

PMXB56EN

30 V, N-channel Trench MOSFET

27 October 2020

Product data sheet

1. General description

N-channel enhancement mode Field-Effect Transistor (FET) in a leadless ultra small DFN1010D-3 (SOT1215) Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

2. Features and benefits

- Trench MOSFET technology
- Leadless ultra small and thin SMD plastic package: $1.1 \times 1.0 \times 0.37$ mm
- Exposed drain pad for excellent thermal conduction
- Very low Drain-Source on-state resistance $R_{DS(on)} = 49$ m Ω
- Very fast switching

3. Applications

- Low-side load switch and charging switch for portable devices
- Power management in battery-driven portables
- LED driver
- DC-to-DC converters

4. Quick reference data

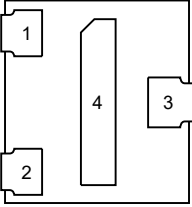
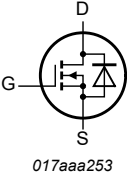
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j = 25$ °C		-	-	30	V
V_{GS}	gate-source voltage			-20	-	20	V
I_D	drain current	$V_{GS} = 10$ V; $T_{amb} = 25$ °C	[1]	-	-	3.2	A
Static characteristics							
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10$ V; $I_D = 3.2$ A; $T_j = 25$ °C		-	49	55	m Ω

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 6 cm².

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 Transparent top view DFN1010D-3 (SOT1215)	
2	S	source		
3	D	drain		
4	D	drain		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMXB56EN	DFN1010D-3	plastic, leadless thermal enhanced ultra thin small outline package with side-wettable flanks (SWF); 3 terminals; 0.75 mm pitch; 1.1 mm x 1 mm x 0.37 mm body	SOT1215

7. Marking

Table 4. Marking codes

Type number	Marking code
PMXB56EN	01 10 10

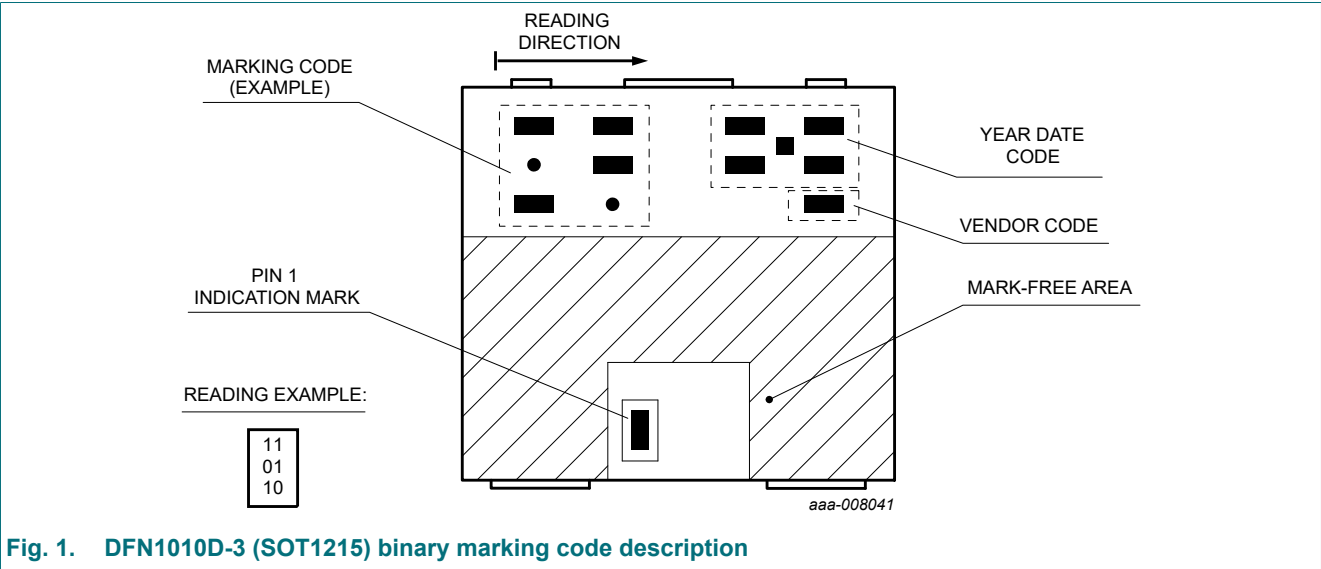


Fig. 1. DFN1010D-3 (SOT1215) binary marking code description

8. Limiting values

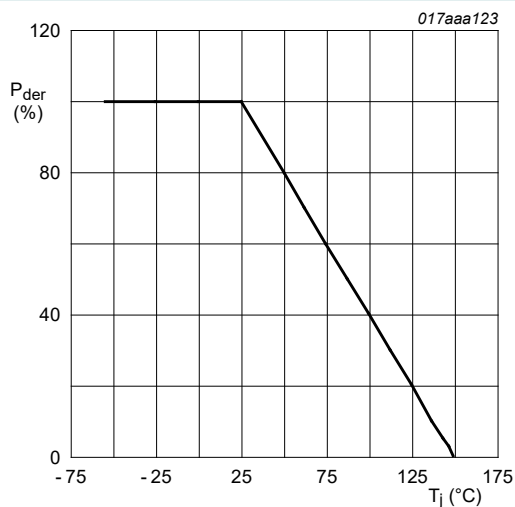
Table 5. Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
V _{DS}	drain-source voltage	T _j = 25 °C		-	30	V
V _{GS}	gate-source voltage			-20	20	V
I _D	drain current	V _{GS} = 10 V; T _{amb} = 25 °C	[1]	-	3.2	A
		V _{GS} = 10 V; T _{amb} = 100 °C	[1]	-	2.8	A
I _{DM}	peak drain current	T _{amb} = 25 °C; single pulse; t _p ≤ 10 μs		-	15	A
P _{tot}	total power dissipation	T _{amb} = 25 °C	[2]	-	0.4	W
			[1]	-	1.07	W
		T _{sp} = 25 °C		-	8.33	W
T _j	junction temperature			-55	150	°C
T _{amb}	ambient temperature			-55	150	°C
T _{stg}	storage temperature			-65	150	°C
Source-drain diode						
I _S	source current	T _{amb} = 25 °C	[1]	-	1	A

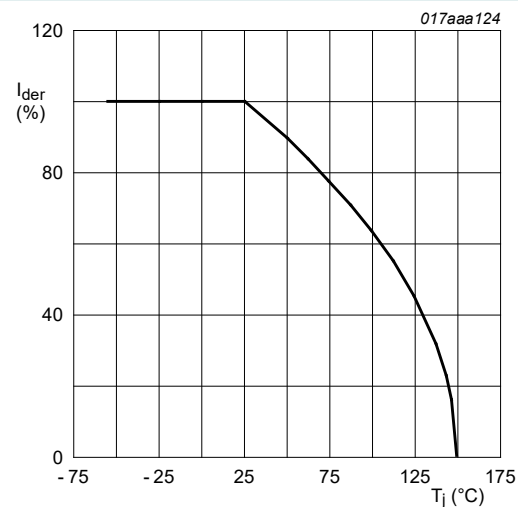
[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 6 cm².

[2] Device mounted on an FR4 Printed Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.



$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}\text{C})}} \times 100 \%$$

Fig. 2. Normalized total power dissipation as a function of junction temperature



$$I_{der} = \frac{I_D}{I_{D(25^{\circ}\text{C})}} \times 100 \%$$

Fig. 3. Normalized continuous drain current as a function of junction temperature

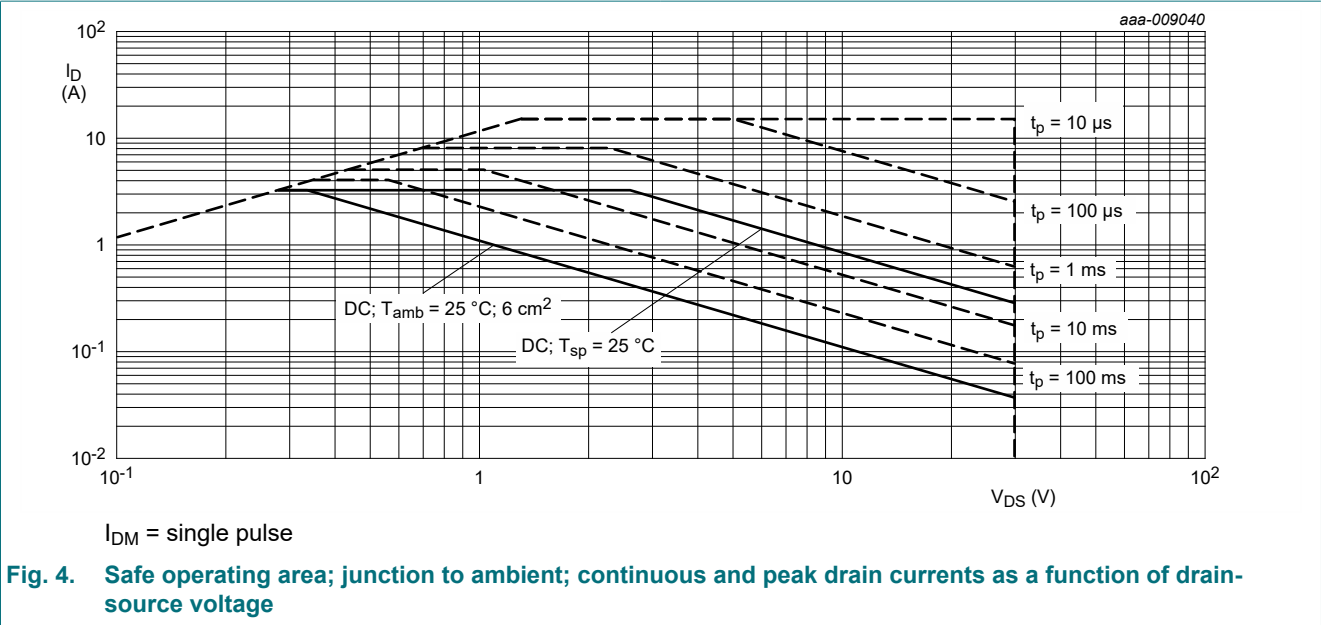


Fig. 4. Safe operating area; junction to ambient; continuous and peak drain currents as a function of drain-source voltage

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	271	312	K/W
			[2]	-	102	117	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	10	15	K/W

- [1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for drain $6 cm^2$.

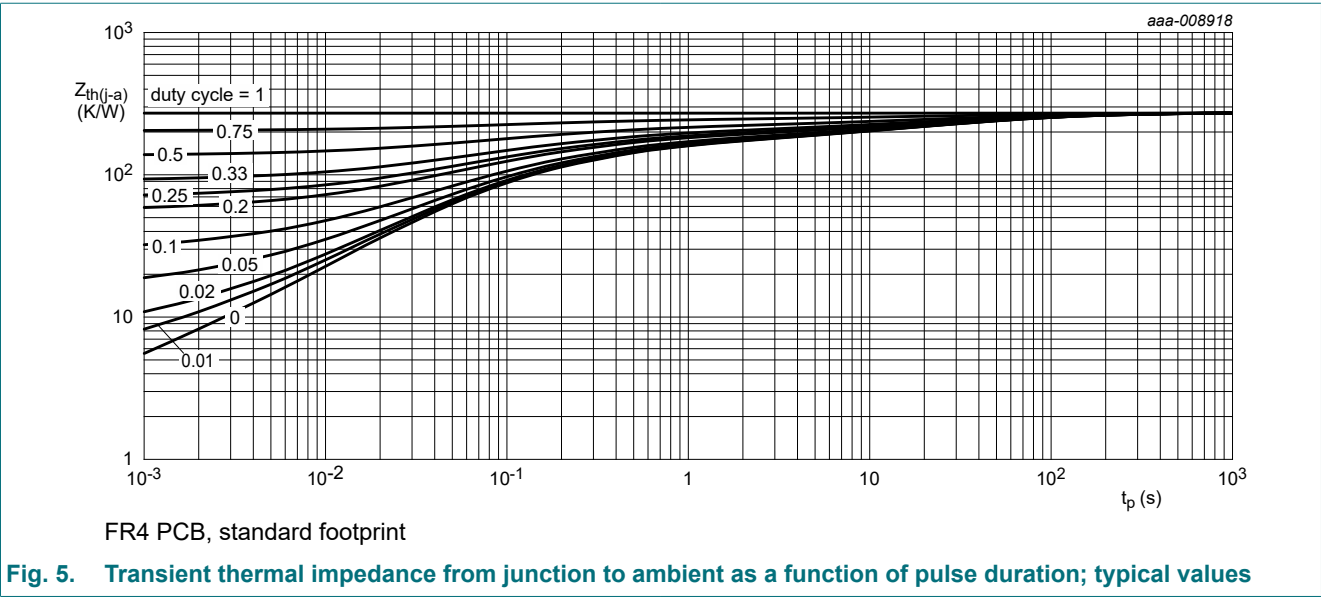


Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

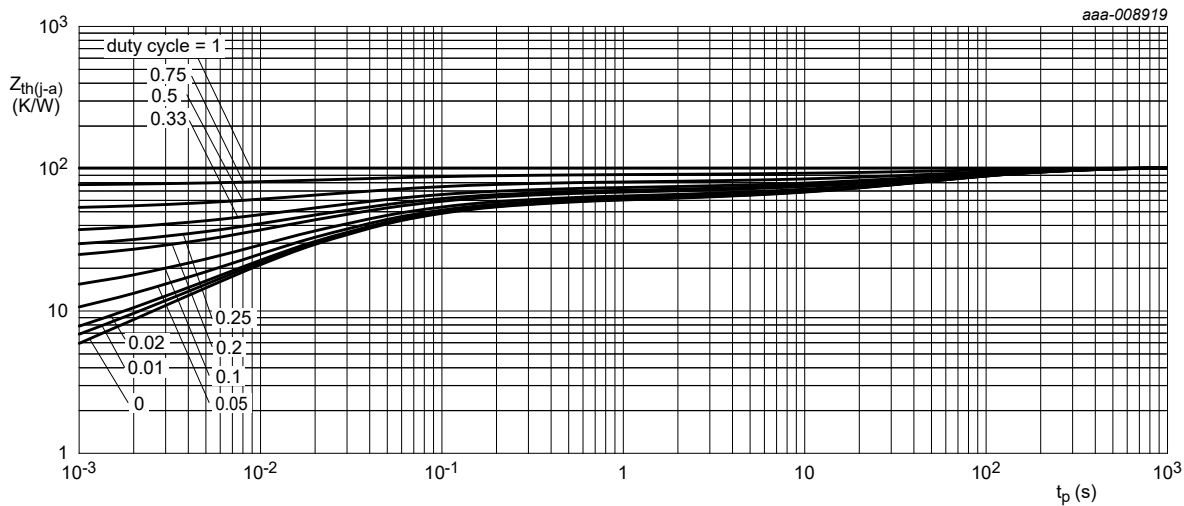


Fig. 6. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

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		30	-	-	V
V _{GSth}	gate-source threshold voltage	I _D = 250 μA; V _{DS} =V _{GS} ; T _j = 25 °C		1	1.5	2	V
I _{DSS}	drain leakage current	V _{DS} = 30 V; V _{GS} = 0 V; T _j = 25 °C		-	-	1	μA
I _{GSS}	gate leakage current	V _{GS} = 20 V; V _{DS} = 0 V; T _j = 25 °C		-	-	100	nA
		V _{GS} = -20 V; V _{DS} = 0 V; T _j = 25 °C		-	-	-100	nA
R _{DSon}	drain-source on-state resistance	V _{GS} = 10 V; I _D = 3.2 A; T _j = 25 °C		-	49	55	mΩ
		V _{GS} = 10 V; I _D = 2.8 A; T _j = 150 °C		-	77	87	mΩ
		V _{GS} = 4.5 V; I _D = 3.2 A; T _j = 25 °C		-	56	65	mΩ
g _{fs}	forward transconductance	V _{DS} = 10 V; I _D = 3.2 A; T _j = 25 °C		-	13	-	S
R _G	gate resistance	f = 1 MHz; T _j = 25 °C		-	2.3	-	Ω
Dynamic characteristics							
Q _{G(tot)}	total gate charge	V _{DS} = 15 V; I _D = 3.2 A; V _{GS} = 10 V; T _j = 25 °C		-	3.6	6.3	nC
Q _{GS}	gate-source charge			-	0.5	-	nC
Q _{GD}	gate-drain charge			-	0.4	-	nC
C _{iss}	input capacitance	V _{DS} = 15 V; f = 1 MHz; V _{GS} = 0 V; T _j = 25 °C		-	209	-	pF
C _{oss}	output capacitance			-	50	-	pF
C _{rss}	reverse transfer capacitance			-	17	-	pF
t _{d(on)}	turn-on delay time	V _{DS} = 15 V; I _D = 3.2 A; V _{GS} = 10 V; R _{G(ext)} = 6 Ω; T _j = 25 °C		-	3	-	ns
t _r	rise time			-	12	-	ns
t _{d(off)}	turn-off delay time			-	11	-	ns
t _f	fall time			-	2	-	ns
Source-drain diode							
V _{SD}	source-drain voltage	I _S = 1 A; V _{GS} = 0 V; T _j = 25 °C		-	0.7	1.2	V

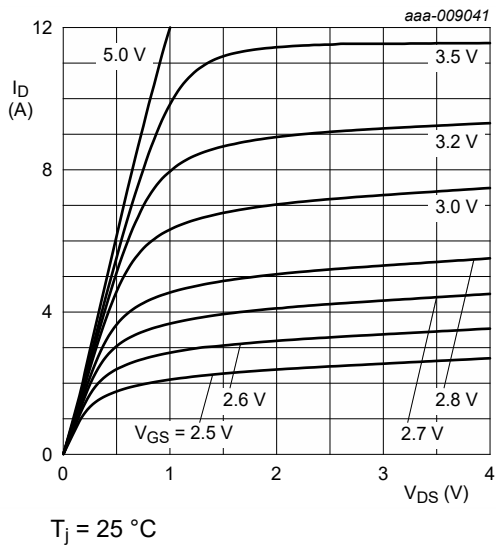


Fig. 7. Output characteristics: drain current as a function of drain-source voltage; typical values

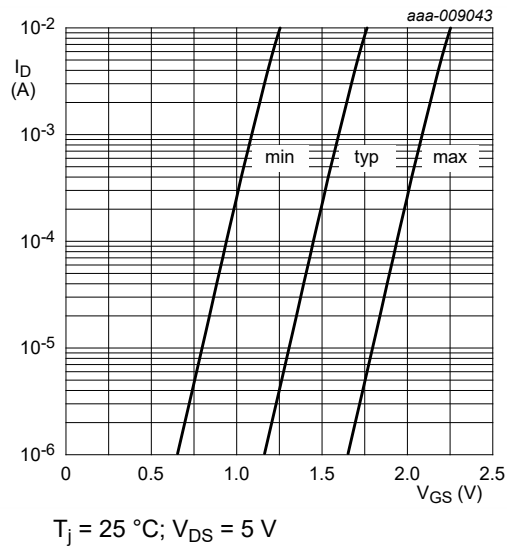


Fig. 8. Sub-threshold drain current as a function of gate-source voltage

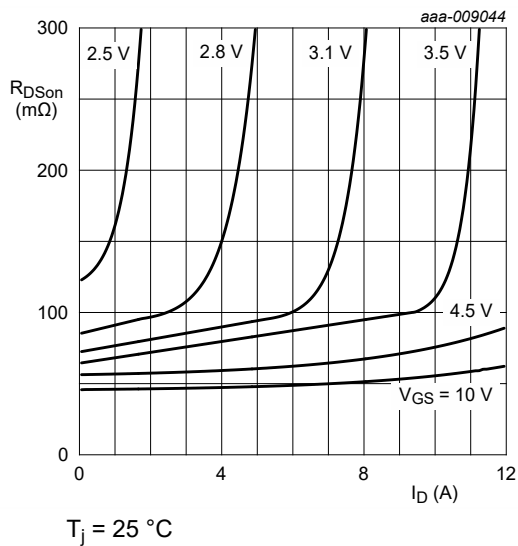


Fig. 9. Drain-source on-state resistance as a function of drain current; typical values

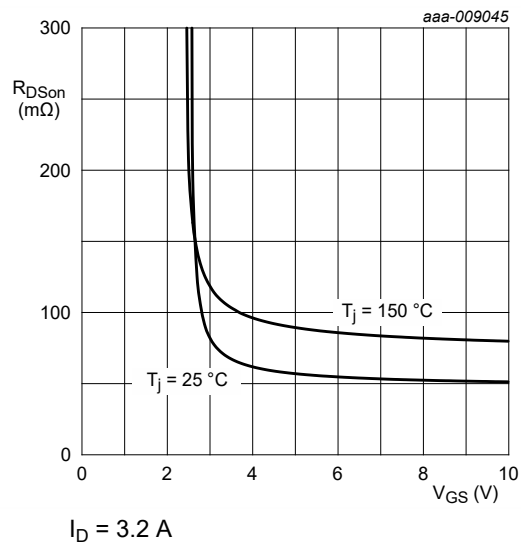


Fig. 10. Drain-source on-state resistance as a function of gate-source voltage; typical values

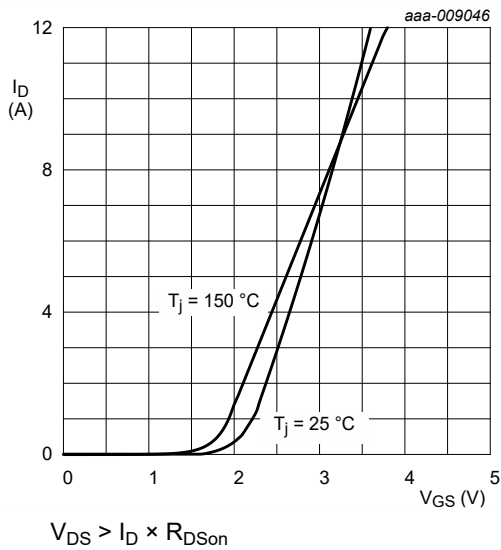


Fig. 11. Transfer characteristics: drain current as a function of gate-source voltage; typical values

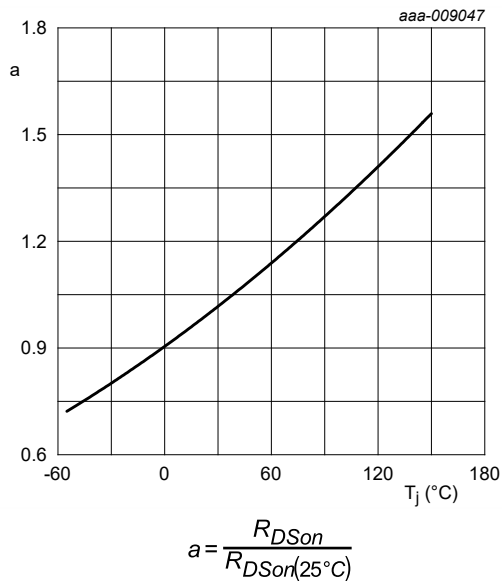


Fig. 12. Normalized drain-source on-state resistance as a function of junction temperature; typical values

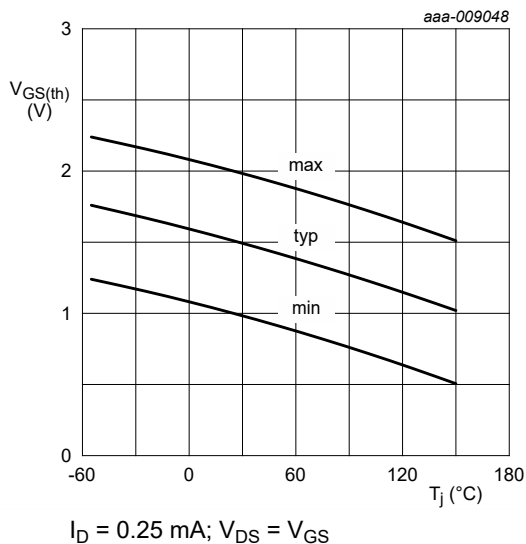


Fig. 13. Gate-source threshold voltage as a function of junction temperature

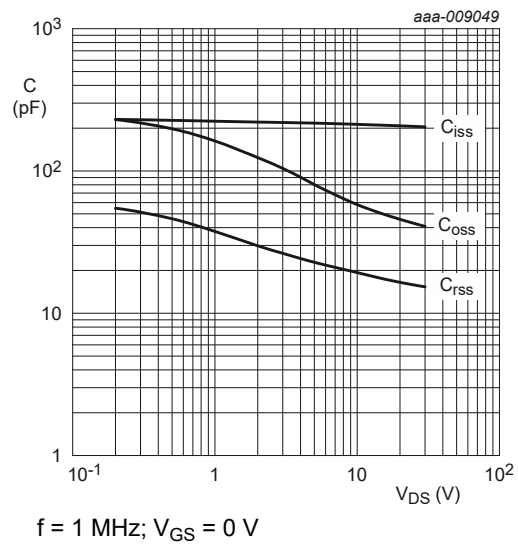


Fig. 14. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

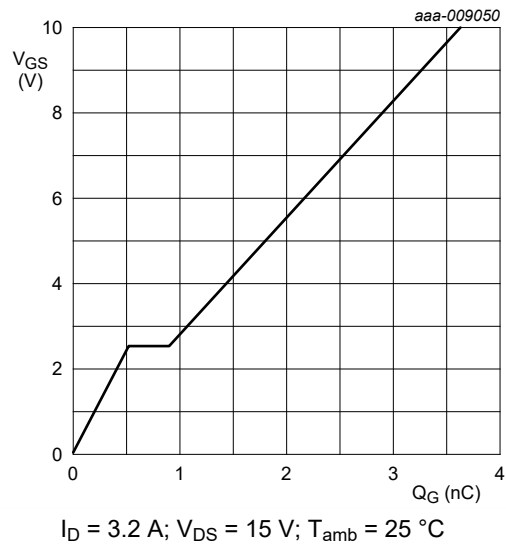


Fig. 15. Gate-source voltage as a function of gate charge; typical values

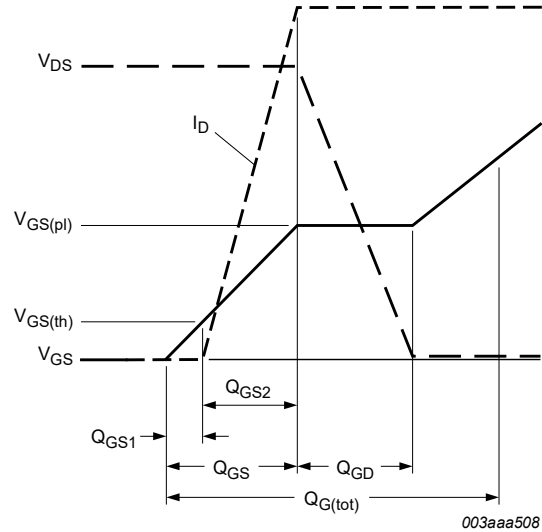


Fig. 16. Gate charge waveform definitions

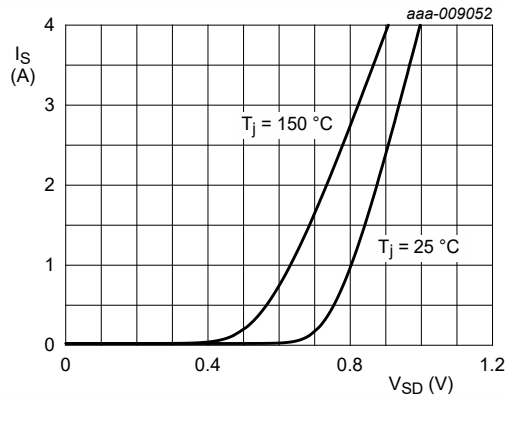


Fig. 17. Source current as a function of source-drain voltage; typical values

11. Test information

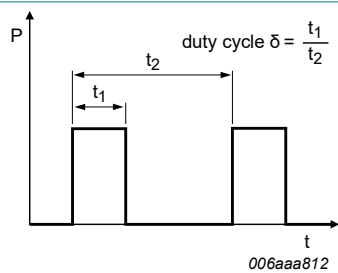
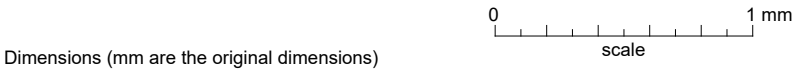
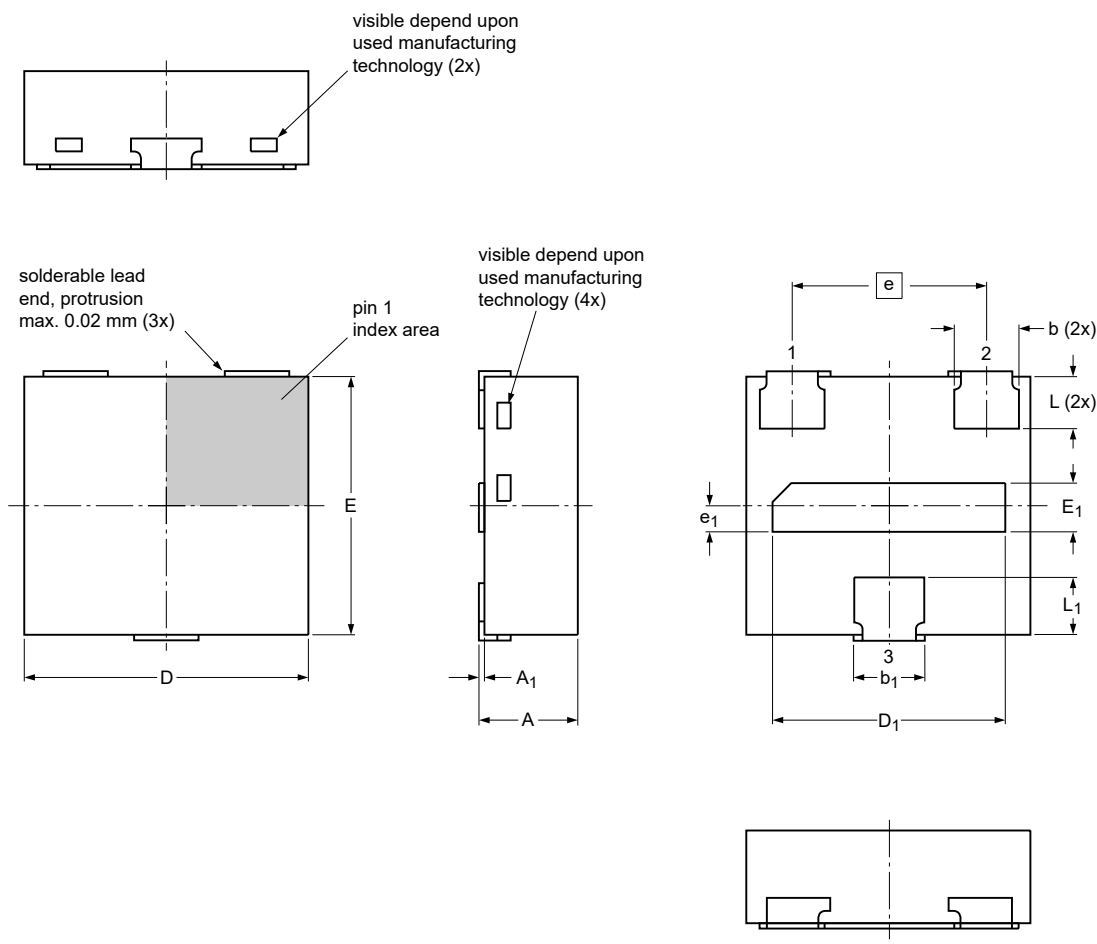


Fig. 18. Duty cycle definition

12. Package outline

DFN1010D-3: plastic thermal enhanced ultra thin small outline package; no leads;
3 terminals; body: 1.1 x 1.0 x 0.37 mm

SOT1215



Dimensions (mm are the original dimensions)

Unit	A	A ₁	b	b ₁	D	D ₁	E	E ₁	e	e ₁	L	L ₁
mm	min	0.34	0.22	0.245	1.05	0.87	0.95	0.16			0.17	0.195
	nom	0.37	0.25	0.275	1.10	0.90	1.00	0.19	0.75	0.1	0.20	0.225
	max	0.40	0.04	0.30	0.325	1.15	0.95	1.05	0.24		0.25	0.275

Note

1. Dimension A is including plating thickness.

sot1215_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT1215						13-03-05 13-03-06

Fig. 19. Package outline DFN1010D-3 (SOT1215)

13. Soldering

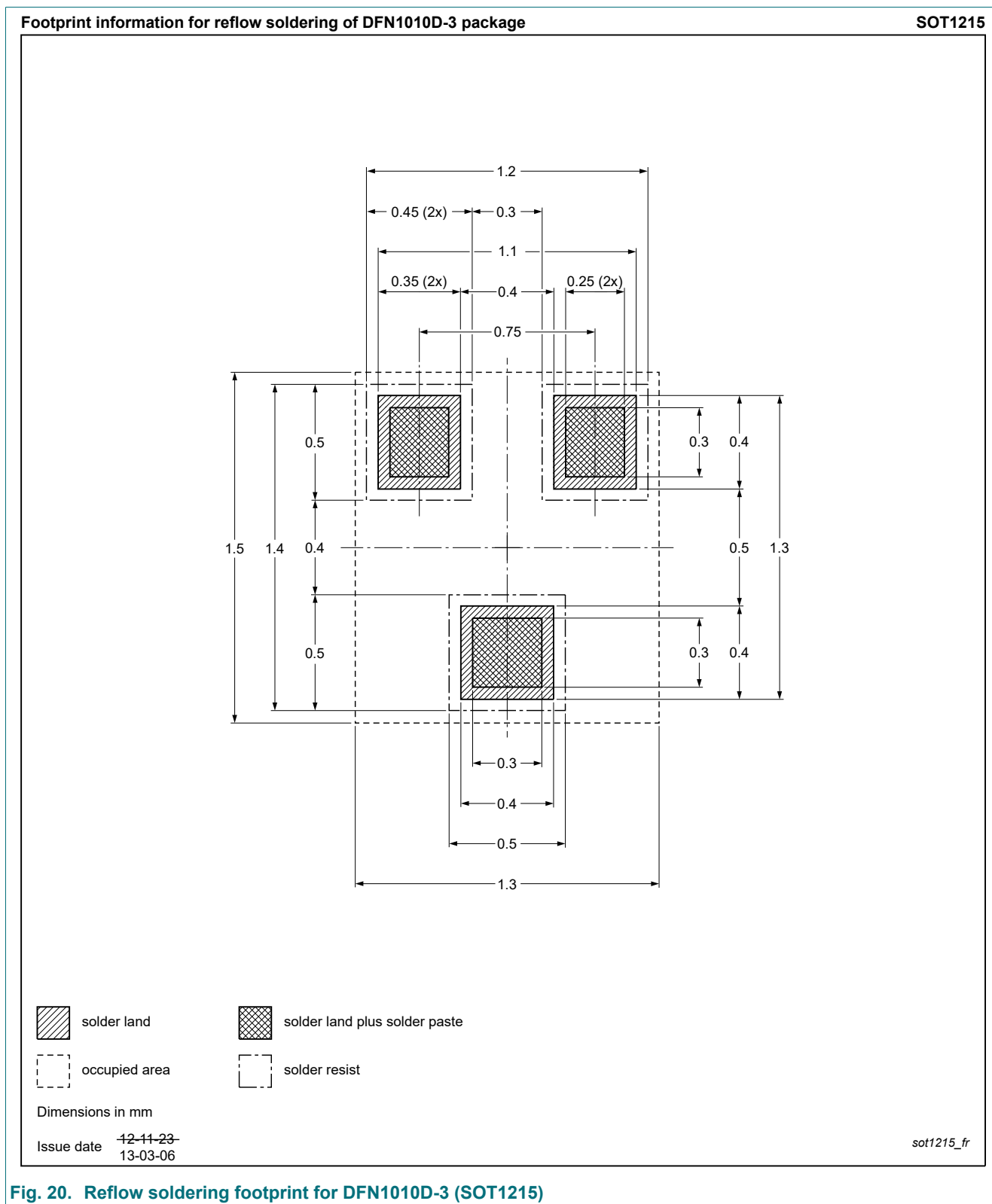


Fig. 20. Reflow soldering footprint for DFN1010D-3 (SOT1215)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMXB56EN v.4	20201027	Product data sheet	-	PMXB56EN v.3
Modifications:	- The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. - Legal texts have been adapted to the new company name where appropriate.			
PMXB56EN v.3	20170111	Product data sheet	-	PMXB56EN v.2
PMXB56EN v.2	20140430	Product data sheet	-	PMXB56EN v.1
PMXB56EN v.1	20130925	Product data sheet	-	-

15. Legal information

Data sheet status

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.

- [1] Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
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Date of release: 27 October 2020