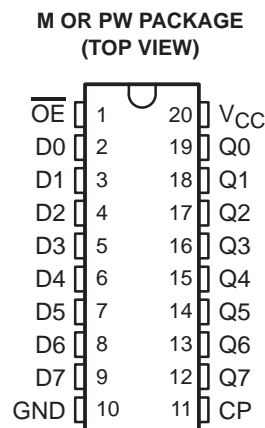


# CD74HCT574-EP HIGH-SPEED CMOS LOGIC OCTAL D-TYPE FLIP-FLOP 3-STATE, POSITIVE-EDGE TRIGGERED

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- **Controlled Baseline**
  - One Assembly/Test Site, One Fabrication Site
- **Extended Temperature Performance of –40°C to 125°C**
- **Enhanced Diminishing Manufacturing Sources (DMS) Support**
- **Enhanced Product Change Notification**
- **Qualification Pedigree†**
- **Buffered Inputs**
- **Common 3-State Output-Enable Control**
- **3-State Outputs**
- **Bus-Line Driving Capability**
- **Typical Propagation Delay (Clock to Q): 15 ns at  $V_{CC} = 5\text{ V}$ ,  $C_L = 15\text{ pF}$ ,  $T_A = 25^\circ\text{C}$**
- **Fanout (Over Temperature Range)**
  - Standard Outputs . . . 10 LSTTL Loads
  - Bus Driver Outputs . . . 15 LSTTL Loads
- **Balanced Propagation Delay and Transition Times**
- **Significant Power Reduction Compared to LSTTL Logic ICs**
- **$V_{CC}$  Voltage = 4.5 V to 5.5 V**
- **Direct LSTTL Input Logic Compatibility,  $V_{IL} = 0.8\text{ V}$  (Max),  $V_{IH} = 2\text{ V}$  (Min)**
- **CMOS Input Compatibility,  $I_I \leq 1\ \mu\text{A}$  at  $V_{OL}$ ,  $V_{OH}$**



† Component qualification in accordance with JEDEC and industry standards to ensure reliable operation over an extended temperature range. This includes, but is not limited to, Highly Accelerated Stress Test (HAST) or biased 85/85, temperature cycle, autoclave or unbiased HAST, electromigration, bond intermetallic life, and mold compound life. Such qualification testing should not be viewed as justifying use of this component beyond specified performance and environmental limits.

## description/ordering information

The CD74HCT574 is an octal D-type flip-flop with 3-state outputs and the capability to drive 15 LSTTL loads. The eight edge-triggered flip-flops enter data into their registers on the low-to-high transition of the clock (CP). The output enable ( $\overline{OE}$ ) controls the 3-state outputs and is independent of the register operation. When  $\overline{OE}$  is high, the outputs are in the high-impedance state.

## ORDERING INFORMATION

$T_A$	PACKAGE‡		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 125°C	SOIC – M	Tape and reel	CD74HCT574QM96EP	HCT574EP
	TSSOP – PW	Tape and reel	CD74HCT574QPWREP	HCT574EP

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



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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.

 **TEXAS  
INSTRUMENTS**

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**CD74HCT574-EP**  
**HIGH-SPEED CMOS LOGIC OCTAL D-TYPE FLIP-FLOP**  
**3-STATE, POSITIVE-EDGE TRIGGERED**

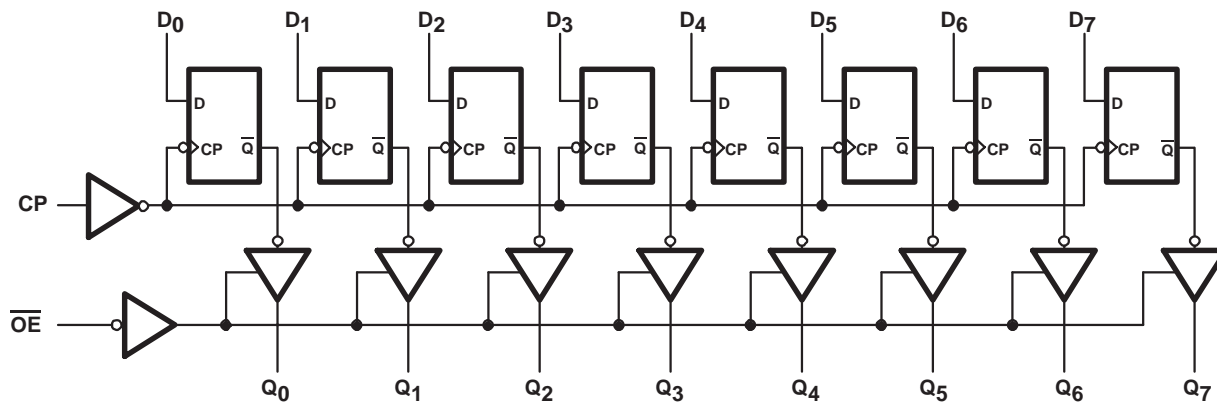
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FUNCTION TABLE

INPUTS			OUTPUT
$\overline{OE}$	CP	D	Q
L	↑	H	H
L	↑	L	L
L	L	X	$Q_0$
H	X	X	Z

NOTE: H = High voltage level (steady state)  
 L = Low voltage level (steady state)  
 X = Don't care  
 ↑ = Transition from low to high level  
 $Q_0$  = Level before the indicated steady-state conditions were established  
 Z = High-impedance state

logic diagram (positive logic)



# CD74HCT574-EP

## HIGH-SPEED CMOS LOGIC OCTAL D-TYPE FLIP-FLOP 3-STATE, POSITIVE-EDGE TRIGGERED

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

Supply voltage range, $V_{CC}$ (see Note 1)	–0.5 V to 7 V
Input clamp current, $I_{IK}$ ( $V_I < -0.5$ V or $V_I > V_{CC} + 0.5$ V)	±20 mA
Output clamp current, $I_{OK}$ ( $V_O < -0.5$ V or $V_O > V_{CC} + 0.5$ V)	±20 mA
Drain current per output, $I_O$ ( $V_O > -0.5$ V or $V_O < V_{CC} + 0.5$ V)	±35 mA
Output source or sink current per output, $I_O$ ( $V_O > -0.5$ V or $V_O < V_{CC} + 0.5$ V)	±25 mA
Continuous current through $V_{CC}$ or GND, $I_{CC}$	±50 mA
Package thermal impedance, $\theta_{JA}$ (see Note 2): M package	58°C/W
PW package	69°C/W
Maximum junction temperature, $T_J$	150°C
Lead temperature (during soldering):	
At distance $1/16 \pm 1/32$ inch ( $1,59 \pm 0,79$ mm) from case for 10 s max	300°C
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. All voltages referenced to GND unless otherwise specified.  
2. The package thermal impedance is calculated in accordance with JESD 51-7.

### recommended operating conditions (see Note 3)

		MIN	MAX	UNIT
$V_{CC}$	Supply voltage	4.5	5.5	V
$V_{IH}$	High-level input voltage	$V_{CC} = 4.5$ V to $5.5$ V		V
$V_{IL}$	Low-level input voltage	$V_{CC} = 4.5$ V to $5.5$ V		V
$V_I$	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		ns
		$V_{CC} = 4.5$ V		
		$V_{CC} = 6$ V		
$T_A$	Operating free-air temperature	–40	125	°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.

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

PARAMETER	TEST CONDITIONS		I <sub>O</sub> (mA)	V <sub>CC</sub>	T <sub>A</sub> = 25°C			T <sub>A</sub> = -40°C TO 125°C		UNIT
					MIN	TYP	MAX	MIN	MAX	
V <sub>OH</sub>	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	CMOS loads	-0.02	4.5 V	4.4			4.4		V
		TTL loads	-6	4.5 V	3.98			3.7		
V <sub>OL</sub>	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	CMOS loads	0.02	4.5 V	0.1			0.1		V
		TTL loads	6	4.5 V	0.26			0.4		
I <sub>I</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND		0	5.5 V	±0.1			±1		μA
I <sub>OZ</sub>	V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub> , V <sub>O</sub> = V <sub>CC</sub> or GND			6 V	±0.5			±10		μA
I <sub>CC</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND		0	5.5 V	8			160		μA
ΔI <sub>CC</sub>	V <sub>I</sub> = V <sub>CC</sub> - 2.1 V, See Note 4			4.5 V to 5.5 V	100 360			490		μA
C <sub>IN</sub>	C <sub>L</sub> = 50 pF				10			10		pF
C <sub>OUT</sub>	3-state				20			20		pF

NOTE 4: For dual-supply systems, theoretical worst-case (V<sub>I</sub> = 2.4 V, V<sub>CC</sub> = 5.5 V) specification is 1.8 mA.

**HCT input loading**

TYPE	INPUT	UNIT LOADS†
'574	D0-D7	0.4
	CP	0.75
	$\overline{\text{OE}}$	0.6

†Unit load is ΔI<sub>CC</sub> limit specified in electrical characteristics table, e.g., 360 μA max at 25°C.

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

PARAMETER		V <sub>CC</sub>	T <sub>A</sub> = 25°C		T <sub>A</sub> = -40°C TO 125°C		UNIT
			MIN	MAX	MIN	MAX	
f <sub>max</sub>	Maximum clock frequency	4.5 V	30		20		MHz
t <sub>w</sub>	Clock pulse duration	4.5 V	16		24		ns
t <sub>su</sub>	Setup time, data before clock↑	4.5 V	12		18		ns
t <sub>h</sub>	Hold time, data after clock↑	4.5 V	5		5		ns



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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	V <sub>CC</sub>	T <sub>A</sub> = 25°C			T <sub>A</sub> = -40°C TO 125°C		UNIT
					MIN	TYP	MAX	MIN	MAX	
t <sub>pd</sub>	CP	Q	C <sub>L</sub> = 50 pF	4.5 V			33		50	ns
			C <sub>L</sub> = 15 pF	5 V		15				
t <sub>dis</sub>	$\overline{OE}$	Q	C <sub>L</sub> = 50 pF	4.5 V			28		42	ns
			C <sub>L</sub> = 15 pF	5 V		11				
t <sub>en</sub>	$\overline{OE}$	Q	C <sub>L</sub> = 50 pF	4.5 V			30		45	ns
			C <sub>L</sub> = 15 pF	5 V		12				
t <sub>f</sub>		Q	C <sub>L</sub> = 50 pF	4.5 V			12		18	ns
f <sub>max</sub>	CP		C <sub>L</sub> = 15 pF	5 V			60			MHz

operating characteristics, V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C, input t<sub>r</sub>, t<sub>f</sub> = 6 ns

PARAMETER		TYP	UNIT
C <sub>pd</sub>	Power dissipation capacitance (see Note 5)	47	pF

NOTE 5: C<sub>pd</sub> is used to determine the dynamic power consumption (P<sub>D</sub>), per package.

$$P_D = (C_{PD} \times V_{CC}^2 \times f_I) + \Sigma (C_L \times V_{CC}^2 \times f_O)$$

f<sub>I</sub> = input frequency

f<sub>O</sub> = output frequency

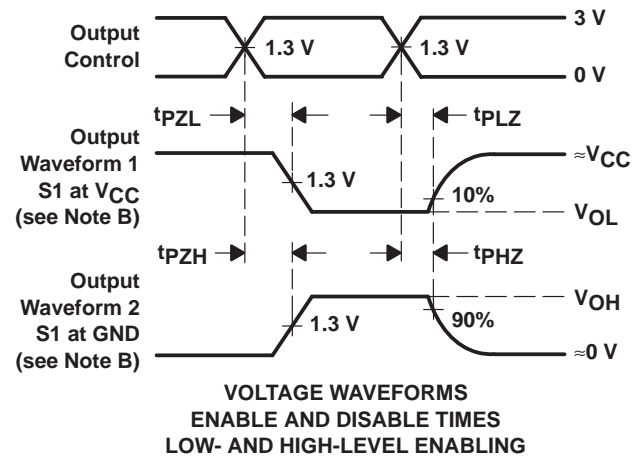
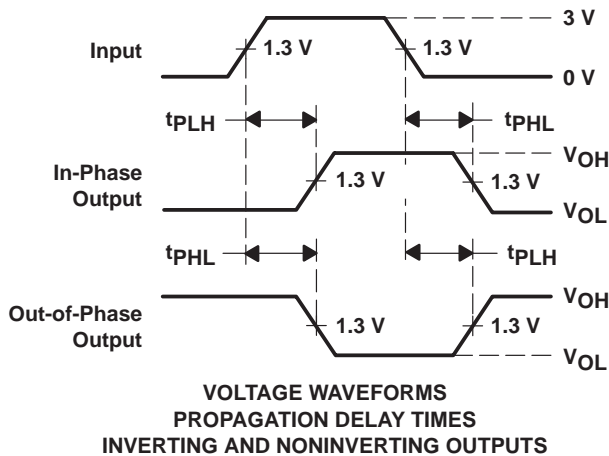
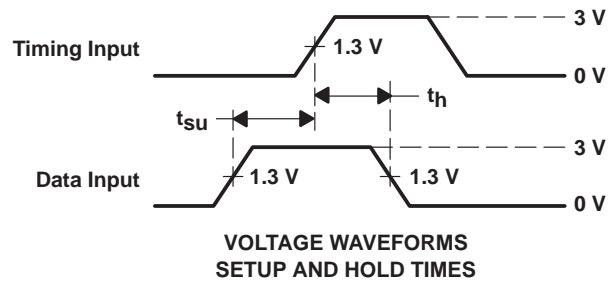
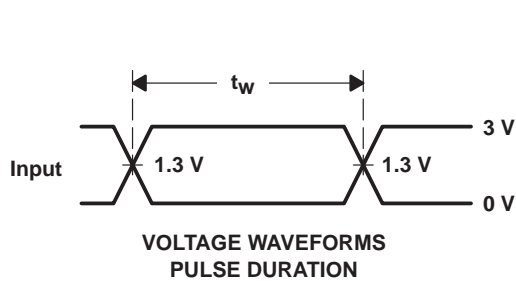
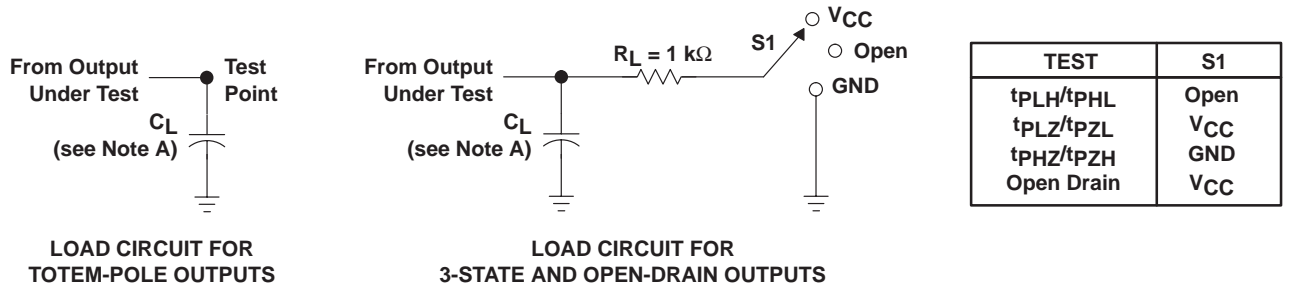
C<sub>L</sub> = output load capacitance

V<sub>CC</sub> = supply voltage

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**PARAMETER MEASUREMENT INFORMATION**



- 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:  $PRR \leq 1\text{ MHz}$ ,  $Z_O = 50\ \Omega$ ,  $t_r \leq 6\text{ ns}$ ,  $t_f \leq 6\text{ ns}$ .
  - 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.
  - F.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .
  - G.  $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
  - H.  $t_{PZH}$  and  $t_{PZL}$  are the same as  $t_{en}$ .

**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
CD74HCT574QM96EP	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	HCT574EP	<a href="#">Samples</a>
CD74HCT574QPWREP	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	HCT574EP	<a href="#">Samples</a>
V62/04739-01XE	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	HCT574EP	<a href="#">Samples</a>
V62/04739-01YE	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	HCT574EP	<a href="#">Samples</a>

(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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**OTHER QUALIFIED VERSIONS OF CD74HCT574-EP :**

- Catalog: [CD74HCT574](#)
  
- Automotive: [CD74HCT574-Q1](#)
  
- Military: [CD54HCT574](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
  
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects
  
- 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
CD74HCT574QM96EP	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
CD74HCT574QPWREP	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)
CD74HCT574QM96EP	SOIC	DW	20	2000	367.0	367.0	45.0
CD74HCT574QPWREP	TSSOP	PW	20	2000	367.0	367.0	38.0

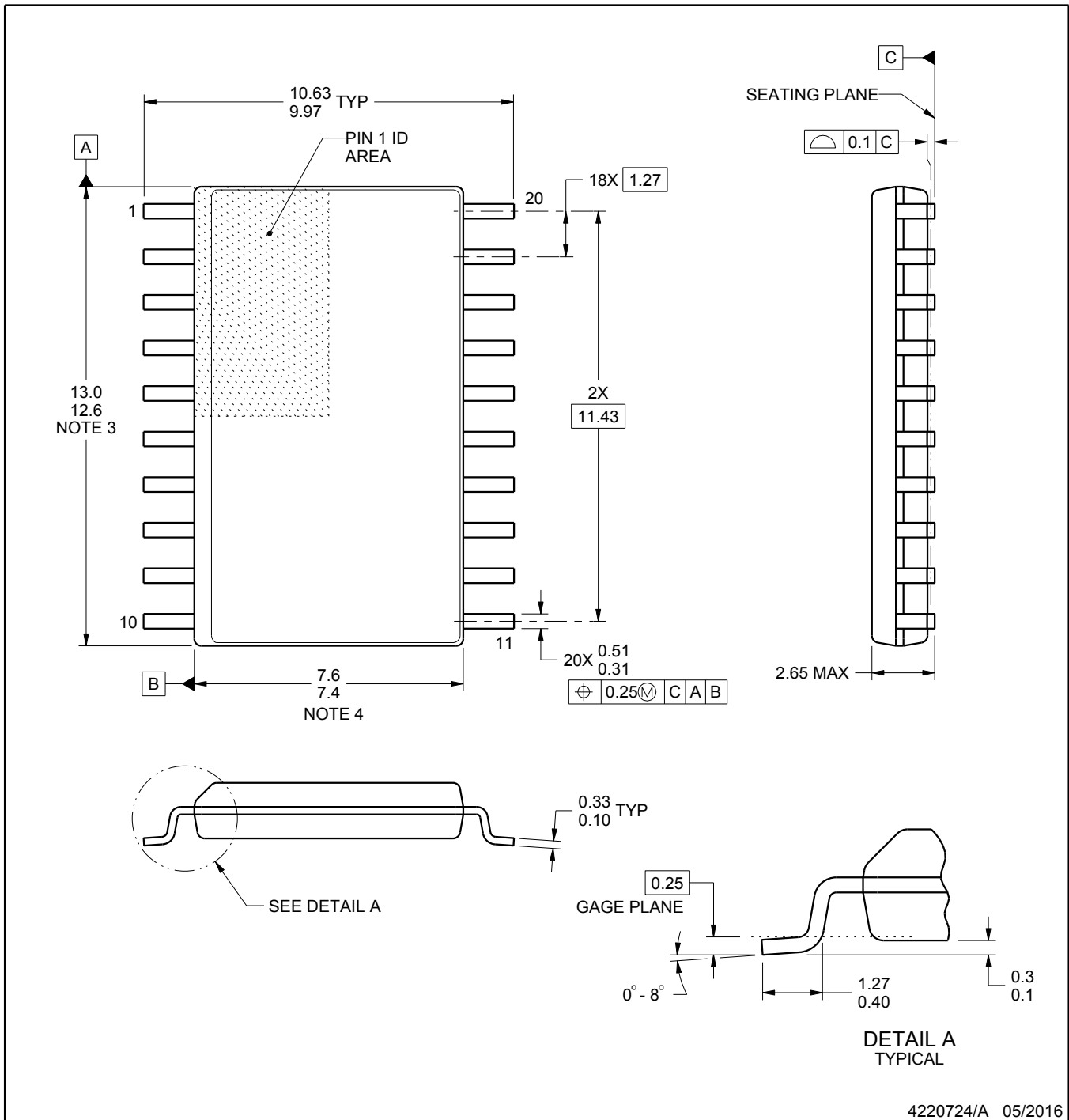
# DW0020A



# 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

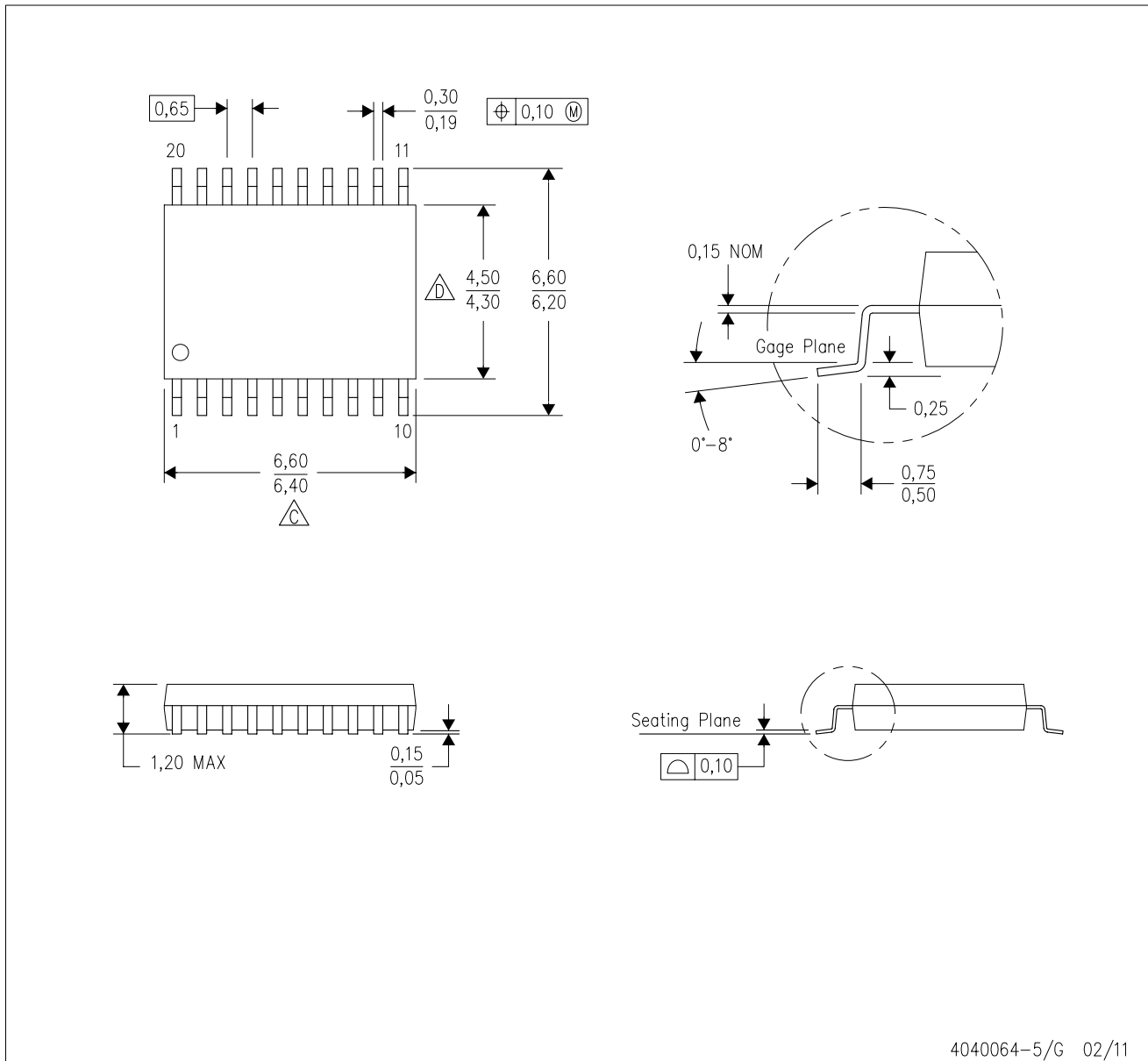
4220724/A 05/2016

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

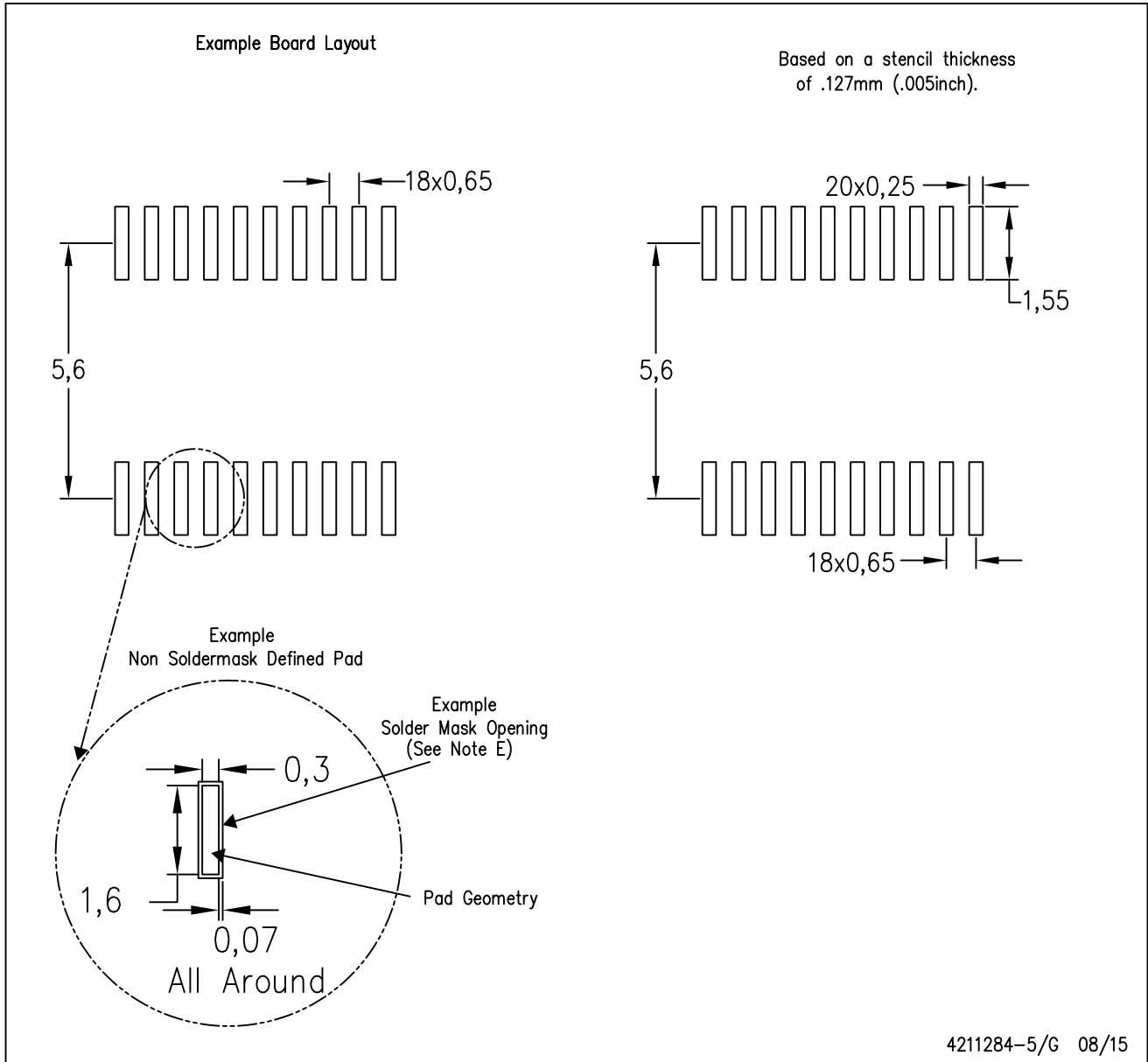


4040064-5/G 02/11

- 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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