

OC1005

N-channel TrenchMOS standard level FET

Rev. 02 — 10 December 2007

Product data sheet

1. Product profile

1.1 General description

Standard level N-channel enhancement mode Field-Effect Transistor (FET) in a plastic package using TrenchMOS technology.

1.2 Features

- Standard level threshold
- Very low on-state resistance

1.3 Applications

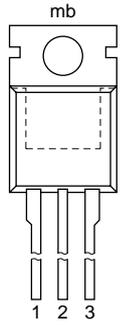
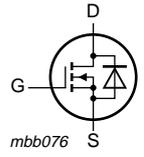
- Motors, lamps, solenoids
- DC-to-DC converters
- Uninterrupted power supplies
- General industrial applications.

1.4 Quick reference data

- $V_{DS} \leq 55 \text{ V}$
- $I_D \leq 110 \text{ A}$
- $P_{tot} \leq 200 \text{ W}$
- $R_{DS(on)} \leq 7.1 \text{ m}\Omega$

2. Pinning information

Table 1. Pinning

Pin	Description	Simplified outline	Symbol
1	gate (G)		
2	drain (D)		
3	source (S)		
mb	mounting base; connected to drain		

SOT78 (TO-220AB)

3. Ordering information

Table 2. Ordering information

Type number	Package		Version
	Name	Description	
OC1005	SC-46	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

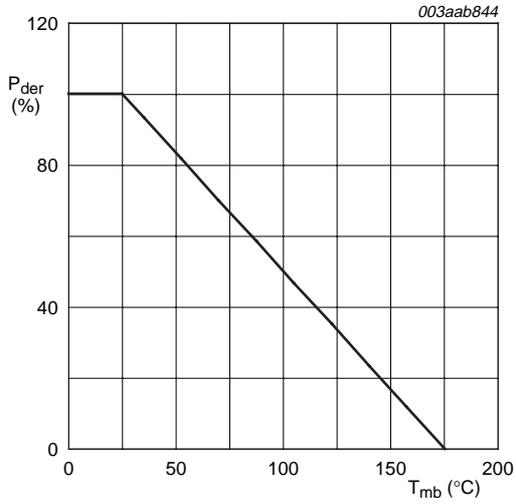
4. Limiting values

Table 3. Limiting values

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

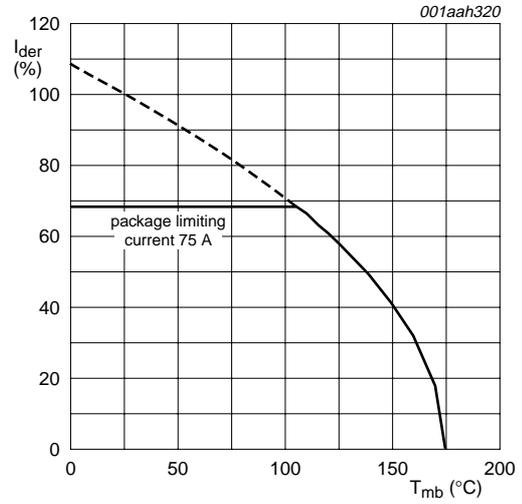
Symbol	Parameter	Conditions	Min	Max	Unit	
V_{DS}	drain-source voltage	$25\text{ °C} \leq T_j \leq 175\text{ °C}$	-	55	V	
V_{DGR}	drain-gate voltage (DC)	$25\text{ °C} \leq T_j \leq 175\text{ °C}$; $R_{GS} = 20\text{ k}\Omega$	-	55	V	
V_{GS}	gate-source voltage		-	± 20	V	
I_D	drain current	$T_{mb} = 25\text{ °C}$; $V_{GS} = 10\text{ V}$; see Figure 2 and 3	[1]	-	110	A
		$T_{mb} = 100\text{ °C}$; $V_{GS} = 10\text{ V}$; see Figure 2	-	-	80	A
I_{DM}	peak drain current	$T_{mb} = 25\text{ °C}$; pulsed; $t_p \leq 10\text{ }\mu\text{s}$; see Figure 3	-	390	A	
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}$; see Figure 1	-	200	W	
T_{stg}	storage temperature		-55	+175	°C	
T_j	junction temperature		-55	+175	°C	
Source-drain diode						
I_S	source current	$T_{mb} = 25\text{ °C}$	[1]	-	110	A
I_{SM}	peak source current	$T_{mb} = 25\text{ °C}$; pulsed; $t_p \leq 10\text{ }\mu\text{s}$	-	390	A	
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	unclamped inductive load; $I_D = 75\text{ A}$; $t_p = 0.1\text{ ms}$; $V_{DS} \leq 55\text{ V}$; $R_{GS} = 50\text{ }\Omega$; $V_{GS} = 10\text{ V}$; starting at $T_j = 25\text{ °C}$	-	280	mJ	

[1] Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 75 A.



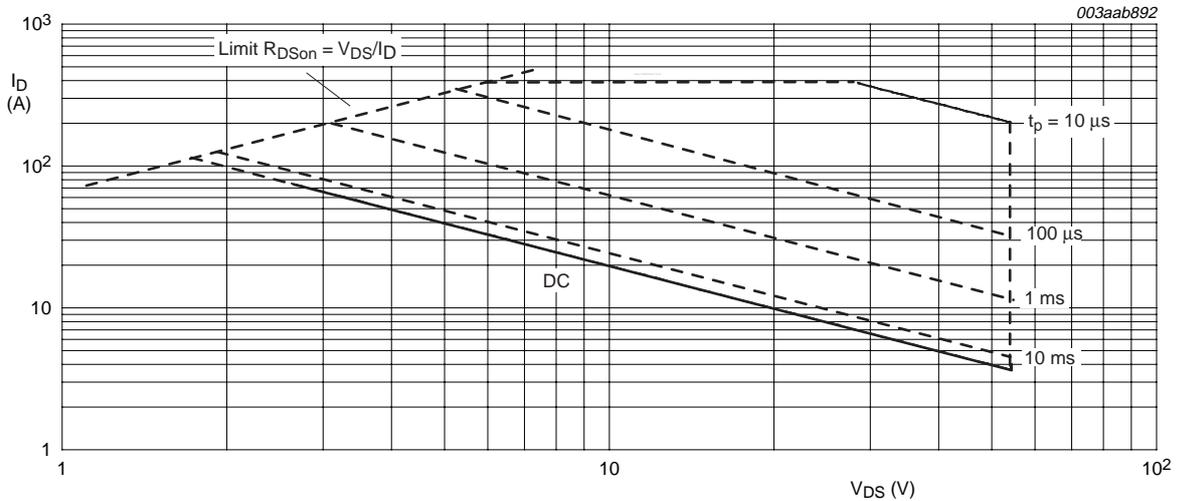
$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}C)}} \times 100 \%$$

Fig 1. Normalized total power dissipation as a function of mounting base temperature



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

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



$T_{mb} = 25^{\circ}C$; I_{DM} is single pulse; $V_{GS} = 10 V$

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

5. Thermal characteristics

Table 4. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	see Figure 4	-	-	0.75	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	vertical in free air	-	60	-	K/W



6. Characteristics

Table 5. Characteristics

$T_j = 25\text{ °C}$ unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250\text{ }\mu\text{A}$; $V_{GS} = 0\text{ V}$				
		$T_j = 25\text{ °C}$	55	-	-	V
		$T_j = -55\text{ °C}$	50	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1\text{ mA}$; $V_{DS} = V_{GS}$; see Figure 9 and 10				
		$T_j = 25\text{ °C}$	2	3	4	V
		$T_j = 175\text{ °C}$	1	-	-	V
		$T_j = -55\text{ °C}$	-	-	4.4	V
I_{DSS}	drain leakage current	$V_{DS} = 55\text{ V}$; $V_{GS} = 0\text{ V}$				
		$T_j = 25\text{ °C}$	-	-	1	μA
		$T_j = 175\text{ °C}$	-	-	500	μA
I_{GSS}	gate leakage current	$V_{GS} = \pm 20\text{ V}$; $V_{DS} = 0\text{ V}$	-	2	100	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}$; $I_D = 25\text{ A}$; see Figure 6 and 8				
		$T_j = 25\text{ °C}$	-	5.8	7.1	m Ω
		$T_j = 175\text{ °C}$	-	10.6	14.2	m Ω
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	$I_D = 25\text{ A}$; $V_{DS} = 44\text{ V}$; $V_{GS} = 10\text{ V}$; see Figure 11 and 12	-	53	-	nC
Q_{GS}	gate-source charge		-	12.3	-	nC
Q_{GD}	gate-drain charge		-	17	-	nC
C_{iss}	input capacitance	$V_{GS} = 0\text{ V}$; $V_{DS} = 25\text{ V}$; $f = 1\text{ MHz}$; see Figure 14	-	2820	-	pF
C_{oss}	output capacitance		-	554	-	pF
C_{rss}	reverse transfer capacitance		-	200	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 30\text{ V}$; $R_L = 1.2\text{ }\Omega$;	-	24	-	ns
t_r	rise time	$V_{GS} = 10\text{ V}$; $R_G = 10\text{ }\Omega$	-	52	-	ns
$t_{d(off)}$	turn-off delay time		-	77	-	ns
t_f	fall time		-	41	-	ns
Source-drain diode						
V_{SD}	source-drain voltage	$I_S = 25\text{ A}$; $V_{GS} = 0\text{ V}$; see Figure 13	-	0.85	1.2	V
t_{rr}	reverse recovery time	$I_S = 20\text{ A}$; $di_S/dt = -100\text{ A}/\mu\text{s}$; $V_{GS} = 0\text{ V}$	-	62	-	ns
Q_r	recovered charge		-	60	-	nC

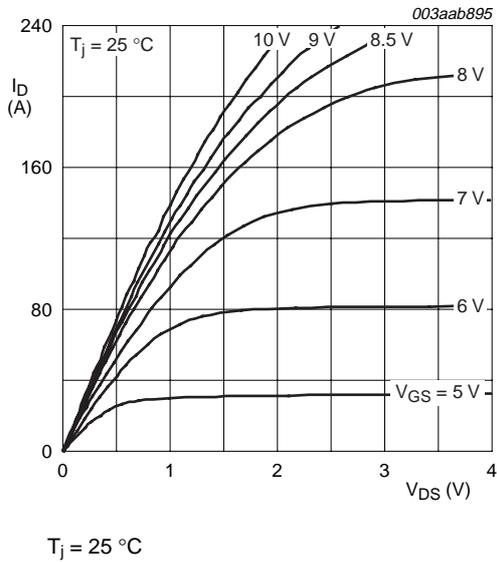


Fig 5. Output characteristics: drain current as a function of drain-source voltage; typical values

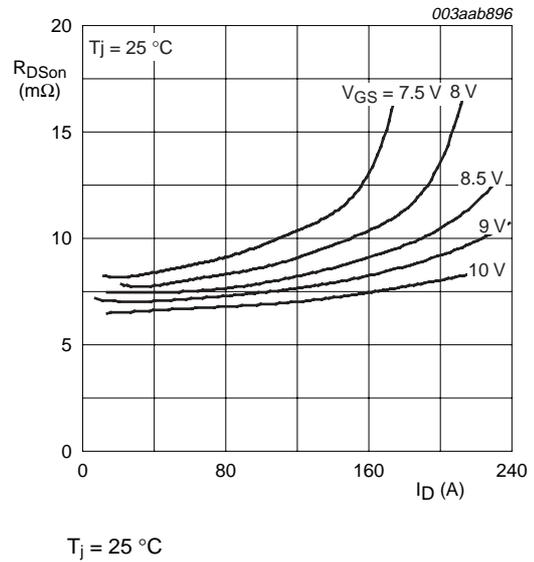


Fig 6. Drain-source on-state resistance as a function of drain current; typical values

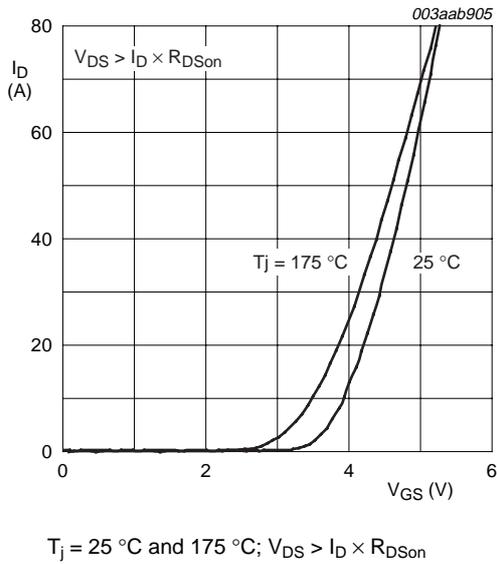
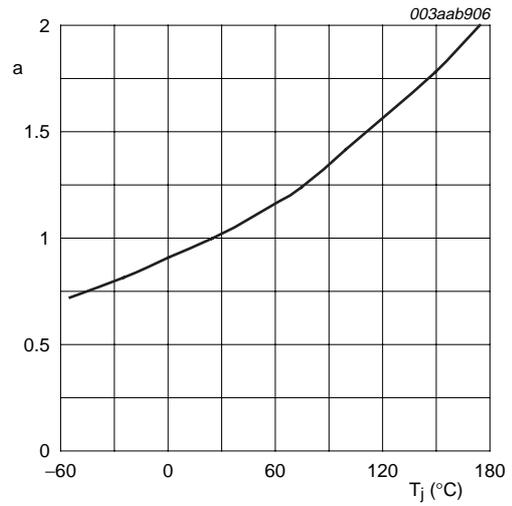
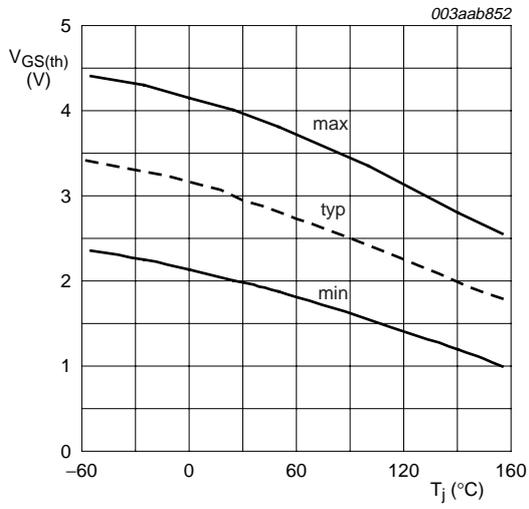


Fig 7. Transfer characteristics: drain current as a function of gate-source voltage; typical values



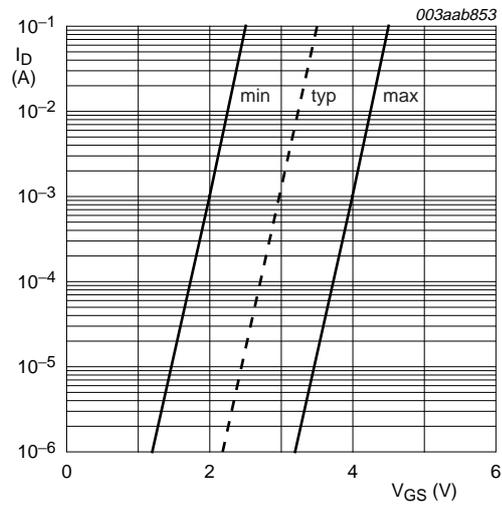
$$a = \frac{R_{DSon}}{R_{DSon(25^\circ\text{C})}}$$

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



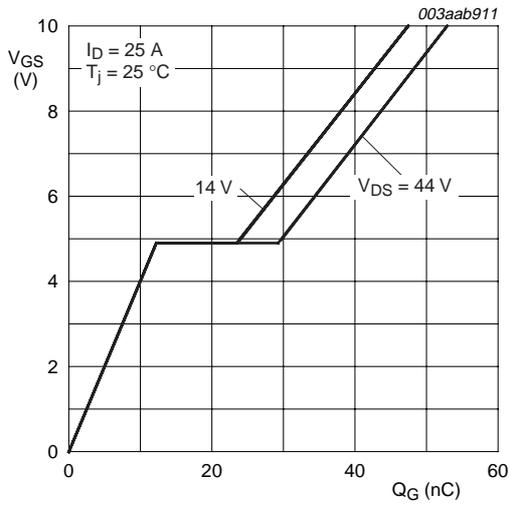
$I_D = 1 \text{ mA}; V_{DS} = V_{GS}$

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



$T_j = 25 \text{ }^{\circ}C; V_{DS} = 5 \text{ V}$

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



$I_D = 25 \text{ A}; V_{DS} = 14 \text{ V and } 44 \text{ V}$

Fig 11. Gate-source voltage as a function of gate charge; typical values

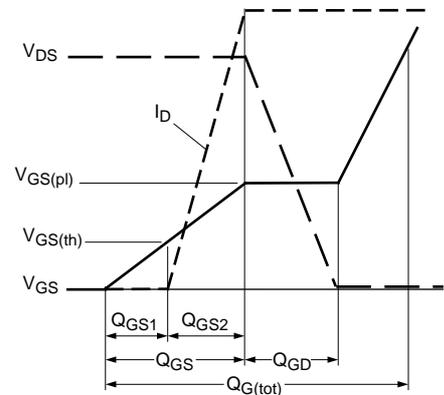
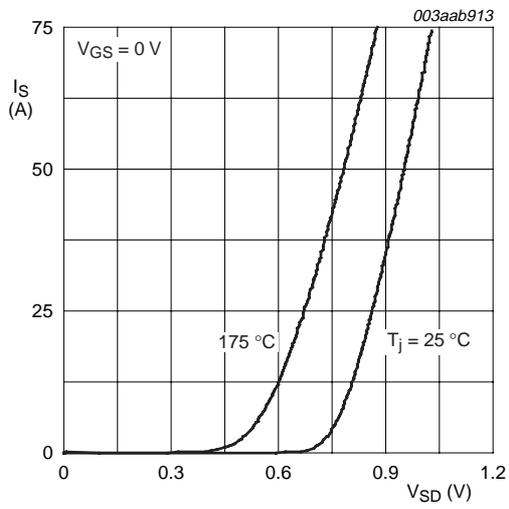
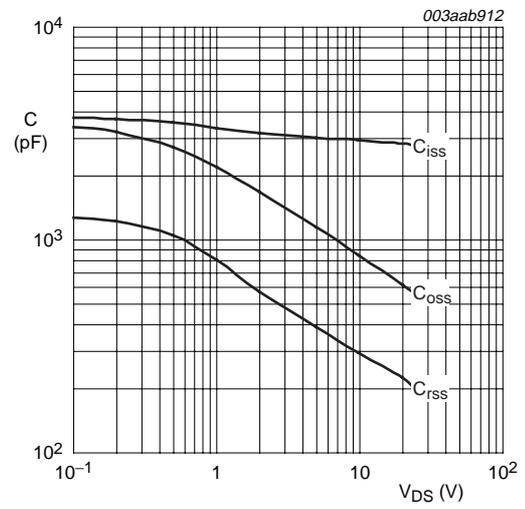


Fig 12. Gate charge waveform definitions



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

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



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

Fig 14. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

7. Package outline

Plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB

SOT78

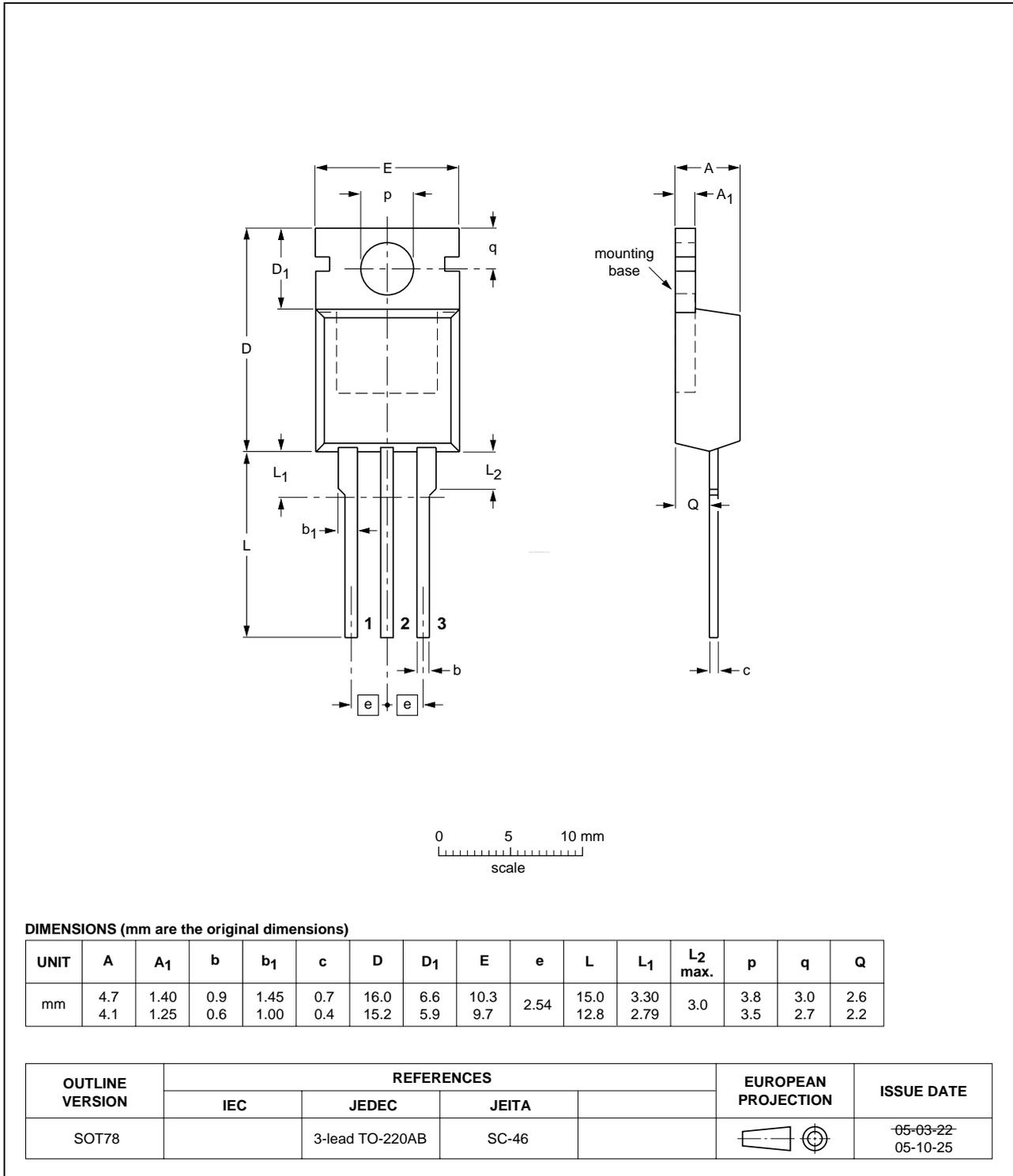


Fig 15. Package outline SOT78 (TO-220AB)

8. Revision history

Table 6. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
OC1005_2	20071210	Product data sheet	-	OC1005_1
Modifications:	• Figure 2 updated.			
OC1005_1	20070907	Product data sheet	-	-

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".

[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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11. Contents

1	Product profile	1
1.1	General description	1
1.2	Features	1
1.3	Applications	1
1.4	Quick reference data	1
2	Pinning information	1
3	Ordering information	2
4	Limiting values	2
5	Thermal characteristics	4
6	Characteristics	5
7	Package outline	9
8	Revision history	10
9	Legal information	11
9.1	Data sheet status	11
9.2	Definitions	11
9.3	Disclaimers	11
9.4	Trademarks	11
10	Contact information	11
11	Contents	12

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