CDx4HC365-Q1、CD74HC366-Q1 高速 CMOS 逻辑六路缓冲器/线路驱动器，三态同相和反相

1 特性

- 符合汽车应用要求
- 缓冲输入
- 高电流总线驱动器输出
- 传播延迟典型值 t_{PLH}、t_{PHL} = 8ns V_{CC} = 5V、C_L = 15pF、T_A = 25°C 时
- 扇出（在温度范围内）
  - 标准输出 - 10 个 LSTTL 负载
  - 总线驱动器输出 - 15 个 LSTTL 负载
- 宽工作温度范围：–40°C 至 125°C
- 平衡的传播延迟及转换时间
- 与 LSTTL 逻辑 IC 相比，功耗显著降低
- HC 类型
  - 工作电压为 2V 至 6V
  - 高抗噪性：当 V_{CC} = 5V 时，N_{IL} = 30%，N_{IH} = V_{CC} 的 30%
- HCT 类型
  - 工作电压为 4.5 V 至 5.5 V
  - 直接 LSTTL 输入逻辑兼容性，V_{IL} = 0.8V（最大值），V_{IH} = 2V（最小值）
  - CMOS 输入兼容性，当电压为 V_{OL}、V_{OH} 时，II ≤ 1μA

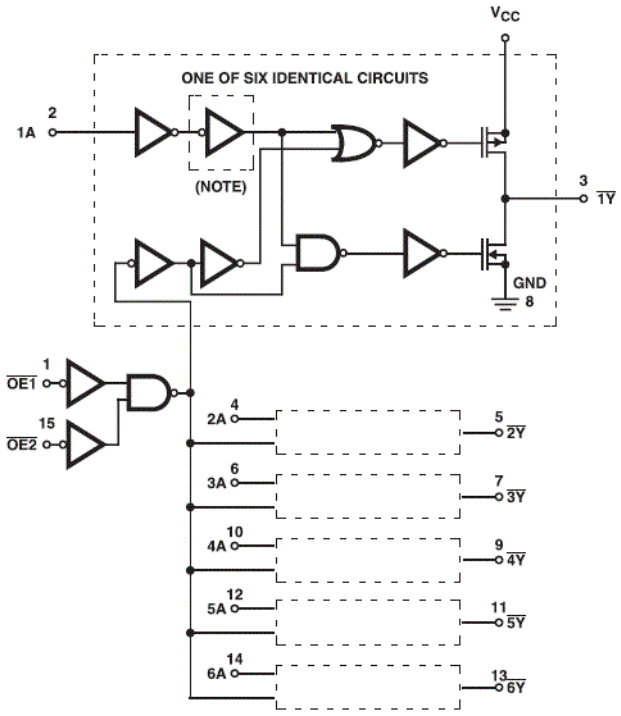
2 说明

CD74HC365-Q1、CD74HC366-Q1 和 CD74HCT365-Q1 硅栅 CMOS 三态缓冲器是通用型高速同相和反相缓冲器。它们具有大驱动电流输出，因而即使在驱动大的总线电容时仍能实现高速运作。这些电路具有很低的 CMOS 电路功耗，然而速度却与低功耗肖特基 TTL 电路不相上下。这两种电路均能够驱动多达 15 个低功耗肖特基输入。

器件信息

器件型号	封装(1)	封装尺寸（标称值）
CD74HC366QDRQ1	D（SOIC、16）	9.90mm × 3.90mm

(1) 如需了解所有可用封装，请参阅数据表末尾的可订购产品附录。



NOTE: Inverter not included in CD74HC365-Q1, CD74HCT365-Q1

功能方框图

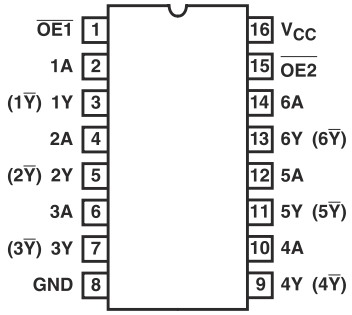
Table of Contents

3 Revision History

注：以前版本的页码可能与当前版本的页码不同

Changes from Revision * (January 2010) to Revision A (August 2022)	Page
• 更新了整个文档中的编号、格式、表格、图和交叉参考，以反映现代数据表标准	1

4 Pin Configuration and Functions



D Package
16-Pin SOIC
Top View

5 Specifications

5.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)(1)

			MIN	MAX	UNIT
V_{CC}	Supply voltage range		-0.5	7	V
I_{IK}	Input clamp current	V_I < -0.5V or V_I > V_{CC} + 0.5V		±20	mA
I_{OK}	Output clamp current	V_O < -0.5V or V_O > V_{CC} + 0.5V		±20	mA
I_O	Drain current	V_O > -0.5V or V_O < V_{CC} + 0.5V		±35	mA
	Continuous output current			±25	
I_{CC}	Continuous current through V_{CC} or GND			±50	mA
Latch up					Class I
T_J	Junction temperature			150	°C
T_{stg}	Storage temperature		-65	150	°C
	Lead temperature (soldering 10s)			300	°C

(1) Stresses beyond those listed under *absolute maximum ratings* may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under *recommended operating conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

5.2 ESD Ratings

			VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	Human body model (HBM), per ANSI/ESDA/JEDEC JS-001, all pins(1)	1500	V
		Charged device model (CDM), per JEDEC specification JESD22-C101, all pins(2)	250	
		Machine model	200	

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

5.3 Recommended Operating Conditions

			MIN	MAX	UNIT
V_{CC}	Supply voltage	HC Types	2	6	V
		HCT Types	4.5	5.5	
V_I	Input voltage		0	V_{CC}	V
V_O	Output voltage		0	V_{CC}	V
T_A	Operating free-air temperature		– 40	125	°C
$\Delta t/\Delta v$	Input Rise and Fall Time	2 V		1000	ns
		4.5 V		500	
		6 V		400	

5.4 Thermal Information

THERMAL METRIC		D (SOIC) 16 PINS	UNIT
$R_{\theta JA}$	Junction-to-ambient thermal resistance(1)	73	°C/W

(1) For more information about traditional and new thermal metrics, see the *Semiconductor and IC package thermal metrics* application report.

5.5 Electrical Characteristics

over operating free-air temperature range (unless otherwise noted)

PARAMETER			TEST CONDITIONS(2)	V_{CC} (V)	25°C			-40°C TO 125°C		UNITS
					MIN	TYP	MAX	MIN	MAX	
HC Types										
V_{IH}	High-level input voltage			2	1.5			1.5		V
				4.5	3.15			3.15		
				6	4.2			4.2		
V_{IL}	Low-level input voltage			2			0.5		0.5	V
				4.5			1.35		1.35	
				6			1.8		1.8	
V_{OH}	High-level output voltage loads	CMOS	I_{OH} = –20 μA	2	1.9			1.9		V
				4.5	4.4			4.4		
				6	5.9			5.9		
		TTL	I_{OH} = –6 mA	4.5	3.98			3.7		
			I_{OH} = –7.8 mA	6	5.48			5.2		
V_{OL}	Low-level output voltage loads	CMOS	I_{OL} = 20 μA	2			0.1		0.1	V
				4.5			0.1		0.1	
				6			0.1		0.1	
		TTL	I_{OL} = 6 mA	4.5			0.26		0.4	
			I_{OL} = 7.8 mA	6			0.26		0.4	
I_I	Input leakage current		V_I = V_{CC} or GND	6			±0.1		±1	μA
I_{CC}	Supply current		V_I = V_{CC} or GND; I_o = 0 A	6			8		160	μA
I_{OZ}	Three-state leakage current		V_O = V_{CC} or GND	6			±0.5		±10	μA
HCT Types										
V_{IH}	High-level input voltage			4.5 to 5.5	2			2		V
V_{IL}	Low-level input voltage			4.5 to 5.5			0.8		0.8	V
V_{OH}	High-level output voltage loads		I_{OH} = – 20 μA	4.5	4.4			4.4		V
			I_{OH} = – 4 mA	4.5	3.98			3.7		
V_{OL}	Low-level output voltage loads		I_{OL} = 20 μA	4.5			0.1		0.1	V
			I_{OL} = 4 mA	4.5			0.26		0.4	
I_I	Input leakage current		V_I = V_{CC} or GND	5.5			±0.1		±1	μA
I_{CC}	Supply current		V_I = V_{CC} or GND	5.5			8		160	μA
ΔI_{CC}	Additional supply current per input pin: 1 unit load(1)		V_{CC} - 2.1	4.5 to 5.5		100	360		490	μA
I_{OZ}	Three-state leakage current		V_O = V_{CC} or GND	5.5			±0.5		±10	μA

(1) For dual-supply systems theoretical worst case (V_I = 2.4V, V_{CC} = 5.5V) specification is 1.8mA.
(2) V_I = V_{IH} or V_{IL}, unless otherwise specified.

5.6 Switching Characteristics

C_L = 50pF. Input t_r, t_f = 6ns

PARAMETER			V_{CC} (V)	25°C		-40°C TO 125°C	UNITS
				TYP	MAX	MAX	
HC Types							
t_{PLH}, t_{PHL}	Propagation delay, data to outputs	HC365	2		110	165	ns
			4.5		22	33	
			6		19	28	
		HC366	2		150	225	
			4.5		31	45	
			6		26	38	
t_{TLH}, t_{THL}	Output transition time		2		60	90	ns
			4.5		12	18	
			6		10	15	
C_I	Input capacitance				10	10	pF
C_O	Three-state output capacitance				20	20	pF
C_{PD}	Power dissipation capacitance(1) (2)		5	40			pF
HCT Types							
t_{PLH}, t_{PHL}	Propagation delay, data to outputs	HCT365	4.5		25	38	ns
		HCT366	4.5		27	41	
t_{PLH}, t_{PHL}	Propagation delay, output enable and disable to outputs		4.5		35	53	ns
t_{TLH}, t_{THL}	Output transition time		4.5		12	18	ns
C_I	Input capacitance				10	10	pF
C_O	Three-state output capacitance				20	20	pF
C_{PD}	Power dissipation capacitance(1) (2)		5	42			pF

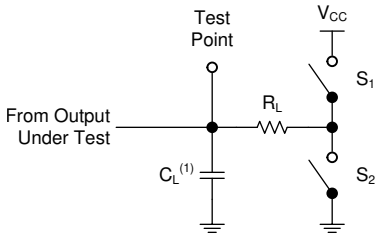
(1) C_{PD} is used to determine the dynamic power consumption, per inverter.
(2) $P_D = V_{CC}{}^2 \times f_i (C_{PD} + C_L)$, where f_i = input frequency, C_L = output load capacitance, V_{CC} = supply voltage.

6 Parameter Measurement Information

Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, Z_O = 50 Ω, t_t < 6 ns.

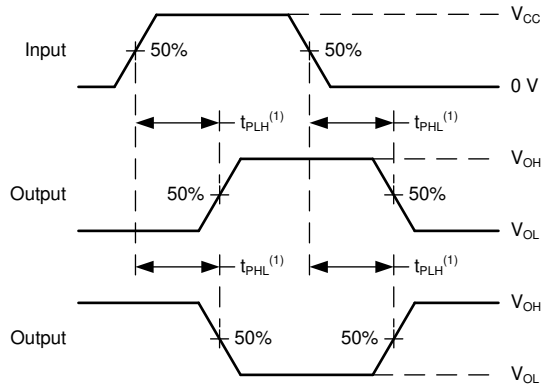
For clock inputs, f_{max} is measured when the input duty cycle is 50%.

The outputs are measured one at a time with one input transition per measurement.



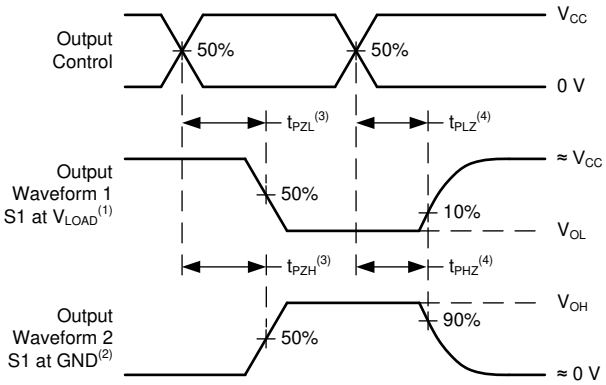
(1) C_L includes probe and test-fixture capacitance.

图 6-1. Load Circuit for 3-State Outputs



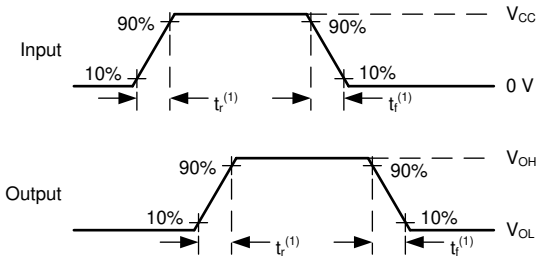
(1) The greater between t_{PLH} and t_{PHL} is the same as t_{pd}.

图 6-2. Voltage Waveforms, Standard CMOS Inputs Setup Propagation Delays



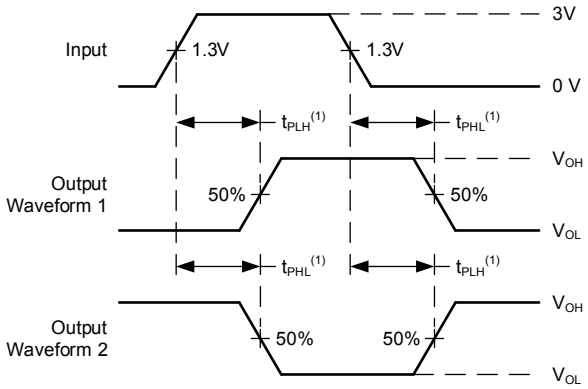
(1) t_{PLZ} and t_{PHZ} are the same as t_{dis}.
(2) t_{PZL} and t_{PZH} are the same as t_{en}.

图 6-3. Voltage Waveforms, Standard CMOS Inputs Propagation Delays



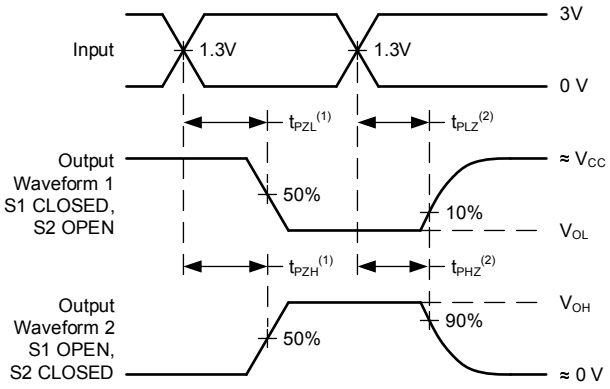
(1) The greater between t_r and t_f is the same as t_t.

图 6-4. Voltage Waveforms, Input and Output Transition Times for Standard CMOS Input Devices



(1) The greater between t_{PLH} and t_{PHL} is the same as t_{pd}.

图 6-5. Voltage Waveforms, TTL-Compatible CMOS Inputs Propagation Delays



(1) t_{PLZ} and t_{PHZ} are the same as t_{dis}.

(2) t_{PZL} and t_{PZH} are the same as t_{en}.

图 6-6. Voltage Waveforms, TTL-Compatible CMOS Inputs Propagation Delays

7 Detailed Description

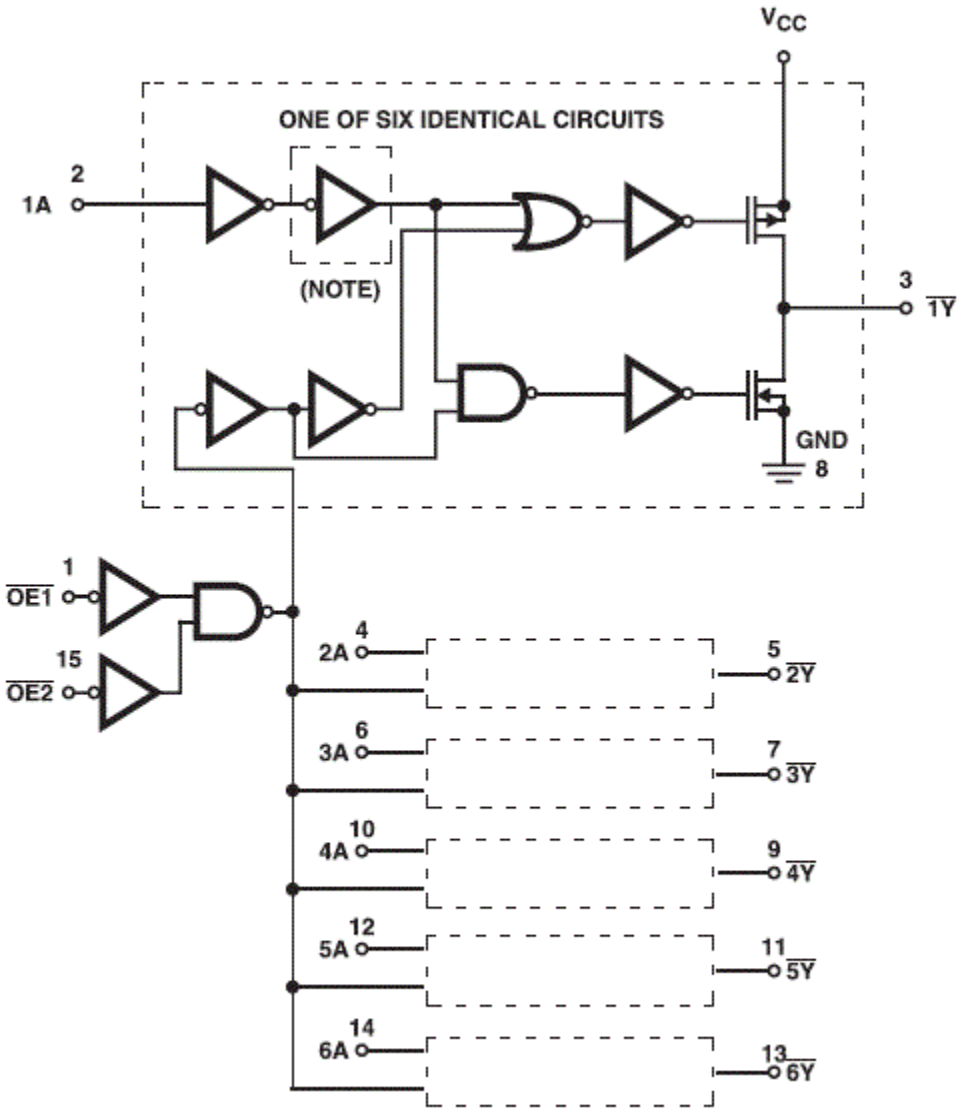
7.1 Overview

The CD74HC365-Q1, CD74HC366-Q1, and CD74HCT365-Q1 silicon gate CMOS three state buffers are general purpose high-speed non-inverting and inverting buffers. They have high drive current outputs which enable high speed operation even when driving large bus capacitances. These circuits possess the low power dissipation of CMOS circuitry, yet have speeds comparable to low power Schottky TTL circuits. Both circuits are capable of driving up to 15 low power Schottky inputs.

The CD74HC365-Q1 and CD74HCT365-Q1 are non-inverting buffers, whereas the CD74HC366-Q1 is an inverting buffer. These devices have two three-state control inputs ($\overline{OE1}$ and $\overline{OE2}$) which are NORed together to control all six gates.

The ’ HCT365-Q1 logic families are speed, function and pin compatible with the standard LS logic family.

7.2 Functional Block Diagram



NOTE: Inverter not included in CD74HC365-Q1, CD74HCT365-Q1

7.3 Device Functional Modes

表 7-1. Function Table

INPUTS(1)			OUTPUTS (Y)(2)	
OE1	OE2	A	HC/HCT365	HC366
L	L	L	L	H
L	L	H	H	L
X	H	X	Z	Z
H	X	X	Z	Z

(1) H = High Voltage Level, L = Low Voltage Level, X = Don’t Care
(2) H = Driving High, L = Driving Low, Z = High Impedance State

8 Power Supply Recommendations

The power supply can be any voltage between the minimum and maximum supply voltage rating located in the *Recommended Operating Conditions*. Each V_{CC} terminal should have a good bypass capacitor to prevent power disturbance. A 0.1-μF capacitor is recommended for this device. It is acceptable to parallel multiple bypass caps to reject different frequencies of noise. The 0.1-μF and 1-μF capacitors are commonly used in parallel. The bypass capacitor should be installed as close to the power terminal as possible for best results.

9 Layout

9.1 Layout Guidelines

When using multiple-input and multiple-channel logic devices inputs must not ever be left floating. In many cases, functions or parts of functions of digital logic devices are unused; for example, when only two inputs of a triple-input AND gate are used or only 3 of the 4 buffer gates are used. Such unused input pins must not be left unconnected because the undefined voltages at the outside connections result in undefined operational states. All unused inputs of digital logic devices must be connected to a logic high or logic low voltage, as defined by the input voltage specifications, to prevent them from floating. The logic level that must be applied to any particular unused input depends on the function of the device. Generally, the inputs are tied to GND or V_{CC}, whichever makes more sense for the logic function or is more convenient.

10 Device and Documentation Support

TI offers an extensive line of development tools. Tools and software to evaluate the performance of the device, generate code, and develop solutions are listed below.

10.1 接收文档更新通知

要接收文档更新通知，请导航至 ti.com 上的器件产品文件夹。点击 *订阅更新* 进行注册，即可每周接收产品信息更改摘要。有关更改的详细信息，请查看任何已修订文档中包含的修订历史记录。

10.2 支持资源

TI E2E™ 支持论坛是工程师的重要参考资料，可直接从专家获得快速、经过验证的解答和设计帮助。搜索现有解答或提出自己的问题可获得所需的快速设计帮助。

链接的内容由各个贡献者“按原样”提供。这些内容并不构成 TI 技术规范，并且不一定反映 TI 的观点；请参阅 TI 的《使用条款》。

10.3 Trademarks

TI E2E™ is a trademark of Texas Instruments.
所有商标均为其各自所有者的财产。

10.4 Electrostatic Discharge Caution

This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

10.5 术语表

TI 术语表　　本术语表列出并解释了术语、首字母缩略词和定义。

11 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
CD74HC366QDRQ1	ACTIVE	SOIC	D	16	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HC366Q	Samples

(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) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".
RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.
Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

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

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

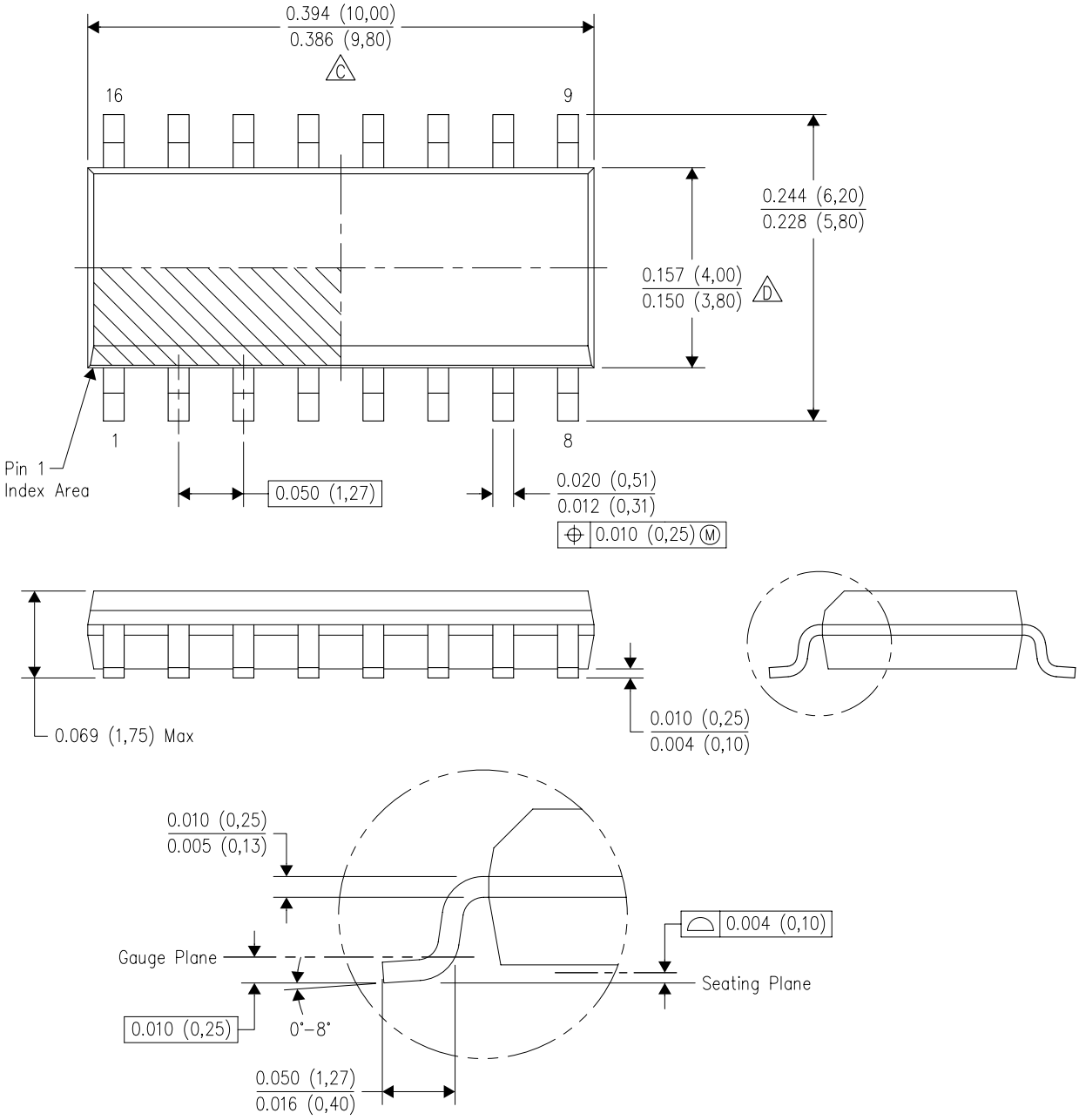
OTHER QUALIFIED VERSIONS OF CD74HC366-Q1 :

- Catalog : CD74HC366
- Military : CD54HC366

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications

D (R–PDSO–G16) PLASTIC SMALL OUTLINE



NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
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.
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 AC.

重要声明和免责声明

TI“按原样”提供技术和可靠性数据（包括数据表）、设计资源（包括参考设计）、应用或其他设计建议、网络工具、安全信息和其他资源，不保证没有瑕疵且不做出任何明示或暗示的担保，包括但不限于对适销性、某特定用途方面的适用性或不侵犯任何第三方知识产权的暗示担保。

这些资源可供使用 TI 产品进行设计的熟练开发人员使用。您将自行承担以下全部责任：(1) 针对您的应用选择合适的 TI 产品，(2) 设计、验证并测试您的应用，(3) 确保您的应用满足相应标准以及任何其他功能安全、信息安全、监管或其他要求。

这些资源如有变更，恕不另行通知。TI 授权您仅可将这些资源用于研发本资源所述的 TI 产品的应用。严禁对这些资源进行其他复制或展示。您无权使用任何其他 TI 知识产权或任何第三方知识产权。您应全额赔偿因在这些资源的使用中对 TI 及其代表造成的任何索赔、损害、成本、损失和债务，TI 对此概不负责。

TI 提供的产品受 TI 的销售条款或 ti.com 上其他适用条款/TI 产品随附的其他适用条款的约束。TI 提供这些资源并不会扩展或以其他方式更改 TI 针对 TI 产品发布的适用的担保或担保免责声明。

TI 反对并拒绝您可能提出的任何其他或不同的条款。

邮寄地址：Texas Instruments, Post Office Box 655303, Dallas, Texas 75265