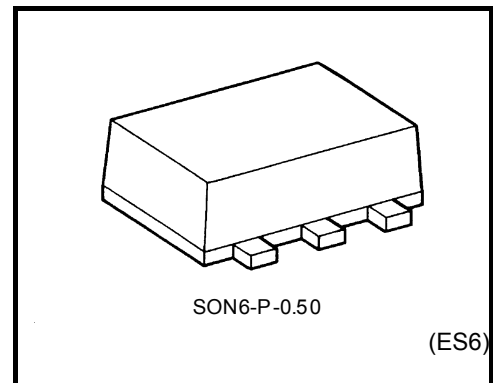


# TC7PA19AFE

## Chip Select Decoder

### Features

- Operating voltage range:  $V_{CC} = 1.4\sim 3.6\text{ V}$
- High-speed operation:  $t_{pd} = 3.3\text{ ns (max) at } V_{CC} = 3.0\sim 3.6\text{ V}$   
 $t_{pd} = 3.9\text{ ns (max) at } V_{CC} = 2.3\sim 2.7\text{ V}$   
 $t_{pd} = 8.0\text{ ns (max) at } V_{CC} = 1.65\sim 1.95\text{ V}$   
 $t_{pd} = 10.0\text{ ns (max) at } V_{CC} = 1.4\sim 1.6\text{ V}$
- High-level output current:  
 $I_{OH}/I_{OL} = \pm 24\text{ mA (min) at } V_{CC} = 3.0\text{ V}$   
 $I_{OH}/I_{OL} = \pm 18\text{ mA (min) at } V_{CC} = 2.3\text{ V}$   
 $I_{OH}/I_{OL} = \pm 4\text{ mA (min) at } V_{CC} = 1.4\text{ V}$
- 3.6 V tolerant inputs



Weight: 0.003 g (typ.)

### Absolute Maximum Ratings (Ta = 25°C)

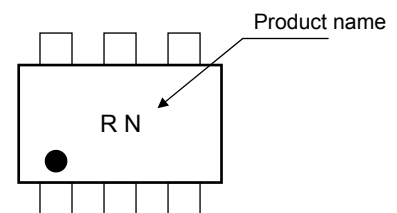
Characteristics	Symbol	Rating	Unit
Supply voltage	$V_{CC}$	-0.5~4.6	V
DC input voltage	$V_{IN}$	-0.5~4.6	V
DC output voltage	$V_{OUT}$	-0.5~ $V_{CC} + 0.5$ (Note 1)	V
Input diode current	$I_{IK}$	-50	mA
Output diode current	$I_{OK}$	$\pm 50$ (Note 2)	mA
DC output current	$I_{OUT}$	+50	mA
Power dissipation	$P_D$	150	mW
DC $V_{CC}$ /ground current	$I_{CC}$	$\pm 100$	mA
Storage temperature	$T_{stg}$	-65~150	°C

Note: 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).

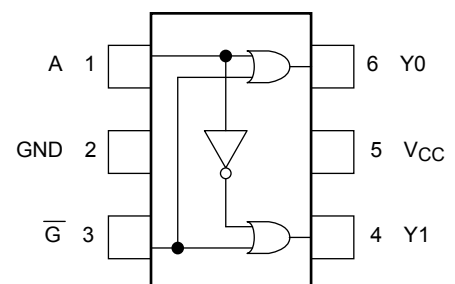
Note 1: High or Low state. The  $I_{OUT}$  absolute maximum rating must be adhered to.

Note 2:  $V_{OUT} < GND, V_{OUT} > V_{CC}$

### Marking



### Pin Assignment (top view)



## Truth Table

Inputs		Outputs		Selected Output
Enable	Select	Y0	Y1	
$\bar{G}$	A			
H	X	H	H	None
L	L	L	H	Y0
L	H	H	L	Y1

X : Don't care

## Operating Ranges

Characteristics	Symbol	Value	Unit
Supply voltage	$V_{CC}$	1.4~3.6	V
		1.2~3.6 (Note 3)	
Input voltage	$V_{IN}$	-0.3~3.6	V
Output voltage	$V_{OUT}$	0~ $V_{CC}$ (Note 4)	V
Output Current	$I_{OH}/I_{OL}$	$\pm 24$ (Note 5)	mA
		$\pm 18$ (Note 6)	
		$\pm 4$ (Note 7)	
Operating temperature	$T_{opr}$	-40~85	°C
Input rise and fall time	$d_t/d_v$	0~10 (Note 8)	ns/V

Note 3: Data retention only

Note 4: High or Low state

Note 5:  $V_{CC} = 3.0\sim 3.6$  V

Note 6:  $V_{CC} = 2.3\sim 2.7$  V

Note 7:  $V_{CC} = 1.4\sim 1.9$  V

Note 8:  $V_{IN} = 0.8\sim 2.0$  V,  $V_{CC} = 3.0$  V

## DC Electrical Characteristics (Ta = -40~85°C, 2.7 V < VCC ≤ 3.6 V)

Characteristics	Symbol	Test Condition		VCC (V)	Min	Max	Unit
High-Level Input Voltage	V <sub>IH</sub>	—		2.7~3.6	2.0	—	V
Low-Level Input Voltage	V <sub>IL</sub>	—		2.7~3.6	—	0.8	
High-Level Output Voltage	V <sub>OH</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> = -100 μA	2.7~3.6	V <sub>CC</sub> - 0.2	—	V
			I <sub>OH</sub> = -12 mA	2.7	2.2	—	
			I <sub>OH</sub> = -18 mA	3.0	2.4	—	
			I <sub>OH</sub> = -24 mA	3.0	2.2	—	
Low-Level Output Voltage	V <sub>OL</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 100 μA	2.7~3.6	—	0.2	V
			I <sub>OL</sub> = 12 mA	2.7	—	0.4	
			I <sub>OL</sub> = 18 mA	3.0	—	0.4	
			I <sub>OL</sub> = 24 mA	3.0	—	0.55	
Input Leakage Current	I <sub>IN</sub>	V <sub>IN</sub> = 0~3.6 V		2.7~3.6	—	±10.0	μA
Quiescent Supply Current	I <sub>CC</sub>	V <sub>IN</sub> = V <sub>CC</sub> or GND		2.7~3.6	—	20.0	μA
		V <sub>CC</sub> ≤ V <sub>IN</sub> ≤ 3.6 V		2.7~3.6	—	±20.0	
Increase in I <sub>CC</sub> per Input	ΔI <sub>CC</sub>	V <sub>IH</sub> = V <sub>CC</sub> - 0.6 V		2.7~3.6	—	750	

## DC Electrical Characteristics (Ta = -40~85°C, 2.3 V ≤ VCC ≤ 2.7 V)

Characteristics	Symbol	Test Condition		VCC (V)	Min	Max	Unit
High-Level Input Voltage	V <sub>IH</sub>	—		2.3~2.7	1.6	—	V
Low-Level Input Voltage	V <sub>IL</sub>	—		2.3~2.7	—	0.7	
High-Level Output Voltage	V <sub>OH</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> = -100 μA	2.3~2.7	V <sub>CC</sub> - 0.2	—	V
			I <sub>OH</sub> = -6 mA	2.3	2.0	—	
			I <sub>OH</sub> = -12 mA	2.3	1.8	—	
			I <sub>OH</sub> = -18 mA	2.3	1.7	—	
Low-Level Output Voltage	V <sub>OL</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 100 μA	2.3~2.7	—	0.2	V
			I <sub>OL</sub> = 12 mA	2.3	—	0.4	
			I <sub>OL</sub> = 18 mA	2.3	—	0.6	
Input Leakage Current	I <sub>IN</sub>	V <sub>IN</sub> = 0~3.6 V		2.3~2.7	—	±10.0	μA
Quiescent Supply Current	I <sub>CC</sub>	V <sub>IN</sub> = V <sub>CC</sub> or GND		2.3~2.7	—	20.0	μA
		V <sub>CC</sub> ≤ V <sub>IN</sub> ≤ 3.6 V		2.3~2.7	—	±20.0	

## DC Electrical Characteristics (Ta = -40~85°C, 1.4 V ≤ VCC < 2.3 V)

Characteristics	Symbol	Test Condition		VCC (V)	Min	Max	Unit
High-Level Input Voltage	V <sub>IH</sub>	—		1.4~2.3	V <sub>CC</sub> × 0.7	—	V
Low-Level Input Voltage	V <sub>IL</sub>	—		1.4~2.3	—	V <sub>CC</sub> × 0.13	
High-Level Output Voltage	V <sub>OH</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> = -100 μA	1.4	V <sub>CC</sub> - 0.2	—	V
			I <sub>OH</sub> = -4 mA	1.4	1.0	—	
Low-Level Output Voltage	V <sub>OL</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 100 μA	1.4	—	0.2	V
			I <sub>OL</sub> = 4 mA	1.4	—	0.3	
Input Leakage Current	I <sub>IN</sub>	V <sub>IN</sub> = 0~3.6 V		1.4	—	±10.0	μA
Quiescent Supply Current	I <sub>CC</sub>	V <sub>IN</sub> = V <sub>CC</sub> or GND		1.4	—	20.0	μA
		V <sub>CC</sub> ≤ V <sub>IN</sub> ≤ 3.6 V		1.4	—	±20.0	

## AC Electrical Characteristics (Ta = -40~85°C, input t<sub>r</sub> = t<sub>f</sub> = 2.0 ns)

Characteristics	Symbol	Test Condition		VCC (V)	Min	Max	Unit	
Propagation delay time (A or $\bar{G}$ - Y0 or Y1)	t <sub>pLH</sub> t <sub>pHL</sub>	(Figure 1 and 2)	C <sub>L</sub> =15pF, R <sub>L</sub> =1MΩ	1.5 ± 0.1	1.8	10.0	ns	
				1.8 ± 0.15	1.5	8.0		
				2.5 ± 0.2	0.8	3.9		
				3.3 ± 0.3	0.6	3.3		
				C <sub>L</sub> =30pF, R <sub>L</sub> =500Ω	1.5 ± 0.1	2.0	13.0	ns
					1.8 ± 0.15	1.8	9.5	
					2.5 ± 0.2	1.2	5.0	
					3.3 ± 0.3	1.0	4.0	

For C<sub>L</sub> = 50 pF, add approximately 300 ps to the AC maximum specification.

## Capacitive Characteristics (Ta = 25°C)

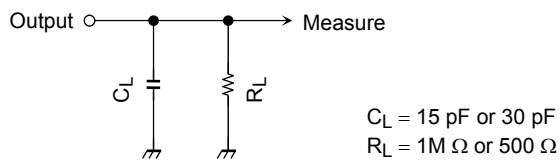
Characteristics	Symbol	Test Condition		VCC (V)	TYP.	Unit
Input Capacitance	C <sub>IN</sub>	—		1.8, 2.5, 3.3	6	pF
Power Dissipation Capacitance	C <sub>PD</sub>	f <sub>IN</sub> = 10 MHz	(Note 9)	1.8, 2.5, 3.3	20	pF

Note 9: 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:

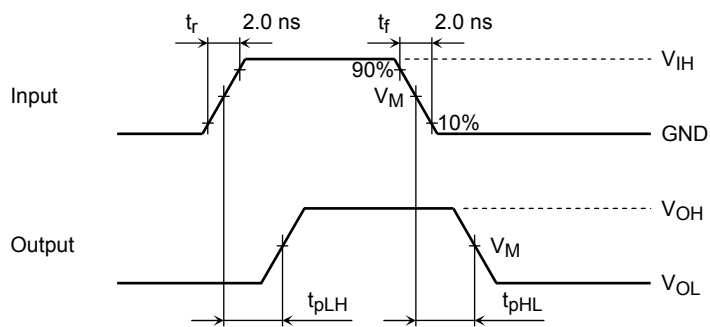
$$I_{CC (opr.)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$

**Test Circuit**



**Figure 1**

**AC Waveforms**



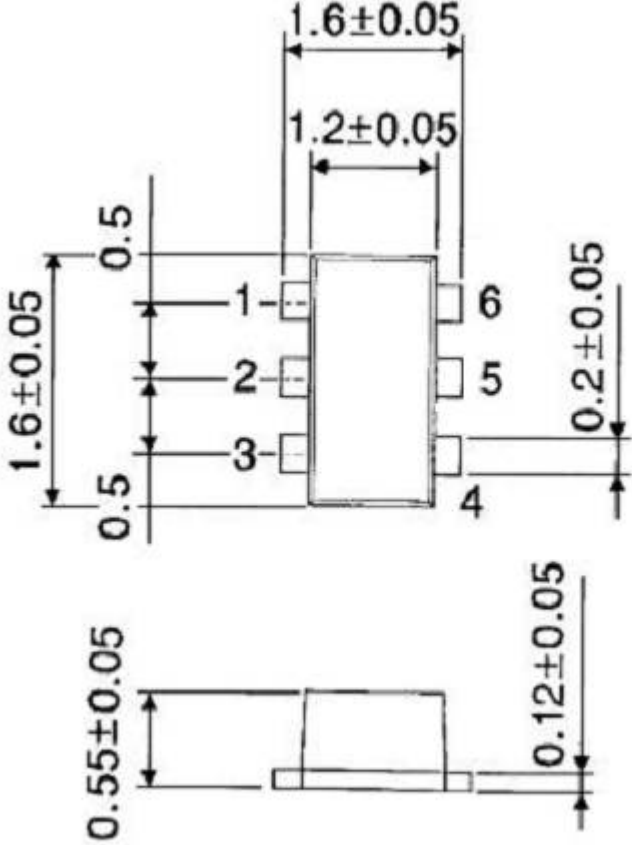
Symbol	$V_{CC}$			
	$3.3 \pm 0.3 \text{ V}$	$2.5 \pm 0.2 \text{ V}$	$1.8 \pm 0.15 \text{ V}$	$1.5 \pm 0.1 \text{ V}$
$V_{IH}$	2.7 V	$V_{CC}$	$V_{CC}$	$V_{CC}$
$V_M$	1.5 V	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$

**Figure 2  $t_{pLH}$ ,  $t_{pHL}$**

Package Dimensions

SON6-P-0.50

Unit : mm



Weight: 0.003 g (typ.)

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