

SANYO**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

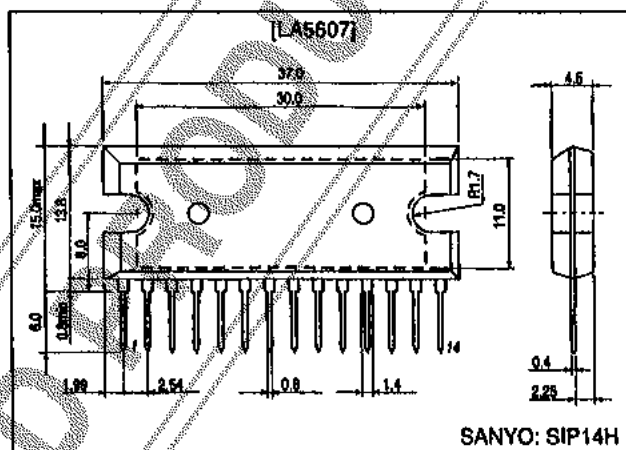
- Four low-dropout regulators (15.7 V/300 mA, 12 V/150 mA, 9 V/100 mA and 5 V/500 mA).
- Output on/off control ("L" active).
- On-chip protective circuitry (current limiter, thermal shut down).
- On-chip microcontroller reset signal generation circuit.

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.

Package Dimensions

unit : mm

3023A-SIP14H

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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 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

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

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Regulator 1 (V _{EN1} = "L", V _{O1} : ON, V _{IN1} = 18.7 V and I _{O1} = 300 mA)						
Output voltage 1	V _{O1}		14.9	15.7	16.5	V
Dropout voltage	V _{DROPI-1}			0.3	0.6	V
	V _{DROPI-2}	I _{O1} = 150 mA		0.15	0.3	V
Line regulation	ΔV _{OLN1}	17.5 V ≤ V _{IN1} ≤ 23 V		20	100	mV
Load regulation	ΔV _{OLD1}	5 mA ≤ I _{O1} ≤ 300 mA		40	200	mV
Peak output current	I _{OP1}		300	540		mA
Output short current	I _{OSC1}			150		mA
Output on control voltage	V _{ENH1}	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}	10 Hz ≤ f ≤ 100 kHz		110		μV _{rms}
Ripple rejection	R _{rrj1}	f = 120 Hz, 18 V ≤ V _{IN1} ≤ 23 V		50		dB
Regulator 2 (V _{EN2} = "L", V _{O2} : ON, V _{IN2} = 15.0 V, I _{O2} = 150 mA)						
Output voltage 2	V _{O2}		11.4	12.0	12.6	V
Dropout voltage	V _{DROPI-2}			0.3	1.0	V
Line regulation	ΔV _{OLN2}	12.6 V ≤ V _{IN2} ≤ 23 V		20	100	mV
Load regulation	ΔV _{OLD2}	1 mA ≤ I _{O2} ≤ 150 mA		20	70	mV
Peak output current	I _{OP2}		150	270		mA
Output short current	I _{OSC2}			70		mA
Output on control voltage	V _{ENH2}	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}	10 Hz ≤ f ≤ 100 kHz		110		μV _{rms}
Ripple rejection	R _{rrj2}	f = 120 Hz, 13 V ≤ V _{IN2} ≤ 23 V		50		dB

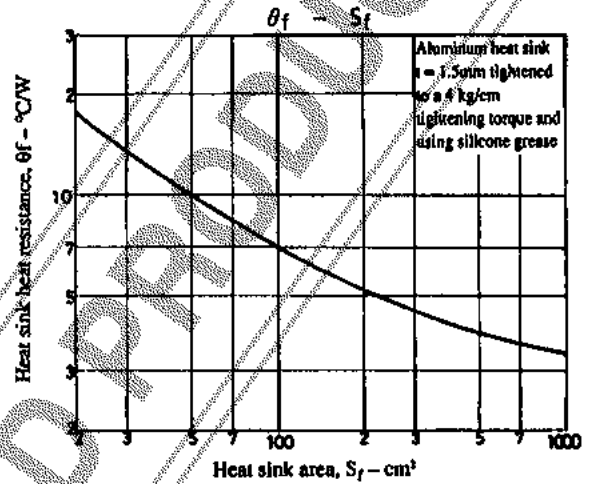
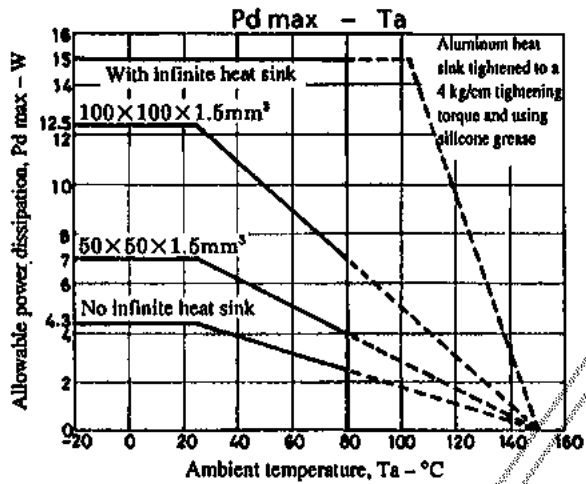
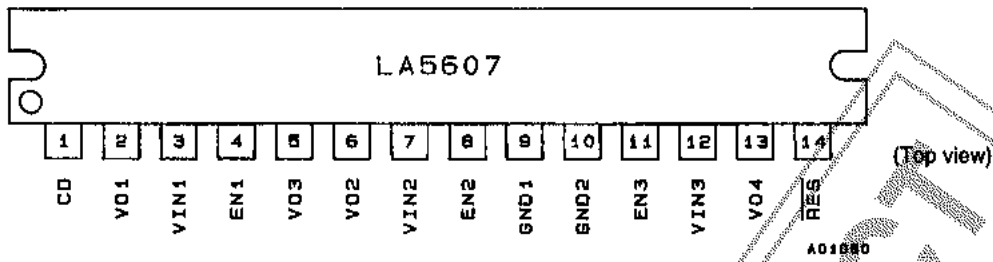
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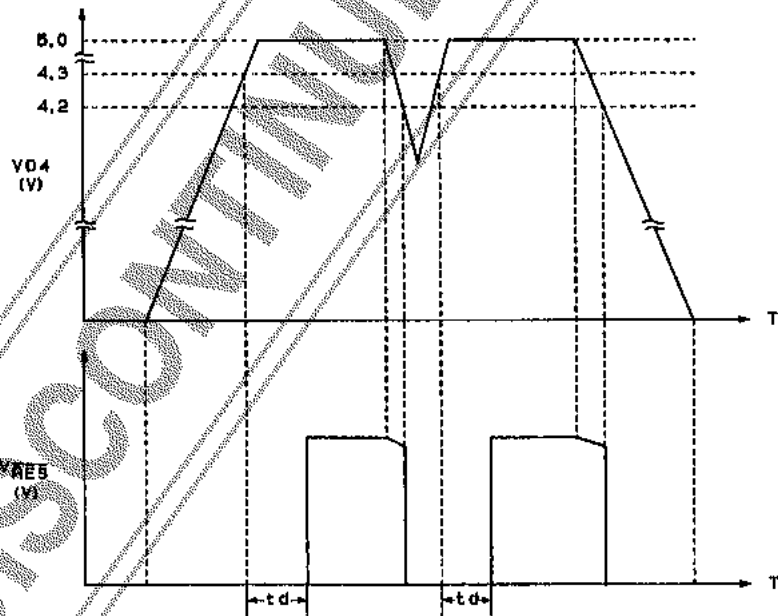
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Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Regulator 3 ($V_{EN2} = "L"$, V_{O3} : ON, $V_{IN2} = 12\text{ V}$, $I_{O3} = 100\text{ mA}$)						
Output voltage 3	V_{O3}		8.55	9.0	9.45	V
Dropout voltage	V_{DROP3}			0.3	1.0	V
Line regulation	ΔV_{OLN3}	$10.45\text{ V} \leq V_{IN2} \leq 23\text{ V}$		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}		160	180		mA
Output short current	I_{OSC3}			40		mA
Output on control voltage	V_{ENL2}	V_{O3} : On			0.4	V
Output off control voltage	V_{ENH2}	V_{O3} : Off	2.0		V_{IN2}	V
Output "L"-level voltage	$V_{O3\text{OFF}}$				0.2	V
Output noise voltage	V_{NO3}	$10\text{ Hz} \leq f \leq 100\text{ kHz}$		70		μV_{rms}
Ripple rejection	Rrej3	$f = 120\text{ Hz}$, $11\text{ V} \leq V_{IN2} \leq 23\text{ V}$		55		dB
Regulator 4 ($V_{EN3} = "L"$, V_{O4} : ON, $V_{IN3} = 8.0\text{ V}$, $I_{O4} = 500\text{ mA}$)						
Output voltage 4	V_{O4}		4.75	5.0	5.25	V
Dropout voltage	$V_{DROP4-1}$			0.4	1.0	V
	$V_{DROP4-2}$	$I_{O4} = 250\text{ mA}$		0.3	0.8	V
Line regulation	ΔV_{OLN4}	$6.25\text{ V} \leq V_{IN3} \leq 23\text{ V}$		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_{ENL3}	V_{O4} : On			0.4	V
Output off control voltage	V_{ENH3}	V_{O4} : Off	2.0		V_{IN3}	V
Output "L"-level voltage	$V_{O4\text{OFF}}$				0.2	V
Output noise voltage	V_{NO4}	$10\text{ Hz} \leq f \leq 100\text{ kHz}$		70		μV_{rms}
Ripple rejection	Rrej4	$f = 120\text{ Hz}$, $7\text{ V} \leq V_{IN3} \leq 23\text{ V}$		60		dB
Current dissipation 1	I_{Q1}	$I_{O1}, I_{O2}, I_{O3}, I_{O4} = 0$		11		mA
Current dissipation 2	I_{Q2}	$I_{O1} = 300\text{ mA}$, $I_{O2} = 150\text{ mA}$, $I_{O3} = 100\text{ mA}$, $I_{O4} = 500\text{ mA}$		53		mA
Reset Circuit						
"H"-level reset output voltage	V_{ORH}	$I_{ORH} = 200\text{ }\mu\text{A}$, 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	$C_d = 0.1\text{ }\mu\text{F}$	7.5	10	12.5	ms

Pin Assignments

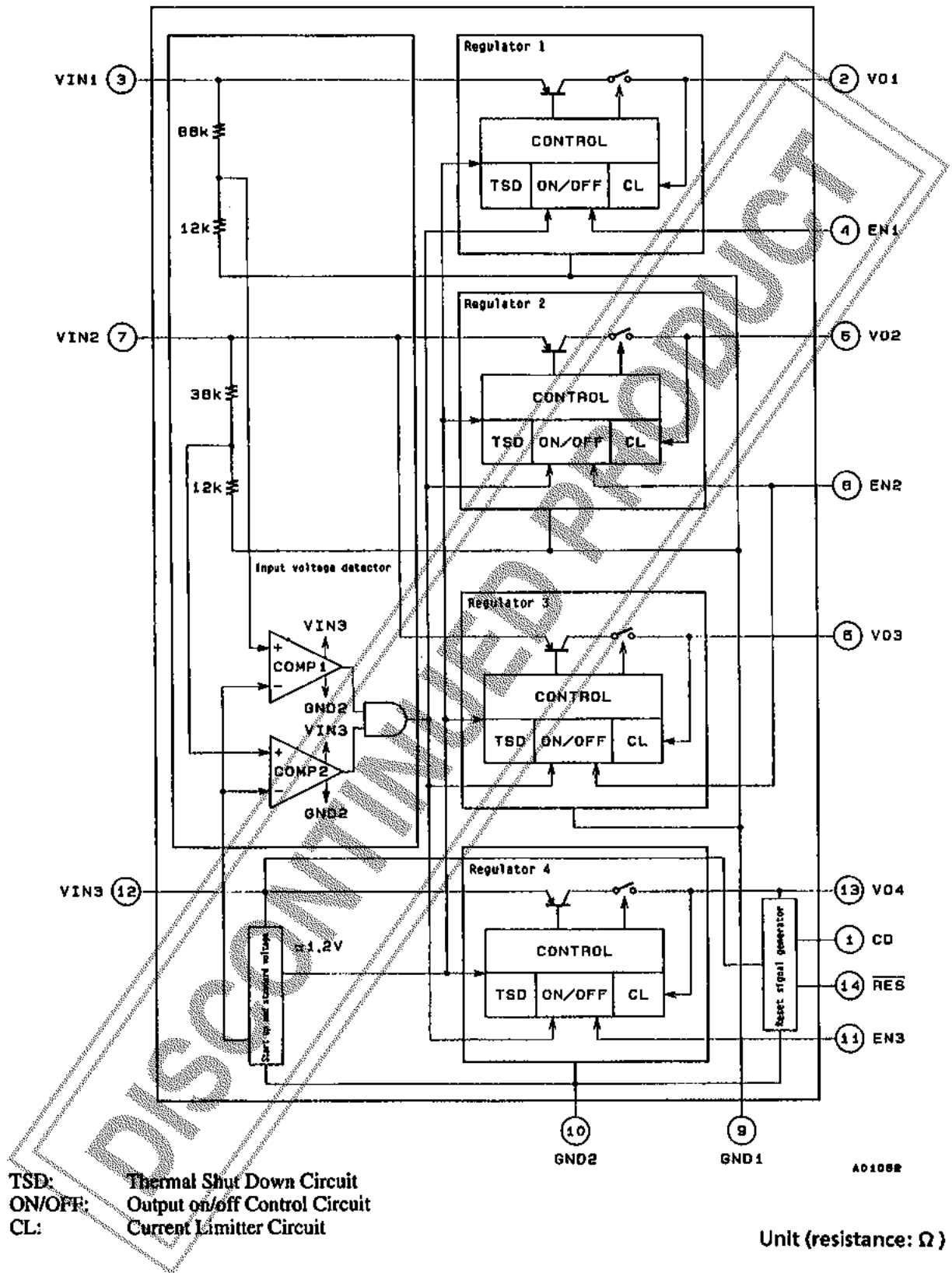


Reset Operation

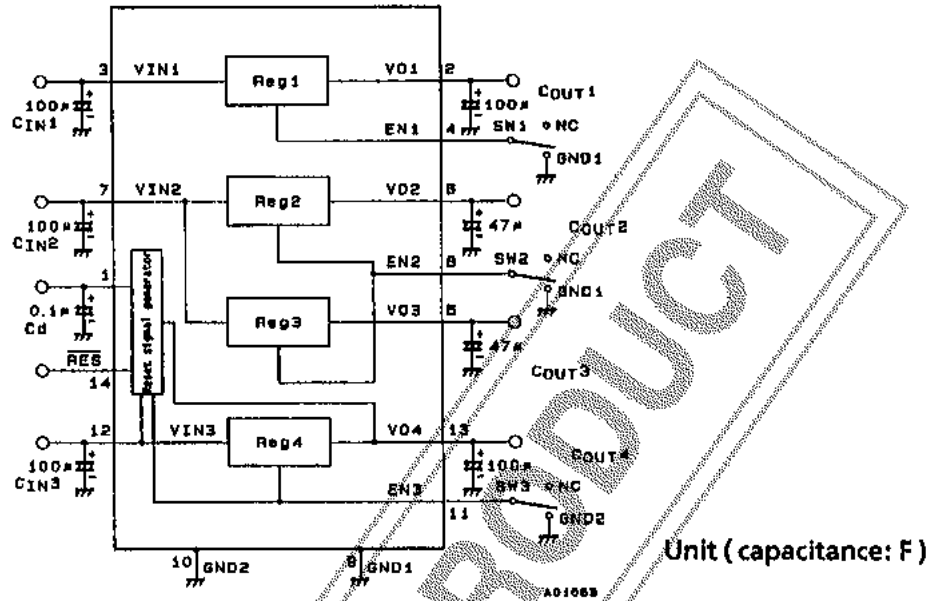


$$t_d = 100 \times C_d (\mu\text{F}) [\text{ms}]$$

Block Diagram



Test Circuit



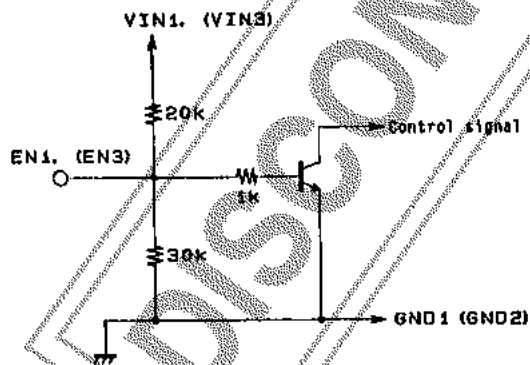
Function Table

The following table indicates conditions for operation with $V_{IN1} \geq V_{IN2} \geq V_{IN3}$ ($V_{IN1} \geq 1.1V$, $V_{IN2} \geq 6V$ and $V_{IN3} \geq 4V$).

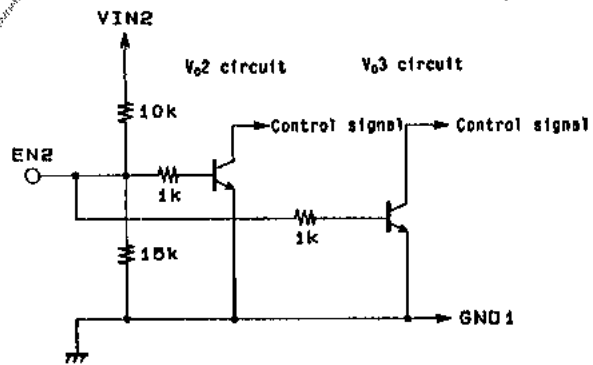
EN1, EN2, EN3	VO1, VO2/VO3, VO4
H	L
L	H

- 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.
($EN1 \rightarrow VO1$, $EN2 \rightarrow VO2$ and $VO3$, $EN3 \rightarrow VO4$)

EN (On/Off Control) Input Equivalent Block Diagram

① $VO1$ ($VO4$)

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② $VO2$ and $VO3$ 

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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 μF or more and C_{OUT2} and C_{OUT3} rated at 47 μF 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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