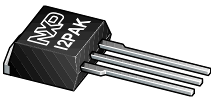


PSMN3R0-60ES

N-channel 60 V 3.0 mΩ standard level MOSFET in I2PAK.

3 June 2014 Product data sheet

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.

2. Features and benefits

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

3. Applications

- DC-to-DC converters
- Load switching
- Motor control
- Server power supplies

4. Quick reference data

Table 1. Quick reference data

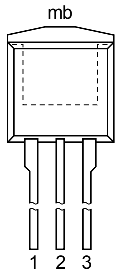
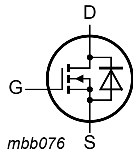
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DS}	drain-source voltage	T_j ≥ 25 °C; T_j ≤ 175 °C		-	-	60	V
I_D	drain current	T_{mb} = 25 °C; V_{GS} = 10 V; Fig. 2	[1]	-	-	100	A
P_{tot}	total power dissipation	T_{mb} = 25 °C; Fig. 1		-	-	306	W
Static characteristics							
R_{DSon}	drain-source on-state resistance	V_{GS} = 10 V; I_D = 25 A; T_j = 25 °C; Fig. 11; Fig. 12		-	2.4	3	mΩ
Dynamic characteristics							
Q_{GD}	gate-drain charge	V_{GS} = 10 V; I_D = 80 A; V_{DS} = 12 V; Fig. 13; Fig. 14		-	28	-	nC

[1] Continuous current is limited by package.

Scan or click this QR code to view the latest information for this product

5. 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		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PSMN3R0-60ES	I2PAK	plastic single-ended package (I2PAK); TO-262	SOT226

7. Marking

Table 4. Marking codes

Type number	Marking code
PSMN3R0-60ES	PSMN3R0-60ES

8. 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	$T_j \geq 25$ °C; $T_j \leq 175$ °C		-	60	V
V_{DGR}	drain-gate voltage	$T_j \geq 25$ °C; $T_j \leq 175$ °C; R_{GS} = 20 kΩ		-	60	V
V_{GS}	gate-source voltage			-20	20	V
P_{tot}	total power dissipation	T_{mb} = 25 °C; Fig. 1		-	306	W
I_D	drain current	V_{GS} = 10 V; T_{mb} = 100 °C; Fig. 2		-	83.4	A
		V_{GS} = 10 V; T_{mb} = 25 °C; Fig. 2	[1]	-	100	A
I_{DM}	peak drain current	pulsed; $t_p \leq 10$ µs; T_{mb} = 25 °C; Fig. 3		-	824	A
T_{stg}	storage temperature			-55	175	°C

Symbol	Parameter	Conditions		Min	Max	Unit
T_j	junction temperature			-55	175	°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		-	824	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} ≤ 60 V; R_{GS} = 50 Ω; unclamped		-	800	mJ

[1] Continuous current is limited by package.

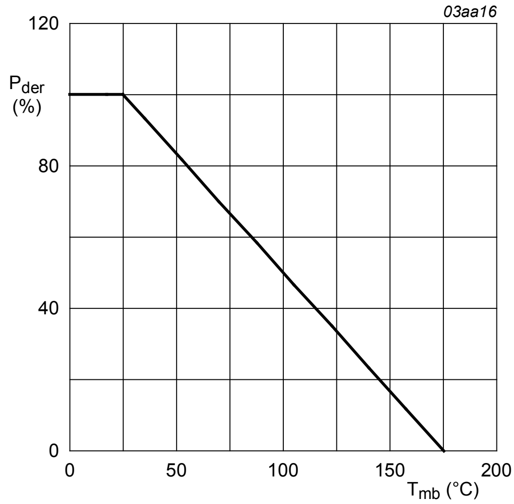


Fig. 1. Normalized total power dissipation as a function of mounting base temperature

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

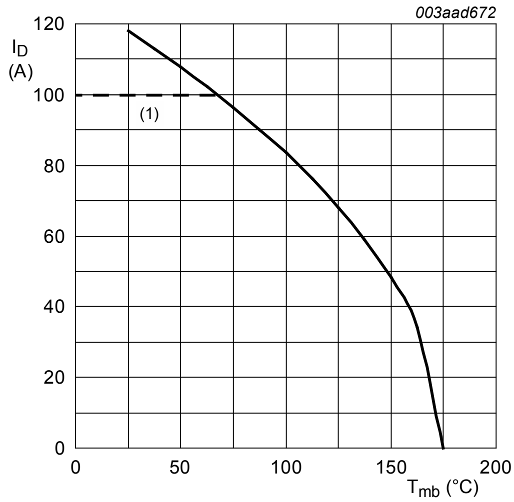


Fig. 2. Continuous drain current as a function of mounting base temperature.

$V_{GS} \geq$ 10 V; (1) Capped at 100 A due to package

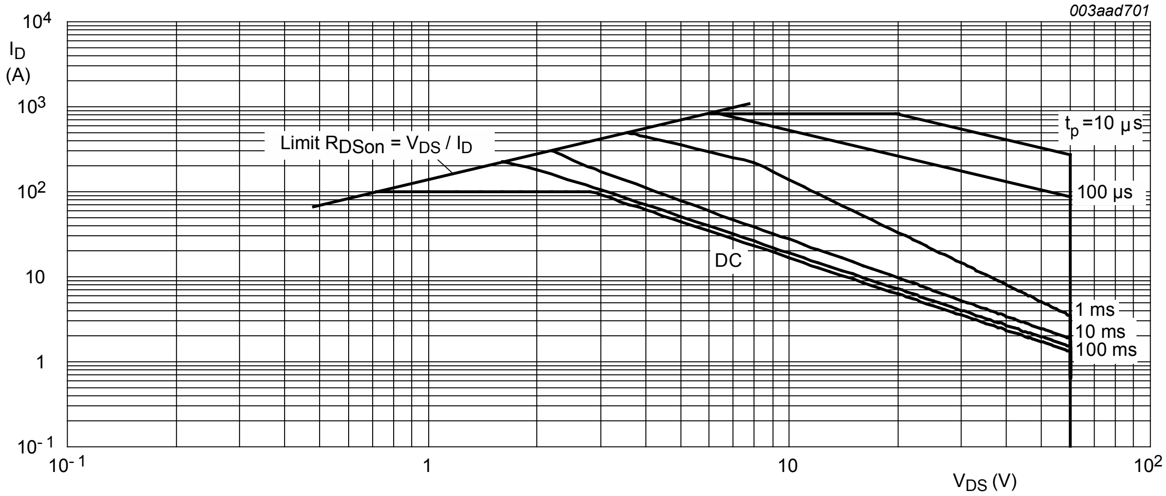


Fig. 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

T_{mb} = 25 °C; I_{DM} is a single pulse; Capped at 100 A due to package

9. 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. 4		-	0.3	0.49	K/W

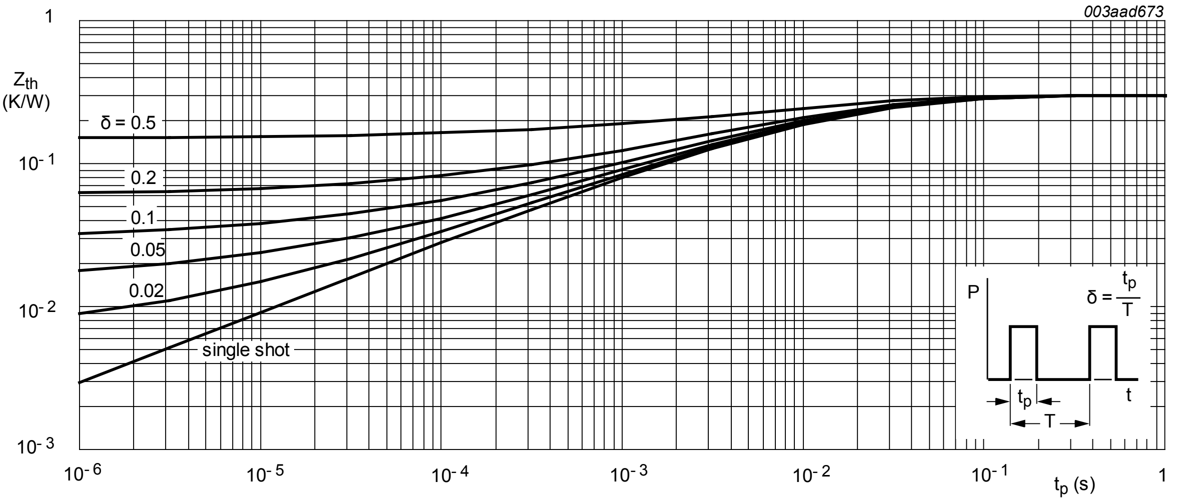


Fig. 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = 250 µA; V_{GS} = 0 V; T_j = -55 °C		54	-	-	V
		I_D = 250 µA; V_{GS} = 0 V; T_j = 25 °C		60	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	I_D = 1 mA; V_{DS} = V_{GS}; T_j = 25 °C; Fig. 8; Fig. 9		2	3	4	V
V_{GSth}	gate-source threshold voltage	I_D = 1 mA; V_{DS} = V_{GS}; T_j = 175 °C; Fig. 9		1	-	-	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = -55 °C; Fig. 9		-	-	4.6	V
I_{DSS}	drain leakage current	V_{DS} = 60 V; V_{GS} = 0 V; T_j = 25 °C		-	0.05	10	µA
		V_{DS} = 60 V; V_{GS} = 0 V; T_j = 175 °C		-	-	500	µA
I_{GSS}	gate leakage current	V_{GS} = -20 V; V_{DS} = 0 V; T_j = 25 °C		-	2	100	nA
		V_{GS} = 20 V; V_{DS} = 0 V; T_j = 25 °C		-	2	100	nA
R_{DSon}	drain-source on-state resistance	V_{GS} = 10 V; I_D = 25 A; T_j = 175 °C; Fig. 10		-	-	7.2	mΩ
		V_{GS} = 10 V; I_D = 25 A; T_j = 25 °C; Fig. 11; Fig. 12		-	2.4	3	mΩ
R_G	gate resistance	f = 1 MHz		0.55	1.1	2.2	Ω
Dynamic characteristics							
$Q_{G(tot)}$	total gate charge	I_D = 80 A; V_{DS} = 12 V; V_{GS} = 10 V; Fig. 13; Fig. 14		-	130	-	nC
Q_{GS}	gate-source charge	I_D = 80 A; V_{DS} = 12 V; V_{GS} = 10 V; Fig. 14; Fig. 13		-	43	-	nC
Q_{GD}	gate-drain charge	I_D = 80 A; V_{DS} = 12 V; V_{GS} = 10 V; Fig. 13; Fig. 14		-	28	-	nC
C_{iss}	input capacitance	V_{DS} = 30 V; V_{GS} = 0 V; f = 1 MHz; T_j = 25 °C; Fig. 15; Fig. 16		-	8079	-	pF
C_{oss}	output capacitance	V_{DS} = 30 V; V_{GS} = 0 V; f = 1 MHz; T_j = 25 °C; Fig. 15		-	971	-	pF
C_{rss}	reverse transfer capacitance	V_{DS} = 30 V; V_{GS} = 0 V; f = 1 MHz; T_j = 25 °C; Fig. 15; Fig. 16		-	492	-	pF
$t_{d(on)}$	turn-on delay time	V_{DS} = 30 V; R_L = 0.5 Ω; V_{GS} = 10 V; $R_{G(ext)}$ = 1.5 Ω		-	31	-	ns
t_r	rise time			-	26	-	ns
$t_{d(off)}$	turn-off delay time			-	77	-	ns
t_f	fall time			-	22	-	ns

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Source-drain diode							
V_{SD}	source-drain voltage	I_S = 25 A; V_{GS} = 0 V; T_j = 25 °C; Fig. 17		-	0.88	1.2	V
t_{rr}	reverse recovery time	I_S = 25 A; dI_S/dt = -100 A/µs; V_{GS} = 0 V; V_{DS} = 30 V		-	54	-	ns
Q_r	recovered charge			-	97	-	nC

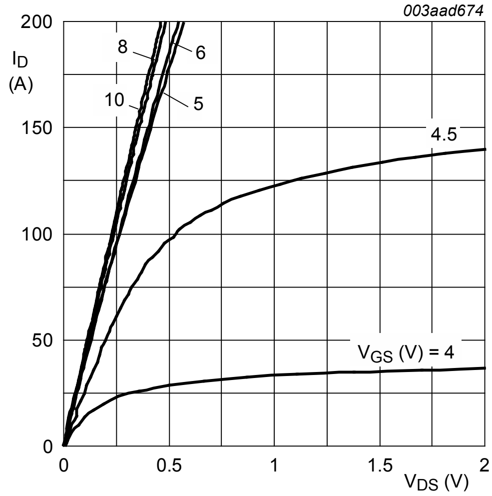


Fig. 5. Output characteristics: drain current as a function of drain-source voltage; typical values

$T_j = 25\,°C$

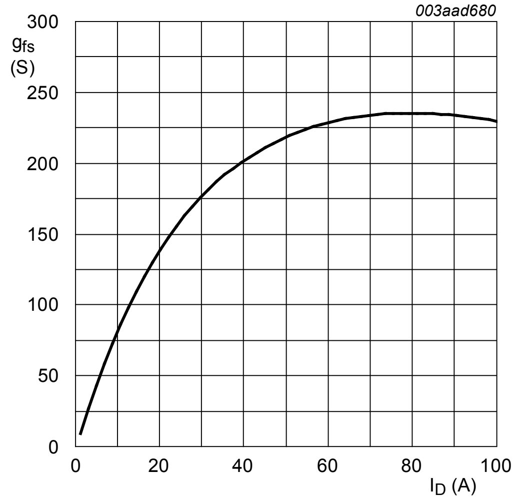


Fig. 6. Forward transconductance as a function of drain current; typical values

$T_j = 25\ °C; V_{DS} = 30V$

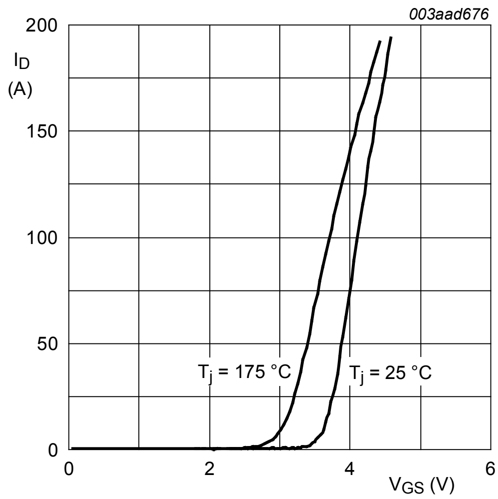


Fig. 7. Transfer characteristics: drain current as a function of gate-source voltage; typical values

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

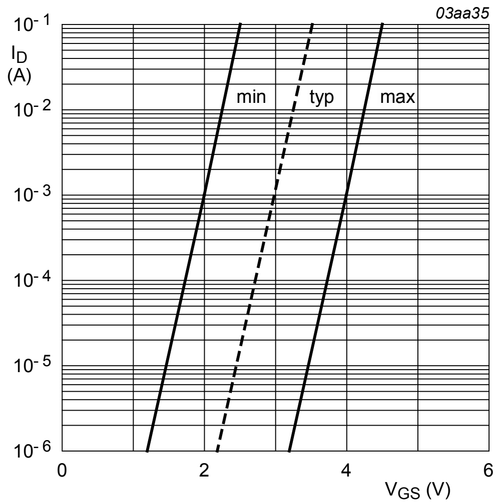


Fig. 8. Sub-threshold drain current as a function of gate-source voltage

$T_j = 25\,°C; V_{DS} = 5V$

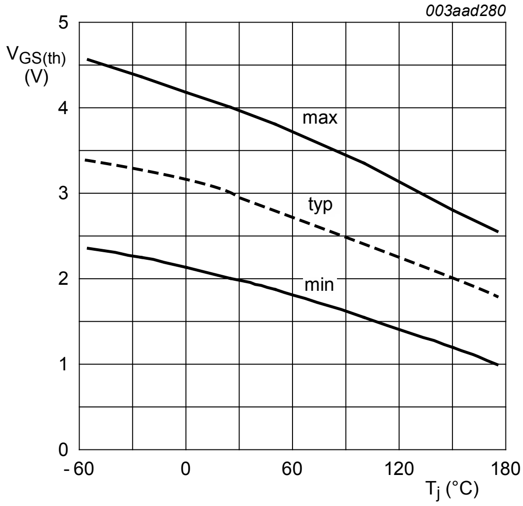


Fig. 9. Gate-source threshold voltage as a function of junction temperature

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

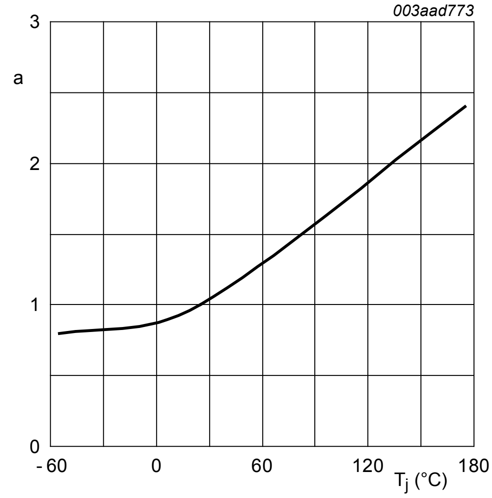


Fig. 10. Normalized drain-source on-state resistance factor as a function of junction temperature

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

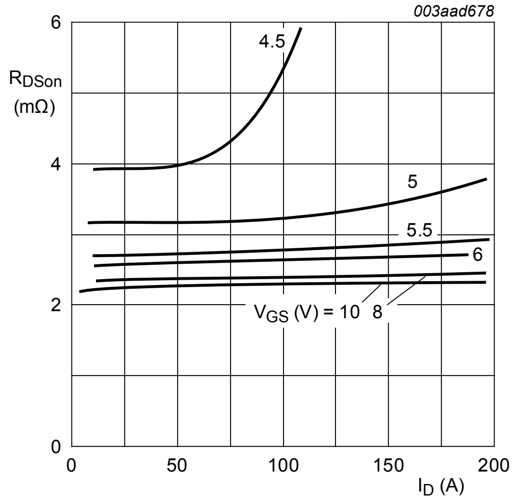


Fig. 11. Drain-source on-state resistance as a function of drain current; typical values

$T_j = 25\,^\circ C$

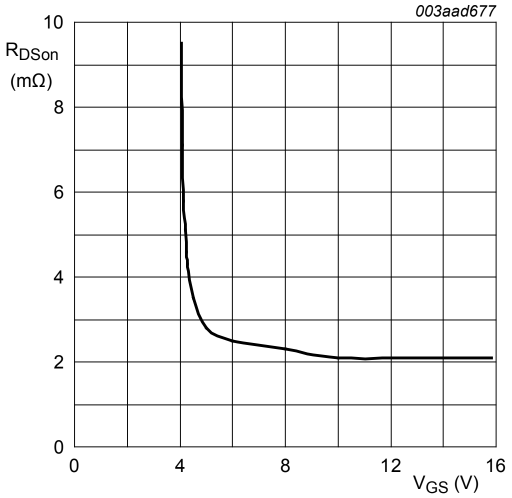


Fig. 12. Drain-source on-state resistance as a function of gate-source voltage; typical values

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

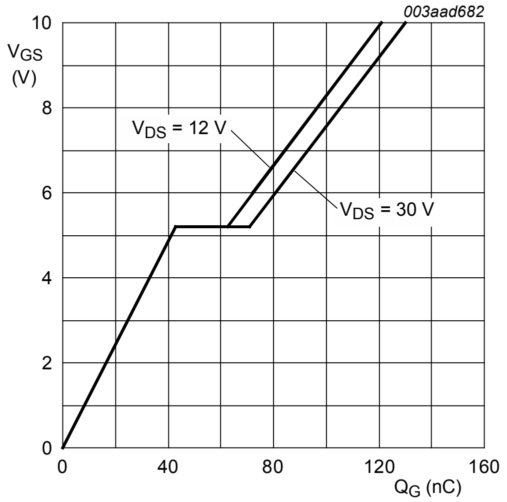


Fig. 13. Gate-source voltage as a function of gate charge; typical values

$T_j = 25\ °C;\ I_D = 25\ A$

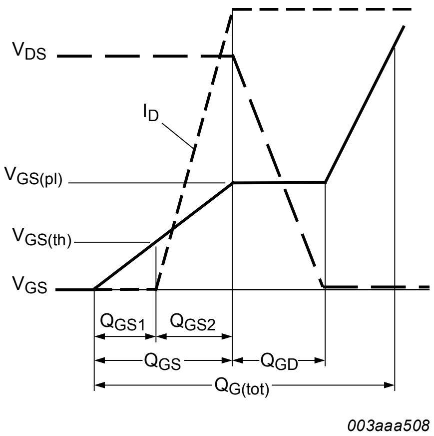


Fig. 14. Gate charge waveform definitions

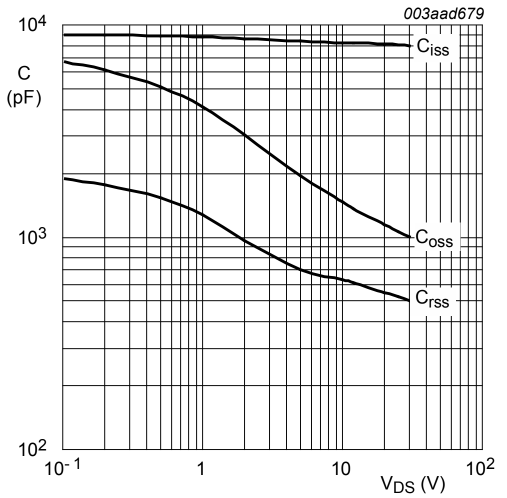


Fig. 15. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

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

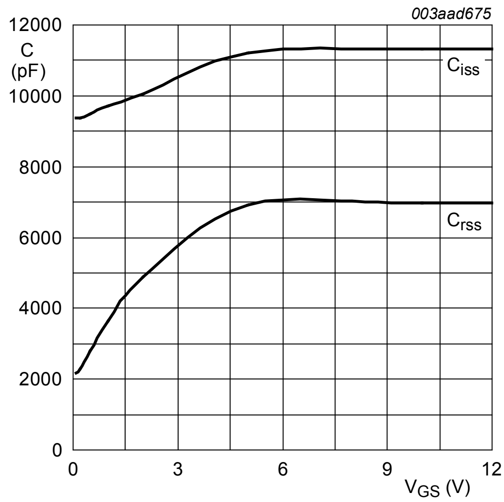


Fig. 16. Input and reverse transfer capacitances as a function of gate-source voltage, typical values

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

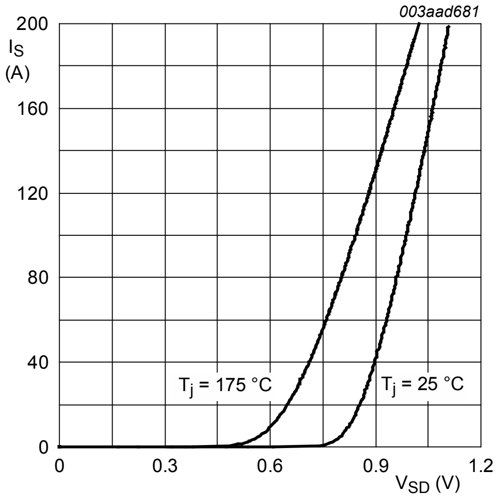
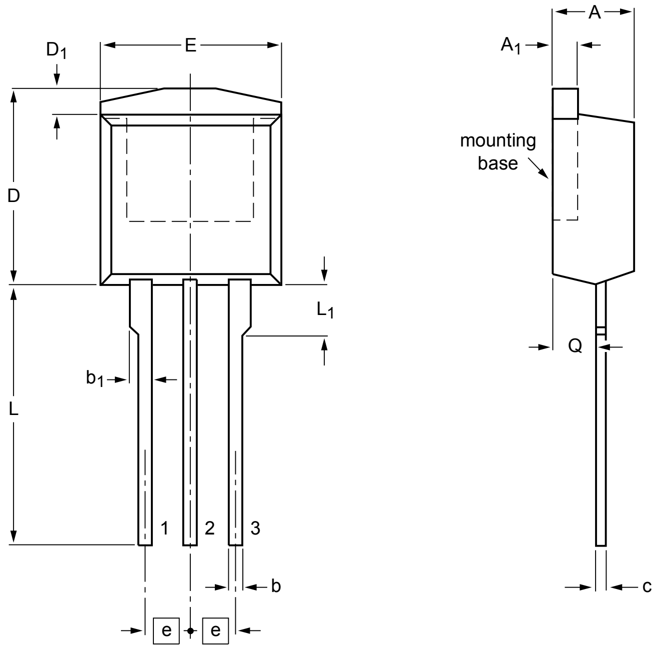


Fig. 17. Source current as a function of source-drain voltage; typical values

$V_{GS} = 0$ V

11. 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

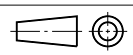
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT226		TO-262				~~06-02-14~~ 09-08-25

Fig. 18. Package outline I2PAK (SOT226)

12. Legal information

12.1 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.
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Date of release: 3 June 2014