



SANYO Semiconductors DATA SHEET

LV23002M — Bi-CMOS IC For Radio Cassette and Mini Component System 1-chip Tuner IC Incorporating PLL

Overview

The LV23002M is a one-chip tuner IC incorporating PLL for radio cassette and mini component system.

Features

- AM
- FM-FE
- FM-IF
- MPX
- PLL

Specifications

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

| Parameter | Symbol | Conditions | Ratings | Unit |
|-----------------------------|----------------------|---|--------------|------------------|
| Maximum supply voltage | $V_{CC\text{ max}}$ | V_{CC} | 7.0 | V |
| | $V_{DD\text{ max}}$ | V_{DD} | 5.0 | V |
| Maximum input voltage | $V_{IN1\text{ max}}$ | CE, DI, CL | 5.0 | V |
| | $V_{IN2\text{ max}}$ | XIN | $V_{DD}+0.3$ | V |
| Maximum output voltage | $V_{O1\text{ max}}$ | DO | 6.0 | V |
| | $V_{O2\text{ max}}$ | XOUT, PD | $V_{DD}+0.3$ | V |
| | $V_{O3\text{ max}}$ | BO1, BO2, AOUT | 12.0 | V |
| Allowable power dissipation | $P_d\text{ max}$ | $T_a \leq 70^\circ\text{C}$ Mounted on a glass epoxy board. Board size : 114.3 mm×76.1mm = 1.6mm | 400 | mW |
| Operating temperature | T_{opr} | | -20 to +70 | $^\circ\text{C}$ |
| Storage temperature | T_{stg} | | -40 to +125 | $^\circ\text{C}$ |

Note : This product should be handled with care because the resistance of one pin against electrostatic discharge damage is low.

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Operating Condition at Ta = 25°C

| Parameter | Symbol | Conditions | Ratings | Unit |
|--------------------------------|--------------------|------------|------------|------|
| Recommended supply voltage | V _{CC} | | 5.0 | V |
| | V _{DD} | | 3.0 | V |
| Operating supply voltage range | V _{CC op} | | 4.0 to 6.0 | V |
| | V _{DD op} | | 2.5 to 3.6 | V |

Note : Use the product with the supply voltage applied to V_{CC} and V_{DD}.

PLL block Allowable Operating Range at Ta = -20 to +70°C, V_{SS} = 0V

| Parameter | Symbol | Conditions | Ratings | | | Unit |
|--------------------------|------------------|-----------------------------------|--------------------|-----|--------------------|------|
| | | | min | typ | max | |
| Supply voltage | V _{DD} | | 2.5 | | 3.6 | V |
| Input high level voltage | V _{IH} | CE, CL, DI | 0.7V _{DD} | | 5.0 | V |
| Input low level voltage | V _{IL} | CE, CL, DI | 0 | | 0.3V _{DD} | V |
| Output voltage | V _{O1} | DO | 0 | | 6.0 | V |
| | V _{O2} | BO1, BO2, AOUT | 0 | | 10 | V |
| Operating frequency | f _{IN1} | XIN ; V _{IN1} | | 75 | | kHz |
| | f _{IN2} | FMIN ; V _{IN2} | 10 | | 160 | MHz |
| | f _{IN3} | AMIN (SNS = 1) ; V _{IN3} | 2 | | 40 | MHz |
| | f _{IN4} | AMIN (SNS = 0) ; V _{IN4} | 0.5 | | 10 | MHz |

Note : Due attention must be paid on leak because the XIN pin has an extremely high input impedance.

Operating Characteristics at Ta = 25°C, V_{CC} = 5.0V, V_{DD} = 3.0V, See the specified circuit.

| Parameter | Symbol | Conditions | Ratings | | | Unit |
|---|----------------|--|---------|-----|------|----------|
| | | | min | typ | max | |
| [FM-FE characteristics] : fc = 98MHz, fm = 1kHz, 22.5kHzdev. | | | | | | |
| 3dB sensitivity | 3dB LS | 60dBμV EMF, 30%mod output reference, -3dB input | | 3 | | dBμV EMF |
| Actual sensitivity | QS | S/N = Input at S/N = 30dB | | 10 | | dBμV EMF |
| [FM-IF monaural characteristics] : fc = 10.7MHz, fm = 1kHz, 75kHzdev. | | | | | | |
| Demodulation output | V _O | 100dBμV, 12pin output | 210 | 330 | 420 | mVrms |
| Channel balance | CB | 100dBμV, 13pin output /12pin output | -1.5 | 0 | +1.5 | dB |
| Signal-to-noise ratio | S/N | 100dBμV, 12pin output | 68 | 75 | | dB |
| Total harmonic distortion (Monaural) | THD | 100dBμV, 12pin output | | 0.3 | 1.5 | % |
| 3dB sensitivity | 3dB LS | V _O reference, Input level at which V _O reference is -3dB. | | 38 | 44 | dBμV |
| IF count sensitivity | IF-C3 | SDC0 = 1, SDC1 = 0, 18pin(DO) output | 45 | 51 | 61 | dBμV |
| Mute attenuation | Mute-Att | 100dBμV, 12pin output | | 68 | | dB |
| [FM-IF stereo characteristics] : fc = 10.7MHz, fm = 1kHz, L+R = 90%, Pilot = 10%, V _{IN} = 100dBμV | | | | | | |
| Separation | SEP | L-mod, 12pin output /13pin output | 28 | 40 | | dB |
| Total harmonic distortion (Main) | THD | Main-mod, 12pin output | | 0.5 | 1.5 | % |
| Stereo ON sensitivity | ST-ON | Stereo operation ON at Pilot = 5.5% Stereo not ON at Pilot = 0.6% | | | | |
| Cap challenge | CR | Stereo ON at fm = 18.6 kHz and 10% modulation fm = 19.4kHz, Stereo ON at fm = 19.4 kHz and 10% modulation | | | | |

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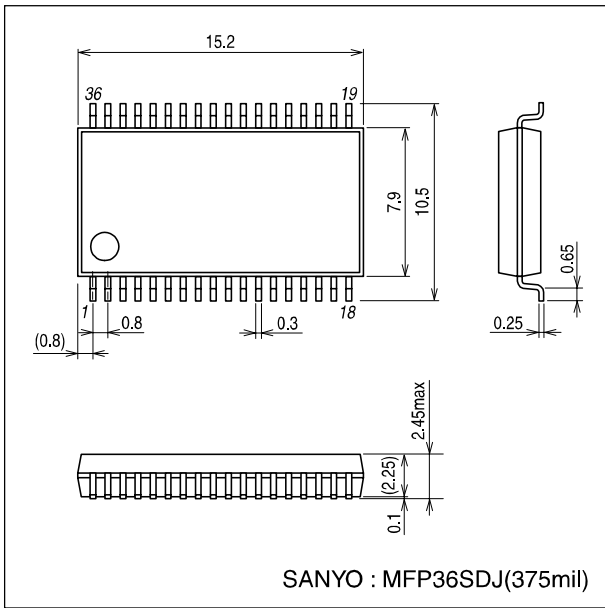
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| Parameter | Symbol | Conditions | Ratings | | | Unit |
|--|--|--|--------------|-------------|------|------------------|
| | | | min | typ | max | |
| [AM characteristics] : $f_c = 1000\text{kHz}$, $f_m = 1\text{kHz}$, 30%mod | | | | | | |
| Detection output 1 | V_{O1} | 23dB μV , 12pin output | 20 | 40 | 80 | mVrms |
| Detection output 2 | V_{O2} | 80dB μV , 12pin output | 60 | 110 | 160 | mVrms |
| Signal-to-noise ratio 1 | S/N1 | 23dB μV , 12pin output | 15 | 20 | | dB |
| Signal-to-noise ratio 2 | S/N2 | 80dB μV , 12pin output | 47 | 54 | | dB |
| Total harmonic distortion | THD | 80dB μV , 12pin output | | 1.2 | 3.0 | % |
| IF count sensitivity | IF-C | 18pin(DO) output | 16 | 26 | 36 | dB μV |
| Low-range attenuation | LOW-CUT | V_{O2} reference, Pin 12 output at $f_m = 100\text{Hz}$ | 5 | 8 | 11 | dB |
| [Current dissipation] | | | | | | |
| Current dissipation | ICCFM | No input in FM mode | 20 | 30 | 40 | mA |
| | ICCAM | No input in AM mode | 10 | 20 | 30 | |
| | I_{DD} | $f_r = 83\text{MHz}$, $X'_{tal} = 75\text{kHz}$, No input to tuner | 1 | 2 | 5 | |
| [PLL characteristics] | | | | | | |
| Internal return resistance | R_f | XIN | | 8 | | $M\Omega$ |
| Built-in output resistance | R_d | XOUT | | 250 | | $k\Omega$ |
| Hysteresis width | VHIS | CE, CL, DI | | $0.1V_{DD}$ | | V |
| Output high level voltage | V_{OH} | PD ; $I_O = -1\text{mA}$ | $V_{DD}-1.0$ | | | V |
| Output low level voltage | V_{OL1} | PD ; $I_O = 1\text{mA}$ | | | 1.0 | V |
| | V_{OL2} | BO1, BO2 ; $I_O = 1\text{mA}$ | | | 0.25 | V |
| | | BO1, BO2 ; $I_O = 5\text{mA}$ | | | | 1.25 |
| | V_{OL3} | DO ; $I_O = 1\text{mA}$ | | | 0.25 | V |
| V_{OL4} | AOUT ; $I_O = 1\text{mA}$, AIN = 2.0V | | | | 0.5 | V |
| Input high level current | I_{IH1} | CE, CL, DI ; $V_I = 6.0\text{V}$ | | | 5.0 | μA |
| | I_{IH2} | XIN ; $V_I = V_{DD}$ | 0.16 | | 0.9 | μA |
| | I_{IH3} | AIN ; $V_I = 6.0\text{V}$ | | | 200 | nA |
| Input low level current | I_{IL1} | CE, CL, DI ; $V_I = 0\text{V}$ | | | 5.0 | μA |
| | I_{IL2} | XIN ; $V_I = 0\text{V}$ | 0.16 | | 0.9 | μA |
| | I_{IL3} | AIN ; $V_I = 0\text{V}$ | | | 200 | nA |
| Output off-leak current | IOFF1 | BO1, AOUT, BO2 ; $V_O = 10\text{V}$ | | | 5.0 | μA |
| | IOFF2 | DO ; $V_O = 6.0\text{V}$ | | | 5.0 | μA |
| "H" level 3-state off-leak current | IOFFH | PD ; $V_O = 6.0\text{V}$ | | 0.01 | 200 | nA |
| "L" level 3-state off-leak current | IOFFL | PD ; $V_O = 0\text{V}$ | | 0.01 | 200 | nA |

Package Dimensions

unit : mm
3263



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