

PHB191NQ06LT

N-channel TrenchMOS logic level FET

Rev. 02 — 13 January 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 industrial applications
- Uninterruptible power supplies

1.4 Quick reference data

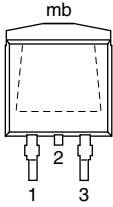
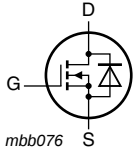
Table 1. Quick reference

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25\text{ °C}$; $T_j \leq 175\text{ °C}$	-	-	55	V
I_D	drain current	$T_{mb} = 25\text{ °C}$; $V_{GS} = 10\text{ V}$; see Figure 1 and 3	-	-	75	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}$; see Figure 2	-	-	300	W
Dynamic characteristics						
Q_{GD}	gate-drain charge	$V_{GS} = 5\text{ V}$; $I_D = 25\text{ A}$; $V_{DS} = 44\text{ V}$; $T_j = 25\text{ °C}$; see Figure 11	-	37.6	-	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 10 and 9	-	3.1	3.7	mΩ



2. Pinning information

Table 2. Pinning information

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

SOT404 (D2PAK)

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

3. Ordering information

Table 3. Ordering information

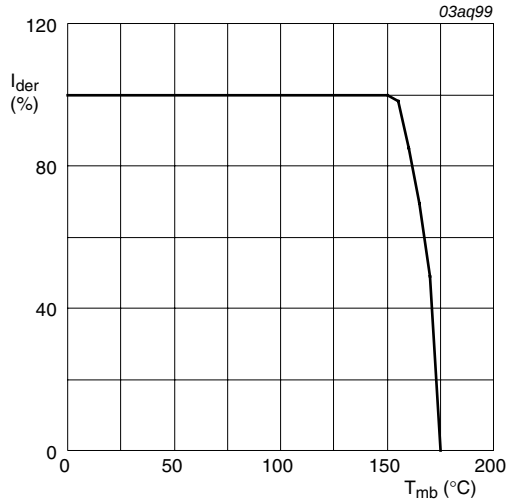
Type number	Package		Version
	Name	Description	
PHB191NQ06LT	D2PAK	plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped)	SOT404

4. Limiting values

Table 4. Limiting values

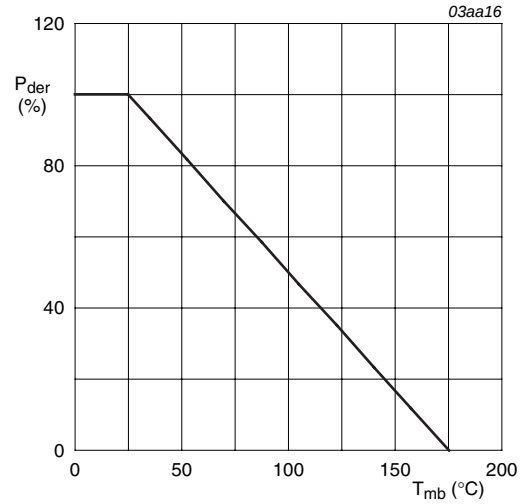
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25\text{ °C}$; $T_j \leq 175\text{ °C}$	-	55	V
V_{DGR}	drain-gate voltage	$T_j \geq 25\text{ °C}$; $T_j \leq 175\text{ °C}$; $R_{GS} = 20\text{ k}\Omega$	-	55	V
V_{GS}	gate-source voltage		-15	15	V
I_D	drain current	$V_{GS} = 10\text{ V}$; $T_{mb} = 100\text{ °C}$; see Figure 1	-	75	A
		$V_{GS} = 10\text{ V}$; $T_{mb} = 25\text{ °C}$; see Figure 1 and 3	-	75	A
I_{DM}	peak drain current	$t_p \leq 10\text{ }\mu\text{s}$; pulsed; $T_{mb} = 25\text{ °C}$; see Figure 3	-	240	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}$; see Figure 2	-	300	W
T_{stg}	storage temperature		-55	175	°C
T_j	junction temperature		-55	175	°C
Source-drain diode					
I_S	source current	$T_{mb} = 25\text{ °C}$	-	75	A
I_{SM}	peak source current	$t_p \leq 10\text{ }\mu\text{s}$; pulsed; $T_{mb} = 25\text{ °C}$	-	240	A
Avalanche ruggedness					
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10\text{ V}$; $T_{j(init)} = 25\text{ °C}$; $I_D = 75\text{ A}$; $V_{sup} \leq 55\text{ V}$; unclamped; $R_{GS} = 50\text{ }\Omega$; $t_p \leq 0.21\text{ ms}$	-	560	mJ



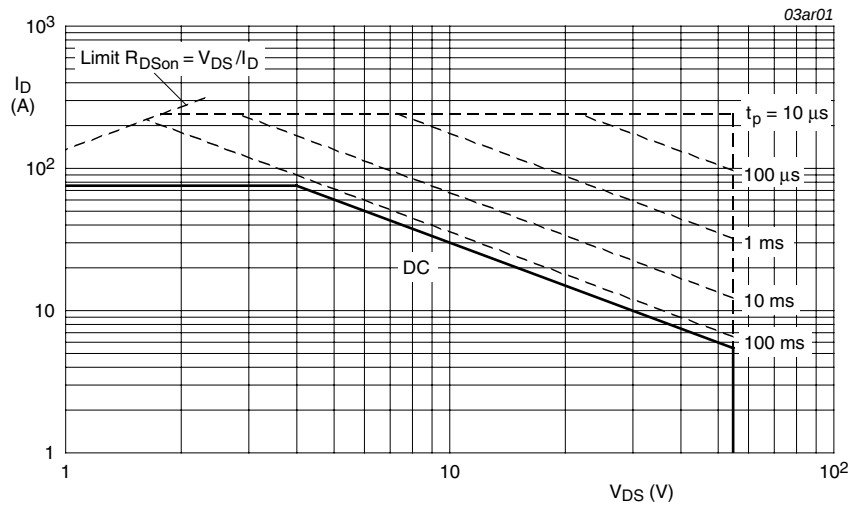
$$I_{der} = \frac{I_D}{I_{D(25^\circ\text{C})}} \times 100\%$$

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



$$T_{mb} = 25^\circ\text{C}; I_{DM} \text{ is single pulse}; V_{GS} = 10\text{V}$$

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	-	-	0.5	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	mounted on a printed-circuit board; vertical in still air; minimum footprint	-	50	-	K/W

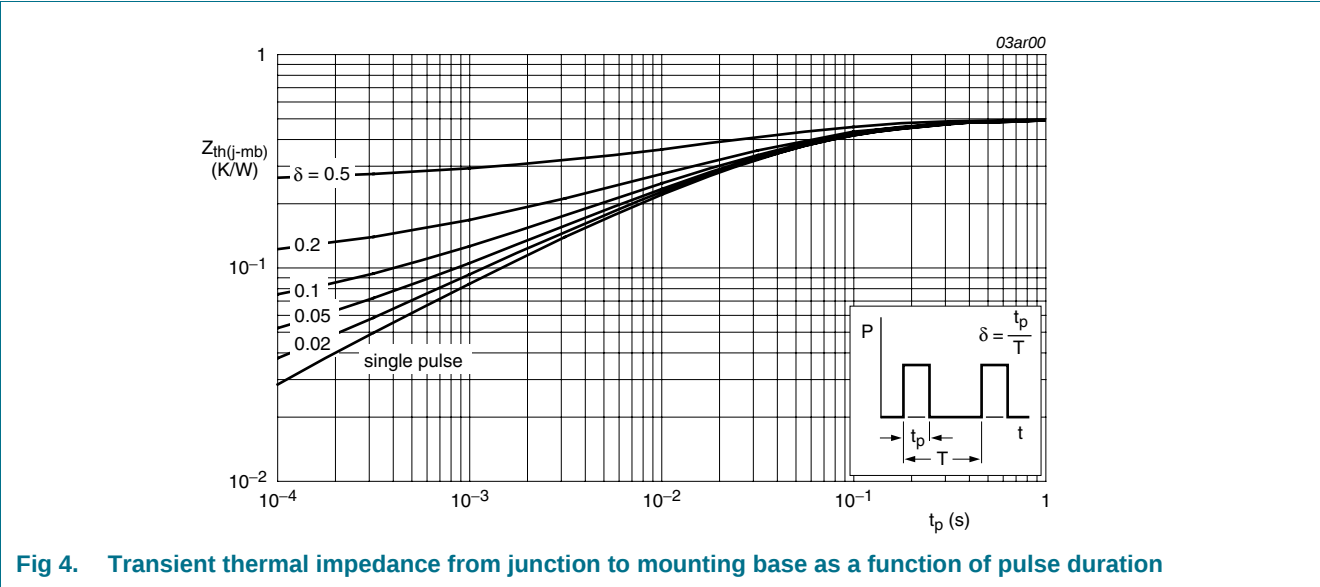


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

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	50	-	-	V
		I _D = 250 μA; V _{GS} = 0 V; T _j = 25 °C	55	-	-	V
V _{GS(th)}	gate-source threshold voltage	I _D = 1 mA; V _{DS} = V _{GS} ; T _j = -55 °C; see Figure 7 and 8	-	-	2.2	V
		I _D = 1 mA; V _{DS} = V _{GS} ; T _j = 175 °C; see Figure 7 and 8	0.5	-	-	V
		I _D = 1 mA; V _{DS} = V _{GS} ; T _j = 25 °C; see Figure 7 and 8	1	1.5	2	V
I _{DSS}	drain leakage current	V _{DS} = 55 V; V _{GS} = 0 V; T _j = 25 °C	-	-	1	μA
		V _{DS} = 55 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	-	-	4.4	mΩ
		V _{GS} = 5 V; I _D = 25 A; T _j = 25 °C; see Figure 10 and 9	-	3.5	4.2	mΩ
		V _{GS} = 10 V; I _D = 25 A; T _j = 175 °C; see Figure 10 and 9	-	-	7.4	mΩ
		V _{GS} = 10 V; I _D = 25 A; T _j = 25 °C; see Figure 10 and 9	-	3.1	3.7	mΩ
Dynamic characteristics						
Q _{G(tot)}	total gate charge	I _D = 25 A; V _{DS} = 44 V; V _{GS} = 5 V; T _j = 25 °C; see Figure 11	-	95.6	-	nC
Q _{GS}	gate-source charge		-	17.2	-	nC
Q _{GD}	gate-drain charge		-	37.6	-	nC
C _{iss}	input capacitance	V _{DS} = 25 V; V _{GS} = 0 V; f = 1 MHz; T _j = 25 °C; see Figure 12	-	7665	-	pF
C _{oss}	output capacitance		-	1045	-	pF
C _{rss}	reverse transfer capacitance		-	465	-	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	-	63	-	ns
t _r	rise time		-	232	-	ns
t _{d(off)}	turn-off delay time		-	273	-	ns
t _f	fall time		-	178	-	ns
Source-drain diode						
V _{SD}	source-drain voltage	I _S = 25 A; V _{GS} = 0 V; T _j = 25 °C; see Figure 13	-	0.79	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	-	78	-	ns
Q _r	recovered charge		-	171	-	nC

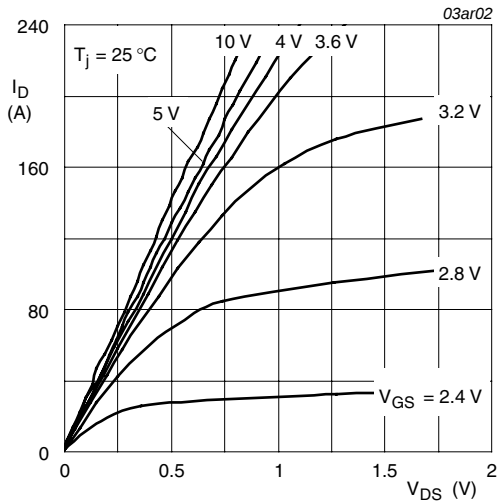


Fig 5. Output characteristics: drain current as a function of drain-source voltage; typical values

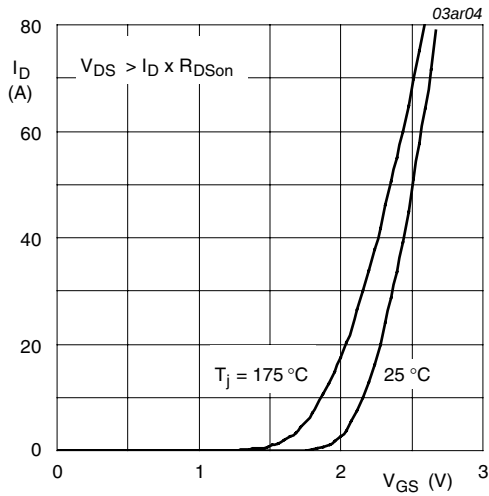


Fig 6. Transfer characteristics: drain current as a function of gate-source voltage; typical values

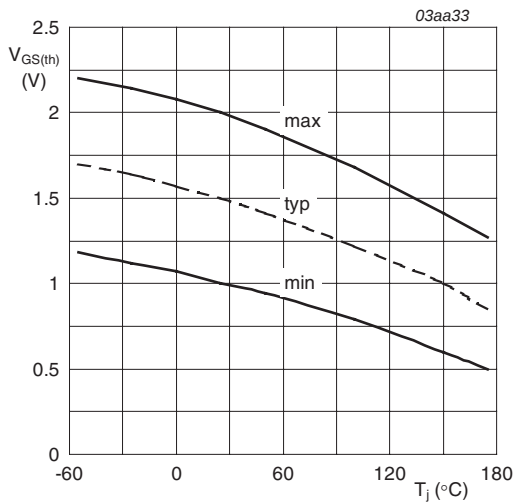


Fig 7. Gate-source threshold voltage as a function of junction temperature

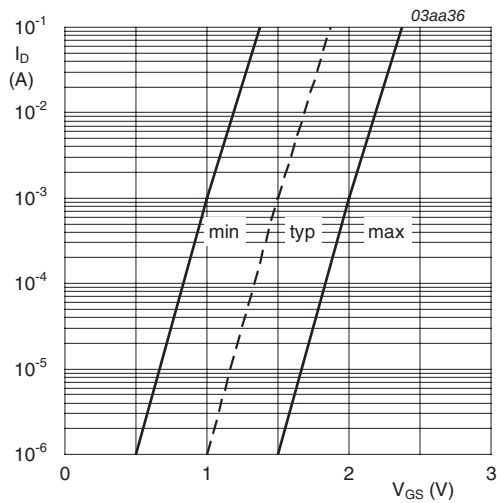
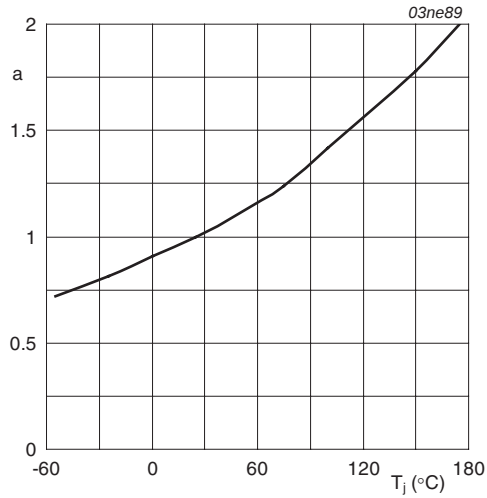
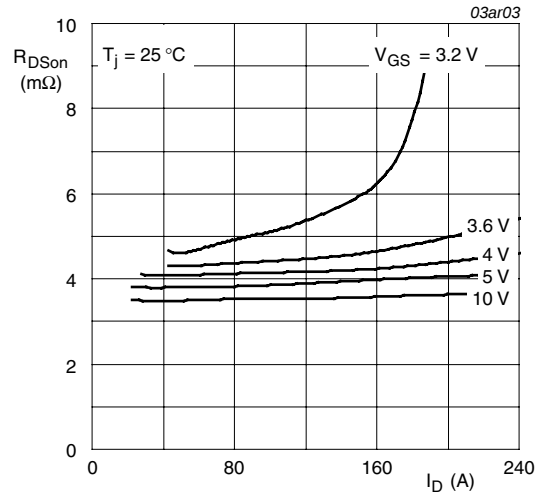


Fig 8. Sub-threshold drain current as a function of gate-source voltage



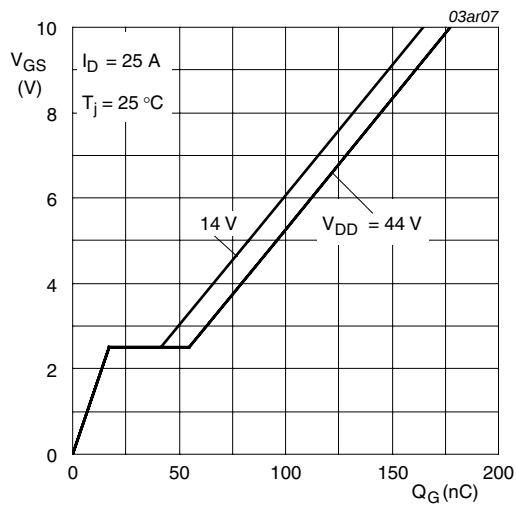
$$a = \frac{R_{DSon}}{R_{DSon(25^{\circ}\text{C})}}$$

Fig 9. Normalized drain-source on-state resistance factor as a function of junction temperature



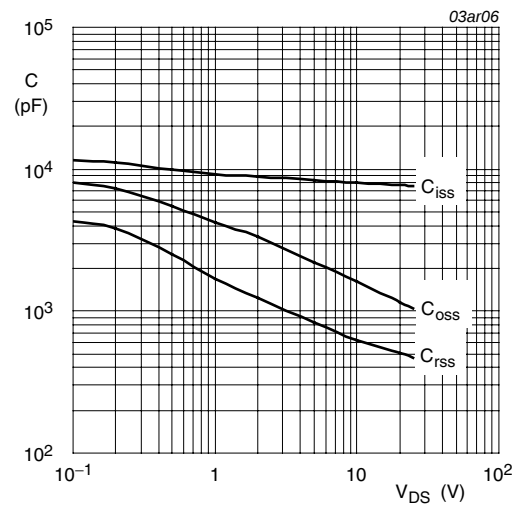
$T_j = 25^{\circ}\text{C}$

Fig 10. Drain-source on-state resistance as a function of drain current; typical values



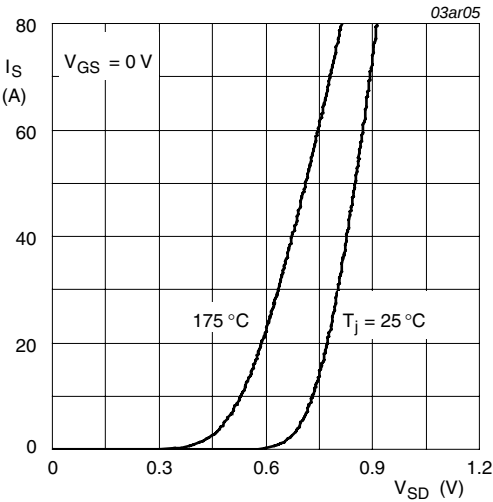
$I_D = 25\text{ A}; V_{DS} = 14\text{ V and } 44\text{ V}$

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



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

Fig 12. Sub-threshold drain current as a function of gate-source voltage



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

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

7. Package outline

Plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped)

SOT404

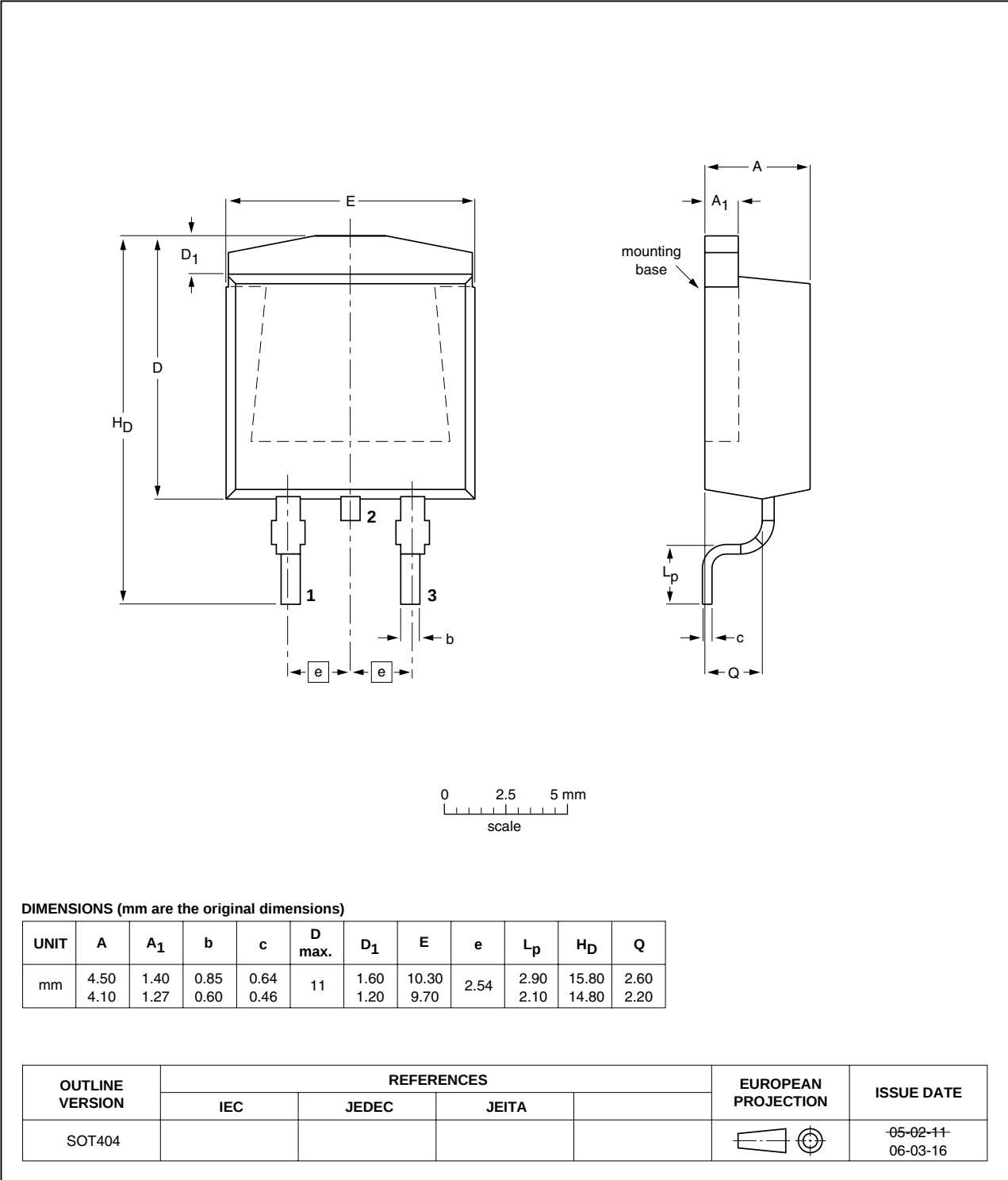


Fig 14. Package outline SOT404 (D2PAK)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PHB191NQ06LT_2	20100113	Product data sheet	-	PHP_PHB191NQ06LT-01
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 PHB191NQ06LT separated from data sheet PHP_PHB191NQ06LT-01.				
PHP_PHB191NQ06LT-01 (9397 750 13168)	20040505	Product data	-	-

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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