## *ZWQ130/A*

# SPECIFICATIONS (CONVECTION COOLING)

A191-01-01/A-E

| | MODEL / ITEMS | | | ZWQ130-5223/A | | | | ZWQ130-5225/A | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | V1 | V2 | V3 | V4 | V1 | V2 | V3 | V4 |
| 1 | Nominal Output Voltage | | V | +5 | +12 | -12 | +3.3 | +5 | +12 | -12 | +5 |
| 2 | Minimum Output Current (Convection) (*1) | | A | 1.5 | 0 | 0 | 0 | 1.5 | 0 | 0 | 0 |
| 3 | Minimum Output Current (Peak Applica(*1) | | A | 2.1 | 0 | 0 | 0 | 2.1 | 0 | 0 | 0 |
| 4 | Maximum Output Current | | A | 15.0 | 4.0 | 4.0 | 10.0 | 15.0 | 4.0 | 4.0 | 10.0 |
| 5 | Total Allowable Output Power (*2) | | W | 130 | | | | | | | |
| 6 | Maximum Peak Output Current (*3) | | A | 19.0 | 5.0 | 5.0 | 12.0 | 19.0 | 5.0 | 5.0 | 12.0 |
| 7 | Total Allowable Peak Output Power (*2) | | W | 149.6 | | | | 170 | | | |
| 8 | Efficiency (Typ) (*4) | | % | 72 | | | | | | | |
| 9 | Input Voltage Range (*5) | | - | 85 - 265VAC (47 - 63Hz) or 120 - 370VDC | | | | | | | |
| 10 | Input Current (100/200VAC) (Typ) (*4) | | A | 2.0/1.0 | | | | | | | |
| 11 | Inrush Current (Typ) (*6) | | - | 14A at 100VAC, 28A at 200VAC, Ta=25°C, Cold Start | | | | | | | |
| 12 | PFHC | | - | Designed to meet IEC61000-3-2 | | | | | | | |
| 13 | Power Factor (100/200VAC) (Typ) (*4) | | - | 0.99 / 0.93 | | | | | | | |
| 14 | Output Voltage Range | | V | 5.0-5.25 | +12/+15 | -12/-15 | 2.0-3.63 | 5.0-5.25 | +12/+15 | -12/-15 | 2.0-5.25 |
| 15 | Output Voltage Accuracy | | - | - | ±5% | ±5% | - | - | ±5% | ±5% | - |
| 16 | Maximum Ripple & Noise(*7 | 0°C ≤Ta≤ +50°C | mV | 120 | 150 | 150 | 120 | 120 | 150 | 150 | 120 |
| | | -10 ≤Ta< 0°C | mV | 160 | 180 | 180 | 160 | 160 | 180 | 180 | 160 |
| 17 | Maximum Line Regulation (*7,8) | | mV | 20 | 48 | 48 | 20 | 20 | 48 | 48 | 20 |
| 18 | Maximum Load Regulation (*7,9) | | mV | 100 | 300 | 300 | 100 | 100 | 300 | 300 | 100 |
| 19 | Temperature Coefficient | | - | Less than 0.02% /°C | | | | | | | |
| 20 | Over Current Protection (*10) | | - | More than 152W of Total Output Power | | | | More than 173W of Total Output Power | | | |
| 21 | Over Voltage Protection (*11) | | V | 5.7 - 7.0 | 16.5 - 22.5 | -22.5 - -16.5 | 3.79 - 4.95 | 5.7 - 7.0 | 16.5 - 22.5 | -22.5 - -16.5 | 5.7 - 7.0 |
| 22 | Hold-Up Time (Typ) (*12) | | - | 20 ms | | | | | | | |
| 23 | Leakage Current (*13) | | - | 0.75mA MAX,0.2mA(Typ) at 100VAC / 0.44mA(Typ) at 230VAC | | | | | | | |
| 24 | Remote ON/OFF Control | | - | - | | | | | | | |
| 25 | Parallel Operation | | - | - | | | | | | | |
| 26 | Series Operation | | - | - | | | | | | | |
| 27 | Operating Temperature (*14) | | - | -10 - +50°C (-10 - +30°C : 100%, +50°C : 50%) | | | | | | | |
| 28 | Operating Humidity | | - | 30 - 90%RH (No Dewdrop) | | | | | | | |
| 29 | Storage Temperature | | - | -30 - +85°C | | | | | | | |
| 30 | Storage Humidity | | - | 10 - 95%RH (No Dewdrop) | | | | | | | |
| 31 | Cooling | | - | Convection Cooling | | | | | | | |
| 32 | Withstand Voltage | | | Input - FG : 2kVAC(20mA), Input - Output : 3kVAC (20mA)<br>Output - FG : 500VAC(100mA), for 1min. | | | | | | | |
| 33 | Isolation Resistance | | - | More than 100MΩ at 25°C and 70%RH Output - FG : 500VDC | | | | | | | |
| 34 | Vibration | | - | At no operating, 10-55Hz (Sweep for 1min)<br>19.6 m/s$^2$ Constant, X, Y, Z 1h each. | | | | | | | |
| 35 | Shock (In package) | | - | Less than 196.1 m/s$^2$ | | | | | | | |
| 36 | Safety (*15) | | - | Approved by UL62368-1, CSA C22.2 No.62368-1, EN62368-1,UL60950-1, CSA C22.2 No.60950-1 & EN60950-1.<br>(Expire date of 60950-1 : 20/12/2020). Designed to meet DENAN | | | | | | | |
| 37 | EMI | | - | Designed to meet EN55011/EN55032-B, FCC-ClassB, VCCI-B | | | | | | | |
| 38 | Immunity (*16) | | - | Designed to meet EN61000-4-2, -3, -4, -5, -6, -8, -11 | | | | | | | |
| 39 | Weight (Typ) | | - | 1000g | | | | | | | |
| 40 | Size (WxHxD) | | mm | 108.5 x 44.5 x 250 (Refer to Outline Drawing) | | | | | | | |

*Read instruction manual carefully, before using the power supply unit.

=NOTES=

*1. For V2, V3,V4 stability, require minimum output current of V1.

*2. Allowable output power is changed according to V4 voltage refer to derating table (A191-01-05/A-_).

*3. Operating period at peak current is less than 10sec. (Duty ≤ 0.35)

*4. At 100/200VAC, Ta=25°C and total allowable output power.

*5. For cases where conformance to various safety specs (UL, CSA, EN) are required, to be described as 100 - 240VAC(50/60Hz).

*6. Not applicable for the inrush current to Noise Filter for less than 0.2ms.

*7. Refer to output measuring (A191-01-07/A-_) for line & load regulation and ripple voltage.

*8. 85 - 265VAC , constant load.

*9. Minimum load - Full load, constant input voltage.

*10. Constant current limit with automatic recovery. Refer to test data (A191-53-01_). Not operate at over load or dead short condition for more than 30 seconds.

*11. OVP circuit will shut down all outputs, manual reset (Line recycle).

*12. At 100/200VAC, nominal output voltage and total allowable output power.

*13. Measured by the each method of UL, CSA, EN and DENAN (at 60Hz), Ta=25°C.

*14. At standard mounting.
- Load (%) is percent of total allowable output power or each maximum output current, whichever is greater.
For other mountings, refer to derating curve (A191-01-05/A-_).

*15. As for DENAN, designed to meet at 100VAC.

*16. Refer to test data(A191-58-01_).

***ZWQ130/A***

# SPECIFICATIONS (FORCED AIR COOLING)

A191-01-02/A-D

| | MODEL / ITEMS | | | ZWQ130-5223/A | | | | ZWQ130-5225/A | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | V1 | V2 | V3 | V4 | V1 | V2 | V3 | V4 |
| 1 | Nominal Output Voltage | | V | +5 | +12 | -12 | +3.3 | +5 | +12 | -12 | +5 |
| 2 | Minimum Output Current | (*1) | A | 2.1 | 0 | 0 | 0 | 2.1 | 0 | 0 | 0 |
| 3 | Maximum Output Current | | A | 19.0 | 5.0 | 5.0 | 12.0 | 19.0 | 5.0 | 5.0 | 12.0 |
| 4 | Total Allowable Output Power | (*2) | W | 149.6 | | | | 170 | | | |
| 5 | Input Current (100/200VAC) (Typ) | (*3) | A | 2.6/1.3 | | | | | | | |
| 6 | Operating Temperature | (*4) | - | -10 ~ +60°C (-10 ~+40°C : 100%, +60°C : 50%) | | | | | | | |
| 7 | Cooling | (*5) | - | Forced Air Cooling | | | | | | | |

*Read instruction manual carefully, before using the power supply unit.

=NOTES=

*For other items, refer to convection cooling specifications (A191-01-01/A-_).

*1. For V2, V3,V4 stability, require minimum output current of V1.
When it is using under condition of forced air cooling, V1 minimum output current is same as convection cooling.

*2. Allowable output power is changed according to V4 voltage, refer to derating table (A191-01-06/A-_).

*3. At 100/200VAC, Ta=25°C total allowable output power.

*4. At standard mounting.
- Load (%) is percent of total allowable output power or each maximum output current, whichever is greater.
For other mountings, refer to derating curve (A191-01-06/A-_).

*5. Air flow $\geq 0.85 m^3$/min(30cfm)

***ZWQ130/A***

# SPECIFICATIONS (CONVECTION COOLING)

A191-01-03/A-C

| | MODEL / ITEMS | | | ZWQ130-5222/A | | | | ZWQ130-5224/A | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | V1 | V2 | V3 | V4 | V1 | V2 | V3 | V4 |
| 1 | Nominal Output Voltage | | V | +5 | +12 | -12 | +12 | +5 | +12 | -12 | +24 |
| 2 | Minimum Output Current (Convection) | (*1) | A | 1.5 | 0 | 0 | 0 | 1.5 | 0 | 0 | 0 |
| 3 | Minimum Output Current (Peak Applicat | (*1) | A | 2.1 | 0 | 0 | 0 | 2.1 | 0 | 0 | 0 |
| 4 | Maximum Output Current | | A | 15.0 | 4.0 | 4.0 | 4.0 | 15.0 | 4.0 | 4.0 | 2.0 |
| 5 | Total Allowable Output Power | | W | 130 | | | | | | | |
| 6 | Maximum Peak Output Current | (*2) | A | 19.0 | 5.0 | 5.0 | 5.0 | 19.0 | 5.0 | 5.0 | 2.5 |
| 7 | Total Allowable Peak Output Power | | W | 170 | | | | | | | |
| 8 | Efficiency (Typ) | (*3) | % | 72 | | | | | | | |
| 9 | Input Voltage Range | (*4) | - | 85 - 265VAC (47 - 63Hz) or 120 - 370VDC | | | | | | | |
| 10 | Input Current (100/200VAC) (Typ) | (*3) | A | 2.0 / 1.0 | | | | | | | |
| 11 | Inrush Current (Typ) | (*5) | - | 14A at 100VAC, 28A at 200VAC, Ta=25°C, Cold Start | | | | | | | |
| 12 | PFHC | | - | Designed to meet IEC61000-3-2 | | | | | | | |
| 13 | Power Factor (100/200VAC) (Typ) | (*3) | - | 0.99 / 0.93 | | | | | | | |
| 14 | Output Voltage Range | | - | 5.0-5.25 | +12/+15 | -12/-15 | 11.4-12.6 | 5.0-5.25 | +12/+15 | -12/-15 | 22.8-25.2 |
| 15 | Output Voltage Accuracy | | - | - | ±5% | ±5% | - | - | ±5% | ±5% | - |
| 16 | Maximum Ripple & Noise (*6) | 0°C ≤Ta≤ +50°C | mV | 120 | 150 | 150 | 150 | 120 | 150 | 150 | 200 |
| | | -10 ≤Ta< 0°C | mV | 160 | 180 | 180 | 180 | 160 | 180 | 180 | 200 |
| 17 | Maximum Line Regulation | (*6,7) | mV | 20 | 48 | 48 | 48 | 20 | 48 | 48 | 96 |
| 18 | Maximum Load Regulation | (*6,8) | mV | 100 | 300 | 300 | 300 | 100 | 300 | 300 | 400 |
| 19 | Temperature Coefficient | | - | Less than 0.02% / °C | | | | | | | |
| 20 | Over Current Protection | (*9) | | More than 173W of Total Output Power | | | | | | | |
| 21 | Over Voltage Protection | (*10) | V | 5.7 - 7.0 | 16.5 - 22.5 | -22.5 - -16.5 | 13.8 - 16.2 | 5.7 - 7.0 | 16.5 - 22.5 | -22.5 - -16.5 | 27.6 - 32.4 |
| 22 | Hold-Up Time (Typ) | (*11) | - | 20 ms | | | | | | | |
| 23 | Leakage Current | (*12) | - | 0.75mA MAX,0.2mA(Typ) at 100VAC / 0.44mA(Typ) at 230VAC | | | | | | | |
| 24 | Remote ON/OFF Control | | - | - | | | | | | | |
| 25 | Parallel Operation | | - | - | | | | | | | |
| 26 | Series Operation | | - | - | | | | | | | |
| 27 | Operating Temperature | (*13) | - | -10 - +50°C (-10 - +30°C : 100%, +50°C : 50%) | | | | | | | |
| 28 | Operating Humidity | | - | 30 - 90%RH (No Dewdrop) | | | | | | | |
| 29 | Storage Temperature | | - | -30 - +85°C | | | | | | | |
| 30 | Storage Humidity | | - | 10 - 95%RH (No Dewdrop) | | | | | | | |
| 31 | Cooling | | - | Convection Cooling | | | | | | | |
| 32 | Withstand Voltage | | | Input - FG:2kVAC(20mA), Input - Output:3kVAC (20mA)<br>Output - FG:500VAC(100mA), for 1min. | | | | | | | |
| 33 | Isolation Resistance | | - | More than 100MΩ at 25°C and 70%RH Output - FG:500VDC | | | | | | | |
| 34 | Vibration | | - | At no operating, 10-55Hz (Sweep for 1min)<br>19.6 $m/s^2$ Constant, X, Y, Z 1h each. | | | | | | | |
| 35 | Shock (In package) | | - | Less than 196.1 $m/s^2$ | | | | | | | |
| 36 | Safety | (*14) | - | Approved by UL62368-1, CSA C22.2 No.62368-1, EN62368-1,UL60950-1, CSA C22.2 No.60950-1 & EN60950-1.<br>(Expire date of 60950-1 : 20/12/2020). Designed to meet DENAN | | | | | | | |
| 37 | EMI | | - | Designed to meet EN55011/EN55032-B, FCC-ClassB, VCCI-B | | | | | | | |
| 38 | Immunity | (*15) | - | Designed to meet EN61000-4-2, -3, -4, -5, -6, -8, -11 | | | | | | | |
| 39 | Weight (Typ) | | - | 1000g | | | | | | | |
| 40 | Size (WxHxD) | | mm | 108.5 x 44.5 x 250 (Refer to Outline Drawing) | | | | | | | |

*Read instruction manual carefully, before using the power supply unit.

=NOTES=

*1. For V2, V3,V4 stability, require minimum output current of V1.

*2. Operating period at peak current is less than 10sec. (Duty≤0.35)

*3. At 100/200VAC, Ta=25°C and total allowable output power.

*4. For cases where conformance to various safety specs (UL, CSA, EN) are required, to be described as 100 - 240VAC(50/60Hz).

*5. Not applicable for the inrush current to Noise Filter for less than 0.2ms.

*6. Refer to output measuring (A191-01-07/A-_) for line & load regulation and ripple voltage.

*7. 85 - 265VAC , constant load.

*8. Minimum load - Full load, constant input voltage.

*9. Constant current limit with automatic recovery. Refer to test data (A191-53-01_). Not operate at over load or dead short condition for more than 30 seconds.

*10. OVP circuit will shut down all outputs, manual reset (Line recycle).

*11. At 100/200VAC, nominal output voltage and total allowable output power.

*12. Measured by the each method of UL, CSA, EN and DENAN (at 60Hz), Ta=25°C.

*13. At standard mounting.
- Load (%) is percent of total allowable output power or each maximum output current, whichever is greater.
For other mountings, refer to derating curve (A191-01-05/A-_).

*14. As for DENAN, designed to meet at 100VAC.

*15. Refer to test data(A191-58-01_).

***ZWQ130/A***

# SPECIFICATIONS (FORCED AIR COOLING)

A191-01-04/A-C

| | ITEMS \ MODEL | | | ZWQ130-5222/A | | | | ZWQ130-5224/A | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | V1 | V2 | V3 | V4 | V1 | V2 | V3 | V4 |
| 1 | Nominal Output Voltage | | V | +5 | +12 | -12 | +12 | +5 | +12 | -12 | +24 |
| 2 | Minimum Output Current | (*1) | A | 2.1 | 0 | 0 | 0 | 2.1 | 0 | 0 | 0 |
| 3 | Maximum Output Current | | A | 19.0 | 5.0 | 5.0 | 5.0 | 19.0 | 5.0 | 5.0 | 2.5 |
| 4 | Total Allowable Output Power | | W | 170 | | | | | | | |
| 5 | Input Current (100/200VAC) (Typ) | (*2) | A | 2.6 / 1.3 | | | | | | | |
| 6 | Operating Temperature | (*3) | - | -10 ~ +60°C (-10 ~+40°C : 100%, +60°C : 50%) | | | | | | | |
| 7 | Cooling | (*4) | - | Forced Air Cooling | | | | | | | |

*Read instruction manual carefully, before using the power supply unit.

=NOTES=

*For other items, refer to convection cooling specifications (A191-01-03/A-_).

*1. For V2, V3,V4 stability, require minimum output current of V1.

When it is using under condition of forced air cooling, V1 minimum output current is same as convection cooling.

*2. At 100/200VAC, Ta=25°C total allowable output power.

*3. At standard mounting.

- Load (%) is percent of total allowable output power or each maximum output current, whichever is greater.

For other mountings, refer to derating curve (A191-01-06/A-_).

*4. Air flow $\geq$ 0.85m$^3$/min(30cfm)

***ZWQ130/A***

## OUTPUT DERATING (CONVECTION COOLING)

A191-01-05/A

| Ta(°C) | LOAD (%) | | |
|---|---|---|---|
| | MOUNTING A | MOUNTING B,C,D | MOUNTING E |
| -10 ~+15 | 100 | 100 | 100 |
| 20 | 100 | 100 | 87 |
| 25 | 100 | 87 | 75 |
| 30 | 100 | 75 | 62 |
| 35 | 87 | 62 | 50 |
| 40 | 75 | 50 | |
| 45 | 62 | | |
| 50 | 50 | | |

**Allowable output power**

5225/A

| A | B | C |
|---|---|---|
| 5V | 170W | 130W |
| 3V | 146W | 130W |
| 2V | 134W | 130W |

5223/A

| A | B | C |
|---|---|---|
| 3.3V | 149.6W | 130W |
| 3V | 146W | 130W |
| 2V | 134W | 130W |

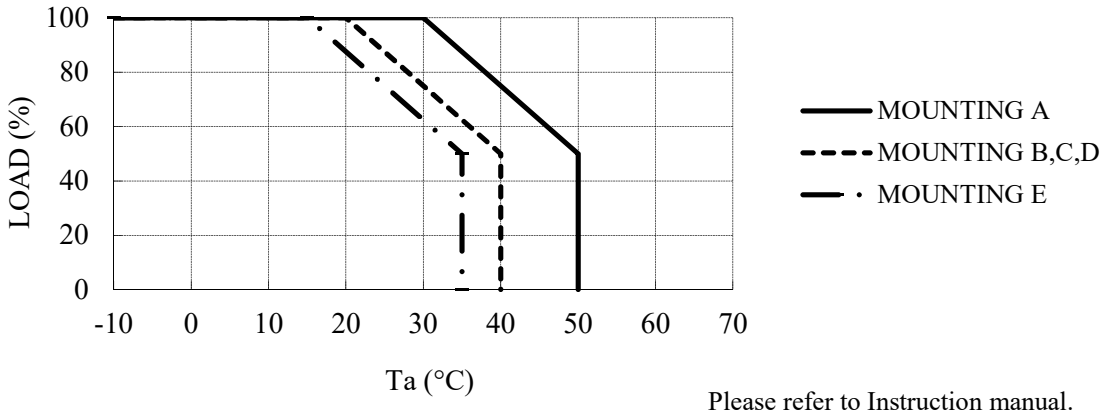
A : V4 setting voltage

B : Total Allowable Peak Output Power

C : Total Allowable Output Power

* The period of peak current at Convection Cooling is limited less than 10sec. (Duty ≤ 0.35)
For peak current application, refer to note (A191-01-07/A_).

OUTPUT DERATING CURVE FOR CONVECTION COOLING

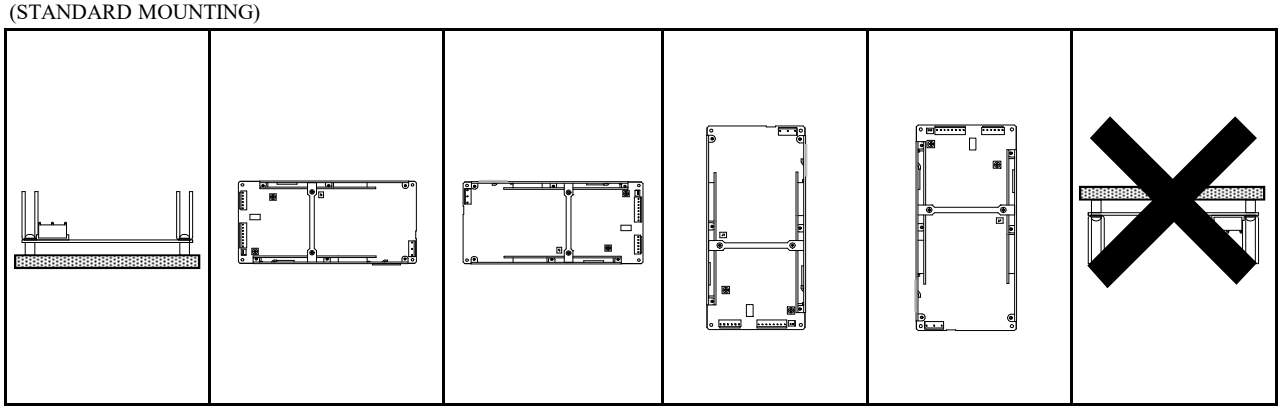



Please refer to Instruction manual.

* Load (%) is percent of total allowable output power or each maximum output current, whichever is greater.

MOUNTING A | MOUNTING B | MOUNTING C | MOUNTING D | MOUNTING E | PROHIBIT

(STANDARD MOUNTING)



# OUTPUT DERATING (FORCED AIR COOLING)

A191-01-06/A-A

| Ta(°C) | LOAD (%) MOUNTING A,B,C,D,E |
|---|---|
| -10 ~+30 | 100 |
| 35 | 100 |
| 40 | 100 |
| 45 | 87 |
| 50 | 75 |
| 55 | 62 |
| 60 | 50 |

**Allowable output power**

5225/A

| A | B |
|---|---|
| 5V | 170W |
| 3V | 146W |
| 2V | 134W |

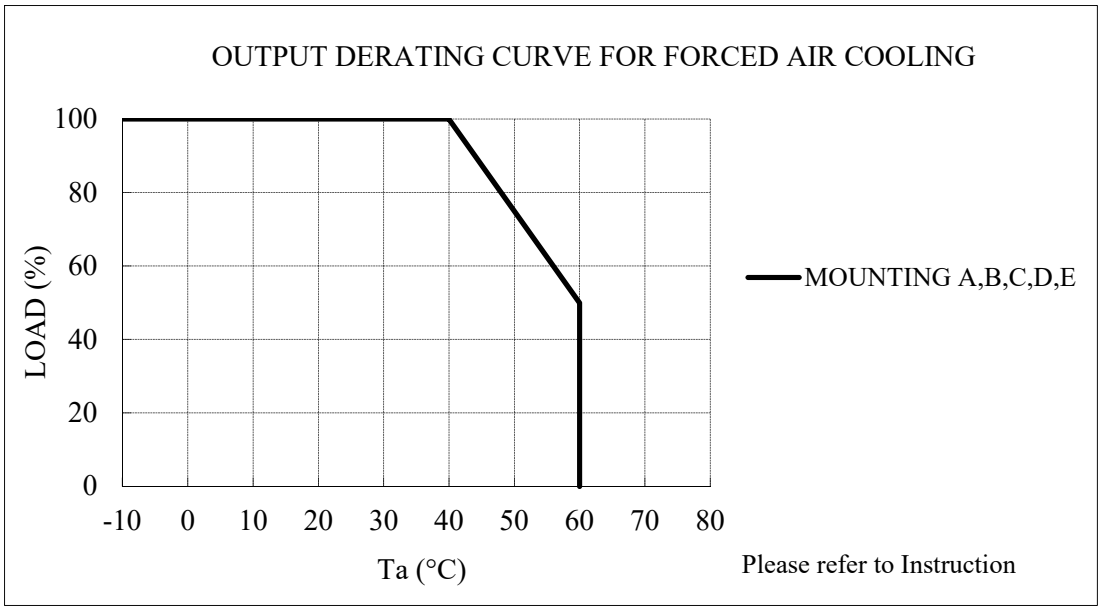
5223/A

| A | B |
|---|---|
| 3.3V | 149.6W |
| 3V | 146W |
| 2V | 134W |

A : V4 setting voltage

B : Total Allowable Output Power

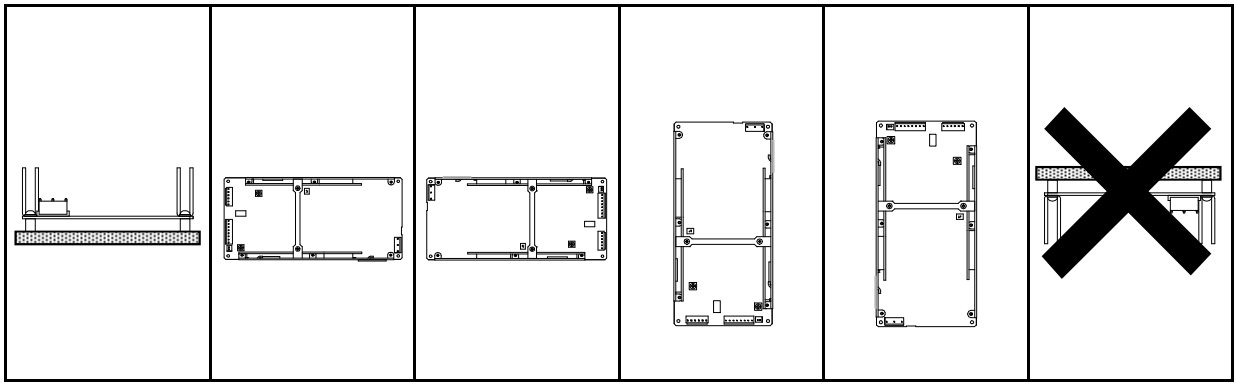
* Air flow $\geq$ 0.85m$^3$/min(30cfm)
Air must flow through component side.




* Load (%) is percent of total allowable output power or each maximum output current, whichever is greater.

MOUNTING A | MOUNTING B | MOUNTING C | MOUNTING D | MOUNTING E | PROHIBIT

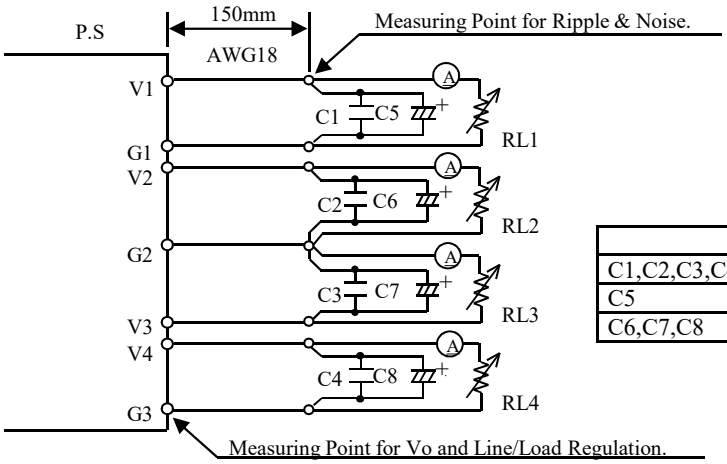
(STANDARD MOUNTING)



## NOTE

A191-01-07/A

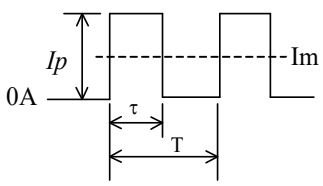
### Output Measuring



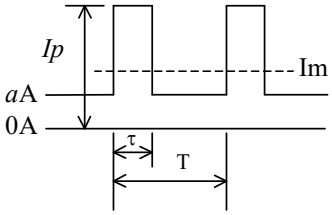

Measure with EIAJ RC-9131 probe.
Bandwidth of scope : 100MHz

| | | Capacitance |
|---|---|---|
| C1,C2,C3,C4 | : Film Cap. | 0.1 μF |
| C5 | : Elec. Cap. | 1000 μF |
| C6,C7,C8 | : Elec. Cap. | 100 μF |

### Peak Output Current (Convection Cooling)




$$Iav \geq \mathrm{Im} = \frac{Ip \times \tau}{\mathrm{T}}$$




$$Iav \geq \mathrm{Im} = \frac{(Ip - a) \times \tau}{\mathrm{T}} + a$$

Ip : Peak output current ( A )
Iav : Average output current ( A )
( Maximum output current (Convection) in Spec. )
Im : Average output current ( A )
$t$ : Pulse width of peak output current ( sec )
( Operating time at peak output )
T : Period ( sec ) : more than 10ms

* The period of peak current at Convection Cooling is limited less than 10sec.. (Duty ≤ 0.35)
* Take V1 minmum output current more than 2.1A.