

TPD1024S

Low-side Power Switch for Motors, Solenoids, and Lamp Drivers

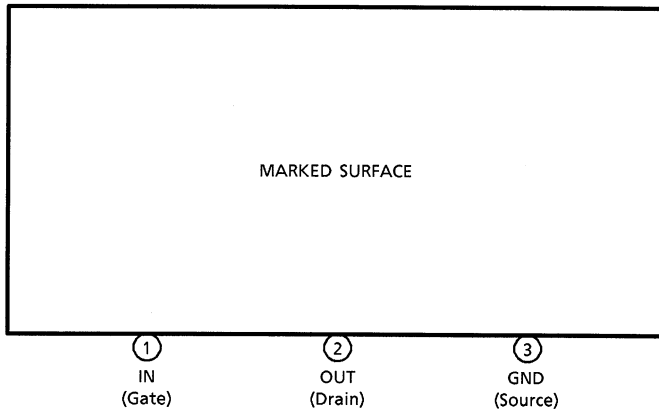
The TPD1024S is a monolithic power IC for low-side switches. The IC has a vertical MOS FET output which can be directly driven from a CMOS or TTL logic circuit (e.g., an MPU).

The device is equipped with an intelligent self-protection function.

Features

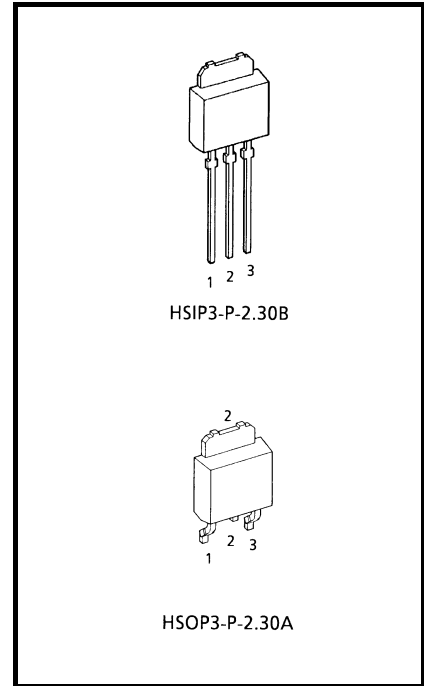
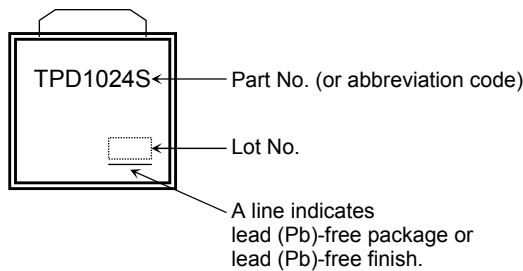
- A monolithic power IC with a new structure combining a control block and a vertical power MOS FET (n -MOS) on a single chip
- Can directly drive a power load from a CMOS logic.
- Built-in protection against overvoltage, load short-circuiting, and thermal shutdown
- Low on-resistance : $R_{DS(ON)} = 0.5 \Omega$ (max), (@ $V_{IN} = 5 V, T_j = 25^\circ C$)
- 3-pin power-molded package usable for surface mounting.

Pin Assignment



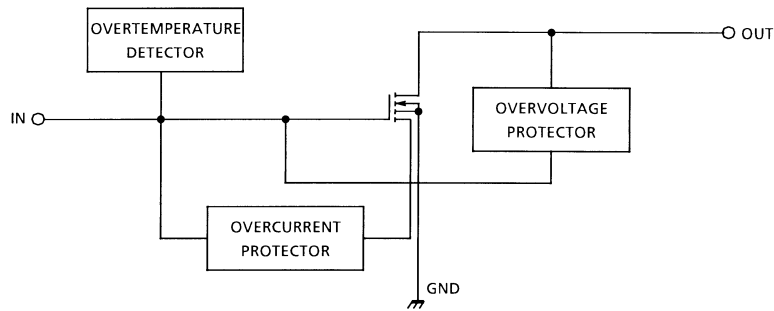
Note: Due to its MOS structure, this product is sensitive to static electricity.

Marking



| | |
|---------------|-----------------|
| Weight | |
| HSIP3-P-2.30B | : 0.36 g (typ.) |
| HSOP3-P-2.30A | : 0.28 g (typ.) |

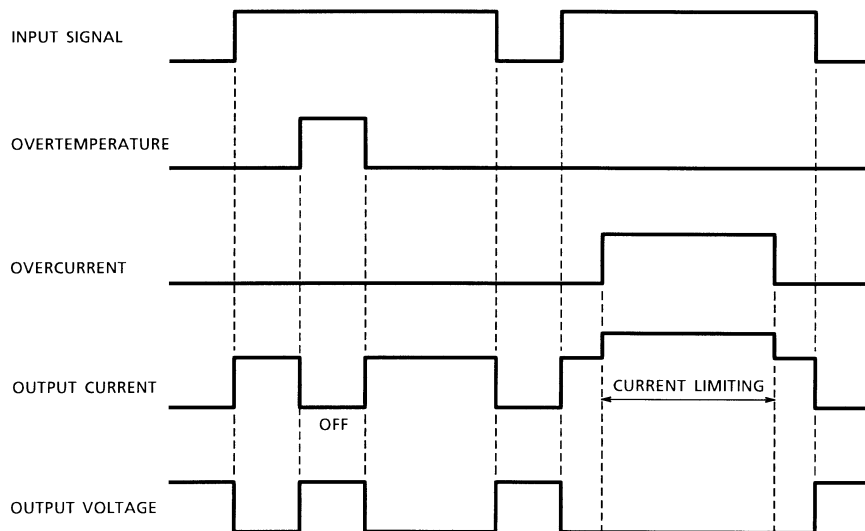
Block Diagram



Pin Description

| Pin No. | Symbol | Function |
|---------|--------|--|
| 1 | IN | Input pin. Input is CMOS-compatible, with pull-down resistor connected. Even if the input is open, output will not accidentally turn on. |
| 2 | OUT | Output pin. When current in excess of the typical current (3.5 A (typ.)) flows to the output pin, the current limiter operates to protect the IC. |
| 3 | GND | Ground pin. |

Timing Chart



Absolute Maximum Ratings (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_{GS} | -0.5 ~ 6 | V | |
| Power dissipation | P_D | Ta = 25°C | 1 | W |
| | | Tc = 25°C | 10 | |
| Operating temperature | T_{opr} | -40 ~ 85 | °C | |
| Junction temperature | T_j | 150 | °C | |
| Storage temperature | T_{stg} | -55 ~ 150 | °C | |

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.

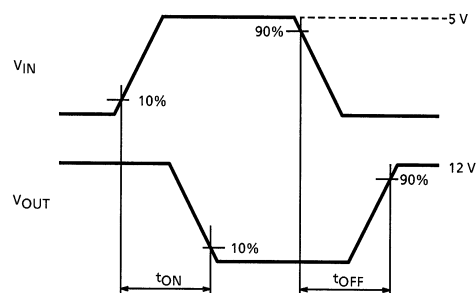
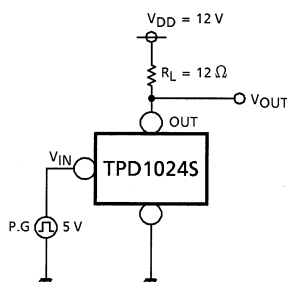
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/Derating Concept and Methods) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

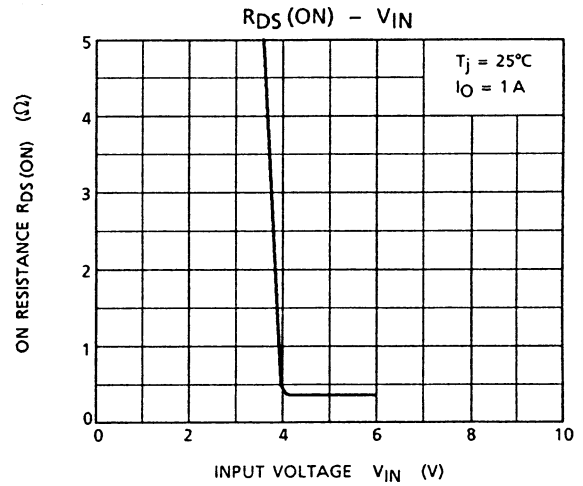
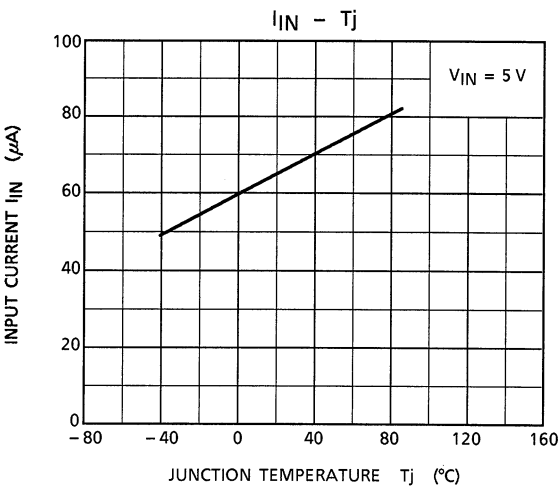
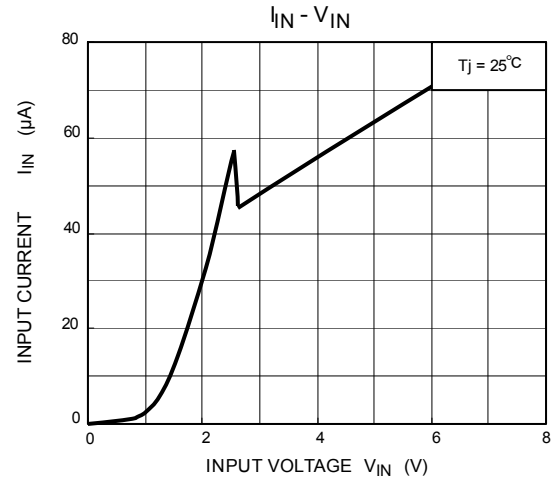
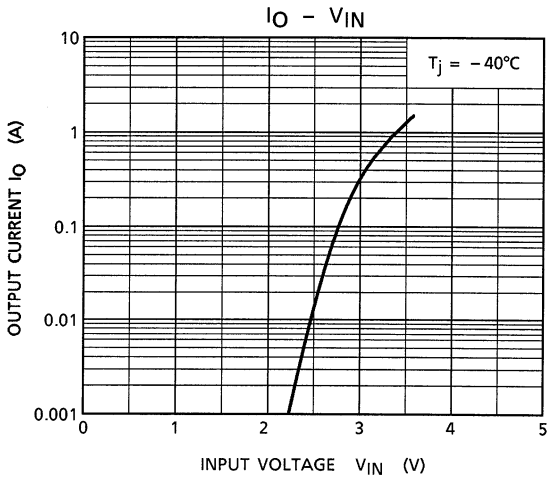
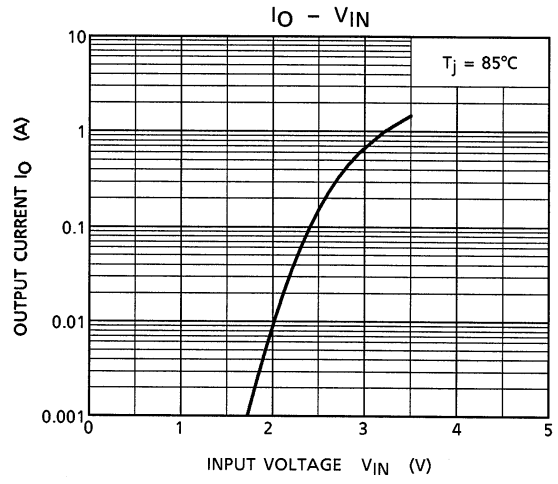
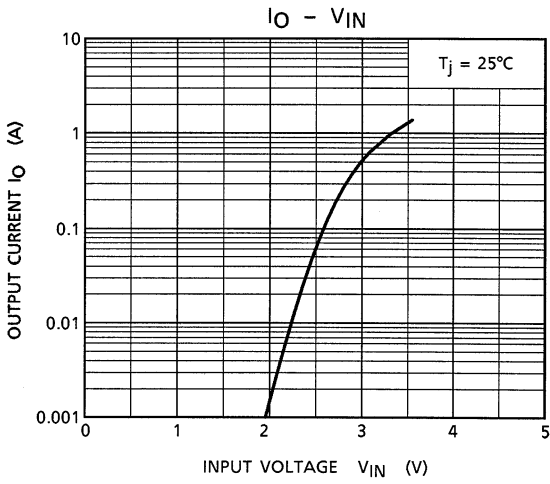
Electrical Characteristics (Tj = 25°C)

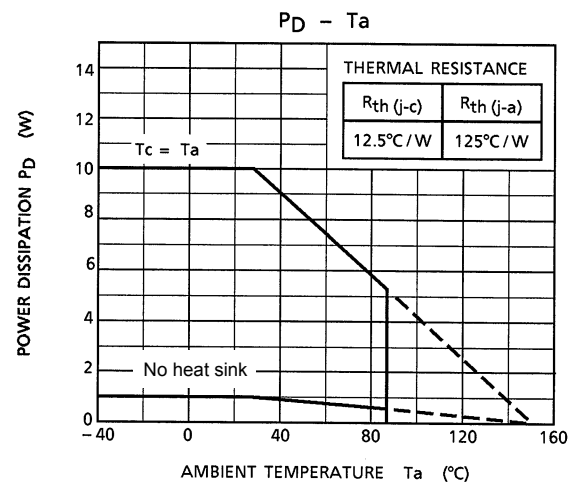
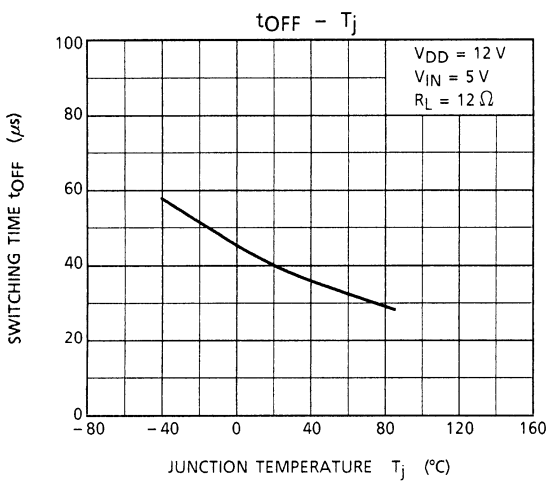
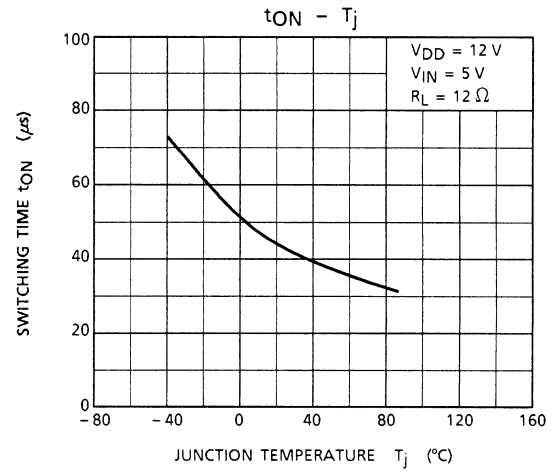
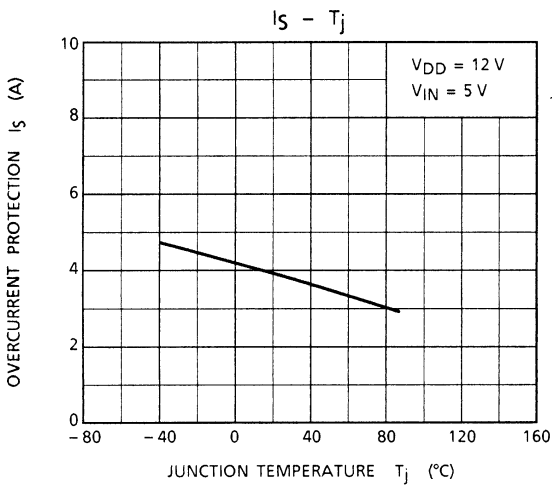
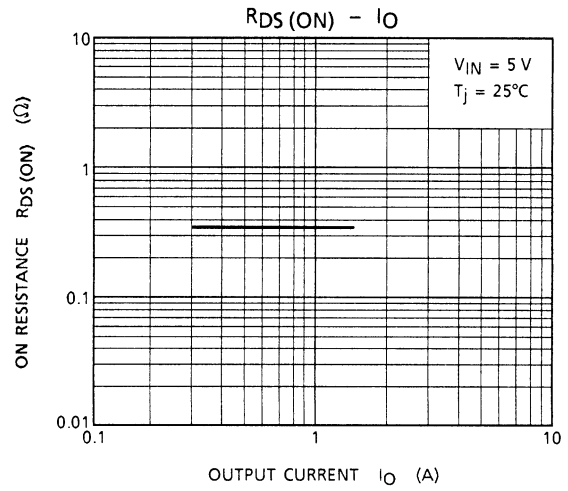
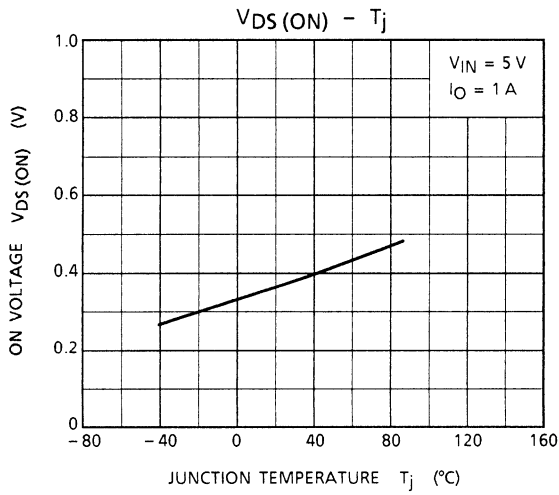
| Characteristic | Symbol | Test Circuit | Test Condition | Min | Typ. | Max | Unit |
|---|----------------|--------------|--|-----|------|-----|------|
| Drain-source breakdown voltage | $V_{(BR) DSS}$ | — | $V_{GS} = 0, I_D = 10 \text{ mA}$ | 40 | — | — | V |
| Operating supply voltage | V_{DD} (OPR) | — | — | — | — | 18 | V |
| Current at output off | I_{DSS} (1) | — | $V_{GS} = 0, V_{DS} = 40 \text{ V}$ | — | — | 3 | mA |
| | I_{DSS} (2) | — | $V_{GS} = 0, V_{DS} = 24 \text{ V}$ | — | — | 100 | μA |
| Input threshold voltage | V_{th} | — | $V_{DS} = 10 \text{ V}, I_D = 1 \text{ mA}$ | 0.8 | — | 2.5 | V |
| Input current | I_{GSS} | — | $V_{GS} = 5 \text{ V}$, at normal operation | — | — | 300 | μA |
| On resistance | R_{DS} (ON) | — | $V_{GS} = 5 \text{ V}, I_D = 1 \text{ A}$ | — | — | 0.5 | Ω |
| Thermal shutdown temperature | T_S | — | — | — | 160 | — | °C |
| Overcurrent protection | I_S | — | $V_{DS} = 12 \text{ V}, V_{GS} = 5 \text{ V}$ | — | 3.5 | — | A |
| Switching time | t_{ON} | 1 | $V_{DS} = 12 \text{ V}, V_{GS} = 5 \text{ V}$, $R_L = 12 \Omega$ | — | 50 | — | μs |
| | t_{OFF} | | | — | 10 | — | μs |
| Diode forward voltage Between drain and source | V_{DSF} | — | $I_F = 1.5 \text{ A}$ | — | 0.9 | 1.8 | V |
| Avalanche energy | E_A | — | L = 10 mH, Single pulse | 30 | — | — | mJ |

Test Circuit 1

Switching Time



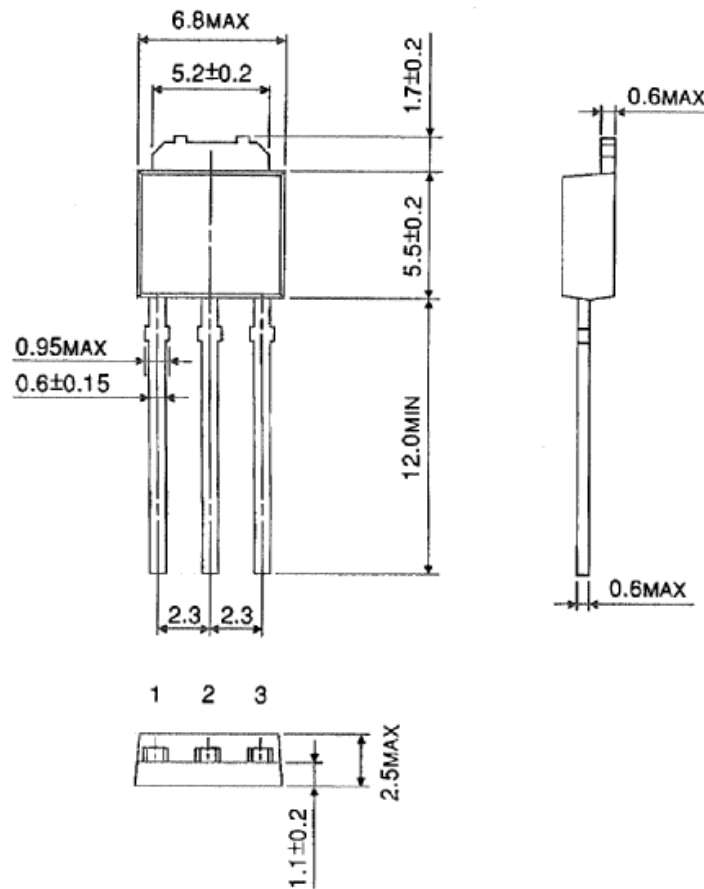




Package Dimensions

HSIP3_P_2.30B

Unit: mm

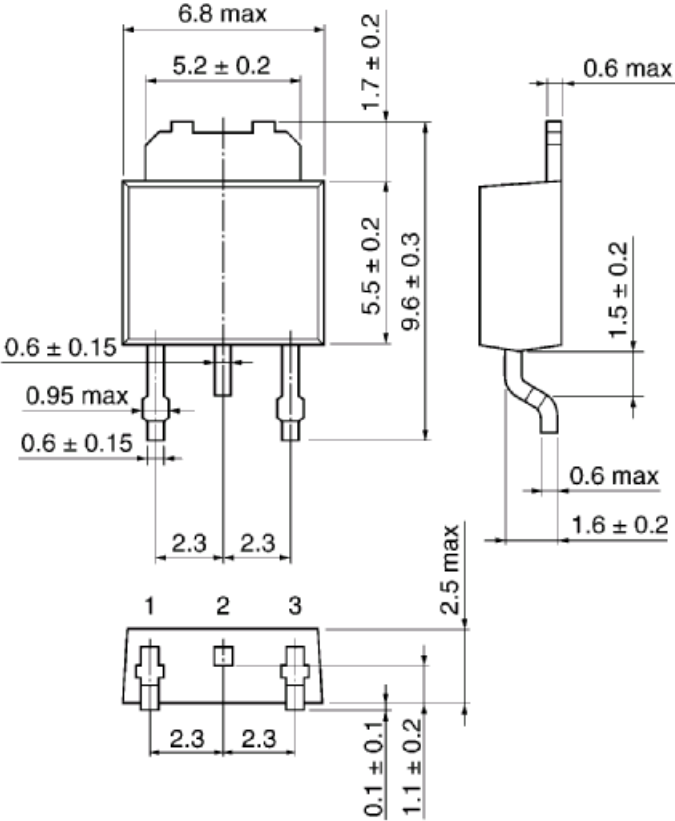


Weight: 0.36 g (typ.)

Package Dimensions

HSOP3_P_2.30A

Unit: mm



Weight: 0.28 g (typ.)

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