



# PMDXB950UPE

20 V, dual P-channel Trench MOSFET

30 June 2015

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

- Trench MOSFET technology
- Leadless ultra small and ultra thin SMD plastic package:  $1.1 \times 1.0 \times 0.37$  mm
- Exposed drain pad for excellent thermal conduction
- ElectroStatic Discharge (ESD) protection  $> 1$  kV HBM
- Drain-source on-state resistance  $R_{DSon} = 1.02 \Omega$

## 3. Applications

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

## 4. Quick reference data

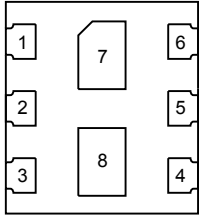
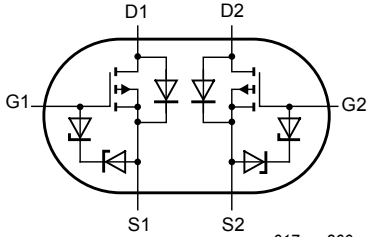
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per transistor</b>						
$V_{DS}$	drain-source voltage	$T_j = 25 \text{ }^\circ\text{C}$	-	-	-20	V
$V_{GS}$	gate-source voltage		-8	-	8	V
$I_D$	drain current	$V_{GS} = -4.5 \text{ V}; T_{amb} = 25 \text{ }^\circ\text{C}$	[1]	-	-500	mA
<b>Static characteristics (per transistor)</b>						
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = -4.5 \text{ V}; I_D = -500 \text{ mA}; T_j = 25 \text{ }^\circ\text{C}$	-	1.02	1.4	$\Omega$

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain  $1 \text{ cm}^2$ .

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	S1	source TR1	 <p>Transparent top view <b>DFN1010B-6 (SOT1216)</b></p>	 <p>017aaa260</p>
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

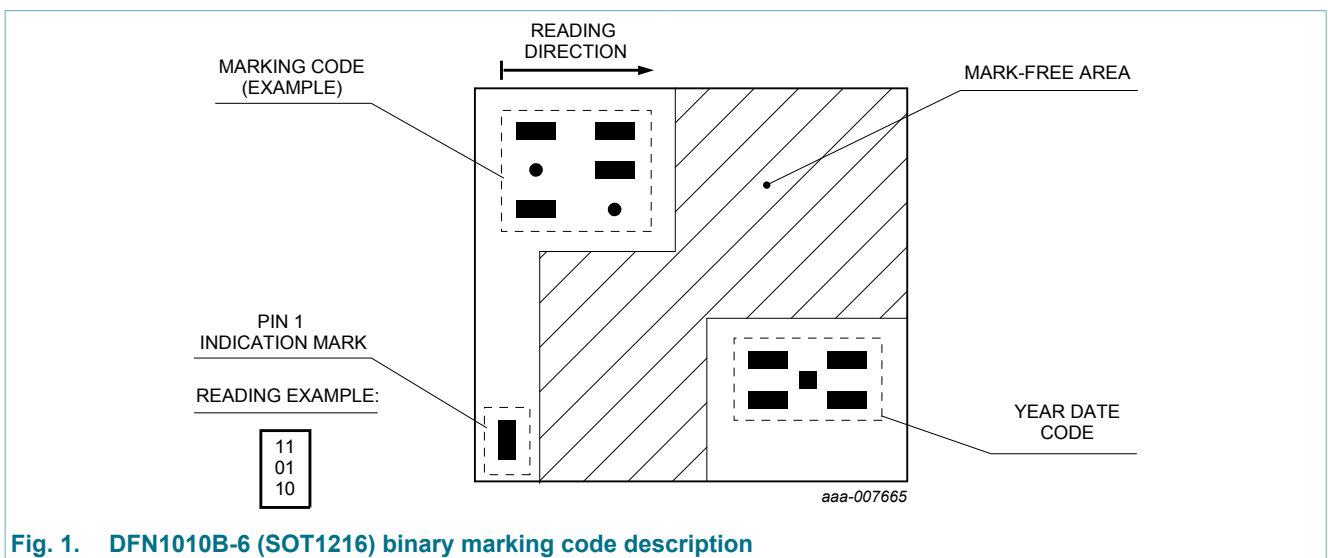
Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMDXB950UPE	DFN1010B-6	DFN1010B-6: plastic thermal enhanced ultra thin small outline package; no leads; 6 terminals	SOT1216

## 7. Marking

Table 4. Marking codes

Type number	Marking code
PMDXB950UPE	10 10 00



## 8. Limiting values

**Table 5. Limiting values**

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

Symbol	Parameter	Conditions		Min	Max	Unit
<b>Per transistor</b>						
$V_{DS}$	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]	-	-500	mA
		$V_{GS} = -4.5\text{ V}; T_{amb} = 100\text{ °C}$	[1]	-	-300	mA
$I_{DM}$	peak drain current	$T_{amb} = 25\text{ °C}; \text{single pulse}; t_p \leq 10\text{ }\mu\text{s}$		-	-2	A
$P_{tot}$	total power dissipation	$T_{amb} = 25\text{ °C}$	[2]	-	265	mW
			[1]	-	380	mW
		$T_{sp} = 25\text{ °C}$		-	4025	mW
<b>Source-drain diode</b>						
$I_S$	source current	$T_{amb} = 25\text{ °C}$	[1]	-	-350	mA
<b>Per device</b>						
$T_j$	junction temperature			-55	150	°C
$T_{amb}$	ambient temperature			-55	150	°C
$T_{stg}$	storage temperature			-65	150	°C

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain  $1\text{ cm}^2$ .

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

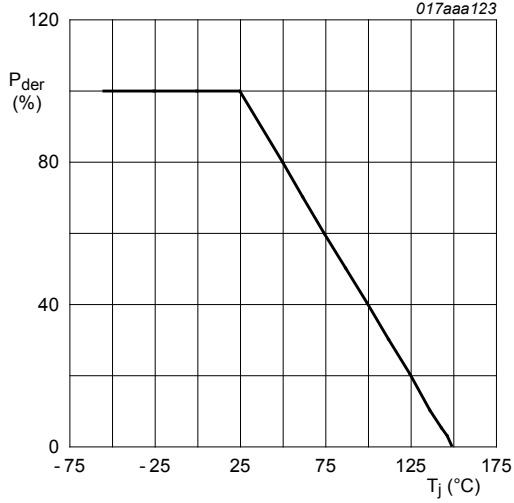


Fig. 2. Normalized total power dissipation as a function of junction temperature

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

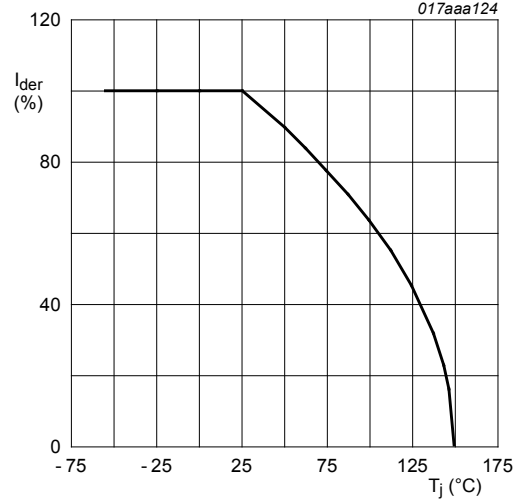


Fig. 3. Normalized continuous drain current as a function of junction temperature

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

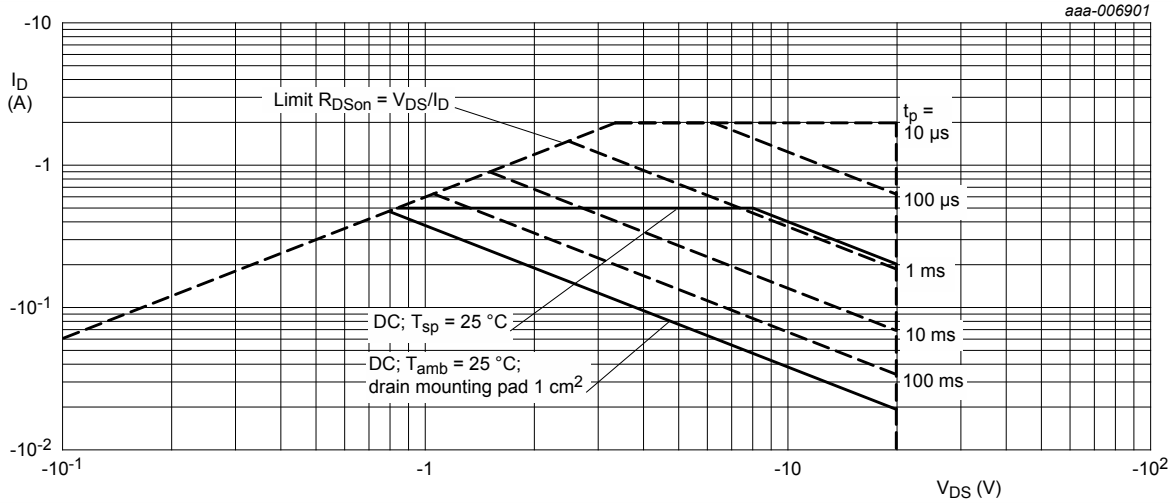


Fig. 4. Safe operating area; junction to ambient; continuous and peak drain currents as a function of drain-source voltage

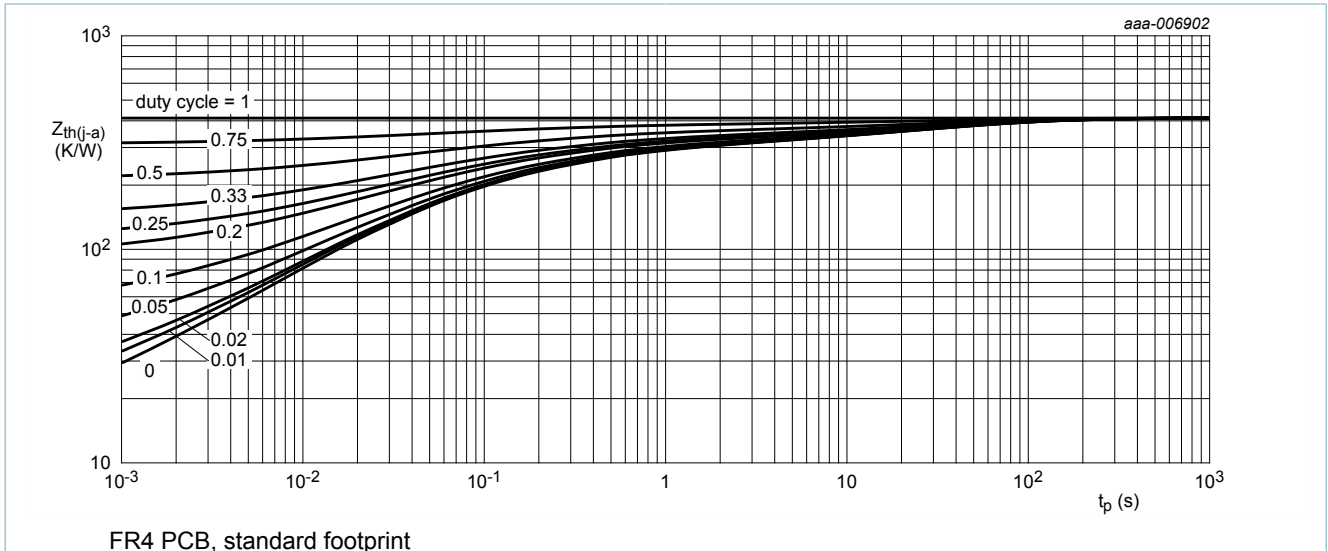
## 9. Thermal characteristics

Table 6. Thermal characteristics

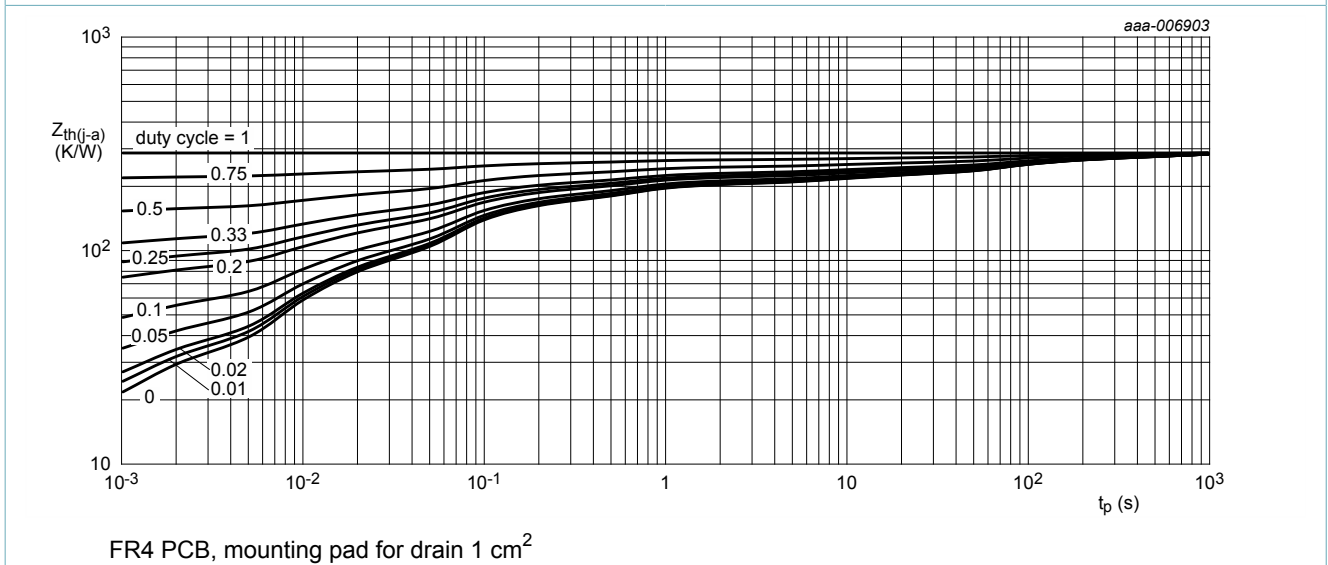
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per transistor</b>						
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	410	475 K/W
			[2]	-	285	330 K/W

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-sp)}$	thermal resistance from junction to solder point		-	27	31	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 cm<sup>2</sup>.



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

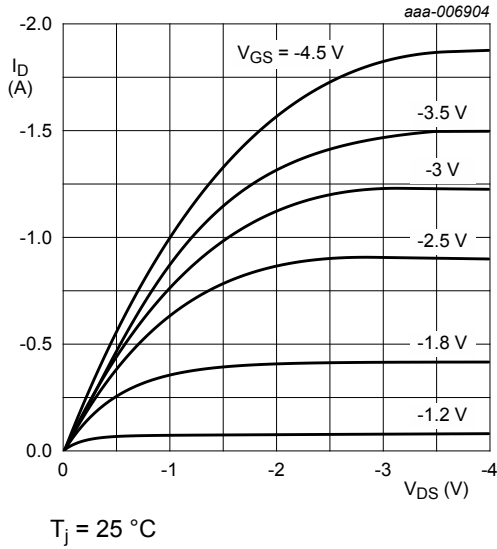


**Fig. 6. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values**

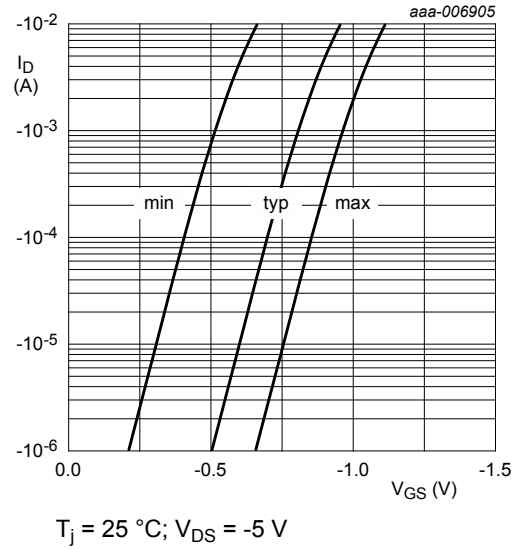
## 10. Characteristics

Table 7. Characteristics

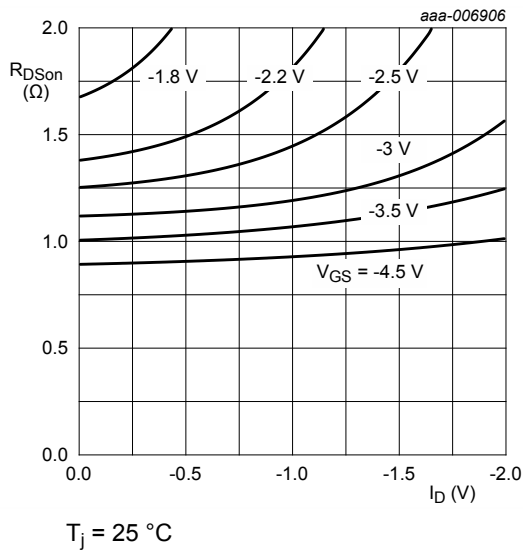
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics (per transistor)</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = -250 \mu\text{A}$ ; $V_{GS} = 0 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-20	-	-	V
$V_{GSth}$	gate-source threshold voltage	$I_D = -250 \mu\text{A}$ ; $V_{DS} = V_{GS}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-0.45	-0.7	-0.95	V
$I_{DSS}$	drain leakage current	$V_{DS} = -20 \text{ V}$ ; $V_{GS} = 0 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	-	-1	$\mu\text{A}$
		$V_{DS} = -20 \text{ V}$ ; $V_{GS} = 0 \text{ V}$ ; $T_j = 150 \text{ }^\circ\text{C}$	-	-	-10	$\mu\text{A}$
$I_{GSS}$	gate leakage current	$V_{GS} = 8 \text{ V}$ ; $V_{DS} = 0 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	-	10	$\mu\text{A}$
		$V_{GS} = -8 \text{ V}$ ; $V_{DS} = 0 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	-	-10	$\mu\text{A}$
		$V_{GS} = 4.5 \text{ V}$ ; $V_{DS} = 0 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	-	1	$\mu\text{A}$
		$V_{GS} = -4.5 \text{ V}$ ; $V_{DS} = 0 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	-	-1	$\mu\text{A}$
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = -4.5 \text{ V}$ ; $I_D = -500 \text{ mA}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	1.02	1.4	$\Omega$
		$V_{GS} = -4.5 \text{ V}$ ; $I_D = -500 \text{ mA}$ ; $T_j = 150 \text{ }^\circ\text{C}$	-	1.54	2.1	$\Omega$
		$V_{GS} = -2.5 \text{ V}$ ; $I_D = -200 \text{ mA}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	1.27	2.2	$\Omega$
		$V_{GS} = -1.8 \text{ V}$ ; $I_D = -40 \text{ mA}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	1.7	3.3	$\Omega$
		$V_{GS} = -1.5 \text{ V}$ ; $I_D = -10 \text{ mA}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	2.3	5	$\Omega$
		$V_{GS} = -1.2 \text{ V}$ ; $I_D = -1 \text{ mA}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	3.5	-	$\Omega$
$g_{fs}$	forward transconductance	$V_{DS} = -10 \text{ V}$ ; $I_D = -500 \text{ mA}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	480	-	mS
<b>Dynamic characteristics (per transistor)</b>						
$Q_{G(tot)}$	total gate charge	$V_{DS} = -10 \text{ V}$ ; $I_D = -450 \text{ mA}$ ; $V_{GS} = -4.5 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	1.19	2.1	nC
$Q_{GS}$	gate-source charge		-	0.17	-	nC
$Q_{GD}$	gate-drain charge		-	0.1	-	nC
$C_{iss}$	input capacitance	$V_{DS} = -10 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $V_{GS} = 0 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	43	-	pF
$C_{oss}$	output capacitance		-	14	-	pF
$C_{rss}$	reverse transfer capacitance		-	8	-	pF
$t_{d(on)}$	turn-on delay time		$V_{DS} = -10 \text{ V}$ ; $I_D = -0.45 \text{ A}$ ; $R_L = 22 \text{ } \Omega$ ; $V_{GS} = -4.5 \text{ V}$ ; $R_{G(ext)} = 6 \text{ } \Omega$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	2.3	-
$t_r$	rise time		-	5	-	ns
$t_{d(off)}$	turn-off delay time		-	13.5	-	ns
$t_f$	fall time		-	6	-	ns
<b>Source-drain diode (per transistor)</b>						
$V_{SD}$	source-drain voltage	$I_S = -115 \text{ mA}$ ; $V_{GS} = 0 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	-0.7	-1.2	V



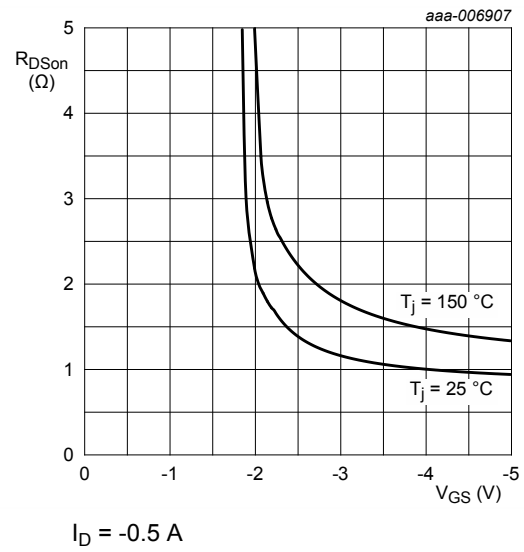
**Fig. 7. Output characteristics: drain current as a function of drain-source voltage; typical values**



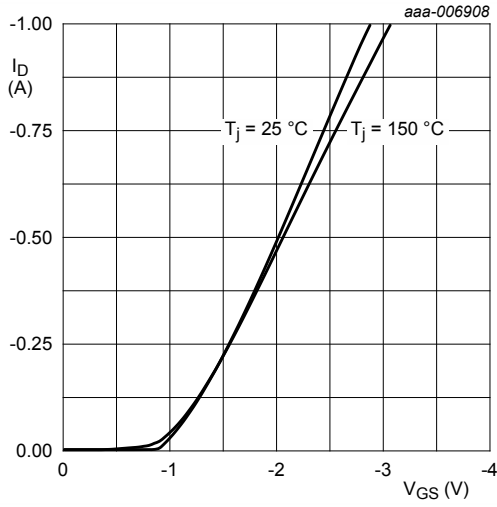
**Fig. 8. Sub-threshold drain current as a function of gate-source voltage**



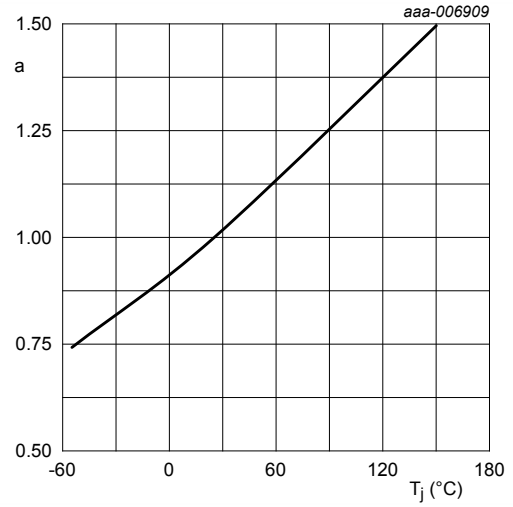
**Fig. 9. Drain-source on-state resistance as a function of drain current; typical values**



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

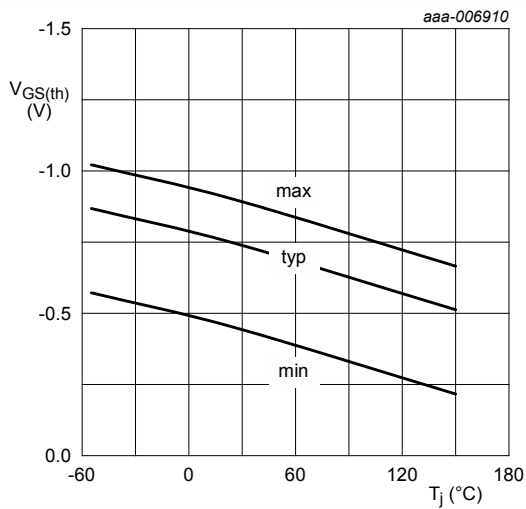


**Fig. 11. Transfer characteristics: drain current as a function of gate-source voltage; typical values**



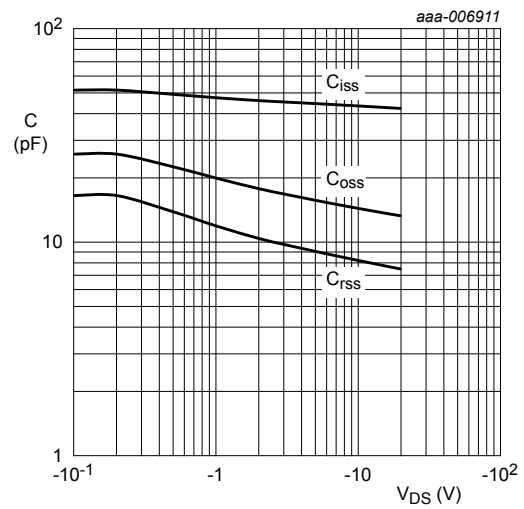
**Fig. 12. Normalized drain-source on-state resistance as a function of junction temperature; typical values**

$$a = \frac{R_{DSon}}{R_{DSon(25^{\circ}C)}}$$



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

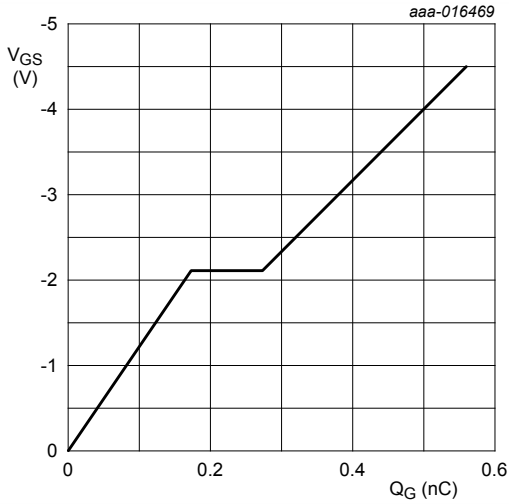
$I_D = -0.25 \text{ mA}; V_{DS} = V_{GS}$



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

$f = 1 \text{ MHz}; V_{GS} = 0 \text{ V}$



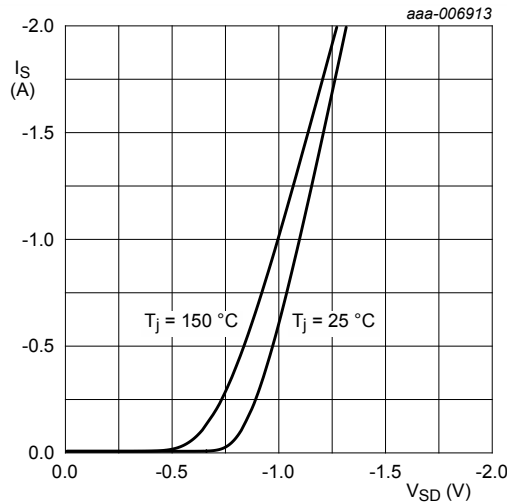


$I_D = -0.5$  A;  $V_{DS} = -10$  V;  $T_{amb} = 25$  °C

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



Fig. 16. MOSFET transistor: Gate charge waveform definitions



$V_{GS} = 0$  V

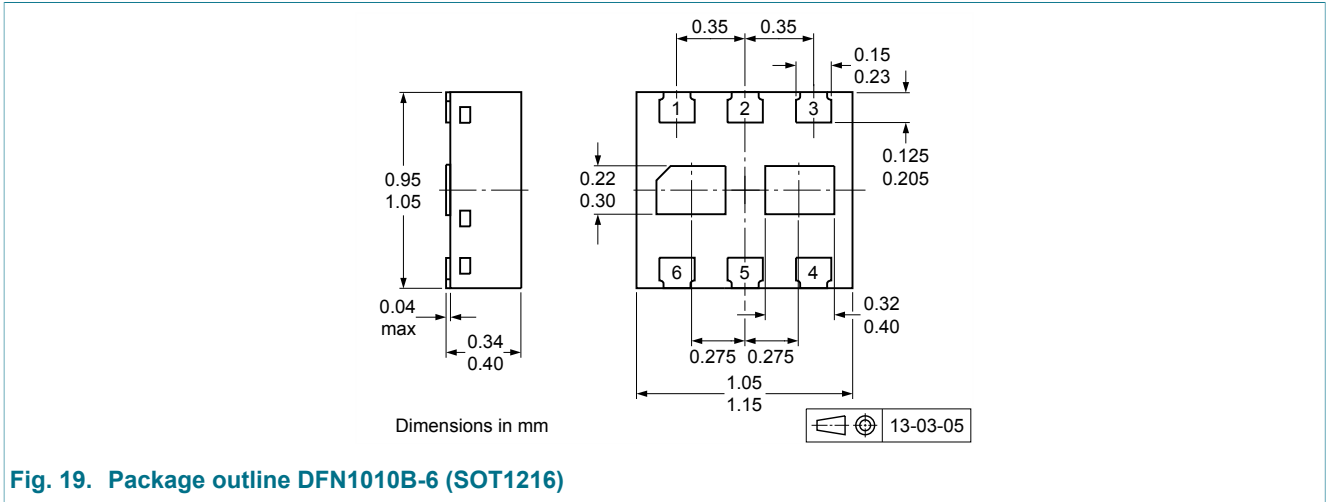
Fig. 17. Source current as a function of source-drain voltage; typical values

## 11. Test information



Fig. 18. Duty cycle definition

## 12. Package outline



### 13. Soldering

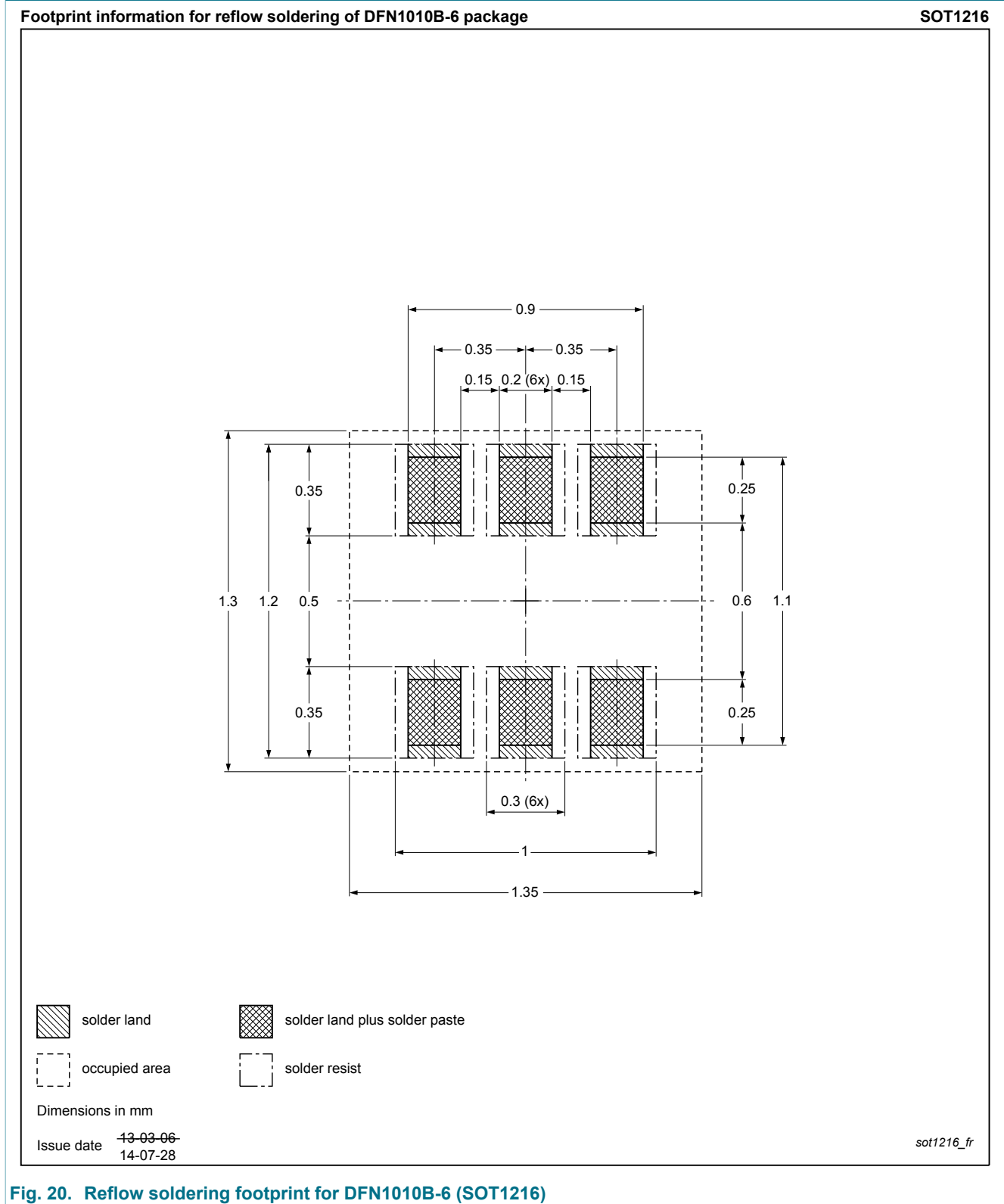


Fig. 20. Reflow soldering footprint for DFN1010B-6 (SOT1216)

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMDXB950UPE v.2	20150630	Product data sheet	-	PMDXB950UPE v.1
Modification:	<ul style="list-style-type: none"><li>Change of binary marking code position.</li></ul>			
PMDXB950UPE v.1	20130910	Product data sheet	-	-

## 15. Legal information

### 15.1 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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