Switching Type Regulator SI-3201S

Features

- Output current of 3A (Ta = 25ºC, V_{IN} = 8 to 18V)
- High efficiency of 82% (V_{IN} = 14V, I_O = 2A)
- Requires 5 external components only
- Built-in reference oscillator (60kHz)
- Phase internally corrected
- Output voltage internally corrected
- Built-in overcurrent and thermal protection circuits
- Built-in soft start circuit

Absolute Maximum Ratings (Ta=25ºC)

Parameter	Symbol	Ratings	Unit	Conditions
Input voltage	V_{IN}	35	V	
Output voltage	I_O	3	A	
SQ terminal voltage with respect to ground	$V_{O, SQ}$	–1	V	
Power Dissipation	P_{D1}	22	W	With infinite heatsink
	P_{D2}	1.8	W	Stand-alone
Junction temperature	Tj	–40 to +150	ºC	
Storage temperature	Tstg	–40 to +125	ºC	
Junction to case thermal resistance	$\theta_{j\text{-}c}$	5.5	ºC/W	
Junction to ambient-air thermal resistance	$\theta_{j\text{-}a}$	66.7	ºC/W	

Recommended Operating Conditions

Parameter	Symbol	Ratings min	Ratings typ	Ratings max	Unit	Conditions
Input voltage	V_{IN}	8		18	V	
Output current	I_O	0.5		3	A	
Operating temperature	Top	–40		+85	ºC	Ta—P_D characteristics

Electrical Characteristics (V_{IN} = 14V, I_{OUT} = 2A, Tj = 25ºC unless otherwise specified)

Parameter		Symbol	Ratings min	Ratings typ	Ratings max	Unit	Conditions
Output voltage		V_O	4.80	5.00	5.20	V	
Line regulation		$\Delta V_{O\ LINE}$			100	mV	V_{IN} = 8 to 18V
Load regulation		$\Delta V_{O\ LOAD}$			50	mV	I_O = 0.5 to 3A
Efficiency *1		η		82		%	
Oscillation frequency		f_{OSC}	50	60	70	kHz	
Quiescent circuit current		Iq		5	10	mA	I_O = 0A
Overcurrent protection starting current		I_S	3.1			A	*2
Soft start terminal *3	Low level voltage	V_{SSL}			0.2	V	
	Source current when low	I_{SSL}	15	25	35	µA	V_{SSL} = 0.2V
	Discharge resistance	R_{DIS}			4	kΩ	

Notes:

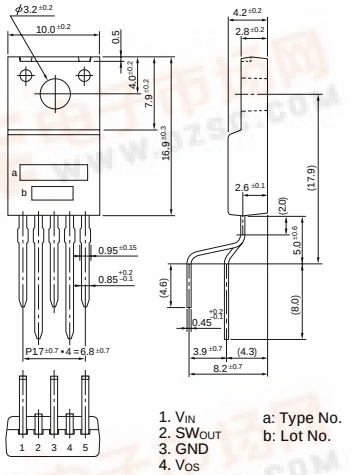
*1. Efficiency is calculated by the following equation:

$$\eta = \frac{V_O \bullet I_O}{V_{IN} \bullet I_{IN}} \bullet 100\ (\%)$$

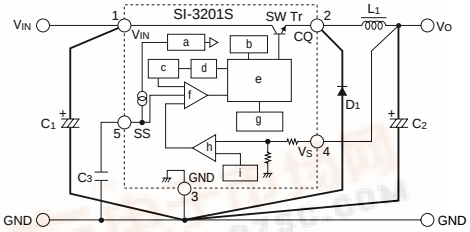
*2. A drooping-type overcurrent protection circuit is built in the IC.

*3. An external voltage may not be applied to the soft start terminal. As shown in the diagram to the right, use this IC in the soft start mode with a capacitor or in the open-collector drive mode with a transistor. Leave the soft start terminal open when not using it since it is already pulled up in the IC.

External Dimensions (unit: mm)



Standard Circuit Diagram



C1: 1000µF
C2: 1000µF
L1: 250µH
D1: RK46 (Sanken)

a: Internal power supply
b: Thermal protection
c: Reference oscillator
d: Reset
e: Latch & driver
f: Comparator
g: Overcurrent protection
h: Error amplifier
i: Reference voltage

Cautions:

(1) A high-ripple current flows through C_1 and C_2. Use high-ripple type 1000µF or higher capacitors with low internal resistance. Refer to the respective data books for more information on reliability and electrical characteristics of the capacitor.

(2) C_3 is a capacitor used for soft start.

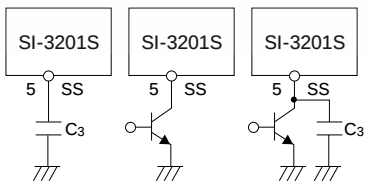
(3) L_1 should be a choke coil with a low core loss for switching power supplies.

(4) Use a Schottky barrier diode for D_1 and make sure that the reverse voltage applied to the 2nd terminal (SQ terminal) is within the maximum ratings (–1V). If you use a fast-recovery diode, the recovery voltage and the ON forward voltage may cause a reversed-bias voltage exceeding the maximum ratings to be applied to the 2nd terminal (SQ terminal). Applying a reversed-bias voltage exceeding the maximum rating to the 2nd terminal (SQ terminal) may damage the IC.

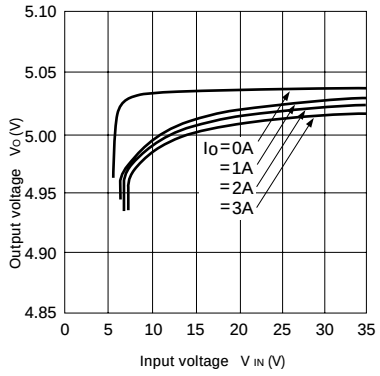
(5) The 4th terminal (V_S) is an output voltage detection terminal. Since this terminal has a high impedance, connect it to the positive (+) terminal of C_2 via the shortest possible route.

(6) Leave the 5th terminal (soft start terminal) open when not using it. It is pulled up internally.

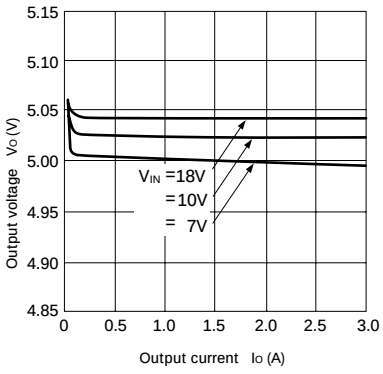
(7) To ensure optimum operating environment, connect the high-frequency current line with minimum wiring length.



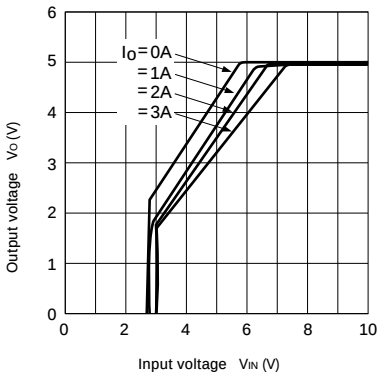
■ Line Regulation



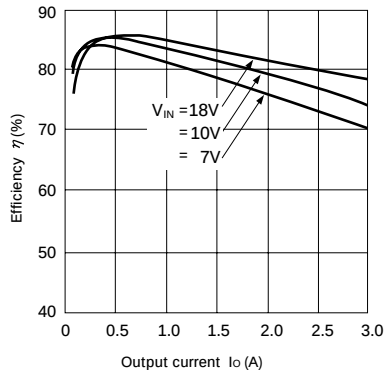
■ Load Regulation



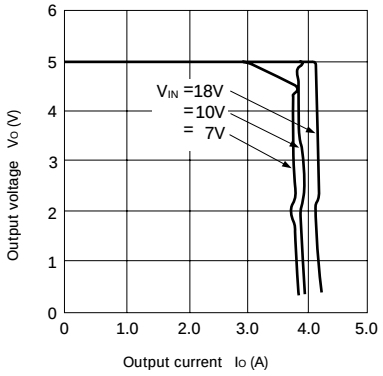
■ Rise Characteristics



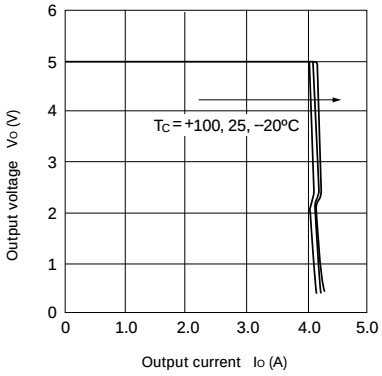
■ Efficiency Curve



■ Overcurrent Protection Characteristics



■ Overcurrent Protection Temperature Characteristics



■ Ta—PD Characteristics