Ordering number: EN 5197

Monolithic Linear IC

LA5612

Multifunctional Voltage Regulator for TVs and VCRs with BS Tuner

Applications

- Audiovisual equipment, VCRs and TVs with BS tuner

Features

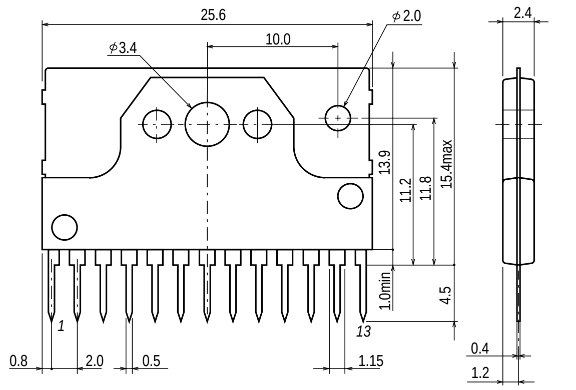
- Low-saturation regulator (ON/OFF function built in)
- Control amplifier built in.
- Current limit and thermal limit circuits built in
- Reverse current prevention provided (V_O1)

Package Dimensions

unit : mm

3107-SIP13H

[LA5612]



SANYO : SIP13H

Specfications

Maximum Ratings at Ta = 25 °C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum input voltage	V_{IN}1 max		22	V
	V_{IN}2 max	V_{IN} 1≧V_{IN} 2	V_{IN}1	
Allowable power dissipation	Pd max	No heat sink	2	W
Thermal resistance between junction and case	θj-c		4.7	°C/W
Operating temperature	Topr		–20 to +80	°C
Storage temperature	Tstg		–40 to +150	°C

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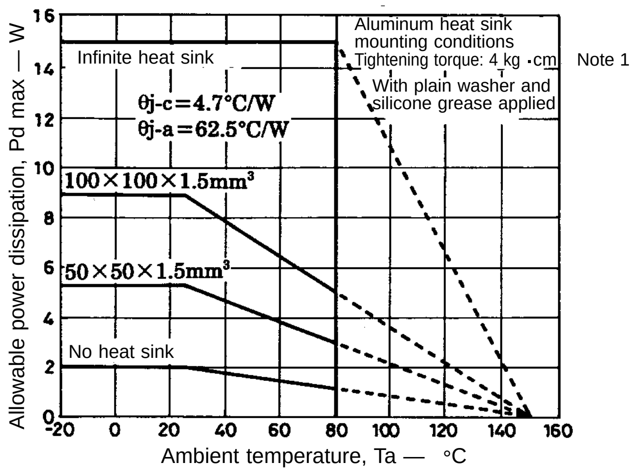
Operating Conditions at Ta = 25 °C

Parameter	Symbol	Conditions	Ratings	Unit
Input voltage	$V_{IN}1$		11.5 to 20	V
	$V_{IN}2$		6.2 to 20	V
Output current 1	I_O1		10 to 360	mA
Output current 2	I_O2		10 to 420	mA
Output current 3	I_O3		10 to 420	mA

Operating Characteristics at Ta = 25 °C, See specified Test Circuit.

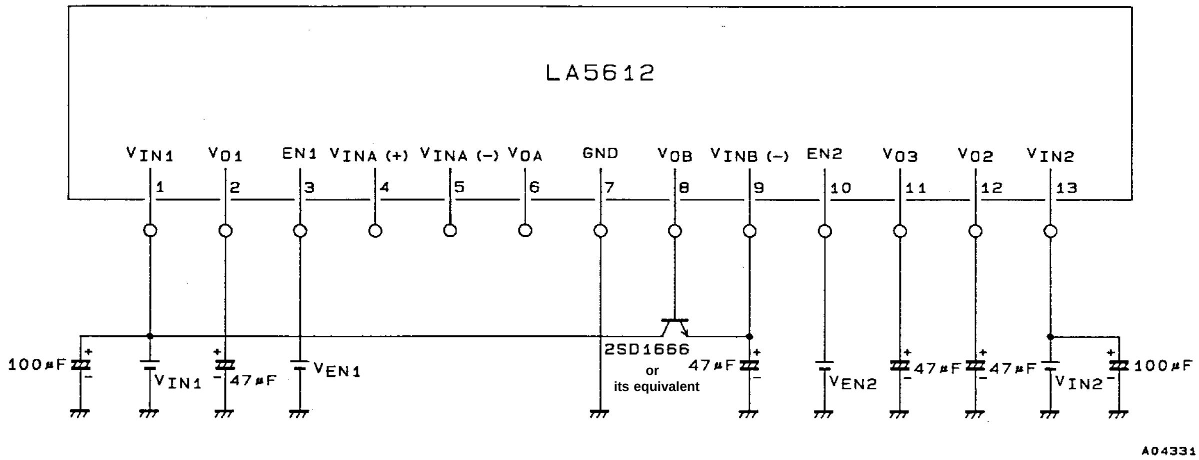
Parameter	Symbol	Conditions	min	typ	max	Unit
[No-load mode] When V_O1, V_O2, V_O3 is on : $V_{EN}1$ = 3 V, $V_{EN}2$ = 3 V, $V_{IN}1$ = 16.5 V, $V_{IN}2$ = 6.6 V, I_O1 to I_O3 = 0 mA						
Quiescent current	$I_{IN}1$			7	14	mA
	$I_{IN}2$			8	16	mA
[Regulator 1] When V_O1, V_O2, V_O3 is on : $V_{EN}1$ = 3 V, $V_{EN}2$ = 3 V, $V_{IN}1$ = 16.5 V, $V_{IN}2$ = 6.6 V, I_O1 = 300 mA						
Output voltage 1	V_O1		13.7	14.5	15.2	V
Dropout voltage	$V_{DROP}1$			0.5	1.0	V
Line regulation	$\Delta V_{OLN}1$	16.5 V $\leqq V_{IN}1 \leqq$ 20.5 V			140	mV
Load regulation	$\Delta V_{OLD}1$	10mA $\leqq I_O1 \leqq$ 300 mA			150	mV
Output inflow current	I_O1 IN	22 V applied to pin V_O1, no-load mode			500	µA
Peak output current	$I_{OP}1$		360			mA
Output short-circuit current	$I_{OSC}1$			45	180	mA
Ripple rejection	Rrej1			50		dB
Output low-level voltage	V_O1 OFF	$V_{EN}1$ = 1 V, when V_O1 is off			0.2	V
Output voltage/temperature coefficient	$\Delta V_O1/\Delta Ta$			±0.5		mV/ °C
[Regulator 2] When V_O1, V_O2, V_O3 is on : $V_{EN}1$ = 3 V, $V_{EN}2$ = 3 V, $V_{IN}1$ = 16.5 V, $V_{IN}2$ = 6.6 V, I_O2 = 350 mA						
Output voltage 2	V_O2		4.80	5.05	5.30	V
Dropout voltage	$V_{DROP}2$			0.5	1.0	V
Line regulation	$\Delta V_{OLN}2$	6 V $\leqq V_{IN}2 \leqq$ 7.2 V			20	mV
Load regulation	$\Delta V_{OLD}2$	100 mA $\leqq I_O2 \leqq$ 350 mA			100	mV
Peak output current	$I_{OP}2$		420			mA
Output short-circuit current	$I_{OSC}2$			65	210	mA
Ripple rejection	Rrej2			50		dB
Output low-level voltage	V_O2 OFF	$V_{EN}2$ = 1 V, when V_O2 is off			0.2	V
Output voltage/temperature coefficient	$\Delta V_O2/\Delta Ta$			±0.5		mV/ °C
[Regulator 3] When V_O1, V_O2, V_O3 is on : $V_{EN}1$ = 3 V, $V_{EN}2$ = 3 V, $V_{IN}1$ = 16.5 V, $V_{IN}2$ = 6.6 V, I_O3 = 350 mA						
Output voltage 3	V_O3		4.80	5.05	5.30	V
Dropout voltage	$V_{DROP}3$			0.5	1.0	V
Line regulation	$\Delta V_{OLN}3$	6 V $\leqq V_{IN}2 \leqq$ 7.2 V			20	mV
Load regulation	$\Delta V_{OLD}3$	100 mA $\leqq I_O3 \leqq$ 350 mA			100	mV
Peak output current	$I_{OP}3$		420			mA
Output short-circuit current	$I_{OSC}3$			65	210	mA
Ripple rejection	Rrej3			50		dB
Output low-level voltage	V_O3 OFF	$V_{EN}2$ = 1 V, when V_O3 is off			0.2	V
Output voltage/temperature coefficient	$\Delta V_O3/\Delta Ta$			±0.5		mV/ °C
[Output on/off control] $V_{IN}1$ = 16.5 V, $V_{IN}2$ = 6.6 V						
Output on control voltage	$V_{EN}1$ H	V_O1: on, $V_{EN}1$ < 22 V	3.0		$V_{IN}1$	V
	$V_{EN}2$ H	V_O2, V_O3: on, $V_{EN}2$ < 22 V				
Output off control voltage	$V_{EN}1$ L	V_O1: off			1.0	V
	$V_{EN}2$ L	V_O2, V_O3: off				
[Amplifier A] When V_O1, V_O2, V_O3 is on : $V_{EN}1$ = 3 V, $V_{EN}2$ = 3 V, $V_{IN}1$ = 16.5 V, $V_{IN}2$ = 6.6 V						
Input offset voltage	V_{IOA}				±7	mV
Input bias current	I_{BA}				250	nA
Output current (source)	$I_{OA\ SOURCE}$	V_{INA}^+ = 1 V, V_{INA}^- = 0 V	10			mA
Output current (sink)	$I_{OA\ SINK}$	V_{INA}^+ = 0 V, V_{INA}^- = 1 V	10			mA
[Amplifier B] When V_O1, V_O2, V_O3 is on : $V_{EN}1$ = 3 V, $V_{EN}2$ = 3 V, $V_{IN}1$ = 16.5 V, $V_{IN}2$ = 6.6 V						
Output current (source)	$I_{OB\ SOURCE}$		10			mA

Pd max — Ta



Note 1: The tightening torque referred to in the above figure is a condition specified for the heat dissipation characteristics and not a working condition to be met when mounting the heat sink.

Test Circuit



Pin Functions

No.	Symbol	Function
1	$V_{IN}1$	High voltage input.
2	V_O1	14.5 V/300 mA regulator, with reverse current prevention.
3	EN1	Regulator 1 on/off control. High active.
4	$V_{INA}(+)$	Amplifier A noninverting input.
5	$V_{INA}(–)$	Amplifier A inverting input.
6	V_{OA}	Amplifier A output.
7	GND	Substrate of the LA5612 (minimum potential).
8	V_{OB}	Amplifier B output (5 V regulator supported by external NPN transistor).
9	$V_{INB}(–)$	Amplifier B inverting input (5 V regulator supported by external NPN transistor).
10	EN2	Regulator 2 and regulator 3 on/off control. High active.
11	V_O3	5.05 V/350 mA regulator.
12	V_O2	5.05 V/350 mA regulator.
13	$V_{IN}2$	Low-voltage input.

Function Table (○: built in, ×: not built in)

Function \ Circuit block	V_O1	V_O2	V_O3	AMP A	AMP B
Input line	$V_{IN}1$	$V_{IN}2$	$V_{IN}2$	$V_{IN}1$	$V_{IN}1$
Current limit	○	○	○	×	×
Thermal limit	○	○	○	×	×
On/off control	EN1	EN2	EN2	×	×

Usage Notes

(1) Apply voltage to the voltage input pins on condition that $V_{IN}1 \geqq V_{IN}2$.

(2) Apply voltage simultaneously to $V_{IN}1$ and $V_{IN}2$. Do not use the LA5612 with voltage applied to only one of these pins.

(3) Since the amplifiers do not have current limit protection such as an external NPN transistor, provide this protection in each application.

Logic Table

Conditions : when $V_{IN}1 \geqq V_{IN}2$ (at $V_{IN}1 \geqq 4$ V, $V_{IN}2 \geqq 4$ V)

EN1,EN2	V_O1, V_O2, V_O3
L or open	L
H	H

(1) "H" for EN denotes high level; "L" denotes low level or open.

(2) "H" for V_O denotes output ON voltage; "L" denotes output OFF voltage.

(3) Each output voltage corresponds to each EN and is controlled independently.
(EN1 is coupled with V_O1, and EN2 with V_O2 and V_O3.)

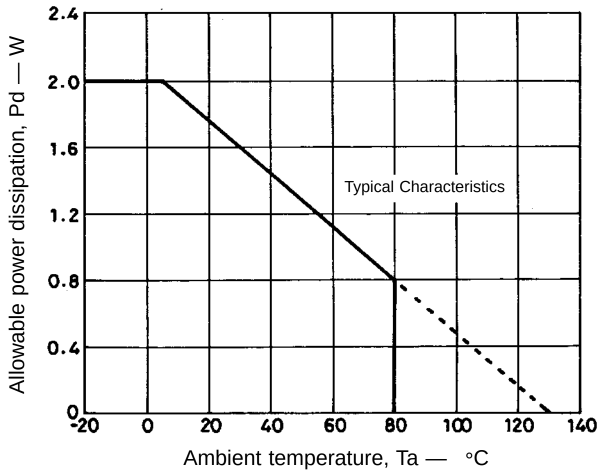
Thermal Design Notes

(1) In the LA5612, the junction temperature (Tj) at which thermal shutdown is activated is approximately equal to 130°C.

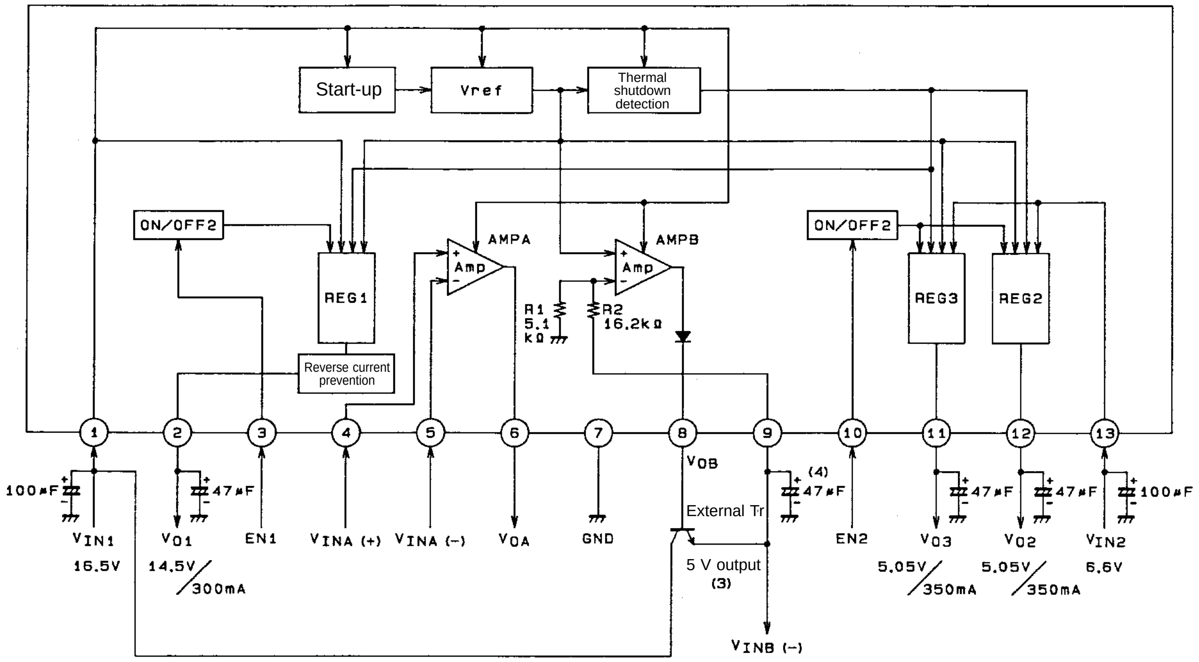
(2) Consequently, the operating range of REG1, REG2 and REG3 with the thermal shutdown function is restricted by the thermal shutdown characteristics (typical value) shown in the figure below.

(3) The thermal shutdown characteristics vary ±20°C or so. Since thermal shutdown is liable to occur with inadequate heat dissipation, sufficient consideration must be given to the heat dissipation design.

Thermal Shutdown Characteristics



Equivalent Circuit Block Diagram and Sample Application Circuit



Application Notes

(1) The input line for AMP A and AMP B is shared with $V_{IN}1$.

(2) AMP A and AMP B are on in normal use.

(3) The output voltage is 5 V when an external NPN transistor has been added.

(4) Depending on the type, load current and connection position (distance from the LA5612) of the external NPN transistor, the value of a capacitor connected between emitter and ground must be changed for stable operation.

(5) The capacitors connected between each pin and GND are bypass capacitors for preventing oscillation: as such, they must be positioned as close to the LA5612 as possible in order to stabilize operation.

This catalog provides information as of September, 1995. Specifications and information herein are subject to change without notice.