



# PMDPB95XNE2

30 V, dual N-channel Trench MOSFET

14 June 2016

Product data sheet

## 1. General description

Dual N-channel enhancement mode Field-Effect Transistor (FET) in a small and leadless DFN2020-6 (SOT1118) Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

## 2. Features and benefits

- Very fast switching
- Trench MOSFET technology
- Leadless medium power SMD plastic package: 2 × 2 × 0.65 mm
- Exposed drain pad for excellent thermal conduction
- ElectroStatic Discharge (ESD) protection > 2 kV HBM

## 3. Applications

- Charging switch for portable devices
- DC-to-DC converters
- Small brushless DC motor drive
- Power management in battery-driven portables
- Hard disk and computing power management

## 4. Quick reference data

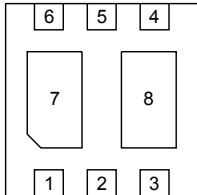
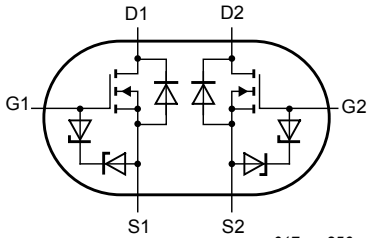
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per transistor</b>						
$V_{DS}$	drain-source voltage	$T_J = 25\text{ °C}$	-	-	30	V
$V_{GS}$	gate-source voltage		-12	-	12	V
$I_D$	drain current	$V_{GS} = 4.5\text{ V}; T_{amb} = 25\text{ °C}; t \leq 5\text{ s}$	[1]	-	3	A
<b>Static characteristics (per transistor)</b>						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 4.5\text{ V}; I_D = 2.8\text{ A}; T_J = 25\text{ °C}$	-	77	99	mΩ

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 6 cm<sup>2</sup>.

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	S1	source TR1	 <p>Transparent top view <b>DFN2020-6 (SOT1118)</b></p>	 <p>017aaa256</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
PMDPB95XNE2	DFN2020-6	DFN2020-6: plastic thermal enhanced ultra thin small outline package; no leads; 6 terminals; body 2 x 2 x 0.65 mm	SOT1118

## 7. Marking

Table 4. Marking codes

Type number	Marking code
PMDPB95XNE2	3B

## 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	$T_j = 25\text{ °C}$		-	30	V
$V_{GS}$	gate-source voltage			-12	12	V
$I_D$	drain current	$V_{GS} = 4.5\text{ V}; T_{amb} = 25\text{ °C}; t \leq 5\text{ s}$	[1]	-	3	A
		$V_{GS} = 4.5\text{ V}; T_{amb} = 25\text{ °C}$	[1]	-	2.7	A
		$V_{GS} = 4.5\text{ V}; T_{amb} = 100\text{ °C}$	[1]	-	1.7	A
$I_{DM}$	peak drain current	$T_{amb} = 25\text{ °C}; \text{single pulse}; t_p \leq 10\text{ }\mu\text{s}$		-	11	A
$P_{tot}$	total power dissipation	$T_{amb} = 25\text{ °C}$	[2]	-	510	mW
			[1]	-	1.165	W
		$T_{sp} = 25\text{ °C}$		-	8.33	W
<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
<b>Source-drain diode</b>						
$I_S$	source current	$T_{amb} = 25\text{ °C}$	[1]	-	1.1	A

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

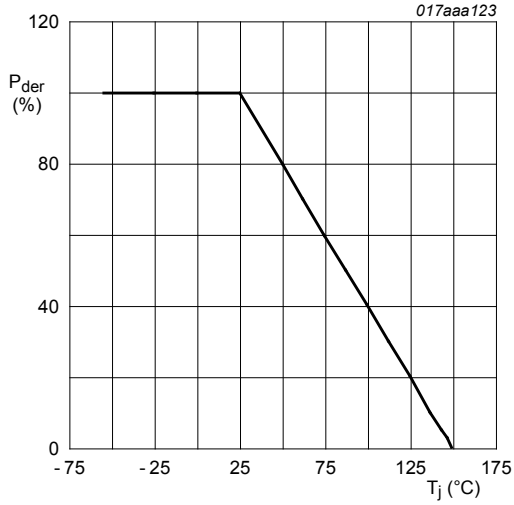


Fig. 1. Normalized total power dissipation as a function of junction temperature

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

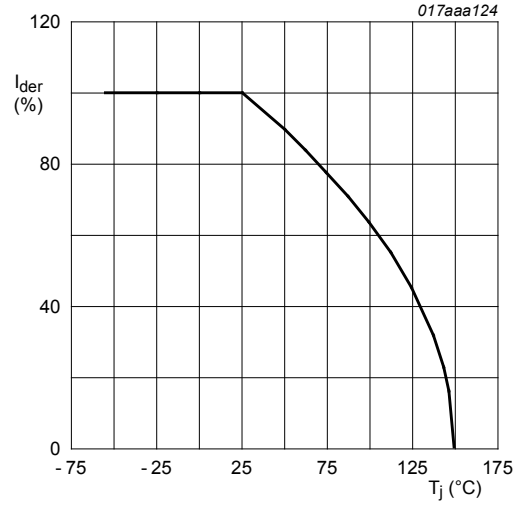


Fig. 2. Normalized continuous drain current as a function of junction temperature

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

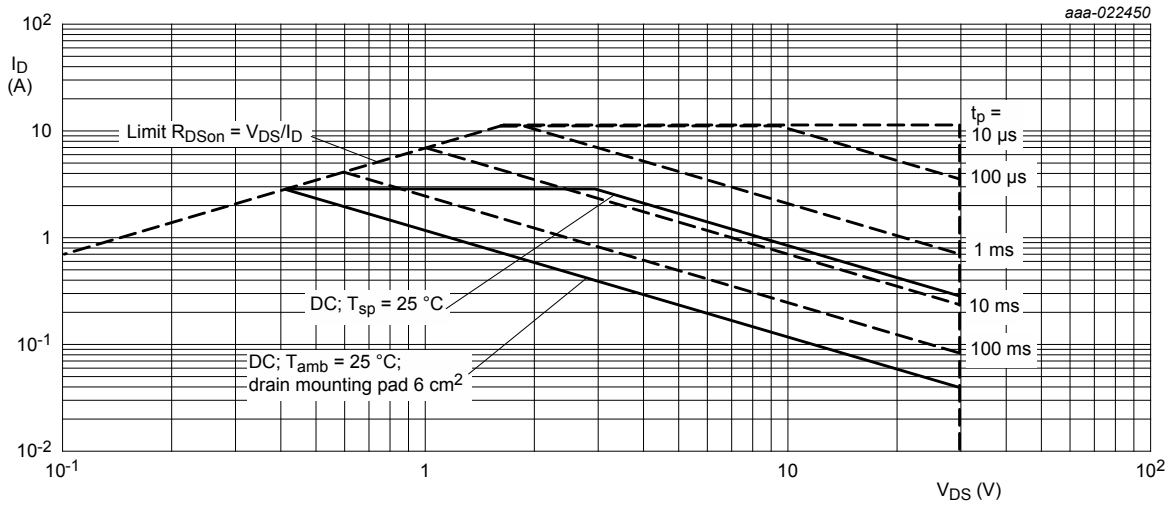


Fig. 3. Safe operating area; junction to ambient; continuous and peak drain currents as a function of drain-source voltage

## 9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
<b>Per transistor</b>							
R <sub>th(j-a)</sub>	thermal resistance from junction to ambient	in free air	[1]	-	224	257	K/W
			[2]	-	95	109	K/W
		in free air; t ≤ 5 s	[2]	-	55	64	K/W

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-sp)}$	thermal resistance from junction to solder point		-	12	15	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 6 cm<sup>2</sup>.

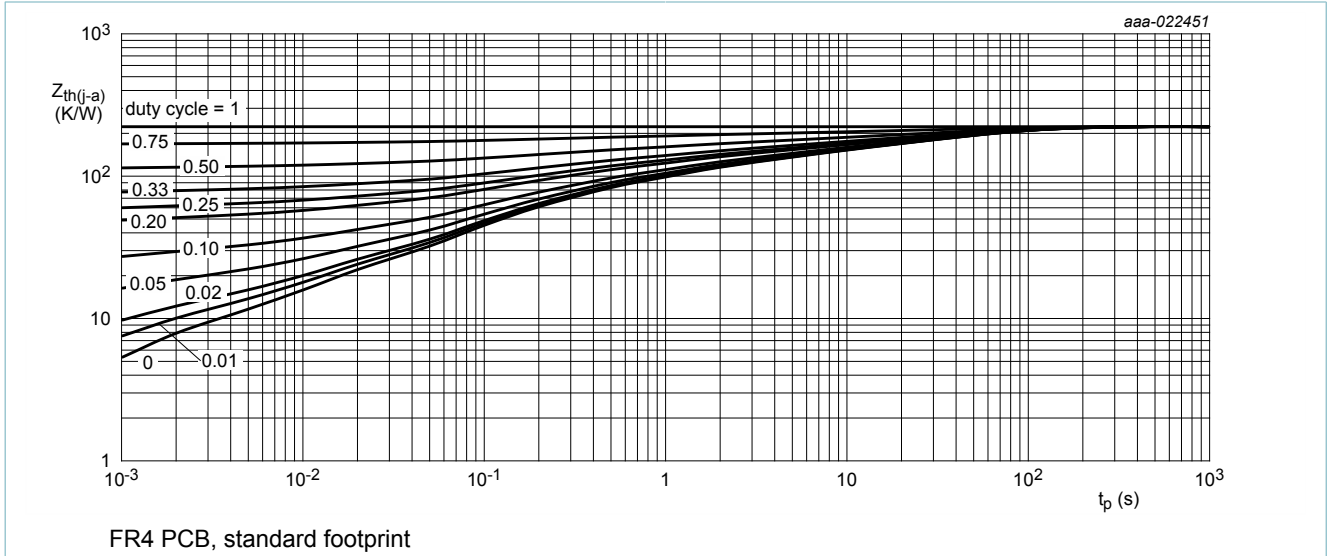


Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

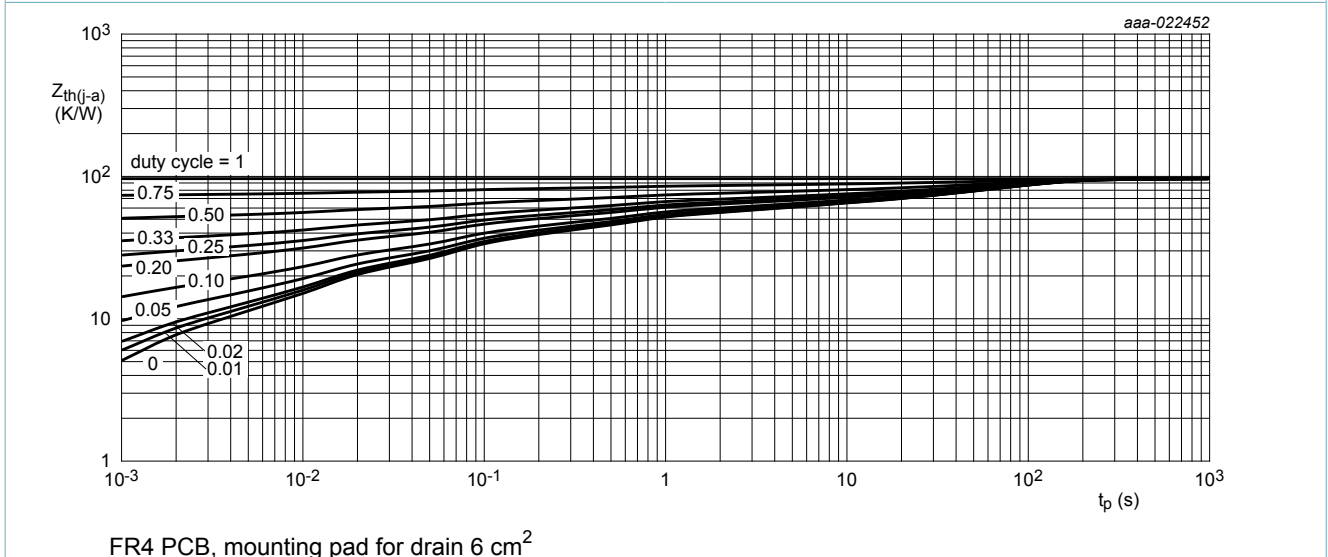
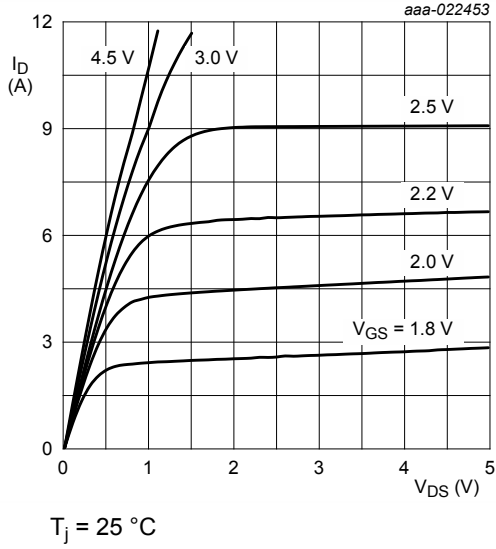


Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

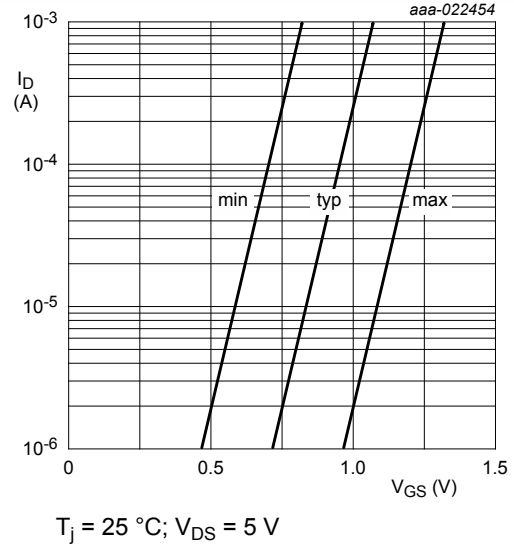
## 10. Characteristics

Table 7. Characteristics

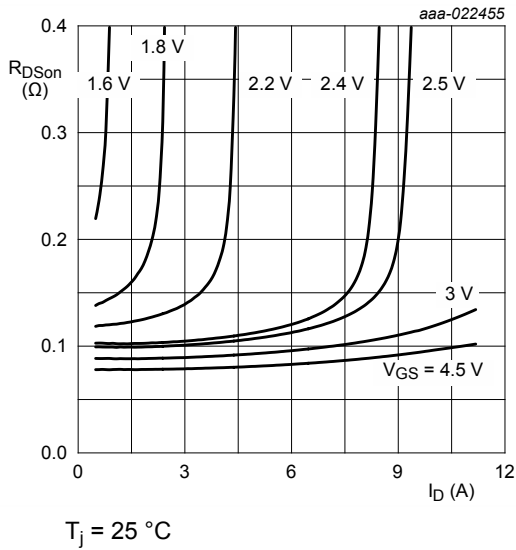
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics (per transistor)</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu\text{A}$ ; $V_{GS} = 0 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	30	-	-	V
$V_{GSth}$	gate-source threshold voltage	$I_D = 250 \mu\text{A}$ ; $V_{DS} = V_{GS}$ ; $T_j = 25 \text{ }^\circ\text{C}$	0.75	1	1.25	V
$I_{DSS}$	drain leakage current	$V_{DS} = 30 \text{ V}$ ; $V_{GS} = 0 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	-	1	$\mu\text{A}$
$I_{GSS}$	gate leakage current	$V_{GS} = 12 \text{ V}$ ; $V_{DS} = 0 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	-	10	$\mu\text{A}$
		$V_{GS} = -12 \text{ V}$ ; $V_{DS} = 0 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	-	-10	$\mu\text{A}$
		$V_{GS} = 4.5 \text{ V}$ ; $V_{DS} = 0 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	-	2	$\mu\text{A}$
		$V_{GS} = -4.5 \text{ V}$ ; $V_{DS} = 0 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	-	-2	$\mu\text{A}$
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 4.5 \text{ V}$ ; $I_D = 2.8 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	77	99	m $\Omega$
		$V_{GS} = 4.5 \text{ V}$ ; $I_D = 2.8 \text{ A}$ ; $T_j = 150 \text{ }^\circ\text{C}$	-	126	170	m $\Omega$
		$V_{GS} = 2.5 \text{ V}$ ; $I_D = 2.5 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	92	117	m $\Omega$
$g_{fs}$	forward transconductance	$V_{DS} = 10 \text{ V}$ ; $I_D = 2.8 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	8.6	-	S
$R_G$	gate resistance	$T_j = 25 \text{ }^\circ\text{C}$ ; $f = 1 \text{ MHz}$	-	9.2	-	$\Omega$
<b>Dynamic characteristics (per transistor)</b>						
$Q_{G(tot)}$	total gate charge	$V_{DS} = 15 \text{ V}$ ; $I_D = 3 \text{ A}$ ; $V_{GS} = 4.5 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	2.9	4.5	nC
$Q_{GS}$	gate-source charge		-	0.4	-	nC
$Q_{GD}$	gate-drain charge		-	0.8	-	nC
$C_{iss}$	input capacitance	$V_{DS} = 15 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $V_{GS} = 0 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	258	-	pF
$C_{oss}$	output capacitance		-	31	-	pF
$C_{riss}$	reverse transfer capacitance		-	23	-	pF
$t_{d(on)}$	turn-on delay time		$V_{DS} = 15 \text{ V}$ ; $I_D = 3 \text{ A}$ ; $V_{GS} = 4.5 \text{ V}$ ; $R_{G(ext)} = 6 \text{ } \Omega$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	9	-
$t_r$	rise time	-		10	-	ns
$t_{d(off)}$	turn-off delay time	-		20	-	ns
$t_f$	fall time	-		8	-	ns
<b>Source-drain diode (per transistor)</b>						
$V_{SD}$	source-drain voltage	$I_S = 1.1 \text{ A}$ ; $V_{GS} = 0 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	0.7	1.2	V



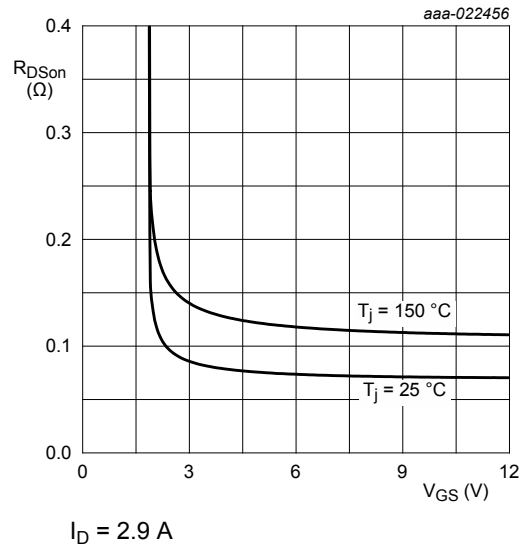
**Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values**



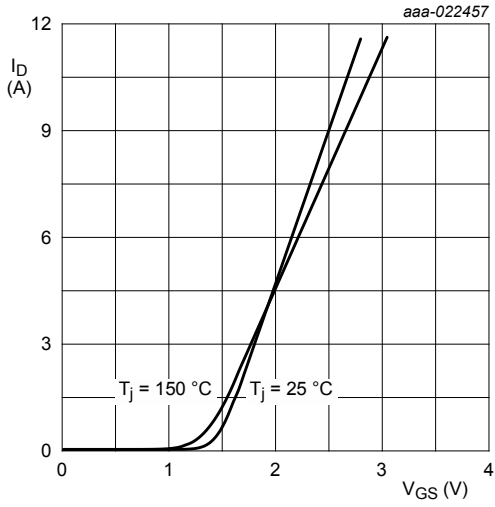
**Fig. 7. Subthreshold drain current as a function of gate-source voltage**



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

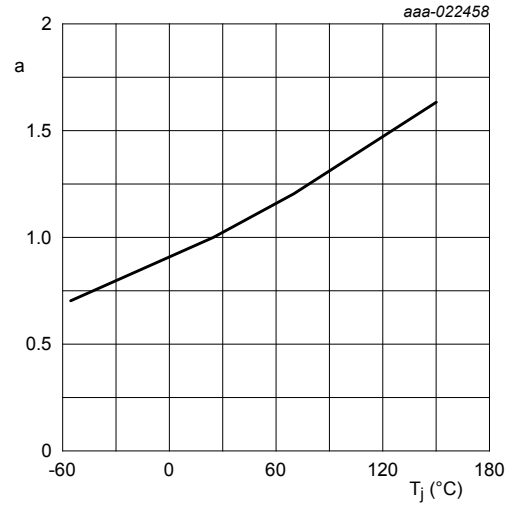


**Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values**



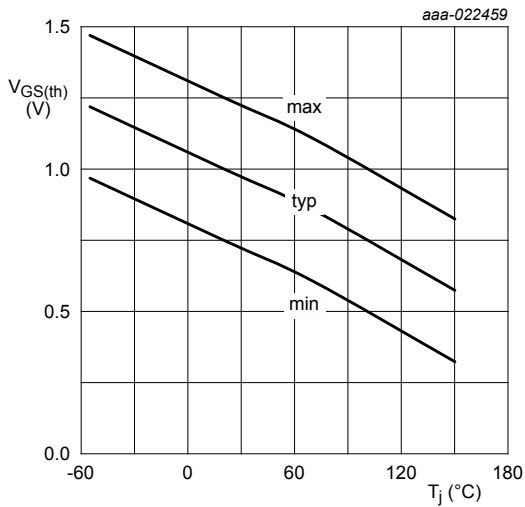
$$V_{DS} > I_D \times R_{DSon}$$

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



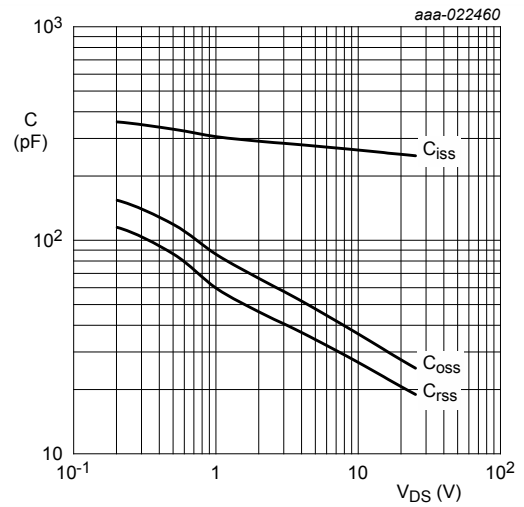
**Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values**

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



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

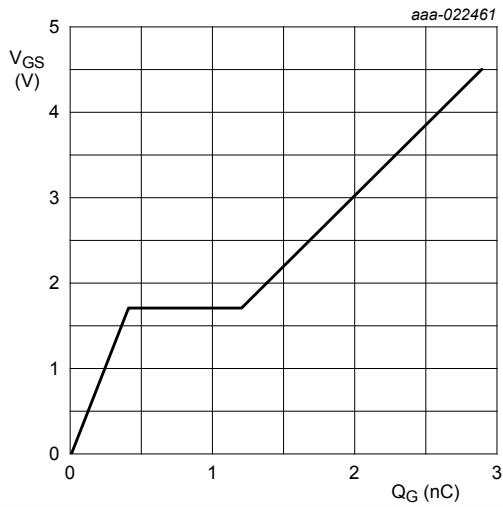
**Fig. 12. Gate-source threshold voltage as a function of junction temperature**



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

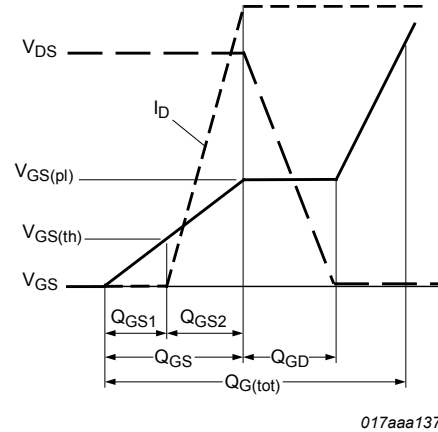
**Fig. 13. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values**



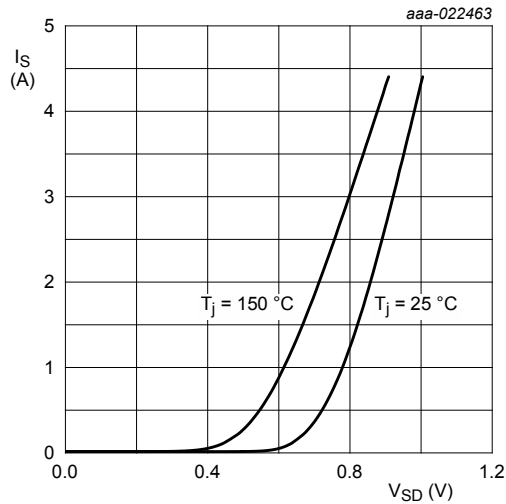


$I_D = 2.8 \text{ A}; V_{DS} = 15 \text{ V}; T_{amb} = 25 \text{ }^\circ\text{C}$

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



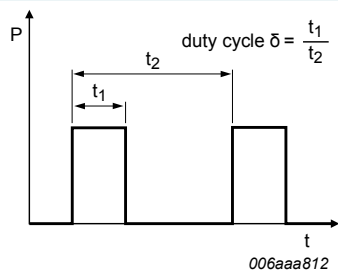
**Fig. 15. Gate charge waveform definitions**



$V_{GS} = 0 \text{ V}$

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

## 11. Test information

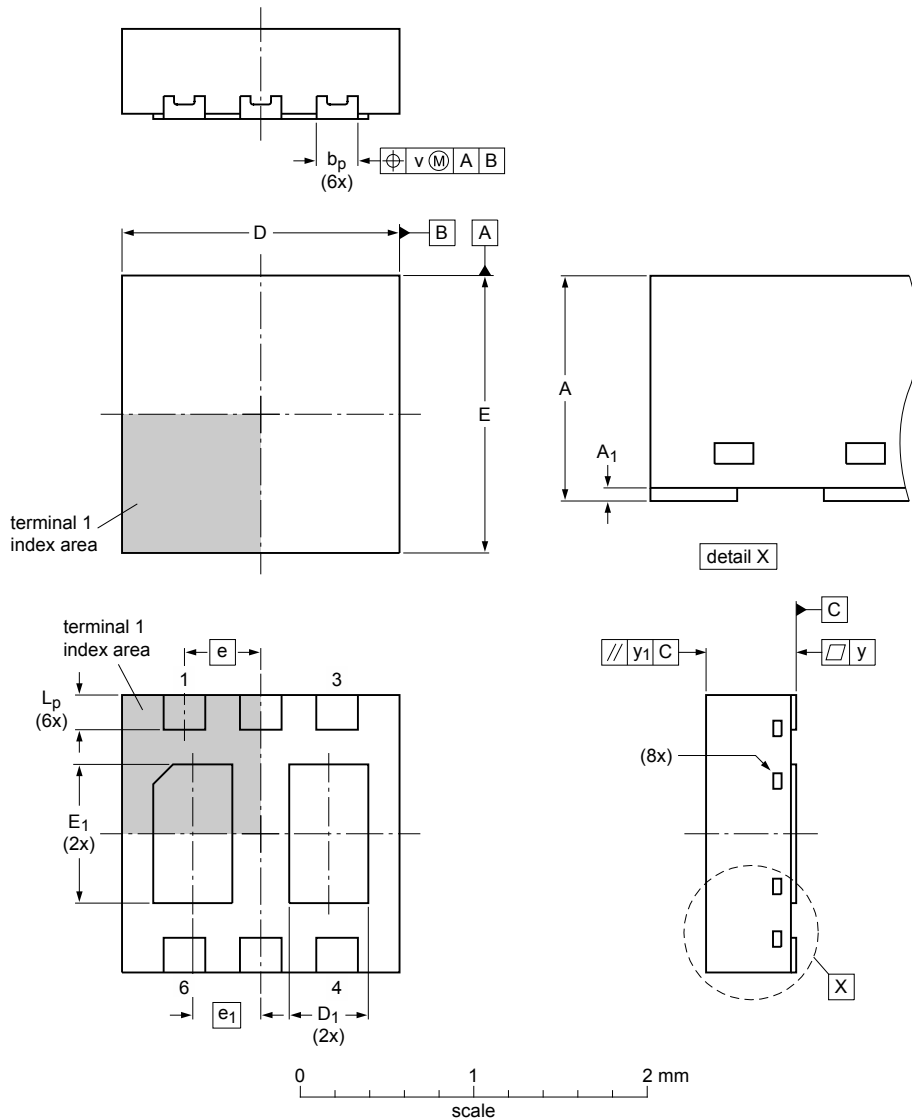


**Fig. 17. Duty cycle definition**

## 12. Package outline

HUSON6: plastic, thermal enhanced ultra thin small outline package; no leads;  
6 terminals; body 2 x 2 x 0.65 mm

SOT1118



Dimensions

Unit	A <sup>(1)</sup>	A <sub>1</sub>	b <sub>p</sub>	D	D <sub>1</sub>	E	E <sub>1</sub>	e	e <sub>1</sub>	L <sub>p</sub>	v	y	y <sub>1</sub>
max	0.65	0.04	0.35	2.1	0.77	2.1	1.1	0.54	0.3				
nom								0.65		0.1	0.05	0.05	
min			0.25	1.9	0.57	1.9	0.9	0.44	0.2				

Note

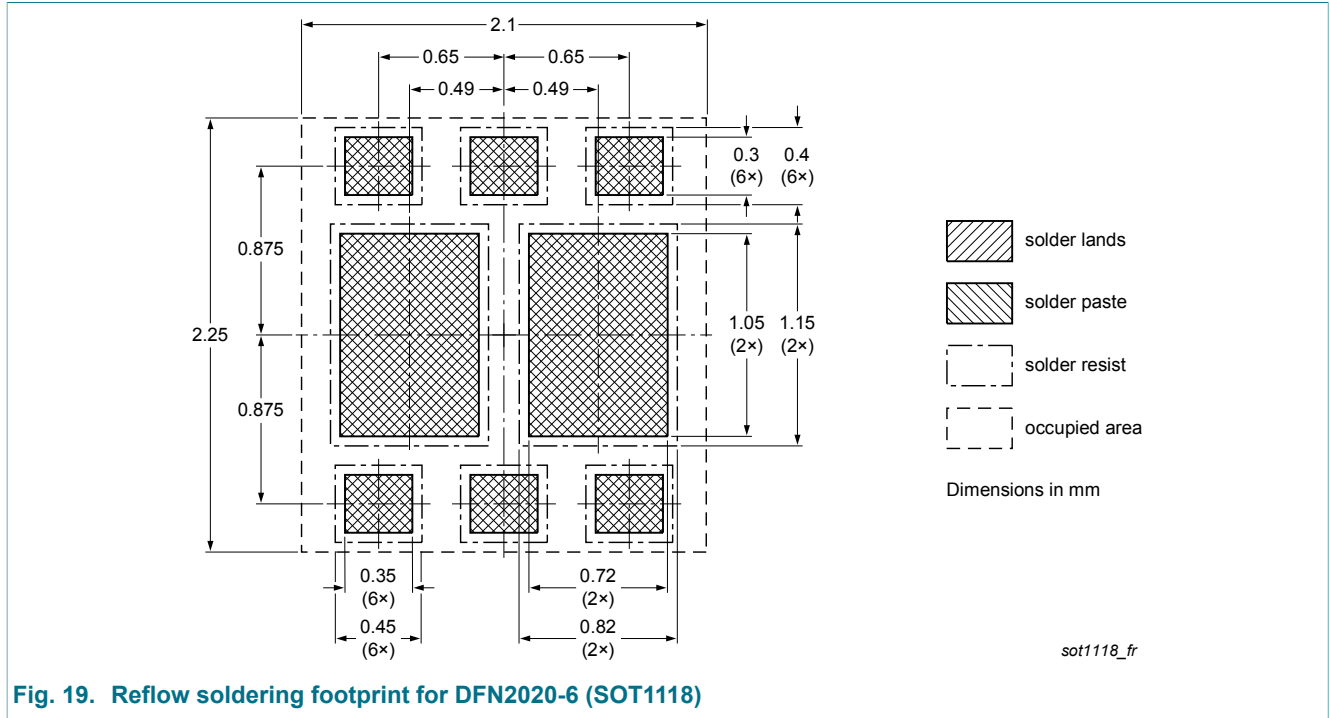
1. Dimension including plating thickness.

sot1118\_po

Outline version	References			European projection	Issue date
	IEC	JEDEC	JEITA		
SOT1118		---			10-08-16 13-06-06

Fig. 18. Package outline DFN2020-6 (SOT1118)

### 13. Soldering



**Fig. 19. Reflow soldering footprint for DFN2020-6 (SOT1118)**

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMDPB95XNE2 v.2	20160614	Product data sheet	-	PMDPB95XNE2 v.1
Modifications:	<ul style="list-style-type: none"><li>• Values of <math>I_D</math> and <math>R_{DSon}</math> corrected</li></ul>			
PMDPB95XNE2 v.1	20160419	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.
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[IPS70R2K0CEAKMA1](#) [BUK954R8-60E](#) [DMN3404LQ-7](#) [NTE6400](#) [SQJ402EP-T1-GE3](#) [2SK2614\(TE16L1,Q\)](#) [2N7002KW-FAI](#)  
[DMN1017UCP3-7](#) [EFC2J004NUZTDG](#) [ECH8691-TL-W](#) [FCAB21350L1](#) [P85W28HP2F-7071](#) [DMN1053UCP4-7](#) [NTE221](#) [NTE2384](#)  
[NTE2903](#) [NTE2941](#) [NTE2945](#) [NTE2946](#) [NTE2960](#) [NTE2967](#) [NTE2969](#) [NTE2976](#) [NTE455](#) [NTE6400A](#) [NTE2910](#) [NTE2916](#) [NTE2956](#)  
[NTE2911](#) [US6M2GTR](#) [TK10A80W,S4X\(S](#) [SSM6P69NU,LF](#)