

# LM301A LM201A

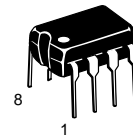
## Operational Amplifiers

A general purpose operational amplifier that allows the user to choose the compensation capacitor best suited to his needs. With proper compensation, summing amplifier slew rates to 10 V/μs can be obtained.

- Low Input Offset Current: 20 nA Maximum Over Temperature Range
- External Frequency Compensation for Flexibility
- Class AB Output Provides Excellent Linearity
- Output Short Circuit Protection
- Guaranteed Drift Characteristics

### OPERATIONAL AMPLIFIERS

#### SEMICONDUCTOR TECHNICAL DATA

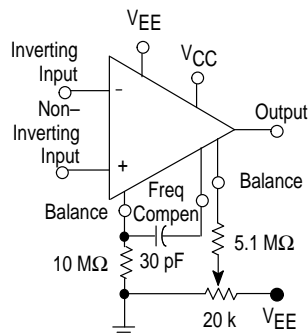


**N SUFFIX**  
PLASTIC PACKAGE  
CASE 626

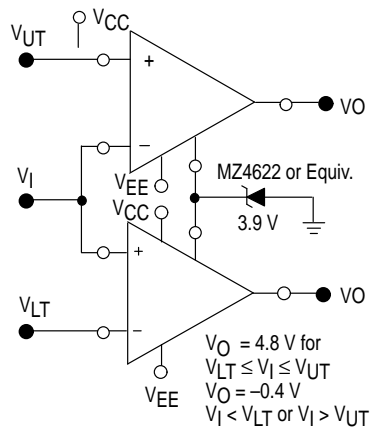


**D SUFFIX**  
PLASTIC PACKAGE  
CASE 751  
(SO-8)

**Figure 1. Standard Compensation and Offset Balancing Circuit**

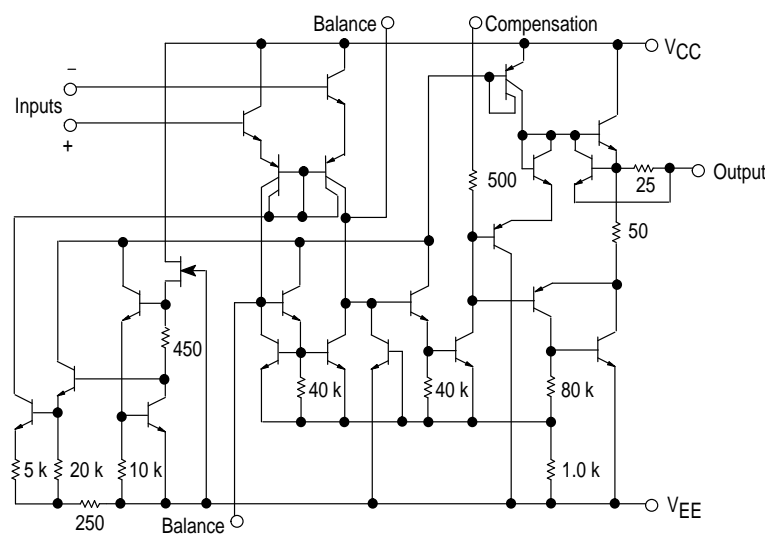


**Figure 2. Double-Ended Limit Detector**

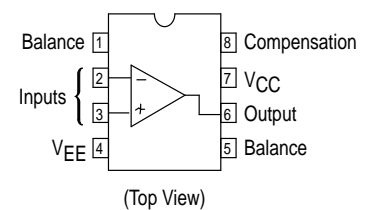


(Pins Not Shown Are Not Connected)

**Figure 3. Representative Circuit Schematic**



### PIN CONNECTIONS



### ORDERING INFORMATION

Device	Operating Temperature Range	Package
LM301AD LM301AN	$T_A = 0^\circ \text{ to } +70^\circ \text{C}$	SO-8 Plastic DIP
LM201AD LM201AN	$T_A = -25^\circ \text{ to } +85^\circ \text{C}$	SO-8 Plastic DIP

# LM301A LM201A

## MAXIMUM RATINGS

Rating	Symbol	Value		Unit
		LM201A	LM301A	
Power Supply Voltage	$V_{CC}, V_{EE}$	$\pm 22$	$\pm 18$	Vdc
Input Differential Voltage	$V_{ID}$	$\longleftrightarrow \pm 30 \longrightarrow$		V
Input Common Mode Range (Note 1)	$V_{ICR}$	$\longleftrightarrow \pm 15 \longrightarrow$		V
Output Short Circuit Duration	$t_{SC}$	$\longleftrightarrow$ Continuous $\longrightarrow$		
Power Dissipation (Package Limitation) Plastic Dual-In-Line Package (LM201A/ Derate above $T_A = +25^\circ\text{C}$ 301A)	$P_D$	625 5.0	625 5.0	mW mW/ $^\circ\text{C}$
Operating Ambient Temperature Range	$T_A$	-25 to +85	0 to +70	$^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	$\longleftrightarrow -65$ to $+150 \longrightarrow$		$^\circ\text{C}$

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

**ELECTRICAL CHARACTERISTICS** ( $T_A = +25^\circ\text{C}$ , unless otherwise noted.) Unless otherwise specified, these specifications apply for supply voltages from  $\pm 5.0$  V to  $\pm 20$  V for the LM201A, and from  $\pm 5.0$  V to  $\pm 15$  V for the LM301A.

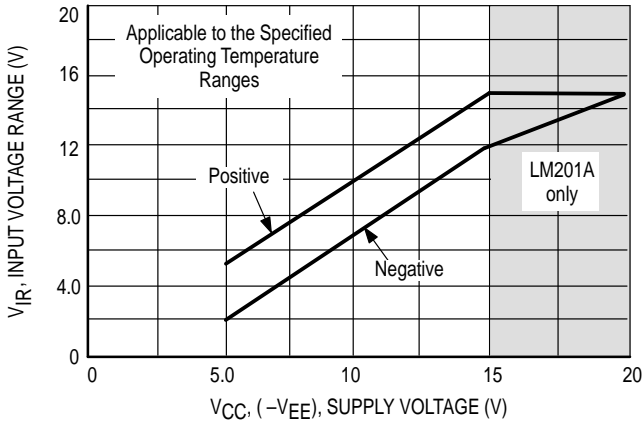
Characteristic	Symbol	LM201A			LM301A			Unit
		Min	Typ	Max	Min	Typ	Max	
Input Offset Voltage ( $R_S \leq 50$ k $\Omega$ )	$V_{IO}$	-	0.7	2.0	-	2.0	7.5	mV
Input Offset Current	$I_{IO}$	-	1.5	10	-	3.0	50	nA
Input Bias Current	$I_{IB}$	-	30	75	-	70	250	nA
Input Resistance	$r_i$	1.5	4.0	-	0.5	2.0	-	M $\Omega$
Supply Current $V_{CC}/V_{EE} = \pm 20$ V $V_{CC}/V_{EE} = \pm 15$ V	$I_{CC}, I_{EE}$	-	1.8	3.0	-	-	-	mA
		-	-	-	-	1.8	3.0	
Large Signal Voltage Gain ( $V_{CC}/V_{EE} = \pm 15$ V, $V_O = \pm 10$ V, $R_L > 2.0$ k $\Omega$ )	$A_V$	50	160	-	25	160	-	V/mV

The following specifications apply over the operating temperature range.

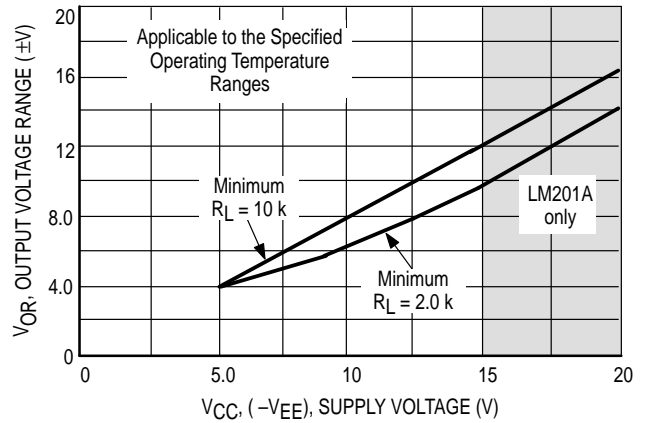
Input Offset Voltage ( $R_S \leq 50$ k $\Omega$ )	$V_{IO}$	-	-	3.0	-	-	10	mV
Input Offset Current	$I_{IO}$	-	-	20	-	-	70	nA
Avg Temperature Coefficient of Input Offset Voltage $T_A(\text{min}) \leq T_A \leq T_A(\text{max})$	$\Delta V_{IO}/\Delta T$	-	3.0	15	-	6.0	30	$\mu\text{V}/^\circ\text{C}$
Avg Temperature Coefficient of Input Offset Current $+25^\circ\text{C} \leq T_A \leq T_A(\text{max})$ $T_A(\text{min}) \leq T_A \leq 25^\circ\text{C}$	$\Delta I_{IO}/\Delta T$	-	0.01 0.02	0.1 0.2	-	0.01 0.02	0.3 0.6	nA/ $^\circ\text{C}$
Input Bias Current	$I_{IB}$	-	-	100	-	-	300	nA
Large Signal Voltage Gain ( $V_{CC}/V_{EE} = \pm 15$ V, $V_O = \pm 10$ V, $R_L > 2.0$ k $\Omega$ )	$A_{VOL}$	25	-	-	15	-	-	V/mV
Input Voltage Range $V_{CC}/V_{EE} = \pm 20$ V $V_{CC}/V_{EE} = \pm 15$ V	$V_{ICR}$	-15 -	- -	+15 -	- -12	- -	- +12	V
Common Mode Rejection ( $R_S \leq 50$ k $\Omega$ )	CMR	80	96	-	70	90	-	dB
Supply Voltage Rejection ( $R_S \leq 50$ k $\Omega$ )	PSR	80	96	-	70	96	-	dB
Output Voltage Swing ( $V_{CC}/V_{EE} = \pm 15$ V, $R_L = \pm 10$ k $\Omega$ , $R_L > 2.0$ k $\Omega$ )	$V_O$	$\pm 12$ $\pm 10$	$\pm 14$ $\pm 13$	- -	$\pm 12$ $\pm 10$	$\pm 14$ $\pm 13$	- -	V
Supply Currents ( $T_A = T_A(\text{max})$ , $V_{CC}/V_{EE} = \pm 20$ V)	$I_{CC}, I_{EE}$	-	1.2	2.5	-	-	-	mA

# LM301A LM201A

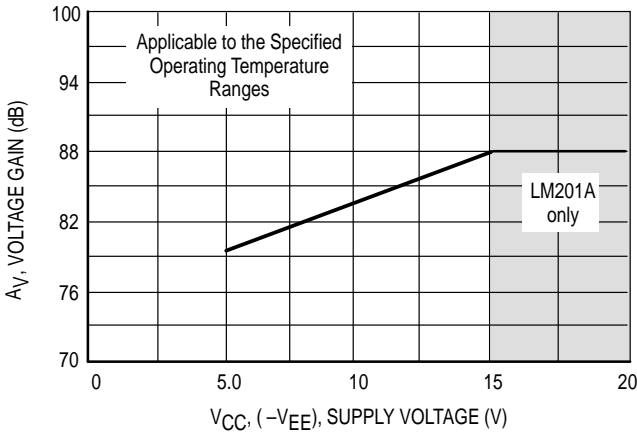
**Figure 4. Minimum Input Voltage Range**



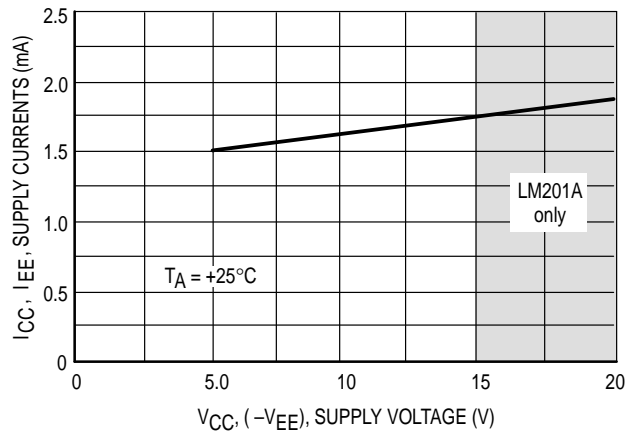
**Figure 5. Minimum Output Voltage Swing**



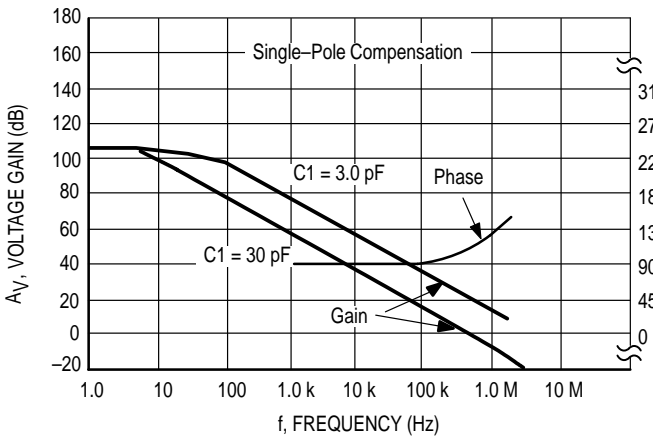
**Figure 6. Minimum Voltage Gain**



**Figure 7. Typical Supply Currents**



**Figure 8. Open Loop Frequency Response**



**Figure 9. Large Signal Frequency Response**

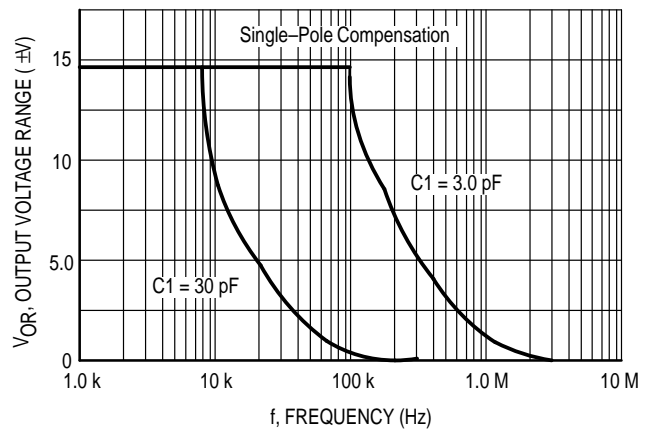


Figure 10. Voltage Follower Pulse Response

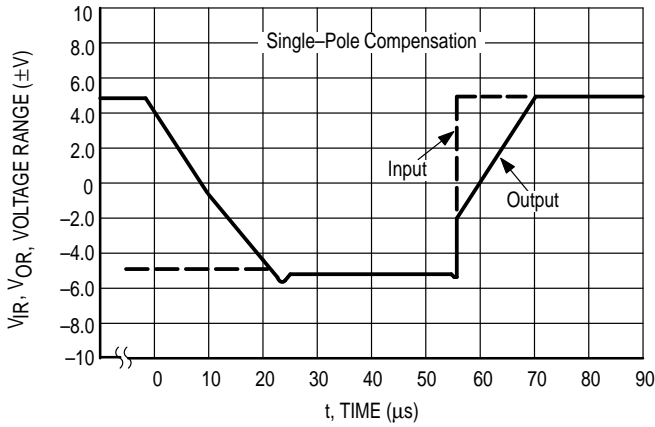


Figure 11. Open Loop Frequency Response

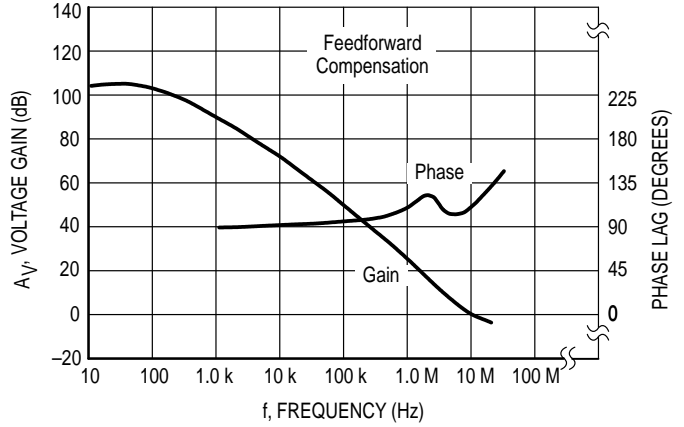


Figure 12. Large Signal Frequency Response

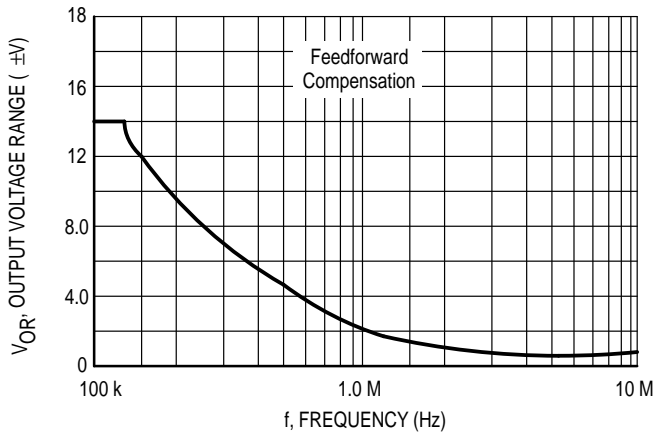


Figure 13. Inverter Pulse Response

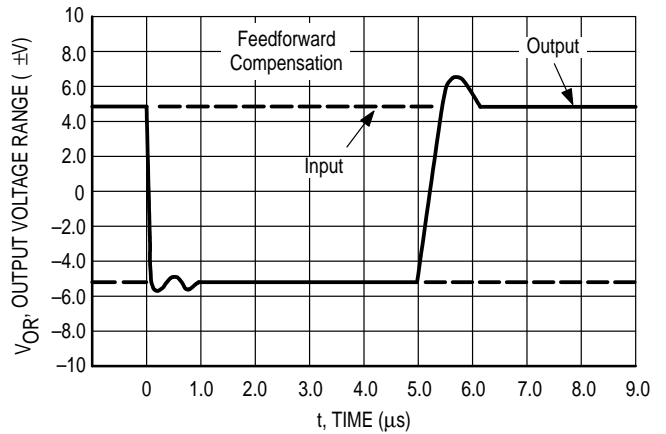


Figure 14. Single-Pole Compensation

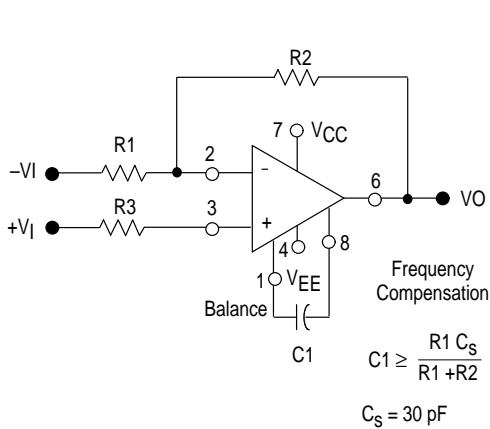
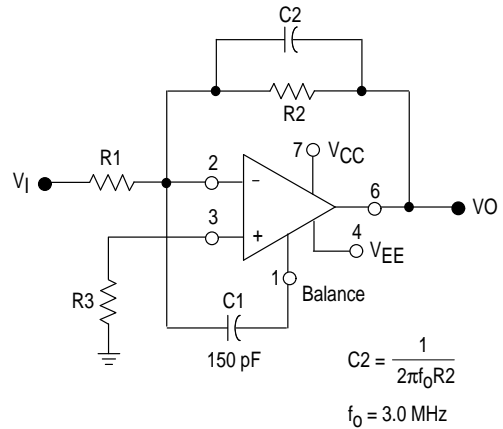


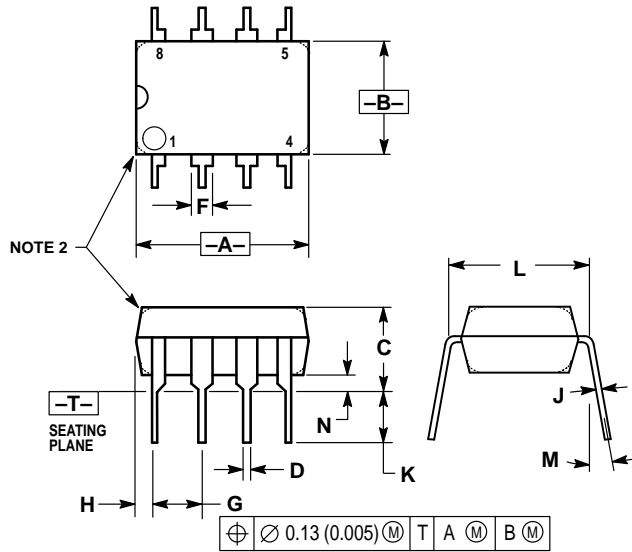
Figure 15. Feedforward Compensation



# LM301A LM201A

## OUTLINE DIMENSIONS

**N SUFFIX**  
 PLASTIC PACKAGE  
 CASE 626-05  
 (LM201A and LM301A)  
 ISSUE K

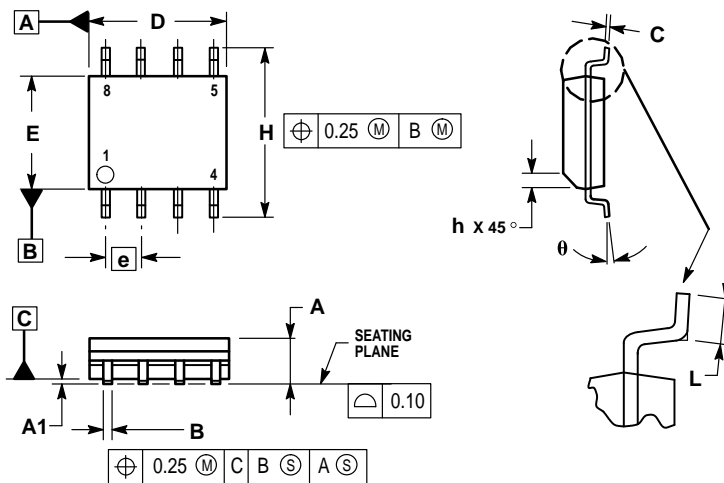


**NOTES:**

1. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.
2. PACKAGE CONTOUR OPTIONAL (ROUND OR SQUARE CORNERS).
3. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.40	10.16	0.370	0.400
B	6.10	6.60	0.240	0.260
C	3.94	4.45	0.155	0.175
D	0.38	0.51	0.015	0.020
F	1.02	1.78	0.040	0.070
G	2.54 BSC		0.100 BSC	
H	0.76	1.27	0.030	0.050
J	0.20	0.30	0.008	0.012
K	2.92	3.43	0.115	0.135
L	7.62 BSC		0.300 BSC	
M	—	10°	—	10°
N	0.76	1.01	0.030	0.040

**D SUFFIX**  
 PLASTIC PACKAGE  
 CASE 751-05  
 (SO-8)  
 ISSUE R




**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. DIMENSIONS ARE IN MILLIMETERS.
3. DIMENSION D AND E DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
5. DIMENSION B DOES NOT INCLUDE MOLD PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 TOTAL IN EXCESS OF THE B DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS	
	MIN	MAX
A	1.35	1.75
A1	0.10	0.25
B	0.35	0.49
C	0.18	0.25
D	4.80	5.00
E	3.80	4.00
e	1.27 BSC	
H	5.80	6.20
h	0.25	0.50
L	0.40	1.25
$\theta$	0°	7°

# LM301A LM201A

Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters which may be provided in Motorola data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and  are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

#### How to reach us:

**USA/EUROPE/Locations Not Listed:** Motorola Literature Distribution;  
P.O. Box 20912; Phoenix, Arizona 85036. 1-800-441-2447 or 602-303-5454

**MFAX:** RMFAX0@email.sps.mot.com – TOUCHTONE 602-244-6609  
**INTERNET:** <http://Design-NET.com>

**JAPAN:** Nippon Motorola Ltd.; Tatsumi-SPD-JLDC, 6F Seibu-Butsuryu-Center,  
3-14-2 Tatsumi Koto-Ku, Tokyo 135, Japan. 03-81-3521-8315

**ASIA/PACIFIC:** Motorola Semiconductors H.K. Ltd.; 8B Tai Ping Industrial Park,  
51 Ting Kok Road, Tai Po, N.T., Hong Kong. 852-26629298



LM301A/D

