



SANYO Semiconductors

DATA SHEET

LA1235M — Monolithic Linear IC FM IF System IC

Overview

The LA1235M is an FM IF system IC developed to feature a high signal-to-noise ratio and low distortion. It features a signal-to-noise ratio of 88dB and a distortion of 0.015%, and is a highly integrated IC that provides essentially all the functions related to the IF stage of an FM tuner. The IF amplifier and limiter stage consists of an AMR 6-stage double-ended differential amplifier and the signal meter drive circuit that runs in parallel with that circuit consists of a 4-stage level detection circuit that features a wide linearity range through powerful input levels. The FM detection circuit is a double balanced quadrature detection circuit that includes the associated low-frequency preamplifier and muting control circuits. The muting drive stage consists of a circuit that takes the logical OR of the weak signal muting drive circuit that detects the signal strength and the detuning muting drive circuit that detects the S-curve DC output, and thus can also prevent noise associated with the tuner being in the detuned state. Additionally, the weak signal muting drive circuit includes a Schmitt circuit, which has hysteresis to prevent incorrect muting operation due to amplitude components in the weak signal. The AFC output and tuning meter drive stage are current drive type circuits and allow the AFC sensitivity and detuned state muting band to be adjusted. Furthermore, this stage includes a tuning meter null (short) circuit so that, when the IF amplifier is stopped, the tuning meter can be forcibly set to 0. The IF amplifier stop circuit stops the FM IF amplifier during AM reception and minimizes impulse noise due to switching between the FM and AM reception modes.

Functions

- IF amplifier and limiter.
- Quadrature detection.
- AF preamplifier.
- Signal strength muting drive output.
- Detuning muting drive output.
- AF signal muting circuit.
- Signal meter drive circuit.
- AFC and tuning meter drive output.
- IF amplifier stop circuit.
- Tuning meter null circuit.

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LA1235M

Specifications

Maximum Ratings at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC\text{ max}}$	Pin 11	13.5	V
Input voltage	V_{IN}	Pins 1, 2	± 1	Vp-p
Supply current	I_{CC}	Pin 11	35	mA
Sink current	I_5	Pin 5	3	mA
Source current	I_{10}	Pin 10	2	mA
	I_{13}	Pin 13	2	mA
Allowable power dissipation	$P_d\text{ max}$	$T_a \leq 70^\circ\text{C}^*$	500	mW
Operating temperature	T_{opr}		-20 to +70	$^\circ\text{C}$
Storage temperature	T_{stg}		-40 to +125	$^\circ\text{C}$

* : When mounted on a 76.1x114.3x1.6mm glass epoxy circuit board.

Note : This product is susceptible to damage by ESD and care is required in its handling.

Operating Conditions at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V_{CC}		12	V
Operating supply voltage range	$V_{CC\text{ op}}$		10 to 13	V

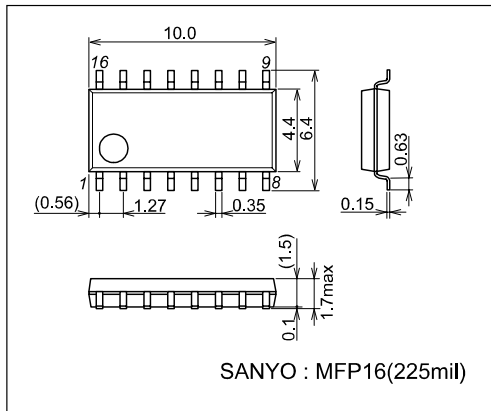
Operating Characteristics at $T_a = 25^\circ\text{C}$

$V_{CC} = 12\text{V}$, $f_c = 10.7\text{MHz}$, $f_m = 1\text{kHz}$, $\text{dev} = 75\text{kHz}$, in the specified test circuit (using an IC socket)

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Quiescent current	I_{CCO}	No signal		21	30	mA
Current drain	I_{CC}	$V_{IN} = 100\text{dB}\mu\text{V}$		22	31	mA
Detector output	V_O	$V_{IN} = 100\text{dB}\mu\text{V}$	310	430	590	mVrms
Signal-to-noise ratio	S/N	$V_{IN} = 100\text{dB}\mu\text{V}$	82	88		dB
-3dB sensitivity	$V_{IN}\text{ (lim)}$	$V_{IN} = 100\text{dB}\mu\text{V}$, the input for -3dB referenced to the 75kHz dev output.		25	31	dB μV
Muting sensitivity	$V_{IN}\text{ (mute)}$	$V_{12} = 5.6\text{V}$, $R_{16} = 56\text{k}\Omega$, $R_{15} = 51\text{k}\Omega$		40	50	dB μ
Muting attenuation	Mute (att)	$V_{IN} = 100\text{dB}\mu\text{V}$, $V_5 = 3.5\text{V}$	80	100		dB
Muting bandwidth	BW (mute)	$V_{IN} = 100\text{dB}\mu\text{V}$, $V_{12} = 3\text{V}$	120	200	330	kHz
Muting	$V_{12}\text{ (1)}$	No signal	5.6	6.2	6.8	V
	$V_{12}\text{ (2)}$	$V_{IN} = 100\text{dB}\mu\text{V}$		0	0.3	V
Total harmonic distortion	THD	$V_{IN} = 100\text{dB}\mu\text{V}$		0.015	0.05	%
AM suppression	AMR	$V_{IN} = 80\text{dB}\mu\text{V}$, $f_m = 1\text{kHz}$, referenced to the 75kHz dev, AM = 1kHz, 30% mod.	45	60		dB
Signal meter voltage	$V_{13}\text{ (1)}$	No signal		0	0.1	V
	$V_{13}\text{ (2)}$	$V_{IN} = 35\text{dB}\mu\text{V}$		0.1	0.5	V
	$V_{13}\text{ (3)}$	$V_{IN} = 70\text{dB}\mu\text{V}$	1.3	2.0	2.9	V
	$V_{13}\text{ (4)}$	$V_{IN} = 100\text{dB}\mu\text{V}$	2.2	3.5	5.0	V
Offset voltage	V_{6-10}	No signal, the voltage between pins 6 and 10.	-0.8	0	+0.8	V
	V_{7-10}	No signal, the voltage between pins 7 and 10.	-0.4	0	+0.4	V
Tuning meter null voltage	$V_{7-10}\text{ (null)}$	$V_5 = 7.5\text{V}$, the voltage between pins 7 and 10.	-50		+50	mV
IF off voltage	$V_5\text{ (IF off)}$	$V_{2-3} = 1\text{V}$, the voltage pin 5.	5.6		7.5	V

Package Dimensions

unit : mm
3035B

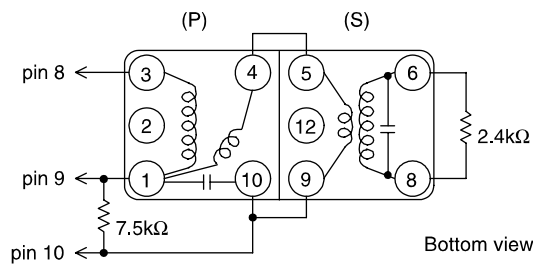


No Signal Pin Voltages ($V_{CC} = 12V$) : Values for reference purposes

Pin No.	Pin voltage (V)
1	2.6
2	
3	
4	GND
6	6.2
7	
8	5.9
11	V_{CC}
10	6.2
12	
14	GND
13	0
15	
16	

Coil Specifications

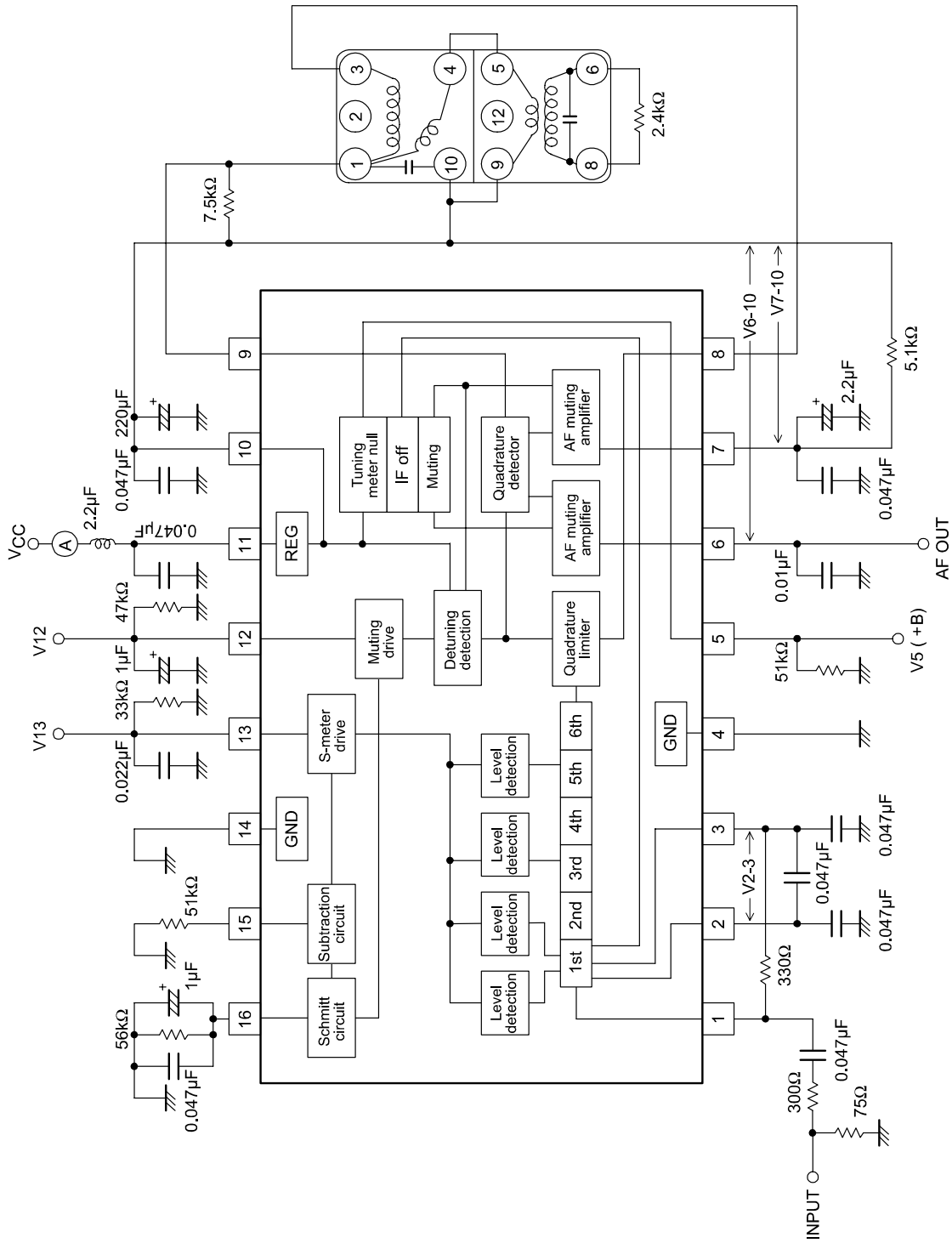
Detector coil : 235SU1 (Sumida)



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	(1-3)	(1-4)	(5-9)	(6-8)
(P)	64T	20 1/2T	-	-
(S)	-	-	1 1/2T	18T
wire	0.10 UEW	0.12 UEW	0.12 UEW	0.12 UEW
fo	-	10.7MHz ±2%	-	10.7MHz ±2%
Qu	-	40 ±20%	-	47 ±20%
Int. Capacity	82pF ±5%(1-10)		-	100pF ±5%
Inductance	26μH ±5%(1-3)		-	

Block Diagram and Test Circuit



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