

# PSMN8R5-100ES

N-channel 100 V 8.5 mΩ standard level MOSFET in I2PAK

11 October 2012

Product data sheet

## 1. Product profile

### 1.1 General description

Standard level N-channel MOSFET in a I2PAK package qualified to 175 °C. This product is designed and qualified for use in a wide range of industrial, communications and domestic equipment.

### 1.2 Features and benefits

- High efficiency due to low switching and conduction losses
- Suitable for standard level gate drive sources

### 1.3 Applications

- AC-to-DC power supply equipment
- Motor control
- Server power supplies
- Synchronous rectification

### 1.4 Quick reference data

Table 1. Quick reference data

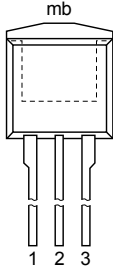
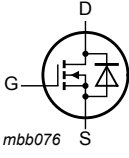
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V <sub>DS</sub>	drain-source voltage	T <sub>j</sub> ≥ 25 °C; T <sub>j</sub> ≤ 175 °C		-	-	100	V
I <sub>D</sub>	drain current	T <sub>j</sub> = 25 °C; V <sub>GS</sub> = 10 V; <a href="#">Fig. 1</a>	[1]	-	-	100	A
P <sub>tot</sub>	total power dissipation	T <sub>mb</sub> = 25 °C; <a href="#">Fig. 2</a>		-	-	263	W
<b>Static characteristics</b>							
R <sub>DSon</sub>	drain-source on-state resistance	V <sub>GS</sub> = 10 V; I <sub>D</sub> = 25 A; T <sub>j</sub> = 25 °C; <a href="#">Fig. 13</a> ; <a href="#">Fig. 12</a>		-	6.4	8.5	mΩ
<b>Dynamic characteristics</b>							
Q <sub>GD</sub>	gate-drain charge	V <sub>GS</sub> = 10 V; I <sub>D</sub> = 25 A; V <sub>DS</sub> = 50 V; <a href="#">Fig. 14</a> ; <a href="#">Fig. 15</a>		-	33	-	nC
Q <sub>G(tot)</sub>	total gate charge			-	111	-	nC
<b>Avalanche Ruggedness</b>							
E <sub>DS(AL)S</sub>	non-repetitive drain-source avalanche energy	V <sub>GS</sub> = 10 V; T <sub>j(init)</sub> = 25 °C; I <sub>D</sub> = 100 A; V <sub>sup</sub> ≤ 100 V; R <sub>GS</sub> = 50 Ω; unclamped; <a href="#">Fig. 3</a>		-	-	219	mJ

[1] Continuous current limited by package.



## 2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 <p>I2PAK (SOT226)</p>	 <p>mbb076</p>
2	D	drain		
3	S	source		
mb	D	mounting base; connected to drain		

## 3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PSMN8R5-100ES	I2PAK	plastic single-ended package (I2PAK); TO-262	SOT226

## 4. Marking

Table 4. Marking codes

Type number	Marking code
PSMN8R5-100ES	PSMN8R5-100ES

## 5. Limiting values

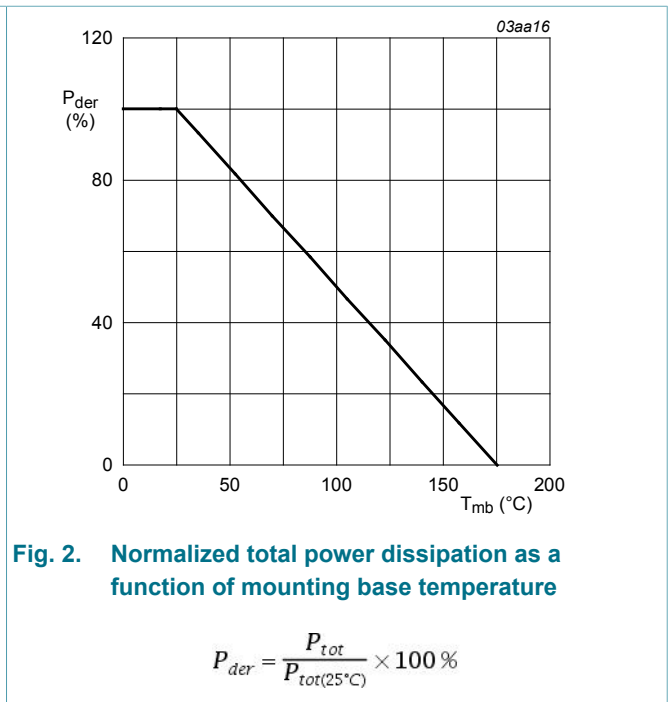
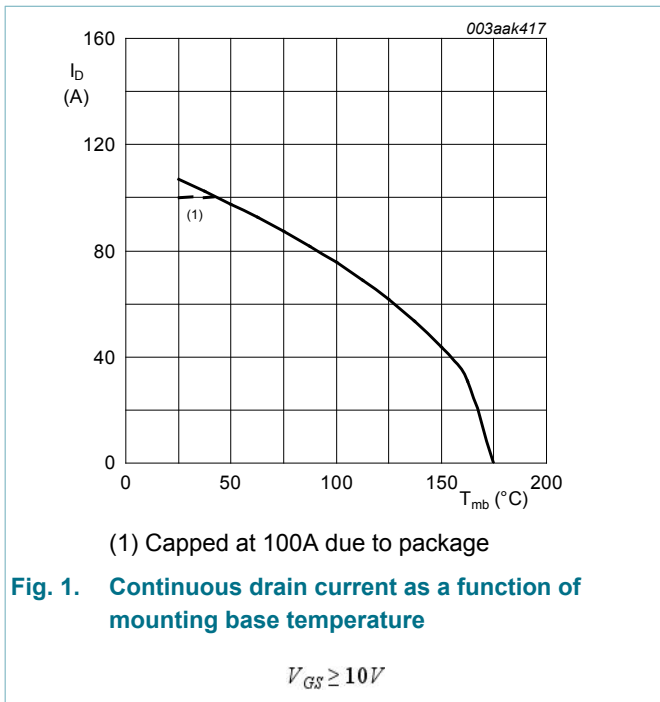
Table 5. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{DS}$	drain-source voltage	$T_j \geq 25\text{ °C}$ ; $T_j \leq 175\text{ °C}$	-	100	V
$V_{DGR}$	drain-gate voltage	$T_j \geq 25\text{ °C}$ ; $T_j \leq 175\text{ °C}$ ; $R_{GS} = 20\text{ k}\Omega$	-	100	V
$V_{GS}$	gate-source voltage		-20	20	V
$I_D$	drain current	$V_{GS} = 10\text{ V}$ ; $T_j = 25\text{ °C}$ ; Fig. 1	[1]	100	A
		$V_{GS} = 10\text{ V}$ ; $T_{mb} = 100\text{ °C}$ ; Fig. 1		75	A
$I_{DM}$	peak drain current	pulsed; $t_p \leq 10\text{ }\mu\text{s}$ ; $T_{mb} = 25\text{ °C}$ ; Fig. 4	-	429	A
$P_{tot}$	total power dissipation	$T_{mb} = 25\text{ °C}$ ; Fig. 2	-	263	W
$T_{stg}$	storage temperature		-55	175	°C

Symbol	Parameter	Conditions		Min	Max	Unit
$T_j$	junction temperature			-55	175	°C
$T_{sld(M)}$	peak soldering temperature			-	260	°C
<b>Source-drain diode</b>						
$I_S$	source current	$T_{mb} = 25\text{ °C}$	[1]	-	100	A
$I_{SM}$	peak source current	pulsed; $t_p \leq 10\ \mu\text{s}$ ; $T_{mb} = 25\text{ °C}$		-	429	A
<b>Avalanche Ruggedness</b>						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10\text{ V}$ ; $T_{j(\text{init})} = 25\text{ °C}$ ; $I_D = 100\text{ A}$ ; $V_{sup} \leq 100\text{ V}$ ; $R_{GS} = 50\ \Omega$ ; unclamped; <a href="#">Fig. 3</a>		-	219	mJ

[1] Continuous current limited by package.



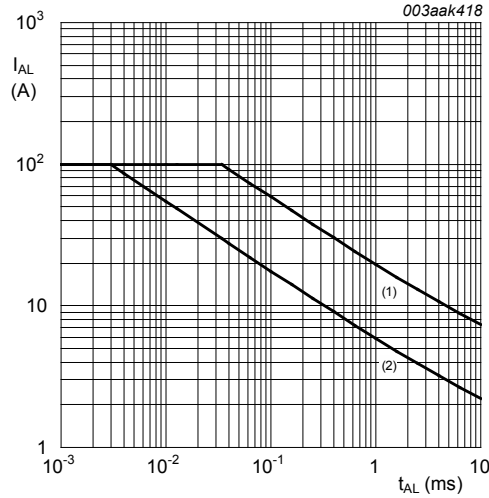


Fig. 3. Avalanche rating; avalanche current as a function of avalanche time

(1)  $T_{j (int)} = 25^{\circ}C$ ; (2)  $T_{j (int)} = 130^{\circ}C$

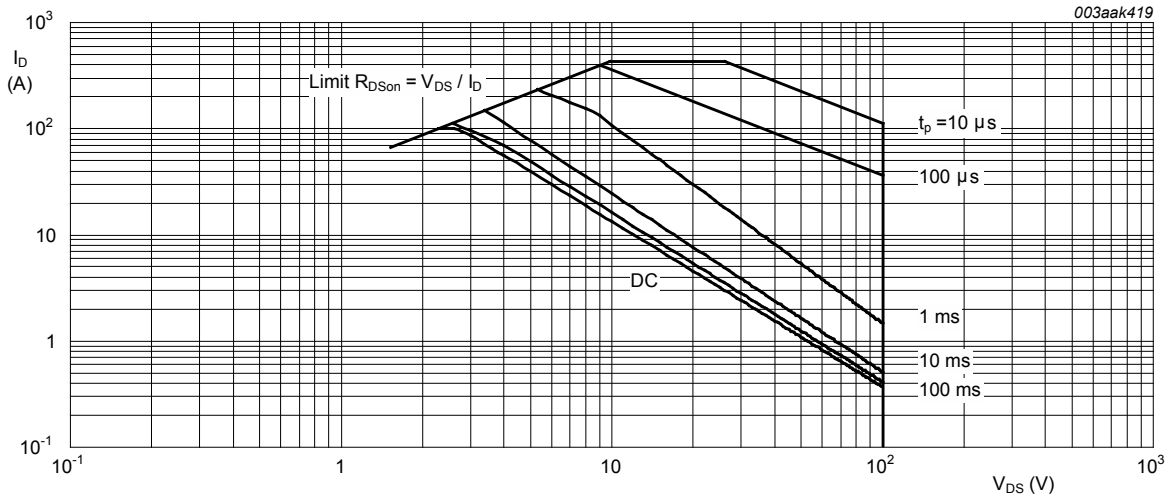


Fig. 4. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

$T_{mb} = 25^{\circ}C$ ;  $I_{DM}$  is a single pulse

## 6. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	Fig. 5	-	0.49	0.57	K/W

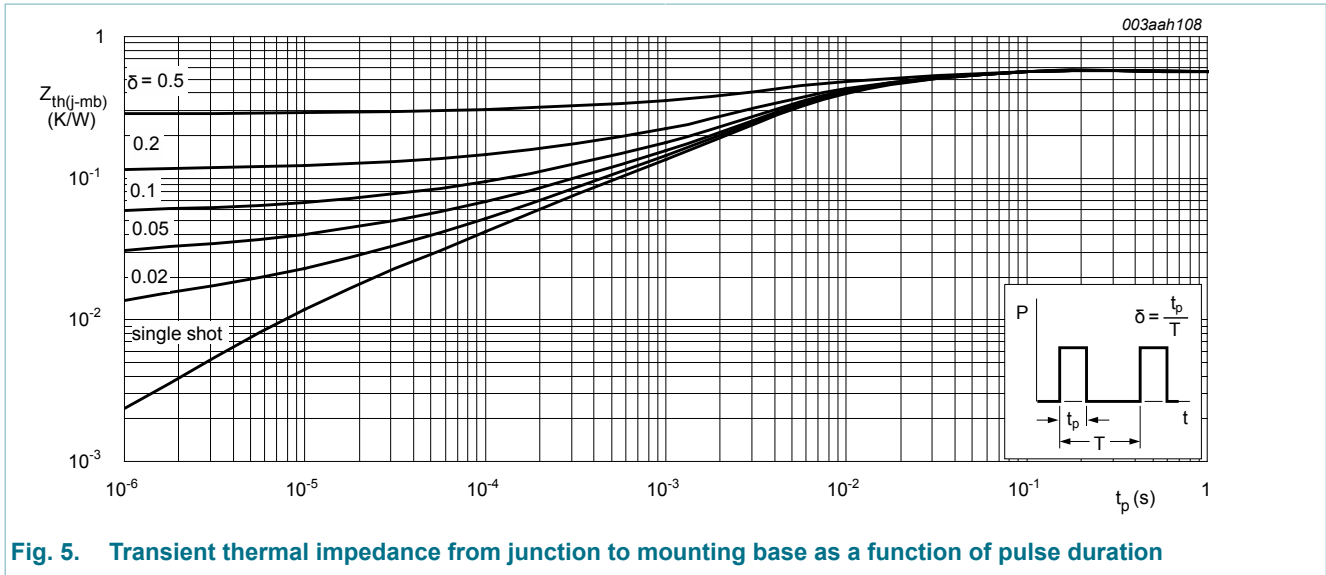


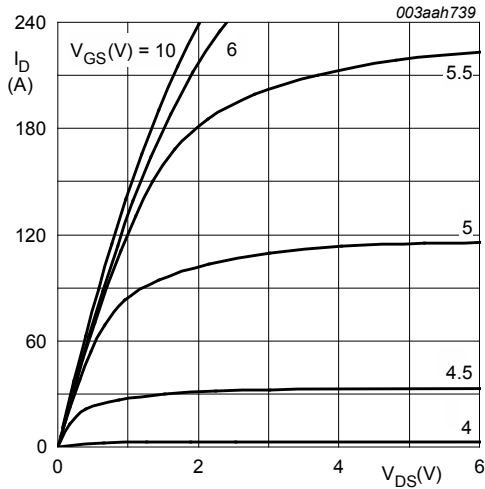
Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

## 7. Characteristics

Table 7. Characteristics

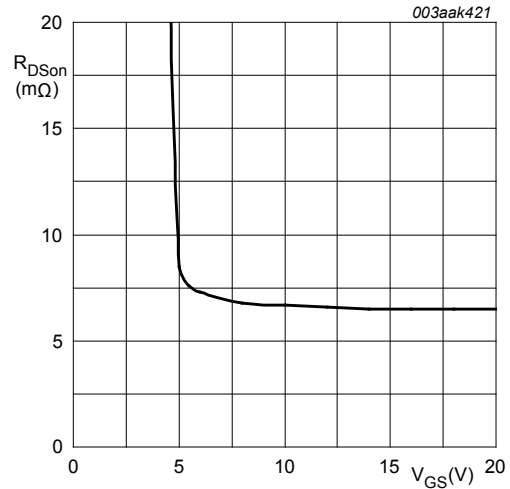
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	100	-	-	V
		$I_D = 250 \mu A; V_{GS} = 0 V; T_j = -55 \text{ }^\circ C$	90	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ C;$ <a href="#">Fig. 10</a> ; <a href="#">Fig. 11</a>	2.4	3	4	V
$V_{GSth}$	gate-source threshold voltage	$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 175 \text{ }^\circ C;$ <a href="#">Fig. 10</a>	1	-	-	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = -55 \text{ }^\circ C;$ <a href="#">Fig. 10</a>	-	-	4.5	V
$I_{DSS}$	drain leakage current	$V_{DS} = 100 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$	-	0.02	1	$\mu A$
		$V_{DS} = 100 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 100 \text{ }^\circ C$	-	-	20	$\mu A$
$I_{GSS}$	gate leakage current	$V_{GS} = -20 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$	-	2	100	nA
		$V_{GS} = 20 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$	-	2	100	nA
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 175 \text{ }^\circ C;$ <a href="#">Fig. 12</a>	-	-	22.6	mΩ
		$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 100 \text{ }^\circ C;$ <a href="#">Fig. 12</a>	-	-	14.9	mΩ
		$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 25 \text{ }^\circ C;$ <a href="#">Fig. 13</a> ; <a href="#">Fig. 12</a>	-	6.4	8.5	mΩ
$R_G$	gate resistance	$f = 1 \text{ MHz}$	-	0.71	-	Ω

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Dynamic characteristics</b>						
$Q_{G(\text{tot})}$	total gate charge	$I_D = 25 \text{ A}$ ; $V_{DS} = 50 \text{ V}$ ; $V_{GS} = 10 \text{ V}$ ; <a href="#">Fig. 14</a> ; <a href="#">Fig. 15</a>	-	111	-	nC
$Q_{GS}$	gate-source charge		-	24	-	nC
$Q_{GS(\text{th})}$	pre-threshold gate-source charge		-	16	-	nC
$Q_{GS(\text{th-pl})}$	post-threshold gate-source charge		-	8	-	nC
$Q_{GD}$	gate-drain charge		-	33	-	nC
$V_{GS(\text{pl})}$	gate-source plateau voltage	$I_D = 15 \text{ A}$ ; $V_{DS} = 50 \text{ V}$ ; <a href="#">Fig. 14</a> ; <a href="#">Fig. 15</a>	-	4.4	-	V
$C_{iss}$	input capacitance	$V_{DS} = 50 \text{ V}$ ; $V_{GS} = 0 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $T_j = 25 \text{ °C}$ ; <a href="#">Fig. 16</a> ; <a href="#">Fig. 17</a>	-	5512	-	pF
$C_{oss}$	output capacitance	$V_{DS} = 50 \text{ V}$ ; $V_{GS} = 0 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $T_j = 25 \text{ °C}$ ; <a href="#">Fig. 16</a>	-	380	-	pF
$C_{rss}$	reverse transfer capacitance	$V_{DS} = 50 \text{ V}$ ; $V_{GS} = 0 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $T_j = 25 \text{ °C}$ ; <a href="#">Fig. 16</a> ; <a href="#">Fig. 17</a>	-	256	-	pF
$t_{d(\text{on})}$	turn-on delay time	$V_{DS} = 50 \text{ V}$ ; $R_L = 2 \text{ } \Omega$ ; $V_{GS} = 10 \text{ V}$ ; $R_{G(\text{ext})} = 5 \text{ } \Omega$	-	20	-	ns
$t_r$	rise time		-	35	-	ns
$t_{d(\text{off})}$	turn-off delay time		-	87	-	ns
$t_f$	fall time		-	43	-	ns
<b>Source-drain diode</b>						
$V_{SD}$	source-drain voltage	$I_S = 25 \text{ A}$ ; $V_{GS} = 0 \text{ V}$ ; $T_j = 25 \text{ °C}$ ; <a href="#">Fig. 18</a>	-	0.82	1.2	V
$t_{rr}$	reverse recovery time	$I_S = 25 \text{ A}$ ; $di_S/dt = -100 \text{ A}/\mu\text{s}$ ; $V_{GS} = 0 \text{ V}$ ;	-	53	-	ns
$Q_r$	recovered charge	$V_{DS} = 50 \text{ V}$	-	124	-	nC



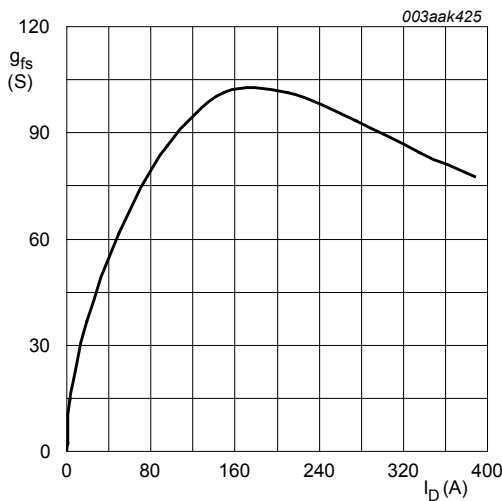
$T_j = 25\text{ }^\circ\text{C}; t_p = 300\text{ }\mu\text{s}$

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



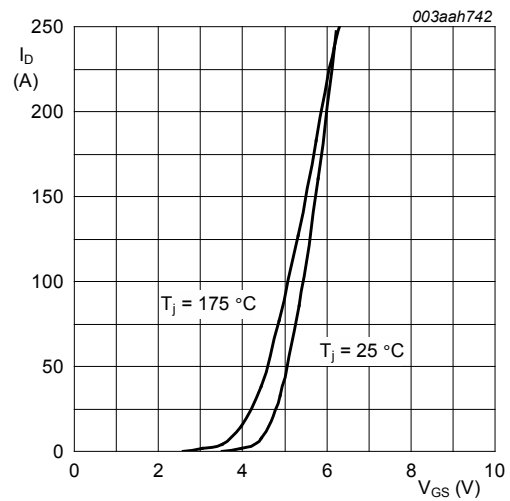
**Fig. 7. Drain-source on-state resistance as a function of gate-source voltage; typical values**

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



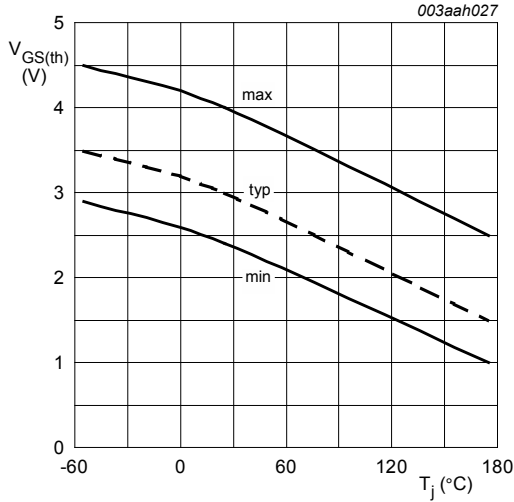
**Fig. 8. Forward transconductance as a function of drain current; typical values**

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



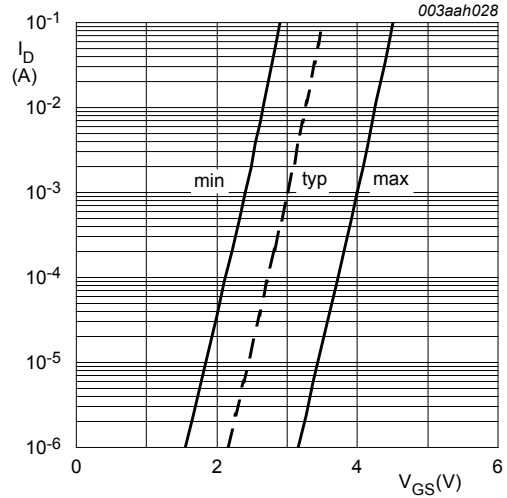
**Fig. 9. Transfer characteristics; drain current as a function of gate-source voltage; typical values**

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



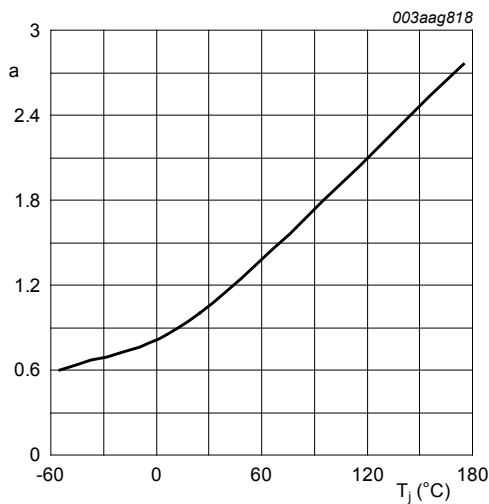
**Fig. 10. Gate-source threshold voltage as a function of junction temperature**

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



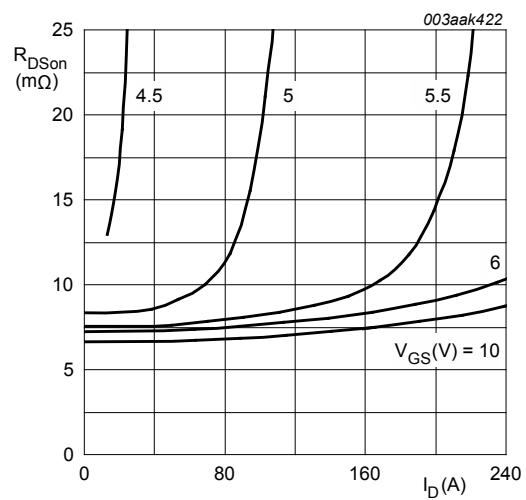
**Fig. 11. Sub-threshold drain current as a function of gate-source voltage**

$$T_j = 25^\circ\text{C}; V_{DS} = 5\text{V}$$



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

$$a = \frac{R_{DSon}}{R_{DSon(25^\circ\text{C})}}$$



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

$$T_j = 25^\circ\text{C}$$



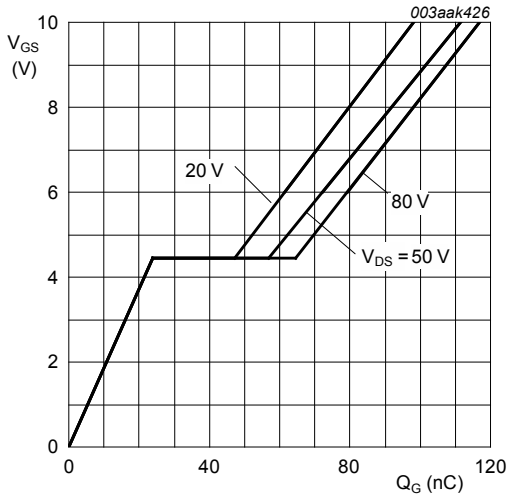


Fig. 14. Gate-source voltage as a function of gate charge; typical values

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

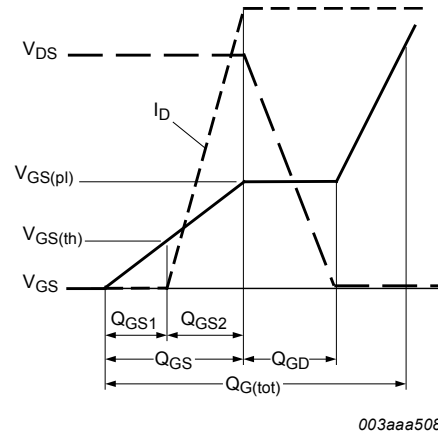


Fig. 15. Gate charge waveform definitions

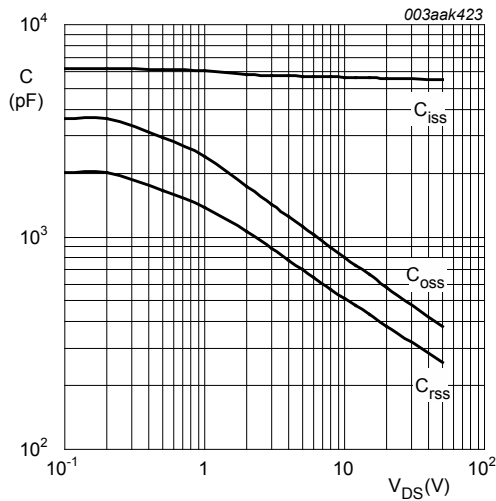


Fig. 16. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

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

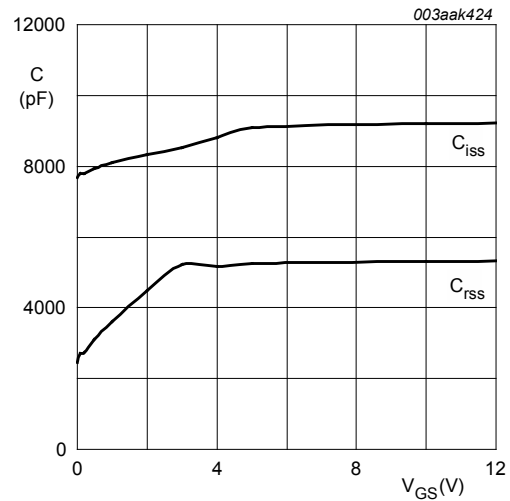


Fig. 17. Input and reverse transfer capacitances as a function of gate-source voltage, typical values

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

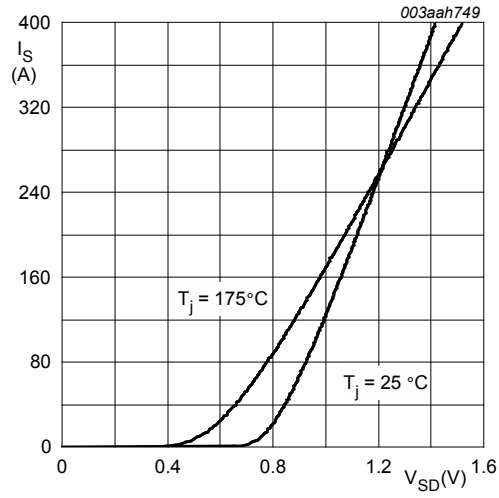


Fig. 18. Source (diode forward) current as a function of source-drain (diode forward) voltage; typical values

$$V_{GS} = 0V$$

### 8. Package outline

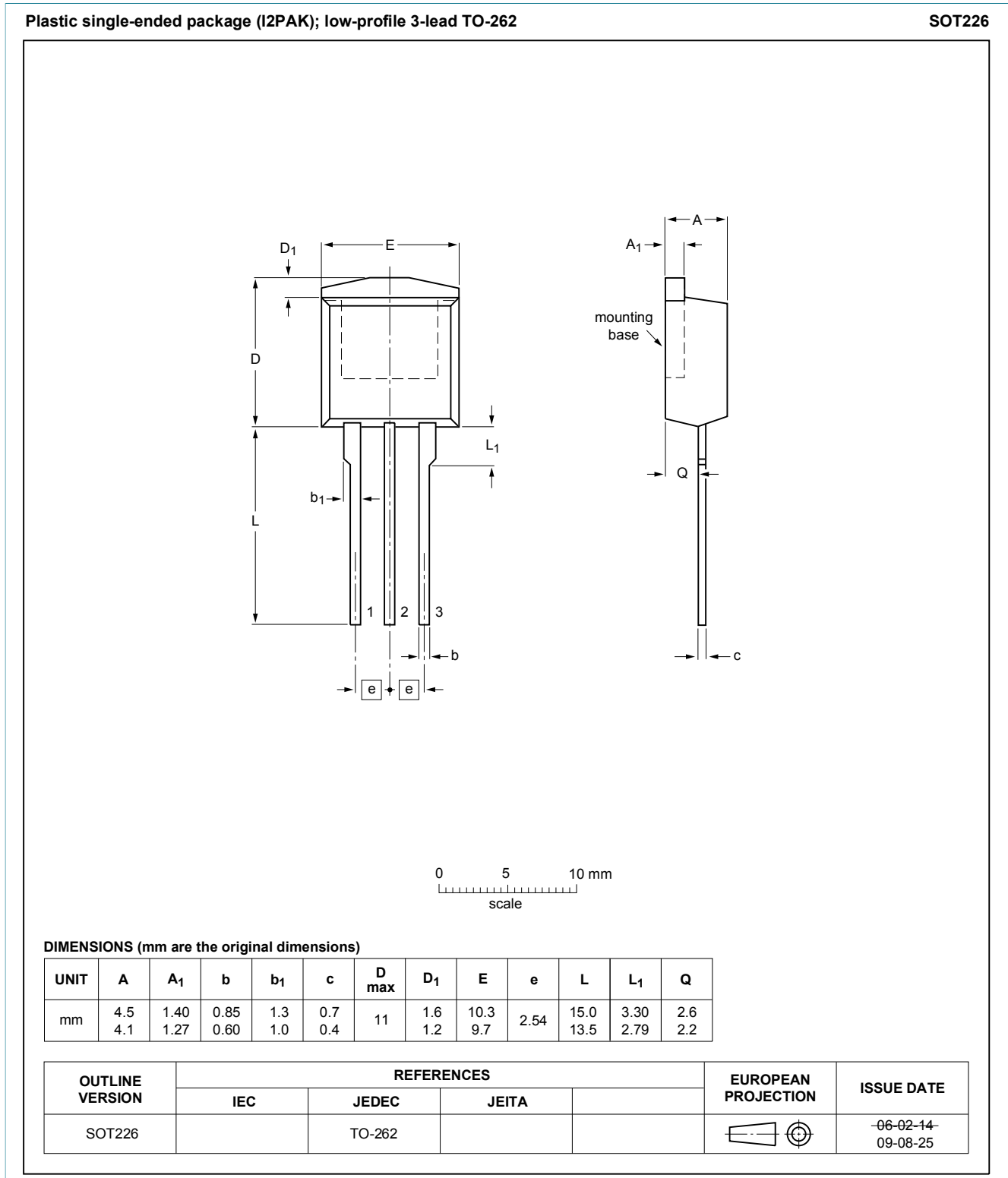


Fig. 19. Package outline I2PAK (SOT226)

## 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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