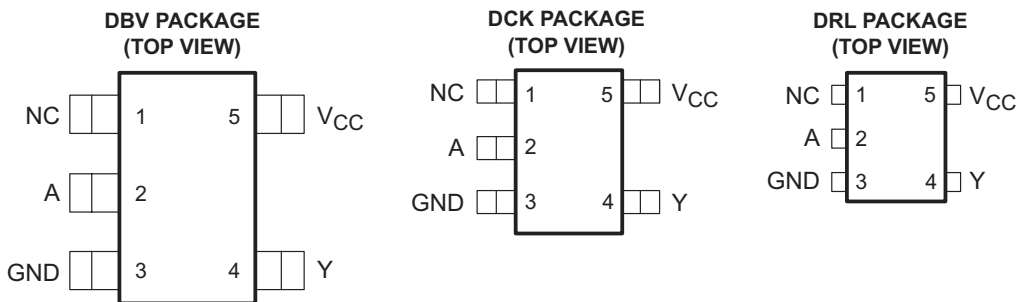


SINGLE SCHMITT-TRIGGER INVERTER GATE

Check for Samples: [SN74AHC1G14](#)

FEATURES

- Operating Range 2-V to 5.5-V
- Max t_{pd} of 10ns at 5-V
- Low Power Consumption, 10- μ A Max I_{CC}
- ± 8 -mA Output Drive at 5-V
- Latch-Up Performance Exceeds 250 mA Per JESD 17



NC – No internal connection

See mechanical drawings for dimensions.

DESCRIPTION

The SN74AHC1G14 contains one inverter gate. The device performs the Boolean function $Y = \overline{A}$.

The device functions as an independent inverter gate, but because of the Schmitt action, gates may have different input threshold levels for positive- (V_{T+}) and negative-going (V_{T-}) signals.

FUNCTION TABLE

INPUT A	OUTPUT Y
H	L
L	H

LOGIC DIAGRAM (POSITIVE SIDE)



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.

SN74AHC1G14

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ABSOLUTE MAXIMUM RATINGS

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

		VALUE	UNIT
Supply voltage range, V_{CC}		-0.5 to 7	V
Input voltage range, V_I ⁽²⁾		-0.5 to 7	V
Output voltage range, V_O ⁽²⁾		-0.5 to $V_{CC} + 0.5$	V
Input clamp current, I_{IK} ($V_I < 0$)		-20	mA
Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$)		± 20	mA
Continuous output current, I_O ($V_O = 0$ to V_{CC})		± 25	mA
Continuous current through V_{CC} or GND		± 50	mA
Package thermal impedance, θ_{JA} ⁽³⁾	DBV package	206	°C/W
	DCK package	252	
	DRL package	142	
Storage temperature range, T_{stg}		-65 to 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.
- (3) The package thermal impedance is calculated in accordance with JESD 51-7.

RECOMMENDED OPERATING CONDITIONS ⁽¹⁾

		MIN	MAX	UNIT
V_{CC}	Supply voltage	2	5.5	V
V_I	Input voltage	0	5.5	V
V_O	Output voltage	0	V_{CC}	V
I_{OH}	High-level output current	$V_{CC} = 2$ V	-50	μ A
		$V_{CC} = 3.3$ V ± 0.3 V	-4	mA
		$V_{CC} = 5$ V ± 0.5 V	-8	
I_{OL}	Low-level output current	$V_{CC} = 2$ V	50	μ A
		$V_{CC} = 3.3$ V ± 0.3 V	4	mA
		$V_{CC} = 5$ V ± 0.5 V	8	
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](#).

ELECTRICAL CHARACTERISTICS

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

PARAMETER	TEST CONDITIONS	VCC	T _A = 25°C			T _A = -40°C to 85°C		Recommended		UNIT
			MIN	TYP	MAX	MIN	MAX	T _A = -40°C to 125°C		
								MIN	MAX	
V _{T+} Positive-going input threshold voltage		3 V	1.2		2.2	1.2	2.2	1.2	2.2	V
		4.5 V	1.75		3.15	1.75	3.15	1.75	3.15	
		5.5 V	2.15		3.85	2.15	2.85	2.15	3.85	
V _{T-} Negative-going input threshold voltage		3 V	0.9		1.9	0.9	1.9	0.9	1.9	V
		4.5 V	1.35		2.75	1.35	2.75	1.35	2.75	
		5.5 V	1.65		3.35	1.65	3.35	1.65	3.35	
ΔV _T Hysteresis (V _{T+} - V _{T-})		3 V	0.3		1.2	0.3	1.2	0.25	1.2	V
		4.5 V	0.4		1.4	0.4	1.4	0.35	1.4	
		5.5 V	0.5		1.6	0.5	1.6	0.45	1.6	
V _{OH}	I _{OH} = -50 μA	2 V	1.9	2		1.9		1.9		V
		3 V	2.9	3		2.9		2.9		
		4.5 V	4.4	4.5		4.4		4.4		
	I _{OH} = -4 mA	3 V	2.58			2.48		2.4		
	I _{OL} = -8 mA	4.5 V	3.94			3.8		3.7		
V _{OL}	I _{OH} = 50 μA	2 V			0.1		0.1		0.1	V
		3 V			0.1		0.1		0.1	
		4.5 V			0.1		0.1		0.1	
	I _{OH} = 4 mA	3 V			0.36		0.44		0.55	
	I _{OL} = 8 mA	4.5 V			0.36		0.44		0.55	
I _I	V _I = 5.5 V or GND	0 V to 5.5 V			±0.1		±1		±1	μA
I _{CC}	V _I = V _{CC} or GND, I _O = 0	5.5 V			1		10		10	μA
C _i	V _I = V _{CC} or GND	5 V		2	10		10		10	pF

SWITCHING CHARACTERISTICS

over recommended operating free-air temperature range, V_{CC} = 3.3 V ± 0.3 V (unless otherwise noted) (see [Figure 1](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	OUTPUT CAPACITANCE	T _A = 25°C		T _A = -40°C to 85°C		Recommended		UNIT
				TYP	MAX	MIN	MAX	T _A = -40°C to 125°C		
								MIN	MAX	
t _{PLH}	A o	Y	C _L = 15 pF	8.3	12.8	1	15	1	16	ns
t _{PHL}				8.3	12.8	1	15	1	16	
t _{PLH}	A	Y	C _L = 50 pF	10.8	16.3	1	18.5	1	19.5	ns
t _{PHL}				10.8	16.3	1	18.5	1	19.5	

SN74AHC1G14

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SWITCHING CHARACTERISTICS

over recommended operating free-air temperature range, $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ (unless otherwise noted) (see [Figure 1](#))

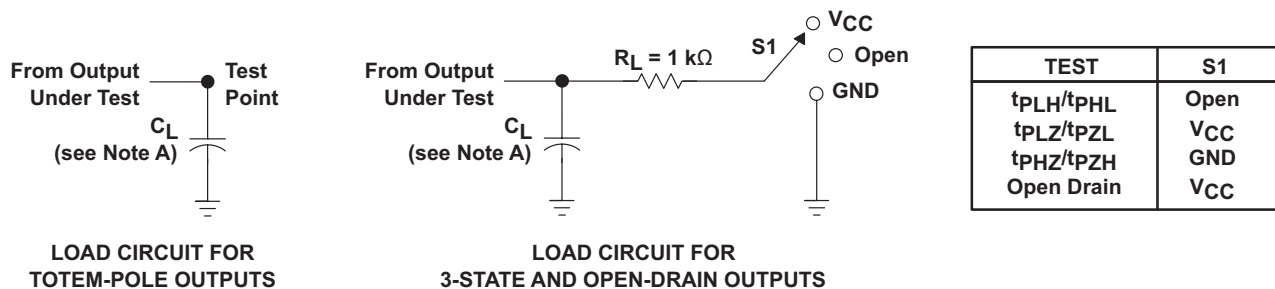
PARAMETER	FROM (INPUT)	TO (OUTPUT)	OUTPUT CAPACITANCE	$T_A = 25^\circ\text{C}$		$T_A = -40^\circ\text{C to } 85^\circ\text{C}$		Recommended		UNIT
				TYP	MAX	MIN	MAX	$T_A = -40^\circ\text{C to } 125^\circ\text{C}$		
								MIN	MAX	
t_{PLH}	A or B	Y	$C_L = 15\text{ pF}$	5.5	8.6	1	10	1	11	ns
t_{PHL}				5.5	8.6	1	10	1	11	
t_{PLH}	A or B	Y	$C_L = 50\text{ pF}$	7	10.6	1	12	1	11	ns
t_{PHL}				7	10.6	1	12	1	11	

OPERATING CHARACTERISTICS

$V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

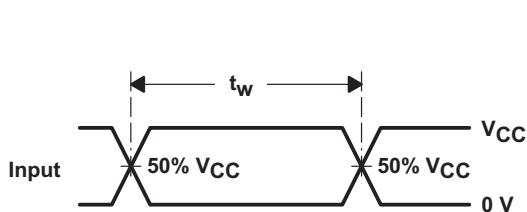
PARAMETER	TEST CONDITIONS	TYP	UNIT
C_{pd} Power dissipation capacitance	No load, $f = 1\text{ MHz}$	9	pF

PARAMETER MEASUREMENT INFORMATION

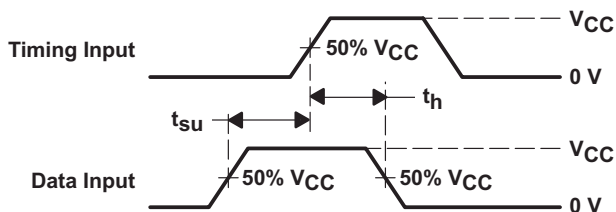


LOAD CIRCUIT FOR TOTEM-POLE OUTPUTS

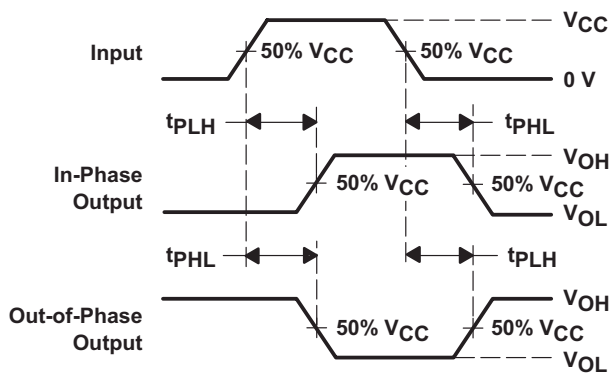
LOAD CIRCUIT FOR 3-STATE AND OPEN-DRAIN OUTPUTS



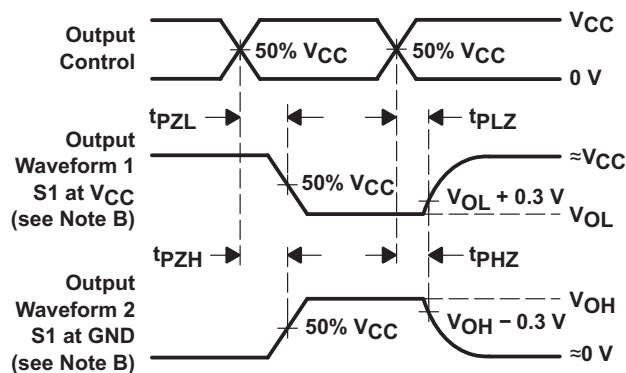
VOLTAGE WAVEFORMS PULSE DURATION



VOLTAGE WAVEFORMS SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS PROPAGATION DELAY TIMES INVERTING AND NONINVERTING OUTPUTS



VOLTAGE WAVEFORMS ENABLE AND DISABLE TIMES LOW- AND HIGH-LEVEL ENABLING

- 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: $PRR \leq 1 \text{ MHz}$, $Z_O = 50 \Omega$, $t_r \leq 3 \text{ ns}$, $t_f \leq 3 \text{ ns}$.
- D. The outputs are measured one at a time with one input transition per measurement.
- E. All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms

REVISION HISTORY**Changes from Revision N (June 2005) to Revision O** **Page**

- Changed document format from Quicksilver to DocZone. [1](#)
-

Changes from Revision O (January 2013) to Revision P **Page**

- Extended operating temperature range to 125°C [2](#)
-

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
SN74AHC1G14DBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(A142 ~ A143 ~ A14G ~ A14J ~ A14L ~ A14S)	Samples
SN74AHC1G14DBVRE4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(A142 ~ A143 ~ A14G ~ A14J ~ A14L ~ A14S)	Samples
SN74AHC1G14DBVRG4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(A142 ~ A143 ~ A14G ~ A14J ~ A14L ~ A14S)	Samples
SN74AHC1G14DBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(A143 ~ A14G ~ A14L ~ A14S)	Samples
SN74AHC1G14DBVTG4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(A143 ~ A14G ~ A14L ~ A14S)	Samples
SN74AHC1G14DCKR	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(AF3 ~ AFG ~ AFJ ~ AFL ~ AFS)	Samples
SN74AHC1G14DCKRE4	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(AF3 ~ AFG ~ AFJ ~ AFL ~ AFS)	Samples
SN74AHC1G14DCKRG4	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(AF3 ~ AFG ~ AFJ ~ AFL ~ AFS)	Samples
SN74AHC1G14DCKT	ACTIVE	SC70	DCK	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(AF3 ~ AFG ~ AFL ~ AFS)	Samples
SN74AHC1G14DCKTE4	ACTIVE	SC70	DCK	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(AF3 ~ AFG ~ AFL ~ AFS)	Samples
SN74AHC1G14DCKTG4	ACTIVE	SC70	DCK	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(AF3 ~ AFG ~ AFL ~ AFS)	Samples
SN74AHC1G14DRLR	ACTIVE	SOT	DRL	5	4000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	AFS	Samples
SN74AHC1G14DRLRG4	ACTIVE	SOT	DRL	5	4000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	AFS	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

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
SN74AHC1G14DBVR	SOT-23	DBV	5	3000	178.0	9.2	3.3	3.2	1.55	4.0	8.0	Q3
SN74AHC1G14DBVR	SOT-23	DBV	5	3000	180.0	9.2	3.17	3.23	1.37	4.0	8.0	Q3
SN74AHC1G14DBVR	SOT-23	DBV	5	3000	180.0	8.4	3.23	3.17	1.37	4.0	8.0	Q3
SN74AHC1G14DBVT	SOT-23	DBV	5	250	178.0	9.2	3.3	3.2	1.55	4.0	8.0	Q3
SN74AHC1G14DBVT	SOT-23	DBV	5	250	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
SN74AHC1G14DBVT	SOT-23	DBV	5	250	180.0	9.2	3.17	3.23	1.37	4.0	8.0	Q3
SN74AHC1G14DCKR	SC70	DCK	5	3000	178.0	9.2	2.4	2.4	1.22	4.0	8.0	Q3
SN74AHC1G14DCKR	SC70	DCK	5	3000	180.0	9.2	2.3	2.55	1.2	4.0	8.0	Q3
SN74AHC1G14DCKT	SC70	DCK	5	250	180.0	9.2	2.3	2.55	1.2	4.0	8.0	Q3
SN74AHC1G14DCKT	SC70	DCK	5	250	178.0	9.0	2.4	2.5	1.2	4.0	8.0	Q3
SN74AHC1G14DCKT	SC70	DCK	5	250	178.0	9.2	2.4	2.4	1.22	4.0	8.0	Q3
SN74AHC1G14DRLR	SOT	DRL	5	4000	180.0	8.4	1.98	1.78	0.69	4.0	8.0	Q3

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74AHC1G14DBVR	SOT-23	DBV	5	3000	180.0	180.0	18.0
SN74AHC1G14DBVR	SOT-23	DBV	5	3000	205.0	200.0	33.0
SN74AHC1G14DBVR	SOT-23	DBV	5	3000	202.0	201.0	28.0
SN74AHC1G14DBVT	SOT-23	DBV	5	250	180.0	180.0	18.0
SN74AHC1G14DBVT	SOT-23	DBV	5	250	180.0	180.0	18.0
SN74AHC1G14DBVT	SOT-23	DBV	5	250	205.0	200.0	33.0
SN74AHC1G14DCKR	SC70	DCK	5	3000	180.0	180.0	18.0
SN74AHC1G14DCKR	SC70	DCK	5	3000	205.0	200.0	33.0
SN74AHC1G14DCKT	SC70	DCK	5	250	205.0	200.0	33.0
SN74AHC1G14DCKT	SC70	DCK	5	250	180.0	180.0	18.0
SN74AHC1G14DCKT	SC70	DCK	5	250	180.0	180.0	18.0
SN74AHC1G14DRLR	SOT	DRL	5	4000	202.0	201.0	28.0

DBV (R-PDSO-G5)

PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.
 - Falls within JEDEC MO-178 Variation AA.

DBV (R-PDSO-G5)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
 - D. Publication IPC-7351 is recommended for alternate designs.
 - E. 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. Example stencil design based on a 50% volumetric metal load solder paste. Refer to IPC-7525 for other stencil recommendations.

DCK (R-PDSO-G5)

PLASTIC SMALL-OUTLINE PACKAGE



- 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. Mold flash and protrusion shall not exceed 0.15 per side.
 - D. Falls within JEDEC MO-203 variation AA.

DCK (R-PDSO-G5)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
 - D. Publication IPC-7351 is recommended for alternate designs.
 - E. 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. Example stencil design based on a 50% volumetric metal load solder paste. Refer to IPC-7525 for other stencil recommendations.



- 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 dimensions do not include mold flash, interlead flash, protrusions, or gate burrs. Mold flash, interlead flash, protrusions, or gate burrs shall not exceed 0,15 per end or side.
 - D. JEDEC package registration is pending.



- 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 designs.
 - D. Customers should contact their board fabrication site for minimum solder mask web tolerances between signal pads.
 - E. Maximum stencil thickness 0,127 mm (5 mils). All linear dimensions are in millimeters.
 - F. 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 stencil design considerations.
 - G. Side aperture dimensions over-print land for acceptable area ratio > 0.66. Customer may reduce side aperture dimensions if stencil manufacturing process allows for sufficient release at smaller opening.

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TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

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