Monolithic Linear IC



LA1061M

Antenna Switching Controller

Overview

The LA1061M is an antenna switching controller for mobile radio equipment.

The LA1061M uses a number of inputs from the receiver circuitry to select the main antenna or sub-antenna according to signal strength and quality. Weak and strong signals are detected with the S-meter DC voltage and F.E. AGC voltage, respectively. Multi-path distortion is detected from the AC component of the IF output, using the same high-sensitivity counter circuit as in Sanyo's earlier LA1060 device. An auxiliary circuit keeps the main antenna selected for a fixed time period when reception conditions outside a moving vehicle are changing rapidly.

The LA1061M is available in surface-mount 8-pin DIPs, facilitating construction of compact equipment. It operates from a single 7 to 12V power supply.

Package Dimensions

unit: mm

3111-MFP14S



Features

- Uses Sanyo's proprietary AGC amplifier and detector, providing accurate detection of multi-path distortion.
- High-current Main and Sub-antenna switching outputs.
- Antenna switching frequency limiting circuit.
- On-board comparators for F.E AGC (strong signal) and S-meter DC (weak signal) detection.
- Surface-mount 14-pin MFP.

Specifications

Maximum	Ratings	at Ta=25°C
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Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V _{CC} max		14	V
Allowable power dissipation	Pd max		182	mW
Operating temperature	Topr		-30 to +80	°C
Storage temperature	Tstg		-40 to +125	°C
Maximum flow-out current	I ₄	Pin 4	1	mA
	I5	Pin 5	10	mA
	I ₆	Pin 6	10	mA
	lg	Pin 9	2	mA
	I ₁₀	Pin 10	5	mA
	I ₁₂	Pin 12	2	mA
Maximum apply voltage	V ₁₃	Pin 13	VCC	V
	V ₁₄	Pin 14	VCC	V

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Operating Conditions at Ta=25°C

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	VCC		8	V
Operating voltage range	VCC op		7 to 12	V

Operation Characteristics at Ta=25°C, V_{CC}=8V, f=100kHz sine wave

Parameter	Symbol	Conditions	Ratings			Unit
	Gymbol		min	typ	max	
Current drain	ICC	No input, I_5 and I_6 are not included.	4.5	7	12	mA
Pin 5 'H'-level voltage	V5	1kΩ to ground	5.0	6.0	7.0	V
Pin 6 'H'-level voltage	V ₆	1kΩ to ground	5.0	6.0	7.0	V
Noise amp gain	G _V 1	V _{IN} =3mVrms, f=100kHz	33	36	39	dB
	G _V 2	VIN=100mVrms, f=100kHz	10	13	16	dB
Noise detection sensitivity	NDS	Noise AGC off	9	12	15	mVrms
Noise count number	NCN	V _{IN} =30mVrms, f=100kHz, sine wave		10		
Gate time 1	tG1	Noise AGC off	120	150	180	μs
Pin 9 voltage	V9	VIN=100mVrms, f=100kHz,	7.0	7.7	8.0	V
		R ₉ =300kΩ				
Strong signal comparator	Vth14		0.8	1.0	1.2	V
threshold						
Weak signal comparator	V _{th13}		1.8	2.0	2.2	V
threshold						
Gate time 2	tG2		2	4	6	ms
Gate time3	tG3		13	23	40	ms
Switching frequency	HCN			15		
limit maximum count						

Equivalent Circuit Block Diagram



LA1061M





Unit (resistance : Ω , capacitance : F)

Sample Printed Circuit Pattern



Functional Description

General Operation

The LA1061M has two inputs for weak and strong signal detection, and one for multi-path distortion detection. It has two outputs for Main and Sub-antenna selection, one of which is selected according to the state of the inputs. Both outputs can directly drive an antenna switching pin diode.

Signal Strength Detection

Each signal strength detection input has a built-in comparator. The weak signal comparator (pin 13) is driven by the S-meter DC voltage and has a threshold of approximately 2V. The antenna switching logic selects the Main antenna when the voltage on this pin is lower than the threshold, regardless of the state of the other inputs.

The strong signal detector (pin 14) is driven by the F.E. AGC voltage and has a threshold of approximately 1V. The antenna switching logic selects the Sub-antenna if the voltage on this pin is lower than the threshold, the weak signal comparator is off, and the multi-path distortion detector is not already on.

Pin Description

Multi-path Distortion Detection

The IF output signal is high-pass filtered and the resulting noise signal input through a coupling capacitor to pin 1, the LA1061M amplifies this signal and applies AGC to it. The AGC amplifier is designed to detect multi-path distortion without amplifying noise due to a weak IF signal. The number of noise pulses within the period set by the time constant on pin 4 is counted. If it exceeds a certain limit, and the strong signal detector is not already on, the antenna switching logic selects the Main antenna.

Switching Frequency Detection

The LA1061M counts the number of antenna changes within the time interval set by the time constant on pin 12. The internal D/A converter outputs a current on pin 11, which is converted to a voltage by the resistor connected to this pin. If this voltage exceeds a certain value, that is, the switching frequency is too high, the Main antenna is selected for the period set by the time constant on pin 10. The Main antenna is selected for this time regardless of the state of the other inputs.

Unit (resistance : Ω , capacitance : F)

Pin No. Function	External circuits	Notes
Pin No. Function	External circuits Isolate noise components present in the IF output signal with a high-pass filter, and input via a decoupling capacitor. LA1140 LA2110 M.C. IC HPF output	Notes The input impedance of the LA 1061M varies with input level. The minimum value is 10kΩ.
1 Noise input	VCC VCC VCC VCC FB-7SG IM C.015µ From IF output or 562k S-meter output """"""""""""""""""""""""""""""""""	

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Pin No.	from preceding p Function	External circuits	(resistance : Ω, capacitance : Notes		
2	H.P.F	10k 10k 300 30k 0.01µ 77	Highpass filter		
3	AGC	1k 1k 100k 77 3 10µ 77 10µ			
4	Mono-stable multi-vibrator 1	100k 3300p This time constant sets the count gate time.			
5	Antenna switching outputs	₹ 10k 100 ///// to pin diode	Pin 6 is for MAIN, pin 5 is fo SUB.		
7	GND	GND 777			
8	VCC				

Continued on next page.

Pin No.	Function	External circuits	Notes
9	AGC Voltage output	Vcc	
10	Mono-stable multi-vibrator 3	100k This time constant sets 100k the Main antenna hold time.	The LA1061M counts antenn switches for the time interva generated by multi-vibrator 2 The internal D/A converte outputs a current on pin 11 which is converted to a voltag
11	D/A converter	Vcc Current drive This resistor sets the D/A output voltage range.	by the resistor connected t this pin. If this voltage exceed a certain value, that is, th switching frequency is to high, multi-vibrator 3 operate to hold the antenna switchin outputs at Main for the time se
12	Mono-stable multi-vibrator 2	100k 0.15µ This time constant sets the count gate time.	by multi-vibrator 3.
13	Weak signal comparator	S meter 100 k =	The threshold level is set at approximately 2V.
14	Strong signal comparator	F.E. 100k	The threshold level is set at approximately 1V.



Ambient temperature, Ta - °C

Pin 12 capacity, $C_{12} - nF$





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