



PSMN2R3-80SSF

NextPower 80 V, 2.3 mOhm, 240 Amp, N-channel MOSFET in LPAK88 package

3 July 2024

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
- 240 Amps $I_{D(max)}$ continuous current rating
- Low $Q_G \times R_{DS(on)}$ 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		-	-	240	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. 12		-	1.7	2.3	mΩ
		V _{GS} = 10 V; I _D = 25 A; T _j = 100 °C; Fig. 13		-	2.6	3.5	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. 14 ; Fig. 15		7	22	51	nC
Q _{G(tot)}	total gate charge			61	123	184	nC
Avalanche ruggedness							
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	I _D = 78 A; V _{sup} ≤ 80 V; R _{GS} = 50 Ω; V _{GS} = 10 V; T _{j(i nit)} = 25 °C; unclamped; t _p = 163 μs; Fig. 4	[1]	-	-	663	mJ

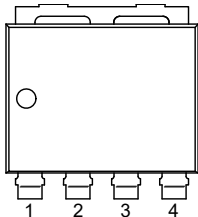
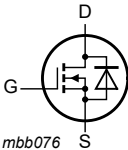
NextPower 80 V, 2.3 mOhm, 240 Amp, N-channel MOSFET in LPAK88 package

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Source-drain diode							
Q_r	recovered charge	$I_S = 25\text{ A}$; $dI_S/dt = -100\text{ A}/\mu\text{s}$; $V_{GS} = 0\text{ V}$; $V_{DS} = 40\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 18		-	47	-	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
PSMN2R3-80SSF	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
PSMN2R3-80SSF	X2F3S80S

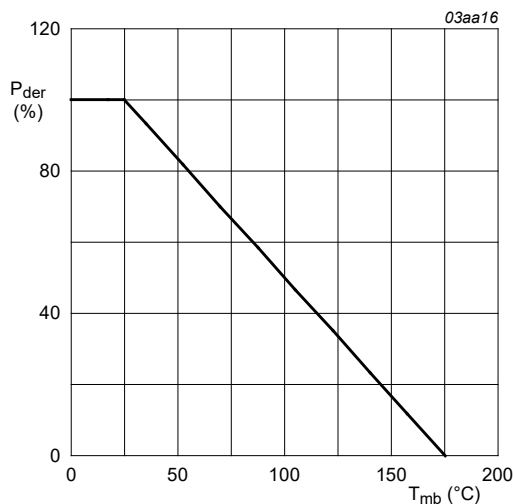
8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). $T_j = 25\text{ °C}$ unless otherwise stated.

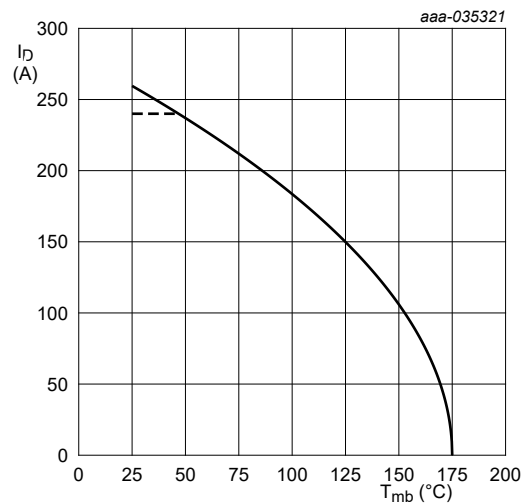
Symbol	Parameter	Conditions		Min	Max	Unit
V_{DS}	drain-source voltage	$25\text{ °C} \leq T_j \leq 175\text{ °C}$		-	80	V
V_{DGR}	drain-gate voltage	$25\text{ °C} \leq T_j \leq 175\text{ °C}$; $R_{GS} = 20\text{ k}\Omega$		-	80	V
V_{GS}	gate-source voltage			-20	20	V
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}$; Fig. 1		-	341	W
I_D	drain current	$V_{GS} = 10\text{ V}$; $T_{mb} = 25\text{ °C}$; Fig. 2		-	240	A
		$V_{GS} = 10\text{ V}$; $T_{mb} = 100\text{ °C}$; Fig. 2		-	183	A
I_{DM}	peak drain current	pulsed; $t_p \leq 10\text{ }\mu\text{s}$; $T_{mb} = 25\text{ °C}$; Fig. 3		-	1038	A
T_{stg}	storage temperature			-55	175	°C
T_j	junction temperature			-55	175	°C
$T_{sld(M)}$	peak soldering temperature			-	260	°C
Source-drain diode						
I_S	source current	$T_{mb} = 25\text{ °C}$		-	240	A
I_{SM}	peak source current	pulsed; $t_p \leq 10\text{ }\mu\text{s}$; $T_{mb} = 25\text{ °C}$		-	1038	A
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 78\text{ A}$; $V_{sup} \leq 80\text{ V}$; $R_{GS} = 50\text{ }\Omega$; $V_{GS} = 10\text{ V}$; $T_{j(\text{init})} = 25\text{ °C}$; unclamped; $t_p = 163\text{ }\mu\text{s}$; Fig. 4	[1]	-	663	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]	-	78	A

[1] Protected by 100% test



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

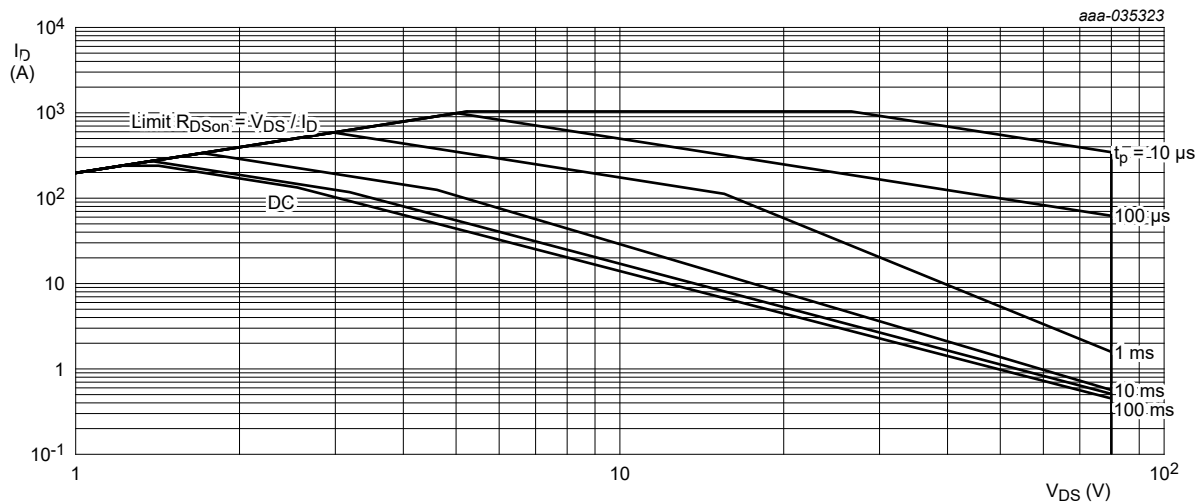
Fig. 1. Normalized total power dissipation as a function of mounting base temperature



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

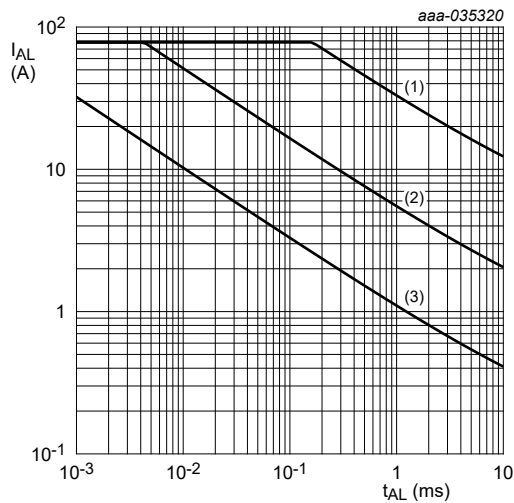
(1) 240 A continuous current has been successfully demonstrated during application tests. Practically the current will be limited by PCB, thermal design and operating temperature.

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



$T_{mb} = 25\text{ }^{\circ}\text{C}$; I_{DM} is a single pulse

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



(1) $T_{j\text{ (init)}} = 25\text{ }^{\circ}\text{C}$; (2) $T_{j\text{ (init)}} = 150\text{ }^{\circ}\text{C}$; (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	-	0.22	0.44	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	Fig. 6	-	35	-	K/W
		Fig. 7	-	70	-	K/W

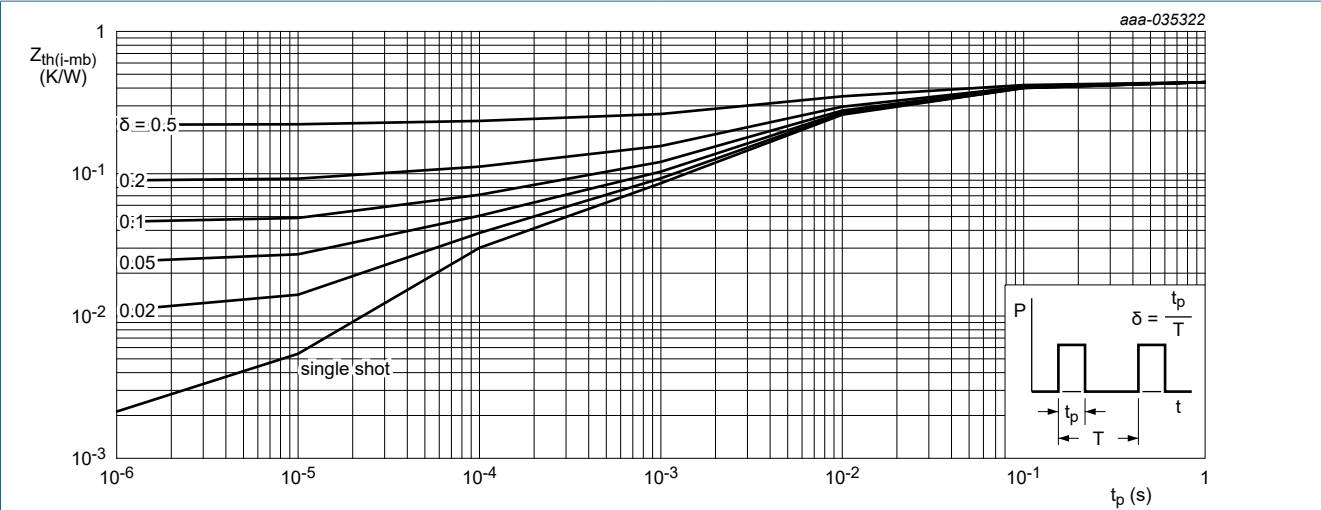
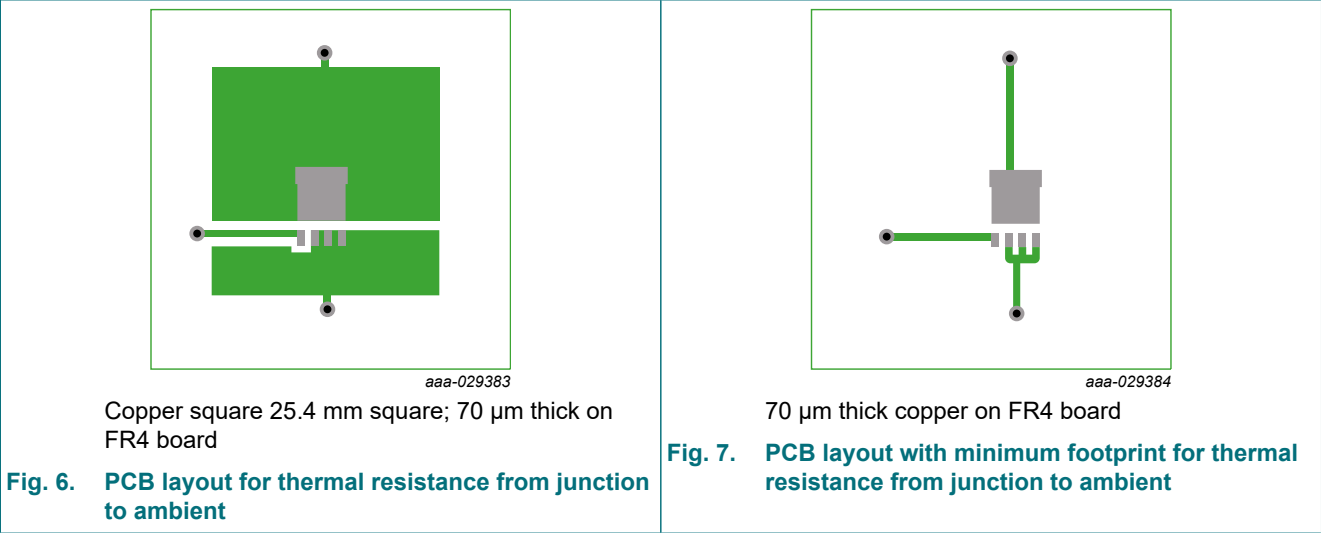


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration



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	$I_D = 1\ mA$; $V_{DS} = V_{GS}$; $T_J = 25\ ^\circ C$; Fig. 11		2	3	4	V
		$I_D = 1\ mA$; $V_{DS} = V_{GS}$; $T_J = 175\ ^\circ C$		-	1.6	-	V
		$I_D = 1\ mA$; $V_{DS} = V_{GS}$; $T_J = -55\ ^\circ C$		-	3.5	-	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	$V_{DS} = 80\ V$; $V_{GS} = 0\ V$; $T_J = 25\ ^\circ C$		-	0.08	1	μA
		$V_{DS} = 80\ V$; $V_{GS} = 0\ V$; $T_J = 125\ ^\circ C$		-	26	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
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\ V$; $I_D = 25\ A$; $T_J = 25\ ^\circ C$; Fig. 12		-	1.7	2.3	m Ω
		$V_{GS} = 7\ V$; $I_D = 25\ A$; $T_J = 25\ ^\circ C$; Fig. 12		-	2.1	3.4	m Ω
		$V_{GS} = 10\ V$; $I_D = 25\ A$; $T_J = 100\ ^\circ C$; Fig. 13		-	2.6	3.5	m Ω
		$V_{GS} = 10\ V$; $I_D = 25\ A$; $T_J = 175\ ^\circ C$; Fig. 13		-	3.6	5.1	m Ω
R_G	gate resistance	$f = 1\ MHz$; $T_J = 25\ ^\circ C$		0.5	1	2	Ω
Dynamic characteristics							
$Q_{G(tot)}$	total gate charge	$I_D = 25\ A$; $V_{DS} = 40\ V$; $V_{GS} = 10\ V$; $T_J = 25\ ^\circ C$; Fig. 14 ; Fig. 15		61	123	184	nC
		$I_D = 0\ A$; $V_{DS} = 0\ V$; $V_{GS} = 10\ V$; $T_J = 25\ ^\circ C$		-	64	-	nC
Q_{GS}	gate-source charge	$I_D = 25\ A$; $V_{DS} = 40\ V$; $V_{GS} = 10\ V$; $T_J = 25\ ^\circ C$; Fig. 14 ; Fig. 15		21	35	49	nC
$Q_{GS(th)}$	pre-threshold gate-source charge			-	24	-	nC
$Q_{GS(th-pl)}$	post-threshold gate-source charge			-	11	-	nC
Q_{GD}	gate-drain charge			7	22	51	nC
$V_{GS(pl)}$	gate-source plateau voltage	$I_D = 25\ A$; $V_{DS} = 40\ V$; $T_J = 25\ ^\circ C$; Fig. 14 ; Fig. 15		-	4.3	-	V
C_{iss}	input capacitance	$V_{DS} = 40\ V$; $V_{GS} = 0\ V$; $f = 0.5\ MHz$; $T_J = 25\ ^\circ C$; Fig. 16		5280	8800	12320	pF
C_{oss}	output capacitance			1530	2550	4080	pF
C_{rss}	reverse transfer capacitance			9	87	260	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 40\ V$; $R_L = 1.6\ \Omega$; $V_{GS} = 10\ V$; $R_{G(ext)} = 5\ \Omega$; $T_J = 25\ ^\circ C$		-	32	-	ns
t_r	rise time			-	28	-	ns
$t_{d(off)}$	turn-off delay time			-	82	-	ns
t_f	fall time			-	40	-	ns

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Source-drain diode						
V_{SD}	source-drain voltage	$I_S = 25\text{ A}$; $V_{GS} = 0\text{ V}$; $T_J = 25\text{ }^{\circ}\text{C}$; Fig. 17	-	0.8	1.2	V
t_{rr}	reverse recovery time	$I_S = 25\text{ A}$; $dI_S/dt = -100\text{ A}/\mu\text{s}$; $V_{GS} = 0\text{ V}$;	-	49	-	ns
Q_r	recovered charge	$V_{DS} = 40\text{ V}$; $T_J = 25\text{ }^{\circ}\text{C}$; Fig. 18	-	47	-	nC

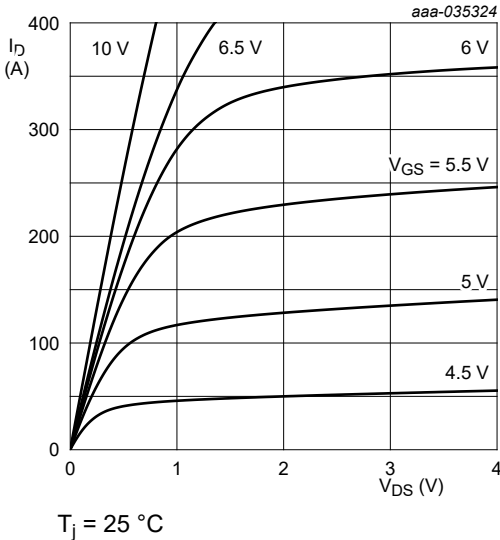


Fig. 8. Output characteristics; drain current as a function of drain-source voltage; typical values

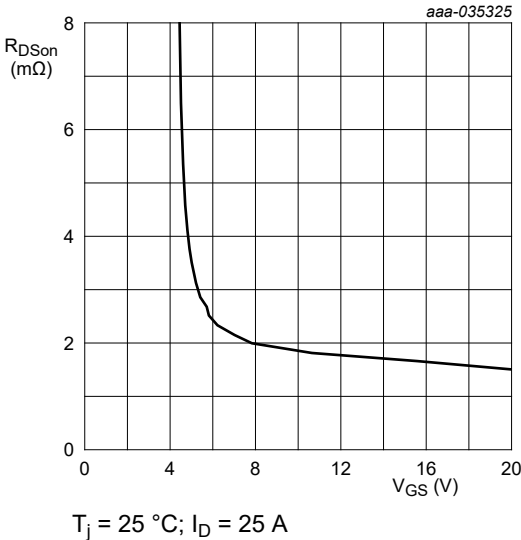


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values

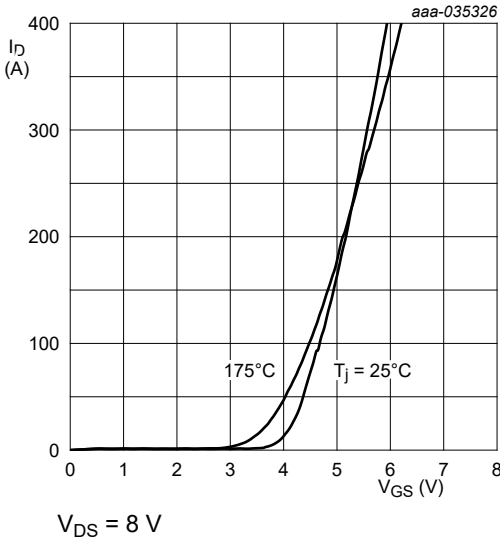


Fig. 10. Transfer characteristics; drain current as a function of gate-source voltage; typical values

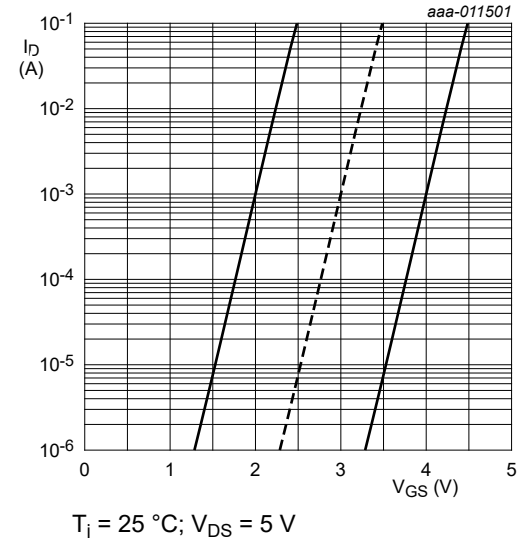


Fig. 11. Sub-threshold drain current as a function of gate-source voltage

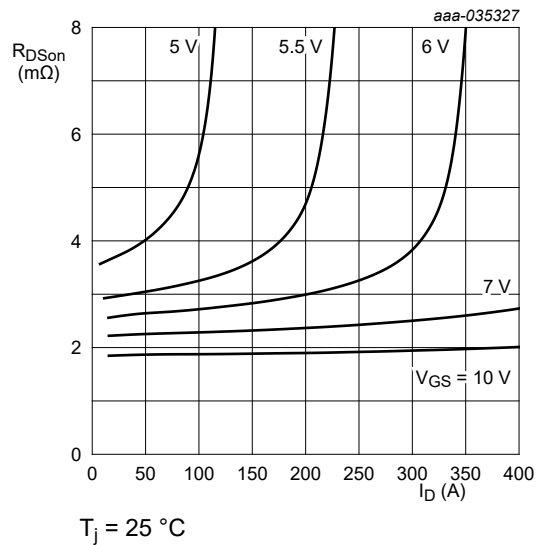


Fig. 12. Drain-source on-state resistance as a function of drain current; typical values

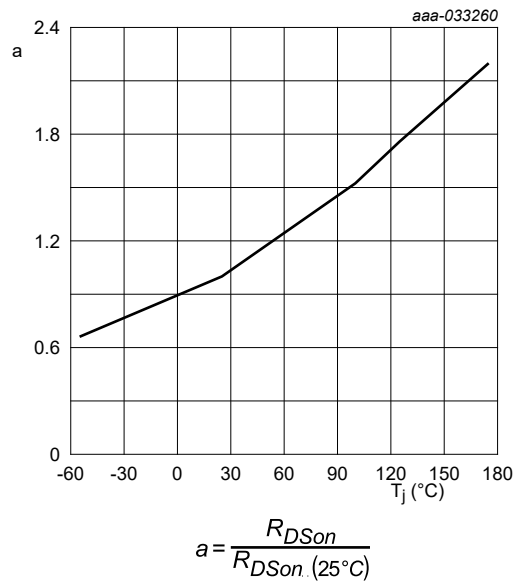


Fig. 13. Normalized drain-source on-state resistance factor as a function of junction temperature

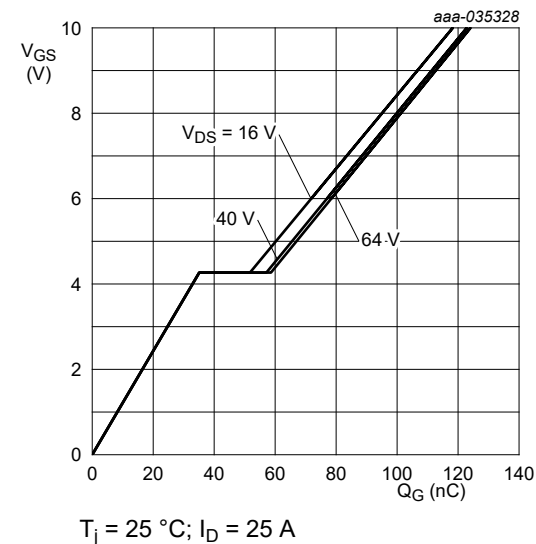


Fig. 14. Gate-source voltage as a function of gate charge; typical values

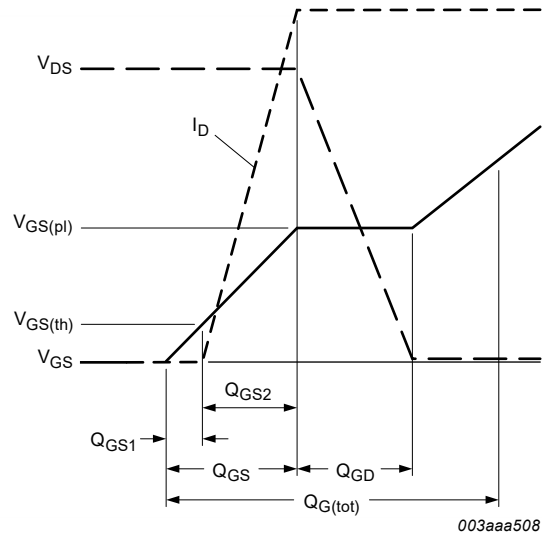


Fig. 15. Gate charge waveform definitions

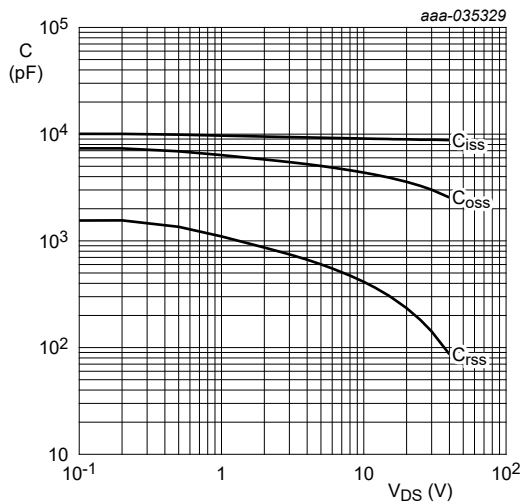


Fig. 16. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

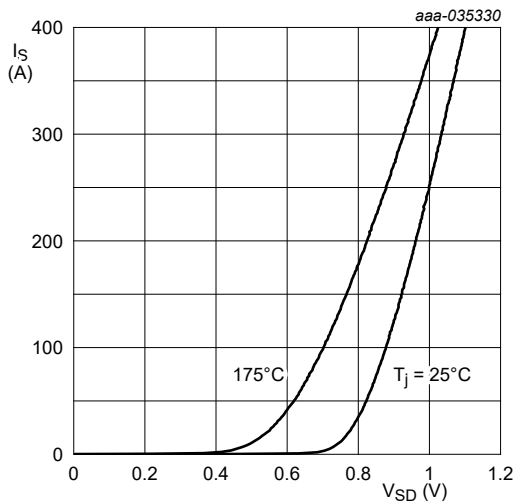


Fig. 17. Source-drain (diode forward) current as a function of source-drain (diode forward) voltage; typical values

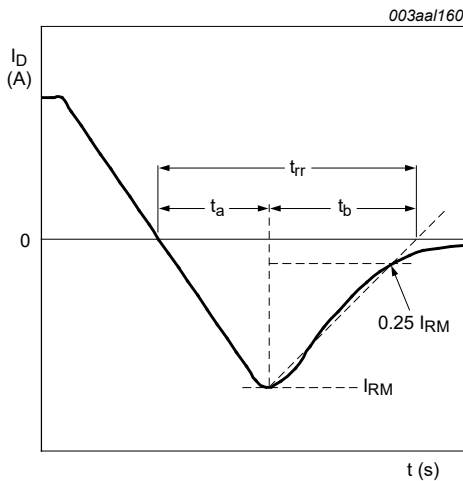


Fig. 18. Reverse recovery timing definition

11. Package outline

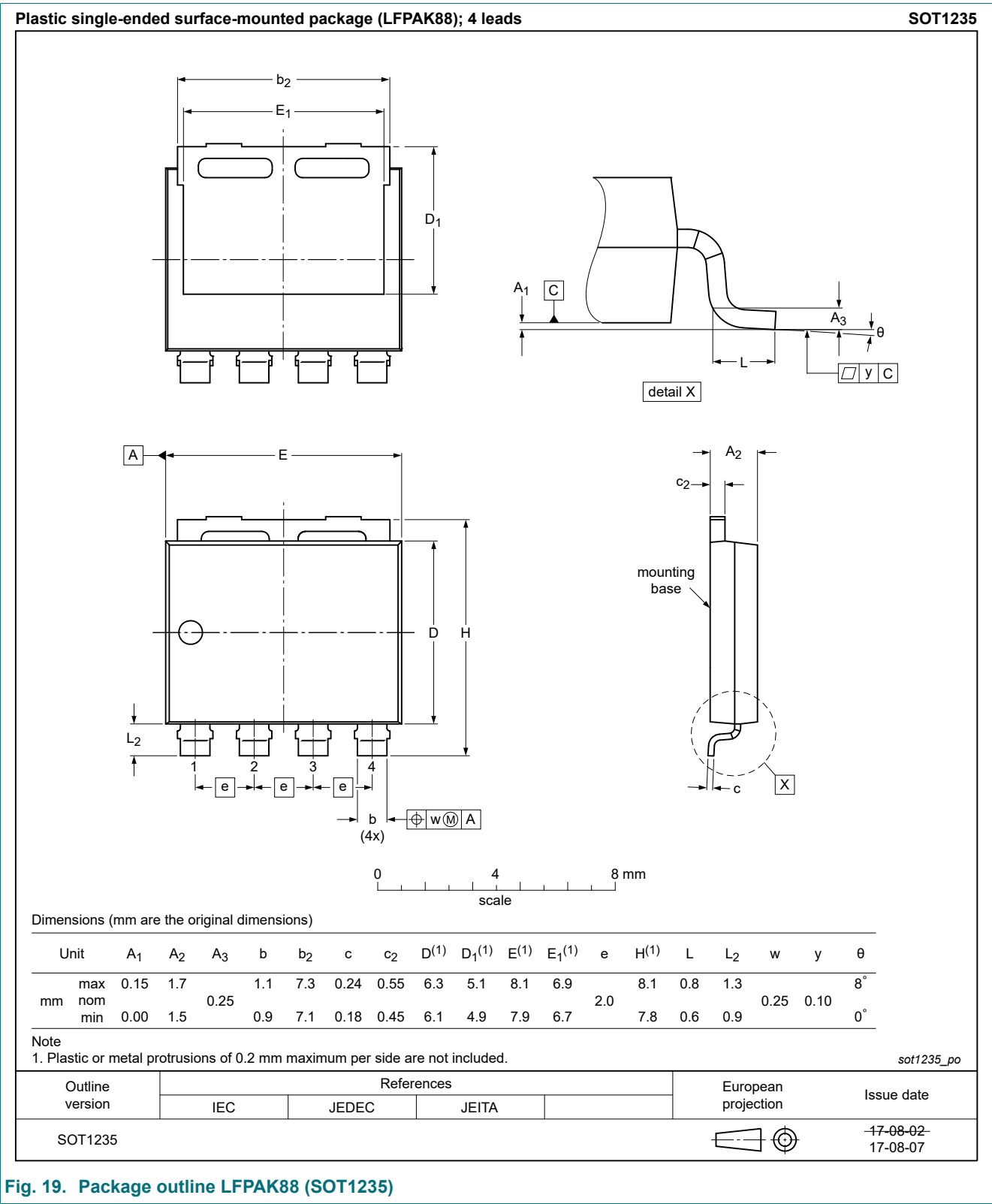


Fig. 19. Package outline LPAK88 (SOT1235)

13. Legal information

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.

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