

查询"NJM2241M"供应商

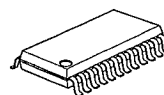
## AM/FM RADIO

## ■ GENERAL DESCRIPTION

The NJM2241 is monolithic integrated circuit in a 24-lead small outline package designed for use in 3-6V portable AM/FM radio receivers.

The functions incorporated are AM RF amplifier, AM mixer, FM/AM IF amplifier, FM/AM detector, FM/AM detector, FM/AM tuning/indicator, AM AGC circuit, Audio Power amplifier.

## ■ PACKAGE OUTLINE

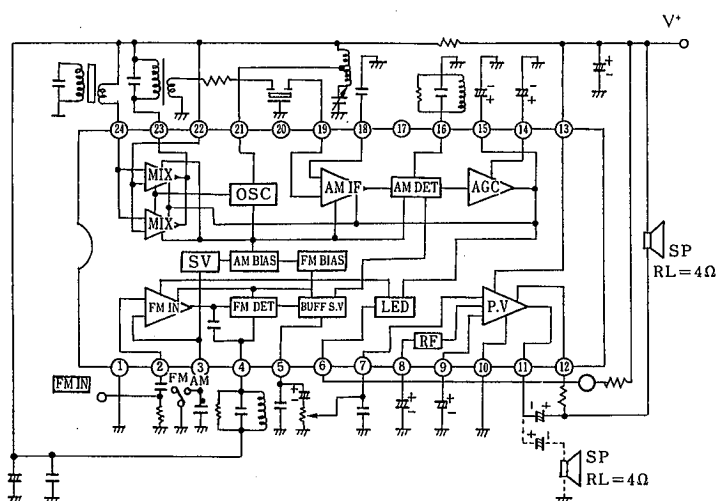


NJM 2241M

## ■ FEATURES

- Wide Operating Voltage (1.8~6.0V)
- Tuning Indicator LED direct drive (10mA Max.)
- Very Simple DC switching of FM/AM
- High AM signal handling
- 4Ω speaker direct drive
- Low tweeter
- Most suitable to use with NJM2236
- Package Outline DMP24
- Bipolar Technology

## ■ BLOCK DIAGRAM



(note) Dotted line shows  $V_{cc}=4.5V$

[查询"NJM2241M"供应商](#)

■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

| PARAMETER                   | SYMBOL                 | RATINGS  | UNIT |
|-----------------------------|------------------------|----------|------|
| Supply Voltage              | V <sup>+</sup>         | 8        | V    |
| Lamp Current                | I <sub>Lamp(Max)</sub> | 10       | mA   |
| Output Current              | I <sub>O(peak)</sub>   | 550      | mA   |
| Power Dissipation           | P <sub>D</sub>         | 700      | mW   |
| Operating Temperature Range | T <sub>opr</sub>       | -20~+75  | °C   |
| Storage Temperature Range   | T <sub>stg</sub>       | -40~+125 | °C   |

■ ELECTRICAL CHARACTERISTICS

(V<sup>+</sup>=3V, Ta=25°C, FM: f=10.7MHz, Δf=22.5kHz dev., fm=1kHz

AM: f=1MHz, Mod=30%, fm=1kHz Unless otherwise noted)

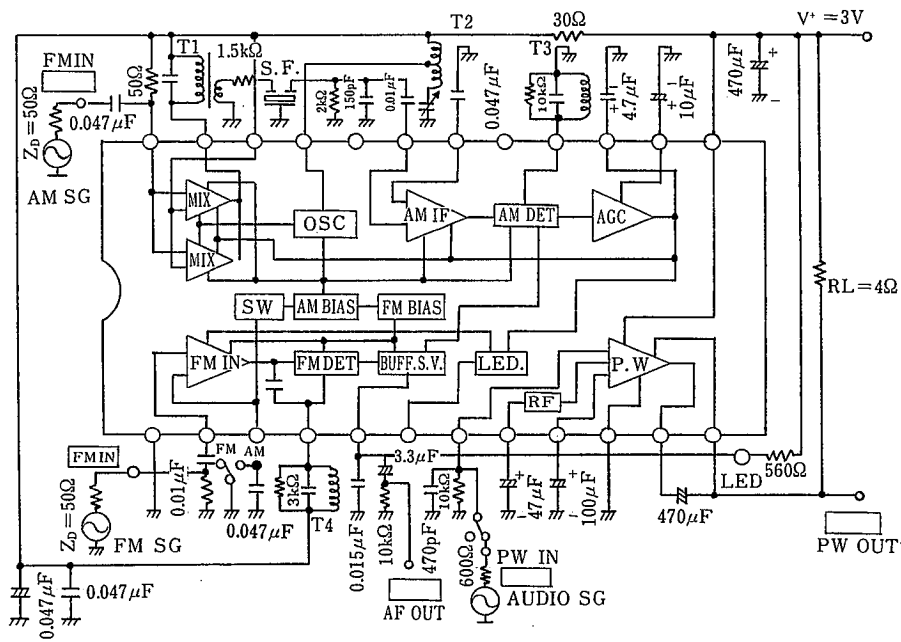
| CHARACTERISTICS   | SYMBOLS                   | TEST CONDITIONS                                           | MIN. | TYP. | MAX. | UNIT  |
|-------------------|---------------------------|-----------------------------------------------------------|------|------|------|-------|
| Operating Current | I <sub>CC</sub> (FM)      | V <sub>IN</sub> =0                                        | —    | 15   | 20   | mA    |
|                   | I <sub>CC</sub> (AM)      | V <sub>IN</sub> =0                                        | —    | 15   | 20   |       |
| F<br>M            | -3dB Limiting Sensitivity | V <sub>IN</sub> (lim)                                     | —    | 36   | 42   | dBμ   |
|                   | Detection Output Voltage  | V <sub>OD</sub>                                           | 22   | 31   | 44   | mVrms |
|                   | Signal to Noise Ratio     | S/N                                                       | —    | 70   | —    | dB    |
|                   | Total Harmonic Distortion | THD                                                       | —    | 0.3  | —    | %     |
|                   | Am Rejection              | AMR                                                       | —    | 33   | —    | dB    |
|                   | Lamp Lighting Sensitivity | V <sub>L</sub>                                            | —    | 47   | 55   | dBμ   |
| A<br>M            | Voltage Gain              | G <sub>V</sub>                                            | 5    | 11   | 17   | mVrms |
|                   | Detection Output Voltage  | V <sub>OD</sub>                                           | 22   | 31   | 44   | mVrms |
|                   | Signal to Noise Ratio     | S/N                                                       | —    | 46   | —    | dB    |
|                   | Total Harmonic Distortion | THD1                                                      | —    | 1.5  | —    | %     |
|                   |                           | THD2                                                      | —    | 4.0  | —    |       |
|                   | Local OSC Stop Voltage    | V <sub>stop</sub>                                         | —    | 1.0  | 1.5  | V     |
| P<br>W            | Lamp Lighting Sensitivity | V <sub>L</sub>                                            | —    | 30   | —    | dBμ   |
|                   | Voltage Gain              | G <sub>V</sub>                                            | 37   | 40   | 43   | dB    |
|                   | Output Power              | P <sub>OD1</sub>                                          | 180  | 220  | —    | mW    |
|                   |                           | P <sub>OD2</sub>                                          | —    | 500  | —    |       |
|                   | Total Harmonic Distortion | THD                                                       | —    | 0.5  | 2.0  | %     |
| W                 | Output Noise Voltage      | R <sub>O</sub> =10kΩ, R <sub>L</sub> =4Ω<br>BW=30Hz~20kHz | —    | 0.18 | —    | mVrms |
|                   |                           |                                                           | —    | 0.18 | —    |       |

查询"NJM2241M"供应商

■ TERMINAL VOLTAGE AT NO SIGNAL (V+=3V, Ta=25℃)

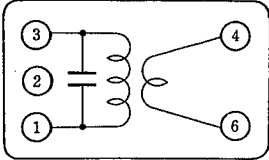
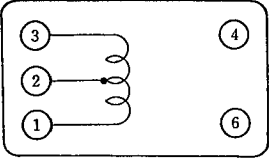
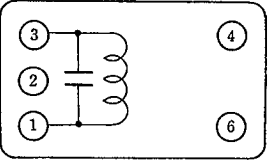
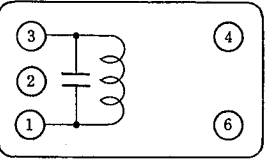
| CHARACTERISTICS |              | SYMBOLS         | TYPICAL VALUES |       | UNIT |
|-----------------|--------------|-----------------|----------------|-------|------|
| PIN NO          | FUNCTION     |                 | AT AM          | AT FM |      |
| 1               | GND          | V <sub>1</sub>  | 0              | 0     | V    |
| 2               | FM IF IN     | V <sub>2</sub>  | 2.4            | 2.0   | V    |
| 3               | FM/AM Switch | V <sub>3</sub>  | 0              | 2.0   | V    |
| 4               | FM DET       | V <sub>4</sub>  | 2.9            | 2.9   | V    |
| 5               | DET OUT      | V <sub>5</sub>  | 0.4            | 0.7   | V    |
| 6               | LED DRIVER   | V <sub>6</sub>  | —              | —     | V    |
| 7               | PW IN        | V <sub>7</sub>  | 0              | 0     | V    |
| 8               | PW REF       | V <sub>8</sub>  | 1.35           | 1.35  | V    |
| 9               | PW Bypass    | V <sub>9</sub>  | 0.6            | 0.6   | V    |
| 10              | PW GND       | V <sub>10</sub> | 0              | 0     | V    |
| 11              | PW OUT       | V <sub>11</sub> | 1.5            | 1.5   | V    |
| 12              | PW Bootstrap | V <sub>12</sub> | 2.8            | 2.8   | V    |
| 13              | V+ 1         | V <sub>13</sub> | 3.0            | 3.0   | V    |
| 14              | AGC1         | V <sub>14</sub> | 0.6            | 0     | V    |
| 15              | AGC2         | V <sub>15</sub> | 0.6            | 0     | V    |
| 16              | AM DET       | V <sub>16</sub> | 0              | 0     | V    |
| 17              | Not Use      | —               | —              | —     | —    |
| 18              | AM Bypass    | V <sub>18</sub> | 1.3            | 0     | V    |
| 19              | AM IF IN     | V <sub>19</sub> | 1.3            | 0     | V    |
| 20              | Not Use      | —               | —              | —     | —    |
| 21              | AM Osc       | V <sub>21</sub> | 2.9            | 2.9   | V    |
| 22              | V+ 2         | V <sub>22</sub> | 2.9            | 2.9   | V    |
| 23              | AM MIX OUT   | V <sub>23</sub> | 2.9            | 2.9   | V    |
| 24              | AM RF IN     | V <sub>24</sub> | 2.9            | 2.9   | V    |

■ TEST CIRCUIT



[查询"NJM2241M"供应商](#)

■ TEST CIRCUIT COIL DATA

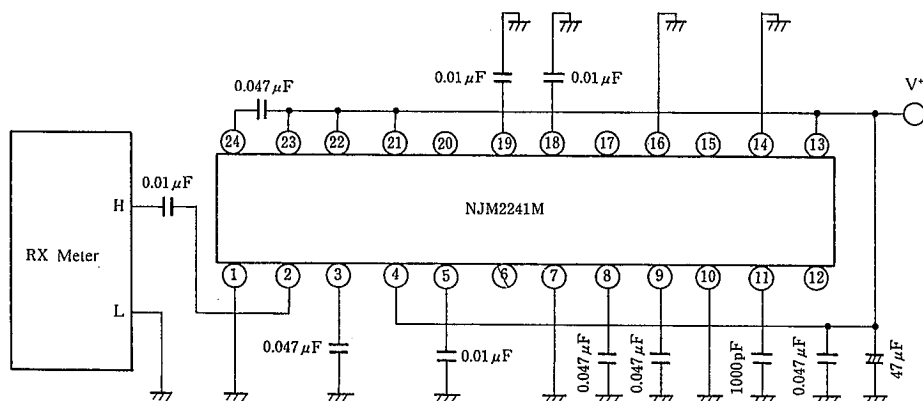
| COIL NO.                             | F <sub>0</sub> | Q <sub>0</sub> | TURNS                                                                  | C <sub>0</sub> |                                                                                                         |
|--------------------------------------|----------------|----------------|------------------------------------------------------------------------|----------------|---------------------------------------------------------------------------------------------------------|
| T <sub>1</sub> : AM IFT<br>(MIX OUT) | 455kHz         | ①-③<br>80      | ①-③ 60 T<br>④-⑥ 16 T<br>Wire : 0.09mmφ UEW<br>SUMIDA<br>2150-2173-302  | ①-③<br>1500pF  |  <p>Bottom View</p>   |
| T <sub>2</sub> : AM OSC              | 796kHz         | ①-③<br>125     | ①-② 15 T<br>②-③ 89 T<br>Wire : 0.06mmφ UEW<br>SUMIDA<br>2157-2239-213A | —              |  <p>Bottom View</p>   |
| T <sub>3</sub> : AM DET              | 455kHz         | ①-③<br>105     | ①-③ 127 T<br>Wire : 0.06mmφ UEW<br>SUMIDA<br>2150-2083-061             | ①-③<br>330pF   |  <p>Bottom View</p>  |
| T <sub>4</sub> : FM DET              | 10.7MHz        | ①-③<br>100     | ①-③ 10 T<br>Wire : 0.12mmφ UEW<br>SUMIDA<br>2153-4095-331              | ①-③<br>150pF   |  <p>Bottom View</p> |

## 查询"NJM2241M"供应商

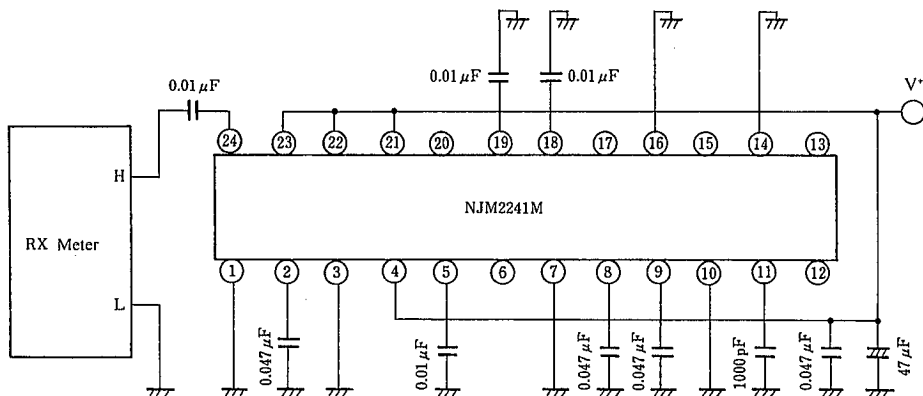
## ■ INPUT OUTPUT IMPEDANCE

| CHARACTERISTICS                 | SYMBOLS        | CIRCUITS | TEST CONDITIONS | TYP.       | UNIT     |
|---------------------------------|----------------|----------|-----------------|------------|----------|
| Pin 2 Input Impedance<br>(FM)   | RIN2<br>CIN2   | 1        | f=10.7MHz       | 4.6<br>5.0 | kΩ<br>pF |
| Pin 24 Input Impedance<br>(AM)  | RIN24<br>CIN24 | 2        | f=1kHz          | 20<br>11   | kΩ<br>pF |
| Pin 19 Input Impedance<br>(AM)  | RIN19<br>CIN19 | 3        | f=455kHz        | 6<br>3.7   | kΩ<br>pF |
| Pin 23 Output Impedance<br>(AM) | RO23<br>CO23   | 4        | f=455kHz        | 2.5<br>5.5 | kΩ<br>pF |
| Pin 16 Output Impedance<br>(AM) | RO16<br>CO16   | 5        | f=455kHz        | 100<br>5.0 | kΩ<br>pF |

■ **TEST CIRCUIT 1** (Pin 2 FM Input Resistance, Capacitance)

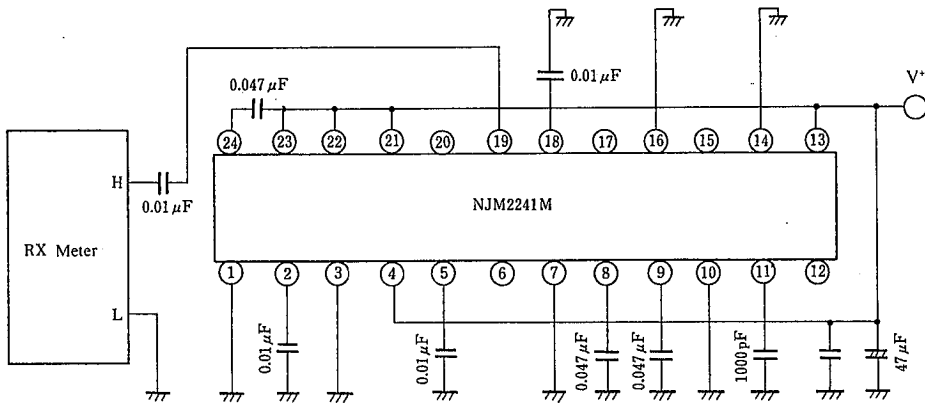


### ■ TEST CIRCUIT 2 (Pin 24 AM Input Resistance, Capacitance)

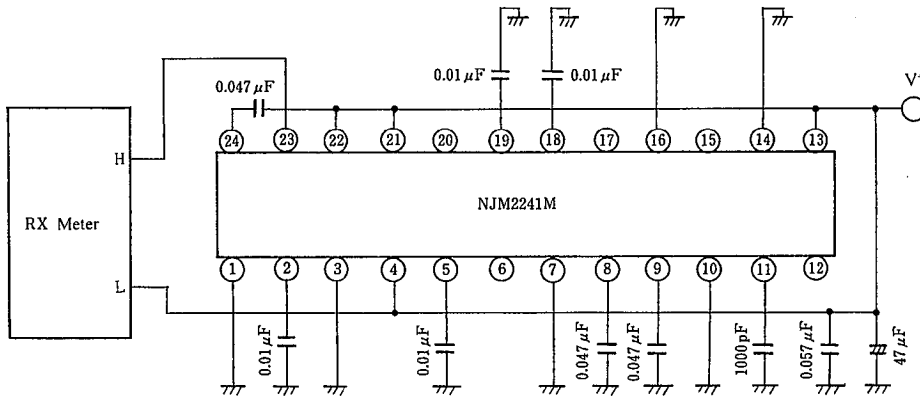


[查询"NJM2241M"供应商](#)

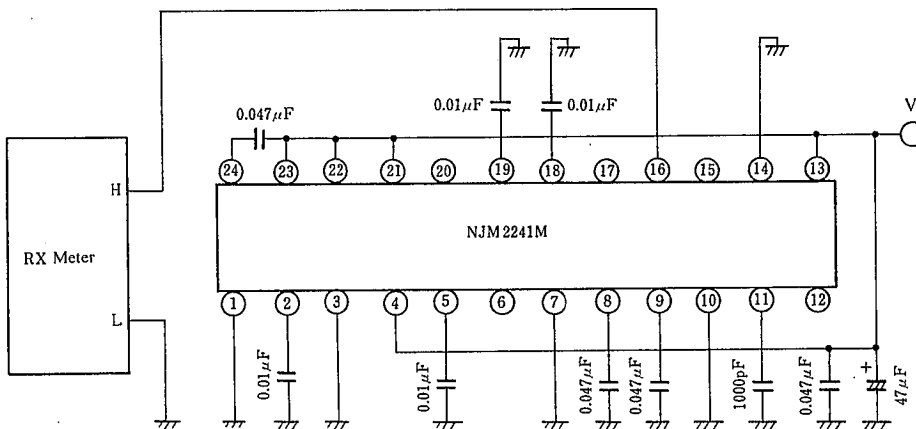
■ TEST CIRCUIT 3 (Pin 19 AM IF Input Resistance, Capacitance)



■ TEST CIRCUIT 4 (Pin 23 AM Mix Output Resistance, Capacitance)



■ TEST CIRCUIT 5 (Pin 16 AM DET Output Resistance, Capacitance)



## ■ NOTES

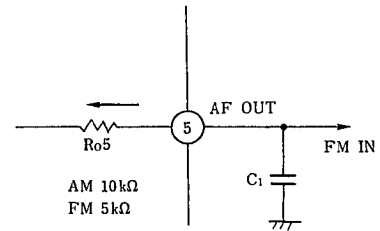
### 1. The frequency characteristics AM and FM mode

The output impedance of pin5 (Ro5) and external capacitor C1 decide frequency characteristics.

The value of Ro5 turns to 10kΩ at AM mode and 5kΩ at FM mode.

Accordingly should consider above, trim C1 to get proper frequency response.

Besides should design the location of C1 closer to pin1 (GND) to get low tweet.



### 2. Loading speaker

Recommend to connect the speaker between pin11 (Vcc) and pin10 (bootstrap) at  $V_s = 3V$  for better low supply to voltage operation. When Vcc is above 4.5V, recommend the speaker connection between pin9 (PW OUT) and (GND) through a coupling capacitor.

### 3. Termination to the power stage

The audio signal of output pin5 includes carrier component slightly, therefore a capacitor between pin5 and GND have to be connected to decrease carrier component.

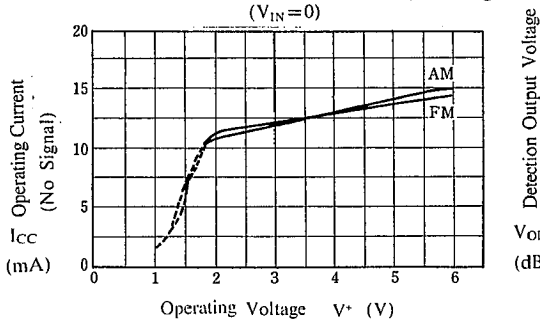
### 4. Supply voltage start-up

The supply voltage of radio circuit block should not start up before power stage start-up.

查询"NJM2241M"供应商

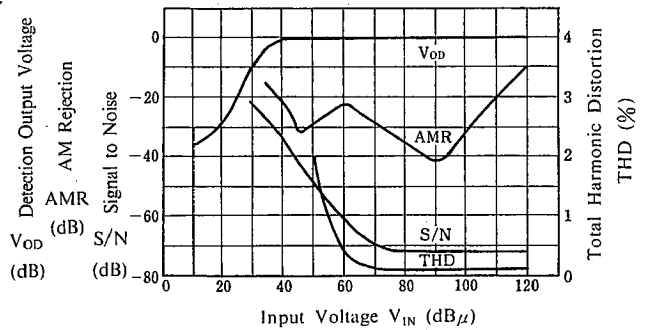
■ TYPICAL CHARACTERISTICS

Operating Current vs. Operating Voltage



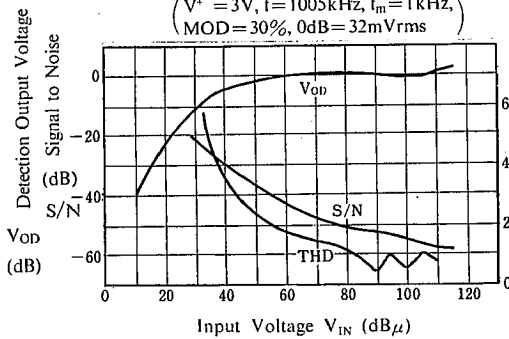
$V_{OD}$ , AMR, S/N, THD vs. Input Voltage

( $V^+ = 3V$ ,  $f = 10.7MHz$ ,  $f_m = 1kHz$ ,  $\Delta f = 22.5kHz$  dev.,  $0dB = 34.5mVrms$ )



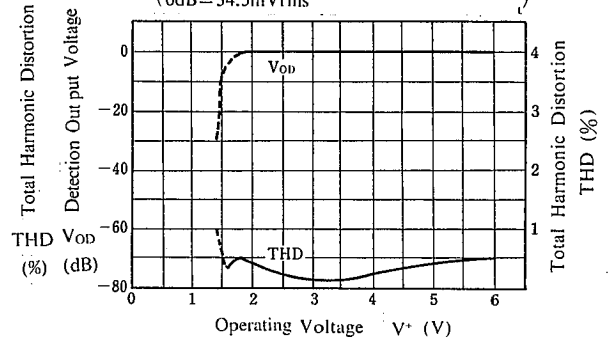
$V_{OD}$ , S/N, THD vs. Input Voltage

( $V^+ = 3V$ ,  $f = 1005kHz$ ,  $f_m = 1kHz$ ,  $MOD = 30\%$ ,  $0dB = 32mVrms$ )



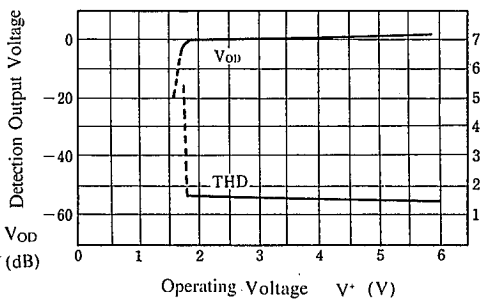
$V_{OD}$ , THD vs. Operating Voltage

( $f = 10.7MHz$ ,  $f_m = 1kHz$ ,  $\Delta f = 22.5kHz$  dev.,  $0dB = 34.5mVrms$ )



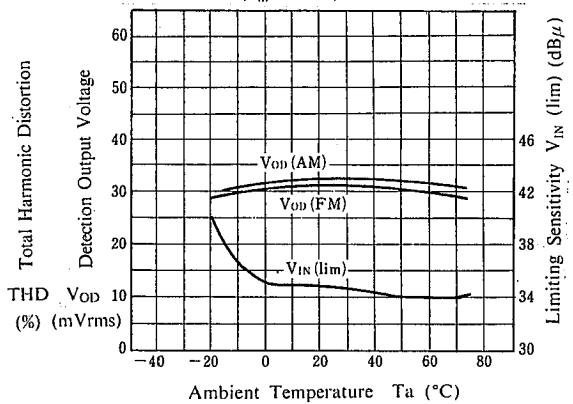
$V_{OD}$ , THD vs. Operating Voltage

( $f = 1005kHz$ ,  $f_m = 1kHz$ ,  $MOD = 30\%$ ,  $0dB = 32mVrms$ )



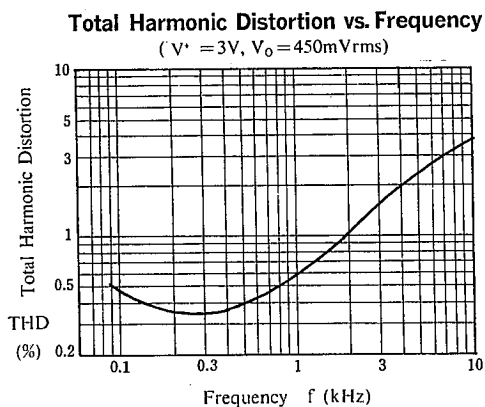
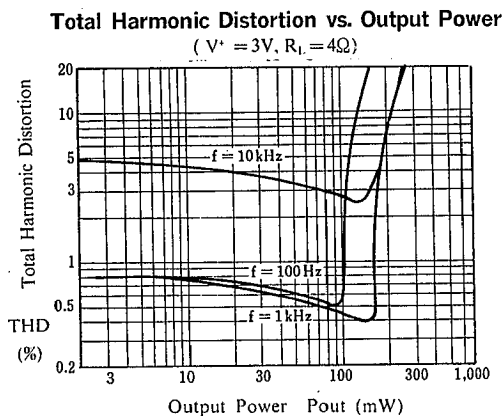
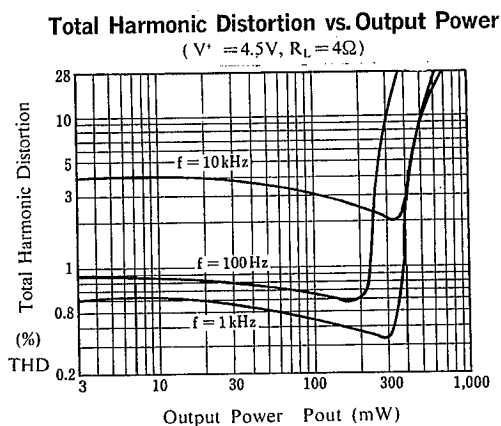
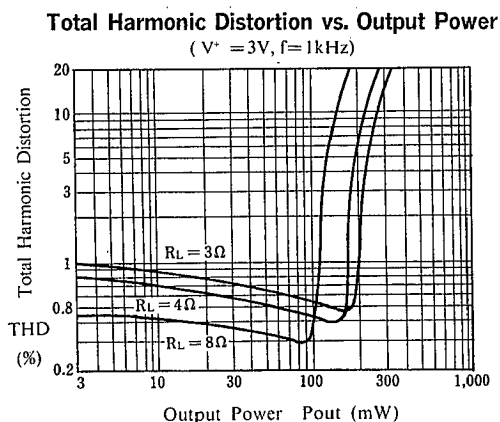
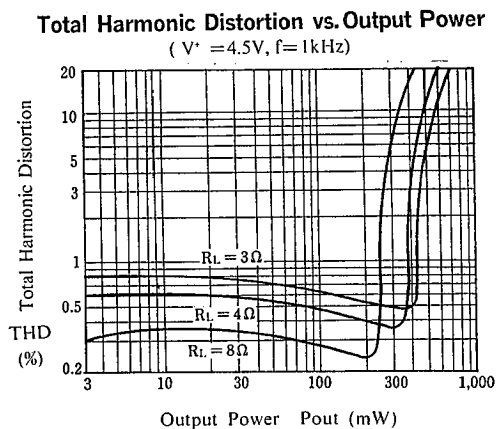
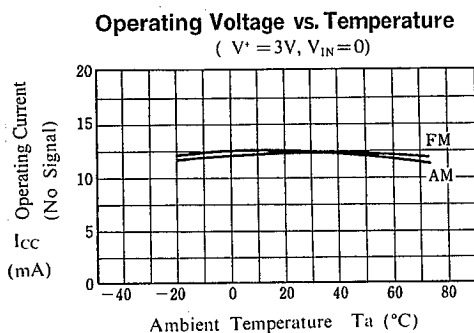
$V_{OD}$ ,  $V_{IN}(lim)$  vs. Temperature

( $V^+ = 3V$ , AM:  $f = 1005kHz$ ,  $f_m = 1kHz$ ,  $MOD = 30\%$ , FM:  $f = 10.7MHz$ ,  $f_m = 1kHz$ ,  $\Delta f = 22.5kHz$  dev.)



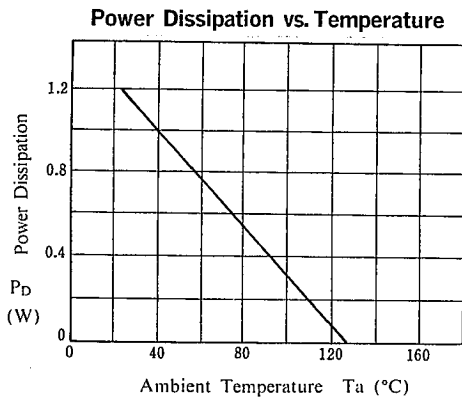
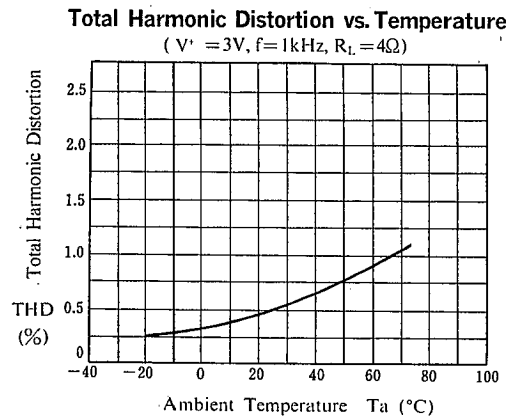
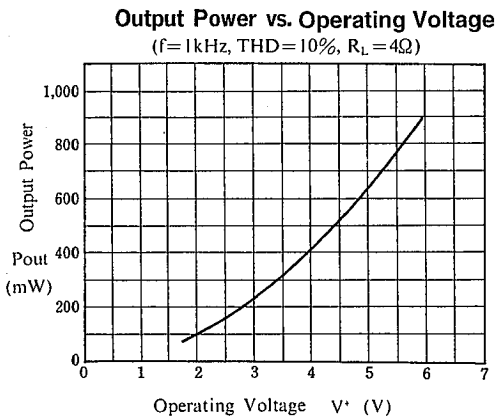
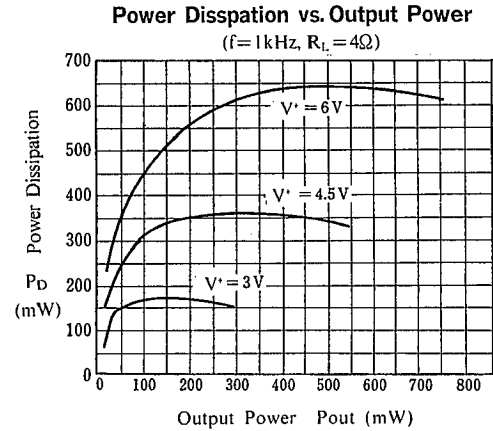
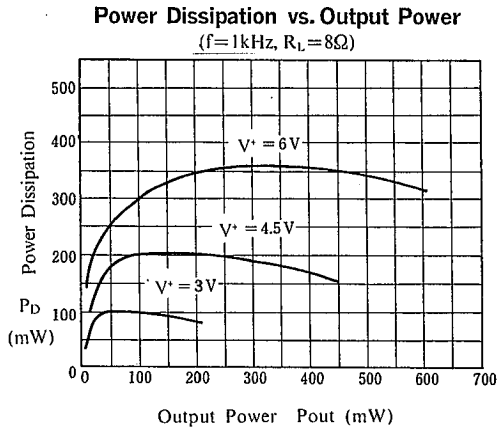


## ■ TYPICAL CHARACTERISTICS



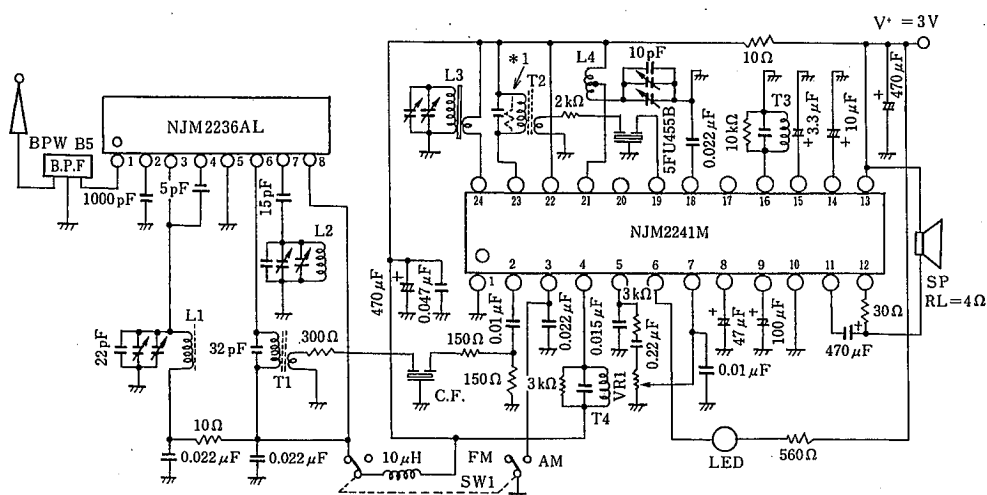
[查询"NJM2241M"供应商](#)

■ TYPICAL CHARACTERISTICS



## 查询"NJM2241M"供应商

### ■ FM/AM RADIO APPLICATION CIRCUIT

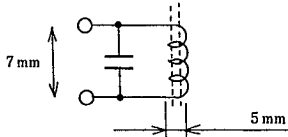
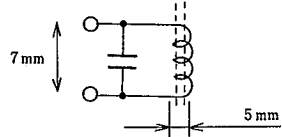
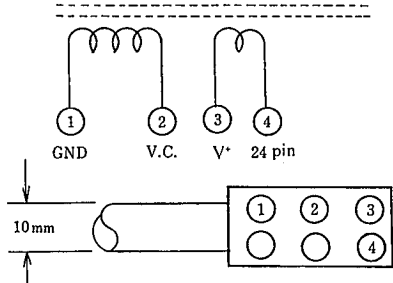
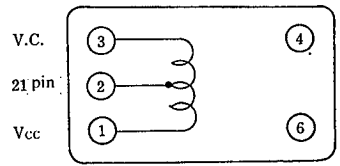


Resister should be located at \*!

if the Trans (T2) is high Q

[查询"NJM2241M"供应商](#)

■ FM/AM RADIO APPLICATION CIRCUIT

| COIL NO.                     | F <sub>0</sub> | Q <sub>0</sub> | TURNS                                                                                                   | C <sub>0</sub>  |                                                                                                         |
|------------------------------|----------------|----------------|---------------------------------------------------------------------------------------------------------|-----------------|---------------------------------------------------------------------------------------------------------|
| L <sub>1</sub> : RF Coil     | 100 MHz        | 100            | 0.7mmφ 2 $\frac{1}{4}$ T<br>SUMIDA<br>0295-057                                                          | 22 pF<br>(ext.) |  <p>Ferrite Core</p>  |
| L <sub>2</sub> : OSC<br>Coil | 100 MHz        | 100            | 0.7mmφ 2 $\frac{1}{2}$ T<br>SUMIDA<br>0295-056                                                          | 30 pF<br>(ext.) |  <p>Ferrite Core</p>  |
| L <sub>3</sub> : AM ANT      | 796 kHz        | ①-②<br>200     | ①-② 100 T<br>L=600 μH<br>③-④ 17 T<br>Wire : 4/0.07mm UATC<br>Core : 10mmφ × 80mm<br>MITUMI<br>YI-7160-1 | —               |  <p>BOTTOM VIEW</p>  |
| L <sub>4</sub> : AM OSC      | 796 kHz        | ①-③<br>125     | ①-② 15 T<br>②-③ 89 T<br>Wire : 0.06mmφ UEW<br>SUMIDA<br>2157-2239-213A                                  | —               |  <p>BOTTOM VIEW</p> |

## ■ FM/AM RADIO APPLICATION CIRCUIT

| COIL NO.                | F <sub>0</sub> | Q <sub>0</sub> | TURNS                                                                 | C <sub>0</sub> | BOTTOM VIEW |
|-------------------------|----------------|----------------|-----------------------------------------------------------------------|----------------|-------------|
| T <sub>1</sub> : FM IFT | 10.7MHz        | ①-③<br>90      | ①-③ 11 T<br>④-⑥ 2 T<br>Wire : 0.12mmφ UEW<br>SUMIDA<br>2153-414-041   | ①-③<br>82pF    |             |
| T <sub>2</sub> : AM IFT | 455kHz         | ①-③<br>80      | ①-③ 60 T<br>④-⑥ 16 T<br>Wire : 0.09mmφ UEW<br>SUMIDA<br>2150-2173-302 | ①-③<br>1500pF  |             |
| T <sub>3</sub> : AM DET | 455kHz         | ①-③<br>105     | ①-③ 127 T<br>Wire : 0.06mmφ UEW<br>SUMIDA<br>2150-2083-061            | ①-③<br>330pF   |             |
| T <sub>4</sub> : FM DET | 10.7MHz        | ①-③<br>100     | ①-③ 10 T<br>Wire : 0.12mmφ UEW<br>SUMIDA<br>2153-4095-331             | ①-③<br>150pF   |             |

# NJM2241

---

[查询"NJM2241M"供应商](#)

## MEMO

[CAUTION]  
The specifications on this databook are only given for information , without any guarantee as regards either mistakes or omissions. The application circuits in this databook are described only to show representative usages of the product and not intended for the guarantee or permission of any right including the industrial rights.