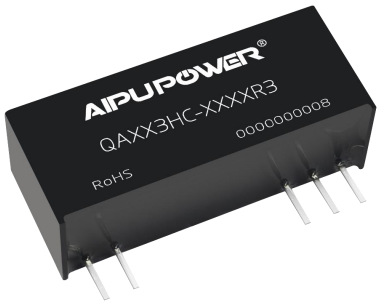
## Typical Features

- ◆ Fixed voltage input, isolated & unregulated output
- ◆ Efficiency up to 87% (Typ.)
- ◆ Mini size SIP Package
- ◆ Reinforced insulated
- ◆ Isolation voltage 5000VAC/6000VDC
- ◆ Continuous short circuit protection, self-recovery
- ◆ Operating temperature from -40℃ to +105℃
- ◆ Plastic case, flame class UL94-V0




## Application

**QAXX3HC-XXXXR3 series ---** DC-DC modular converters specially designed for IGBT driver. It has asymmetric voltage output to decrease IGBT driving loss, also the output short circuit protection and self-recovery.

## Typical Product List

| Certificate | Part No. | Input Voltage Range | | Output Voltage/ Current (Vo/Io) | | Input Current (mA) Typ. @Nominal volt. | | Max Capacitive load | Efficiency (%) @Full load nominal volt. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Nominal (VDC) | Range (VDC) | Vo (VDC) | Io (mA) | Full Load | No load | (uF) | Min | Typ. |
| - | QA053HC-1505R3 | 5 | 4.5 - 5.5 | +15/-5 | +80/-40 | 328 | 26 | 1000 | 79 | 83 |
| - | QA053HC-1803R3 | | | +18/-3.5 | +80/-80 | 405 | 22 | 680 | 79 | 83 |
| - | QA053HC-2003R3 | | | +20/-3.5 | +80/-80 | 435 | 35 | 470 | 79 | 83 |
| - | QA053HC-2004R3 | | | +20/-4 | +80/-40 | 400 | 35 | 470 | 79 | 83 |
| - | *QA123HC-1502R3 | 12 | 10.8 - 13.2 | +15/-2.5 | +100/-100 | 165 | 10 | 2200 | 82 | 87 |
| - | QA123HC-1504R3 | | | +15/-4 | +120/-120 | 215 | 10 | 2200 | 82 | 87 |
| - | QA123HC-1803R3 | | | +18/-3 | +100/-100 | 200 | 10 | 1000 | 82 | 87 |
| - | QA123HC-2005R3 | | | +20/-5 | +90/-90 | 210 | 14 | 470 | 82 | 87 |
| - | QA153HC-1504R3 | 15 | 13.5 - 16.5 | +15/-4 | +120/-120 | 170 | 10 | 2200 | 82 | 87 |
| - | QA153HC-1802R3 | | | +18/-2.5 | +100/-100 | 160 | 10 | 1500 | 81 | 86 |
| - | QA153HC-1803R3 | | | +18/-3 | +100/-100 | 165 | 10 | 1500 | 82 | 87 |
| - | QA153HC-2004R3 | | | +20/-4 | +80/-40 | 140 | 10 | 470 | 79 | 83 |
| - | *QA153HC-2005R3 | | | +20/-5 | +90/-90 | 165 | 10 | 2200 | 82 | 87 |
| - | QA243HC-1503R3 | 24 | 21.6 - 26.4 | +15/-3 | +100/-100 | 90 | 8 | 2200 | 81 | 86 |
| - | QA243HC-1504R3 | | | +15/-4 | +120/-120 | 113 | 8 | 2200 | 76 | 82 |
| - | QA243HC-1508R3 | | | +15/-8 | +120/-120 | 130 | 8 | 1000 | 78 | 84 |
| - | QA243HC-1803R3 | | | +18/-3 | +100/-100 | 110 | 8 | 2200 | 78 | 83 |
| - | *QA243HC-2005R3 | | | +20/-5 | +90/-90 | 125 | 8 | 2200 | 76 | 82 |

Note 1: The maximum capacitive load is the capacitance allowed to be used when the power supply starts up at full load. The converter may not start if the capacitor exceeds this value.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Note 2: The efficiency is tested at the nominal input voltage and the rated load.

Note 3: Please contact Aipu sales for other output voltages requirements of this series but not listed in this table.

Note 4: The * marked parts have been developed in process.

## Input Specifications

| Item | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Input inrush voltage (1sec. max.) | 5VDC Input | -0.7 | -- | 9 | VDC |
| | 12VDC Input | -0.7 | -- | 18 | |
| | 15VDC Input | -0.7 | -- | 21 | |
| | 24VDC Input | -0.7 | -- | 30 | |
| Input filter | Capacitor filter | | | | |
| Hot Plug | Unavailable | | | | |

## Output Specifications

| Item | | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| QA053HC-1505R3 | +Vo | Vin=5Vdc, Pin6 & Pin7 +Io= +80mA | 14.25 | 15 | 15.75 | VDC |
| | -Vo | Vin=5Vdc, Pin5 & Pin6 -Io= -40mA | -4.85 | -5.10 | -5.35 | VDC |
| QA053HC-1803R3 | +Vo | Vin=5Vdc, Pin6 & Pin7 +Io= +80mA | 16.72 | 17.6 | 18.48 | VDC |
| | -Vo | Vin=5Vdc, Pin5 & Pin6 -Io= -80mA | -3.16 | -3.33 | -3.49 | VDC |
| QA053HC-2003R3 | +Vo | Vin=5Vdc, Pin6 & Pin7 +Io= +80mA | 18.80 | 19.80 | 20.80 | VDC |
| | -Vo | Vin=5Vdc, Pin5 & Pin6 -Io= -80mA | -3.395 | -3.57 | -3.745 | VDC |
| QA053HC-2004R3 | +Vo | Vin=5Vdc, Pin6 & Pin7 +Io= +80mA | 18.8 | 19.8 | 20.8 | VDC |
| | -Vo | Vin=5Vdc, Pin5 & Pin6 -Io= -40mA | -3.84 | -4.04 | -4.24 | VDC |
| *QA123HC-1502R3 | +Vo | Vin=12Vdc, Pin6 & Pin7 +Io= +100mA | -- | -- | -- | VDC |
| | -Vo | Vin=12Vdc, Pin5 & Pin6 -Io= -100mA | -- | -- | -- | VDC |
| QA123HC-1504R3 | +Vo | Vin=12Vdc, Pin6 & Pin7 +Io= +120mA | 14 | 14.75 | 15.5 | VDC |
| | -Vo | Vin=12Vdc, Pin5 & Pin6 -Io= -120mA | -3.8 | -4 | -4.2 | VDC |
| QA123HC-1803R3 | +Vo | Vin=12Vdc, Pin6 & Pin7 +Io= +100mA | 17.1 | 18 | 18.9 | VDC |
| | -Vo | Vin=12Vdc, Pin5 & Pin6 -Io= -100mA | -3.0 | -3.15 | -3.3 | VDC |
| QA123HC-2005R3 | +Vo | Vin=12Vdc, Pin6 & Pin7 +Io= +90mA | 18.80 | 19.80 | 20.80 | VDC |
| | -Vo | Vin=12Vdc, Pin5 & Pin6 -Io= -90mA | -4.85 | -5.10 | -5.35 | VDC |
| QA153HC-1504R3 | +Vo | Vin=15Vdc, Pin6 & Pin7 +Io= +120mA | 14.25 | 15.00 | 15.75 | VDC |
| | -Vo | Vin=15Vdc, Pin5 & Pin6 -Io= -120mA | -3.72 | -3.91 | -4.11 | VDC |
| QA153HC-1802R3 | +Vo | Vin=15Vdc, Pin6 & Pin7 +Io= +100mA | 17.10 | 18.00 | 18.90 | VDC |
| | -Vo | Vin=15Vdc, Pin5 & Pin6 -Io= -100mA | -2.43 | -2.55 | -2.68 | VDC |
| QA153HC-1803R3 | +Vo | Vin=15Vdc, Pin6 & Pin7 +Io= +100mA | 17.10 | 18.00 | 18.90 | VDC |
| | -Vo | Vin=15Vdc, Pin5 & Pin6 -Io= -100mA | -2.88 | -3.03 | -3.18 | VDC |
| QA153HC-2004R3 | +Vo | Vin=15Vdc, Pin6 & Pin7 +Io= +80mA | 19.2 | 20.20 | 21.2 | VDC |
| | -Vo | Vin=15Vdc, Pin5 & Pin6 -Io= -40mA | -3.84 | -4.04 | -4.24 | VDC |


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| | | | | | | |
|---|---|---|---|---|---|---|
| *QA153HC-2005R3 | +Vo | Vin=15Vdc, Pin6 & Pin7 +Io= +90mA | -- | -- | -- | VDC |
| | -Vo | Vin=15Vdc, Pin5 & Pin6 -Io= -90mA | -- | -- | -- | VDC |
| QA243HC-1503R3 | +Vo | Vin=24Vdc, Pin6 & Pin7 +Io= +100mA | 14.24 | 15.00 | 15.75 | VDC |
| | -Vo | Vin=24Vdc, Pin5 & Pin6 -Io= -100mA | -2.8 | -2.94 | -3.23 | VDC |
| QA243HC-1504R3 | +Vo | Vin=24Vdc, Pin6 & Pin7 +Io= +120mA | 14.25 | 15.00 | 15.75 | VDC |
| | -Vo | Vin=24Vdc, Pin5 & Pin6 -Io= -120mA | -3.8 | -4.03 | -4.23 | VDC |
| QA243HC-1508R3 | +Vo | Vin=24Vdc, Pin6 & Pin7 +Io= +120mA | 14.40 | 15.15 | 15.91 | VDC |
| | -Vo | Vin=24Vdc, Pin5 & Pin6 -Io= -120mA | -7.60 | -8.00 | -8.40 | VDC |
| QA243HC-1803R3 | +Vo | Vin=24Vdc, Pin6 & Pin7 +Io= +100mA | 17.27 | 18.18 | 19.09 | VDC |
| | -Vo | Vin=24Vdc, Pin5 & Pin6 -Io= -100mA | -2.85 | -3.00 | -3.15 | VDC |
| *QA243HC-2005R3 | +Vo | Vin=24Vdc, Pin6 & Pin7 +Io= +90mA | -- | -- | -- | VDC |
| | -Vo | Vin=24Vdc, Pin5 & Pin6 -Io= -90mA | -- | -- | -- | VDC |
| Output voltage accuracy | | Please refer to the output voltage deviation graphs (Figure 1-15) | | | | |
| Load regulation | 10%-100% load | Positive output | -- | 10 | 17 | % |
| | | Negative output | -- | 13 | 71 | |
| Line voltage regulation | Input voltage change ±1% | Positive output | -- | ±1.2 | ±1.5 | % |
| | | Positive output | -- | ±1.2 | ±1.5 | |
| Temperature drift coefficient | 100% Load | | -- | -- | ±0.03 | %/°C |
| Ripple & Noise | 0%-100% load, 20MHz bandwidth | | -- | 80 | 150 | mVp-p |
| Short circuit protection | Continuous, self-recovery | | | | | |
| Note: The Ripple & Noise is tested by the Twisted Pair Method, please refer to the following test instruction. | | | | | | |

## General Specifications

| Item | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Switching frequency | Nominal input voltage, full load | -- | 260 | -- | KHz |
| Operating temperature | Refer to temperature derating graph (Figure 16) | -40 | -- | +105 | ℃ |
| Storage temperature | | -55 | -- | +125 | |
| Case temperature rise | Within the operating derating range | -- | 25° | -- | |
| Pin soldering temperature | 1.5mm from the case, soldering time 10S | -- | -- | 300 | |
| Relative humidity | No condensation | 5 | -- | 95 | %RH |
| Isolation voltage | Input/Output, test 1min, leakage current <1mA | 5000 | -- | -- | VAC |
| | | 6000 | -- | -- | VDC |
| Insulation resistance | Input/Output, @500VDC | 1000 | -- | -- | MΩ |
| Isolation capacitance | Input/Output,100KHz/0.1V | -- | 6 | -- | pF |
| Vibration | | 10-150Hz, 5G, 30 Min. along X, Y and Z | | | |
| MTBF | MIL-HDBK-217F@25℃ | 3500 | -- | -- | K Hours |
| Transformer CL distance | | 5 | -- | -- | mm |
| Transformer CR distance | | 5 | -- | -- | |
| PCB CL&CR distance | | 9.8 | -- | -- | |


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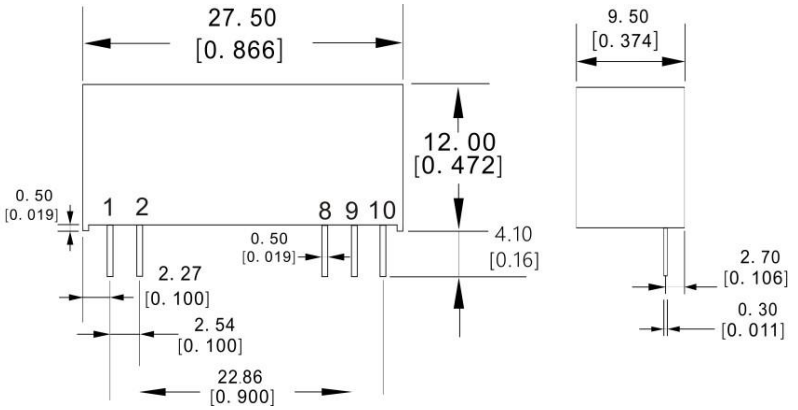
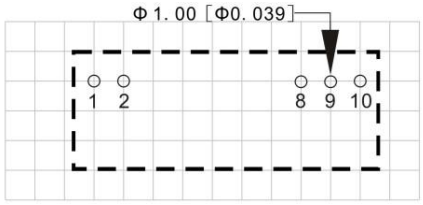
| | | | |
|---|---|---|---|
| Case material | Plastic in Black, flame class UL94-V0 | | |
| Unit weight | 5.2g (Typ.) | | |
| Cooling method | Natural air | | |
| Packing | Tube size (525x18x10mm) | | 18PCS/Tube |
| | Carton size (542x110x155mm) | | 1008PCS (Total 56 Tubes) |
| Unit dimensions | L x W x H | 27.50 × 9.50 × 12.00 mm | 0.866 × 0.374 × 0.472 inch |

## EMC Performance

| Item | | Test Standard | Performance/Class |
|---|---|---|---|
| EMI | CE | CISPR32/EN55032 | CLASS B (With the Recommended EMC Circuit) |
| | RE | CISPR32/EN55032 | CLASS B (With the Recommended EMC Circuit) |
| EMS | ESD | IEC/EN61000-4-2 | Contact ±6kV, Air ±8kV perf. Criteria B |

## Mechanical Dimensions




PCB layout vertical view
Grid 2.54x2.54[0.10x0.10]

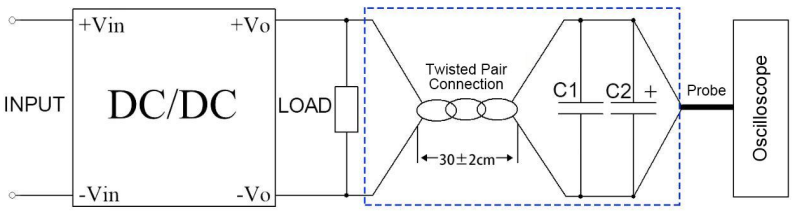
Unit: mm[inch]
Pin section tolerance: ±0.10[±0.004]
General tolerance: ±0.50[±0.020]

**Pin-out Function Description**

| Pin No. | 1 | 2 | Others | 8 | 9 | 10 |
|---|---|---|---|---|---|---|
| Dual (D) | +Vin | GND | No Pin | -Vo | 0V | +Vo |

Note: Please take the pin definition on the product label as the right one if it is different than the data sheet description.

## Ripple & Noise Test Instructions (Twisted Pair Method, 20MHz Bandwidth)




1. The Ripple & noise test needs 12# twisted pair cables, an oscilloscope which should be set at the Sample Mode, bandwidth 20MHz. 100M bandwidth probe with cap and ground removed. C1(0.1uF) polypropylene capacitor and C2(10uF) high-frequency low-resistance electrolytic capacitor are connected in parallel with the probes and one side of the twisted pair.
2. Refer to the test diagram, the converter output connects to the electronic load by the jig with cables which size should be defined according to the output current value. The other side of the twisted pair (length 30cm±2 cm) should be connected in parallel with the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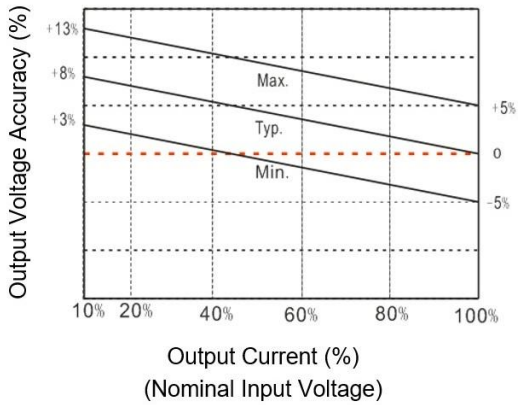
load. The test can start after the input power on.

3. It is recommended to use a ≥10% load or a high-frequency low resistance electrolytic capacitor (≥100uF) load at the output to avoid the output ripple increasing.

## Product Characteristics Graphs

QA053HC-1505R3
+Vo Output Voltage Deviation Graph




QA053HC-1505R3
-Vo Output Voltage Deviation Graph

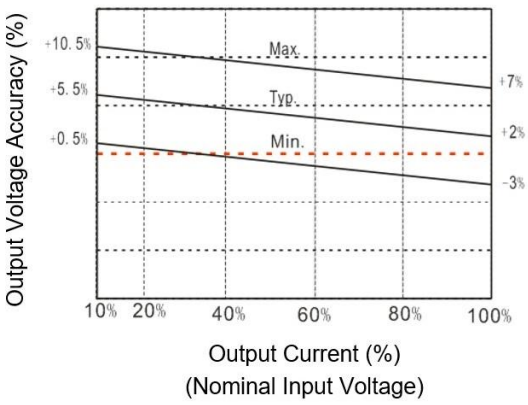
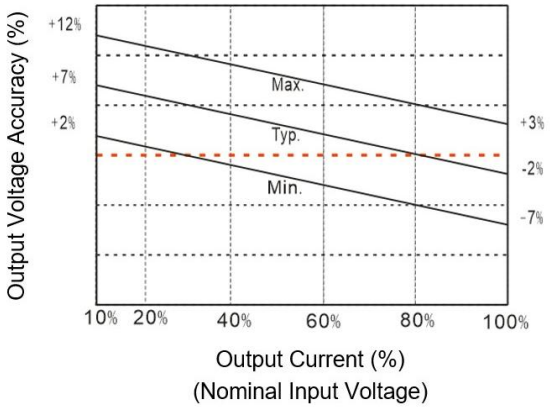



**Figure 1**

QA053HC-1803R3
+Vo Output Voltage Deviation Graph




QA053HC-1803R3
-Vo Output Voltage Deviation Graph

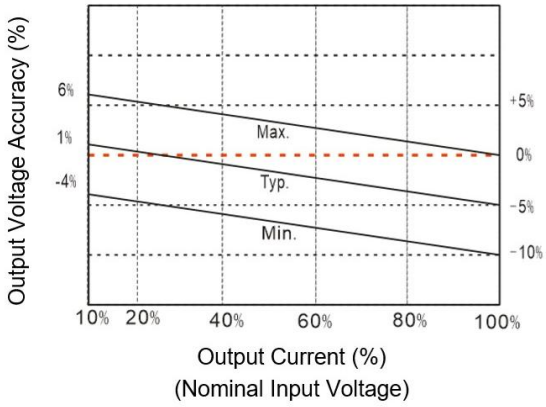



**Figure 2**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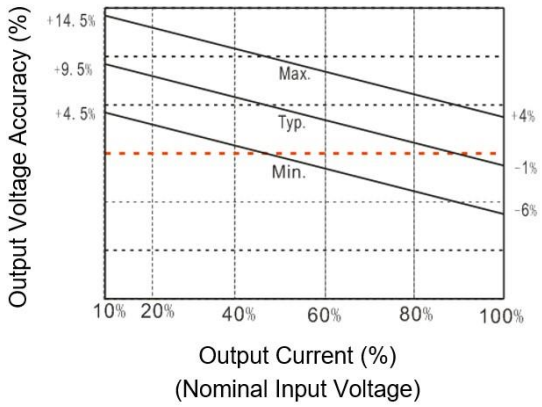
QA053HC-2003R3
+Vo Output Voltage Deviation Graph




QA053HC-2003R3
-Vo Output Voltage Deviation Graph

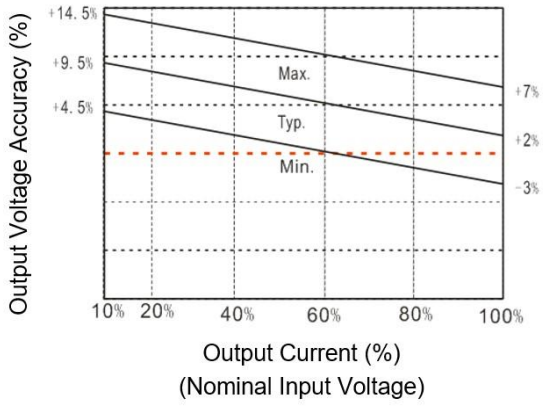
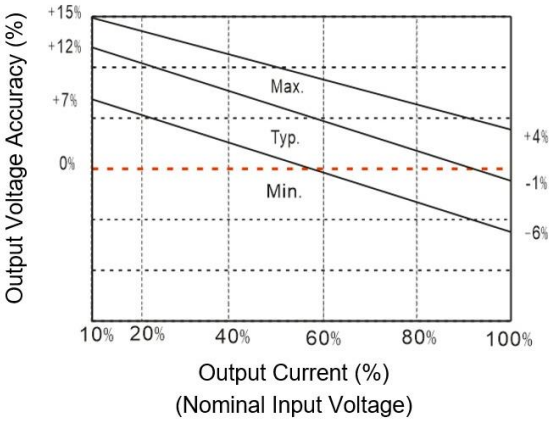



**Figure 3**

QA053HC-2004R3
+Vo Output Voltage Deviation Graph




QA053HC-2004R3
-Vo Output Voltage Deviation Graph

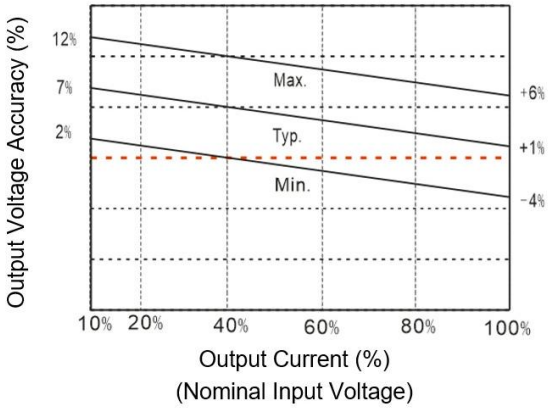
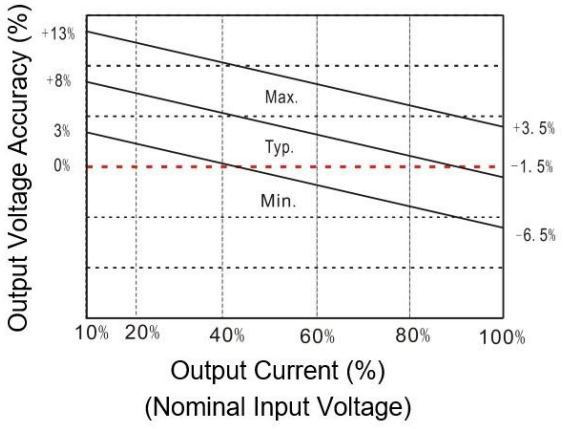



**Figure 4**

QA123HC-1504R3
+Vo Output Voltage Deviation Graph




QA123HC-1504R3
-Vo Output Voltage Deviation Graph

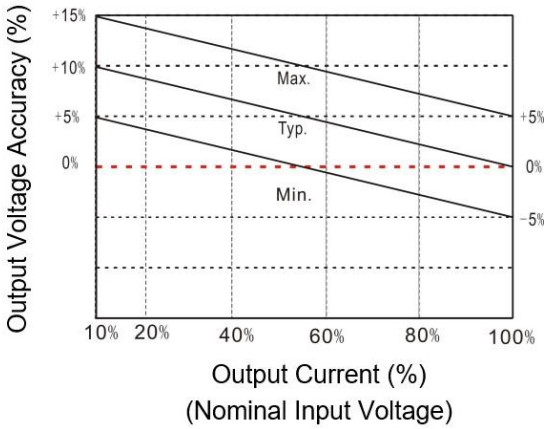



**Figure 5**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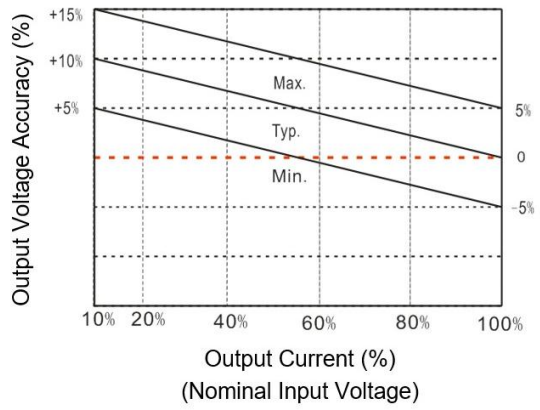
QA123HC-1803R3
+Vo Output Voltage Deviation Graph




QA123HC-1803R3
-Vo Output Voltage Deviation Graph

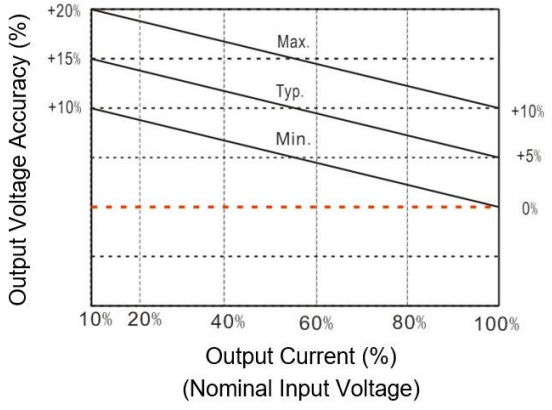
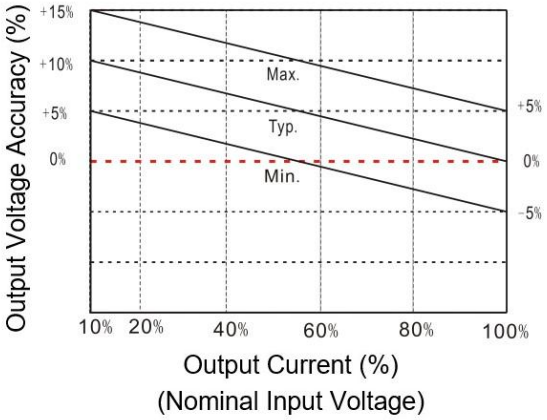



**Figure 6**

QA123HC-2005R3
+Vo Output Voltage Deviation Graph




QA123HC-2005R3
-Vo Output Voltage Deviation Graph

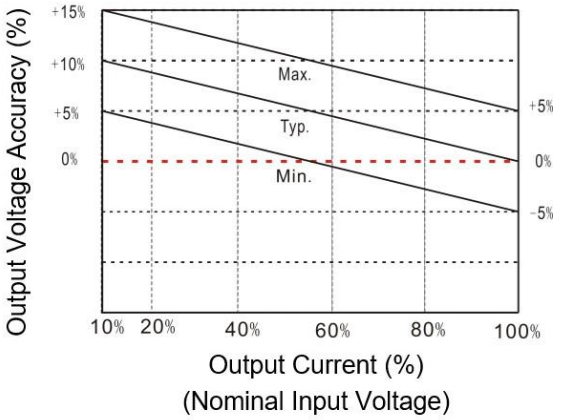
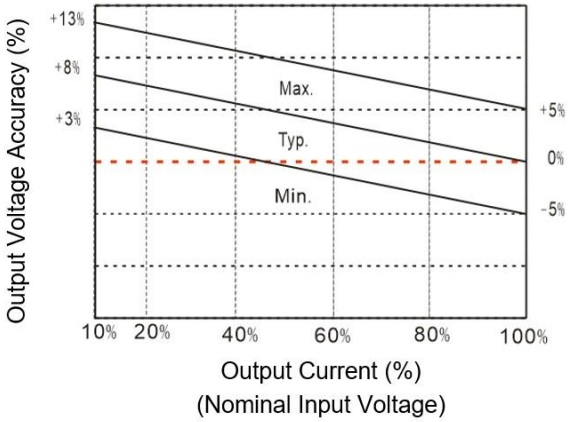



**Figure 7**

QA153HC-1504R3
+Vo Output Voltage Deviation Graph




QA153HC-1504R3
-Vo Output Voltage Deviation Graph

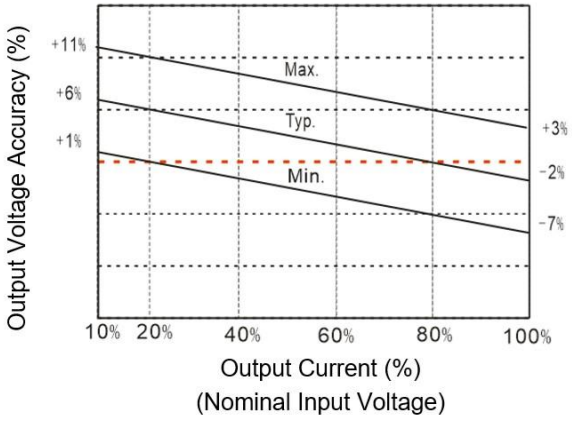



**Figure 8**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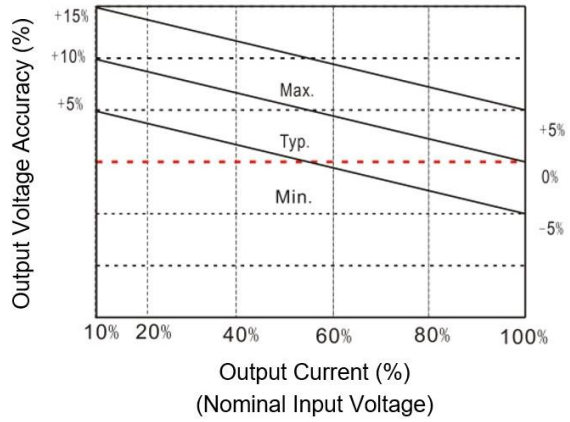
QA153HC-1802R3
+Vo Output Voltage Deviation Graph




QA153HC-1802R3
-Vo Output Voltage Deviation Graph

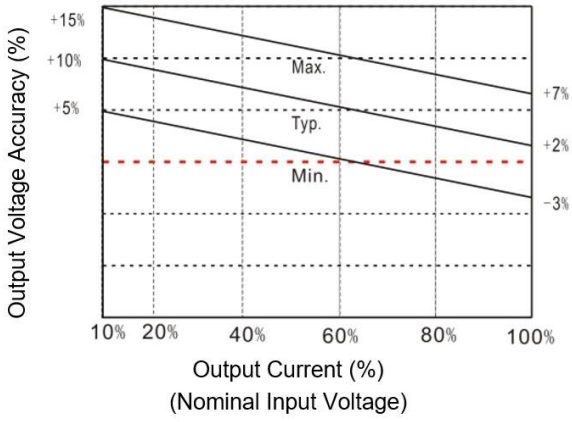
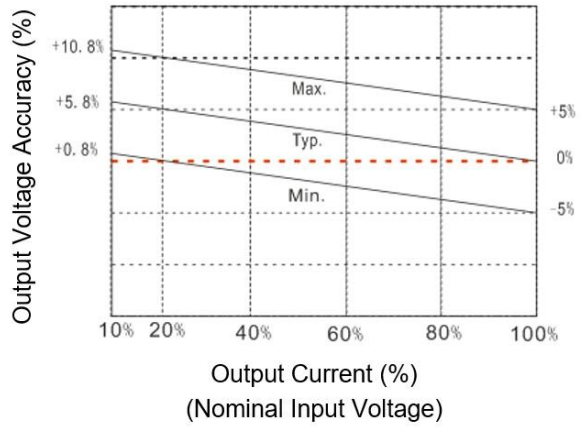



**Figure 9**

QA153HC-1803R3
+Vo Output Voltage Deviation Graph




QA153HC-1803R3
-Vo Output Voltage Deviation Graph

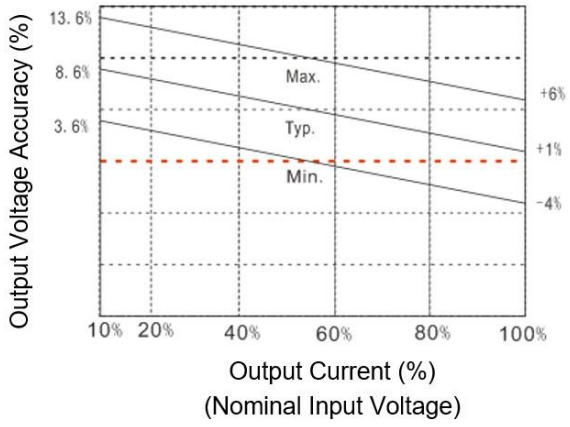
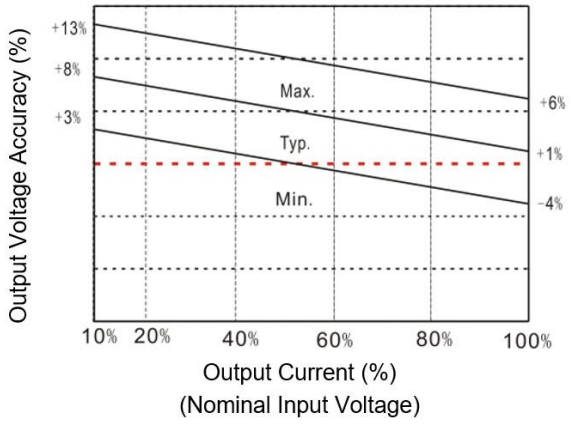



**Figure 10**

QA153HC-2004R3
+Vo Output Voltage Deviation Graph




QA153HC-2004R3
-Vo Output Voltage Deviation Graph

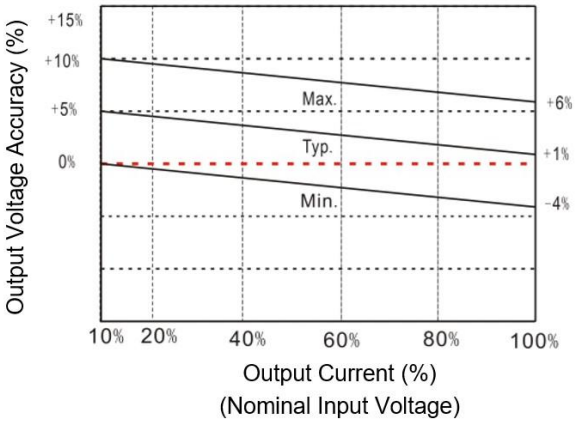



**Figure 11**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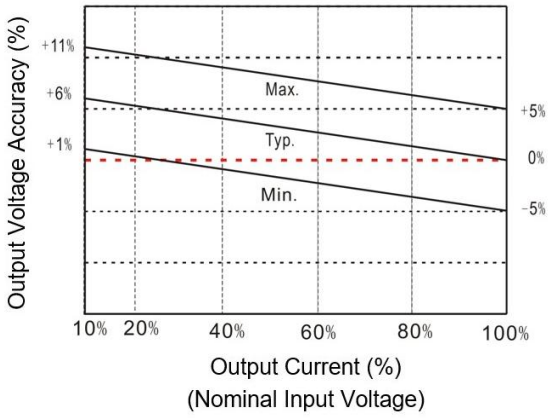
QA243HC-1503R3
+Vo Output Voltage Deviation Graph




QA243HC-1503R3
-Vo Output Voltage Deviation Graph

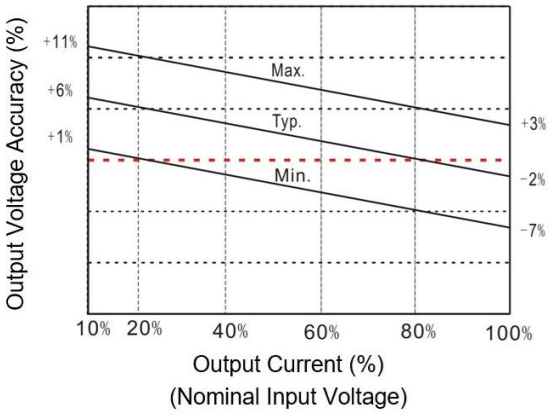
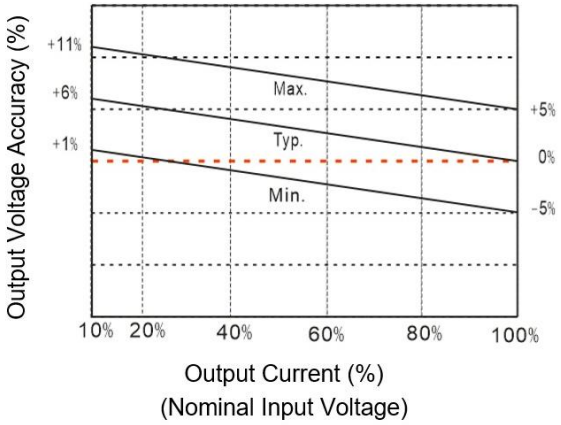



**Figure 12**

QA243HC-1504R3
+Vo Output Voltage Deviation Graph




QA243HC-1504R3
-Vo Output Voltage Deviation Graph

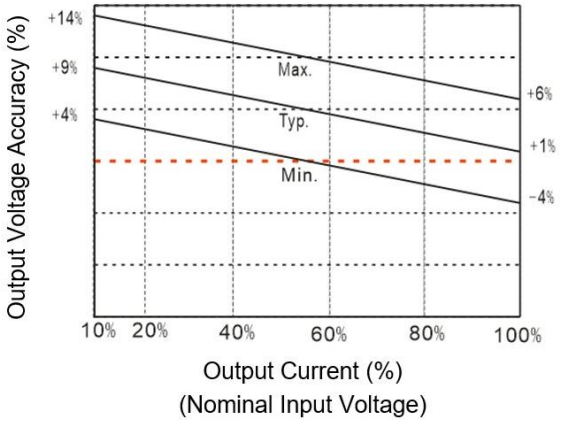
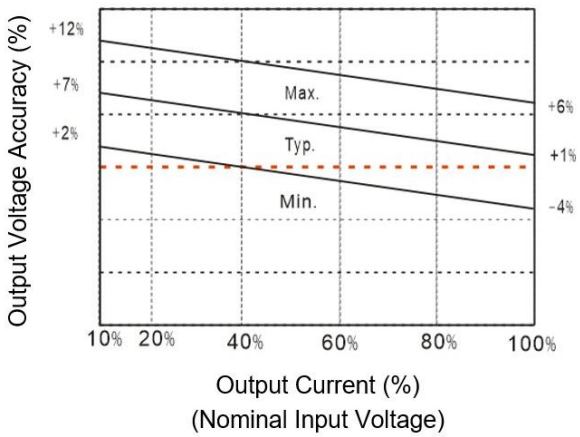



**Figure 13**

QA243HC-1803R3
+Vo Output Voltage Deviation Graph




QA243HC-1803R3
-Vo Output Voltage Deviation Graph

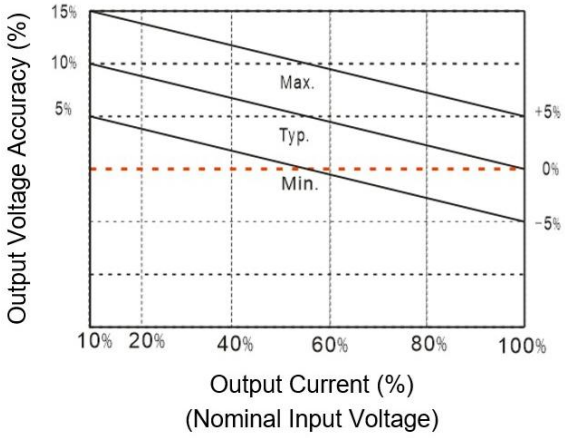



**Figure 14**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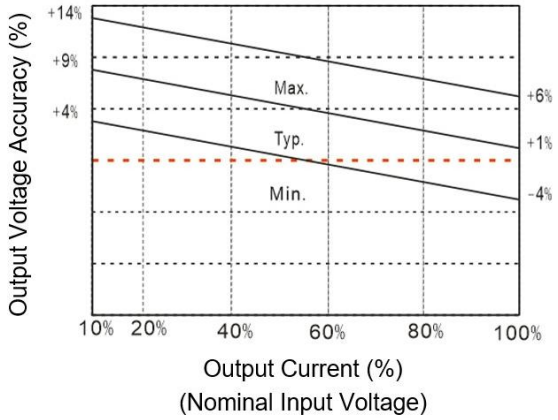
QA243HC-1508R3
+Vo Output Voltage Deviation Graph




QA243HC-1508R3
-Vo Output Voltage Deviation Graph

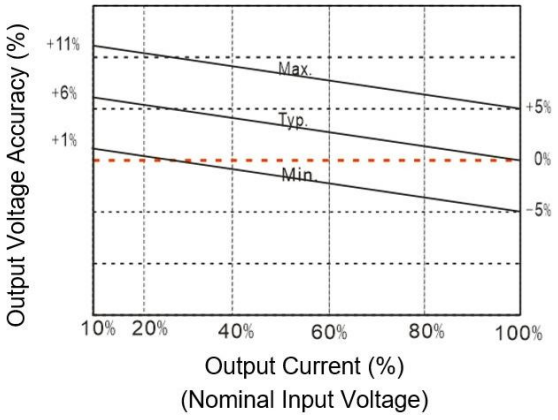



**Figure 15**

Temperture Derating Graph

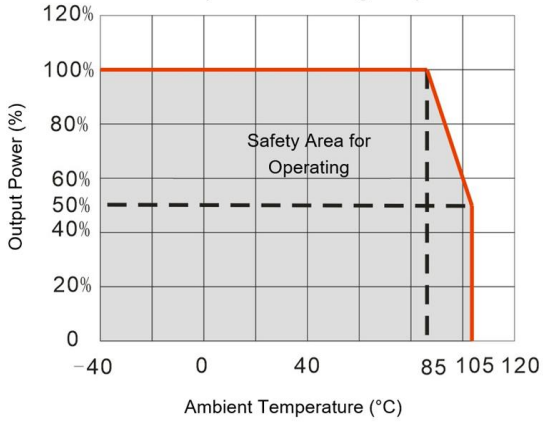



**Figure 16**

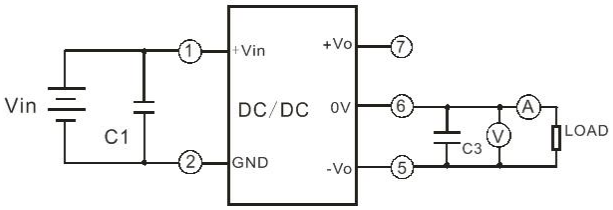
## Recommended Circuits for Application

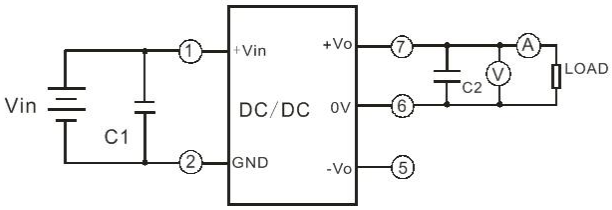
**1. Output load requirements**

a. To ensure the converter operating efficiently and reliably, its minimum load should not be less than 10% of the rated load. It is recommended to connect a resistor in parallel to the output when the real load is less than 10% (the sum of the power consumed should be bigger than or equal to 10% of the rated power).

b. The maximum capacitive load is tested at the rated full load. The converter may not start or be broken at the capacitive over-load.

**2. Test circuit diagrams**




**3. Typical application circuit diagram**

The capacitor filters can be used at the input and output to improve the output ripple and noise. The application circuit diagram is shown below, suitable capacitors should be used as the recommendation.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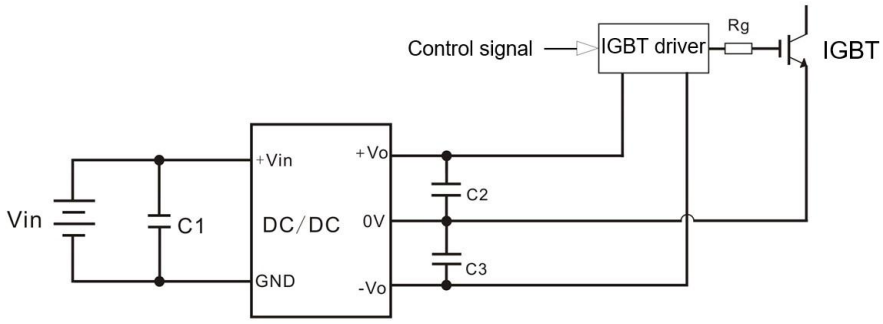
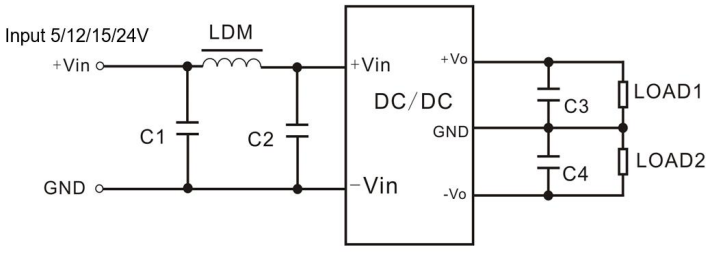
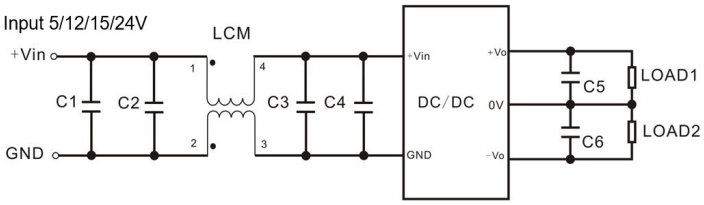



| C1/C2/C3 |
|---|
| 100uF/50V (Low ESR Capacitors) |

**4. Recommended EMC circuit diagrams**




| Input Voltage | | 5/12/15/24Vdc |
|---|---|---|
| EMI | C1/C2 | 1uF/50V |
| | C3/C4 | 100uF/30V |
| | LDM | 33uH |




| Input Voltage | | 5/12/15/24Vdc |
|---|---|---|
| EMI | C1/C2 | 4.7uF/50V |
| | C3/C4 | 1uF/50V |
| | C5/C6 | 100uF/50V |
| | LCM | 2.2uH (CMC) |

**Application Notice**

1.This series of products cannot be connected in parallel to increase the output power, and do not support hot-plug.

2.The product should be used according to the specifications, otherwise it could be permanently damaged.

3. The product performance cannot be guaranteed if it works at a lower load than the minimum load defined.

4. The product performance cannot be guaranteed if it works under over-load condition.

5. Unless otherwise specified, all values or indicators on this datasheet are tested at Ta=25℃, humidity<75%RH, nominal input voltage and rated load (pure resistance load).

6. All values or indicators on this datasheet have been tested based on Aipupower test specifications.

7.The specifications are specially for the parts listed on this datasheet, any other non-standard model performances could be out of the specifications. Please contact our technician for specific requirements.

8. Aipupower can provide customization service.

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