

TPD1037BS

Low-Side Switch for Motor, Solenoid and Lamp Drive

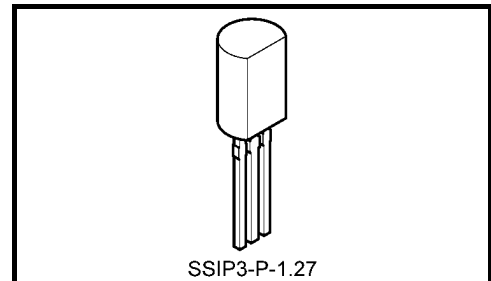
TPD1037BS is a monolithic power IC for low-side switch.

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.

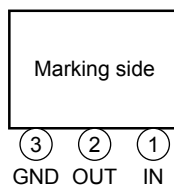
Features

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



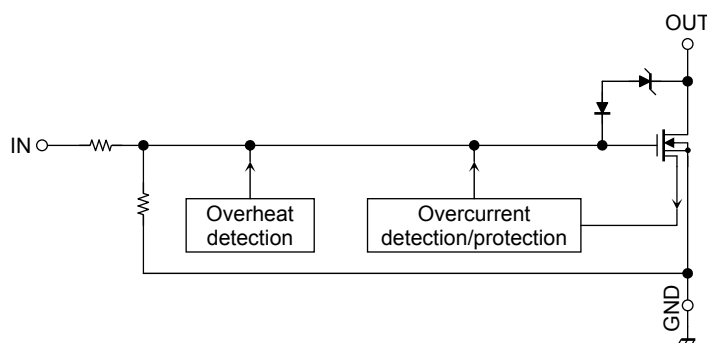
Weight: 0.36 g (typ.)

Pin Assignment



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

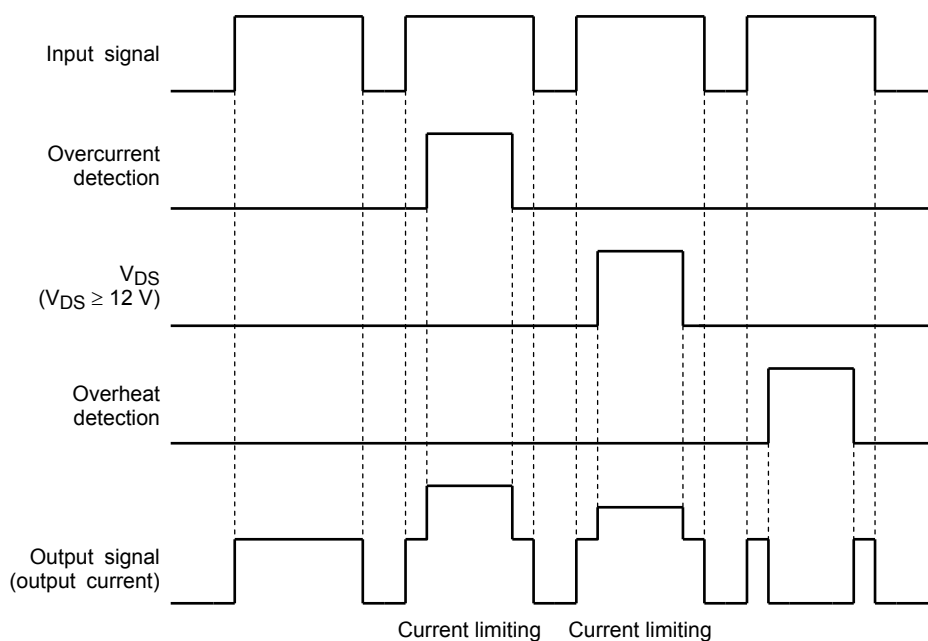
Block Diagram



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	V _{OUT}	Mode
L	H	Normal
H	L	
L	H	Overcurrent (during inrush)
H	L	
L	H	Overcurrent (shorted load)
H	L	
L	H	Overheat
H	H	

Absolute Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Drain-source voltage	V _{DS} (DC)	40	V
Output current	I _D	1.5	A
Input voltage	V _{IN}	–0.5 to 6	V
Power dissipation (Ta = 25°C)	P _D	0.9	W
Energy tolerance	ES/B	200	mJ
Operating temperature	T _{opr}	–40 to 85	°C
Junction temperature	T _j	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).

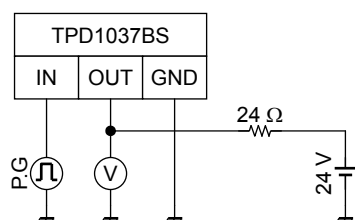
Electrical Characteristics (T_j = 25°C)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Drain-source breakdown voltage	V _{(BR) DSS}	—	V _{IN} = 0 V, I _D = 10 mA	40	—	—	V
High level input voltage	V _{IH}	—	V _{DS} = 10 to 40 V, I _D = 1 A	3.5	5	6	V
Low level input voltage	V _{IL}	—	V _{DS} = 10 to 40 V, I _D = 10 μA	—	—	0.8	V
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
Overheat protection	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

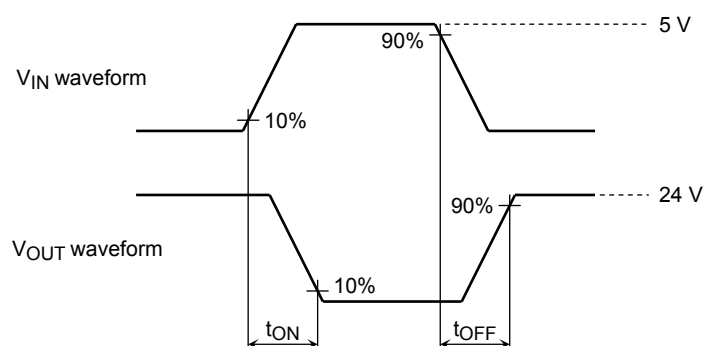
Test Circuit 1

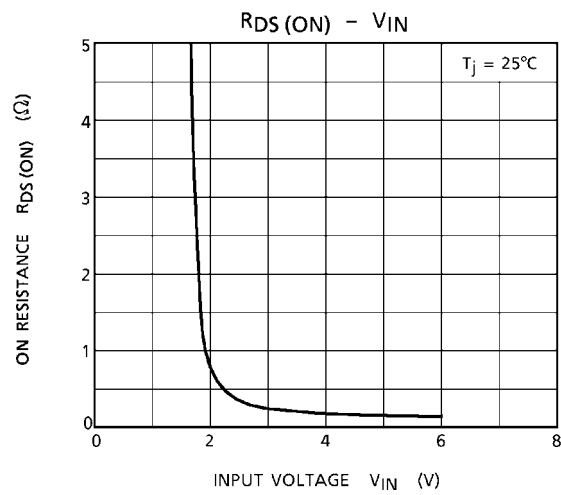
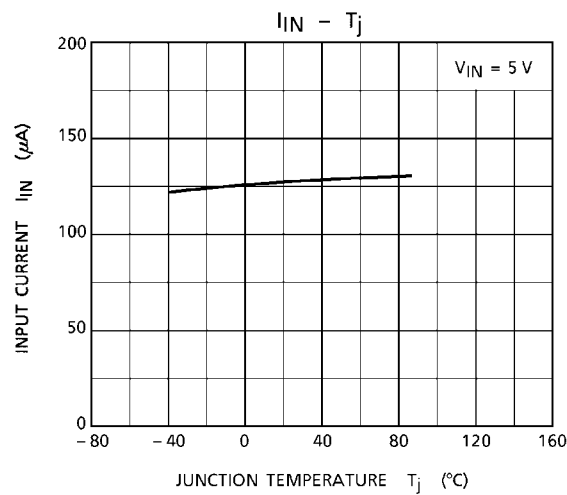
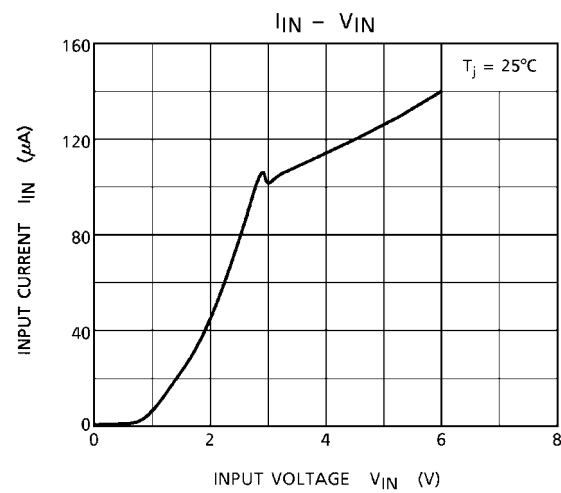
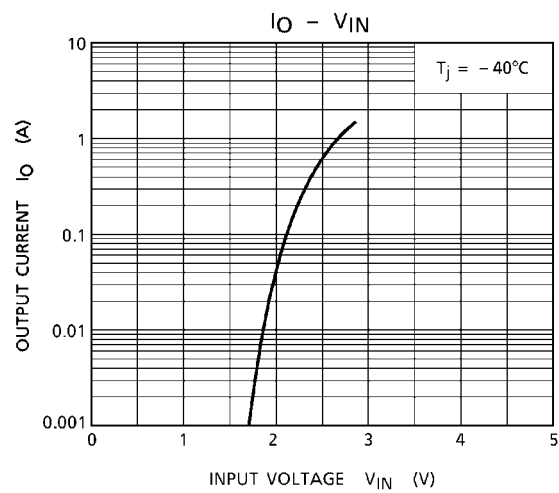
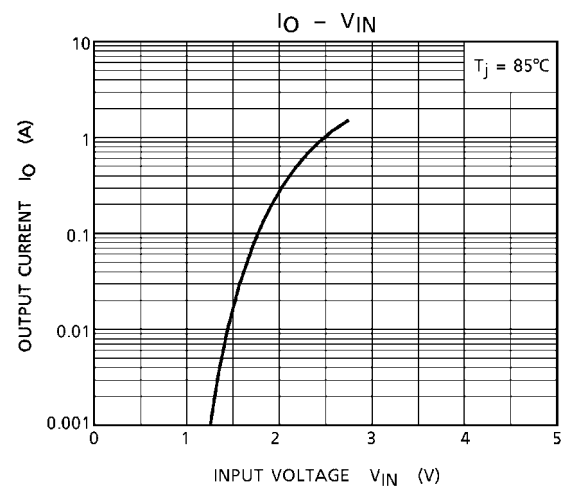
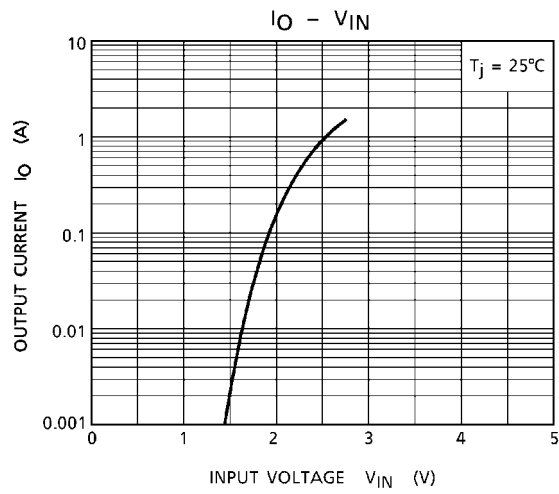
Switching Time Measuring Circuit

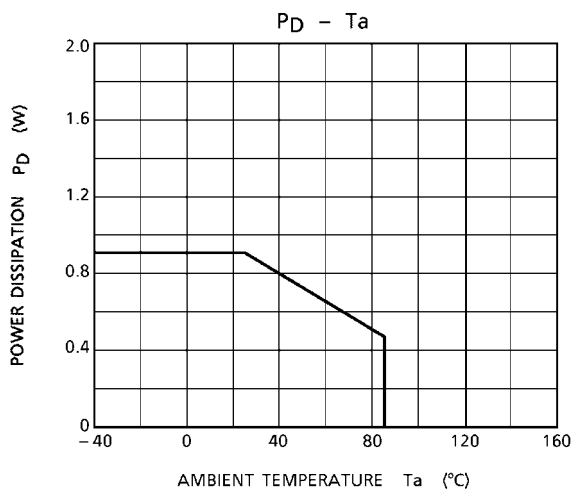
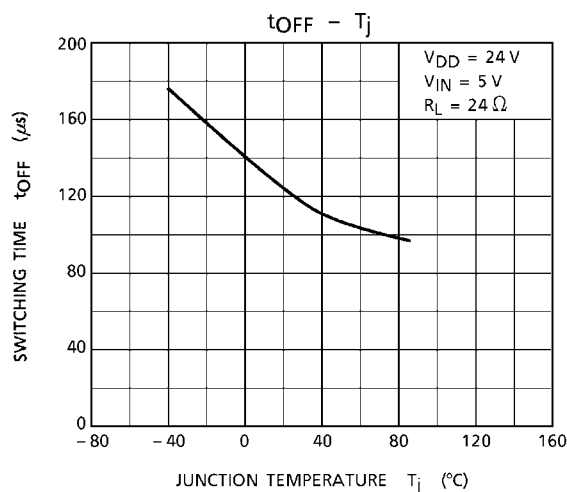
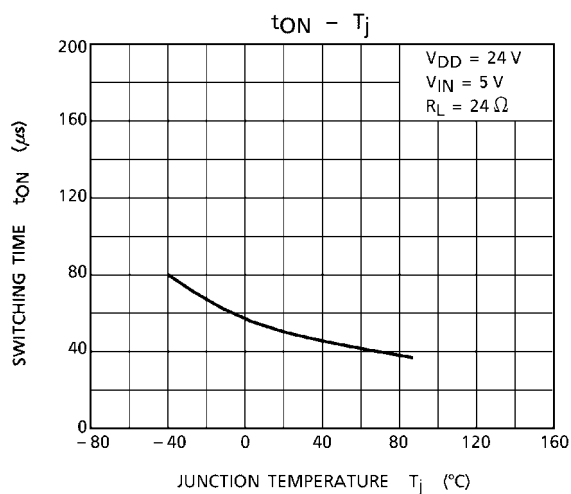
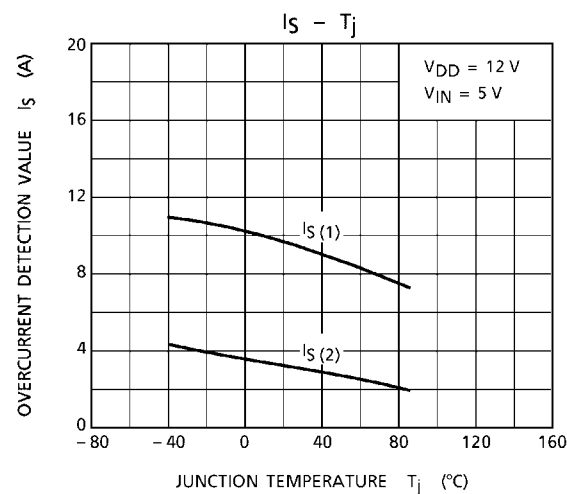
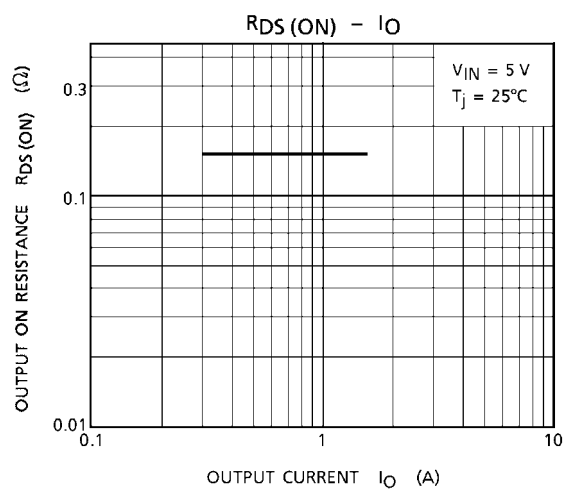
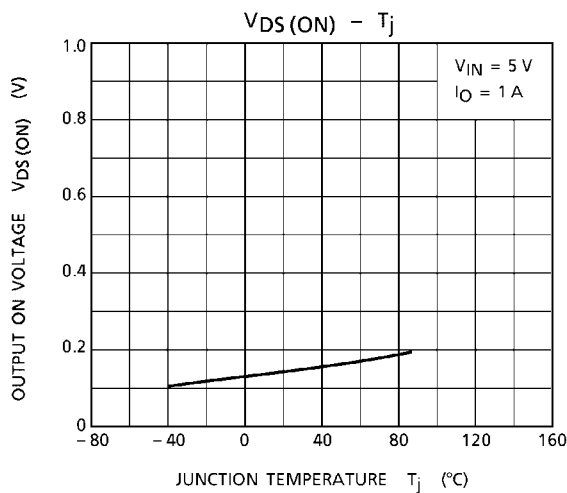
Test Circuit



Measured Waveforms



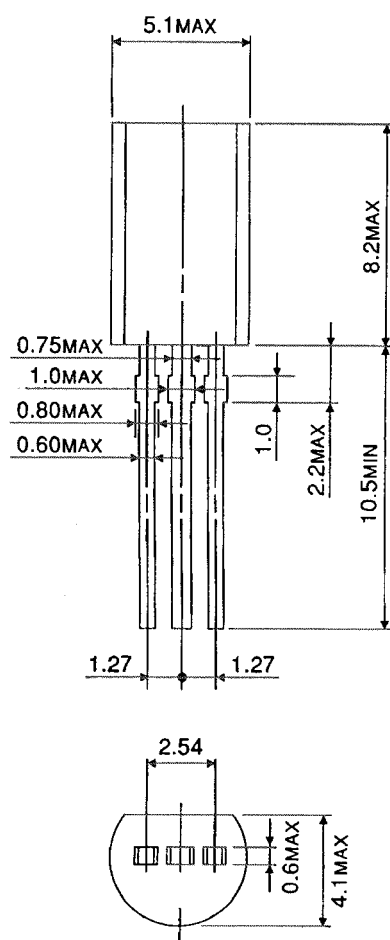




Package Dimensions

SSIP3-P-1.27

Unit : mm



Weight: 0.36 g (typ.)

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