

SN74HC244-Q1 具有三态输出的八路缓冲器和线路驱动器

1 特性

- 符合汽车应用要求
- ESD 保护超过 2000V (根据 MIL-STD-883 方法 3015) ; 超过 200V (使用机器模型, C = 200pF , R = 0)
- 2V 至 6V 的宽工作电压范围
- 高电流输出可驱动多达 15 个 LSTTL 负载
- 三态输出驱动总线或缓冲存储器地址寄存器
- 低功耗, I_{CC} 最大值为 80 μ A
- t_{pd} 典型值 = 11ns
- 电压为 5V 时, 输出驱动为 ± 6 mA
- 低输出电流, 最大值 1 μ A

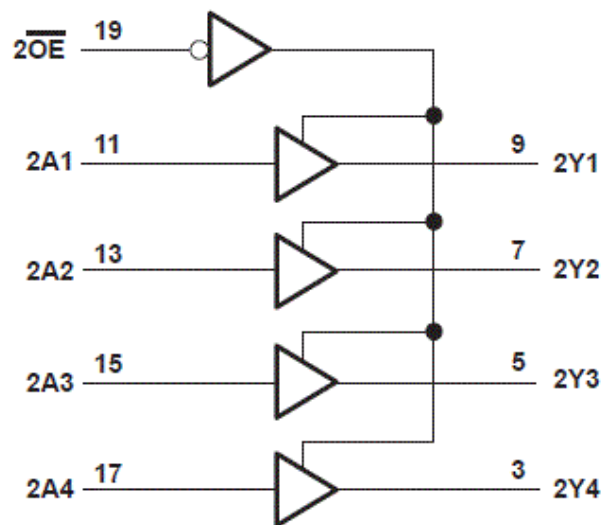
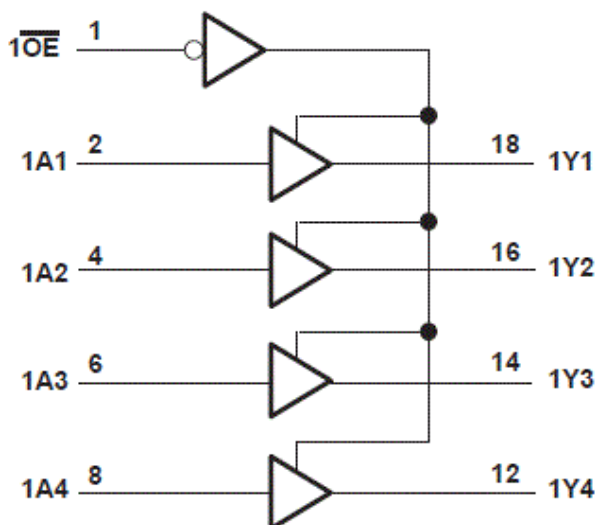
2 说明

该八路缓冲器和线路驱动器专门设计用于提高三态存储器地址驱动器、时钟驱动器以及总线导向接收器和发送器的性能和密度。SN74HC244 配置为两个具有独立输出使能 (\overline{OE}) 输入的 4 位缓冲器/驱动器。当 \overline{OE} 为低电平时, 该器件将来自 A 输入的同相数据传递到 Y 输出。当 \overline{OE} 为高电平时, 输出处于高阻态。

器件信息

器件型号	封装 ⁽¹⁾	封装尺寸 (标称值)
SN74HC244QDW-Q1	SOIC (20)	12.80mm × 7.50mm
SN74HC244QPW-Q1	TSSOP (20)	6.50mm × 4.40mm

(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。



功能方框图



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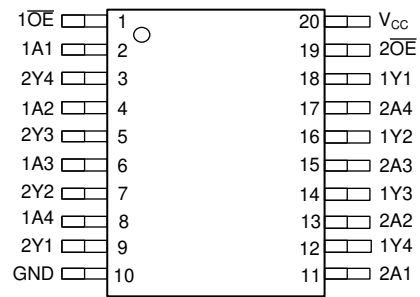
3 Revision History

注：以前版本的页码可能与当前版本的页码不同

Changes from Revision B (February 2022) to Revision C (June 2022)	Page
• Junction-to-ambient thermal resistance values increased. DW was 58 is now 109.1, PW was 83 is now 131.8.....	4

Changes from Revision A (April 2008) to Revision B (February 2022)	Page
• 更新了整个文档中的编号、格式、表格、图和交叉参考，以反映现代数据表标准.....	1

4 Pin Configuration and Functions



DW or PW Package
20-Pin SOIC or TSSOP
Top View

5 Specifications

5.1 Absolute Maximum Ratings

over operating free-air temperature range⁽¹⁾

		MIN	MAX	UNIT
V _{CC}	Supply voltage range	-0.5	7	V
I _{IK}	Input clamp current ⁽²⁾	V _I < 0 or V _I > V _{CC}	±20	mA
I _{OK}	Output clamp current ⁽²⁾	V _O < 0 or V _O > V _{CC}	±20	mA
I _O	Continuous output current	V _O = 0 to V _{CC}	±35	mA
	Continuous current through V _{CC} or GND		±70	mA
T _J	Junction temperature		150	°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) The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

5.2 Recommended Operating Conditions⁽¹⁾

		MIN	NOM	MAX	UNIT
V _{CC}	Supply voltage	2	5	6	V
V _{IH}	High-level input voltage	V _{CC} = 2 V	1.5		V
		V _{CC} = 4.5 V	3.15		
		V _{CC} = 6 V	4.2		
V _{IL}	Low-level input voltage	V _{CC} = 2 V		0.5	V
		V _{CC} = 4.5 V		1.35	
		V _{CC} = 6 V		1.8	
V _I	Input voltage	0		V _{CC}	V
V _O	Output voltage	0		V _{CC}	V
t _t	Input transition (rise and fall) time	V _{CC} = 2 V		1000	ns
		V _{CC} = 4.5 V		500	
		V _{CC} = 6 V		400	
T _A	Operating free-air temperature	-40		125	°C

- (1) All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number [SCBA004](#).

5.3 Thermal Information

THERMAL METRIC		DW (SOIC)	PW (TSSOP)	UNIT
		20 PINS	20 PINS	
R _{θJA}	Junction-to-ambient thermal resistance ⁽¹⁾	109.1	131.8	°C/W
R _{θJC(top)}	Junction-to-case (top) thermal resistance	76	72.2	°C/W
R _{θJB}	Junction-to-board thermal resistance	77.6	82.8	°C/W
Ψ _{JT}	Junction-to-top characterization parameter	51.5	21.5	°C/W
Ψ _{JB}	Junction-to-board characterization parameter	77.1	82.4	°C/W
R _{θJC(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 Electrical Characteristics

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

PARAMETER	TEST CONDITIONS		V _{CC}	T _A = 25°C			MIN	MAX	UNIT
				MIN	TYP	MAX			
V _{OH}	V _I = V _{IH} or V _{IL}	I _{OH} = -20 μA	2 V	1.9	1.998		1.9	V	
			4.5 V	4.4	4.499	4.4			
			6 V	5.9	5.999	5.9			
		I _{OH} = -6 mA	4.5 V	3.98	4.3	3.7			
			6 V	5.48	5.8	5.2			
V _{OL}	V _I = V _{IH} or V _{IL}	I _{OL} = 20 μA	2 V		0.002	0.1	0.1	V	
			4.5 V		0.001	0.1	0.1		
			6 V		0.001	0.1	0.1		
		I _{OL} = 6 mA	4.5 V		0.17	0.26	0.4		
			6 V		0.15	0.26	0.4		
I _I	V _I = V _{CC} or 0		6 V		±0.1	±100	±1000	nA	
I _{OZ}	V _O = V _{CC} or 0, V _I = V _{IH} or V _{IL}		6 V		±0.01	±0.5	±10	μA	
I _{CC}	V _I = V _{CC} or 0, I _O = 0		6 V			8	160	μA	
C _i			2 V to 6 V		3	10	10	pF	

5.5 Switching Characteristics

over recommended operating free-air temperature range, C_L = 50 pF (unless otherwise noted) See: ([Parameter Measurement Information](#))

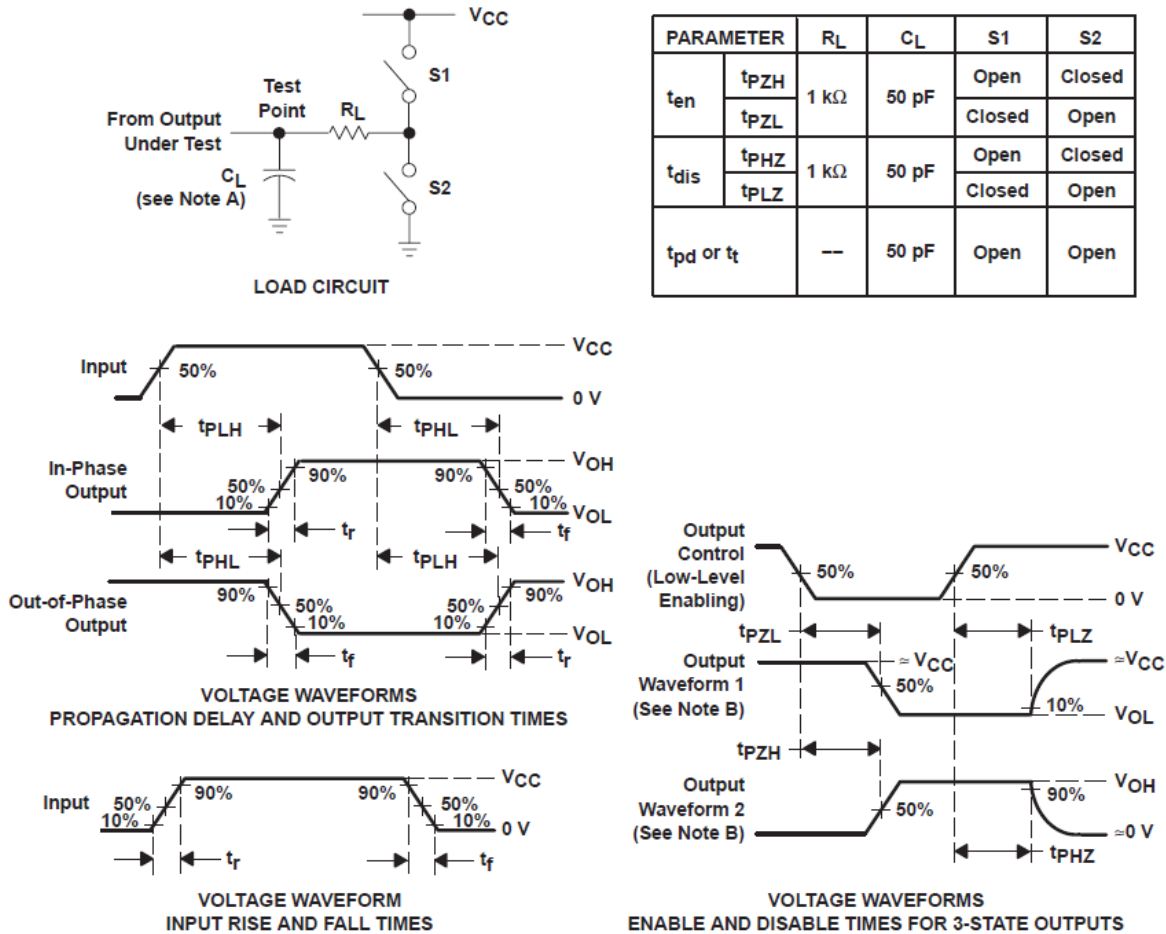
PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC}	T _A = 25°C			MIN	MAX	UNIT
				MIN	TYP	MAX			
t _{pd}	A	Y	2 V		40	115		170	ns
			4.5 V		13	23	34		
			6 V		11	20	29		
t _{en}	OE	Y	2 V		75	150		225	ns
			4.5 V		15	30	45		
			6 V		13	26	38		
t _{dis}	OE	Y	2 V		75	150		225	ns
			4.5 V		15	30	45		
			6 V		13	26	38		
t _t		Y	2 V		28	60		90	ns
			4.5 V		8	12	18		
			6 V		6	10	15		

5.6 Operating Characteristics

T_A = 25°C

PARAMETER	TEST CONDITIONS	TYP	UNIT
C _{pd}	Power dissipation capacitance per buffer/driver	35	pF

6 Parameter Measurement Information



- A. C_L includes probe and test-fixture capacitance.
- B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
- C. Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1$ MHz, $Z_O = 50 \Omega$, $t_r = 6$ ns, $t_f = 6$ ns.
- D. The outputs are measured one at a time with one input transition per measurement.
- E. t_{PLZ} and t_{PHZ} are the same as t_{dis} .
- F. t_{PZL} and t_{PZH} are the same as t_{en} .
- G. t_{PLH} and t_{PHL} are the same as t_{pd} .

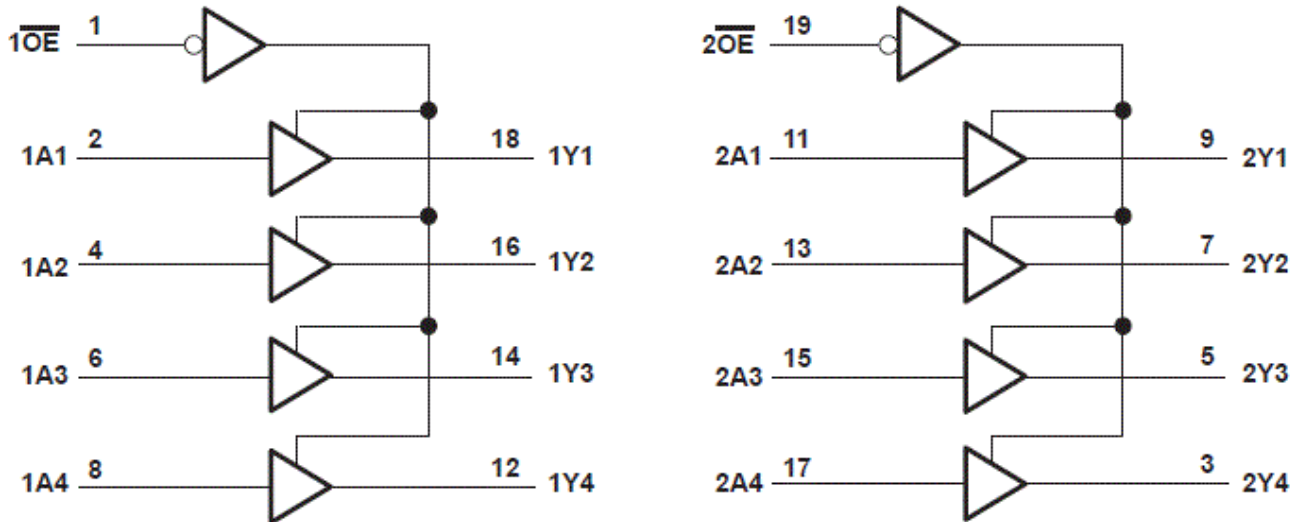
图 6-1. Load Circuit and Voltage Waveforms

7 Detailed Description

7.1 Overview

This octal buffer and line driver is designed specifically to improve both the performance and density of 3-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters. The SN74HC244 is organized as two 4-bit buffers/drivers with separate output-enable (\overline{OE}) inputs. When \overline{OE} is low, the device passes noninverted data from the A inputs to the Y outputs. When \overline{OE} is high, the outputs are in the high-impedance state.

7.2 Functional Block Diagram



7.3 Device Functional Modes

**表 7-1. Function Table
(each buffer/driver)**

INPUTS		OUTPUT
\overline{OE}	A	Y
L	H	H
L	L	L
H	X	Z

8 Power Supply Recommendations

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

9 Layout

9.1 Layout Guidelines

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

10 Device and Documentation Support

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

10.1 接收文档更新通知

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

10.2 支持资源

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

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

10.3 Trademarks

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

10.4 Electrostatic Discharge Caution



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

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

10.5 术语表

[TI 术语表](#) 本术语表列出并解释了术语、首字母缩略词和定义。

11 Mechanical, Packaging, and Orderable Information

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

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
SN74HC244QDWRQ1	ACTIVE	SOIC	DW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HC244Q	Samples
SN74HC244QPWRG4Q1	ACTIVE	TSSOP	PW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HC244Q	Samples
SN74HC244QPWRQ1	ACTIVE	TSSOP	PW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HC244Q	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.

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OTHER QUALIFIED VERSIONS OF SN74HC244-Q1 :

- Catalog : [SN74HC244](#)
- Enhanced Product : [SN74HC244-EP](#)
- Military : [SN54HC244](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Enhanced Product - Supports Defense, Aerospace and Medical Applications
- 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
SN74HC244QDWRQ1	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
SN74HC244QPWRG4Q1	TSSOP	PW	20	2000	330.0	16.4	6.95	7.0	1.4	8.0	16.0	Q1
SN74HC244QPWRG4Q1	TSSOP	PW	20	2000	330.0	16.4	6.95	7.0	1.4	8.0	16.0	Q1
SN74HC244QPWRQ1	TSSOP	PW	20	2000	330.0	16.4	6.95	7.0	1.4	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)
SN74HC244QDWRQ1	SOIC	DW	20	2000	367.0	367.0	45.0
SN74HC244QPWRG4Q1	TSSOP	PW	20	2000	356.0	356.0	35.0
SN74HC244QPWRG4Q1	TSSOP	PW	20	2000	356.0	356.0	35.0
SN74HC244QPWRQ1	TSSOP	PW	20	2000	356.0	356.0	35.0

DW0020A



PACKAGE OUTLINE

SOIC - 2.65 mm max height

SOIC



4220724/A 05/2016

NOTES:

- All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. 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 0.15 mm per side.
- This dimension does not include interlead flash. Interlead flash shall not exceed 0.43 mm per side.
- Reference JEDEC registration MS-013.

EXAMPLE BOARD LAYOUT

DW0020A

SOIC - 2.65 mm max height

SOIC



LAND PATTERN EXAMPLE
SCALE:6X



SOLDER MASK DETAILS

4220724/A 05/2016

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

DW0020A

SOIC - 2.65 mm max height

SOIC



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:6X

4220724/A 05/2016

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.



4220206/A 02/2017

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 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.
5. Reference JEDEC registration MO-153.

EXAMPLE BOARD LAYOUT

PW0020A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X



SOLDER MASK DETAILS

4220206/A 02/2017

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

PW0020A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE: 10X

4220206/A 02/2017

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.

PW (R-PDSO-G20)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Publication IPC-7351 is recommended for alternate design.
 - D. 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.
 - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

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