1.5MHz, 800mA Synchronous Step-Down Regulator

Features

• High Efficiency: Up to 96%
• Very Low Quiescent Current: 35μA
• 800mA Output Current
• 2.3V to 5.5V Input Voltage Range
• 1.5MHz Constant Frequency Operation
• No Schottky Diode Required
• Low Dropout Operation: 100% Duty Cycle
• 0.6V Reference Allows Low Output Voltages
• Shutdown Mode Draws ≤ 1μA Supply Current
• Current Mode Operation for Excellent Line and Load Transient Response
• Over temperature Protected

General Description

The RCR2001L series are a high efficiency monolithic synchronous buck regulator using a constant frequency, current mode architecture. The device is available in an adjustable version and fixed output voltages of 1.2V, 1.5V,1.8V,2.5V and 3.3V. Supply current during operation is only 35μA and drops to ≤ 1μA in shutdown. The 2.3V to 5.5V input voltage range makes the RCR2001L ideally suited for single Li-Ion battery-powered applications. 100% duty cycle provides low dropout operation, extending battery life in portable systems. Automatic Burst Mode operation increases efficiency at light loads, further extending battery life.

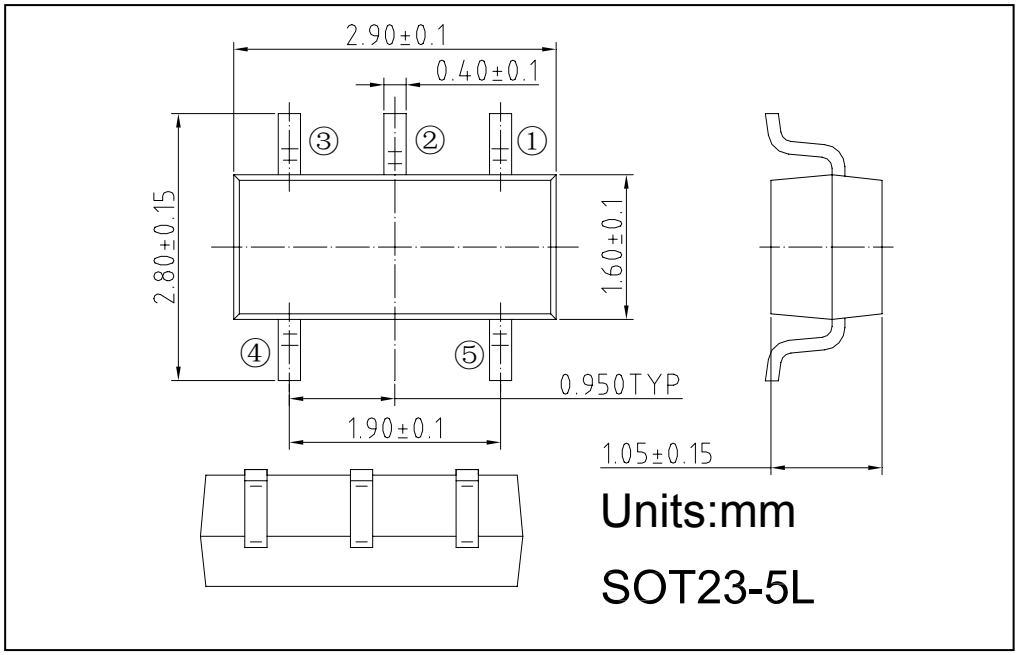
Switching frequency is internally set at 1.5MHz, allowing the use of small surface mount inductors and capacitors.

The internal synchronous switch increases efficiency and eliminates the need for an external Schottky diode. Low output voltages are easily supported with the 0.6V feedback reference voltage. The RCR2001L is available in a low profile (1mm) Thin SOT23-5L package.

Applications

• Cellular Telephones
• Personal Information Appliances
• Wireless and DSL Modems
• Digital Still Cameras
• MP3 Players
• Portable Instruments

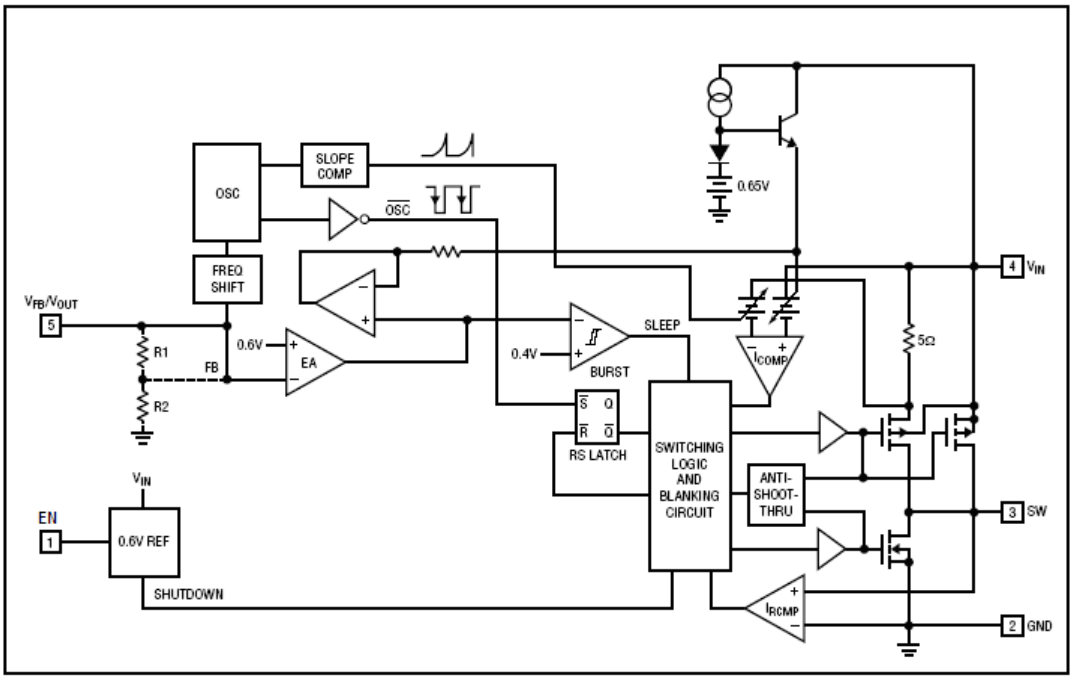
Package Information



- **Pin Configurations**

Pin Configurations Code						
Pin Type	A		…	E		
Pin Name	SOT23-5L			Pin Name	SOT23-5L	
	RCR2001L-AD	RCR2001L-FIXED			RCR2001L-AD	RCR2001L-FIXED
①	EN	EN	…	①	VIN	VIN
②	GND	GND	…	②	GND	GND
③	SW	SW	…	③	EN	EN
④	VIN	VIN	…	④	VFB	VOUT
⑤	VFB	VOUT	…	⑤	SW	SW

- **Functional Block Diagram**



- **Ordering Information**

RCR2001L - □ □ □ □ □

Package Type :
SK: SOT23-5L
Pin Assignment
A; E Refer to the Pin Configuration
Output Voltage
12 = 1.2V; 15 = 1.5V; 18 = 1.8V; 25=2.5V;33=3.3V;AD = ADJ
Indicate the product number

- **Absolute Maximum Ratings**

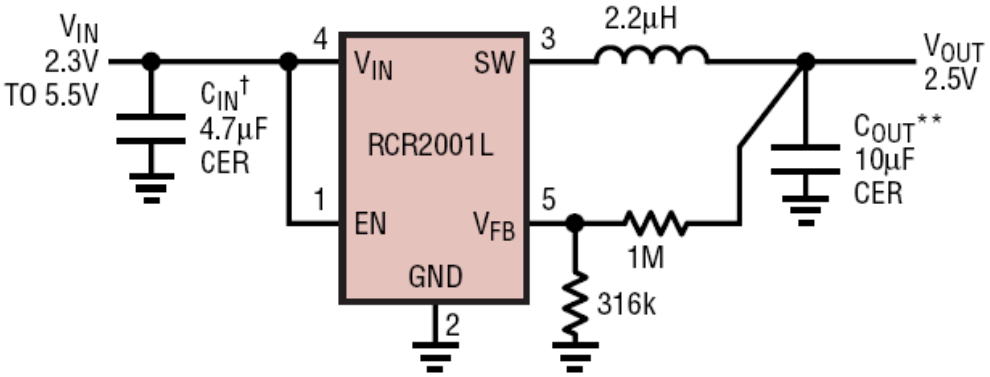
Parameter	Symbol	Ratings	Unit
Supply Voltage	V_{IN}	-0.3 to 6	V
EN,VFB Voltages	V_{EN}	-0.3 to V_{IN}	V
SW Voltage	V_{SW}	-0.3 to V_{IN} +0.3	V
Peak SW Sink and Source Current	I_{PK}	1.8	A
Operation Temperature	T_{OPR}	-40 to +85	℃
Storage Temperature Range	T_{STG}	-65 to +150	℃

- **Electrical Characteristics**

T_A = 25°C. V_{IN} = V_{EN} =3.6V, V_{OUT}=1.8V,unless otherwise specified.

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Input Voltage Range	V_{IN}		2.3	--	6	V
UVLO Threshold	V_{UVLO}		1.7	1.9	2.1	V
Input DC Bias Current Sleep Mode Shutdown	I_S	V_{FB} = 0.63V, I_{LOAD} = 0A V_{EN} = 0V, V_{IN} = 4.2V	--	20 0.1	35 1	μA μA
Regulated Feedback Voltage	V_{FB}	T_A = 25°C 0°C ≤ TA ≤ 85°C –40°C ≤ T_A ≤ 85°C	0.588 0.586 0.585	0.6 0.6 0.6	0.612 0.613 0.615	V V V
Reference Voltage Line Regulation	ΔV_{FB}	V_{IN} = 2.7V to 5.5V	--	0.04	0.4	%/V
Regulated Output Voltage	V_{OUT}	RCR2001L - 1.2, I_{OUT} = 100mA RCR2001L - 1.5, I_{OUT} = 100mA RCR2001L - 1.8, I_{OUT} = 100mA	1.164 1.455 1.746	1.2 1.500 1.800	1.236 1.545 1.854	V
Output Voltage Line Regulation	ΔV_{OUT}	V_{IN} = 2.7V to 5.5V	--	0.04	0.4	%/V
Peak Inductor Current	I_{PK}	V_{IN} = 3V, V_{FB} = 0.5V or V_{OUT} = 90%, Duty Cycle < 35%	--	1.5	--	A
Output Voltage Load Regulation	$V_{LOADREG}$		--	0.5	--	%/A
Feedback Current	I_{FB}		--	--	±30	nA
Oscillator Frequency	F_{OSC}	V_{FB} = 0.6V or V_{OUT} = 100%	--	1.5	--	MHz
		V_{OUT} =0	--	300	--	kHz
RDS (ON) of P-Channel FET	R_{PFET}	I_{SW} = 100mA	--	0.35	0.45	Ω
RDS (ON) of N-Channel FET	R_{NFET}	I_{SW} = –100mA	--	0.3	0.45	Ω
EN Input Logic Low Threshold	V_{IL}	T_J = -40℃ to 125℃	--	--	0.3	V
EN Input Logic High Threshold	V_{IH}	T_J = -40℃ to 125℃	1.5	--	--	V
EN Leakage Current	I_{EN}		--	±0.01	±1	μA
SW Leakage	ILSW	VEN = 0V, VSW = 0V or 5V, VIN = 5V	--	±0.01	±1	μA

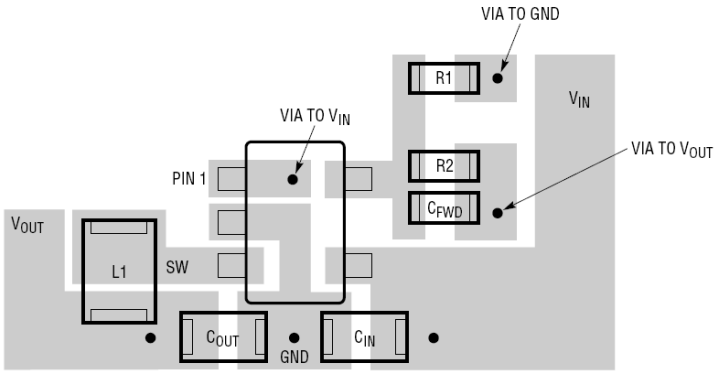
- **Typical Application Circuit(RCR2001L-ADASK)**



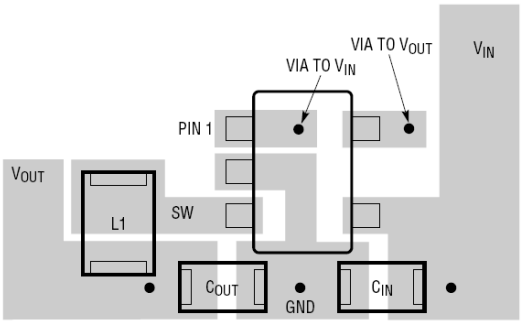
PCB Layout Checklist

When laying out the printed circuit board, the following checklist should be used to ensure proper operation of the RCR2001L. Check the following in your layout:

1. The power traces, consisting of the GND trace, the SW trace and the V_{IN} trace should be kept short, direct and wide.
2. Does the V_{FB} pin connect directly to the feedback resistors? The resistive divider R1/R2 must be connected between the (+) plate of C_{OUT} and ground.
3. Does the (+) plate of C_{IN} connect to V_{IN} as closely as possible? This capacitor provides the AC current to the internal power MOSFETs.
4. Keep the switching node, SW, away from the sensitive V_{FB} node.
5. Keep the (–) plates of C_{IN} and C_{OUT} as close as possible.

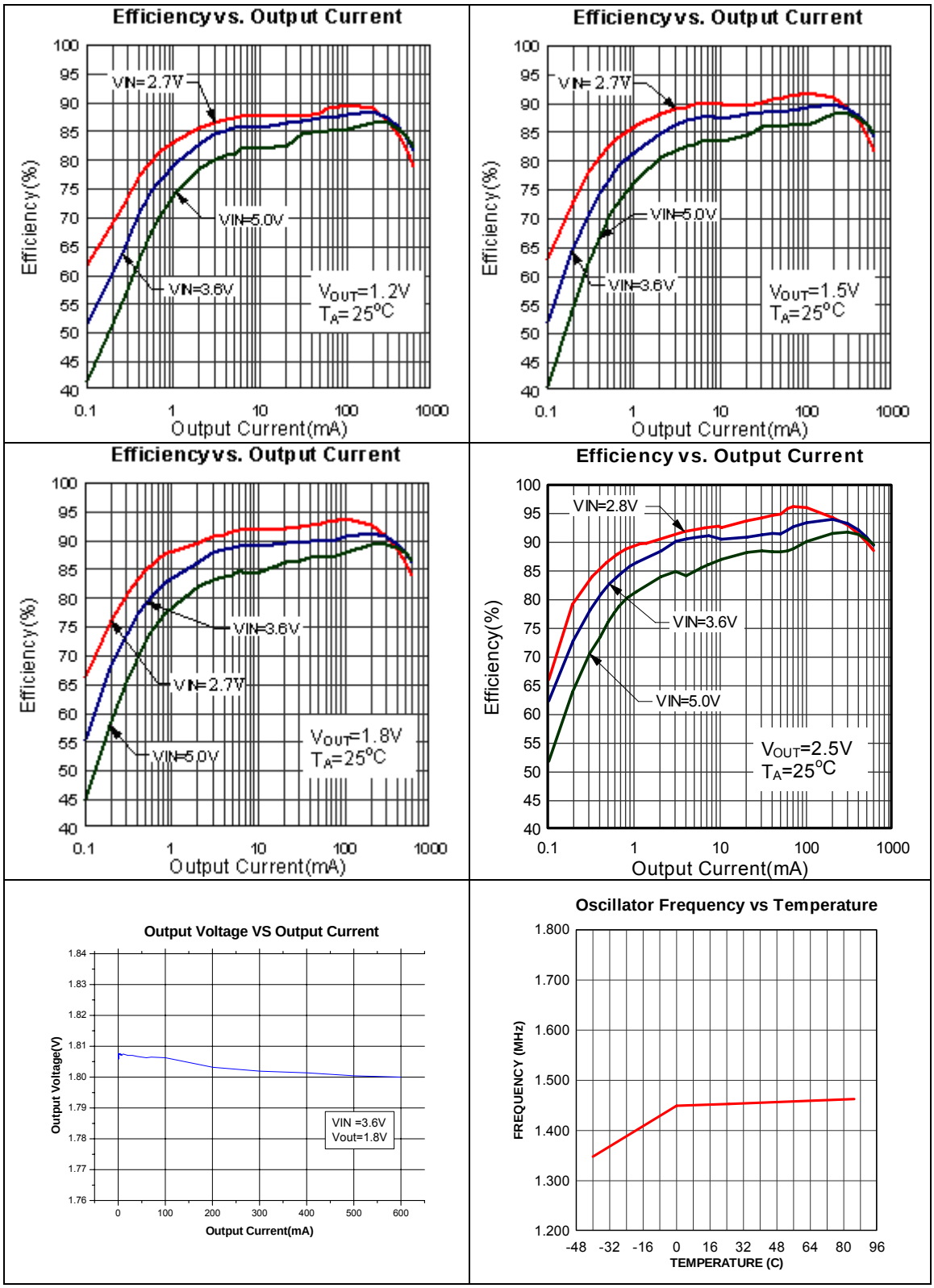


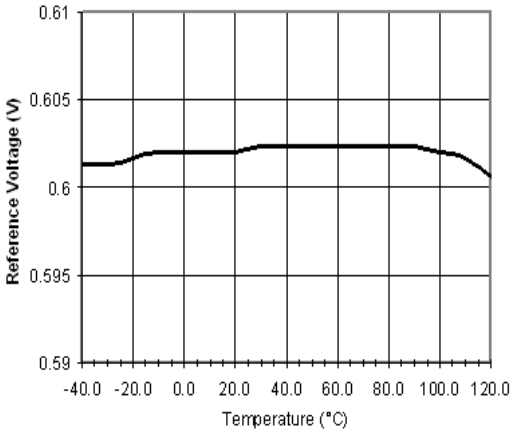
RCR2001L-ADJ Suggested Layout

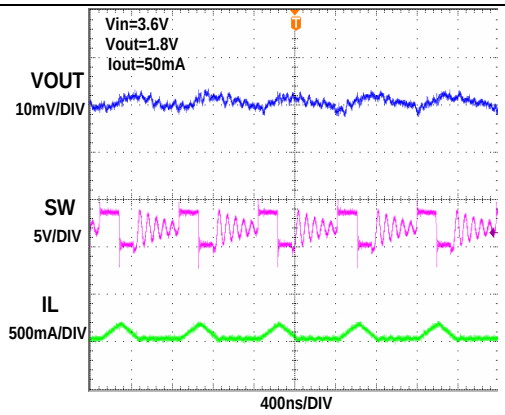


RCR2001L-1.8V Suggested Layout

- **Typical Performance Characteristics**




0.61
0.605
0.6
0.595
0.59
Reference Voltage (V)
-40.0 -20.0 0.0 20.0 40.0 60.0 80.0 100.0 120.0
Temperature (°C)


Vin=3.6V
Vout=1.8V
Iout=50mA
VOUT
10mV/DIV
SW
5V/DIV
IL
500mA/DIV
400ns/DIV

PFM MODE

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