



**AM Tuner for Car Radio**

**Overview**

The LA1130 is an IC developed for AM tuner systems in car radio applications. It provides low-level local oscillation so that it can be applied in varactor diode tuning applications as well as  $\mu$  tuning applications.

**Functions**

- RF amplification
- MIX
- OSC (with ALC)
- IF amplification
- Detection
- AGC (normal)
- RF wide-band AGC
- Others

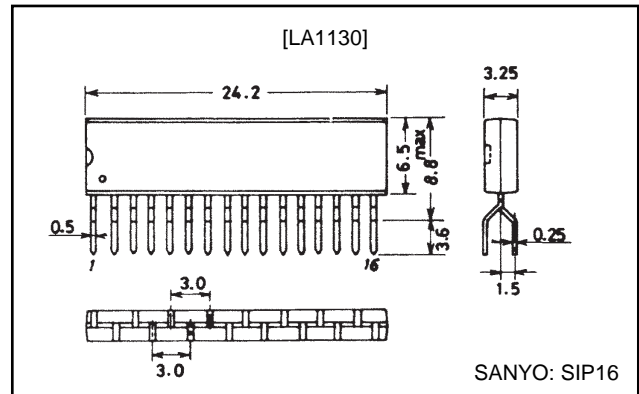
**Features**

- Good space factor due to single-end package.
- Easy to design printed circuit pattern due to 3mm-pitch pin interval.
- Double-balanced type MIX : Improvement in IF interference, spurious interference.
- Normal AGC : Less variation in detector output to input.
- RF wide-band AGC : Improvement in cross modulation distortion, especially strong input characteristics in varactor diode tuning applications because of low operating level (300mVrms).
- AGC drive output for FET : Possible to apply AGC to FET at input stage in varactor diode tuning applications.
- ALC at OSC stage : Improvement in tracking error due to stabilized low-level (350mVrms) oscillation output in varactor diode tuning applications.
- Reference voltage output : Possible to use 5.6V reference voltage for other bias (FET, etc.).
- VCC variation compensation : Less variation in gain, distortion, etc. (7.5 to 16V)
- Less ripple voltage : Less modulation of carrier by supply voltage ripple.
- Low pop noise : Possible to reduce pop noise at the time of VCC-on, mode-on by selecting AGC time constant.

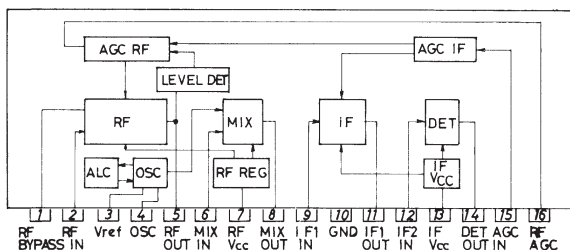
**Package Dimensions**

unit: mm

**3020A-SIP16**



**Equivalent Circuit Block Diagram**



# LA1130

## Specifications

**Maximum Ratings** at Ta=25°C, See specified Test Circuit.

| Parameter                   | Symbol              | Conditions                               | Ratings     | Unit |
|-----------------------------|---------------------|--|-------------|------|
| Maximum supply voltage      | V <sub>CC</sub> max | Pins 7, 13                               | 16          | V    |
| Maximum output voltage      | V <sub>O5</sub>     | Pin 5                                    | 17          | V    |
|                             | V <sub>O8, 11</sub> | Pins 8, 11                               | 24          | V    |
| Maximum input voltage       | V <sub>IN</sub> max | Pin 2                                    | 5.6         | V    |
| Maximum supply current      | I <sub>CC</sub> max | Total of current at pins 5, 7, 8, 11, 13 | 35          | mA   |
| Maximum flow-out current    | I <sub>3</sub>      | Pin 3                                    | 6           | mA   |
| Allowable power dissipation | P <sub>d</sub> max  | Ta≤45°C                                  | 520         | mW   |
| Operating temperature       | T <sub>opr</sub>    |  | -20 to +70  | °C   |
| Storage temperature         | T <sub>stg</sub>    |  | -40 to +125 | °C   |

**Recommended Operating Condition** at Ta=25°C

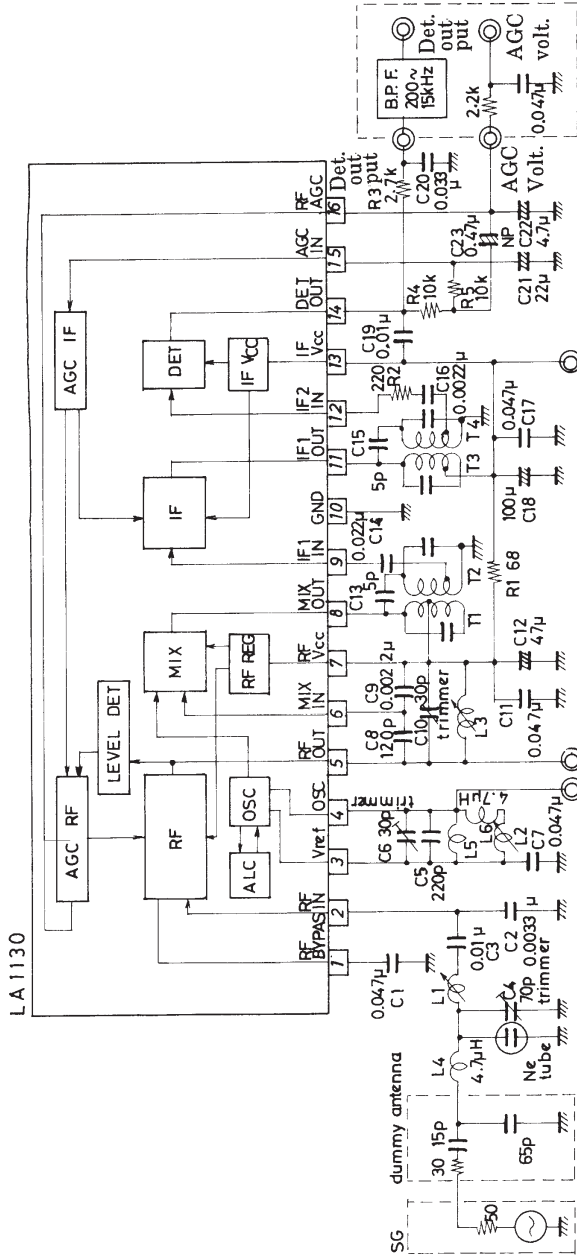
| Parameter                  | Symbol          | Conditions | Ratings     | Unit |
|----------------------------|-----------------|------------|-------------|------|
| Recommended supply voltage | V <sub>CC</sub> |            | 7.5 to 14.0 | V    |

**Operating Characteristics** at Ta=25°C, V<sub>CC</sub>=8V, f<sub>r</sub>=1MHz, f<sub>m</sub>=400Hz, See specified Test Circuit.

| Parameter                         | Symbol                | Conditions   | Ratings |       |       | Unit  |
|-----------------------------------|-----------------------|--|---------|-------|-------|-------|
|                                   |                       |  | min     | typ   | max   |       |
| Current drain                     | I <sub>CC1</sub>      | Quiescent  | 12.5    | 18.0  | 24.5  | mA    |
|                                   | I <sub>CC2</sub>      | 120dBμ input   | 14.0    | 20.0  | 26.5  | mA    |
| Detection output                  | V <sub>O1</sub>       | 24dBμ input, 30% mod.  | -31.0   | -26.5 | -12.0 | dBm   |
|                                   | V <sub>O2</sub>       | 74dBμ input, 30% mod.  | -18.0   | -15.5 | -12.0 | dBm   |
| Signal to noise ratio             | S/N 1                 | 24dBμ input, 30% mod.  | 16      | 20    |       | dB    |
|                                   | S/N 2                 | 74dBμ input, 30% mod.  | 46      | 50    |       | dB    |
| Total harmonic distortion         | THD1                  | 74dBμ input, 30% mod.  |         | 0.35  | 1.0   | %     |
|                                   | THD2                  | 74dBμ input, 80% mod.  |         | 0.35  | 1.5   | %     |
|                                   | THD3                  | 120dBμ input, 30% mod.   |         | 0.35  | 2.0   | %     |
| RF AGC voltage (V <sub>16</sub> ) | V <sub>RFAGC1</sub>   | Quiescent  | 5.2     | 5.6   | 5.9   | V     |
| [Reference characteristics]       |                       |  |         |       |       |       |
| Signal to noise ratio             | S/N 3                 | 35dBμ input, 30% mod.  |         | 31    |       | dB    |
| Total harmonic distortion         | THD4                  | 128dBμ input, 80% mod.   |         | 0.58  |       | %     |
| Detection output variation        | ΔV <sub>O</sub>       | V <sub>O</sub> (128dBμ)/V <sub>O</sub> (74dBμ)                       |         | 0.4   |       | dB    |
| Bandwidth (6dB)                   | BW <sub>6</sub>       | 6dB width, 15dBμ input 30% mod.                                      |         | 7     |       | kHz   |
|                                   | BW <sub>60</sub>      | 60dB width, 15dBμ input 30% mod.                                     |         | 30    |       | kHz   |
| Selectivity (1 signal)            | ACA                   | ±10kHz detuning, 15dBμ input, 30% mod.                               |         | 40    |       | dB    |
| Ripple rejection ratio            |                       | 100dBμ input, IF V <sub>CC</sub> (pin 13) ripple level 50Hz to 15dBm |         | 40.5  |       | dB    |
| Local oscillation voltage         | V <sub>osc</sub>      |  |         | 350   |       | mVrms |
| Local osc drift                   | ΔV <sub>osc</sub>     | V <sub>oscL</sub> (515kHz) to V <sub>oscH</sub> (1660kHz)            |         | 20    |       | mVrms |
| Whistle                           | 2f <sub>i</sub> Tweet | 74dBμ input, 400Hz beat max.   |         | -33   |       | dB    |
| RF AGC voltage (V <sub>16</sub> ) | V <sub>RFAGC2</sub>   | 120dBμ input   |         | 1     |       | V     |
| RF output voltage                 | V <sub>ORF</sub>      | 100dBμ input, ±10kHz   |         | 300   |       | mVrms |
| IF interference                   |                       | f <sub>r</sub> =600kHz, 15dBμ input                                  |         | 91.5  |       | dB    |
| Image frequency interference      |                       | f <sub>r</sub> =1400kHz, 15dBμ input                                 |         | 70.5  |       | dB    |

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**Sample Application Circuit** (excluding the area bounded by the dotted line) / also used as characteristics test circuit.



※ Adjust trimmer when testing  $V_{CC}=8V$

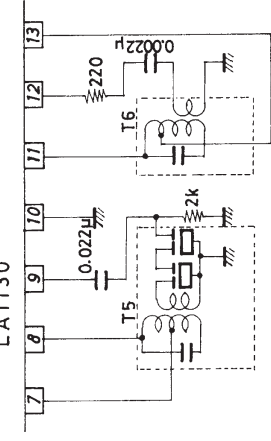
※ RF output

※ OSC output

Unit (resistance :  $\Omega$ , capacitance : F)

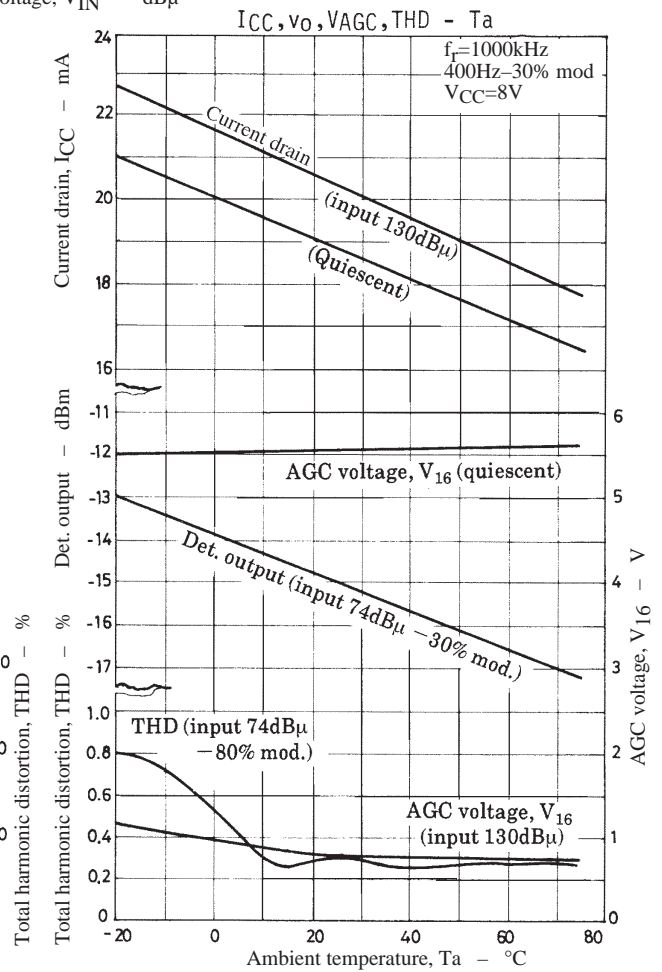
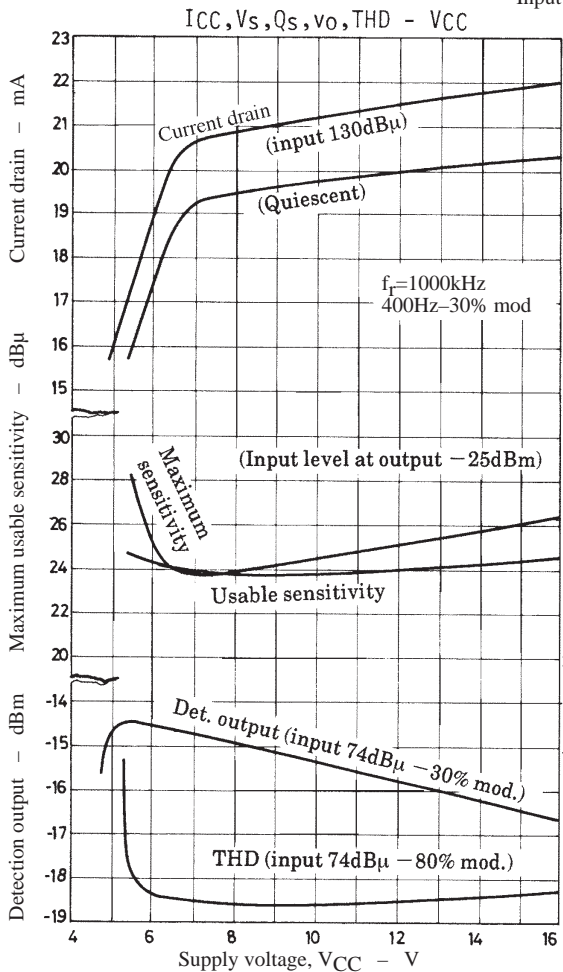
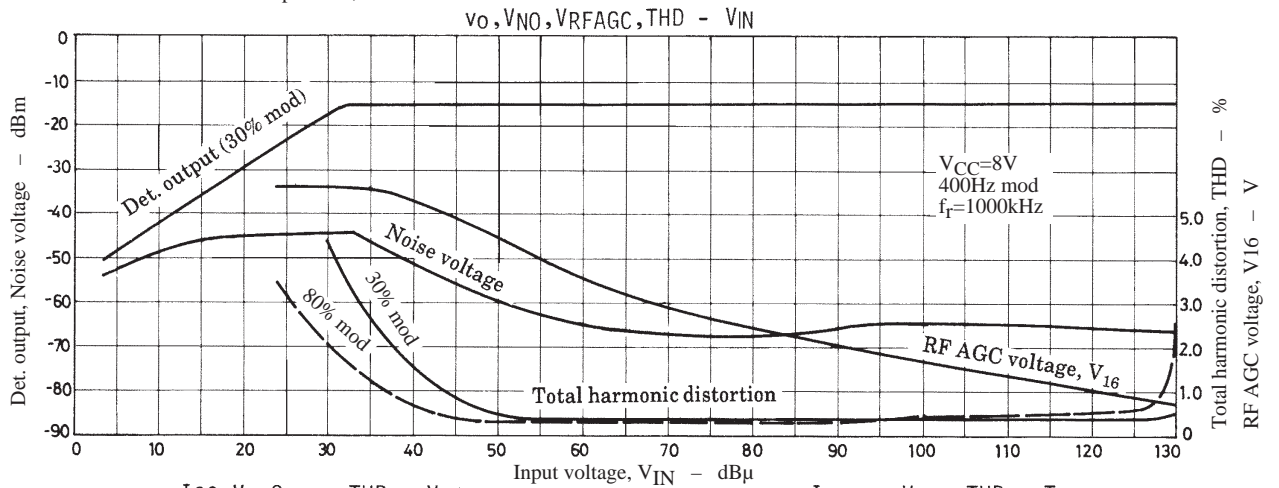
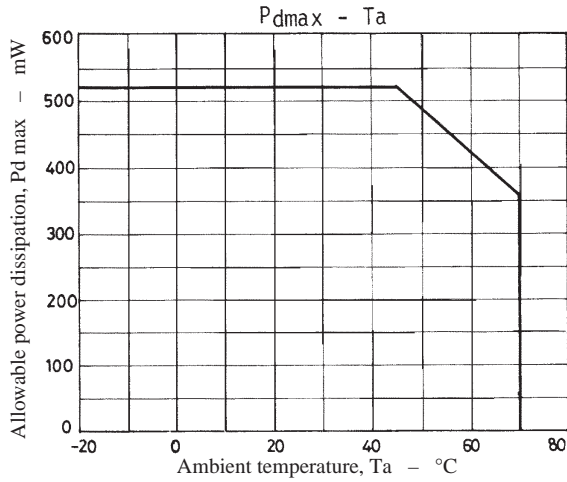
☆ Application where ceramic filter is used between IF stages

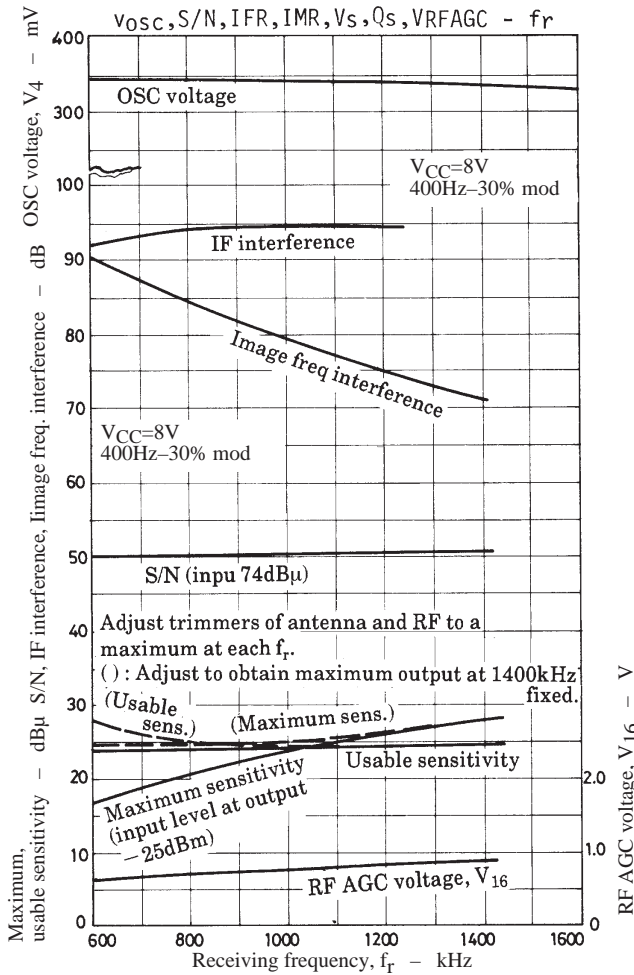
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| Coil Specification |                       |
|--------------------|-----------------------|
|                    |                       |
| L1                 | SUMIDA TOKO MITSUMI   |
| L2                 |                       |
| L3                 | CMU ZT-01             |
| L5                 | 51N-190-154 7BR 5721Z |
| T1                 | 58H-190-036 7MC 5723Y |
| T2                 | 49H-190-036 7MC5722BY |
| T3                 | 58H-190-037 7MC 5725Y |
| T4                 | 58H-190-035 7MC 5724Y |
| T5                 | CFMA-003              |
| T6                 | 7MC-5919N             |

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