



April 1996

LMC6008 8 Channel Buffer

General Description

The LMC6008 octal buffer is designed specifically to buffer the multi-level voltages going to the inputs of the integrated circuits. The LMC6008 AC characteristics, including settling time, are specified for a capacitive load of 0.1 μ F for this reason.

The LMC6008 contains 4 high-speed buffers and 4 low-power buffers. The high-speed buffers can provide an output current of at least 250 mA (minimum), and the low-power buffers can provide at least 150 mA (minimum). By including the 2 types of buffers, the LMC6008 is able to provide this function while consuming a supply current of only 6.5 mA (maximum). The buffers are a rail-to-rail design, which typically swing to within 30 mV of either supply.

The LMC6008 also contains a standby function which puts the buffer into a high-impedance mode. The supply current in the standby mode is a low 500 μ A max. Also, a thermal limit circuit is included to protect the device from overload conditions.

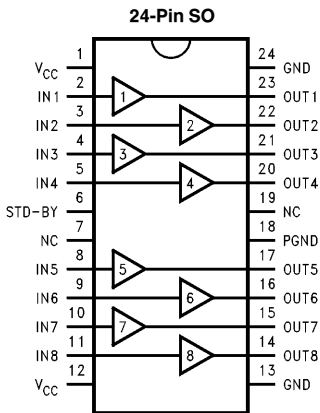
Features

- High Output Current:
 - High Speed Buffers 250 mA min
 - Low Power Buffers 150 mA min
- Slew Rate:
 - High Speed Buffers 1.7 V/ μ s
 - Low Power Buffers 0.85V/ μ s
- Settling Time, $C_L = 0.1 \mu$ F 16 μ s max
- Wide Input/Output Range 0.1V to $V_{CC} - 0.1$ V min
- Supply Voltage Range 5V to 16V
- Supply Current 6.5 mA max
- Standby Mode Current 500 μ A

Applications

- AMLCD voltage buffering
- Multi-voltage buffering

Connection Diagram



TL/H/12321-1

Top View

Note: Buffers 1, 3, 5 and 7 are High Speed and Buffers 2, 4, 6 and 8 are Low Speed.

Ordering Information

Package	Temperature Range - 40°C to + 85°C	NSC Drawing	Transport Media
24-Pin	LMC6008IM	M24B	Rail
Surface Mount	LMC6008IMX	M24B	Tape & Reel

LMC6008 8 Channel Buffer

Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

ESD Tolerance (Note 2)	2000V
Voltage at Input Pin	$V^+ + 0.4V, V^- - 0.4V$
Voltage at Output Pin	$V^+ + 0.4V, V^- - 0.4V$
Supply Voltage ($V^+ - V^-$)	16V
Lead Temperature (soldering, 10 sec.)	260°C
Storage Temperature Range	-55°C to +150°C
Junction Temperature (Note 4)	150°C
Power Dissipation (Note 4)	Internally Limited

Operating Ratings (Note 1)

Supply Voltage	$4.5V \leq V^+ \leq 16V$
Temperature Range	-20°C to +100°C
Thermal Resistance (θ_{JA})	
M Package, 24-Pin Surface Mount	50°C/W

DC Electrical Characteristics

Unless otherwise specified, all limits guaranteed for $T_J = 25^\circ\text{C}$, $V_{CC} = 14.5V$ and $R_L = 0$.

Symbol	Parameter	Conditions	Typ (Note 5)	LMC6008 Limit (Note 6)	Units
V_{OS}	Input Offset Voltage	$R_S = 10\text{ k}\Omega$		25	mV max
A_V	$V_O = 10\text{ V}_{PP}$			0.985	V/V
I_B	Input Bias Current			300	nA max
I_{LP}	Peak Load Current	Hi Speed Buffers $V_O = 13\text{ V}_{PP}$		-250	mA max
				+250	mA min
I_{LP}	Peak Load Current	Lo Speed Buffers $V_O = 13\text{ V}_{PP}$		-150	mA max
				+150	mA min
V_{ERR}	Output Voltage Difference (Note 9)		35		mV max
V_{IH}	Standby Logic High Voltage			3.30	V min
V_{IL}	$I_{STANDBY}$ Logic Low Voltage			1.80	V max
I_{IH}	Standby High Input Current			1.0	μA max
I_{IL}	Standby Low Input Current			1.0	μA max
I_O (STD-BY)	Output Leakage Current	$V_{STD-BY} = \text{High}$		5	μA max
I_{CC}	Supply Current	$V_{IL} = \text{Low}, V_{IN} = 7.25V$		6.5	mA max
I_{STD-BY}	Standby Current	$V_{STD-BY} = \text{High}$		500	μA max
PSRR	Power Supply Rejection Ratio	$5V < V_{CC} < 14.5V$		55	dB min
V_O	Voltage Output Swing			0.1	V min
				$V_{CC} - 0.1$	V max

AC Electrical Characteristics

Unless otherwise specified, all limits guaranteed for $T_J = 25^\circ\text{C}$, $V_{CC} = 14.5\text{V}$ and $R_L = 0\Omega$.

Symbol	Parameter	Conditions	Typ (Note 5)	LMC6008 Limit (Note 6)	Units
SR	Slew Rate	Buffers 1, 3, 5, 7 (Note 3)		1.70	V/ μs min
		Buffers 2, 4, 6, 8 (Note 3)		0.85	V/ μs min
t_S	Settling Time	(Notes 3, 7)		16	μs max
t_{ON}	Standby Response Time ON			10	μs max
t_{OFF}	Standby Response Time OFF			10	μs max
PBW	Power Bandwidth	$V_O = 10 V_{PP}$ for Hi-Speed $V_O = 5 V_{PP}$ for Lo-Speed (Note 3)		45	KHz min
C_L	Load Capacitance			0.1	μF max

Note 1: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating ratings indicate conditions for which the device is intended to be functional, but specific performance is not guaranteed. For guaranteed specifications and the test conditions, see the Electrical Characteristics.

Note 2: Human body model, 1.5 k Ω in series with 100 pF.

Note 3: The Load is a series connection of a 0.1 μF capacitor and a 1 Ω resistor.

Note 4: The maximum power dissipation is a function of $T_{J(max)}$, θ_{JA} , and T_A . The maximum allowable power dissipation at any ambient temperature is $P_D = (T_{J(max)} - T_A)/\theta_{JA}$, where the junction-to-ambient thermal resistance $\theta_{JA} = 50^\circ\text{C}/\text{W}$. If the maximum allowable power dissipation is exceeded, the thermal limit circuit will limit the die temperature to approximately 160°C . All numbers apply for packages soldered directly into a PC board.

Note 5: Typical Values represent the most likely parametric norm.

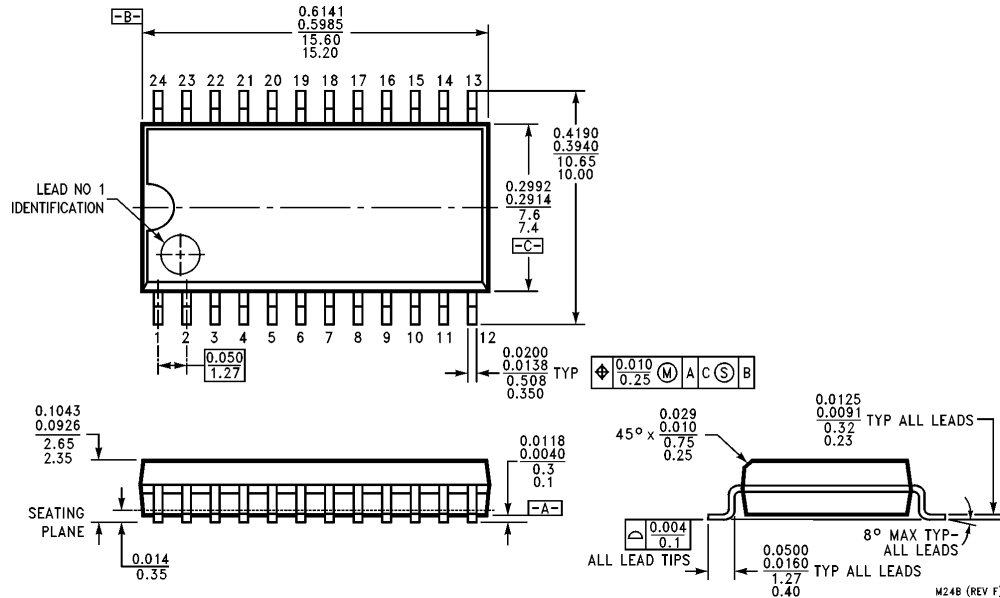
Note 6: All limits are guaranteed by testing or statistical analysis.

Note 7: The settling time is measured from the input transition to a point 50 mV of the final value, for both rising and falling transitions. The input swing is 0.5V to 13.5V for buffers 1, 3, 5, 7 and 3.75V to 10.25V for buffers 2, 4, 6, 8. Input rise time should be less than 1 μs .

Note 8: High-Speed Buffers are 1, 3, 5, 7 and Low-Speed Buffers are 2, 4, 6, 8.

Note 9: Output Voltage Difference is the difference between the highest and lowest buffer output voltage when all buffer inputs are at identical voltages.

Physical Dimensions inches (millimeters) unless otherwise noted



24-Lead (3.00" Wide) Small Outline Molded Package (M)
Order Number LMC6008IM or LMC6008IMX
NS Package Number M24B

LIFE SUPPORT POLICY

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.



National Semiconductor Corporation
 1111 West Bardin Road
 Arlington, TX 76017
 Tel: (800) 272-9959
 Fax: 1(800) 737-7018

<http://www.national.com>

National Semiconductor Europe

Fax: +49 (0) 180-530 85 86
 Email: europe.support@nsc.com
 Deutsch Tel: +49 (0) 180-530 85 85
 English Tel: +49 (0) 180-532 78 32
 Français Tel: +49 (0) 180-532 93 58
 Italiano Tel: +49 (0) 180-534 16 80

National Semiconductor Hong Kong Ltd.

13th Floor, Straight Block,
 Ocean Centre, 5 Canton Rd.
 Tsimshatsui, Kowloon
 Hong Kong
 Tel: (852) 2737-1600
 Fax: (852) 2736-9960

National Semiconductor Japan Ltd.

Tel: 81-043-299-2308
 Fax: 81-043-299-2408

National does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and National reserves the right at any time without notice to change said circuitry and specifications.