

## 1. General description

WSJM65R099DTL is a high voltage N-channel MOSFET in TOLL package, which utilizes the advanced super-junction technology to provide superior FOM  $R_{DS(on)} \cdot Q_g$  among silicon based MOSFETs. It is particularly suitable for applications require extreme high efficiency and power density



## 2. Features and benefits

- Superior FOM  $R_{DS(on)} \cdot Q_g$
- Extremely low switching loss
- Integrated ultrafast body diode
- 100% avalanche tested

## 3. Applications

- EV charger
- High efficiency power supplies
- On board charger
- Inverters

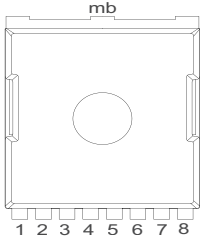
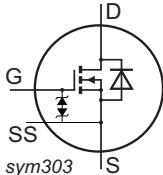
## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Notes	Values			Unit
Absolute maximum rating							
V <sub>DS</sub>	drain-source voltage			650			V
V <sub>GS</sub>	gate-source voltage			±30			V
I <sub>D</sub>	continuous drain current	T <sub>mb</sub> = 25 °C		25			A
P <sub>tot</sub>	power dissipation	T <sub>mb</sub> = 25 °C		147			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> = 16 A		-	87	99	mΩ
Dynamic characteristics							
Q <sub>G(tot)</sub>	total gate charge	I <sub>D</sub> = 16 A; V <sub>DS</sub> = 400 V; V <sub>GS</sub> = 10 V		-	57	-	nC
E <sub>OSS</sub>	coss stored energy	V <sub>GS</sub> = 0 V; V <sub>DS</sub> = 0 to 400 V		-	7.0	-	μJ

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate		
2	SS	source sence		
3-8	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
WSJM65R099DTL	TOLL	WSJM65R099DTLJ	Reel	1800	TOLLN	12-Jan-2024

7. Marking

Table 4. Marking codes

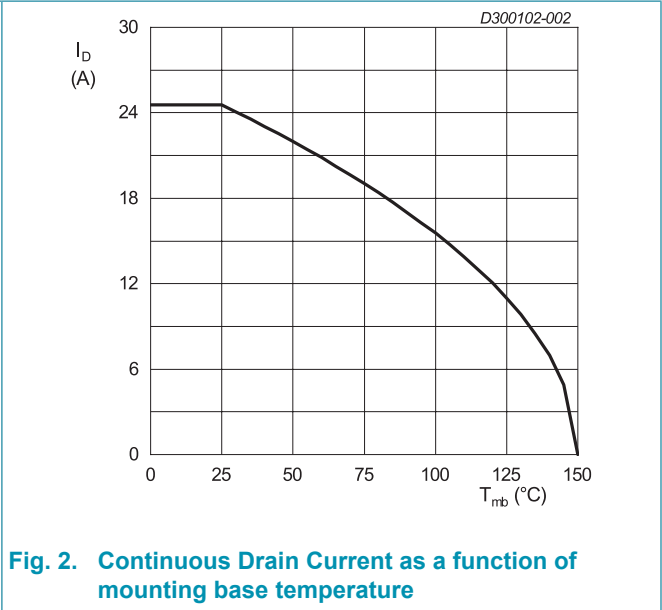
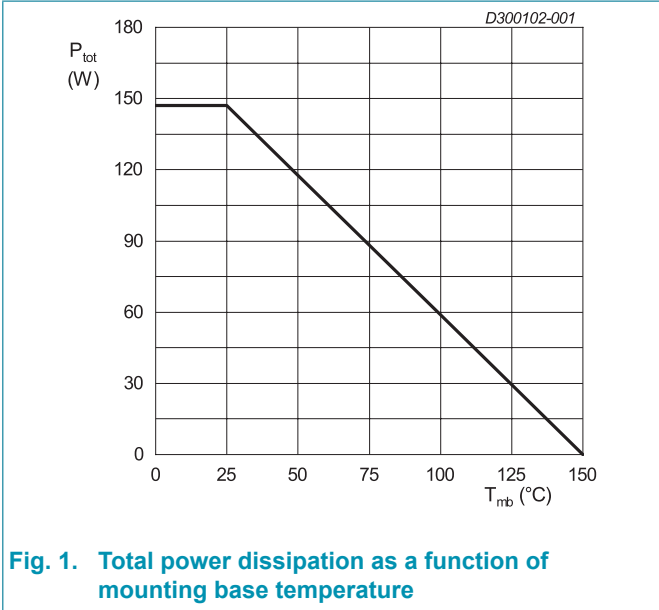
Type number	Marking codes
WSJM65R099DTL	WSJM 65R099DTL

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			650	V
$V_{GS}$	gate-source voltage			$\pm 30$	V
$I_D$	continuous drain current	$T_{mb} = 25\text{ }^{\circ}\text{C}$		25	A
		$T_{mb} = 100\text{ }^{\circ}\text{C}$		16	A
$I_{DM}$	pulsed drain current	$T_{mb} = 25\text{ }^{\circ}\text{C}$		100	A
$P_{tot}$	power dissipation	$T_{mb} = 25\text{ }^{\circ}\text{C}$		147	W
$E_{AS}$	single pulse drain-to-source avalanche	$I_{AS} = 6.4\text{ A}$ ; $R_{GS} = 25\text{ }\Omega$ ; $V_{DD} = 50\text{ V}$ ; $T_j = 25\text{ }^{\circ}\text{C}$		204	mJ
$E_{AR}$	repetitive avalanche energy	$I_{AS} = 6.4\text{ A}$ ; $R_{GS} = 25\text{ }\Omega$ ; $V_{DD} = 50\text{ V}$ ; $T_j = 25\text{ }^{\circ}\text{C}$		0.72	mJ
$I_{AS}$	avalanche current, single pulse			6.4	A
dv/dt	MOSFET dv/dt ruggedness			64	V/ns
dv/dt	reverse diode dv/dt			50	V/ns
dI <sub>F</sub> /dt	maximum diode commutation speed			850	A/ $\mu$ s
$T_{stg}$	storage temperature			-55 to 150	$^{\circ}\text{C}$
$T_j$	junction temperature			-55 to 150	$^{\circ}\text{C}$



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			-	0.65	0.85	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air		-	45	-	K/W

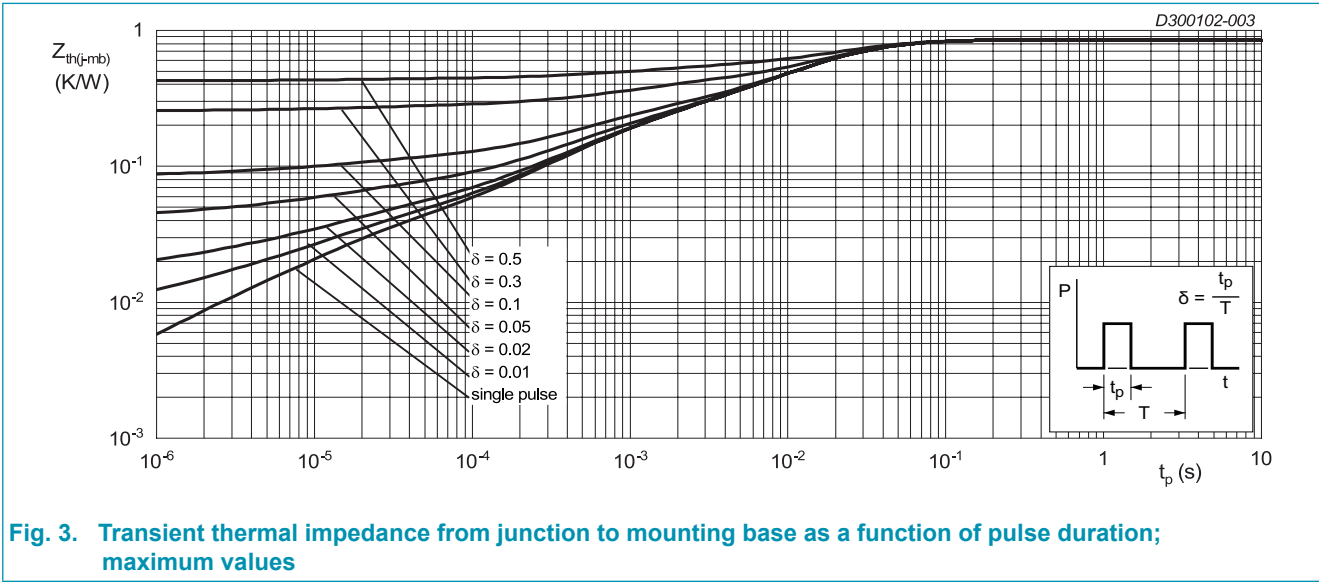


Fig. 3. Transient thermal impedance from junction to mounting base as a function of pulse duration; maximum values

## 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> = 1 mA; V <sub>GS</sub> = 0 V		650	-	-	V
V <sub>GS(th)</sub>	gate-source threshold voltage	I <sub>D</sub> = 250 μA; V <sub>DS</sub> = V <sub>GS</sub>		3.0	-	5.0	V
I <sub>DSS</sub>	drain leakage current	V <sub>DS</sub> = 650 V; V <sub>GS</sub> = 0 V		-	-	10	μA
		V <sub>DS</sub> = 650 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> = ±30 V; V <sub>DS</sub> = 0 V		-	-	±500	nA
R <sub>DS(on)</sub>	drain-source on-state resistance	V <sub>GS</sub> = 10 V; I <sub>D</sub> = 16 A		-	87	99	mΩ
R <sub>G</sub>	gate resistance	f = 1 MHz		-	32	-	Ω
Dynamic characteristics							
Q <sub>G(tot)</sub>	total gate charge	I <sub>D</sub> = 16 A; V <sub>DS</sub> = 400 V; V <sub>GS</sub> = 10 V		-	57	-	nC
Q <sub>GS</sub>	gate-source charge			-	16	-	nC
Q <sub>GD</sub>	gate-drain charge			-	22	-	nC
C <sub>iss</sub>	input capacitance	V <sub>DS</sub> = 400 V; V <sub>GS</sub> = 0 V; f = 250 kHz		-	2797	-	pF
C <sub>oss</sub>	output capacitance			-	44	-	pF
C <sub>rss</sub>	reverse transfer capacitance			-	1.6	-	pF
C <sub>o(er)</sub>	effective output capacitance, energy related	V <sub>GS</sub> = 0 V; V <sub>DS</sub> = 0 to 400 V		-	88	-	pF
C <sub>o(tr)</sub>	effective output capacitance, time related			-	731	-	pF
t <sub>d(on)</sub>	turn-on delay time	V <sub>DS</sub> = 400 V; V <sub>GS</sub> = 10 V; R <sub>G</sub> = 2 Ω; I <sub>D</sub> = 16 A		-	129	-	ns
t <sub>r</sub>	rise time			-	15	-	ns
t <sub>d(off)</sub>	turn-off delay time			-	225	-	ns
t <sub>f</sub>	fall time			-	9.1	-	ns
Source-drain diode							
V <sub>SD</sub>	source-drain voltage	V <sub>GS</sub> = 0 V; I <sub>S</sub> = 16 A		-	0.94	1.2	V
I <sub>S</sub>	body-diode continuous current	T <sub>mb</sub> = 25 °C		-	-	25	A
t <sub>rr</sub>	reverse recovery time	V <sub>R</sub> = 400 V; I <sub>F</sub> = 16 A; dI <sub>F</sub> /dt = 100 A/μs		-	142	-	ns
Q <sub>rr</sub>	reverse recovered charge			-	1.0	-	μC
I <sub>rrm</sub>	reverse recovery current			-	14	-	A

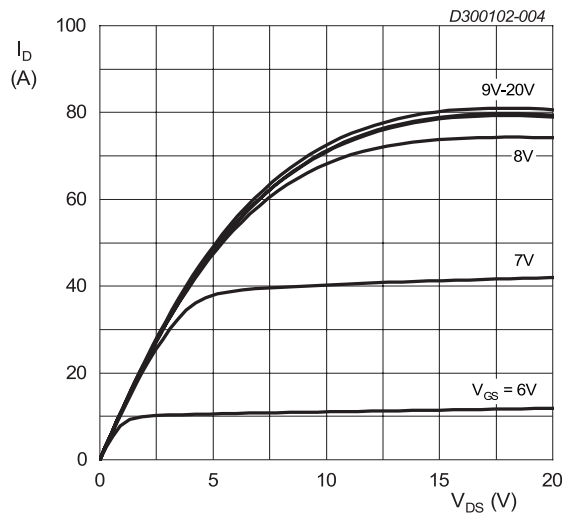
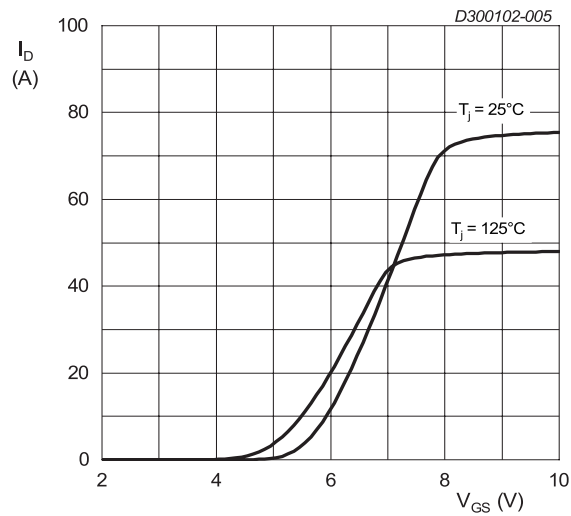
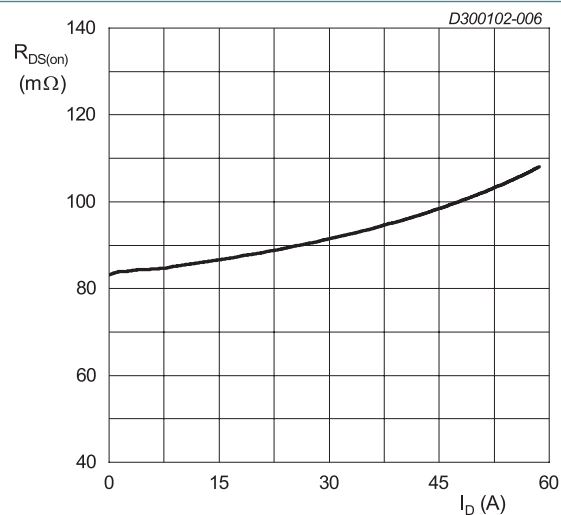


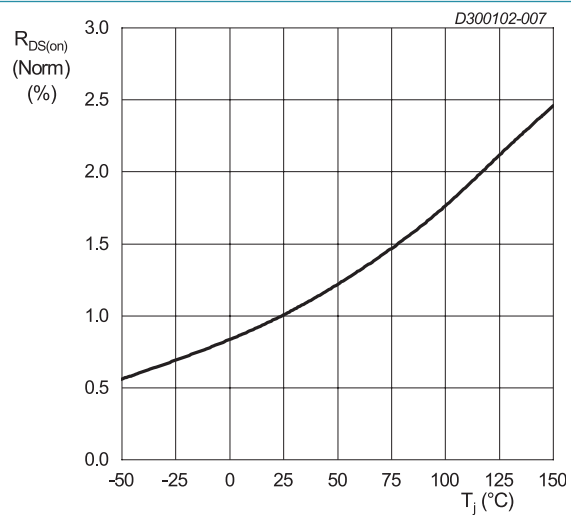
Fig. 4. Drain current as a function of drain-source voltage; typical values



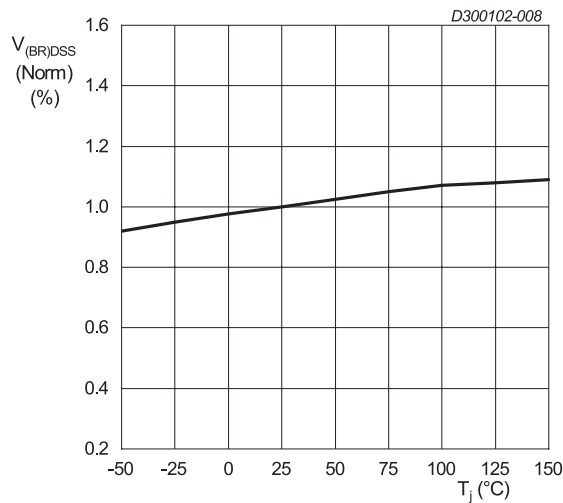
$V_{DS} = 20\text{ V}$   
Fig. 5. Drain current as a function of gate-source voltage; typical values



$V_{GS} = 10\text{ V}$   
Fig. 6. Drain-source on-state resistance as a function of drain current; typical values

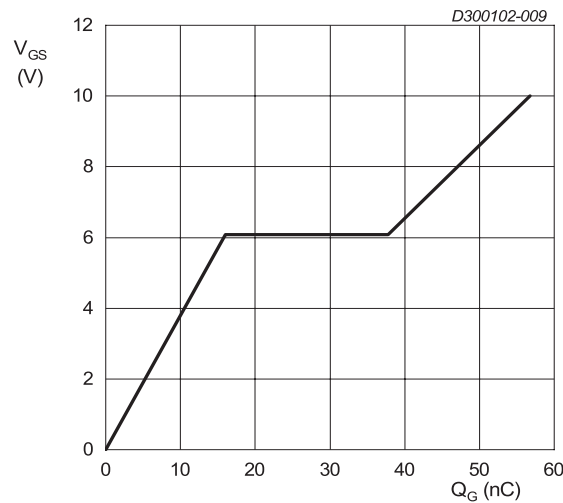


$V_{GS} = 10\text{ V}$ ;  $I_D = 16\text{ A}$   
Fig. 7. Normalized drain-source on-state resistance as a function of junction temperature



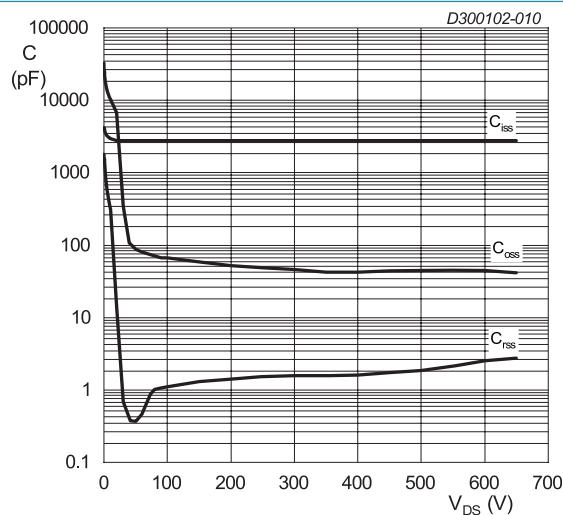
$I_D = 1\text{ mA}$

Fig. 8. Normalized drain-source breakdown voltage as a function of junction temperature



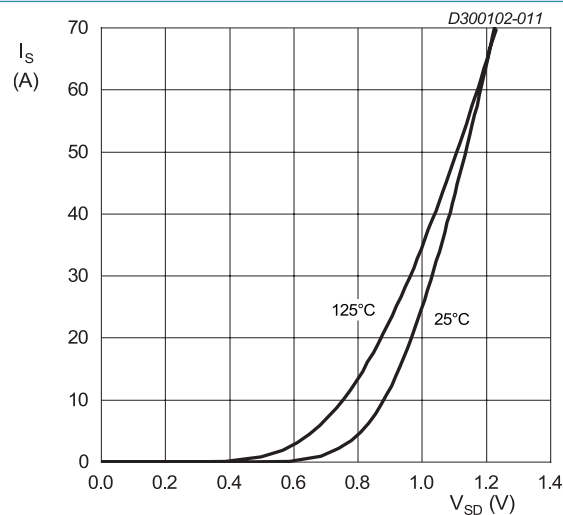
$I_D = 16\text{ A}; V_{DS} = 400\text{ V}$

Fig. 9. Gate-source voltage as a function of gate charge; typical values



$V_{GS} = 0\text{ V}; f = 250\text{ kHz}$

Fig 10. Capacitances as a function of drain-source voltage; typical values



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

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

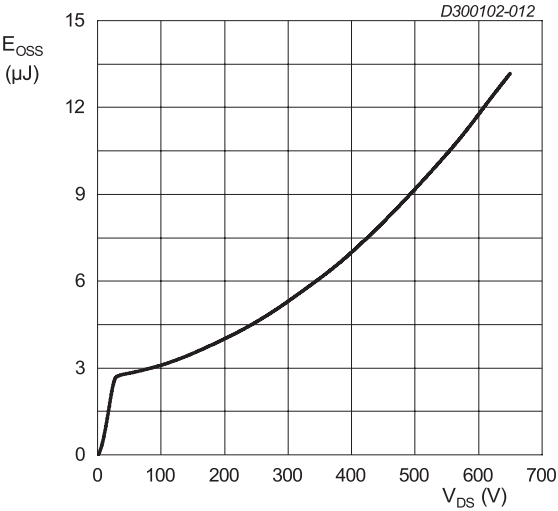
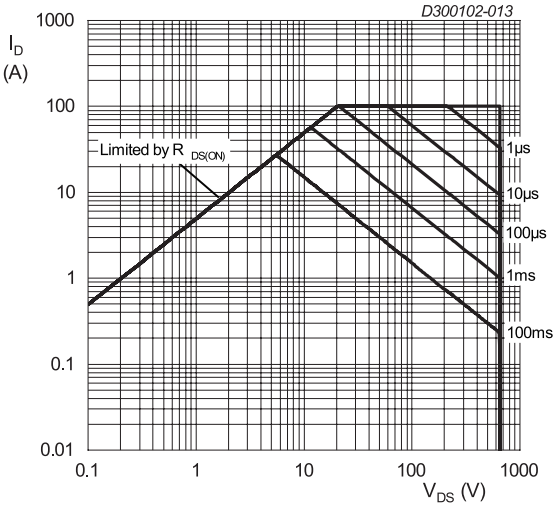


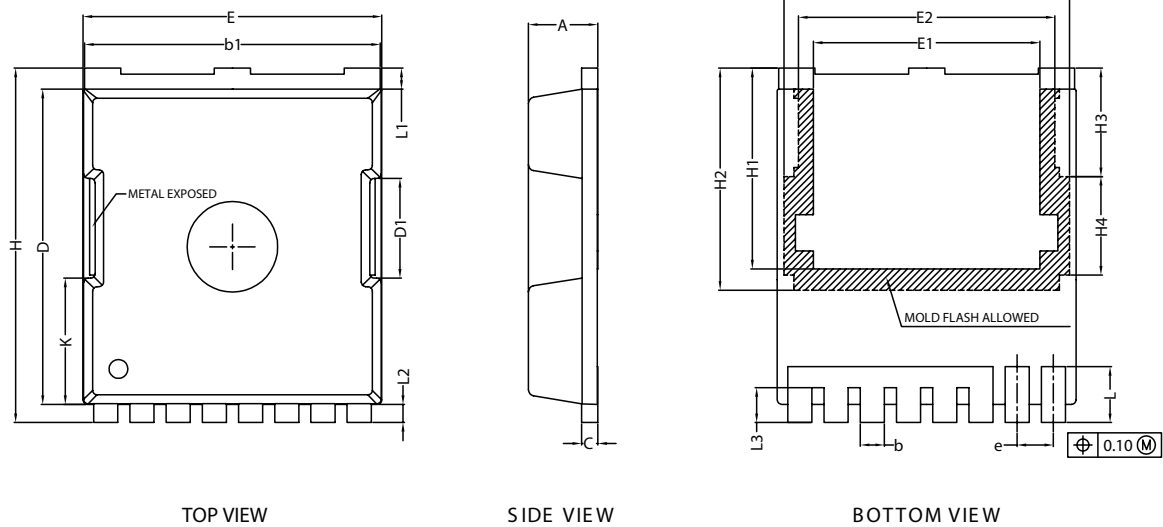
Fig. 12. Output capacitance stored energy as a function of drain-source voltage



$T_{mb} = 25\text{ }^{\circ}C$   
Fig. 13. Safe operating area



11. Package outline



(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	2.20	2.30	2.40
b	0.70	0.80	0.90
b1	9.70	9.80	9.90
c	0.40	0.50	0.60
D	10.28	10.43	10.58
D1	3.15	3.30	3.45
E	9.70	9.90	10.10
E1	7.35	7.50	7.65
E2	8.35	8.50	8.65
E3	9.31	9.46	9.61
e	1.10	1.20	1.30
H	11.48	11.73	11.88
H1	6.55	6.65	6.75
H2	7.20	7.35	7.50
H3	3.44	3.59	3.74
H4	3.11	3.26	3.41
K	4.03	4.18	4.33
L	1.60	1.85	2.10
L1	0.55	0.70	0.85
L2	0.45	0.60	0.75
L3	1.00	1.15	1.30

Note:  
All dimensions do not include mold flash or protrusion.

## 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.
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