

SN65LBC173、SN75LBC173 四通道低功耗差分线路接收器

1 特性

- 符合或超出 ANSI 标准 EIA/TIA-422-B、EIA/TIA-423-B、RS-485 和 ITU 建议 V.10 和 V.11 的要求。
- 可以低至 20ns 的脉冲持续时间运行
- 适用于嘈杂环境中长总线上的多点总线传输
- 输入灵敏度： $\pm 200\text{mV}$
- 低功耗：20 mA (最大值)
- 开路失效防护设计
- 与 SN75173 和 AM26LS32 引脚兼容

2 应用

- 工厂自动化
- ATM 和点钞机
- 智能电网
- 交流和伺服电机驱动器

3 说明

SN65LBC173 和 SN75LBC173 是具有三态输出的单片四通道差分线路接收器。二者均旨在满足 ANSI 标准 EIA/TIA-422-B、EIA/TIA-423-B、RS-485 以及数项 ITU 建议 V.10 和 V.11 的要求。这个器件针对数据速率高达和超过每秒 10 兆位的平衡多点总线传输进行了优化。

4 个接收器共用 2 个进行或操作的使能输入，一个在高电平时有效，一个在低电平时有效。

每个接收器在 12V 至 -7 V 的共模输入电压范围内特具有高输入阻抗、输入滞后以增加抗扰度，以及 $\pm 200\text{mV}$ 的输入灵敏度。故障安全设计确保了在输入为开路时，输出始终为高电平。这两款器件都使用德州仪器 (TI) 专有 LinBiCMOS™ 技术进行设计，该技术具有低功耗、高开关速度和稳健性。

这些器件会在与 SN75LBC172 或 SN75LBC174 四通道线路驱动器配合使用时提供卓越性能。SN65LBC173 和 SN75LBC173 采用 16 引脚 DIP (N) 和 SOIC (D) 封装。

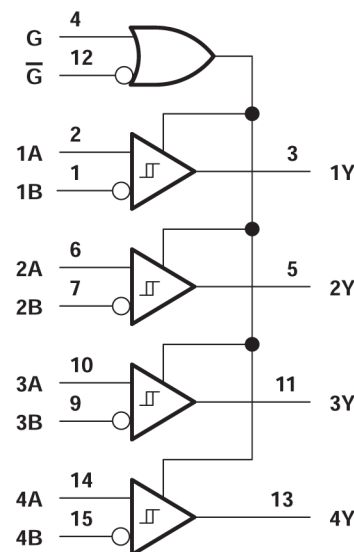
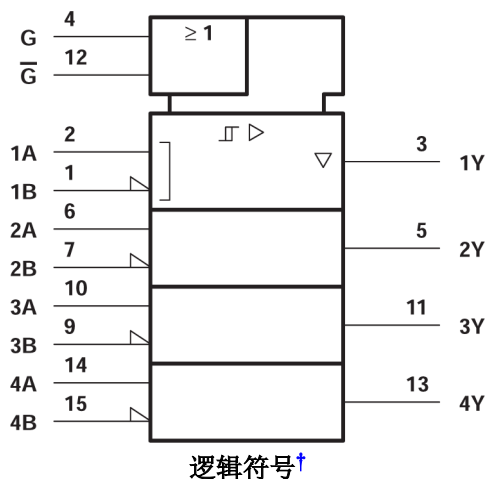
SN65LBC173 可在 -40°C 至 85°C 的工业温度范围内运行。SN75LBC173 可在 0°C 至 70°C 的商用温度范围内运行。

封装信息

器件型号	封装 ⁽¹⁾	封装尺寸 ⁽²⁾
SN65LBC173	D (SOIC, 16)	9.9mm × 6mm
SN75LBC173	N (PDIP, 16)	19.3mm × 9.4mm

(1) 有关详细信息，请参阅节 10。

(2) 封装尺寸 (长 × 宽) 为标称值，并包括引脚 (如适用)。



逻辑图 (正逻辑)

† 此符号符合 ANSI/IEEE 标准 91-1984 和 IEC 出版物 617-12。



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4 Pin Configuration and Functions

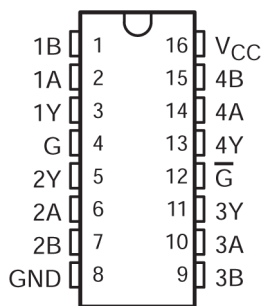


图 4-1. D or N Package
(Top View)

表 4-1. Pin Functions

PIN		TYPE ⁽¹⁾	DESCRIPTION
NAME	NO.		
1B	1	I	Channel 1 Inverting Differential Input
1A	2	I	Channel 1 Non-Inverting Differential Input
1Y	3	O	Channel 1 Output
G	4	I	Active High Receiver Enable
2Y	5	O	Channel 2 Output
2A	6	I	Channel 2 Non-Inverting Differential Input
2B	7	I	Channel 2 Inverting Differential Input
GND	8	GND	Device Ground
3B	9	I	Channel 3 Inverting Differential Input
3A	10	I	Channel 3 Non-Inverting Differential Input
3Y	11	O	Channel 3 Output
$\overline{G}$	12	I	Active Low Receiver Enable
4Y	13	O	Channel 4 Output
4A	14	I	Channel 4 Non-Inverting Differential Input
4B	15	I	Channel 4 Inverting Differential Input
V _{CC}	16	POW	Device Supply

(1) Signal Types: I = Input, O = Output, I/O = Input or Output.

5 Specifications

5.1 Absolute Maximum Ratings

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

			MIN	MAX	UNIT
V_{CC} ⁽²⁾	Supply voltage range		-0.3	7	V
V_I	Input voltage (A or B inputs)			± 25	V
V_{ID} ⁽³⁾	Differential input voltage			± 25	V
	Voltage range at Y, G, $\bar{G}$		-0.3	$V_{CC} + 0.5$	V
	Continuous total dissipation		See Dissipation Rating Table		
T_A	Operating free-air temperature range:	SN65LBC173	-40	85	°C
		SN75LBC173	0	70	°C
T_{stg}	Storage temperature range		-65	150	°C
	Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds			260	°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.
- (2) All voltage values are with respect to GND.
- (3) Differential input voltage is measured at the noninverting input with respect to the corresponding inverting input.

5.2 Dissipation Ratings

PACKAGE	$T_A \leq 25^\circ\text{C}$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25^\circ\text{C}$	$T_A = 70^\circ\text{C}$ POWER RATING	$T_A = 85^\circ\text{C}$ POWER RATING
D	1100 mW	8.7 mW/°C	708 mW	578 mW
N	1150 mW	9.2 mW/°C	736 mW	598 mW

5.3 Thermal Information

THERMAL METRIC ⁽¹⁾		SOIC (D)	PDIP (N)	UNIT
		16 Pins	16 Pins	
$R_{\theta JA}$	Junction-to-ambient thermal resistance	84.6	60.6	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	43.5	48.1	°C/W
$R_{\theta JB}$	Junction-to-board thermal resistance	43.1	40.6	°C/W
ψ_{JT}	Junction-to-top characterization parameter	10.4	27.5	°C/W
ψ_{JB}	Junction-to-board characterization parameter	42.8	40.3	°C/W
$R_{\theta JC(bot)}$	Junction-to-case (bottom) thermal resistance	N/A	N/A	°C/W

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

5.4 Recommended Operating Conditions

		MIN	NOM	MAX	UNIT
Supply voltage, V _{CC}		4.75	5	5.25	V
Common-mode input voltage, V _{IC}		−7		12	V
Differential input voltage, V _{ID}				±6	V
High-level input voltage, V _{IH}	G inputs	2			V
Low-level input voltage, V _{IL}				0.8	V
High-level output current, I _{OH}				−8	mA
Low-level output current, I _{OL}				8	mA
Operating free-air temperature, T _A	SN65LBC173	−40		85	°C
	SN75LBC173	0		70	

5.5 Electrical Characteristics

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)

PARAMETER		TEST CONDITIONS		MIN	TYP ⁽¹⁾	MAX	UNIT
V_{IT+}	Positive-going input threshold voltage	$I_O = -8$ mA				0.2	V
V_{IT-}	Negative-going input threshold voltage	$I_O = 8$ mA		-0.2			V
V_{hys}	Hysteresis voltage ($V_{IT+} - V_{IT-}$)			45			mV
V_{IK}	Enable input clamp voltage	$I_I = -18$ mA		-0.9		-1.5	V
V_{OH}	High-level output voltage	$V_{ID} = 200$ mV,	$I_{OH} = -8$ mA	3.5	4.5		V
V_{OL}	Low-level output voltage	$V_{ID} = -200$ mV,	$I_{OL} = 8$ mA	0.3		0.5	V
I_{OZ}	High-impedance-state output current	$V_O = 0$ V to V_{CC}				±20	μA
I_I	Bus input current	A or B inputs	$V_{IH} = 12$ V, $V_{CC} = 5$ V, Other inputs at 0 V		0.7	1	mA
			$V_{IH} = 12$ V, $V_{CC} = 0$ V, Other inputs at 0 V		0.8	1	
			$V_{IH} = -7$ V, $V_{CC} = 5$ V, Other inputs at 0 V		-0.5	-0.8	
			$V_{IH} = -7$ V, $V_{CC} = 0$ V, Other inputs at 0 V		-0.4	-0.8	
I_{IH}	High-level input current	$V_{IH} = 5$ V				±20	μA
I_{IL}	Low-level input current	$V_{IL} = 0$ V				-20	μA
I_{OS}	Short-circuit output current	$V_O = 0$		-80		-120	mA
I_{CC}	Supply current	Outputs enabled, $I_O = 0$, $V_{ID} = 5$ V		11		20	mA
		Outputs disabled		0.9		1.4	

(1) All typical values are at $V_{CC} = 5$ V and $T_A = 25^\circ\text{C}$.

5.6 Switching Characteristics

$V_{CC} = 5$ V, $C_L = 15$ pF, $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PHL}	Propagation delay time, high- to low-level output	11	22	30	ns
t_{PLH}	Propagation delay time, low- to high-level output				ns
t_{PZH}	Output enable time to high level		17	30	ns
t_{PZL}	Output enable time to low level		18	30	ns
t_{PHZ}	Output disable time from high level		35	45	ns
t_{PLZ}	Output disable time from low level		25	40	ns
$t_{sk(p)}$	Pulse skew ($ t_{PHL} - t_{PLH} $)		0.5	6	ns
t_t	Transition time		5	10	ns

5.7 Typical Characteristics

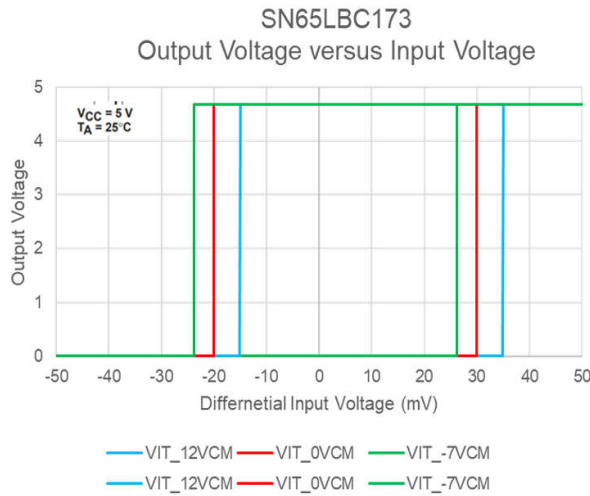


图 5-1. Output Voltage vs Differential Input Voltage

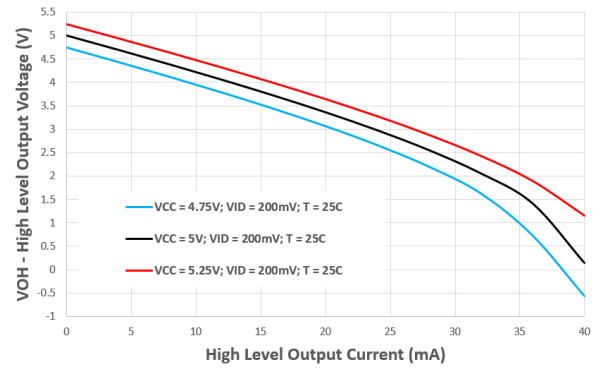


图 5-2. High-level Output Voltage vs High-level Output Current

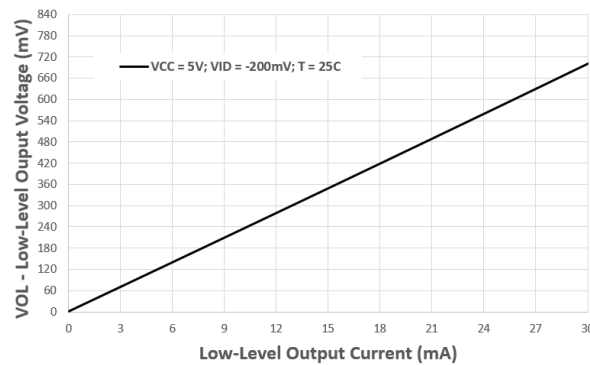


图 5-3. Low-level Output Voltage vs Low-level Output Current

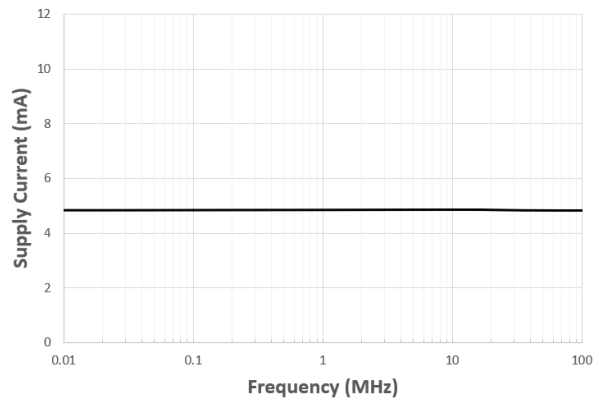


图 5-4. Average Supply Current vs Frequency

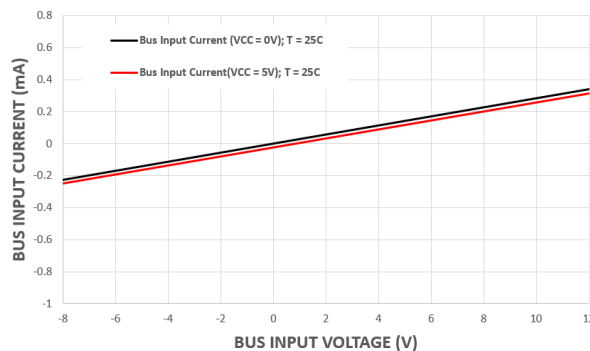


图 5-5. Bus Input Current vs Input Voltage (Complementary Input at 0 V)

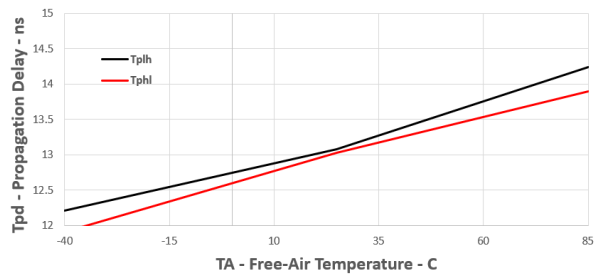


图 5-6. Propagation Delay Time vs Free-air Temperature

6 Parameter Measurement Information

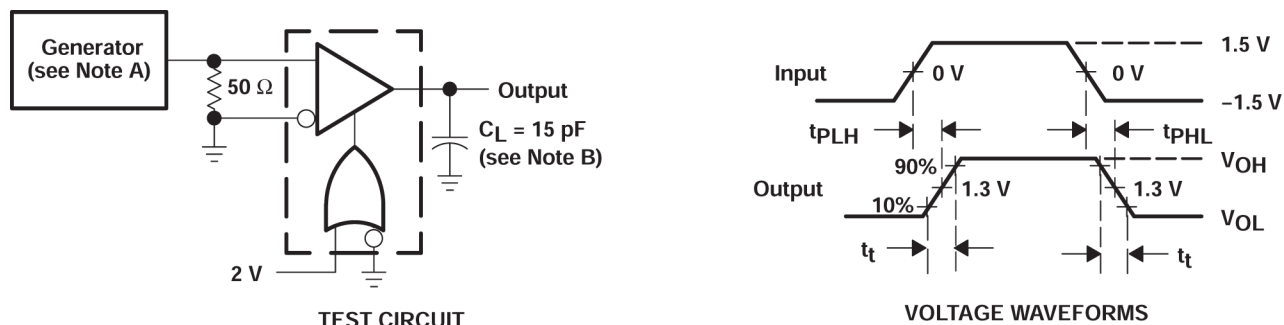
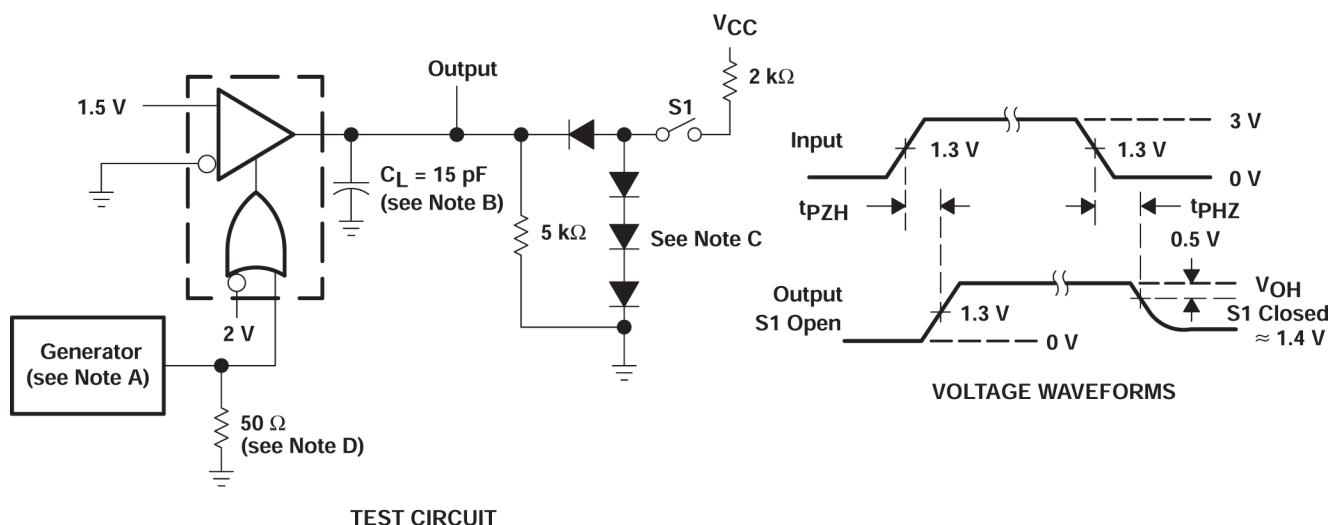
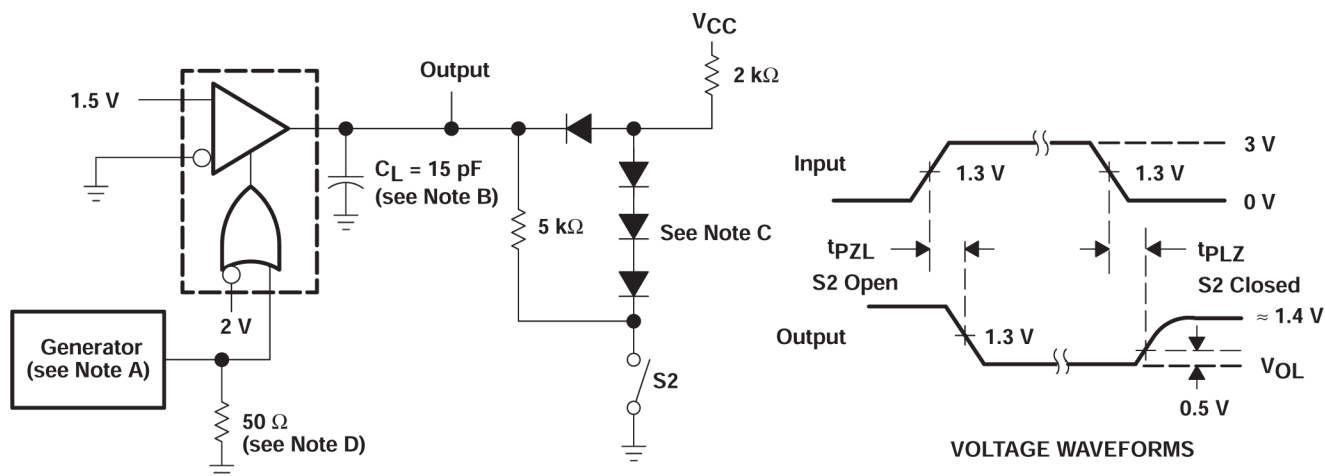


图 6-1. t_{pd} and t_t Test Circuit and Voltage Waveforms



- A. The input pulse is supplied by a generator having the following characteristics: PRR = 1 MHz, duty cycle = 50%, $t_r \leq 6$ ns, $t_f \leq 6$ ns, $Z_O = 50 \Omega$.
- B. C_L includes probe and jig capacitance.
- C. All diodes are 1N916 or equivalent.
- D. To test the active-low enable $\overline{G}$, ground G and apply an inverted input waveform to $\overline{G}$.

图 6-2. t_{PHZ} and t_{PZH} Test Circuit and Voltage Waveforms



TEST CIRCUIT

- A. The input pulse is supplied by a generator having the following characteristics: PRR = 1 MHz, duty cycle = 50%, $t_r \leq 6$ ns, $t_f \leq 6$ ns, $Z_O = 50 \Omega$.
- B. C_L includes probe and jig capacitance.
- C. All diodes are 1N916 or equivalent.
- D. To test the active-low enable $\overline{G}$, ground G and apply an inverted input waveform to $\overline{G}$.

图 6-3. t_{PZL} and t_{PLZ} Test Circuit and Voltage Waveforms

7 Detailed Description

7.1 Device Functional Modes

表 7-1. Function Table (Each Receiver)

DIFFERENTIAL INPUTS	ENABLES ⁽¹⁾		OUTPUT
A-B	G	$\bar{G}$	Y
$V_{ID} \geq 0.2\text{ V}$	H	X	H
	X	L	H
$-0.2\text{ V} < V_{ID} < 0.2\text{ V}$	H	X	?
	X	L	?
$V_{ID} \leq -0.2\text{ V}$	H	X	L
	X	L	L
X	L	H	Z
Open Circuit	H	X	H
	X	L	H

(1) H = high level, L = low level, X = irrelevant, Z = high impedance (off), ? = indeterminate

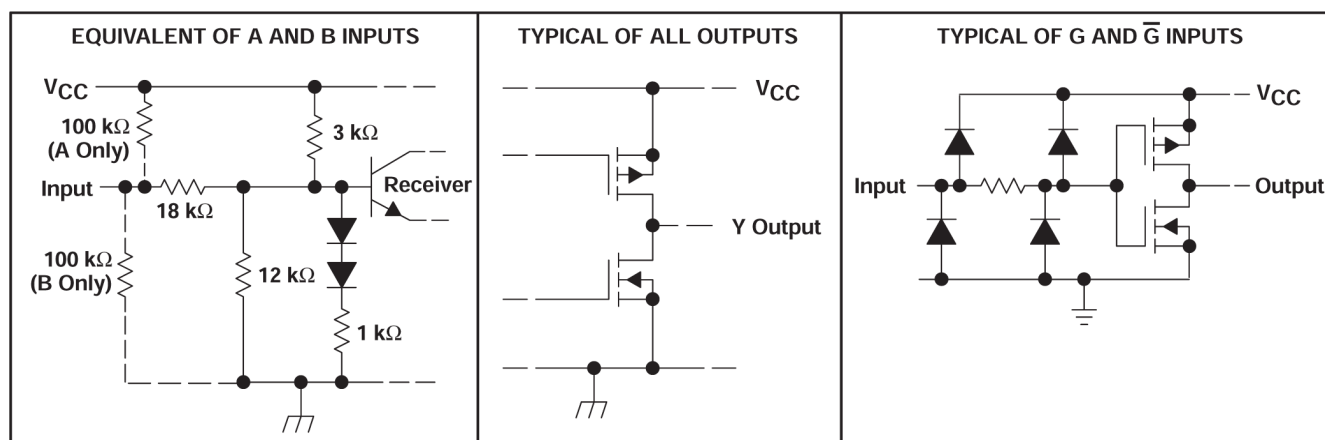


图 7-1. Schematics of Inputs and Outputs

8 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.

8.1 接收文档更新通知

要接收文档更新通知，请导航至 [ti.com](https://www.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。

8.2 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](#)》。

8.3 Trademarks

TI E2E™ is a trademark of Texas Instruments.

所有商标均为其各自所有者的财产。

8.4 静电放电警告



静电放电 (ESD) 会损坏这个集成电路。德州仪器 (TI) 建议通过适当的预防措施处理所有集成电路。如果不遵守正确的处理和安装程序，可能会损坏集成电路。

ESD 的损坏小至导致微小的性能降级，大至整个器件故障。精密的集成电路可能更容易受到损坏，这是因为非常细微的参数更改都可能会导致器件与其发布的规格不相符。

8.5 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。

9 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 E (August 2000) to Revision F (August 2023)	Page
• 更改了整个文档中的表格、图和交叉参考的编号格式.....	1

10 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 part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
SN65LBC173D	Obsolete	Production	SOIC (D) 16	-	-	Call TI	Call TI	-40 to 85	65LBC173
SN65LBC173DR	Active	Production	SOIC (D) 16	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	65LBC173
SN65LBC173DR.A	Active	Production	SOIC (D) 16	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	65LBC173
SN65LBC173DRG4	Active	Production	SOIC (D) 16	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	65LBC173
SN65LBC173DRG4.A	Active	Production	SOIC (D) 16	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	65LBC173
SN65LBC173N	Active	Production	PDIP (N) 16	25 TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	SN65LBC173N
SN65LBC173N.A	Active	Production	PDIP (N) 16	25 TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	SN65LBC173N
SN75LBC173D	Obsolete	Production	SOIC (D) 16	-	-	Call TI	Call TI	0 to 70	75LBC173
SN75LBC173N	Active	Production	PDIP (N) 16	25 TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN75LBC173N
SN75LBC173N.A	Active	Production	PDIP (N) 16	25 TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN75LBC173N
SN75LBC173NE4	Active	Production	PDIP (N) 16	25 TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN75LBC173N

⁽¹⁾ **Status:** For more details on status, see our [product life cycle](#).

⁽²⁾ **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

⁽³⁾ **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

⁽⁴⁾ **Lead finish/Ball material:** Parts 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.

⁽⁵⁾ **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

⁽⁶⁾ **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

OTHER QUALIFIED VERSIONS OF SN75LBC173 :

- Military : [SN55LBC173](#)

NOTE: Qualified Version Definitions:

- Military - QML certified for Military and Defense Applications

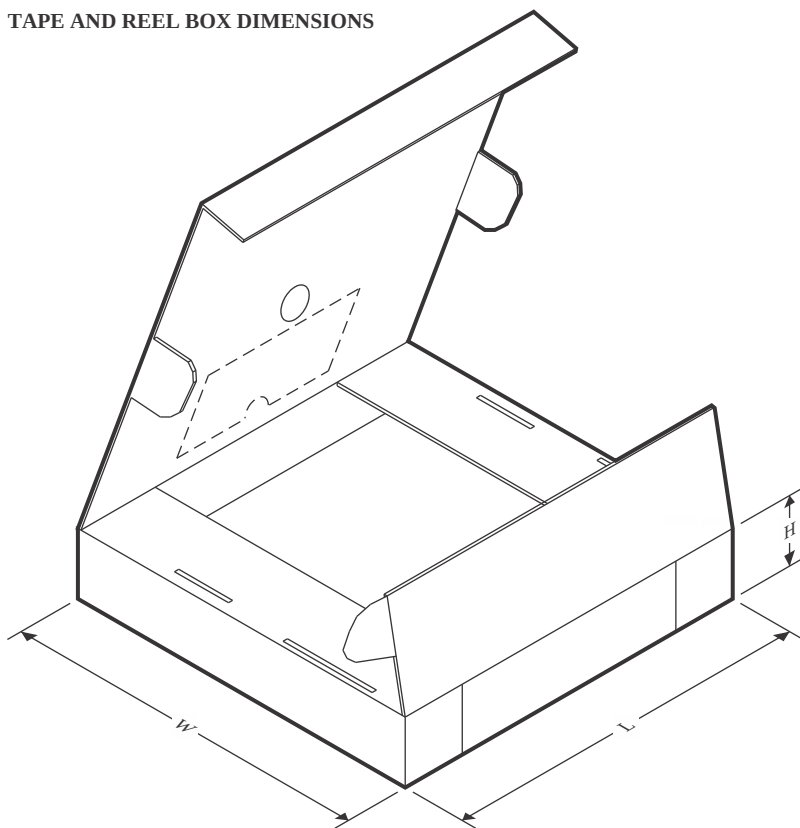
TAPE AND REEL INFORMATION



*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
SN65LBC173DR	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1
SN65LBC173DRG4	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN65LBC173DR	SOIC	D	16	2500	340.5	336.1	32.0
SN65LBC173DRG4	SOIC	D	16	2500	353.0	353.0	32.0

TUBE



*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
SN65LBC173N	N	PDIP	16	25	506	13.97	11230	4.32
SN65LBC173N.A	N	PDIP	16	25	506	13.97	11230	4.32
SN75LBC173N	N	PDIP	16	25	506	13.97	11230	4.32
SN75LBC173N.A	N	PDIP	16	25	506	13.97	11230	4.32
SN75LBC173NE4	N	PDIP	16	25	506	13.97	11230	4.32

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