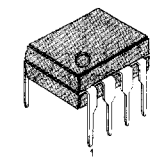
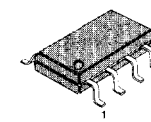
## SINGLE OPERATIONAL AMPLIFIERS

The LM741 is a general purpose operational amplifier the high gain & wide range of operating voltage provide superior performance in integrator, summing amplifier and general feedback amplifier.

8 DIP



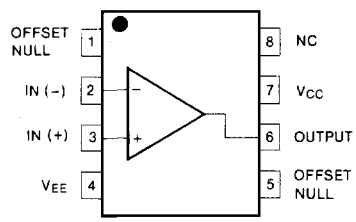
8 SOP



## FEATURES

- **Short circuit protection**
- **Excellent temperature stability**
- **Internal frequency compensation**
- **High input voltage range: ±13V (TYP)**
- **Null of offset**

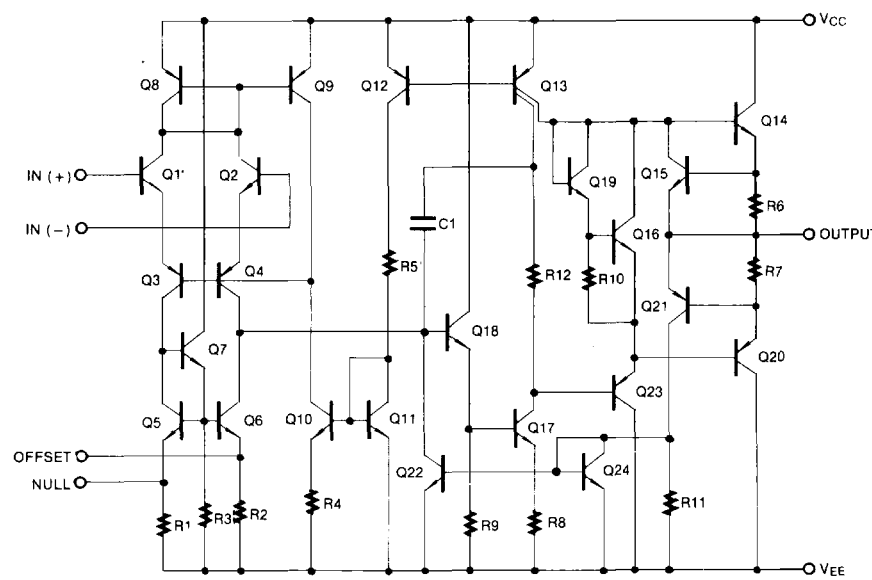
## BLOCK DIAGRAM




## ORDERING INFORMATION

| Device | Package | Operating Temperature |
|---|---|---|
| LM741CN | 8 DIP | 0 ~ +70°C |
| LM741CD | 8 SOP | |

## SCHEMATIC DIAGRAM



## ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Power Supply Voltage | $V_S$ | ±18 | V |
| Differential Input Voltage | $V_{ID}$ | ±30 | V |
| Input Voltage | $V_I$ | ±15 | V |
| Output Short Circuit Duration | | Indefinite | |
| Power Dissipation | $P_D$ | 500 | mW |
| Operating Temperature Range | $T_{opr}$ | 0 ~ +70 | °C |
| Storage Temperature Range | $T_{stg}$ | −65 ~ +150 | °C |

## ELECTRICAL CHARACTERISTICS

($V_{CC}$ = 15V, $V_{EE}$ = −15V, Ta = 25°C, unless otherwise specified)

| Characteristic | Symbol | Test Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| Input Offset Voltage | $V_{IO}$ | $R_S \leq 10K\Omega$ | | | 2.0 | 6.0 | mV |
| | | $R_S \leq 50\Omega$ | | | | | |
| Input Offset Voltage Adjustment Range | $V_{IOR}$ | $V_S = \pm 20V$ | | | ±15 | | mV |
| Input Offset Current | $I_{IO}$ | | | | 20 | 200 | nA |
| Input Bias Current | $I_{IB}$ | | | | 80 | 500 | nA |
| Input Resistance | $R_i$ | $V_S = \pm 20V$ | | 0.3 | 2.0 | | MΩ |
| Input Voltage Range | $V_{ICR}$ | | | ±12 | ±13 | | V |
| Large Signal Voltage Gain | $A_V$ | $R_L \geq 2K\Omega$ | $V_S = \pm 20V$, $V_O = \pm 15V$ | | | | V/mV |
| | | | $V_S = \pm 15V$, $V_O = \pm 10V$ | 20 | 200 | | |
| Output Short Circuit Current | $I_{OS}$ | | | | 25 | | mA |
| Output Voltage Swing | $V_{OUT}$ | $V_S = \pm 20V$ | $R_L \geq 10K\Omega$ | | | | V |
| | | | $R_L \geq 2KQ$ | | | | |
| | | $V_S = \pm 15V$ | $R_L \geq 10K\Omega$ | ±12 | ±14 | | |
| | | | $R_L \geq 2K\Omega$ | ±10 | ±13 | | |
| Common Mode Rejection Ratio | CMRR | $R_S \leq 10K\Omega$, $V_{CM} = \pm 12V$ | | 70 | 90 | | dB |
| | | $R_S \leq 50K\Omega$, $V_{CM} = \pm 12V$ | | | | | |
| Power Supply Rejection Ratio | PSRR | $V_S = \pm 20V$ to $V_S = \pm 5V$ $R_S \leq 50\Omega$ | | | | | dB |
| | | $V_S = \pm 15V$ to $V_S = \pm 5V$ $R_S \leq 10K\Omega$ | | 77 | 96 | | |

## ELECTRICAL CHARACTERISTICS (Continued)

| Characteristic | | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| Transient Response | Rise Time | $t_r$ | Unity Gain | | 0.3 | | μS |
| | Overshoot | OS | | | 10 | | % |
| Bandwidth | | BW | | | | | MHz |
| Slew Rate | | SR | Unity Gain | | 0.5 | | V/μS |
| Supply Current | | $I_S$ | $R_L = \infty\Omega$ | | 1.5 | 2.8 | mA |
| Power Consumption | | $P_C$ | $V_S = \pm 20V$ | | | | mW |
| | | | $V_S = \pm 15V$ | | 50 | 85 | |

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## ELECTRICAL CHARACTERISTICS

($0°C \leq Ta \leq +70°C$ for the LM741C $V_{CC} = \pm 15V$, unless otherwise specified)

| Characteristic | Symbol | Test Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| Input Offset Voltage | $V_{IO}$ | $R_S \leq 50K\Omega$ | | | | | mV |
| | | $R_S \leq 10\Omega$ | | | | 7.5 | |
| Input Offset Voltage Drift | $\Delta V_{IO}/\Delta T$ | | | | | | μV/°C |
| Input Offset Current | $I_{IO}$ | | | | | 300 | nA |
| Input Offset Current Drift | $\Delta I_{IO}/\Delta T$ | | | | | | nA/°C |
| Input Bias Current | $I_{IB}$ | | | | | 0.8 | μA |
| Input Resistance | $R_I$ | $V_S = \pm 20V$ | | | | | MΩ |
| Input Voltage Range | $V_{ICR}$ | | | ±12 | ±13 | | V |
| Output Voltage Swing | $V_{OUT}$ | $V_S = \pm 20V$ | $R_L \geq 10K\Omega$ | | | | V |
| | | | $R_L \geq 2K\Omega$ | | | | |
| | | $V_S = \pm 15V$ | $R_L \geq 10K\Omega$ | ±12 | ±14 | | |
| | | | $R_L \geq 2K\Omega$ | ±10 | ±13 | | |
| Output Short Circuit Current | $I_{OS}$ | | | 10 | | 40 | mA |
| Common Mode Rejection Ratio | CMRR | $R_S \leq 10K\Omega$, $V_{CM} = \pm 12V$ | | 70 | 90 | | dB |
| | | $R_S \leq 50K\Omega$, $V_{CM} = \pm 12V$ | | | | | |
| Power Supply Rejection Ratio | PSRR | $V_S = \pm 20V$ to $\pm 5V$ | $R_S \leq 50\Omega$ | | | | dB |
| | | | $R_S \leq 10K\Omega$ | 77 | 96 | | |
| Large Signal Voltage Gain | $A_V$ | $R_L \geq 2K\Omega$ | $V_S = \pm 20V$, $V_O = \pm 15V$ | | | | V/mV |
| | | | $V_S = \pm 15V$, $V_O = \pm 10V$ | 15 | | | |
| | | | $V_S = \pm 15V$, $V_O = 2V$ | | | | |

## TYPICAL PERFORMANCE CHARACTERISTICS

Fig. 7 OUTPUT RESISTANCE vs FREQUENCY

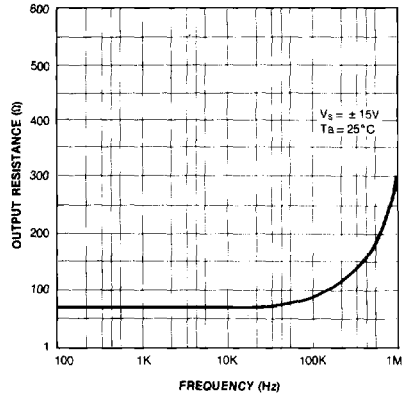


Fig. 8 INPUT RESISTANCE AND INPUT CAPACITANCE vs FREQUENCY

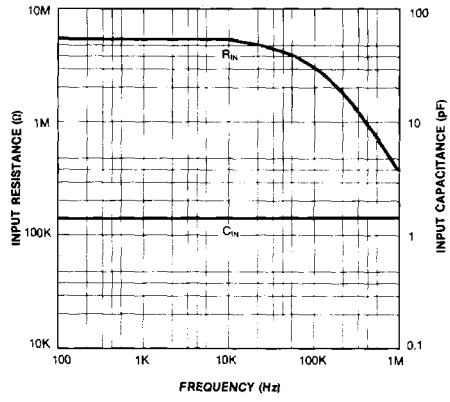


Fig. 9 INPUT BIAS CURRENT vs AMBIENT TEMPERATURE

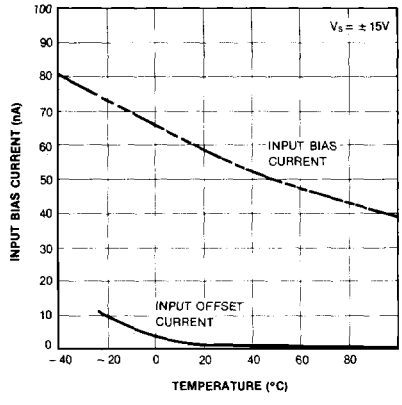


Fig. 10 POWER CONSUMPTION vs AMBIENT TEMPERATURE

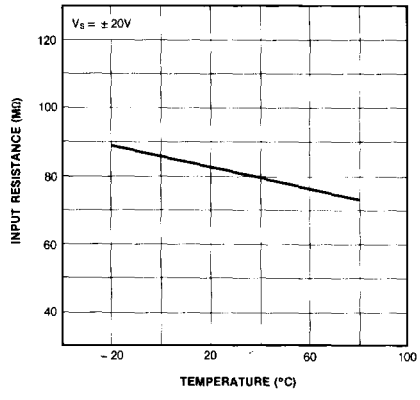


Fig. 11 INPUT OFFSET CURRENT vs AMBIENT TEMPERATURE

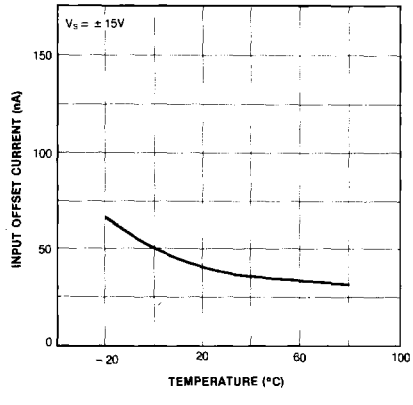


Fig. 12 INPUT RESISTANCE vs AMBIENT TEMPERATURE

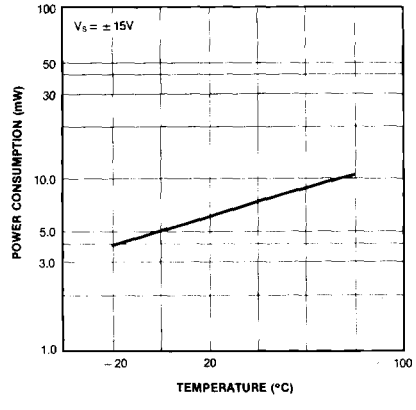

**Fig. 13 NORMALIZED DC PARAMETERS vs AMBIENT TEMPERATURE**

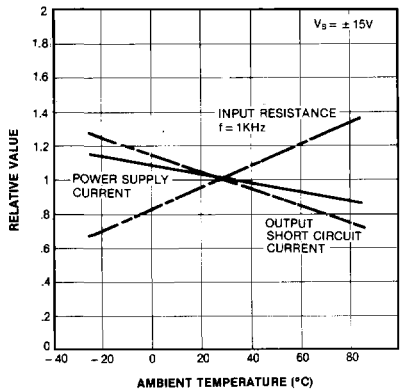


**Fig. 14 FREQUENCY CHARACTERISTICS vs AMBIENT TEMPERATURE**

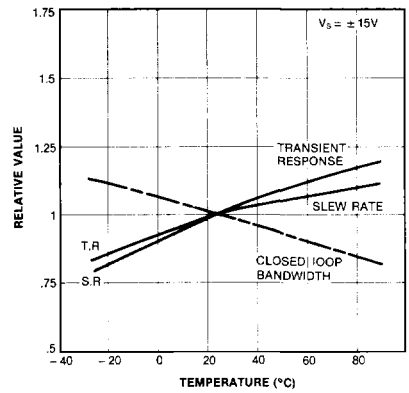


**Fig. 15 FREQUENCY CHARACTERISTICS vs SUPPLY VOLTAGE**

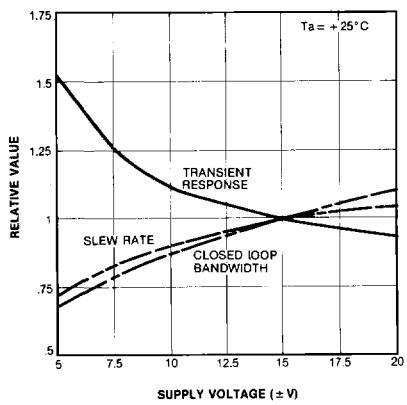


**Fig. 16 OUTPUT SHORT CIRCUIT CURRENT vs AMBIENT TEMPERATURE**

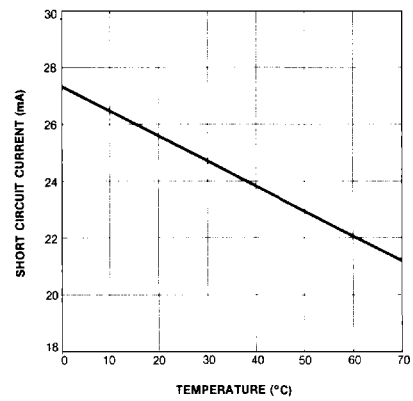


**Fig. 17 TRANSIENT RESPONSE**

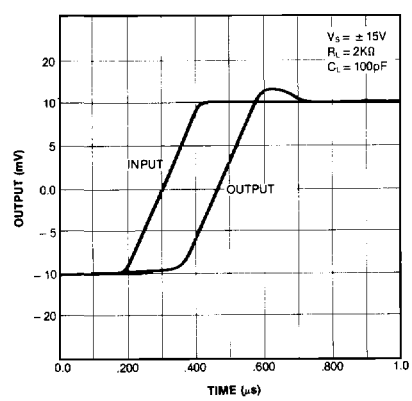


**Fig. 18 COMMON-MODE REJECTION RATIO vs FREQUENCY**

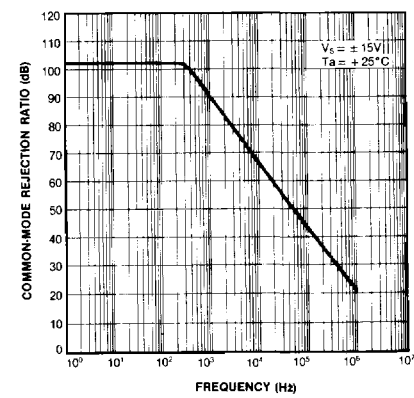


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Fig. 18 VOLTAGE FOLLOWER LARGE SIGNAL PULSE RESPONSE

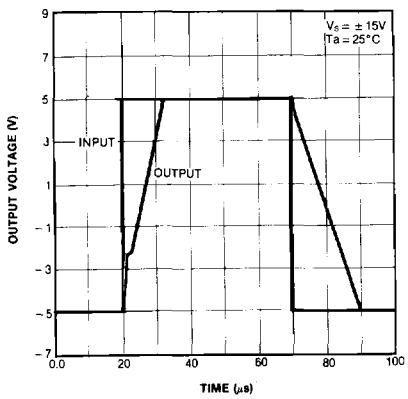


Fig. 19 OUTPUT SWING AND INPUT RANGE vs SUPPLY VOLTAGE