

MIP0221SY, MIP0222SY, MIP0223SY, MIP0224SY, MIP0225SY, MIP0226SY, MIP0227SY

Silicon MOS IC

■ Features

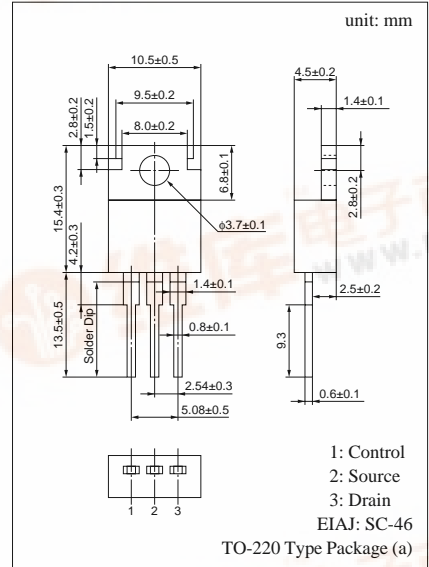
- Single chip IC with high breakdown voltage power MOS FET and CMOS control circuits
- Allowing to input worldwide mains (AC 85 to 274V)
- A pulse-by-pulse overcurrent protection circuit and a timer auto-restart circuit are integrated.

■ Applications

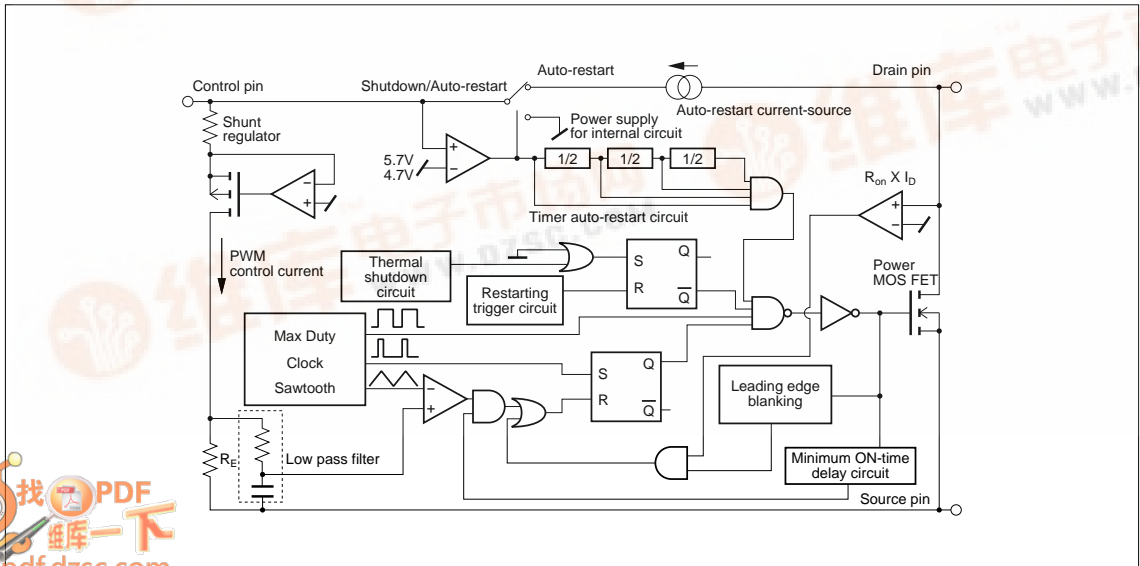
- Switching power supply (to 90W)
- AC adaptor
- Battery charger

■ Absolute Maximum Ratings (Ta = 25 ± 3°C)

| Parameter           | Symbol           | Rated       | Unit  |   |
|---------------------|------------------|-------------|-------|---|
| Drain voltage       | V <sub>D</sub>   | 700         | V     |   |
| Control voltage     | V <sub>C</sub>   | 8           | V     |   |
| Output current      | I <sub>D</sub>   | MIP0221SY   | 0.3   | A |
|                     |                  | MIP0222SY   | 0.585 |   |
|                     |                  | MIP0223SY   | 1.15  |   |
|                     |                  | MIP0224SY   | 1.72  |   |
|                     |                  | MIP0225SY   | 2.4   |   |
|                     |                  | MIP0226SY   | 2.9   |   |
| MIP0227SY           | 3.5              |             |       |   |
| Control current     | I <sub>C</sub>   | 0.1         | mA    |   |
| Channel temperature | T <sub>ch</sub>  | 150         | °C    |   |
| Storage temperature | T <sub>stg</sub> | -55 to +150 | °C    |   |



■ Block Diagram



■ Electrical Characteristics ( $T_C = 25 \pm 2^\circ\text{C}$ )

|                                  | Parameter                        | Symbol                         | Conditions  | min  | typ  | max           | Unit             |
|----------------------------------|----------------------------------|--------------------------------|---|------|------|---------------|------------------|
| Control functions                | Output frequency                 | $f_{\text{OSC}}$               | $I_C = 2\text{mA}$                                      | 90   | 100  | 110           | kHz              |
|                                  | Maximum duty cycle               | MAXDC                          | $I_C = 2\text{mA}$                                      | 64   | 67   | 70            | %                |
|                                  | Minimum duty cycle               | MINDC                          | $I_C = 10\text{mA}$                                     |      |      | 3             | %                |
| Auto-restart                     | Control pin charging current     | $I_C$                          | $V_C = 0$   | -2.4 | -1.9 | -1.2          | mA               |
|                                  |                                  |                                | $V_C = 5\text{V}$                                       | -2   | -1.5 | -0.8          |                  |
|                                  | Auto-restart threshold voltage   | $V_{C(\text{on})}$             |   | 5    | 5.7  | 6.3           | V                |
|                                  | Lockout threshold voltage        | $V_{C(\text{off})}$            |   | 4    | 4.7  | 5.3           | V                |
|                                  | Auto-restart hysteresis voltage  | $\Delta V_C$                   |   | 0.5  | 1    | 1.5           | V                |
|                                  | Auto-restart duty cycle          | $T_{\text{SW}}/T_{\text{TIM}}$ |   |      | 5    | 8             | %                |
|                                  | Auto-restart frequency           | $f_{\text{TIM}}$               |   | 1.2  |      | Hz            |                  |
| Circuit protection               | Self-protection current limit    | $I_{\text{LIMIT}}$             | MIP0221SY   | 0.23 | 0.25 | 9.28          | A                |
|                                  |                                  |                                | MIP0222SY   | 0.45 | 0.5  | 0.55          |                  |
|                                  |                                  |                                | MIP0223SY   | 0.9  | 1    | 1.1           |                  |
|                                  |                                  |                                | MIP0224SY   | 1.35 | 1.5  | 1.65          |                  |
|                                  |                                  |                                | MIP0225SY   | 1.8  | 2    | 2.2           |                  |
|                                  |                                  |                                | MIP0226SY   | 2.25 | 2.5  | 2.75          |                  |
|                                  |                                  |                                | MIP0227SY   | 2.7  | 3    | 3.3           |                  |
|                                  | Leading edge blanking delay      | $t_{\text{on(BLK)}}$           | $I_C = 3\text{mA}$                                      |      | 0.25 |               | $\mu\text{s}$    |
|                                  | Current limit delay              | $t_{\text{d(OCL)}}$            | $I_C = 3\text{mA}$                                      |      | 0.1  |               | $\mu\text{s}$    |
|                                  | Thermal shutdown temperature     | $T_{\text{OTP}}$               | $I_C = 3\text{mA}$                                      | 130  | 140  | 150           | $^\circ\text{C}$ |
| Power-up reset threshold voltage | $V_{C\text{reset}}$              |                                | 2.3   | 3.3  | 4.2  | V             |                  |
| Output                           | ON-state resistance              | $R_{\text{DS(on)}}$            | $I_D = 0.025\text{A}$                                   |      | 31.2 | 36            | $\Omega$         |
|                                  |                                  |                                | $I_D = 0.1\text{A}$                                     |      | 15   | 18            |                  |
|                                  |                                  |                                | $I_D = 0.2\text{A}$                                     |      | 8.5  | 10            |                  |
|                                  |                                  |                                | $I_D = 0.3\text{A}$                                     |      | 5.8  | 6.7           |                  |
|                                  |                                  |                                | $I_D = 0.3\text{A}$                                     |      | 4    | 5             |                  |
|                                  |                                  |                                | $I_D = 0.3\text{A}$                                     |      | 3.3  | 4             |                  |
|                                  |                                  |                                | $I_D = 0.3\text{A}$                                     |      | 2.6  | 3             |                  |
|                                  | OFF-state current                | $I_{\text{DSS}}$               | $V_{\text{DS}} = 650\text{V}$ , Output MOS FET disabled |      | 0.01 | 0.25          | mA               |
|                                  | Breakdown voltage                | $V_{\text{DSS}}$               | $I_D = 0.25\text{mA}$ , Output MOS FET disabled         | 700  |      |               | V                |
|                                  | Rise time                        | $t_r$                          |   |      | 0.1  | 0.2           | $\mu\text{s}$    |
| Fall time                        | $t_f$                            |                                |   | 0.1  | 0.2  | $\mu\text{s}$ |                  |
| Power supply voltage             | Drain supply voltage             | $V_{\text{D(MIN)}}$            |   | 36   |      |               | V                |
|                                  | Shunt regulator voltage          | $V_C$                          | $I_C = 3\text{mA}$                                      | 5.4  | 5.7  | 6.1           | V                |
|                                  | Control supply/discharge current | $I_{\text{CD1}}$               | Output MOS FET enabled                                  | 0.7  | 1.4  | 1.8           | mA               |
|                                  |                                  | $I_{\text{CD2}}$               | Output MOS FET disabled                                 | 0.5  | 0.8  | 1.1           | mA               |