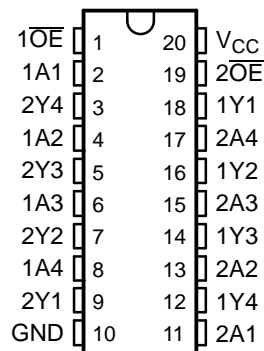


FEATURES

- Operates From 1.65 V to 3.6 V
- Max t_{pd} of 2.8 ns at 3.3 V
- ± 24 -mA Output Drive at 3.3 V
- Bus Hold on Data Inputs Eliminates the Need for External Pullup/Pulldown Resistors
- Latch-Up Performance Exceeds 250 mA Per JESD 17
- ESD Protection Exceeds JESD 22
 - 2000-V Human-Body Model (A114-A)
 - 200-V Machine Model (A115-A)

DG, DW, NS, OR PW PACKAGE
(TOP VIEW)



DESCRIPTION/ORDERING INFORMATION

This octal buffer/line driver is designed for 1.65-V to 3.6-V V_{CC} operation.

The SN74ALVCH244 is organized as two 4-bit line drivers with separate output-enable (\overline{OE}) inputs. When \overline{OE} is low, the device passes data from the A inputs to the Y outputs. When \overline{OE} is high, the outputs are in the high-impedance state.

To ensure the high-impedance state during power up or power down, \overline{OE} should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

Active bus-hold circuitry holds unused or undriven inputs at a valid logic state. Use of pullup or pulldown resistors with the bus-hold circuitry is not recommended.

ORDERING INFORMATION

| T_A | PACKAGE ⁽¹⁾ | | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|---------------|------------------------|---------------|-----------------------|------------------|
| -40°C to 85°C | SOIC - DW | Tube | SN74ALVCH244DW | ALVCH244 |
| | | Tape and reel | SN74ALVCH244DWR | |
| | SOP - NS | Tape and reel | SN74ALVCH244NSR | ALVCH244 |
| | | TSSOP - PW | Tube | SN74ALVCH244PW |
| | Tape and reel | | SN74ALVCH244PWR | |
| | TVSOP - DGV | Tape and reel | SN74ALVCH244DGVR | VB244 |

(1) Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

FUNCTION TABLE (each buffer)

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



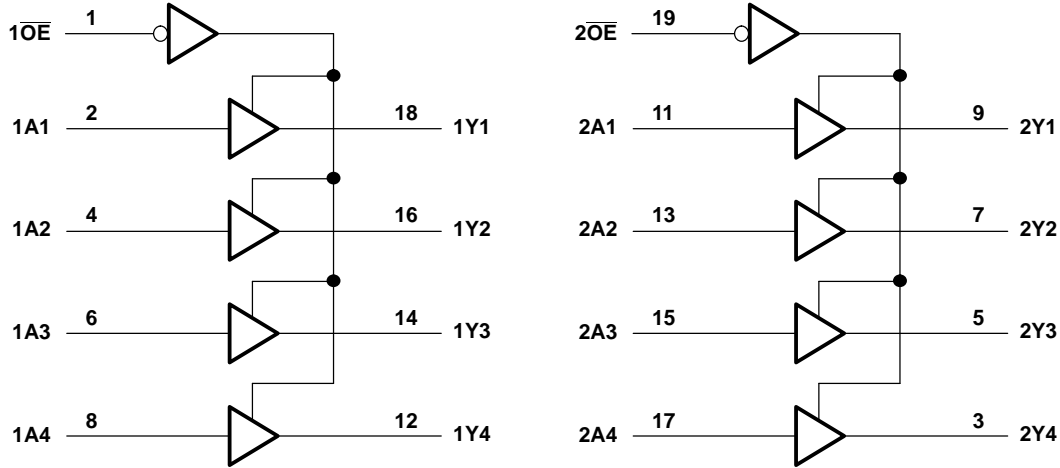
Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

SN74ALVCH244

OCTAL BUFFER/DRIVER WITH 3-STATE OUTPUTS

SCES112F—JULY 1997—REVISED AUGUST 2004

LOGIC DIAGRAM (POSITIVE LOGIC)



ABSOLUTE MAXIMUM RATINGS⁽¹⁾

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

| | | MIN | MAX | UNIT |
|---------------|--|-------------|----------------|------|
| V_{CC} | Supply voltage range | -0.5 | 4.6 | V |
| V_I | Input voltage range ⁽²⁾ | -0.5 | 4.6 | V |
| V_O | Output voltage range ⁽²⁾⁽³⁾ | -0.5 | $V_{CC} + 0.5$ | V |
| I_{IK} | Input clamp current | $V_I < 0$ | -50 | mA |
| I_{OK} | Output clamp current | $V_O < 0$ | -50 | mA |
| I_O | Continuous output current | | ± 50 | mA |
| | Continuous current through V_{CC} or GND | | ± 100 | mA |
| θ_{JA} | Package thermal impedance ⁽⁴⁾ | DGV package | 92 | °C/W |
| | | DW package | 58 | |
| | | NS package | 60 | |
| | | PW package | 83 | |
| 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 negative-voltage and output voltage ratings may be exceeded if the input and output current ratings are observed.
- (3) This value is limited to 4.6 V maximum.
- (4) The package thermal impedance is calculated in accordance with JESD 51-7.

RECOMMENDED OPERATING CONDITIONS⁽¹⁾

| | | MIN | MAX | UNIT |
|-----------------|------------------------------------|------------------------------------|------------------------|------|
| V _{CC} | Supply voltage | 1.65 | 3.6 | V |
| V _{IH} | High-level input voltage | V _{CC} = 1.65 V to 1.95 V | 0.65 × V _{CC} | V |
| | | V _{CC} = 2.3 V to 2.7 V | 1.7 | |
| | | V _{CC} = 2.7 V to 3.6 V | 2 | |
| V _{IL} | Low-level input voltage | V _{CC} = 1.65 V to 1.95 V | 0.35 × V _{CC} | V |
| | | V _{CC} = 2.3 V to 2.7 V | 0.7 | |
| | | V _{CC} = 2.7 V to 3.6 V | 0.8 | |
| V _I | Input voltage | 0 | V _{CC} | V |
| V _O | Output voltage | 0 | V _{CC} | V |
| I _{OH} | High-level output current | V _{CC} = 1.65 V | -4 | mA |
| | | V _{CC} = 2.3 V | -12 | |
| | | V _{CC} = 2.7 V | -12 | |
| | | V _{CC} = 3 V | -24 | |
| I _{OL} | Low-level output current | V _{CC} = 1.65 V | 4 | mA |
| | | V _{CC} = 2.3 V | 12 | |
| | | V _{CC} = 2.7 V | 12 | |
| | | V _{CC} = 3 V | 24 | |
| Δt/Δv | Input transition rise or fall rate | | 5 | ns/V |
| T _A | Operating free-air temperature | -40 | 85 | °C |

(1) All unused control 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.

SN74ALVCH244

OCTAL BUFFER/DRIVER

WITH 3-STATE OUTPUTS

SCES112F–JULY 1997–REVISED AUGUST 2004

ELECTRICAL CHARACTERISTICS

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

| PARAMETER | TEST CONDITIONS | V _{CC} | MIN | TYP ⁽¹⁾ | MAX | UNIT |
|----------------------|--|---|-----------------------|--------------------|------|------|
| V _{OH} | I _{OH} = -100 μA | 1.65 V to 3.6 V | V _{CC} - 0.2 | | | V |
| | I _{OH} = -4 mA | 1.65 V | 1.2 | | | |
| | I _{OH} = -6 mA | 2.3 V | 2 | | | |
| | I _{OH} = -12 mA | 2.3 V | 1.7 | | | |
| | | 2.7 V | 2.2 | | | |
| | I _{OH} = -24 mA | 3 V | 2.4 | | | |
| V _{OL} | I _{OL} = 100 μA | 1.65 V to 3.6 V | | | 0.2 | V |
| | I _{OL} = 4 mA | 1.65 V | | | 0.45 | |
| | I _{OL} = 6 mA | 2.3 V | | | 0.4 | |
| | I _{OL} = 12 mA | 2.3 V | | | 0.7 | |
| | | 2.7 V | | | 0.4 | |
| | I _{OL} = 24 mA | 3 V | | | 0.55 | |
| I _I | V _I = V _{CC} or GND | 3.6 V | | | ±5 | μA |
| I _{I(hold)} | V _I = 0.58 V | 1.65 V | (2) | | | μA |
| | V _I = 1.07 V | 1.65 V | (2) | | | |
| | V _I = 0.7 V | 2.3 V | 45 | | | |
| | V _I = 1.7 V | 2.3 V | -45 | | | |
| | V _I = 0.8 V | 3 V | 75 | | | |
| | V _I = 2 V | 3 V | -75 | | | |
| | V _I = 0 to 3.6 V ⁽³⁾ | 3.6 V | | | ±500 | |
| I _{OZ} | V _O = V _{CC} or GND | 3.6 V | | | ±10 | μA |
| I _{CC} | V _I = V _{CC} or GND, I _O = 0 | 3.6 V | | | 10 | μA |
| ΔI _{CC} | One input at V _{CC} - 0.6 V, Other inputs at V _{CC} or GND | 3 V to 3.6 V | | | 750 | μA |
| C _i | Control inputs | V _I = V _{CC} or GND | 3.3 V | | 4.5 | pF |
| | Data inputs | | | | 6 | |
| C _o | Outputs | V _O = V _{CC} or GND | 3.3 V | | 8 | pF |

(1) All typical values are at V_{CC} = 3.3 V, T_A = 25°C.

(2) This information was not available at the time of publication.

(3) This is the bus-hold maximum dynamic current. It is the minimum overdrive current required to switch the input from one state to another.

SWITCHING CHARACTERISTICS

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

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | V _{CC} = 1.8 V | | V _{CC} = 2.5 V ± 0.2 V | | V _{CC} = 2.7 V | | V _{CC} = 3.3 V ± 0.3 V | | UNIT |
|------------------|------------------------|-------------|-------------------------|-----|---------------------------------|-----|-------------------------|-----|---------------------------------|----|------|
| | | | TYP | MIN | MAX | MIN | MAX | MIN | MAX | | |
| t _{pd} | A | Y | (1) | 1 | 3.1 | | 3.1 | 1.1 | 2.8 | ns | |
| t _{en} | $\overline{\text{OE}}$ | Y | (1) | 1.5 | 5.4 | | 5.3 | 1.5 | 4.5 | ns | |
| t _{dis} | $\overline{\text{OE}}$ | Y | (1) | 1 | 4.1 | | 4.4 | 1.7 | 4.2 | ns | |

(1) This information was not available at the time of publication.

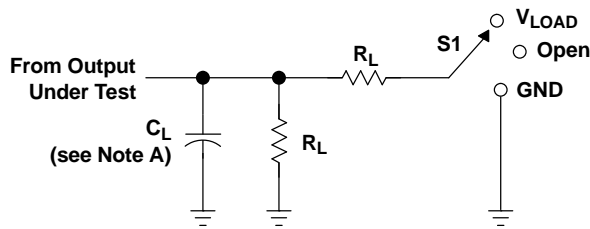
OPERATING CHARACTERISTICS

$T_A = 25^\circ\text{C}$

| PARAMETER | | TEST CONDITIONS | $V_{CC} = 1.8\text{ V}$ | $V_{CC} = 2.5\text{ V}$ | $V_{CC} = 3.3\text{ V}$ | UNIT |
|-----------|--|------------------------------|-------------------------|-------------------------|-------------------------|------|
| | | | TYP | TYP | TYP | |
| C_{pd} | Power dissipation capacitance per buffer/driver | Outputs enabled | (1) | 22 | 28 | pF |
| | Outputs disabled | $C_L = 0, f = 10\text{ MHz}$ | (1) | 1.5 | 4 | |

(1) This information was not available at the time of publication.

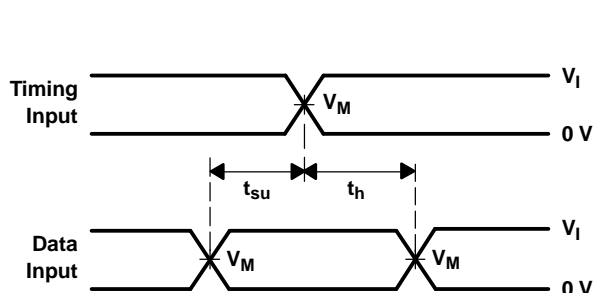
PARAMETER MEASUREMENT INFORMATION



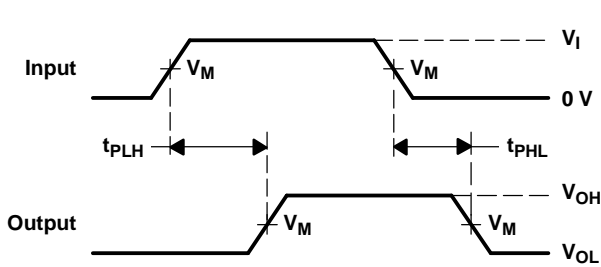
LOAD CIRCUIT

| TEST | S1 |
|-------------------|------------|
| t_{pd} | Open |
| t_{PLZ}/t_{PZL} | V_{LOAD} |
| t_{PHZ}/t_{PZH} | GND |

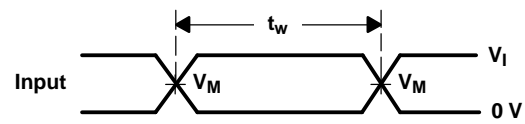
| V_{CC} | INPUT | | V_M | V_{LOAD} | C_L | R_L | V_{Δ} |
|----------------------------------|----------|----------------------|------------|-------------------|-------|--------------|--------------|
| | V_I | t_r/t_f | | | | | |
| $1.8\text{ V} \pm 0.15\text{ V}$ | V_{CC} | $\leq 2\text{ ns}$ | $V_{CC}/2$ | $2 \times V_{CC}$ | 30 pF | 1 k Ω | 0.15 V |
| $2.5\text{ V} \pm 0.2\text{ V}$ | V_{CC} | $\leq 2\text{ ns}$ | $V_{CC}/2$ | $2 \times V_{CC}$ | 30 pF | 500 Ω | 0.15 V |
| 2.7 V | 2.7 V | $\leq 2.5\text{ ns}$ | 1.5 V | 6 V | 50 pF | 500 Ω | 0.3 V |
| $3.3\text{ V} \pm 0.3\text{ V}$ | 2.7 V | $\leq 2.5\text{ ns}$ | 1.5 V | 6 V | 50 pF | 500 Ω | 0.3 V |



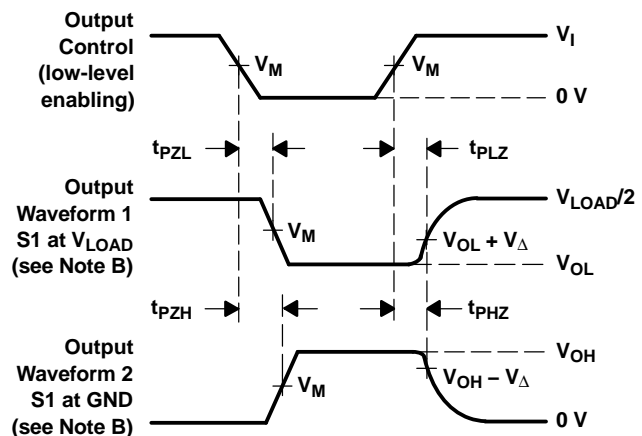
VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES



VOLTAGE WAVEFORMS
PULSE DURATION



VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES

- NOTES: A. C_L includes probe and jig 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. All input pulses are supplied by generators having the following characteristics: PRR $\leq 10\text{ MHz}$, $Z_O = 50\ \Omega$.
D. The outputs are measured one at a time, with one 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} .
H. All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms

PACKAGING INFORMATION

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|-------------------|---------------|--------------|-----------------|------|-------------|-------------------------|-------------------------|----------------------|--------------|-------------------------|-------------------------|
| SN74ALVCH244DGVR | ACTIVE | TVSOP | DGV | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | VB244 | Samples |
| SN74ALVCH244DW | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | ALVCH244 | Samples |
| SN74ALVCH244DWR | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | ALVCH244 | Samples |
| SN74ALVCH244PW | ACTIVE | TSSOP | PW | 20 | 70 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | VB244 | Samples |
| SN74ALVCH244PWLE | OBSOLETE | TSSOP | PW | 20 | | TBD | Call TI | Call TI | -40 to 85 | | |
| SN74ALVCH244PWR | ACTIVE | TSSOP | PW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | VB244 | Samples |
| SN74ALVCH244PWRE4 | ACTIVE | TSSOP | PW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | VB244 | 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) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

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TAPE AND REEL INFORMATION
REEL DIMENSIONS

TAPE DIMENSIONS


| | |
|----|---|
| A0 | Dimension designed to accommodate the component width |
| B0 | Dimension designed to accommodate the component length |
| K0 | Dimension designed to accommodate the component thickness |
| W | Overall width of the carrier tape |
| P1 | Pitch between successive cavity centers |

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 |
|------------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74ALVCH244DGVR | TVSOP | DGV | 20 | 2000 | 330.0 | 12.4 | 6.9 | 5.6 | 1.6 | 8.0 | 12.0 | Q1 |
| SN74ALVCH244DWR | SOIC | DW | 20 | 2000 | 330.0 | 24.4 | 10.8 | 13.0 | 2.7 | 12.0 | 24.0 | Q1 |
| SN74ALVCH244PWR | TSSOP | PW | 20 | 2000 | 330.0 | 16.4 | 6.95 | 7.1 | 1.6 | 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) |
|------------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74ALVCH244DGVR | TVSOP | DGV | 20 | 2000 | 367.0 | 367.0 | 35.0 |
| SN74ALVCH244DWR | SOIC | DW | 20 | 2000 | 367.0 | 367.0 | 45.0 |
| SN74ALVCH244PWR | TSSOP | PW | 20 | 2000 | 367.0 | 367.0 | 38.0 |

DGV (R-PDSO-G**)

PLASTIC SMALL-OUTLINE

24 PINS SHOWN



- 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 per side.
 D. Falls within JEDEC: 24/48 Pins – MO-153
 14/16/20/56 Pins – MO-194

DW0020A



PACKAGE OUTLINE

SOIC - 2.65 mm max height

SOIC



4220724/A 05/2016

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 0.43 mm per side.
5. 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.

PW (R-PDSO-G20)

PLASTIC SMALL OUTLINE



4040064-5/G 02/11

- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 - B. This drawing is subject to change without notice.
 - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
 - D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
 - E. Falls within JEDEC MO-153

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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| Wireless Connectivity | www.ti.com/wirelessconnectivity |

Applications

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| Automotive and Transportation | www.ti.com/automotive |
| Communications and Telecom | www.ti.com/communications |
| Computers and Peripherals | www.ti.com/computers |
| Consumer Electronics | www.ti.com/consumer-apps |
| Energy and Lighting | www.ti.com/energy |
| Industrial | www.ti.com/industrial |
| Medical | www.ti.com/medical |
| Security | www.ti.com/security |
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