



**THE DATASHEET OF  
PSMN3R5-30YL,115**





# PSMN3R5-30YL

N-channel 30 V 3.5 mΩ logic level MOSFET in LPAK

3 August 2018

Product data sheet

## 1. General description

Logic level N-channel enhancement mode Field-Effect Transistor (FET) in a plastic package using TrenchMOS technology. This product is designed and qualified for use in industrial and communications applications.

## 2. Features and benefits

- High efficiency due to low switching and conduction losses
- Suitable for logic level gate drive sources

## 3. Applications

- Class-D amplifiers
- DC-to-DC converters
- Motor control
- Server power supplies

## 4. Quick reference data

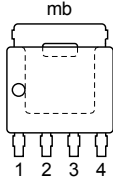
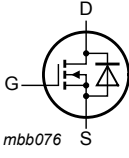
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DS}$	drain-source voltage	$25\text{ °C} \leq T_j \leq 175\text{ °C}$	-	-	30	V
$I_D$	drain current	$V_{GS} = 10\text{ V}$ ; $T_{mb} = 25\text{ °C}$ ; <a href="#">Fig. 2</a>	[1]	-	100	A
$P_{tot}$	total power dissipation	$T_{mb} = 25\text{ °C}$ ; <a href="#">Fig. 1</a>	-	-	74	W
<b>Static characteristics</b>						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}$ ; $I_D = 15\text{ A}$ ; $T_j = 25\text{ °C}$	-	2.43	3.5	mΩ
<b>Dynamic characteristics</b>						
$Q_{GD}$	gate-drain charge	$I_D = 10\text{ A}$ ; $V_{DS} = 12\text{ V}$ ; $V_{GS} = 4.5\text{ V}$ ; <a href="#">Fig. 14</a> ; <a href="#">Fig. 15</a>	-	5	-	nC
$Q_{G(tot)}$	total gate charge		-	19	-	nC
<b>Avalanche ruggedness</b>						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 100\text{ A}$ ; $V_{sup} \leq 30\text{ V}$ ; $R_{GS} = 50\text{ }\Omega$ ; $V_{GS} = 10\text{ V}$ ; $T_{j(init)} = 25\text{ °C}$ ; unclamped	-	-	54	mJ

[1] Continuous current is limited by package.

## 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</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
PSMN3R5-30YL	LPAK56; Power-SO8	Plastic single-ended surface-mounted package (LPAK56; Power-SO8); 4 leads	SOT669

## 7. Marking

Table 4. Marking codes

Type number	Marking code
PSMN3R5-30YL	3R530

## 8. Limiting values

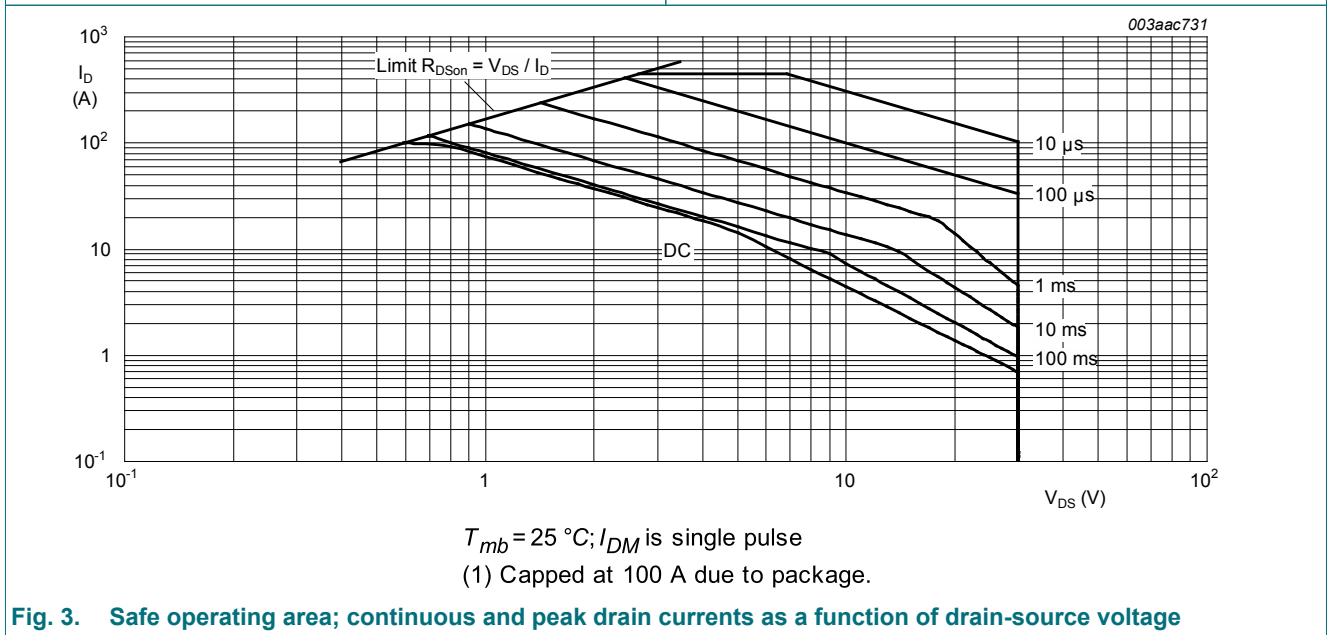
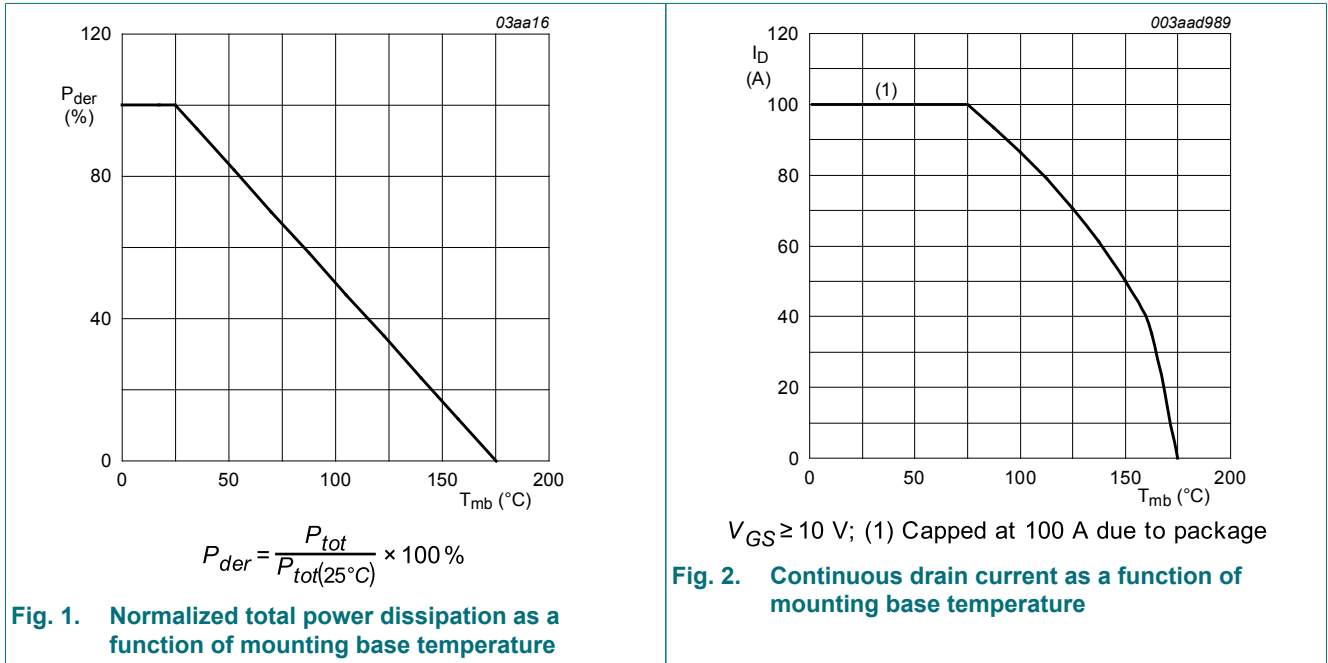
Table 5. Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
$V_{DS}$	drain-source voltage	$25\text{ °C} \leq T_j \leq 175\text{ °C}$		-	30	V
$V_{DSM}$	peak drain-source voltage	$t_p \leq 25\text{ ns}$ ; $f \leq 500\text{ kHz}$ ; $E_{DS(AL)} \leq 180\text{ nJ}$ ; pulsed		-	35	V
$V_{DGR}$	drain-gate voltage	$25\text{ °C} \leq T_j \leq 175\text{ °C}$ ; $R_{GS} = 20\text{ k}\Omega$		-	30	V
$V_{GS}$	gate-source voltage			-20	20	V
$P_{tot}$	total power dissipation	$T_{mb} = 25\text{ °C}$ ; <a href="#">Fig. 1</a>		-	74	W
$I_D$	drain current	$V_{GS} = 10\text{ V}$ ; $T_{mb} = 100\text{ °C}$ ; <a href="#">Fig. 2</a>	[1]	-	86	A
		$V_{GS} = 10\text{ V}$ ; $T_{mb} = 25\text{ °C}$ ; <a href="#">Fig. 2</a>	[1]	-	100	A
$I_{DM}$	peak drain current	pulsed; $t_p \leq 10\text{ }\mu\text{s}$ ; $T_{mb} = 25\text{ °C}$ ; <a href="#">Fig. 3</a>		-	447	A
$T_{stg}$	storage temperature			-55	175	°C
$T_j$	junction temperature			-55	175	°C
<b>Source-drain diode</b>						
$I_S$	source current	$T_{mb} = 25\text{ °C}$	[1]	-	100	A
$I_{SM}$	peak source current	pulsed; $t_p \leq 10\text{ }\mu\text{s}$ ; $T_{mb} = 25\text{ °C}$		-	447	A
<b>Avalanche ruggedness</b>						

Symbol	Parameter	Conditions	Min	Max	Unit
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 100\text{ A}$ ; $V_{sup} \leq 30\text{ V}$ ; $R_{GS} = 50\ \Omega$ ; $V_{GS} = 10\text{ V}$ ; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$ ; unclamped	-	54	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. 4	-	0.6	1.68	K/W

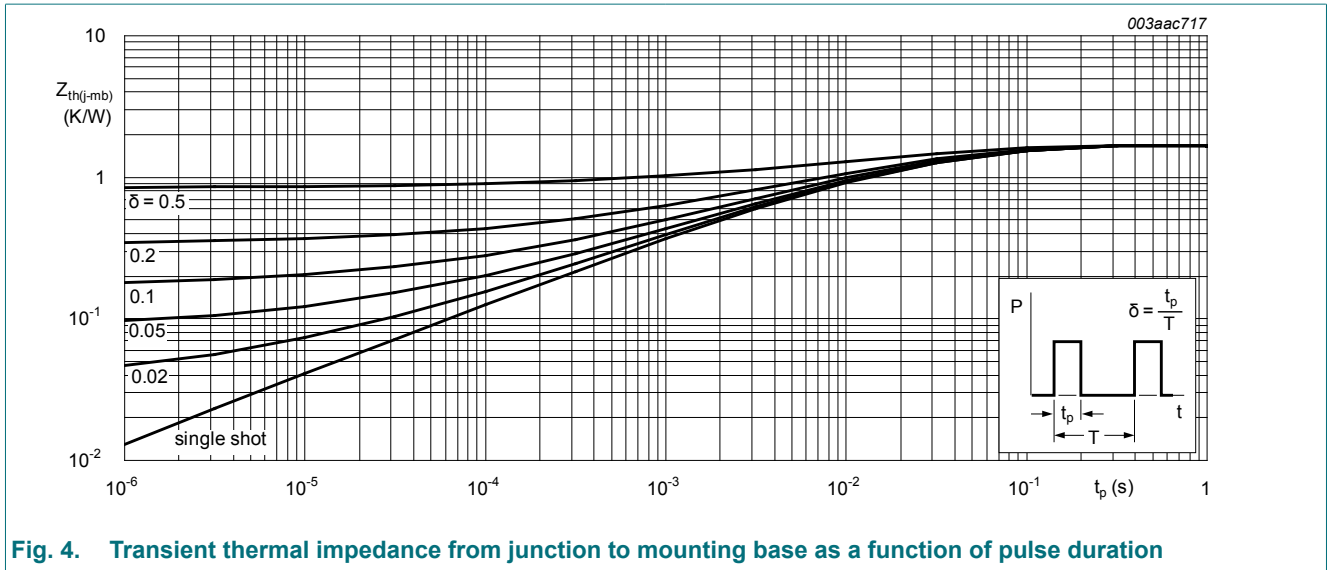


Fig. 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

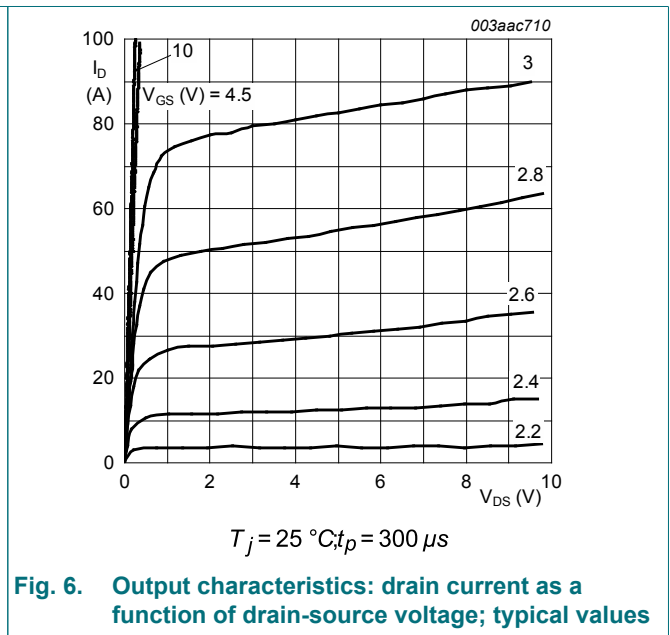
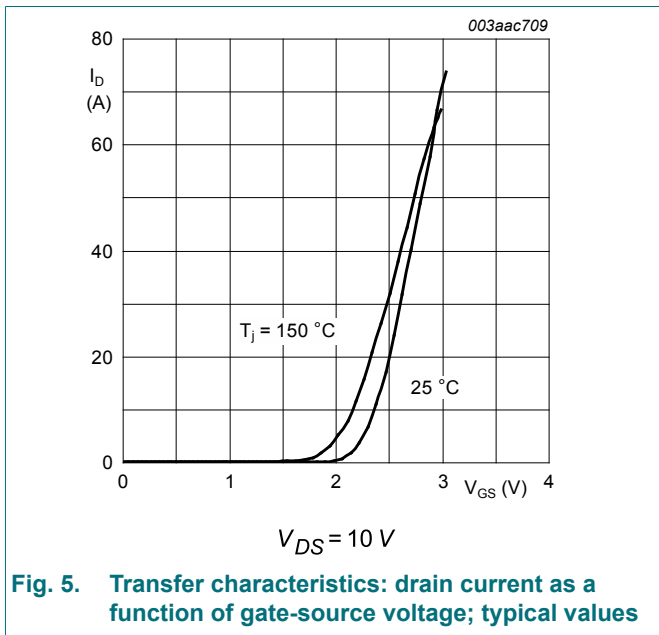
## 10. Characteristics

Table 7. Characteristics

Tested to JEDEC standards where applicable.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	30	-	-	V
		$I_D = 250 \mu A; V_{GS} = 0 V; T_j = -55 \text{ }^\circ C$	27	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 \text{ mA}; V_{DS}=V_{GS}; T_j = 25 \text{ }^\circ C$ ; <a href="#">Fig. 11</a> ; <a href="#">Fig. 12</a>	1.3	1.7	2.15	V
		$I_D = 1 \text{ mA}; V_{DS}=V_{GS}; T_j = 150 \text{ }^\circ C$ ; <a href="#">Fig. 12</a>	0.65	-	-	V
		$I_D = 1 \text{ mA}; V_{DS}=V_{GS}; T_j = -55 \text{ }^\circ C$ ; <a href="#">Fig. 12</a>	-	-	2.45	V
$I_{DSS}$	drain leakage current	$V_{DS} = 30 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$	-	-	1	$\mu A$
		$V_{DS} = 30 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 150 \text{ }^\circ C$	-	-	100	$\mu A$
$I_{GSS}$	gate leakage current	$V_{GS} = 16 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$	-	-	100	nA
		$V_{GS} = -16 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$	-	-	100	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 4.5 \text{ V}; I_D = 15 \text{ A}; T_j = 25 \text{ }^\circ C$	-	3.37	4.61	mΩ
		$V_{GS} = 10 \text{ V}; I_D = 15 \text{ A}; T_j = 150 \text{ }^\circ C$ ; <a href="#">Fig. 13</a>	-	-	6	mΩ
		$V_{GS} = 10 \text{ V}; I_D = 15 \text{ A}; T_j = 25 \text{ }^\circ C$	-	2.43	3.5	mΩ
$R_G$	gate resistance	$f = 1 \text{ MHz}$	-	0.53	1.5	Ω
<b>Dynamic characteristics</b>						
$Q_{G(tot)}$	total gate charge	$I_D = 10 \text{ A}; V_{DS} = 12 \text{ V}; V_{GS} = 4.5 \text{ V}$ ; <a href="#">Fig. 14</a> ; <a href="#">Fig. 15</a>	-	19	-	nC
		$I_D = 0 \text{ A}; V_{DS} = 0 \text{ V}; V_{GS} = 10 \text{ V}$	-	37	-	nC
		$I_D = 10 \text{ A}; V_{DS} = 12 \text{ V}; V_{GS} = 10 \text{ V}$ ; <a href="#">Fig. 14</a> ; <a href="#">Fig. 15</a>	-	41	-	nC
$Q_{GS}$	gate-source charge	$I_D = 10 \text{ A}; V_{DS} = 12 \text{ V}; V_{GS} = 4.5 \text{ V}$ ; <a href="#">Fig. 14</a> ; <a href="#">Fig. 15</a>	-	6	-	nC
$Q_{GS(th)}$	pre-threshold gate-source charge		-	4	-	nC

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$Q_{GS(th-pl)}$	post-threshold gate-source charge		-	2	-	nC
$Q_{GD}$	gate-drain charge		-	5	-	nC
$V_{GS(pl)}$	gate-source plateau voltage	$V_{DS} = 12\text{ V}$ ; <a href="#">Fig. 14</a> ; <a href="#">Fig. 15</a>	-	2.4	-	V
$C_{iss}$	input capacitance	$V_{DS} = 12\text{ V}$ ; $V_{GS} = 0\text{ V}$ ; $f = 1\text{ MHz}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 16</a>	-	2458	3441	pF
$C_{oss}$	output capacitance		-	532	718	pF
$C_{rss}$	reverse transfer capacitance		-	252	353	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 12\text{ V}$ ; $R_L = 0.5\text{ }\Omega$ ; $V_{GS} = 4.5\text{ V}$ ; $R_{G(ext)} = 4.7\text{ }\Omega$	-	33	-	ns
$t_r$	rise time		-	50	-	ns
$t_{d(off)}$	turn-off delay time		-	45	-	ns
$t_f$	fall time		-	18	-	ns
<b>Source-drain diode</b>						
$V_{SD}$	source-drain voltage	$I_S = 25\text{ A}$ ; $V_{GS} = 0\text{ V}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 17</a>	-	0.82	1.2	V
$t_{rr}$	reverse recovery time	$I_S = 20\text{ A}$ ; $dI_S/dt = -100\text{ A}/\mu\text{s}$ ; $V_{GS} = 0\text{ V}$ ; $V_{DS} = 20\text{ V}$	-	37	-	ns
$Q_r$	recovered charge		-	31	-	nC



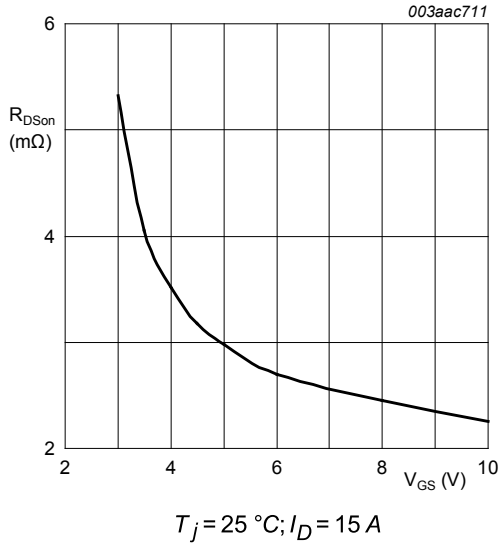


Fig. 7. Drain-source on-state resistance as a function of gate-source voltage; typical values

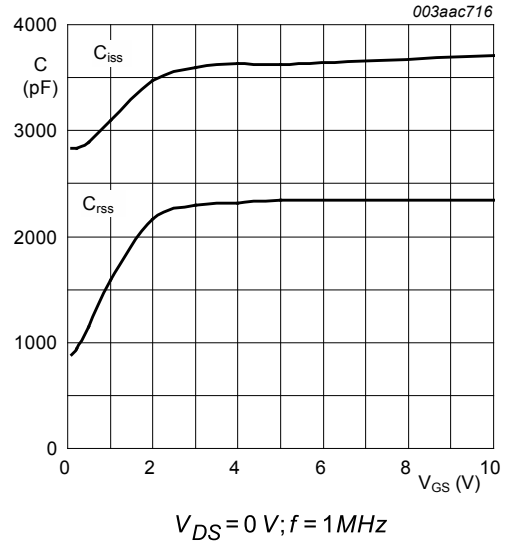


Fig. 8. Input and reverse transfer capacitances as a function of gate-source voltage; typical values

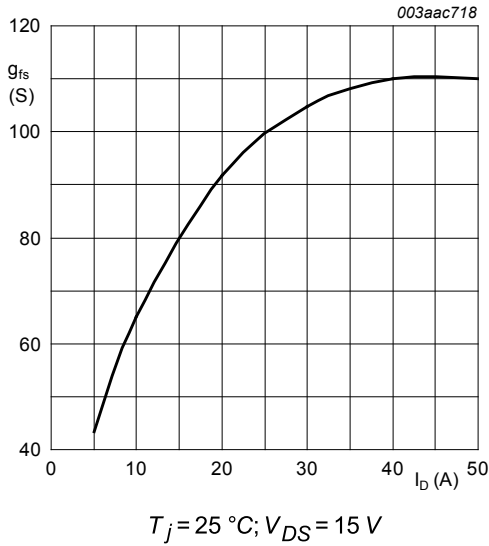


Fig. 9. Forward transconductance as a function of drain current; typical values

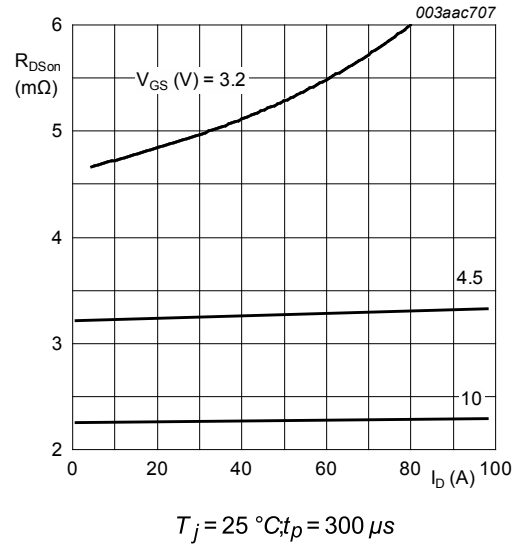
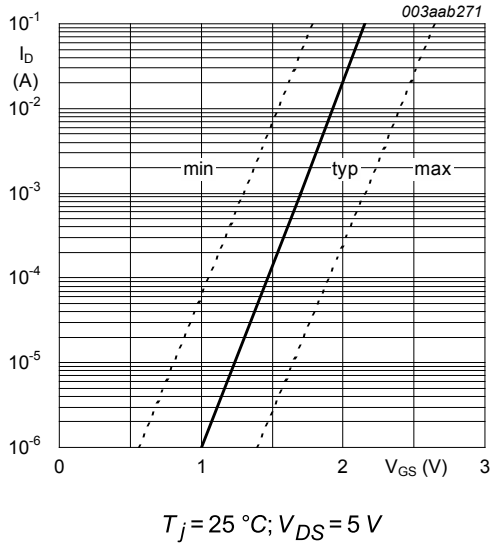
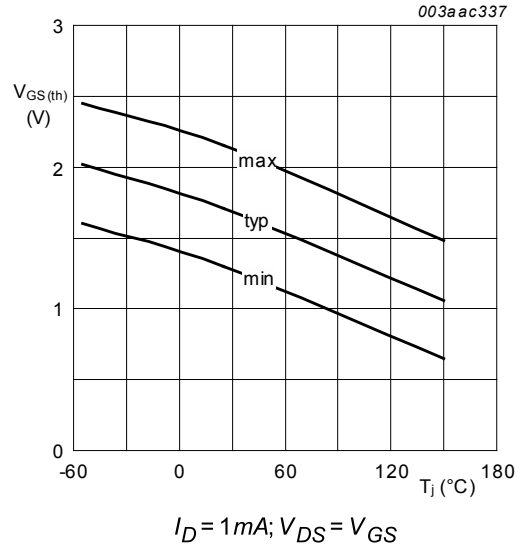


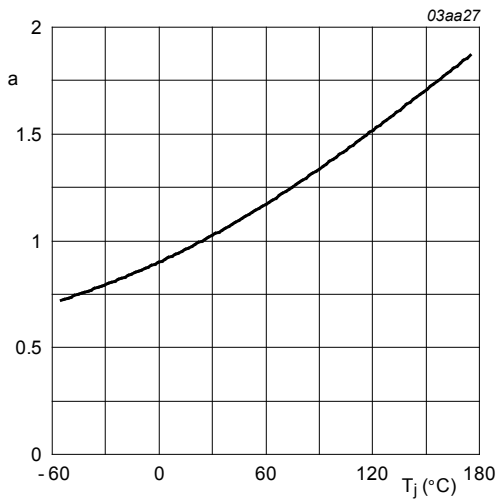
Fig. 10. Drain-source on-state resistance as a function of drain current; typical values



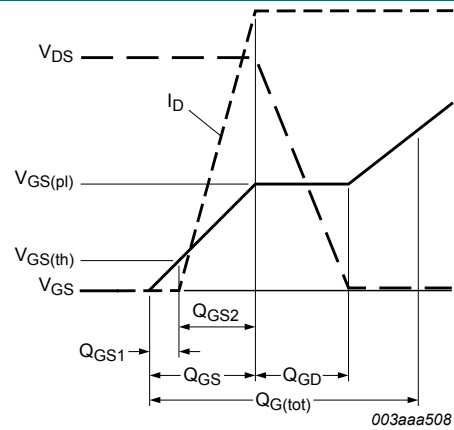
**Fig. 11. Sub-threshold drain current as a function of gate-source voltage**



**Fig. 12. Gate-source threshold voltage as a function of junction temperature**



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



**Fig. 14. Gate charge waveform definitions**

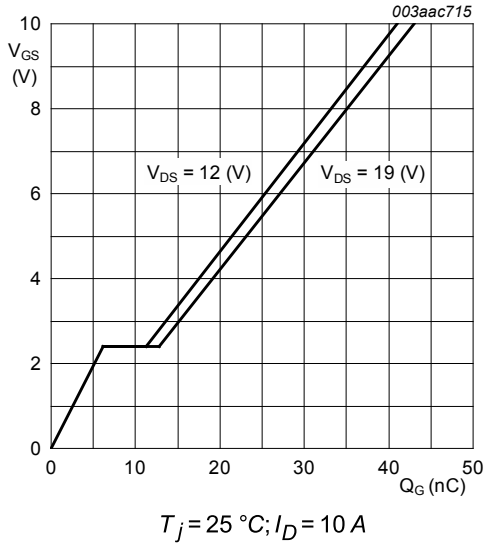


Fig. 15. Gate-source voltage as a function of gate charge; typical values

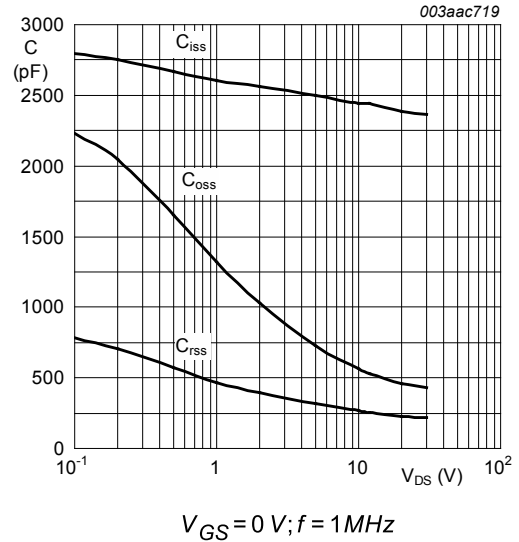


Fig. 16. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

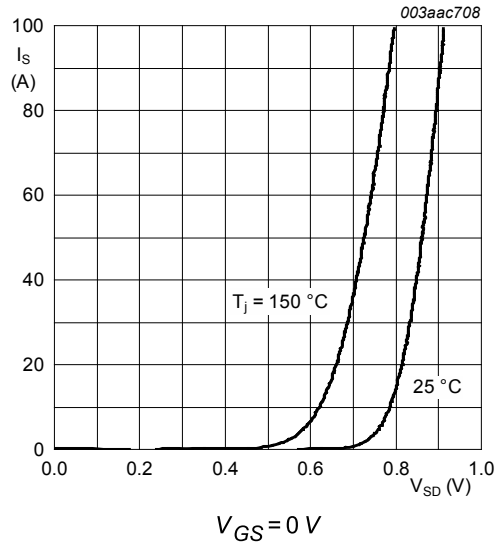


Fig. 17. Source (diode forward) current as a function of source-drain (diode forward) voltage; typical values

### 11. Package outline

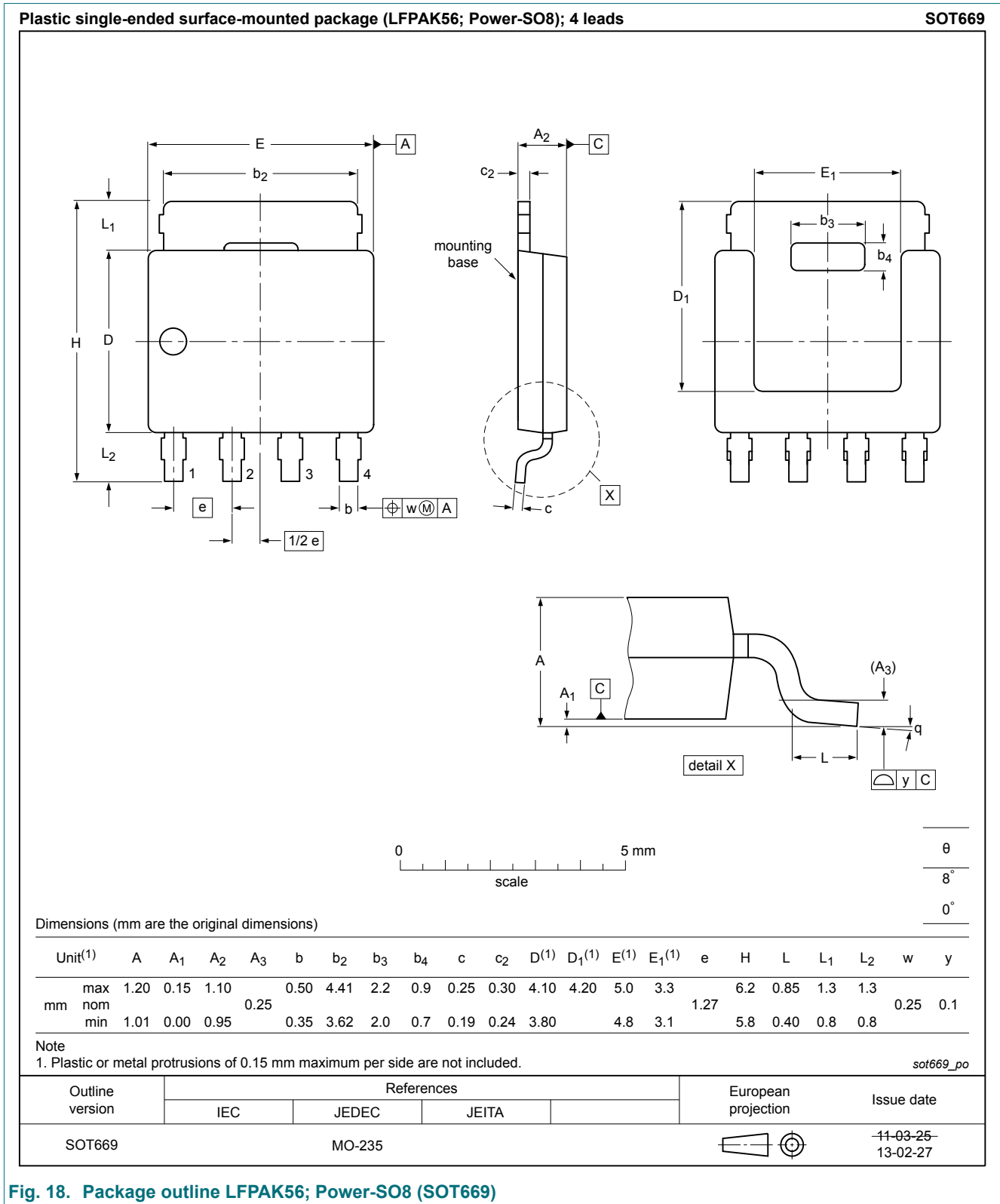


Fig. 18. Package outline LPAK56; Power-SO8 (SOT669)

## 12. Soldering

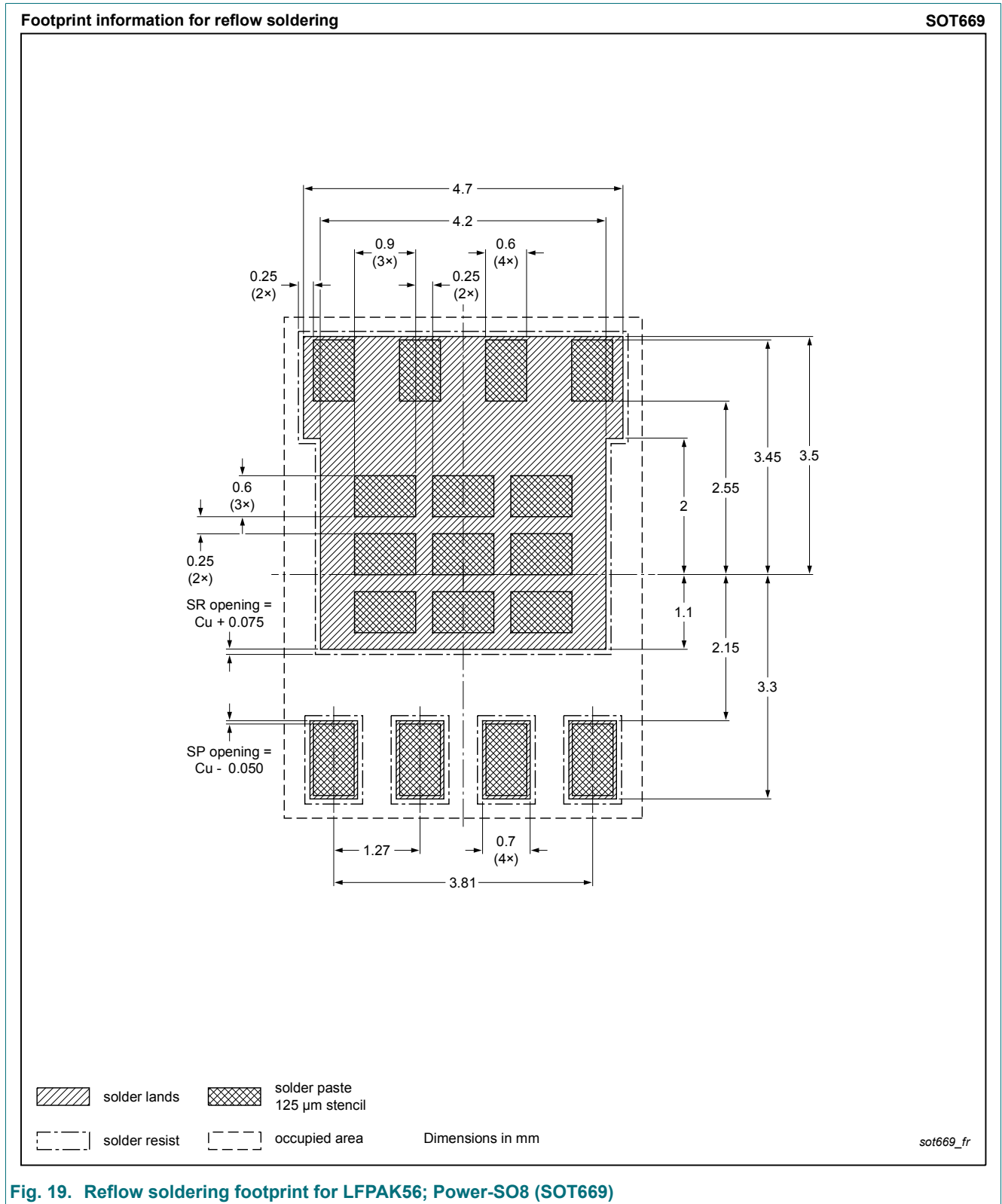
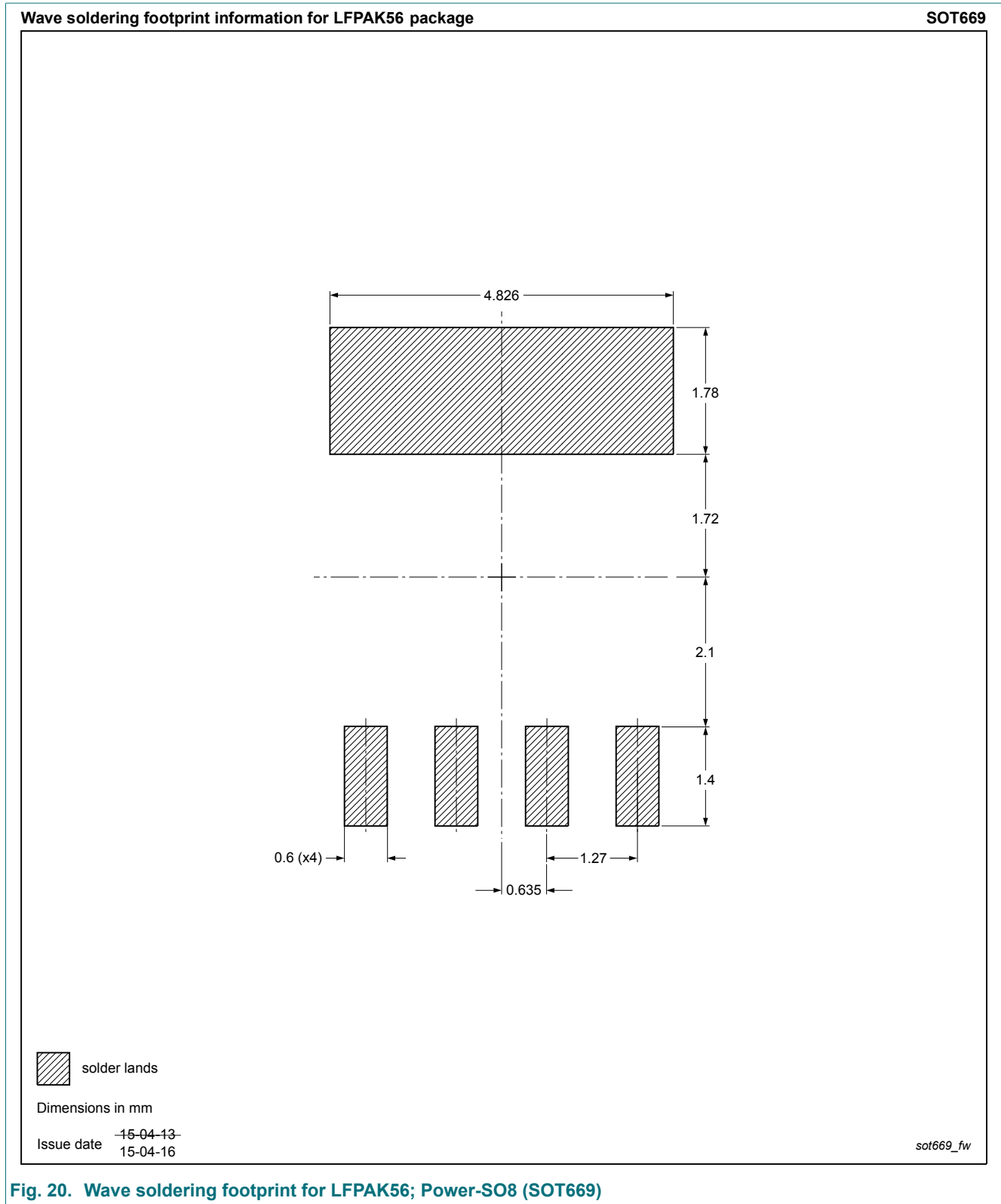


Fig. 19. Reflow soldering footprint for LPAK56; Power-SO8 (SOT669)



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## Contents

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1. General description.....	1
2. Features and benefits.....	1
3. Applications.....	1
4. Quick reference data.....	1
5. Pinning information.....	2
6. Ordering information.....	2
7. Marking.....	2
8. Limiting values.....	2
9. Thermal characteristics.....	3
10. Characteristics.....	4
11. Package outline.....	9
12. Soldering.....	10
13. Legal information.....	12

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