Low-Voltage CMOS Octal Buffer With 5V Tolerant Inputs and Outputs

General Description

The ET74LCX244 is a high performance, non-inverting octal buffer operating from a 2.3 to 5.5V supply. High impedance TTL compatible inputs significantly reduce current loading to input drivers while TTL compatible outputs offer improved switching noise performance. A VI specification of 5.5V allows ET74LCX244 inputs to be safely driven from 5V devices.

The ET74LCX244 is suitable for memory address driving and all TTL level bus oriented transceiver applications. Current drive capability is 24mA at the outputs. The Output Enable (OE) input, when HIGH, disable the output by placing them in a HIGH Z condition.

Features

- Designed for 2.3 to 5.5V VCC Operation
- 5V Tolerant-Interface Capability With 5V TTL Logic
- Supports Live Insertion and Withdrawal
- IOFF Specification Guarantees High Impedance When VCC = 0 V
- LVTTL Compatible
- LVCMOS Compatible
- 24mA Balanced Output Sink and Source Capability
- Near Zero Static Supply Current in All Three Logic States (10uA) Substantially Reduces System Power Requirements
- Latch up Performance Exceeds 500mA
- ESD Performance:

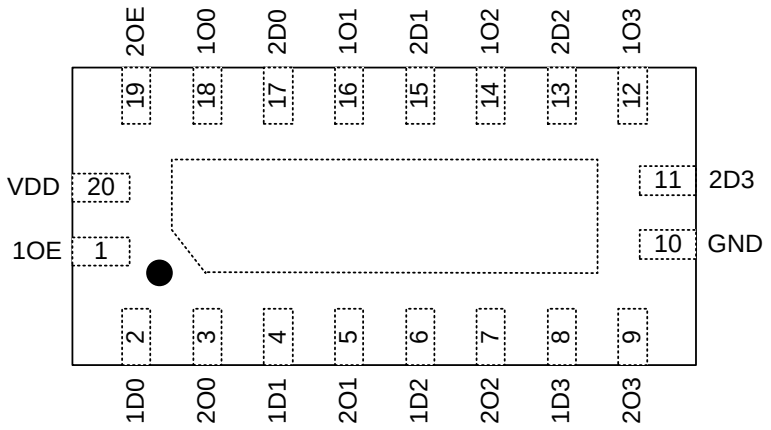
  -- Human Body Model >2000V

  -- Machine Model >200V
- These Devices are Pb. Free, Halogen Free/BFR Free and are RoHS Compliant
- Part No. and Package
- Packages:QFN20,SOP20,TSSOP20

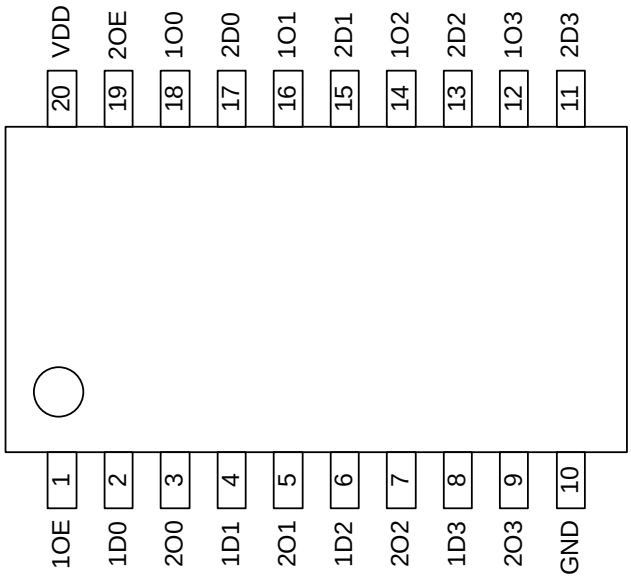
Device Information

Part No.	Package	Size
ET74LCX244	QFN20	2.5mm×3.5mm
ET74LCX244M	SOP20	12.75mm×10.3mm
ET74LCX244V	TSSOP20	6.5mm×6.4mm

Pin Configuration



QFN20



SOP20/TSSOP20

Figure1. Top View

Pin Function

QFN20/SOP20/TSSOP20

Pin No.	Symbol	Description
1,19	nOE	Output Enable Inputs
2,4,6,8	1Dn	Data Inputs
18,16,14,12	1On	3-State Outputs
17,15,13,11	2Dn	Data Inputs
3,5,7,9	2On	3-State Outputs
10	GND	Ground
20	VCC	Supply Voltage

Block Diagram

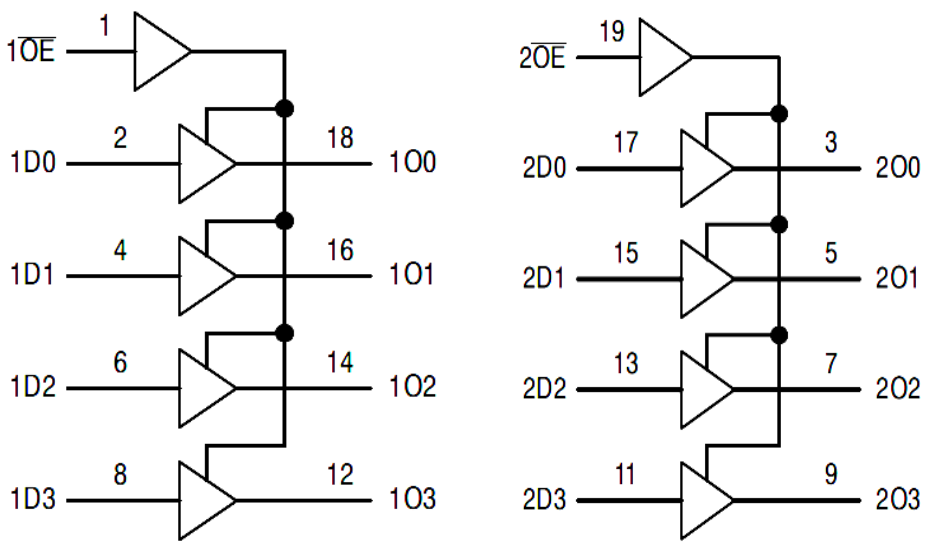


Figure2. Logic Symbol

Functional Description

Function Table

Input		Output
1OE/2OE	1Dn/2Dn	1On/2On
Low voltage level	Low voltage level	Low voltage level
Low voltage level	High voltage level	High voltage level
High voltage level	High or Low voltage level	High Impedance State

Absolute Maximum Ratings

Symbol	Parameter	Conditions	Min / Max	Unit
V_{CC}	Supply Voltage		-0.5 to +7.0	V
V_I	Input Voltage		-0.5 ≤ V_I ≤ +7.0	V
V_O	Output Voltage	Output in 3-State	-0.5 ≤ V_O ≤ +7.0	V
		Output in High or Low State (1)	-0.5 ≤ V_O ≤ V_{CC}+0.5	V
I_{IK}	Input Diode Current	V_I < 0 V	-50	mA
I_{OK}	Output Diode Current	V_O < 0 V	-50	mA
		V_O > V_{CC}	+50	mA
I_O	Output Source/Sink Current		±50	mA
I_{CC}	Supply Current Per Supply Pin		±100	mA
I_{GND}	Ground Current Per Ground Pin		±100	mA
T_{STG}	Storage Temperature Range		-65 to +150	°C
T_J	Max Junction Temperature		150	°C
θ_{JA}	Thermal Resistance		140	°C/W

Note1： Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

I_O absolute maximum rating must be observed.

Recommended operating conditions

Symbol	Parameter		Min	Typ	Max	Unit
V_{CC}	Supply Voltage	Operating	2.0	2.5, 3.3	5.5	V
		Data Retention Only	1.5	2.5, 3.3	5.5	
V_I	Input Voltage		0		5.5	V
V_O	Output Voltage	HIGH or LOW State	0		V_{CC}	V
		3-State	0		5.5	
I_{OH}	HIGH Level Output Current	V_{CC} = 3.0V - 3.6V			-24	mA
		V_{CC} = 2.7V - 3.0V			-12	
I_{OL}	LOW Level Output Current	V_{CC} = 3.0V - 3.6V			24	mA
		V_{CC} = 2.7V - 3.0V			12	
T_A	Operating Free-Air Temperature		-55		+125	°C
Δt/ΔV	Input Transition Rise or Fall Rate, V_{IN} from 0.8V to 2.0V, V_{CC} = 3.0 V		0		10	ns/V

Electrical Characteristics

DC Electrical Characteristics

Symbol	Characteristic	Condition	T_A = -55°C to +125°C		Unit
			Min	Max	
V_{IH}	HIGH Level Input Voltage(2)	2.3 V ≤ V_{CC} ≤ 2.7 V	1.7		V
		2.7 V ≤ V_{CC} ≤ 3.6 V	2.0		V
V_{IL}	LOW Level Input Voltage(2)	2.3 V ≤ V_{CC} ≤ 2.7 V		0.7	V
		2.7 V ≤ V_{CC} ≤ 3.6 V		0.8	V
V_{OH}	HIGH Level Output Voltage	2.3 V ≤ V_{CC} ≤ 3.6 V I_{OL} = 100 uA	V_{CC} - 0.2		V
		V_{CC} = 2.3 V，I_{OH} = -8 mA	1.8		
		V_{CC} = 2.7 V，I_{OH} = -12 mA	2.2		
		V_{CC} = 3.0 V，I_{OH} = -18 mA	2.4		
		V_{CC} = 3.0 V, I_{OH} = -24 mA	2.2		
V_{OL}	LOW Level Output Voltage	2.3 V ≤ V_{CC} ≤ 3.6 V I_{OL} = 100 uA		0.2	V
		V_{CC} = 2.3 V, I_{OL} = 8 mA		0.6	
		V_{CC} = 2.7 V, I_{OL} = 12 mA		0.4	
		V_{CC} = 3.0 V,I_{OL} = 16 mA		0.4	
		V_{CC} = 3.6 V,I_{OL} = 24 mA		0.55	
I_{OZ}	3-State Output Current	V_{CC} = 3.6 V, V_{IN} = V_{IH} or V_{IL} V_{OUT} = 0 to 5.5 V		±5	uA
I_{OFF}	Power Off Leakage Current	V_{CC} = 0, V_{IN} = 5.5 V or V_{OUT} = 5.5 V		10	uA
I_{IN}	Input Leakage Current	V_{CC} = 3.6 V V_{IN} = 5.5 V or GND		±5	uA
I_{CC}	Quiescent Supply Current	V_{CC} = 3.6 V V_{IN} = 5.5 V or GND		10	uA
ΔI_{CC}	Increase in I_{CC} per Input	2.3 ≤ V_{CC} ≤ 3.6 V V_{IH} = V_{CC} - 0.6 V		500	uA

Note2： These values of V_I are used to test DC electrical characteristics only.

AC Electrical Characteristics

($t_R = t_F$ = 2.5 ns; R_L = 500Ω)

Symbol	Parameter	T_A = -55°C to +125°C						Unit
		V_{CC} = 3.0V to 3.6V		V_{CC} = 2.7V		V_{CC} = 2.5V ± 0.2		
		C_L= 50 pF		C_L= 50 pF		C_L= 30 pF		
		Min	Max	Min	Max	Min	Max	
t_{PLH}	Propagation Delay	1.5	6.5	1.5	7.5	1.5	7.8	ns
t_{PHL}	Input to Output	1.5	6.5	1.5	7.5	1.5	7.8	
t_{PZH}	Output Enable Time to	1.5	8.0	1.5	9.0	1.5	10	ns
t_{PZL}	High and Low Level	1.5	8.0	1.5	9.0	1.5	10	
t_{PHZ}	Output Disable Time From	1.5	7.0	1.5	8.0	1.5	8.4	ns
t_{PLZ}	High and Low Level	1.5	7.0	1.5	8.0	1.5	8.4	
t_{OSHL}	Output-to-Output Skew (3)		1.0					ns
t_{OSLH}			1.0					

Note3: Skew is defined as the absolute value of the difference between the actual propagation delay for any two separate outputs of the same device. The specification applies to any outputs switching in the same direction, either HIGH-to-LOW (tOSHL) or LOW-to-HIGH (tOSLH); parameter guaranteed by design.

Dynamic Switching Characteristics

Symbol	Characteristic	Condition	T_A = +25°C			Unit
			Min	Typ	Max	
V_{OLP}	Dynamic LOW Peak Voltage (4)	V_{CC} = 3.3 V, C_L = 50 pF, V_{IH} = 3.3 V, V_{IL} = 0 V		0.8		V
		V_{CC} = 2.5 V, C_L = 30 pF, V_{IH} = 2.5 V, V_{IL} = 0 V		0.6		
V_{OLV}	Dynamic LOW Valley Voltage (4)	V_{CC} = 3.3 V, C_L = 50 pF, V_{IH} = 3.3 V, V_{IL} = 0 V		-0.8		V
		V_{CC} = 2.5 V, C_L = 30 pF, V_{IH} = 2.5 V, V_{IL} = 0		-0.6		

Note4: Number of outputs defined as “n”. Measured with “n-1” outputs switching from HIGH-to-LOW or LOW-to-HIGH. The remaining output is measured in the LOW state.

Capacitance Characteristics

Symbol	Parameter	Condition	Typ	Unit
C_{IN}	Input Capacitance	V_{CC} = 3.3 V, V_I = 0 V or V_{CC}	7	pF
C_{OUT}	Output Capacitance	V_{CC} = 3.3 V, V_I = 0 V or V_{CC}	8	pF
C_{PD}	Power Dissipation Capacitance	10 MHz, V_{CC} = 3.3 V,V_I = 0 V or V_{CC}	25	pF

PROPAGATION DELAYS

$t_R = t_F$ = 2.5 ns, 10% to 90%; f = 1 MHz; t_W = 500 ns

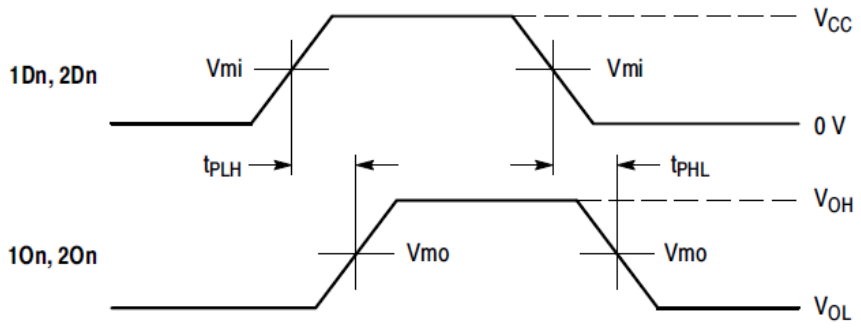


Figure3. t_{PLH} / t_{PHL}

OUTPUT ENABLE AND DISABLE TIMES

$t_R = t_F$ = 2.5 ns, 10% to 90%; f = 1 MHz; t_W = 500 ns

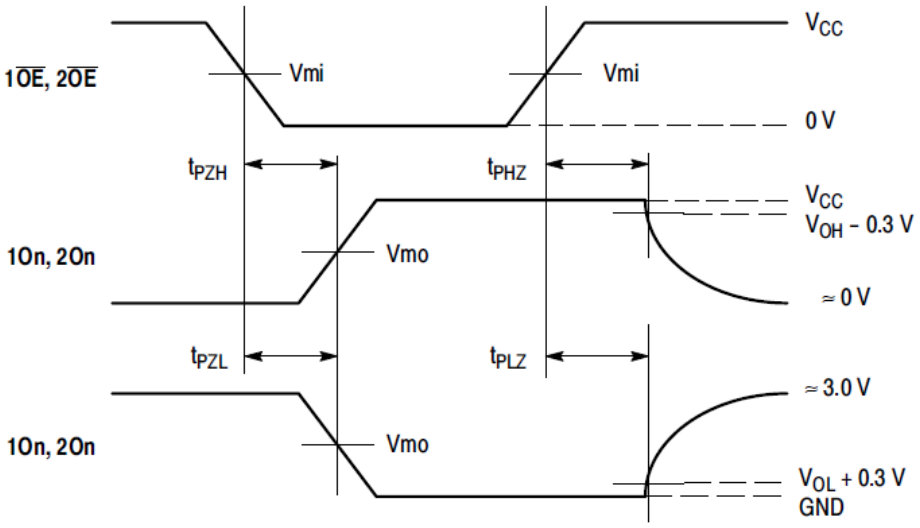


Figure4. t_{PZH} / t_{PZL} / t_{PHZ} / t_{PLZ}

AC Waveforms

Symbol	V_{CC}		
	3.3 V ±. 0.3 V	2.7 V	2.5 V ±. 0.2 V
V_{mi}	1.5 V	1.5 V	$V_{CC}/2$
V_{mo}	1.5 V	1.5 V	$V_{CC}/2$
V_{HZ}	V_{OL} + 0.3 V	V_{OL} + 0.3 V	V_{OL} + 0.15 V
V_{LZ}	V_{OH} - 0.3 V	V_{OH} - 0.3 V	V_{OH} - 015 V

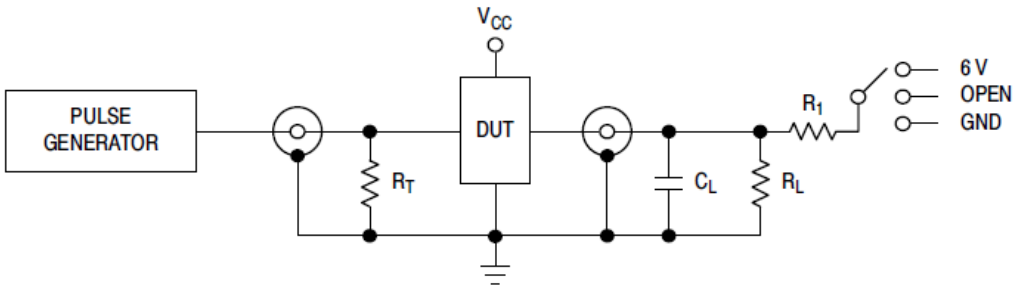


Figure5. Test Circuit

Test Item	Switch Mode
t_{PLH}, t_{PHL}	Open
t_{PZL}, t_{PLZ}	6 V at V_{CC} = 3.3 ± 0.3 V 6 V at V_{CC} = 2.5 ± 0.2 V
Open Collector/Drain t_{PLH} and t_{PHL}	6 V
t_{PZH}, t_{PHZ}	GND

C_L= 50 pF at V_{CC} = 3.3 ± 0.3 V or equivalent (includes jig and probe capacitance)

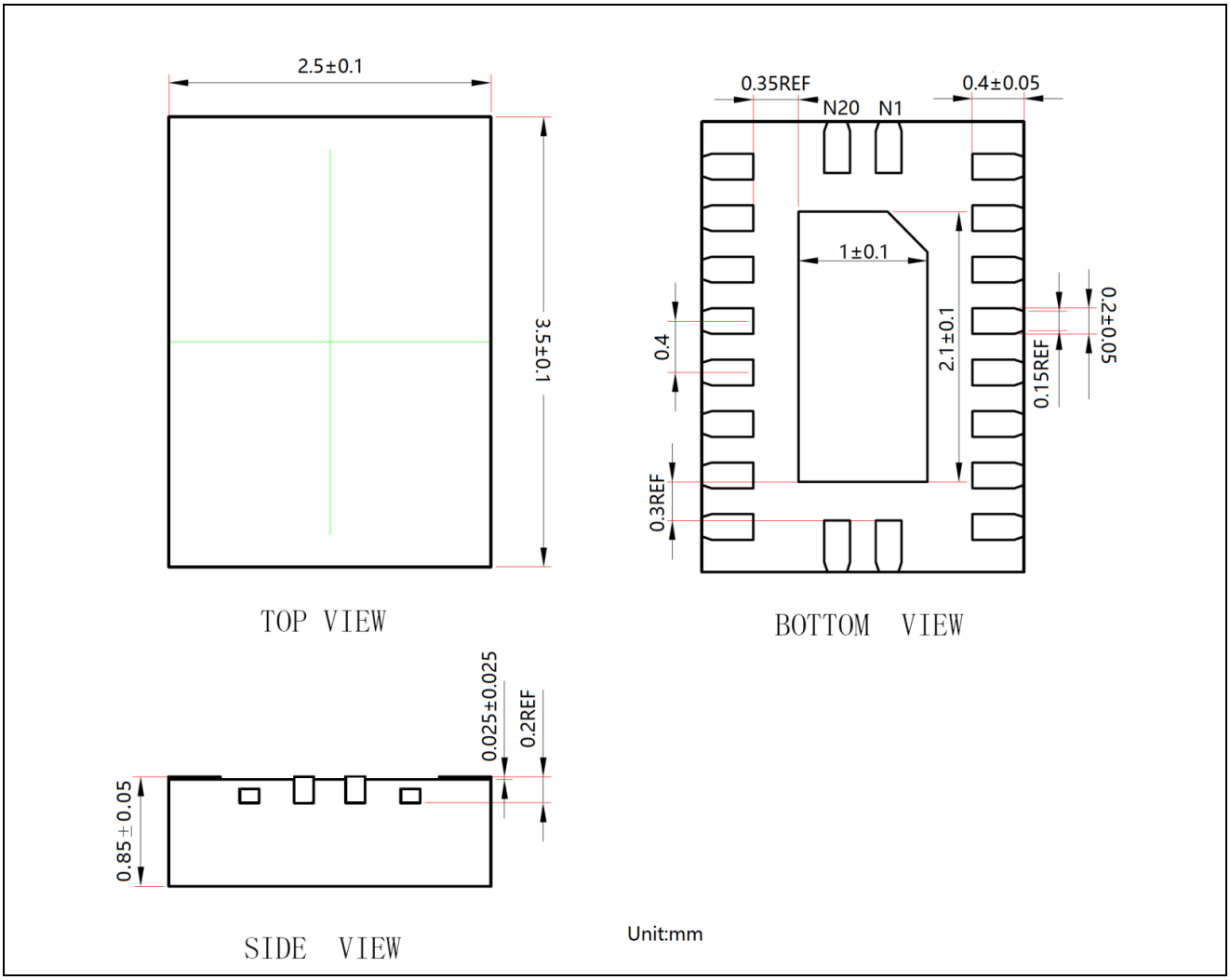
C_L= 30 pF at V_{CC} = 2.5 ± 0.2 V or equivalent (includes jig and probe capacitance)

R_L= R_1 = 500Ω or equivalent

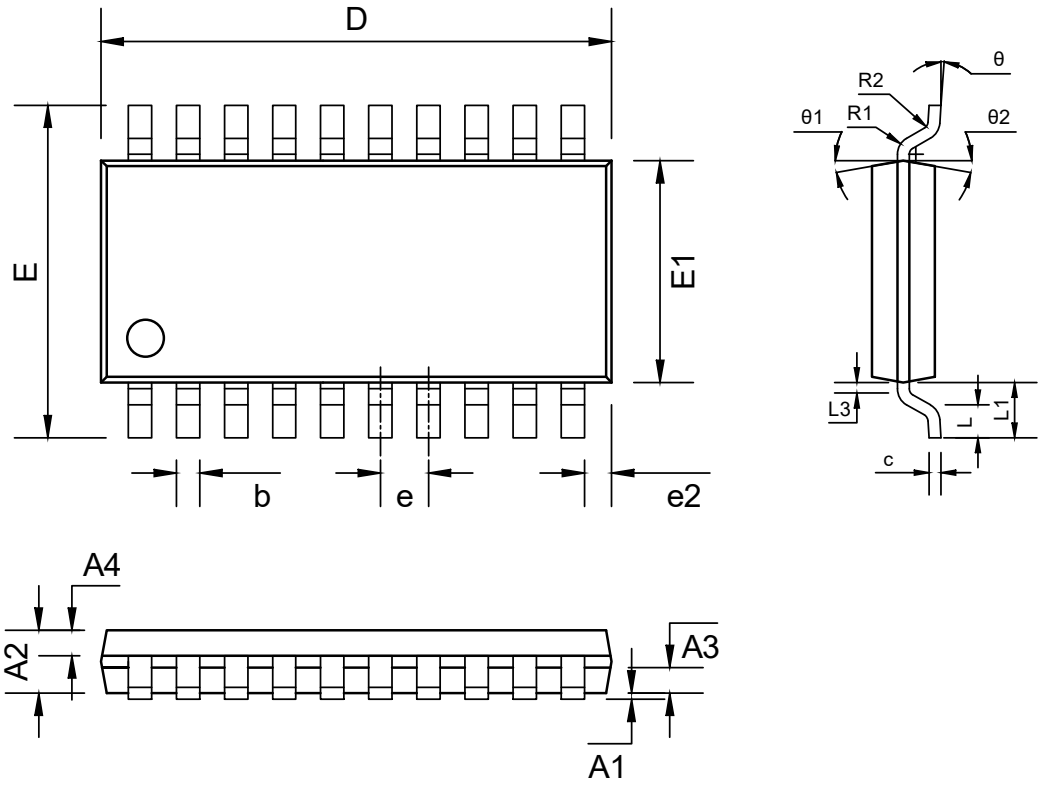
R_T = Z_{OUT} of pulse generator (typically 50Ω)

Package Dimension

QFN20



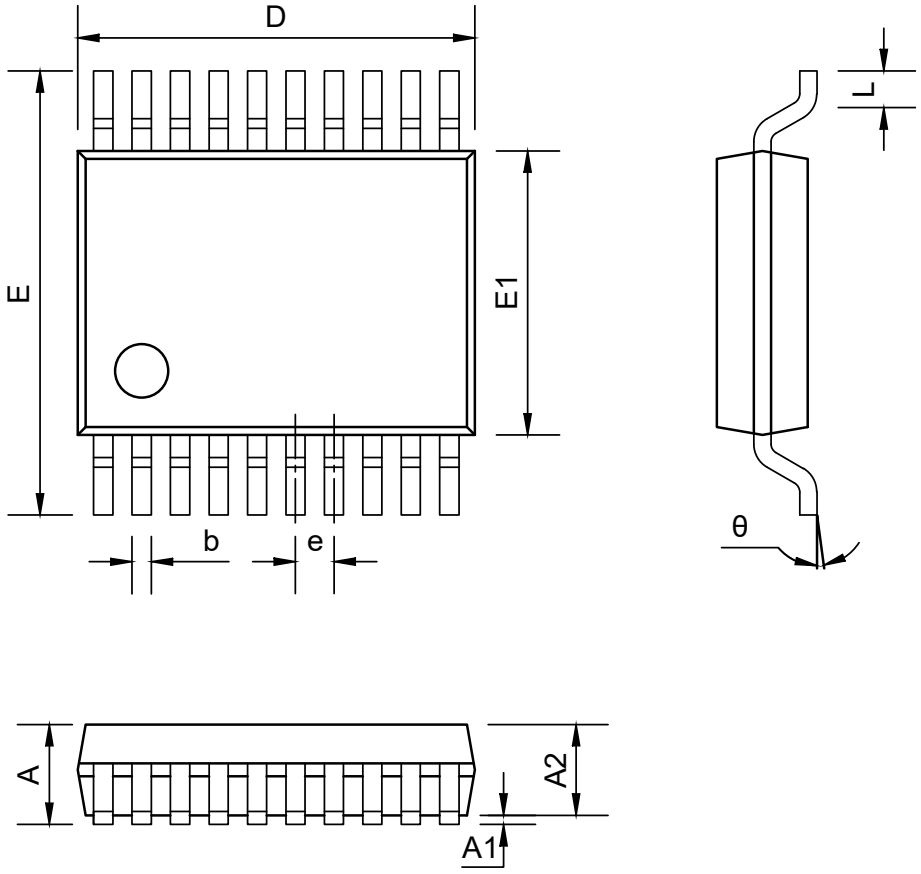
SOP20



Dimensions Table (Units:mm)

SYMBOL	MIN	MAX	SYMBOL	MIN	MAX
A1	0.1	0.205	e2	0.45	0.46
A2	2.1	2.5	L	0.764	0.946
A3	0.938	1.038	L1	1.303	1.503
A4	0.938	1.038	L3	0.18REF	
b	0.356	0.456	R1	0.20REF	
c	0.246	0.289	R2	0.30REF	
D	12.5	12.9	θ	0°	10°
E	10.206	10.406	θ1	12°REF	
E1	7.4	7.6	θ2	12°REF	
e	1.24	1.30			

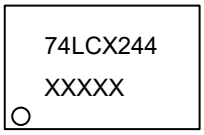
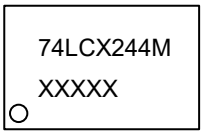
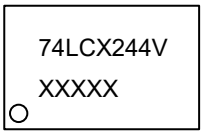
TSSOP20



Dimensions Table (Units:mm)

SYMBOL	MIN	NOM	MAX
A	--	--	1.20
A1	0.05	--	0.15
A2	0.90	--	1.05
b	0.20	--	0.28
D	6.35	6.45	6.55
E	6.20	6.40	6.60
E1	4.30	4.40	4.50
e	0.65BSC		
L	0.45	0.60	0.75
θ	0°	--	8°

Marking

		
QFN20 74LCX244-Part Number XXXXX-Tracking Number	SOP20 74LCX244M-Part Number XXXXX-Tracking Number	TSSOP20 74LCX244V-Part Number XXXXX-Tracking Number

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
1.0	2016-07-29	Original Version	Shi Liang Jun	Shi Liang Jun	Zhu Jun Li
1.1	2016-12-15	Update package dimension	Shi Liang Jun	Shi Liang Jun	Zhu Jun Li
1.2	2022-03-29	Update package	Shi Liang Jun	Shi Liang Jun	Zhu Jun Li
1.3	2022-08-29	Update Typeset	Shibo	Shi Liang Jun	Zhu Jun Li
1.4	2024-08-16	Update Marking	Wangp	Luh	Liujy