



PSMN011-100YSF

NextPower 100V, 10.9 mΩ N-channel MOSFET in LFPAK56 package

18 March 2019

Product data sheet

1. General description

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

2. Features and benefits

- Low Q_{rr} for higher efficiency and lower spiking
- Qualified to 175 °C
- 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 LFPAK56 package
- Wave-solderable LFPAK56 package
- Low-stress LFPAK leadframe for high-reliability applications

3. Applications

- Synchronous rectifier in AC-DC and DC-DC
- BLDC motor control
- USB-PD and mobile fast-charge adapters
- LED lighting
- Full-bridge and half-bridge applications
- Flyback and resonant topologies

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	$V_{GS} = 10\text{ V}; T_{mb} = 25\text{ °C}; \text{Fig. 2}$	-	-	79.5	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}; \text{Fig. 1}$	-	-	152	W
T_j	junction temperature		-55	-	175	°C
Static characteristics						
R_{DSon}	drain-source on-state resistance	$V_{GS} = 10\text{ V}; I_D = 20\text{ A}; T_j = 25\text{ °C}; \text{Fig. 12}$	-	8.8	10.9	mΩ
		$V_{GS} = 10\text{ V}; I_D = 20\text{ A}; T_j = 100\text{ °C}; \text{Fig. 13}$	-	13.9	17.7	mΩ
Dynamic characteristics						
Q_{GD}	gate-drain charge	$I_D = 20\text{ A}; V_{DS} = 50\text{ V}; V_{GS} = 10\text{ V}; \text{Fig. 14}; \text{Fig. 15}$	-	8.1	-	nC
$Q_{G(tot)}$	total gate charge		-	34.3	-	nC
Avalanche ruggedness						

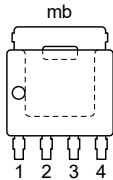
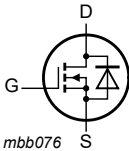
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Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 27\text{ A}$; $V_{sup} \leq 100\text{ V}$; $R_{GS} = 50\ \Omega$; $V_{GS} = 10\text{ V}$; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$; unclamped; Fig. 4	[1]	-	-	173	mJ
Source-drain diode							
Q_r	recovered charge	$I_S = 20\text{ A}$; $di_S/dt = -100\text{ A}/\mu\text{s}$; $V_{GS} = 0\text{ V}$; $V_{DS} = 50\text{ V}$; Fig. 18		-	36.5	-	nC

[1] Protected by 100% test

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	S	source	 <p>LPAK56; Power-SO8 (SOT669)</p>	 <p>mbb076 S</p>
2	S	source		
3	S	source		
4	G	gate		
mb	D	mounting base; connected to drain		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PSMN011-100YSF	LPAK56; Power-SO8	plastic, single-ended surface-mounted package; 4 terminals	SOT669

7. Marking

Table 4. Marking codes

Type number	Marking code
PSMN011-100YSF	11FS10Y

8. Limiting values

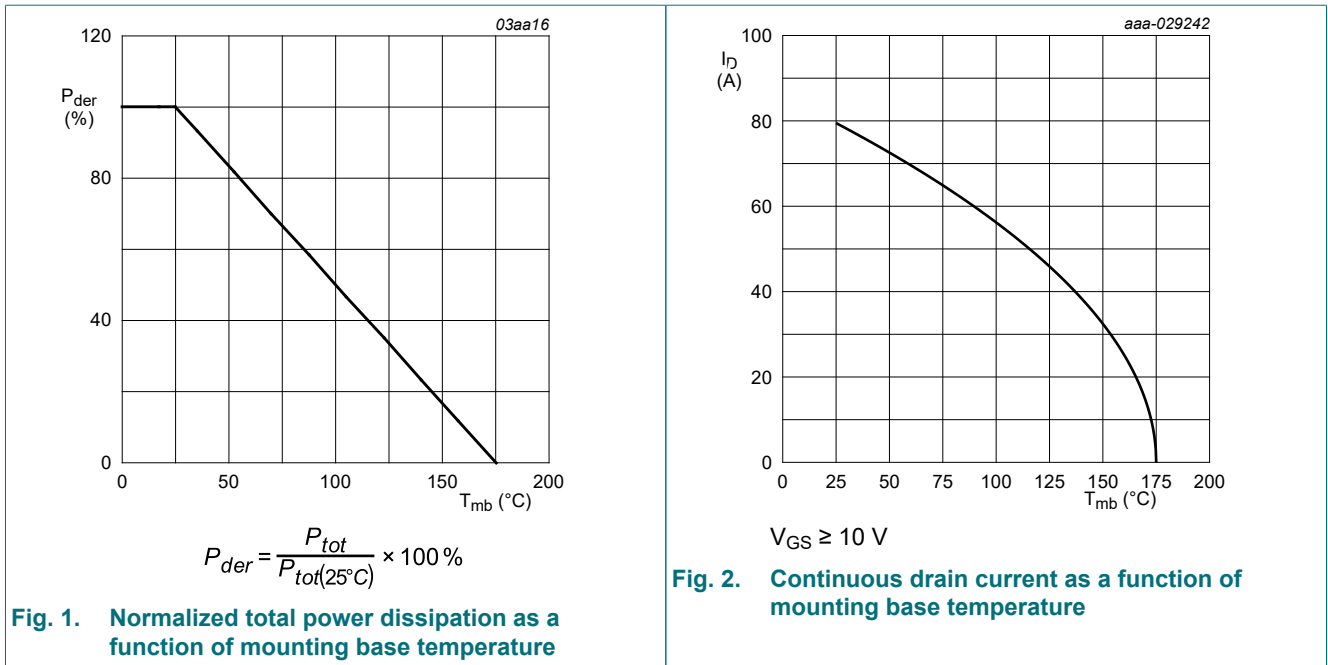
Table 5. Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
V_{DS}	drain-source voltage	$25\text{ }^\circ\text{C} \leq T_j \leq 175\text{ }^\circ\text{C}$		-	100	V
V_{DGR}	drain-gate voltage	$25\text{ }^\circ\text{C} \leq T_j \leq 175\text{ }^\circ\text{C}$; $R_{GS} = 20\text{ k}\Omega$		-	100	V
V_{GS}	gate-source voltage			-20	20	V
P_{tot}	total power dissipation	$T_{mb} = 25\text{ }^\circ\text{C}$; Fig. 1		-	152	W
I_D	drain current	$V_{GS} = 10\text{ V}$; $T_{mb} = 25\text{ }^\circ\text{C}$; Fig. 2		-	79.5	A
		$V_{GS} = 10\text{ V}$; $T_{mb} = 100\text{ }^\circ\text{C}$; Fig. 2		-	56.2	A
I_{DM}	peak drain current	pulsed; $t_p \leq 10\ \mu\text{s}$; $T_{mb} = 25\text{ }^\circ\text{C}$; Fig. 3		-	318	A

Symbol	Parameter	Conditions	Min	Max	Unit
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 °C	-	79.5	A
I _{SM}	peak source current	pulsed; t _p ≤ 10 μs; T _{mb} = 25 °C	-	318	A
Avalanche ruggedness					
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	I _D = 27 A; V _{sup} ≤ 100 V; R _{GS} = 50 Ω; V _{GS} = 10 V; T _{j(init)} = 25 °C; unclamped; Fig. 4	[1]	-	173 mJ
I _{AS}	non-repetitive avalanche current	V _{sup} = 100 V; V _{GS} = 10 V; T _{j(init)} = 25 °C; R _{GS} = 50 Ω	[1]	-	27 A

[1] Protected by 100% test



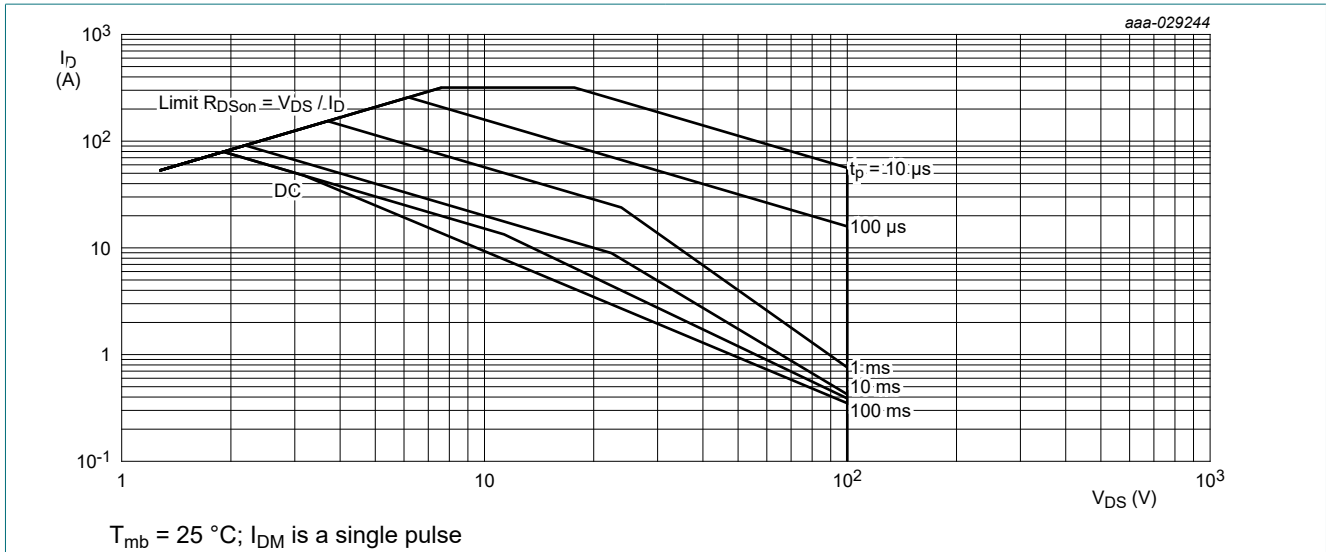


Fig. 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

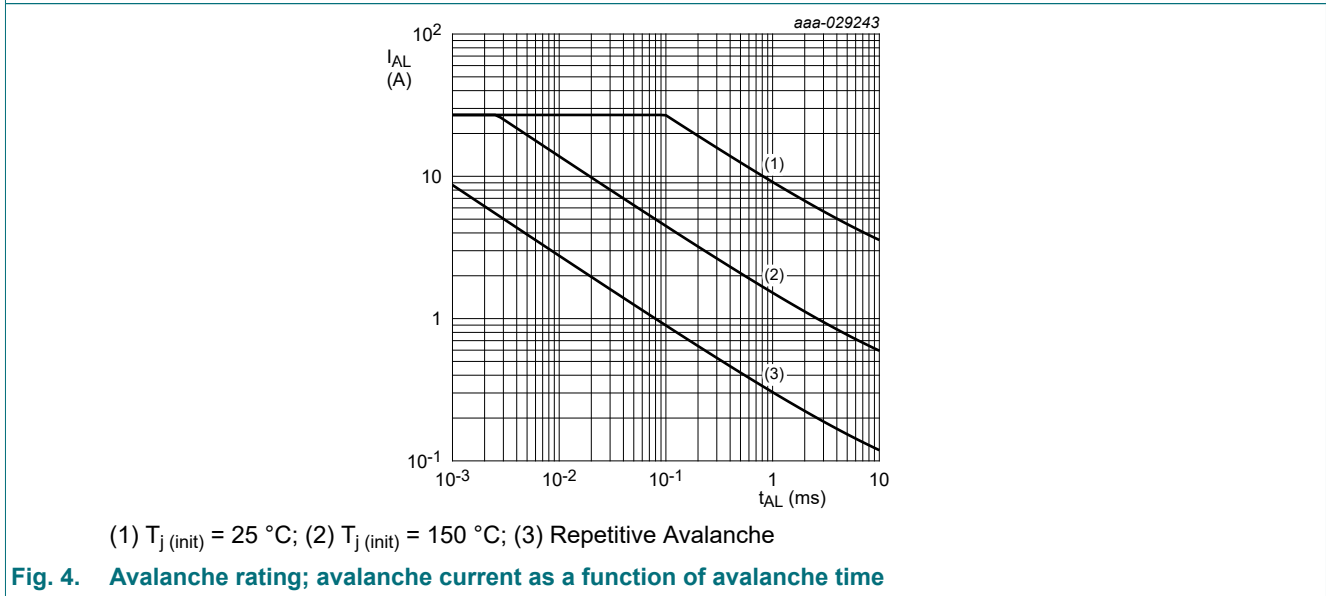


Fig. 4. Avalanche rating; avalanche current as a function of avalanche time

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	Fig. 5	-	0.87	0.99	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	Fig. 6	-	42	-	K/W
		Fig. 7	-	85	-	K/W

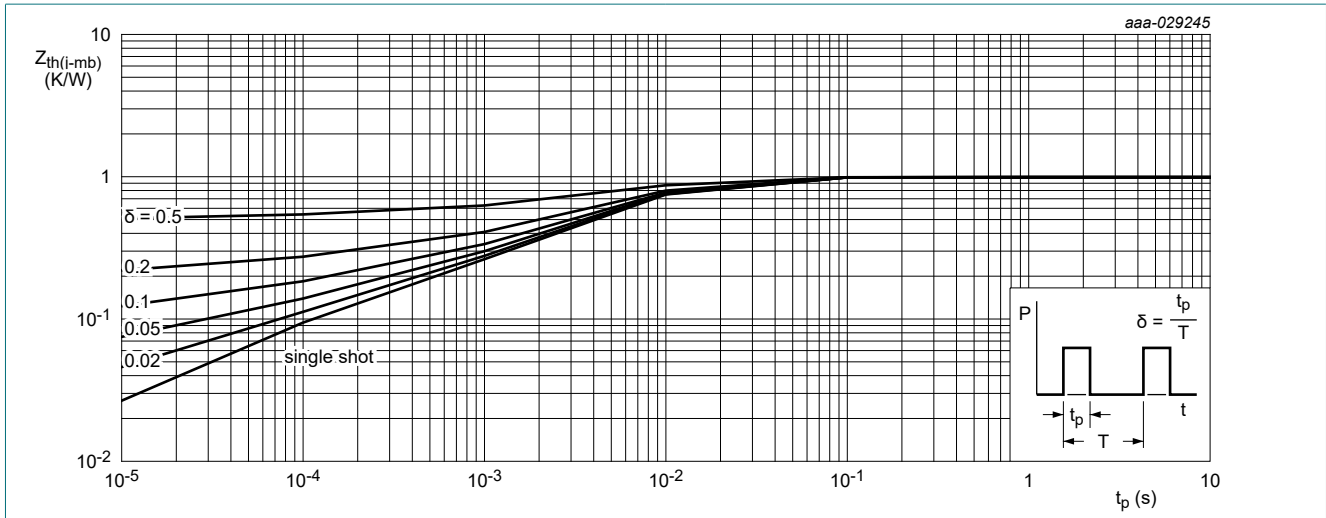


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

aaa-027933

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

aaa-027935

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
Static characteristics						
$V_{(BR)DSS}$	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	$I_D = 1 \text{ mA}; V_{DS}=V_{GS}; T_j = -55 \text{ }^\circ C$	-	3.6	-	V
		$I_D = 1 \text{ mA}; V_{DS}=V_{GS}; T_j = 175 \text{ }^\circ C$	-	1.9	-	V
		$I_D = 1 \text{ mA}; V_{DS}=V_{GS}; T_j = 25 \text{ }^\circ C; \text{ Fig. 11}$	2	3.1	4	V
$\Delta V_{GS(th)}/\Delta T$	gate-source threshold voltage variation with temperature	$25 \text{ }^\circ C \leq T_j \leq 175 \text{ }^\circ C$	-	-7.9	-	mV/K
I_{DSS}	drain leakage current	$V_{DS} = 100 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$	-	0.02	5	μA
		$V_{DS} = 100 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 125 \text{ }^\circ C$	-	-	100	μA
I_{GSS}	gate leakage current	$V_{GS} = 20 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$	-	5	100	nA
		$V_{GS} = -20 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$	-	5	100	nA

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Symbol	Parameter	Conditions	Min	Typ	Max	Unit
R _{DSon}	drain-source on-state resistance	V _{GS} = 10 V; I _D = 20 A; T _J = 25 °C; Fig. 12	-	8.8	10.9	mΩ
		V _{GS} = 7 V; I _D = 20 A; T _J = 25 °C; Fig. 12	-	10.2	15.2	mΩ
		V _{GS} = 10 V; I _D = 20 A; T _J = 100 °C; Fig. 13	-	13.9	17.7	mΩ
		V _{GS} = 10 V; I _D = 20 A; T _J = 175 °C; Fig. 13	-	20	25.5	mΩ
R _G	gate resistance	f = 1 MHz; T _J = 25 °C	-	1.8	-	Ω
Dynamic characteristics						
Q _{G(tot)}	total gate charge	I _D = 20 A; V _{DS} = 50 V; V _{GS} = 10 V; Fig. 14 ; Fig. 15	-	34.3	-	nC
		I _D = 0 A; V _{DS} = 0 V; V _{GS} = 10 V	-	16.4	-	nC
Q _{GS}	gate-source charge	I _D = 20 A; V _{DS} = 50 V; V _{GS} = 10 V; Fig. 14 ; Fig. 15	-	10.6	-	nC
Q _{GS(th)}	pre-threshold gate-source charge		-	6.4	-	nC
Q _{GS(th-pl)}	post-threshold gate-source charge		-	4.2	-	nC
Q _{GD}	gate-drain charge		-	8.1	-	nC
V _{GS(pl)}	gate-source plateau voltage	I _D = 20 A; V _{DS} = 50 V; Fig. 14 ; Fig. 15	-	4.9	-	V
C _{iss}	input capacitance	V _{DS} = 50 V; V _{GS} = 0 V; f = 1 MHz; T _J = 25 °C; Fig. 16	-	2258	-	pF
C _{oss}	output capacitance		-	395	-	pF
C _{rss}	reverse transfer capacitance		-	21	-	pF
t _{d(on)}	turn-on delay time	V _{DS} = 50 V; R _L = 2.5 Ω; V _{GS} = 10 V; R _{G(ext)} = 5 Ω; T _J = 25 °C	-	10.2	-	ns
t _r	rise time		-	12.1	-	ns
t _{d(off)}	turn-off delay time		-	21.3	-	ns
t _f	fall time		-	12.8	-	ns
Source-drain diode						
V _{SD}	source-drain voltage	I _S = 20 A; V _{GS} = 0 V; T _J = 25 °C; Fig. 17	-	0.85	1.2	V
t _{rr}	reverse recovery time	I _S = 20 A; dI _S /dt = -100 A/μs; V _{GS} = 0 V; V _{DS} = 50 V; Fig. 18	-	38.4	-	ns
Q _r	recovered charge		-	36.5	-	nC

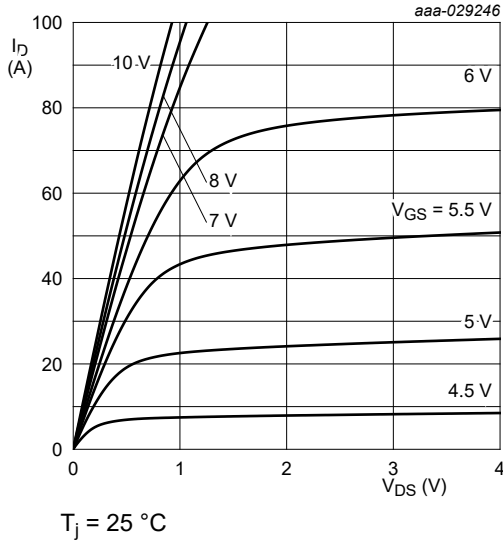


Fig. 8. Output characteristics; drain current as a function of drain-source voltage; typical values

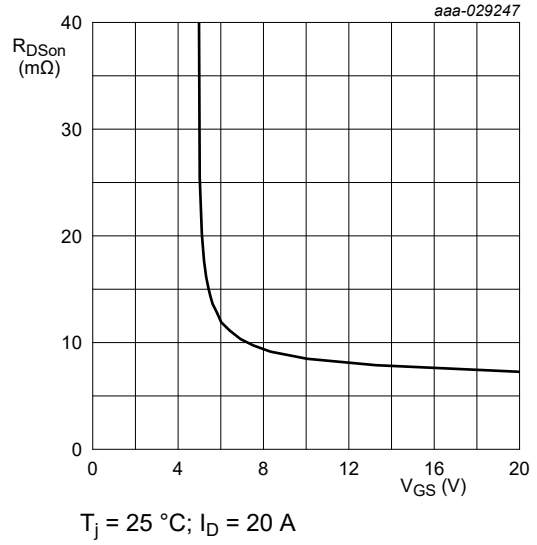


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values

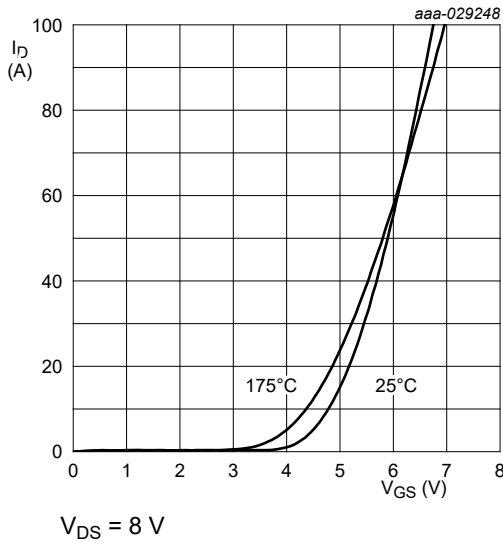


Fig. 10. Transfer characteristics; drain current as a function of gate-source voltage; typical values

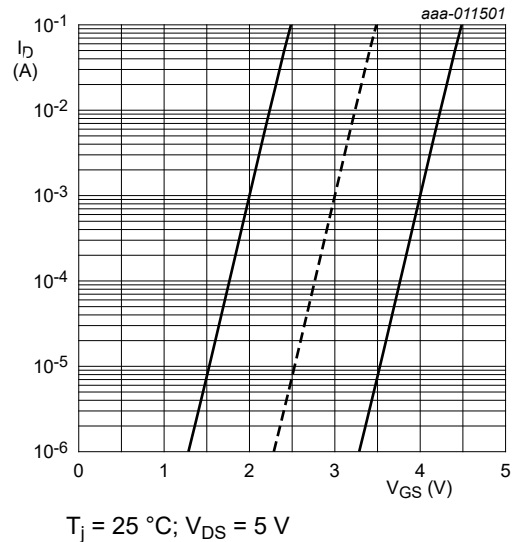


Fig. 11. Sub-threshold drain current as a function of gate-source voltage

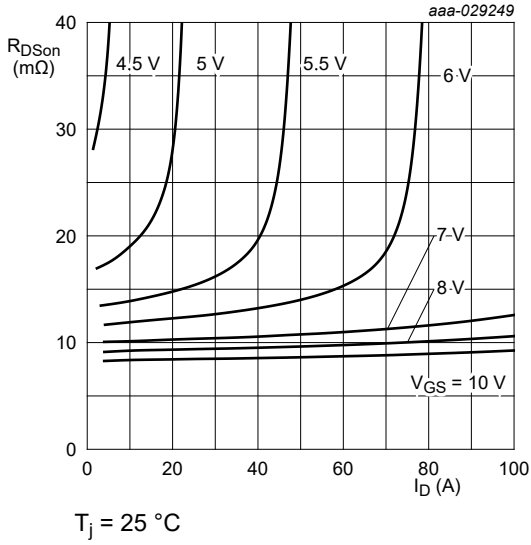
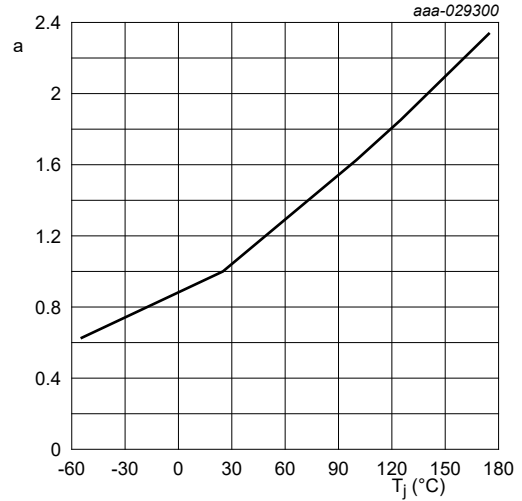


Fig. 12. Drain-source on-state resistance as a function of drain current; typical values



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

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

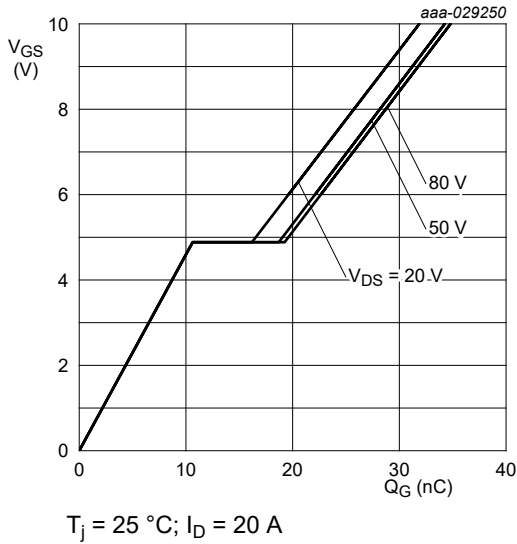


Fig. 14. Gate-source voltage as a function of gate charge; typical values

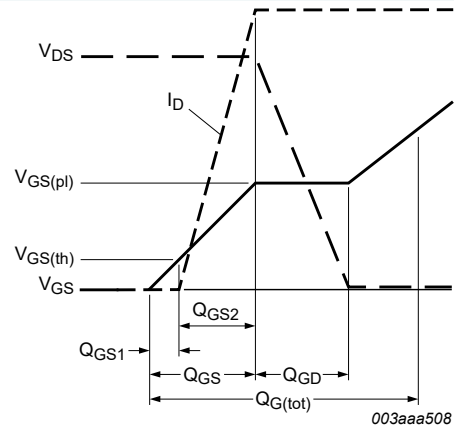


Fig. 15. Gate charge waveform definitions

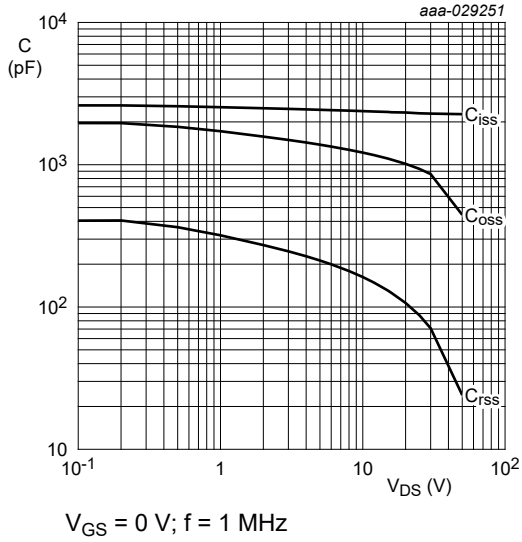


Fig. 16. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

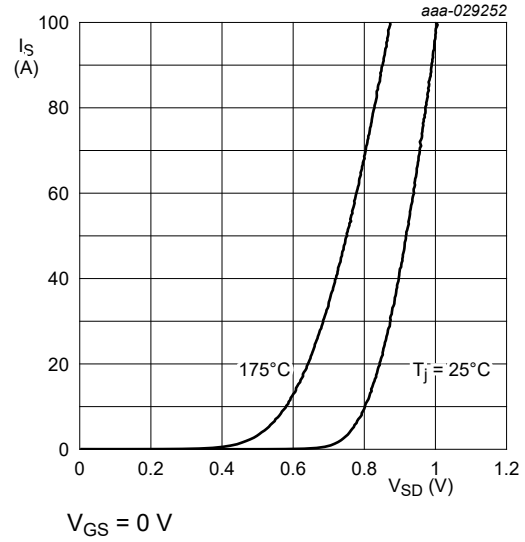


Fig. 17. Source-drain (diode forward) current as a function of source-drain (diode forward) voltage; typical values

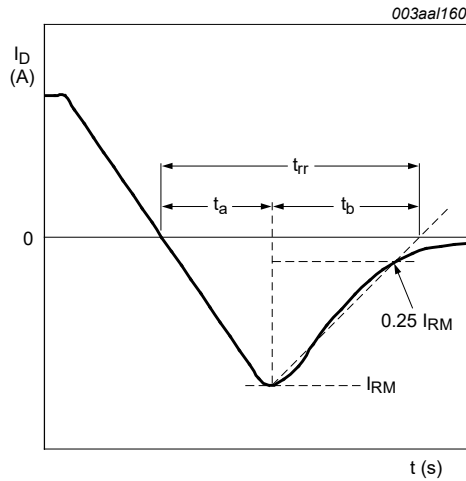


Fig. 18. Reverse recovery timing definition

11. Package outline

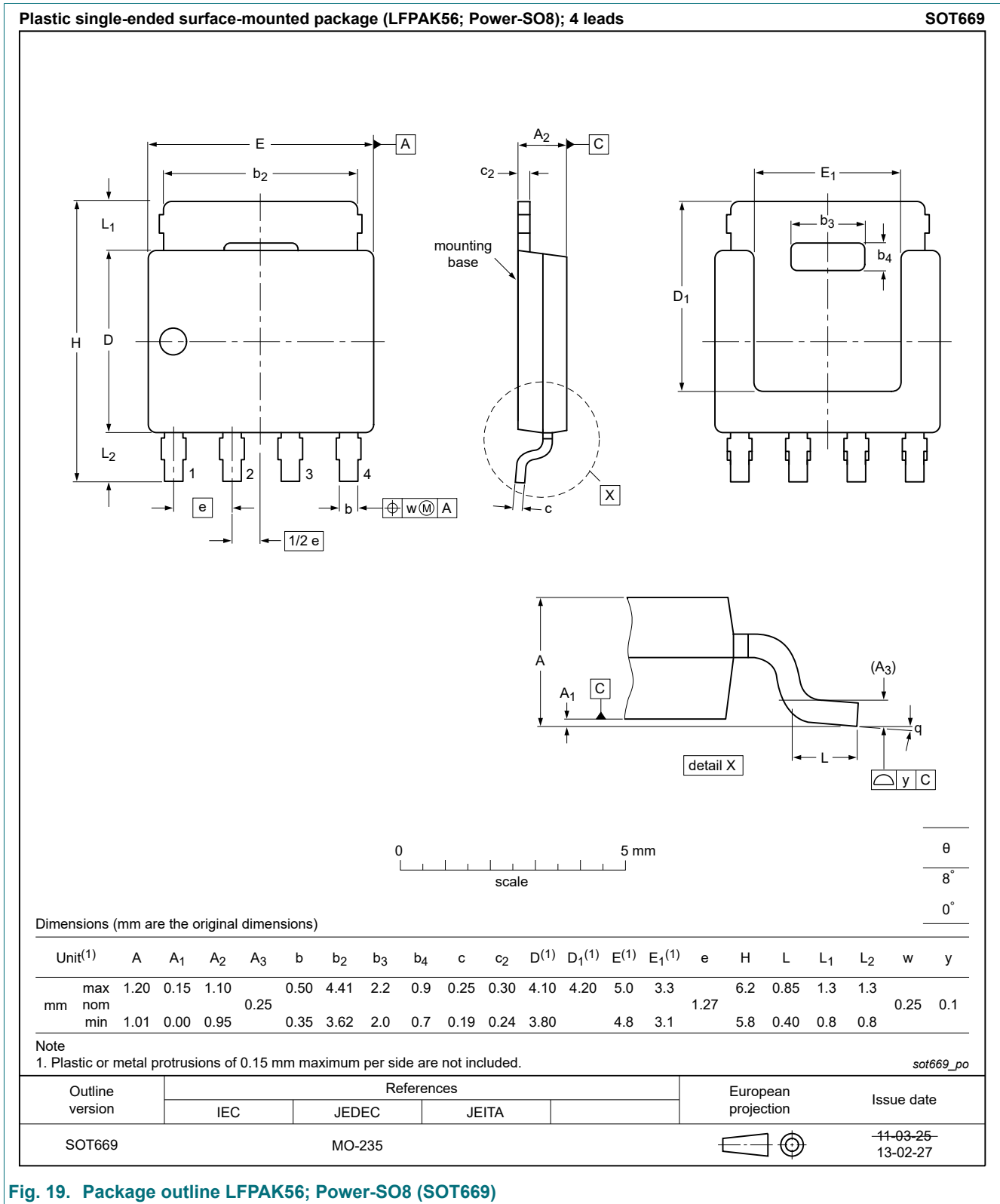
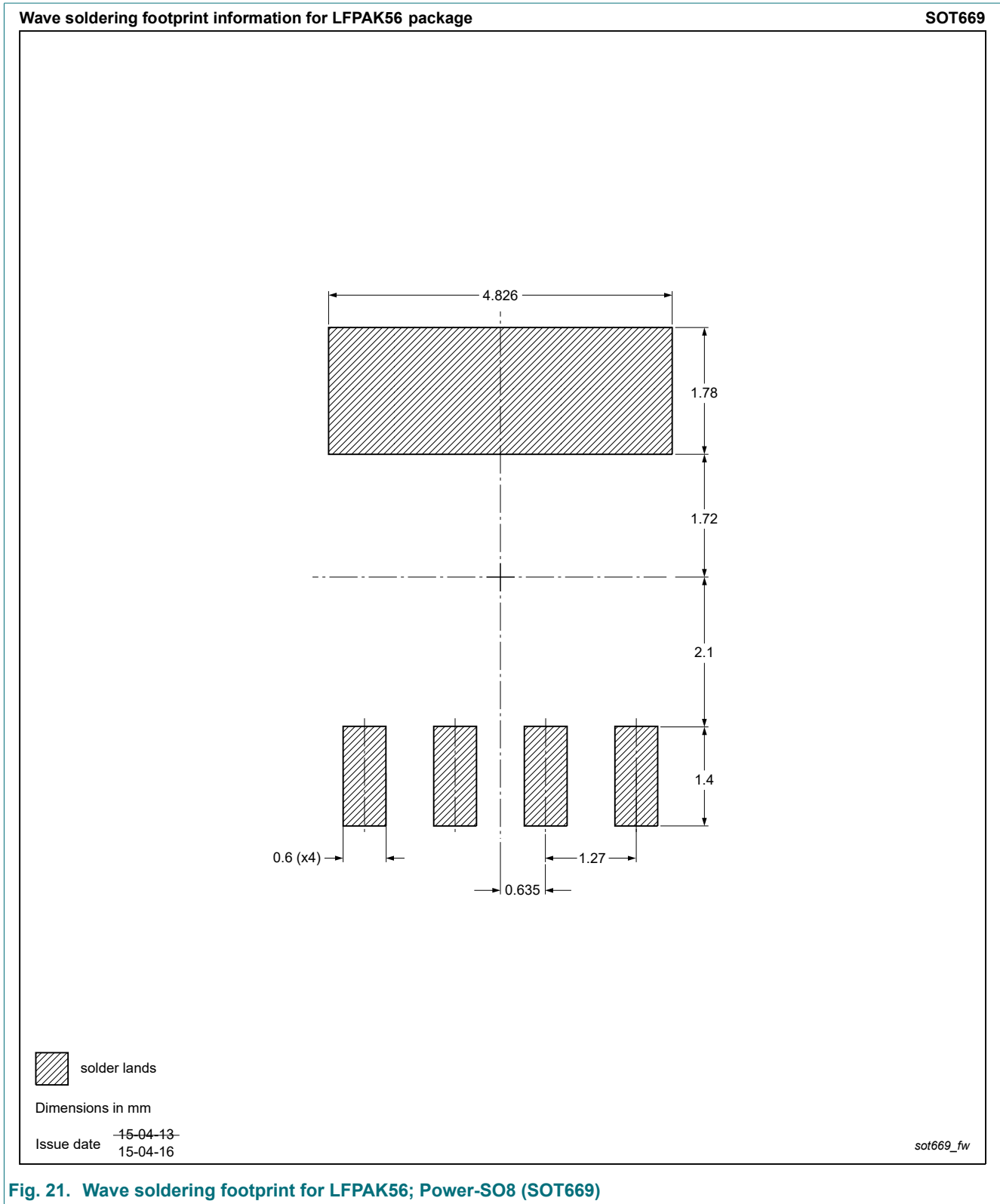


Fig. 19. Package outline LPAK56; Power-SO8 (SOT669)



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