

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC7MET573AFK

Octal D - type latch with 3 - state output

The TC7MET573A is an advanced high speed CMOS OCTAL LATCH with 3-STATE OUTPUT fabricated with silicon gate C²MOS technology.

It achieves the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation.

This 8-bit D-type latch is controlled by a latch enable input (LE) and an output enable input (\overline{OE}).

When the \overline{OE} input is high, the eight outputs are in a high impedance state.

The input voltage are compatible with TTL output voltage.

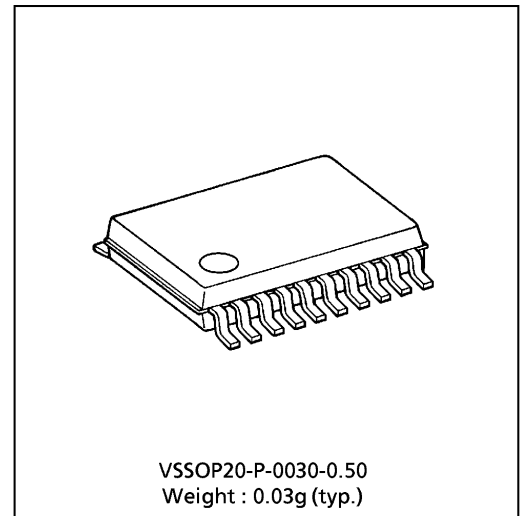
This device may be used as a level converter for interfacing 3.3V to 5V system.

Input protection and output circuit ensure that 0 to 5.5V can be applied to the input and output*1 pins without regard to the supply voltage. This structure prevents device destruction due to mismatched supply and input/output voltages such as battery back up, hot board insertion, etc.

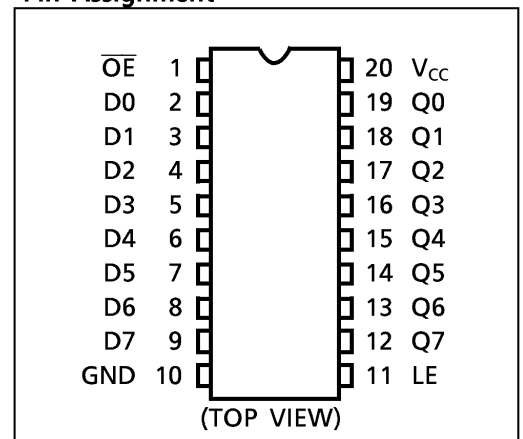
*1: output in off-state

FEATURES :

- High Speed..... $t_{pd} = 7.7ns(\text{typ.})$ at $V_{CC} = 5V$
- Low Power Dissipation..... $I_{CC} = 4\mu A(\text{max})$ at $T_a = 25^\circ C$
- Compatible with TTL outputs.... $V_{IL} = 0.8V$ (max)
 $V_{IH} = 2.0V$ (min)
- Power Down Protection is provided on all inputs and outputs.
- Balanced Propagation Delays..... $t_{pLH} \approx t_{pHL}$
- Low Noise $V_{OLP} = 1.6V$ (max)
- Pin and Function Compatible with the 74 series (74AC / HC / F / ALS / LS etc.) 573 type.



Pin Assignment

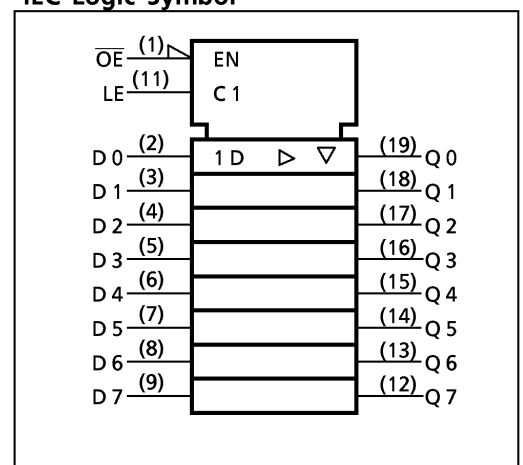


Truth Table

INPUTS			OUTPUT
\overline{OE}	LE	D	
H	X	X	Z
L	L	X	Q_n
L	H	L	L
L	H	H	H

X : Don't Care
Z : High Impedance
 Q_n : Q outputs are latched at the time when the LE input is taken to a low logic level.

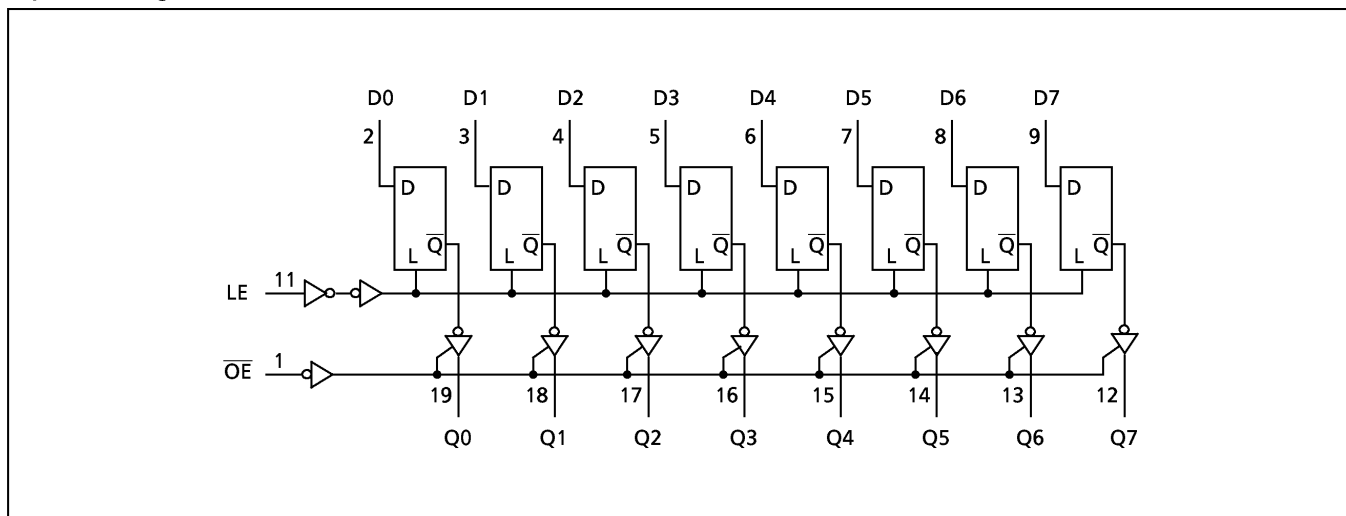
IEC Logic Symbol



980910EBA2

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System Diagram



Absolute Maximum Ratings

PARAMETER	SYMBOL	VALUE	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}	-20	mA
Output Diode Current	I_{OK}	±20 (Note 3)	mA
DC Output Current	I_{OUT}	±25	mA
DC Vcc/Ground Current	I_{CC}	±75	mA
Power Dissipation	P_D	180	mW
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	VALUE	UNIT
Supply Voltage	V_{CC}	4.5~5.5	V
Input Voltage	V_{IN}	0~5.5	V
Output Voltage	V_{OUT}	0~5.5 (Note 4)	V
		0~ V_{CC} (Note 5)	
Operating Temperature	T_{opr}	-40~85	°C
Input Rise and Fall Time	dt/dV	0~20	ns/V

(Note 4): Output in Off-State

(Note 5): High or Low State

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DC Electrical Characteristics

PARAMETER	SYMBOL	CONDITON		Ta = 25°C			Ta = -40~85°C		UNIT	
				V _{CC} (V)	Min	Typ.	Max	Min		Max
High - Level Input Voltage	V _{IH}			4.5~5.5	2.0	—	—	2.0	—	V
Low - Level Input Voltage	V _{IL}			4.5~5.5	—	—	0.8	—	0.8	V
High - Level Output Voltage	V _{OH}	V _{IN} = V _{IH} or V _{IL}	I _{OH} = -50μA	4.5	4.40	4.50	—	4.40	—	V
			I _{OH} = -8mA	4.5	3.94	—	—	3.80	—	V
Low - Level Output Voltage	V _{OL}	V _{IN} = V _{IH} or V _{IL}	I _{OL} = 50μA	4.5	—	0.0	0.1	—	0.1	V
			I _{OL} = 8mA	4.5	—	—	0.36	—	0.44	V
3 - State Output Off - State Current	I _{OZ}	V _{IN} = V _{IH} or V _{IL} V _{OUT} = V _{CC} or GND		5.5	—	—	±0.25	—	±2.50	μA
Input Leakage Current	I _{IN}	V _{IN} = 5.5V or GND		0~5.5	—	—	±0.1	—	±1.0	
Quiescent Supply Current	I _{CC}	V _{IN} = V _{CC} or GND		5.5	—	—	4.0	—	40.0	
	I _{CCT}	PER INPUT : V _{IN} = 3.4V OTHER INPUT : V _{CC} or GND		5.5	—	—	1.35	—	1.50	mA
Output Leakage Current	I _{OPD}	V _{OUT} = 5.5V		0	—	—	0.5	—	5.0	μA

Timing Requirements (Input t_r = t_f = 3ns)

PARAMETER	SYMBOL	TEST CONDITION	Ta = 25°C			Ta = -40~85°C	UNIT
			V _{CC} (V)	Typ .	Limit	Limit	
Minimum Pulse Width (LE)	t _W (H)		5.0 ± 0.5	—	6.5	8.5	ns
Minimum Set - up Time	t _s		5.0 ± 0.5	—	1.5	1.5	
Minimum Hold Time	t _h		5.0 ± 0.5	—	3.5	3.5	

AC Electrical Characteristics (Input $t_r = t_f = 3ns$)

PARAMETER	SYMBOL	TEST CONDITION		Ta = 25°C			Ta = -40~85°C		UNIT	
		V _{CC} (V)	CL (pF)	Min	Typ.	Max	Min	Max		
Propagation Delay Time (LE-Q)	t_{pLH} t_{pHL}	5.0 ± 0.5	15	—	7.7	12.3	1.0	13.5	ns	
			50	—	8.5	13.3	1.0	14.5		
Propagation Delay Time (D-Q)	t_{pLH} t_{pHL}	5.0 ± 0.5	15	—	5.1	8.5	1.0	9.5		
			50	—	5.9	9.5	1.0	10.5		
3-State Output Enable Time	t_{pZL} t_{pZH}	RL = 1kΩ	5.0 ± 0.5	15	—	6.3	10.9	1.0		12.5
			50	—	7.1	11.9	1.0	13.5		
3-State Output Disable Time	t_{pLZ} t_{pHZ}	RL = 1kΩ	5.0 ± 0.5	50	—	8.8	11.2	1.0	12.0	
Output to Output Skew	$t_{oS LH}$ $t_{oS HL}$	(Note 6)	5.0 ± 0.5	50	—	—	1.0	—	1.0	
Input Capacitance	C _{IN}				—	4	10	—	10	pF
Output Capacitance	C _{OUT}				—	6	—	—	—	
Power Dissipation Capacitance	C _{PD}	(Note 7)			—	25	—	—	—	

(Note 6): Parameter guaranteed by design. $t_{oS LH} = |t_{pLH m} - t_{pLH n}|$, $t_{oS HL} = |t_{pHL m} - t_{pHL n}|$

(Note 7): C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation :

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

And the total C_{PD} when n pcs. of Latch operate can be gained by the following equation :

$$C_{PD} \text{ (total)} = 14 + 11 \cdot n$$

Noise Characteristics (Input $t_r = t_f = 3ns$)

PARAMETER	SYMBOL	TEST CONDITION		Ta = 25°C		UNIT
		V _{CC} (V)		Typ.	Limit	
Quiet Output Maximum Dynamic V _{OL}	V _{OLP}	C _L = 50pF	5.0	1.1	1.5	V
Quiet Output Minimum Dynamic V _{OL}	V _{OLV}	C _L = 50pF	5.0	-1.1	-1.5	V
Minimum High Level Dynamic Input Voltage	V _{IHD}	C _L = 50pF	5.0	—	2.0	V
Maximum Low Level Dynamic Input Voltage	V _{ILD}	C _L = 50pF	5.0	—	0.8	V

PACKAGE DIMENSIONS (VSSOP20-P-0030-0.50)

Unit in mm

