

### 1. General description

N-channel enhancement mode Field-Effect Transistor (FET) in a leadless ultra small DFN0606-3 (SOT8001) Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

### 2. Features and benefits

- Low threshold voltage
- Very fast switching
- Trench MOSFET technology
- ElectroStatic Discharge (ESD) protection > 2 kV HBM
- Leadless ultra small and ultra thin SMD plastic package: 0.62 x 0.62 x 0.37 mm

### 3. Applications

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

### 4. Quick reference data

#### Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Тур	Max	Unit
V <sub>DS</sub>	drain-source voltage	T <sub>j</sub> = 25 °C		-	-	60	V
V <sub>GS</sub>	gate-source voltage	_		-20	-	20	V
ID	drain current	V <sub>GS</sub> = 10 V; T <sub>amb</sub> = 25 °C	[1]	-	-	380	mA
Static chara	cteristics						
R <sub>DSon</sub>	drain-source on-state resistance	V <sub>GS</sub> = 10 V; I <sub>D</sub> = 380 mA; T <sub>j</sub> = 25 °C		-	1.8	2.3	Ω

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and mounting pad for drain 1 cm<sup>2</sup>.

# nexperia

# 5. Pinning information

Table 2. Pinning information							
Pin	Symbol	Description	Simplified outline	Graphic symbol			
1	G	gate		D			
2	S	source					
3	D	drain	Transparent top view DFN0606-3 (SOT8001)	G G S 017aaa255			

### 6. Ordering information

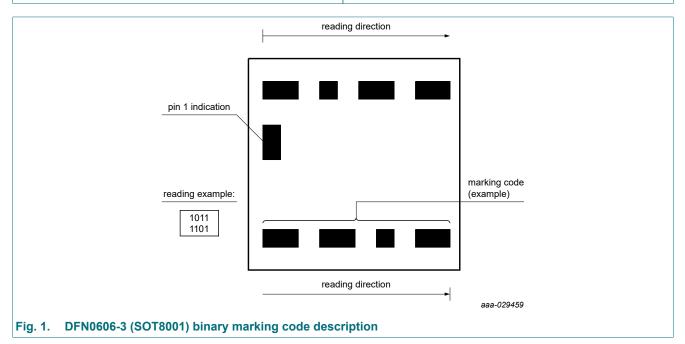
### Table 3. Ordering information

Type number	Package				
	Name	Description	Version		
NX138BKH		plastic, leadless ultra small package; 3 terminals; body 0.62 x 0.62 x 0.37 mm	SOT8001		

# 7. Marking

#### Table 4. Marking codes

Type number	Marking code
NX138BKH	0001 1100



### 8. Limiting values

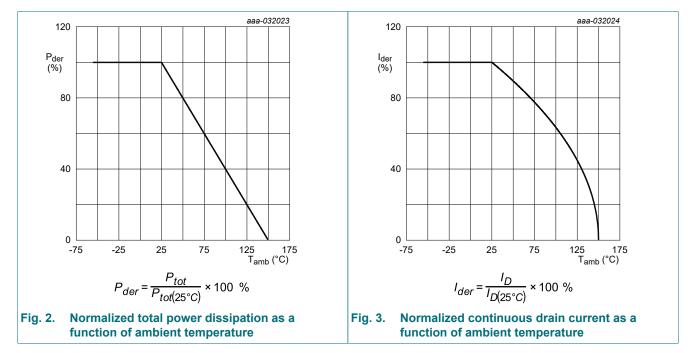
#### Table 5. Limiting values

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

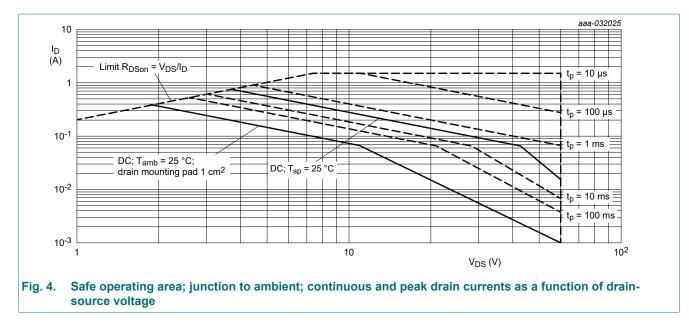
Symbol	Parameter	Conditions		Min	Max	Unit
V <sub>DS</sub>	drain-source voltage	T <sub>j</sub> = 25 °C		-	60	V
V <sub>GS</sub>	gate-source voltage	_		-20	20	V
I <sub>D</sub>	drain current	V <sub>GS</sub> = 10 V; T <sub>amb</sub> = 25 °C	[1]	-	380	mA
		V <sub>GS</sub> = 10 V; T <sub>amb</sub> = 100 °C	[1]	-	240	mA
I <sub>DM</sub>	peak drain current	$T_{amb}$ = 25 °C; single pulse; $t_p \le 10 \ \mu s$		-	1.5	A
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> = 25 °C	[2]	-	380	mW
			[1]	-	710	mW
		T <sub>sp</sub> = 25 °C		-	2.8	W
Tj	junction temperature			-55	150	°C
T <sub>amb</sub>	ambient temperature			-55	150	°C
T <sub>stg</sub>	storage temperature			-65	150	°C
Source-drai	n diode					
Is	source current	T <sub>amb</sub> = 25 °C	[1]	-	380	mA

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and mounting pad for drain 1 cm<sup>2</sup>.

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



#### 60 V, N-channel Trench MOSFET

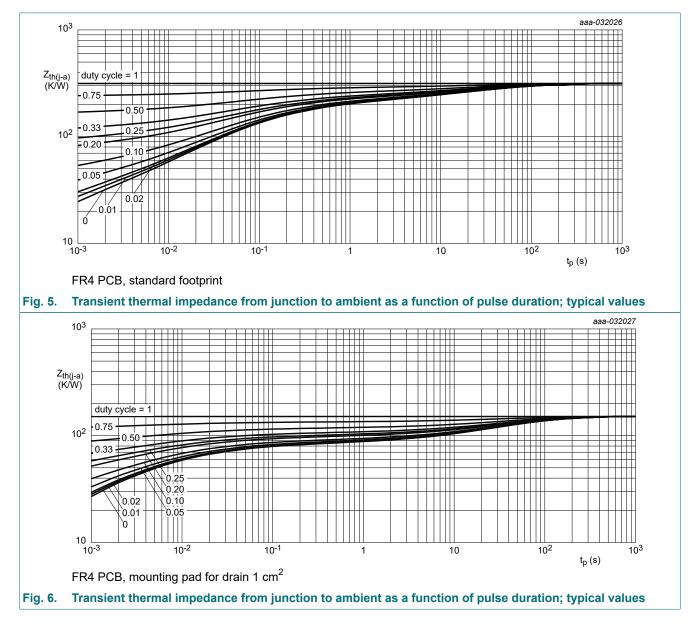


### 9. Thermal characteristics

Symbol	Parameter	Conditions		Min	Тур	Мах	Unit
R <sub>th(j-a)</sub>	thermal resistance from	in free air	[1]	-	285	330	K/W
	junction to ambient		[2]	-	150	175	K/W
R <sub>th(j-sp)</sub>	thermal resistance from junction to solder point			-	40	45	K/W

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

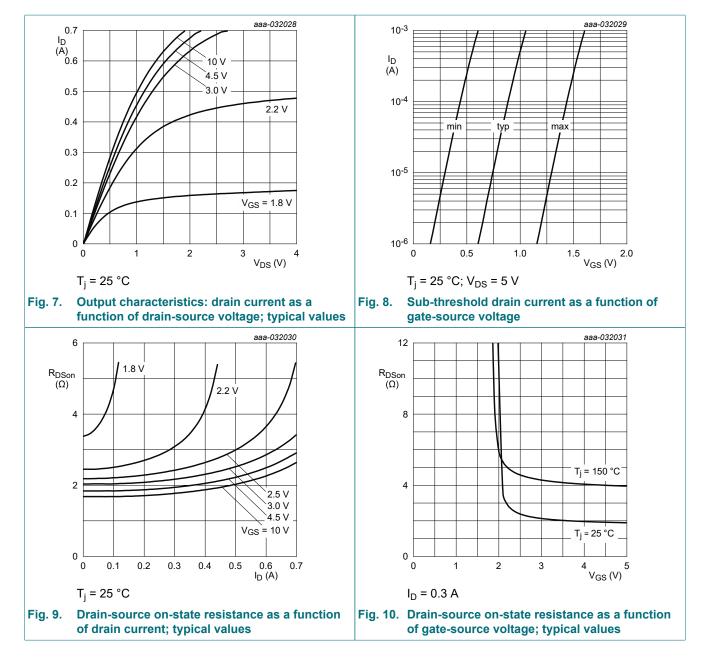
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and mounting pad for drain 1 cm<sup>2</sup>.



## **10. Characteristics**

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
Static chara	cteristics					
V <sub>(BR)DSS</sub>	drain-source breakdown voltage	I <sub>D</sub> = 250 μA; V <sub>GS</sub> = 0 V; T <sub>j</sub> = 25 °C	60	-	-	V
V <sub>GSth</sub>	gate-source threshold voltage	I <sub>D</sub> = 250 μA; V <sub>DS</sub> = V <sub>GS</sub> ; T <sub>j</sub> = 25 °C	0.5	1	1.5	V
I <sub>DSS</sub>	drain leakage current	V <sub>DS</sub> = 60 V; V <sub>GS</sub> = 0 V; T <sub>j</sub> = 25 °C	-	-	1	μA
I <sub>GSS</sub>	gate leakage current	$V_{GS}$ = 20 V; $V_{DS}$ = 0 V; $T_j$ = 25 °C	-	-	10	μA
		V <sub>GS</sub> = -20 V; V <sub>DS</sub> = 0 V; T <sub>j</sub> = 25 °C	-	-	-10	μA
		V <sub>GS</sub> = 10 V; V <sub>DS</sub> = 0 V; T <sub>j</sub> = 25 °C	-	-	1	μA
		V <sub>GS</sub> = -10 V; V <sub>DS</sub> = 0 V; T <sub>j</sub> = 25 °C	-	-	-1	μA
		V <sub>GS</sub> = 5 V; V <sub>DS</sub> = 0 V; T <sub>j</sub> = 25 °C	-	-	500	nA
		V <sub>GS</sub> = -5 V; V <sub>DS</sub> = 0 V; T <sub>j</sub> = 25 °C	-	-	-500	nA
R <sub>DSon</sub>	drain-source on-state resistance	V <sub>GS</sub> = 10 V; I <sub>D</sub> = 380 mA; T <sub>j</sub> = 25 °C	-	1.8	2.3	Ω
		V <sub>GS</sub> = 10 V; I <sub>D</sub> = 380 mA; T <sub>j</sub> = 150 °C	-	3.9	4.9	Ω
		V <sub>GS</sub> = 5 V; I <sub>D</sub> = 330 mA; T <sub>j</sub> = 25 °C	-	2.2	2.9	Ω
		V <sub>GS</sub> = 2.5 V; I <sub>D</sub> = 260 mA; T <sub>j</sub> = 25 °C	-	2.4	4.8	Ω
9 <sub>fs</sub>	forward transconductance	V <sub>DS</sub> = 5 V; I <sub>D</sub> = 380 mA; T <sub>j</sub> = 25 °C	-	0.7	-	S
Dynamic ch	aracteristics		I			
Q <sub>G(tot)</sub>	total gate charge	V <sub>DS</sub> = 30 V; I <sub>D</sub> = 380 mA; V <sub>GS</sub> = 10 V;	-	0.5	0.7	nC
Q <sub>GS</sub>	gate-source charge	T <sub>j</sub> = 25 °C	-	0.1	-	nC
Q <sub>GD</sub>	gate-drain charge		-	0.1	-	nC
C <sub>iss</sub>	input capacitance	V <sub>DS</sub> = 30 V; f = 1 MHz; V <sub>GS</sub> = 0 V;	-	20	-	pF
C <sub>oss</sub>	output capacitance	T <sub>j</sub> = 25 °C	-	3.1	-	pF
C <sub>rss</sub>	reverse transfer capacitance		-	2	-	pF
t <sub>d(on)</sub>	turn-on delay time	V <sub>DS</sub> = 30 V; I <sub>D</sub> = 380 mA; V <sub>GS</sub> = 10 V;	-	7.9	-	ns
t <sub>r</sub>	rise time	$R_{G(ext)} = 6 \Omega; T_j = 25 °C$	-	8.4	-	ns
t <sub>d(off)</sub>	turn-off delay time	1	-	12.5	-	ns
t <sub>f</sub>	fall time		-	5.1	-	ns
Source-drai	n diode	· ·	I			
V <sub>SD</sub>	source-drain voltage	I <sub>S</sub> = 380 mA; V <sub>GS</sub> = 0 V; T <sub>i</sub> = 25 °C	-	0.7	1.2	V

#### 60 V, N-channel Trench MOSFET

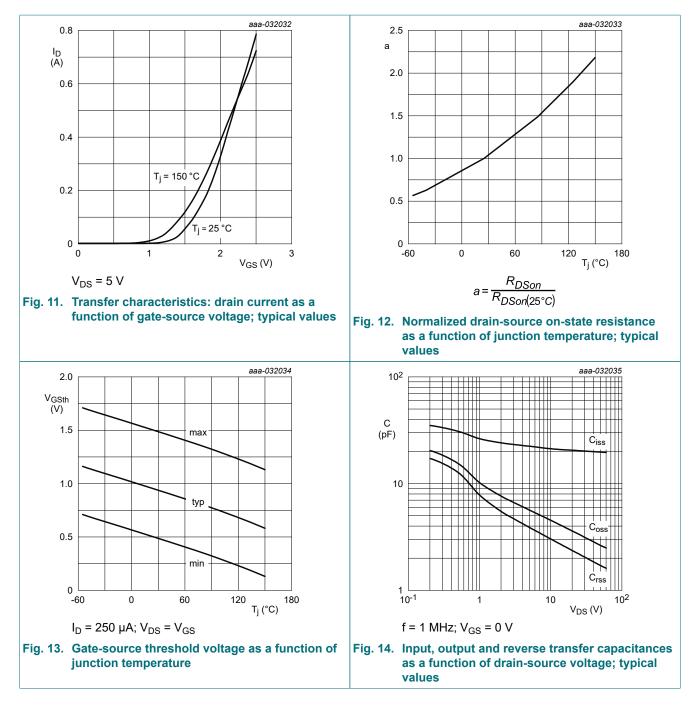


**Product data sheet** 

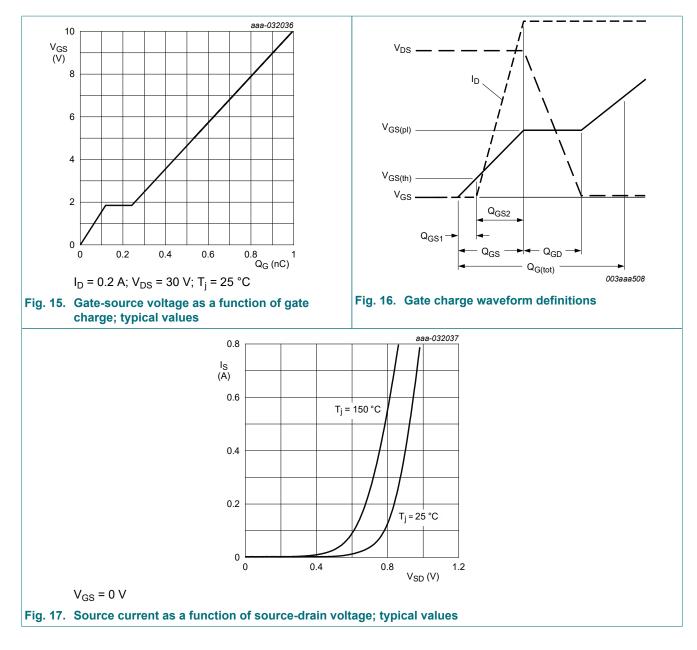
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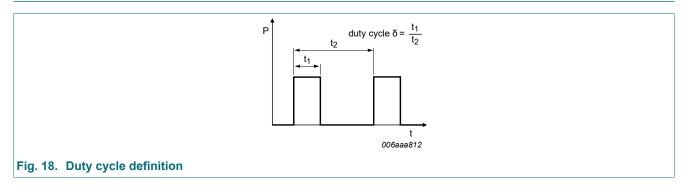
#### 60 V, N-channel Trench MOSFET



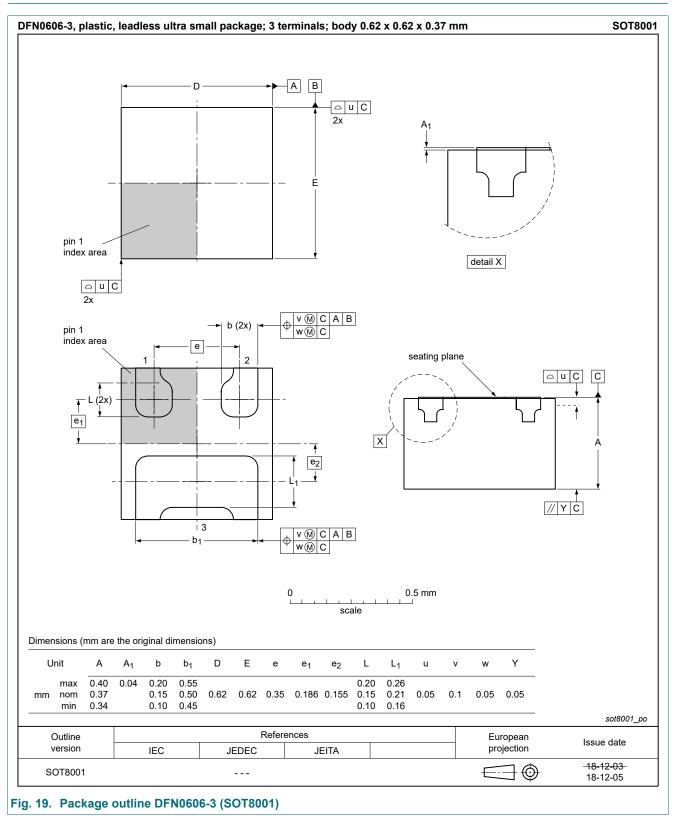
#### 60 V, N-channel Trench MOSFET



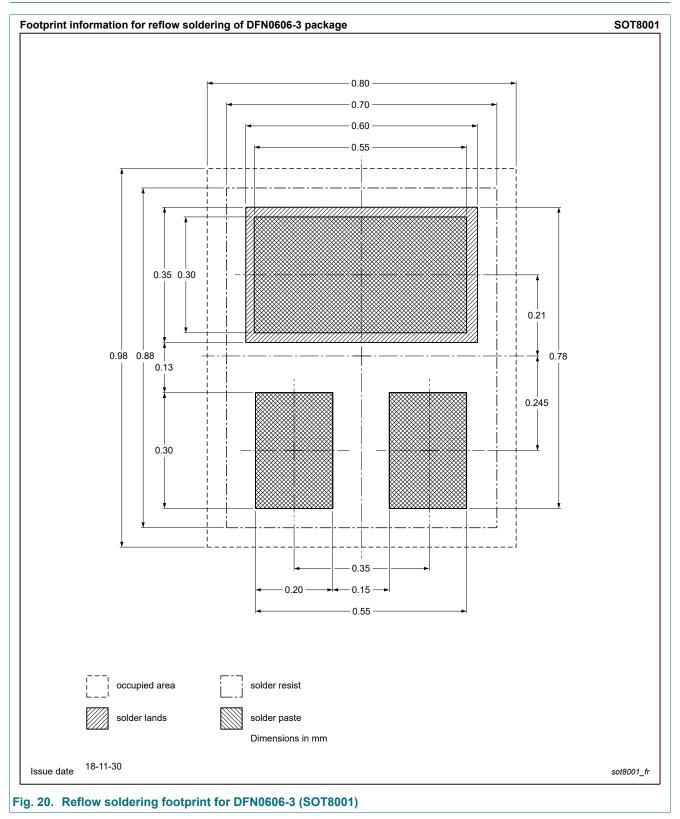
### **11. Test information**



### 12. Package outline



### 13. Soldering



**Product data sheet** 

# 14. Revision history

Table 8. Revision history						
Data sheet ID	Release date	Data sheet status	Change notice	Supersedes		
NX138BKH v.1	20200901	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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