

#### FEATURES

- Over 92% Efficiency
- Adjustable max output voltage to 5.5V
- Switch Current max 3A
- Programmable Current Limit
- +2.8V to +5.5V Input Range
- 750KHz Fixed Switching Frequency
- 1µA Shutdown Current
- Internal Soft-Start
- Thermal Shutdown
- 70mΩN-Channel power MOSFET
- SOT-26 Pb-free & HF Package

# DESCRIPTION

The AT6121 is a current mode step up converter, fixed frequency, inrush current limiting and internal soft-start. It includes an error amplifier, ramp generator, comparator, built-in 70m  $\Omega$  N-Channel power MOSFET make this regulator highly power efficient.

The 750KHz switching frequency allows for smaller external components producing a compact solution for a wide range of load currents. The AT6121 regulates the output voltage up to 5.5V and provides up to 1A output.

#### **APPLICATION**

- LED lighting
- Down light
- Tube lamp
- PAR lamp
- Bulb

#### **ORDER INFORMATION**



#### PIN CONFIGURATIONS (TOP VIEW)





#### **PIN DESCRIPTIONS**

Pin Name	Pin Description		
VCC	VCC Input Pin		
EN	Enable control. Pull high to turn on. Do not float.		
GND	Ground.		
ED	Feedback Input. FB senses the output voltage to regulate that voltage. Drive FB with a		
FВ	resistive voltage divider from the output voltage.		
SW	Switching Pin		
OC	Adjustable Current limit		

# **TYPICAL APPLICATION CIRCUITS**

1. EC ( Recommend Circuit )



2. MLCC



Figure 3. Typical Application Circuit

V<sub>OUT</sub>=V<sub>FB</sub> × (1+R1/R2), V<sub>FB</sub> = 1.00V, R2 suggest 10k~30kΩ



### **BLOCK DIAGRAM**





#### ABSOLUTE MAXIMUM RATINGS (Note 1)

Parameter	Symbol	Max Value	Unit
Vin pin voltage	V <sub>IN</sub>	-0.3 to 6.0	V
EN,OC,FB pin voltage		-0.3 to V <sub>IN</sub> +0.3	V
SW pin voltage	V <sub>SW</sub>	Internal limit	V
Maximum Junction Temperature	TJ	125	ĉ
Storage Temperature Range	T <sub>STG</sub>	-60 to +150	ĉ
Lead Temperature(Soldering) 5 Sec.	T <sub>LEAD</sub>	260	C
Power Dissipation $P_D @ T_A=25$ °C	P <sub>D</sub>	300	mW
Thermal Resistance Junction to Ambient (Note 2)	$\theta_{JA}$	333	℃/W
Thermal Resistance Junction to Case	θ <sub>JC</sub>	106.6	℃/W
ESD Rating (Human body mode) (Note 3)	V <sub>ESD</sub>	2000	V
ESD Rating (Machine mode) (Note 3)	V <sub>ESD</sub>	200	V

### **RECOMMENDED OPERATING CONDITIONS** (Note 4)

Parameter	Symbol	<b>Operation Conditions</b>	Unit
Supply Input Voltage	V <sub>IN</sub>	2.8 to 5.5	V
Maximum Output Voltage	Vout_max	5.5	V
Operating Junction Temperature Range	TJ	-40 to +125	C
Operating Ambient Temperature Range	T <sub>OPA</sub>	-40 to +85	ĉ

Note 1: Stresses listed as the above "Absolute Maximum Ratings" may cause permanent damage to the device. These are for stress ratings. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may remain possibility to affect device reliability.

Note 2: Thermal Resistance is specified with the component mounted on a low effective thermal conductivity test board in free air at  $T_A=25$  °C.

Note 3: Devices are ESD sensitive. Handling precaution recommended.

Note 4: The device is not guaranteed to function outside its operating conditions.



## **ELECTRICAL CHARACTERISTICS**

 $V_{\text{IN}}$  = 3.6V,  $V_{\text{EN}}$  =3.6V,  $V_{\text{OUT}}$  = 5V,  $T_{\text{A}}$  = 25°C

Parameter	Symbol	Conditions	Min	Тур	Max	Unit
Input Voltage Range	V <sub>IN</sub>		2.8	-	5.5	V
Input UVLO	UVLO		2.4	2.6	2.75	V
Quiescent Current	I <sub>CCQ</sub>	$V_{FB} = 1.3V$	_	300		μA
Shutdown Current	I <sub>SD</sub>	$V_{EN} = 0V$	_	1	3	μA
FB Pin Voltage	$V_{FB}$		0.588	0.6	0.612	V
Load Regulation		0A < I <sub>OUT</sub> <1A	—	0.5	_	%
Line Regulation		2.8V <v<sub>IN&lt;4.5V</v<sub>	—	0.5	_	%/V
EN Pin Voltage High	V <sub>ENH</sub>		1.4	_	_	V
EN Pin Voltage Low	V <sub>ENL</sub>		_	_	0.6	V
EN Pin Leakage Current		$V_{EN} = 3V$	—	0.1	1	μA
Switching Frequency	Fosc	—	—	750	_	KHz
Programmable Switching Current Limit	CL	Roc=15k	—	2.6	_	А
Switching Maximum Duty	Dmax		—	65	_	%
Minimum Duty	Dmin		0	-	_	%
N-Switch R <sub>DS(ON)</sub> (Note 5)	R <sub>DS(ON)-N</sub>		_	70	_	mΩ
Thermal Shutdown	T <sub>SD</sub>		—	155	_	C
Thermal Shutdown Protection hysteresis	Т <sub>зн</sub>		_	30	_	ĉ

Note 5: Guaranteed by design.



#### **APPLICATION INFORMATION**

The AT6121 uses a 750KHz fixed-frequency, current-mode regulation architecture to regulate the output voltage. The AT6121 measures the output voltage through an external resistive voltage divider and compares that to the internal 0.6V reference to generate the error voltage. The current-mode regulator compares the error voltage to the inductor current to regulate the output voltage. The use of current-mode regulation improves transient response and control loop stability.

At the beginning of each cycle, the N-Channel MOSFET switch is turned on, forcing the inductor current to rise. The current at the source of the switch is internally measured and converted to a voltage by the current sense amplifier. That voltage is compared to the error voltage. When the inductor current rises sufficiently, the PWM comparator turns off the switch, forcing the inductor current to the output capacitor through the SBD, which forces the inductor current to decrease. The peak inductor current is controlled by the error voltage, which in turn is controlled by the output voltage. Thus the output voltage controls the inductor current to satisfy the load.

#### Soft-Start

The AT6121 includes a soft-start timer that limits the voltage at the error amplifier output during startup to prevent excessive current at the input. This prevents premature termination of the source voltage at startup due to inrush current. This also Immense Advance Tech. limits the inductor current at startup, forcing the input current to rise slowly to the amount required to regulate the output voltage during soft-start.

#### **Current Limit**

A resistor between OC and GND pin programs peak switch current. The resistor value should be between 10k to 135k. the current limit will be set from 3.3A to 1A. Keep traces at pin as short as possible. Do not put capacitance at OC pin. To set the over current point according to the following equation:

ICL=180000/(45k +R3)



#### PACKAGE OUTLINE DIMENSIONS Sot-26 Package outline dimensions







Symbol	<b>Dimensions In Millimeters</b>		
	Min	Max	
Α	1.05	1.45	
A1	0.05	2.15	
A2	0.90	1.30	
С	0.08	0.22	
D	2.70	3.10	
E	2.60	3.00	
E1	1.40	1.80	
L	0.30	0.60	
L1	0.50	0.70	
L2	0.25 REF.		
Θ	<b>0</b> °	<b>8</b> °	
b	0.30	0.50	
е	0.85	1.15	
e1	1.80	2.00	

#### Note :

Information provided by IAT is believed to be accurate and reliable. However, we cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in an IAT product; nor for any infringement of patents or other rights of third parties that may result from its use. We reserve the right to change the circuitry and specifications without notice.

Life Support Policy: IAT does not authorize any IAT product for use in life support devices and/or systems. Life support devices or systems are devices or systems which, (I) are intended for surgical implant into the body or (II) support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user. Typical numbers are at 25°C and represent the most likely norm.