

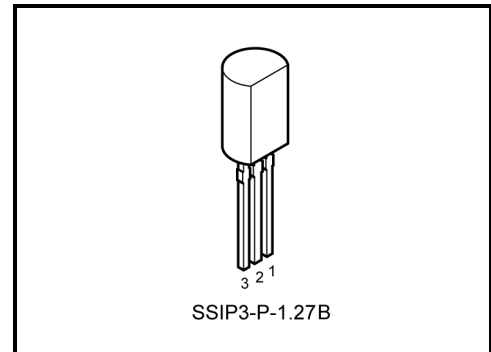
TPD1028BS

Low-Side Switch for Motors, Solenoids, and Lamp Drivers

TPD1028BS is a monolithic power IC for low-side switch. The IC has a vertical MOSFET output which can be directly driven from a CMOS or TTL logic circuit (e.g., an MPU). The IC offers intelligent self-protection functions.

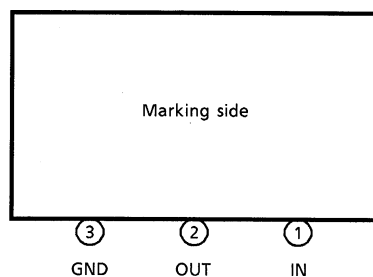
Features

- A monolithic power IC with a new structure combining a control block and a vertical power MOSFET (n -MOS) on a single chip.
- Can directly drive a power load from a CMOS or TTL logic.
- Built-in Protection circuits against overvoltage, load short circuiting, and thermal shutdown.
- Low on-resistance. $R_{DS(ON)} = 0.25$ (max) (@ $V_{IN} = 5$ V, $T_j = 25^\circ\text{C}$)
- Package TO-92(MOD) can be packed in tape.



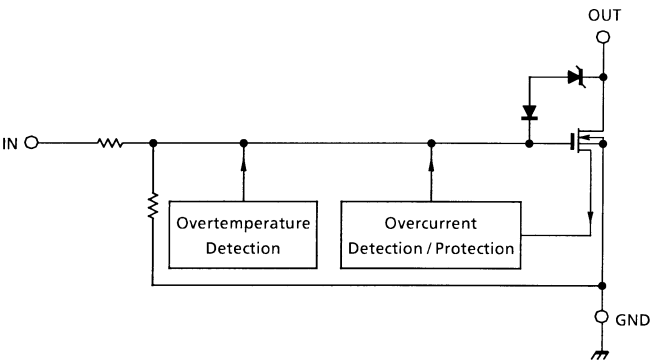
Weight: 0.36 g (typ.)

Pin Assignment



Note: That because of its MOS structure, this product is sensitive to static electricity.

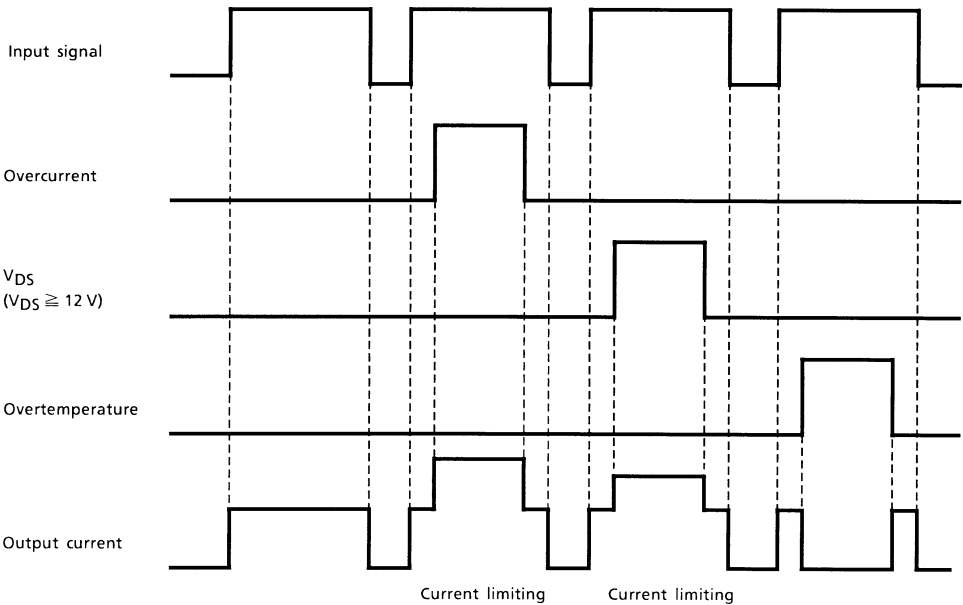
Block Diagram



Pin Description

| Pin No. | Symbol | Pin Description |
|---------|--------|---|
| 1 | IN | Input pin. This pin is connected to a pull-down resistor internally, so that even when input wiring is open-circuited, output can never be turned on inadvertently. |
| 2 | OUT | Output pin. If an inrush current flows (e.g., from a lamp), the current is clamped at 10 A (typ.) by an overcurrent protective circuit. Also, a 150 μ s (typ.) mask circuit is included internally, so that if $V_{DS} \geq 12$ V (typ.) after this mask time, the current is clamped at 3 A (typ.). |
| 3 | GND | Ground pin. |

Timing Chart



Truth Table

| In | Vout | State |
|----|------|--------------------------------|
| L | H | Normal |
| H | L | |
| L | H | Overcurrent (during inrush) |
| H | L | |
| L | H | Overcurrent (shorted load) |
| H | L | |
| L | H | Overtemperature |
| H | H | |

Maximum Rating (Ta = 25°C)

| Characteristic | Symbol | Rating | Unit |
|-----------------------|--------------|-----------|------|
| Drain-source voltage | $V_{DS(DC)}$ | 40 | V |
| Output current | I_D | 1.5 | A |
| Input voltage | V_{IN} | - 0.5 ~ 6 | V |
| Power dissipation | P_D | 0.9 | W |
| Energy tolerance | E_S / B | 200 | mJ |
| Operating temperature | T_{opr} | - 40 ~ 85 | °C |
| Junction temperature | T_j | 150 | °C |

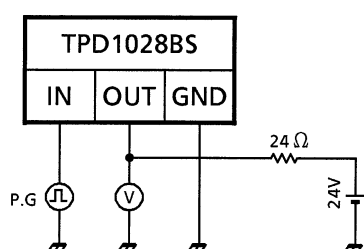
Electrical Characteristics (T_j = 25°C)

| Characteristic | Symbol | Test Cir- cuit | Test Condition | Min | Typ. | Max | Unit |
|--|-----------------------|-------------------|---|-----|------|------|------|
| Drain-source breakdown voltage | V _{(BR) DSS} | — | V _{IN} = 0 V, I _D = 10 mA | 40 | — | — | V |
| Operating supply voltage | V _{DD} | — | — | — | — | 38 | V |
| High level input voltage | V _{IH(1)} | — | V _{DS} = 24 V, I _D = 1 A | 4.5 | 5 | 5.5 | V |
| | V _{IH(2)} | — | V _{DS} = 10 V, I _D = 0.75 A | 3.9 | 5 | 5.7 | |
| | V _{IH(3)} | — | V _{DS} = 38 V, I _D = 0.75 A | 3.9 | 5 | 5.7 | |
| Low level input voltage | V _{IL(1)} | — | V _{DS} = 24 V, I _D = 10 μA | — | — | 0.8 | V |
| | V _{IL(2)} | — | V _{DS} = 10 V, I _D = 10 μA | — | — | 0.8 | |
| | V _{IL(3)} | — | V _{DS} = 38 V, I _D = 10 μA | — | — | 0.8 | |
| Current at output off | I _{DSS(1)} | — | V _{IN} = 0 V, V _{DS} = 40 V | — | — | 100 | μA |
| | I _{DSS(2)} | | V _{IN} = 0 V, V _{DS} = 24 V | — | — | 10 | |
| Input current | I _{IN} | — | V _{IN} = 5 V, at normal operation | — | — | 300 | μA |
| On resistance | R _{DS(ON)} | — | V _{IN} = 5 V, I _D = 1 A | — | — | 0.25 | Ω |
| Thermal shutdown temperature | T _S | — | V _{IN} = 5 V | — | 160 | — | °C |
| Overcurrent protection | I _{S(1)} | — | V _{DS} = 24 V, V _{IN} = 5 V, during inrush | — | 10 | — | A |
| | I _{S(2)} | — | V _{DS} = 24 V, V _{IN} = 5 V, when shorted load | — | 3 | — | |
| Shorted load detection voltage | V _{DS} | — | when shorted load | — | 12 | — | V |
| Switching time | t _{ON} | 1 | V _{DS} = 24 V, V _{IN} = 5 V, R _L = 24 Ω | — | 70 | — | μs |
| | t _{OFF} | | | — | 120 | — | |
| Diode forward voltage between drain and source | V _{DSF} | — | I _F = 1.5 A | — | 0.9 | 1.8 | V |

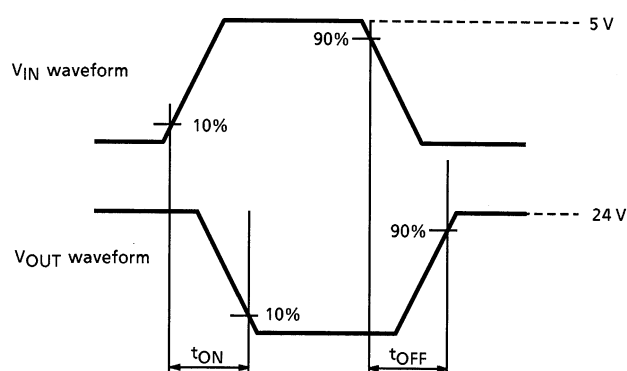
Test Circuit 1

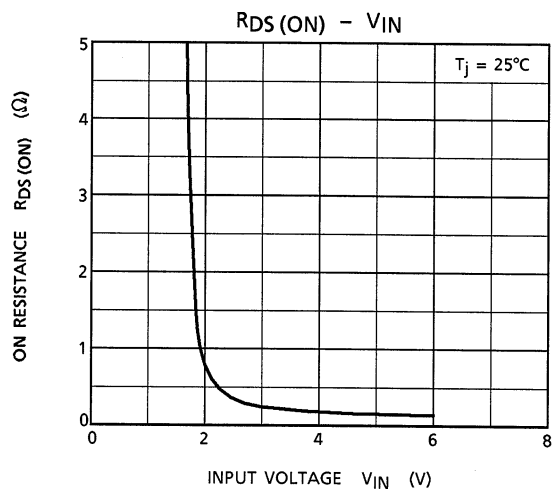
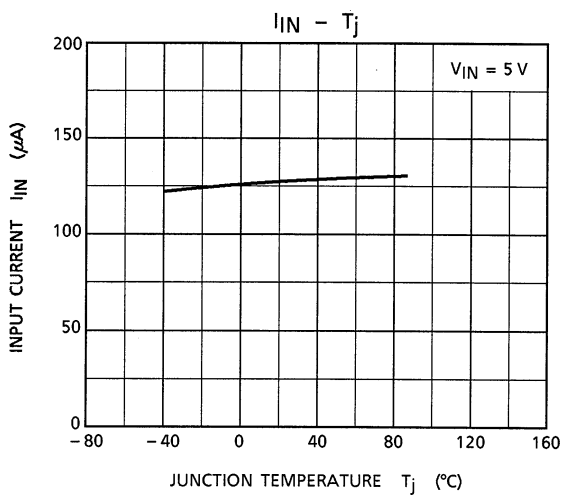
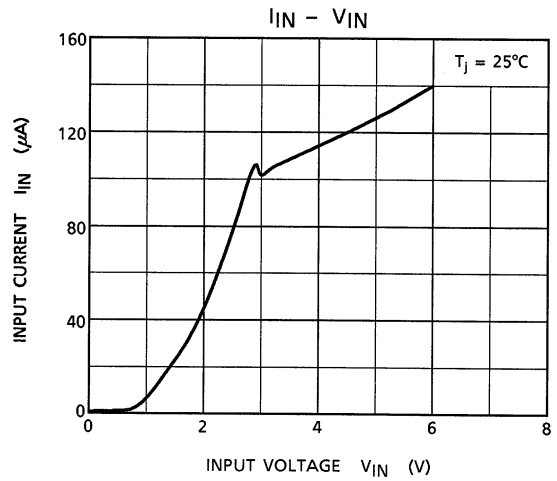
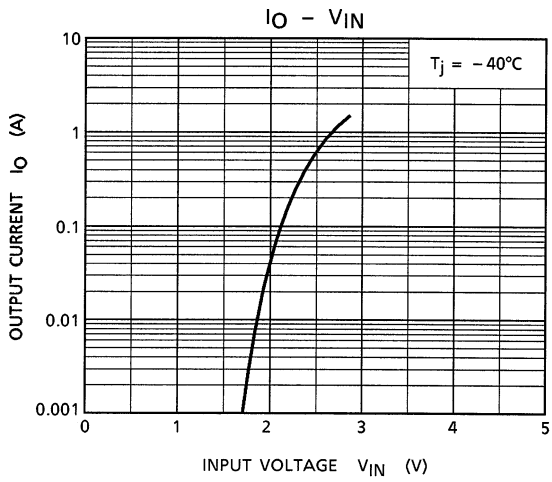
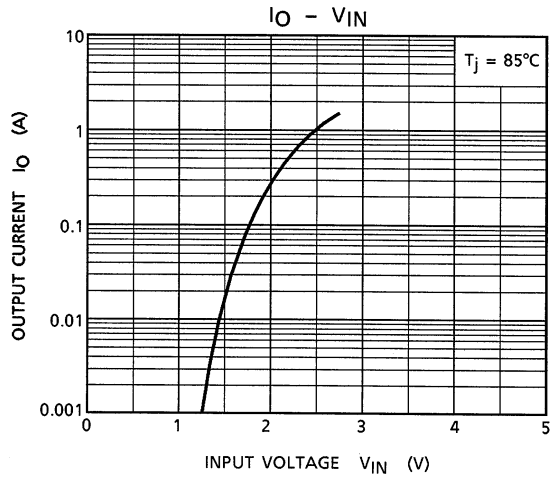
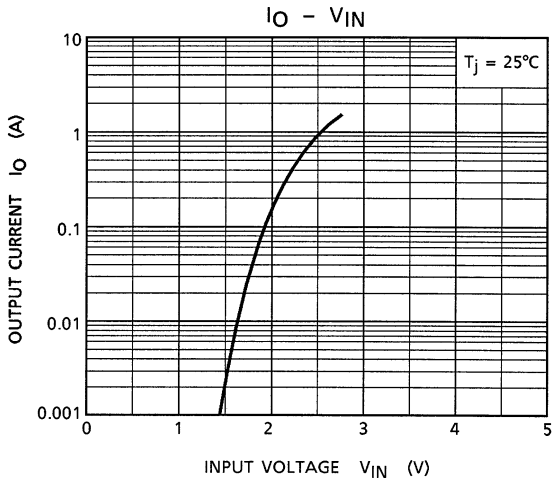
Switching time measuring circuit

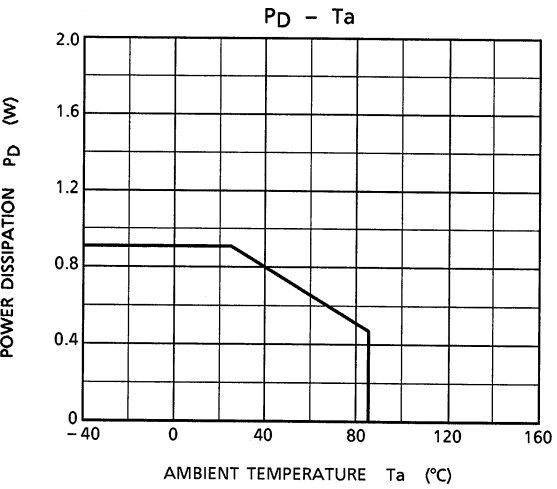
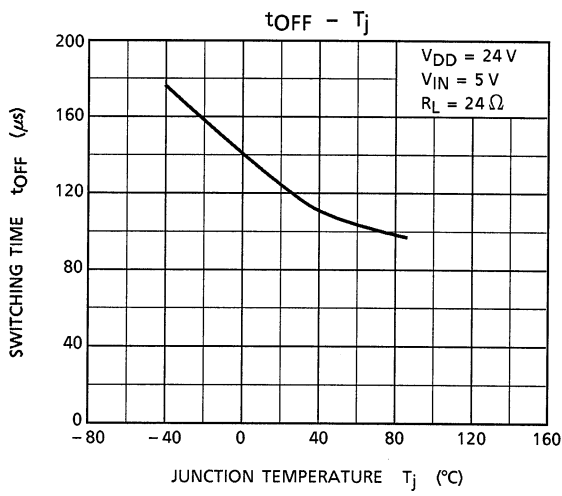
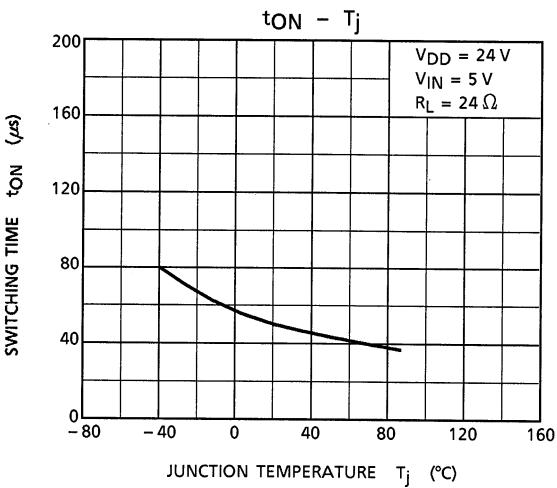
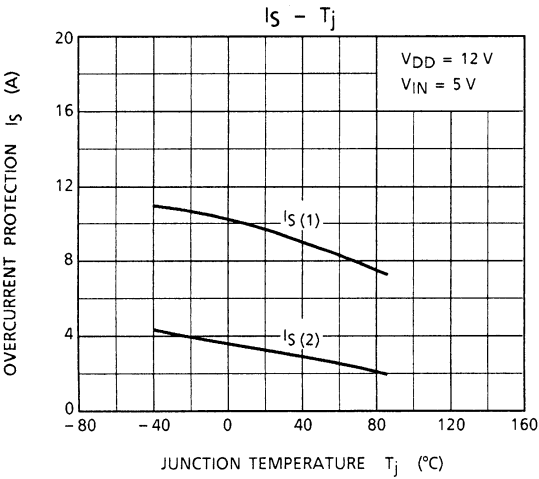
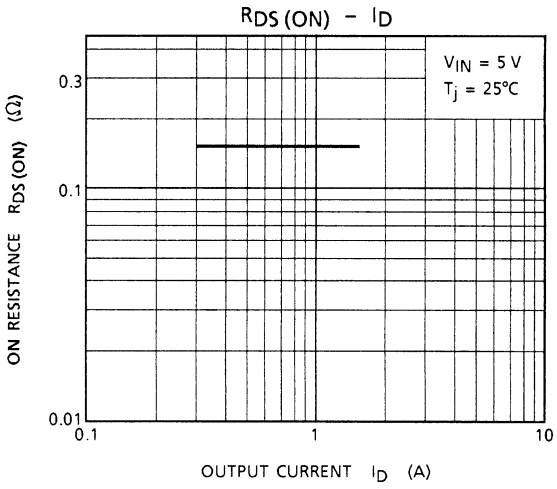
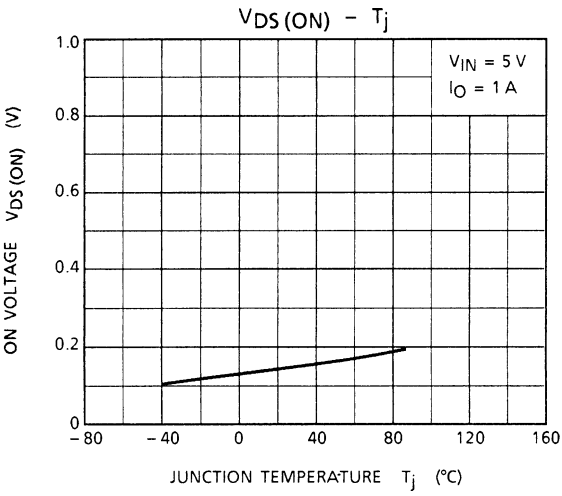
Test circuit



Measured waveforms



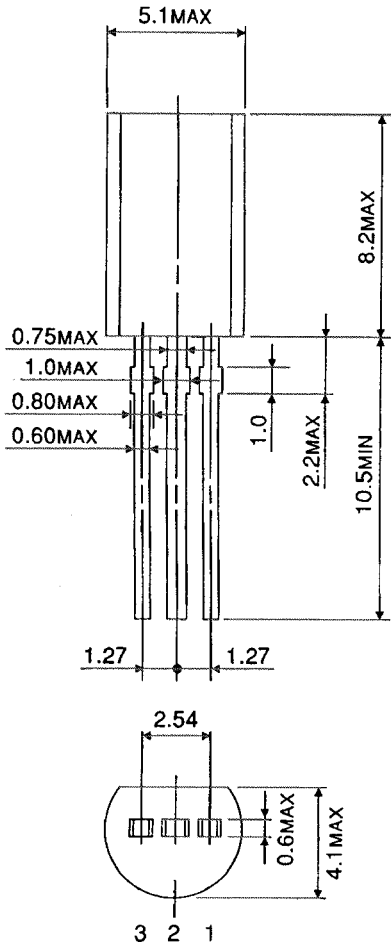




Package Dimensions

SSIP3-P-1.27B

Unit : mm



Weight: 0.36 g (typ.)

RESTRICTIONS ON PRODUCT USE

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