

ABSOLUTE MAXIMUM RATINGS

Supply Voltage	
LF412AM/AC, OP-215A/E.....	$\pm 22V$
LF412M/C, OP-215C/G.....	$\pm 18V$
Internal Power Dissipation.....	670mW
Operating Temperature Range	
LF412AM/M, OP-215A/C.....	$-55^{\circ}C$ to $125^{\circ}C$
LF412AC/C, OP-215E/G.....	$0^{\circ}C$ to $70^{\circ}C$
Differential Input Voltage	
LF412AM/AC, OP-215A/E.....	$\pm 40V$
LF412M/C, OP-215C/G.....	$\pm 30V$
Input Voltage (Note A)	
LF412AM/AC, OP-215A/E.....	$\pm 20V$
LF412M/C, OP-215C/G.....	$\pm 16V$
Output Short Circuit Duration.....	Indefinite
Storage Temperature Range.....	$-65^{\circ}C$ to $150^{\circ}C$
Lead Temperature (Soldering, 10 sec).....	$300^{\circ}C$

Note A: Maximum negative input voltage is equal to the negative supply voltage.

PACKAGE/ORDER INFORMATION

TOP VIEW	ORDER PART NUMBER
H PACKAGE METAL CAN	LF412AMH OP-215AH LF412MH OP-215CH LF412ACH OP-215EH LF412CH OP-215GH
J8 PACKAGE HERMETIC DIP N8 PACKAGE PLASTIC DIP	LF412AMJ8 OP-215AJ8 LF412MJ8 OP-215CJ8 LF412ACJ8 OP-215EJ8 LF412CJ8 OP-215GJ8 LF412ACN8 OP-215EN8 LF412CN8 OP-215GN8

ELECTRICAL CHARACTERISTICS

$V_S = \pm 20V$ for LF412A, $V_S = \pm 15V$ for all other grades.
 $V_{CM} = 0V$, $T_A = 25^{\circ}C$ unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS	OP-215A/E			LF412AM/AC			LF412, OP-215C/G			UNITS
			MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
V_{OS}	Input Offset Voltage		—	0.2	1.0	—	0.3	1.0	—	0.5	3.0	mV
I_{OS}	Input Offset Current	$T_J = 25^{\circ}C$ (Note 1) Warmed-Up $V_S = \pm 15V$	—	6	50	—	6	50	—	10	100	pA
			—	10	100	—	10	100	—	15	200	pA
I_B	Input Bias Current	$T_J = 25^{\circ}C$ (Note 1) Warmed-Up $V_S = \pm 15V$	—	± 10	± 100	—	± 10	± 100	—	± 15	± 200	pA
			—	± 15	± 300	—	± 15	± 300	—	± 20	± 400	pA
R_{IN}	Input Resistance		—	10^{12}	—	—	10^{12}	—	—	10^{12}	—	Ω
A_{VOL}	Large Signal Voltage Gain	$R_L \geq 2k\Omega$, $V_O = \pm 10V$ $V_S = \pm 15V$	150	400	—	100	300	—	50	250	—	V/mV
V_O	Output Voltage Swing	$R_L = 10k\Omega$, $V_S = \pm 15V$ $R_L = 2k\Omega$, $V_S = \pm 15V$	± 12 ± 11	± 13 ± 12.7	—	± 12 ± 11	± 13 ± 12.7	—	± 12 ± 11	± 13 ± 12.7	—	V V
I_S	Supply Current		—	3.8	6.0	—	3.6	5.6	—	3.8	6.8	mA
SR	Slew Rate	$V_S = \pm 15V$	10	15	—	10	15	—	8	13	—	V/ μs
GBW	Gain Bandwidth Product	$V_S = \pm 15V$ (Note 2)	3.5	5.7	—	3.5	5.7	—	3.0	5.5	—	MHz
	Settling Time	to 0.01% to 0.10%	—	2.3 1.1	—	—	2.3 1.1	—	—	2.4 1.2	—	μs μs
	Input Voltage Range		± 11	+14.5 -11.5	—	± 16	+19.5 -16.5	—	± 11	+14.5 -11.5	—	V
CMRR	Common-Mode Rejection Ratio	$V_{CM} = \pm 16V$ $V_{CM} = \pm 11V$ $V_{CM} = \pm 10.5V$	— 78 86	— 100 100	—	80 — —	100 — —	—	— 72 82	— 100 100	—	dB dB dB
PSRR	Power Supply Rejection Ratio	$V_S = \pm 10V$ to $\pm 20V$ $V_S = \pm 10V$ to $\pm 18V$	— 86	— 100	—	80 —	100 —	—	— 80	— 100	—	dB dB
e_n	Input Noise Voltage Density	$f_o = 100Hz$ $f_o = 1000Hz$	— —	20 15	—	— —	20 15	—	— —	20 15	—	nV/ $\sqrt{Hz}$ nV/ $\sqrt{Hz}$
i_n	Input Noise Current Density	$f_o = 100Hz$ $f_o = 1000Hz$	— —	0.01 0.01	—	— —	0.01 0.01	—	— —	0.01 0.01	—	pA/ $\sqrt{Hz}$ pA/ $\sqrt{Hz}$
	Channel Separation	$f = 1Hz$ to $20kHz$	—	120	—	—	120	—	—	120	—	dB

ELECTRICAL CHARACTERISTICS $V_S = \pm 20V$ for LF412A, $V_S = \pm 15V$ for all other grades. $V_{CM} = 0V$, $-55^\circ C \leq T_A \leq 125^\circ C$ unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS		OP-215A			LF412AM			LF412M, OP-215C			UNITS
				MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
V_{OS}	Input Offset Voltage		●	—	0.5	2.0	—	0.7	2.0	—	1.0	5.0	mV
	Average Input Offset Voltage Drift		●	—	3	10	—	4	10	—	5	20	$\mu V/^\circ C$
				(Note 3)						(Note 3)			
I_{OS}	Input Offset Current	$T_J = 125^\circ C$ (Note 1)	●	—	0.8	8	—	0.8	8	—	1.0	12	nA
		$T_A = 125^\circ C$, Warmed-Up	●	—	1.2	14	—	1.2	14	—	1.5	22	nA
		$V_S = \pm 15V$											
I_B	Input Bias Current	$T_J = 125^\circ C$ (Note 1)	●	—	± 1.5	± 10	—	± 1.5	± 10	—	± 1.8	± 15	nA
		$T_A = 125^\circ C$, Warmed-Up	●	—	± 2.2	± 18	—	± 2.2	± 18	—	± 2.7	± 28	nA
		$V_S = \pm 15V$											
	Input Voltage Range	OP-215	●	± 10.3	$+14.5$ -11.5	—	—	—	—	± 10.3	$+14.5$ -11.5	—	V
		LF412	●	—	—	—	± 16	$+19.5$ -16.5	—	± 11	$+14.5$ -11.5	—	V
CMRR	Common-Mode Rejection Ratio	$V_{CM} = \pm 16V$	●	—	—	—	80	100	—	—	—	—	dB
		$V_{CM} = \pm 11V$	●	—	—	—	—	—	—	70	100	—	dB
		$V_{CM} = \pm 10.3V$	●	82	100	—	—	—	—	80	100	—	dB
I_S	Supply Current		●	—	4.2	6.8	—	4.0	5.6	—	4.2	6.8	mA
PSRR	Power Supply Rejection Ratio	$V_S = \pm 10V$ to $\pm 20V$	●	—	—	—	80	100	—	—	—	—	dB
		$V_S = \pm 10V$ to $\pm 16V$	●	80	100	—	—	—	—	78	100	—	dB
A_{VOL}	Large Signal Voltage Gain	$R_L \geq 2k\Omega$, $V_O = \pm 10V$	●	30	150	—	30	150	—	25	150	—	V/mV
		$V_S = \pm 15V$											
V_O	Output Voltage Swing	$R_L \geq 10k\Omega$, $V_S = \pm 15V$	●	± 12	± 13	—	± 12	± 13	—	± 12	± 13	—	V

ELECTRICAL CHARACTERISTICS $V_S = \pm 20V$ for LF412A, $V_S = \pm 15V$ for all other grades. $V_{CM} = 0V$, $0^\circ C \leq T_A \leq 70^\circ C$ unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS		OP-215E			LF412AC			LF412C, OP-215G			UNITS
				MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
V_{OS}	Input Offset Voltage		●	—	0.4	1.65	—	0.5	1.45	—	0.7	3.9	mV
	Average Input Offset Voltage Drift		●	—	3	15	—	4	10	—	5	20	$\mu V/^\circ C$
				(Note 3)						(Note 3)			
I_{OS}	Input Offset Current	$T_J = 70^\circ C$ (Note 1)	●	—	0.06	0.45	—	0.06	0.45	—	0.08	0.65	nA
		$T_A = 70^\circ C$, Warmed-Up	●	—	0.08	0.8	—	0.08	0.8	—	0.10	1.2	nA
		$V_S = \pm 15V$											
I_B	Input Bias Current	$T_J = 70^\circ C$ (Note 1)	●	—	± 0.12	± 0.7	—	± 0.12	± 0.7	—	± 0.14	± 0.9	nA
		$T_A = 70^\circ C$, Warmed-Up	●	—	± 0.16	± 1.4	—	± 0.16	± 1.4	—	± 0.19	± 1.8	nA
		$V_S = \pm 15V$											
	Input Voltage Range	OP-215	●	± 10.3	$+14.5$ -11.5	—	—	—	—	± 10.3	$+14.5$ -11.5	—	V
		LF412	●	—	—	—	± 16	$+19.5$ -11.5	—	± 11	$+14.5$ -11.5	—	V
CMRR	Common-Mode Rejection Ratio	$V_{CM} = \pm 16V$	●	—	—	—	80	100	—	—	—	—	dB
		$V_{CM} = \pm 11V$	●	—	—	—	—	—	—	70	100	—	dB
		$V_{CM} = \pm 10.3V$	●	80	100	—	—	—	—	76	100	—	dB
I_S	Supply Current		●	—	4.0	6.8	—	3.8	5.6	—	4.0	6.8	mA
PSRR	Power Supply Rejection Ratio	$V_S = \pm 10V$ to $\pm 20V$	●	—	—	—	80	100	—	—	—	—	dB
		$V_S = \pm 10V$ to $\pm 16V$	●	80	100	—	—	—	—	76	100	—	dB
A_{VOL}	Large Signal Voltage Gain	$R_L \geq 2k\Omega$, $V_O = \pm 10V$	●	50	180	—	50	180	—	35	180	—	V/mV
		$V_S = \pm 15V$											
V_O	Output Voltage Swing	$R_L \geq 10k\Omega$, $V_S = \pm 15V$	●	± 12	± 13	—	± 12	± 13	—	± 12	± 13	—	V

The ● denotes the specifications which apply over the full operating temperature range. The shaded electrical specifications indicate those parameters which have been improved or guaranteed test limits provided for the first time.

Note 1: Input bias and offset currents are specified for two different conditions. The T specification is with the junction at ambient temperature; the

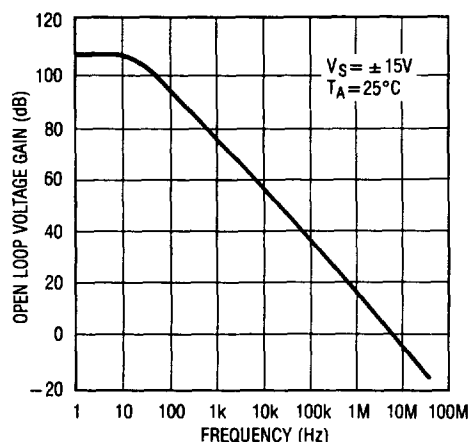
warmed-up specification is with the device operating in a warmed-up condition at the ambient temperature specified.

Note 2: Gain-bandwidth product is not tested. It is guaranteed by design and by inference from the slew rate measurement.

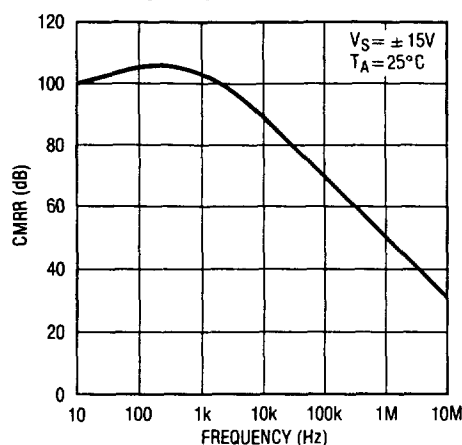
Note 3: The LF412A is 100% tested to this specification. All other grades are sample tested.

TYPICAL PERFORMANCE CHARACTERISTICS

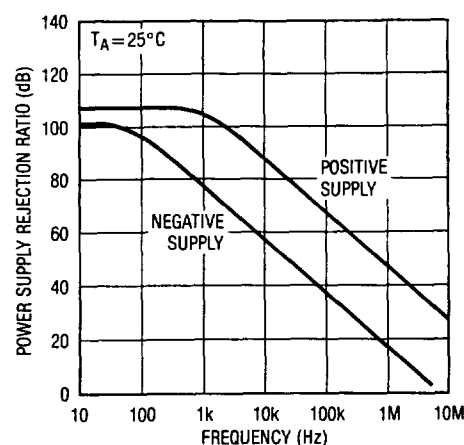
Open-Loop Frequency Response



Common-Mode Rejection Ratio vs Frequency

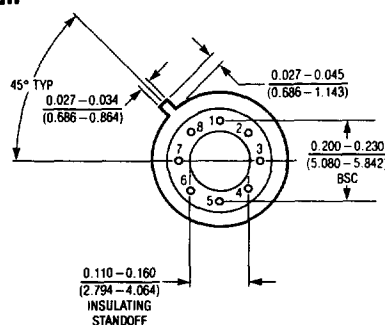
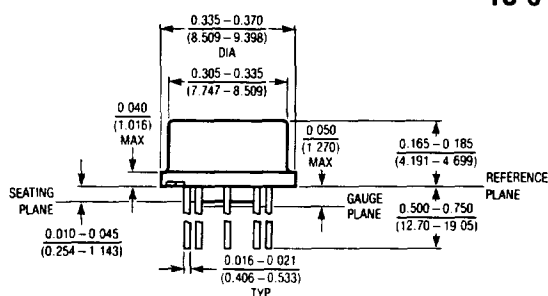


Power Supply Rejection Ratio vs Frequency



PACKAGE DESCRIPTIONS

**H Package
TO-5 Metal Can**

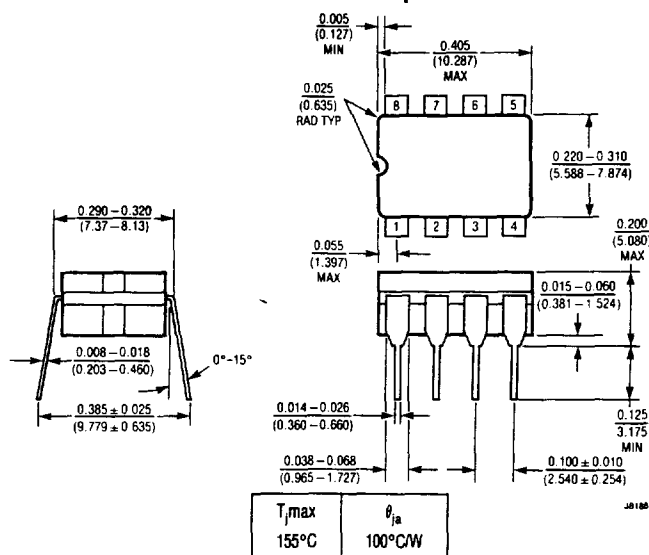


T _j max 165°C	θ _{ja} 140°C/W	θ _{jc} 40°C/W
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NOTE: LEAD DIAMETER IS UNCONTROLLED BETWEEN THE REFERENCE PLANE AND SEATING PLANE.

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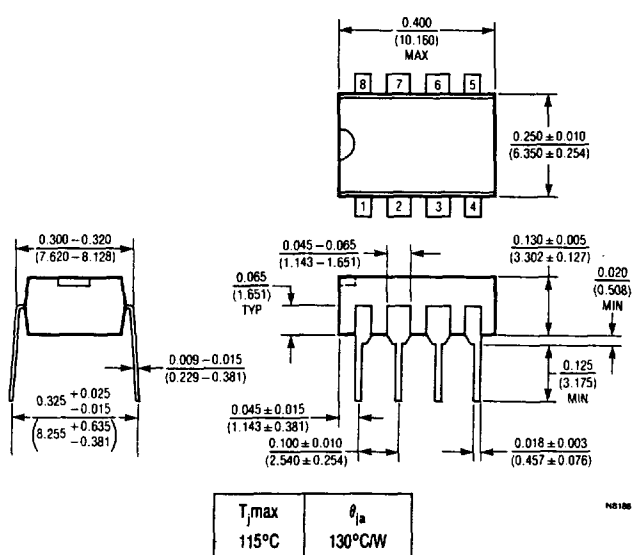
**J Package
8 Lead Cerdip**



T_{jmax} 155°C	θ_{ja} 100°C/W
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4918A

**N Package
8 Lead Molded Dip**



T_{jmax} 115°C	θ_{ja} 130°C/W
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NZ105