



PSMN1R8-80SSF

NextPower 80 V, 1.8 mOhm, 270 Amp, N-channel MOSFET in LPAK88 package

16 December 2022

Product data sheet

1. General description

NextPower 80 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
- 270 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 in DC-DC
- BLDC motor control
- Full-bridge and half-bridge applications
- Battery protection

4. Quick reference data

Table 1. Quick reference data

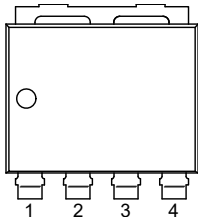
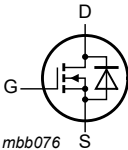
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V _{DS}	drain-source voltage	25 °C ≤ T _j ≤ 175 °C		-	-	80	V
I _D	drain current	V _{GS} = 10 V; T _{mb} = 25 °C; Fig. 2		-	-	270	A
P _{tot}	total power dissipation	T _{mb} = 25 °C; Fig. 1		-	-	341	W
T _j	junction temperature			-55	-	175	°C
Static characteristics							
R _{DSon}	drain-source on-state resistance	V _{GS} = 10 V; I _D = 25 A; T _j = 25 °C; Fig. 11		-	1.35	1.8	mΩ
		V _{GS} = 7 V; I _D = 25 A; T _j = 25 °C; Fig. 11		-	1.7	2.5	mΩ
Dynamic characteristics							
Q _{GD}	gate-drain charge	I _D = 25 A; V _{DS} = 40 V; V _{GS} = 10 V; T _j = 25 °C; Fig. 13 ; Fig. 14		7	25	58	nC
Q _{G(tot)}	total gate charge			74	148	222	nC
Avalanche ruggedness							
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	I _D = 89.3 A; V _{sup} ≤ 80 V; R _{GS} = 50 Ω; V _{GS} = 10 V; T _{j(init)} = 25 °C; unclamped; t _p = 182 μs; Fig. 4	[1]	-	-	847	mJ

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Source-drain diode						
Q _r	recovered charge	I _S = 25 A; dI _S /dt = -100 A/μs; V _{GS} = 0 V; V _{DS} = 40 V; T _j = 25 °C; Fig. 17	-	59	-	nC

[1] Protected by 100% test

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 LPAK88 (SOT1235)	 mbb076
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
PSMN1R8-80SSF	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
PSMN1R8-80SSF	X1F8S80S

8. Limiting values

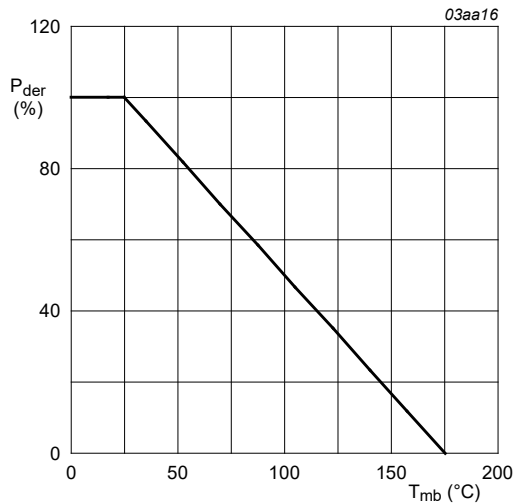
Table 5. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
V _{DS}	drain-source voltage	25 °C ≤ T _j ≤ 175 °C	-	80	V
V _{DGR}	drain-gate voltage	25 °C ≤ T _j ≤ 175 °C; R _{GS} = 20 kΩ	-	80	V
V _{GS}	gate-source voltage		-20	20	V
P _{tot}	total power dissipation	T _{mb} = 25 °C; Fig. 1	-	341	W
I _D	drain current	V _{GS} = 10 V; T _{mb} = 25 °C; Fig. 2	-	270	A
		V _{GS} = 10 V; T _{mb} = 100 °C; Fig. 2	-	205	A
I _{DM}	peak drain current	pulsed; t _p ≤ 10 μs; T _{mb} = 25 °C; Fig. 3	-	1158	A
T _{stg}	storage temperature		-55	175	°C

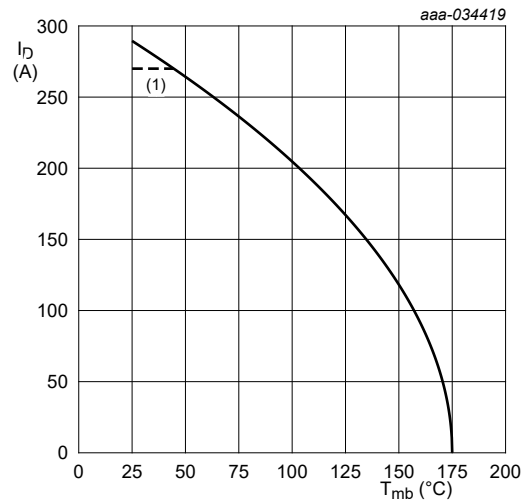
Symbol	Parameter	Conditions		Min	Max	Unit
T_j	junction temperature			-55	175	°C
$T_{sld(M)}$	peak soldering temperature			-	260	°C
Source-drain diode						
I_S	source current	$T_{mb} = 25\text{ °C}$		-	270	A
I_{SM}	peak source current	pulsed; $t_p \leq 10\text{ }\mu\text{s}$; $T_{mb} = 25\text{ °C}$		-	1158	A
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 89.3\text{ A}$; $V_{sup} \leq 80\text{ V}$; $R_{GS} = 50\text{ }\Omega$; $V_{GS} = 10\text{ V}$; $T_{j(\text{init})} = 25\text{ °C}$; unclamped; $t_p = 182\text{ }\mu\text{s}$; Fig. 4	[1]	-	847	mJ
I_{AS}	non-repetitive avalanche current	$V_{sup} \leq 80\text{ V}$; $V_{GS} = 10\text{ V}$; $T_{j(\text{init})} = 25\text{ °C}$; $R_{GS} = 50\text{ }\Omega$; Fig. 4	[1]	-	89.3	A

[1] Protected by 100% test



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

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



$V_{GS} \geq 10\text{ V}$

(1) 270A continuous current has been successfully demonstrated during application tests. Practically the current will be limited by PCB, thermal design and operating temperature.

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

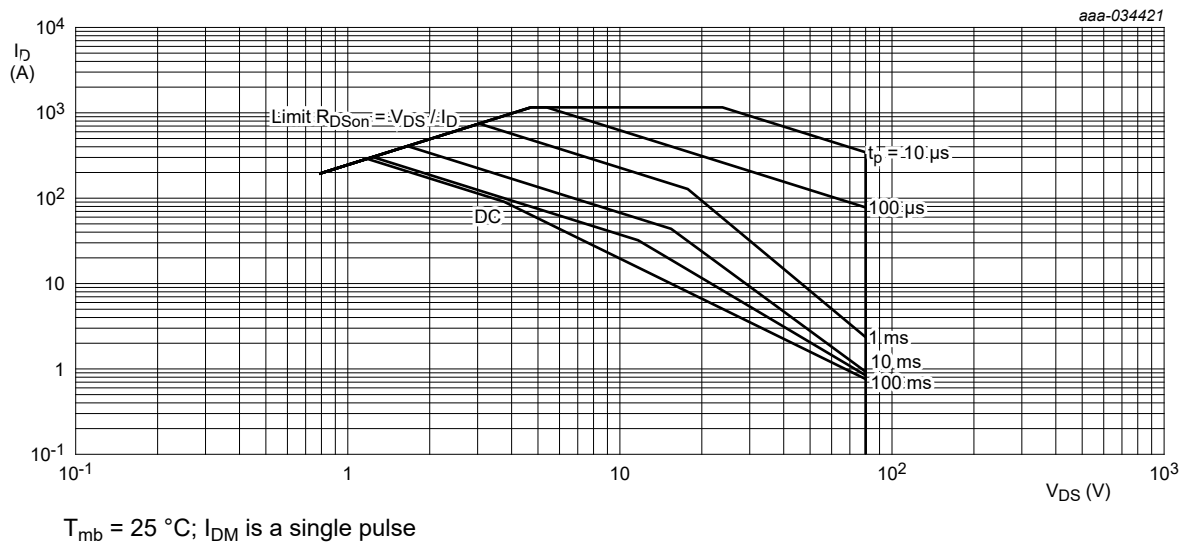
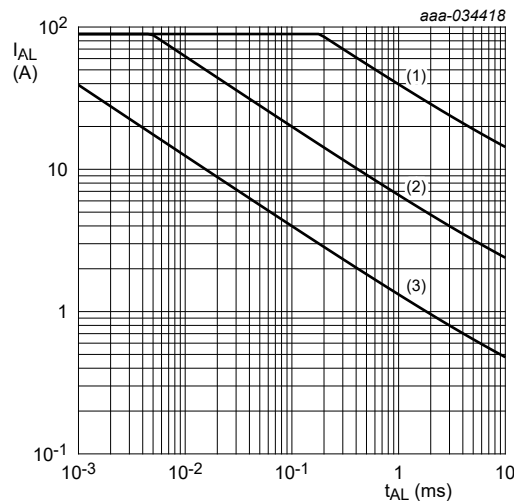


Fig. 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage



(1) $T_{j (init)} = 25 \text{ }^\circ\text{C}$; (2) $T_{j (init)} = 150 \text{ }^\circ\text{C}$; (3) Repetitive Avalanche

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

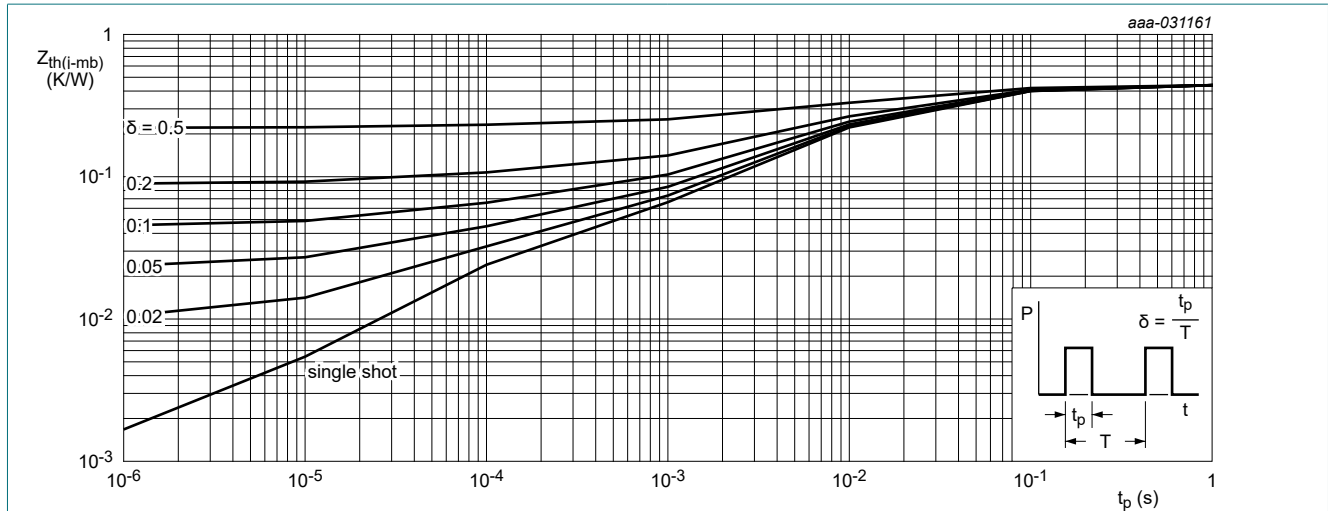
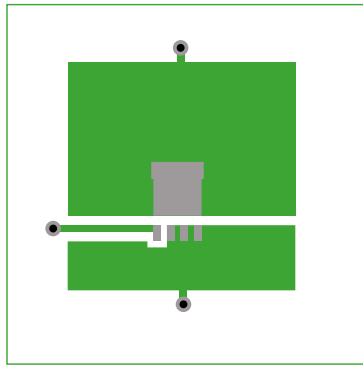
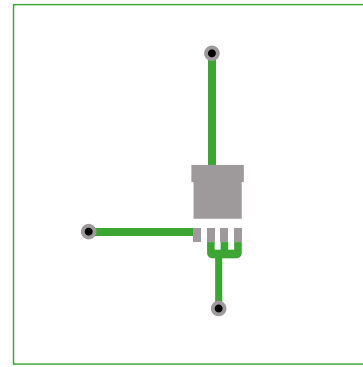


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration



Copper square 25.4 mm square; 70 μ m thick on FR4 board

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



70 μ m thick copper on FR4 board

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
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A$; $V_{GS} = 0 V$; $T_j = 25 ^\circ C$	80	-	-	V
		$I_D = 250 \mu A$; $V_{GS} = 0 V$; $T_j = -55 ^\circ C$	72	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 mA$; $V_{DS} = V_{GS}$; $T_j = 25 ^\circ C$	2	3	4	V
		$I_D = 1 mA$; $V_{DS} = V_{GS}$; $T_j = -55 ^\circ C$	-	3.5	-	V
		$I_D = 1 mA$; $V_{DS} = V_{GS}$; $T_j = 175 ^\circ C$	-	1.6	-	V
$\Delta V_{GS(th)}/\Delta T$	gate-source threshold voltage variation with temperature	$25 ^\circ C \leq T_j \leq 150 ^\circ C$	-	-8.4	-	mV/K
I_{DSS}	drain leakage current	$V_{DS} = 80 V$; $V_{GS} = 0 V$; $T_j = 25 ^\circ C$	-	0.06	1	μA
		$V_{DS} = 80 V$; $V_{GS} = 0 V$; $T_j = 125 ^\circ C$	-	20	100	μA
I_{GSS}	gate leakage current	$V_{GS} = 20 V$; $V_{DS} = 0 V$; $T_j = 25 ^\circ C$	-	2	100	nA
		$V_{GS} = -20 V$; $V_{DS} = 0 V$; $T_j = 25 ^\circ C$	-	2	100	nA

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
R _{DSon}	drain-source on-state resistance	V _{GS} = 10 V; I _D = 25 A; T _j = 25 °C; Fig. 11		-	1.35	1.8	mΩ
		V _{GS} = 7 V; I _D = 25 A; T _j = 25 °C; Fig. 11		-	1.7	2.5	mΩ
		V _{GS} = 10 V; I _D = 25 A; T _j = 100 °C; Fig. 12		-	2	2.9	mΩ
		V _{GS} = 10 V; I _D = 25 A; T _j = 175 °C; Fig. 12		-	2.8	4.1	mΩ
R _G	gate resistance	f = 1 MHz; T _j = 25 °C		0.8	1.6	3.2	Ω
Dynamic characteristics							
Q _{G(tot)}	total gate charge	I _D = 25 A; V _{DS} = 40 V; V _{GS} = 10 V; T _j = 25 °C; Fig. 13 ; Fig. 14		74	148	222	nC
		I _D = 0 A; V _{DS} = 0 V; V _{GS} = 10 V; T _j = 25 °C		-	77	-	nC
Q _{GS}	gate-source charge	I _D = 25 A; V _{DS} = 40 V; V _{GS} = 10 V; T _j = 25 °C; Fig. 13 ; Fig. 14		26	44	62	nC
Q _{GS(th)}	pre-threshold gate-source charge			-	30	-	nC
Q _{GS(th-pl)}	post-threshold gate-source charge			-	14	-	nC
Q _{GD}	gate-drain charge			7	25	58	nC
V _{GS(pl)}	gate-source plateau voltage	I _D = 25 A; V _{DS} = 40 V; T _j = 25 °C; Fig. 13 ; Fig. 14		-	4.3	-	V
C _{iss}	input capacitance	V _{DS} = 40 V; V _{GS} = 0 V; f = 0.5 MHz; T _j = 25 °C; Fig. 15		6565	10946	15319	pF
C _{oss}	output capacitance			1925	3209	5134	pF
C _{rss}	reverse transfer capacitance			8	81	244	pF
t _{d(on)}	turn-on delay time	V _{DS} = 40 V; R _L = 1.6 Ω; V _{GS} = 10 V; R _{G(ext)} = 5 Ω; T _j = 25 °C		-	40	-	ns
t _r	rise time			-	33	-	ns
t _{d(off)}	turn-off delay time			-	90	-	ns
t _f	fall time			-	45	-	ns
Source-drain diode							
V _{SD}	source-drain voltage	I _S = 25 A; V _{GS} = 0 V; T _j = 25 °C; Fig. 16		-	0.8	1	V
t _{rr}	reverse recovery time	I _S = 25 A; dI _S /dt = -100 A/μs; V _{GS} = 0 V; V _{DS} = 40 V; T _j = 25 °C; Fig. 17		-	56	-	ns
Q _r	recovered charge			-	59	-	nC

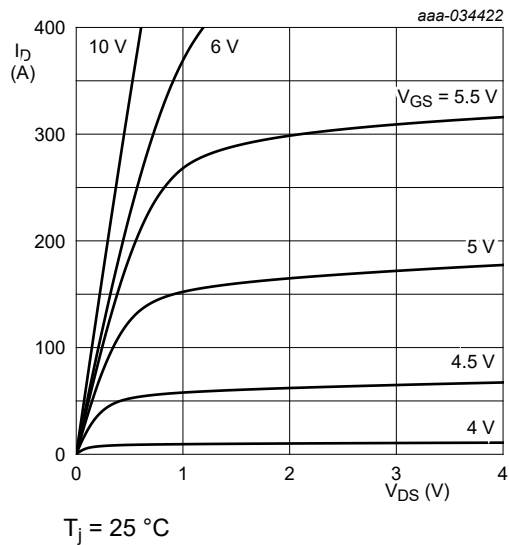


Fig. 8. Output characteristics; drain current as a function of drain-source voltage; typical values

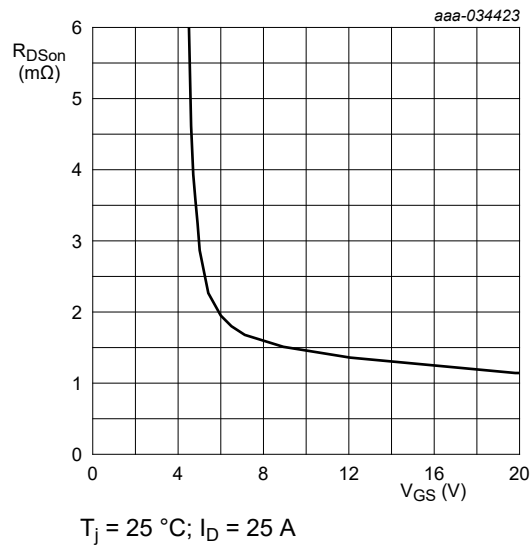


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values

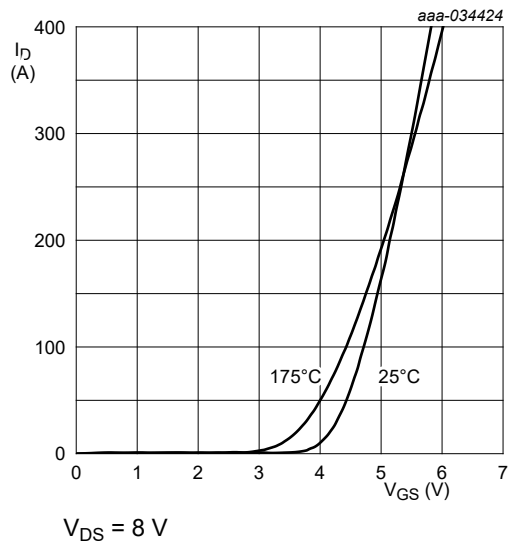


Fig. 10. Transfer characteristics; drain current as a function of gate-source voltage; typical values

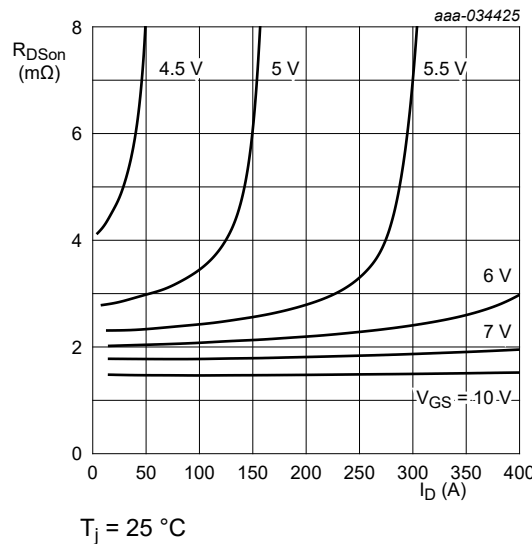


Fig. 11. Drain-source on-state resistance as a function of drain current; typical values

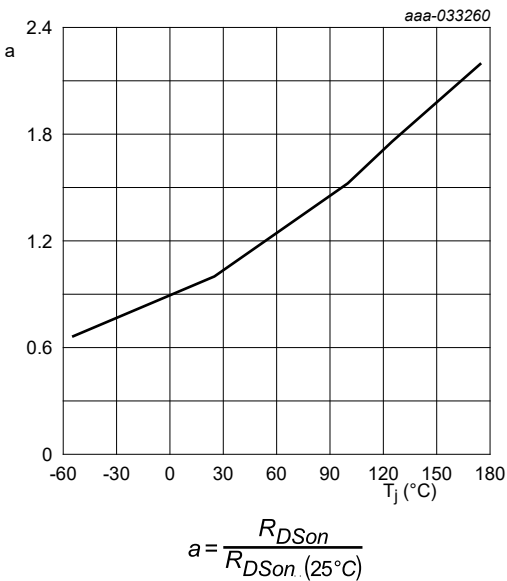


Fig. 12. Normalized drain-source on-state resistance factor as a function of junction temperature

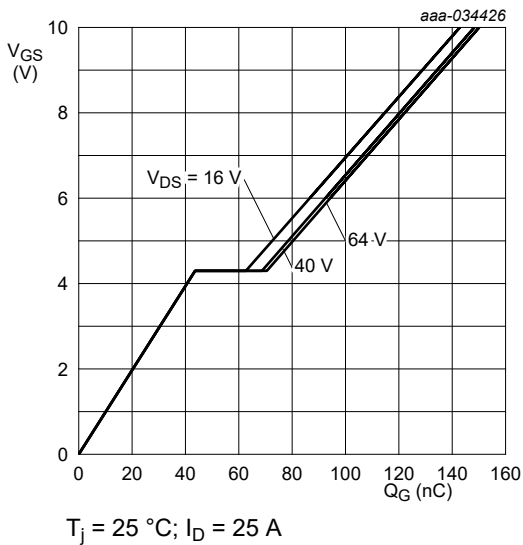


Fig. 13. Gate-source voltage as a function of gate charge; typical values

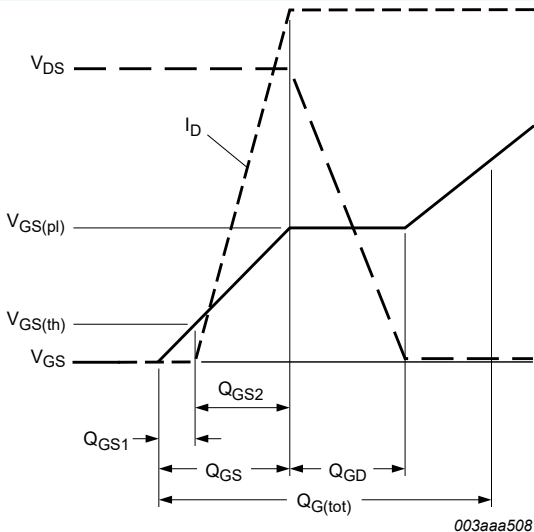


Fig. 14. Gate charge waveform definitions

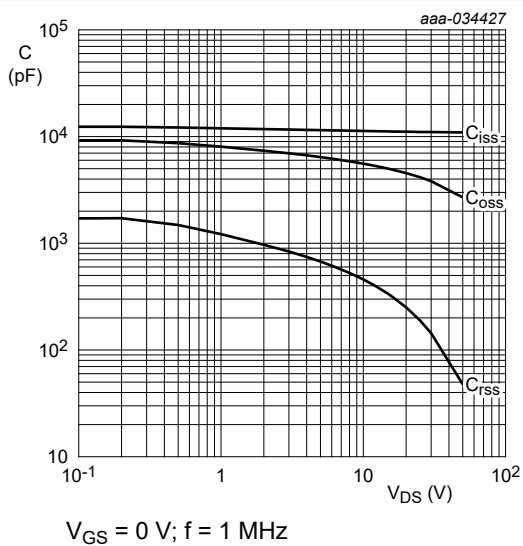


Fig. 15. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

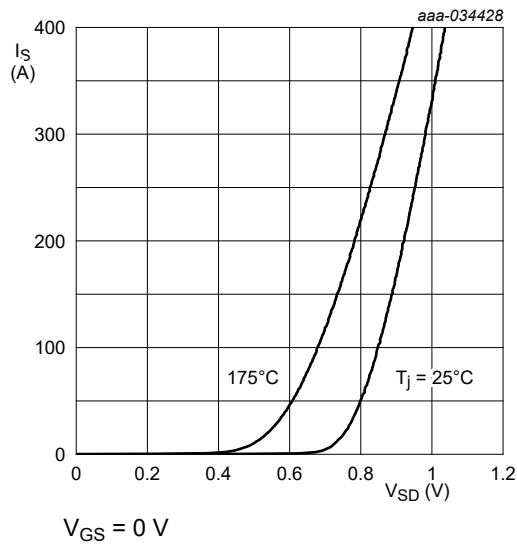


Fig. 16. Source-drain (diode forward) current as a function of source-drain (diode forward) voltage; typical values

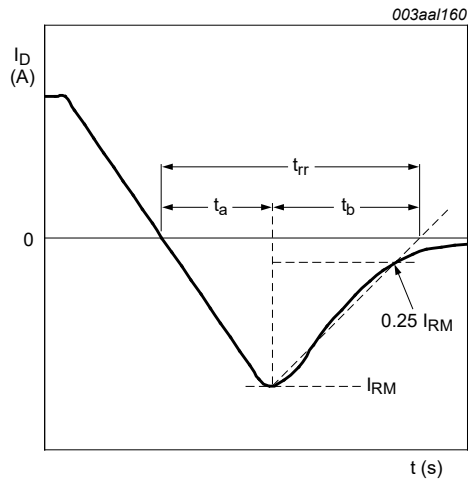
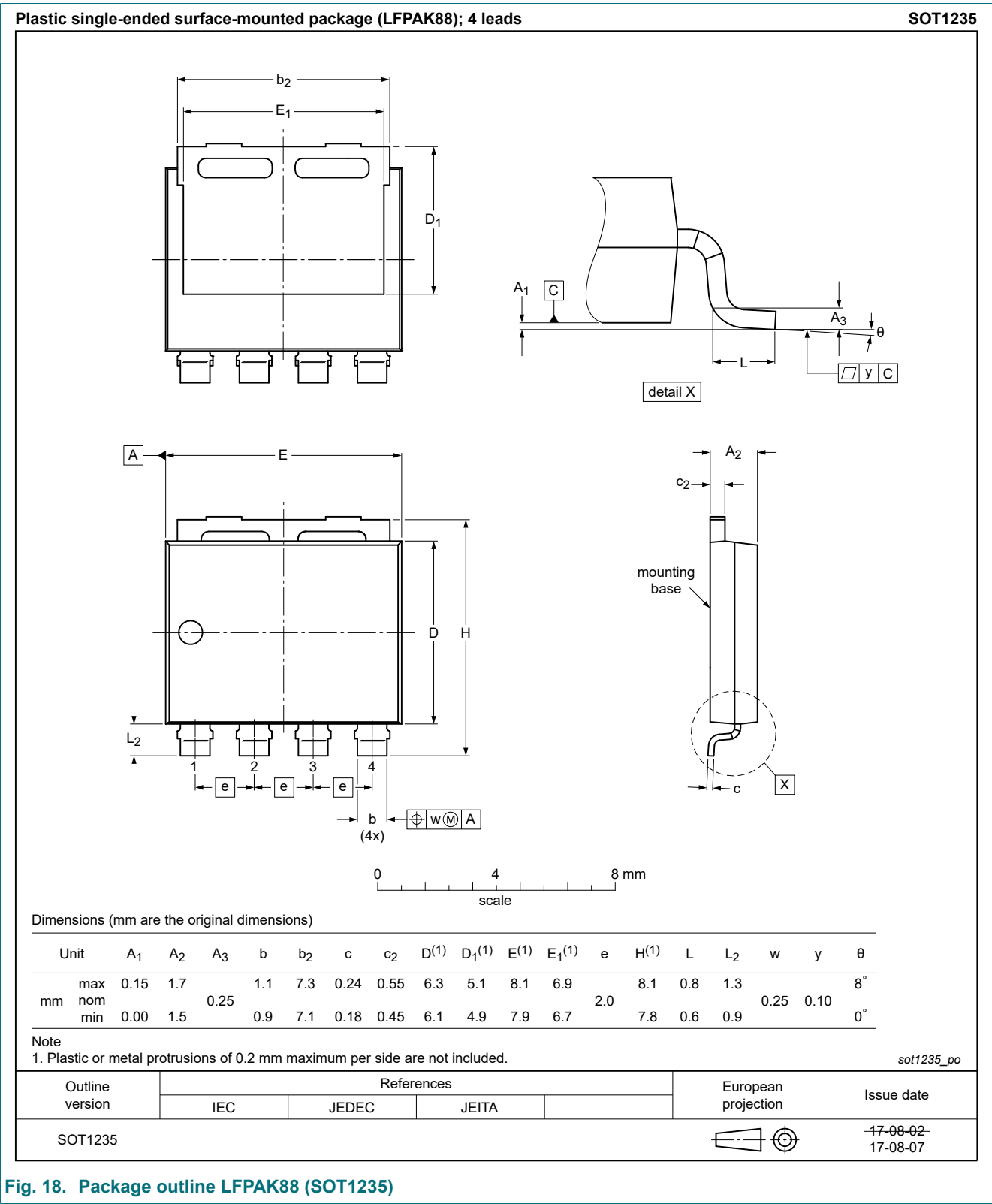


Fig. 17. Reverse recovery timing definition

11. Package outline



12. Soldering

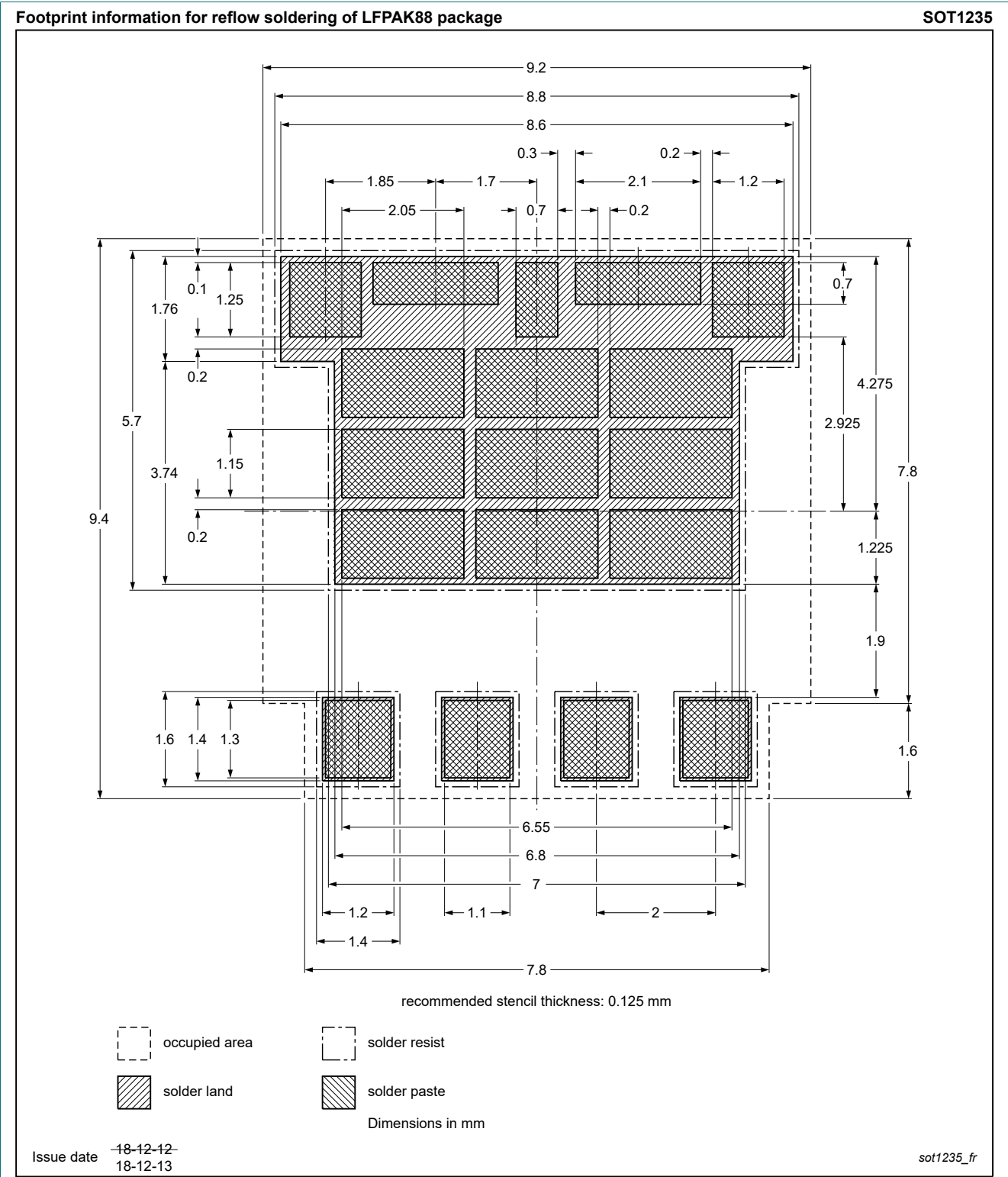


Fig. 19. Reflow soldering footprint for LPAK88 (SOT1235)

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.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

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- [2] The term 'short data sheet' is explained in section "Definitions".
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