

SLA7075MR, MPR, MPRT/7076MR, MPR, MPRT/7077MR, MPR, MPRT/7078MR, MPR, MPRT 2-Phase to 4W 1-2 Phase Excitation Support, Built-in Sequencer

Features

- Lineup of built-in current sense resistor and built-in protection circuit-type
- Power supply voltages, V<sub>BB</sub>: 46 V (max), 10 to 44 V normal operating range
- Logic supply voltages, V<sub>DD</sub>: 3.0 to 5.5 V
- Maximum output currents: 1 A, 1.5 A, 2 A, and 3 A
- Clock input method (built-in sequencer)
- Self-excitation PWM current control with fixed off-time
- Synchronous PWM chopping function prevents motor noise in Hold mode
- Sleep mode for reducing the IC input current in stand-by state
- ZIP type 23-pin molded package (SLA package)

Absolute Maximum Ratings

| Parameter                     | Symbol           | Ratings                      | Unit | Remarks                        |
|-------------------------------|------------------|------------------------------|------|--------------------------------|
| Motor Supply Voltage          | V <sub>M</sub>   | 46                           | V    |                                |
| Driver Supply Voltage         | V <sub>BB</sub>  | 46                           | V    |                                |
| Logic Supply Voltage          | V <sub>DD</sub>  | 6                            | V    |                                |
| Output Current                | I <sub>O</sub>   | *1                           | A    | V <sub>ref</sub> =0.4V, Mode F |
| Logic Input Voltage           | V <sub>IN</sub>  | −0.3 to V <sub>DD</sub> +0.3 | V    |                                |
| REF Input Voltage             | V <sub>REF</sub> | −0.3 to V <sub>DD</sub> +0.3 | V    |                                |
| Sense Voltage                 | V <sub>RS</sub>  | ±2                           | V    | Excluding tw<1μs               |
| Power Dissipation             | PD               | 4.7                          | W    | When T <sub>a</sub> = 25°C     |
|                               |                  | 17                           |      | When T <sub>c</sub> = 25°C     |
| Junction Temperature          | T <sub>J</sub>   | +150                         | °C   |                                |
| Operating Ambient Temperature | T <sub>a</sub>   | −20 to +85                   | °C   |                                |
| Storage Temperature           | T <sub>stg</sub> | −30 to +150                  | °C   |                                |

\*1: Output current value may be limited for the SLA7075MR, MPR, MPRT (1.0 A), SLA7076MR, MPR, MPRT (1.5 A), SLA7077MR, MPR, MPRT (2.0 A), and SA7078MR, MPR, MPRT (3.0 A), depending on the duty ratio, ambient temperature, and heating conditions.  
Do not exceed junction temperature of T<sub>J</sub> under any circumstances.

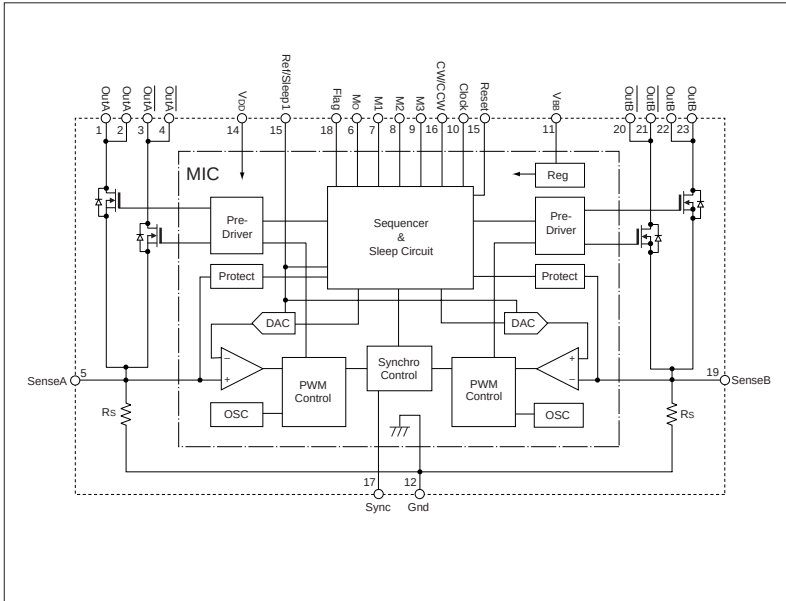
Recommended Operating Conditions

| Parameter             | Symbol          | Rating |      | Unit | Remarks                                                    |
|-----------------------|-----------------|--------|------|------|------------------------------------------------------------|
|                       |                 | min.   | max. |      |                                                            |
| Motor Supply Voltage  | V <sub>M</sub>  |        | 44   | V    |                                                            |
| Driver Supply Voltage | V <sub>S</sub>  | 10     | 44   | V    |                                                            |
| Logic Supply Voltage  | V <sub>DD</sub> | 3.0    | 5.5  | V    | The V <sub>CC</sub> surge voltage should be 0.5 V or lower |
| Case Temperature      | T <sub>C</sub>  |        | 90   | °C   | Temperature at Pin-12 Lead (without heatsink)              |

Electrical Characteristics

| Parameter                           | Symbol               | Ratings               |                  |                     | Unit | Conditions                                                |
|-------------------------------------|----------------------|-----------------------|------------------|---------------------|------|-----------------------------------------------------------|
|                                     |                      | min.                  | typ.             | max.                |      |                                                           |
| Main Supply Current                 | I <sub>BB</sub>      |                       |                  | 15                  | mA   | In operation                                              |
|                                     | I <sub>BBS</sub>     |                       |                  | 100                 | μA   | Sleep 1 and Sleep 2 modes                                 |
| Logic Supply Current                | I <sub>DD</sub>      |                       |                  | 5                   | mA   |                                                           |
| Output MOSFET Breakdown Voltage     | V <sub>(BR)DSS</sub> | 100                   |                  |                     | V    | V <sub>BB</sub> =44V, I <sub>O</sub> =1mA                 |
| Output MOSFET ON Resistance         | R <sub>DS(ON)</sub>  |                       | 0.7              | 0.85                | Ω    | SLA7075M, I <sub>O</sub> =1.0A                            |
|                                     |                      |                       | 0.45             | 0.6                 |      | SLA7076M, I <sub>O</sub> =1.5A                            |
|                                     |                      |                       | 0.25             | 0.4                 |      | SLA7077M, I <sub>O</sub> =2.0A                            |
|                                     |                      |                       | 0.18             | 0.24                |      | SLA7078M, I <sub>O</sub> =3.0A                            |
| Output MOSFET Diode Forward Voltage | V <sub>F</sub>       |                       | 0.85             | 1.1                 | V    | SLA7075M, I <sub>O</sub> =1.0A                            |
|                                     |                      |                       | 1.0              | 1.25                |      | SLA7076M, I <sub>O</sub> =1.5A                            |
|                                     |                      |                       | 0.95             | 1.2                 |      | SLA7077M, I <sub>O</sub> =2.0A                            |
|                                     |                      |                       | 0.95             | 2.1                 |      | SLA7078M, I <sub>O</sub> =3.0A                            |
| Maximum Clock Frequency             | F <sub>clock</sub>   | 250                   |                  |                     | kHz  | When Clock Duty = 50%                                     |
| Logic Input Voltage                 | V <sub>IL</sub>      |                       |                  | 0.25V <sub>DD</sub> | V    |                                                           |
|                                     | V <sub>IH</sub>      | 0.75V <sub>DD</sub>   |                  |                     |      |                                                           |
| Logic Input Current                 | I <sub>IL</sub>      |                       | ±1               |                     | μA   |                                                           |
|                                     | I <sub>IH</sub>      |                       | ±1               |                     |      |                                                           |
| REF Input Voltage                   | V <sub>REF</sub>     | 0.04                  |                  | 0.3                 | V    | SLA7075M, within the specified current limit              |
|                                     |                      | 0.04                  |                  | 0.45                |      | SLA7076M, within the specified current limit              |
|                                     |                      | 0.04                  |                  | 0.4                 |      | SLA7077M, within the specified current limit              |
|                                     |                      | 0.04                  |                  | 0.45                |      | SLA7078M, within the specified current limit              |
|                                     | V <sub>REFS</sub>    | 2                     |                  | V <sub>DD</sub>     |      | Output (OFF) Sleep 1                                      |
| REF Input Current                   | I <sub>REF</sub>     |                       | ±10              |                     | μA   |                                                           |
| SENSE Sense Voltage                 | V <sub>SENSE</sub>   |                       | V <sub>REF</sub> |                     | V    | When step reference current ratio is 100%                 |
| Sleep-Enable Recovery Time          | T <sub>SE</sub>      | 100                   |                  |                     | μs   | Sleep1&Sleep2                                             |
| Switching Time                      | t <sub>con</sub>     |                       | 2.0              |                     | μs   | Clock → Out ON                                            |
|                                     | t <sub>coff</sub>    |                       | 1.5              |                     | μs   | Clock → Out OFF                                           |
| Sense Resistance                    | R <sub>S</sub>       | 0.296                 | 0.305            | 0.314               | Ω    | SLA7075M, tolerance of ±3%                                |
|                                     |                      | 0.296                 | 0.305            | 0.314               |      | SLA7076M, tolerance of ±3%                                |
|                                     |                      | 0.199                 | 0.205            | 0.211               |      | SLA7077M, tolerance of ±3%                                |
|                                     |                      | 0.150                 | 0.155            | 0.160               |      | SLA7078M, tolerance of ±3%                                |
| Overcurrent Sense Voltage           | V <sub>ocp</sub>     | 0.65                  | 0.7              | 0.75                | V    | SLA707xMPR, MPRT, when motor coil shorts out              |
| Overcurrent Sense Current           | I <sub>ocp</sub>     |                       | 2.3              |                     | A    | SLA7075MPR, MPRT/7076MPR, MPRT                            |
|                                     |                      |                       | 3.5              |                     |      | SLA7077MPR, MPRT                                          |
|                                     |                      |                       | 4.6              |                     |      | SLA7078MPR, MPRT                                          |
| Thermal Protection Temperature      | T <sub>std</sub>     |                       | 140              |                     | °C   | SLA707xMPRT, Rear of case (at the saturation temperature) |
| Logic Output Voltage                | V <sub>LOL</sub>     |                       |                  | 1.25                | V    | SLA707xMPR, MPRT, I <sub>FlagL</sub> =1.25mA              |
|                                     | V <sub>LOH</sub>     | V <sub>DD</sub> −1.25 |                  |                     |      | SLA707xMPR, MPRT, I <sub>FlagH</sub> =−1.25mA             |
| Logic Output Current                | I <sub>LOL</sub>     |                       |                  | 1.25                | mA   | SLA707xMPR, MPRT                                          |
|                                     | I <sub>LOH</sub>     | −1.25                 |                  |                     |      |                                                           |
| Step Reference Current Ratio        | ModeF                |                       | 100              |                     | %    |                                                           |
|                                     | ModeE                |                       | 98.1             |                     | %    |                                                           |
|                                     | ModeD                |                       | 95.7             |                     | %    |                                                           |
|                                     | ModeC                |                       | 92.4             |                     | %    |                                                           |
|                                     | ModeB                |                       | 88.2             |                     | %    |                                                           |
|                                     | ModeA                |                       | 83.1             |                     | %    |                                                           |
|                                     | Mode9                |                       | 77.3             |                     | %    |                                                           |
|                                     | Mode8                |                       | 70.7             |                     | %    |                                                           |
|                                     | Mode7                |                       | 63.4             |                     | %    |                                                           |
|                                     | Mode6                |                       | 55.5             |                     | %    |                                                           |
|                                     | Mode5                |                       | 47.1             |                     | %    |                                                           |
|                                     | Mode4                |                       | 38.2             |                     | %    |                                                           |
|                                     | Mode3                |                       | 29.0             |                     | %    |                                                           |
|                                     | Mode2                |                       | 19.5             |                     | %    |                                                           |
| PWM Minimum ON Time                 | ton(min)             |                       | 1.7              |                     | μs   |                                                           |
|                                     | toff1                |                       | 12               |                     | μs   | Mode 8 to F                                               |
| PWM OFF Time                        | toff2                |                       | 9                |                     | μs   | Mode 4 to 7                                               |
|                                     | toff3                |                       | 7                |                     | μs   | Mode 1 to 3                                               |

## Internal Block Diagram



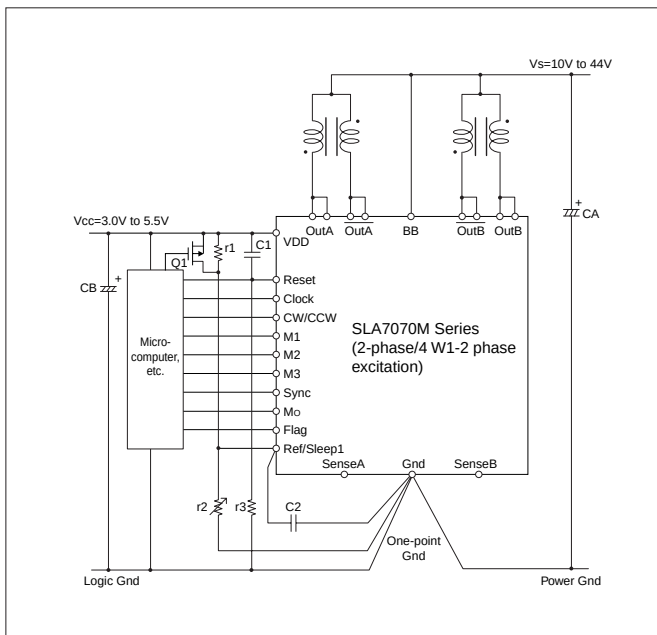
The protect circuit is deleted and the flag pin is N.C. for SLA7075MR, 7076MR, 7077MR, and 7078MR.

## Pin Assignment

| Pin No. | Symbol            | Function                                       |
|---------|-------------------|------------------------------------------------|
| 1       |                   |                                                |
| 2       | OutA              | Phase A output                                 |
| 3       |                   |                                                |
| 4       | OutA/             | Phase A output                                 |
| 5       | SenseA            | Phase A current sense                          |
| 6       | Mo                | 2 phase excitation state output monitor output |
| 7       | M1                | Excitation mode/Sleep 2 setting input          |
| 8       | M2                |                                                |
| 9       | M3                |                                                |
| 10      | Clock             | Step Clock input                               |
| 11      | V <sub>BB</sub>   | Driver supply (motor supply)                   |
| 12      | Gnd               | Device GND                                     |
| 13      | Ref/Sleep1        | Control current mode/Sleep 1 setting input     |
| 14      | V <sub>DD</sub>   | Logic supply                                   |
| 15      | Reset             | Internal logic reset input                     |
| 16      | CW/CCW            | Normal/reverse control input                   |
| 17      | Sync              | PWM control signal input                       |
| 18      | Flag <sup>1</sup> | Protection circuit monitor output <sup>1</sup> |
| 19      | SenseB            | Phase B current sense                          |
| 20      |                   |                                                |
| 21      | OutB/             | Phase B current output                         |
| 22      |                   |                                                |
| 23      | OutB              | Phase B current output                         |

\*1: N.C. pin for SLA7075MR, 7076MR, 7077MR, and 7078MR.

## Typical Connection Diagram



\* There is no Flag pin (pin 18) for SLA7075MR, 7076MR, 7077MR, and 7078MR.

## External Dimensions (ZIP23 with Fin [SLA23Pin])

