PIP3118-B

DESCRIPTION

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

APPLICATIONS

General purpose switch for driving

- lamps
- motors
- solenoids
- heaters

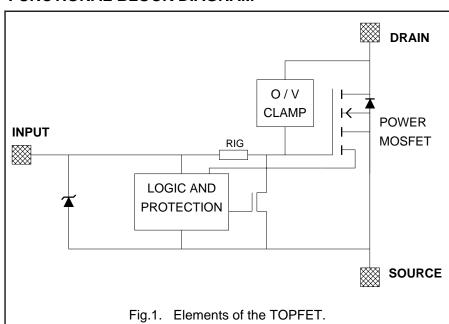
FEATURES

- 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 20 90 150 28	V A W °C mΩ
I _{ISL}	Input supply current $V_{IS} = 5 \text{ V}$	650	μΑ

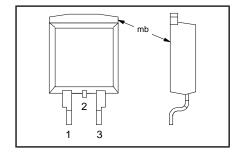
FUNCTIONAL BLOCK DIAGRAM



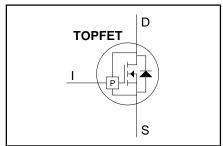
PINNING - SOT404

DESCRIPTION		
input		
drain		
source		
drain		
•		

PIN CONFIGURATION



SYMBOL



PIP3118-B

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	$V_{IS} = 5 \text{ V}; T_{mb} = 25^{\circ}\text{C}$	-	self -	Α
				limited	
I _D	Continuous drain current	$V_{IS} = 5 \text{ V}; T_{mb} \le 121^{\circ}\text{C}$	-	20	Α
l ₁	Continuous input current		-5	5	mA
I _{IRM}	Repetitive peak input current	$\delta \le 0.1$, tp = 300 μs	-50	50	mA
P_{D}	Total power dissipation	$T_{mb} \le 25^{\circ}C$	-	90	W
T _{stg}	Storage temperature		-55	175	°C
T _j	Continuous junction temperature ²	normal operation	-	150	°C
T _{sold}	Case 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		MAX.	UNIT
	Inductive load turn-off Non-repetitive clamping energy Repetitive clamping energy	$I_{DM} = 20 \text{ A}; V_{DD} \le 20 \text{ V}$ $T_{mb} \le 25 ^{\circ}\text{C}$ $T_{mb} \le 95 ^{\circ}\text{C}; f = 250 \text{ Hz}$	-	350 45	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 CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
R _{th j-mb}	Thermal resistance Junction to mounting base	-	1	1.25	1.39	K/W
R _{th j-a}	Junction to ambient	minimum footprint FR4 PCB	-	50	1	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_i is allowed as an overload condition but at the threshold T_{i(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.

PIP3118-B

OUTPUT CHARACTERISTICS

Limits are for -40°C \leq T_{mb} \leq 150°C; typicals are for T_{mb} = 25°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
		$I_{DM} = 4 \text{ A}; t_p \le 300 \mu\text{s}; \delta \le 0.01$	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	$V_{IS} \ge 4.4 \text{ V}; t_p \le 300 \mu\text{s}; \delta \le 0.01$				
R _{DS(ON)}	Drain-source resistance	$I_{DM} = 10 A$	-	-	52	mΩ
		$T_{mb} = 25^{\circ}C$	-	22	28	$m\Omega$

OVERLOAD CHARACTERISTICS

 $V_{IS} = 5 \text{ V}$; $T_{mb} = 25^{\circ}\text{C}$ unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
	Short circuit load					
I _D	Drain current limiting	V _{DS} = 13 V	28.5	43	57	Α
		4.4 V \leq V _{IS} \leq 5.5 V; -40°C \leq T _{mb} \leq 150°C	21	-	65	Α
	Overload protection					
P _{D(TO)} T _{DSC}	Overload power threshold Characteristic time	device trips if P _D > P _{D(TO)} which determines trip time ¹	75 200	185 380	250 600	W 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 $t_{d\,sc} \approx T_{DSC} / ln[P_D / P_{D(TO)}]$.

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

PIP3118-B

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	$V_{DS} = 5 \text{ V}; I_D = 1 \text{ mA}$	$T_{mb} = 25^{\circ}C$	0.6 1.1	- 1.6	2.4 2.1	V V
I _{IS}	Input supply current	normal operation;	$V_{IS} = 5 V$ $V_{IS} = 4 V$	100 80	220 195	400 330	μA μA
I _{ISL}	Input supply current	protection latched;	$V_{IS} = 5 V$ $V_{IS} = 3 V$	200 130	400 250	650 430	μA μA
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	$V_{IS} = 5 V$	1	25	50	μs
t _r	Rise time		-	50	100	μs
t _{d off}	Turn-off delay time	$V_{IS} = 0 V$	-	60	120	μs
t _f	Fall time		-	50	100	μs

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

² Not directly measureable from device terminals.

PIP3118-B

MECHANICAL DATA

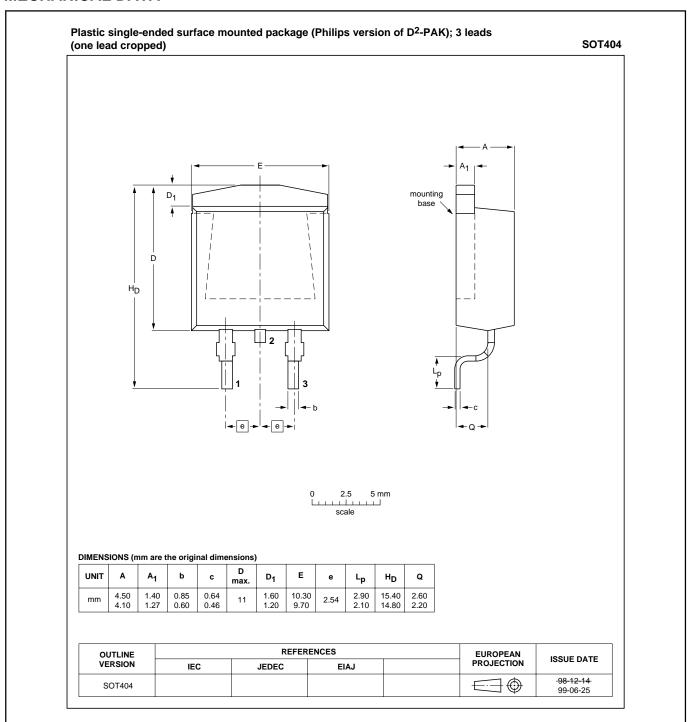


Fig.2. SOT404 surface mounting package¹, centre pin connected to mounting base.

¹ Epoxy meets UL94 V0 at 1/8". Net mass: 1.4 g For soldering guidelines and SMD footprint design, please refer to Data Handbook SC18.

Philips Semiconductors Product specification

Logic level TOPFET

PIP3118-B

DEFINITIONS

DATA SHEET STA	TUS	
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 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.

© Philips Electronics N.V. 2001

All rights are reserved. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner.

The information presented in this document does not form part of any quotation or contract, it is believed to be accurate and reliable and may be changed without notice. No liability will be accepted by the publisher for any consequence of its use. Publication thereof does not convey nor imply any license under patent or other industrial or intellectual property rights.

LIFE SUPPORT APPLICATIONS

These products are not designed for use in life support appliances, devices or systems where malfunction of these products can be reasonably expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.

¹ Please consult the most recently issued datasheet before initiating or completing a design.

² The product status of the device(s) described in this datasheet may have changed since this datasheet was published. The latest information is available on the Internet at URL http://www.semiconductors.philips.com.