

# General purpose operational amplifier

# $\mu$ A741/ $\mu$ A741C/SA741C

## DESCRIPTION

The  $\mu$ A741 is a high performance operational amplifier with high open-loop gain, internal compensation, high common mode range and exceptional temperature stability. The  $\mu$ A741 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

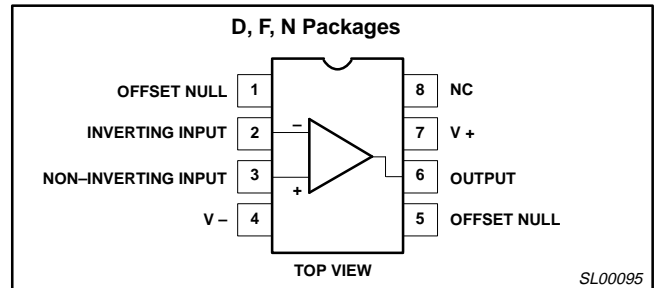


Figure 1. Pin Configuration

## ORDERING INFORMATION

DESCRIPTION	TEMPERATURE RANGE	ORDER CODE	DWG #
8-Pin Plastic Dual In-Line Package (DIP)	-55°C to +125°C	$\mu$ A741N	SOT97-1
8-Pin Plastic Dual In-Line Package (DIP)	0 to +70°C	$\mu$ A741CN	SOT97-1
8-Pin Plastic Dual In-Line Package (DIP)	-40°C to +85°C	SA741CN	SOT97-1
8-Pin Ceramic Dual In-Line Package (CERDIP)	-55°C to +125°C	$\mu$ A741F	0580A
8-Pin Ceramic Dual In-Line Package (CERDIP)	0 to +70°C	$\mu$ A741CF	0580A
8-Pin Small Outline (SO) Package	0 to +70°C	$\mu$ A741CD	SOT96-1

## ABSOLUTE MAXIMUM RATINGS

SYMBOL	PARAMETER	RATING	UNIT
$V_S$	Supply voltage		
	$\mu$ A741C	$\pm 18$	V
	$\mu$ A741	$\pm 22$	V
$P_D$	Internal power dissipation		
	D package	780	mW
	N package	1170	mW
	F package	800	mW
$V_{IN}$	Differential input voltage	$\pm 30$	V
$V_{IN}$	Input voltage <sup>1</sup>	$\pm 15$	V
$I_{SC}$	Output short-circuit duration	Continuous	
$T_A$	Operating temperature range		
	$\mu$ A741C	0 to +70	°C
	SA741C	-40 to +85	°C
	$\mu$ A741	-55 to +125	°C
$T_{STG}$	Storage temperature range	-65 to +150	°C
$T_{SOLD}$	Lead soldering temperature (10sec max)	300	°C

### NOTES:

1. For supply voltages less than  $\pm 15V$ , the absolute maximum input voltage is equal to the supply voltage.

## General purpose operational amplifier

 $\mu$ A741/ $\mu$ A741C/SA741C**DC ELECTRICAL CHARACTERISTICS** $T_A = 25^\circ\text{C}$ ,  $V_S = \pm 15\text{V}$ , unless otherwise specified.

SYMBOL	PARAMETER	TEST CONDITIONS	$\mu$ A741			$\mu$ A741C			UNIT	
			Min	Typ	Max	Min	Typ	Max		
$V_{OS}$	Offset voltage	$R_S=10\text{k}\Omega$ $R_S=10\text{k}\Omega$ , over temp.		1.0	5.0		2.0	6.0	mV	
$\Delta V_{OS}/\Delta T$				1.0	6.0		10	7.5	mV	
					10			10	$\mu\text{V}/^\circ\text{C}$	
$I_{OS}$	Offset current	Over temp. $T_A=+125^\circ\text{C}$ $T_A=-55^\circ\text{C}$		20	200		20	200	nA	
$\Delta I_{OS}/\Delta T$				7.0	200			300	nA	
				20	500		200		nA	
$I_{BIAS}$	Input bias current	Over temp. $T_A=+125^\circ\text{C}$ $T_A=-55^\circ\text{C}$		80	500		80	500	nA	
$\Delta I_B/\Delta T$				30	500			800	nA	
				300	1500		1		nA	
			1					$\text{nA}/^\circ\text{C}$		
$V_{OUT}$	Output voltage swing	$R_L=10\text{k}\Omega$	$\pm 12$	$\pm 14$		$\pm 12$	$\pm 14$		V	
		$R_L=2\text{k}\Omega$ , over temp.	$\pm 10$	$\pm 13$		$\pm 10$	$\pm 13$		V	
$A_{VOL}$	Large-signal voltage gain	$R_L=2\text{k}\Omega$ , $V_O=\pm 10\text{V}$	50	200		20	200		V/mV	
		$R_L=2\text{k}\Omega$ , $V_O=\pm 10\text{V}$ , over temp.	25			15			V/mV	
	Offset voltage adjustment range			$\pm 30$			$\pm 30$		mV	
PSRR	Supply voltage rejection ratio	$R_S \leq 10\text{k}\Omega$					10	150	$\mu\text{V}/\text{V}$	
		$R_S \leq 10\text{k}\Omega$ , over temp.		10	150				$\mu\text{V}/\text{V}$	
CMRR	Common-mode rejection ratio					70	90		dB	
		Over temp.	70	90					dB	
$I_{CC}$	Supply current	$T_A=+125^\circ\text{C}$ $T_A=-55^\circ\text{C}$		1.4	2.8		1.4	2.8	mA	
					1.5	2.5				mA
					2.0	3.3				mA
$V_{IN}$	Input voltage range	( $\mu$ A741, over temp.)	$\pm 12$	$\pm 13$		$\pm 12$	$\pm 13$		V	
$R_{IN}$	Input resistance		0.3	2.0		0.3	2.0		M $\Omega$	
$P_D$	Power consumption	$T_A=+125^\circ\text{C}$ $T_A=-55^\circ\text{C}$		50	85		50	85	mW	
					45	75				mW
					45	100				mW
$R_{OUT}$	Output resistance			75			75		$\Omega$	
$I_{SC}$	Output short-circuit current		10	25	60	10	25	60	mA	

## General purpose operational amplifier

 $\mu$ A741/ $\mu$ A741C/SA741C**DC ELECTRICAL CHARACTERISTICS** $T_A = 25^\circ\text{C}$ ,  $V_S = \pm 15\text{V}$ , unless otherwise specified.

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

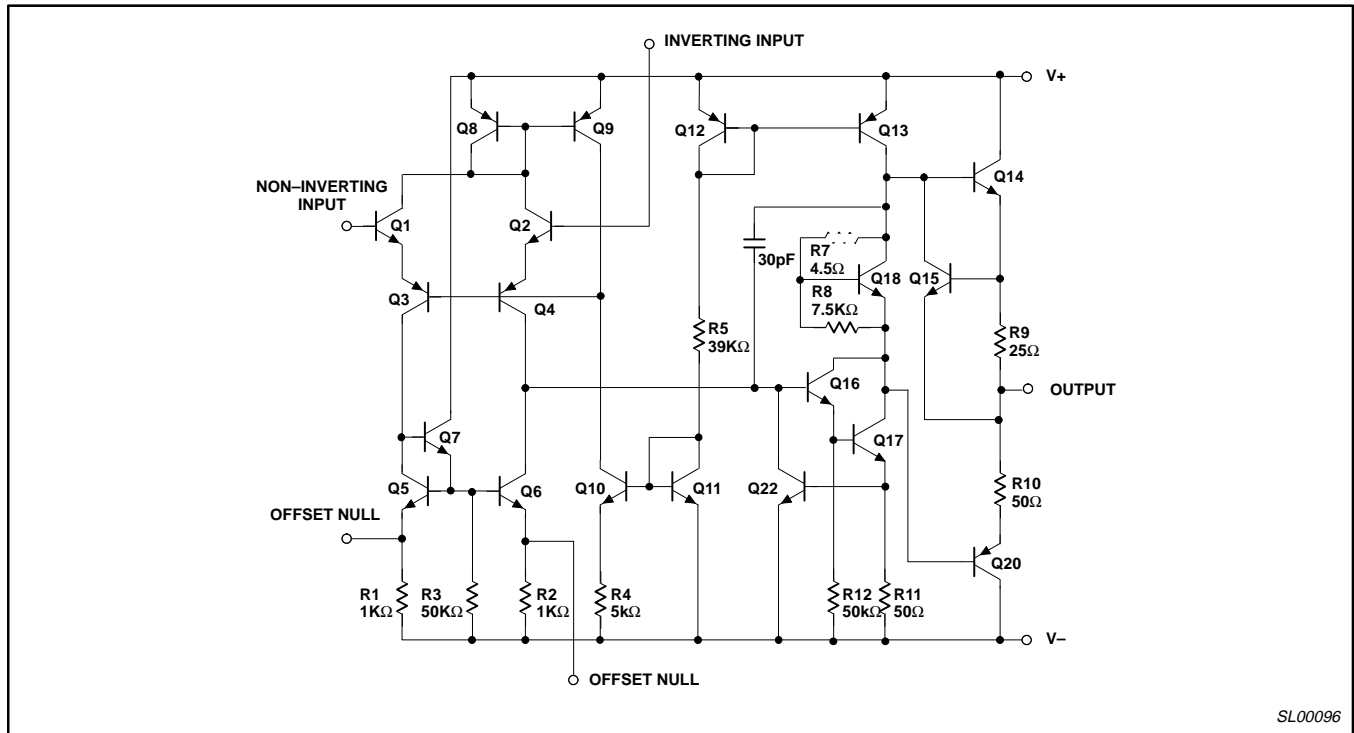
**AC ELECTRICAL CHARACTERISTICS** $T_A=25^\circ\text{C}$ ,  $V_S = \pm 15\text{V}$ , unless otherwise specified.

SYMBOL	PARAMETER	TEST CONDITIONS	$\mu$ A741, $\mu$ A741C			UNIT
			Min	Typ	Max	
$R_{IN}$	Parallel input resistance	Open-loop, $f=20\text{Hz}$	0.3			$\text{M}\Omega$
$C_{IN}$	Parallel input capacitance	Open-loop, $f=20\text{Hz}$		1.4		pF
	Unity gain crossover frequency	Open-loop		1.0		MHz
$t_R$	Transient response unity gain	$V_{IN}=20\text{mV}$ , $R_L=2\text{k}\Omega$ , $C_L \leq 100\text{pF}$				
	Rise time			0.3		$\mu\text{s}$
	Overshoot			5.0		%
SR	Slew rate	$C \leq 100\text{pF}$ , $R_L \geq 2\text{k}\Omega$ , $V_{IN}=\pm 10\text{V}$		0.5		$\text{V}/\mu\text{s}$

General purpose operational amplifier

$\mu$ A741/ $\mu$ A741C/SA741C

EQUIVALENT SCHEMATIC



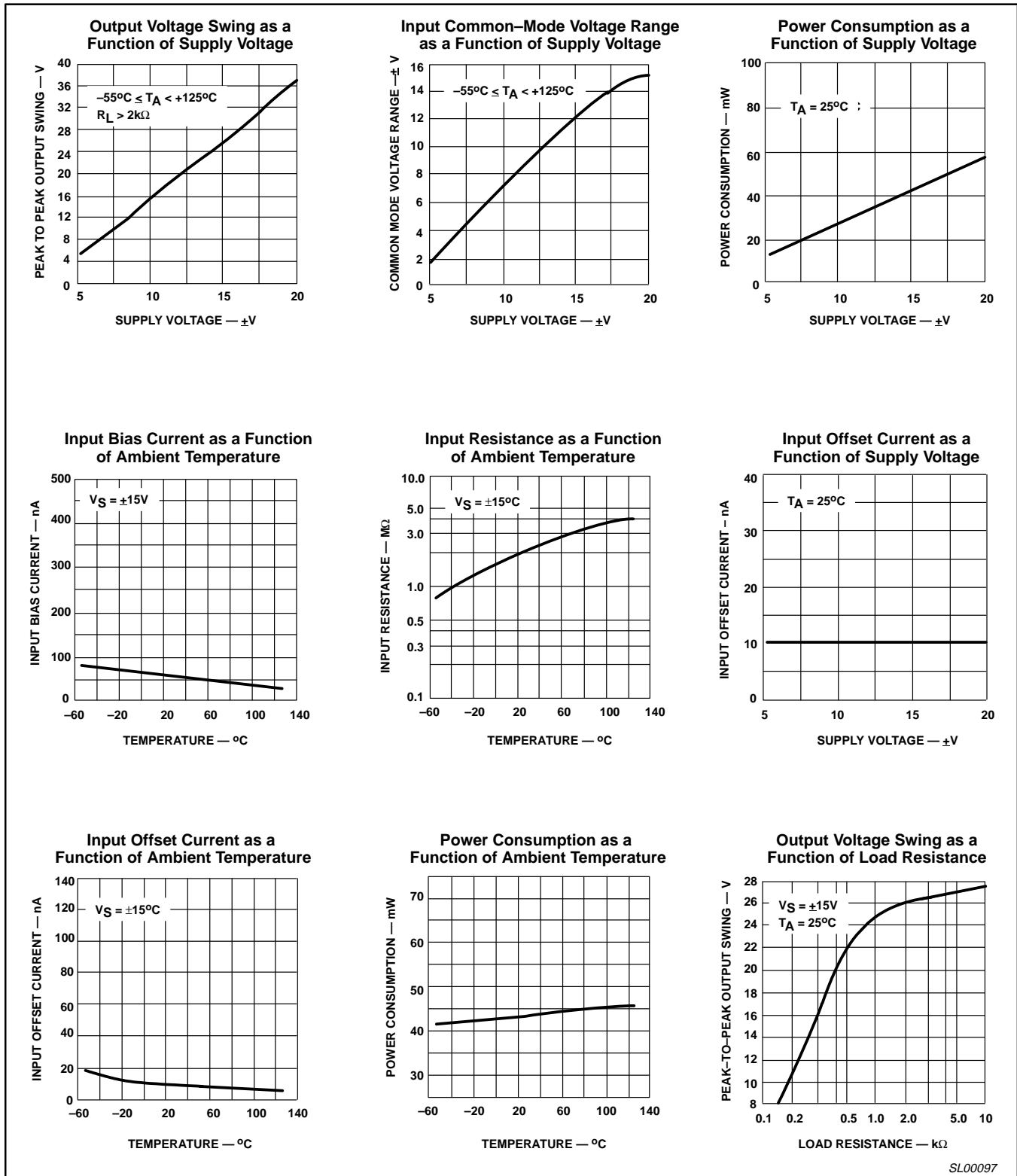
SL00096

Figure 2. Equivalent Schematic

# General purpose operational amplifier

# $\mu$ A741/ $\mu$ A741C/SA741C

## TYPICAL PERFORMANCE CHARACTERISTICS



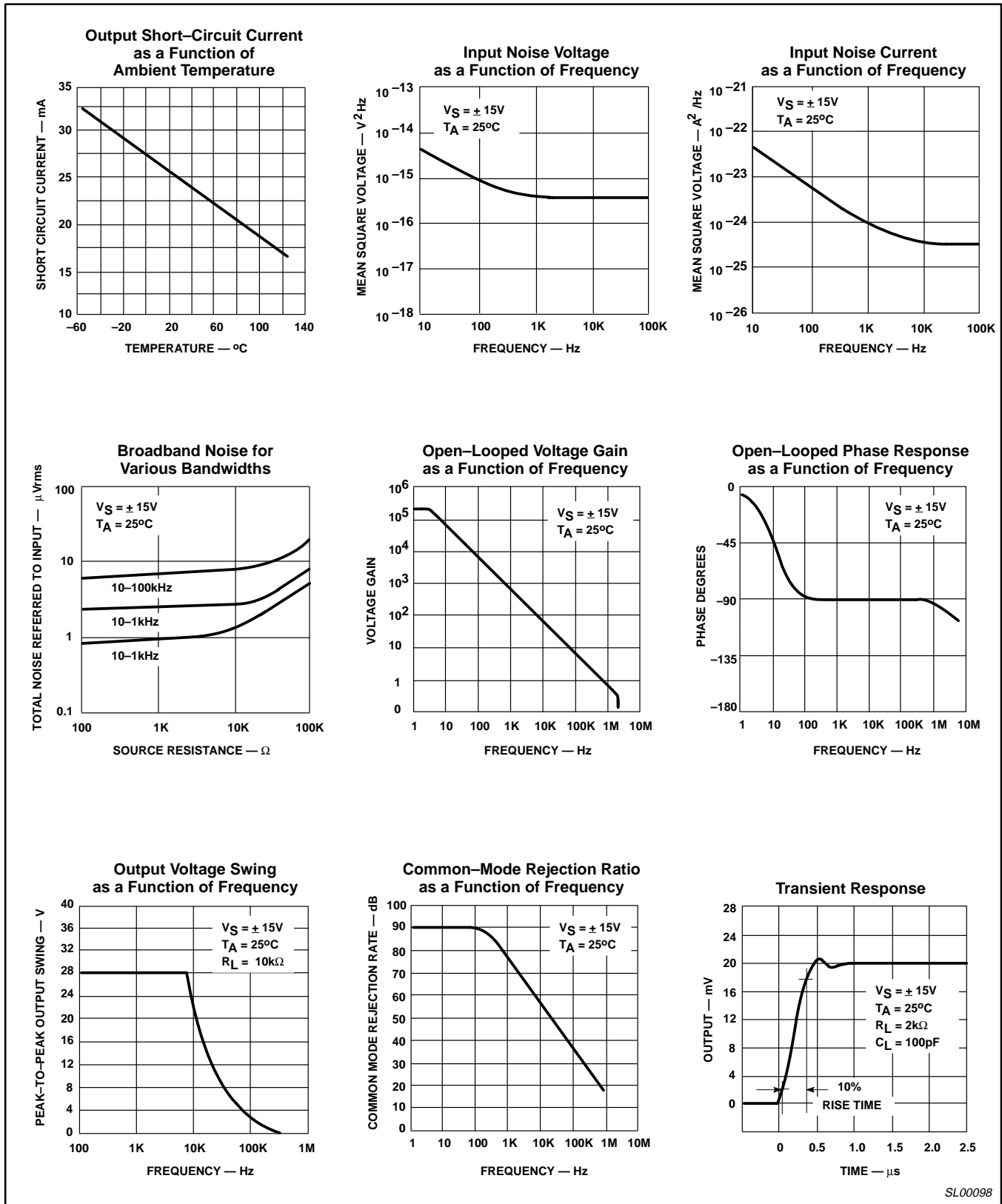
SL00097

Figure 3. Typical Performance Characteristics

General purpose operational amplifier

$\mu$ A741/ $\mu$ A741C/SA741C

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)



SL00098

Figure 4. Typical Performance Characteristics (cont.)

# General purpose operational amplifier

# $\mu$ A741/ $\mu$ A741C/SA741C

## TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

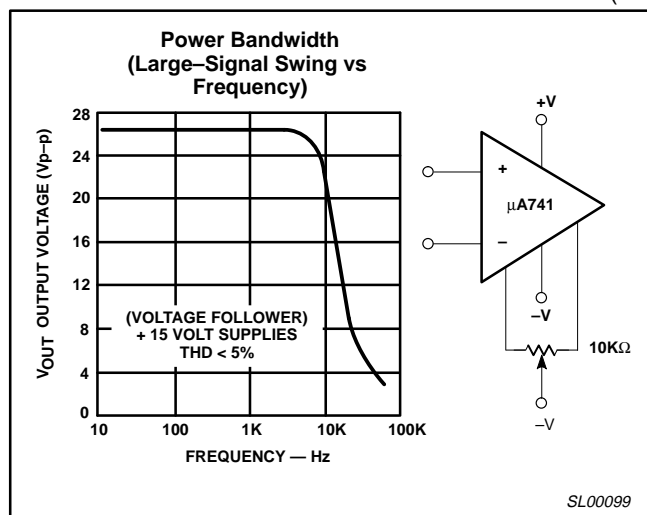


Figure 5. Typical Performance Characteristics (cont.)