# M5221L, P, FP/M5T082P

## DUAL J-FET INPUT OPERATIONAL AMPLIFIERS

## DESCRIPTION

The M5221/M5T082P are semiconductor integrated circuits designed as high-performance dual operational amplifiers which adopt J-FETs in the input stage.

The devices come in an 8-pin SIP, DIP or FP and contain two circuits for yielding a high input impedance, high slew rate, low bias current and other excellent characteristics. They can be widely used as a general-purpose operational amplifiers in stereo equipment, tape decks, digital audio disc players and other similar products as well as in VCRs, video disc players and video related players.

## FEATURES

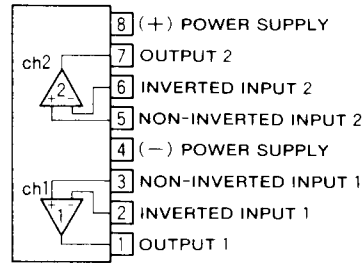
- High input impedance due to J-FET input ..... $R_i$=1000MΩ (typ.)
- High slew rate ..... SR=13V/μs (typ.)
- High gain, low distortion ..... $G_{VO}$=106dB, THD=0.007% ($G_V$=40dB @f=1kHz) (typ.)
- High laod current, high power dissipation ..... $I_{LP}$=±50mA, $P_d$=800mW (SIP) $P_d$=625mW (DIP) $P_d$=440mW (FP)

## APPLICATION

General-purpose operational amplifier in stereo equipment, tape decks and digital audio disc players, VCRs and video disc players.

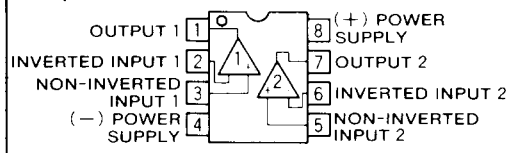
## PIN CONFIGURATION (TOP VIEW)

**SIP**



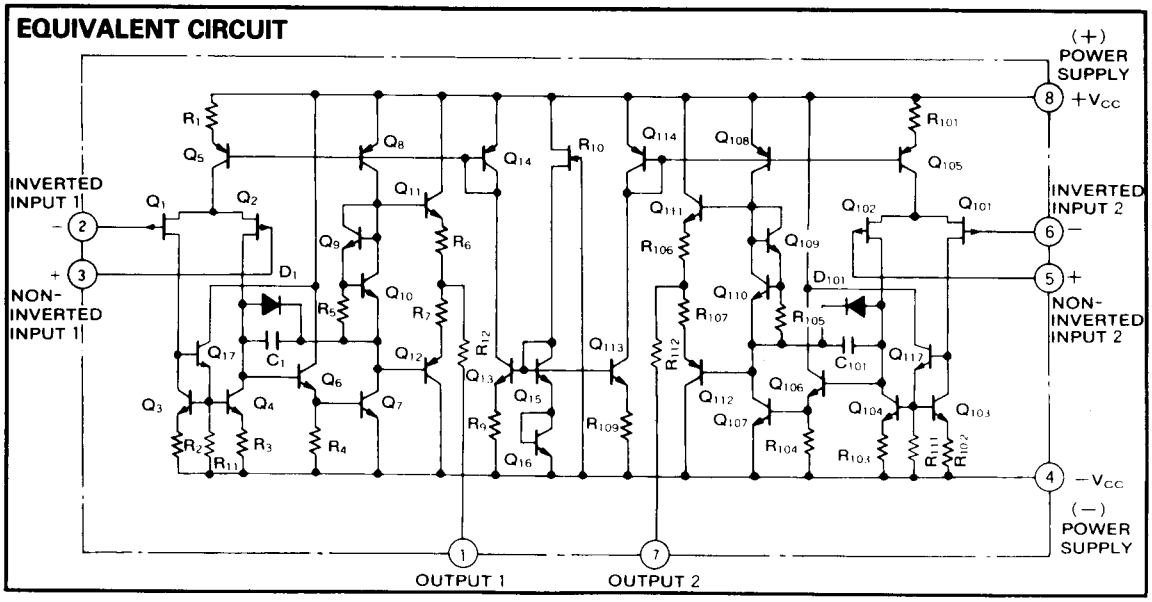

Outline 8P5 (M5221L)

**DIP, MINI FLAT**




Outline 8P4 (M5221P)
8P2S (M5221FP)

## EQUIVALENT CIRCUIT



## DUAL J-FET INPUT OPERATIONAL AMPLIFIERS

### ABSOLUTE MAXIMUM RATINGS ($T_a$=25℃, unless otherwise noted)

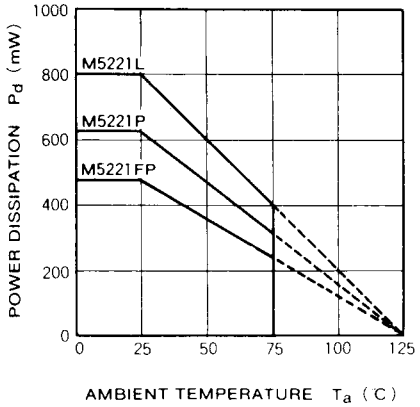
| Symbol | Parameter | Conditions | Ratings | Unit |
|---|---|---|---|---|
| $V_{CC}$ | Supply voltage | | ±18 | V |
| $I_{LP}$ | Load current | | ±50 | mA |
| $V_{id}$ | Differential input voltage | | ±30 | V |
| $V_{ic}$ | Common input voltage | | ±15 | V |
| $P_d$ | Power dissipation | | 800(SIP)/625(DIP)/440(FP) | mW |
| $K_\theta$ | Thermal derating | $T_a$≧25℃ | 8(SIP)/6.25(DIP)/4.4(FP) | mW/℃ |
| $T_{opr}$ | Operating temperature | | −20～+75 | ℃ |
| $T_{stg}$ | Storage temperature | | −55～+125 | ℃ |

### ELECTRICAL CHARACTERISTICS ($T_a$=25℃, $V_{CC}$=±15V)

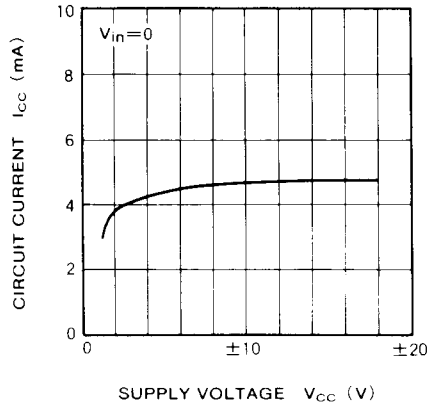
| Symbol | Parameter | Test conditions | Limits | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | |
| $I_{CC}$ | Circuit current | $V_{in}$=0 | | 3.0 | 6.0 | mA |
| $V_{IO}$ | Input offset voltage | $R_S$≦10kΩ | | 5.0 | 15.0 | mV |
| $I_{IO}$ | Input offset current | | | 5 | 200 | pA |
| $I_{IB}$ | Input bias current | | | 30 | 400 | pA |
| $R_{in}$ | Input resistance | | | $10^3$ | | MΩ |
| $G_{VO}$ | Open loop voltage gain | $R_L$≧2kΩ, $V_O$=±10V | 86 | 106 | | dB |
| $V_{OM}$ | Maximum output voltage | $R_L$≧10kΩ | ±12 | ±14 | | V |
| | | $R_L$≧2kΩ | ±10 | ±13 | | |
| $V_{CM}$ | Common input voltage width | | ±10 | ±12 | | V |
| CMRR | Common mode rejection ratio | $R_S$≦10kΩ | 70 | 76 | | dB |
| SVRR | Supply voltage rejection ratio | $R_S$≦10kΩ | | 30 | 150 | μV/V |
| $P_d$ | Power dissipation | | | 90 | 180 | mW |
| SR | Slew rate | $G_V$=0dB, $R_L$=2kΩ | | 13 | | V/μs |
| $f_T$ | Gaing bandwidth product | | | 3 | | MHz |
| $V_{NI}$ | Input-referred noise voltage | $R_S$=100Ω, BW=10Hz～ 30kHz | | 2.2 | | μVrms |

### TYPICAL CHARACTERISTICS

**THERMAL DERATING (MAXIMUM RATING)**




**CIRCUIT CURRENT VS. SUPPLY VOLTAGE**



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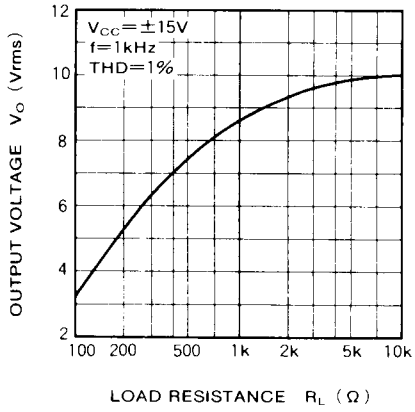
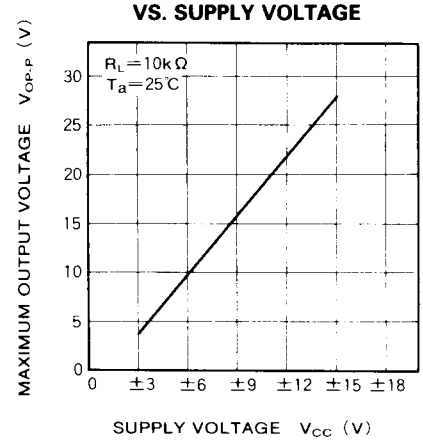
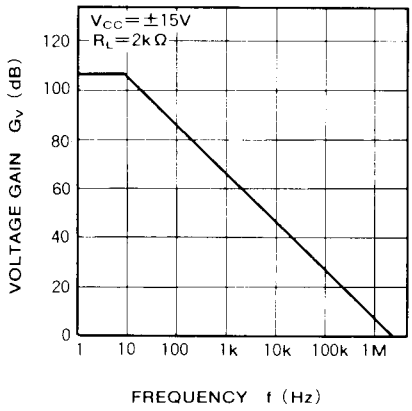
### OUTPUT VOLTAGE VS. LOAD RESISTANCE



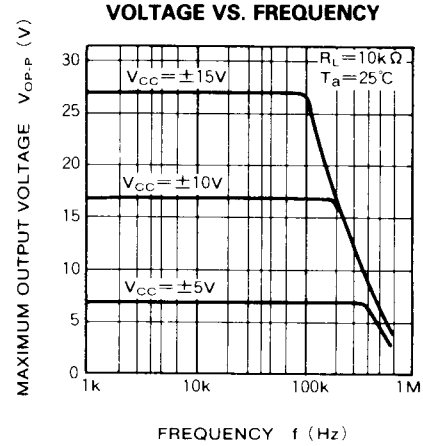

### MAXIMUM OUTPUT VOLTAGE VS. SUPPLY VOLTAGE



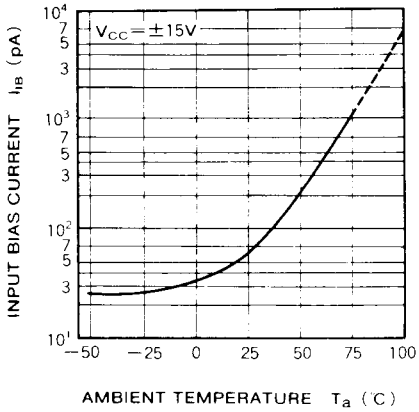

### VOLTAGE GAIN VS. FREQUENCY RESPONSE



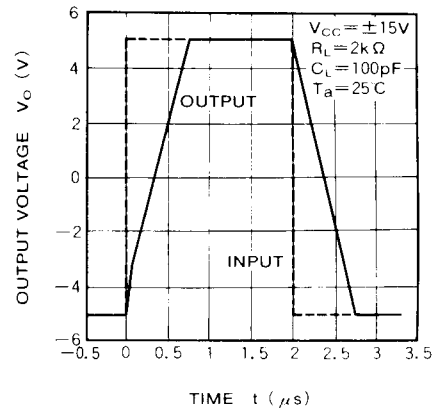

### MAXIMUM OUTPUT VOLTAGE VS. FREQUENCY




### INPUT BIAS CURRNET VS. AMBIENT TEMPERATURE

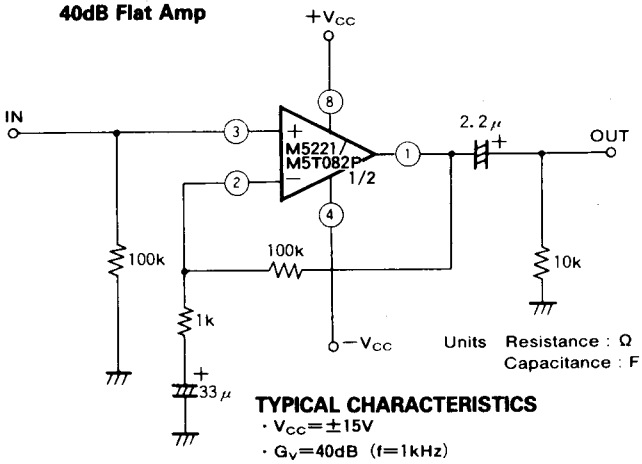



### SLEW RATE (SR) CHARACTERISTICS



## APPLICATION CIRCUIT

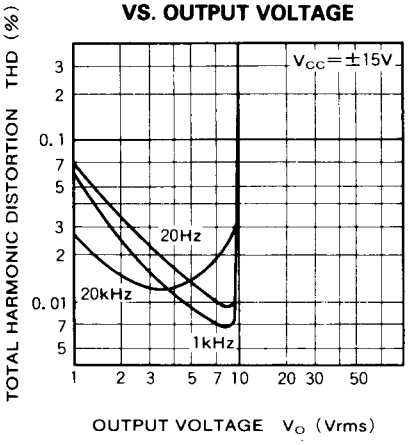
**40dB Flat Amp**




**TYPICAL CHARACTERISTICS**

- $V_{CC}$=±15V
- $G_V$=40dB (f=1kHz)
- $V_O$=9.5Vrms (f=1kHz, THD=0.1%)
- THD=0.007% (f=1kHz, $V_O$=7Vrms)

**TOTAL HARMONIC DISTORTION VS. OUTPUT VOLTAGE**



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