



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_{DS}	drain-source voltage	$T_j \geq 25 \text{ }^\circ\text{C}; T_j \leq 175 \text{ }^\circ\text{C}$		-	-	100	V
I_D	drain current	$T_j = 25 \text{ }^\circ\text{C}; V_{GS} = 10 \text{ V}$; Fig. 1	[1]	-	-	100	A
P_{tot}	total power dissipation	$T_{mb} = 25 \text{ }^\circ\text{C}$; Fig. 2		-	-	263	W
Static characteristics							
R_{DSon}	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$; Fig. 13 ; Fig. 12		-	6.4	8.5	mΩ
Dynamic characteristics							
Q_{GD}	gate-drain charge	$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; V_{DS} = 50 \text{ V}$; Fig. 14 ; Fig. 15		-	33	-	nC
$Q_{G(tot)}$	total gate charge			-	111	-	nC
Avalanche Ruggedness							
$E_{DS(AL)s}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10 \text{ V}; T_{j(init)} = 25 \text{ }^\circ\text{C}; I_D = 100 \text{ A}; V_{sup} \leq 100 \text{ V}; R_{GS} = 50 \Omega$; unclamped; Fig. 3		-	-	219	mJ

[1] Continous current limited by package.

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2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 I2PAK (SOT226)	
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

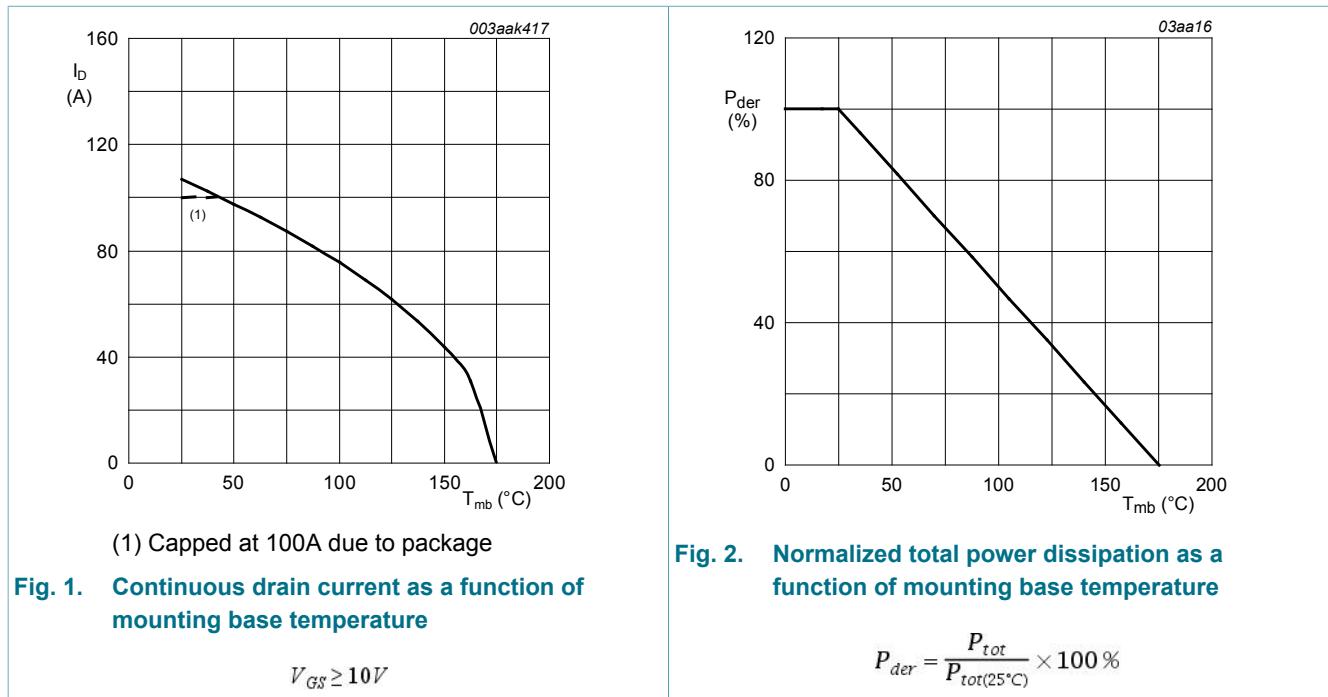
Table 5. Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25^\circ\text{C}$; $T_j \leq 175^\circ\text{C}$		-	100	V
V_{DGR}	drain-gate voltage	$T_j \geq 25^\circ\text{C}$; $T_j \leq 175^\circ\text{C}$; $R_{GS} = 20\text{ k}\Omega$		-	100	V
V_{GS}	gate-source voltage			-20	20	V
I_D	drain current	$V_{GS} = 10\text{ V}$; $T_j = 25^\circ\text{C}$; Fig. 1	[1]	-	100	A
		$V_{GS} = 10\text{ V}$; $T_{mb} = 100^\circ\text{C}$; Fig. 1		-	75	A
I_{DM}	peak drain current	pulsed; $t_p \leq 10\text{ }\mu\text{s}$; $T_{mb} = 25^\circ\text{C}$; Fig. 4		-	429	A
P_{tot}	total power dissipation	$T_{mb} = 25^\circ\text{C}$; 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
Source-drain diode					
I _S	source current	T _{mb} = 25 °C	[1]	-	100 A
I _{SM}	peak source current	pulsed; t _p ≤ 10 µs; T _{mb} = 25 °C	-	429	A
Avalanche Ruggedness					
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	V _{GS} = 10 V; T _{j(init)} = 25 °C; I _D = 100 A; V _{sup} ≤ 100 V; R _{GS} = 50 Ω; unclamped; Fig. 3	-	219	mJ

[1] Continous current limited by package.



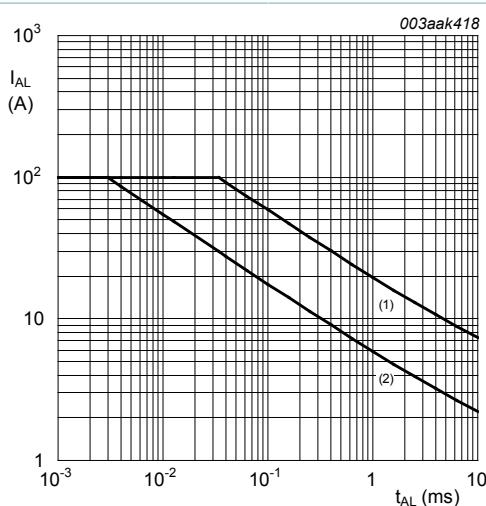


Fig. 3. Avalanche rating; avalanche current as a function of avalanche time

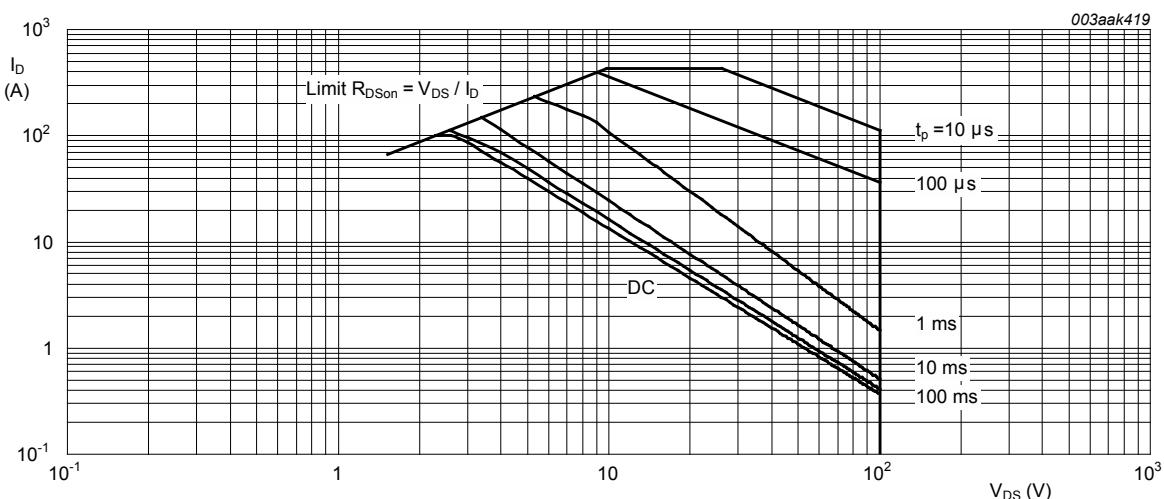
(1) $T_j \text{ (init)} = 25^\circ\text{C}$; (2) $T_j \text{ (init)} = 130^\circ\text{C}$ 

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

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

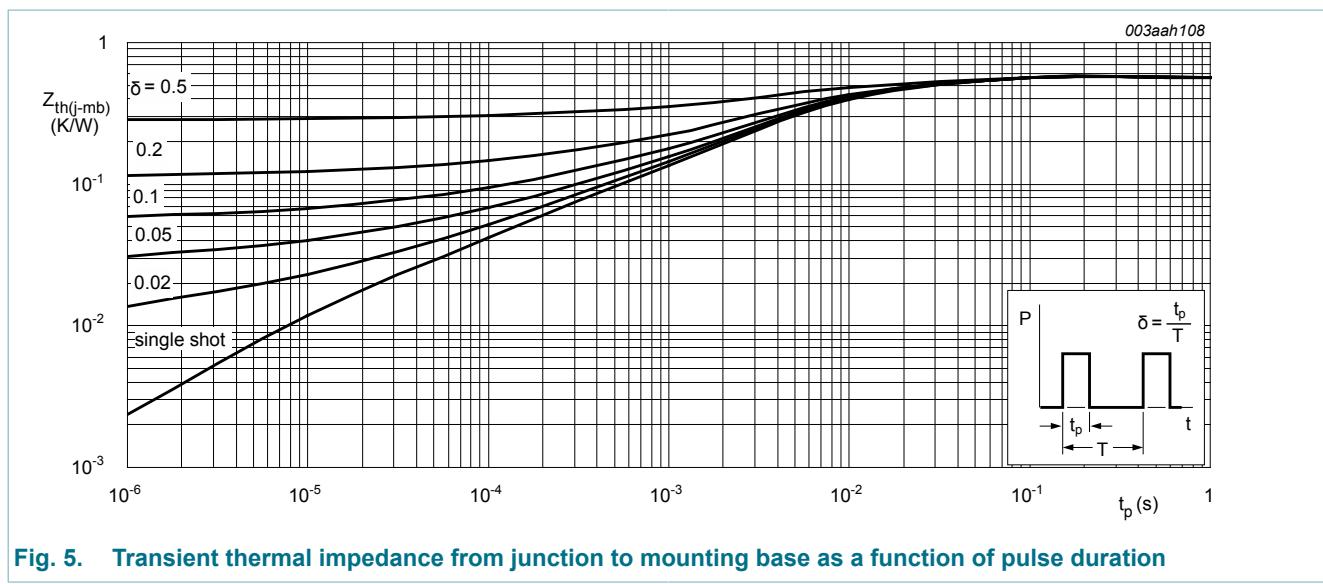


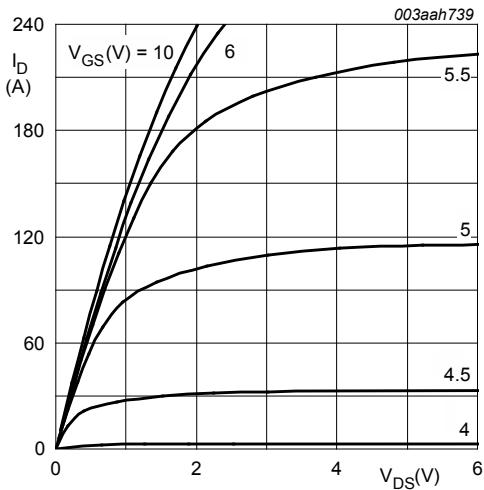
Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

7. Characteristics

Table 7. Characteristics

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

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



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

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

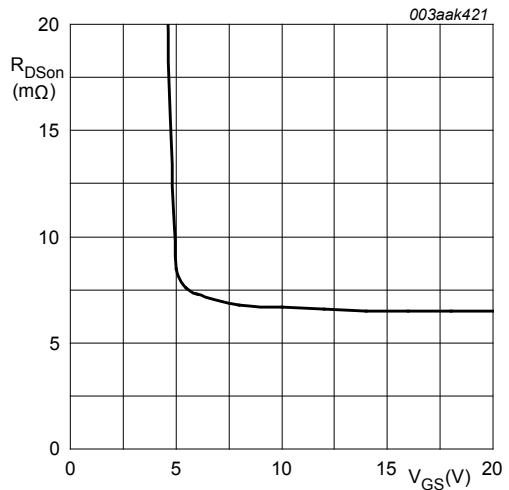


Fig. 7. Drain-source on-state resistance as a function of gate-source voltage; typical values

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

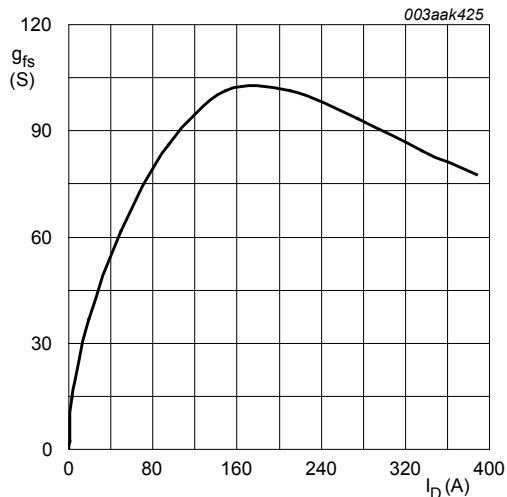


Fig. 8. Forward transconductance as a function of drain current; typical values

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

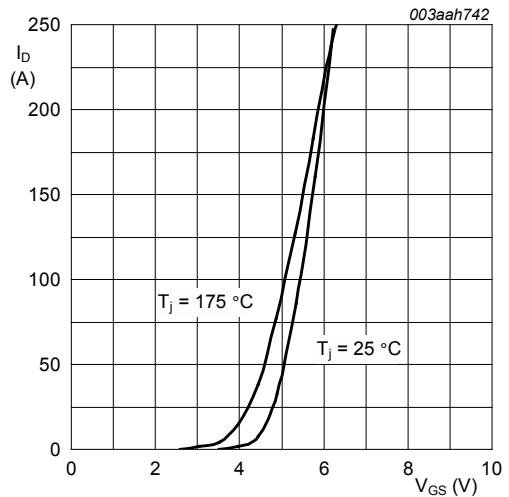


Fig. 9. Transfer characteristics; drain current as a function of gate-source voltage; typical values

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

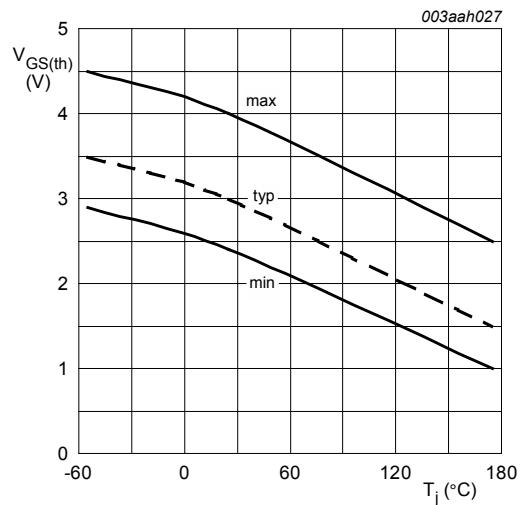


Fig. 10. Gate-source threshold voltage as a function of junction temperature

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

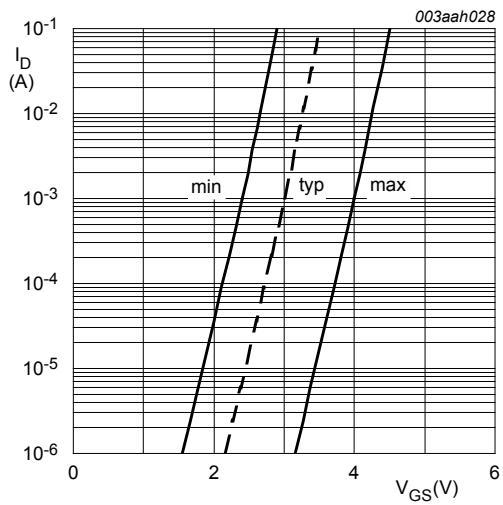


Fig. 11. Sub-threshold drain current as a function of gate-source voltage

$T_j = 25$ °C; $V_{DS} = 5$ V

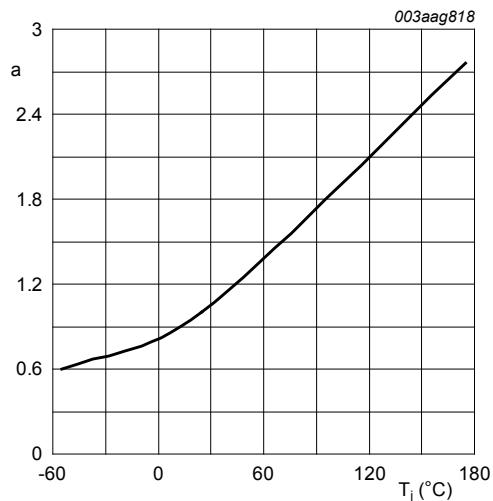


Fig. 12. Normalized drain-source on-state resistance factor as a function of junction temperature

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

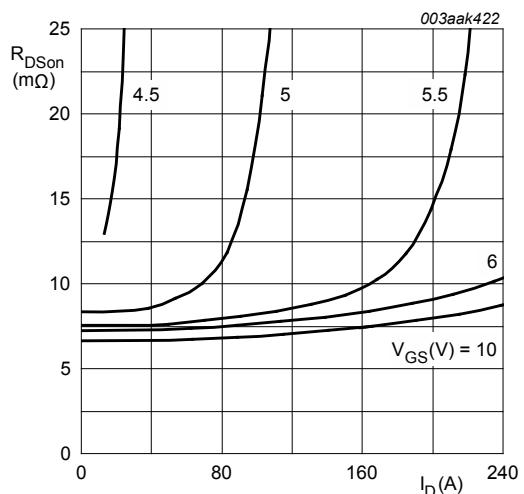


Fig. 13. Drain-source on-state resistance as a function of drain current; typical values

$T_j = 25$ °C

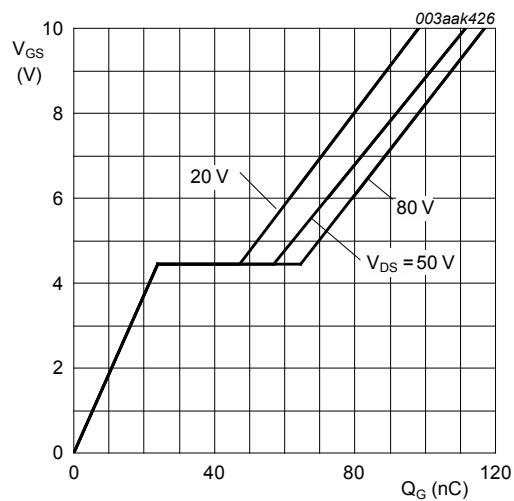


Fig. 14. Gate-source voltage as a function of gate charge; typical values

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

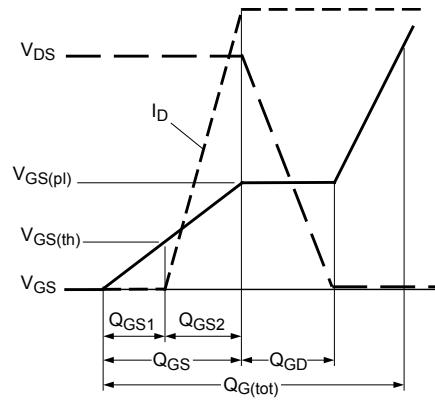


Fig. 15. Gate charge waveform definitions

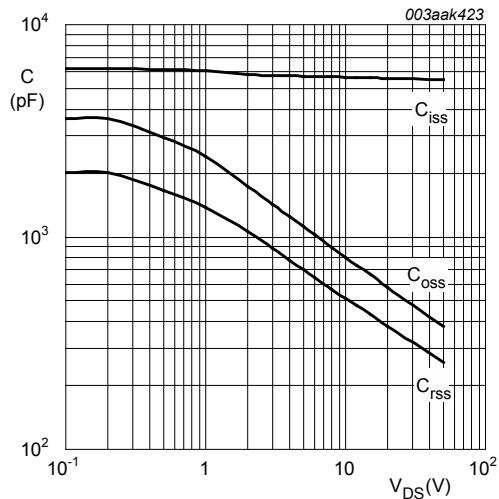


Fig. 16. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

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

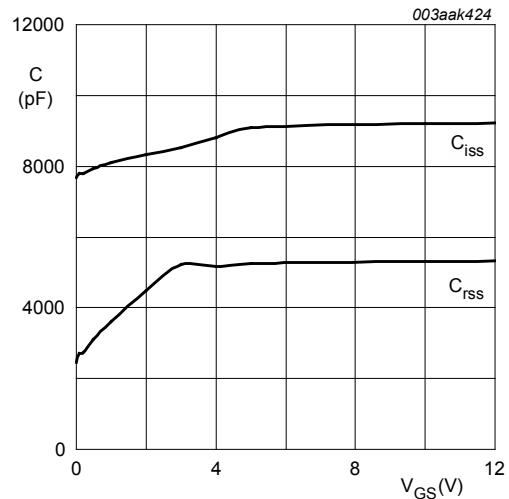


Fig. 17. Input and reverse transfer capacitances as a function of gate-source voltage, typical values

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

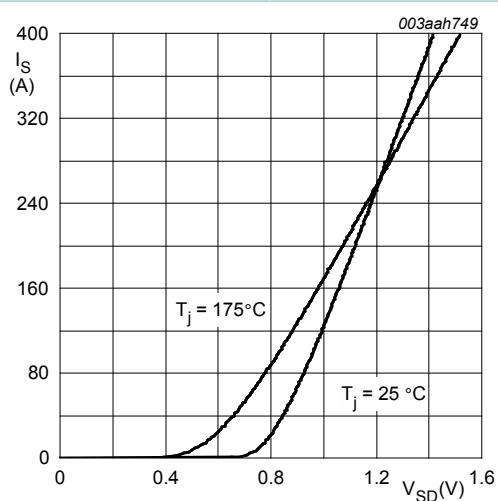


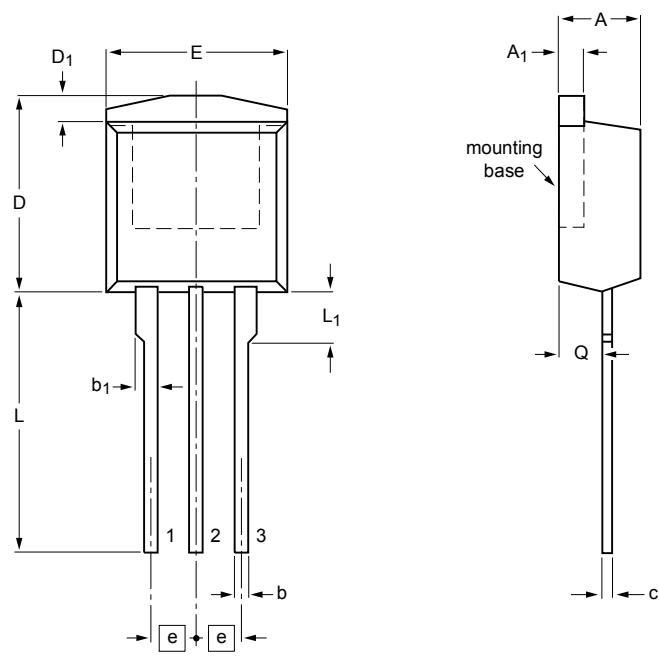
Fig. 18. Source (diode forward) current as a function of source-drain (diode forward) voltage; typical values

$V_{GS} = 0V$

8. Package outline

Plastic single-ended package (I2PAK); low-profile 3-lead TO-262

SOT226



DIMENSIONS (mm are the original dimensions)

UNIT	A	A ₁	b	b ₁	c	D _{max}	D ₁	E	e	L	L ₁	Q
mm	4.5 4.1	1.40 1.27	0.85 0.60	1.3 1.0	0.7 0.4	11	1.6 1.2	10.3 9.7	2.54	15.0 13.5	3.30 2.79	2.6 2.2

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT226		TO-262				-06-02-14-09-08-25

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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