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BUK765R0-100E

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BUK765R0-100E

N-channel TrenchMOS standard level FET

28 July 2016 **Product data sheet**

1. General description

Standard level N-channel MOSFET in a SOT404 package using TrenchMOS technology. This product has been designed and qualified to AEC Q101 standard for use in high performance automotive applications.

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 $V_{GS(th)}$ rating of greater than 1 V at 175 °C

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

4. Quick reference data

Table 1. Quick reference data

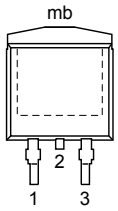
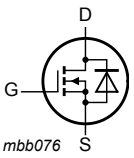
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25$ °C; $T_j \leq 175$ °C		-	-	100	V
I_D	drain current	V_{GS} = 10 V; T_{mb} = 25 °C; Fig. 2	[1]	-	-	120	A
P_{tot}	total power dissipation	T_{mb} = 25 °C; Fig. 1		-	-	349	W
Static characteristics							
R_{DSon}	drain-source on-state resistance	V_{GS} = 10 V; I_D = 25 A; T_j = 25 °C; Fig. 11		-	3.9	5	mΩ
Dynamic characteristics							
Q_{GD}	gate-drain charge	V_{GS} = 10 V; I_D = 25 A; V_{DS} = 80 V; T_j = 25 °C; Fig. 13; Fig. 14		-	65	-	nC

[1] Continuous current is limited by package.

Scan or click this QR code to view the latest information for this product

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 **D2PAK (SOT404)**	
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
BUK765R0-100E	D2PAK	plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped)	SOT404

7. Marking

Table 4. Marking codes

Type number	Marking code
BUK765R0-100E	BUK765R0-100E

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	$T_j \geq 25$ °C; $T_j \leq 175$ °C		-	100	V
V_{DGR}	drain-gate voltage	R_{GS} = 20 kΩ		-	100	V
V_{GS}	gate-source voltage	$T_j \leq 175$ °C; DC		-20	20	V
P_{tot}	total power dissipation	T_{mb} = 25 °C; Fig. 1		-	349	W
I_D	drain current	T_{mb} = 25 °C; V_{GS} = 10 V; Fig. 2	[1]	-	120	A
		T_{mb} = 100 °C; V_{GS} = 10 V; Fig. 2		-	115	A
I_{DM}	peak drain current	T_{mb} = 25 °C; pulsed; $t_p \leq 10$ µs; Fig. 3		-	643	A
T_{stg}	storage temperature			-55	175	°C
T_j	junction temperature			-55	175	°C

Symbol	Parameter	Conditions		Min	Max	Unit
Source-drain diode						
I_S	source current	T_{mb} = 25 °C	[1]	-	120	A
I_{SM}	peak source current	pulsed; $t_p \leq 10$ µs; T_{mb} = 25 °C		-	643	A
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	I_D = 120 A; $V_{sup} \leq 100$ V; R_{GS} = 50 Ω; V_{GS} = 10 V; $T_{j(init)}$ = 25 °C; unclamped; Fig. 4	[2][3]	-	385	mJ

[1] Continuous current is limited by package.
[2] Single-pulse avalanche rating limited by maximum junction temperature of 175 °C.
[3] Refer to application note AN10273 for further information.

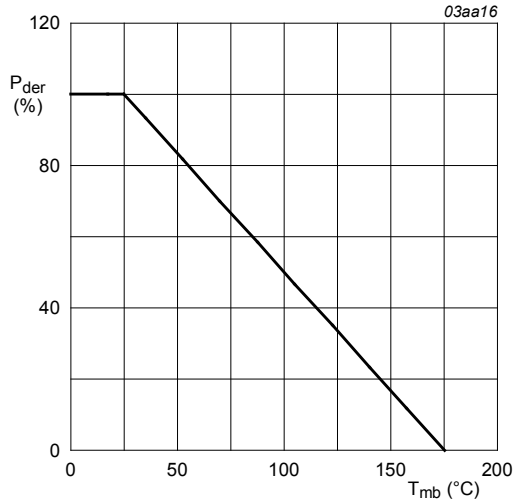


Fig. 1. Normalized total power dissipation as a function of mounting base temperature

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

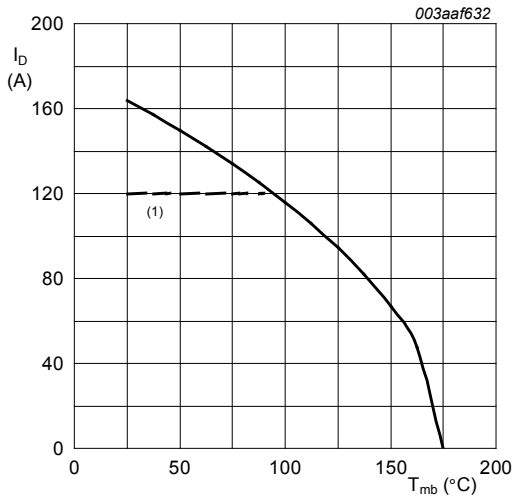


Fig. 2. Continuous drain current as a function of mounting base temperature

$V_{GS} \geq 10\,V$

(1) Capped at 120 A due to package.

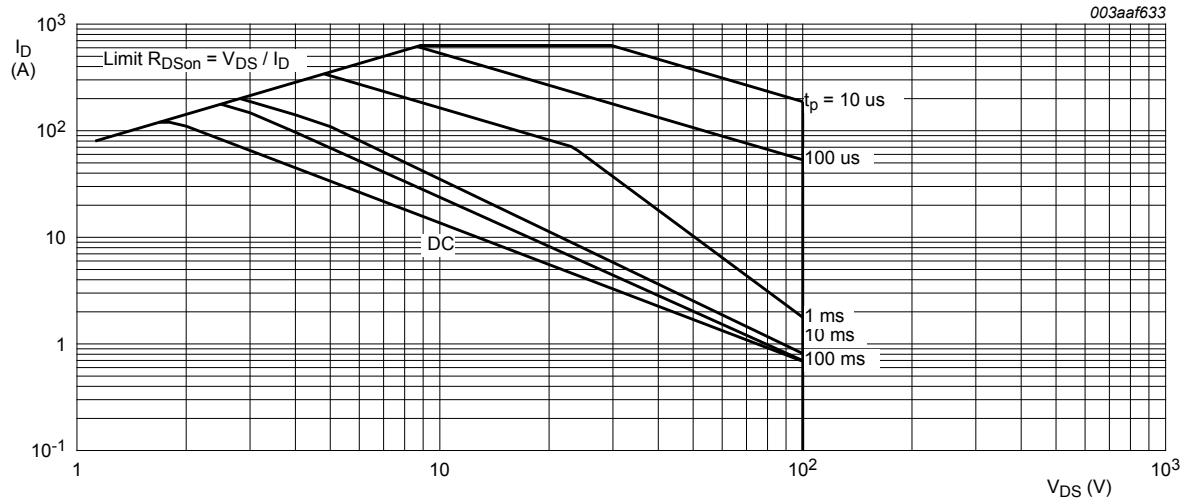


Fig. 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

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

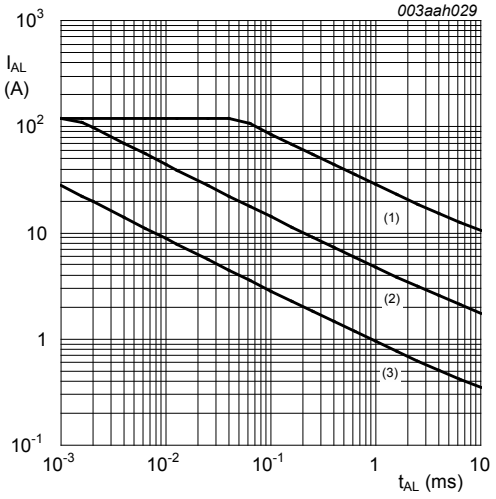


Fig. 4. Single-pulse and repetitive avalanche rating; avalanche current as a function of avalanche time

(1) $T_{j(init)} = 25°C$; (2) $T_{j(init)} = 150°C$; (3) Repetitive Avalanche

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. 5		-	-	0.43	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	minimum footprint ; mounted on a printed-circuit board		-	50	-	K/W

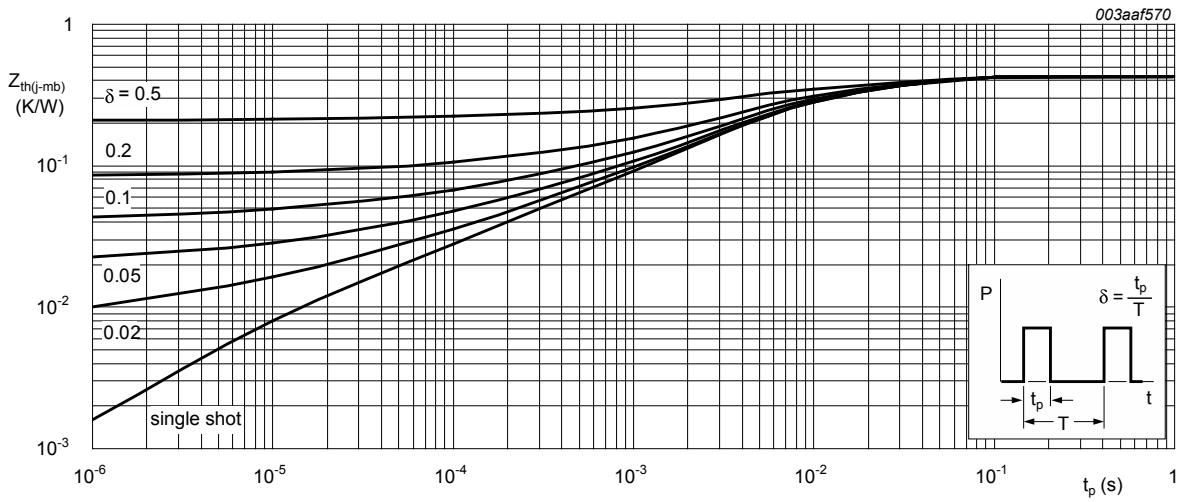


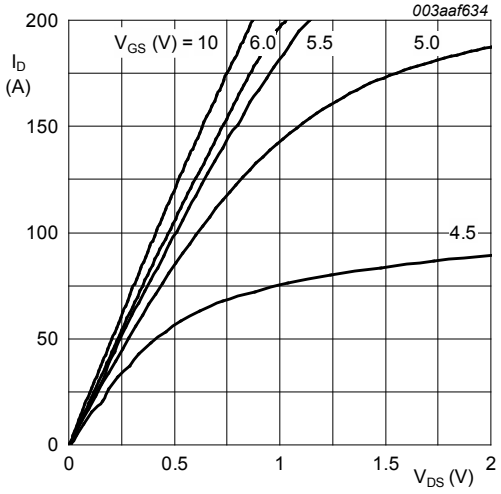
Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration.

10. Characteristics

Table 7. 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		100	-	-	V
		I_D = 250 µA; V_{GS} = 0 V; T_j = -55 °C		90	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	I_D = 1 mA; V_{DS} = V_{GS}; T_j = 25 °C; Fig. 9; Fig. 10		2.4	3	4	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = 175 °C; Fig. 9		1	-	-	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = -55 °C; Fig. 9		-	-	4.5	V
I_{DSS}	drain leakage current	V_{DS} = 100 V; V_{GS} = 0 V; T_j = 25 °C		-	0.1	1	µA
		V_{DS} = 100 V; V_{GS} = 0 V; T_j = 175 °C		-	-	500	µA
I_{GSS}	gate leakage current	V_{GS} = 20 V; V_{DS} = 0 V; T_j = 25 °C		-	2	100	nA
		V_{GS} = -20 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; Fig. 11		-	3.9	5	mΩ
		V_{GS} = 10 V; I_D = 25 A; T_j = 175 °C; Fig. 11; Fig. 12		-	-	13.5	mΩ
Dynamic characteristics							
$Q_{G(tot)}$	total gate charge	I_D = 25 A; V_{DS} = 80 V; V_{GS} = 10 V; T_j = 25 °C; Fig. 13; Fig. 14		-	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 V; V_{DS} = 25 V; f = 1 MHz; T_j = 25 °C; 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 V; R_L = 3.2 Ω; V_{GS} = 10 V; $R_{G(ext)}$ = 5 Ω		-	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 mounting base to centre of die		-	2.5	-	nH
L_S	internal source inductance	measured from source lead to source bond pad; T_j = 25 °C		-	7.5	-	nH
Source-drain diode							
V_{SD}	source-drain voltage	I_S = 25 A; V_{GS} = 0 V; T_j = 25 °C; Fig. 16		-	0.77	1.2	V
t_{rr}	reverse recovery time	I_S = 20 A; dI_S/dt = -100 A/µs; V_{GS} = 0 V; V_{DS} = 25 V		-	65	-	ns
Q_r	recovered charge			-	191	-	nC



T_j = 25 °C; t_p = 300 µs

Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values

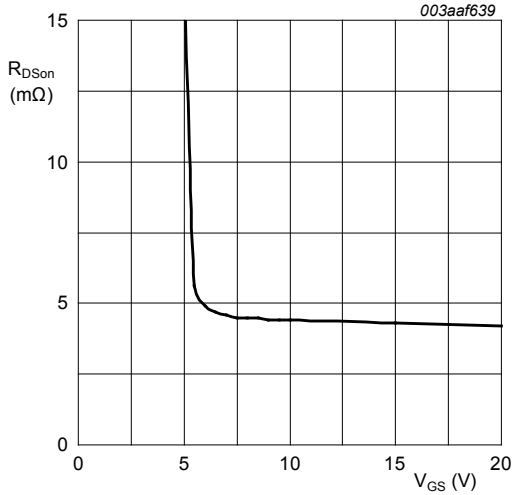


Fig. 7. Drain-source on-state resistance as a function of gate-source voltage; typical values

$T_j = 25\,°C; I_D = 25A$

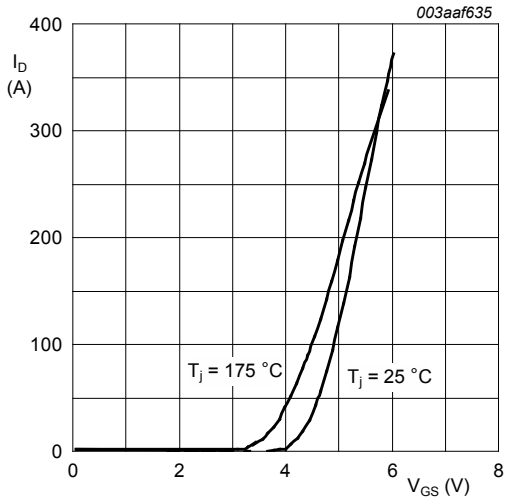


Fig. 8. Transfer characteristics: drain current as a function of gate-source voltage; typical values

$V_{DS} = 12V$

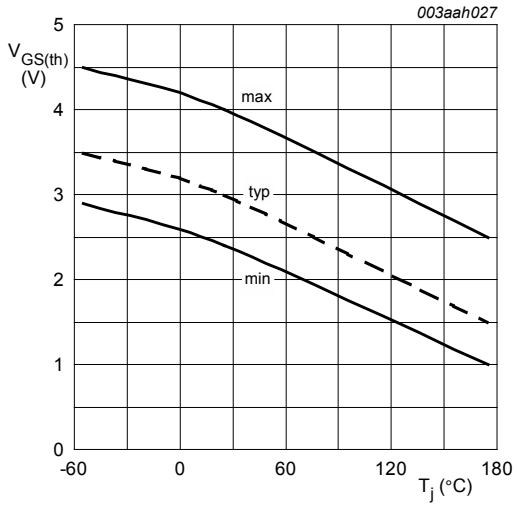


Fig. 9. Gate-source threshold voltage as a function of junction temperature

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

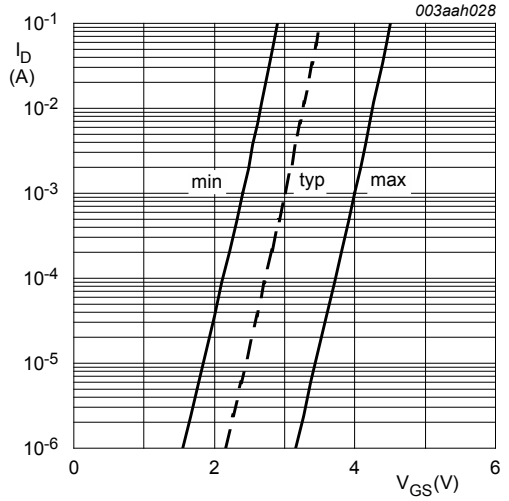
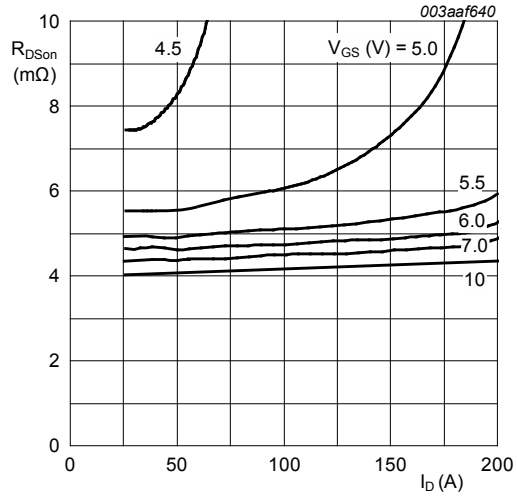


Fig. 10. Sub-threshold drain current as a function of gate-source voltage

$T_j = 25°C$; $V_{DS} = 5V$



T_j = 25 °C; t_p = 300 µs

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

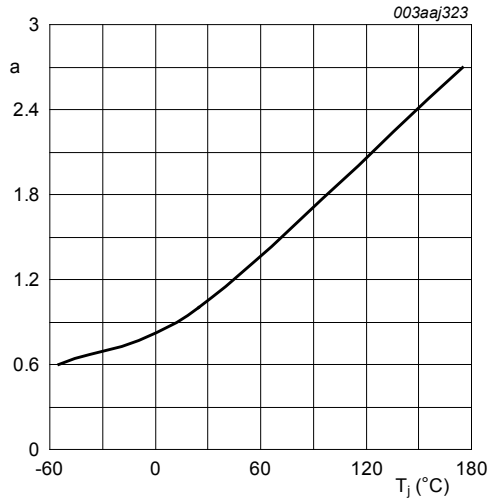
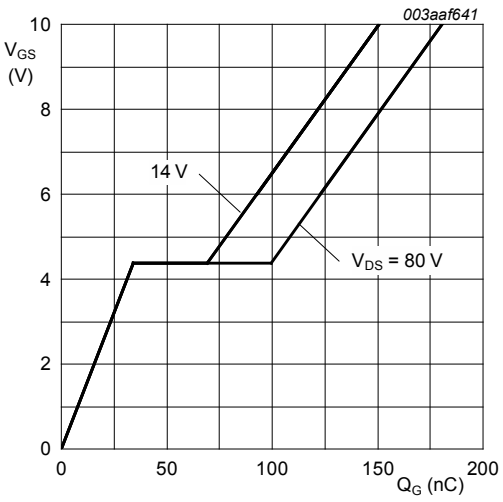


Fig. 12. Normalized drain-source on-state resistance factor as a function of junction temperature

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



T_j = 25 °C; I_D = 25 A

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

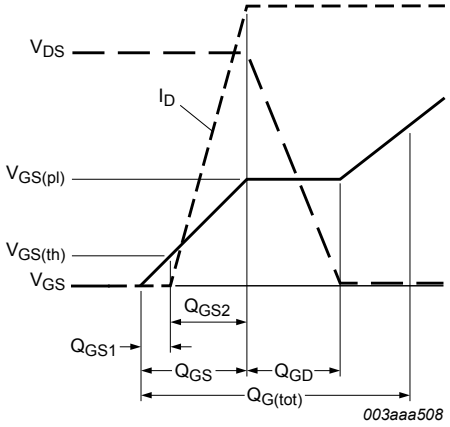
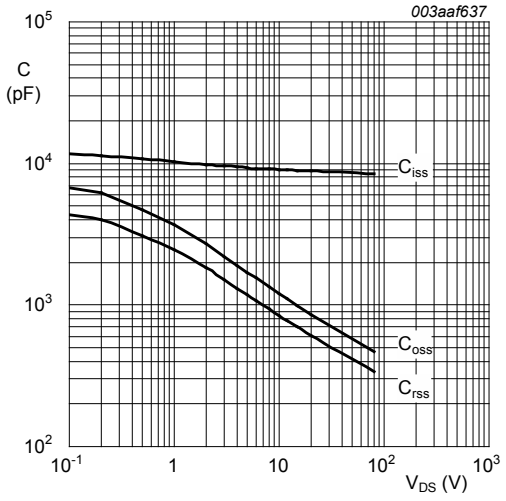
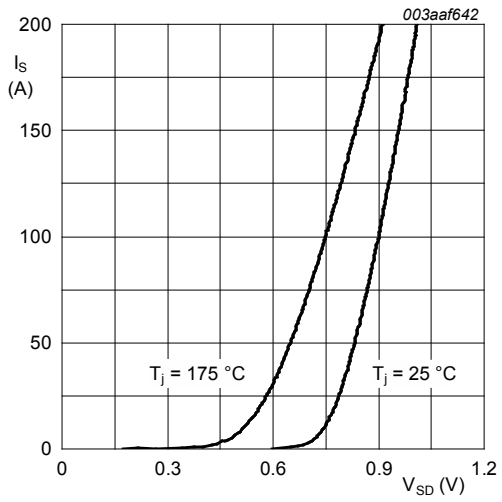


Fig. 14. Gate charge waveform definitions



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

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

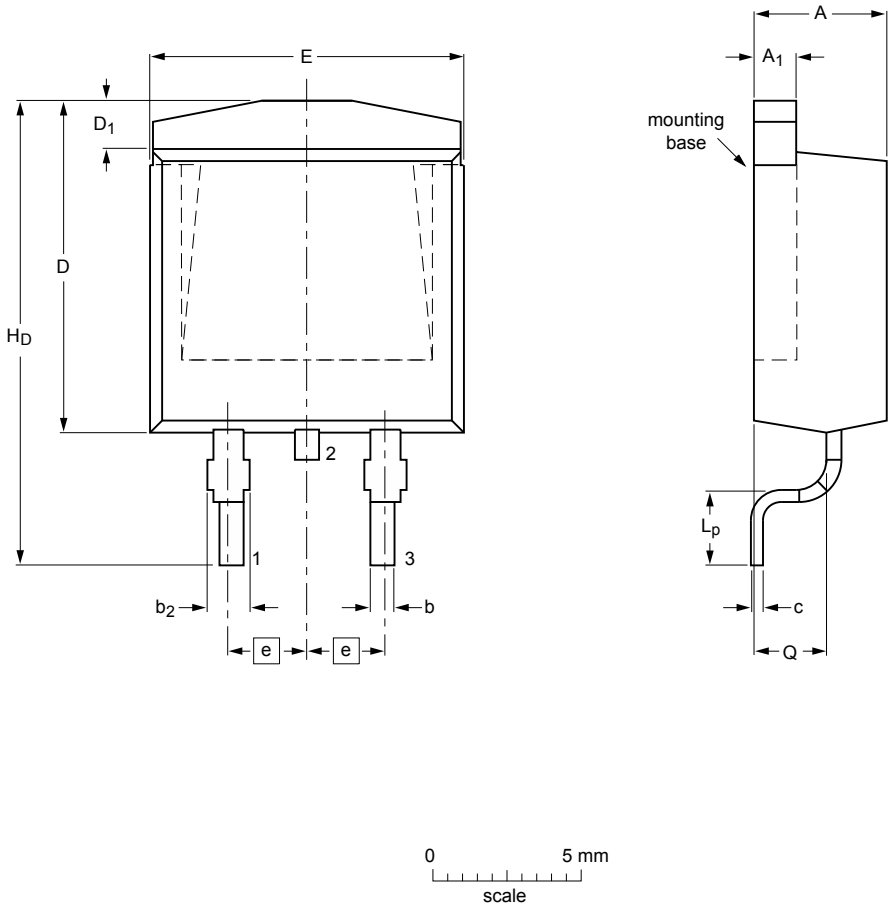


V_{GS} = 0 V

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

11. Package outline

Plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped) **SOT404**



Dimensions (mm are the original dimensions)

Unit		A	A_1	b	b_2	c	D	D_1	E	e	H_D	L_p	Q
mm	max	4.5	1.40	0.85	1.45	0.64	11	1.6	10.3		15.8	2.9	2.6
	nom									2.54			
	min	4.1	1.27	0.60	1.05	0.46		1.2	9.7		14.8	2.1	2.2

sot404_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT404						~~06-03-16~~ 13-02-25

Fig. 17. Package outline D2PAK (SOT404)

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.
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Date of release: 28 July 2016

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BUK765R0-100E

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