



PSMN3R0-60ES

N-channel 60 V 3.0 m Ω 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	m Ω
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.

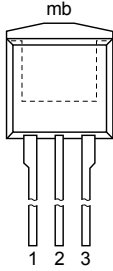
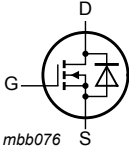


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5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 <p>I2PAK (SOT226)</p>	
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

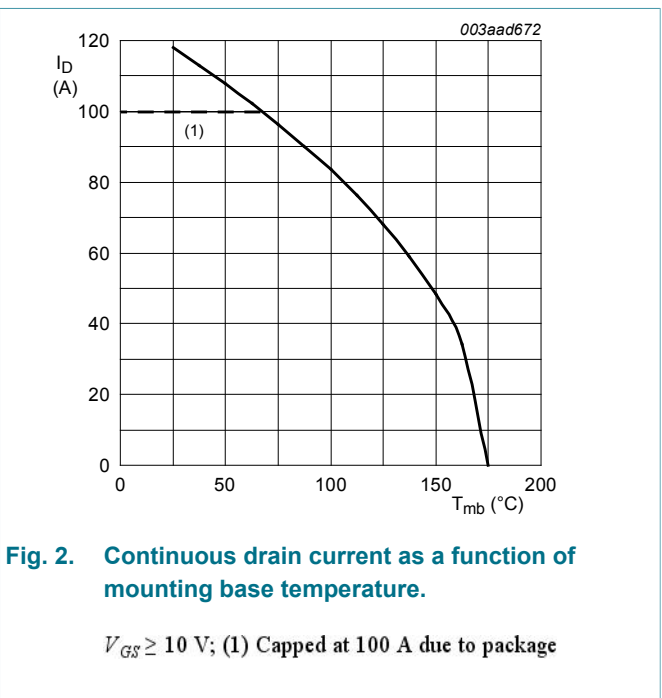
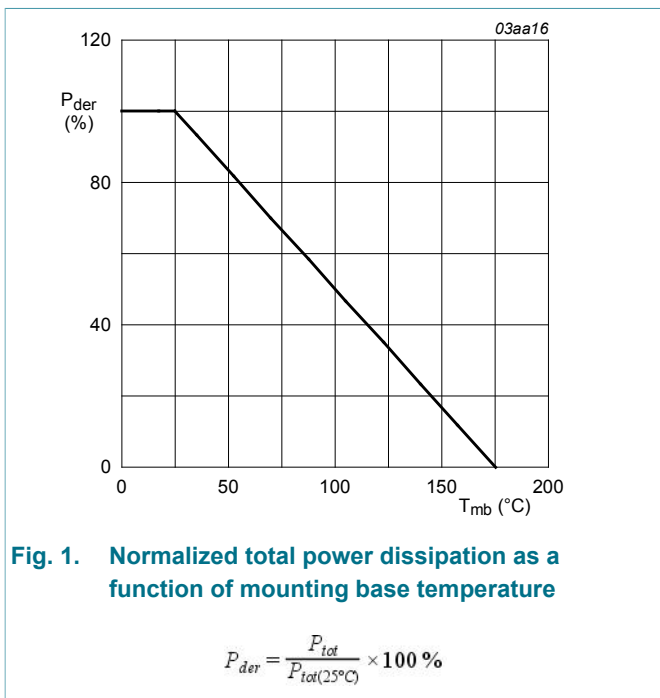
Table 5. Limiting values

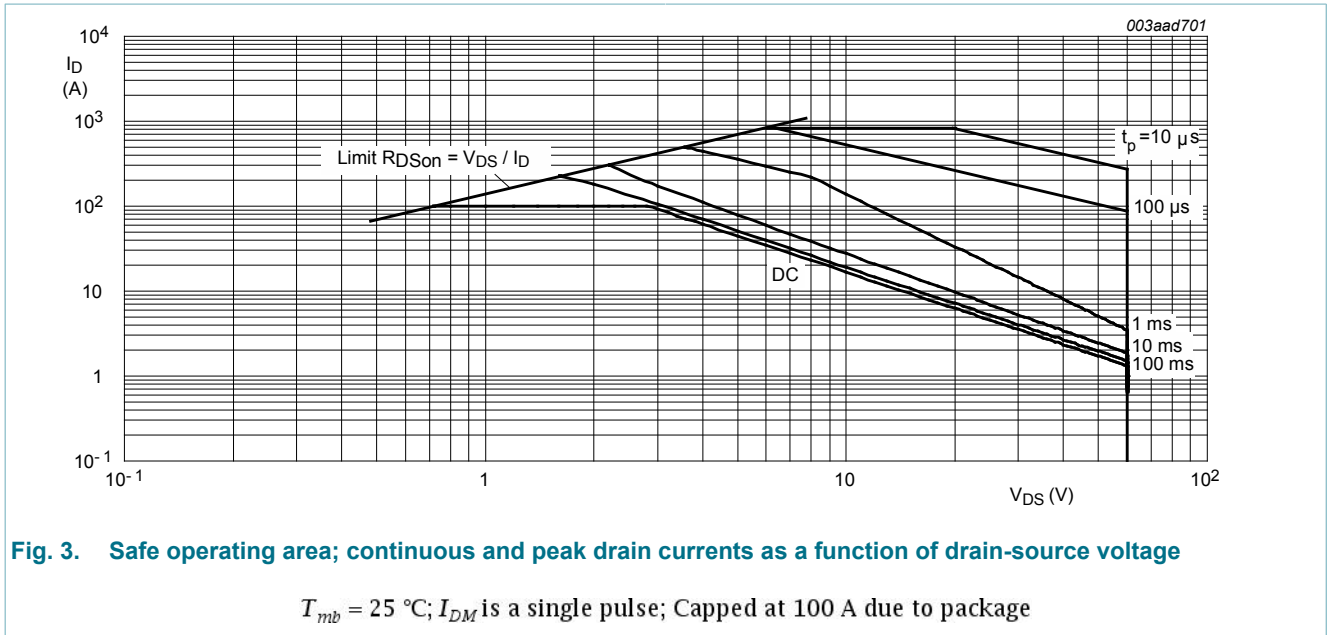
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25\text{ °C}$; $T_j \leq 175\text{ °C}$	-	60	V
V_{DGR}	drain-gate voltage	$T_j \geq 25\text{ °C}$; $T_j \leq 175\text{ °C}$; $R_{GS} = 20\text{ k}\Omega$	-	60	V
V_{GS}	gate-source voltage		-20	20	V
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}$; Fig. 1	-	306	W
I_D	drain current	$V_{GS} = 10\text{ V}$; $T_{mb} = 100\text{ °C}$; Fig. 2	-	83.4	A
		$V_{GS} = 10\text{ V}$; $T_{mb} = 25\text{ °C}$; Fig. 2 [1]	-	100	A
I_{DM}	peak drain current	pulsed; $t_p \leq 10\text{ }\mu\text{s}$; $T_{mb} = 25\text{ °C}$; 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.

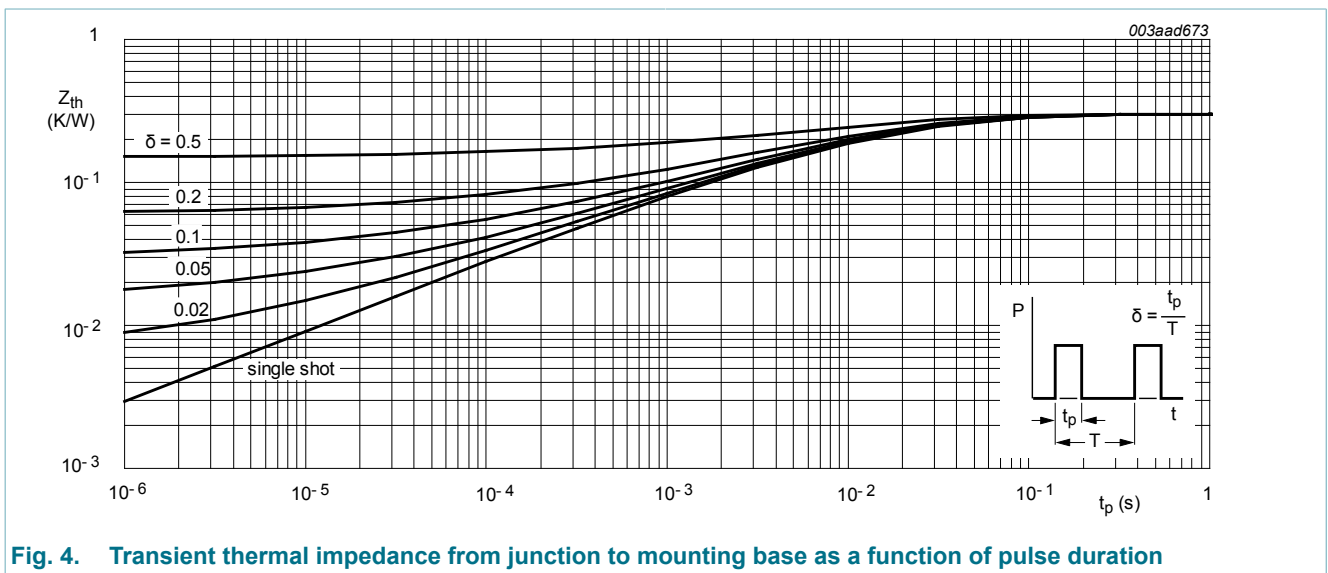




9. Thermal characteristics

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



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	$I_S = 25\text{ A}$; $V_{GS} = 0\text{ V}$; $T_j = 25\text{ °C}$; Fig. 17	-	0.88	1.2	V
t_{rr}	reverse recovery time	$I_S = 25\text{ A}$; $di_S/dt = -100\text{ A}/\mu\text{s}$; $V_{GS} = 0\text{ V}$;	-	54	-	ns
Q_r	recovered charge	$V_{DS} = 30\text{ V}$	-	97	-	nC

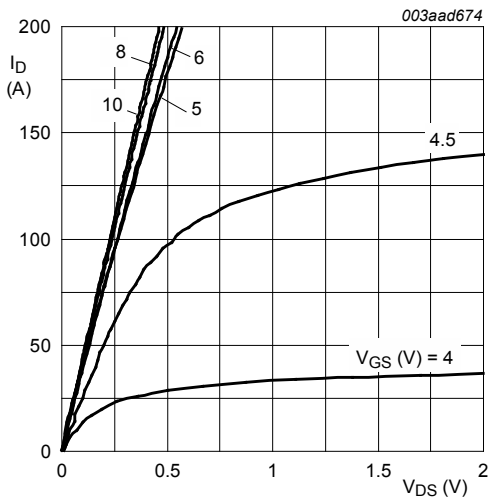


Fig. 5. Output characteristics: drain current as a function of drain-source voltage; typical values

$T_j = 25\text{ °C}$

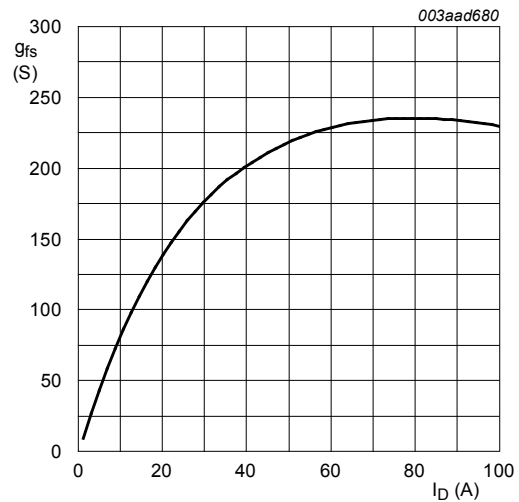


Fig. 6. Forward transconductance as a function of drain current; typical values

$T_j = 25\text{ °C}$; $V_{DS} = 30\text{ V}$

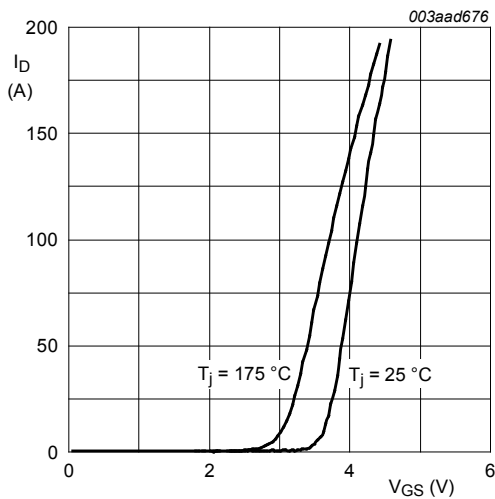


Fig. 7. Transfer characteristics: drain current as a function of gate-source voltage; typical values

$V_{DS} > I_D \times R_{DS(on)}$

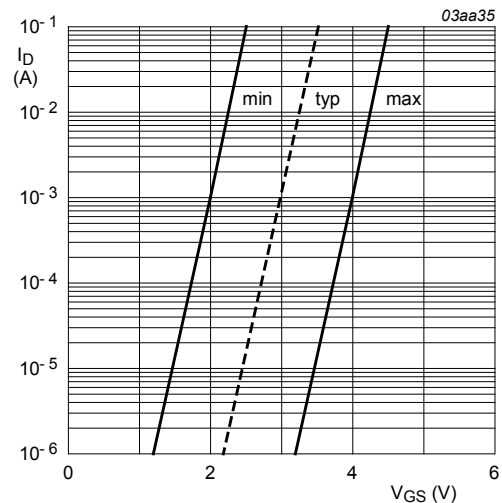


Fig. 8. Sub-threshold drain current as a function of gate-source voltage

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

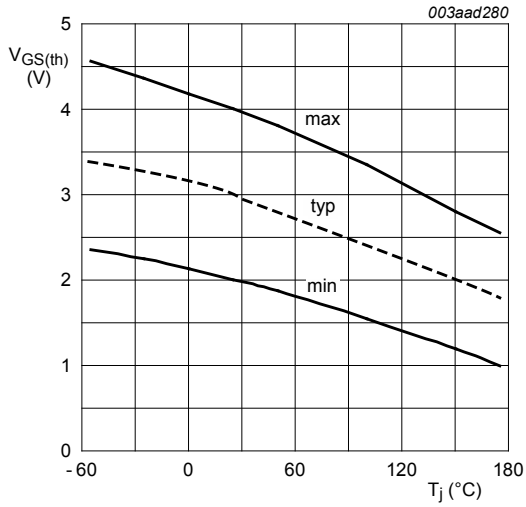


Fig. 9. Gate-source threshold voltage as a function of junction temperature

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

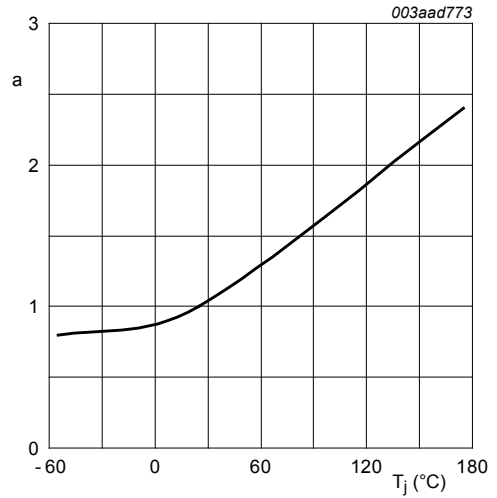


Fig. 10. Normalized drain-source on-state resistance factor as a function of junction temperature

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

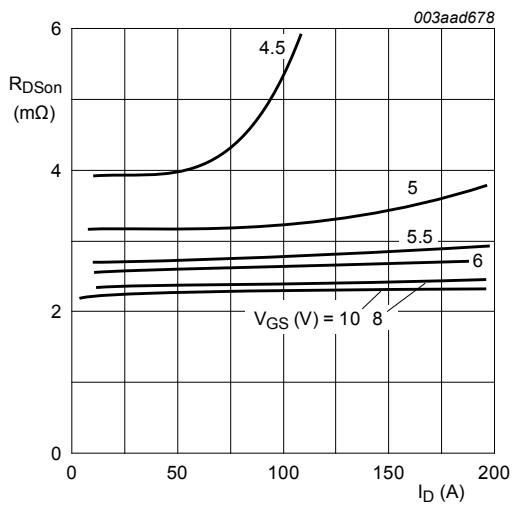


Fig. 11. Drain-source on-state resistance as a function of drain current; typical values

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

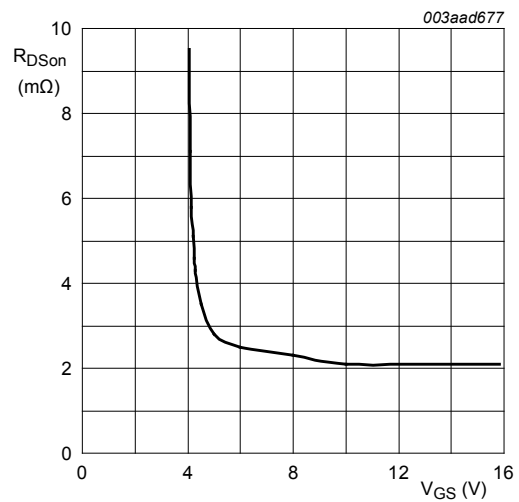


Fig. 12. Drain-source on-state resistance as a function of gate-source voltage; typical values

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

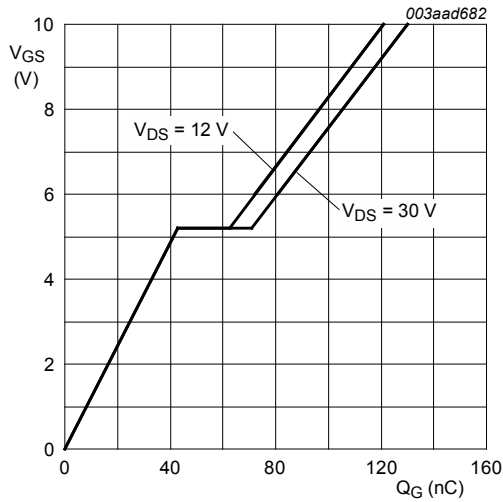


Fig. 13. Gate-source voltage as a function of gate charge; typical values

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



Fig. 14. Gate charge waveform definitions

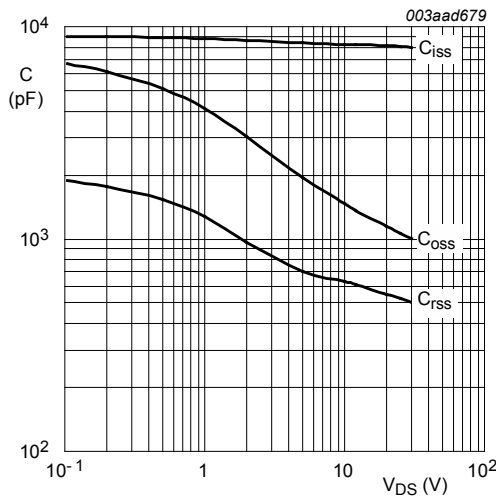


Fig. 15. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

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

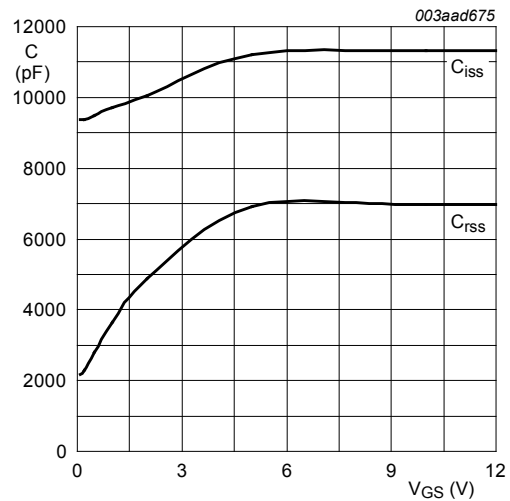


Fig. 16. Input and reverse transfer capacitances as a function of gate-source voltage, typical values

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

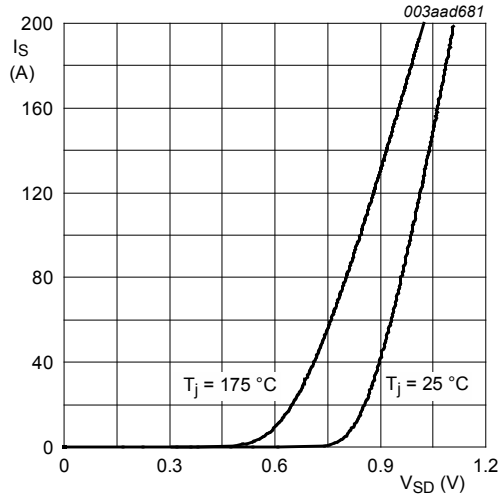


Fig. 17. Source current as a function of source-drain voltage; typical values

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

11. Package outline

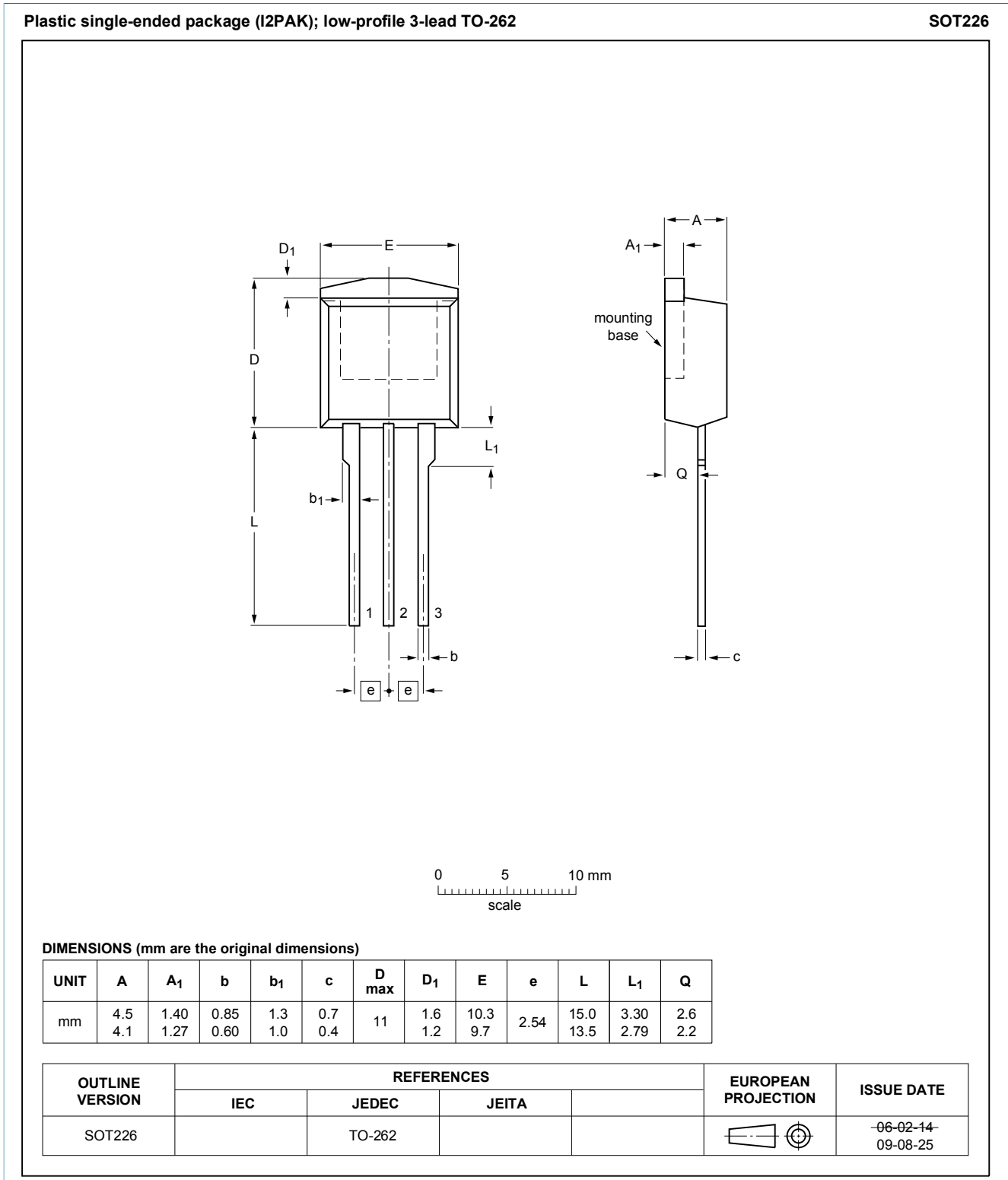


Fig. 18. Package outline I2PAK (SOT226)

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