

2μA 超低静态电流1.3A同步升压IC

概要

CS5009S是一款高效同步升压转换器，具有低至2μA的超低静态电流。它最高能够输出5V@0.7A的电流。CS5009S还具有一个真正的关闭功能，在关闭和输出短路情况下，断开输入和输出。这省去了用外部MOSFET及其控制电路，以断开输入和输出的需要，并提供了强大的过载保护。500KHz的开关频率允许使用微型低剖面电感器和陶瓷电容器，从而最大限度地减少了解决方案的面积。内部同步MOSFET提供最高的效率和电流模式控制，内部补偿，外部零件的数量减少到最小。有超低静态功耗功能，CS5009S是需要有低待机功率和紧凑的电路板尺寸，如IoT 应用理想的解决方案。

特性

- 供电范围：1~5V
- 输出电压范围：2.2~5V
- 超低静态电流（无开关动作时）：2μA
- 输出断开功能，短路保护功能
- 输出能力：

1.0V → 3.3V : 0.1A	1.8V → 3.3V : 0.36A
3.7V → 5.0V : 0.7A	3.0V → 3.7V : 0.8A
1.8V → 3.7V : 0.3A	2.0V → 3.7V : 0.35A
- 输出到输入防倒灌保护
- 高达94%效率
- 内置同步整流
- 电流模控制
- 逻辑控制关机
- 过温保护功能
- SOT23-6L 封装

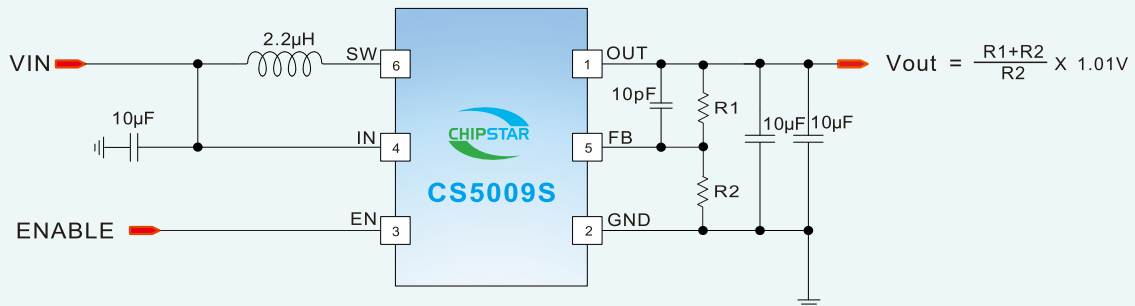
封装

- SOT23_6L

应用

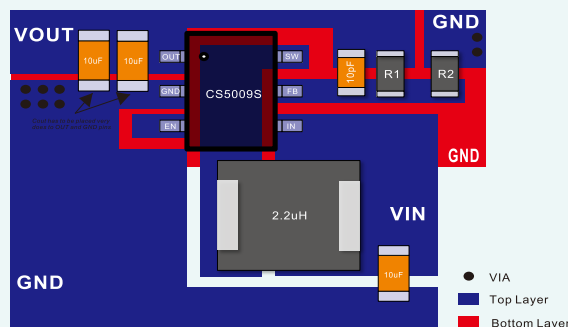
- 键盘
- 鼠标
- 玩具
- 单节干电池，纽扣电池应用
- TWS
- 平板MID
- 智能手机
- 移动电源

典型应用图



备注：固定输出电压5V。通过FB引脚设置输出电压，电阻消耗额外的7μA电流。

PCB Guidelines:



2μA Ultra Low IQ 1.3A Synchronous Boost IC

DESCRIPTION

The CS5009S is a high efficiency synchronous step-up converter with ultra-low quiescent current down to 2μA. It is capable of delivering at least 3W of power from a low voltage source, i.e. 0.7A at 5V output. It also features a ture-shutoff function that disconnects the input from output, during shutdown and output short-circuit conditions. This eliminates the need for an external MOSFET and its control circuitry to disconnect the input from output and provides robust overload protection. A switching frequency of 500KHz minimizes solution footprint by allowing the use of tiny and low profile inductors and ceramic capacitors. An internal synchronous MOSFET provides highest efficiency and with a current mode control that is internally compensated, external parts count is reduced to minimal. With the ultra-low IQ feature, CS5009S is ideal for solution that requires low standby power and compact board size such as IoT applications.

Package

- SOT23-6L

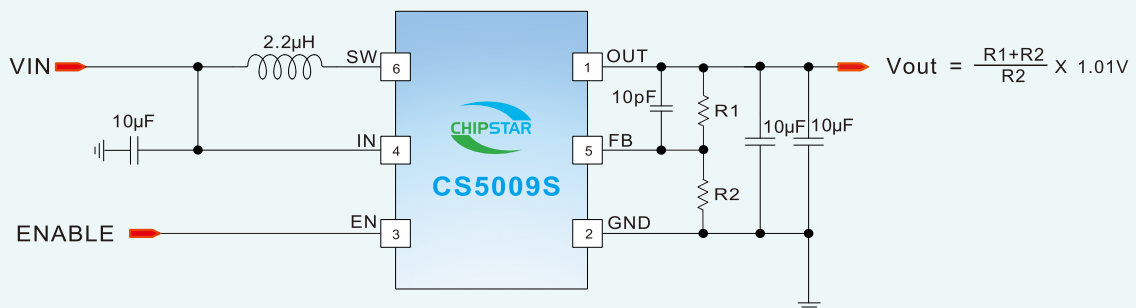
FEATURES

- Power supply range: 1~5V
- Output voltage range: 2.2~5V
- Ultra low IQ when No Switching: 2μA
- Output Disconnect
- Short-circuit Protection
- Output Power
 - 1.0V → 3.3V : 0.1A 1.8V → 3.3V : 0.36A
 - 3.7V → 5.0V : 0.7A 3.0V → 3.7V : 0.8A
 - 1.8V → 3.7V : 0.3A 2.0V → 3.7V : 0.35A
- Output to input Reversed Current Protection
- Up to 94% Efficiency
- Internal Synchronous Rectifier
- Current Mode control
- Logic Control Shutdown and Thermal shutdown
- SOT23-6L Package

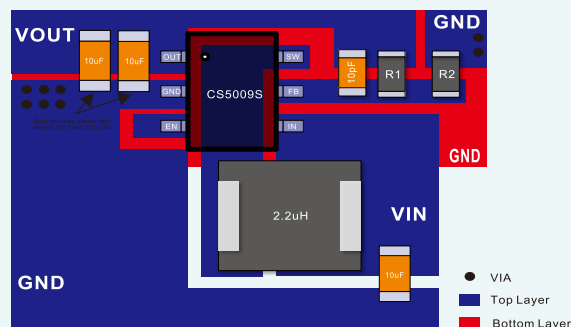
APPLICATIONS

- TWS
- Keyboard
- Tablet MID
- Mouse
- Smart phone
- Plaything
- Power Bank
- Single dry battery application

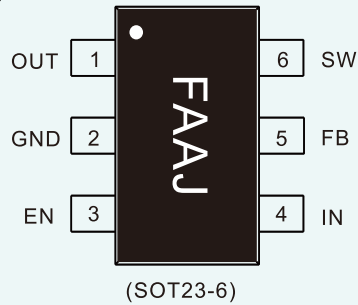
TYPICAL APPLICATION CIRCUIT



PCB Guidelines:



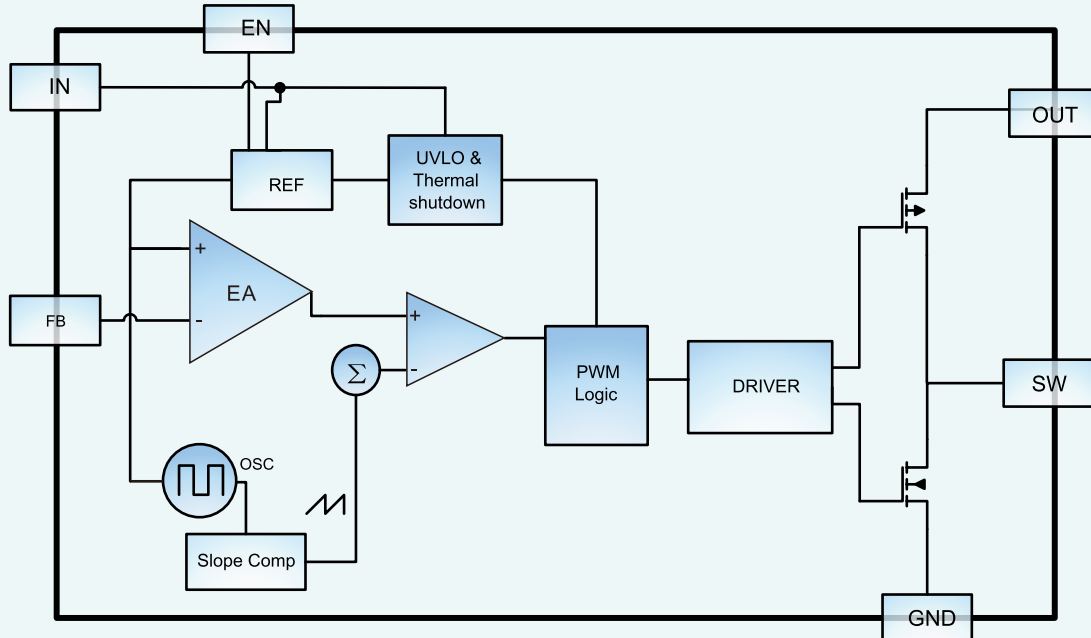
PIN CONFIGURATION (TOP VIEW)



TERMINAL FUNCTIONS

TERMINAL		I/O	DESCRIPTION
NAME	PIN		
OUT	1	O	Output pin. Bypass with a 10 μ F or larger ceramic capacitor closely between this pin and GND
GND	2	–	Ground Pin
EN	3	I	Enable pin for the IC. Drive this pin high to enable the part, low to disable.
IN	4	I	Input Supply Voltage. Bypass with a 10 μ F ceramic capacitor to GND
FB	5	I	Feedback Input. Connect a 10pF from OUT to FB pin for fixed output voltage. And add an external resistor divider from the OUT to FB and GND to set VOUT for adjustable output voltage
SW	6	O	Inductor Connection. Connect an inductor Between SW and the regulator output

Block Diagram



Absolute Maximum Ratings

IN,OUT,SW,FB, EN Voltage	-----	-0.3V to 6.0V
SW to ground current	-----	Internally limited
θ_{JA}	-----	180°C/W
θ_{JC}	-----	90°C/W
Mayction Temperature Range	-----	125°C
Lead Temperature (Soldering, 10 sec.)	-----	260°C
Storage Temperature Range	-----	-55°C to 150°C
Mayction Temperature Range	-----	-40°C to 125°C
Ambient Temperature Range	-----	-40°C to 85°C
ESD HBM(Human Body Mode)	-----	4KV
ESD MM(Machine Mode)	-----	400V

Order Information

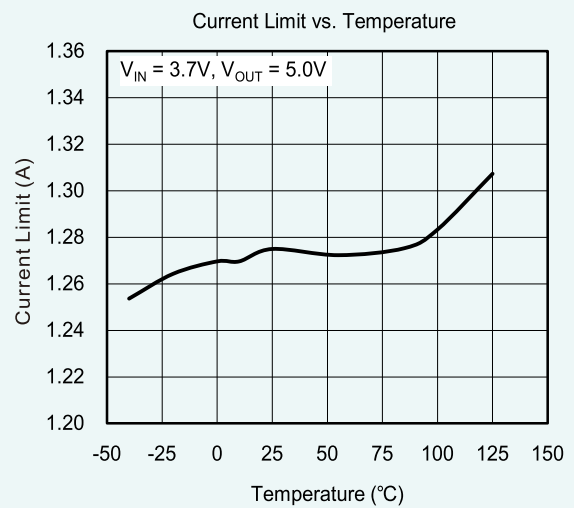
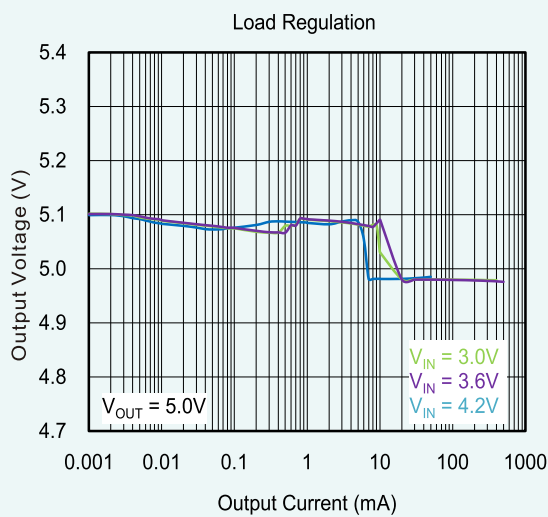
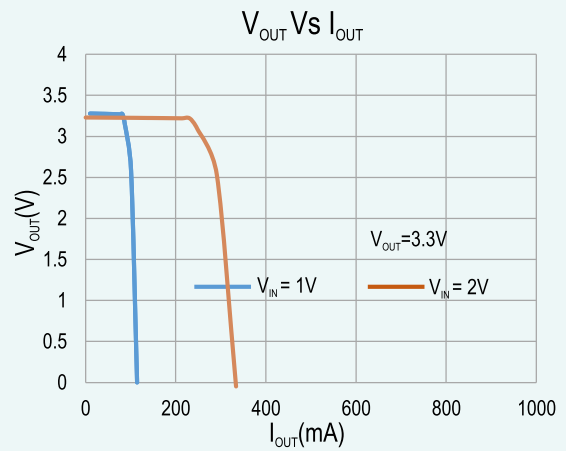
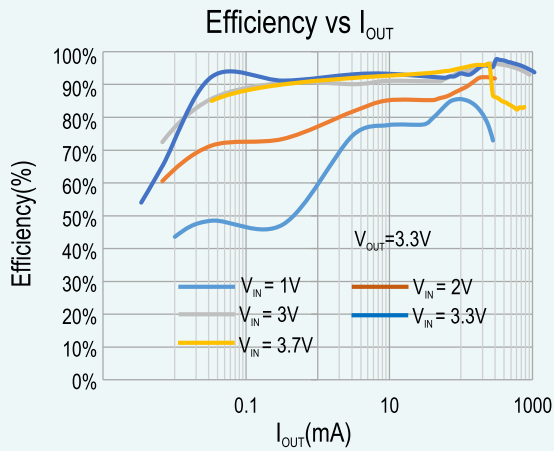
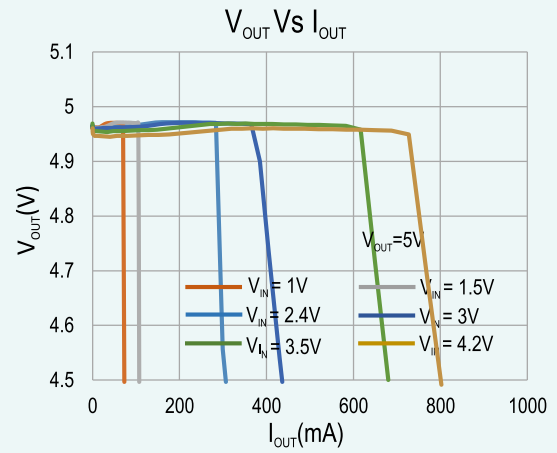
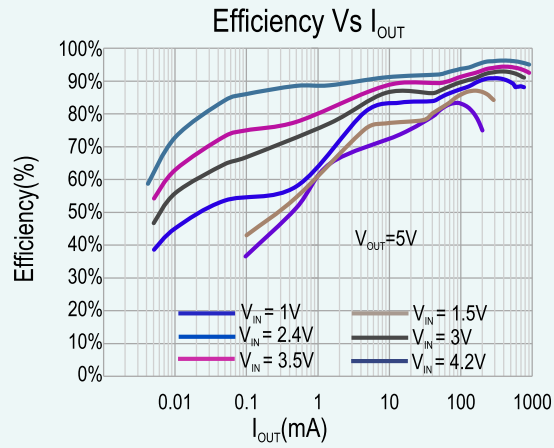
Device	Package	Making	Reel Size	Tape Width	Quantity
CS5009S	SOT23-6L		7"	8mm	3000

Electrical Characteristics

($V_{IN}=3.6V$, $V_{OUT}=5V$, $T_A=25^\circ C$ unless otherwise specified)

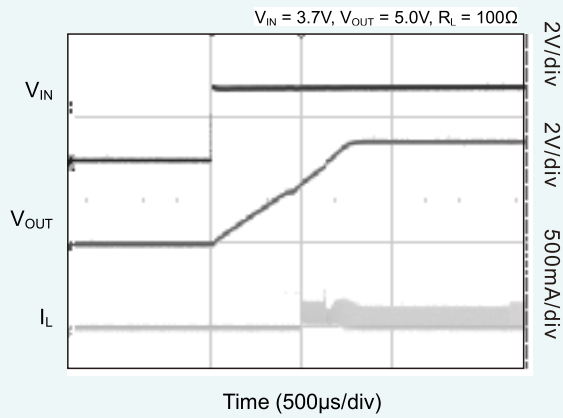
PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Quiescent current at OUT	$V_{EN}=IN$, No load ,Not Switching		2.0		μA
Shutdown Supply Current at IN	$V_{EN}=GND$		0.1		μA
IN Startup Voltage	$I_{OUT}=1mA$		0.9		V
IN Operation voltage	After Start-up	1.0		4.5	V
Output Voltage t 5V		4.90	5.05	5.20	V
Output Voltage t 3.3V		3.2	3.3	3.4	V
Fedback Voltage		0.985	1.01	1.03	V
Switching Frequency			500		Khz
MOS Swtch On Resistance	$I_{SW}=100mA$		220		m Ω
PMOS Switch On Resistance	$I_{SW}=100mA$		160		m Ω
SW Leakage Current	$V_{OUT}=5.2V$, $V_{EN}=GND$, $V_{SW}=5.2V$ $V_{SW}=0V$			10	μA
NMOS Switch Curret Limit			1.3		A
start-up Current Limit			1.3		A
Short-Circuit Hiccup time	ON		2		ms
	OFF		80		ms
EN Input Current	$V_{EN}=5V$ or $0V$	-1	0	1	μA
EN High Voltage	$V_{OUT}=5V$	1.2			V
EN low Voltage	$V_{OUT}=0V$			0.4	V
Thermal Shutdown	Rising,Hysteresis= $25^\circ C$		160		$^\circ C$

TYPICAL PERFORMANCE CHARACTERISTICS($T_A=25^{\circ}\text{C}$ unless otherwise specified)

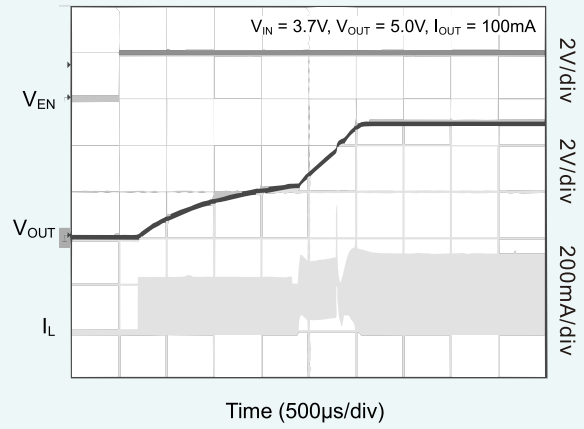


(1) Not tested in production. Specified by design.

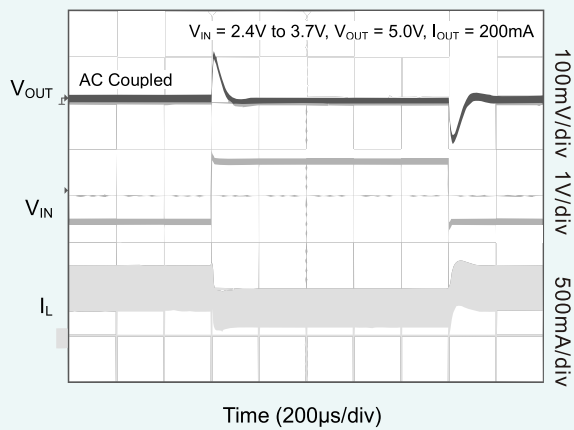
Startup by VIN Pin



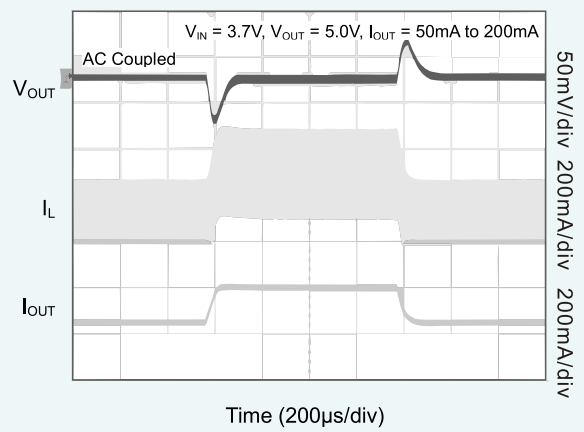
Startup by EN Pin



Line Transient Response



Load Transient Response



APPLICATION INFORMATION

Loop Operation

CS5009S is a high efficiency synchronous step-up converter with ultra-low quiescent current down to 2μA. It integrates a 220mΩ low side main MOSFET and 160mΩ synchronous MOSFET. It uses a PWM current -mode control scheme. An error amplifier integrates error between the FB signal and the internal reference voltage. The output of the integrator is then compared to the sum of a current-sense signal and the slope compensation ramp. This operation generates a PWM signal that modulates the duty cycle of the power MOSFETs to achieve regulation for output voltage. The peak current of the NMOS switch is also sensed to limit the maximum current flowing through the switch and inductor. The typical peak current limit is set to 1.3A. An internal temperature sensor prevents the device from getting overheated in case of excessive power dissipation.

Ultra low current consumption at light load operation

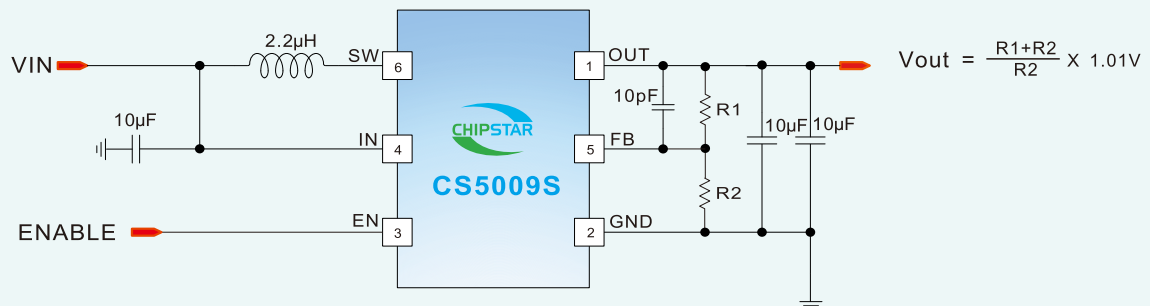
Traditionally, a fixed constant frequency PWM DC/DC regulator always switches even when the output load is small. When energy is shuffling back and forth through the power MOSFET, power is lost due to the finite RDS(ON)s of the MOSFETs and parasitic capacitances. At light load, this loss is prominent and efficiency is therefore very low. CS5009S employs a proprietary control scheme that improves efficiency in this situation by enabling the device into a power saving mode during light load and the no load quiescent current can be as low as 2μA.

Short-Circuit Protection

Unlike most step-up converters, the CS5009S allows for short circuit on the output. In the event of a short circuit, the device first turns off the NMOS when the sensed current reaches the current limit. When OUT drops below IN, the device then enters a linear charge period with the current limited same as with the start-up period. In addition, the thermal shutdown circuits disable switching if the die temperature rises above 160°C.

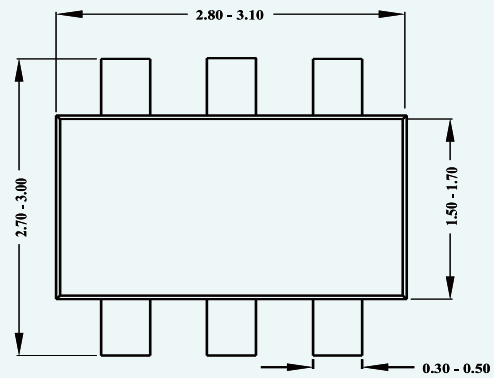
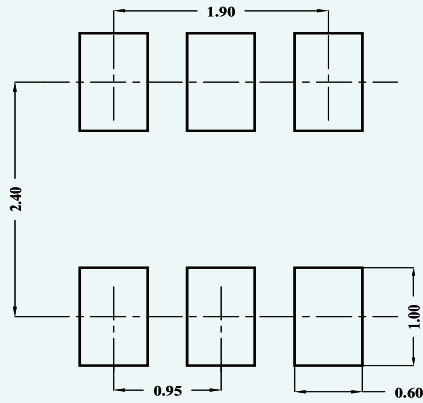
Adjustable Output Voltage Setting with FB pin

By adding a resistor divider at FB pin (R1 and R2 as shown in the circuit below), CS5009S can be set to any voltage level less than 5V at output node. But as there is already a large internal resistor (about 20MΩ) from FB to GND to set the fixed output voltage, the R2 is recommended to be 200K or less, which will add about 6μA or more at output. The output voltage is set by following equation:

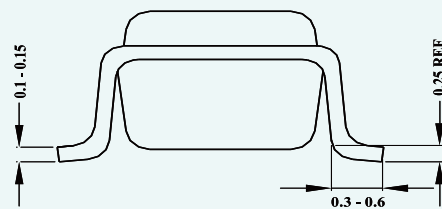


PACKAGE INFORMATION

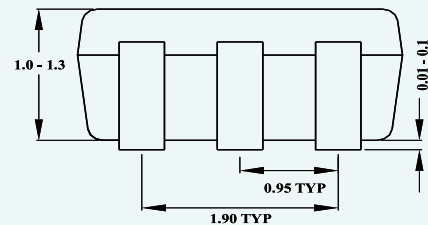
SOT23-6L Package Outline



Recommended Pad Layout



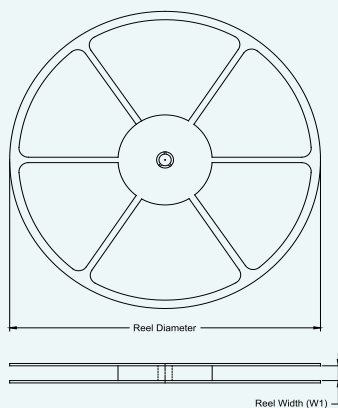
Top View



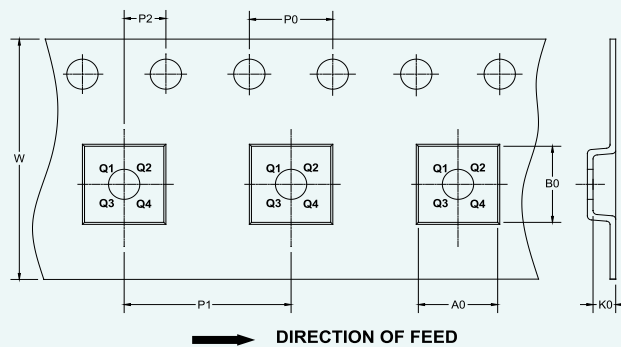
Notes: All dimension in MM
All dimension don't not include mold flash & metal burr

TAPE AND REEL INFORMATION

REEL DIMENSIONS



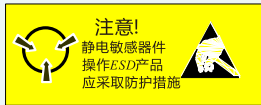
TAPE DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard

KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
SOT-23-6	7"	9.5	3.20	3.20	1.40	4.0	4.0	2.0	8.0	Q3



MOS电路操作注意事项：

静电在很多地方都会产生，采取下面的预防措施，可以有效防止MOS电路由于受静电放电影响而引起的损坏：

- 操作人员要通过防静电腕带接地。
- 设备外壳必须接地。
- 装配过程中使用的工具必须接地。
- 必须采用导体包装或抗静电材料包装或运输。

声明:

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