

TOSHIBA Intelligent Power Device Silicon Monolithic Power MOS Integrated Circuit

TPD1024S

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

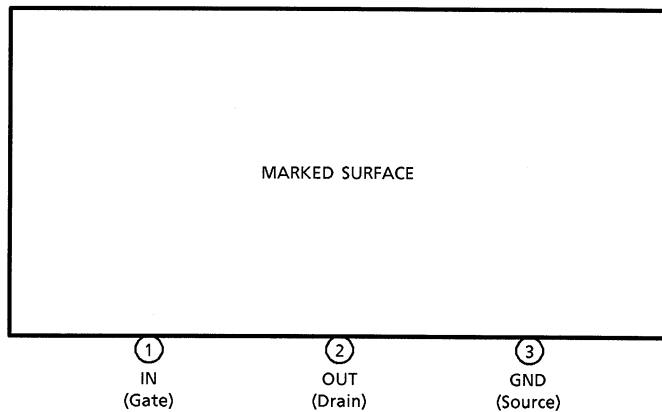
The TPD1024S is a monolithic power IC for low-side switches. The IC has a vertical MOS FET output which can be directly driven from a CMOS or TTL logic circuit (e.g., an MPU).

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

Features

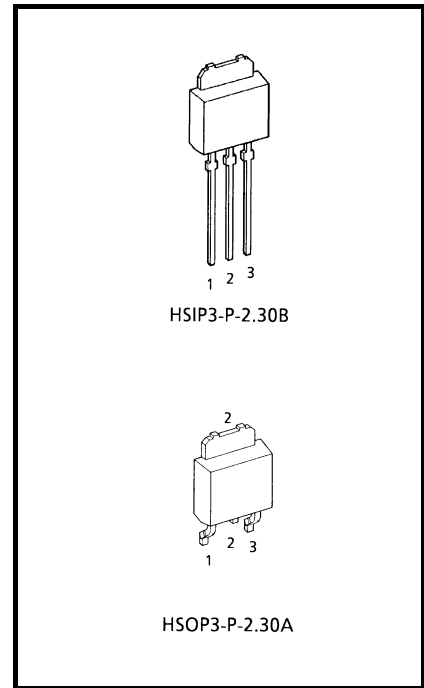
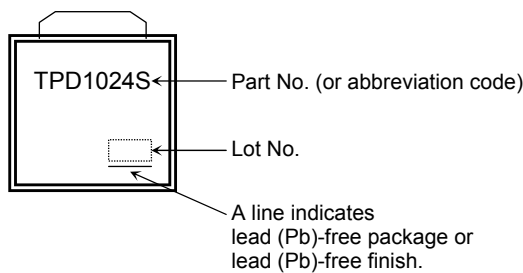
- A monolithic power IC with a new structure combining a control block and a vertical power MOS FET (n -MOS) on a single chip
- Can directly drive a power load from a CMOS logic.
- Built-in protection against overvoltage, load short-circuiting, and thermal shutdown
- Low on-resistance : $R_{DS(ON)} =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

Pin Assignment



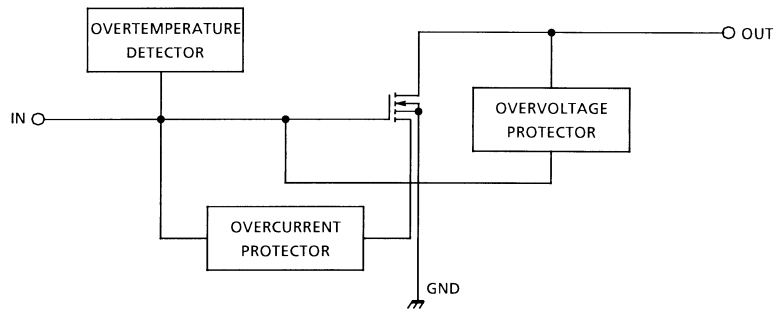
Note: Due to its MOS structure, this product is sensitive to static electricity.

Marking



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

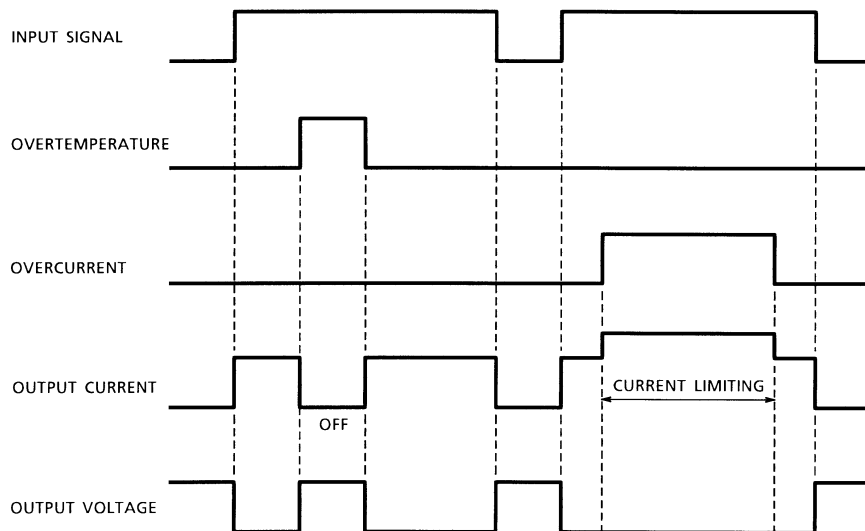
Block Diagram



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.

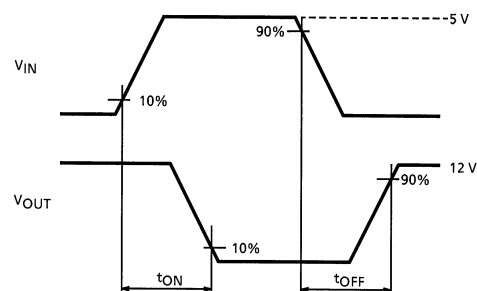
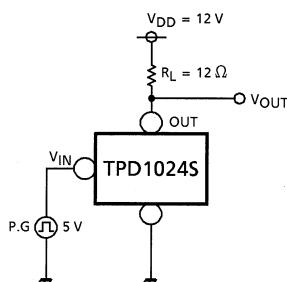
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/Derating Concept and Methods) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

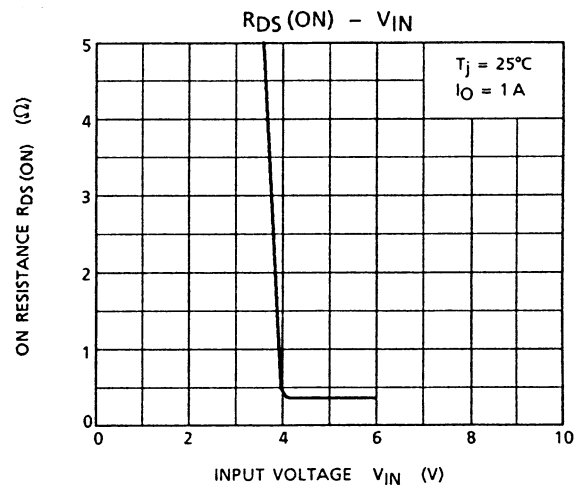
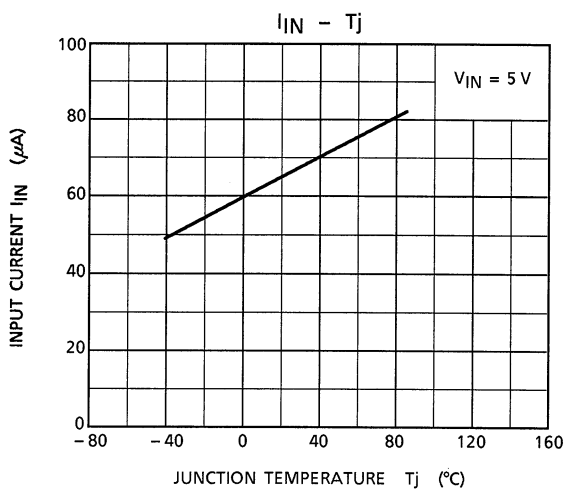
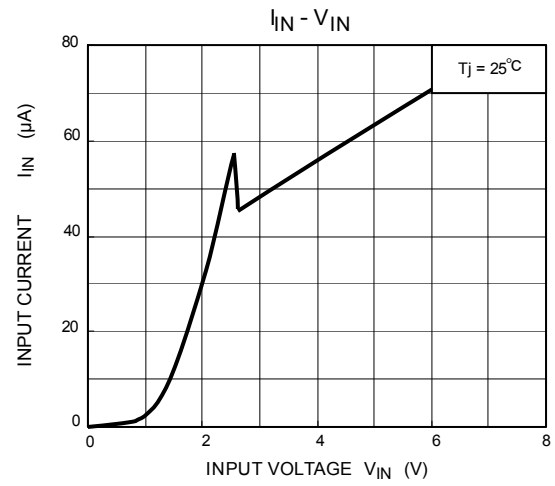
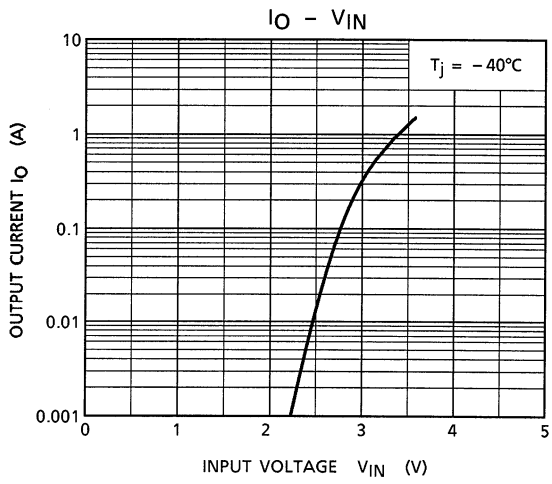
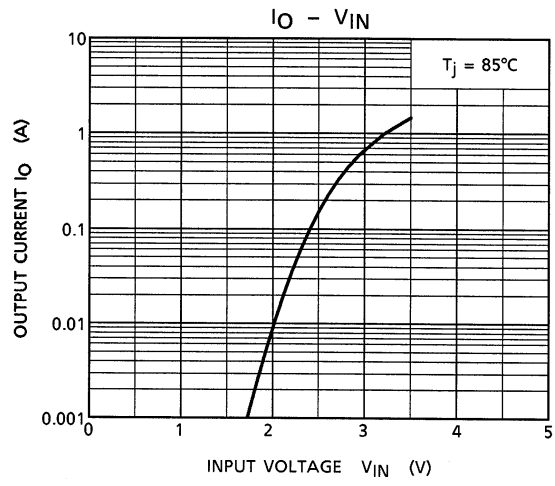
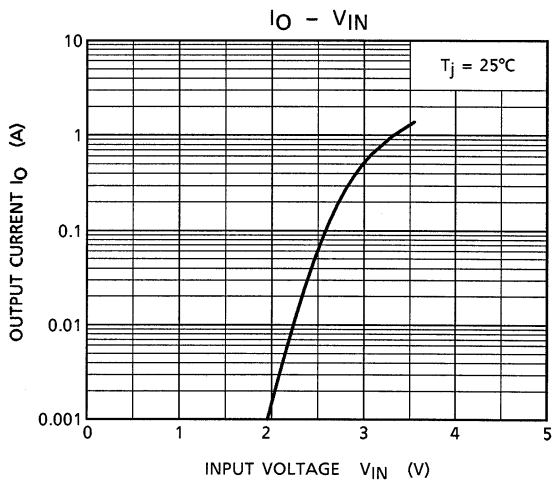
Electrical Characteristics (Tj = 25°C)

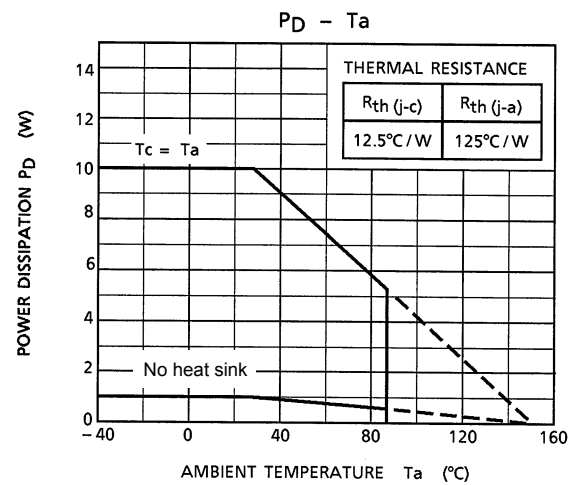
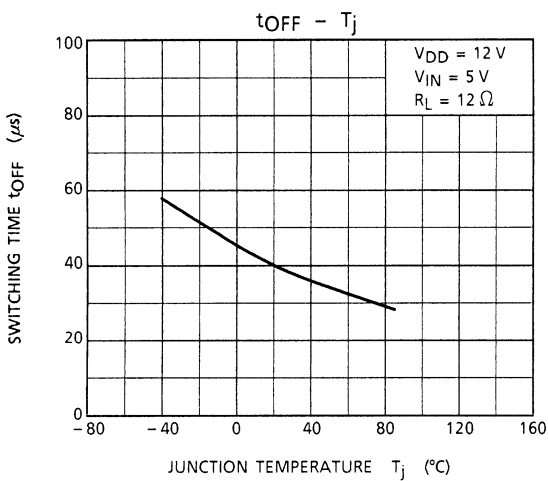
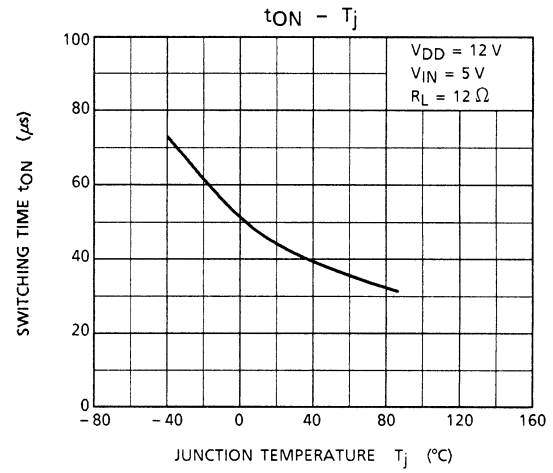
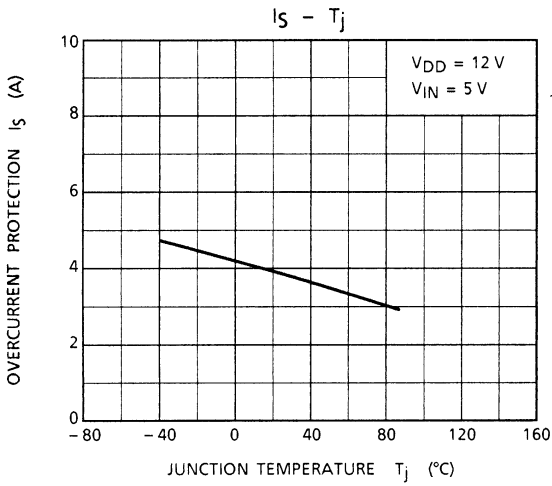
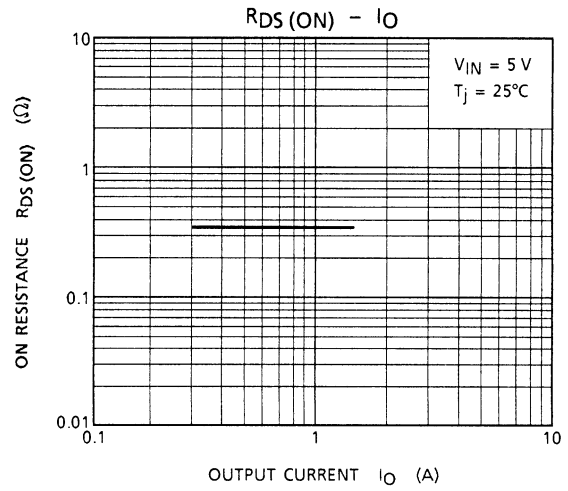
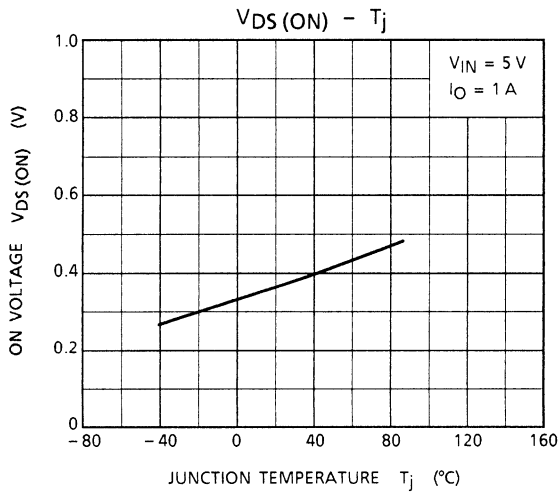
Characteristic	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Drain-source breakdown voltage	$V_{(BR) DSS}$	—	$V_{GS} = 0, I_D = 10 \text{ mA}$	40	—	—	V
Operating supply voltage	V_{DD} (OPR)	—	—	—	—	18	V
Current at output off	I_{DSS} (1)	—	$V_{GS} = 0, V_{DS} = 40 \text{ V}$	—	—	3	mA
	I_{DSS} (2)	—	$V_{GS} = 0, V_{DS} = 24 \text{ V}$	—	—	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



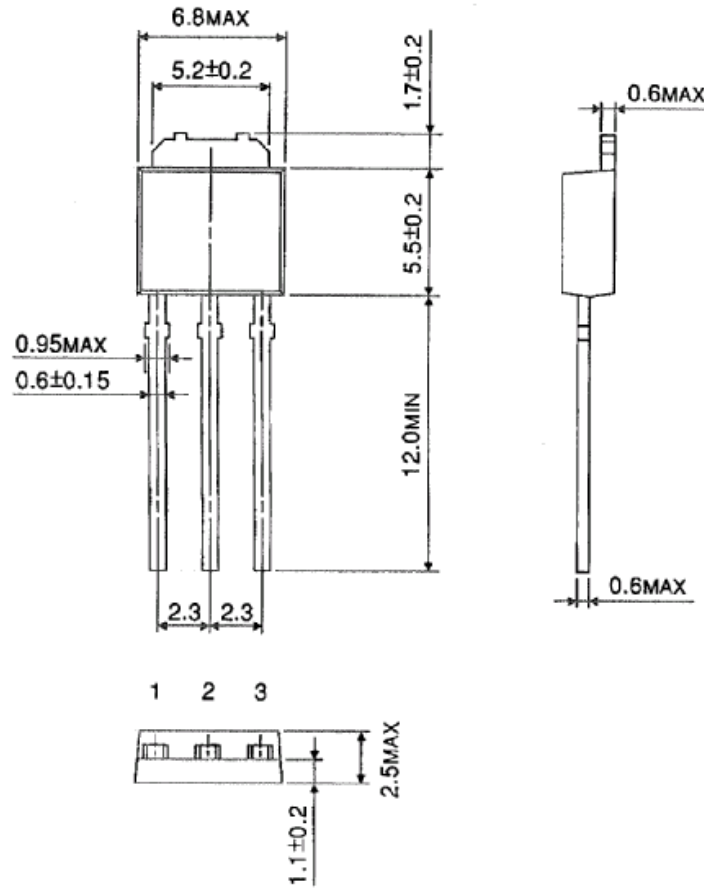




Package Dimensions

HSIP3_P_2.30B

Unit: mm

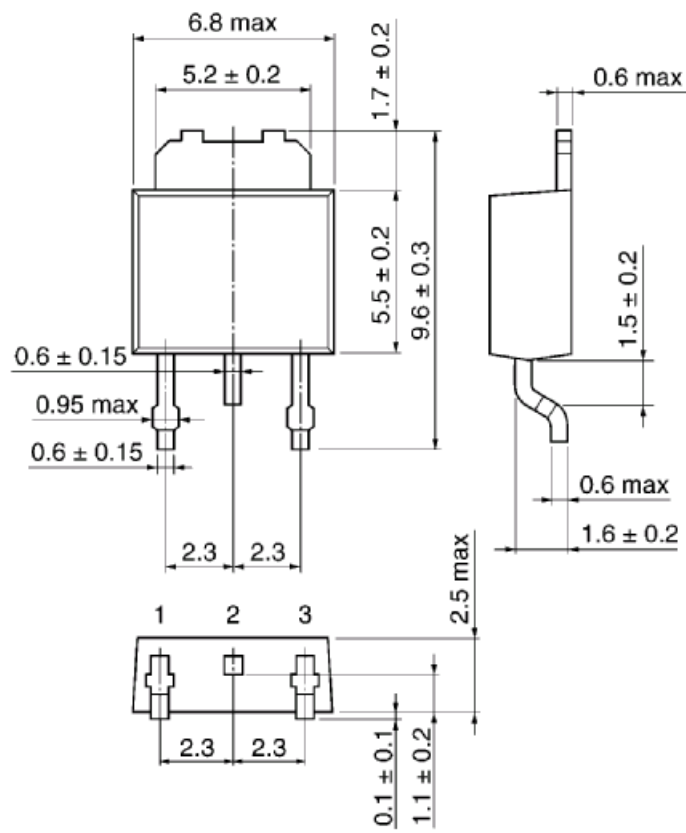


Weight: 0.36 g (typ.)

Package Dimensions

HSOP3_P_2.30A

Unit: mm



Weight: 0.28 g (typ.)

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