

## 1. General description

WMS30N020S is a high performance logic level N-channel MOSFET in TO252 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
- 100% UIS Tested
- RoHS Compliant and Halogen Free

## 3. Applications

- DC-DC Converters
- BLDC Motor Control
- Load Switch
- Lithium-ion Battery Protection

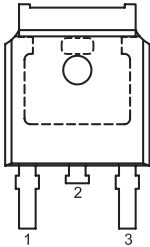
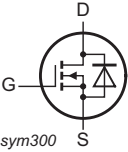
## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Notes	Values			Unit
Absolute maximum rating							
V <sub>DS</sub>	drain-source voltage			30			V
V <sub>GS</sub>	gate-source voltage			±20			V
I <sub>D</sub>	continuous drain current	V <sub>GS</sub> = 10 V; T <sub>mb</sub> = 25 °C	[1]	159			A
P <sub>tot</sub>	power dissipation	T <sub>mb</sub> = 25 °C		83			W
T <sub>j</sub>	junction temperature			-55 to 150			°C
Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
R <sub>DS(on)</sub>	drain-source on-state resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 20 A		-	1.6	2.1	mΩ
		V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 20 A		-	2.1	3.3	mΩ
Dynamic characteristics							
Q <sub>G(tot)</sub>	total gate charge	I <sub>D</sub> = 20 A; V <sub>DS</sub> = 15 V; V <sub>GS</sub> = 10 V		-	146	-	nC

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate		
2	D	drain		
3	S	source		
mb	D	mounting base; connected to 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
WMS30N020S	TO252	WMS30N020SJ	Reel	2500	TO252N	14-Nov-2016

7. Marking

Table 4. Marking codes

Type number	Marking codes
WMS30N020S	WMS 30N020

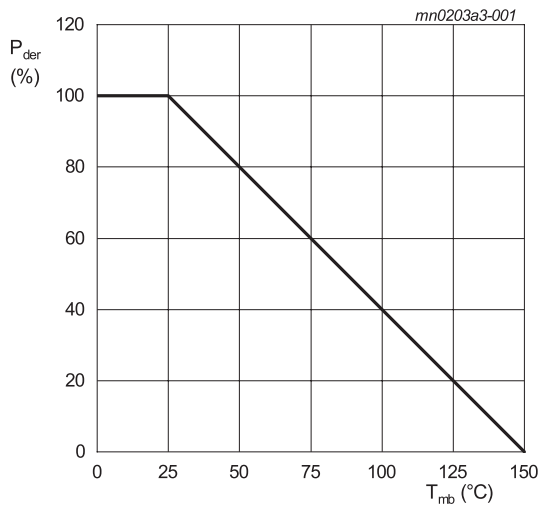
## 8. Limiting values

**Table 5. Limiting values**

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

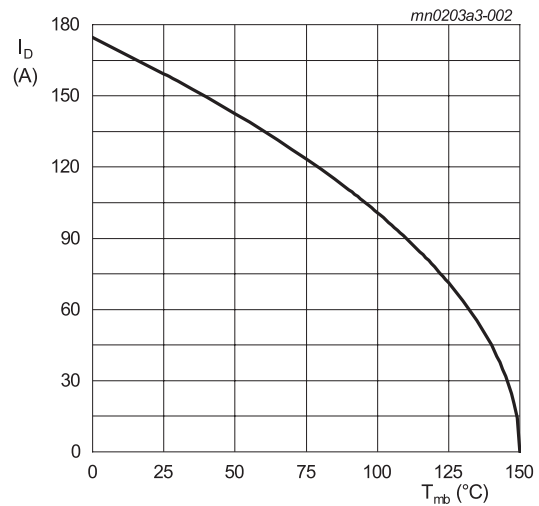
Symbol	Parameter	Conditions	Notes	Values	Unit
$V_{DS}$	drain-source voltage			30	V
$V_{GS}$	gate-source voltage			$\pm 20$	V
$I_D$	continuous drain current	$V_{GS} = 10\text{ V}; T_{mb} = 25\text{ }^{\circ}\text{C}$	[1]	159	A
		$V_{GS} = 10\text{ V}; T_{mb} = 120\text{ }^{\circ}\text{C}$		78	A
$I_{DM}$	pulsed drain current	$t_p = 10\text{ }\mu\text{s}; T_{mb} = 25\text{ }^{\circ}\text{C}$		636	A
$P_{tot}$	power dissipation	$T_{mb} = 25\text{ }^{\circ}\text{C}$		83	W
$E_{as}$	single pulse drain-to-source avalanche	$I_{AS} = 40\text{ A}; L = 0.1\text{ mH}; R_{GS} = 25\text{ }\Omega;$ $V_{GS} = 10\text{ V}; T_j = 25\text{ }^{\circ}\text{C}$		80	mJ
$T_{stg}$	storage temperature			-55 to 150	$^{\circ}\text{C}$
$T_j$	junction temperature			-55 to 150	$^{\circ}\text{C}$

[1] Calculated continuous current based on maximum allowable junction temperature. Package current limitation is 70A.



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

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



$$V_{GS} = 10\text{ V}$$

**Fig. 2. Continuous Drain Current as a function of mounting base temperature**

9. Thermal & Mechanical characteristics

Table 6. Thermal & Mechanical characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base			-	1.2	1.5	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[2]	-	-	50	K/W

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

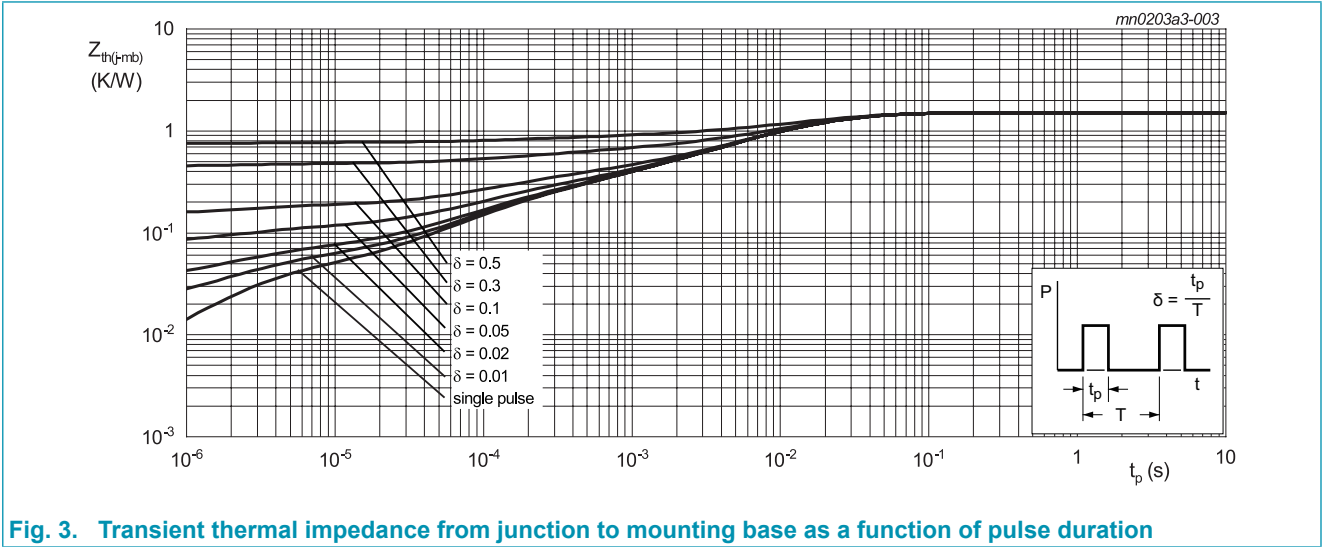


Fig. 3. Transient thermal impedance from junction to mounting base as a function of pulse duration

## 10. Characteristics

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

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
V <sub>(BR)DSS</sub>	drain-source breakdown voltage	I <sub>D</sub> = 250 μA; V <sub>GS</sub> = 0 V		30	-	-	V
V <sub>GS(th)</sub>	gate-source threshold voltage	I <sub>D</sub> = 250 μA; V <sub>DS</sub> = V <sub>GS</sub>		1.0	1.5	2.4	V
I <sub>DSS</sub>	drain leakage current	V <sub>DS</sub> = 30 V; V <sub>GS</sub> = 0 V		-	-	1	μA
		V <sub>DS</sub> = 30 V; V <sub>GS</sub> = 0 V; T <sub>j</sub> = 125 °C		-	-	100	μA
I <sub>GSS</sub>	gate leakage current	V <sub>GS</sub> = ±20 V; V <sub>DS</sub> = 0 V		-	-	±100	nA
R <sub>DS(on)</sub>	drain-source on-state resistance	V <sub>GS</sub> = 10 V; I <sub>D</sub> = 20 A		-	1.6	2.1	mΩ
		V <sub>GS</sub> = 4.5 V; I <sub>D</sub> = 20 A		-	2.1	3.3	mΩ
R <sub>G</sub>	gate resistance	f = 1 MHz		-	1.1	-	Ω
Dynamic characteristics							
Q <sub>G(tot)</sub>	total gate charge	I <sub>D</sub> = 20 A; V <sub>DS</sub> = 15 V; V <sub>GS</sub> = 10 V		-	146	-	nC
Q <sub>GS</sub>	gate-source charge			-	21	-	nC
Q <sub>GD</sub>	gate-drain charge			-	25	-	nC
C <sub>iss</sub>	input capacitance	V <sub>DS</sub> = 15 V; V <sub>GS</sub> = 0 V; f = 1 MHz		-	7940	-	pF
C <sub>oss</sub>	output capacitance			-	847	-	pF
C <sub>rss</sub>	reverse transfer capacitance			-	710	-	pF
t <sub>d(on)</sub>	turn-on delay time	V <sub>DS</sub> = 15 V; V <sub>GS</sub> = 10 V; R <sub>G</sub> = 6 Ω; I <sub>D</sub> = 20 A		-	17	-	ns
t <sub>r</sub>	rise time			-	31	-	ns
t <sub>d(off)</sub>	turn-off delay time			-	60	-	ns
t <sub>f</sub>	fall time			-	34	-	ns
Source-drain diode							
V <sub>SD</sub>	source-drain voltage	V <sub>GS</sub> = 0 V; I <sub>S</sub> = 1 A		-	0.67	1	V
		V <sub>GS</sub> = 0 V; I <sub>S</sub> = 1 A; T <sub>j</sub> = 125 °C		-	0.50	-	V
I <sub>S</sub>	body-diode continuous current	T <sub>mb</sub> = 25 °C		-	-	90	A
t <sub>rr</sub>	reverse recovery time	V <sub>GS</sub> = 0 V; I <sub>S</sub> = 20 A; di/dt = 100 A/μs		-	19	-	ns
Q <sub>rr</sub>	reverse recovered charge			-	12	-	nC
I <sub>rrm</sub>	reverse recovery current			-	1	-	A

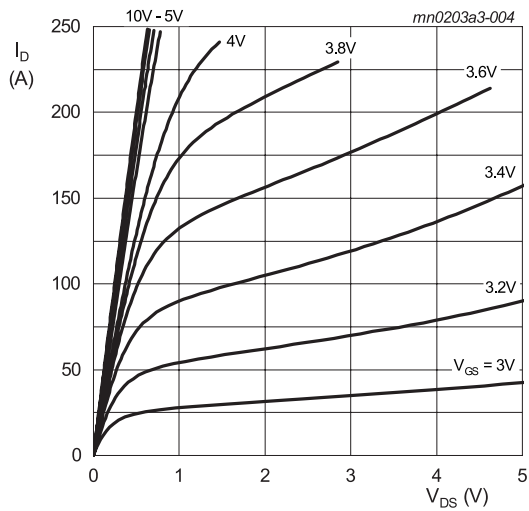


Fig. 4. Drain current as a function of drain-source voltage; typical values

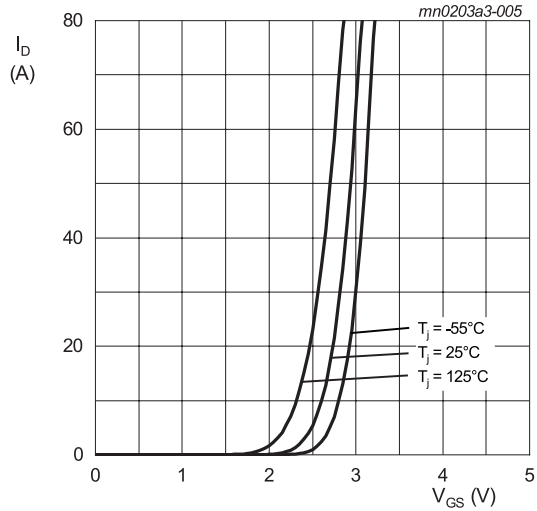


Fig. 5. Drain current as a function of gate-source voltage; typical values

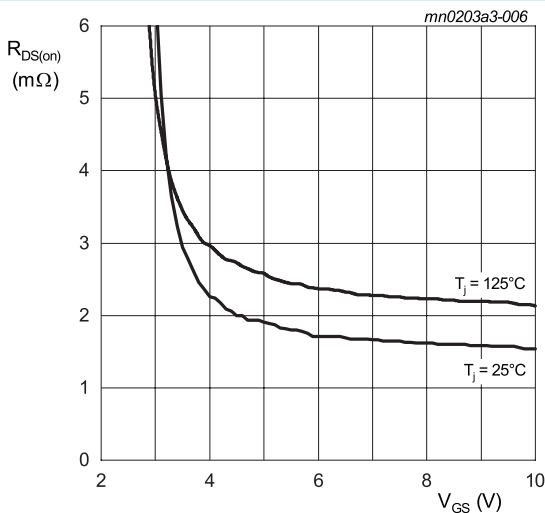


Fig. 6. Drain-source on-state resistance as a function of gate-source voltage; typical values

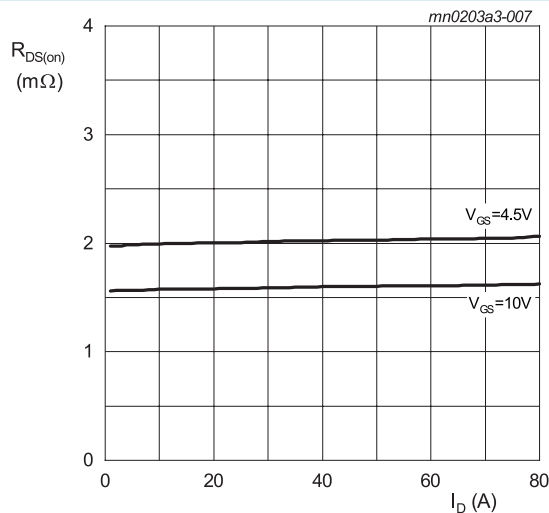
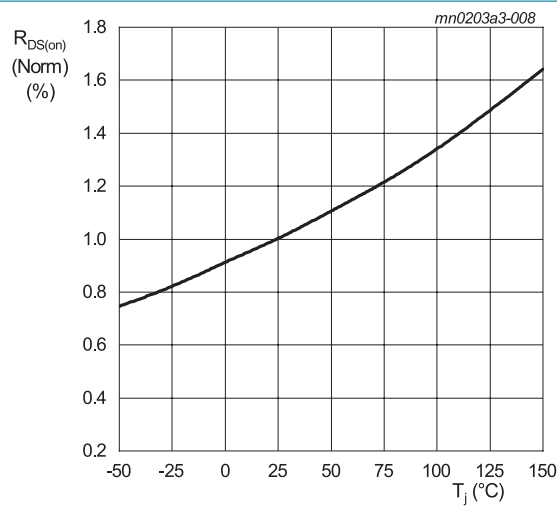
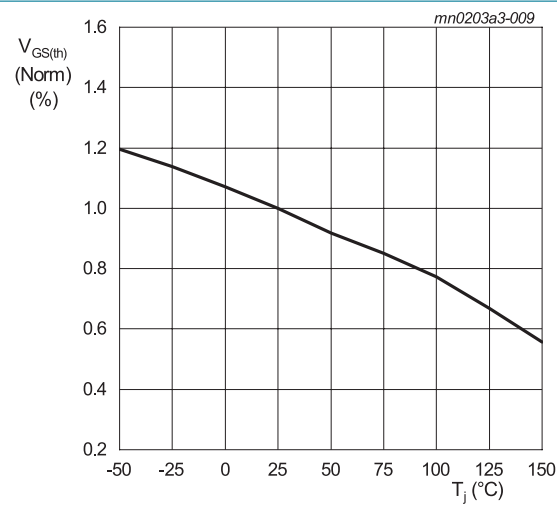


Fig. 7. Drain-source on-state resistance as a function of drain current; typical values



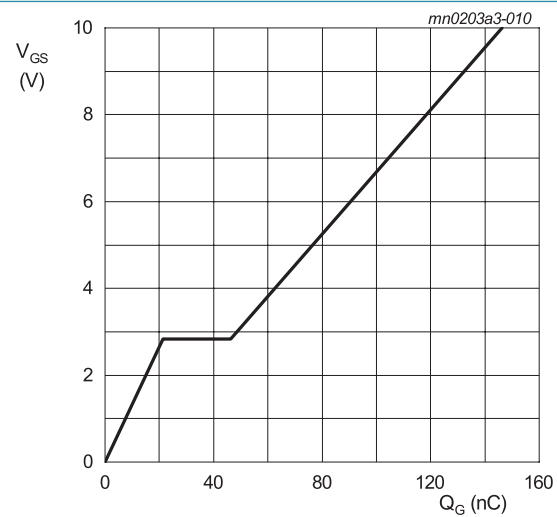
$V_{GS} = 10\text{ V}; I_D = 20\text{ A}$

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



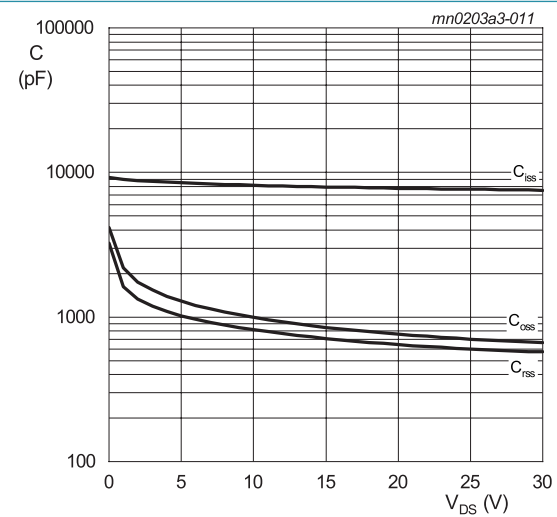
$V_{DS} = V_{GS}; I_D = 250\text{ }\mu\text{A}$

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



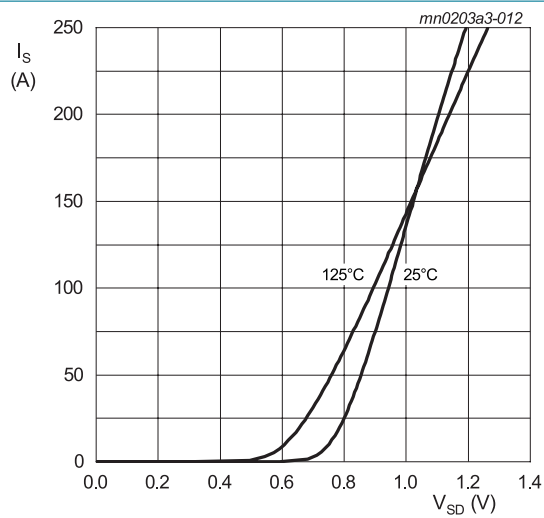
$I_D = 20\text{ A}; V_{DS} = 15\text{ V}$

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



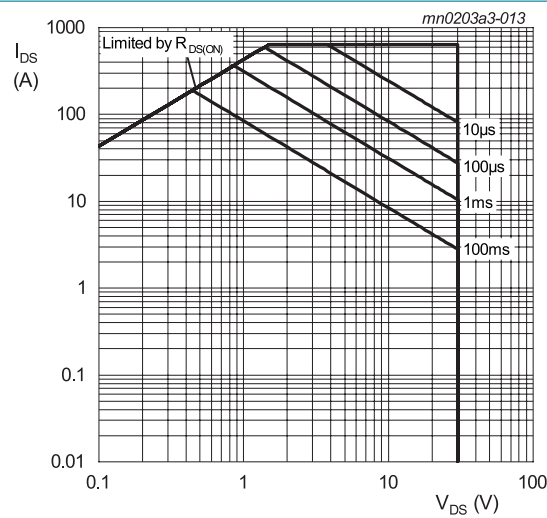
$V_{GS} = 0\text{ V}; f = 1\text{ MHz}$

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



$V_{GS} = 0\text{ V}$

Fig 12. Source current as a function of source-drain voltage; typical values



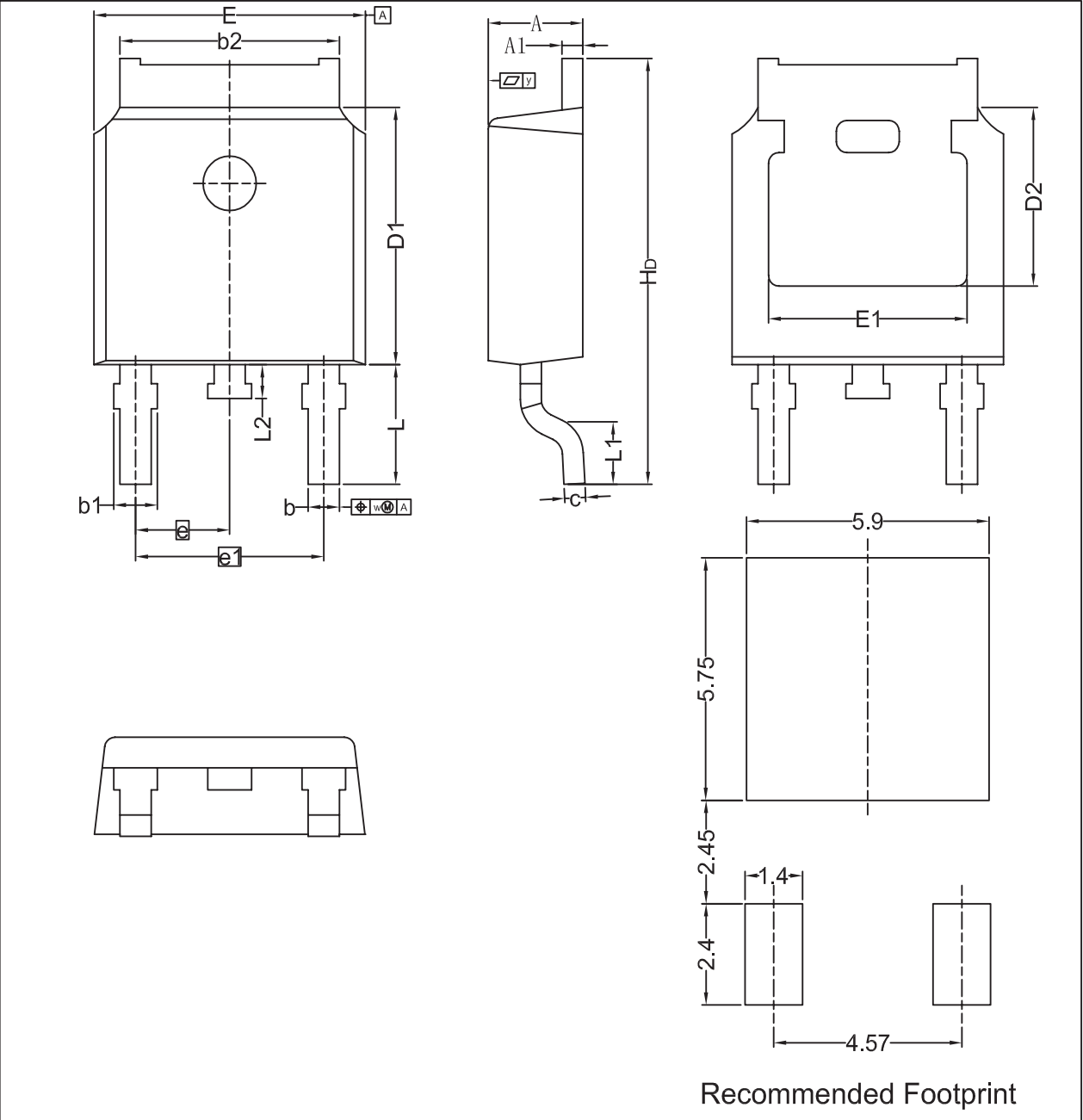
$T_{mb} = 25\text{ °C}$

Fig 13. Safe operating area



11. Package outline

Plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped) TO252



Recommended Footprint

Unit	A	A1	b	b1	b2	c	D1	D2	E	E1	e	e1	H <sub>p</sub>	L	L1	L2	w	y
min	2.22	0.46	0.71	0.72	5.00	0.20	5.98	4.00	6.47	4.45	2.285	4.57	9.60	2.90 (Ref.)	0.50	0.50	0.20	0.20
mm nom																		
max	2.38	0.93	0.89	1.10	5.46	0.56	6.22	---	6.73	---			10.40		---	0.90		

## 12. Legal information

### 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.
Product [short] data sheet	Production	This document contains the product specification.

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Date of release: 18 May 2023