STA820M Series Separate Excitation Switching Mode Regulator ICs with Flywheel Diode

■Features

- Output current: 3A
- High efficiency: TYP 83% (STA821M)
- Built-in flywheel diode (Schottky-barrier diode)
- Requires only 3 discrete components: output coil, input and output capacitors
- Phase correction and output voltage adjustment performed internally
- Built-in reference oscillator (110kHz)
- Built-in foldback-overcurrent and thermal protection circuits
- Built-in ON/OFF circuit (soft start available)

■Applications

- Power supplies for telecommunication equipment
- On-board local power supplies
- OA equipment
- For stabilization of the secondary-side output voltage of switching power supplies

■Lineup

Part Number	Output Voltage (V)
STA821M	5

Output voltage: 3.3V, 9V, 12V; adjustable types currently being planned

■Absolute Maximum Ratings[1]

Parameter	Symbol	Ratings	Unit
DC Input Voltage	V_{IN}	31	V
Output Current	I_O	3	A
Power Dissipation[2]	P_{D1}	18.2 (With infinite heatsink)	W
	P_{D2}	2.7 (Without heatsink, stand-alone operation)	W
Junction Temperature	T_j	+125	°C
Storage Temperature	T_{stg}	−40 to +125	°C
Thermal Resistance (Junction to Case)	θ_{j-c}	5.5	°C/W
Thermal Resistance (Junction to Ambient Air)	θ_{j-a}	37	°C/W

[1]: The absolute maximum ratings show the destructive limit. No parameter should exceed the ratings in transient or normal operations.

[2]: Limited by thermal protection.

■Recommended Operating Conditions[1]

Parameter	Symbol	Ratings STA821M min.	max.	Unit
DC Input Voltage Range	V_{IN}	7	30	V
Output Current Range[2]	I_O	0	3	A
Operating Junction Temperature Range	T_{jop}	−30	+125	°C
Ambient Temperature Range[2]	T_{op}	−30	+80	°C

[1]: The recommended operating conditions show the operating conditions required for the normal circuit function described in the electrical characteristics. These conditions must be followed in actual use.

[2]: Limited by T_a-P_D characteristics.
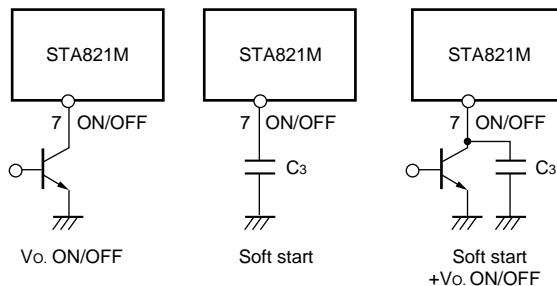
■Electrical Characteristics

(Ta=25°C)

Parameter		Symbol	Ratings STA821M min.	typ.	max.	Unit
Output Voltage		V_O	4.8	5.0	5.2	V
		Conditions	V_{IN}=20V, I_O=1A			
Efficiency[1]		η		83		%
		Conditions	V_{IN}=20V, I_O=1A			
Oscillation Frequency		f_O		110		kHz
		Conditions	V_{IN}=20V, I_O=1A			
Line Regulation		V_{Line}		40	100	mV
		Conditions	V_{IN}=10 to 30V, I_O=1A			
Load Regulation		V_{Load}		10	40	mV
		Conditions	V_{IN}=20V, I_O=0.5 to 1.5A			
Temperature Coefficient of Output Voltage		$\Delta V_O/\Delta T$		±0.5		mV/°C
Overcurrent Protection Starting Current		I_S	3.1			A
		Conditions	V_{IN}=20V			
ON/OFF Terminal[2]	Low Level Voltage	V_{SSL}		0.2		V
	Outflow Current at Low Voltage	I_{SSL}	15	25	35	μA
		Conditions	V_{SSL}=0.2V			
Quiescent Circuit Current		I_q		4		mA
		Conditions	V_{IN}=20V, I_O=0A			

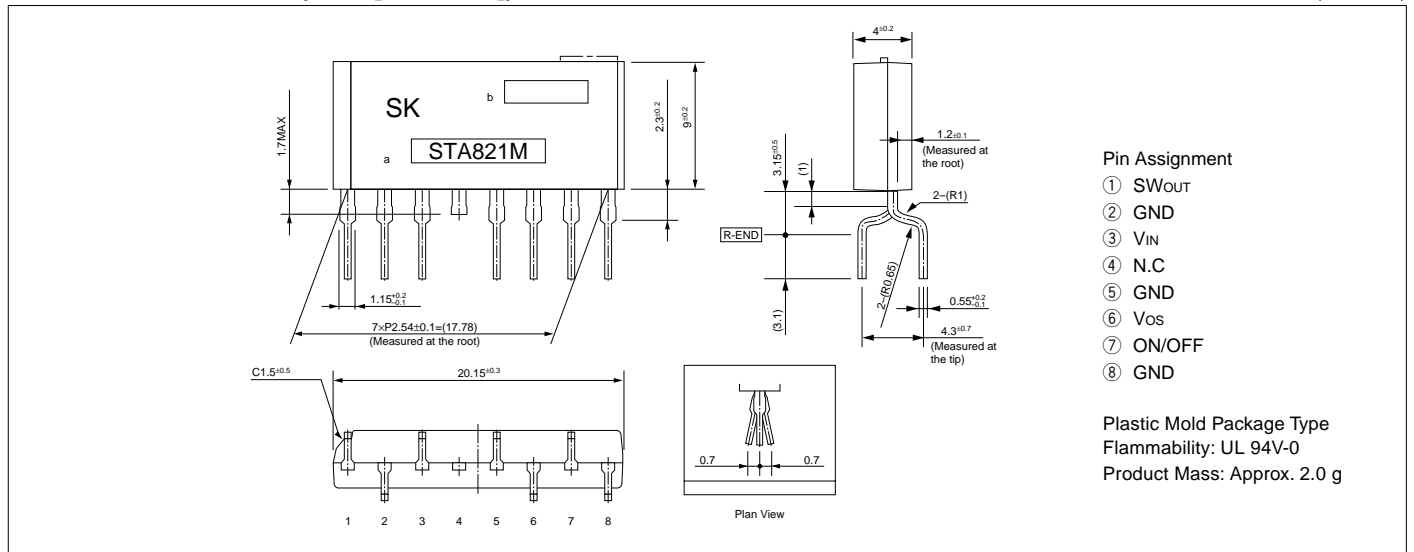[1]: Efficiency is calculated from the following formula.

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

[2]: Pin 7 is the ON/OFF pin. Soft start at power on can be performed by connecting a capacitor to this pin. The output can also be turned ON/OFF with this pin. The output is stopped by setting the voltage of this pin to V_{SSL} or lower. ON/OFF-pin voltage can be changed with an open-collector drive circuit of a transistor. When using both the soft-start and ON/OFF functions together, the discharge current from C_3 flows into the ON/OFF control transistor. Therefore, limit the current securely to protect the transistor if C_3 capacitance is large. The ON/OFF pin is pulled up to the power supply in the IC, so applying the external voltage is prohibited. If this pin is not used, leave it open.
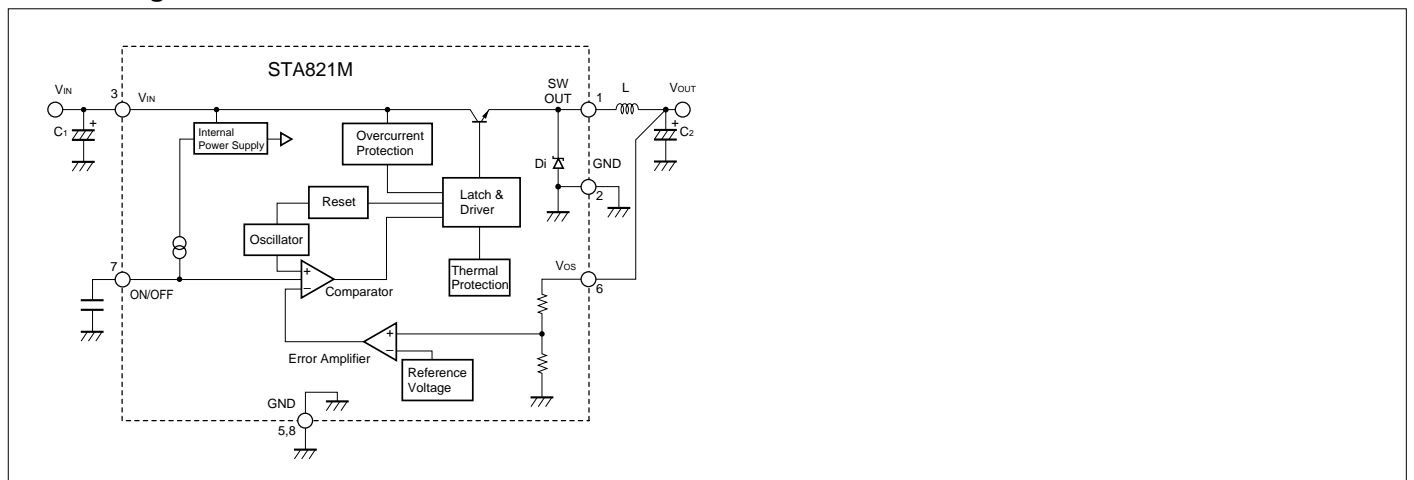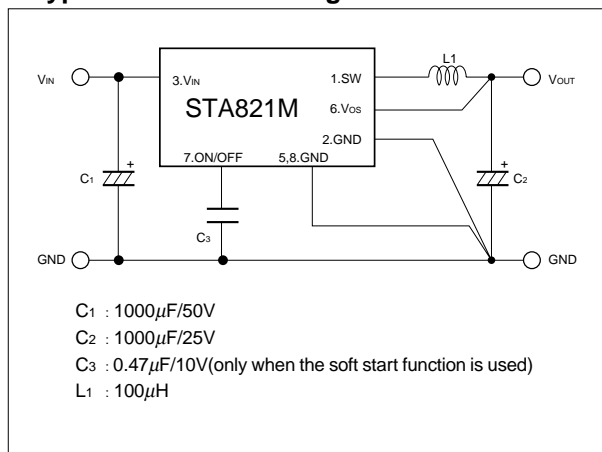

VO. ON/OFF

Soft start

Soft start +VO. ON/OFF

■External Dimensions (SIP8 [STA 8Pin])

(Unit : mm)

SK

STA821M

Pin Assignment
① SW$_{OUT}$
② GND
③ V$_{IN}$
④ N.C
⑤ GND
⑥ V$_{OS}$
⑦ ON/OFF
⑧ GND

Plastic Mold Package Type
Flammability: UL 94V-0
Product Mass: Approx. 2.0 g

1.7MAX

2.3$^{±0.2}$
9$^{±0.2}$

4$^{±0.2}$

1.2$±0.1$
(Measured at the root)

2–(R1)

3.15$^{±0.5}$
(1)

R-END

2–(R0.65)

(3.1)

0.55$^{+0.2}_{-0.1}$

4.3$^{±0.7}$
(Measured at the tip)

1.15$^{+0.2}_{-0.1}$

7×P2.54±0.1=(17.78)
(Measured at the root)

C1.5$^{±0.5}$

20.15$^{±0.3}$

0.7   0.7

Plan View

1 2 3 4 5 6 7 8

■Block Diagram

■Typical Connection Diagram

C$_1$: 1000μF/50V
C$_2$: 1000μF/25V
C$_3$: 0.47μF/10V(only when the soft start function is used)
L$_1$: 100μH

■T$_a$-P$_D$ Characteristics

$$P_D = V_O \cdot I_O \left(\frac{100}{\eta\chi} - 1\right)$$

V$_O$: Output voltage
V$_{IN}$: Input voltage
I$_O$: Output current
$\eta\chi$: Efficiency (%)