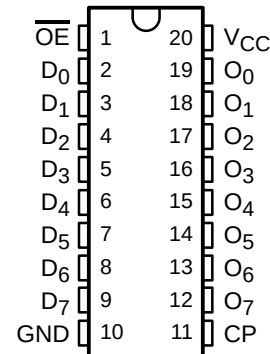


- Function and Pinout Compatible With FCT and F Logic
- 25- Ω Output Series Resistors to Reduce Transmission-Line Reflection Noise
- Reduced V_{OH} (Typically = 3.3 V) Version of Equivalent FCT Functions
- Edge-Rate Control Circuitry for Significantly Improved Noise Characteristics
- I_{off} Supports Partial-Power-Down Mode Operation
- Matched Rise and Fall Times
- Fully Compatible With TTL Input and Output Logic Levels
- ESD Protection Exceeds JESD 22
 - 2000-V Human-Body Model (A114-A)
 - 200-V Machine Model (A115-A)
 - 1000-V Charged-Device Model (C101)
- 3-State Outputs
- 12-mA Output Sink Current
15-mA Output Source Current
- Edge-Triggered D-Type Inputs
- 250-MHz Typical Switching Rate

Q OR SO PACKAGE
(TOP VIEW)



description

The CY74FCT2574T is a high-speed, low-power, octal D-type flip-flop featuring separate D-type inputs for each flip-flop. On-chip termination resistors at the outputs reduce system noise caused by reflections. The CY74FCT2574T can replace the CY74FCT574T to reduce noise in an existing design. This device has 3-state outputs for bus-oriented applications. A buffered clock (CP) and output-enable ($\overline{OE}$) inputs are common to all flip-flops. The CY74FCT2574T is identical to the CY74FCT2374T, except that on the CY74FCT2574T all outputs are on one side of the package and all inputs are on the other side. The flip-flops in the CY74FCT2574T store the state of their individual D inputs that meet the setup-time and hold-time requirements on the low-to-high CP transition. When $\overline{OE}$ is low, the contents of the flip-flops are available at the outputs. When $\overline{OE}$ is high, the outputs are in the high-impedance state. The state of $\overline{OE}$ does not affect the state of the flip-flops.

This device is fully specified for partial-power-down applications using I_{off} . The I_{off} circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.



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.

**TEXAS
INSTRUMENTS**

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CY74FCT2574T

8-BIT REGISTER

WITH 3-STATE OUTPUTS

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ORDERING INFORMATION

T _A	PACKAGE†		SPEED (ns)	ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	QSOP – Q	Tape and reel	5.2	CY74FCT2574CTQCT	FCT2574C
	SOIC – SO	Tube	5.2	CY74FCT2574CTSOC	FCT2574C
		Tape and reel	5.2	CY74FCT2574CTSOCT	
	QSOP – Q	Tape and reel	6.5	CY74FCT2574ATQCT	FCT2574A
	SOIC – SO	Tube	10	CY74FCT2574TSOC	FCT2574
		Tape and reel	10	CY74FCT2574TSOCT	

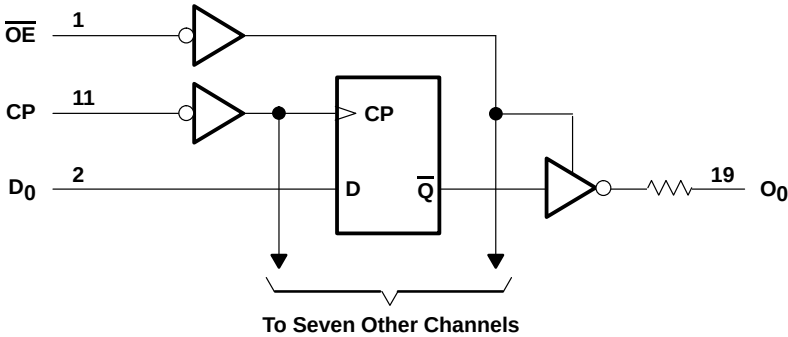
† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

FUNCTION TABLE

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

H = High logic level, L = Low logic level,
X = Don't care, Z = High-impedance state, ↑ = Low-to-high clock transition

logic diagram (positive logic)



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

Supply voltage range to ground potential	–0.5 V to 7 V
DC input voltage range	–0.5 V to 7 V
DC output voltage range	–0.5 V to 7 V
DC output current (maximum sink current/pin)	120 mA
Package thermal impedance, θ_{JA} (see Note 1): Q package	68°C/W
SO package	58°C/W
Ambient temperature range with power applied, T_A	–65°C to 135°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.

NOTE 1: The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions (see Note 2)

	MIN	NOM	MAX	UNIT
V_{CC} Supply voltage	4.75	5	5.25	V
V_{IH} High-level input voltage	2			V
V_{IL} Low-level input voltage			0.8	V
I_{OH} High-level output current			–15	mA
I_{OL} Low-level output current			12	mA
T_A Operating free-air temperature	–40		85	°C

NOTE 2: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation.

CY74FCT2574T

8-BIT REGISTER

WITH 3-STATE OUTPUTS

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

PARAMETER	TEST CONDITIONS		MIN	TYP [†]	MAX	UNIT
V _{IK}	V _{CC} = 4.75 V,	I _{IN} = -18 mA		-0.7	-1.2	V
V _{OH}	V _{CC} = 4.75 V,	I _{OH} = -15 mA	2.4	3.3		V
V _{OL}	V _{CC} = 4.75 V,	I _{OL} = 12 mA		0.3	0.55	V
R _{OUT}	V _{CC} = 4.75 V,	I _{OL} = 12 mA	20	25	40	Ω
V _{hys}	All inputs			0.2		V
I _I	V _{CC} = 5.25 V,	V _{IN} = V _{CC}			5	μA
I _{IH}	V _{CC} = 5.25 V,	V _{IN} = 2.7 V			±1	μA
I _{IL}	V _{CC} = 5.25 V,	V _{IN} = 0.5 V			±1	μA
I _{OZH}	V _{CC} = 5.25 V,	V _{OUT} = 2.7 V			10	μA
I _{OZL}	V _{CC} = 5.25 V,	V _{OUT} = 0.5 V			-10	μA
I _{OS} [‡]	V _{CC} = 5.25 V,	V _{OUT} = 0 V	-60	-120	-225	mA
I _{off}	V _{CC} = 0 V,	V _{OUT} = 4.5 V			±1	μA
I _{CC}	V _{CC} = 5.25 V,	V _{IN} ≤ 0.2 V, V _{IN} ≥ V _{CC} - 0.2 V		0.1	0.2	mA
ΔI _{CC}	V _{CC} = 5.25 V, V _{IN} = 3.4 V [§] , f ₁ = 0, Outputs open			0.5	2	mA
I _{CCD} [¶]	V _{CC} = 5.25 V, Outputs open, One input switching at 50% duty cycle, OE = GND, V _{IN} ≤ 0.2 V or V _{IN} ≥ V _{CC} - 0.2 V			0.06	0.12	mA/MHz
I _C [#]	V _{CC} = 5.25 V, Outputs open, f ₀ = 10 MHz, OE = GND	One bit switching at f ₁ = 5 MHz at 50% duty cycle	V _{IN} ≤ 0.2 V or V _{IN} ≥ V _{CC} - 0.2 V	0.7	1.4	mA
			V _{IN} = 3.4 V or GND	1.2	3.4	
		Eight bits switching at f ₁ = 2.5 MHz at 50% duty cycle	V _{IN} ≤ 0.2 V or V _{IN} ≥ V _{CC} - 0.2 V	1.6	3.2	
			V _{IN} = 3.4 V or GND	3.9	12.2	
C _i				5	10	pF
C ₀				9	12	pF

[†] Typical values are at V_{CC} = 5 V, T_A = 25°C.

[‡] Not more than one output should be shorted at a time. Duration of short should not exceed one second. The use of high-speed test apparatus and/or sample-and-hold techniques are preferable to minimize internal chip heating and more accurately reflect operational values. Otherwise, prolonged shorting of a high output can raise the chip temperature well above normal and cause invalid readings in other parametric tests. In any sequence of parameter tests, I_{OS} tests should be performed last.

[§] Per TTL-driven input (V_{IN} = 3.4 V); all other inputs at V_{CC} or GND

[¶] This parameter is derived for use in total power-supply calculations.

[#] I_C = I_{CC} + ΔI_{CC} × D_H × N_T + I_{CCD} (f₀/2 + f₁ × N₁)

Where:

I_C = Total supply current

I_{CC} = Power-supply current with CMOS input levels

ΔI_{CC} = Power-supply current for a TTL high input (V_{IN} = 3.4 V)

D_H = Duty cycle for TTL inputs high

N_T = Number of TTL inputs at D_H

I_{CCD} = Dynamic current caused by an input transition pair (HLH or LHL)

f₀ = Clock frequency for registered devices, otherwise zero

f₁ = Input signal frequency

N₁ = Number of inputs changing at f₁

All currents are in milliamperes and all frequencies are in megahertz.

|| Values for these conditions are examples of the I_{CC} formula.



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

		CY74FCT2574T		CY74FCT2574AT		CY74FCT2574CT		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
t_W	Pulse duration, CP	7		5		4		ns
t_{SU}	Setup time, data before CP $\uparrow$	2		2		1.5		ns
t_H	Hold time, data after CP $\uparrow$	1.5		1.5		1		ns

switching characteristics over operating free-air temperature range (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	CY74FCT2574T		CY74FCT2574AT		CY74FCT2574CT		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	CP	O	2	10	2	6.5	2	5.2	ns
t_{PHL}			2	10	2	6.5	2	5.2	
t_{PZH}	$\overline{OE}$	O	1.5	12.5	1.5	6.5	1.5	6.2	ns
t_{PZL}			1.5	12.5	1.5	6.5	1.5	6.2	
t_{PHZ}	$\overline{OE}$	O	1.5	8	1.5	5.5	1.5	5	ns
t_{PLZ}			1.5	8	1.5	5.5	1.5	5	

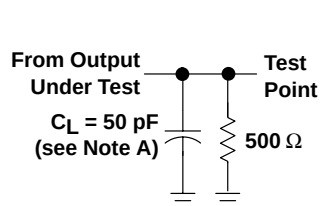
CY74FCT2574T

8-BIT REGISTER

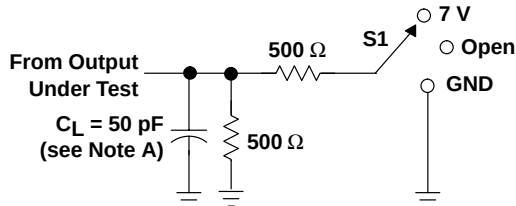
WITH 3-STATE OUTPUTS

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PARAMETER MEASUREMENT INFORMATION

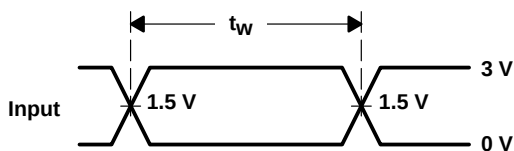


LOAD CIRCUIT FOR
TOTEM-POLE OUTPUTS

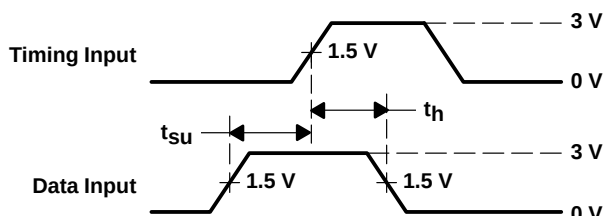


LOAD CIRCUIT FOR
3-STATE OUTPUTS

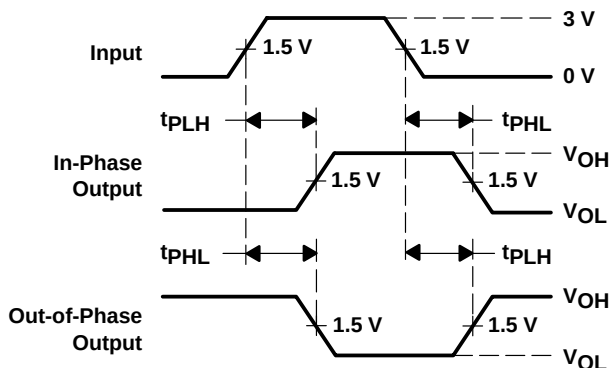
TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	7 V
t_{PHZ}/t_{PZH}	Open



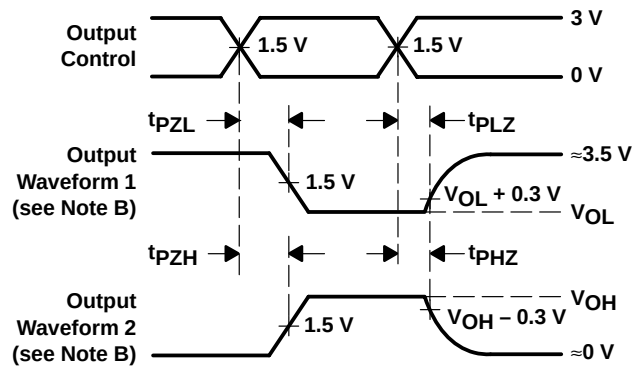
VOLTAGE WAVEFORMS
PULSE DURATION



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. The outputs are measured one at a time with one input transition per measurement.

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)
CY74FCT2574ATQCT	Active	Production	SSOP (DBQ) 20	2500 LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	FCT2574A
CY74FCT2574ATQCT.B	Active	Production	SSOP (DBQ) 20	2500 LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	FCT2574A
CY74FCT2574ATSOC	Active	Production	SOIC (DW) 20	25 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	FCT2574A
CY74FCT2574ATSOC.B	Active	Production	SOIC (DW) 20	25 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	FCT2574A
CY74FCT2574CTQCT	Active	Production	SSOP (DBQ) 20	2500 LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	FCT2574C
CY74FCT2574CTQCT.B	Active	Production	SSOP (DBQ) 20	2500 LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	FCT2574C
CY74FCT2574CTSOC	Active	Production	SOIC (DW) 20	25 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	FCT2574C
CY74FCT2574CTSOC.B	Active	Production	SOIC (DW) 20	25 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	FCT2574C

⁽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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TAPE AND REEL INFORMATION



*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
CY74FCT2574ATQCT	SSOP	DBQ	20	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
CY74FCT2574CTQCT	SSOP	DBQ	20	2500	330.0	16.4	6.5	9.0	2.1	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)
CY74FCT2574ATQCT	SSOP	DBQ	20	2500	353.0	353.0	32.0
CY74FCT2574CTQCT	SSOP	DBQ	20	2500	353.0	353.0	32.0

TUBE

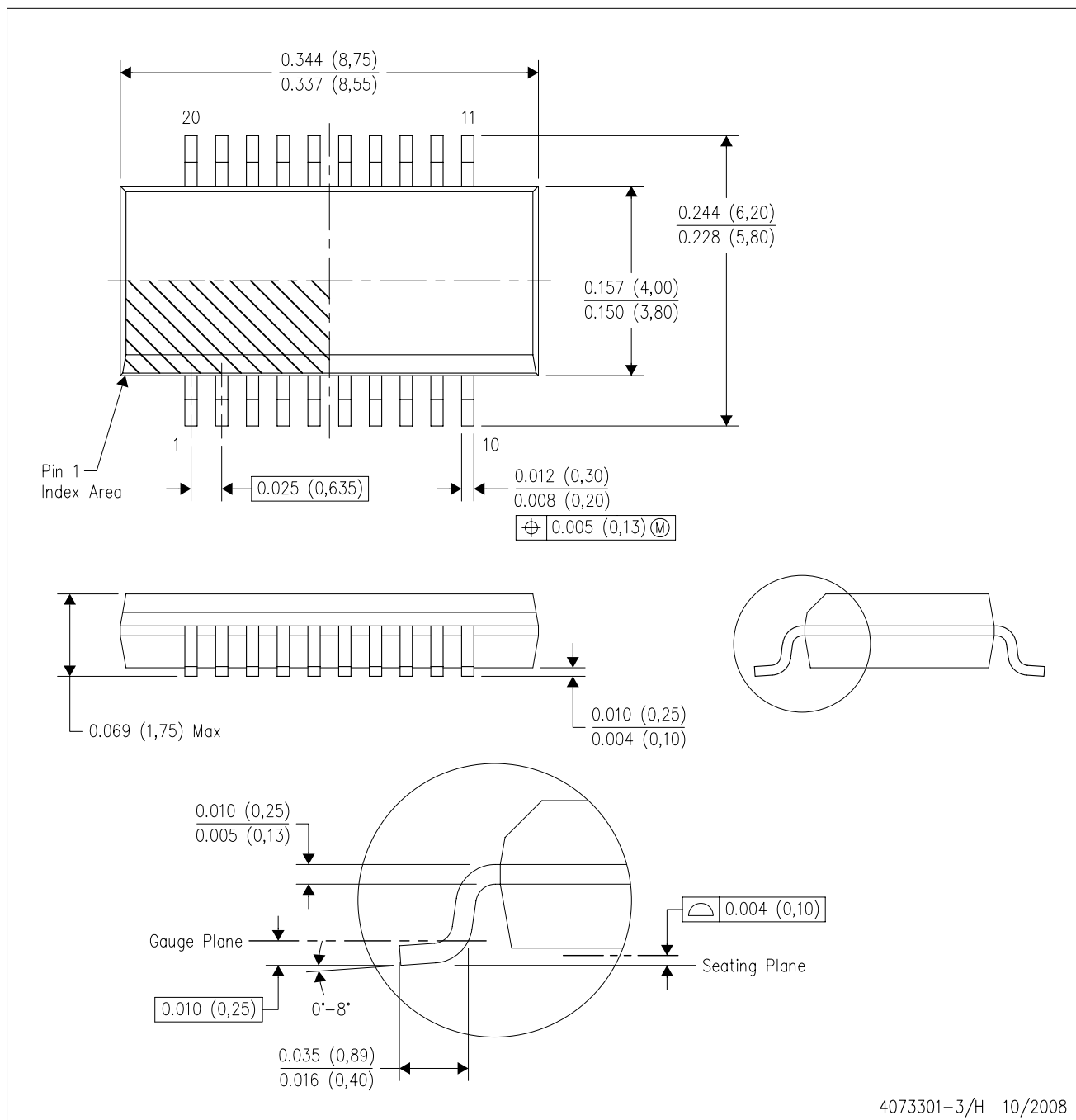


*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
CY74FCT2574ATSOC	DW	SOIC	20	25	507	12.83	5080	6.6
CY74FCT2574ATSOC.B	DW	SOIC	20	25	507	12.83	5080	6.6
CY74FCT2574CTSOC	DW	SOIC	20	25	507	12.83	5080	6.6
CY74FCT2574CTSOC.B	DW	SOIC	20	25	507	12.83	5080	6.6

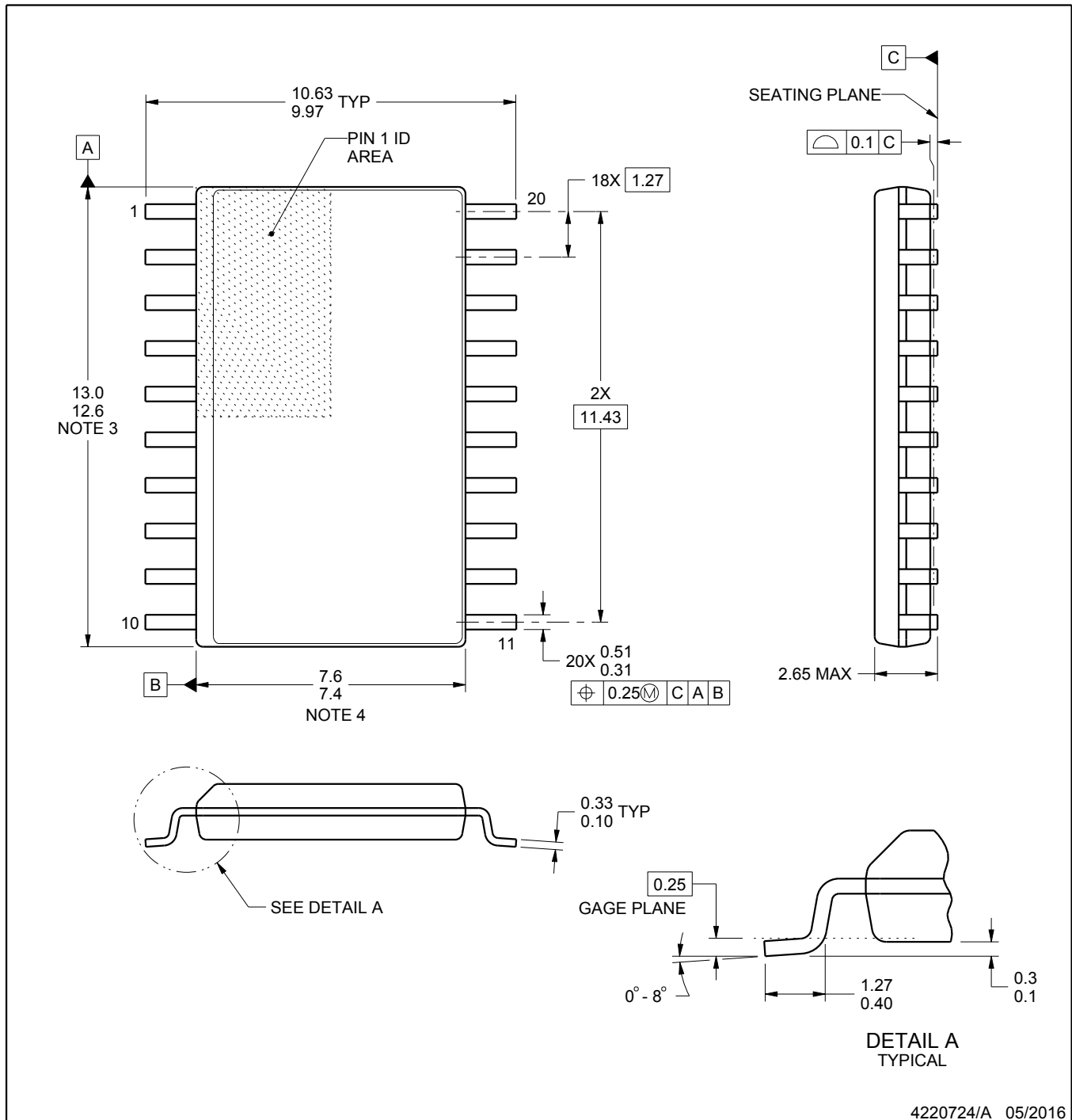
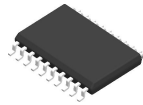
DBQ (R-PDSO-G20)

PLASTIC SMALL-OUTLINE PACKAGE



4073301-3/H 10/2008

- NOTES:
- All linear dimensions are in inches (millimeters).
 - This drawing is subject to change without notice.
 - Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15) per side.
 - Falls within JEDEC MO-137 variation AD.

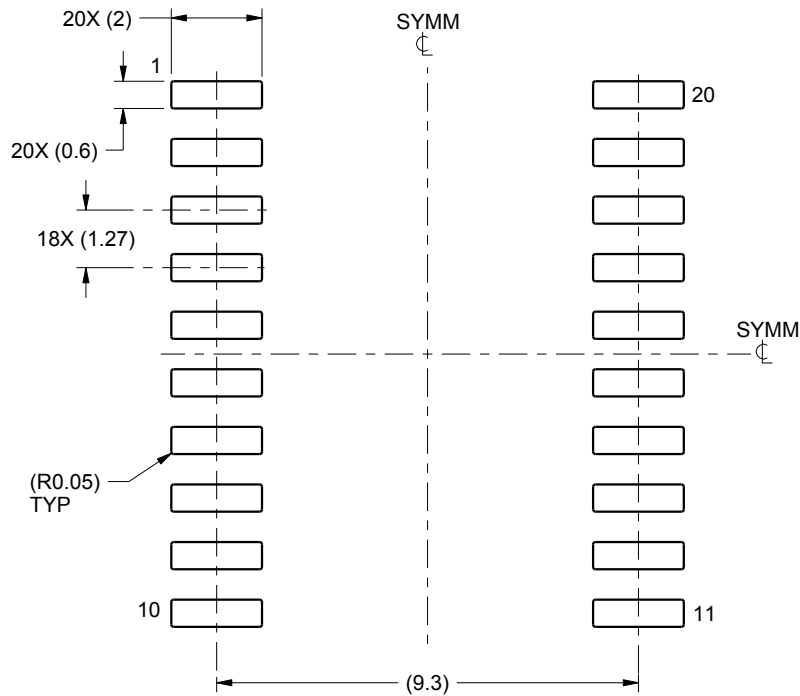


EXAMPLE BOARD LAYOUT

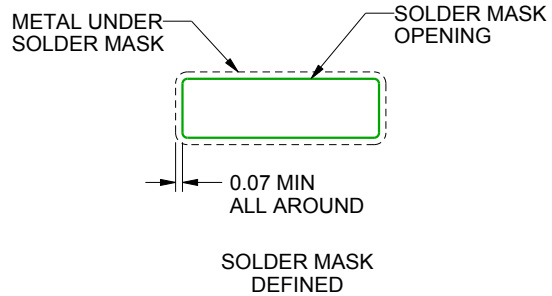
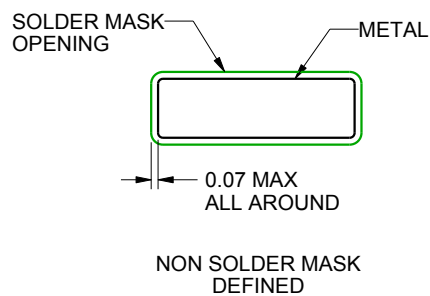
DW0020A

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.

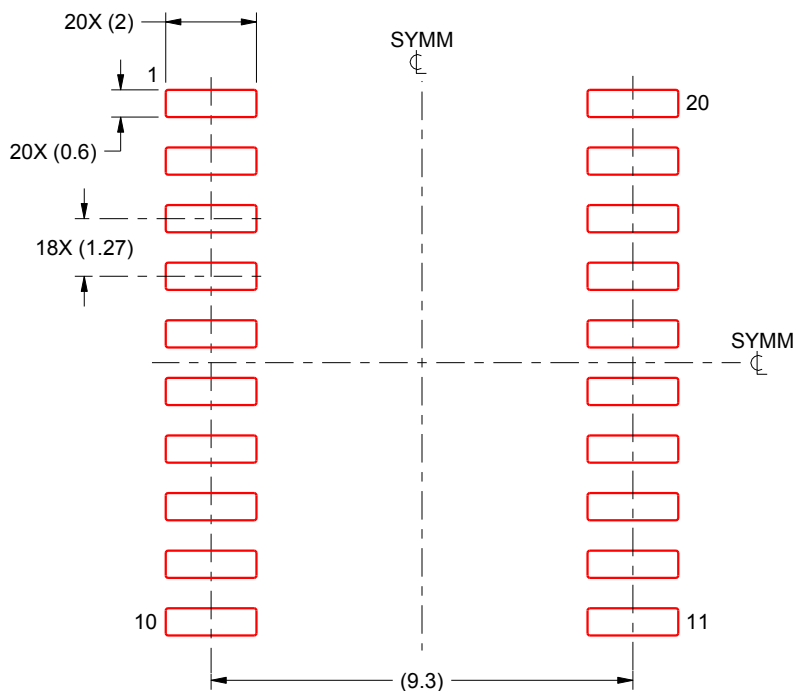
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

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.

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