

CY74FCT2543T

8-BIT LATCHED TRANSCEIVER

WITH 3-STATE OUTPUTS

SCCS042C – SEPTEMBER 1994 – REVISED NOVEMBER 2001

PIN DESCRIPTION

NAME	DESCRIPTION
\overline{OEAB}	A-to-B output-enable input (active low)
\overline{OEBA}	B-to-A output-enable input (active low)
\overline{CEAB}	A-to-B enable input (active low)
\overline{CEBA}	B-to-A enable input (active low)
\overline{LEAB}	A-to-B latch-enable input (active low)
\overline{LEBA}	B-to-A latch-enable input (active low)
A	A-to-B data inputs or B-to-A 3-state outputs
B	B-to-A data inputs or A-to-B 3-state outputs

ORDERING INFORMATION

T _A	PACKAGE†		SPEED (ns)	ORDERABLE PART NUMBER	TOP-SIDE MARKING
-40°C to 85°C	QSOP – Q	Tape and reel	5.3	CY74FCT2543CTQCT	FCT2543C
	SOIC – SO	Tube	5.3	CY74FCT2543CTSOC	FCT2543C
		Tape and reel	5.3	CY74FCT2543CTSOCT	
	QSOP – Q	Tape and reel	6.5	CY74FCT2543ATQCT	FCT2543A
	SOIC – SO	Tube	6.5	CY74FCT2543ATSOC	FCT2543A
		Tape and reel	6.5	CY74FCT2543ATSOCT	
QSOP – Q	Tape and reel	8.5	CY74FCT2543TQCT	FCT2543	

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

FUNCTION TABLE

INPUTS			LATCH A-TO-B‡	OUTPUT B
\overline{CEAB}	\overline{LEAB}	\overline{OEAB}		
H	X	X	Storing	Z
X	H	X	Storing	X
X	X	H	X	Z
L	L	L	Transparent	Current A inputs
L	H	L	Storing	Previous A inputs

‡ Before \overline{LEAB} low-to-high transition

H = High logic level, L = Low logic level, X = Don't care,

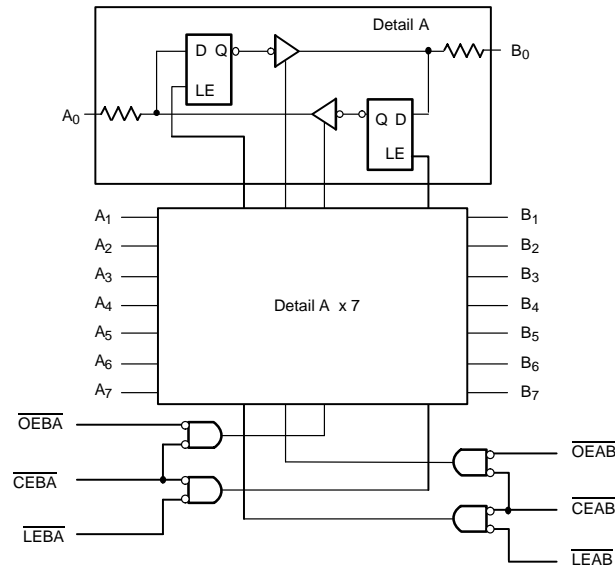
Z = High-impedance state

A-to-B data flow shown; B-to-A is the same, except using \overline{CEBA} , \overline{LEBA} , and \overline{OEBA} .

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functional block diagram



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	61°C/W
SO package	46°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.

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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}	$V_{CC} = 4.75\text{ V}$,	$I_{IN} = -18\text{ mA}$	-0.7	-1.2		V	
V_{OH}	$V_{CC} = 4.75\text{ V}$,	$I_{OH} = -15\text{ mA}$	2.4	3.3		V	
V_{OL}	$V_{CC} = 4.75\text{ V}$,	$I_{OL} = 12\text{ mA}$		0.3	0.55	V	
R_{out}	$V_{CC} = 4.75\text{ V}$,	$I_{OL} = 12\text{ mA}$	20	25	40	Ω	
V_{hys}	All inputs			0.2		V	
I_{IH}	$V_{CC} = 5.25\text{ V}$	$V_{IN} = V_{CC}$			5	μA	
		$V_{IN} = 2.7\text{ V}$			± 1		
I_{IL}	$V_{CC} = 5.25\text{ V}$,	$V_{IN} = 0.5\text{ V}$			± 1	μA	
I_{OZH}	$V_{CC} = 5.25\text{ V}$,	$V_{OUT} = 2.7\text{ V}$			15	μA	
I_{OZL}	$V_{CC} = 5.25\text{ V}$,	$V_{OUT} = 0.5\text{ V}$			-15	μA	
I_{OS}^{\ddagger}	$V_{CC} = 5.25\text{ V}$,	$V_{OUT} = 0\text{ V}$	-60	-120	-225	mA	
I_{off}	$V_{CC} = 0\text{ V}$,	$V_{OUT} = 4.5\text{ V}$			± 1	μA	
I_{CC}	$V_{CC} = 5.25\text{ V}$,	$V_{IN} \leq 0.2\text{ V}$, $V_{IN} \geq V_{CC} - 0.2\text{ V}$		0.1	0.2	mA	
ΔI_{CC}	$V_{CC} = 5.25\text{ V}$, $V_{IN} = 3.4\text{ V}^{\S}$, $f_1 = 0$, Outputs open			0.5	2	mA	
I_{CCD}^{\uparrow}	$V_{CC} = 5.25\text{ V}$, One input switching at 50% duty cycle, Outputs open, \overline{CEAB} and $\overline{OEAB} = \text{LOW}$, $\overline{CEBA} = \text{HIGH}$, $V_{IN} \leq 0.2\text{ V}$ or $V_{IN} \geq V_{CC} - 0.2\text{ V}$			0.06	1.2	mA/MHz	
$I_C^{\#}$	$V_{CC} = 5.25\text{ V}$, $f_0 = 10\text{ MHz}$, Outputs open, \overline{CEAB} and $\overline{OEAB} = \text{LOW}$, $\overline{CEBA} = \text{HIGH}$, $f_0 = \overline{LEAB} = 10\text{ MHz}$	One bit switching at $f_1 = 5\text{ MHz}$ at 50% duty cycle	$V_{IN} \leq 0.2\text{ V}$ or $V_{IN} \geq V_{CC} - 0.2\text{ V}$		0.7	1.4	mA
			$V_{IN} = 3.4\text{ V}$ or GND		1.2	3.4	
		Eight bits switching at $f_1 = 5\text{ MHz}$ at 50% duty cycle	$V_{IN} \leq 0.2\text{ V}$ or $V_{IN} \geq V_{CC} - 0.2\text{ V}$		2.8	5.6	
			$V_{IN} = 3.4\text{ V}$ or GND		5.1	14.6	
C_i				5	10	pF	
C_o				9	12	pF	

† Typical values are at $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$.

‡ 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 ($V_{IN} = 3.4\text{ V}$); all other inputs at V_{CC} or GND

↑ This parameter is derived for use in total power-supply calculations.

$I_C = I_{CC} + \Delta I_{CC} \times D_H \times N_T + I_{CCD} (f_0/2 + f_1 \times N_1)$

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 ($V_{IN} = 3.4\text{ V}$)

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)

f_0 = Clock frequency for registered devices, otherwise zero

f_1 = Input signal frequency

N_1 = Number of inputs changing at f_1

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

|| Values for these conditions are examples of the I_C formula.



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

PARAMETER		CY74FCT2543T		CY74FCT2543AT		CY74FCT2543CT		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
t_w	Pulse duration, \overline{LEBA} or \overline{LEAB} low	5		5		5		ns
t_{su}	Setup time, high or low	A or B before $\overline{LEBA}\downarrow$ or $\overline{LEAB}\downarrow$		2		2		ns
t_h	Hold time, high or low	A or B after $\overline{LEBA}\downarrow$ or $\overline{LEAB}\downarrow$		2		2		ns

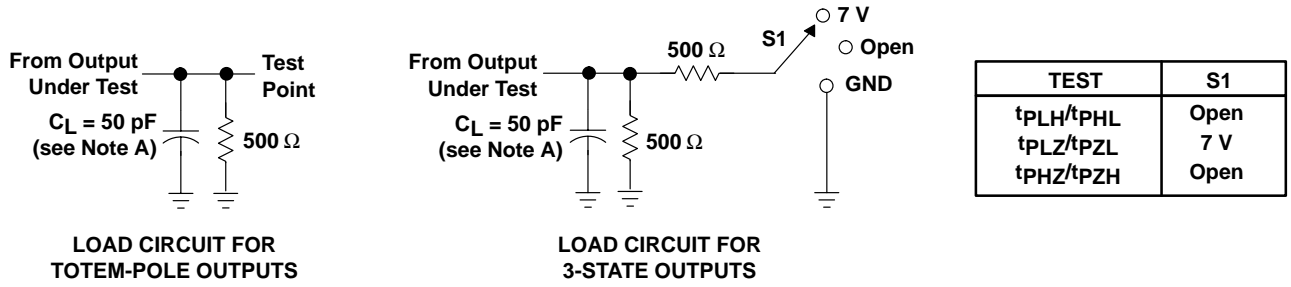
switching characteristics over operating free-air temperature range (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	CY74FCT2543T		CY74FCT2543AT		CY74FCT2543CT		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	A or B	B or A	2.5	8.5	2.5	6.5	2.5	5.5	ns
t_{PHL}									
t_{PLH}	\overline{LEBA} or \overline{LEAB}	A or B	2.5	12.5	2.5	8	2.5	7	ns
t_{PHL}									
t_{PZH}	\overline{OEBA} or \overline{OEAB}	A or B	2	12	2	9	2	8	ns
t_{PZL}									
t_{PZH}	\overline{CEBA} or \overline{CEAB}	A or B	2	12	2	9	2	8	ns
t_{PZL}									
t_{PHZ}	\overline{OEBA} or \overline{OEAB}	A or B	2	9	2	7.5	2	6.5	ns
t_{PLZ}									
t_{PHZ}	\overline{CEBA} or \overline{CEAB}	A or B	2	9	2	7.5	2	6.5	ns
t_{PLZ}									

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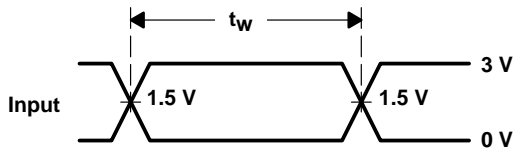
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PARAMETER MEASUREMENT INFORMATION

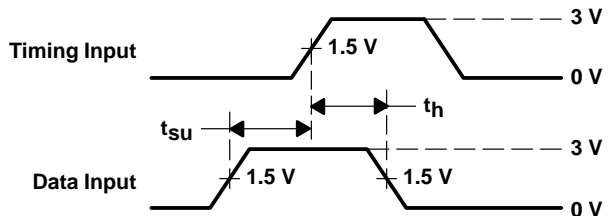


LOAD CIRCUIT FOR TOTEM-POLE OUTPUTS

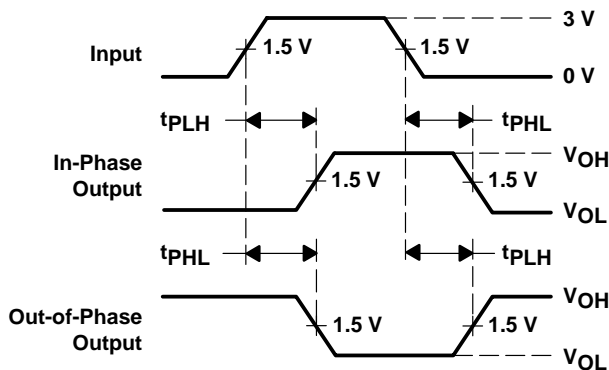
LOAD CIRCUIT FOR 3-STATE OUTPUTS



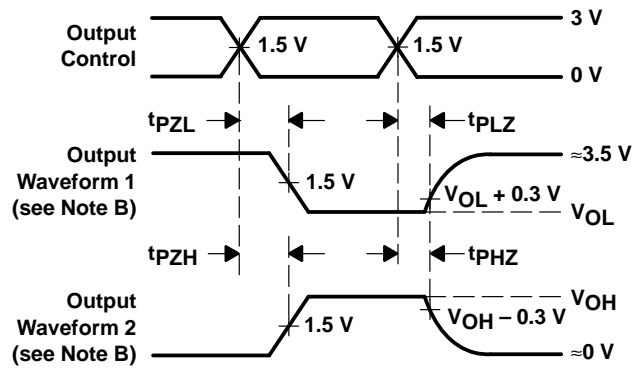
VOLTAGE WAVEFORMS PULSE DURATION



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

- 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 Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
74FCT2543ATSOCTE4	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74FCT2543ATSOCTG4	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74FCT2543CTSOCTE4	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74FCT2543CTSOCTG4	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CY74FCT2543ATQCT	ACTIVE	SSOP/ QSOP	DBQ	24	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
CY74FCT2543ATQCTE4	ACTIVE	SSOP/ QSOP	DBQ	24	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
CY74FCT2543ATQCTG4	ACTIVE	SSOP/ QSOP	DBQ	24	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
CY74FCT2543ATSOC	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CY74FCT2543ATSOCE4	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CY74FCT2543ATSOCG4	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CY74FCT2543ATSOCT	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CY74FCT2543CTQCT	ACTIVE	SSOP/ QSOP	DBQ	24	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
CY74FCT2543CTQCTE4	ACTIVE	SSOP/ QSOP	DBQ	24	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
CY74FCT2543CTQCTG4	ACTIVE	SSOP/ QSOP	DBQ	24	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
CY74FCT2543CTSOC	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CY74FCT2543CTSOCE4	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CY74FCT2543CTSOCG4	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CY74FCT2543ATSOCT	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CY74FCT2543TQCT	ACTIVE	SSOP/ QSOP	DBQ	24	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
CY74FCT2543TQCTE4	ACTIVE	SSOP/ QSOP	DBQ	24	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
CY74FCT2543TQCTG4	ACTIVE	SSOP/ QSOP	DBQ	24	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR

⁽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.

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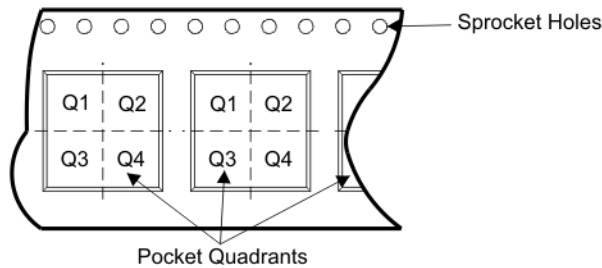
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TAPE AND REEL BOX INFORMATION



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



Device	Package	Pins	Site	Reel Diameter (mm)	Reel Width (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
CY74FCT2543ATQCT	DBQ	24	SITE 41	330	16	6.5	9.0	2.1	8	16	Q1
CY74FCT2543ATSOCT	DW	24	SITE 60	330	24	10.75	15.7	2.7	12	24	Q1
CY74FCT2543CTQCT	DBQ	24	SITE 41	330	16	6.5	9.0	2.1	8	16	Q1
CY74FCT2543CTSOCT	DW	24	SITE 60	330	24	10.75	15.7	2.7	12	24	Q1
CY74FCT2543TQCT	DBQ	24	SITE 41	330	16	6.5	9.0	2.1	8	16	Q1

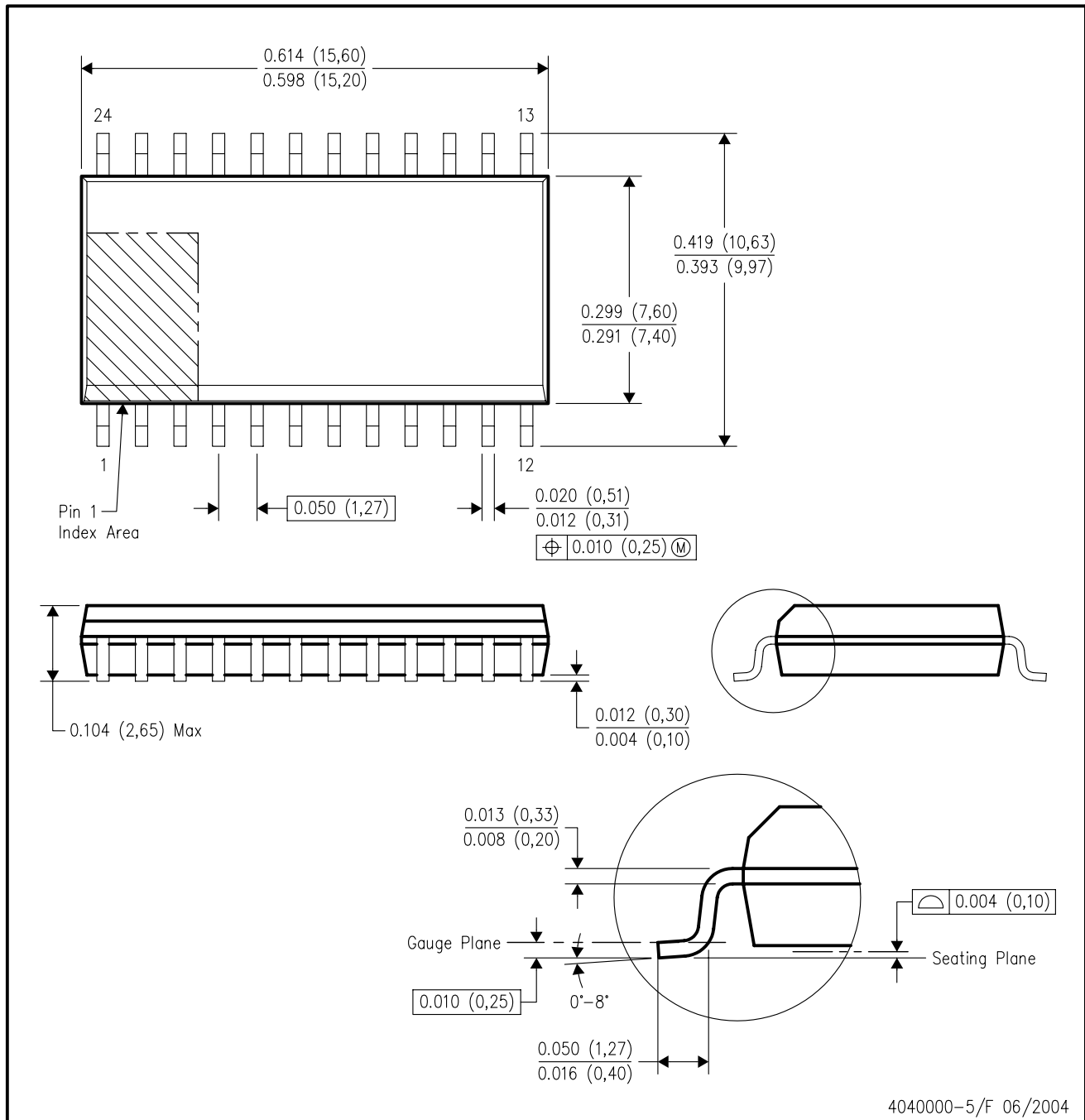
TAPE AND REEL BOX DIMENSIONS



Device	Package	Pins	Site	Length (mm)	Width (mm)	Height (mm)
CY74FCT2543ATQCT	DBQ	24	SITE 41	346.0	346.0	33.0
CY74FCT2543ATSOCT	DW	24	SITE 60	346.0	346.0	41.0
CY74FCT2543CTQCT	DBQ	24	SITE 41	346.0	346.0	33.0
CY74FCT2543CTSOCT	DW	24	SITE 60	346.0	346.0	41.0
CY74FCT2543TQCT	DBQ	24	SITE 41	346.0	346.0	33.0

DW (R-PDSO-G24)

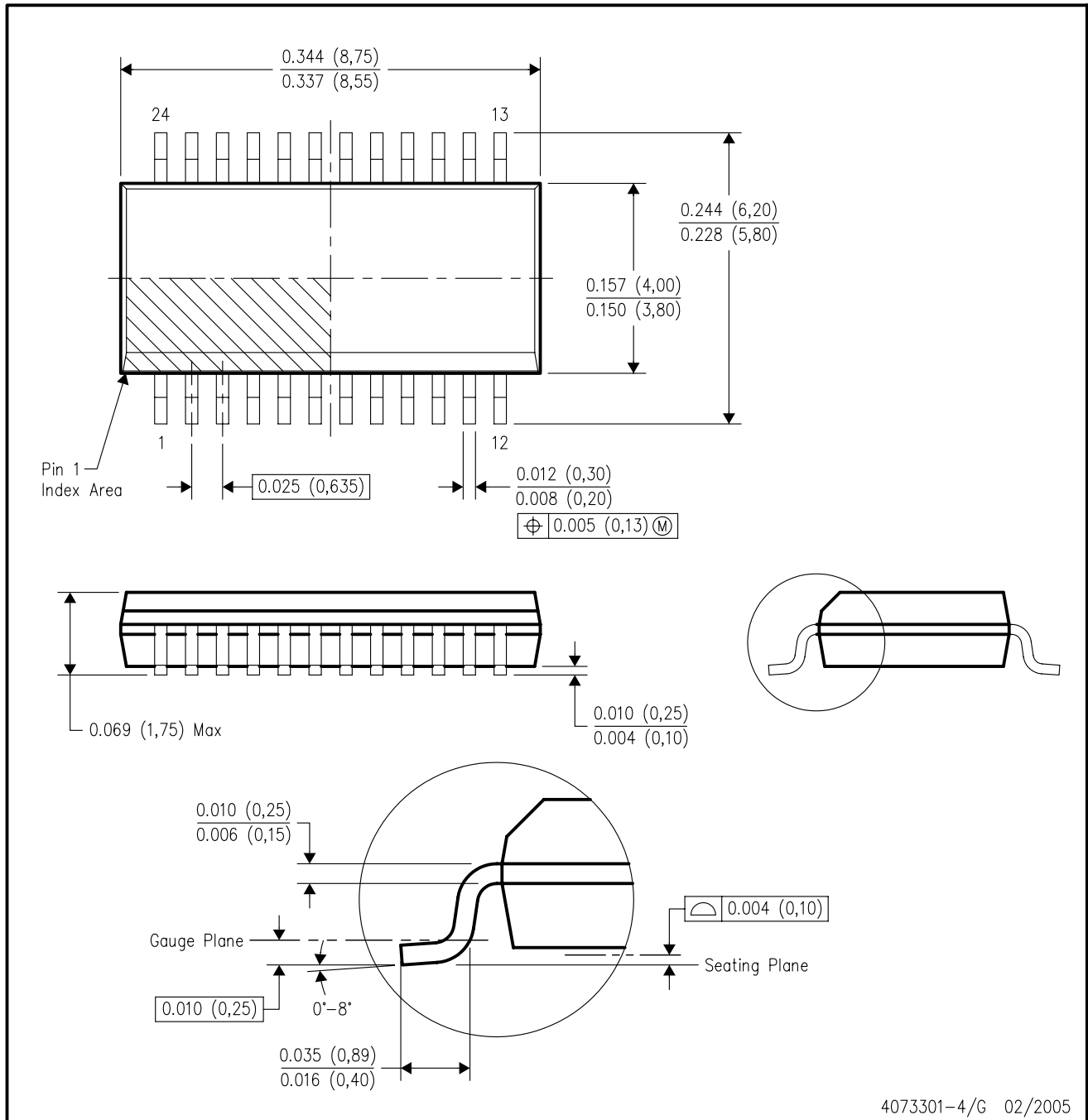
PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
 - D. Falls within JEDEC MS-013 variation AD.

DBQ (R-PDSO-G24)

PLASTIC SMALL-OUTLINE PACKAGE



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

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