

## 1. General description

WSJM65R170TL is a high voltage N-channel MOSFET in TOLL package, which utilizes the advanced super-junction technology to provide superior FOM  $R_{DS(on)} * Q_g$  among silicon based MOSFETs. It is particularly suitable for applications require extreme high efficiency and power density.



## 2. Features and benefits

- Superior FOM  $R_{DS(on)} * Q_g$
- Extremely low switching loss
- 100% avalanche tested

## 3. Applications

- Server power
- LEV charger
- LED power
- Adapters

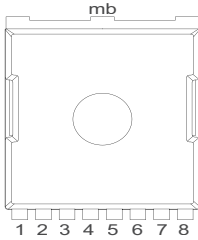
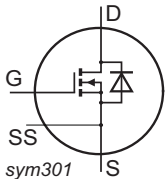
## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Notes	Values			Unit
<b>Absolute maximum rating</b>							
$V_{DS}$	drain-source voltage			650			V
$V_{GS}$	gate-source voltage			±30			V
$I_D$	continuous drain current	$T_{mb} = 25\text{ °C}$		21			A
$P_{tot}$	power dissipation	$T_{mb} = 25\text{ °C}$		202			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	$V_{GS} = 10\text{ V}, I_D = 11\text{ A}$		-	156	170	mΩ
<b>Dynamic characteristics</b>							
$Q_{G(tot)}$	total gate charge	$I_D = 11\text{ A}; V_{DS} = 400\text{ V}; V_{GS} = 10\text{ V}$		-	38	-	nC
$E_{OSS}$	coss stored energy	$V_{GS} = 0\text{ V}; V_{DS} = 0\text{ to }400\text{ V}$		-	5.1	-	μJ

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate		
2	SS	source sense		
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
WSJM65R170TL	TOLL	WSJM65R170TLJ	Reel	1800	TOLLN	12-Jan-2024

## 7. Marking

Table 4. Marking codes

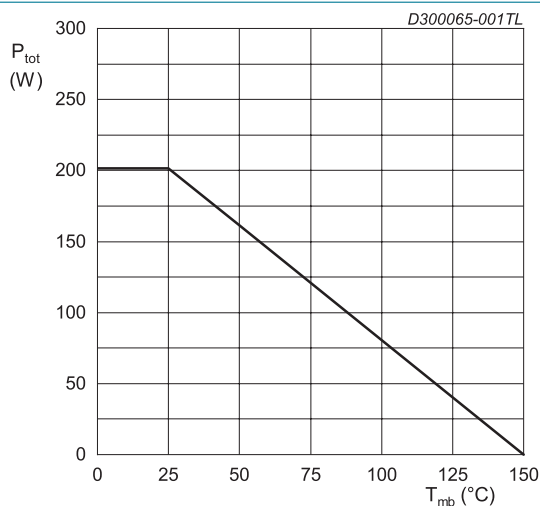
Type number	Marking codes
WSJM65R170TL	WSJM 65R170TL

## 8. Limiting values

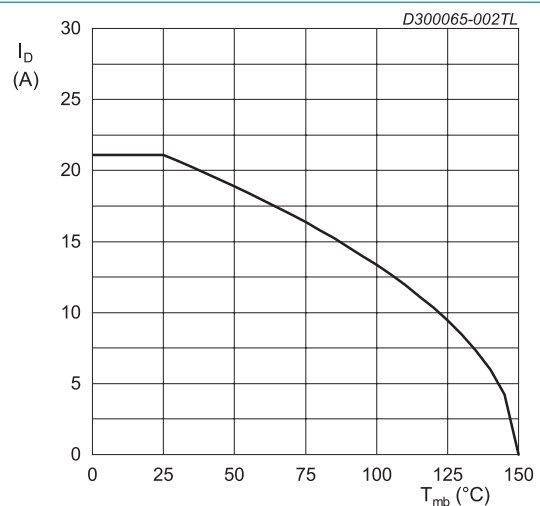
**Table 5. Limiting values**

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	$T_{mb} = 25\text{ }^\circ\text{C}$		21	A
		$T_{mb} = 100\text{ }^\circ\text{C}$		13	A
$I_{DM}$	pulsed drain current	$T_{mb} = 25\text{ }^\circ\text{C}$		72	A
$P_{tot}$	power dissipation	$T_{mb} = 25\text{ }^\circ\text{C}$		202	W
$E_{AS}$	single pulse drain-to-source avalanche	$I_{AS} = 6.9\text{ A}$ ; $R_{GS} = 25\text{ }\Omega$ ; $V_{DD} = 50\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$		238	mJ
$E_{AR}$	repetitive avalanche energy	$I_{AS} = 6.9\text{ A}$ ; $R_{GS} = 25\text{ }\Omega$ ; $V_{DD} = 50\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$		0.95	mJ
$I_{AS}$	avalanche current, single pulse			6.9	A
dv/dt	MOSFET dv/dt ruggedness			50	V/ns
dv/dt	reverse diode dv/dt			15	V/ns
dI <sub>p</sub> /dt	maximum diode commutation speed			500	A/ $\mu$ s
$T_{stg}$	storage temperature			-55 to 150	$^\circ\text{C}$
$T_j$	junction temperature			-55 to 150	$^\circ\text{C}$



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



**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			-	0.53	0.62	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air		-	45	-	K/W

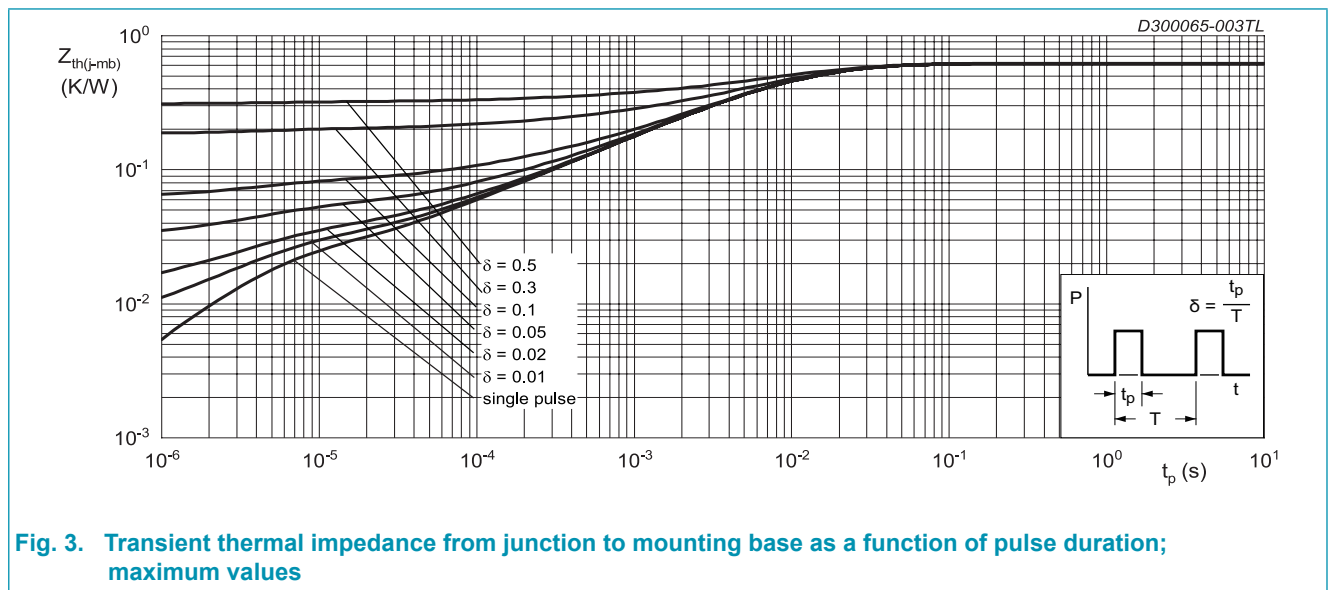
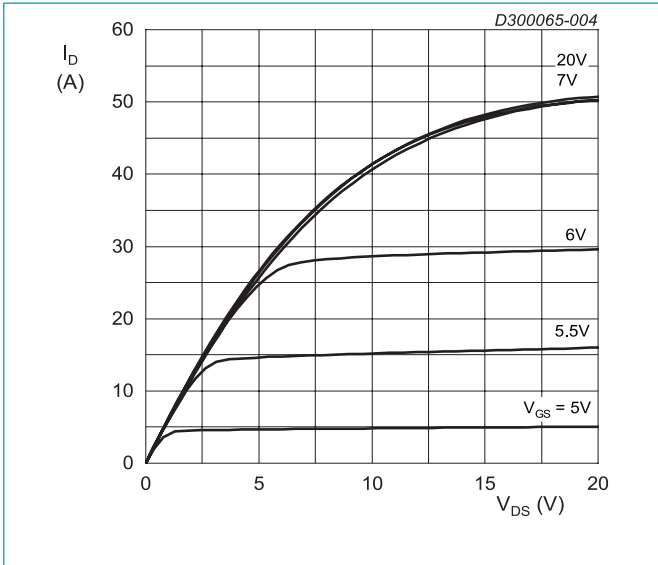


Fig. 3. Transient thermal impedance from junction to mounting base as a function of pulse duration; maximum values

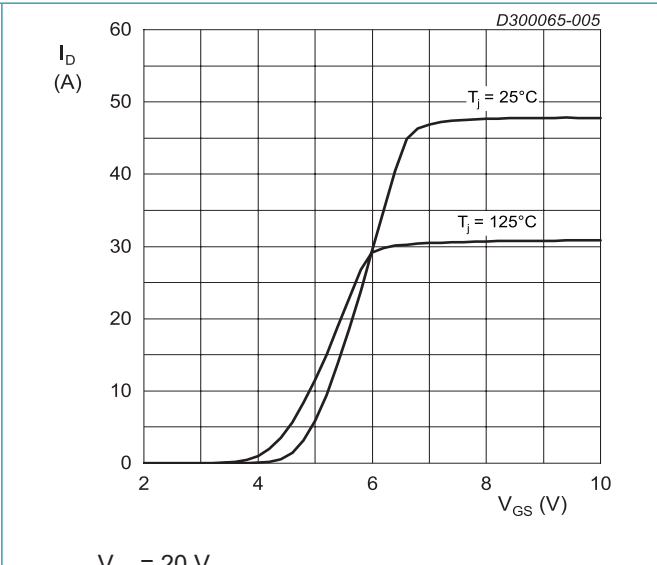
## 10. Characteristics

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

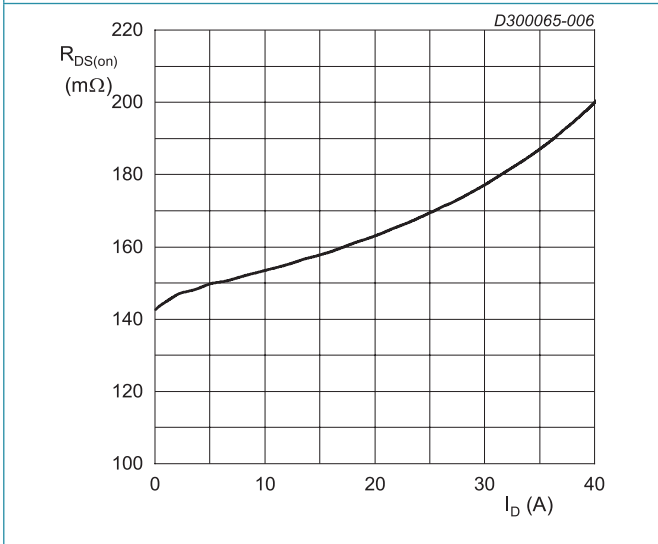
Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
<b>Static characteristics</b>							
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250\text{ }\mu\text{A}; V_{GS} = 0\text{ V}$		650	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 250\text{ }\mu\text{A}; V_{DS} = V_{GS}$		2.5	-	4.5	V
$I_{DSS}$	drain leakage current	$V_{DS} = 650\text{ V}; V_{GS} = 0\text{ V}$		-	-	1	$\mu\text{A}$
		$V_{DS} = 650\text{ V}; V_{GS} = 0\text{ V}; T_j = 125\text{ }^\circ\text{C}$		-	-	10	$\mu\text{A}$
$I_{GSS}$	gate leakage current	$V_{GS} = \pm 30\text{ V}; V_{DS} = 0\text{ V}$		-	-	$\pm 100$	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}; I_D = 11\text{ A}$		-	156	170	m $\Omega$
$R_G$	gate resistance	$f = 1\text{ MHz}$		-	12	-	$\Omega$
<b>Dynamic characteristics</b>							
$Q_{G(tot)}$	total gate charge	$I_D = 11\text{ A}; V_{DS} = 400\text{ V}; V_{GS} = 10\text{ V}$		-	38	-	nC
$Q_{GS}$	gate-source charge			-	8.7	-	nC
$Q_{GD}$	gate-drain charge			-	14	-	nC
$C_{iss}$	input capacitance	$V_{DS} = 400\text{ V}; V_{GS} = 0\text{ V}; f = 1\text{ MHz}$		-	1751	-	pF
$C_{oss}$	output capacitance			-	41	-	pF
$C_{rss}$	reverse transfer capacitance			-	2.3	-	pF
$C_{o(er)}$	effective output capacitance, energy related	$V_{GS} = 0\text{ V}; V_{DS} = 0\text{ to }400\text{ V}$		-	64	-	pF
$C_{o(tr)}$	effective output capacitance, time related			-	370	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 400\text{ V}; V_{GS} = 10\text{ V}; R_G = 2\text{ }\Omega;$ $I_D = 11\text{ A}$		-	21	-	ns
$t_r$	rise time			-	21	-	ns
$t_{d(off)}$	turn-off delay time			-	72	-	ns
$t_f$	fall time			-	11	-	ns
<b>Source-drain diode</b>							
$V_{SD}$	source-drain voltage	$V_{GS} = 0\text{ V}; I_S = 11\text{ A}$		-	0.8	1.1	V
$I_S$	body-diode continuous current	$T_{mb} = 25\text{ }^\circ\text{C}$		-	-	21	A
$t_{rr}$	reverse recovery time	$V_R = 400\text{ V}; I_F = 11\text{ A}; di_F/dt = 100\text{ A}/\mu\text{s}$		-	285	-	ns
$Q_{rr}$	reverse recovered charge			-	3.8	-	$\mu\text{C}$
$I_{rrm}$	reverse recovery current			-	26	-	A



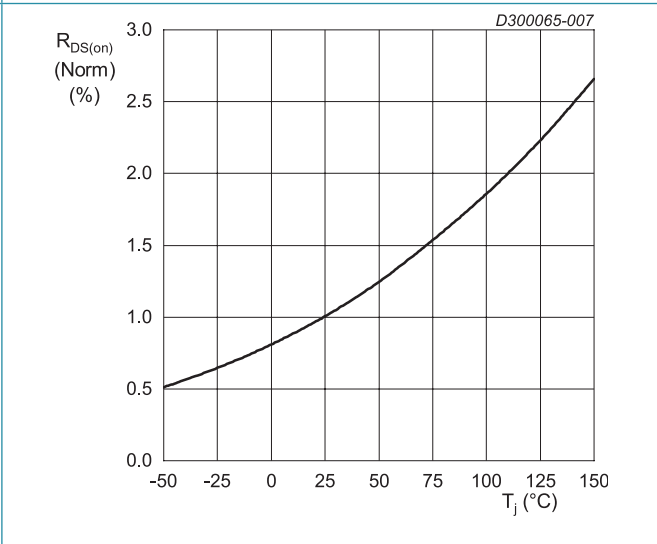
**Fig. 4. Drain current as a function of drain-source voltage; typical values**



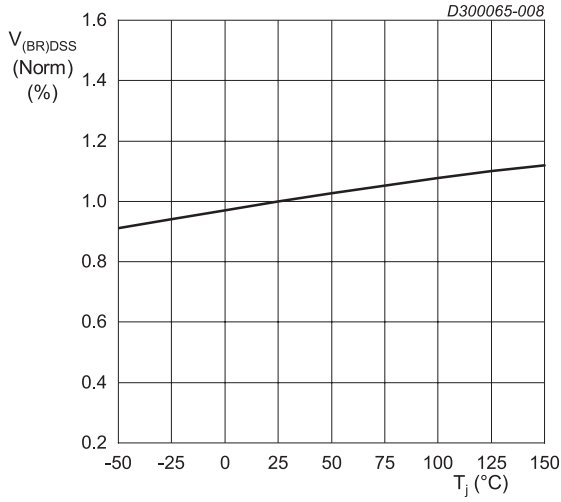
**Fig. 5. Drain current as a function of gate-source voltage; typical values**  
 $V_{DS} = 20\text{ V}$



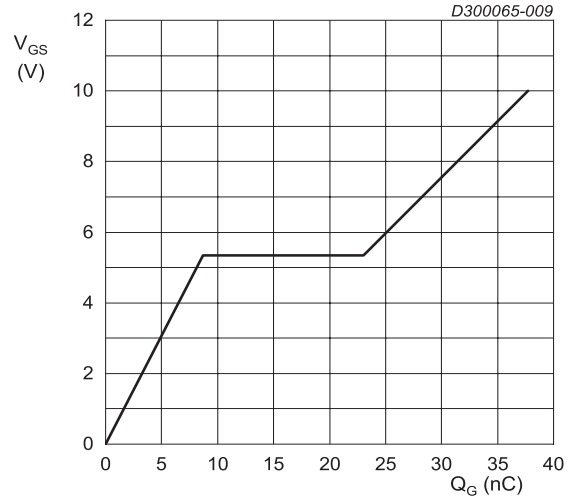
**Fig. 6. Drain-source on-state resistance as a function of drain current; typical values**  
 $V_{GS} = 10\text{ V}$



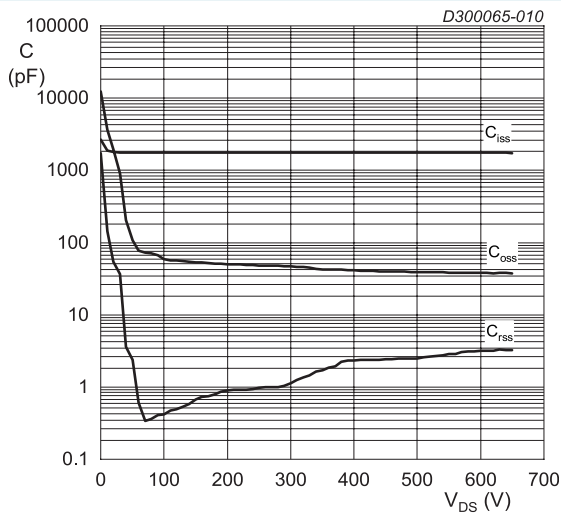
**Fig. 7. Normalized drain-source on-state resistance as a function of junction temperature**  
 $V_{GS} = 10\text{ V}; I_D = 11\text{ A}$



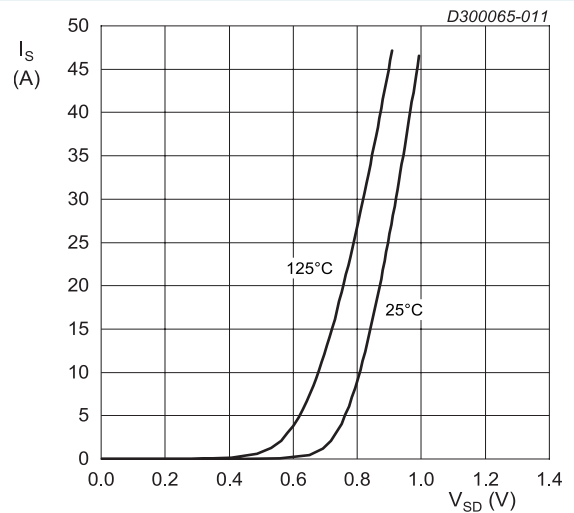
$I_D = 250 \mu A$   
**Fig. 8. Normalized drain-source breakdown voltage as a function of junction temperature**



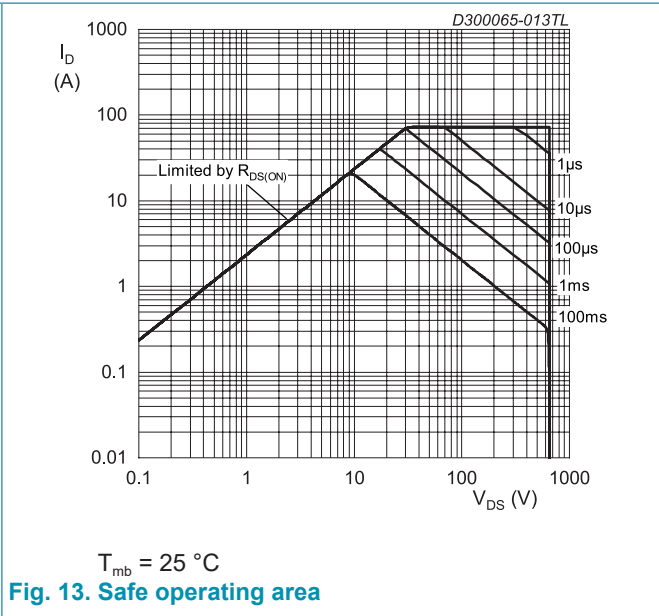
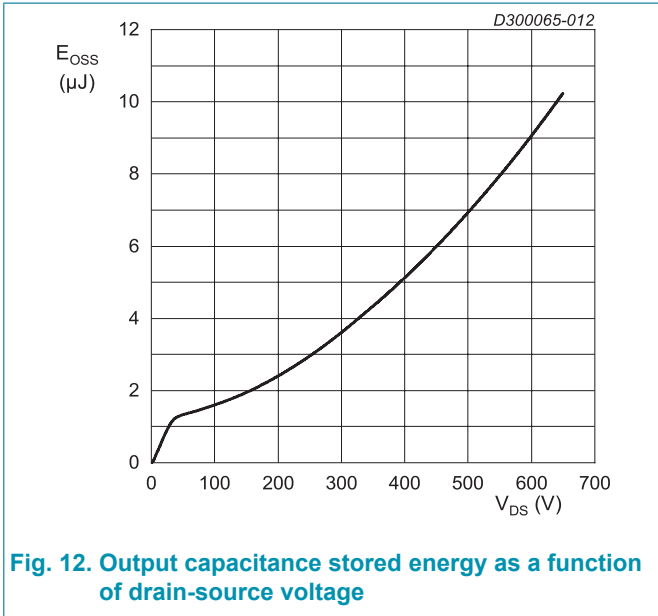
$I_D = 11 A; V_{DS} = 400 V$   
**Fig. 9. Gate-source voltage as a function of gate charge; typical values**



$V_{GS} = 0 V; f = 1 MHz$   
**Fig. 10. Capacitances as a function of drain-source voltage; typical values**

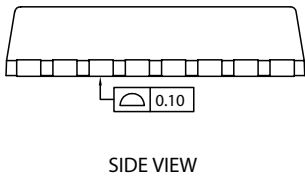
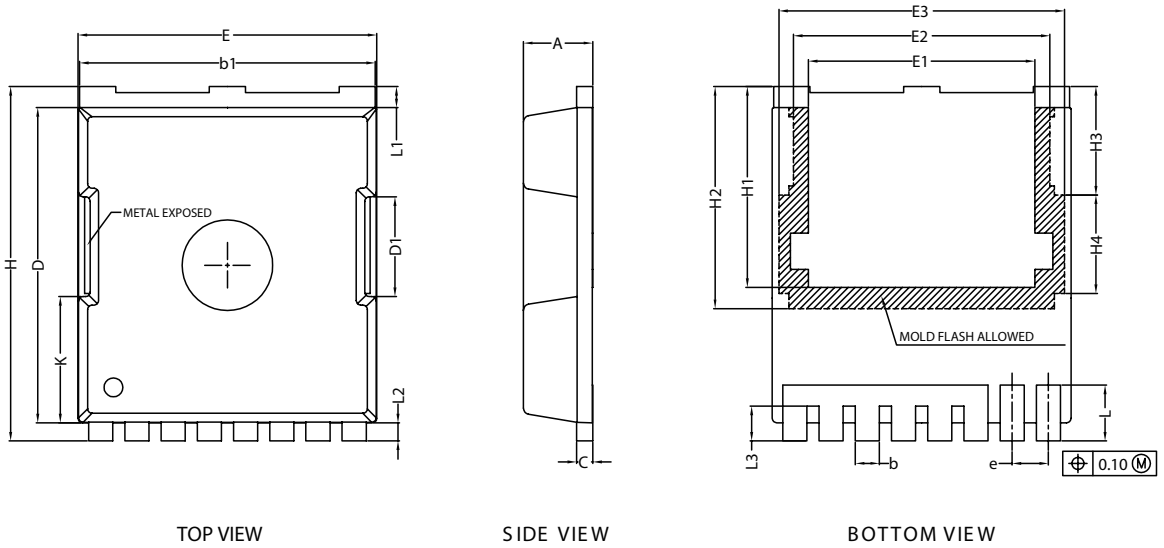


$V_{GS} = 0 V$   
**Fig. 11. Source current as a function of source-drain voltage; typical values**





### 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

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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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