Ordering number: EN2619B

Monolithic Linear IC

LA3335M

PLL FM Multiplex Demodulator for 3 V Headphone Stereos and Radio-cassette Recorders

Overview

The LA3335M is PLL FM stereo multiplex demodulator IC designed for use in headphone stereos, etc. which operate from a low supply voltage.

Applications

- FM Multiplex IC for 3 V headphones, radio-cassette recorders

Functions

- PLL FM stereo decoder, VCO stop, stereo indicator

Features

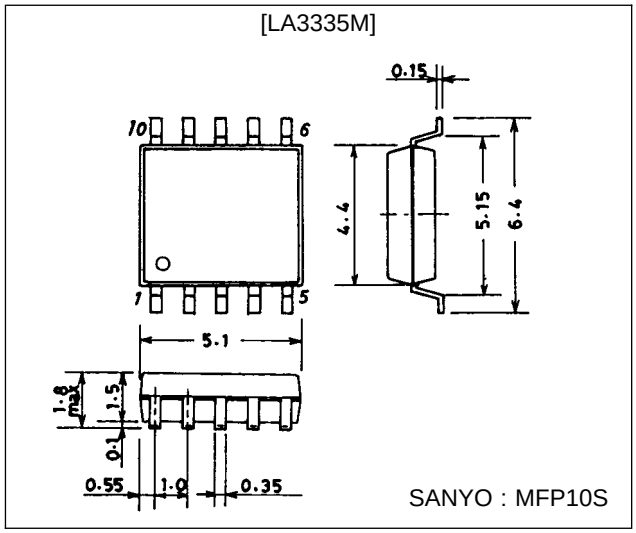
- Wide operating voltage range : 1.8 to 6 V
- Low current dissipation : 1.6 mA
- Minimum number of external parts required

Package Dimensions

unit : mm

3086A-MFP10S

[LA3335M]



Specifications

Maximum Ratings at Ta = 25 °C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max		8	V
Lamp drive current	I_L max		10	mA
Allowable power dissipation	Pd max	Ta ≦ 70 °C	50	mW
Operating temperature	Topr		–20 to +70	°C
Storage temperature	Tstg		–40 to +125	°C

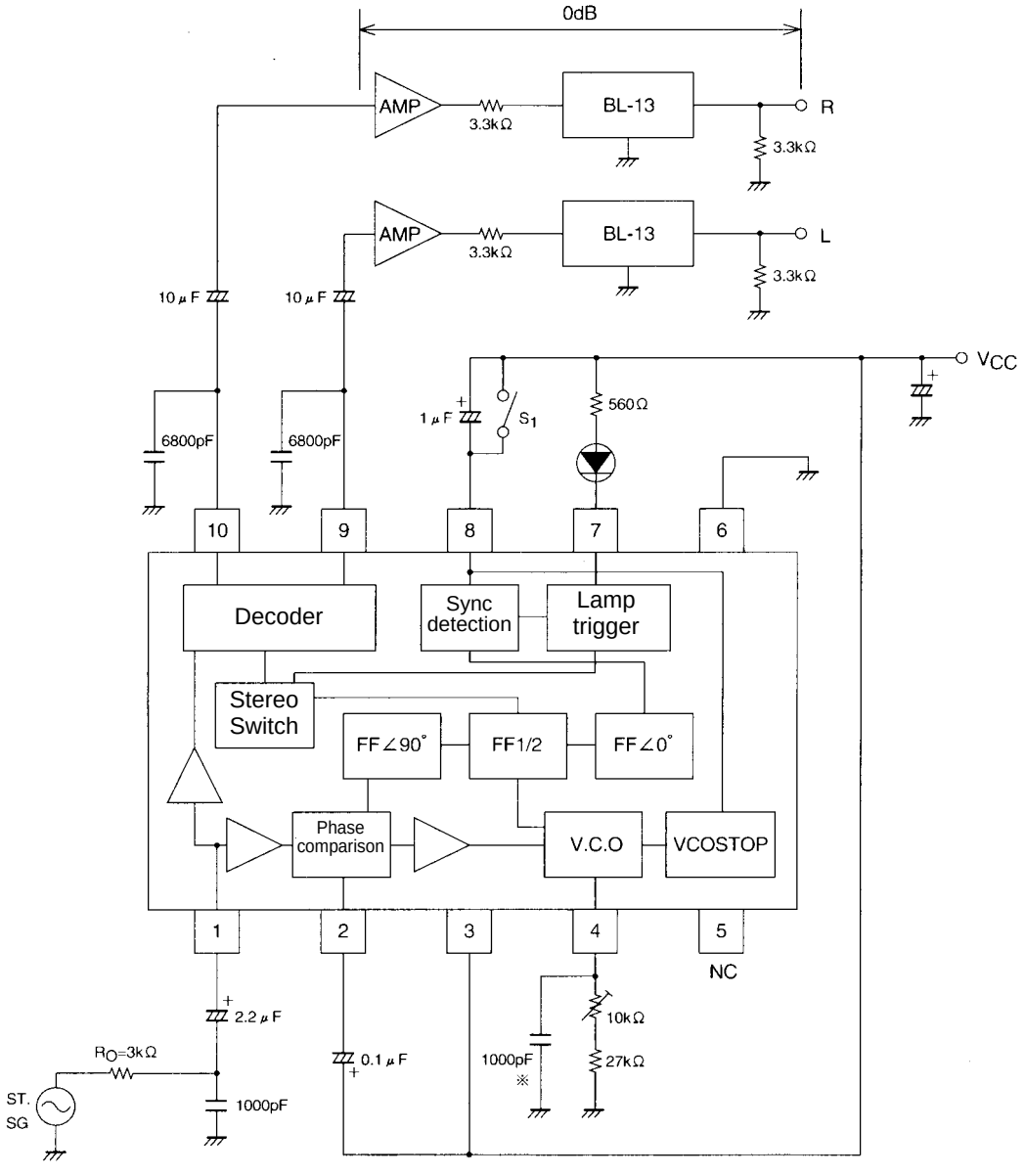
Operating Conditions at Ta = 25 °C

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V_{CC}		3	V
Operating voltage range	V_{CC} op		1.8 to 6	V
Input signal voltage	V_{IN}		150	mV

Operating Characteristics at Ta = 25 °C, V_{CC} = 3 V, input 150 mV, L + R = 90%, pilot = 10%, f = 1 kHz, See specified Test Circuit.

Parameter	Symbol	Conditions	min	typ	max	Unit
Quiescent current	I_{CCO}	No input		1.6	2.5	mA
Input resistance	Ri		35	50	65	kΩ
Output resistance	Ro		5.3	7.5	9.7	kΩ
Channel separation	CHsep		30	45		dB
Total harmonic distortion	THD	Monaural		0.6	1.5	%
		Stereo main		0.3	1.5	%
Output voltage	V_O	Monaural	90	130	180	mV
Channel balance	CB	Monaural		0	1.5	dB
Lamp lighting level	V_L	Pilot	1.5	3.5	6	mV
Lamp hysteresis	hy			3.5		dB
Capture range	CR	Pilot 15 mV		±3		%
Allowable input level	V_{IN} max	Monaural, THD = 5%		350		mV
Signal to noise ratio	S/N	Monaural		82		dB

Equivalent Circuit Block Diagram and Test Circuit



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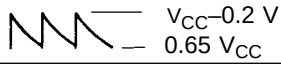
S1: VCO STOP when ON
AMP: Bandwidth of 100 kHz or more, THD = 0.01% or less, input impedance of 330 kΩ or more
* Styrol capacitor

External Parts

Part Name	Symbol	Kind	Value	Remarks
Resistor	R1	Carbon resistor	27 kΩ	VCO time constant
	R2	Carbon resistor	560 Ω	Limiting resistor
Semifixed resistor	VR1	Carbon resistor	10 kΩ	VCO OSC frequency adjust
Capacitor	C1	Electrolytic capacitor	2.2 µF	DC blocking
	C2	Electrolytic capacitor	0.1 µF	Loop filter
	C3	Polystyrol capacitor	1000 pF	VCO time constant
	C4	Electrolytic capacitor	1 µF	Pilot detection
	C5	Ceramic capacitor	6800 pF	De-emphasis
	C6	Ceramic capacitor	6800 pF	De-emphasis
	C7	Electrolytic capacitor		Power supply ripple filter

Typical Voltage and Name of Each Pin

Pin No.	Voltage	Name	Remarks
1	1.2 V	Input	
2	V_{CC}–0.7 V	PLL loop filter	
3	V_{CC}	Power supply	
4	—	VCO	
5	—	NC	
6	0 V	GND	
7	—	Stereo indicator	Open collector
8	V_{CC}–0.7 V	Pilot sync detection filter	
9	1.3 V	Decoder output (low)	
10	1.3 V	Decoder output (high)	

Proper cares in using IC

1. VCO stop method
   Short pin 7 and pin 3 (V_{CC} pin) to stop the VCO.
   (Note) The maximum voltage to be applied to pin 7 must not exceed the voltage on pin 3.
2. Free-running frequency check method : Use either of the following two methods.
   a) Connect pin 4 to a frequency counter through the high input impedance amplifier.

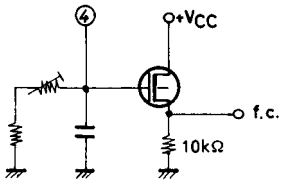


Figure 1

b) Connect the connection point of the semifixed resistor connected to pin 4 and the fixed resistor to a frequency counter through the R_X of 240 kΩ. Fig. 2 shows how the error changes as the R_X value is decreased.

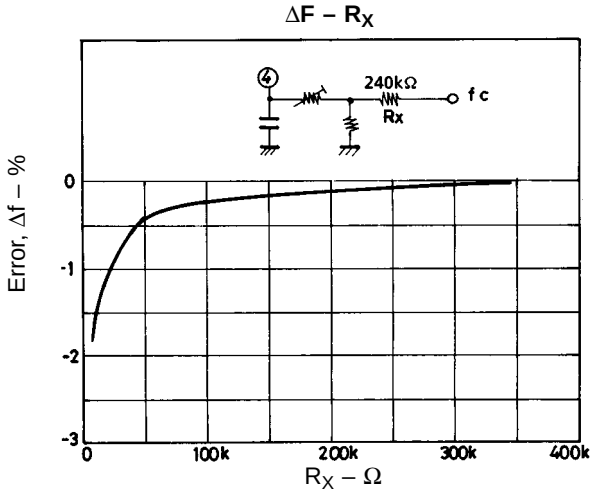


Figure 2

3. Separation setting mothod

The LA3335M is so designed that the sub-signal gain is approximately 1.25 times as high as the main signal gain. The separation can be set by attenuating the sub-signal of the FM detection output. (See Figure 3)

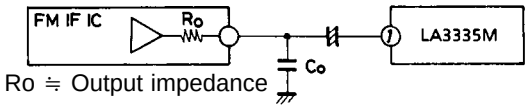


Figure 3

The value of capacitor Co depends on the attenuation of the sub-signal of the FM detection output and the IF IC output impedance Ro. Fig. 4 shows the value of separation setting capacitor Co when Ro is set to 3 kΩ.

For example, when the attenuation of sub-signal of the IF IC output is 0.9 time that of the main signal, it is seen from Figure 4 that the value of Co is approximately 500 pF.

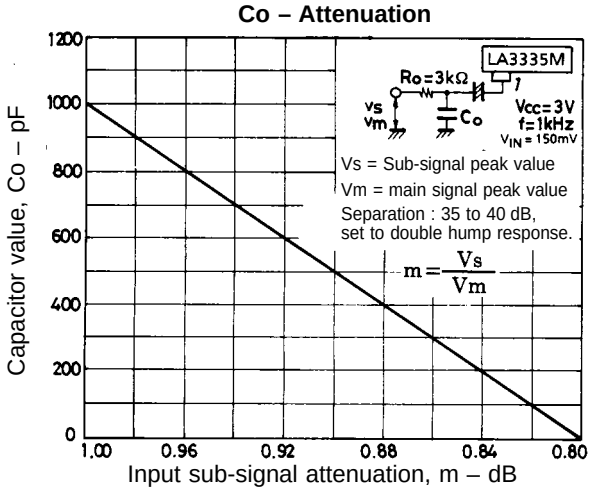
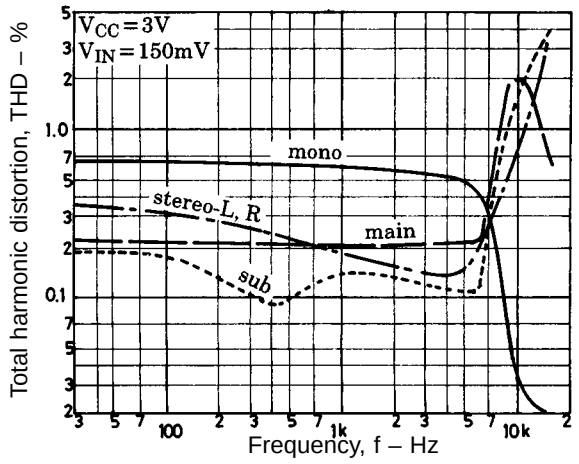
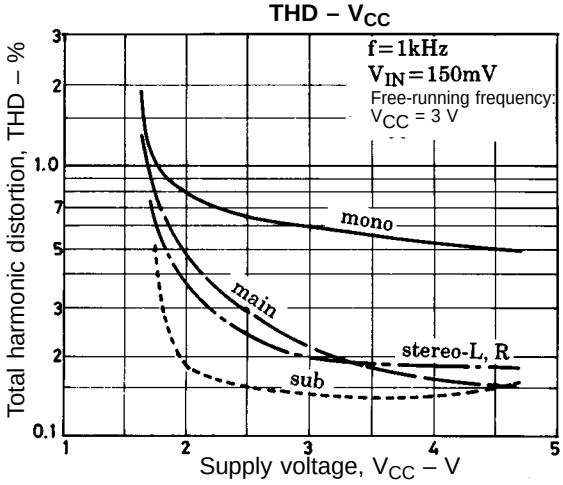


Figure 4

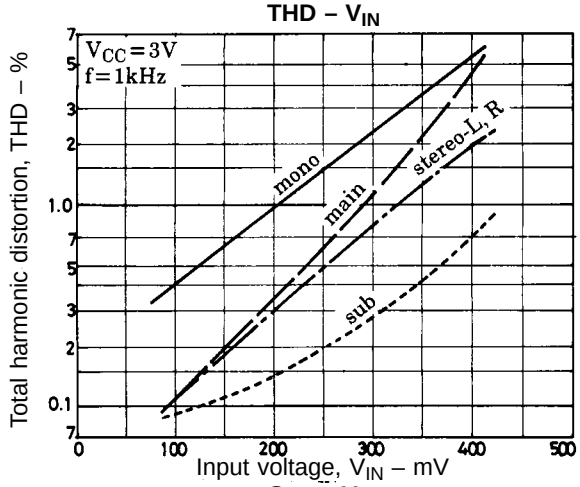
THD – f



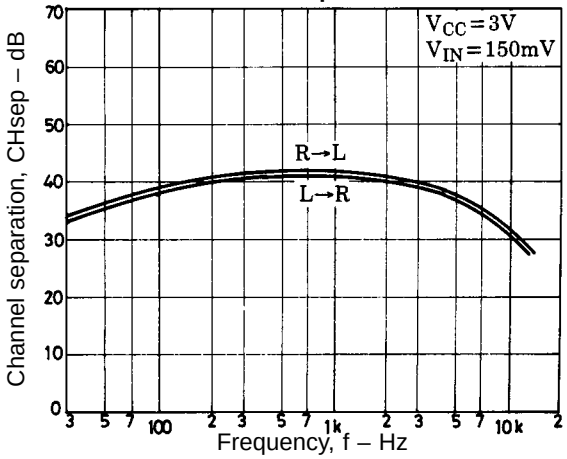
THD – V_{CC}



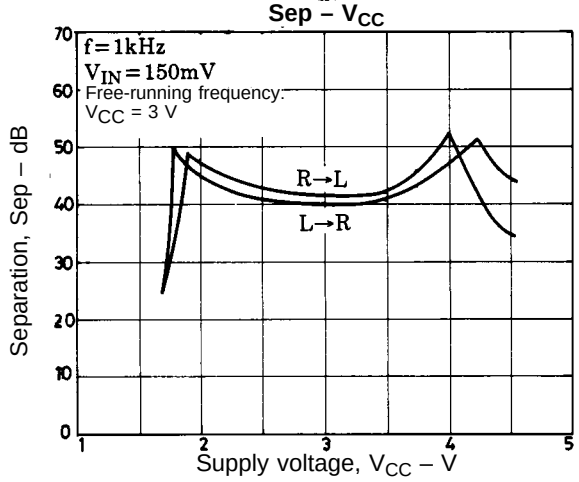
THD – V_{IN}



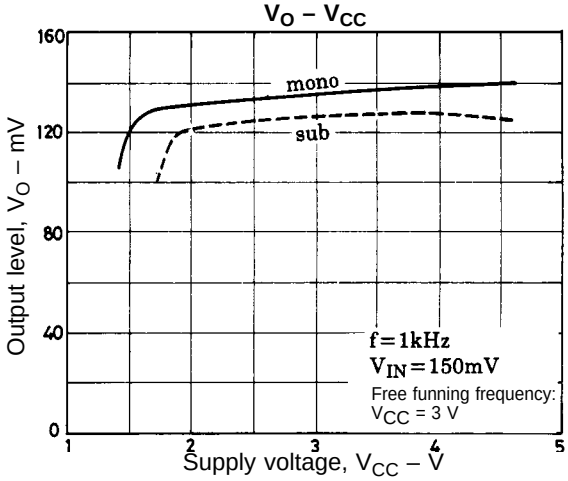
CHsep – f



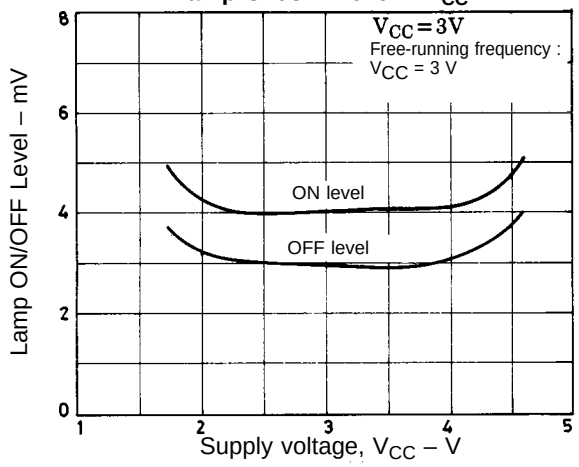
Sep – V_{CC}



V_O – V_{CC}



Lamp ON/OFF level – V_{CC}



Capture range