

PHP30NQ15T

N-channel TrenchMOS standard level FET

Rev. 03 — 3 March 2010

Product data sheet

1. Product profile

1.1 General description

Standard level N-channel enhancement mode Field-Effect Transistor (FET) in a plastic package using TrenchMOS technology. This product is designed and qualified for use in computing, communications, consumer and industrial applications only.

1.2 Features and benefits

- Low conduction losses due to low on-state resistance
- Suitable for high frequency applications due to fast switching characteristics

1.3 Applications

- DC-to-DC convertors
- Switched-mode power supplies

1.4 Quick reference data

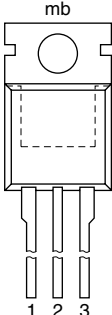
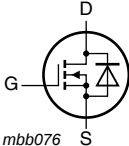
Table 1. Quick reference

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25\text{ °C}$; $T_j \leq 175\text{ °C}$	-	-	150	V
I_D	drain current	$T_{mb} = 25\text{ °C}$; $V_{GS} = 10\text{ V}$; see Figure 1 and 2	-	-	29	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}$; see Figure 3	-	-	150	W
Dynamic characteristics						
Q_{GD}	gate-drain charge	$V_{GS} = 10\text{ V}$; $I_D = 30\text{ A}$; $V_{DS} = 120\text{ V}$; $T_j = 25\text{ °C}$; see Figure 13	-	20	27	nC
Static characteristics						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}$; $I_D = 15\text{ A}$; $T_j = 25\text{ °C}$; see Figure 11 and 12	-	60	63	mΩ



2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate		
2	D	drain		
3	S	source		
mb	D	mounting base; connected to drain		

SOT78 (TO-220AB)

3. Ordering information

Table 3. Ordering information

Type number	Package		Version
	Name	Description	
PHP30NQ15T	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

4. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

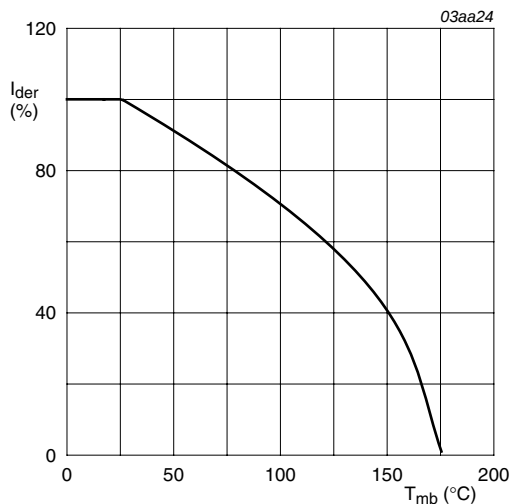
Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25\text{ }^{\circ}\text{C}$; $T_j \leq 175\text{ }^{\circ}\text{C}$	-	150	V
V_{DGR}	drain-gate voltage	$T_j \geq 25\text{ }^{\circ}\text{C}$; $T_j \leq 175\text{ }^{\circ}\text{C}$; $R_{GS} = 20\text{ k}\Omega$	-	150	V
V_{GS}	gate-source voltage		-20	20	V
I_D	drain current	$V_{GS} = 10\text{ V}$; $T_{mb} = 25\text{ }^{\circ}\text{C}$; see Figure 1 and 2	-	29	A
		$V_{GS} = 10\text{ V}$; $T_{mb} = 100\text{ }^{\circ}\text{C}$; see Figure 1	-	20	A
I_{DM}	peak drain current	$t_p \leq 10\text{ }\mu\text{s}$; pulsed; $T_{mb} = 25\text{ }^{\circ}\text{C}$; see Figure 2	-	116	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ }^{\circ}\text{C}$; see Figure 3	-	150	W
T_{stg}	storage temperature		-55	175	$^{\circ}\text{C}$
T_j	junction temperature		-55	175	$^{\circ}\text{C}$

Source-drain diode

I_S	source current	$T_{mb} = 25\text{ }^{\circ}\text{C}$	-	29	A
I_{SM}	peak source current	$t_p \leq 10\text{ }\mu\text{s}$; pulsed; $T_{mb} = 25\text{ }^{\circ}\text{C}$	-	116	A

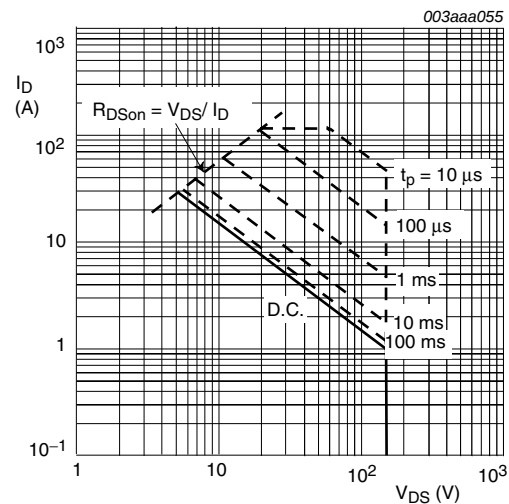
Avalanche ruggedness

$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10\text{ V}$; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$; $I_D = 26\text{ A}$; $V_{sup} \leq 25\text{ V}$; unclamped; $R_{GS} = 50\text{ }\Omega$; $t_p = 0.2\text{ ms}$; see Figure 4	-	502	mJ
I_{AS}	non-repetitive avalanche current	$V_{sup} \leq 25\text{ V}$; $V_{GS} = 10\text{ V}$; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$; $R_{GS} = 50\text{ }\Omega$; unclamped; see Figure 4	-	29	A



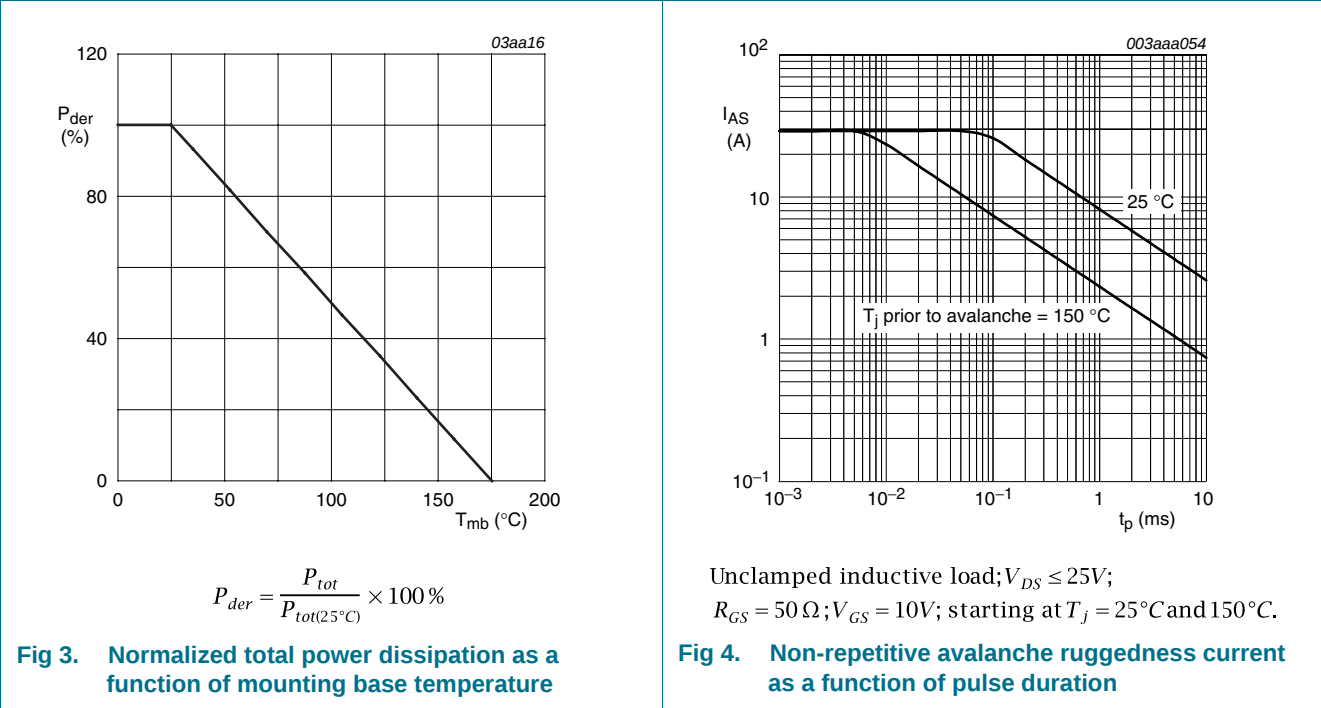
$$I_{der} = \frac{I_D}{I_{D(25^{\circ}\text{C})}} \times 100\%$$

Fig 1. Normalized continuous drain current as a function of mounting base temperature



$T_{mb} = 25^{\circ}\text{C}$; I_{DM} is single pulse

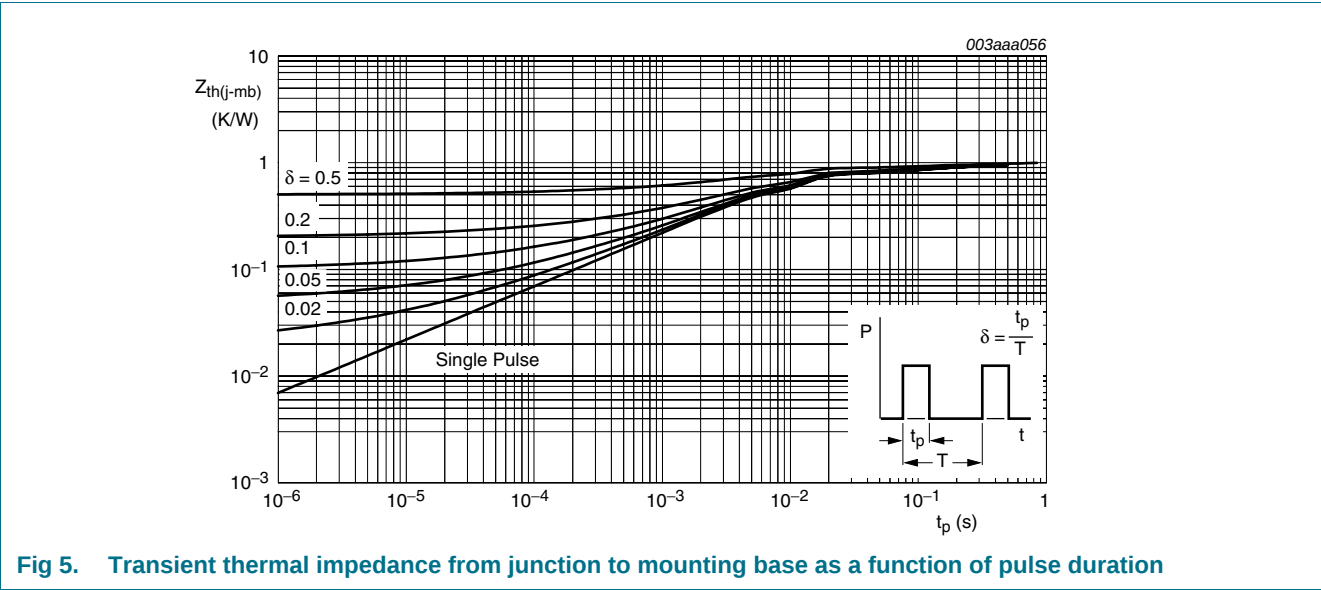
Fig 2. Safe operating area; continuous and peak drain currents as a function of drain-source voltage



5. Thermal characteristics

Table 5. Thermal characteristics

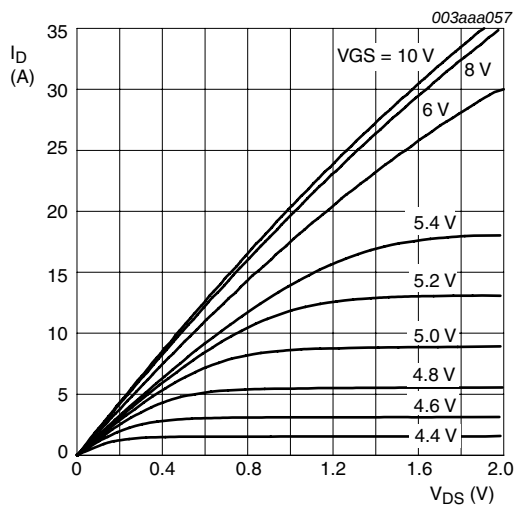
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	see Figure 5	-	-	1	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	vertical in still air	-	60	-	K/W



6. Characteristics

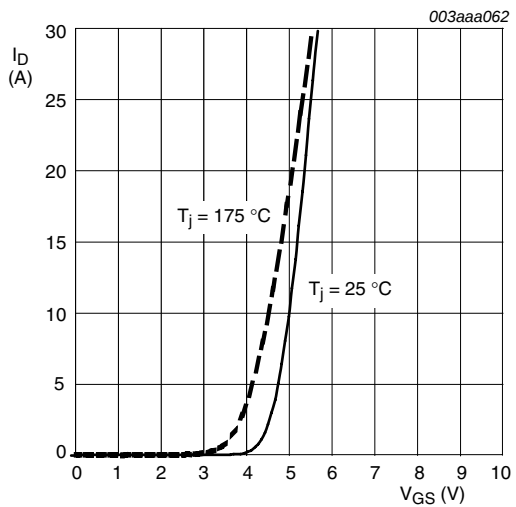
Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
V _{(BR)DSS}	drain-source breakdown voltage	I _D = 250 μA; V _{GS} = 0 V; T _j = 25 °C	150	-	-	V
V _{GS(th)}	gate-source threshold voltage	I _D = 1 mA; V _{DS} = V _{GS} ; T _j = 25 °C; see Figure 8	2	3	4	V
		I _D = 1 mA; V _{DS} = V _{GS} ; T _j = 175 °C; see Figure 8	1	-	-	V
I _{DSS}	drain leakage current	V _{DS} = 150 V; V _{GS} = 0 V; T _j = 25 °C	-	0.05	10	μA
		V _{DS} = 150 V; V _{GS} = 0 V; T _j = 175 °C	-	-	500	μA
I _{GSS}	gate leakage current	V _{GS} = 10 V; V _{DS} = 0 V; T _j = 25 °C	-	0.02	100	nA
		V _{GS} = -10 V; V _{DS} = 0 V; T _j = 25 °C	-	0.02	100	nA
R _{DSon}	drain-source on-state resistance	V _{GS} = 10 V; I _D = 15 A; T _j = 175 °C; see Figure 11 and 12	-	-	176	mΩ
		V _{GS} = 10 V; I _D = 15 A; T _j = 25 °C; see Figure 11 and 12	-	60	63	mΩ
Dynamic characteristics						
Q _{G(tot)}	total gate charge	I _D = 30 A; V _{DS} = 120 V; V _{GS} = 10 V; T _j = 25 °C; see Figure 13	-	55	-	nC
Q _{GS}	gate-source charge		-	10	-	nC
Q _{GD}	gate-drain charge		-	20	27	nC
C _{iss}	input capacitance	V _{DS} = 25 V; V _{GS} = 0 V; f = 1 MHz; T _j = 25 °C; see Figure 14	-	2390	-	pF
C _{oss}	output capacitance		-	240	-	pF
C _{rss}	reverse transfer capacitance		-	98	-	pF
t _{d(on)}	turn-on delay time	V _{DS} = 75 V; R _L = 2.7 Ω; V _{GS} = 10 V; R _{G(ext)} = 5.6 Ω; T _j = 25 °C	-	14	-	ns
t _r	rise time		-	50	-	ns
t _{d(off)}	turn-off delay time		-	48	-	ns
t _f	fall time		-	38	-	ns
Source-drain diode						
V _{SD}	source-drain voltage	I _S = 25 A; V _{GS} = 0 V; T _j = 25 °C; see Figure 15	-	0.9	1.2	V
t _{rr}	reverse recovery time	I _S = 20 A; dI _S /dt = -100 A/μs; V _{GS} = 0 V; V _{DS} = 25 V; T _j = 25 °C	-	105	-	ns
Q _r	recovered charge	V _{DS} = 25 V; T _j = 25 °C	-	0.55	-	μC



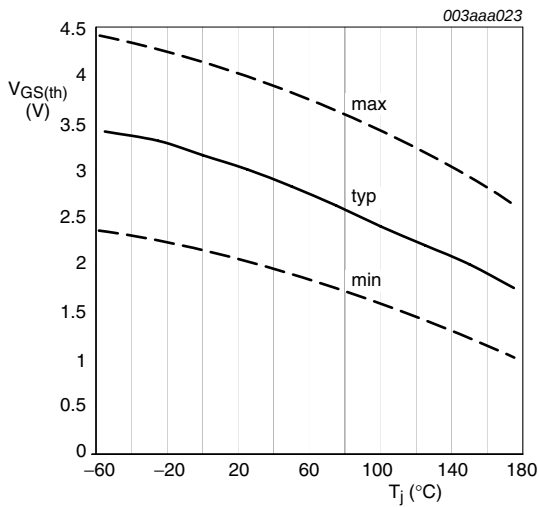
$T_j = 25^{\circ}\text{C}$

Fig 6. Output characteristics: drain current as a function of drain-source voltage; typical values



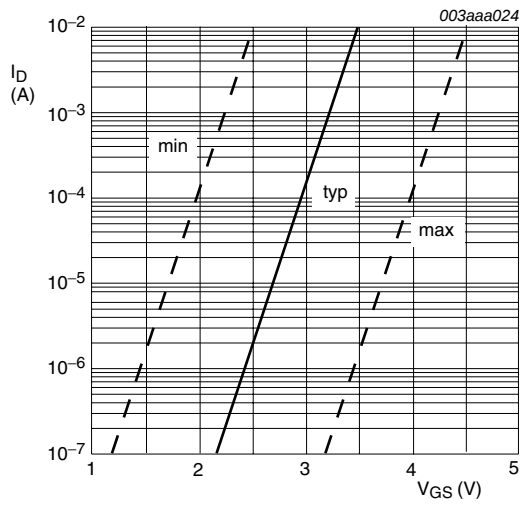
$T_j = 25^{\circ}\text{C}$ and $175^{\circ}\text{C}; V_{DS} > I_D \times R_{DSon}$

Fig 7. Transfer characteristics: drain current as a function of gate-source voltage; typical values



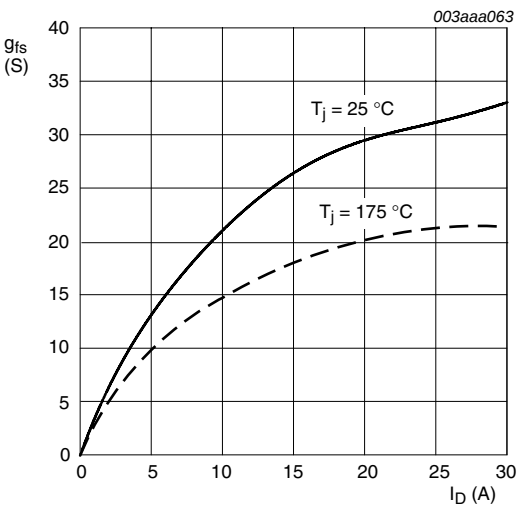
$I_D = 1\text{mA}; V_{DS} = V_{GS}$

Fig 8. Gate-source threshold voltage as a function of junction temperature



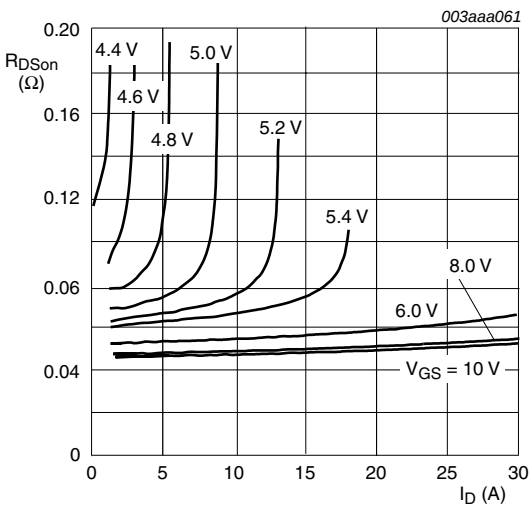
$T_j = 25^{\circ}\text{C}$

Fig 9. Sub-threshold drain current as a function of gate-source voltage



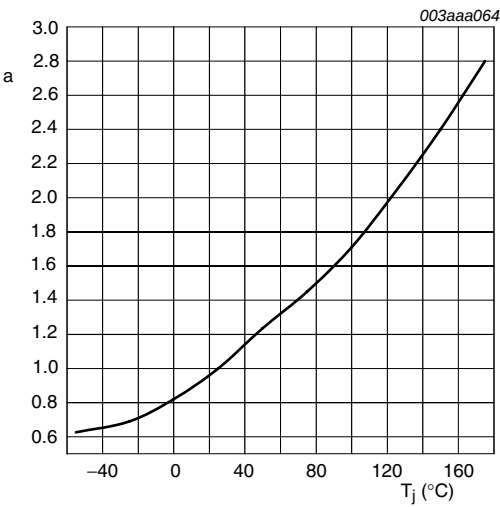
$T_j = 25^\circ\text{C}$ and 175°C ; $V_{DS} > I_D \times R_{DSon}$

Fig 10. Forward transconductance as a function of drain current; typical values



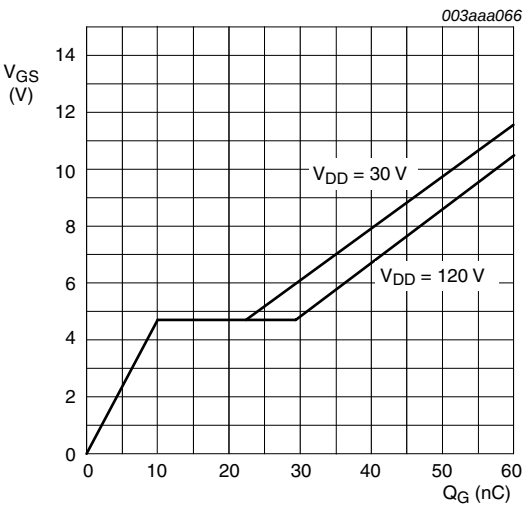
$T_j = 25^\circ\text{C}$

Fig 11. Drain-source on-state resistance as a function of drain current; typical values



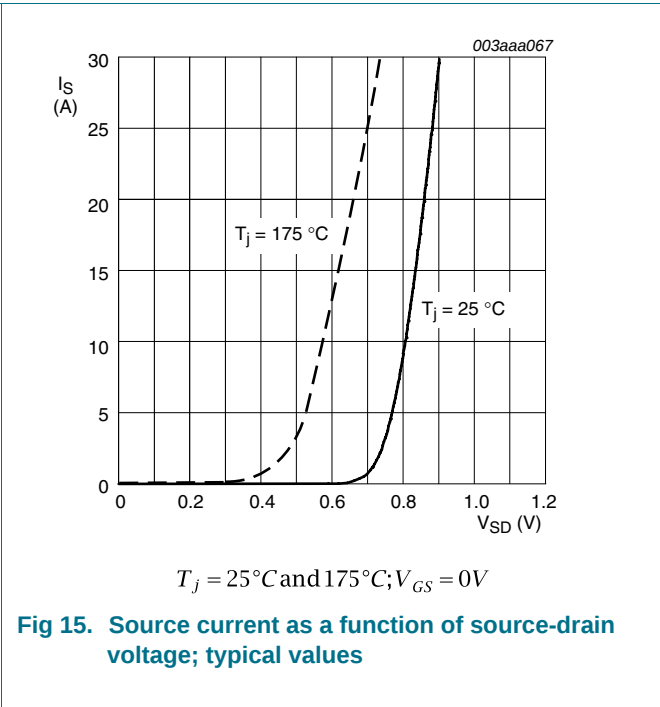
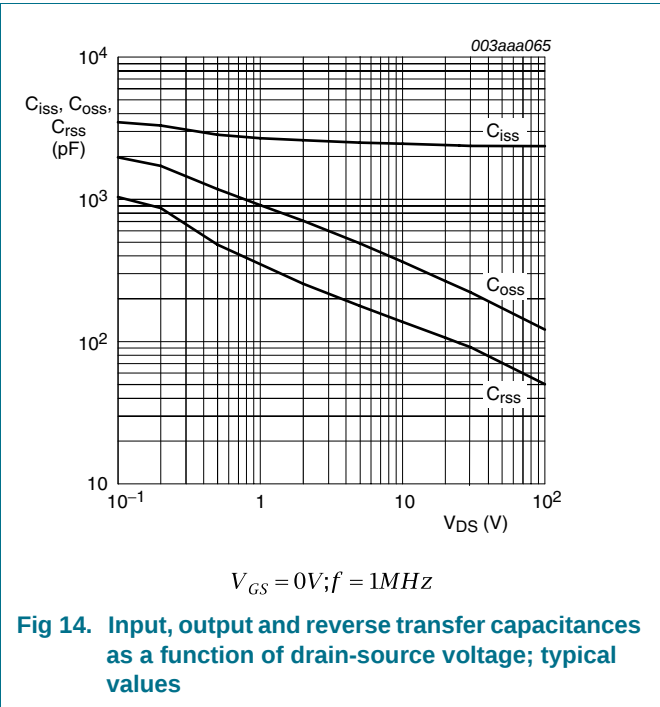
$$a = \frac{R_{DSon}}{R_{DSon(25^\circ\text{C})}}$$

Fig 12. Normalized drain-source on-state resistance factor as a function of junction temperature



$I_D = 30\text{A}$; $V_{DS} = 30\text{V}$ and 120V

Fig 13. Gate-source voltage as a function of gate charge; typical values



7. Package outline

Plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB SOT78

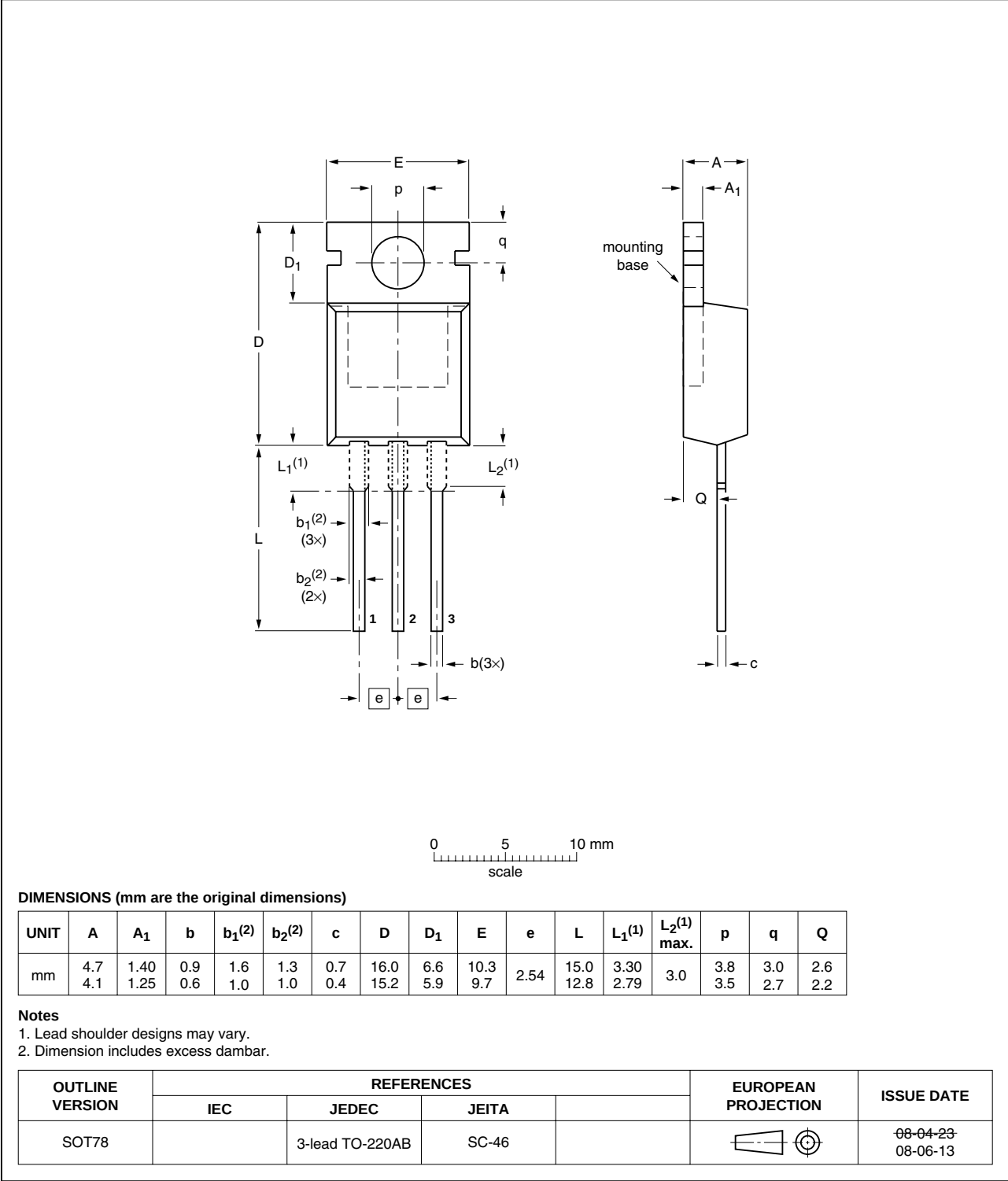


Fig 16. Package outline SOT78 (TO-220AB)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PHP30NQ15T_3	20100303	Product data sheet	-	PHB_PHP30NQ15T-02
Modifications:	• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate. • Typenumber PHP30NQ15T separated from data sheet PHB_PHP30NQ15T-02.			
PHB_PHP30NQ15T-02 (9397 750 08037)	20010312	Product specification	-	PHB_PHP30NQ15T_1
PHB_PHP30NQ15T_1	19990801	Product specification	-	-

9. Legal information

9.1 Data sheet status

Document status ^{[1][2]}	Product status ^[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

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