

Preliminary

Toshiba Intelligent Power Device Silicon Monolithic Power MOS Integrated Circuit

TPD1032F

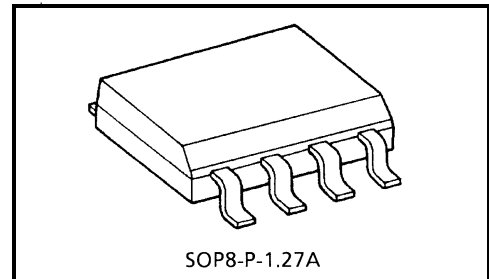
2-IN-1 Low-Side Power Switch for Motor, Solenoid and Lamp Drivers

TPD1032F 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 functions.

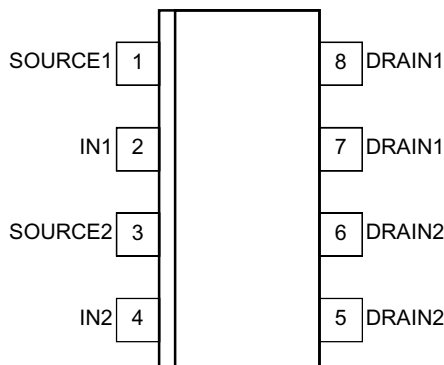
Features

- Built-in two power IC chips with a new structure combining a control block and a vertical power MOSFET (L²-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: $R_{DS(ON)} = 0.4 \Omega$ (max) (@ $V_{IN} = 5\text{ V}$, $I_D = 1\text{ A}$, $T_{ch} = 25^\circ\text{C}$)
- 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 for surface 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.

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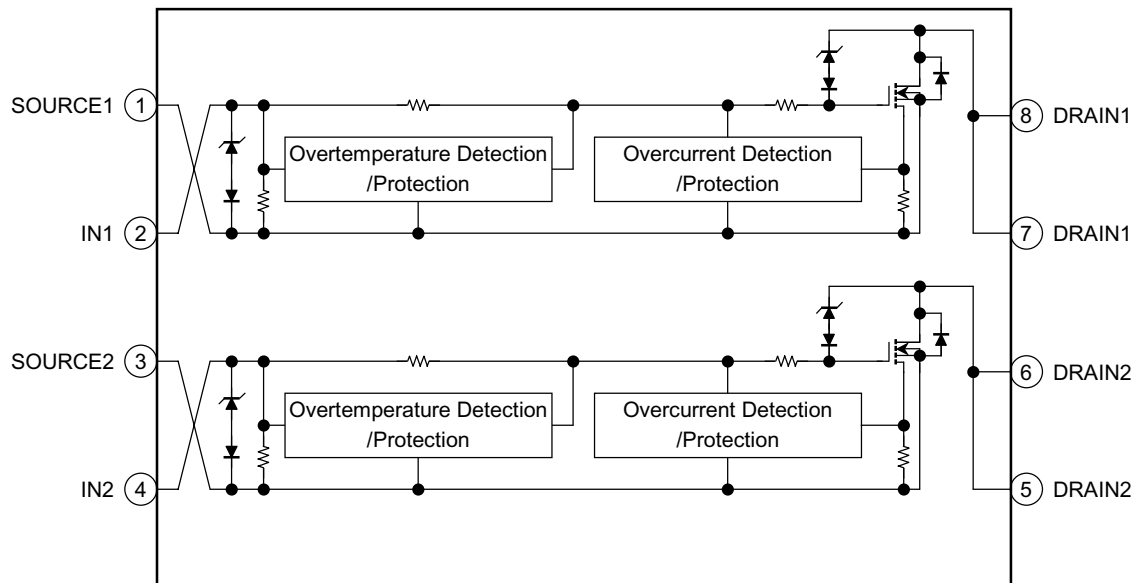
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Block Diagram

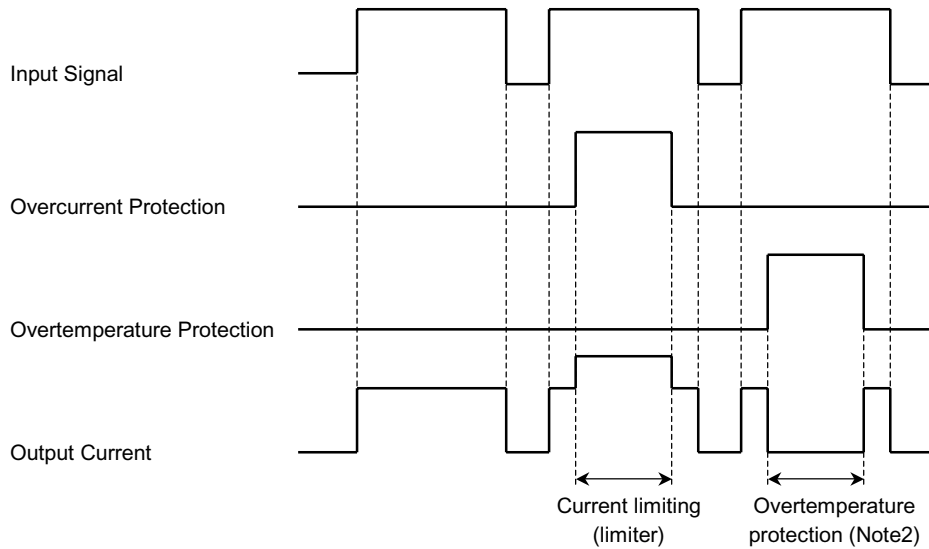


Pin Description

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 3 A (min) in order to protect the IC.
7, 8	DRAIN1	Drain pin 1 Drain current is limited (by current limiter) if it exceeds 3 A (min) in order to protect the IC.

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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)	20	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)

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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 inch² × 0.8 t] (in the two devices driving)

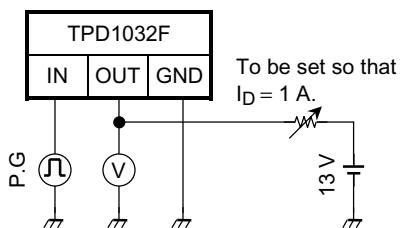
Electrical Characteristics (T_{ch} = 25°C)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Drain-source clamp voltage	$V_{(CL) DSS}$	—	$V_{IN} = 0 V, I_D = 1 mA$	40	—	60	V
Input threshold voltage	V_{th}	—	$V_{DS} = 13 V, I_D = 10 mA$	1.0	—	2.8	V
Protective circuit operation input voltage range	$V_{IN (opr)}$	—	—	3	—	7	V
Drain cut-off current	I_{DSS}	—	$V_{IN} = 0 V, V_{DS} = 30 V$	—	—	10	μA
Input current	$I_{IN (1)}$	—	$V_{IN} = 5 V$, at normal operation	—	—	300	μA
	$I_{IN (2)}$	—	$V_{IN} = 5 V$, when protective circuit is actuated	—	—	390	
Drain-source on resistance	$R_{DS (ON)}$	—	$V_{IN} = 5 V, I_D = 1 A$	—	0.25	0.4	Ω
Overtemperature protection	T_S	—	$V_{IN} = 5 V$	150	160	—	°C
Overcurrent protection	I_S	—	$V_{IN} = 5 V$	3	—	—	A
Switching time	t_{ON}	1	$V_{DD} = 13 V, V_{IN} = 5 V, I_D = 1 A$	—	—	30	μs
	t_{OFF}	1		—	—	60	
Source-drain diode forward voltage	V_{DSF}	—	$I_F = 3 A, V_{IN} = 0 V$	—	—	1.7	V

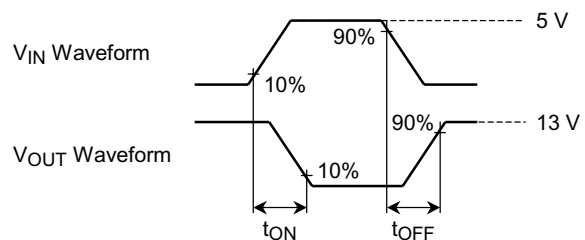
Test Circuit 1

Switching time measuring circuit

Test Circuit

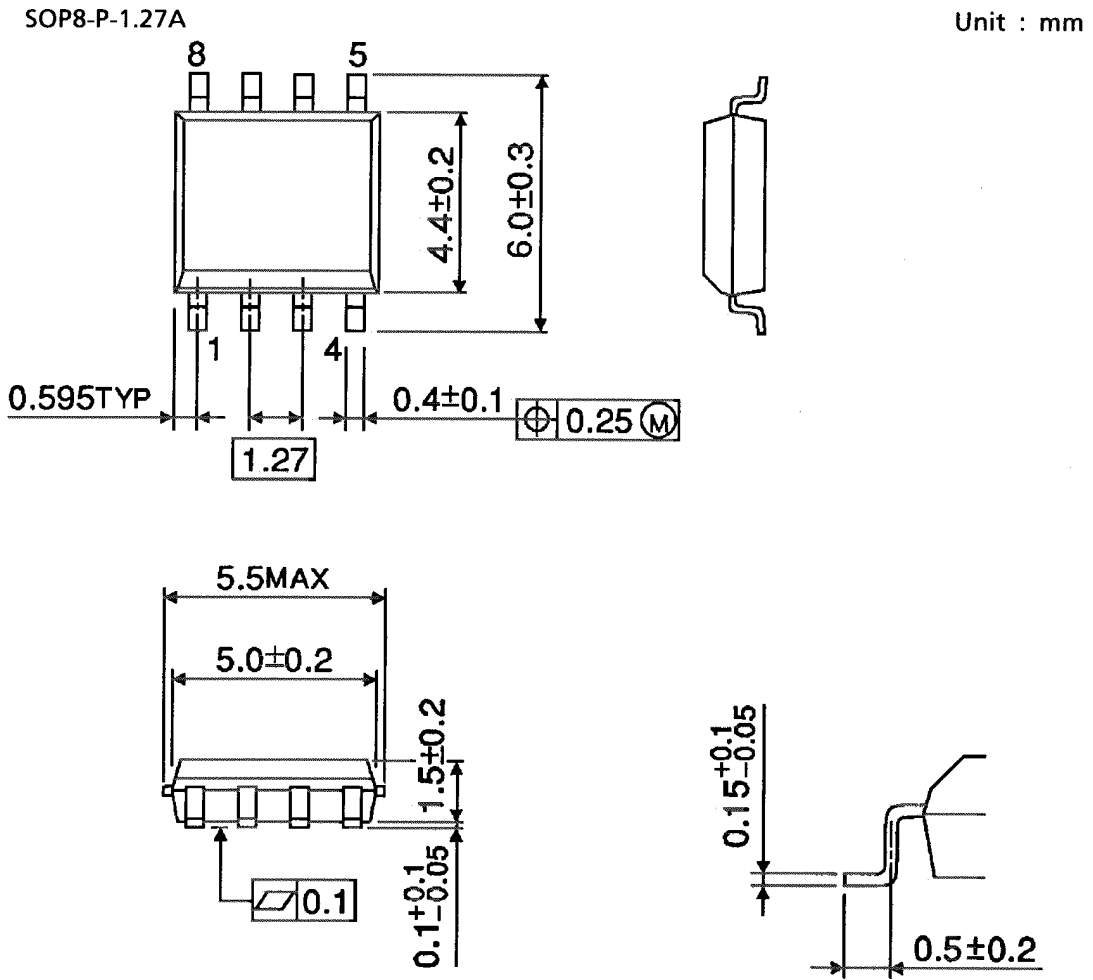


Measured Waveforms



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Package Dimensions



Weight: 0.08 g (typ.)