

SANYO

No. 4371

LA5607**BS/CS Tuner Regulator with Reset, On/Off Function****Overview**

The LA5607 is a low-dropout voltage regulator IC for BS/CS tuner applications, equipped with four regulators capable of ON/OFF control plus reset function.

Applications

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

Functions

- Four low-dropout 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 shut down).
- On-chip microcontroller reset signal generation circuit.

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-dropout voltage regulators.
- Adapting three input pins contributes power dissipation reduction and heat sink design.
- On-chip reset signal generation circuit is most suitable for tuners using microcontrollers.

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

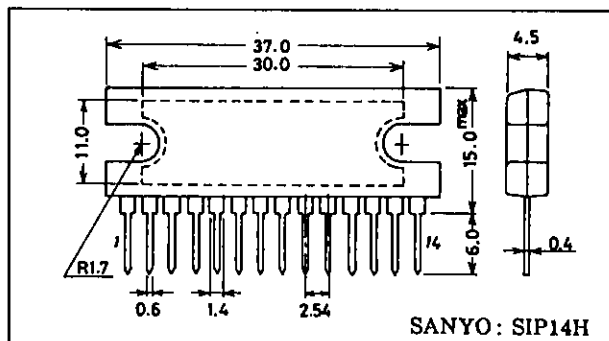
				unit
Maximum input voltage	$V_{IN\ max}$	$V_{IN1} \geq V_{IN2} \geq V_{IN3}$	35	V
Enable pin voltage	$V_{EN\ max}$	EN1, EN2, EN3	$V_{IN\ max}$	V
Allowable power dissipation	$P_d\ max$	With infinite heat sink	15	W
		With no heat sink	4.3	W
Operating temperature	T_{opr}		-20 to +80	$^\circ\text{C}$
Storage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

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

				unit
Output current 1	I_{O1}	Regulator 1	5 to 300	mA
Output current 2	I_{O2}	Regulator 2	1 to 150	mA
Output current 3	I_{O3}	Regulator 3	1 to 100	mA
Output current 4	I_{O4}	Regulator 4	5 to 500	mA
Reset output source current	I_{ORH}	SOURCE	0 to 200	μA
Reset output sink current	I_{ORL}	SINK	0 to 2	mA

Package Dimensions

unit : mm

3023A-SIP14H

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

Regulator 1 (V _{EN1} = "L", V _{O1} : ON, V _{IN1} = 18.7 V and I _{O1} = 300 mA)			min	typ	max	unit
Output voltage 1	V _{O1}		14.9	15.7	16.5	V
Dropout voltage	V _{DROP1-1}			0.3	0.6	V
	V _{DROP1-2}	I _{O1} = 150mA		0.15	0.3	V
Line regulation	ΔV _{OLN1}	17.5V ≤ V _{IN1} ≤ 23V		20	100	mV
Load regulation	ΔV _{OLD1}	5mA ≤ I _{O1} ≤ 300mA		40	200	mV
Peak output current	I _{OP1}		300	540		mA
Output short current	I _{OSC1}			150		mA
Output on control voltage	V _{ENL1}	V _{O1} : On			0.4	V
Output off control voltage	V _{ENH1}	V _{O1} : Off	2.0		V _{IN1}	V
Output "L"-level voltage	V _{O1} OFF				0.2	V
Output noise voltage	V _{NO1}	10Hz ≤ f ≤ 100kHz		110		μVrms
Ripple rejection	R _{rej1}	f = 120Hz, 18V ≤ V _{IN1} ≤ 23V		50		dB
Regulator 2 (V _{EN2} = "L", V _{O2} : ON, V _{IN2} = 15.0V, I _{O2} = 150mA)						
Output voltage 2	V _{O2}		11.4	12.0	12.6	V
Dropout voltage	V _{DROP2}			0.3	1.0	V
Line regulation	ΔV _{OLN2}	12.6V ≤ V _{IN2} ≤ 23V		20	100	mV
Load regulation	ΔV _{OLD2}	1mA ≤ I _{O2} ≤ 150mA		20	70	mV
Peak output current	I _{OP2}		150	270		mA
Output short current	I _{OSC2}			70		mA
Output on control voltage	V _{ENL2}	V _{O2} : On			0.4	V
Output off control voltage	V _{ENH2}	V _{O2} : Off	2.0		V _{IN2}	V
Output "L"-level voltage	V _{O2} OFF				0.2	V
Output noise voltage	V _{NO2}	10Hz ≤ f ≤ 100kHz		110		μVrms
Ripple rejection	R _{rej2}	f = 120Hz, 13V ≤ V _{IN2} ≤ 23V		50		dB
Regulator 3 (V _{EN3} = "L", V _{O3} : ON, V _{IN3} = 12V, I _{O3} = 100mA)						
Output voltage 3	V _{O3}		8.55	9.0	9.45	V
Dropout voltage	V _{DROP3}			0.3	1.0	V
Line regulation	ΔV _{OLN3}	10.45V ≤ V _{IN3} ≤ 23V		20	100	mV
Load regulation	ΔV _{OLD3}	1mA ≤ I _{O3} ≤ 100mA		20	50	mV
Peak output current	I _{OP3}		100	180		mA
Output short current	I _{OSC3}			40		mA
Output on control voltage	V _{ENL3}	V _{O3} : On			0.4	V
Output off control voltage	V _{ENH3}	V _{O3} : Off	2.0		V _{IN3}	V
Output "L"-level voltage	V _{O3} OFF				0.2	V
Output noise voltage	V _{NO3}	10Hz ≤ f ≤ 100kHz		70		μVrms
Ripple rejection	R _{rej3}	f = 120Hz, 11V ≤ V _{IN3} ≤ 23V		55		dB
Regulator 4 (V _{EN4} = "L", V _{O4} : ON, V _{IN4} = 8.0V, I _{O4} = 500mA)						
Output voltage 4	V _{O4}		4.75	5.0	5.25	V
Dropout voltage	V _{DROP4-1}			0.4	1.0	V
	V _{DROP4-2}	I _{O4} = 250mA		0.3	0.8	V
Line regulation	ΔV _{OLN4}	6.25V ≤ V _{IN4} ≤ 23V		20	100	mV
Load regulation	ΔV _{OLD4}	5mA ≤ I _{O4} ≤ 500mA		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			0.4	V
Output off control voltage	V _{ENH4}	V _{O4} : Off	2.0		V _{IN4}	V
Output "L"-level voltage	V _{O4} OFF				0.2	V
Output noise voltage	V _{NO4}	10Hz ≤ f ≤ 100kHz		70		μVrms
Ripple rejection	R _{rej4}	f = 120Hz, 7V ≤ V _{IN4} ≤ 23V		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} = 150mA, I _{O3} = 100mA, I _{O4} = 500mA		53		mA

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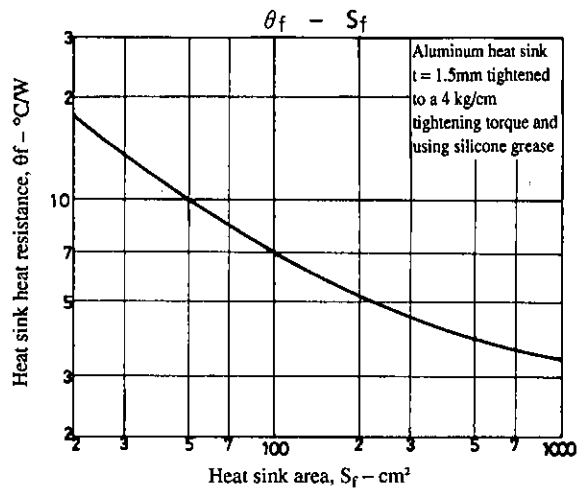
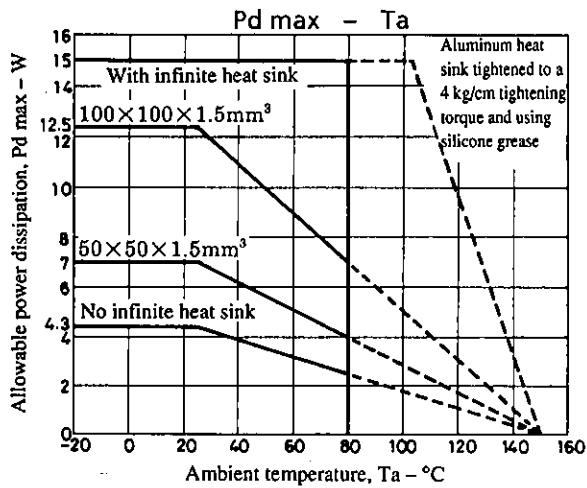
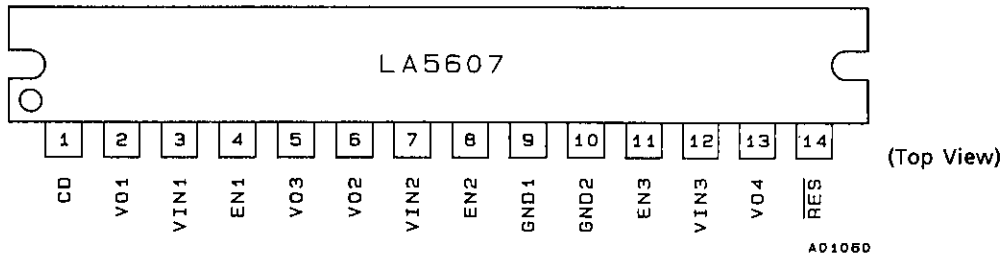
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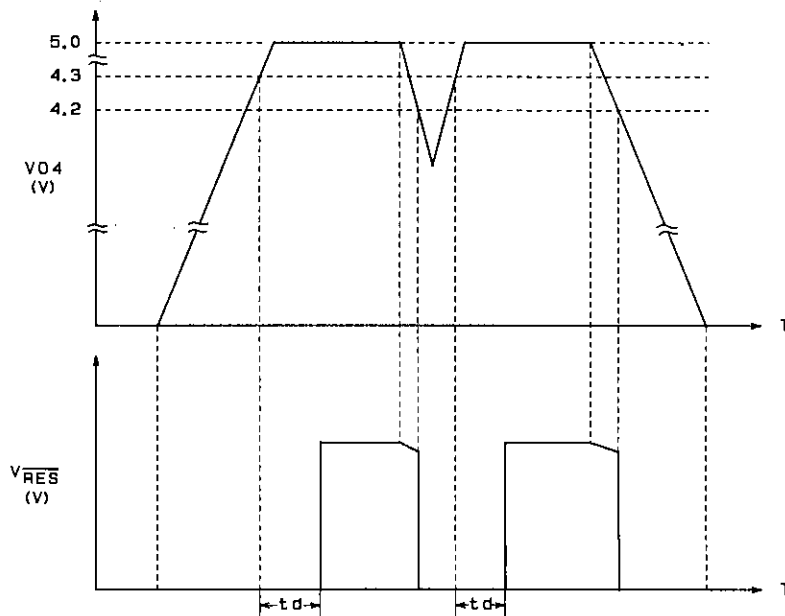
Reset Circuit

			min	typ	max	unit
"H"-level reset output voltage	V_{ORH}	$I_{ORH} = 200 \mu A$, CD pin open	4.83	4.98	5.13	V
"L"-level reset output voltage	V_{ORL}	$I_{ORL} = 2 \text{ mA}$, CD pin shorted to ground (GND)		100	200	mV
Reset threshold voltage	V_{RT}	$I_{O4} = 5 \text{ mA}$	3.95	4.2	4.45	V
Reset hysteresis voltage	V_{hys}	$I_{O4} = 5 \text{ mA}$	50	100	200	mV
Reset output delay time	t_d	$C_d = 0.1 \mu F$	7.5	10	12.5	ms

Pin Assignments



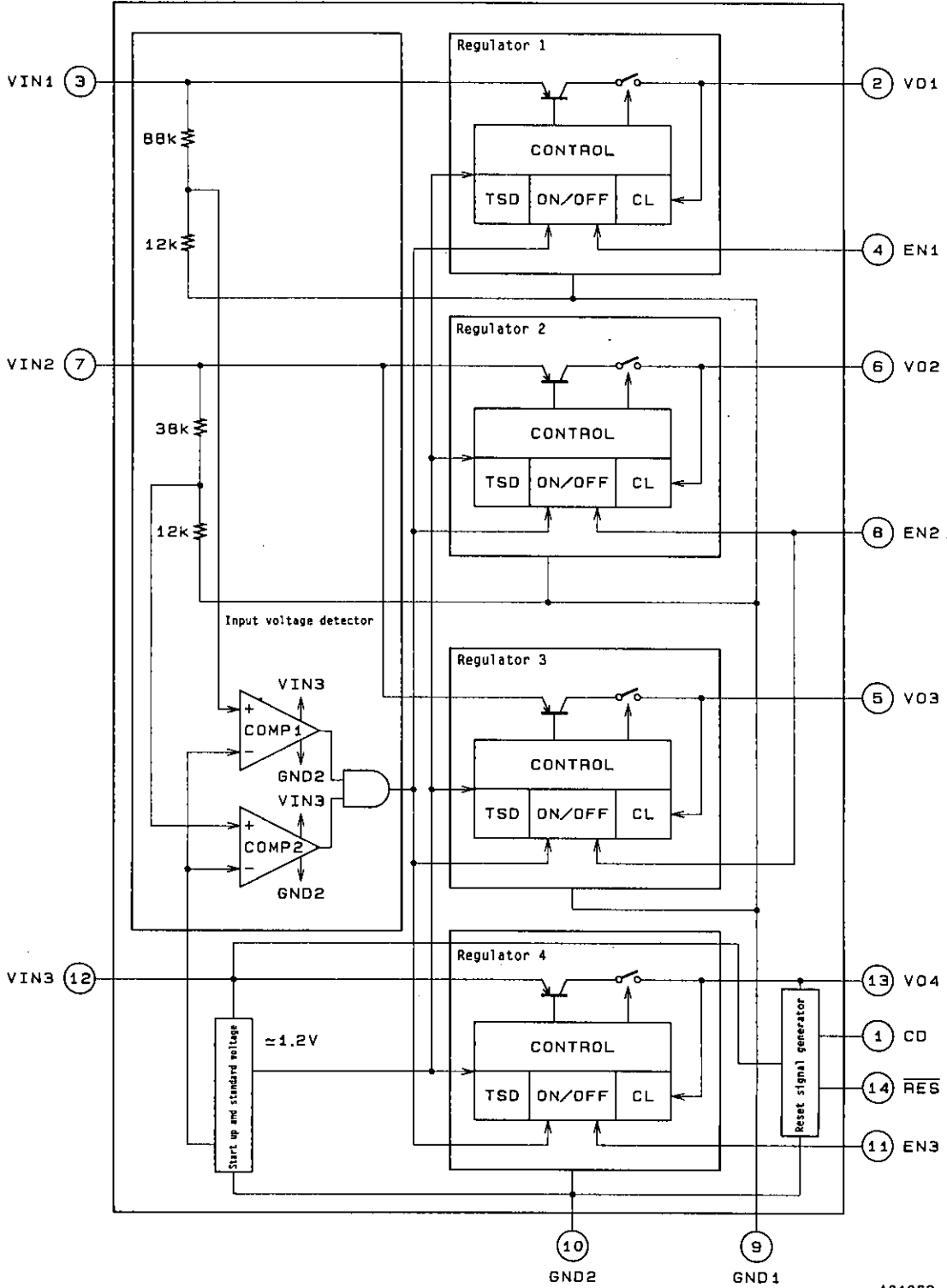
Reset Operation



$$t_d = 100 \times C_d (\mu F) [\text{ms}]$$

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Block Diagram

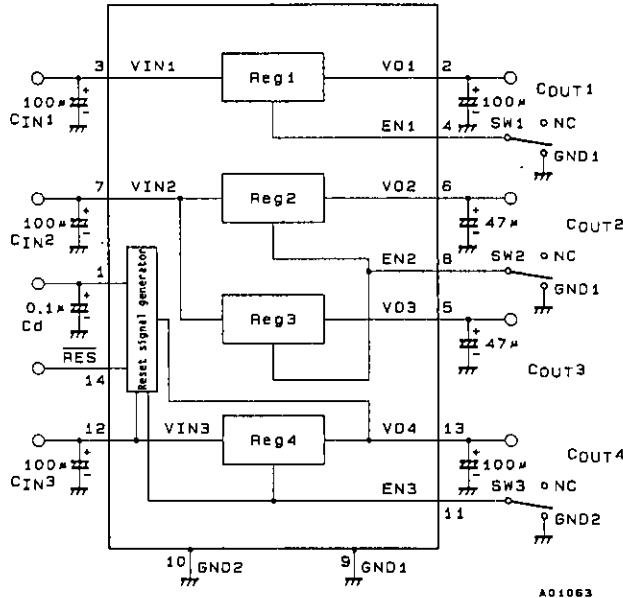


TSD: Thermal Shut Down Circuit
 ON/OFF: Output on/off Control Circuit
 CL: Current Limiter Circuit

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Unit (resistance: Ω)

Test Circuit



Function Table

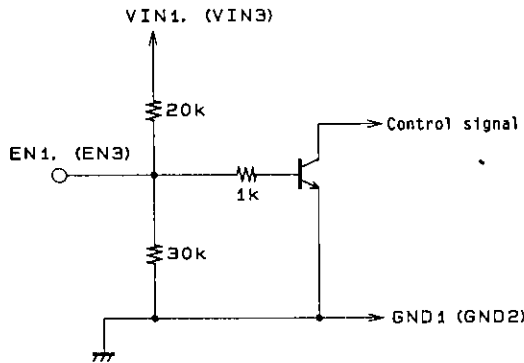
The following table indicates conditions for operation with $V_{IN1} \geq V_{IN2} \geq V_{IN3}$ ($V_{IN1} \geq 11$ V, $V_{IN2} \geq 6$ V and $V_{IN3} \geq 4$ V).

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

- ① Within the table H of EN indicates an H level or open and L indicates an L level.
- ② H of V_O in the table 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} , $EN3 \rightarrow V_{O4}$)

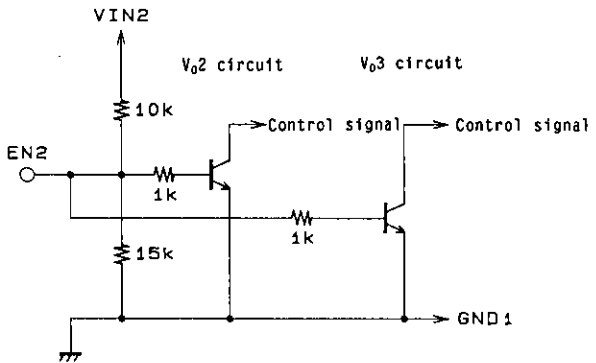
EN (On/Off Control) Input Equivalent Block Diagram

① V_{O1} (V_{O4})



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② V_{O2} and V_{O3}



Unit (resistance: Ω)

A01059

Notes for Above Applications

- ① GND1 and GND2 should be at same electric potential; since these are connected to the substrate of the LA5607, the lowest possible electric potential should be used. (If the electric potential of GND1 and GND2 differ, performance characteristics of the LA5607 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 Use delay capacitor C_d which has little change in capacity caused by temperature, such as a tantalum capacitor.
- ⑥ In order to provide stable operation, C_{IN1} to C_{IN3} and C_{OUT1} to C_{OUT4} should be mounted as close to the LA5607 as possible.

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