



PSMN5R6-100YSF

NextPower 100 V, 6 mΩ N-channel MOSFET in LPAK56 package

17 August 2018

Preliminary data sheet

1. General description

NextPower 100 V 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 LPAK56 package
- Wave-solderable LPAK56 package

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

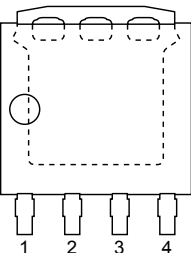
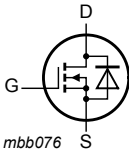
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V _{DS}	drain-source voltage	25 °C ≤ T _j ≤ 175 °C		-	-	100	V
I _D	drain current	V _{GS} = 10 V; T _{mb} = 25 °C; Fig. 2		-	-	120	A
P _{tot}	total power dissipation	T _{mb} = 25 °C; Fig. 1		-	-	294	W
T _j	junction temperature			-55	-	175	°C
Static characteristics							
R _{DSon}	drain-source on-state resistance	V _{GS} = 10 V; I _D = 25 A; T _j = 25 °C; Fig. 12		-	4.5	5.6	mΩ
		V _{GS} = 10 V; I _D = 25 A; T _j = 100 °C; Fig. 13		-	7.3	8.7	mΩ
Dynamic characteristics							
Q _{GD}	gate-drain charge	I _D = 25 A; V _{DS} = 50 V; V _{GS} = 10 V; Fig. 14 ; Fig. 15		-	13.5	-	nC
Q _{G(tot)}	total gate charge			-	65.1	-	nC
Avalanche ruggedness							

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 41.8\text{ A}$; $V_{sup} \leq 100\text{ V}$; $R_{GS} = 50\ \Omega$; $V_{GS} = 10\text{ V}$; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$; Fig. 4; Unclamped	[1]	-	-	440	mJ
Source-drain diode							
Q_r	recovered charge	$I_S = 25\text{ A}$; $di_S/dt = -100\text{ A}/\mu\text{s}$; $V_{GS} = 0\text{ V}$; $V_{DS} = 50\text{ V}$; Fig. 18		-	67.3	-	nC

[1] Protected by 100% test

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	S	source	 <p>LPAK56E; Power-SO8 (SOT1023)</p>	 <p>mbb076</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
PSMN5R6-100YSF	LPAK56E; Power-SO8	plastic, single-ended surface-mounted package (LPAK56); 4 leads; 1.27 mm pitch	SOT1023

7. Marking

Table 4. Marking codes

Type number	Marking code
PSMN5R6-100YSF	5F6S10

8. Limiting values

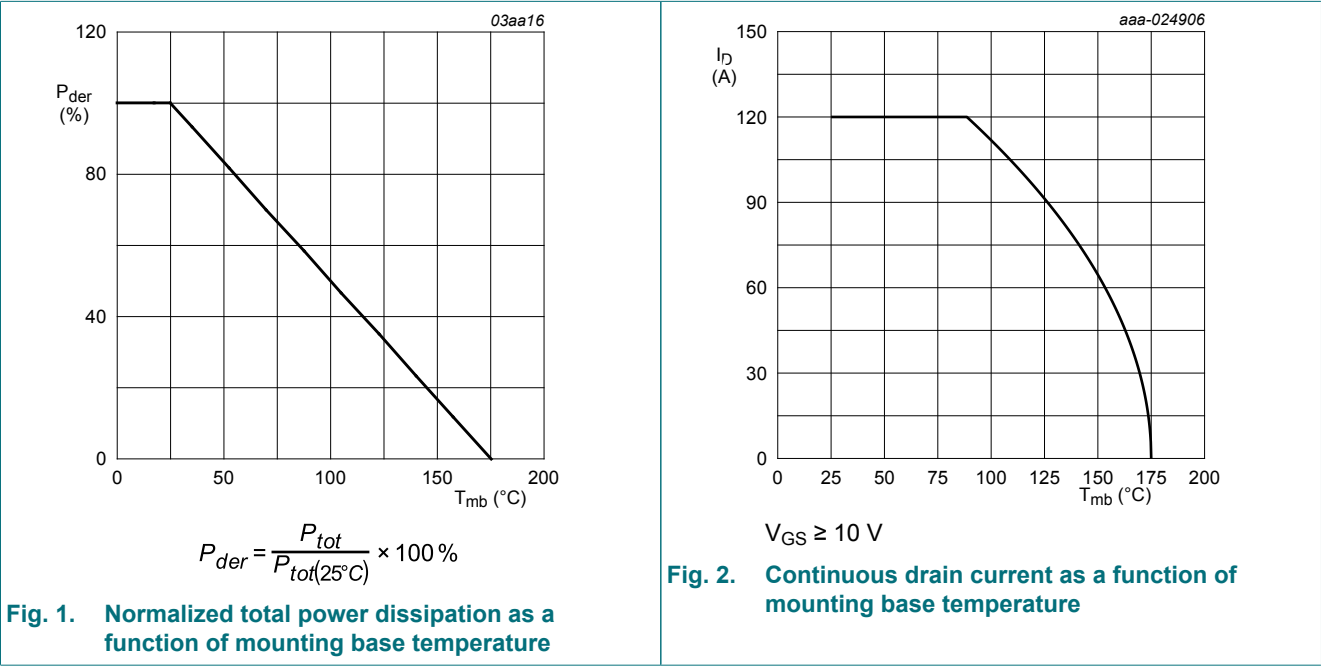
Table 5. Limiting values

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		-	294	W
I_D	drain current	$V_{GS} = 10\text{ V}$; $T_{mb} = 25\text{ }^\circ\text{C}$; Fig. 2		-	120	A

Symbol	Parameter	Conditions		Min	Max	Unit
		$V_{GS} = 10\text{ V}$; $T_{mb} = 100\text{ °C}$; Fig. 2		-	112	A
I_{DM}	peak drain current	pulsed; $t_p \leq 10\text{ }\mu\text{s}$; $T_{mb} = 25\text{ °C}$; Fig. 3		-	480	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	$T_{mb} = 25\text{ °C}$		-	120	A
I_{SM}	peak source current	pulsed; $t_p \leq 10\text{ }\mu\text{s}$; $T_{mb} = 25\text{ °C}$		-	480	A
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 41.8\text{ A}$; $V_{sup} \leq 100\text{ V}$; $R_{GS} = 50\text{ }\Omega$; $V_{GS} = 10\text{ V}$; $T_{j(init)} = 25\text{ °C}$; Fig. 4; Unclamped	[1]	-	440	mJ
I_{AS}	non-repetitive avalanche current	$V_{sup} \leq 100\text{ V}$; $V_{GS} = 10\text{ V}$; $T_{j(init)} = 25\text{ °C}$; $R_{GS} = 50\text{ }\Omega$	[1]	-	41.8	A

[1] Protected by 100% test



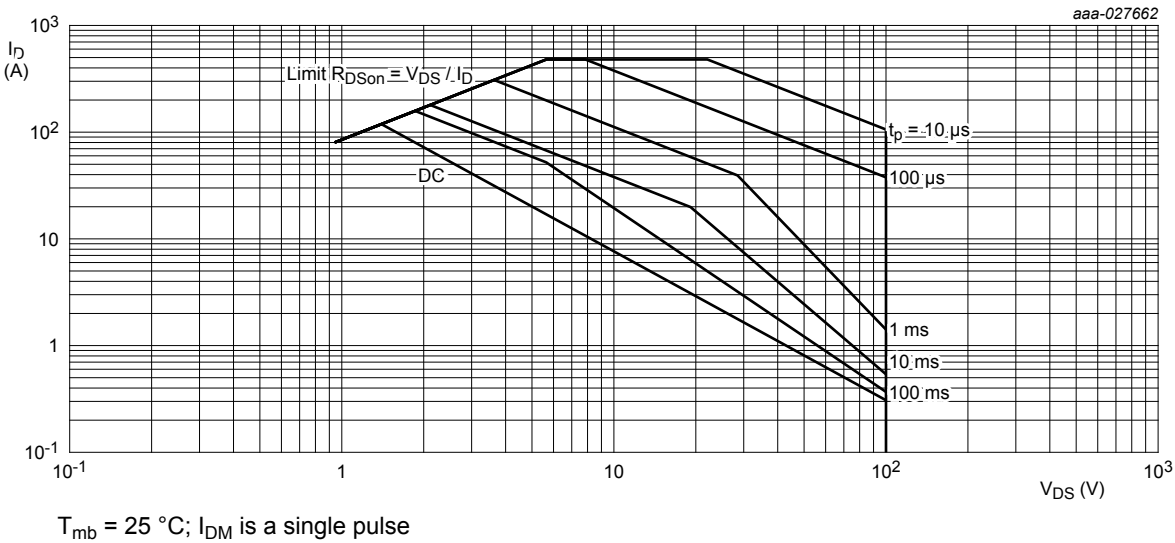


Fig. 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

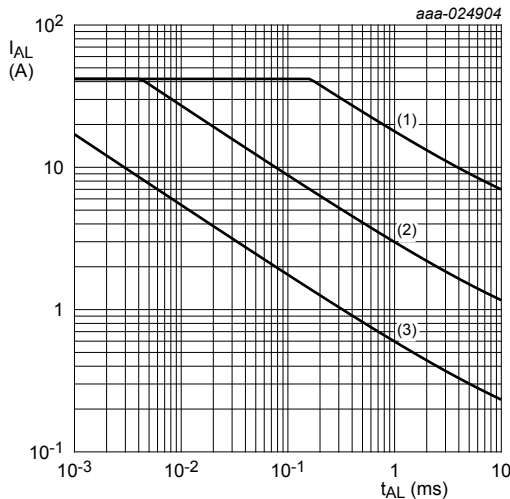


Fig. 4. Avalanche rating; avalanche current as a function of avalanche time

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	-	0.45	0.51	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	Fig. 6	-	42	-	K/W
		Fig. 7	-	85	-	K/W

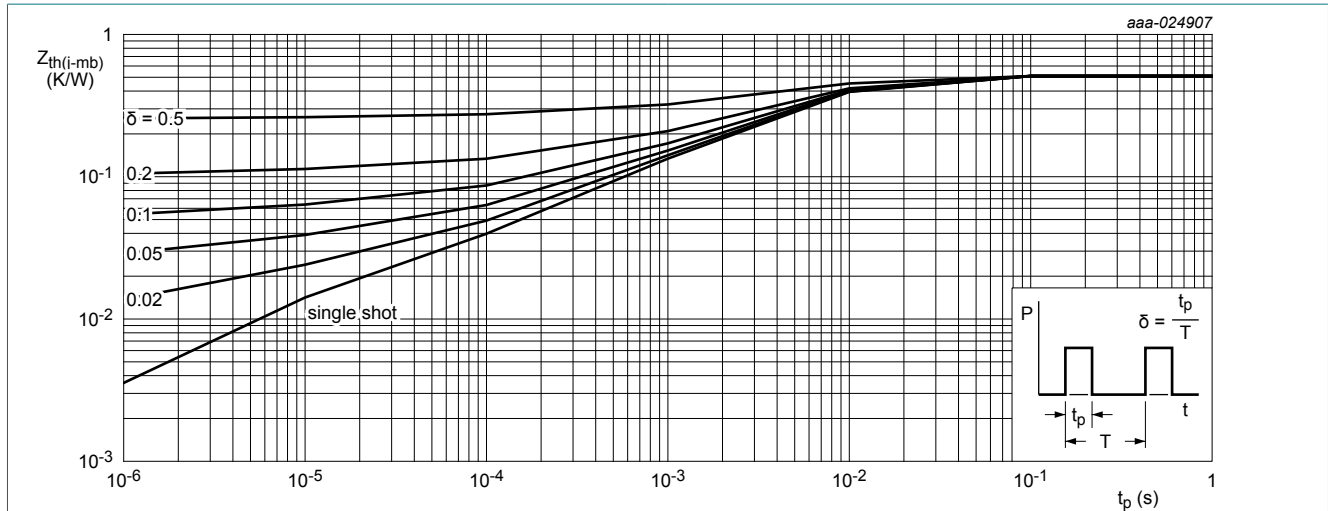
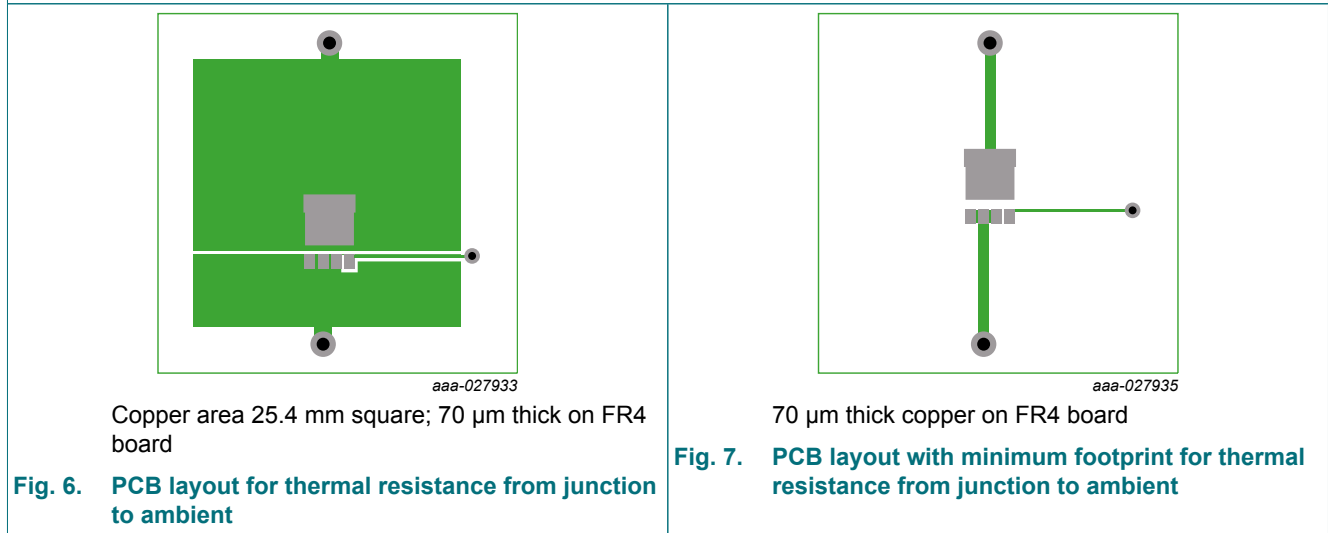


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration



10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A$; $V_{GS} = 0 V$; $T_j = 25^\circ C$	100	-	-	V
		$I_D = 250 \mu A$; $V_{GS} = 0 V$; $T_j = -55^\circ C$	90	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 mA$; $V_{DS} = V_{GS}$; $T_j = -55^\circ C$	-	3.6	-	V
		$I_D = 1 mA$; $V_{DS} = V_{GS}$; $T_j = 175^\circ C$	-	1.8	-	V
		$I_D = 1 mA$; $V_{DS} = V_{GS}$; $T_j = 25^\circ C$; Fig. 11	2	3.1	4	V
$\Delta V_{GS(th)}/\Delta T$	gate-source threshold voltage variation with temperature	$25^\circ C \leq T_j \leq 175^\circ C$	-	-8.8	-	mV/K
I_{DSS}	drain leakage current	$V_{DS} = 100 V$; $V_{GS} = 0 V$; $T_j = 25^\circ C$	-	0.03	5	μA
		$V_{DS} = 100 V$; $V_{GS} = 0 V$; $T_j = 125^\circ C$	-	-	100	μA
I_{GSS}	gate leakage current	$V_{GS} = -20 V$; $V_{DS} = 0 V$; $T_j = 25^\circ C$	-	5	100	nA
		$V_{GS} = 20 V$; $V_{DS} = 0 V$; $T_j = 25^\circ C$	-	5	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. 12		-	4.5	5.6	mΩ
		V _{GS} = 7 V; I _D = 25 A; T _J = 25 °C; Fig. 12		-	5.1	7.9	mΩ
		V _{GS} = 10 V; I _D = 25 A; T _J = 100 °C; Fig. 13		-	7.3	8.7	mΩ
		V _{GS} = 10 V; I _D = 25 A; T _J = 175 °C; Fig. 13		-	10.3	12.3	mΩ
R _G	gate resistance	f = 1 MHz		-	0.9	-	Ω
Dynamic characteristics							
Q _{G(tot)}	total gate charge	I _D = 25 A; V _{DS} = 50 V; V _{GS} = 10 V; Fig. 14 ; Fig. 15		-	65.1	-	nC
		I _D = 0 A; V _{DS} = 0 V; V _{GS} = 10 V		-	32.2	-	nC
Q _{GS}	gate-source charge	I _D = 25 A; V _{DS} = 50 V; V _{GS} = 10 V; Fig. 14 ; Fig. 15		-	20.4	-	nC
Q _{GS(th)}	pre-threshold gate-source charge			-	12.5	-	nC
Q _{GS(th-pl)}	post-threshold gate-source charge			-	7.9	-	nC
Q _{GD}	gate-drain charge			-	13.5	-	nC
V _{GS(pl)}	gate-source plateau voltage	I _D = 25 A; V _{DS} = 50 V; Fig. 14 ; Fig. 15		-	4.8	-	V
C _{iss}	input capacitance	V _{DS} = 50 V; V _{GS} = 0 V; f = 1 MHz; T _J = 25 °C; Fig. 16		-	4616	-	pF
C _{oss}	output capacitance			-	805	-	pF
C _{rss}	reverse transfer capacitance			-	12	-	pF
t _{d(on)}	turn-on delay time	V _{DS} = 50 V; R _L = 2 Ω; V _{GS} = 10 V; R _{G(ext)} = 5 Ω; T _J = 25 °C		-	17.4	-	ns
t _r	rise time			-	16.3	-	ns
t _{d(off)}	turn-off delay time			-	35.1	-	ns
t _f	fall time			-	19.7	-	ns
Source-drain diode							
V _{SD}	source-drain voltage	I _S = 25 A; V _{GS} = 0 V; T _J = 25 °C; Fig. 17		-	0.8	1.2	V
t _{rr}	reverse recovery time	I _S = 25 A; dI _S /dt = -100 A/μs; V _{GS} = 0 V; V _{DS} = 50 V; Fig. 18		-	51.4	-	ns
Q _r	recovered charge			-	67.3	-	nC

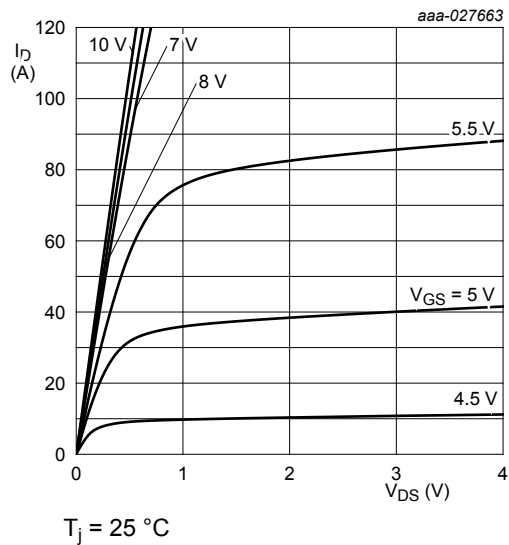


Fig. 8. Output characteristics; drain current as a function of drain-source voltage; typical values

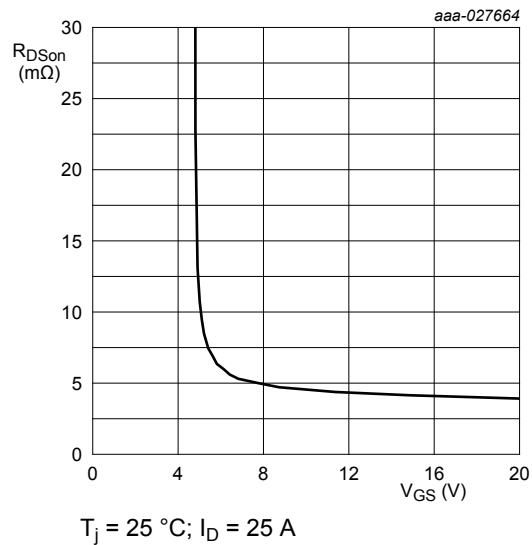


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values

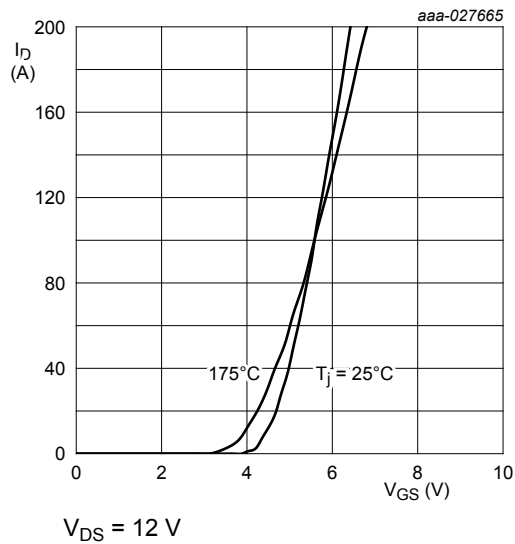


Fig. 10. Transfer characteristics; drain current as a function of gate-source voltage; typical values

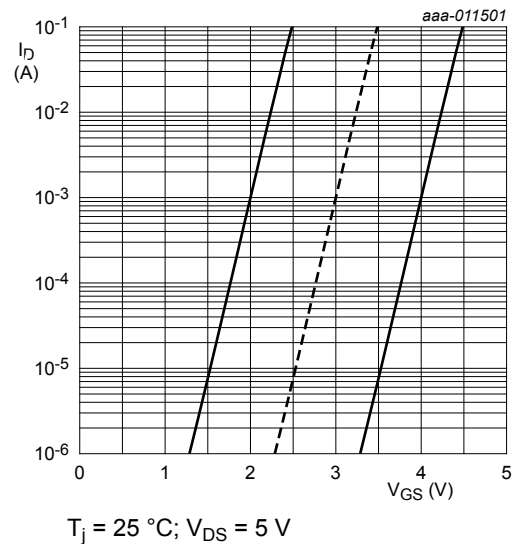


Fig. 11. Sub-threshold drain current as a function of gate-source voltage

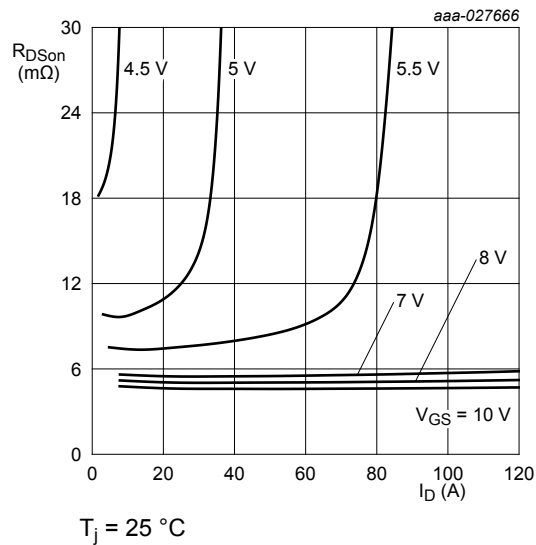


Fig. 12. Drain-source on-state resistance as a function of drain current; typical values

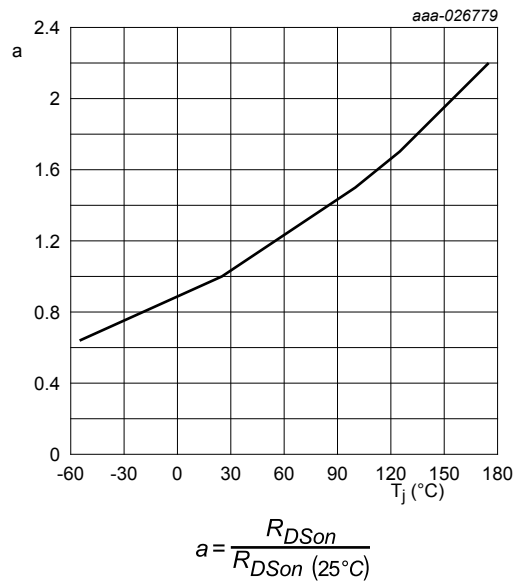


Fig. 13. Normalized drain-source on-state resistance factor as a function of junction temperature

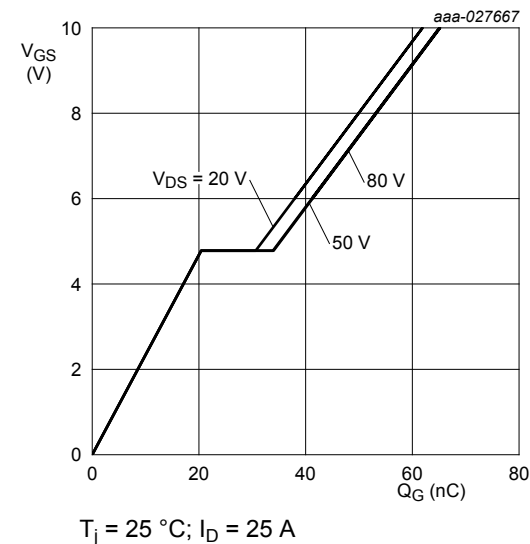


Fig. 14. Gate-source voltage as a function of gate charge; typical values

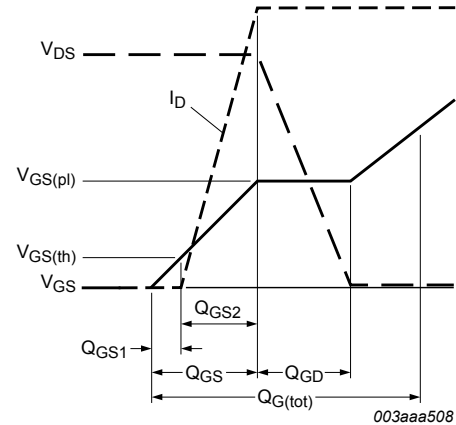


Fig. 15. Gate charge waveform definitions

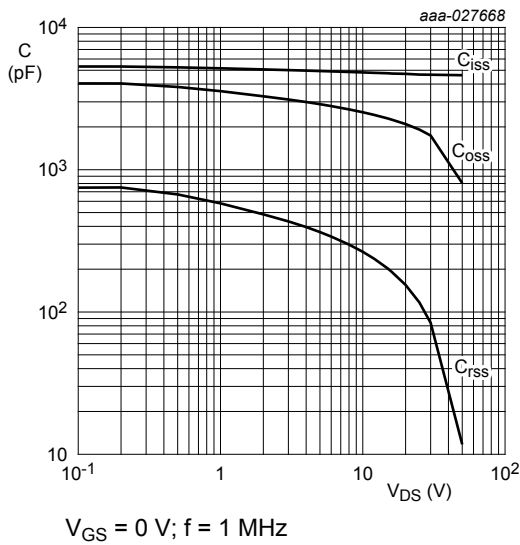


Fig. 16. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

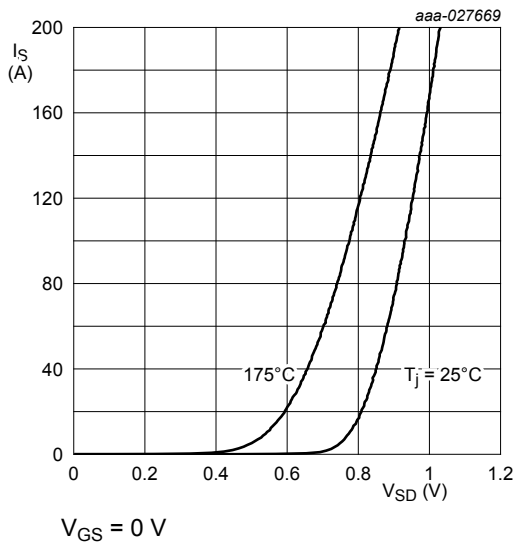


Fig. 17. Source-drain (diode forward) current as a function of source-drain (diode forward) voltage; typical values

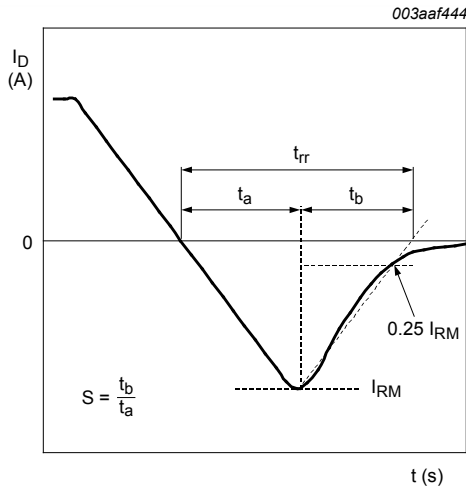


Fig. 18. Reverse recovery timing definition

11. Package outline

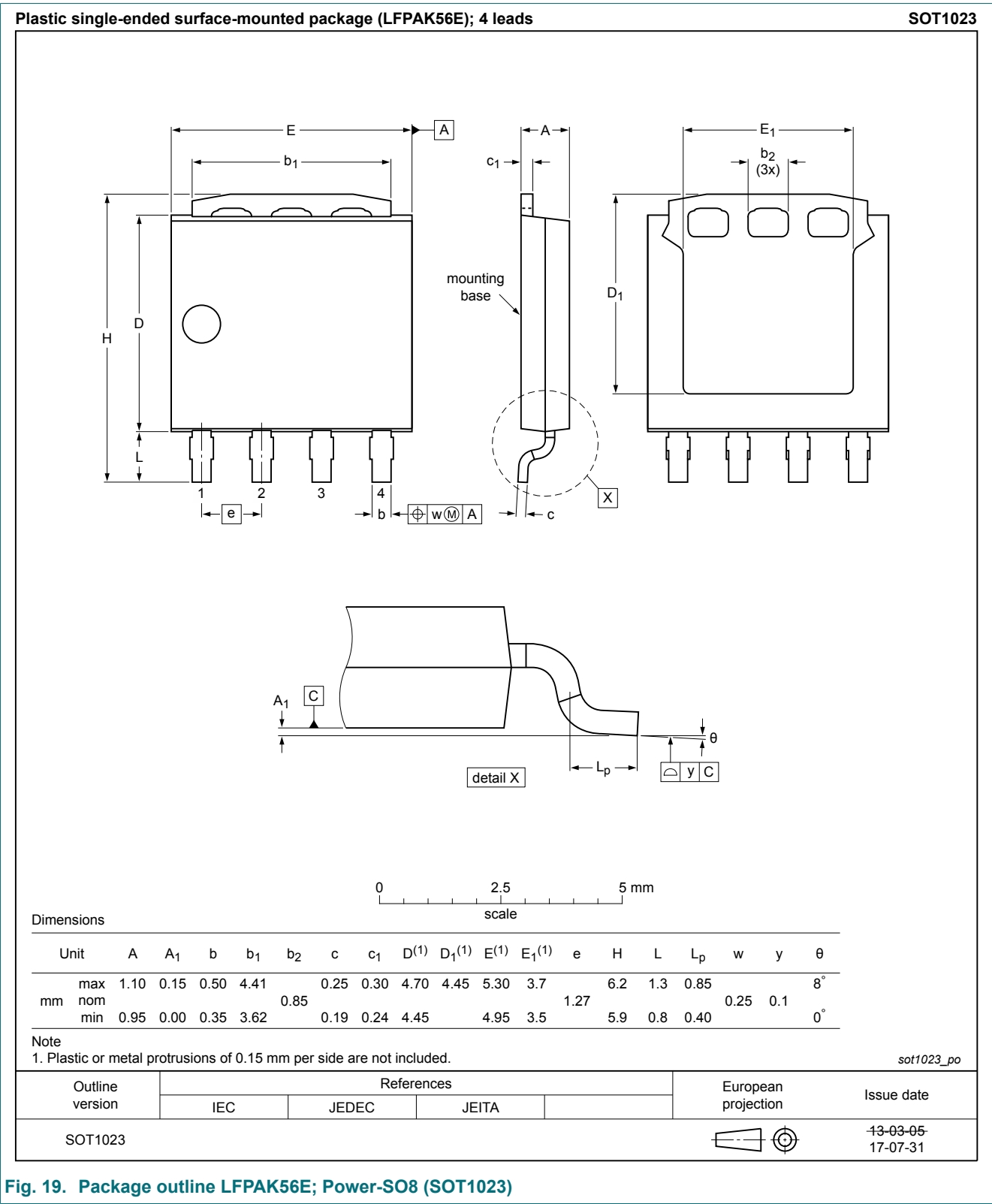


Fig. 19. Package outline LPAK56E; Power-SO8 (SOT1023)

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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