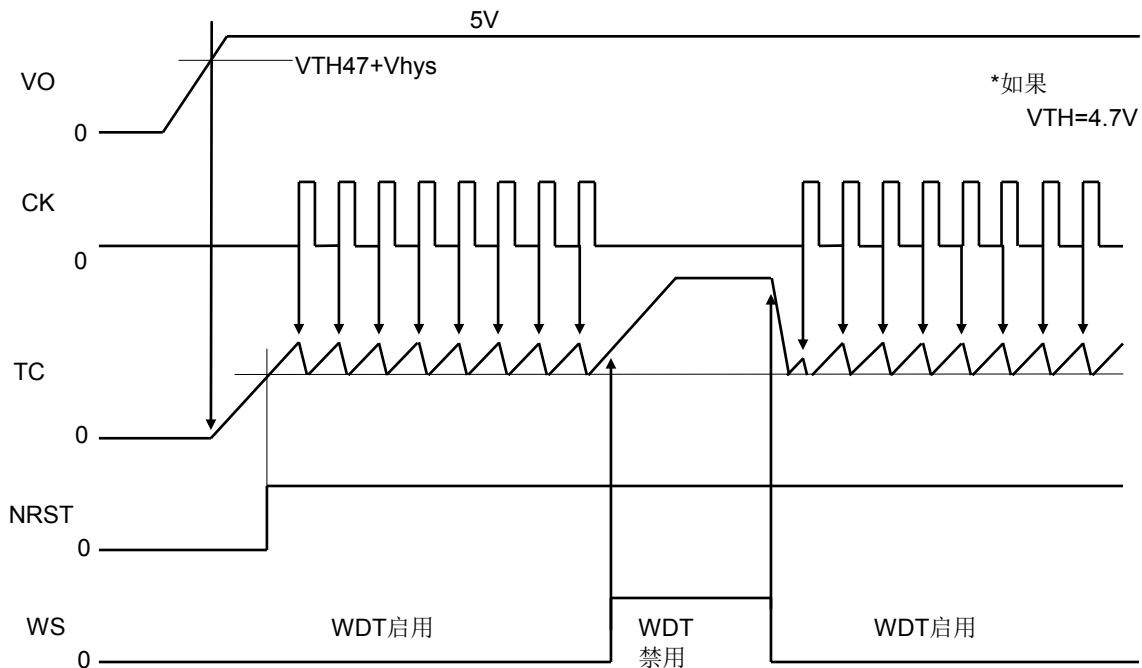
时序图（2）



看门狗定时器激活/禁用

看门狗定时器启用/禁用如下所示。

时序图（3）



（注） 请参考“电气规范”，了解上述符号。  
为方便说明，时序图可能被简化。

绝对最大额定值 ( $T_a = 25^{\circ}\text{C}$ )

特征	符号	引脚	值	单位
输入电压	VIN1	VB	50	V
	VIN2	VB	-16 (*)	
输出电流	ILOAD	VO	200	mA
	IOUT	NRST	1	
工作温度	Topr	—	-40 to 125	$^{\circ}\text{C}$
结温	Tj	—	-40 to 150	$^{\circ}\text{C}$
存储温度	Tstg	—	-55 to 150	$^{\circ}\text{C}$

(注)

半导体器件的绝对最大额定值是指在运行过程中，任何时候都绝对不能超过的一组额定值，即使是瞬时超过也不允许。如果运行过程中超过任何额定值，该器件的电气特性可能被不可恢复的改变，该器件的可靠性和使用寿命也无法再保证。而且，在超过额定值的情况下运行，可能导致其它设备发生故障、损坏和/或退化。使用此器件的应用的设计，应保证在任何运行条件下这些绝对最大额定值都不会被超过。使用、创建和/或制作设计之前，请参考并遵照本文中规定的注意事项和条件。

(注)

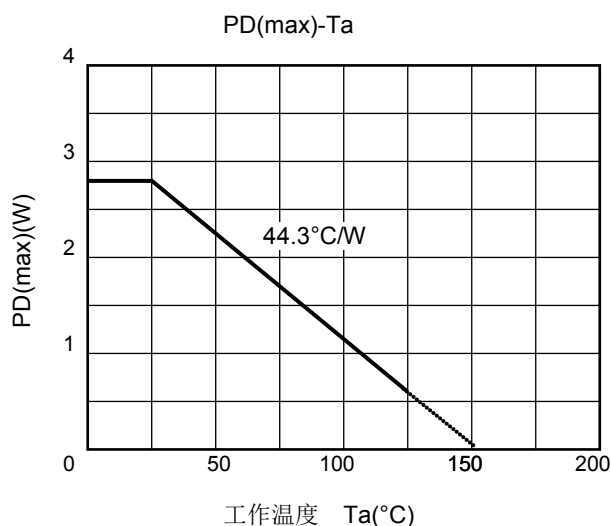
\*电池反向

热阻数据 ( $T_a = 25^{\circ}\text{C}$ )

特征	符号	值	单位
功耗	PD	2.8	W
热阻	$\theta_{j-a}$	44.3	$^{\circ}\text{C}/\text{W}$
过温检测	TSD	165	$^{\circ}\text{C}$

(注) 此过温检测是以最大额定温度为基础；装运测试不是在最大额定温度下实施。

## 封装功率耗散



PCB: JEDEC4L 76.2mm x 114.3mm x t1.6mm

## 静态电气特性

(以下内容是以 $V_B = 6\text{--}18\text{ V}$ 以及 $T_c = -40\text{--}125^\circ\text{C}$ 为条件, 另有规定除外)

特征	符号	引脚	条件	最小值	典型值	最大值	单位
DC CHARACTERISTICS							
电流消耗	Icc1	VB	$I_{LOAD} < 200\mu\text{A}$ *1	—	30	60	$\mu\text{A}$
	Icc2	VB	$200\mu\text{A} \leq I_{LOAD} < 1\text{mA}$ *1	—	60	120	
	Icc3	VB	$1\text{mA} \leq I_{LOAD}$ *1	—	—	420	
Regulator							
输出电压	VREG	VO		4.9	5.0	5.1	V
线性调整率	VLINE1	VO	$V_B = 6\text{ to }18\text{V}, I_{LOAD} = 10\text{mA}$	—	—	10	mV
	VLINE2		$V_B = 6\text{ to }50\text{V}, I_{LOAD} = 10\text{mA}$	—	—	20	
负载调整率	VLOAD	VO	$V_B = 14\text{V}, I_{LOAD} = 1\text{ to }100\text{mA}$	—	—	20	mV
温度系数		VO		—	0.01	—	$\%/^\circ\text{C}$
输入-输出电压降	VDROP	VO	$V_B = 5\text{V}, I_{LOAD} = 200\text{mA}$	—	0.25	—	V
限流器	ILIMIT	VO		—	300	—	mA
RESET TIMER DC CHARACTERISTICS							
输入电流	I <sub>IH</sub>	SEV, WS	$V_{IN} = V_O$	-1	—	1	$\mu\text{A}$
	I <sub>IL</sub>	SEW, CK	$V_{IN} = \text{GND}$	-1	—	1	
输入阈值电压	VTH	SEV, WS SEW, CK		$0.2 \times V_O$	—	$0.8 \times V_O$	V
输出电压	VOL	NRST	$I_{OL} = 1\text{mA}$	—	—	0.5	V
输入电流	I <sub>IN</sub>	TC		—	-1	—	$\mu\text{A}$
复位检测电压	VTH47	VO	SEV=GND	—	4.7	—	V
	VTH42		SEV=VO	—	4.2	—	
	V <sub>hys</sub>			—	0.1	—	
AC CHARACTERISTICS							
上电复位时间	TPR	NRST		—	$2 \times CT$	—	s
WDT检测时间	TWD-S	NRST		—	$2 \times CT$	—	s
WDT异常频率检测周期	TWD-FW	NRST		—	1.0	—	ms
WDT异常频率检测期	TWD-FD	NRST		—	10	—	ms
WDT复位信号宽度	TRST-S	NRST		—	$7 \times CT$	—	ms
异常频率检测时的复位信号宽度	TRST-F	NRST		—	1.0	—	ms
WDT输入时钟宽度	TW	CK		1	—	—	$\mu\text{s}$

\*: 电流消耗值Icc1和Icc2不包含负载电流(ILOAD)

\*: CT的单位是( $\mu\text{F}$ )。

\*: 上文所述关于上电复位时间、看门狗定时器和复位信号宽度的规定不涉及外部电容“CT”的容差。

## 外部电容

零件	最小值	最大值	单位
CT	0.0022	0.22	$\mu\text{F}$

(注) “CT”的充电电流是一个较小的值 $1\mu\text{A}$ (典型值)。

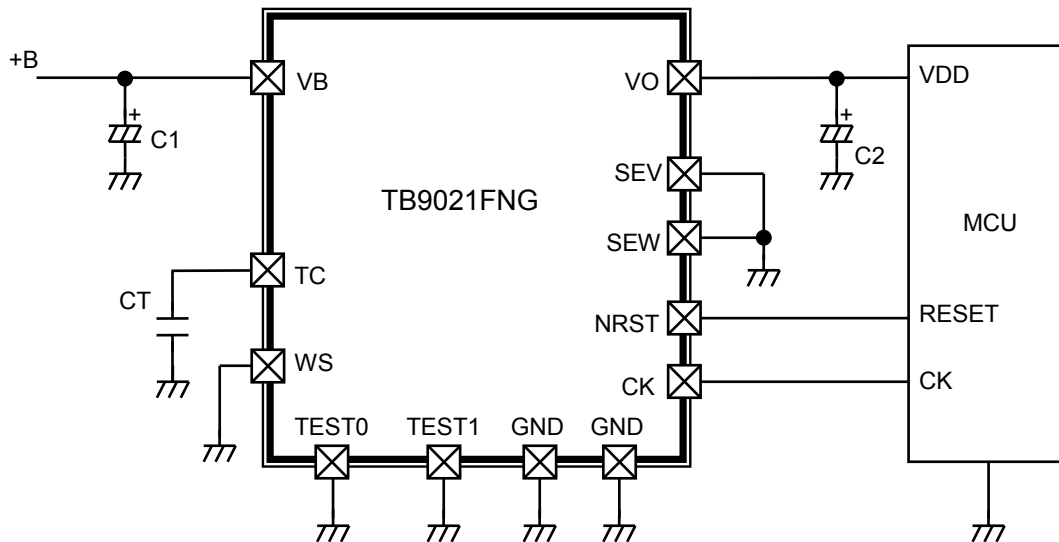
如果至“CT”的较小电流存在泄漏, 会影响复位信号时间宽度。

选择较小的泄漏电流的电容器。

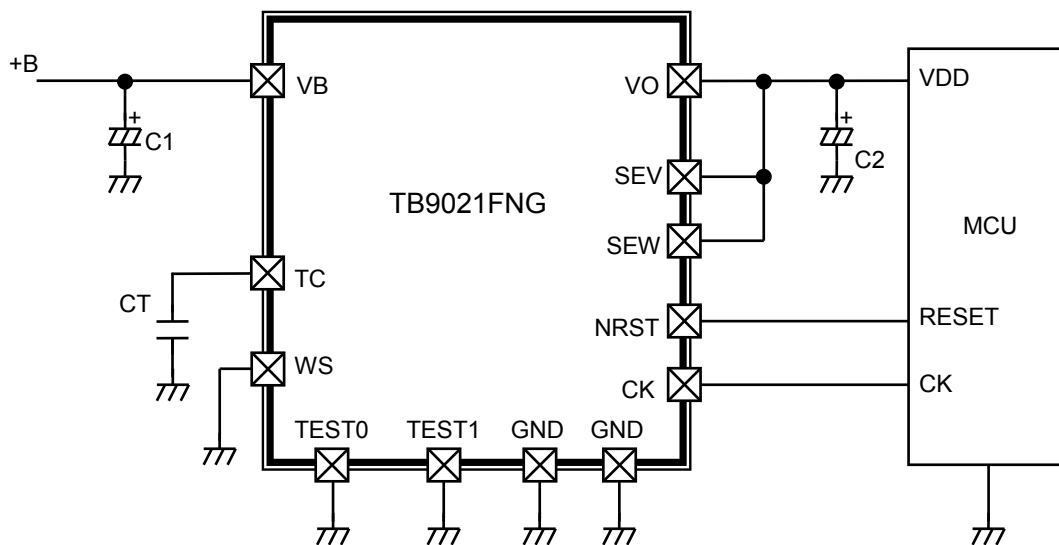


## 应用电路图

(示例1) 如果看门狗定时器低压检测为4.7V，那么看门狗定时器时钟“CK”检测功能可能检测到异常高频和低频。



(示例2) 如果看门狗定时器低压检测为4.2V，那么看门狗定时器时钟“CK”检测功能可能检测到异常低频。



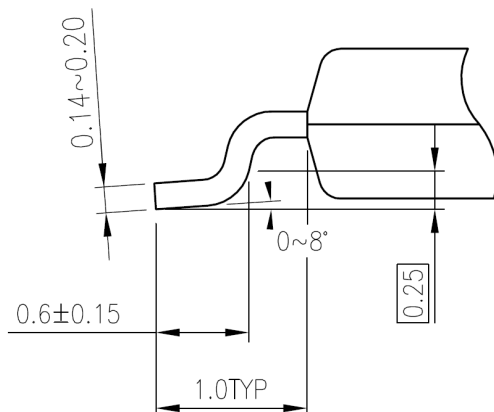
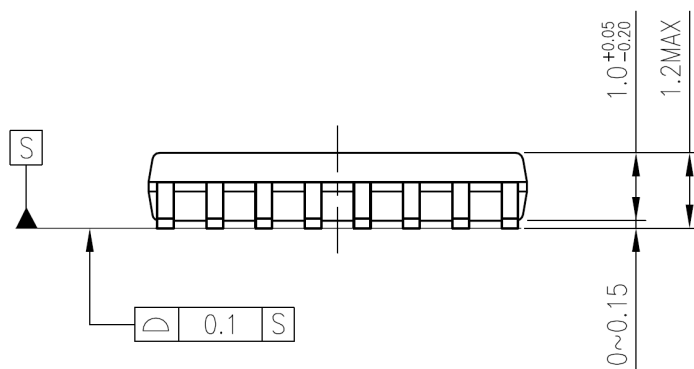
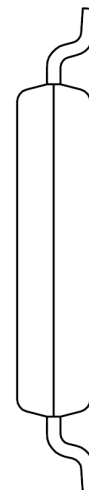
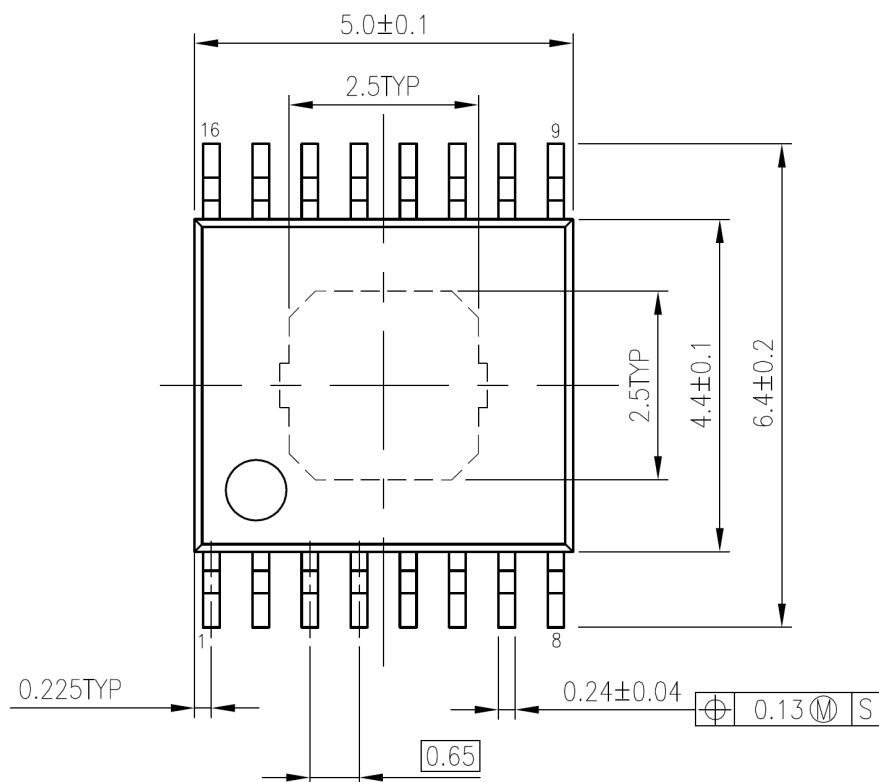
(注)

- C1和C2是吸收干扰、噪音等用的电容器。尽量将各电容器连接到离IC较近的地方。
- 正确完成本产品的安装。否则，可能造成本产品或设备故障、损坏和/或退化。
- 本文中所示应用电路仅供参考。

特别是，批量生产设计阶段需要全面的评估。东芝并没有通过这些应用电路示例授权其任何工业产权的使用权。

封装: P-HTSSOP16-0505-0.65-001

单位: mm



重量: 0.062g (典型值)

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