

## DS90LV027AH High Temperature LVDS Dual Differential Driver

Check for Samples: [DS90LV027AH](#)

### FEATURES

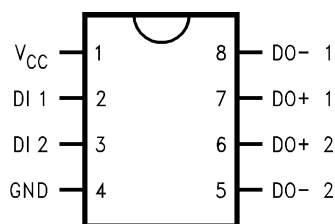
- -40°C to +125°C operating temperature range
- >600 Mbps (300MHz) switching rates
- 0.3 ns typical differential skew
- 0.7 ns maximum differential skew
- 3.3V power supply design
- Low power dissipation (46 mW @ 3.3V static)
- Flow-through design simplifies PCB layout
- Power Off Protection (outputs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

### 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.

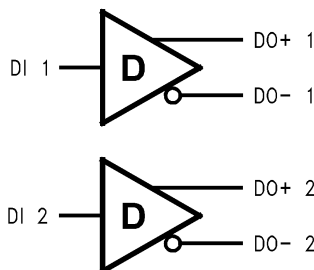
The device is in a 8-lead SOIC package. The DS90LV027AH has a flow-through design for easy PCB layout. The differential driver outputs provides low EMI with its typical low output swing of 360 mV. It is perfect for high speed transfer of clock and data. The DS90LV027AH can be paired with its companion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

### Connection Diagram



**Figure 1. Dual-In-Line**  
**See Package Number D (R-PDSO-G8)**

### Functional Diagram



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.



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### Absolute Maximum Ratings <sup>(1)</sup>

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	
D Package	1190 mW
Derate D 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 $\Omega$ , 100 pF)	$\geq 8$ kV
(EIAJ 0 $\Omega$ , 200 pF)	$\geq 1000$ V
(CDM)	$\geq 1000$ V
(IEC direct 330 $\Omega$ , 150 pF)	$\geq 4$ kV

(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. [Electrical Characteristics](#) specifies conditions of device operation.

### 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. <sup>(1)</sup> <sup>(2)</sup> <sup>(3)</sup>

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

- (1) Current into device pins is defined as positive. Current out of device pins is defined as negative. All voltages are referenced to ground except  $V_{OD}$ .
- (2) All typicals are given for:  $V_{CC} = +3.3V$  and  $T_A = +25^\circ C$ .
- (3) The DS90LV027AH is a current mode device and only function with datasheet specification when a resistive load is applied to the drivers outputs.

## Switching Characteristics

Over Supply Voltage and Operating Temperature Ranges, unless otherwise specified. <sup>(1)</sup> <sup>(2)</sup> <sup>(3)</sup> <sup>(4)</sup>

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>DIFFERENTIAL DRIVER CHARACTERISTICS</b>						
$t_{PHLD}$	Differential Propagation Delay High to Low	$R_L = 100\Omega$ , $C_L = 15$ pF (Figure 3 and Figure 4)	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 $ t_{PHLD} - t_{PLHD} $ <sup>(5)</sup>		0	0.3	0.7	ns
$t_{SKD2}$	Channel to Channel Skew <sup>(6)</sup>		0	0.4	0.8	ns
$t_{SKD3}$	Differential Part to Part Skew <sup>(7)</sup>		0		1.0	ns
$t_{SKD4}$	Differential Part to Part Skew <sup>(8)</sup>		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 <sup>(9)</sup>			350		MHz

- (1) All typicals are given for:  $V_{CC} = +3.3V$  and  $T_A = +25^\circ C$ .
- (2) These parameters are guaranteed by design. The limits are based on statistical analysis of the device over PVT (process, voltage, temperature) ranges.
- (3)  $C_L$  includes probe and fixture capacitance.
- (4) Generator waveform for all tests unless otherwise specified:  $f = 1$  MHz,  $Z_O = 50\Omega$ ,  $t_r \leq 1$  ns,  $t_f \leq 1$  ns (10%-90%).
- (5)  $t_{SKD1}$ ,  $|t_{PHLD} - t_{PLHD}|$ , is the magnitude difference in differential propagation delay time between the positive going edge and the negative going edge of the same channel.
- (6)  $t_{SKD2}$  is the Differential Channel to Channel Skew of any event on the same device.
- (7)  $t_{SKD3}$ , 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  $5^\circ C$  of each other within the operating temperature range.
- (8)  $t_{SKD4}$ , 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.
- (9)  $f_{MAX}$  generator input conditions:  $t_r = t_f < 1$  ns (0% to 100%), 50% duty cycle, 0V to 3V. Output criteria: duty cycle = 45%/55%,  $V_{OD} > 250mV$ , all channels switching.

## PARAMETER MEASUREMENT INFORMATION

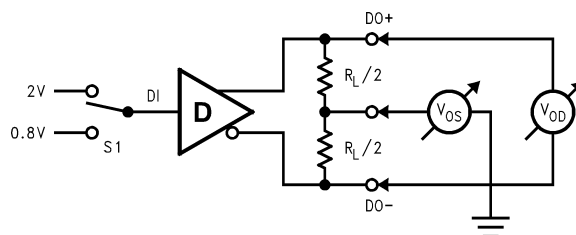


Figure 2. Differential Driver DC Test Circuit

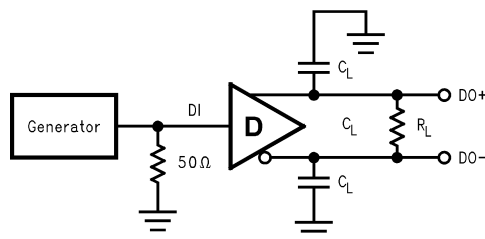


Figure 3. Differential Driver Propagation Delay and Transition Time Test Circuit

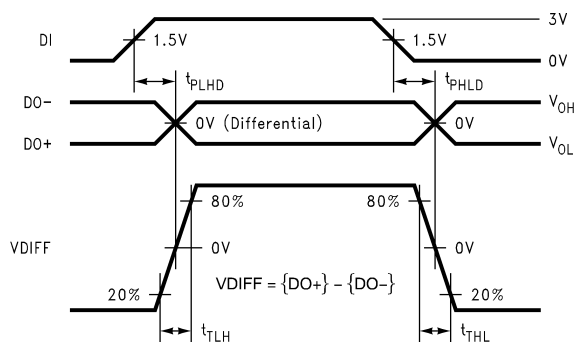


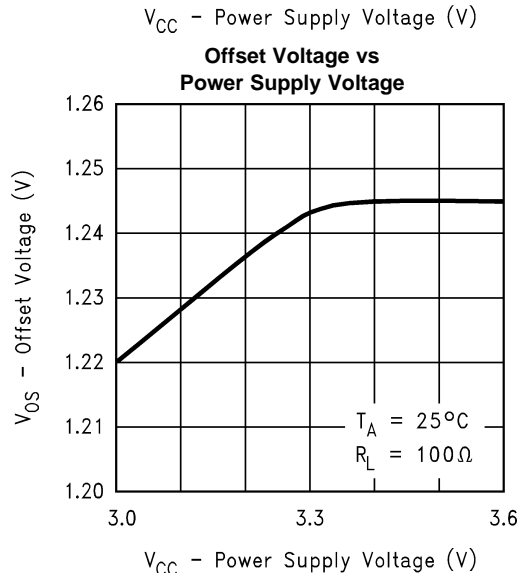
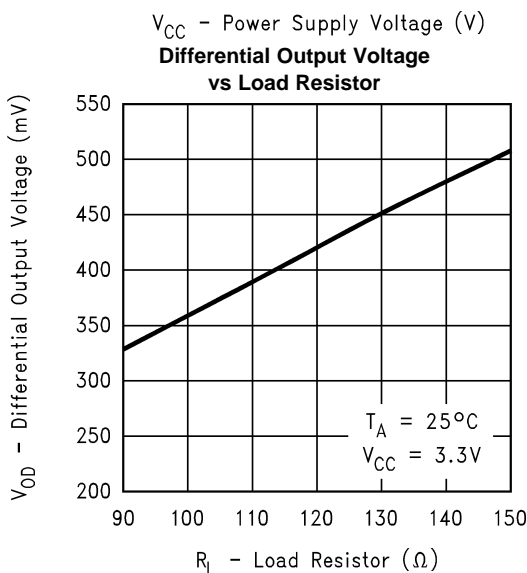
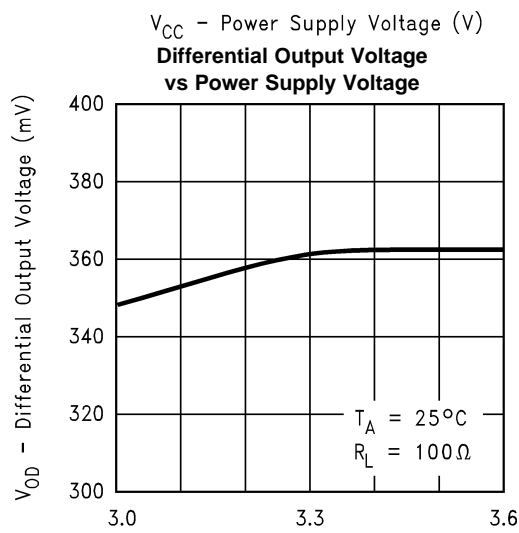
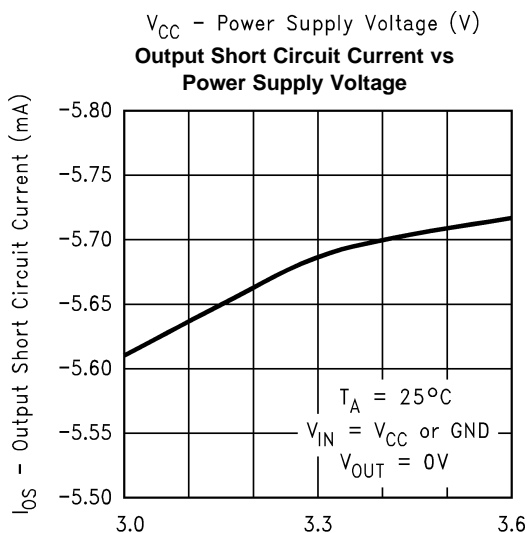
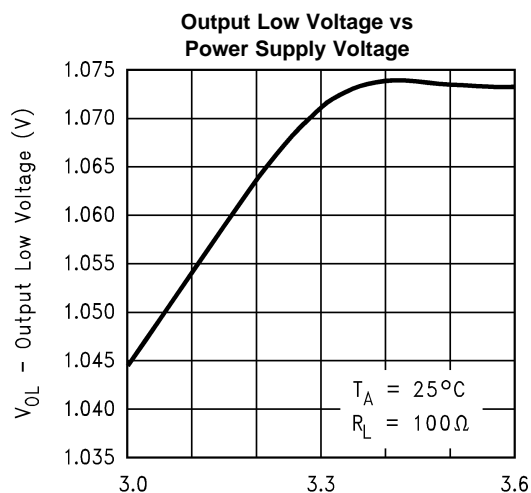
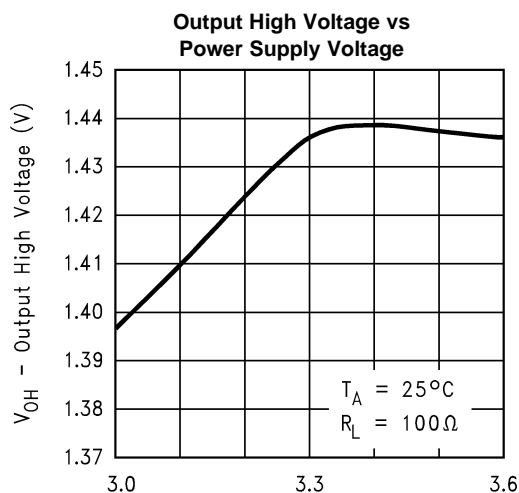
Figure 4. Differential Driver Propagation Delay and Transition Time Waveforms

## APPLICATION INFORMATION

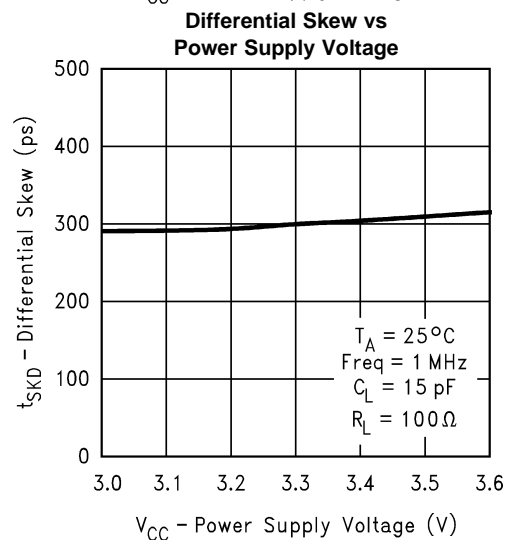
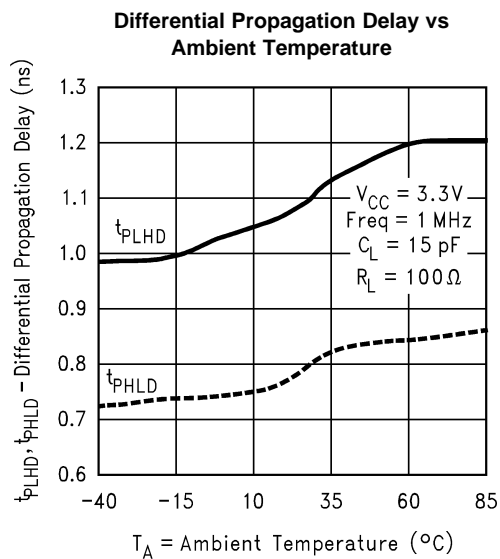
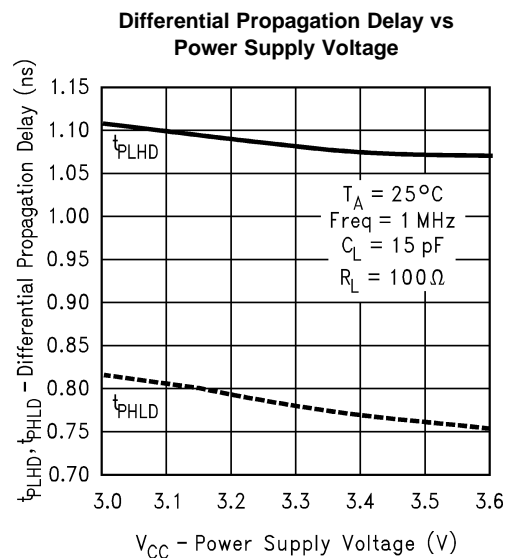
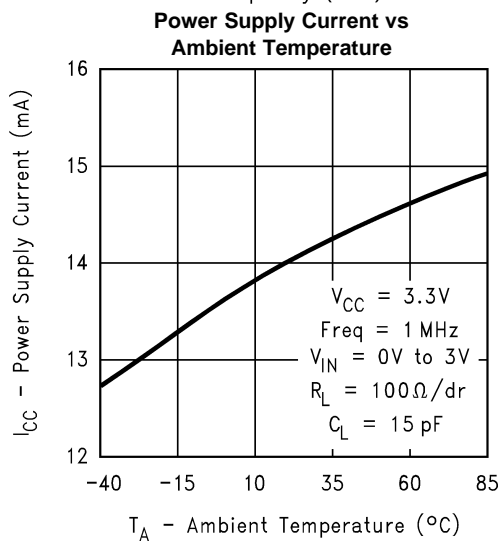
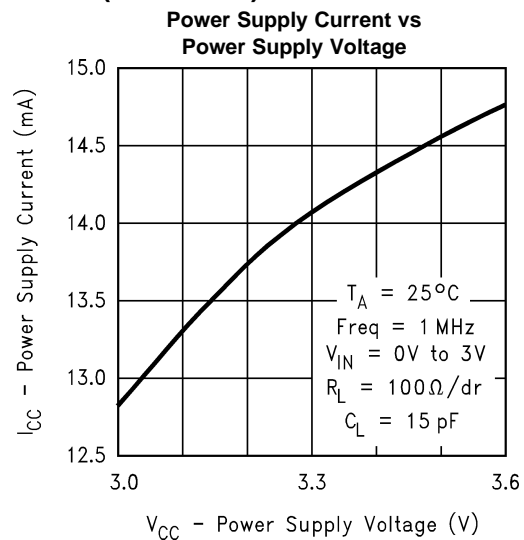
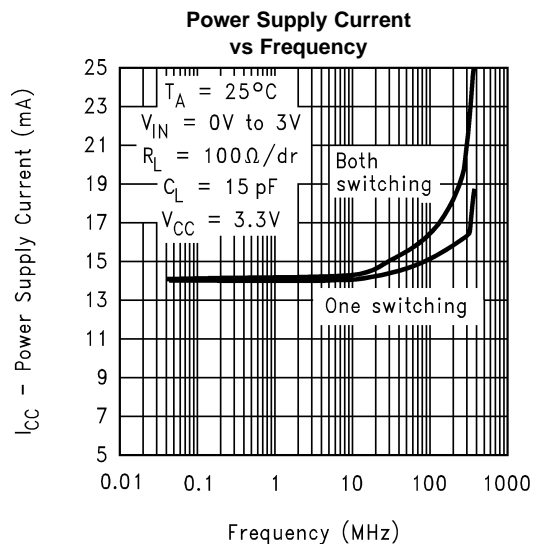
Table 1. Device Pin Descriptions

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 <sub>CC</sub>	Positive power supply pin, +3.3V ± 0.3V

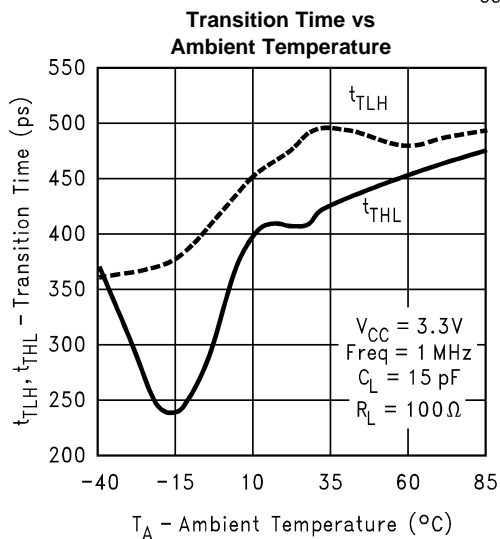
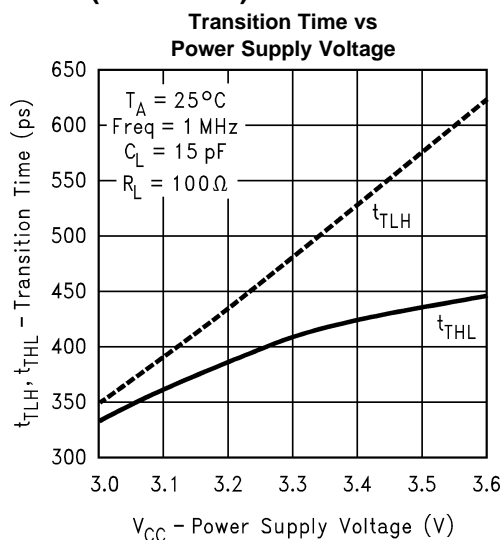
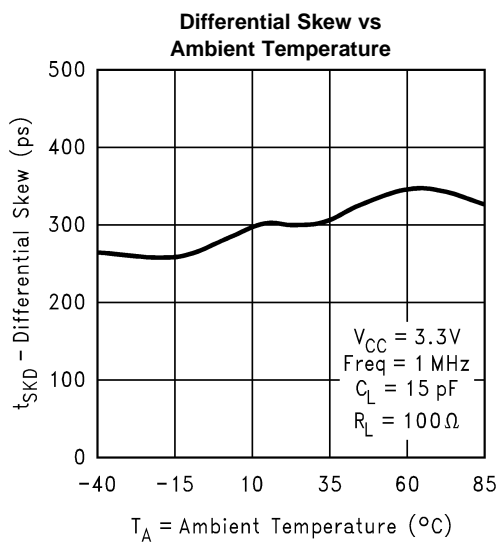
## TYPICAL PERFORMANCE CURVES



### TYPICAL PERFORMANCE CURVES (continued)



## TYPICAL PERFORMANCE CURVES (continued)



**PACKAGING INFORMATION**

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
DS90LV027AHM	NRND	SOIC	D	8	95	TBD	Call TI	Call TI		LV27A HM	
DS90LV027AHM/NOPB	NRND	SOIC	D	8	95	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM		LV27A HM	
DS90LV027AHMX	NRND	SOIC	D	8	2500	TBD	Call TI	Call TI		LV27A HM	
DS90LV027AHMX/NOPB	NRND	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM		LV27A HM	

(1) The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) Only one of markings shown within the brackets will appear on the physical device.

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**TAPE AND REEL INFORMATION**


\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
DS90LV027AHMX	SOIC	D	8	2500	330.0	12.4	6.5	5.4	2.0	8.0	12.0	Q1
DS90LV027AHMX/NOPB	SOIC	D	8	2500	330.0	12.4	6.5	5.4	2.0	8.0	12.0	Q1

## TAPE AND REEL BOX DIMENSIONS

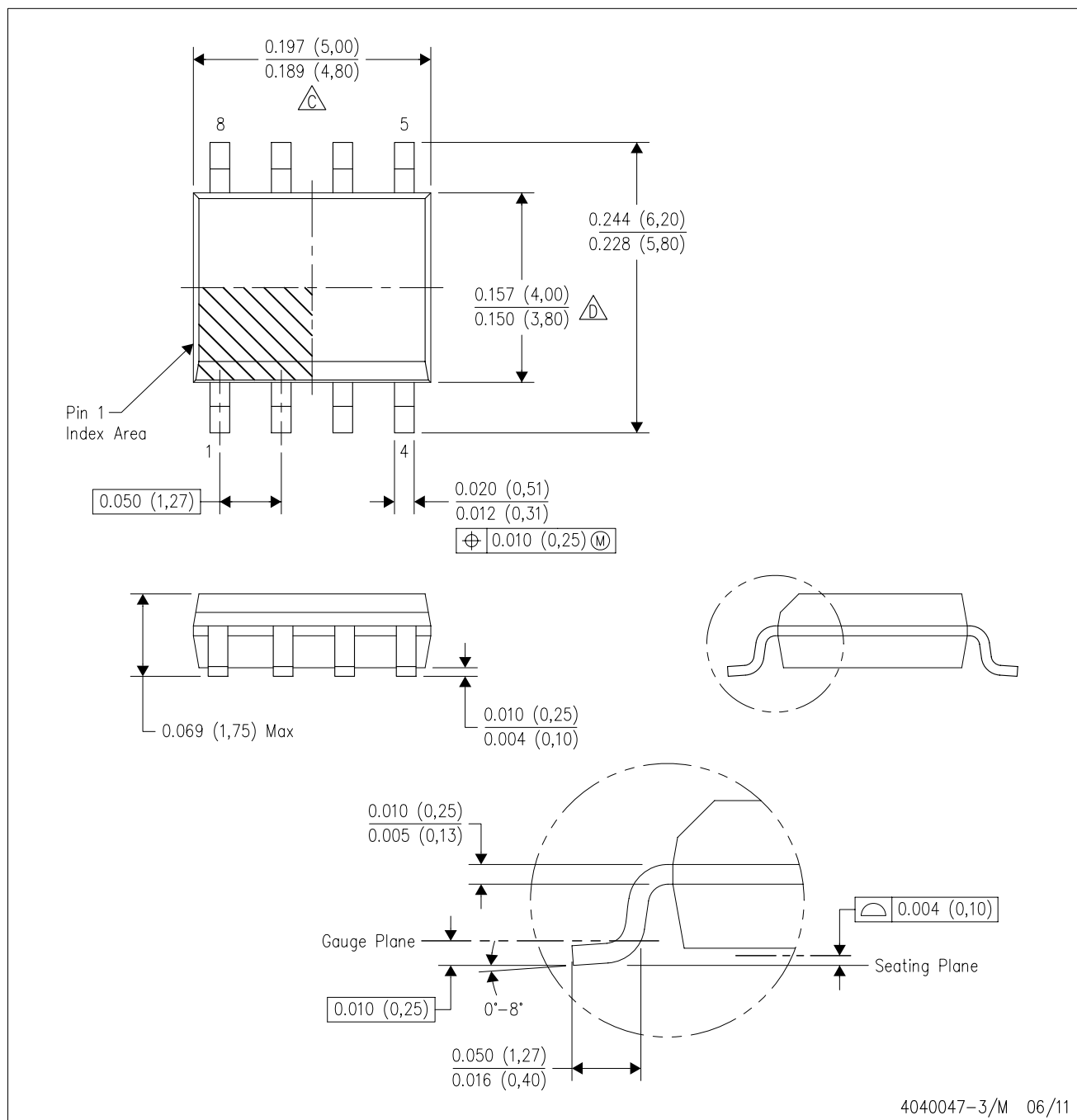


\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
DS90LV027AHMX	SOIC	D	8	2500	349.0	337.0	45.0
DS90LV027AHMX/NOPB	SOIC	D	8	2500	349.0	337.0	45.0

D (R-PDSO-G8)

PLASTIC SMALL OUTLINE



## NOTES:

- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- $\triangle C$  Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
- $\triangle D$  Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
- E. Reference JEDEC MS-012 variation AA.

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