

## SANYO Semiconductors DATA SHEET



## Monolithic Linear IC For VCR Regulator and Control Amplifier

#### **Overview**

The LA5613 is an IC that includes an independently on/off switchable 5V/0.7A low-saturation regulator, an 11.3V/0.3A ripple filter, and a control amplifier on chip. It is optimal for use in VCR and similar products.

#### Function

- 5V/0.7A low-saturation regulator (Includes an on/off function)
- 11.3V/0.3A ripple filter (Includes an on/off function.)
- Switching regulator control amplifier
- Includes input overvoltage and thermal protection circuits on chip.

#### **Specifications**

#### Maximum Ratings at $Ta = 25^{\circ}C$

Symbol	Conditions	Ratings	Unit
V <sub>CC</sub> 1 max		14	V
V <sub>CC</sub> 2 max	V <sub>CC</sub> 1≥V <sub>CC</sub> 2	V <sub>CC</sub> 1	V
Pd max	No heat sink	1.7	w
Topr		-20 to +80	°C
Tstg		-40 to +150	°C
	Symbol V <sub>CC</sub> 1 max V <sub>CC</sub> 2 max Pd max Topr Tstg	Symbol     Conditions       V <sub>CC</sub> 1 max     V       V <sub>CC</sub> 2 max     V <sub>CC</sub> 1 ≥ V <sub>CC</sub> 2       Pd max     No heat sink       Topr	Symbol         Conditions         Ratings           V <sub>CC</sub> 1 max         14           V <sub>CC</sub> 2 max         V <sub>CC</sub> 1 ≥ V <sub>CC</sub> 2         V <sub>CC</sub> 1           Pd max         No heat sink         1.7           Topr         -20 to +80         -40 to +150

# Operating Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Input voltage	V <sub>CC</sub> 1		$12.3\pm0.4$	V
	V <sub>CC</sub> 2		$6\pm0.5$	V
Output current 1	I <sub>O</sub> 1		0 to 0.3	А
Output current 2	1 <sub>0</sub> 2		0 to 0.7	A

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Symbol	Conditions	Ratings			Unit			
Farameter Symbol		min	typ	max	Onit			
No Load : $V_{STB}$ = high, $V_{CC}1$ = 12.3V, $V_{CC}2$ = 6V, I <sub>O</sub> 1 and I <sub>O</sub> 2 = 0A								
I <sub>IN</sub> 1			20	30	mA			
I <sub>IN</sub> 2			0.2	0.3	mA			
<b>Output 1</b> : V <sub>STB</sub> = high, V <sub>CC</sub> 1 = 12.3V, V <sub>CC</sub> 2 = 6V, I <sub>O</sub> 1 = 0.3A								
V <sub>O</sub> 1		10.9	11.3		V			
V <sub>DROP</sub> 1			1.0	1.4	V			
I <sub>OP</sub> 1		0.3		/	A			
V <sub>O</sub> 1 OFF			$\langle$	0.2	v			
<b>Output 2</b> : $V_{STB}$ = high, $V_{CC}$ 1 = 12.3V, $V_{CC}$ 2 = 6V, $I_{O}$ 2 = 0.7A								
V <sub>O</sub> 2		4.9	5.1	5.3	V			
V <sub>DROP</sub> 2			0.3	0.5	V			
$\Delta V_{OLN}^2$	$6V \le V_{CC} 2 \le 7V$			20	mV			
$\Delta V_{OLD}^2$	$0.1A \le I_{O}2 \le 0.7A$			300	mV			
I <sub>OP</sub> 2		0.7			А			
I <sub>OSC</sub> 2				0.75	А			
Rrej2	$f = 120Hz, 6V \le V_{CC}2 \le 7V$		50		dB			
V <sub>O</sub> 2 OFF				0.2	V			
VHVTH		7.6	8.0	8.4	V			
V <sub>CC</sub> 1 = 12.3V, V	/CC2 = 6V							
V <sub>STB</sub> L	V <sub>O</sub> 1 and V <sub>O</sub> 2: off			1.0	V			
VSTBH	V <sub>O</sub> 1 and V <sub>O</sub> 2: on	3.0		V <sub>CC</sub> 1	V			
Control Amplifier : $V_{CC}1 = 12.3V$ , $V_{CC}2 = 6V$								
ICONT	V <sub>CC</sub> 1 = 12.8V	10			mA			
KR	KR = R1/R2, V <sub>REF</sub> = 1.28V typ		8.61					
V <sub>CC</sub> 1 - ERR	$I_0 1 = 0.3 \text{A}, I_0 2 = 0.7 \text{A}$	11.9	12.3	12.7	V			
	Symbol           CC2 = 6V, IO1 at           IIN1           IIN2           (CC2 = 6V, IO1 =           VO1           VDROP1           IOP1           VO1 OFF           (CC2 = 6V, IO2 =           VO2           VDROP2           ΔVOLN2           ΔVOLN2           IOP2           IOSC2           Rrej2           VO2 OFF           VHVTH           VCC1 = 12.3V, V           VSTBL           VSTBH           = 6V           ICONT           KR           VCC1 - ERR	Symbol         Conditions $CC2 = 6V, I_01 \text{ and } I_02 = 0A$ IIN1 $I_{IN2}$ ICC2 = 6V, I_01 = 0.3A $V_{01}$ V $V_{01}$ ICC2 = 6V, I_01 = 0.3A $V_{01}$ V $V_{01}$ ICC2 = 6V, I_01 = 0.3A $V_{01}$ V_01 $V_{01}$ ICC2 = 6V, I_02 = 0.7A $V_{02}$ V $V_{02}$ ICC2 = 6V, I_02 = 0.7A $V_{02}$ ICC2 = 6V $V_{02}$ 0.1A $\leq I_02 \leq 0.7A$ $V_{02}$ 0.1A $\leq I_02 \leq 0.7A$ $I_{0P2}$ ICC2 = 6V $I_{0SC2}$ I $Rreij2$ f = 120Hz, 6V $\leq V_{CC}2 \leq 7V$ $V_{02}$ OFF         ICC1 = 12.3V, $V_{CC}2 = 6V$ V_HVTH         V $V_{C1} = 12.3V, V_{CC}2 = 6V$ VSTBL         V_01 and $V_02$ : off $V_{STBH}$ V_01 and $V_02$ : on $I_{CONT}$ $V_{CC}1 = 12.8V$ KR         KR = R1/R2, $V_{REF} = 1.28V$ typ $V_{CC}1 - ERR$ $I_01 = 0.3A, I_02 = 0.7A$	Symbol         Conditions         min $C_{C2} = 6V,  _{O1} and  _{O2} = 0A$ I         I $I_{IN1}$ I         I $I_{IN2}$ V         I $V_{C2} = 6V,  _{O1} = 0.3A$ I         I $V_{O1}$ I         I         I $V_{O1}$ I         0.9         V $V_{DROP1}$ I         I         I $V_{O2}$ I         I         I $V_{O2} = 0.7A$ I         I         I $V_{O2} = 6V,  _{O2} = 0.7A$ I         I         I $V_{DROP2} = 0.7A$ I         I         I         I $\Delta V_{OLD2} = 0.1A \le I_{O2} \le 0.7A$ I         I         I         I $V_{O2}$ I         I         I         I         I $V_{O2}$ I         I </td <td>Symbol         Conditions         Ratings           IN1         typ           <math>l_{N1}</math>         20           <math>l_{N2}</math>         0.2           <math>V_{C2} = 6V, I_{0}1 = 0.3A</math>         0.2           <math>V_{01}</math>         10.9         11.3           <math>V_{01}</math>         10.9         11.3           <math>V_{01}</math>         0.3         10.9           <math>V_{02}</math>         4.9         5.1           <math>V_{02}</math>         4.9         5.1           <math>V_{02}</math>         0.1A ≤ <math>I_{02} \le 0.7A</math>         0.3           <math>V_{0LD2}</math>         0.1A ≤ <math>I_{02} \le 0.7A</math>         0.7           <math>I_{0P2}</math>         0.1A ≤ <math>I_{02} \le 0.7A</math>         0.7           <math>I_{0SC2}</math>         0.7         10.9           <math>V_{HVTH}</math> <math>V_{01}</math> and <math>V_{02} : off</math> <math>V_{01}</math> <math>V_{01}</math> and <math>V_{02} : off</math> <math>V_{01}</math> <math>V_{01}</math> and <math>V_{02} : off</math> <math>V_{STBH}</math> <math>V_{01}</math> and <math>V_{02} : off</math> <math>V_{01}</math> <tr< td=""><td>Ratings           Symbol         Conditions         Ratings           min         typ         max           CC2 = 6V, IQ1 and IQ2 = 0A         20         30           IIN1         20         30           IIN2         0.2         0.3           VQ1         0.2         0.3           VQ1         10.9         ///////////////////////////////////</td></tr<></td>	Symbol         Conditions         Ratings           IN1         typ $l_{N1}$ 20 $l_{N2}$ 0.2 $V_{C2} = 6V, I_{0}1 = 0.3A$ 0.2 $V_{01}$ 10.9         11.3 $V_{01}$ 10.9         11.3 $V_{01}$ 0.3         10.9 $V_{02}$ 4.9         5.1 $V_{02}$ 4.9         5.1 $V_{02}$ 0.1A ≤ $I_{02} \le 0.7A$ 0.3 $V_{0LD2}$ 0.1A ≤ $I_{02} \le 0.7A$ 0.7 $I_{0P2}$ 0.1A ≤ $I_{02} \le 0.7A$ 0.7 $I_{0SC2}$ 0.7         10.9 $V_{HVTH}$ $V_{01}$ and $V_{02} : off$ $V_{01}$ $V_{01}$ and $V_{02} : off$ $V_{01}$ $V_{01}$ and $V_{02} : off$ $V_{STBH}$ $V_{01}$ and $V_{02} : off$ $V_{01}$ <tr< td=""><td>Ratings           Symbol         Conditions         Ratings           min         typ         max           CC2 = 6V, IQ1 and IQ2 = 0A         20         30           IIN1         20         30           IIN2         0.2         0.3           VQ1         0.2         0.3           VQ1         10.9         ///////////////////////////////////</td></tr<>	Ratings           Symbol         Conditions         Ratings           min         typ         max           CC2 = 6V, IQ1 and IQ2 = 0A         20         30           IIN1         20         30           IIN2         0.2         0.3           VQ1         0.2         0.3           VQ1         10.9         ///////////////////////////////////			

#### **Electrical Characteristics** at $Ta = 25^{\circ}C$ , in the specified Test Circuit

### Package Dimensions

unit : mm (typ) 3046D





#### **Test Circuit**



#### **Pin Functions**

Pin No.	Symbol	Function
1	V <sub>CC</sub> 2	Low-voltage input
2	V <sub>O</sub> 2	5.1V/0.7A regulator output, with on/off, current limiter thermal shutdown.
3	STB	V <sub>O</sub> 1 and V <sub>O</sub> 2 on/off control. Active high.
4	GND	Substrate of the LA5613 (minimum potential)
5	V <sub>O</sub> 1-FIL	V <sub>O</sub> 1 ripple filter capacitor connection
6	V <sub>O</sub> 1	Ripple filter 0.3A output, with on/off, current limiter thermal shutdown.
7	V <sub>CC</sub> 1	High-voltage input
8	SENSE	V <sub>CC</sub> 1 voltage detection
9	NF	Phase compensation and V <sub>CC</sub> 1 adjustment. Connect resistors between this pin and SENSE or ground.
10	V <sub>O</sub> ERR	Switching register control amplifier drive output

Notes: 1. CL. Current limiter 2. TSD: Thermal shutdown

#### Function Table (O : built-in, × : not built-in)

Circuit block Function	V <sub>O</sub> 1	V <sub>0</sub> 2	Control amplifier
Input line	V <sub>CC</sub> 1	V <sub>CC</sub> 2	Vcc1
Output current protection	0	0	
Thermal shutdown protection	0	0	×
On/off control	0	0	×
Overvoltage protection	0	0	0

#### **Usage Notes**

- (1) The relationship  $V_{CC1} \ge V_{CC2}$  must hold at all times when power is applied.
- (2) Power should be applied to V<sub>CC</sub>1 and V<sub>CC</sub>2 simultaneously. Do not use this IC with only one or the other voltage applied.
- (3) This IC will be destroyed if the  $V_01$  output load is shorted. Do not short the outputs of this IC.

#### Logic Table

Conditions: When  $V_{CC1} \ge V_{CC2}$ 

(However, the conditions  $V_{CC} \ge 12V$  and  $V_{CC} \ge 6V$  must also apply.)

			_
STB		V01, V02	
L or open			
н	À	н	

Notes : (1) "H" for STB denotes high level; "L" denotes low level.

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





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