BUK9215-55A

N-channel TrenchMOS logic level FET

7 April 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

- AEC Q101 compliant
- Low conduction losses due to low on-state resistance
- 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	$T_j \geq 25$ °C; $T_j \leq 175$ °C		-	-	55	V
I_D	drain current	V_{GS} = 5 V; T_{mb} = 25 °C; Fig. 2; Fig. 3	[1]	-	-	62	A
P_{tot}	total power dissipation	T_{mb} = 25 °C; Fig. 1		-	-	115	W
Static characteristics							
R_{DSon}	drain-source on-state resistance	V_{GS} = 10 V; I_D = 25 A; T_j = 25 °C		-	11	13.6	mΩ
		V_{GS} = 4.5 V; I_D = 25 A; T_j = 25 °C		-	-	16.6	mΩ
		V_{GS} = 5 V; I_D = 25 A; T_j = 25 °C; Fig. 11; Fig. 12		-	13	15	mΩ
Dynamic characteristics							
Q_{GD}	gate-drain charge	V_{GS} = 5 V; I_D = 25 A; V_{DS} = 44 V; T_j = 25 °C; Fig. 9		-	20	-	nC

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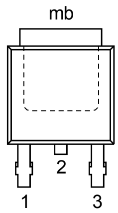
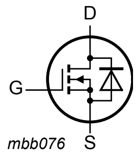
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Avalanche ruggedness							
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	I_D = 62 A; V_{sup} ≤ 55 V; R_{GS} = 50 Ω; V_{GS} = 5 V; $T_{j(init)}$ = 25 °C; unclamped		-	-	211	mJ

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

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 **DPAK (SOT428)**	
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
BUK9215-55A	DPAK	plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped)	SOT428

7. 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; $T_j \leq 175$ °C		-	55	V
V_{DGR}	drain-gate voltage	R_{GS} = 20 kΩ		-	55	V
V_{GS}	gate-source voltage			-15	15	V
P_{tot}	total power dissipation	T_{mb} = 25 °C; Fig. 1		-	115	W
I_D	drain current	T_{mb} = 25 °C; V_{GS} = 5 V; Fig. 2; Fig. 3	[1]	-	62	A
			[2]	-	55	A
		T_{mb} = 100 °C; V_{GS} = 5 V; Fig. 2	[1]	-	44	A
I_{DM}	peak drain current	T_{mb} = 25 °C; pulsed; $t_p \leq 10$ µs; Fig. 3		-	248	A
T_{stg}	storage temperature			-55	175	°C
T_j	junction temperature			-55	175	°C
Source-drain diode						
I_S	source current	T_{mb} = 25 °C	[2]	-	55	A
			[1]	-	62	A
I_{SM}	peak source current	pulsed; $t_p \leq 10$ µs; T_{mb} = 25 °C		-	248	A
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	I_D = 62 A; $V_{sup} \leq 55$ V; R_{GS} = 50 Ω; V_{GS} = 5 V; $T_{j(init)}$ = 25 °C; unclamped		-	211	mJ

[1] Current is limited by power dissipation chip rating.
[2] Continious current is limited by bond wires.

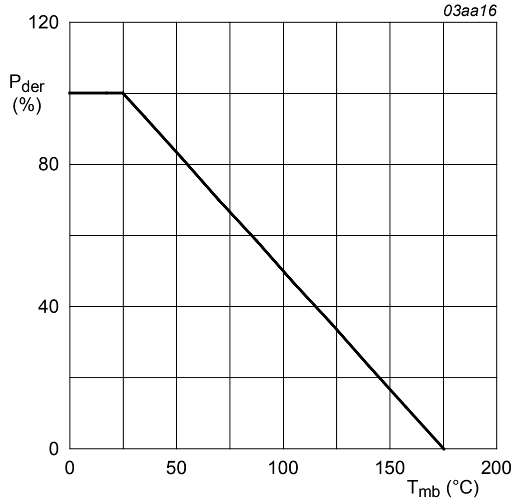


Fig. 1. Normalized total power dissipation as a function of mounting base temperature

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

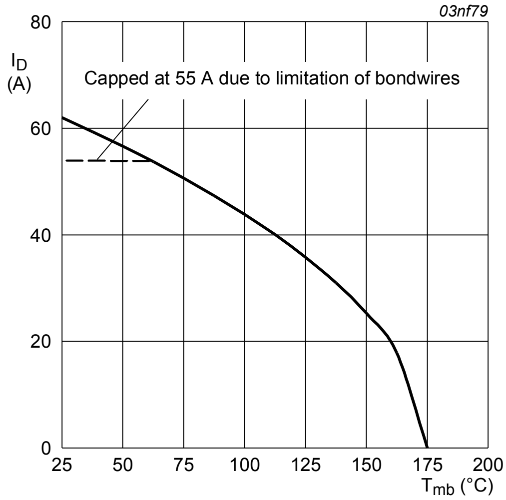


Fig. 2. Continuous drain current as a function of mounting base temperature

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

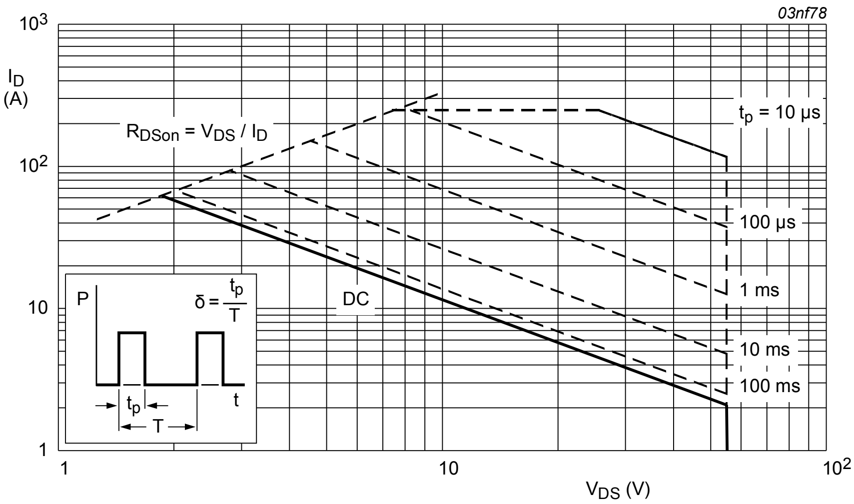


Fig. 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

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

8. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	Fig. 4		-	-	1.3	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient			-	71.4	-	K/W

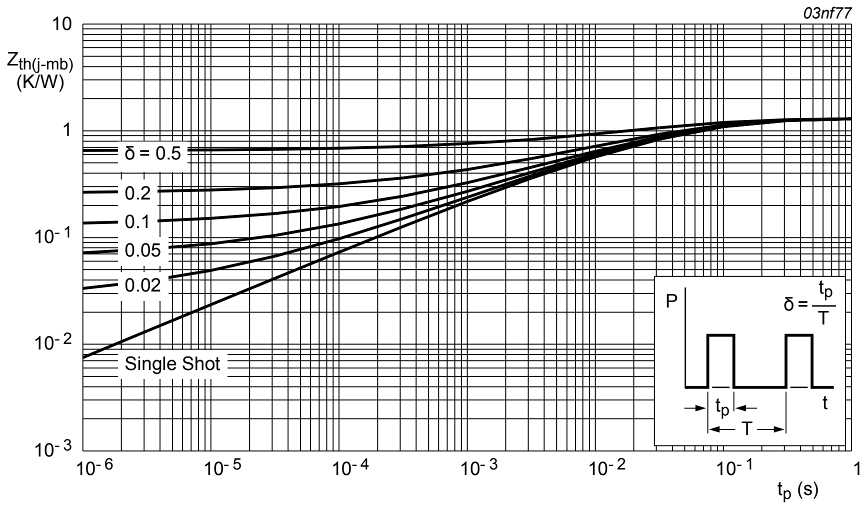


Fig. 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

9. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = 0.25 mA; V_{GS} = 0 V; T_j = 25 °C		55	-	-	V
		I_D = 0.25 mA; 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 = -55 °C; Fig. 10		-	-	2.3	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = 175 °C; Fig. 10		0.5	-	-	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = 25 °C; Fig. 10		1	1.5	2	V
I_{DSS}	drain leakage current	V_{DS} = 55 V; V_{GS} = 0 V; T_j = 25 °C		-	0.05	10	μA
		V_{DS} = 55 V; V_{GS} = 0 V; T_j = 175 °C		-	-	500	μA
I_{GSS}	gate leakage current	V_{GS} = 10 V; V_{DS} = 0 V; T_j = 25 °C		-	2	100	nA
		V_{GS} = -10 V; V_{DS} = 0 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 = 25 °C		-	11	13.6	mΩ
		V_{GS} = 4.5 V; I_D = 25 A; T_j = 25 °C		-	-	16.6	mΩ
		V_{GS} = 5 V; I_D = 25 A; T_j = 175 °C; Fig. 11; Fig. 12		-	-	30	mΩ
		V_{GS} = 5 V; I_D = 25 A; T_j = 25 °C; Fig. 11; Fig. 12		-	13	15	mΩ
Dynamic characteristics							
$Q_{G(tot)}$	total gate charge	I_D = 25 A; V_{DS} = 44 V; V_{GS} = 5 V; T_j = 25 °C; Fig. 9		-	48	-	nC
Q_{GS}	gate-source charge			-	6	-	nC
Q_{GD}	gate-drain charge			-	20	-	nC
C_{iss}	input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz; T_j = 25 °C; Fig. 13		-	2190	2916	pF
C_{oss}	output capacitance			-	380	450	pF
C_{rss}	reverse transfer capacitance			-	250	344	pF
$t_{d(on)}$	turn-on delay time	V_{DS} = 30 V; R_L = 1.2 Ω; V_{GS} = 5 V; $R_{G(ext)}$ = 10 Ω; T_j = 25 °C		-	19	-	ns
t_r	rise time			-	161	-	ns
$t_{d(off)}$	turn-off delay time			-	138	-	ns
t_f	fall time			-	165	-	ns
L_D	internal drain inductance	measured from drain to centre of die		-	2.5	-	nH

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
L_S	internal source inductance	measured from source lead to source bond pad		-	7.5	-	nH
Source-drain diode							
V_{SD}	source-drain voltage	I_S = 20 A; V_{GS} = 0 V; T_j = 25 °C; Fig. 14		-	0.85	1.2	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		-	51	-	ns
Q_r	recovered charge			-	102	-	nC

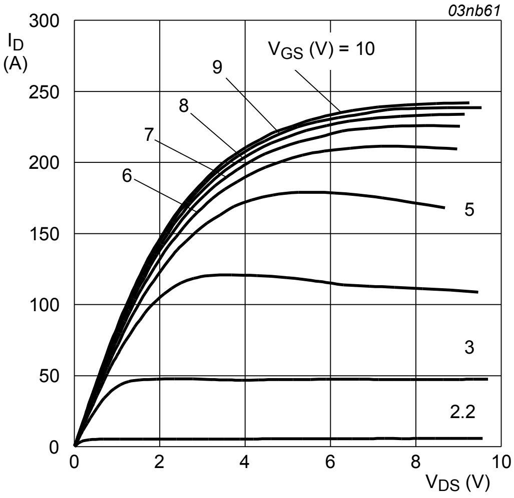


Fig. 5. Output characteristics: drain current as a function of drain-source voltage; typical values

$T_j = 25°C$

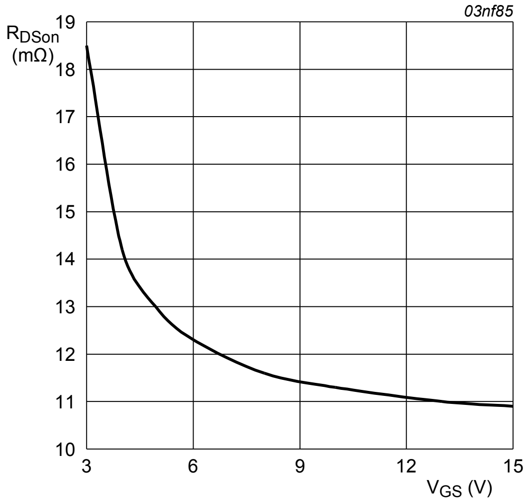


Fig. 6. Drain-source on-state resistance as a function of gate-source voltage; typical values

$T_j = 25°C; I_D = 25A$

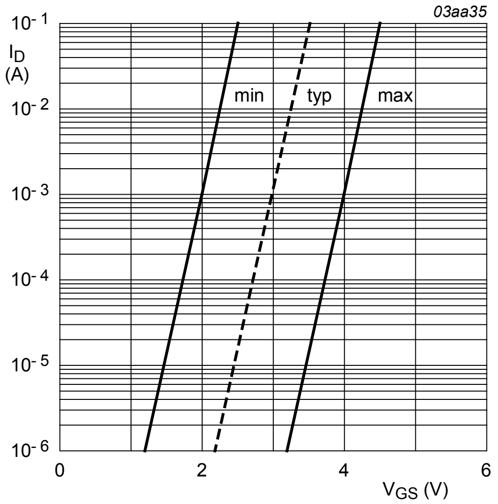


Fig. 7. Sub-threshold drain current as a function of gate-source voltage

$T_j = 25°C; V_{DS} = 5V$

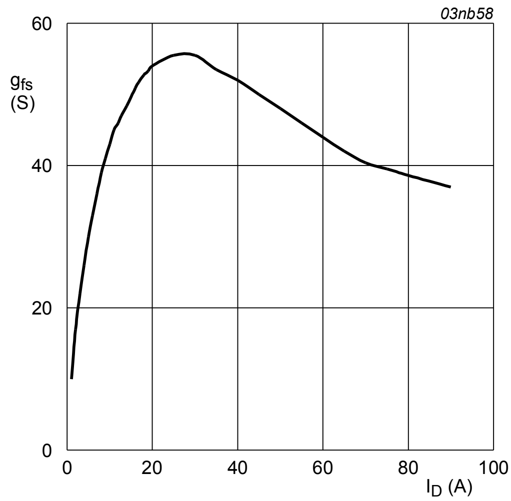


Fig. 8. Forward transconductance as a function of drain current; typical values

$T_j = 25°C; V_{DS} = 25V$

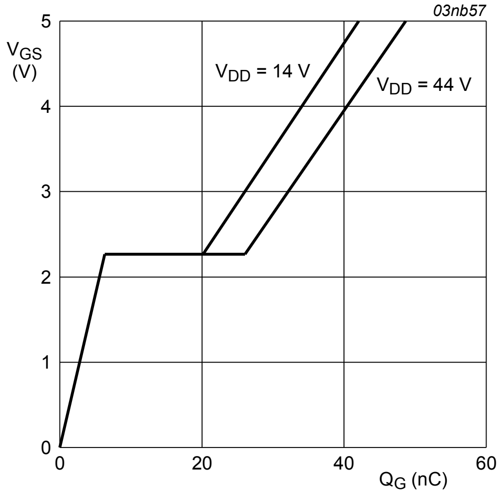


Fig. 9. Gate-source voltage as a function of turn-on gate charge; typical values

$T_j = 25°C; I_D = 25 A$

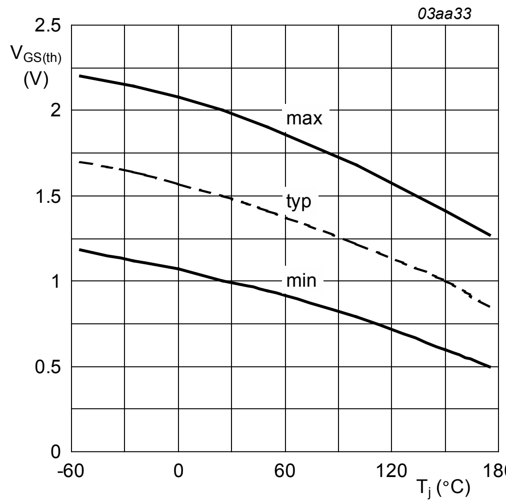


Fig. 10. Gate-source threshold voltage as a function of junction temperature

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

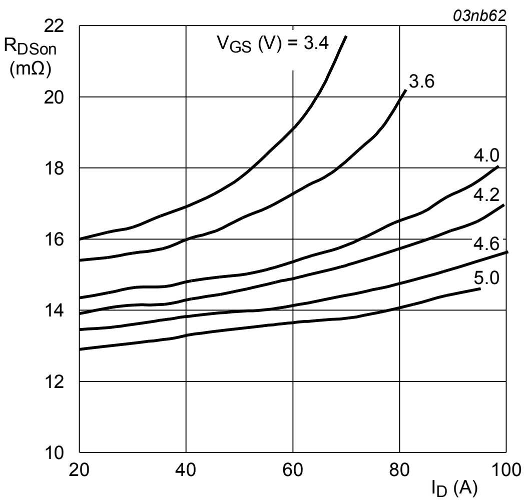


Fig. 11. Drain-source on-state resistance as a function of drain current; typical values

$T_j = 25°C$

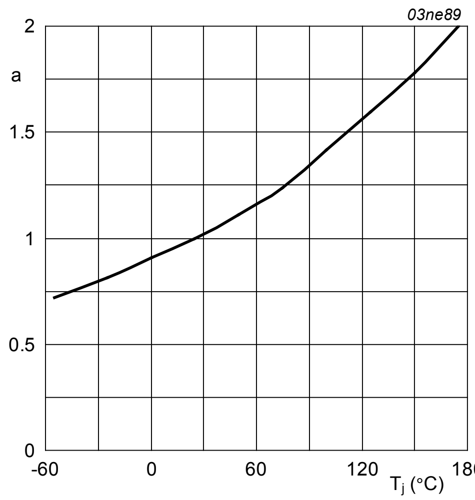


Fig. 12. Normalized drain-source on-state resistance factor as a function of junction temperature

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

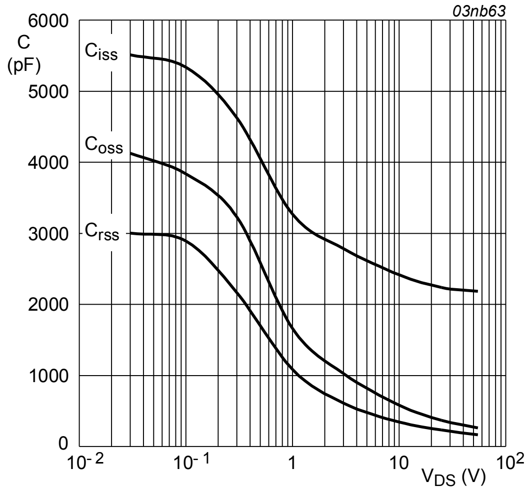


Fig. 13. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

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

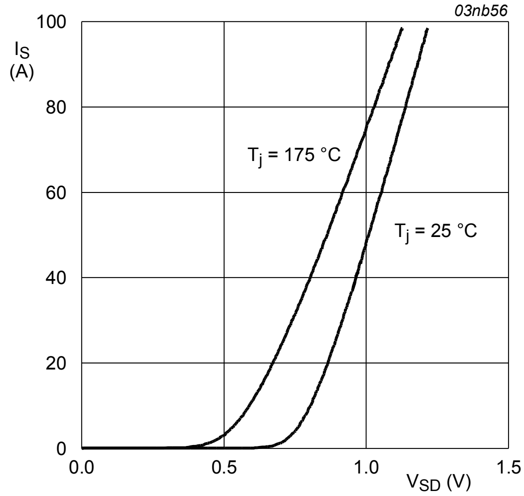
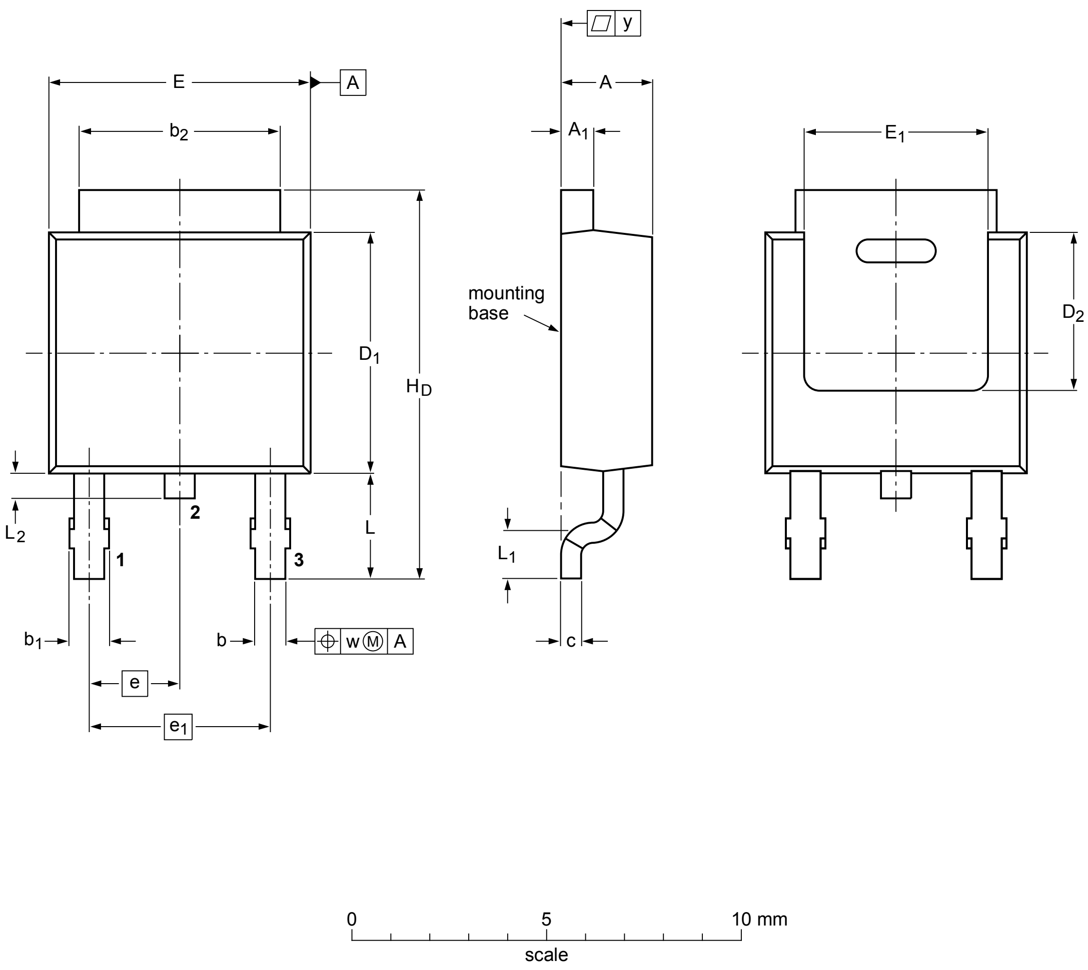


Fig. 14. Reverse diode current; typical value

$V_{GS} = 0V$

10. 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. 15. Package outline DPAK (SOT428)

11. Legal information

11.1 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.
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12. Contents

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