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Kind regards,

Team Nexperia

# BUK755R4-100E

N-channel TrenchMOS standard level FET

11 September 2012

Product data sheet

## 1. Product profile

### 1.1 General description

Standard level N-channel MOSFET in a SOT78 package using TrenchMOS technology. This product has been designed and qualified to AEC Q101 standard for use in high performance automotive applications.

### 1.2 Features and benefits

- AEC Q101 compliant
- Repetitive avalanche rated
- Suitable for thermally demanding environments due to 175 °C rating
- True standard level gate with VGS(th) rating of greater than 1V at 175 °C

### 1.3 Applications

- 12V, 24V and 48V Automotive systems
- Electric and electro-hydraulic power steering
- Motors, lamps and solenoid control
- Start-Stop micro-hybrid applications
- Transmission control
- Ultra high performance power switching

### 1.4 Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{DS}$	drain-source voltage	$T_j \geq 25 \text{ }^\circ\text{C}; T_j \leq 175 \text{ }^\circ\text{C}$		-	-	100	V
$I_D$	drain current	$V_{GS} = 10 \text{ V}; T_{mb} = 25 \text{ }^\circ\text{C}$ ; <a href="#">Fig. 1</a>	[1]	-	-	120	A
$P_{tot}$	total power dissipation	$T_{mb} = 25 \text{ }^\circ\text{C}$ ; <a href="#">Fig. 2</a>		-	-	349	W
<b>Static characteristics</b>							
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$ ; <a href="#">Fig. 11</a>		-	4.1	5.2	$\text{m}\Omega$
<b>Dynamic characteristics</b>							
$Q_{GD}$	gate-drain charge	$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; V_{DS} = 80 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$ ; <a href="#">Fig. 13</a> ; <a href="#">Fig. 14</a>		-	65	-	nC

[1] Continuous current is limited by package.

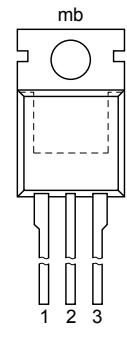
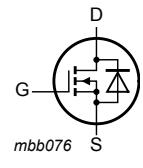


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## 2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate		
2	D	drain		
3	S	source		
mb	D	mounting base; connected to drain	 TO-220AB (SOT78A)	

## 3. Ordering information

Table 3. Ordering information

Type number	Package			Version
	Name	Description	Version	
BUK755R4-100E	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB		SOT78A

## 4. Marking

Table 4. Marking codes

Type number	Marking code
BUK755R4-100E	BUK755R4-100E

## 5. Limiting values

Table 5. Limiting values

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

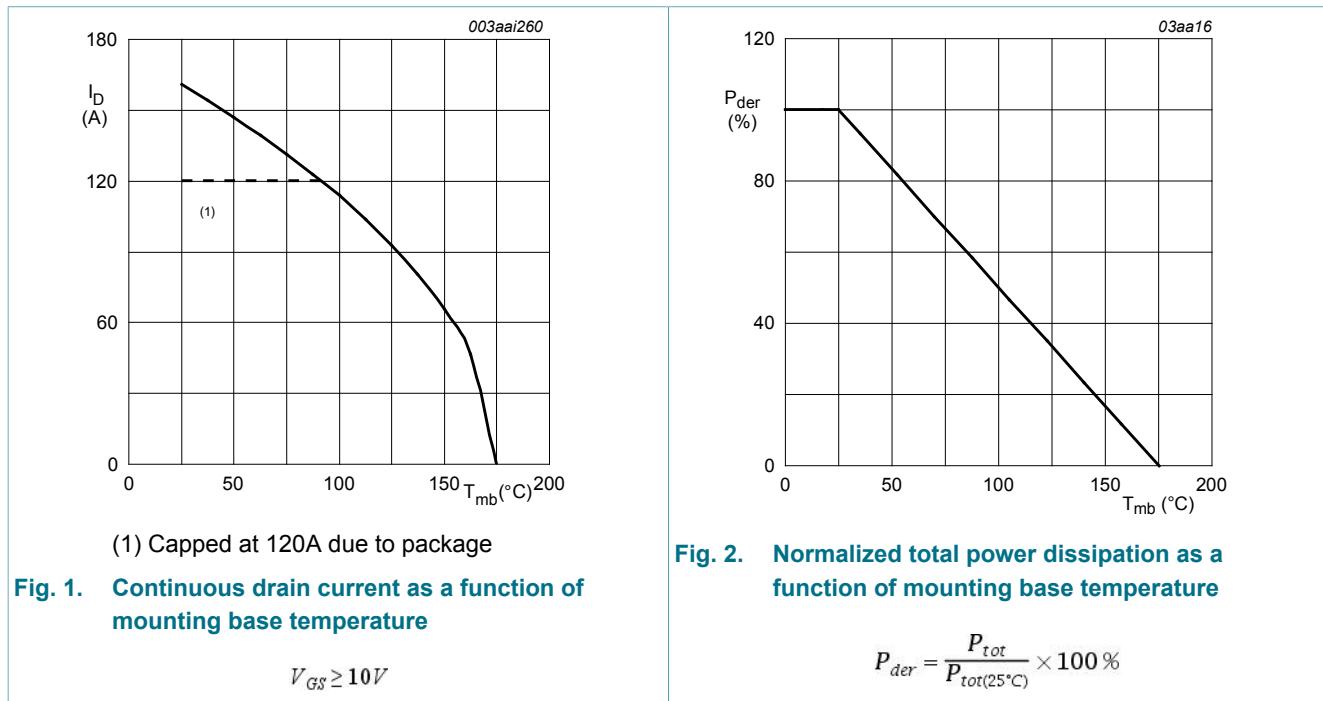
Symbol	Parameter	Conditions	Min	Max	Unit
$V_{DS}$	drain-source voltage	$T_j \geq 25^\circ\text{C}$ ; $T_j \leq 175^\circ\text{C}$	-	100	V
$V_{DGR}$	drain-gate voltage	$R_{GS} = 20\text{ k}\Omega$	-	100	V
$V_{GS}$	gate-source voltage	$T_j = 175^\circ\text{C}$ ; DC	-20	20	V
$I_D$	drain current	$T_{mb} = 25^\circ\text{C}$ ; $V_{GS} = 10\text{ V}$ ; <a href="#">Fig. 1</a>	[1]	120	A
		$T_{mb} = 100^\circ\text{C}$ ; $V_{GS} = 10\text{ V}$ ; <a href="#">Fig. 1</a>	-	112	A
$I_{DM}$	peak drain current	$T_{mb} = 25^\circ\text{C}$ ; pulsed; $t_p \leq 10\text{ }\mu\text{s}$ ; <a href="#">Fig. 4</a>	-	631	A

Symbol	Parameter	Conditions		Min	Max	Unit
$P_{tot}$	total power dissipation	$T_{mb} = 25^\circ\text{C}$ ; <a href="#">Fig. 2</a>		-	349	W
$T_{stg}$	storage temperature			-55	175	°C
$T_j$	junction temperature			-55	175	°C
<b>Source-drain diode</b>						
$I_S$	source current	$T_{mb} = 25^\circ\text{C}$	[1]	-	120	A
$I_{SM}$	peak source current	pulsed; $t_p \leq 10 \mu\text{s}$ ; $T_{mb} = 25^\circ\text{C}$		-	631	A
<b>Avalanche ruggedness</b>						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 120 \text{ A}$ ; $V_{sup} \leq 100 \text{ V}$ ; $R_{GS} = 50 \Omega$ ; $V_{GS} = 10 \text{ V}$ ; $T_{j(\text{init})} = 25^\circ\text{C}$ ; unclamped; <a href="#">Fig. 3</a>	[2][3]	-	387	mJ

[1] Continuous current is limited by package.

[2] Single-pulse avalanche rating limited by maximum junction temperature of  $175^\circ\text{C}$ .

[3] Refer to application note AN10273 for further information.



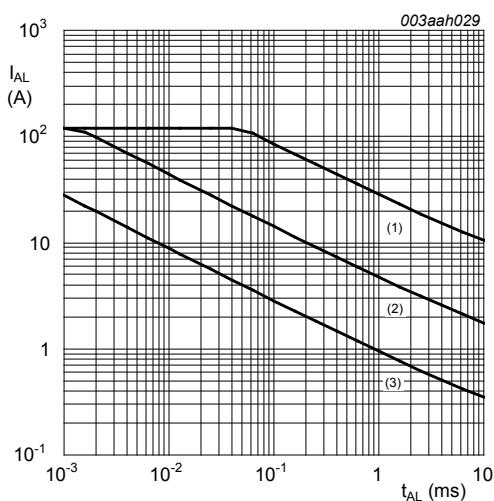


Fig. 3. Single-pulse and repetitive avalanche rating; avalanche current as a function of avalanche time

(1)  $T_j \text{ (init)} = 25^\circ\text{C}$ ; (2)  $T_j \text{ (init)} = 150^\circ\text{C}$ ; (3) Repetitive Avalanche

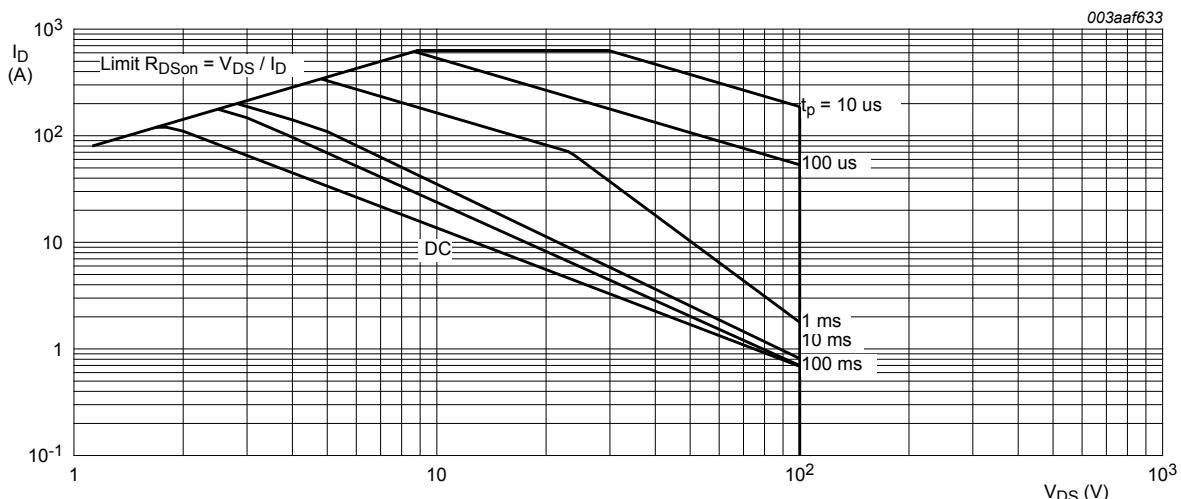


Fig. 4. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

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

## 6. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	<a href="#">Fig. 5</a>	-	-	0.43	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	vertical in free air	-	60	-	K/W

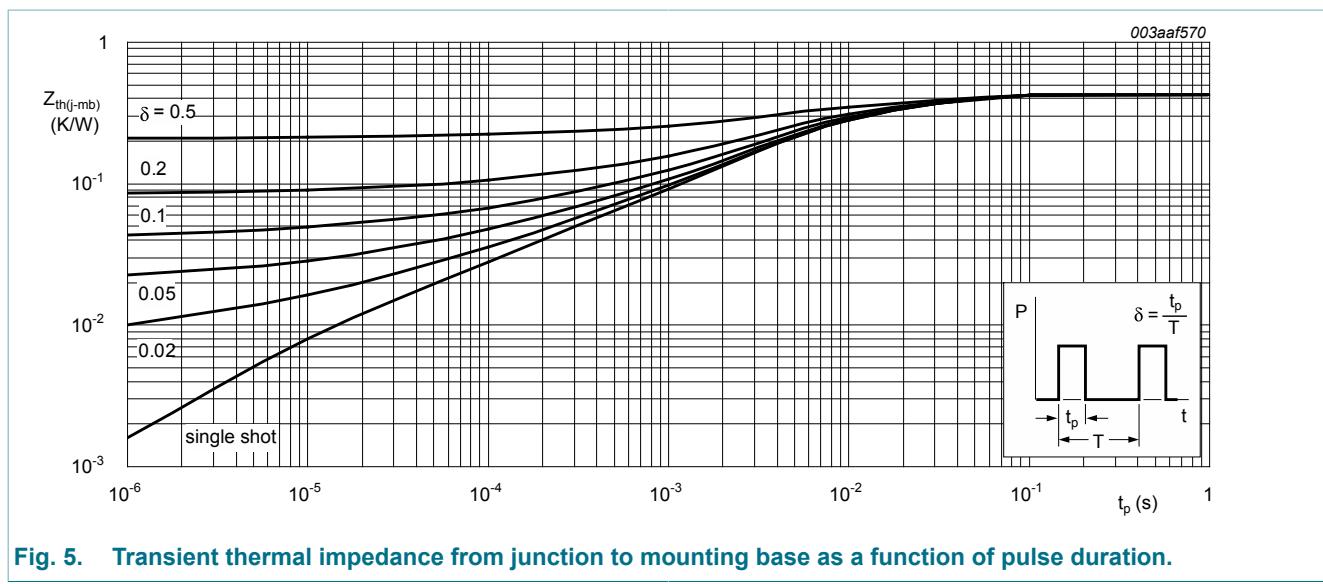


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration.

## 7. Characteristics

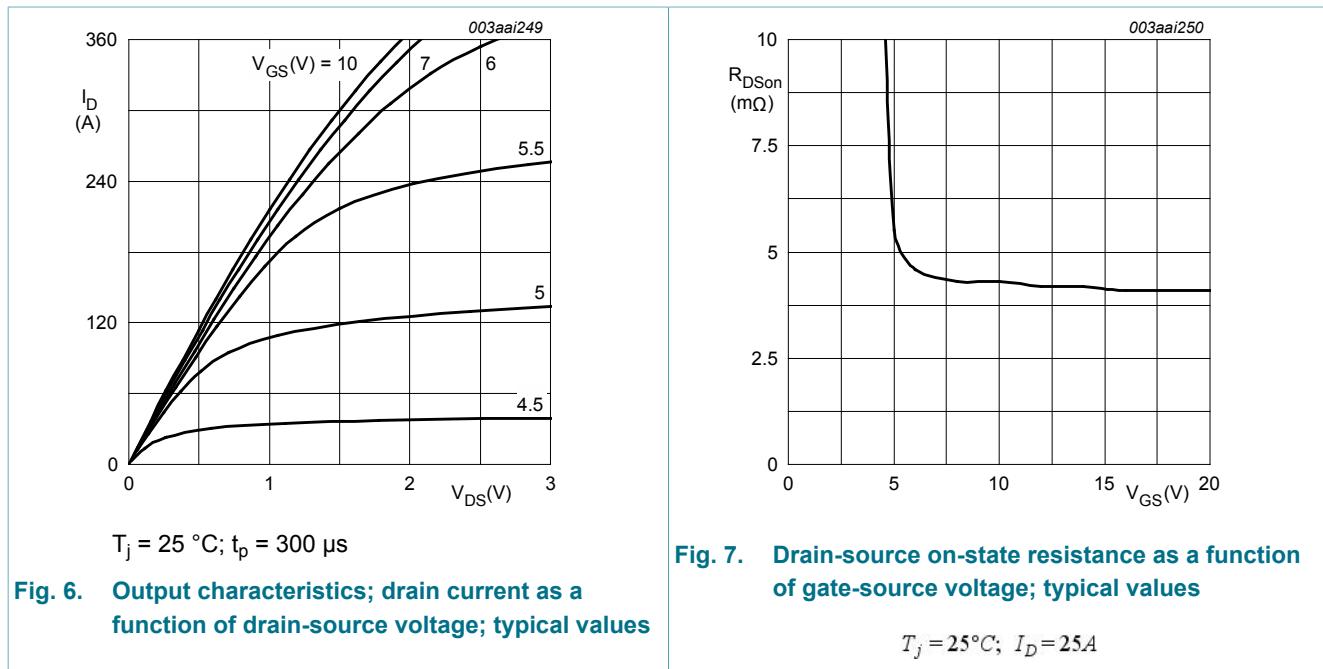
Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
<b>Static characteristics</b>							
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25^\circ C$		100	-	-	V
		$I_D = 250 \mu A; V_{GS} = 0 V; T_j = -55^\circ C$		90	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 mA; V_{DS} = V_{GS}; T_j = 25^\circ C$ <a href="#">Fig. 9</a> ; <a href="#">Fig. 10</a>		2.4	3	4	V
		$I_D = 1 mA; V_{DS} = V_{GS}; T_j = 175^\circ C$ <a href="#">Fig. 9</a>		1	-	-	V
		$I_D = 1 mA; V_{DS} = V_{GS}; T_j = -55^\circ C$ <a href="#">Fig. 9</a>		-	-	4.5	V
$I_{DSS}$	drain leakage current	$V_{DS} = 100 V; V_{GS} = 0 V; T_j = 25^\circ C$		-	0.15	2	$\mu A$
		$V_{DS} = 100 V; V_{GS} = 0 V; T_j = 175^\circ C$		-	-	500	$\mu A$
$I_{GSS}$	gate leakage current	$V_{GS} = 20 V; V_{DS} = 0 V; T_j = 25^\circ C$		-	2	100	nA
		$V_{GS} = -20 V; V_{DS} = 0 V; T_j = 25^\circ C$		-	2	100	nA
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 10 V; I_D = 25 A; T_j = 25^\circ C$ <a href="#">Fig. 11</a>		-	4.1	5.2	$m\Omega$
		$V_{GS} = 10 V; I_D = 25 A; T_j = 175^\circ C$ <a href="#">Fig. 11</a> ; <a href="#">Fig. 12</a>		-	-	14	$m\Omega$
<b>Dynamic characteristics</b>							
$Q_{G(tot)}$	total gate charge	$I_D = 25 A; V_{DS} = 80 V; V_{GS} = 10 V; T_j = 25^\circ C$ <a href="#">Fig. 13</a> ; <a href="#">Fig. 14</a>		-	180	-	nC
$Q_{GS}$	gate-source charge			-	34	-	nC
$Q_{GD}$	gate-drain charge			-	65	-	nC

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$C_{iss}$	input capacitance	$V_{GS} = 0 \text{ V}; V_{DS} = 25 \text{ V}; f = 1 \text{ MHz}; T_j = 25 \text{ }^\circ\text{C}; \text{Fig. 15}$		-	8860	11810	pF
$C_{oss}$	output capacitance			-	770	925	pF
$C_{rss}$	reverse transfer capacitance			-	546	750	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 80 \text{ V}; R_L = 3.2 \Omega; V_{GS} = 10 \text{ V}; R_{G(ext)} = 5 \Omega$		-	37	-	ns
$t_r$	rise time			-	62	-	ns
$t_{d(off)}$	turn-off delay time			-	158	-	ns
$t_f$	fall time			-	80	-	ns
$L_D$	internal drain inductance	from upper edge of drain mounting base to centre of die		-	2.5	-	nH
		from drain lead 6mm from package to centre of die		-	4.5	-	nH
$L_S$	internal source inductance	from source lead to source bond pad		-	7.5	-	nH

**Source-drain diode**

$V_{SD}$	source-drain voltage	$I_S = 25 \text{ A}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}; \text{Fig. 16}$		-	0.77	1.2	V
$t_{rr}$	reverse recovery time	$I_S = 20 \text{ A}; dI_S/dt = -100 \text{ A}/\mu\text{s}; V_{GS} = 0 \text{ V}; V_{DS} = 25 \text{ V}$		-	65	-	ns
$Q_r$	recovered charge			-	191	-	nC



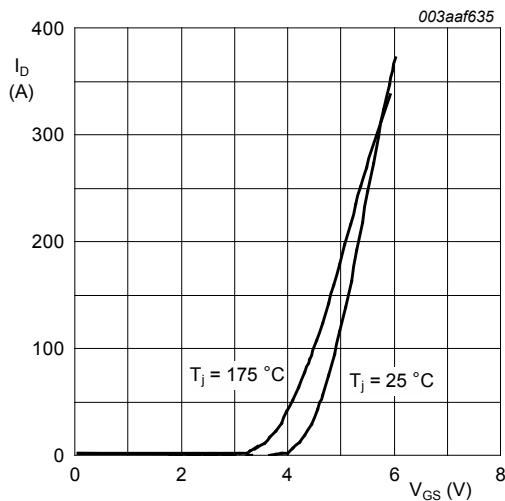


Fig. 8. Transfer characteristics: drain current as a function of gate-source voltage; typical values

$V_{DS} = 12\text{ V}$

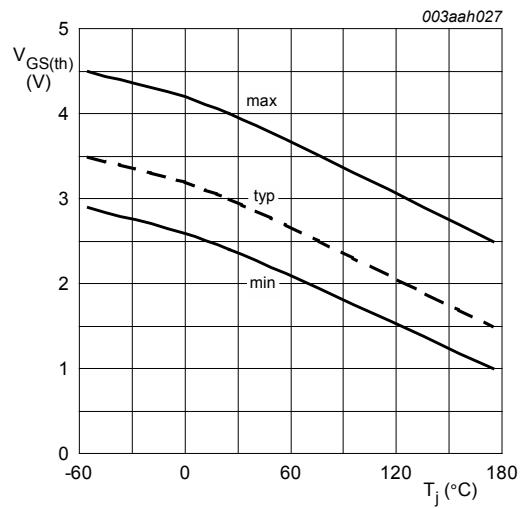


Fig. 9. Gate-source threshold voltage as a function of junction temperature

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

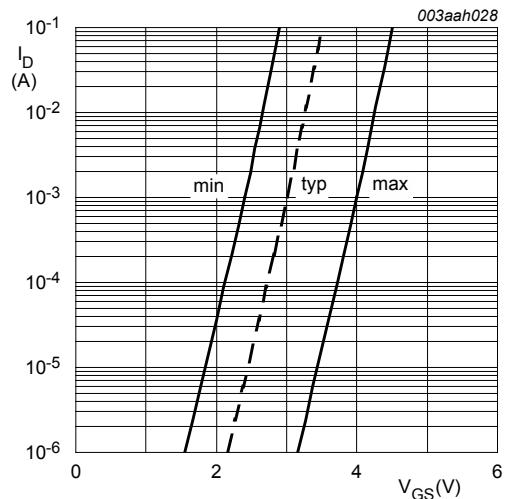
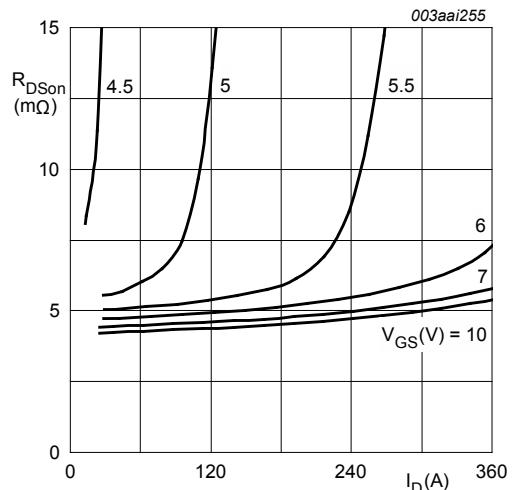


Fig. 10. Sub-threshold drain current as a function of gate-source voltage

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



$T_j = 25\text{ }^{\circ}\text{C}; t_p = 300\text{ }\mu\text{s}$

Fig. 11. Drain-source on-state resistance as a function of drain current; typical values

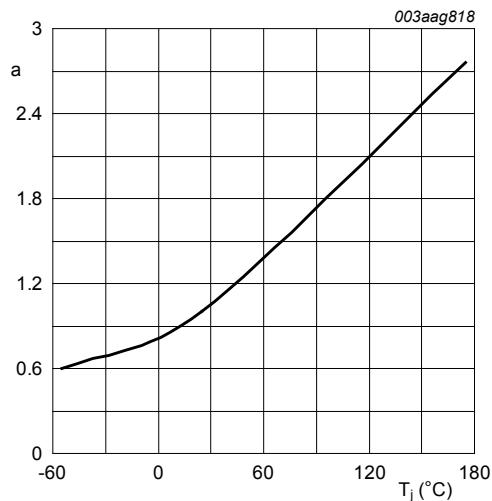


Fig. 12. Normalized drain-source on-state resistance factor as a function of junction temperature

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

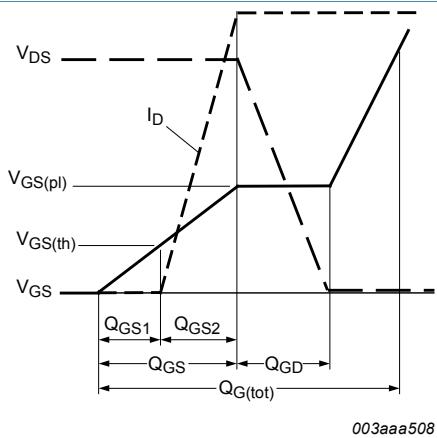
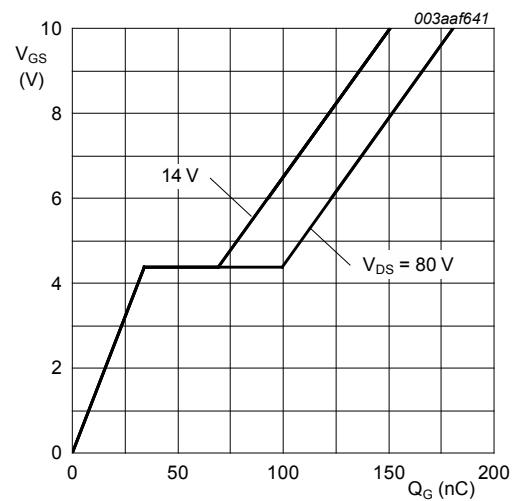
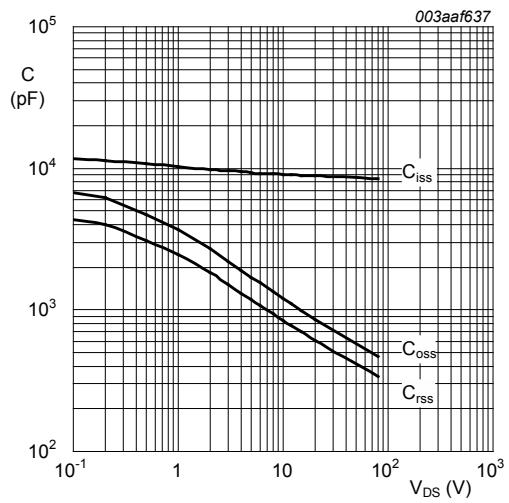


Fig. 14. Gate charge waveform definitions



$T_j = 25\text{ }^{\circ}\text{C}$ ;  $I_D = 25\text{ A}$

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



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

Fig. 15. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

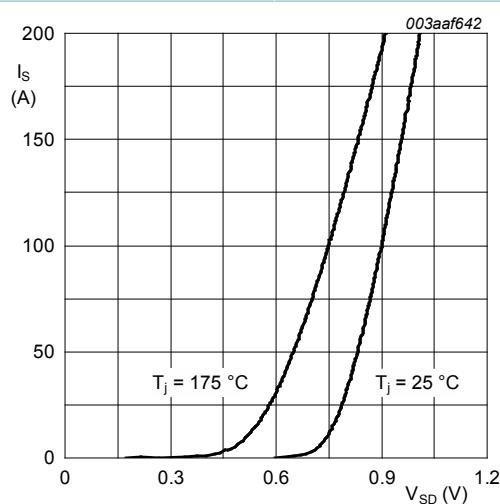
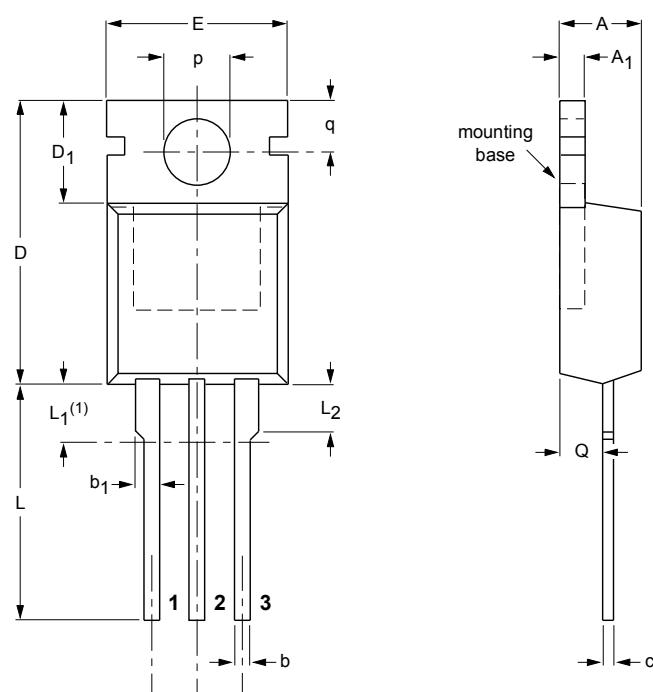
 $V_{GS} = 0 \text{ V}$ 

Fig. 16. Source (diode forward) current as a function of source-drain (diode forward) voltage; typical values

## 8. Package outline

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

SOT78A



### DIMENSIONS (mm are the original dimensions)

UNIT	A	A <sub>1</sub>	b	b <sub>1</sub>	c	D	D <sub>1</sub>	E	e	L	L <sub>1(1)</sub>	L <sub>2</sub> max.	p	q	Q
mm	4.5 4.1	1.39 1.27	0.9	1.3	0.7 0.4	15.8 15.2	6.4 5.9	10.3 9.7	2.54	15.0 13.5	3.30 2.79	3.0	3.8 3.6	3.0 2.7	2.6 2.2

### Note

1. Terminals in this zone are not tinned.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT78A		3-lead TO-220AB	SC-46			03-01-22 05-03-14

Fig. 17. Package outline TO-220AB (SOT78A)

## 9. Legal information

### 9.1 Data sheet status

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Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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