National Semiconductor

September 2005

DS90LV027AH High Temperature LVDS Dual Differential Driver

DS90LV027AH
High Temperature LVDS Dual Differential Driver

General Description

The DS90LV027AH is a dual LVDS driver device optimized for high data rate and low power applications. The device is designed to support data rates in excess of 600Mbps (300MHz) utilizing Low Voltage Differential Signaling (LVDS) technology. The DS90LV027AH is a current mode driver allowing power dissipation to remain low even at high frequency. In addition, the short circuit fault current is also minimized.

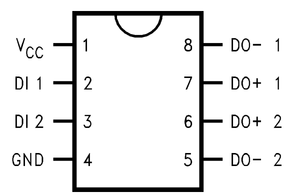
The device is in a 8-lead small outline package. The DS90LV027AH has a flow-through design for easy PCB layout. The differential driver outputs provides low EMI with its typical low output swing of 360 mV. It is perfect for high speed transfer of clock and data. The DS90LV027AH can be paired with its companion dual line receiver, the DS90LV028AH, or with any of National's LVDS receivers, to provide a high-speed point-to-point LVDS interface.

Features

- −40˚C to +125˚C operating temperature range
- >600 Mbps (300MHz) switching rates
- 0.3 ns typical differential skew
- 0.7 ns maximum differential skew
- 3.3V power supply design
- Low power dissipation (46 mW @ 3.3V static)
- Flow-through design simplifies PCB layout
- Power Off Protection (outputs in high impedance)
- Conforms to TIA/EIA-644 Standard
- 8-Lead SOIC package saves space

Connection Diagram

Dual-In-Line



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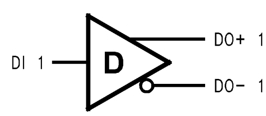
Order Number DS90LV027AHM
See NS Package Number M08A

Functional Diagram



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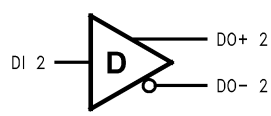

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Absolute Maximum Ratings (Note 1)

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

Supply Voltage (V_{CC})	−0.3V to +4V
Input Voltage (DI)	−0.3V to +3.6V
Output Voltage (DO±)	−0.3V to +3.9V
Maximum Package Power Dissipation @ +25˚C	
M Package	1190 mW
Derate M Package	9.5 mW/˚C above +25˚C
Storage Temperature Range	−65˚C to +150˚C
Lead Temperature Range Soldering	
(4 sec.)	+260˚C

ESD Ratings

(HBM 1.5 kΩ, 100 pF)	≥ 8kV
(EIAJ 0 Ω, 200 pF)	≥ 1000V
(CDM)	≥ 1000V
(IEC direct 330 Ω, 150 pF)	≥ 4kV

Recommended Operating Conditions

	Min	Typ	Max	Units
Supply Voltage (V_{CC})	3.0	3.3	3.6	V
Temperature (T_A)	−40	25	+125	˚C

Electrical Characteristics

Over Supply Voltage and Operating Temperature ranges, unless otherwise specified. (Notes 2, 3, 7)

Symbol	Parameter	Conditions		Pin	Min	Typ	Max	Units
DIFFERENTIAL DRIVER CHARACTERISTICS								
V_{OD}	Output Differential Voltage	R_L = 100Ω (*Figure 1*)		DO+, DO−	250	360	450	mV
ΔV_{OD}	V_{OD} Magnitude Change					1	35	mV
V_{OH}	Output High Voltage					1.4	1.6	V
V_{OL}	Output Low Voltage				0.9	1.1		V
V_{OS}	Offset Voltage				1.125	1.2	1.375	V
ΔV_{OS}	Offset Magnitude Change				0	3	25	mV
I_{OXD}	Power-off Leakage	$V_{OUT} = V_{CC}$ or GND, V_{CC} = 0V				±1	±10	μA
I_{OSD}	Output Short Circuit Current					−5.7	−8	mA
V_{IH}	Input High Voltage			DI	2.0		V_{CC}	V
V_{IL}	Input Low Voltage				GND		0.8	V
I_{IH}	Input High Current	V_{IN} = 3.3V or 2.4V				±2	±10	μA
I_{IL}	Input Low Current	V_{IN} = GND or 0.5V				±1	±10	μA
V_{CL}	Input Clamp Voltage	I_{CL} = −18 mA			−1.5	−0.6		V
I_{CC}	Power Supply Current	No Load	$V_{IN} = V_{CC}$ or GND	V_{CC}		8	14	mA
		R_L = 100Ω				14	20	mA

Switching Characteristics

Over Supply Voltage and Operating Temperature Ranges, unless otherwise specified. (Notes 3, 4, 5, 6)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
DIFFERENTIAL DRIVER CHARACTERISTICS						
t_{PHLD}	Differential Propagation Delay High to Low	R_L = 100Ω, C_L = 15 pF (*Figure 2* and *Figure 3*)	0.3	0.8	2.0	ns
t_{PLHD}	Differential Propagation Delay Low to High		0.3	1.1	2.0	ns
t_{SKD1}	Differential Pulse Skew $\lvert t_{PHLD} - t_{PLHD} \rvert$ (Note 8)		0	0.3	0.7	ns
t_{SKD2}	Channel to Channel Skew (Note 9)		0	0.4	0.8	ns
t_{SKD3}	Differential Part to Part Skew (Note 10)		0		1.0	ns
t_{SKD4}	Differential Part to Part Skew (Note 11)		0		1.2	ns
t_{TLH}	Transition Low to High Time		0.2	0.5	1.0	ns
t_{THL}	Transition High to Low Time		0.2	0.5	1.0	ns
f_{MAX}	Maximum Operating Frequency (Note 12)			350		MHz

Note 1: "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. They are not meant to imply that the devices should be operated at these limits. The table of "Electrical Characteristics" specifies conditions of device operation.

Note 2: Current into device pins is defined as positive. Current out of device pins is defined as negative. All voltages are referenced to ground except V_{OD}.

Note 3: All typicals are given for: V_{CC} = +3.3V and T_A = +25˚C.

Note 4: These parameters are guaranteed by design. The limits are based on statistical analysis of the device over PVT (process, voltage, temperature) ranges.

Note 5: C_L includes probe and fixture capacitance.

Switching Characteristics (Continued)

Note 6: Generator waveform for all tests unless otherwise specified: f = 1 MHz, Z_O = 50Ω, $t_r \leq 1$ ns, $t_f \leq 1$ ns (10%-90%).

Note 7: The DS90LV027AH is a current mode device and only function with datasheet specification when a resistive load is applied to the drivers outputs.

Note 8: t_{SKD1}, $|t_{PHLD} - t_{PLHD}|$, is the magnitude difference in differential propagation delay time between the positive going edge and the negative going edge of the same channel.

Note 9: t_{SKD2} is the Differential Channel to Channel Skew of any event on the same device.

Note 10: t_{SKD3}, Differential Part to Part Skew, is defined as the difference between the minimum and maximum specified differential propagation delays. This specification applies to devices at the same V_{CC} and within 5˚C of each other within the operating temperature range.

Note 11: t_{SKD4}, part to part skew, is the differential channel to channel skew of any event between devices. This specification applies to devices over recommended operating temperature and voltage ranges, and across process distribution. t_{SKD4} is defined as |Max − Min| differential propagation delay.

Note 12: f_{MAX} generator input conditions: $t_r = t_f < 1$ ns (0% to 100%), 50% duty cycle, 0V to 3V. Output criteria: duty cycle = 45%/55%, $V_{OD} > 250$mV, all channels switching.

Parameter Measurement Information

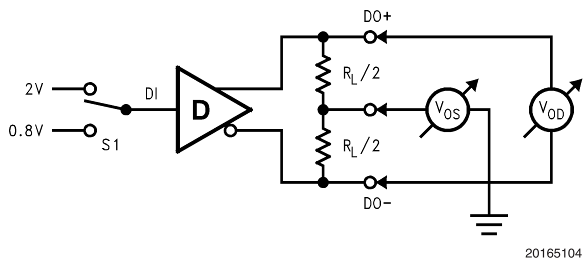


FIGURE 1. Differential Driver DC Test Circuit

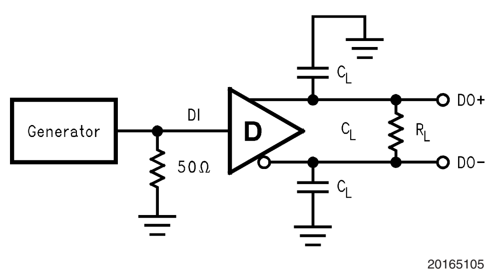


FIGURE 2. Differential Driver Propagation Delay and Transition Time Test Circuit

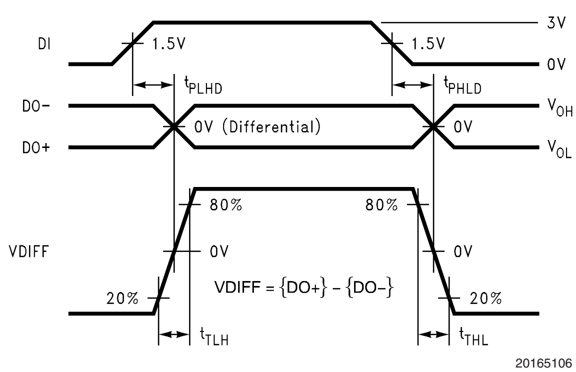


FIGURE 3. Differential Driver Propagation Delay and Transition Time Waveforms

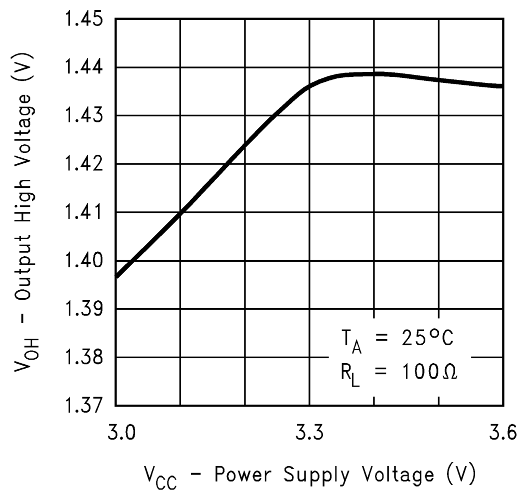
Application Information

TABLE 1. Device Pin Descriptions

Pin #	Name	Description
2, 3	DI	TTL/CMOS driver input pins
6, 7	DO+	Non-inverting driver output pin
5, 8	DO–	Inverting driver output pin
4	GND	Ground pin
1	V_{CC}	Positive power supply pin, +3.3V ± 0.3V

Typical Performance Curves

Output High Voltage vs Power Supply Voltage



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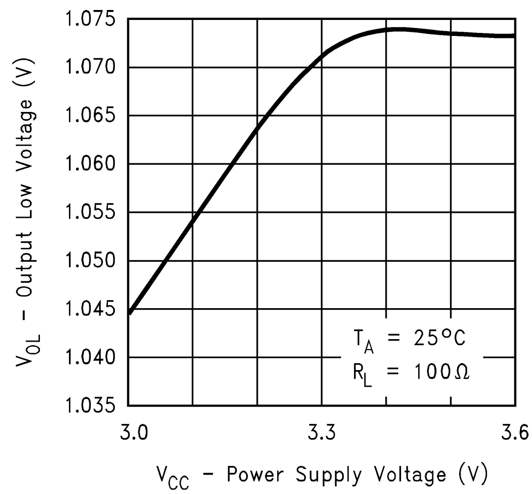
Output Low Voltage vs Power Supply Voltage



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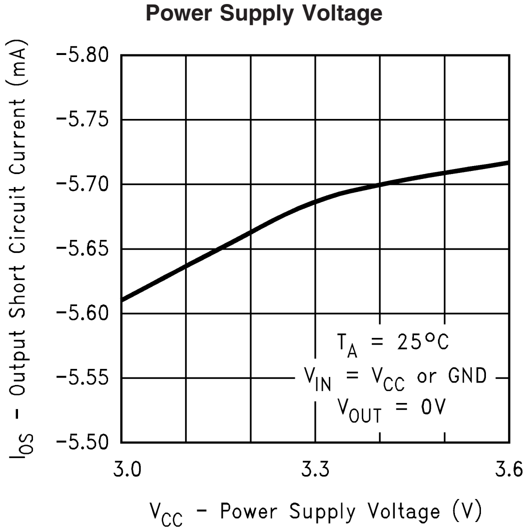
Output Short Circuit Current vs Power Supply Voltage



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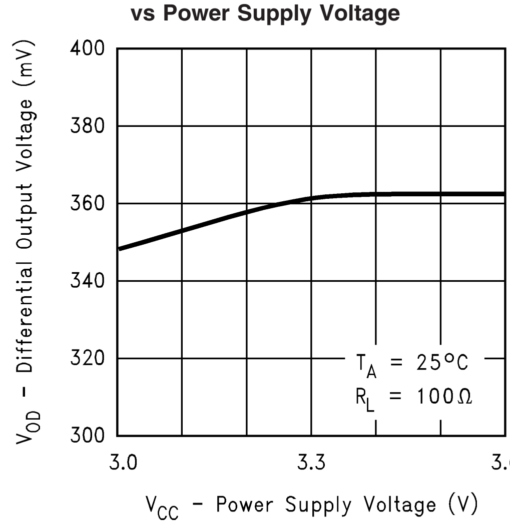
Differential Output Voltage vs Power Supply Voltage



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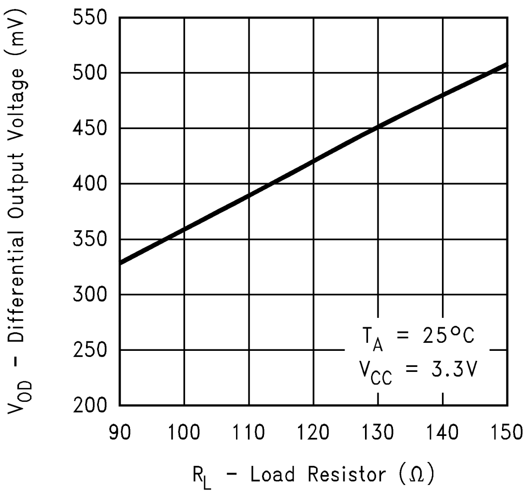
Typical Performance Curves (Continued)

Differential Output Voltage vs Load Resistor



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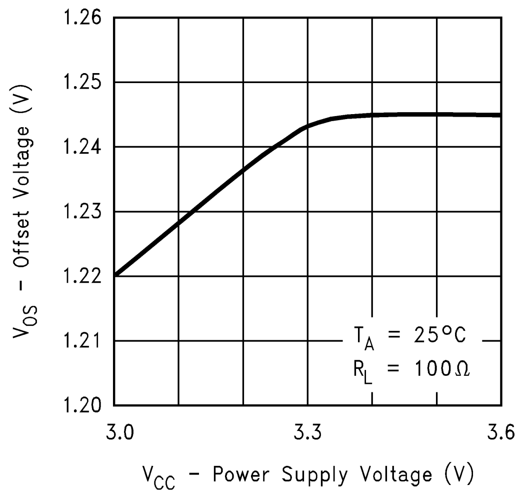
Offset Voltage vs Power Supply Voltage



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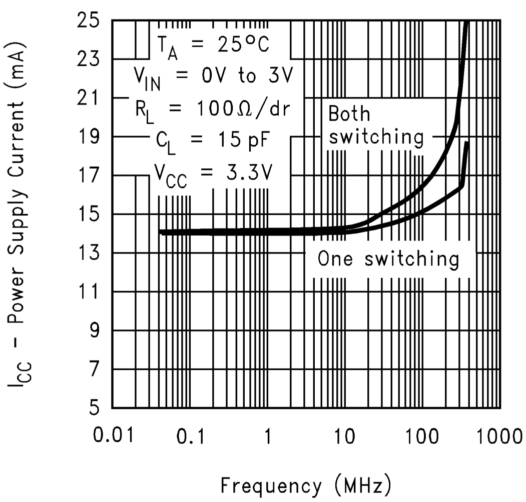
Power Supply Current vs Frequency



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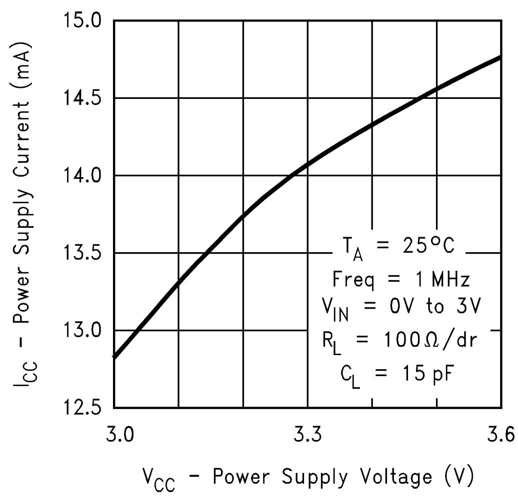
Power Supply Current vs Power Supply Voltage



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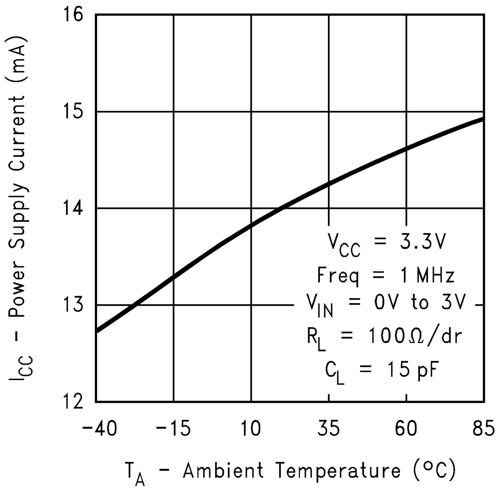
Typical Performance Curves (Continued)

Power Supply Current vs Ambient Temperature



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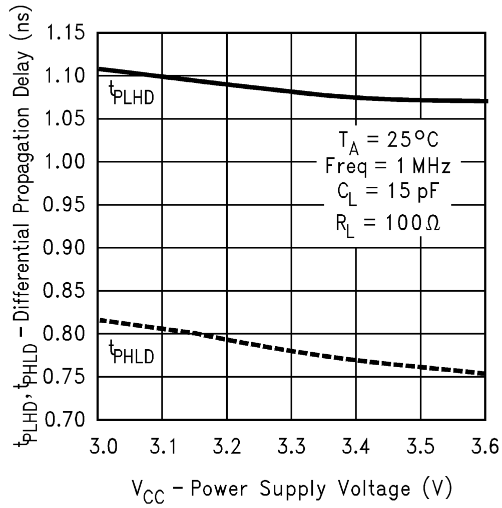
Differential Propagation Delay vs Power Supply Voltage



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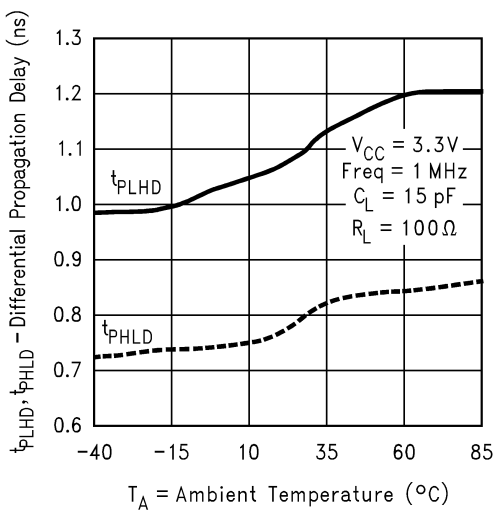
Differential Propagation Delay vs Ambient Temperature



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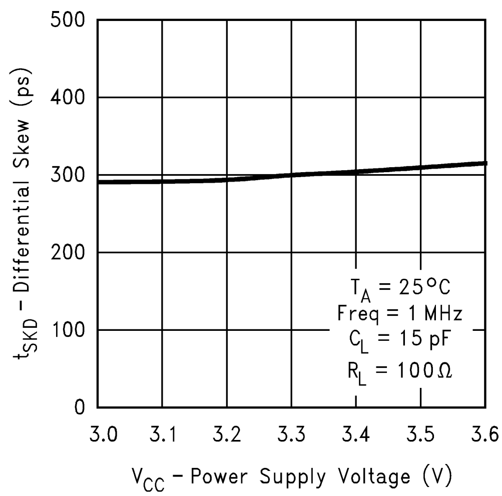
Differential Skew vs Power Supply Voltage



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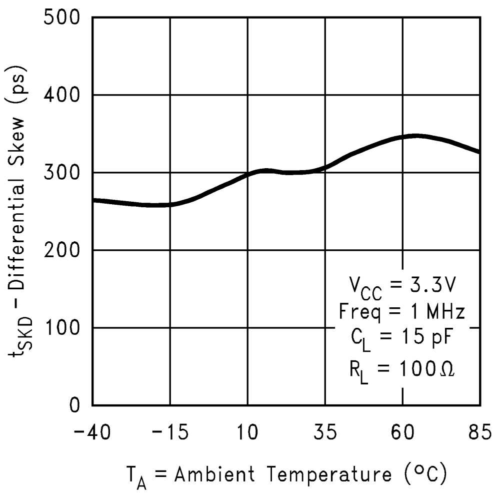
Typical Performance Curves (Continued)

Differential Skew vs Ambient Temperature



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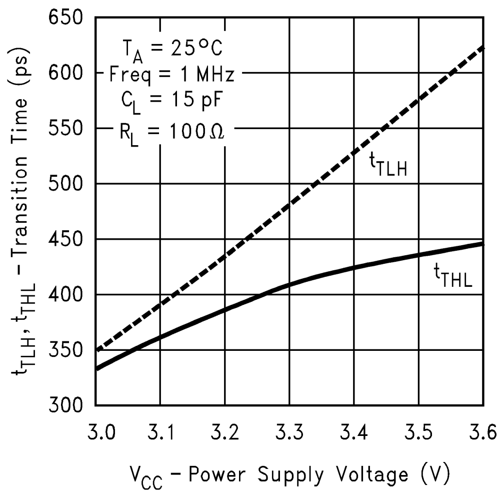
Transition Time vs Power Supply Voltage



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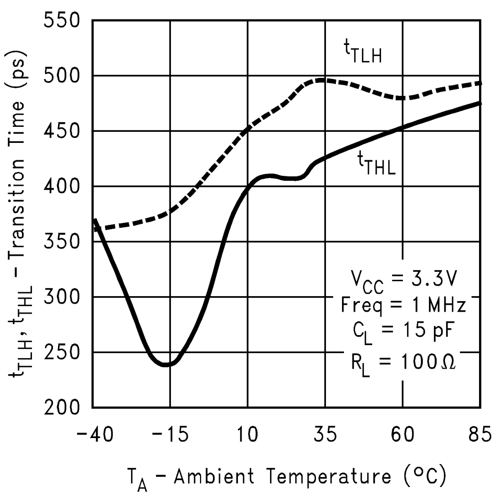
Transition Time vs Ambient Temperature



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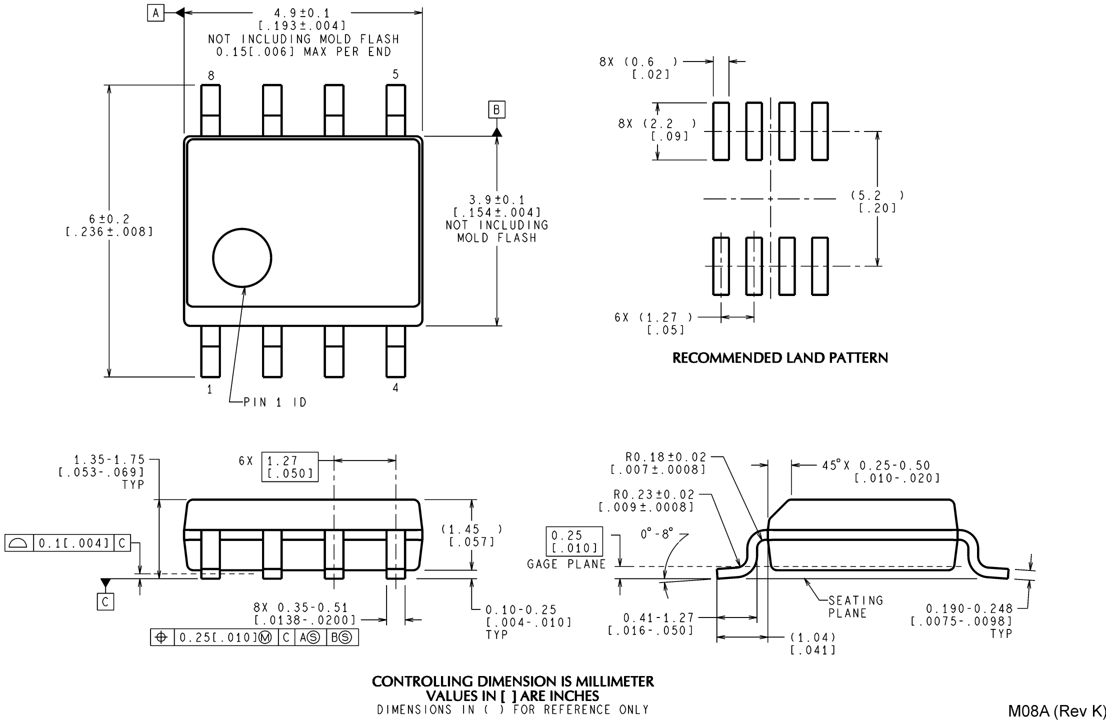
Physical Dimensions inches (millimeters) unless otherwise noted



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NS Package Number M08A

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