

SI-8511NVS Surface-Mount, Synchronous Rectifier Step-down Switching Mode Control ICs

■ Features

- Surface-mount package (TSSOP24)
- High efficiency due to synchronous rectification: 92% (at $V_{IN} = 5V$, $I_o = 1A$, $V_o = 2.5V$)
- Capable of downsize a choke-coil due to IC's high switching frequency (400kHz typ, On Time Control). (Compared with conventional Sanken devices)
- Low reference voltage (V_{ref}) of 1.1V. The output voltage is variable from 1.1V to 6V.
- High-speed response to a load
- Compatible with low ESR capacitors
- Soft start and output ON/OFF available
- Built-in overcurrent and output-overvoltage protection circuits
- PWRGD function to indicate the output voltage status
- High precision reference voltage: $1.1V \pm 1.2\%$

■ Absolute Maximum Ratings

(Ta=25°C)

Parameter	Symbol	Ratings	Unit
Control-System DC Input Voltage	V _{CC}	7	V
DC Input Voltage	V _{IN}	25	V
Boost Block Input Voltage	V _H	30	V
EN Terminal Input Voltage	V _{EN}	V _{CC}	V
PWRGD Terminal Applied Voltage	V _{PWRGD}	7	V
Junction Temperature	T _J	+150	°C
Storage Temperature	T _{Stg}	-40 to +150	°C

■ Applications

- Power supplies for notebook PCs and mobile devices
- Onboard local power supplies
- OA equipment
- For stabilization of the secondary-side output voltage of switching power supplies

■ Recommended Operating Conditions

Parameter	Symbol	Ratings	Unit
Control System Input Voltage Range	V _{CC}	4.5 to 5.5	V
Input Voltage Range	V _{IN}	3 to 18	V
Output Voltage Range	V _O	1.1 to 6	V
Operating Temperature Range	T _{OP}	-20 to +85	°C

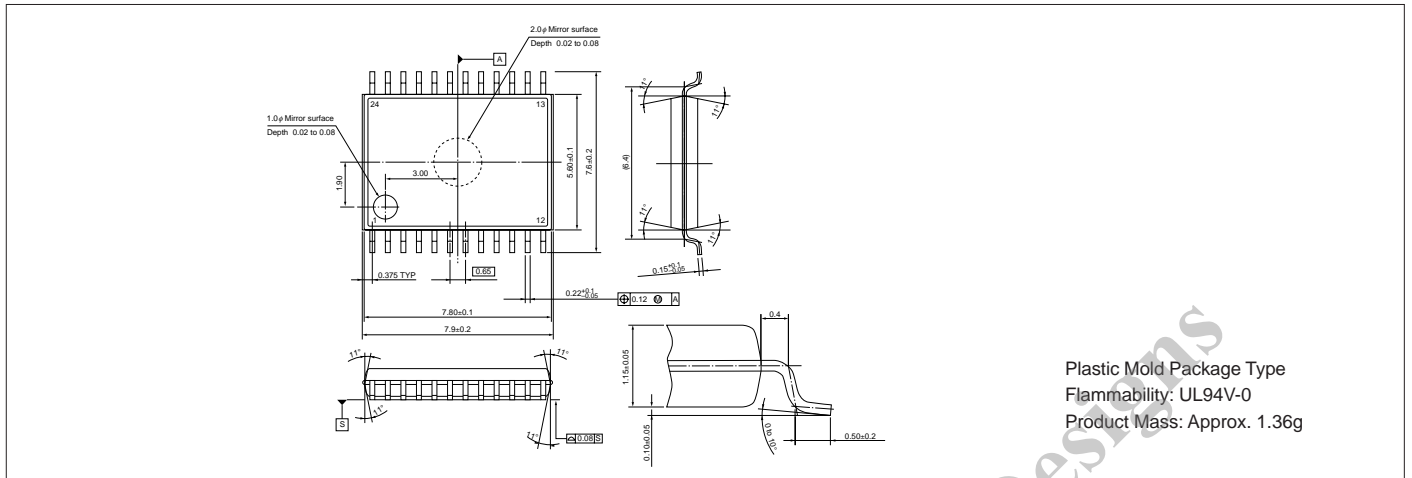
■ Electrical Characteristics

(Ta=25°C unless otherwise specified)

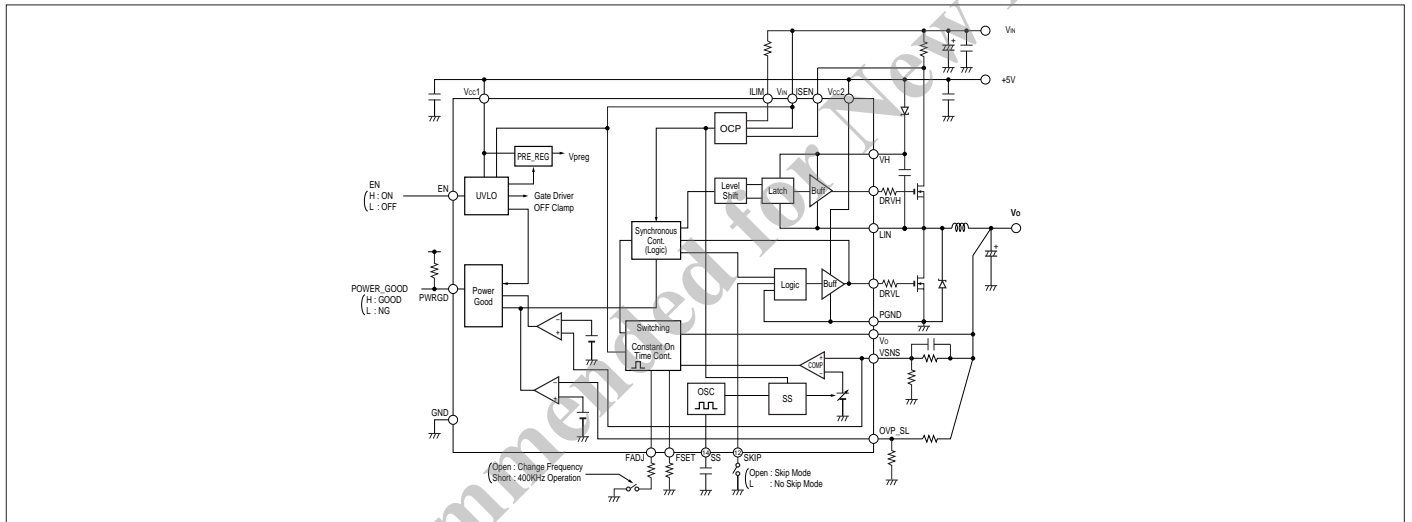
Parameter	Symbol	Ratings			Unit	Conditions	
		min.	typ.	max.			
Dynamic Characteristics	Output Voltage	V _O	-1.2%	1.1	+1.2%	V	V _{IN} =5V, V _{CC} =5V, VSNS connected to V _O , I _O =0A
	Temperature Coefficient of Output Voltage	$\Delta V_o/\Delta T$		±0.03		mV/°C	V _{IN} =5V, V _{CC} =5V, VSNS connected to V _O , I _O =0A, T _a =0 to 85°C
Circuit Current	Circuit Current (V _{CC} Terminal)	I _{OP}			6	mA	V _{CC} =5V, EN=H, FADJ=open
	Circuit Current (V _{IN} Terminal)	I _{OP}			1	mA	V _{IN} =5V, EN=H
	Standby Current 1 (V _{CC} Terminal)	I _{st1}			100	μA	V _{CC} =5V, EN=L
	Standby Current 2 (V _{IN} Terminal)	I _{st2}			50	μA	V _{IN} =5V, EN=L
Undervoltage Lockout	UVLO Operating Voltage 1 (V _{CC} Terminal)	V _{UVLO1}	3.7		4.45	V	V _{IN} =5V
	UVLO Operating Voltage 2 (V _{IN} Terminal)	V _{UVLO2}	2.5		2.9	V	V _{CC} =5V
On Time Control	On Time	T _{ON}		1.27		μS	V _{CC} =5V, V _{IN} =5V, V _O =2.5V
	Minimum Off Time	T _{OFF}		0.7		μS	V _{CC} =5V
	REF Terminal Voltage	V _{REF}	1.1	1.2	1.3	V	V _{CC} =5V
	REF Terminal Source Current	I _{REF}			100	μA	V _{CC} =5V
High Side Drive	On Resistance (high side)	R _{ONHH}		5.5		Ω	V _H -V _{LIN} =5V
	On Resistance (low side)	R _{ONHL}		5.5		Ω	V _H -V _{LIN} =5V
Low Side Drive	On Resistance (high side)	R _{ONLH}		5.5		Ω	V _{CC} =5V
	On Resistance (low side)	R _{ONLL}		5.5		Ω	V _{CC} =5V
Bootstrap	Bootstrap Voltage	V _H -V _{LIN}	4.5	5	5.5	V	
Protection System	Current for Current Limit Detection	I _{lim}	90	100	110	μA	V _{CC} =5V, V _{IN} =5V
	Soft Start Terminal Current	I _{SS}		±20		μA	V _{CC} =5V
	EN Low Level Voltage	V _{CELO}	0		0.8	V	V _{CC} =5V
	EN High Level Voltage	V _{CEHI}	2.4		V _{CC}	V	V _{CC} =5V
	EN Bias Level Current	ICE			5	μA	V _{CC} =5V, EN=5V
	PWRGD Good Voltage (high side)	V _{SENS}		1.32		V	V _{CC} =5V
	PWRGD Good Voltage (low side)	V _{SENS}		0.88		V	V _{CC} =5V
	PWRGD Low Output Voltage	V _{PWRGD}			0.4	V	V _{CC} =5V, I _{PWRGD} =120μA
	PWRGD Terminal Current	I _{PWRGD}			120	μA	V _{CC} =5V, V _{PWRGD} =0.4V
	PWRGD Leakage Current	I _{PWRGD}			5	μA	V _{PWRGD} =5V

External Dimensions (TSSOP24)

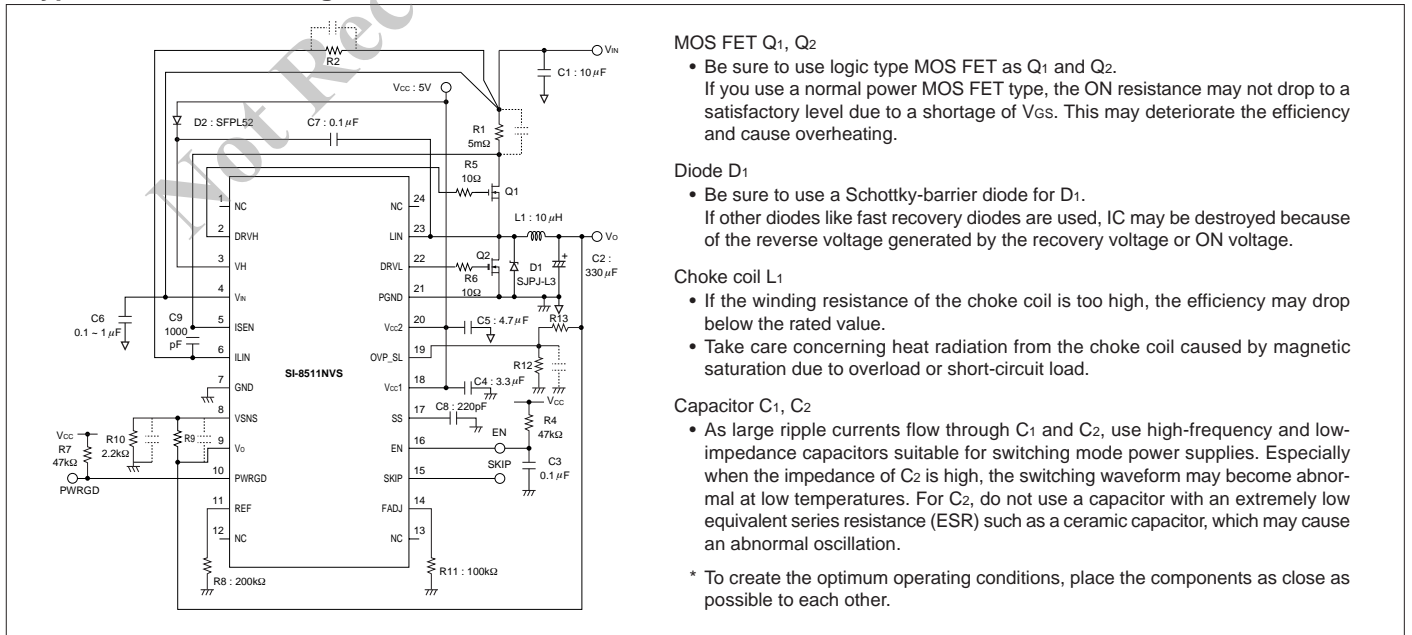
(Unit : mm)



Block Diagram (Pin Assignment)



Typical Connection Diagram



MOS FET Q1, Q2

- Be sure to use logic type MOS FET as Q1 and Q2. If you use a normal power MOS FET type, the ON resistance may not drop to a satisfactory level due to a shortage of V_{GS}. This may deteriorate the efficiency and cause overheating.

Diode D1

- Be sure to use a Schottky-barrier diode for D1. If other diodes like fast recovery diodes are used, IC may be destroyed because of the reverse voltage generated by the recovery voltage or ON voltage.

Choke coil L1

- If the winding resistance of the choke coil is too high, the efficiency may drop below the rated value.
- Take care concerning heat radiation from the choke coil caused by magnetic saturation due to overload or short-circuit load.

Capacitor C1, C2

- As large ripple currents flow through C1 and C2, use high-frequency and low-impedance capacitors suitable for switching mode power supplies. Especially when the impedance of C2 is high, the switching waveform may become abnormal at low temperatures. For C2, do not use a capacitor with an extremely low equivalent series resistance (ESR) such as a ceramic capacitor, which may cause an abnormal oscillation.

* To create the optimum operating conditions, place the components as close as possible to each other.