

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_{sig}	-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

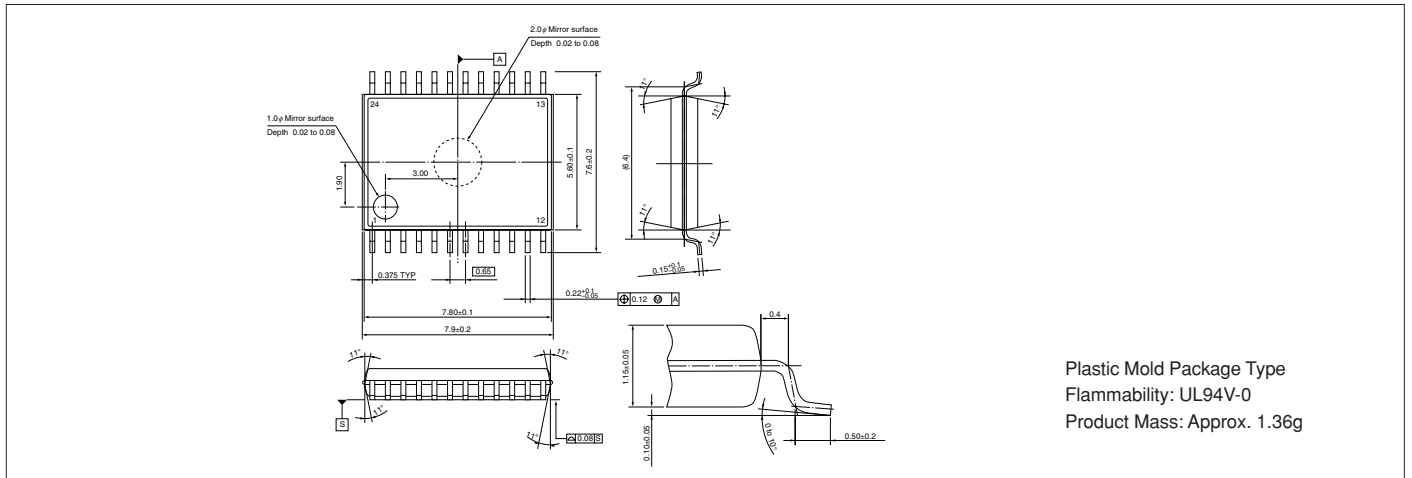
■ Electrical Characteristics

(Ta=25°C unless otherwise specified)

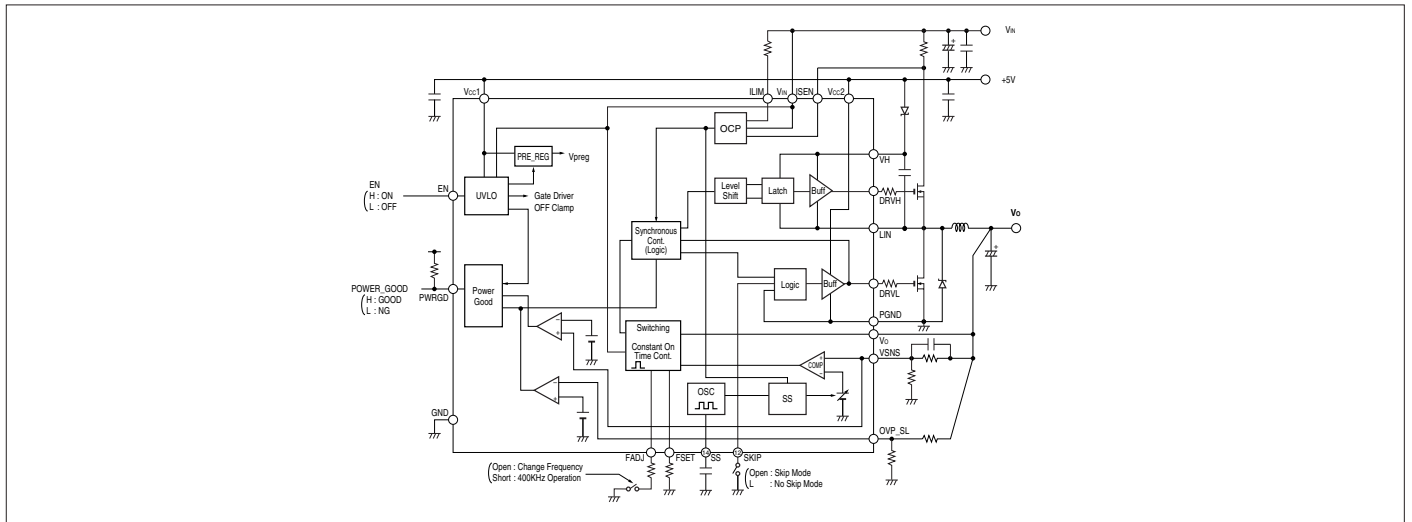
Parameter	Symbol	Ratings			Unit	Conditions	
		min.	typ.	max.			
Dynamic Characteristics	Output Voltage	V_o	-1.2%	1.1	+1.2%	V	$V_{IN}=5V$, $V_{CC}=5V$, $VSNS$ connected to VO , $I_o=0A$
	Temperature Coefficient of Output Voltage	$\Delta V_o/\Delta T$		± 0.03		mV/°C	$V_{IN}=5V$, $V_{CC}=5V$, $VSNS$ connected to VO , $I_o=0A$, $T_a=0$ to $85^\circ C$
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_{std1}			100	μA	$V_{CC}=5V$, $EN=L$
	Standby Current 2 (V_{IN} Terminal)	I_{std2}			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	$V_{CC}=5V$, $I_{pwrgd}=120\mu A$
	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)

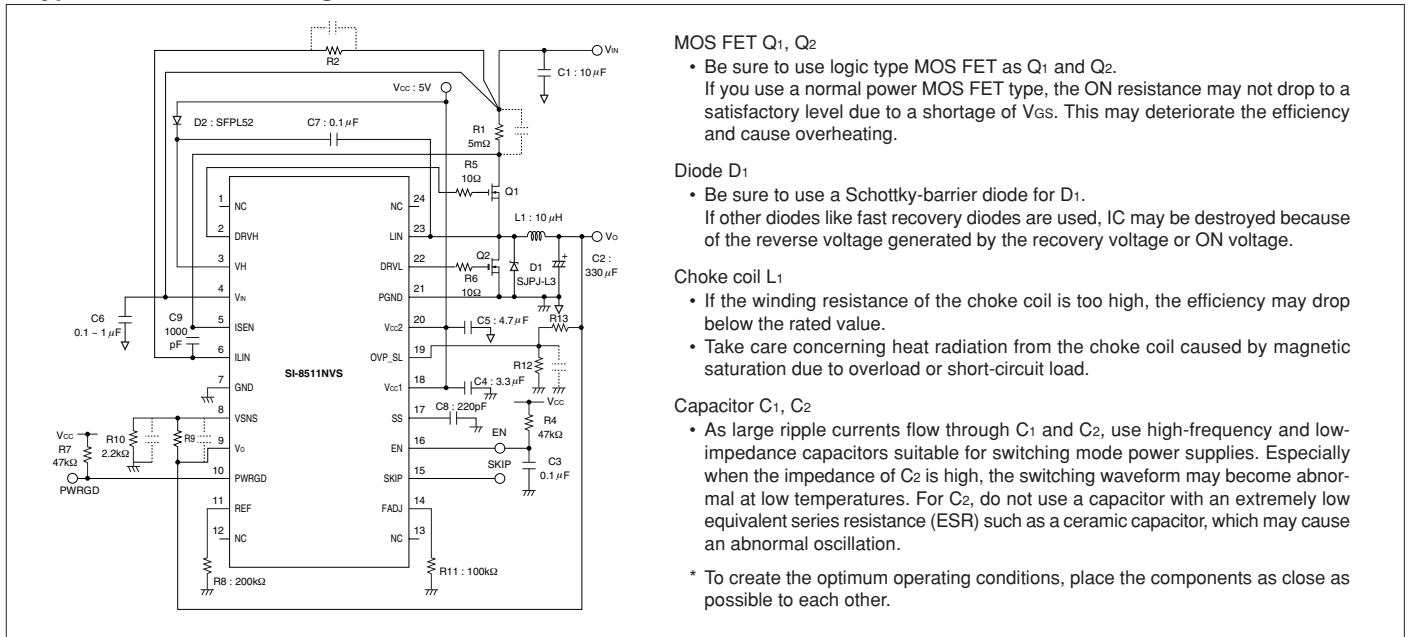
(Unit : mm)



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 Vgs. 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.