PowerMOS transistor PHP2N40E

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope featuring high avalanche energy capability, stable blocking voltage, fast switching and high thermal cycling performance with low thermal resistance. Intended for use in Switched Mode Power Supplies (SMPS), motor control circuits and general purpose switching applications.

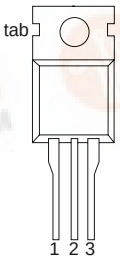
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	UNIT
V_{DS}	Drain-source voltage	400	V
I_D	Drain current (DC)	2.5	A
P_{tot}	Total power dissipation	50	W
$R_{DS(ON)}$	Drain-source on-state resistance	3.5	Ω

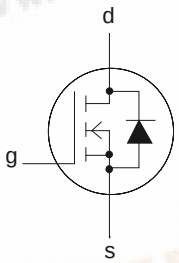
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	Drain-source voltage		-	400	V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	400	V
$\pm V_{GS}$	Gate-source voltage		-	30	V
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	2.5	A
		T_{mb} = 100 ˚C	-	1.6	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	10	A
I_{DR}	Source-drain diode current (DC)	T_{mb} = 25 ˚C	-	2.5	A
I_{DRM}	Source-drain diode current (pulse peak value)	T_{mb} = 25 ˚C	-	10	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	50	W
T_{stg}	Storage temperature		-55	150	˚C
T_j	Junction temperature		-	150	˚C

AVALANCHE LIMITING VALUE

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 2.5 A ; $V_{DD} \le$ 50 V ; V_{GS} = 10 V ; R_{GS} = 50 Ω			
		T_j = 25˚C prior to surge	-	120	mJ
		T_j = 100˚C prior to surge	-	20	mJ
W_{DSR} [1]	Drain-source repetitive unclamped inductive turn-off energy	I_D = 2.5 A ; $V_{DD} \le$ 50 V ; V_{GS} = 10 V ; R_{GS}= 50 Ω ; $T_j \le$ 150 ˚C	-	3.6	mJ

1. Pulse width and frequency limited by $T_{j(max)}$

THERMAL RESISTANCES

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$R_{th\ j\text{-}mb}$	Thermal resistance junction to mounting base		-	-	2.5	K/W
$R_{th\ j\text{-}a}$	Thermal resistance junction to ambient		-	60	-	K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	400	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 0.25 mA	2.0	3.0	4.0	V
I_{DSS}	Drain-source leakage current	V_{DS} = 400 V; V_{GS} = 0 V; T_j = 25 ˚C	-	10	100	µA
		V_{DS} = 320 V; V_{GS} = 0 V; T_j = 125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate-source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 1.25 A	-	3.1	3.5	Ω
V_{SD}	Source-drain diode forward voltage	I_F = 2.5 A ;V_{GS} = 0 V	-	1.4	2.0	V

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 15 V; I_D = 1.25 A	0.5	0.9	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	225	315	pF
C_{oss}	Output capacitance		-	30	42	pF
C_{rss}	Feedback capacitance		-	6.0	12	pF
$Q_{g(tot)}$	Total gate charge	V_{GS} = 10 V; I_D = 2.5 A; V_{DS} = 320 V	-	12	-	nC
Q_{gs}	Gate to source charge		-	2	-	nC
Q_{gd}	Gate to drain (Miller) charge		-	6	-	nC
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.2 A;	-	10	15	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	30	45	ns
$t_{d\ off}$	Turn-off delay time	R_{GEN} = 50 Ω	-	30	40	ns
t_f	Turn-off fall time		-	20	30	ns
t_{rr}	Source-drain diode reverse recovery time	I_F = 2.5 A; -dI_F/dt = 100 A/µs;	-	350	-	ns
Q_{rr}	Source-drain diode reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	2.5	-	µC
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

MECHANICAL DATA

Dimensions in mm

Net Mass: 2 g

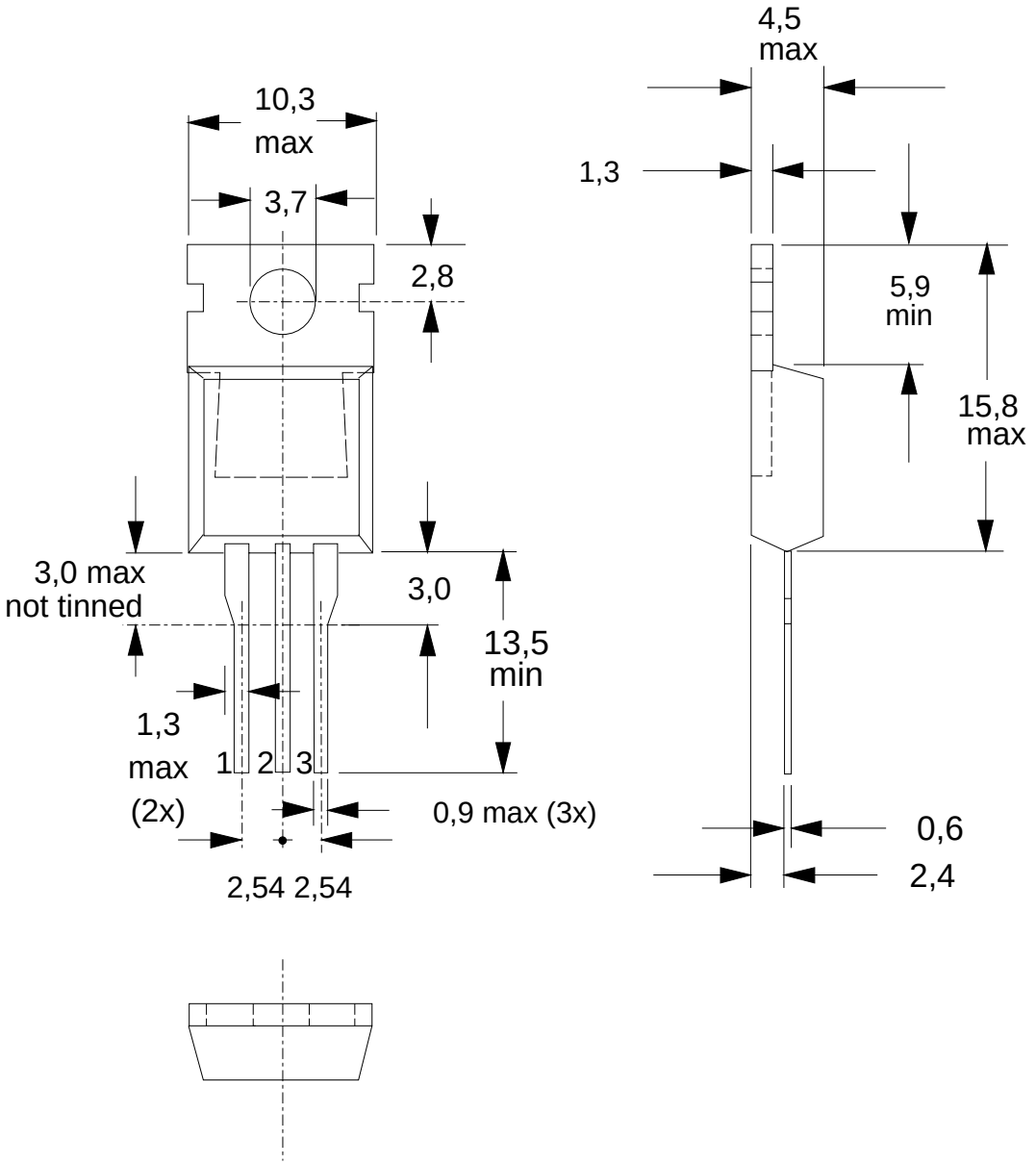


Fig.1. TO220AB; pin 2 connected to mounting base.

Notes

1. Observe the general handling precautions for electrostatic-discharge sensitive devices (ESDs) to prevent damage to MOS gate oxide.
2. Refer to mounting instructions for TO220 envelopes.
3. Epoxy meets UL94 V0 at 1/8".

DEFINITIONS

Data sheet status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
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.	

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.