

# LM107, LM207, LM307 HIGH-PERFORMANCE OPERATIONAL AMPLIFIERS

D962, DECEMBER 1970—REVISED JUNE 1988

- Low Input Currents
- No Frequency Compensation Required
- Low Input Offset Parameters
- Short-Circuit Protection
- No Latch-Up
- Wide Common-Mode and Differential Voltage Ranges

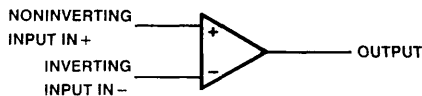
## description

The LM107, LM207, and LM307 are high-performance operational amplifiers featuring very low input bias current and input offset voltage and current to improve the accuracy of high-impedance circuits using these devices.

The high common-mode input voltage range and the absence of latch-up make these amplifiers ideal for voltage follower applications. The devices are short-circuit protected and the internal frequency compensation ensures stability without external components.

The LM107 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ , the LM207 is characterized for operation from  $-25^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ , and the LM307 is characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

## symbol

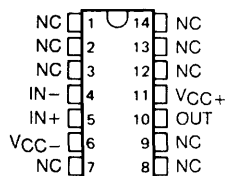


## AVAILABLE OPTIONS

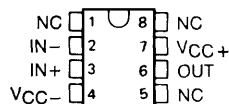
T <sub>A</sub>	V <sub>IO</sub> MAX at 25°C	PACKAGE					
		SMALL OUTLINE (D)	CERAMIC (J)	CERAMIC DIP (JG)	PLASTIC DIP (P)	FLAT PACK (U)	FLAT PACK (W)
0°C to 70°C	7.5 mV	LM307D	—	LM307JG	LM307P	—	—
-25°C to 85°C	2 mV	LM207D	—	LM207JG	LM207P	—	—
-55°C to 125°C	2 mV	—	LM107J	LM107JG	—	LM107U	LM107W

The D package is available taped and reeled. Add the suffix R to the device type when ordering. (e.g., LM307DR)

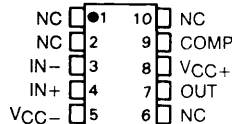
### LM107 . . . J OR W PACKAGE (TOP VIEW)



### LM107 . . . JG PACKAGE LM207, LM307 . . . D, JG, OR P PACKAGE (TOP VIEW)



### LM107 . . . U FLAT PACKAGE (TOP VIEW)



NC—No internal connection

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Operational Amplifiers

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Operational Amplifiers

	LM107	LM207	LM307	UNIT
Supply voltage $V_{CC+}$ (see Note 1)	22	22	18	V
Supply voltage $V_{CC-}$ (see Note 1)	-22	-22	-18	V
Differential input voltage (see Note 2)	$\pm 30$	$\pm 30$	$\pm 30$	V
Input voltage (either input, see Notes 1 and 3)	$\pm 15$	$\pm 15$	$\pm 15$	V
Duration of output short-circuit (see Note 4)	unlimited	unlimited	unlimited	
Continuous total dissipation	See Dissipation Rating Table			
Operating free-air temperature range	-55 to 125	-25 to 85	0 to 70	$^{\circ}\text{C}$
Storage temperature range	-65 to 150	-65 to 150	-65 to 150	$^{\circ}\text{C}$
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds: J, JG, U, or W package	300	300	300	$^{\circ}\text{C}$
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: D or P package		260	260	$^{\circ}\text{C}$

- NOTES: 1. All voltage values, unless otherwise noted, are with respect to the midpoint between  $V_{CC+}$  and  $V_{CC-}$ .  
 2. Differential voltages are at the noninverting input terminal with respect to the inverting input terminal.  
 3. The magnitude of the input voltage must never exceed the magnitude of the supply voltage or 15 V, whichever is less.  
 4. The output may be shorted to ground or either power supply. For the LM107 only, the unlimited duration of the short-circuit applies at (or below) 125 $^{\circ}\text{C}$  case temperature or 75 $^{\circ}\text{C}$  free-air temperature. For the LM207 only, the unlimited duration of the short-circuit applies at (or below) 85 $^{\circ}\text{C}$  case temperature or 75 $^{\circ}\text{C}$  free-air temperature.

DISSIPATION RATING TABLE

PACKAGE	$T_A \leq 25^{\circ}\text{C}$	DERATING FACTOR	DERATE ABOVE $T_A$	$T_A = 70^{\circ}\text{C}$	$T_A = 85^{\circ}\text{C}$	$T_A = 125^{\circ}\text{C}$
	POWER RATING			POWER RATING	POWER RATING	POWER RATING
D	500 mW	5.8 mW/ $^{\circ}\text{C}$	64 $^{\circ}\text{C}$	464 mW	377 mW	—
J (LM107)	500 mW	11.0 mW/ $^{\circ}\text{C}$	105 $^{\circ}\text{C}$	500 mW	500 mW	275 mW
JG (LM107)	500 mW	8.4 mW/ $^{\circ}\text{C}$	90 $^{\circ}\text{C}$	500 mW	500 mW	210 mW
JG (LM207, LM307)	500 mW	6.6 mW/ $^{\circ}\text{C}$	74 $^{\circ}\text{C}$	500 mW	429 mW	—
P	500 mW	N/A	N/A	500 mW	500 mW	—
U	500 mW	5.4 mW/ $^{\circ}\text{C}$	57 $^{\circ}\text{C}$	432 mW	351 mW	135 mW
W	500 mW	8.0 mW/ $^{\circ}\text{C}$	87 $^{\circ}\text{C}$	500 mW	500 mW	200 mW

# LM107, LM207, LM307 HIGH-PERFORMANCE OPERATIONAL AMPLIFIERS

electrical characteristics at specified free-air temperature (see Note 5)

PARAMETER	TEST CONDITIONS†	LM107, LM207			LM307			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	
$V_{IO}$ Input offset voltage	$V_O = 0$	25°C	0.6	2	2	7.5	mV	
		Full range		3		10		
$\alpha_{VIO}$ Average temperature coefficient of input offset voltage	$V_O = 0$	Full range	3	15	6	30	$\mu\text{V}/^\circ\text{C}$	
$I_{IO}$ Input offset current	$V_O = 0$	25°C	1.5	10	3	50	nA	
		Full range		20		70		
$\alpha_{IIO}$ Average temperature coefficient of input offset current	$T_A = -55^\circ\text{C}$ to $25^\circ\text{C}$		0.02	0.2			nA/°C	
	$T_A = 25^\circ\text{C}$ to MAX		0.01	0.1				
	$T_A = 0^\circ\text{C}$ to $25^\circ\text{C}$				0.02	0.6		
	$T_A = 25^\circ\text{C}$ to $70^\circ\text{C}$				0.01	0.3		
$I_{IB}$ Input bias current		25°C	30	75	70	250	nA	
		Full range		100		300		
$V_{ICR}$ Common-mode input voltage range	See Note 6	Full range	$\pm 15$		$\pm 12$		V	
$V_{OPP}$ Maximum peak-to-peak output voltage swing	$V_{CC\pm} = \pm 15\text{ V}$ , $R_L = 10\text{ k}\Omega$	25°C	24	28	24	28	V	
		Full range	24		24			
		25°C	20	26	20	26		
		Full range	20		20			
$A_{VD}$ Large-signal differential voltage amplification	$V_{CC\pm} = \pm 15\text{ V}$ , $V_O = \pm 10\text{ V}$ , $R_L \geq 2\text{ k}\Omega$	25°C	50	200	25	200	V/mV	
		Full range	25		15			
$r_i$ Input resistance		25°C	1.5	4	0.5	2	M $\Omega$	
CMRR Common-mode rejection ratio	$V_{IC} = V_{ICR\text{ min}}$	25°C	80	98	70	90	dB	
		Full range	80		70			
$k_{SVR}$ Supply voltage rejection ratio ( $\Delta V_{CC}/\Delta V_{IO}$ )		25°C	80	98	70	96	dB	
		Full range	80		70			
$I_{CC}$ Supply current	No load, $V_O = 0$ , See Note 6	25°C	1.8	3	1.8	3	mA	
		MAX	1.2	2.5				

† All characteristics are measured under open-loop conditions with zero common-mode input voltage unless otherwise specified. Full range for LM107 is  $-55^\circ\text{C}$  to  $125^\circ\text{C}$ , for LM207 is  $-25^\circ\text{C}$  to  $85^\circ\text{C}$ , and for LM307 is  $0^\circ\text{C}$  to  $70^\circ\text{C}$ .

NOTES: 5. Unless otherwise noted  $V_{CC\pm} = \pm 5\text{ V}$  to  $\pm 20\text{ V}$  for LM107 and LM207, and  $V_{CC\pm} = \pm 5\text{ V}$  to  $\pm 15\text{ V}$  for LM307. All typical values are at  $V_{CC\pm} = \pm 15\text{ V}$ .

6. For LM107 and LM207,  $V_{CC\pm} = \pm 20\text{ V}$ . For LM307,  $V_{CC\pm} = \pm 15\text{ V}$ .

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