

DS90LV027A

DS90LV027A LVDS Dual High Speed Differential Driver



Literature Number: SNLS026B

DS90LV027A

LVDS Dual High Speed Differential Driver

General Description

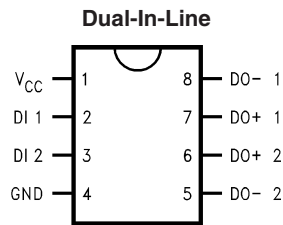
The DS90LV027A is a dual LVDS driver device optimized for high data rate and low power applications. The device is designed to support data rates in excess of 600Mbps (300MHz) utilizing Low Voltage Differential Signaling (LVDS) technology. The DS90LV027A is a current mode driver allowing power dissipation 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 DS90LV027A 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 DS90LV027A can be paired with its companion dual line receiver, the DS90LV028A, or with any of National's LVDS receivers, to provide a high-speed point-to-point LVDS interface.

Features

- >600 Mbps (300MHz) switching rates
- 0.3 ns typical differential skew
- 0.7 ns maximum differential skew
- 1.5 ns maximum propagation delay
- 3.3V power supply design
- ±360 mV differential signaling
- Low power dissipation (46 mW @ 3.3V static)
- Flow-through design simplifies PCB layout
- Interoperable with existing 5V LVDS devices
- Power Off Protection (outputs in high impedance)
- Conforms to TIA/EIA-644 Standard
- 8-Lead SOIC package saves space
- Industrial temperature operating range (-40°C to +85°C)

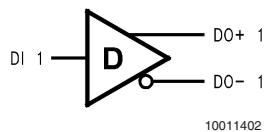
Connection Diagram



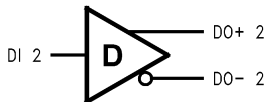
10011401

Order Number DS90LV027ATM
See NS Package Number M08A

Functional Diagram



10011402



10011403

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 \pm)	-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 k Ω , 100 pF)	≥ 8 kV
(EIAJ 0 Ω , 200 pF)	≥ 1000 V
(CDM)	≥ 1000 V
(IEC direct 330 Ω , 150 pF)	≥ 4 kV

Recommended Operating Conditions

	Min	Typ	Max	Units
Supply Voltage (V_{CC})	3.0	3.3	3.6	V
Temperature (T_A)	-40	25	+85	°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	$R_L = 100\Omega$ (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
		$R_L = 100\Omega$				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	$R_L = 100\Omega$, $C_L = 15$ pF (Figure 2 and Figure 3)	0.3	0.8	1.5	ns	
t_{PLHD}	Differential Propagation Delay Low to High		0.3	1.1	1.5	ns	
t_{SKD1}	Differential Pulse Skew $ t_{PHLD} - t_{PLHD} $ (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 $T_A = +25^\circ C$.

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: $f = 1 \text{ MHz}$, $Z_0 = 50\Omega$, $t_r \leq 1 \text{ ns}$, $t_f \leq 1 \text{ ns}$ (10%-90%).

Note 7: The DS90LV027A 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 $I_{Max} - I_{Min}$ differential propagation delay.

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

Parameter Measurement Information

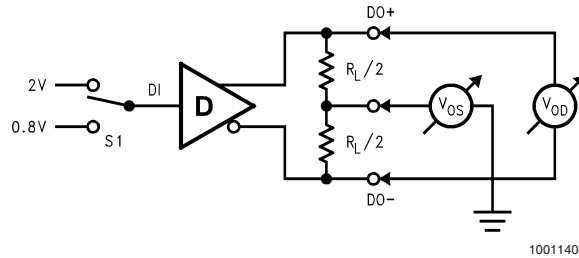


FIGURE 1. Differential Driver DC Test Circuit

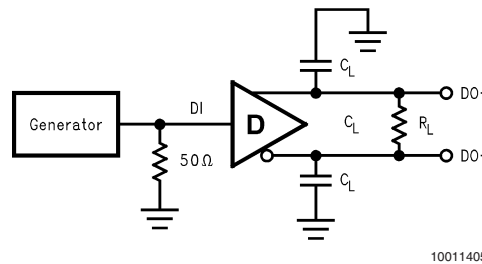


FIGURE 2. Differential Driver Propagation Delay and Transition Time Test Circuit

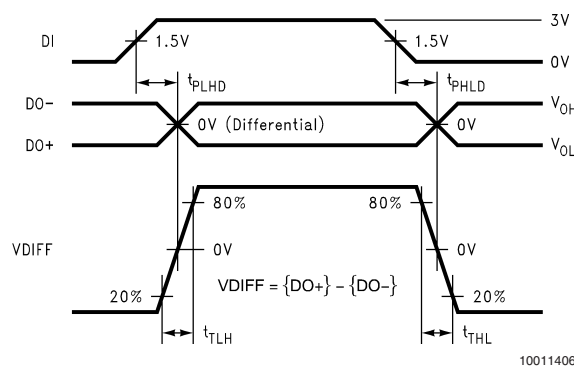


FIGURE 3. Differential Driver Propagation Delay and Transition Time Waveforms

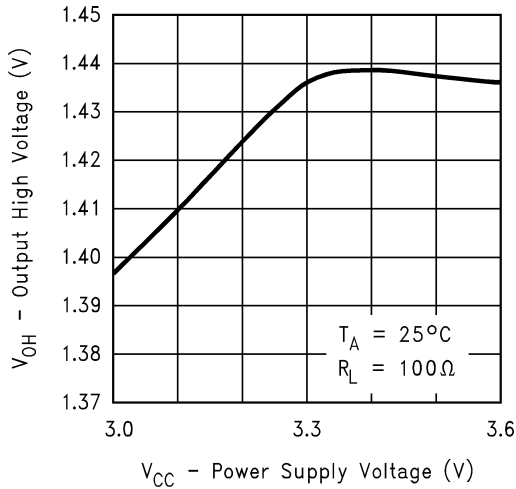
Application Information

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

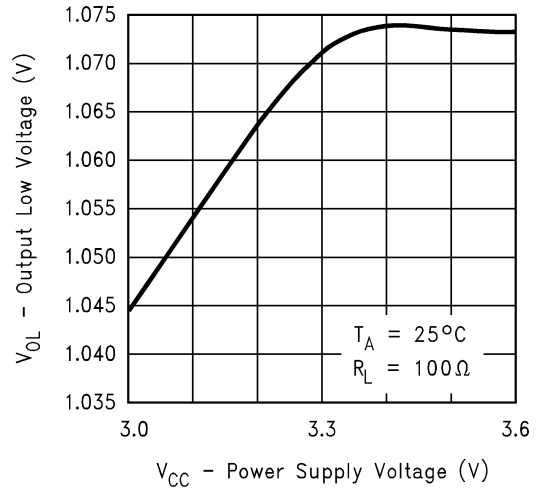
Typical Performance Curves

Output High Voltage vs Power Supply Voltage



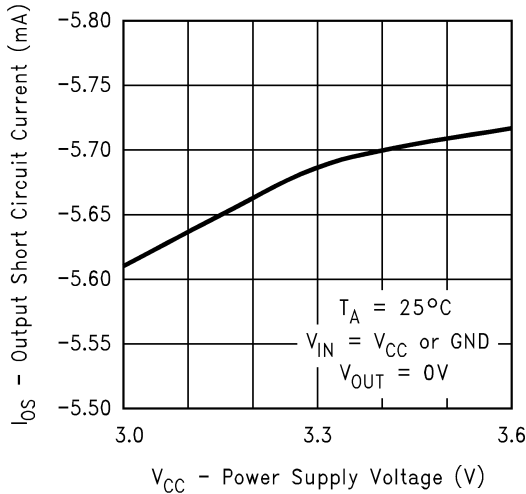
10011407

Output Low Voltage vs Power Supply Voltage



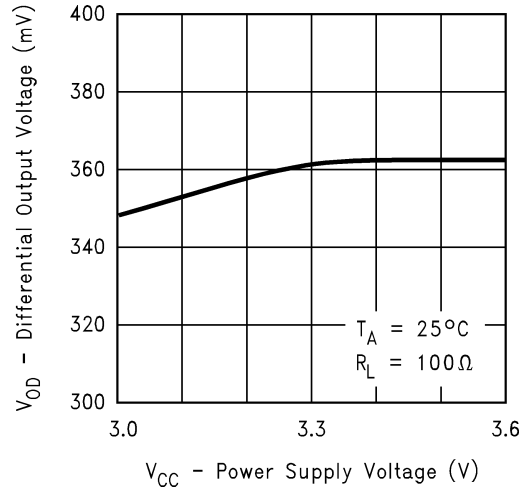
10011408

Output Short Circuit Current vs Power Supply Voltage



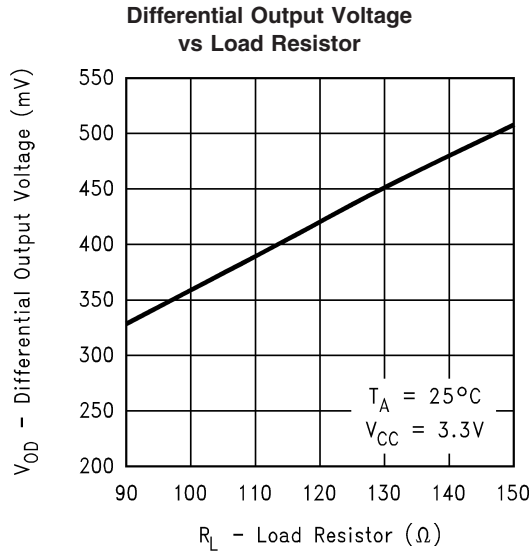
10011409

Differential Output Voltage vs Power Supply Voltage

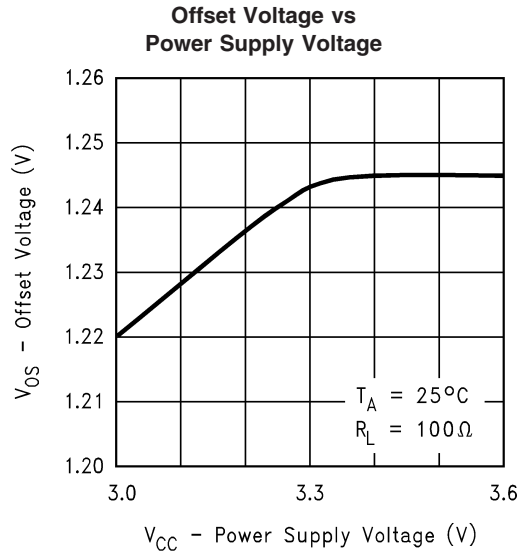


10011410

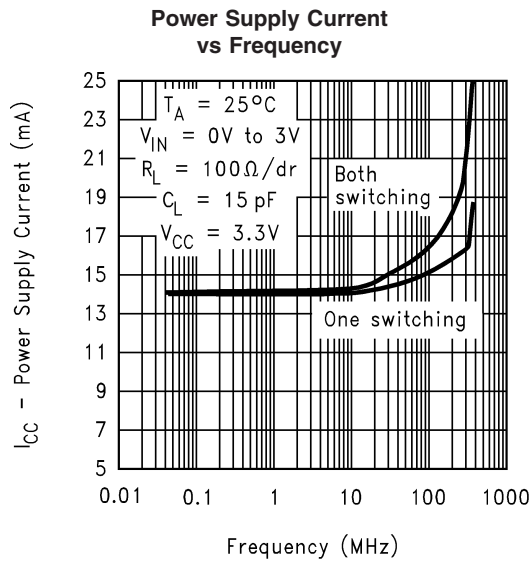
Typical Performance Curves (Continued)



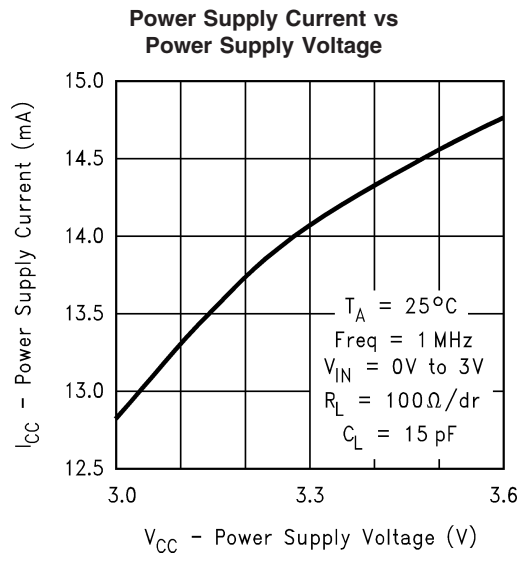
10011411



10011412



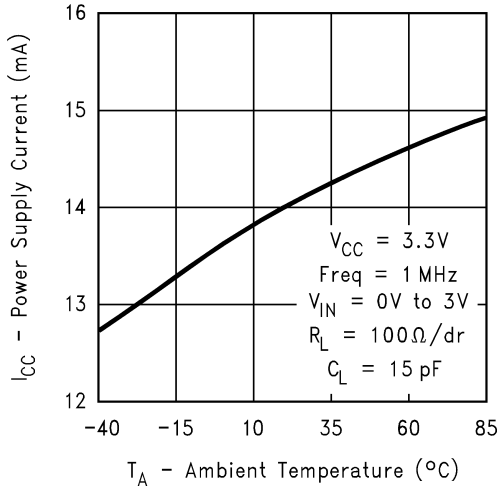
10011413



10011414

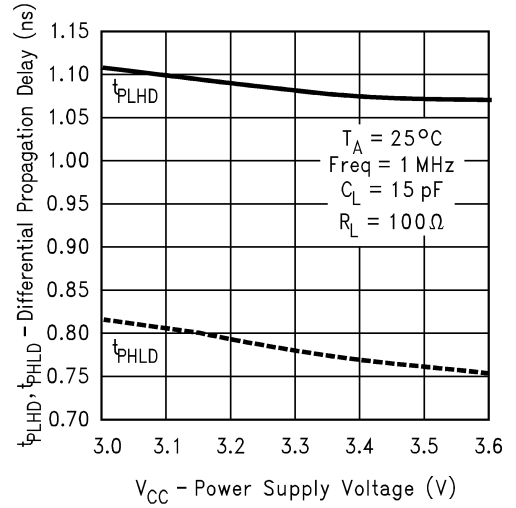
Typical Performance Curves (Continued)

Power Supply Current vs Ambient Temperature



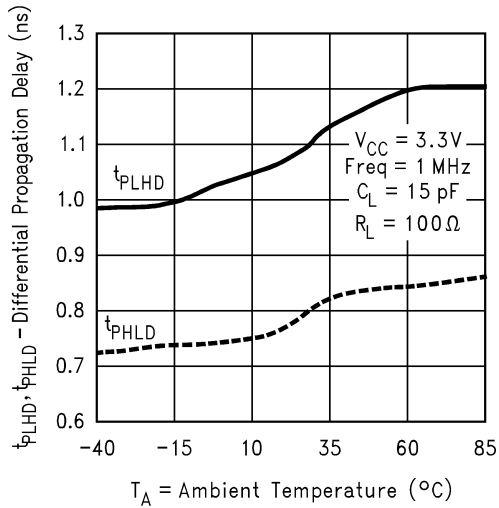
10011415

Differential Propagation Delay vs Power Supply Voltage



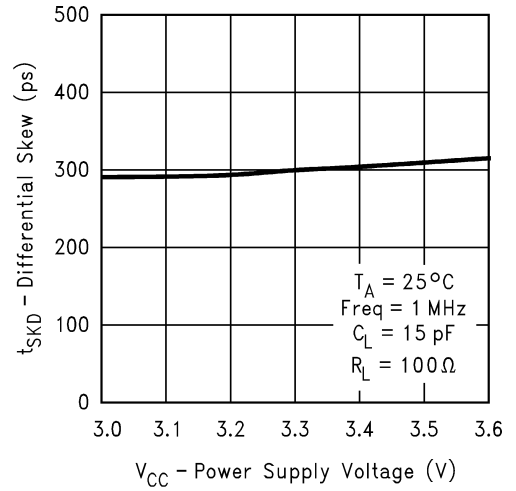
10011416

Differential Propagation Delay vs Ambient Temperature



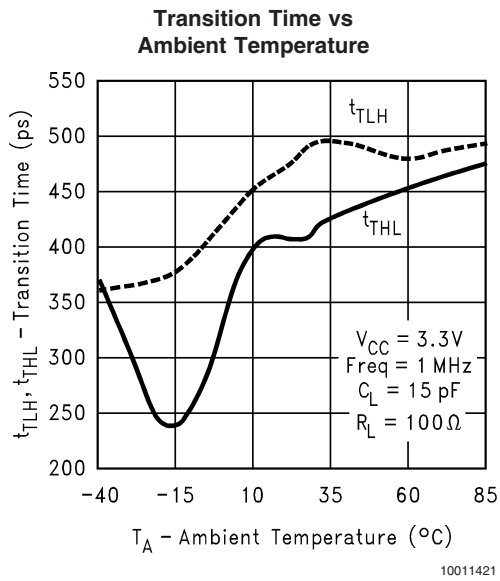
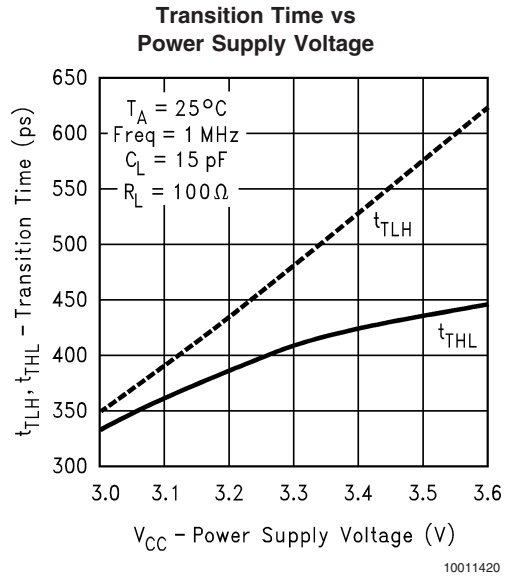
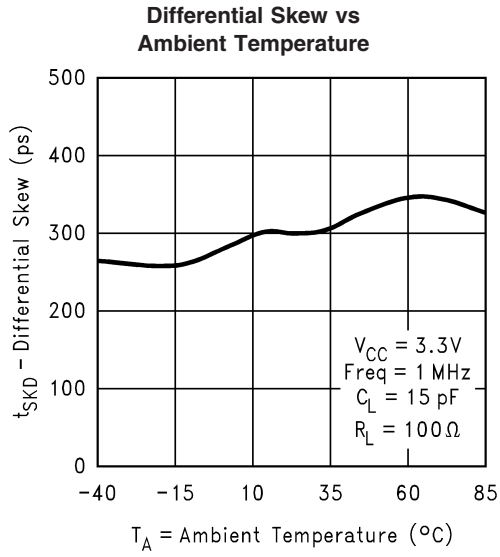
10011417

Differential Skew vs Power Supply Voltage

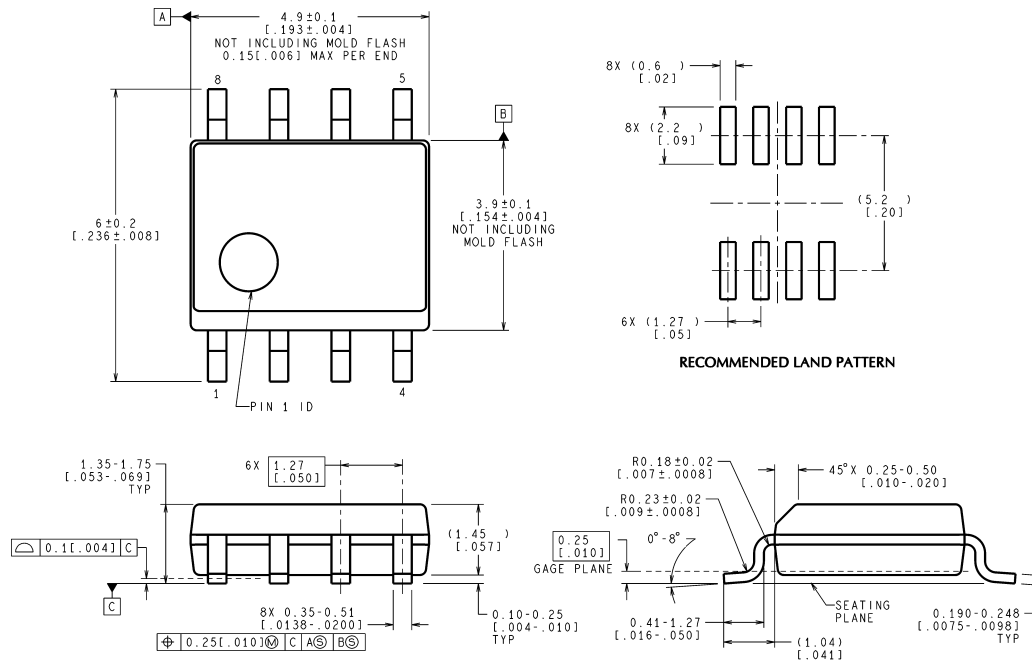


10011418

Typical Performance Curves (Continued)



Physical Dimensions inches (millimeters) unless otherwise noted



CONTROLLING DIMENSION IS MILLIMETER
VALUES IN [] ARE INCHES
DIMENSIONS IN () FOR REFERENCE ONLY

M08A (Rev K)

Order Number DS90LV027ATM
NS Package Number M08A

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.

For the most current product information visit us at www.national.com.

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 AND GENERAL COUNSEL 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.

BANNED SUBSTANCE COMPLIANCE

National Semiconductor manufactures products and uses packing materials that meet the provisions of the Customer Products Stewardship Specification (CSP-9-111C2) and the Banned Substances and Materials of Interest Specification (CSP-9-111S2) and contain no "Banned Substances" as defined in CSP-9-111S2.

Leadfree products are RoHS compliant.



National Semiconductor
Americas Customer
Support Center
Email: new.feedback@nsc.com
Tel: 1-800-272-9959

National Semiconductor
Europe Customer Support Center
Fax: +49 (0) 180-530 85 86
Email: europe.support@nsc.com
Deutsch Tel: +49 (0) 69 9508 6208
English Tel: +44 (0) 870 24 0 2171
Français Tel: +33 (0) 1 41 91 8790

National Semiconductor
Asia Pacific Customer
Support Center
Email: ap.support@nsc.com

National Semiconductor
Japan Customer Support Center
Fax: 81-3-5639-7507
Email: jpn.feedback@nsc.com
Tel: 81-3-5639-7560

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products

Audio	www.ti.com/audio
Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
OMAP Mobile Processors	www.ti.com/omap
Wireless Connectivity	www.ti.com/wirelessconnectivity

Applications

Communications and Telecom	www.ti.com/communications
Computers and Peripherals	www.ti.com/computers
Consumer Electronics	www.ti.com/consumer-apps
Energy and Lighting	www.ti.com/energy
Industrial	www.ti.com/industrial
Medical	www.ti.com/medical
Security	www.ti.com/security
Space, Avionics and Defense	www.ti.com/space-avionics-defense
Transportation and Automotive	www.ti.com/automotive
Video and Imaging	www.ti.com/video

TI E2E Community Home Page

e2e.ti.com

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2011, Texas Instruments Incorporated