

# 100W DC/DC POWER SUPPLY FOR AUTOMOBILE

## 1 Function Description

DC/DC ATX power supply for automobile application, 6-18VDC input, +5V,+12V,+3.3V,-12V,+5VSB and PG (power good signal) outputs.

## 2 Operation Environment

| Item        | Unit | Minimum | Typical | Maximum | Test Conditon   |
|-------------|------|---------|---------|---------|-----------------|
| Temperature | °C   | -20     |         | 50      |                 |
| RH          | %RH  | 40      |         | 90      | No Condensation |

## 3 Technique Requirement

### 3.1 Input Characteristic

| Item          | Unit | Minimum | Typical | Maximum | Test Conditon |
|---------------|------|---------|---------|---------|---------------|
| DC INPUT      | Vdc  | 6       | 12/     | 18      |               |
| Input Current | A    |         | 10      |         |               |

### 3.2 Output Characteristic

#### 3.2.1 Output Voltage Regulation

| Output | Min. Load | Max. Load | Peak Load | Output Voltage range | Ripple (pk-pk) (rated load、20MHz limit) * |
|--------|-----------|-----------|-----------|----------------------|---|
| +5V    | 0.5A      | 6A        |           | 4.75~5.25V           | 50mV                                      |
| +12V   | 0.3A      | 3A        |           | 11.40~12.60V         | 120mV                                     |
| +3.3V  | 0.5A      | 6A        |           | 3.14~3.55V           | 50mV                                      |
| -12V   | 0A        | 0.05A     |           | -11.0~-13.2V         | 120mV                                     |
| +5VSB  | 0.1A      | 1.5A      |           | 4.75~5.25V           | 100mV                                     |

\*: Need to add 47 $\mu$ F tantalum capacitor and 0.1 $\mu$ F high frequency capacitor on test point when testing.

### 3.2.2 Others Output Characteristics

| Item              | Unit | Minimum | Typical | Maximum | Test Conditon                                |
|-------------------|------|---------|---------|---------|--|
| Output Power      | W    |         | 100     |         | DC output power                              |
| Efficiency        | %    |         | 90      |         | Rated load                                   |
| Turn on Overshoot | %    |         |         | 10      |  |
| Rise Time         | ms   |         | 20      |         | Output voltage up from 0% to 95%, rated load |
| Hold up Time      | ms   |         | 2       |         | Rated load                                   |

### 3.3 EMC Requirement

| Item                   | Request             | Standard | Judgement Grade                                    |
|------------------------|---------------------|----------|--|
| Conducted interference | CLASS B, 3dB margin | EN55022  | Ensure system pass the CLASS B and have 3dB margin |
| Radiation interference | CLASS B, 3dB margin | EN55022  | Ensure system pass the CLASS B and have 3dB margin |

### 3.4 Protection Function

| Item                                      | Unit | Yes/No | Minimum | Typical | Maximum | Recovery Characteristic                        |
|---|------|--------|---------|---------|---------|--|
| Input inversion protection                |      | Yes    |         |         |         |  |
| +5V OVP                                   | V    | Yes    | 5.8     |         | 6.8     | Latched, need to re-apply DC input to recovery |
| +12V OVP                                  | V    | Yes    | 13.2    |         | 15.6    | Latched  |
| +3.3V OVP                                 | V    | Yes    | 3.9     |         | 4.3     | Latched  |
| Short Circuit Protection (+5V,+12V,+3.3V) |      | Yes    |         |         |         | Latched  |

## 4 Monitoring ,Signal Control

### 4.1 Process Sequence

| Item | Name  | Characteristic   |
|------|---|--|
| 1    | Ignition<br>(The Ignition signal controlled by the voltage signal from the key) | <ol style="list-style-type: none"> <li>1) Ignition=OFF, Nothing happens , waiting for Ignition signal ON.</li> <li>2) Ignition=ON, wait for 3-4s, open +5VSB output, after another 1s the MCU sends an "ON" signal to the motherboard via the 2 wires connected to the motherboard's ON/OFF pins. The motherboard will turn ON and your system should start booting.</li> <li>3) Ignition=ON , nothing happens , your computer will remain ON.</li> <li>4) Ignition=OFF ,wait about 10s and then it turned motherboard OFF by sending a signal to the motherboard's ON/OFF switch. Your computer should turn off gracefully. During this time, power will still be available for your PC to perform shutdown.</li> <li>5) Ignition=OFF after 10s. Power will still be provided for another 50s, long enough for most soft shutdown processes. In the event where the shutdown processes is hanging, power will be shutdown hard, turn off your computer's main power source to prevent battery drain.</li> <li>6) Go back to step 1, until ignition is turned ON again.</li> </ol> |
| 2    | Controlled motherboard signal (PS-ON)   | PS-ON is to control motherboard ON/OFF switch for 'soft' start/stop sequence.. PS-ON is activated 5s after the ignition circuit is turned on and 10s after the ignition turned off.  |
| 3    | Power good signal (PG)  | <p>The PG signal comes from the No. pin8 of the 20pin output connector, it indicate the power supply working condition, this 'TTL' signal is the result of "AND" relationship with DC output and DC input voltage . On working condition, if the DC input voltage is well within it's operation range, then the PG signal is sent out (PG is in H logic) after 100-500ms delay. If the DC input voltage down and below to 11V, or the one of DC output voltage out of it's normal range, then send out Power Fall signal (that is: PG is in L logic). The Power Fall signal fall to below 0.3V, should have 1ms (at least) before the +5V output down to 4.5V,. And the PG signal's slop during the rise up and fall down</p> <p>Should be smooth and no any oscillation happened. PG signal should have the capacity to drive 6 standard TTL</p>  |

|           |                                |  |        |        |      |       |      |           |       |        |  |        |
|-----------|--------------------------------|--|--------|--------|------|-------|------|-----------|-------|--------|--|--------|
|           |                                | loading.<br>Following is the under voltage level of each output:   |        |        |      |       |      |           |       |        |  |        |
|           |                                | <table border="1"> <tr> <td>Output</td> <td>+5V</td> <td>+12V</td> <td>+3.3V</td> <td>-12V</td> </tr> <tr> <td>UVP level</td> <td>+4.5V</td> <td>+10.8V</td> <td></td> <td>-10.4V</td> </tr> </table>  | Output | +5V    | +12V | +3.3V | -12V | UVP level | +4.5V | +10.8V |  | -10.4V |
| Output    | +5V                            | +12V   | +3.3V  | -12V   |      |       |      |           |       |        |  |        |
| UVP level | +4.5V                          | +10.8V   |        | -10.4V |      |       |      |           |       |        |  |        |
| 4         | Sleeping mode control (ON/OFF) | The ON/OFF signal comes from the No. pin14 of the 20pin output connector, is to control the power supply's working state. (Be active in 'L' level). If the ON/OFF signal is in floating, the power supply will have no output (except 5VSB ) and in sleeping mode . The 5VSB should be within the range of 4.75-5.25V under 1.5A loading condition, and no any audible noise can be heard. If the ON/OFF signal is shorted to ground, the power supply will be in normal working condition and have normal output voltage. |        |        |      |       |      |           |       |        |  |        |
| 5         | Battery Protection             | The power supply will shutdown hard when the battery voltage below 11V, and the power supply will recovery ON when the battery voltage back and exceed <b>12V</b> .  |        |        |      |       |      |           |       |        |  |        |

|   |              |  |
|---|--------------|--|
| 6 | Hand control | <p>The power output set by the jumper wire. when it's set in automation mode, the power supply will work according to the process of the item 1.</p> <p>When it's set to hand control mode, it controlled by external switch:</p> <ol style="list-style-type: none"> <li>1) Ignition=OFF, Nothing happens , waiting for Ignition signal ON。</li> <li>2) Ignition=ON, wait for 3-4s, open +5VSB output, the power supply go into sleeping mode, waiting for switch ON/OFF.</li> <li>3) Ignition=ON, press the switch button one time, sends an "ON" signal to the motherboard .The motherboard will turn ON and your system should start booting。</li> <li>4) Ignition=ON, during power be in ON condition, press the switch button one time (&lt;1s transient time). Nothing happens.</li> <li>5) Ignition=ON, during power be in ON condition, press the switch button for 3-4s, then send an "OFF" signal to the motherboard, the power supply go into sleeping mode.</li> <li>6) Ignition=OFF, during power be in ON condition, wait about 10s and then it turned motherboard OFF by sending a signal to the motherboard's ON/OFF switch. Your computer should turn off gracefully. During this time, Power will still be provided for another 50s, long enough for most soft shutdown processes. In the event where the shutdown processes is hanging, power will be shutdown hard, turn off your computer's main power source to prevent battery drain.</li> <li>7) Ignition=OFF after 10s. during power be in OFF condition. Power will be shutdown include +5VSB output.</li> <li>8) Go back to step 1, until ignition is turned ON again。</li> </ol> |
|---|--------------|--|

#### 4.2 PG signal Sequence

| Parameter | Value Request |         |         | Test Condition |               | Figure |
|-----------|---------------|---------|---------|----------------|---------------|--------|
|           | Name          | Minimum | Typical | Maximum        | Input voltage |        |
| tp.G      | 100ms         |         | 500ms   | 24VDC          | 100%          | FIG1   |
| tp.F      | 0.5ms         | 1ms     |         | 24VDC          | 100%          | FIG2   |

|    |  |       |        |       |      |      |
|----|--|-------|--------|-------|------|------|
| tr |  | 5ns   | 50 μ s | 24VDC | 100% | FIG3 |
| tf |  | 500ns | 10 μ s | 24VDC | 100% | FIG4 |

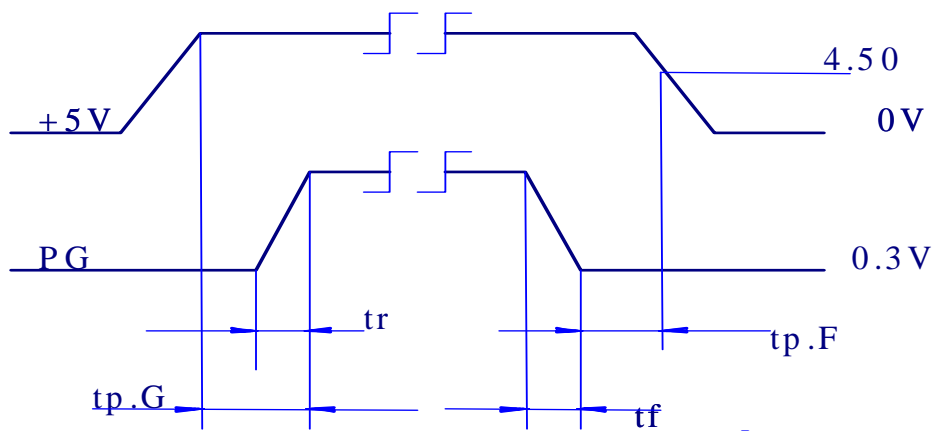


FIG1

## 5 Mechanical Requirement

### 5.1 Outline and Connection

V+: Positive DC input from battery

V-: Negative DC input from battery

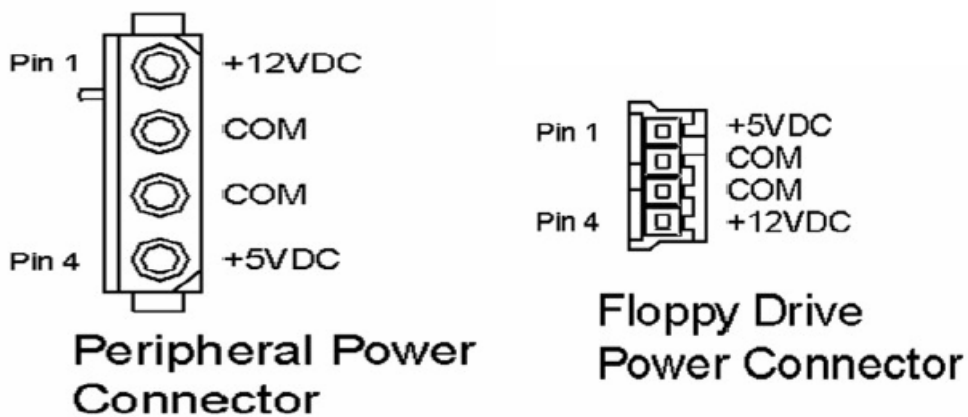
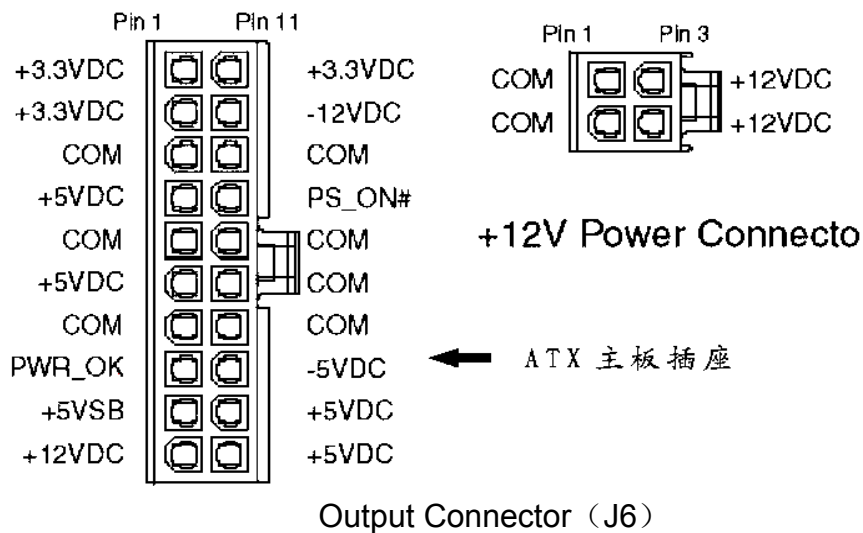
ACC: Control Signal from Ignition

J4/J5: ITPS control signal to Motherboard "power off" Pin

J6: To ATX Motherboard 20 power pin Connector

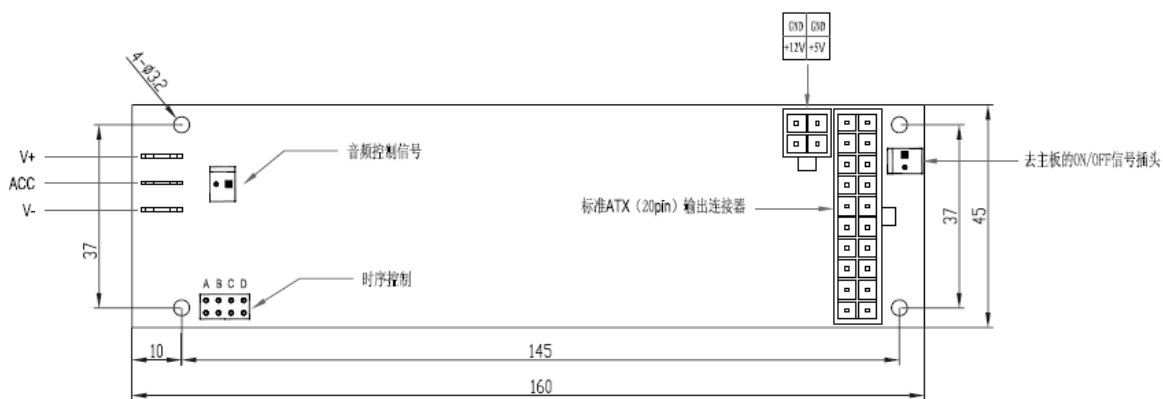
J7: To peripheral power Connector for 12V and +5V

DC Input Fuse: ATO series SMT fuse 15A



Output Connector (J7)

## 5.2 Dimension



Dimension: 160mmX45mmX18mm