Signetics

# μA741/μA741C/SA741C
# General Purpose Operational Amplifier

***Product Specification***

**Linear Products**

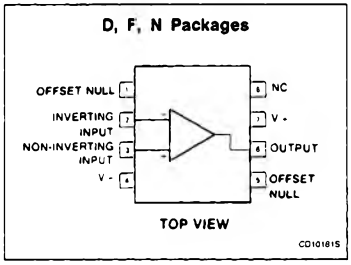
## DESCRIPTION

The μA741 is a high performance operational amplifier with high open-loop gain, internal compensation, high common mode range and exceptional temperature stability. The μA741 is short-circuit-protected and allows for nulling of offset voltage.

## FEATURES

- **Internal frequency compensation**
- **Short circuit protection**
- **Excellent temperature stability**
- **High input voltage range**

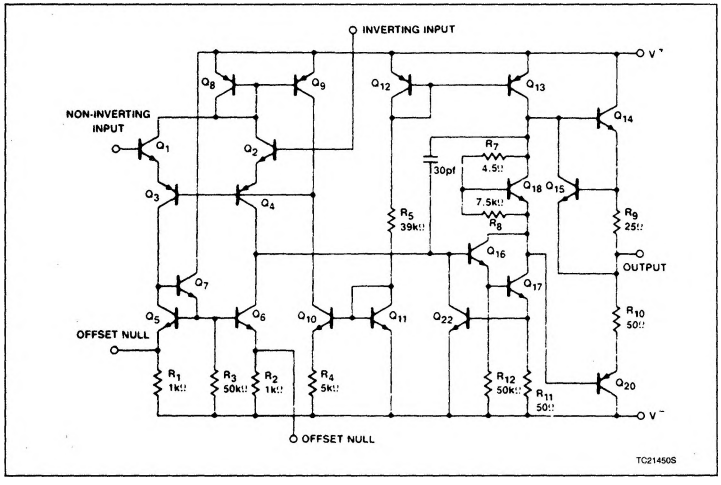
## PIN CONFIGURATION




## ORDERING INFORMATION

| DESCRIPTION | TEMPERATURE RANGE | ORDER CODE |
|---|---|---|
| 8-Pin Plastic DIP | −55°C to +125°C | μA741N |
| 8-Pin Plastic DIP | 0 to +70°C | μA741CN |
| 8-Pin Plastic DIP | −40°C to +85°C | SA741CN |
| 8-Pin Cerdip | −55°C to +125°C | μA741F |
| 8-Pin Cerdip | 0 to +70°C | μA741CF |
| 8-Pin SO | 0 to +70°C | μA741CD |

## EQUIVALENT SCHEMATIC



## ABSOLUTE MAXIMUM RATINGS

| SYMBOL | PARAMETER | RATING | UNIT |
|---|---|---|---|
| $V_S$ | Supply voltage | | |
| | μA741C | ±18 | V |
| | μA741 | ±22 | V |
| $P_D$ | Internal power dissipation | | |
| | D package | 780 | mW |
| | N package | 1170 | mW |
| | F package | 800 | mW |
| $V_{IN}$ | Differential input voltage | ±30 | V |
| $V_{IN}$ | Input voltage[1] | ±15 | V |
| $I_{SC}$ | Output short-circuit duration | Continuous | |
| $T_A$ | Operating temperature range | | |
| | μA741C | 0 to +70 | °C |
| | SA741C | -40 to +85 | °C |
| | μA741 | -55 to +125 | °C |
| $T_{STG}$ | Storage temperature range | -65 to +150 | °C |
| $T_{SOLD}$ | Lead soldering temperature (10sec max) | 300 | °C |

**NOTE:**
1. For supply voltages less than ± 15V, the absolute maximum input voltage is equal to the supply voltage.

## DC ELECTRICAL CHARACTERISTICS (μA741, μA741C) $T_A$ = 25°C, $V_S$ = ±15V, unless otherwise specified.

| SYMBOL | PARAMETER | TEST CONDITIONS | μA741 | | | μA741C | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Typ | Max | |
| $V_{OS}$ | Offset voltage | $R_S$ = 10kΩ | | 1.0 | 5.0 | | 2.0 | 6.0 | mV |
| | | $R_S$ = 10kΩ, over temp. | | 1.0 | 6.0 | | | 7.5 | mV |
| $\Delta V_{OS}/\Delta T$ | | | | 10 | | | 10 | | μV/°C |
| $I_{OS}$ | Offset current | | | 20 | 200 | | 20 | 200 | nA |
| | | Over temp. | | | | | | 300 | nA |
| | | $T_A$ = +125°C | | 7.0 | 200 | | | | nA |
| | | $T_A$ = -55°C | | 20 | 500 | | | | nA |
| $\Delta I_{OS}/\Delta T$ | | | | 200 | | | 200 | | pA/°C |
| $I_{BIAS}$ | Input bias current | | | 80 | 500 | | 80 | 500 | nA |
| | | Over temp. | | | | | | 800 | nA |
| | | $T_A$ = +125°C | | 30 | 500 | | | | nA |
| | | $T_A$ = -55°C | | 300 | 1500 | | | | nA |
| $\Delta I_B/\Delta T$ | | | | 1 | | | 1 | | nA/°C |
| $V_{OUT}$ | Output voltage swing | $R_L$ = 10kΩ | ±12 | ±14 | | ±12 | ±14 | | V |
| | | $R_L$ = 2kΩ, over temp. | ±10 | ±13 | | ±10 | ±13 | | V |
| $A_{VOL}$ | Large-signal voltage gain | $R_L$ = 2kΩ, $V_O$ = ±10V | 50 | 200 | | 20 | 200 | | V/mV |
| | | $R_L$ = 2kΩ, $V_O$ = ±10V, over temp. | 25 | | | 15 | | | V/mV |
| | Offset voltage adjustment range | | | ±30 | | | ±30 | | mV |
| PSRR | Supply voltage rejection ratio | $R_S \leq$ 10kΩ | | | | | 10 | 150 | μV/V |
| | | $R_S \leq$ 10kΩ, over temp. | | 10 | 150 | | | | μV/V |
| CMRR | Common-mode rejection ratio | | | | | 70 | 90 | | dB |
| | | Over temp. | 70 | 90 | | | | | dB |
| $I_{CC}$ | Supply current | | | 1.4 | 2.8 | | 1.4 | 2.8 | mA |
| | | $T_A$ = +125°C | | 1.5 | 2.5 | | | | mA |
| | | $T_A$ = -55°C | | 2.0 | 3.3 | | | | mA |

**DC ELECTRICAL CHARACTERISTICS** (Continued) (μA741, μA741C) $T_A = 25°C$, $V_S = \pm 15V$, unless otherwise specified.

| SYMBOL | PARAMETER | TEST CONDITIONS | μA741 | | | μA741C | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Typ | Max | |
| $V_{IN}$<br>$R_{IN}$ | Input voltage range<br>Input resistance | (μA741, over temp.) | ±12<br>0.3 | ±13<br>2.0 | | ±12<br>0.3 | ±13<br>2.0 | | V<br>MΩ |
| $P_D$ | Power consumption | $T_A = +125°C$<br>$T_A = -55°C$ | | 50<br>45<br>45 | 85<br>75<br>100 | | 50 | 85 | mW<br>mW<br>mW |
| $R_{OUT}$ | Output resistance | | | 75 | | | 75 | | Ω |
| $I_{SC}$ | Output short-circuit current | | 10 | 25 | 60 | 10 | 25 | 60 | mA |

**DC ELECTRICAL CHARACTERISTICS** (SA741C) $T_A = 25°C$, $V_S = \pm 15V$, unless otherwise specified.

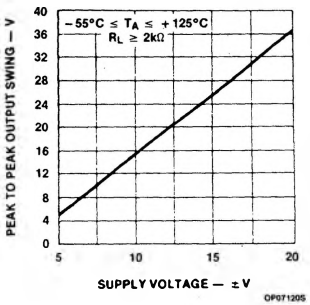
| SYMBOL | PARAMETER | TEST CONDITIONS | SA741C | | | UNIT |
|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | |
| $V_{OS}$<br><br>$\Delta V_{OS}/\Delta T$ | Offset voltage | $R_S = 10k\Omega$<br>$R_S = 10k\Omega$, over temp. | | 2.0<br><br>10 | 6.0<br>7.5 | mV<br>mV<br>μV/°C |
| $I_{OS}$<br><br>$\Delta I_{OS}/\Delta T$ | Offset current | Over temp. | | 20<br><br>200 | 200<br>500 | nA<br>nA<br>pA/°C |
| $I_{BIAS}$<br><br>$\Delta I_B/\Delta T$ | Input bias current | Over temp. | | 80<br><br>1 | 500<br>1500 | nA<br>nA<br>nA/°C |
| $V_{OUT}$ | Output voltage swing | $R_L = 10k\Omega$<br>$R_L = 2k\Omega$, over temp. | ±12<br>±10 | ±14<br>±13 | | V<br>V |
| $A_{VOL}$ | Large-signal voltage gain | $R_L = 2k\Omega$, $V_O = \pm 10V$<br>$R_L = 2k\Omega$, $V_O = \pm 10V$, over temp. | 20<br>15 | 200 | | V/mV<br>V/mV |
| | Offset voltage adjustment range | | | ±30 | | mV |
| PSRR | Supply voltage rejection ratio | $R_S \leq 10k\Omega$ | | 10 | 150 | μV/V |
| CMRR | Common mode rejection ration | | 70 | 90 | | dB |
| $V_{IN}$ | Input voltage range | Over temp. | ±12 | ±13 | | V |
| $R_{IN}$ | Input resistance | | 0.3 | 2.0 | | MΩ |
| $P_d$ | Power consumption | | | 50 | 85 | mW |
| $R_{OUT}$ | Output resistance | | | 75 | | Ω |
| $I_{SC}$ | Output short-circuit current | | | 25 | | mA |

**AC ELECTRICAL CHARACTERISTICS** $T_A = 25°C$, $V_S = \pm 15V$, unless otherwise specified.

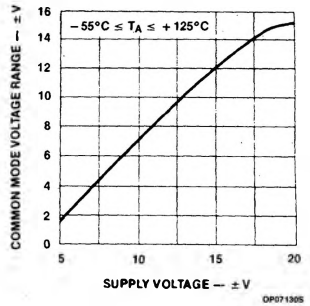
| SYMBOL | PARAMETER | TEST CONDITIONS | μA741, μA741C | | | UNIT |
|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | |
| $R_{IN}$ | Parallel input resistance | Open-loop, f = 20Hz | 0.3 | | | MΩ |
| $C_{IN}$ | Parallel input capacitance | Open-loop, f = 20Hz | | 1.4 | | pF |
| | Unity gain crossover frequency | Open-loop | | 1.0 | | MHz |
| | Transient response unity gain | $V_{IN} = 20mV$, $R_L = 2k\Omega$, $C_L \leq 100pF$ | | | | |
| $t_R$ | Rise time | | | 0.3 | | μs |
| | Overshoot | | | 5.0 | | % |
| SR | Slew rate | $C \leq 100pF$, $R_L \geq 2k\Omega$, $V_{IN} = \pm 10V$ | | 0.5 | | V/μs |

## TYPICAL PERFORMANCE CHARACTERISTICS

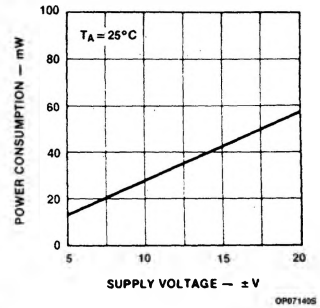
**Output Voltage Swing as a Function of Supply Voltage**



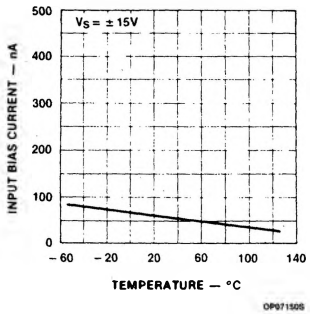

**Input Common-Mode Voltage Range as a Function of Supply Voltage**



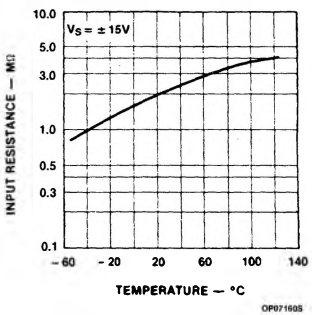

**Power Consumption as a Function of Supply Voltage**



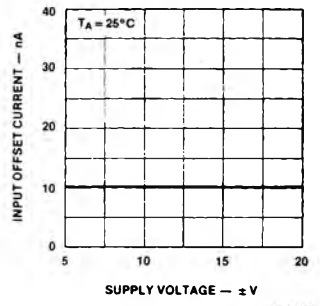

**Input Bias Current as a Function of Ambient Temperature**



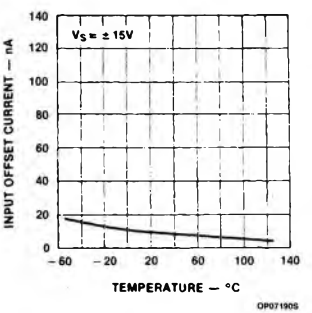

**Input Resistance as a Function of Ambient Temperature**



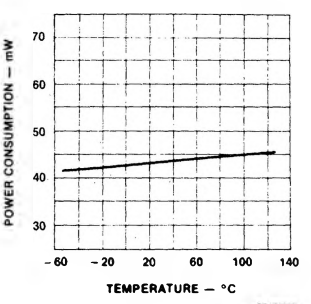

**Input Offset Current as a Function of Supply Voltage**



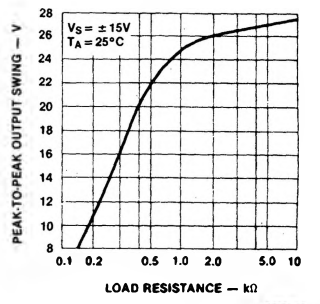

**Input Offset Current as a Function of Ambient Temperature**




**Power Consumption as a Function of Ambient Temperature**

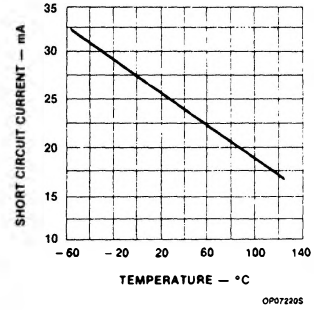



**Output Voltage Swing as a Function of Load Resistance**

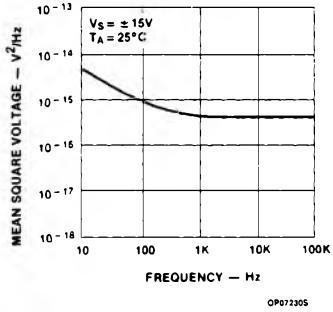


## TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

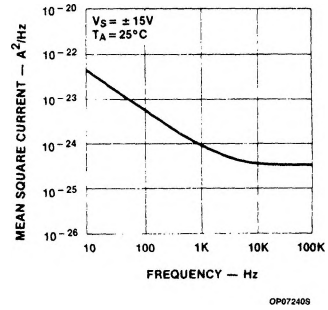
**Output Short-Circuit Current as a Function of Ambient Temperature**



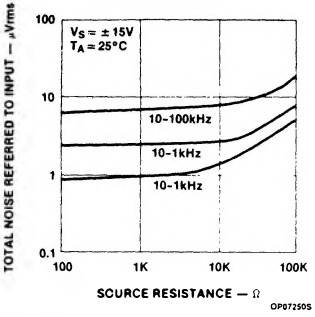

**input Noise Voltage as a Function of Frequency**



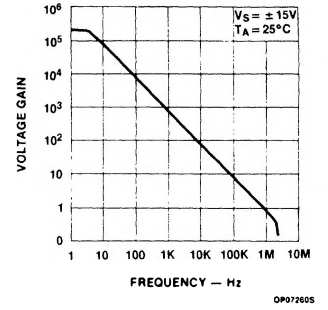

**Input Noise Current as a Function of Frequency**



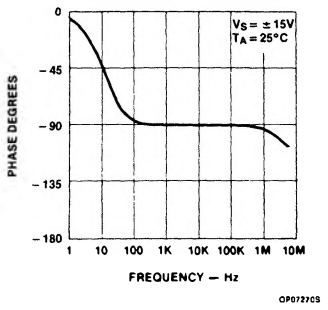

**Broadband Noise for Various Bandwidths**



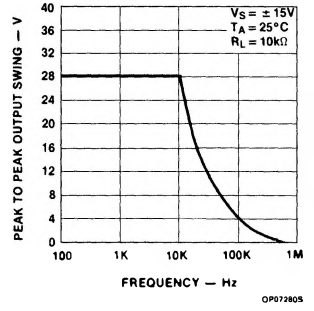

**Open-Loop Voltage Gain as a Function of Frequency**



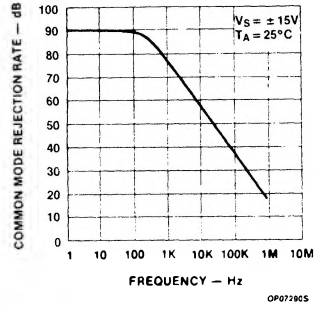

**Open-Loop Phase Response as a Function of Frequency**



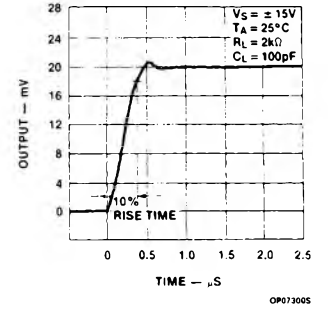

**Output Voltage Swing as a Function of Frequency**




**Common-Mode Rejection Ratio as a Function of Frequency**




**Transient Response**



**TYPICAL PERFORMANCE CHARACTERISTICS** (Continued)