



PMN230ENE

60 V, N-channel Trench MOSFET

16 April 2018

Product data sheet

1. General description

N-channel enhancement mode Field-Effect Transistor (FET) in a small SOT457 (SC-74) Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

2. Features and benefits

- Trench MOSFET technology
- Logic-level compatible
- Very fast switching
- ElectroStatic Discharge (ESD) protection > 2 kV HBM

3. Applications

- Relay driver
- High-speed line driver
- Low-side load switch
- Switching circuits

4. Quick reference data

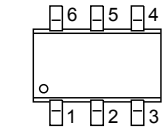
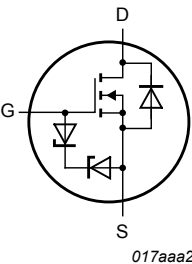
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j = 25\text{ }^{\circ}\text{C}$	-	-	60	V
V_{GS}	gate-source voltage		-20	-	20	V
I_D	drain current	$V_{GS} = 10\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}; t \leq 5\text{ s}$	[1]	-	2	A
Static characteristics						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}; I_D = 1.6\text{ A}; T_j = 25\text{ }^{\circ}\text{C}$	-	176	222	m Ω

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

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	D	drain	 TSOP6 (SOT457)	
2	D	drain		
3	G	gate		
4	S	source		
5	D	drain		
6	D	drain		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMN230ENE	TSOP6	plastic surface-mounted package (TSOP6); 6 leads	SOT457

7. Marking

Table 4. Marking codes

Type number	Marking code
PMN230ENE	3E

8. Limiting values

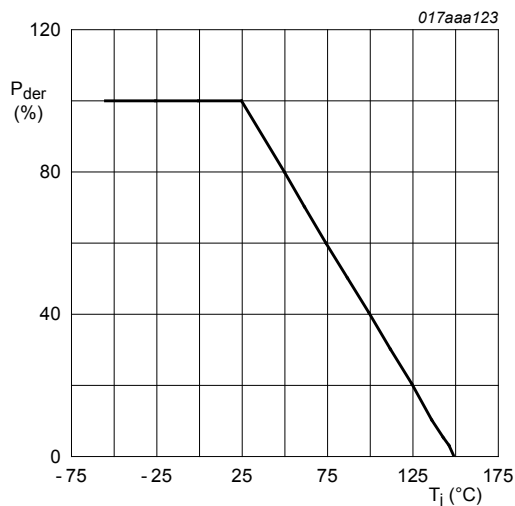
Table 5. Limiting values

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		-	60	V
V _{GS}	gate-source voltage			-20	20	V
I _D	drain current	V _{GS} = 10 V; T _{amb} = 25 °C; t ≤ 5 s	[1]	-	2	A
		V _{GS} = 10 V; T _{amb} = 25 °C	[1]	-	1.6	A
		V _{GS} = 10 V; T _{amb} = 100 °C	[1]	-	1	A
I _{DM}	peak drain current	T _{amb} = 25 °C; single pulse; t _p ≤ 10 μs		-	7	A
P _{tot}	total power dissipation	T _{amb} = 25 °C	[2]	-	475	mW
			[1]	-	1.14	W
		T _{sp} = 25 °C		-	3.9	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]	-	1.1	A

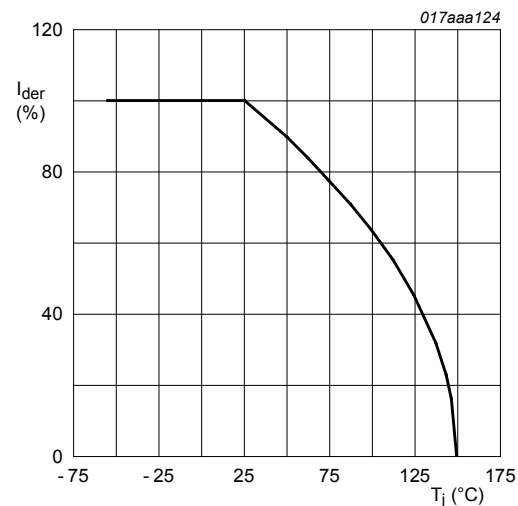
[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and mounting pad for drain 6 cm².

[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 junction temperature



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

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

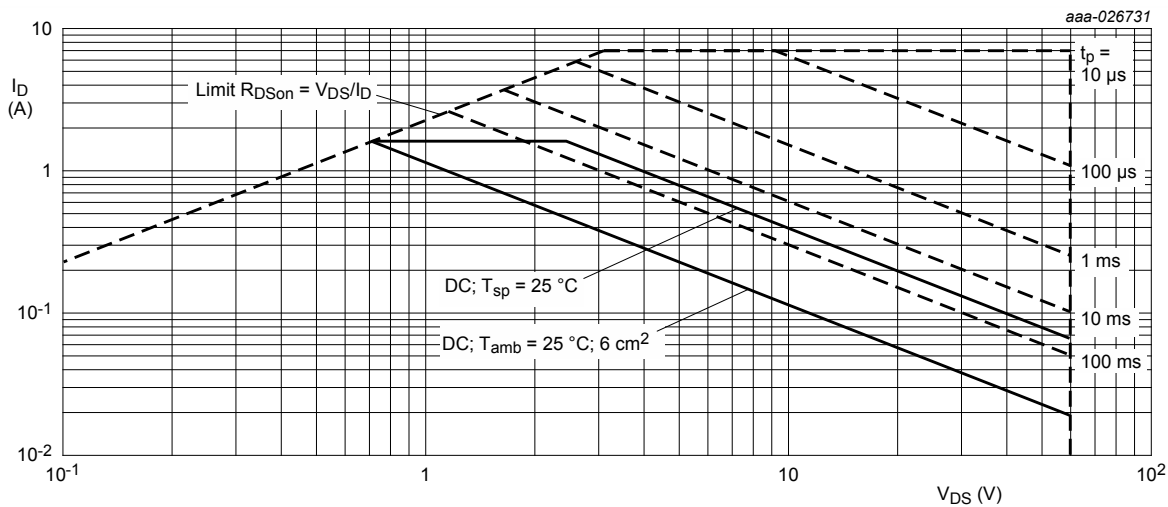


Fig. 3. Safe operating area; junction to ambient; continuous and peak drain currents as a function of drain-source voltage

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]	-	230	265	K/W
			[2]	-	95	110	K/W
		in free air; $t \leq 5$ s	[2]	-	55	63	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	28	32	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 6 cm².

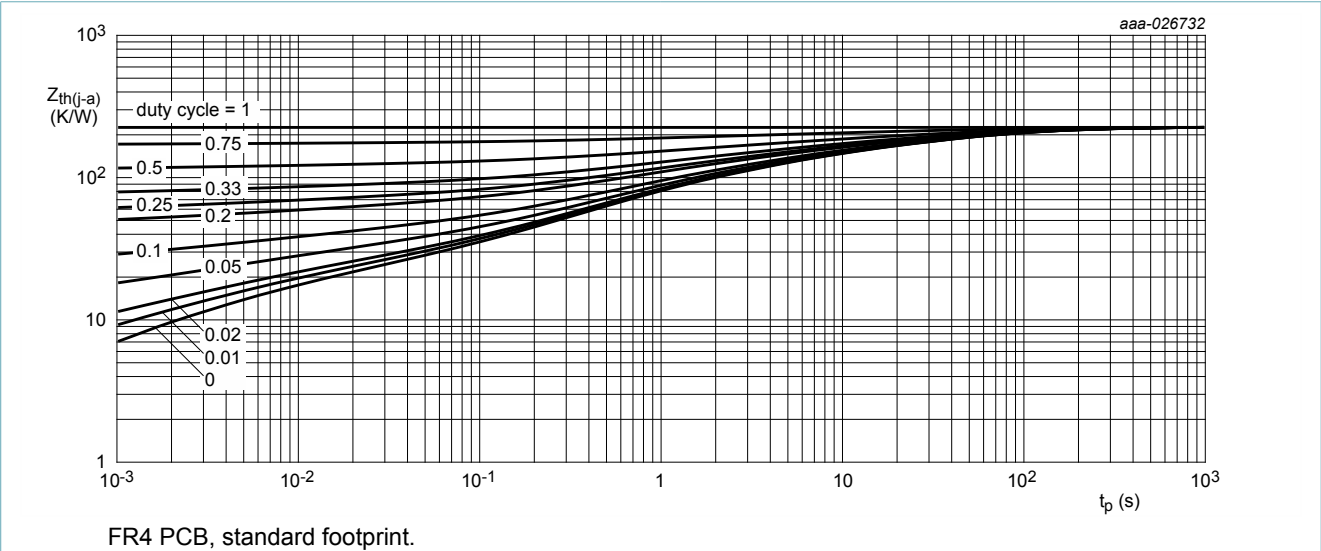


Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

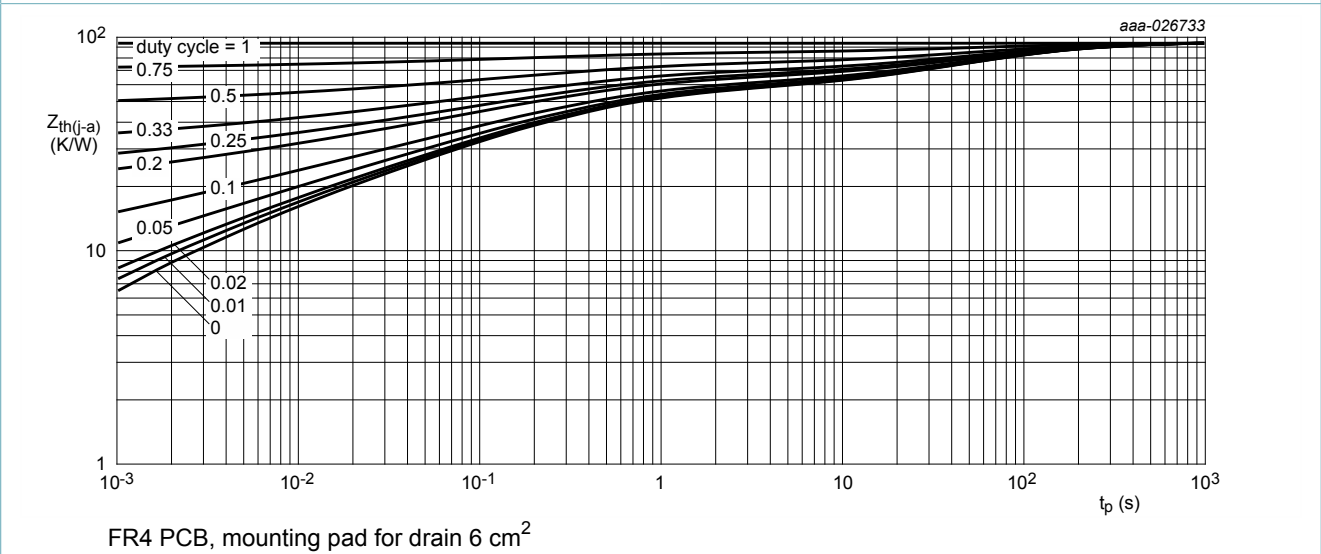


Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

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		60	-	-	V
V _{GSth}	gate-source threshold voltage	I _D = 250 μA; V _{DS} = V _{GS} ; T _j = 25 °C		1.3	1.7	2.7	V
I _{DSS}	drain leakage current	V _{DS} = 60 V; V _{GS} = 0 V; T _j = 25 °C		-	-	1	μA
I _{GSS}	gate leakage current	V _{GS} = 20 V; V _{DS} = 0 V; T _j = 25 °C		-	-	10	μA
		V _{GS} = -20 V; V _{DS} = 0 V; T _j = 25 °C		-	-	-10	μA
		V _{GS} = 10 V; V _{DS} = 0 V; T _j = 25 °C		-	-	1	μA
		V _{GS} = -10 V; V _{DS} = 0 V; T _j = 25 °C		-	-	-1	μA
R _{DSon}	drain-source on-state resistance	V _{GS} = 10 V; I _D = 1.6 A; T _j = 25 °C		-	176	222	mΩ
		V _{GS} = 10 V; I _D = 1.6 A; T _j = 150 °C		-	352	444	mΩ
		V _{GS} = 4.5 V; I _D = 1.5 A; T _j = 25 °C		-	196	262	mΩ
g _{fs}	forward transconductance	V _{DS} = 10 V; I _D = 1.5 A; T _j = 25 °C		-	6.2	-	S
R _G	gate resistance	f = 1 MHz		-	9	-	Ω
Dynamic characteristics							
Q _{G(tot)}	total gate charge	V _{DS} = 30 V; I _D = 1.5 A; V _{GS} = 10 V; T _j = 25 °C		-	3.9	5	nC
Q _{GS}	gate-source charge			-	0.4	-	nC
Q _{GD}	gate-drain charge			-	0.7	-	nC
C _{iss}	input capacitance	V _{DS} = 30 V; f = 1 MHz; V _{GS} = 0 V; T _j = 25 °C		-	177	-	pF
C _{oss}	output capacitance			-	15	-	pF
C _{rss}	reverse transfer capacitance			-	11	-	pF
t _{d(on)}	turn-on delay time	V _{DS} = 30 V; I _D = 1.5 A; V _{GS} = 10 V; R _{G(ext)} = 6 Ω; T _j = 25 °C		-	6	-	ns
t _r	rise time			-	8	-	ns
t _{d(off)}	turn-off delay time			-	13	-	ns
t _f	fall time			-	5	-	ns
Source-drain diode							
V _{SD}	source-drain voltage	I _S = 1.1 A; V _{GS} = 0 V; T _j = 25 °C		-	0.85	1.2	V

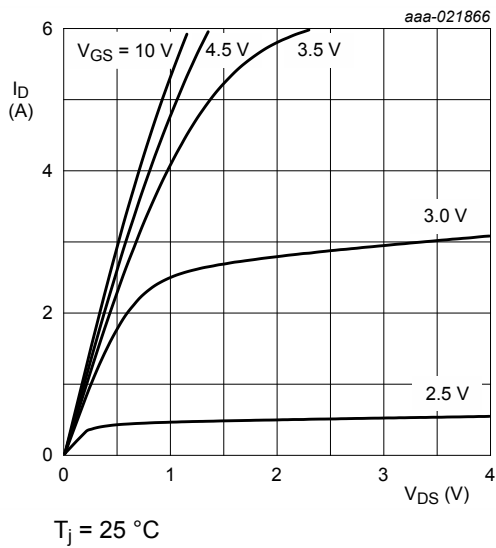


Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values

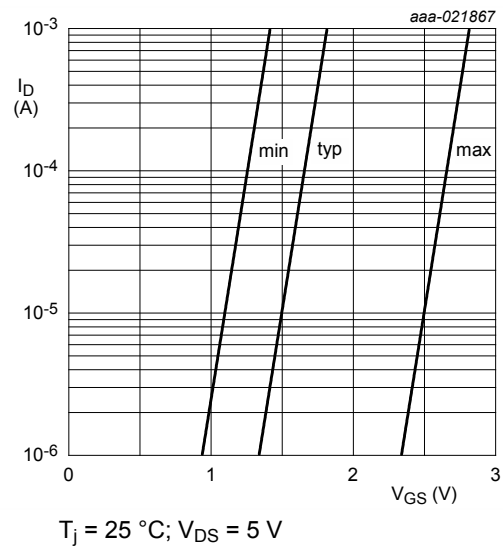


Fig. 7. Sub-threshold drain current as a function of gate-source voltage

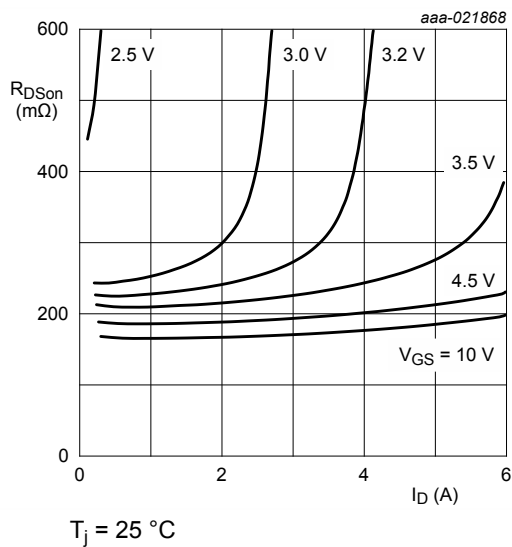


Fig. 8. Drain-source on-state resistance as a function of drain current; typical values

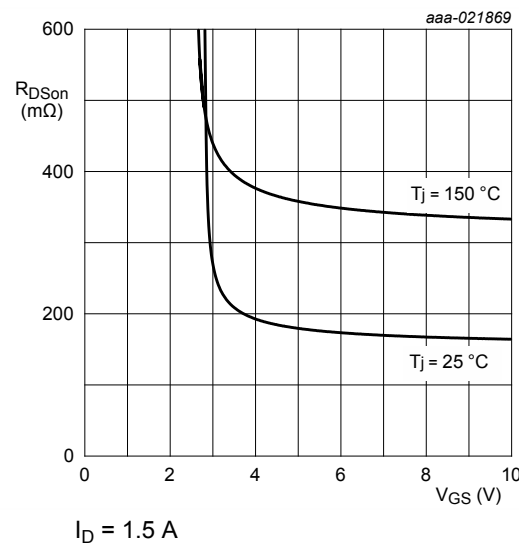


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values

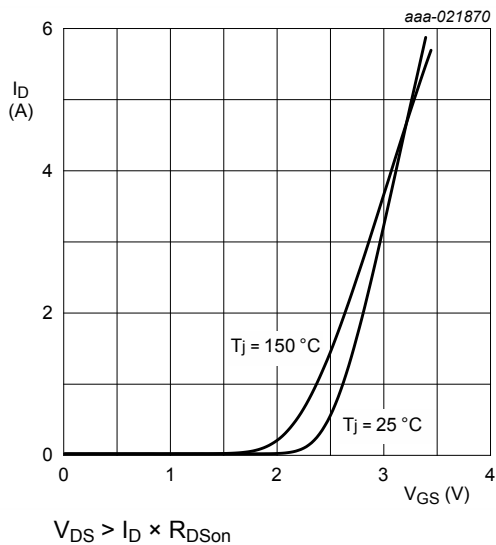


Fig. 10. Transfer characteristics: drain current as a function of gate-source voltage; typical values

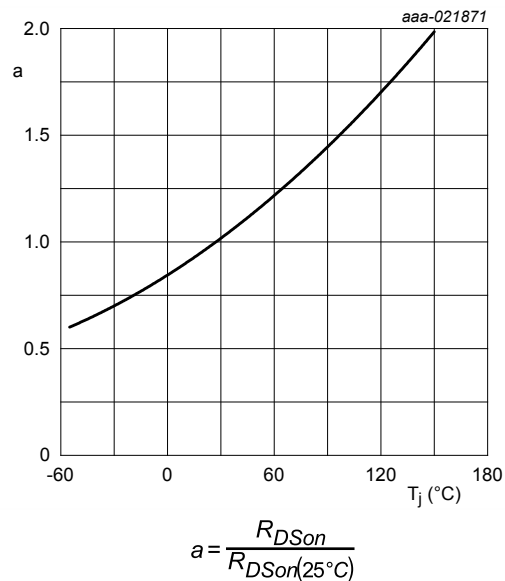


Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values

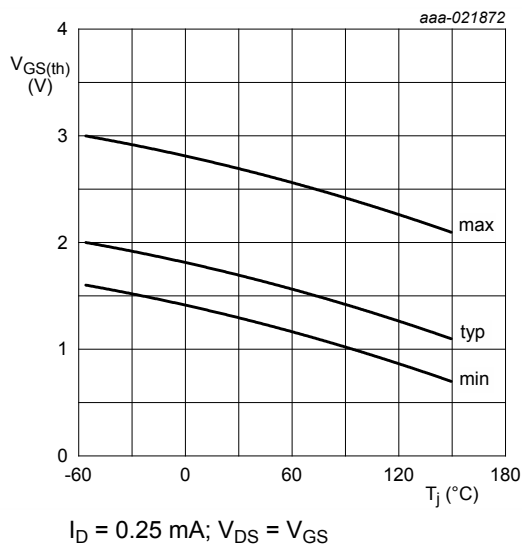


Fig. 12. Gate-source threshold voltage as a function of junction temperature

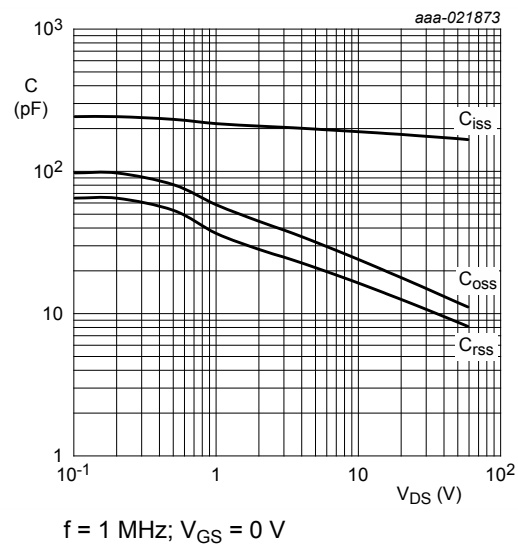


Fig. 13. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

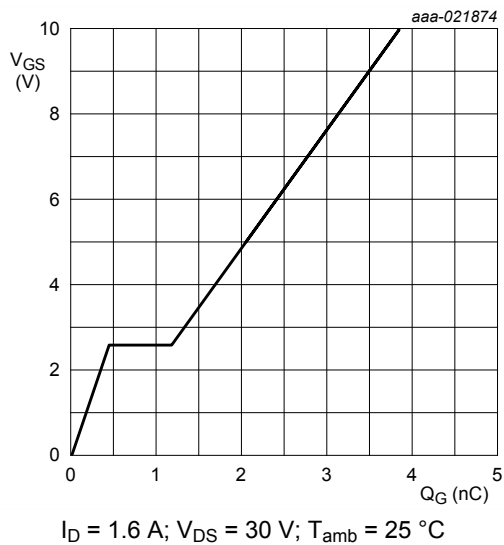


Fig. 14. Gate-source voltage as a function of gate charge; typical values

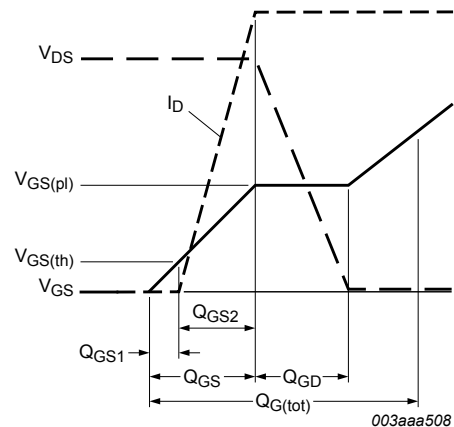


Fig. 15. Gate charge waveform definitions

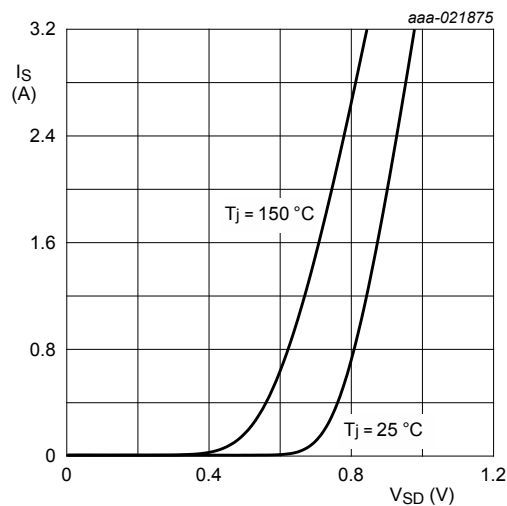
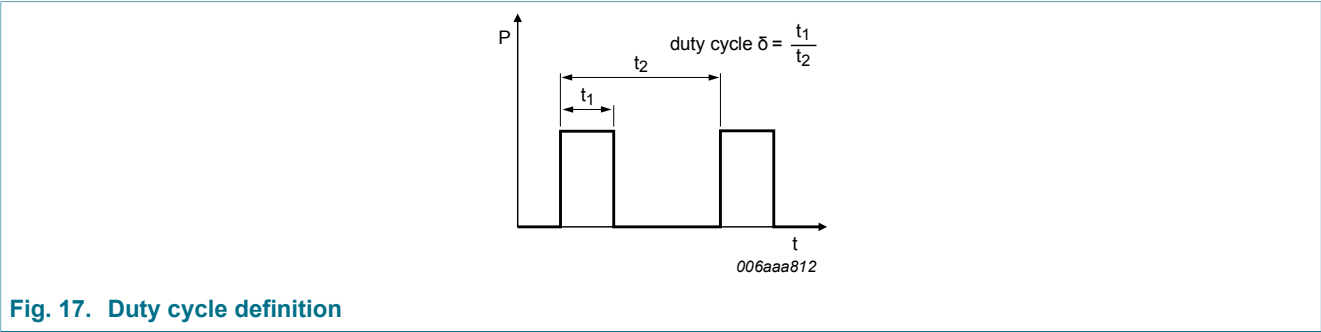
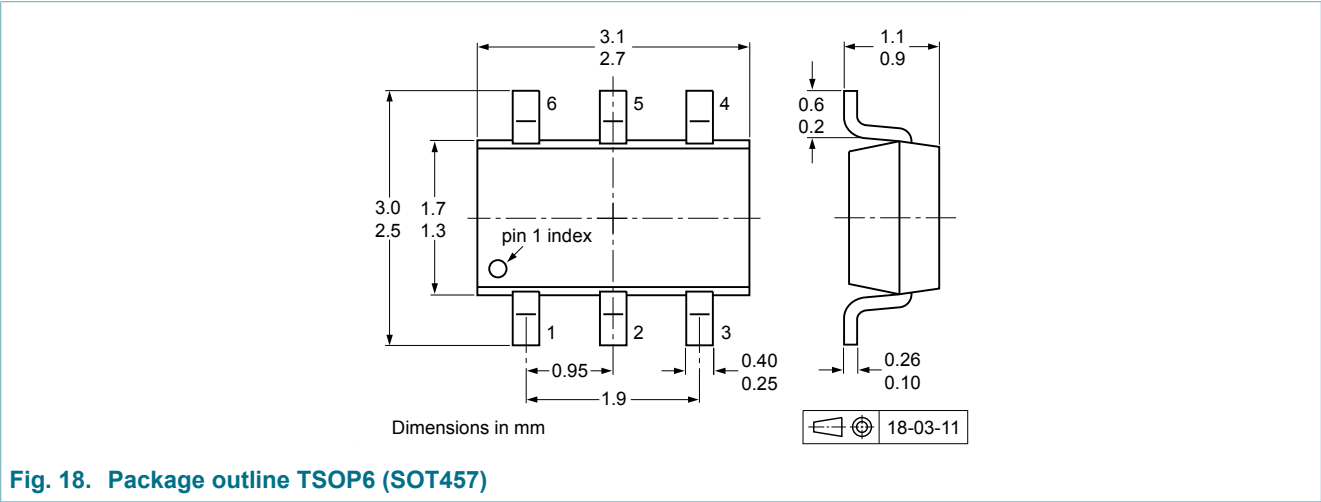


Fig. 16. Source current as a function of source-drain voltage; typical values

11. Test information



12. Package outline



13. Soldering

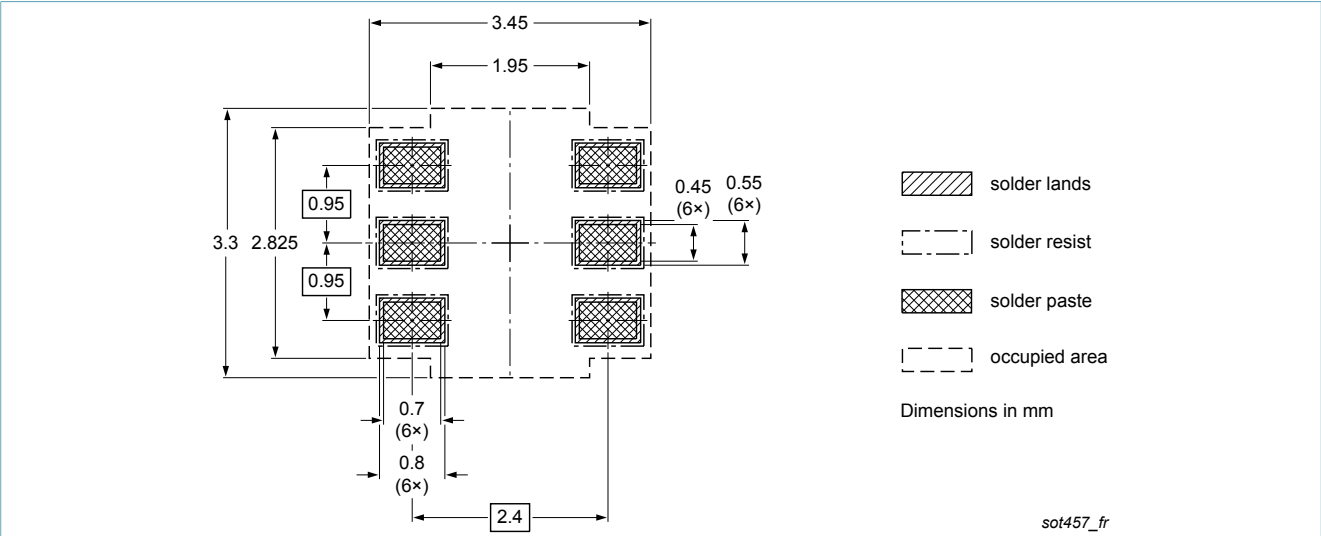


Fig. 19. Reflow soldering footprint for TSOP6 (SOT457)

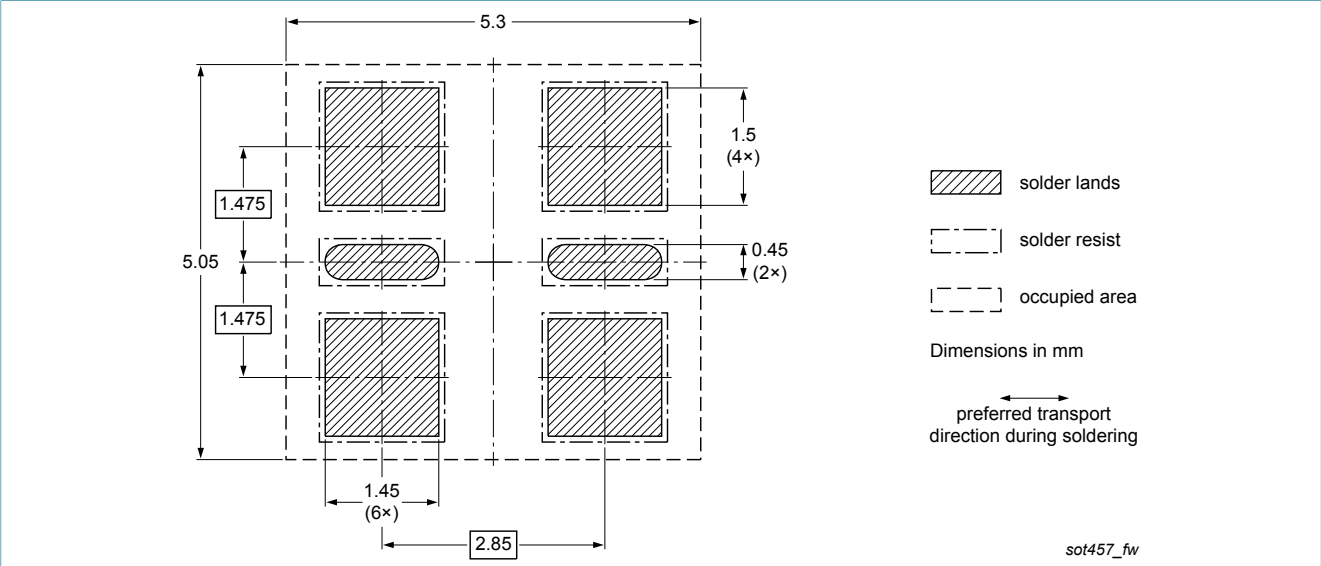


Fig. 20. Wave soldering footprint for TSOP6 (SOT457)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMN230ENE v.1	20180416	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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16. Contents

1. General description..... 1

2. Features and benefits..... 1

3. Applications..... 1

4. Quick reference data..... 1

5. Pinning information.....2

6. Ordering information.....2

7. Marking.....2

8. Limiting values..... 3

9. Thermal characteristics..... 5

10. Characteristics.....6

11. Test information..... 10

12. Package outline..... 10

13. Soldering..... 11

14. Revision history.....12

15. Legal information..... 13

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