



# PSMN072-100MSE

N-channel 100 V 76 mOhm standard level ASFET with enhanced SOA in LPAK33. Designed specifically for Power-over-ethernet (PoE) applications

17 October 2022

Objective data sheet

## 1. General description

New standards and proprietary approaches are enabling Power-over-Ethernet (PoE) systems capable of delivering up to 90 W to each powered device (PD). Such solutions place increased demands on the power sourcing equipment (PSE) in terms of “soft-start”, thermal management and power density requirements.

## 2. Features and benefits

- Enhanced safe operating area (SOA) for superior linear mode operation
- Low  $R_{DS(on)}$  for low  $I^2R$  losses
- Ultra reliable LPAK33 package for superior thermal and ruggedness performance
- Very low  $I_{DSS}$  leakage

## 3. Applications

- Power-over-ethernet (PoE) applications (<50 W)
- IEEE802.3at and proprietary solutions
- CCTV
- WiFi hotspots
- 5G picocells
- Fault tolerant load switch - Inrush management and eFuse applications

## 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	$V_{GS} = 10\text{ V}; T_{mb} = 25\text{ °C}$	-	-	16	A	
$P_{tot}$	total power dissipation	$T_{mb} = 25\text{ °C}; \text{Fig. 1}$	-	-	45	W	
$T_j$	junction temperature		-55	-	175	°C	
<b>Static characteristics</b>							
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}; I_D = 5\text{ A}; T_j = 25\text{ °C}$	-	58	76	mΩ	
		$V_{GS} = 10\text{ V}; I_D = 5\text{ A}; T_j = 100\text{ °C}$	-	91	116	mΩ	
<b>Dynamic characteristics</b>							
$Q_{GD}$	gate-drain charge	$I_D = 25\text{ A}; V_{DS} = 50\text{ V}; V_{GS} = 10\text{ V}; T_j = 25\text{ °C}$	[tbd]	0.9	[tbd]	nC	
$Q_{G(tot)}$	total gate charge		[tbd]	4.9	[tbd]	nC	
<b>Avalanche ruggedness</b>							
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 9\text{ A}; V_{sup} \leq 100\text{ V}; R_{GS} = 50\text{ Ω}; V_{GS} = 10\text{ V}; T_{j(init)} = 25\text{ °C}; \text{unclamped}; t_p = 13.4\text{ μs}$	[1]	-	-	7.8	mJ

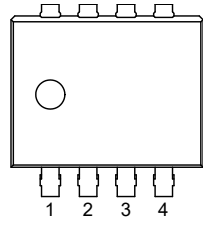
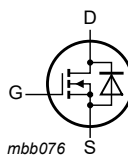
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Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Source-drain diode</b>						
$Q_r$	recovered charge	$I_S = 25\text{ A}$ ; $di_S/dt = -100\text{ A}/\mu\text{s}$ ; $V_{GS} = 0\text{ V}$ ; $V_{DS} = 50\text{ V}$ ; $T_J = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 6</a>	-	21	-	nC

[1] Protected by 100% test

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	S	source	 <p>LFAK33 (SOT1210)</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
PSMN072-100MSE	LFAK33	Plastic, single ended surface mounted package (LFAK33); 8 leads; 0.65 mm pitch	SOT1210

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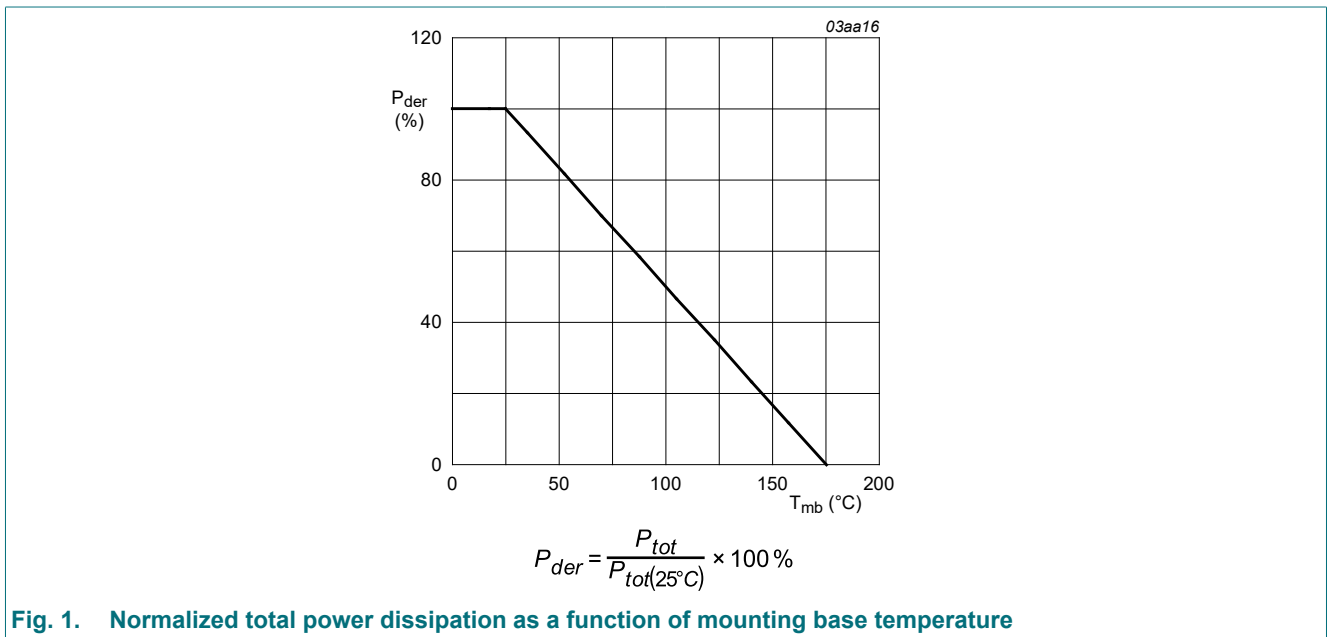
## 7. Limiting values

**Table 4. Limiting values**

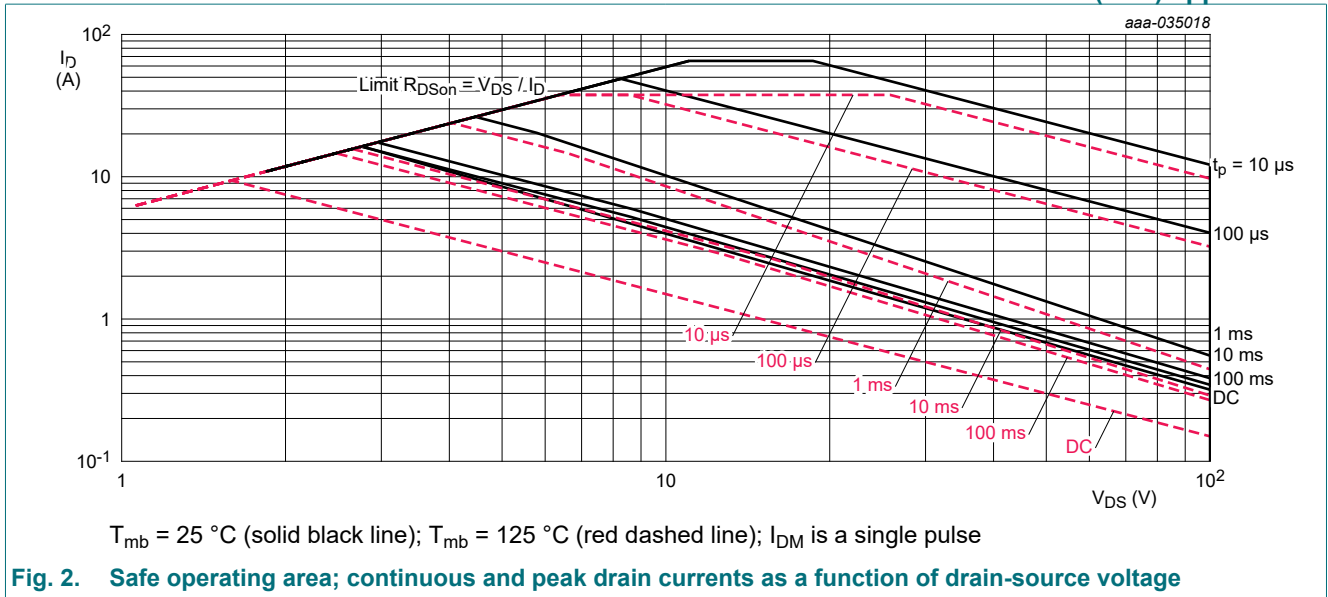
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V <sub>DS</sub>	drain-source voltage	25 °C ≤ T <sub>j</sub> ≤ 175 °C	-	100	V
V <sub>DGR</sub>	drain-gate voltage	25 °C ≤ T <sub>j</sub> ≤ 175 °C; R <sub>GS</sub> = 20 kΩ	-	100	V
V <sub>GS</sub>	gate-source voltage		-20	20	V
P <sub>tot</sub>	total power dissipation	T <sub>mb</sub> = 25 °C; Fig. 1	-	45	W
I <sub>D</sub>	drain current	V <sub>GS</sub> = 10 V; T <sub>mb</sub> = 25 °C	-	16	A
		V <sub>GS</sub> = 10 V; T <sub>mb</sub> = 100 °C	-	11	A
I <sub>DM</sub>	peak drain current	pulsed; t <sub>p</sub> ≤ 10 μs; T <sub>mb</sub> = 25 °C; Fig. 2	-	65	A
T <sub>stg</sub>	storage temperature		-55	175	°C
T <sub>j</sub>	junction temperature		-55	175	°C
T <sub>slid(M)</sub>	peak soldering temperature		-	260	°C
<b>Source-drain diode</b>					
I <sub>S</sub>	source current	T <sub>mb</sub> = 25 °C	-	16	A
I <sub>SM</sub>	peak source current	pulsed; t <sub>p</sub> ≤ 10 μs; T <sub>mb</sub> = 25 °C	-	65	A
<b>Avalanche ruggedness</b>					
E <sub>DS(AL)S</sub>	non-repetitive drain-source avalanche energy	I <sub>D</sub> = 9 A; V <sub>sup</sub> ≤ 100 V; R <sub>GS</sub> = 50 Ω; V <sub>GS</sub> = 10 V; T <sub>j(init)</sub> = 25 °C; unclamped; t <sub>p</sub> = 13.4 μs	[1]	-	7.8 mJ
I <sub>AS</sub>	non-repetitive avalanche current	V <sub>sup</sub> = 100 V; V <sub>GS</sub> = 10 V; T <sub>j(init)</sub> = 25 °C; R <sub>GS</sub> = 50 Ω	[1]	-	9 A

[1] Protected by 100% test



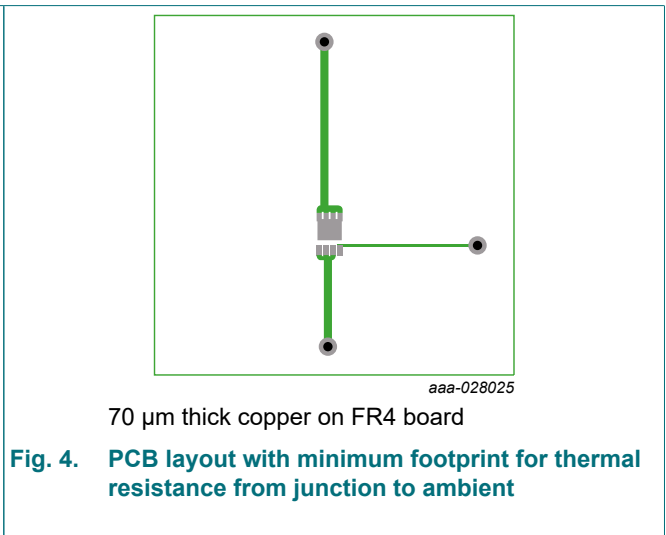
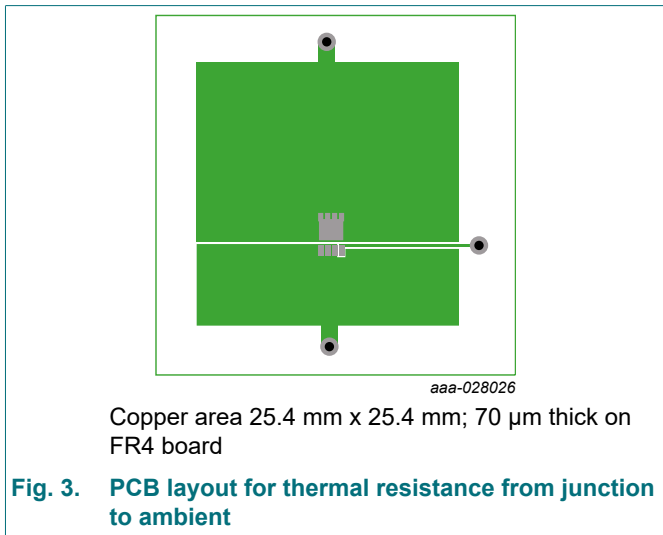
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### 8. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base		-	[tbd]	3.3	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	Fig. 3	-	50	-	K/W
		Fig. 4	-	130	-	K/W



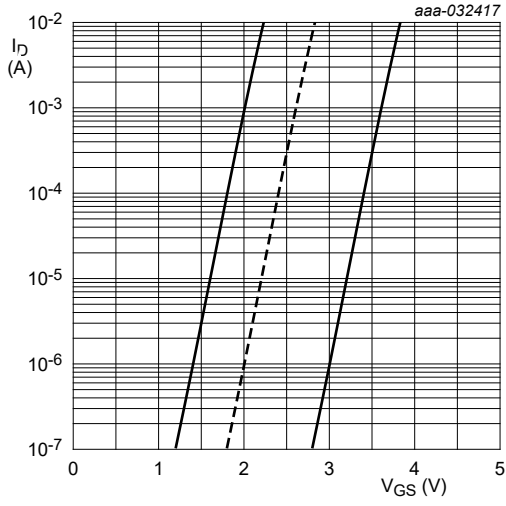
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## 9. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	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	$I_D = 1 \text{ mA}; V_{DS}=V_{GS}; T_j = 25 \text{ }^\circ C; \text{ Fig. 5}$	2	2.6	3.6	V
		$I_D = 1 \text{ mA}; V_{DS}=V_{GS}; T_j = 175 \text{ }^\circ C$	-	[tbd]	-	V
		$I_D = 1 \text{ mA}; V_{DS}=V_{GS}; T_j = -55 \text{ }^\circ C$	-	[tbd]	-	V
$\Delta V_{GS(th)}/\Delta T$	gate-source threshold voltage variation with temperature	$25 \text{ }^\circ C \leq T_j \leq 150 \text{ }^\circ C$	-	[tbd]	-	mV/K
$I_{DSS}$	drain leakage current	$V_{DS} = 100 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$	-	[tbd]	1	$\mu A$
		$V_{DS} = 100 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 125 \text{ }^\circ C$	-	-	100	$\mu A$
$I_{GSS}$	gate leakage current	$V_{DS} = 20 \text{ V}; T_j = 25 \text{ }^\circ C$	-	2	100	nA
		$V_{DS} = -20 \text{ V}; T_j = 25 \text{ }^\circ C$	-	2	100	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 5 \text{ A}; T_j = 25 \text{ }^\circ C$	-	58	76	m $\Omega$
		$V_{GS} = 10 \text{ V}; I_D = 5 \text{ A}; T_j = 100 \text{ }^\circ C$	-	91	116	m $\Omega$
		$V_{GS} = 10 \text{ V}; I_D = 5 \text{ A}; T_j = 175 \text{ }^\circ C$	-	128	172	m $\Omega$
$R_G$	gate resistance	$f = 1 \text{ MHz}; T_j = 25 \text{ }^\circ C$	[tbd]	1.2	[tbd]	$\Omega$
<b>Dynamic characteristics</b>						
$Q_{G(tot)}$	total gate charge	$I_D = 25 \text{ A}; V_{DS} = 50 \text{ V}; V_{GS} = 10 \text{ V}; T_j = 25 \text{ }^\circ C$	[tbd]	4.9	[tbd]	nC
		$I_D = 0 \text{ A}; V_{DS} = 0 \text{ V}; V_{GS} = 10 \text{ V}$	-	2.6	-	nC
$Q_{GS}$	gate-source charge	$I_D = 25 \text{ A}; V_{DS} = 50 \text{ V}; V_{GS} = 10 \text{ V}; T_j = 25 \text{ }^\circ C$	[tbd]	1.4	[tbd]	nC
$Q_{GS(th)}$	pre-threshold gate-source charge		-	0.9	-	nC
$Q_{GS(th-pl)}$	post-threshold gate-source charge		-	0.5	-	nC
$Q_{GD}$	gate-drain charge		[tbd]	0.9	[tbd]	nC
$V_{GS(pl)}$	gate-source plateau voltage	$I_D = 25 \text{ A}; V_{DS} = 50 \text{ V}; T_j = 25 \text{ }^\circ C$	-	4.5	-	V
$C_{iss}$	input capacitance	$V_{DS} = 50 \text{ V}; V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}; T_j = 25 \text{ }^\circ C$	[tbd]	345	[tbd]	pF
$C_{oss}$	output capacitance		[tbd]	76	[tbd]	pF
$C_{rss}$	reverse transfer capacitance		[tbd]	2.4	[tbd]	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 50 \text{ V}; R_L = 2 \text{ } \Omega; V_{GS} = 10 \text{ V}; R_{G(ext)} = 5 \text{ } \Omega; T_j = 25 \text{ }^\circ C$	-	1.2	-	ns
$t_r$	rise time		-	1	-	ns
$t_{d(off)}$	turn-off delay time		-	3	-	ns
$t_f$	fall time		-	1.5	-	ns
<b>Source-drain diode</b>						
$V_{SD}$	source-drain voltage	$I_S = 25 \text{ A}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$	-	-	1	V
$t_{rr}$	reverse recovery time	$I_S = 25 \text{ A}; di_S/dt = -100 \text{ A}/\mu s; V_{GS} = 0 \text{ V}; V_{DS} = 50 \text{ V}; \text{ Fig. 6}$	-	30	-	ns
$Q_r$	recovered charge	$I_S = 25 \text{ A}; di_S/dt = -100 \text{ A}/\mu s; V_{GS} = 0 \text{ V}; V_{DS} = 50 \text{ V}; T_j = 25 \text{ }^\circ C; \text{ Fig. 6}$	-	21	-	nC

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$T_j = 25\text{ }^\circ\text{C}; V_{DS} = 5\text{ V}$

Fig. 5. Sub-threshold drain current as a function of gate-source voltage

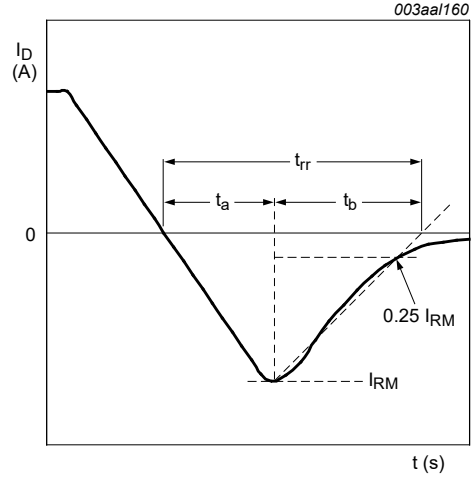


Fig. 6. Reverse recovery timing definition

### 10. Package outline

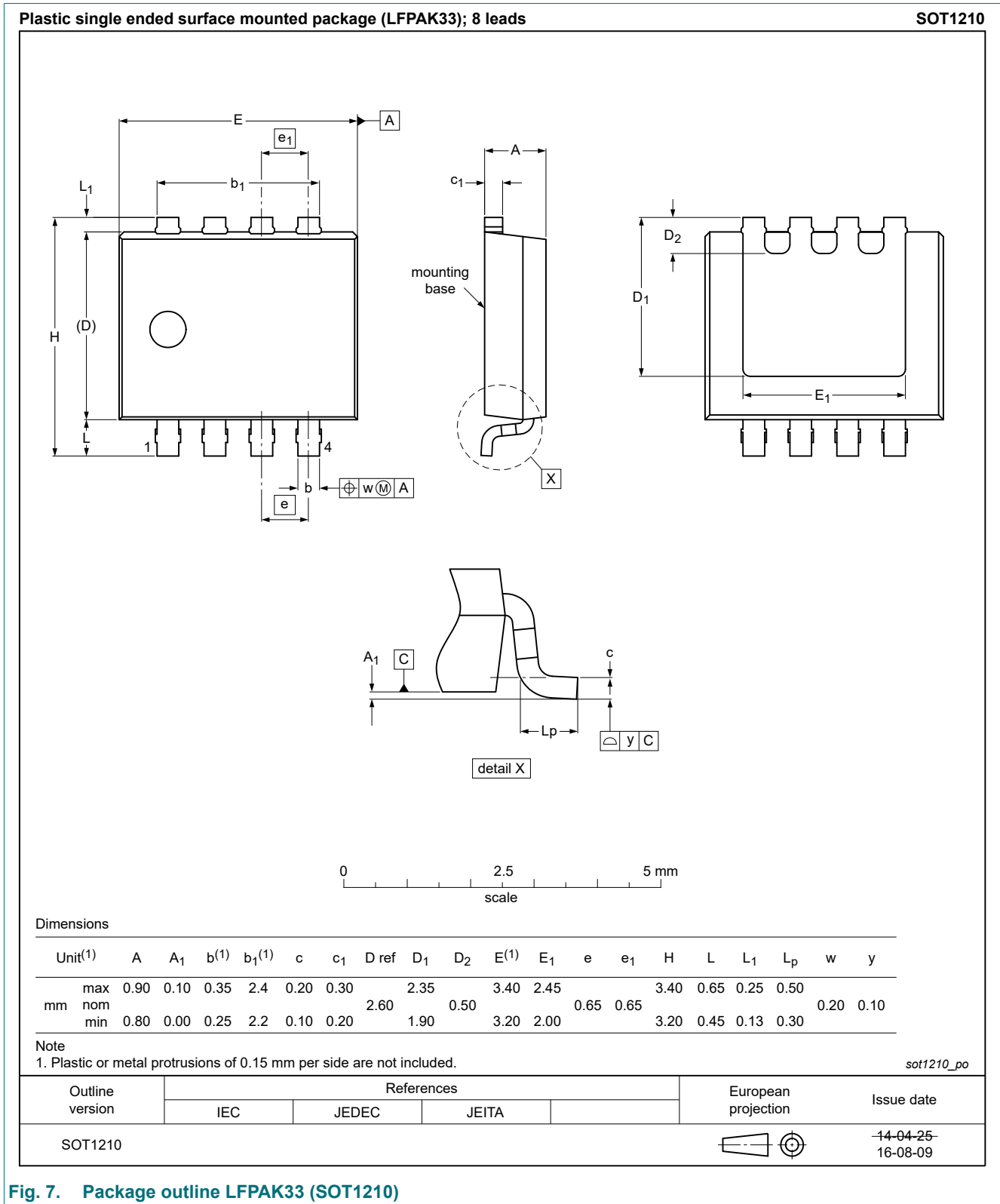
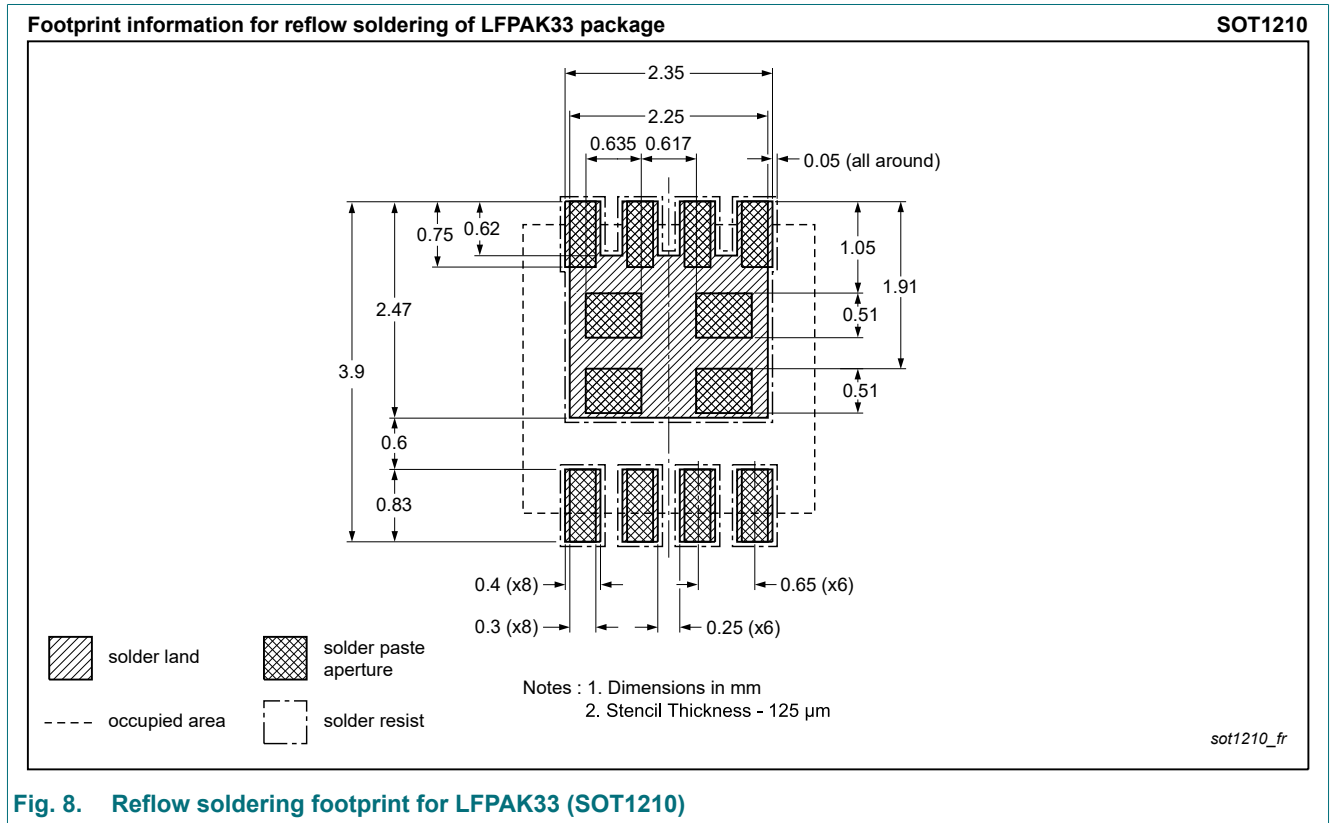


Fig. 7. Package outline LPAK33 (SOT1210)

### 11. Soldering



**Fig. 8. Reflow soldering footprint for LFPAK33 (SOT1210)**



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### 12. Legal information

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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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Date of release: 17 October 2022

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