

DC/DC Converter for IGBT driver



Patent Protection

CE Report  
EN62368-1

CB  
IEC60950-1

RoHS

### FEATURES

- High efficiency up to 80%
- Ultra-Compact SIP package
- Excellent thermal characteristic
- I/O isolation test voltage 3000 VAC
- Ultra-low isolation capacitance
- Operating ambient temperature range: -40°C to +105°C
- No load operation is available

QA series are DC-DC converters for IGBT drivers. The ultra low isolation capacitance can improve the capability of anti-interference. The built-in common-ground mode of the unique asymmetric voltage output mode reduces the driver loss of IGBT driver. It features short-circuit protection, auto-recovery and can be widely used in:

1. General inverter
2. AC servo drive system
3. Electric welding machine
4. Uninterruptible power supply (UPS)

### Selection Guide

| Certification | Part No. | Input             |                           | Output       |             | Full Load Efficiency (%)<br>Min./Typ. | Capacitive Load(μF)<br>Max. |
|---------------|----------|-------------------|---------------------------|--------------|-------------|---------------------------------------|-----------------------------|
|               |          | Voltage(VDC)      | Current(mA)               | Voltage(VDC) | Current(mA) |                                       |                             |
|               |          | Nominal(Range)    | Typ.<br>full load/no-load | +Vo/-Vo      | +Io/-Io     |                                       |                             |
| EN/IEC        | QA01     | 15<br>(14.5-15.5) | 130/20                    | +15/-8.7     | +80/-40     | 77/80                                 | 220                         |
|               | QA01-09  |                   | 84/20                     | +9.0/--      | +111/--     |                                       |                             |
|               | QA01-A09 |                   | 84/20                     | +9.0/-9.0    | +55/-55     |                                       |                             |
|               | QA01-17  |                   | 143/20                    | +17/-8.7     | +80/-40     |                                       |                             |
|               | QA02     | 12<br>(11.6-12.4) | 162/20                    | +15/-8.7     | +80/-40     |                                       |                             |
|               | QA03     | 24<br>(23.3-24.7) | 81/20                     | +15/-8.7     | +80/-40     |                                       |                             |
|               | QA04     | 12<br>(9-15)      | 223/20                    | +15/-8.0     | +100/-80    |                                       |                             |

### Input Specifications

| Item                                              |       | Operating Conditions | Min.               | Typ. | Max. | Unit |
|---------------------------------------------------|-------|----------------------|--------------------|------|------|------|
| Input Voltage                                     | QA01* | DC                   | -0.7               | --   | 16   | VDC  |
|                                                   | QA02  | DC                   | -0.7               | --   | 13   |      |
|                                                   | QA03  | DC                   | -0.7               | --   | 26   |      |
|                                                   | QA04  | DC                   | -0.7               | --   | 15   |      |
| Input Filter                                      |       |                      | Capacitance filter |      |      |      |
| Hot Plug                                          |       |                      | Unavailable        |      |      |      |
| Note: QA01* refers to all models begin with QA01. |       |                      |                    |      |      |      |

### Output Specifications

| Item           | Operating Conditions |     |                                   | Min.  | Typ. | Max.  | Unit |
|----------------|----------------------|-----|-----------------------------------|-------|------|-------|------|
| Output Voltage | QA01                 | +Vo | Vin=15VDC, Pin6 & Pin7 +Io=+80mA  | 14.25 | 15   | 15.75 | VDC  |
|                |                      | -Vo | Vin=15VDC, Pin5 & Pin6 -Io=-40mA  | -8.00 | -8.7 | -9.40 |      |
|                | QA01-09              | +Vo | Vin=15VDC, Pin6 & Pin7 +Io=+111mA | 8.46  | 9    | 9.54  |      |
|                |                      | -Vo | --                                | --    | --   | --    |      |
|                | QA01-A09             | +Vo | Vin=15VDC, Pin6 & Pin7 +Io=+55mA  | 8.55  | 9    | 9.45  |      |
|                |                      | -Vo | Vin=15VDC, Pin5 & Pin6 -Io=-55mA  | -8.28 | -9   | -9.72 |      |

|                                                                                                                                                    |         |                     |                                   |                 |                                      |      |       |       |
|----------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------------------|-----------------------------------|-----------------|--------------------------------------|------|-------|-------|
| Output Voltage                                                                                                                                     | QA01-17 | +Vo                 | Vin=15VDC, Pin6 & Pin7 +Io=+80mA  |                 | 16.15                                | 17   | 17.85 | VDC   |
|                                                                                                                                                    |         | -Vo                 | Vin=15VDC, Pin5 & Pin6 -Io=-40mA  |                 | -8.00                                | -8.7 | -9.40 |       |
|                                                                                                                                                    | QA02    | +Vo                 | Vin=12VDC, Pin6 & Pin7 +Io=+80mA  |                 | 14.25                                | 15   | 15.75 |       |
|                                                                                                                                                    |         | -Vo                 | Vin=12VDC, Pin5 & Pin6 -Io=-40mA  |                 | -8.00                                | -8.7 | -9.40 |       |
|                                                                                                                                                    | QA03    | +Vo                 | Vin=24VDC, Pin6 & Pin7 +Io=+80mA  |                 | 14.25                                | 15   | 15.75 |       |
|                                                                                                                                                    |         | -Vo                 | Vin=24VDC, Pin5 & Pin6 -Io=-40mA  |                 | -8.00                                | -8.7 | -9.40 |       |
|                                                                                                                                                    | QA04    | +Vo                 | Vin=12VDC, Pin6 & Pin7 +Io=+100mA |                 | 14.25                                | 15   | 15.75 |       |
|                                                                                                                                                    |         | -Vo                 | Vin=12VDC, Pin5 & Pin6 -Io=-80mA  |                 | -7.36                                | -8   | -8.64 |       |
| Voltage Accuracy                                                                                                                                   |         | QA01-09             |                                   |                 | --                                   | ±4   | ±6    | %     |
|                                                                                                                                                    |         | Other models        |                                   |                 | See output regulation curve (Fig. 1) |      |       |       |
| Linear Regulation                                                                                                                                  |         | Input voltage range |                                   |                 | --                                   | ±1.2 | ±1.5  | --    |
| Load Regulation                                                                                                                                    |         | 10%-100% load       | QA01-09                           |                 | --                                   | 12   | 26    | %     |
|                                                                                                                                                    |         |                     | Other models                      | Positive output | --                                   | 8    | 15    |       |
|                                                                                                                                                    |         |                     |                                   | Negative output | --                                   | 10   | 15    |       |
| Temperature Coefficient                                                                                                                            |         | Full load           |                                   |                 | --                                   | --   | ±0.03 | %/°C  |
| Ripple & Noise*                                                                                                                                    |         | 20MHz bandwidth     |                                   |                 | --                                   | 100  | 200   | mVp-p |
| Short-circuit Protection                                                                                                                           |         |                     |                                   |                 | Continuous, self-recovery            |      |       |       |
| Note: * The “parallel cable” method is used for ripple and noise test, please refer to DC-DC converter application notes for specific information. |         |                     |                                   |                 |                                      |      |       |       |

## General Specifications

| Item                                 | Operating Conditions                                                                | Min.      | Typ. | Max. | Unit    |
|--------------------------------------|-------------------------------------------------------------------------------------|-----------|------|------|---------|
| Isolation Voltage                    | Input-output Electric strength test for 1 minute with a leakage current of 1mA max. | 3000      | --   | --   | VAC     |
| Insulation Resistance                | Input-output resistance at 500VDC                                                   | 1000      | --   | --   | MΩ      |
| Isolation Capacitance                | Input-output capacitance at 100kHz/0.1V                                             | --        | 6.6  | --   | pF      |
| Operating Temperature                | Derating when operating temperature up to 85°C, (see Fig. 2)                        | -40       | --   | 105  | °C      |
| Storage Temperature                  |                                                                                     | -55       | --   | 125  |         |
| Pin Soldering Resistance Temperature | Soldering spot is 1.5mm away from case for 10 seconds                               | --        | --   | 300  |         |
| Case Temperature Rise                | Ta=25°C, nominal input, full load output                                            | --        | 25   | --   |         |
| Storage Humidity                     | Non-condensing                                                                      | --        | --   | 95   | %RH     |
| Switching Frequency                  | Full load, nominal input voltage                                                    | --        | 100  | 300  | kHz     |
| Safety Class                         |                                                                                     | CLASS III |      |      |         |
| MTBF                                 | MIL-HDBK-217F@25°C                                                                  | 3500      | --   | --   | k hours |

## Mechanical Specifications

|                |                                                              |
|----------------|--------------------------------------------------------------|
| Case Material  | Black plastic; flame-retardant and heat-resistant (UL94 V-0) |
| Dimensions     | 19.50 x 9.80 x 12.50 mm                                      |
| Weight         | 4.3g (Typ.)                                                  |
| Cooling Method | Free air convection                                          |

## Electromagnetic Compatibility (EMC)

|           |     |                                                              |
|-----------|-----|--------------------------------------------------------------|
| Emissions | CE  | CISPR32/EN55032 CLASS B (see Fig. 4 for recommended circuit) |
|           | RE  | CISPR32/EN55032 CLASS B (see Fig. 4 for recommended circuit) |
| Immunity  | ESD | IEC/EN61000-4-2 Contact ±8kV perf. Criteria B                |

## Typical Characteristic Curves

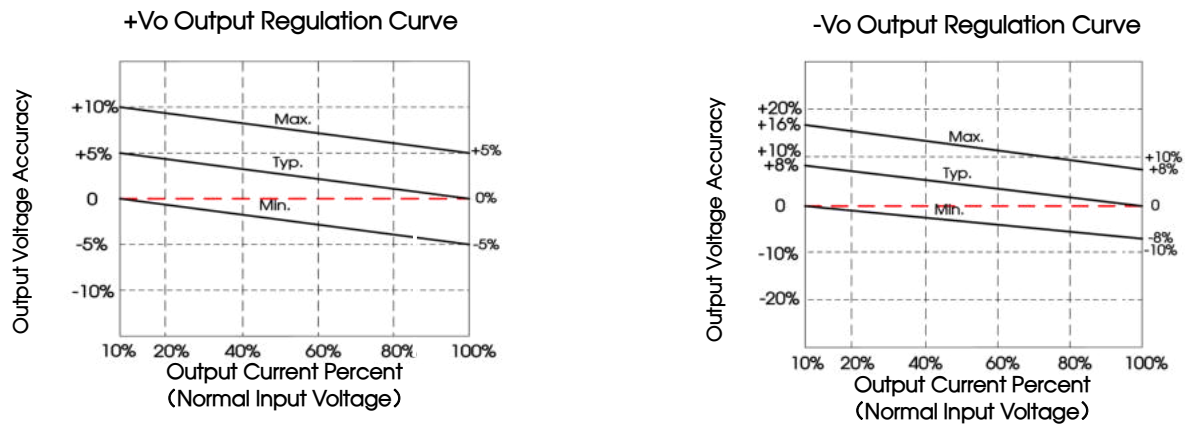


Fig. 1  
(Excluding QA01-09 model)

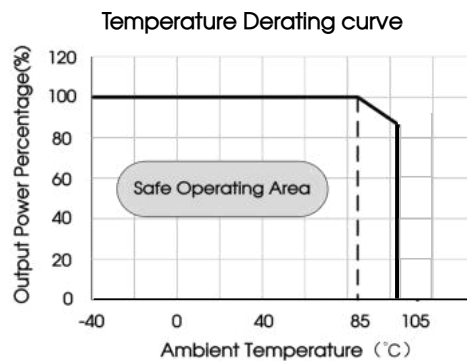
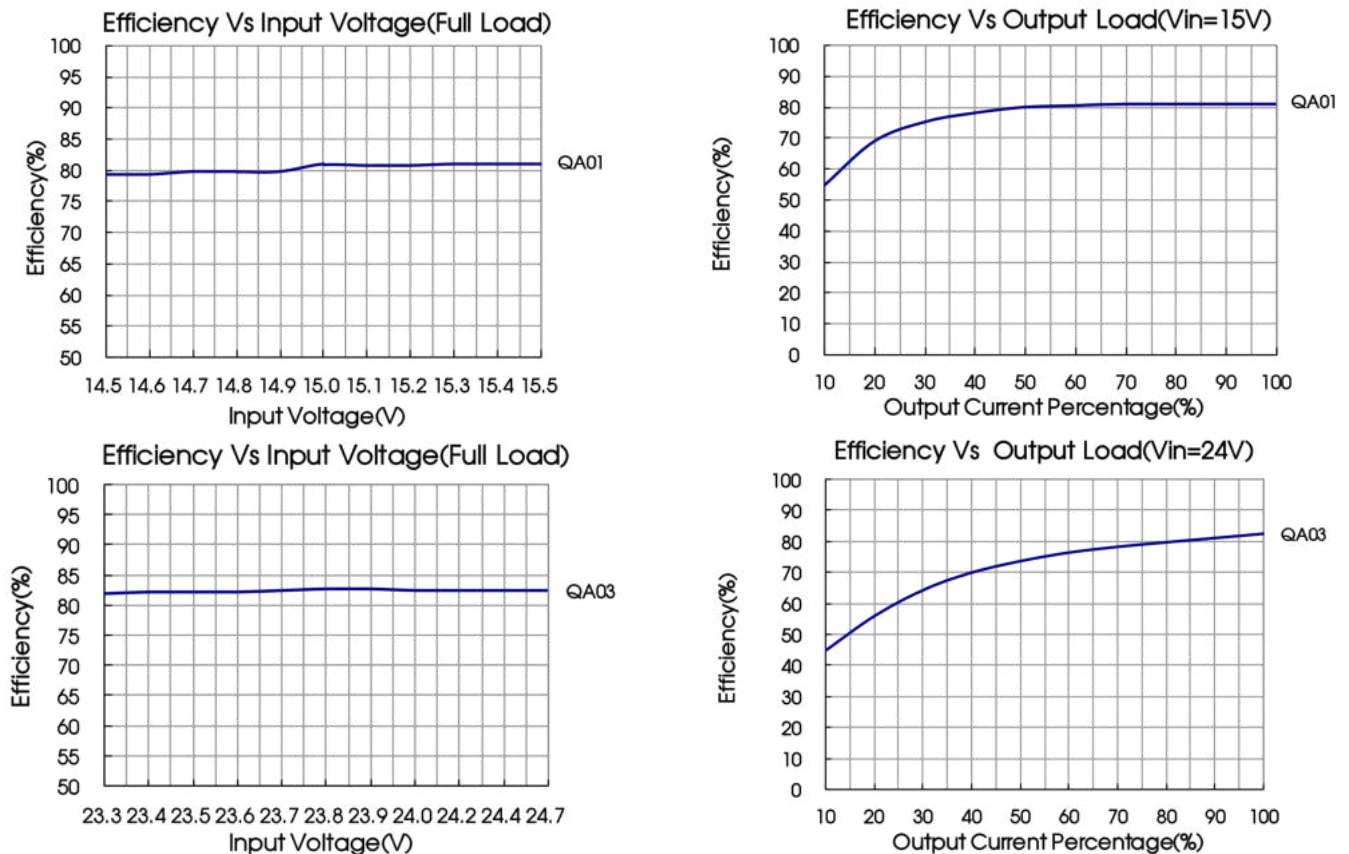


Fig. 2



## Design Reference

### 1. Typical application

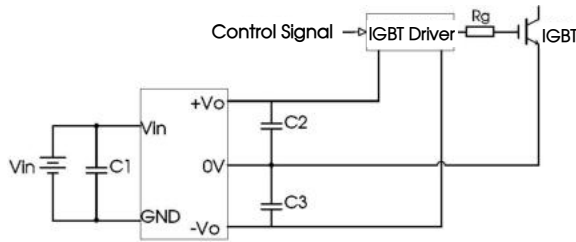


Fig. 3

| C1/ C2 /C3                                      |
|-------------------------------------------------|
| 100uF/35V (Low internal resistance capacitance) |

Note: A ceramic capacitor (1uF-10uF) can be connected in parallel to both ends of the C2 and C3 to reduce ripple and noise.

### 2. EMC (CLASS B) compliance circuit

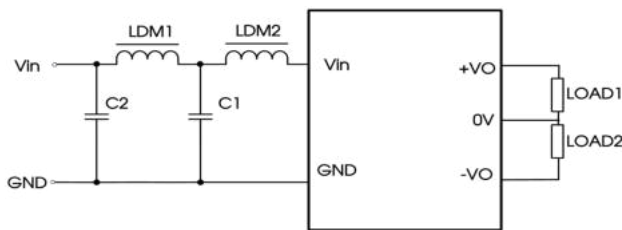


Fig. 4

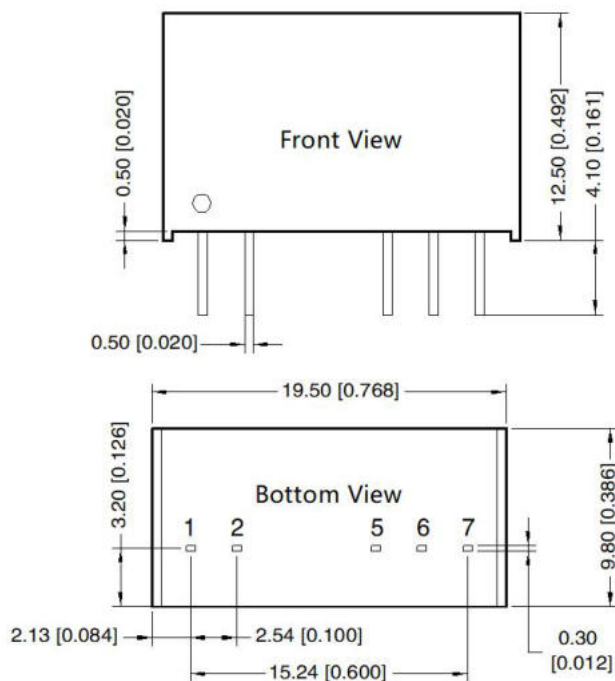
| Input Voltage |       | 12/15/24VDC |
|---------------|-------|-------------|
| EMI           | C1、C2 | 4.7μF /50V  |
|               | LDM1  | 12μH        |
|               | LDM2  | 47μH        |

3. The products do not support parallel connection of their output

4. For additional information please refer to DC-DC converter application notes on

[www.mornsun-power.com](http://www.mornsun-power.com)

## Dimensions and Recommended Layout



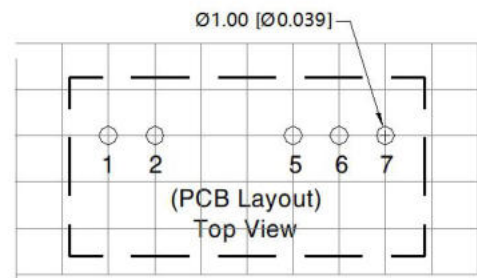
Note:

Unit: mm[inch]

Pin section tolerances:  $\pm 0.10$  [ $\pm 0.004$ ]

General tolerances:  $\pm 0.50$  [0.020]

THIRD ANGLE PROJECTION



Note: Grid 2.54\*2.54mm

| Pin-Out |      |
|---------|------|
| Pin     | Mark |
| 1       | Vin  |
| 2       | GND  |
| 5       | -Vo  |
| 6       | 0V   |
| 7       | +Vo  |

Notes:

1. For additional information on Product Packaging please refer to [www.mornsun-power.com](http://www.mornsun-power.com). Packaging bag number: 58200013;
2. The lead connecting the power supply module and IGBT driver should be as short as possible during use;
3. The output filtering capacitor should be as close as possible to the power supply module and IGBT driver;
4. The peak of the IGBT driver dedicated power supply gate drive current is high, so low internal resistance electrolytic capacitor is recommended to be used for the power supply module output filter capacitor;
5. The average output power of the driver must be lower than that of the power supply module;
6. Consider fixing with glue near the module if being used in vibration occasion;
7. The max. capacitive load should be tested within the input voltage range and under full load conditions;
8. Unless otherwise specified, parameters in this datasheet were measured under the conditions of  $T_a=25^{\circ}\text{C}$  , humidity<75%RH with nominal input voltage and rated output load;
9. All index testing methods in this datasheet are based on company corporate standards;
10. We can provide product customization service, please contact our technicians directly for specific information;
11. Products are related to laws and regulations: see "Features" and "EMC";
12. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

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