

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.

Specifications

Maximum Ratings at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum input voltage	$V_{IN\ max}$	$V_{IN1} \geq V_{IN2} \geq V_{IN3}$	35	V
Enable pin voltage	$V_{EN\ max}$	EN1, EN2, EN3	$V_{IN\ max}$	V
Allowable power dissipation	$P_d\ max$	With infinite heat sink	15	W
		With no heat sink	4.3	W
Operating temperature	T_{opr}		-20 to +80	$^\circ\text{C}$
Storage temperature	T_{stg}		-55 to +150	$^\circ\text{C}$

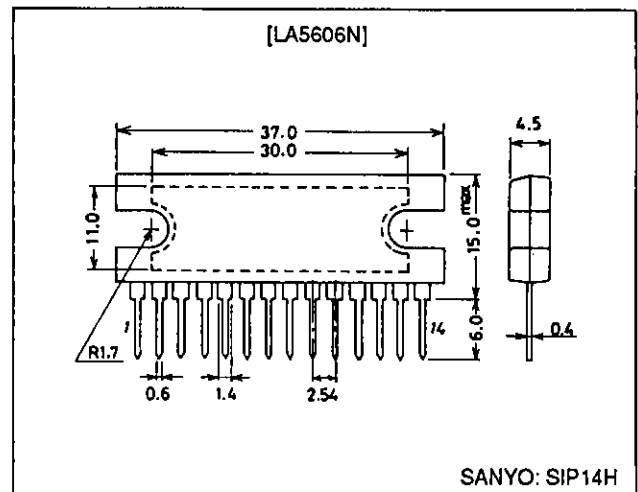
Operating Conditions at $T_a = 25^\circ\text{C}$

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

Package Dimensions

unit: mm

3023A-SIP14H



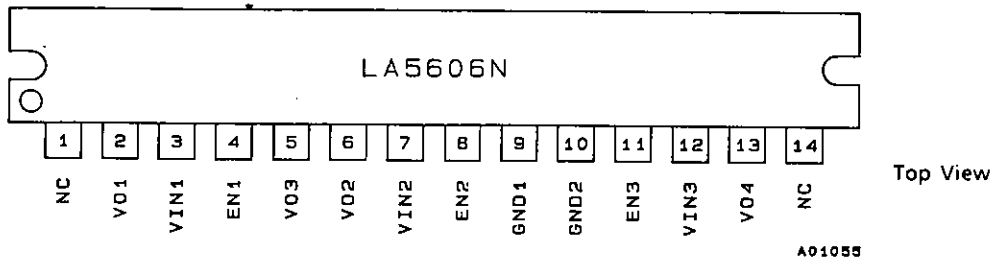
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Operating Characteristics at $T_a = 25^\circ\text{C}$ and the specified Test Circuit

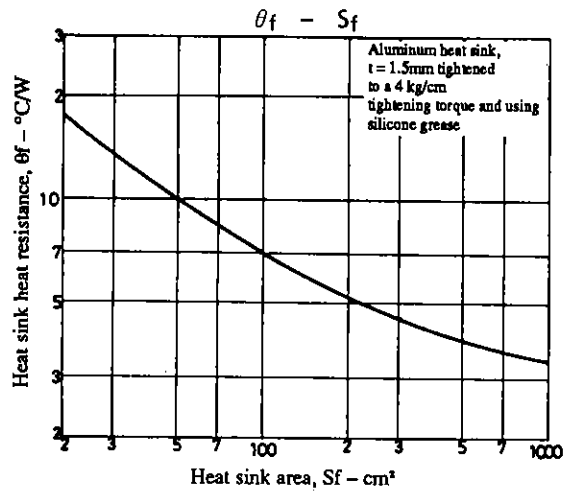
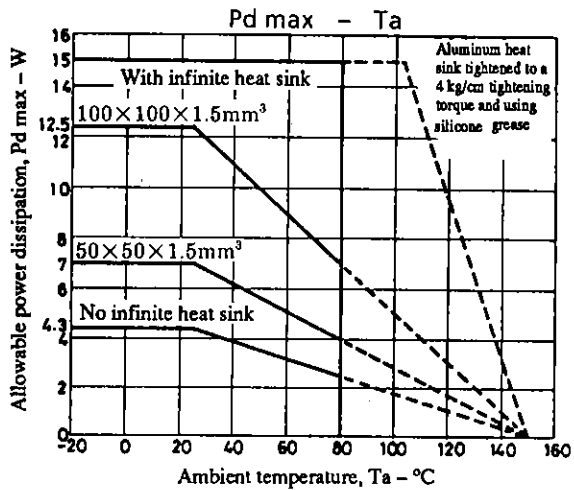
Parameter	Symbol	Conditions	min	typ	max	Unit
Regulator 1 ($V_{EN1} = \text{low}$, V_{O1} : ON, $V_{IN1} = 18.7\text{ V}$ and $I_{O1} = 300\text{ mA}$)						
Output voltage 1	V_{O1}		14.9	15.7	16.5	V
Dropout voltage	$V_{DROP1-1}$			0.3	0.5	V
	$V_{DROP1-2}$	$I_{O1} = 150\text{ mA}$		0.15	0.3	V
Line regulation	ΔV_{OLN1}	$17.5\text{ V} \leq V_{IN1} \leq 23\text{ V}$		20	100	mV
Load regulation	ΔV_{OLD1}	$5\text{ mA} \leq I_{O1} \leq 300\text{ mA}$		40	200	mV
Peak output current	I_{OP1}		350	540		mA
Output short current	I_{OSC1}			150		mA
Output on control voltage	V_{ENL1}	V_{O1} : On			1.0	V
Output off control voltage	V_{ENH1}	V_{O1} : Off	4.0		V_{IN1}	V
Output low level voltage	$V_{O1\text{ OFF}}$				0.2	V
Output noise voltage	V_{NO1}	$10\text{ Hz} \leq f \leq 100\text{ kHz}$		110		μVrms
Ripple rejection	Rrej1	$f = 120\text{ Hz}$, $18\text{ V} \leq V_{IN1} \leq 23\text{ V}$		50		dB
Regulator 2 ($V_{EN2} = \text{low}$, V_{O2} : ON, $V_{IN2} = 15.0\text{ V}$, $I_{O2} = 150\text{ mA}$)						
Output voltage 2	V_{O2}		11.4	12.0	12.6	V
Dropout voltage	V_{DROP2}			0.3	0.5	V
Line regulation	ΔV_{OLN2}	$12.6\text{ V} \leq V_{IN2} \leq 23\text{ V}$		20	100	mV
Load regulation	ΔV_{OLD2}	$1\text{ mA} \leq I_{O2} \leq 150\text{ mA}$		20	70	mV
Peak output current	I_{OP2}		200	270		mA
Output short current	I_{OSC2}			70		mA
Output on control voltage	V_{ENL2}	V_{O2} : On			1.0	V
Output off control voltage	V_{ENH2}	V_{O2} : Off	4.0		V_{IN2}	V
Output low level voltage	$V_{O2\text{ OFF}}$				0.2	V
Output noise voltage	V_{NO2}	$10\text{ Hz} \leq f \leq 100\text{ kHz}$		110		μVrms
Ripple rejection	Rrej2	$f = 120\text{ Hz}$, $13\text{ V} \leq V_{IN2} \leq 23\text{ V}$		50		dB
Regulator 3 ($V_{EN3} = \text{low}$, V_{O3} : ON, $V_{IN3} = 12\text{ V}$, $I_{O3} = 100\text{ mA}$)						
Output voltage 3	V_{O3}		8.55	9.0	9.45	V
Dropout voltage	V_{DROP3}			0.3	0.5	V
Line regulation	ΔV_{OLN3}	$10.45\text{ V} \leq V_{IN3} \leq 23\text{ V}$		20	100	mV
Load regulation	ΔV_{OLD3}	$1\text{ mA} \leq I_{O3} \leq 100\text{ mA}$		20	50	mV
Peak output current	I_{OP3}		150	180		mA
Output short current	I_{OSC3}			40		mA
Output on control voltage	V_{ENL3}	V_{O3} : On			1.0	V
Output off control voltage	V_{ENH3}	V_{O3} : Off	4.0		V_{IN3}	V
Output low level voltage	$V_{O3\text{ OFF}}$				0.2	V
Output noise voltage	V_{NO3}	$10\text{ Hz} \leq f \leq 100\text{ kHz}$		70		μVrms
Ripple rejection	Rrej3	$f = 120\text{ Hz}$, $11\text{ V} \leq V_{IN3} \leq 23\text{ V}$		55		dB
Regulator 4 ($V_{EN4} = \text{low}$, V_{O4} : ON, $V_{IN4} = 8.0\text{ V}$, $I_{O4} = 500\text{ mA}$)						
Output voltage 4	V_{O4}		4.75	5.0	5.25	V
Dropout voltage	$V_{DROP4-1}$			0.3	0.5	V
	$V_{DROP4-2}$	$I_{O4} = 250\text{ mA}$		0.2	0.4	V
Line regulation	ΔV_{OLN4}	$6.25\text{ V} \leq V_{IN4} \leq 23\text{ V}$		20	100	mV
Load regulation	ΔV_{OLD4}	$5\text{ mA} \leq I_{O4} \leq 500\text{ mA}$		30	150	mV
Peak output current	I_{OP4}		500	900		mA
Output short current	I_{OSC4}			250		mA
Output on control voltage	V_{ENL4}	V_{O4} : On			1.0	V
Output off control voltage	V_{ENH4}	V_{O4} : Off	4.0		V_{IN4}	V
Output low level voltage	$V_{O4\text{ OFF}}$				0.2	V
Output noise voltage	V_{NO4}	$10\text{ Hz} \leq f \leq 100\text{ kHz}$		70		μVrms
Ripple rejection	Rrej4	$f = 120\text{ Hz}$, $7\text{ V} \leq V_{IN4} \leq 23\text{ V}$		60		dB
Current dissipation 1	I_{O1}	$I_{O1}, I_{O2}, I_{O3}, I_{O4} = 0$		11		mA
Current dissipation 2	I_{O2}	$I_{O1} = 300\text{ mA}$, $I_{O2} = 150\text{ mA}$, $I_{O3} = 100\text{ mA}$, $I_{O4} = 500\text{ mA}$		53		mA

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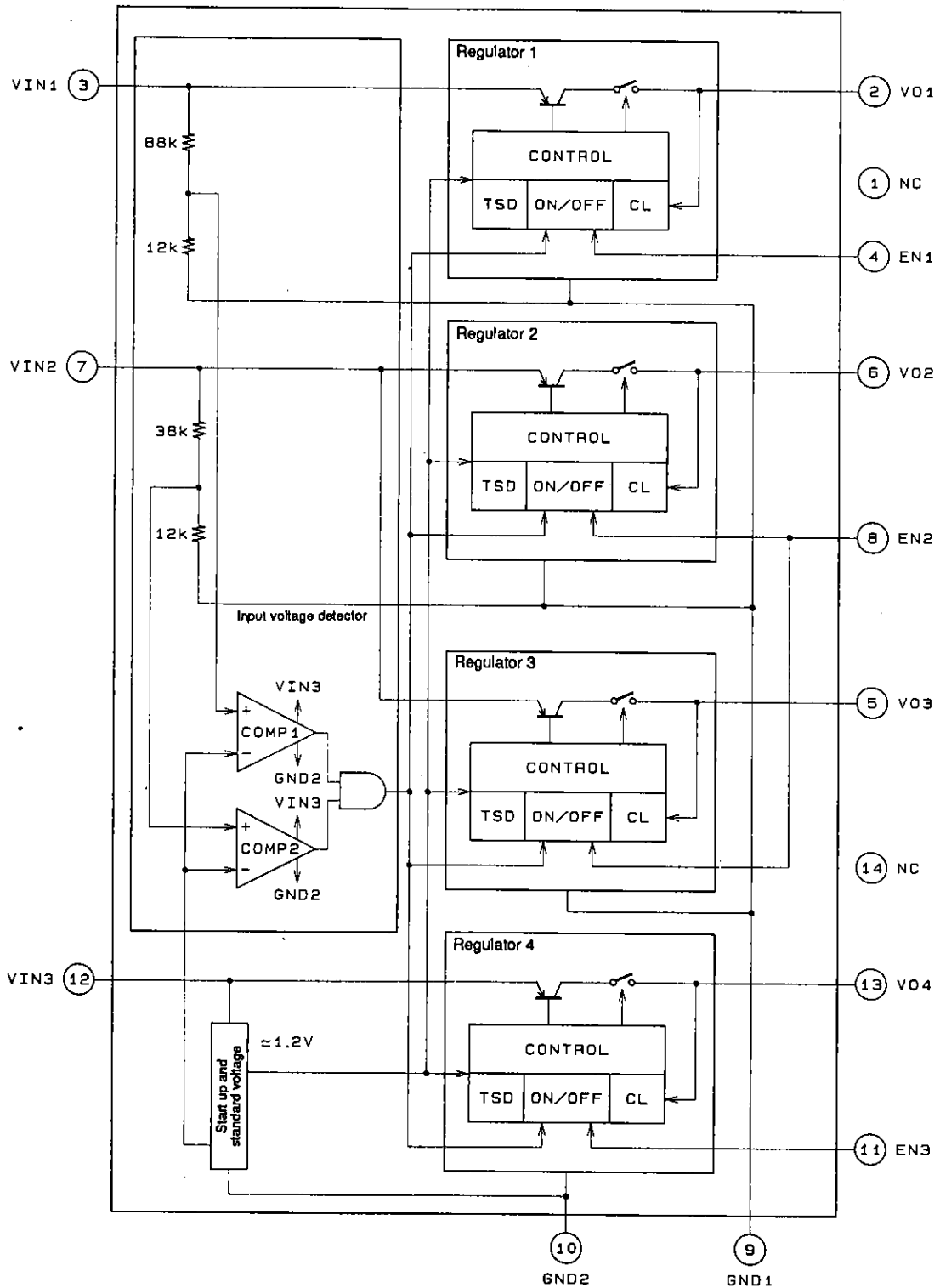
Pin Assignments



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



Block Diagram



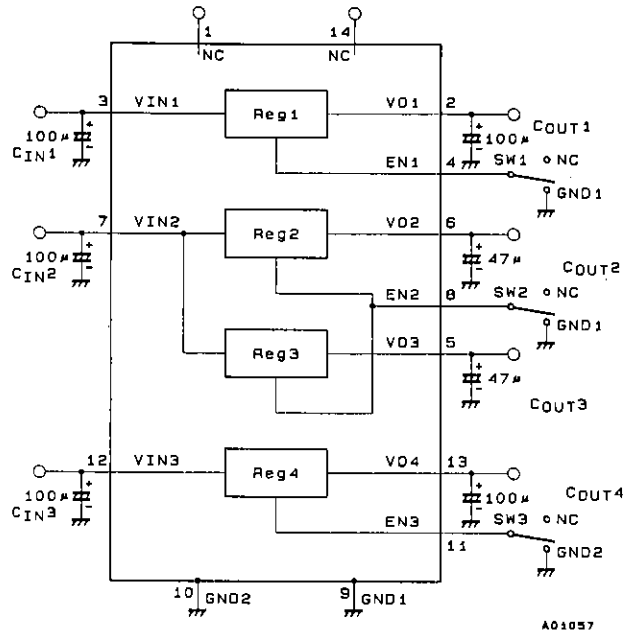
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TSD: Thermal Shutdown Circuit
 ON/OFF: Output on/off Control Circuit
 CL: Current Limiter Circuit

Unit (resistance: Ω)

Test Circuit

Unit (capacitance: F)



Function Table

The following table indicates conditions for operation with $V_{IN1} \geq V_{IN2} \geq V_{IN3}$ ($V_{IN1} \geq 11$ V, $V_{IN2} \geq 6$ V and $V_{IN3} \geq 4$ V).

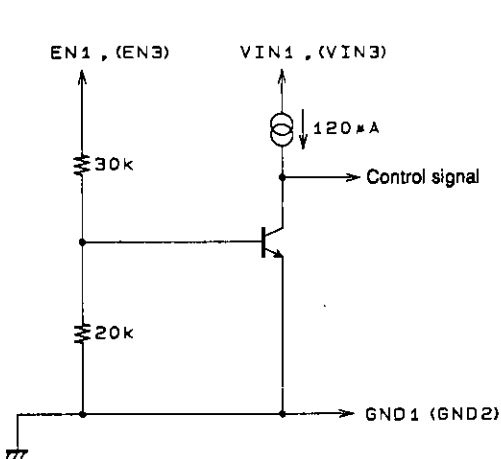
EN1, EN2, EN3	$V_{O1}, V_{O2}/V_{O3}, V_{O4}$
H	L
L	H

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.

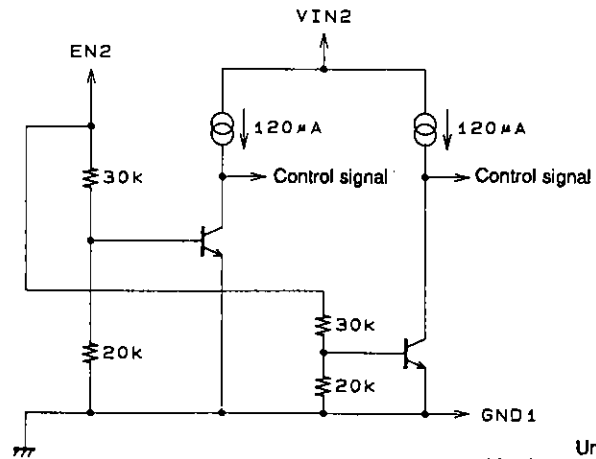
EN (On/Off Control) Input Equivalent Block Diagram

$V_{O1} (V_{O4})$

V_{O2} and V_{O3}



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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_{IN1} , V_{IN2} and V_{IN3} should be unified and concerning these pins operating in an open-circuit state or connected to the ground state is forbidden.
3. When V_{IN1} and V_{IN2} 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_{OUT1} and C_{OUT4} rated at 100 μ F or more and C_{OUT2} and C_{OUT3} rated at 47 μ F or more. To prevent oscillation at low temperature, be sure to use less temperature sensitive capacitors.
5. In order to provide stable operation, C_{IN1} to C_{IN3} and C_{OUT1} to C_{OUT4} 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.

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