

PSMN063-150D

N-channel TrenchMOS SiliconMAX standard level FET

Rev. 04 — 17 December 2009

Product data sheet

1. Product profile

1.1 General description

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

1.2 Features and benefits

- Higher operating power due to low thermal resistance
- Low conduction losses due to low on-state resistance
- Suitable for high frequency applications due to fast switching characteristics

1.3 Applications

- DC-to-DC converters
- Switched-mode power supplies

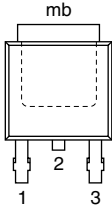
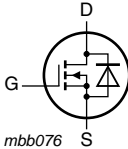
1.4 Quick reference data

Table 1. Quick reference

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25\text{ °C}; T_j \leq 175\text{ °C}$	-	-	150	V
I_D	drain current	$T_{mb} = 25\text{ °C}; V_{GS} = 10\text{ V};$ see Figure 1 and 3	-	-	29	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C};$ see Figure 2	-	-	150	W
Static characteristics						
R_{DSon}	drain-source on-state resistance	$V_{GS} = 10\text{ V}; I_D = 15\text{ A};$ $T_j = 25\text{ °C};$ see Figure 10 and 11	-	60	63	mΩ

2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate		
2	D	drain [1]		
3	S	source		
mb	D	mounting base; connected to drain		

SOT428 (DPAK)

[1] It is not possible to make a connection to pin 2.

3. Ordering information

Table 3. Ordering information

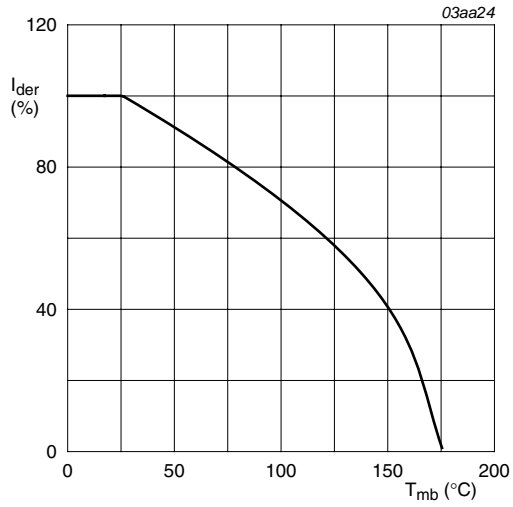
Type number	Package		Version
	Name	Description	
PSMN063-150D	DPAK	plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped)	SOT428

4. Limiting values

Table 4. Limiting values

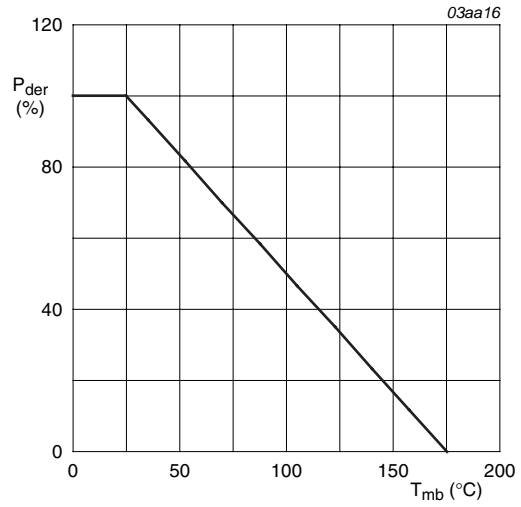
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25\text{ °C}$; $T_j \leq 175\text{ °C}$	-	150	V
V_{DGR}	drain-gate voltage	$T_j \geq 25\text{ °C}$; $T_j \leq 175\text{ °C}$; $R_{GS} = 20\text{ k}\Omega$	-	150	V
V_{GS}	gate-source voltage		-20	20	V
I_D	drain current	$V_{GS} = 10\text{ V}$; $T_{mb} = 100\text{ °C}$; see Figure 1 and 3	-	20	A
		$V_{GS} = 10\text{ V}$; $T_{mb} = 25\text{ °C}$; see Figure 1 and 3	-	29	A
I_{DM}	peak drain current	$t_p \leq 10\text{ }\mu\text{s}$; pulsed; $T_{mb} = 25\text{ °C}$; see Figure 3	-	116	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}$; see Figure 2	-	150	W
T_{stg}	storage temperature		-55	175	°C
T_j	junction temperature		-55	175	°C
Source-drain diode					
I_S	source current	$T_{mb} = 25\text{ °C}$	-	29	A
I_{SM}	peak source current	$t_p \leq 10\text{ }\mu\text{s}$; pulsed; $T_{mb} = 25\text{ °C}$	-	116	A
Avalanche ruggedness					
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10\text{ V}$; $T_{j(init)} = 25\text{ °C}$; $I_D = 26\text{ A}$; $V_{sup} \leq 25\text{ V}$; $t_p = 0.2\text{ ms}$; unclamped; $R_{GS} = 50\text{ }\Omega$	-	502	mJ
I_{AS}	non-repetitive avalanche current	$V_{sup} \leq 25\text{ V}$; $V_{GS} = 10\text{ V}$; $T_{j(init)} = 25\text{ °C}$; $R_{GS} = 50\text{ }\Omega$; unclamped	-	29	A



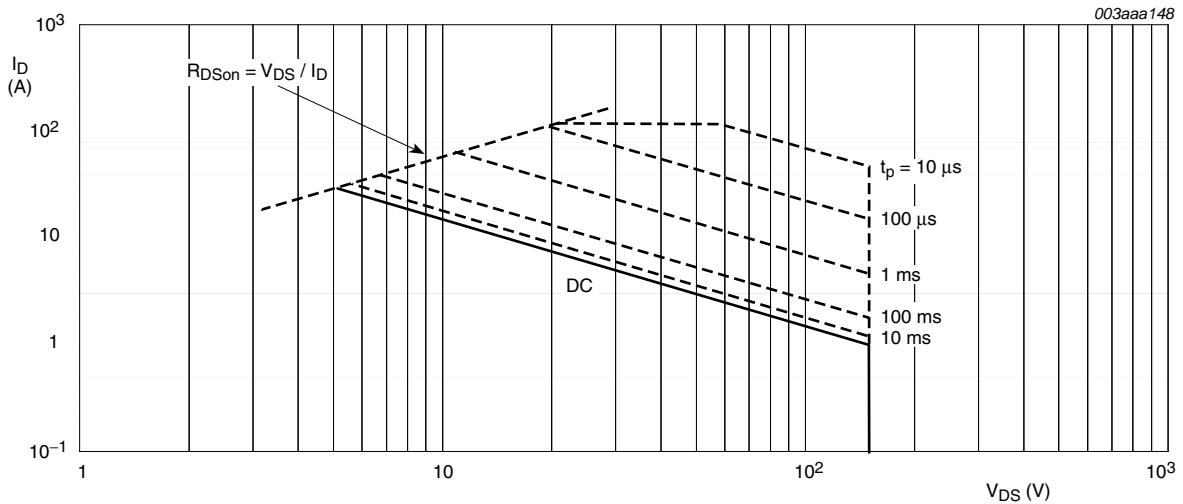
$$I_{der} = \frac{I_D}{I_{D(25^\circ\text{C})}} \times 100\%$$

Fig 1. Normalized continuous drain current as a function of mounting base temperature



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

Fig 2. Normalized total power dissipation as a function of mounting base temperature



$T_{mb} = 25^\circ\text{C}; I_{DM}$ is single pulse

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

5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	see Figure 4	-	-	1	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	vertical in still air	-	50	-	K/W

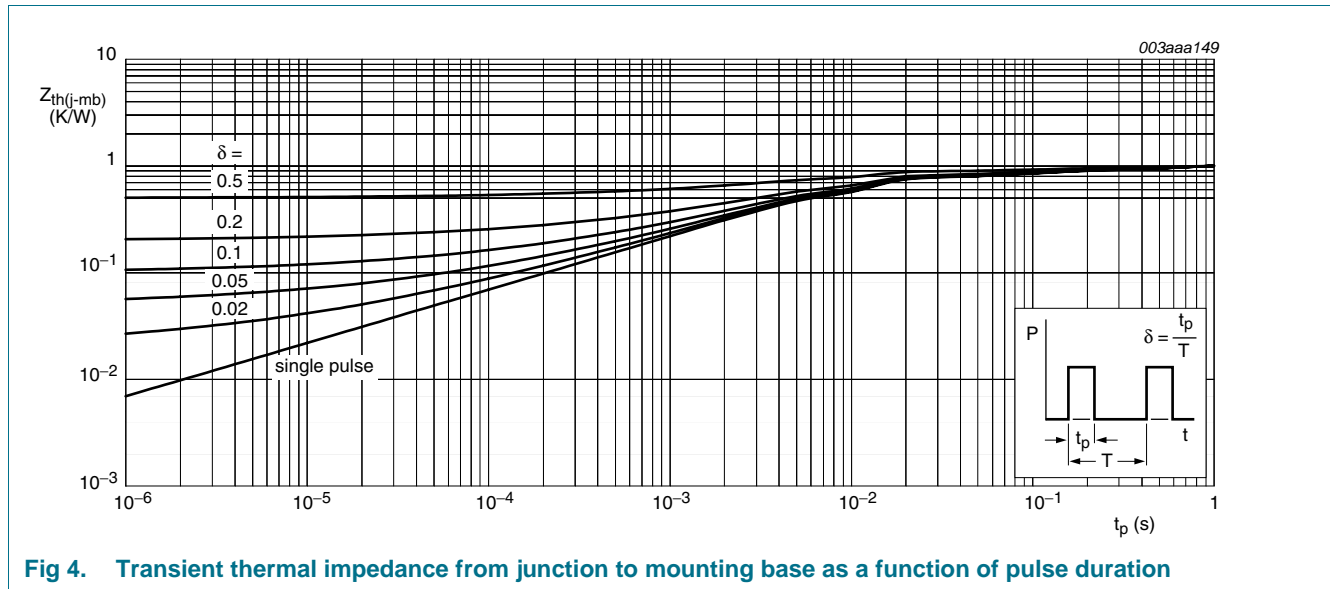


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu\text{A}; V_{GS} = 0 \text{ V}; T_j = -55 \text{ }^\circ\text{C}$	133	-	-	V
		$I_D = 250 \mu\text{A}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	150	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 175 \text{ }^\circ\text{C}$; see Figure 9	1	-	-	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = -55 \text{ }^\circ\text{C}$; see Figure 9	-	-	6	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ\text{C}$; see Figure 9	2	3	4	V
I_{DSS}	drain leakage current	$V_{DS} = 150 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	0.05	10	μA
		$V_{DS} = 150 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 175 \text{ }^\circ\text{C}$	-	-	500	μA
I_{GSS}	gate leakage current	$V_{GS} = 10 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	0.02	100	nA
		$V_{GS} = -10 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	0.02	100	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 15 \text{ A}; T_j = 175 \text{ }^\circ\text{C}$; see Figure 10 and 11	-	-	176	m Ω
		$V_{GS} = 10 \text{ V}; I_D = 15 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$; see Figure 10 and 11	-	60	63	m Ω
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	$I_D = 30 \text{ A}; V_{DS} = 120 \text{ V}; V_{GS} = 10 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$; see Figure 12	-	55	-	nC
Q_{GS}	gate-source charge	$I_D = 30 \text{ A}; V_{DS} = 120 \text{ V}; V_{GS} = 120 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$; see Figure 12	-	10	-	nC
Q_{GD}	gate-drain charge	$I_D = 30 \text{ A}; V_{DS} = 120 \text{ V}; V_{GS} = 10 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$; see Figure 12	-	20	27	nC
C_{iss}	input capacitance	$V_{DS} = 25 \text{ V}; V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}; T_j = 25 \text{ }^\circ\text{C}$; see Figure 13	-	2390	-	pF
C_{oss}	output capacitance		-	240	-	pF
C_{rss}	reverse transfer capacitance		-	98	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 75 \text{ V}; R_L = 2.7 \text{ } \Omega; V_{GS} = 10 \text{ V}; R_{G(ext)} = 5.6 \text{ } \Omega; T_j = 25 \text{ }^\circ\text{C}$	-	14	-	ns
t_r	rise time		-	50	-	ns
$t_{d(off)}$	turn-off delay time		-	48	-	ns
t_f	fall time		-	38	-	ns
Source-drain diode						
V_{SD}	source-drain voltage	$I_S = 25 \text{ A}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$; see Figure 14	-	0.9	1.2	V
t_{rr}	reverse recovery time	$I_S = 20 \text{ A}; di_S/dt = -100 \text{ A}/\mu\text{s}; V_{GS} = 0 \text{ V}; V_{DS} = 25 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	105	-	ns
Q_r	recovered charge		-	0.55	-	μC

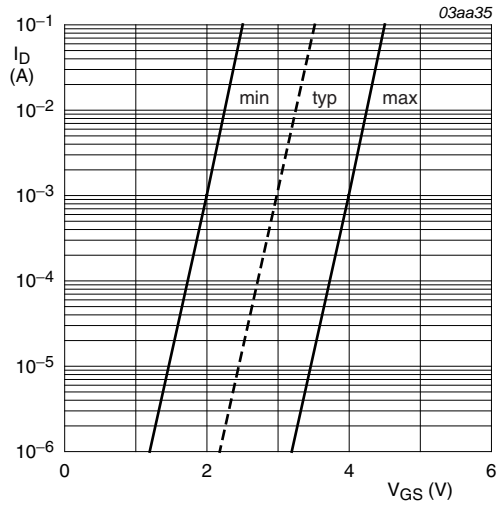


Fig 5. Sub-threshold drain current as a function of gate-source voltage

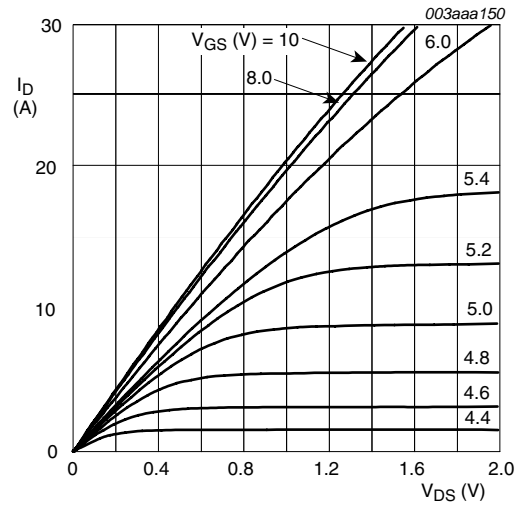


Fig 6. Output characteristics: drain current as a function of drain-source voltage; typical values

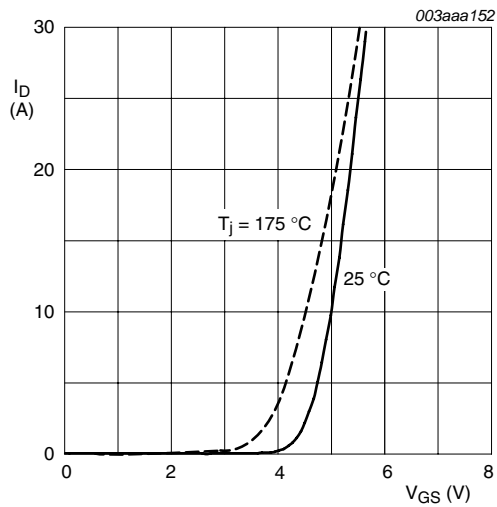


Fig 7. Transfer characteristics: drain current as a function of gate-source voltage; typical values

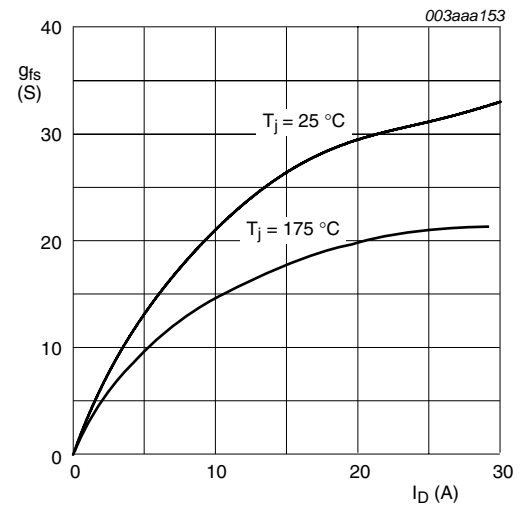
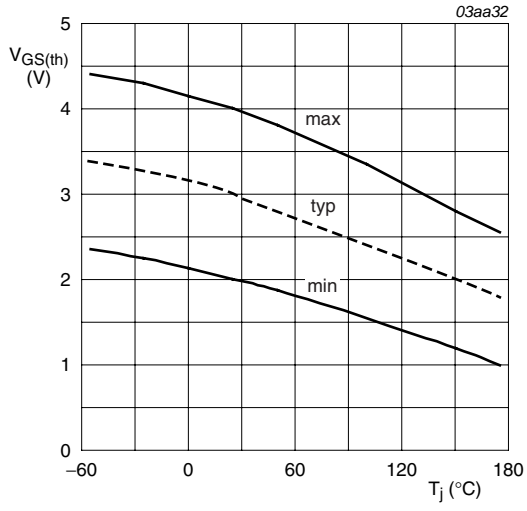
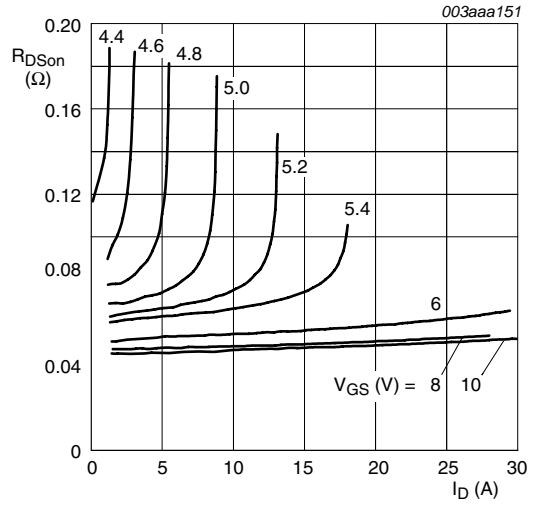


Fig 8. Forward transconductance as a function of drain current; typical values



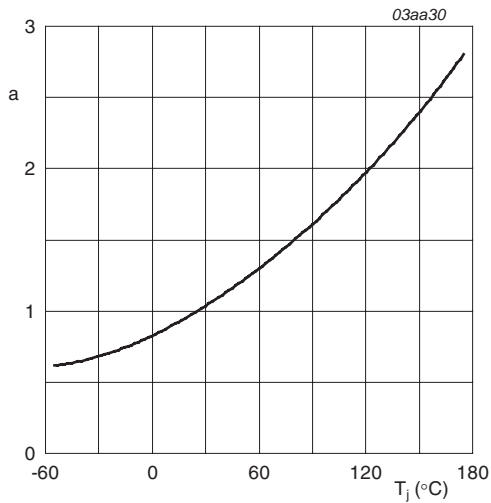
$$I_D = 1\text{ mA}; V_{DS} = V_{GS}$$

Fig 9. Gate-source threshold voltage as a function of junction temperature



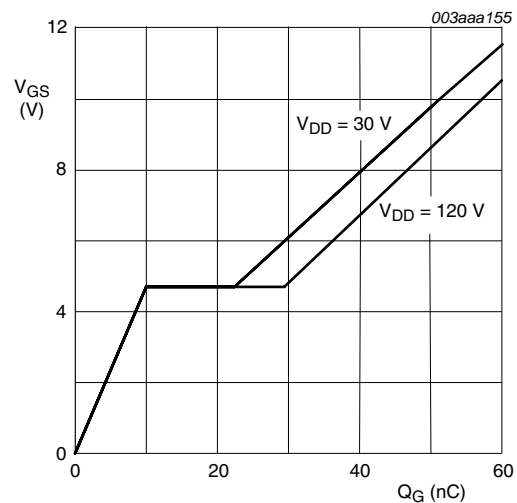
$$T_j = 25^\circ\text{C}$$

Fig 10. Drain-source on-state resistance as a function of drain current; typical values



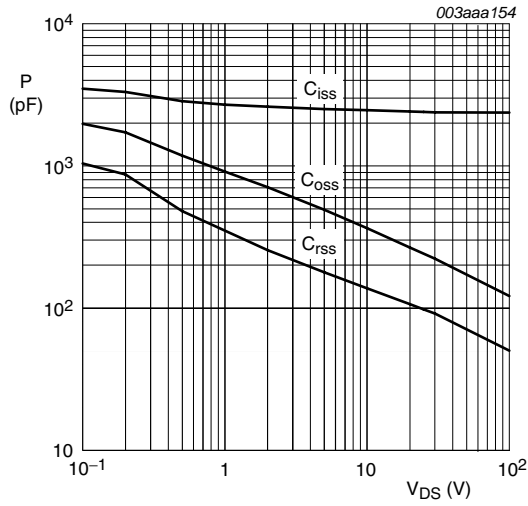
$$a = \frac{R_{DSon}}{R_{DSon(25^\circ\text{C})}}$$

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



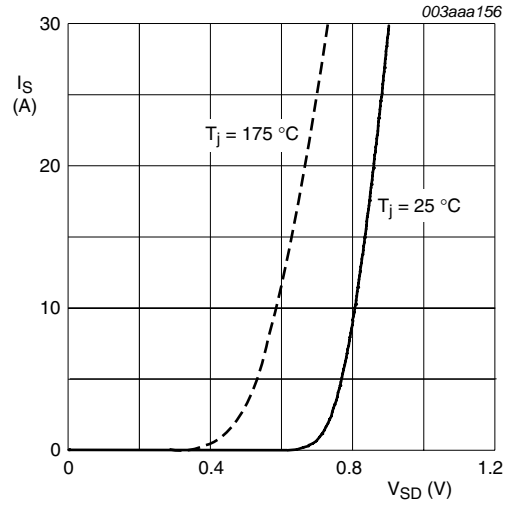
$$I_D = 30\text{ A}; V_{DS} = 30\text{ V and } 120\text{ V}$$

Fig 12. Gate-source voltage as a function of gate charge; typical values



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

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



$T_j = 25^{\circ}C \text{ and } 175^{\circ}C; V_{GS} = 0V$

Fig 14. Source current as a function of source-drain voltage; typical values

7. Package outline

Plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped)

SOT428

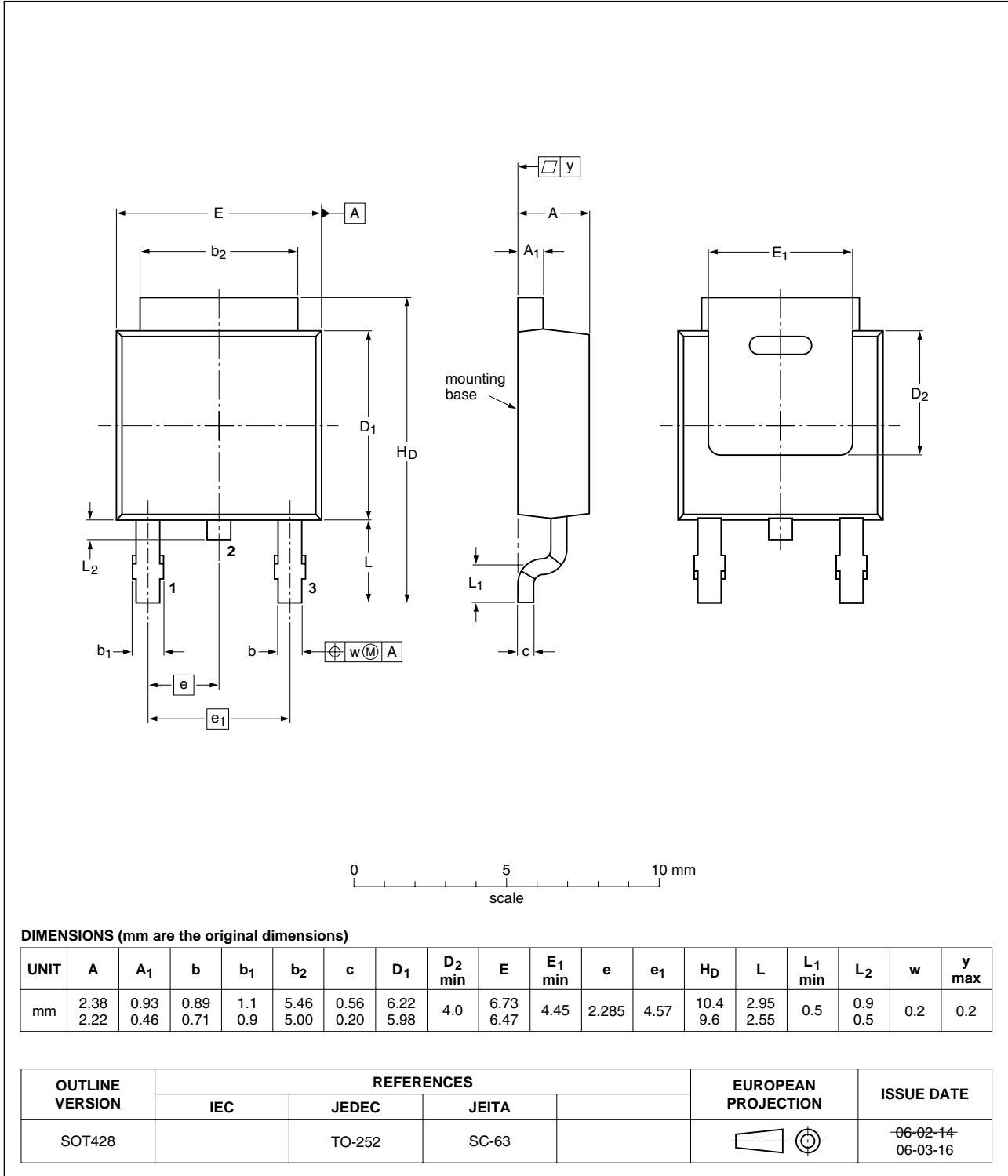


Fig 15. Package outline SOT428 (DPAK)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PSMN063-150D_4	20091217	Product data sheet	-	PSMN063_150D-03
Modifications:		<ul style="list-style-type: none">• 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 new company name where appropriate.		
PSMN063_150D-03 (9397 750 08594)	20011031	Product data	-	PSMN063-150D_2
PSMN063-150D_2	19990801	Product specification	-	PSMN063-150D_1
PSMN063-150D_1	19990201	Objective specification	-	-

9. Legal information

9.1 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.
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".

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