



PSMN2R6-80YSF

NextPower 80 V, 2.4 mOhm, 231 A, N-channel MOSFET in LPAK56E package

29 April 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
- 231 A $I_{D(max)}$ – demonstrated 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 LPAK56E package

3. Applications

- Synchronous rectifier in AC-DC and DC-DC
- Primary side switch in DC-DC
- BLDC motor control
- USB-PD adapters
- 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		-	-	80	V
I _D	drain current	V _{GS} = 10 V; T _{mb} = 25 °C; Fig. 2		-	-	231	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		-	1.9	2.4	mΩ
		V _{GS} = 10 V; I _D = 25 A; T _j = 105 °C; Fig. 13		-	3.1	4.3	mΩ
Dynamic characteristics							
Q _{GD}	gate-drain charge	I _D = 25 A; V _{DS} = 40 V; V _{GS} = 10 V; Fig. 14 ; Fig. 15		5.8	16.5	38	nC
Q _{G(tot)}	total gate charge			42.5	85	127	nC
Avalanche ruggedness							
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	I _D = 58 A; V _{sup} ≤ 80 V; R _{GS} = 50 Ω; V _{GS} = 10 V; T _{j(init)} = 25 °C; unclamped; t _p = 127 μs; Fig. 4	[1]	-	-	383	mJ

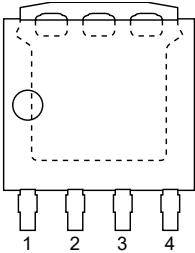
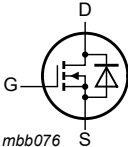
NextPower 80 V, 2.4 mOhm, 231 A, N-channel MOSFET in LPAK56E package

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; Fig. 18	-	33	-	nC

[1] Protected by 100% test

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	S	source	 LPAK56E; Power-SO8 (SOT1023)	 mbb076
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
PSMN2R6-80YSF	LPAK56E; Power-SO8	plastic, single-ended surface-mounted package (LPAK56E); 4 leads; 1.27 mm pitch	SOT1023

7. Marking

Table 4. Marking codes

Type number	Marking code
PSMN2R6-80YSF	2F6S80Y

8. Limiting values

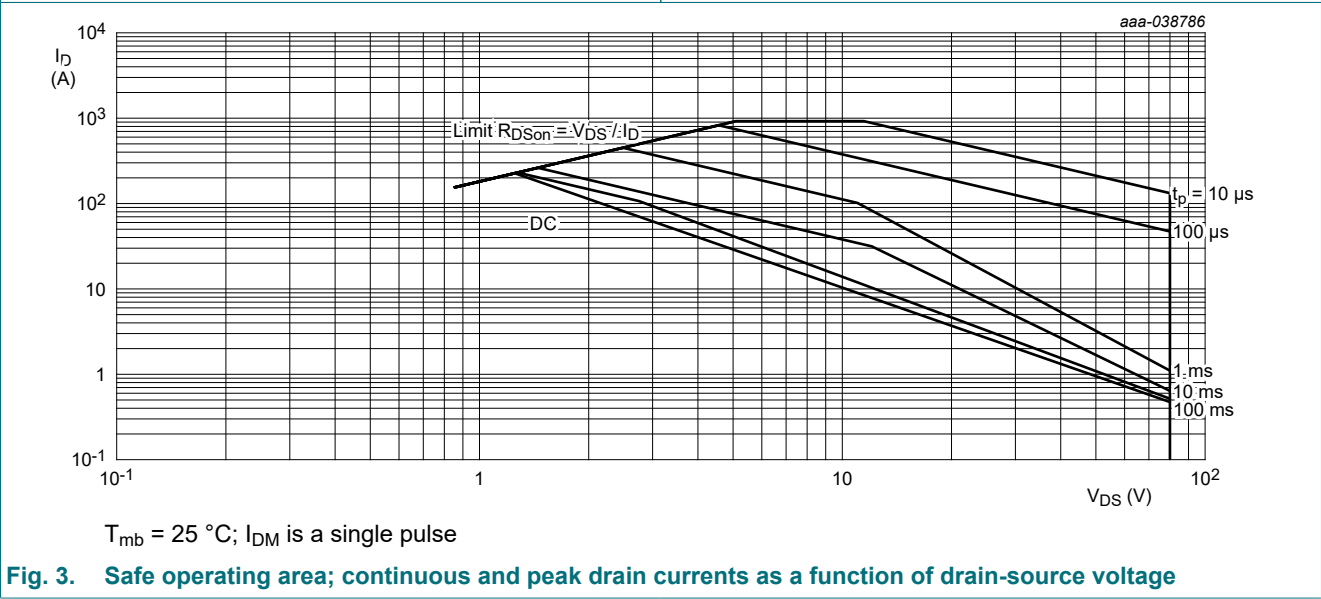
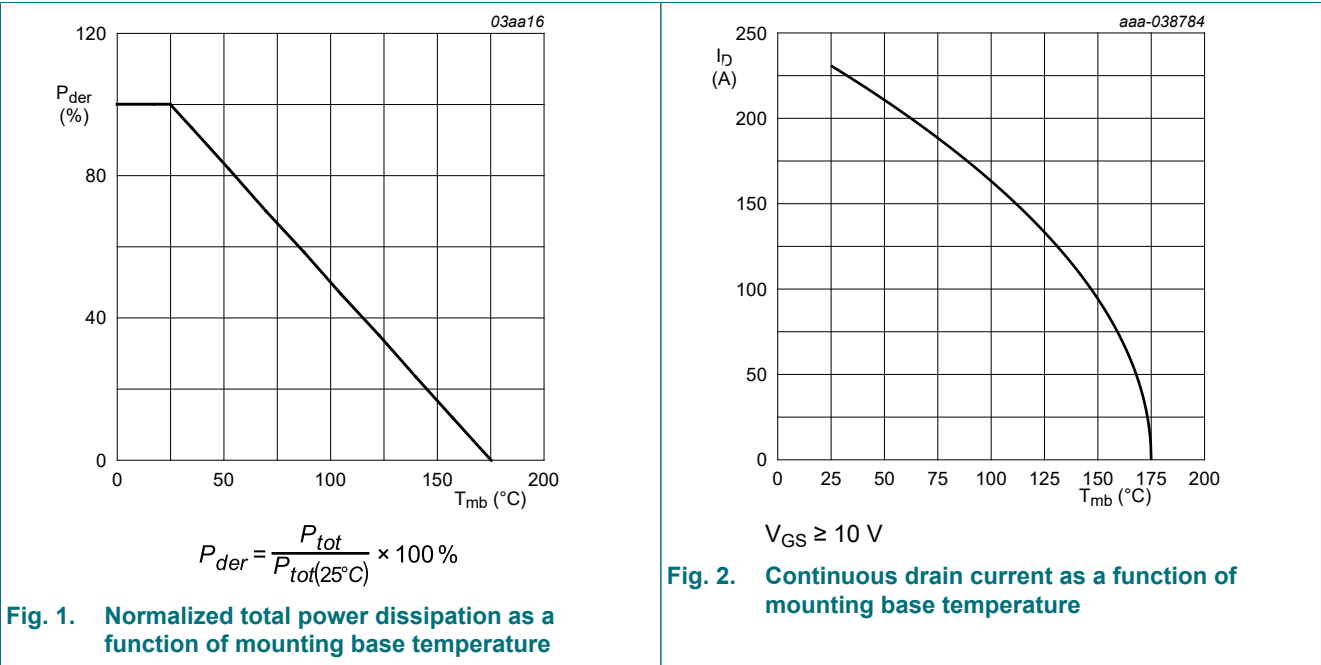
Table 5. Limiting values

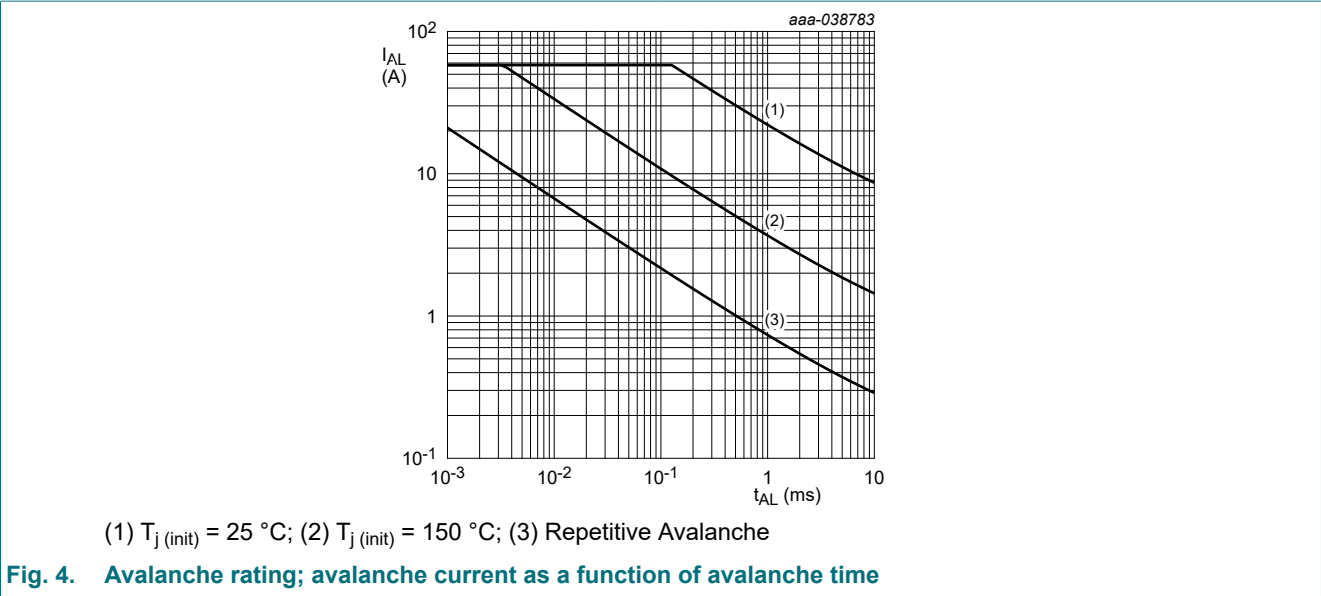
In accordance with the Absolute Maximum Rating System (IEC 60134). T_j = 25 °C unless otherwise stated.

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	-	294	W
I _D	drain current	V _{GS} = 10 V; T _{mb} = 25 °C; Fig. 2	-	231	A
		V _{GS} = 10 V; T _{mb} = 100 °C; Fig. 2	-	163	A
I _{DM}	peak drain current	pulsed; t _p ≤ 10 μs; T _{mb} = 25 °C; Fig. 3	-	923	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 °C		-	231	A
I _{SM}	peak source current	pulsed; t _p ≤ 10 μs; T _{mb} = 25 °C		-	923	A
Avalanche ruggedness						
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	I _D = 58 A; V _{sup} ≤ 80 V; R _{GS} = 50 Ω; V _{GS} = 10 V; T _{j(init)} = 25 °C; unclamped; t _p = 127 μs; Fig. 4	[1]	-	383	mJ
I _{AS}	non-repetitive avalanche current	V _{sup} = 80 V; V _{GS} = 10 V; T _{j(init)} = 25 °C; R _{GS} = 50 Ω	[1]	-	58	A

[1] Protected by 100% test

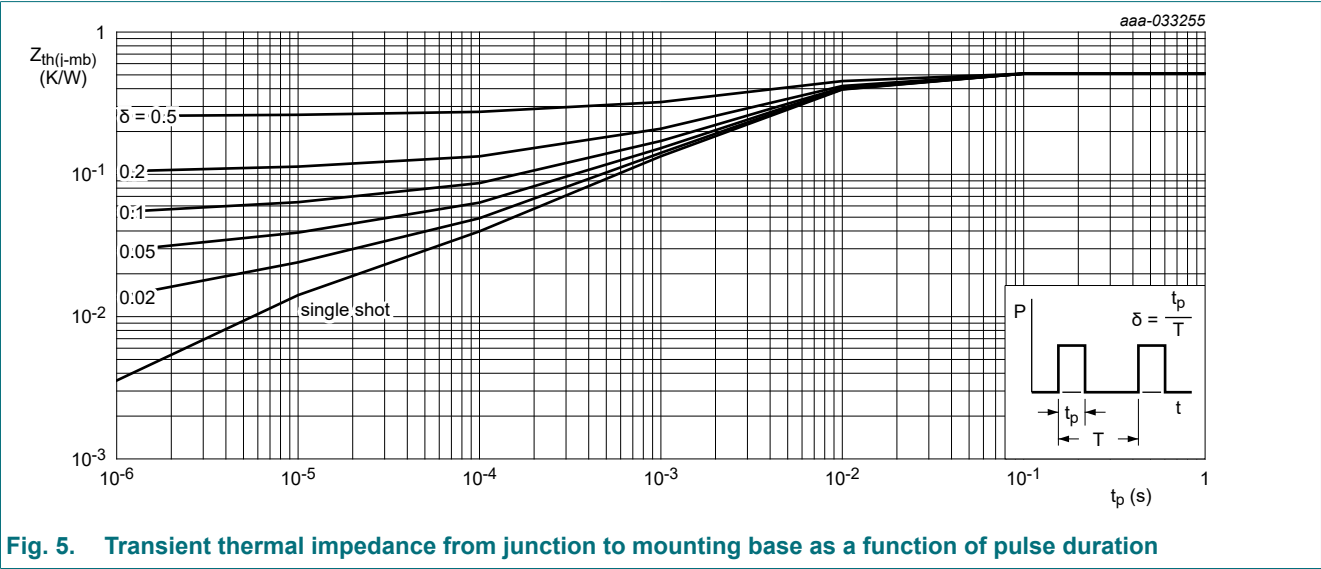


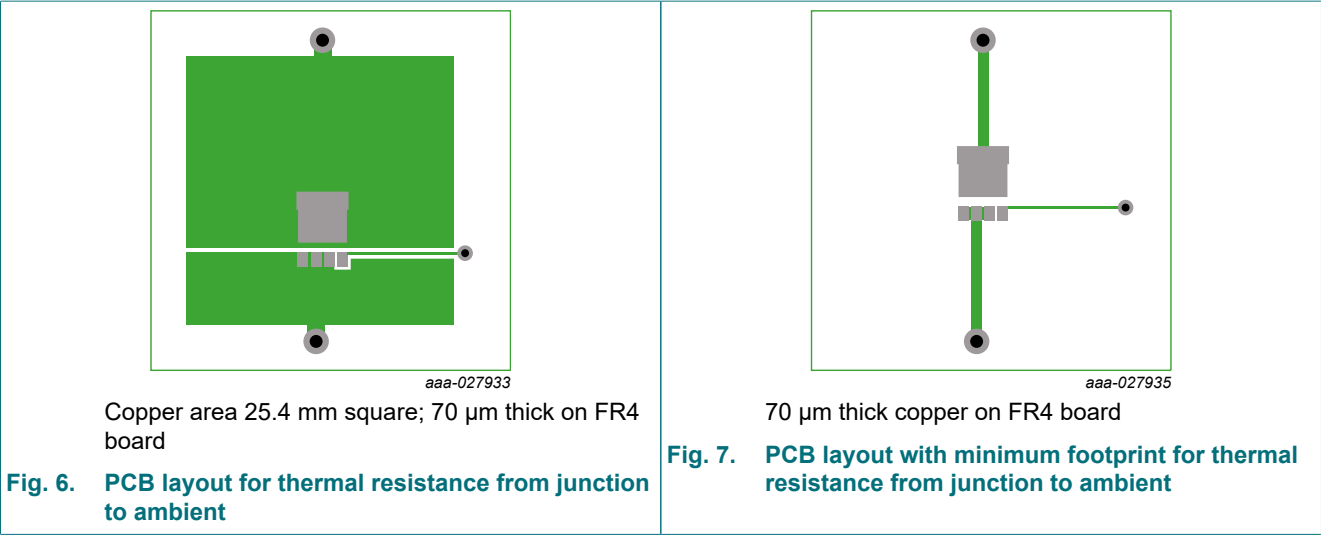


9. Thermal characteristics

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



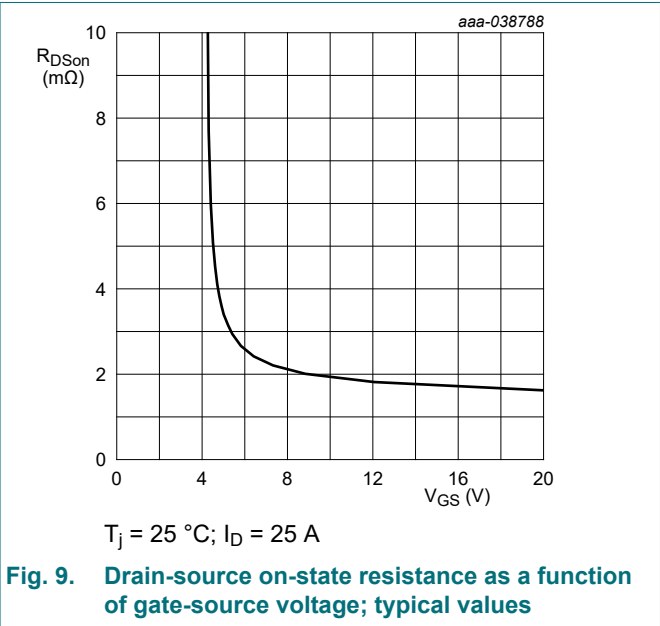
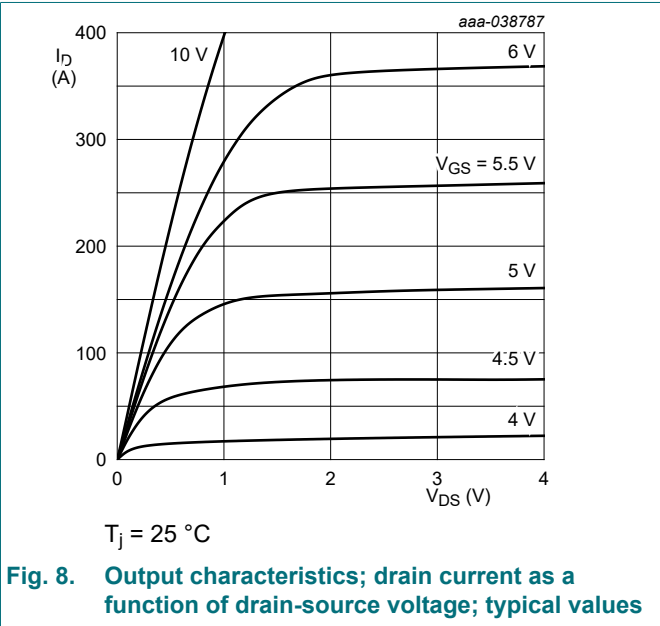


10. Characteristics

Table 7. Characteristics
T_j = 25 °C unless otherwise stated.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
V _{(BR)DSS}	drain-source breakdown voltage	I _D = 250 μA; V _{GS} = 0 V; T _j = 25 °C	80	87	-	V
		I _D = 250 μA; V _{GS} = 0 V; T _j = -55 °C	72	84	-	V
V _{GS(th)}	gate-source threshold voltage	I _D = 1 mA; V _{DS} =V _{GS} ; T _j = 25 °C; Fig. 11	2	3	4	V
		I _D = 1 mA; V _{DS} =V _{GS} ; T _j = 175 °C	-	1.9	-	V
		I _D = 1 mA; V _{DS} =V _{GS} ; T _j = -55 °C	-	3.3	-	V
ΔV _{GS(th)} /ΔT	gate-source threshold voltage variation with temperature	25 °C ≤ T _j ≤ 150 °C	-	-7	-	mV/K
I _{DSS}	drain leakage current	V _{DS} = 80 V; V _{GS} = 0 V; T _j = 25 °C	-	0.003	1	μA
		V _{DS} = 80 V; V _{GS} = 0 V; T _j = 125 °C	-	3	100	μA
I _{GSS}	gate leakage current	V _{GS} = 20 V; V _{DS} = 0 V; T _j = 25 °C	-	2	100	nA
		V _{GS} = -20 V; V _{DS} = 0 V; T _j = 25 °C	-	2	100	nA
R _{DSon}	drain-source on-state resistance	V _{GS} = 10 V; I _D = 25 A; T _j = 25 °C; Fig. 12	-	1.9	2.4	mΩ
		V _{GS} = 10 V; I _D = 25 A; T _j = 105 °C; Fig. 13	-	3.1	4.3	mΩ
		V _{GS} = 10 V; I _D = 25 A; T _j = 175 °C; Fig. 13	-	4.4	5.5	mΩ
R _G	gate resistance	f = 1 MHz; T _j = 25 °C	0.4	0.8	1.6	Ω
Dynamic characteristics						
Q _{G(tot)}	total gate charge	I _D = 25 A; V _{DS} = 40 V; V _{GS} = 10 V; Fig. 14 ; Fig. 15	42.5	85	127	nC
		I _D = 0 A; V _{DS} = 0 V; V _{GS} = 10 V	-	74	-	nC

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Q_{GS}	gate-source charge	$I_D = 25\text{ A}$; $V_{DS} = 40\text{ V}$; $V_{GS} = 10\text{ V}$; Fig. 14 ; Fig. 15		8.8	22	35	nC
$Q_{GS(th)}$	pre-threshold gate-source charge			-	16	-	nC
$Q_{GS(th-pl)}$	post-threshold gate-source charge			-	6	-	nC
Q_{GD}	gate-drain charge			5.8	16.5	38	nC
$V_{GS(pl)}$	gate-source plateau voltage	$I_D = 25\text{ A}$; $V_{DS} = 40\text{ V}$; Fig. 14 ; Fig. 15		-	4	-	V
C_{iss}	input capacitance	$V_{DS} = 40\text{ V}$; $V_{GS} = 0\text{ V}$; $f = 1\text{ MHz}$; Fig. 16		3510	5850	8191	pF
C_{oss}	output capacitance			554	1385	2493	pF
C_{rss}	reverse transfer capacitance			4	44	102	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 40\text{ V}$; $R_L = 1.6\text{ }\Omega$; $V_{GS} = 10\text{ V}$; $R_{G(ext)} = 5\text{ }\Omega$		-	19	-	ns
t_r	rise time			-	18	-	ns
$t_{d(off)}$	turn-off delay time			-	53	-	ns
t_f	fall time			-	29	-	ns
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		-	0.79	1	V
t_{rr}	reverse recovery time	$I_S = 25\text{ A}$; $di_S/dt = -100\text{ A}/\mu\text{s}$; $V_{GS} = 0\text{ V}$; $V_{DS} = 40\text{ V}$; Fig. 18		-	38	-	ns
Q_r	recovered charge			-	33	-	nC



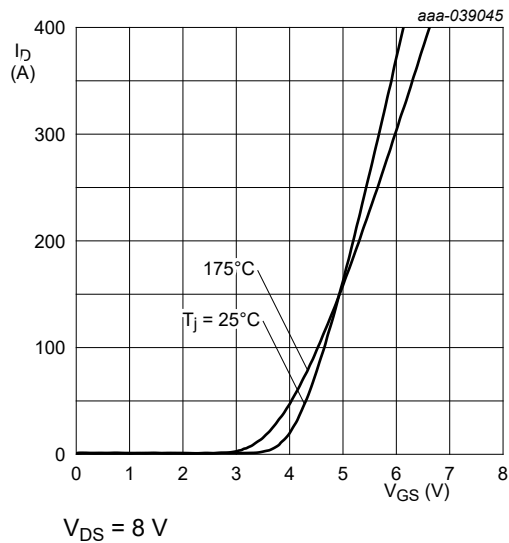


Fig. 10. Transfer characteristics; drain current as a function of gate-source voltage; typical values

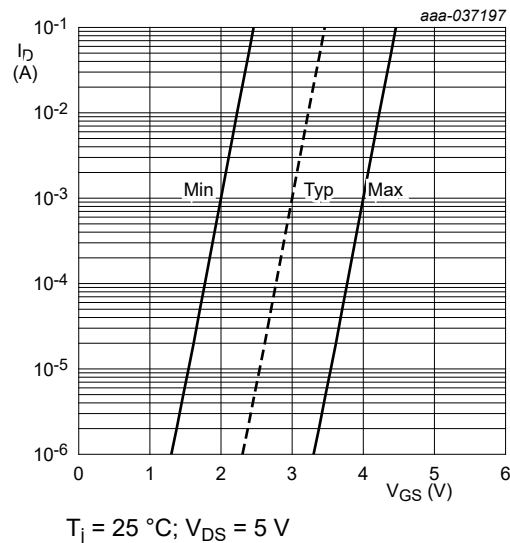


Fig. 11. Sub-threshold drain current as a function of gate-source voltage

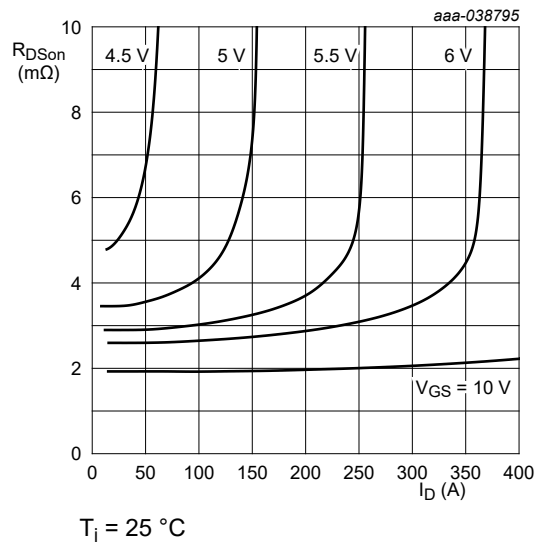


Fig. 12. Drain-source on-state resistance as a function of drain current; typical values

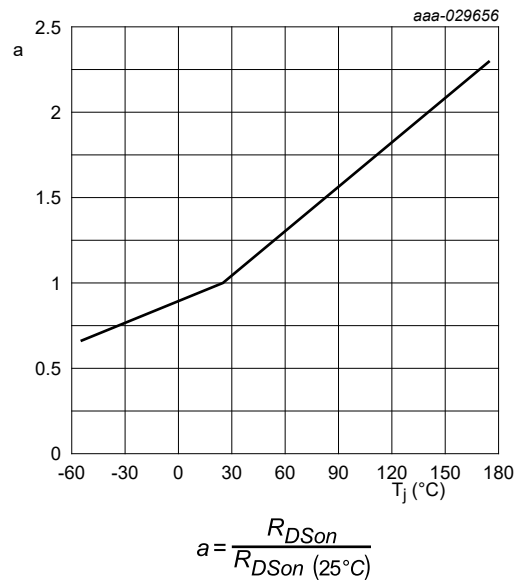


Fig. 13. Normalized drain-source on-state resistance factor as a function of junction temperature

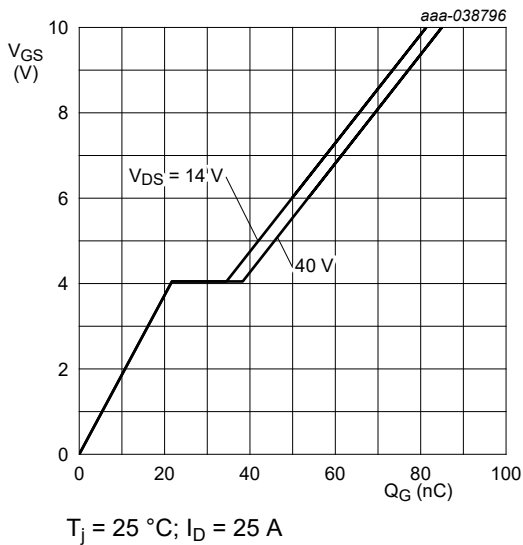


Fig. 14. Gate-source voltage as a function of gate charge; typical values

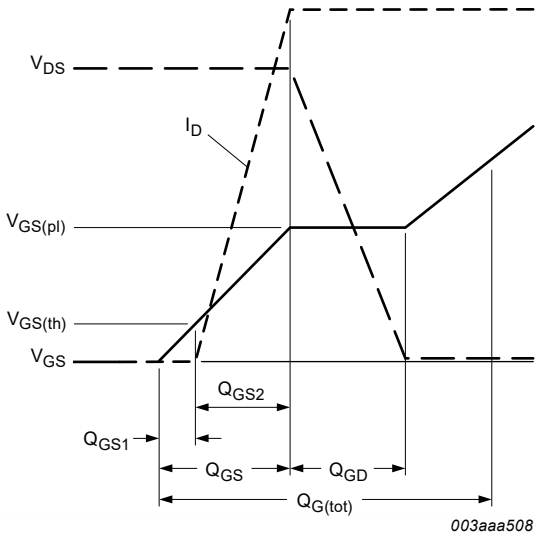


Fig. 15. Gate charge waveform definitions

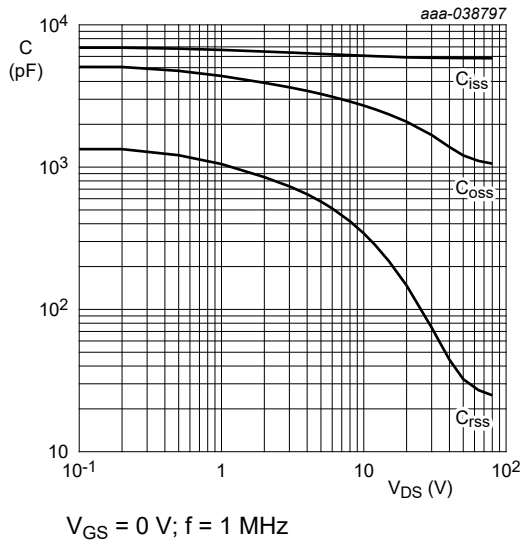


Fig. 16. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

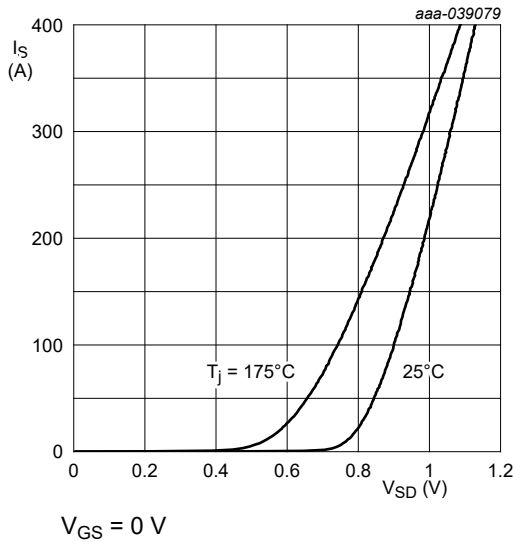


Fig. 17. Source-drain (diode forward) current as a function of source-drain (diode forward) voltage; typical values

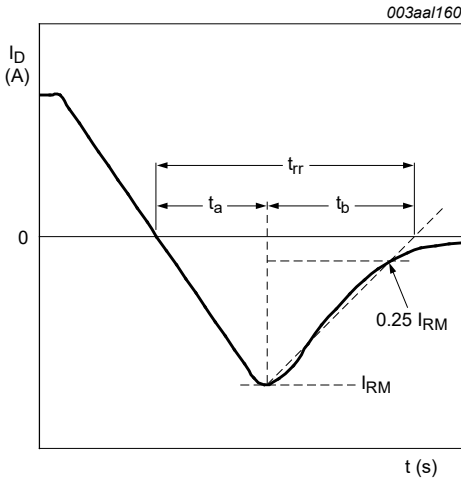


Fig. 18. Reverse recovery timing definition

11. Package outline

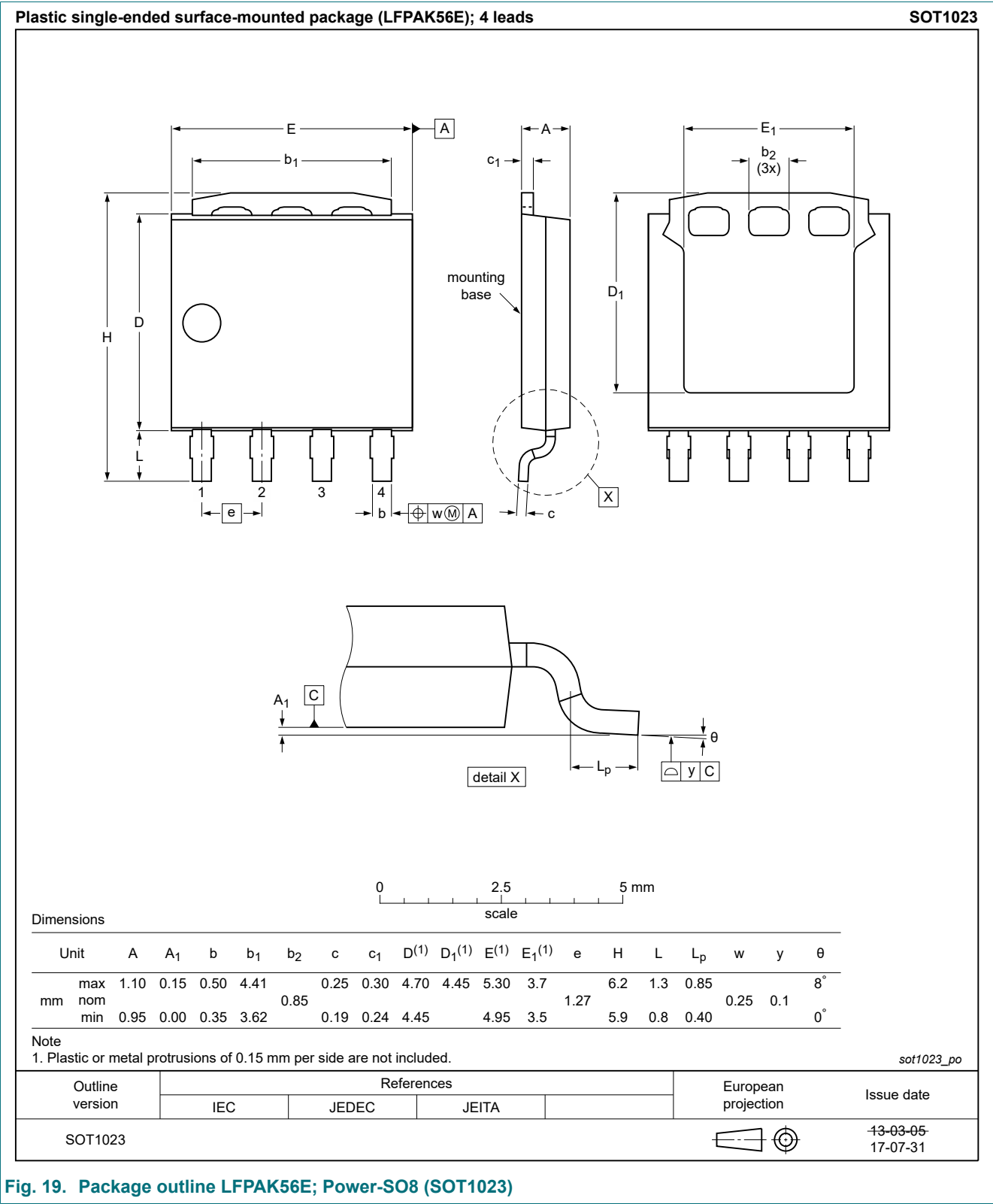


Fig. 19. Package outline LPAK56E; Power-SO8 (SOT1023)

12. Soldering

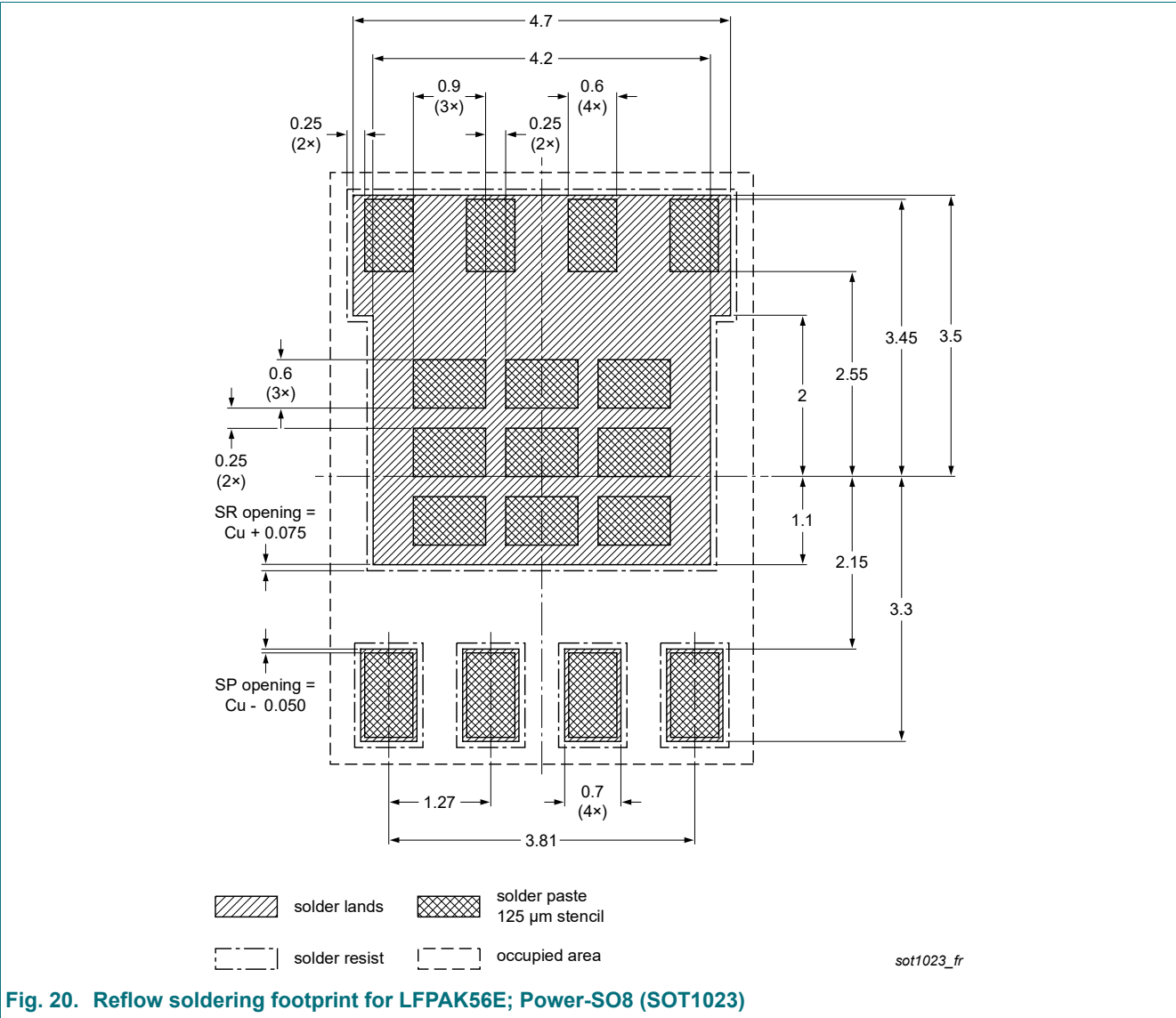


Fig. 20. Reflow soldering footprint for LPAK56E; Power-SO8 (SOT1023)

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.
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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