

1. General description

WMS20N500SK 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

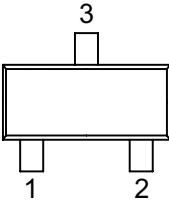
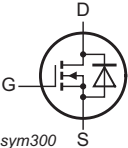
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Notes	Values			Unit
Absolute maximum rating							
V_{DS}	drain-source voltage			20			V
V_{GS}	gate-source voltage			±10			V
I_D	continuous drain current	$V_{GS} = 4.5\text{ V}; T_a = 25\text{ °C}$		4.2			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
Static characteristics							
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 4.5\text{ V}, I_D = 4.2\text{ A}$		-	34	50	mΩ
		$V_{GS} = 2.5\text{ V}, I_D = 3\text{ A}$		-	45	65	mΩ
Dynamic characteristics							
$Q_{G(tot)}$	total gate charge	$I_D = 4.2\text{ A}; V_{DS} = 10\text{ V}; V_{GS} = 4.5\text{ V}$		-	2.5	-	nC

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate		 sym300
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
WMS20N500SK	SOT23	WMS20N500SKX	Reel	3000	SOT23L	22-Aug-2022

7. Marking

Table 4. Marking codes

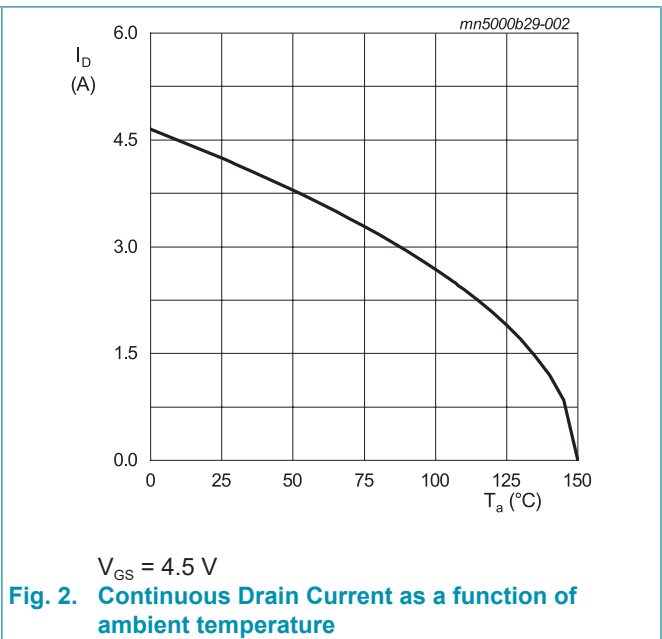
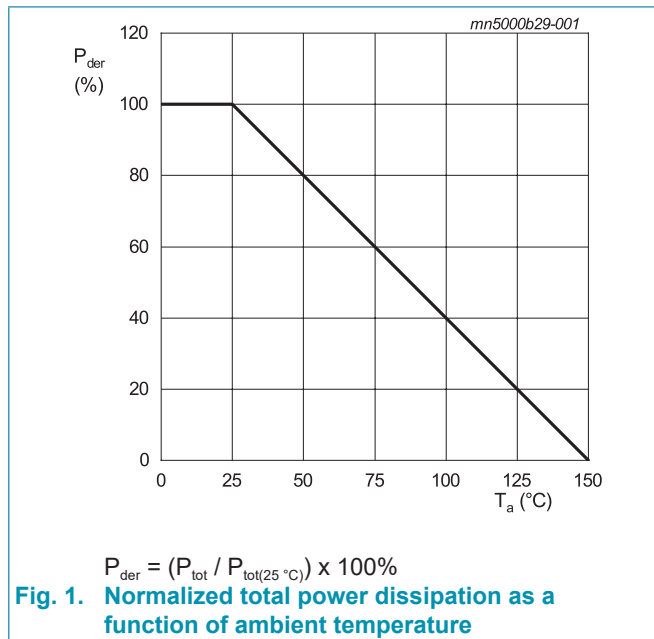
Type number	Marking codes
WMS20N500SK	AB

8. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions	Notes	Values	Unit
V _{DS}	drain-source voltage			20	V
V _{GS}	gate-source voltage			±10	V
I _D	continuous drain current	V _{GS} = 4.5 V; T _a = 25 °C		4.2	A
		V _{GS} = 4.5 V; T _a = 70 °C		3.3	A
I _{DM}	pulsed drain current	t _p = 10 μs; T _a = 25 °C		16.8	A
P _{tot}	power dissipation	T _a = 25 °C		1.4	W
T _{stg}	storage temperature			-55 to 150	°C
T _j	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 inch², 1 oz copper.

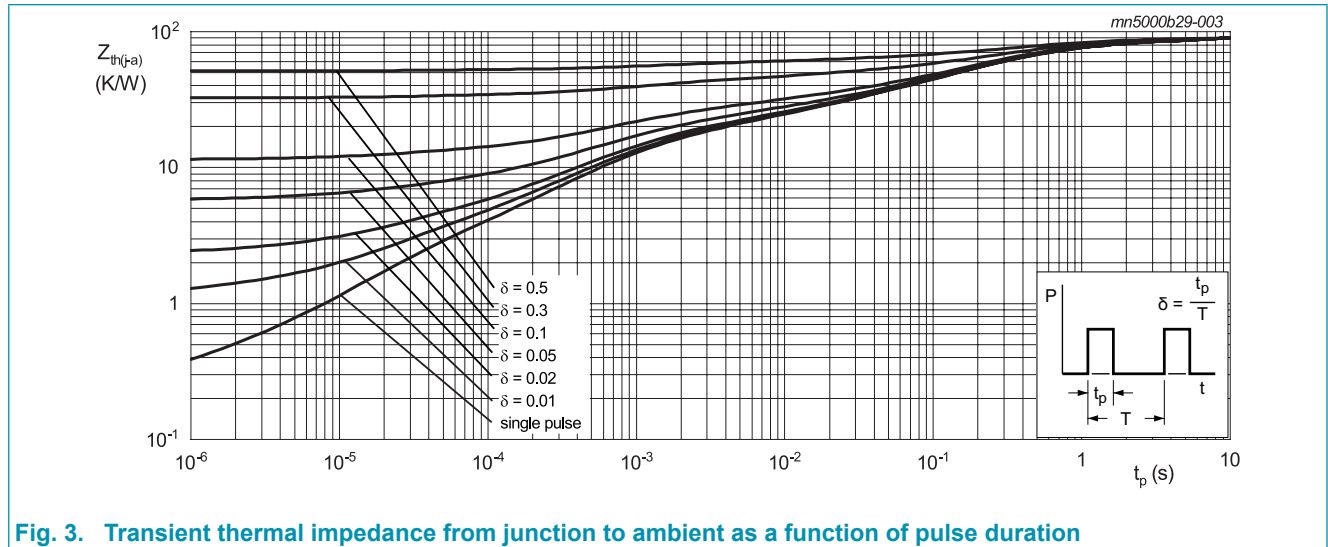


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration

10. Characteristics

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

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250\ \mu\text{A}; V_{GS} = 0\ \text{V}$		20	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 250\ \mu\text{A}; V_{DS} = V_{GS}$		0.45	0.7	1.1	V
I_{DSS}	drain leakage current	$V_{DS} = 20\ \text{V}; V_{GS} = 0\ \text{V}$		-	-	1	μA
		$V_{DS} = 20\ \text{V}; V_{GS} = 0\ \text{V}; T_j = 125\text{ °C}$		-	-	10	μA
I_{GSS}	gate leakage current	$V_{GS} = \pm 10\ \text{V}; V_{DS} = 0\ \text{V}$		-	-	± 100	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 4.5\ \text{V}; I_D = 4.2\ \text{A}$		-	34	50	m Ω
		$V_{GS} = 2.5\ \text{V}; I_D = 3\ \text{A}$		-	45	65	m Ω
R_G	gate resistance	$f = 1\ \text{MHz}$		-	4.2	-	Ω
Dynamic characteristics							
$Q_{G(tot)}$	total gate charge	$I_D = 4.2\ \text{A}; V_{DS} = 10\ \text{V}; V_{GS} = 4.5\ \text{V}$		-	2.5	-	nC
Q_{GS}	gate-source charge			-	0.5	-	nC
Q_{GD}	gate-drain charge			-	0.6	-	nC
C_{iss}	input capacitance	$V_{DS} = 10\ \text{V}; V_{GS} = 0\ \text{V}; f = 1\ \text{MHz}$		-	178	-	pF
C_{oss}	output capacitance			-	40	-	pF
C_{rss}	reverse transfer capacitance			-	35	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 10\ \text{V}; V_{GS} = 4.5\ \text{V}; R_G = 6\ \Omega;$ $I_D = 4.2\ \text{A}$		-	6.2	-	ns
t_r	rise time			-	11	-	ns
$t_{d(off)}$	turn-off delay time			-	23	-	ns
t_f	fall time			-	9.0	-	ns
Source-drain diode							
V_{SD}	source-drain voltage	$V_{GS} = 0\ \text{V}; I_S = 1\ \text{A}$		-	0.71	1	V
		$V_{GS} = 0\ \text{V}; I_S = 1\ \text{A}; T_j = 125\text{ °C}$		-	0.59	-	V
I_S	body-diode continuous current	$T_a = 25\text{ °C}$		-	-	2	A
t_{rr}	reverse recovery time	$V_{GS} = 0\ \text{V}; I_S = 4.2\ \text{A}; di/dt = 100\ \text{A}/\mu\text{s}$		-	11	-	ns
Q_{rr}	reverse recovered charge			-	2.6	-	nC
I_{rrm}	reverse recovery current			-	0.4	-	A

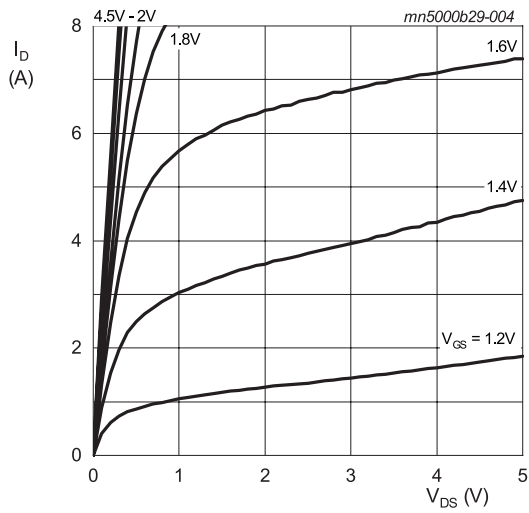
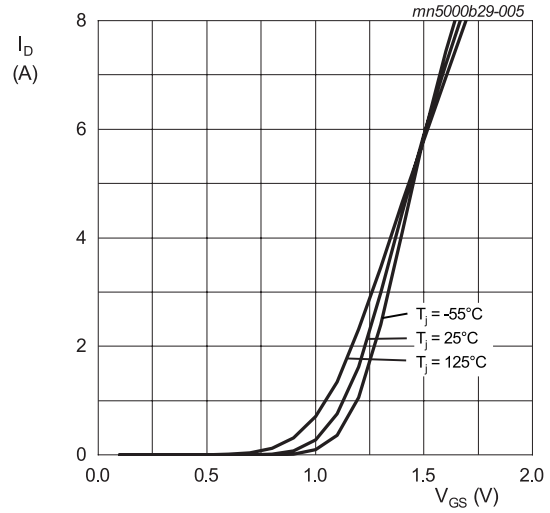
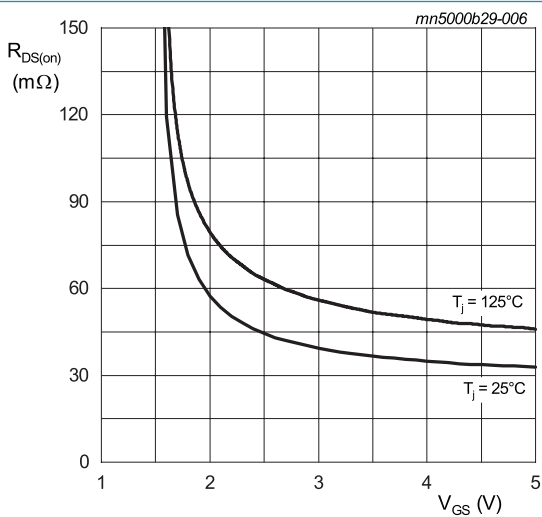


Fig. 4. Drain current as a function of drain-source voltage; typical values



$V_{DS} = 5\text{ V}$
Fig. 5. Drain current as a function of gate-source voltage; typical values



$V_{GS} = 4.5\text{ V}; I_D = 4.2\text{ A}$
Fig. 6. Drain-source on-state resistance as a function of gate-source voltage; typical values

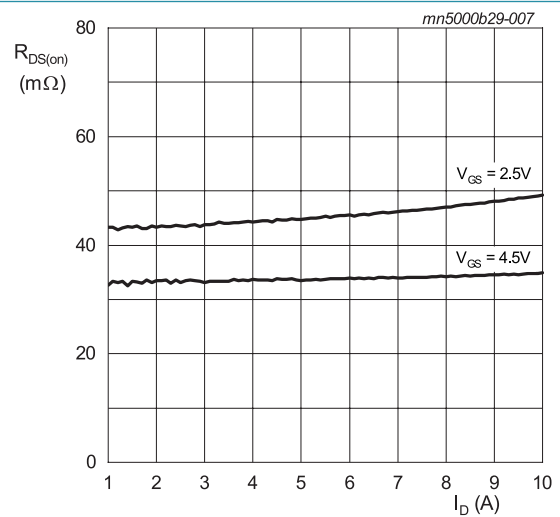
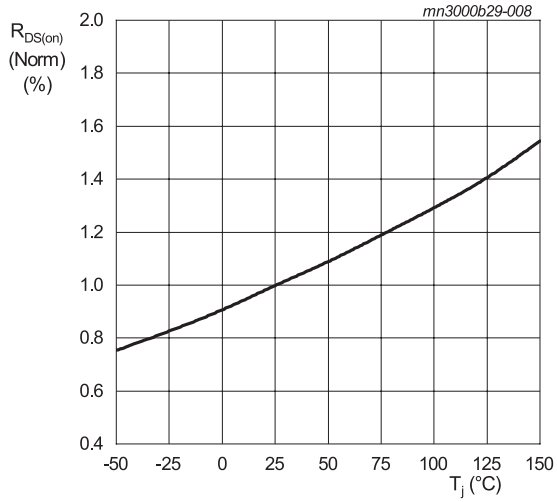
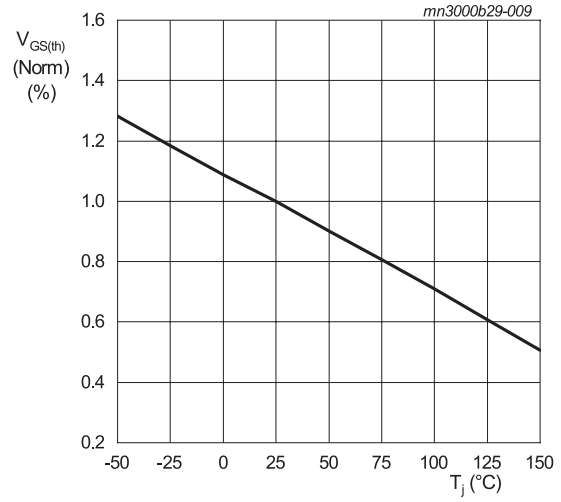


Fig. 7. Drain-source on-state resistance as a function of drain current; typical values



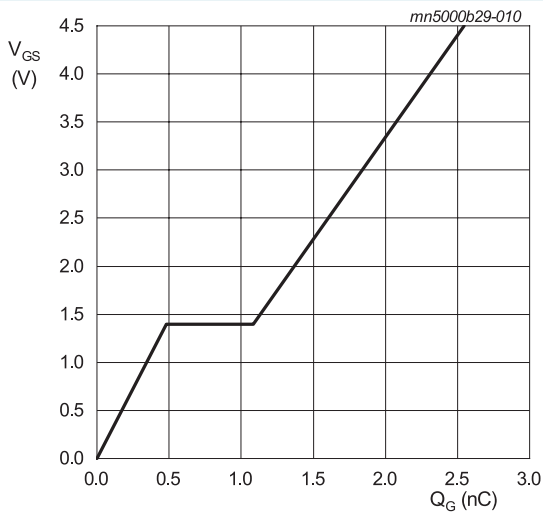
$V_{GS} = 4.5\text{ V}; I_D = 4.2\text{ A}$

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



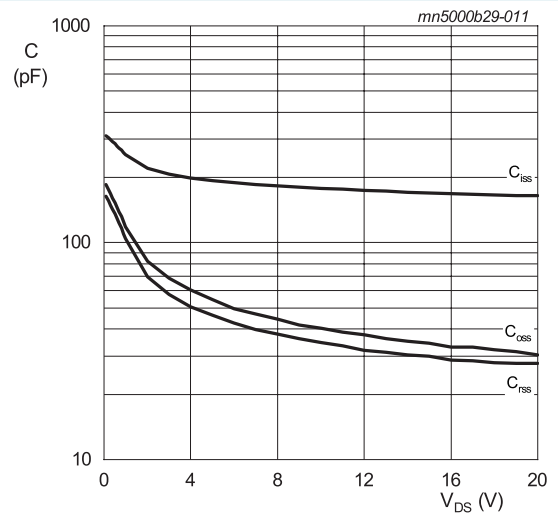
$V_{DS} = V_{GS}; I_D = 250\text{ }\mu\text{A}$

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



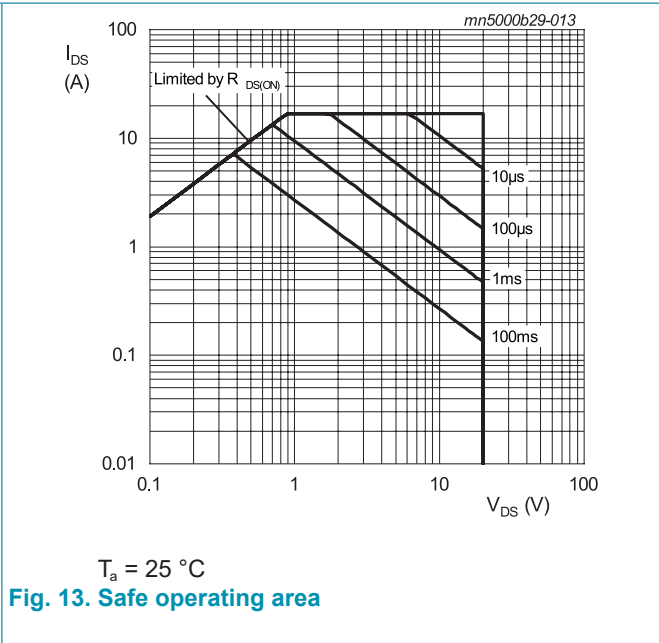
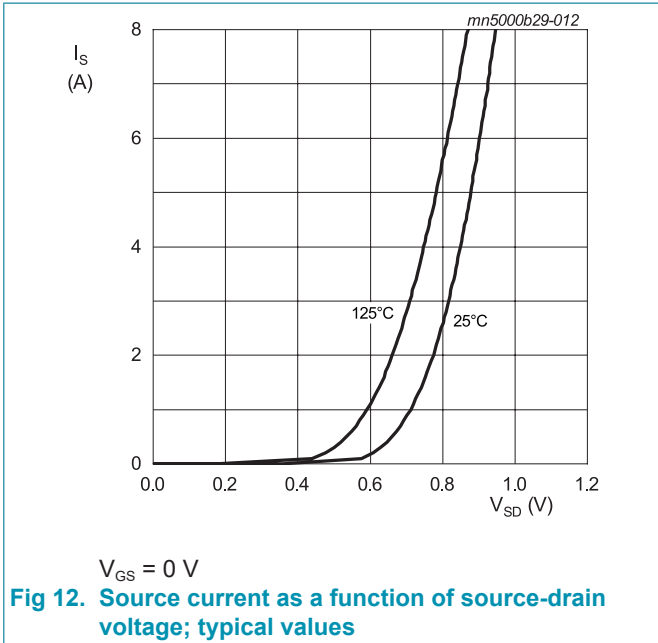
$I_D = 4.2\text{ A}; V_{DS} = 10\text{ V}$

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

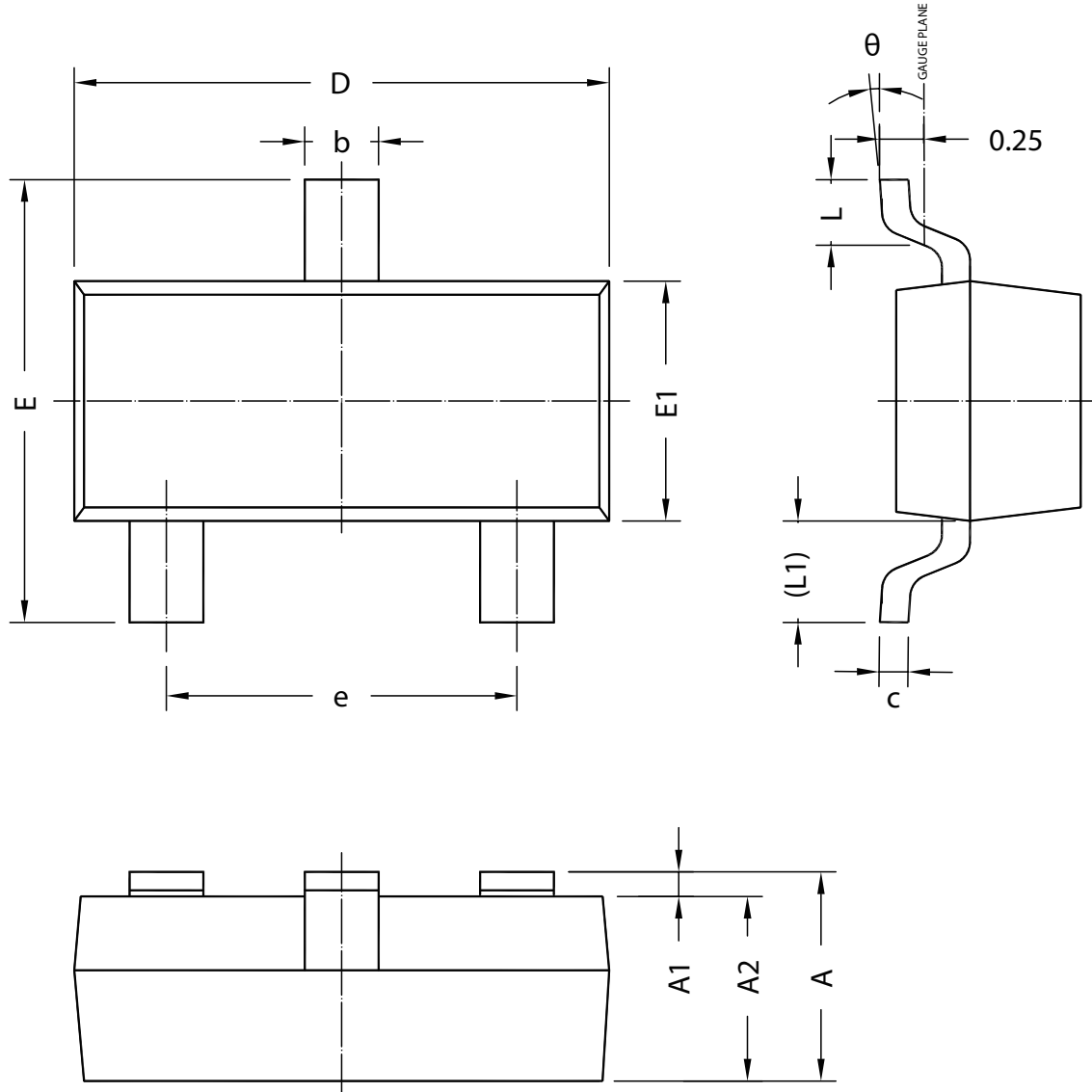


$V_{GS} = 0\text{ V}; f = 1\text{ MHz}$

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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