

TOSHIBA INTELLIGENT POWER DEVICE SILICON MONOLITHIC POWER MOS IC

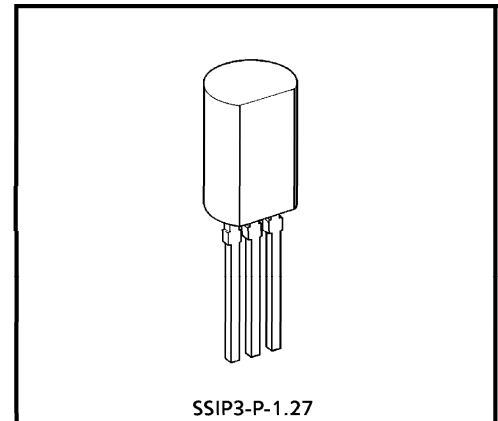
TPD1028BS

LOW-SIDE SWITCH FOR MOTOR, SOLENOID AND LAMP DRIVE

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.

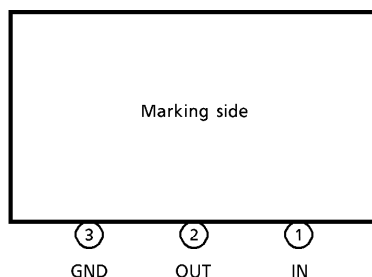
FEATURES

- A monolithic power IC with a new structure combining a control block and a vertical power MOSFET (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. $R_{DS(ON)} = 0.25$ (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

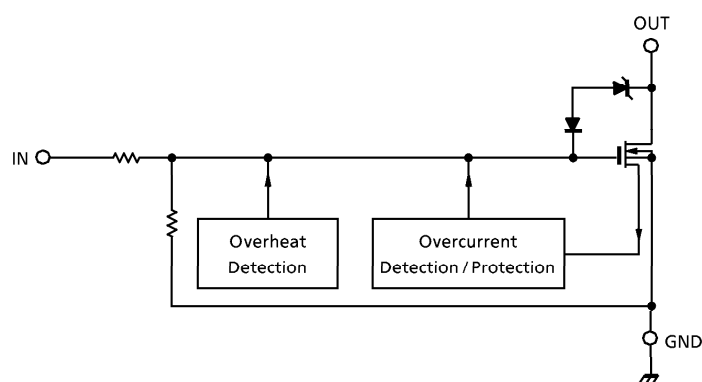


(Note) That because of its MOS structure, this product is sensitive to static electricity.

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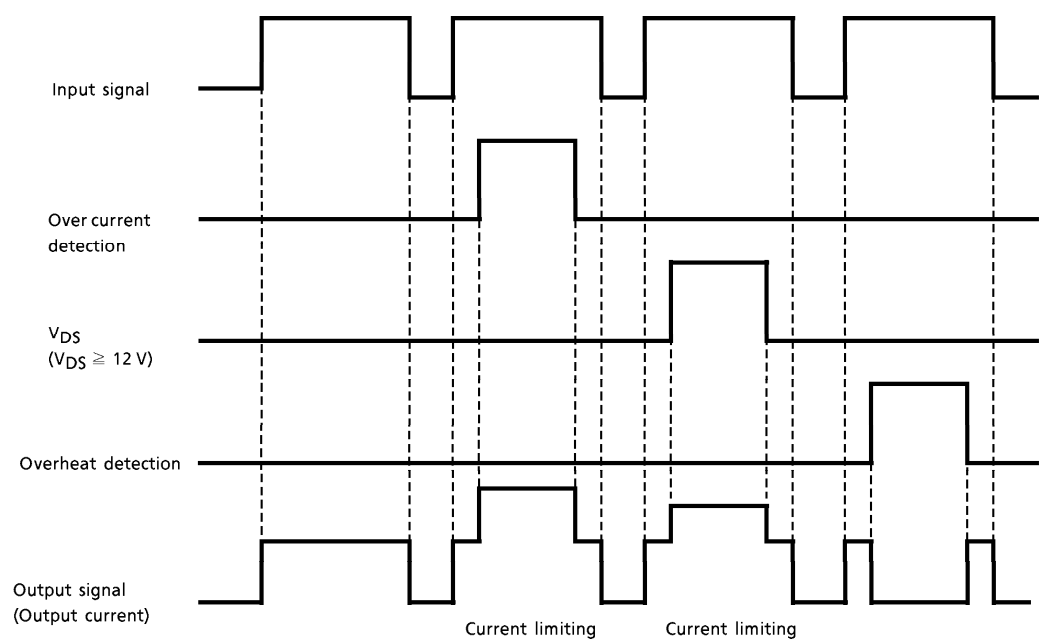
BLOCK DIAGRAM



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	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 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	ES / B	200	mJ
Operating Temperature	T _{opr}	– 40~85	°C
Junction Temperature	T _j	150	°C

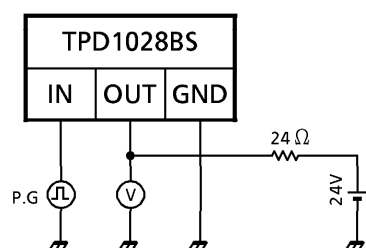
ELECTRICAL CHARACTERISTICS ($T_j = 25^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
Drain-source Breakdown Voltage	$V_{(BR) DSS}$	—	$V_{IN} = 0\text{ V}$, $I_D = 10\text{ mA}$	40	—	—	V
Operating Supply Voltage	V_{DD}	—	—	—	—	38	V
High Level Input Voltage	$V_{IH} (1)$	—	$V_{DS} = 24\text{ V}$, $I_D = 1\text{ A}$	4.5	5	5.5	V
	$V_{IH} (2)$	—	$V_{DS} = 10\text{ V}$, $I_D = 0.75\text{ A}$	3.9	5	5.7	
	$V_{IH} (3)$	—	$V_{DS} = 38\text{ V}$, $I_D = 0.75\text{ A}$	3.9	5	5.7	
Low Level Input Voltage	$V_{IL} (1)$	—	$V_{DS} = 24\text{ V}$, $I_D = 10\text{ }\mu\text{A}$	—	—	0.8	V
	$V_{IL} (2)$	—	$V_{DS} = 10\text{ V}$, $I_D = 10\text{ }\mu\text{A}$	—	—	0.8	
	$V_{IL} (3)$	—	$V_{DS} = 38\text{ V}$, $I_D = 10\text{ }\mu\text{A}$	—	—	0.8	
Current at Output Off	$I_{DSS} (1)$	—	$V_{IN} = 0\text{ V}$, $V_{DS} = 40\text{ V}$	—	—	100	μA
	$I_{DSS} (2)$		$V_{IN} = 0\text{ V}$, $V_{DS} = 24\text{ V}$	—	—	10	
Input Current	I_{IN}	—	$V_{IN} = 5\text{ V}$, at normal operation	—	—	300	μA
ON-Resistance	$R_{DS (ON)}$	—	$V_{IN} = 5\text{ V}$, $I_D = 1\text{ A}$	—	—	0.25	Ω
Overheat Protection	T_S	—	$V_{IN} = 5\text{ V}$	—	160	—	$^\circ\text{C}$
Overcurrent Protection	$I_S (1)$	—	$V_{DS} = 24\text{ V}$, $V_{IN} = 5\text{ V}$, during inrush	—	10	—	A
	$I_S (2)$	—	$V_{DS} = 24\text{ V}$, $V_{IN} = 5\text{ V}$, when shorted load	—	3	—	
Shorted Load Detection Voltage	V_{DS}	—	when shorted load	—	12	—	V
Switching Time	t_{ON}	1	$V_{DS} = 24\text{ V}$, $V_{IN} = 5\text{ V}$, $R_L = 24\text{ }\Omega$	—	70	—	μs
	t_{OFF}			—	120	—	
Diode Forward Voltage Between Drain and Source	V_{DSF}	—	$I_F = 1.5\text{ A}$	—	0.9	1.8	V

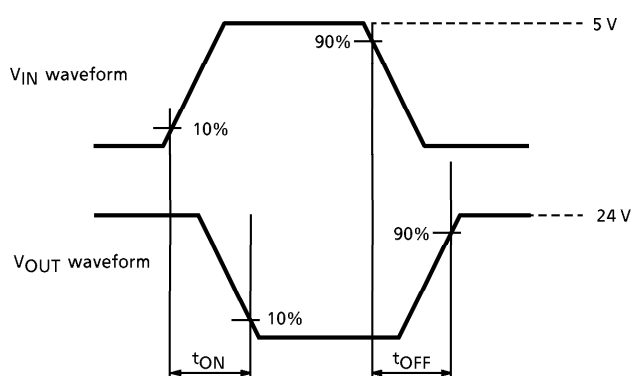
TEST CIRCUIT 1

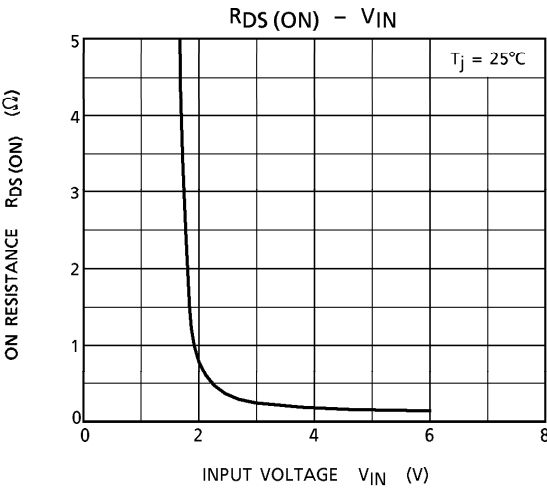
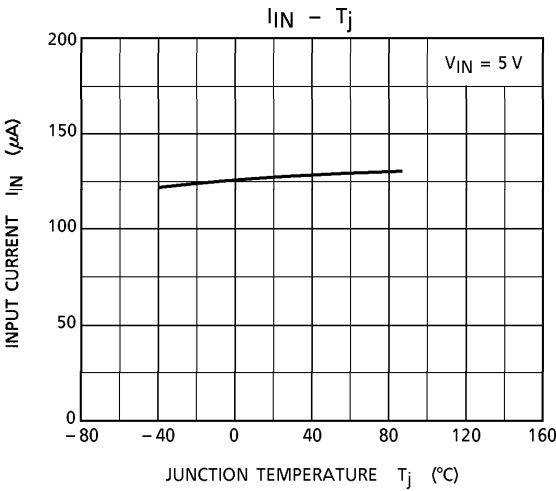
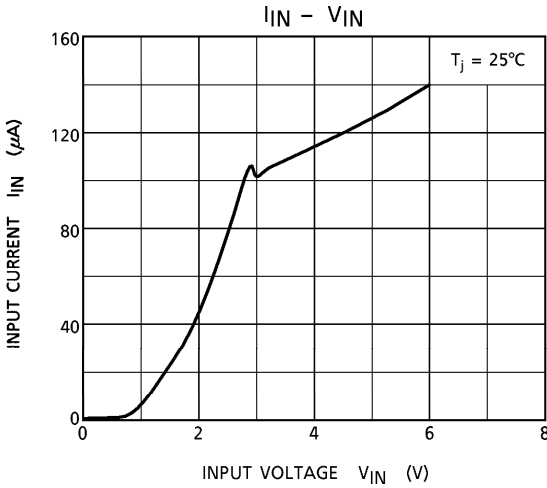
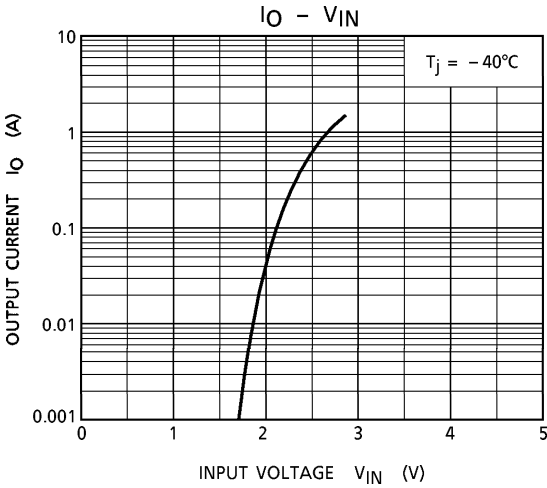
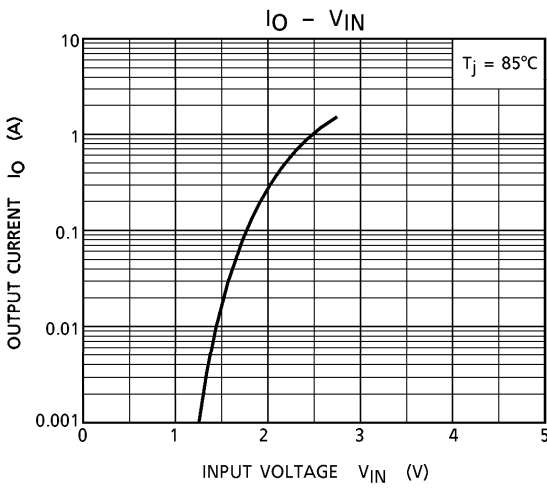
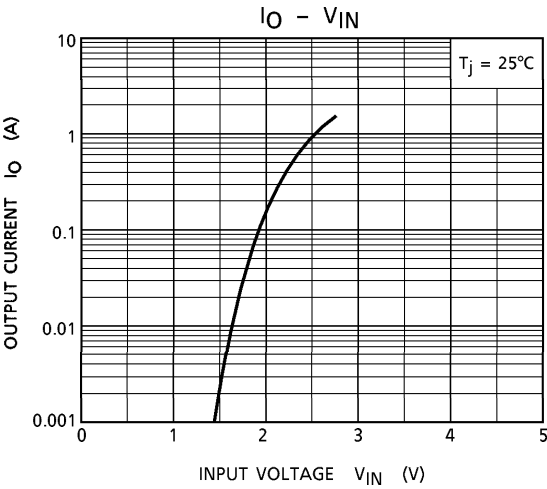
Switching time measuring circuit

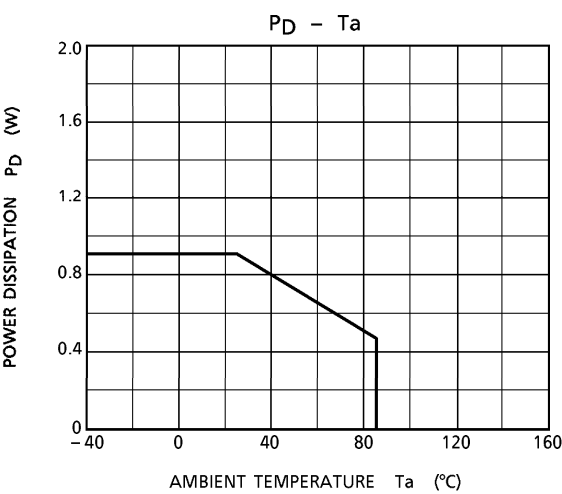
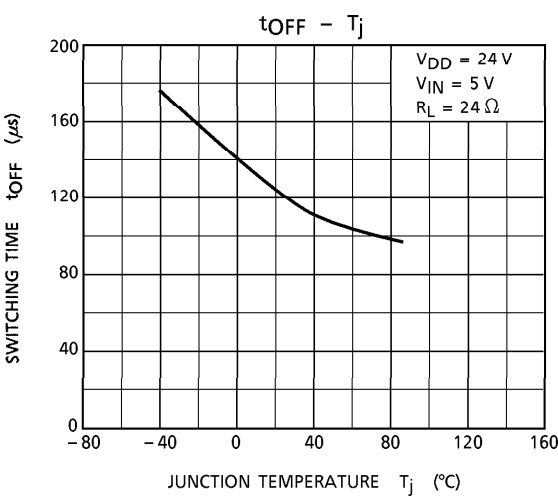
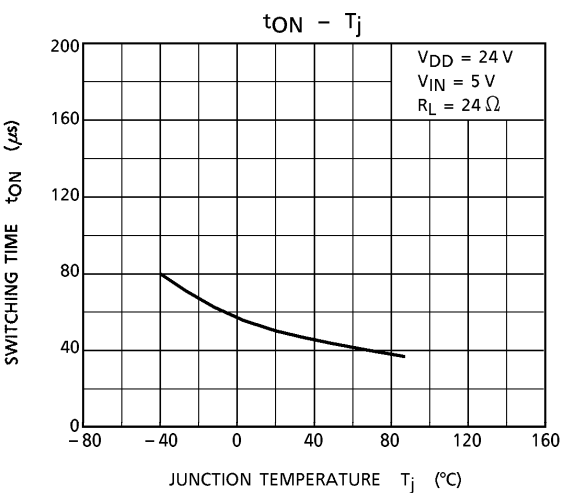
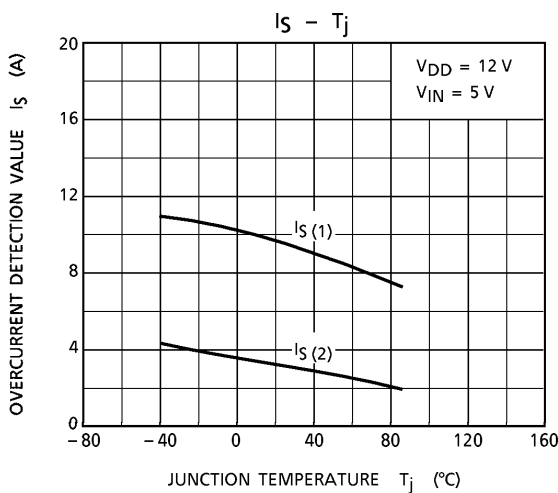
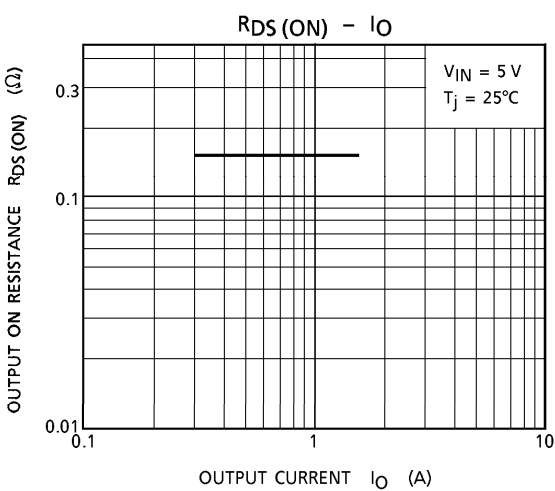
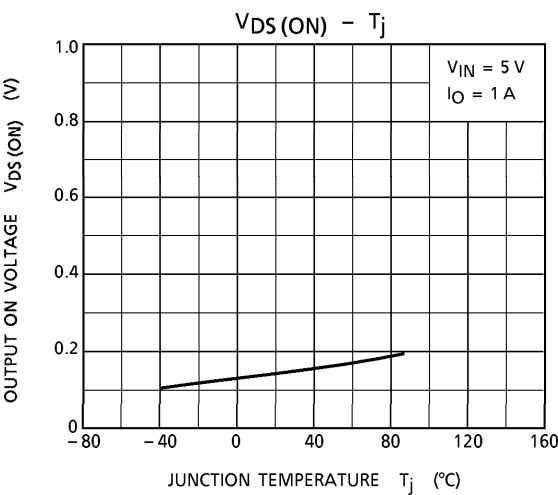
Test circuit



Measured waveforms

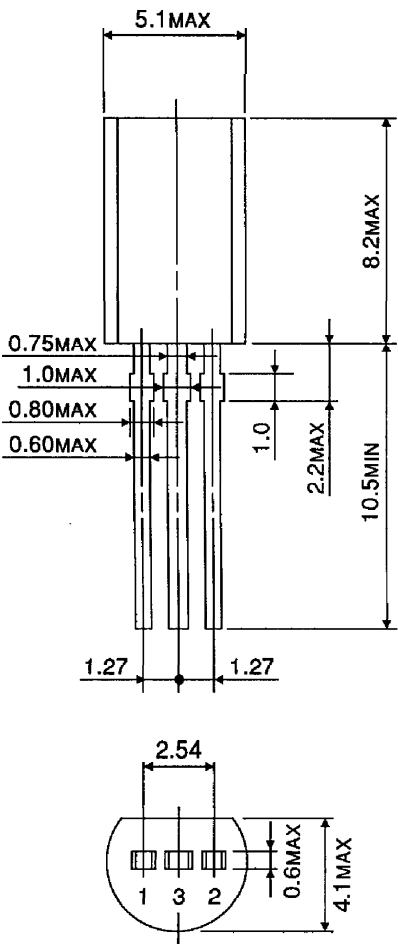






PACKAGE DIMENSIONS
SSIP3-P-1.27

Unit : mm



Weight : 0.36 g (Typ.)