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Kind regards,

Team Nexperia

PHD66NQ03LT

N-channel TrenchMOS logic level FET

Rev. 07 — 30 June 2009

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
- General purpose switching

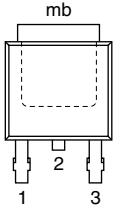
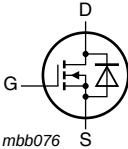
1.4 Quick reference data

Table 1. Quick reference

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25\text{ °C}$; $T_j \leq 175\text{ °C}$	-	-	25	V
I_D	drain current	$T_{mb} = 25\text{ °C}$; $V_{GS} = 10\text{ V}$	-	-	66	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}$; see Figure 2	-	-	93	W
Dynamic characteristics						
Q_{GD}	gate-drain charge	$V_{GS} = 5\text{ V}$; $I_D = 50\text{ A}$; $V_{DS} = 15\text{ V}$; $T_j = 25\text{ °C}$; see Figure 11	-	3.6	-	nC
Static characteristics						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}$; $I_D = 25\text{ A}$; $T_j = 25\text{ °C}$; see Figure 9 ; see Figure 10	-	9.1	10.5	mΩ

2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 SOT428 (DPAK)	 <i>mbb076</i>
2	D	drain		
3	S	source		
mb	D	mounting base; connected to drain		

[1] It is not possible to make a connection to pin 2

3. Ordering information

Table 3. Ordering information

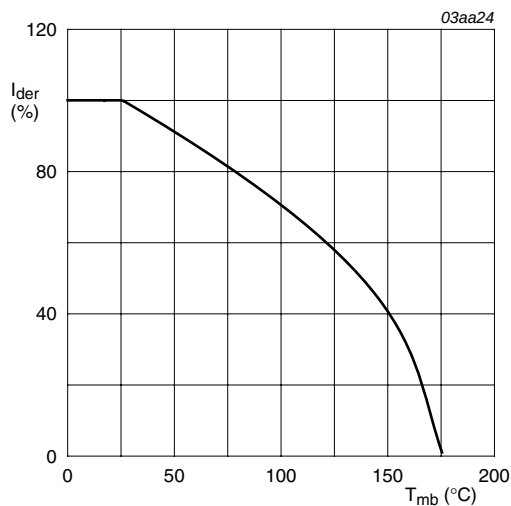
Type number	Package		Version
	Name	Description	
PHD66NQ03LT	DPAK	plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped)	SOT428

4. Limiting values

Table 4. Limiting values

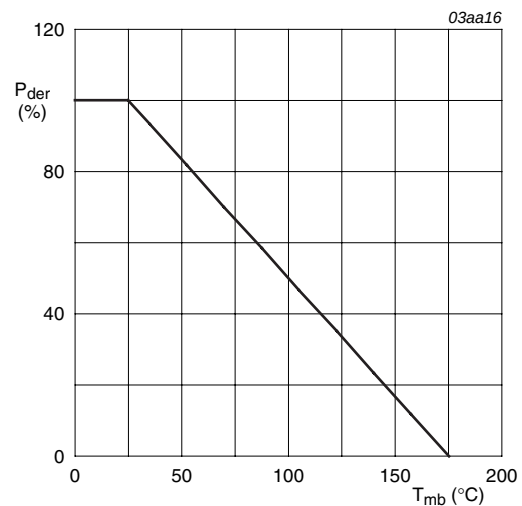
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V _{DS}	drain-source voltage	T _j ≥ 25 °C; T _j ≤ 175 °C	-	25	V
V _{DGR}	drain-gate voltage	T _j ≥ 25 °C; T _j ≤ 175 °C; R _{GS} = 20 kΩ	-	25	V
V _{GS}	gate-source voltage		-20	20	V
I _D	drain current	V _{GS} = 10 V; T _{mb} = 100 °C	-	45	A
		V _{GS} = 5 V; T _{mb} = 100 °C; see Figure 1	-	40	A
		V _{GS} = 5 V; T _{mb} = 25 °C; see Figure 1 ; see Figure 3	-	57	A
		V _{GS} = 10 V; T _{mb} = 25 °C	-	66	A
I _{DM}	peak drain current	t _p ≤ 10 μs; pulsed; T _{mb} = 25 °C; see Figure 3	-	228	A
P _{tot}	total power dissipation	T _{mb} = 25 °C; see Figure 2	-	93	W
T _{stg}	storage temperature		-55	175	°C
T _j	junction temperature		-55	175	°C
Source-drain diode					
I _S	source current	T _{mb} = 25 °C	-	57	A
I _{SM}	peak source current	t _p ≤ 10 μs; pulsed; T _{mb} = 25 °C	-	228	A
Avalanche ruggedness					
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	V _{GS} = 10 V; T _{j(init)} = 25 °C; I _D = 43 A; V _{sup} ≤ 25 V; unclamped; t _p = 0.15 ms; R _{GS} = 50 Ω	-	90	mJ



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

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



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

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

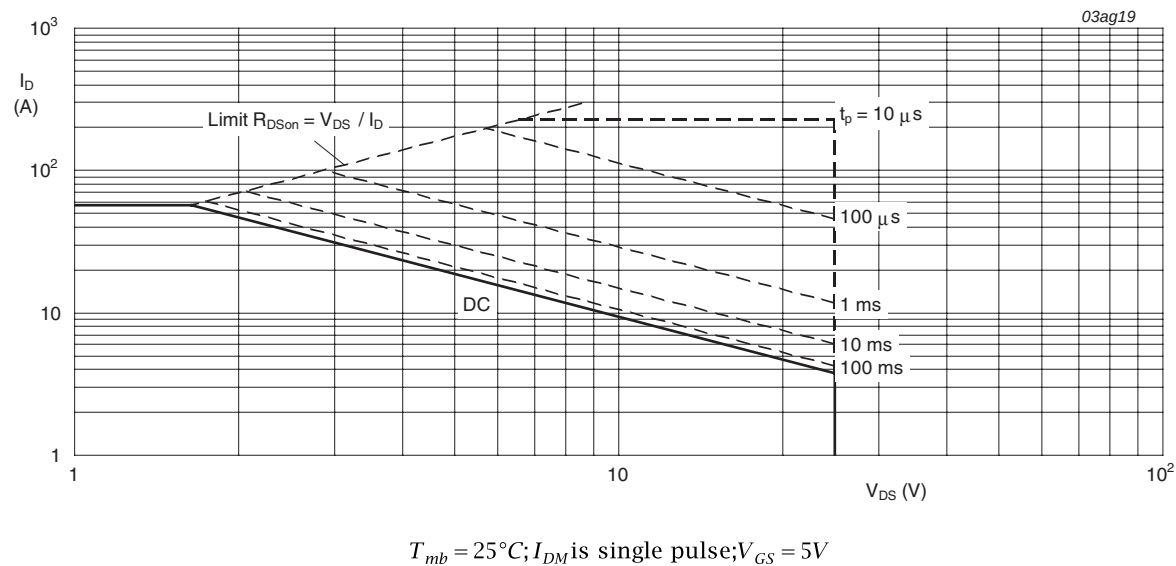
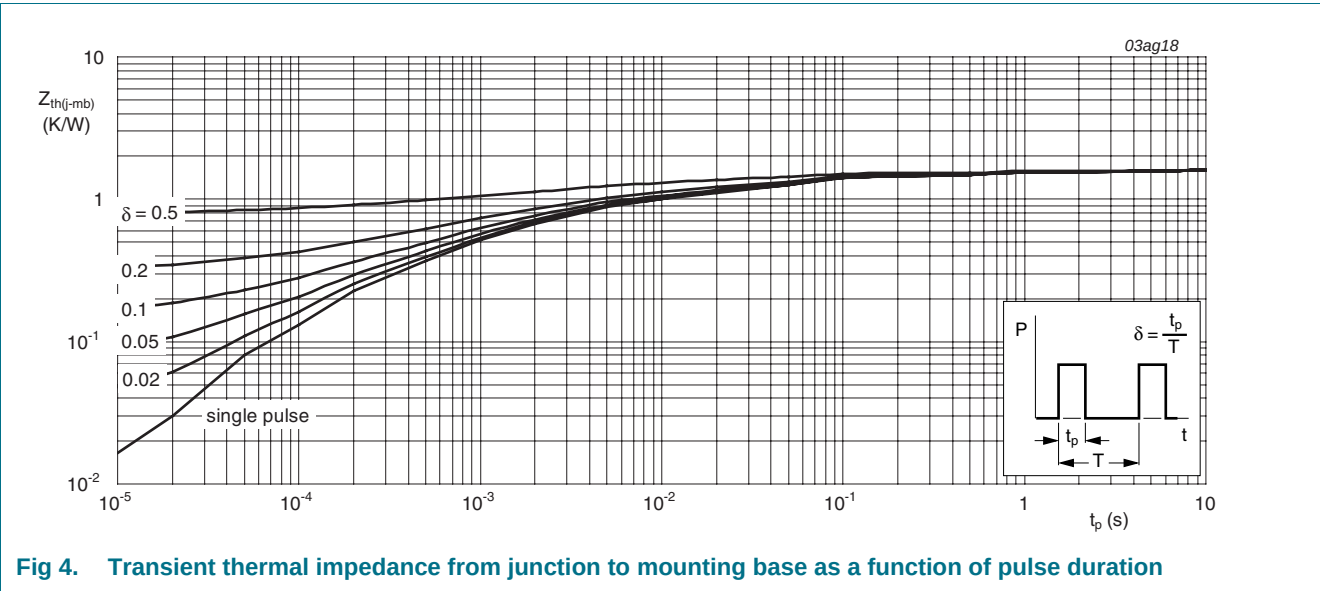


Fig 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

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	-	-	1.6	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	vertical in still air	-	75	-	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 = -55 °C	22	-	-	V
		I _D = 250 μA; V _{GS} = 0 V; T _j = 25 °C	25	-	-	V
V _{GS(th)}	gate-source threshold voltage	I _D = 1 mA; V _{DS} = V _{GS} ; T _j = -55 °C; see Figure 7 ; see Figure 8	-	-	2.2	V
		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 = 25 °C; see Figure 7 ; see Figure 8	1	1.5	2	V
I _{DSS}	drain leakage current	V _{DS} = 25 V; V _{GS} = 0 V; T _j = 25 °C	-	-	10	μA
		V _{DS} = 25 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	-	10	100	nA
		V _{GS} = -15 V; V _{DS} = 0 V; T _j = 25 °C	-	10	100	nA
R _{DSon}	drain-source on-state resistance	V _{GS} = 10 V; I _D = 25 A; T _j = 175 °C; see Figure 9 ; see Figure 10	-	16.4	18.9	mΩ
		V _{GS} = 5 V; I _D = 25 A; T _j = 25 °C; see Figure 9 ; see Figure 10	-	11.2	13.6	mΩ
		V _{GS} = 10 V; I _D = 25 A; T _j = 25 °C; see Figure 9 ; see Figure 10	-	9.1	10.5	mΩ
Dynamic characteristics						
Q _{G(tot)}	total gate charge	I _D = 50 A; V _{DS} = 15 V; V _{GS} = 5 V; T _j = 25 °C; see Figure 11	-	12	-	nC
Q _{GS}	gate-source charge		-	4.5	-	nC
Q _{GD}	gate-drain charge		-	3.6	-	nC
C _{iss}	input capacitance	V _{DS} = 25 V; V _{GS} = 0 V; f = 1 MHz; T _j = 25 °C; see Figure 12	-	860	-	pF
C _{oss}	output capacitance		-	330	-	pF
C _{rss}	reverse transfer capacitance		-	145	-	pF
t _{d(on)}	turn-on delay time	V _{DS} = 15 V; R _L = 0.6 Ω; V _{GS} = 5 V; R _{G(ext)} = 5.6 Ω; T _j = 25 °C	-	15	25	ns
t _r	rise time		-	90	135	ns
t _{d(off)}	turn-off delay time		-	25	40	ns
t _f	fall time		-	25	40	ns
Source-drain diode						
V _{SD}	source-drain voltage	I _S = 25 A; V _{GS} = 0 V; T _j = 25 °C; see Figure 13	-	0.95	1.2	V
t _{rr}	reverse recovery time	I _S = 10 A; dI _S /dt = -100 A/μs; V _{GS} = 0 V; V _{DS} = 25 V; T _j = 25 °C	-	32	-	ns
Q _r	recovered charge		-	20	-	nC

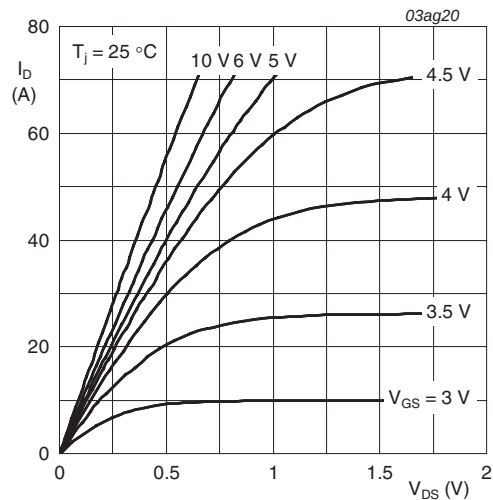


Fig 5. Output characteristics: drain current as a function of drain-source voltage; typical values

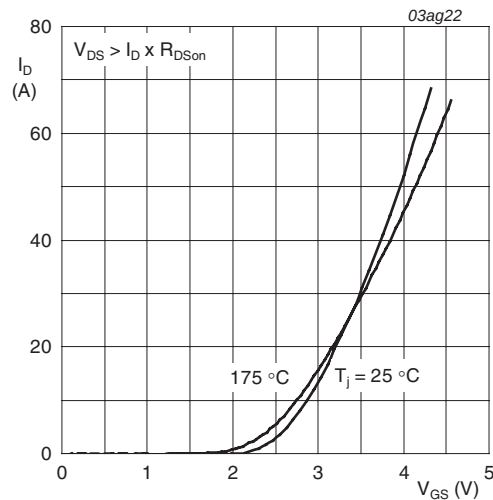


Fig 6. Transfer characteristics: drain current as a function of gate-source voltage; typical values

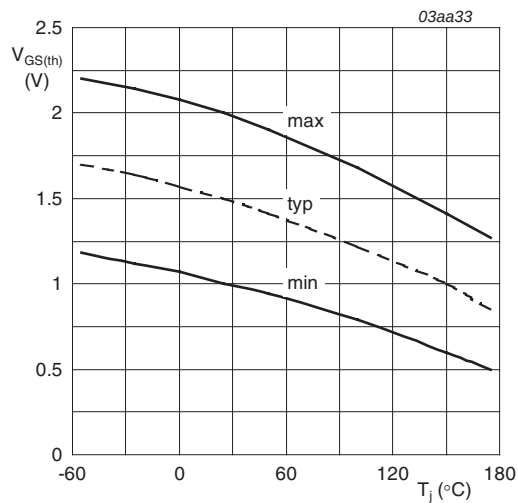


Fig 7. Gate-source threshold voltage as a function of junction temperature

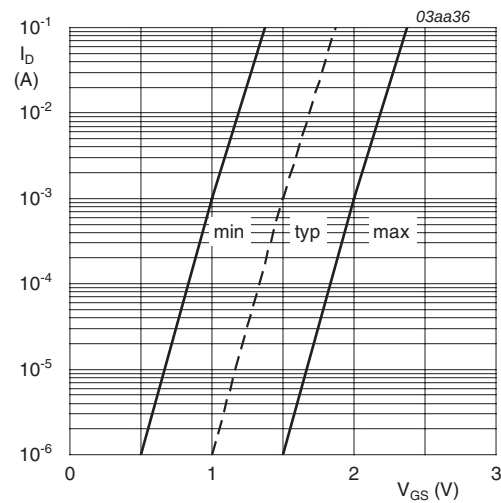
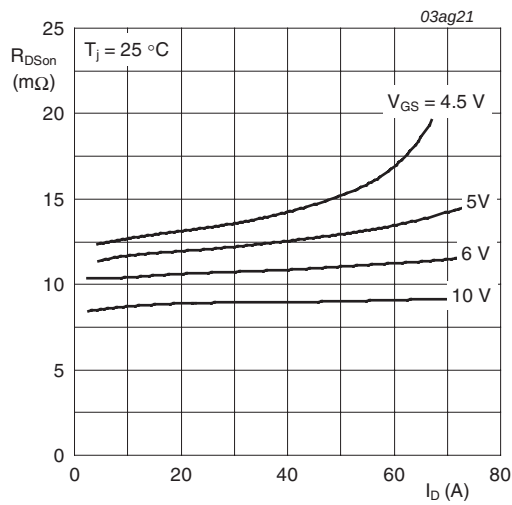
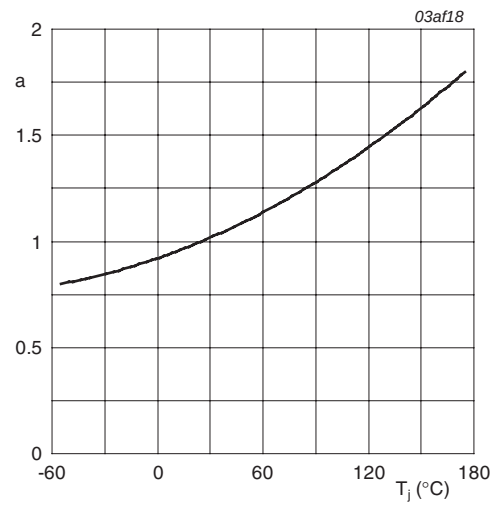


Fig 8. Sub-threshold drain current as a function of gate-source voltage



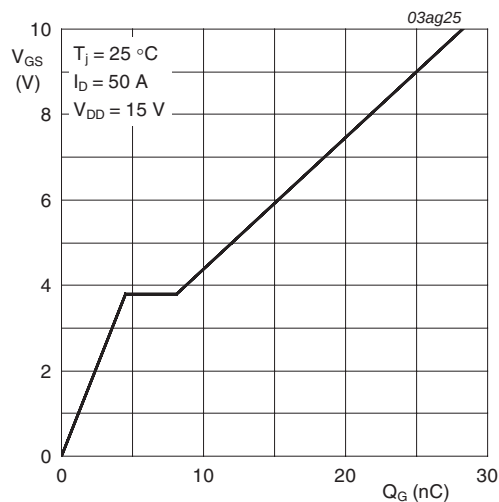
$T_j = 25^\circ\text{C}$

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



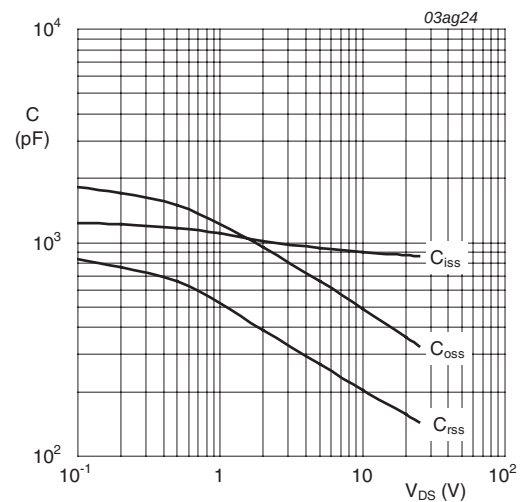
$$a = \frac{R_{DS(on)}}{R_{DS(on)(25^\circ\text{C})}}$$

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



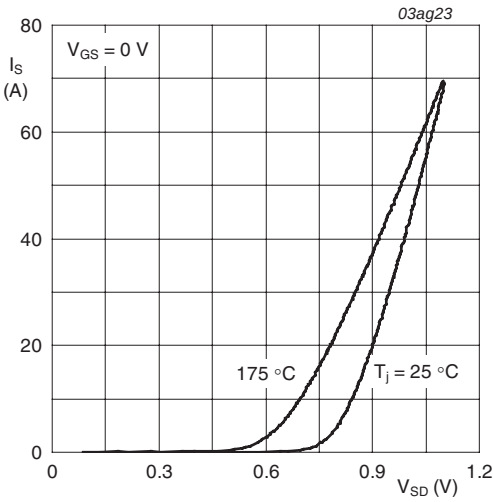
$I_D = 50\text{ A}; V_{DS} = 15\text{ V}$

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



$V_{GS} = 0\text{ V}; f = 1\text{ MHz}$

Fig 12. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values



$T_j = 25^\circ\text{C}$ and 175°C ; $V_{GS} = 0\text{ V}$

Fig 13. Source current as a function of source-drain voltage; typical values

7. Package outline

Plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped)

SOT428

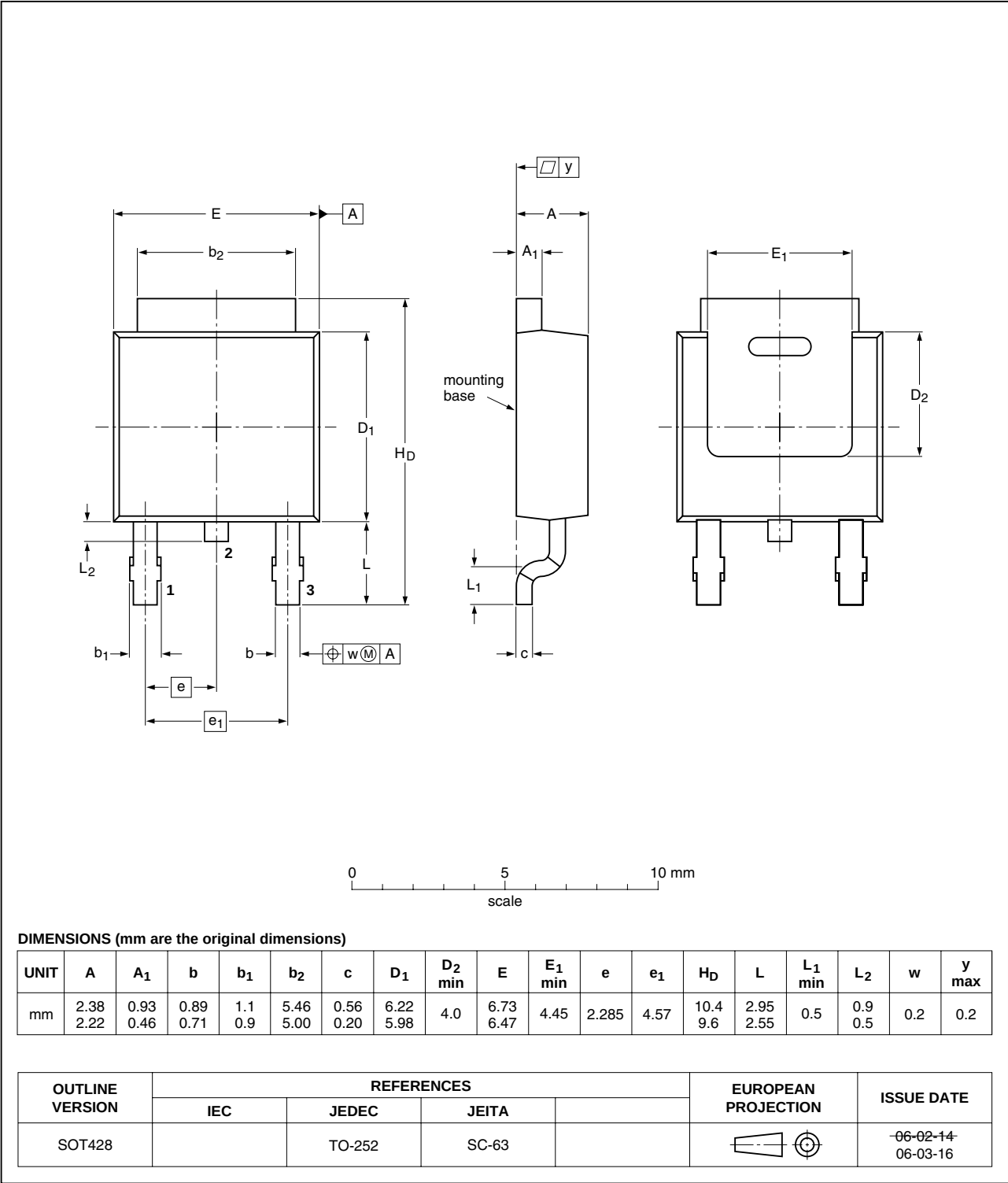


Fig 14. Package outline SOT428 (DPAK)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PHD66NQ03LT_7	20090630	Product data sheet	-	PHB_PHD66NQ03LT_6
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. • Type number PHD66NQ03LT separated from data sheet PHB_PHD66NQ03LT_6.				
PHB_PHD66NQ03LT_6 (9397 750 13429)	20040802	Product data sheet	-	PHP_PHB_PHD66NQ03LT_5
PHP_PHB_PHD66NQ03LT_5 (9397 750 13107)	20040415	Product data sheet	-	PHP_PHB_PHD66NQ03LT_4
PHP_PHB_PHD66NQ03LT_4 (9397 750 10158)	20020909	Product data sheet	-	PHP_PHB_PHD66NQ03LT_3
PHP_PHB_PHD66NQ03LT_3 (9397 750 09284)	20020312	Product data sheet	-	PHP_PHB_PHD66NQ03LT_2
PHP_PHB_PHD66NQ03LT_2 (9397 750 09119)	20011210	Product data sheet	-	PHP_PHB_PHD66NQ03LT_1
PHP_PHB_PHD66NQ03LT_1 (9397 750 08725)	20011012	Product data sheet	-	-

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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