

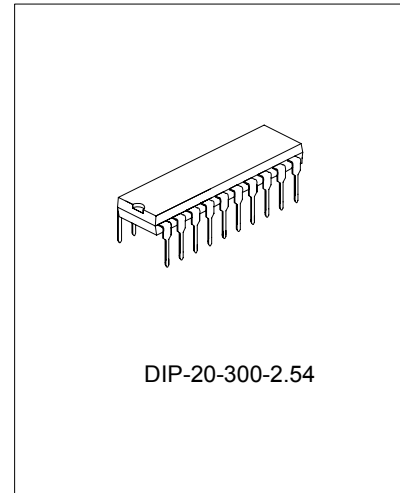
## VOLTAGE MODE PWM POWER SUPPLY WITH BUILT-IN SUPERVISOR, PROTECTION AND REGULATION FOR PCs

### DESCRIPTION

The SD6109 is a power management IC for computers. It integrates various monitoring functions and protections, such as AC fail detection, over power protection, negative voltage protection, over/under voltage protection and provides power down signal for PG.

Built-in high precision oscillator provides accurate protection and delay time for monitoring. And internal regulators TL431 are used for stable output 3.3V and 5V, with few peripheral components.

Built-in soft-start decreases stress of transformer against saturation. SD6109 used for pull-push or half-bridge power system with high efficiency and stability.



### FEATURES

- \* Advanced Bi-CMOS process.
- \* 4KV HBM ESD protection
- \* Bipolar structure adopted in Shunt regulators TL431, with high reliability
- \* Over voltage protection for 3.3V/5V/12V
- \* Under voltage protection for 3.3V/±5V/±12V
- \* Over power protection
- \* Short circuit protection
- \* AC-input under voltage protection
- \* PG Circuit
- \* PSON for remote control
- \* Delay time for PSON or PG signals
- \* Two bypass regulators for 3.3V and 5V- voltage stability
- \* Soft start and maximum 93% duty cycle

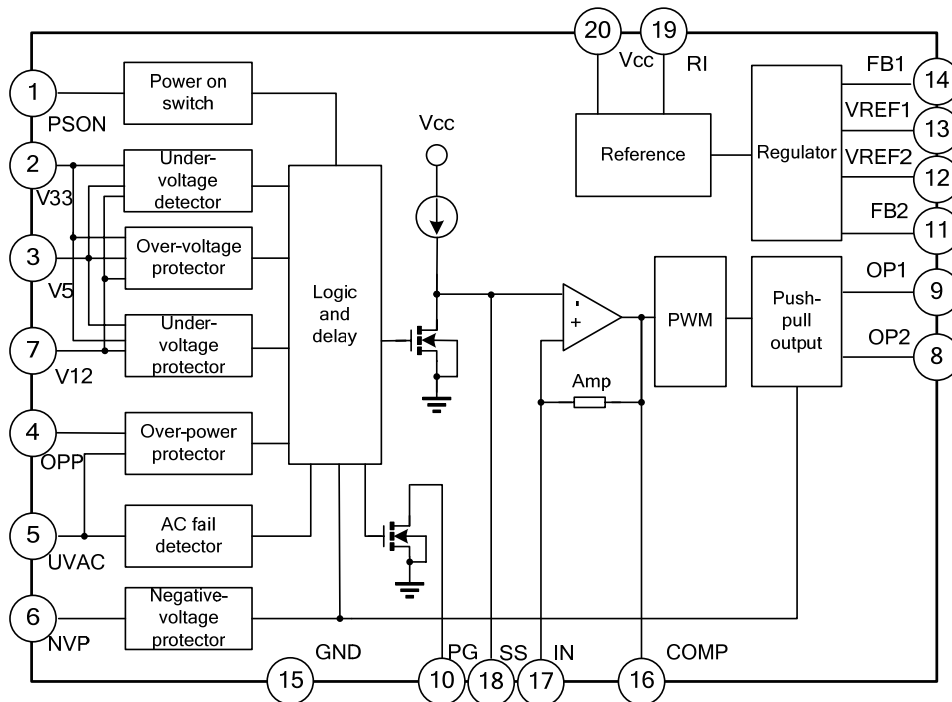
### APPLICATIONS

- \* Switching mode power supply for computers.

### ORDERING INFORMATION

| Part No. | Package         | Marking |
|----------|-----------------|---------|
| SD6109   | DIP-20-300-2.54 | SD6109  |

**BLOCK DIAGRAM**



**ABSOLUTE MAXIMUM RATING**

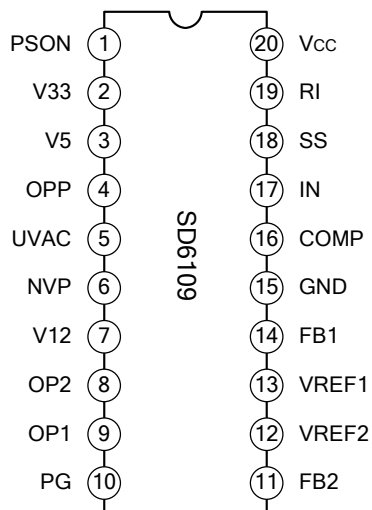
| Characteristics                          | Symbol | Rating     | Unit |
|--|--------|------------|------|
| Supply Voltage(pin 20)                   | VCC    | 12         | V    |
| Regulator Output At Pins FB1, FB2 Pins   | VFB    | 16         | V    |
| Output Current At Pins PG, FB1, FB2 Pins | IOUT   | 30         | mA   |
| Power Dissipation(Tamb=25°C)             | PD     | 1.5        | W    |
| Power Dissipation(Tamb=90°C)             | PD     | 0.5        | W    |
| Thermal Resistance, Junction-To-Air      | RθJA   | 82.5       | °C/W |
| Operating Temperature Range              | Tamb   | -30 ~ +125 | °C   |
| Storage Temperature Range                | Tstg   | -55~+155   | °C   |

**ELECTRICAL CHARACTERISTICS** (Unless otherwise stated, VCC=5V, Tamb=25°C)

| Characteristics                              |                                   | Symbol   | Test condition            | Min.  | Typ. | Max.  | Unit |
|--|-----------------------------------|----------|---------------------------|-------|------|-------|------|
| Supply Voltage                               |                                   | VCC      | All functions are normal. | 4.5   | 5.0  | 7.0   | V    |
| Supply Current                               |                                   | ICC      | PG High                   | --    | 5    | 10    | mA   |
| Over-Voltage Protection 3.3V                 |                                   | VOVP1    | -                         | 3.9   | 4.1  | 4.3   | V    |
| Over-Voltage Protection 5V                   |                                   | VOVP2    | -                         | 5.8   | 6.1  | 6.5   | V    |
| Over-Voltage Protection 12V                  |                                   | VOVP3    | -                         | 13.9  | 14.5 | 14.9  | V    |
| Under-Voltage Protection 3.3V                |                                   | VUVP1    | -                         | 2.0   | 2.6  | 2.8   | V    |
| Under-Voltage Protection 5V                  |                                   | VUVP2    | -                         | 3.0   | 3.6  | 3.9   | V    |
| Under-Voltage Protection 12V                 |                                   | VUVP3    | -                         | 6.0   | 7.2  | 8.0   | V    |
| Under-Voltage Sense 3.3V For PG Low          |                                   | VUVS1    | -                         | 2.5   | 2.8  | 3.0   | V    |
| Under-Voltage Sense 5V For PG Low            |                                   | VUVS2    | -                         | 4.0   | 4.3  | 4.5   | V    |
| Under-Voltage Sense 12V For PG Low           |                                   | VUVS3    | -                         | 9.4   | 10.1 | 10.4  | V    |
| Over-Power Protection.                       |                                   | VOPPS    | VUVAC = 1.5V              | 2.02  | 2.4  | 2.66  | V    |
| Negative Voltage Protection: Voltage Level   |                                   | VNVP     | -                         | 1.9   | 2.05 | 2.2   | V    |
| Negative Voltage Protection: Source Current  |                                   | INVP     | RI = 75KΩ                 | 50    | 61   | 72    | μA   |
| Timing For Over-Voltage Protection           |                                   | tOVP     | RI = 75KΩ                 | 0.5   | 0.7  | 1.3   | ms   |
| Timing For Under-Voltage Protection          |                                   | tUVP     | RI = 75KΩ                 | 0.9   | 2.4  | 3.8   | ms   |
| Timing For Under-Voltage Sense for PG Low    |                                   | tUVS     | RI = 75KΩ                 | 0.5   | 1.2  | 1.9   | ms   |
| Timing for Over-Power-Protection             |                                   | tOPP     | RI = 75KΩ                 | 4.0   | 7.0  | 10.0  | ms   |
| Timing for Negative Voltage Protection       |                                   | tNVP     | RI = 75KΩ                 | 4.0   | 7.0  | 10.0  | ms   |
| Bypass Regulator<br>(FB1, VREF1, FB2, VREF2) | Reference Voltage                 | VREF     | IFB = 0.5mA, Tamb = 25°C  | 2.475 | 2.5  | 2.525 | V    |
|  | Line Regulation                   | REGLI-FB | 4 < VFB < 16V             | -     | 1    | -     | MV/V |
|  | Output Sinking Current Capability | IOUT-FB  | VFB > 2V                  | 10    | -    | -     | mA   |
| PG   | PG Delay                          | tPG      | RI = 75KΩ                 | 200   | 300  | 400   | ms   |
|  | UVAC Voltage Sense for PG         | VUVAC    | -                         | 0.65  | 0.7  | 0.75  | V    |
|  | PG Output Rising Time             | tR       | CL = 100pF                | -     | 1    | -     | us   |
|  | PG Falling Time                   | tF       | CL = 100pF                | -     | 300  | -     | ns   |
|  | PG Output Saturation Level        | VOL2     | IPG = 5mA                 | -     | -    | 0.5   | V    |
|  | PG Leakage Current Collector      | ION2     | VPG = 5V                  | -     | -    | 1     | μA   |

| Characteristics |                              | Symbol       | Test condition | Min.      | Typ. | Max. | Unit |    |
|-----------------|------------------------------|--------------|----------------|-----------|------|------|------|----|
| Remote Control  | PSON Input Threshold Level   | VPSON        | -              | 1         | 1.4  | 2.0  | V    |    |
|                 | Remote Input Driving Current | IPSON        | -              | -         | -    | 0.5  | mA   |    |
|                 | Timing PSON to On/Off        | On           | tPSON(ON)      | RI = 75kΩ | 20   | 40   | 50   | ms |
|                 |                              | Off (PS-off) | tPSON(OFF)     |           | 10   | 20   | 30   | ms |
|                 | Timing PG low to Power Off   | tPSOFF       | RI = 75kΩ      | 2         | 4.8  | 6.5  | ms   |    |
| Error Amplifier | Reference Voltage            | V2.5         | -              | 2.45      | 2.5  | 2.55 | V    |    |
|                 | Input Bias Current           | IIB          | -              | -         | -    | 0.1  | μA   |    |
|                 | Open-Loop Voltage Gain       | AVOL         | -              | 50        | 60   | -    | dB   |    |
|                 | Unity Gain Bandwidth         | BW           | -              | 0.3       | 1    | -    | MHz  |    |
|                 | Power Supply Rejection Ratio | PSRR         |                | 50        | -    | -    | dB   |    |
| Oscillator      | PWM Frequency                | FOSC         | RI = 75kΩ      | 60        | 65   | 70   | kHz  |    |
| Soft-Start      | Charge Current               | ISS          | RI = 75kΩ      | 4.0       | 5.7  | 7.0  | μA   |    |
|                 | Duty Cycle                   | DC           | -              | 85        | -    | 93   | %    |    |
| PWM Output      | Output Voltage Low           | VOL          | Io = 5mA       | -         | -    | 0.5  | V    |    |
|                 | Output Voltage High          | VOH          | V12 = 12V      | 4         | -    | -    | V    |    |
|                 | Output Impedance of VOH      | RO           | -              | 1.5       | -    | 3.3  | kΩ   |    |

### PIN CONFIGURATIONS



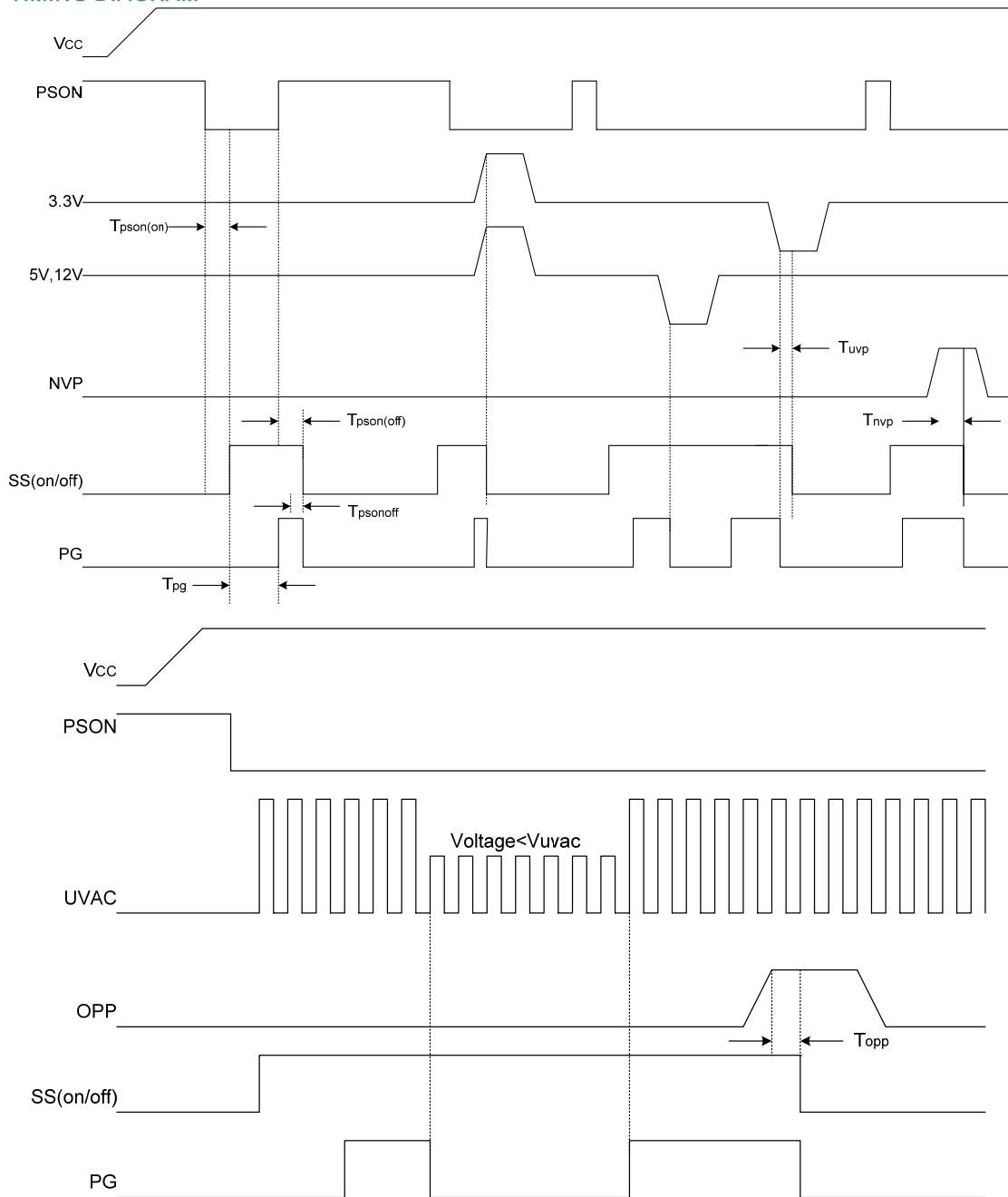
**PIN DESCRIPTIONS**

| Pin No. | Pin Name | I/O | Description   |
|---------|----------|-----|---|
| 1       | PSON     | I   | Remote switch input for CPU or controller. Control the PWM Output.  |
| 2       | V33      | I   | 3.3V over-voltage/under-voltage control sense input.  |
| 3       | V5       | I   | 5V over-voltage/under-voltage control sense input.  |
| 4       | OPP      | I   | Over-power sense input.   |
| 5       | UVAC     | I   | AC fail detection.  |
| 6       | NVP      | I   | The protection input for negative output.   |
| 7       | V12      | I   | 12V over-voltage/under-voltage control sense input.   |
| 8       | OP2      | O   | The totem-pole output drivers of push-pull PWM. The maximum duty cycle (OP1 or OP2) is 46%.   |
| 9       | OP1      | O   | The totem-pole output drivers of push-pull PWM.   |
| 10      | PG       | O   | PG logic output, 0 or 1 (open-collector). PG=1 means that the power is good for operation.  |
| 11      | FB2      | O   | Output of second converter regulation loop.   |
| 12      | VREF2    | I   | Reference comparison input for second converter regulation loop. 2.5V.  |
| 13      | VREF1    | I   | Reference comparison input for first converter regulation loop. 2.5V.   |
| 14      | FB1      | O   | Output of first converter regulation loop.  |
| 15      | GND      | -   | Ground.   |
| 16      | COMP     | I/O | Error amplifier output and the input of the PWM comparator.   |
| 17      | IN       | I   | The negative input of error amplifier. The positive input of error amplifier is connected to 2.5V reference voltage.                          |
| 18      | SS       | I/O | The soft-start. It is settable through external capacitor. The current source output at this pin is 5.7uA and the voltage is clamped at 2.5V. |
| 19      | RI       | I   | Connected to external resistor for the reference setting.   |
| 20      | VCC      | -   | Supply voltage. It is connected to 5V-standby.  |

**FUNCTION DESCRIPTION**

The SD6109 is a power management IC for computers. It integrates various monitoring functions and protections, such as AC fail detection, over power protection, negative voltage protection, over/under voltage protection and provides power down signal for PG. Built-in high precision oscillator provides accurate protection and delay time for monitoring. And internal regulators TL431 are used for stable output 3.3V and 5V, with few peripheral components. Built-in soft-start decreases stress of transformer against saturation. SD6109 used for pull-push or half-bridge power system with high efficiency and stability.

**1. TIMING DIAGRAM**

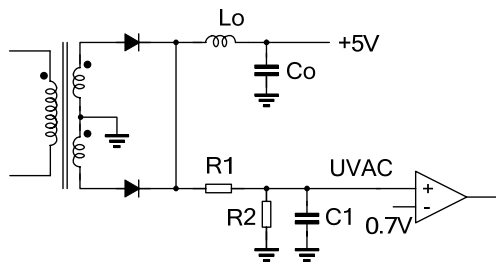


## 2. Remote Switch Control (PSON)

The PC generates the remote switch control signal which is connected to PSON. When the control signal is low, PC power is on. And when the control signal is high, PC power is off.

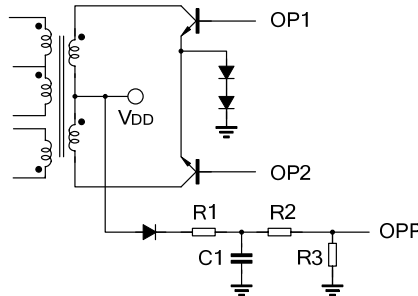
## 3. AC Fails Detection (UVAC)

The AC line voltage is coupled from the primary side to the secondary side through the main transformer, and UVAC is connected to the secondary side by a resistor. When UVAC voltage drops below 0.7V and maintains this situation over 200us, the PG signal will be pulled low, and it indicates that the AC line is power-down. The voltage amplitude of the PWM switching signal from the secondary side is proportional to the AC line voltage. Adjusting the ratio of the voltage divider can set the threshold for the power-down.



## 4. Over Power Protection (OPP)

The over power protection is designed to detect over power and short circuit. When the voltage of OPP is higher than 2.4V and maintains this situation over 7msec, PG will be pulled low and the power outputs will be locked.

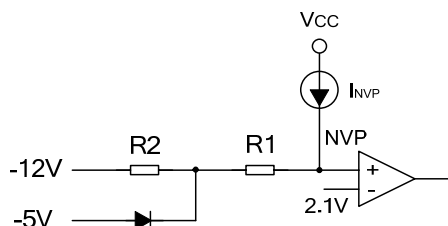


## 5. Negative Voltage Protection (NVP)

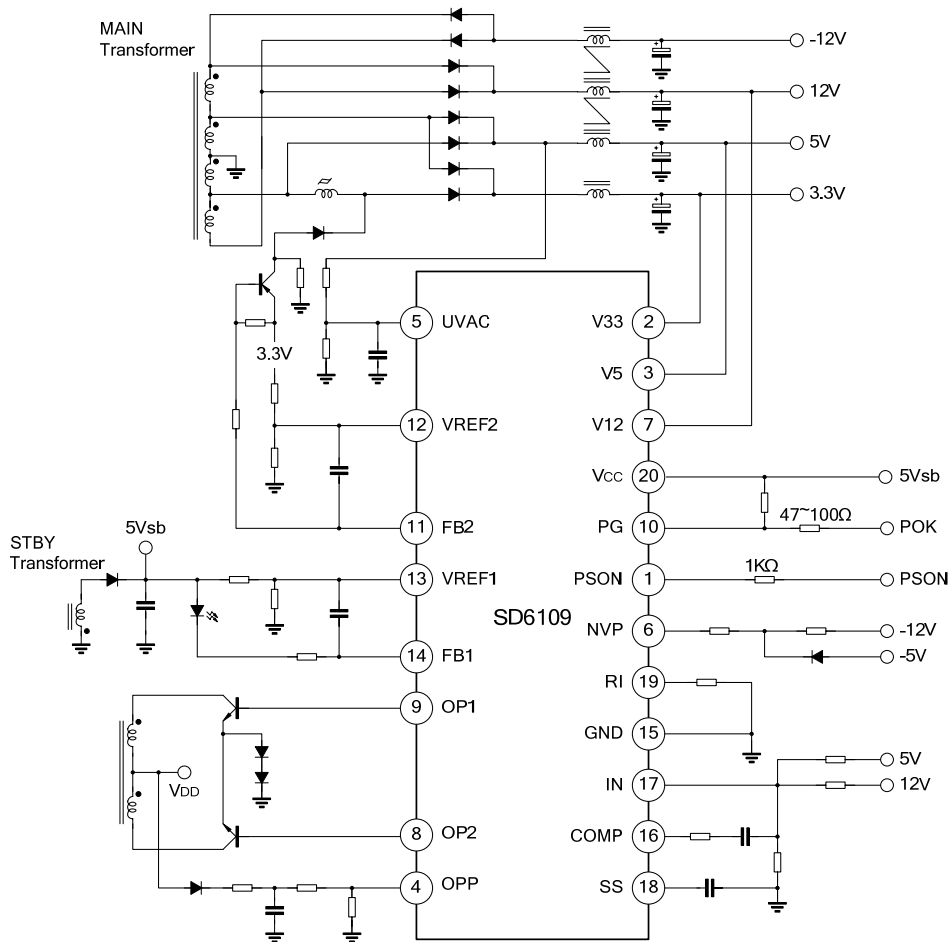
The negative voltage protection is designed to provide under voltage protection for negative voltage output. Overload and short circuit can cause under voltage of negative voltage output. When the voltage of NVP is higher than 2.1V and this situation exists for longer than 7msec, the power outputs will be off and be locked. Adjusting the resistor will set the threshold for locking the power outputs off. The threshold is determined by:

$$V_{NVP} = I_{NVP} \times (R1 + R2) + V - 12V$$

$$V_{NVP} = I_{NVP} \times R1 + V - 5V - 0.7V$$



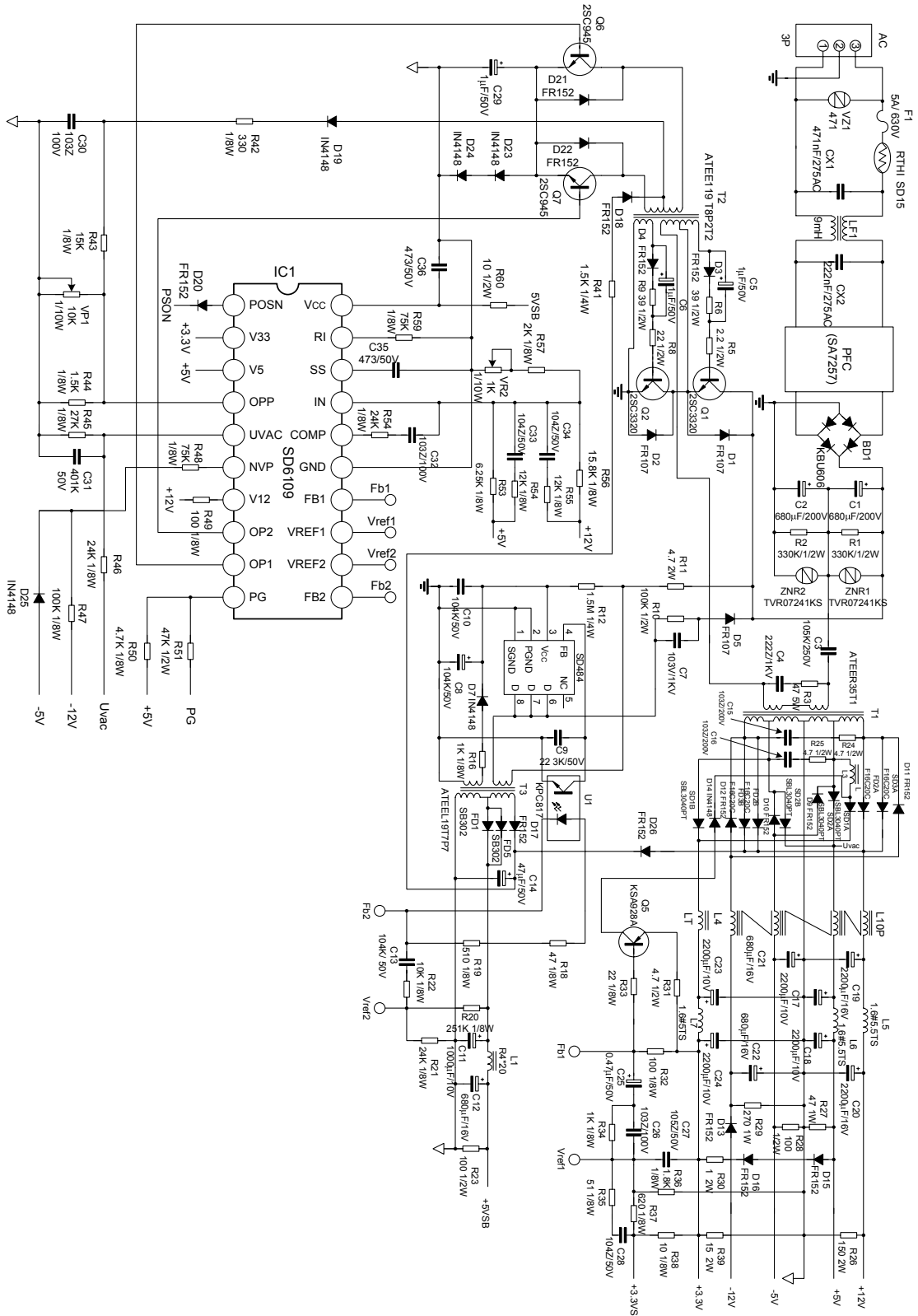
TYPICAL APPLICATION CIRCUIT



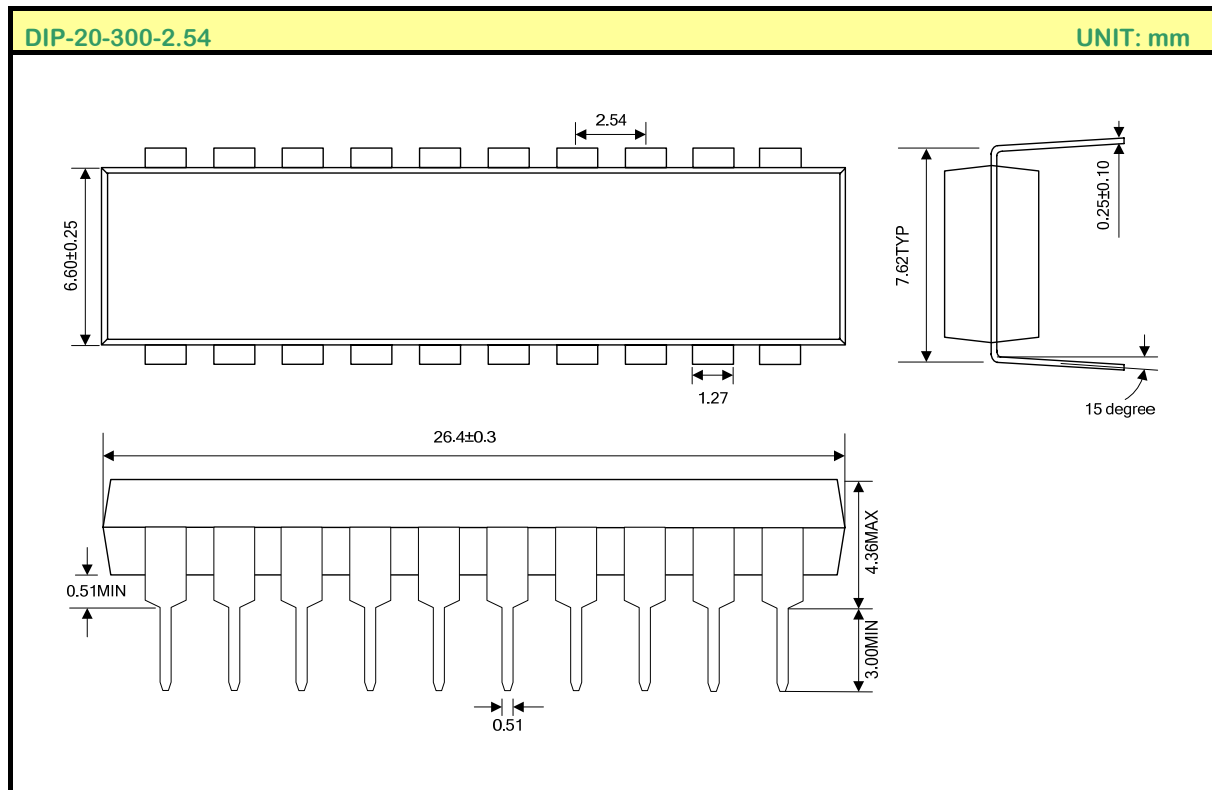
Note: The circuit and parameters are for reference only, please set the parameters of the real application circuit based on the practical test.



DETAIL APPLICATION CIRCUIT



PACKAGE OUTLINE



**MOS DEVICES OPERATE NOTES:**

Electrostatic charges may exist in many things. Please take following preventive measures to prevent effectively the MOS electric circuit as a result of the damage which is caused by discharge:

- The operator must put on wrist strap which should be earthed to against electrostatic.
- Equipment cases should be earthed.
- All tools used during assembly, including soldering tools and solder baths, must be earthed.
- MOS devices should be packed in antistatic/conductive containers for transportation.

**Disclaimer:**

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