



BUK761R6-40E

N-channel TrenchMOS standard level FET

5 September 2013

Product data sheet

1. General description

Standard level N-channel MOSFET in a SOT404A 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

- 12 V 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

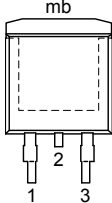
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25\text{ °C}$; $T_j \leq 175\text{ °C}$		-	-	40	V
I_D	drain current	$V_{GS} = 10\text{ V}$; $T_{mb} = 25\text{ °C}$; Fig. 1	[1]	-	-	120	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}$; Fig. 2		-	-	349	W
Static characteristics							
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}$; $I_D = 25\text{ A}$; $T_j = 25\text{ °C}$; Fig. 11		-	1.3	1.57	mΩ
Dynamic characteristics							
Q_{GD}	gate-drain charge	$V_{GS} = 10\text{ V}$; $I_D = 25\text{ A}$; $V_{DS} = 32\text{ V}$; Fig. 13 ; Fig. 14		-	48.2	-	nC

[1] Continuous current is limited by package.

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 D2PAK (SOT404A)	 mbb076
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
BUK761R6-40E	D2PAK	plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped)	SOT404A

7. Marking

Table 4. Marking codes

Type number	Marking code
BUK761R6-40E	BUK761R6-40E

8. Limiting values

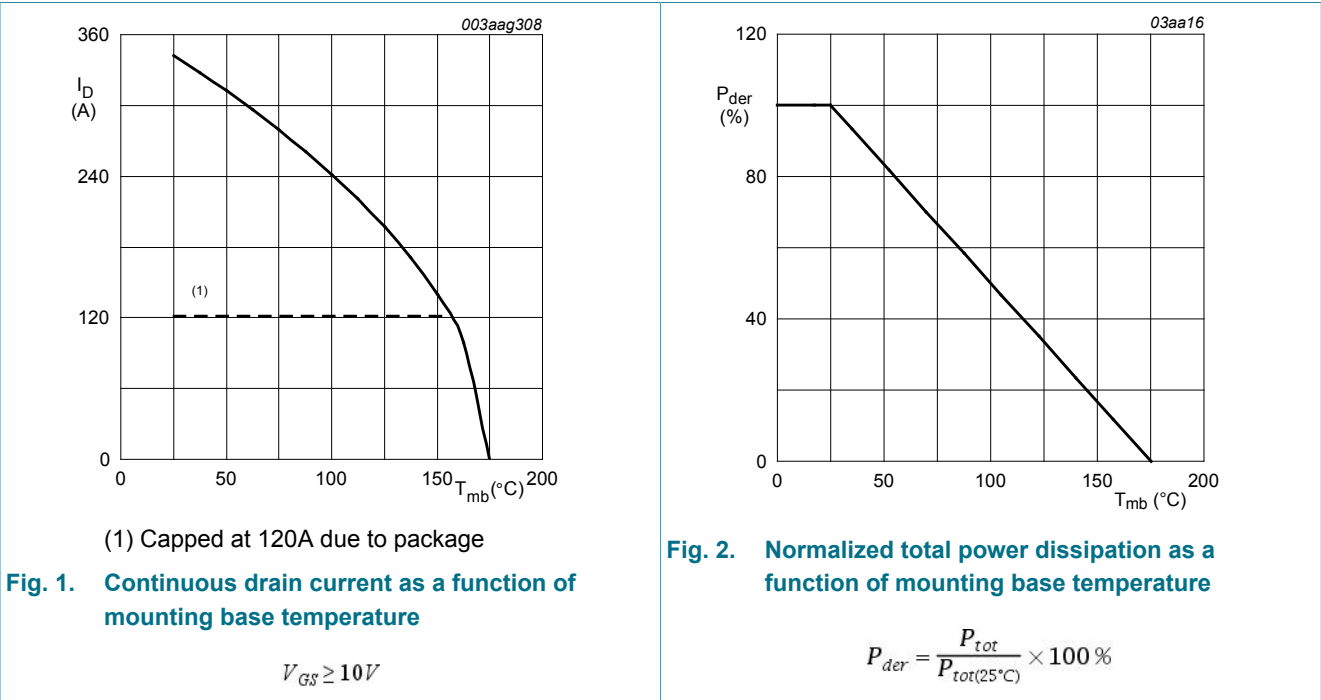
Table 5. Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25\text{ °C}$; $T_j \leq 175\text{ °C}$		-	40	V
V_{DGR}	drain-gate voltage	$R_{GS} = 20\text{ k}\Omega$		-	40	V
V_{GS}	gate-source voltage	$T_j \leq 175\text{ °C}$; DC		-20	20	V
I_D	drain current	$T_{mb} = 25\text{ °C}$; $V_{GS} = 10\text{ V}$; Fig. 1	[1]	-	120	A
		$T_{mb} = 100\text{ °C}$; $V_{GS} = 10\text{ V}$; Fig. 1	[1]	-	120	A
I_{DM}	peak drain current	$T_{mb} = 25\text{ °C}$; pulsed; $t_p \leq 10\text{ }\mu\text{s}$; Fig. 4		-	1355	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}$; Fig. 2		-	349	W
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 ≤ 10 μs; T _{mb} = 25 °C		-	1355	A
Avalanche ruggedness						
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	I _D = 120 A; V _{sup} ≤ 40 V; R _{GS} = 50 Ω; V _{GS} = 10 V; T _{j(init)} = 25 °C; unclamped; Fig. 3	[2][3]	-	1008	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.



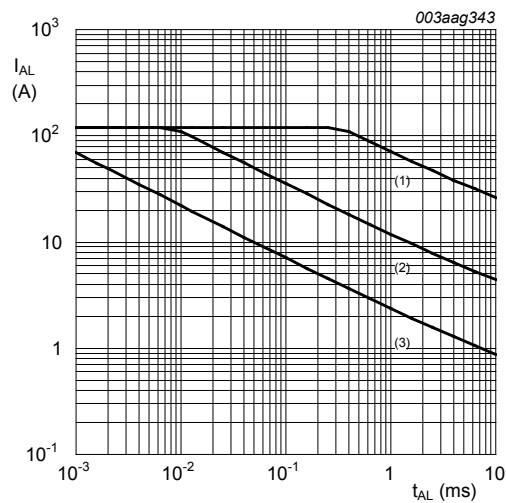


Fig. 3. Single-pulse and repetitive avalanche rating; avalanche current as a function of avalanche time

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

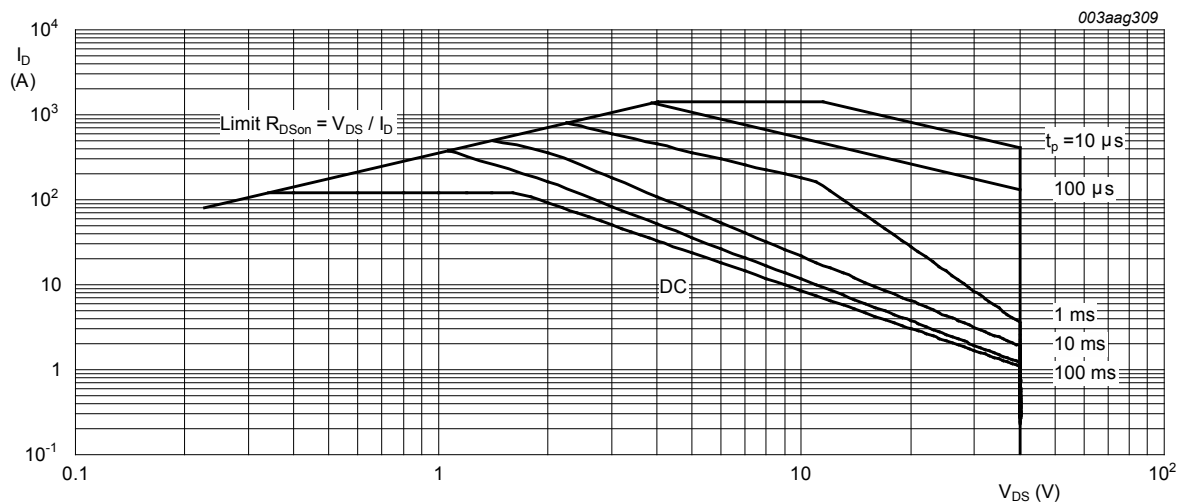


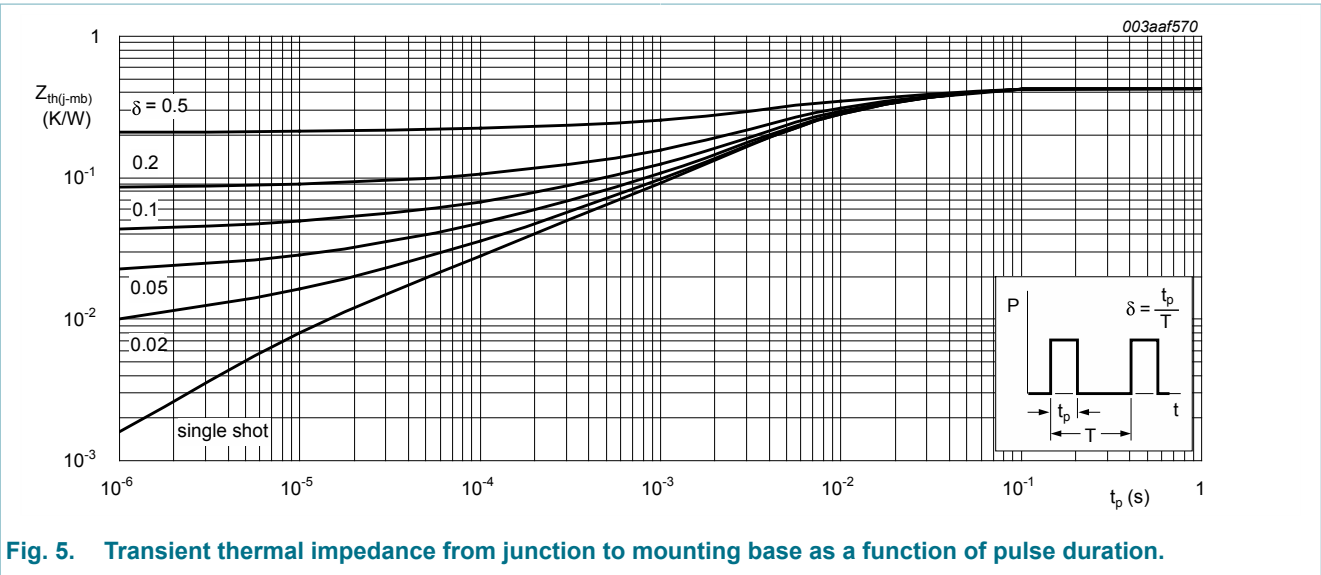
Fig. 4. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

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

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

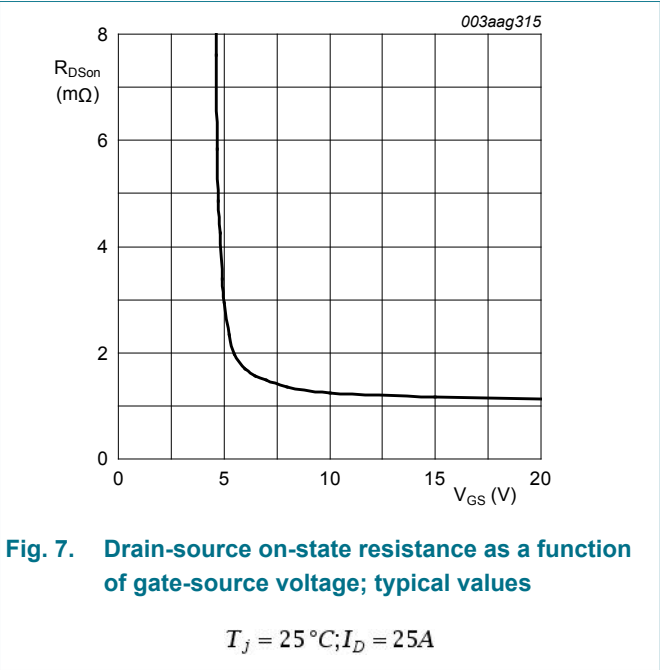
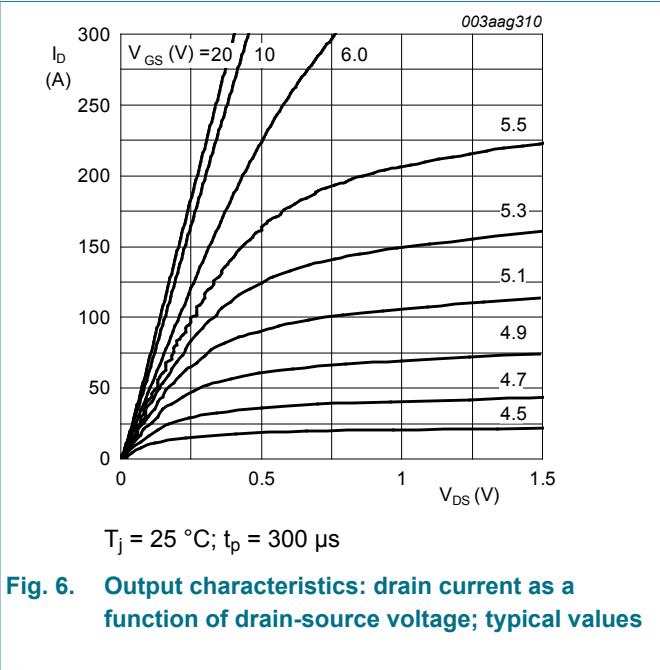


10. Characteristics

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		40	-	-	V
		I _D = 250 μA; V _{GS} = 0 V; T _J = -55 °C		36	-	-	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 = -55 °C; Fig. 10		-	-	4.5	V
		I _D = 1 mA; V _{DS} = V _{GS} ; T _J = 175 °C; Fig. 10		1	-	-	V
I _{DSS}	drain leakage current	V _{DS} = 40 V; V _{GS} = 0 V; T _J = 25 °C		-	0.25	2	μA
		V _{DS} = 40 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		-	1.3	1.57	mΩ
		V _{GS} = 10 V; I _D = 25 A; T _J = 175 °C; Fig. 12 ; Fig. 11		-	-	3	mΩ
Dynamic characteristics							
Q _{G(tot)}	total gate charge	I _D = 25 A; V _{DS} = 32 V; V _{GS} = 10 V; Fig. 13 ; Fig. 14		-	145	-	nC
Q _{GS}	gate-source charge			-	35.7	-	nC
Q _{GD}	gate-drain charge			-	48.2	-	nC

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
C _{iss}	input capacitance	V _{GS} = 0 V; V _{DS} = 25 V; f = 1 MHz;		-	8500	11340	pF
C _{oss}	output capacitance	T _j = 25 °C; Fig. 15		-	1620	1950	pF
C _{rss}	reverse transfer capacitance			-	985	1350	pF
t _{d(on)}	turn-on delay time	V _{DS} = 30 V; R _L = 1.2 Ω; V _{GS} = 10 V; R _{G(ext)} = 5 Ω		-	42	-	ns
t _r	rise time			-	60	-	ns
t _{d(off)}	turn-off delay time			-	121	-	ns
t _f	fall time			-	83	-	ns
L _D	internal drain inductance	from upper edge of drain mounting base to center of die		-	2.5	-	nH
L _S	internal source inductance	from source lead to source bonding pad		-	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;		-	56	-	ns
Q _r	recovered charge	V _{DS} = 25 V		-	94	-	nC



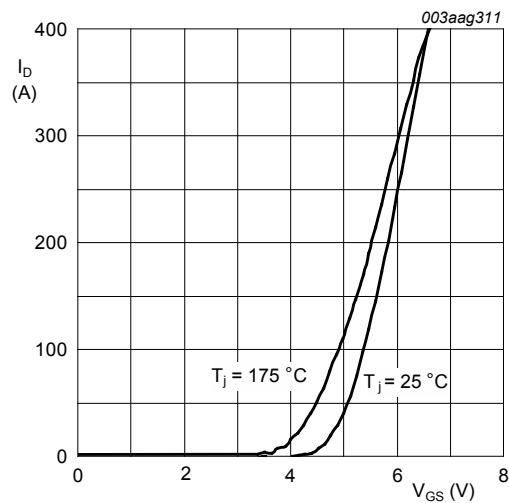


Fig. 8. Transfer characteristics: drain current as a function of gate-source voltage; typical values

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

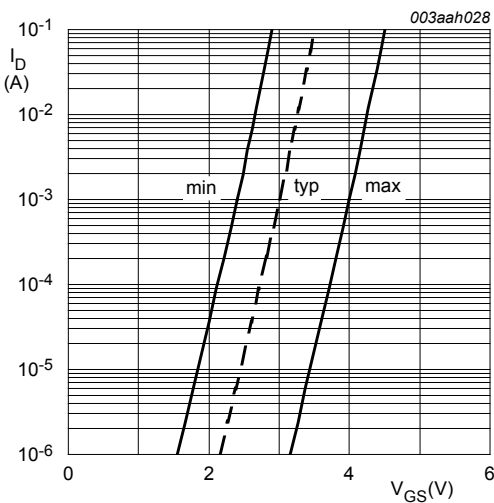


Fig. 9. Sub-threshold drain current as a function of gate-source voltage

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

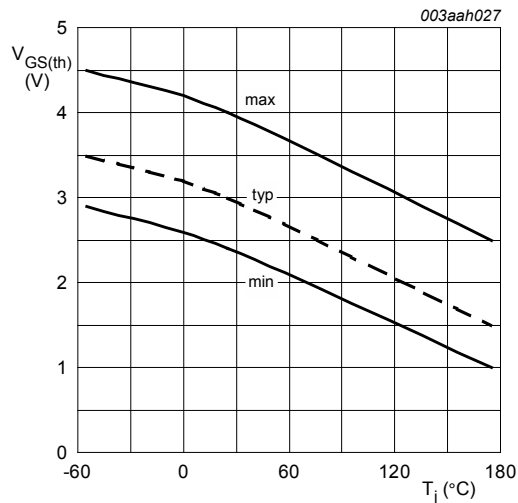


Fig. 10. Gate-source threshold voltage as a function of junction temperature

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

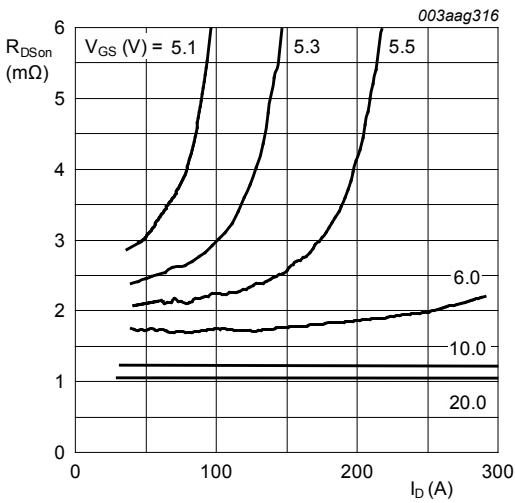


Fig. 11. Drain-source on-state resistance as a function of drain current; typical values

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

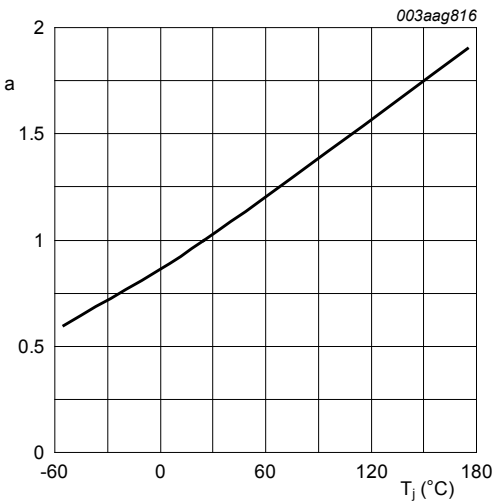


Fig. 12. Normalized drain-source on-state resistance factor as a function of junction temperature

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

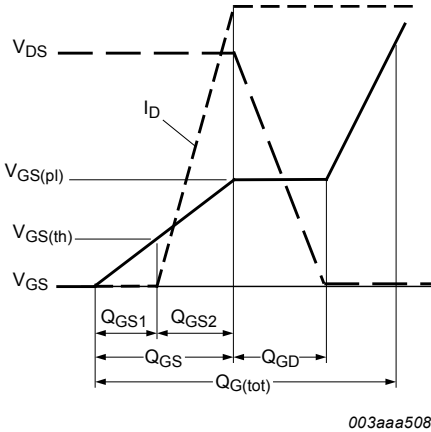


Fig. 13. Gate charge waveform definitions

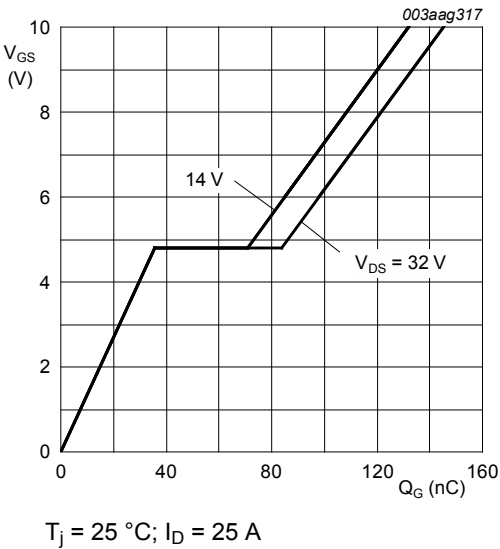


Fig. 14. Gate-source voltage as a function of gate charge; typical values

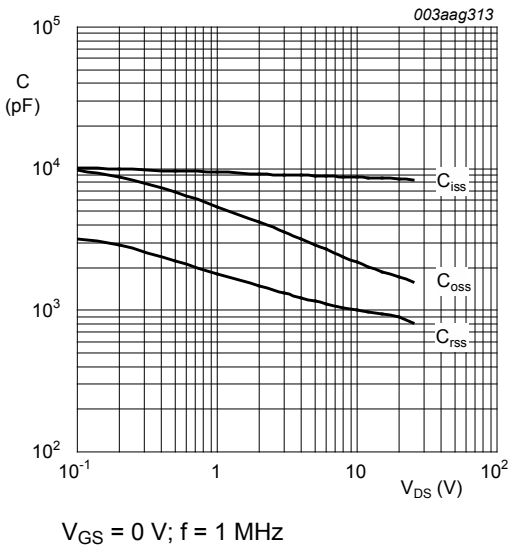
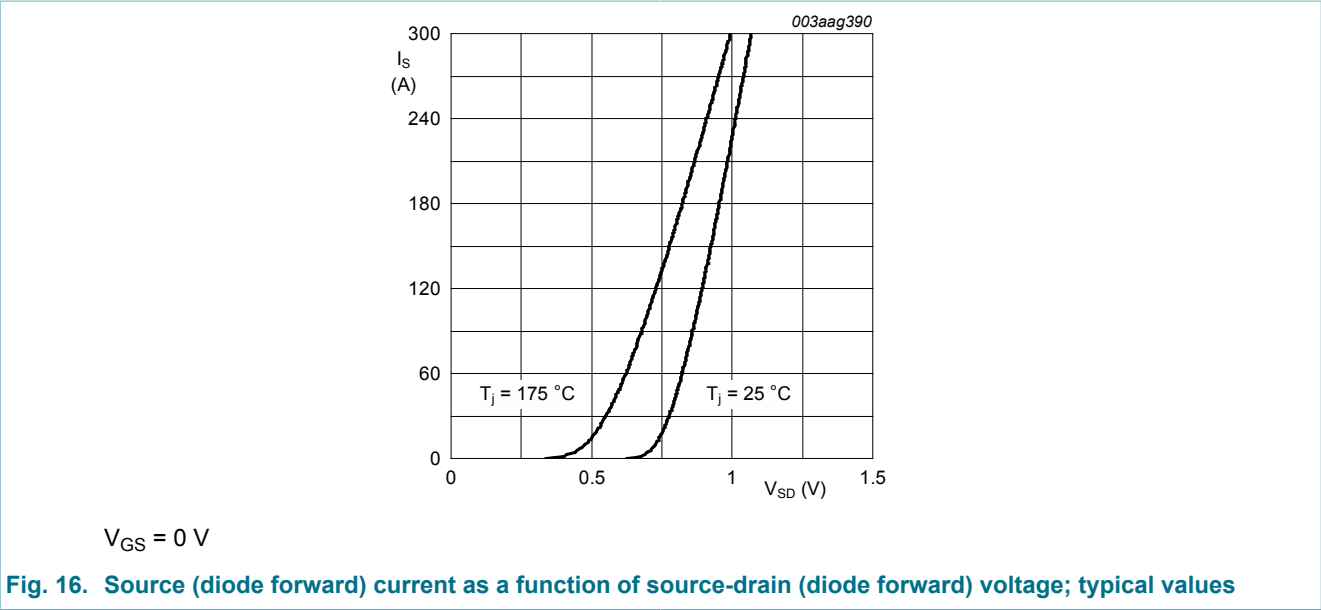


Fig. 15. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values



11. Package outline

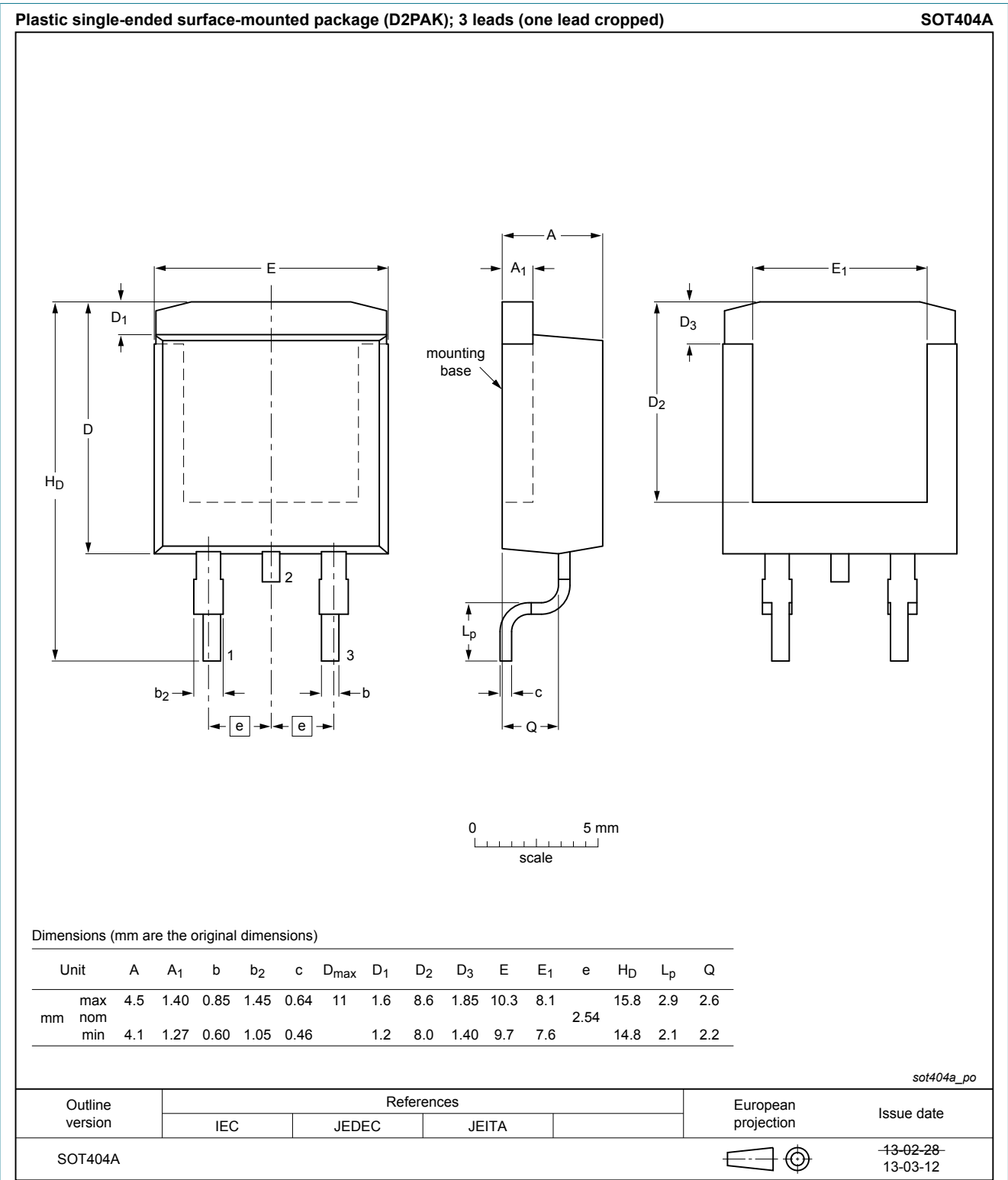


Fig. 17. Package outline D2PAK (SOT404A)

12. Legal information

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