



PSMN1R0-30YLC

N-channel 30 V 1.15 mΩ logic level MOSFET in LPAK using NextPower technology

7 June 2024

Product data sheet

1. General description

Logic level enhancement mode N-channel MOSFET in LPAK package. This product is designed and qualified for use in a wide range of industrial, communications and domestic equipment.

2. Features and benefits

- High reliability Power SO8 package, qualified to 175°C
- Optimised for 4.5V Gate drive utilising NextPower Superjunction technology
- Ultra low QG, QGD, & QOSS for high system efficiencies at low and high loads
- Ultra low R_{ds(on)} and low parasitic inductance

3. Applications

- DC-to-DC converters
- Lithium-ion battery protection
- Load switching
- Power OR-ing
- Server power supplies
- Sync rectifier

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		-	-	30	V
I _D	drain current	V _{GS} = 10 V; T _{mb} = 25 °C; Fig. 2	[1]	-	-	100	A
P _{tot}	total power dissipation	T _{mb} = 25 °C; Fig. 1		-	-	272	W
T _j	junction temperature			-55	-	175	°C
Static characteristics							
R _{DSon}	drain-source on-state resistance	V _{GS} = 4.5 V; I _D = 25 A; T _j = 25 °C; Fig. 12		-	1.1	1.4	mΩ
		V _{GS} = 10 V; I _D = 25 A; T _j = 25 °C; Fig. 12		-	0.85	1.15	mΩ
Dynamic characteristics							
Q _{GD}	gate-drain charge	I _D = 25 A; V _{DS} = 15 V; V _{GS} = 4.5 V; Fig. 14 ; Fig. 15		-	14.6	26	nC
Q _{G(tot)}	total gate charge	I _D = 25 A; V _{DS} = 15 V; V _{GS} = 10 V; Fig. 14 ; Fig. 15		-	103.5	145	nC
Avalanche ruggedness							
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	I _D = 100 A; V _{sup} ≤ 30 V; R _{GS} = 50 Ω; V _{GS} = 10 V; T _{j(init)} = 25 °C; unclamped; Fig. 4		-	-	259	mJ

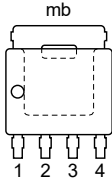
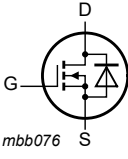
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Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Source-drain diode							
Q _r	recovered charge	I _S = 25 A; dI _S /dt = -100 A/μs; V _{GS} = 0 V; V _{DS} = 15 V		-	67	-	nC

[1] Continuous current is limited by package.

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	S	source	 LPAK56; Power-SO8 (SOT669)	 <i>mbb076</i>
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
PSMN1R0-30YLC	LPAK56; Power-SO8	plastic, single-ended surface-mounted package; 4 terminals	SOT669

7. Marking

Table 4. Marking codes

Type number	Marking code
PSMN1R0-30YLC	1C030L

8. Limiting values

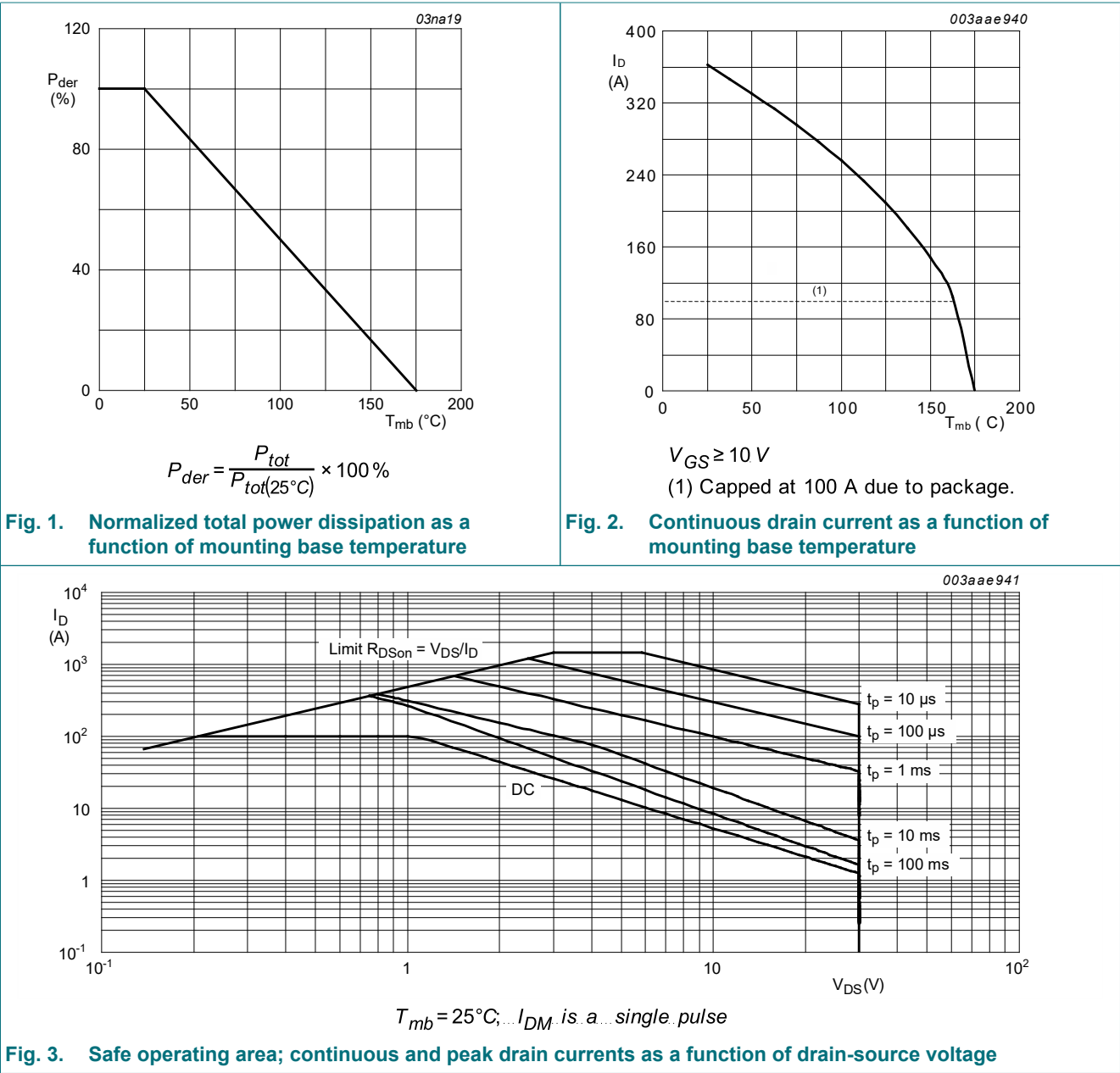
Table 5. Limiting values

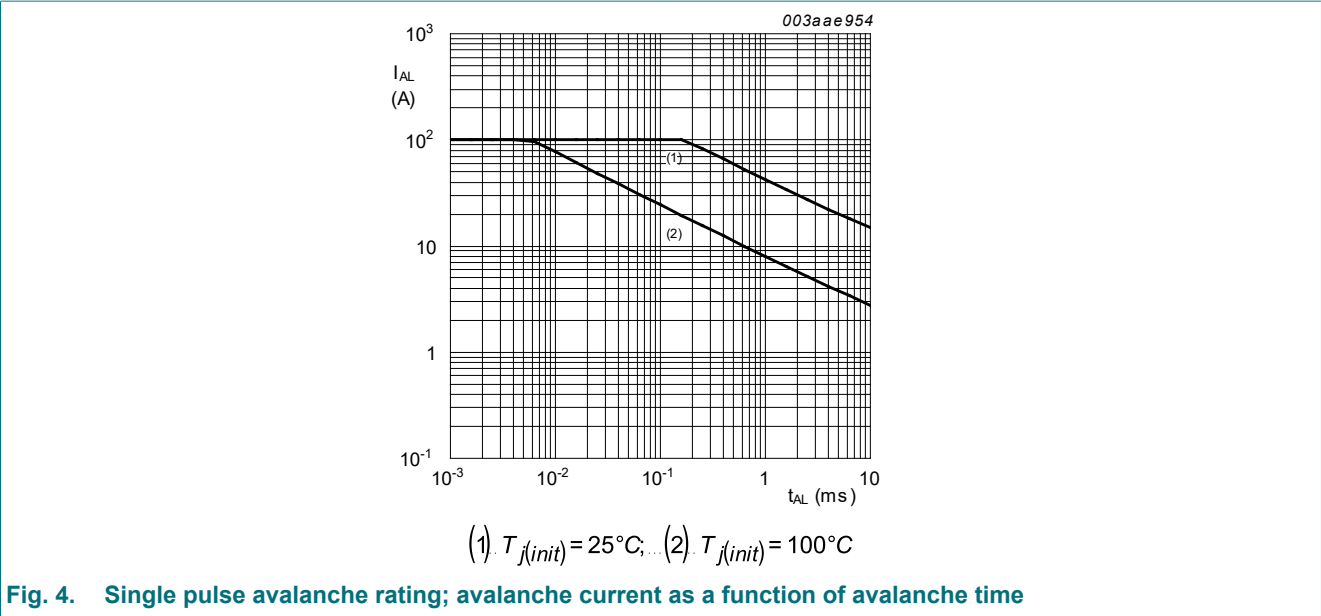
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
V _{DS}	drain-source voltage	25 °C ≤ T _j ≤ 175 °C		-	30	V
V _{DGR}	drain-gate voltage	25 °C ≤ T _j ≤ 175 °C; R _{GS} = 20 kΩ		-	30	V
V _{GS}	gate-source voltage			-20	20	V
P _{tot}	total power dissipation	T _{mb} = 25 °C; Fig. 1		-	272	W
I _D	drain current	V _{GS} = 10 V; T _{mb} = 25 °C; Fig. 2	[1]	-	100	A
		V _{GS} = 10 V; T _{mb} = 100 °C; Fig. 2	[1]	-	100	A
I _{DM}	peak drain current	pulsed; t _p ≤ 10 μs; T _{mb} = 25 °C; Fig. 3		-	1450	A
T _{stg}	storage temperature			-55	175	°C
T _j	junction temperature			-55	175	°C

Symbol	Parameter	Conditions		Min	Max	Unit
T _{slid(M)}	peak soldering temperature			-	260	°C
V _{ESD}	electrostatic discharge voltage	machine model according to JEDEC JESD22-A115		960	-	V
Source-drain diode						
I _S	source current	T _{mb} = 25 °C	[1]	-	100	A
I _{SM}	peak source current	pulsed; t _p ≤ 10 μs; T _{mb} = 25 °C		-	1450	A
Avalanche ruggedness						
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	I _D = 100 A; V _{sup} ≤ 30 V; R _{GS} = 50 Ω; V _{GS} = 10 V; T _{j(init)} = 25 °C; unclamped; Fig. 4		-	259	mJ

[1] Continuous current is limited by package.

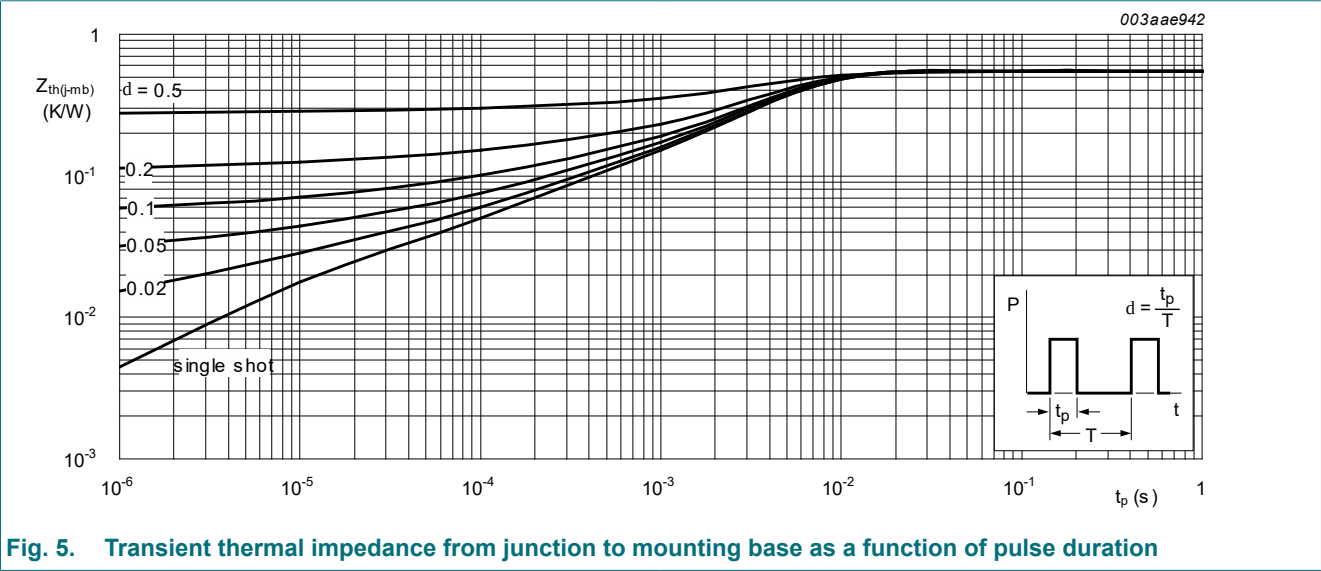




9. Thermal characteristics

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	0.55	K/W



10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250\text{ }\mu\text{A}$; $V_{GS} = 0\text{ V}$; $T_j = 25^{\circ}\text{C}$	30	-	-	V
		$I_D = 250\text{ }\mu\text{A}$; $V_{GS} = 0\text{ V}$; $T_j = -55^{\circ}\text{C}$	27	-	-	V

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Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V _{GS(th)}	gate-source threshold voltage	I _D = 1 mA; V _{DS} =V _{GS} ; T _J = 25 °C; Fig. 10		1.05	1.41	1.95	V
		I _D = 10 mA; V _{DS} =V _{GS} ; T _J = 150 °C; Fig. 11		0.5	-	-	V
		I _D = 1 mA; V _{DS} =V _{GS} ; T _J = -55 °C; Fig. 11		-	-	2.25	V
I _{DSS}	drain leakage current	V _{DS} = 30 V; V _{GS} = 0 V; T _J = 25 °C		-	-	1	μA
		V _{DS} = 30 V; V _{GS} = 0 V; T _J = 150 °C		-	-	100	μA
I _{GSS}	gate leakage current	V _{GS} = 16 V; V _{DS} = 0 V; T _J = 25 °C		-	-	100	nA
		V _{GS} = -16 V; V _{DS} = 0 V; T _J = 25 °C		-	-	100	nA
R _{DS(on)}	drain-source on-state resistance	V _{GS} = 4.5 V; I _D = 25 A; T _J = 25 °C; Fig. 12		-	1.1	1.4	mΩ
		V _{GS} = 4.5 V; I _D = 25 A; T _J = 150 °C; Fig. 12 ; Fig. 13		-	-	2.4	mΩ
		V _{GS} = 10 V; I _D = 25 A; T _J = 25 °C; Fig. 12		-	0.85	1.15	mΩ
		V _{GS} = 10 V; I _D = 25 A; T _J = 150 °C; Fig. 12 ; Fig. 13		-	-	1.85	mΩ
R _G	gate resistance	f = 1 MHz		-	1.1	2.2	Ω
Dynamic characteristics							
Q _{G(tot)}	total gate charge	I _D = 25 A; V _{DS} = 15 V; V _{GS} = 10 V; Fig. 14 ; Fig. 15		-	103.5	145	nC
		I _D = 25 A; V _{DS} = 15 V; V _{GS} = 4.5 V; Fig. 14 ; Fig. 15		-	50	70	nC
		I _D = 0 A; V _{DS} = 0 V; V _{GS} = 10 V; Fig. 15		-	96.5	-	nC
Q _{GS}	gate-source charge	I _D = 25 A; V _{DS} = 15 V; V _{GS} = 4.5 V; Fig. 14 ; Fig. 15		-	12.9	-	nC
Q _{GS(th)}	pre-threshold gate-source charge			-	10.1	-	nC
Q _{GS(th-pl)}	post-threshold gate-source charge			-	2.8	-	nC
Q _{GD}	gate-drain charge			-	14.6	26	nC
V _{GS(pl)}	gate-source plateau voltage	I _D = 25 A; V _{DS} = 15 V; Fig. 14		-	2.2	-	V
C _{iss}	input capacitance	V _{DS} = 15 V; V _{GS} = 0 V; f = 1 MHz; T _J = 25 °C; Fig. 16		3322	6645	9968	pF
C _{oss}	output capacitance			605	1210	1815	pF
C _{rss}	reverse transfer capacitance			240	481	842	pF
t _{d(on)}	turn-on delay time	V _{DS} = 15 V; R _L = 0.6 Ω; V _{GS} = 4.5 V; R _{G(ext)} = 4.7 Ω		-	44	-	ns
t _r	rise time			-	77	-	ns
t _{d(off)}	turn-off delay time			-	108	-	ns
t _f	fall time			-	60	-	ns
Q _{oss}	output charge	V _{GS} = 0 V; V _{DS} = 15 V; f = 1 MHz; T _J = 25 °C		-	35.2	-	nC
Source-drain diode							
V _{SD}	source-drain voltage	I _S = 25 A; V _{GS} = 0 V; T _J = 25 °C; Fig. 17		-	0.8	1.1	V
t _{rr}	reverse recovery time	I _S = 25 A; dI _S /dt = -100 A/μs; V _{GS} = 0 V; V _{DS} = 15 V		-	45	-	ns
Q _r	recovered charge			-	67	-	nC

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
t_a	reverse recovery rise time	$I_S = 25\text{ A}$; $dI_S/dt = -100\text{ A}/\mu\text{s}$; $V_{GS} = 0\text{ V}$; $V_{DS} = 15\text{ V}$; Fig. 18		-	28.5	-	ns
t_b	reverse recovery fall time			-	16.5	-	ns

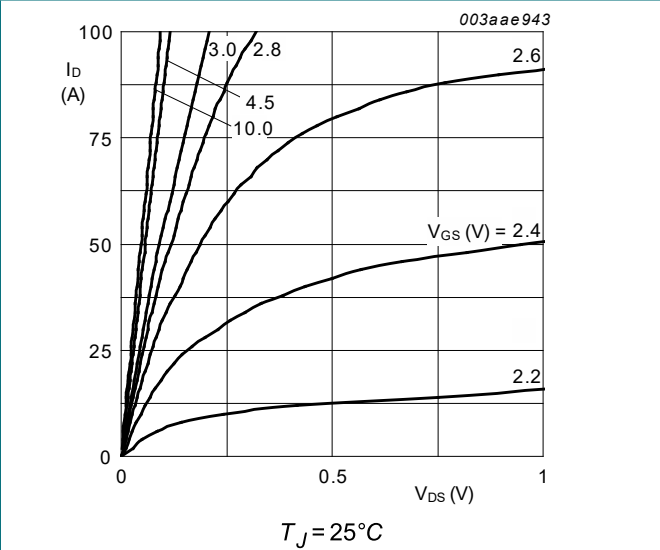


Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values

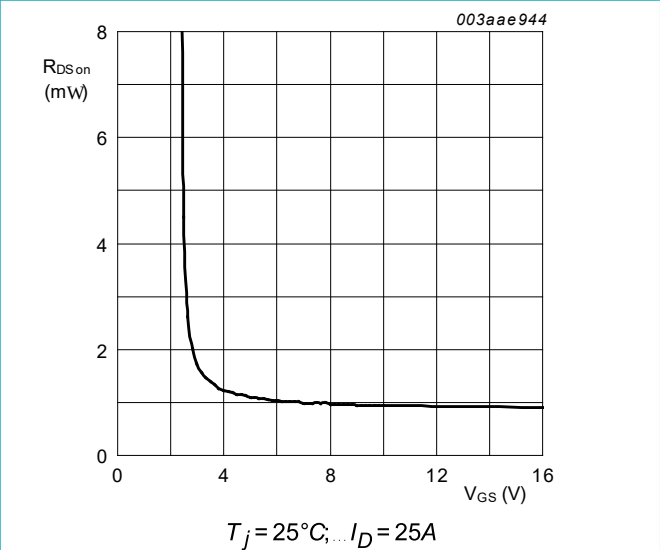


Fig. 7. Drain-source on-state resistance as a function of gate-source voltage; typical values

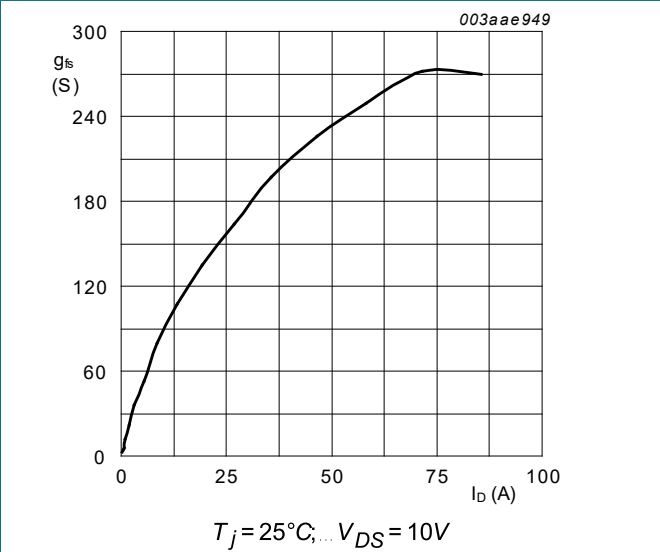


Fig. 8. Forward transconductance as a function of drain current; typical values

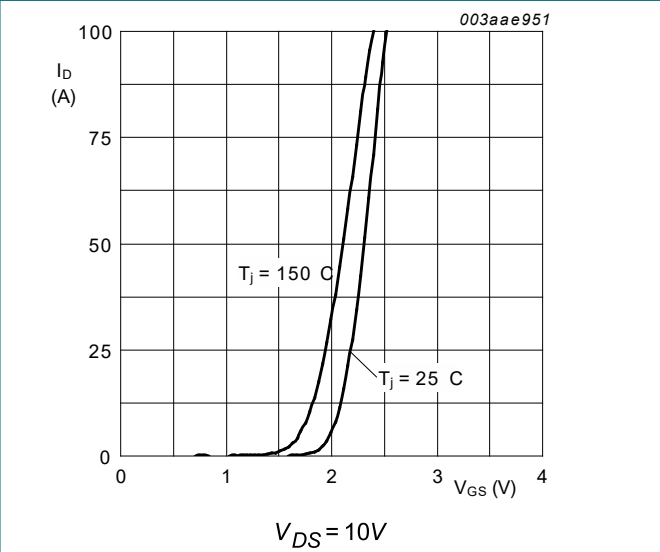


Fig. 9. Transfer characteristics: drain current as a function of gate-source voltage; typical values

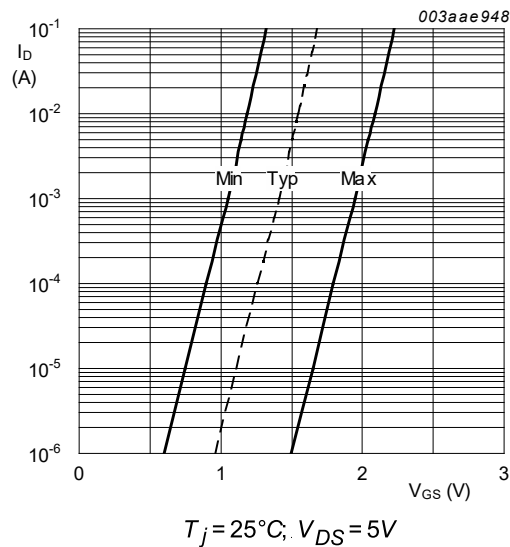


Fig. 10. Sub-threshold drain current as a function of gate-source voltage

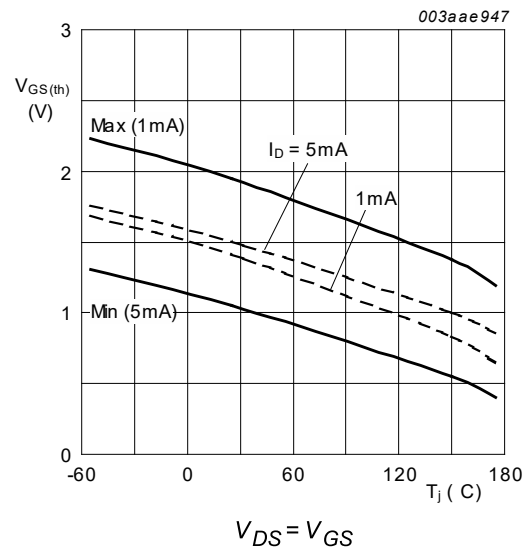


Fig. 11. Gate-source threshold voltage as a function of junction temperature

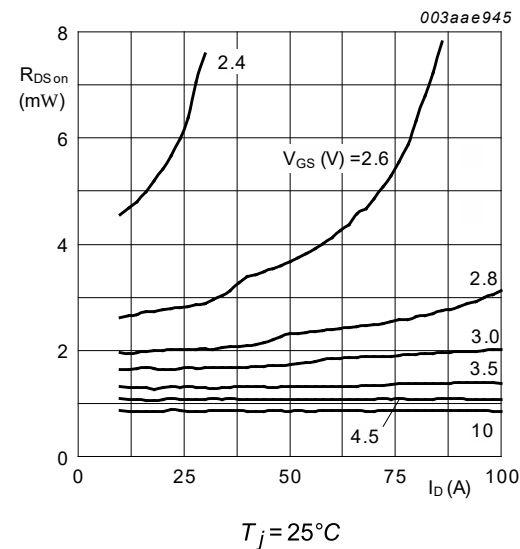


Fig. 12. Drain-source on-state resistance as a function of drain current; typical values

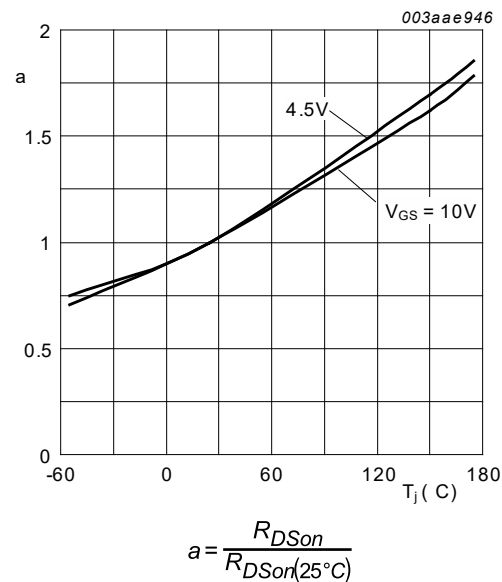


Fig. 13. Normalized drain-source on-state resistance factor as a function of junction temperature

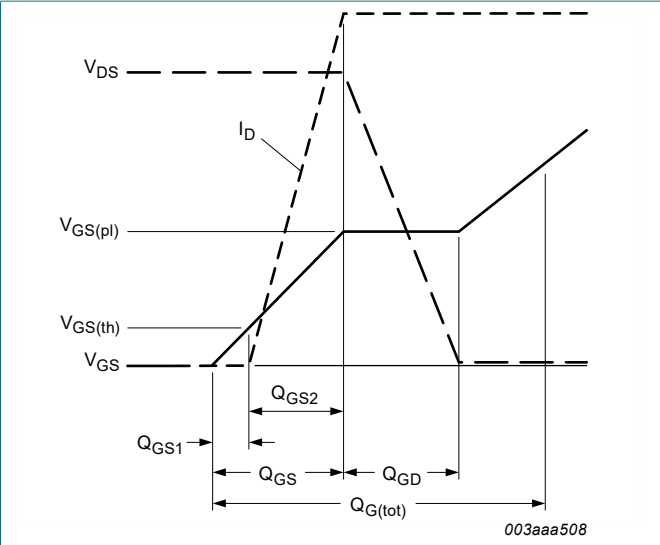


Fig. 14. Gate charge waveform definitions

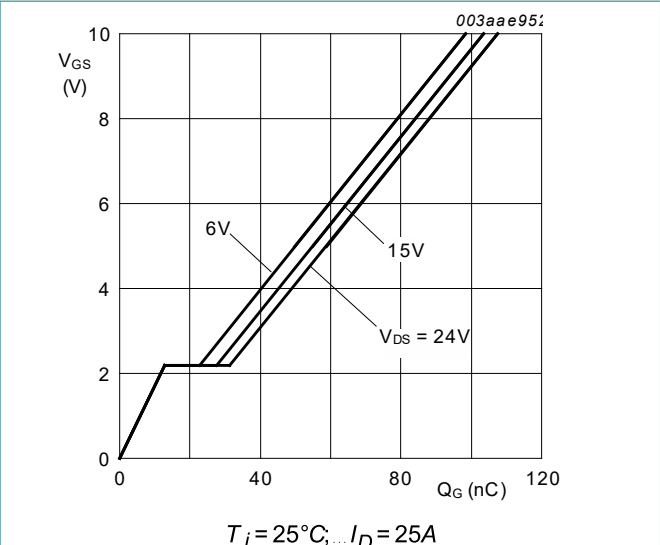


Fig. 15. Gate-source voltage as a function of gate charge; typical values

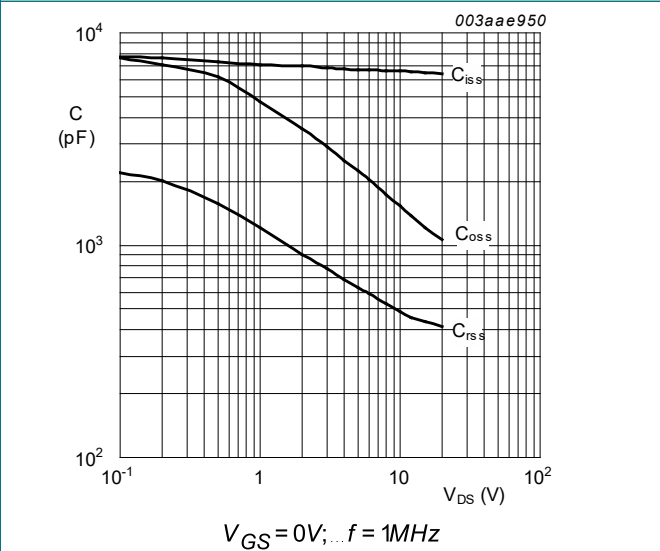


Fig. 16. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

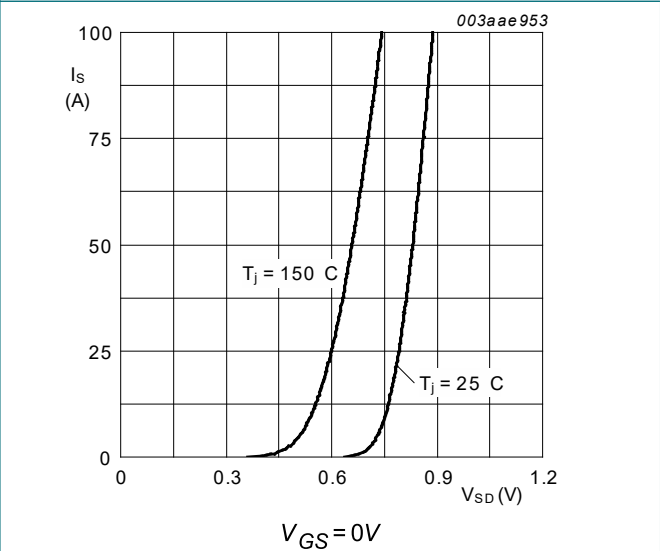
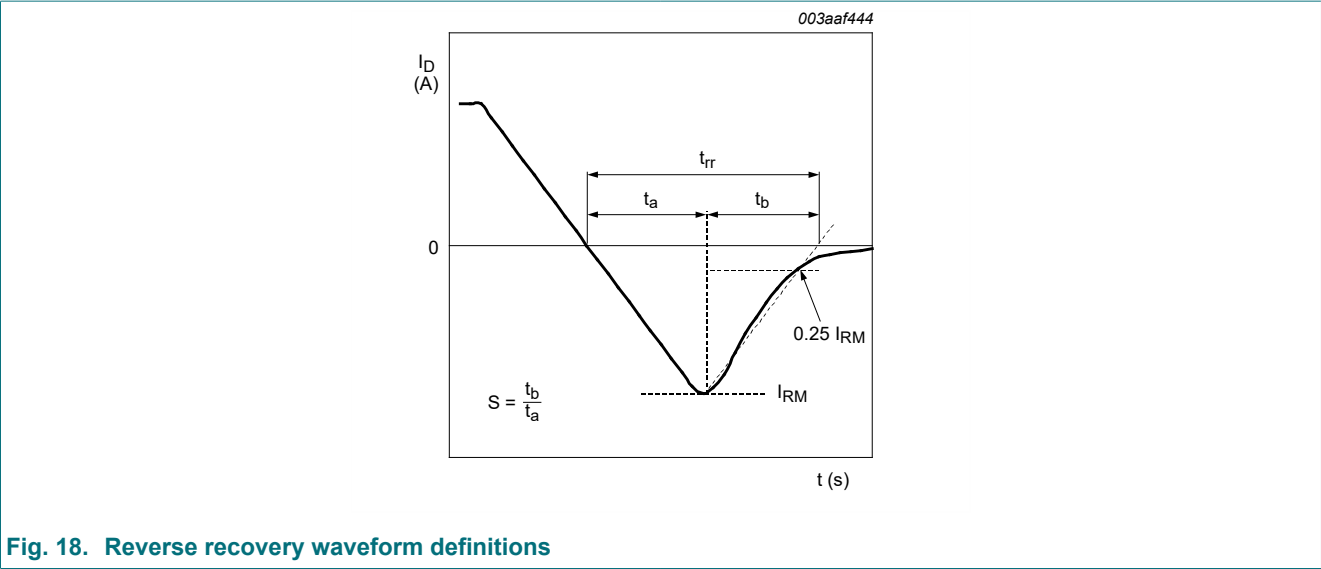


Fig. 17. Source current as a function of source-drain voltage; typical values



11. Package outline

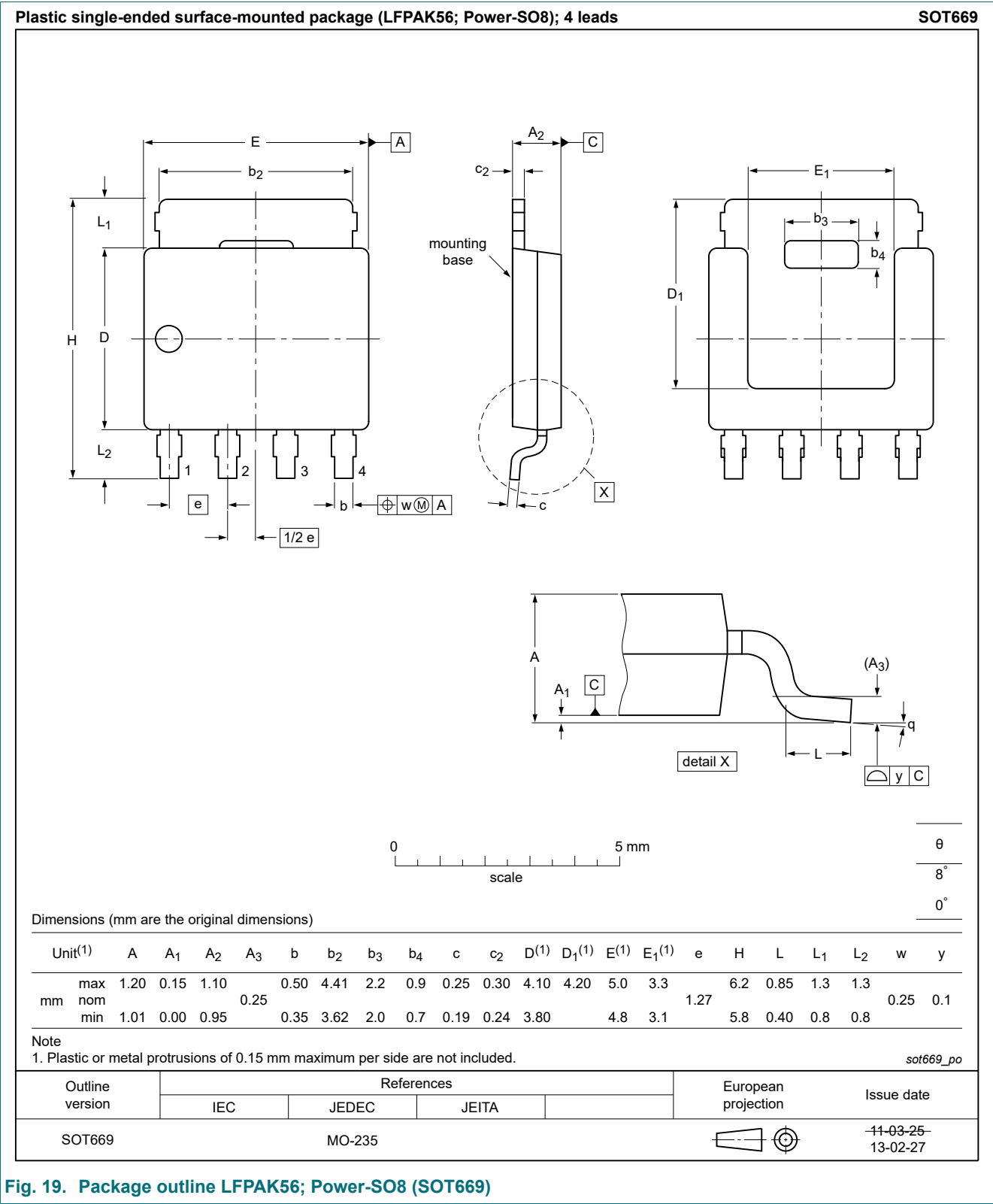


Fig. 19. Package outline LPAK56; Power-SO8 (SOT669)

12. Soldering

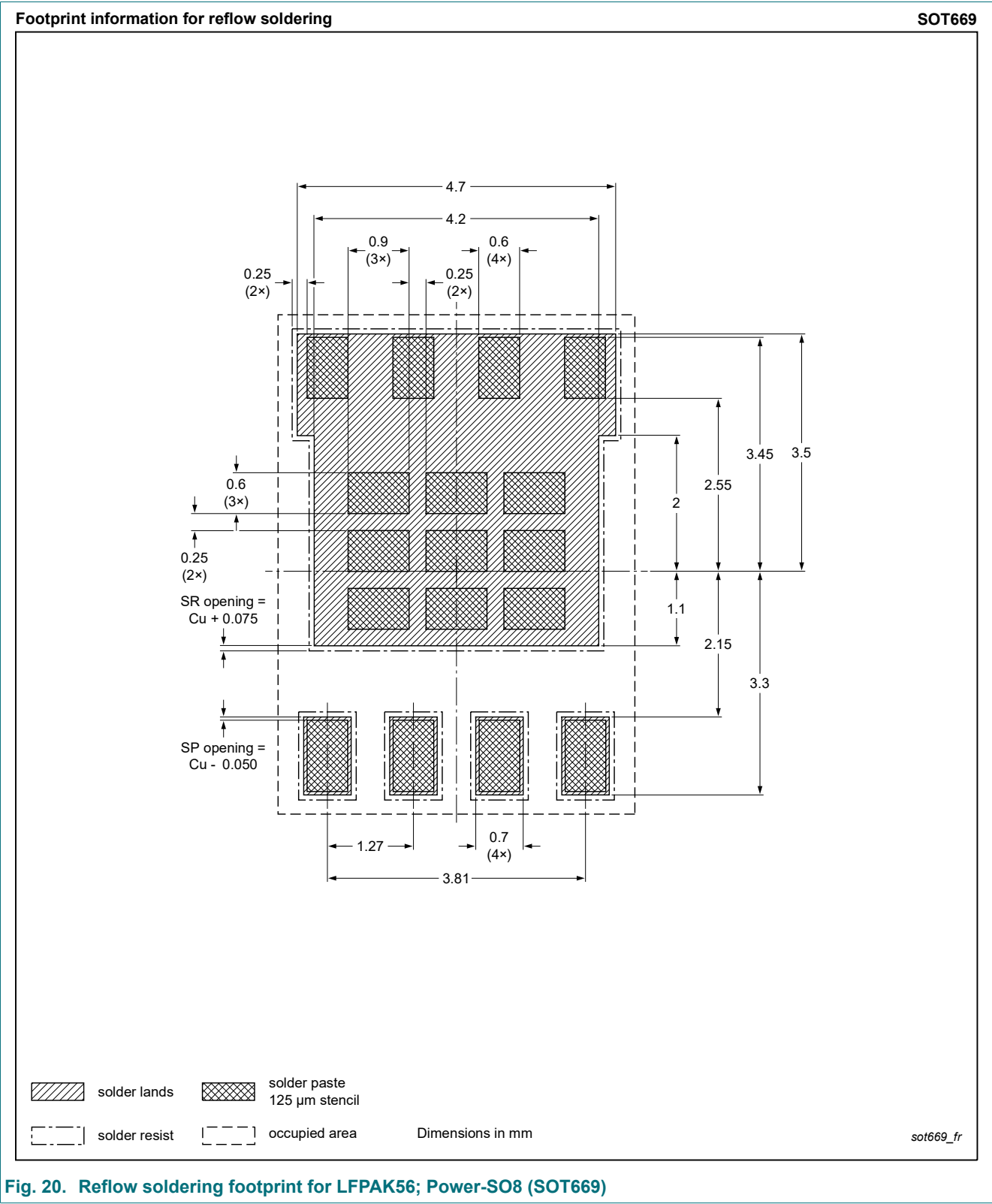


Fig. 20. Reflow soldering footprint for LPAK56; Power-SO8 (SOT669)

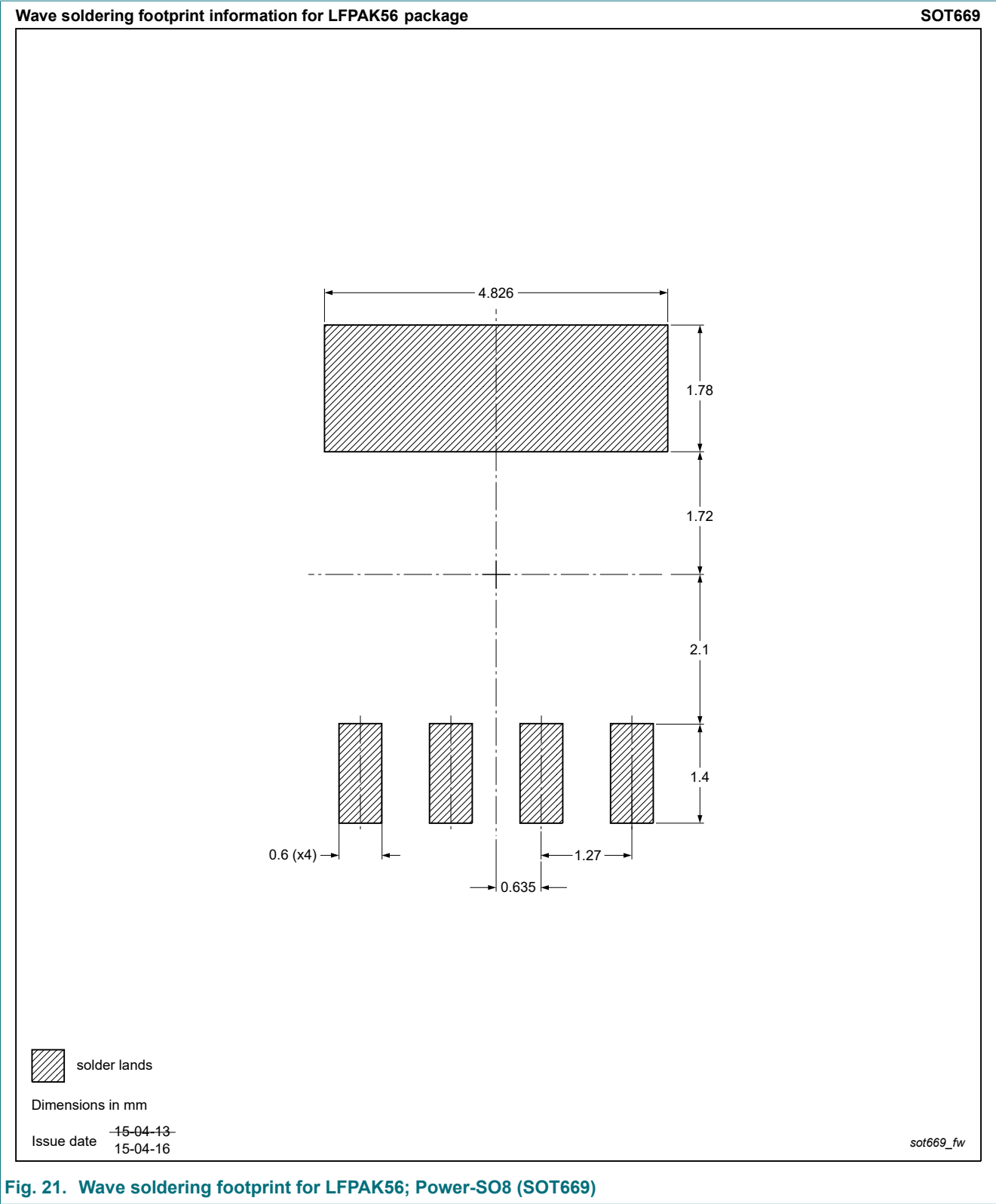


Fig. 21. Wave soldering footprint for LPAK56; Power-SO8 (SOT669)

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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