



# BUK92150-55A

N-channel TrenchMOS logic level FET

12 June 2014

Product data sheet

## 1. General description

Logic level N-channel enhancement mode Field-Effect Transistor (FET) in a plastic package using TrenchMOS technology. This product has been designed and qualified to the appropriate AEC standard for use in automotive critical applications.

## 2. Features and benefits

- Low conduction losses due to low on-state resistance
- Q101 compliant
- Suitable for logic level gate drive sources
- Suitable for thermally demanding environments due to 175 °C rating

## 3. Applications

- 12 V and 24 V loads
- Automotive and general purpose power switching
- Motors, lamps and solenoids

## 4. Quick reference data

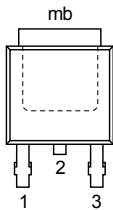
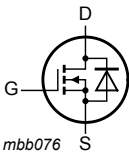
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DS}$	drain-source voltage	$T_j \geq 25\text{ °C}; T_j \leq 175\text{ °C}$	-	-	55	V
$I_D$	drain current	$V_{GS} = 5\text{ V}; T_{mb} = 25\text{ °C};$ <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	-	-	11	A
$P_{tot}$	total power dissipation	$T_{mb} = 25\text{ °C};$ <a href="#">Fig. 1</a>	-	-	36	W
<b>Static characteristics</b>						
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}; I_D = 5\text{ A}; T_j = 25\text{ °C}$	-	97	125	mΩ
		$V_{GS} = 5\text{ V}; I_D = 5\text{ A}; T_j = 175\text{ °C};$ <a href="#">Fig. 11</a> ; <a href="#">Fig. 12</a>	-	-	280	mΩ
		$V_{GS} = 4.5\text{ V}; I_D = 5\text{ A}; T_j = 25\text{ °C}$	-	-	155	mΩ
		$V_{GS} = 5\text{ V}; I_D = 5\text{ A}; T_j = 25\text{ °C};$ <a href="#">Fig. 11</a> ; <a href="#">Fig. 12</a>	-	120	140	mΩ
<b>Dynamic characteristics</b>						
$Q_{GD}$	gate-drain charge	$V_{GS} = 5\text{ V}; I_D = 5\text{ A}; V_{DS} = 44\text{ V};$ $T_j = 25\text{ °C};$ <a href="#">Fig. 13</a>	-	2.6	-	nC

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Avalanche ruggedness</b>						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 11\text{ A}$ ; $V_{sup} \leq 55\text{ V}$ ; $R_{GS} = 50\ \Omega$ ; $V_{GS} = 5\text{ V}$ ; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$ ; unclamped	-	-	16	mJ

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 <p><b>DPAK (SOT428)</b></p>	 <p>mbb076</p>
2	D	Drain		
3	S	source		
mb	D	mounting base; connected to drain		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BUK92150-55A	DPAK	plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped)	SOT428
BUK92150-55A/CD	DPAK	plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped)	SOT428

## 7. Marking

Table 4. Marking codes

Type number	Marking code
BUK92150-55A	9215055A
BUK92150-55A/CD	

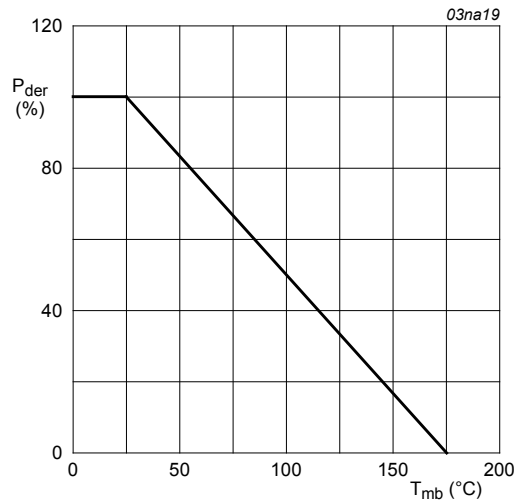
## 8. Limiting values

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	$T_j \geq 25\text{ }^\circ\text{C}$ ; $T_j \leq 175\text{ }^\circ\text{C}$	-	55	V

Symbol	Parameter	Conditions	Min	Max	Unit
V <sub>DGR</sub>	drain-gate voltage	R <sub>GS</sub> 20 kΩ	-	55	V
V <sub>GS</sub>	gate-source voltage		-15	15	V
P <sub>tot</sub>	total power dissipation	T <sub>mb</sub> = 25 °C; <a href="#">Fig. 1</a>	-	36	W
I <sub>D</sub>	drain current	T <sub>mb</sub> = 25 °C; V <sub>GS</sub> = 5 V; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	-	11	A
		T <sub>mb</sub> = 100 °C; V <sub>GS</sub> = 5 V; <a href="#">Fig. 3</a>	-	7.8	A
I <sub>DM</sub>	peak drain current	T <sub>mb</sub> = 25 °C; pulsed; t <sub>p</sub> ≤ 10 μs; <a href="#">Fig. 2</a>	-	44	A
T <sub>stg</sub>	storage temperature		-55	175	°C
T <sub>j</sub>	junction temperature		-55	175	°C
<b>Source-drain diode</b>					
I <sub>S</sub>	source current	T <sub>mb</sub> = 25 °C	-	11	A
I <sub>SM</sub>	peak source current	pulsed; t <sub>p</sub> ≤ 10 μs; T <sub>mb</sub> = 25 °C	-	44	A
<b>Avalanche ruggedness</b>					
E <sub>DS(AL)S</sub>	non-repetitive drain-source avalanche energy	I <sub>D</sub> = 11 A; V <sub>sup</sub> ≤ 55 V; R <sub>GS</sub> = 50 Ω; V <sub>GS</sub> = 5 V; T <sub>j(init)</sub> = 25 °C; unclamped	-	16	mJ



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

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

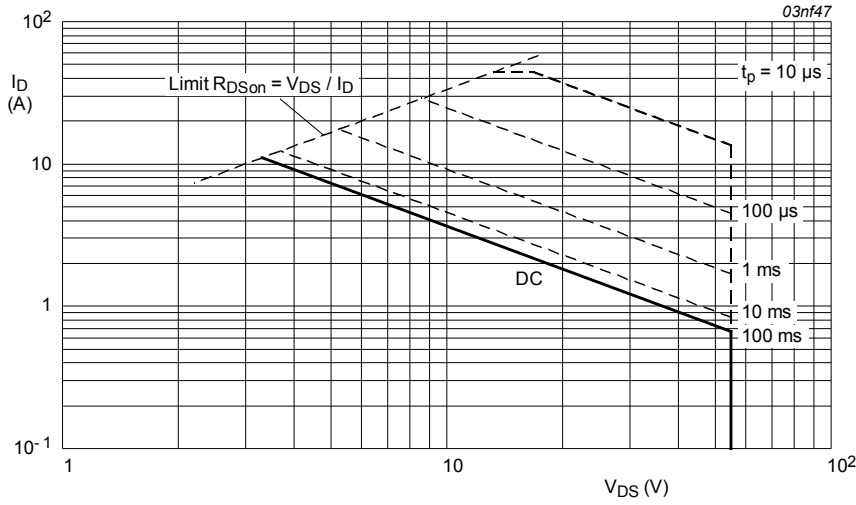


Fig. 2. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

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

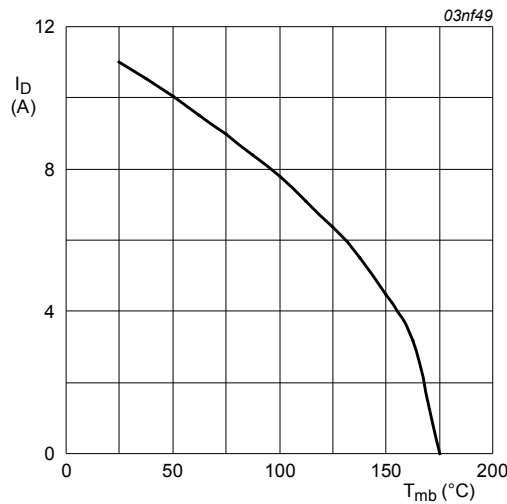


Fig. 3. Continuous drain current as a function of mounting base temperature

$$V_{GS} \geq 4.5V I_{der} = \frac{I_D}{I_{D(25^\circ C)}} \times 100\%$$

## 9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	Fig. 4	-	-	4.1	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient		-	71.4	-	K/W

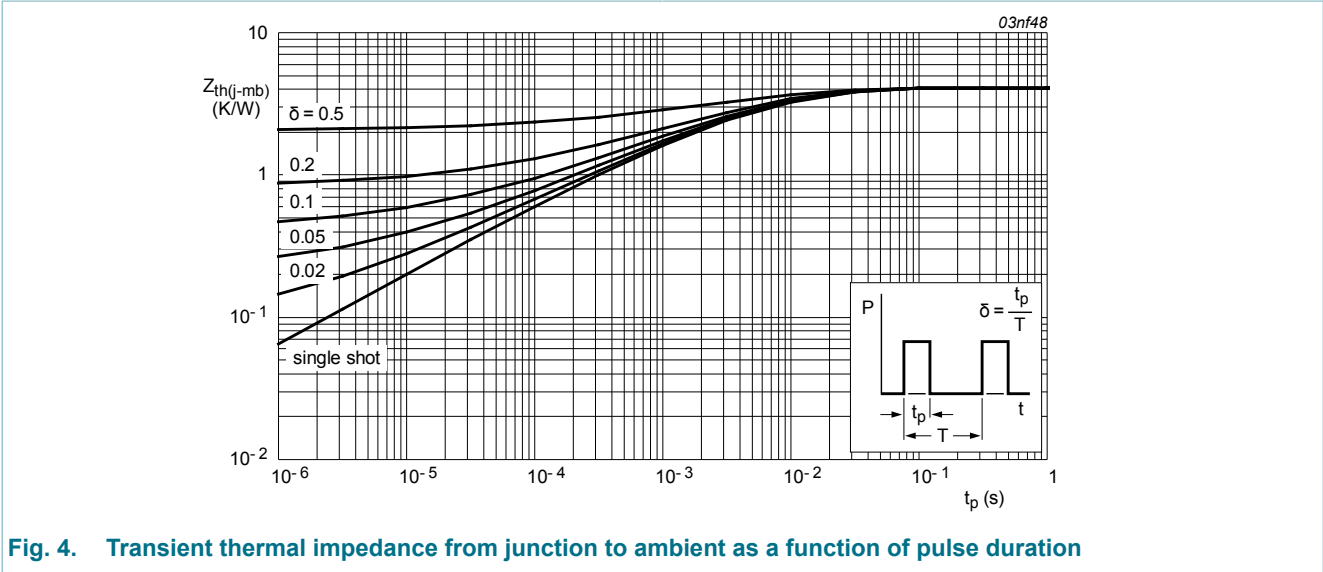


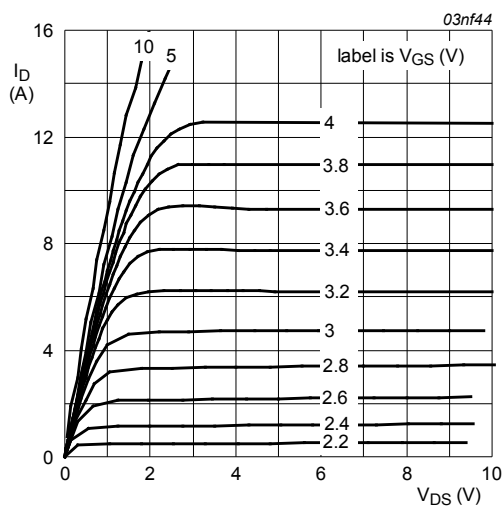
Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration

## 10. Characteristics

Table 7. Characteristics

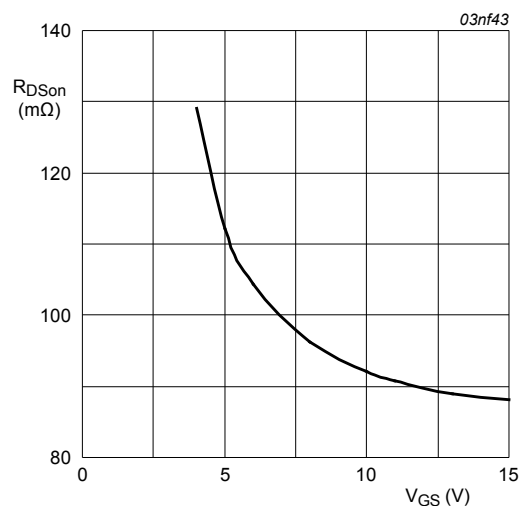
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 0.25 \text{ mA}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	55	-	-	V
		$I_D = 0.25 \text{ mA}; V_{GS} = 0 \text{ V}; T_j = -55 \text{ }^\circ\text{C}$	50	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = -55 \text{ }^\circ\text{C};$ <a href="#">Fig. 10</a>	-	-	2.3	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ\text{C};$ <a href="#">Fig. 10</a>	1	1.5	2	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 175 \text{ }^\circ\text{C};$ <a href="#">Fig. 10</a>	0.5	-	-	V
$I_{DSS}$	drain leakage current	$V_{DS} = 55 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 175 \text{ }^\circ\text{C}$	-	-	500	$\mu\text{A}$
		$V_{DS} = 55 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	0.05	10	$\mu\text{A}$
$I_{GSS}$	gate leakage current	$V_{GS} = 10 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	2	100	nA
		$V_{GS} = -10 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	2	100	nA
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 5 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$	-	97	125	m $\Omega$
		$V_{GS} = 5 \text{ V}; I_D = 5 \text{ A}; T_j = 175 \text{ }^\circ\text{C};$ <a href="#">Fig. 11; Fig. 12</a>	-	-	280	m $\Omega$
		$V_{GS} = 4.5 \text{ V}; I_D = 5 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$	-	-	155	m $\Omega$
		$V_{GS} = 5 \text{ V}; I_D = 5 \text{ A}; T_j = 25 \text{ }^\circ\text{C};$ <a href="#">Fig. 11;</a> <a href="#">Fig. 12</a>	-	120	140	m $\Omega$

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Dynamic characteristics</b>						
$Q_{G(\text{tot})}$	total gate charge	$I_D = 5 \text{ A}$ ; $V_{DS} = 44 \text{ V}$ ; $V_{GS} = 5 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; <a href="#">Fig. 13</a>	-	6	-	nC
$Q_{GS}$	gate-source charge		-	0.76	-	nC
$Q_{GD}$	gate-drain charge		-	2.6	-	nC
$C_{iss}$	input capacitance	$V_{GS} = 0 \text{ V}$ ; $V_{DS} = 25 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; <a href="#">Fig. 14</a>	-	240	338	pF
$C_{oss}$	output capacitance		-	50	65	pF
$C_{rss}$	reverse transfer capacitance		-	40	58	pF
$t_{d(\text{on})}$	turn-on delay time	$V_{DS} = 20 \text{ V}$ ; $R_L = 3.3 \text{ } \Omega$ ; $V_{GS} = 5 \text{ V}$ ; $R_{G(\text{ext})} = 10 \text{ } \Omega$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	8	-	ns
$t_r$	rise time		-	57	-	ns
$t_{d(\text{off})}$	turn-off delay time		-	16	-	ns
$t_f$	fall time		-	13	-	ns
$L_D$	internal drain inductance	measured from drain to centre of die; $T_j = 25 \text{ }^\circ\text{C}$	-	2.5	-	nH
$L_S$	internal source inductance	measured from source lead to source bond pad; $T_j = 25 \text{ }^\circ\text{C}$	-	7.5	-	nH
<b>Source-drain diode</b>						
$V_{SD}$	source-drain voltage	$I_S = 15 \text{ A}$ ; $V_{GS} = 0 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; <a href="#">Fig. 15</a>	-	0.85	1.2	V
$t_{rr}$	reverse recovery time	$I_S = 20 \text{ A}$ ; $di_S/dt = -100 \text{ A}/\mu\text{s}$ ; $V_{GS} = -10 \text{ V}$ ; $V_{DS} = 30 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	24	-	ns
$Q_r$	recovered charge		-	26	-	nC



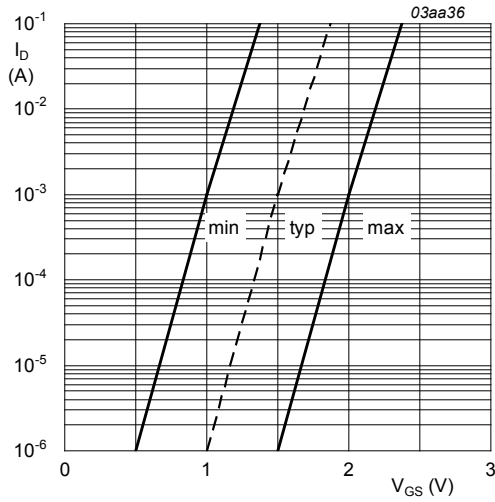
**Fig. 5. Output characteristics: drain current as a function of drain-source voltage; typical values**

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



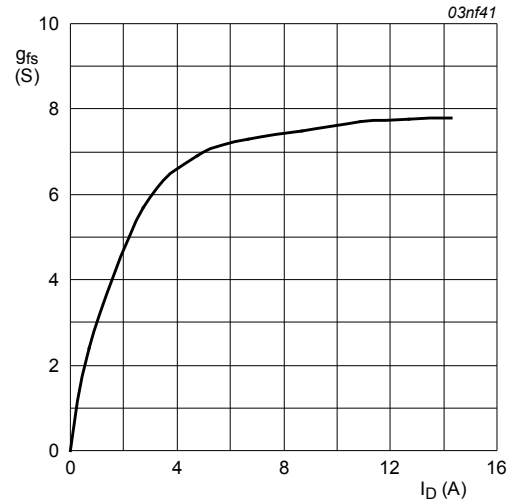
**Fig. 6. Drain-source on-state resistance as a function of gate-source voltage; typical values**

$T_j = 25^\circ\text{C}; I_D = 5\text{A}$



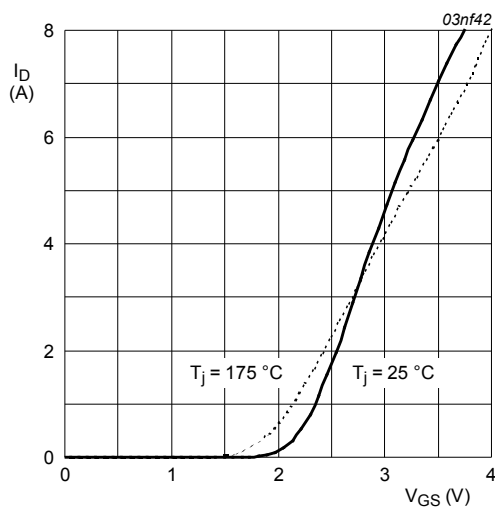
$T_j = 25\text{ }^\circ\text{C}; V_{DS} = 5\text{ V}$

**Fig. 7. Sub-threshold drain current as a function of gate-source voltage**



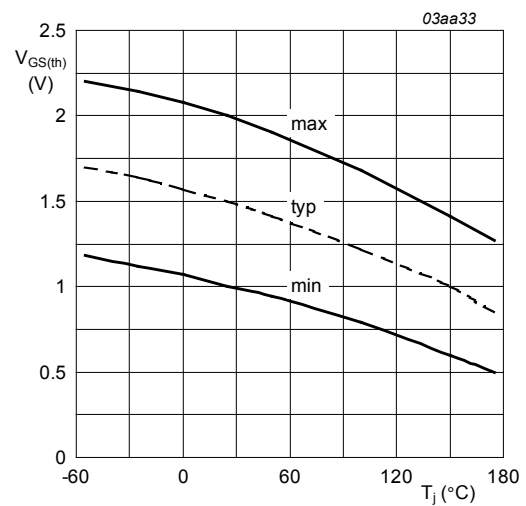
**Fig. 8. Forward transconductance as a function of drain current; typical values**

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



**Fig. 9. Transfer characteristics: drain current as a function of gate-source voltage; typical values**

$V_{DS} = 25\text{ V}$



**Fig. 10. Gate-source threshold voltage as a function of junction temperature**

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

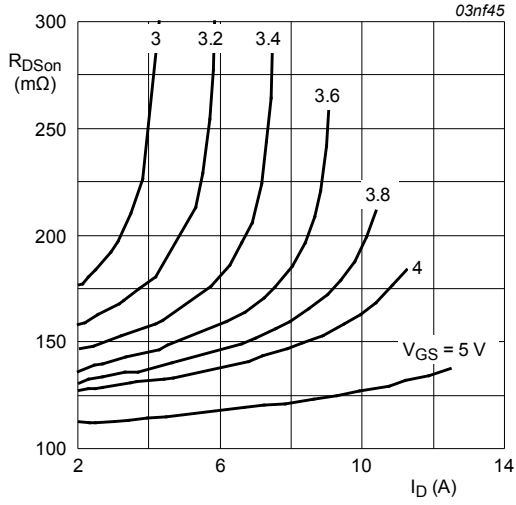


Fig. 11. Drain-source on-state resistance as a function of drain current; typical values

$T_j = 25^\circ C$

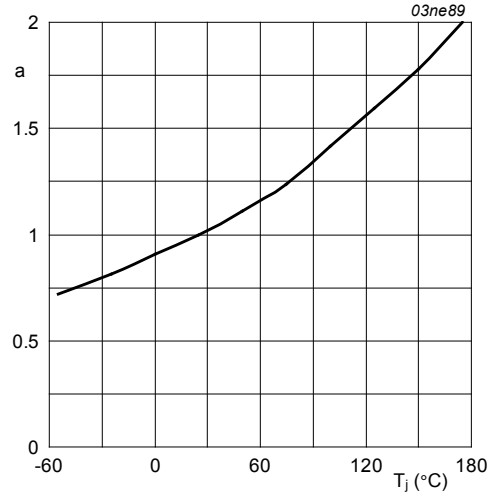


Fig. 12. Normalized drain-source on-state resistance factor as a function of junction temperature

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

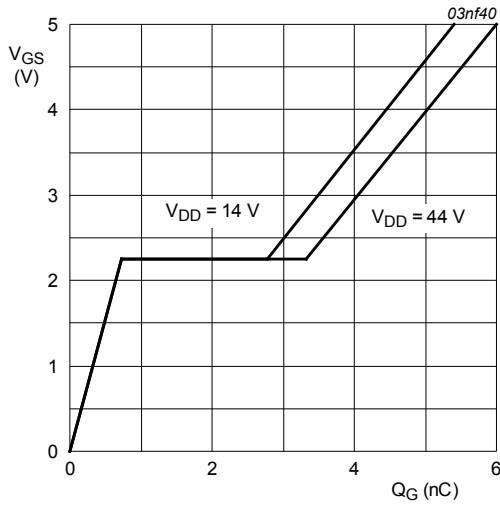


Fig. 13. Gate-source voltage as a function of gate charge; typical values

$T_j = 25^\circ C; I_D = 5A$

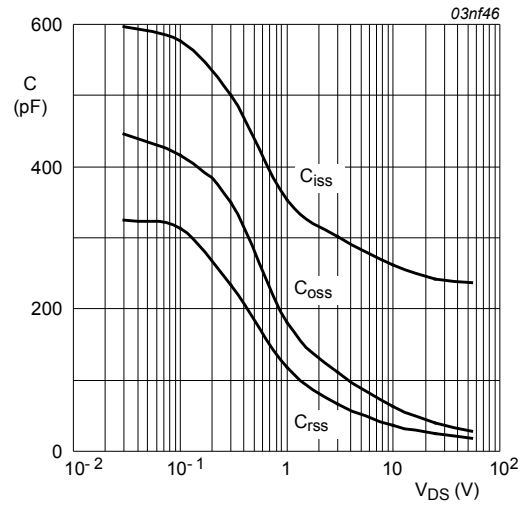
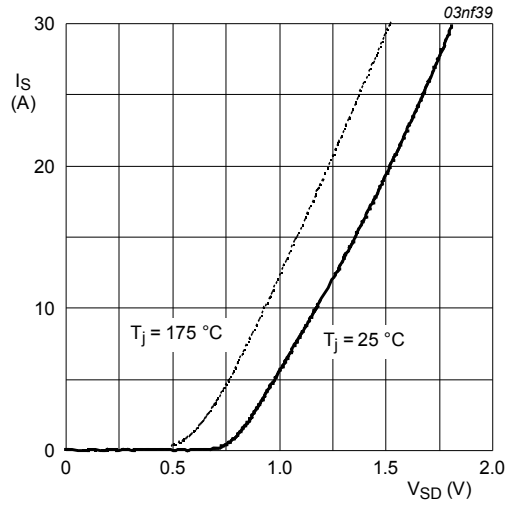


Fig. 14. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

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

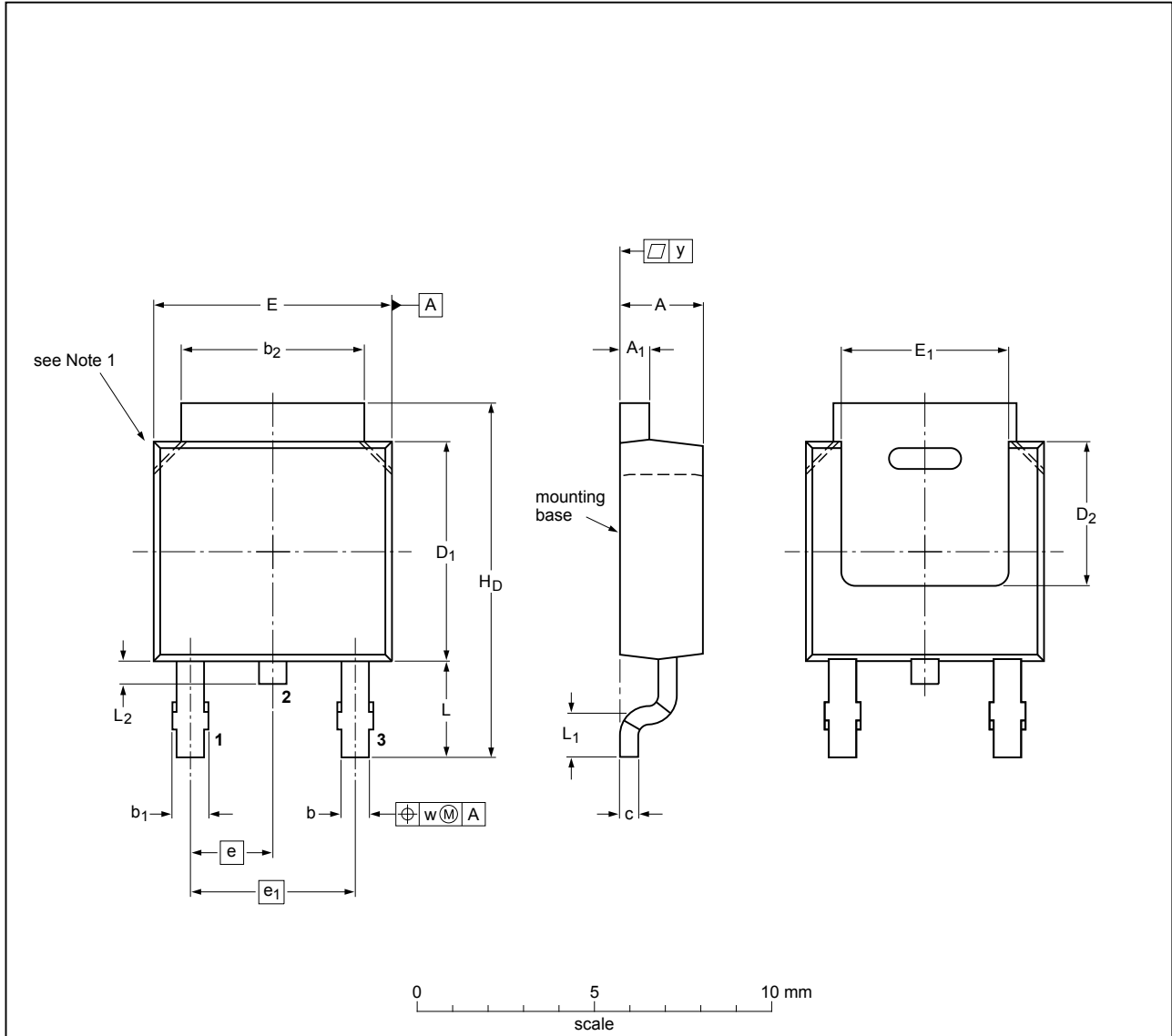


**Fig. 15. Reverse diode current as a function of reverse diode voltage; typical values**

$$V_{GS} = 0V$$

### 11. Package outline

Plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped) SOT428



Dimensions (mm are the original dimensions)

Unit	A	A <sub>1</sub>	b	b <sub>1</sub>	b <sub>2</sub>	c	D <sub>1</sub>	D <sub>2</sub>	E	E <sub>1</sub>	e	e <sub>1</sub>	H <sub>D</sub>	L	L <sub>1</sub>	L <sub>2</sub>	w	y
max	2.38	0.93	0.89	1.1	5.46	0.56	6.22		6.73				10.4	2.95		0.9		0.2
nom											2.285	4.57					0.2	
min	2.22	0.46	0.71	0.9	5.00	0.20	5.98	4.0	6.47	4.45			9.6	2.55	0.5	0.5		

Note

1. Plastic body may have 45° chamfer.

sot428\_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT428		TO-252	SC-63			06-03-16 14-06-10

Fig. 16. Package outline DPAK (SOT428)

## 12. Legal information

### 12.1 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.

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- [2] The term 'short data sheet' is explained in section "Definitions".
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Date of release: 12 June 2014