

# SNx5LBC176 差分总线收发器

## 1 特性

- 双向收发器
- 符合或超出 ANSI 标准 TIA/EIA-485-A 和 ISO 8482:1987(E) 的要求
- 高速低功耗 LinBiCMOS™ 电路
- 专为在串行和并行应用中实现高速运行而设计
- 低偏斜
- 针对嘈杂环境中的长距离总线线路上的多点传输而设计
- 极低的禁用电源电流。.. 200µA (最大值)
- 宽正负输入/输出总线电压范围
- 热关断保护
- 驱动器正负电流限制
- 开路故障安全接收器设计
- 接收器输入灵敏度..±200mV (最大值)
- 接收器输入迟滞。..50 mV (典型值)
- 采用 5V 单电源供电
- 无干扰上电和断电保护
- 可用于 Q-Temp 汽车高可靠性汽车应用配置控制/打印支持通过汽车标准认证

## 2 说明

SN55LBC176、SN65LBC176、SN65LBC176Q 和 SN75LBC176 差分总线收发器是单片集成电路，旨在用于多点总线传输线路上的双向数据通信。这些器件专为平衡传输线路而设计，符合 ANSI 标准 TIA/EIA-485-A (RS-485) 和 ISO 8482:1987(E)。

SN55LBC176、SN65LBC176、SN65LBC176Q 和 SN75LBC176 器件整合了一个三态差分线路驱动器和一个差分输入线路接收器，两者均采用 5V 单电源供电。驱动器和接收器分别具有高电平有效和低电平有效使能端，它们可以在外部连接在一起以用作方向控制。驱动器差分输出端和接收器差分输入端在内部连接以形成差分输入/输出 (I/O) 总线端口，该端口用于在禁用驱动器或  $V_{CC} = 0$  时为总线提供最小负载。该端口具有较宽的正负共模电压范围，使得该器件适用于合用线应用。可以通过禁用驱动器和接收器来实现较低的器件电源电流。

### 封装信息

器件型号	封装 <sup>(1)</sup>	封装尺寸 (标称值)
SN55LBC176	LCCC (20)	8.89 mm x 8.89 mm
	CDIP (8)	9.60 mm x 6.67 mm
SN65LBC176	SOIC (8)	4.90mm x 3.91mm
	PDIP (8)	9.81mm x 6.35mm
SN75LBC176	SOIC (8)	4.90mm x 3.91mm
	PDIP (8)	9.81mm x 6.35mm

(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。

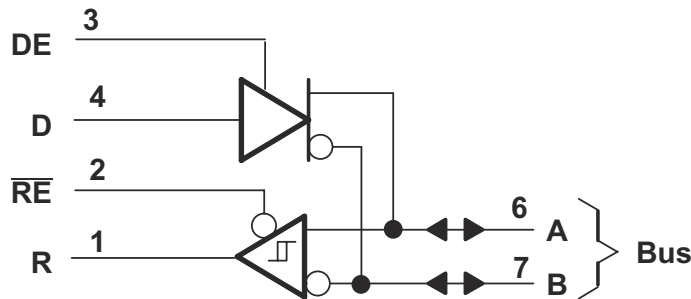


图 2-1. 逻辑图 (正逻辑)



## Table of Contents

<b>1 特性</b> .....	1	6.8 Receiver Electrical Characteristics.....	8
<b>2 说明</b> .....	1	6.9 Receiver Switching Characteristics.....	8
<b>3 Revision History</b> .....	2	<b>7 Parameter Measurement Information</b> .....	9
<b>4 说明 (续)</b> .....	3	<b>8 Detailed Description</b> .....	12
<b>5 Pin Configuration and Functions</b> .....	3	8.1 Functional Block Diagram.....	12
<b>6 Specifications</b> .....	4	8.2 Device Functional Modes.....	12
6.1 Absolute Maximum Ratings.....	4	<b>9 Device and Documentation Support</b> .....	14
6.2 Recommended Operating Conditions.....	4	9.1 Device Support.....	14
6.3 Thermal Information: SN55LBC176.....	4	9.2 Trademarks.....	14
6.4 Thermal Information: SN65LBC176, SN75LBC176....	5	9.3 Electrostatic Discharge Caution.....	15
6.5 Dissipation Ratings.....	5	9.4 术语表.....	15
6.6 Driver Electrical Characteristics.....	5	<b>10 Mechanical, Packaging, and Orderable Information</b> .....	15
6.7 Driver Switching Characteristics.....	7		

### 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 H (December 2010) to Revision I (October 2022)

Page

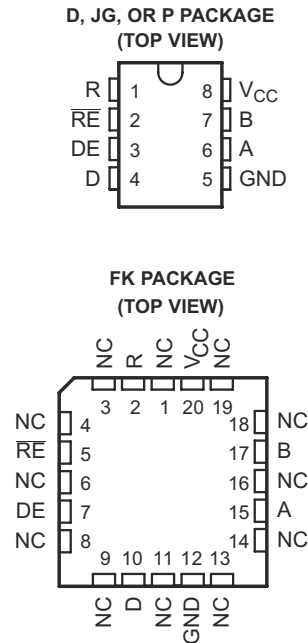
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|--|---|
| • 添加了引脚配置和功能部分、热性能信息表、详细说明部分、器件功能模式、器件和文档支持部分和机械、包装和可订购信息部分..... | 1 |
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## 4 说明 (续)

这些收发器适用于 ANSI 标准 TIA/EIA-485 (RS-485) 和 ISO 8482 应用，前提是它们在此数据表的运行条件和特性部分中已指定。TIA/EIA-485-A 和 ISO 8482:1987 (E) 中包含的某些限制不符合或无法在整个军用温度范围内进行测试。

SN55LBC176 的额定工作温度范围是 -55°C 至 125°C。SN65LBC176 的额定工作温度范围是 -40°C 至 85°C，SN65LBC176Q 的额定工作温度范围是 -40°C 至 125°C。SN75LBC176 的额定工作温度范围是 0°C 至 70°C。

## 5 Pin Configuration and Functions



NC – No internal connection

**表 5-1. Pin Functions**

NAME	PIN		TYPE	DESCRIPTION
	SOIC,PDIP,CDIP	LCCC		
R	1	2	O	Logic output RS485 data
RE	2	5	I	Receiver enable/disable
DE	3	7	I	Driver enable/disable
D	4	10	I	Logic input RS485 data
GND	5	12	-	Ground
A	6	15	I/O	RS485 bus pin; Non-Inverting
B	7	17	I/O	RS485 bus pin; Inverted
V <sub>CC</sub>	8	20	-	5V Supply Voltage
NC	-	1,2,3,6,8,9,11,13,14,16,18,19	-	No Internal Connection

## 6 Specifications

### 6.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted) <sup>(1)</sup>

	MIN	MAX	UNIT
Supply voltage, $V_{CC}$ <sup>(2)</sup>		7	V
Voltage range at any bus terminal	- 10	15	V
Input voltage, $V_I$ (D, DE, R, or $\overline{RE}$ )	- 0.3	$V_{CC} + 0.5$	V
Receiver output current, $I_O$	- 10	10	mA
Continuous total power dissipation	See # 6.5		
Storage temperature range, $T_{stg}$	- 65	150	°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 # 6.2 is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) All voltage values, except differential I/O bus voltage, are with respect to network ground terminal.

### 6.2 Recommended Operating Conditions

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

		MIN	NOM	MAX	UNIT
Supply voltage, $V_{CC}$		4.75	5	5.25	V
Voltage at any bus terminal (separately or common mode), $V_I$ or $V_{IC}$		- 7		12	V
High-level input voltage, $V_{IH}$	D, DE, and $\overline{RE}$	2			V
Low-level input voltage, $V_{IL}$	D, DE, and $\overline{RE}$			0.8	V
Differential input voltage, $V_{ID}$ <sup>(1)</sup>		- 12		12	V
High-level output current, $I_{OH}$	Driver	- 60			mA
	Receiver	- 400			μA
Low-level output current, $I_{OL}$	Driver			60	mA
	Receiver			8	mA
Junction temperature, $T_J$				140	°C
Operating free-air temperature, $T_A$	SN55LBC176	-55		125	°C
	SN65LBC176	- 40		85	
	SN65LBC176Q	- 40		125	
	SN75LBC176	0		70	

- (1) Differential input /output bus voltage is measured at the noninverting terminal A with respect to the inverting terminal B.

### 6.3 Thermal Information: SN55LBC176

THERMAL METRIC <sup>(1)</sup>		FK	JG	UNIT
		20 PINS	8 PINS	
$R_{\theta JA}$	Junction-to-ambient thermal resistance	61.6	99.5	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	36.8	51.5	
$R_{\theta JB}$	Junction-to-board thermal resistance	36.1	86.5	
$\psi_{JT}$	Junction-to-top characterization parameter	31.0	23.7	
$\psi_{JB}$	Junction-to-board characterization parameter	36.0	80.2	
$R_{\theta JC(bot)}$	Junction-to-case (bottom) thermal resistance	4.2	11.6	

## 6.4 Thermal Information: SN65LBC176, SN75LBC176

THERMAL METRIC <sup>(1)</sup>		D	P	UNIT
		8 PINS		
$R_{\theta JA}$	Junction-to-ambient thermal resistance	116.7	65.6	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	56.3	54.6	
$R_{\theta JB}$	Junction-to-board thermal resistance	63.4	42.1	
$\psi_{JT}$	Junction-to-top characterization parameter	8.8	22.9	
$\psi_{JB}$	Junction-to-board characterization parameter	62.6	41.6	
$R_{\theta JC(bot)}$	Junction-to-case (bottom) thermal resistance	n/a	n/a	

(1) For more information about traditional and new thermal metrics, see the *IC Package Thermal Metrics* application report, [SPRA953](#).

## 6.5 Dissipation Ratings

PACKAGE	THERMAL MODEL	$T_A < 25^\circ\text{C}$ 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	$T_A = 110^\circ\text{C}$ POWER RATING
D	Low K <sup>(1)</sup>	526 mW	5.0 mW/°C	301 mW	226 mW	—
	High K <sup>(2)</sup>	882 mW	8.4 mW/°C	504 mW	378 mW	—
P		840 mW	8.0 mW/°C	480 mW	360 mW	—
JG		1050 mW	8.4 mW/°C	672 mW	546 mW	210 mW
FK		1375 mW	11.0 mW/°C	880 mW	715 mW	440 mW

(1) In accordance with the low effective thermal conductivity metric definitions of EIA/JESD 51-3.

(2) In accordance with the high effective thermal conductivity metric definitions of EIA/JESD 51-7.

## 6.6 Driver Electrical Characteristics

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

PARAMETER		TEST CONDITIONS		MIN	MAX	UNIT
$V_{IK}$	Input clamp voltage	$I_I = -18 \text{ mA}$		-1.5		V
$V_O$	Output voltage	$I_O = 0$		0	6	V
$ V_{OD1} $	Differential output voltage	$I_O = 0$		1.5	6	V
$ V_{OD2} $	Differential output voltage	$R_L = 54 \Omega$ , See (2)	See 图 7-1, 55LBC176, 65LBC176, 65LBC176Q	1.1		V
				1.5	5	
$ V_{OD3} $	Differential output voltage	$V_{test} = -7 \text{ V to } 12 \text{ V}$ , See Figure 2, See (2)	55LBC176, 65LBC176, 65LBC176Q	1.1		V
				1.5	5	
$\Delta V_{OD} $	Change in magnitude of differential output voltage (1)	$R_L = 54 \Omega$ or $100 \Omega$ , See 图 7-1		-0.2	0.2	V
$V_{OC}$	Common-mode output voltage			-1	3	V
$\Delta V_{OC} $	Change in magnitude of common-mode output voltage (1)			-0.2	0.2	V
$I_O$	Output current	Output disabled, See (3)	$V_O = 12 \text{ V}$		1	mA
			$V_O = -7 \text{ V}$	-0.8		
$I_{IH}$	High-level input current	$V_I = 2.4 \text{ V}$		-100		μA
$I_{IL}$	Low-level input current	$V_I = 0.4 \text{ V}$		-100		μA

## 6.6 Driver Electrical Characteristics (continued)

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

PARAMETER		TEST CONDITIONS		MIN	MAX	UNIT	
I <sub>OS</sub>	Short circuit output current	V <sub>O</sub> = -7 V		-	250	mA	
		V <sub>O</sub> = 0		-	150		
		V <sub>O</sub> = V <sub>CC</sub>			250		
		V <sub>O</sub> = 12 V			250		
I <sub>CC</sub>	Supply current	V <sub>I</sub> = 0 or V <sub>CC</sub> , No load	Receiver disabled and driver enabled	55LBC176, 65LBC176Q		1.75	mA
				65LBC176, 75LBC176		1.5	
			Receiver and driver disabled	55LBC176, 65LBC176Q		0.25	
				65LBC176, 75LBC176		0.2	

- (1)  $\Delta |V_{OD}|$  and  $\Delta |V_{OC}|$  are the changes in magnitude of V<sub>OD</sub> and V<sub>OC</sub>, respectively, that occur when the input changes from a high level to a low level.
- (2) This device meets the V<sub>OD</sub> requirements of TIA/EIA-485-A above 0°C only.
- (3) This applies for both power on and off; refer to TIA/EIA-485-A for exact conditions.

## 6.7 Driver Switching Characteristics

over recommended ranges of supply voltage and operating free-air temperature

PARAMETER	TEST CONDITIONS	SN55LBC176 SN65LBC176Q			SN65LBC176 SN75LBC176			UNIT
		MIN	TYP	MAX	MIN	TYP <sup>(1)</sup>	MAX	
$t_{d(OD)}$	Differential output delay time	8		31	8		25	ns
$t_{t(OD)}$	Differential output transition time		12			12		ns
$t_{sk(p)}$	Pulse skew ( $ t_{d(ODH)} - t_{d(ODL)} $ )			6		0	6	ns
$t_{PZH}$	Output enable time to high level			65			35	ns
$t_{PZL}$	Output enable time to low level			65			35	ns
$t_{PHZ}$	Output disable time from high level			105			60	ns
$t_{PLZ}$	Output disable time from low level			105			35	ns

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

**表 6-1. Driver Symbol Equivalent**

DATA SHEET PARAMETER	RS-485
$V_O$	$V_{oa}, V_{ob}$
$ V_{OD1} $	$V_O$
$ V_{OD2} $	$V_t (R_L = 54\ \Omega)$
$ V_{OD} $	$V_t$ (test termination measurement 2)
$\Delta  V_{OD} $	$  V_t  -  \bar{V}_t  $
$V_{OC}$	$ V_{os} $
$\Delta  V_{OC} $	$ V_{os} - \bar{V}_{os} $
$I_{OS}$	None
$I_O$	$I_{ia}, I_{ib}$

## 6.8 Receiver Electrical Characteristics

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

PARAMETER		TEST CONDITIONS		MIN	TYP <sup>(1)</sup>	MAX	UNIT	
V <sub>IT+</sub>	Positive-going input threshold voltage	V <sub>O</sub> = 2.7 V,	I <sub>O</sub> = -0.4 mA			0.2	V	
V <sub>IT-</sub>	Negative-going input threshold voltage	V <sub>O</sub> = 0.5 V,	I <sub>O</sub> = 8 mA	-0.2 <sup>(2)</sup>			V	
V <sub>hys</sub>	Hysteresis voltage (V <sub>IT+</sub> - V <sub>IT-</sub> ) (see 图 7-4)				50		mV	
V <sub>IK</sub>	Enable-input clamp voltage	I <sub>I</sub> = -18 mA		-1.5			V	
V <sub>OH</sub>	High level output voltage	V <sub>ID</sub> = 200 mV, See 图 7-6	I <sub>OH</sub> = -400 μA,		2.7		V	
V <sub>OL</sub>	Low level output voltage	V <sub>ID</sub> = -200 mV, See 图 7-6	I <sub>OL</sub> = 8 mA,			0.45	V	
I <sub>OZ</sub>	High-impedance-state output current	V <sub>O</sub> = 0.4 V to 2.4 V		-20		20	μA	
I <sub>I</sub>	Line input current	Other input = 0 V, See <sup>(3)</sup>	V <sub>I</sub> = 12 V			1	mA	
			V <sub>I</sub> = -7 V		-0.8			
I <sub>IH</sub>	High-level enable-input current	V <sub>IH</sub> = 2.7 V				-100	μA	
I <sub>IL</sub>	Low-level enable-input current	V <sub>IL</sub> = 0.4 V				-100	μA	
r <sub>I</sub>	Input resistance				12		kΩ	
I <sub>CC</sub>	Supply current	V <sub>I</sub> = 0 or V <sub>CC</sub> , No load	Receiver enabled and driver disabled				3.9	mA
			Receiver and driver disabled	SN55LBC176, SN65LBC176, SN65LBC176Q			0.25	
				SN75LBC176			0.2	

(1) All typical values are at V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C.

(2) The algebraic convention, in which the less-positive (more-negative) limit is designated minimum, is used in this data sheet.

(3) This applies for both power on and power off. Refer to ANSI Standard RS-485 for exact conditions.

## 6.9 Receiver Switching Characteristics

over recommended ranges of supply voltage and operating free-air temperature, C<sub>L</sub> = 15 pF

PARAMETER	TEST CONDITIONS	SN55LBC176 SN65LBC176Q		SN65LBC176 SN75LBC176			UNIT	
		MIN	MAX	MIN	TYP <sup>(1)</sup>	MAX		
t <sub>PLH</sub>	Propagation delay time, low- to high-level single-ended output	V <sub>ID</sub> = -1.5 V to 1.5 V, See 图 7-7	11	37	11		33	ns
t <sub>PHL</sub>	Propagation delay time, high- to low-level single-ended output		11	37	11		33	
t <sub>sk(p)</sub>	Pulse skew ( t <sub>PLH</sub> - t <sub>PHL</sub>  )			10		3	6	
t <sub>PZH</sub>	Output enable time to high level	See 图 7-8		35			35	ns
t <sub>PZL</sub>	Output enable time to low level			35			30	
t <sub>PHZ</sub>	Output disable time from high level	See 图 7-8		35			35	ns
t <sub>PLZ</sub>	Output disable time from low level			35			30	

(1) All typical values are at V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C.

## 7 Parameter Measurement Information

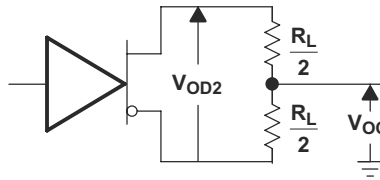


图 7-1. Driver  $V_{OD}$  and  $V_{OC}$

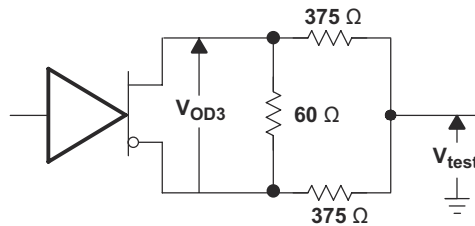
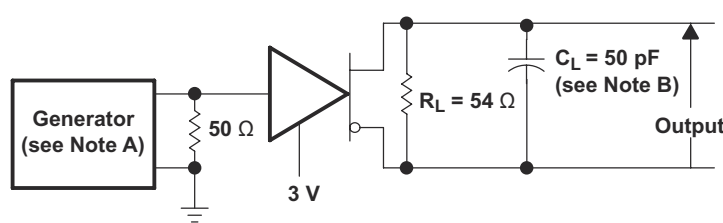
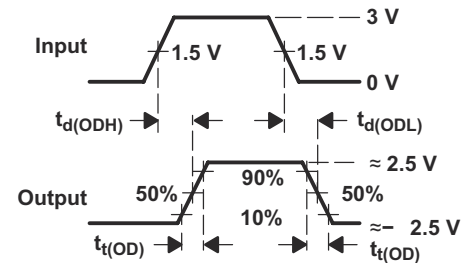


图 7-2. Driver  $V_{OD3}$

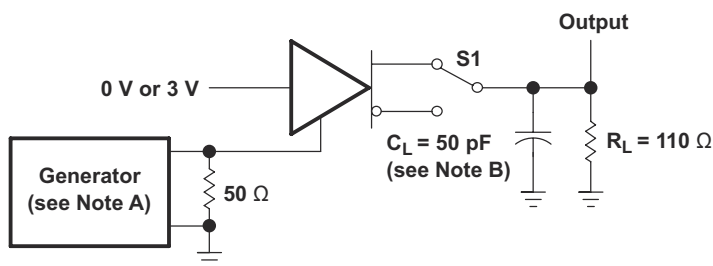


TEST CIRCUIT

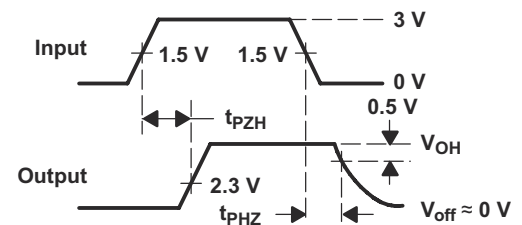


VOLTAGE WAVEFORMS

图 7-3. Driver Test Circuit and Voltage Waveforms



TEST CIRCUIT



VOLTAGE WAVEFORMS

图 7-4. Driver Test Circuit and Voltage Waveforms

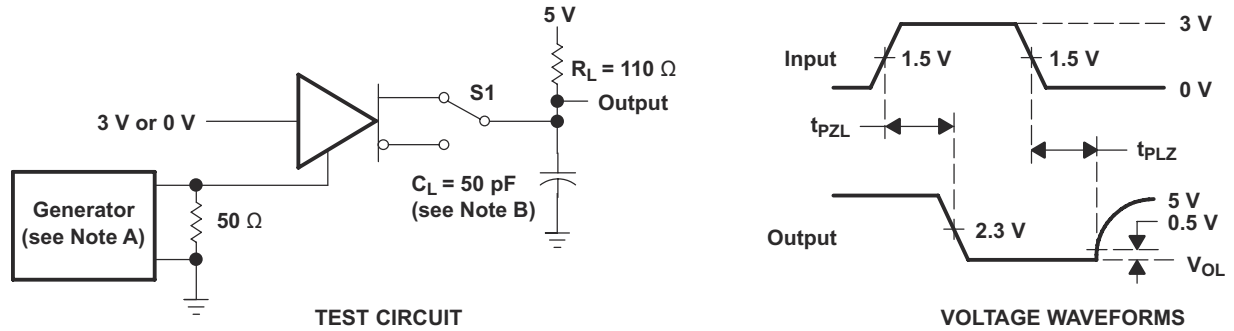


图 7-5. Driver Test Circuit and Voltage Waveforms

- A. The input pulse is supplied by a generator having the following characteristics:  $PRR \leq 1 \text{ MHz}$ , 50% duty cycle,  $t_r \leq 6 \text{ ns}$ ,  $t_f \leq 6 \text{ ns}$ ,  $Z_O = 50 \Omega$ .
- B.  $C_L$  includes probe and jig capacitance.
- C. The input pulse is supplied by a generator having the following characteristics:  $PRR \leq 1 \text{ MHz}$ , 50% duty cycle,  $t_r \leq 6 \text{ ns}$ ,  $t_f \leq 6 \text{ ns}$ ,  $Z_O = 50 \Omega$ .
- D.  $C_L$  includes probe and jig capacitance.

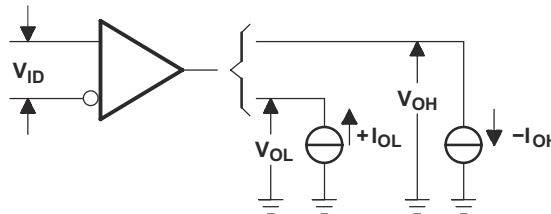


图 7-6. Receiver  $V_{OH}$  and  $V_{OL}$

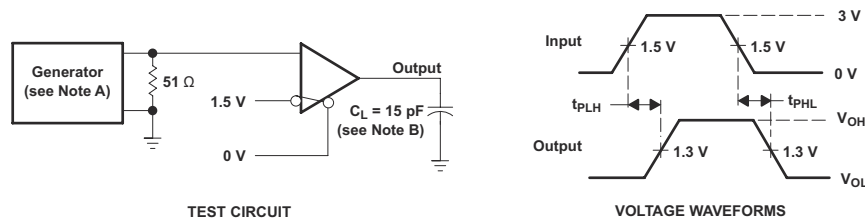
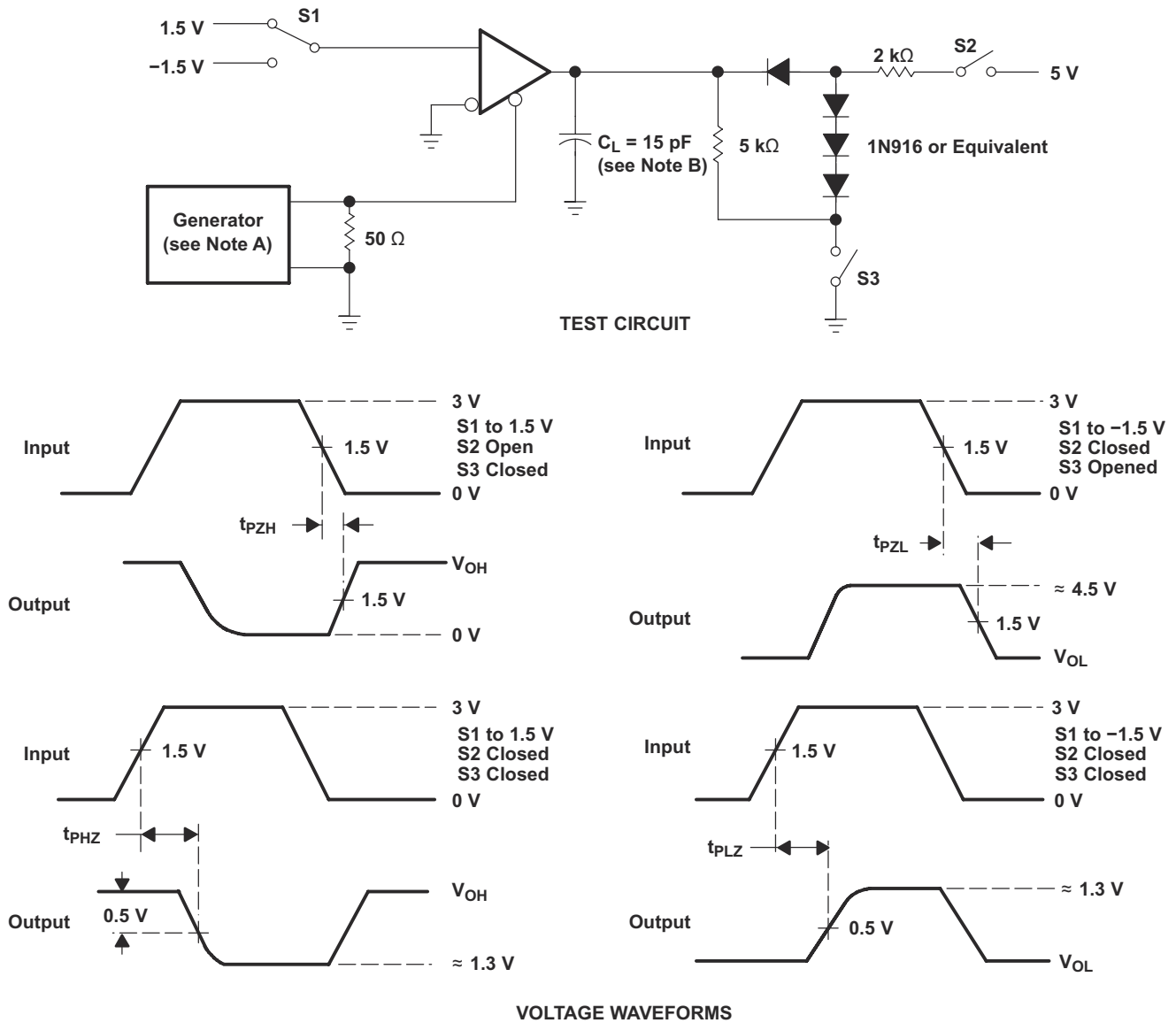


图 7-7. Receiver Test Circuit and Voltage Waveforms



- A. The input pulse is supplied by a generator having the following characteristics:  $PRR \leq 1 \text{ MHz}$ , 50% duty cycle,  $t_r \leq 6 \text{ ns}$ ,  $t_f \leq 6 \text{ ns}$ ,  $Z_o = 50 \Omega$ .
- B.  $C_L$  includes probe and jig capacitance.

**图 7-8. Receiver Test Circuit and Voltage Waveforms**

## 8 Detailed Description

### 8.1 Functional Block Diagram

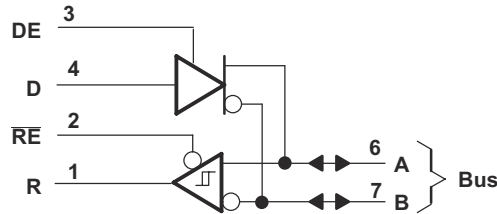
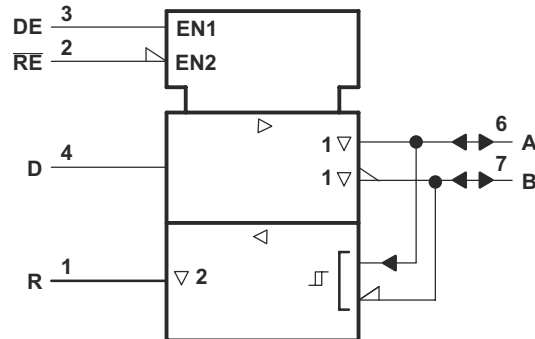


图 8-1. Logic Diagram (Positive Logic)



A. This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

图 8-2. Logic Symbol(A)

### 8.2 Device Functional Modes

表 8-1. Driver Function Tables<sup>(1)</sup>

DRIVER			
INPUT D	ENABLE DE	OUTPUTS	
		A	B
H	H	H	L
L	H	L	H
X	L	Z	Z

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

表 8-2. Receiver Function Tables<sup>(1)</sup>

RECEIVER		
DIFFERENTIAL INPUTS $V_{ID} = V_{IA} - V_{IB}$	ENABLE RE	OUTPUTS R
$V_{ID} \geq 0.2 \text{ V}$	L	H
$-0.2 \text{ V} < V_{ID} < 0.2 \text{ V}$	L	?
$V_{ID} \leq -0.2 \text{ V}$	L	L
X	H	Z
Open	L	H

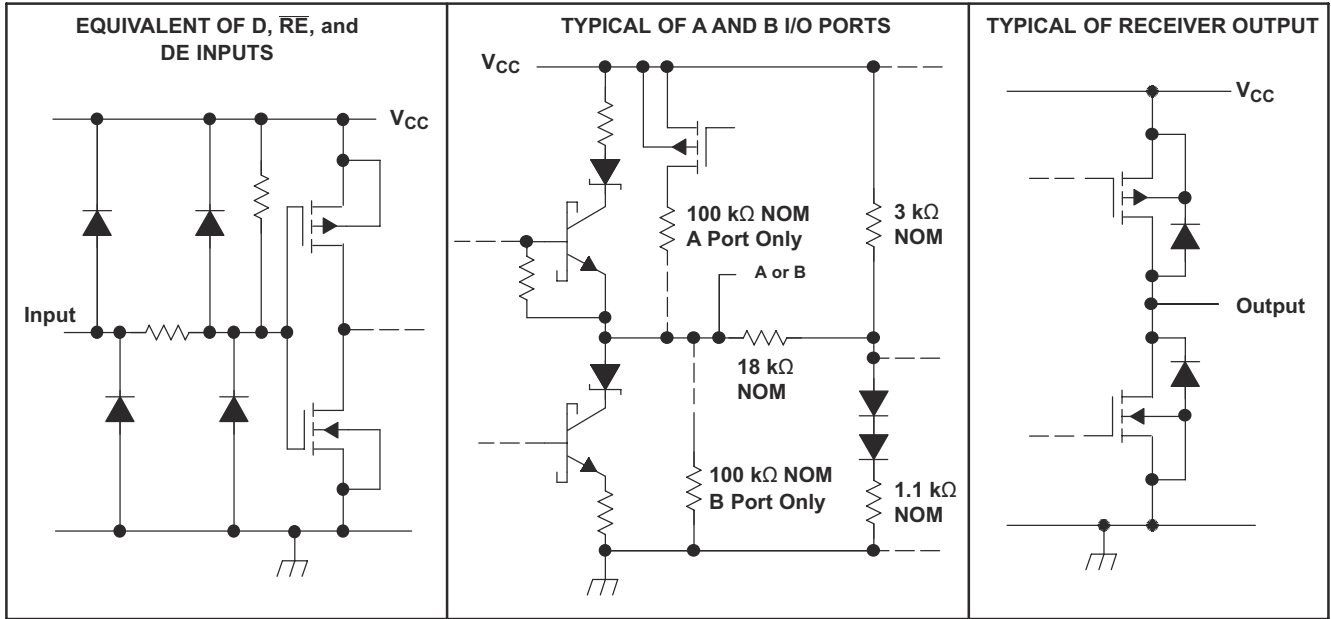


图 8-3. Schematics of Inputs and Outputs

## 9 Device and Documentation Support

### 9.1 Device Support

#### 9.1.1 Thermal Characteristics of IC Packages

$\theta_{JA}$  (Junction-to-Ambient Thermal Resistance) is defined as the difference in junction temperature to ambient temperature divided by the operating power.

$\theta_{JA}$  is NOT a constant and is a strong function of

- the PCB design (50% variation)
- altitude (20% variation)
- device power (5% variation)

$\theta_{JA}$  can be used to compare the thermal performance of packages if the specific test conditions are defined and used. Standardized testing includes specification of PCB construction, test chamber volume, sensor locations, and the thermal characteristics of holding fixtures.  $\theta_{JA}$  is often misused when it is used to calculate junction temperatures for other installations.

TI uses two test PCBs as defined by JEDEC specifications. The low-k board gives average in-use condition thermal performance and consists of a single trace layer 25 mm long and 2-oz thick copper. The high-k board gives best case in-use condition and consists of two 1-oz buried power planes with a single trace layer 25 mm long with 2-oz thick copper. A 4% to 50% difference in  $\theta_{JA}$  can be measured between these two test cards.

$\theta_{JC}$  (Junction-to-Case Thermal Resistance) is defined as difference in junction temperature to case divided by the operating power. It is measured by putting the mounted package up against a copper block cold plate to force heat to flow from die, through the mold compound into the copper block.

$\theta_{JC}$  is a useful thermal characteristic when a heatsink is applied to package. It is NOT a useful characteristic to predict junction temperature as it provides pessimistic numbers if the case temperature is measured in a non-standard system and junction temperatures are backed out. It can be used with  $\theta_{JB}$  in 1-dimensional thermal simulation of a package system.

$\theta_{JB}$  (Junction-to-Board Thermal Resistance) is defined to be the difference in the junction temperature and the PCB temperature at the center of the package (closest to the die) when the PCB is clamped in a cold-plate structure.  $\theta_{JB}$  is only defined for the high-k test card.

$\theta_{JB}$  provides an overall thermal resistance between the die and the PCB. It includes a bit of the PCB thermal resistance (especially for BGA's with thermal balls) and can be used for simple 1-dimensional network analysis of package system (see [图 9-1](#)).

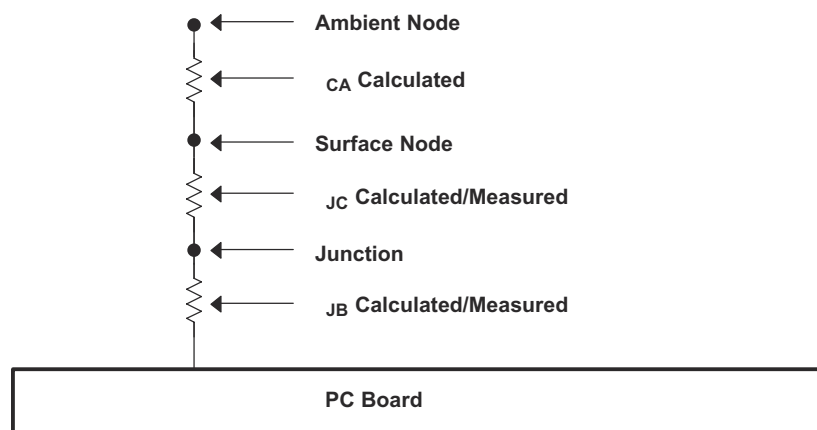


图 9-1. Thermal Resistance

### 9.2 Trademarks

LinBiCMOS™ is a trademark of Texas Instruments Incorporated.

所有商标均为其各自所有者的财产。

### 9.3 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.

### 9.4 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。

## 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)
<a href="#">5962-9318301Q2A</a>	Active	Production	LCCC (FK)   20	55   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962- 9318301Q2A SNJ55 LBC176FK
<a href="#">5962-9318301QPA</a>	Active	Production	CDIP (JG)   8	50   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	9318301QPA SNJ55LBC176
<a href="#">SN65LBC176D</a>	Obsolete	Production	SOIC (D)   8	-	-	Call TI	Call TI	-40 to 85	6LB176
<a href="#">SN65LBC176DR</a>	Active	Production	SOIC (D)   8	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	6LB176
SN65LBC176DR.A	Active	Production	SOIC (D)   8	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	6LB176
SN65LBC176DRG4	Active	Production	SOIC (D)   8	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	6LB176
<a href="#">SN65LBC176P</a>	Active	Production	PDIP (P)   8	50   TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	65LBC176
SN65LBC176P.A	Active	Production	PDIP (P)   8	50   TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	65LBC176
<a href="#">SN65LBC176QD</a>	Obsolete	Production	SOIC (D)   8	-	-	Call TI	Call TI	-40 to 125	LB176Q
<a href="#">SN65LBC176QDG4</a>	Obsolete	Production	SOIC (D)   8	-	-	Call TI	Call TI	-40 to 125	LB176Q
<a href="#">SN65LBC176QDR</a>	Active	Production	SOIC (D)   8	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LB176Q
SN65LBC176QDR.A	Active	Production	SOIC (D)   8	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LB176Q
<a href="#">SN65LBC176QDRG4</a>	Active	Production	SOIC (D)   8	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	(J176Q1, LB176Q)
SN65LBC176QDRG4.A	Active	Production	SOIC (D)   8	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	(J176Q1, LB176Q)
<a href="#">SN75LBC176D</a>	Obsolete	Production	SOIC (D)   8	-	-	Call TI	Call TI	0 to 70	7LB176
<a href="#">SN75LBC176P</a>	Active	Production	PDIP (P)   8	50   TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	75LBC176
SN75LBC176P.A	Active	Production	PDIP (P)   8	50   TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	75LBC176
<a href="#">SNJ55LBC176FK</a>	Active	Production	LCCC (FK)   20	55   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962- 9318301Q2A SNJ55 LBC176FK
SNJ55LBC176FK.A	Active	Production	LCCC (FK)   20	55   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962- 9318301Q2A SNJ55 LBC176FK
<a href="#">SNJ55LBC176JG</a>	Active	Production	CDIP (JG)   8	50   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	9318301QPA SNJ55LBC176

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)
SNJ55LBC176JG.A	Active	Production	CDIP (JG)   8	50   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	9318301QPA SNJ55LBC176

(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 SN55LBC176, SN65LBC176, SN75LBC176 :**

- Catalog : [SN75LBC176](#)

- Automotive : [SN65LBC176-Q1](#)

- Military : [SN55LBC176](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects
- Military - QML certified for Military and Defense Applications

**TAPE AND REEL INFORMATION**

**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**

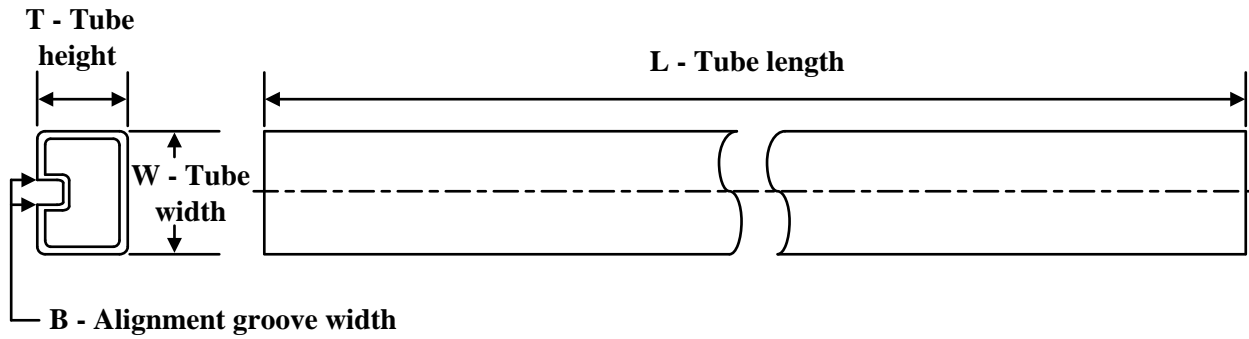

\*All dimensions are nominal

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
SN65LBC176DR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	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)
SN65LBC176DR	SOIC	D	8	2500	340.5	336.1	25.0

**TUBE**


\*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
5962-9318301Q2A	FK	LCCC	20	55	506.98	12.06	2030	NA
SN65LBC176P	P	PDIP	8	50	506	13.97	11230	4.32
SN65LBC176P.A	P	PDIP	8	50	506	13.97	11230	4.32
SN75LBC176P	P	PDIP	8	50	506	13.97	11230	4.32
SN75LBC176P.A	P	PDIP	8	50	506	13.97	11230	4.32
SNJ55LBC176FK	FK	LCCC	20	55	506.98	12.06	2030	NA
SNJ55LBC176FK.A	FK	LCCC	20	55	506.98	12.06	2030	NA

## GENERIC PACKAGE VIEW

**FK 20**

**LCCC - 2.03 mm max height**

8.89 x 8.89, 1.27 mm pitch

LEADLESS CERAMIC CHIP CARRIER

This image is a representation of the package family, actual package may vary.  
Refer to the product data sheet for package details.



4229370VA\



D0008A

# PACKAGE OUTLINE

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



4214825/C 02/2019

NOTES:

- Linear dimensions are in inches [millimeters]. Dimensions in parenthesis are for reference only. Controlling dimensions are in inches. Dimensioning and tolerancing per ASME Y14.5M.
- This drawing is subject to change without notice.
- This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed  $.006$  [0.15] per side.
- This dimension does not include interlead flash.
- Reference JEDEC registration MS-012, variation AA.

# EXAMPLE BOARD LAYOUT

D0008A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



LAND PATTERN EXAMPLE  
 EXPOSED METAL SHOWN  
 SCALE:8X



SOLDER MASK DETAILS

4214825/C 02/2019

NOTES: (continued)

- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

D0008A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



SOLDER PASTE EXAMPLE  
BASED ON .005 INCH [0.125 MM] THICK STENCIL  
SCALE:8X

4214825/C 02/2019

NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

P (R-PDIP-T8)

PLASTIC DUAL-IN-LINE PACKAGE



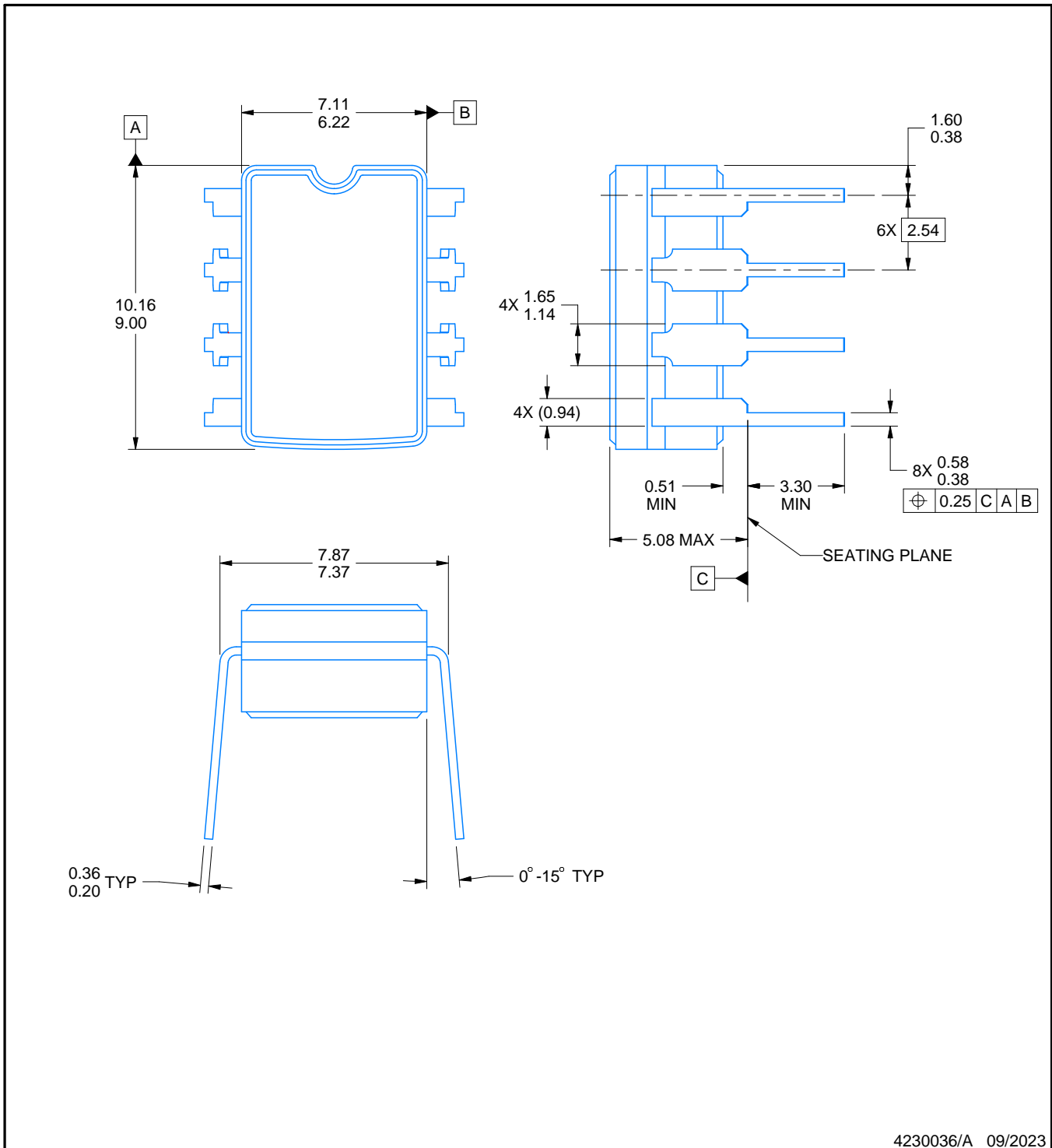
- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. Falls within JEDEC MS-001 variation BA.

# PACKAGE OUTLINE

## JG0008A

### CDIP - 5.08 mm max height

CERAMIC DUAL IN-LINE PACKAGE



#### NOTES:

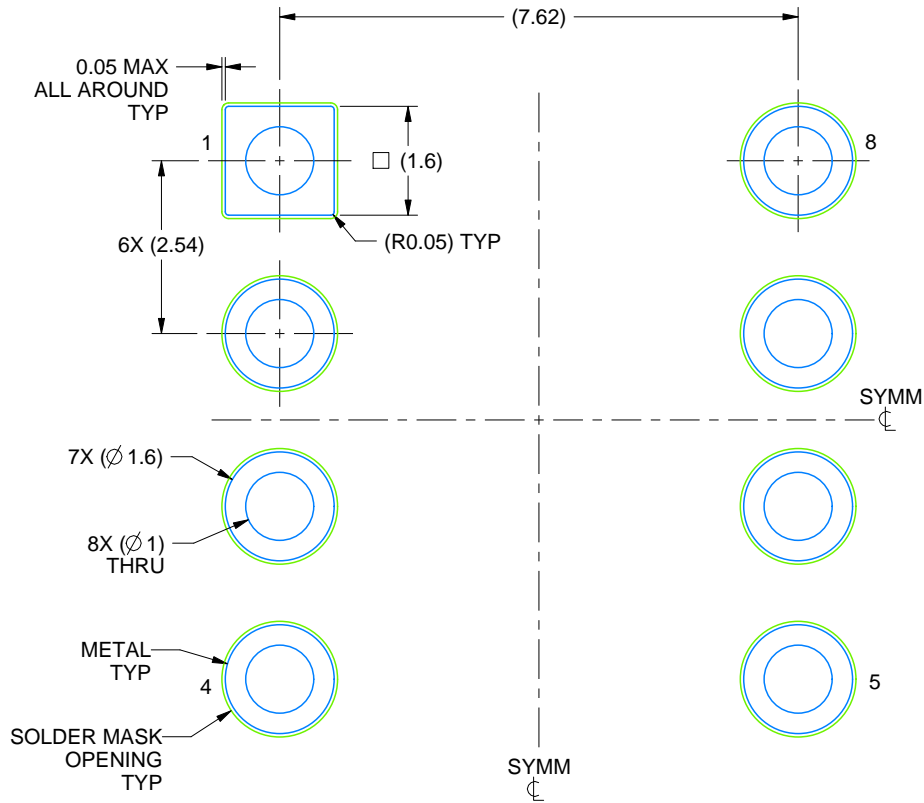
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This package can be hermetically sealed with a ceramic lid using glass frit.
4. Index point is provided on cap for terminal identification.
5. Falls within MIL STD 1835 GDIP1-T8

# EXAMPLE BOARD LAYOUT

JG0008A

CDIP - 5.08 mm max height

CERAMIC DUAL IN-LINE PACKAGE



LAND PATTERN EXAMPLE  
NON SOLDER MASK DEFINED  
SCALE: 9X

4230036/A 09/2023

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最后更新日期：2025 年 10 月