

SI-8011NVS

Surface-Mount, Synchronous Rectifier Step-down Switching Mode Regulator Control ICs

Features

- Surface-mount package (TSSOP24)
- High efficiency due to synchronous rectification: 93% (at $V_{IN} = 5V$, $I_O = 1A$, $V_O = 2.5V$)
- Capable of downsize a choke-coil due to IC's high switching frequency (250kHz 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 protection circuit
- PWRGD function to indicate the output voltage status
- High precision reference voltage: $1.1V \pm 1.2\%$

Absolute Maximum Ratings

($T_a=25^{\circ}C$)

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	$^{\circ}C$
Storage Temperature	T_{stg}	-40 to +150	$^{\circ}C$

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	$^{\circ}C$

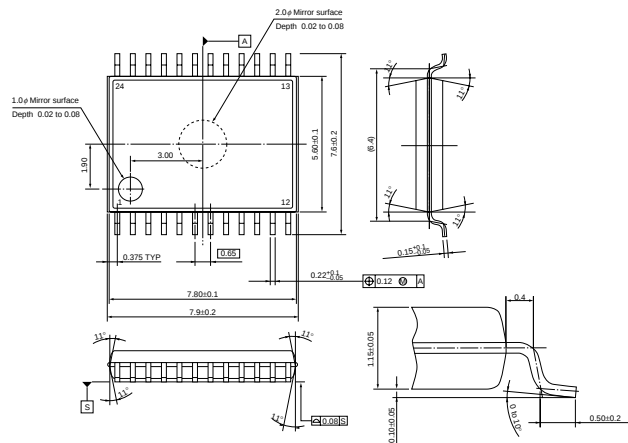
Electrical Characteristics

($T_a = 25^{\circ}C$ 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/ $^{\circ}C$	$V_{IN}=5V$, $V_{CC}=5V$, VSNS connected to V_O , $I_O=0A$, $T_a=0$ 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		4.4	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}		2		μS	$V_{CC}=5V$, $V_{IN}=5V$, $V_O=2.5V$
	Minimum Off Time	T_{off}		1		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	$V_{pwrgd}=5V$

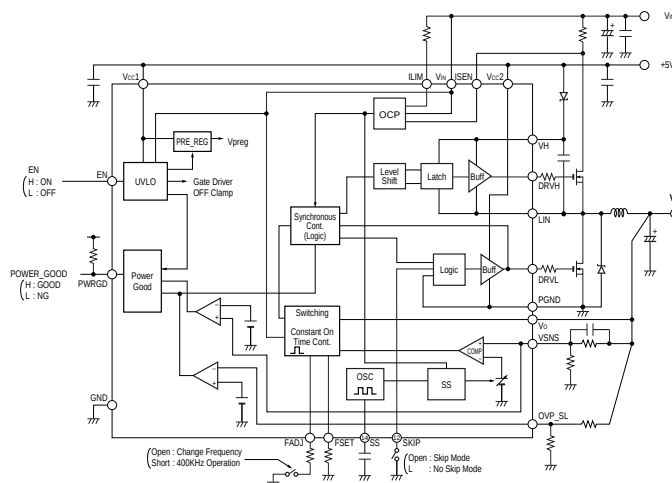
■ External Dimensions (TSSOP24)

(Unit : mm)

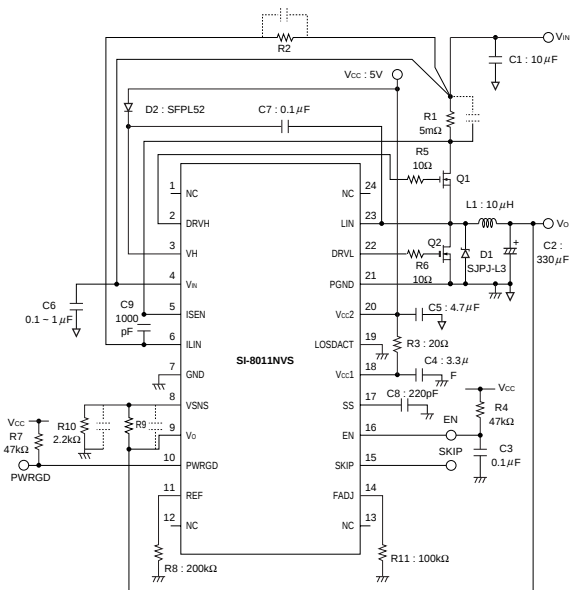


Plastic Mold Package Type
Flammability: UL94V-0
Product Mass: Approx. 1.36g

■Block Diagram (Pin Assignment)



■ Typical Connection Diagram



MOS FET Q_1, Q_2

- Be sure to use logic type MOS FET as Q_1 and Q_2 .
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 L_1

- 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 C_1, C_2

- As large ripple currents flow through C₁ and C₂, use high-frequency and low-impedance capacitors aiming for switching-mode-power-supply use. 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.