

## OCTAL BUS BUFFER

**TC74LVQ240 INVERTED, 3-STATE OUTPUTS**

**TC74LVQ241 NON-INVERTED, 3-STATE OUTPUTS**

**TC74LVQ244 NON-INVERTED, 3-STATE OUTPUTS**

The TC74LVQ240, 241 and 244 are high speed CMOS OCTAL BUS BUFFERs fabricated with silicon gate and double-layer metal wiring C<sup>2</sup>MOS technology.

Designed for use in 3.3 Volt systems, they achieve high speed operation while maintaining the CMOS low power dissipation.

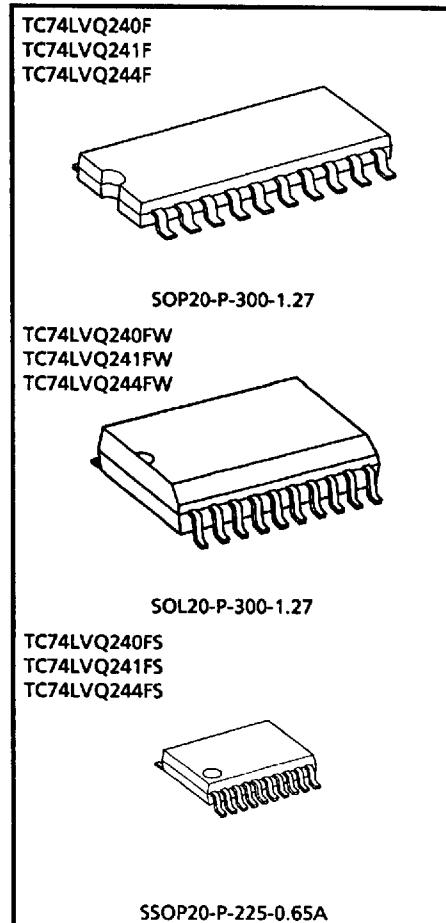
The TC74LVQ240 is an inverting 3-state buffer having two active-low output enables. The TC74LVQ241 and TC74LVQ244 are non-inverting 3-state buffers that differ only in that the LVQ241 has one active-high and one active-low output enable, and the LVQ244 has two active-low output enables.

These devices are designed to be used with 3-state memory address drivers, etc.

All inputs are equipped with protection circuits against static discharge or transient excess voltage.

## FEATURES

- High speed :  $t_{pd} = 5.4\text{ns}$  (Typ.) ( $V_{CC} = 3.3\text{V}$ )
- Low power dissipation :  $I_{CC} = 4\mu\text{A}$  (Max.) ( $T_a = 25^\circ\text{C}$ )
- Input voltage level :  $V_{IL} = 0.8\text{V}$  (Max.) ( $V_{CC} = 3\text{V}$ )  
 $V_{IH} = 2.0\text{V}$  (Min.) ( $V_{CC} = 3\text{V}$ )
- Symmetrical output impedance :  $|I_{OH}| = I_{OL} = 12\text{mA}$  (Min.)
- Balanced propagation delays :  $t_{PLH} \approx t_{PHL}$
- Pin and function compatible with 74HC240 / 241 / 244



Weight  
SOP20-P-300-1.27 : 0.22g (Typ.)  
SOL20-P-300-1.27 : 0.46g (Typ.)  
SSOP20-P-225-0.65A : 0.09g (Typ.)

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In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent products specifications. Also, please keep in mind the precautions and conditions set forth in the TOSHIBA Semiconductor Reliability Handbook.

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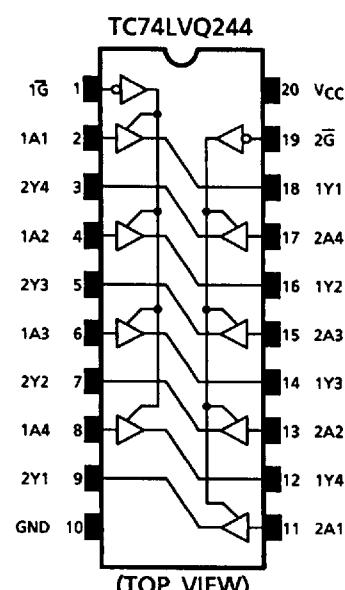
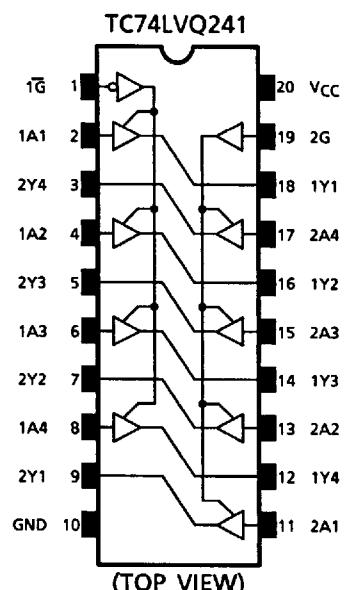
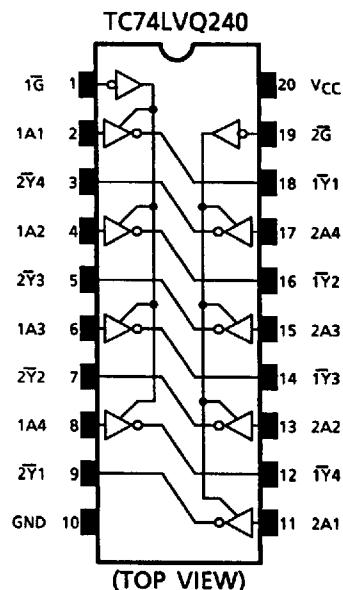
1996-09-09

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**TOSHIBA**  
**INTEGRATED CIRCUIT**  
**TECHNICAL DATA**

TC74LVQ240F, C74LVQ240FW, C74LVQ240FS  
 TC74LVQ241F, C74LVQ241FW, C74LVQ241FS  
 TC74LVQ244F, C74LVQ244FW, C74LVQ244FS

**PIN ASSIGNMENT**



**TRUTH TABLE**

INPUTS			OUTPUTS	
$\bar{G}$	$G^\Delta$	$A_n$	$Y_n$	$\bar{Y}_n^{\Delta\Delta}$
L	H	L	L	H
L	H	H	H	L
H	L	X	Z	Z

$\Delta$  : for TC74LVQ241 only

$\Delta\Delta$  : for TC74LVQ240 only

X : Don't Care

Z : High Impedance

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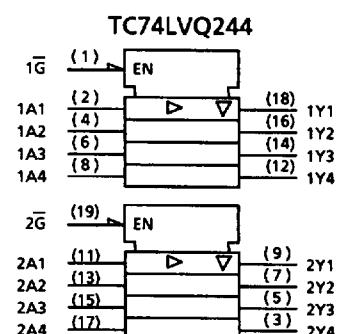
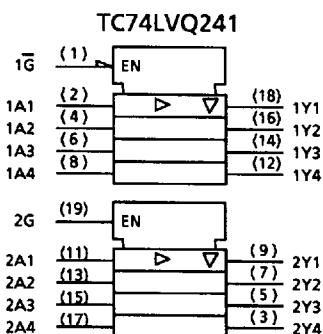
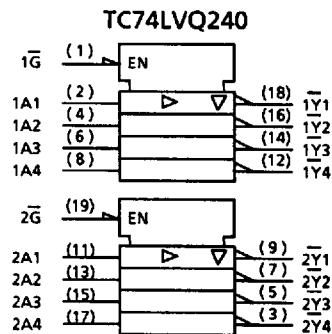
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TC74LVQ244F, C74LVQ244FW, C74LVQ244FS

IEC LOGIC SYMBOL



MAXIMUM RATINGS

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage Range	$V_{CC}$	-0.5~7.0	V
DC Input Voltage	$V_{IN}$	-0.5~ $V_{CC} + 0.5$	V
DC Output Voltage	$V_{OUT}$	-0.5~ $V_{CC} + 0.5$	V
Input Diode Current	$I_{IK}$	$\pm 20$	mA
Output Diode Current	$I_{OK}$	$\pm 50$	mA
DC Output Current	$I_{OUT}$	$\pm 50$	mA
DC $V_{CC}$ / Ground Current	$I_{CC}$	$\pm 200$	mA
Power Dissipation	$P_D$	180	mW
Storage Temperature	$T_{stg}$	-65~150	°C

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	$V_{CC}$	2.0~3.6	V
Input Voltage	$V_{IN}$	0~ $V_{CC}$	V
Output Voltage	$V_{OUT}$	0~ $V_{CC}$	V
Operating Temperature	$T_{opr}$	-40~85	°C
Input Rise And Fall Time	$dt/dv$	0~100	ns/V

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**ELECTRICAL CHARACTERISTICS**

DC characteristics

PARAMETER	SYM-BOL	TEST CONDITION	V <sub>CC</sub> (V)	Ta = 25°C			Ta = - 40~85°C		UNIT	
				MIN.	TYP.	MAX.	MIN.	MAX.		
Input Voltage	"H" Level	V <sub>IH</sub>	3.0	2.0	—	—	2.0	—	V	
	"L" Level	V <sub>IL</sub>	3.0	—	—	0.8	—	0.8		
Output Voltage	"H" Level	V <sub>OH</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> = - 50μA	3.0	2.9	3.0	—	2.9	V
	"L" Level	V <sub>OL</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 50μA	3.0	2.58	—	—	2.48	
3-State Output Off-State Current	I <sub>OZ</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> V <sub>OUT</sub> = V <sub>CC</sub> or GND	3.6	—	—	—	±0.5	—	±5.0	μA
Input Leakage Current	I <sub>IN</sub>	V <sub>IN</sub> = V <sub>CC</sub> or GND	3.6	—	—	—	±0.1	—	±1.0	μA
Quiescent Supply Current	I <sub>CC</sub>	V <sub>IN</sub> = V <sub>CC</sub> or GND	3.6	—	—	—	4.0	—	40.0	μA

AC characteristics (Input t<sub>r</sub> = t<sub>f</sub> = 3ns, C<sub>L</sub> = 50pF, R<sub>L</sub> = 500Ω)

PARAMETER	SYMBOL	TEST CONDITION	V <sub>CC</sub> (V)	Ta = 25°C			Ta = - 40~85°C		UNIT
				MIN.	TYP.	MAX.	MIN.	MAX.	
Propagation Delay Time (TC74LVQ240)	t <sub>pLH</sub>		2.7	—	7.2	14.1	1.0	15.0	ns
	t <sub>pHL</sub>		3.3 ± 0.3	—	6.0	10.0	1.0	10.5	
Propagation Delay Time (TC74LVQ241 / 244)	t <sub>pLH</sub>		2.7	—	7.8	13.4	1.0	15.0	ns
	t <sub>pHL</sub>		3.3 ± 0.3	—	6.5	9.5	1.0	10.5	
Output Enable Time	t <sub>pZL</sub>		2.7	—	9.5	18.3	1.0	19.0	ns
	t <sub>pZH</sub>		3.3 ± 0.3	—	7.9	13.0	1.0	13.5	
Output Disable Time	t <sub>pLZ</sub>		2.7	—	7.2	19.0	1.0	20.0	ns
	t <sub>pHZ</sub>		3.3 ± 0.3	—	6.0	13.5	1.0	14.0	
Output To Output Skew	t <sub>osLH</sub>	(Note 1)	2.7	—	—	1.5	—	1.5	ns
	t <sub>osHL</sub>		3.3 ± 0.3	—	—	1.5	—	1.5	
Input Capacitance	C <sub>IN</sub>	(Note 2)	—	5	10	—	—	10	pF
Output Capacitance	C <sub>OUT</sub>		—	10	—	—	—	—	pF
Power Dissipation Capacitance	C <sub>PD</sub>	(Note 3)	—	30	—	—	—	—	pF

(Note 1) Parameter guaranteed by design.

$$(t_{osLH} = |t_{pLHm} - t_{pLHn}|, t_{osHL} = |t_{pHLm} - t_{pHLn}|)$$

(Note 2) Parameter guaranteed by design.

(Note 3) C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption.

Average operating current can be obtained by the equation :

$$I_{CC(\text{opr})} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/8 \text{ (per bit)}$$

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 TC74LVQ241F, C74LVQ241FW, C74LVQ241FS  
 TC74LVQ244F, C74LVQ244FW, C74LVQ244FS

Noise characteristics (Ta = 25°C, Input  $t_r = t_f = 3\text{ns}$ ,  $C_L = 50\text{pF}$ ,  $R_L = 500\Omega$ )

PARAMETER	SYMBOL	TEST CONDITION	V <sub>CC</sub> (V)	TYP.	LIMIT	UNIT
			3.3			
Quiet Output Maximum Dynamic V <sub>OL</sub>	V <sub>O LP</sub>		3.3	0.5	0.8	V
Quiet Output Minimum Dynamic V <sub>OL</sub>	V <sub>O LV</sub>		3.3	-0.5	-0.8	V
Minimum High Level Dynamic Input Voltage	V <sub>IHD</sub>		3.3	—	2.0	V
Maximum Low Level Dynamic Input Voltage	V <sub>ILD</sub>		3.3	—	0.8	V

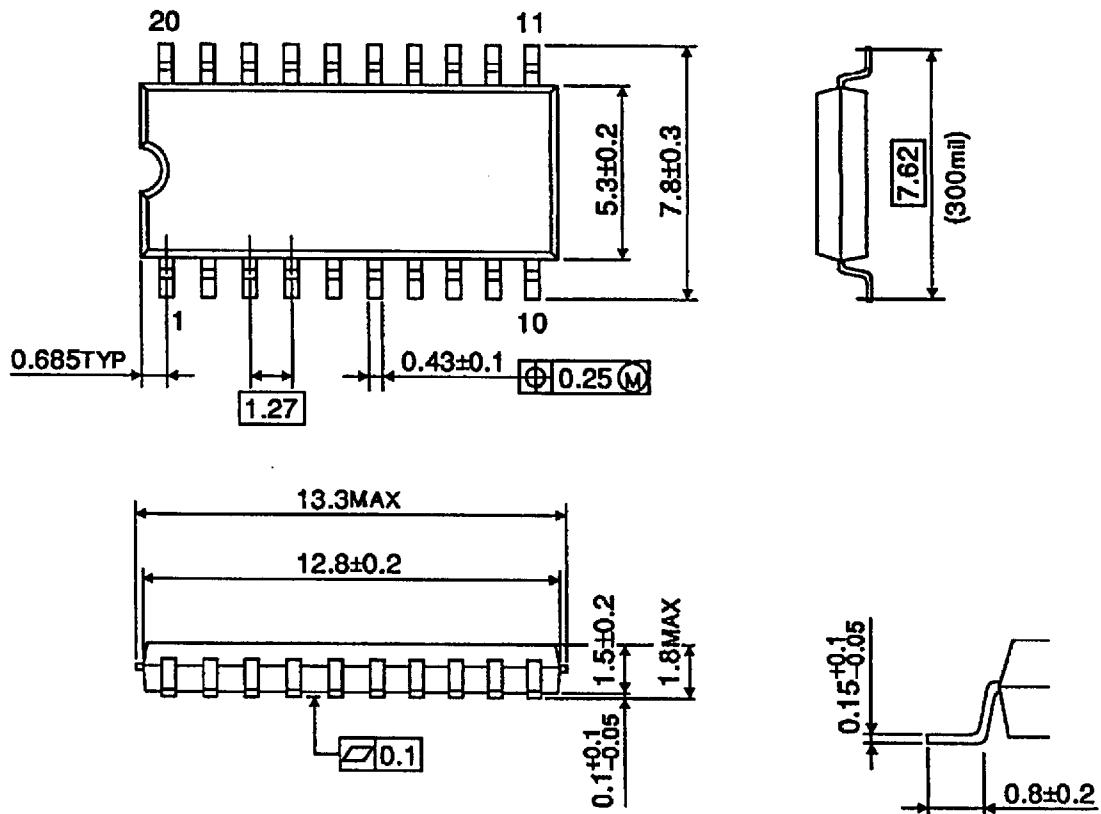
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**OUTLINE DRAWING**  
SOP20-P-300-1.27

Unit : mm



Weight : 0.22g (Typ.)

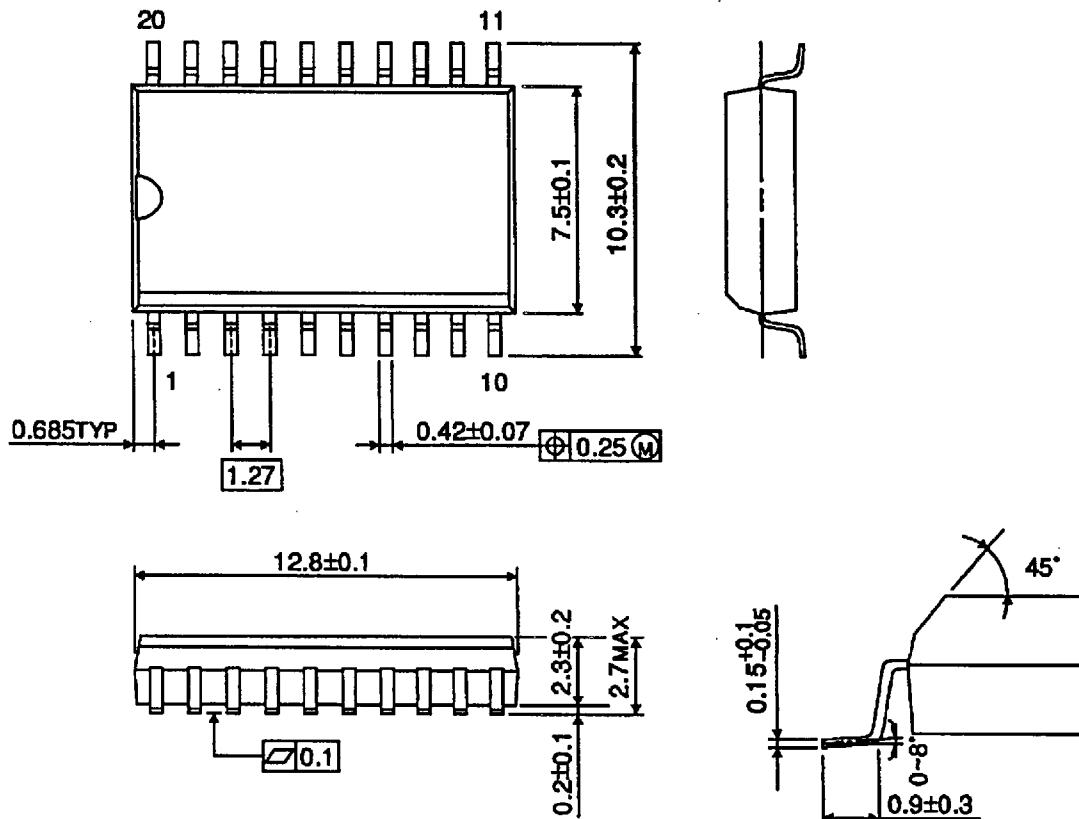
TC74LVQ240F - 6

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**TOSHIBA CORPORATION**

**OUTLINE DRAWING**  
SOL20-P-300-1.27

Unit : mm

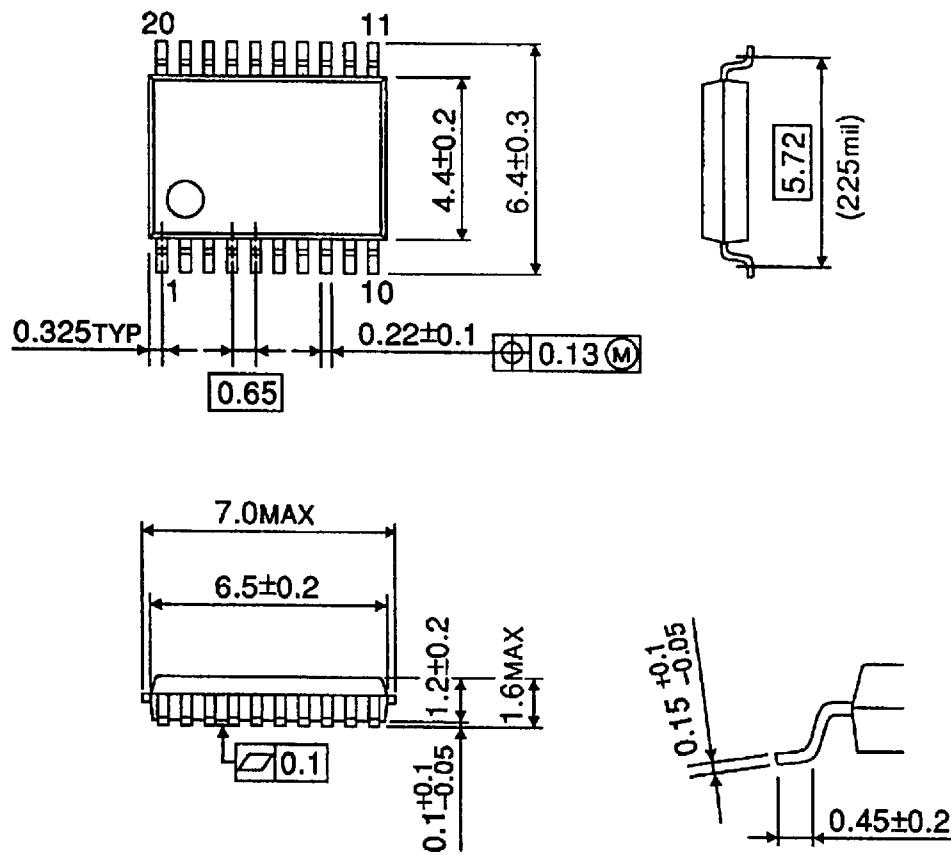


Weight : 0.46g (Typ.)

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**OUTLINE DRAWING**  
SSOP20-P-225-0.65A

Unit : mm



Weight : 0.09g (Typ.)

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