Ordering number : ENA0715

SANYO Semiconductors

DATA SHEET

Monolithic Linear IC

LA1070 — On-Glass Antenna Amplifier AGC IC

Overview

The LA1070 is an automatic gain control IC for use with automotive on-glass antennas.

Functions

- RF-AGC

Features

- AGC circuit includes a 20dB hysteresis function
- Can implement an FM/AM tuner AGC circuit with just one IC
- AGC circuit provides improved interference characteristics
- Built-in time constant circuit for underbridge countermeasures
- Allows implementation of miniature antenna amplifier modules with a minimal number of external components
- Includes a total of four PIN diode driver circuits

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Specifications

Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions		Ratings	Unit
Maximum supply voltage	$V_{CC}1$ Max	The pin 1 voltage (115°C)		9	V
	$V_{CC}2$ Max (DC)	The pin 14 voltage (115°C)		16	V
	$V_{CC}2$ Max (Pulse)	The pin 14 voltage (25°C) (*1, *2)		18	V
Maximum sink current	ITHA	The pin 11 sink current (*1)		2	mA
Maximum output current	DRV IOUT	(*1)		10	mA
Maximum current consumption	ICC1 Max	INPUT = 130dBu, VCC1 = 9V, DRV I_{OUT} = 10mA		29	mA
	ICC2 Max	INPUT = 130dBu, VCC2 = 16V, DRV I_{OUT} = 10mA		29	mA
Allowable power dissipation	Pd max	INPUT = 130dBu, DRV I_{OUT} = 10mA Circuit board size : 30 × 70 × 1.6(*1)	115°C	320	mW
			25°C	1	W
Operating temperature	Topr			-40 to +115	°C
Storage temperature	Tstg			-55 to +150	°C

*1: The stipulated Pdmax must not be exceeded.

*2: Ten cycles with V_{Hi} = 18V for 1 minute and V_{Lo} = 0V for 9 minutes.

Operating Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage 1	$V_{CC}1$		8	V
Guaranteed operating supply voltage 1	$V_{CC}1$ op	(*1)	7 to 8.8	V
Recommended supply voltage 2	$V_{CC}2$		12	V
Guaranteed operating supply voltage 2	$V_{CC}2$ op	(*1)	7 to 15.8	V
Maximum allowable RF input	Input max	Pins 2-4, 6, 7, 27-25, 23, 22	130	dBu

*1: The stipulated Pdmax must not be exceeded.

Electrical Characteristics at at Ta = 25°C, $V_{CC}1$ = 8.0V, $V_{CC}2$ = 12V in the specified circuit

Parameter	Symbol	Conditions	Frequency (Hz)	Ratings min	Ratings typ	Ratings max	Unit
Signal detection sensitivity 1	Sen1	The input level when the pin 12 and pin 17 (DRV_OUT) output voltage switches from 10.3V to 0V. The input level when the pin 13 and pin 16 (DRV_OUT) output voltage switches from 0V to 10.3V. (*1)	100K 1M 110M 250M (*2) 800M (*2)	79 79 79 89	83 83 83 93 91	87 87 87 97	dBu
Signal detection sensitivity 2	Sen2	The input level when the pin 12 and pin 17 (DRV_OUT) output voltage switches from 0 V to 10.3 V. The input level when the pin 13 and pin 16 (DRV_OUT) output voltage switches from 10.3 V to 0 V. (*1)	100k 1M 110M 250M (*2) 800M (*2)	99 99 99 99	103 103 103 103 102	107 107 107 107	dBu
DRV circuit output voltage	V_OHi	The high-level output voltage provided by pins 12, 13, 17, and 16 (DRV_OUT).		9.8	10.3	10.8	V
	V_OLo	The low-level output voltage provided by pins 12, 13, 17, and 16 (DRV_OUT).			0.1	0.2	V
Latch start time	FFAT	The time from the point the RF signal goes on to the point the pin 12 and 17 output voltage reaches 10% of the saturation voltage.		58	90	122	ms
Latch release time	FFRE	The time from the point the RF signal goes on to the point the pin 12 and 17 output voltage reaches 90% of the saturation voltage.		570	950	1520	ms
Comparator reference voltage 1	Traise	The pin 9 and pin 20 (VREF_OUT) pin output voltage with the pins open		2.2	2.4	2.6	V

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*1: The DRV circuit depends on VCC. The DRV circuit output voltage (output saturation voltage) varies with the output current setting set with an external resistor. See the internal equivalent circuit diagram for details.

*2: The values at 250MHz and 800MHz are used for the specifications and refer to the "Input circuit when the input signal is in the range 250MHz to 800MHz" in the specified peripheral components circuit diagram and block diagram.

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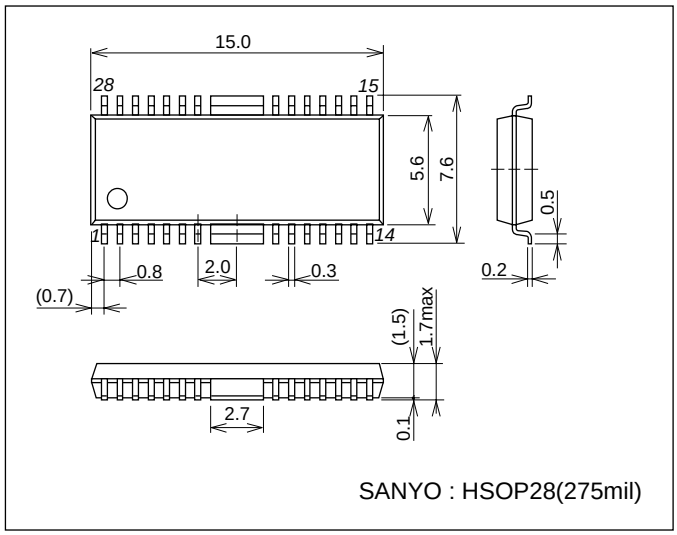
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Comparator reference voltage 2	VREF1	The pin 9 and pin 20 (VREF_OUT) pin output voltage with the pins grounded through a 10 k resistor.	1.3	1.5	1.7	V
Temperature fluctuation type voltage output	VREF2	The pin 10 and pin 19 (FM_BIAS) output voltage level Maximum output current = 1 mA	2.6	2.8	3.0	V
Temperature detection circuit output voltage	VTHA1	The pin 11 (THAMAL_OUT) output voltage	7.5	7.9	8	V
	VTHA2	The pin 11 (THAMAL_OUT) output voltage, sink current =160µA, ,Ta=115°C		0.25	0.35	V
Current drain 1	ICCO1	The VCC1 current drain with no input	15	19	23	mA
Current drain 2	ICCO2	The VCC2 current drain with no input	15	18	21	mA
Temperature detection sensitivity	TTHA	The ambient temperature when pin 11 (THAMAL_OUT) is low. (Design guarantee value)	80	95	110	°C

Package Dimensions

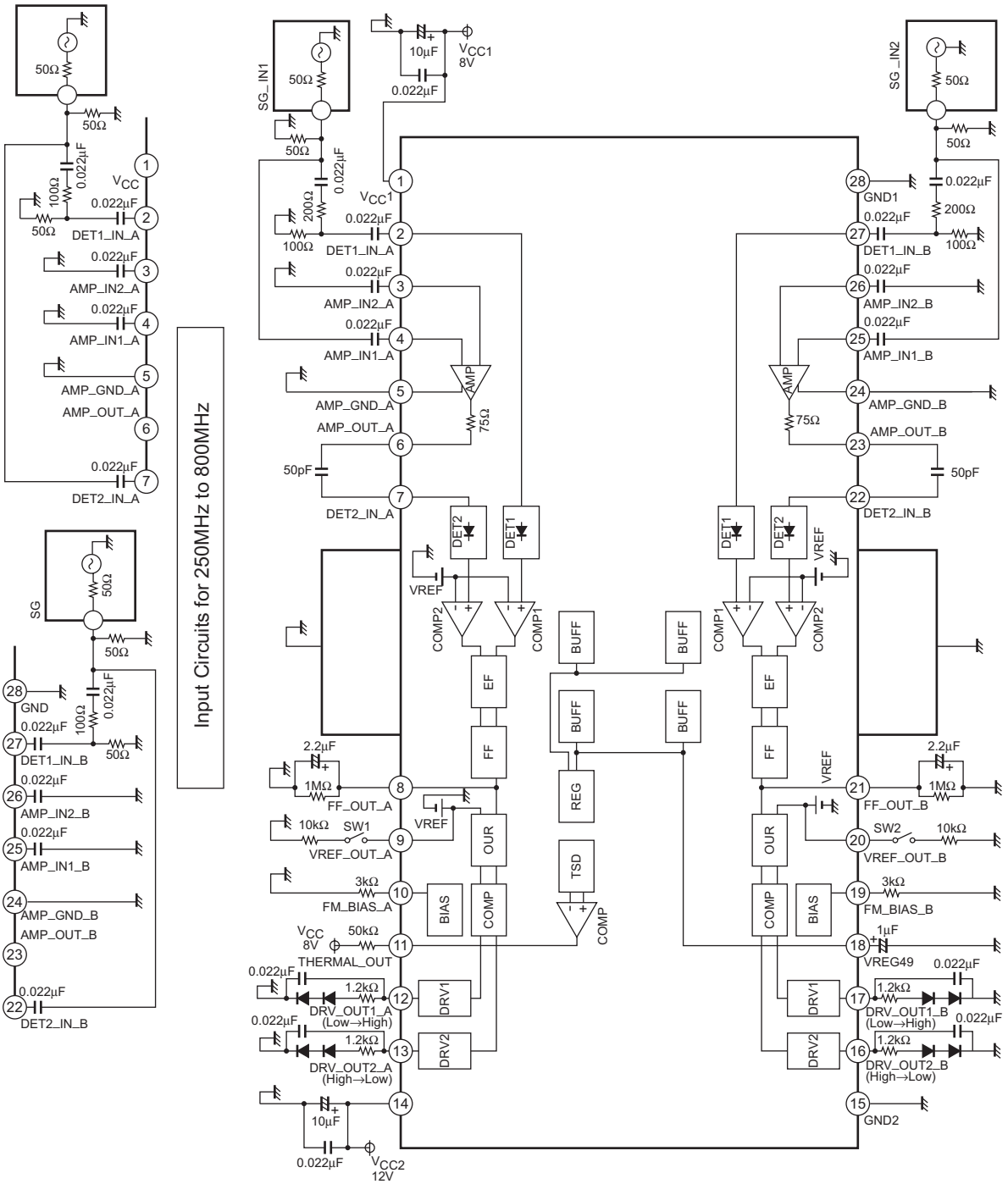
unit : mm (typ)

3222A



SANYO : HSOP28(275mil)

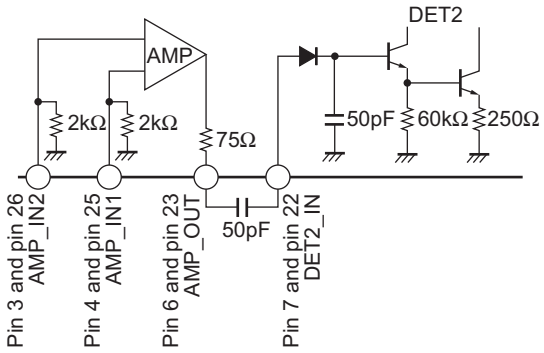
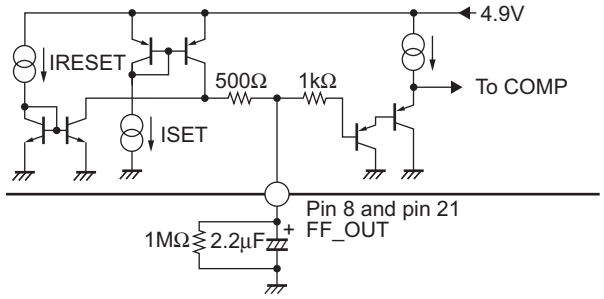
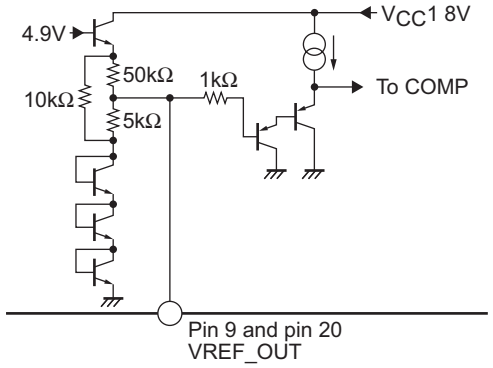
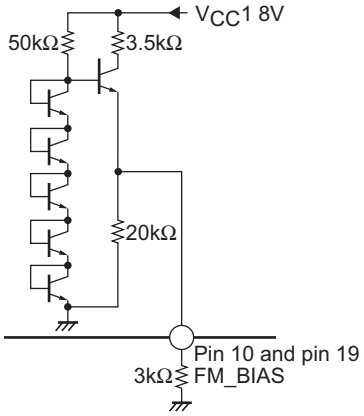
Block Diagram



Pin Functions and bias voltage (Ta = 25°C)

PIN No.	Pin	Description	Pin bias voltage	Note
1	$V_{CC}1$	Power supply for circuits other than the DRV circuit	8.00	
2	DET1_IN_A	Detection circuit 1 input	1.85	
3	AMP_IN2_A	Differential amplifier single-sided input	1.87	
4	AMP_IN1_A	Differential amplifier single-sided input	1.87	
5	AMP_GND_A	RF circuit dedicated ground	0	
6	AMP_OUT_A	Differential amplifier output	6.62	
7	DET2_IN_A	Detection circuit 2 input	1.85	
8	FF_OUT_A	Hold circuit and time constant circuit output	0	
9	VREF_OUT_A	Comparator reference voltage output	2.39	
10	FM_BIAS_A	Temperature fluctuation type bias circuit output	2.79	
11	THERMAL_OUT	Temperature detection circuit output	7.97	
12	DRV1_OUT_A	DRV circuit output (low-level output with no input)	0	When set, Low → High
13	DRV2_OUT_A	DRV circuit output (high-level output with no input)	10.30	When set, High → Low
14	$V_{CC}2$	DRV circuit power supply	12.00	
15	GND2	DRV circuit ground	0	
16	DRV2_OUT_B	DRV circuit output (high-level output with no input)	10.30	When set, High → Low
17	DRV1_OUT_B	DRV circuit output (low-level output with no input)	0	When set, Low → High
18	VREG49	Internal power supply circuit. 4.9V output	4.92	
19	FM_BIAS_B	Temperature fluctuation type bias circuit output	2.78	
20	VREF_OUT_B	Comparator reference voltage output	2.39	
21	FF_OUT_B	Hold circuit and time constant circuit output	0	
22	DET2_IN_B	Detection circuit 2 input	1.85	
23	AMP_OUT_B	Differential amplifier output	6.61	
24	AMP_GND_B	RF circuit dedicated ground	0	
25	AMP_IN1_B	Differential amplifier single-sided input	1.87	
26	AMP_IN2_B	Differential amplifier single-sided input	1.87	
27	DET1_IN_B	Detection circuit 1 input	1.85	
28	GND1	Ground for circuits other than the DRV circuit	0	

Pin Equivalent Circuit

Pin No	Pin Function	Equivalent Circuit	Note
3, 4, 26, 25 6, 23 7, 22	Amplifier input Amplifier output Detection circuit 2 input		AMP Zin = 2kΩ
8, 21	Time constant setting capacitor connection		When a 2.2µF capacitor is used to set the time constant, DRV will be on for 100ms and off for 1 second.
9, 20	Comparator reference voltage output for DRV operation and switching		
10, 19	Temperature fluctuation type bias voltage output		Maximum rated load: 3kΩ

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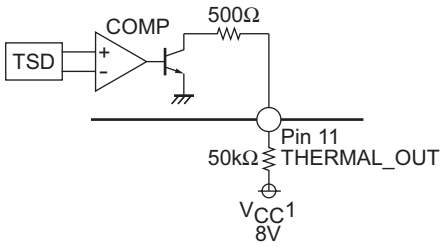
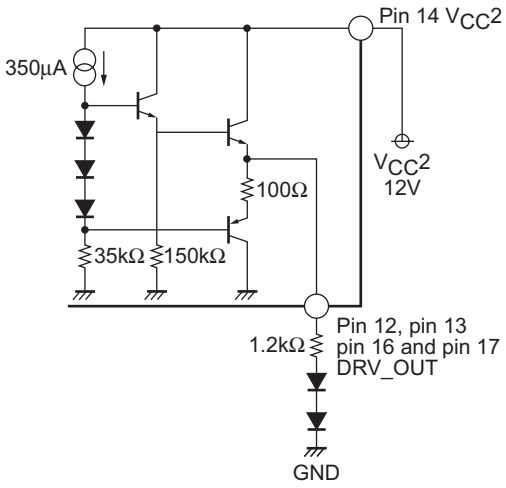
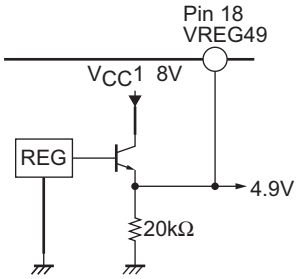
Pin No.	Pin Function	Equivalent Circuit	Note
11	Temperature detection circuit output		
12, 13, 16, 17	DRV circuit output		VCC dependent type voltage output circuit
18	Bandgap regulator bypass capacitor connection		Recommended capacitance: 1μF