

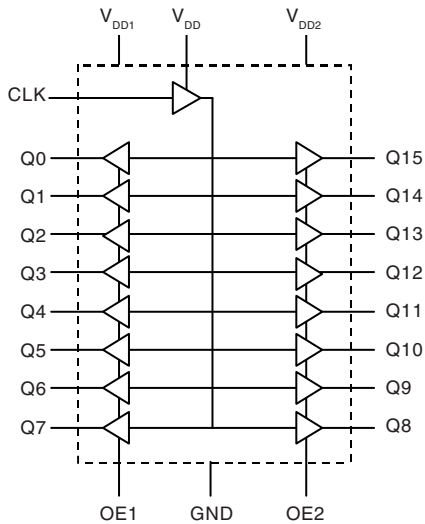
## General Description

The 8343-01 is a low skew, 1-to-16 LVCMOS/LVTTTL Fanout Buffer. The 8343-01 single ended clock input accepts LVCMOS or LVTTTL input levels. The ICS8343-01 operates at 3.3V, 2.5V and mixed 3.3V input and 2.5V supply modes over the commercial temperature range. Guaranteed output and part-to-part skew characteristics make the 8343-01 ideal for those clock distribution applications demanding well defined performance and repeatability.

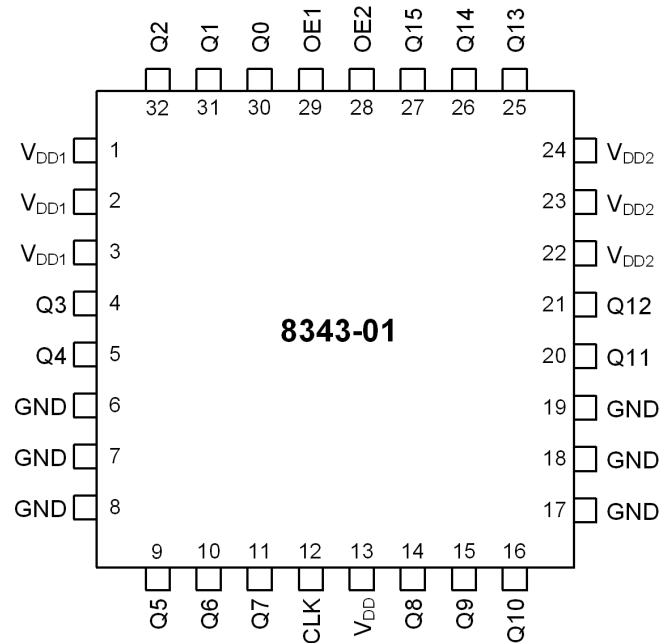
## Features

- 16 LVCMOS/LVTTTL outputs
- One LVCMOS/LVTTTL clock input
- CLK can accept the following input levels: LVCMOS, LVTTTL
- Maximum output frequency: 200MHz
- Dual output enable inputs facilitates 1-to-16 or 1-to-8 input to output modes
- All inputs are 5V tolerant
- Output skew: 250ps (maximum)
- Part-to-part skew: 700ps (maximum)
- Full 3.3V and 2.5V or mixed 3.3V core/2.5V operating supply
- 0°C to 70°C ambient operating temperature
- Lead-Free packaging
- Industrial temperature information available upon request

## Block Diagram



## Pin Assignment



**32-Lead LQFP**  
**7mm x 7mm x 1.4mm body package**  
**Y Package**  
 (Top View)

## Pin Descriptions and Characteristics

Table 1. Pin Descriptions<sup>1</sup>

Number	Name	Type		Description
1	V <sub>DD1</sub>	Power		Q0 through Q7 output supply pin.
2	V <sub>DD1</sub>	Power		Q0 through Q7 output supply pin.
3	V <sub>DD1</sub>	Power		Q0 through Q7 output supply pin.
4	Q3	Output		LVC MOS/LVTTL clock output. 7Ω typical output impedance.
5	Q4	Output		LVC MOS/LVTTL clock output. 7Ω typical output impedance.
6	GND	Power		Power supply ground.
7	GND	Power		Power supply ground.
8	GND	Power		Power supply ground.
9	Q5	Output		LVC MOS/LVTTL clock output. 7Ω typical output impedance.
10	Q6	Output		LVC MOS/LVTTL clock output. 7Ω typical output impedance.
11	Q7	Output		LVC MOS/LVTTL clock output. 7Ω typical output impedance.
12	CLK	Input	Pulldown	LVC MOS/LVTTL clock input / 5V tolerant.
13	V <sub>DD</sub>	Power		Core supply pin.
14	Q8	Output		LVC MOS/LVTTL clock output. 7Ω typical output impedance.
15	Q9	Output		LVC MOS/LVTTL clock output. 7Ω typical output impedance.
16	Q10	Output		LVC MOS/LVTTL clock output. 7Ω typical output impedance.
17	GND	Power		Power supply ground.
18	GND	Power		Power supply ground.
19	GND	Power		Power supply ground.
20	Q11	Output		LVC MOS/LVTTL clock output. 7Ω typical output impedance.
21	Q12	Output		LVC MOS/LVTTL clock output. 7Ω typical output impedance.
22	V <sub>DD2</sub>	Power		Q8 through Q15 output supply pin.
23	V <sub>DD2</sub>	Power		Q8 through Q15 output supply pin.
24	V <sub>DD2</sub>	Power		Q8 through Q15 output supply pin.
25	Q13	Output		LVC MOS/LVTTL clock output. 7Ω typical output impedance.
26	Q14	Output		LVC MOS/LVTTL clock output. 7Ω typical output impedance.
27	Q15	Output		LVC MOS/LVTTL clock output. 7Ω typical output impedance.
28	OE2	Input	Pullup	Output enable. When low forces outputs Q8 through Q15 to HiZ state. 5V tolerant. LVC MOS/LVTTL interface levels.
29	OE1	Input	Pullup	Output enable. When low forces outputs Q0 through Q7 to HiZ state. 5V tolerant. LVC MOS/LVTTL interface levels.
30	Q0	Output		LVC MOS/LVTTL clock output. 7Ω typical output impedance.
31	Q1	Output		LVC MOS/LVTTL clock output. 7Ω typical output impedance.
32	Q2	Output		LVC MOS/LVTTL clock output. 7Ω typical output impedance.

NOTE 1: *Pullup* and *Pulldown* refer to internal input resistors. See Table 2, *Pin characteristics*, for typical values.

**Table 2. Pin Characteristics**

Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
$C_{IN}$	Input Capacitance			4		pF
$C_{PD}$	Power Dissipation Capacitance (per output)	$V_{DD}, V_{DD1}, V_{DD2} = 3.465V$		11		pF
		$V_{DD1}, V_{DD2} = 2.63V$		9		pF
$R_{PULLUP}$	Input Pullup Resistor			51		k $\Omega$
$R_{PULLDOWN}$	Input Pulldown Resistor			51		k $\Omega$
$R_{OUT}$	Output Impedance	$V_{DD}, V_{DD1}, V_{DD2} = 3.3V$	5	7	12	$\Omega$

**Table 3. Function Table<sup>1</sup>**

Inputs		Outputs	
OE1	OE2	Q0:Q7	Q8:Q15
0	0	HiZ	HiZ
1	0	Active	HiZ
0	1	HiZ	Active
1	1	Active	Active

NOTE 1: OE1 and OE2 are 5V tolerant.

## Absolute Maximum Ratings

NOTE: Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These ratings are stress specifications only. Functional operation of product at these conditions or any conditions beyond those listed in the *Section , "DC Electrical Characteristics" or AC Electrical Characteristics* is not implied. Exposure to absolute maximum rating conditions for extended periods may affect product reliability.

Item	Rating
Supply Voltage, $V_{DD}$	4.6V
Inputs, $V_I$	-0.5V to $V_{DD} + 0.5V$
Outputs, $V_O$	-0.5V to $V_{DDx} + 0.5V$
Storage Temperature, $T_{STG}$	-65°C to 150°C
Maximum Junction Temperature, $T_{JMAX}$	125°C

## DC Electrical Characteristics

**Table 4A. Power Supply DC Characteristics,  $V_{DD} = 3.3V \pm 5\%$ ,  $V_{DD1} = V_{DD2} = 3.3V \pm 5\%$  or  $2.5V \pm 5\%$ ,  $T_A = 0^\circ C$  to  $70^\circ C$**

Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
$V_{DD}$	Core Supply Voltage		3.135	3.3	3.465	V
$V_{DDx}$	Output Supply Voltage <sup>1</sup>		3.135	3.3	3.465	V
			2.375	2.5	2.625	V
$I_{DD}$	Power Supply Current				35	mA
$I_{DDx}$	Output Supply Current <sup>2</sup>				14	mA

NOTE 1:  $V_{DDx}$  denotes  $V_{DD1}$  and  $V_{DD2}$ .

NOTE 2:  $I_{DDx}$  denotes the sum of  $I_{DD1}$  and  $I_{DD2}$ .

**Table 4B. Power Supply DC Characteristics,  $V_{DD} = V_{DD1} = V_{DD2} = 2.5V \pm 5\%$ ,  $T_A = 0^\circ C$  to  $70^\circ C$**

Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
$V_{DD}$	Core Supply Voltage		2.375	2.5	2.625	V
$V_{DDx}$	Output Supply Voltage <sup>1</sup>		2.375	2.5	2.625	V
$I_{DD}$	Power Supply Current				34	mA
$I_{DDx}$	Output Supply Current <sup>2</sup>				13	mA

NOTE 1:  $V_{DDx}$  denotes  $V_{DD1}$  and  $V_{DD2}$ .

NOTE 2:  $I_{DDx}$  denotes the sum of  $I_{DD1}$  and  $I_{DD2}$ .

**Table 4C. LVCMOS / LVTTTL DC Characteristics,  $V_{DD} = V_{DD1} = V_{DD2} = 3.3V \pm 5\%$  or  $2.5V \pm 5\%$ ,  $V_{DD} = 3.3V \pm 5\%$ ,  $V_{DD1} = V_{DD2} = 2.5V \pm 5\%$ ,  $T_A = 0^\circ C$  to  $70^\circ C$**

Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
$V_{IH}$	Input High Voltage	OE1, OE2	2		$V_{DD} + 0.3$	V
		CLK	2		$V_{DD} + 0.3$	V
$V_{IL}$	Input Low Voltage	OE1, OE2	-0.3		0.8	V
		CLK	-0.3		1.3	V
$I_{IH}$	Input High Current	OE1, OE2	$V_{DD} = V_{IN} = 3.465V$ or $2.625V$		5	$\mu A$
		CLK	$V_{DD} = V_{IN} = 3.465V$ or $2.625V$		150	$\mu A$
$I_{IL}$	Input Low Current	OE1, OE2	$V_{DD} = 3.465V$ or $2.625V$ , $V_{IN} = 0V$	-150		$\mu A$
		CLK	$V_{DD} = 3.465V$ or $2.625V$ , $V_{IN} = 0V$	-5		$\mu A$
$V_{OH}$	Output High Voltage <sup>1</sup>	$V_{DD1} = V_{DD2} = 3.465V$	2.6			V
		$V_{DD1} = V_{DD2} = 2.625V$	1.8			V
$V_{OL}$	Output Low Voltage	$V_{DD1} = V_{DD2} = 3.465V$ or $2.625V$			0.5	V
$I_{OZL}$	Output Tristate Current Low				5	$\mu A$
$I_{OZH}$	Output Tristate Current High				5	$\mu A$

NOTE 1: Outputs terminated with  $50\Omega$  to  $V_{DDx}/2$ . See Parameter Measurement Information, "Output Load Test Circuit Diagrams".

## AC Electrical Characteristics

**Table 5A. AC Electrical Characteristics,  $V_{DD} = V_{DD1} = V_{DD2} = 3.3V \pm 5\%$ ,  $T_A = 0^\circ C$  to  $70^\circ C$ <sup>1</sup>**

Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
$f_{MAX}$	Output Frequency				200	MHz
$t_{pLH}$	Propagation Delay <sup>2</sup>	$f \leq 200MHz$	2.0		4.0	ns
$t_{sk(o)}$	Output Skew <sup>3, 4</sup>	Measured on rising edge @ $V_{DDx}/2$			250	ps
$t_{sk(pp)}$	Part-to-Part Skew <sup>4, 5</sup>	Measured on rising edge @ $V_{DDx}/2$			700	ps
$t_R / t_F$	Output Rise/ Fall Time	20% to 80%	0.4		1.5	ns
odc	Output Duty Cycle	$f \leq 133MHz$	45		55	%
$t_{PW}$	Output Pulse Width	$f > 133MHz$	$t_{PERIOD}/2 - 0.25$	$t_{PERIOD}/2$	$t_{PERIOD}/2 + 0.25$	ns

NOTE 1: All parameters measured at  $f_{MAX}$  unless noted otherwise.

NOTE 2: Measured from  $V_{DD}/2$  of the input to  $V_{DDx}/2$  of the output.

NOTE 3: Defined as skew between outputs at the same supply voltage and with equal load conditions. Measured at  $V_{DDx}/2$ .

NOTE 4: This parameter is defined in accordance with JEDEC Standard 65.

NOTE 5: Defined as skew between outputs on different devices operating at the same supply voltages and with equal load conditions. Using the same type of inputs on each device, the outputs are measured at  $V_{DDx}/2$ .

**Table 5B. AC Electrical Characteristics,  $V_{DD} 3.3V \pm 5\%$ ,  $V_{DD1} = V_{DD2} = 2.5V \pm 5\%$ ,  $T_A = 0^\circ C$  to  $70^\circ C$ <sup>1</sup>**

Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
$f_{MAX}$	Output Frequency				200	MHz
$t_{pLH}$	Propagation Delay <sup>2</sup>	$f \leq 200MHz$	2.0		4.5	ns
$t_{sk(o)}$	Output Skew <sup>3, 4</sup>	Measured on rising edge @ $V_{DDx}/2$			250	ps
$t_{sk(pp)}$	Part-to-Part Skew <sup>4, 5</sup>	Measured on rising edge @ $V_{DDx}/2$			700	ps
$t_R / t_F$	Output Rise/ Fall Time	20% to 80%	0.4		1.0	ns
odc	Output Duty Cycle	$f \leq 133MHz$	40		60	%

NOTE 1: All parameters measured at  $f_{MAX}$  unless noted otherwise.

NOTE 2: Measured from  $V_{DD}/2$  of the input to  $V_{DDx}/2$  of the output.

NOTE 3: Defined as skew between outputs at the same supply voltage and with equal load conditions. Measured at  $V_{DDx}/2$ .

NOTE 4: This parameter is defined in accordance with JEDEC Standard 65.

NOTE 5: Defined as skew between outputs on different devices operating at the same supply voltages and with equal load conditions. Using the same type of inputs on each device, the outputs are measured at  $V_{DDx}/2$ .

**Table 5C. AC Electrical Characteristics,  $V_{DD} = V_{DD2} = 3.3V \pm 5\%$ ,  $V_{DD1} = 2.5V \pm 5\%$ ,  $T_A = 0^\circ C$  to  $70^\circ C$ <sup>1</sup>**

Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
$f_{MAX}$	Output Frequency				200	MHz
$t_{sk(o)}$	Output Skew <sup>2</sup>	Measured on rising edge @ $V_{DDx}/2$			250	ps

NOTE 1: All parameters measured at  $f_{MAX}$  unless noted otherwise.

NOTE 2: Defined as skew across outputs at the same supply voltages within a bank, and with equal load conditions.

**Table 5D. AC Electrical Characteristics,  $V_{DD} 3.3V \pm 5\%$ ,  $V_{DD1} = V_{DD2} = 2.5V \pm 5\%$ ,  $T_A = 0^\circ C$  to  $70^\circ C$ <sup>1</sup>**

Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
$f_{MAX}$	Output Frequency				133	MHz
$t_{pLH}$	Propagation Delay <sup>2</sup>	$f \leq 200MHz$	2.0		4.0	ns
$t_{sk(o)}$	Output Skew <sup>3, 4</sup>	Measured on rising edge @ $V_{DDx}/2$			250	ps
$t_{sk(pp)}$	Part-to-Part Skew <sup>4, 5</sup>	Measured on rising edge @ $V_{DDx}/2$			1	ns
$t_R / t_F$	Output Rise/ Fall Time	20% to 80%	0.4		1.0	ns
odc	Output Duty Cycle	$f \leq 133MHz$	40		60	%

NOTE 1: All parameters measured at  $f_{MAX}$  unless noted otherwise.

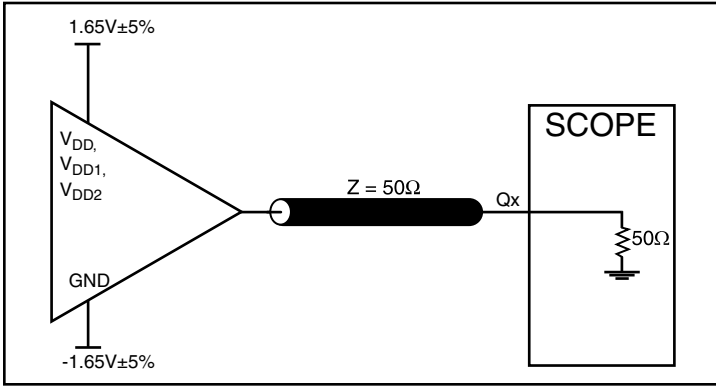
NOTE 2: Measured from  $V_{DD}/2$  of the input to  $V_{DDx}/2$  of the output.

NOTE 3: Defined as skew between outputs at the same supply voltage and with equal load conditions. Measured at  $V_{DDx}/2$ .

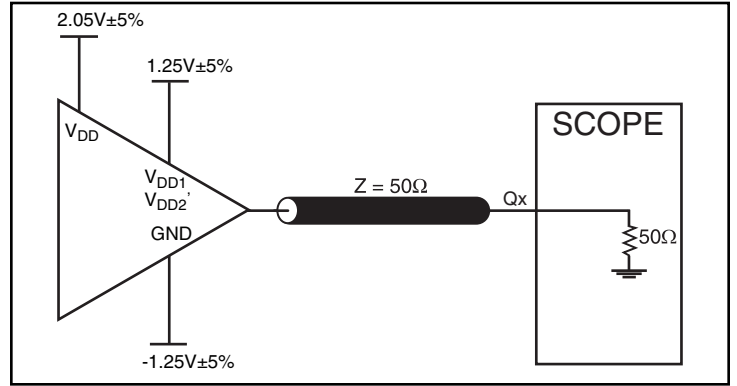
NOTE 4: This parameter is defined in accordance with JEDEC Standard 65.

NOTE 5: Defined as skew between outputs on different devices operating at the same supply voltages and with equal load conditions. Using the same type of inputs on each device, the outputs are measured at  $V_{DDx}/2$ .

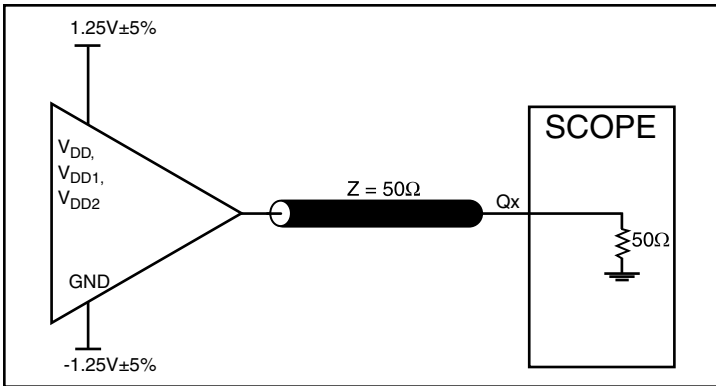
Parameter Measurement Information



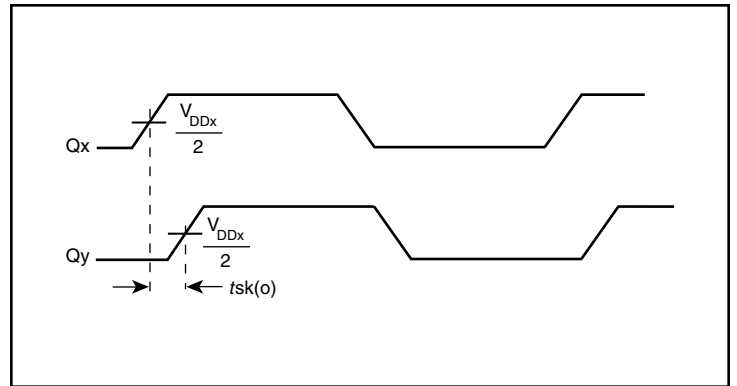
3.3V Core/3.3V Output Load Test Circuit



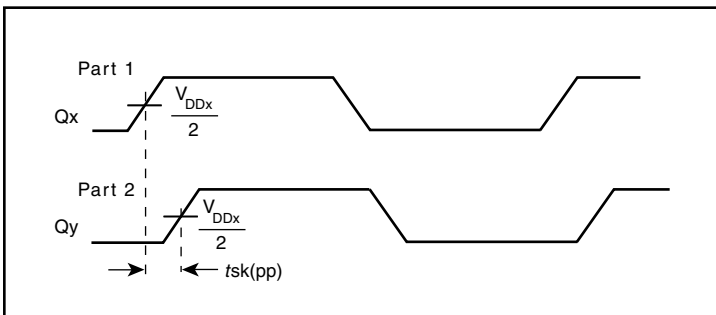
3.3V Core/2.5V Output Load Test Circuit



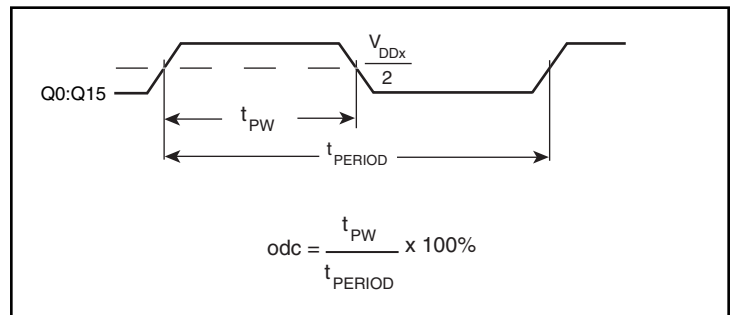
2.5V Core/2.5V Output Load Test Circuit



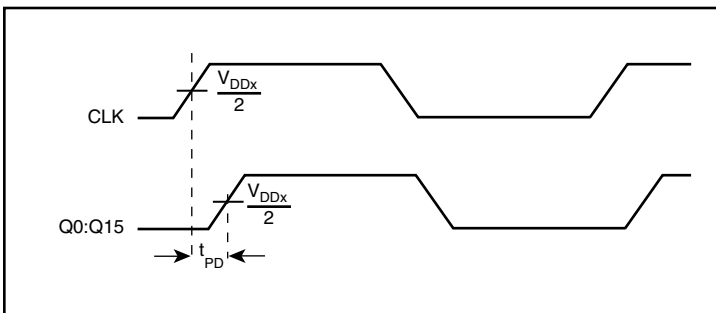
Output Skew



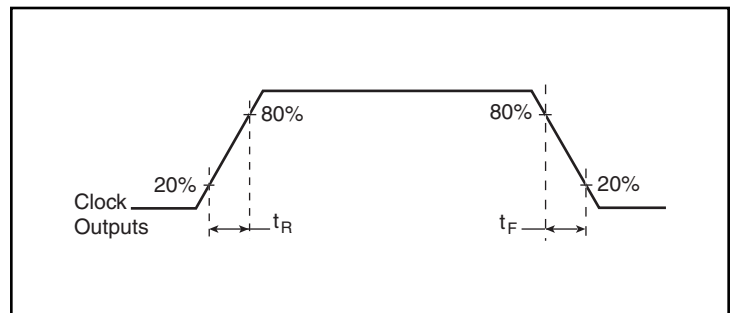
Part-to-Part Skew



Output Duty Cycle/Pulse Width/Period



Propagation Delay



Output Rise/Fall Time



## Reliability Information

**Table 6.  $\theta_{JA}$  vs. Air Flow Table for a 32-Lead LQFP<sup>1</sup>**

$\theta_{JA}$ by Velocity			
Linear Feet per Minute	0	200	500
Single-Layer PCB, JEDEC Standard Test Boards	67.8°C/W	55.9°C/W	50.1°C/W
Multi-Layer PCB, JEDEC Standard Test Boards	47.9°C/W	42.1°C/W	39.4°C/W

NOTE 1: Most modern PCB designs use multi-layered boards. The data in the second row pertains to most designs.

## Transistor Count

The transistor count for 8343-01 is 985.

## Package Outline and Package Dimensions

### Package Outline - Y Suffix for 32-Lead LQFP

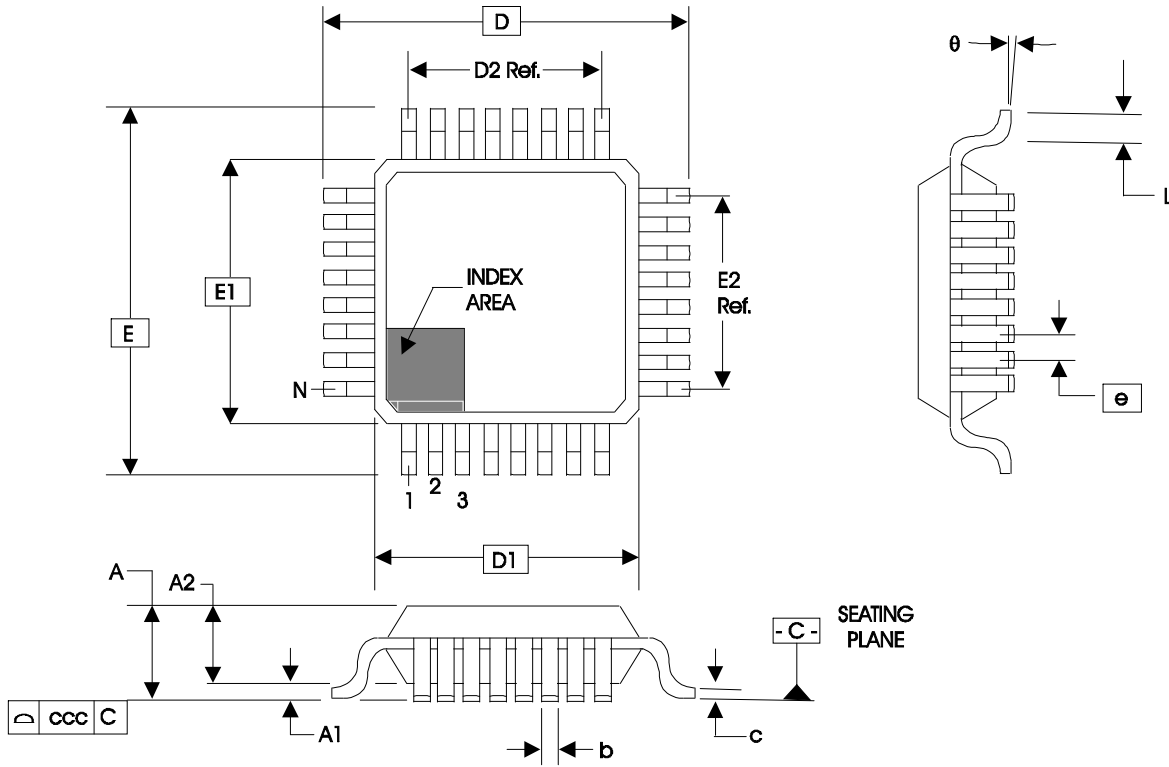


Table 7. Package Dimensions

JEDEC Variation All Dimensions in Millimeters			
Symbol	Minimum	Nominal	Maximum
N		32	
A	–	–	1.60
A1	0.05	–	0.15
A2	1.35	1.40	1.45
b	0.30	0.37	0.45
c	0.09	–	0.20
D	9.00 Basic		
D1	7.00 Basic		
D2	5.60 Ref.		
E	9.00 Basic		
E1	7.00 Basic		
E2	5.60 Ref.		
e	0.80 Basic		
L	0.45	0.60	0.75
$\theta$	0°	–	7°
ccc	–	–	0.10

## Ordering Information

**Table 8. Ordering Information**

<b>Part/Order Number</b>	<b>Marking</b>	<b>Package</b>	<b>Shipping Packaging</b>	<b>Temperature</b>
8343AY-01LF	ICS8343AY01L	"Lead-Free" 32-Lead LQFP	Tray	0°C to 70°C
8343AY-01LFT	ICS8343AY01L	"Lead-Free" 32-Lead LQFP	Tape & Reel	0°C to 70°C

## Revision History Sheet

Rev	Table	Page	Description of Change	Date
A	T2	2	Pin Characteristics Table - changed $C_{IN}$ 4pF max to 4pF typical. Added to $R_{OUT}$ , 5 $\Omega$ min. and 12 $\Omega$ max.	9/18/03
	T8	11	Ordering Information correct package column from 48 Lead to 32 Lead.	
B	T5C	5	Added Mixed AC Characteristics Table. Updated format.	8/13/04
B	T8	9	Added Lead-Free marking to Ordering Information Table.	9/16/04
B		1	Updated format and contact information. General Description: Deleted HiPerClockS reference.	8/25/14
	T1	2	Re-organized table sequentially.	
	T8	10	Removed leaded option.	



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