

CMOS Digital Integrated Circuits Silicon Monolithic

# 7UL2G126FK

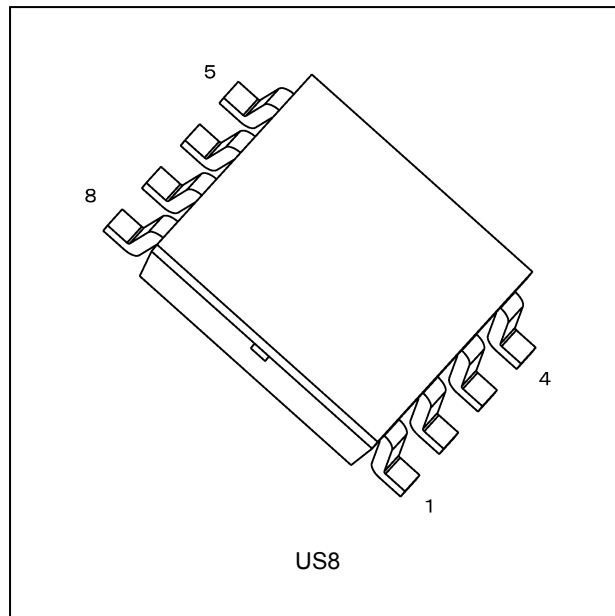
### 1. Functional Description

- Dual Bus Buffer with 3-State Output

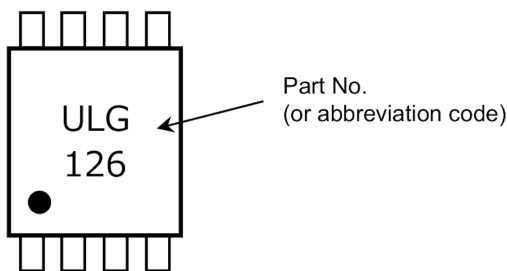
### 2. Features

- (1) Wide operating temperature range:  $T_{opr} = -40$  to  $125$  °C
- (2) High output current:  $\pm 8.0$  mA (min) at  $V_{CC} = 3.0$  V
- (3) Super high speed operation:  $t_{pd} = 2.9$  ns (typ.) at  $V_{CC} = 3.3$  V,  $C_L = 15$  pF
- (4) Operation voltage range:  $V_{CC} = 0.9$  to  $3.6$  V
- (5) 3.6 V tolerant inputs
- (6) 3.6 V power down protection output

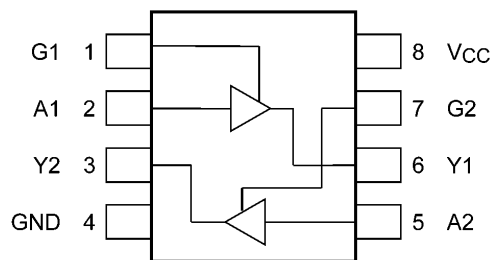
### 3. Packaging



### 4. Marking and Pin Assignment



Marking

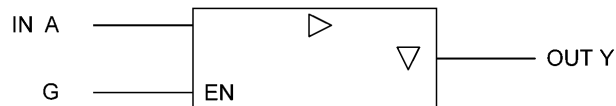


Pin Assignment (Top view)

Start of commercial production

2020-09

## 5. IEC Logic Symbol



## 6. Truth Table

Input G	Input A	Output Y
L	X	Z
H	L	L
H	H	H

X: Don't care

Z: High impedance

## 7. Absolute Maximum Ratings (Note) (Unless otherwise specified, $T_a = 25\text{ }^\circ\text{C}$ )

Characteristics	Symbol	Note	Rating	Unit
Supply voltage	$V_{CC}$		-0.5 to 4.6	V
Input voltage	$V_{IN}$		-0.5 to 4.6	V
DC output voltage	$V_{OUT}$	(Note 1)	-0.5 to 4.6	V
		(Note 2)	-0.5 to $V_{CC} + 0.5$	
Input diode current	$I_{IK}$		-20	mA
Output diode current	$I_{OK}$	(Note 3)	-20	mA
DC output current	$I_{OUT}$		$\pm 25$	mA
$V_{CC}$ /ground current	$I_{CC}$		$\pm 50$	mA
Power dissipation	$P_D$		200	mW
Storage temperature	$T_{stg}$		-65 to 150	$^\circ\text{C}$

Note: Exceeding any of the absolute maximum ratings, even briefly, lead to deterioration in IC performance or even destruction.

Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note 1:  $V_{CC} = 0\text{ V}$  or high impedance condition

Note 2: High (H) or Low (L) state.  $I_{OUT}$  absolute maximum rating must be observed.

Note 3:  $V_{OUT} < \text{GND}$

### 8. Operating Ranges (Note)

Characteristics	Symbol	Note	Test Condition	Rating	Unit
Supply voltage	$V_{CC}$		—	0.9 to 3.6	V
Input voltage	$V_{IN}$		—	0 to 3.6	V
Output voltage	$V_{OUT}$	(Note 1)	—	0 to 3.6	V
		(Note 2)	—	0 to $V_{CC}$	
Output current	$I_{OH}, I_{OL}$		$V_{CC} = 3.0$ to $3.6$ V	$\pm 8.0$	mA
			$V_{CC} = 2.3$ to $2.7$ V	$\pm 4.0$	
			$V_{CC} = 1.65$ to $1.95$ V	$\pm 3.0$	
			$V_{CC} = 1.4$ to $1.6$ V	$\pm 1.7$	
			$V_{CC} = 1.1$ to $1.3$ V	$\pm 0.3$	
			$V_{CC} = 0.9$ V	$\pm 0.02$	
Operating temperature	$T_{opr}$		—	-40 to 125	°C
Input rise and fall time	dt/dv		$V_{IN} = 0.8$ to $2.0$ V, $V_{CC} = 3.0$ V	0 to 10	ns/V

Note: The operating ranges must be maintained to ensure the normal operation of the device.

Unused inputs must be tied to either  $V_{CC}$  or GND.

Note 1:  $V_{CC} = 0$  V or high impedance condition

Note 2: High (H) or Low (L) state.

### 9. Electrical Characteristics

#### 9.1. DC Characteristics (Unless otherwise specified, $T_a = 25\text{ }^\circ\text{C}$ )

Characteristics	Symbol	Test Condition	$V_{CC}$ (V)	Min	Typ.	Max	Unit	
High-level input voltage	$V_{IH}$	—	0.9	$V_{CC}$	—	—	V	
			1.1 to 1.3	$V_{CC} \times 0.70$	—	—		
			1.4 to 1.6	$V_{CC} \times 0.65$	—	—		
			1.65 to 1.95	$V_{CC} \times 0.65$	—	—		
			2.3 to 2.7	1.7	—	—		
			3.0 to 3.6	2.0	—	—		
Low-level input voltage	$V_{IL}$	—	0.9	—	—	GND	V	
			1.1 to 1.3	—	—	$V_{CC} \times 0.30$		
			1.4 to 1.6	—	—	$V_{CC} \times 0.35$		
			1.65 to 1.95	—	—	$V_{CC} \times 0.35$		
			2.3 to 2.7	—	—	0.7		
			3.0 to 3.6	—	—	0.8		
High-level output voltage	$V_{OH}$	$V_{IN} = V_{IH}$	$I_{OH} = -0.02\text{ mA}$	0.9	0.75	—	V	
			$I_{OH} = -0.3\text{ mA}$	1.1 to 1.3	$V_{CC} \times 0.75$	—		—
			$I_{OH} = -1.7\text{ mA}$	1.4 to 1.6	$V_{CC} \times 0.75$	—		—
			$I_{OH} = -3.0\text{ mA}$	1.65 to 1.95	$V_{CC} - 0.45$	—		—
			$I_{OH} = -4.0\text{ mA}$	2.3 to 2.7	2.0	—		—
			$I_{OH} = -8.0\text{ mA}$	3.0 to 3.6	2.48	—		—
Low-level output voltage	$V_{OL}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OL} = 0.02\text{ mA}$	0.9	—	—	V	
			$I_{OL} = 0.3\text{ mA}$	1.1 to 1.3	—	—		$V_{CC} \times 0.25$
			$I_{OL} = 1.7\text{ mA}$	1.4 to 1.6	—	—		$V_{CC} \times 0.25$
			$I_{OL} = 3.0\text{ mA}$	1.65 to 1.95	—	—		0.45
			$I_{OL} = 4.0\text{ mA}$	2.3 to 2.7	—	—		0.4
			$I_{OL} = 8.0\text{ mA}$	3.0 to 3.6	—	—		0.4
Input leakage current	$I_{IN}$	$V_{IN} = 0$ to $3.6\text{ V}$	0 to 3.6	—	—	$\pm 0.1$	$\mu\text{A}$	
3-state output OFF-state leakage current	$I_{OZ}$	$V_{IN} = V_{IH}$ or $V_{IL}$ , $V_{OUT} = 0$ to $3.6\text{ V}$	0.9 to 3.6	—	—	$\pm 1.0$	$\mu\text{A}$	
Power-OFF leakage current	$I_{OFF}$	$V_{IN} = 0$ to $3.6\text{ V}$ , $V_{OUT} = 0$ to $3.6\text{ V}$	0	—	—	1.0	$\mu\text{A}$	
Quiescent supply current	$I_{CC}$	$V_{IN} = V_{CC}$ or GND	3.6	—	—	1.0	$\mu\text{A}$	

### 9.2. DC Characteristics (Unless otherwise specified, $T_a = -40$ to $85$ °C)

Characteristics	Symbol	Test Condition	$V_{CC}$ (V)	Min	Max	Unit	
High-level input voltage	$V_{IH}$	—	0.9	$V_{CC}$	—	V	
			1.1 to 1.3	$V_{CC} \times 0.70$	—		
			1.4 to 1.6	$V_{CC} \times 0.65$	—		
			1.65 to 1.95	$V_{CC} \times 0.65$	—		
			2.3 to 2.7	1.7	—		
			3.0 to 3.6	2.0	—		
Low-level input voltage	$V_{IL}$	—	0.9	—	GND	V	
			1.1 to 1.3	—	$V_{CC} \times 0.30$		
			1.4 to 1.6	—	$V_{CC} \times 0.35$		
			1.65 to 1.95	—	$V_{CC} \times 0.35$		
			2.3 to 2.7	—	0.7		
			3.0 to 3.6	—	0.8		
High-level output voltage	$V_{OH}$	$V_{IN} = V_{IH}$	$I_{OH} = -0.02$ mA	0.9	0.75	—	V
			$I_{OH} = -0.3$ mA	1.1 to 1.3	$V_{CC} \times 0.75$	—	
			$I_{OH} = -1.7$ mA	1.4 to 1.6	$V_{CC} \times 0.75$	—	
			$I_{OH} = -3.0$ mA	1.65 to 1.95	$V_{CC} - 0.45$	—	
			$I_{OH} = -4.0$ mA	2.3 to 2.7	2.0	—	
			$I_{OH} = -8.0$ mA	3.0 to 3.6	2.48	—	
Low-level output voltage	$V_{OL}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OL} = 0.02$ mA	0.9	—	0.1	V
			$I_{OL} = 0.3$ mA	1.1 to 1.3	—	$V_{CC} \times 0.25$	
			$I_{OL} = 1.7$ mA	1.4 to 1.6	—	$V_{CC} \times 0.25$	
			$I_{OL} = 3.0$ mA	1.65 to 1.95	—	0.45	
			$I_{OL} = 4.0$ mA	2.3 to 2.7	—	0.4	
			$I_{OL} = 8.0$ mA	3.0 to 3.6	—	0.4	
Input leakage current	$I_{IN}$	$V_{IN} = 0$ to $3.6$ V	0 to 3.6	—	$\pm 0.5$	$\mu$ A	
3-state output OFF-state leakage current	$I_{OZ}$	$V_{IN} = V_{IH}$ or $V_{IL}$ , $V_{OUT} = 0$ to $3.6$ V	0.9 to 3.6	—	$\pm 10.0$	$\mu$ A	
Power-OFF leakage current	$I_{OFF}$	$V_{IN} = 0$ to $3.6$ V, $V_{OUT} = 0$ to $3.6$ V	0	—	10.0	$\mu$ A	
Quiescent supply current	$I_{CC}$	$V_{IN} = V_{CC}$ or GND	3.6	—	10.0	$\mu$ A	

### 9.3. DC Characteristics (Unless otherwise specified, $T_a = -40$ to $125$ °C)

Characteristics	Symbol	Test Condition	$V_{CC}$ (V)	Min	Max	Unit	
High-level input voltage	$V_{IH}$	—	0.9	$V_{CC}$	—	V	
			1.1 to 1.3	$V_{CC} \times 0.70$	—		
			1.4 to 1.6	$V_{CC} \times 0.65$	—		
			1.65 to 1.95	$V_{CC} \times 0.65$	—		
			2.3 to 2.7	1.7	—		
			3.0 to 3.6	2.0	—		
Low-level input voltage	$V_{IL}$	—	0.9	—	GND	V	
			1.1 to 1.3	—	$V_{CC} \times 0.30$		
			1.4 to 1.6	—	$V_{CC} \times 0.35$		
			1.65 to 1.95	—	$V_{CC} \times 0.35$		
			2.3 to 2.7	—	0.7		
			3.0 to 3.6	—	0.8		
High-level output voltage	$V_{OH}$	$V_{IN} = V_{IH}$	$I_{OH} = -0.02$ mA	0.9	0.75	—	V
			$I_{OH} = -0.3$ mA	1.1 to 1.3	$V_{CC} \times 0.73$	—	
			$I_{OH} = -1.7$ mA	1.4 to 1.6	$V_{CC} \times 0.73$	—	
			$I_{OH} = -3.0$ mA	1.65 to 1.95	$V_{CC} - 0.5$	—	
			$I_{OH} = -4.0$ mA	2.3 to 2.7	1.95	—	
			$I_{OH} = -8.0$ mA	3.0 to 3.6	2.4	—	
Low-level output voltage	$V_{OL}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OL} = 0.02$ mA	0.9	—	0.1	V
			$I_{OL} = 0.3$ mA	1.1 to 1.3	—	$V_{CC} \times 0.27$	
			$I_{OL} = 1.7$ mA	1.4 to 1.6	—	$V_{CC} \times 0.27$	
			$I_{OL} = 3.0$ mA	1.65 to 1.95	—	0.5	
			$I_{OL} = 4.0$ mA	2.3 to 2.7	—	0.45	
			$I_{OL} = 8.0$ mA	3.0 to 3.6	—	0.45	
Input leakage current	$I_{IN}$	$V_{IN} = 0$ to $3.6$ V	0 to 3.6	—	$\pm 2.0$	$\mu$ A	
3-state output OFF-state leakage current	$I_{OZ}$	$V_{IN} = V_{IH}$ or $V_{IL}$ $V_{OUT} = 0$ to $3.6$ V	0.9 to 3.6	—	$\pm 80.0$	$\mu$ A	
Power-OFF leakage current	$I_{OFF}$	$V_{IN} = 0$ to $3.6$ V $V_{OUT} = 0$ to $3.6$ V	0	—	80.0	$\mu$ A	
Quiescent supply current	$I_{CC}$	$V_{IN} = V_{CC}$ or GND	3.6	—	80.0	$\mu$ A	

### 9.4. AC Characteristics (Unless otherwise specified, $T_a = 25\text{ }^\circ\text{C}$ , Input: $t_r = t_f = 3\text{ ns}$ )

Characteristics	Symbol	Note	Test Condition	$V_{CC}$ (V)	$C_L$ (pF)	Min	Typ.	Max	Unit					
Propagation delay time	$t_{PLH}, t_{PHL}$		$R_L = 1\text{ M}\Omega$	0.9	10	—	20.7	—	ns					
				1.1 to 1.3		—	10.5	18.4						
				1.4 to 1.6		—	6.1	8.5						
				1.65 to 1.95		—	4.5	6.2						
				2.3 to 2.7		—	3.0	3.9						
				3.0 to 3.6		—	2.3	3.1						
			$R_L = 1\text{ M}\Omega$	0.9	15	—	24.5	—						
				1.1 to 1.3		—	12.7	21.5						
				1.4 to 1.6		—	7.3	10.1						
				1.65 to 1.95		—	5.4	7.3						
				2.3 to 2.7		—	3.5	4.5						
				3.0 to 3.6		—	2.9	3.6						
			$R_L = 1\text{ M}\Omega$	0.9	30	—	31.8	—						
				1.1 to 1.3		—	16.3	29.6						
				1.4 to 1.6		—	9.2	13.1						
				1.65 to 1.95		—	6.9	9.3						
				2.3 to 2.7		—	4.7	6.4						
				3.0 to 3.6		—	3.8	4.9						
			Output enable time	$t_{PZL}, t_{PZH}$		$R_L = 100\text{ k}\Omega$	0.9	10		—	23.9	—	ns	
							$R_L = 5\text{ k}\Omega$			1.1 to 1.3	—	11.5		20.3
										1.4 to 1.6	—	6.2		9.5
										1.65 to 1.95	—	5.1		7.3
										2.3 to 2.7	—	3.4		4.6
										3.0 to 3.6	—	2.9		4.0
$R_L = 100\text{ k}\Omega$	0.9	15				—	25.2	—						
	$R_L = 5\text{ k}\Omega$					1.1 to 1.3	—	12.6	21.3					
						1.4 to 1.6	—	7.3	10.5					
						1.65 to 1.95	—	5.5	7.7					
						2.3 to 2.7	—	4.1	5.1					
						3.0 to 3.6	—	3.1	3.9					
$R_L = 100\text{ k}\Omega$	0.9	30				—	31.0	—						
	$R_L = 5\text{ k}\Omega$					1.1 to 1.3	—	16.1	30.7					
						1.4 to 1.6	—	9.2	13.1					
						1.65 to 1.95	—	8.7	11.6					
						2.3 to 2.7	—	4.8	6.0					
						3.0 to 3.6	—	3.9	4.7					
Output disable time	$t_{PLZ}, t_{PHZ}$					$R_L = 100\text{ k}\Omega$	0.9	10	—	123.5	—	ns		
							$R_L = 5\text{ k}\Omega$		1.1 to 1.3	—	10.6			16.0
									1.4 to 1.6	—	6.3			9.1
									1.65 to 1.95	—	7.3			8.8
									2.3 to 2.7	—	5.1			6.4
									3.0 to 3.6	—	5.8			7.9
			$R_L = 100\text{ k}\Omega$	0.9	15	—	172.0	—						
				$R_L = 5\text{ k}\Omega$		1.1 to 1.3	—	12.2	16.9					
						1.4 to 1.6	—	7.5	9.8					
						1.65 to 1.95	—	8.3	9.9					
						2.3 to 2.7	—	6.0	9.4					
						3.0 to 3.6	—	7.1	9.5					

Characteristics	Symbol	Note	Test Condition	V <sub>CC</sub> (V)	C <sub>L</sub> (pF)	Min	Typ.	Max	Unit
Output disable time	t <sub>PLZ</sub> , t <sub>PHZ</sub>		R <sub>L</sub> = 100 kΩ	0.9	30	—	266.7	—	ns
			R <sub>L</sub> = 5 kΩ	1.1 to 1.3		—	16.9	20.8	
				1.4 to 1.6		—	10.1	13.2	
				1.65 to 1.95		—	12.7	14.6	
				2.3 to 2.7		—	8.6	10.8	
				3.0 to 3.6		—	12.2	14.4	
Input capacitance	C <sub>IN</sub>		—	3.6	—	—	3	—	pF
Power dissipation capacitance	C <sub>PD</sub>	(Note 1)	—	0.9 to 3.6	—	—	9	—	pF

Note 1: C<sub>PD</sub> 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.

$$I_{CC(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$

### 9.5. AC Characteristics

(Unless otherwise specified, T<sub>a</sub> = -40 to 85 °C, Input: t<sub>r</sub> = t<sub>f</sub> = 3 ns)

Characteristics	Symbol	Test Condition	V <sub>CC</sub> (V)	C <sub>L</sub> (pF)	Min	Max	Unit	
Propagation delay time	t <sub>PLH</sub> , t <sub>PHL</sub>	R <sub>L</sub> = 1 MΩ	0.9	10	—	—	ns	
			1.1 to 1.3		1.0	34.2		
			1.4 to 1.6		1.0	10.0		
			1.65 to 1.95		1.0	6.8		
			2.3 to 2.7		1.0	4.7		
			3.0 to 3.6		1.0	3.9		
		R <sub>L</sub> = 1 MΩ	0.9	15	—	—		
			1.1 to 1.3		1.0	37.2		
			1.4 to 1.6		1.0	11.2		
			1.65 to 1.95		1.0	8.6		
			2.3 to 2.7		1.0	5.8		
			3.0 to 3.6		1.0	4.8		
		R <sub>L</sub> = 1 MΩ	0.9	30	—	—		
			1.1 to 1.3		1.0	56.0		
			1.4 to 1.6		1.0	15.9		
			1.65 to 1.95		1.0	10.6		
			2.3 to 2.7		1.0	7.3		
			3.0 to 3.6		1.0	5.9		
Output enable time	t <sub>PZL</sub> , t <sub>PZH</sub>	R <sub>L</sub> = 100 kΩ	0.9	10	—	—	ns	
			R <sub>L</sub> = 5 kΩ		1.1 to 1.3	1.0		29.8
					1.4 to 1.6	1.0		11.3
					1.65 to 1.95	1.0		8.3
					2.3 to 2.7	1.0		5.6
					3.0 to 3.6	1.0		4.7
		R <sub>L</sub> = 100 kΩ	0.9	15	—	—		
			R <sub>L</sub> = 5 kΩ		1.1 to 1.3	1.0	34.7	
					1.4 to 1.6	1.0	11.4	
					1.65 to 1.95	1.0	8.9	
					2.3 to 2.7	1.0	6.8	
					3.0 to 3.6	1.0	4.9	
		R <sub>L</sub> = 100 kΩ	0.9	30	—	—		
			R <sub>L</sub> = 5 kΩ		1.1 to 1.3	1.0	50.5	
					1.4 to 1.6	1.0	15.1	
					1.65 to 1.95	1.0	13.8	



Characteristics	Symbol	Test Condition	V <sub>CC</sub> (V)	C <sub>L</sub> (pF)	Min	Max	Unit
Output enable time	t <sub>PZL</sub> , t <sub>PZH</sub>	R <sub>L</sub> = 5 kΩ	2.3 to 2.7	30	1.0	7.6	ns
			3.0 to 3.6		1.0	6.1	
Output disable time	t <sub>PLZ</sub> , t <sub>PHZ</sub>	R <sub>L</sub> = 100 kΩ	0.9	10	—	—	ns
			R <sub>L</sub> = 5 kΩ		1.1 to 1.3	1.0	
		1.4 to 1.6		1.0	10.4		
		1.65 to 1.95		1.0	9.8		
		2.3 to 2.7		1.0	7.2		
		3.0 to 3.6		1.0	9.3		
		R <sub>L</sub> = 100 kΩ	0.9	15	—	—	
			R <sub>L</sub> = 5 kΩ		1.1 to 1.3	1.0	
		1.4 to 1.6		1.0	11.3		
		1.65 to 1.95		1.0	11.1		
		2.3 to 2.7		1.0	12.4		
		3.0 to 3.6		1.0	13.2		
		R <sub>L</sub> = 100 kΩ	0.9	30	—	—	
			R <sub>L</sub> = 5 kΩ		1.1 to 1.3	1.0	
		1.4 to 1.6		1.0	14.9		
		1.65 to 1.95		1.0	16.6		
		2.3 to 2.7		1.0	12.2		
		3.0 to 3.6		1.0	16.4		

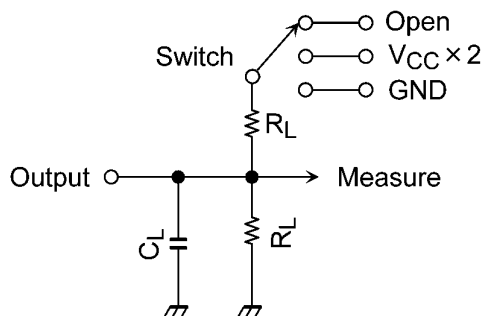
### 9.6. AC Characteristics

(Unless otherwise specified,  $T_a = -40$  to  $125$  °C, Input:  $t_r = t_f = 3$  ns)

Characteristics	Symbol	Test Condition	$V_{CC}$ (V)	$C_L$ (pF)	Min	Max	Unit				
Propagation delay time	$t_{PLH}, t_{PHL}$	$R_L = 1\text{ M}\Omega$	0.9	10	—	—	ns				
			1.1 to 1.3		1.0	44.8					
			1.4 to 1.6		1.0	11.0					
			1.65 to 1.95		1.0	7.2					
			2.3 to 2.7		1.0	5.3					
			3.0 to 3.6		1.0	4.5					
		$R_L = 1\text{ M}\Omega$	0.9	15	—	—					
			1.1 to 1.3		1.0	47.7					
			1.4 to 1.6		1.0	12.0					
			1.65 to 1.95		1.0	9.5					
			2.3 to 2.7		1.0	6.7					
			3.0 to 3.6		1.0	5.6					
		$R_L = 1\text{ M}\Omega$	0.9	30	—	—					
			1.1 to 1.3		1.0	73.6					
			1.4 to 1.6		1.0	17.8					
			1.65 to 1.95		1.0	11.5					
			2.3 to 2.7		1.0	7.9					
			3.0 to 3.6		1.0	6.6					
		Output enable time	$t_{PZL}, t_{PZH}$	$R_L = 100\text{ k}\Omega$	0.9	10		—	—	ns	
					$R_L = 5\text{ k}\Omega$			1.1 to 1.3	1.0		36.2
								1.4 to 1.6	1.0		12.5
								1.65 to 1.95	1.0		9.0
								2.3 to 2.7	1.0		6.3
				3.0 to 3.6	1.0	5.2					
$R_L = 100\text{ k}\Omega$	0.9			15	—	—					
	$R_L = 5\text{ k}\Omega$				1.1 to 1.3	1.0	43.7				
					1.4 to 1.6	1.0	12.0				
					1.65 to 1.95	1.0	9.7				
2.3 to 2.7	1.0			11.3							
3.0 to 3.6	1.0			5.6							
$R_L = 100\text{ k}\Omega$	0.9			30	—	—					
	$R_L = 5\text{ k}\Omega$				1.1 to 1.3	1.0	63.7				
					1.4 to 1.6	1.0	16.5				
					1.65 to 1.95	1.0	15.3				
					2.3 to 2.7	1.0	8.7				
3.0 to 3.6	1.0			7.1							
Output disable time	$t_{PLZ}, t_{PHZ}$			$R_L = 100\text{ k}\Omega$	0.9	10	—	—	ns		
					$R_L = 5\text{ k}\Omega$		1.1 to 1.3	1.0			26.7
							1.4 to 1.6	1.0			11.3
							1.65 to 1.95	1.0			10.5
							2.3 to 2.7	1.0			7.8
				3.0 to 3.6	1.0	10.3					
		$R_L = 100\text{ k}\Omega$	0.9	15	—	—					
			$R_L = 5\text{ k}\Omega$		1.1 to 1.3	1.0	30.6				
					1.4 to 1.6	1.0	12.3				
					1.65 to 1.95	1.0	11.9				
		2.3 to 2.7	1.0	14.4							

Characteristics	Symbol	Test Condition	V <sub>CC</sub> (V)	C <sub>L</sub> (pF)	Min	Max	Unit
Output disable time	t <sub>PLZ</sub> , t <sub>PHZ</sub>	R <sub>L</sub> = 5 kΩ	3.0 to 3.6	15	1.0	15.7	ns
		R <sub>L</sub> = 100 kΩ	0.9	30	—	—	
		R <sub>L</sub> = 5 kΩ	1.1 to 1.3		1.0	39.3	
			1.4 to 1.6		1.0	16.1	
			1.65 to 1.95		1.0	18.0	
			2.3 to 2.7		1.0	13.2	
			3.0 to 3.6		1.0	17.8	

### 9.7. AC Test Circuit



**Table 9.7.1 Parameter for AC Test Circuit**

Characteristics	Switch
t <sub>PLH</sub> , t <sub>PHL</sub>	Open
t <sub>PLZ</sub> , t <sub>PZL</sub>	V <sub>CC</sub> × 2
t <sub>PHZ</sub> , t <sub>PZH</sub>	GND

## 9.8. AC Waveform

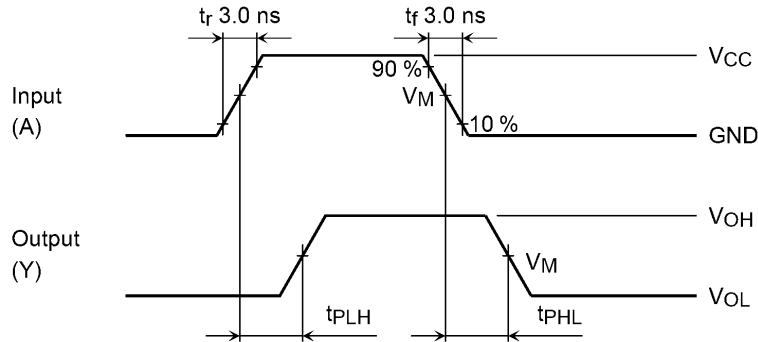


Fig. 9.8.1  $t_{PLH}$ ,  $t_{PHL}$

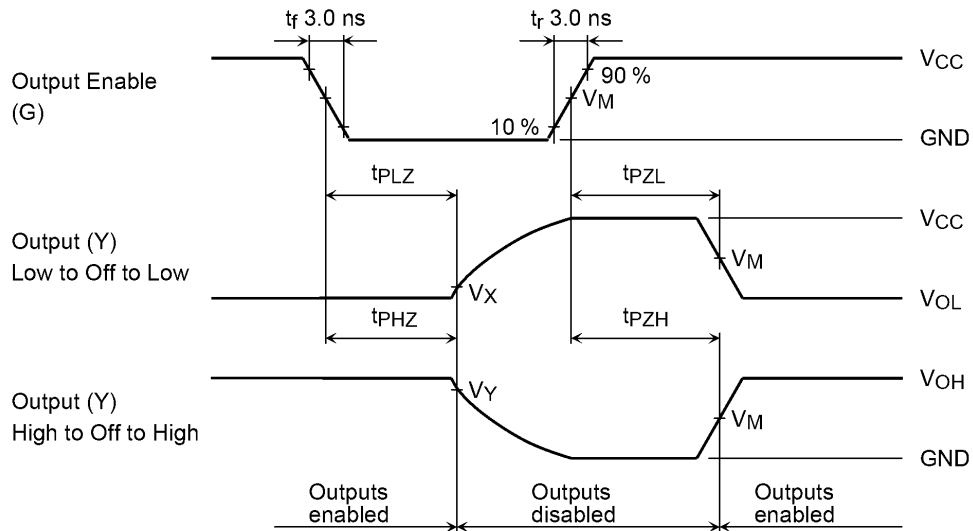


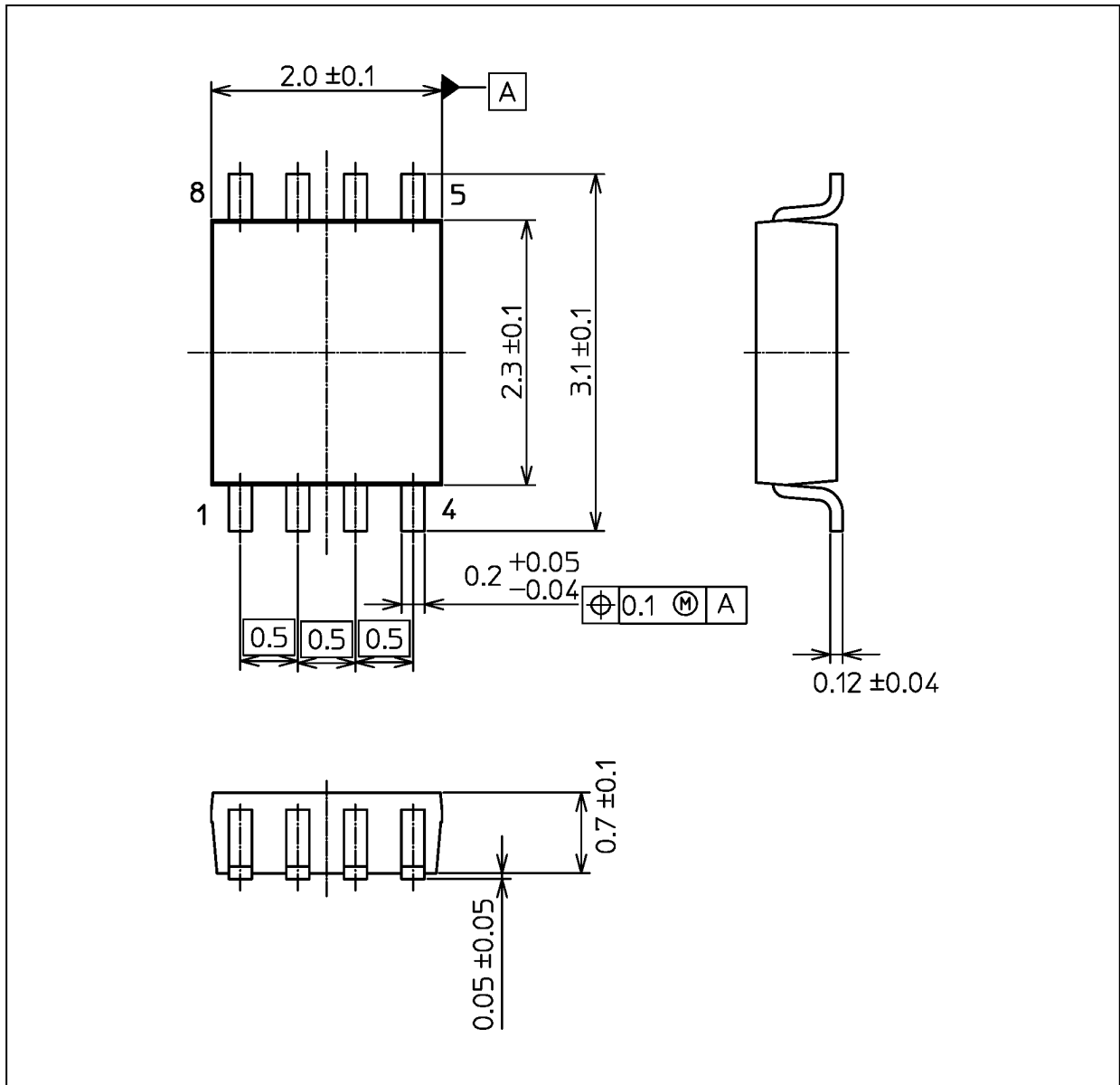
Fig. 9.8.2  $t_{PLZ}$ ,  $t_{PHZ}$ ,  $t_{PZL}$ ,  $t_{PZH}$

Table 9.8.1 AC Waveform Symbols

Symbol	$V_{CC} = 3.3 \pm 0.3 \text{ V}$	$V_{CC} = 2.5 \pm 0.2 \text{ V}$	$V_{CC} = 1.8 \pm 0.15 \text{ V}$	$V_{CC} = 1.5 \pm 0.1 \text{ V}$	$V_{CC} = 1.2 \pm 0.1 \text{ V}$	$V_{CC} = 0.9 \text{ V}$
$V_M$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$
$V_X$	$V_{OL} + 0.3 \text{ V}$	$V_{OL} + 0.15 \text{ V}$	$V_{OL} + 0.15 \text{ V}$	$V_{OL} + 0.1 \text{ V}$	$V_{OL} + 0.1 \text{ V}$	$V_{OL} + 0.1 \text{ V}$
$V_Y$	$V_{OH} - 0.3 \text{ V}$	$V_{OH} - 0.15 \text{ V}$	$V_{OH} - 0.15 \text{ V}$	$V_{OH} - 0.1 \text{ V}$	$V_{OH} - 0.1 \text{ V}$	$V_{OH} - 0.1 \text{ V}$

## Package Dimensions

Unit: mm



Weight: 0.01 g (typ.)

Package Name(s)
JEDEC: SOT-765
Nickname: US8

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