



TND023F, TND023MP

Lamp-, solenoid-, and motor-driving Applications

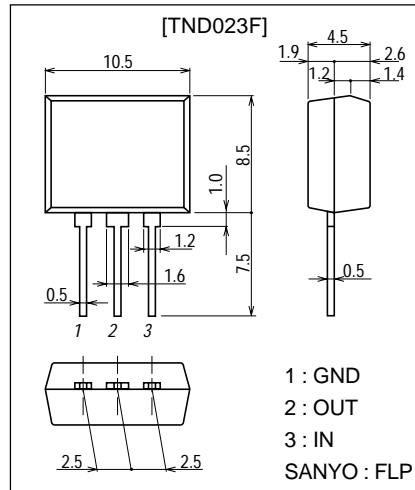
Features

- N-channel MOSFET built in.
- Overheat protection.
- Overcurrent protection.
- Overvoltage protection.

Package Dimensions

Unit:mm

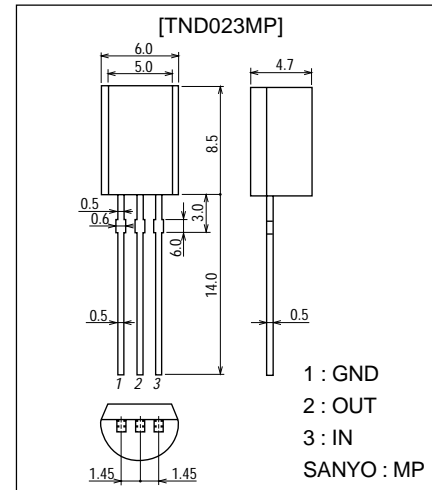
2154



Package Dimensions

Unit:mm

2145



Absolute Maximum Ratings at Ta = 25°C

| Parameter | Symbol | Conditions | Ratings | Unit |
|-----------------------------|--------------|------------|-------------|------|
| Drain-to-Source Voltage | $V_{DS(DC)}$ | | 60 | V |
| Output Current (Average) | $I_O(DC)$ | TND023F | 2.5 | A |
| | $I_O(DC)$ | TND023MP | 2.0 | A |
| Input Voltage | V_{IN} | | -0.3 to +10 | V |
| Allowable Power Dissipation | P_D | TND023F | 1.5 | W |
| | P_D | TND023MP | 1.0 | W |
| Operating Temperature | T_{opr} | | -40 to +150 | °C |
| Junction Temperature | T_j | | 150 | °C |
| Storage Temperature | T_{stg} | | -55 to +150 | °C |

Electrical Characteristics at Ta = 25°C

| Parameter | Symbol | Conditions | Ratings | | | Unit |
|-------------------------------|------------------------|------------------------|---------|-----|-----|------|
| | | | min | typ | max | |
| Drain-to-Source Clamp Voltage | $V_{DS \text{ clamp}}$ | $V_{IN}=0, I_O=1mA$ | 60 | | | V |
| Output-OFF Current | $I_{DSS(1)}$ | $V_{IN}=0, V_{DS}=50V$ | | | 100 | μA |
| | $I_{DSS(2)}$ | $V_{IN}=0, V_{DS}=12V$ | | | 10 | μA |
| Input Threshold Voltage | $V_{IN(th)}$ | $V_{DS}=5V, I_O=1mA$ | 1.0 | | 2.5 | V |
| Drain-to-Source ON Resistance | $R_{DS(on)}$ | $V_{IN}=5V, I_O=1A$ | | | 0.2 | Ω |

Continued on next page.

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12501TS TA-3186/51099TS (KOTO) TA-1743, 1748 No.6034-1/4

TND023F, 023MP

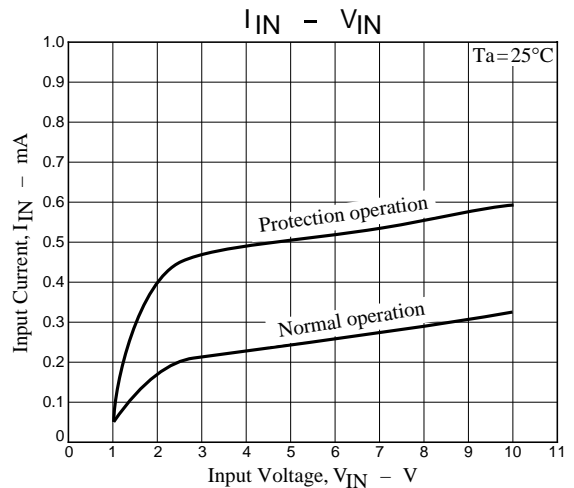
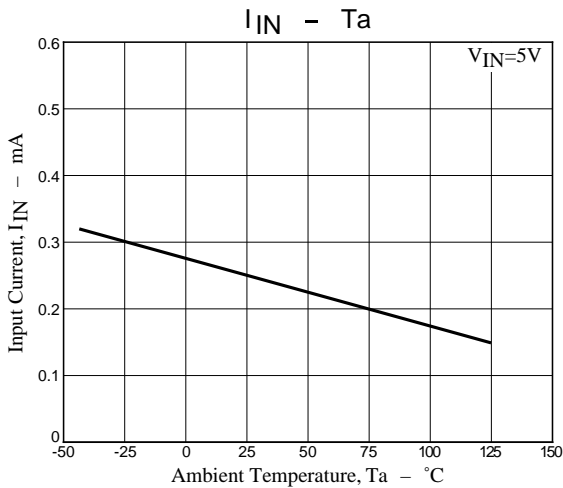
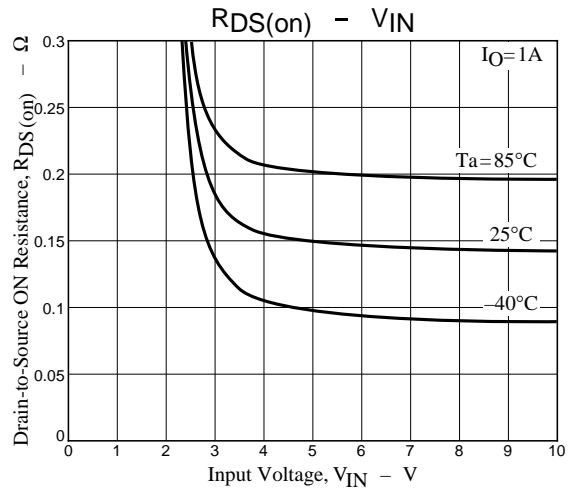
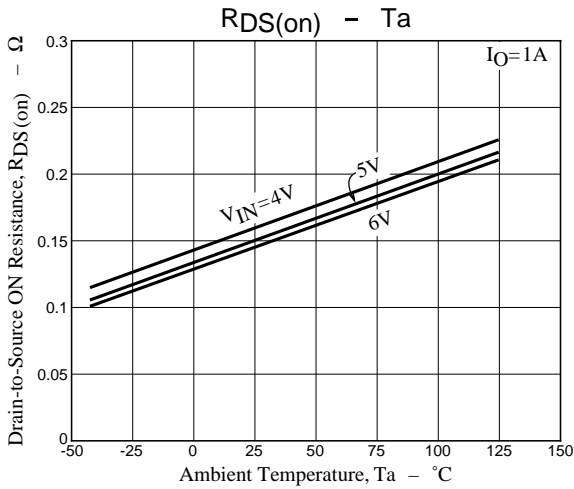
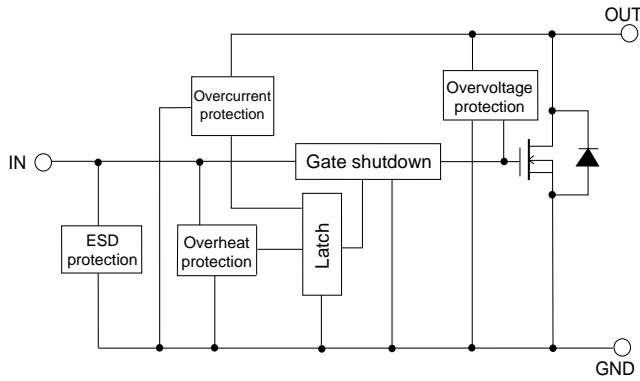
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| Parameter | Symbol | Conditions | Ratings | | | Unit |
|--------------------------------|-----------------|---------------------|---------|------|------|-------------|
| | | | min | typ | max | |
| Output-ON Input current | I_{IN} | $V_{IN}=5V$ | | 0.25 | 0.6 | mA |
| Overheat Detecting Temperature | $T_J(sd)$ | $V_{IN}=5V, I_O=1A$ | 155 | 165 | | $^{\circ}C$ |
| Overcurrent Detecting Current | I_s | $V_{IN}=5V$ | 3.75 | 5 | 6.25 | A |
| Input Clamp Voltage | $V_{IN\ clamp}$ | $I_{IN}=5mA$ | 10 | | | V |

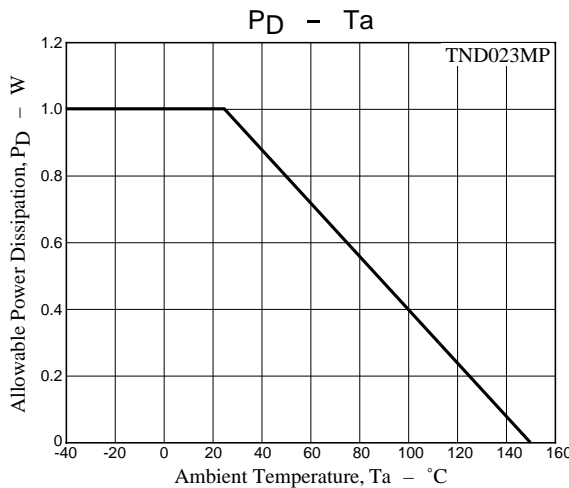
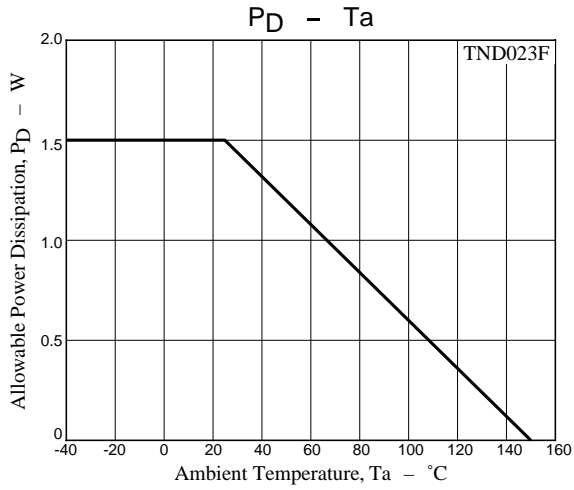
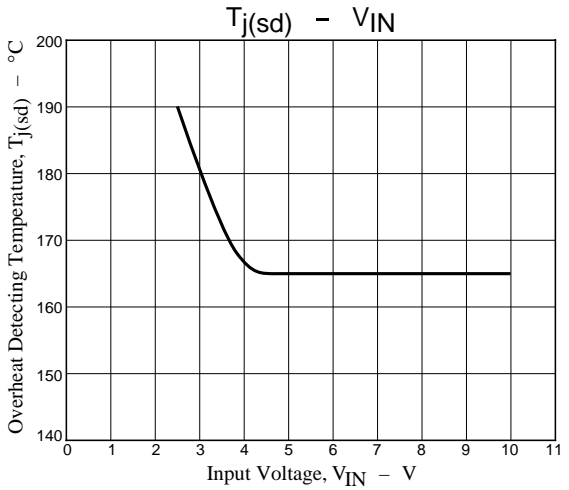
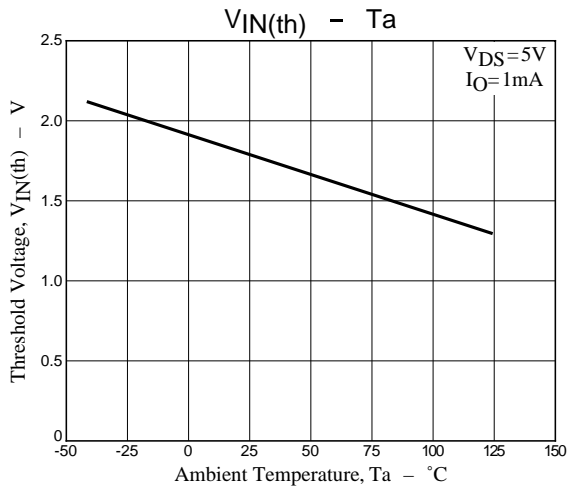
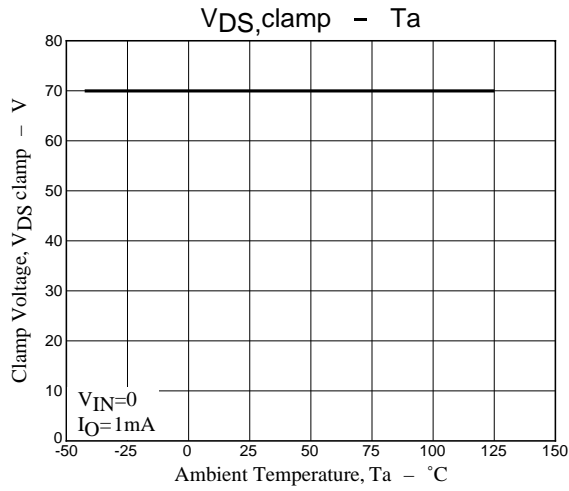
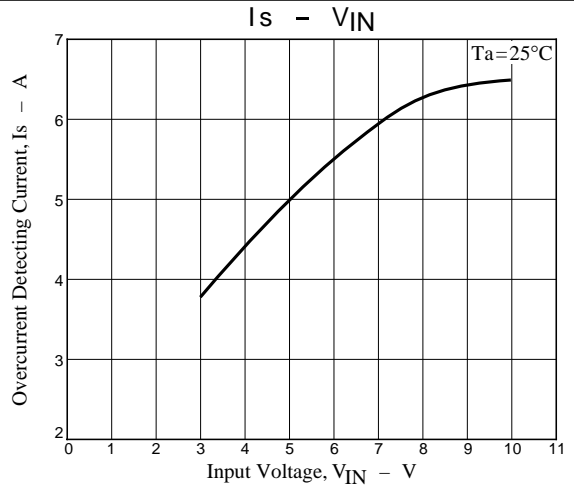
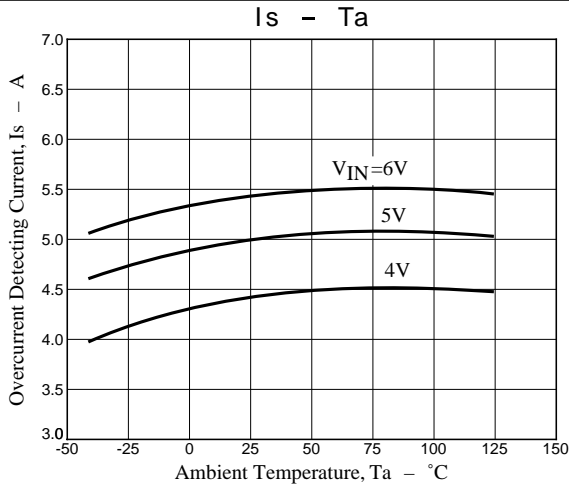
*Note:

- 1.Shutdown state will be kept after overheat and overcurrent protections operation and the system will be reset when the input voltage goes to or below the reset voltage (1.0V).
- 2.Overheat detecting temperature value is not a guarantee value but for reference only.

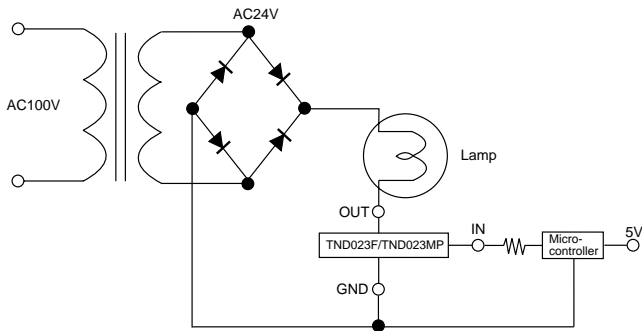
Block Diagram



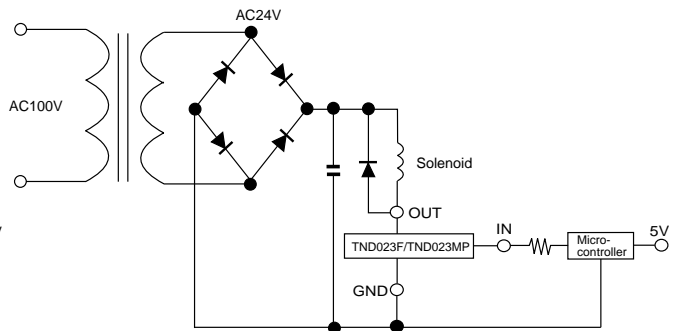
TND023F, 023MP



Sample Application Circuit



**Another Sample Application Circuit
(solenoid drive)**



Operation Description

1. The output power MOSFET will be turned on when the input voltage exceeds the input threshold voltage (5V is recommended), and then the lamp will be turned on by the current flowing to the lamp. Conversely, the output power MOSFET will be turned off when the input voltage goes below the input threshold voltage, and then the lamp will be turned off.
2. The internal overcurrent protection function shuts down the output power MOSFET when output current of at least the overcurrent detecting current value flows at load short. Besides, if the device temperature exceeds the allowable power dissipation, overheat protection function protects the power switch from being broken down by shutting down the MOSFET when T_j comes to 165°C (typical).
3. Shutdown state will be kept after overheat and overcurrent protections operation and the system will be reset when the input voltage goes to or below the reset voltage (1.0V).
4. As an example of application circuit, DC voltage can also be controlled as a solenoid drive.

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