SCLS005D - MARCH 1984 - REVISED AUGUST 2003

- Operating Voltage Range of 4.5 V to 5.5 V
- High-Current 3-State True Outputs Can Drive Up To 15 LSTTL Loads
- Low Power Consumption, 80-μA Max I_{CC}
- Typical t_{pd} = 22 ns
- ±6-mA Output Drive at 5 V
- Low Input Current of 1 μA Max
- Inputs Are TTL-Voltage Compatible
- Eight D-Type Flip-Flops in a Single Package
- Full Parallel Access for Loading

description/ordering information

These 8-bit flip-flops feature 3-state outputs designed specifically for driving highly capacitive or relatively low-impedance loads. They are particularly suitable for implementing buffer registers, I/O ports, bidirectional bus drivers, and working registers.

The eight flip-flops of the 'HCT374 devices are edge-triggered D-type flip-flops. On the positive transition of the clock (CLK) input, the Q outputs are set to the logic levels that were set up at the data (D) inputs.

An output-enable (\overline{OE}) input places the eight outputs in either a normal logic state (high or low

logic levels) or the high-impedance state. In the high-impedance state, the outputs neither load nor drive the bus lines significantly. The high-impedance state and increased drive provide the capability to drive bus lines without interface or pullup components.

т _А	PACK	AGET	ORDERABLE PART NUMBER	TOP-SIDE MARKING
	PDIP – N	Tube of 20	SN74HCT374N	SN74HCT374N
	Tube of 25		SN74HCT374DW	1107074
	SOIC – DW	Reel of 2000	SN74HCT374DWR	HCT374
	SOP – NS	Reel of 2000	SN74HCT374NSR	HCT374
–40°C to 85°C	SSOP – DB	Reel of 2000	SN74HCT374DBR	HT374
		Tube of 70	SN74HCT374PW	
	TSSOP – PW	Reel of 2000	SN74HCT374PWR	HT374
		Reel of 250	SN74HCT374PWT	1
	CDIP – J	Tube of 20	SNJ54HCT374J	SNJ54HCT374J
–55°C to 125°C	CFP – W	Tube of 85	SNJ54HCT374W	SNJ54HCT374W
	LCCC – FK	Tube of 55	SNJ54HCT374FK	SNJ54HCT374FK

ORDERING INFORMATION

[†] Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.



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.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.



Copyright © 2003, Texas Instruments Incorporated On products compliant to MIL-PRF-38535, all parameters are tested unless otherwise noted. On all other products, production processing does not necessarily include testing of all parameters.

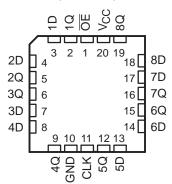
	(10	JP VIEVV)
OE [1	
1Q [2	19 🛛 8Q
1D [3	18 🛛 8D
2D [4	17 🛛 7D
2Q [5	16 🛛 7Q
3Q [6	15 🛛 6Q
3D [7	14 🛛 6D
4D [8	13 🛛 5D
4Q [9	12 5Q

SN54HCT374 . . . J OR W PACKAGE SN74HCT374 . . . DB, DW, N, NS, OR PW PACKAGE

SN54HCT374 . . . FK PACKAGE (TOP VIEW)

11 CLK

GND 10



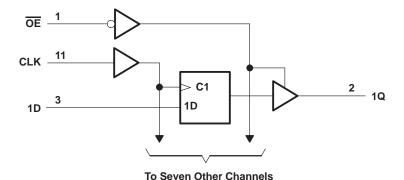
SCLS005D - MARCH 1984 - REVISED AUGUST 2003

description/ordering information (continued)

OE does not affect the internal operations of the flip-flops. Old data can be retained or new data can be entered while the outputs are in the high-impedance state.

	FUNCTION TABLE (each flip-flop)												
	INPUTS		OUTPUT										
OE	CLK	D	Q										
L	\uparrow	Н	Н										
L	\uparrow	L	L										
L	H or L	Х	Q ₀										
н	Х	Х	Z										

logic diagram (positive logic)



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)[†]

Supply voltage range, V_{CC}
Input clamp current, I_{IK} ($V_I < 0$ or $V_I > V_{CC}$) (see Note 1) ±20 mA
Output clamp current, I_{OK} (V _O < 0 or V _O > V _{CC}) (see Note 1) ±20 mA
Continuous output current, $I_O (V_O = 0 \text{ to } V_{CC})$ ±35 mA
Continuous current through V _{CC} or GND
Package thermal impedance, θ_{JA} (see Note 2): DB package
DW package
N package
NS package
PW package
Storage temperature range, T _{stg} 65°C to 150°C

[†] 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.

NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

2. The package thermal impedance is calculated in accordance with JESD 51-7.



SCLS005D - MARCH 1984 - REVISED AUGUST 2003

recommended operating conditions (see Note 3)

			SN	54HCT3	74	SN	74HCT3	74	
			MIN	NOM	MAX	MIN	NOM	MAX	UNIT
VCC	Supply voltage		4.5	5	5.5	4.5	5	5.5	V
VIH	High-level input voltage	V_{CC} = 4.5 V to 5.5 V	2			2			V
VIL	Low-level input voltage	V_{CC} = 4.5 V to 5.5 V			0.8			0.8	V
VI	Input voltage		0		VCC	0		VCC	V
VO	Output voltage		0		VCC	0		VCC	V
$\Delta t/\Delta v$	Input transition rise/fall time				500			500	ns
TA	Operating free-air temperature		-55		125	-40		85	°C

NOTE 3: 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 recommended operating free-air temperature range (unless otherwise noted)

DADAMETED	TEAT OO	v _{cc}	Т	A = 25°C	;	SN54H	CT374	SN74H	CT374		
PARAMETER	TEST CO	TEST CONDITIONS			TYP	MAX	MIN	MAX	MIN	MAX	UNIT
		I _{OH} = -20 μA		4.4	4.499		4.4		4.4		V
VOH	VI = VIH or VIL	$I_{OH} = -6 \text{ mA}$	4.5 V	3.98	4.3		3.7		3.84		V
		I _{OL} = 20 μA	4.5.1		0.001	0.1		0.1		0.1	
V _{OL}	VI = VIH or VIL	$I_{OL} = 6 \text{ mA}$	4.5 V		0.17	0.26		0.4		0.33	V
l	$V_{I} = V_{CC} \text{ or } 0$		5.5 V		±0.1	±100		±1000		±1000	nA
I _{OZ}	$V_{O} = V_{CC} \text{ or } 0$		5.5 V		±0.01	±0.5		±10		±5	μΑ
ICC	$V_I = V_{CC} \text{ or } 0,$	I ^O = 0	5.5 V			8		160		80	μΑ
ΔI_{CC}^{\dagger}	One input at 0.5 V Other inputs at 0 of		5.5 V		1.4	2.4		3		2.9	mA
Ci			4.5 V to 5.5 V		3	10		10		10	pF

[†] This is the increase in supply current for each input that is at one of the specified TTL voltage levels, rather than 0 V or V_{CC}.

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

		N.	T _A = 2	25°C	SN54H	CT374	SN74H	CT374	
		Vcc	MIN	MAX	MIN	MAX	MIN	MAX	UNIT
4	Clash fragmanni	4.5 V		31		21		25	N 41 1-
fclock	Clock frequency	5.5 V		36		23		28	MHz
	Data duration OLIC bish as how	4.5 V	16		24		20		
tw	Pulse duration, CLK high or low	5.5 V	14		22		18		ns
		4.5 V	20		30		25		
^t su	Setup time, data before CLK↑	5.5 V	17		27		23		ns
÷.	Hold time, data after CLK↑	4.5 V	10		10		10		20
th		5.5 V	10		10		10		ns



SCLS005D - MARCH 1984 - REVISED AUGUST 2003

switching characteristics over recommended operating free-air temperature range, $C_L = 50 \text{ pF}$ (unless otherwise noted) (see Figure 1)

	FROM	то		T,	₄ = 25°C	;	SN54H	CT374	SN74H	CT374	
PARAMETER	(INPUT)	(OUTPUT)	VCC	MIN	TYP	MAX	MIN	MAX	MIN	MAX	UNIT
4			4.5 V	31	36		21		25		N 41 1-
fmax			5.5 V	36	40		23		28		MHz
4		Am. 0	4.5 V		30	36		54		45	
^t pd	CLK	Any Q	5.5 V		25	32		49		41	ns
	OE	1	4.5 V		26	30		45		38	
t _{en}	ÛE	Any Q	5.5 V		23	27		41		34	ns
	OE	1	4.5 V		23	30		45		38	
^t dis	OE	Any Q	5.5 V		22	27		41		34	ns
		Amy O	4.5 V		10	12		18		15	
tt		Any Q	5.5 V		9	11		16		14	ns

switching characteristics over recommended operating free-air temperature range, $C_L = 150 \text{ pF}$ (unless otherwise noted) (see Figure 1)

DADAMETED	FROM	то		Т	λ = 25°C	;	SN54H	CT374	SN74H	CT374	
PARAMETER	(INPUT)	(OUTPUT)	VCC	MIN	TYP	MAX	MIN	MAX	MIN	MAX	UNIT
		A	4.5 V		40	46		69		58	
^t pd	CLK	Any Q	5.5 V		35	41		62		52	ns
	OE	A	4.5 V		34	40		60		50	
^t en	OE	Any Q	5.5 V		29	36		54		45	ns
		Amy O	4.5 V		18	42		63		53	
t		Any Q	5.5 V		16	38		57		48	ns

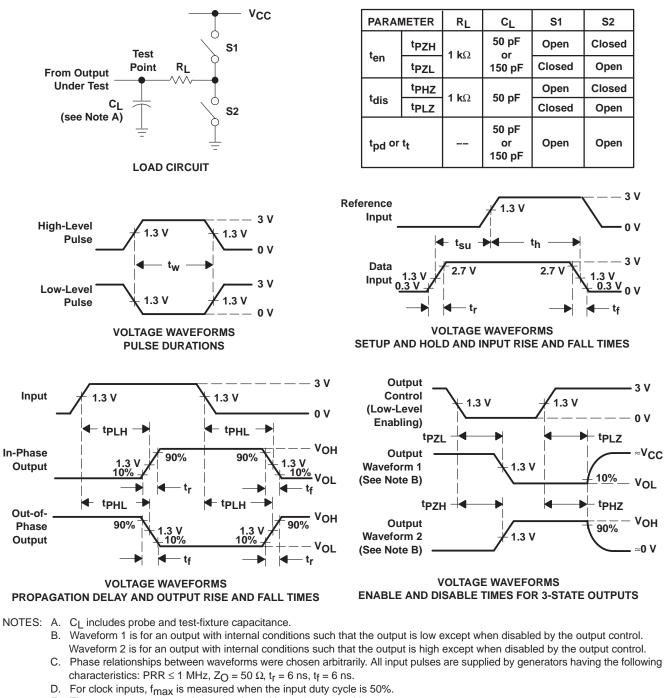
operating characteristics, $T_A = 25^{\circ}C$

	PARAMETER	TEST CONDITIONS	TYP	UNIT
C _{pd}	Power dissipation capacitance per flip-flop	No load	85	pF



SCLS005D - MARCH 1984 - REVISED AUGUST 2003

PARAMETER MEASUREMENT INFORMATION



- E. The outputs are measured one at a time with one input transition per measurement.
- F. tpLz and tpHz are the same as tdis.
- G. t_{P7I} and t_{P7H} are the same as t_{en} .
- H. tpLH and tpHL are the same as tpd.

Figure 1. Load Circuit and Voltage Waveforms





9-Mar-2021

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
85507012A	ACTIVE	LCCC	FK	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	85507012A SNJ54HCT 374FK	Samples
8550701RA	ACTIVE	CDIP	J	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	8550701RA SNJ54HCT374J	Samples
JM38510/65652BRA	ACTIVE	CDIP	J	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 65652BRA	Samples
M38510/65652BRA	ACTIVE	CDIP	J	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 65652BRA	Samples
SN54HCT374J	ACTIVE	CDIP	J	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SN54HCT374J	Samples
SN74HCT374DBR	ACTIVE	SSOP	DB	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HT374	Samples
SN74HCT374DW	ACTIVE	SOIC	DW	20	25	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT374	Samples
SN74HCT374DWG4	ACTIVE	SOIC	DW	20	25	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT374	Samples
SN74HCT374DWR	ACTIVE	SOIC	DW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT374	Samples
SN74HCT374DWRE4	ACTIVE	SOIC	DW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT374	Samples
SN74HCT374N	ACTIVE	PDIP	Ν	20	20	RoHS & Green	NIPDAU	N / A for Pkg Type	-40 to 85	SN74HCT374N	Samples
SN74HCT374NSR	ACTIVE	SO	NS	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT374	Samples
SN74HCT374PW	ACTIVE	TSSOP	PW	20	70	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HT374	Samples
SN74HCT374PWR	ACTIVE	TSSOP	PW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HT374	Samples
SN74HCT374PWT	ACTIVE	TSSOP	PW	20	250	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HT374	Samples
SNJ54HCT374FK	ACTIVE	LCCC	FK	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	85507012A SNJ54HCT 374FK	Samples
SNJ54HCT374J	ACTIVE	CDIP	J	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	8550701RA SNJ54HCT374J	Samples



www.ti.com

9-Mar-2021

(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 (CI) 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.

OTHER QUALIFIED VERSIONS OF SN54HCT374, SN74HCT374 :

• Catalog: SN74HCT374

• Military: SN54HCT374

NOTE: Qualified Version Definitions:



www.ti.com

PACKAGE OPTION ADDENDUM

9-Mar-2021

- Catalog TI's standard catalog product
- Military QML certified for Military and Defense Applications

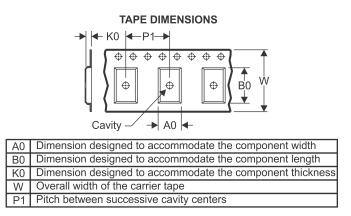
PACKAGE MATERIALS INFORMATION

www.ti.com

Texas Instruments

TAPE AND REEL INFORMATION





QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



Device		Package Drawing		SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74HCT374DBR	SSOP	DB	20	2000	330.0	16.4	8.2	7.5	2.5	12.0	16.0	Q1
SN74HCT374DWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
SN74HCT374NSR	SO	NS	20	2000	330.0	24.4	8.4	13.0	2.5	12.0	24.0	Q1
SN74HCT374PWR	TSSOP	PW	20	2000	330.0	16.4	6.95	7.0	1.4	8.0	16.0	Q1
SN74HCT374PWT	TSSOP	PW	20	250	330.0	16.4	6.95	7.0	1.4	8.0	16.0	Q1

TEXAS INSTRUMENTS

www.ti.com

PACKAGE MATERIALS INFORMATION

30-Dec-2020



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74HCT374DBR	SSOP	DB	20	2000	853.0	449.0	35.0
SN74HCT374DWR	SOIC	DW	20	2000	367.0	367.0	45.0
SN74HCT374NSR	SO	NS	20	2000	367.0	367.0	45.0
SN74HCT374PWR	TSSOP	PW	20	2000	853.0	449.0	35.0
SN74HCT374PWT	TSSOP	PW	20	250	853.0	449.0	35.0

J (R-GDIP-T**) 14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



NOTES: A. All linear dimensions are in inches (millimeters).

- B. This drawing is subject to change without notice.
- C. This package is hermetically sealed with a ceramic lid using glass frit.
- D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
- E. Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

PW (R-PDSO-G20)

PLASTIC SMALL OUTLINE



NOTES:

A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994. β . This drawing is subject to change without notice.

Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.

Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.

E. Falls within JEDEC MO-153



LAND PATTERN DATA



NOTES: Α. 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.



N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



NOTES:

- A. All linear dimensions are in inches (millimeters).B. This drawing is subject to change without notice.
- Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
- \triangle The 20 pin end lead shoulder width is a vendor option, either half or full width.



DW0020A



PACKAGE OUTLINE

SOIC - 2.65 mm max height

SOIC



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.



DW0020A

EXAMPLE BOARD LAYOUT

SOIC - 2.65 mm max height

SOIC



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.



DW0020A

EXAMPLE STENCIL DESIGN

SOIC - 2.65 mm max height

SOIC



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.



LEADLESS CERAMIC CHIP CARRIER

FK (S-CQCC-N**) 28 TERMINAL SHOWN



NOTES: A. All linear dimensions are in inches (millimeters).

B. This drawing is subject to change without notice.

- C. This package can be hermetically sealed with a metal lid.
- D. Falls within JEDEC MS-004



DB0020A



PACKAGE OUTLINE

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



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-150.



DB0020A

EXAMPLE BOARD LAYOUT

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



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.



DB0020A

EXAMPLE STENCIL DESIGN

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



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

PLASTIC SMALL-OUTLINE PACKAGE

0,51 0,35 ⊕0,25⊛ 1,27 8 14 0,15 NOM 5,60 8,20 5,00 7,40 \bigcirc Gage Plane ₽ 0,25 7 1 1,05 0,55 0°-10° Δ 0,15 0,05 Seating Plane — 2,00 MAX 0,10PINS ** 14 16 20 24 DIM 10,50 10,50 12,90 15,30 A MAX A MIN 9,90 9,90 12,30 14,70 4040062/C 03/03

NOTES: A. All linear dimensions are in millimeters.

NS (R-PDSO-G**)

14-PINS SHOWN

- B. This drawing is subject to change without notice.
- C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.



IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements. These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to TI's Terms of Sale (https://www.ti.com/legal/termsofsale.html) or other applicable terms available either on ti.com or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265 Copyright © 2021, Texas Instruments Incorporated