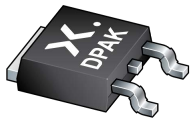


BUK7210-55B

N-channel TrenchMOS standard level FET

Rev. 01 — 11 December 2008 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 Nexperia High-Performance Automotive (HPA) TrenchMOS technology. This product has been designed and qualified to the appropriate AEC standard for use in automotive critical applications.

1.2 Features and benefits

- 185 °C rated
- Q101 compliant
- Standard level compatible
- Very low on-state resistance

1.3 Applications

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

1.4 Quick reference data

Table 1. Quick reference

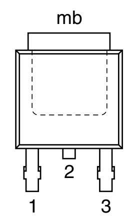
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25$ °C; $T_j \leq 185$ °C	-	-	55	V
I_D	drain current	$V_{GS} = 10$ V; $T_{mb} = 25$ °C; see Figure 1; see Figure 3; [1]	-	-	75	A
Static characteristics						
R_{DSon}	drain-source on-state resistance	$V_{GS} = 10$ V; $I_D = 25$ A; $T_j = 25$ °C; see Figure 10; see Figure 9	-	8.5	10	mΩ
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 75$ A; $V_{sup} \leq 55$ V; $R_{GS} = 50$ Ω; $V_{GS} = 10$ V; $T_{j(init)} = 25$ °C; unclamped inductive load	-	-	173	mJ

[1] Continuous current is limited by package.

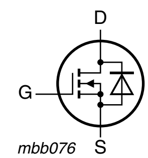
2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate		
2	D	drain [1]		
3	S	source		
mb	D	mounting base; connected to drain		



SOT428 (SC-63; DPAK)



[1] It is not possible to make connection to pin 2 of the SOT428 package.

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BUK7210-55B	SC-63; DPAK	plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped)	SOT428

4. Limiting values

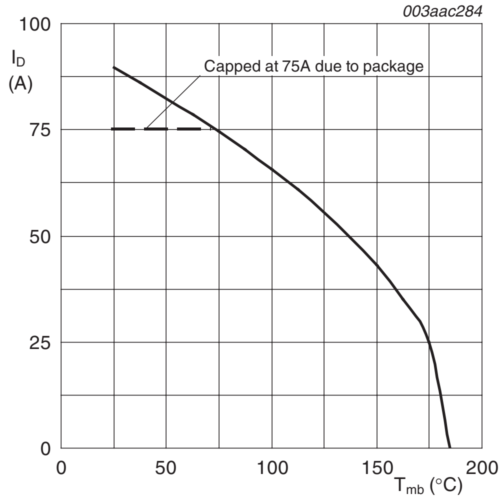
Table 4. Limiting values
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25$ °C; $T_j \leq 185$ °C		-	55	V
V_{DGR}	drain-gate voltage	$R_{GS} = 20$ kΩ; 25 °C ≤ $T_j \leq 185$ °C		-	55	V
V_{GS}	gate-source voltage			-20	20	V
I_D	drain current	$T_{mb} = 25$ °C; $V_{GS} = 10$ V; see Figure 1; see Figure 3;	[1]	-	89.6	A
		$T_{mb} = 100$ °C; $V_{GS} = 10$ V; see Figure 1		-	65.5	A
		$T_{mb} = 25$ °C; $V_{GS} = 10$ V; see Figure 1; see Figure 3;	[2]	-	75	A
I_{DM}	peak drain current	$T_{mb} = 25$ °C; $t_p \leq 10$ µs; pulsed		-	335	A
P_{tot}	total power dissipation	$T_{mb} = 25$ °C; see Figure 2		-	167	W
T_{stg}	storage temperature			-55	185	°C
T_j	junction temperature			-55	185	°C
Source-drain diode						
I_S	source current	$T_{mb} = 25$ °C;	[2]	-	75	A
		$T_{mb} = 25$ °C;	[3]	-	89.6	A
I_{SM}	peak source current	$t_p \leq 10$ µs; pulsed; $T_{mb} = 25$ °C		-	335	A
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 75$ A; $V_{sup} \leq 55$ V; $R_{GS} = 50$ Ω; $V_{GS} = 10$ V; $T_{j(init)} = 25$ °C; unclamped inductive load		-	173	mJ

[1] Current is limited by power dissipation chip rating.

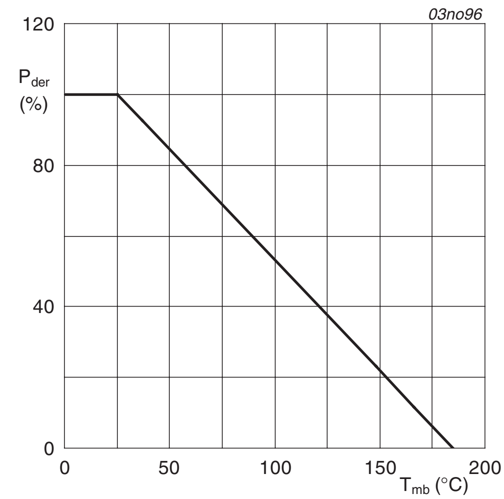
[2] Continuous current is limited by package.

[3] Current is limited by power dissipation chip rating.



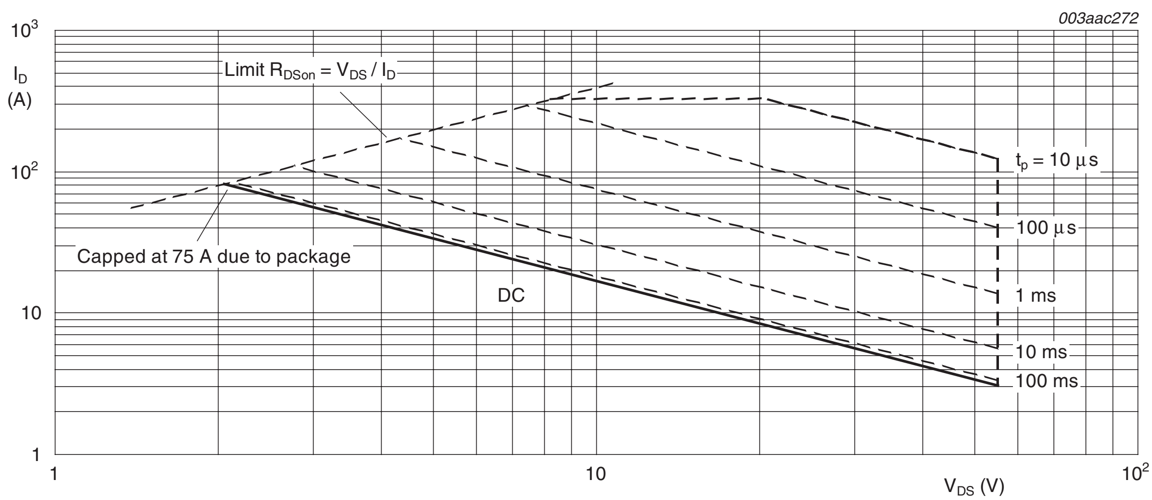
$$I_{der} = \frac{I_D}{I_{D(25°C)}} \times 100\ \%$$

Fig 1. Normalized continuous drain current as a function of mounting base temperature



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

Fig 2. Normalized total power dissipation as a function of mounting base temperature



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

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

5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	see Figure 4	-	-	0.95	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	Mounted on a printed circuit board; vertical in still air.; minimum footprint	-	75	-	K/W

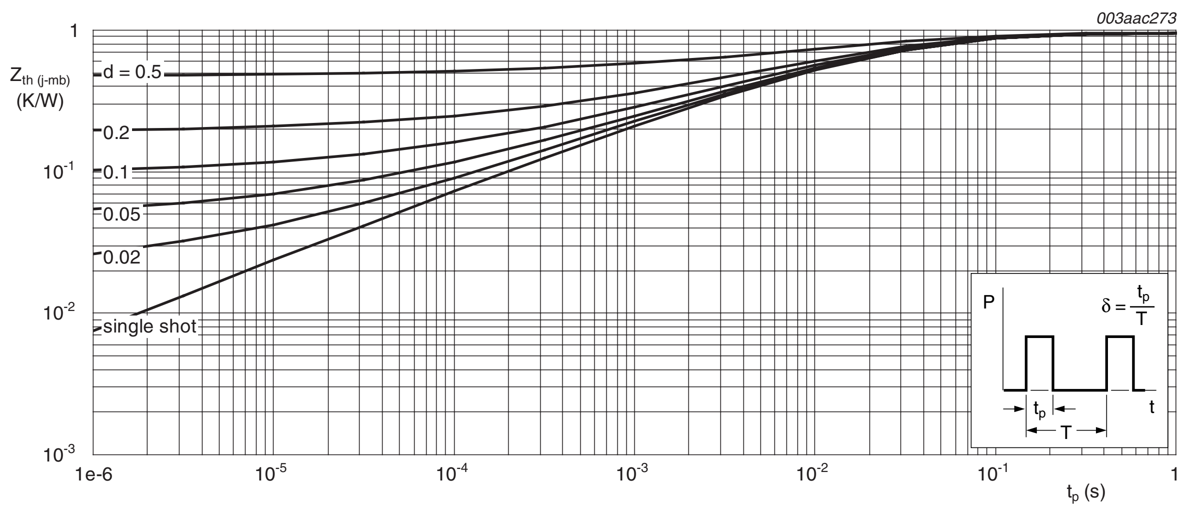


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

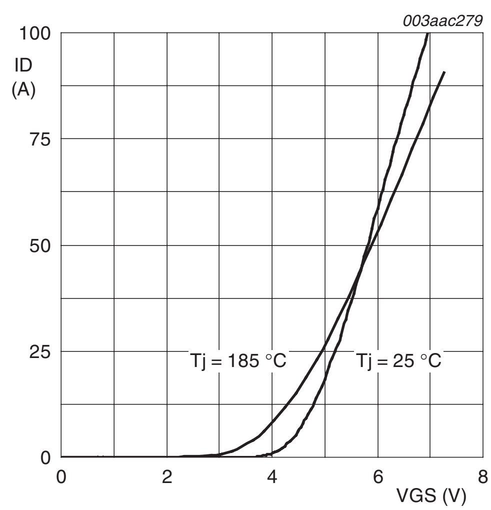
6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = 250 µA; V_{GS} = 0 V; T_j = 25 °C	55	-	-	V
		I_D = 250 µA; V_{GS} = 0 V; T_j = -55 °C	50	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	I_D = 1 mA; V_{DS} = V_{GS}; T_j = 175 °C; see Figure 7	-	1.75	-	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = 25 °C; see Figure 7; see Figure 8	2	3	4	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = 185 °C; see Figure 7	0.9	-	-	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = -40 °C; see Figure 7	-	2.8	-	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = -55 °C; see Figure 7	-	-	4.4	V
I_{DSS}	drain leakage current	V_{DS} = 55 V; V_{GS} = 0 V; T_j = 175 °C	-	1.5	500	µA
		V_{DS} = 55 V; V_{GS} = 0 V; T_j = 125 °C	-	0.1	90	µA
		V_{DS} = 55 V; V_{GS} = 0 V; T_j = 25 °C	-	0.02	1	µA
		V_{DS} = 55 V; V_{GS} = 0 V; T_j = 185 °C	-	3	800	µA
I_{GSS}	gate leakage current	V_{DS} = 0 V; V_{GS} = 20 V; T_j = 25 °C	-	2	100	nA
		V_{DS} = 0 V; V_{GS} = -20 V; T_j = 25 °C	-	2	100	nA
R_{DSon}	drain-source on-state resistance	V_{GS} = 10 V; I_D = 25 A; T_j = 185 °C; see Figure 9	-	-	20.8	mΩ
		V_{GS} = 10 V; I_D = 25 A; T_j = 25 °C; see Figure 10; see Figure 9	-	8.5	10	mΩ
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	I_D = 25 A; V_{DS} = 44 V; V_{GS} = 10 V; T_j = 25 °C; see Figure 12; see Figure 13	-	35	-	nC
Q_{GS}	gate-source charge		-	9	-	nC
Q_{GD}	gate-drain charge		-	12	-	nC
C_{iss}	input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz; T_j = 25 °C; see Figure 14	-	1840	2453	pF
C_{oss}	output capacitance		-	379	455	pF
C_{rss}	reverse transfer capacitance		-	165	226	pF
$t_{d(on)}$	turn-on delay time	V_{DS} = 25 V; R_L = 1.2 Ω; V_{GS} = 10 V; $R_{G(ext)}$ = 10 Ω; T_j = 25 °C	-	18	-	ns
t_r	rise time		-	91	-	ns
$t_{d(off)}$	turn-off delay time		-	48	-	ns
t_f	fall time		-	45	-	ns
L_D	internal drain inductance	measured from drain to center of die; T_j = 25 °C	-	2.5	-	nH
L_S	internal source inductance	measured from source lead to source bond pad; T_j = 25 °C	-	7.5	-	nH

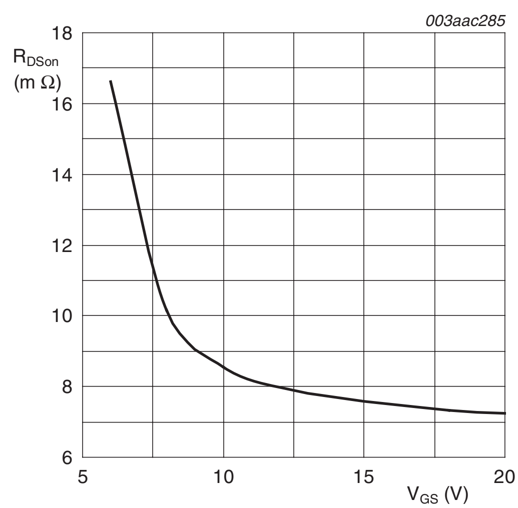
Table 6. Characteristics *…continued*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Source-drain diode						
V_{SD}	source-drain voltage	I_S = 18 A; V_{GS} = 0 V; T_j = 150 °C	-	0.76	-	V
		I_S = 18 A; V_{GS} = 0 V; T_j = 175 °C	-	0.74	-	V
		I_S = 18 A; V_{GS} = 0 V; T_j = 100 °C	-	0.8	-	V
		I_S = 18 A; V_{GS} = 0 V; T_j = 25 °C; see Figure 11	-	0.85	1.2	V
		I_S = 18 A; V_{GS} = 0 V; T_j = 125 °C	-	0.78	-	V
		I_S = 18 A; V_{GS} = 0 V; T_j = 185 °C; see Figure 11	-	0.73	-	V
t_{rr}	reverse recovery time	I_S = 20 A; dI_S/dt = -100 A/µs; V_{GS} = -10 V; V_{DS} = 30 V; T_j = 25 °C	-	67	-	ns
Q_r	recovered charge		-	65	-	nC



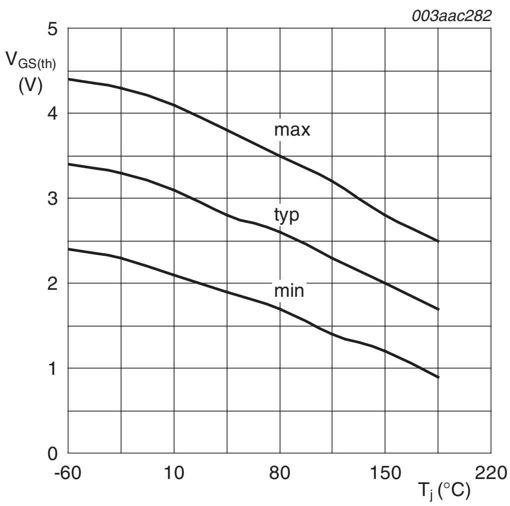
$V_{DS} > I_D \times R_{DSon}$

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



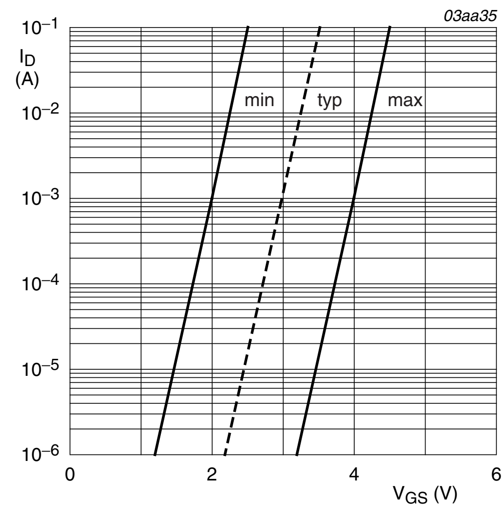
$T_j = 25\,°C; V_{DS} = 25\,V$

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



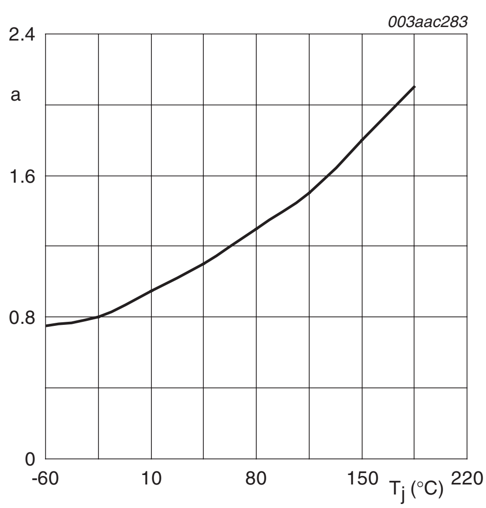
$I_D = 1 mA; V_{DS} = V_{GS}$

Fig 7. Gate-source threshold voltage as a function of junction temperature



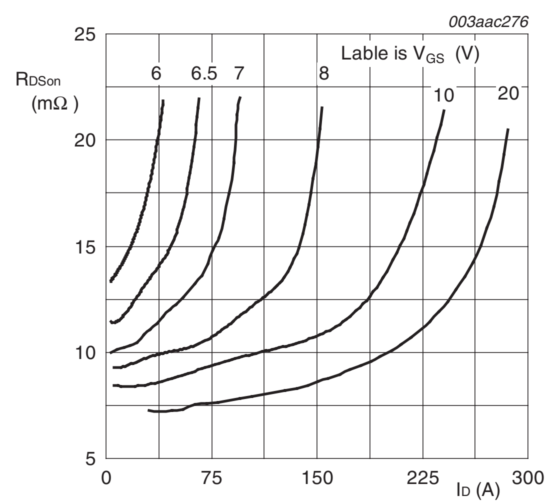
$T_j = 25\,°C; V_{DS} = 5 V$

Fig 8. Sub-threshold drain current as a function of gate-source voltage



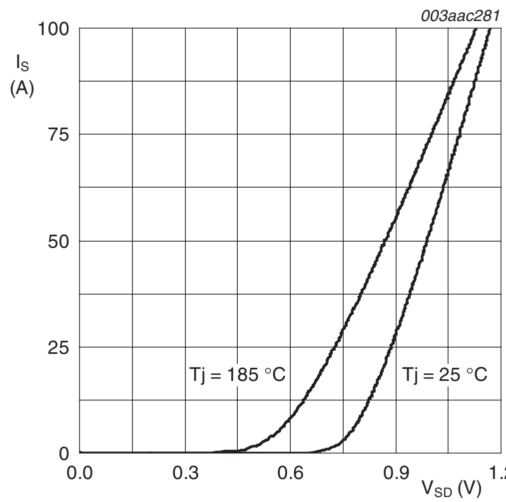
$$a = \frac{R_{DSon}}{R_{DSon(25\,°C)}}$$

Fig 9. Normalized drain-source on-state resistance factor as a function of junction temperature



$T_j = 25\,°C$

Fig 10. Drain-source on-state resistance as a function of drain current; typical values



$V_{GS} = 0V$

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

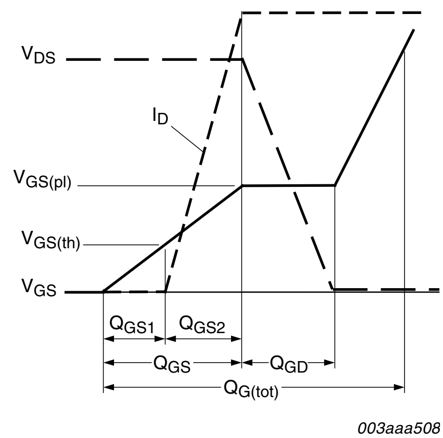
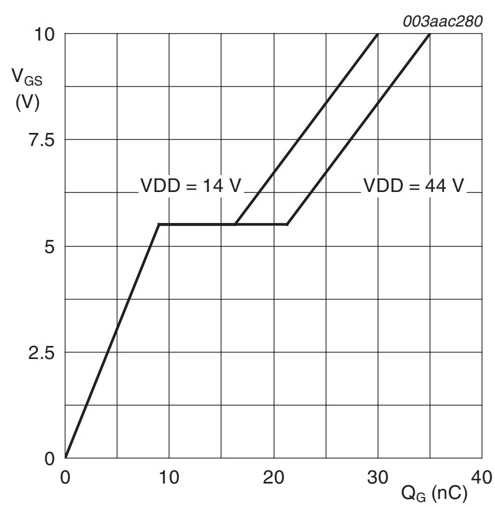
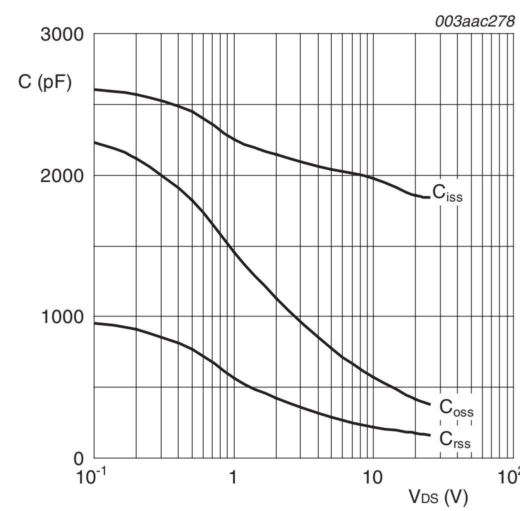


Fig 12. Gate charge waveform definitions



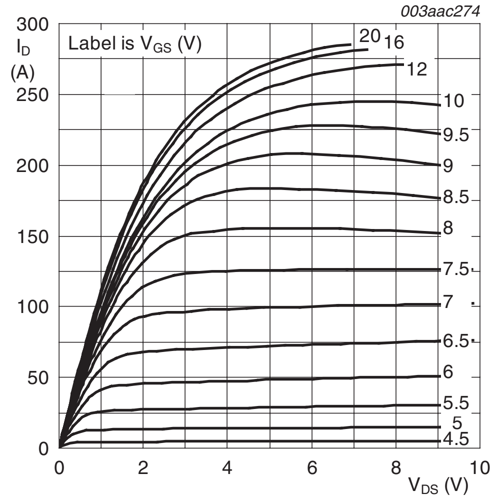
$I_D = 25A$

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



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

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

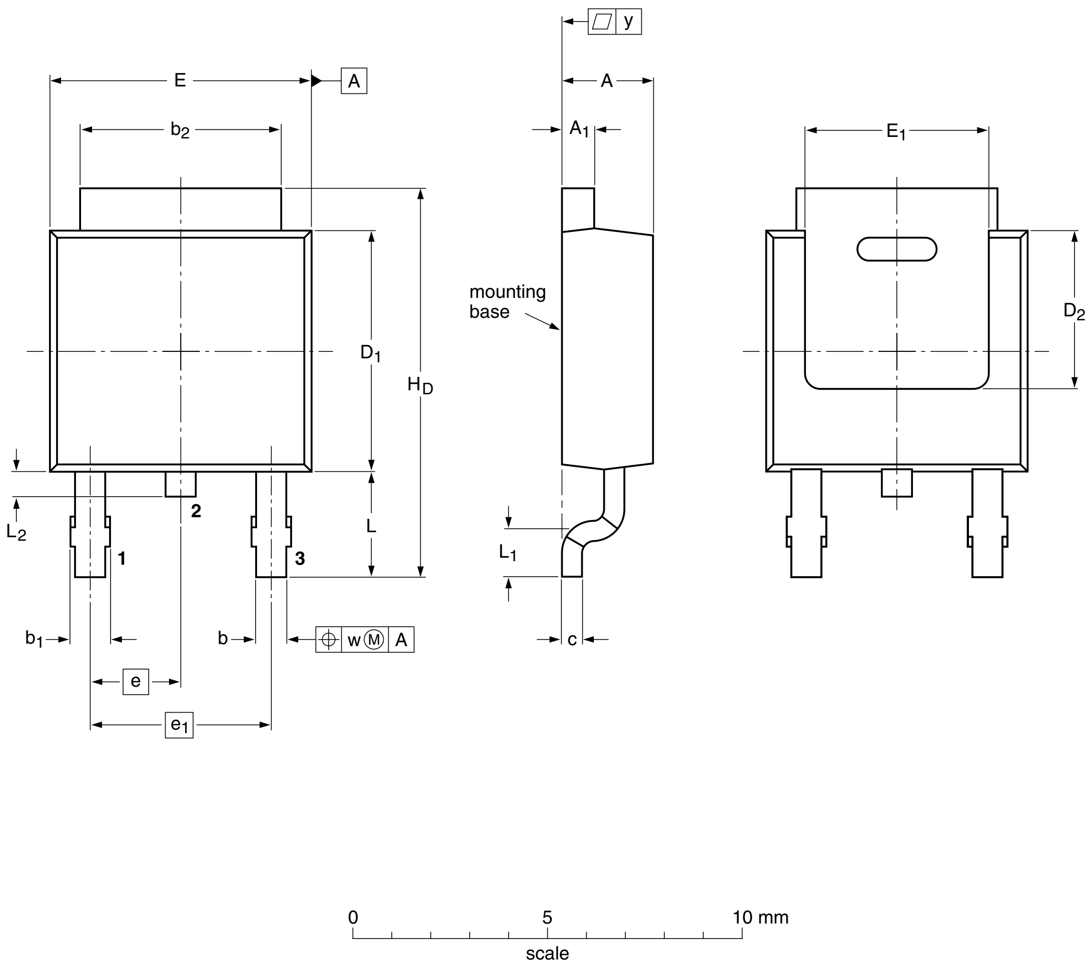


$T_j = 25\,°C$

Fig 15. Output characteristics: drain current as a function of drain-source voltage; typical values

7. Package outline

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



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b	b_1	b_2	c	D_1	D_2 min	E	E_1 min	e	e_1	H_D	L	L_1 min	L_2	w	y max
mm	2.38 2.22	0.93 0.46	0.89 0.71	1.1 0.9	5.46 5.00	0.56 0.20	6.22 5.98	4.0	6.73 6.47	4.45	2.285	4.57	10.4 9.6	2.95 2.55	0.5	0.9 0.5	0.2	0.2

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT428		TO-252	SC-63			~~06-02-14~~ 06-03-16

Fig 16. Package outline SOT428 (DPAK)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BUK7210-55B_1	20081211	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.nexperia.com.

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11. Contents

Date of release: 11 December 2008