AN5905, AN5905S

Switching Regulator Control Circuit

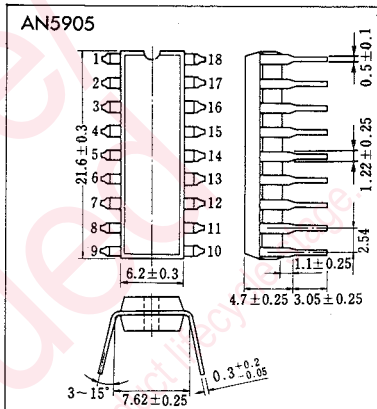
■ Outline

The AN5905 and the AN5905S are integrated circuits designed for integrating functions necessary for switching power control and enabling the miniaturization of power system.

■ Features

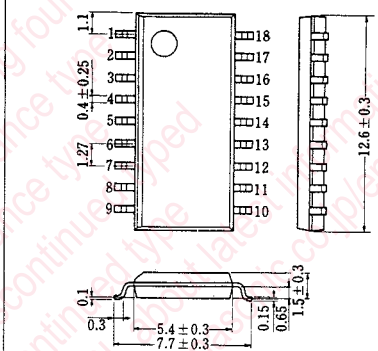
- Oscillation frequency variable (2 times or 4 times)
- Over-current protection circuit
- Soft start circuit

AN5905 Unit: mm



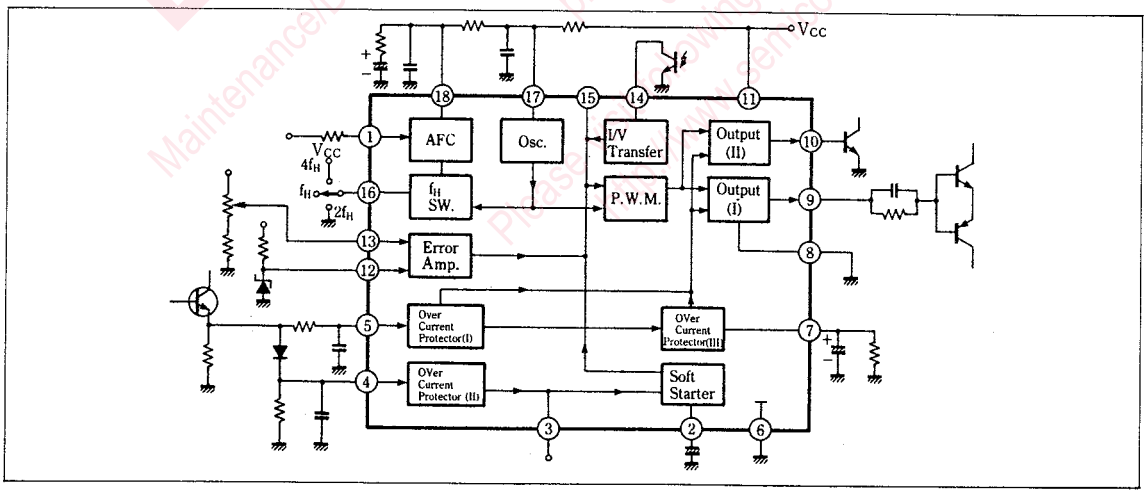
18-Lead DIL Plastic Package

AN5905S Unit: mm



18-Lead PANAFLAT Package (SO-18D)

■ Block Diagram



■ Pin

Pin No.	Pin Name	Pin No.	Pin Name
1	Trigger Input	10	Output(Ⅱ)
2	Soft Start CR	11	V_{CC}
3	Remote Control Input	12	Error Amp. Reference Voltage Input
4	Over Current Protector(Ⅱ)Input	13	Error Amp. Input
5	Over Current Protector(Ⅰ)Input	14	Photo Coupler Input
6	GND	15	Max. Duty Adj.
7	Over Current Protector(Ⅲ)CR	16	Freq. SW. Input
8	Output GND	17	Osc. CR
9	Output(Ⅰ)	18	PLL Det. Output

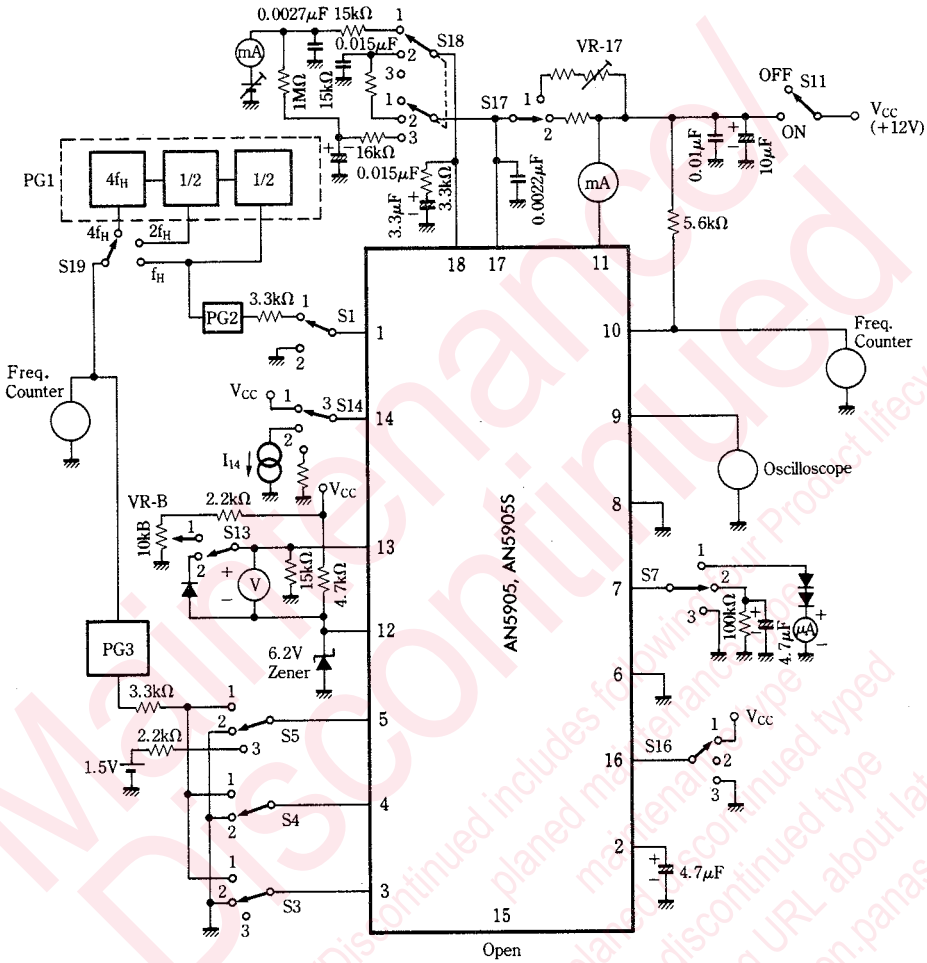
■ Absolute Maximum Ratings(Ta=25℃)

Item	Symbol	Rating	Unit
Supply Voltage	V_{CC}	14.4	V
Power Dissipation	P_D	230	mW
Operating Ambient Temperature	T_{opr}	−20~+70	℃
Storage Temperature	T_{stg}	−55~+125	℃

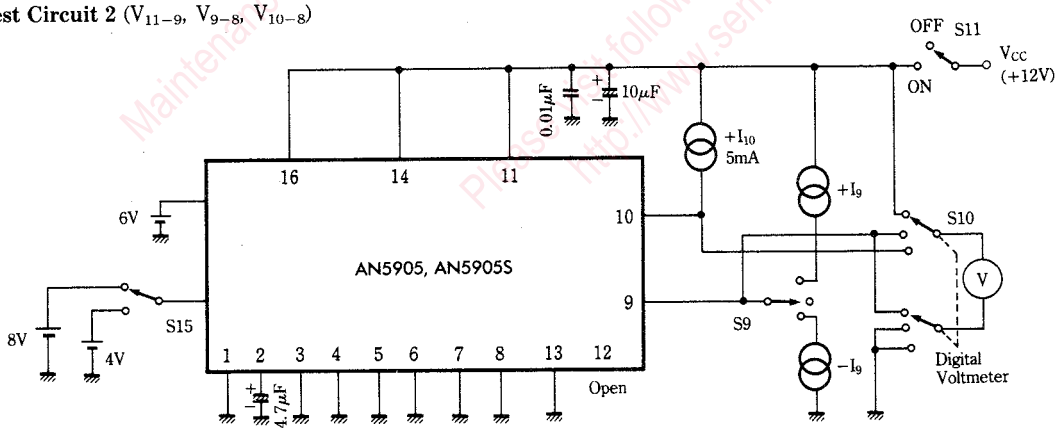
■ Electrical Characteristics(V_{CC}=12V, Ta=25℃)

Item	Symbol	Test Circuit	Condition	min.	typ.	max.	Unit
Total Circuit Current	I_{tot}	1	V_{CC}=12.0V	10	15	18.5	mA
Oscillation Frequency	4_{fosc}	1	V_{CC}=12.0V	56	63	68	kHz
Output Pulse Duty(max.)	$t_{W(duty)}$	1	V_{CC}=12.0V	73	81	91	%
Output Pulse Duty(min.)	$t_{W(duty)}$	1	V_{CC}=12.0V		0	0	%
Output Saturation Voltage (1)	V_{11-9}	2	I_9=−50mA	1.1	1.5	1.8	V
Output Saturation Voltage (2)	V_{11-9}	2	I_9=−150mA	1.3	1.7	2.0	V
Output Saturation Voltage (3)	V_{9-8}	2	I_9=50mA		0.35	0.50	V
Output Saturation Voltage (4)	V_{9-8}	2	I_9=150mA		1.7	2.1	V
Output Saturation Voltage (5)	V_{10-8}	2	I_{10}=5mA		0.40	0.70	V
Overcurrent Protector (Ⅰ)	$V_{ocp(1)}$	1	V_{CC}=12.0V	0.51	0.63	0.75	V
Overcurrent Protector (Ⅱ)	$V_{ocp(2)}$	1	V_{CC}=12.0V	0.51	0.63	0.75	V
Overcurrent Protector (Ⅲ)	$I_{ocp(3)}$	1	V_{CC}=12.0V	40	70	95	μA
Low Supply Voltage Protector	V_{LVP}	1	V_{CC} voltage value when V_{CC}=12V is lowered gradually until Pin⑨ output is not made	4.2	4.7	5.2	V
External Trigger Operation Starting Voltage	V_{tri}	1	V_{CC}=12.0V		1.4	2.0	V_{OP}
Remote Control Terminal Operating Level	V_{RMT}		V_{CC}=12.0V	0.55	0.71	0.85	V
Oscillation Control Sensitivity	β_{OSC}	1	Oscillation : 4fH, Trigger pulse width 12μs		120		Hz/μA
Phase Detector Sensitivity	μ	1	Oscillation : 4fH, Trigger pulse width 12μs		28		μA/μs
Horizontal Pull-in Range	f_{HP}	1	Oscillation : 4fH, Trigger pulse width 12μs		±9.5		kHz
Hot Coupler Control Sensitivity	β_P	1	Output duty change to current change flowed out from Pin⑭		0.27		%/μA
Hot Coupler Min. Current	I_{14}	1	Pin⑭ flow-out current required for output off	−450	−340		μA
Error Amp. Control Sensitivity	β_{ER}	1	Output duty change to ΔV_{13-12} change		3.7		%/mV

Test Circuit 1 (I_{CC}, $4f_{osc}$, $t_{W(duty)}$, $V_{ocp(1)}$, $V_{ocp(2)}$, $I_{ocp(3)}$, V_{LVP}, V_{tri}, β_{CW}, μ, f_{HP}, β_P, I_{14}, β_{ER})



Test Circuit 2 (V_{11-9}, V_{9-8}, V_{10-8})



Switch Condition Table

Item	Test Circuit	Switch																Measuring Instrument
		Trigger	Remote Control	OCP (I)	OCP (II)	Constant for ODP	Output (I)	Output (II)	V_{CC}	Error Input	Hot Co-upier input		Mode SW	Oscillation	AFC	PG Input		
		S1	S3	S4	S5	S7	S9	S10	S11	S13	S14	S15	S16	S17	S18	S19		
I_{CC}	1	2	2	2	2	3	—	—	ON	2	1	—	1	2	2	$4f_H$		Ammeter
$4f_{OSC}$	1	2	2	2	2	3	—	—	ON	2	1	—	1	2	2	$4f_H$		Frequency Counter
$tw_{(duty)}$max.	1	1	2	2	2	3	—	—	ON	2	1	—	1	2	2	$4f_H$		Oscilloscope
$tw_{(duty)}$min.	1	1	2	2	2	3	—	—	ON	2	3	—	1	2	2	$4f_H$		Oscilloscope
V_{11-9}	2	—	—	—	—	—	3	1	ON	—	—	2	—	—	—	—	Pin⑨ flow-out 50mA	Digital Voltmeter
V_{11-9}	2	—	—	—	—	—	3	1	ON	—	—	2	—	—	—	—	Pin⑨ flow-out 150mA	〃
V_{9-8}	2	—	—	—	—	—	1	2	ON	—	—	1	—	—	—	—	Pin⑨ flow-in 50mA	〃
V_{9-8}	2	—	—	—	—	—	1	2	ON	—	—	1	—	—	—	—	Pin⑨ flow-in 150mA	〃
V_{10-8}	2	—	—	—	—	—	2	3	ON	—	—	2	—	—	—	—	Pin⑨ flow-in 5mA	〃
$V_{ocp(1)}$	1	1	2	2	1	3	—	—	ON	2	1	—	1	2	2	$4f_H$		Pin ⑨ Oscilloscope
$V_{ocp\ (2)}$	1	1	3	1	2	3	—	—	ON	2	1	—	1	2	2	$4f_H$		〃
$I_{ocp\ (3)}$	1	1	2	2	3	1	—	—	ON	2	1	—	1	2	2	$4f_H$		Ammeter
V_{LVP}	1	1	2	2	2	3	—	—	ON	2	1	—	1	2	2	$4f_H$		Pin ⑨ Supply Voltage
V_{tri}	1	1	2	2	2	3	—	—	ON	2	1	—	1	2	2	$4f_H$		Pin ① Oscilloscope
V_{RMT}	1	1	1	2	2	3	—	—	ON	2	1	—	1	2	2	$4f_H$		Pin ③ Oscilloscope
$\beta_{OSC\ osc}$	1	2	2	2	2	3	—	—	ON	2	1	—	1	2	3	$4f_H$		Frequency Counter
μ	1	1	2	2	2	3	—	—	ON	2	1	—	1	2	1	$4f_H$		Ammeter
f_{HP}	1	1	2	2	2	3	—	—	ON	2	1	—	1	1	2	$4f_H$		Frequency Counter
β_p	1	1	2	2	2	3	—	—	ON	2	2	—	1	2	2	$4f_H$		Oscilloscope
I_{14}	1	1	2	2	2	3	—	—	ON	2	2	—	1	2	2	$4f_H$		Ammeter
β_{ER}	1	1	2	2	2	3	—	—	ON	1	1	—	1	2	2	$4f_H$		Oscilloscope

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