



# LA1845N, 1845NM

## Single-Chip Home Stereo IC

### Overview

The LA1845N/1845NM is designed for use in mini systems and is a single-chip tuner IC that provides electronic tuning functions using SD/IF-count technique. It incorporates a pilot canceler and an adjustment-free MUX VCO circuit, thus allows additional parts to be reduced.

### Functions

- AM: RF amplifier, mixer, oscillator, IF amplifier, detector, AGC, SD, oscillator buffer, IF buffer, stereo IF output, AGC time constant switch
- FM IF: IF amplifier, quadrature detector, S-meter, SD (signal detection), S-curve detection, IF buffer output
- MPX: PLL stereo decoder, stereo display, forced monaural, VCO stop, audio muting, adjacent channel interference rejection function, pilot canceler

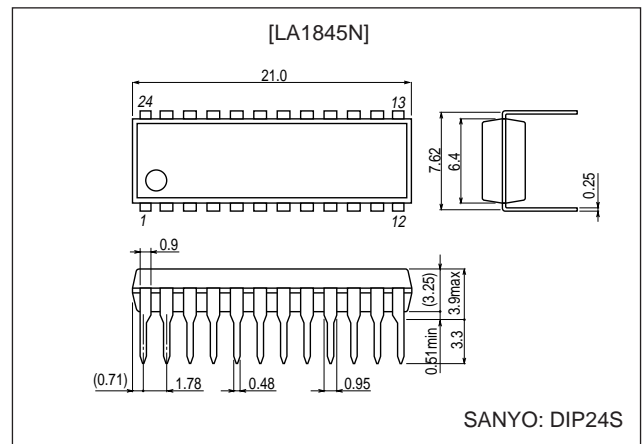
### Features

- Integrated MPX VCO (ceramic resonators are no longer required.)
- Built-in adjacent channel interference rejection function (114 kHz, 190 kHz)
- Supports both SD and IF-count techniques
- Both FM SD sensitivity and bandwidth can be set
- Pilot canceler built in.

### Package Dimensions

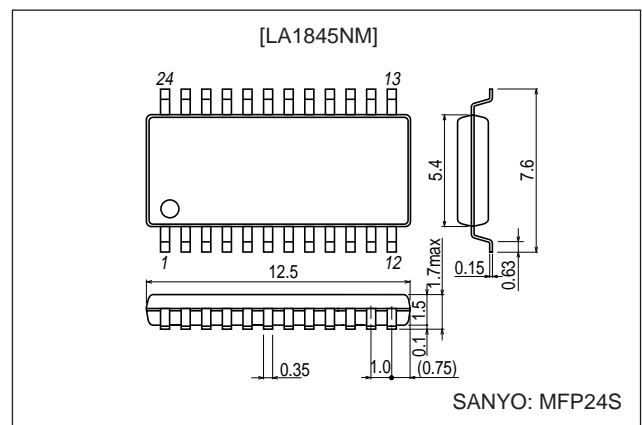
unit: mm

#### 3067A-DIP24S



unit: mm

#### 3112A-MFP24S



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### Specifications

#### Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V <sub>CC</sub> max		9	V
Allowable power dissipation	Pd max	Ta ≤ 45°C	400	mW
	Pd max	Ta = 80°C (DIP)	400	mW
	Pd max	Ta = 80°C (MFP)	260	mw
Operating temperature	To <sub>pr</sub>		-20 to +80	°C
Storage temperature	T <sub>stg</sub>		-40 to +125	°C

#### Operating Conditions at Ta = 25°C

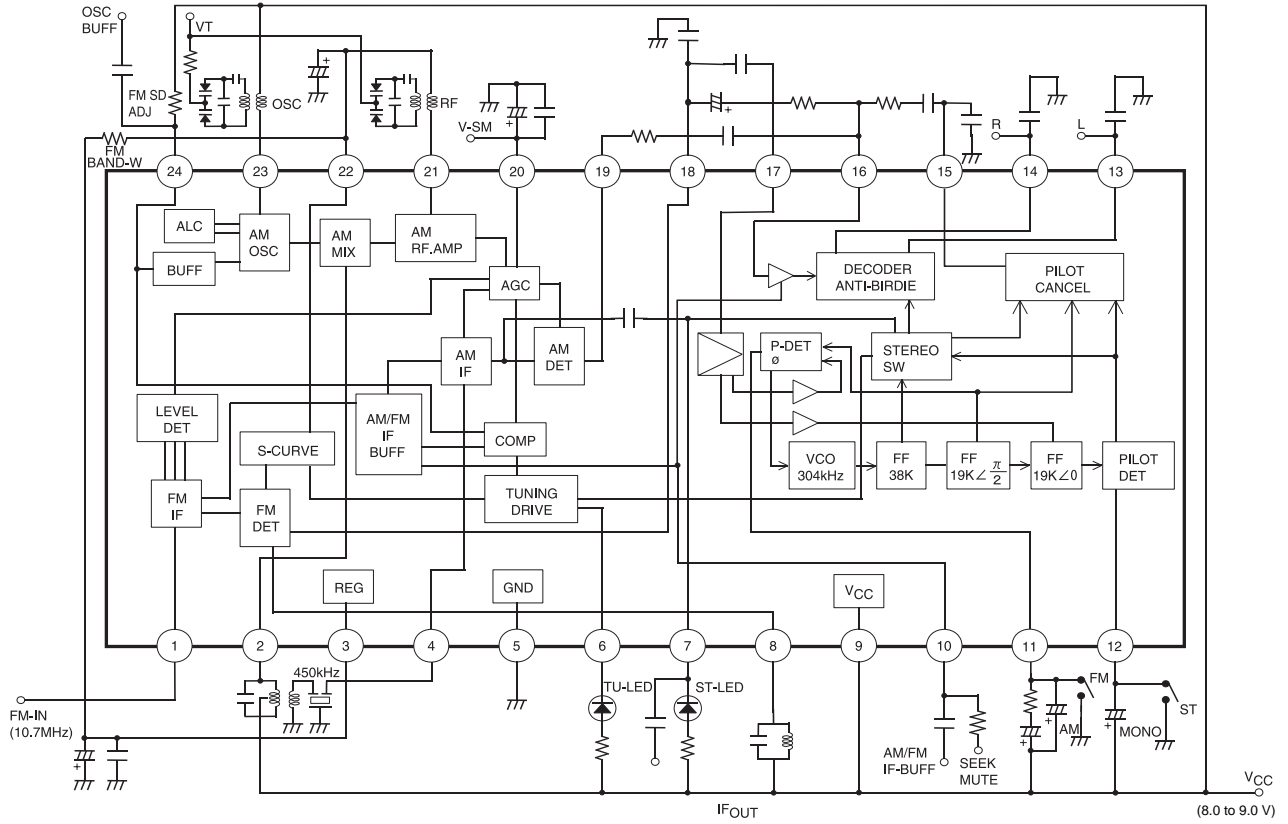
Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V <sub>CC</sub>		8	V
Operating supply voltage range	V <sub>CCOP</sub>	Ta = 80°C	4.3 to 8.5	V

#### Operating Characteristics at Ta = 25°C, V<sub>CC</sub> = 8 V, in the specified test circuit.

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
[FM Mono Characteristics] fc = 10.7 MHz, Vi = 100 dBμ, fm = 1 kHz, Mod = 75 kHz						
Current drain	I <sub>CCO-FM</sub>	With no input signal	20	30	40	mA
Demodulator output	V <sub>O<sub>FM</sub></sub>	100 dBμ, 100% modulation, fm = 1 kHz	230	360	460	mVrms
Total harmonic distortion	THD <sub>FM</sub>	100 dBμ, 100% modulation, fm = 1 kHz		0.35	1.5	%
Signal-to-noise ratio	S/N <sub>FM</sub>	100 dBμ, 100% modulation, fm = 1 kHz	73	80		dB
AM rejection ratio	AMR	100 dBμ, AM 30% modulation, fm = 1 kHz	47	65		dB
3 dB sensitivity		100 dBμ, 100% modulation, fm = 1 kHz, -3 dB input		32	40	dBμ
SD sensitivity		0% modulation	38	47	56	dBμ
IF counter buffer output	V <sub>IFBuff-FM</sub>	100 dBμ, the pin 13 output	80	120	160	mVrms
Mute attenuation	Mute-Att	100 dBμ, 100% modulation, fm = 1 kHz	75	85		dB
[FM Stereo Characteristics] fc = 10.7 MHz, Vi = 100 dBμ, fm = 1 kHz, L + R = 90%, Pilot = 10%						
Separation	Sep <sub>L</sub>	Left channel modulated. The pin 16 output/the pin 17 output	30	42		dB
Stereo on level	ST <sub>ON</sub>	The pilot modulation such that V7 falls under 0.7 V	1.5	3.5	5.5	%
Total harmonic distortion	THD-main	Left + right modulation. The pin 16 output.		0.45	1.5	%
Adjacent channel rejection ratio 1	Brej-3rd	fs = 113 kHz, Vs = 90%, pilot = 10% The left - right modulation, demodulated output		36		dB
Adjacent channel rejection ratio 2	Brej-5th	fs = 189 kHz, Vs = 90%, pilot = 10% The left - right modulation, demodulated output		41		dB
Carrier leak		L + R = 90%, pilot = 10% reference, pilot = 10% output	38	44		dB
[AM Characteristics] fc = 1000 kHz, Vi = 80 dBμ, fm = 1 kHz, Mod = 30%						
Current drain	I <sub>CCO-AM</sub>	With no input signal	13	27	39	mA
Detector output 1	V <sub>O<sub>AM1</sub></sub>	23 dBμ, 30% modulation, fm = 1 kHz	40	80	160	mVrms
Detector output 2	V <sub>O<sub>AM2</sub></sub>	80 dBμ, 30% modulation, fm = 1 kHz	90	160	230	mVrms
Signal-to-noise ratio 1	S/N <sub>AM1</sub>	23 dBμ, 30% modulation, fm = 1 kHz	17	23		dB
Signal-to-noise ratio 2	S/N <sub>AM2</sub>	80 dBμ, 30% modulation, fm = 1 kHz	46	52		dB
Total harmonic distortion 1	THD <sub>AM1</sub>	80 dBμ, 30% modulation, fm = 1 kHz		0.4	1.1	%
Total harmonic distortion 2	THD <sub>AM2</sub>	107 dBμ, 30% modulation, fm = 1 kHz		0.5	1.3	%
SD sensitivity		0% modulation	11	20	29	dBμ
Local oscillator buffer output	V <sub>OSC-AM</sub>	With no input signal	100	140	200	mVrms
IF counter buffer output	V <sub>IFBuff-AM</sub>	23 dBμ	140	285	400	mVrms

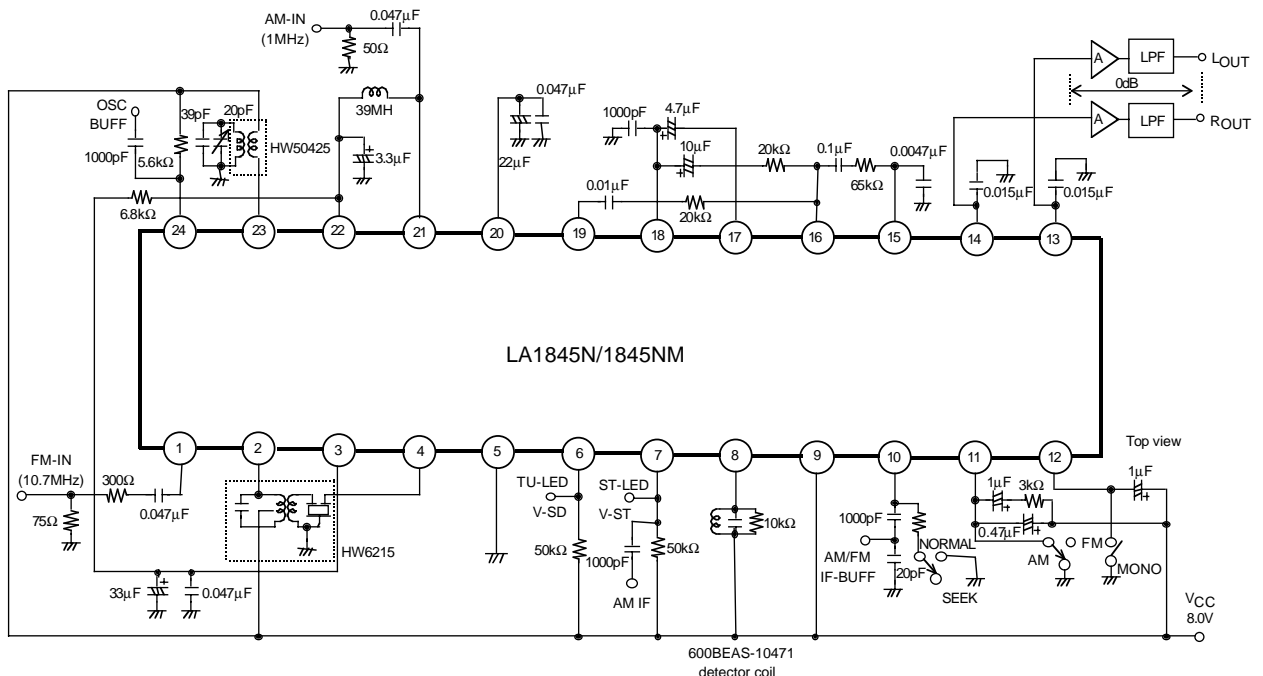
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## Block Diagram



Top view

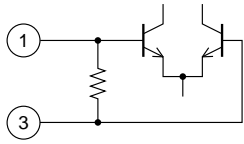
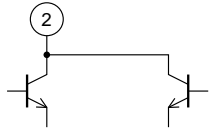
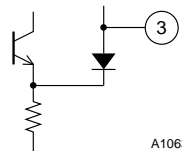
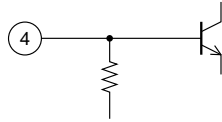
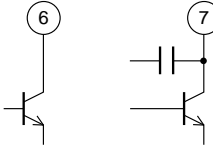
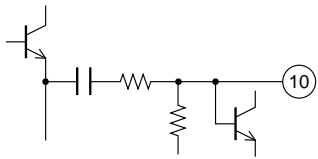
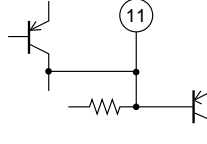
## AC Test Circuit



Top view

## LA1845N, 1845NM

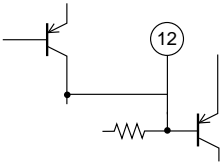
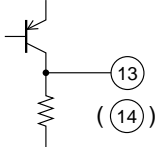
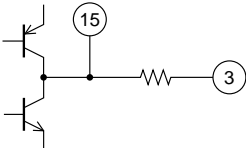
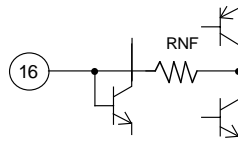
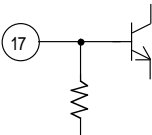
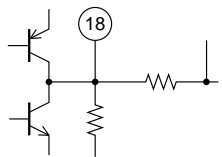
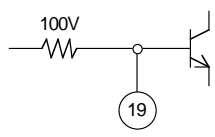
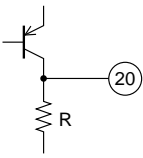
### Pin Functions

Pin No.	Pin function	Pin voltage	Notes	Equivalent circuit
1	FM IF input	Vreg	Input impedance $r_i = 330 \Omega$	 <p style="text-align: right;">A10635</p>
2	AM mixer output	V <sub>CC</sub>	Connect the mixer coil between this pin and V <sub>CC</sub>	 <p style="text-align: right;">A10636</p>
3	REG	2.3	Vreg = 2.3 V	 <p style="text-align: right;">A10635</p>
4	AM IF input	Vreg	Input impedance $r_i = 2 \text{ k}\Omega$	 <p style="text-align: right;">A10637</p>
5	GND	0 V		
6	TU-LED	V <sub>CC</sub>	Active low	 <p style="text-align: right;">A10638</p>
7	ST-LED / AF-IF output	V <sub>CC</sub>	Open collector	
8	FM detector	V <sub>CC</sub>	The 600BEAS-10471 (Toko Mfg. Co., Ltd.) is recommended for detector coil.	
9	V <sub>CC</sub>			
10	AM / FM IF counter output, output control switch, mute switch	0 V	$V_{10} \leq 0.5 \text{ V}$ : Reception state $1.4 \text{ V} \leq V_{10} \leq 2.2 \text{ V}$ : Muting on $V_{10} \geq 3.5 \text{ V}$ : IF counter output and muting on	 <p style="text-align: right;">A10643</p>
11	Phase comparator low-pass filter (AM/FM switching)	V <sub>CC</sub> - 1.0	The device operates in AM mode when a current of over 200 $\mu\text{A}$ flows from pin.12. Limit values for the resistor: 2.7 $\text{k}\Omega$ (When V <sub>CC</sub> = 7 V) 3.9 $\text{k}\Omega$ (8 V)	 <p style="text-align: right;">A10641</p>

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## LA1845N, 1845NM

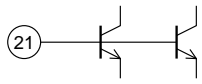
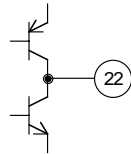
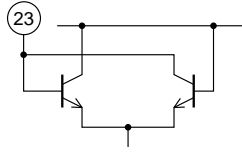
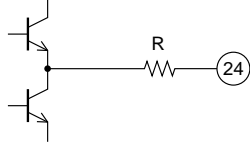
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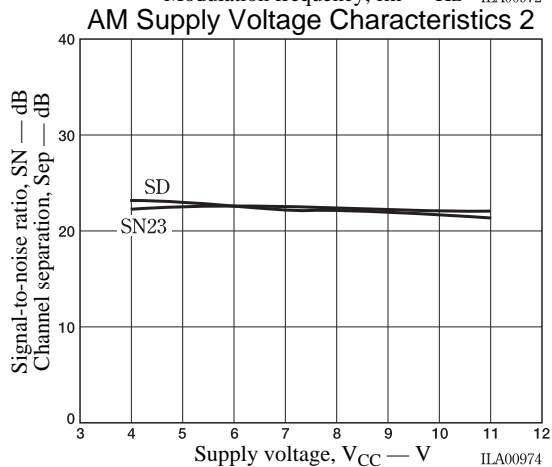
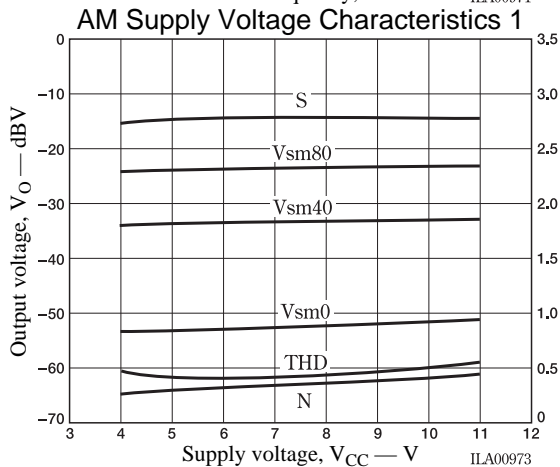
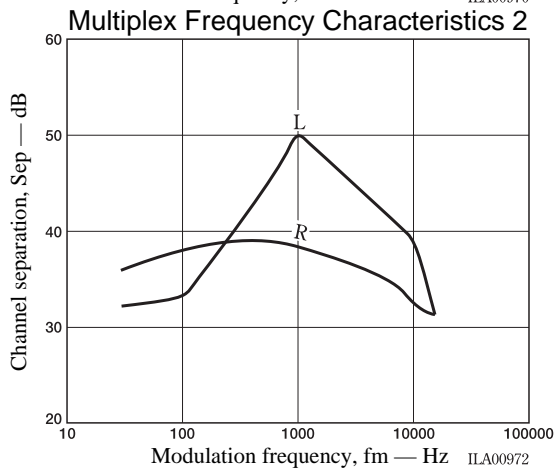
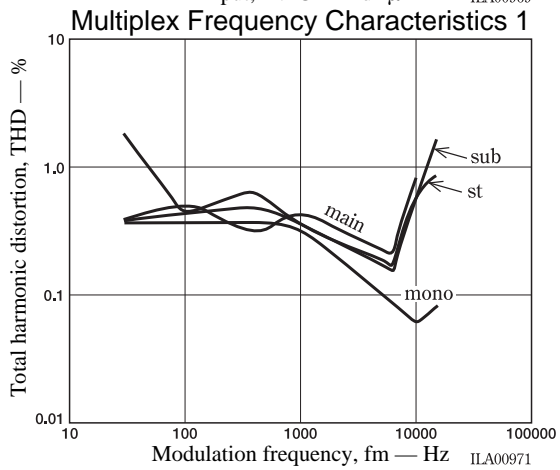
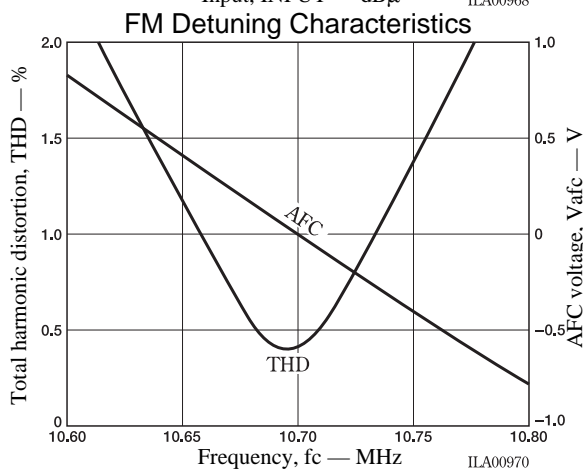
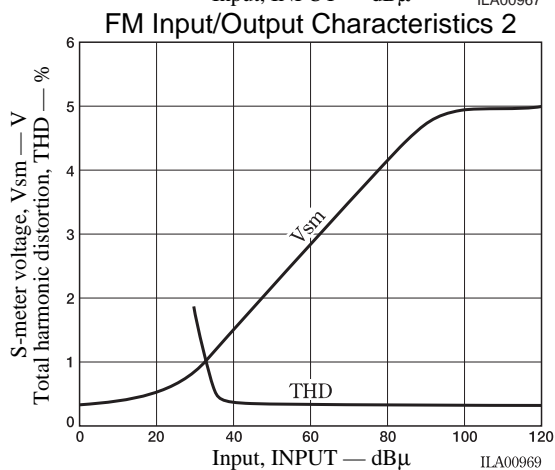
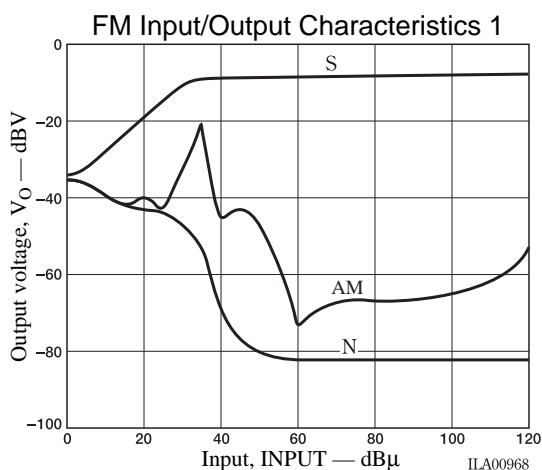
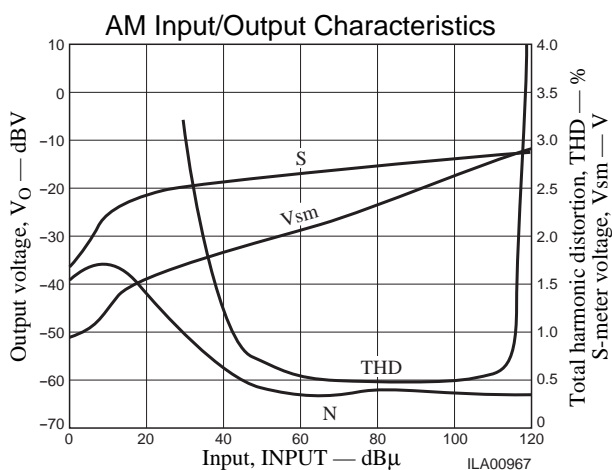
Pin No.	Pin function	Pin voltage	Notes	Equivalent circuit
12	Pilot detector low-pass filter (Forced mono) (VCO stop)	$V_{CC} - 1.0$	<p>The device is forced to monaural when a current of over <math>50 \mu\text{A}</math> flows from this pin.</p> <p>The VCO is stopped when a current of over <math>200 \mu\text{A}</math> flows from this pin.</p> <p>The limit values for the resistor are the same as those for pin 11.</p>	 <p style="text-align: right;">A10642</p>
13 14	L outputs R outputs	3.2 V 3.2 V	Output impedance $r_o = 3.3 \text{ k}\Omega$	 <p style="text-align: right;">A10647</p>
15	Pilot canceler output	Vreg		 <p style="text-align: right;">A10645</p>
16	Decoder input	Vreg	<p>Inverting input pin</p> <p>RNF = <math>20 \text{ k}\Omega</math></p>	
17	PLL input	Vreg	Input impedance $r_i = 20 \text{ k}\Omega$	
18	FM demodulator output	$V_{reg} + 0.7$ (FM) $V_{reg} + 0.7$ (AM)	<p>Output impedance <math>r_o = 2.3 \text{ k}\Omega</math></p> <p>The channel separation can be adjusted with an external capacitor connected between this pin and ground.</p>	 <p style="text-align: right;">A10649</p>
19	AM detector output	0 V (FM) 1.5 V (AM)	Output impedance $r_o = 10 \text{ k}\Omega$	
20	S meter, AM AGC	0.2 V (FM) 0.9 V (AM)	<p>The resistance of the built-in resistor R is <math>13.9 \text{ k}\Omega</math></p> <p>The SD response during seek operation is determined with the external capacitor connected to this pin.</p>	 <p style="text-align: right;">A10651</p>

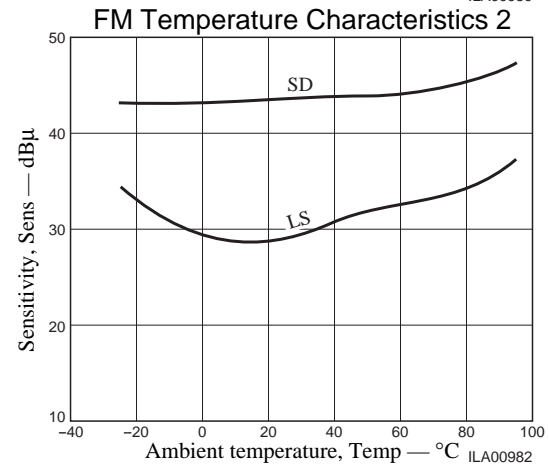
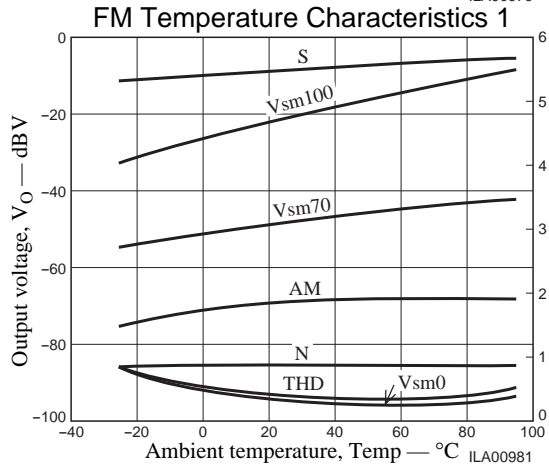
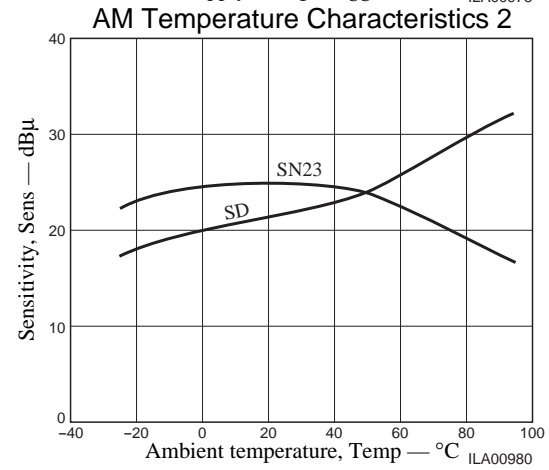
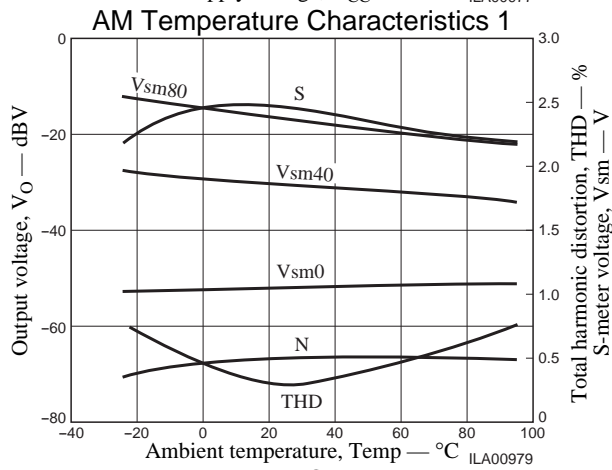
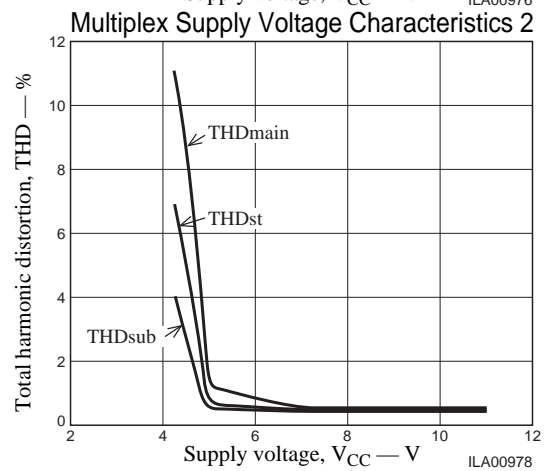
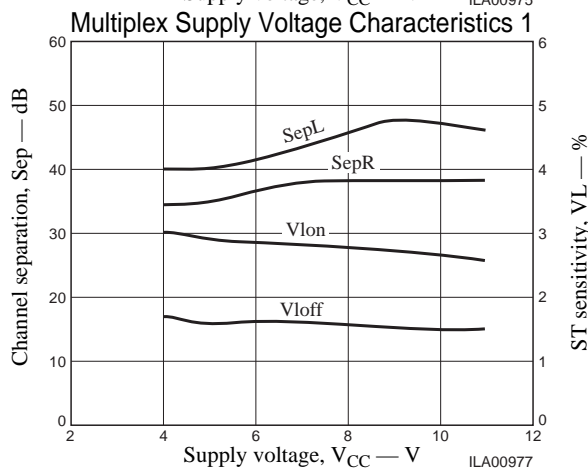
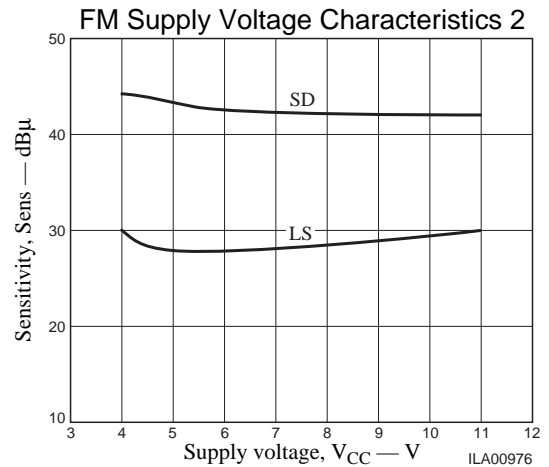
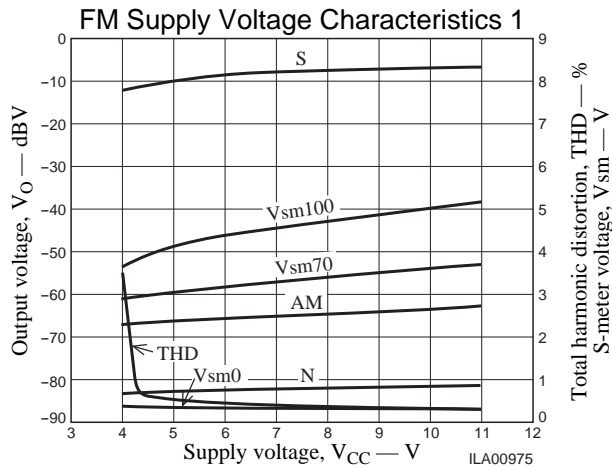
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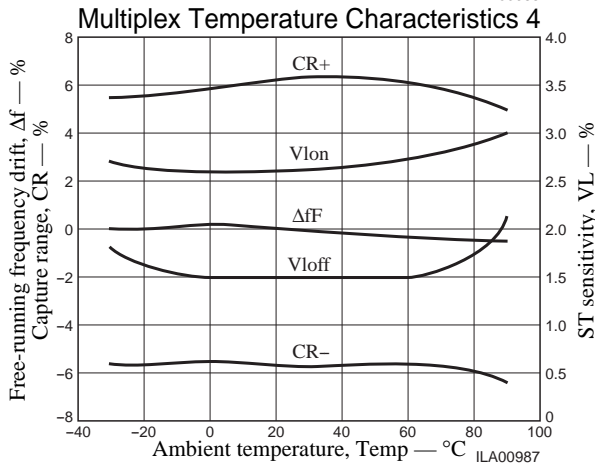
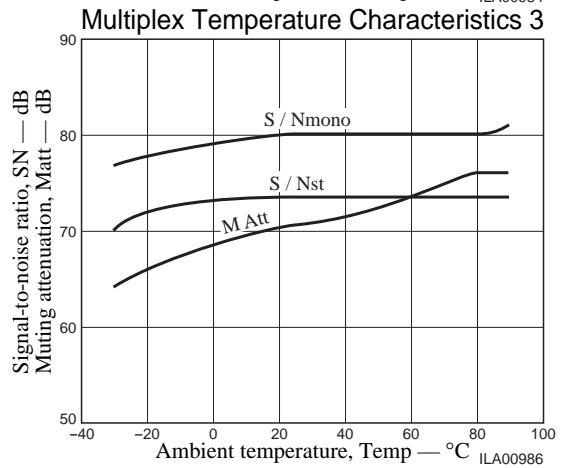
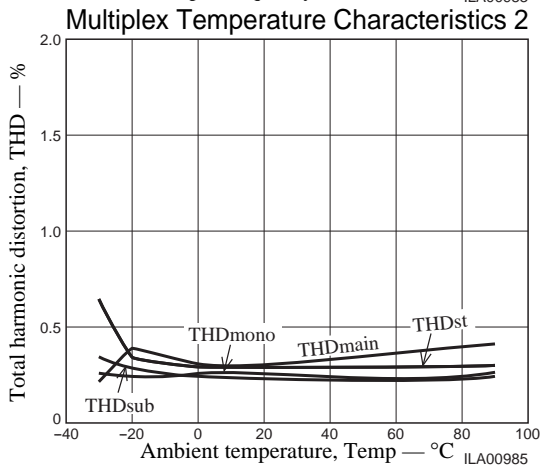
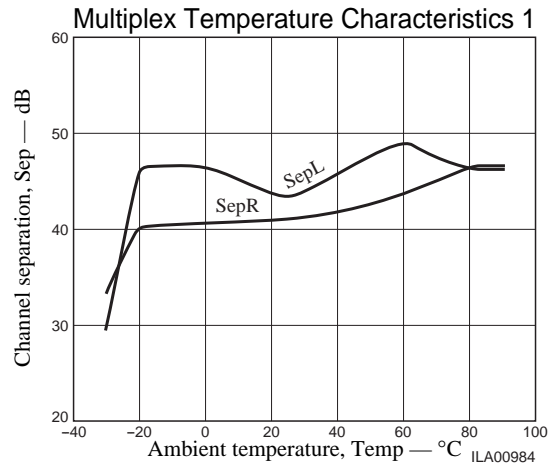
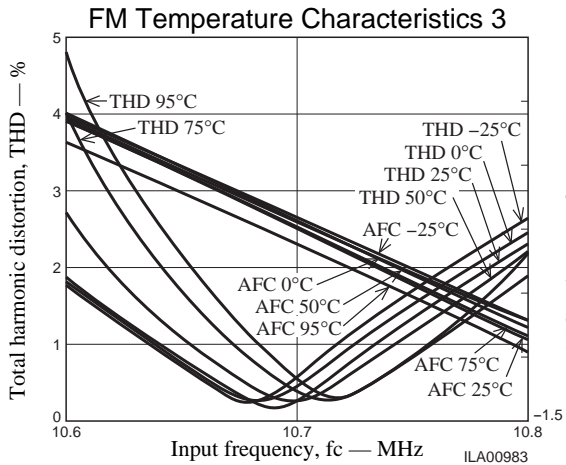
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Pin No.	Pin function	Pin voltage	Notes	Equivalent circuit
21	AM RF input	Vreg	Must be used at the same potential as pin 22	 <p>A10653</p>
22	AFC	Vreg	The FM SD bandwidth can be adjusted with the external resistor connected between this pin and pin 3 (Vreg)	
23	OSC	Vcc	Connect the oscillator coil between this pin and pin 9 (Vcc) Note: Impedance of the secondary oscillator coil must be 5 kΩ or higher.	 <p>A10655</p>
24	Oscillator buffer output, FM SD sensitivity adjustment	Vcc - 1.4	The FM SD sensitivity can be adjusted with an external resistor connected to this pin. Output impedance $r_o = 200 \Omega$ Note: Resistance of the external resistor connected to the pin 24 must be 3.3 kΩ or higher.	 <p>A10656</p>









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