

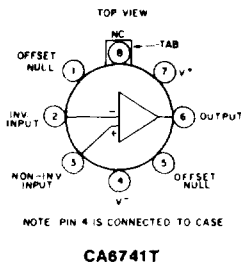
May 1990

## Operational Amplifiers

**CA6078AT - Micropower Type**  
**CA6741T - General-Purpose Type**

For Applications where Low Noise  
(Burst + 1/f) is a Prime Requirement

Virtually free from "popcorn" (burst) noise:  
device rejected if any noise burst exceeds 20 mV  
(peak), referred to input over a 30-second time period.

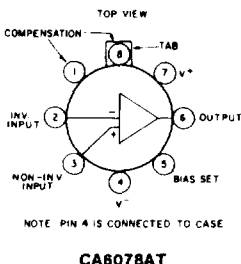


### Features:

- Internal phase compensation
- Input bias current: 500 nA max.
- Input offset current: 200 nA max.
- Open loop voltage gain: 50,000 (94 dB) min.
- Input offset voltage: 5 mV max.

### Applications:

- Low noise AC amplifier
- Narrow band or bandpass filter
- Integrator or differentiator
- DC amplifier
- Summing amplifier



### Features:

- Open loop voltage gain: 40,000 (92 dB) min.
- Input offset voltage: 3.5 mV max.
- Operates with low total supply voltage: 1.5 V min. ( $\pm 0.75$  V)
- Low quiescent operating current: adjustable for application optimization
- Input bias current: adjustable to below 1 nA

### Applications:

- Portable electronics
- Medical electronics
- DC amplifier
- Narrow band or bandpass filter
- Integrator or differentiator
- Instrumentation
- Telemetry
- Summing amplifier

CA6078AT and CA6741T\* are low-noise linear IC operational amplifiers that are virtually free of "popcorn" (burst) noise.

These low noise versions of the CA3078AT and CA3471T are a result of improved processing developments and rigid burst noise inspection criteria. A highly selective test circuit (See Figure 2) assures that each type meets the rigid low noise standards in the data section. This low burst noise property also assures excellent performance throughout the 1/f noise spectrum.

In addition the CA6078AT and CA6741T offer the same features incorporated in the CA3078AT and CA3471T respectively, including output short circuit protection, latch free operation, wide common-mode and differential-mode signal ranges, and low offset nulling capability.

For detailed data, characteristics curves, schematic diagram, dimensional outline, and test circuits, refer to the Operational Amplifier Data Bulletins File No. 531 and 535. In addition, for details of considerations in burst-noise measurements, refer to Application Note, ICAN-6732, "Measurement of Burst ("Popcorn") Noise in Linear IC's".

The CA6078AT and CA6741T utilize the hermetically sealed 8-lead TO-5 type package. The CA6078AT and the CA6741T can also be supplied on request with dual-in-line formed leads. These types are identified as the CA6078AS and CA6741S. This formed-lead configuration conforms to that of the 8-lead dual-in-line (Mini-Dip) package. For terminal arrangements, see page 4.

\*Formerly Dev. No. TA5807X and TA6029 respectively.

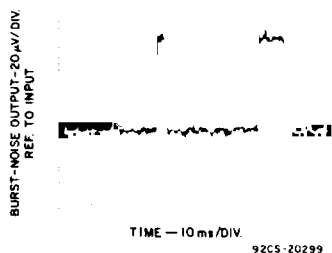
# CA6078A, CA6741

## MAXIMUM RATINGS, Absolute-Maximum Values at $T_A = 25^\circ\text{C}$

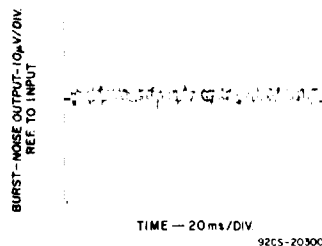
	CA6741T	CA6078AT
DC Supply Voltage (between $V^+$ and $V^-$ terminals)	44 V	36 V
Differential-Mode Input Voltage	$\pm 30$ V	$\pm 6$ V
Common-Mode DC Input Voltage <sup>▲</sup>	$\pm 15$ V	$V^+$ to $V^-$
Device Dissipation:		
Up to $75^\circ\text{C}$ (CA6741T), Up to $125^\circ$ (CA6078AT)	500 mW	250 mW
Above $75^\circ\text{C}$	Derate linearly 5 mW/ $^\circ\text{C}$	
Temperature Range:		
Operating	$-55$ to $+125^\circ\text{C}$	$-55$ to $+125^\circ\text{C}$
Storage	$-65$ to $+150^\circ\text{C}$	$-65$ to $+150^\circ\text{C}$
Output Short-Circuit Duration <sup>●</sup>	No limitation	No limitation
Lead Temperature (During soldering):		
At distance $1/16 \pm 1/32$ inch ( $1.59 \pm 0.79$ mm)		
from case for 10 seconds max.	$300^\circ\text{C}$	$300^\circ\text{C}$

<sup>▲</sup>If Supply Voltage is less than  $\pm 15$  volts, the Absolute Maximum Input Voltage is equal to the Supply Voltage.

<sup>●</sup>Short circuit may be applied to ground or to either supply.

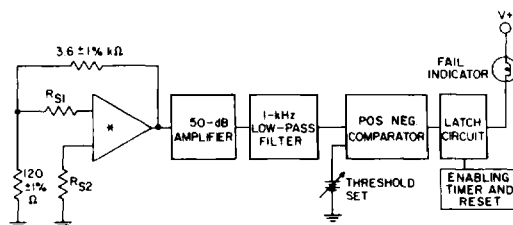


a. Typ. device with high-burst-noise characteristic.



b. Typ. device controlled for burst noise.

Fig.1—Typ. waveforms of type with high burst noise and type controlled for burst noise.



$R_{S1}$  &  $R_{S2}$  =  $100\text{ k}\Omega$  FOR CA6741T AND  $200\text{ k}\Omega$  FOR CA6078AT  
 \* CA6741T OR CA6078AT

92CS-19423

Fig.2—Block diagram of burst-noise "popcorn" test equipment.

## CA6078A, CA6741

### ELECTRICAL CHARACTERISTICS – CA6078AT, For Equipment Design.

CHARACTERISTICS	SYMBOLS	TEST CONDITIONS Supply Volts: $V^+ = 6, V^- = -6$ $T_A = 25^\circ\text{C}, I_Q = 20 \mu\text{A}$	LIMITS			UNITS
			MIN.	TYP.	MAX.	
<b>Noise Characteristic</b>						
“Popcorn” (Burst) Noise		Bandwidth = 1 kHz $R_{S1} = R_{S2} = 200 \text{ k}\Omega$	Device is rejected if the total noise voltage (burst + 1/f), referred to input, exceeds 20 $\mu\text{V}$ peak, during a 30-sec. test period.			
<b>Principal Characteristics (For detailed Electrical Characteristics refer to CA3078AT Data Bulletin, File No. 535.)</b>						
Input Offset Voltage	$V_{IO}$	$R_S \leq 10 \text{ k}\Omega$	–	0.7	3.5	mV
Input Offset Current	$I_{IO}$		–	0.5	2.5	nA
Input Bias Current	$I_{IB}$		–	7	12	nA
Open-Loop Differential Voltage Gain	$A_{OL}$	$R_L \geq 10 \text{ k}\Omega$ $V_O = \pm 4\text{V}$	40,000 92	100,000 100	–	– dB
Common-Mode Input Voltage Range	$V_{ICR}$	$V^+ = V^- = 15 \text{ V}$	$\pm 14$	–	–	V
Common-Mode Rejection Ratio	CMRR	$R_S \leq 10 \text{ k}\Omega$	80	115	–	dB
Output Voltage Swing	$V_{O(P-P)}$	$R_L \geq 10 \Omega$ $R_L \geq 2 \text{ k}\Omega$	$\pm 13.7$ –	$\pm 14.1$ $\pm 14$	–	– V
Supply Current	$I_Q$		–	20	25	$\mu\text{A}$

### ELECTRICAL CHARACTERISTICS – CA6741T, For Equipment Design.

CHARACTERISTICS	SYMBOLS	TEST CONDITIONS Supply Volts: $V^+ = 15, V^- = -15$ $T_A = 25^\circ\text{C}$	LIMITS			UNITS
			MIN.	TYP.	MAX.	
<b>Noise Characteristic</b>						
“Popcorn” (Burst) Noise		Bandwidth = 1 kHz $R_{S1} = R_{S2} = 100 \text{ k}\Omega$	Device is rejected if the total noise voltage (burst + 1/f), referred to input, exceeds 20 $\mu\text{V}$ peak, during a 30-sec. test period.			
<b>Principal Characteristics (For detailed Electrical Characteristics refer to CA3741T Data Bulletin, File No. 531.)</b>						
Input Offset Voltage	$V_{IO}$	$R_S \leq 10 \text{ k}\Omega$	–	1	5	mV
Input Offset Current	$I_{IO}$		–	20	200	nA
Input Bias Current	$I_{IB}$		–	80	500	nA
Open-Loop Differential Voltage Gain	$A_{OL}$	$R_L \geq 2 \text{ k}\Omega$ $V_O = \pm 10 \text{ V}$	50,000 94	200,000 106	–	– dB
Common-Mode Input Voltage Range	$V_{ICR}$		$\pm 12$	$\pm 13$	–	V
Common-Mode Rejection Ratio	CMRR	$R_S \leq 10 \text{ k}\Omega$	70	90	–	dB
Output Voltage Swing	$V_{O(P-P)}$	$R_L \geq 10 \text{ k}\Omega$ $R_L \geq 2 \text{ k}\Omega$	$\pm 12$ $\pm 10$	$\pm 14$ $\pm 13$	–	– V
Supply Current	$I_Q$		–	1.7	2.8	mA

# CA6078A, CA6741

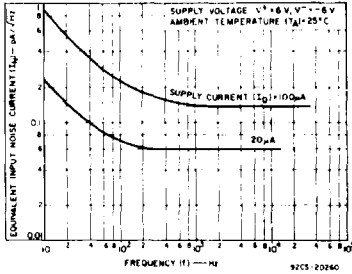


Fig.3— $I_N$  vs. Frequency for CA6078AT.

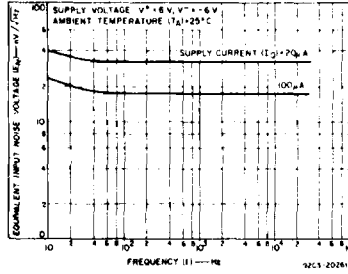


Fig.4— $E_N$  vs. Frequency for CA6078AT.

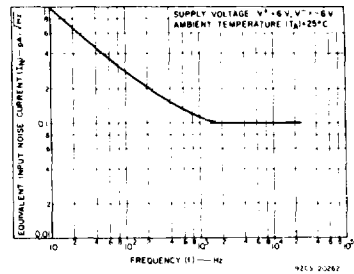


Fig.5— $I_N$  vs. Frequency for CA6741T.

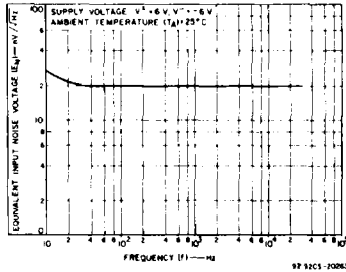


Fig.6— $E_N$  vs. Frequency for CA6741T.

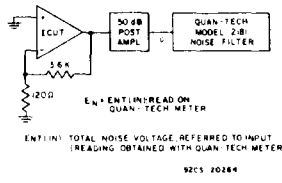


Fig.7—Test block diagram for  $E_N$ .

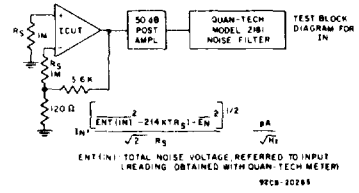


Fig.8—Test block diagram for  $I_N$ .

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