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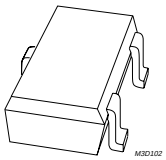


PMF280UN

N-channel µTrenchMOS™ ultra low level FET

Rev. 01 — 27 February 2004 **Product data**

1. Product profile

1.1 Description

N-channel enhancement mode field-effect transistor in a plastic package using TrenchMOS™ technology.

1.2 Features

- Surface mounted package
- Low on-state resistance
- Footprint 40% smaller than SOT23
- Low threshold voltage.

1.3 Applications

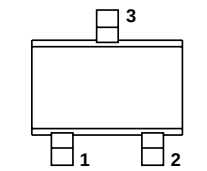
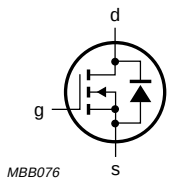
- Driver circuits
- Switching in portable appliances.

1.4 Quick reference data

- $V_{DS} \leq 20$ V
- $P_{tot} \leq 0.56$ W
- $I_D \leq 1.02$ A
- $R_{DSon} \leq 340$ mΩ.

2. Pinning information

Table 1: Pinning - SOT323 (SC-70), simplified outline and symbol

Pin	Description	Simplified outline	Symbol
1	gate (g)	 Top view MBC870 **SOT323 (SC-70)**	
2	source (s)		
3	drain (d)		

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3. Ordering information

Table 2: Ordering information

Type number	Package		
	Name	Description	Version
PMF280UN	SC-70	Plastic surface mounted package; 3 leads	SOT323

4. Limiting values

Table 3: Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage (DC)	25 °C ≤ T_j ≤ 150 °C	-	20	V
V_{DGR}	drain-gate voltage (DC)	25 °C ≤ T_j ≤ 150 °C; R_{GS} = 20 kΩ	-	20	V
V_{GS}	gate-source voltage (DC)		-	±8	V
I_D	drain current (DC)	T_{sp} = 25 °C; V_{GS} = 4.5 V; Figure 2 and 3	-	1.02	A
		T_{sp} = 100 °C; V_{GS} = 4.5 V; Figure 2	-	0.64	A
I_{DM}	peak drain current	T_{sp} = 25 °C; pulsed; t_p ≤ 10 μs; Figure 3	-	2.04	A
P_{tot}	total power dissipation	T_{sp} = 25 °C; Figure 1	-	0.56	W
T_{stg}	storage temperature		–55	+150	°C
T_j	junction temperature		–55	+150	°C
Source-drain diode					
I_S	source (diode forward) current (DC)	T_{sp} = 25 °C	-	0.47	A
I_{SM}	peak source (diode forward) current	T_{sp} = 25 °C; pulsed; t_p ≤ 10 μs	-	0.94	A

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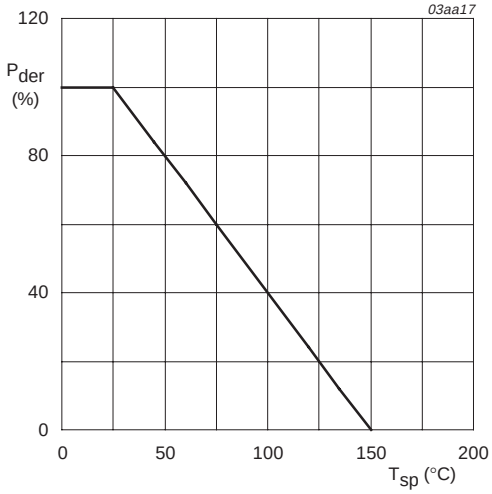
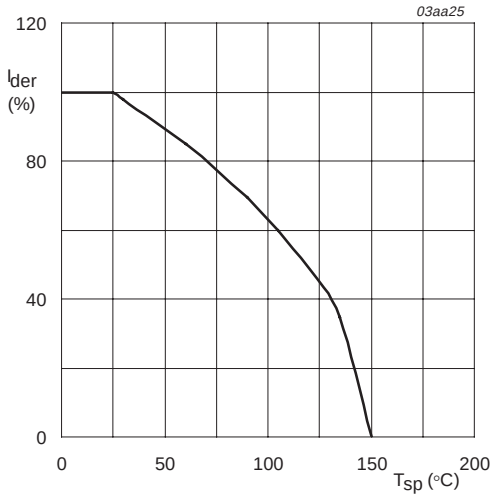


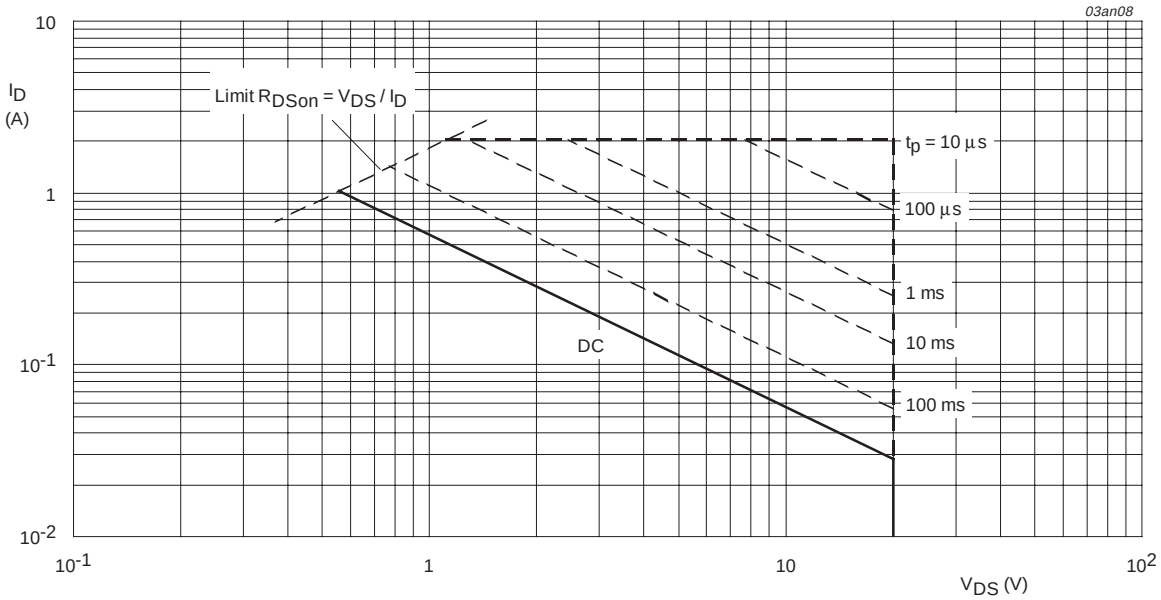
$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}C)}} \times 100\%$$

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



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

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



T_{sp} = 25 °C; I_{DM} is single pulse; V_{GS} = 4.5 V

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 4: Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-sp)}$	thermal resistance from junction to solder point	Figure 4	-	-	220	K/W

5.1 Transient thermal impedance

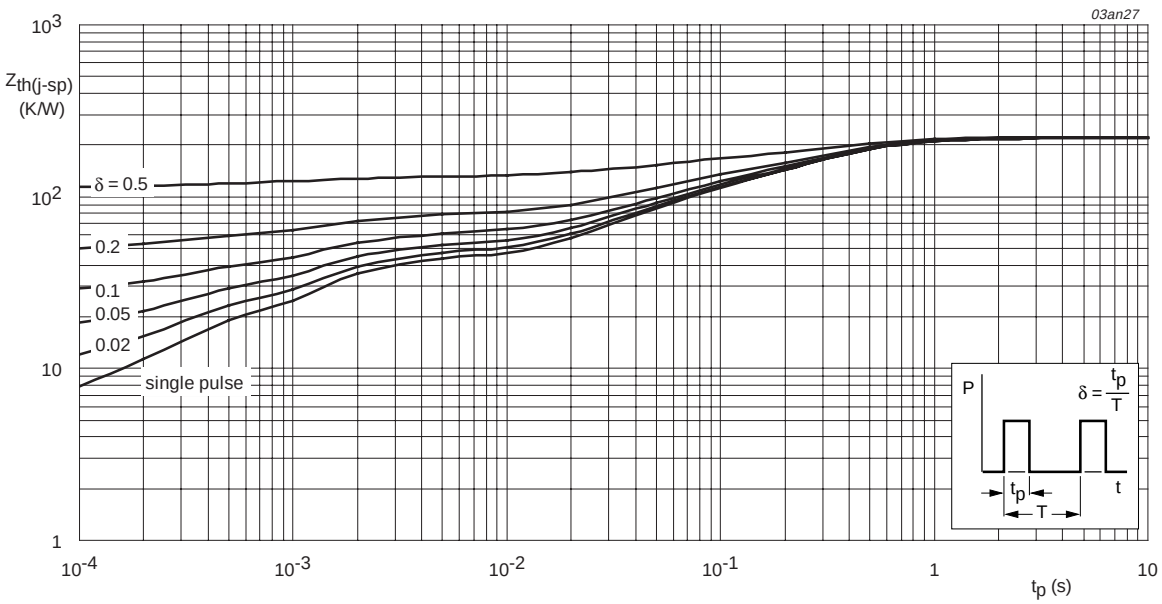

Fig 4. Transient thermal impedance from junction to solder point as a function of pulse duration.

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6. Characteristics

Table 5: Characteristics

T_j = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = 1 μA; V_{GS} = 0 V				
		T_j = 25 °C	20	-	-	V
		T_j = –55 °C	18	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	I_D = 0.25 mA; V_{DS} = V_{GS}; Figure 9				
		T_j = 25 °C	0.45	0.7	1	V
		T_j = 150 °C	0.25	-	-	V
		T_j = –55 °C	-	-	1.2	V
I_{DSS}	drain-source leakage current	V_{DS} = 20 V; V_{GS} = 0 V				
		T_j = 25 °C	-	-	1	μA
		T_j = 150 °C	-	-	100	μA
I_{GSS}	gate-source leakage current	V_{GS} = ±8 V; V_{DS} = 0 V	-	10	100	nA
R_{DSon}	drain-source on-state resistance	V_{GS} = 4.5 V; I_D = 0.2 A; Figure 7 and 8				
		T_j = 25 °C	-	280	340	mΩ
		T_j = 150 °C	-	448	544	mΩ
		V_{GS} = 2.5 V; I_D = 0.1 A; Figure 7 and 8	-	360	430	mΩ
		V_{GS} = 1.8 V; I_D = 0.075 A; Figure 7 and 8	-	460	660	mΩ
Dynamic characteristics						
$Q_{g(tot)}$	total gate charge	I_D = 1 A; V_{DD} = 10 V; V_{GS} = 4.5 V; Figure 13	-	0.89	-	nC
Q_{gs}	gate-source charge		-	0.13	-	nC
Q_{gd}	gate-drain (Miller) charge		-	0.18	-	nC
C_{iss}	input capacitance	V_{GS} = 0 V; V_{DS} = 20 V; f = 1 MHz; Figure 11	-	45	-	pF
C_{oss}	output capacitance		-	11	-	pF
C_{rss}	reverse transfer capacitance		-	7	-	pF
$t_{d(on)}$	turn-on delay time	V_{DD} = 10 V; R_L = 10 Ω; V_{GS} = 4.5 V; R_G = 6 Ω	-	4.5	-	ns
t_r	rise time		-	10	-	ns
$t_{d(off)}$	turn-off delay time		-	18.5	-	ns
t_f	fall time		-	5	-	ns
Source-drain diode						
V_{SD}	source-drain (diode forward) voltage	I_S = 0.3 A; V_{GS} = 0 V; Figure 12	-	0.83	1.2	V

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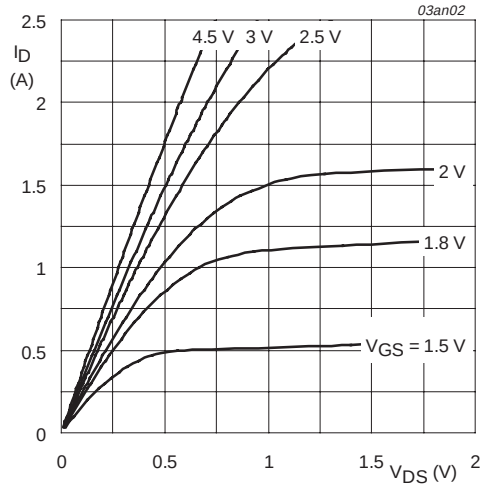
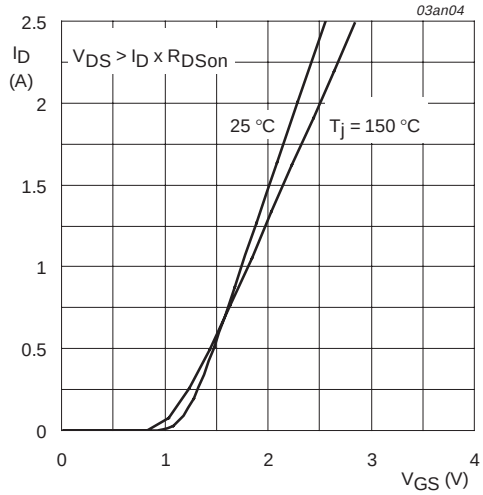


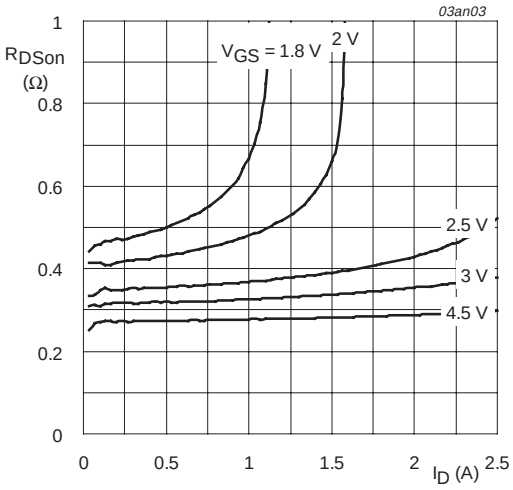
T_j = 25 °C

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



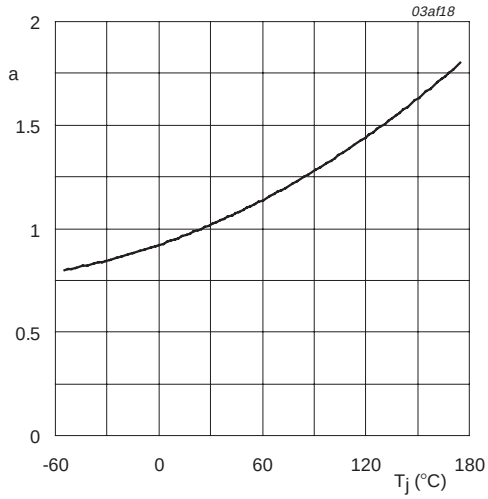
T_j = 25 °C and 150 °C; V_{DS} > I_D x R_{DSon}

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



T_j = 25 °C

Fig 7. Drain-source on-state resistance as a function of drain current; typical values.



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

Fig 8. Normalized drain-source on-state resistance factor as a function of junction temperature.

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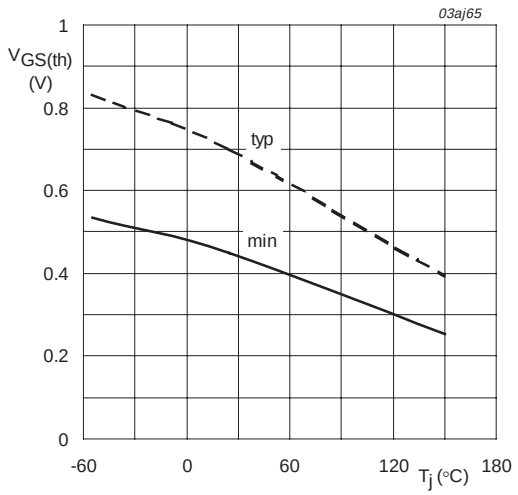
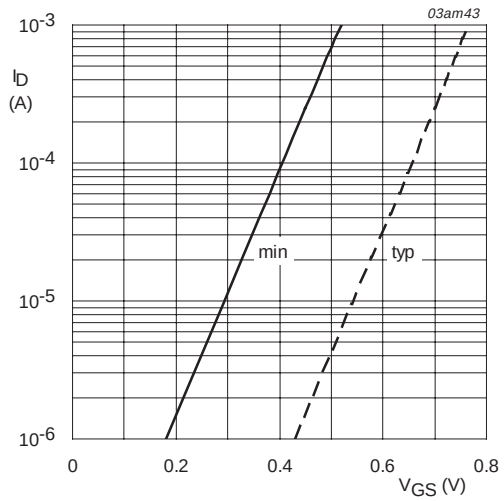


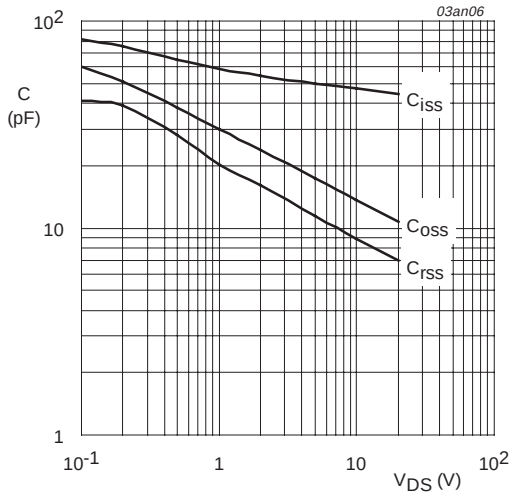
I_D = 0.25 mA; V_{DS} = V_{GS}

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



T_j = 25 °C; V_{DS} = 5 V

Fig 10. Sub-threshold drain current as a function of gate-source voltage.



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

Fig 11. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values.

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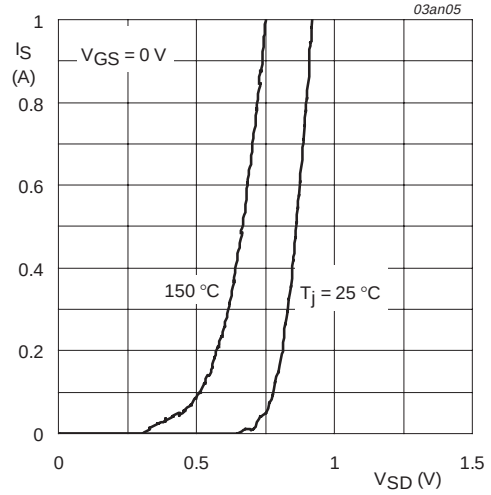
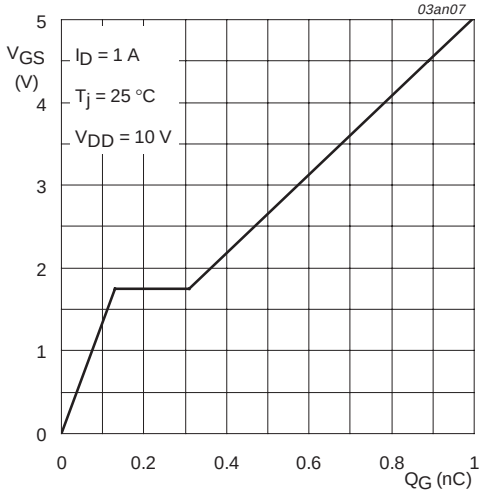


T_j = 25 °C and 150 °C; V_{GS} = 0 V

Fig 12. Source (diode forward) current as a function of source-drain (diode forward) voltage; typical values.



I_D = 1 A; V_{DD} = 10 V

Fig 13. Gate-source voltage as a function of gate charge; typical values.

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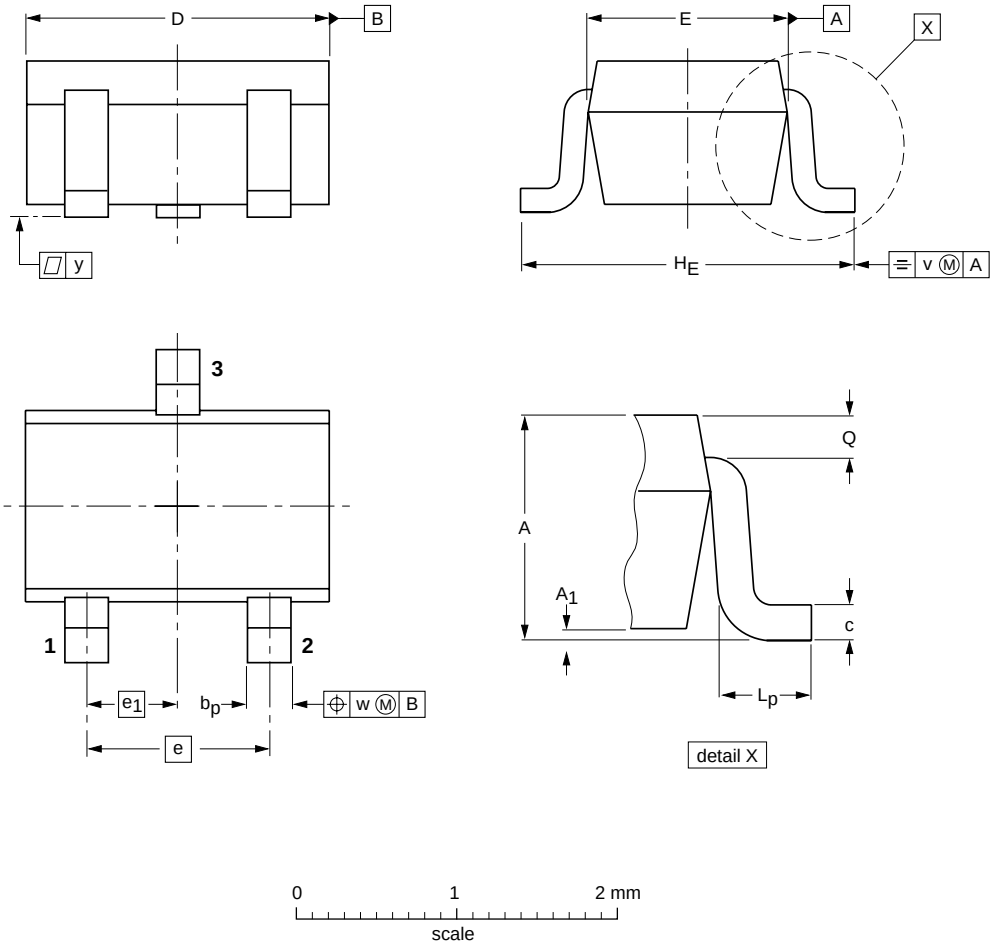
7. Package outline

Plastic surface mounted package; 3 leads **SOT323**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1 max	b_p	c	D	E	e	e_1	H_E	L_p	Q	v	w
mm	1.1 0.8	0.1	0.4 0.3	0.25 0.10	2.2 1.8	1.35 1.15	1.3	0.65	2.2 2.0	0.45 0.15	0.23 0.13	0.2	0.2

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT323			SC-70			97-02-28

Fig 14. SOT323 (SC-70).

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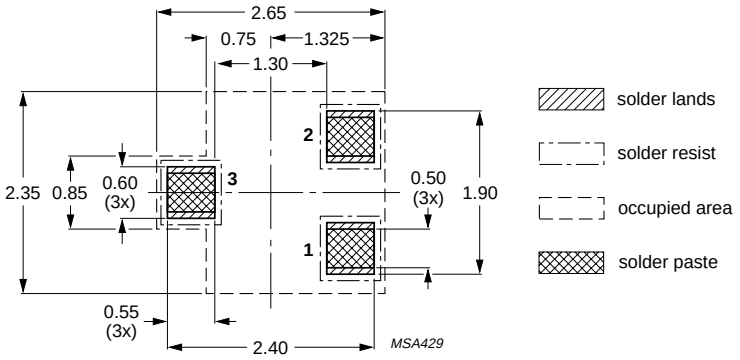
8. Soldering



Dimensions in mm.

Fig 15. Reflow soldering footprint for SOT323 (SC-70).

9. Revision history

Table 6: Revision history

Rev	Date	CPCN	Description
01	20040227	-	Product data (9397 750 12768).

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10. Data sheet status

Level	Data sheet status[1]	Product status[2][3]	Definition
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
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