

PSMN7R0-40LS

N-channel DFN3333-8 40 V 7.0 mΩ standard level MOSFET

Rev. 3 — 13 December 2011

Product data sheet

1. Product profile

1.1 General description

Standard 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
- Suitable for standard level gate drive sources
- Small footprint for compact designs

1.3 Applications

- DC-to-DC converters
- Load switching
- Lithium-ion battery protection
- Power ORing

1.4 Quick reference data

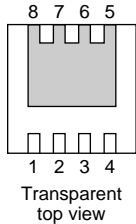
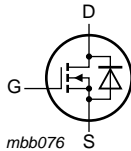
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25\text{ °C}$; $T_j \leq 150\text{ °C}$	-	-	40	V
I_D	drain current	$T_{mb} = 25\text{ °C}$; $V_{GS} = 10\text{ V}$; see Figure 1	-	-	40	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}$; see Figure 2	-	-	65	W
T_j	junction temperature		-55	-	150	°C
Static characteristics						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}$; $I_D = 10\text{ A}$; $T_j = 100\text{ °C}$; see Figure 12	-	-	10	mΩ
		$V_{GS} = 10\text{ V}$; $I_D = 10\text{ A}$; $T_j = 25\text{ °C}$; see Figure 13	-	5.6	7	mΩ
Dynamic characteristics						
Q_{GD}	gate-drain charge	$V_{GS} = 10\text{ V}$; $I_D = 30\text{ A}$; $V_{DS} = 20\text{ V}$; see Figure 14 ; see Figure 15	-	4.6	-	nC
$Q_{G(tot)}$	total gate charge		-	21.4	-	nC
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10\text{ V}$; $T_{j(init)} = 25\text{ °C}$; $I_D = 40\text{ A}$; $V_{sup} \leq 40\text{ V}$; unclamped; $R_{GS} = 50\text{ Ω}$	-	-	64	mJ



2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	S	source	 <p>SOT873-1 (DFN3333-8)</p>	 <p>mbb076</p>
2	S	source		
3	S	source		
4	G	gate		
5,6,7,8	D	drain		
mb	D	mounting base; connected to drain		

3. Ordering information

Table 3. Ordering information

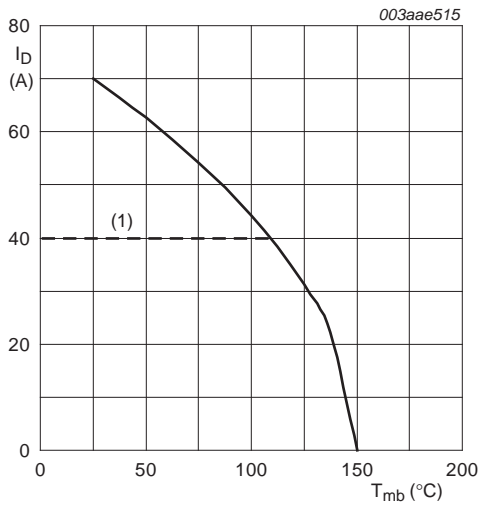
Type number	Package		Version
	Name	Description	
PSMN7R0-40LS	DFN3333-8	plastic thermal enhanced very thin small outline package; no leads; 8 terminals	SOT873-1

4. Limiting values

Table 4. Limiting values

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

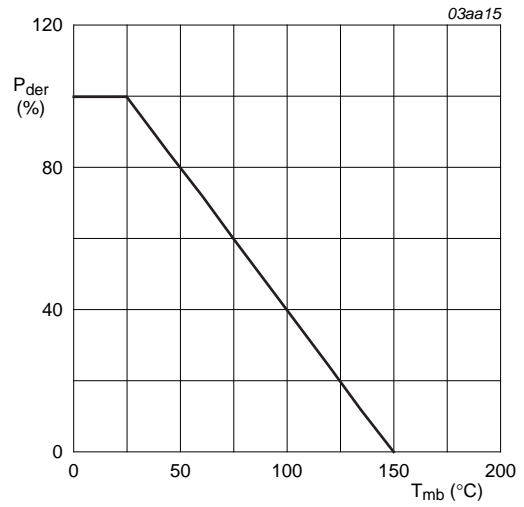
Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25\text{ °C}; T_j \leq 150\text{ °C}$	-	40	V
V_{DGR}	drain-gate voltage	$T_j \geq 25\text{ °C}; T_j \leq 150\text{ °C}; R_{GS} = 20\text{ k}\Omega$	-	40	V
V_{GS}	gate-source voltage		-20	20	V
I_D	drain current	$V_{GS} = 10\text{ V}; T_{mb} = 100\text{ °C}$; see Figure 1	-	40	A
		$V_{GS} = 10\text{ V}; T_{mb} = 25\text{ °C}$; see Figure 1	-	40	A
I_{DM}	peak drain current	pulsed; $t_p \leq 10\text{ }\mu\text{s}$; $T_{mb} = 25\text{ °C}$; see Figure 3	-	280	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}$; see Figure 2	-	65	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	$T_{mb} = 25\text{ °C}$	-	40	A
I_{SM}	peak source current	pulsed; $t_p \leq 10\text{ }\mu\text{s}$; $T_{mb} = 25\text{ °C}$	-	280	A
Avalanche ruggedness					
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10\text{ V}; T_{j(init)} = 25\text{ °C}; I_D = 40\text{ A}; V_{sup} \leq 40\text{ V}$; unclamped; $R_{GS} = 50\text{ }\Omega$	-	64	mJ



$V_{GS} \geq 10\text{ V}$

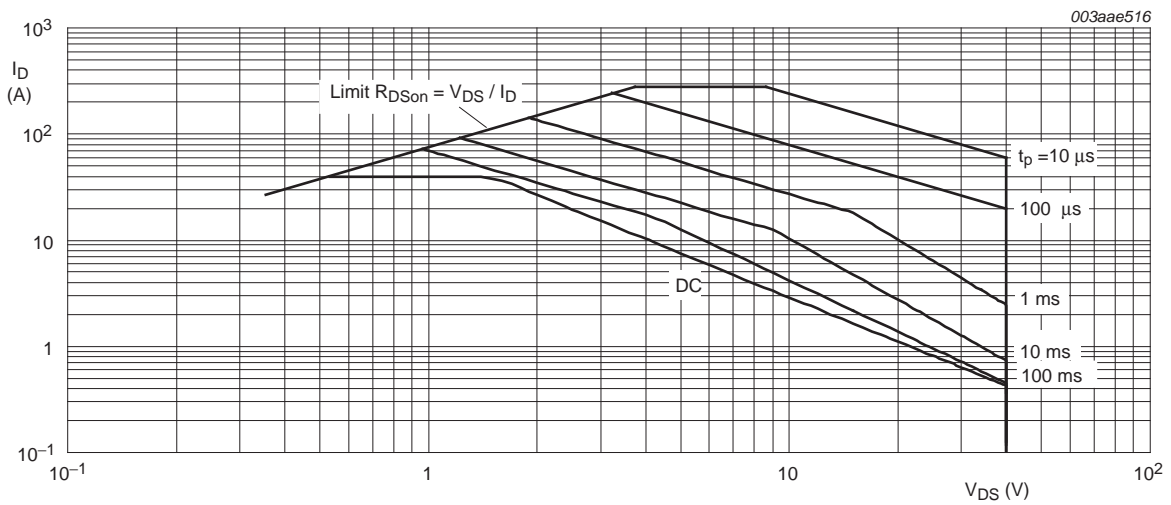
(1) Capped at 40 A due to package.

Fig 1. 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



$T_{mb} = 25^\circ\text{C}; t_p = 300\text{ us}$

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	1.3	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	[1]	-	53	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

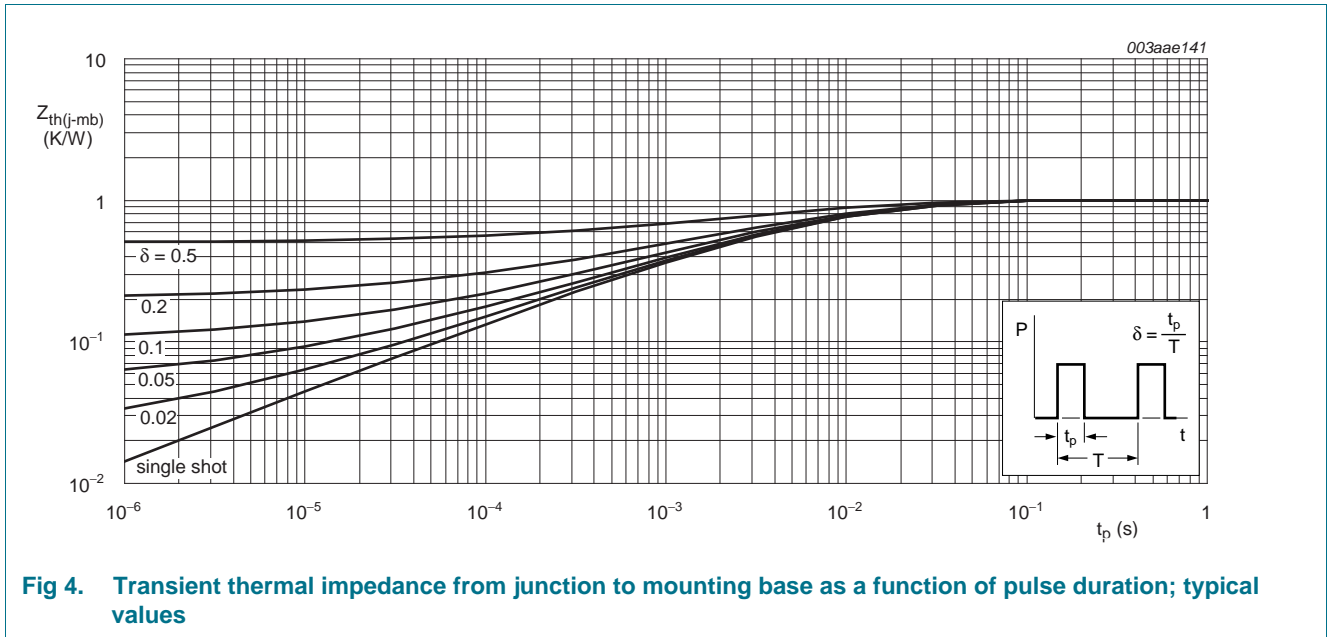
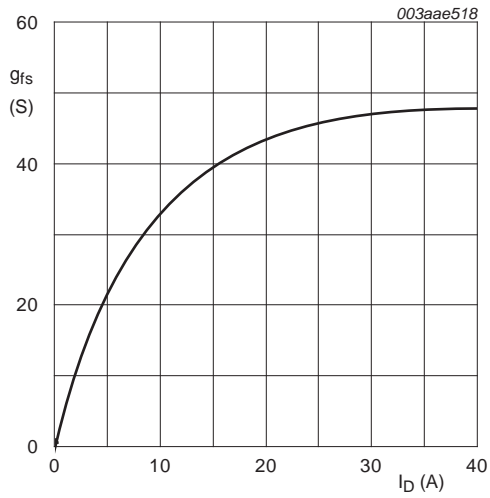


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration; typical values

6. Characteristics

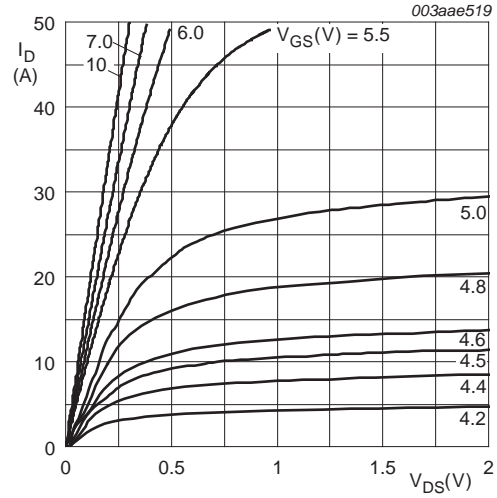
Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu\text{A}; V_{GS} = 0 \text{ V}; T_j = -55 \text{ }^\circ\text{C}$	36	-	-	V
		$I_D = 250 \mu\text{A}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	40	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = -55 \text{ }^\circ\text{C};$ see Figure 10	-	-	4.7	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 150 \text{ }^\circ\text{C};$ see Figure 10	1	-	-	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ\text{C};$ see Figure 10 ; see Figure 11	2.3	3	4	V
I_{DSS}	drain leakage current	$V_{DS} = 40 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	0.1	2	μA
		$V_{DS} = 40 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 125 \text{ }^\circ\text{C}$	-	-	50	μA
I_{GSS}	gate leakage current	$V_{GS} = 20 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	10	100	nA
		$V_{GS} = -20 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	10	100	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 10 \text{ A}; T_j = 100 \text{ }^\circ\text{C};$ see Figure 12	-	-	10	mΩ
		$V_{GS} = 10 \text{ V}; I_D = 10 \text{ A}; T_j = 150 \text{ }^\circ\text{C};$ see Figure 12	-	9.5	11.9	mΩ
		$V_{GS} = 10 \text{ V}; I_D = 10 \text{ A}; T_j = 25 \text{ }^\circ\text{C};$ see Figure 13	-	5.6	7	mΩ
R_G	internal gate resistance (AC)	$f = 1 \text{ MHz}$	-	0.9	-	Ω
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	$I_D = 0 \text{ A}; V_{DS} = 0 \text{ V}; V_{GS} = 10 \text{ V}$	-	18.2	-	nC
		$I_D = 30 \text{ A}; V_{DS} = 20 \text{ V}; V_{GS} = 10 \text{ V};$ see Figure 14 ; see Figure 15	-	21.4	-	nC
Q_{GS}	gate-source charge		-	7.9	-	nC
$Q_{GS(th)}$	pre-threshold gate-source charge		-	3.8	-	nC
$Q_{GS(th-pl)}$	post-threshold gate-source charge		-	4	-	nC
Q_{GD}	gate-drain charge		-	4.6	-	nC
$V_{GS(pl)}$	gate-source plateau voltage	$I_D = 30 \text{ A}; V_{DS} = 20 \text{ V};$ see Figure 14 ; see Figure 15	-	5.4	-	V
C_{iss}	input capacitance	$V_{DS} = 12 \text{ V}; V_{GS} = 0 \text{ V}; f = 1 \text{ MHz};$ $T_j = 25 \text{ }^\circ\text{C};$ see Figure 16	-	1286	-	pF
C_{oss}	output capacitance		-	278	-	pF
C_{rss}	reverse transfer capacitance		-	149	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 20 \text{ V}; R_L = 0.67 \text{ }^\circ\Omega;$ $V_{GS} = 10 \text{ V}; R_{G(ext)} = 4.7 \text{ }^\circ\Omega$	-	11	-	ns
t_r	rise time		-	32	-	ns
$t_{d(off)}$	turn-off delay time		-	19	-	ns
t_f	fall time		-	5.9	-	ns
Source-drain diode						
V_{SD}	source-drain voltage	$I_S = 17 \text{ A}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C};$ see Figure 17	-	0.85	1.2	V
t_{rr}	reverse recovery time	$I_S = 30 \text{ A}; di_S/dt = -100 \text{ A}/\mu\text{s};$ $V_{GS} = 0 \text{ V}; V_{DS} = 20 \text{ V}$	-	26.2	-	ns
Q_r	recovered charge		-	18.8	-	nC



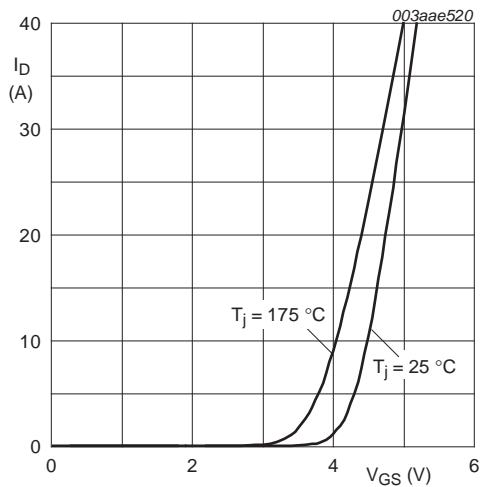
$T_j = 25^\circ\text{C}; V_{DS} = 10\text{ V}$

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



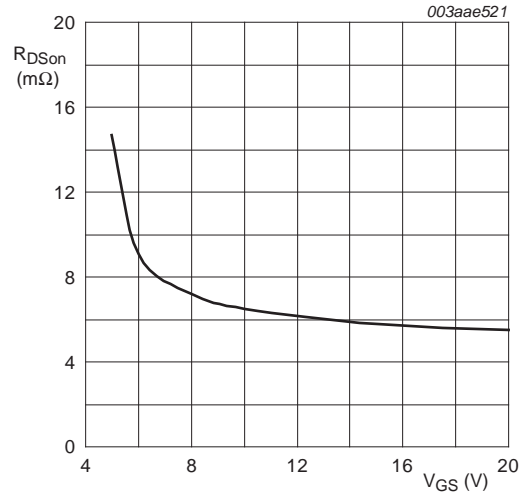
$T_j = 25^\circ\text{C}$ and $t_p = 300\text{ us}$

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



$V_{DS} = 10\text{ V}$

Fig 7. Transfer characteristics: drain current as a function of gate-source voltage; typical values



$T_j = 25^\circ\text{C}; I_D = 10\text{ A}$

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

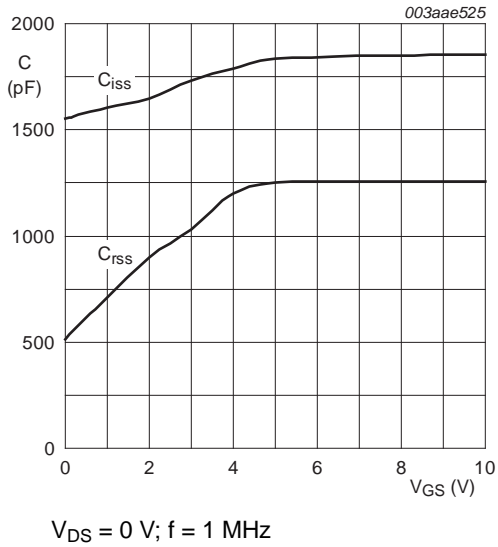


Fig 9. Input and reverse transfer capacitances as a function of gate-source voltage, typical values

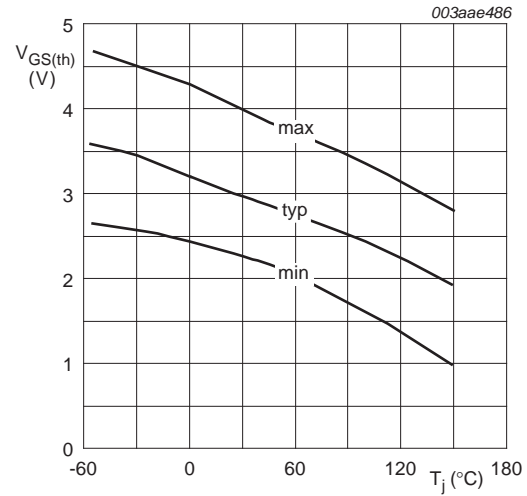


Fig 10. Gate-source threshold voltage as a function of junction temperature

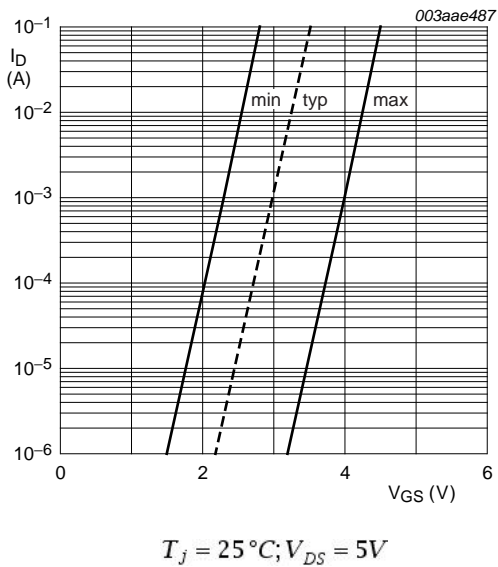


Fig 11. Sub-threshold drain current as a function of gate-source voltage

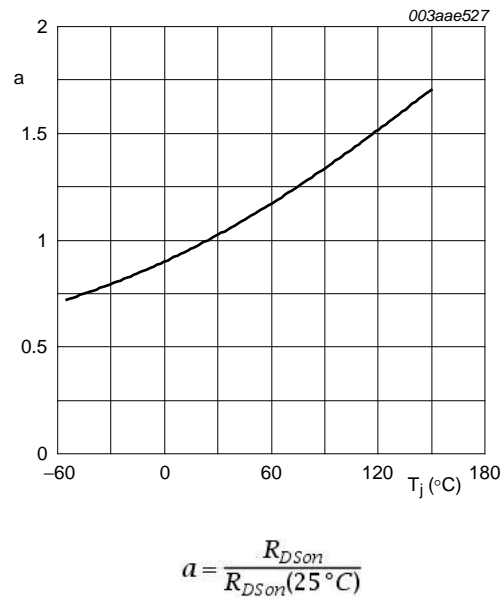


Fig 12. Normalized drain-source on-state resistance factor as a function of junction temperature

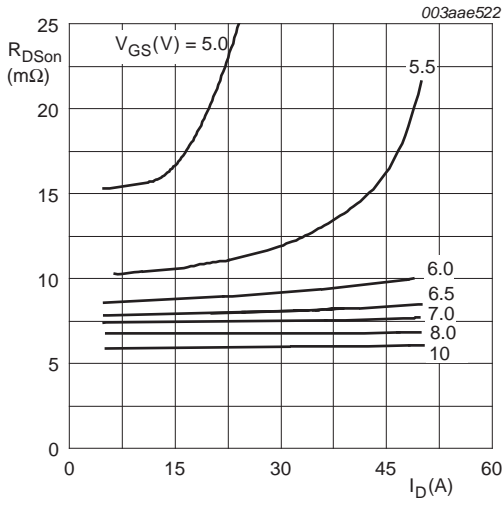


Fig 13. Drain-source on-state resistance as a function of drain current; typical values

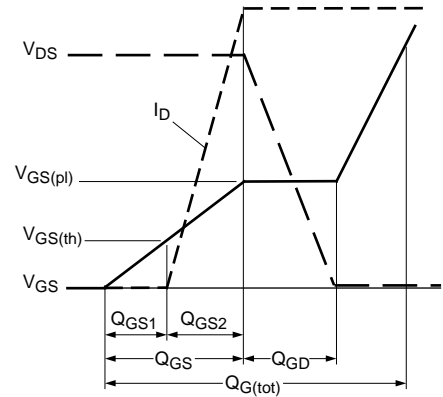


Fig 14. Gate charge waveform definitions

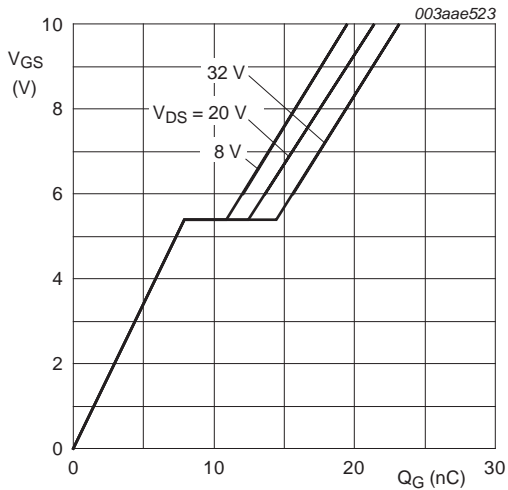


Fig 15. Gate-source voltage as a function of gate charge; typical values

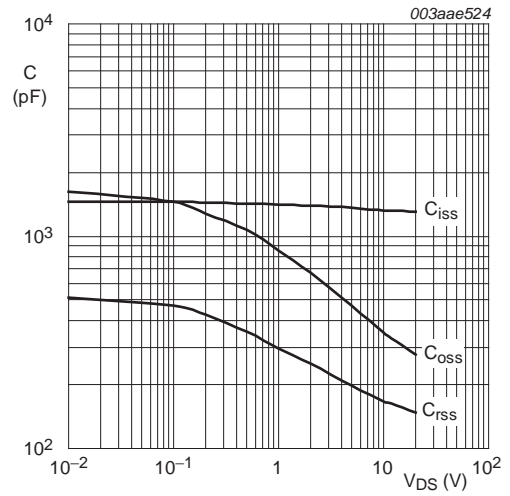
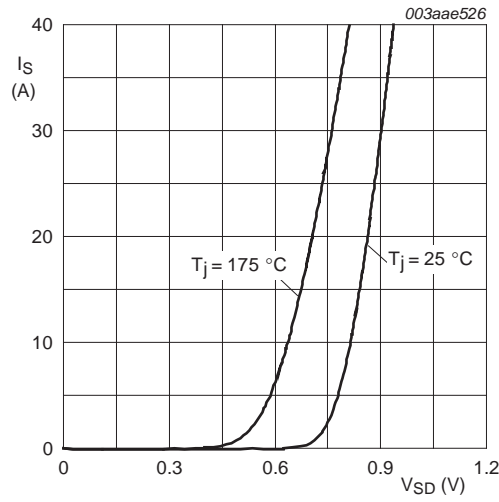


Fig 16. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values



$V_{GS} = 0\text{ V}$

Fig 17. Source (diode forward) current as a function of source-drain (diode forward) voltage; 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

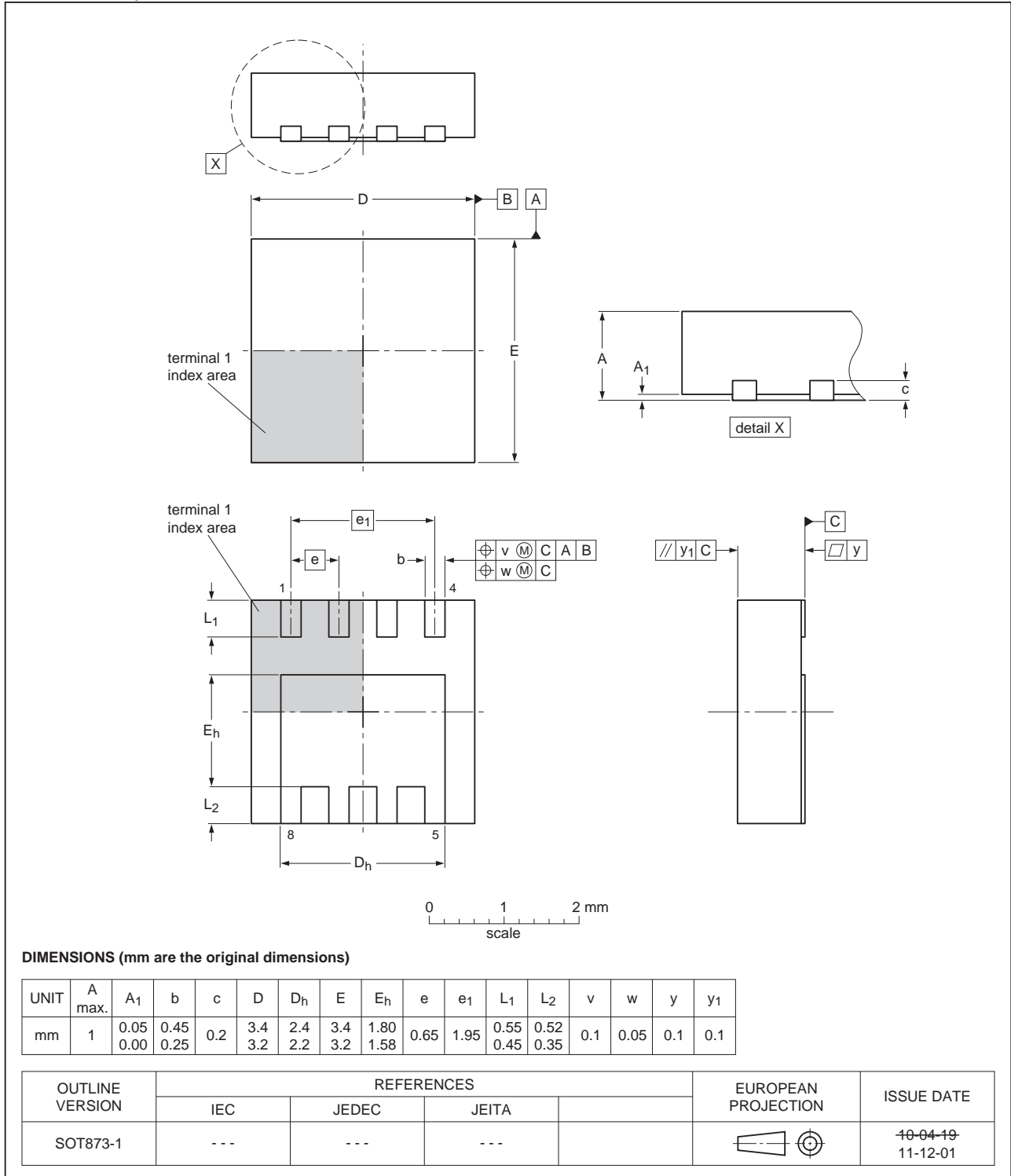


Fig 18. Package outline SOT873-1 (DFN3333-8)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PSMN7R0-40LS v.3	20111213	Product data sheet	-	PSMN7R0-40LS v.2
Modifications:	• Various changes to content.			
PSMN7R0-40LS v.2	20100818	Product data sheet	-	PSMN7R0-40LS v.1

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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