PHP191NQ06LT

N-channel TrenchMOS logic level FET

Rev. 02 — 14 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
- General industrial applications
- Motors, lamps and solenoids
- Uninterruptible power supplies

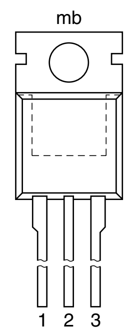
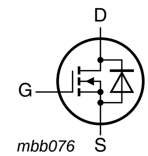
1.4 Quick reference data

Table 1. Quick reference

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25$ °C; $T_j \leq 175$ °C	-	-	55	V
I_D	drain current	$T_{mb} = 25$ °C; $V_{GS} = 10$ V; see Figure 1 and 3	-	-	75	A
P_{tot}	total power dissipation	$T_{mb} = 25$ °C; see Figure 2	-	-	300	W
Dynamic characteristics						
Q_{GD}	gate-drain charge	$V_{GS} = 5$ V; $I_D = 25$ A; $V_{DS} = 44$ V; $T_j = 25$ °C; see Figure 11	-	37.6	-	nC
Static characteristics						
R_{DSon}	drain-source on-state resistance	$V_{GS} = 10$ V; $I_D = 25$ A; $T_j = 25$ °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		
3	S	source		
mb	D	mounting base; connected to drain		

SOT78 (TO-220AB)

3. Ordering information

Table 3. Ordering information

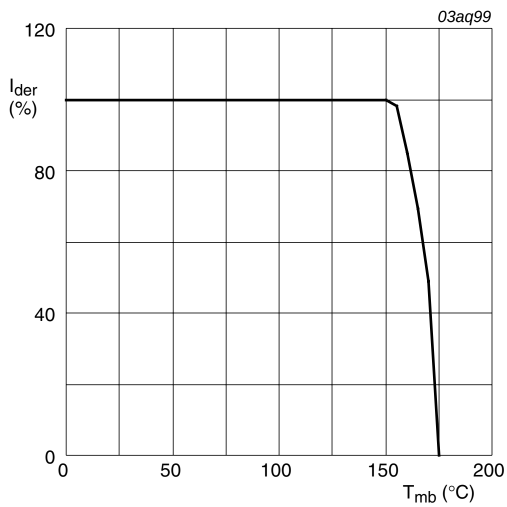
Type number	Package		
	Name	Description	Version
PHP191NQ06LT	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

4. Limiting values

Table 4. Limiting values

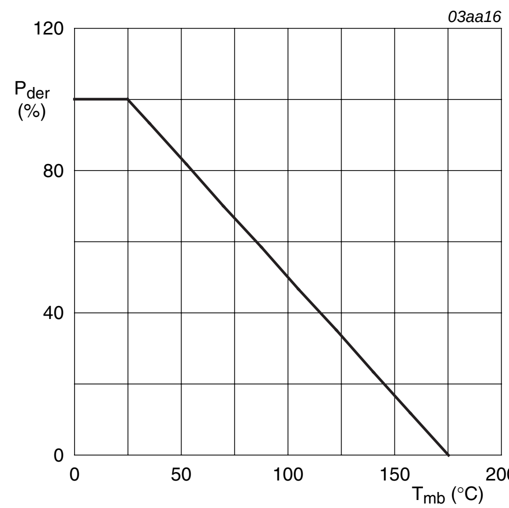
In accordance with the Absolute Maximum Rating System (IEC 60134).

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



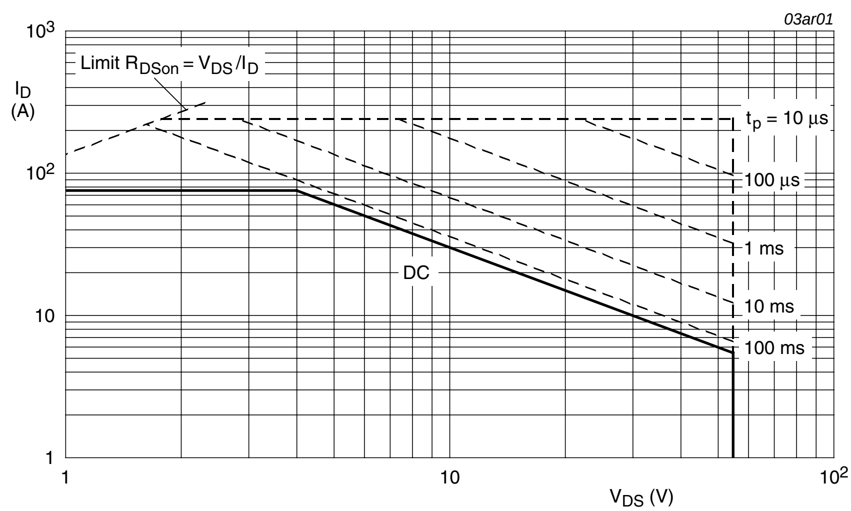
$$I_{der} = \frac{I_D}{I_{D(25°C)}} \times 100\,\%$$

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



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

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



$T_{mb} = 25°C; I_{DM}$ is single pulse; $V_{GS} = 10V$

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	vertical in still air	-	60	-	K/W

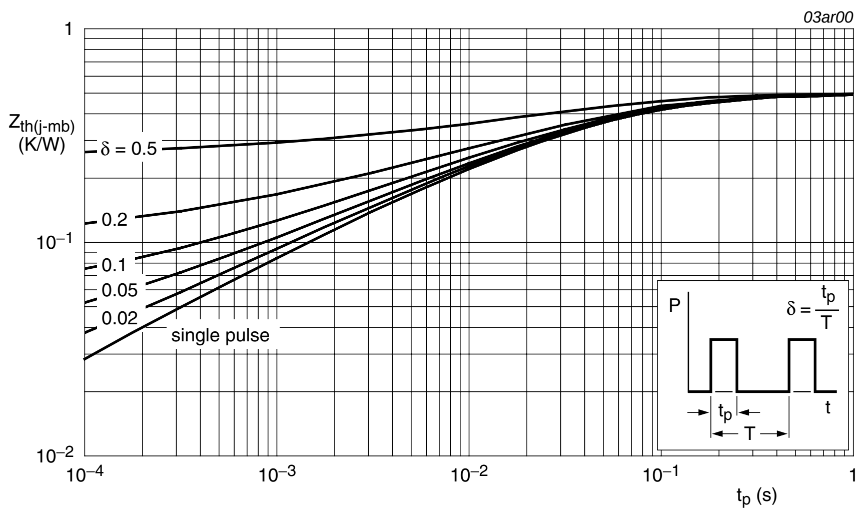
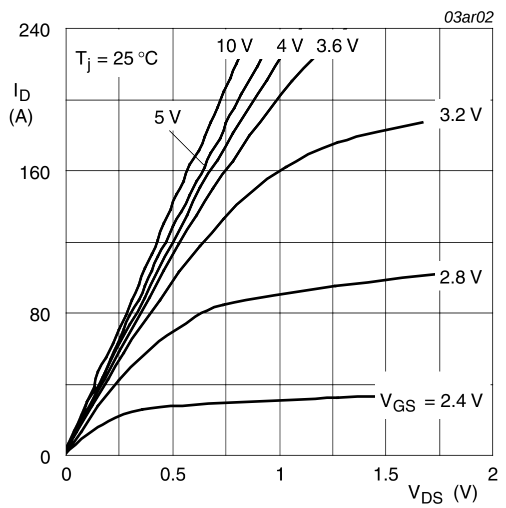


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

6. Characteristics

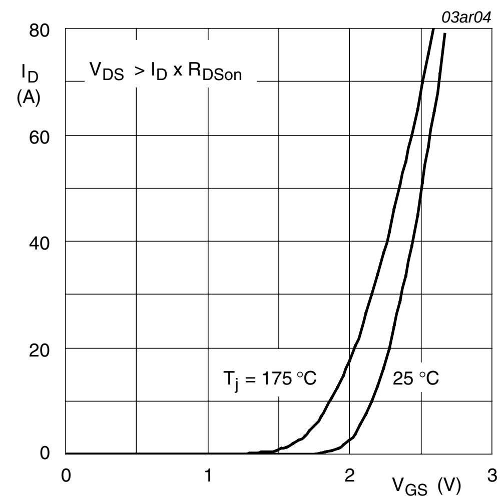
Table 6. Characteristics

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



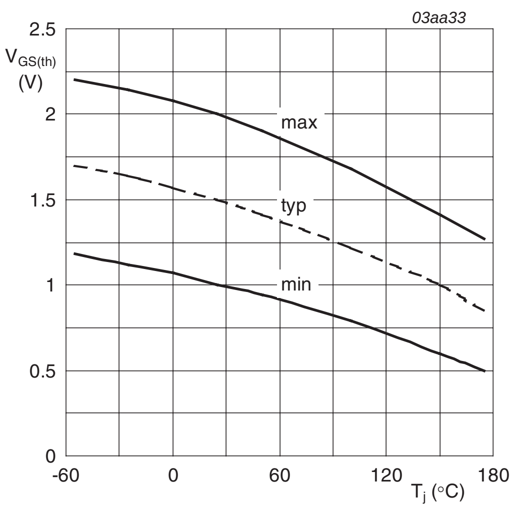
$T_j = 25°C$

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



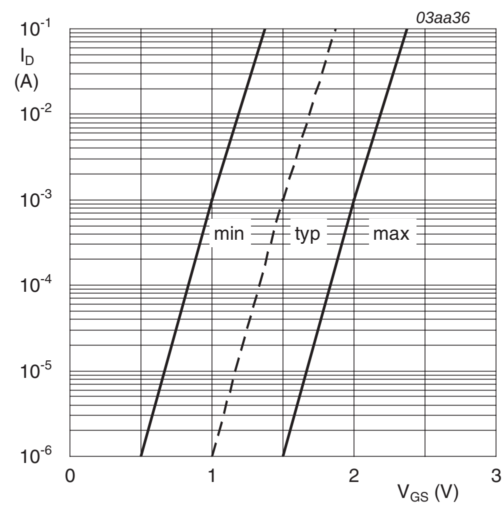
$T_j = 25°C$ and $175°C$; $V_{DS} > I_D \times R_{DSon}$

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



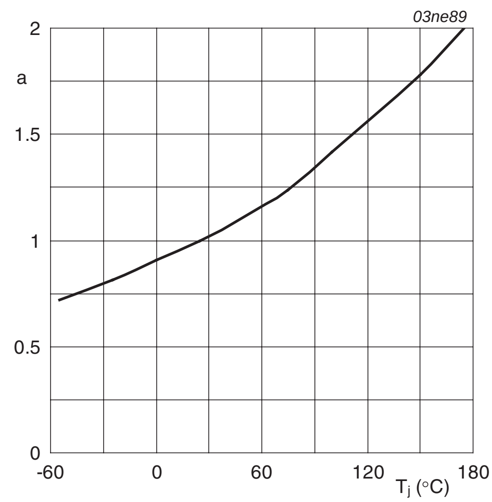
$I_D = 1mA$; $V_{DS} = V_{GS}$

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



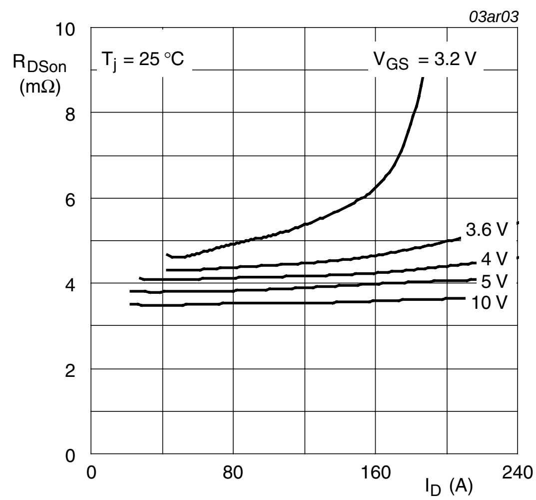
$T_j = 25°C$; $V_{DS} = V_{GS}$

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



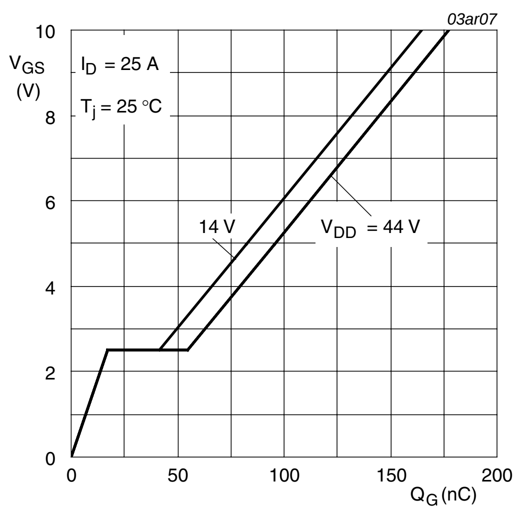
$$a = \frac{R_{DSon}}{R_{DSon(25°C)}}$$

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



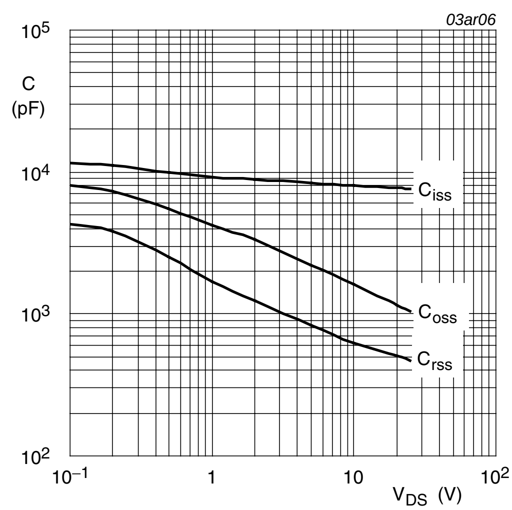
$$T_j = 25°C$$

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



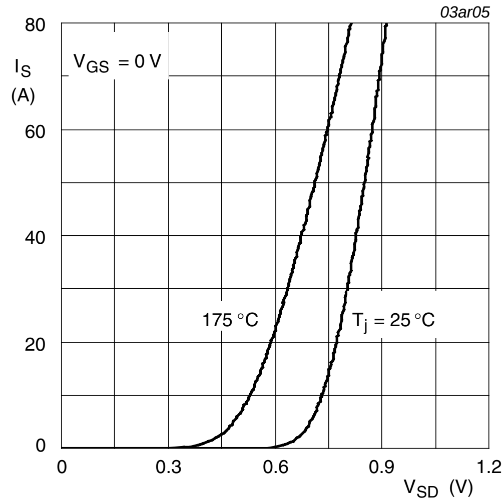
$$I_D = 25A; V_{DS} = 14V \text{ and } 44V$$

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



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

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

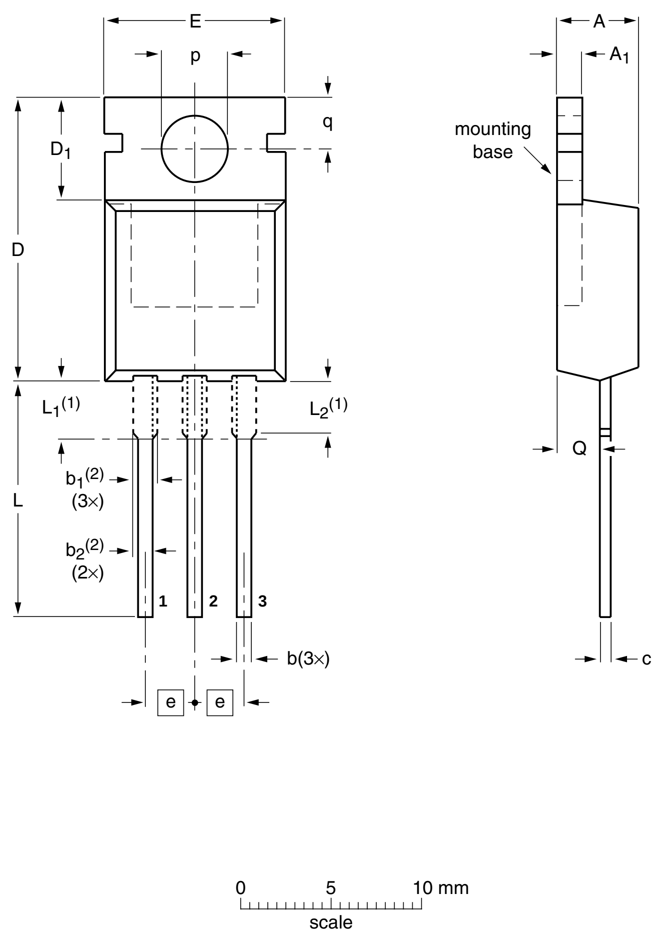


$T_j = 25°C$ and $175°C; V_{GS} = 0V$

Fig 13. 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**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b	$b_1^{(2)}$	$b_2^{(2)}$	c	D	D_1	E	e	L	$L_1^{(1)}$	$L_2^{(1)}$ max.	p	q	Q
mm	4.7 4.1	1.40 1.25	0.9 0.6	1.6 1.0	1.3 1.0	0.7 0.4	16.0 15.2	6.6 5.9	10.3 9.7	2.54	15.0 12.8	3.30 2.79	3.0	3.8 3.5	3.0 2.7	2.6 2.2

Notes

1. Lead shoulder designs may vary.
2. Dimension includes excess dambar.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT78		3-lead TO-220AB	SC-46			~~08-04-23~~ 08-06-13

Fig 14. Package outline SOT78 (TO-220AB)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PHP191NQ06LT_2	20100114	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 PHP191NQ06LT separated from data sheet PHP_PHB191NQ06LT-01.			
PHP_PHB191NQ06LT-01 (9397 750 13168)	20040505	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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For sales office addresses, please send an email to: salesaddresses@nxp.com

11. Contents

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