CY29942

1:18 Clock Distribution Buffer

Features

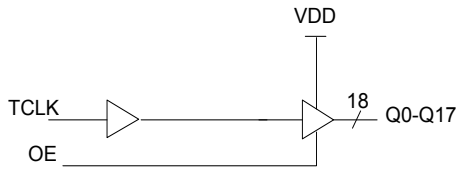
- Operational range: Up to 200 MHz
- LVCMOS/LVTTL clock input
- LVCMOS-/LVTTL-compatible logic input
- 18 clock outputs: Drive up to 36 clock lines
- Output-to-output Skew: 110 ps (typical)
- Output enable control
- Supply voltage: 2.5 V or 3.3 V
- Temperature range: Commercial and Industrial
- 32-pin TQFP package
- Pin compatible with MPC942C

Functional Description

The CY29942 is a low voltage clock distribution buffer with an LVCMOS or LVTTL compatible clock input. The output enable control input is LVCMOS/LVTTL compatible. The eighteen outputs are 2.5 V or 3.3 V LVCMOS or LVTTL compatible, operate up to 200 MHz, and can drive 50 Ω series or parallel terminated transmission lines. For series terminated transmission lines, each output can drive one or two traces, giving the devices an effective fanout of 1:36. Low output-to-output skews make the CY29942 an ideal clock distribution buffer for nested clock trees in the most demanding of synchronous systems.

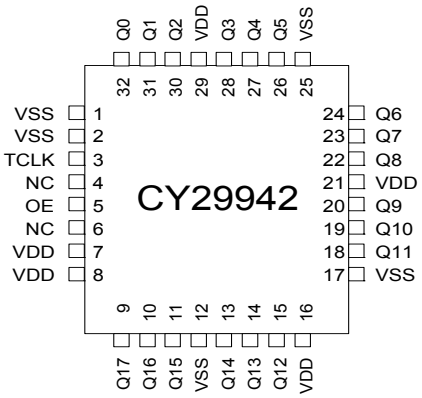
For a complete list of related documentation, click here.

Logic Block Diagram



Pin Configuration

Figure 1. 32-pin TQFP pinout



Pin Descriptions

Pin	Name	I/O	Description
3	TCLK	Input	External reference/Test clock input. Weak internal pull-down resistor.
5	OE	Input	Output enable. When HIGH, all outputs are enabled. When set LOW, the outputs are at high impedance. Weak internal pull-up resistor.
9, 10, 11, 13, 14, 15, 18, 19, 20, 22, 23, 24, 26, 27, 28, 30, 31, 32	Q(17:0)	Output	Clock outputs
7, 8, 16, 21, 29	VDD		2.5 V or 3.3 V power supply
1, 2, 12, 17, 25	VSS		Ground
4, 6	NC		No connection

Absolute Maximum Ratings

Exceeding the maximum ratings may impair the useful life of the device. User guidelines are not tested. [1]

Maximum input voltage relative to V_{SS}: ..... V_{SS} – 0.3 V

Maximum input voltage relative to V_{DD}: ..... V_{DD} + 0.3 V

Storage temperature: ..... –65 °C to 150 °C

Operating temperature: ..... –40 °C to 85 °C

Maximum ESD protection ..... 2 kV

Maximum power supply: ..... 5.5 V

Maximum input current: ..... ±20 mA

This device contains circuitry to protect the inputs against damage due to high static voltages or electric field; however, precautions should be taken to avoid application of any voltage higher than the maximum rated voltages to this circuit. For proper operation, I/O voltages should be constrained to the range:

$V_{SS} < V_{I/O} < V_{DD}$

Unused inputs must always be tied to an appropriate logic voltage level (either V_{SS} or V_{DD}).

DC Electrical Specifications

V_{DD} = 3.3 V ± 5% or 2.5 V ± 5% over the specified temperature range.

Parameter	Description	Conditions	Min	Typ	Max	Unit
V_{IL}	Input low voltage		V_{SS}	–	0.8	V
V_{IH}	Input high voltage		2.0	–	V_{DD}	V
I_{IL}	Input low current[2]		–	–	–200	µA
I_{IH}	Input high current[2]		–	–	200	µA
V_{OL}	Output low voltage[3]	I_{OL} = 20 mA	–	–	0.5	V
V_{OH}	Output high voltage[3]	I_{OH} = –20 mA, V_{DD} = 3.3 V	2.4	–	–	V
		I_{OH} = –16 mA, V_{DD} = 2.5 V	2.0	–	–	V
I_{DDQ}	Quiescent supply current	OE = V_{SS}	–	5	7	mA
I_{DD}	Dynamic supply current	V_{DD} = 3.3 V, Outputs at 150 MHz, CL = 15 pF	–	285	–	mA
		V_{DD} = 3.3 V, Outputs at 200 MHz, CL = 15 pF	–	335	–	mA
		V_{DD} = 2.5 V, Outputs at 150 MHz, CL = 15 pF	–	200	–	mA
		V_{DD} = 2.5 V, Outputs at 200 MHz, CL = 15 pF	–	240	–	mA
Z_{out}	Output impedance	V_{DD} = 3.3 V	8	12	16	Ω
		V_{DD} = 2.5 V	10	15	20	Ω
C_{in}	Input capacitance		–	4	–	pF

Thermal Resistance

Parameter [4]	Description	Test Conditions	32-pin TQFP	Unit
θ_{JA}	Thermal resistance (junction to ambient)	Test conditions follow standard test methods and procedures for measuring thermal impedance, in accordance with EIA/JESD51.	67	°C/W
θ_{JC}	Thermal resistance (junction to case)		28	°C/W

Notes
1. The voltage on any input or I/O pin cannot exceed the power pin during power-up.
2. Inputs have pull-up/pull-down resistors that effect input current.
3. Driving series or parallel terminated 50Ω (or 50 Ω to V_{DD}/2) transmission lines.
4. These parameters are guaranteed by design and are not tested.

AC Electrical Specifications

V_{DD} = 3.3 V ±5% or 2.5 V ±5% over the specified temperature range [5]

Parameter	Description	Conditions	Min	Typ	Max	Unit
Fmax	Input frequency		–	–	200	MHz
tpd	TTL_CLK to Q delay[6, 7]	V_{DD} = 3.3 V	1.8	3.3	3.8	ns
		V_{DD} = 2.5 V	2.3	3.8	4.4	ns
DC	Output duty cycle[6, 7, 8]	Measured at $V_{DD}/2$	45	–	55	%
tsk(0)	Output-to-output skew[6, 7]		–	110	200	ps
tskew(pp)	Part-to-part skew[9]	V_{DD} = 3.3 V	–	–	1.0	ns
		V_{DD} = 2.5 V	–	–	1.3	ns
tskew(pp)	Part-to-part skew[10]		–	–	600	ps
tr/tf	Output clocks rise/fall time[6, 7]	0.8 V to 2.0 V, V_{DD} = 3.3 V; 0.5 V to 1.8 V, V_{DD} = 2.5 V	0.2	–	1.1	ns

Notes
5. Parameters are guaranteed by design and characterization. Not 100% tested in production. All parameters specified with loaded outputs.
6. Outputs driving 50 Ω transmission lines.
7. See Figure 2.
8. 50% input duty cycle.
9. Across temperature and voltage ranges, includes output skew.
10. For a specific temperature and voltage, includes output skew.

Figure 2. LVCMOS_CLK CY29942 Test Reference for V_{CC} = 3.3 V and V_{CC} = 2.5 V

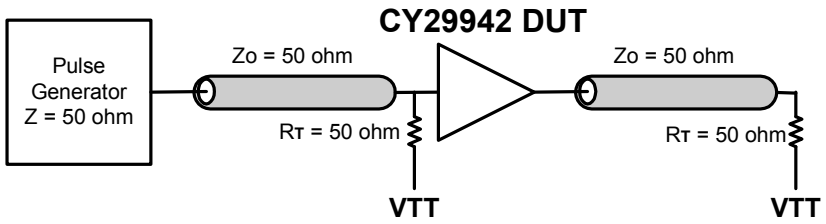


Figure 3. LVCMOS Propagation Delay (tpd) Test Reference

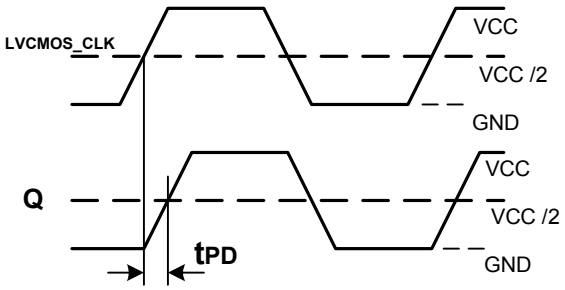


Figure 4. Output Duty Cycle (DC)

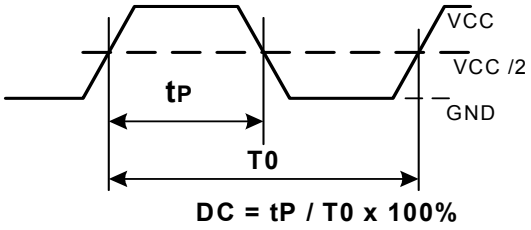
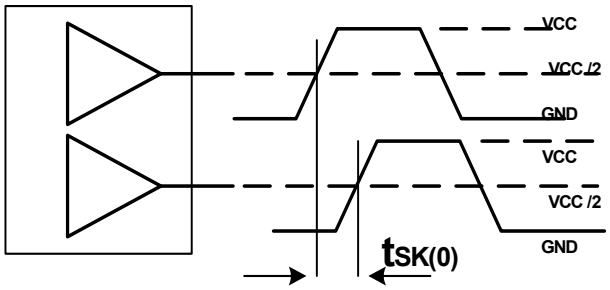


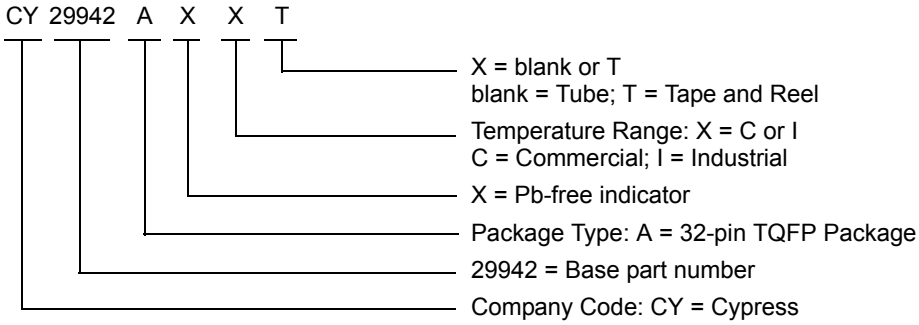
Figure 5. Output-to-Output Skew tsk(0)



Ordering Information

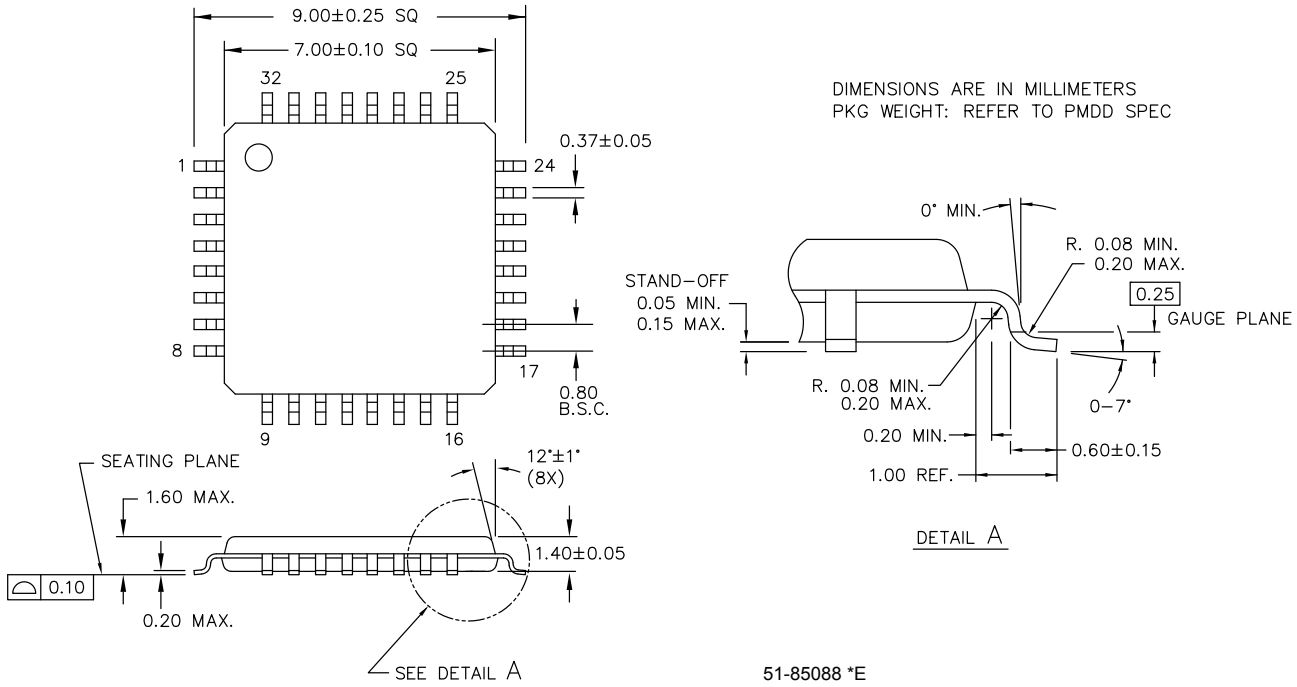
Part Number	Package Type	Production Flow
Pb-free		
CY29942AXI	32-pin TQFP	Industrial, –40 °C to 85 °C
CY29942AXIT	32-pin TQFP – Tape and Reel	Industrial, –40 °C to 85 °C
CY29942AXC	32-pin TQFP	Commercial, 0 °C to 70 °C
CY29942AXCT	32-pin TQFP – Tape and Reel	Commercial, 0 °C to 70 °C

Ordering Code Definitions



Package Drawing and Dimensions

Figure 6. 32-pin TQFP (7 × 7 × 1.4 mm) A3214 Package Outline, 51-85088



Acronyms

Acronym	Description
LVCMOS	Low Voltage Complementary Metal Oxide Semiconductor
LVTTL	Low Voltage Transistor-Transistor Logic
OE	Output Enable
PLL	Phase-Locked Loop
TQFP	Thin Quad Flat Pack

Document Conventions

Units of Measure

Symbol	Unit of Measure
°C	degree Celsius
kV	kilovolt
MHz	megahertz
µA	microampere
mA	milliampere
ms	millisecond
mW	milliwatt
ns	nanosecond
Ω	ohm
%	percent
pF	picofarad
ps	picosecond
V	volt

Document History Page

Document Title: CY29942, 1:18 Clock Distribution Buffer Document Number: 38-07284				
Revision	**ECN**	**Orig. of Change**	**Submission Date**	**Description of Change**
**	111095	BRK	02/07/02	New data sheet.
*A	116777	HWT	08/14/02	Added a Commercial Temp. Range in the Ordering Information
*B	122876	RBI	12/21/02	Add power up requirements to maximum rating information.
*C	334117	RGL	See ECN	Added Lead-free devices Added typical value for output-output skew
*D	2761988	KVM	09/10/09	Ordering Information table: fixed typo and removed obsolete CY29942ACT. Changed Lead-free to Pb-free.
*E	2899304	BASH / CXQ	03/25/2010	Removed CY29942AC part from Ordering Information. Updated package diagram.
*F	3034172	CXQ	09/21/2010	Changed spec title. Updated format of “Features”, changed wording in “Functional Description”. Removed note 1, added info into Table 1 directly. Removed reference to multiple supplies, power supply sequencing from Absolute Maximum Ratings. Removed reference to V_{DDC} from AC/DC Electrical Specs tables. Added condition OE = V_{SS} for I_{DDQ} in DC Electrical Specs table. Fixed formatting in AC/DC Electrical specs tables. Changed t_{SKEW} to $t_{SK(o)}$ to match Figure 6. Added Ordering Code Definitions. Added Acronyms and Units of Measure sections. Minor edits.
*G	3548252	PURU	03/12/2012	Changed LQFP to TQFP throughout document.
*H	4149208	CINM	10/07/2013	Updated Package Drawing and Dimensions: spec 51-85088 – Changed revision from *D to *E. Updated to new template. Completing Sunset Review.
*I	4586288	CINM	12/03/2014	Updated Functional Description: Added “For a complete list of related documentation, click here.” at the end. Updated Ordering Information: Removed the prune part numbers CY29942AI and CY29942AIT.
*J	5258930	PSR	05/04/2016	Added Thermal Resistance. Updated to new template.
*K	5500790	PAWK	10/28/2016	Sunset Review - No content change

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