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Team Nexperia

PHP79NQ08LT

N-channel TrenchMOS logic level FET

Rev. 03 — 26 April 2010

Product data sheet

1. Product profile

1.1 General description

Logic 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 logic level gate drive sources

1.3 Applications

- DC-to-DC convertors
- Motors, lamps and solenoids
- General purpose power switching
- Uninterruptible power supplies

1.4 Quick reference data

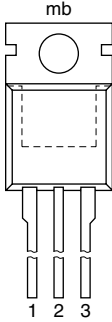
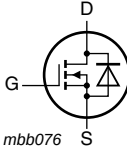
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25\text{ }^{\circ}\text{C}$; $T_j \leq 175\text{ }^{\circ}\text{C}$	-	-	75	V
I_D	drain current	$T_{mb} = 25\text{ }^{\circ}\text{C}$; $V_{GS} = 10\text{ V}$	-	-	73	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ }^{\circ}\text{C}$; see Figure 2	-	-	157	W
Static characteristics						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}$; $I_D = 25\text{ A}$; $T_j = 25\text{ }^{\circ}\text{C}$; see Figure 9 ; see Figure 10	-	14	16	m Ω
Dynamic characteristics						
Q_{GD}	gate-drain charge	$V_{GS} = 5\text{ V}$; $I_D = 25\text{ A}$; $V_{DS} = 60\text{ V}$; $T_j = 25\text{ }^{\circ}\text{C}$; see Figure 11 ; see Figure 12	-	14	-	nC



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		
	Name	Description	Version
PHP79NQ08LT	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

4. Limiting values

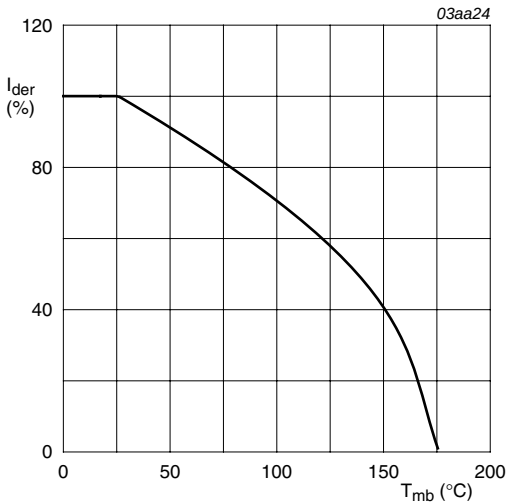
Table 4. Limiting values

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25\text{ }^{\circ}\text{C}$; $T_j \leq 175\text{ }^{\circ}\text{C}$	-	-	75	V
V_{DGR}	drain-gate voltage	$T_j \leq 175\text{ }^{\circ}\text{C}$; $T_j \geq 25\text{ }^{\circ}\text{C}$; $R_{GS} = 20\text{ k}\Omega$	-	-	75	V
V_{GS}	gate-source voltage		-15	-	15	V
I_D	drain current	$V_{GS} = 10\text{ V}$; $T_{mb} = 25\text{ }^{\circ}\text{C}$	-	-	73	A
		$V_{GS} = 5\text{ V}$; $T_{mb} = 100\text{ }^{\circ}\text{C}$; see Figure 1	-	-	47	A
		$V_{GS} = 10\text{ V}$; $T_{mb} = 100\text{ }^{\circ}\text{C}$	-	-	51	A
		$V_{GS} = 5\text{ V}$; $T_{mb} = 25\text{ }^{\circ}\text{C}$; see Figure 1 ; see Figure 3	-	-	67	A
I_{DM}	peak drain current	$t_p \leq 10\text{ }\mu\text{s}$; pulsed; $T_{mb} = 25\text{ }^{\circ}\text{C}$; see Figure 3	-	-	240	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ }^{\circ}\text{C}$; see Figure 2	-	-	157	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	$T_{mb} = 25\text{ }^{\circ}\text{C}$	-	-	67	A

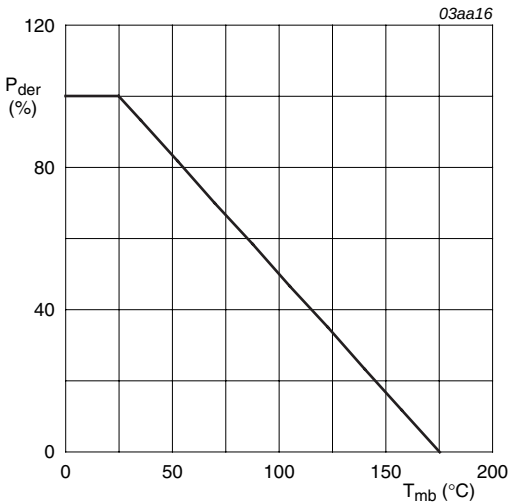
Table 4. Limiting values ...continued
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{SM}	peak source current	$t_p \leq 10 \mu s$; pulsed; $T_{mb} = 25^\circ C$	-	-	270	A
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10 V$; $T_{j(init)} = 25^\circ C$; $I_D = 35 A$; $V_{sup} \leq 75 V$; $R_{GS} = 50 \Omega$; $t_p = 0.07 ms$; unclamped	-	-	120	mJ



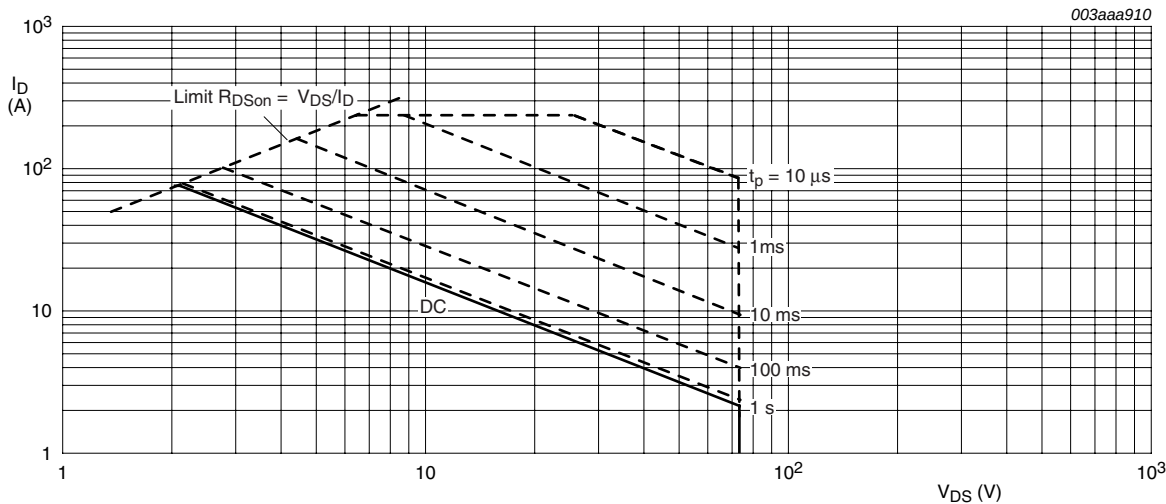
$$I_{der} = \frac{I_D}{I_{D(25^\circ C)}} \times 100\%$$

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



$$P_{der} = \frac{P_{tot}}{P_{tot(25^\circ C)}} \times 100\%$$

Fig 2. Normalized total power dissipation as a function of mounting base temperature



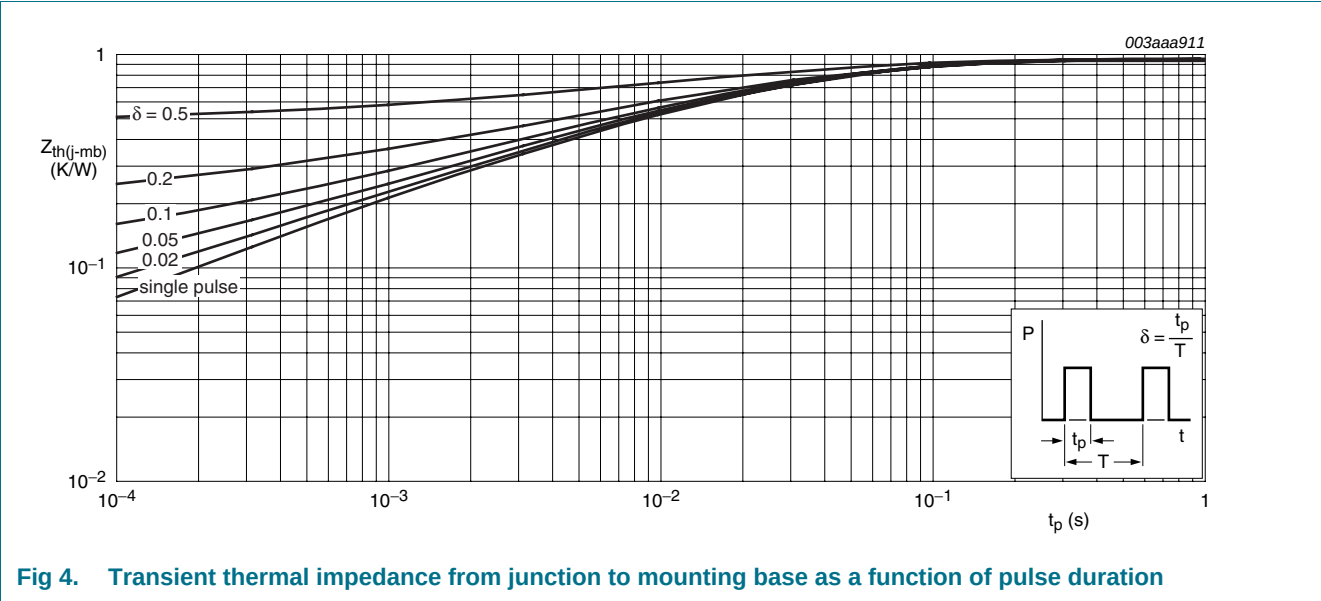
$$T_{mb} = 25^\circ C; I_{DM} \text{ is single pulse}$$

Fig 3. 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 4	-	-	0.95	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 = 0.25 mA; V _{GS} = 0 V; T _j = -55 °C	70	-	-	V
		I _D = 0.25 mA; V _{GS} = 0 V; T _j = 25 °C	75	-	-	V
V _{GS(th)}	gate-source threshold voltage	I _D = 1 mA; V _{DS} = V _{GS} ; T _j = 175 °C; see Figure 7 ; see Figure 8	0.5	-	-	V
		I _D = 1 mA; V _{DS} = V _{GS} ; T _j = -55 °C; see Figure 7 ; see Figure 8	-	-	2.3	V
		I _D = 1 mA; V _{DS} = V _{GS} ; T _j = 25 °C; see Figure 7 ; see Figure 8	1.1	1.5	2	V
I _{DSS}	drain leakage current	V _{DS} = 75 V; V _{GS} = 0 V; T _j = 25 °C	-	0.02	1	μA
		V _{DS} = 75 V; V _{GS} = 0 V; T _j = 175 °C	-	-	500	μA
I _{GSS}	gate leakage current	V _{GS} = 15 V; V _{DS} = 0 V; T _j = 25 °C	-	2	100	nA
		V _{GS} = -15 V; V _{DS} = 0 V; T _j = 25 °C	-	2	100	nA
R _{DSon}	drain-source on-state resistance	V _{GS} = 4.5 V; I _D = 25 A; T _j = 25 °C; see Figure 9 ; see Figure 10	-	15.5	18	mΩ
		V _{GS} = 5 V; I _D = 25 A; T _j = 175 °C; see Figure 9 ; see Figure 10	-	-	34	mΩ
		V _{GS} = 10 V; I _D = 25 A; T _j = 25 °C; see Figure 9 ; see Figure 10	-	14	16	mΩ
		V _{GS} = 5 V; I _D = 25 A; T _j = 25 °C; see Figure 9 ; see Figure 10	-	15	16.4	mΩ
Dynamic characteristics						
Q _{G(tot)}	total gate charge	I _D = 25 A; V _{DS} = 60 V; V _{GS} = 5 V; T _j = 25 °C; see Figure 11 ; see Figure 12	-	30	-	nC
Q _{GS}	gate-source charge		-	6	-	nC
Q _{GD}	gate-drain charge		-	14	-	nC
C _{iss}	input capacitance	V _{DS} = 25 V; V _{GS} = 0 V; f = 1 MHz; T _j = 25 °C; see Figure 13	-	3026	-	pF
C _{oss}	output capacitance		-	301	-	pF
C _{rss}	reverse transfer capacitance		-	140	-	pF
t _{d(on)}	turn-on delay time	V _{DS} = 30 V; R _L = 1.2 Ω; V _{GS} = 5 V; R _{G(ext)} = 10 Ω; T _j = 25 °C	-	30	-	ns
t _r	rise time		-	102	-	ns
t _{d(off)}	turn-off delay time		-	101	-	ns
t _f	fall time		-	57	-	ns
Source-drain diode						
V _{SD}	source-drain voltage	I _S = 25 A; V _{GS} = 0 V; T _j = 25 °C; see Figure 14	-	0.85	1.2	V
t _{rr}	reverse recovery time	I _S = 20 A; dI _S /dt = -100 A/μs; V _{GS} = -10 V; V _{DS} = 30 V; T _j = 25 °C	-	90	-	ns
Q _r	recovered charge		-	110	-	nC

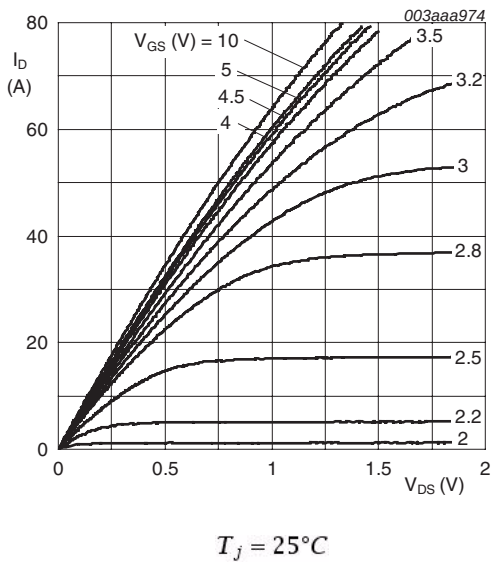


Fig 5. Output characteristics: drain current as a function of drain-source voltage; typical values

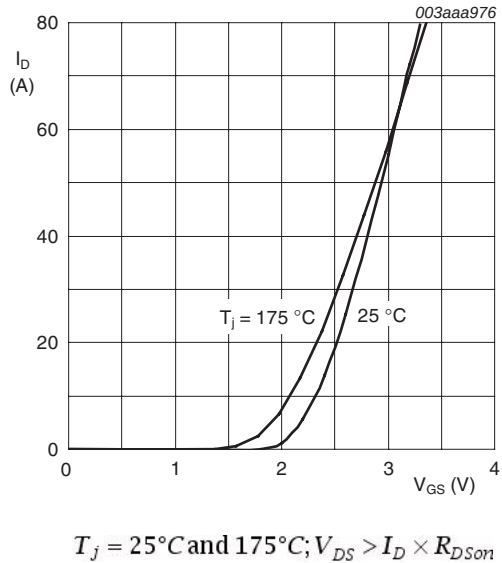


Fig 6. Transfer characteristics: drain current as a function of gate-source voltage: typical values

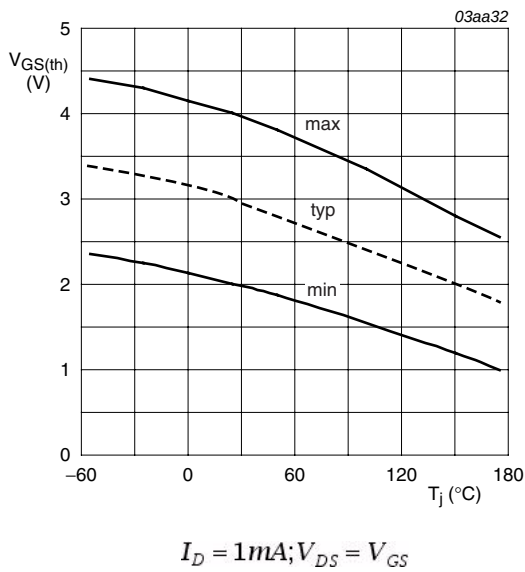


Fig 7. Gate-source threshold voltage as a function of junction temperature

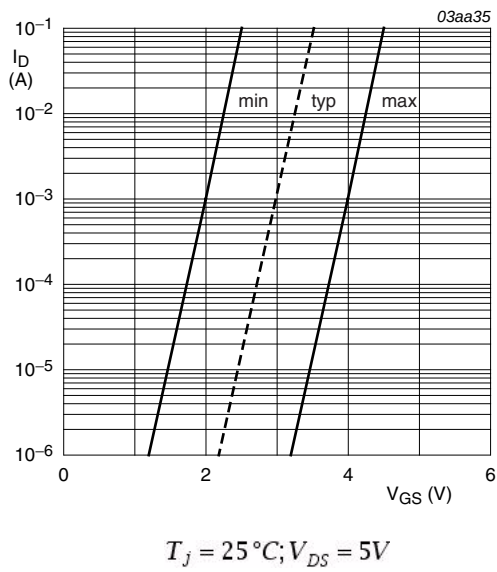


Fig 8. Sub-threshold drain current as a function of gate-source voltage

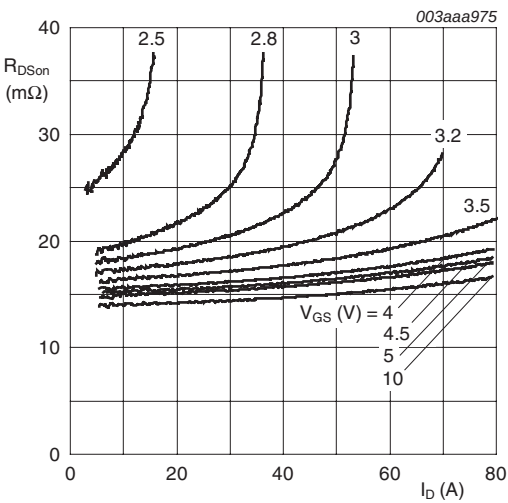
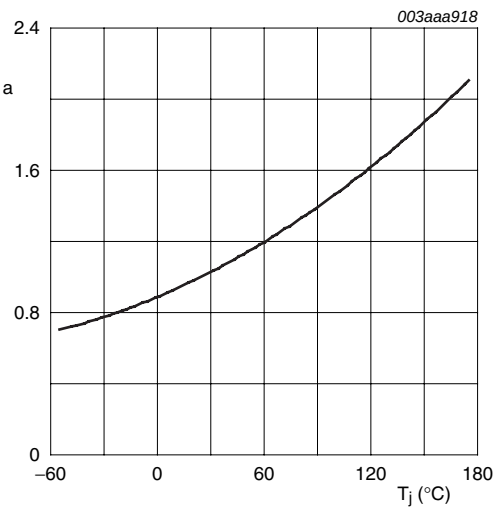


Fig 9. Drain-source on-state resistance as a function of drain current; typical values



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

Fig 10. Normalized drain-source on-state resistance factor as a function of junction temperature

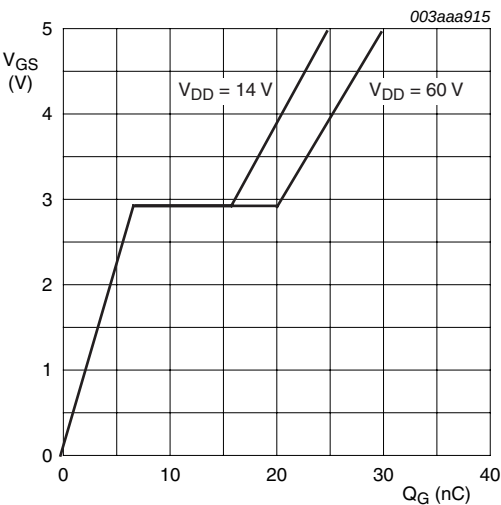


Fig 11. Gate-source voltage as a function of gate charge; typical values

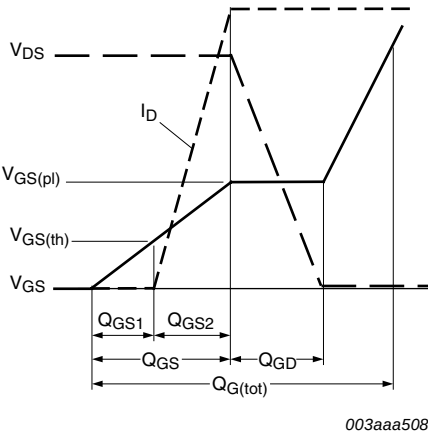


Fig 12. Gate charge waveform definitions

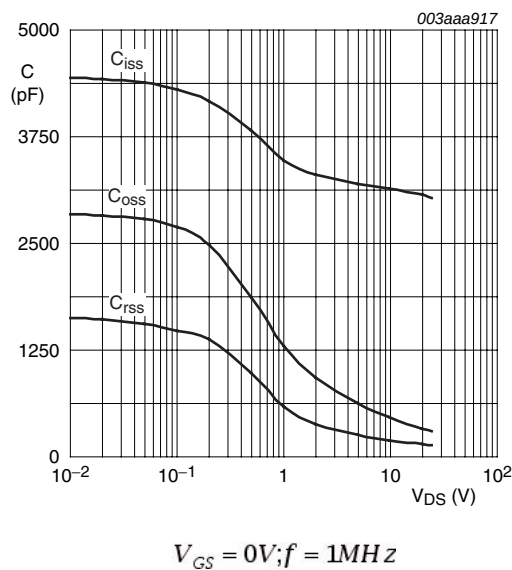


Fig 13. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

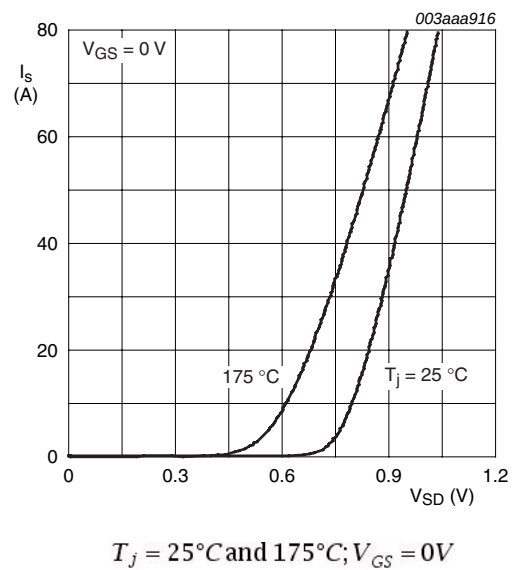


Fig 14. Source current as a function of source-drain voltage; typical values

7. Package outline

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

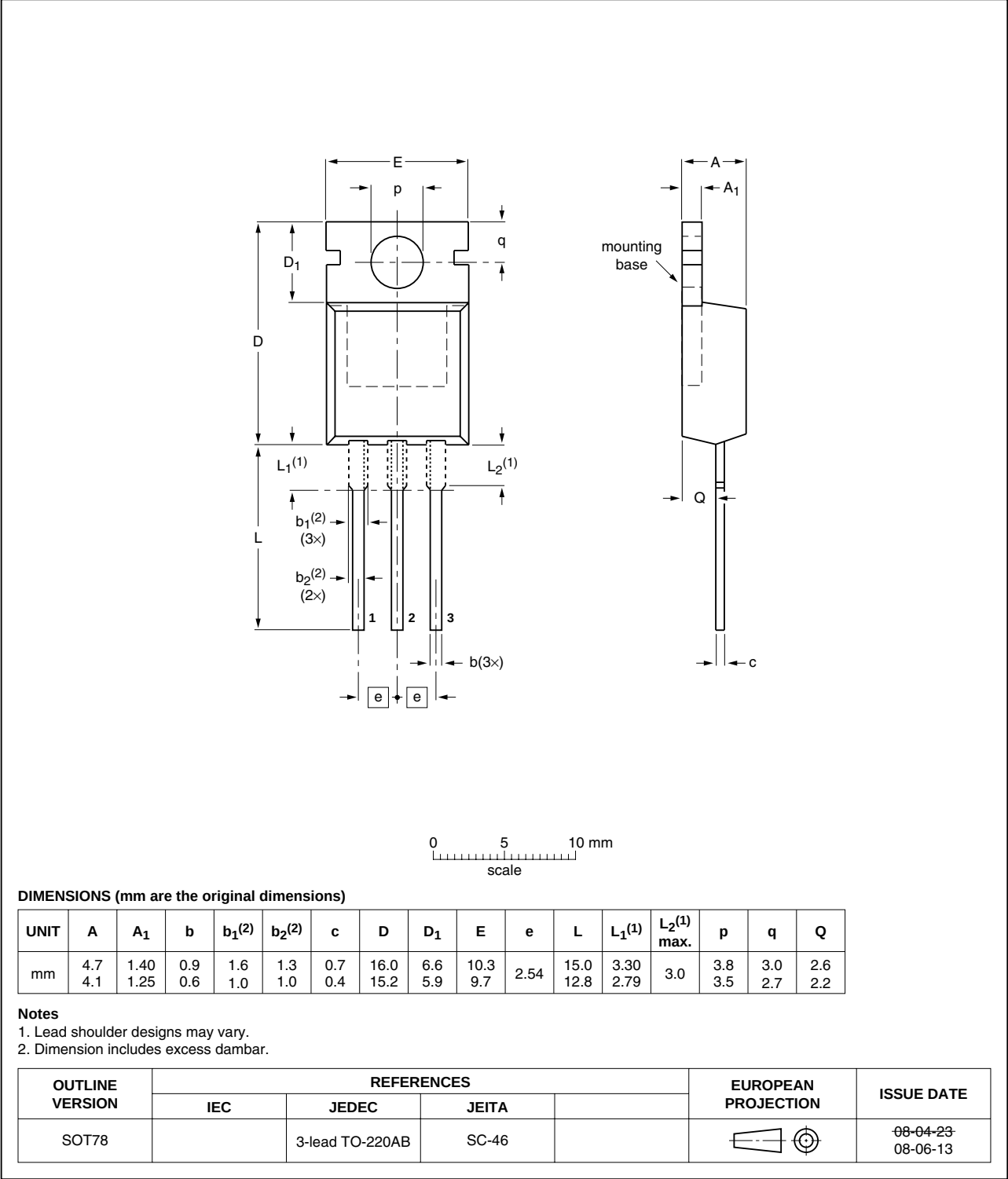


Fig 15. Package outline SOT78 (TO-220AB)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PHP79NQ08LT _3	20100426	Product data sheet	-	PHP79NQ08LT _2
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.			
PHP79NQ08LT _2	20100419	Product data sheet	-	PHP79NQ08LT _1

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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