

双路差分线路驱动器

1 特性

- 符合或超出 ANSI EIA/TIA-422-B 和 ITU 建议 V.11 的要求
- 单 5V 电源
- 平衡线路运行
- TTL 兼容
- 在断电情况下具有高输出阻抗
- 高电流有源上拉输出
- 短路保护
- 双通道
- 输入钳位二极管

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

SN75158 是一款双路差分线路驱动器，符合 ANSI EIA/TIA-422-B 和 ITU V.11 接口规范所设定的要求。输出提供具有高电流能力的信号，用于驱动具有正常线路阻抗的平衡线路（例如双绞线），而不会产生高功率耗散。此输出级为 TTL 图腾柱输出，在断电情况下提供高阻抗状态。

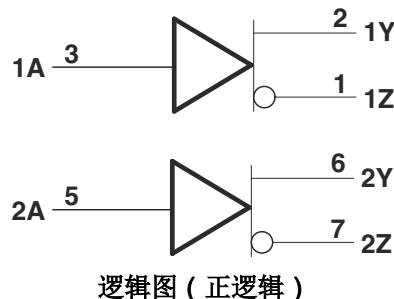
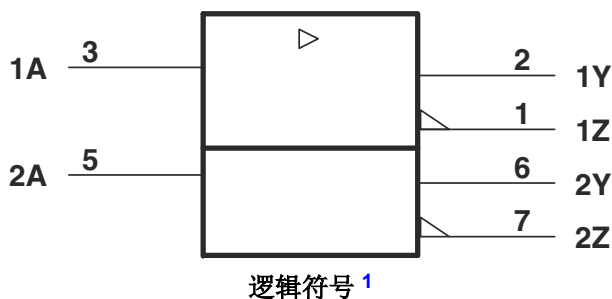
SN75158 的工作温度范围是 0°C 至 70°C。

封装信息

器件型号	封装 ⁽¹⁾	封装尺寸 ⁽²⁾
SN75158	SOIC (D , 8)	4.9mm × 6mm
	PDIP (P , 8)	9.81mm × 9.43mm
	SOP (PS , 8)	6.2mm × 7.8mm

(1) 有关更多信息，请参阅节 8。

(2) 封装尺寸（长 × 宽）为标称值，并包括引脚（如适用）。



¹ 此符号符合 ANSI/IEEE 标准 91-1984 和 IEC 出版物 617-12。



Table of Contents

1 特性	1	5.7 Typical Characteristics.....	6
2 应用	1	Parameter Measurement Information	9
3 说明	1	6 Device and Documentation Support	10
4 Pin Configuration and Functions	3	6.1 接收文档更新通知.....	10
5 Specifications	4	6.2 支持资源.....	10
5.1 Absolute Maximum Ratings.....	4	6.3 商标.....	10
5.2 Dissipation Ratings.....	4	6.4 静电放电警告.....	10
5.3 Recommended Operating Conditions.....	4	6.5 术语表.....	10
5.4 Thermal Information.....	4	7 Revision History	10
5.5 Electrical Characteristics.....	5	8 Mechanical, Packaging, and Orderable Information ..	10
5.6 Switching Characteristics.....	5		

4 Pin Configuration and Functions

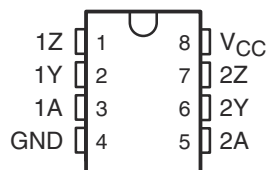


图 4-1. D, P, OR PS Package
(Top View)

表 4-1. Pin Functions

PIN		TYPE ⁽¹⁾	DESCRIPTION
NAME	NO.		
1Z	1	O	Inverting Output of Differential Driver on Channel 1
1Y	2	O	Non-Inverting Output for Differential Driver on Channel 1
1A	3	I	Single Ended Data Input for Channel 1
GND	4	GND	Device Ground
2A	5	I	Single Ended Data Input for Channel 2
2Y	6	O	Non-Inverting Output for Differential Driver on Channel 2
2Z	7	O	Inverting Output of Differential Driver on Channel 2
V _{CC}	8	P	5V Power Supply Positive Terminal Connection

(1) Signal Types: I = Input, O = Output, I/O = Input or Output, P = Power, GND = Ground.

5 Specifications

5.1 Absolute Maximum Ratings

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

		MIN	MAX	UNIT
V _{CC}	Supply voltage ⁽²⁾		7	V
V _I	Input voltage range		5.5	V
	Continuous total power dissipation	See Dissipation Ratings		
T _J	Operating free-air temperature range	0	70	°C
T _{stg}	Storage temperature range	– 65	150	°C
	Lead temperature 1,6 mm (1/16 inch) from case for 10 s		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, except differential input voltage, are with respect to the network ground terminal.
- (3) Differential input voltage is measured at the noninverting input with respect to the corresponding inverting input.

5.2 Dissipation Ratings

PACKAGE	TA ≤ 25°C POWER RATING	OPERATING FACTOR ABOVE TA = 25°C	TA ≤ 70°C POWER RATING
D	725 mW	5.8 mW/°C	464 mW
P	1000 mW	8.0 mW/°C	640 mW
PS	450 mW	3.6 mW/°C	288 mW

5.3 Recommended Operating Conditions

		MIN	NOM	MAX	UNIT
V _{CC}	Supply voltage	4.75	5	5.25	V
V _{IH}	High-level input voltage	2			V
V _{IL}	Low-level input voltage			0.8	V
I _{OH}	High-level output current			– 40	mA
I _{OL}	Low-level output current			40	mA
T _A	Operating free-air temperature	0		70	°C

5.4 Thermal Information

THERMAL METRIC ⁽¹⁾		D	P	PS	UNIT
		8-Pins			
R _{θJA}	Junction-to-ambient thermal resistance	116.7	84.3	89.5	°C/W
R _{θJC(top)}	Junction-to-case (top) thermal resistance	56.3	65.4	46.2	°C/W
R _{θJB}	Junction-to-board thermal resistance	63.4	62.1	50.7	°C/W
ψ _{JT}	Junction-to-top characterization parameter	8.8	31.3	23.5	°C/W
ψ _{JB}	Junction-to-board characterization parameter	62.6	60.4	60.3	°C/W
R _{θJC(bot)}	Junction-to-case (bottom) thermal resistance	N/A	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.

5.5 Electrical Characteristics

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

PARAMETER		TEST CONDITIONS ⁽¹⁾		MIN	TYP ⁽²⁾	MAX	UNIT
V _{IK}	Input clamp voltage	V _{CC} = MIN,	I _I = -12mA		-0.9	-1.5	V
V _{OH}	High-level output voltage	V _{CC} = MIN, V _{IH} = 2V,	V _{IL} = 0.8V, I _{OH} = -40mA	2.4	3		V
V _{OL}	Low-level output voltage	V _{CC} = MIN, V _{IH} = 2V,	V _{IL} = 0.8V, I _{OH} = 40mA		0.2	0.4	V
V _{OD1}	Differential output voltage	V _{CC} = MAX,	I _O = 0		3.5	2 × V _{OD2}	V
V _{OD2}		V _{CC} = MIN,	R _L = 100Ω, See 图 6-1		3	3	V
ΔV _{OD}	Change in magnitude of differential output voltage ⁽³⁾	V _{CC} = MIN,	R _L = 100Ω, See 图 6-1		±0.02	±0.4	V
V _{OC}	Common-mode output voltage ⁽⁴⁾	V _{CC} = MAX,	R _L = 100Ω, See 图 6-1		1.8	3	V
		V _{CC} = MIN,	See 图 6-1		1.5	3	
ΔV _{OC}	Change in magnitude of common-mode output voltage ⁽³⁾	V _{CC} = MIN or MAX,	R _L = 100Ω, See 图 6-1		±0.02	±0.4	V
I _O	Output current with power off	V _{CC} = 0,	V _O = 6V		0.1	100	μA
			V _O = -0.25V		-0.1	-100	
			V _O = -0.25 to 6V			±100	
I _I	Input current at maximum input voltage	V _{CC} = MAX,	V _I = 5.5V			1	mA
I _{IH}	High-level input current	V _{CC} = MAX,	V _I = 2.4V			40	μA
I _{IL}	Low-level input current	V _{CC} = MAX,	V _I = 0.4V		-1	-1.6	mA
I _{OS}	Short-circuit output current ⁽⁵⁾	V _{CC} = MAX,		-40	-90	-150	mA
I _{CC}	Supply current (both drivers)	V _{CC} = MAX, T _A = 25°C,	Inputs grounded, No load		37	50	mA

- (1) For conditions shown as MIN or MAX, use the appropriate value specified under [Recommended Operating Conditions](#).
- (2) All typical values are at V_{CC} = 5 V and T_A = 25°C except for V_{OC}, for which V_{CC} is as stated under test conditions.
- (3) ΔV_{OD} and ΔV_{OC} are the changes in magnitudes of V_{OD} and V_{OC}, respectively, that occur when the input is changed from a high level to a low level.
- (4) In ANSI Standard EIA/TIA-422-B, V_{OC}, which is the average of the two output voltages with respect to ground, is called output offset voltage, V_{OS}.
- (5) Only one output should be shorted at a time, and duration of the short circuit should not exceed one second.

5.6 Switching Characteristics

V_{CC} = 5V, T_A = 25°C

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
t _{PLH}	Propagation delay time, low- to high-level output	See 图 6-2	Termination A		16	25	ns
			Termination B		13	20	
t _{PHL}	Propagation delay time, high- to low-level output	See 图 6-2	Termination A		10	20	ns
			Termination B		9	15	
t _{TLH}	Transition time, low-to-high-level output	See 图 6-2	Termination A		4	20	ns
t _{THL}	Transition time, high- to low-level output	See 图 6-2	Termination A		4	20	ns
Overshoot factor		See 图 6-2	Termination C			10	%

5.7 Typical Characteristics

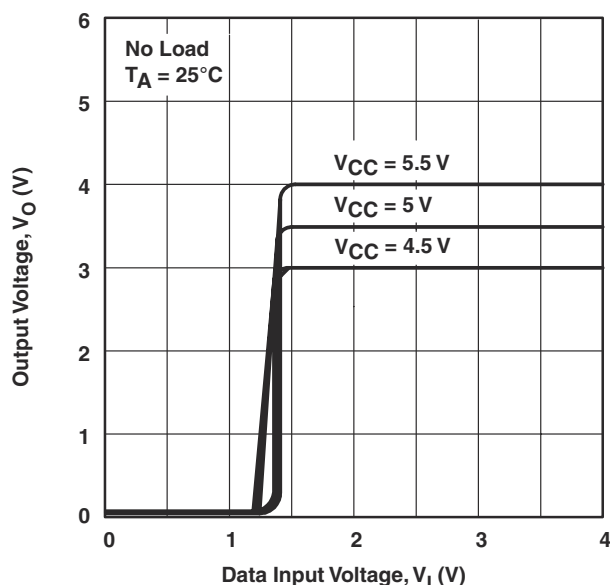


图 5-1. Output Voltage vs Data Input Voltage

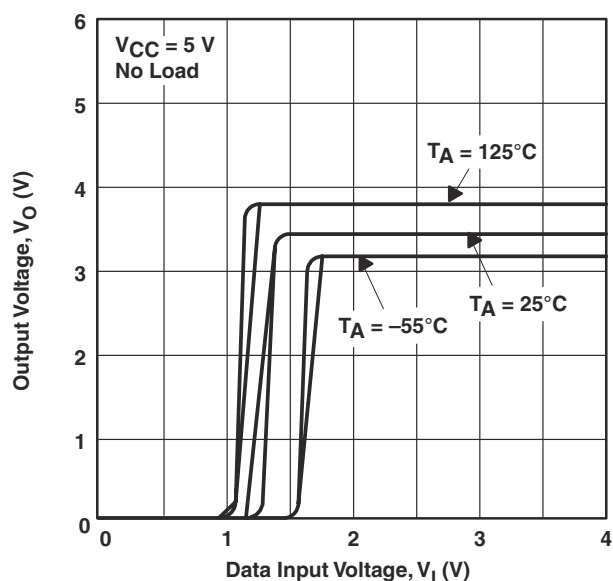


图 5-2. Output Voltage vs DATA Input Voltage

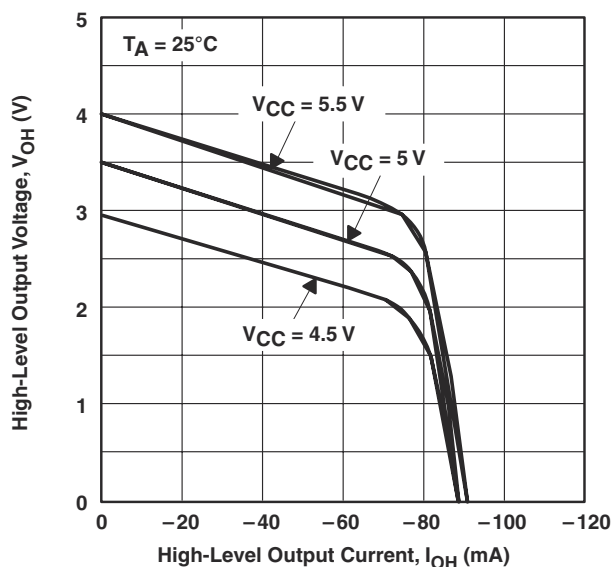


图 5-3. High-Level Output Voltage vs High-Level Output Current

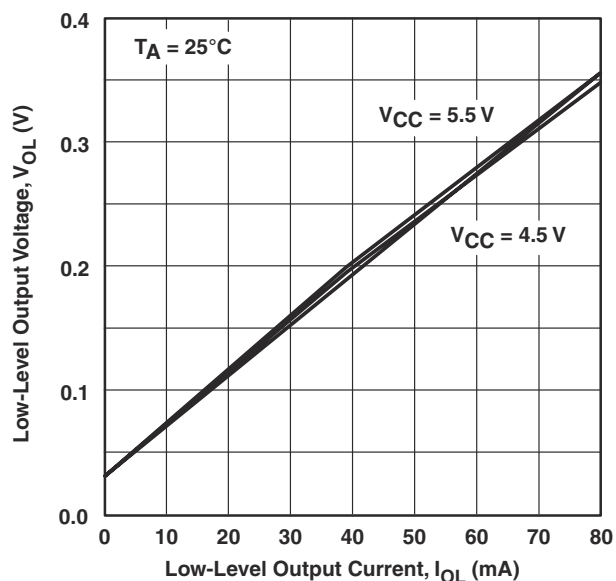


图 5-4. Low-Level Output Voltage vs Low-Level Output Current

5.7 Typical Characteristics (continued)

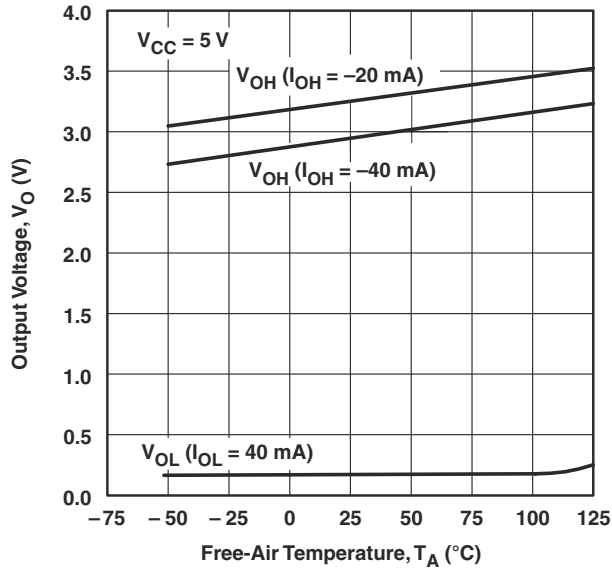


图 5-5. Output Voltage vs Free-Air Temperature

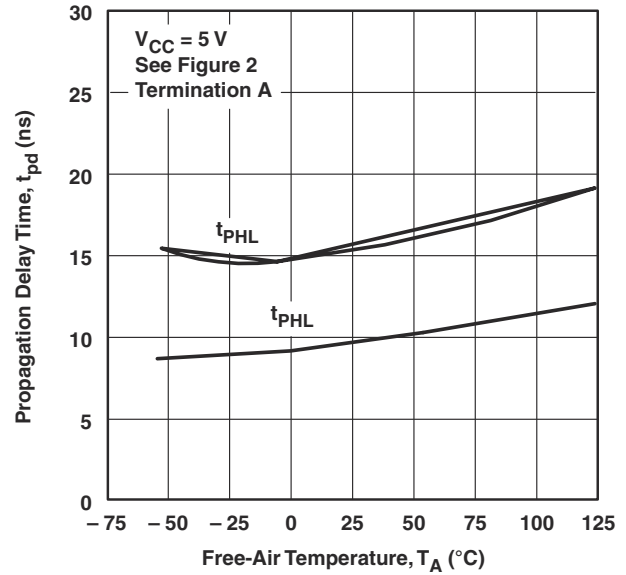


图 5-6. Propagation Delay Times vs Free-Air Temperature

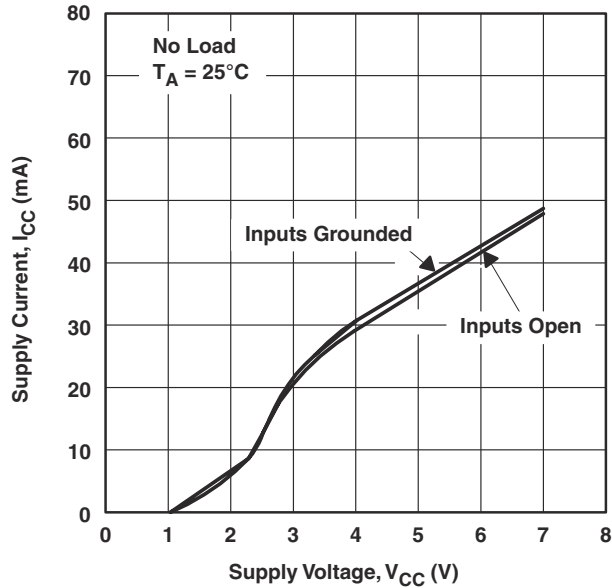


图 5-7. Supply Current(Both Drivers) vs Supply Voltage

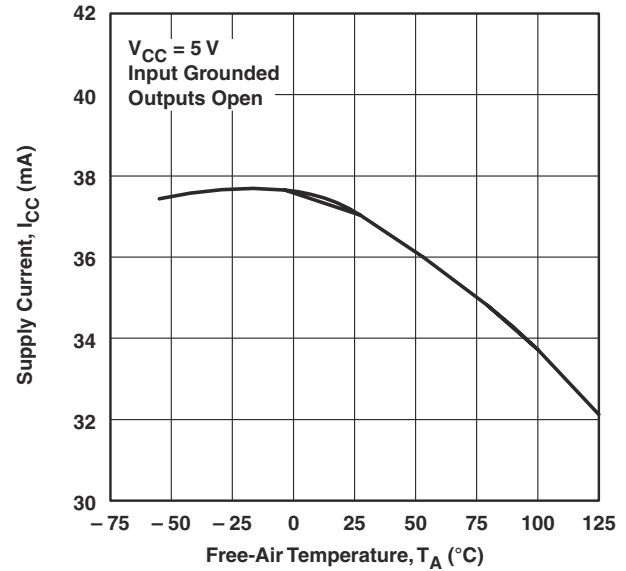


图 5-8. Supply Current(Both Drivers) vs Free-Air Temperature

5.7 Typical Characteristics (continued)

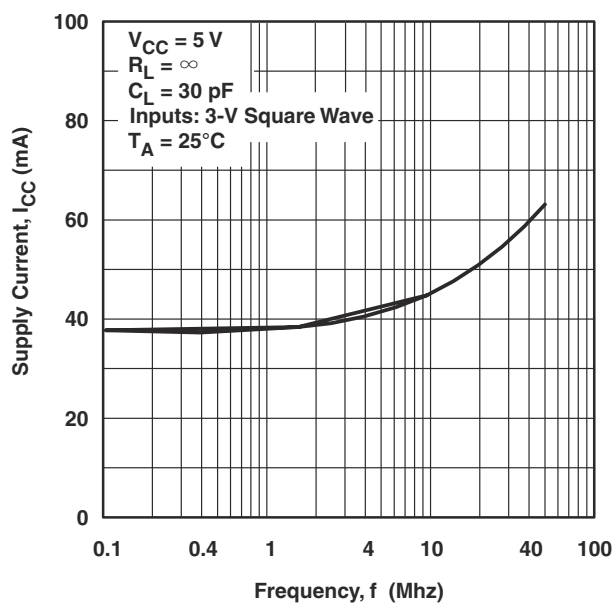


图 5-9. Supply Current(Both Drivers) vs Frequency

Parameter Measurement Information

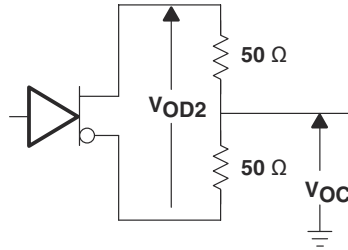
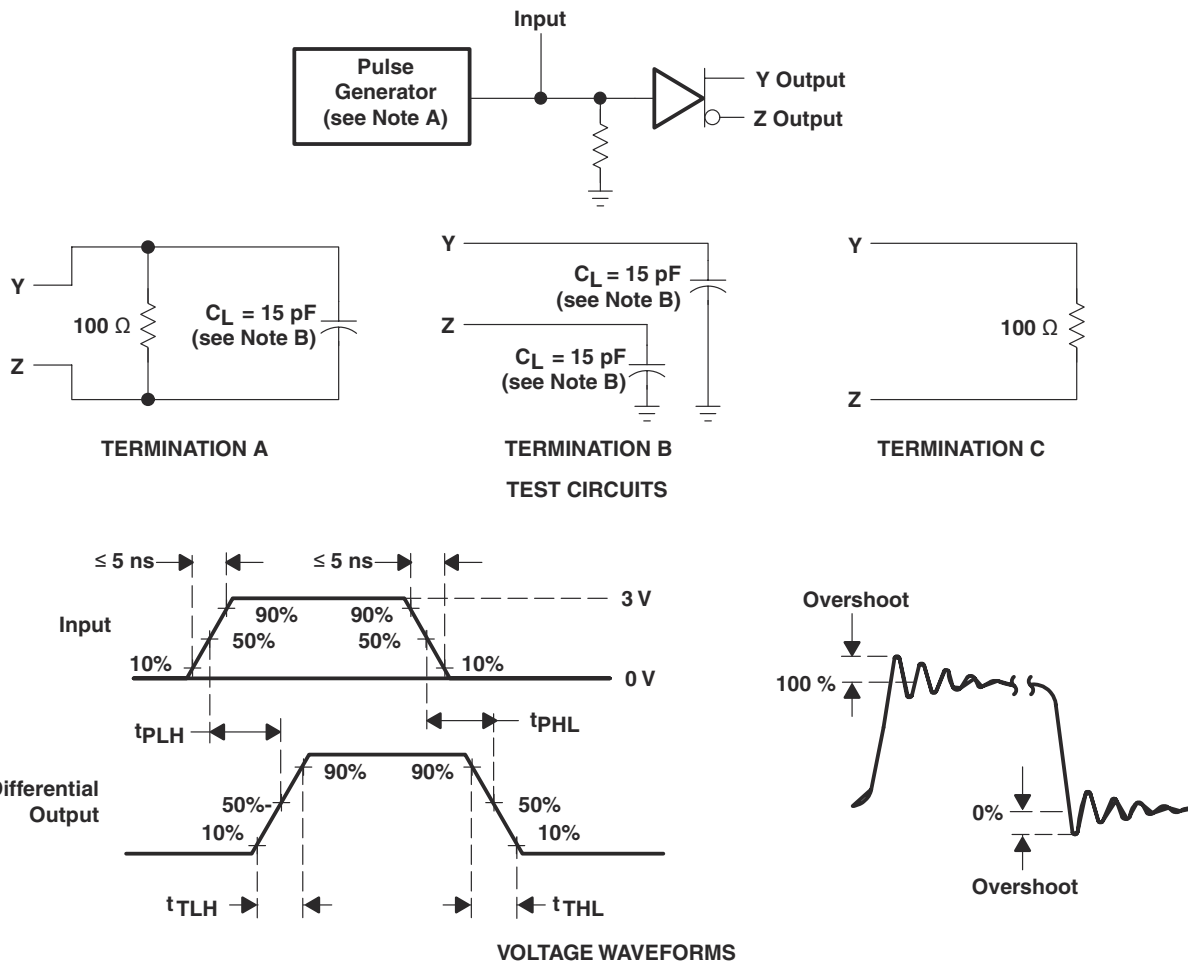


图 6-1. Differential and Common-Mode Output Voltages



- A. The input pulse is supplied by a generator having the following characteristics: $Z_O = 50\Omega$, $t_w = 25\text{ns}$, $\text{PRR} \leq 10\text{MHz}$.
 B. C_L includes probe and jig capacitance.

图 6-2. Test Circuit and Voltage Waveforms

6 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.

6.1 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 [通知](#) 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。

6.2 支持资源

[TI E2E™ 中文支持论坛](#) 是工程师的重要参考资料，可直接从专家处获得快速、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，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](#)。

6.3 商标

TI E2E™ is a trademark of Texas Instruments.

所有商标均为其各自所有者的财产。

6.4 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。

6.5 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。

7 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 B (May 1995) to Revision C (March 2024)	Page
• 更改了整个文档中的表格、图和交叉参考的编号格式.....	1

8 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
SN75158D	LIFEBUY	SOIC	D	8	75	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	75158	
SN75158DG4	LIFEBUY	SOIC	D	8	75	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	75158	
SN75158DR	ACTIVE	SOIC	D	8	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	75158	Samples
SN75158P	ACTIVE	PDIP	P	8	50	RoHS & Green	NIPDAU	N / A for Pkg Type	0 to 70	SN75158P	Samples
SN75158PSR	ACTIVE	SO	PS	8	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	A158	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.

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.

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
SN75158DR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
SN75158PSR	SO	PS	8	2000	330.0	16.4	8.35	6.6	2.4	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)
SN75158DR	SOIC	D	8	2500	340.5	336.1	25.0
SN75158PSR	SO	PS	8	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)
SN75158D	D	SOIC	8	75	507	8	3940	4.32
SN75158DG4	D	SOIC	8	75	507	8	3940	4.32
SN75158P	P	PDIP	8	50	506	13.97	11230	4.32



PACKAGE OUTLINE

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT

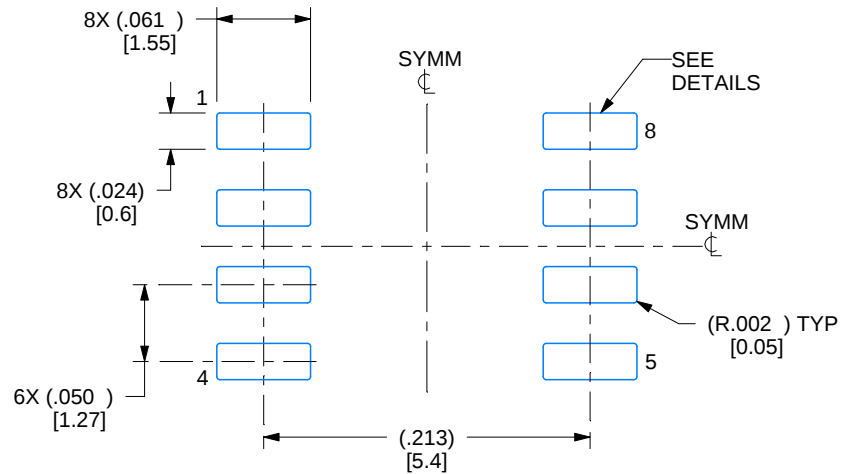


1. Linear dimensions are in inches [millimeters]. Dimensions in parenthesis are for reference only. Controlling dimensions are in inches. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate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

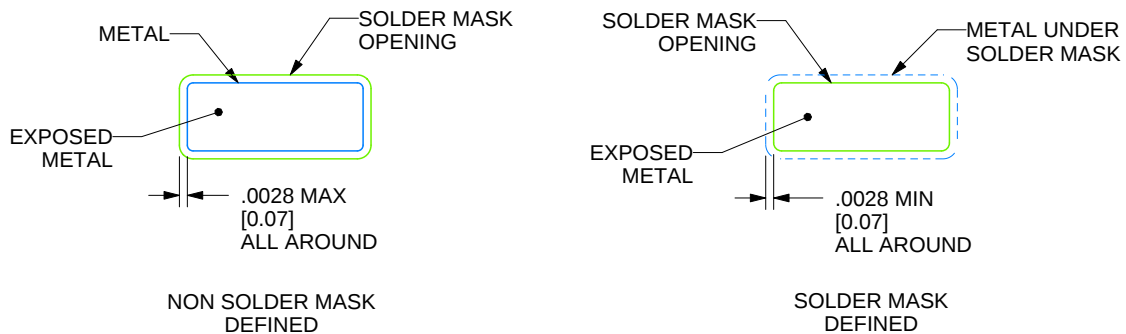
D0008A

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

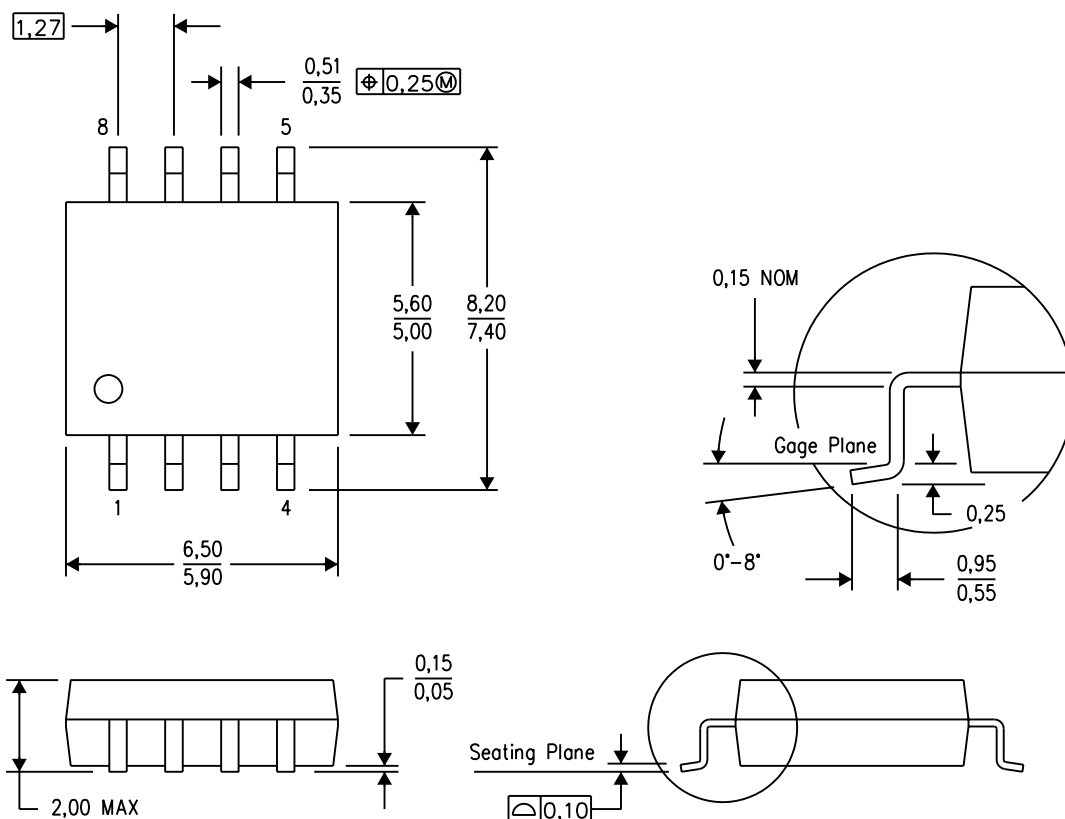
NOTES: (continued)

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.

MECHANICAL DATA

PS (R-PDSO-G8)

PLASTIC SMALL-OUTLINE PACKAGE

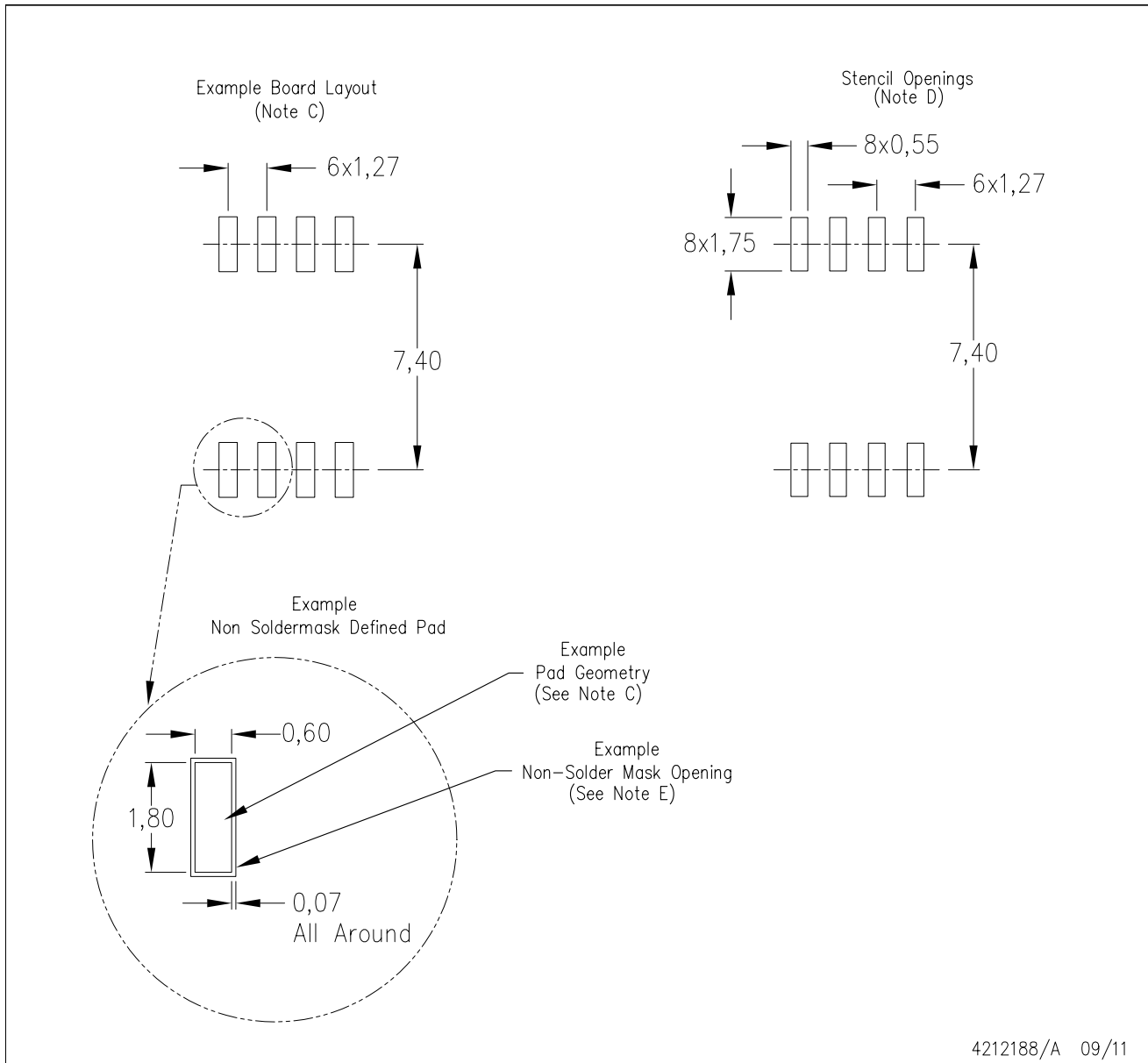


4040063/C 03/03

- 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.

PS (R-PDSO-G8)

PLASTIC SMALL OUTLINE



- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - Publication IPC-7351 is recommended for alternate designs.
 - Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
 - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

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.

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