升压跟随功能,最低1.0V启动,2μA超低静态电流1.3A同步升压IC

概要

IU5011S是一款高效同步升压转换器，特点有:具有升压直通跟随输入电压功能，最低1.0V启动，低至2μA的超低静态电流，最高能够输出5V@0.7A的电流。
IU5011S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，IU5011S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
- VIN > VOUT 时切换为直通模式
- 最高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

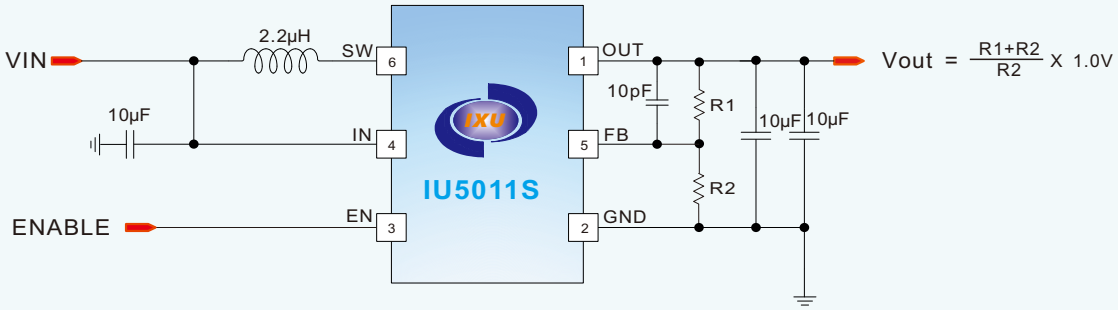
应用

- 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
- 麦克风

封装

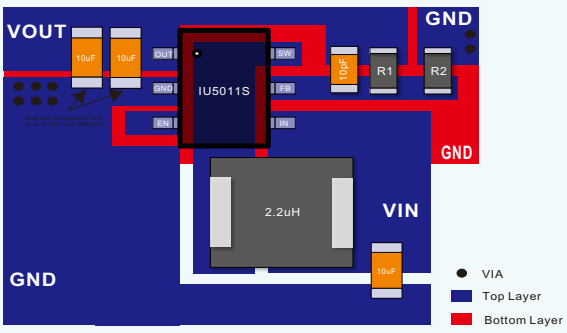
- SOT23_6L

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:



Pass–Through Mode,1.0V start,2μA quiescent current,1.3A synchronous boost IC

DESCRIPTION

The IU5011S 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 elimnates 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, IU5011S is ideal for solution that requires low standby power and compact board size such as IoT applications.

Package

- SOT23_6L

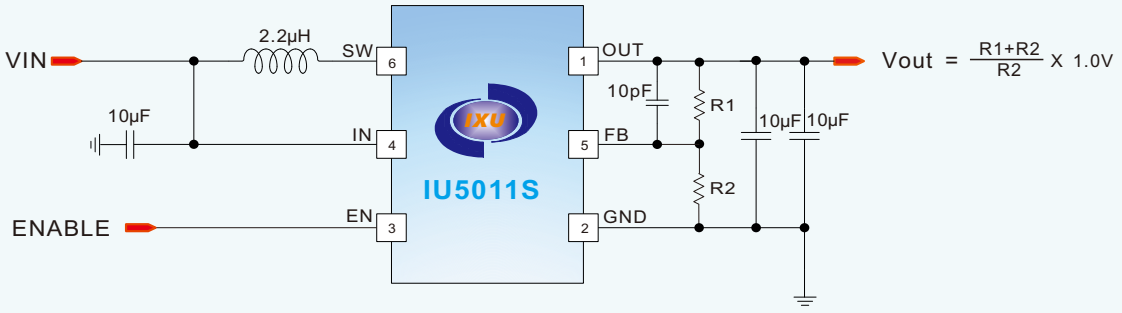
FEATURES

- 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
- VIN > VOUT, the system switches to the pass-through mode
- Internal Synchronous Rectifier
- Current Mode control
- Logic Control Shutdown and Thermal shutdown
- SOT23-6L Package

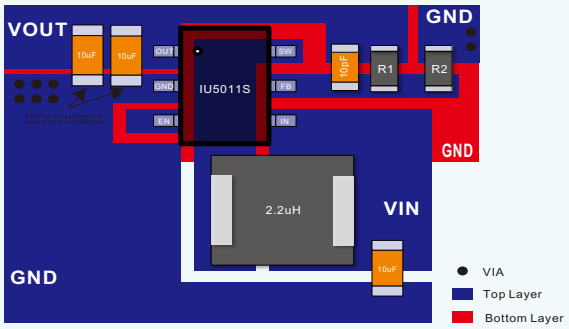
APPLICATIONS

- TWS
- Tablet MID
- Smart phone
- Power Bank
- Keyboard
- Mouse
- Plaything
- MIC

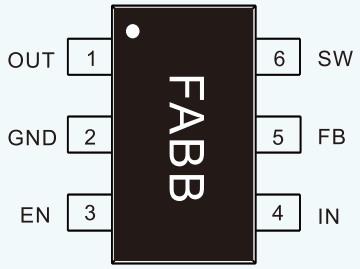
TYPICAL APPLICATION CIRCUIT



PCB Guidelines:



PIN CONFIGURATION (TOP VIEW)

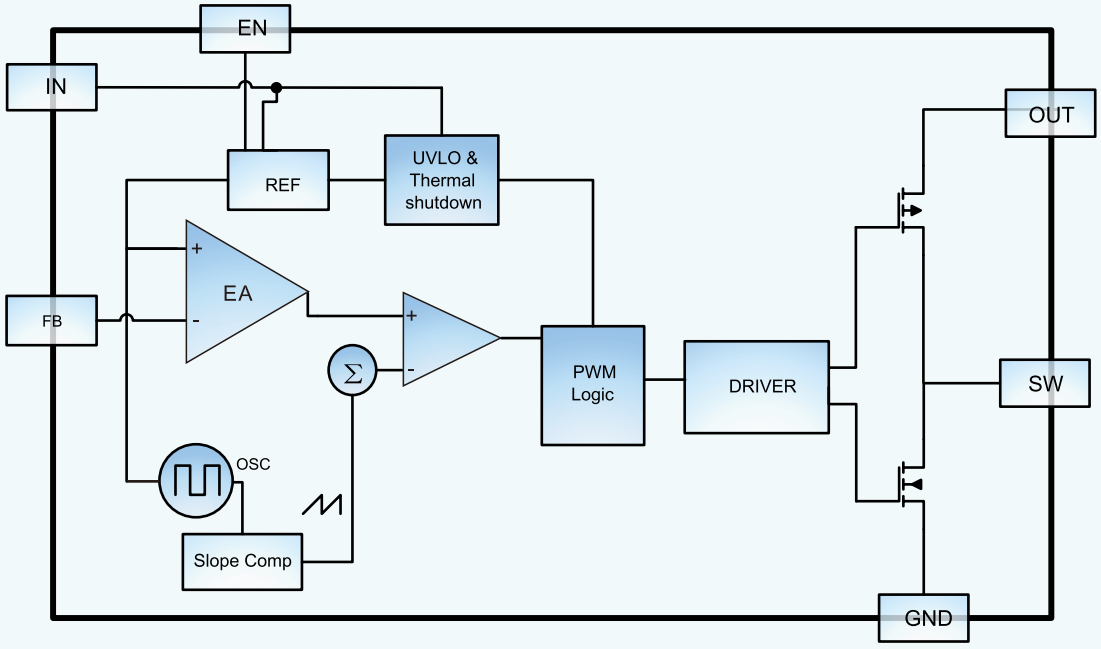


(SOT23-6)

TERMINAL FUNCTIONS

TERMINAL		I/O	DESCRIPTION
NAME	PIN		
OUT	1	O	Output pin.Bypass with a 10μF or larger ceramic capactior 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 10μF 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

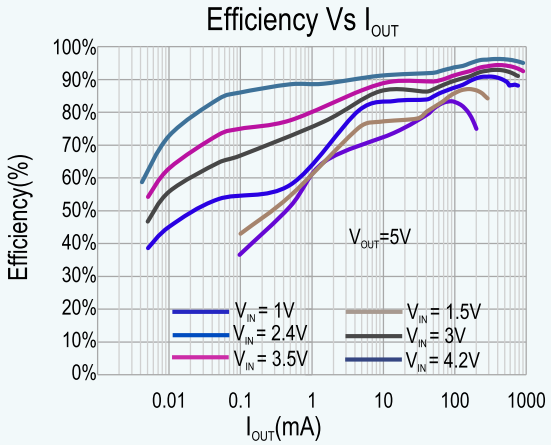
Device	Package	Making	Reel Size	Tape Width	**Quantity**
IU5011S	SOT23-6L		7"	8mm	**3000**

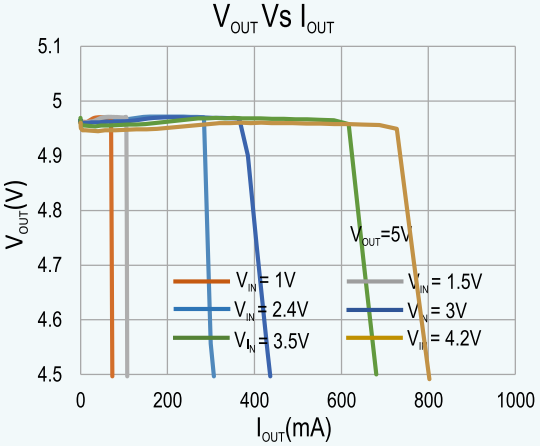
Electrical Characteristics

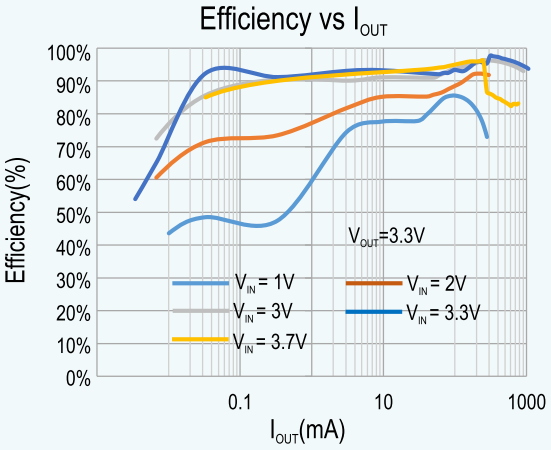
(V_{IN}=3.6V, V_{OUT} = 5V, T_A=25°C unless otherwise specified)

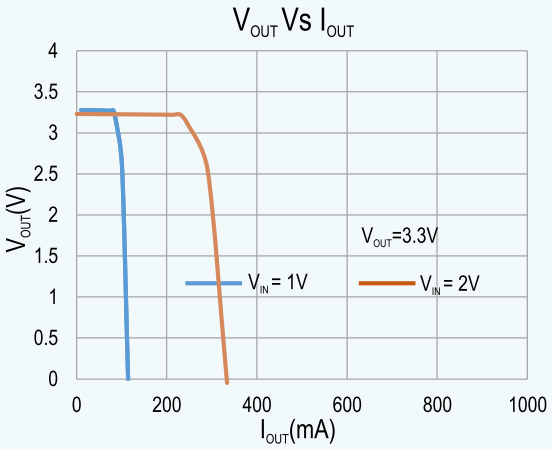
PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Quiescent current at OUT	V_{EN}=IN,No load ,Not Switching		2.0		μA
Shutdown Supply Current at IN	V_{EN}=GND		0.1		μA
IN Startup Voltage	I_{OUT}=1mA		0.9		V
IN Operation voltage	After Start-up	1.0		4.5	V
Output Voltage t 5V		4.90	5.05	5.20	V
Output Voltage t 3.3V		3.2	3.3	3.4	V
Fedback Voltage		0.98	1.0	1.02	V
Switching Frequency			500		Khz
MOS Swtch On Resistance	I_{SW}=100mA		220		mΩ
PMOS Switch On Resistance	I_{SW}=100mA		160		mΩ
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°C		160		°C

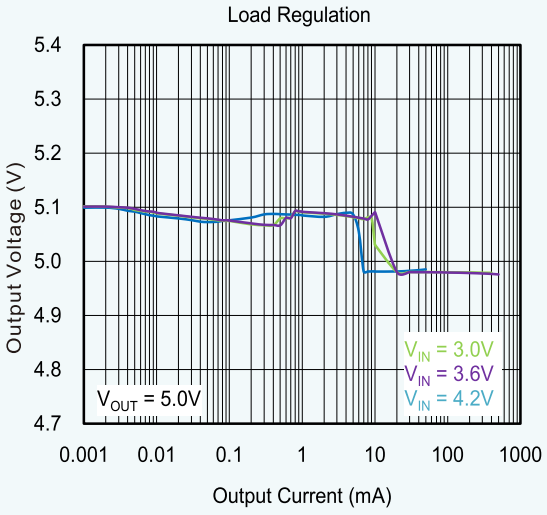
TYPICAL PERFORMANCE CHARACTERISTICS(T_A=25°C unless otherwise specified)

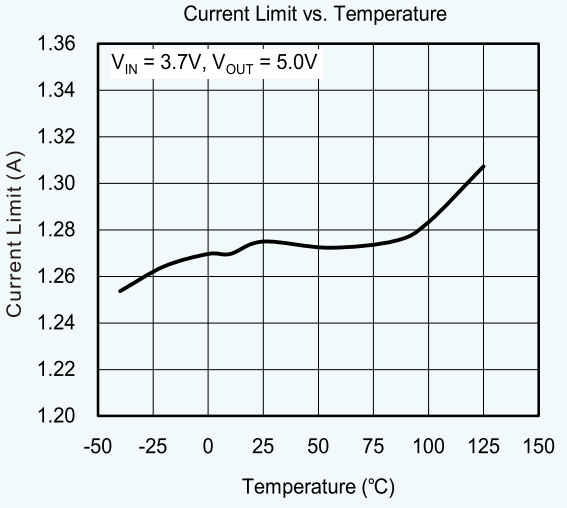




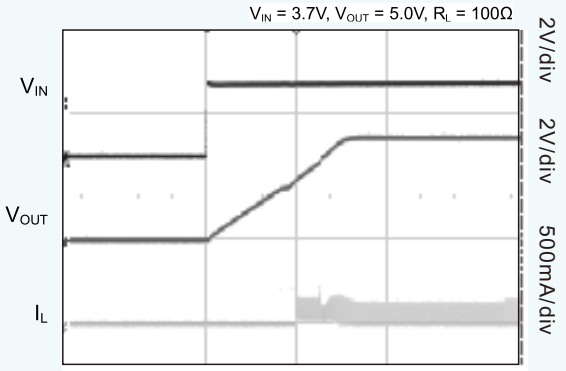






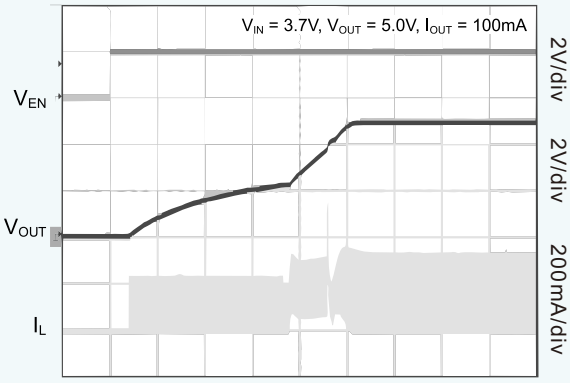


Startup by VIN Pin



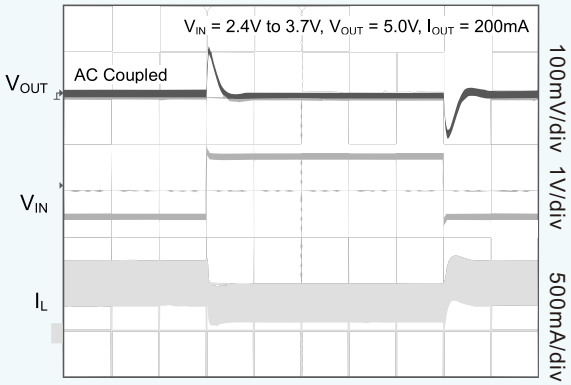
Time (500μs/div)

Startup by EN Pin



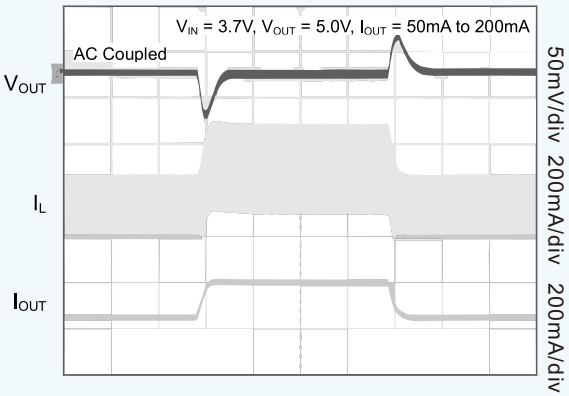
Time (500μs/div)

Line Transient Response



Time (200μs/div)

Load Transient Response



Time (200μs/div)

APPLICATION INFORMATIN

Loop Operation

IU5011S is a high efficiency synchronous step-up coverter with ultra-low quiescent current down to 2μ A.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

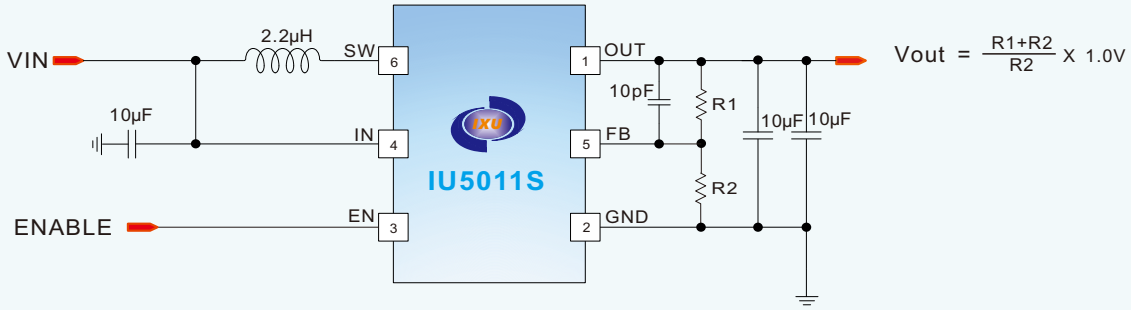
Traditionally,a fixed constant frequency PWM DC/DC regulator always switches even when the output load is small.When energy is shuffling back and forth through the power MOSFET, power is lost due to the finite RDSONs of the MOSFETs and parasitic capacitances.At light load, this loss is prominent and efficiency is therefore very low.IU5011S 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 IU5011S allows for short cicuit 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℃.

Adjustable Output Voltage Setting with FB pin

By adding a resistor divider at FB pin (Rl and R1 as shown i the circuit below),IU5011S an be set to any voltage level less then 5V at output node. But as there is already a large internal resistor (about 20Mohm) from FB to GND to set the fixed output voltagemed ,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:

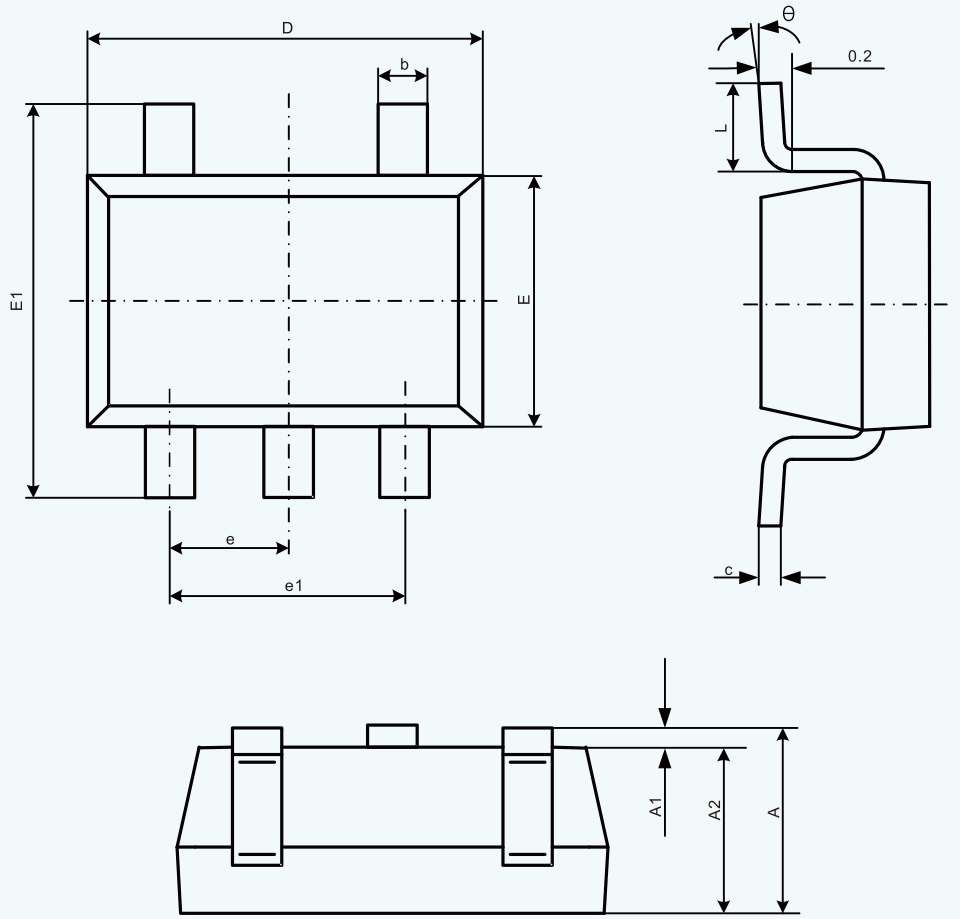


Pass-Through Mode

When the input voltage is higher than the set output voltage, the output voltage will be higher than the target regulated voltage. When the output voltage is 101% of the target regulated voltage, the IU5011S stops the switching action and fully connects the high-side power transistor, and the chip operates in a bypass mode. The output voltage is equal to the input voltage minus the total voltage drop across the inductor DCR and the high-side power transistor RDS(on). When the input voltage drops or the load current increases, the output voltage drops below 96.5% of the set target voltage, the chip will resume the switching action to regulate the output voltage again.

Package information

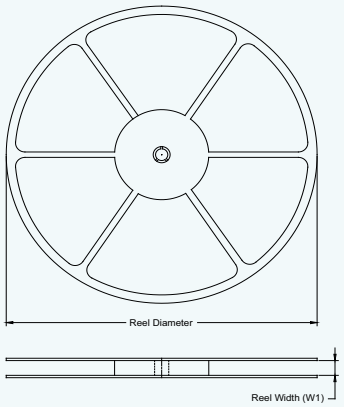
IU5011S SOT23-6L PACKAGE INFORMATION



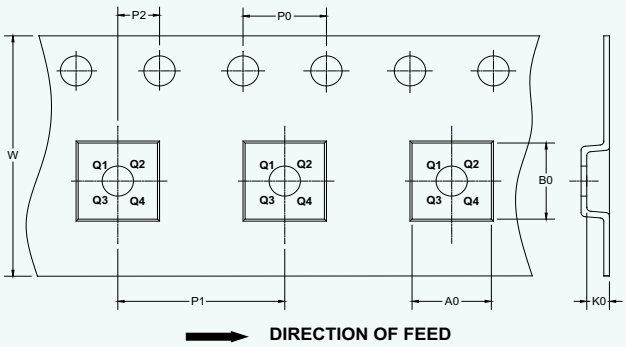
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)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

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



Precautions for MOS Circuit Operation:

Static electricity can be generated in many places. The following precautions can effectively prevent MOS circuit from being damaged due to the sound of electrostatic discharge:

- Operators shall be grounded through anti-static wrist strap.
- The equipment enclosure must be grounded.
- Tools used during assembly must be grounded.
- Conductor packaging or anti-static materials must be used for packaging or transportation.

Declaration:

•Shanghai IXU Semiconductor Co., Ltd. reserves the right to make changes to the manual without prior notice! Customers should obtain the latest version of the material before use and verify whether the relevant information is complete and up-to-date.
•Any semiconductor product has a certain possibility of failure or malfunction under specific conditions. The buyer is responsible for complying with safety standards and taking safety measures when using products from Shanghai IXU Semiconductor Co., Ltd. for system design and complete machine manufacturing, in order to avoid potential risks of failure that may cause personal injury or property damage!
•The pursuit of enhancing product quality is endless. Shanghai IXU Semiconductor Co., Ltd. will wholeheartedly provide customers with even better products!