



PMX400UP

20 V, P-channel Trench MOSFET

7 April 2021

Product data sheet

1. General description

P-channel enhancement mode Field-Effect Transistor (FET) in a leadless ultra small DFN0603-3 (SOT8013) Surface-Mounted Device (SMD) using Trench MOSFET technology.

2. Features and benefits

- Low threshold voltage
- Leadless ultra small package; 0.63 x 0.33 x 0.25 mm
- Trench MOSFET technology
- Low profile (0.25 mm)

3. Applications

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

4. Quick reference data

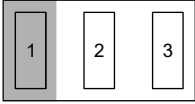
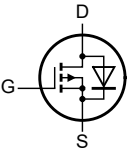
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j = 25\text{ °C}$		-	-	-20	V
V_{GS}	gate-source voltage			-12	-	12	V
I_D	drain current	$V_{GS} = -4.5\text{ V}; T_{amb} = 25\text{ °C}$	[1]	-	-	-900	mA
Static characteristics							
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = -4.5\text{ V}; I_D = -1\text{ A}; T_j = 25\text{ °C}$		-	334	500	mΩ

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

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 Transparent top view DFN0603-3 (SOT8013)	 <i>017aaa094</i>
2	S	source		
3	D	drain		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMX400UP	DFN0603-3	DFN0603-3; plastic, ultra small and leadless full encapsulated package; 3 terminals; 0.225 mm pitch; 0.63 mm x 0.33 mm x 0.25 mm body	SOT8013

7. Marking

Table 4. Marking codes

Type number	Marking code
PMX400UP	H

8. Limiting values

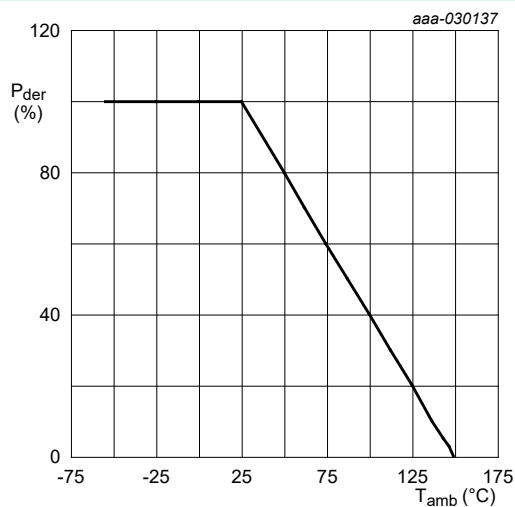
Table 5. Limiting values

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			-12	12	V
I _D	drain current	V _{GS} = -4.5 V; T _{amb} = 25 °C	[1]	-	-900	mA
		V _{GS} = -4.5 V; T _{amb} = 100 °C	[1]	-	-500	mA
I _{DM}	peak drain current	T _{amb} = 25 °C; single pulse; t _p ≤ 10 μs		-	-3.4	A
P _{tot}	total power dissipation	T _{amb} = 25 °C	[2]	-	300	mW
			[1]	-	500	mW
		T _{sp} = 25 °C		-	4.7	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]	-	-500	mA

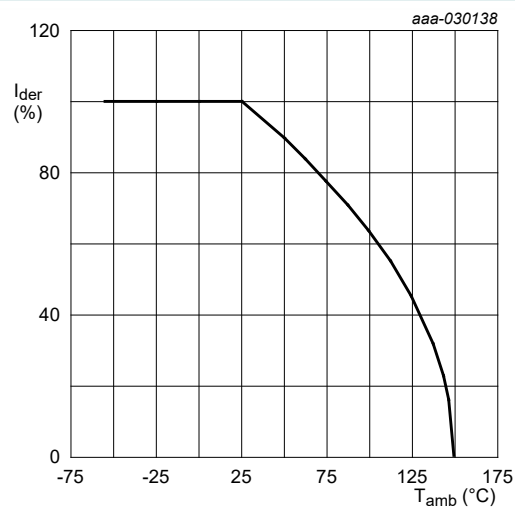
[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and mounting pad for drain 1 cm².

[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. 1. Normalized total power dissipation as a function of ambient temperature



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

Fig. 2. Normalized continuous drain current as a function of ambient temperature

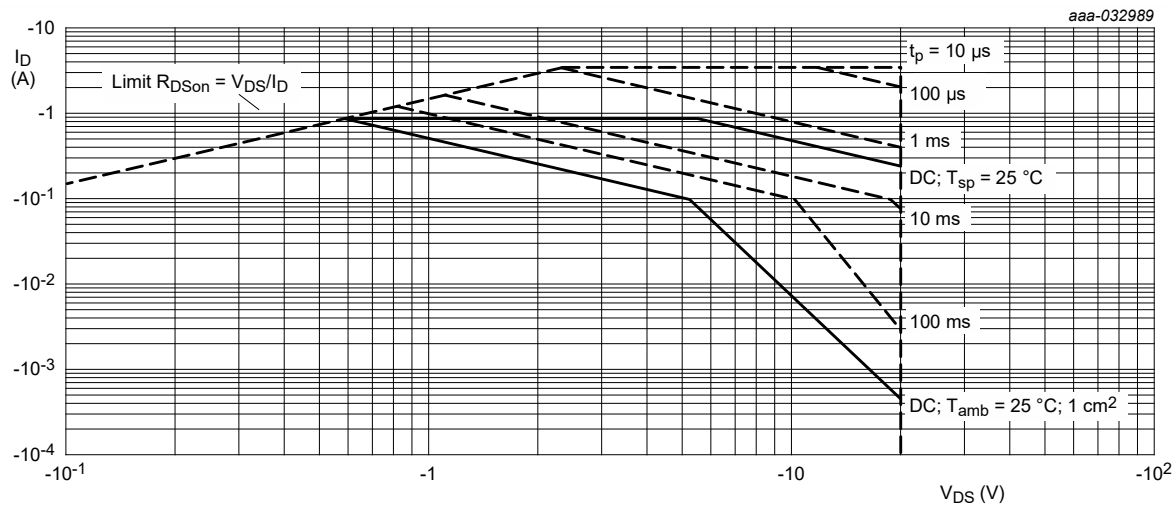


Fig. 3. Safe operating area; junction to ambient; continuous and peak drain currents as a function of drain-source voltage

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]	-	360	415	K/W
			[2]	-	215	250	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	23	26	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 and mounting pad for drain 1 cm².

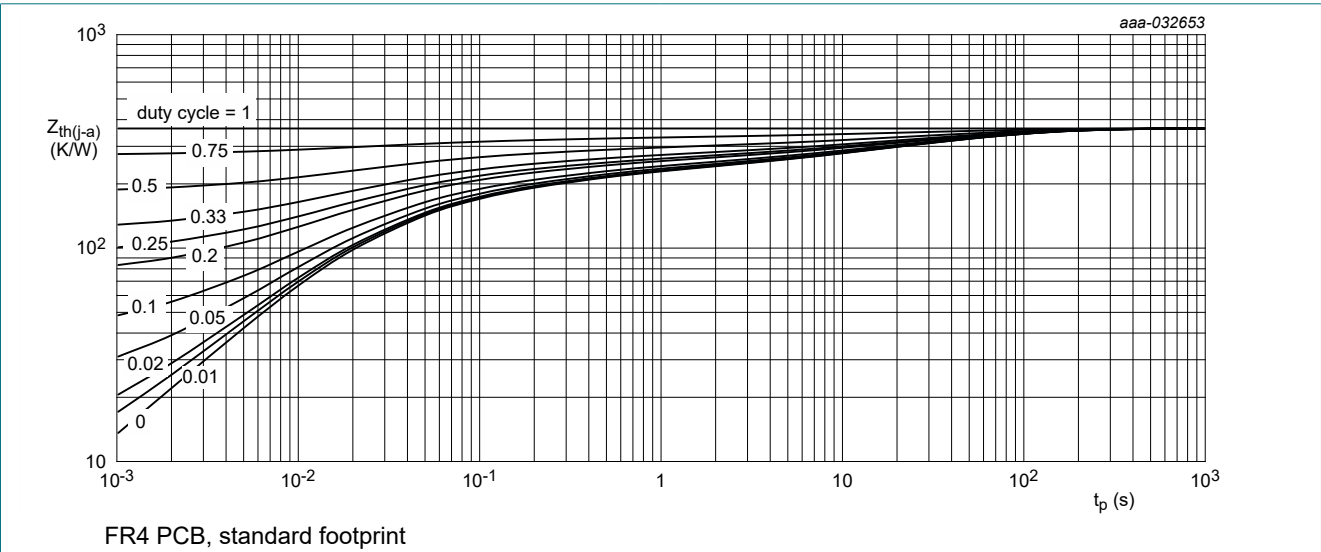


Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

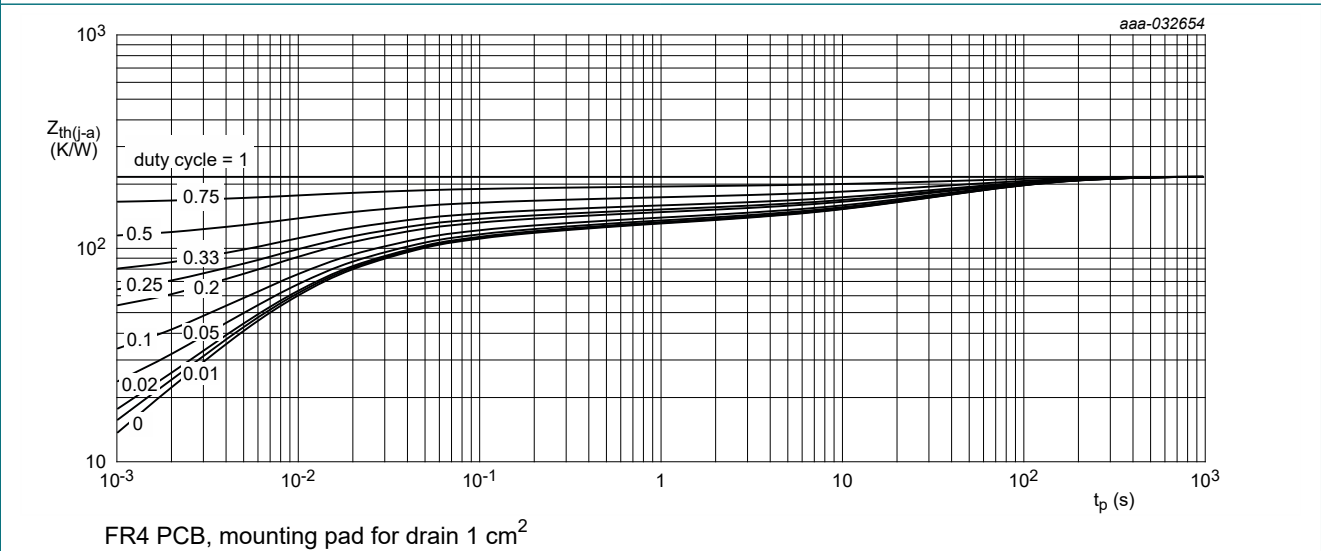


Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

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		-0.5	-0.7	-0.9	V
I _{DSS}	drain leakage current	V _{DS} = -20 V; V _{GS} = 0 V; T _j = 25 °C		-	-	-1	μA
I _{GSS}	gate leakage current	V _{GS} = -12 V; V _{DS} = 0 V; T _j = 25 °C		-	-	-100	nA
		V _{GS} = 12 V; V _{DS} = 0 V; T _j = 25 °C		-	-	100	nA
R _{DSon}	drain-source on-state resistance	V _{GS} = -4.5 V; I _D = -1 A; T _j = 25 °C		-	334	500	mΩ
		V _{GS} = -4.5 V; I _D = -1 A; T _j = 150 °C		-	450	680	mΩ
		V _{GS} = -2.5 V; I _D = -1 A; T _j = 25 °C		-	398	600	mΩ
		V _{GS} = -1.8 V; I _D = -0.5 A; T _j = 25 °C		-	490	950	mΩ
g _{fs}	forward transconductance	V _{DS} = -10 V; I _D = -1 A; T _j = 25 °C		-	2.5	-	S
R _G	gate resistance	f = 1 MHz		-	10	-	Ω
Dynamic characteristics							
Q _{G(tot)}	total gate charge	V _{DS} = -10 V; I _D = -0.9 A; V _{GS} = -4.5 V; T _j = 25 °C		-	1.6	2.4	nC
Q _{GS}	gate-source charge			-	0.2	-	nC
Q _{GD}	gate-drain charge			-	0.4	-	nC
C _{iss}	input capacitance	V _{DS} = -10 V; f = 1 MHz; V _{GS} = 0 V; T _j = 25 °C		-	146	-	pF
C _{oss}	output capacitance			-	16	-	pF
C _{rss}	reverse transfer capacitance			-	13	-	pF
t _{d(on)}	turn-on delay time	V _{DS} = -10 V; I _D = -1 A; V _{GS} = -4.5 V; R _{G(ext)} = 6 Ω; T _j = 25 °C		-	1.5	-	ns
t _r	rise time			-	3	-	ns
t _{d(off)}	turn-off delay time			-	7	-	ns
t _f	fall time			-	3	-	ns
Source-drain diode							
V _{SD}	source-drain voltage	I _S = -0.5 A; V _{GS} = 0 V; T _j = 25 °C		-	-0.9	-1.2	V

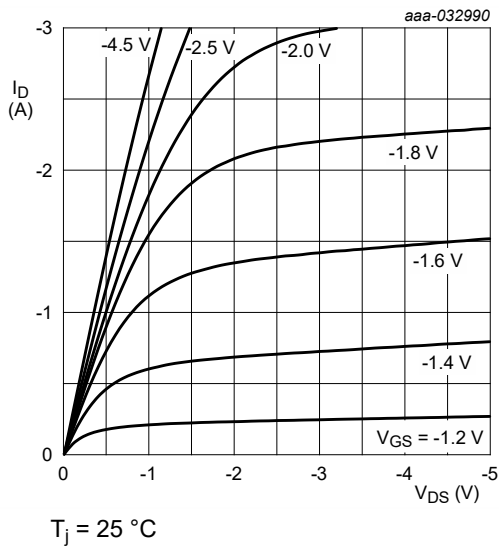


Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values

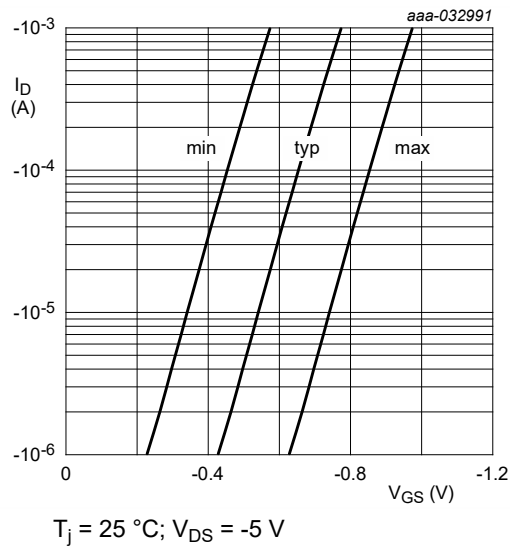


Fig. 7. Sub-threshold drain current as a function of gate-source voltage

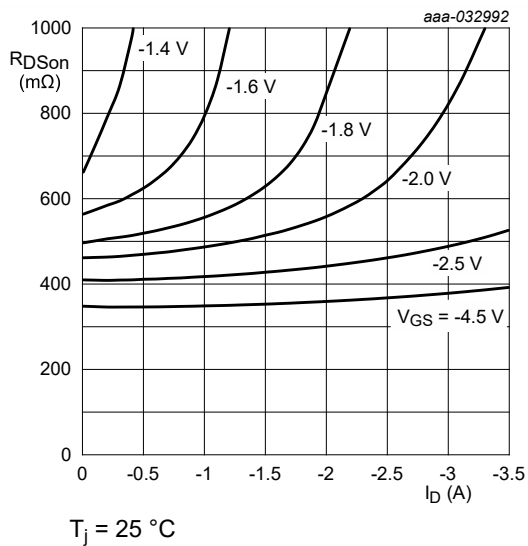


Fig. 8. Drain-source on-state resistance as a function of drain current; typical values

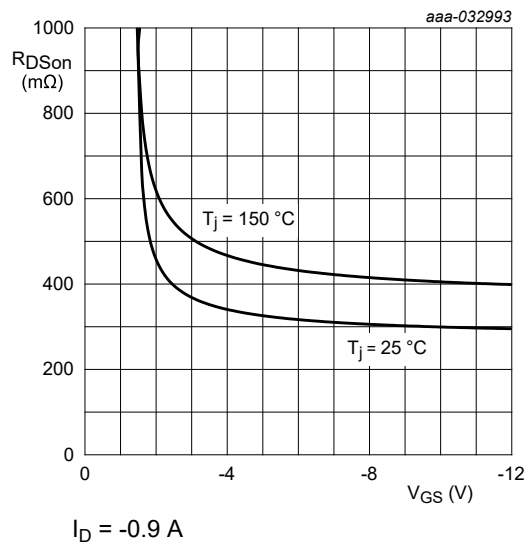


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values

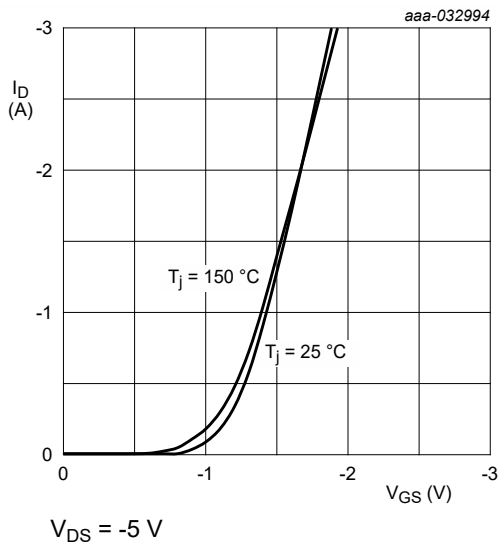


Fig. 10. Transfer characteristics: drain current as a function of gate-source voltage; typical values

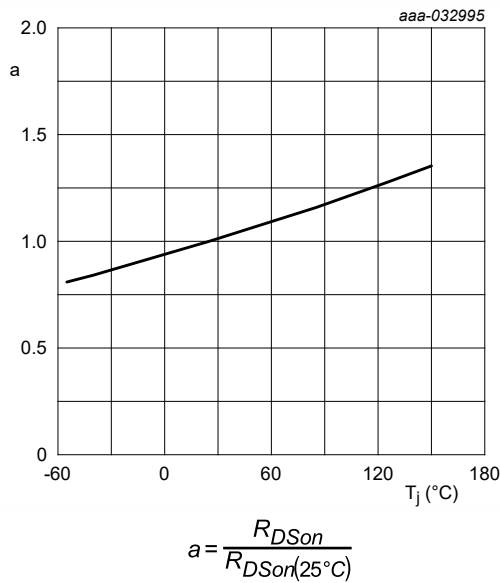


Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values

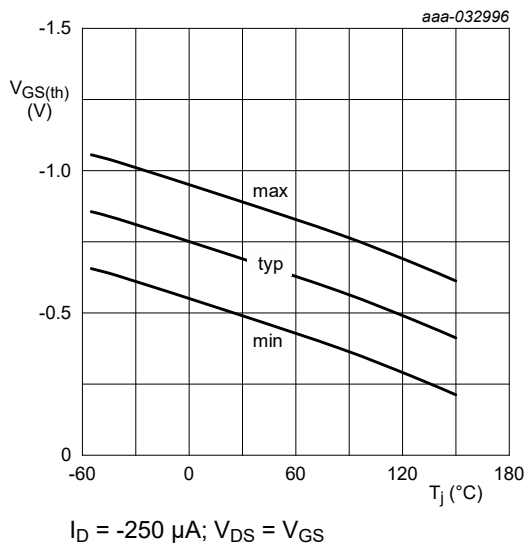


Fig. 12. Gate-source threshold voltage as a function of junction temperature

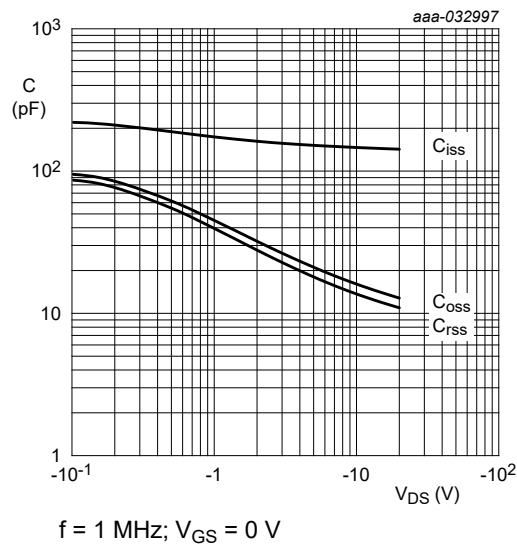


Fig. 13. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

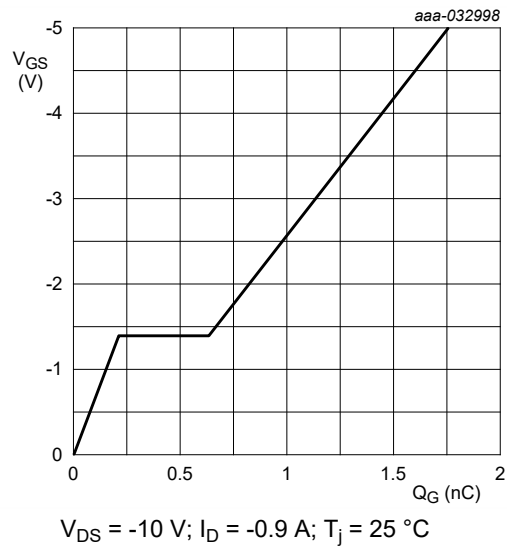


Fig. 14. Gate-source voltage as a function of gate charge; typical values

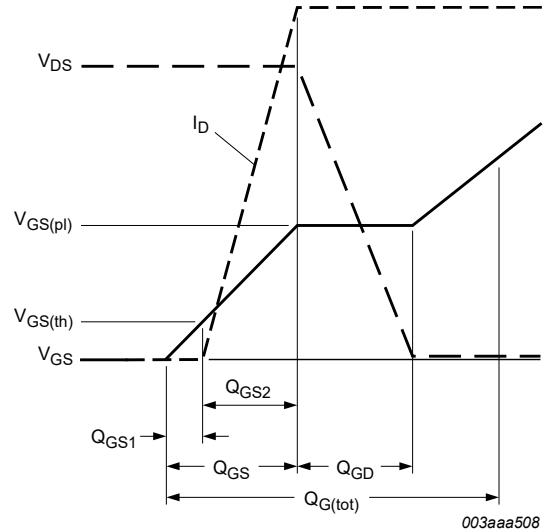


Fig. 15. Gate charge waveform definitions

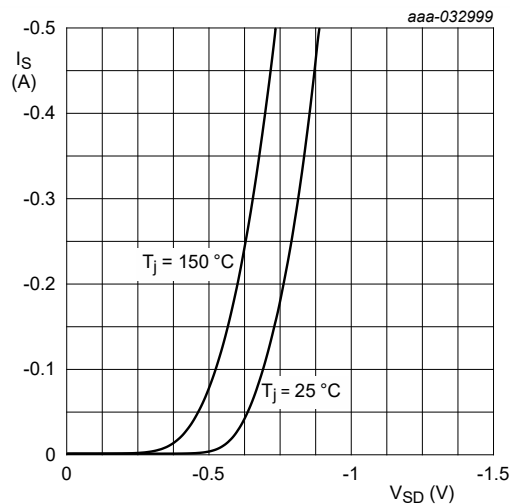


Fig. 16. Source current as a function of source-drain voltage; typical values

11. Test information

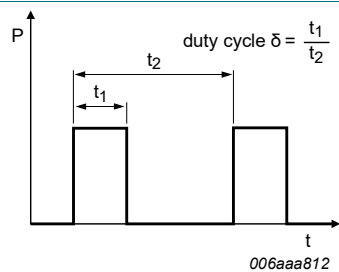
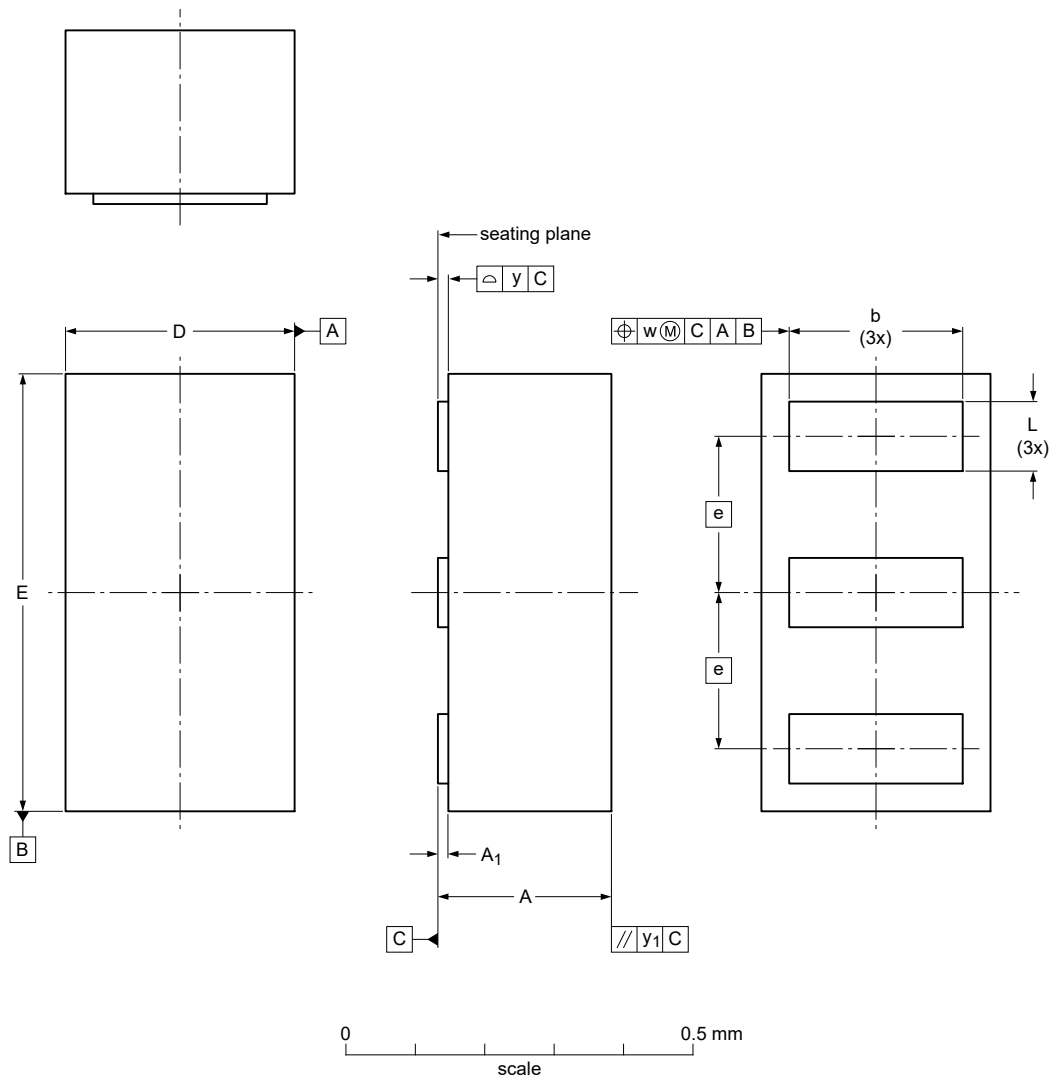


Fig. 17. Duty cycle definition

12. Package outline

DFN0603-3; plastic, ultra small and leadless full encapsulated package;
3 terminals; 0.225 mm pitch; 0.63 mm x 0.33 mm x 0.25 mm body

SOT8013



Dimensions (mm are the original dimensions)

Unit ⁽¹⁾	A	A ₁	b	D	E	e	L	w	y	y ₁
max	0.275	0.03	0.27	0.350	0.650		0.12			
mm nom						0.225		0.04	0.03	0.05
min	0.225		0.23	0.305	0.605		0.08			

Note
1. The marking bar indicates Pin 1. For electrical symmetrical devices the marking bar is omitted.

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT8013	---					19-08-06 19-08-29

Fig. 18. Package outline DFN0603-3 (SOT8013)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMX400UP v.1	20210407	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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