

OP-15/OP-16

ABSOLUTE MAXIMUM RATINGS

Supply Voltage	
A, B, E, F Grades	± 22V
C, G Grades	± 18V
Internal Power Dissipation	500mW
Operating Temperature Range	
A, B, C Grades	− 55°C to 125°C
E, F, G Grades	0°C to 70°C
Junction Temperature	150°C
Differential Input Voltage	
A, B, E, F Grades	± 40V
C, G Grades	± 30V
Input Voltage (Note 4)	
A, B, E, F Grades	± 20V
C, G Grades	± 16V
Output Short Circuit Duration	Indefinite
Storage Temperature Range	− 65°C to 150°C
Lead Temperature (Soldering, 10 sec.)	300°C

PACKAGE/ORDER INFORMATION

TOP VIEW	ORDER PART NUMBER	
	OP-15AH	OP-16AH
TOP VIEW NC VOS TRIM -IN +IN V- (CASE) VOS TRIM OUT V+ H PACKAGE METAL CAN	OP-15BH	OP-16BH
	OP-15CH	OP-16CH
	OP-15EH	OP-16EH
	OP-15FH	OP-16FH
	OP-15GH	OP-16GH
TOP VIEW	OP-15GN8 OP-16GN8	
TOP VIEW VOS TRIM -IN +IN V- VOS TRIM OUT V+ NC NB PACKAGE 8 PIN PLASTIC DIP	V_{OS} is adjusted with a potentiometer ranging from 10k to 1M. The wiper is connected to V^+	

ELECTRICAL CHARACTERISTICS $V_S = \pm 15V$, $T_A = 25^\circ C$ unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS	OP-15A/E OP-16A/E			OP-15B/F OP-16B/F			OP-15C/G OP-16C/G			UNITS
			MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
V_{OS}	Input Offset Voltage	$R_S = 50\Omega$	—	0.2	0.5	—	0.4	1.0	—	0.5	3.0	mV
I_{OS}	Input Offset Current	$T_I = 25^\circ C$ (Note 1) Warmed-Up OP-15 OP-16	—	3	10	—	6	20	—	12	50	pA
			—	5	22	—	10	40	—	20	100	pA
			—	5	25	—	10	50	—	20	125	pA
I_B	Input Bias Current	$T_I = 25^\circ C$ (Note 1) Warmed-Up OP-15 OP-16	—	± 15	± 50	—	± 30	± 100	—	± 60	± 200	pA
			—	± 18	± 110	—	± 40	± 200	—	± 80	± 400	pA
			—	± 20	± 130	—	± 40	± 250	—	± 80	± 500	pA
R_{IN}	Input Resistance		—	10^{12}	—	—	10^{12}	—	—	10^{12}	—	Ω
A_{VOL}	Large Signal Voltage Gain	$R_L \geq 2k\Omega$ $V_O = \pm 10V$	100	240	—	75	220	—	50	200	—	V/mV
V_O	Output Voltage Swing	$R_L = 10k\Omega$ $R_L = 2k\Omega$	± 12 ± 11	± 13 ± 12.7	—	± 12 ± 11	± 13 ± 12.7	—	± 12 ± 11	± 13 ± 12.7	—	V V
I_S	Supply Current	OP-15 OP-16	— —	2.7 4.6	4.0 7.0	— —	2.7 4.6	4.0 7.0	— —	2.8 4.8	5.0 8.0	mA mA
SR	Slew Rate	$A_{VCL} = +1$ OP-15 OP-16	10 18	13 20	—	7.5 12	11 18	—	5 9	9 16	—	V/ μs V/ μs
GBW	Gain Bandwidth Product	(Note 3) OP-15 OP-16	4.0 —	6.0 8.0	—	3.5 —	5.7 7.6	—	3.0 —	5.4 7.2	—	MHz MHz
	Settling Time (Note 2)	to 0.01% OP-15 to 0.10% to 0.01% OP-16 to 0.10%	— — — —	4.5 1.2 3.8 0.9	— — — —	— — — —	4.5 1.2 3.8 0.9	— — — —	— — — —	4.7 1.3 4.0 1.0	— — — —	μs μs μs μs
	Input Voltage Range		± 10.5	—	—	± 10.5	—	—	± 10.3	—	—	V
CMRR	Common-Mode Rejection Ratio	$V_{CM} = \pm 10.5V$ $V_{CM} = \pm 10.3V$	86 —	100 —	—	86 —	100 —	—	— 82	— 96	—	dB dB
PSRR	Power Supply Rejection Ratio	$V_S = \pm 10V$ to $\pm 18V$ $V_S = \pm 10V$ to $\pm 15V$	— —	10 —	51 —	— —	10 —	51 —	— —	— 10	— 80	$\mu V/V$ $\mu V/V$
e_n	Input Noise Voltage Density	$f_0 = 100Hz$ $f_0 = 1000Hz$	— —	20 15	—	— —	20 15	—	— —	20 15	—	nV/ $\sqrt{Hz}$ nV/ $\sqrt{Hz}$
i_n	Input Noise Current Density	$f_0 = 100Hz$ $f_0 = 1000Hz$	— —	0.01 0.01	—	— —	0.01 0.01	—	— —	0.01 0.01	—	pA/ $\sqrt{Hz}$ pA/ $\sqrt{Hz}$
C_{IN}	Input Capacitance		—	3	—	—	3	—	—	3	—	pF

ELECTRICAL CHARACTERISTICS $V_S = \pm 15V$, $-55^\circ C \leq T_A \leq 125^\circ C$ unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS		OP-15A OP-16A			OP-15B OP-16B			OP-15C OP-16C			UNITS
				MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
V_{OS}	Input Offset Voltage	$R_S = 50\Omega$	●	—	0.4	0.9	—	0.7	2.0	—	0.9	4.5	mV
TCV_{OS}	Average Input Offset Voltage Drift Without External Trim		●	—	2	5	—	3	10	—	4	15	$\mu V/^\circ C$
TCV_{OSn}	With External Trim	$R_P = 100k\Omega$	●	—	2	—	—	3	—	—	4	—	$\mu V/^\circ C$
I_{OS}	Input Offset Current	$T_J = 125^\circ C$ (Note 1)	●	—	0.6	4.0	—	0.8	6.0	—	1.0	9.0	nA
		$T_A = 125^\circ C$, Warmed-Up OP-15	●	—	0.8	7.0	—	1.2	11	—	1.5	17	nA
		OP-16	●	—	1.0	8.5	—	1.3	14.5	—	1.7	22	nA
I_B	Input Bias Current	$T_J = 125^\circ C$ (Note 1)	●	—	± 1.2	± 5.0	—	± 1.5	± 7.5	—	± 1.8	± 10	nA
		$T_A = 125^\circ C$, Warmed-Up OP-15	●	—	± 1.7	± 9.0	—	± 2.2	± 14	—	± 2.7	± 19	nA
		OP-16	●	—	± 2.0	± 11	—	± 2.5	± 18	—	± 3.0	± 25	nA
	Input Voltage Range		●	± 10.4	—	—	± 10.4	—	—	± 10.25	—	—	V
CMRR	Common-Mode Rejection Ratio	$V_{CM} = \pm 10.4V$	●	85	97	—	85	97	—	—	—	—	dB
		$V_{CM} = \pm 10.25V$	●	—	—	—	—	—	—	80	93	—	dB
PSRR	Power Supply Rejection Ratio	$V_S = \pm 10V$ to $\pm 18V$	●	—	15	57	—	15	57	—	—	—	$\mu V/V$
		$V_S = \pm 10V$ to $\pm 15V$	●	—	—	—	—	—	—	—	23	100	$\mu V/V$
A_{VOL}	Large Signal Voltage Gain	$R_L \geq 2k\Omega$ $V_O = \pm 10V$	●	35	120	—	30	110	—	25	100	—	V/mV
V_O	Output Voltage Swing	$R_L \geq 10k\Omega$	●	± 12	± 13	—	± 12	± 13	—	± 12	± 13	—	V

ELECTRICAL CHARACTERISTICS $V_S = \pm 15V$, $0^\circ C \leq T_A \leq 70^\circ C$ unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS		OP-15E OP-16E			OP-15F OP-16F			OP-15G OP-16G			UNITS
				MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
V_{OS}	Input Offset Voltage	$R_S = 50\Omega$	●	—	0.3	0.75	—	0.55	1.5	—	0.7	3.8	mV
TCV_{OS}	Average Input Offset Voltage Drift Without External Trim		●	—	2	5	—	3	10	—	4	15	$\mu V/^\circ C$
TCV_{OSn}	With External Trim	$R_P = 100k\Omega$	●	—	2	—	—	3	—	—	4	—	$\mu V/^\circ C$
I_{OS}	Input Offset Current	$T_J = 70^\circ C$ (Note 1)	●	—	0.04	0.30	—	0.06	0.45	—	0.08	0.65	nA
		$T_A = 70^\circ C$, Warmed-Up OP-15	●	—	0.06	0.55	—	0.08	0.80	—	0.10	1.2	nA
		OP-16	●	—	0.07	0.70	—	0.10	1.1	—	0.15	1.7	nA
I_B	Input Bias Current	$T_J = 70^\circ C$ (Note 1)	●	—	± 0.10	± 0.40	—	± 0.12	± 0.60	—	± 0.14	± 0.80	nA
		$T_A = 70^\circ C$, Warmed-Up OP-15	●	—	± 0.13	± 0.75	—	± 0.16	± 1.1	—	± 0.19	± 1.5	nA
		OP-16	●	—	± 0.15	± 0.90	—	± 0.20	± 1.4	—	± 0.25	± 2.0	nA
	Input Voltage Range		●	± 10.4	—	—	± 10.4	—	—	± 10.25	—	—	V
CMRR	Common-Mode Rejection Ratio	$V_{CM} = \pm 10.4V$	●	85	98	—	85	98	—	—	—	—	dB
		$V_{CM} = \pm 10.25V$	●	—	—	—	—	—	—	80	94	—	dB
PSRR	Power Supply Rejection Ratio	$V_S = \pm 10V$ to $\pm 18V$	●	—	13	57	—	13	57	—	—	—	$\mu V/V$
		$V_S = \pm 10V$ to $\pm 15V$	●	—	—	—	—	—	—	—	20	100	$\mu V/V$
A_{VO}	Large Signal Voltage Gain	$R_L \geq 2k\Omega$ $V_O = \pm 10V$	●	65	200	—	50	180	—	35	160	—	V/mV
V_O	Output Voltage Swing	$R_L \geq 10k\Omega$	●	± 12	± 13	—	± 12	± 13	—	± 12	± 13	—	V

The ● denotes the specifications which apply over full operating temperature range.

For MIL-STD components, please refer to LTC 883C data sheet for test listing and parameters.

Note 1: Input bias current is specified for two different conditions. The T_J specification is with the junction at ambient temperature; the warmed-up specification is with the device operating in a warmed-up condition at the ambient temperature specified. I_B and I_{OS} are measured at $V_{CM} = 0$.

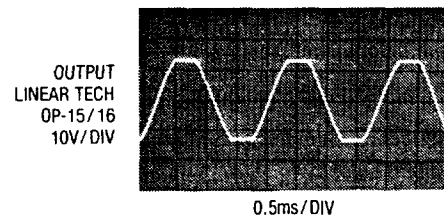
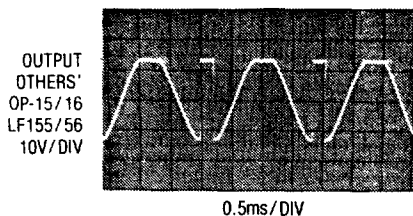
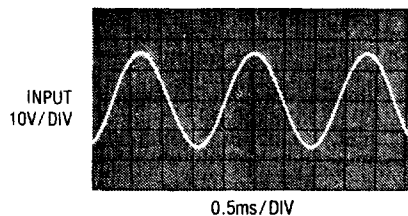
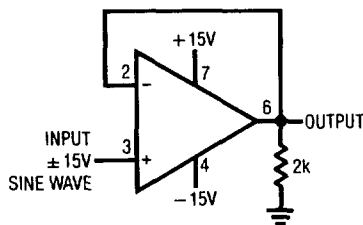
Note 2: Settling time is defined here for a unity gain inverter connection using $2k\Omega$ resistors. It is the time required for the error voltage (the voltage at the inverting input pin on the amplifier) to settle to within a specified percentage of its final value from the time a $10V$ step input is applied to the inverter.

Note 3: Sample tested.

Note 4: Unless otherwise specified, the absolute maximum negative input voltage is equal to the negative power supply voltage.

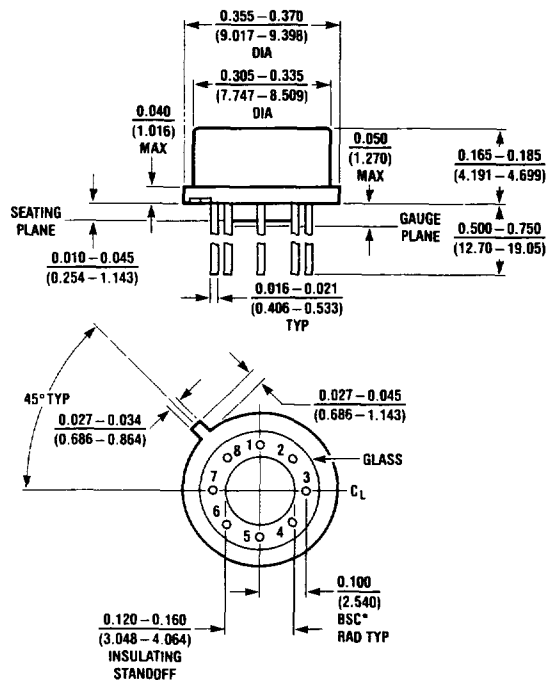
APPLICATIONS

Voltage Follower with Input Exceeding the Negative Common-Mode Range



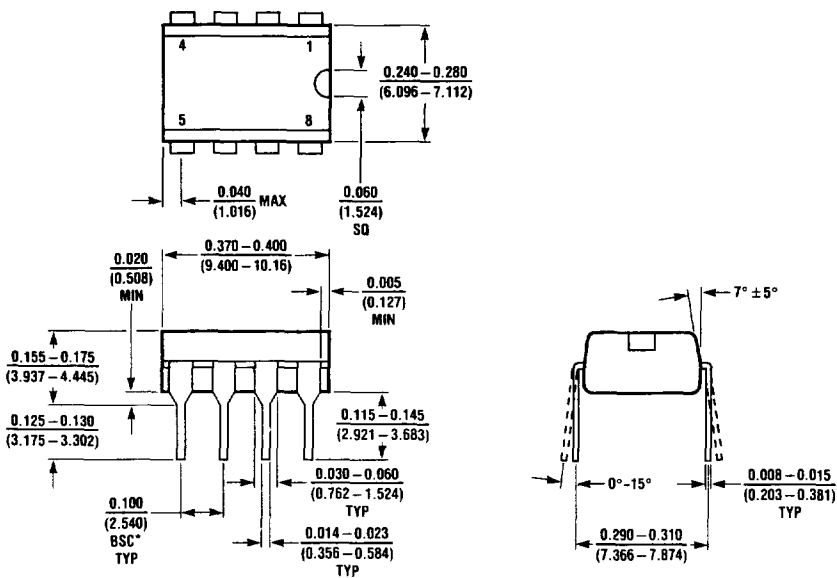
PACKAGE DESCRIPTION

H Package Metal Can



T_{jmax}	θ_{ja}	θ_{jc}
150°C	150°C/W	45°C/W

N8 Package 8 Lead Plastic



T_{jmax}	θ_{ja}
100°C	130°C/W