LM101A/LH2101A

General Purpose Operational Amplifier

Features

- Input offset voltage 0.7 mV
- Input bias current 30 nA
- Input offset current 1.5 nA
- Full frequency compensation 30pF
- Supply voltage ±5.0V to ±20V

Description

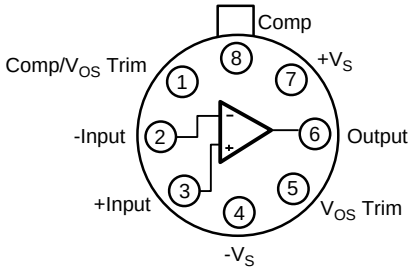
The LM101A/LH2101A is a general purpose high performance operational amplifier fabricated monolithically on a silicon chip by an advanced epitaxial process. The LH2101A consists of two LM101A ICs in one 16-lead DIP. The units may be fully compensated with the addition of a 30 pF capacitor stabilizing the circuit for all feedback configurations including capacitive loads.

The device may be operated as a comparator with a differential input as high as 30V. Used as a comparator the output can be clamped at any desired level to make it compatible with logic circuits.

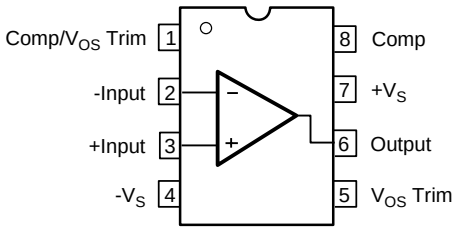
The LM101A and LH2101A operate over the full military temperature range from -55°C to +125°C.

Pin Assignments

8-Lead Metal Can
(Top View)

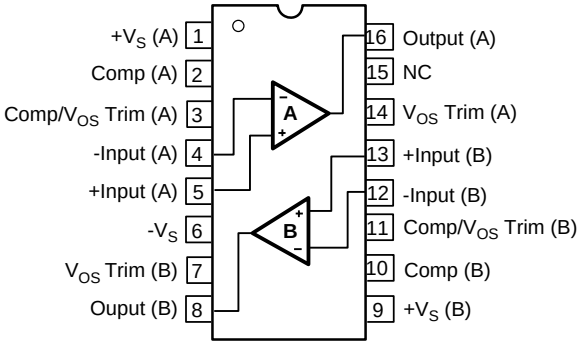


8-Lead DIP
(Top View)



65-101A-01

16-Lead DIP
(Top View)



65-101A-02

Absolute Maximum Ratings

Parameter	Min.	Max.	Units
Supply Voltage		±22	V
Differential Input Voltage		30	V
Input Voltage[1]		±15	V
Output Short-Circuit Duration[2]	Indefinite		
Storage Temperature Range	-65	+150	°C
Operating Temperature Range	-55	+125	°C
Lead Soldering Temperature (60 sec)		+300	°C

Notes:
1. For supply voltages less than ±15V, the absolute maximum input voltage is equal to the supply voltage.
2. Observe package thermal characteristics.

Thermal Characteristics

Parameter	8-Lead Ceramic DIP	8-Lead TO-99 Metal Can	16-Lead Ceramic DIP
Maximum Junction Temperature	+175°C	+175°C	+175°C
Maximum P_D T_A <50°C	833 mW	658 mW	1042 mW
Thermal Resistance, θ_{JC}	45°C/W	50°C/W	60°C/W
Thermal Resistance, θ_{JA}	150°C/W	190°C/W	120°C/W
For T_A > 50°C Derate at	8.33 mW/°C	5.26 mW/°C	8.33 mW/°C

Electrical Characteristics

C = 30pF; ±5.0V ≤ V_S ≤ ±20V; -55°C ≤ T_A ≤ +125°C unless otherwise specified

Parameters	Test Conditions	LM101A/LH2101 A			Units
		Mln.	Typ.	Max.	
Input Offset Voltage	T_A = +25°C, R_S ≤ 50 kΩ		0.7	2.0	mV
Input Offset Current	T_A = +25°C		1.5	10	nA
Input Bias Current	T_A = +25°C		30	75	nA
Input Resistance	T_A = +25°C	1.5	4.0		MΩ
Supply Current	T_A = +25°C V_S = ±20V		1.8	3.0	mA
Large Signal Voltage Gain	T_A = +25°C, V_S = ±15V V_{OUT} = ±10V, R_L ≥ 2 KΩ	50	160		V/mV
Input Offset Voltage	R_S ≤ 50 KΩ			3.0	mV
Average Input Offset Voltage Drift	R_S ≤ 50 KΩ		3.0	15	μV/°C
Input Offset Current				20	nA
Average Input Offset Current Drift	+25°C ≤ T_A +125°C		0.01	0.1	nA/°C
	-55°C ≤ T_A +25°C		0.02	0.2	
Input Bias Current				100	nA
Supply Current	T_A = +125°C, V_S = ±20V		1.2	2.5	mA
Large Signal Voltage Gain	V_S = ±15V V_{OUT} = ±10V, R_L ≥ 2 KΩ	25			V/mV
Output Voltage Swing	V_S = ±15V, R_L = 10 KΩ	±12	±14		V
	R_L = 2 KΩ	±10	±13		
Input Voltage Range	V_S = ±20V	±15			V
Common Mode Rejection Ratio	R_S ≤ 50 KΩ	80	96		dB
Power Supply Rejection Ratio	R_S ≤ 50 KΩ	80	96		dB

Typical Performance Characteristics

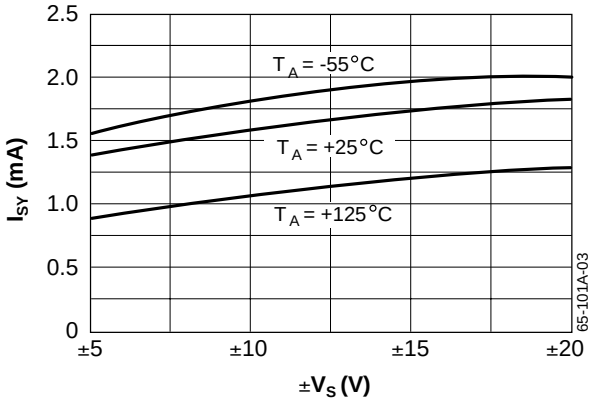


Figure 1. Supply Current vs. Supply Voltage

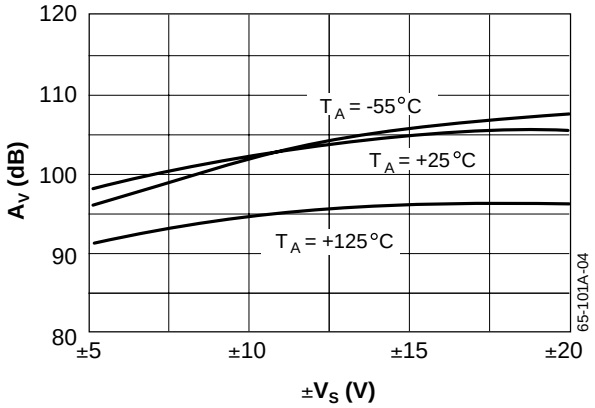


Figure 2. Voltage Gain vs. Supply Voltage

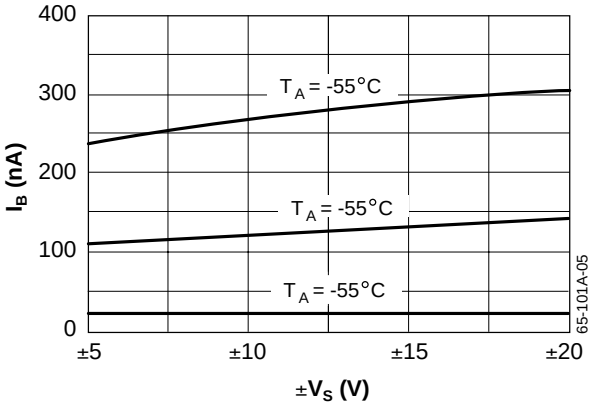


Figure 3. Input Bias Current vs. Supply Voltage

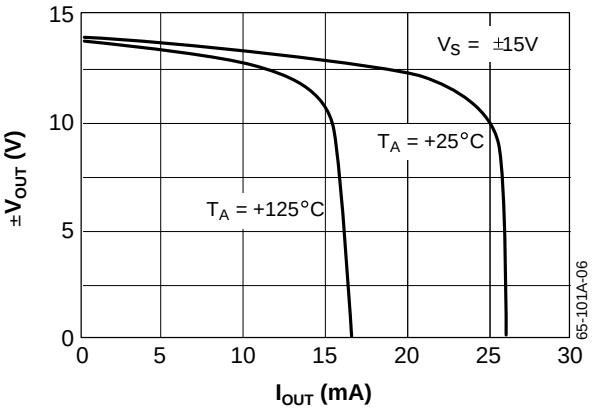


Figure 4. Current Limiting Output Voltage vs. Output Current

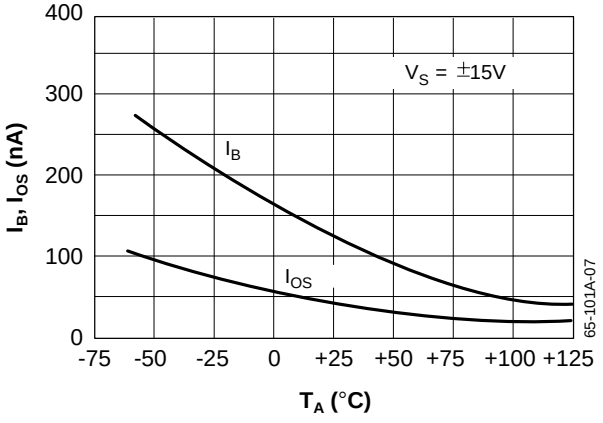


Figure 5. Input Bias, Offset Current vs. Temperature

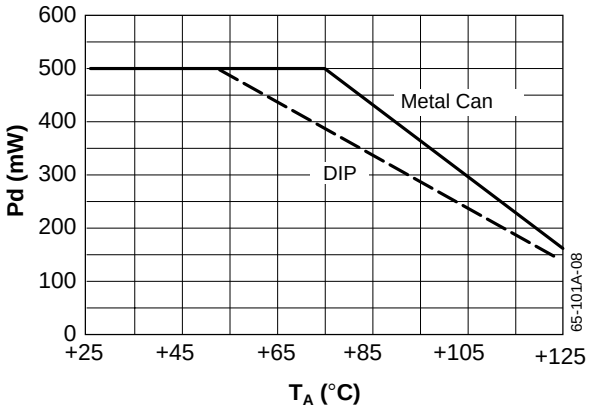


Figure 6. Maximum Power Dissipation vs. Temperature

Typical Performance Characteristics (continued)

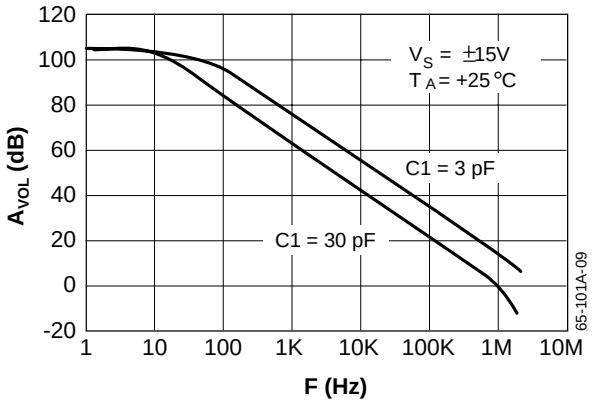


Figure 7. Open Loop Gain vs. Frequency

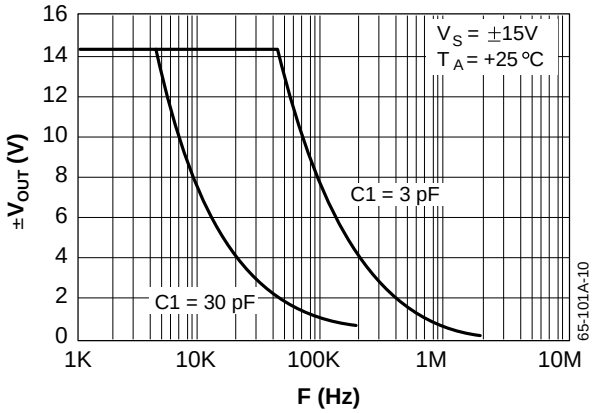


Figure 8. Output Voltage Swing vs. Frequency

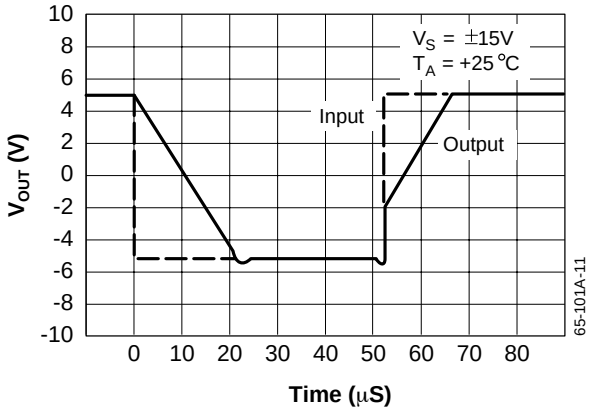
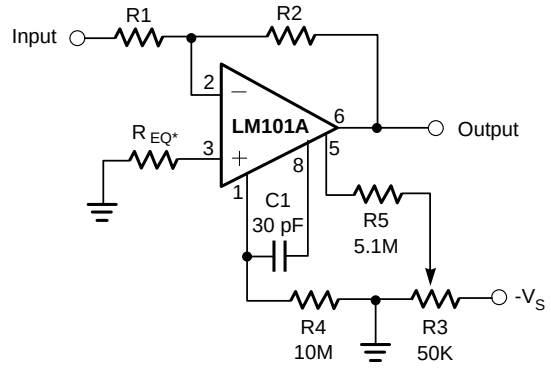


Figure 9. Follower Large Signal Pulse Response Output Voltage vs. Time

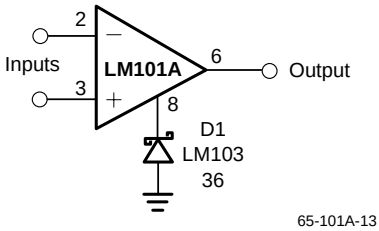
Typical Applications



*May be zero or equal to parallel combination of R1 and R2 for minimum offset.

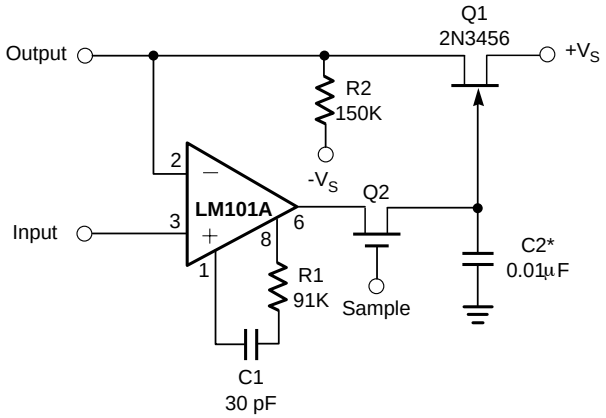
65-101A-12

Figure 10. Inverting Amplifier with Balancing Circuit



65-101A-13

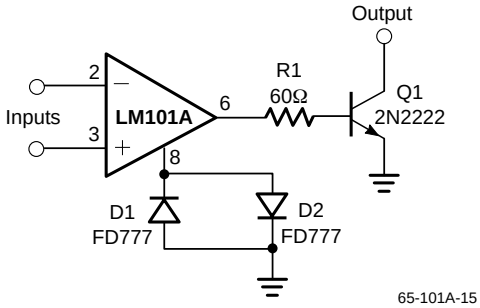
Figure 11. Voltage Comparator for Driving DTL or TTL ICs



*Polycarbonate dielectric capacitor

65-101A-14

Figure 12. Low Drift Sample and Hold



65-101A-15

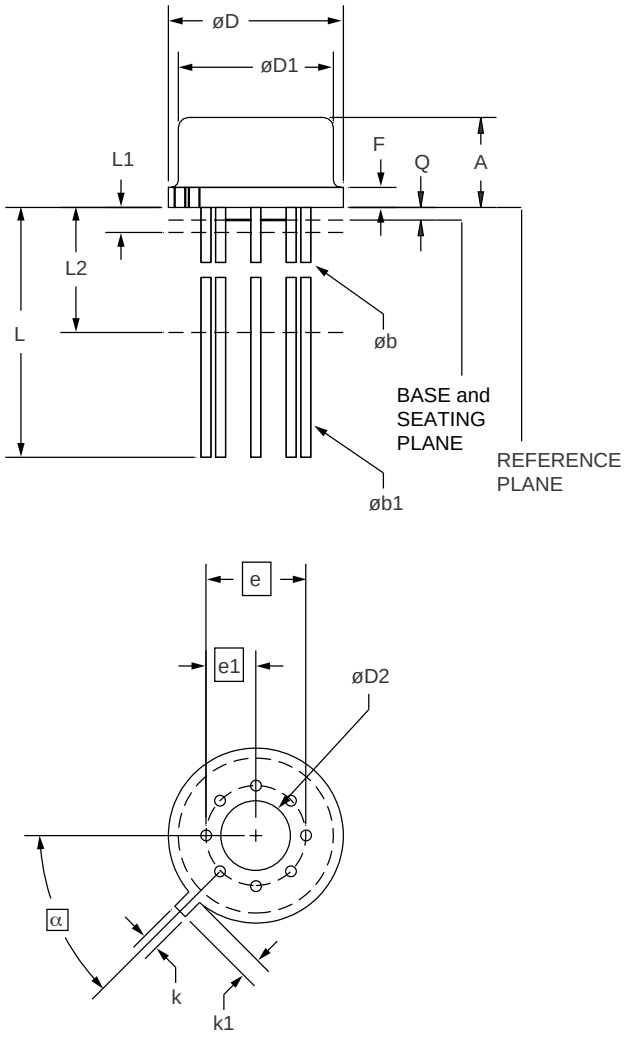
Figure 13. Voltage Comparator for Driving RTL Logic or High Current Driver

Notes:

Notes:

Mechanical Dimensions

8-Lead TO-99 Metal Can



Symbol	Inches		Millimeters		Notes
	Min.	Max.	Min.	Max.	
A	.165	.185	4.19	4.70	
øb	.016	.019	.41	.48	1, 5
øb1	.016	.021	.41	.53	1, 5
øD	.335	.375	8.51	9.52	
øD1	.305	.335	7.75	8.51	
øD2	.110	.160	2.79	4.06	
e	.200 BSC		5.08 BSC		
e1	.100 BSC		2.54 BSC		
F	—	.040	—	1.02	
k	.027	.034	.69	.86	
k1	.027	.045	.69	1.14	2
L	.500	.750	12.70	19.05	1
L1	—	.050	—	1.27	1
L2	.250	—	6.35	—	1
Q	.010	.045	.25	1.14	
α	45° BSC		45° BSC		

Notes:

1. (All leads) øb applies between L1 & L2. øb1 applies between L2 & .500 (12.70mm) from the reference plane. Diameter is uncontrolled in L1 & beyond .500 (12.70mm) from the reference plane.
2. Measured from the maximum diameter of the product.
3. Leads having a maximum diameter .019 (.48mm) measured in gauging plane, .054 (1.37mm) +.001 (.03mm) –.000 (.00mm) below the reference plane of the product shall be within .007 (.18mm) of their true position relative to a maximum width tab.
4. The product may be measured by direct methods or by gauge.
5. All leads – increase maximum limit by .003 (.08mm) when lead finish is applied.

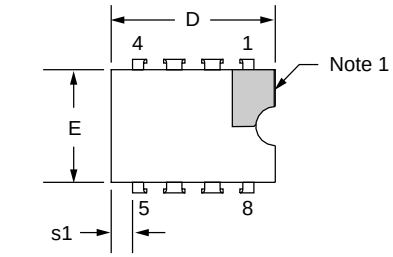
Mechanical Dimensions (continued)

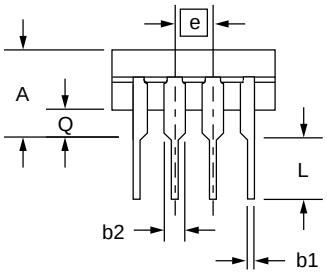
8-Lead Ceramic DIP

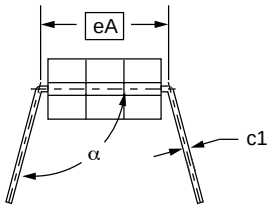
Symbol	Inches		Millimeters		Notes
	Min.	Max.	Min.	Max.	
A	—	.200	—	5.08	
b1	.014	.023	.36	.58	8
b2	.045	.065	1.14	1.65	2, 8
c1	.008	.015	.20	.38	8
D	—	.405	—	10.29	4
E	.220	.310	5.59	7.87	4
e	.100 BSC		2.54 BSC		5, 9
eA	.300 BSC		7.62 BSC		7
L	.125	.200	3.18	5.08	
Q	.015	.060	.38	1.52	3
s1	.005	—	.13	—	6
α	90°	105°	90°	105°	

Notes:

1. Index area: a notch or a pin one identification mark shall be located adjacent to pin one. The manufacturer's identification shall not be used as pin one identification mark.
2. The minimum limit for dimension "b2" may be .023 (.58mm) for leads number 1, 4, 5 and 8 only.
3. Dimension "Q" shall be measured from the seating plane to the base plane.
4. This dimension allows for off-center lid, meniscus and glass overrun.
5. The basic pin spacing is .100 (2.54mm) between centerlines. Each pin centerline shall be located within ±.010 (.25mm) of its exact longitudinal position relative to pins 1 and 8.
6. Applies to all four corners (leads number 1, 4, 5, and 8).
7. "eA" shall be measured at the center of the lead bends or at the centerline of the leads when "α" is 90°.
8. All leads – Increase maximum limit by .003 (.08mm) measured at the center of the flat, when lead finish applied.
9. Six spaces.







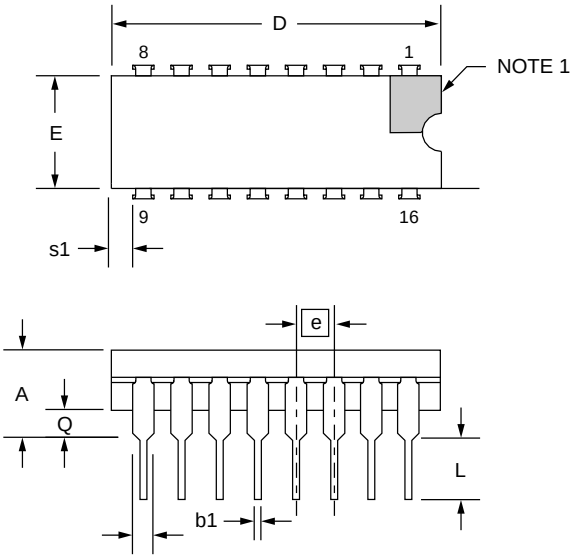
Mechanical Dimensions (continued)

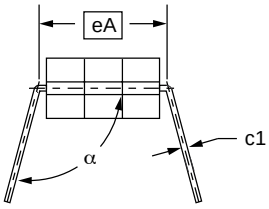
16-Lead Ceramic DIP

Symbol	Inches		Millimeters		Notes
	Min.	Max.	Min.	Max.	
A	—	.200	—	5.08	
b1	.014	.023	.36	.58	8
b2	.050	.065	1.27	1.65	2
c1	.008	.015	.20	.38	8
D	.745	.840	18.92	21.33	4
E	.220	.310	5.59	7.87	4
e	.100 BSC		2.54 BSC		5, 9
eA	.300 BSC		7.62 BSC		7
L	.115	.160	2.92	4.06	
Q	.015	.060	.38	1.52	3
s1	.005	—	.13	—	6
α	90°	105°	90°	105°	

Notes:

1. Index area: a notch or a pin one identification mark shall be located adjacent to pin one. The manufacturer's identification shall not be used as pin one identification mark.
2. The minimum limit for dimension "b2" may be .023 (.58mm) for leads number 1, 8, 9 and 16 only.
3. Dimension "Q" shall be measured from the seating plane to the base plane.
4. This dimension allows for off-center lid, meniscus and glass overrun.
5. The basic pin spacing is .100 (2.54mm) between centerlines. Each pin centerline shall be located within ±.010 (.25mm) of its exact longitudinal position relative to pins 1 and 16.
6. Applies to all four corners (leads number 1, 8, 9, and 16).
7. "eA" shall be measured at the center of the lead bends or at the centerline of the leads when "α" is 90°.
8. All leads – Increase maximum limit by .003 (.08mm) measured at the center of the flat, when lead finish applied.
9. Fourteen spaces.





Ordering Information

Part Number	Package	Operating Temperature Range
LM101AD	8-Lead Ceramic DIP	-55°C to +125°C
LM101AD/883B	8-Lead Ceramic DIP	-55°C to +125°C
LM101AT	8-Lead Metal Can	-55°C to +125°C
LM101AT/883B	8-Lead Metal Can	-55°C to +125°C
LH2101AD	16-Lead Ceramic DIP	-55°C to +1 25°C
LH2101AD/883B	16-Lead Ceramic DIP	-55°C to +125°C

Notes:

1. /883B suffix denotes Mil-Std-883. Level B processing.
2. Contact a Fairchild Semiconductor sales office or representative for ordering information on special package/ temperature range combinations.

5/20/98 0.0m 001
Stock#DS3000101A