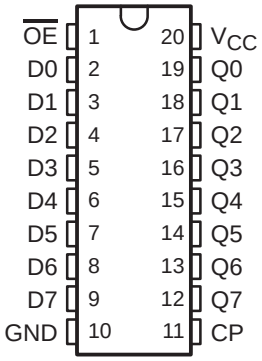
- **Controlled Baseline**
  - **One Assembly/Test Site, One Fabrication Site**
- **Extended Temperature Performance of −40°C to 125°C**
- **Enhanced Diminishing Manufacturing Sources (DMS) Support**
- **Enhanced Product Change Notification**
- **Qualification Pedigree†**
- **Buffered Inputs**
- **Common 3-State Output-Enable Control**
- **3-State Outputs**
- **Bus-Line Driving Capability**
- **Typical Propagation Delay (Clock to Q): 15 ns at V_{CC} = 5 V, C_L = 15 pF, T_A = 25°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 V (Max), V_{IH} = 2 V (Min)**
- **CMOS Input Compatibility, $I_I \leq 1\ \mu A$ 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.

M OR PW PACKAGE
(TOP VIEW)



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.

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.

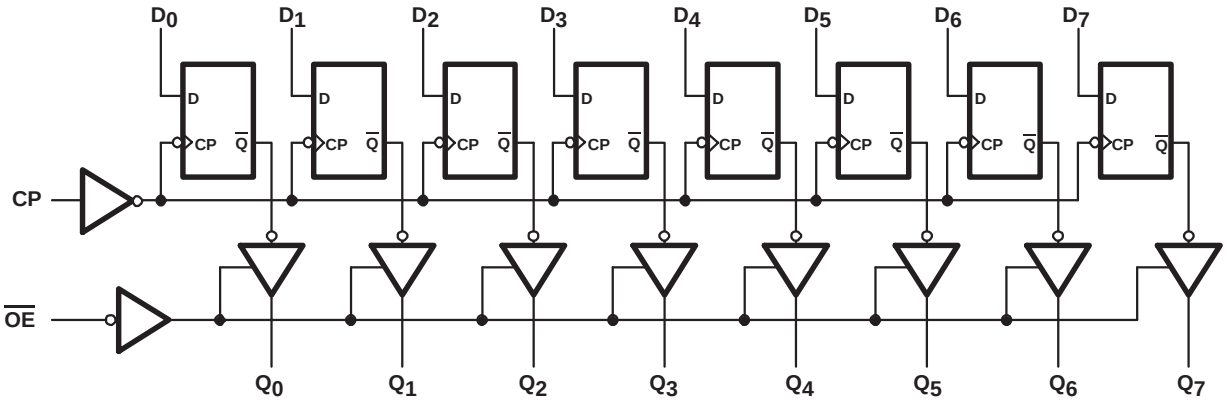
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FUNCTION TABLE

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)



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, θ_{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 ± 1/32 inch (1,59 ± 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	2		V
V_{IL}	Low-level input voltage	V_{CC} = 4.5 V to 5.5 V		0.8	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	0	1000	ns
		V_{CC} = 4.5 V	0	500	
		V_{CC} = 6 V	0	400	
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.

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

PARAMETER	TEST CONDITIONS		I_O (mA)	V_{CC}	T_A = 25°C			T_A = −40°C TO 125°C		UNIT
					MIN	TYP	MAX	MIN	MAX	
V_{OH}	$V_I = V_{IH}$ or V_{IL}	CMOS loads	−0.02	4.5 V	4.4			4.4		V
		TTL loads	−6	4.5 V	3.98			3.7		
V_{OL}	$V_I = V_{IH}$ or V_{IL}	CMOS loads	0.02	4.5 V			0.1		0.1	V
		TTL loads	6	4.5 V			0.26		0.4	
I_I	$V_I = V_{CC}$ or GND		0	5.5 V			±0.1		±1	µA
I_{OZ}	$V_I = V_{IL}$ or V_{IH},	$V_O = V_{CC}$ or GND		6 V			±0.5		±10	µA
I_{CC}	$V_I = V_{CC}$ or GND		0	5.5 V			8		160	µA
ΔI_{CC}	$V_I = V_{CC}$ − 2.1 V,	See Note 4		4.5 V to 5.5 V		100	360		490	µA
C_{IN}	C_L = 50 pF						10		10	pF
C_{OUT}	3-state						20		20	pF

NOTE 4: For dual-supply systems, theoretical worst-case (V_I = 2.4 V, V_{CC} = 5.5 V) specification is 1.8 mA.

HCT input loading

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

† Unit load is ΔI_{CC} 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_{CC}	T_A = 25°C		T_A = −40°C TO 125°C		UNIT
			MIN	MAX	MIN	MAX	
f_{max}	Maximum clock frequency	4.5 V	30		20		MHz
t_w	Clock pulse duration	4.5 V	16		24		ns
t_{su}	Setup time, data before clock↑	4.5 V	12		18		ns
t_h	Hold time, data after clock↑	4.5 V	5		5		ns

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

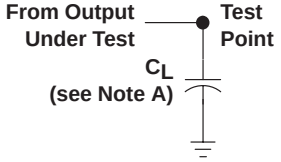
PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	V_{CC}	T_A = 25°C			T_A = −40°C TO 125°C		UNIT
					MIN	TYP	MAX	MIN	MAX	
t_{pd}	CP	Q	C_L = 50 pF	4.5 V			33		50	ns
			C_L = 15 pF	5 V		15				
t_{dis}	$\overline{OE}$	Q	C_L = 50 pF	4.5 V			28		42	ns
			C_L = 15 pF	5 V		11				
t_{en}	$\overline{OE}$	Q	C_L = 50 pF	4.5 V			30		45	ns
			C_L = 15 pF	5 V		12				
t_t		Q	C_L = 50 pF	4.5 V			12		18	ns
f_{max}	CP		C_L = 15 pF	5 V		60				MHz

operating characteristics, V_{CC} = 5 V, T_A = 25°C, input t_r, t_f = 6 ns

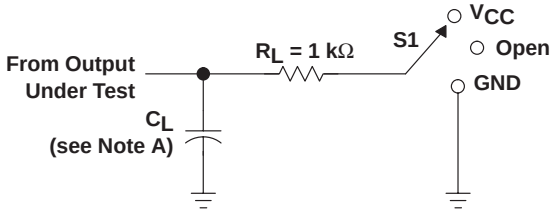
PARAMETER		TYP	UNIT
C_{pd}	Power dissipation capacitance (see Note 5)	47	pF

NOTE 5: C_{pd} is used to determine the dynamic power consumption (P_D), per package.
$P_D = (C_{PD} \times V_{CC}^2 \times f_I) + \Sigma (C_L \times V_{CC}^2 \times f_O)$
f_I = input frequency
f_O = output frequency
C_L = output load capacitance
V_{CC} = supply voltage

PARAMETER MEASUREMENT INFORMATION

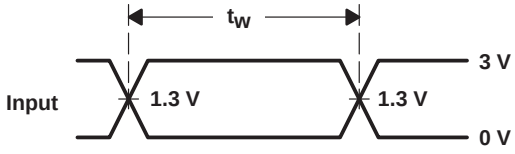


LOAD CIRCUIT FOR
TOTEM-POLE OUTPUTS

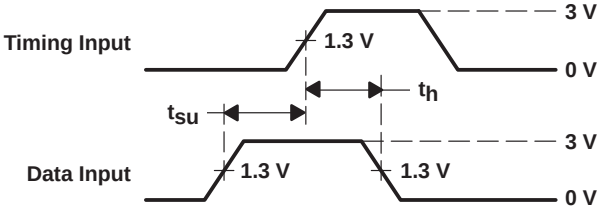


LOAD CIRCUIT FOR
3-STATE AND OPEN-DRAIN OUTPUTS

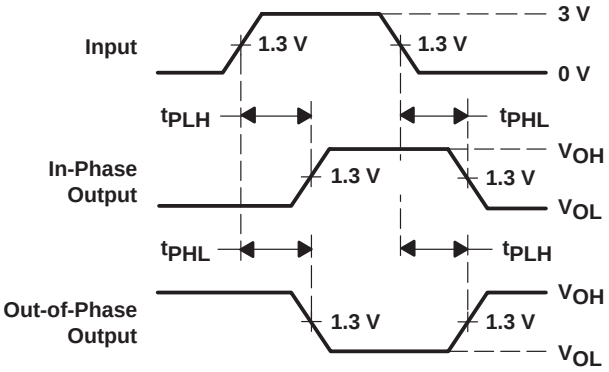
TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	V_{CC}
t_{PHZ}/t_{PZH}	GND
Open Drain	V_{CC}



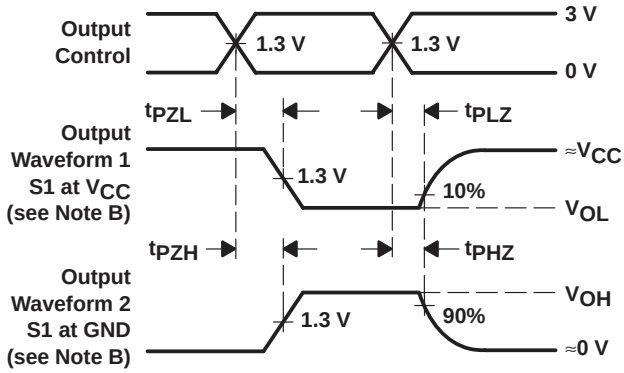
VOLTAGE WAVEFORMS
PULSE DURATION



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

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 ≤ 1 MHz, Z_O = 50 Ω, t_r ≤ 6 ns, t_f ≤ 6 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 part number	Status (1)	Material type (2)	Package | Pins	Package qty | Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
CD74HCT574QM96EP	Active	Production	SOIC (DW) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HCT574EP
CD74HCT574QM96EP.A	Active	Production	SOIC (DW) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HCT574EP
CD74HCT574QPWREP	Active	Production	TSSOP (PW) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HCT574EP
CD74HCT574QPWREP.A	Active	Production	TSSOP (PW) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HCT574EP
V62/04739-01XE	Active	Production	SOIC (DW) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HCT574EP
V62/04739-01YE	Active	Production	TSSOP (PW) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HCT574EP

(1) **Status:** For more details on status, see our product life cycle.

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the TI RoHS Statement for additional information and value definition.

(4) **Lead finish/Ball material:** Parts 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.

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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OTHER QUALIFIED VERSIONS OF CD74HCT574-EP :

- Catalog : CD74HCT574
- Automotive : CD74HCT574-Q1
- Military : CD54HCT574

NOTE: Qualified Version Definitions:

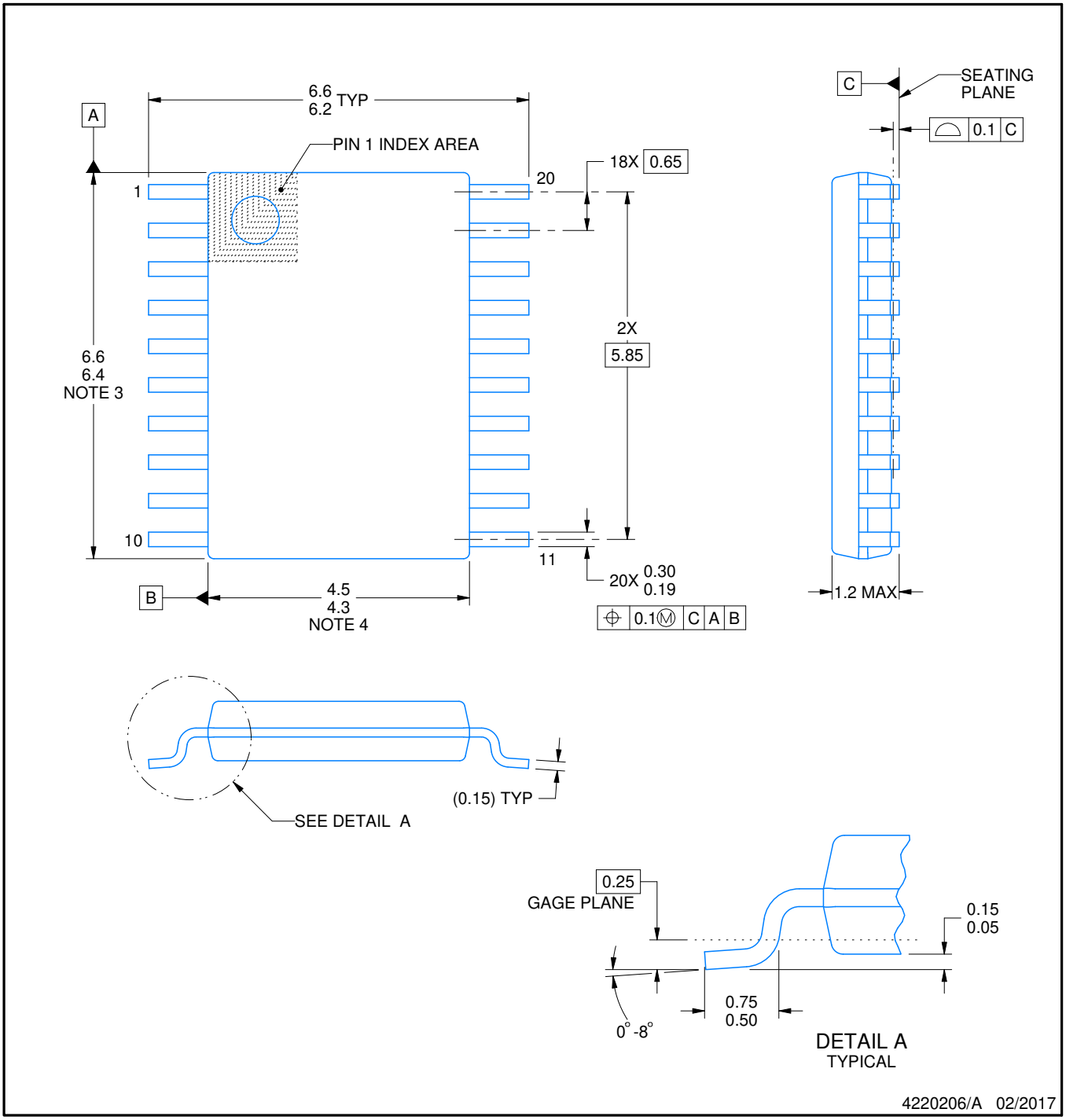
- Catalog - TI's standard catalog product
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects
- Military - QML certified for Military and Defense Applications

PACKAGE OUTLINE

PW0020A

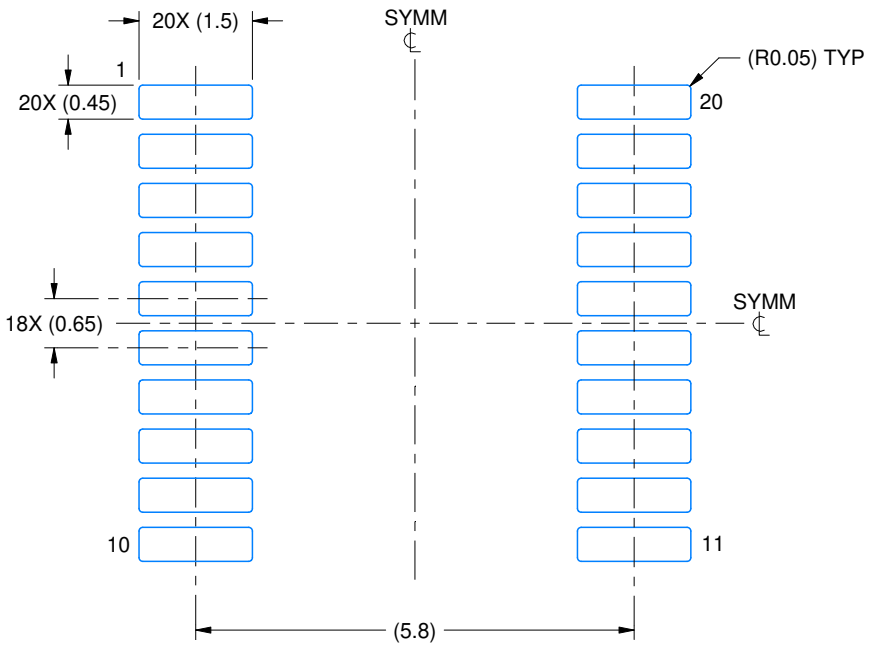
TSSOP - 1.2 mm max height

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-153.



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X

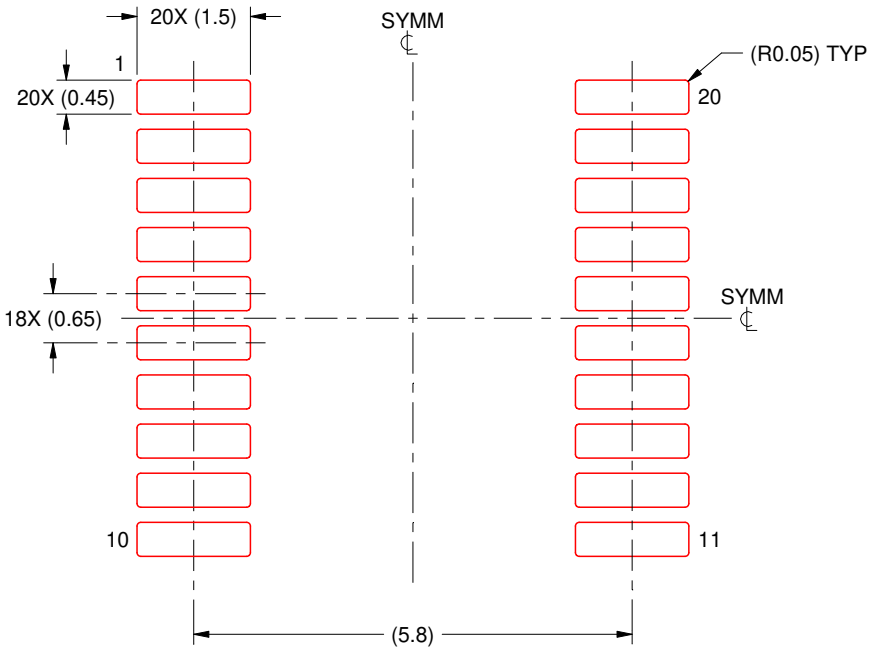


SOLDER MASK DETAILS

4220206/A 02/2017

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.



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE: 10X

4220206/A 02/2017

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.

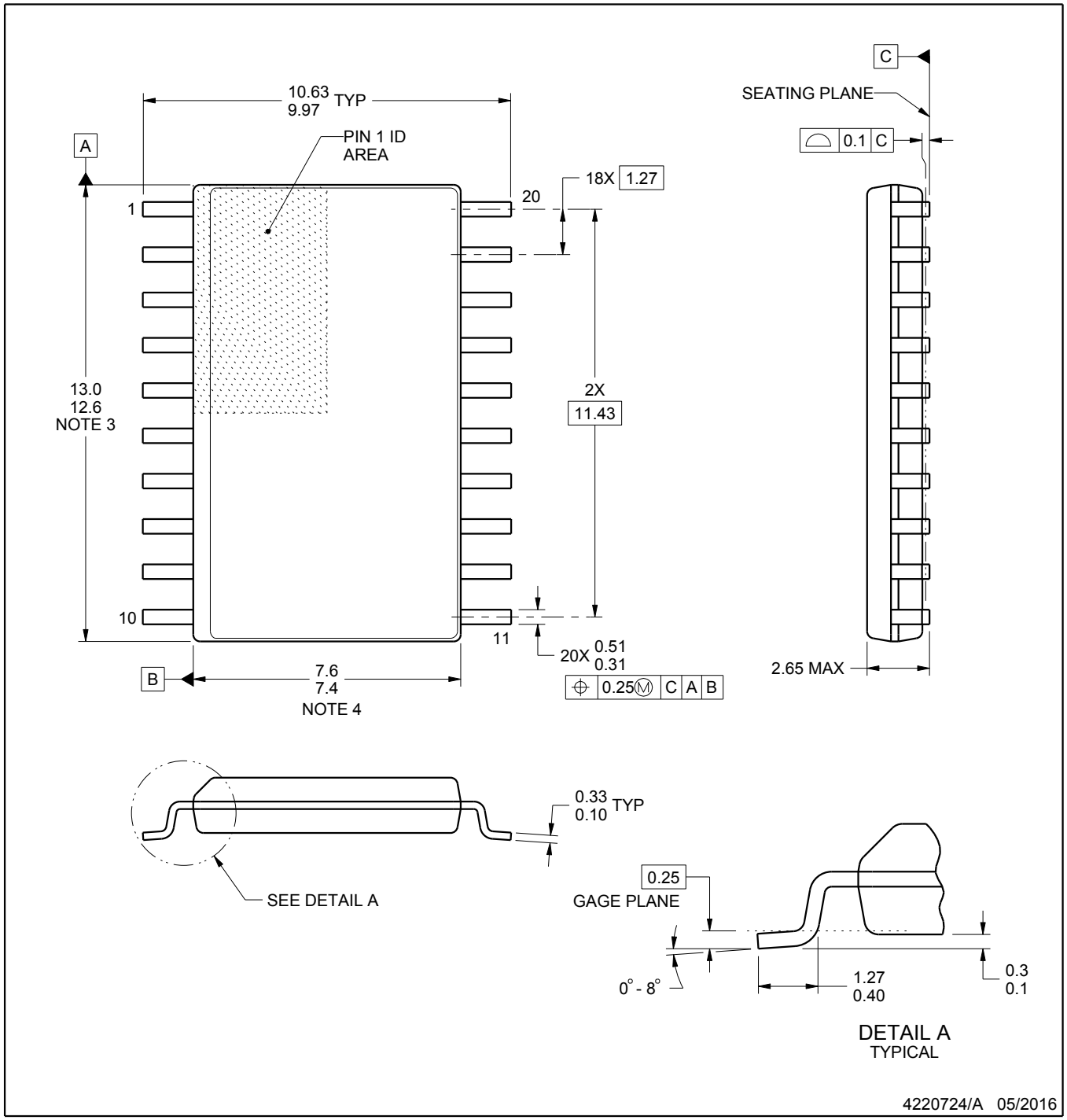


PACKAGE OUTLINE

DW0020A

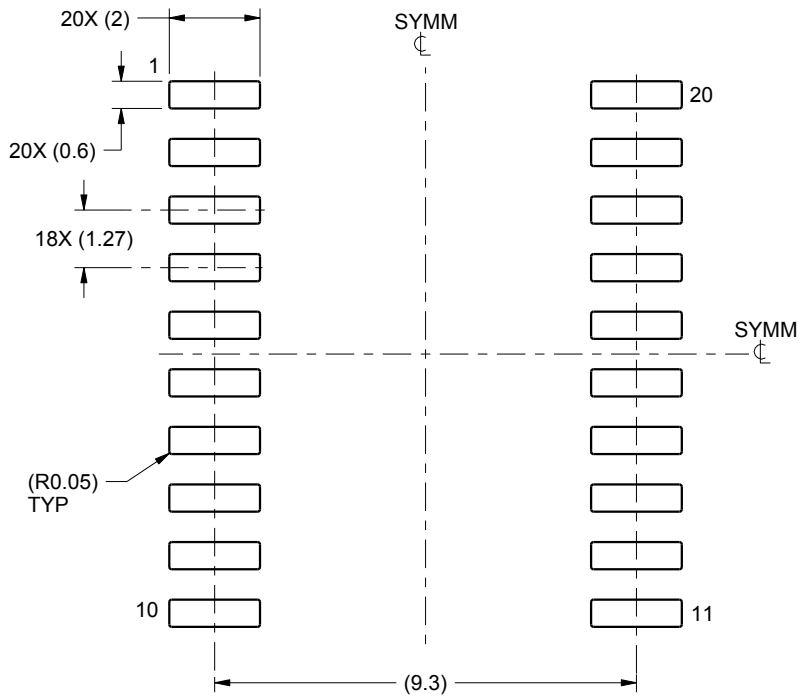
SOIC - 2.65 mm max height

SOIC

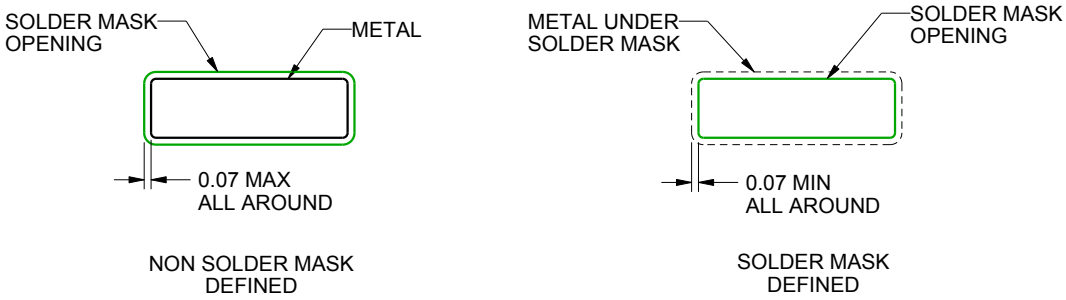


NOTES:

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.



LAND PATTERN EXAMPLE
SCALE:6X

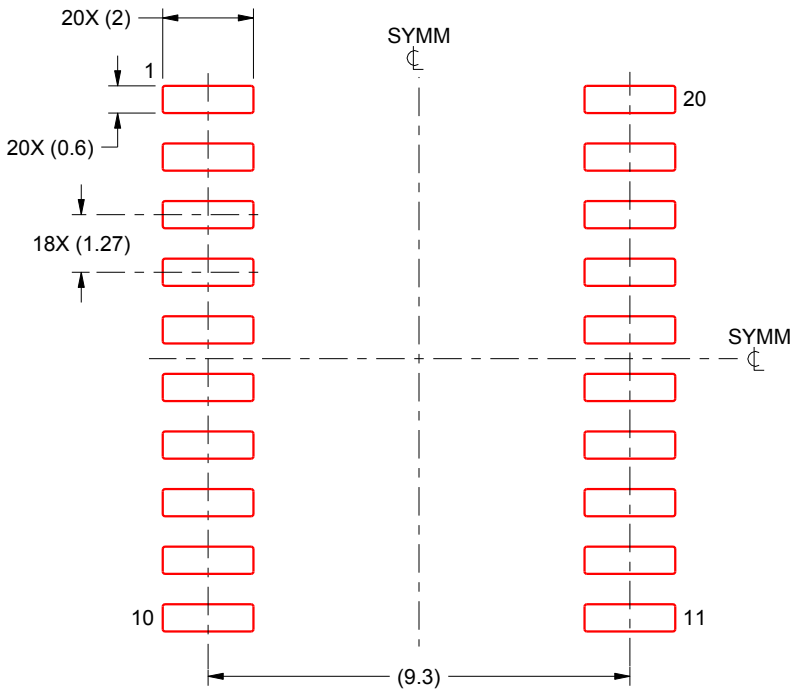


SOLDER MASK DETAILS

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.



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.

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