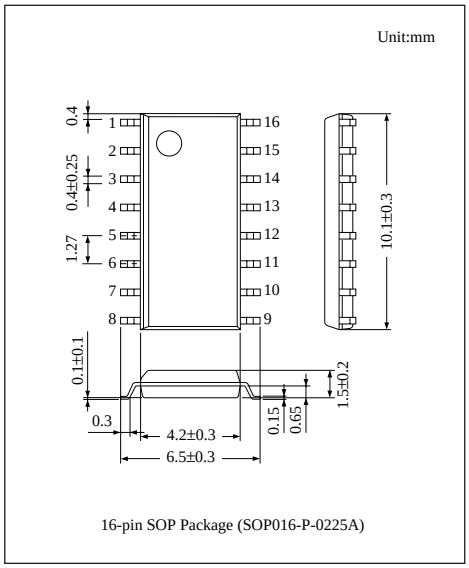
AN8011S

2-ch. Output PWM-Method DC-DC Converter Control ICs

■ Overview

The AN8011S is a DC-DC Converter Control IC with 2-ch. output using the PWM method, which allows 500 kHz high-speed control.

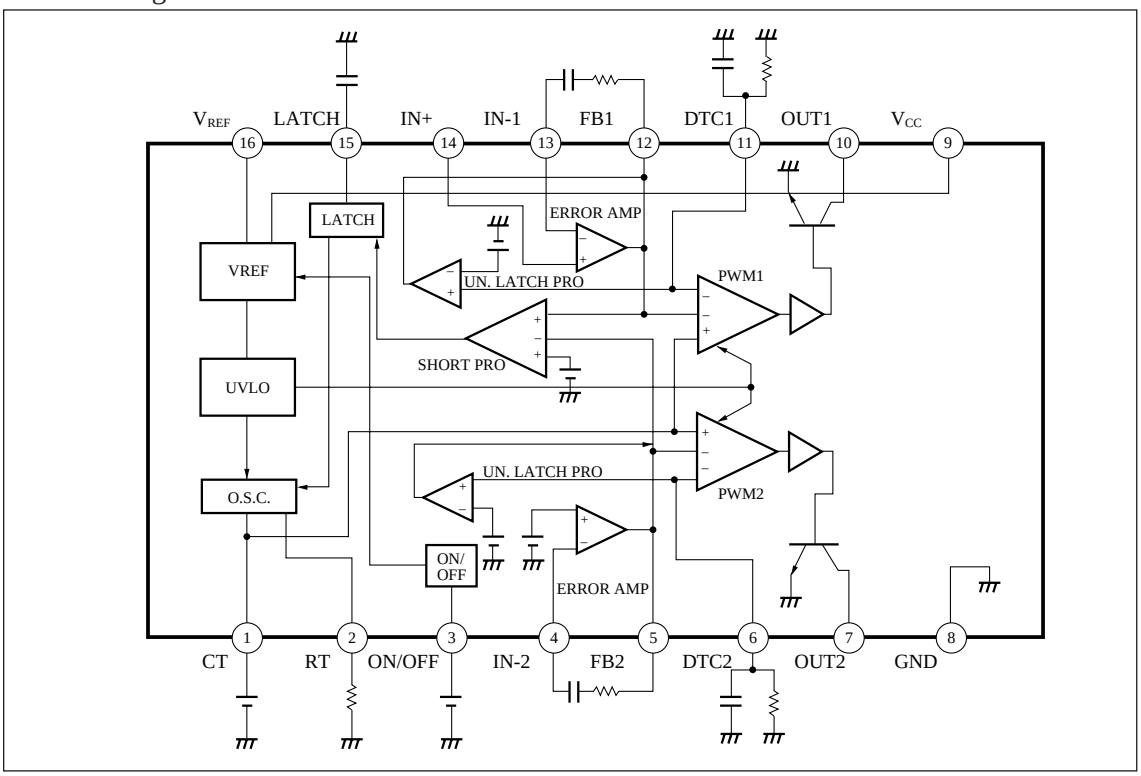
The same oscillation outputs realize completely synchronous operation.



■ Features

- PWM control frequency : 500 kHz
- Wide operating supply voltage range : V_{CC} = 3.6 to 34 V
- Built-in 2-ch. of open collector type for output : One channel can support the reverse amplification type.
- The external control can stop the output by channels.
- Built-in ON/OFF function for operation/stop of IC
- Circuits incorporated for preventing short-circuit and malfunction at low input (U.V.L.O.)
- The external control can have effect on the latch circuit.
- Small consumption current (During operation : 5 mA, During stand-by : 2μ A)

■ Block Diagram



■ Absolute Maximum Ratings (Ta=25˚C)

Parameter	Symbol	Rating	Unit
Supply voltage	V_{CC}	35	V
Power dissipation	P_D	380 *	mW
Operating ambient temperature	T_{opr}	–30 to + 85	˚C
Storage temperature	T_{stg}	–40 to + 125	˚C

Note) Either current nor voltage should not be applied from the outside to any terminals not specified.
For the circuit current, (+) is current flowing into IC and (–) is one flowing out of IC.
✻When the Ta exceeds 25˚C, the power dissipation shold be decreased 3.8mW for one ˚C.

■ Recommended Operating Range (Ta=25˚C)

Parameter	Symbol	Range
Operating supply voltage	V_{CC}	3.6V to 34V

■ Electrical Characteristics (V_{CC}=12V, Ta=25˚C)

Parameter	Symbol	Condition	min	typ	max	Unit
Reference Voltage Block						
Output voltage	V_{REF}		2.413	2.5	2.588	V
Input stability	L_{INE}	V_{CC}=3.6V to 34V	—	3	20	mV
Load stability	R_{oad}	I_{REF}=0 to 5mA	—	2	10	mV
Output voltage fluctuation with temperature1 Note1)	$V_{TC}1$	Ta=–25˚C+25˚C	—	±1	—	%
Output voltage fluctuation with temperature2 Note1)	$V_{TC}2$	Ta=25˚C to 85˚C	—	±1	—	%
Overcurrent protective drive current Note1)	I_{CC}		—	–20	—	mA
U, V, L, O Block						
Circuit operation starting voltage	V_{UON}		2.8	3.1	3.4	V
Hysteresis width	V_{HYS}		100	200	300	mV
Error Amplifier Block 1						
Input offset voltage 1	$V_{IN-O}1$		–6	—	6	mV
Input current 1	I_B1		–500	–25	100	nA
Common-mode input voltage range	V_{CM}		0.5	—	0.8	V
‘H’ level output voltage 1	$V_{EH}1$		V_{REF} – 0.3	—	—	V
‘L’ level output voltage 1	$V_{EL}1$		—	—	0.5	V
Error Amplifier Block 2						
Input current 2	I_B2		25	—	100	nA
Common-mode input threshold voltage	V_{IN}^+		0.72	0.75	0.78	V
‘H’ level output voltage 2	$V_{EH}2$		V_{REF} – 0.3	—	—	V
‘L’ level output voltage 2	$V_{EL}2$		—	—	0.5	V
PWM Comparator Block 1/2						
Input threshold voltage ‘H’	V_{DT-H}	f_{OSC}=200kHz, Duty Ratio : 100%	1.2	—	—	V
Input threshold voltage ‘L’	V_{DT-L}	f_{OSC}=200kHz, Duty Ratio : 0%	—	—	0.6	V
Input current	I_{DTC}	RT=20kΩ	–37	–34	–31	µA

Note 1) These values are design reference values, not guaranteed values.

■ Electrical Characteristics (cont.) (V_{CC}=12V, Ta=25˚C)

Parameter	Symbol	Condition	min	typ	max	Unit
Output 1/2Block						
Output frequency 1	$f_{OUT}1$	CT=150pF, RT=20kΩ, I_O=30mA	180	200	220	kHz
Frequency fluctuation 1	fdv	V_{CC}=3.6V to 34V, CT=150pF, RT=20kΩ	–2	—	2	%
Output duty ratio 1	Du1	CT=150pF, RT=20kΩ, R_{DTC}=24kΩ	40	45	50	%
Output duty ratio 2	Du2	CT=150pF, RT=20kΩ, R_{DTC}=33kΩ	65	75	85	%
Output saturation voltage 1	$V_{O\,(sat)}1$	I_O=30mA	—	—	0.9	V
Output saturation voltage 2	$V_{O\,(sat)}2$	I_O=100mA	—	—	1.2	V
Output leak current 1	$I_{OLe}1$	V_{CC}=34V, When Output Tr is off	—	—	10	µA
Frequency fluctuation with temperature 1 Note1)	$f_{dT}1$	f_{OSC}=200kHz, Ta=–30 to +25˚C	—	±9	—	%
Frequency fluctuation with temperature 2 Note1)	$f_{dT}2$	f_{OSC}=200kHz, Ta=25 to 85˚C	—	±9	—	%
Output frequency 2 Note1)	$f_{out}2$	CT=150pF, RT=6.6kΩ, I_O=30mA	—	500	—	kHz
Frequency fluctuation 2 Note1)	$f_{dv}2$	V_{CC}=3.6V to 34V, CT=150pF, RT=6.6kΩ	—	±2	—	%
Short-circuit Protector Block						
Input threshold voltage	V_{SLTH}		1.75	1.85	1.95	V
LATCH drive voltage	V_{SLON}		1.15	1.25	1.35	V
Charging current	I_{CHG}		–120	–50	–40	µA
UN-LATCH PRO. Block 1/2						
Input threshold voltage	V_{ULTH}		0.12	—	—	V
ON/OFF Block						
Threshold voltage	V_{TH}		0.8	—	2	V
All Devices						
Total consumption current	I_{CC}	V_{CC}=12V, RT=20kΩ	—	5	7	mA
Total consumption current fluctuation	$I_{CC\,(MAX)}$	V_{CC}=3.6V to 34V, RT=20kΩ	—	—	2	mA
Stand-by consumption current	$I_{CC\,(SB)}$	V_{CC}=12V, with V_{REF} down	—	—	2	µA
Maximum stand-by consumption current	$I_{CC\,(SB–M)}$	V_{CC}=34V, with V_{REF} down	—	—	5	µA

Note 1) These values are design reference values, not guaranteed ones.

■ Pin Descriptions

Pin No.	Symbol	Pin description
1	CT	Capacitive connector terminal setting oscillation frequency for triangular oscillation circuit. Frequency of triangular oscillation is set, by connecting capacitance between GND and it.
2	RT	Resistance connector terminal setting oscillation frequency for triangular oscillation circuit. Frequency of triangular oscillation is set, by connecting resistance between GND and it.
3	ON/OFF	Terminal turning on/off IC. 'L' turns off IC (Output OFF) and 'H' turns on IC.
4	IN^-2	Reverse input terminal for CH2 error amplifier
5	F/B2	Output terminal for CH2 error amplifier. Gain setting or phase compensation is provided, by connecting resistance or capacitance between IN^-2 and it. It is also connected to PWM short-circuit protector.
6	DTC2	Terminal setting dead time of CH2. Dead time of CH2 is set, by connecting external resistor to it. Soft start function can be given to it, by connecting capacitance with external resistor in parallel. Output can be turned off only for CH.2, by decreasing the terminal voltage under 0.12 V. (Short-circuit protection function stop circuit)
7	OUT2	Output terminal of CH2 open collector type. I_O=100mA (max.)
8	GND	Ground terminal of signal system
9	V_{CC}	Terminal applying supply voltage. It detects start voltage and stop voltage.
10	OUT1	Output terminal of CH1 open collector type. I_O=100mA (max.)
11	DTC1	Terminal setting dead time of CH1. Dead time of CH1 is set, by connecting external resistor to it. Soft start function can be given to it, by connecting capacitance with external resistor in parallel. Output can be turned off only for CH.2, by decreasing the terminal voltage under 0.12 V. (Short-circuit protection function stop circuit)
12	F/B1	Output terminal for CH1 error amplifier. Gain setting or phase compensation is provided, by connecting resistance or capacitance between IN^-1 and it. It is also connected to PWM short-circuit protector.
13	IN^-1	Reverse input terminal for CH1 error amplifier
14	IN^+	Non-reverse input terminal for CH1 error amplifier
15	LATCH	For short-circuit protection circuit of timer latch type, capacitive connector terminal setting constant. Time constant for short-circuit protection is set, by connecting capacitance between GND and it.
16	V_{REF}	Internal reference voltage output terminal. When 20 mA (typ.) or more load is given to it (2.5V±3%), overcurrent protection starts to operate, V_{REF} voltage gets down and switching operation stops.

■ Application Circuit