



# PSMN2R8-25MLC

N-channel 25 V 2.8 mΩ logic level MOSFET in LPAK33 using NextPower Technology

Rev. 3 — 15 June 2012

Product data sheet

## 1. Product profile

### 1.1 General description

Logic level enhancement mode N-channel MOSFET in LPAK33 package. This product is designed and qualified for use in a wide range of industrial, communications and domestic equipment.

### 1.2 Features and benefits

- 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

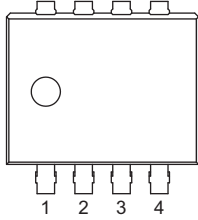
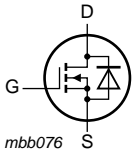
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>DS</sub>	drain-source voltage	T <sub>j</sub> = 25°C	-	-	25	V
I <sub>D</sub>	drain current	T <sub>mb</sub> = 25 °C; V <sub>GS</sub> = 10 V; see <a href="#">Figure 1</a>	[1] -	-	70	A
P <sub>tot</sub>	total power dissipation	T <sub>mb</sub> = 25 °C; see <a href="#">Figure 2</a>	-	-	88	W
T <sub>j</sub>	junction temperature		-55	-	175	°C
Static characteristics						
R <sub>DSon</sub>	drain-source on-state resistance	V <sub>GS</sub> = 4.5 V; I <sub>D</sub> = 25 A; T <sub>j</sub> = 25 °C; see <a href="#">Figure 10</a>	-	3.25	3.75	mΩ
		V <sub>GS</sub> = 10 V; I <sub>D</sub> = 25 A; T <sub>j</sub> = 25 °C; see <a href="#">Figure 10</a>	-	2.45	2.8	mΩ
Dynamic characteristics						
Q <sub>GD</sub>	gate-drain charge	V <sub>GS</sub> = 4.5 V; I <sub>D</sub> = 25 A; V <sub>DS</sub> = 12.5 V; see <a href="#">Figure 12</a> ; see <a href="#">Figure 13</a>	-	3.9	-	nC
Q <sub>G(tot)</sub>	total gate charge	V <sub>GS</sub> = 4.5 V; I <sub>D</sub> = 25 A; V <sub>DS</sub> = 12.5 V; see <a href="#">Figure 12</a> ; see <a href="#">Figure 13</a>	-	16.3	-	nC

[1] Continuous current is limited by package.



## 2. Pinning information

Table 2. Pinning information

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

SOT1210 (LPAK33)

## 3. Ordering information

Table 3. Ordering information

Type number	Package		Version
	Name	Description	
PSMN2R8-25MLC	LPAK33	Plastic single ended surface mounted package (LPAK33); 4 leads	SOT1210

## 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	$T_j = 25^\circ\text{C}$	-	25	V
$V_{GS}$	gate-source voltage		-20	20	V
$I_D$	drain current	$V_{GS} = 10\text{ V}$ ; $T_{mb} = 25^\circ\text{C}$ ; see <a href="#">Figure 1</a>	[1]	70	A
		$V_{GS} = 10\text{ V}$ ; $T_{mb} = 100^\circ\text{C}$ ; see <a href="#">Figure 1</a>	[1]	70	A
$I_{DM}$	peak drain current	pulsed; $t_p \leq 10\text{ }\mu\text{s}$ ; $T_{mb} = 25^\circ\text{C}$ ; see <a href="#">Figure 4</a>	-	536	A
$P_{tot}$	total power dissipation	$T_{mb} = 25^\circ\text{C}$ ; see <a href="#">Figure 2</a>	-	88	W
$T_{stg}$	storage temperature		-55	175	$^\circ\text{C}$
$T_j$	junction temperature		-55	175	$^\circ\text{C}$
$T_{sld(M)}$	peak soldering temperature		-	260	$^\circ\text{C}$
$V_{ESD}$	electrostatic discharge voltage	MM (JEDEC JESD22-A115)	350	-	V
<b>Source-drain diode</b>					
$I_S$	source current	$T_{mb} = 25^\circ\text{C}$	[1]	70	A
$I_{SM}$	peak source current	pulsed; $t_p \leq 10\text{ }\mu\text{s}$ ; $T_{mb} = 25^\circ\text{C}$	-	536	A
<b>Avalanche ruggedness</b>					
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10\text{ V}$ ; $T_{j(\text{init})} = 25^\circ\text{C}$ ; $I_D = 70\text{ A}$ ; $V_{sup} \leq 25\text{ V}$ ; $R_{GS} = 50\text{ }\Omega$ ; unclamped; see <a href="#">Figure 3</a>	-	77	mJ

[1] Continuous current is limited by package.

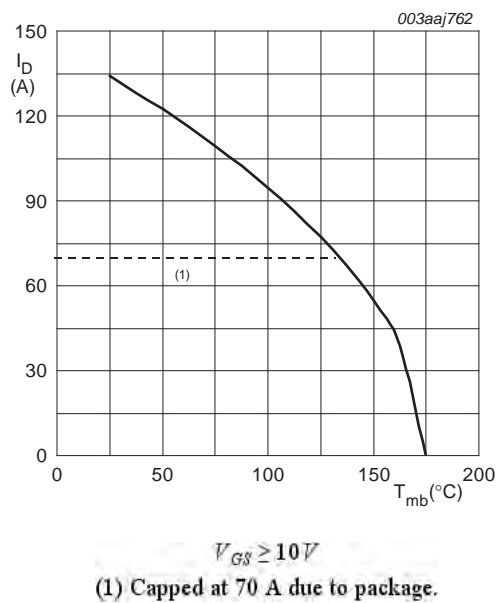


Fig 1. Continuous drain current as a function of mounting base temperature

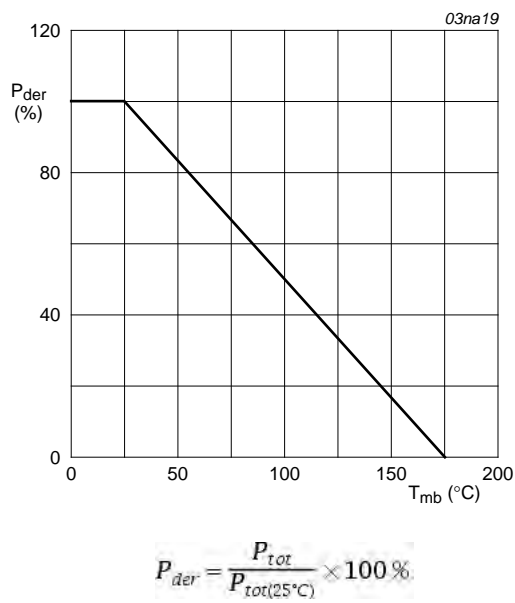


Fig 2. Normalized total power dissipation as a function of mounting base temperature

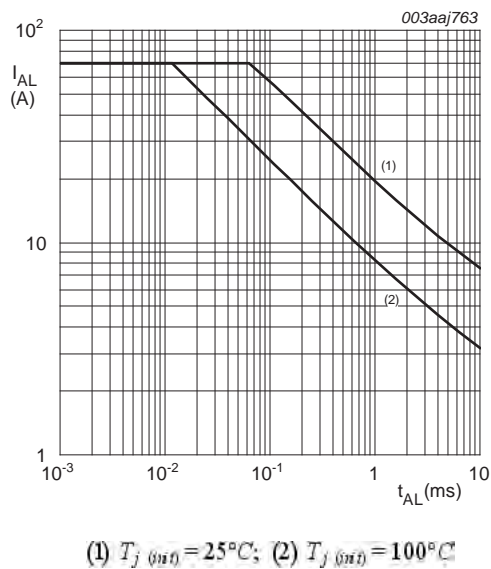
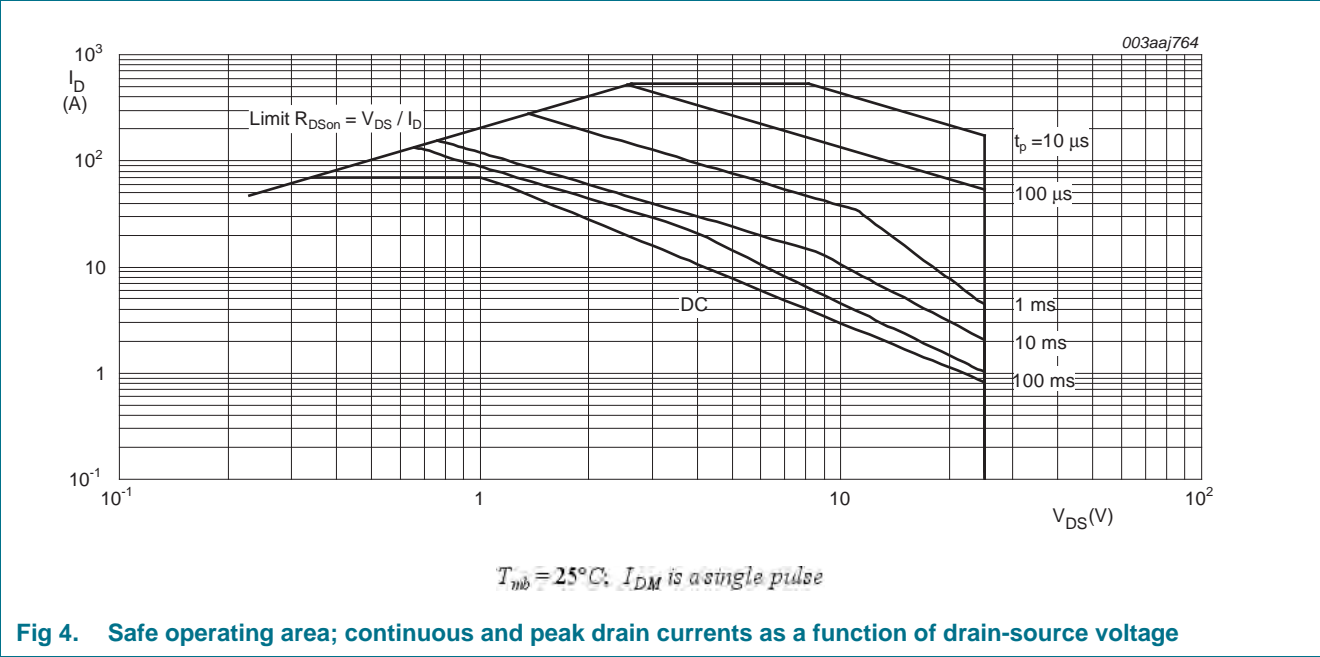


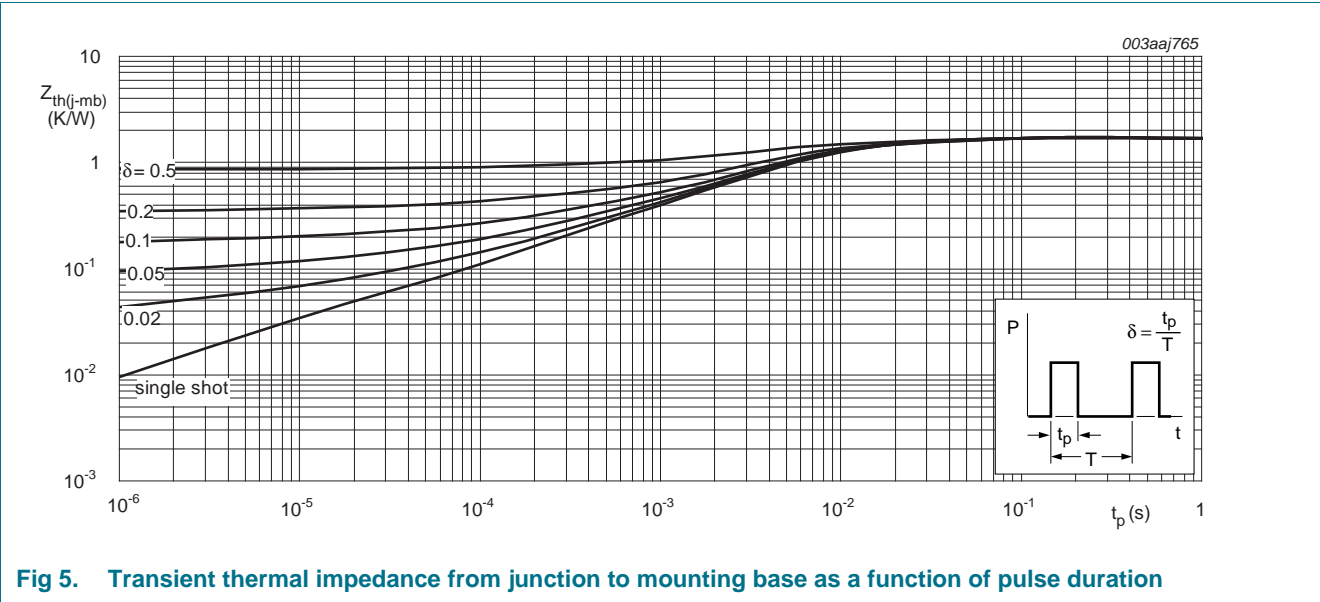
Fig 3. Single pulse avalanche rating; avalanche current as a function of avalanche time



5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	see <a href="#">Figure 5</a>	-	1.49	1.7	K/W



## 6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250\ \mu\text{A}$ ; $V_{GS} = 0\ \text{V}$ ; $T_j = 25\ ^\circ\text{C}$	25	-	-	V
		$I_D = 250\ \mu\text{A}$ ; $V_{GS} = 0\ \text{V}$ ; $T_j = -55\ ^\circ\text{C}$	22.5	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1\ \text{mA}$ ; $V_{DS} = V_{GS}$ ; $T_j = 25\ ^\circ\text{C}$	1.45	1.74	2.15	V
$\Delta V_{GS(th)}/\Delta T$	gate-source threshold voltage variation with temperature		-	-4.2	-	mV/K
$I_{DSS}$	drain leakage current	$V_{DS} = 25\ \text{V}$ ; $V_{GS} = 0\ \text{V}$ ; $T_j = 25\ ^\circ\text{C}$	-	-	1	$\mu\text{A}$
		$V_{DS} = 25\ \text{V}$ ; $V_{GS} = 0\ \text{V}$ ; $T_j = 150\ ^\circ\text{C}$	-	-	100	$\mu\text{A}$
$I_{GSS}$	gate leakage current	$V_{GS} = 16\ \text{V}$ ; $V_{DS} = 0\ \text{V}$ ; $T_j = 25\ ^\circ\text{C}$	-	-	100	nA
		$V_{GS} = -16\ \text{V}$ ; $V_{DS} = 0\ \text{V}$ ; $T_j = 25\ ^\circ\text{C}$	-	-	100	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 4.5\ \text{V}$ ; $I_D = 25\ \text{A}$ ; $T_j = 25\ ^\circ\text{C}$ ; see <a href="#">Figure 10</a>	-	3.25	3.75	mΩ
		$V_{GS} = 4.5\ \text{V}$ ; $I_D = 25\ \text{A}$ ; $T_j = 150\ ^\circ\text{C}$ ; see <a href="#">Figure 10</a> ; see <a href="#">Figure 11</a>	-	-	6	mΩ
		$V_{GS} = 10\ \text{V}$ ; $I_D = 25\ \text{A}$ ; $T_j = 25\ ^\circ\text{C}$ ; see <a href="#">Figure 10</a>	-	2.45	2.8	mΩ
		$V_{GS} = 10\ \text{V}$ ; $I_D = 25\ \text{A}$ ; $T_j = 150\ ^\circ\text{C}$ ; see <a href="#">Figure 10</a> ; see <a href="#">Figure 11</a>	-	-	4.5	mΩ
$R_G$	gate resistance	$f = 1\ \text{MHz}$	0.37	0.74	1.48	Ω
<b>Dynamic characteristics</b>						
$Q_{G(tot)}$	total gate charge	$I_D = 25\ \text{A}$ ; $V_{DS} = 12.5\ \text{V}$ ; $V_{GS} = 10\ \text{V}$ ; see <a href="#">Figure 12</a> ; see <a href="#">Figure 13</a>	-	37.7	-	nC
		$I_D = 25\ \text{A}$ ; $V_{DS} = 12.5\ \text{V}$ ; $V_{GS} = 4.5\ \text{V}$ ; see <a href="#">Figure 12</a> ; see <a href="#">Figure 13</a>	-	16.3	-	nC
		$I_D = 0\ \text{A}$ ; $V_{DS} = 0\ \text{V}$ ; $V_{GS} = 10\ \text{V}$	-	36.7	-	nC
$Q_{GS}$	gate-source charge	$I_D = 25\ \text{A}$ ; $V_{DS} = 12.5\ \text{V}$ ; $V_{GS} = 4.5\ \text{V}$ ; see <a href="#">Figure 12</a> ; see <a href="#">Figure 13</a>	-	6.5	-	nC
$Q_{GS(th)}$	pre-threshold gate-source charge		-	3.9	-	nC
$Q_{GS(th-pl)}$	post-threshold gate-source charge		-	2.6	-	nC
$Q_{GD}$	gate-drain charge		-	3.9	-	nC
$V_{GS(pl)}$	gate-source plateau voltage	$I_D = 25\ \text{A}$ ; $V_{DS} = 12.5\ \text{V}$ ; see <a href="#">Figure 12</a> ; see <a href="#">Figure 13</a>	-	2.9	-	V
$C_{iss}$	input capacitance	$V_{DS} = 12.5\ \text{V}$ ; $V_{GS} = 0\ \text{V}$ ; $f = 1\ \text{MHz}$ ; $T_j = 25\ ^\circ\text{C}$ ; see <a href="#">Figure 14</a>	-	2432	-	pF
$C_{oss}$	output capacitance		-	533	-	pF
$C_{rss}$	reverse transfer capacitance		-	198	-	pF

Table 6. Characteristics ...continued

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
t <sub>d(on)</sub>	turn-on delay time	V <sub>DS</sub> = 12.5 V; R <sub>L</sub> = 0.5 Ω; V <sub>GS</sub> = 4.5 V;	-	16.4	-	ns
t <sub>r</sub>	rise time	R <sub>G(ext)</sub> = 5 Ω	-	24.6	-	ns
t <sub>d(off)</sub>	turn-off delay time		-	19.9	-	ns
t <sub>f</sub>	fall time		-	13.1	-	ns
Q <sub>oss</sub>	output charge	V <sub>GS</sub> = 0 V; V <sub>DS</sub> = 12.5 V; f = 1 MHz; T <sub>j</sub> = 25 °C	-	14.3	-	nC

Source-drain diode

V <sub>SD</sub>	source-drain voltage	I <sub>S</sub> = 25 A; V <sub>GS</sub> = 0 V; T <sub>j</sub> = 25 °C; see <a href="#">Figure 15</a>	-	0.82	1.1	V
t <sub>rr</sub>	reverse recovery time	I <sub>S</sub> = 25 A; dI <sub>S</sub> /dt = -100 A/μs; V <sub>GS</sub> = 0 V;	-	21.3	-	ns
Q <sub>r</sub>	recovered charge	V <sub>DS</sub> = 12.5 V	-	14.1	-	nC
t <sub>a</sub>	reverse recovery rise time	V <sub>GS</sub> = 0 V; I <sub>S</sub> = 25 A; dI <sub>S</sub> /dt = -100 A/μs; V <sub>DS</sub> = 12.5 V; see <a href="#">Figure 16</a>	-	12.1	-	ns
t <sub>b</sub>	reverse recovery fall time		-	9.2	-	ns

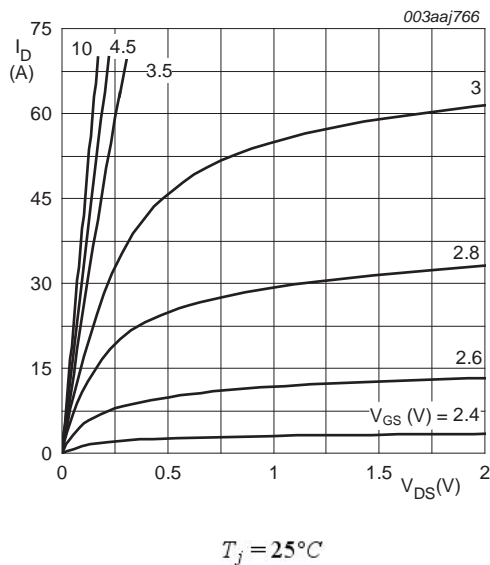


Fig 6. Output characteristics; drain current as a function of drain-source voltage; typical values

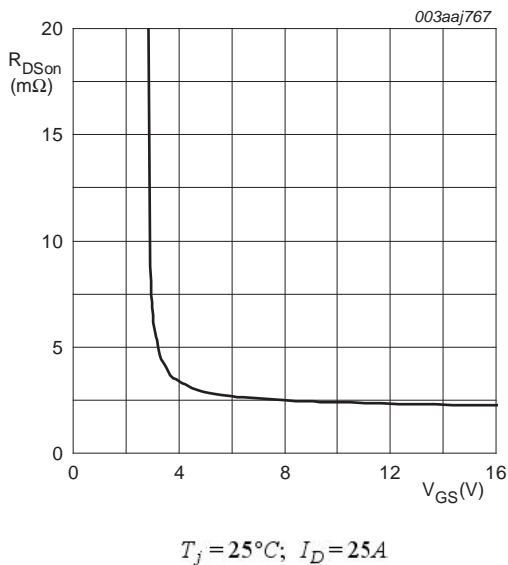


Fig 7. Drain-source on-state resistance as a function of gate-source voltage; typical values

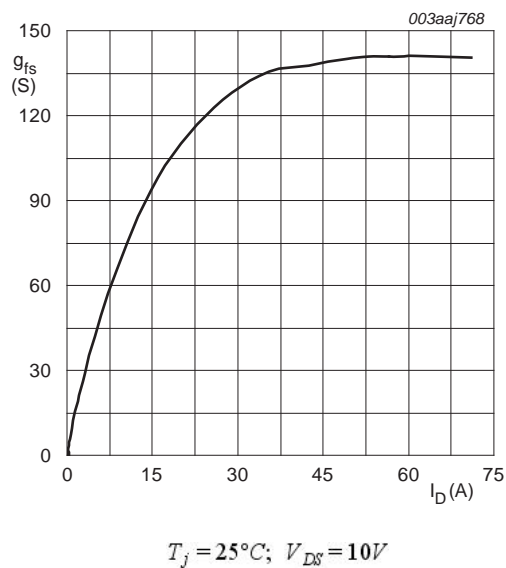


Fig 8. Forward transconductance as a function of drain current; typical values

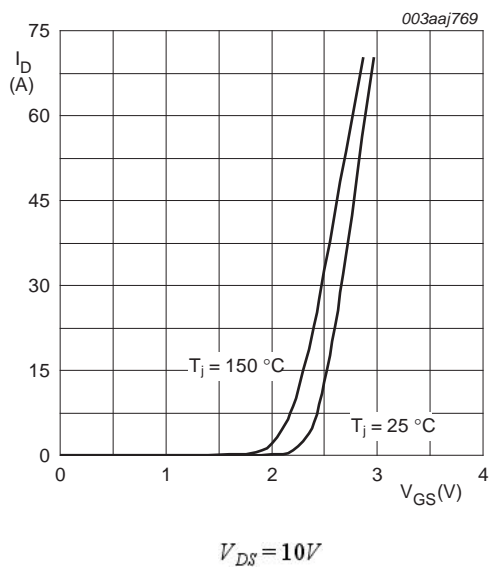


Fig 9. Transfer characteristics; drain current as a function of gate-source voltage; typical values

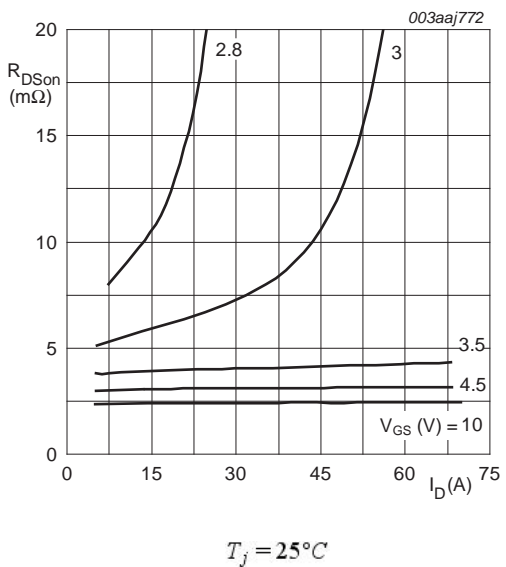


Fig 10. Drain-source on-state resistance as a function of drain current; typical values

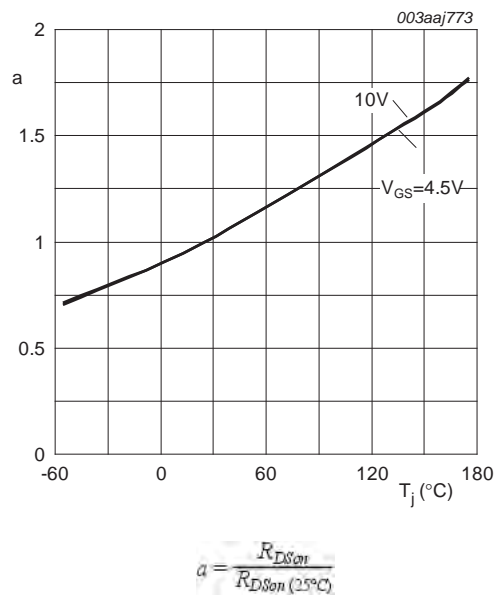
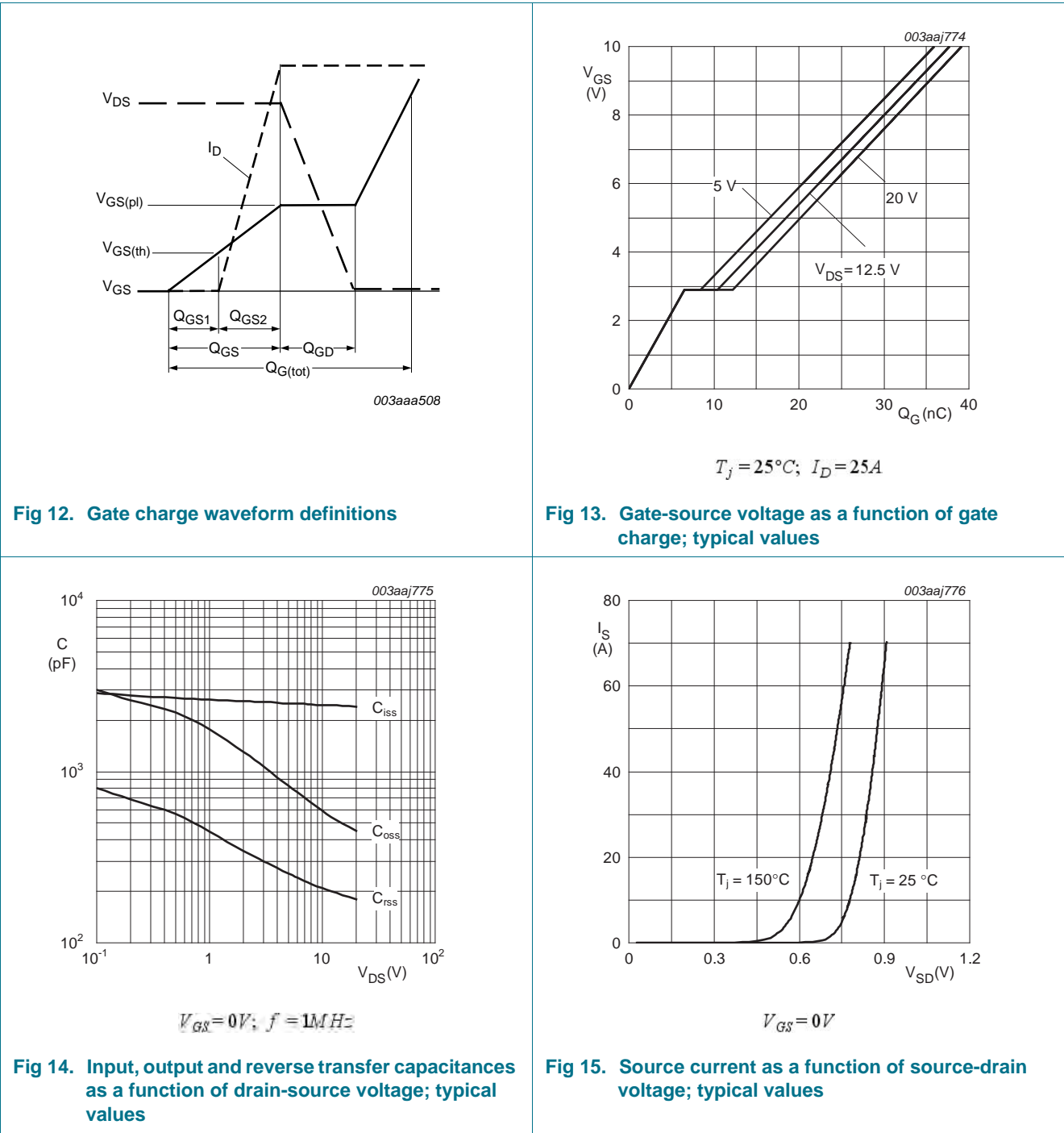


Fig 11. Normalized drain-source on-state resistance factor as a function of junction temperature





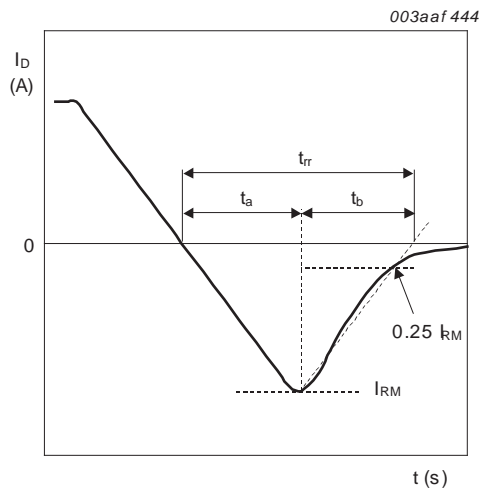


Fig 16. Reverse recovery timing definition

7. Package outline

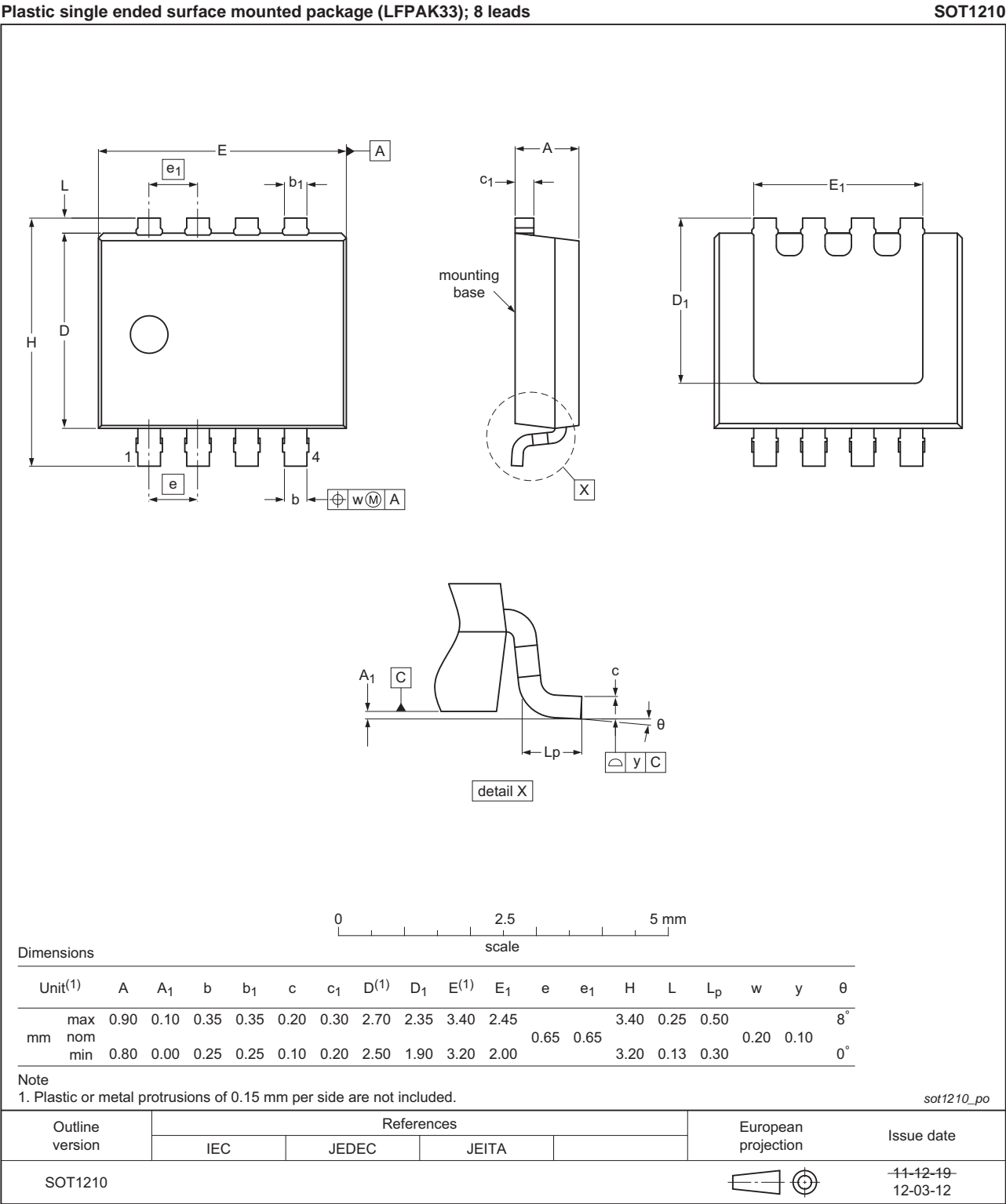


Fig 17. Package outline SOT1210 (LPAK33)

## 8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PSMN2R8-25MLC v.3	20120615	Product data sheet	-	PSMN2R8-25MLC v.2
Modifications: <ul style="list-style-type: none"><li>• Various changes to content.</li></ul>				
PSMN2R8-25MLC v.2	20120607	Product data sheet	-	PSMN2R8-25MLC v.1

## 9. Legal information

### 9.1 Data sheet status

Document status <sup>[1] [2]</sup>	Product status <sup>[3]</sup>	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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Product [short] data sheet	Production	This document contains the product specification.

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