



# TND027MP

## Excellent Power Device

Lowside Power Switch Lamp-, Solenoid-, and Motor-Driving, Single MP

ON Semiconductor®

<http://onsemi.com>

### Features

- N-channel MOSFET built in
- Overheat protection. (Self recovery type)
- Overcurrent protection. (Self recovery type current limiting function)
- Overvoltage protection

### Specifications

Absolute Maximum Ratings at Ta=25°C

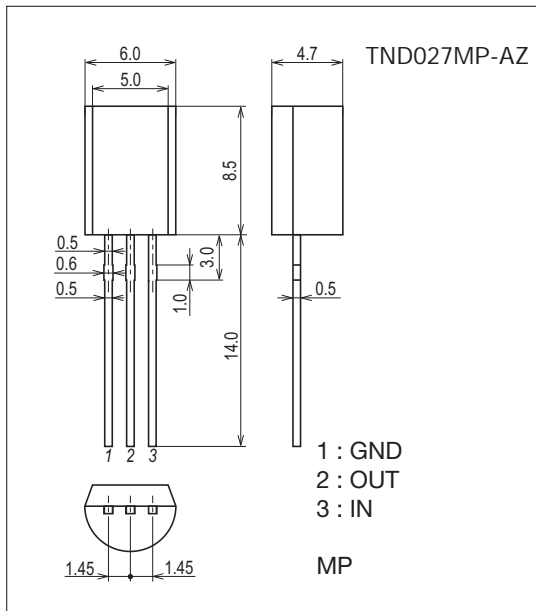
| Parameter                   | Symbol               | Conditions | Ratings     | Unit |
|-----------------------------|----------------------|------------|-------------|------|
| Drain-to-Source Voltage     | V <sub>DS</sub>      |            | 60          | V    |
| Output Current              | I <sub>O(DC)</sub>   |            | 1.5         | A    |
| Input Voltage               | V <sub>IN</sub>      |            | -0.3 to +10 | V    |
| Allowable Power Dissipation | PD                   |            | 1.0         | W    |
| Operating Supply Voltage    | V <sub>DS(opr)</sub> |            | 40          | V    |
| Operating Temperature       | Topr                 |            | -40 to +85  | °C   |
| Junction Temperature        | Tj                   |            | 150         | °C   |
| Storage Temperature         | Tstg                 |            | -55 to +150 | °C   |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

### Package Dimensions

unit : mm (typ)

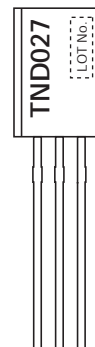
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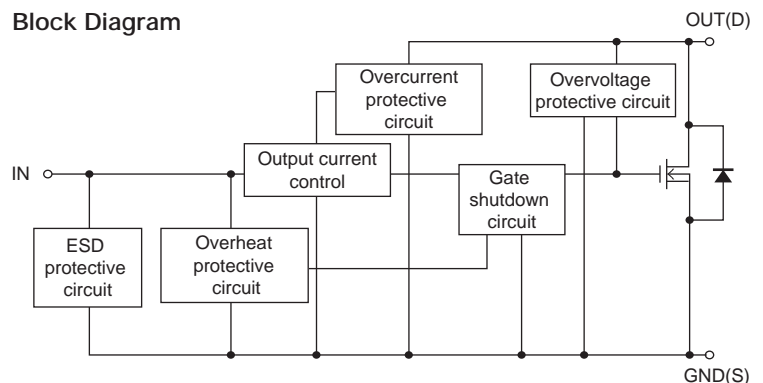
### Product & Package Information

- Package : MP
- JEITA, JEDEC : SC-51, TO-92(1-WATT), TO-226AE
- Minimum Packing Quantity : 1,000 pcs./box

### Marking



### Block Diagram



# TND027MP

## Electrical Characteristics at Ta=25°C

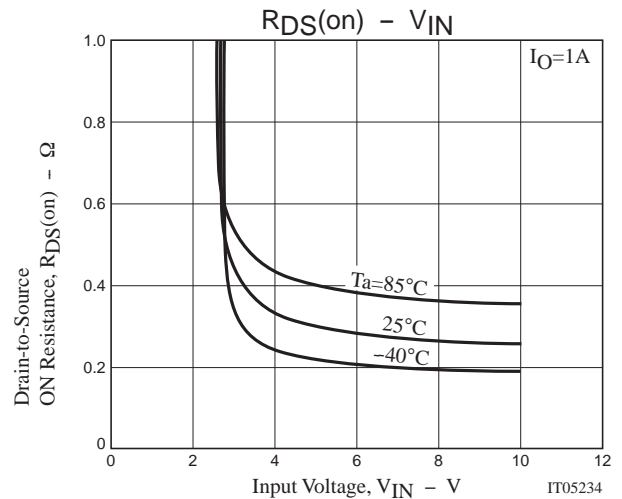
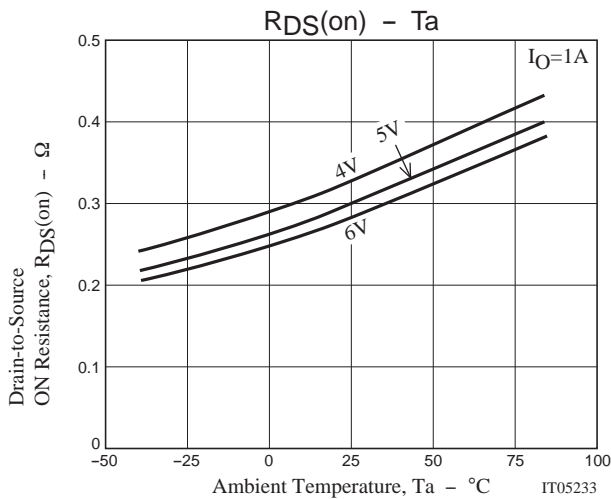
| Parameter                                  | Symbol          | Conditions              | Ratings |     |     | Unit        |
|--|-----------------|-------------------------|---------|-----|-----|-------------|
|  |                 |                         | min     | typ | max |             |
| Drain-to-Source Clamp Voltage              | $V_{DS, clamp}$ | $V_{IN}=0V, I_O=1mA$    | 60      |     |     | V           |
| Output-OFF Current                         | $I_{DSS(1)}$    | $V_{IN}=0V, V_{DS}=50V$ |         |     | 10  | $\mu A$     |
|  | $I_{DSS(2)}$    | $V_{IN}=0V, V_{DS}=12V$ |         |     | 5   | $\mu A$     |
| Input Threshold Voltage                    | $V_{IN(th)}$    | $V_{DS}=5V, I_O=1mA$    | 1.0     | 1.5 | 2.0 | V           |
| Protection Circuit Operating Input Voltage | $V_{IN(opr)}$   |                         | 4       |     | 10  | V           |
| Drain-to-Source ON Resistance              | $R_{DS(on)}$    | $V_{IN}=5V, I_O=1A$     |         | 0.3 | 0.4 | $\Omega$    |
| Input Current (Output On)                  | $I_{IN}$        | $V_{IN}=5V$             |         |     | 0.6 | mA          |
| Over-Heat Detecting Temperature            | $T_{j(sd)}$     | $V_{IN}=5V, I_O=1A$     | 120     | 150 | 190 | $^{\circ}C$ |
| Over-Current Detecting Current             | $I_s$           | $V_{IN}=5V$             | 3.0     | 6.0 | 9.0 | A           |
| Over-Current Limit (Peak)                  | $I_{LMT}$       | $V_{IN}=5V$             | 3.0     | 6.0 | 9.0 | A           |
| Input Clamp Voltage                        | $V_{IN, clamp}$ | $I_{IN}=1mA$            | 10      |     |     | V           |

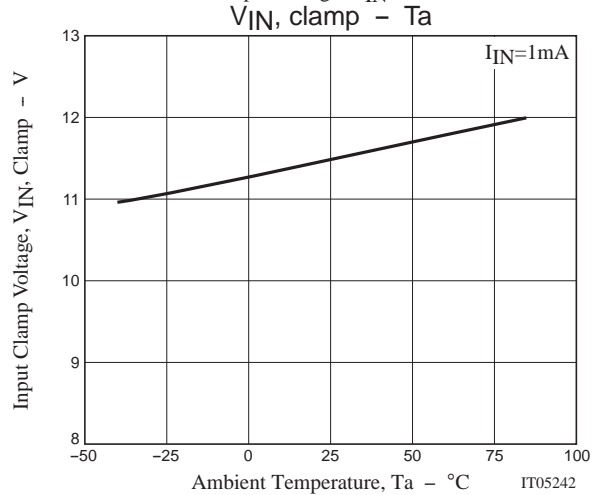
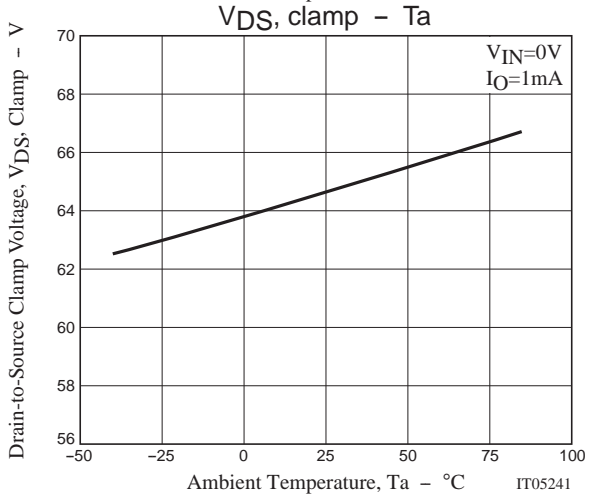
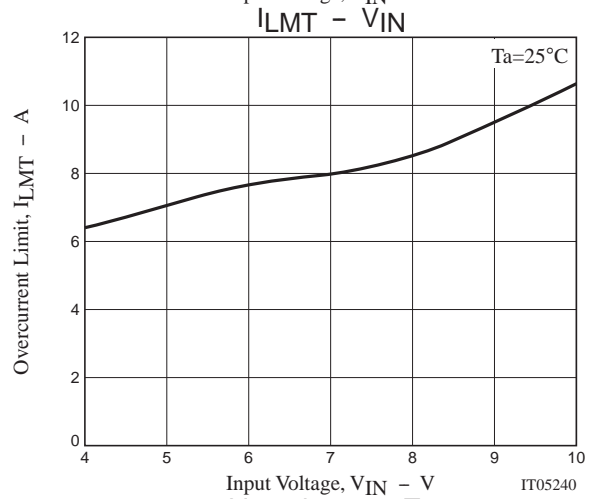
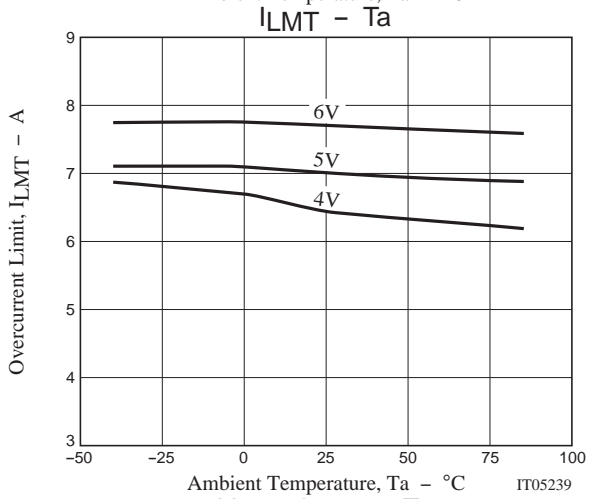
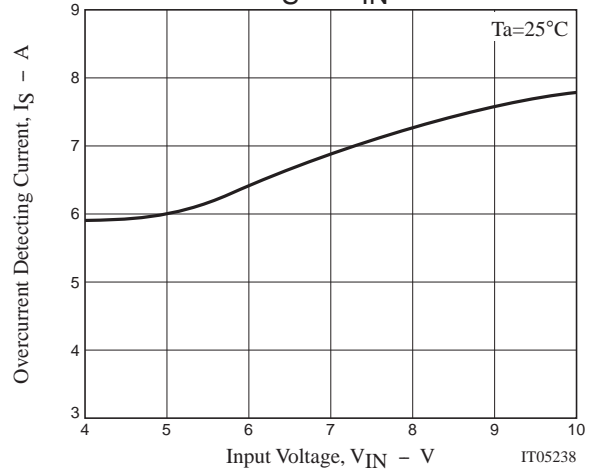
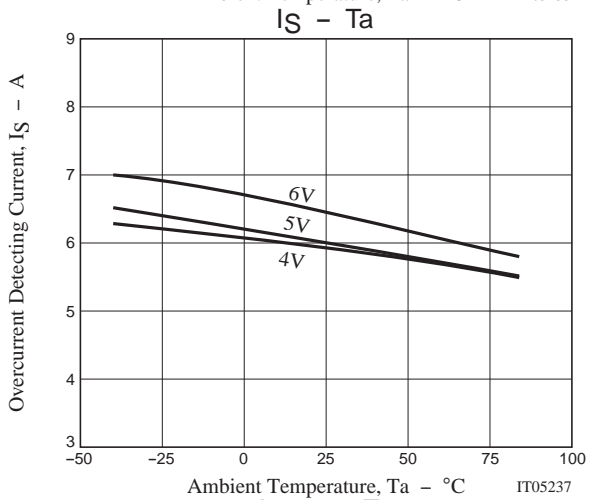
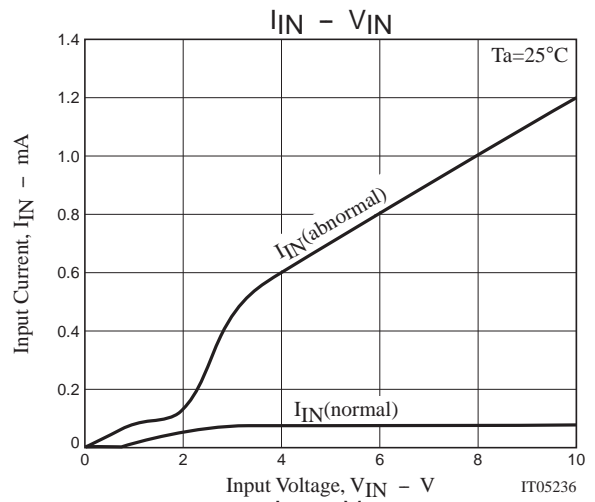
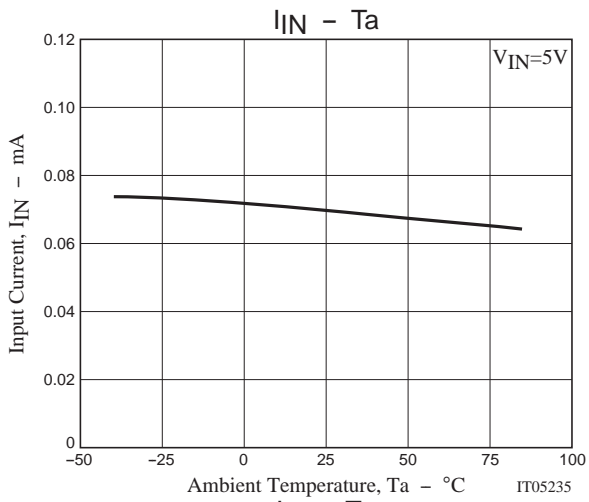
Notes : 1. Overcurrent protection circuit limits the output current to the range of overcurrent limit value.

2. During overheat protecting operation, output current is turned off.

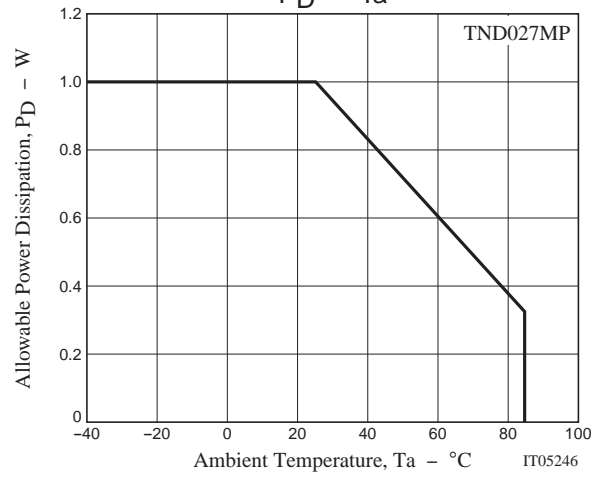
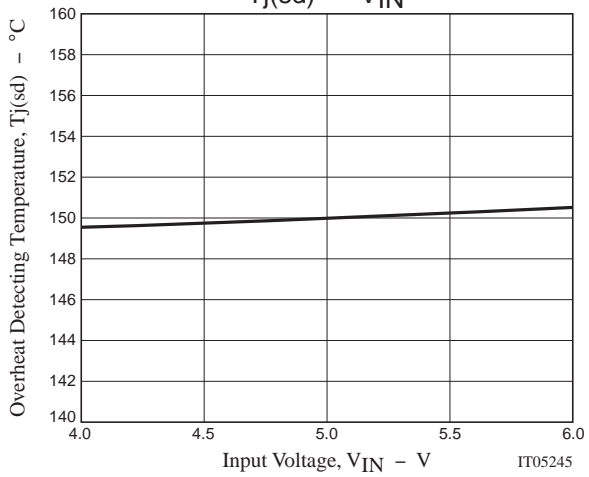
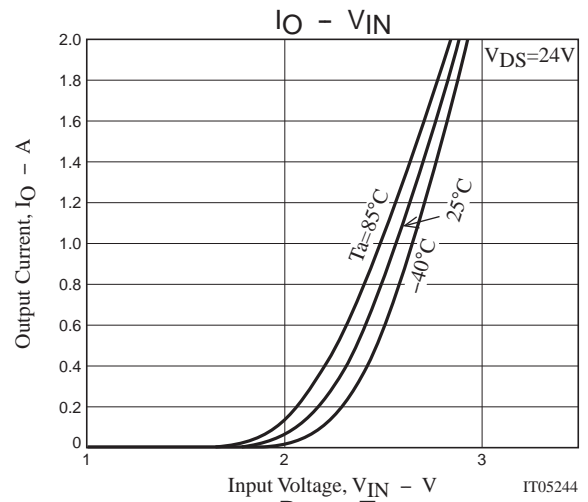
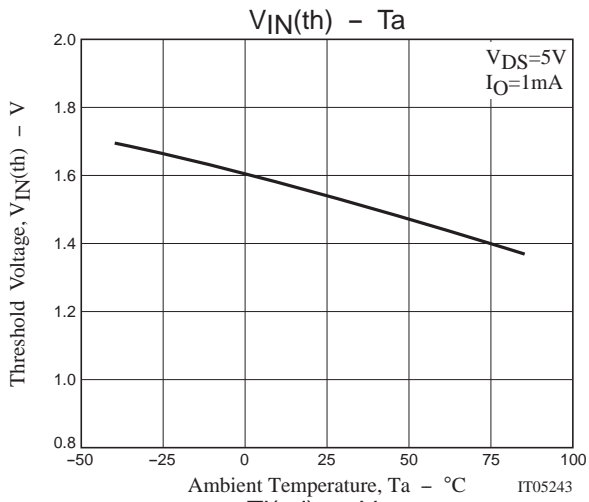
## Ordering Information

| Device      | Package | Shipping      | memo    |
|-------------|---------|---------------|---------|
| TND027MP-AZ | MP      | 1,000pcs./box | Pb Free |

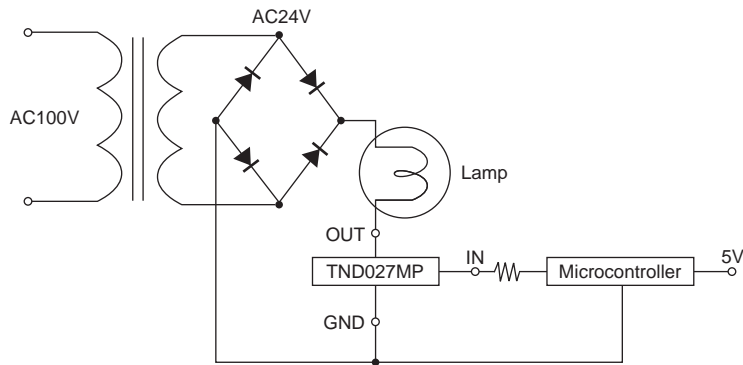




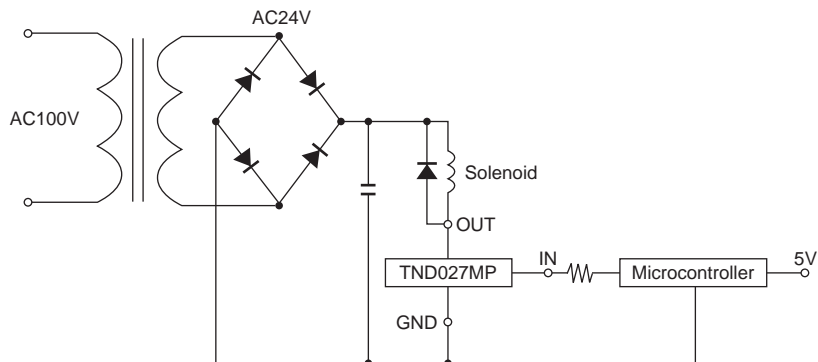
# TND027MP



## Sample Application Circuit



## Another Sample Application Circuit (Solenoid drive)



## Operation Description

- The output power MOSFET will be turned on when the input voltage exceeds the input threshold voltage (4 to 6V 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 the lamp will be turned off.
- The inrush current that occurs during normal lamp operation is limited to a preset value by the built-in overcurrent protecting circuit, which makes the lamp life longer.
- The internal overcurrent protection function limits the current of 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 turning off the current of output power MOSFET when  $T_j$  comes to 150°C (typical).
- As an example of application circuit, DC voltage can also be controlled as a solenoid drive.

## Addition

- The diode between OUT and GND in the block diagram is parasitic diode of the MOSFET.
- Not apply a voltage on IN terminal during the period when OUT voltage is lower than GND voltage when driving a solenoid or a motor.
- Be sure connect a diode between OUT terminal and GND terminal when you want to apply a voltage on IN terminal under the above-stated state (that is, OUT Voltage < GND Voltage).

Taping Specification

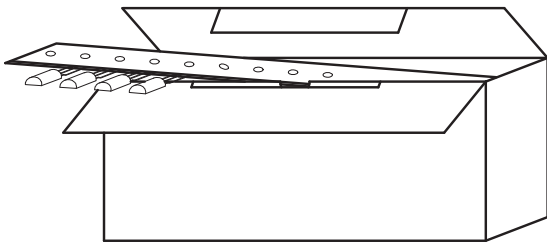
TND027MP-AZ

1. Packing Format

| Package Name | Packing Type | Maximum Number of devices contained (pcs)     |                     | Packing format  |   |
|--------------|--------------|---|---------------------|---|---|
|              |              | Inner BOX                                     | number of contained | Outer Box (C-14)  | Outer Box (C-15)  |
| M P          | AE/AZ        | C-3<br>Dimensions:mm (external)<br>330×45×125 | 1,000               | 16 Inner Box contained (16,000pcs)<br>Dimensions:mm (external)<br>500×345×195 | 8 Inner Box contained (8,000pcs)<br>Dimensions:mm (external)<br>345×260×195 |
|              | A J          | C-5<br>Dimensions:mm (external)<br>330×45×245 | 2,000               | 8 Inner Box contained (16,000pcs)<br>Dimensions:mm (external)<br>500×345×195  | 4 Inner Box contained (8,000pcs)<br>Dimensions:mm (external)<br>345×260×195 |

Packing method

Put zigzag folding in an inner box.



Inner box label

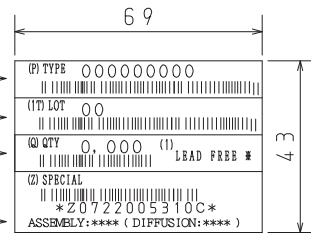
(unit:mm)

Type No. →

Lot No. →

Quantity →

Origin →



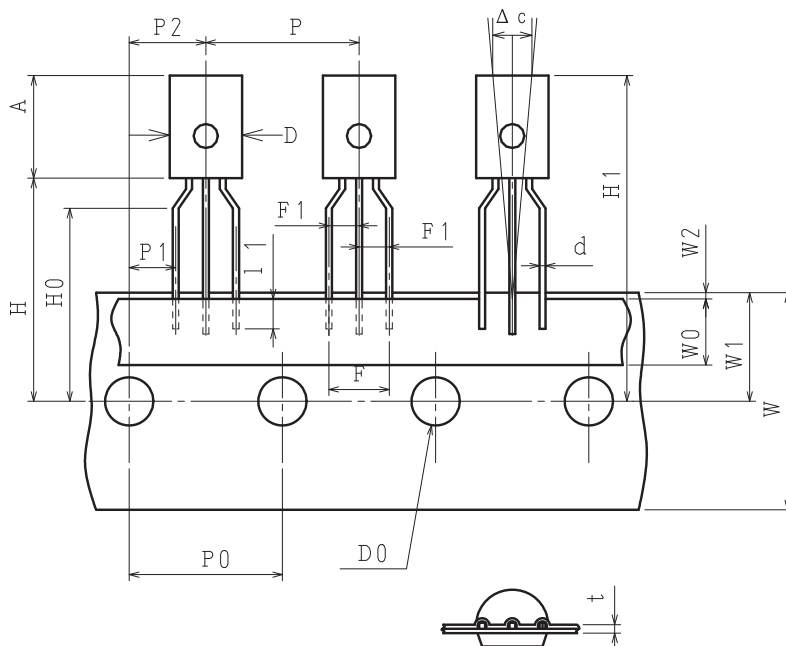
NOTE (1)

The LEAD FREE \* description shows that the surface treatment of the terminal is lead free.

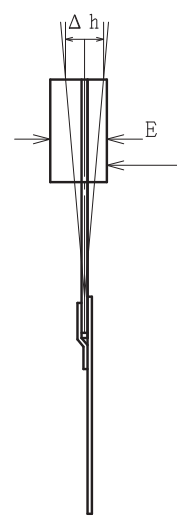
| Label       | JEITA Phase    |
|-------------|----------------|
| LEAD FREE 3 | JEITA Phase 3A |
| LEAD FREE 4 | JEITA Phase 3  |

2. Taping specifications

2-1. Carrier tape size



Marking surface

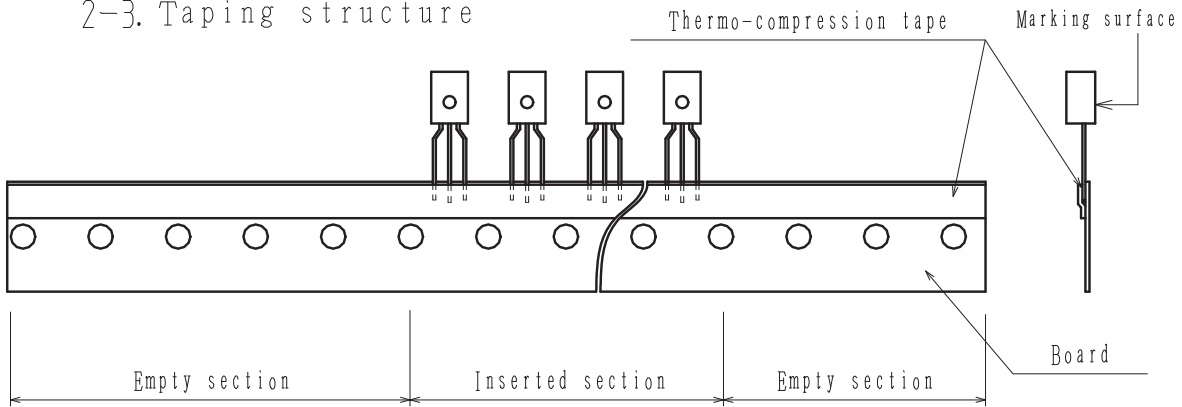


2-2. Taping size standard

unit:mm

| Item                         | Symbol | Standard | Tolerance    | Item   | Symbol | Standard | Tolerance    |
|------------------------------|--------|----------|--------------|--|--------|----------|--------------|
| Work piece outside diameter  | D      | 6.0      | ±0.2         | Tape width                                       | W      | 18.0     | +1.0<br>-0.5 |
|                              | E      | 4.7      | ±0.2         | Adhesive tape                                    | WO     | 6.0      | ±1.5         |
| Work piece height            | A      | 8.5      | ±0.2         | Displacement of perforations                     | W1     | 9.0      | ±0.5         |
| Lead wire diameter           | d      | 0.5×0.5t | ±0.1         | Work piece bottom surface position               | H      | 18.5     | ±1.0         |
| Bonded lead wire             | l1     | 2.5MIN   |              | Insert stopper position                          | HO     | 16.0     | ±0.5         |
| Pitch between products       | P      | 12.7     | ±1.0         | Work piece upper limit position                  | H1     | 27.0     | ±1.5         |
| Pitch between perforations   | P0     | 12.7     | ±0.2         | Perforations diameter                            | DO     | φ4.0     | ±0.2         |
| Accumulation Pitch           | P0×20  | 254.0    | ±1.0         | Tape thickness                                   | t      | 0.7      | ±0.2         |
| Distance between lead wire   | F      | 5.0      | +0.8<br>-0.2 | Product inclination                              | △c     | 0        | ±1.5         |
| Lead wire pitch distance     | F1     | 2.5      | +0.4<br>-0.1 |  |        |          |              |
| Product inclination          | △h     | 0        | ±2.0         |  |        |          |              |
| Displacement of perforations | P1     | 3.85     | ±0.3         | Measurement position is the bottom of the clinch |        |          |              |
|                              | P2     | 6.35     | ±0.3         |  |        |          |              |
| Displacement of tape         | W2     | 0.5MAX   |              | Not to be displaced to the outside of the board  |        |          |              |

2-3. Taping structure

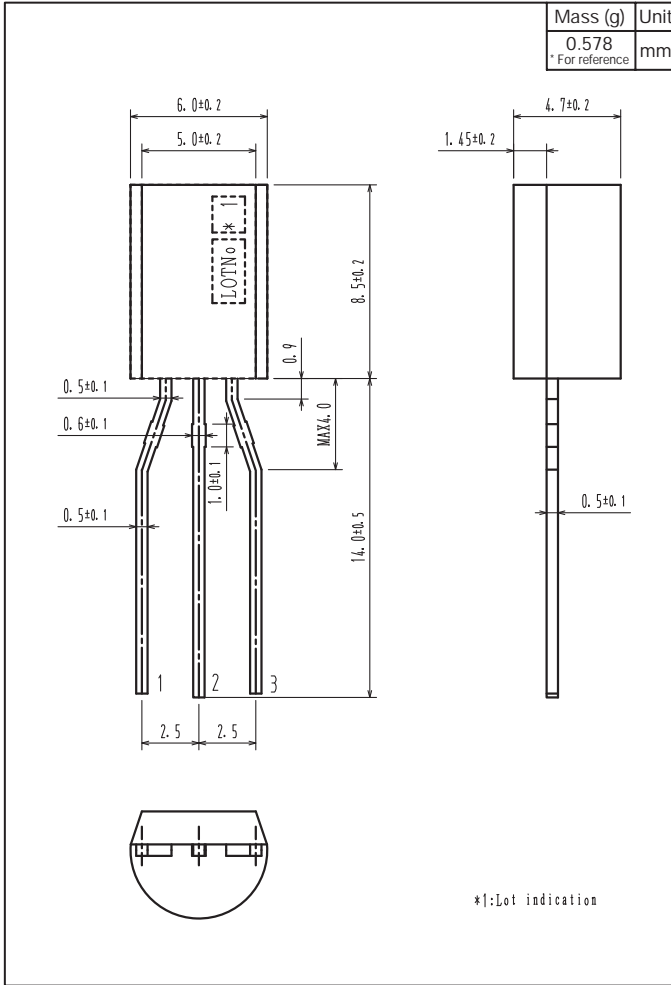


•Provide 3~5 empty sections in the leading and end portions of the tape.

# TND027MP

## Outline Drawing

TND027MP-AZ





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