# CMOS LOGIC IC ELM7S04B Inverter

## ■General description

　ELM7S04B is CMOS inverter IC. It realizes high speed operation similar to LS-TTL with lower power consumption by CMOS features. The inner circuit structure of 3-stage logic gate obtains wider noise immunity and constant output.

## ■Features

・Same electrical characteristic as 74HC series (output current is around 1/2 of 74HC series)
・Low consumption current 　　　　: Idd=1.0$\mu$A(Max.)(Top=25℃ )
・Wide power voltage range 　　　　: 2.0V～6.0V
・High speed 　　　　　　　　　　: Tpd=5ns(Typ.)(Vdd=5.0V)
・Symmetrical output impedance 　: | Ioh |=Iol=2mA (Min.)(Vdd=4.5V)
・Small package 　　　　　　　　 : SOT-25

## ■Application

・Cell phones
・Digital cameras
・Portable electrical appliances like PDA, etc.
・Computers and peripherals
・Digital electrical appliances like LCD TV sets, DVD recorders/players, STB, etc.
・Modification inside print board, adjustment of timing, solution to noise

## ■Selection guide

### ELM7S04B-EL

| Symbol | | |
|---|---|---|
| a | Function | 04 : Inverter |
| b | Product version | B |
| c | Taping direction | EL : Refer to PKG file |

ELM7S 0 4　B - EL
　　　 ↑　 ↑　 ↑
　　　 a　 b　 c

## ■Maximum absolute ratings

| Parameter | Symbol | Limit | Unit |
|---|---|---|---|
| Power supply voltage | Vdd | −0.5～+7.0 | V |
| Input voltage | Vin | −0.5～Vdd+0.5 | V |
| Output voltage | Vout | −0.5～Vdd+0.5 | V |
| Input protection diode current | Iik | ±20 | mA |
| Output parasitic diode current | Iok | ±20 | mA |
| Output current | Iout | ±25 | mA |
| VDD/GND current | Idd, Ignd | ±25 | mA |
| Power dissipation | Pd | 200 | mW |
| Storage temperature | Tstg | −65～+150 | ℃ |

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## ■Suggested operating condition

| Parameter | Symbol | Limit | | Unit |
|---|---|---|---|---|
| Power voltage | Vdd | 2.0～6.0 | | V |
| Input voltage | Vin | 0～Vdd | | V |
| Output voltage | Vout | 0～Vdd | | V |
| Operating temperature | Top | −40～+85 | | ℃ |
| High-input down-time | tr, tf | Vdd=2.0V | 0～1000 | ns |
| | | Vdd=4.5V | 0～500 | |
| | | Vdd=6.0V | 0～400 | |

## ■Pin configuration

SOT−25 (TOP VIEW)
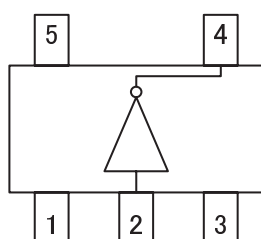
| Pin No. | Pin name |
|---|---|
| 1 | NC |
| 2 | INY |
| 3 | GND |
| 4 | OUTX |
| 5 | VDD |

| Input | Output |
|---|---|
| INY | OUTX |
| Low | High |
| High | Low |

## ■AC electrical characteristics

CL=15pF, tr=tf=6ns, Vdd=5V

| Parameter | Sym. | Top=25℃ | | | Unit | Condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Output transition time | tTLH | | 4 | 10 | ns | Refer to test circuit |
| | tTHL | | 3 | 10 | | |
| Propagation delay-time | tPLH | | 5 | 15 | ns | Refer to test circuit |
| | tPHL | | 5 | 15 | | |

CL=50pF, tr=tf=6ns

| Parameter | Sym. | Vdd | Top=25℃ | | | Top=−40～+85℃ | | Unit | Condition |
|---|---|---|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | Min. | Max. | | |
| Output transition time | tTLH | 2.0 | | 22 | 125 | | 155 | ns | Refer to test circuit |
| | | 4.5 | | 8 | 25 | | 31 | | |
| | | 6.0 | | 6 | 21 | | 26 | | |
| | tTHL | 2.0 | | 16 | 125 | | 155 | ns | |
| | | 4.5 | | 7 | 25 | | 31 | | |
| | | 6.0 | | 6 | 21 | | 26 | | |
| Propagation delay-time | tPLH | 2.0 | | 18 | 100 | | 125 | ns | Refer to test circuit |
| | | 4.5 | | 8 | 20 | | 25 | | |
| | | 6.0 | | 7 | 17 | | 21 | | |
| | tPHL | 2.0 | | 17 | 100 | | 125 | ns | |
| | | 4.5 | | 7 | 20 | | 25 | | |
| | | 6.0 | | 6 | 17 | | 21 | | |
| Input capacity | Cin | | | 5 | 10 | | 10 | pF | |
| Equivalent inner capacity | Cpd | | | 10 | | | | pF | |

＊ Cpd is IC's inner equivalent capacity which is calculated from non-loaded operating current consumption referred to test circuit.
Averaged operating current consumption at non load is calculated as following formula: Idd(opr)=Cpd·Vdd·fin+Idd

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## ■DC electrical characteristics

| Parameter | Sym. | Vdd | Top=25℃ | | | Top=−40〜+85℃ | | Unit | Condition | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | Min. | Max. | | | |
| Input voltage | Vih | 2.0 | 1.50 | | | 1.50 | | V | | |
| | | 4.5 | 3.15 | | | 3.15 | | | | |
| | | 6.0 | 4.20 | | | 4.20 | | | | |
| | Vil | 2.0 | | | 0.50 | | 0.50 | V | | |
| | | 4.5 | | | 1.35 | | 1.35 | | | |
| | | 6.0 | | | 1.80 | | 1.80 | | | |
| Output voltage | Voh | 2.0 | 1.90 | 2.00 | | 1.90 | | V | Vin=Vil | Ioh=−20$\mu$A |
| | | 4.5 | 4.40 | 4.50 | | 4.40 | | | | |
| | | 6.0 | 5.90 | 6.00 | | 5.90 | | | | |
| | | 4.5 | 4.18 | 4.35 | | 4.13 | | | | Ioh=−2mA |
| | | 6.0 | 5.68 | 5.83 | | 5.63 | | | | Ioh=−2.6mA |
| | Vol | 2.0 | | 0.00 | 0.10 | | 0.10 | V | Vin=Vih | Iol=20$\mu$A |
| | | 4.5 | | 0.00 | 0.10 | | 0.10 | | | |
| | | 6.0 | | 0.00 | 0.10 | | 0.10 | | | |
| | | 4.5 | | 0.12 | 0.26 | | 0.33 | | | Iol=2mA |
| | | 6.0 | | 0.13 | 0.26 | | 0.33 | | | Iol=2.6mA |
| Input current | Iin | 6.0 | −0.1 | | 0.1 | −1.0 | 1.0 | $\mu$A | Vin=Vdd or GND | |
| Static current | Idd | 6.0 | | | 1.0 | | 10.0 | $\mu$A | Vin=Vdd or GND | |

## ■Test circuit
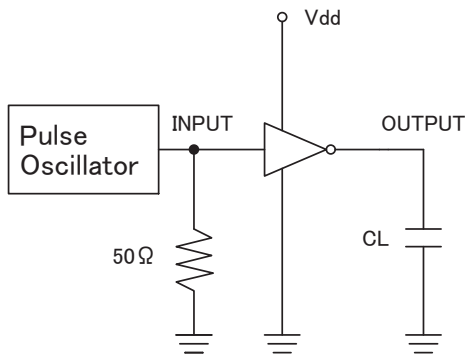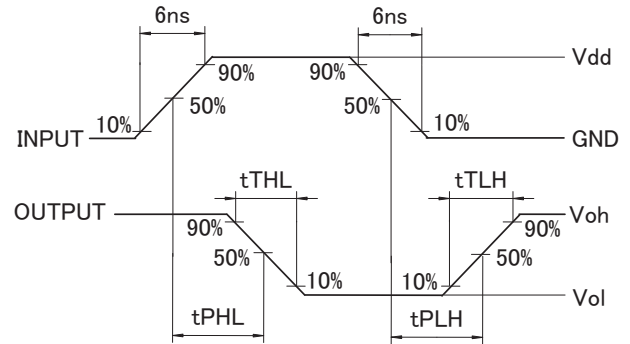


＊ Output should be opened when measuring current consumption.

## ■Measured wave pattern



## ■Marking

SOT−25
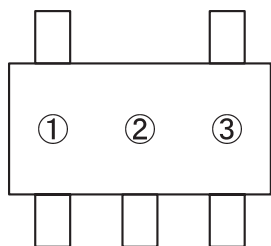


| No. | Mark | Content |
|---|---|---|
| ① | E | ELM7S series |
| ② | 5 | ELM7S04B |
| ③ | A〜Z (except I, O, X) | Lot No. |

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