## PG001M Serial Signal Generator ICs for SLA7042M and SLA7044M

## ■Absolute Maximum Ratings

| Parameter | Symbol | Ratings | Unit |
| :--- | :---: | :---: | :---: |
| Supply Voltage | $\mathrm{V}_{\mathrm{DD}}$ | -0.5 to 7 | V |
| Input Voltage | $\mathrm{V}_{\mathrm{I}}$ | -0.5 to $\mathrm{V}_{\mathrm{DD}+}+0.5$ | V |
| Input Current | I | $\pm 10$ | mA |
| Output Voltage | $\mathrm{V}_{\circ}$ | -0.5 to $\mathrm{V}_{\mathrm{DD}+}+0.5$ | V |
| Output Current | l | $\pm 15$ | mA |
| Power Dissipation | $\mathrm{P}_{\mathrm{D}}$ | 200 | mW |
| Operating Temperature | $\mathrm{Top}^{\circ}$ | -20 to +85 | ${ }^{\circ} \mathrm{C}$ |
| Storage Temperature | $\mathrm{T}_{\text {stg }}$ | -40 to +150 | ${ }^{\circ} \mathrm{C}$ |

## Electrical Characteristics

| Parameter |  | Symbol | Conditions | Ratings |  |  | Unit |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | min. |  | typ. | max. |  |
|  | Supply Voltage |  | Vdo |  | 4.5 |  | 5.5 | V |
|  | Supply Current | Iod | $\mathrm{V}_{\mathrm{DD}}=5.5 \mathrm{~V}$ |  | 0.35 | 0.45 | mA |
|  | Output Voltage | Voн | $V_{\text {do }}=5 \mathrm{~V}, \mathrm{lo}= \pm 3 \mathrm{~mA}$ | 4.5 |  |  | V |
|  |  | VoL |  |  |  | 0.4 |  |
|  | Input Current | 1 | $\mathrm{V}_{\mathrm{D} D}=5 \mathrm{~V}, \mathrm{~V}_{1}=0$ or 5 V |  |  | $\pm 1$ | $\mu \mathrm{A}$ |
|  | Input Voltage | $\mathrm{V}_{\mathrm{H}}$ | $V_{\text {d }}=5 \mathrm{~V}$ | 3.5 |  | 5 | V |
|  |  | $\mathrm{V}_{\mathrm{IL}}$ |  | -0.3 |  | 1.5 |  |
|  | Input Hysteresis Voltage | $\mathrm{V}_{\mathrm{H}}$ | $\mathrm{V}_{\mathrm{DD}}=5 \mathrm{~V}$ |  | 1 |  | V |
|  | Input Capacity | $\mathrm{Cl}_{1}$ | $\mathrm{V}_{\mathrm{DD}}=5 \mathrm{~V}$ |  | 5 | 10 | pF |
|  | Internal Oscillation Frequency | F | $V_{D D}=5 \mathrm{~V}$ <br> See Fig. 1. |  | 1.5 |  | MHz |
|  | Propagation Delay Time | Tcs |  |  | 50 | 100 | ns |
|  |  | Tcc |  |  | 430 | 550 |  |
|  | Output Voltage Rise and Fall Time | Tr | $V_{D D}=5 \mathrm{~V}, \mathrm{C}_{\mathrm{L}}=15 \mathrm{pF}$ <br> See Fig. 2. |  | 20 |  | ns |
|  |  | T ${ }_{\text {f }}$ |  |  | 20 |  |  |
|  | CLOCK IN Terminal Input Clock Time | $\mathrm{V}_{\text {CIH }}$ | H level time, $\mathrm{V}_{\mathrm{DD}}=5 \mathrm{~V}$ | 4.5 |  |  | $\mu \mathrm{s}$ |
|  |  | $\mathrm{V}_{\text {cIL }}$ | L level time, $\mathrm{V}_{\mathrm{DD}}=5 \mathrm{~V}$ | 0.5 |  |  |  |
|  | Reset Setting Time (A) | ${ }_{\text {ts } R}$ | From/To CLOCK_IN $\uparrow$ See Fig. 3. | 100 |  |  | ns |
|  | Stabilization Time After Reset Input (B) | ${ }_{\text {tps }} \mathrm{R}$ |  |  |  |  |  |
|  | Signal Setting Time (C) | ${ }_{1 s} \mathrm{~S}$ | From/To CLOCK_IN $\uparrow$ See Fig. 3. | 100 |  |  | ns |
|  | Stabilization Time After Signal Input (D) | tps S |  |  |  |  |  |

Fig. 3 Timing conditions


Typical Connection Diagram


## ■Internal Block Diagram



## ©Input and Output Function Correlation Table

| Input |  |  |  | Output |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Mode | $\begin{array}{\|l\|l\|} \hline \text { CLOCK } \\ \hline \end{array}$ | $\begin{aligned} & \mathrm{CW} \\ & \stackrel{C D W}{ } \end{aligned}$ | RESET | $\overline{\text { MO }}$ | $\begin{aligned} & \text { CLOCK } \\ & \text { OUUT } \\ & \hline \end{aligned}$ | Strobe | $\begin{aligned} & \hline \text { DATA } \\ & - \text { - } \end{aligned}$ | ${ }_{-B}^{\text {DATA }}$ |
| cw | 5 | L | H | L | Л]ITI | $\sqrt{2}$ | cw | cw |
|  | $\underline{L}$ | L | H | 5 | - | $\square$ |  |  |
| ccw | $\checkmark$ | H | H | L | Л]ITI | , | ccw | cCw |
|  | $\underline{L}$ | H | H |  | - | L |  |  |
| RESET | 5 | $\times$ | L | $\square$ |  | , | $\begin{array}{\|c\|} \hline \text { Output Mode } \\ 4 \text { or } 7 \end{array}$ | $\begin{gathered} \text { Input Mode } \\ 4 \mathrm{or} 7 \end{gathered}$ |
|  | L | $\times$ | L | - | - | L | Ouput Mode | Output Mode |

$x$ : Immaterial
: $\overline{\mathrm{MO}}$ outputs L level while CLOCK_IN is H level when output mode is $4: 4$ ( $7: 7$ ), $\overline{4}: 4$ ( $\overline{7}: 7$ ), $4: \overline{4}(7: \overline{7})$, or $\overline{4}: \overline{4}(\overline{7}: \overline{7})$.
Modes in brackets ( ) are for 2-2 phase VC:H.

## Excitation Selection Table

| Excitation method | Input <br> Excitation mode <br> selection <br> $v e$ |  |  | Output current mode of SLA7042M/7044M |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  | 0 | $\begin{array}{\|c\|} \hline 1 \\ \hline 20 \% \\ \hline \end{array}$ | $\begin{array}{\|c\|} \hline 2 \\ \hline 40 \% \\ \hline \end{array}$ | $\begin{array}{\|c\|} \hline 3 \\ \hline 55.5 \% \\ \hline \end{array}$ | $\frac{4}{9 \% 71.4 \%}$ | $5$ | $\begin{array}{\|c\|} \hline 6 \\ \hline 91 \% \\ \hline \end{array}$ | $\begin{array}{c\|} \hline 7 \\ \hline 100 \% \\ \hline \end{array}$ | Torque vector |
|  | vc | MS1 | MS2 | 0\% |  |  |  |  |  |  |  |  |
| $\begin{aligned} & \text { 2-2 Phase } \\ & \text { Full Step } \end{aligned}$ | H | L | L | - | - | - | - | - | - | - | - | 141\% |
|  | L | L | L | - | - | - | - | - | - | - | - | 100\% |
| 1-2 Phase Half Step | $\times$ | H | L | $\bigcirc$ | - | - | - | - | - | - | $\bigcirc$ | 100\% |
| $\begin{gathered} \hline \text { W1-2 Phase } \\ \text { 1/4 Step } \\ \hline \end{gathered}$ | $\times$ | L | H | $\bigcirc$ | - | $\bigcirc$ | - | $\bigcirc$ | - | $\bigcirc$ | $\bigcirc$ | 100\% |
| $\begin{gathered} \text { 2W1-2 Phase } \\ 1 / 8 \text { Step } \\ \hline \end{gathered}$ | $\times$ | H | H | $\bigcirc$ | $\bigcirc$ | $\bigcirc$ | $\bigcirc$ | $\bigcirc$ | $\bigcirc$ | $\bigcirc$ | $\bigcirc$ | 100\% |

©Output Mode Vs Output Pulse


■Output Mode Sequence

| Excitation method | CW/CCW | CLOCK | $\stackrel{\text { RESET }}{\sim}$ |  | 23 | 34 | 45 |  |  |  | 91 | 1011 | 1112 | 1213 | 3141 |  | 1617 |  |  |  |  |  |  |  |  |  |  | 2829 | 2930 |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | $\overline{\text { MO }}$ | L |  | H H | H H | H | H | H | L | H H | H H | H H | H H | H H | H L | L H | H H | H H | H H | H H | H H | H H | HL | H | H | H H | H H | H H |  | HL |
| 2-2 Phase Full Step (1) (VC:H) | cW | DATA_A | 7 |  | $==$ | $=$ = | $==$ | $=$ | $=$ | 7 | $==$ | $=$ | $==$ | $=$ = | $==$ | $=7$ | $7=$ | $=$ | $=$ | $=$ | $=$ = | $=$ | $=$ | 7 | $=$ | $=$ | $=$ | $=$ = | $==$ |  | $=7$ |
|  |  | DATA_B | 7 | $=$ | $=$ | $=$ = | $=$ = | = | $=$ | 7 | $=$ | $=$ | $=$ = | $=$ = | $==$ |  | $\overline{7}=$ | $=$ | $=$ | $=$ | $=$ | $=$ | $=$ | $\overline{7}$ | = | $=$ | $=$ | $=$ = | = |  |  |
|  | ccw | DATA_A | 7 | $=$ | $=$ | $=$ = | $=$ = | = | $=$ | 7 | $=$ | $=$ | $==$ | $=$ = | $=$ |  | $7=$ | = | $=$ | $=$ | $=$ |  |  | 7 | = | $=$ | $=$ | $=$ = | = |  |  |
|  |  | DATA_B | 7 | $=$ | $=$ | $=$ = | $=$ = | = | $=$ | 7 | $=$ | $=$ | $=$ | $=$ = | $==$ |  | 7 = | $=$ | = | $=$ | $=$ |  |  | $=7$ | $=$ | $=$ | $=$ | = | $=$ |  |  |
| 2-2 Phase Full Step (2) (VC:L) | cW | DATA_A | 4 | $=$ | $=$ | $=$ = | $=$ = | $=$ | $=$ | 4 | = | $=$ | $=$ = | $=$ = | $==$ | $=\overline{4}$ | $\overline{4}=$ | $=$ | = | $=$ | $=$ | $=$ |  | $=4$ | = | $=$ | $=$ | = | $=$ |  | $=4$ |
|  |  | DATA_B | 4 | $=$ | $=$ | $==$ | $==$ | = | $=$ | 4 | = | $=$ | $==$ | $=$ = | $==$ |  | $\overline{4}=$ | $=$ | $=$ | $=$ | $=$ |  |  | $\overline{4}$ | $=$ | $=$ | = | $=$ | $=$ = |  |  |
|  | CCW | DATA_A | 4 | $=$ | $=$ | $==$ | $==$ | = | $=$ | 4 | = | $=$ | $==$ | $=$ = | $==$ | $=\overline{4}$ | $\overline{4}=$ | $=$ | $=$ | $=$ | $=$ | $=$ = | $=$ | $\overline{4}$ | = | = | $=$ | = | $=$ |  | $=4$ |
|  |  | DATA_B | 4 | $=$ | $=$ | $=$ = | $==$ | $=$ | $=$ | 4 | $=$ | $=$ | $==$ | $=$ = | $==$ | $=\overline{4}$ | $\overline{4}=$ | $=$ | $=$ | = | $=$ | $=$ | $=$ | 4 | = | $=$ | $=$ | = | $=$ |  | 4 |
| 1-2 Phase Half Step | CW | DATA_A | 4 | $=$ | $=$ | $=\overline{0}$ | $\overline{\mathrm{o}}=$ | = | = | $\overline{4}$ | = | $=$ | $=\overline{7}$ | $\overline{7}=$ | $==$ | $=\overline{4}$ | $\overline{4}=$ | $=$ | $=$ | 0 | 0 | $=$ | $=$ | 4 | = | $=$ | 7 | $7=$ | $=$ |  | $=4$ |
|  |  | DATA_B | 4 | $=$ | $=-$ | $=7$ | $7=$ | = | $=$ | 4 | = | = | $=\overline{0}$ | $\overline{0}=$ | $=$ | $=\overline{4}$ | $\overline{4}$ | $=$ | $=$ | $\overline{7}$ | 7 | $=$ |  | $=\overline{4}$ | = | $=$ | 0 | $0=$ | $=$ |  | 4 |
|  | CCW | DATA_A | 4 | $=$ | $=$ | $=7$ | $7=$ | $=$ | $=$ | 4 | $=$ | $=$ | $=0$ | $0=$ | $==$ | $=\overline{4}$ | $\overline{4}=$ | $=$ | $=$ | $=7$ | 7 = | $=$ |  | 4 | = | $=$ | $=\overline{0}$ | $\overline{0}=$ | $=$ |  |  |
|  |  | DATA_B | 4 | = | $=$ | $=0$ | $0=$ | $=$ | = | 4 | = | $=$ | $=7$ | $7=$ | $==$ | $=4$ | 4 | $=$ | = | $=\overline{0}$ | $\overline{0}=$ | = | $=$ | $=4$ | = | = | $=7$ | 7 = | $==$ |  |  |
| $\begin{aligned} & \text { W1-2 Phase } \\ & \text { 1/4 Step } \end{aligned}$ | cW | DATA_A | 4 | $=$ | $2=$ | $=\overline{0}$ | $\overline{0}=$ | $\overline{2}$ | = | $\overline{4}$ | $\overline{=}=\overline{6}$ | $\overline{6}=$ | $=\overline{7}$ | $\overline{7}=$ | $=\overline{6}$ | $=\overline{4}$ | $\overline{4}=$ | $=\overline{2}$ | $\overline{2}=$ | $=0$ | $0=$ | $=2$ | 2 | $=4$ | = | 6 | $=7$ | 7 = | $=6$ |  | $=4$ |
|  |  | DATA_B | 4 | $=$ | $6=$ | $=7$ | $7=$ | 6 | = | 4 | = 2 | $2=$ | $=\overline{0}$ | $\overline{0}=$ | $=\overline{2}$ | $=\overline{4}$ | $\overline{4}=$ | $=\overline{6}$ | $\overline{6}$ | 7 | 7 = | $=\overline{6}$ | $\overline{6}$ | $\overline{4}$ | = | $\overline{2}$ | $=0$ | $0=$ | $=2$ |  | $=4$ |
|  | CCW | DATA_A | 4 | $=$ | $6=$ | $=7$ | $7=$ | 6 | = | 4 | = 2 | $2=$ | = 0 | $0=$ | $=\overline{2}=$ | $=\overline{4}$ | $\overline{4}=$ | $=\overline{6}$ | $\overline{6}$ | 7 | 7 = | $=\overline{6}$ | $\overline{6}$ | $=\overline{4}$ | = | $\overline{2}$ | $=\overline{0}$ | $\overline{0}=$ | $=2$ |  | $=4$ |
|  |  | DATA_B | 4 | $=$ | $2=$ | $=0$ | $0=$ | 2 | = | 4 | = 6 | 6 $=$ | $=7$ | $7=$ | $=\overline{6}$ | $=4$ | $4=$ | $=2$ | $2=$ | б | $\bar{\sigma}=$ | $=2$ | 2 | $=4$ | = | 6 | 7 | $7=$ | $=6$ |  |  |
| $\begin{aligned} & \text { 2W1-2 Phase } \\ & 1 / 8 \text { Step } \end{aligned}$ | CW | DATA_A | 4 | 3 | 21 | $1 \overline{0}$ | $\overline{\mathrm{o}} \overline{\mathrm{T}}$ | $\overline{2}$ | $\overline{3}$ | $\overline{4}$ | $5 \overline{6}$ | $\overline{6} 7$ | $\overline{7} \overline{7}$ | $\overline{7}$ | $\overline{7} \overline{6}$ | $5 \overline{4}$ | $\overline{4} \overline{3}$ | $\overline{3} \overline{2}$ | $\overline{2}$ | 10 | 01 | 12 | 23 | 34 | 5 | 6 | 77 | 77 | 76 |  |  |
|  |  | DATA_B | 4 | 5 | 67 | 77 | 77 | 6 | 5 | 4 | 32 | 21 | $1 \overline{0}$ | $\overline{\mathrm{O}} \overline{1}$ | $\overline{1} \overline{2}$ | $\overline{3} \overline{4}$ | $\overline{4} 5$ | $\overline{5} \overline{6}$ | $\overline{6} \overline{7}$ | $\overline{7}$ | $\overline{7}$ | $\overline{7} \overline{6}$ | $\overline{6} 5$ | $5 \overline{4}$ | $\overline{3}$ | $\overline{2}$ | T 0 | 01 | 12 |  | 34 |
|  | ccw | DATA_A | 4 |  | 67 | 7 7 | 77 | 6 | 5 | 4 | 32 | 21 | 10 | 0 1 | $\bigcirc \overline{2}$ | $\overline{3} \overline{4}$ | $\overline{4} 5$ |  |  | 77 | $\overline{7}$ | $\overline{7} \overline{6}$ | $\overline{6} 5$ | $5 \overline{4}$ | $\overline{3}$ | $\overline{2}$ | T $\overline{0}$ | - $\quad 1$ | 12 |  | 34 |
|  |  | DATA_B | 4 | 3 | 21 | 10 | ${ }^{1} \mathrm{~T}$ |  | $\overline{3}$ |  | 56 | б 7 | 77 | 77 | 7 ¢ | 54 | 4 3 | $3 \overline{2}$ | 2 T | T 0 | $\bigcirc 1$ | 12 | 23 | 34 | 5 | 6 | 77 | 77 | 76 |  |  |



