



**THE DATASHEET OF
SN74ALVCH162344VR**



FEATURES

- Member of the Texas Instruments Widebus™ Family
- Operates From 1.65 V to 3.6 V
- Max t_{pd} of 4.4 ns at 3.3 V
- ± 12 -mA Output Drive at 3.3 V
- Output Ports Have Equivalent 26- Ω Series Resistors, So No External Resistors Are Required
- Bus Hold on Data Inputs Eliminates the Need for External Pullup/Pulldown Resistors
- Latch-Up Performance Exceeds 250 mA Per JESD 17

DESCRIPTION/ORDERING INFORMATION

This 1-bit to 4-bit address driver is designed for 1.65-V to 3.6-V V_{CC} operation.

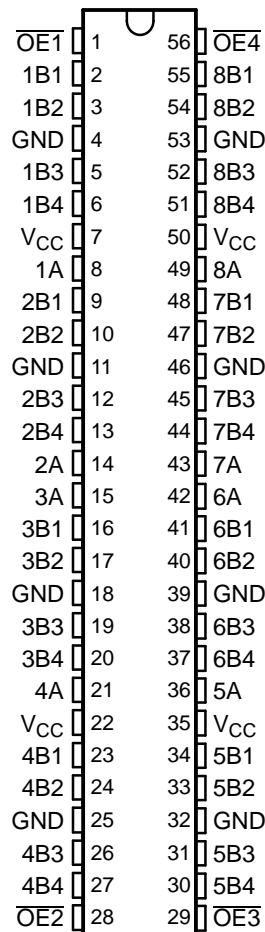
The SN74ALVCH162344 is used in applications in which four separate memory locations must be addressed by a single address.

The outputs, which are designed to sink up to 12 mA, include equivalent 26- Ω resistors to reduce overshoot and undershoot.

To ensure the high-impedance state during power up or power down, the output-enable (\overline{OE}) inputs 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.

DGG, DGV, OR DL PACKAGE (TOP VIEW)



ORDERING INFORMATION

T_A	PACKAGE ⁽¹⁾		ORDERABLE PART NUMBER	TOP-SIDE MARKING
-40°C to 85°C	SSOP - DL	Tube	SN74ALVCH162344DL	ALVCH162344
		Tape and reel	SN74ALVCH162344DLR	
	TSSOP - DGG	Tape and reel	SN74ALVCH162344GR	ALVCH162344
	TVSOP - DGV	Tape and reel	SN74ALVCH162344VR	VH2344

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



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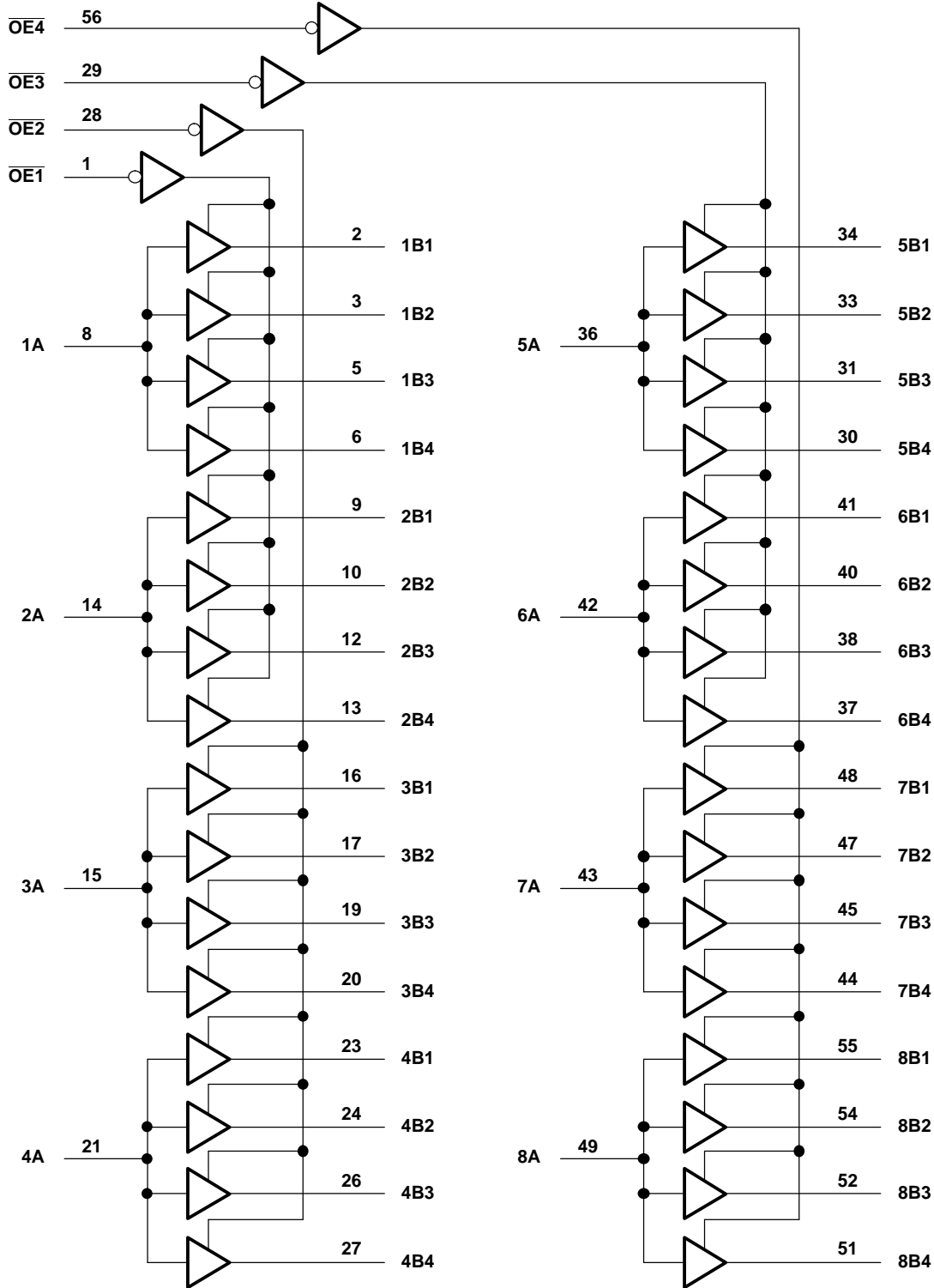
SN74ALVCH162344
1-BIT TO 4-BIT ADDRESS DRIVER
WITH 3-STATE OUTPUTS

SCES085I–AUGUST 1996–REVISED OCTOBER 2004

A-TO-B FUNCTION TABLE

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

LOGIC DIAGRAM (POSITIVE LOGIC)



SN74ALVCH162344
1-BIT TO 4-BIT ADDRESS DRIVER
WITH 3-STATE OUTPUTS

SCES085I–AUGUST 1996–REVISED OCTOBER 2004

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 each V _{CC} or GND				±100 mA
θ _{JA}	Package thermal impedance ⁽⁴⁾	DGG package		64 °C/W
		DGV package		48
		DL package		56
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 _{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 _{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		-2 mA
		V _{CC} = 2.3 V		-6
		V _{CC} = 2.7 V		-8
		V _{CC} = 3 V		-12
I _{OL}	Low-level output current	V _{CC} = 1.65 V		2 mA
		V _{CC} = 2.3 V		6
		V _{CC} = 2.7 V		8
		V _{CC} = 3 V		12
Δt/Δv	Input transition rise or fall rate			10 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.

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} = -2 mA	1.65 V	1.2			
	I _{OH} = -4 mA	2.3 V	1.9			
	I _{OH} = -6 mA	2.3 V	1.7			
		3 V	2.4			
	I _{OH} = -8 mA	2.7 V	2			
I _{OH} = -12 mA	3 V	2				
V _{OL}	I _{OL} = 100 μA	1.65 V to 3.6 V			0.2	V
	I _{OL} = 2 mA	1.65 V			0.45	
	I _{OL} = 4 mA	2.3 V			0.4	
	I _{OL} = 6 mA	2.3 V			0.55	
		3 V			0.55	
	I _{OL} = 8 mA	2.7 V			0.6	
	I _{OL} = 12 mA	3 V			0.8	
I _I	V _I = V _{CC} or GND	3.6 V			±5	μA
I _{I(hold)}	V _I = 0.58 V	1.65 V	25			μA
	V _I = 1.07 V	1.65 V	-25			
	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 ⁽²⁾	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			40	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	2.5		pF
	Data inputs			3.5		
C _o	Outputs	V _O = V _{CC} or GND	3.3 V	4		pF

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

(2) 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	B	(1)	1	4.9	5.1		1.4	4.4	ns
t _{en}	\overline{OE}	B	(1)	1	6.4	6.6		1.2	5.7	ns
t _{dis}	\overline{OE}	B	(1)	1	5.4	4.7		1.2	4.5	ns
t _{sk(o)} ⁽²⁾								0.35		ns
t _{sk(o)} ⁽³⁾								0.5		ns

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

(2) Skew between outputs of the same bank and same package (same transition)

(3) Skew between outputs of all banks of same package (A1–A8 tied together)

SN74ALVCH162344

1-BIT TO 4-BIT ADDRESS DRIVER WITH 3-STATE OUTPUTS

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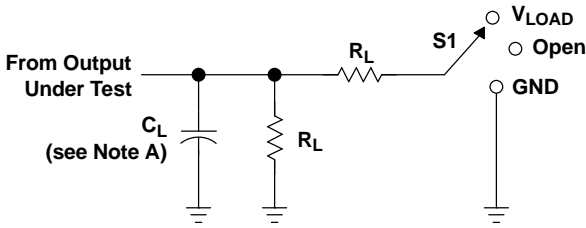
OPERATING CHARACTERISTICS

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

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	$C_L = 0\text{ pF}, f = 10\text{ MHz}$	(1)	68	82	pF
	Outputs disabled		(1)	12	14	

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

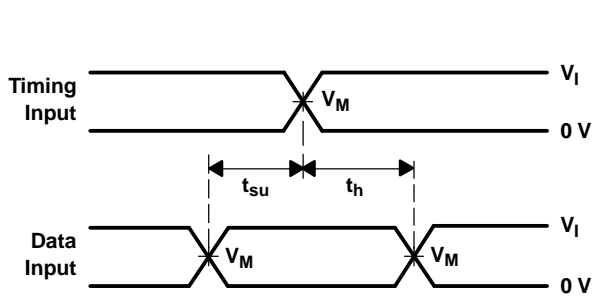
PARAMETER MEASUREMENT INFORMATION



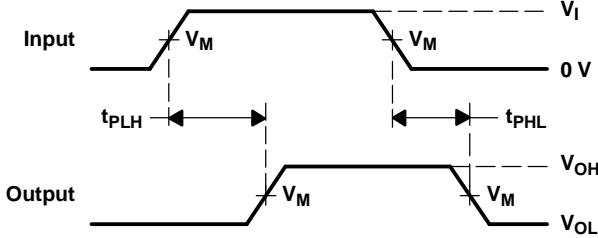
LOAD CIRCUIT

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

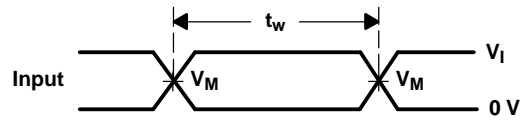
V_{CC}	INPUT		V_M	V_{LOAD}	C_L	R_L	V_{Δ}
	V_I	t_r/t_f					
$1.8\text{ V} \pm 0.15\text{ V}$	V_{CC}	$\leq 2\text{ ns}$	$V_{CC}/2$	$2 \times V_{CC}$	30 pF	1 k Ω	0.15 V
$2.5\text{ V} \pm 0.2\text{ V}$	V_{CC}	$\leq 2\text{ ns}$	$V_{CC}/2$	$2 \times V_{CC}$	30 pF	500 Ω	0.15 V
2.7 V	2.7 V	$\leq 2.5\text{ ns}$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



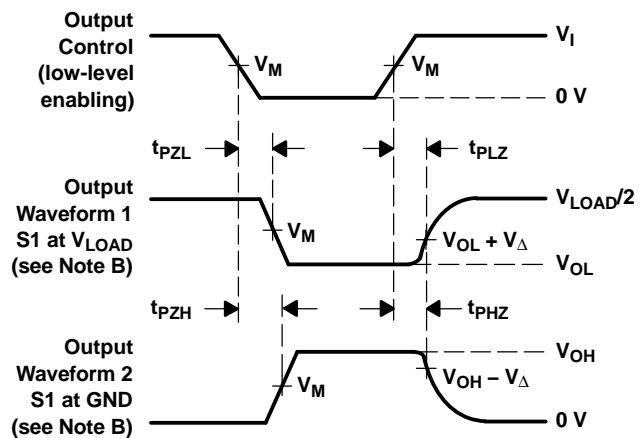
VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES



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 finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
SN74ALVCH162344DL	ACTIVE	SSOP	DL	56	20	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ALVCH162344	Samples
SN74ALVCH162344GR	ACTIVE	TSSOP	DGG	56	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ALVCH162344	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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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
SN74ALVCH162344GR	TSSOP	DGG	56	2000	330.0	24.4	8.6	15.6	1.8	12.0	24.0	Q1

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74ALVCH162344GR	TSSOP	DGG	56	2000	367.0	367.0	45.0

TUBE


*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
SN74ALVCH162344DL	DL	SSOP	56	20	473.7	14.24	5110	7.87



4222167/A 07/2015

NOTES:

- All linear dimensions are in millimeters. Any 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.
- Reference JEDEC registration MO-153.

EXAMPLE BOARD LAYOUT

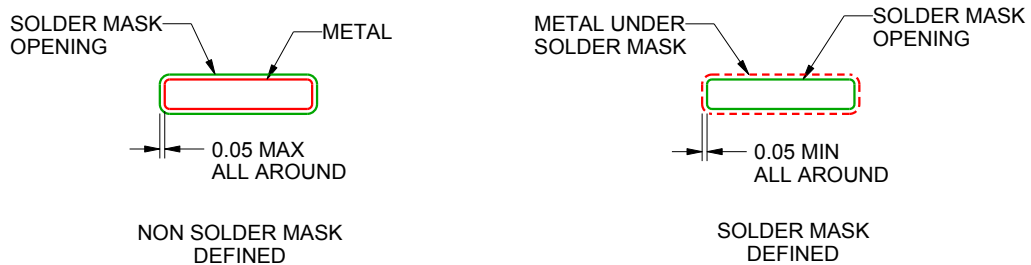
DGG0056A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE
SCALE:6X



SOLDER MASK DETAILS

4222167/A 07/2015

NOTES: (continued)

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

EXAMPLE STENCIL DESIGN

DGG0056A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



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

4222167/A 07/2015

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.

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