



PSMN013-100ES

N-channel 100V 13.9mΩ standard level MOSFET in I2PAK.

Rev. 3 — 29 September 2011

Product data sheet

1. Product profile

1.1 General description

Standard level N-channel enhancement MOSFET in 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

- Low conduction losses due to low on-state resistance
- Suitable for high frequency applications due to fast switching characteristics

1.3 Applications

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

1.4 Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25\text{ °C}$; $T_j \leq 175\text{ °C}$	-	-	100	V
I_D	drain current	$T_{mb} = 25\text{ °C}$; $V_{GS} = 10\text{ V}$; see Figure 1	[1]	-	68	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}$; see Figure 2	-	-	170	W
T_j	junction temperature		-55	-	175	°C
Static characteristics						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}$; $I_D = 15\text{ A}$; $T_j = 100\text{ °C}$; see Figure 11	-	-	25	mΩ
		$V_{GS} = 10\text{ V}$; $I_D = 15\text{ A}$; $T_j = 25\text{ °C}$; see Figure 12 ; see Figure 11	[2]	11	13.9	mΩ
Dynamic characteristics						
Q_{GD}	gate-drain charge	$V_{GS} = 10\text{ V}$; $I_D = 25\text{ A}$; $V_{DS} = 50\text{ V}$; see Figure 14 ; see Figure 13	-	17	-	nC

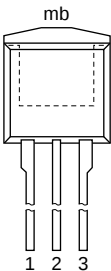
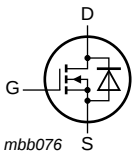
Table 1. Quick reference data ...continued

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$Q_{G(tot)}$	total gate charge	$V_{GS} = 10\text{ V}$; $I_D = 25\text{ A}$; $V_{DS} = 50\text{ V}$; see Figure 13 ; see Figure 14	-	59	-	nC
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10\text{ V}$; $T_{J(init)} = 25\text{ °C}$; $I_D = 68\text{ A}$; $V_{sup} \leq 100\text{ V}$; unclamped; $R_{GS} = 50\text{ }\Omega$	-	-	127	mJ

- [1] Continuous current is limited by package.
[2] Measured 3 mm from package.

2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate		
2	D	drain		
3	S	source		
mb	D	mounting base; connected to drain		

SOT226 (I2PAK)

3. Ordering information

Table 3. Ordering information

Type number	Package		Version
	Name	Description	
PSMN013-100ES	I2PAK	plastic single-ended package (I2PAK); TO-262	SOT226

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	$T_j \geq 25\text{ °C}$; $T_j \leq 175\text{ °C}$	-	100	V
V_{DGR}	drain-gate voltage	$T_j \leq 175\text{ °C}$; $T_j \geq 25\text{ °C}$; $R_{GS} = 20\text{ k}\Omega$	-	100	V
V_{GS}	gate-source voltage		-20	20	V
I_D	drain current	$V_{GS} = 10\text{ V}$; $T_{mb} = 100\text{ °C}$; see Figure 1 ^[1]	-	47	A
		$V_{GS} = 10\text{ V}$; $T_{mb} = 25\text{ °C}$; see Figure 1 ^[1]	-	68	A
I_{DM}	peak drain current	pulsed; $t_p \leq 10\text{ }\mu\text{s}$; $T_{mb} = 25\text{ °C}$	-	272	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}$; see Figure 2	-	170	W
T_{stg}	storage temperature		-55	175	°C
T_j	junction temperature		-55	175	°C
$T_{slid(M)}$	peak soldering temperature		-	260	°C

Source-drain diode

I_S	source current	$T_{mb} = 25\text{ °C}$ ^[1]	-	68	A
I_{SM}	peak source current	pulsed; $t_p \leq 10\text{ }\mu\text{s}$; $T_{mb} = 25\text{ °C}$	-	272	A

Avalanche ruggedness

$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10\text{ V}$; $T_{j(\text{init})} = 25\text{ °C}$; $I_D = 68\text{ A}$; $V_{sup} \leq 100\text{ V}$; unclamped; $R_{GS} = 50\text{ }\Omega$	-	127	mJ
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[1] Continuous current is limited by package.

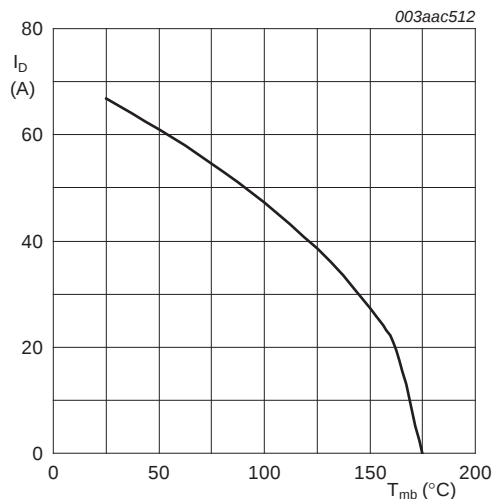
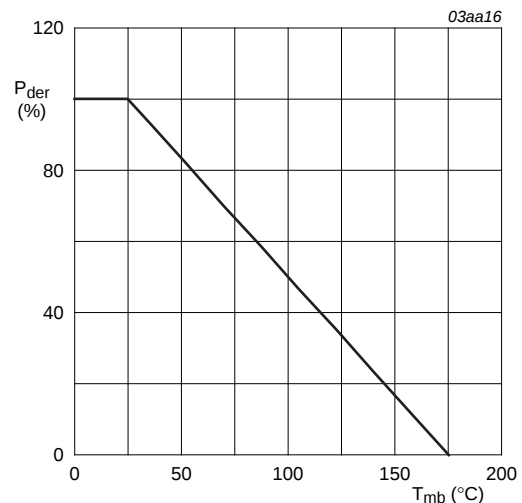


Fig 1. Continuous drain current as a function of mounting base temperature



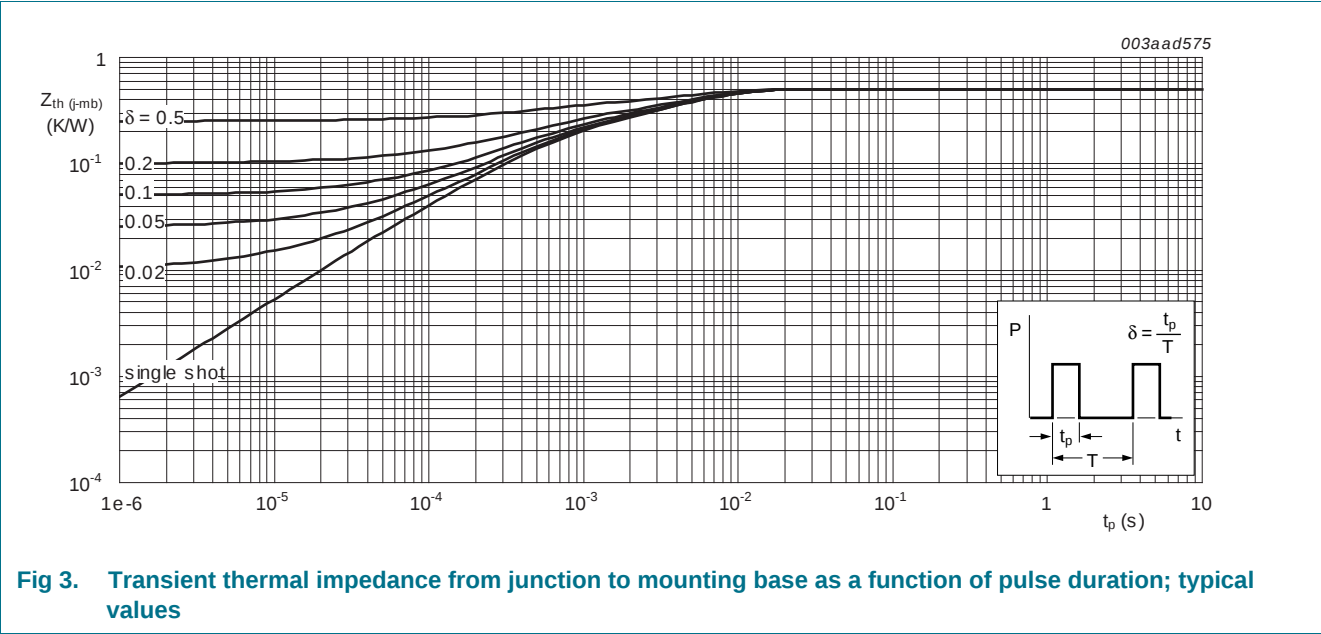
$$P_{der} = \frac{P_{tot}}{P_{tot(25\text{ °C})}} \times 100\%$$

Fig 2. Normalized total power dissipation as a function of mounting base temperature

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 3	-	0.5	0.9	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	vertical in free air	-	60	-	K/W



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	90	-	-	V
		I _D = 0.25 mA; V _{GS} = 0 V; T _j = 25 °C	100	-	-	V
V _{GS(th)}	gate-source threshold voltage	I _D = 1 mA; V _{DS} = V _{GS} ; T _j = 175 °C; see Figure 9	1	-	-	V
		I _D = 1 mA; V _{DS} = V _{GS} ; T _j = 25 °C; see Figure 10 ; see Figure 9	2	3	4	V
		I _D = 1 mA; V _{DS} = V _{GS} ; T _j = -55 °C; see Figure 10	-	-	4.8	V
I _{DSS}	drain leakage current	V _{DS} = 100 V; V _{GS} = 0 V; T _j = 125 °C	-	-	100	μA
		V _{DS} = 100 V; V _{GS} = 0 V; T _j = 25 °C	-	0.06	2	μA
I _{GSS}	gate leakage current	V _{GS} = 20 V; V _{DS} = 0 V; T _j = 25 °C	-	10	100	nA
		V _{GS} = -20 V; V _{DS} = 0 V; T _j = 25 °C	-	10	100	nA
R _{DSon}	drain-source on-state resistance	V _{GS} = 10 V; I _D = 15 A; T _j = 175 °C; see Figure 11	-	30	38.9	mΩ
		V _{GS} = 10 V; I _D = 15 A; T _j = 100 °C; see Figure 11	-	-	25	mΩ
		V _{GS} = 10 V; I _D = 15 A; T _j = 25 °C; see Figure 12 ; see Figure 11	11	-	11	13.9
R _G	internal gate resistance (AC)	f = 1 MHz	-	1	-	Ω
Dynamic characteristics						
Q _{G(tot)}	total gate charge	I _D = 25 A; V _{DS} = 50 V; V _{GS} = 10 V; see Figure 13 ; see Figure 14	-	59	-	nC
		I _D = 0 A; V _{DS} = 0 V; V _{GS} = 10 V	-	47.6	-	nC
Q _{GS}	gate-source charge	I _D = 25 A; V _{DS} = 50 V; V _{GS} = 10 V; see Figure 13 ; see Figure 14	-	13.8	-	nC
Q _{GS(th)}	pre-threshold gate-source charge	I _D = 25 A; V _{DS} = 50 V; V _{GS} = 10 V; see Figure 14	-	9.2	-	nC
Q _{GS(th-pl)}	post-threshold gate-source charge		-	4.6	-	nC
Q _{GD}	gate-drain charge	I _D = 25 A; V _{DS} = 50 V; V _{GS} = 10 V; see Figure 14 ; see Figure 13	-	17	-	nC
V _{GS(pl)}	gate-source plateau voltage	V _{DS} = 50 V; see Figure 14 ; see Figure 13	-	4.4	-	V
C _{iss}	input capacitance	V _{DS} = 50 V; V _{GS} = 0 V; f = 1 MHz;	-	3195	-	pF
C _{oss}	output capacitance	T _j = 25 °C; see Figure 15	-	221	-	pF
C _{rss}	reverse transfer capacitance		-	136	-	pF
t _{d(on)}	turn-on delay time	V _{DS} = 50 V; R _L = 2 Ω; V _{GS} = 10 V;	-	20.7	-	ns
t _r	rise time	R _{G(ext)} = 4.7 Ω; T _j = 25 °C	-	25	-	ns
t _{d(off)}	turn-off delay time		-	52.5	-	ns
t _f	fall time		-	24	-	ns

Table 6. Characteristics ...continued

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Source-drain diode						
V_{SD}	source-drain voltage	$I_S = 15\text{ A}$; $V_{GS} = 0\text{ V}$; $T_j = 25\text{ °C}$; see Figure 16	-	0.8	1.2	V
t_{rr}	reverse recovery time	$I_S = 25\text{ A}$; $dI_S/dt = 100\text{ A}/\mu\text{s}$;	-	52	-	ns
Q_r	recovered charge	$V_{GS} = 0\text{ V}$; $V_{DS} = 50\text{ V}$	-	109	-	nC

[1] Measured 3 mm from package.

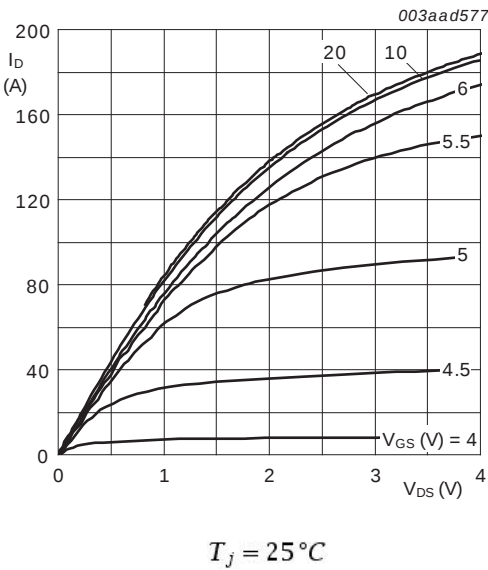


Fig 4. Output characteristics: drain current as a function of drain-source voltage; typical values

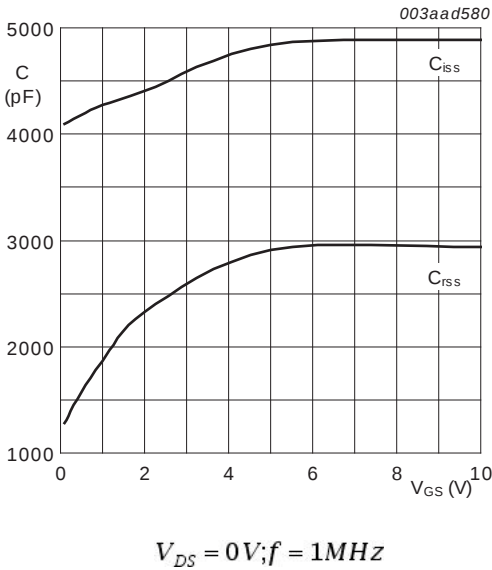


Fig 5. Input and reverse transfer capacitances as a function of gate-source voltage; typical values

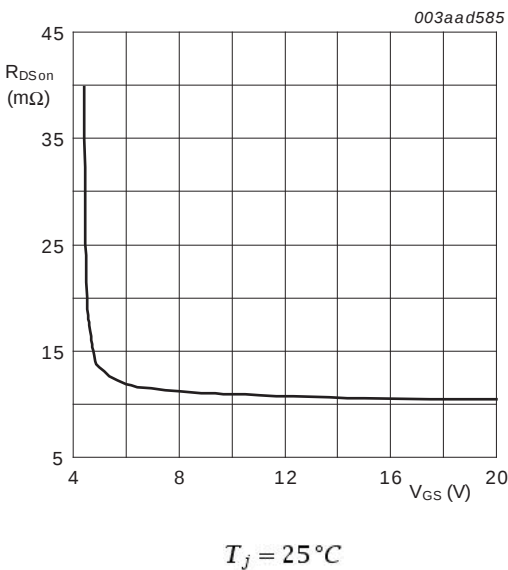


Fig 6. Drain-source on-state resistance as a function of gate-source voltage; typical values

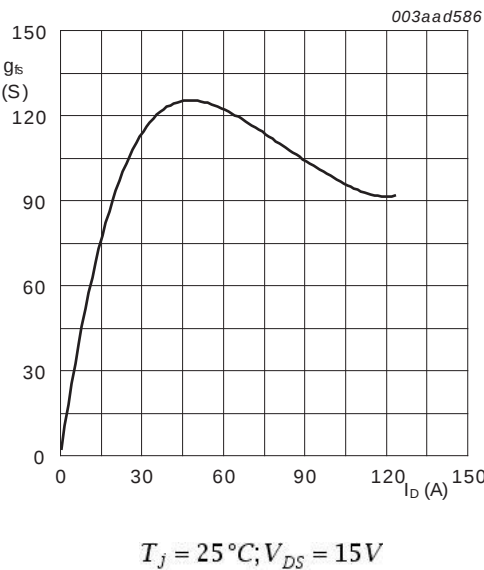


Fig 7. Forward transconductance as a function of drain current; typical values

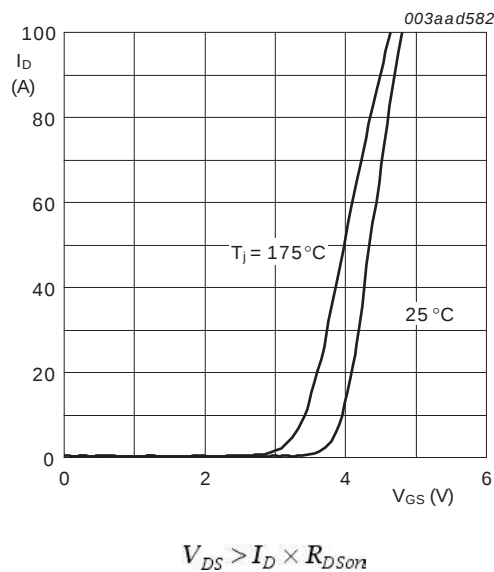


Fig 8. Transfer characteristics: drain current as a function of gate-source voltage; typical values

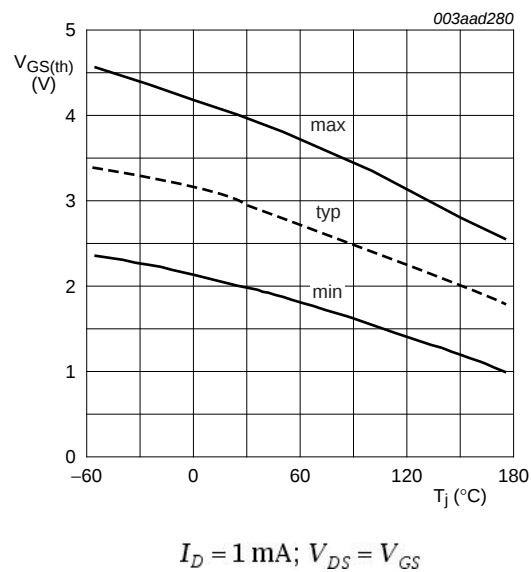


Fig 9. Gate-source threshold voltage as a function of junction temperature

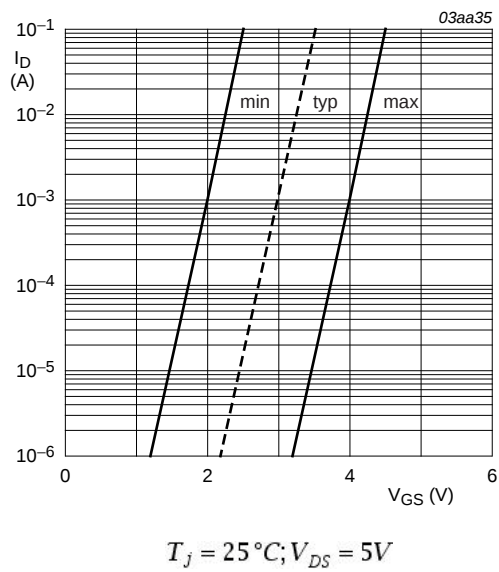


Fig 10. Sub-threshold drain current as a function of gate-source voltage

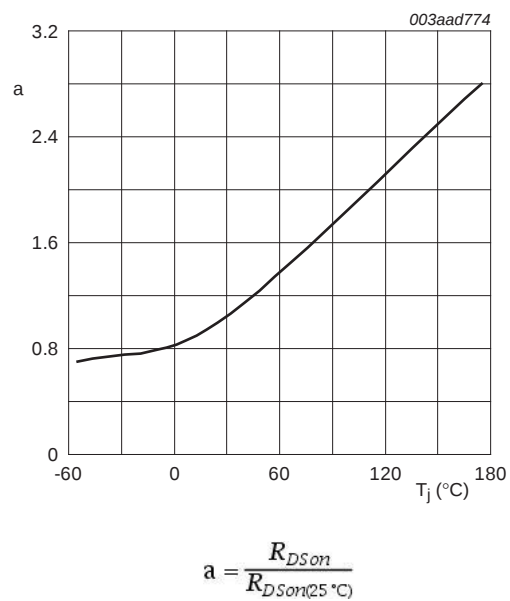


Fig 11. Normalized drain-source on-state resistance factor as a function of junction temperature

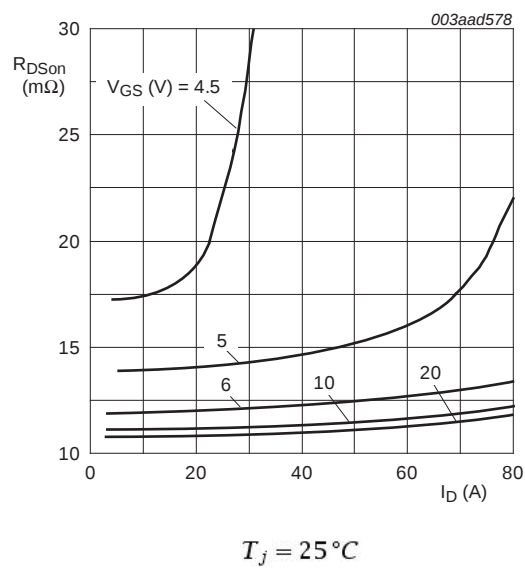


Fig 12. Drain-source on-state resistance as a function of drain current; typical values

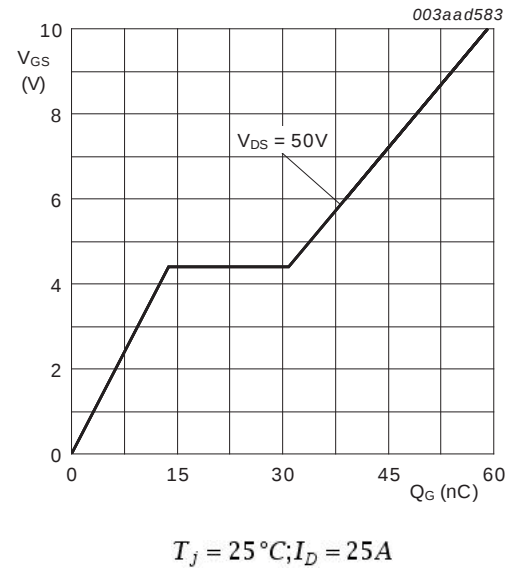


Fig 13. Gate-source voltage as a function of gate charge; typical values

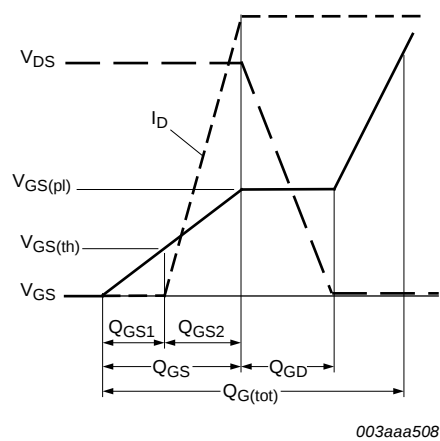


Fig 14. Gate charge waveform definitions

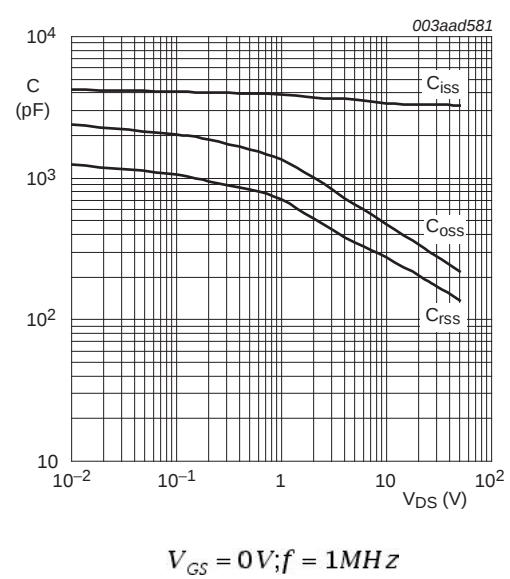


Fig 15. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

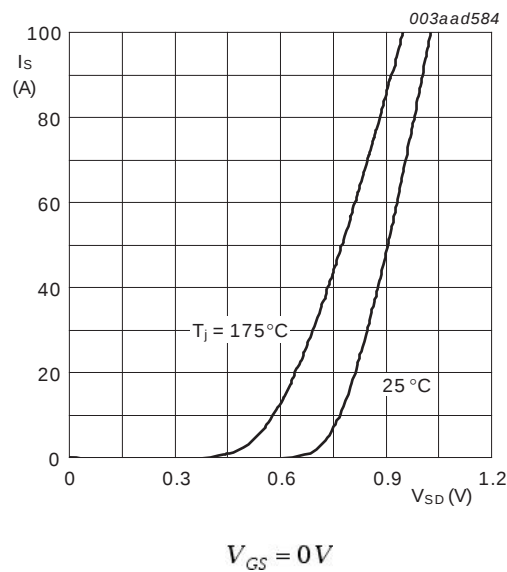


Fig 16. Source (diode forward) current as a function of source-drain (diode forward) voltage; typical values

7. Package outline

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

SOT226

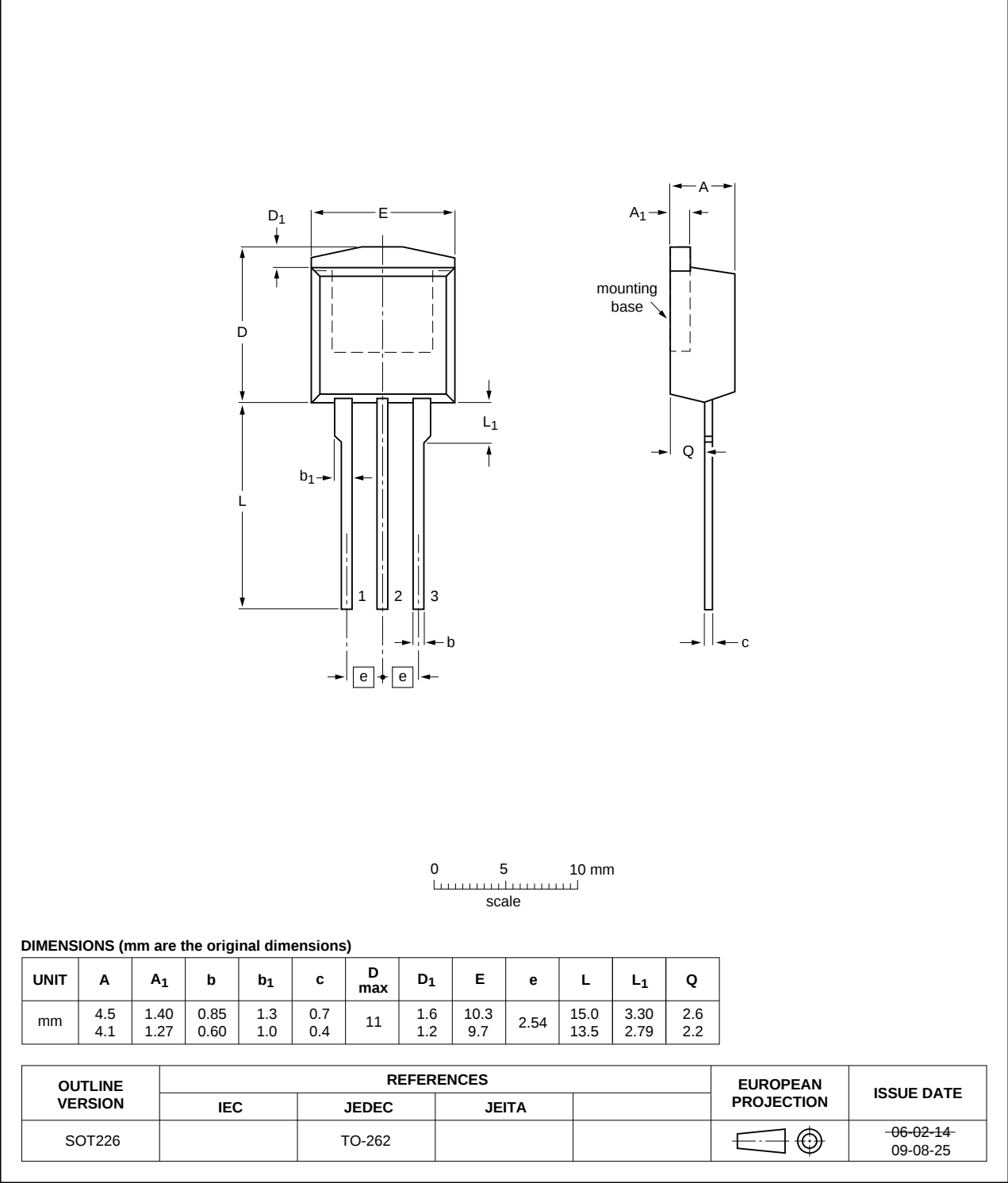


Fig 17. Package outline SOT226 (I2PAK)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PSMN013-100ES v.3	20110929	Product data sheet	-	PSMN013-100ES v.2
Modifications:	• Status changed from objective to product. • Various changes to content.			
PSMN013-100ES v.2	20100219	Objective data sheet	-	PSMN013-100ES 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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