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PMN38EN

N-channel TrenchMOS logic level FET

Rev. 02 — 3 October 2007 Product data sheet

1. Product profile

1.1 General description

Logic level N-channel enhancement mode Field-Effect Transistor (FET) in a plastic package. This product is designed and qualified for use in computing, communications, consumer and industrial applications only.

1.2 Features

- Logic level threshold
- Surface-mounted package
- Low threshold voltage
- Very fast switching

1.3 Applications

- Battery powered motor control
- High speed switch in set top box power supplies
- Driver FET in DC-to-DC converters
- Load switch in notebook computers

1.4 Quick reference data

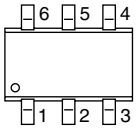
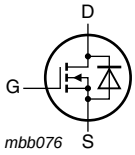
Table 1. Quick reference

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25$ °C; $T_j \leq 150$ °C	-	-	30	V
I_D	drain current	T_{sp} = 25 °C; V_{GS} = 10 V; see Figure 1 and 3	-	-	5.4	A
P_{tot}	total power dissipation	T_{sp} = 25 °C; see Figure 2	-	-	1.75	W
Static characteristics						
R_{DSon}	drain-source on-state resistance	V_{GS} = 4.5 V; I_D = 2.8 A; T_j = 25 °C; see Figure 8 and 9	-	38	46	mΩ

founded by Philips

2. Pinning information

Table 2. Pinning

Pin	Symbol	Description	Simplified outline	Graphic Symbol
1	D	drain	 SOT457 (TSOP6)	 mbb076
2	D	drain		
3	G	gate		
4	S	source		
5	D	drain		
6	D	drain		

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMN38EN	TSOP6	plastic surface-mounted package (TSOP6); 6 leads	SOT457

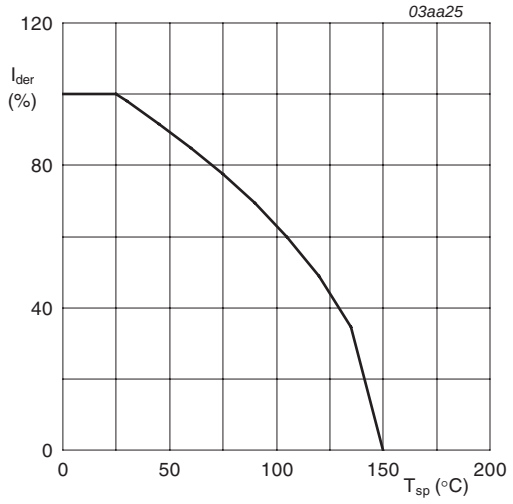
4. Limiting values

Table 4. Limiting values

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

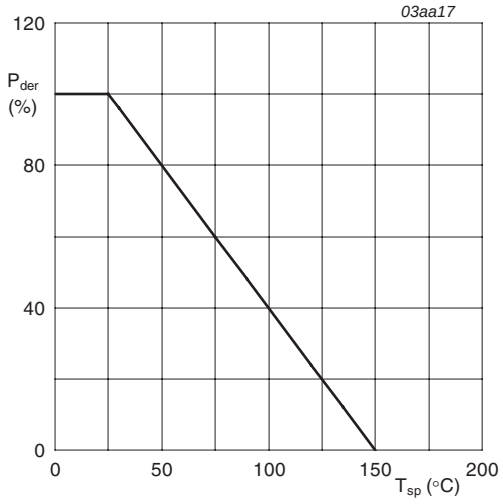
Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25$ °C; $T_j \leq 150$ °C	-	30	V
V_{GS}	gate-source voltage		-20	20	V
I_D	drain current	T_{sp} = 100 °C; V_{GS} = 10 V; see Figure 1	-	3.4	A
		T_{sp} = 25 °C; V_{GS} = 10 V; see Figure 1 and 3	-	5.4	A
I_{DM}	peak drain current	T_{sp} = 25 °C; $t_p \leq 10$ μs; pulsed; see Figure 3	-	21.6	A
P_{tot}	total power dissipation	T_{sp} = 25 °C; see Figure 2	-	1.75	W
T_{stg}	storage temperature		-55	150	°C
T_j	junction temperature		-55	150	°C
Source-drain diode					
I_S	source current	T_{sp} = 25 °C	-	1.45	A
I_{SM}	peak source current	T_{sp} = 25 °C; t_p = 10 μs; pulsed	-	5.8	A

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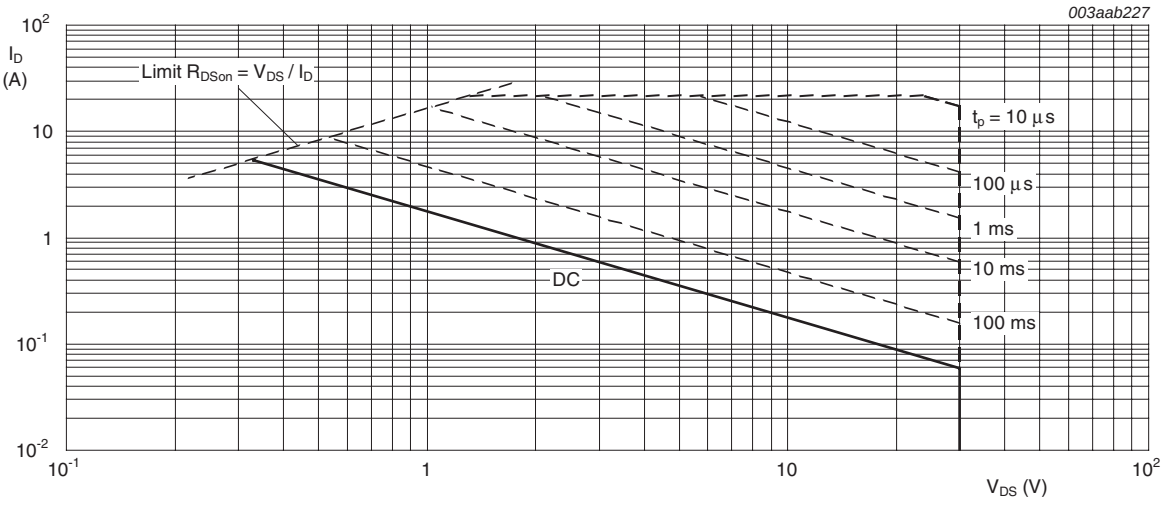
$$I_{der} = \frac{I_D}{I_{D(25°C)}} \times 100\ \%$$

Fig 1. Normalized continuous drain current as a function of solder point temperature



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

Fig 2. Normalized total power dissipation as a function of solder point temperature



T_{sp} = 25 °C; I_{DM} is single pulse

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

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5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-sp)}$	thermal resistance from junction to solder point	see Figure 4	[1]	-	-	70	K/W

[1] Mounted on a metal clad board

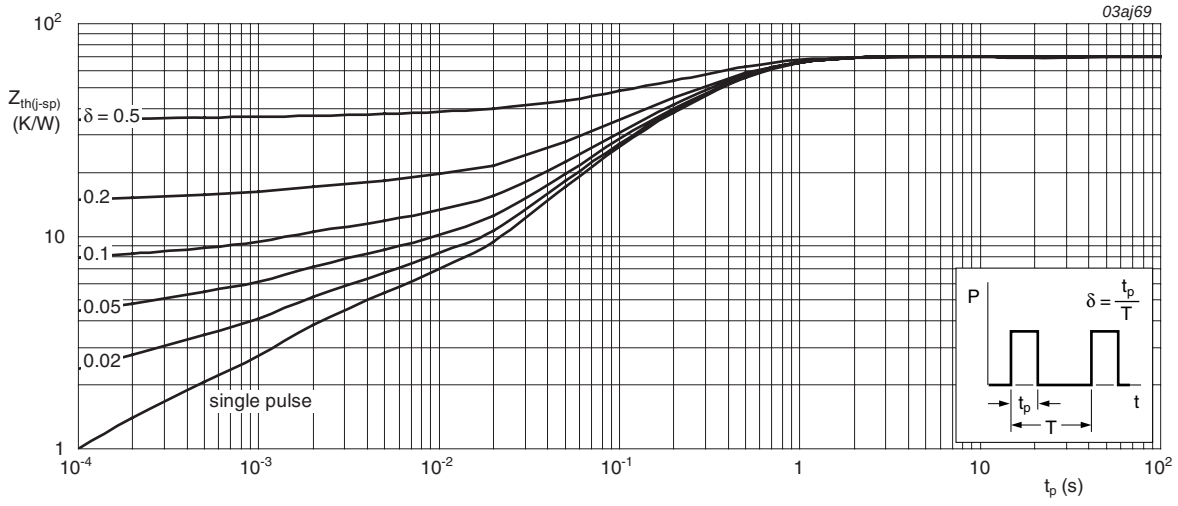


Fig 4. Transient thermal impedance from junction to solder point as a function of pulse duration

6. Characteristics

Table 6. Characteristics

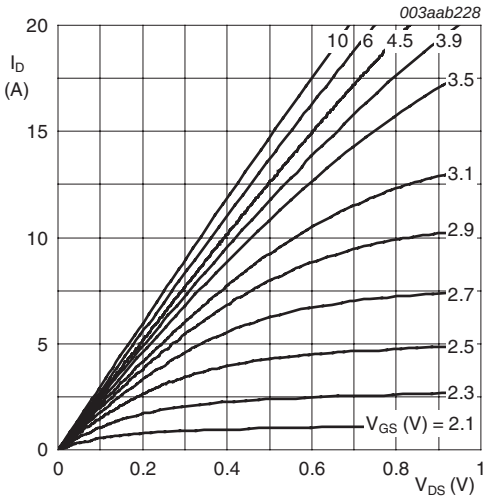
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = 250 μA; V_{GS} = 0 V; T_j = -55 °C	27	-	-	V
		I_D = 250 μA; V_{GS} = 0 V; T_j = 25 °C	30	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	I_D = 1 mA; V_{DS} = V_{GS}; T_j = 150 °C	0.6	-	-	V
		I_D =1 mA; V_{DS} = V_{GS}; T_j = -55 °C	-	-	2.2	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = 25 °C; see Figure 7	1	1.5	2	V
I_{DSS}	drain leakage current	V_{DS} = 30 V; V_{GS} = 0 V; T_j = 25 °C	-	0.01	0.1	μA
		V_{DS} = 30 V; V_{GS} = 0 V; T_j = 150 °C	-	-	10	μA

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Table 6. Characteristics *…continued*

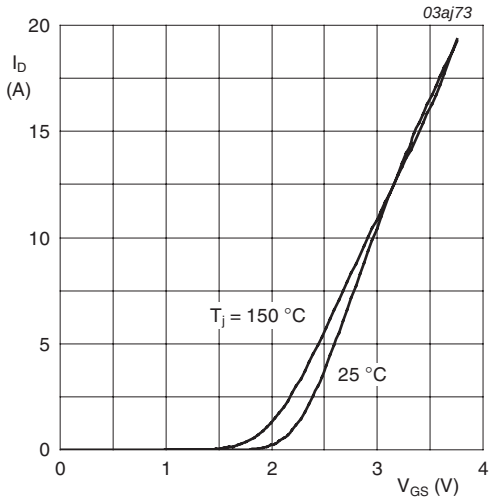
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{GSS}	gate leakage current	V_{GS} = +20 V; V_{DS} = 0 V; T_j = 25 °C	-	10	100	nA
		V_{GS} = -20 V; V_{DS} = 0 V; T_j = 25 °C	-	10	100	nA
R_{DSon}	drain-source on-state resistance	V_{GS} = 10 V; I_D = 3 A; T_j = 150 °C	-	49.6	60.9	mΩ
		V_{GS} = 4.5 V; I_D = 2.8 A; T_j = 25 °C; see Figure 8 and 9	-	38	46	mΩ
		V_{GS} = 10 V; I_D = 3 A; T_j = 25 °C; see Figure 8 and 9	-	31	38	mΩ
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	I_D = 5 A; V_{DS} = 15 V; V_{GS} = 4.5 V; T_j = 25 °C; see Figure 10 and 11	-	6.1	-	nC
Q_{GS}	gate-source charge	I_D = 5 A; V_{DS} = 15 V; V_{GS} = 4.5 V; T_j = 25 °C; see Figure 10 and 11	-	1.7	-	nC
Q_{GD}	gate-drain charge	I_D = 5 A; V_{DS} = 15 V; V_{GS} = 4.5 V; T_j = 25 °C; see Figure 10 and 11	-	2.35	-	nC
C_{iss}	input capacitance	V_{DS} = 25 V; V_{GS} = 0 V; f = 1 MHz; T_j = 25 °C; see Figure 12	-	495	-	pF
C_{oss}	output capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz; T_j = 25 °C; see Figure 12	-	100	-	pF
C_{rss}	reverse transfer capacitance	V_{DS} = 25 V; V_{GS} = 0 V; f = 1 MHz; T_j = 25 °C; see Figure 12	-	70	-	pF
$t_{d(on)}$	turn-on delay time	$R_{G(ext)}$ = 6 Ω; R_L = 12 Ω; V_{DS} = 15 V; V_{GS} = 4.5 V; T_j = 25 °C	-	14	-	ns
t_r	rise time	$R_{G(ext)}$ = 6 Ω; R_L = 12 Ω; V_{DS} = 15 V; V_{GS} = 4.5 V; T_j = 25 °C	-	19	-	ns
$t_{d(off)}$	turn-off delay time	V_{DS} = 15 V; R_L = 12 Ω; V_{GS} = 4.5 V; $R_{G(ext)}$ = 6 Ω; T_j = 25 °C	-	28	-	ns
t_f	fall time	$R_{G(ext)}$ = 6 Ω; R_L = 12 Ω; V_{DS} = 15 V; V_{GS} = 4.5 V; T_j = 25 °C	-	16	-	ns
Source-drain diode						
V_{SD}	source-drain voltage	I_S = 1.7 A; V_{GS} = 0 V; T_j = 25 °C; see Figure 13	-	0.75	1.2	V
t_{rr}	reverse recovery time	I_S = 2.3 A; dI_S/dt = 100 A/µs; V_{GS} = 0 V; V_{DS} = 30 V; T_j = 25 °C	-	22	-	ns

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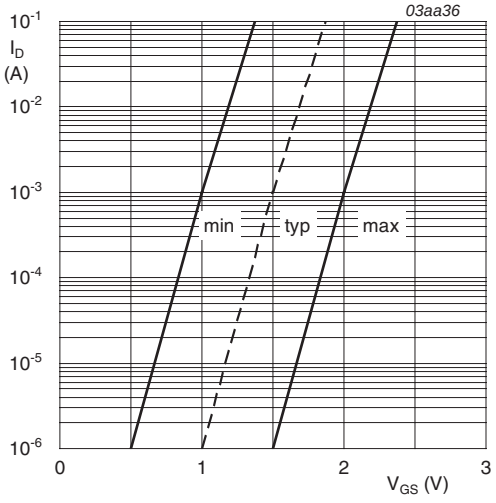
$T_j = 25\ °C$

Fig 5. Output characteristics: drain current as a function of drain-source voltage; typical values



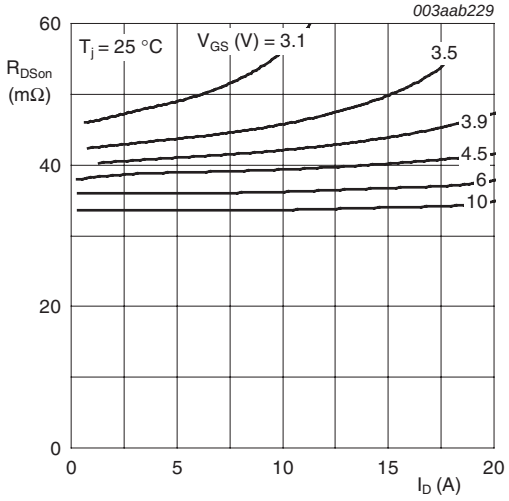
$V_{DS} > I_D \times R_{DSon}$

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



$T_j = 25\ °C; V_{DS} = V_{GS}$

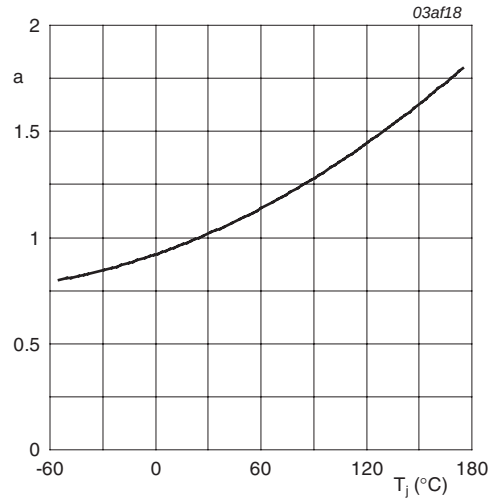
Fig 7. Sub-threshold drain current as a function of gate-source voltage



$T_j = 25\ °C$

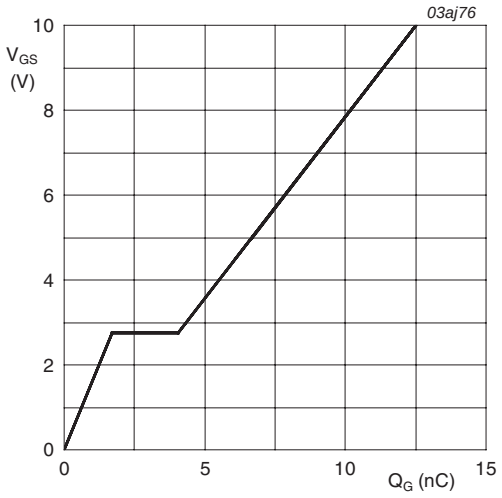
Fig 8. Drain-source on-state resistance as a function of drain current; typical values

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

Fig 9. Normalized drain-source on-state resistance factor as a function of junction temperature



$I_D = 5\ A; T_j = 25\ °C; V_{DS} = 15\ V$

Fig 10. Gate-source voltage as a function of gate charge; typical values

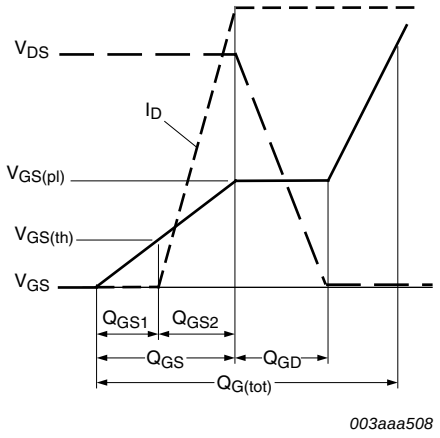
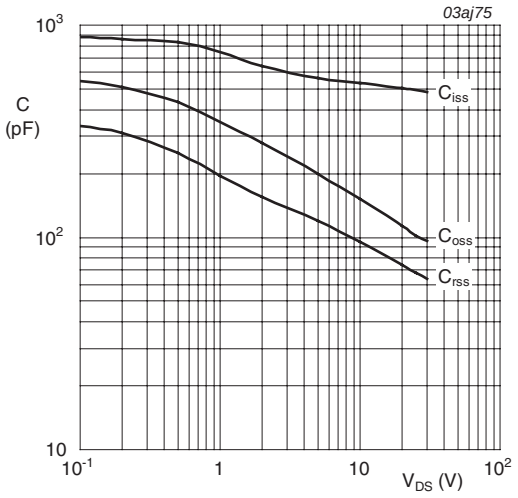


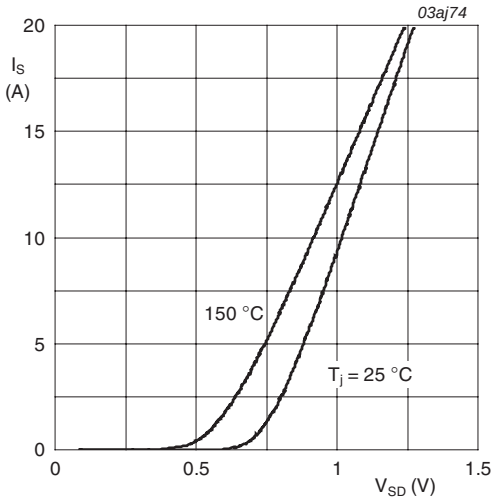
Fig 11. Gate charge waveform definitions



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

Fig 12. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

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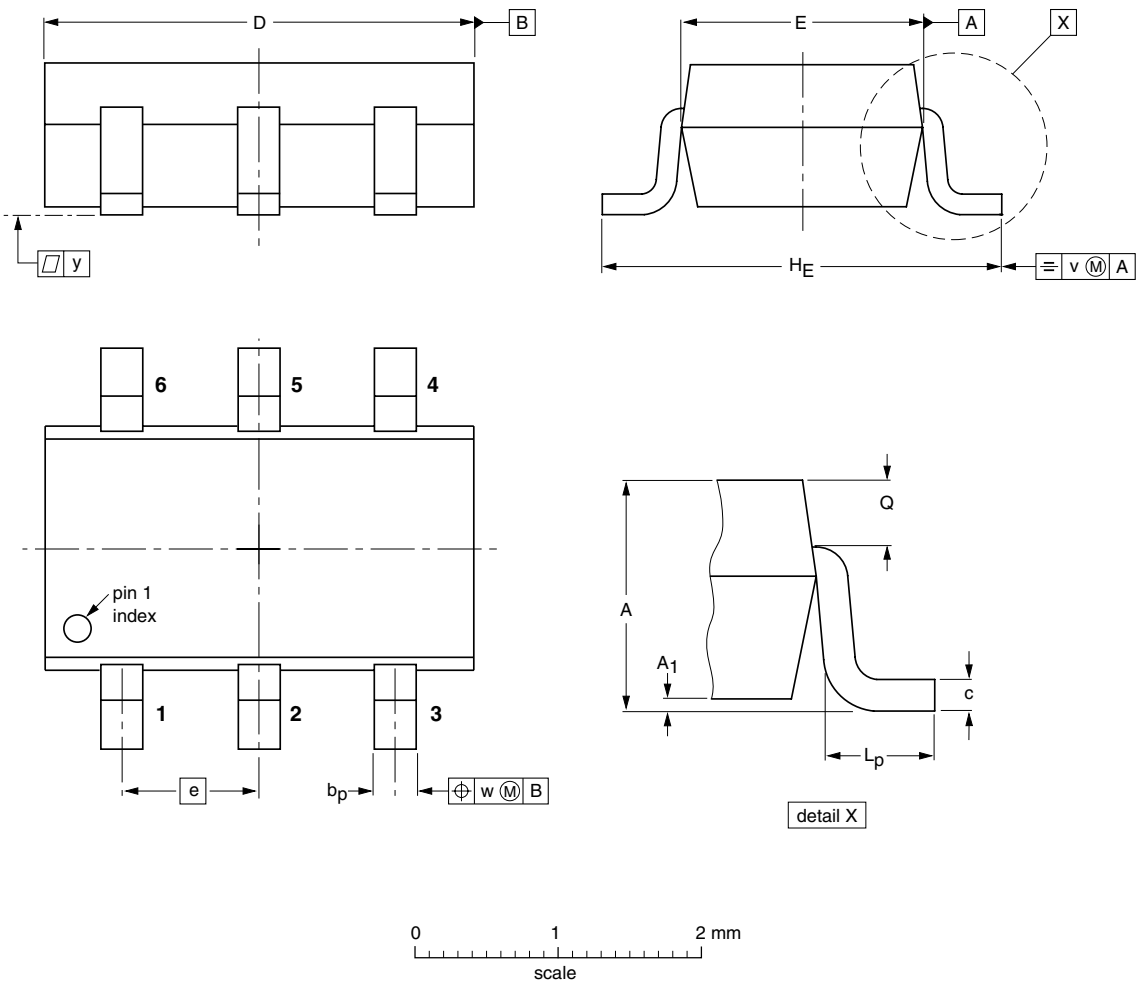
V_{GS} = 0 V

Fig 13. Source current as a function of source-drain voltage; typical values

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7. Package outline

Plastic surface-mounted package (TSOP6); 6 leads **SOT457**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b_p	c	D	E	e	H_E	L_p	Q	v	w	y
mm	1.1 0.9	0.1 0.013	0.40 0.25	0.26 0.10	3.1 2.7	1.7 1.3	0.95	3.0 2.5	0.6 0.2	0.33 0.23	0.2	0.2	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT457			SC-74			~~05-11-07~~ 06-03-16

Fig 14. Package outline SOT457 (TSOP6)

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8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PMN38EN_2	20071003	Product data sheet	-	PMN38EN_1
Modifications:	• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the company name where appropriate.			
PMN38EN_1	20060113	Product data sheet	-	-

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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.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

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