Ordering number: EN 3979

Monolithic Linear IC

No. 3979

# LA1883M

## Single-chip FM/AM Tuner for Car Radio and Home Stereo Equipment

## OVERVIEW

The LA1883M is a single-chip stereo FM/AM tuner system IC for use in car radio and home stereo equipment. It features higher performance and 30% fewer external components than current devices.

The LA1883M is a basic FM/AM tuner block on a single chip. It comprises FM front end, FM IF, MPX, noise canceller, AM and AM/FM switch.

The LA1883M operates from a 7.5 to 9.2 V supply and is available in 64-pin QIPs.

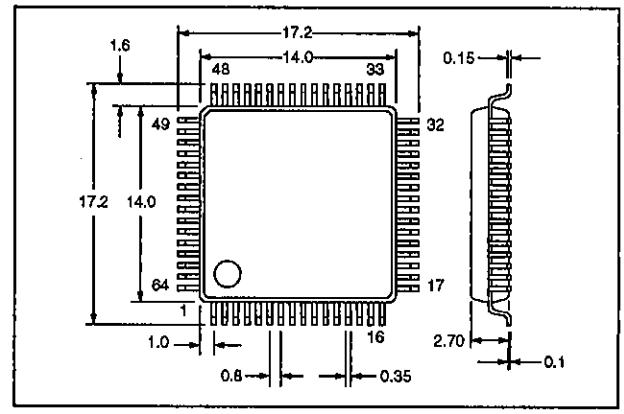
## FEATURES

- Single-chip stereo FM/AM tuner
- FM front end, FM IF, MPX, noise canceller, AM and FM/AM switch
- Higher performance and 30% fewer external components than current devices.
- High FM front end to FM IF stage isolation
- 7.5 to 9.2 V supply
- 64-pin QIP

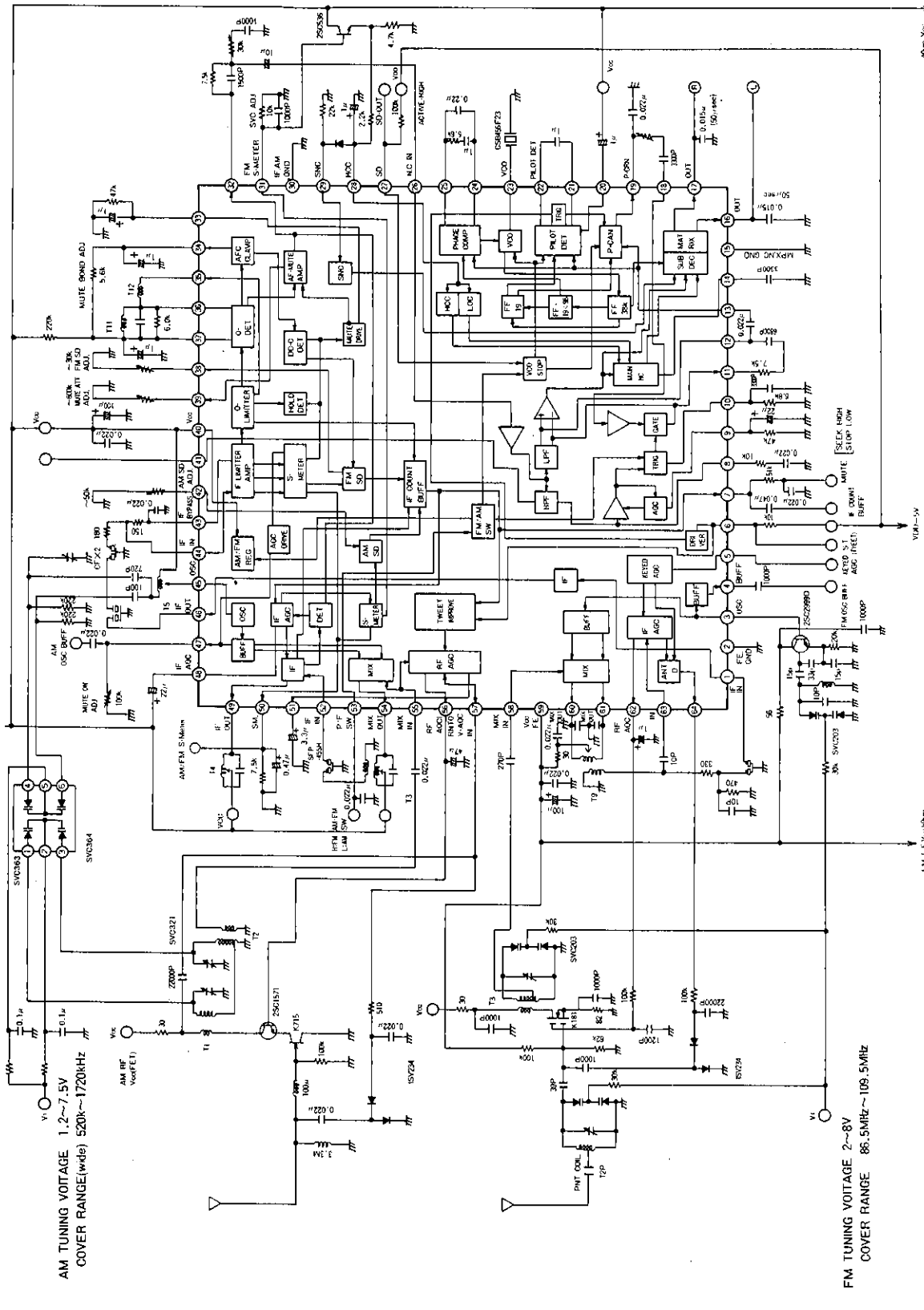
## PACKAGE DIMENSIONS

Unit: mm

**3159-QIP64E**



## BLOCK DIAGRAM




Unit (resistance: Ω, capacitance: F)

# SPECIFICATIONS

## Absolute Maximum Ratings

| Parameter | Symbol | Rating | Unit |
|---|---|---|---|
| Supply voltage | $V_{CC}$ | 9.5 | V |
| Power dissipation | $P_D$ | 950 | mW |
| Operating temperature range | Topr | –30 to 85 | °C |
| Storage temperature range | $T_{stg}$ | –40 to 150 | °C |

## Recommended Operating Conditions

$T_a$ = 25 °C

| Parameter | Symbol | Rating | Unit |
|---|---|---|---|
| Supply voltage | $V_{CC}$ | 8.5 | V |
| Supply voltage range | $V_{CC}$ | 7.5 to 9.2 | V |
| STEREO INJ supply voltage | $V_{CC\ STEREO\ INJ}$ | 5 | V |

## Electrical Characteristics

### FM IF

$V_{CC}$ = 8.5 V, $T_a$ = 25 °C, $f_C$ = 10.7 MHz

| Parameter | Symbol | Condition | Rating | | | Unit |
|---|---|---|---|---|---|---|
| | | | min | typ | max | |
| Demodulator output voltage | $V_{OFM}$ | $f_m$ = 1 kHz, 100% modulation, $V_I$ = 80 dBμ | 180 | 280 | 380 | mV |
| Channel balance | CB | $f_m$ = 1 kHz, 100% modulation, $V_I$ = 80 dBμ | –1 | 0 | 1 | dB |
| FM total harmonic distortion | $THD_{FM}$ | f = 1 kHz, 100% modulation, $V_I$ = 80 dBμ | – | 0.5 | 1.2 | % |
| Signal-to-noise ratio | $S/N_{FM\ IF}$ | f = 1 kHz, 100% modulation, $V_I$ = 80 dBμ | 68 | 75 | – | dB |
| AM suppression ratio | AMR | f = 1 kHz, $f_m$ = 1 kHz, 30% AM modulation, $V_I$ = 80 dBμ | 56 | 69 | – | dB |
| Muting attenuation | $\alpha_{MUTE}$ | f = 1 kHz, $V_I$ = 80 dBμ. $V_{33}$ changed from 0 to 2 V. | 5 | 10 | 15 | dB |
| | | f = 1 kHz, $V_I$ = 80 dBμ. $V_{33}$ changed from 0 to 4 V. | 19 | 24 | 29 | |
| Separation | SEP | See note 2. | 35 | 45 | – | dB |
| Stereo LED turn-ON pilot tone modulation | $ST_{ON}$ | $V_6$ < 1.5 V | 2.5 | 3.7 | 6.6 | % |

| Parameter | Symbol | Condition | Rating | | | Unit |
|---|---|---|---|---|---|---|
| | | | min | typ | max | |
| Stereo LED turn-OFF pilot tone modulation | $ST_{OFF}$ | $V_6$ < 3.5 V | 1.5 | 2.7 | – | % |
| Main channel total harmonic distortion | $THD_{main}$ | See note 2. | – | 0.4 | 1.5 | % |
| Pilot signal cancellation level | $P_{CAN}$ | 10% pilot signal, $V_I$ = 80 dBμ, Pilot-level leakage DIN-AUDIO measurement | 15 | 22 | – | dB |
| SNC output voltage | $V_{OSUB}$ | $V_I$ = 80 dBμ, $V_{31}$ = 0.1 V. See note 2. | – | – | 5 | mV |
| SNC output attenuation | $\alpha_{SNC}$ | $V_I$ = 80 dBμ. $V_{31}$ changed from 3.0 to 0.6 V. See note 2. | 0 | 4 | 8 | dB |
| HCC output attenuation | $\alpha_{HCC}$ | $V_I$ = 80 dBμ, f = 10 kHz. $V_{28}$ changed from 3.0 to 0.6 V. See note 2. | 0.5 | 4.5 | 8.5 | dB |
| | | $V_I$ = 80 dBμ, f = 10 kHz. $V_{28}$ changed from 3.0 to 0.1 V. See note 2. | 20 | 24 | 28 | |
| Input –3 dB limiting voltage | $V_{ILIM}$ | Referred to $V_I$ = 80 dBμ. | 33 | 40 | 47 | dBμ |
| Muting sensitivity | $V_{IMUTE}$ | Unmodulated signal, $V_{33}$ = 2 V | 27 | 35 | 43 | dBμ |
| SD sensitivity | $SD_{SEN\ MPX}$ | Unmodulated signal. IF count buffer is ON (V > 100 mV). | 60 | 72 | 84 | dBμ |
| | | Unmodulated signal. SD is ON. | 60 | 72 | 84 | |
| IF count buffer output voltage | $V_{IF\ BUFF\ FM}$ | Unmodulated input and output, $V_{FM\ IF}$ = 100 dBμ | 170 | 260 | 400 | mV |
| S-meter output voltage | $V_{SM\ FM}$ | No signal | 0 | 0.4 | 1.0 | V |
| | | $V_I$ = 50 dBμ | 1.0 | 1.9 | 3.0 | |
| | | $V_I$ = 70 dBμ | 1.9 | 3.4 | 5.5 | |
| | | $V_I$ = 100 dBμ | 3.3 | 5.2 | 6.9 | |
| Muting bandwidth | $BW_{MUTE}$ | $V_I$ = 100 dBμ, $V_{33}$ = 2 V unmodulated wideband signal | 150 | 230 | 330 | kHz |

**Notes**

1. Mounted in Yamaichi Electrical Industries' IC-51-0644-824 or KS8277 IC socket
2. $f_I$ comprises 90% left and right signals, and 10% pilot signal.

## FM front end

$V_{CC}$ = 8.5 V, $T_a$ = 25 °C

| Parameter | Symbol | Condition | Rating | | | Unit |
|---|---|---|---|---|---|---|
| | | | min | typ | max | |
| RF AGC turn-ON input voltage | $V_{IAGC}$ | $V_{64}$ = 0.7 V | 65 | 72 | 79 | dBμ |
| Conversion voltage gain | $A_V$ | $V_{MIX\ IN}$ = 70 dBμ at 98 MHz with no modulation | 74 | 118 | 187 | mV |
| OSC BUFF output voltage | $V_{OSC\ BUFF\ FM}$ | No signal, $f_{OSC}$ = 108.7 MHz, $V_t$ = 4.6 V | 130 | 200 | 270 | mV |
| FM section quiescent supply current | $I_{CCOFM}$ | No signal. $I_{40} + I_{49} + I_{54} + I_{60} + I_{61}$ | 54 | 77 | 95 | mA |

## Noise canceller

$V_{CC}$ = 8.5 V, $T_a$ = 25 °C

| Parameter | Symbol | Condition | Rating | | | Unit |
|---|---|---|---|---|---|---|
| | | | min | typ | max | |
| Gate time | $\tau_{GATE}$ | $V_{NC\ IN}$ = 100 mV peak at f = 1 kHz, 1 μs pulse | 15 | 25 | 35 | μs |
| Noise sensitivity | $N_{SEN}$ | 1 kHz, 1 μs pulse input level when noise canceller is ON | – | – | 30 | $mV_p$ |

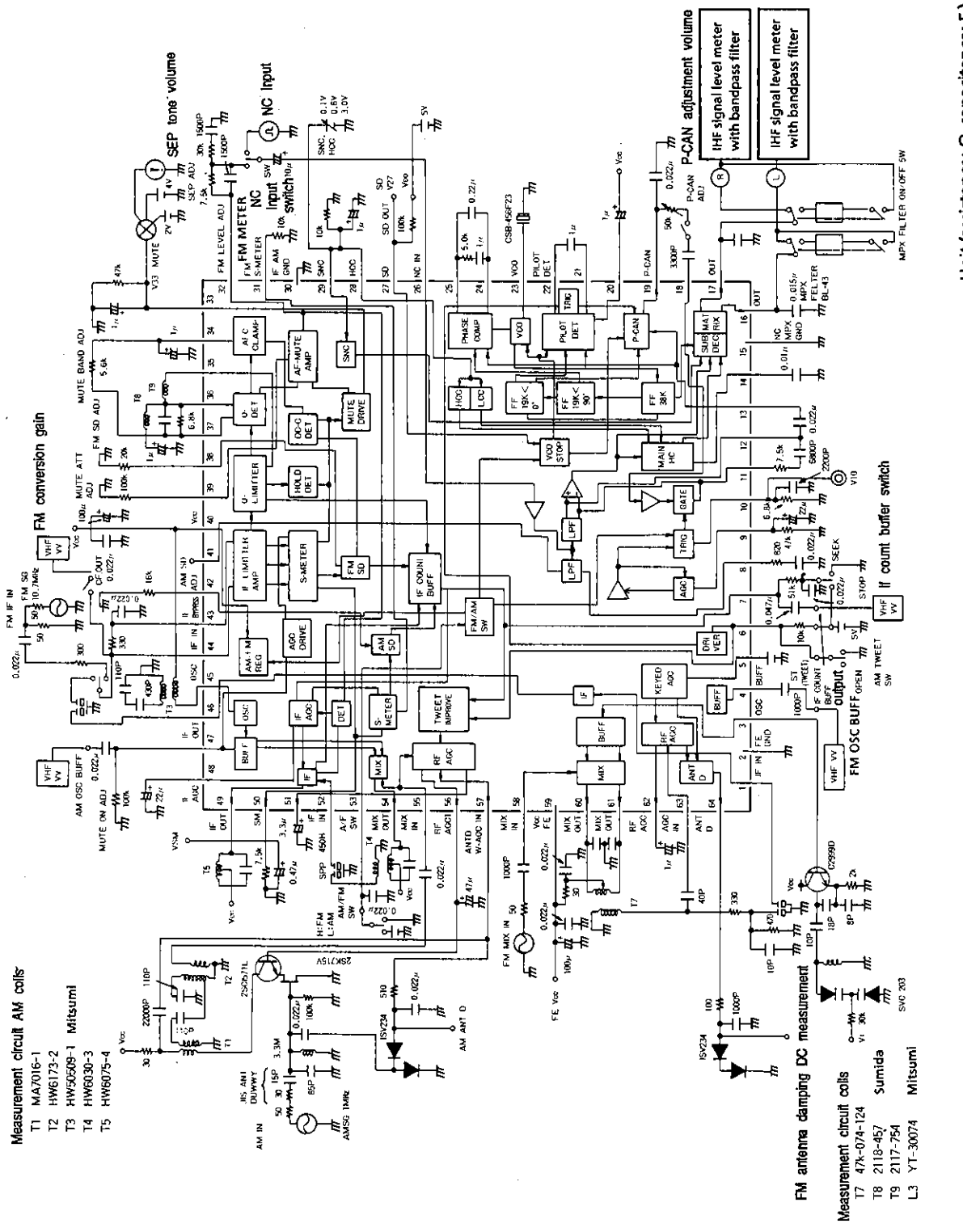
## AM

$V_{CC}$ = 8.5 V, $T_a$ = 25 °C, $f_{AM\ ANT}$ = 1 MHz unless otherwise noted

| Parameter | Symbol | Condition | Rating | | | Unit |
|---|---|---|---|---|---|---|
| | | | min | typ | max | |
| Usable sensitivity | S | $V_{AM\ ANT}$ = 27 dBμ, $f_m$ = 1 kHz, 30% modulation | 16 | 20 | – | dB |
| Detector output voltage | $V_{OAM}$ | $V_{AM\ ANT}$ = 74 dBμ, $f_m$ = 1 kHz, 30% modulation | 85 | 120 | 170 | mV |
| AGC figure-of-merit | $V_{AGCFOM}$ | Referred to $V_{AM\ ANT}$ = 74 dBμ, change in input required for output to fall 10 dB | 52 | 57 | 62 | dB |
| Signal-to-noise ratio | $S/N_{AM}$ | $V_{AM\ ANT}$ = 74 dBμ, $f_m$ = 1 kHz, 30% modulation | 45 | 50 | – | dB |
| Total harmonic distortion | $THD_{AM}$ | $V_{AM\ ANT}$ = 74 dBμ, $f_m$ = 1 kHz, 80% modulation | – | 0.4 | 1.0 | % |
| S-meter output voltage | $V_{SM\ AM}$ | No signal | – | 0 | 0.3 | V |
| | | $V_{AM\ ANT}$ = 100 dBμ, unmodulated | 3.3 | 4.7 | 7.0 | |
| OSC BUFF output voltage | $V_{OSC\ BUFF\ AM}$ | No signal | 310 | 370 | – | mV |

| Parameter | Symbol | Condition | Rating | | | Unit |
|---|---|---|---|---|---|---|
| | | | min | typ | max | |
| Wideband-AGC sensitivity | W-AGC$_{SEN}$ | $f_{AM\ ANT}$ = 1.4 MHz, $V_{57}$ = 0.7 V | 93 | 99 | 105 | dBμ |
| SD antenna input level sensitivity | SD$_{SEN\ AM}$ | IF count output is ON. | 23 | 30 | 37 | dBμ |
| | | SD is ON. | 23 | 30 | 37 | |
| Tweet reduction circuit antenna input level sensitivity | Tweet$_{SEN}$ | $N_6$ = 0 V, AGC ON input | 50 | 56 | 62 | dBμ |
| IF BUFF output voltage | $V_{IF\ BUFF\ AM}$ | $V_{AM\ ANT}$ = 74 dBμ, unmodulated | 200 | 260 | – | mV |

## Measurement Circuit



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