



PMDPB56XNEA

30 V, dual N-channel Trench MOSFET

19 April 2016

Product data sheet

1. General description

Dual N-channel enhancement mode Field-Effect Transistor (FET) in a small and leadless DFN2020D-6 (SOT1118D) Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

2. Features and benefits

- Trench MOSFET technology
- Low threshold voltage
- Leadless medium power SMD plastic package: $2 \times 2 \times 0.65$ mm
- Tin-plated 100 % solderable side pads for optical solder inspection
- ElectroStatic Discharge (ESD) protection > 2 kV HBM
- AEC-Q101 qualified

3. Applications

- LED driver
- Power management
- Low-side loadswitch
- Switching circuits

4. Quick reference data

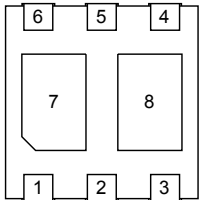
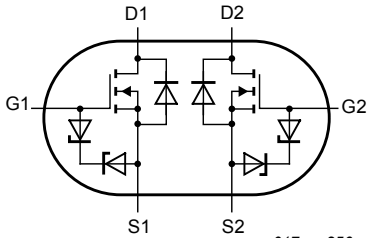
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per transistor							
V_{DS}	drain-source voltage	$T_J = 25\text{ °C}$		-	-	30	V
V_{GS}	gate-source voltage			-12	-	12	V
I_D	drain current	$V_{GS} = 4.5\text{ V}; T_{amb} = 25\text{ °C}$	[1]	-	-	3.1	A
Static characteristics (per transistor)							
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 4.5\text{ V}; I_D = 3.1\text{ A}; T_J = 25\text{ °C}$		-	55	72	mΩ

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

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	S1	source TR1	 Transparent top view DFN2020D-6 (SOT1118D)	 017aaa256
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
PMDPB56XNEA	DFN2020D-6	DFN2020D-6: plastic, thermally enhanced ultra thin and small outline package; no leads; 6 terminals; body 2 x 2 x 0.65 mm	SOT1118D

7. Marking

Table 4. Marking codes

Type number	Marking code
PMDPB56XNEA	3A

8. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
Per transistor						
V _{DS}	drain-source voltage	T _j = 25 °C		-	30	V
V _{GS}	gate-source voltage			-12	12	V
I _D	drain current	V _{GS} = 4.5 V; T _{amb} = 25 °C	[1]	-	3.1	A
		V _{GS} = 4.5 V; T _{amb} = 100 °C	[1]	-	2	A
I _{DM}	peak drain current	T _{amb} = 25 °C; single pulse; t _p ≤ 10 μs		-	12	A
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	I _D = 0.3 A; T _{j(init)} = 25 °C; DUT in avalanche (unclamped)		-	6.2	mJ
P _{tot}	total power dissipation	T _{amb} = 25 °C	[2]	-	485	mW
			[1]	-	1.15	W
		T _{sp} = 25 °C		-	8.33	W
Per device						
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]	-	1.1	A
ESD Maximum rating						
V _{ESD}	electrostatic discharge voltage	HBM	[3]	-	2000	V

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

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

[3] Measured between all pins.



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

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



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

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

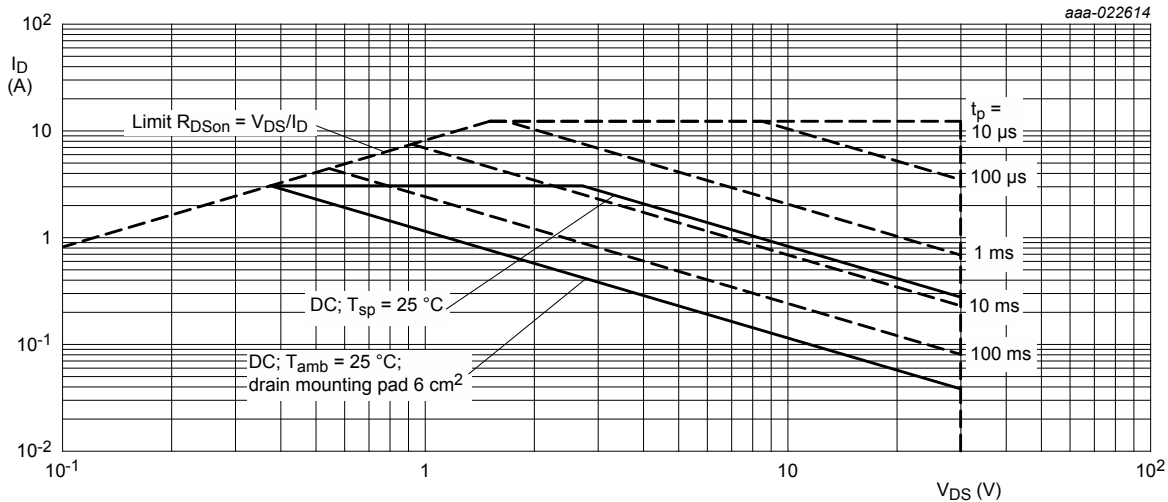


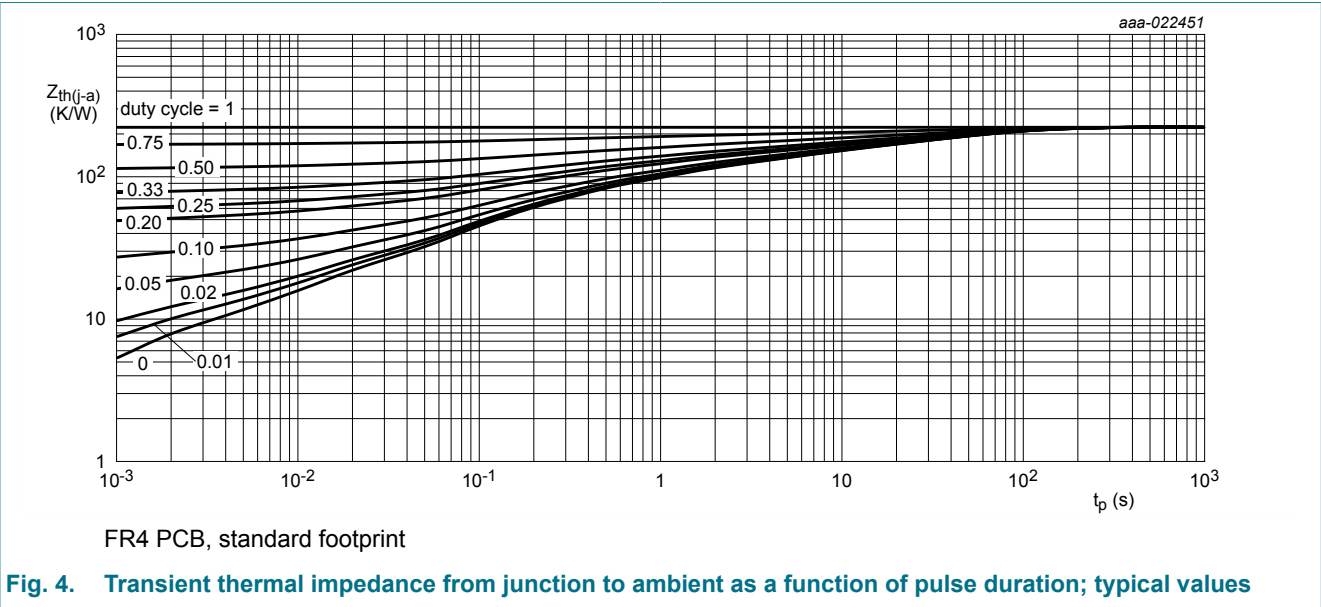
Fig. 3. Safe operating area; junction to ambient; continuous and peak drain currents as a function of drain-source voltage

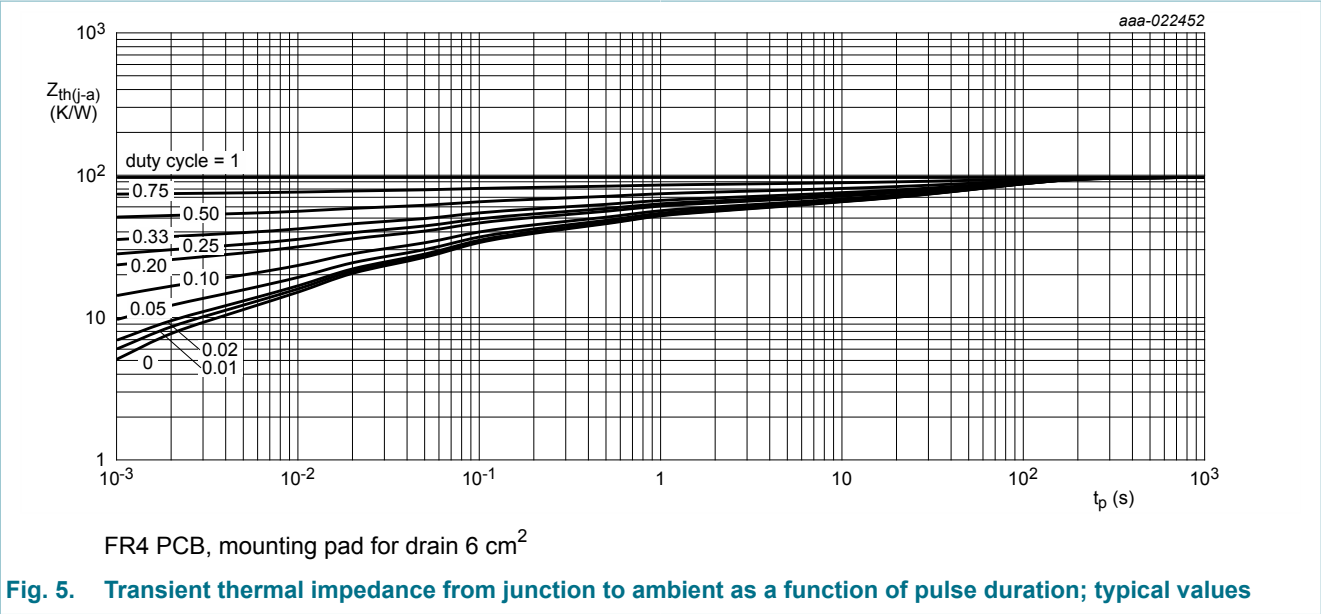
9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per transistor							
R _{th(j-a)}	thermal resistance from junction to ambient	in free air	[1]	-	224	257	K/W
			[2]	-	96	109	K/W
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 cm².





10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics (per transistor)							
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		0.75	1	1.25	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} = 12 V; V _{DS} = 0 V; T _j = 25 °C		-	-	10	μA
		V _{GS} = -12 V; V _{DS} = 0 V; T _j = 25 °C		-	-	-10	μA
		V _{GS} = 4.5 V; V _{DS} = 0 V; T _j = 25 °C		-	-	2	μA
		V _{GS} = -4.5 V; V _{DS} = 0 V; T _j = 25 °C		-	-	-2	μA
R _{DSon}	drain-source on-state resistance	V _{GS} = 4.5 V; I _D = 3.1 A; T _j = 25 °C		-	55	72	mΩ
		V _{GS} = 4.5 V; I _D = 3.1 A; T _j = 150 °C		-	92	121	mΩ
		V _{GS} = 2.5 V; I _D = 2.6 A; T _j = 25 °C		-	72	102	mΩ
g _{fs}	forward transconductance	V _{DS} = 10 V; I _D = 3.1 A; T _j = 25 °C		-	12	-	S
R _G	gate resistance	f = 1 MHz; T _j = 25 °C		-	9.2	-	Ω
Dynamic characteristics (per transistor)							
Q _{G(tot)}	total gate charge	V _{DS} = 15 V; I _D = 3.1 A; V _{GS} = 4.5 V; T _j = 25 °C		-	2.9	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 V; f = 1 MHz; V _{GS} = 0 V; T _j = 25 °C		-	256	-	pF
C _{oss}	output capacitance			-	31	-	pF
C _{rss}	reverse transfer capacitance			-	23	-	pF
t _{d(on)}	turn-on delay time	V _{DS} = 15 V; I _D = 8 A; V _{GS} = 4.5 V; R _{G(ext)} = 6 Ω; T _j = 25 °C		-	9	-	ns
t _r	rise time			-	20	-	ns
t _{d(off)}	turn-off delay time			-	19	-	ns
t _f	fall time			-	7	-	ns
Source-drain diode (per transistor)							
V _{SD}	source-drain voltage	I _S = 1.1 A; V _{GS} = 0 V; T _j = 25 °C		-	0.7	1.2	V

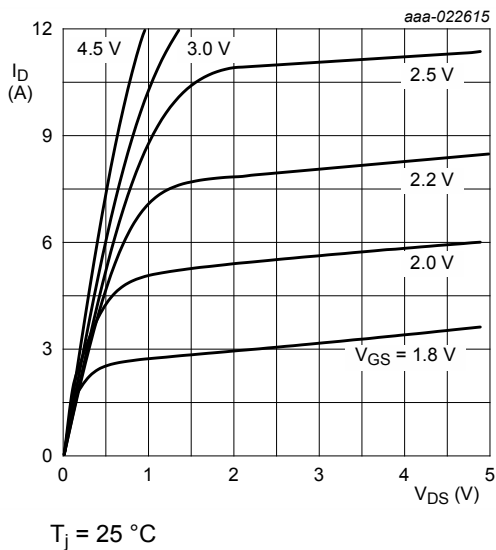


Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values

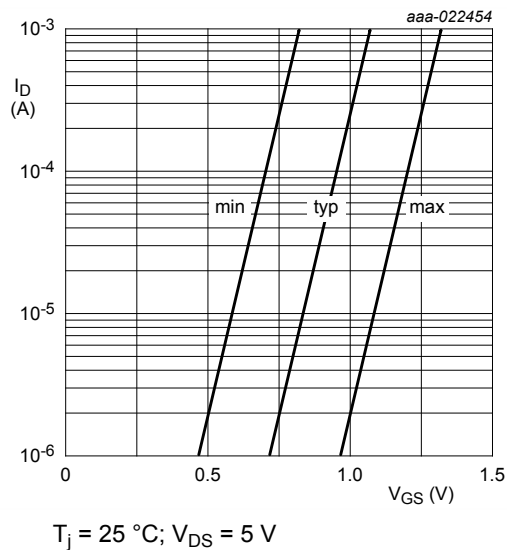


Fig. 7. Subthreshold drain current as a function of gate-source voltage

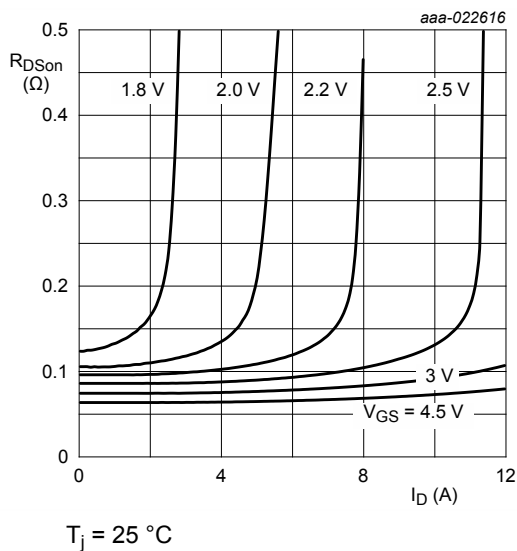


Fig. 8. Drain-source on-state resistance as a function of drain current; typical values

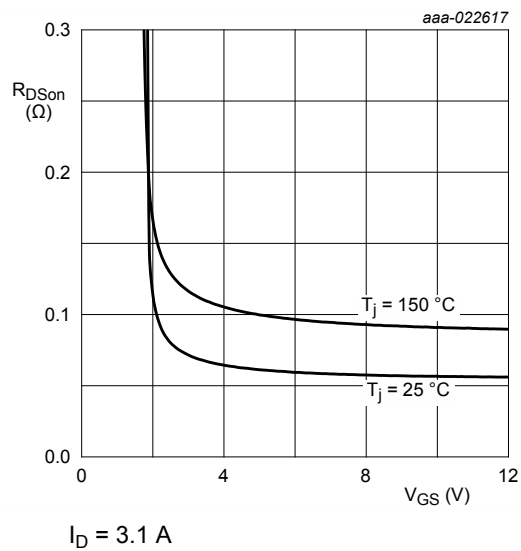


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values

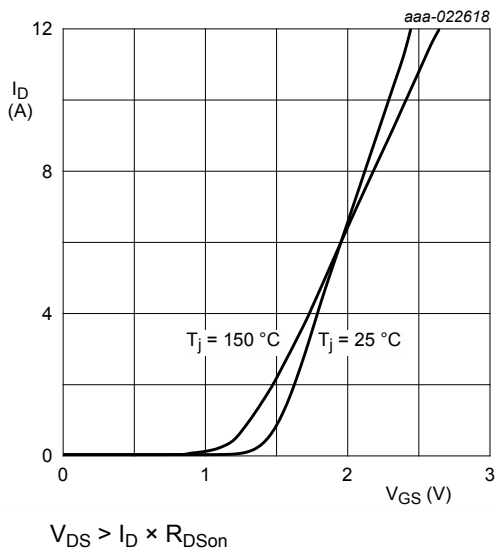


Fig. 10. Transfer characteristics: drain current as a function of gate-source voltage; typical values

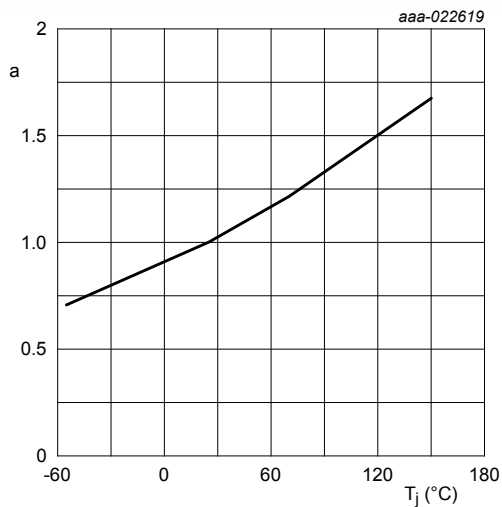


Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values

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

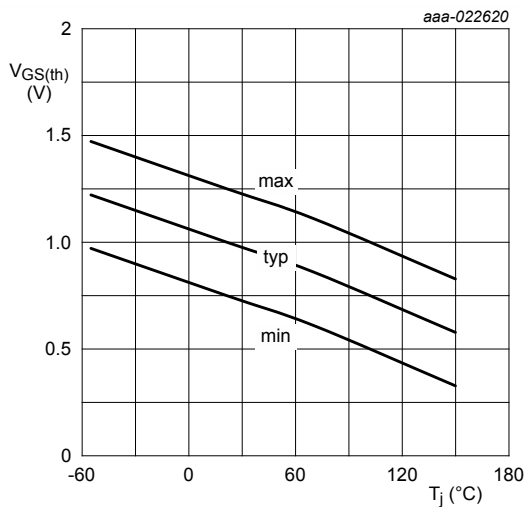


Fig. 12. Gate-source threshold voltage as a function of junction temperature

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

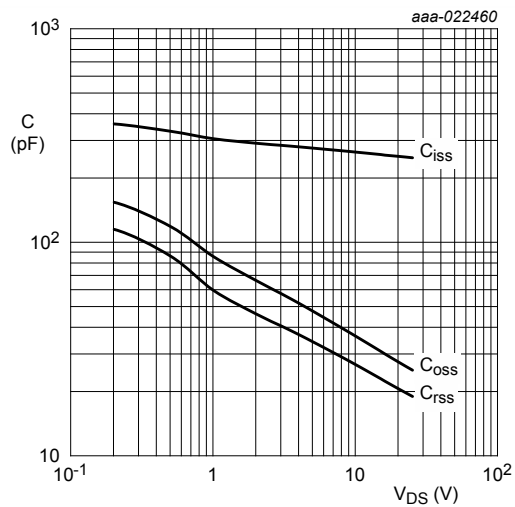


Fig. 13. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

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

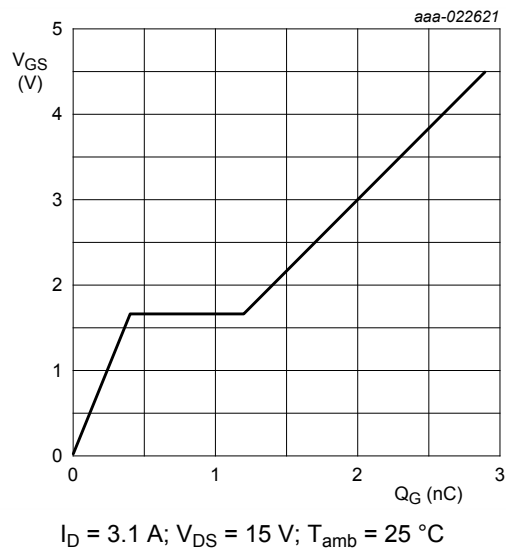


Fig. 14. Gate-source voltage as a function of gate charge; typical values

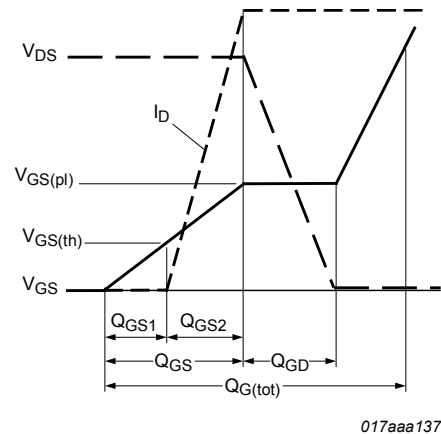
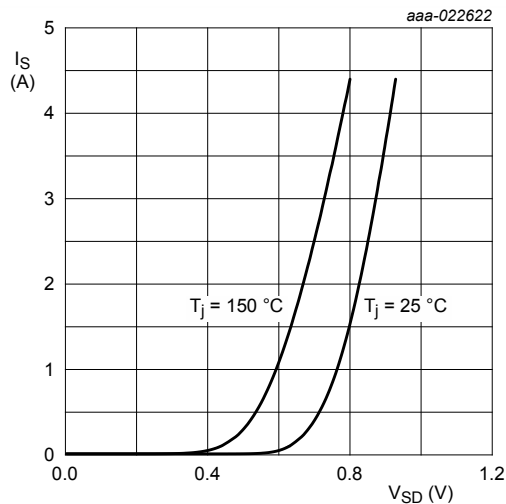


Fig. 15. Gate charge waveform definitions



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

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

11. Test information

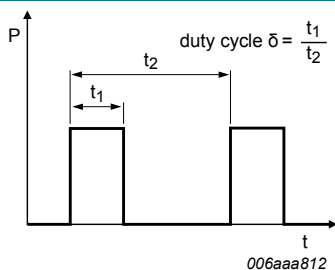


Fig. 17. Duty cycle definition

11.1 Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - Stress test qualification for discrete semiconductors, and is suitable for use in automotive applications.

12. Package outline

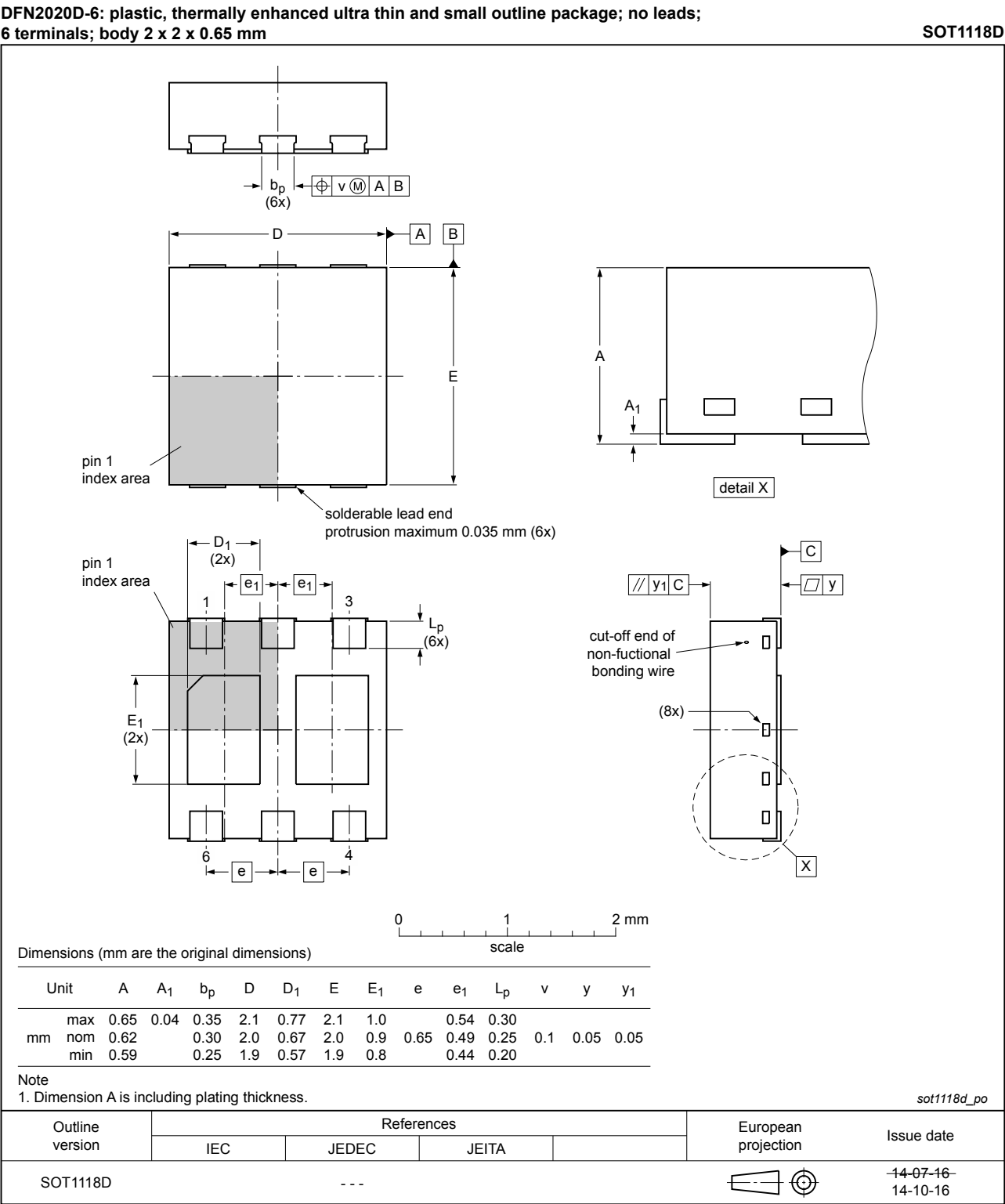
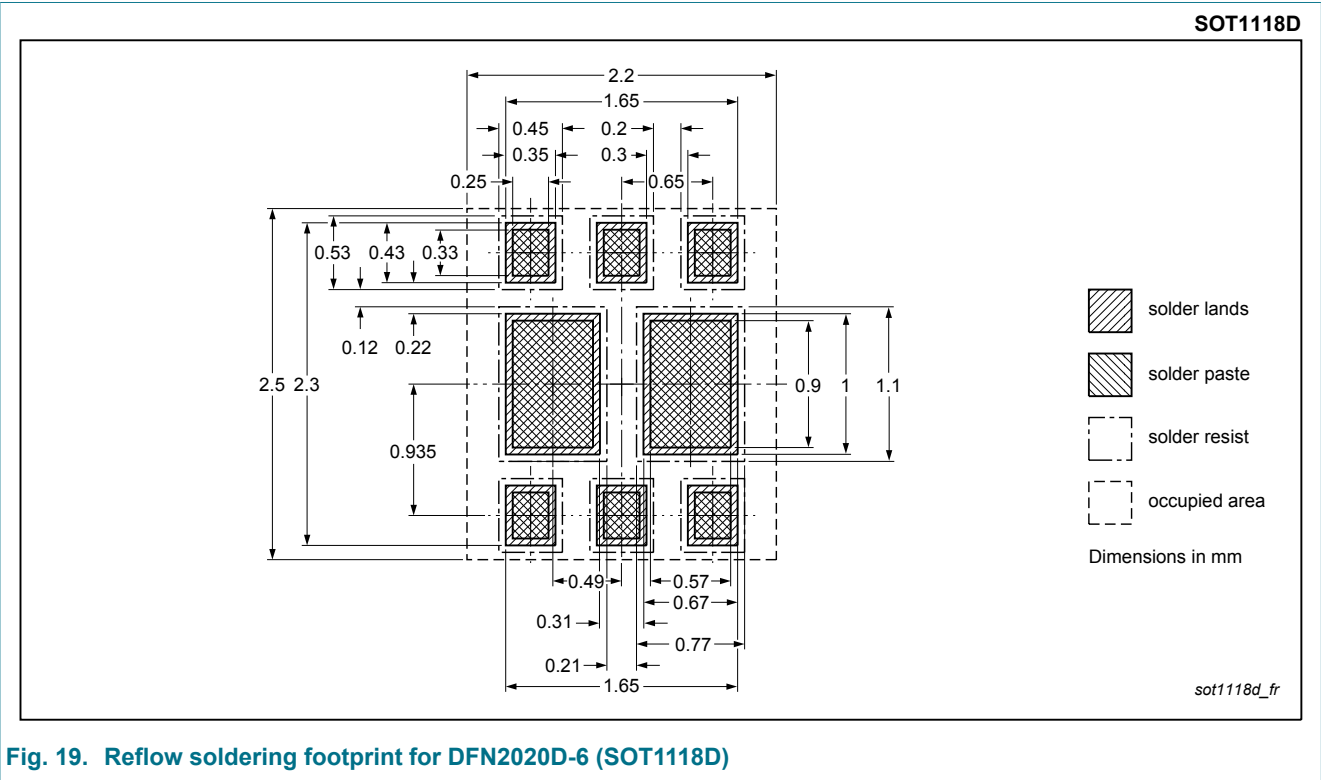


Fig. 18. Package outline DFN2020D-6 (SOT1118D)

13. Soldering



14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMDPB56XNEA 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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