

1:18 Clock Distribution Buffer

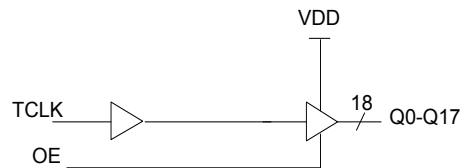
Features

- 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

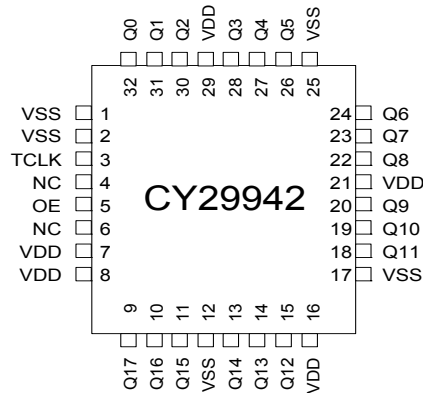
The CY29942 is a low voltage clock distribution buffer with an LVCMOS or LVTTL compatible clock input. The output enable control input is LVCMOS/LVTTL compatible. The eighteen outputs are 2.5 V or 3.3 V LVCMOS or LVTTL compatible, operate up to 200 MHz, and can drive 50 Ω series or parallel terminated 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.

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} : $V_{SS} - 0.3\text{ V}$
- Maximum input voltage relative to V_{DD} : $V_{DD} + 0.3\text{ V}$
- 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: $\pm 20\text{ mA}$

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

$V_{DD} = 3.3\text{ V} \pm 5\%$ or $2.5\text{ V} \pm 5\%$ 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]	$I_{OL} = 20\text{ mA}$	–	–	0.5	V
V_{OH}	Output high voltage ^[3]	$I_{OH} = -20\text{ mA}, V_{DD} = 3.3\text{ V}$	2.4	–	–	V
		$I_{OH} = -16\text{ mA}, V_{DD} = 2.5\text{ V}$	2.0	–	–	V
I_{DDQ}	Quiescent supply current	$OE = V_{SS}$	–	5	7	mA
I_{DD}	Dynamic supply current	$V_{DD} = 3.3\text{ V}, \text{Outputs at } 150\text{ MHz}, \text{CL} = 15\text{ pF}$	–	285	–	mA
		$V_{DD} = 3.3\text{ V}, \text{Outputs at } 200\text{ MHz}, \text{CL} = 15\text{ pF}$	–	335	–	mA
		$V_{DD} = 2.5\text{ V}, \text{Outputs at } 150\text{ MHz}, \text{CL} = 15\text{ pF}$	–	200	–	mA
		$V_{DD} = 2.5\text{ V}, \text{Outputs at } 200\text{ MHz}, \text{CL} = 15\text{ pF}$	–	240	–	mA
Z_{out}	Output impedance	$V_{DD} = 3.3\text{ V}$	8	12	16	Ω
		$V_{DD} = 2.5\text{ V}$	10	15	20	Ω
C_{in}	Input capacitance		–	4	–	pF

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 $50\ \Omega$ to $V_{DD}/2$) transmission lines.

AC Electrical Specifications

$V_{DD} = 3.3\text{ V} \pm 5\%$ or $2.5\text{ V} \pm 5\%$ over the specified temperature range ^[4]

Parameter	Description	Conditions	Min	Typ	Max	Unit
Fmax	Input frequency		–	–	200	MHz
tpd	TTL_CLK to Q delay ^[5, 6]	$V_{DD} = 3.3\text{ V}$	1.8	3.3	3.8	ns
		$V_{DD} = 2.5\text{ V}$	2.3	3.8	4.4	ns
DC	Output duty cycle ^[5, 6, 7]	Measured at $V_{DD}/2$	45	–	55	%
tsk(0)	Output-to-output skew ^[5, 6]		–	110	200	ps
tskew(pp)	Part-to-part skew ^[8]	$V_{DD} = 3.3\text{ V}$	–	–	1.0	ns
		$V_{DD} = 2.5\text{ V}$	–	–	1.3	ns
tskew(pp)	Part-to-part skew ^[9]		–	–	600	ps
tr/tf	Output clocks rise/fall time ^[5, 6]	0.8 V to 2.0 V, $V_{DD} = 3.3\text{ V}$; 0.5 V to 1.8 V, $V_{DD} = 2.5\text{ V}$	0.2	–	1.1	ns

Notes

4. Parameters are guaranteed by design and characterization. Not 100% tested in production. All parameters specified with loaded outputs.
5. Outputs driving $50\ \Omega$ transmission lines.
6. See [Figure 2](#).
7. 50% input duty cycle.
8. Across temperature and voltage ranges, includes output skew.
9. For a specific temperature and voltage, includes output skew.

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

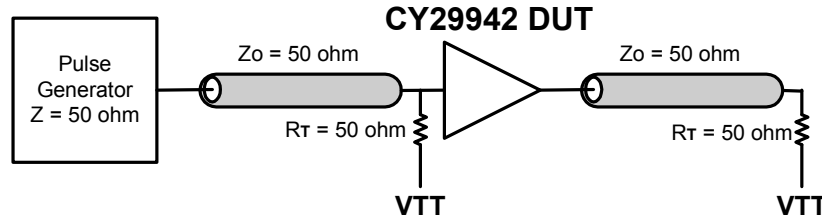


Figure 3. LVCMOS Propagation Delay (t_{pd}) Test Reference

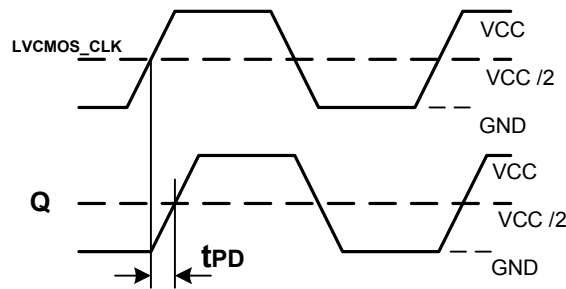


Figure 4. Output Duty Cycle (DC)

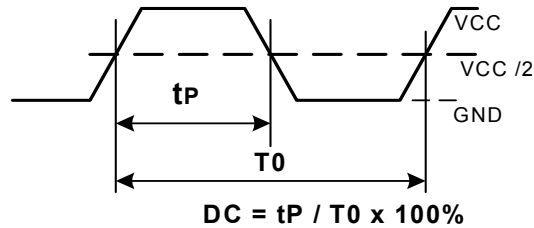
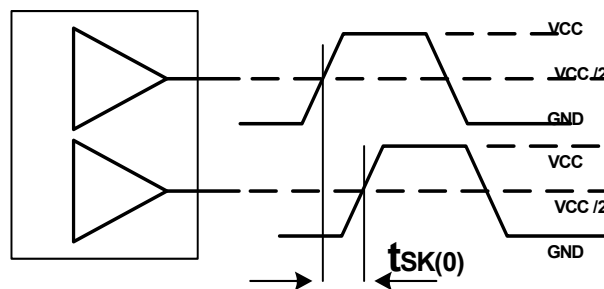


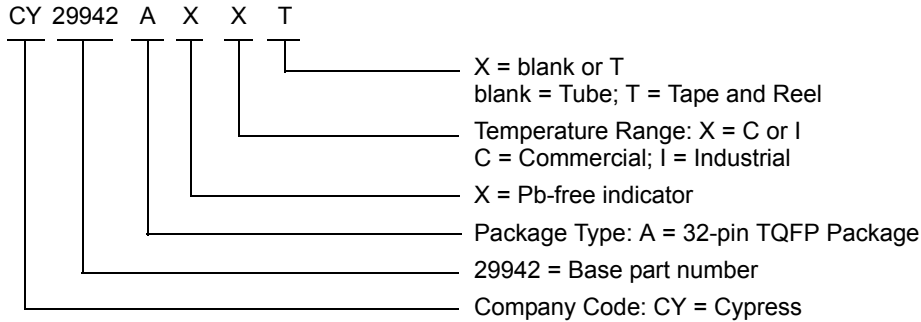
Figure 5. Output-to-Output Skew $t_{sk(0)}$



Ordering Information

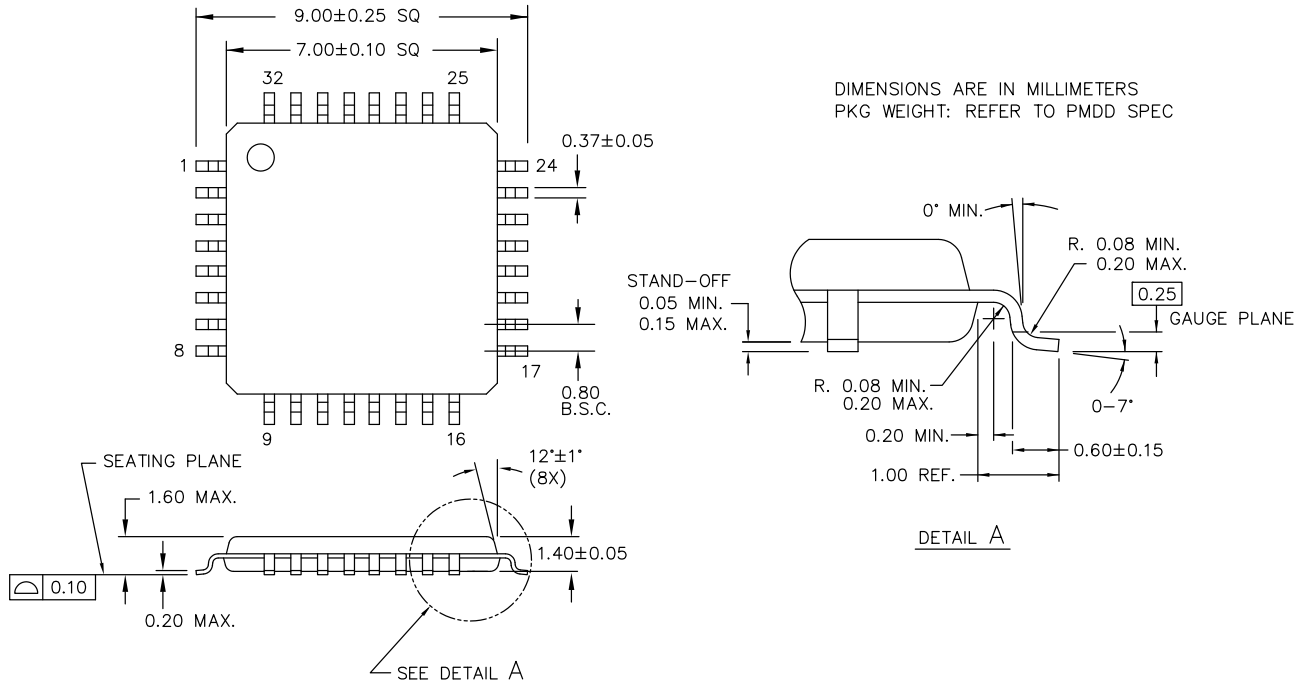
Part Number	Package Type	Production Flow
CY29942AI	32-pin TQFP	Industrial, -40 °C to 85 °C
CY29942AIT	32-pin TQFP – Tape and Reel	Industrial, -40 °C to 85 °C
Pb-free		
CY29942AXI	32-pin TQFP	Industrial, -40 °C to 85 °C
CY29942AXIT	32-pin TQFP – Tape and Reel	Industrial, -40 °C to 85 °C
CY29942AXC	32-pin 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



51-85088 *E

Acronyms

Acronym	Description
LVC MOS	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 in new template. Completing Sunset Review.

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