

Preliminary

Toshiba Intelligent Power Device Silicon Monolithic Power MOS Integrated Circuit

TPD1030F

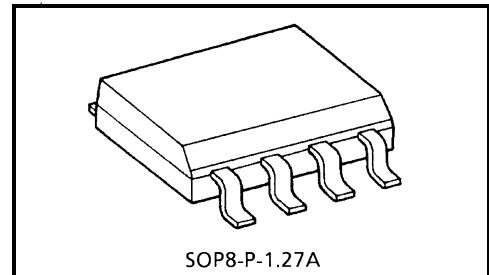
2-IN-1 Low-Side Switch for Motor, Solenoid and Lamp Drive

TPD1030F is a 2-IN-1 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 function.

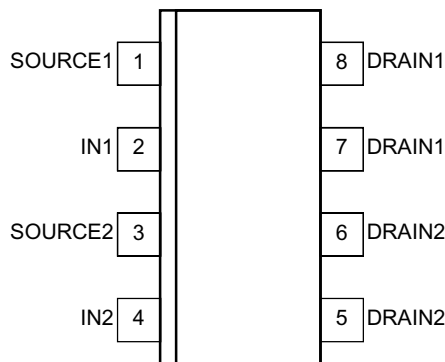
Features

- Built-in two power IC chips with a new structure combining a control block and a vertical power MOSFET (L^2 - π -MOS) on each chip.
- Can directly drive a power load from a CMOS or TTL logic.
- Built-in protection circuits against overvoltage (active clamp), overtemperature (thermal shutdown), and overcurrent (current limiter).
- Low Drain-Source ON-resistance: $R_{DS(ON)} = 0.6 \Omega$ (max) (@ $V_{IN} = 5 \text{ V}$, $I_D = 0.5 \text{ A}$, $T_{ch} = 25^\circ\text{C}$)
- Low Leakage Current: $I_{DSS} = 10 \mu\text{A}$ (max) (@ $V_{IN} = 0 \text{ V}$, $V_{DS} = 30 \text{ V}$, $T_{ch} = 25^\circ\text{C}$)
- Low Input Current: $I_{IN} = 300 \mu\text{A}$ (max) (@ $V_{IN} = 5 \text{ V}$, $T_{ch} = 25^\circ\text{C}$)
- 8-pin SOP package with embossed-tape packing.



Weight: 0.08 g (typ.)

Pin Assignment (top view)



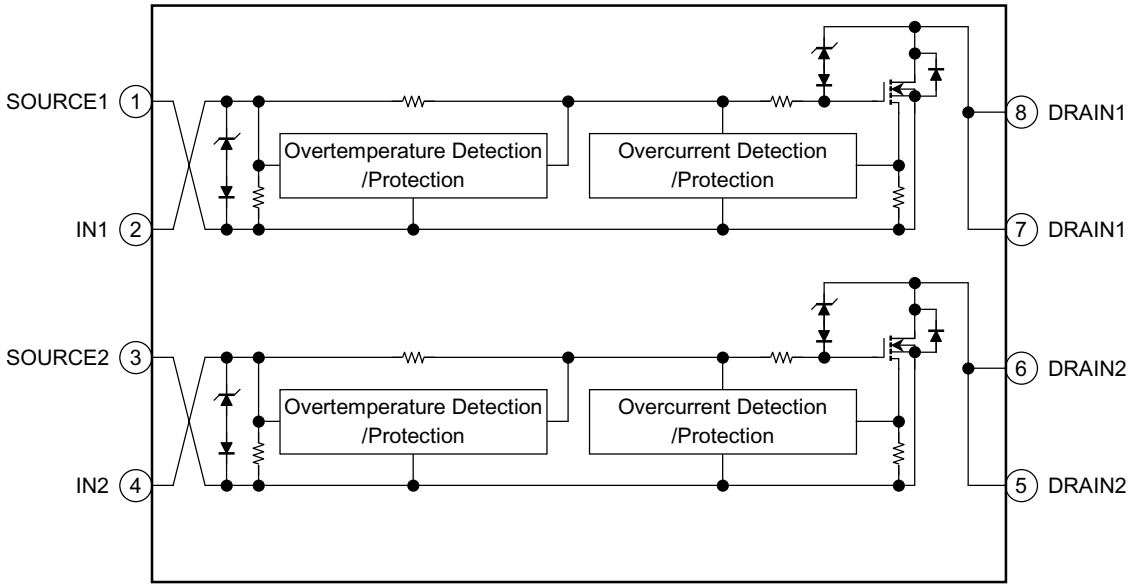
Note1: That because of its MOS structure, this product is sensitive to static electricity.

980910EBA1

- TOSHIBA is continually working to improve the quality and the reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to observe standards of safety, and to avoid situations in which a malfunction or failure of a TOSHIBA product could cause loss of human life, bodily injury or damage to property. In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent products specifications. Also, please keep in mind the precautions and conditions set forth in the TOSHIBA Semiconductor Reliability Handbook.
- The products described in this document are subject to the foreign exchange and foreign trade laws.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- The information contained herein is subject to change without notice.

Preliminary

Block Diagram

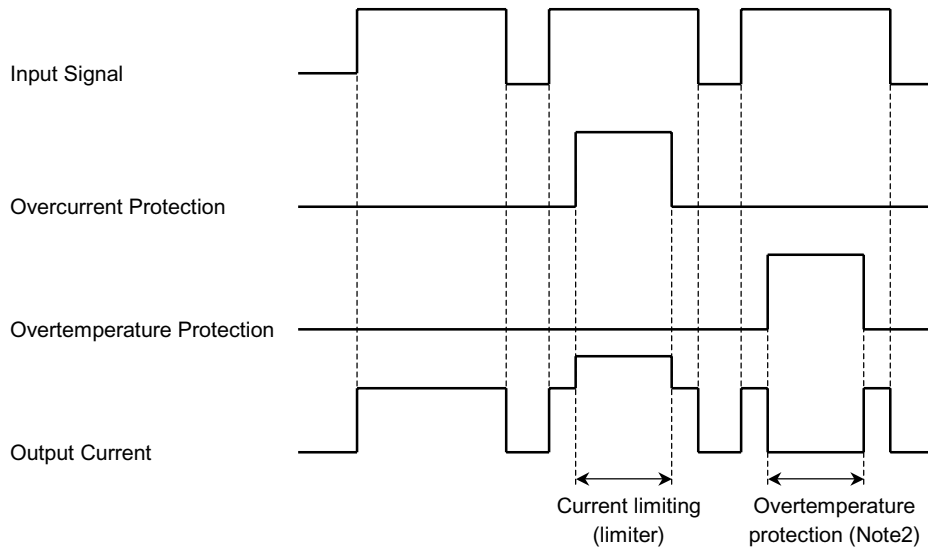


Pin Description

Pin No.	Symbol	Pin Description
1	SOURCE1	Source pin 1
2	IN1	Input pin 1 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.
3	SOURCE2	Source pin 2
4	IN2	Input pin 2 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.
5, 6	DRAIN2	Drain pin 2 Drain current is limited (by current limiter) if it exceeds 1 A (min) in order to protect the IC.
7, 8	DRAIN1	Drain pin 1 Drain current is limited (by current limiter) if it exceeds 1 A (min) in order to protect the IC.

Preliminary

Timing Chart



Note2: The overheating detector circuits feature hysteresis. After overheating is detected, normal operation is restored only when the channel temperature falls by the hysteresis amount (5°C typ.) in relation to the overheating detection temperature.

Truth Table

IN	V _{OUT}	Mode
L	H	Normal
H	L	
L	H	Overcurrent
H	H	
L	H	Overtemperature
H	H	

Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Drain-source voltage	V _{DS} (DC)	40	V
Drain current	I _D	Internally Limited	A
Input voltage	V _{IN}	-0.3 to 7	V
Power dissipation (t = 10 s)	P _D	2.0 (Note3)	W
Operating temperature	T _{opr}	-40 to 110	°C
Channel temperature	T _{ch}	150	°C
Storage temperature	T _{stg}	-55 to 150	°C

Note3: Drive operation: Mount on glass epoxy board [1 inch² × 0.8 t] (in the two devices driving)

Preliminary**Thermal Characteristics**

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to ambient (t = 10 s) (Note3)	$R_{th(ch-a)}$	62.5	°C/W

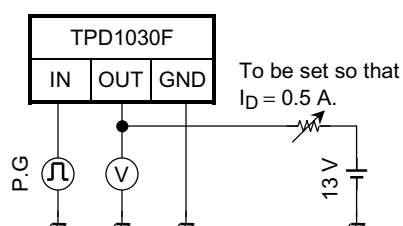
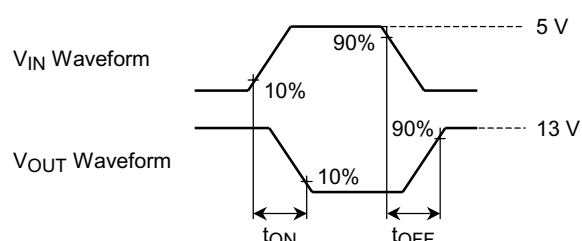
Note3: Drive operation: Mount on glass epoxy board [$1\text{ inch}^2 \times 0.8\text{ t}$] (in the two devices driving)

Electrical Characteristics ($T_{ch} = 25^\circ\text{C}$)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Drain-source clamp voltage	$V_{(CL)DSS}$	—	$V_{IN} = 0\text{ V}$, $I_D = 1\text{ mA}$	40	—	60	V
Input threshold voltage	V_{th}	—	$V_{DS} = 13\text{ V}$, $I_D = 10\text{ mA}$	1.0	—	2.8	V
Protective circuit operation input voltage range	$V_{IN(opr)}$	—	—	3	—	7	V
Drain cut-off current	I_{DSS}	—	$V_{IN} = 0\text{ V}$, $V_{DS} = 30\text{ V}$	—	—	10	μA
Input current	$I_{IN(1)}$	—	$V_{IN} = 5\text{ V}$, at normal operation	—	—	300	μA
	$I_{IN(2)}$	—	$V_{IN} = 5\text{ V}$, when protective circuit is actuated	—	—	390	
Drain-source on resistance	$R_{DS(ON)}$	—	$V_{IN} = 5\text{ V}$, $I_D = 0.5\text{ A}$	—	0.44	0.6	Ω
Overtemperature protection	T_S	—	$V_{IN} = 5\text{ V}$	150	160	—	°C
Overcurrent protection	I_S	—	$V_{IN} = 5\text{ V}$	1.0	—	—	A
Switching time	t_{ON}	1	$V_{DD} = 13\text{ V}$, $V_{IN} = 5\text{ V}$, $I_D = 0.5\text{ A}$	—	—	30	μs
	t_{OFF}	1		—	—	30	
Source-drain diode forward voltage	V_{DSF}	—	$I_F = 1\text{ A}$, $V_{IN} = 0\text{ V}$	—	—	1.7	V

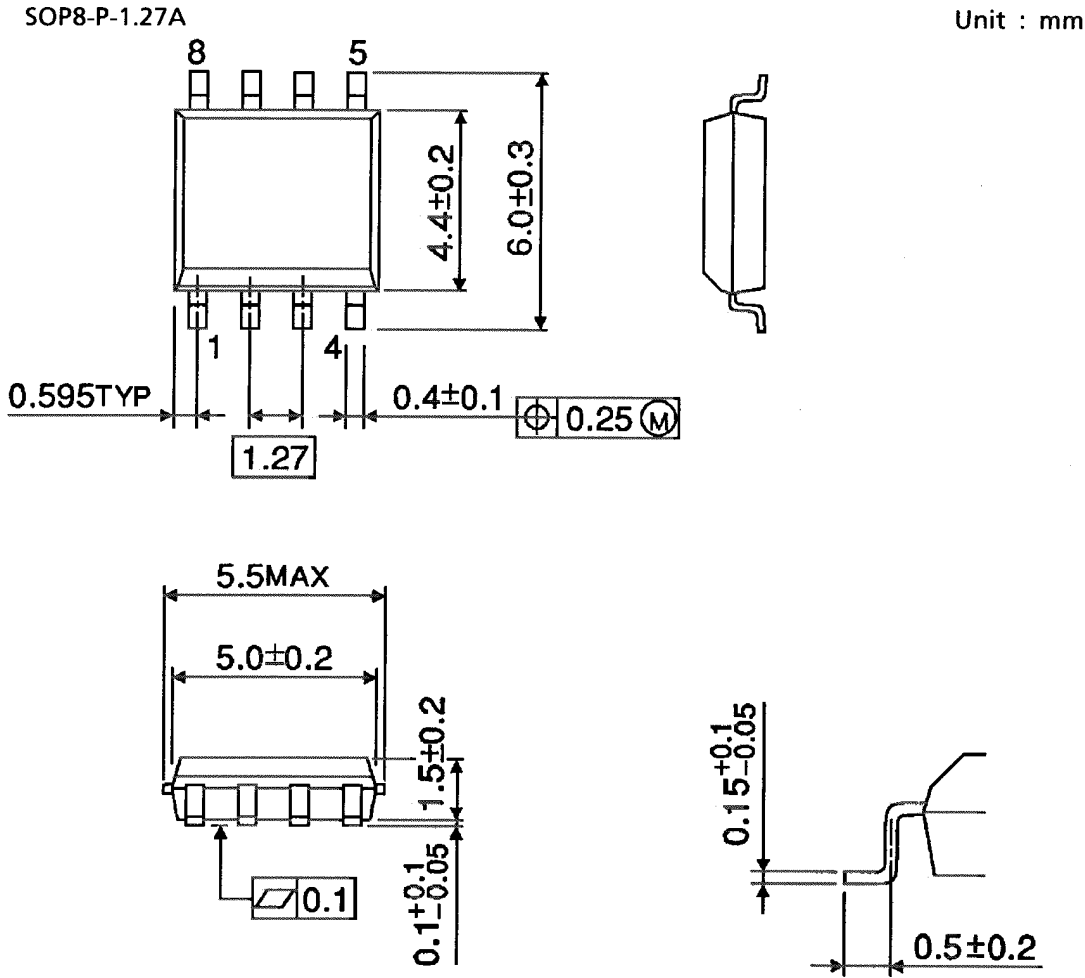
Test Circuit 1

Switching time measuring circuit

Test Circuit**Measured Waveforms**

Preliminary

Package Dimensions



Weight: 0.08 g (typ.)