



# PSMN2R0-100SSF

NextPower 100 V, 2.07 mOhm, 267 Amp, N-channel MOSFET  
in LPAK88 package

6 September 2021

Preliminary data sheet

## 1. General description

NextPower 100 V, standard level gate drive MOSFET. Qualified to 175 °C and recommended for industrial and consumer applications.

## 2. Features and benefits

- Low  $Q_{rr}$  for higher efficiency and lower spiking
- 267 Amps  $I_{D(max)}$  continuous current rating
- Low  $Q_G \times R_{DSon}$  FOM for high efficiency switching applications
- Strong avalanche energy rating ( $E_{as}$ )
- Avalanche rated and 100% tested
- Ha-free and RoHS compliant LPAK88 package

## 3. Applications

- Synchronous rectifier in AC-DC and DC-DC
- Primary side switch
- BLDC motor control
- Full-bridge and half-bridge applications
- Battery protection

## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DS}$	drain-source voltage	$25\text{ °C} \leq T_j \leq 175\text{ °C}$	-	-	100	V
$I_D$	drain current	$V_{GS} = 10\text{ V}$ ; $T_{mb} = 25\text{ °C}$ ; <a href="#">Fig. 2</a>	-	-	267	A
$P_{tot}$	total power dissipation	$T_{mb} = 25\text{ °C}$ ; <a href="#">Fig. 1</a>	-	-	341	W
$T_j$	junction temperature		-55	-	175	°C
<b>Static characteristics</b>						
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}$ ; $I_D = 25\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 11</a>	-	1.63	2.07	mΩ
		$V_{GS} = 10\text{ V}$ ; $I_D = 25\text{ A}$ ; $T_j = 100\text{ °C}$ ; <a href="#">Fig. 12</a>	-	2.6	3.3	mΩ
<b>Dynamic characteristics</b>						
$Q_{GD}$	gate-drain charge	$I_D = 25\text{ A}$ ; $V_{DS} = 50\text{ V}$ ; $V_{GS} = 10\text{ V}$ ; <a href="#">Fig. 13</a> ; <a href="#">Fig. 14</a>	9	31	71	nC
$Q_{G(tot)}$	total gate charge		80	161	242	nC
<b>Avalanche ruggedness</b>						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 82\text{ A}$ ; $V_{sup} \leq 100\text{ V}$ ; $R_{GS} = 50\text{ Ω}$ ; $V_{GS} = 10\text{ V}$ ; $T_{j(init)} = 25\text{ °C}$ ; unclamped; $t_p = 137\text{ μs}$ ; <a href="#">Fig. 4</a>	[1]	-	732	mJ

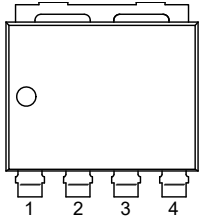
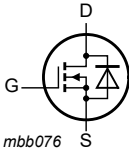
NextPower 100 V, 2.07 mOhm, 267 Amp, N-channel MOSFET in LPAK88 package

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Source-drain diode</b>						
$Q_r$	recovered charge	$I_S = 25\text{ A}$ ; $di_S/dt = -100\text{ A}/\mu\text{s}$ ; $V_{GS} = 0\text{ V}$ ; $V_{DS} = 50\text{ V}$ ; <a href="#">Fig. 17</a>	-	55	-	nC

[1] Protected by 100% test

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 <p>LPAK88 (SOT1235)</p>	 <p>mbb076</p>
2	S	source		
3	S	source		
4	S	source		
mb	D	mounting base; connected to drain		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PSMN2R0-100SSF	LPAK88	plastic, single-ended surface-mounted package (LPAK88); 4 leads; 2 mm pitch; 8 mm x 8 mm x 1.6 mm body	SOT1235

## 7. Marking

Table 4. Marking codes

Type number	Marking code
PSMN2R0-100SSF	X2F0S10S

## 8. Limiting values

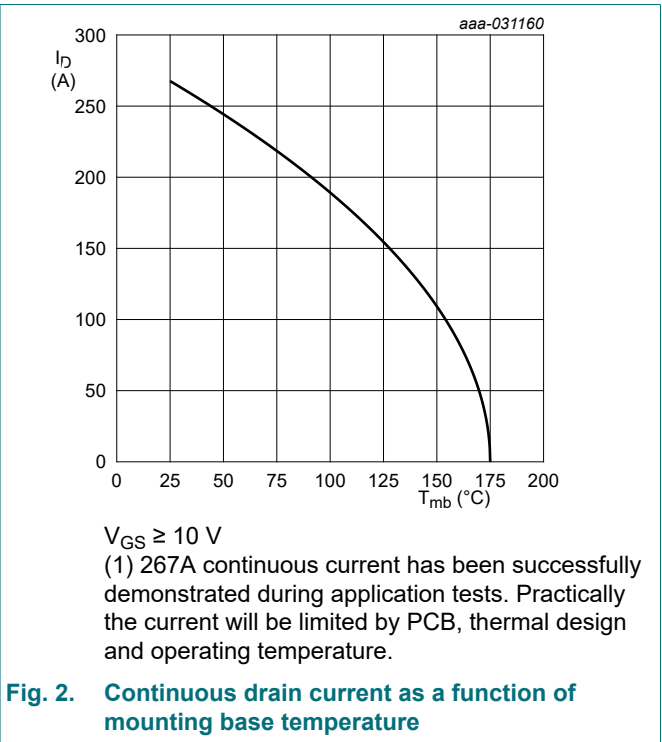
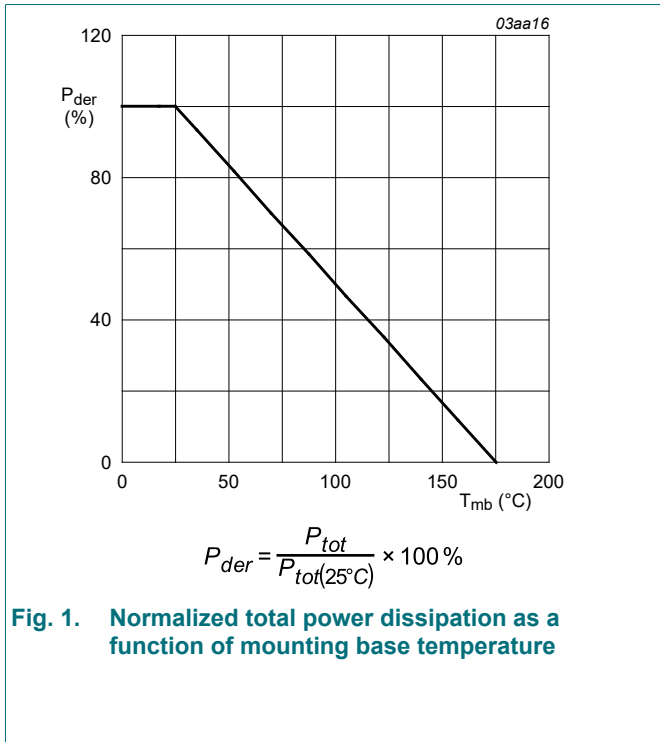
Table 5. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{DS}$	drain-source voltage	$25\text{ °C} \leq T_j \leq 175\text{ °C}$	-	100	V
$V_{DGR}$	drain-gate voltage	$25\text{ °C} \leq T_j \leq 175\text{ °C}$ ; $R_{GS} = 20\text{ k}\Omega$	-	100	V
$V_{GS}$	gate-source voltage		-20	20	V
$P_{tot}$	total power dissipation	$T_{mb} = 25\text{ °C}$ ; <a href="#">Fig. 1</a>	-	341	W
$I_D$	drain current	$V_{GS} = 10\text{ V}$ ; $T_{mb} = 25\text{ °C}$ ; <a href="#">Fig. 2</a>	-	267	A
		$V_{GS} = 10\text{ V}$ ; $T_{mb} = 100\text{ °C}$ ; <a href="#">Fig. 2</a>	-	189	A
$I_{DM}$	peak drain current	pulsed; $t_p \leq 10\text{ }\mu\text{s}$ ; $T_{mb} = 25\text{ °C}$ ; <a href="#">Fig. 3</a>	-	1070	A
$T_{stg}$	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	$T_{mb} = 25\text{ °C}$	-	267	A
$I_{SM}$	peak source current	pulsed; $t_p \leq 10\text{ }\mu\text{s}$ ; $T_{mb} = 25\text{ °C}$	-	1070	A
<b>Avalanche ruggedness</b>					
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 82\text{ A}$ ; $V_{sup} \leq 100\text{ V}$ ; $R_{GS} = 50\text{ }\Omega$ ; $V_{GS} = 10\text{ V}$ ; $T_{j(init)} = 25\text{ °C}$ ; unclamped; $t_p = 137\text{ }\mu\text{s}$ ; <a href="#">Fig. 4</a>	[1]	-	732 mJ
$I_{AS}$	non-repetitive avalanche current	$V_{sup} \leq 100\text{ V}$ ; $V_{GS} = 10\text{ V}$ ; $T_{j(init)} = 25\text{ °C}$ ; $R_{GS} = 50\text{ }\Omega$ ; <a href="#">Fig. 4</a>	[1]	-	82 A

[1] Protected by 100% test



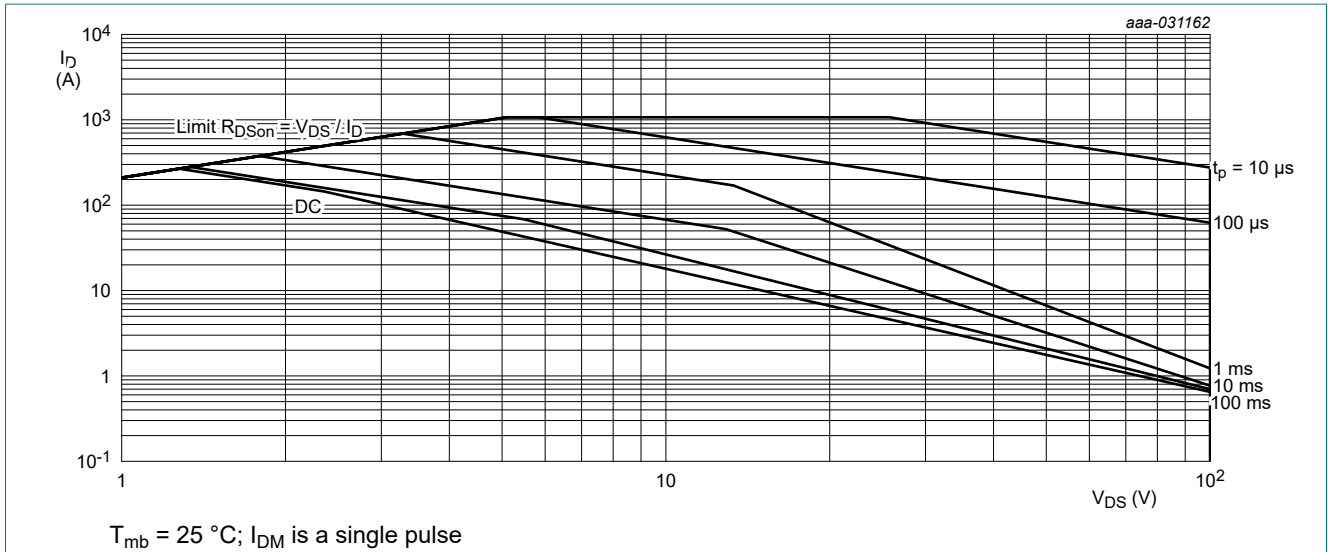


Fig. 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

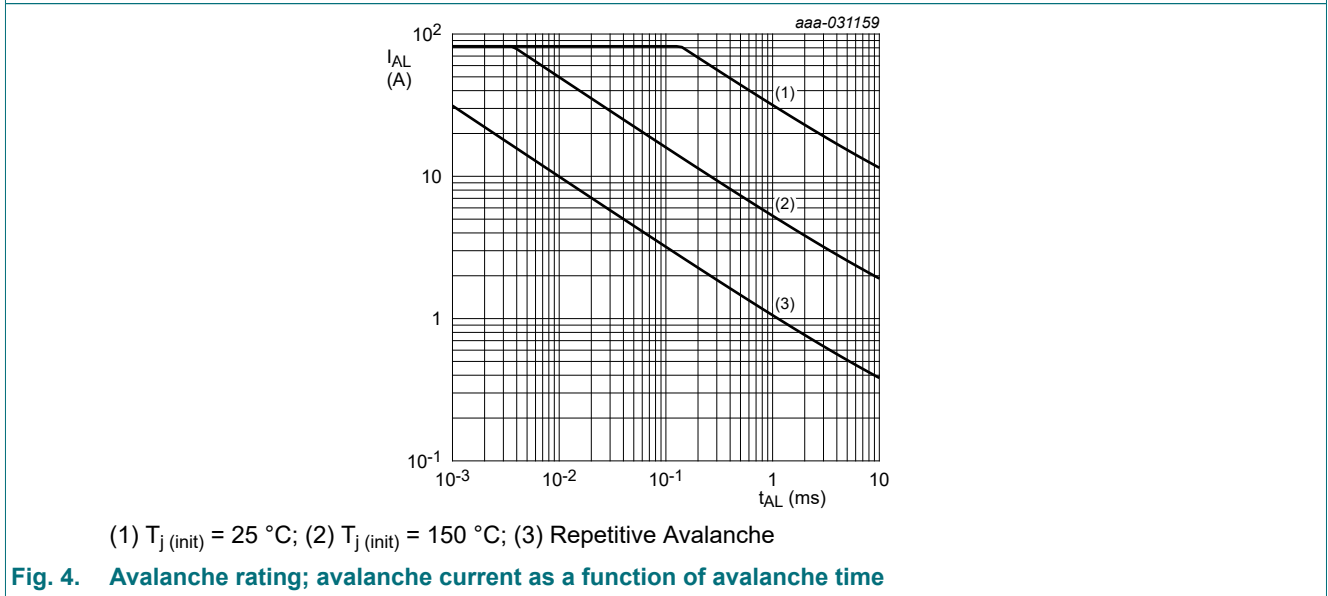


Fig. 4. Avalanche rating; avalanche current as a function of avalanche time

## 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	<a href="#">Fig. 5</a>	-	0.2	0.44	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	<a href="#">Fig. 6</a>	-	35	-	K/W
		<a href="#">Fig. 7</a>	-	70	-	K/W

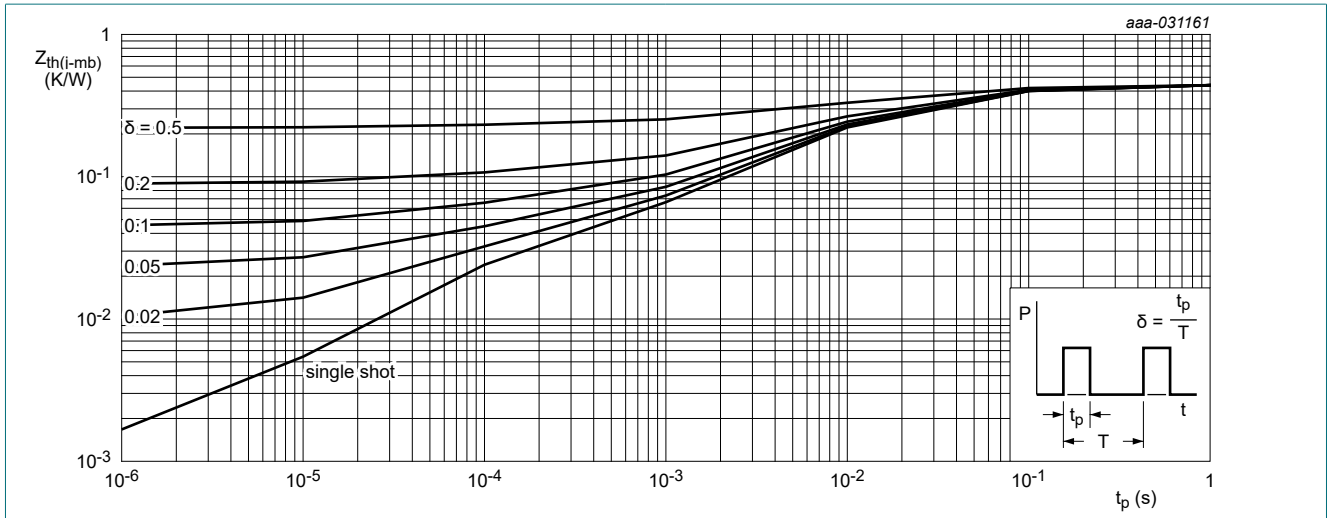


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

aaa-029383

Copper square 25.4 mm x 25.4 mm; 70 μm thick on FR4 board

aaa-029384

70 μm thick copper on FR4 board

Fig. 6. PCB layout for resistance from junction to ambient

Fig. 7. PCB layout with minimum footprint for thermal resistance from junction to ambient

## 10. 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	$I_D = 1 \text{ mA}; V_{DS}=V_{GS}; T_j = 25 \text{ }^\circ C$	2	3	4	V
		$I_D = 1 \text{ mA}; V_{DS}=V_{GS}; T_j = 175 \text{ }^\circ C$	-	1.6	-	V
		$I_D = 1 \text{ mA}; V_{DS}=V_{GS}; T_j = -55 \text{ }^\circ C$	-	3.5	-	V
$\Delta V_{GS(th)}/\Delta T$	gate-source threshold voltage variation with temperature	$25 \text{ }^\circ C \leq T_j \leq 150 \text{ }^\circ C$	-	-8.8	-	mV/K
$I_{DSS}$	drain leakage current	$V_{DS} = 100 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$	-	0.1	1	μA
		$V_{DS} = 100 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 125 \text{ }^\circ C$	-	46	200	μA
$I_{GSS}$	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

## NextPower 100 V, 2.07 mOhm, 267 Amp, N-channel MOSFET in LPAK88 package

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
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. 11</a>	-	1.63	2.07	mΩ
		V <sub>GS</sub> = 7 V; I <sub>D</sub> = 25 A; T <sub>j</sub> = 25 °C; <a href="#">Fig. 11</a>	-	2	3	mΩ
		V <sub>GS</sub> = 10 V; I <sub>D</sub> = 25 A; T <sub>j</sub> = 100 °C; <a href="#">Fig. 12</a>	-	2.6	3.3	mΩ
		V <sub>GS</sub> = 10 V; I <sub>D</sub> = 25 A; T <sub>j</sub> = 175 °C; <a href="#">Fig. 12</a>	-	3.5	4.8	mΩ
R <sub>G</sub>	gate resistance	f = 1 MHz; T <sub>j</sub> = 25 °C	2	1	0.5	Ω
<b>Dynamic characteristics</b>						
Q <sub>G(tot)</sub>	total gate charge	I <sub>D</sub> = 25 A; V <sub>DS</sub> = 50 V; V <sub>GS</sub> = 10 V; <a href="#">Fig. 13</a> ; <a href="#">Fig. 14</a>	80	161	242	nC
		I <sub>D</sub> = 0 A; V <sub>DS</sub> = 0 V; V <sub>GS</sub> = 10 V; <a href="#">Fig. 13</a> ; <a href="#">Fig. 14</a>	-	83	-	nC
Q <sub>GS</sub>	gate-source charge	I <sub>D</sub> = 25 A; V <sub>DS</sub> = 50 V; V <sub>GS</sub> = 10 V; <a href="#">Fig. 13</a> ; <a href="#">Fig. 14</a>	28	47	66	nC
Q <sub>GS(th)</sub>	pre-threshold gate-source charge		-	31.5	-	nC
Q <sub>GS(th-pl)</sub>	post-threshold gate-source charge		-	15.5	-	nC
Q <sub>GD</sub>	gate-drain charge		9	31	71	nC
V <sub>GS(pl)</sub>	gate-source plateau voltage	I <sub>D</sub> = 25 A; V <sub>DS</sub> = 50 V; <a href="#">Fig. 13</a> ; <a href="#">Fig. 14</a>	-	4.4	-	V
C <sub>iss</sub>	input capacitance	V <sub>DS</sub> = 50 V; V <sub>GS</sub> = 0 V; f = 1 MHz; T <sub>j</sub> = 25 °C; <a href="#">Fig. 15</a>	6900	11530	16140	pF
C <sub>oss</sub>	output capacitance		1550	2590	4150	pF
C <sub>rss</sub>	reverse transfer capacitance		4	41	107	pF
t <sub>d(on)</sub>	turn-on delay time	V <sub>DS</sub> = 50 V; R <sub>L</sub> = 2 Ω; V <sub>GS</sub> = 10 V; R <sub>G(ext)</sub> = 5 Ω	-	42	-	ns
t <sub>r</sub>	rise time		-	36	-	ns
t <sub>d(off)</sub>	turn-off delay time		-	95	-	ns
t <sub>f</sub>	fall time		-	47	-	ns
<b>Source-drain diode</b>						
V <sub>SD</sub>	source-drain voltage	I <sub>S</sub> = 25 A; V <sub>GS</sub> = 0 V; T <sub>j</sub> = 25 °C; <a href="#">Fig. 16</a>	-	0.8	1	V
t <sub>rr</sub>	reverse recovery time	I <sub>S</sub> = 25 A; dI <sub>S</sub> /dt = -100 A/μs; V <sub>GS</sub> = 0 V; V <sub>DS</sub> = 50 V; <a href="#">Fig. 17</a>	-	54	-	ns
Q <sub>r</sub>	recovered charge		-	55	-	nC

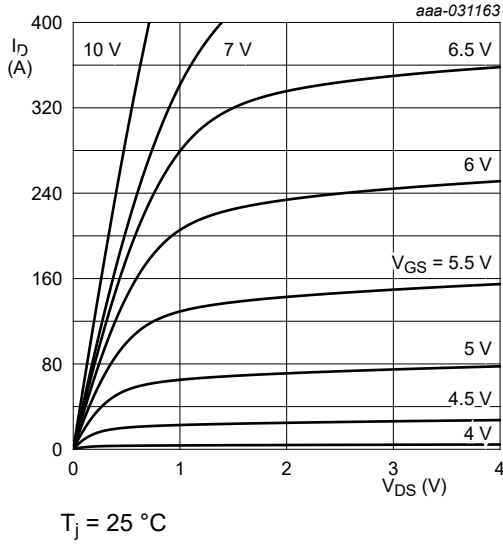


Fig. 8. Output characteristics; drain current as a function of drain-source voltage; typical values

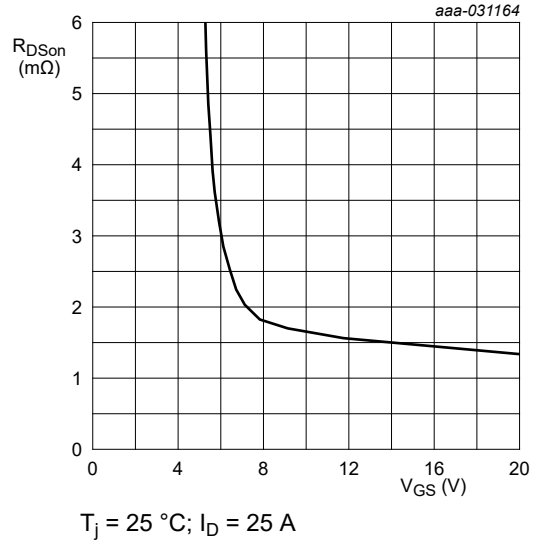


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values

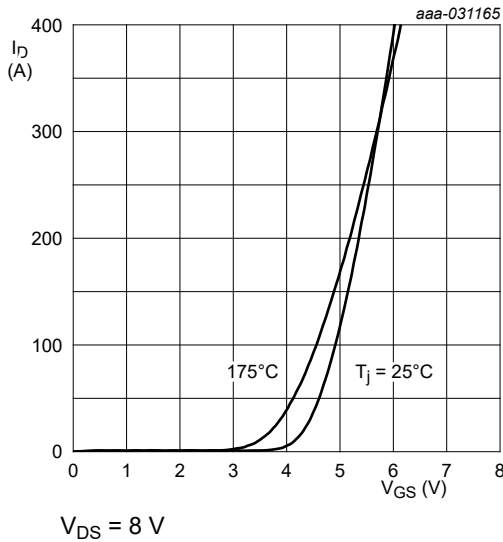


Fig. 10. Transfer characteristics; drain current as a function of gate-source voltage; typical values

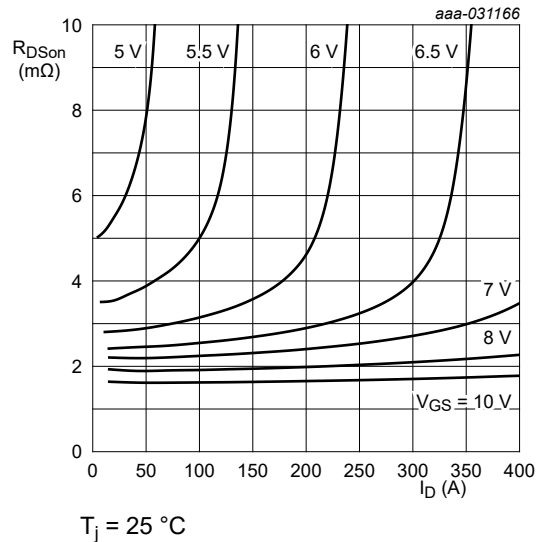
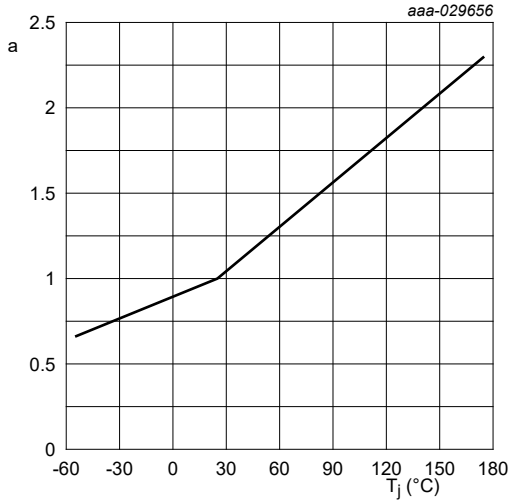
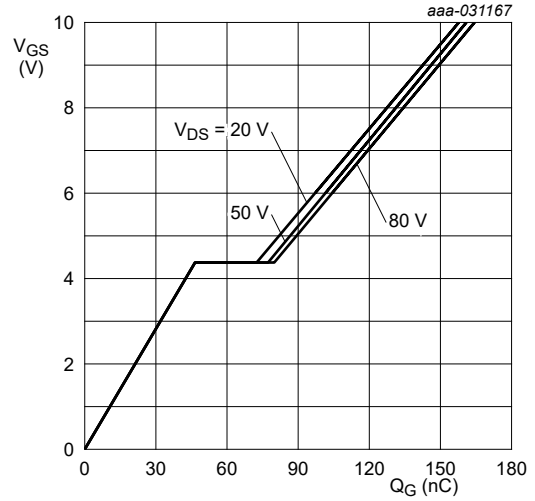


Fig. 11. Drain-source on-state resistance as a function of drain current; typical values



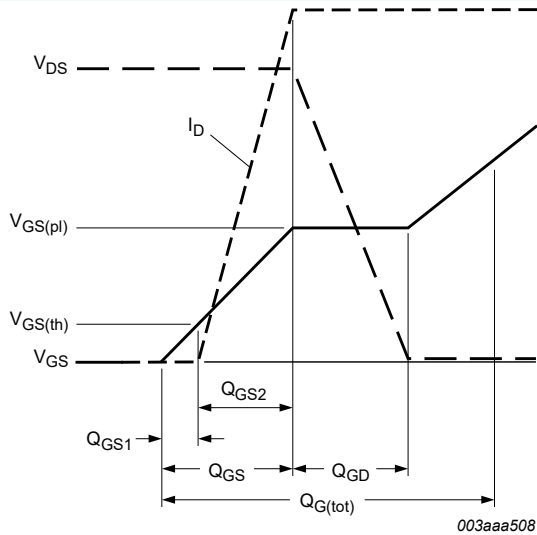
$$a = \frac{R_{DSon}}{R_{DSon}(25^{\circ}\text{C})}$$

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

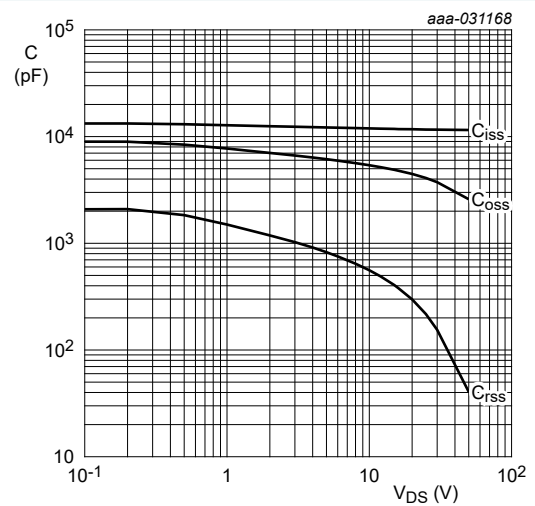


$T_j = 25^{\circ}\text{C}; I_D = 25\text{ A}$

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



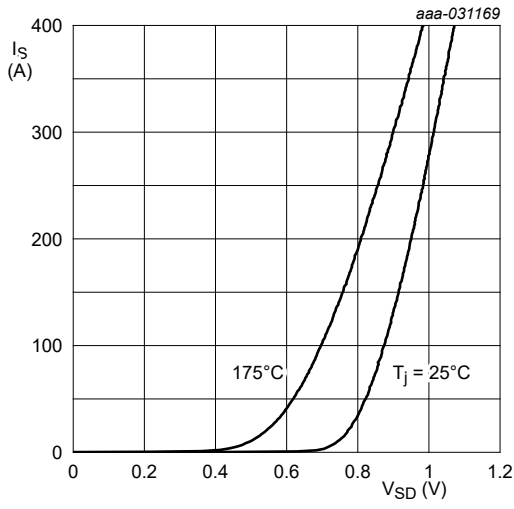
**Fig. 14. Gate charge waveform definitions**



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

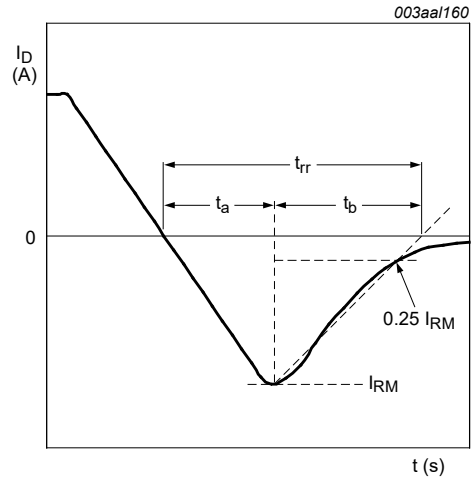
**Fig. 15. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values**





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

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



**Fig. 17. Reverse recovery timing definition**

### 11. Package outline

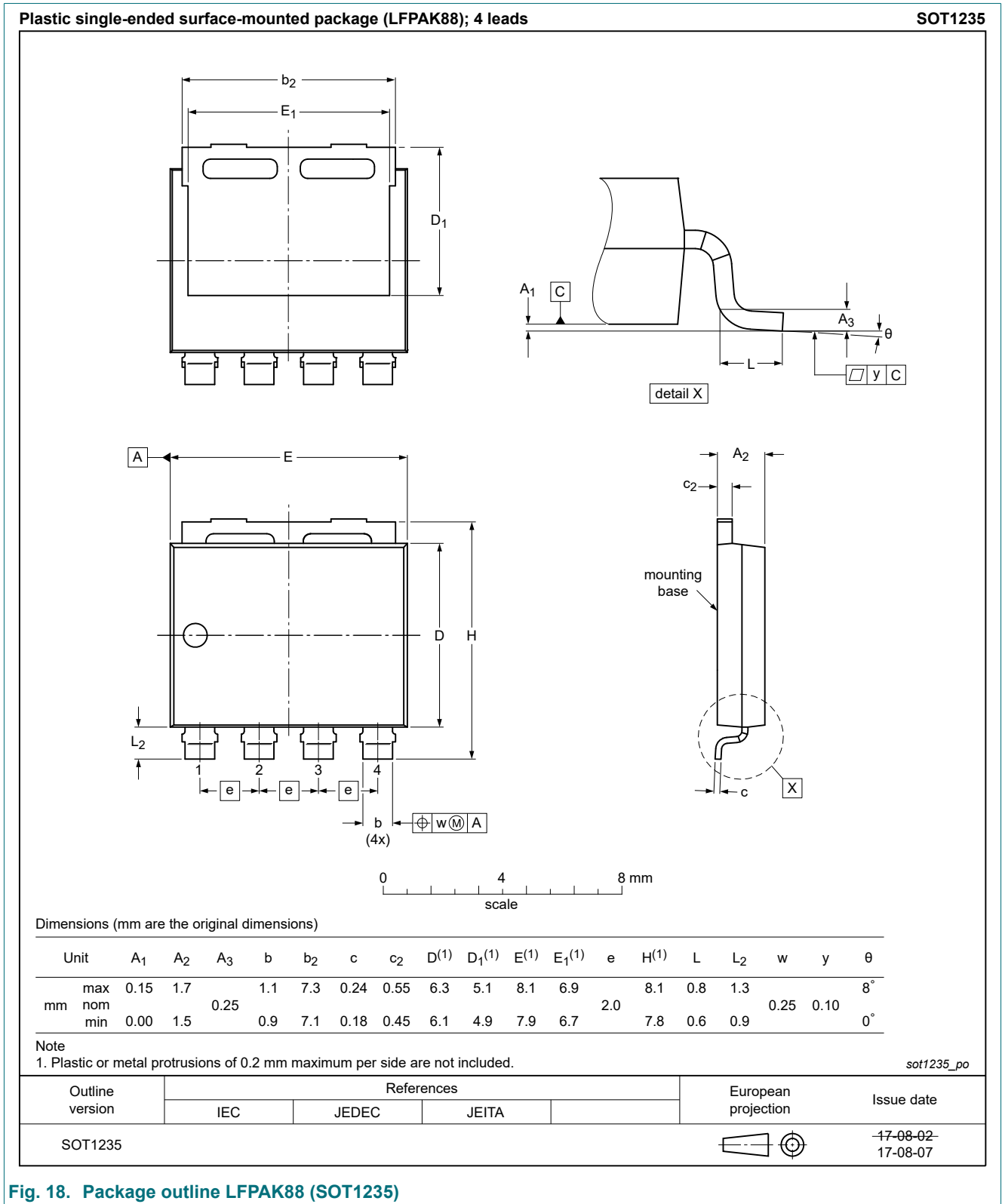
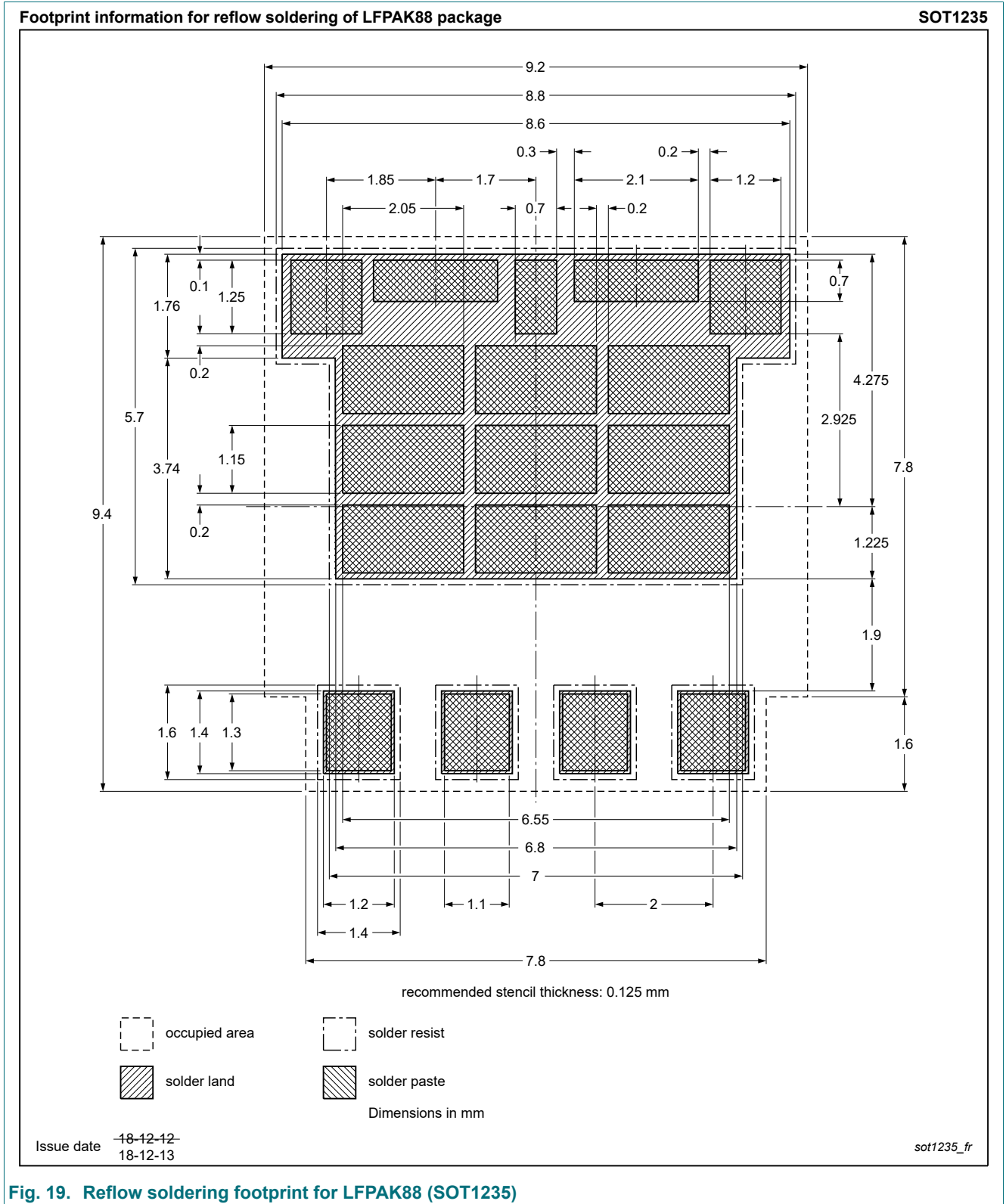


Fig. 18. Package outline LPAK88 (SOT1235)

## 12. Soldering



**Fig. 19. Reflow soldering footprint for LPAK88 (SOT1235)**

## 13. Legal information

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Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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