

TOSHIBA

TPD1031S

TOSHIBA INTELLIGENT POWER DEVICE SILICON MONOLITHIC POWER MOS INTEGRATED CIRCUIT

TPD1031S

LOW-SIDE POWER SWITCH FOR MOTORS, SOLENOIDS, AND LAMP DRIVERS

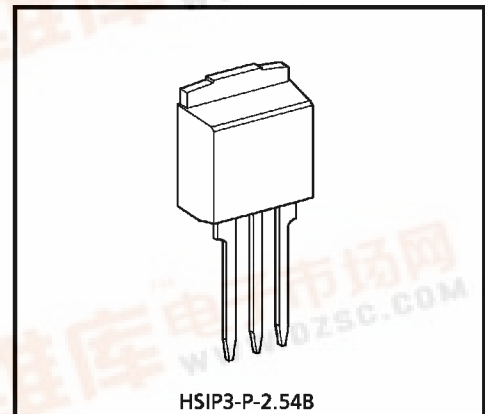
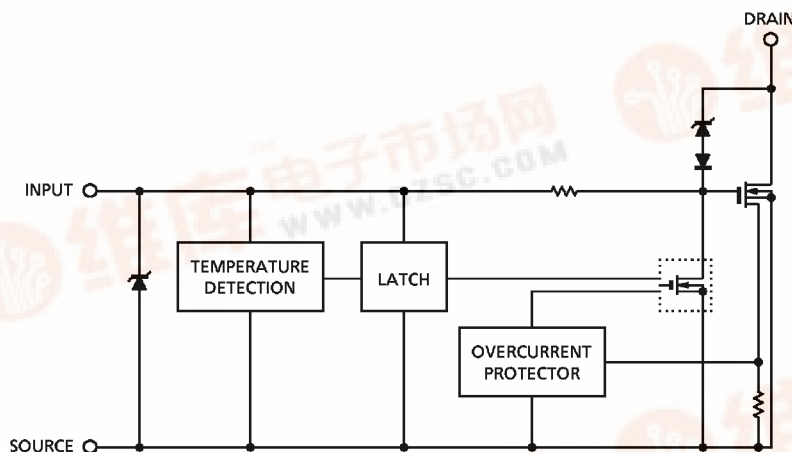
TPD1031S is a monolithic power IC for low-side switches. The TPD1031F has a vertical MOSFET output with logic level input.

The TPD1031F features current limiting for over current protection, thermal shutdown for over temperature protection and Drain voltage clamping for over voltage protection.

FEATURES

- Monolithic power IC with a new structure combining a control block with a vertical power MOSFET ($L^2-\pi$ -MOS) on a single chip.
- logic level input enables driving power loads directly from CMOS or TTL logic circuit.
- Built-in protection against over voltage, over current, and over temperature.
- Low ON-resistance : $R_{DS(ON)} = 65 \text{ m}\Omega$ (Max) (@ $V_{IN} = 5 \text{ V}$, $T_{ch} = 25^\circ\text{C}$)

BLOCK DIAGRAM



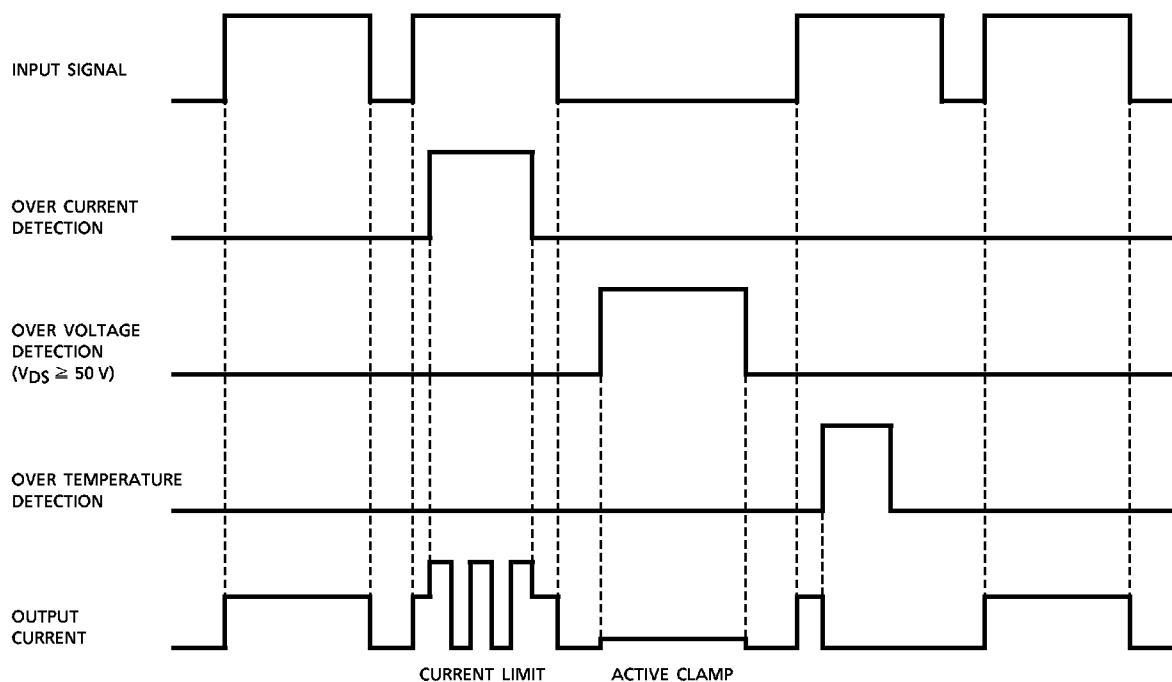
HSIP3-P-2.54B

Weight : 1.5 g (Typ.)

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TIMING CHART

MAXIMUM RATINGS ($T_a = 25^\circ\text{C}$)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		V_{DS}	50	V
Drain Current		I_D	Internally Limited	A
Input Voltage		V_{IN}	0~7	V
Power Dissipation	$T_c = 25^\circ\text{C}$	$P_D(1)$	50	W
	$T_a = 25^\circ\text{C}$	$P_D(2)$	1.3	W
Single Pulse Avalanche Energy*		E_{AS}	1190	mJ
Avalanche Current		I_{AR}	11	A
Channel Temperature		T_{ch}	150	$^\circ\text{C}$
Storage Temperature Range		T_{stg}	- 55~150	$^\circ\text{C}$

THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Channel to Case	$R_{th(ch-c)}$	2.5	$^\circ\text{C/W}$
Thermal Resistance, Channel to Ambient	$R_{th(ch-a)}$	96.1	$^\circ\text{C/W}$

(Note) : * Avalanche Energy (Single pulse) TEST CONDITION

$V_{DD} = 12\text{ V}$, $T_{ch} = 25^\circ\text{C}$, $L = 19.7\text{ mH}$, $I_{AR} = 11\text{ A}$

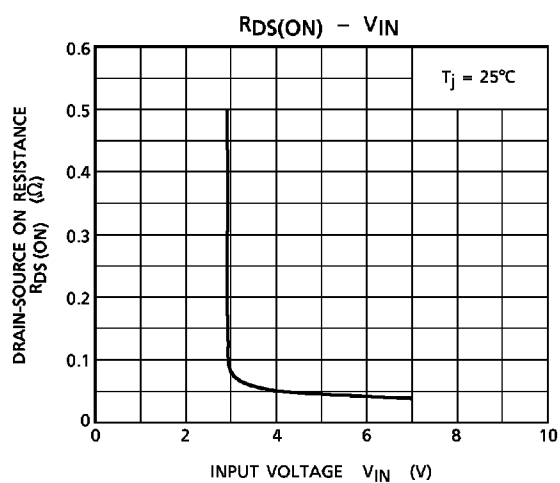
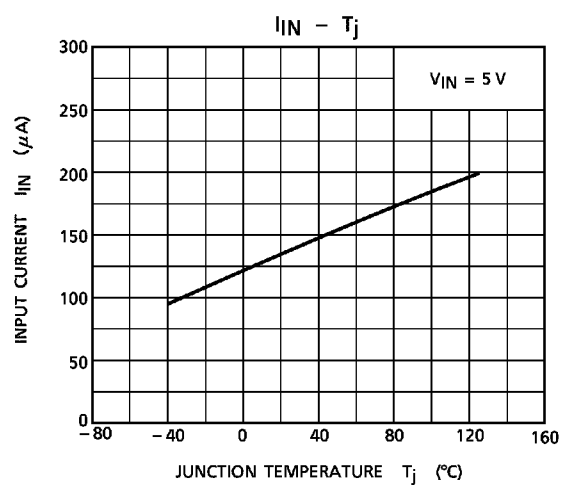
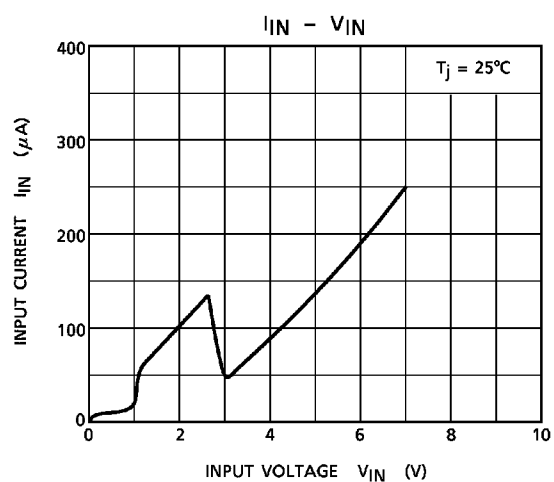
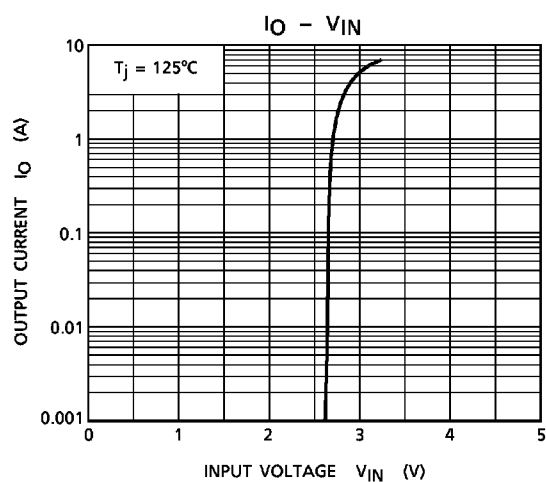
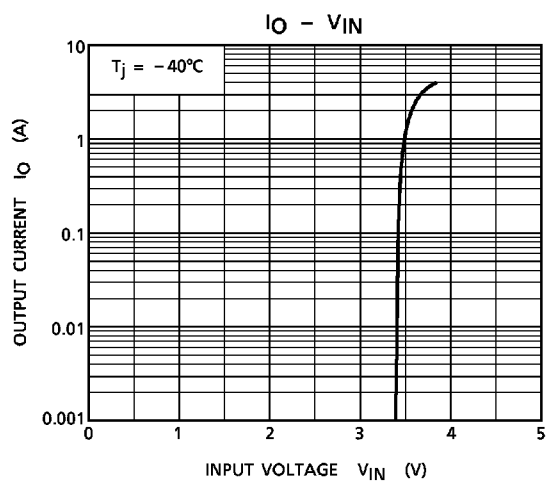
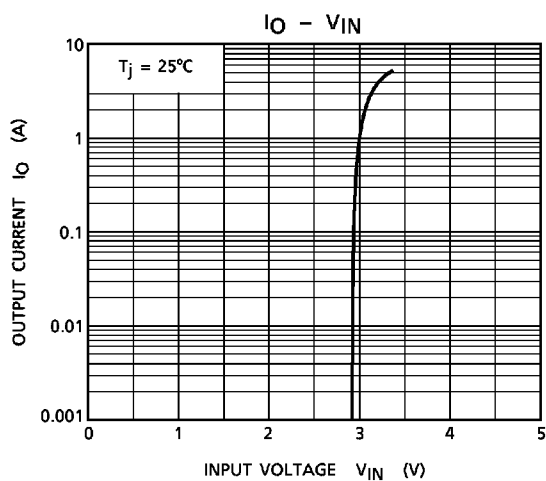
Repetitive rating ; Avalanche Energy Limited by maximum junction temperature.

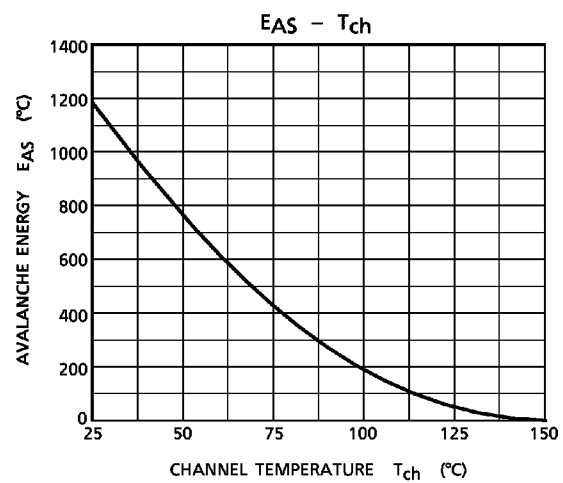
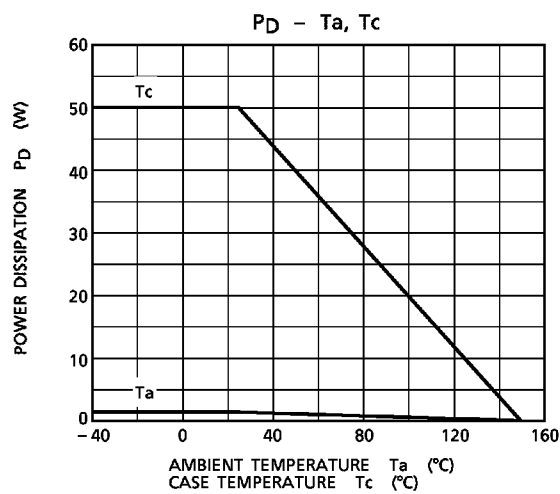
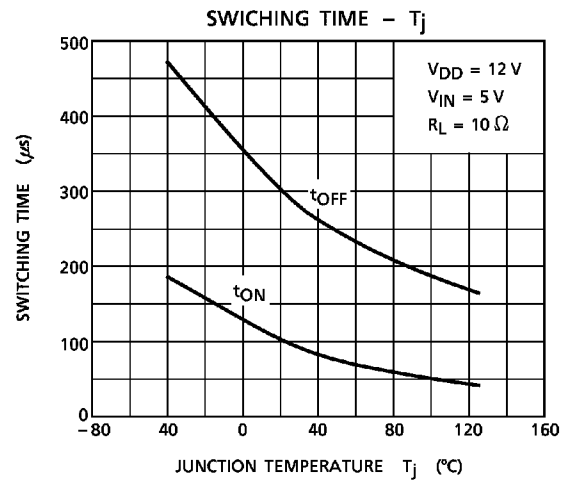
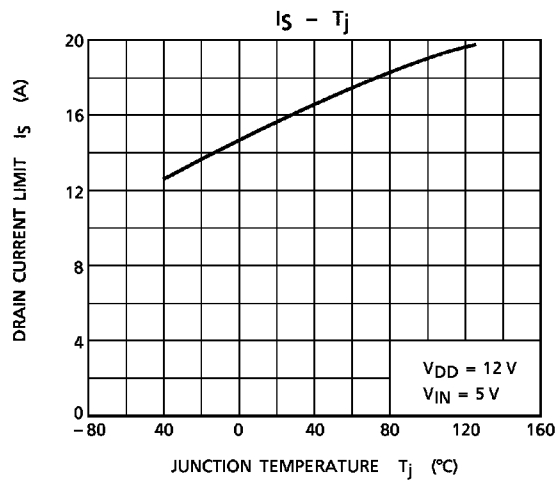
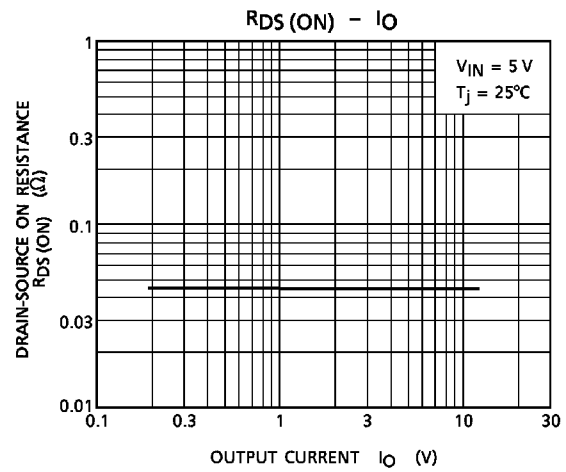
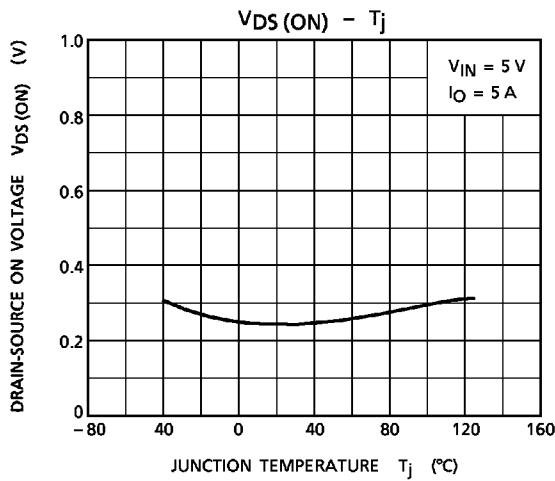
ELECTRICAL CHARACTERISTICS ($T_j = 25^\circ\text{C}$)

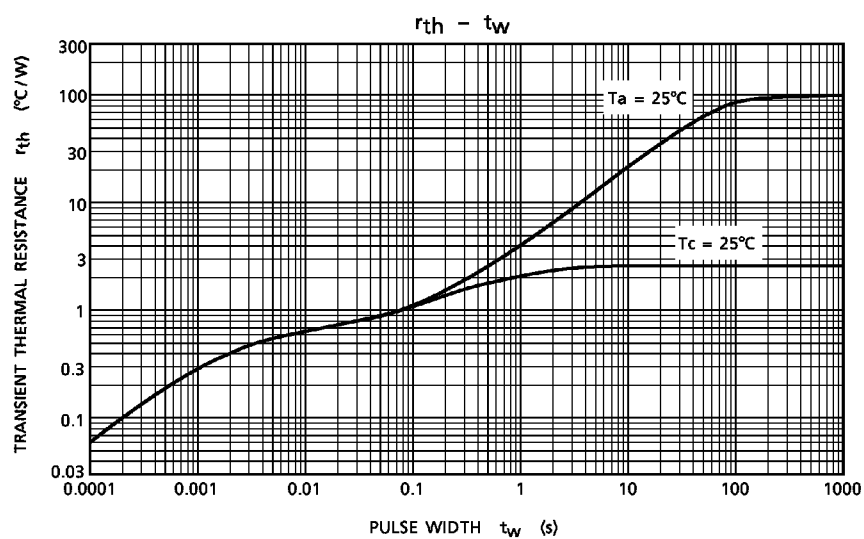
CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input Current		I_{IN}	$V_{IN} = 5\text{ V}, V_{DS} = 0\text{ V}$	—	—	500	μA
Drain Cut-Off Current		I_{DSS}	$V_{DS} = 40\text{ V}, V_{IN} = 0\text{ V}$	—	—	100	μA
Drain-source Breakdown Voltage		$V_{(CL) DSS}$	$I_D = 10\text{ mA}, V_{IN} = 0\text{ V}$	50	—	—	V
Operating Supply Voltage		$V_{DD (opr)}$				20	V
Drain-Source ON Resistance		$R_{DS (ON)}$	$V_{IN} = 5\text{ V}, I_D = 4\text{ A}$	—	0.045	0.065	Ω
Switching Time	Rise Time	t_r	$V_{IN} = 0\text{ V} / +5\text{ V}, V_{DD} = 12\text{ V}$ $R_L = 10\ \Omega$	—	70	—	μs
	Turn-on Time	t_{on}		—	100	250	
	Fall Time	t_f		—	120	—	
	Turn-off Time	t_{off}		—	300	450	
Input Threshold Voltage		V_{th}	$V_{DS} = 12\text{ V}, I_D = 1\text{ mA}$	2	3	3.5	V
Protection Supply Voltage		$V_{IN (P)}$		4	—	—	V
Drain Current Limit		I_{OC}	$V_{IN} = 5\text{ V}$	11	15	—	A
Over Temperature Shutdown		T_{OT}	$V_{IN} = 5\text{ V}$	—	160	—	$^\circ\text{C}$
Diode Forward Voltage		V_{DSF}	$I_F = 25\text{ A}, V_{IN} = 0\text{ V}$	—	—	1.8	V

ELECTRICAL CHARACTERISTICS ($T_j = -40\sim 110^\circ\text{C}$)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input Current		I_{IN}	$V_{IN} = 5\text{ V}, V_{DS} = 0\text{ V}$	—	—	750	μA
Drain Cut-Off Current		I_{DSS}	$V_{DS} = 40\text{ V}, V_{IN} = 0\text{ V}$	—	—	100	μA
Drain-source Breakdown Voltage		$V_{(CL) DSS}$	$I_D = 10\text{ mA}, V_{IN} = 0\text{ V}$	48	—	—	V
Operating Supply Voltage		$V_{DD (opr)}$				20	V
Drain-Source ON Resistance		$R_{DS (ON)}$	$V_{IN} = 5\text{ V}, I_D = 4\text{ A}$	—	0.045	0.095	Ω
Switching Time	Rise Time	t_r	$V_{IN} = 0\text{ V} / +5\text{ V}, V_{DD} = 12\text{ V}$ $R_L = 10\ \Omega$	—	70	—	μs
	Turn-on Time	t_{on}		—	100	400	
	Fall Time	t_f		—	120	—	
	Turn-off Time	t_{off}		—	300	700	
Input Threshold Voltage		V_{th}	$V_{DS} = 12\text{ V}, I_D = 1\text{ mA}$	1.5	3	4	V
Protection Supply Voltage		$V_{IN (P)}$		4	—	—	V
Drain Current Limit		I_{OC}	$V_{IN} = 5\text{ V}$	11	15	—	A
Over Temperature Shutdown		T_{OT}	$V_{IN} = 5\text{ V}$	—	160	—	$^\circ\text{C}$

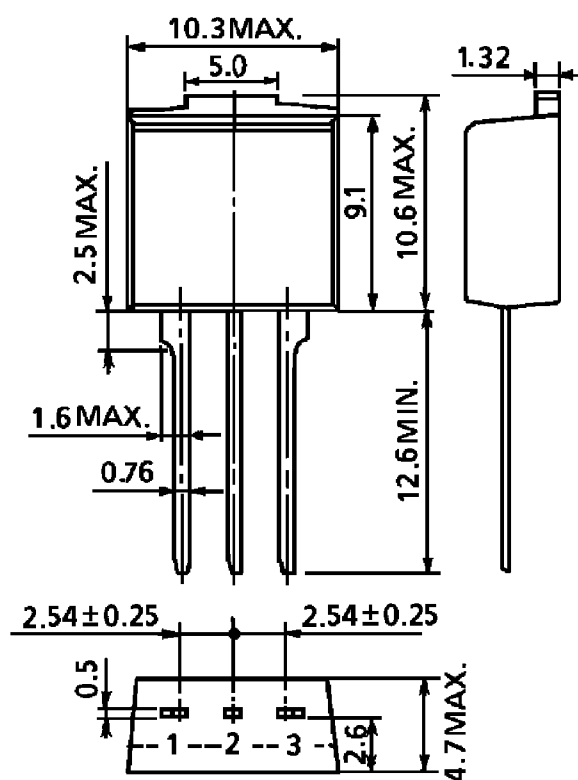






OUTLINE DRAWING
HSIP3-P-2.54B

Unit : mm



Weight : 1.5 g (Typ.)