

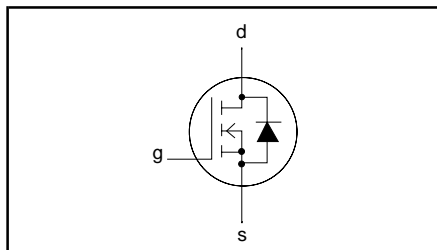
# N-channel TrenchMOS™ transistor

# PHW35NQ20T

## FEATURES

- 'Trench' technology
- Very low on-state resistance
- Fast switching
- Low thermal resistance

## SYMBOL



## QUICK REFERENCE DATA

$V_{DSS} = 200 \text{ V}$
$I_D = 35 \text{ A}$
$R_{DS(ON)} \leq 70 \text{ m}\Omega$

## GENERAL DESCRIPTION

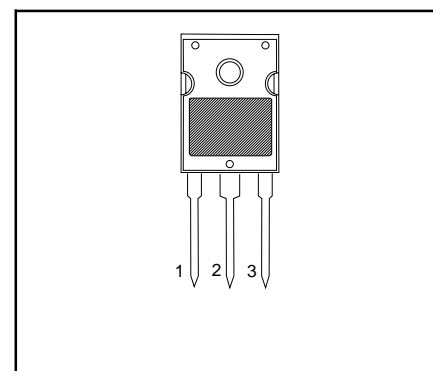
N-channel enhancement mode field-effect power transistor in a plastic envelope using 'trench' technology. The device has very low on-state resistance. It is intended for use in dc to dc converters and general purpose switching applications.

The PHW35NQ20T is supplied in the SOT429 (TO247) conventional leaded package.

## PINNING

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

## SOT429 (TO247)



## LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{DSS}$	Drain-source voltage	$T_j = 25 \text{ }^\circ\text{C}$ to $175 \text{ }^\circ\text{C}$	-	200	V
$V_{DGR}$	Drain-gate voltage	$T_j = 25 \text{ }^\circ\text{C}$ to $175 \text{ }^\circ\text{C}$ ; $R_{GS} = 20 \text{ k}\Omega$	-	200	V
$V_{GS}$	Gate-source voltage		-	$\pm 20$	V
$I_D$	Continuous drain current	$T_{mb} = 25 \text{ }^\circ\text{C}$	-	35	A
		$T_{mb} = 100 \text{ }^\circ\text{C}$	-	25	A
$I_{DM}$	Pulsed drain current	$T_{mb} = 25 \text{ }^\circ\text{C}$	-	140	A
$P_D$	Total power dissipation	$T_{mb} = 25 \text{ }^\circ\text{C}$	-	250	W
$T_j, T_{stg}$	Operating junction and storage temperature		-55	175	$^\circ\text{C}$

## AVALANCHE ENERGY LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$E_{AS}$	Non-repetitive avalanche energy	Unclamped inductive load, $I_{AS} = 35 \text{ A}$ ; $t_p = 100 \text{ }\mu\text{s}$ ; $T_j$ prior to avalanche = $25 \text{ }^\circ\text{C}$ ; $V_{DD} \leq 50 \text{ V}$ ; $R_{GS} = 50 \text{ }\Omega$ ; $V_{GS} = 10 \text{ V}$ ; refer to fig:15	-	462	mJ
$I_{AS}$	Non-repetitive avalanche current		-	35	A

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## THERMAL RESISTANCES

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
$R_{th\ j-mb}$	Thermal resistance junction to mounting base		-	0.6	K/W
$R_{th\ j-a}$	Thermal resistance junction to ambient	in free air	45	-	K/W

## ELECTRICAL CHARACTERISTICS

 $T_j = 25^\circ\text{C}$  unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}; I_D = 0.25\text{ mA}; T_j = -55^\circ\text{C}$	200 178	- -	- -	V V
$V_{GS(TO)}$	Gate threshold voltage	$V_{DS} = V_{GS}; I_D = 1\text{ mA}; T_j = 175^\circ\text{C}$ $T_j = -55^\circ\text{C}$	2.0 1.0 -	3.0 -	4.0 -	V V V
$R_{DS(ON)}$	Drain-source on-state resistance	$V_{GS} = 10\text{ V}; I_D = 17\text{ A}; T_j = 175^\circ\text{C}$	-	60	70	m $\Omega$
$I_{GSS}$	Gate source leakage current	$V_{GS} = \pm 10\text{ V}; V_{DS} = 0\text{ V}; T_j = 175^\circ\text{C}$	-	2	100	nA
$I_{DSS}$	Zero gate voltage drain current	$V_{DS} = 200\text{ V}; V_{GS} = 0\text{ V}; T_j = 175^\circ\text{C}$	-	0.05	10	$\mu\text{A}$
$Q_{g(tot)}$	Total gate charge	$I_D = 35\text{ A}; V_{DD} = 160\text{ V}; V_{GS} = 10\text{ V}$	-	77	-	nC
$Q_{gs}$	Gate-source charge		-	16	-	nC
$Q_{gd}$	Gate-drain (Miller) charge		-	28	-	nC
$t_{d\ on}$	Turn-on delay time	$V_{DD} = 100\text{ V}; R_D = 2.7\ \Omega;$	-	22	-	ns
$t_r$	Turn-on rise time	$V_{GS} = 10\text{ V}; R_G = 5.6\ \Omega;$	-	100	-	ns
$t_{d\ off}$	Turn-off delay time	Resistive load	-	80	-	ns
$t_f$	Turn-off fall time		-	90	-	ns
$L_d$	Internal drain inductance	Measured from tab to centre of die	-	3.5	-	nH
$L_d$	Internal drain inductance	Measured from drain lead to centre of die	-	4.5	-	nH
$L_s$	Internal source inductance	Measured from source lead to source bond pad	-	7.5	-	nH
$C_{iss}$	Input capacitance	$V_{GS} = 0\text{ V}; V_{DS} = 25\text{ V}; f = 1\text{ MHz}$	-	4570	-	pF
$C_{oss}$	Output capacitance		-	370	-	pF
$C_{rss}$	Feedback capacitance		-	160	-	pF

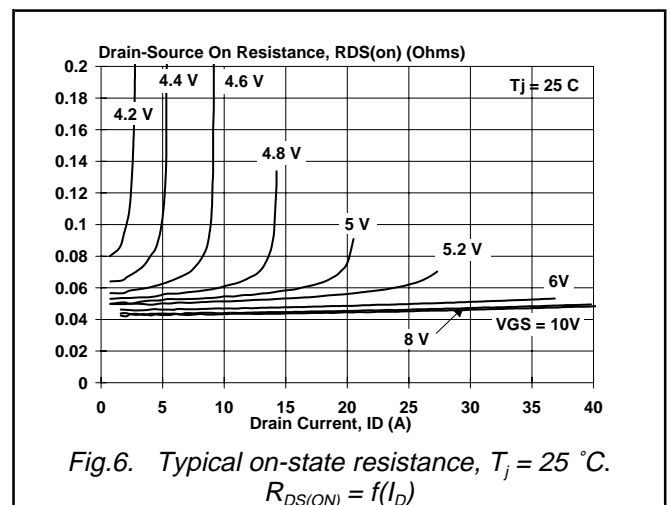
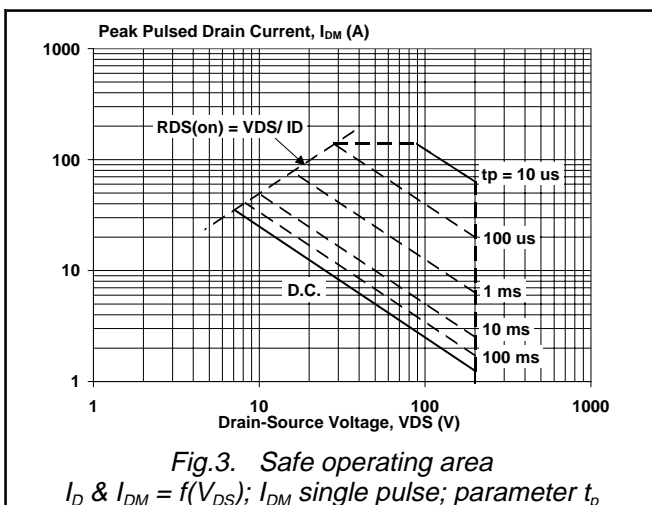
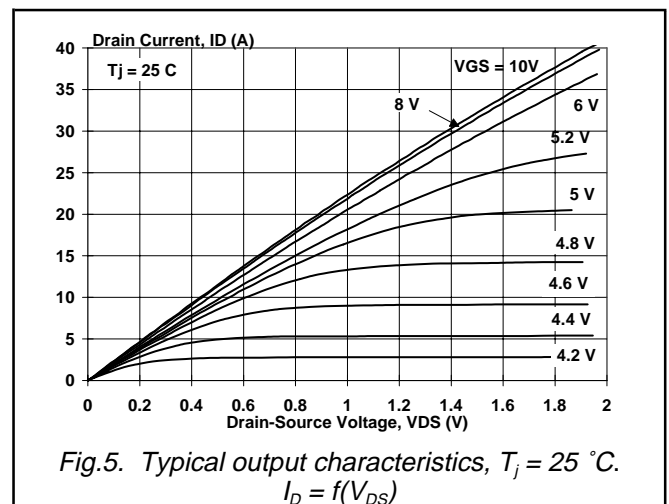
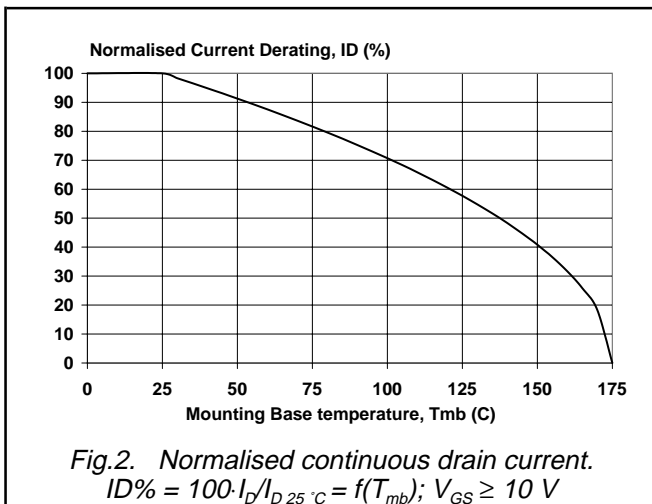
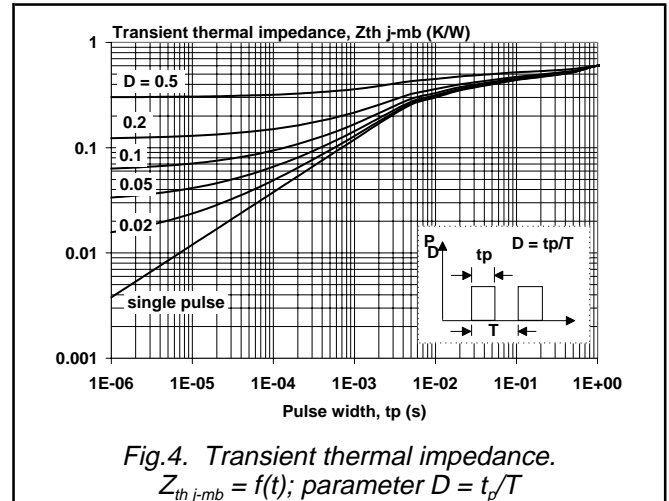
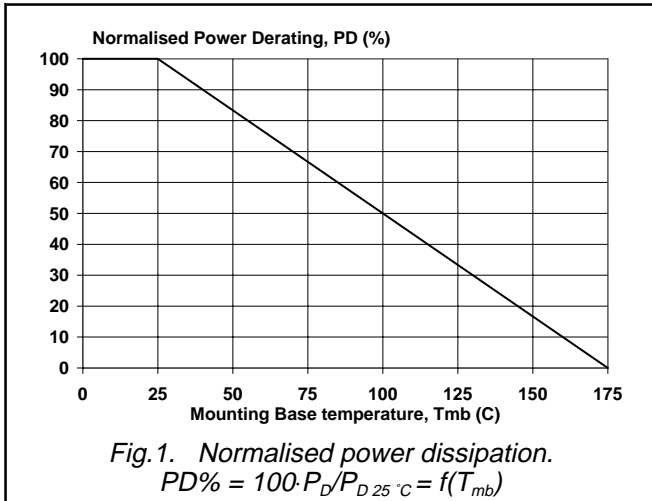
## REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

 $T_j = 25^\circ\text{C}$  unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$I_S$	Continuous source current (body diode)		-	-	35	A
$I_{SM}$	Pulsed source current (body diode)		-	-	140	A
$V_{SD}$	Diode forward voltage	$I_F = 35\text{ A}; V_{GS} = 0\text{ V}$	-	0.85	1.2	V
$t_{rr}$	Reverse recovery time	$I_F = 20\text{ A}; -di_F/dt = 100\text{ A}/\mu\text{s}; V_{GS} = 0\text{ V}; V_R = 30\text{ V}$	-	160	-	ns
$Q_{rr}$	Reverse recovery charge		-	1.0	-	$\mu\text{C}$

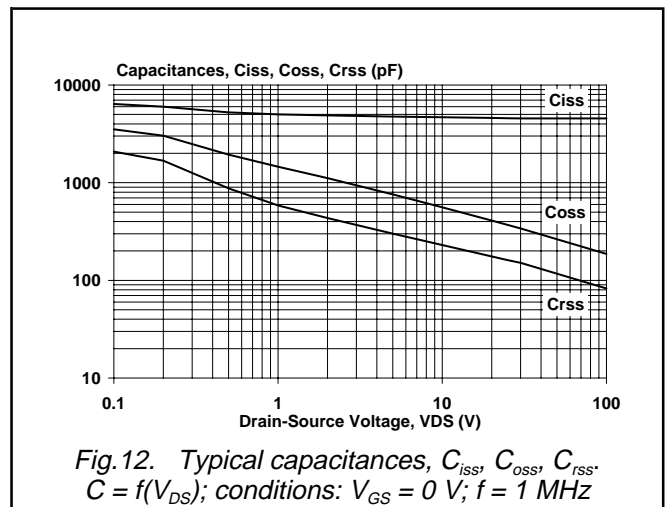
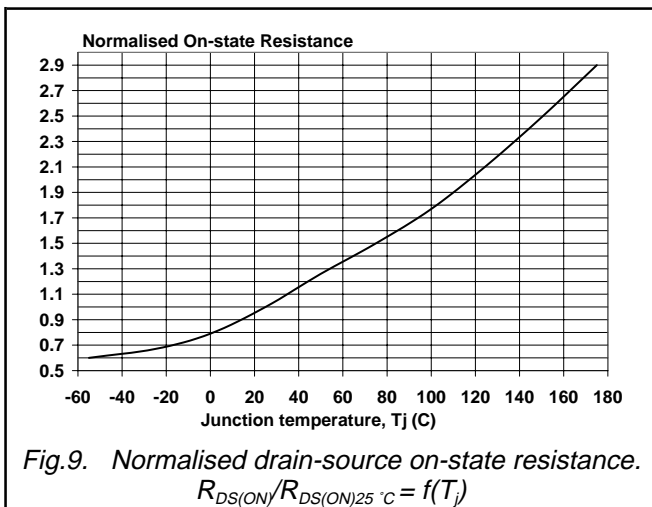
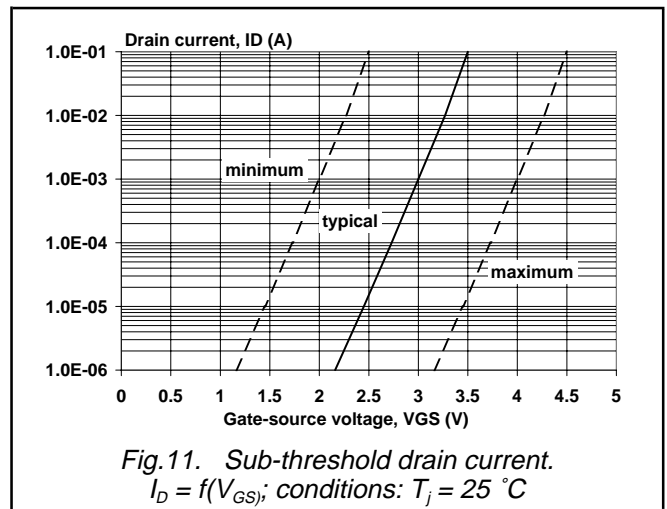
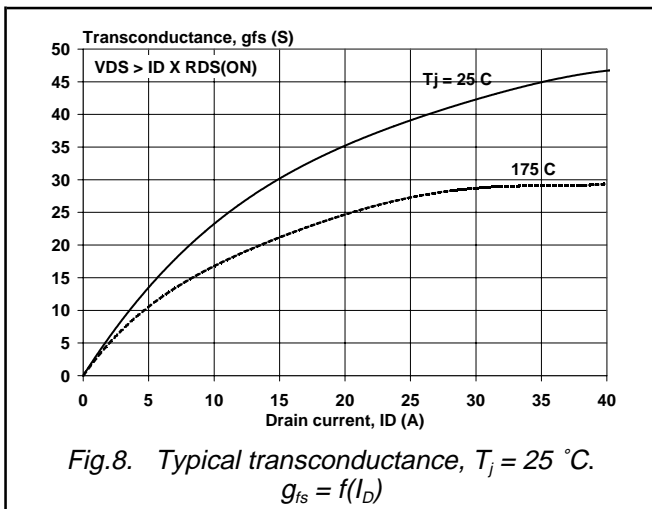
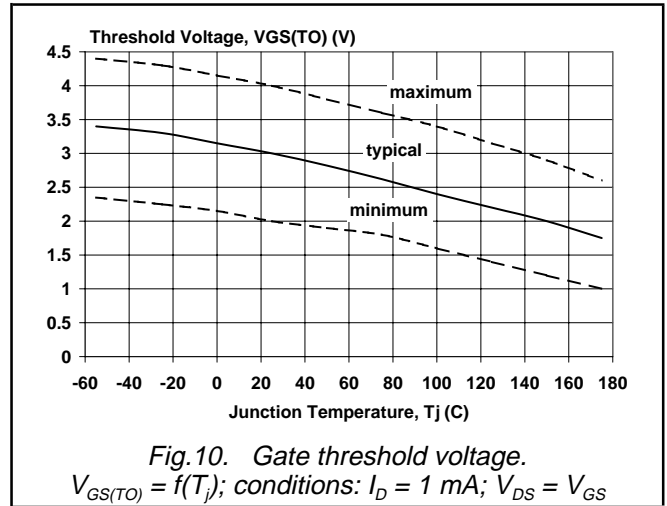
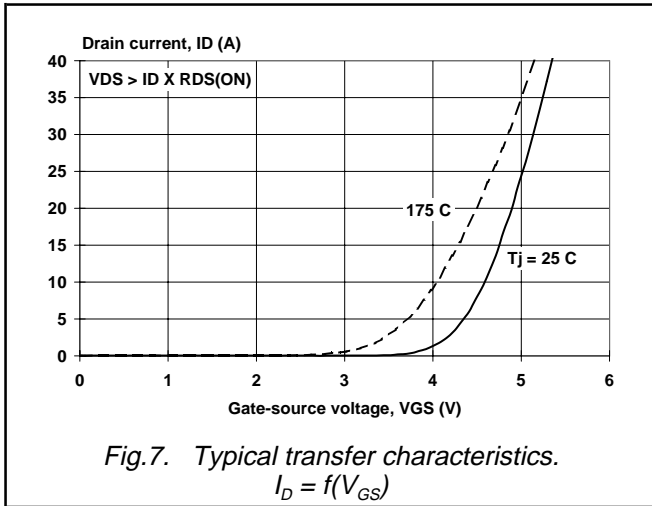
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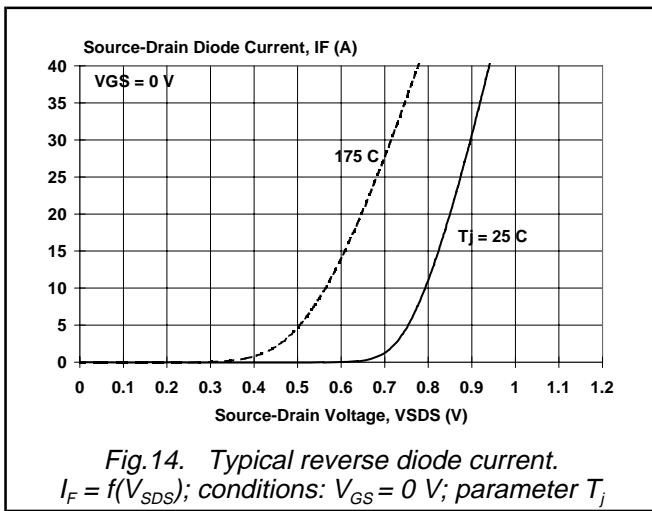
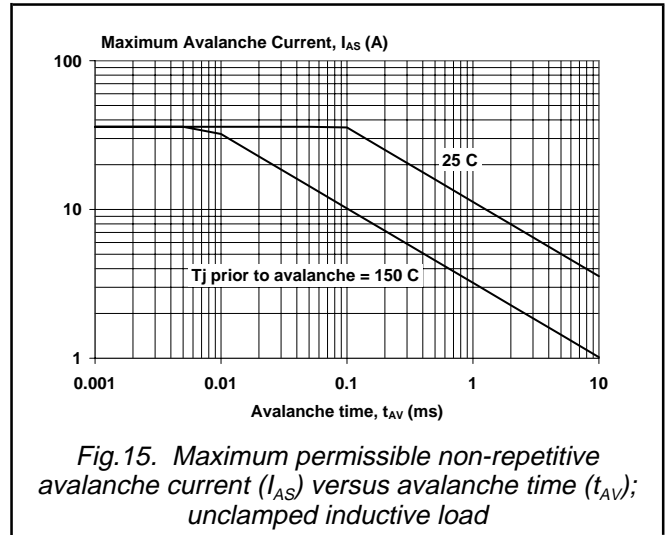
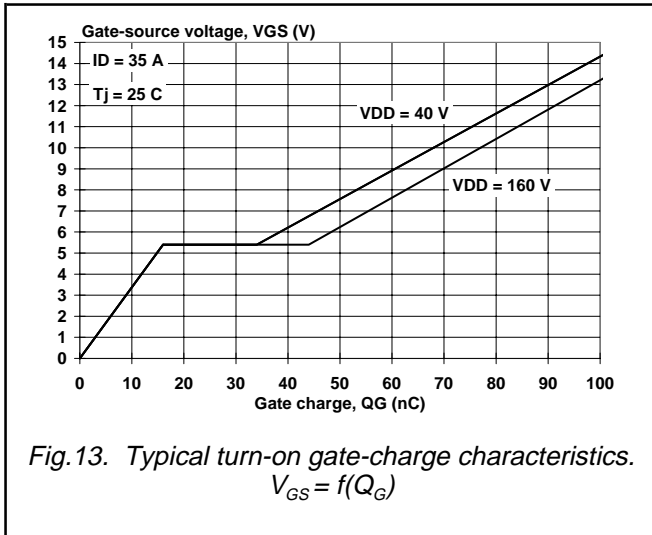
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MECHANICAL DATA

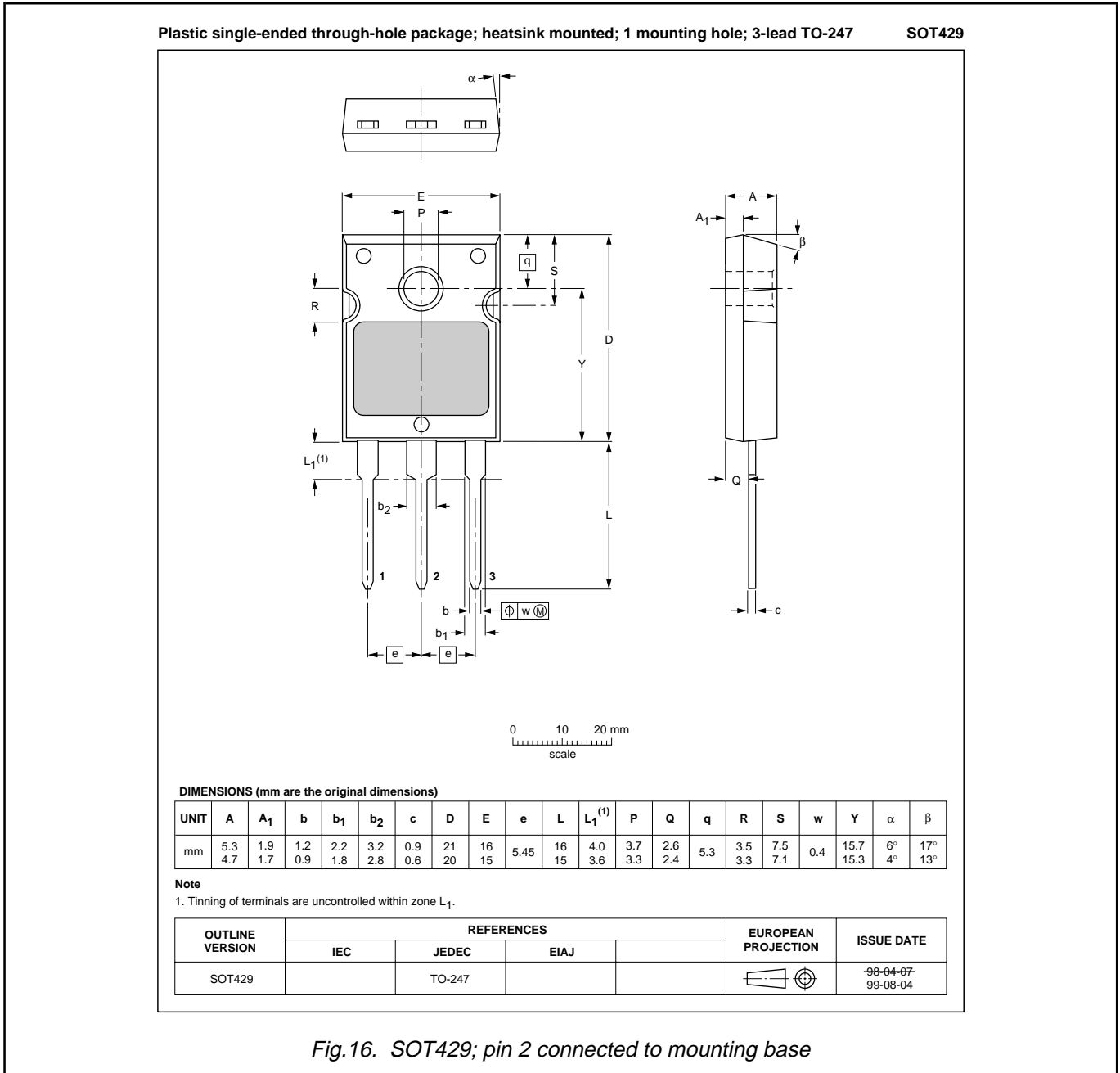


Fig. 16. SOT429; pin 2 connected to mounting base

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 SOT429 envelope.
3. Epoxy meets UL94 V0 at 1/8".

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**DEFINITIONS**

<b>Data sheet status</b>	
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.
<b>Limiting values</b>	
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.	
<b>Application information</b>	
Where application information is given, it is advisory and does not form part of the specification.	
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