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PSMN6R0-25YLB

N-channel 25 V 6.1 m Ω logic level MOSFET in LFPAK using NextPower technology

Rev. 2 — 31 October 2011

Product data sheet

1. Product profile

1.1 General description

Logic level enhancement mode N-channel MOSFET in LFPAK package. This product is designed and qualified for use in a wide range of industrial, communications and domestic equipment.

1.2 Features and benefits

- High reliability Power SO8 package, qualified to 175°C
- Low parasitic inductance and resistance
- Optimised for 4.5V Gate drive utilising NextPower Superjunction technology
- Ultra low QG, QGD, & QOSS for high system efficiencies at low and high loads

1.3 Applications

- DC-to-DC converters
- Load switching

Synchronous buck regulator

1.4 Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Тур	Max	Unit	
V_{DS}	drain-source voltage	25 °C ≤ T _j ≤ 175 °C	-	-	25	V	
I _D	drain current	T_{mb} = 25 °C; V_{GS} = 10 V; see <u>Figure 1</u>	-	-	73	Α	
P _{tot}	total power dissipation	T _{mb} = 25 °C; see <u>Figure 2</u>	-	-	58	W	
Tj	junction temperature		-55	-	175	°C	
Static characteristics							
R _{DSon}	drain-source on-state resistance	$V_{GS} = 4.5 \text{ V}; I_D = 20 \text{ A}; T_j = 25 \text{ °C};$ see <u>Figure 12</u>	-	6.7	7.9	mΩ	
		$V_{GS} = 10 \text{ V}; I_D = 20 \text{ A}; T_j = 25 \text{ °C};$ see <u>Figure 12</u>	-	5.1	6.1	mΩ	
Dynamic c	Dynamic characteristics						
Q_{GD}	gate-drain charge	$V_{GS} = 4.5 \text{ V}; I_D = 20 \text{ A}; V_{DS} = 12 \text{ V};$	-	2.6	-	nC	
$Q_{G(tot)}$	total gate charge	see Figure 14; see Figure 15	-	9	-	nC	



2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	S	source		
2	S	source	mb (D
3	S	source		
4	G	gate	- q	
mb	D	mounting base; connected to drain	1 2 3 4	mbb076 S

SOT669 (LFPAK; Power-SO8)

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PSMN6R0-25YLB	LFPAK; Power-SO8	plastic single-ended surface-mounted package; 4 leads	SOT669

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	25 °C ≤ T _j ≤ 175 °C	-	25	٧
V_{DGR}	drain-gate voltage	25 °C \leq T _j \leq 175 °C; R _{GS} = 20 k Ω	-	25	V
V_{GS}	gate-source voltage		-20	20	V
I _D	drain current	$V_{GS} = 10 \text{ V}; T_{mb} = 25 \text{ °C}; \text{ see } \frac{\text{Figure 1}}{\text{Model}}$	-	73	Α
		$V_{GS} = 10 \text{ V}; T_{mb} = 100 \text{ °C}; \text{ see } \frac{\text{Figure 1}}{}$	-	52	Α
I _{DM}	peak drain current	pulsed; $t_p \le 10 \mu s$; $T_{mb} = 25 \text{ °C}$; see Figure 4	-	292	Α
P _{tot}	total power dissipation	T _{mb} = 25 °C; see <u>Figure 2</u>	-	58	W
T _{stg}	storage temperature		-55	175	°C
Tj	junction temperature		-55	175	°C
T _{sld(M)}	peak soldering temperature		-	260	°C
V _{ESD}	electrostatic discharge voltage	MM (JEDEC JESD22-A115)	220	-	٧
Source-drain	diode				
Is	source current	T _{mb} = 25 °C	-	53	Α
I _{SM}	peak source current	pulsed; $t_p \le 10 \ \mu s$; $T_{mb} = 25 \ ^{\circ}C$	-	292	Α
Avalanche ru	ıggedness				
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	V_{GS} = 10 V; $T_{j(init)}$ = 25 °C; I_D = 73 A; $V_{sup} \le$ 25 V; unclamped; R_{GS} = 50 Ω ; see Figure 3	-	15	mJ

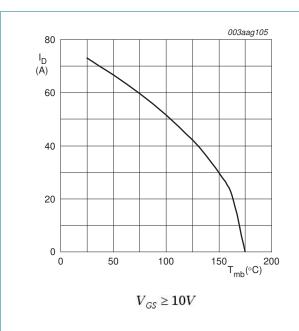


Fig 1. Continuous drain current as a function of mounting base temperature

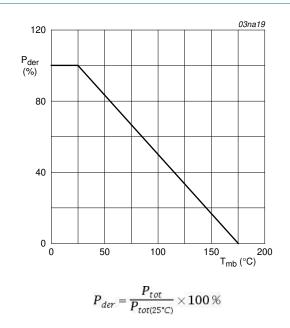


Fig 2. Normalized total power dissipation as a function of mounting base temperature

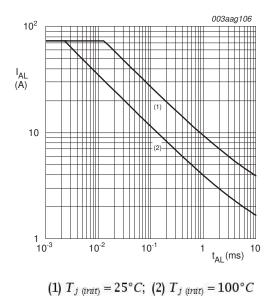
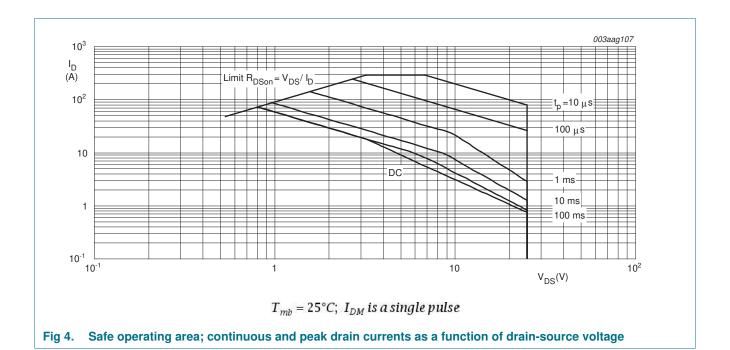


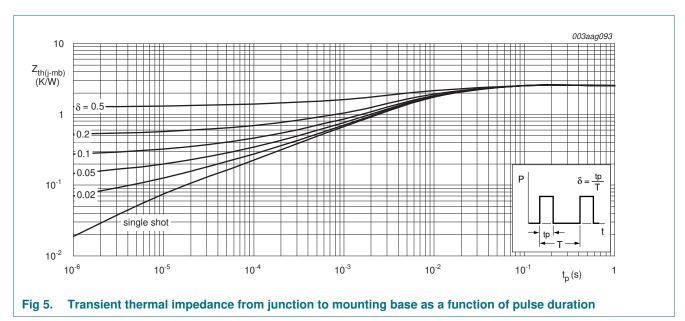
Fig 3. Single pulse avalanche rating; avalanche current as a function of avalanche time



5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
R _{th(j-mb)}	thermal resistance from junction to mounting base	see Figure 5	-	2.35	2.57	K/W



6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
•	aracteristics	Conditions	141111	iyp	IVIQA	Oilit
	drain-source breakdown	$I_D = 250 \mu A; V_{GS} = 0 V; T_i = 25 °C$	25	_	_	V
$V_{(BR)DSS}$	voltage	$I_D = 250 \mu\text{A}, V_{GS} = 0 \text{V}, I_j = 25 \text{°C}$ $I_D = 250 \mu\text{A}; V_{GS} = 0 \text{V}; T_i = -55 \text{°C}$	22.5	<u>-</u>		V
V	gate-source threshold voltage	2 , ,				V
$V_{GS(th)}$	gate-source threshold voltage	see Figure 10; see Figure 11	1.05	1.42	1.95	V
		$I_D = 10 \text{ mA}; V_{DS} = V_{GS}; T_j = 150 \text{ °C}$	0.5	-	-	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = -55 \text{ °C}$	-	-	2.25	V
I_{DSS}	drain leakage current	$V_{DS} = 25 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ °C}$	-	-	1	μΑ
		$V_{DS} = 25 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 150 \text{ °C}$	-	-	100	μΑ
I_{GSS}	gate leakage current	$V_{GS} = 16 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ °C}$	-	-	100	nA
		V_{GS} = -16 V; V_{DS} = 0 V; T_j = 25 °C	-	-	100	nA
R_{DSon}	drain-source on-state resistance	$V_{GS} = 4.5 \text{ V}; I_D = 20 \text{ A}; T_j = 25 \text{ °C};$ see Figure 12	-	6.7	7.9	mΩ
		$V_{GS} = 4.5 \text{ V}; I_D = 20 \text{ A}; T_j = 150 \text{ °C};$ see Figure 12; see Figure 13	-	-	13	mΩ
		$V_{GS} = 10 \text{ V}; I_D = 20 \text{ A}; T_j = 25 \text{ °C};$ see Figure 12	-	5.1	6.1	mΩ
		$V_{GS} = 10 \text{ V}; I_D = 20 \text{ A}; T_j = 150 \text{ °C};$ see Figure 12; see Figure 13	-	-	10.1	mΩ
R _G	internal gate resistance (AC)	f = 1 MHz	-	1.62	3.24	Ω
Dynamic	characteristics					
Q _{G(tot)}	Q _{G(tot)} total gate charge	$I_D = 20 \text{ A}$; $V_{DS} = 12 \text{ V}$; $V_{GS} = 10 \text{ V}$; see Figure 14; see Figure 15	-	19.3	-	nC
		I _D = 20 A; V _{DS} = 12 V; V _{GS} = 4.5 V; see <u>Figure 14</u> ; see <u>Figure 15</u>	-	9	-	nC
		$I_D = 0 \text{ A}; V_{DS} = 0 \text{ V}; V_{GS} = 10 \text{ V}$	- 17.7 -	-	nC	
Q _{GS}	gate-source charge	$I_D = 20 \text{ A}; V_{DS} = 12 \text{ V}; V_{GS} = 4.5 \text{ V};$	-	2.6	-	nC
Q _{GS(th)}	pre-threshold gate-source charge	see Figure 14; see Figure 15	-	1.9	-	nC
Q _{GS(th-pl)}	post-threshold gate-source charge		-	0.7	-	nC
Q _{GD}	gate-drain charge		-	2.6	-	nC
V _{GS(pl)}	gate-source plateau voltage	I _D = 20 A; V _{DS} = 12 V; see <u>Figure 14</u> ; see Figure 15	-	2.44	-	V
C _{iss}	input capacitance	V _{DS} = 12 V; V _{GS} = 0 V; f = 1 MHz;	-	1099	-	pF
C _{oss}	output capacitance	T _j = 25 °C; see <u>Figure 16</u>	-	337	-	pF
C _{rss}	reverse transfer capacitance		-	99	-	pF
t _{d(on)}	turn-on delay time	$V_{DS} = 12 \text{ V}; R_L = 0.6 \Omega; V_{GS} = 4.5 \text{ V};$	-	16	-	ns
t _r	rise time	$R_{G(ext)} = 4.7 \Omega$	_	17	_	ns
t _{d(off)}	turn-off delay time		_	30	_	ns
t _f	fall time		-	9	_	ns
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Table 6. Characteristics ... continued

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
Q _{oss}	output charge	$V_{GS} = 0 \text{ V}; V_{DS} = 12 \text{ V}; f = 1 \text{ MHz}$	-	6.6	-	nC
Source-drain diode						
V_{SD}	source-drain voltage	$I_S = 20 \text{ A}$; $V_{GS} = 0 \text{ V}$; $T_j = 25 \text{ °C}$; see Figure 17	-	0.85	1.1	V
t _{rr}	reverse recovery time	$I_S = 20 \text{ A}; dI_S/dt = -100 \text{ A}/\mu s;$	-	27	-	ns
Q _r	recovered charge	$V_{GS} = 0 \text{ V}; V_{DS} = 12 \text{ V}$	-	18	-	nC
ta	reverse recovery rise time	$V_{GS} = 0 \text{ V}; I_S = 20 \text{ A};$	-	15	-	ns
t _b	reverse recovery fall time	$dI_S/dt = -100 A/\mu s; V_{DS} = 12 V;$ see Figure 18	-	12	-	ns

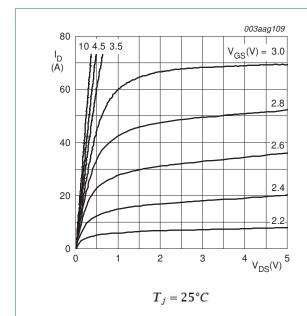


Fig 6. Output characteristics; drain current as a function of drain-source voltage; typical values

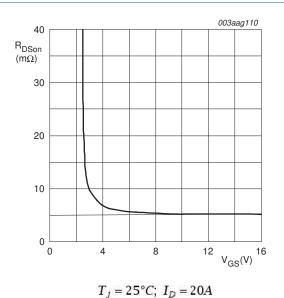


Fig 7. Drain-source on-state resistance as a function of gate-source voltage; typical values

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N-channel 25 V 6.1 mΩ logic level MOSFET in LFPAK using NextPower technology

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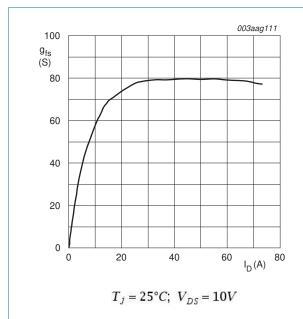


Fig 8. Forward transconductance as a function of drain current; typical values

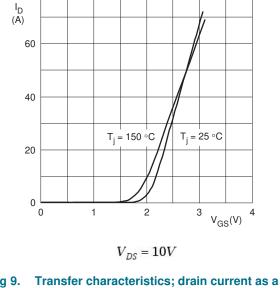


Fig 9. Transfer characteristics; drain current as a function of gate-source voltage; typical values

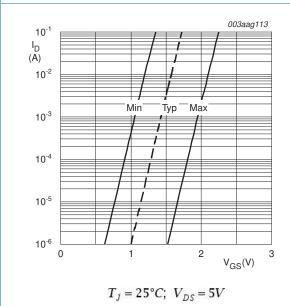


Fig 10. Sub-threshold drain current as a function of gate-source voltage

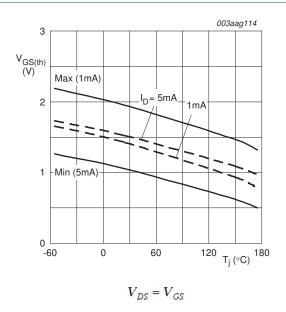


Fig 11. Gate-source threshold voltage as a function of junction temperature

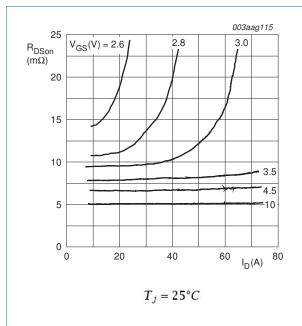


Fig 12. Drain-source on-state resistance as a function of drain current; typical values

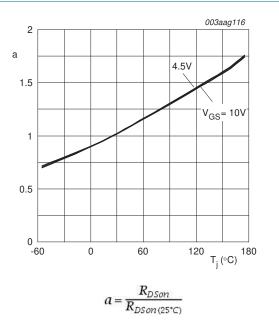


Fig 13. Normalized drain-source on-state resistance factor as a function of junction temperature

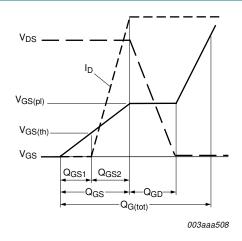
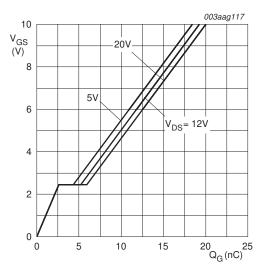


Fig 14. Gate charge waveform definitions



 $T_j = 25^{\circ}C; I_D = 20A$

Fig 15. Gate-source voltage as a function of gate charge; typical values

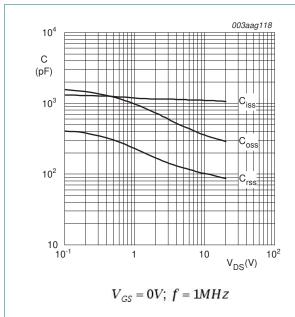


Fig 16. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

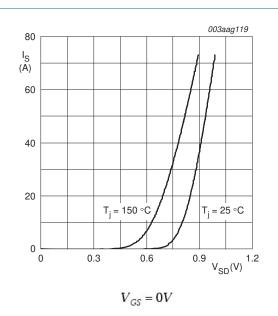


Fig 17. Source current as a function of source-drain voltage; typical values

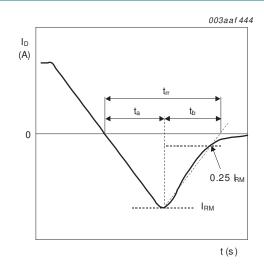
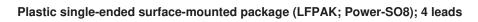


Fig 18. Reverse recovery timing definition

7. Package outline



SOT669

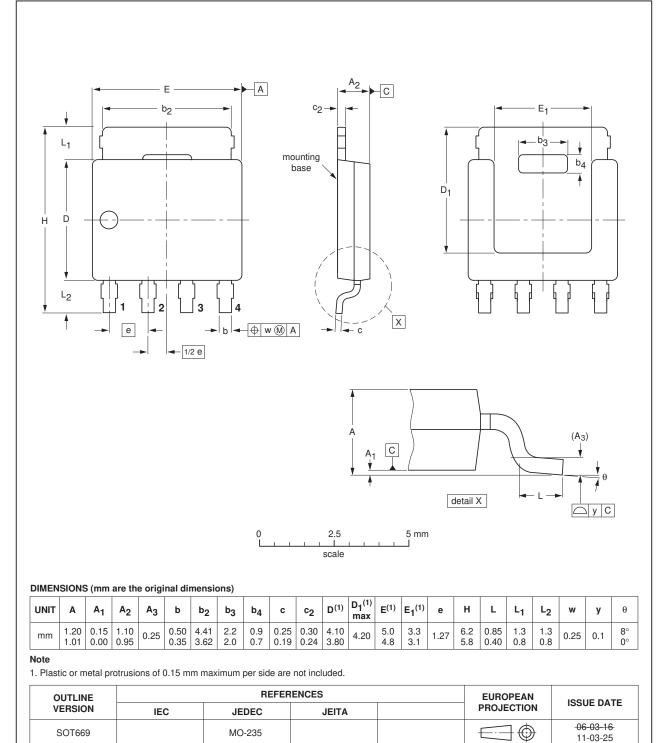


Fig 19. Package outline SOT669 (LFPAK; Power-SO8)

PSMN6R0-25YLB

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Revision history

Table 7. **Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
PSMN6R0-25YLB v.2	20111031	Product data sheet	-	PSMN6R0-25YLB v.1
Modifications:	Status changed froVarious changes to	om preliminary to product. o content.		
PSMN6R0-25YLB v.1	20110908	Preliminary data sheet	-	-

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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N-channel 25 V 6.1 mΩ logic level MOSFET in LFPAK using NextPower technology

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