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Electronic Components Sourcing Information

Product Reference Information

Part Number:	BUK4D122-20PX
Manufacturer:	Nexperia USA Inc.
Package:	Please confirm with sales
Availability:	Please confirm with sales

Product Page:

<https://antrexco.com/product/details/nexperia-usa-inc/buk4d122-20px.html>

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Note:

This PDF includes an ANTREX product reference cover page.

The original manufacturer datasheet follows from the next page.



BUK4D122-20P

20 V, P-channel Trench MOSFET

27 March 2023

Product data sheet

1. General Description

P-channel enhancement mode Field-Effect Transistor (FET) in a leadless medium power DFN2020MD-6 (SOT1220) Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

2. Features and benefits

- Extended temperature range $T_j = 175\text{ °C}$
- Small and leadless ultra thin SMD plastic package: 2 x 2 x 0.65 mm
- Tin-plated 100% solderable side pads for optical solder inspection
- ElectroStatic Discharge (ESD) protection > 2 kV HBM
- Trench MOSFET technology
- AEC-Q101 qualified

3. Applications

- Relay driver
- High-speed line driver
- High-side loadswitch
- Switching circuits

4. Quick reference data

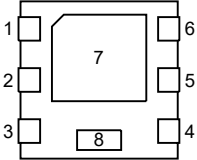
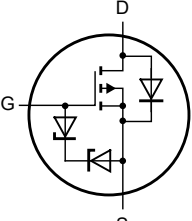
Table 1. Quick reference data

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	-	8	V
I_D	drain current	$V_{GS} = -4.5\text{ V}; T_{amb} = 25\text{ °C}$	[1]	-	-	-3.2	A
Static characteristics							
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = -4.5\text{ V}; I_D = -3.2\text{ A}; T_j = 25\text{ °C}$		-	100	122	mΩ

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 6 cm².

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	D	drain	 Transparent top view DFN2020MD-6 (SOT1220)	 017aaa259
2	D	drain		
3	G	gate		
4	S	source		
5	D	drain		
6	D	drain		
7	D	drain		
8	S	source		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BUK4D122-20P	DFN2020MD-6	plastic, leadless thermal enhanced ultra thin small outline package with side-wettable flanks (SWF); 6 terminals; 0.65 mm pitch; 2 mm x 2 mm x 0.65 mm body	SOT1220

7. Marking

Table 4. Marking codes

Type number	Marking code
BUK4D122-20P	6H

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	8	V
I _D	drain current	V _{GS} = -4.5 V; T _{amb} = 25 °C	[1]	-	-3.2	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		-	-13	A
P _{tot}	total power dissipation	T _{amb} = 25 °C	[2]	-	550	mW
			[1]	-	1.95	W
		T _{sp} = 25 °C		-	10	W
T _j	junction temperature			-55	175	°C
T _{amb}	ambient temperature			-55	175	°C
T _{stg}	storage temperature			-65	175	°C
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	T _{j(initial)} = 25 °C; I _D = -0.5 A; DUT in avalanche (unclamped)		-	5	mJ
Source-drain diode						
I _S	source current	T _{amb} = 25 °C	[1]	-	-1.9	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 cm².
 [2] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper; tin-plated and standard footprint.
 [3] Measured between all pins.

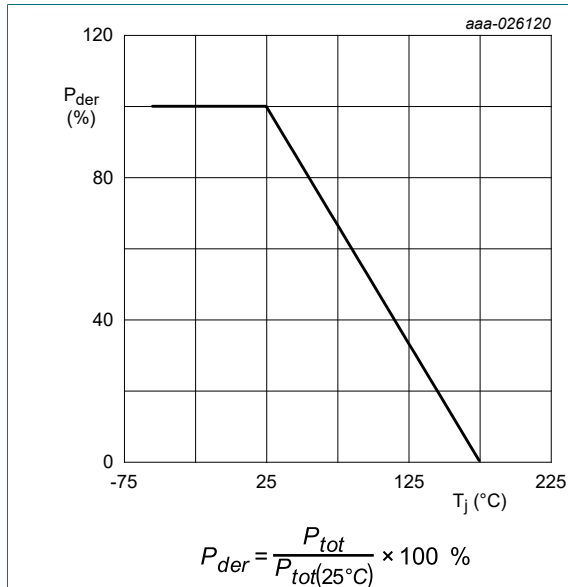


Fig. 1. Normalized total power dissipation as a function of junction temperature

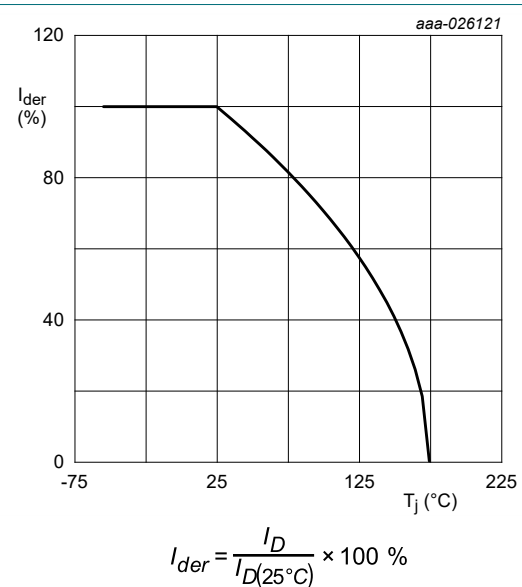
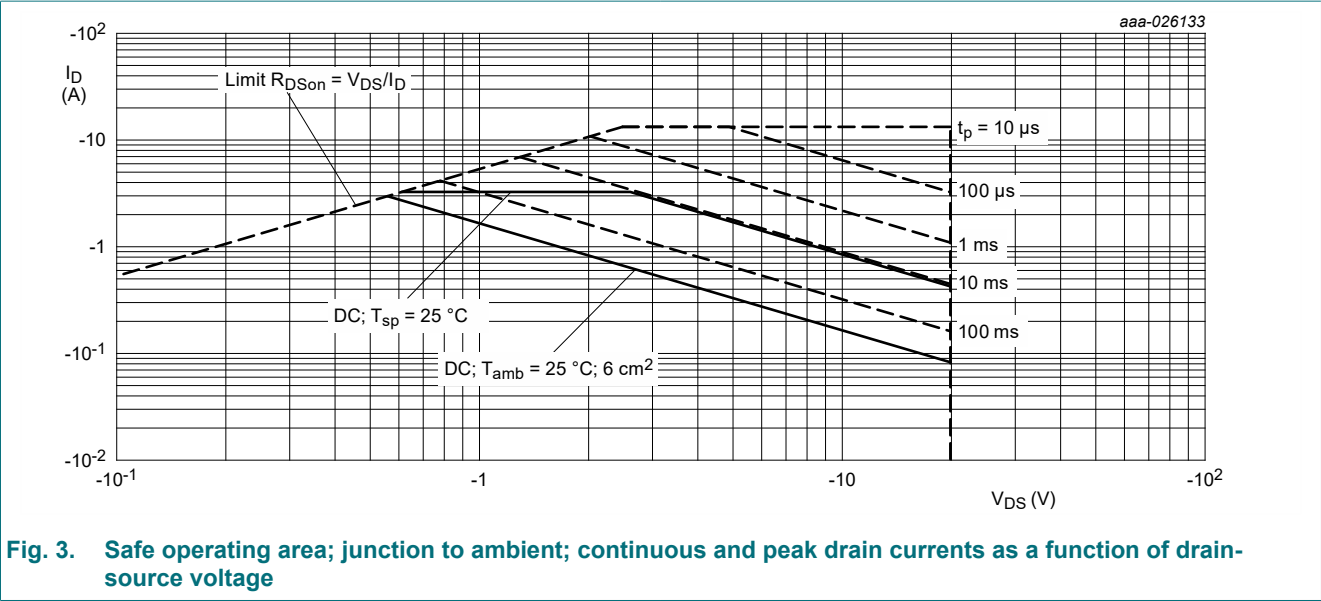


Fig. 2. Normalized continuous drain current as a function of junction temperature



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]	-	236	272	K/W
			[2]	-	67	77	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 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 6 cm².

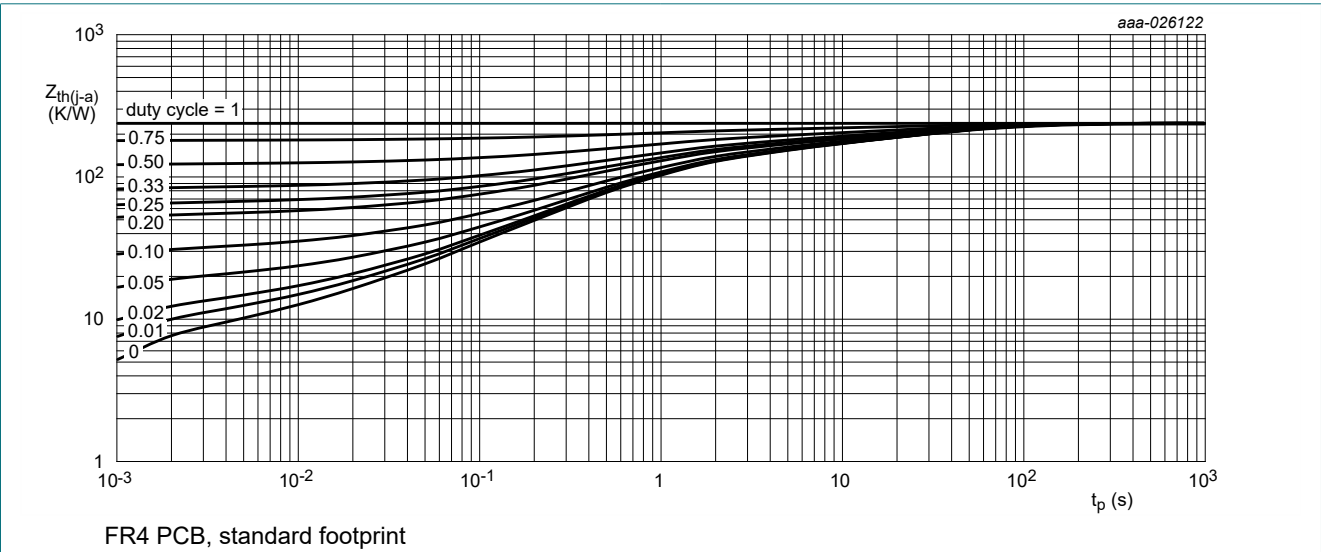


Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

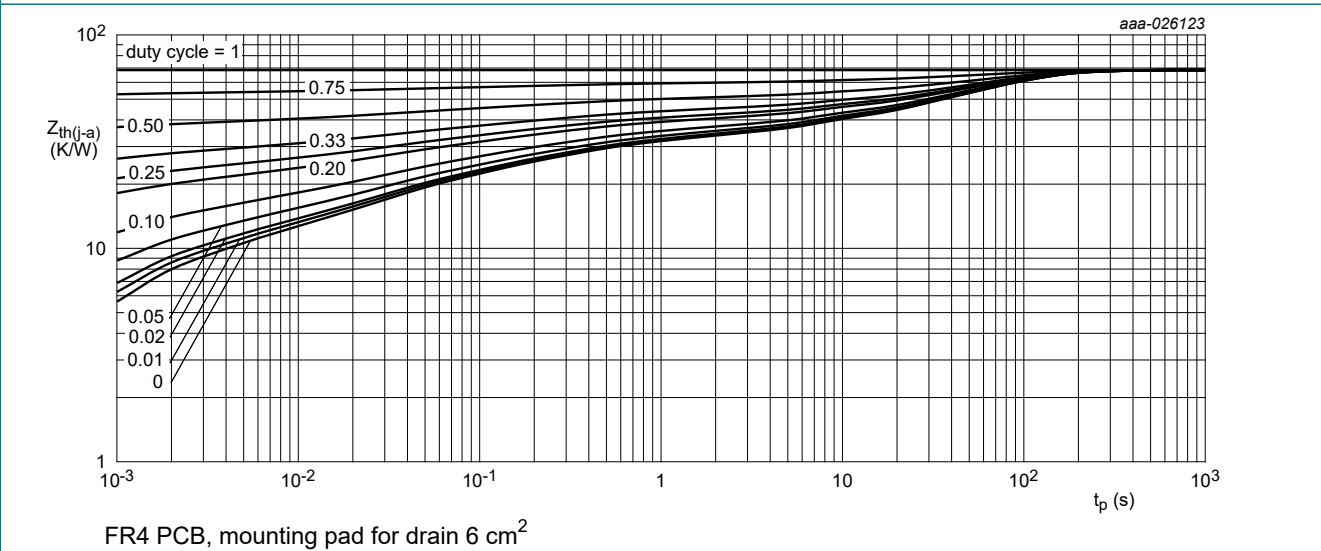


Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

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		-0.75	-1	-1.25	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		-	-	-10	μA
		V _{GS} = 8 V; V _{DS} = 0 V; T _j = 25 °C		-	-	5	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 = -3.2 A; T _j = 25 °C		-	100	122	mΩ
		V _{GS} = -4.5 V; I _D = -3.2 A; T _j = 175 °C		-	157	191	mΩ
		V _{GS} = -3 V; I _D = -2.6 A; T _j = 25 °C		-	125	190	mΩ
g _{fs}	forward transconductance	V _{DS} = -10 V; I _D = -3.2 A; T _j = 25 °C		-	7	-	S
R _G	gate resistance	f = 1 MHz; T _j = 25 °C		-	18.6	-	Ω
Dynamic characteristics							
Q _{G(tot)}	total gate charge	V _{DS} = -10 V; I _D = -3.2 A; V _{GS} = -4.5 V; T _j = 25 °C		-	3.3	5	nC
Q _{GS}	gate-source charge			-	0.8	-	nC
Q _{GD}	gate-drain charge			-	0.8	-	nC
C _{iss}	input capacitance	V _{DS} = -10 V; f = 1 MHz; V _{GS} = 0 V; T _j = 25 °C		-	388	-	pF
C _{oss}	output capacitance			-	56	-	pF
C _{rss}	reverse transfer capacitance			-	39	-	pF
t _{d(on)}	turn-on delay time	V _{DS} = -10 V; I _D = -2.6 A; V _{GS} = -4.5 V; R _{G(ext)} = 6 Ω; T _j = 25 °C		-	5	-	ns
t _r	rise time			-	4	-	ns
t _{d(off)}	turn-off delay time			-	36	-	ns
t _f	fall time			-	17	-	ns
Source-drain diode							
V _{SD}	source-drain voltage	I _S = -1.9 A; V _{GS} = 0 V; T _j = 25 °C		-	-0.9	-1.2	V
t _{rr}	reverse recovery time	I _S = -1.9 A; dI _S /dt = 100 A/μs; V _{GS} = 0 V; V _{DS} = -10 V; T _j = 25 °C		-	13.7	-	ns
Q _r	recovered charge			-	4.5	-	nC

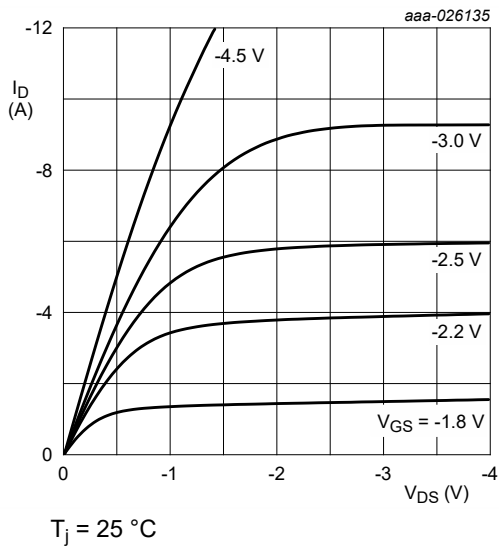


Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values

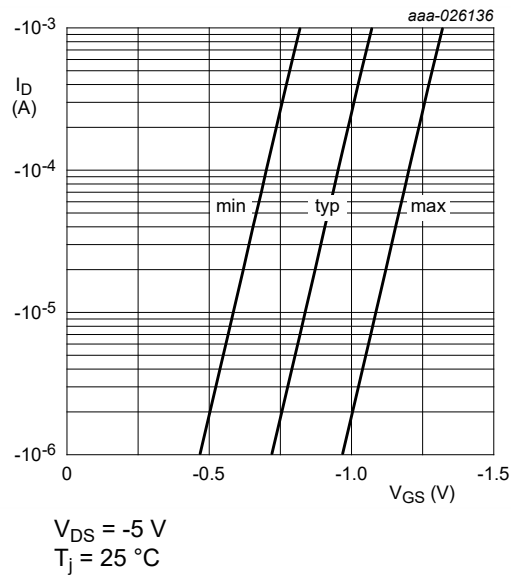


Fig. 7. Sub-threshold drain current as a function of gate-source voltage

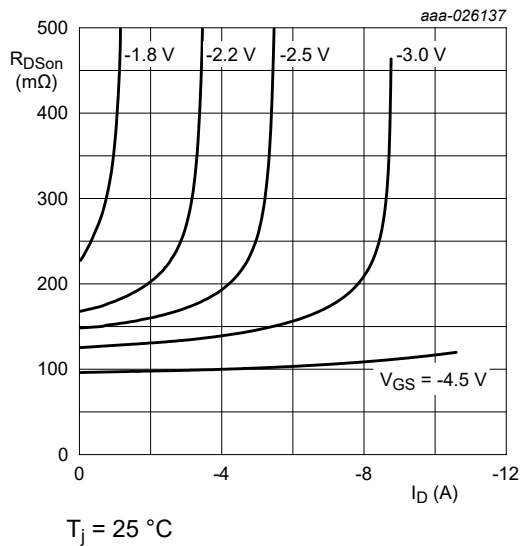


Fig. 8. Drain-source on-state resistance as a function of drain current; typical values

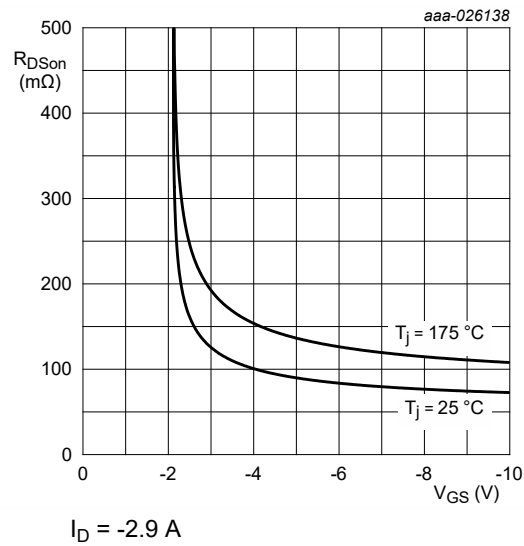


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values

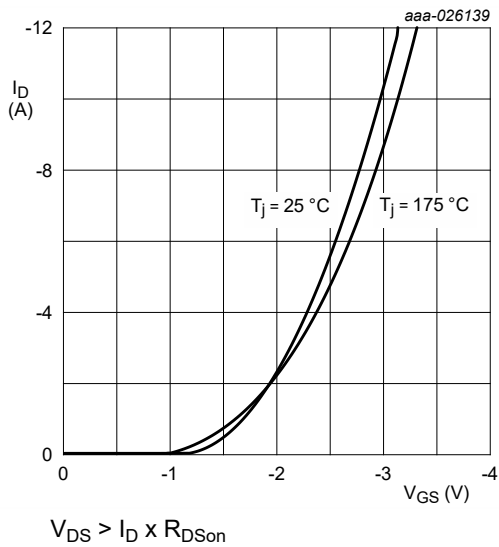


Fig. 10. Transfer characteristics: drain current as a function of gate-source voltage; typical values

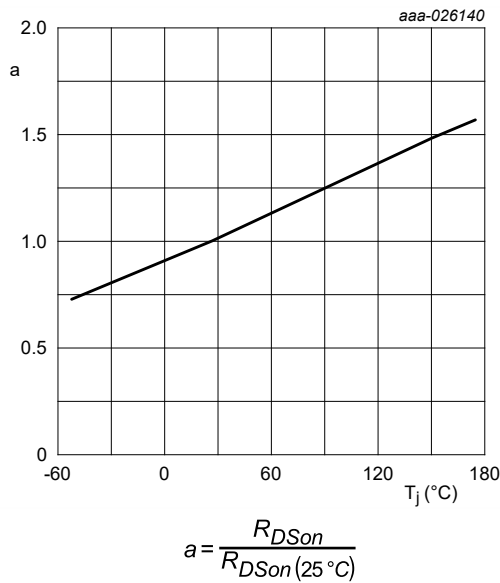


Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values

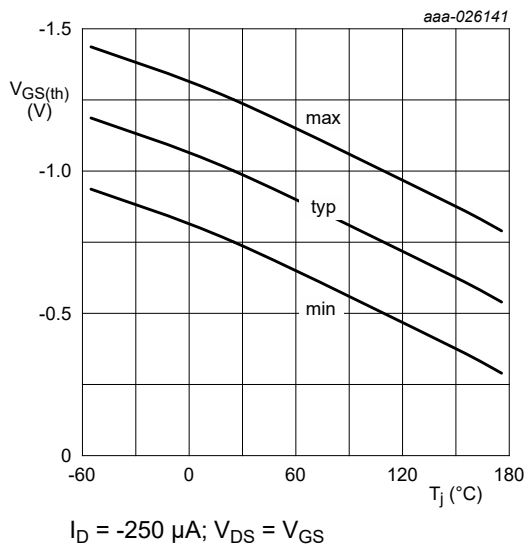


Fig. 12. Gate-source threshold voltage as a function of junction temperature

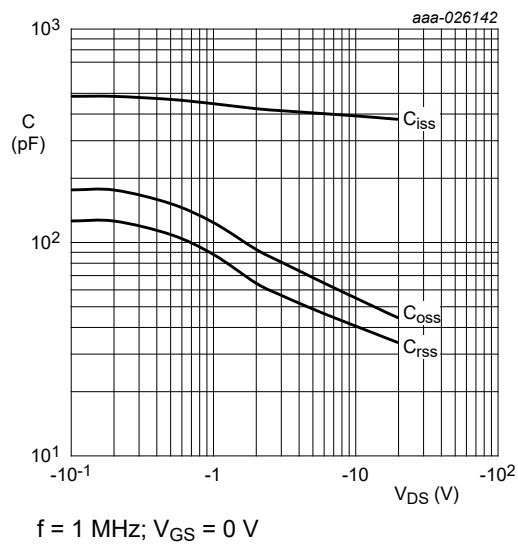
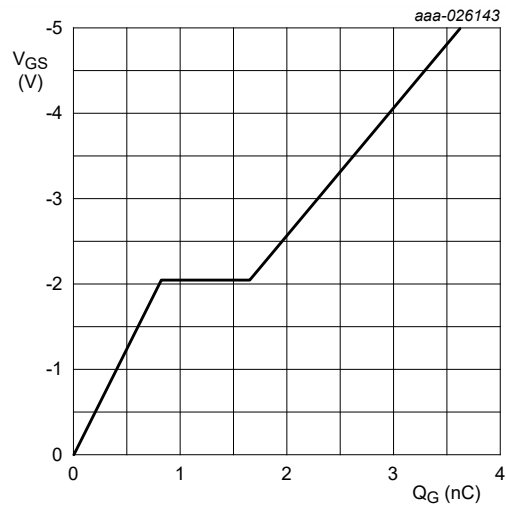


Fig. 13. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values



$V_{DS} = -10\text{ V}$; $I_D = -3.2\text{ A}$

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

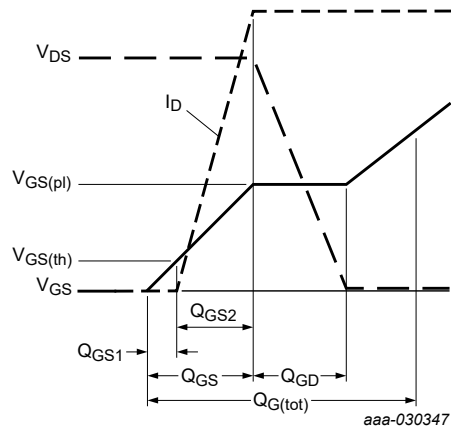
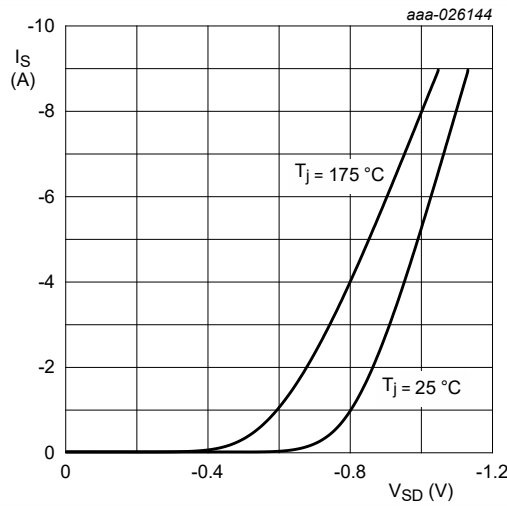


Fig. 15. Gate charge waveform definitions



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

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

11. Test information

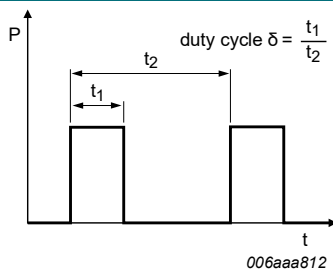


Fig. 17. Duty cycle definition

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.

13. Soldering

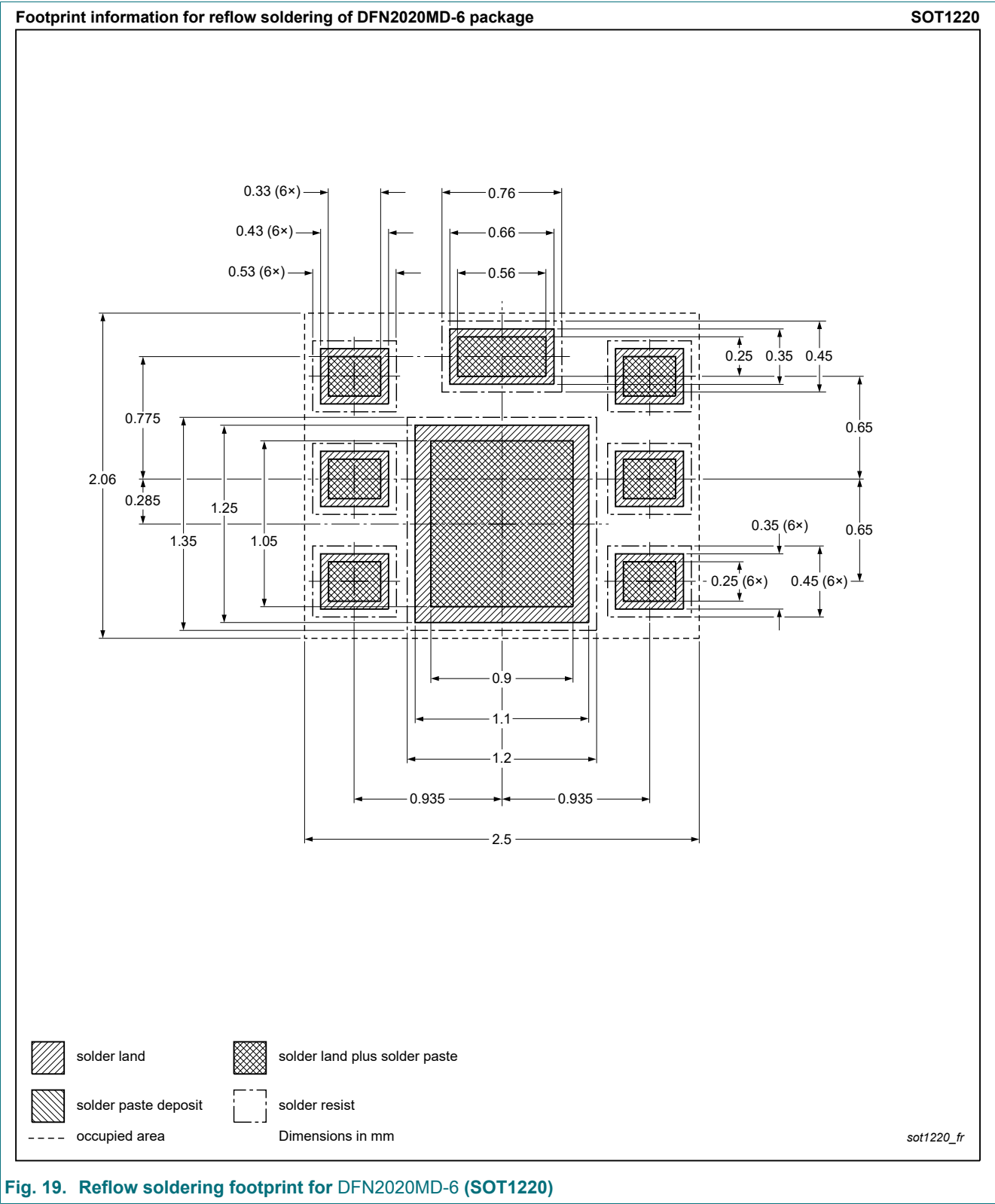


Fig. 19. Reflow soldering footprint for DFN2020MD-6 (SOT1220)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
BUK4D122-20P v.2	20230327	Product data sheet	-	BUK4D122-20P v.1
Modifications:	Complete rework			
BUK4D122-20P v.1	20200708	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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