



Antenna Switching Controller

Overview

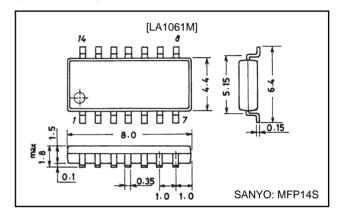
The LA1061M is an antenna switching controller for mobile radio equipment.

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

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	VCC 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	14	Pin 4	1	mA
	15	Pin 5	10	mA
	16	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

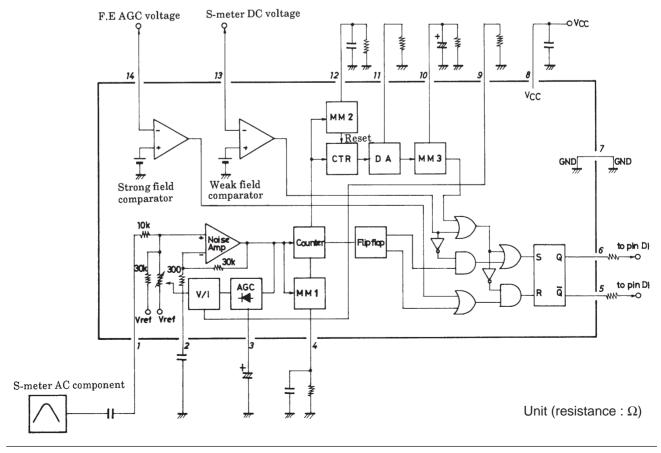
Operating Conditions at Ta=25°C

Parameter	Symbol	Conditions	Ratings	Unit	
Recommended supply voltage	VCC		8	V	I
Operating voltage range	ACC ob		7 to 12	V	Ī

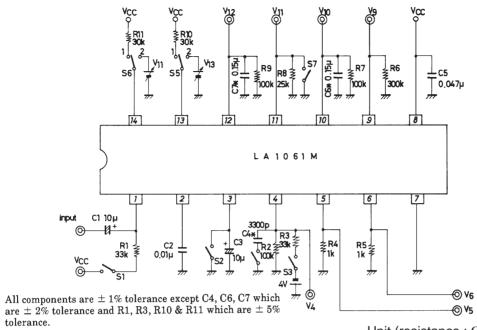
Operation Characteristics at Ta=25 $^{\circ}$ C, V_{CC}=8V, f=100kHz sine wave

Parameter	Symbol	Symbol Conditions	Ratings			Unit	
r arameter	Cymbol	Conditions	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	V ₅	1k $Ω$ 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	V _{IN} =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	t _G 1	Noise AGC off	120	150	180	μs	
Pin 9 voltage	Vg	V _{IN} =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	t _G 2		2	4	6	ms	
Gate time3	t _G 3		13	23	40	ms	
Switching frequency	HCN			15			
limit maximum count							

Equivalent Circuit Block Diagram

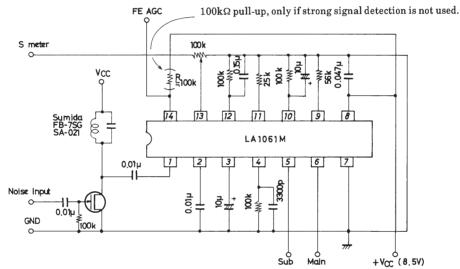


Operating Characteristic Test Circuit



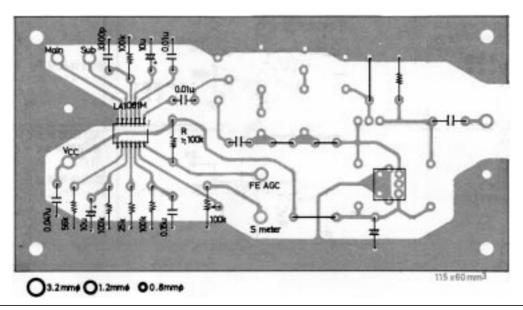
Sample Application Circuit

Unit (resistance : Ω , capacitance : F)



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.

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.

Pin Description

Unit (resistance : Ω , capacitance : F)

Pin No.	Function	External circuits	Notes
		Isolate noise components present in the IF output signal	The input impedance of the
		with a high-pass filter, and input via a decoupling	LA 1061M varies with input
		capacitor.	level. The minimum value is
			10kΩ.
		LA1140 LA2110 N.C. IC HPF output	
1	Noise input	VCC VCC VCC VCC VCC VCC Sumida FB-75G SA-21 M 0.015µ From IF output or S-meter output (Under development)	

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Unit (resistance : Ω , capacitance : F)

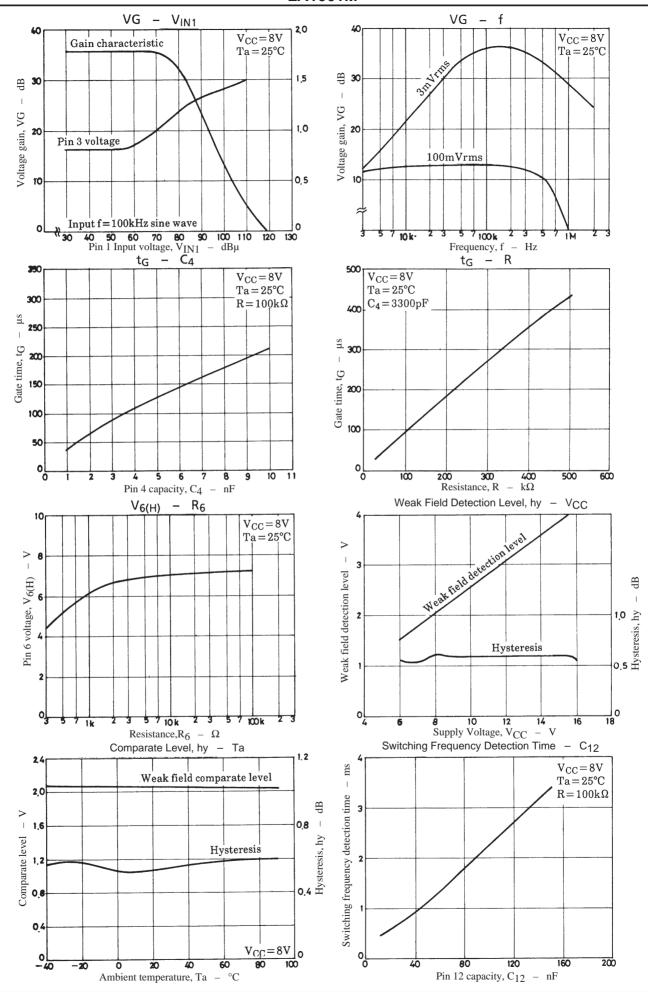
Pin No.	Function	External circuits	Notes
2	H.P.F	10k 300 30k 2 0.01µ	Highpass filter
3	AGC	1k 1k 1k 100k 100k 10µ	
4	Mono-stable multi-vibrator	3300p This time constant sets the count gate time.	
5	Antenna switching outputs	100 to pin diode	Pin 6 is for MAIN, pin 5 is for SUB.
7	GND	GND THE STATE OF T	
8	VCC	Ф VCC — 0.047µ +8Y	

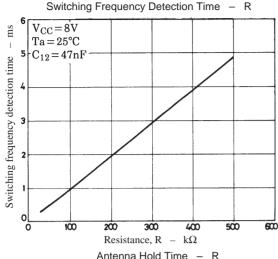
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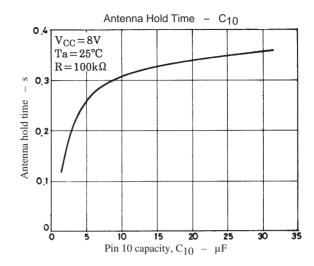
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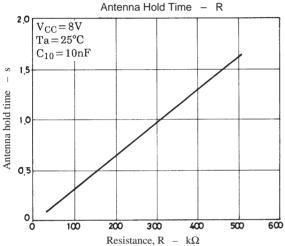
Unit (resistance : Ω , capacitance : F)

Pin No.	Function Function	External circuits	Notes
9	AGC Voltage output	V _C C ≱56k	
10	Mono-stable multi-vibrator 3	This time constant sets the Main antenna hold time.	The LA1061M counts antenna switches for the time interval generated by multi-vibrator 2. The internal D/A converter outputs a current on pin 11, which is converted to a voltage
11	D/A converter	Current drive This resistor sets the D/A output voltage range. ₹25k	by the resistor connected to this pin. If this voltage exceeds a certain value, that is, the switching frequency is too high, multi-vibrator 3 operates to hold the antenna switching outputs at Main for the time set
12	Mono-stable multi-vibrator 2	This time constant sets the count gate time.	by multi-vibrator 3.
13	Weak signal comparator	S meter 100k	The threshold level is set at approximately 2V.
14	Strong signal comparator	F.E. 100k	The threshold level is set at approximately 1V.









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