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 (125kHz 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 ± 1.2%

■Absolute Maximum Ratings

(T_a=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

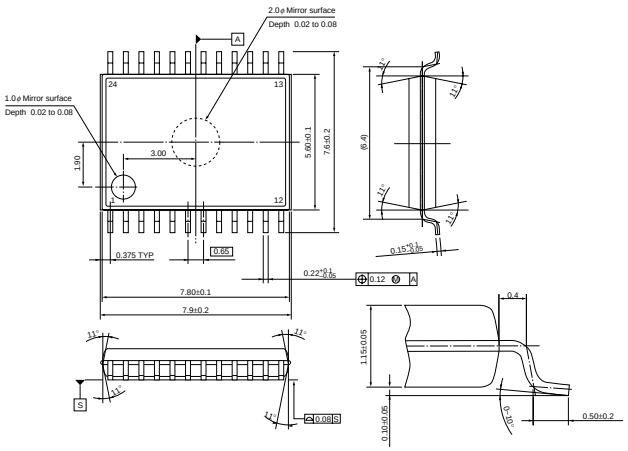
■Electrical Characteristics

(T_a = 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°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)	RonHH		5.5		Ω	VH-VLIN=5V
	On Resistance (low side)	RonHL		5.5		Ω	VH-VLIN=5V
Low Side Drive	On Resistance (high side)	RonLH		5.5		Ω	V_{CC}=5V
	On Resistance (low side)	RonLL		5.5		Ω	V_{CC}=5V
Bootstrap	Bootstrap Voltage	VH-VLIN	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, Ipwrgd=120μA
	PWRGD Terminal Current	I_{pwrgd}			120	μA	V_{CC}=5V, Vpwrgd=0.4V
	PWRGD Leakage Current	I_{pwrgd}			5	μA	Vpwrgd=5V

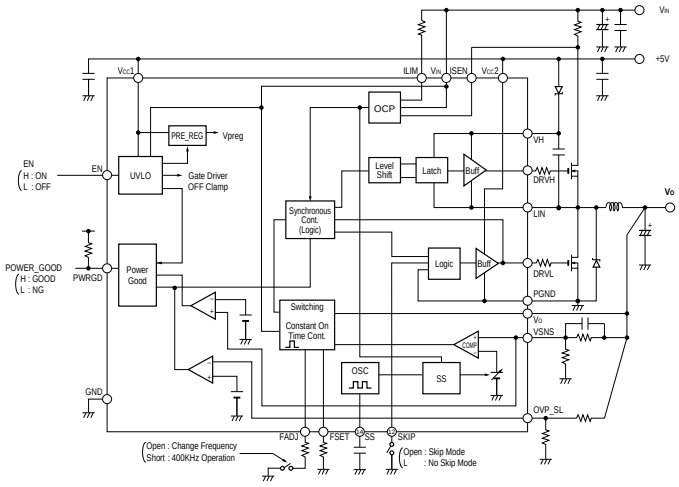
■External Dimensions (TSSOP24)

(Unit : mm)

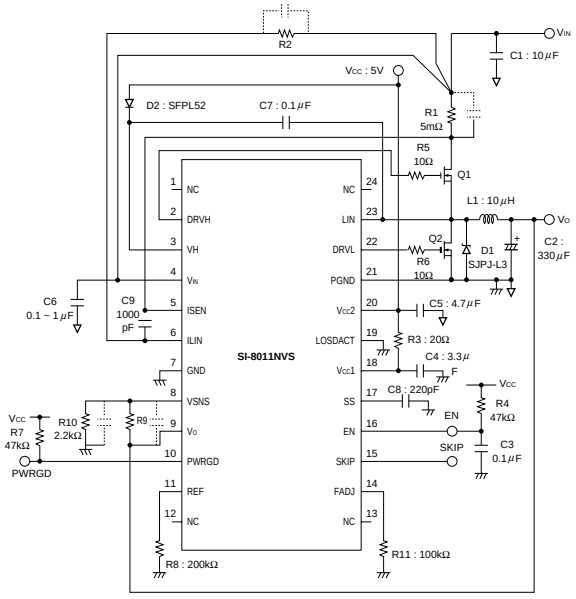


Plastic Mold Package Type
Flammability: UL94V-0
Product Mass: Approx. 1.36g

■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 D_1

- Be sure to use a Schottky-barrier diode for D_1.
  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 C_1 and C_2, use high-frequency and low-impedance capacitors aiming for switching-mode-power-supply use. Especially when the impedance of C_2 is high, the switching waveform may become abnormal at low temperatures. For C_2, 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.