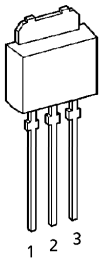
TOSHIBA INTELLIGENT POWER DEVICE SILICON MONOLITHIC POWER MOS INTEGRATED CIRCUIT

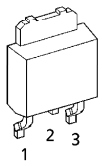
TPD1024S

LOW-SIDE POWER SWITCH for MOTORS, SOLENOIDS, and LAMP DRIVERS

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 offers intelligent self-protection function.



HSIP3-P-2.30B



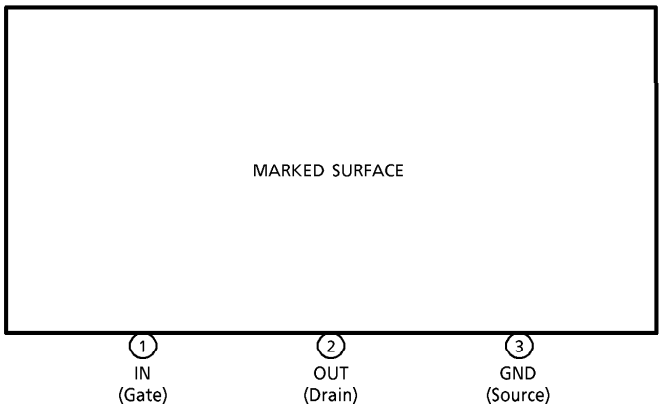
HSOP3-P-2.30A

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

FEATURES

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

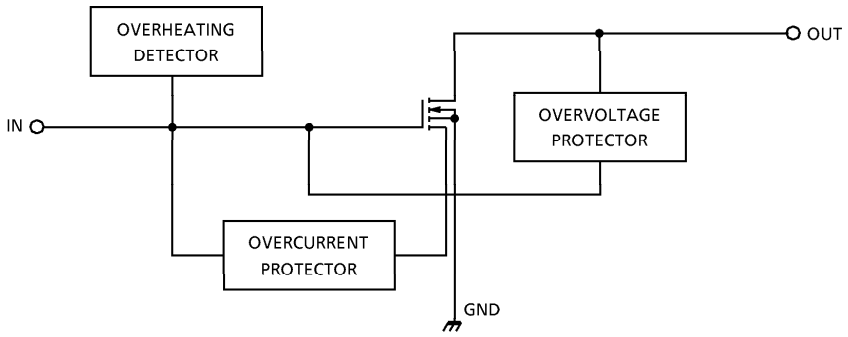
PIN ASSIGNMENT



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

980910EBA1

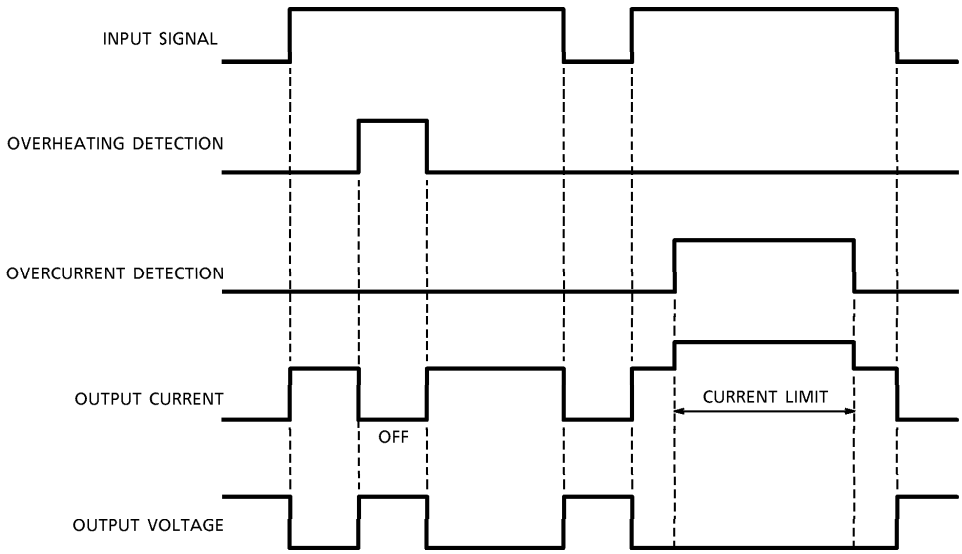
BLOCK DIAGRAM



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) flows to the output pin, the current limiter operates to protect the IC.
3	GND	Ground pin.

TIMING CHART



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	Ta = 25°C	P_D	1	W
	Tc = 25°C		10	
Operating Temperature		T_{opr}	−40~85	°C
Junction Temperature		Tj	150	°C
Storage Temperature		T_{stg}	−55~150	°C

RECOMMENDABLE CONDITION

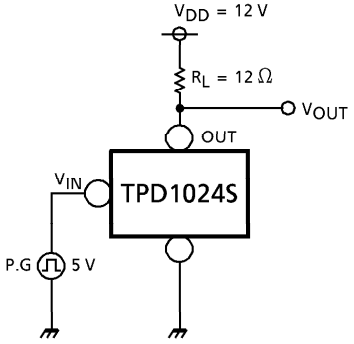
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN	TYP.	MAX	UNIT
Input Voltage	V_{IN}	—	4.5	5	6	V

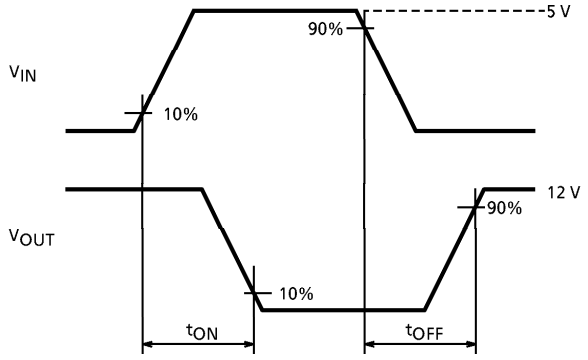
ELECTRICAL CHARACTERISTICS (T_j = 25°C)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
Drain-source Breakdown Voltage	$V_{(BR)\ DSS}$	—	V_{GS} = 0, I_D = 10 mA	40	—	—	V
Operating Supply Voltage	$V_{DD\ (OPR)}$	—	—	—	—	18	V
Current at Output Off	$I_{DSS\ (1)}$	—	V_{GS} = 0, V_{DS} = 40 V	—	—	3	mA
	$I_{DSS\ (2)}$	—	V_{GS} = 0, V_{DS} = 24 V	—	—	100	μA
Input Threshold Voltage	V_{th}	—	V_{DS} = 10 V, I_D = 1 mA	0.8	—	2.5	V
Input Current	I_{GSS}	—	V_{GS} = 5 V, at normal operation	—	—	300	μA
On Resistance	$R_{DS\ (ON)}$	—	V_{GS} = 5 V, I_D = 1 A	—	—	0.5	Ω
Overheating Protection	T_S	—	—	—	160	—	°C
Overcurrent Protection	I_S	—	V_{DS} = 12 V, V_{GS} = 5 V	—	3.5	—	A
Switching Time	t_{ON}	1	V_{DS} = 12 V, V_{GS} = 5 V, R_L = 12 Ω	—	50	—	μs
	t_{OFF}			—	10	—	μs
Diode Forward Voltage Between Drain and Source	V_{DSF}	—	I_F = 1.5 A	—	0.9	1.8	V
Avalanche Energy Rating	E_A	—	L = 10 mH, Single-shot pulse	30	—	—	mJ

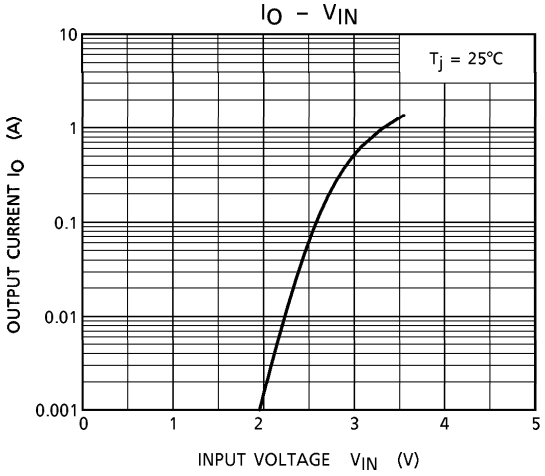
TEST CIRCUIT 1

Switching Time

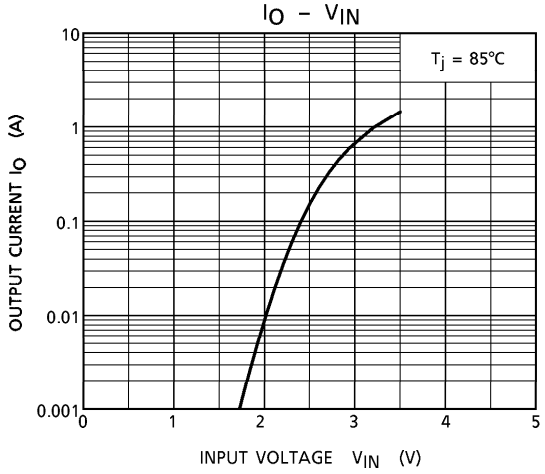




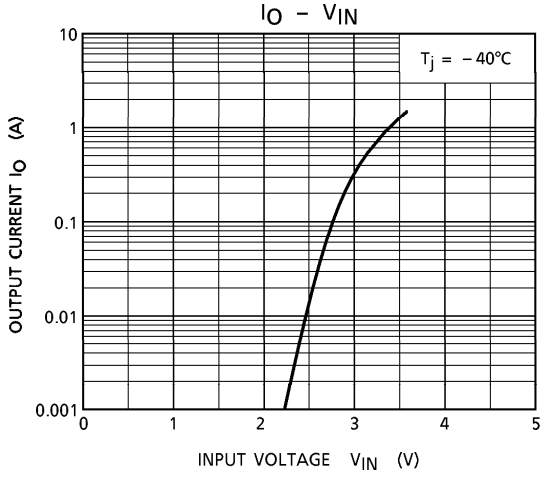
I_O – V_{IN}



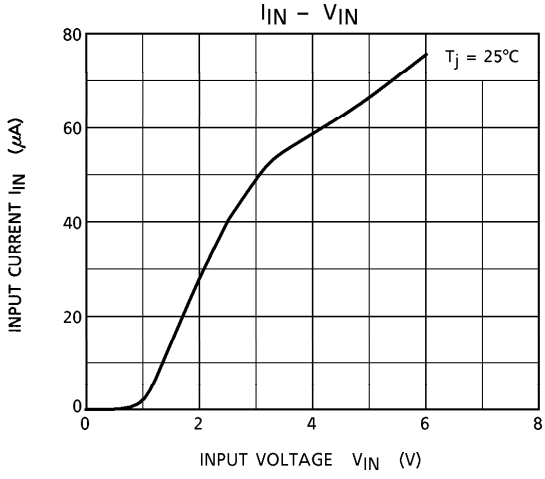
I_O – V_{IN}



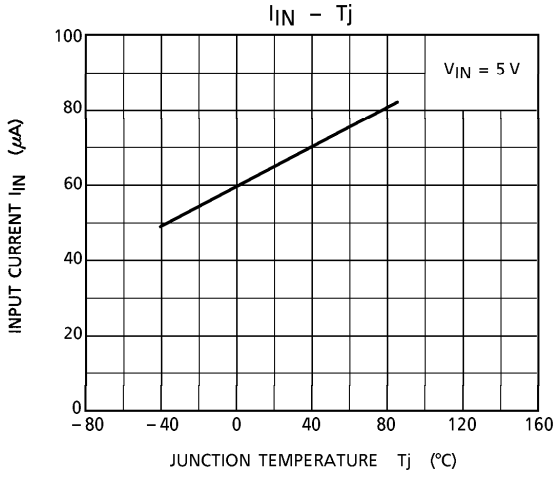
I_O – V_{IN}



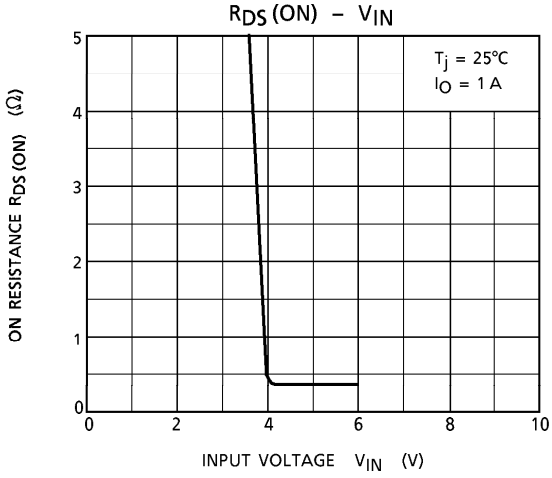
I_{IN} – V_{IN}



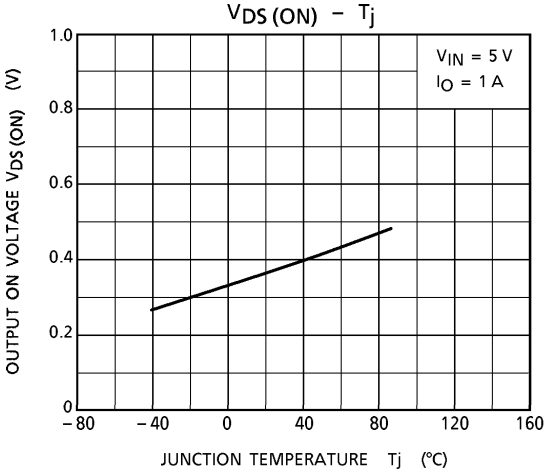
I_{IN} – Tj



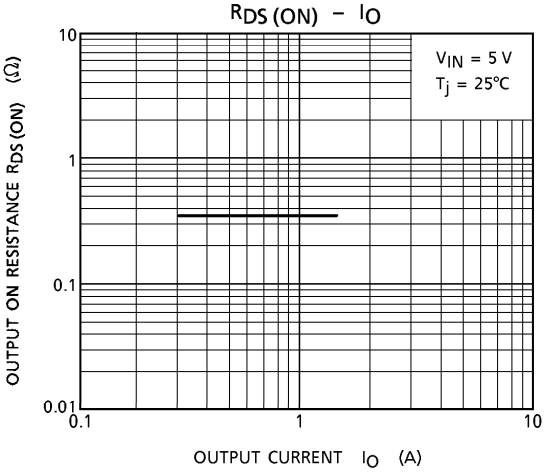
R_{DS} (ON) – V_{IN}



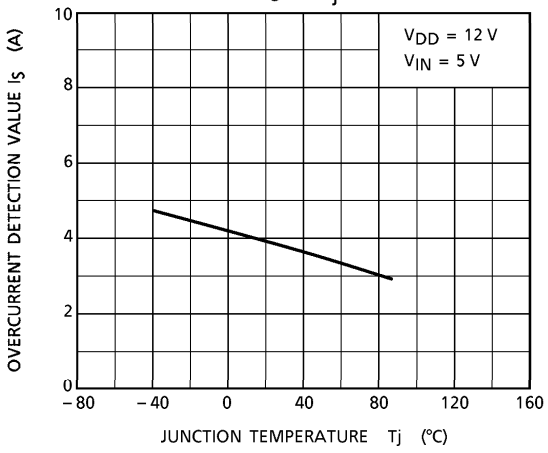
$V_{DS\,(ON)}$ – T_j



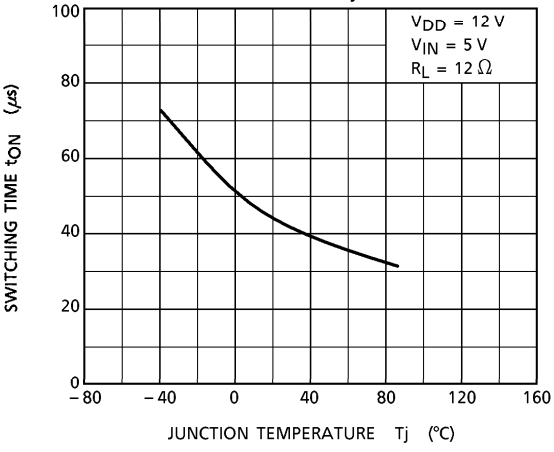
$R_{DS\,(ON)}$ – I_O



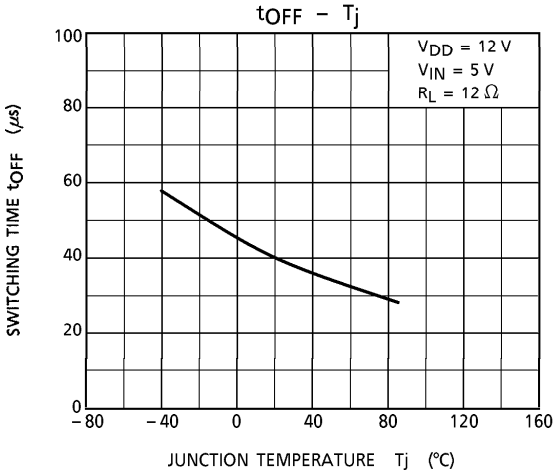
I_S – T_j



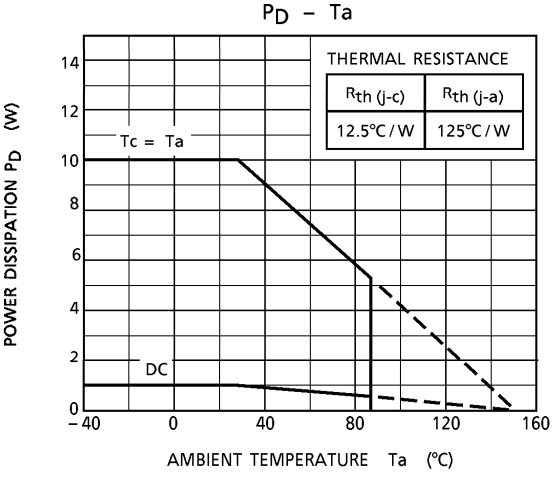
t_{ON} – T_j



t_{OFF} – T_j



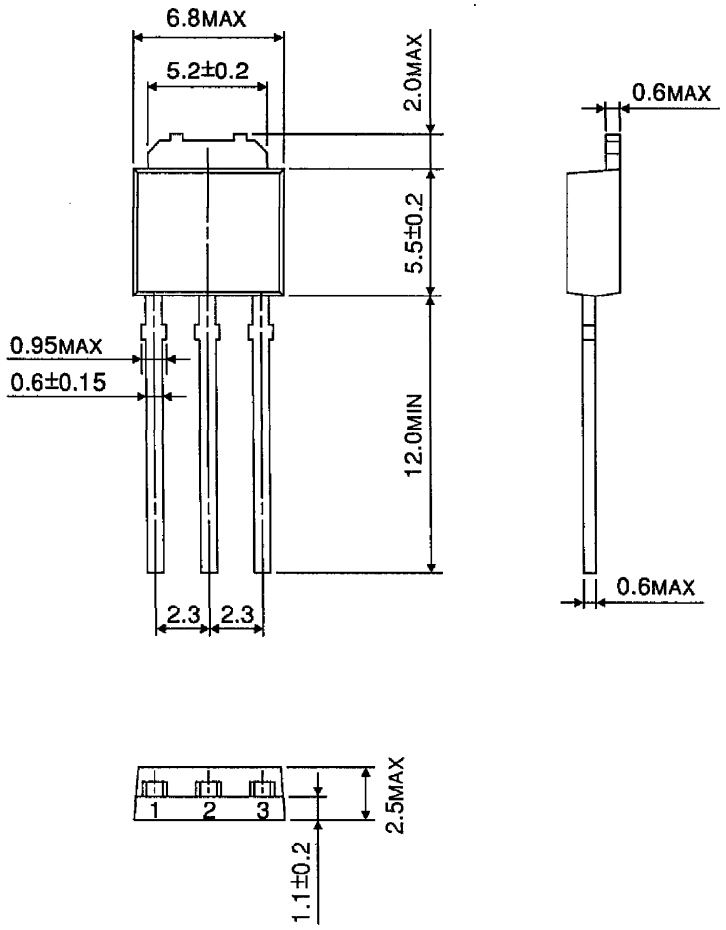
P_D – Ta



OUTLINE DRAWING

HSIP3-P-2.30B

Unit : mm

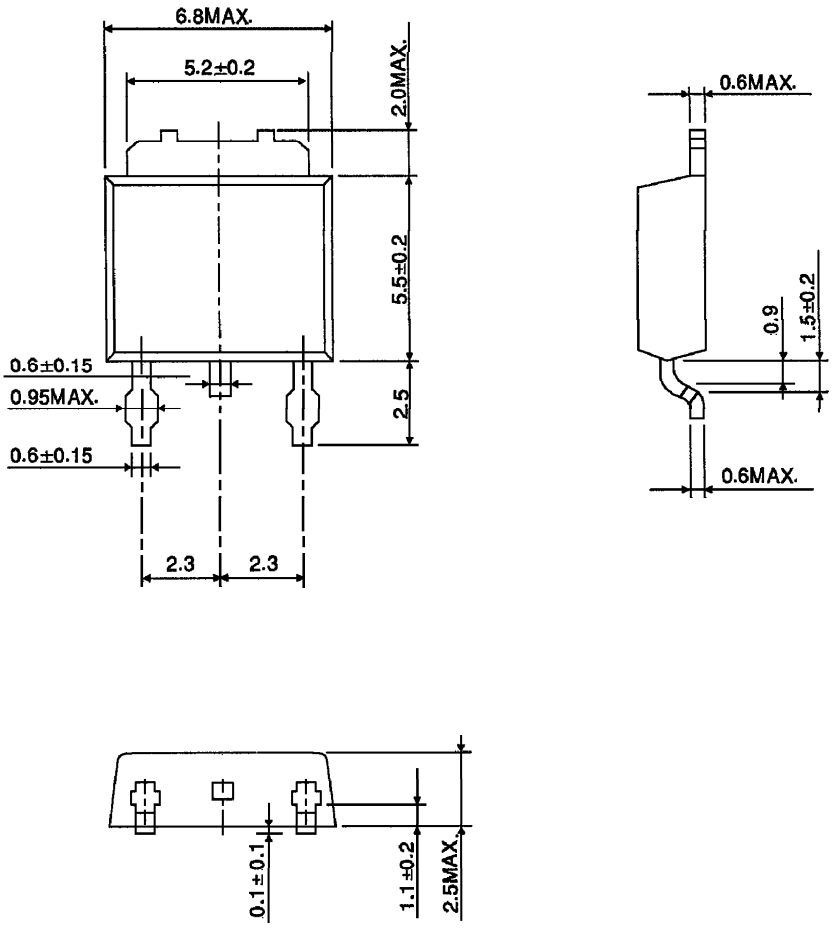


Weight : 0.36 g (Typ.)

OUTLINE DRAWING

HSOP3-P-2.30A

Unit : mm



Weight : 0.28 g (Typ.)