PIP3105-P

DESCRIPTION

Monolithic temperature and overload protected logic level power MOSFET in TOPFET2 technology assembled in a 3 pin plastic package.

APPLICATIONS

General purpose switch for driving

- lamps
- motors
- solenoids
- heaters

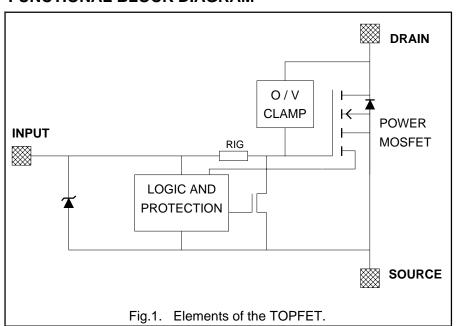
FEATURES

- TrenchMOS output stage
- **Current limiting**
- Overload protection
- Overtemperature protection Protection latched reset by input
- 5 V logic compatible input level Control of output stage and supply of overload protection circuits derived from input
- Low operating input current permits direct drive by micro-controller
- ESD protection on all pins
- Overvoltage clamping for turn off of inductive loads

QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	UNIT
V_{DS} I_{D} P_{D} T_{j} $R_{DS(ON)}$	Continuous drain source voltage Continuous drain current Total power dissipation Continuous junction temperature Drain-source on-state resistance	50 16 65 150 50	V A W °C mΩ
I _{ISL}	Input supply current $V_{IS} = 5 \text{ V}$	650	μΑ

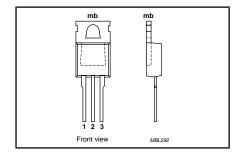
FUNCTIONAL BLOCK DIAGRAM



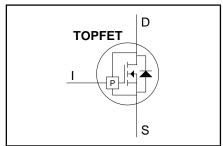
PINNING - SOT78B

PIN	DESCRIPTION
1	input
2	drain
3	source
tab	drain
I	

PIN CONFIGURATION



SYMBOL



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LIMITING VALUES

Limiting values in accordance with the Absolute Maximum Rating System (IEC 134)

SYMBOL	PARAMETER CONDITIONS		MIN.	MAX.	UNIT
V _{DS}	Continuous drain source voltage ¹	-	-	50	V
I _D	Continuous drain current	$V_{IS} = 5 \text{ V}; T_{mb} = 25 \text{ °C}$	-	self -	Α
				limited	
I _D	Continuous drain current	$V_{IS} = 5 \text{ V}; T_{mb} \le 125 \text{ °C}$	-	16	Α
I ₁	Continuous input current	-	-5	5	mA
I _{IRM}	Non-repetitive peak input current	$t_p \le 1 \text{ ms}$	-10	10	mA
P_{D}	Total power dissipation	T _{mb} ≤ 25 °C	-	65	W
T_{stg}	Storage temperature	-	-55	175	°C
T _j	Continuous junction temperature ²	normal operation	-	150	°C
T _{sold}	Lead temperature	during soldering	-	260	°C

ESD LIMITING VALUE

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V _C	Electrostatic discharge capacitor voltage	Human body model; C = 250 pF; R = 1.5 kΩ	-	2	kV

OVERVOLTAGE CLAMPING LIMITING VALUES

At a drain source voltage above 50 V the power MOSFET is actively turned on to clamp overvoltage transients.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
E _{DSM}	Inductive load turn-off Non-repetitive clamping energy Repetitive clamping energy	$I_{DM} = 16 \text{ A}; V_{DD} \le 20 \text{ V}$ $T_{mb} \le 25 \text{ °C}$ $T_{mb} \le 95 \text{ °C}; f = 250 \text{ Hz}$		200 32	mJ mJ

OVERLOAD PROTECTION LIMITING VALUE

With an adequate protection supply provided via the input pin, TOPFET can protect itself from two types of overload - overtemperature and short circuit load.

SYMBOL	PARAMETER	REQUIRED CONDITION	MIN.	MAX.	UNIT
V_{DS}	Drain source voltage ³	4 V ≤ V _{IS} ≤ 5.5 V	0	35	V

THERMAL CHARACTERISTIC

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
	Thermal resistance					
R_{thj-mb}	Junction to mounting base	-	-	1.75	1.92	K/W

¹ Prior to the onset of overvoltage clamping. For voltages above this value, safe operation is limited by the overvoltage clamping energy.

² A higher T_j is allowed as an overload condition but at the threshold T_{j(TO)} the over temperature trip operates to protect the switch.

³ All control logic and protection functions are disabled during conduction of the source drain diode.

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OUTPUT CHARACTERISTICS

Limits are for -40 $^{\circ}$ C \leq T_{mb} \leq 150 $^{\circ}$ C; typicals are for T_{mb} = 25 $^{\circ}$ C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
	Off-state	V _{IS} = 0 V				
$V_{(CL)DSS}$	Drain-source clamping voltage	I _D = 10 mA	50	-	-	V
		$I_{DM} = 2 \text{ A}; t_p \le 300 \mu\text{s}; \delta \le 0.01$	50	60	70	V
I _{DSS}	Drain source leakage current	$V_{DS} = 40 \text{ V}$	-	-	100	μΑ
		$T_{mb} = 25 ^{\circ}C$	-	0.1	10	μΑ
	On-state	$I_{DM} = 6 \text{ A}; t_p \le 300 \mu\text{s}; \delta \le 0.01$				
R _{DS(ON)}	Drain-source resistance	V _{IS} ≥ 4.4 V	-	-	95	mΩ
, ,		$T_{mb} = 25 ^{\circ}C$	-	36	50	$m\Omega$
		$V_{IS} \ge 4 V$	-	-	100	mΩ
		$T_{mb} = 25 ^{\circ}C$	-	39	55	mΩ

OVERLOAD CHARACTERISTICS

-40°C $\leq T_{mb} \leq 150^{\circ} C$ unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
	Short circuit load	V _{DS} = 13 V				
I _D	Drain current limiting	$V_{IS} = 5 \text{ V};$ $T_{mb} = 25^{\circ}\text{C}$ $4.4 \text{ V} \leq V_{IS} \leq 5.5 \text{ V}$	16 12	24 -	32 36	A A
		$4 \text{ V} \leq \text{V}_{IS} \leq 5.5 \text{ V}$	8	-	36	Α
	Overload protection	$V_{IS} = 5 \text{ V;} T_{mb} = 25^{\circ}\text{C}$				
$P_{D(TO)}$	Overload power threshold	device trips if $P_D > P_{D(TO)}$	40	120	160	W
T _{DSC}	Characteristic time	which determines trip time ¹	200	350	600	μs
	Overtemperature protection					
$T_{j(TO)}$	Threshold junction temperature ²		150	170	-	°C

¹ Trip time $t_{d\,sc}$ varies with overload dissipation P_D according to the formula $t_{d\,sc} \approx T_{DSC} / ln[P_D / P_{D(TO)}]$.

 $[{]f 2}$ This is independent of the dV/dt of input voltage $V_{\rm IS}$.

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INPUT CHARACTERISTICS

The supply for the logic and overload protection is taken from the input. Limits are for -40 $^{\circ}$ C \leq T_{mb} \leq 150 $^{\circ}$ C; typicals are for T_{mb} = 25 $^{\circ}$ C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
V _{IS(TO)}	Input threshold voltage	$V_{DS} = 5 \text{ V}; I_{D} = 1 \text{ mA}$		0.6	-	2.4	V
			$T_{mb} = 25^{\circ}C$	1.1	1.6	2.1	V
I _{IS}	Input supply current	normal operation;	$V_{IS} = 5 V$	100	220	400	μΑ
			$V_{IS} = 4 V$	80	195	330	μΑ
I _{ISL}	Input supply current	protection latched;	$V_{IS} = 5 V$	200	400	650	μΑ
			$V_{IS} = 3 V$	130	250	430	μΑ
V_{ISR}	Protection reset voltage ¹	reset time $t_r \ge 100 \mu s$		1.5	2	2.9	V
t _{ir}	Latch reset time	$V_{IS1} = 5 \text{ V}, V_{IS2} < 1 \text{ V}$		10	40	100	μs
$V_{(CL)IS}$	Input clamping voltage	I _I = 1.5 mA		5.5	-	8.5	V
R _{IG}	Input series resistance ² to gate of power MOSFET		$T_{mb} = 25^{\circ}C$	-	33	-	kΩ

SWITCHING CHARACTERISTICS

 T_{mb} = 25 °C; V_{DD} = 13 V; resistive load R_L = 4 Ω . Refer to waveform figure and test circuit.

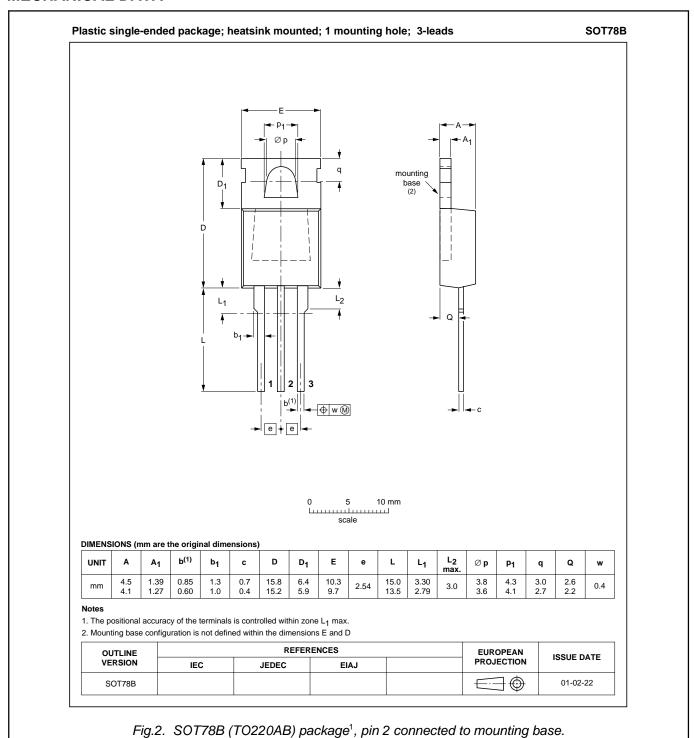
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
t _{d on}	Turn-on delay time	$V_{IS} = 5 V$	ı	15	30	μs
t _r	Rise time		-	30	60	μs
t _{d off}	Turn-off delay time	$V_{IS} = 0 V$	-	70	140	μs
t _f	Fall time		-	35	70	μs

¹ The input voltage below which the overload protection circuits will be reset.

² Not directly measureable from device terminals.

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MECHANICAL DATA



¹ Refer to mounting instructions for SOT78 (TO220) envelopes. Epoxy meets UL94 V0 at 1/8". Net mass: 2 g

Philips Semiconductors Product specification

Logic level TOPFET

PIP3105-P

DEFINITIONS

DATA SHEET STATU	DATA SHEET STATUS						
DATA SHEET STATUS ¹	PRODUCT STATUS ²	DEFINITIONS					
Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice					
Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in ordere to improve the design and supply the best possible product					
Product data	Production	This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Changes will be communicated according to the Customer Product/Process Change Notification (CPCN) procedure SNW-SQ-650A					
Limiting values							

Limiting values

Limiting values are given in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of this specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

Application information

Where application information is given, it is advisory and does not form part of the specification.

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