



PHP225

Dual P-channel intermediate level FET

Rev. 04 — 17 March 2011

Product data sheet

1. Product profile

1.1 General description

Dual intermediate level P-channel enhancement mode Field-Effect Transistor (FET) in a plastic package using vertical D-MOS technology. This product is designed and qualified for use in computing, communications, consumer and industrial applications only.

1.2 Features and benefits

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

1.3 Applications

- Motor and actuator drivers
- Synchronized rectification
- Power management

1.4 Quick reference data

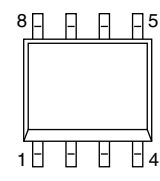
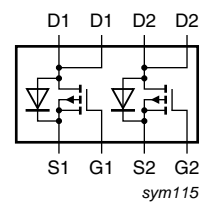
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25\text{ °C}; T_j \leq 150\text{ °C}$	-	-	-30	V
I_D	drain current	$T_{sp} \leq 80\text{ °C}$	-	-	-2.3	A
P_{tot}	total power dissipation	$T_{sp} = 80\text{ °C}$	[1]	-	2	W
Static characteristics						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = -10\text{ V}; I_D = -1\text{ A}; T_j = 25\text{ °C}$	-	0.22	0.25	Ω
Dynamic characteristics						
Q_{GD}	gate-drain charge	$V_{GS} = -10\text{ V}; I_D = -2.3\text{ A}; V_{DS} = -15\text{ V}; T_j = 25\text{ °C}$	-	3	-	nC

[1] Maximum permissible dissipation per MOS transistor. Both devices may be loaded up to 2 W at the same time.

2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	S1	source1	 <p>SOT96-1 (SO8)</p>	 <p><i>sym115</i></p>
2	G1	gate1		
3	S2	source2		
4	G2	gate2		
5	D2	drain2		
6	D2	drain2		
7	D1	drain1		
8	D1	drain1		

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PHP225	SO8	plastic small outline package; 8 leads; body width 3.9 mm	SOT96-1

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	$T_j \geq 25\text{ °C}; T_j \leq 150\text{ °C}$	-	-30	V
V_{GS}	gate-source voltage		-	-	V
V_{GSO}	gate-source voltage	open drain	-20	20	V
I_D	drain current	$T_{sp} \leq 80\text{ °C}$	-	-2.3	A
I_{DM}	peak drain current	$T_{sp} = 25\text{ °C};$ pulsed	[1]	-10	A
P_{tot}	total power dissipation	$T_{amb} = 25\text{ °C}$	[2]	1	W
		$T_{sp} = 80\text{ °C}$	[3]	2	W
		$T_{amb} = 25\text{ °C}$	[4]	1.3	W
			[5]	2	W
T_{stg}	storage temperature		-65	150	°C
T_j	junction temperature		-	150	°C
Source-drain diode					
I_S	source current	$T_{sp} \leq 80\text{ °C}$	-	-1.25	A
I_{SM}	peak source current	$T_{sp} = 25\text{ °C};$ pulsed	[1]	-5	A

- [1] Pulse width and duty cycle limited by maximum junction temperature.
- [2] Maximum permissible dissipation per MOS transistor. Device mounted on printed-circuit board with a thermal resistance from ambient to tie-point of 90 K/W.
- [3] Maximum permissible dissipation per MOS transistor. Both devices may be loaded up to 2 W at the same time.
- [4] Maximum permissible dissipation if only one MOS transistor dissipates. Device mounted on printed-circuit board with a thermal resistance from ambient to tie-point of 90 K/W.
- [5] Maximum permissible dissipation per MOS transistor. Device mounted on printed-circuit board with a thermal resistance from ambient to tie-point of 27.5 K/W.

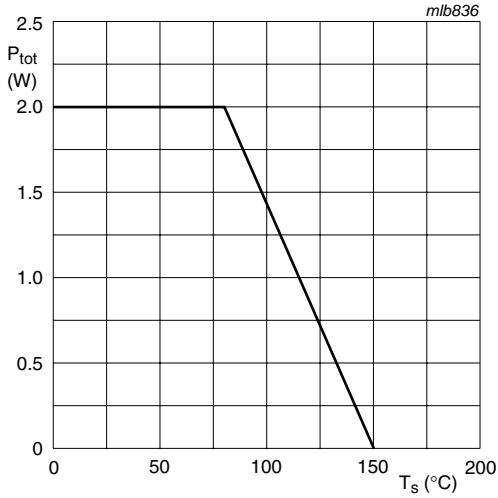
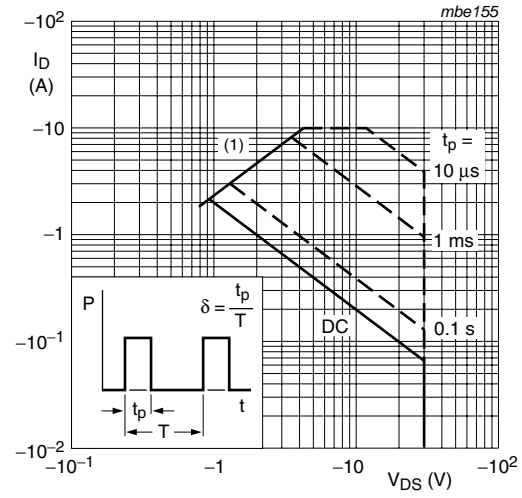


Fig 1. Power derating curve



$\delta = 0.01$
 $T_s = 80 \text{ }^\circ\text{C}$.
 (1) R_{DSon} limitation.

Fig 2. SOAR; P-channel

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 3	-	-	35	K/W

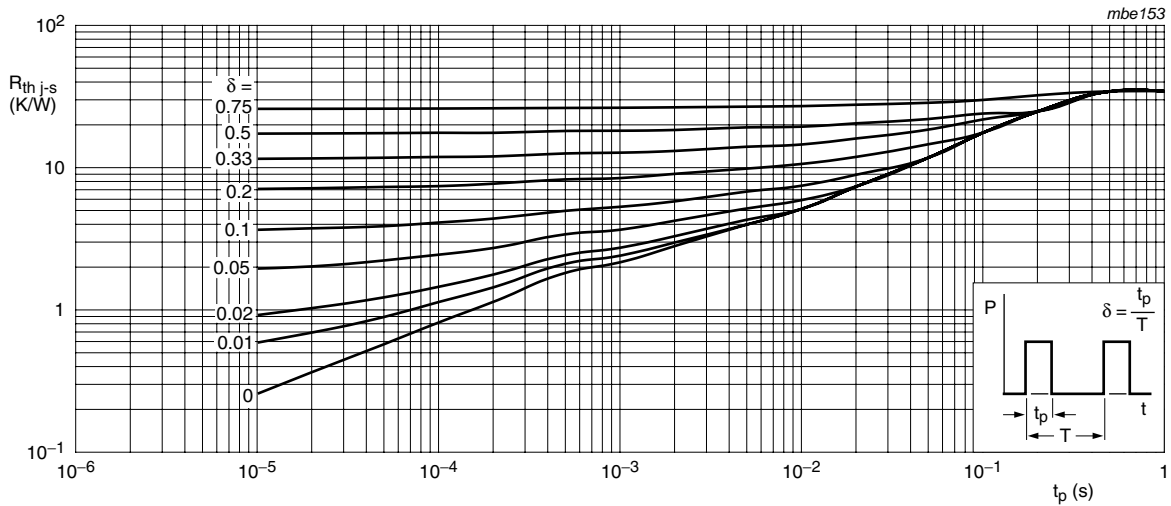
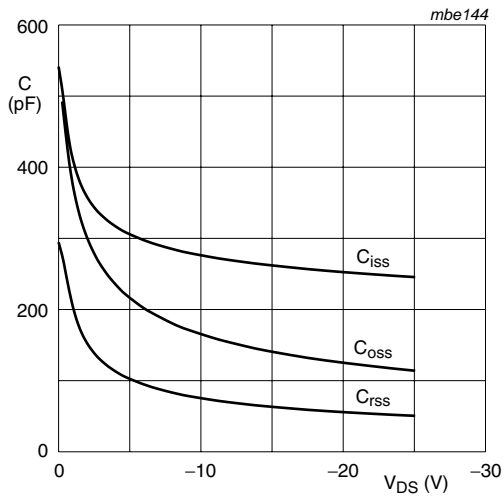


Fig 3. Transient thermal resistance from junction to soldering point as a function of pulse time; typical values.

6. Characteristics

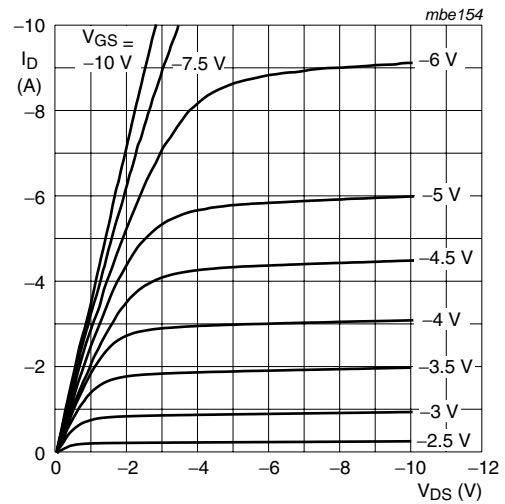
Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = -10 \mu\text{A}$; $V_{GS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-30	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = -1 \text{ mA}$; $V_{DS} = V_{GS}$; $T_j = 25 \text{ }^\circ\text{C}$	-1	-	-2.8	V
I_{DSS}	drain leakage current	$V_{DS} = -24 \text{ V}$; $V_{GS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-	-	-100	nA
I_{GSS}	gate leakage current	$V_{GS} = 20 \text{ V}$; $V_{DS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-	-	100	nA
		$V_{GS} = -20 \text{ V}$; $V_{DS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-	-	100	nA
R_{DSon}	drain-source on-state resistance	$V_{GS} = -10 \text{ V}$; $I_D = -1 \text{ A}$; $T_j = 25 \text{ }^\circ\text{C}$	-	0.22	0.25	Ω
		$V_{GS} = -4.5 \text{ V}$; $I_D = -0.5 \text{ A}$; $T_j = 25 \text{ }^\circ\text{C}$	-	0.33	0.4	Ω
I_{Dson}	on-state drain current	$V_{DS} = -1 \text{ V}$; $V_{GS} = -10 \text{ V}$	-2.3	-	-	A
		$V_{DS} = -5 \text{ V}$; $V_{GS} = -4.5 \text{ V}$	-1	-	-	A
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	$I_D = -2.3 \text{ A}$; $V_{DS} = -15 \text{ V}$; $V_{GS} = -10 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-	10	25	nC
Q_{GS}	gate-source charge		-	1	-	nC
Q_{GD}	gate-drain charge		-	3	-	nC
C_{iss}	input capacitance	$V_{DS} = -20 \text{ V}$; $V_{GS} = 0 \text{ V}$; $f = 1 \text{ MHz}$; $T_j = 25 \text{ }^\circ\text{C}$	-	250	-	pF
C_{oss}	output capacitance		-	140	-	pF
C_{rss}	reverse transfer capacitance		-	50	-	pF
g_{fs}	transfer conductance	$V_{DS} = -20 \text{ V}$; $I_D = -1 \text{ A}$; $T_j = 25 \text{ }^\circ\text{C}$	1	2	-	S
t_{off}	turn-off time	$V_{DS} = -20 \text{ V}$; $V_{GS} = -10 \text{ V}$; $R_{G(ext)} = 4.7 \text{ } \Omega$;	-	50	140	ns
t_{on}	turn-on time	$R_L = 20 \text{ } \Omega$; $T_j = 25 \text{ }^\circ\text{C}$; $I_D = -1 \text{ A}$	-	20	80	ns
Source-drain diode						
V_{SD}	source-drain voltage	$I_S = -1.25 \text{ A}$; $V_{GS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-	-	-1.6	V
t_{rr}	reverse recovery time	$I_S = -1.25 \text{ A}$; $di_S/dt = 100 \text{ A}/\mu\text{s}$; $V_{GS} = 0 \text{ V}$; $V_{DS} = 25 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-	150	200	ns



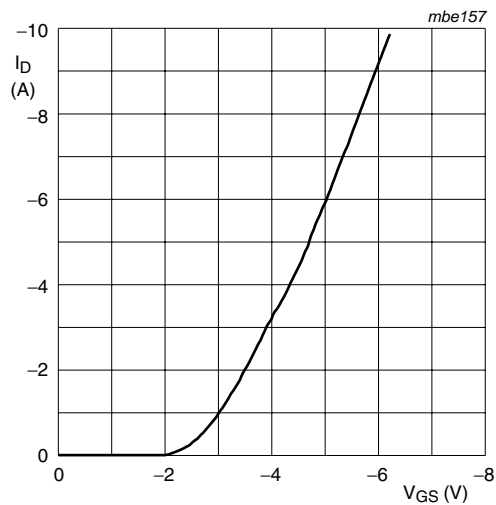
$T_j = 25^\circ\text{C}$; $V_{GS} = 0\text{V}$

Fig 4. Capacitance as a function of drain-source voltage; P-channel; typical values



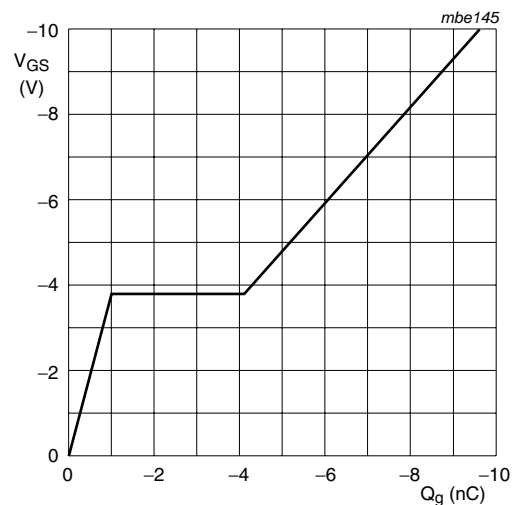
$T_j = 25^\circ\text{C}$

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



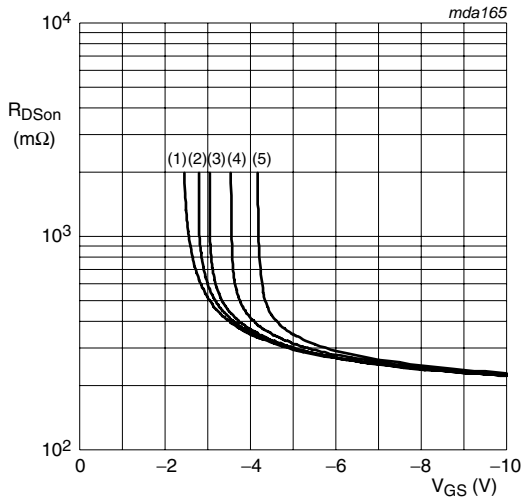
$T_j = 25^\circ\text{C}$; $V_{DS} = -10\text{V}$

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



$I_D = -2.3\text{A}$; $V_{DS} = -15\text{V}$

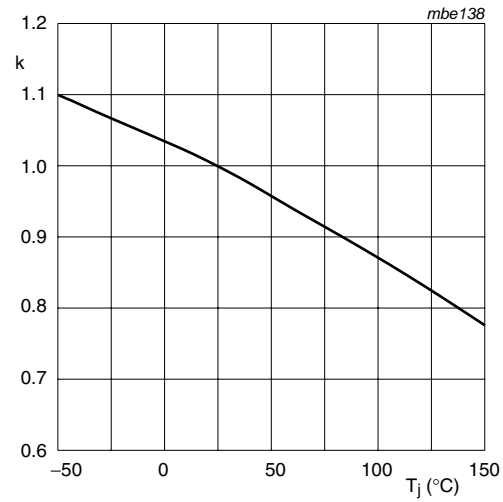
Fig 7. Gate-source voltage as a function of gate charge; P-channel; typical values



$-V_{DS} \geq -I_D \times R_{DS(on)}$; $T_j = 25^\circ\text{C}$.

- (1) $I_D = -0.1\text{ A}$.
- (2) $I_D = -0.5\text{ A}$.
- (3) $I_D = -1\text{ A}$.
- (4) $I_D = -2.3\text{ A}$.
- (5) $I_D = -4.5\text{ A}$.

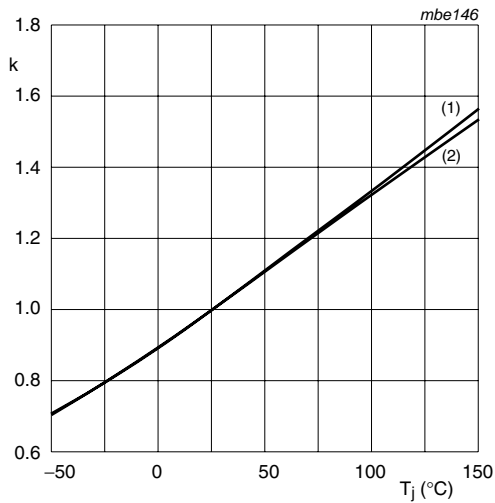
Fig 8. Drain-source on-state resistance as a function of drain current; typical values



$$k = \frac{V_{GSth} \text{ at } T_j}{V_{GSth} \text{ at } 25^\circ\text{C}}$$

Typical V_{GSth} at $I_D = 1\text{ mA}$; $V_{DS} = V_{GS} = V_{GSth}$.

Fig 9. Temperature coefficient of gate-source threshold voltage

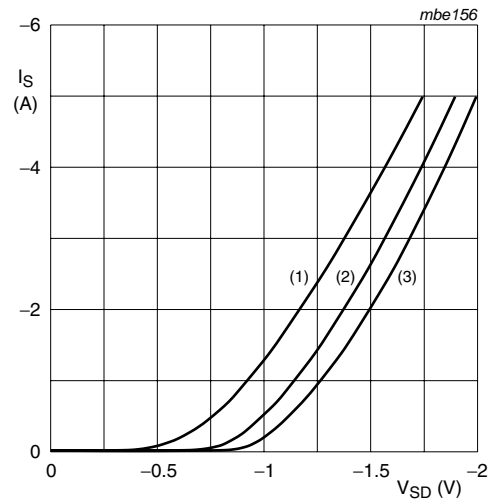


$$k = \frac{R_{DS(on)} \text{ at } T_j}{R_{DS(on)} \text{ at } 25^\circ\text{C}}$$

Typical $R_{DS(on)}$ at:

- (1) $I_D = -1\text{ A}$; $V_{GS} = -10\text{ V}$.
- (2) $I_D = -0.5\text{ A}$; $V_{GS} = -4.5\text{ V}$.

Fig 10. Temperature coefficient of drain-source on-state resistance; P-channel



$V_{GD} = 0\text{V}$ (1) $T_j = 150^\circ\text{C}$ (2) $T_j = 25^\circ\text{C}$ (3) $T_j = -55^\circ\text{C}$

Fig 11. Source current as a function of source-drain voltage

7. Package outline

SO8: plastic small outline package; 8 leads; body width 3.9 mm

SOT96-1

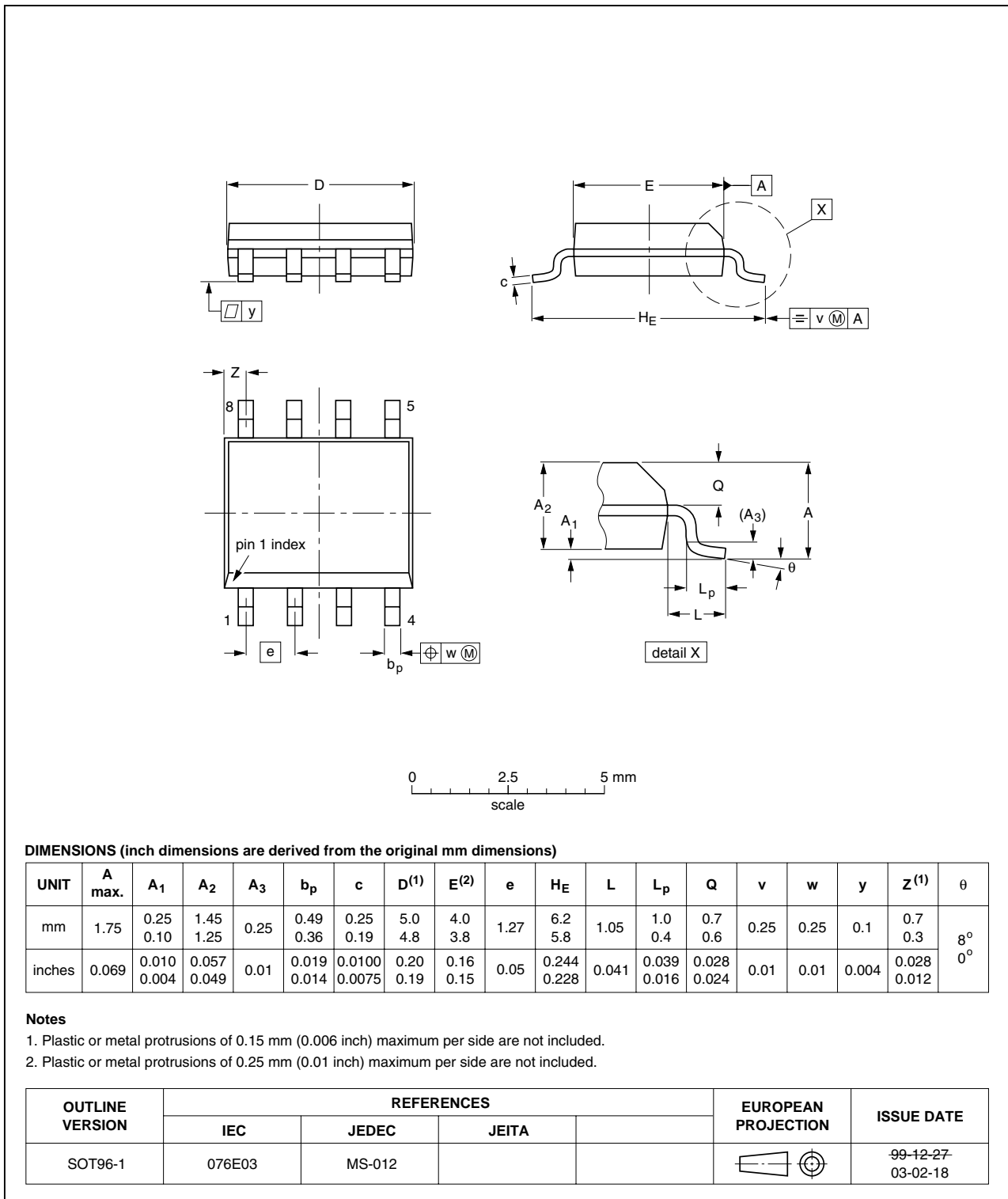


Fig 12. Package outline SOT96-1 (SO8)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PHP225 v.4	20110317	Product data sheet	-	PHP225 v.3
Modifications:	• Various changes to content.			
PHP225 v.3	20110104	Product data sheet	-	PHP225 v.2

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.
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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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