

## 1. General description

WMS20N300SK is a high performance super logic level N-channel MOSFET in SOT23 package, which utilizes advanced Trench MOSFET technology to provide low  $R_{DS(on)}$  and gate charge. It is designed and qualified in a wide range of industrial and consumer applications.



## 2. Features and benefits

- Advance High Cell Density Trench Technology
- Low  $R_{DS(on)}$  to Minimize Conduction Losses
- Low Capacitance to Minimize Switching Losses
- Optimized Gate Charge to Minimize Driver Losses
- RoHS Compliant, Halogen Free and Lead Free

## 3. Applications

- Load Switch
- General PWM Applications

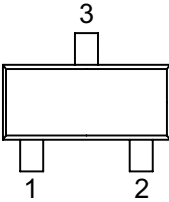
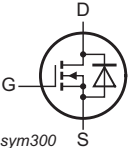
## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Notes	Values			Unit
<b>Absolute maximum rating</b>							
$V_{DS}$	drain-source voltage			20			V
$V_{GS}$	gate-source voltage			±10			V
$I_D$	continuous drain current	$V_{GS} = 4.5\text{ V}; T_a = 25\text{ °C}$		5.4			A
$P_{tot}$	power dissipation	$T_a = 25\text{ °C}$		1.4			W
$T_j$	junction temperature			-55 to 150			°C
Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
<b>Static characteristics</b>							
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 4.5\text{ V}, I_D = 5.4\text{ A}$		-	23	30	mΩ
		$V_{GS} = 2.5\text{ V}, I_D = 3\text{ A}$		-	30	45	mΩ
<b>Dynamic characteristics</b>							
$Q_{G(tot)}$	total gate charge	$I_D = 5.4\text{ A}; V_{DS} = 10\text{ V}; V_{GS} = 4.5\text{ V}$		-	4.5	-	nC

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate		
2	S	source		
3	D	drain		

## 6. Ordering information

Table 3. Ordering information

Type number	Package Name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
WMS20N300SK	SOT23	WMS20N300SKX	Reel	3000	SOT23L	22-Aug-2022

## 7. Marking

Table 4. Marking codes

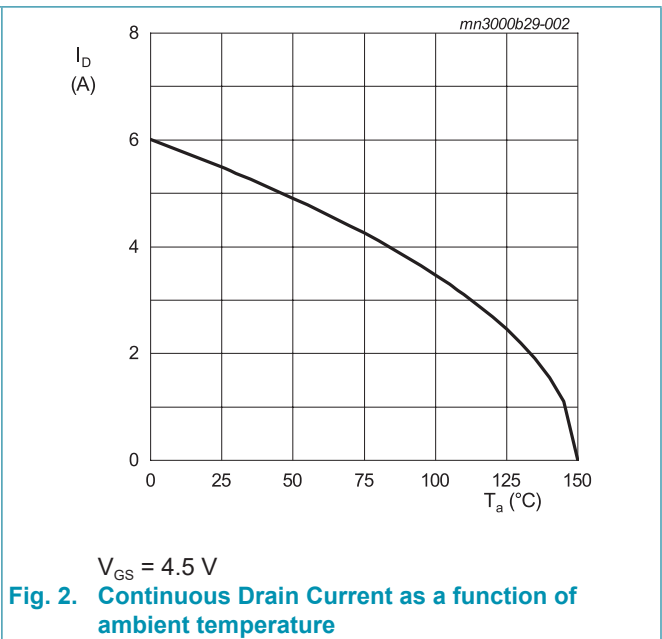
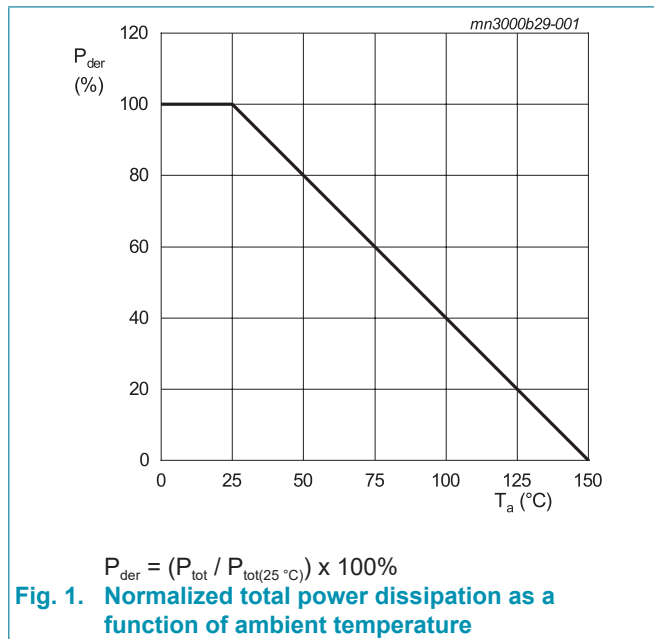
Type number	Marking codes
WMS20N300SK	AA

## 8. Limiting values

**Table 5. Limiting values**

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

Symbol	Parameter	Conditions	Notes	Values	Unit
V <sub>DS</sub>	drain-source voltage			20	V
V <sub>GS</sub>	gate-source voltage			±10	V
I <sub>D</sub>	continuous drain current	V <sub>GS</sub> = 4.5 V; T <sub>a</sub> = 25 °C		5.4	A
		V <sub>GS</sub> = 4.5 V; T <sub>a</sub> = 70 °C		4.3	A
I <sub>DM</sub>	pulsed drain current	t <sub>p</sub> = 10 μs; T <sub>a</sub> = 25 °C		21.6	A
P <sub>tot</sub>	power dissipation	T <sub>a</sub> = 25 °C		1.4	W
T <sub>stg</sub>	storage temperature			-55 to 150	°C
T <sub>j</sub>	junction temperature			-55 to 150	°C

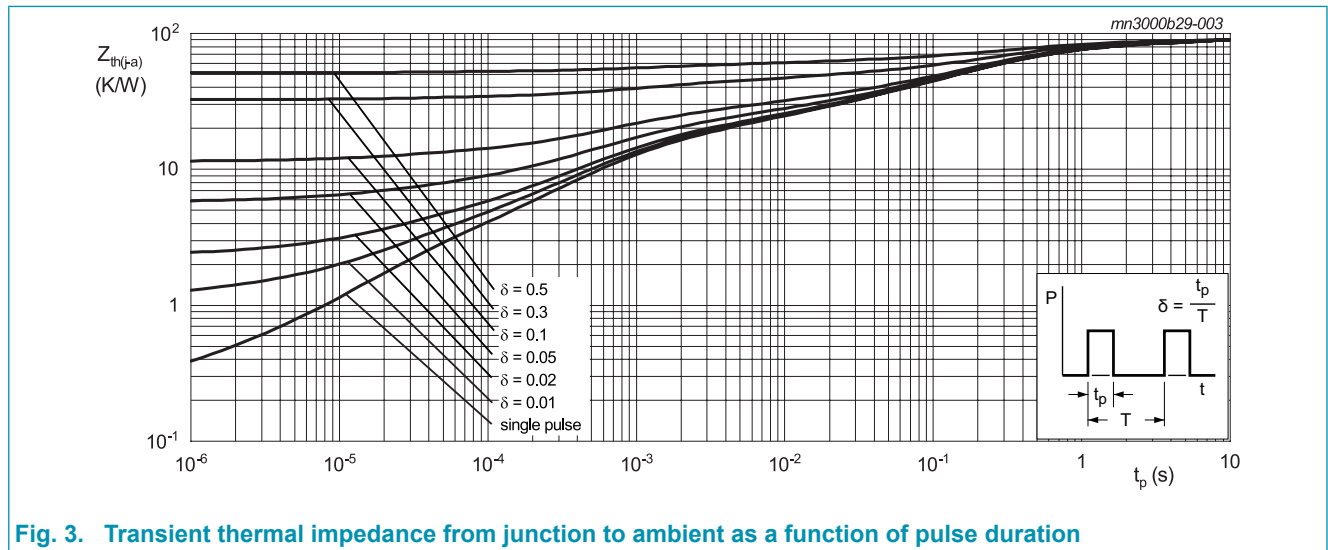


## 9. Thermal & Mechanical characteristics

**Table 6. Thermal & Mechanical characteristics**

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	$t \leq 10s$	[1]	-	72	90	K/W
		in free air	[1]	-	95	120	K/W

[1] Surface mount on FR4 board of 1 inch<sup>2</sup>, 1 oz copper.

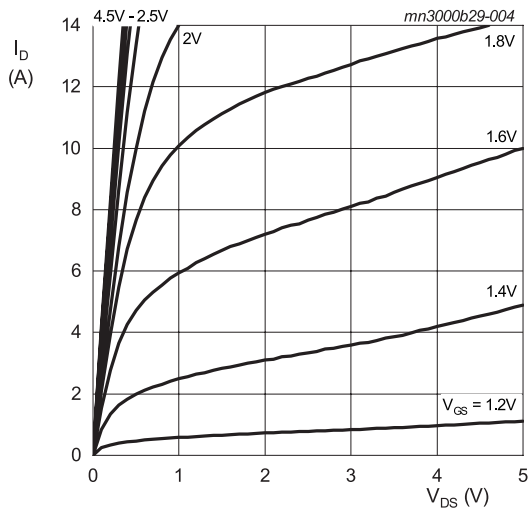


**Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration**

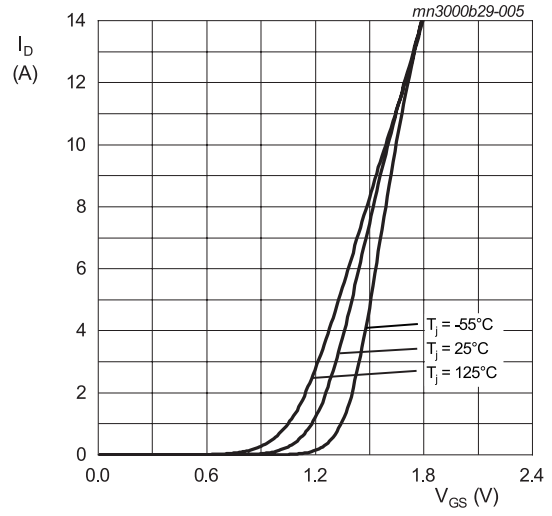
## 10. Characteristics

**Table 7. Characteristics**
 $T_j = 25\text{ }^\circ\text{C}$  unless otherwise noted

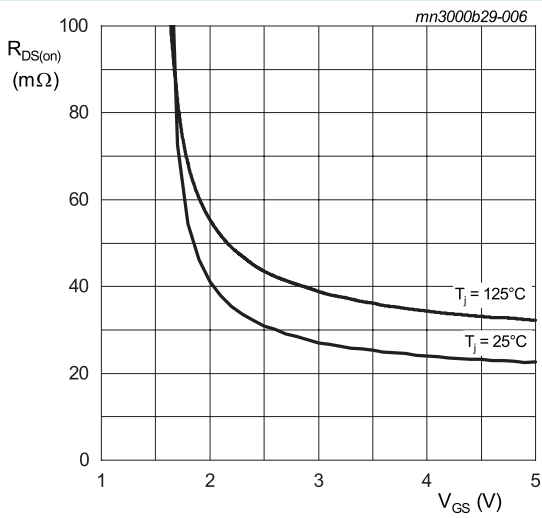
Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
<b>Static characteristics</b>							
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250\text{ }\mu\text{A}; V_{GS} = 0\text{ V}$		20	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 250\text{ }\mu\text{A}; V_{DS} = V_{GS}$		0.45	0.7	1.1	V
$I_{DSS}$	drain leakage current	$V_{DS} = 20\text{ V}; V_{GS} = 0\text{ V}$		-	-	1	$\mu\text{A}$
		$V_{DS} = 20\text{ V}; V_{GS} = 0\text{ V}; T_j = 125\text{ }^\circ\text{C}$		-	-	10	$\mu\text{A}$
$I_{GSS}$	gate leakage current	$V_{GS} = \pm 10\text{ V}; V_{DS} = 0\text{ V}$		-	-	$\pm 100$	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 4.5\text{ V}; I_D = 5.4\text{ A}$		-	23	30	m $\Omega$
		$V_{GS} = 2.5\text{ V}; I_D = 3\text{ A}$		-	30	45	m $\Omega$
$R_G$	gate resistance	$f = 1\text{ MHz}$		-	4.2	-	$\Omega$
<b>Dynamic characteristics</b>							
$Q_{G(tot)}$	total gate charge	$I_D = 5.4\text{ A}; V_{DS} = 10\text{ V}; V_{GS} = 4.5\text{ V}$		-	4.5	-	nC
$Q_{GS}$	gate-source charge			-	0.8	-	nC
$Q_{GD}$	gate-drain charge			-	1.3	-	nC
$C_{iss}$	input capacitance	$V_{DS} = 10\text{ V}; V_{GS} = 0\text{ V}; f = 1\text{ MHz}$		-	319	-	pF
$C_{oss}$	output capacitance			-	66	-	pF
$C_{rss}$	reverse transfer capacitance			-	58	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 10\text{ V}; V_{GS} = 4.5\text{ V}; R_G = 6\text{ }\Omega;$ $I_D = 5.4\text{ A}$		-	7.0	-	ns
$t_r$	rise time			-	13	-	ns
$t_{d(off)}$	turn-off delay time			-	25	-	ns
$t_f$	fall time			-	12	-	ns
<b>Source-drain diode</b>							
$V_{SD}$	source-drain voltage	$V_{GS} = 0\text{ V}; I_S = 1\text{ A}$		-	0.7	1	V
		$V_{GS} = 0\text{ V}; I_S = 1\text{ A}; T_j = 125\text{ }^\circ\text{C}$		-	0.57	-	V
$I_S$	body-diode continuous current	$T_a = 25\text{ }^\circ\text{C}$		-	-	2	A
$t_{rr}$	reverse recovery time	$V_{GS} = 0\text{ V}; I_S = 5.4\text{ A}; di/dt = 100\text{ A}/\mu\text{s}$		-	9.4	-	ns
$Q_{rr}$	reverse recovered charge			-	2.7	-	nC
$I_{rrm}$	reverse recovery current			-	0.5	-	A



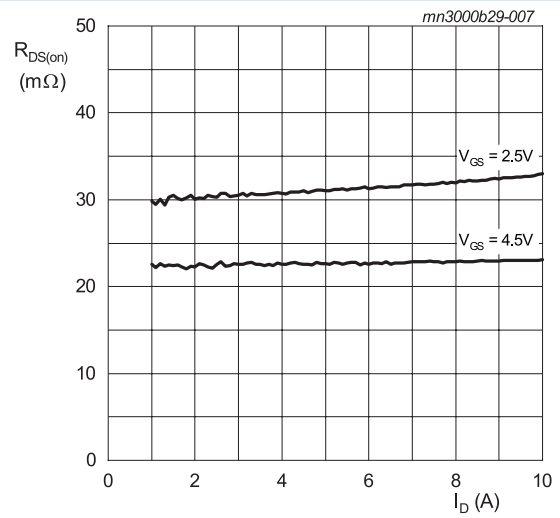
**Fig. 4. Drain current as a function of drain-source voltage; typical values**



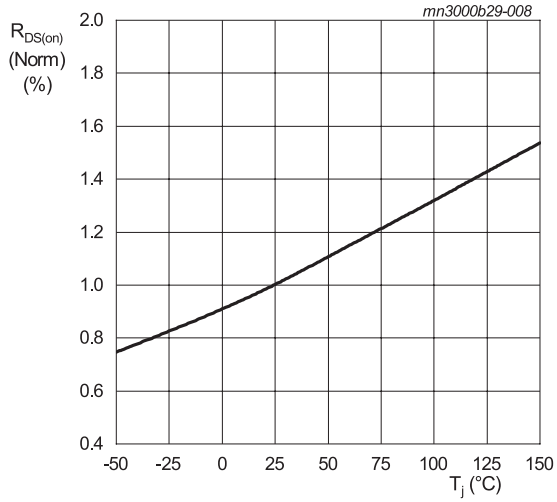
**Fig. 5. Drain current as a function of gate-source voltage; typical values**



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

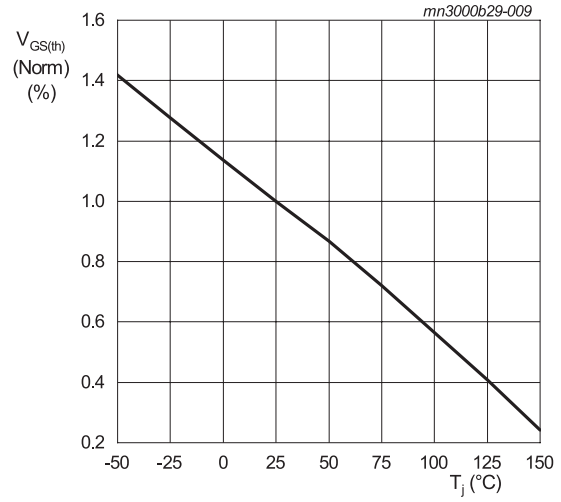


**Fig. 7. Drain-source on-state resistance as a function of drain current; typical values**



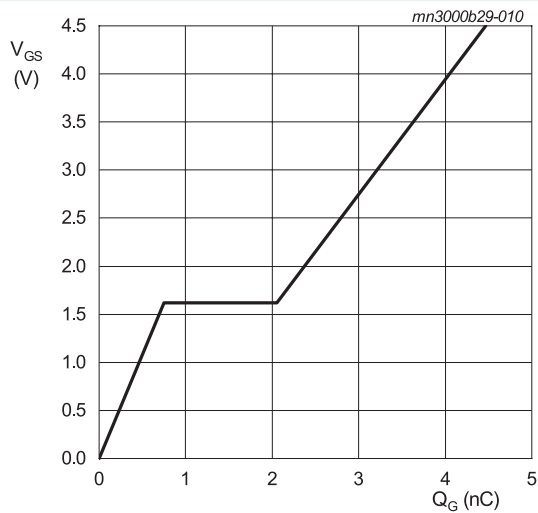
$V_{GS} = 4.5\text{ V}; I_D = 5.4\text{ A}$

**Fig. 8. Normalized drain-source on-state resistance as a function of junction temperature**



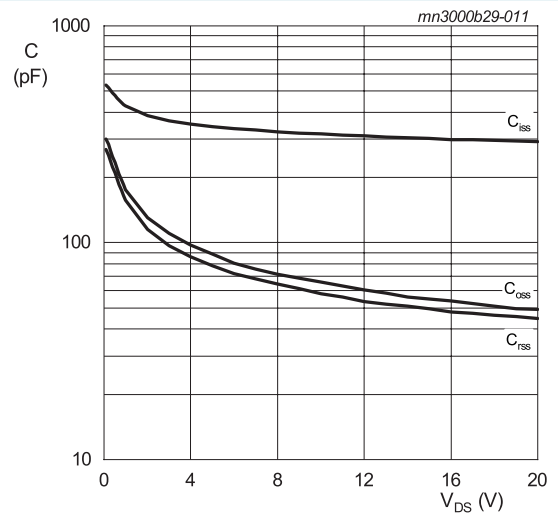
$V_{GS} = V_{GS(th)}; I_D = 250\text{ }\mu\text{A}$

**Fig. 9. Normalized gate-source threshold voltage as a function of junction temperature**



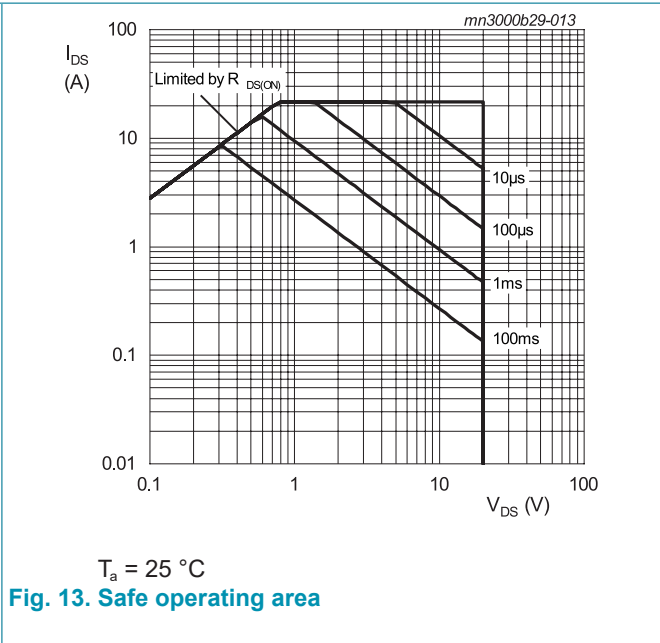
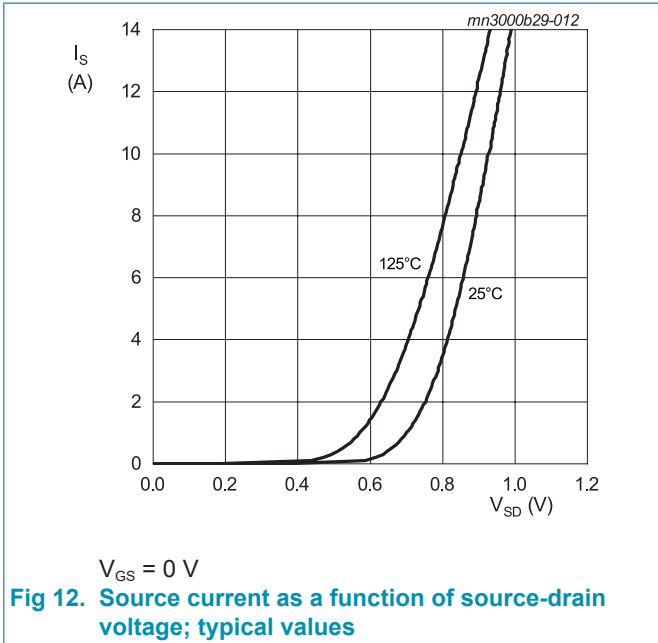
$I_D = 5.4\text{ A}; V_{DS} = 10\text{ V}$

**Fig. 10. Gate-source voltage as a function of gate charge; typical values**



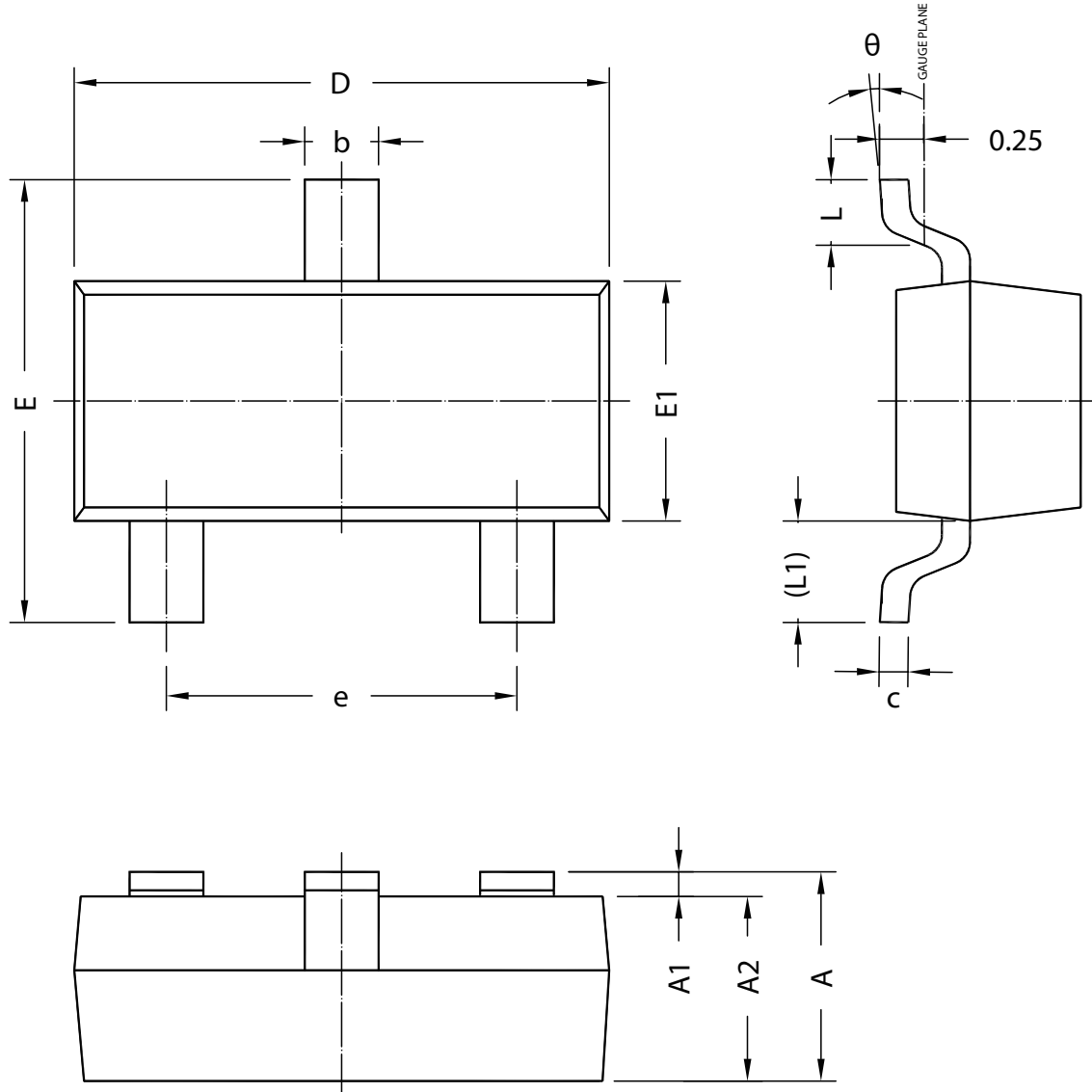
$V_{GS} = 0\text{ V}; f = 1\text{ MHz}$

**Fig. 11. Capacitances as a function of drain-source voltage; typical values**





### 11. Package outline



UNIT	A	A1	A2	b	c	D	E	E1	e	L	L1	
mm	Min	0.90	0.00	0.90	0.30	2.80	2.25	1.20	1.80	0.30	(0.55)	0°
	Max	1.20	0.10	1.10	0.50	3.00	2.55	1.40	2.00	0.50		8°

Note:  
1. All dimensions don't include mold flash and metal protrusion.

## 12. Legal information

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Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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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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