

## LOW VOLTAGE AUDIO POWER AMPLIFIER

### ■ GENERAL DESCRIPTION

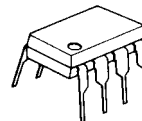
The NJM2135 is a Low voltage audio power amplifier for speaker drivers. No external coupling capacitors are required because of the differential output. The closed loop gain is adjusted by two external resistors. The low supply current in power down mode contributes to the reduction of power consumption of portable battery powered equipment, cellular phones, for example.

### ■ FEATURES

- Operating Voltage ( +2V~+16V )
- Low Operating Current in Power Down Mode ( 0.1 $\mu$ A typ. )
- Low Operating Current in Normal Operation Mode ( 2.7mA typ. )
- Output Power Exceeds 250mW (  $V^+=6V, R_L=32\Omega$  )
- Gain Range ( GVD=0~43dB, Voice Band )
- Load Impedance ( 8~200 $\Omega$  )
- Bipolar Technology
- Package Outline DIP8, DMP8, SIP8, SSOP8, VSP8

### ■ PIN CONFIGURATION

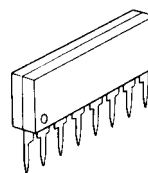
### ■ PACKAGE OUTLINE



NJM2135D



NJM2135M



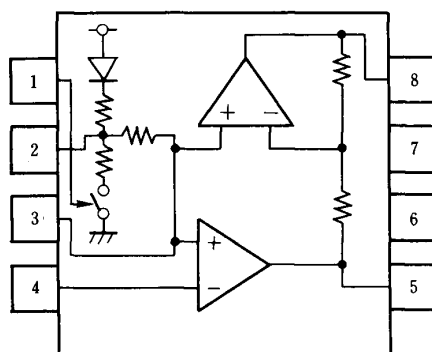
NJM2135L



NJM2135V



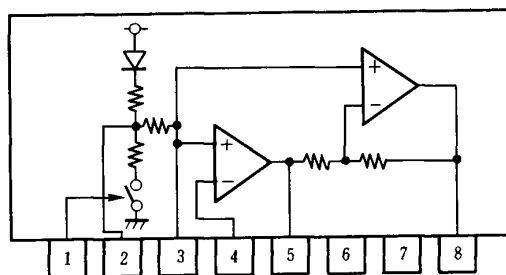
NJM2135R



NJM2135D  
NJM2135M  
NJM2135V  
NJM2135R

#### PIN FUNCTION

1. CD
2.  $V_{REF1}$
3.  $V_{REF2}$
4.  $-V_{IN}$
5.  $V_{OUT1}$
6.  $V^+$
7. GND
8.  $V_{OUT2}$



NJM2135L

# NJM2135

## ■ ABSOLUTE MAXIMUM RATINGS

( Ta=25°C )

| PARAMETER                   | SYMBOL                                     | RATINGS                                                                                           | UNIT   |
|-----------------------------|--------------------------------------------|---------------------------------------------------------------------------------------------------|--------|
| Supply Voltage              | $V^+$                                      | +18                                                                                               | V      |
| Output Peak Current         | $I_{OP}$                                   | ± 250                                                                                             | mA     |
| Maximum Input Voltage       | $V_{IN}$ ( 1-4pin )<br>$V_{IN}$ ( 5-8pin ) | -0.3, $V^+$ +0.3<br>-0.3, $V^+$ +0.3 ( In power down )                                            | V<br>V |
| Power Dissipation           | $P_D$                                      | ( DIP8 ) 500<br>( SIP8 ) 800<br>( DMP8 ) 500 ( note1 )<br>( SSOP8 ) 360 ( note1 )<br>( VSP8 ) 320 | mW     |
| Operating Temperature Range | $T_{opr}$                                  | -20~+75                                                                                           | °C     |
| Storage Temperature Range   | $T_{stg}$                                  | -40~+125                                                                                          | °C     |

( note1 ) Mounted on PC Board

## ■ ELECTRICAL CHARACTERISTICS

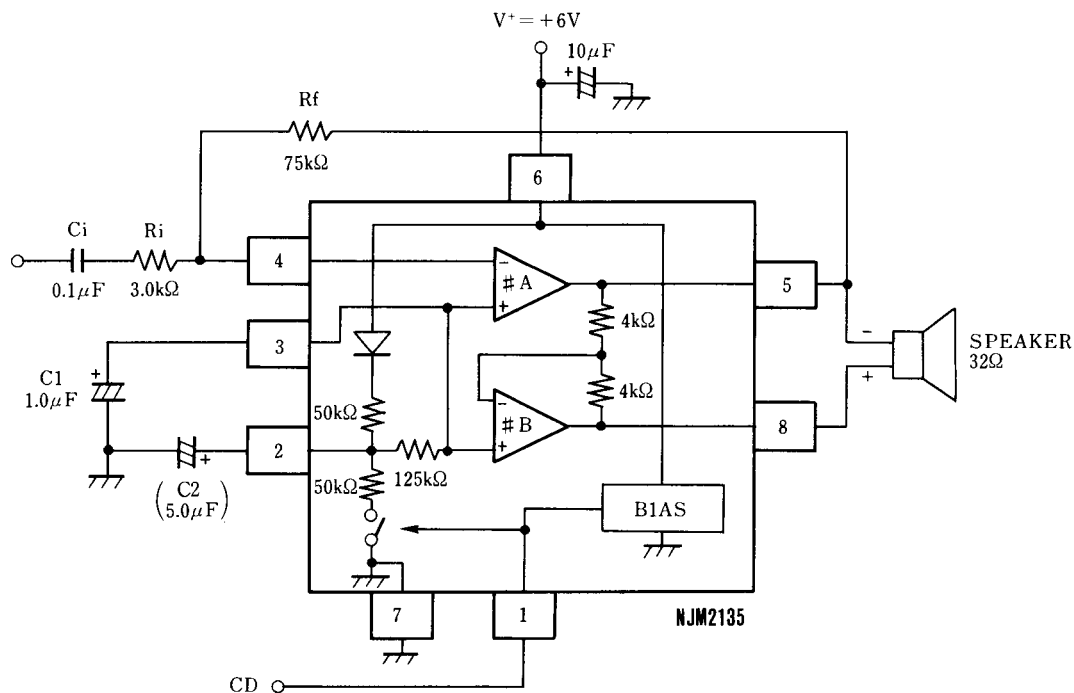
(  $V^+=6.0V$ ,  $T_a=25^\circ C$  unless otherwise specified )

| PARAMETER                                                       | SYMBOL                              | TEST CONDITIONS                                                                                                                                             | MIN.             | TYP.                 | MAX.              | UNIT                     |
|-----------------------------------------------------------------|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|----------------------|-------------------|--------------------------|
| Operating Current<br>( NO SIGNAL )<br>( At Power Down Mode )    | $I_{CC1}$<br>$I_{CC2}$<br>$I_{CCD}$ | $V^+=3.0V, R_L=\infty, 1pin=2.0V$<br>$V^+=16.0V, R_L=\infty, 1pin=2.0V$<br>$V^+=3.0V, R_L=\infty, 1pin=0.8V$                                                | -<br>-<br>-      | 2.7<br>3.4<br>0.1    | 4.0<br>5.0<br>1.0 | mA<br>mA<br>$\mu A$      |
| Open Loop Gain                                                  | $A_{v1}$                            | AMP#A, $f < 100Hz$                                                                                                                                          | 77               | 83                   | -                 | dB                       |
| Closed Loop Gain                                                | $A_{v2}$                            | AMP#B, $f=1kHz, R_L=32\Omega$                                                                                                                               | -0.35            | -                    | +0.35             | dB                       |
| Output Power<br>( note2 )                                       | $P_{O1}$<br>$P_{O2}$<br>$P_{O3}$    | $V^+=3.0V, R_L=16\Omega, THD \leq 10\%$<br>$V^+=6.0V, R_L=32\Omega, THD \leq 10\%$<br>$V^+=12.0V, R_L=100\Omega, THD \leq 10\%$ ( note3 )                   | 55<br>250<br>400 | -<br>-<br>-          | -<br>-<br>-       | mW<br>mW<br>mW           |
| Total Harmonic Distortion<br>( $f=1kHz$ )                       | THD1<br>THD2<br>THD3                | $V^+=6V, R_L=32\Omega, P_O=125mW, G_{VD}=34dB$<br>$V^+ \geq 3V, R_L=8\Omega, P_O=20mW, G_{VD}=12dB$<br>$V^+ \geq 12V, R_L=32\Omega, P_O=200mW, G_{VD}=34dB$ | -<br>-<br>-      | 0.5<br>0.5<br>0.6    | 1.0<br>-<br>-     | %<br>%<br>%              |
| Power Supply Rejection Ratio<br>( $V^+=6.0V, \Delta V^+=3.0V$ ) | PSRR1<br>PSRR2<br>PSRR3             | $C1=\infty, C2=0.01\mu F, DC$<br>$C1=0.1\mu F, C2=0, f=1kHz$<br>$C1=1.0\mu F, C2=5.0\mu F, f=1kHz$                                                          | 50<br>-<br>-     | -<br>12<br>52        | -<br>-<br>-       | dB<br>dB<br>dB           |
| Mute Attenuation                                                | MAT                                 | $f=1kHz \sim 20kHz, 1pin=2.0V$                                                                                                                              | -                | 70                   | -                 | dB                       |
| Output Voltage<br>( $R_f=75k\Omega, DC$ )                       | $V_{O1}$<br>$V_{O2}$<br>$V_{O3}$    | $V^+=3.0V, R_L=16\Omega$<br>$V^+=6.0V$<br>$V^+=12.0V$                                                                                                       | 1.00<br>-<br>-   | 1.15<br>2.55<br>5.45 | 1.25<br>-<br>-    | V<br>V<br>V              |
| Output High Level                                               | $V_{OH}$                            | $I_{OUT}=-75mA, V^+=2.0 \sim 16.0V$                                                                                                                         | -                | $V^+-1.1$            | -                 | V                        |
| Output Low Level                                                | $V_{OL}$                            | $I_{OUT}=75mA, V^+=2.0 \sim 16.0V$                                                                                                                          | -                | 0.21                 | -                 | V                        |
| Output DC Offset                                                | $\Delta V_O$                        | $R_f=75k\Omega, R_L=32\Omega, 5pin \sim 8pin$                                                                                                               | -30              | 0                    | +30               | mV                       |
| Input Bias Current                                              | $I_B$                               | 4pin                                                                                                                                                        | -                | -30                  | -200              | nA                       |
| Equivalent Resistance                                           | $R_{IN}$<br>$R_{REF}$               | 3pin<br>2pin                                                                                                                                                | 100<br>18        | 150<br>25            | 220<br>40         | k $\Omega$<br>k $\Omega$ |
| CD Input Voltage H                                              | $V_{CDH}$                           | 1pin                                                                                                                                                        | 2.0              | -                    | $V^+$             | V                        |
| CD Input Voltage L                                              | $V_{CDL}$                           | 1pin                                                                                                                                                        | 0.0              | -                    | 0.8               | V                        |
| CD Input Resistance                                             | $R_{CD}$                            | $V^+=V_{CD}=16.0V, 1pin$                                                                                                                                    | 50               | 90                   | 175               | k $\Omega$               |

( note2 ) NJM2135M, NJM2135V, NJM2135R : Mounted on PC Board

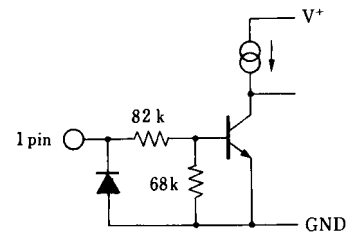
( note3 ) NJM2135V, NJM2135R is excluded

## ■ APPLICATION CIRCUIT



( note )

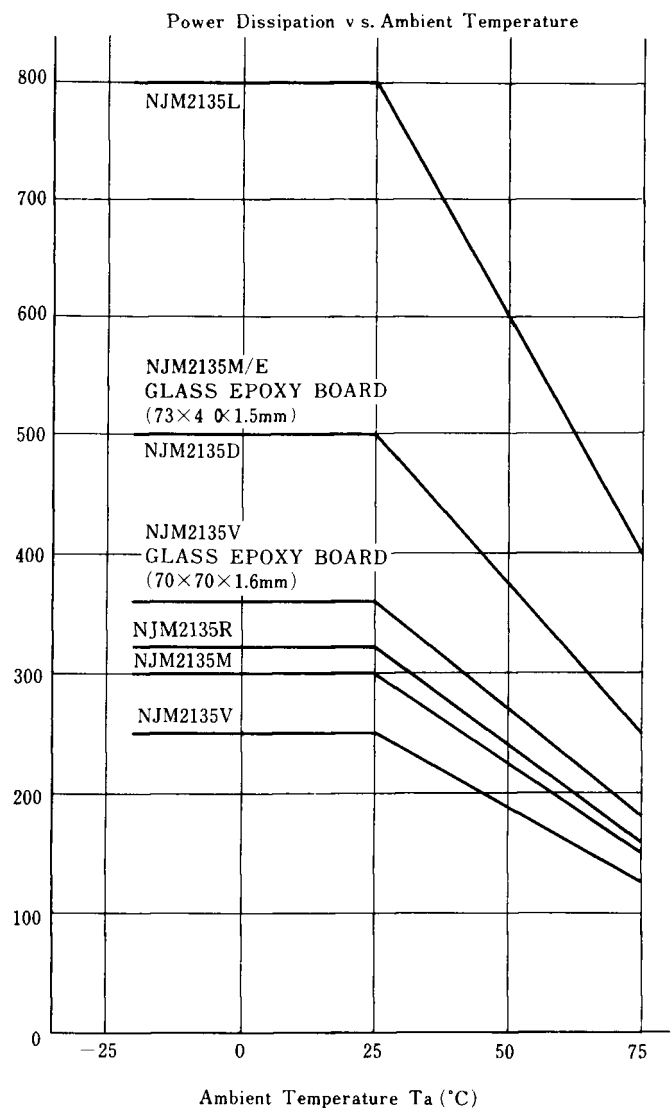
1. The NJM2135 is active mode during the CD terminal is High level ( >2.0V ) and it is stand-by mode during the CD terminal is Low level ( <0.8V ).
2. C1 and C2 improve power supply rejection ratio.  
In case of C1 is enough large, C2 is unnecessary.
3. Please note that the C1 and C2 make slow power rise up to the NJM2135 regardless the external power supply condition.
4. Input current flow on the internal resistor shown in the equivalent circuit of CD terminal.
5. No snubber resistor and capacitor are required normally. But the snubber resistor and capacitor are required if the NJM2135 oscillates by condition of PCB layout, stray capacitor and speaker wire length.
6. When the NJM2135 change the mode to active or stand-by the CD terminal ON/OFF, the actual operation takes some delay by the charge and discharge of C1, C2.
7. When the power turns on in stand-by mode, the NJM2135 operates during charging time of C1 and C2.
8. If the supply voltage fluctuate large during the stand-by mode, the mode of active and stand-by of NJM2135 becomes unstable.



# NJM2135

## ■ POWER DISSIPATION

The allowable power is restricted by the ambient temperature.Characteristics of the allowable power ( PD : Power Dissipation ) against ambient temperature is indicated below.



**[CAUTION]**

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- Подбор аналогов.
- Поставку компонентов в любых объемах, удовлетворяющих вашим потребностям.
- Приемлемые сроки поставки, возможна ускоренная поставка.
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- Комплексную поставку.
- Работу по проектам и поставку образцов.
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