

SN75ALS1177/SN75ALS1178 デュアル差動ドライバ/レシーバ

1 特長

- TIA/EIA-422-B および TIA/EIA-485-A の規格に適合
- ノイズの多い環境の、長いバスラインでのマルチポイントバス伝送用に設計
- 低消費電流要件: 50mA (最大値)
- ドライバの正および負電流制限
- ドライバ同相出力電圧範囲: -7V~12V
- サーマル シャットダウン保護、ドライバ 3 ステート出力アクティブ High イネーブル
- レシーバ同相入力電圧範囲: -12V~12V
- レシーバ入力感度: $\pm 200\text{mV}$
- レシーバヒステリシス: 50mV (標準値)
- レシーバ高入力インピーダンス: 12k Ω (最小値)
- レシーバ 3 ステート出力アクティブ Low イネーブル (SN75ALS1177 のみ)
- 5V 単一電源で動作

2 アプリケーション

- モータードライバ
- ファクトリオートメーション
- ビルオートメーション

3 概要

SN75ALS1177 および SN75ALS1178 デュアル差動ドライバ/レシーバは、マルチポイントバス伝送ラインでの双方向データ通信を目的として設計された集積回路です。これらのデバイスは平衡伝送ライン用に設計されており、TIA/EIA-422-B および TIA/EIA-485-A 規格に適合しています。

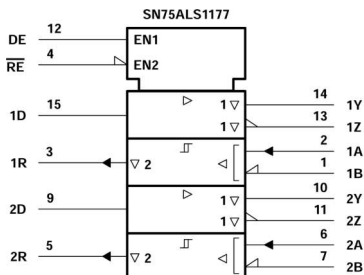
SN75ALS1177 は、デュアル 3 ステート差動ラインドライバとデュアル 3 ステート差動入力ラインレシーバを統合しており、どちらも 5V 単一電源で動作します。ドライバとレシーバはそれぞれアクティブ High、アクティブ Low のイネーブルを備えており、それらのイネーブルを外部で互いに接続することで、方向制御として機能させることができます。SN75ALS1178 ドライバは、それぞれ個別のアクティブ High イネーブルを搭載しています。フェイルセーフ設計により、レシーバ入力がオープンの際にはレシーバ出力は常に High になります。

SN75ALS1177 および SN75ALS1178 は 0°C~70°C で動作が規定されています。

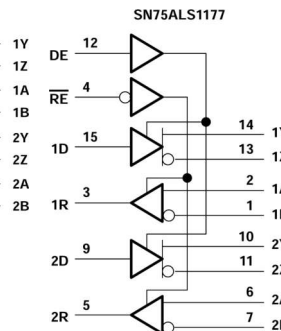
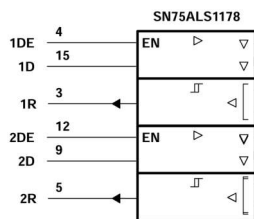
パッケージオプション

部品番号	パッケージ ⁽¹⁾	パッケージサイズ ⁽²⁾
SN75ALS1177	SOP (NS, 16)	10.2mm × 7.8mm
SN75ALS1178	PDIP (N, 16)	19.3mm × 9.4mm

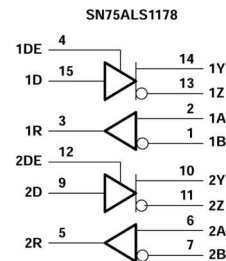
- (1) 詳細については、[セクション 10](#) を参照してください。
- (2) パッケージサイズ (長さ × 幅) は公称値であり、該当する場合はピンも含まれます。



論理記号†



論理図 (正論理)



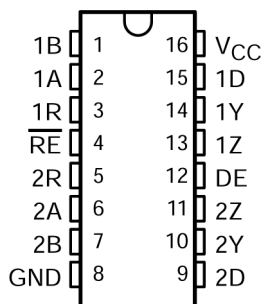
† これらの記号は ANSI/IEEE 規格 91-1984 と IEC Publication 617-12 に準拠しています。



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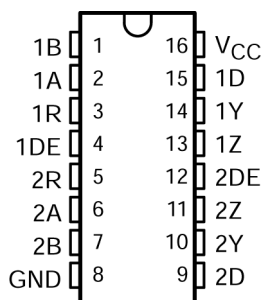
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4 Pin Configuration and Functions



**4-1. SN75ALS1177: N or NS Package
(Top View)**

PIN			TYPE	DESCRIPTION
NAME	SO	TSSOP		
1A	2	2	I	RS422 differential input (non-inverting) to receiver 1
2A	6	6	I	RS422 differential input (non-inverting) to receiver 2
1B	1	1	I	RS422 differential input (inverting) to receiver 1
2B	7	7	I	RS422 differential input (inverting) to receiver 2
1D	15	15	I	Logic data input to RS422 driver 1
2D	9	9	I	Logic data input to RS422 driver 2
DE	12	12	I	Driver enable (active high)
GND	8	8	—	Device ground pin
1R	3	3	O	Logic data output of RS422 receiver 1
2R	5	5	O	Logic data output of RS422 receiver 2
RE	4	4	I	Receiver enable pin (active low)
V _{CC}	16	16	—	Power supply
1Y	14	14	O	RS-422 differential (non-inverting) driver output 1
2Y	10	10	O	RS-422 differential (non-inverting) driver output 2
1Z	13	13	O	RS-422 differential (inverting) driver output 1
2Z	11	11	O	RS-422 differential (inverting) driver output 2



**図 4-2. SN75ALS1178: N or NS Package
(Top View)**

PINT			TYPE	DESCRIPTION
NAME	SO	TSSOP		
1A	2	2	I	RS422 differential input (non-inverting) to receiver 1
2A	6	6	I	RS422 differential input (non-inverting) to receiver 2
1B	1	1	I	RS422 differential input (inverting) to receiver 1
2B	7	7	I	RS422 differential input (inverting) to receiver 2
1D	15	15	I	Logic data input to RS422 driver 1
2D	9	9	I	Logic data input to RS422 driver 2
1DE	4	4	I	Driver 1 enable (active high)
2DE	12	12	I	Driver 2 enable (active high)
GND	8	8	—	Device ground
1R	3	3	O	Logic data output of RS422 receiver 1
2R	5	5	O	Logic data output of RS422 receiver 2
V _{CC}	16	16	—	Power supply
1Y	14	14	O	RS-422 differential (non-inverting) driver output 1
2Y	10	10	O	RS-422 differential (non-inverting) driver output 2
1Z	13	13	O	RS-422 differential (non-inverting) driver output 1
2Z	11	11	O	RS-422 differential (non-inverting) driver output 2

5 Specifications

5.1 Absolute Maximum Ratings

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

		MIN	MAX	UNIT
V _{CC}	Supply voltage, (see ⁽²⁾)		7	V
V _I	Input voltage, (DE, RE, and D inputs)		7	V
V _O	Output voltage range, drivers	–9	14	V
	Input voltage range, receiver	–14	14	V
	Receiver differential-input voltage range, (see ⁽³⁾)	–14	14	V
	Receiver low-level output current		50	mA
	Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds		260	°C
T _{stg}	Storage temperature range	–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 “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) All voltage values, except differential input voltage, are with respect to the network ground terminal.
- (3) Differential input voltage is measured at the noninverting terminal with respect to the inverting terminal.

5.2 Recommended Operating Conditions

		MIN	NOM	MAX	UNIT
V _{CC}	Supply voltage	4.75	5	5.25	V
V _{ID}	Differential input voltage			±12	V
V _{OC}	Common-mode output voltage			12	V
V _{IC}	Common-mode input voltage			±12	V
V _{IH}	High-level input voltage	2			V
V _{IL}	Low-level input voltage			0.8	V
I _{OH}	High-level output current			–60	mA
				–400	µA
I _{OL}	Low - level out output current			60	mA
				8	mA
T _A	Operating free-air temperature	0		70	°C

- (1) The algebraic convention, where the less positive (more negative) limit is designated as minimum, is used in this data sheet for common-mode output and threshold voltage level only.

5.3 Thermal Information

THERMAL METRIC ⁽¹⁾		PDIP (N)	SO (NS)	UNIT
		16 Pins	16 Pins	
R _{θJA}	Junction-to-ambient thermal resistance (see ⁽²⁾)	60.6	88.5	°C/W
R _{θJB}	Junction-to-board thermal resistance	48.1	46.2	°C/W
ψ _{JT}	Junction-to-top characterization parameter	40.6	50.7	°C/W
ψ _{JB}	Junction-to-board characterization parameter	27.5	13.5	°C/W
R _{θJC(bot)}	Junction-to-case (bottom) thermal resistance	40.3	50.3	°C/W

- (1) For more information about traditional and new thermal metrics, see the [Semiconductor and IC package thermal metrics](#) application report.
- (2) The package thermal impedance is calculated in accordance with JESD 51-7.

5.4 Driver Section

5.4.1 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 _{IK}	Input clamp voltage	I _I = -18 mA					-1.5	V
V _{OH}	High-level output voltage	V _{IH} = 2V,	V _{IL} = 0.8V,	I _{OH} = - 33mA		3.3		V
V _{OL}	Low-level output voltage	V _{IH} = 2V,	V _{IL} = 0.8V,	I _{OL} = 33mA		1.1		V
V _{OD1}	Differential output voltage	I _O = 0			1.5		6	V
V _{OD2}	Differential output voltage	V _{CC} = 5V,	R _L = 100Ω,	See 6-1	1/2V _{OD1} or 2 ⁽²⁾			V
		R _L = 54Ω,	See 6-1		1.5	2.5	5	
V _{OD3}	Differential output voltage	See Note 4			1.5		5	V
Δ V _{OD}	Change in magnitude of differential output voltage (see Note 5)	R _L = 54Ω or 100Ω,		See 6-1			±0.2	V
V _{OC}	Common-mode output voltage	R _L = 54Ω or 100Ω,		See 6-1	-1 ⁽³⁾		3	V
Δ V _{OC}	Change in magnitude of common-mode output voltage (see Note 5)	R _L = 54Ω or 100Ω,		See 6-1			±0.2	V
I _{O(OFF)}	Output current with power off	V _{CC} = 0,	V _O = -7V to 12V				±100	μA
I _{OZ}	High-impedance-state output current	V _O = -7V to 12V					±100	μA
I _{IH}	High-level input current	V _{IH} = 2.7V					100	μA
I _{IL}	Low-level input current	V _{IL} = 0.4V					-100	μA
I _{OS}	Short-circuit output current	V _O = -7V					-250	mA
		V _O = V _{CC}					250	
		V _O = 12V					250	
		V _O = 0V					150	
I _{CC}	Supply current (total package)	No load	Outputs enabled			35	50	mA
			Outputs disabled			20	50	

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

(2) The minimum V_{OD2} with a 100Ω load is either $1/2 V_{OD1}$ or 2V , whichever is greater.

(3) The algebraic convention, where the less positive (more negative) limit is designated as minimum, is used in this data sheet for common-mode output and threshold voltage levels only.

(4) See TIA/EIA-485-A [6-3.5](#), test termination measurement 2.

(5) $\Delta|V_{OD}|$ and $\Delta|V_{OC}|$ are the changes in magnitude of V_{OD} and V_{OC} , respectively, that occur when the input is changed from a high level to a low level.

5.4.2 Switching Characteristics

at $V_{CC} = 5\text{V}$, $T_A = 25^\circ\text{C}$ (unless otherwise noted)

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
t_{PLH}	Propagation delay time, high- to low-level output	$R_L = 60\Omega$, $C_{L1} = C_{L2} = 100\text{pF}$, See 6-3		9	15	22	ns
t_{PHL}	Propagation delay time, low- to high-level output	$R_L = 60\Omega$, $C_{L1} = C_{L2} = 100\text{pF}$, See 6-3		9	15	22	ns
t_{sk}	Output-to-output skew	$R_L = 60\Omega$, $C_{L1} = C_{L2} = 100\text{pF}$, See 6-3		0	2	8	ns
t_{PZH}	Output enable time to high level	$C_L = 100\text{pF}$,	See 6-4	30	35	50	ns
t_{PZL}	Output enable time to low level	$C_L = 100\text{pF}$,	See 6-5	5	15	25	ns
t_{PHZ}	Output disable time from high level	$C_L = 15\text{pF}$,	See 6-4	7	15	30	ns
t_{PLZ}	Output disable time from low level	$C_L = 15\text{pF}$,	See 6-5	7	15	30	ns

5.5 Receiver Section

5.5.1 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 ⁽¹⁾	MAX	UNIT
V _{IT+}	Positive-going input threshold voltage		V _O = 2.7V,	I _O = -0.4mA			0.2	V
V _{IT-}	Negative-going input threshold voltage		V _O = 0.5V,	I _O = 8mA	-0.2 ⁽²⁾			V
V _{hys}	Input hysteresis voltage (V _{IT+} - V _{IT-})					50		mV
V _{IK}	Enable input clamp voltage	SN75ALS1177	I _I = -18mA				-1.5	V
V _{OH}	High-level output voltage		V _{ID} = 200mV, I _{OH} = -400μA, See 6-2		2.7			V
V _{OL}	Low-level output voltage		V _{ID} = 200mV, I _{OL} = 8mA, See 6-2				0.45	V
I _{OZ}	High-impedance-state output current	SN75ALS1177	V _O = 0.4V to 2.4V				±20	μA
I _I	Line input current (see Note 6)		Other input at 0V	V _I = 12V			1	mA
				V _I = -7V			-0.8	
I _{IH}	High-level input current, $\overline{RE}$	SN75ALS1177	V _{IH} = 2.7V				20	μA
I _{IL}	Low-level input current, $\overline{RE}$	SN75ALS1177	V _{IL} = 0.4V				-100	μA
r _i	Input resistance				12			kΩ
I _{OS}	Short-circuit output current		V _O = 0V,	See Note 7	-15		-85	mA
I _{CC}	Supply current (total package)		No load,	outputs enabled		35	50	mA

(1) All typical values are at V_{CC} = 5V and T_A = 25°C.

(2) The algebraic convention, where the less positive (more negative) limit is designated as minimum, is used in this data sheet for common-mode output and threshold voltage levels only.

(3) Refer to TIA/EIA-422-B, TIA/EIA-423-A, and TIA/EIA-485-A for exact conditions.

(4) Not more than one output should be shorted at a time.

5.5.2 Switching Characteristics

at V_{CC} = 5V, T_A = 25°C (unless otherwise noted)

PARAMETER			TEST CONDITIONS		MIN	TYP	MAX	UNIT
t _{PLH}	Propagation delay time, low- to high-level output		C _L = 15pF,	See 6-6	15	25	37	ns
t _{PHL}	Propagation delay time, high- to low-level output		C _L = 15pF,	See 6-6	15	25	37	ns
t _{PZH}	Output enable time to high level	SN75ALS1177	C _L = 100pF,	See 6-7	10	20	30	ns
t _{PZL}	Output enable time to low level	SN75ALS1177	C _L = 100pF,	See 6-7	10	20	30	ns
t _{PHZ}	Output disable time from high level	SN75ALS1177	C _L = 15pF,	See 6-7	3.5	12	16	ns
t _{PLZ}	Output disable time from low level	SN75ALS1177	C _L = 15pF,	See 6-7	5	12	16	ns

6 Parameter Measurement Information

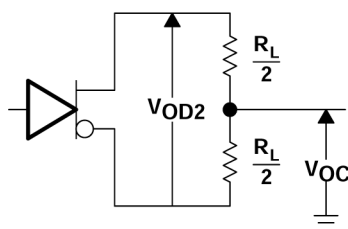


图 6-1. Driver Test Circuit, V_{OD} and V_{OC}

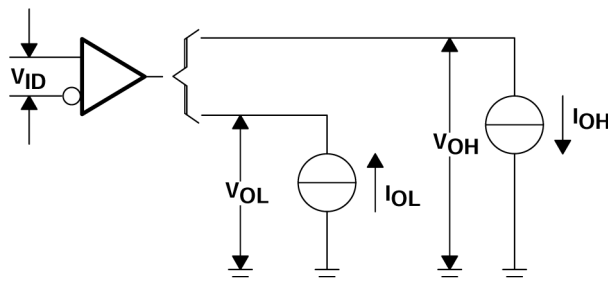
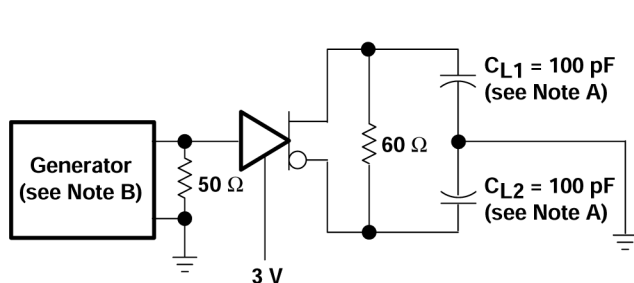
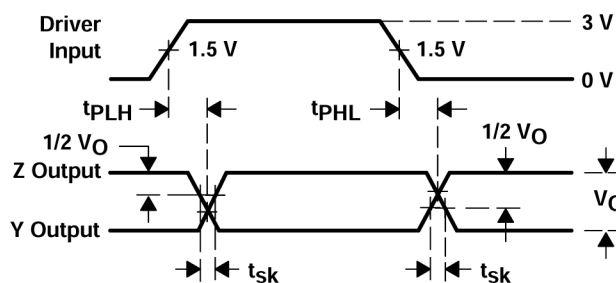


图 6-2. Receiver Test Circuit, V_{OH} and V_{OL}



DRIVER TEST CIRCUIT

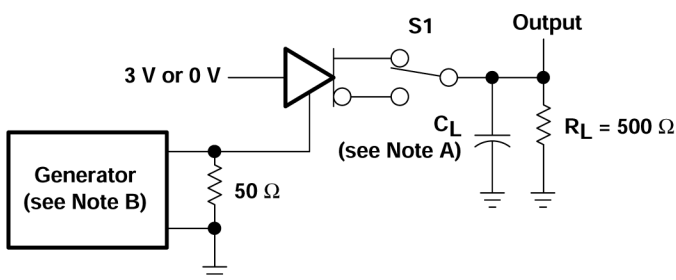


DRIVER VOLTAGE WAVEFORMS

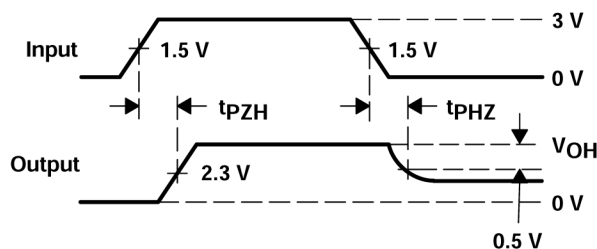
A. C_L includes probe and jig capacitance.

B. The pulse generator has the following characteristics: $PRR \leq 1\text{MHz}$, 50% duty cycle, $t_r \leq 10\text{ns}$, $t_f \leq 10\text{ns}$.

图 6-3. Driver Propagation Delay Times



DRIVER TEST CIRCUIT

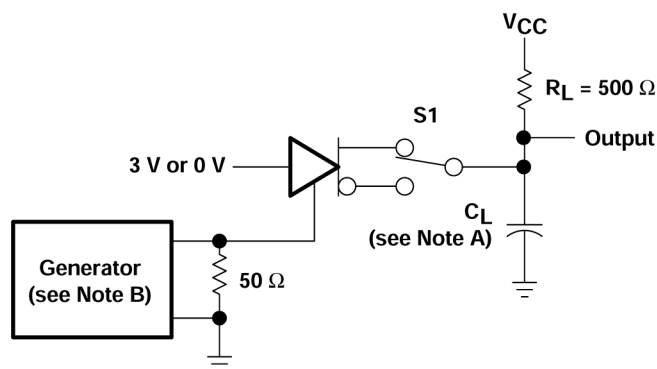


DRIVER VOLTAGE WAVEFORMS

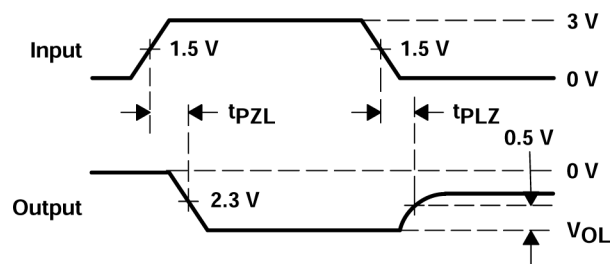
A. C_L includes probe and jig capacitance.

B. The pulse generator has the following characteristics: $PRR \leq 1\text{MHz}$, 50% duty cycle, $t_r \leq 10\text{ns}$, $t_f \leq 10\text{ns}$.

图 6-4. Driver Enable and Disable Times



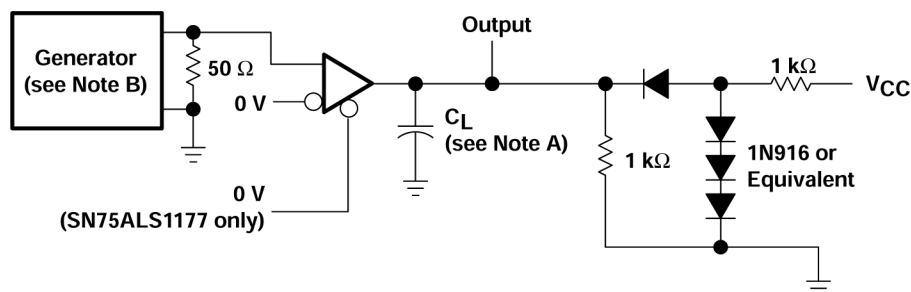
DRIVER TEST CIRCUIT



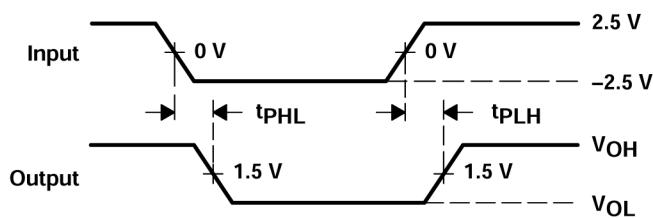
DRIVER VOLTAGE WAVEFORMS

- A. C_L includes probe and jig capacitance.
B. The pulse generator has the following characteristics: $PRR \leq 1\text{MHz}$, 50% duty cycle, $t_r \leq 10\text{ns}$, $t_f \leq 10\text{ns}$.

6-5. Driver Enable and Disable Times



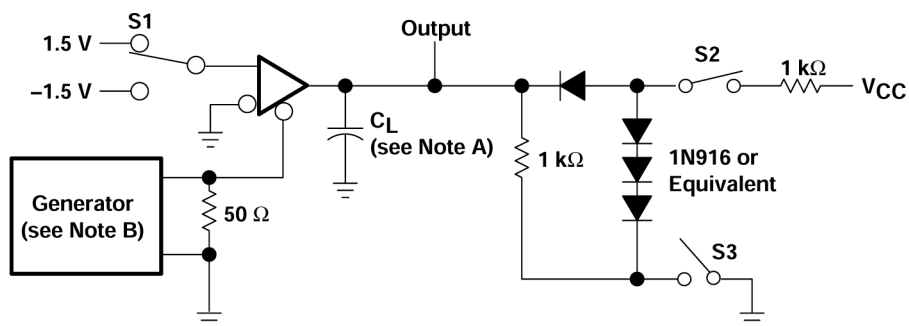
RECEIVER TEST CIRCUIT



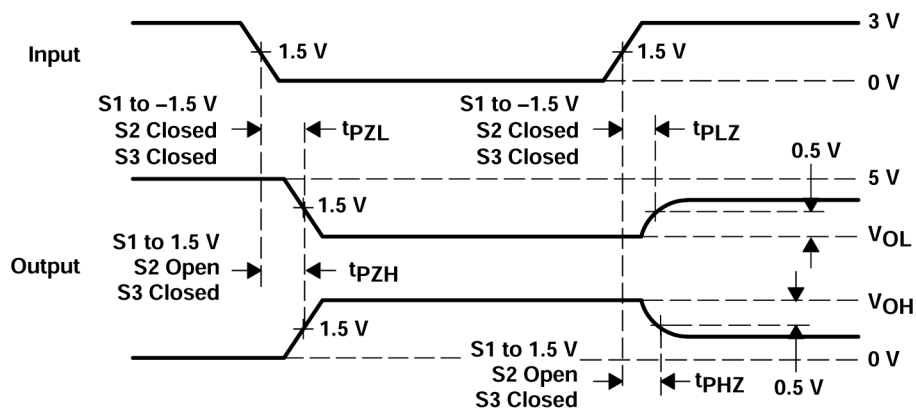
DRIVER VOLTAGE WAVEFORMS

- A. C_L includes probe and jig capacitance.
B. The pulse generator has the following characteristics: $PRR \leq 1\text{MHz}$, 50% duty cycle, $t_r \leq 10\text{ns}$, $t_f \leq 10\text{ns}$.

6-6. Receiver Propagation Delay Times



RECEIVER TEST CIRCUIT



RECEIVER VOLTAGE WAVEFORMS

- A. C_L includes probe and jig capacitance.
- B. The pulse generator has the following characteristics: $PRR \leq 1\text{MHz}$, 50% duty cycle, $t_r \leq 10\text{ns}$, $t_f \leq 10\text{ns}$.

6-7. Receiver Output Enable and Disable Times

7 Detailed Description

7.1 Device Functional Modes

表 7-1. SN75ALS1177, SN75ALS1178 Functional Table (Each Driver)

INPUT D	ENABLE DE	OUTPUTS ⁽¹⁾	
		Y	Z
H	H	H	L
L	H	L	H
X	L	Z	Z

表 7-2. SN75ALS1177 Functional Table (Each Receiver)

DIFFERENTIAL A–B	ENABLE RE ⁽¹⁾	OUTPUT Y ⁽¹⁾
$V_{ID} \geq 0.2V$	L	H
$-0.2V < V_{ID} < 0.2V$	L	?
$V_{ID} \leq -0.2V$	L	L
X	H	Z
Open	L	H

表 7-3. SN75ALS1178 Functional Table (Each Receiver)

DIFFERENTIAL A–B	OUTPUT Y ⁽¹⁾
$V_{ID} \geq 0.2V$	H
$-0.2V < V_{ID} < 0.2V$	?
$V_{ID} \leq -0.2V$	L
Open	H

(1) H = High level, L = Low level, ? = Indeterminate, X = Irrelevant, Z = High impedance (off)

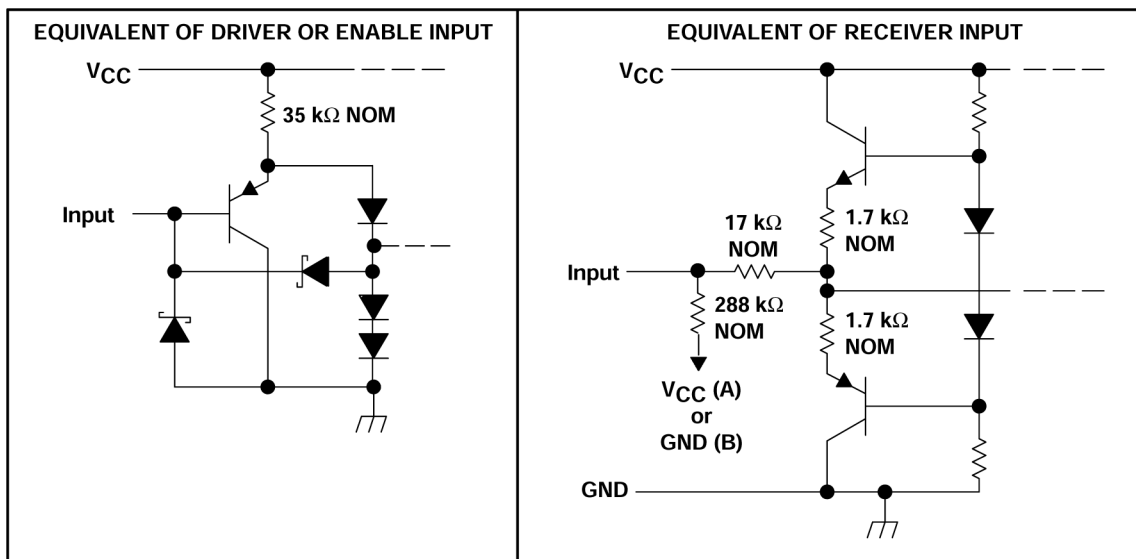
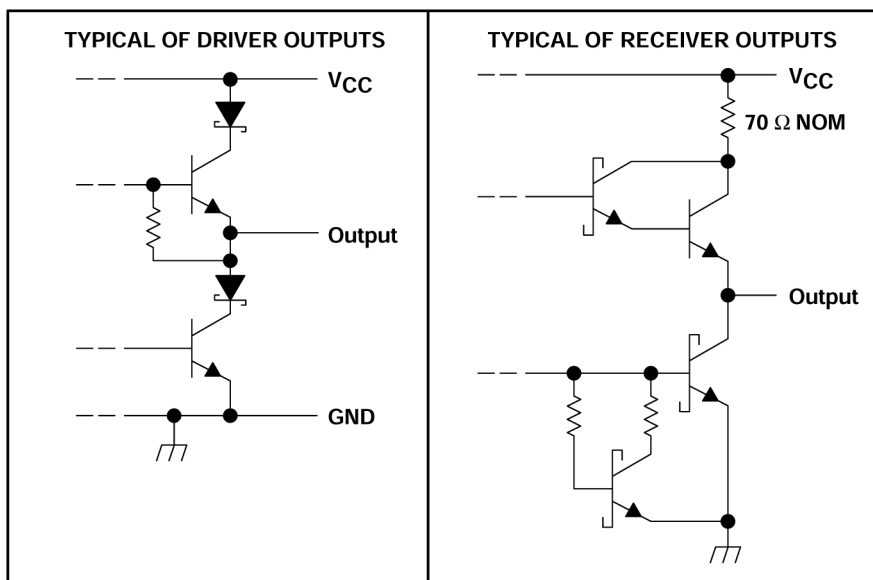


図 7-1. Equivalent Schematics



7-2. Schematics of 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 Documentation Support

8.2 ドキュメントの更新通知を受け取る方法

ドキュメントの更新についての通知を受け取るには、[ti.com](https://www.ti.com) のデバイス製品フォルダを開いてください。「更新の通知を受け取る」をクリックして登録すると、変更されたすべての製品情報に関するダイジェストを毎週受け取れます。変更の詳細については、修正されたドキュメントに含まれている改訂履歴をご覧ください。

8.3 サポート・リソース

[E2E™ サポート・フォーラム](#)は、エンジニアが検証済みの回答と設計に関するヒントをエキスパートから迅速かつ直接得ることができる場所です。既存の回答を検索したり、独自の質問をしたりすることで、設計に必要な支援を迅速に得ることができます。

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8.4 Trademarks

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8.5 静電気放電に関する注意事項



この IC は、ESD によって破損する可能性があります。テキサス・インスツルメンツは、IC を取り扱う際には常に適切な注意を払うことを推奨します。正しい取り扱いおよび設置手順に従わない場合、デバイスを破損するおそれがあります。

ESD による破損は、わずかな性能低下からデバイスの完全な故障まで多岐にわたります。精密な IC の場合、パラメータがわずかに変化するだけで公表されている仕様から外れる可能性があるため、破損が発生しやすくなっています。

8.6 用語集

[テキサス・インスツルメンツ用語集](#)

この用語集には、用語や略語の一覧および定義が記載されています。

9 Revision History

Changes from Revision B (February 2001) to Revision C (February 2024)

Page

- ドキュメント全体にわたって表、図、相互参照の採番方法を変更..... **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 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
SN75ALS1177N	ACTIVE	PDIP	N	16	25	RoHS & Green	NIPDAU	N / A for Pkg Type	0 to 70	SN75ALS1177N	Samples
SN75ALS1177NSR	ACTIVE	SO	NS	16	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	75ALS1177	Samples
SN75ALS1178N	ACTIVE	PDIP	N	16	25	RoHS & Green	NIPDAU	N / A for Pkg Type	0 to 70	SN75ALS1178N	Samples
SN75ALS1178NSR	ACTIVE	SO	NS	16	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	75ALS1178	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.

OBSELETE: 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.

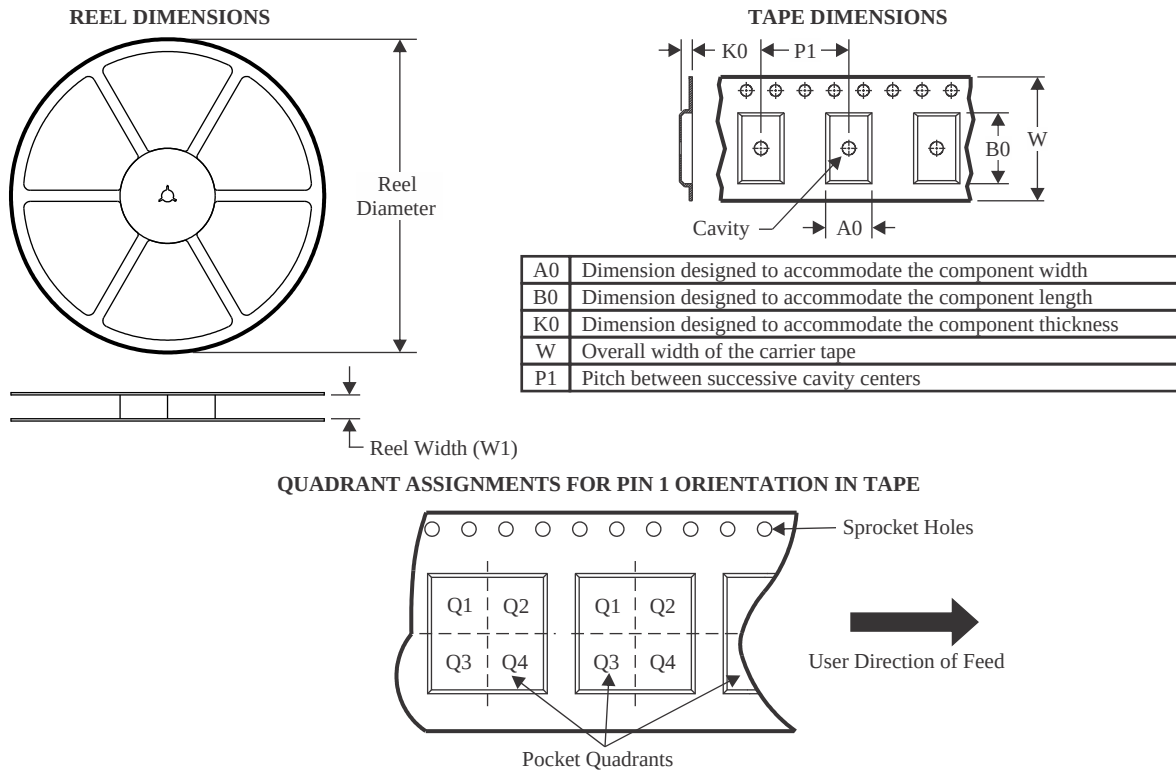
⁽⁶⁾ Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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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.

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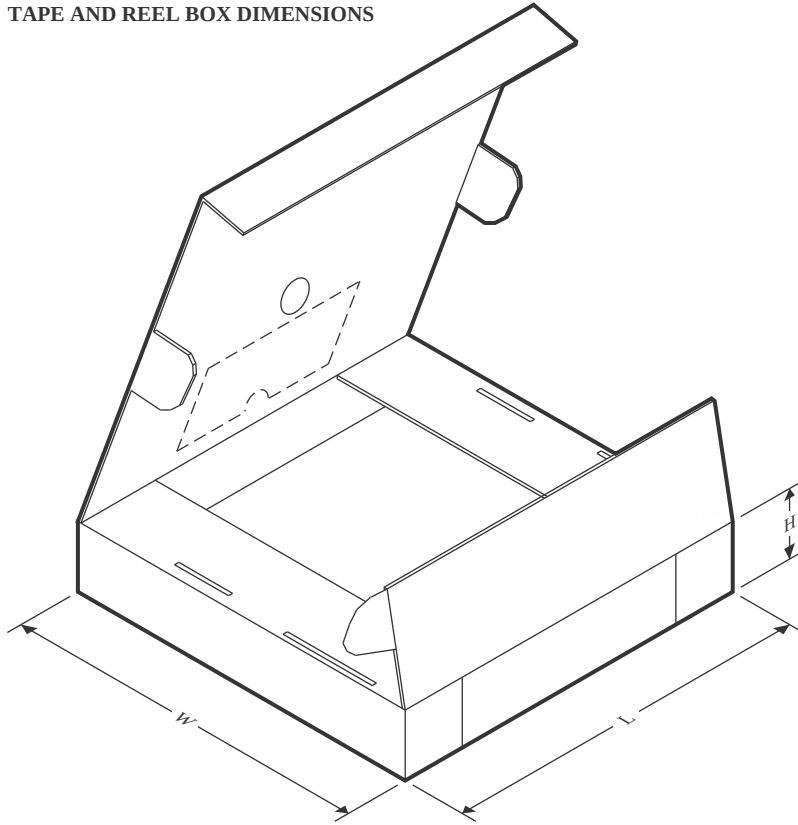
TAPE AND REEL INFORMATION



*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
SN75ALS1177NSR	SO	NS	16	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1
SN75ALS1178NSR	SO	NS	16	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1

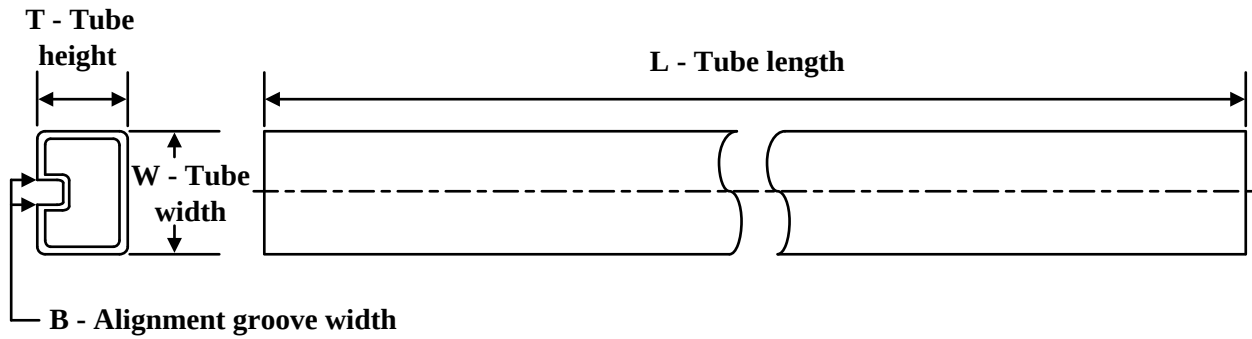
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

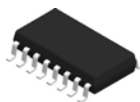
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN75ALS1177NSR	SO	NS	16	2000	356.0	356.0	35.0
SN75ALS1178NSR	SO	NS	16	2000	356.0	356.0	35.0

TUBE



*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
SN75ALS1177N	N	PDIP	16	25	506	13.97	11230	4.32
SN75ALS1178N	N	PDIP	16	25	506	13.97	11230	4.32

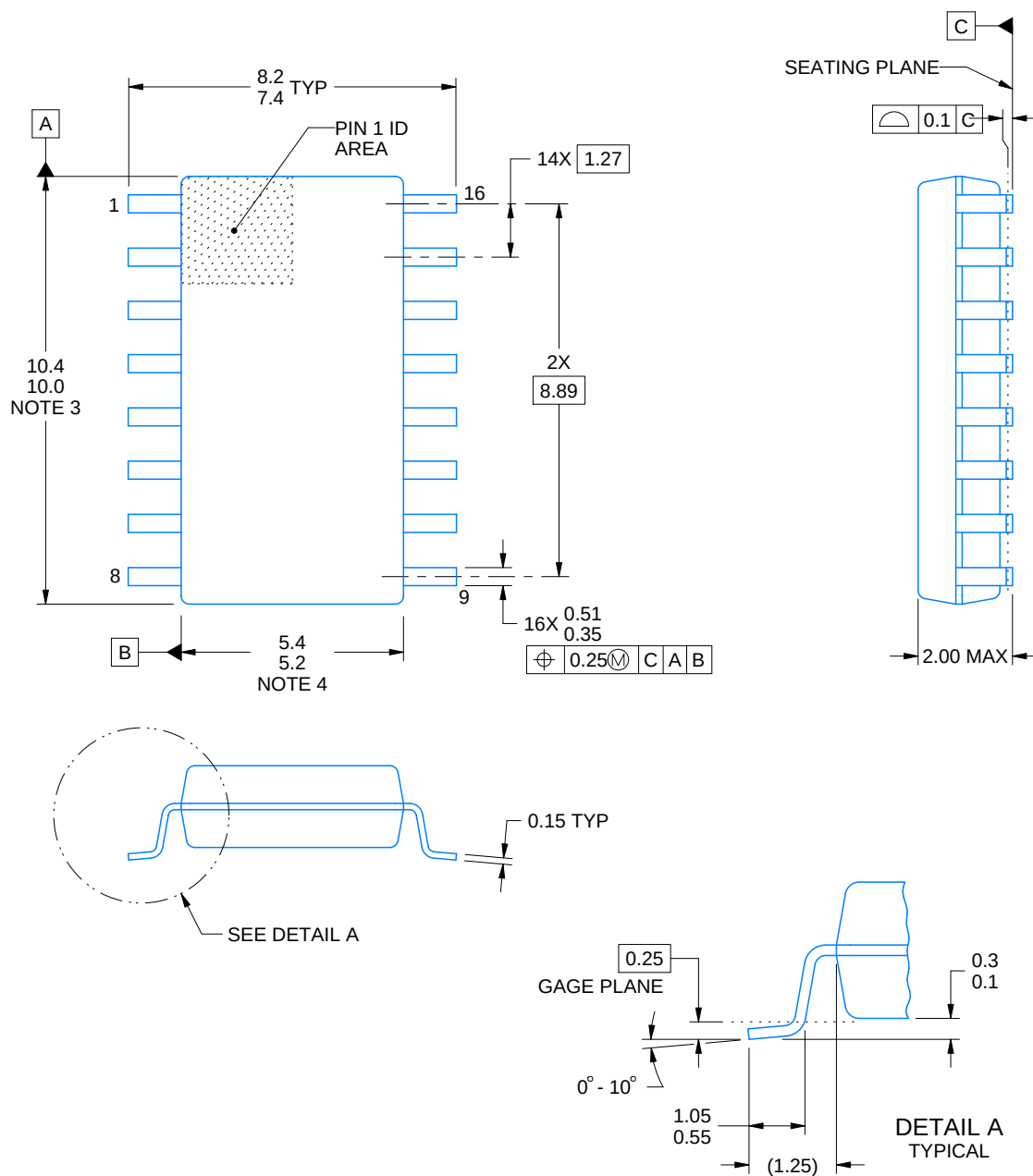


NS0016A

PACKAGE OUTLINE

SOP - 2.00 mm max height

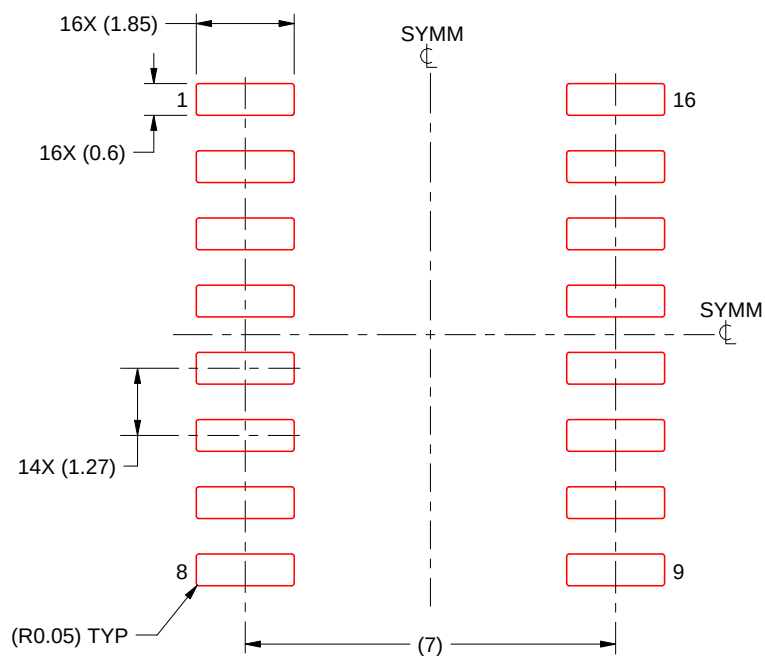
SOP



4220735/A 12/2021

NOTES:

1. All linear dimensions are in millimeters. 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 dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm, per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm, per side.



SOLDER PASTE EXAMPLE
 BASED ON 0.125 mm THICK STENCIL
 SCALE:7X

4220735/A 12/2021

NOTES: (continued)

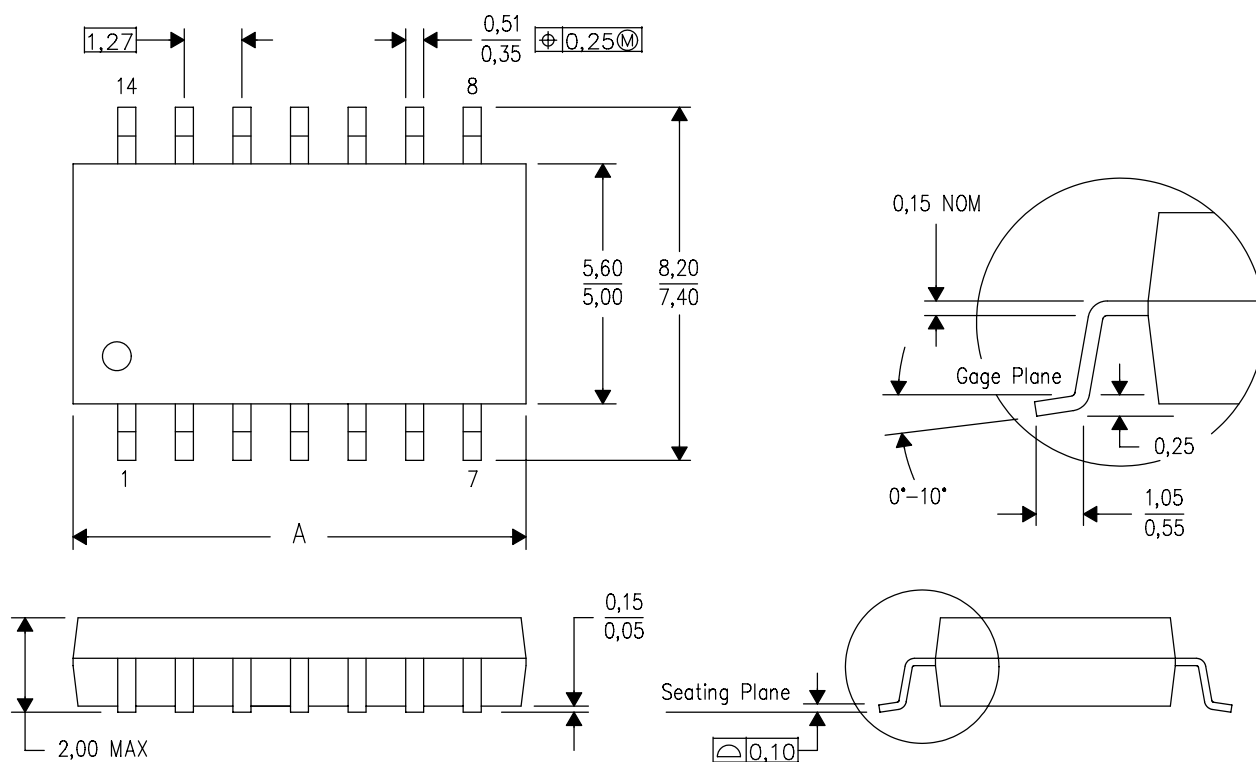
7. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
8. Board assembly site may have different recommendations for stencil design.

MECHANICAL DATA

NS (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



DIM \ PINS **	14	16	20	24
A MAX	10,50	10,50	12,90	15,30
A MIN	9,90	9,90	12,30	14,70

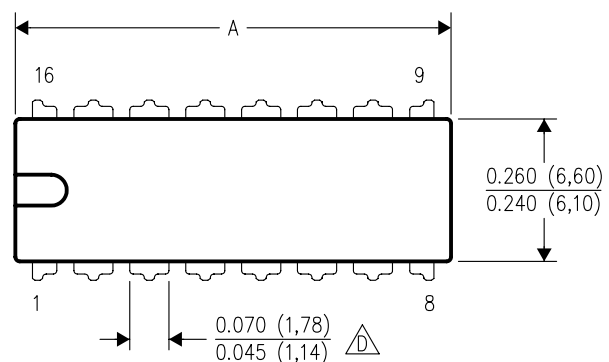
4040062/C 03/03

- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

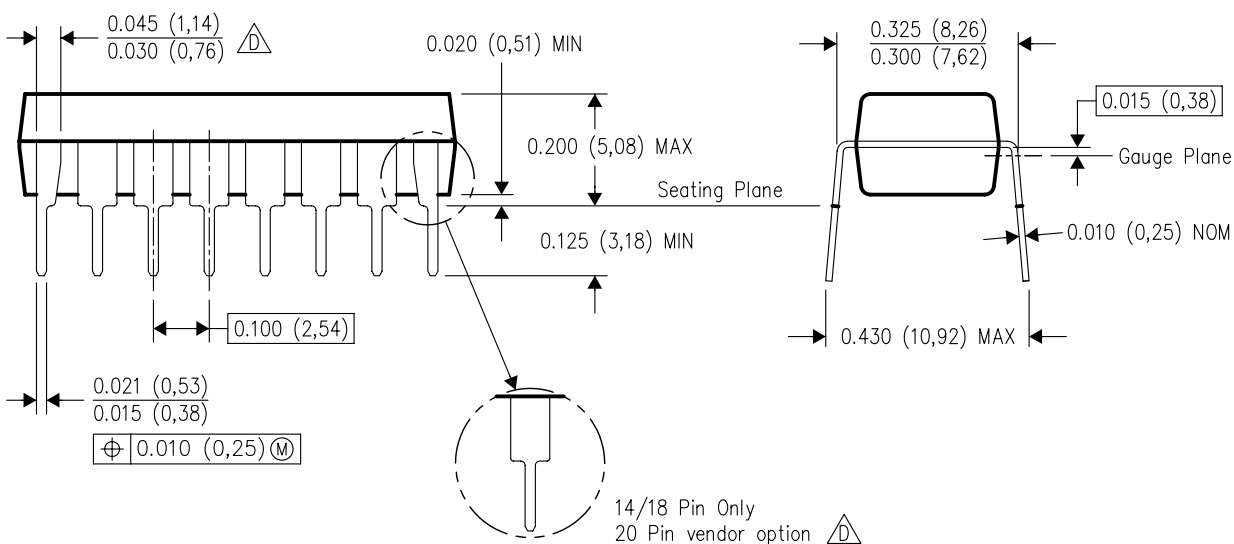
N (R-PDIP-T**)

16 PINS SHOWN

PLASTIC DUAL-IN-LINE PACKAGE



PINS ** DIM	14	16	18	20
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS-001 VARIATION	AA	BB	AC	AD



4040049/E 12/2002

NOTES:

- A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
-  Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
 The 20 pin end lead shoulder width is a vendor option, either half or full width.

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