

PMDXB590UPE

20 V, dual P-channel Trench MOSFET

30 May 2023

Product data sheet

1. General description

Dual P-channel enhancement mode Field-Effect Transistor (FET) in a leadless ultra small DFN1010B-6 (SOT1216) Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

2. Features and benefits

- Low threshold voltage
- Very fast switching
- Trench MOSFET technology
- ElectroStatic Discharge (ESD) protection typically > 2 kV HBM

3. Applications

- Relay driver
- High-speed line driver
- High-side load switch
- Switching circuits

4. Quick reference data

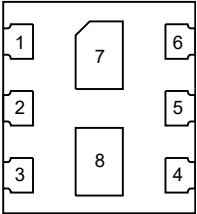
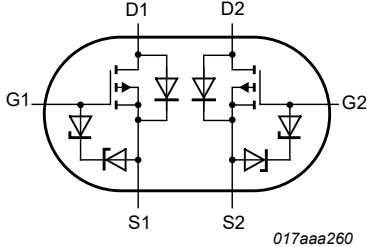
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j = 25\text{ °C}$		-	-	-20	V
V_{GS}	gate-source voltage			-8	-	8	V
I_D	drain current	$V_{GS} = -4.5\text{ V}; T_{amb} = 25\text{ °C}$	[1]	-	-	-0.57	A
		$V_{GS} = -4.5\text{ V}; T_{sp} = 25\text{ °C}$		-	-	-2.3	A
Static characteristics							
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = -4.5\text{ V}; I_D = -1.2\text{ A}; T_j = 25\text{ °C}$		-	590	770	mΩ

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

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	S1	source TR1	 Transparent top view DFN1010B-6 (SOT1216)	 017aaa260
2	G1	gate TR1		
3	D2	drain TR2		
4	S2	source TR2		
5	G2	gate TR2		
6	D1	drain TR1		
7	D1	drain TR1		
8	D2	drain TR2		

6. Ordering information

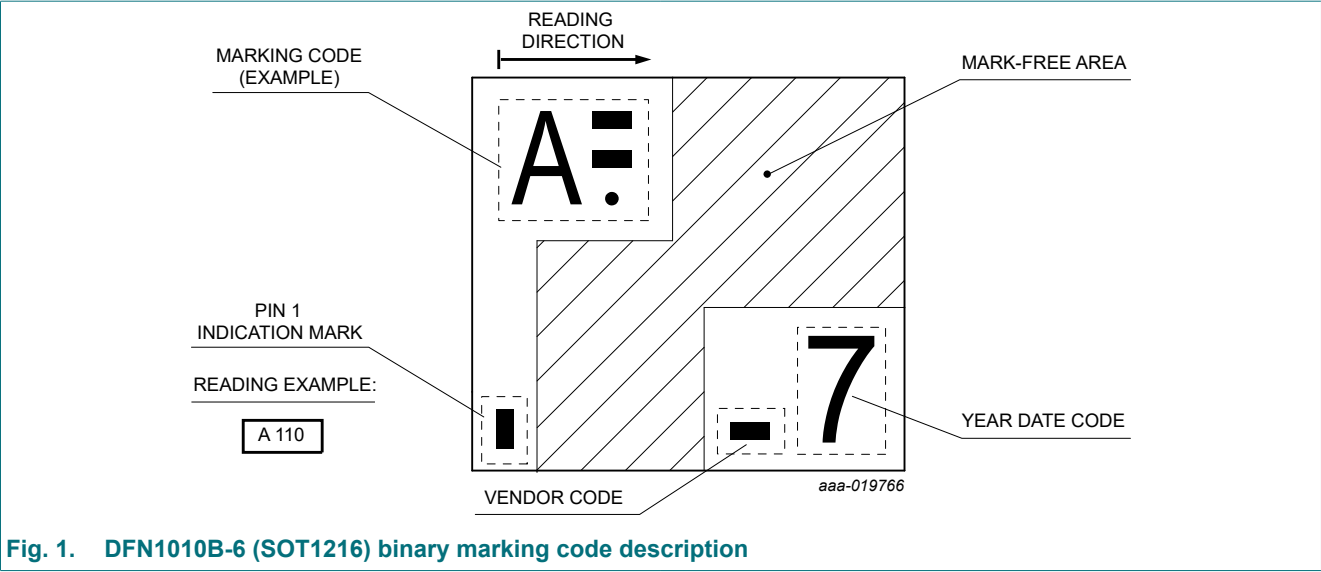
Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMDXB590UPE	DFN1010B-6	plastic, leadless thermal enhanced ultra thin small outline package; 6 terminals; 0.35 mm pitch; 1.1 mm x 1 mm x 0.37 mm body	SOT1216

7. Marking

Table 4. Marking codes

Type number	Marking code
PMDXB590UPE	D 010



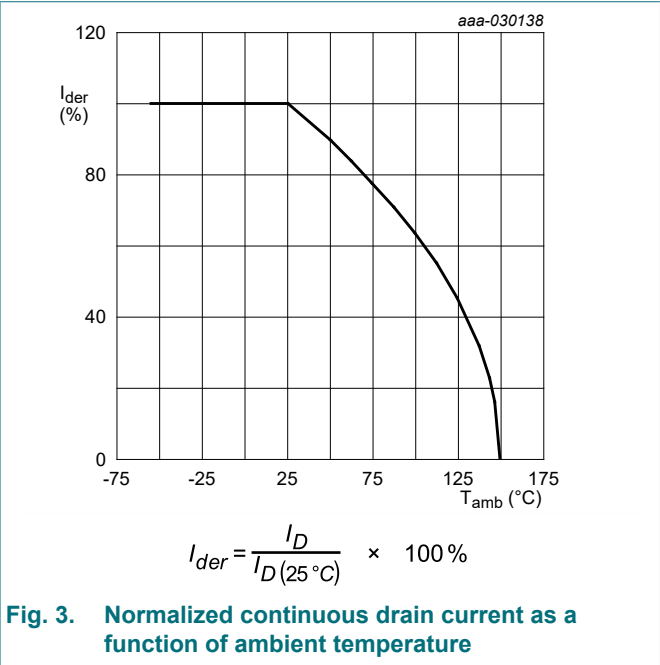
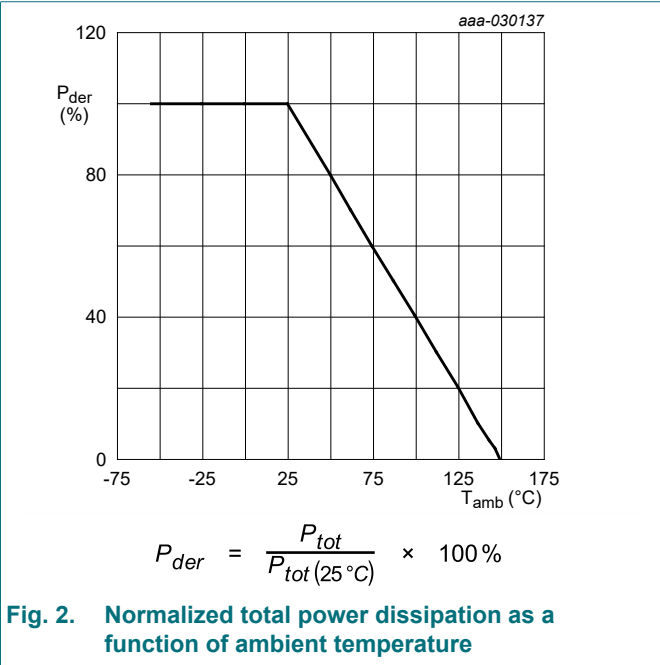
8. Limiting values

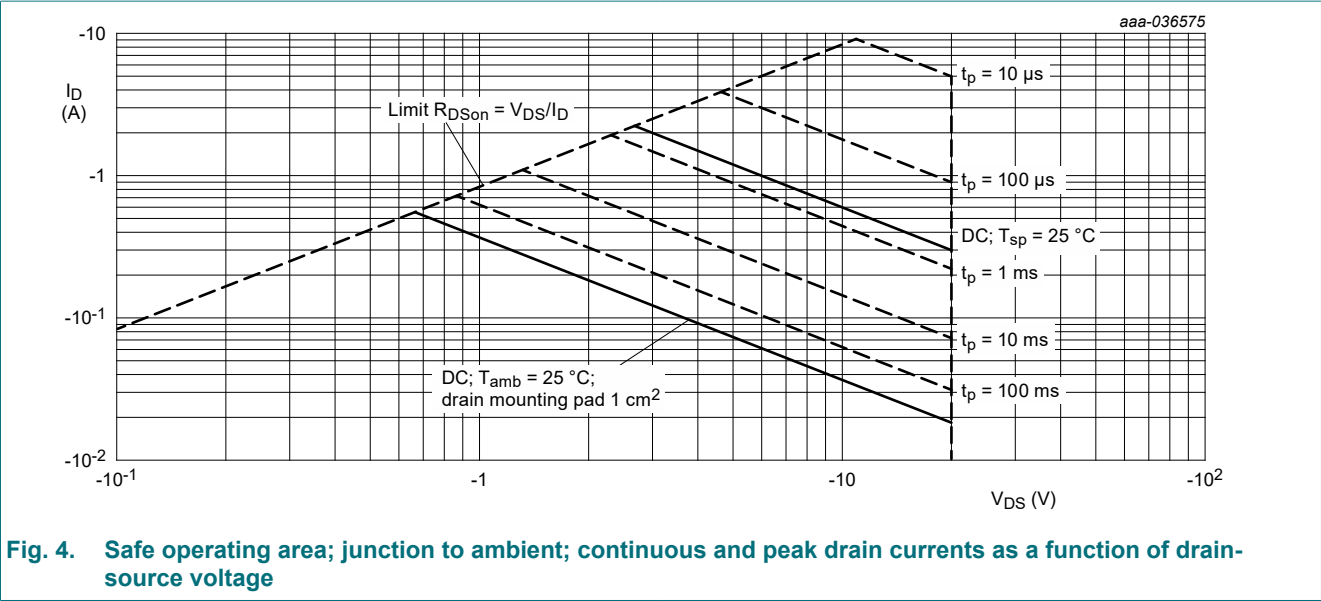
Table 5. Limiting values

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		-	-20	V
V _{GS}	gate-source voltage			-8	8	V
I _D	drain current	V _{GS} = -4.5 V; T _{amb} = 25 °C	[1]	-	-0.57	A
		V _{GS} = -4.5 V; T _{sp} = 25 °C		-	-2.3	A
		V _{GS} = -4.5 V; T _{amb} = 100 °C	[1]	-	-0.36	A
		V _{GS} = -4.5 V; T _{sp} = 100 °C		-	-1.5	A
I _{DM}	peak drain current	T _{amb} = 25 °C; single pulse; t _p ≤ 10 μs		-	-9.2	A
P _{tot}	total power dissipation	T _{amb} = 25 °C	[2]	-	280	mW
			[1]	-	370	mW
		T _{sp} = 25 °C		-	6	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]	-	-0.34	A

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





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]	-	386	444	K/W
			[2]	-	297	342	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	18	21	K/W

- [1] Device mounted on an FR4 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 1 cm².

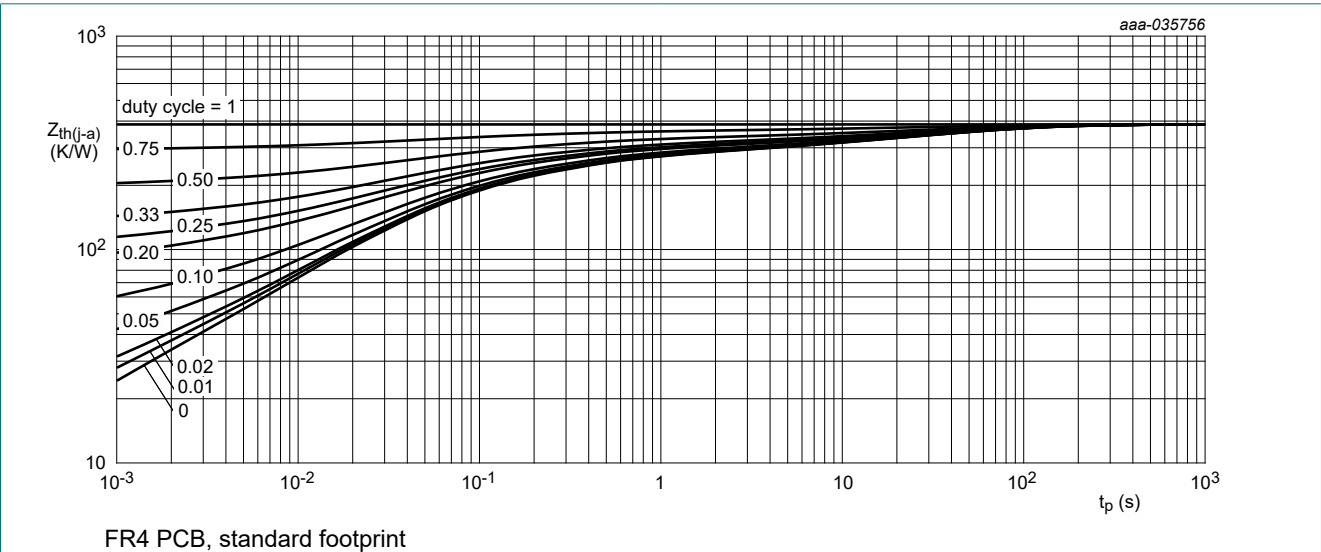


Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

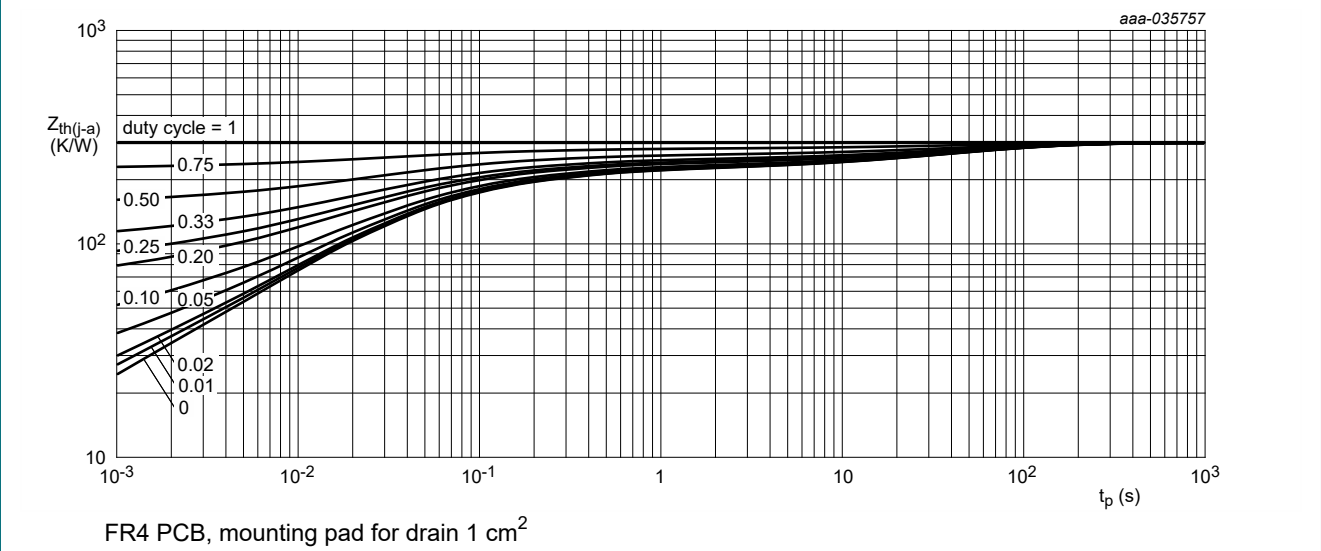


Fig. 6. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

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		-20	-	-	V
V _{GSth}	gate-source threshold voltage	I _D = -250 μA; V _{DS} = V _{GS} ; T _j = 25 °C		-0.45	-0.7	-1	V
I _{DSS}	drain leakage current	V _{DS} = -20 V; V _{GS} = 0 V; T _j = 25 °C		-	-	-1	μA
		V _{DS} = -20 V; V _{GS} = 0 V; T _j = 150 °C		-	-	-20	μA
I _{GSS}	gate leakage current	V _{GS} = -8 V; V _{DS} = 0 V; T _j = 25 °C		-	-	-10	μA
		V _{GS} = 8 V; V _{DS} = 0 V; T _j = 25 °C		-	-	10	μA
		V _{GS} = -4.5 V; V _{DS} = 0 V; T _j = 25 °C		-	-	-1	μA
		V _{GS} = 4.5 V; V _{DS} = 0 V; T _j = 25 °C		-	-	1	μA
		V _{GS} = -2.5 V; V _{DS} = 0 V; T _j = 25 °C		-	-	-500	nA
		V _{GS} = 2.5 V; V _{DS} = 0 V; T _j = 25 °C		-	-	500	nA
R _{DSon}	drain-source on-state resistance	V _{GS} = -4.5 V; I _D = -1.2 A; T _j = 25 °C		-	590	770	mΩ
		V _{GS} = -4.5 V; I _D = -1.2 A; T _j = 150 °C		-	890	1200	mΩ
		V _{GS} = -2.5 V; I _D = -1 A; T _j = 25 °C		-	980	1400	mΩ
		V _{GS} = -1.8 V; I _D = -120 mA; T _j = 25 °C		-	1170	1970	mΩ
g _{fs}	forward transconductance	V _{DS} = -5 V; I _D = -0.6 A; T _j = 25 °C		-	1.2	-	S
Dynamic characteristics							
Q _{G(tot)}	total gate charge	V _{DS} = -10 V; I _D = -0.6 A; V _{GS} = -4.5 V; T _j = 25 °C		-	0.6	0.8	nC
Q _{GS}	gate-source charge			-	0.1	-	nC
Q _{GD}	gate-drain charge			-	0.1	-	nC
C _{iss}	input capacitance	V _{DS} = -10 V; f = 1 MHz; V _{GS} = 0 V; T _j = 25 °C		-	53.5	-	pF
C _{oss}	output capacitance			-	9.6	-	pF
C _{rss}	reverse transfer capacitance			-	7.8	-	pF
t _{d(on)}	turn-on delay time	V _{DS} = -10 V; I _D = -1.2 A; V _{GS} = -4.5 V; R _{G(ext)} = 6 Ω; T _j = 25 °C		-	1	-	ns
t _r	rise time			-	3	-	ns
t _{d(off)}	turn-off delay time			-	6	-	ns
t _f	fall time			-	3.7	-	ns
Source-drain diode							
V _{SD}	source-drain voltage	I _S = -0.34 A; V _{GS} = 0 V; T _j = 25 °C		-	-0.9	-1.2	V

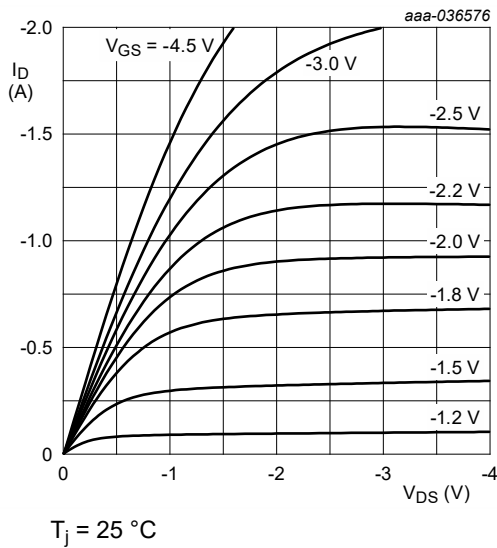


Fig. 7. Output characteristics: drain current as a function of drain-source voltage; typical values

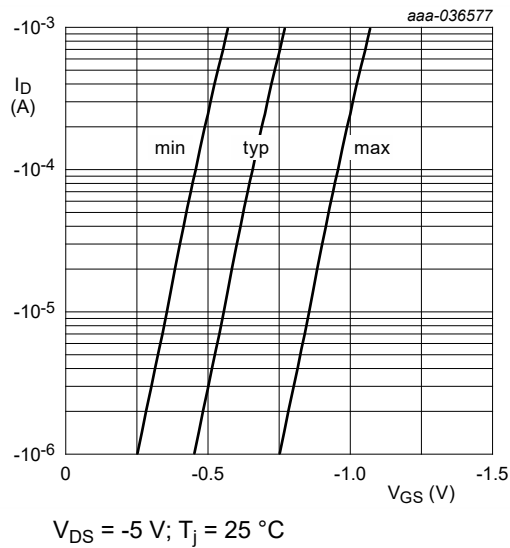


Fig. 8. Sub-threshold drain current as a function of gate-source voltage

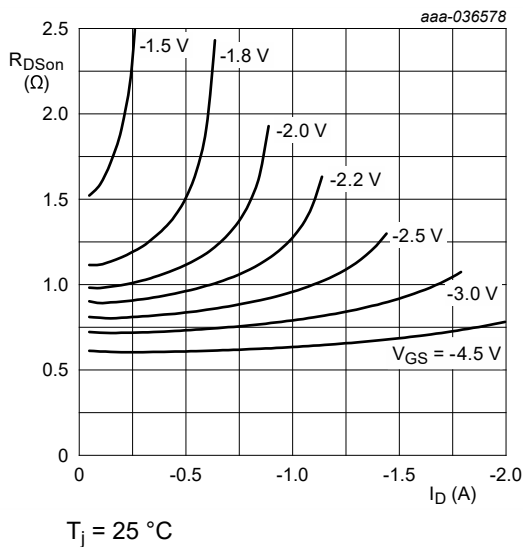


Fig. 9. Drain-source on-state resistance as a function of drain current; typical values

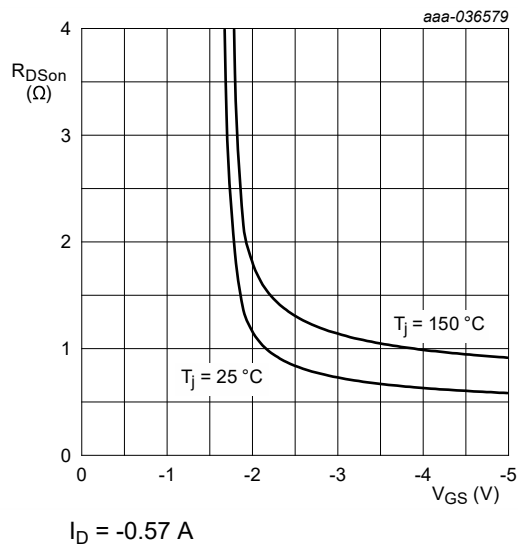


Fig. 10. Drain-source on-state resistance as a function of gate-source voltage; typical values

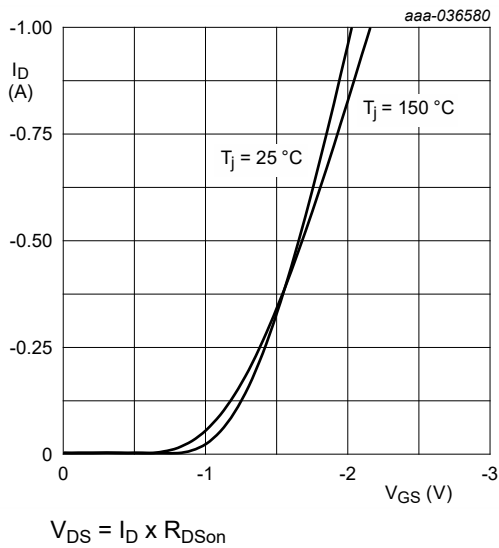


Fig. 11. Transfer characteristics: drain current as a function of gate-source voltage; typical values

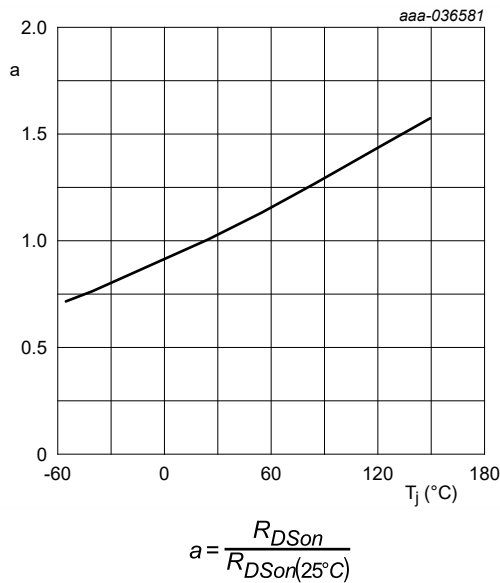


Fig. 12. Normalized drain-source on-state resistance as a function of junction temperature; typical values

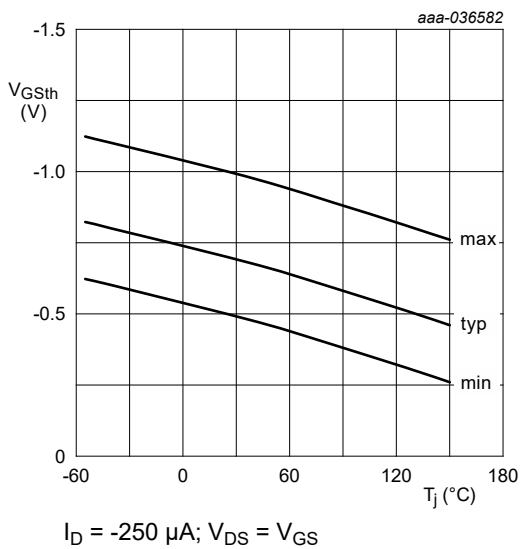


Fig. 13. Gate-source threshold voltage as a function of junction temperature

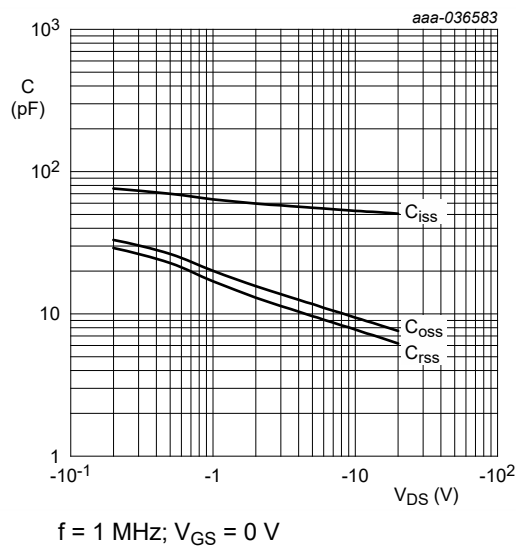


Fig. 14. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

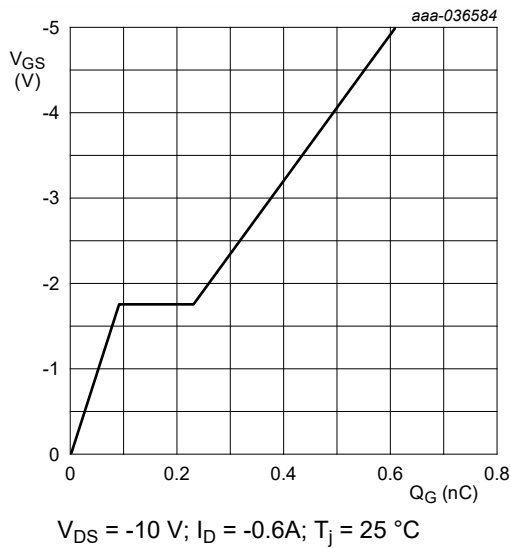


Fig. 15. Gate-source voltage as a function of gate charge; typical values

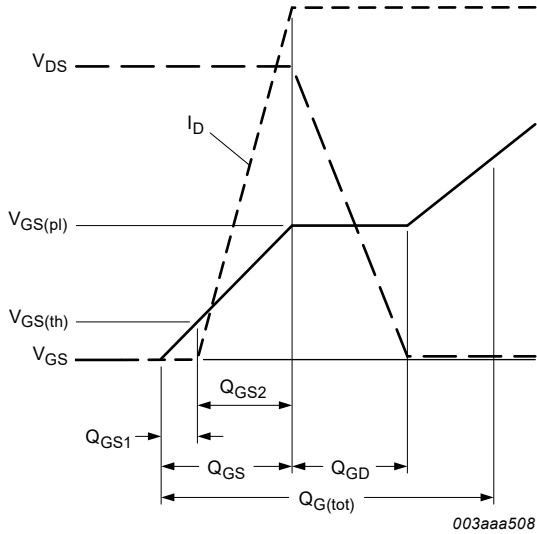


Fig. 16. Gate charge waveform definitions

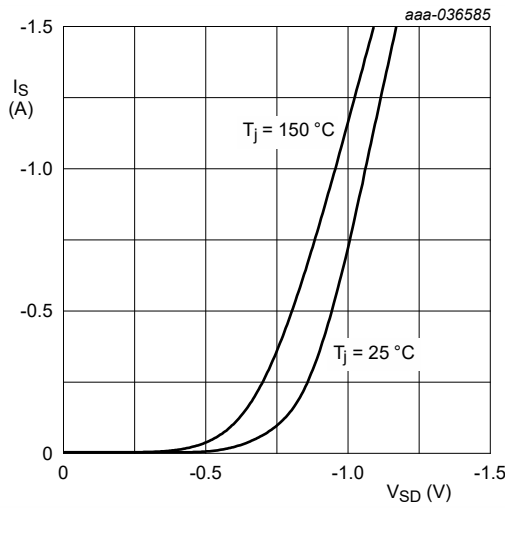


Fig. 17. Source current as a function of source-drain voltage; typical values

11. Test information

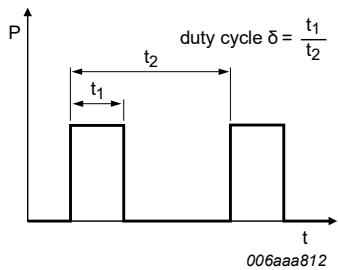
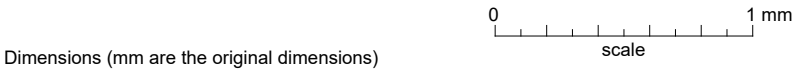
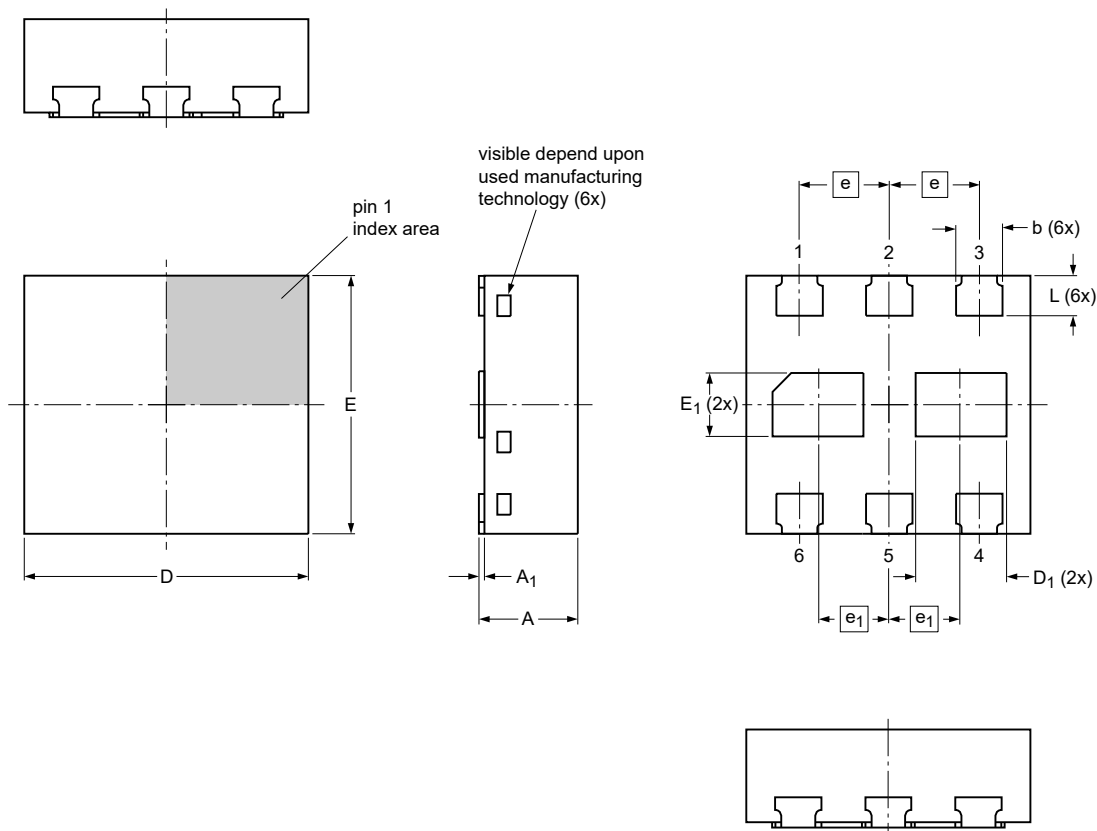


Fig. 18. Duty cycle definition

12. Package outline

DFN1010B-6: plastic thermal enhanced ultra thin small outline package; no leads;
6 terminals; body: 1.1 x 1.0 x 0.37 mm

SOT1216



Dimensions (mm are the original dimensions)										
Unit	A	A ₁	b	D	D ₁	E	E ₁	e	e ₁	L
mm	min	0.34	0.15	1.05	0.32	0.95	0.22			0.125
	nom	0.37	0.18	1.10	0.35	1.00	0.25	0.35	0.275	0.155
	max	0.40	0.04	0.23	1.15	0.40	1.05	0.30		0.205

Note
1. Dimension A is including plating thickness.

sot1216_po

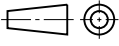
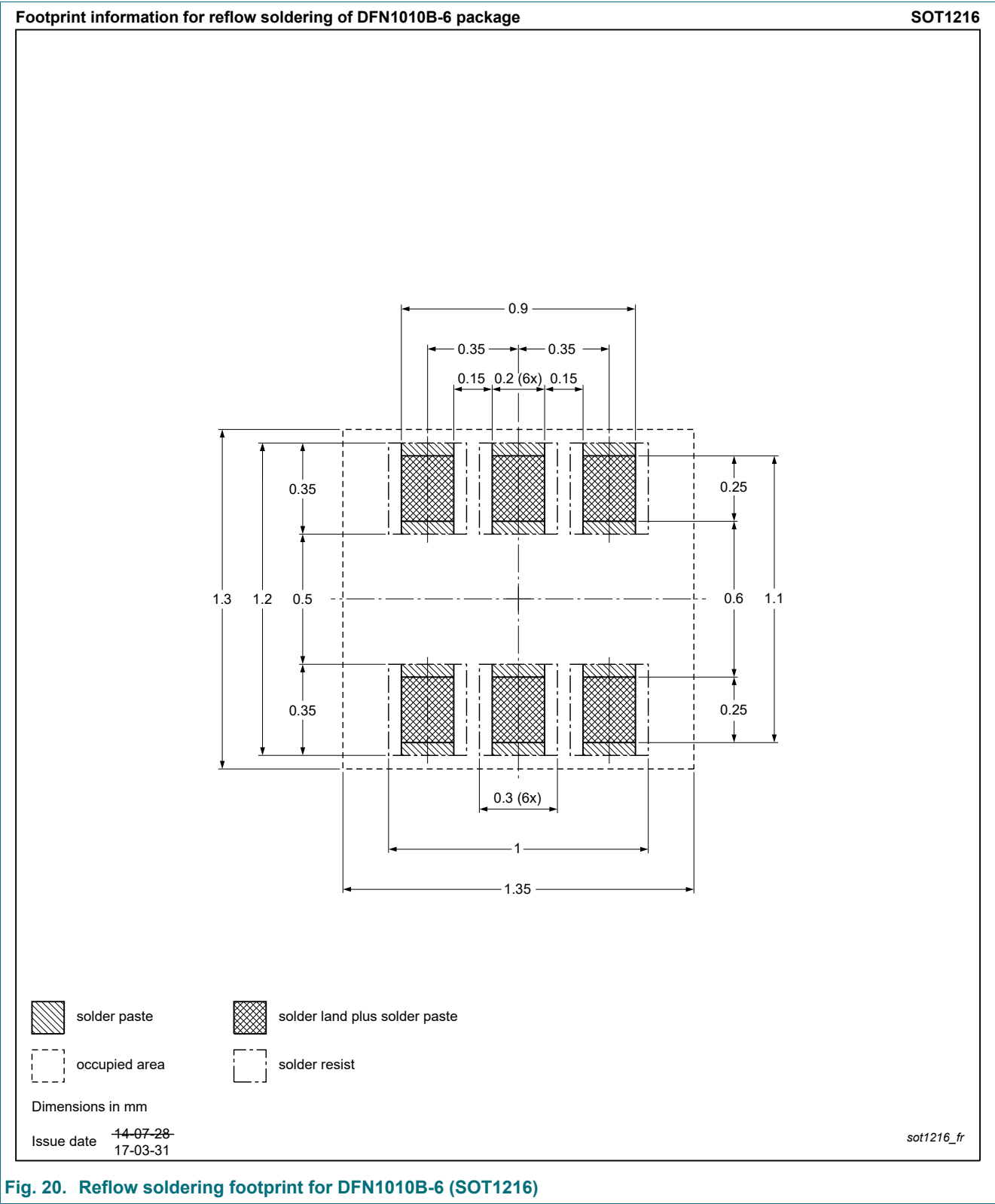
Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT1216						13-03-05 13-03-06

Fig. 19. Package outline DFN1010B-6 (SOT1216)

13. Soldering



14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMDXB590UPE v.1	20230530	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.

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- [2] The term 'short data sheet' is explained in section "Definitions".
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Contents

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..... 3

9. Thermal characteristics..... 5

10. Characteristics.....6

11. Test information.....9

12. Package outline..... 10

13. Soldering..... 11

14. Revision history.....12

15. Legal information.....13

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