Monolithic Linear IC

SANYO No. 4370A

LA5606N

BS/CS Tuner Regulator with On/Off Function

Overview

The LA5606N is a low saturation regulator IC for BS/CS tuner applications, equipped with four regulators capable of ON/OFF control.

Applications

- BS/CS tuner power supply system.
- Audio Video (AV) equipment with BS/CS receivers.
- Compact electronic equipment.

Functions

- Four low saturation regulators (15.7 V/300 mA, 12 V/150 mA, 9 V/100 mA and 5 V/500 mA).
- Output on/off control ("L" active).
- On-chip protective circuitry (current limiter, thermal shutdown).

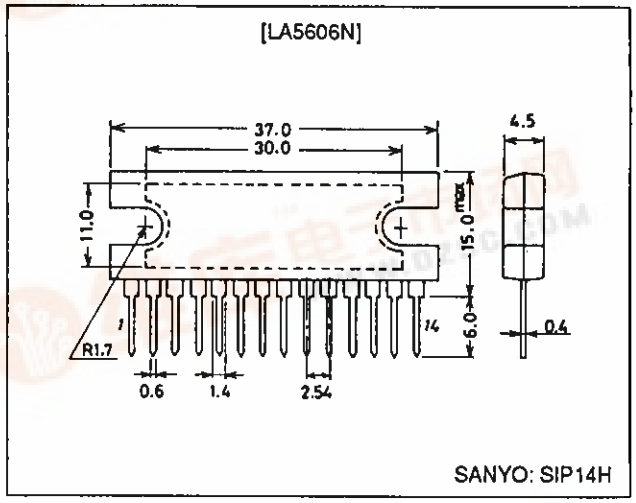
Features

- Supports compact set design while incorporating four regulators needed by BS/CS tuners.
- Flexible system design by independent on/off control of V_O1, V_O4, as well as V_O2 and V_O3 pair.
- Reduces internal loss by employment of low saturation regulators.
- Adapting three input pins contributes power dissipation reduction and heat sink design.

Package Dimensions

unit: mm

3023A-SIP14H



Specifications

Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum input voltage	V_{IN} max	$V_{IN}1 \geq V_{IN}2 \geq V_{IN}3$	35	V
Enable pin voltage	V_{EN} max	EN1, EN2, EN3	V_{IN} max	V
Allowable power dissipation	Pd max	With infinite heat sink	15	W
		With no heat sink	4.3	W
Operating temperature	Topr		−20 to +80	°C
Storage temperature	Tstg		−55 to +150	°C

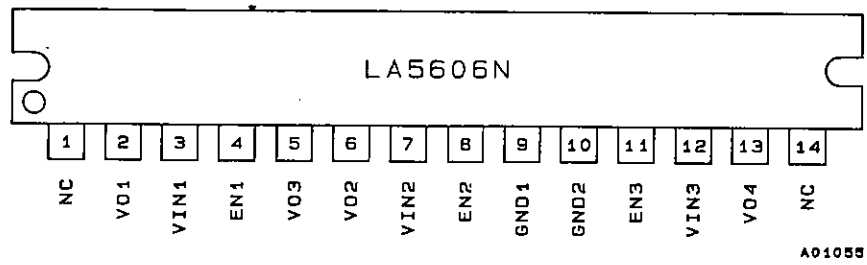
Operating Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Output current 1	I_O1	Regulator 1	5 to 350	mA
Output current 2	I_O2	Regulator 2	1 to 200	mA
Output current 3	I_O3	Regulator 3	1 to 150	mA
Output current 4	I_O4	Regulator 4	5 to 500	mA

Operating Characteristics at Ta = 25°C and the specified Test Circuit

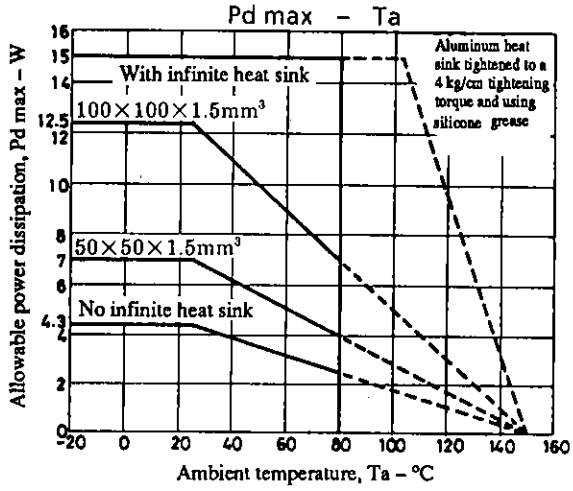
Parameter	Symbol	Conditions	min	typ	max	Unit
Regulator 1 ($V_{EN}1$ = low, V_O1: ON, $V_{IN}1$ = 18.7 V and I_O1 = 300 mA)						
Output voltage 1	V_O1		14.9	15.7	16.5	V
Dropout voltage	$V_{DROP1\text{-}1}$			0.3	0.5	V
	$V_{DROP1\text{-}2}$	I_O1 = 150 mA		0.15	0.3	V
Line regulation	$\Delta V_{OLN}1$	17.5 V ≤ $V_{IN}1$ ≤ 23 V		20	100	mV
Load regulation	$\Delta V_{OLD}1$	5 mA ≤ I_O1 ≤ 300 mA		40	200	mV
Peak output current	$I_{OP}1$		350	540		mA
Output short current	$I_{OSC}1$			150		mA
Output on control voltage	$V_{ENL}1$	V_O1: On			1.0	V
Output off control voltage	$V_{ENH}1$	V_O1: Off	4.0		$V_{IN}1$	V
Output low level voltage	V_O1 OFF				0.2	V
Output noise voltage	$V_{NO}1$	10 Hz ≤ f ≤ 100 kHz		110		μVrms
Ripple rejection	Rrej1	f = 120 Hz, 18 V ≤ $V_{IN}1$ ≤ 23 V		50		dB
Regulator 2 ($V_{EN}2$ = low, V_O2: ON, $V_{IN}2$ = 15.0 V, I_O2 = 150 mA)						
Output voltage 2	V_O2		11.4	12.0	12.6	V
Dropout voltage	$V_{DROP}2$			0.3	0.5	V
Line regulation	$\Delta V_{OLN}2$	12.6 V ≤ $V_{IN}2$ ≤ 23 V		20	100	mV
Load regulation	$\Delta V_{OLD}2$	1 mA ≤ I_O2 ≤ 150 mA		20	70	mV
Peak output current	$I_{OP}2$		200	270		mA
Output short current	$I_{OSC}2$			70		mA
Output on control voltage	$V_{ENL}2$	V_O2: On			1.0	V
Output off control voltage	$V_{ENH}2$	V_O2 :Off	4.0		$V_{IN}2$	V
Output low level voltage	V_O2OFF				0.2	V
Output noise voltage	$V_{NO}2$	10 Hz ≤ f ≤ 100 kHz		110		μVrms
Ripple rejection	Rrej2	f = 120 Hz, 13 V ≤ $V_{IN}2$ ≤ 23 V		50		dB
Regulator 3 ($V_{EN}2$ = low, V_O3: ON, $V_{IN}2$ = 12 V, I_O3 = 100 mA)						
Output voltage 3	V_O3		8.55	9.0	9.45	V
Dropout voltage	$V_{DROP}3$			0.3	0.5	V
Line regulation	$\Delta V_{OLN}3$	10.45 V ≤ $V_{IN}2$ ≤ 23 V		20	100	mV
Load regulation	$\Delta V_{OLD}3$	1 mA ≤ I_O3 ≤ 100 mA		20	50	mV
Peak output current	$I_{OP}3$		150	180		mA
Output short current	$I_{OSC}3$			40		mA
Output on control voltage	$V_{ENL}2$	V_O3: On			1.0	V
Output off control voltage	$V_{ENH}2$	V_O3: Off	4.0		$V_{IN}2$	V
Output low level voltage	V_O3 OFF				0.2	V
Output noise voltage	$V_{NO}3$	10 Hz ≤ f ≤ 100 kHz		70		μVrms
Ripple rejection	Rrej3	f = 120 Hz, 11 V ≤ $V_{IN}2$ ≤ 23 V		55		dB
Regulator 4 ($V_{EN}3$ = low, V_O4: ON, $V_{IN}3$ = 8.0 V, I_O4 = 500 mA)						
Output voltage 4	V_O4		4.75	5.0	5.25	V
Dropout voltage	$V_{DROP4\text{-}1}$			0.3	0.5	V
	$V_{DROP4\text{-}2}$	I_O4 = 250 mA		0.2	0.4	V
Line regulation	$\Delta V_{OLN}4$	6.25 V ≤ $V_{IN}3$ ≤ 23 V		20	100	mV
Load regulation	$\Delta V_{OLD}4$	5 mA ≤ IO4 ≤ 500 mA		30	150	mV
Peak output current	$I_{OP}4$		500	900		mA
Output short current	$I_{OSC}4$			250		mA
Output on control voltage	$V_{ENL}3$	V_O4: On			1.0	V
Output off control voltage	$V_{ENH}3$	V_O4: Off	4.0		$V_{IN}3$	V
Output low level voltage	V_O4 OFF				0.2	V
Output noise voltage	$V_{NO}4$	10 Hz ≤ f ≤ 100 kHz		70		μVrms
Ripple rejection	Rrej4	f = 120 Hz, 7 V ≤ $V_{IN}3$ ≤ 23 V		60		dB
Current dissipation 1	I_{Q1}	I_O1, I_O2, I_O3, I_O4 = 0		11		mA
Current dissipation 2	I_{Q2}	I_O1 = 300mA, I_O2 = 150 mA, I_O3 = 100mA, I_O4 = 500 mA		53		mA

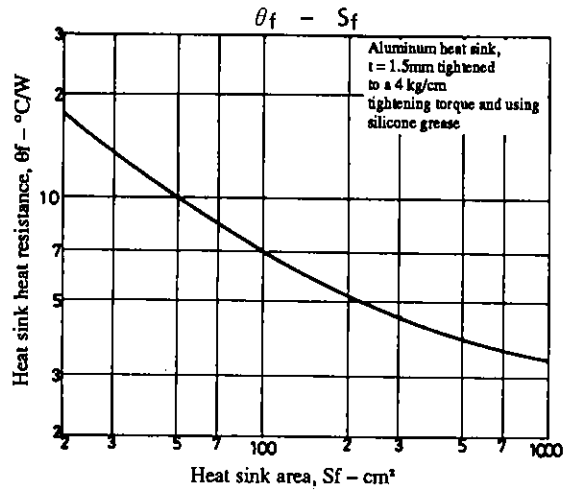
Pin Assignments



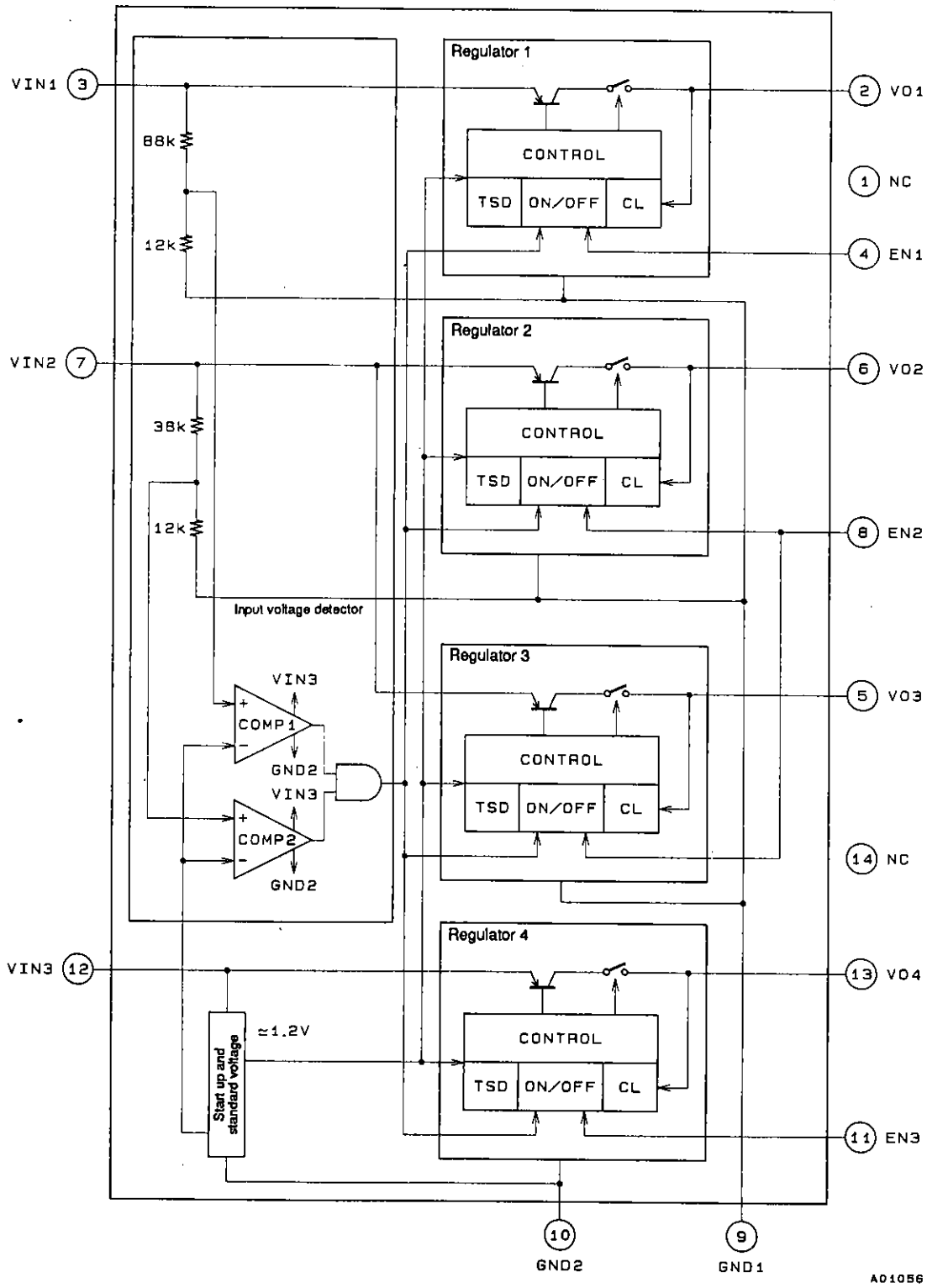
Top View

Note: The NC pins should not be used (No. 1 and No. 14 in the pin layout).





Block Diagram

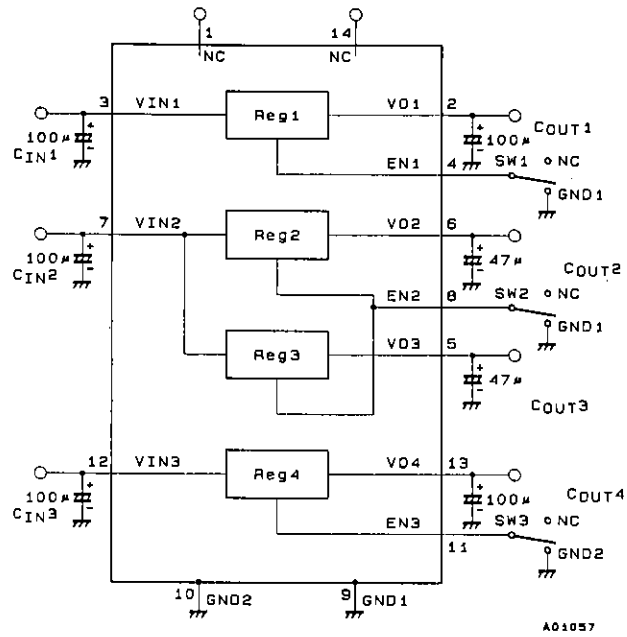


TSD: Thermal Shutdown Circuit
ON/OFF: Output on/off Control Circuit
CL: Current Limiter Circuit

Unit (resistance: Ω)

Test Circuit

Unit (capacitance: F)



Function Table

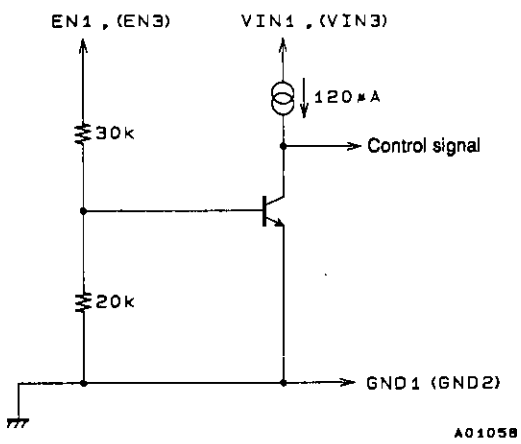
The following table indicates conditions for operation with $V_{IN}1 \geq V_{IN}2 \geq V_{IN}3$ ($V_{IN}1 \geq 11$ V, $V_{IN}2 \geq 6$ V and $V_{IN}3 \geq 4$ V).

EN1, EN2, EN3	V_O1, V_O2/V_O3, V_O4
H	L
L	H

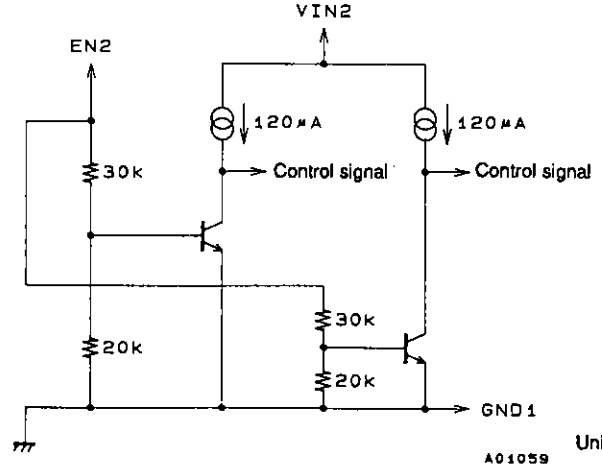
1. Within the table of EN "H" indicates an H level and "L" indicates an L level.
2. In the table of V_O "H" indicates an output on voltage while "L" indicates an output off voltage.
3. All output voltages corresponding to all EN locations are controlled independently.
   (EN1 $\rightarrow V_O1$, EN2 $\rightarrow V_O2$ and V_O3 , EN3 $\rightarrow V_O4$)
4. When EN is open, V_O is at the H level.

EN (On/Off Control) Input Equivalent Block Diagram

V_O1 (V_O4)



V_O2 and V_O3



Unit (resistance: Ω)

Notes for Above Applications

1. GND1 and GND2 should be at the same electric potential; since these are connected to the substrate of the LA5606N, the lowest possible electric potential should be used. (If the electric potential of GND1 and GND2 differ, performance characteristics of the LA5606N can not be guaranteed.)
2. Rise and fall times for $V_{IN}1$, $V_{IN}2$ and $V_{IN}3$ should be unified and concerning these pins operating in an open-circuit state or connected to the ground state is forbidden.
3. When $V_{IN}1$ and $V_{IN}2$ are open or lower than the required value, V_O1 to V_O4 are forced off for the IC's protection.
4. Use output capacitors $C_{OUT}1$ and $C_{OUT}4$ rated at 100 μF or more and $C_{OUT}2$ and $C_{OUT}3$ rated at 47 μF or more. To prevent oscillation at low temperature, be sure to use less temperature sensitive capacitors.
5. In order to provide stable operation, $C_{IN}1$ to $C_{IN}3$ and $C_{OUT}1$ to $C_{OUT}4$ should be mounted as close to the LA5606N as possible.
6. The NC pins should not be used (No. 1 and No. 14 in the pin layout).
7. The output voltage of each voltage regulator is affected by a change in the load on the other voltage regulators.