

TPD1030F

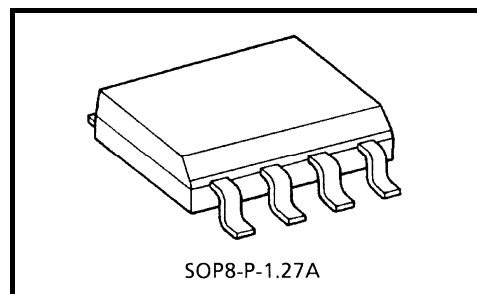
2-IN-1 Low-Side Switch for Motor, Solenoid and Lamp Drive

The 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 is equipped with intelligent self-protection functions.

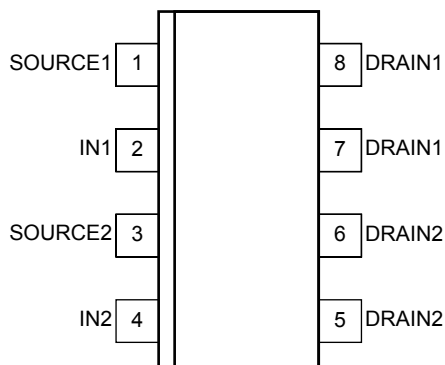
Features

- Two built-in 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: $I_{IN} = 350 \mu\text{A}$ (max) (@ $V_{IN} = 5 \text{ V}$, $T_{ch} = -40$ to 110°C)
- 8-pin SOP package with embossed-tape packing.

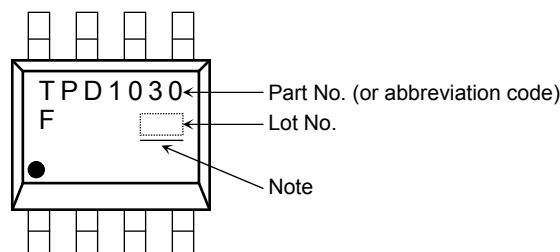


Weight: 0.08 g (typ.)

Pin Assignment (top view)



Marking

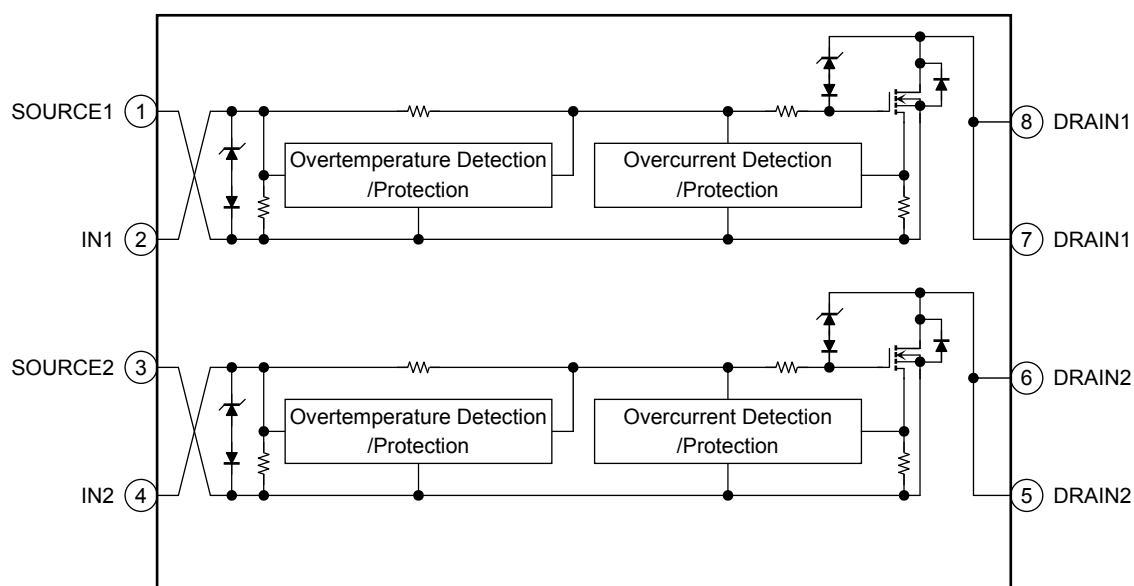


Note : A line under a Lot No. identifies the indication of product Labels
[[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. The RoHS is Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

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

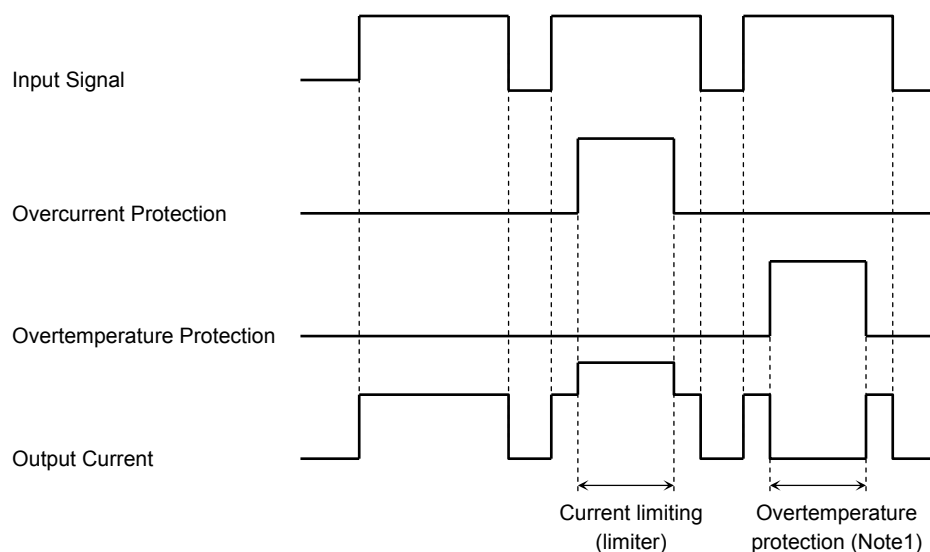
Block Diagram



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 0.7 A (min) in order to protect the IC.
7, 8	DRAIN1	Drain pin 1 Drain current is limited (by current limiter) if it exceeds 0.7 A (min) in order to protect the IC.

Timing Chart



Note1: 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	

Absolute 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 (Note2)	W
Single pulse active clamp capability (Note 3)	E _{AS}	10	mJ
Active clamp current	I _{AR}	1	A
Repetitive active clamp capability (Note 4)	E _{AR}	0.2	mJ
Operating temperature	T _{opr}	−40 to 110	°C
Channel temperature	T _{ch}	150	°C
Storage temperature	T _{stg}	−55 to 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).

Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to ambient (t = 10 s) (Note2)	$R_{th} (ch-a)$	62.5	°C/W

Note 2: Drive operation: Mounted on glass epoxy board [25.4mm × 25.4mm × 0.8mm]
(with the two devices operating)

Note 3: Active clamp capability (single pulse) test condition
 $V_{DD} = 25\text{ V}$, Starting $T_{ch} = 25^\circ\text{C}$, $L = 10\text{ mH}$, $I_{AR} = 1\text{ A}$, $R_G = 25\ \Omega$

Note 4: Repetitive rating, pulse width limited by maximum channel temperature.

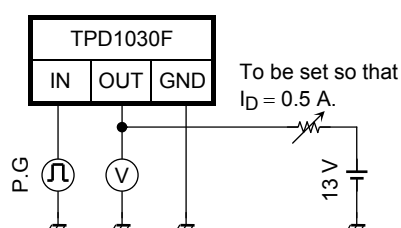
Electrical Characteristics

Characteristics	Symbol	Test Circuit	Test Condition		Min	Typ.	Max	Unit
Drain-source clamp voltage	V _{(CL) DSS}	—	T _{ch} =−40 to 110°C	V _{IN} = 0 V, I _D =1mA	40	—	60	V
Input threshold voltage	V _{th}	—	T _{ch} =25°C	V _{DS} = 13 V, I _D =10mA	1.0	—	2.8	V
			T _{ch} =−40 to 110°C		0.9	—	3.0	
Protective circuit operation input voltage range	V _{IN (opr)}	—	T _{ch} =25°C	—	3	—	7	V
			T _{ch} =−40 to 110°C	—	3.5	—	7	
Drain cut-off current	I _{DSS}	—	T _{ch} =25°C	V _{IN} = 0 V, V _{DS} =30V	—	—	10	μA
			T _{ch} =−40 to 110°C		—	—	100	
Input current	I _{IN} (1)	—	T _{ch} =25°C	V _{IN} = 5 V, at normal operation	—	—	300	μA
	I _{IN} (2)	—	T _{ch} =−40 to 110°C	V _{IN} = 5 V, when overcurrent protective circuit is actuated	—	—	350	
Drain-source on resistance	R _{DS (ON)}	—	T _{ch} =25°C	V _{IN} = 5 V, I _D = 0.5 A	—	0.44	0.6	Ω
			T _{ch} =−40 to 110°C		—	—	0.9	
Overtemperature protection	T _S	—	—	V _{IN} = 5 V	150	160	—	°C
Overcurrent protection	I _S	—	T _{ch} =25°C	V _{IN} = 5 V	1	1.8	—	A
			T _{ch} =−40 to 110°C		0.7	—	—	
Switching time	t _{ON}	1	T _{ch} =25°C	V _{DD} = 13 V, V _{IN} = 0V/5 V, I _D = 0.5 A	—	—	30	μs
			T _{ch} =−40 to 110°C		—	—	60	
	t _{OFF}		T _{ch} =25°C		—	—	60	
			T _{ch} =−40 to 110°C		—	—	90	
Source-drain diode forward voltage	V _{DSF}	—	T _{ch} =25°C	I _F = 1 A, V _{IN} = 0 V	—	—	1.7	V

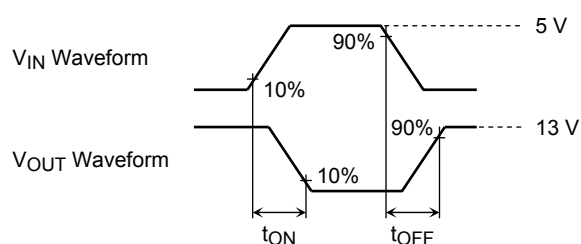
Test Circuit 1

Switching time measuring circuit

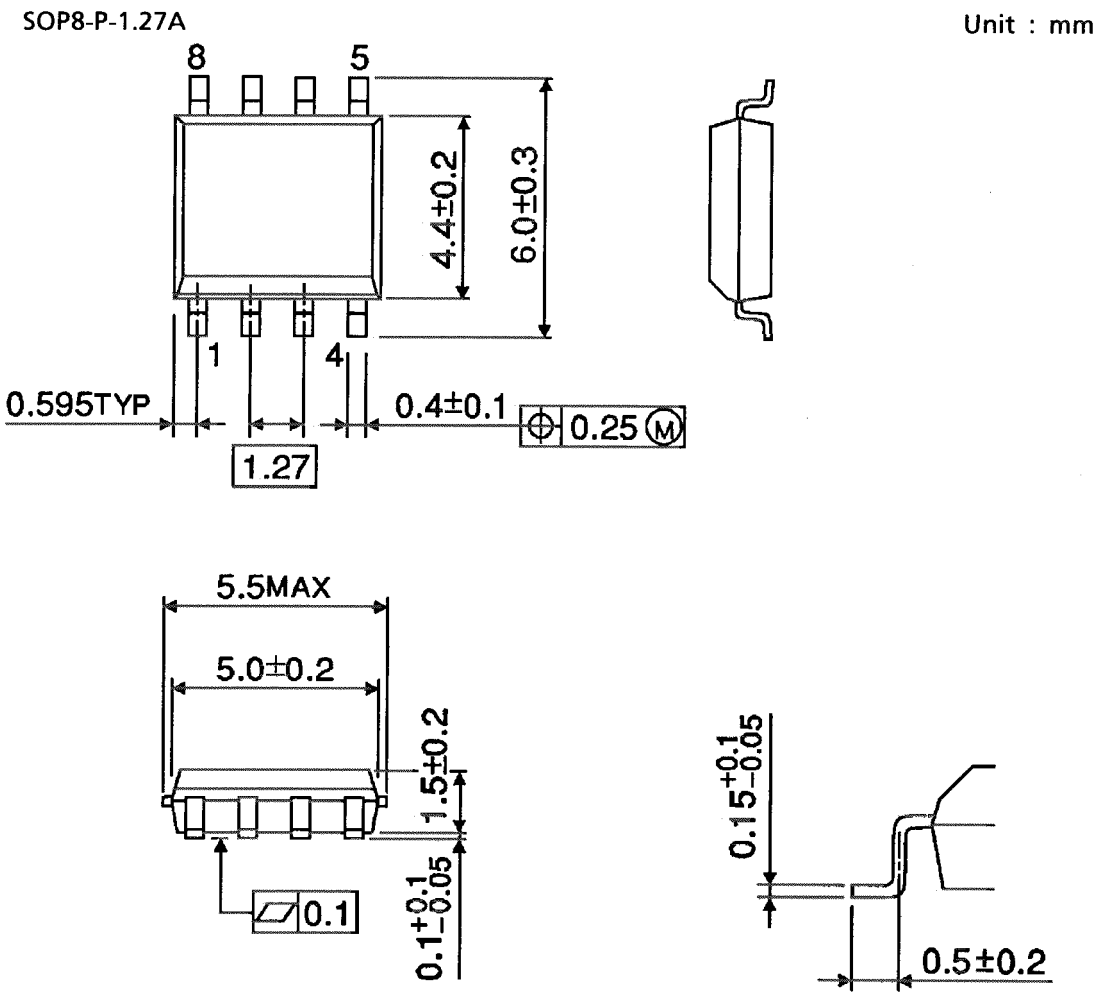
Test Circuit



Measured Waveforms



Package Dimensions



Weight: 0.08 g (typ.)

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