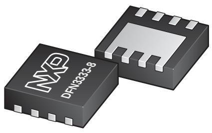


PSMN9R0-30LL

N-channel DFN3333-8 30 V 9 mΩ logic level MOSFET

Rev. 5 — 13 December 2011 **Product data sheet**

1. Product profile

1.1 General description

Logic level N-channel MOSFET in DFN3333-8 package qualified to 150 °C. This product is designed and qualified for use in a wide range of industrial, communications and power supply equipment.

1.2 Features and benefits

- High efficiency due to low switching and conduction losses
- Small footprint for compact designs
- Suitable for logic level gate drive sources

1.3 Applications

- Battery protection
- DC-to-DC converters
- Load switching
- Power ORing

1.4 Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25$ °C; $T_j \leq 150$ °C	-	-	30	V
I_D	drain current	$T_{mb} = 25$ °C; $V_{GS} = 10$ V; see Figure 1	-	-	21	A
P_{tot}	total power dissipation	$T_{mb} = 25$ °C; see Figure 2	-	-	50	W
T_j	junction temperature		-55	-	150	°C
Static characteristics						
R_{DSon}	drain-source on-state resistance	$V_{GS} = 4.5$ V; $I_D = 5$ A; $T_j = 25$ °C; see Figure 12	-	10.6	13	mΩ
		$V_{GS} = 10$ V; $I_D = 5$ A; $T_j = 100$ °C; see Figure 13	-	-	11.9	mΩ
		$V_{GS} = 10$ V; $I_D = 5$ A; $T_j = 25$ °C; see Figure 12	-	8	9	mΩ

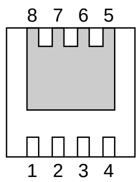
Table 1. Quick reference data *...continued*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Dynamic characteristics						
Q_{GD}	gate-drain charge	V_{GS} = 10 V; I_D = 10 A; V_{DS} = 15 V; see Figure 14; see Figure 17	-	2.9	-	nC
$Q_{G(tot)}$	total gate charge		-	20.6	-	nC
		V_{GS} = 4.5 V; I_D = 10 A; V_{DS} = 15 V; see Figure 17; see Figure 14	-	10	-	nC
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	V_{GS} = 10 V; $T_{j(init)}$ = 25 °C; I_D = 40 A; V_{sup} ≤ 30 V; unclamped; R_{GS} = 50 Ω	-	-	32	mJ

2. Pinning information

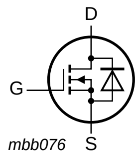
Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	S	source		
2	S	source		
3	S	source		
4	G	gate		
5,6,7,8	D	drain		
mb				



Transparent top view

SOT873-1 (DFN3333-8)



3. Ordering information

Table 3. Ordering information

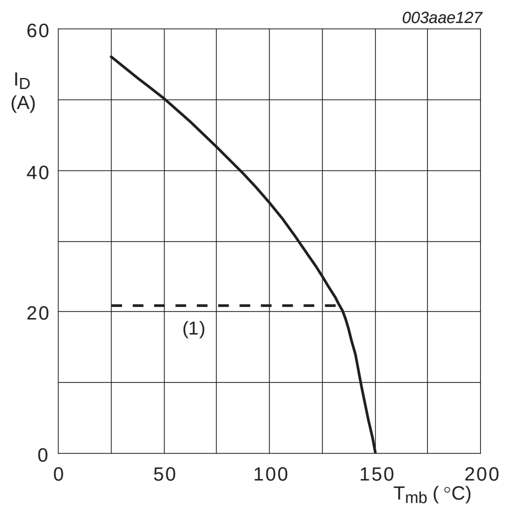
Type number	Package		
	Name	Description	Version
PSMN9R0-30LL	DFN3333-8	plastic thermal enhanced very thin small outline package; no leads; 8 terminals	SOT873-1

4. Limiting values

Table 4. Limiting values

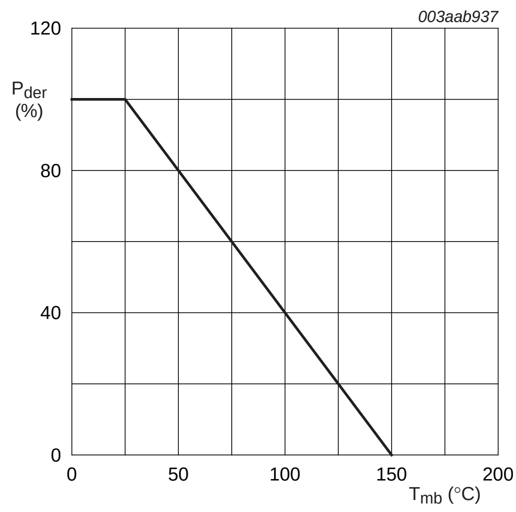
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25$ °C; $T_j \leq 150$ °C	-	30	V
V_{DGR}	drain-gate voltage	$T_j \leq 150$ °C; $T_j \geq 25$ °C; R_{GS} = 20 kΩ	-	30	V
V_{GS}	gate-source voltage		-20	20	V
I_D	drain current	V_{GS} = 10 V; T_{mb} = 100 °C; see Figure 1	-	21	A
		V_{GS} = 10 V; T_{mb} = 25 °C; see Figure 1	-	21	A
I_{DM}	peak drain current	pulsed; $t_p \leq 10$ µs; T_{mb} = 25 °C; see Figure 3	-	226	A
P_{tot}	total power dissipation	T_{mb} = 25 °C; see Figure 2	-	50	W
T_{stg}	storage temperature		-55	150	°C
T_j	junction temperature		-55	150	°C
$T_{sld(M)}$	peak soldering temperature		-	260	°C
Source-drain diode					
I_S	source current	T_{mb} = 25 °C	-	21	A
I_{SM}	peak source current	pulsed; $t_p \leq 10$ µs; T_{mb} = 25 °C	-	226	A
Avalanche ruggedness					
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	V_{GS} = 10 V; $T_{j(init)}$ = 25 °C; I_D = 40 A; $V_{sup} \leq 30$ V; unclamped; R_{GS} = 50 Ω	-	32	mJ



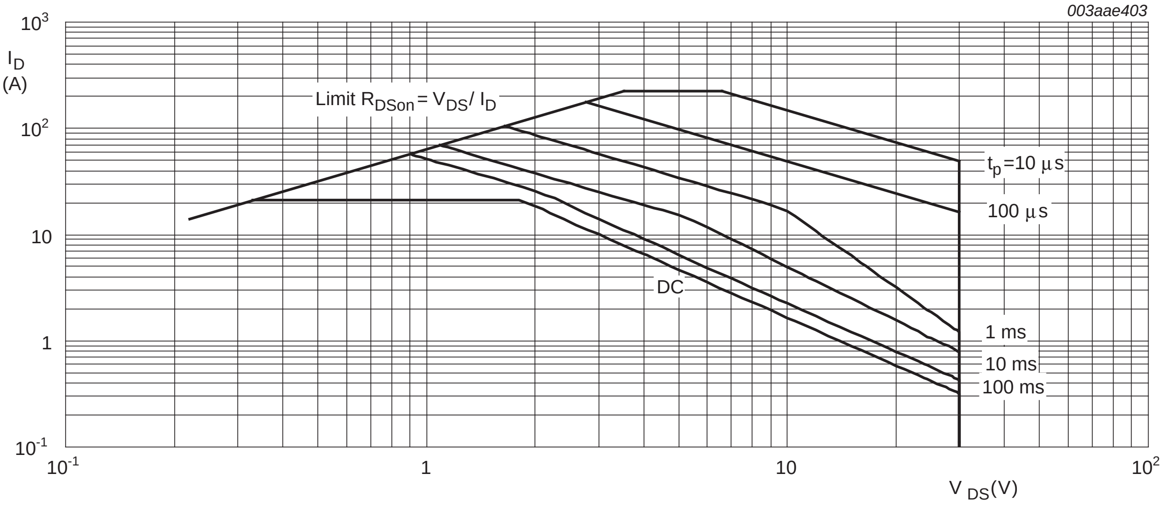
$V_{GS} \geq 10$ V; (1) Capped at 21 A due to wires.

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



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

Fig 2. Normalized total power dissipation as a function of solder point temperature



$T_{mb} = 25\,°C; I_{DM}$ is single pulse

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		-	1.9	4.5	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient		[1]	-	55	60	K/W

[1] $R_{th(j-a)}$ is guaranteed by design and assumes that the device is mounted on a 40mm x 40mm x 70µm copper pad at 20°C ambient temperature. In practice $R_{th(j-a)}$ will be determined by the customer's PCB characteristics

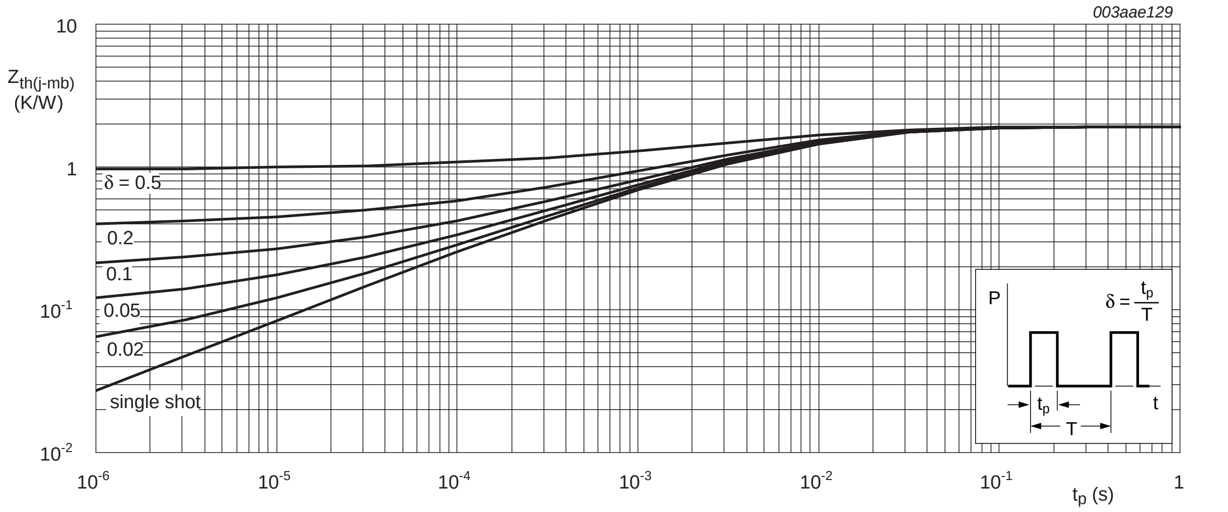


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration; typical values

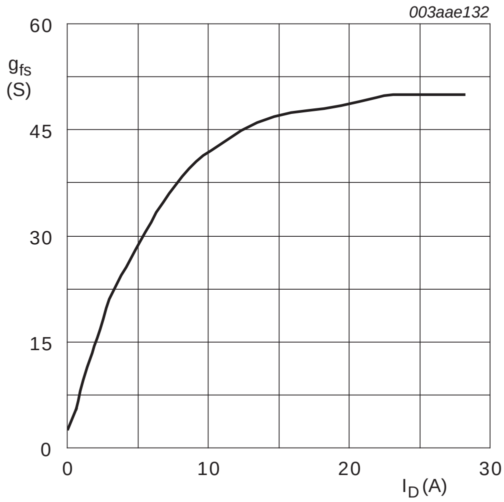
6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = 0.25 mA; V_{GS} = 0 V; T_j = -55 °C	27	-	-	V
		I_D = 0.25 mA; V_{GS} = 0 V; T_j = 25 °C	30	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	I_D = 1 mA; V_{DS} = V_{GS}; T_j = 150 °C; see Figure 10	0.5	-	-	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = 25 °C; see Figure 11; see Figure 10	1.3	1.7	2.15	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = -55 °C; see Figure 10	-	-	2.55	V
I_{DSS}	drain leakage current	V_{DS} = 30 V; V_{GS} = 0 V; T_j = 25 °C	-	0.02	1	µA
		V_{DS} = 30 V; V_{GS} = 0 V; T_j = 125 °C	-	-	50	µA
I_{GSS}	gate leakage current	V_{GS} = 20 V; V_{DS} = 0 V; T_j = 25 °C	-	5	100	nA
		V_{GS} = -20 V; V_{DS} = 0 V; T_j = 25 °C	-	5	100	nA
R_{DSon}	drain-source on-state resistance	V_{GS} = 4.5 V; I_D = 5 A; T_j = 25 °C; see Figure 12	-	10.6	13	mΩ
		V_{GS} = 10 V; I_D = 5 A; T_j = 100 °C; see Figure 13	-	-	11.9	mΩ
		V_{GS} = 10 V; I_D = 5 A; T_j = 150 °C; see Figure 13	-	14.4	16.2	mΩ
		V_{GS} = 10 V; I_D = 5 A; T_j = 25 °C; see Figure 12	-	8	9	mΩ
R_G	internal gate resistance (AC)	f = 1 MHz	-	1.46	-	Ω
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	I_D = 10 A; V_{DS} = 15 V; V_{GS} = 10 V; see Figure 14; see Figure 17	-	20.6	-	nC
		I_D = 10 A; V_{DS} = 15 V; V_{GS} = 4.5 V; see Figure 17; see Figure 14	-	10	-	nC
		I_D = 0 A; V_{DS} = 0 V; V_{GS} = 10 V	-	18.6	-	nC
Q_{GS}	gate-source charge	I_D = 10 A; V_{DS} = 15 V; V_{GS} = 10 V; see Figure 14	-	3.4	-	nC
$Q_{GS(th)}$	pre-threshold gate-source charge		-	1.9	-	nC
$Q_{GS(th-pl)}$	post-threshold gate-source charge		-	1.4	-	nC
Q_{GD}	gate-drain charge	I_D = 10 A; V_{DS} = 15 V; V_{GS} = 10 V; see Figure 14; see Figure 17	-	2.9	-	nC
$V_{GS(pl)}$	gate-source plateau voltage	I_D = 10 A; V_{DS} = 15 V; see Figure 14; see Figure 17	-	2.6	-	V
C_{iss}	input capacitance	V_{DS} = 15 V; V_{GS} = 0 V; f = 1 MHz; T_j = 25 °C; see Figure 15	-	1193	-	pF
C_{oss}	output capacitance		-	223	-	pF
C_{rss}	reverse transfer capacitance		-	106	-	pF

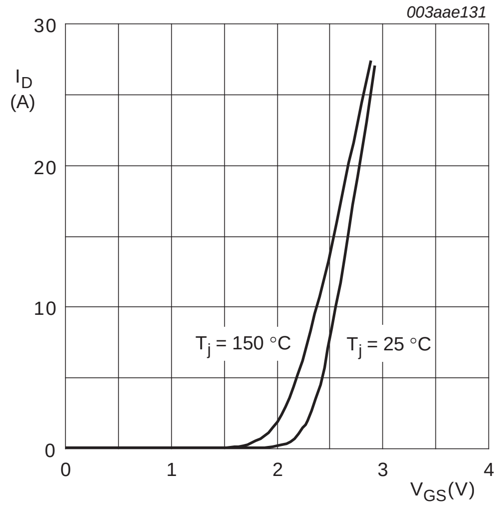
Table 6. Characteristics *...continued*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$t_{d(on)}$	turn-on delay time	V_{DS} = 15 V; R_L = 1.5 Ω; V_{GS} = 10 V; $R_{G(ext)}$ = 4.7 Ω; T_j = 25 °C	-	16	-	ns
t_r	rise time		-	18	-	ns
$t_{d(off)}$	turn-off delay time		-	22	-	ns
t_f	fall time		-	8	-	ns
Source-drain diode						
V_{SD}	source-drain voltage	I_S = 7.5 A; V_{GS} = 0 V; T_j = 25 °C; see Figure 16	-	0.85	1.2	V
t_{rr}	reverse recovery time	I_S = 10 A; dI_S/dt = 100 A/µs; V_{GS} = 0 V; V_{DS} = 15 V	-	30	-	ns
Q_r	recovered charge		-	22	-	nC



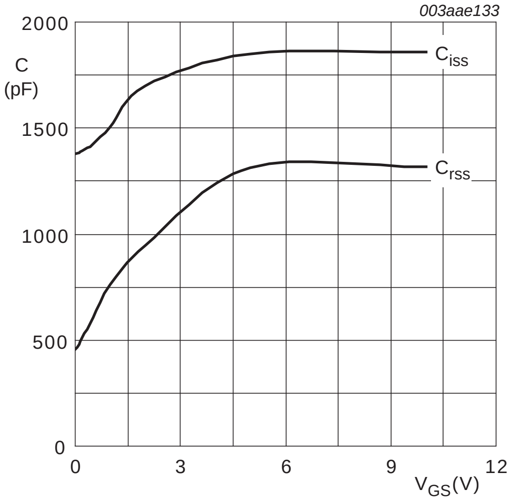
T_j = 25 °C; V_{DS} = 10 V

Fig 5. Forward transconductance as a function of drain current; typical values



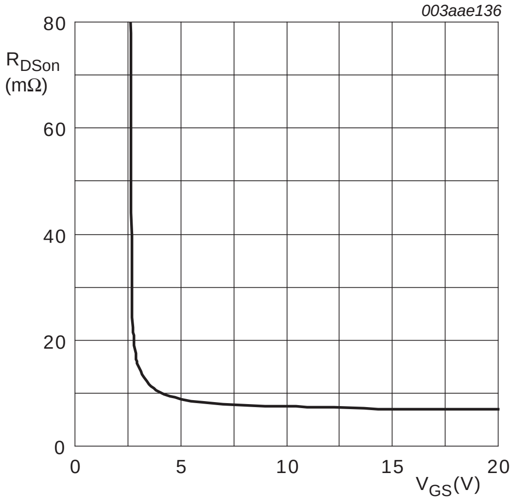
$V_{DS} > I_D \times R_{DSon}$

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



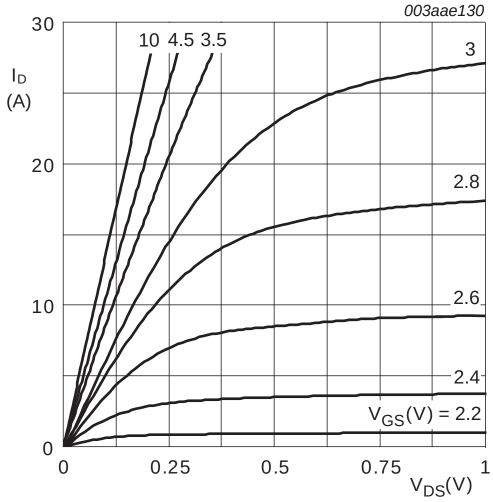
$V_{DS} = 0$ V; f = 1 MHz

Fig 7. Input and reverse transfer capacitances as a function of gate-source voltage, typical values



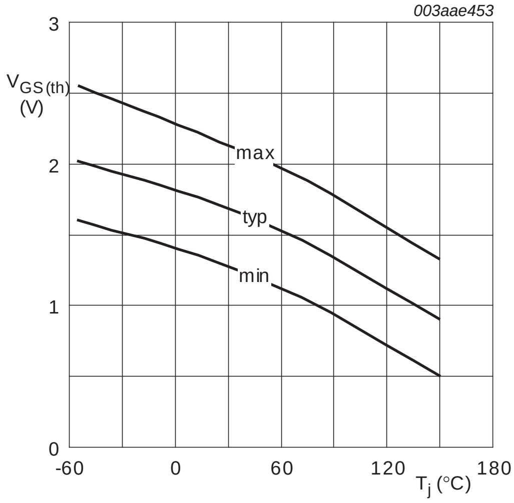
$T_j = 25$ °C; $I_D = 8$ A

Fig 8. Drain-source on-state resistance as a function of gate-source voltage; typical values



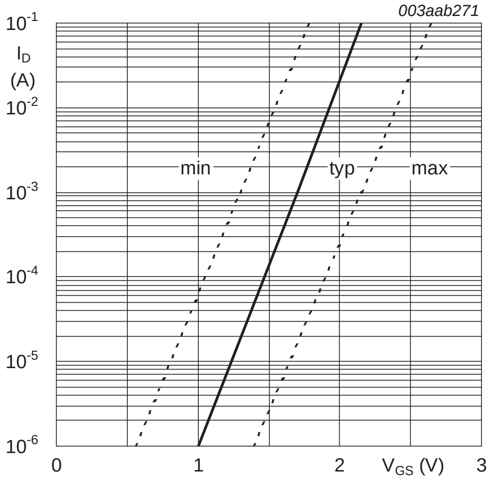
$T_j = 25$ °C

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



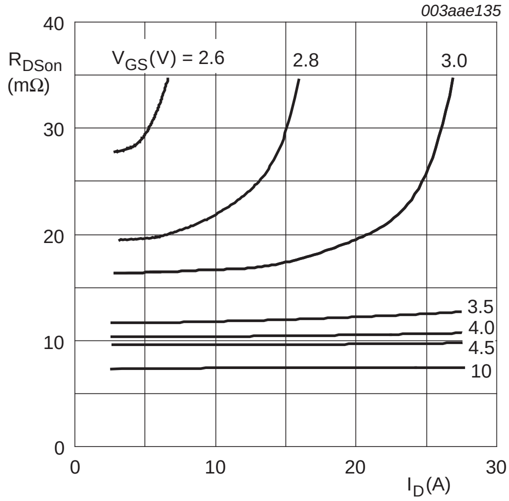
$I_D = 1$ mA; $V_{DS} = V_{GS}$

Fig 10. Gate-source threshold voltage as a function of junction temperature



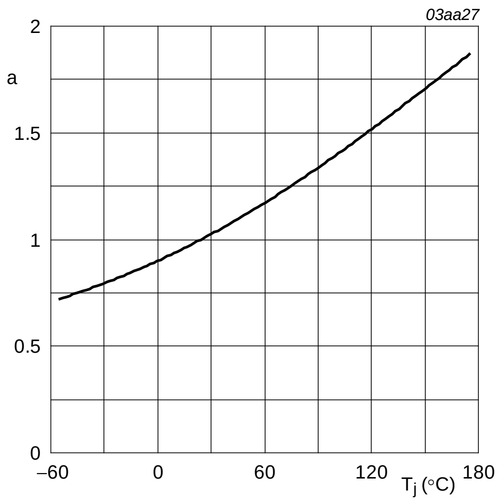
$T_j = 25\,°C; V_{DS} = 5\,V$

Fig 11. Sub-threshold drain current as a function of gate-source voltage



$T_j = 25\,°C$

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



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

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

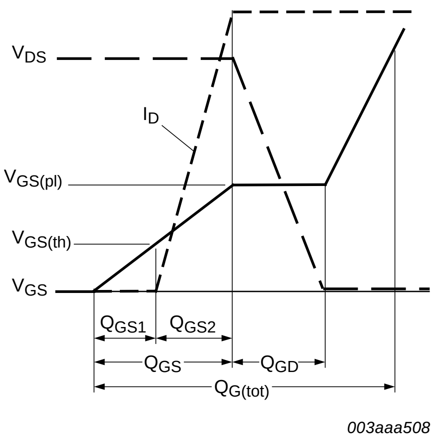
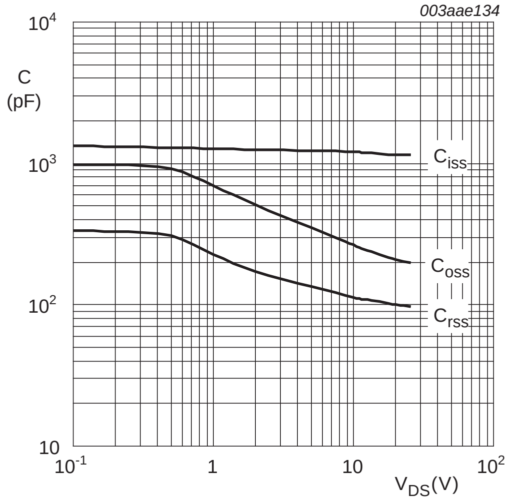
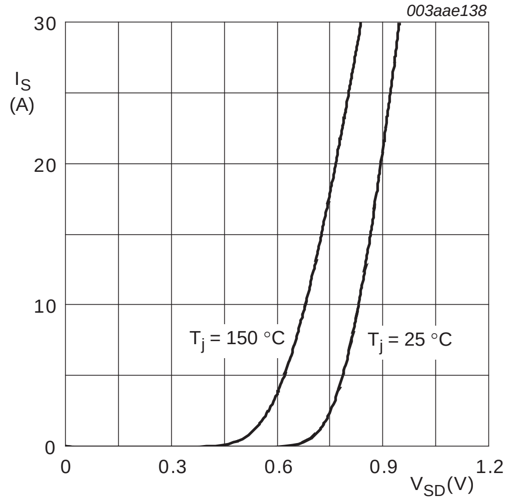


Fig 14. Gate charge waveform definitions



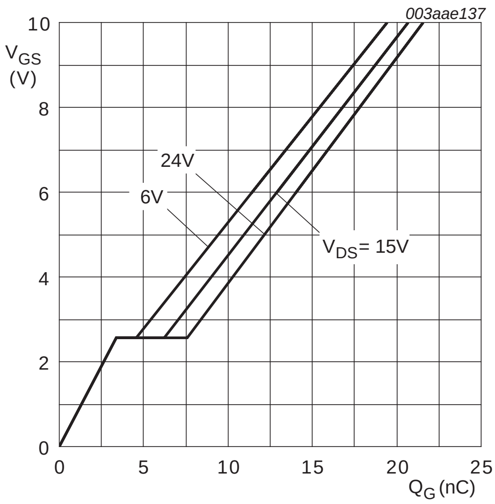
V_{GS} = 0 V; f = 1 MHz

Fig 15. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values



V_{GS} = 0V

Fig 16. Source (diode forward) current as a function of source-drain (diode forward) voltage; typical values



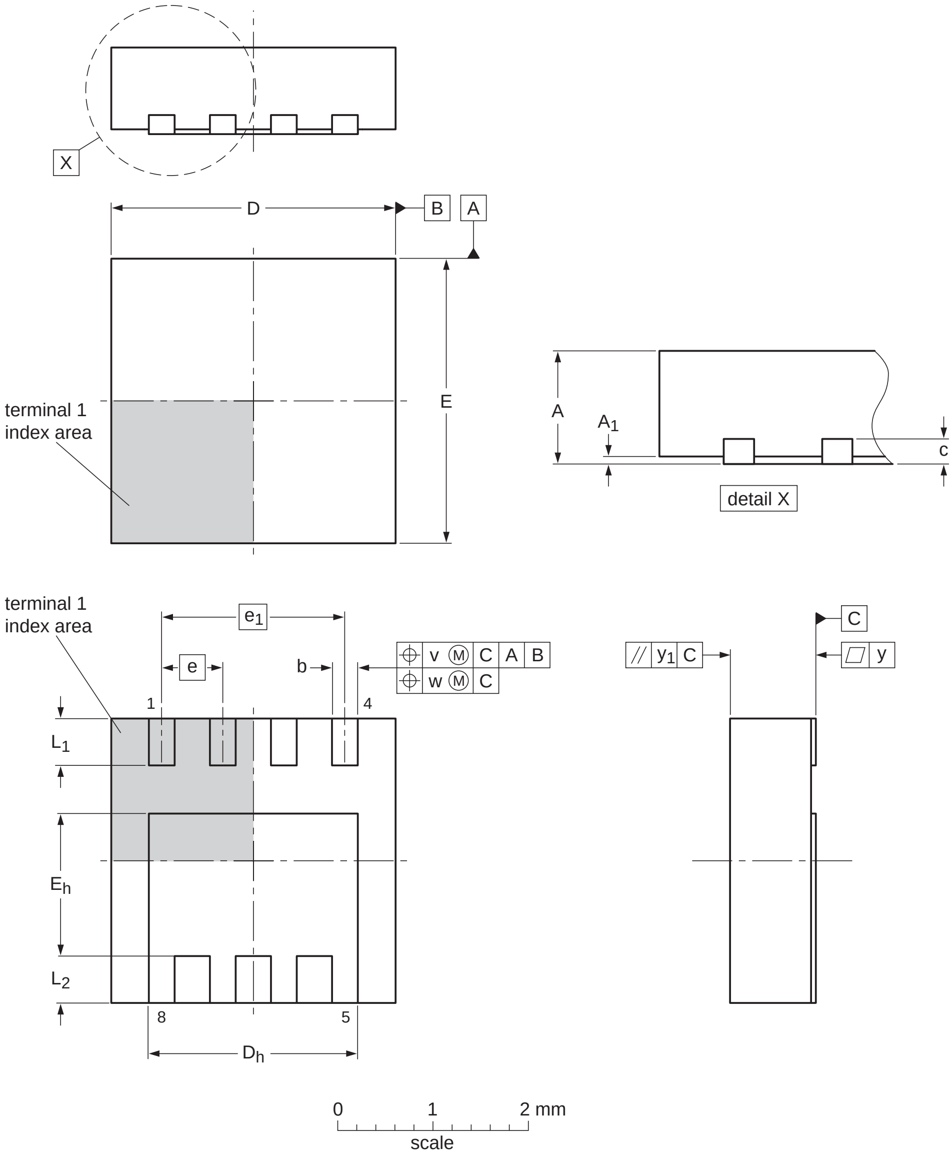
T_j = 25 °C; I_D = 10 A

Fig 17. Gate-source voltage as a function of gate charge; typical values

7. Package outline

DFN3333-8: plastic thermal enhanced very thin small outline package; no leads; 8 terminals; body 3.3 x 3.3 x 1.0 mm

SOT873-1



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	b	c	D	D_h	E	E_h	e	e_1	L_1	L_2	v	w	y	y_1
mm	1	0.05 0.00	0.45 0.25	0.2	3.4 3.2	2.4 2.2	3.4 3.2	1.80 1.58	0.65	1.95	0.55 0.45	0.52 0.35	0.1	0.05	0.1	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT873-1	- - -	- - -	- - -			~~10-04-19~~ 11-12-01

Fig 18. Package outline SOT873-1 (DFN3333-8)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PSMN9R0-30LL v.5	20111213	Product data sheet	-	PSMN9R0-30LL v.4
Modifications:	• Various changes to content.			
PSMN9R0-30LL v.4	20100707	Product data sheet	-	PSMN9R0-30LL v.3

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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