

# SPECIFICATION

## 1. DESCRIPTION

The DK1203 is a secondary side flyback type AC-DC Switch Mode Power Controlling IC. With integrated 700V high voltage power transistor, patented self-power supply circuit and integrated MOS circuit design, lots of external components are saved, transformer design is simple, only two windings is needed for the transformer in isolated output circuit.

## 2. APPLICATIONS

- AC/DC power adapters
- Air conditioner power supply
- DVB power supply
- TV/Monitor power supply
- DVD/VCD power supply
- Electromagnetic oven power supply
- LED driver applications

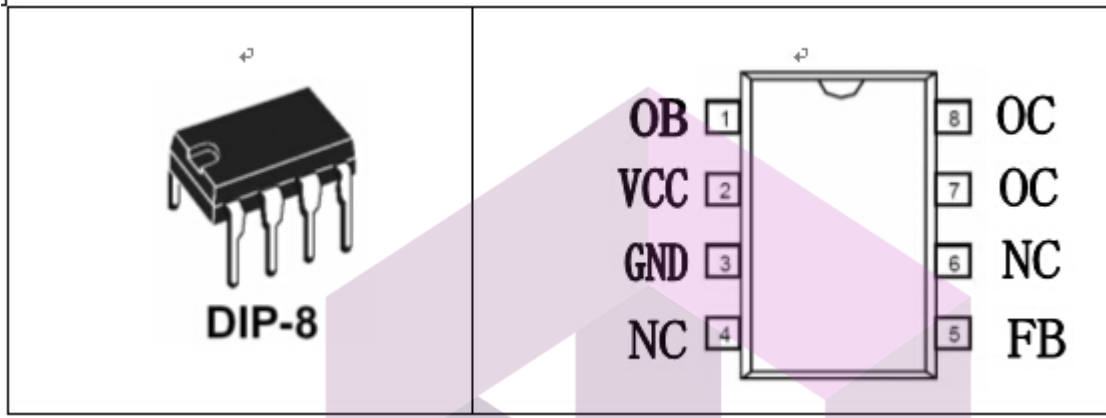
## 3. MAIN FEATURES

- 85V—265V wide range AC power input.
- Build-in 700V power transistor.
- Internal integrated high voltage starting circuit, no need for additional resistance.
- Integrated self-start circuit.
- Pulse-Width Modulation (PWM) controlled system.
- VCC operating voltage range: 4-6V.
- 65kHz switching frequency.
- Automatically turn to skip cycle mode under light load condition.
- Over current, Over loading, Over temperature and Over voltage Protection.
- Standby power consumption lower then 0.3W.
- Internal frequency modulation circuit to reduce EMI filter cost.

## 4. POWER RANGE

|                          |            |            |             |
|--------------------------|------------|------------|-------------|
| <b>Input Voltage</b>     | 85-265V AC | 85-145V AC | 180-265V AC |
| <b>MAX. output power</b> | 12W        | 12W        | 18W         |

## 5. CONNECTION DIAGRAM (DIP-8)



### PIN FUNCTION

| Pin NO. | Pin Name | Function   |
|---------|----------|--|
| 1       | OB       | Startup pin. Internal startup circuit to contact with OC pin.  |
| 2       | VCC      | Power supply of control circuits, contacted with an external grounded capacitor of 10uF~100uF            |
| 3       | GND      | Ground reference   |
| 4       | NC       | Empty pin without internal connection.   |
| 5       | FB       | Feedback control pin , connected with 1nF ~ 10nF grounded capacitor, coupler grounded to control output. |
| 6       | NC       | Empty pin without internal connection.   |
| 7,8     | OC       | Output pin. Connected with internal high voltage Collector point and switch mode transformer.            |

## 6. ABSOLUTE MAXIMUM RATINGS

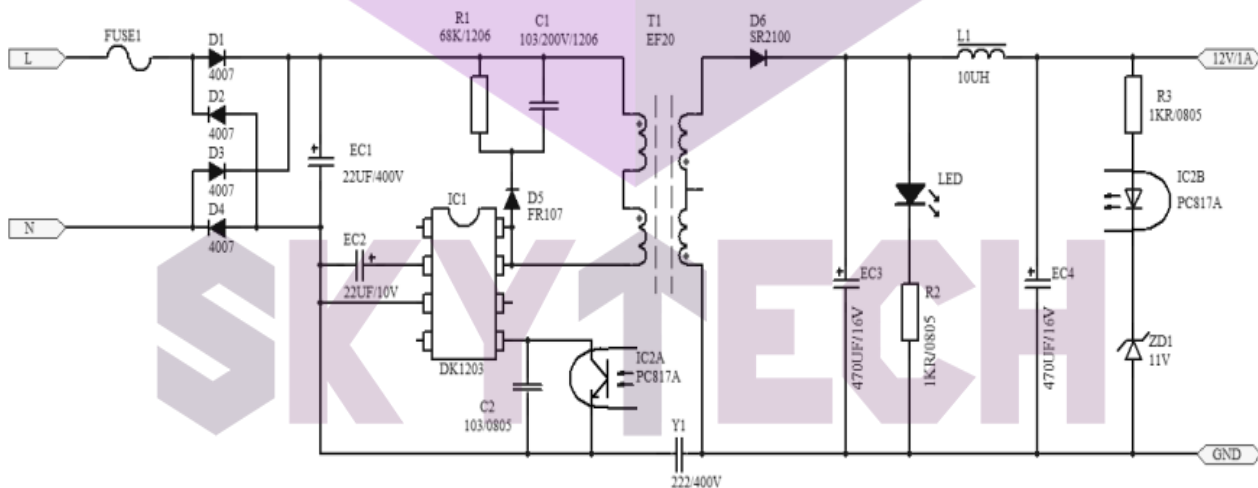
| Symbol | Parameter                  | Value         | Unit  |
|--------|----------------------------|---------------|-------|
| Vcc    | Supply voltage             | -0.3V--8      | V     |
| Ivcc   | Current of supply voltage  | 100           | mA    |
| Vpin   | Pin voltage                | -0.3--Vcc+0.3 | V     |
| Vcol   | Collector to GND voltage   | -0.3--730     | V     |
| Ip     | Peak current               | 0.8           | A     |
| Pd     | Dissipation power          | 1000          | mW    |
| Tc     | Case operating temperature | -20--+125     | °C    |
| Tstg   | Storage temperature        | -55--+150     | °C    |
| Tsol   | Soldering temperature      | +280          | °C/5S |

## 7. ELECTRICAL CHARACTERISTIC

| Parameter                 | Condition                | Value |      |      | Unit |
|---------------------------|--------------------------|-------|------|------|------|
|                           |                          | Min.  | Typ. | Max. |      |
| Vcc (Work Power Supply)   | AC input: 85V-265V       | 4     | 5    | 6    | V    |
| Start threshold Voltage   | AC input: 85V-265V       | 4.8   | 5.0  | 5.2  | V    |
| Restart Voltage           | AC input: 85V-265V       | 3.6   | 4.0  | 4.2  | V    |
| Protect Voltage of VCC    | AC input: 85V-265V       | 6.25  | 6.55 | 6.85 | V    |
| Current of Vcc            | Vcc=5V, Fb=2.2V          | 10    | 20   | 30   | mA   |
| Start time                | AC input: 85V            | --    | --   | 500  | mS   |
| BJT Voc Breakdown voltage | Ioc=1mA                  | 700   | --   | --   | V    |
| OC Protection Voltage     | L=1.2mH                  | 460   | 480  | 500  | V    |
| Peak Current Protection   | Vcc=5V, Fb=1.6V---3.6V   | 650   | 720  | 800  | mA   |
| PWM Output frequency      | Vcc=5V, Fb=1.6V---2.8V   | 50    | 65   | 70   | Khz  |
|                           | Vcc=4.6V, Fb=2.8V---3.6V | 0.05  | ---  | 65   | Khz  |
| Stepped Frequency         | Vcc=4.6V, Fb=1.6V---2.8V | 0.8   | 1    | 1.2  | Khz  |
| Temperature protection    | Vcc=4.6V, Fb=1.6V---3.6V | 120   | 125  | 130  | °C   |
| Duty cycle of PWM         | Vcc=4.6V, Fb=1.6V---3.6V | 5     | --   | 75   | %    |
| Control voltage Fb        | AC input: 85V-265V       | 1.6   |      | 3.6  | V    |

## 8. TYPICAL APPLICATION SAMPLE

(12V1A OUTPUT FLYBACK TYPE SWITCH MODE POWER SUPPLY)



### 8.1 Components list

| NO. | NAME  | SPEC. / MODEL NO. | POSITION | USED QTY | REMARK |
|-----|-------|-------------------|----------|----------|--------|
| 1   | Fuse  | F2A/AC250V        | F1       | 1        |        |
| 2   | Diode | IN4007            | D1~D4    | 4        |        |
| 3   | Diode | FR107             | D5       | 1        |        |

|    |                        |            |       |   |  |
|----|------------------------|------------|-------|---|--|
| 4  | Diode                  | SR2100     | D6    | 1 |  |
| 5  | Zener Diode            | 11V/0.5W   | ZD1   | 1 |  |
| 6  | Electrolytic capacitor | 22uF/400V  | EC1   | 1 |  |
| 7  | Electrolytic capacitor | 22uF/10V   | EC2   | 1 |  |
| 8  | Electrolytic capacitor | 470uF/16V  | EC3,4 | 2 |  |
| 9  | Ceramic capacitor      | 103/200V   | C1    | 1 |  |
| 10 | Ceramic capacitor      | 103/25V    | C2    | 1 |  |
| 11 | IC                     | DK1203     | IC1   | 1 |  |
| 12 | Y capacitor            | 222/400V   | Y1    | 1 |  |
| 13 | I-shape inductance     | 10uH       | L1    | 1 |  |
| 14 | LED                    | red        | LED   | 1 |  |
| 15 | Photo-coupler          | PC817      | IC2   | 1 |  |
| 16 | Transformer            | EF20       | T1    | 1 |  |
| 17 | Resistance             | 100K/0.25W | R1    | 1 |  |
| 18 | Resistance             | 1K/0.125W  | R2,3  | 2 |  |

## 8.2 TRANSFORMER DESIGN (for reference only)

### 8.2.1 Parameter confirmation: confirm the below parameter before transformer design

- (1) Input voltage range: AC85V-265V
- (2) Output Voltage and current: DC12V 1A
- (3) Switch frequency: 65Khz
- (4) MAX. duty cycle: D=0.5

### 8.2.2 Core selecting

- (1) Input power calculation

$P = P_{out} / \eta$  ( $\eta$  is the efficiency of the power supply, take it 0.8 for example),  $P_{out} = V_{out} * I_{out} = 12V * 1A = 12W$ ,  
so  $P = 12 / 0.8 = 15W$ .

- (2) Choose the core:

Checking via supplier or the correlative chart can know that EE25 or EF20 core is suitable for 15W power supply. Now we choose EE25 for below calculation.

### 8.2.3 Original input voltage

$$V_s = 85 * 1.3 = 110V$$

### 8.2.4 PMW conducting time

$$T_{on} = (1/F) * D = (1/65) * 0.5 = 7.7\mu S$$

### 8.2.5 Number of the original(input) turns (Np)

$$N_p = \frac{V_s \times T_{on}}{\Delta B_{ac} \times A_e} = \frac{110 \times 7.7}{0.2 \times 50} \approx 85 \text{ [匝]}$$

### 8.2.6 Number of the output turns (Ns)

$$N_s = \frac{V_{out} \times N_p}{V_{or}} = \frac{13 \times 85}{100} = 11 \text{ [匝]}$$

### 8.2.7 The primary inductance

$$L_p = \frac{V_s \times T_{on}}{I_p} = \frac{110 \times 7.7}{720} \approx 1.2mH$$

### 8.2.8 Leakage inductance of a transformer

It is suggested to use P/S/P way to wind the transformer so that to reduce the leakage inductance.

Important notice:

## 9. SPECIAL NOTICE FOR PBC LAYOUT DESIGN

**9.1** Heat dissipation: A good estimate is that the controller will dissipate the output power. So enough cooper area connected to the 7, 8 COLLECTED pins and tin-plating are necessary to provide the controller heat sink.

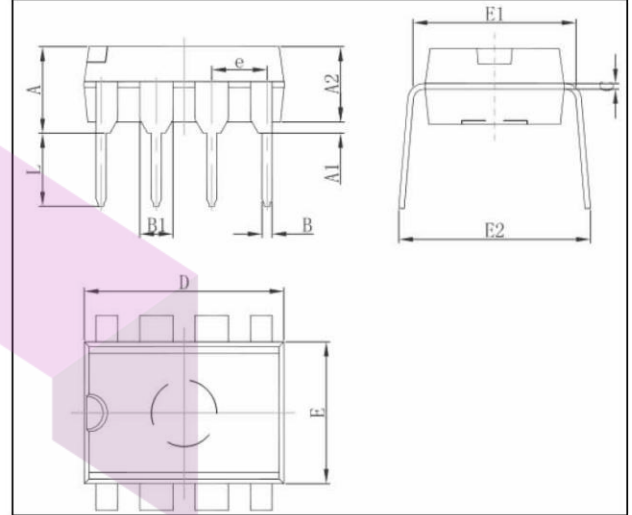
**9.2** The 7, 8 COLLECTED pins is high voltage part of the IC, peak voltage is as high as 600V, so it should be at least 1.5mm far away from the low voltage part in the PCB as to avoid circuit breakdown and discharging.



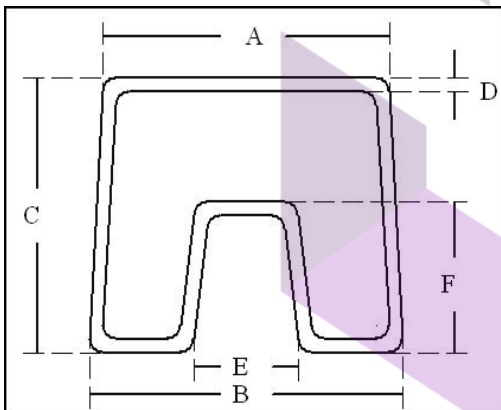
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### 10. MECHANICAL AND PACKING INFORMATION

| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min                       | Max   | Min                  | Max   |
| A      | 3.710                     | 4.310 | 0.146                | 0.170 |
| A1     | 0.510                     |       | 0.020                |       |
| A2     | 3.200                     | 3.600 | 0.126                | 0.142 |
| B      | 0.380                     | 0.570 | 0.015                | 0.022 |
| B1     | 1.524 (BSC)               |       | 0.060 (BSC)          |       |
| C      | 0.204                     | 0.360 | 0.008                | 0.014 |
| D      | 9.000                     | 9.400 | 0.354                | 0.370 |
| E      | 6.200                     | 6.600 | 0.244                | 0.260 |
| E1     | 7.320                     | 7.920 | 0.288                | 0.312 |
| e      | 2.540 (BSC)               |       | 0.100 (BSC)          |       |
| L      | 3.000                     | 3.600 | 0.118                | 0.142 |
| E2     | 8.400                     | 9.000 | 0.331                | 0.354 |



• Antistatic pipe packing:



| signal | MIN. (mm) | RATED (mm) | MAX. (mm) |
|--------|-----------|------------|-----------|
| A      | 11        | 11.5       | 12        |
| B      | 11.5      | 12         | 12.5      |
| C      | 10        | 10.5       | 11        |
| D      | 0.4       | 0.5        | 0.6       |
| E      | 3.5       | 4          | 4.5       |
| F      | 5         | 5.5        | 6         |

• Packing quantity

| QTY/tube | QTY/inner carton | QTY/master carton |
|----------|------------------|-------------------|
| 50       | 2000             | 20000             |

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