



Integrated  
Circuit  
Systems, Inc.

**PRELIMINARY**

**ICS8343I-01**  
LOW SKEW, 1-TO-16  
LVCMOS / LVTTTL FANOUT BUFFER

**GENERAL DESCRIPTION**

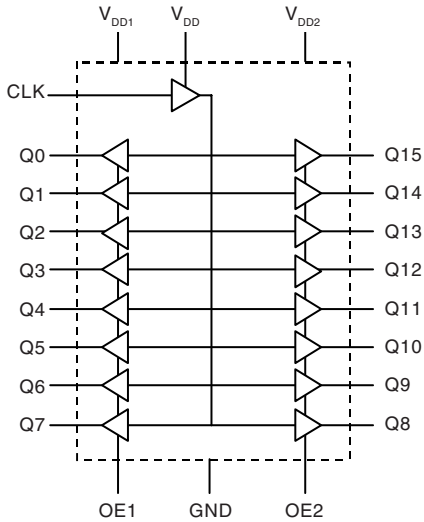


The ICS8343I-01 is a low skew, 1-to-16 LVCMOS/LVTTTL Fanout Buffer and a member of the HiPerClockS™ family of High Performance Clock Solutions from ICS. The ICS8343I-01 single ended clock input accepts LVCMOS or LVTTTL input levels. The ICS8343I-01 operates at 3.3V, 2.5V and mixed 3.3V input and 2.5V supply modes over the commercial temperature range. Guaranteed output and part-to-part skew characteristics make the ICS8343I-01 ideal for those clock distribution applications demanding well defined performance and repeatability.

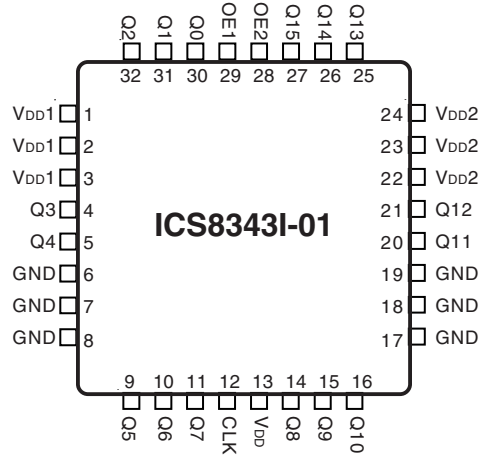
**FEATURES**

- 16 LVCMOS/LVTTTL outputs
- 1 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 (typical)
- Part-to-part skew: 700ps (typical)
- Full 3.3V and 2.5V or mixed 3.3V core/2.5V operating supply
- -40°C to 85°C ambient operating temperature

**BLOCK DIAGRAM**



**PIN ASSIGNMENT**



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

The Preliminary Information presented herein represents a product in prototyping or pre-production. The noted characteristics are based on initial product characterization. Integrated Circuit Systems, Incorporated (ICS) reserves the right to change any circuitry or specifications without notice.



**TABLE 1. PIN DESCRIPTIONS**

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

NOTE: *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**

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: OE1 and OE2 are 5V tolerant.



**ABSOLUTE MAXIMUM RATINGS**

Supply Voltage, $V_{DD}$	4.6V
Inputs, $V_i$	-0.5V to $V_{DD} + 0.5V$
Outputs, $V_o$	-0.5V to $V_{DDx} + 0.5V$
Package Thermal Impedance, $\theta_{JA}$	47.9°C/W (0 lfm)
Storage Temperature, $T_{STG}$	-65°C to 150°C

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 *DC Characteristics* or *AC Characteristics* is not implied. Exposure to absolute maximum rating conditions for extended periods may affect product reliability.

**TABLE 4A. POWER SUPPLY DC CHARACTERISTICS,  $V_{DD} = V_{DD1} = V_{DD2} = 3.3V \pm 5\%$ ,  $T_A = -40^\circ$  TO  $85^\circ C$**

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; NOTE 1		3.135	3.3	3.465	V
$I_{DD}$	Power Supply Current				35	mA
$I_{DDx}$	Output Supply Current; NOTE 2				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. LVCMOS / LVTTTL DC CHARACTERISTICS,  $V_{DD} = V_{DD1} = V_{DD2} = 3.3V \pm 5\%$ ,  $T_A = -40^\circ$  TO  $85^\circ C$**

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	$V_{DD} = V_{IN} = 3.465V$		5	$\mu A$
		CLK	$V_{DD} = V_{IN} = 3.465V$		150	$\mu A$
$I_{IL}$	Input Low Current	OE1, OE2	$V_{DD} = 3.465V, V_{IN} = 0V$	-150		$\mu A$
		CLK	$V_{DD} = 3.465V, V_{IN} = 0V$	-5		$\mu A$
$V_{OH}$	Output High Voltage; NOTE 1		2.6			V
$V_{OL}$	Output Low Voltage; NOTE 1				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, 3.3V Output Load Test Circuit.



**TABLE 4C. POWER SUPPLY DC CHARACTERISTICS,  $V_{DD} = 3.3V \pm 5\%$ ,  $V_{DD1} = V_{DD2} = 2.5V \pm 5\%$ ,  $T_A = -40^\circ$  TO  $85^\circ C$**

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; NOTE 1		2.375	2.5	2.625	V
$I_{DD}$	Power Supply Current				35	mA
$I_{DDx}$	Output Supply Current; NOTE 2				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 4D. LVCMOS / LVTTTL DC CHARACTERISTICS,  $V_{DD} = 3.3V \pm 5\%$ ,  $V_{DD1} = V_{DD2} = 2.5V \pm 5\%$ ,  $T_A = -40^\circ$  TO  $85^\circ C$**

Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
$V_{IH}$	Input High Voltage	OE1, OE2			$V_{DD} + 0.3$	V
		CLK			$V_{DD} + 0.3$	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	$V_{DD} = V_{IN} = 3.465V$		5	$\mu A$
		CLK	$V_{DD} = V_{IN} = 3.465V$		150	$\mu A$
$I_{IL}$	Input Low Current	OE1, OE2	$V_{DD} = 3.465V, V_{IN} = 0V$	-150		$\mu A$
		CLK	$V_{DD} = 3.465V, V_{IN} = 0V$	-5		$\mu A$
$V_{OH}$	Output High Voltage; NOTE 1		1.8			V
$V_{OL}$	Output Low Voltage; NOTE 1				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, 3.3V/2.5 Output Load Test Circuit.



**TABLE 4E. POWER SUPPLY DC CHARACTERISTICS,  $V_{DD} = V_{DD1} = V_{DD2} = 2.5V \pm 5\%$ ,  $T_A = -40^\circ$  TO  $85^\circ C$**

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; NOTE 1		2.375	2.5	2.625	V
$I_{DD}$	Power Supply Current				34	mA
$I_{DDx}$	Output Supply Current; NOTE 2				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 4F. LVCMOS / LVTTTL DC CHARACTERISTICS,  $V_{DD} = V_{DD1} = V_{DD2} = 2.5V \pm 5\%$ ,  $T_A = -40^\circ$  TO  $85^\circ C$**

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	$V_{DD} = V_{IN} = 2.625V$		5	$\mu A$
		CLK	$V_{DD} = V_{IN} = 2.625V$		150	$\mu A$
$I_{IL}$	Input Low Current	OE1, OE2	$V_{DD} = 2.625V, V_{IN} = 0V$	-150		$\mu A$
		CLK	$V_{DD} = 2.625V, V_{IN} = 0V$	-5		$\mu A$
$V_{OH}$	Output High Voltage; NOTE 1		1.8			V
$V_{OL}$	Output Low Voltage; NOTE 1				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, 2.5V Output Load Test Circuit.



**TABLE 5A. AC CHARACTERISTICS,  $V_{DD} = V_{DD1} = V_{DD2} = 3.3V \pm 5\%$ ,  $T_A = -40^\circ$  TO  $85^\circ C$**

Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
$f_{MAX}$	Onput Frequency				200	MHz
$t_{pLH}$	Propagation Delay; NOTE 1	$f \leq 200MHz$		3		ns
$tsk(o)$	Output Skew; NOTE 2, 4	Measured on rising edge @ $V_{DDX}/2$		250		ps
$tsk(pp)$	Part-to-Part Skew; NOTE 3, 4	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	$f \leq 133MHz$		50		%
$t_{PW}$	Output Pulse Width	$f > 133MHz$		$t_{PERIOD}/2$		ns

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

NOTE 1: Measured from  $V_{DD}/2$  of the input to  $V_{DDX}/2$  of the output.

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

NOTE 3: 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  $V_{DDX}/2$ .

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

**TABLE 5B. AC CHARACTERISTICS,  $V_{DD} = 3.3V \pm 5\%$ ,  $V_{DD1} = V_{DD2} = 2.5V \pm 5\%$ ,  $T_A = -40^\circ$  TO  $85^\circ C$**

Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
$f_{MAX}$	Onput Frequency				200	MHz
$t_{pLH}$	Propagation Delay; NOTE 1	$f \leq 200MHz$		3.25		ns
$tsk(o)$	Output Skew; NOTE 2, 4	Measured on rising edge @ $V_{DDX}/2$		250		ps
$tsk(pp)$	Part-to-Part Skew; NOTE 3, 4	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	$f \leq 133MHz$		50		%

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

NOTE 1: Measured from  $V_{DD}/2$  of the input to  $V_{DDX}/2$  of the output.

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

NOTE 3: 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  $V_{DDX}/2$ .

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

**TABLE 5C. AC CHARACTERISTICS,  $V_{DD} = V_{DD1} = V_{DD2} = 2.5V \pm 5\%$ ,  $T_A = -40^\circ$  TO  $85^\circ C$**

Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
$f_{MAX}$	Onput Frequency				133	MHz
$t_{pLH}$	Propagation Delay; NOTE 1	$f \leq 200MHz$		3		ns
$tsk(o)$	Output Skew; NOTE 2, 4	Measured on rising edge @ $V_{DDX}/2$		250		ps
$tsk(pp)$	Part-to-Part Skew; NOTE 3, 4	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	$f \leq 133MHz$		50		%

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

NOTE 1: Measured from  $V_{DD}/2$  of the input to  $V_{DDX}/2$  of the output.

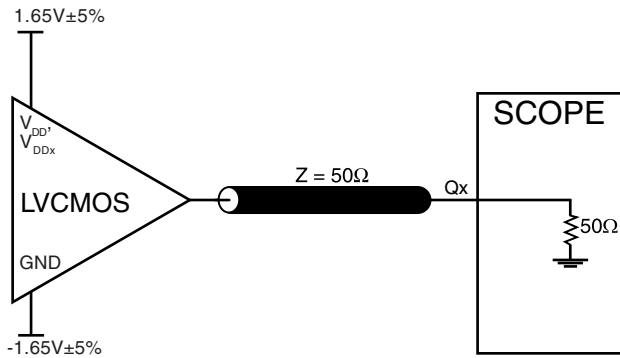
NOTE 2: Defined as skew between outputs at the same supply voltage and with equal load conditions. Measured at  $V_{DDX}/2$ .

NOTE 3: 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  $V_{DDX}/2$ .

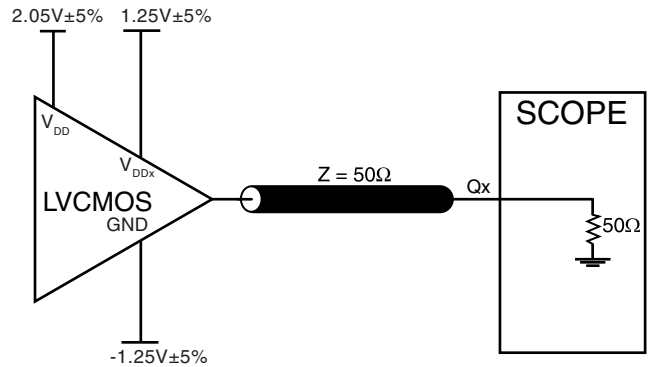
NOTE 4: This parameter is defined in accordance with JEDEC Standard 65.



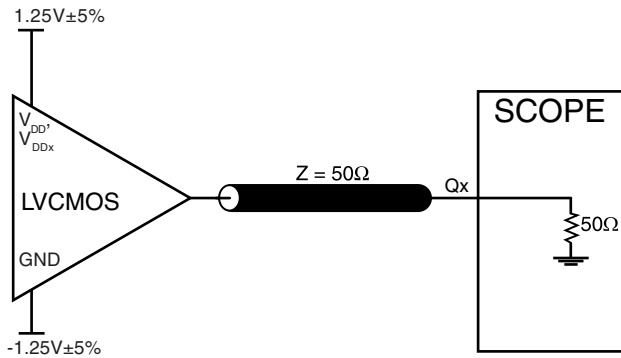
**PARAMETER MEASUREMENT INFORMATION**



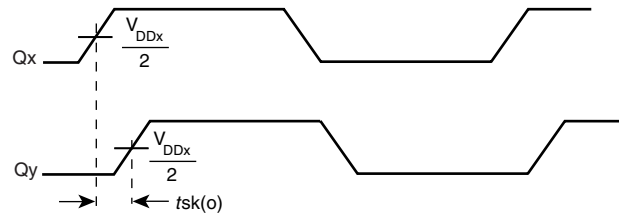
**3.3V CORE/ 3.3V OUTPUT LOAD AC TEST CIRCUIT**



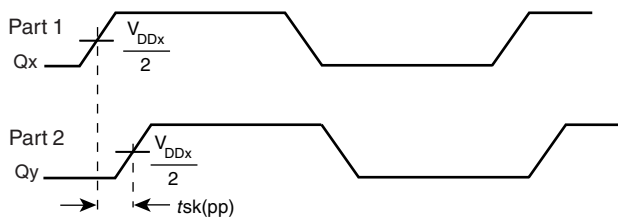
**3.3V CORE/2.5V OUTPUT LOAD AC TEST CIRCUIT**



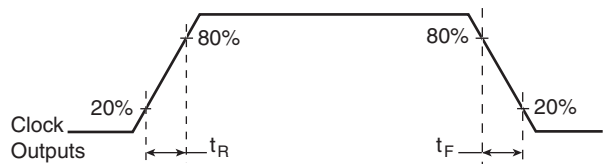
**2.5V CORE/ 2.5V OUTPUT LOAD AC TEST CIRCUIT**



**OUTPUT SKEW**



**PART-TO-PART SKEW**



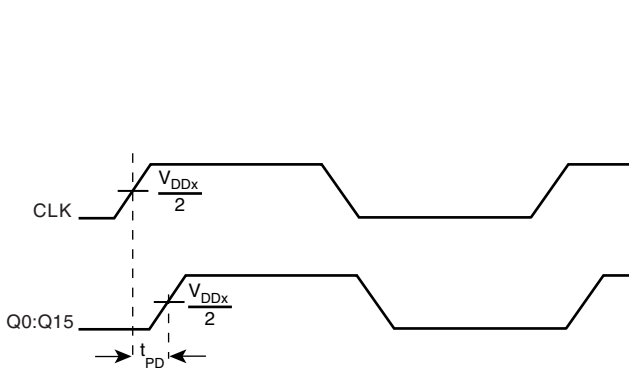
**OUTPUT RISE/FALL TIME**



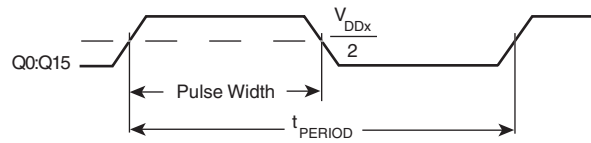
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**PROPAGATION DELAY**



$$odc = \frac{t_{PW}}{t_{PERIOD}}$$

**OUTPUT DUTY CYCLE/PULSE WIDTH/PERIOD**





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LVCMOS / LVTTTL FANOUT BUFFER

## RELIABILITY INFORMATION

TABLE 6.  $\theta_{JA}$  vs. AIR FLOW TABLE FOR 32 LEAD LQFP

$\theta_{JA}$ 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

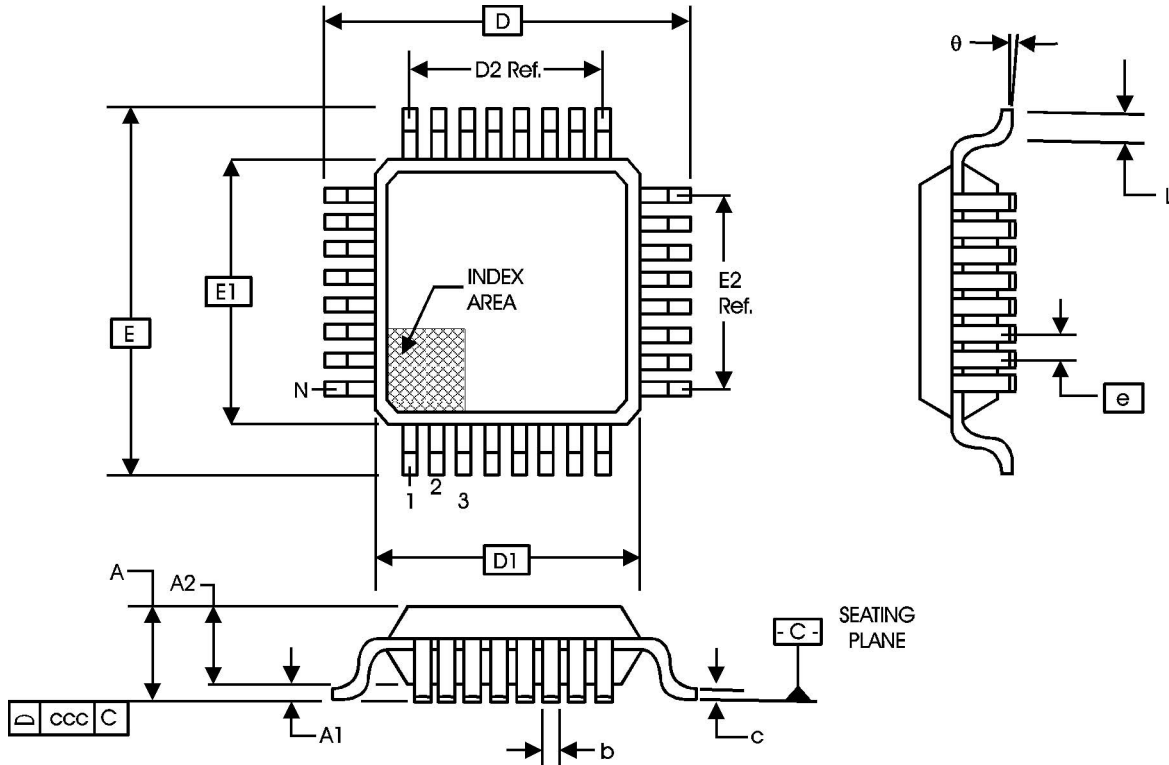
**NOTE:** Most modern PCB designs use multi-layered boards. The data in the second row pertains to most designs.

### TRANSISTOR COUNT

The transistor count for ICS8343I-01 is: 985



**PACKAGE OUTLINE - Y SUFFIX FOR 32 LEAD LQFP**



**TABLE 7. PACKAGE DIMENSIONS**

JEDEC VARIATION ALL DIMENSIONS IN MILLIMETERS			
SYMBOL	BBA		
	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

Reference Document: JEDEC Publication 95, MS-026



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**TABLE 8. ORDERING INFORMATION**

Part/Order Number	Marking	Package	Count	Temperature
ICS8343AYI-01	ICS8343AYI-01	32 Lead LQFP	250 per tray	-40°C to 85°C
ICS8343AYI-01T	ICS8343AYI-01	32 Lead LQFP on Tape and Reel	1000	-40°C to 85°C

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