

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC7MZ240FK

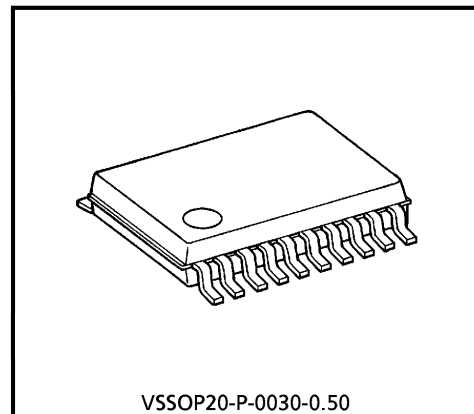
LOW VOLTAGE OCTAL BUS BUFFER (INVERTED) WITH 5V TOLERANT INPUTS AND OUTPUTS

The TC7MZ240 is a high performance CMOS OCTAL BUS BUFFER. Designed for use in 3.3 Volt systems, it achieves high speed operation while maintaining the CMOS low power dissipation.

The device is designed for low-voltage (3.3 V) V_{CC} applications, but it could be used to interface to 5 V supply environment for both inputs and outputs.

The TC7MZ240 is an inverting 3-state buffer having two active-low output enables. This device is designed to be used with 3-state memory address drivers, etc.

All inputs are equipped with protection circuits against static discharge.



VSSOP20-P-0030-0.50

Weight : 0.03 g (typ.)

Features

- Low voltage operation : $V_{CC} = 2.0 \sim 3.6 \text{ V}$
- High speed operation : $t_{pd} = 6.5 \text{ ns (max)}$
($V_{CC} = 3.0 \sim 3.6 \text{ V}$)
- Output current : $|I_{OH}|/I_{OL} = 24 \text{ mA (min)}$
($V_{CC} = 3.0 \text{ V}$)
- Latch-up performance : $\pm 500 \text{ mA}$
- Available in VSSOP (US20)
- Power down protection is provided on all inputs and outputs.
- Pin and function compatible with the 74 series
(74AC/VHC/HC/F/ALS/LS etc.) 240 type.

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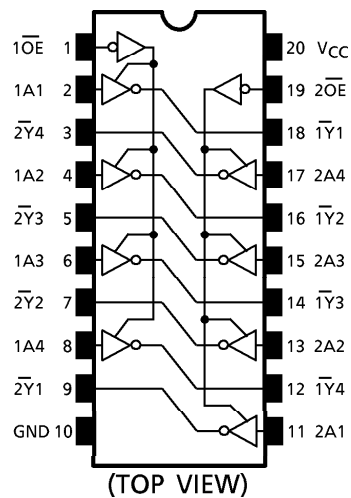
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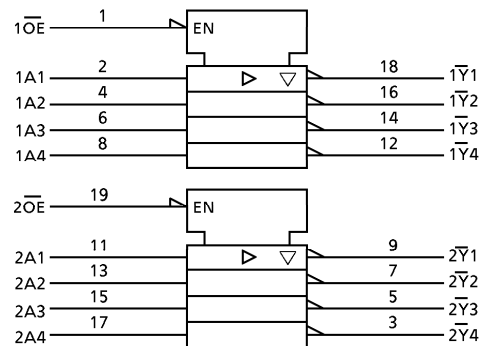
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Pin Assignment



IEC Logic Symbol



Truth Table

INPUTS		OUTPUTS
OE	An	
L	L	H
L	H	L
H	X	Z

X : Don't Care
Z : High Impedance

Maximum Ratings

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage Range	V_{CC}	- 0.5~7.0	V
DC Input Voltage	V_{IN}	- 0.5~7.0	V
DC Output Voltage	V_{OUT}	- 0.5~7.0 (Note 1)	V
		- 0.5~ V_{CC} + 0.5 (Note 2)	
Input Diode Current	I_{IK}	- 50	mA
Output Diode Current	I_{OK}	± 50 (Note 3)	mA
DC Output Current	I_{OUT}	± 50	mA
Power Dissipation	P_D	180	mW
DC V_{CC} /Ground Current	I_{CC}/I_{GND}	± 100	mA
Storage Temperature	T_{stg}	- 65~150	°C

(Note 1): Output in Off-State
(Note 2): High or Low State. I_{OUT} absolute maximum rating must be observed.
(Note 3): $V_{OUT} < GND$, $V_{OUT} > V_{CC}$

Recommended Operating Conditions

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V_{CC}	2.0~3.6	V
		1.5~3.6 (Note 4)	
Input Voltage	V_{IN}	0~5.5	V
Output Voltage	V_{OUT}	0~5.5 (Note 5)	V
		0~ V_{CC} (Note 6)	
Output Current	I_{OH}/I_{OL}	± 24 (Note 7)	mA
		± 12 (Note 8)	
Operating Temperature	T_{opr}	-40~85	°C
Input Rise And Fall Time	dt/dv	0~10 (Note 9)	ns/V

(Note 4): Data Retention Only

(Note 5): Output in Off-State

(Note 6): High or Low State

(Note 7): $V_{CC} = 3.0\sim 3.6$ V(Note 8): $V_{CC} = 2.7\sim 3.0$ V(Note 9): $V_{IN} = 0.8\sim 2.0$ V, $V_{CC} = 3.0$ V

Electrical Characteristics

DC Characteristics ($T_a = -40\sim 85^\circ\text{C}$)

PARAMETER		SYMBOL	TEST CONDITION			Min	Max	UNIT
			V _{CC} (V)					
Input Voltage	“H” Level	V _{IH}	2.7~3.6			2.0	—	V
	“L” Level	V _{IL}	2.7~3.6			—	0.8	
Output Voltage	“H” Level	V _{OH}	V _{IN} = V _{IH} or V _{IL}	I _{OH} = - 100 μA	2.7~3.6	V _{CC} - 0.2	—	V
				I _{OH} = - 12 mA	2.7	2.2	—	
				I _{OH} = - 18 mA	3.0	2.4	—	
				I _{OH} = - 24 mA	3.0	2.2	—	
	“L” Level	V _{OL}	V _{IN} = V _{IH} or V _{IL}	I _{OL} = 100 μA	2.7~3.6	—	0.2	
				I _{OL} = 12 mA	2.7	—	0.4	
				I _{OL} = 16 mA	3.0	—	0.4	
				I _{OL} = 24 mA	3.0	—	0.55	
Input Leakage Current		I _{IN}	V _{IN} = 0~5.5 V		2.7~3.6	—	± 5.0	μA
3-State Output Off-State Current		I _{OZ}	V _{IN} = V _{IH} or V _{IL} V _{OUT} = 0~5.5 V		2.7~3.6	—	± 5.0	μA
Power Off Leakage Cuurent		I _{OFF}	V _{IN} / V _{OUT} = 5.5 V		0	—	10.0	μA
Quiescent Supply Current		I _{CC}	V _{IN} = V _{CC} or GND		2.7~3.6	—	10.0	μA
			V _{IN} / V _{OUT} = 3.6~5.5 V		2.7~3.6	—	± 10.0	
Increase In I _{CC} Per Input		ΔI _{CC}	V _{IH} = V _{CC} - 0.6 V		2.7~3.6	—	500	μA

AC Characteristic (Ta = -40~85°C)

PARAMETER	SYMBOL	TEST CONDITION	V _{CC} (V)	Min	Max	UNIT
Propagation Delay Time	t _{pLH} t _{pHL}	(Fig.1, 2)	2.7	—	7.5	ns
			3.3 ± 0.3	1.5	6.5	
Output Enable Time	t _{pZL} t _{pZH}	(Fig.1, 3)	2.7	—	9.0	ns
			3.3 ± 0.3	1.5	8.0	
Output Disable Time	t _{pLZ} t _{pHZ}	(Fig.1, 3)	2.7	—	8.0	ns
			3.3 ± 0.3	1.5	7.0	
Output To Output Skew	t _{osLH} t _{osHL}	(Note 10)	2.7	—	—	ns
			3.3 ± 0.3	—	1.0	

(Note 10): Parameter guaranteed by design.

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

Dynamic Switching Characteristics (Ta = 25°C, Input t_r = t_f = 2.5 ns, C_L = 50 pF, R_L = 500 Ω)

PARAMETER	SYMBOL	TEST CONDITION	V _{CC} (V)	Typ.	UNIT
Quiet Output Maximum Dynamic	V _{OLP}	V _{IH} = 3.3 V, V _{IL} = 0 V	3.3	0.8	V
V _{OL}					
Quiet Output Minimum Dynamic	V _{OLV}	V _{IH} = 3.3 V, V _{IL} = 0 V	3.3	0.8	V
V _{OL}					

Capacitive Characteristics (Ta = 25°C)

PARAMETER	SYMBOL	TEST CONDITION	V _{CC} (V)	Typ.	UNIT
Input Capacitance	C _{IN}	—	3.3	7	pF
Output Capacitance	C _{OUT}		3.3	8	pF
Power Dissipation Capacitance	C _{PD}	f _{IN} = 10 MHz (Note 11)	3.3	25	pF

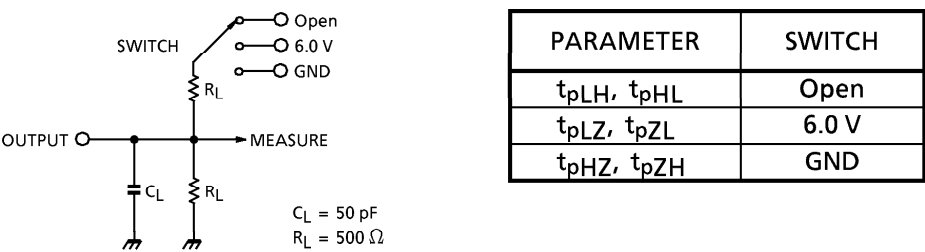
(Note 11): C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption.

Average operating current can be obtained by the equation :

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

Test Circuit

Fig.1



AC Waveform

Fig.2 t_{pLH} , t_{pHL}

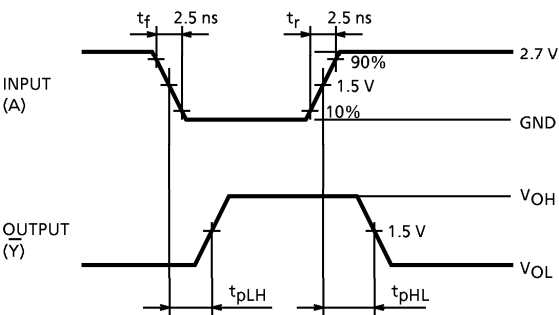
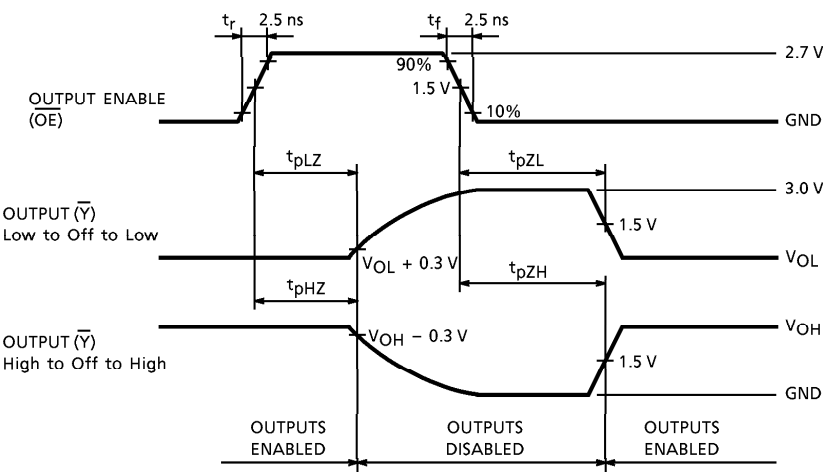


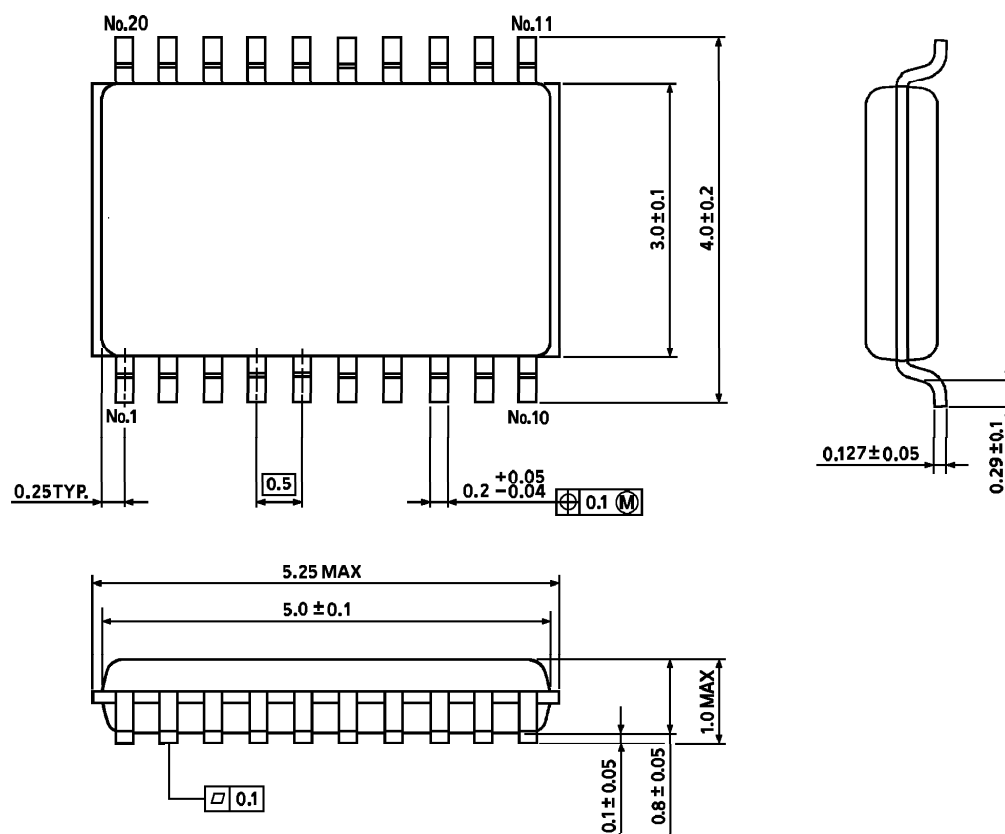
Fig.3 t_{pLZ} , t_{pHZ} , t_{pZL} , t_{pZH}



Outline Drawing

VSSOP20-P-0030-0.50

Unit : mm



Weight : 0.03 g (typ.)