



# SPE03M60TW-AD

## 主要参数 MAIN CHARACTERISTICS

|                 |       |
|-----------------|-------|
| 600V/3A 3 相全桥驱动 |       |
| $V_{CES}$       | 600V  |
| $I_D$           | 1.5A  |
| $V_{ISO}$       | 1500V |

### 用途

- 风机
- 水泵
- 冰箱

### APPLICATIONS

- Fan motor
- Water pump
- Fridge

### 产品特性

- 内置 6 个 600V/3A 快恢复功率 MOS。
- 信号高电平有效，兼容 3.3V 和 5V 的 MCU。
- 内置自举二极管。
- 内置欠压保护、过流保护、过温保护。
- 内置使能关断功能。
- 内部集成温度检测输出。

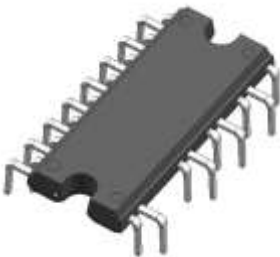
### FEATURES

- Build-in six 600V/3A fast recovery MOSFET
- Signal high level active, compatible with 3.3v and 5V MCU.
- Built-in bootstrap diode.
- Built-in undervoltage protection、Over current protection、Over temperature protection
- Build-in shut-Down Input.
- Internal integrated temperature detection output.

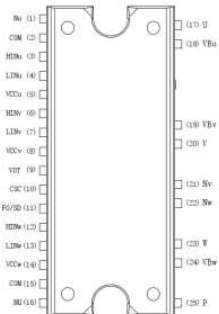
## 订货信息 ORDER MESSAGE

| 订 货 料 号<br>Order number | 产 品 信 息 Product information |                            |                |                |
|-------------------------|-----------------------------|----------------------------|----------------|----------------|
|                         | 无卤-条管<br>Halogen-Free-Tube  | 无卤-编带<br>Halogen-Free-Reel | 印 记<br>Marking | 封 装<br>Package |
| 2A01-0961               | SPE03M60TW-AD               | N/A                        | SPE03M60TW-AD  | DIP23WD-FP     |

### 封装 Packag



DIP23WD-FP



PIN1-PIN25



模块分布示意图 Module distribution diagram

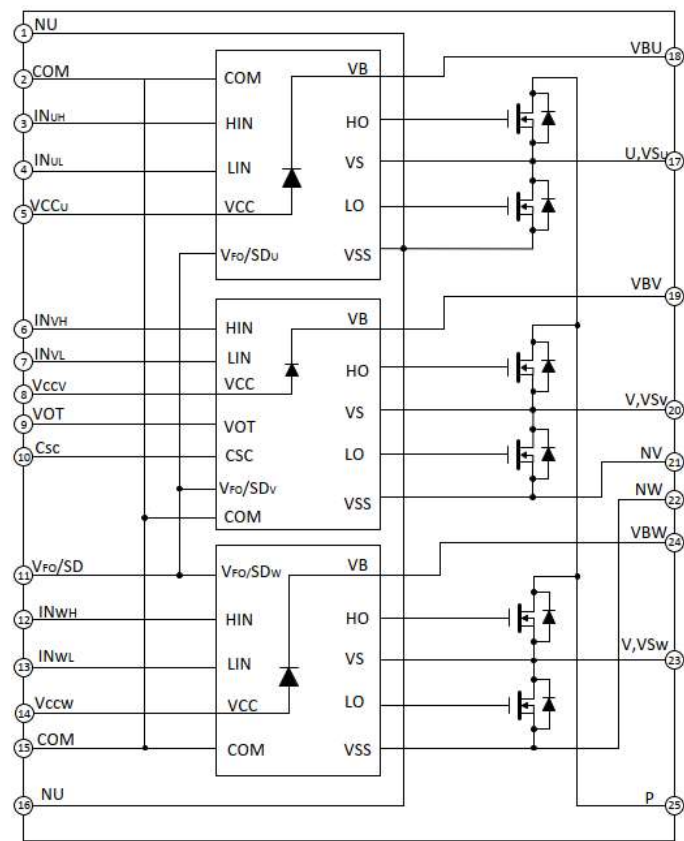


图 1：模块内部电路示意图

Fig 1: Internal circuit

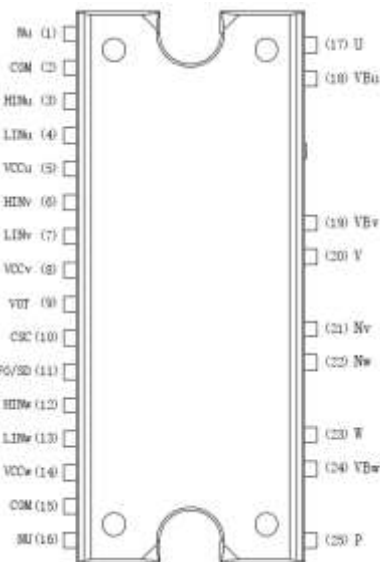


图 2：模块引脚分布示意图

Fig 2: Distribution of pin



## SPE03M60TW- AD

| 引脚编号<br>Number | 引脚名称<br>Name     | 引脚描述<br>Description                                                                             |
|----------------|------------------|-------------------------------------------------------------------------------------------------|
| 1              | NU               | U 相下臂 MOSFET 源极端子<br>U phase lower arm MOSFET source terminal                                   |
| 2              | COM              | 公共电源接地 GND<br>Common Supply Ground                                                              |
| 3              | HIN <sub>U</sub> | U 相上臂控制信号输入端子<br>U phase upper arm control signal input terminal                                |
| 4              | LIN <sub>U</sub> | U 相下臂控制信号输入端子<br>U phase lower arm control signal input terminal                                |
| 5              | VCC <sub>U</sub> | 控制电源端子<br>Control power terminal                                                                |
| 6              | HIN <sub>V</sub> | V 相上臂控制信号输入端子<br>V phase upper arm control signal input terminal                                |
| 7              | LIN <sub>V</sub> | V 相下臂控制信号输入端子<br>V phase lower arm control signal input terminal                                |
| 8              | VCC <sub>V</sub> | 控制电源端子<br>Control power terminal                                                                |
| 9              | VOT              | HVIC 温度输出 Output for HVIC Temperature Sensing                                                   |
| 10             | CIN              | 过流和短路保护关闭输入端子<br>Shut Down Input for Over Current and Short Circuit Protection                  |
| 11             | /FO, /SDW        | 故障输出, W 相输入关闭<br>Fault Output, Shut-Down Input for W Phase, Temperature Output                  |
| 12             | HIN <sub>W</sub> | W 相上臂控制信号输入端子<br>W phase upper arm control signal input terminal                                |
| 13             | LIN <sub>W</sub> | W 相下臂控制信号输入端子<br>W phase lower arm control signal input terminal                                |
| 14             | VCC <sub>W</sub> | 控制电源端子<br>Control power terminal                                                                |
| 15             | COM              | 公共电源接地 GND<br>Common Supply Ground                                                              |
| 16             | NU               | U 相下臂 MOSFET 源极端子<br>U phase lower arm MOSFET source terminal                                   |
| 17             | U                | U 相输出和 U 相高侧驱动偏置电压地<br>Output for U-Phase & Bias Voltage Ground for U-phase High-Side Driving   |
| 18             | VB <sub>U</sub>  | U 相上臂驱动电源端子<br>U-phase upper arm drive power terminal                                           |
| 19             | VB <sub>V</sub>  | V 相上臂驱动电源端子<br>V-phase upper arm drive power terminal                                           |
| 20             | V                | V 相输出和 V 相高侧驱动偏置电压地<br>V output for V-Phase & Bias Voltage Ground for V-phase High-Side Driving |
| 21             | NV               | V 相下臂 MOSFET 源极端子<br>V phase lower arm MOSFET source terminal                                   |
| 22             | NW               | W 相下臂 MOSFET 源极端子<br>W phase lower arm MOSFET source terminal                                   |
| 23             | W                | W 相输出和 W 相高侧驱动偏置电压地<br>W output for U-Phase & Bias Voltage Ground for W-phase High-Side Driving |
| 24             | VB <sub>W</sub>  | W 相上臂驱动电源端子<br>W-phase upper arm drive power terminal                                           |
| 25             | P                | 逆变器直流输入端子<br>DC input terminal of inverter                                                      |

图 3：模块引脚功能定义表

Fig 3: Pin function

最大额定值 (T<sub>j</sub>= 25℃,除非特殊说明)Absolute Maximum Ratings (T<sub>j</sub>= 25℃, Unless otherwise Specified)

## 逆变部分 Inverter Part

| 记号<br>Symbol           | 参数<br>Parameter                                      | 条件<br>Condition                                                           | 额定值<br>Ratings | 单位<br>Units |
|------------------------|------------------------------------------------------|---------------------------------------------------------------------------|----------------|-------------|
| V <sub>PN</sub>        | 电源电压<br>Power supply voltage                         | 应用于 P- NU, NV, NW 之间<br>Applied between P- NU, NV, NW                     | 450            | V           |
| V <sub>PN(Surge)</sub> | 电源电压 (含浪涌)<br>Power supply voltage (including surge) | 应用于 P- NU, NV, NW 之间<br>Applied between P- NU, NV, NW                     | 500            | V           |
| V <sub>DSS</sub>       | 漏-源电压<br>Drain-Source Voltage of Each MOSFET         | /                                                                         | 600            | V           |
| I <sub>D</sub>         | 漏极连续电流<br>Each MOSFET Current, Continuous            | T <sub>c</sub> =25℃                                                       | 1.5            | A           |
| I <sub>DM</sub>        | 漏极电流 (峰值)<br>Each MOSFET Pulse Current, Peak         | T <sub>c</sub> =25℃, 脉冲宽度小于 100us<br>T <sub>c</sub> =25℃, less than 100us | 3              | A           |
| P <sub>D</sub>         | 最大功耗 Maximum Power Dissipation                       | T <sub>c</sub> =25℃, 每个 MOSFET<br>T <sub>c</sub> =25℃, For Each MOSFET    | 6.8            | W           |
| T <sub>J</sub>         | 结温<br>Junction Temperature                           | (见备注 1)<br>Note1                                                          | -40~150        | ℃           |

## 控制部分 Control Part

| 记号<br>Symbol    | 参数<br>Parameter                                          | 条件<br>Condition                              | 额定值<br>Ratings            | 单位<br>Units |
|-----------------|----------------------------------------------------------|----------------------------------------------|---------------------------|-------------|
| V <sub>CC</sub> | 控制电源电压<br>Control Supply Voltage                         | VCC-COM 之间<br>Applied between VCC and COM    | 20                        | V           |
| V <sub>BS</sub> | 高侧控制电压<br>High-side Bias Voltage                         | VB-VS 之间<br>Applied between VB and VS        | 20                        | V           |
| V <sub>IN</sub> | 输入信号电压<br>Input Signal Voltage                           | VIN-COM 之间<br>Applied between VIN and COM    | -0.3~V <sub>CC</sub> +0.3 | V           |
| I <sub>FO</sub> | 故障输出电流<br>Fault output current                           | FO 端子吸入电流值<br>FO terminal sink current value | 1.5                       | mA          |
| V <sub>SC</sub> | 电流检测端输入电压<br>Input voltage of current detection terminal | 应用于 CSC- COM 之间<br>Applied between CSC-COM   | -0.3~V <sub>CC</sub> +0.3 | V           |
| V <sub>FO</sub> | 故障输出电压<br>Fault output voltage                           | 应用于 FO - COM之间<br>Applied between FO-COM     | -0.3~V <sub>CC</sub> +0.3 | V           |

## 整个系统 Total System

| 记号<br>Symbol          | 参数<br>Parameter                                          | 条件<br>Condition                                                                             | 额定值<br>Ratings | 单位<br>Units |
|-----------------------|----------------------------------------------------------|---------------------------------------------------------------------------------------------|----------------|-------------|
| V <sub>PN(PROT)</sub> | 自我保护电源电压限制<br>Self-protecting power supply voltage limit | V <sub>CC</sub> =V <sub>BS</sub> =13.5V~16.5V, T <sub>J</sub> =125℃, 非重复性, <2us             | 400            | V           |
| T <sub>C</sub>        | 模块壳体工作温度<br>Module shell temperature                     | -                                                                                           | -20~100        | ℃           |
| T <sub>STG</sub>      | 贮存温度<br>Storage Temperature                              | -                                                                                           | -40~125        | ℃           |
| V <sub>ISO</sub>      | 绝缘耐压<br>Isolation Voltage                                | 60Hz, 正弦, AC 1 分钟, 连接管脚到散热器<br>60Hz, Sinusoidal, AC 1 min, between pins and heat-sink plate | 1500           | Vrms        |



|   |                         |         |     |     |
|---|-------------------------|---------|-----|-----|
| T | 安装力矩<br>Mounting Torque | 安装螺丝：M3 | 0.6 | N.m |
|---|-------------------------|---------|-----|-----|

备注 1：IPM 功率晶片最大额定结温为 150℃(@表面温度 TC≤100℃)。然而,为了确保 IPM 运行安全，结温应限定于 Tj(av) ≤ 125℃ (@表面温度 Tc ≤ 100℃)。

Note 1: The maximum rated junction temperature of the IPM power chip is 150℃ (@surface temperature TC≤100℃).  
However, to ensure safe operation of the IPM, the junction temperature should be limited to Tj(av) ≤ 125℃ (@surface temperature TC≤100℃)

热阻 Thermal Resistance

| 记号<br>Symbol | 参数<br>Parameter                                | 条件<br>Condition              | 额定值<br>Ratings | 单位<br>Units |
|--------------|------------------------------------------------|------------------------------|----------------|-------------|
| Rth(j-c)     | 结到外壳的热阻<br>Junction to Case Thermal resistance | 每个 MOSFET<br>For Each MOSFET | 18.3           | ℃/W         |

电气特性 (Tj=25℃, 除非特殊说明)

Electrical Characteristics (TJ=25℃, Unless Otherwise Specified)

逆变部分 Inverter Part

| 记号 Symbol | 参数<br>Parameter                                  | 条件<br>Condition                                                                                                                             | 最小值<br>Min. | 典型值 Typ. | 最大值<br>Max. | 单位<br>Unit |
|-----------|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|-------------|----------|-------------|------------|
| BVDSS     | 漏-源击穿电压<br>Drain-Source Breakdown Voltage        | VIN=0V, ID=1mA (备注 2) (Note2)                                                                                                               | 600         | -        | -           | V          |
| IDSS      | 零栅极电压漏极电流<br>Zero Gate Voltage Drain Current     | VIN=0V, VDS=600V                                                                                                                            | -           | -        | 1           | mA         |
| VSD       | 源-漏二极管正向电压<br>Drain-Source Diode Forward Voltage | VCC=VBS=15V, VIN=0V, ID=-1A                                                                                                                 | -           | 0.85     | -           | V          |
| RDS(on)   | 漏-源导通电阻<br>Drain-Source Turn-On Resistance       | VCC=VBS=15V, VIN=5V, ID=1A                                                                                                                  | -           | 2.4      | -           | ohm        |
| tON       | 开关时间(备注 2)<br>Switching Times(备注 2)              | V <sub>PN</sub> =400V, V <sub>CC</sub> =V <sub>BS</sub> =15V, I <sub>C</sub> =4A, V <sub>IN</sub> =0/5V, 感性负载(Inductive Load)(备注 2) (Note2) | -           | 740      | -           | nS         |
| tC(ON)    |                                                  |                                                                                                                                             | -           | 160      | -           | nS         |
| tOFF      |                                                  |                                                                                                                                             | -           | 700      | -           | nS         |
| tC(OFF)   |                                                  |                                                                                                                                             | -           | 70       | -           | nS         |
| tT        |                                                  |                                                                                                                                             | -           | 180      | -           | nS         |

备注 2：tON 和 tOFF 包括驱动 IC 内部传输延迟时间, tC(ON) 和 tC(OFF) 是 MOSFET 自身被内部给定门极驱动条件下的开关时间。详见图 5。

Note 2: tON and tOFF include the internal propagation delay time of the driver IC. tC(ON) and tC(OFF) are the switching times of the MOSFET itself driven by the internally given gate. See Figure 4 for details.

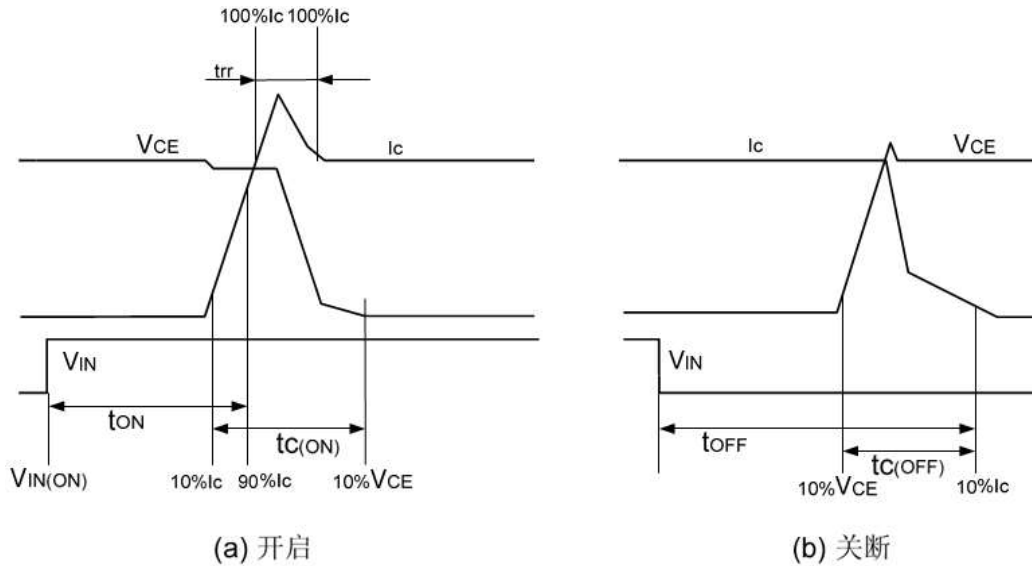


图 5：开关时间定义

Fig 5: Switching Time Definition

## 控制部分 Control Part

| 记号<br>Symbol  | 参数<br>Parameter                                           | 条件<br>Condition                        |                                                                              | 最小值<br>Min. | 典型值<br>Typ. | 最大值<br>Max. | 单位<br>Unit |
|---------------|-----------------------------------------------------------|----------------------------------------|------------------------------------------------------------------------------|-------------|-------------|-------------|------------|
| $I_{QCC}$     | VCC 静态电流<br>Quiescent VCC Supply Current                  | VCC=15V<br>VIN=5V                      | VCC-COM 之间<br>Applied between VCC and COM                                    | -           | -           | 1500        | uA         |
| $I_{QBS}$     | VBS 静态电流<br>Quiescent VBS Supply Current                  | VBS=15V<br>VIN=5V                      | VB(U)-U, VB(V)-V, VB(W)-W 之间<br>Applied between VB(U)-U,<br>VB(V)-V, VB(W)-W | -           | -           | 500         | uA         |
| $V_{FOH}$     | 故障输出电压<br>Fault Out Voltage                               | VSC=0V, /FO Circuit: 10K to 5V pull-up |                                                                              | 4.9         | -           | -           | V          |
| $V_{FOL}$     |                                                           | VSC=1V, /FO Circuit: 1mA               |                                                                              | -           | -           | 0.9         |            |
| $V_{SC(ref)}$ | 短路跳闸阈值<br>Short-Circuit Trip Level                        | $V_{CC}=15\text{ V}$                   |                                                                              | 0.44        | 0.48        | 0.51        | V          |
| $U_{VCCD}$    | 低侧欠压保护(图 5)<br>Low-Side Under-Voltage Protection (Fig 5)  | 检测电平<br>Detection Level                |                                                                              | 7.6         | 8.6         | 9.6         | V          |
| $U_{VCCR}$    |                                                           | 复位电平<br>Reset Level                    |                                                                              | 8.3         | 9.3         | 10.3        | V          |
| $U_{VBSD}$    | 高侧欠压保护(图 6)<br>High-Side Under-Voltage Protection (Fig 6) | 检测电平<br>Detection Level                |                                                                              | 7.6         | 8.6         | 9.6         | V          |
| $U_{VBSR}$    |                                                           | 复位电平<br>Reset Level                    |                                                                              | 8.3         | 9.3         | 10.3        | V          |
| $T_{FO}$      | 故障输出脉冲宽度<br>Fault-Out Pulse Width                         |                                        |                                                                              | 20          | -           | -           | uS         |
| $V_{OT}$      | 温度输出, 备注 3<br>Temperature output, remark 3                | $T_c=90^{\circ}\text{C}$               |                                                                              | 2.63        | 2.77        | 2.91        | V          |
|               |                                                           | $T_c=25^{\circ}\text{C}$               |                                                                              | 0.88        | 1.13        | 1.39        | V          |
| $V_{FSDR}$    | 使能关断复位电平<br>Shut-down Reset level                         | SDx-COM                                |                                                                              | 1.8         | 2.3         | 2.6         | V          |



## SPE03M60TW- AD

|            |                                       |                           |          |            |          |        |
|------------|---------------------------------------|---------------------------|----------|------------|----------|--------|
| $V_{FSDD}$ | 使能关断阈值电压<br>Shut-down Detection level | SDx-COM                   | 0.8      | 1.3        | 1.5      | V      |
| $I_{IN}$   | 输入偏执电流<br>Input bias current          | $V_{IN}=5V$               | 0.7      | 1.0        | 1.5      | mA     |
| $V_{IH}$   | 导通阈值电压<br>ON Threshold Voltage        | 逻辑高电平<br>Logic high level | -<br>0.8 | 2.2<br>1.3 | 2.6<br>- | V<br>V |
| $V_{IL}$   | 关断阈值电压<br>OFF Threshold Voltage       | 逻辑低电平<br>Logic low level  |          |            |          |        |

备注 4: IPM 温度输出电流曲线请参考图 6.0

Note 4: Please refer to figure 6.0 for the temperature output current characteristic curve of IPM.

## 自举二极管部分 Bootstrap Diode Part

| 记号<br>Symbol | 参数<br>Parameter                     | 条件<br>Condition | 最小值<br>Min. | 典型值<br>Typ. | 最大值<br>Max. | 单位<br>Unit |
|--------------|-------------------------------------|-----------------|-------------|-------------|-------------|------------|
| $RER_{BSD}$  | 自举电阻<br>Bootstrap diode on resistor |                 | -           | 160         | -           | $\Omega$   |

## 推荐工作条件 Recommended Operating Conditions

| 记号<br>Symbol                     | 参数<br>Parameter                                       | 条件<br>Condition                                            | 最小值<br>Min. | 典型值<br>Typ. | 最大值<br>Max. | 单位<br>Unit |
|----------------------------------|-------------------------------------------------------|------------------------------------------------------------|-------------|-------------|-------------|------------|
| $V_{PN}$                         | 电源电压<br>Supply Voltage                                | 施加在P和N之间<br>Between P and N                                | -           | 300         | 400         | V          |
| $V_{CC}$                         | 控制电源电压<br>Control Supply Voltage                      | 施加在 $V_{CC}$ 和 COM之间<br>Between $V_{CC}$ and COM           | 13.5        | 15.0        | 16.5        | V          |
| $V_{BS}$                         | 高端偏压<br>High-Side Bias Voltage                        | 施加在 $V_B$ 和 $V_S$ 之间<br>Between $V_B$ and $V_S$            | 13.5        | 15.0        | 16.5        | V          |
| $dv_{CC}/dt_i$<br>$dv_{BS}/dt_i$ | 控制电源波动<br>Control power fluctuation                   | -                                                          | -1          | -           | 1           | V/us       |
| $t_{dead}$                       | 防止桥臂直通的死区时间<br>Blanking Time for Preventing Arm-Short | $V_{CC} = V_{BS} = 13.5 \sim 16.5 V, T_j \leq 150^\circ C$ | 1.0         | -           | -           | us         |
| $P_{WIN(ON)}$                    | 输入信号最小开启脉宽<br>Minimum On pulse width of input signal  | -                                                          | 0.7         | -           | -           | us         |
| $P_{WIN(off)}$                   | 输入信号最小关闭脉宽<br>Minimum Off Pulse Width of              | -                                                          | 0.7         | -           | -           |            |



|           |                                     |                                |   |   |    |     |
|-----------|-------------------------------------|--------------------------------|---|---|----|-----|
|           | Input Signal                        |                                |   |   |    |     |
| $F_{PWM}$ | PWM 开关频率<br>PWM Switching Frequency | $T_j \leq 150^{\circ}\text{C}$ | - | - | 20 | KHz |

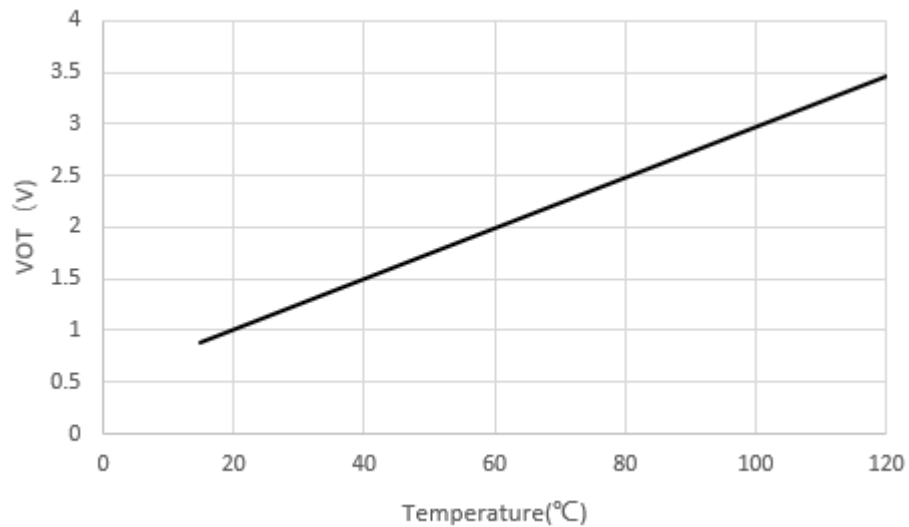


图 6.0: VOT 输出电压曲线

Figure 6.0: VOT output voltage curve

## 保护功能时序图 Time Charts of Protective Function

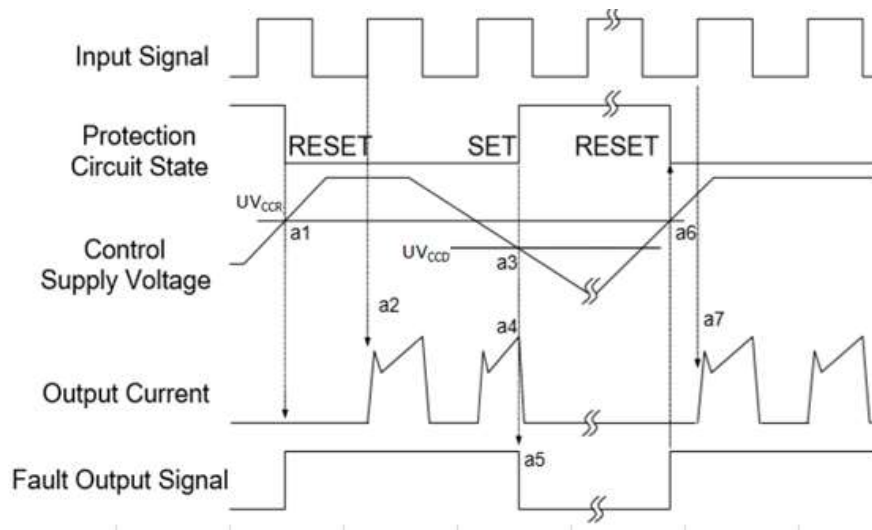


图 7: 欠压保护时序图(低侧)

Fig 7: Undervoltage protection sequence diagram (low side)

a1 :电源电压上升: 电压上升至  $UV_{CCR}$ , 当下一个输入信号到来时电路开始工作;



- a1 : Control supply voltage rises: after the voltage rises  $UV_{CCR}$ , the circuits start to operate when next input is applied.
- a2: 正常运行: MOSFET 开启并加载电流。
- a2: Normal operation: MOSFET turns on and loads current.
- a3: 欠压检测点( $UV_{CCD}$ )。
- a3: Undervoltage detection point ( $UV_{CCD}$ ).
- a4: 不管输入是什么信号, MOSFET 都是关闭状态。
- a4: No matter what signal is input, the MOSFET is off.
- a5: 故障输出开启。
- a5: Fault output is on.
- a6: 欠压恢复( $UV_{CCR}$ )。
- a6: Undervoltage recovery ( $UV_{CCR}$ ).
- a7: 正常运行: MOSFET 导通并加载负载电流。
- a7: Normal operation: MOSFET is turned on and load current is loaded.

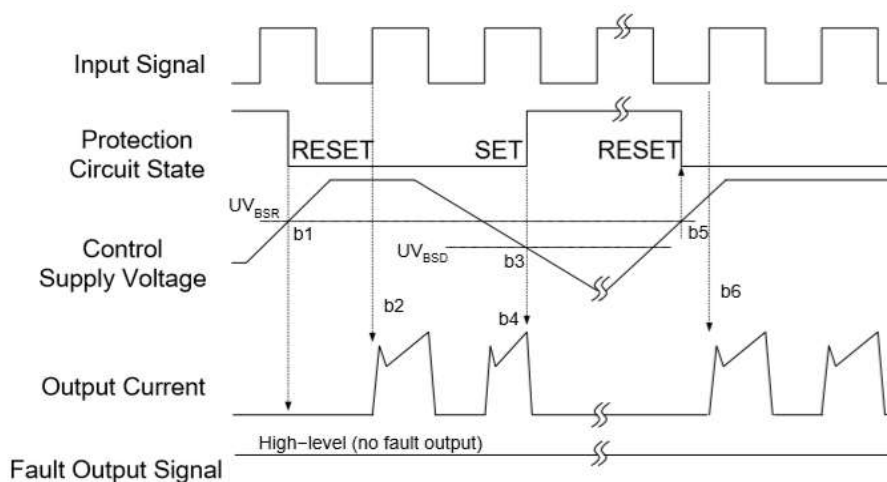


图 8: 欠压保护时序图(高侧)

Fig 8: Undervoltage protection sequence diagram (High side)

- b1 : 电源电压上升: 当该电压上升到欠压恢复点, 在下一个欠压信号被执行前该线路将启动运行。
- b1: Power supply voltage rise: When the voltage rises to the undervoltage recovery point, the line will start running before the next undervoltage signal is executed.
- b2: 正常运行: MOSFET 导通并加载负载电流。
- b2: Normal operation: MOSFET is turned on and load current is applied.
- b3 : 欠压检测 ( $UV_{BSD}$ )。
- b3: Undervoltage detection ( $UV_{BSD}$ ).
- b4 : 不管输入是什么信号, MOSFET 都是关闭状态。
- b4: No matter what signal is input, MOSFET is off.
- b5 : 欠压恢复( $UV_{BSR}$ )。
- b5: Undervoltage recovery ( $UV_{BSR}$ )。 .
- b6 : 正常运行: MOSFET 导通并加载负载电流。
- b6: Normal operation: MOSFET is turned on and load current is applied.



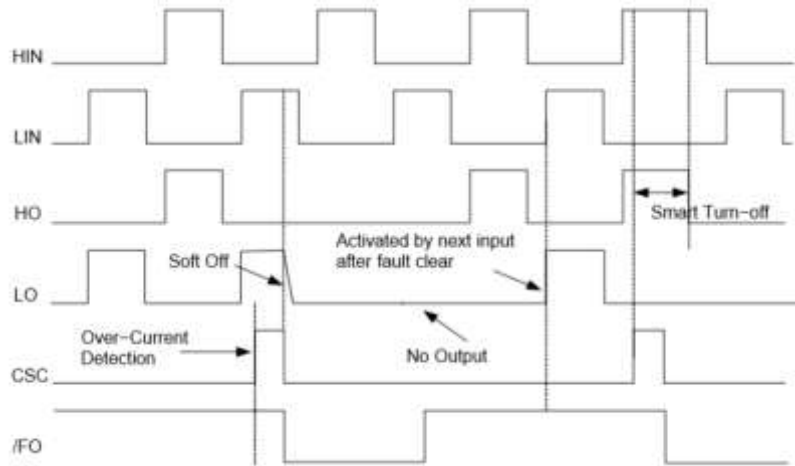


图 9：过流保护时序

Fig9: Fault-Out Function by Over Current Protection

HIN :高侧输入信号;

HIN : High-side Input Signal

LIN : 低侧输入信号;

LIN : Low-side Input Signal

HO : 高侧输出信号;

HO : High-Side Output Signal

LO : 低侧输出信号;

LO : Low-Side Output Signal

CSC :过流侦测信号;

CSC : Over Current Detection Input

/FO:故障输出信号

/FO : Fault Out Function

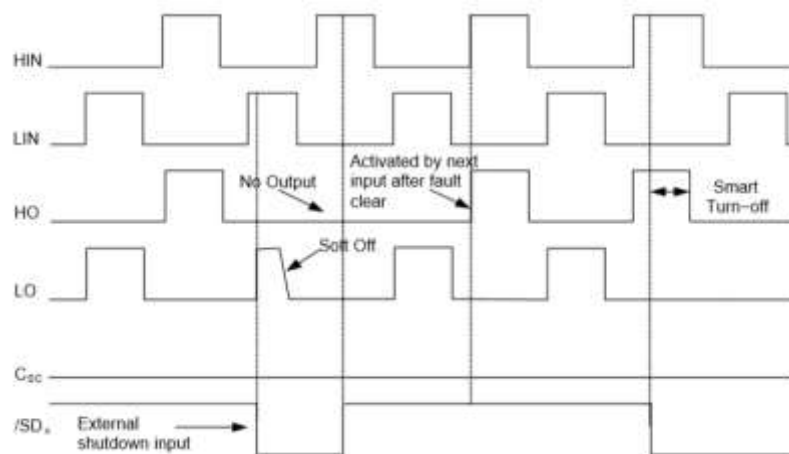


图 10. 外部关断功能时序

Figure 10. Shutdown Input Function by External Command

HIN :高侧输入信号;

HIN : High-side Input Signal

LIN : 低侧输入信号;

LIN : Low-side Input Signal

HO : 高侧输出信号;

HO : High-Side Output Signal

LO : 低侧输出信号;

LO : Low-Side Output Signal

CSC :过流侦测信号;

CSC : Over Current Detection Input

/SDx:外部关断输入信号

/SDx : Shutdown Input Function

### 输入输出接口电路 Input/output interface circuit

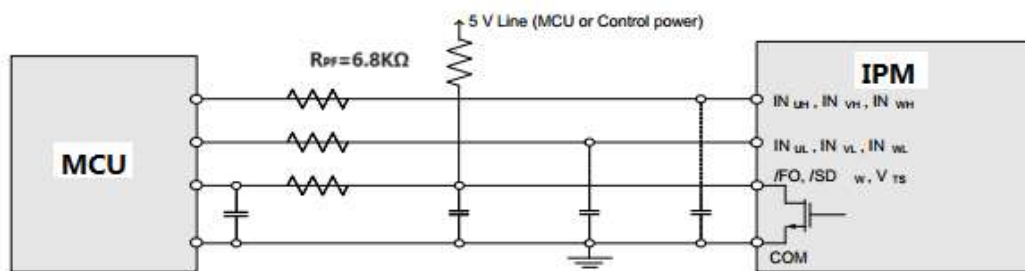


图 11. 推荐的 MCU I/O 接口电路

Figure 11: Recommended MCU input and output interface circuit

备注 5: 由于 PWM 的控制方式和实际应用电路的阻抗及线路板的阻抗, RC 去耦可能会有变化。

Note 5 : Due to the PWM control method and the impedance of the actual application circuit and the impedance of the circuit board, RC decoupling may change.

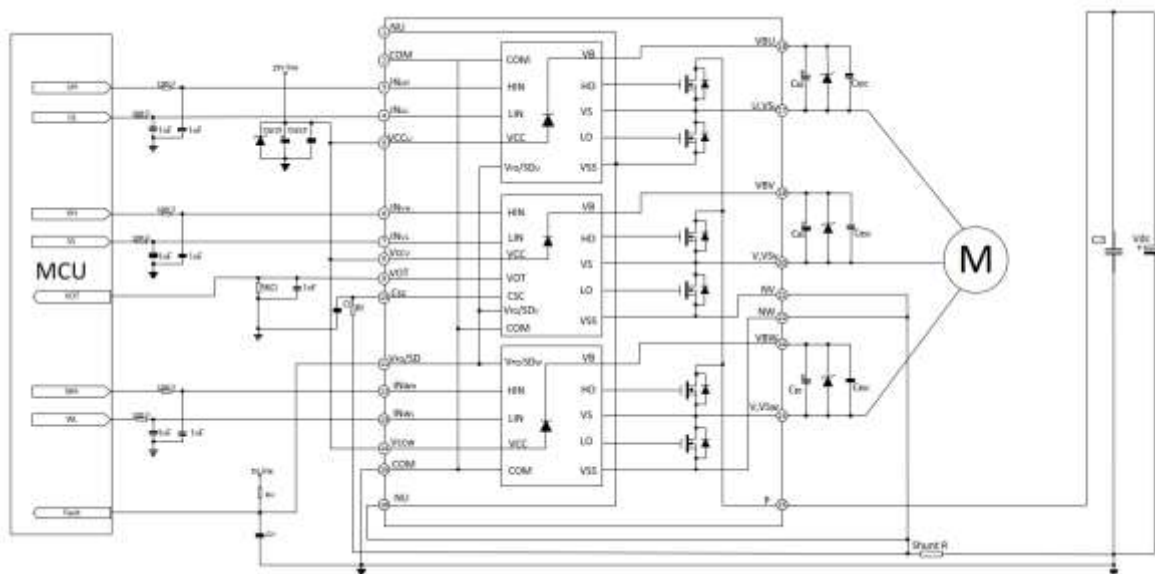


图 12: 典型应用电路图

Fig 12: Example of Application Circuit

备注 6: .关于引脚的位置请参阅图 1.

Note 6: Refer to figure 1 for pin location.

备注 7:为避免故障, 各输入接线应尽可能短。

Note 7:To avoid malfunction, the wiring of each input should be as short as possible

备注 8:为防止浪涌损坏, PN 之间建议增加一个高频非感性平缓电容 ( $0.1\mu\text{F}\sim 0.22\mu\text{F}$ ), 电容的连线要尽量短。

Note 8:To prevent surge destruction, it is recommended to add a high-frequency non inductive smoothing capacitor ( $0.1\mu\text{F}\sim 0.22\mu\text{F}$ ) between PN, and the wiring of the capacitor should be as short as possible.

备注 9:输入信号高电平有效, 在 HVIC 每个通道的输入端都有一个下拉电阻连接到地; 建议在输入端增加 RC 滤波电路来防止输入信号振荡。

Note 9: The high level of the input signal is effective, and a pull-down resistor is connected to the ground at the input terminals of each channel of HVIC; It is suggested to add RC filter circuit at the input terminals to prevent input signal oscillation.

备注 10:所有电容的位置尽可能的靠近 IPM。

Note 10: Position all capacitors as close to IPM as possible.

备注 11:控制地线和电源地线要连接在一个点, 走线尽量短;

Note 11:The control ground wire and power ground wire shall be connected at one point, and the wiring shall be as short as possible;

备注 12:在短路保护电路, 请选择时间常数在  $1.5\sim 2\mu\text{s}$  范围内的  $R_f$  和  $C_f$ ,同时  $R_f$  和  $C_f$  周边的接线都应尽量短,  $R_f$  接线应靠近分流电阻;

Note 12:In the short-circuit current protection circuit, please select the  $R_f$   $C_f$  time constant in the range  $1.5\sim 2\mu\text{s}$ ,At the same time, the wiring around  $R_f$  and  $C_f$  shall be as short as possible, and  $R_f$  wiring shall be close to shunt resistance;

备注 13:/FO,/SD 的连线尽可能短。

Note 13:/FO and /SD must be connected as short as possible.





DIP23WD-FP

单位: mm

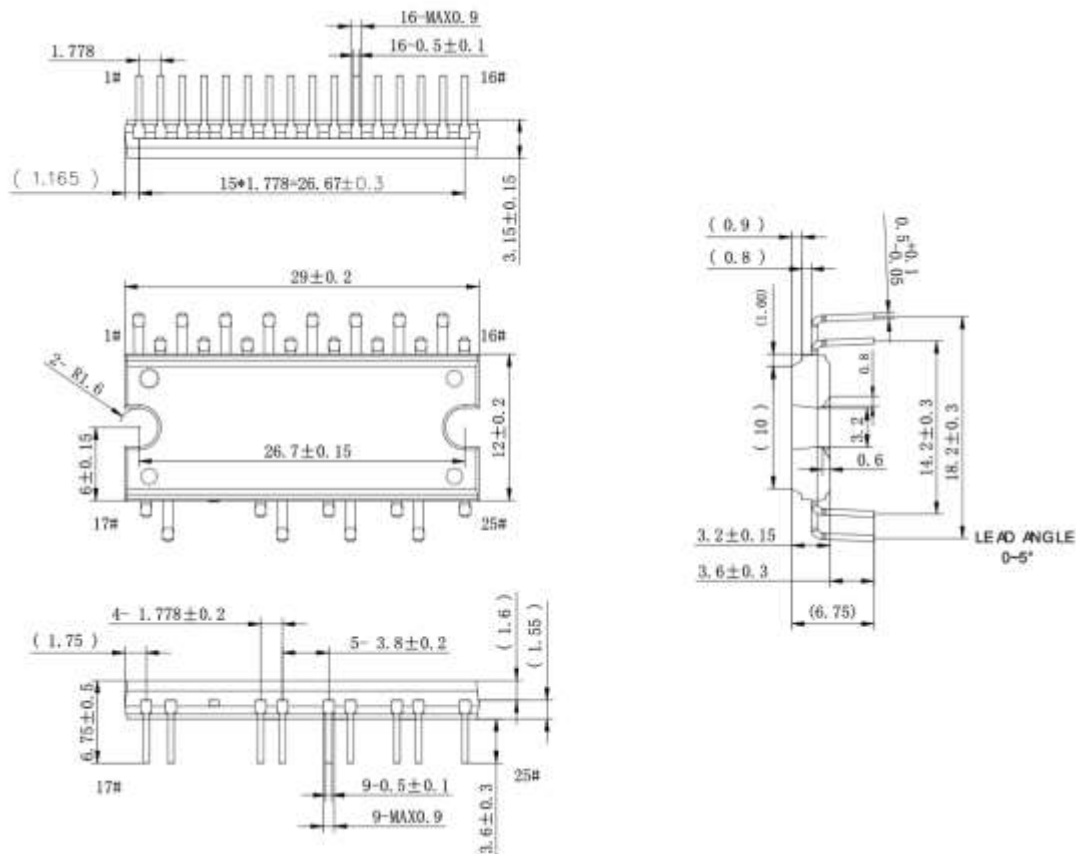


图 15: SPE03M60TW-AD 封装外形图

Fig 15: SPE03M60TW-AD Package Outline Drawings





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