

## 1. General description

WSJM65R170W is a high voltage N-channel MOSFET in TO247 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

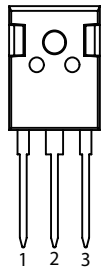
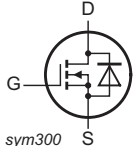
## 4. Quick reference data

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	$T_{mb} = 25\text{ °C}$		23			A
$P_{tot}$	power dissipation	$T_{mb} = 25\text{ °C}$		240			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	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
WSJM65R170W	TO247	WSJM65R170WQ	Tube	30	TO247N	20-Jul-2016

## 7. Marking

Table 4. Marking codes

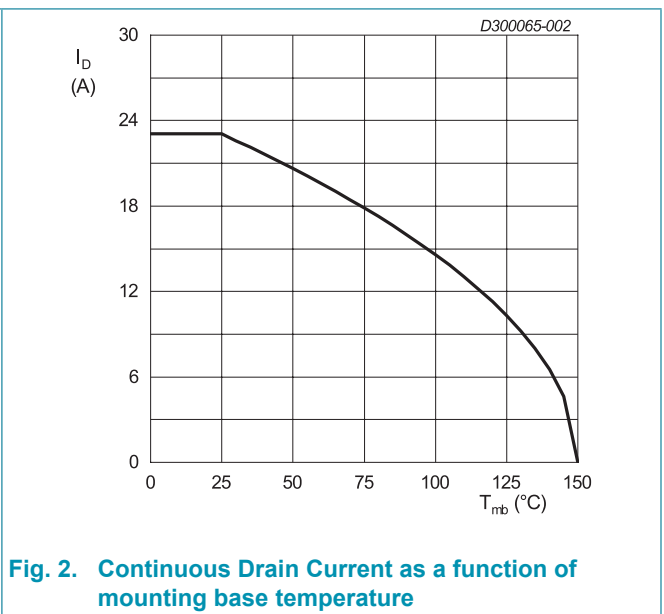
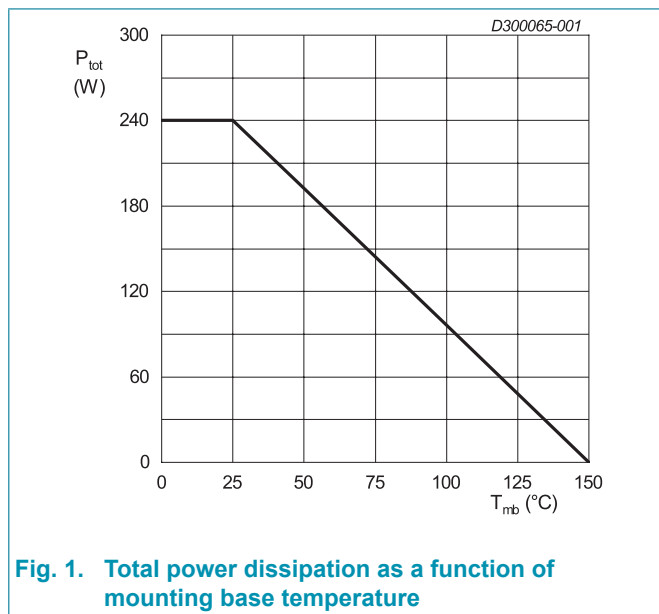
Type number	Marking codes
WSJM65R170W	WSJM 65R170W

## 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	$T_{mb} = 25\text{ }^\circ\text{C}$		23	A
		$T_{mb} = 100\text{ }^\circ\text{C}$		14	A
$I_{DM}$	pulsed drain current	$T_{mb} = 25\text{ }^\circ\text{C}$		72	A
$P_{tot}$	power dissipation	$T_{mb} = 25\text{ }^\circ\text{C}$		240	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	$I_{AS} = 6.9\text{ A}$ ; $R_{GS} = 25\text{ }\Omega$ ; $V_{DD} = 50\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$		1.67	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>r</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	$^\circ\text{C}$



## 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			-	0.45	0.52	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air		-	45	-	K/W

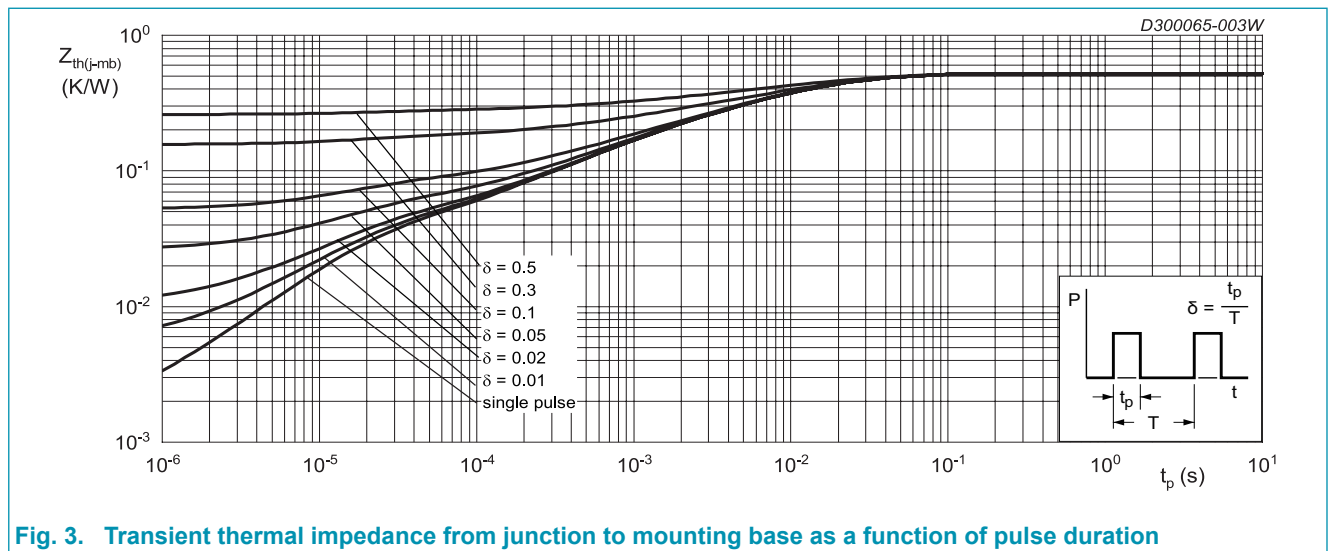
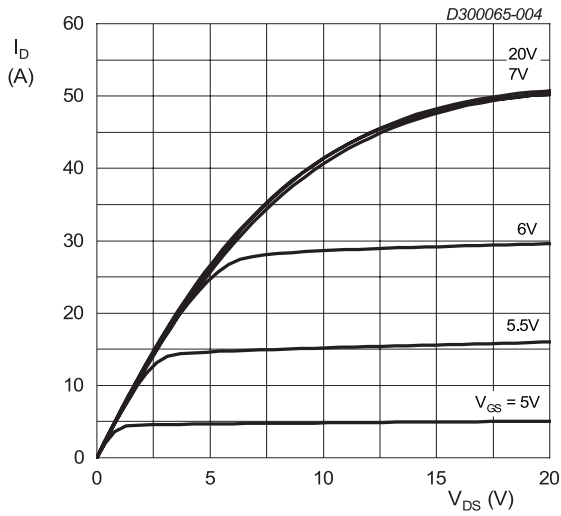


Fig. 3. Transient thermal impedance from junction to mounting base as a function of pulse duration

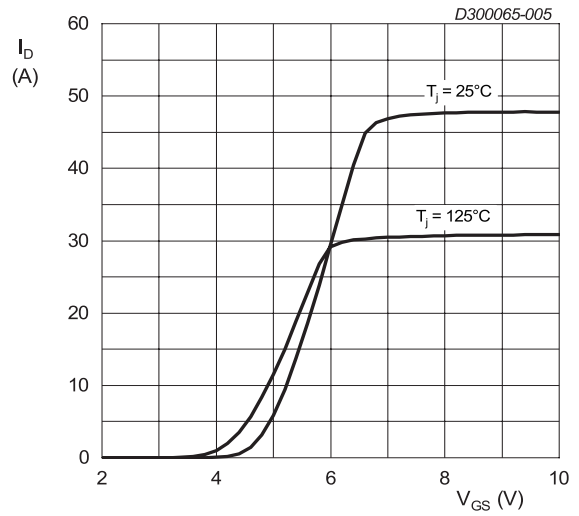
## 10. Characteristics

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

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
<b>Static characteristics</b>							
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250\ \mu\text{A}; V_{GS} = 0\ \text{V}$		650	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 250\ \mu\text{A}; V_{DS} = V_{GS}$		2.5	-	4.5	V
$I_{DSS}$	drain leakage current	$V_{DS} = 650\ \text{V}; V_{GS} = 0\ \text{V}$		-	-	1	$\mu\text{A}$
		$V_{DS} = 650\ \text{V}; V_{GS} = 0\ \text{V}; T_j = 125\text{ °C}$		-	-	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	$V_{DS} = 400\ \text{V}; V_{GS} = 10\ \text{V}; R_G = 2\ \Omega;$ $I_D = 11\ \text{A}$		-	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	$T_{mb} = 25\text{ °C}$		-	-	23	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

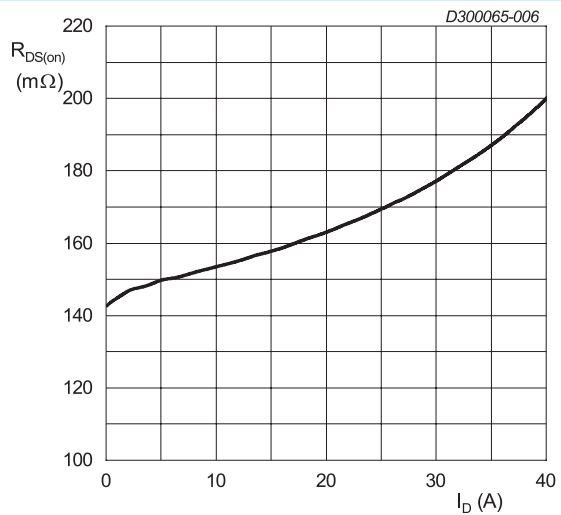


**Fig. 4. Drain current as a function of drain-source voltage; typical values**



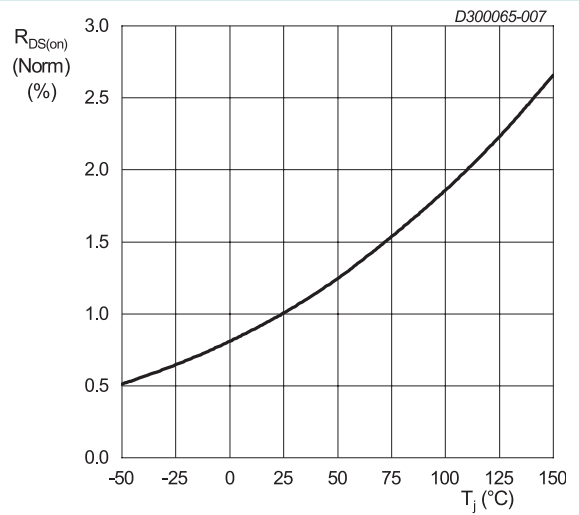
**Fig. 5. Drain current as a function of gate-source voltage; typical values**

$V_{DS} = 20\text{ V}$



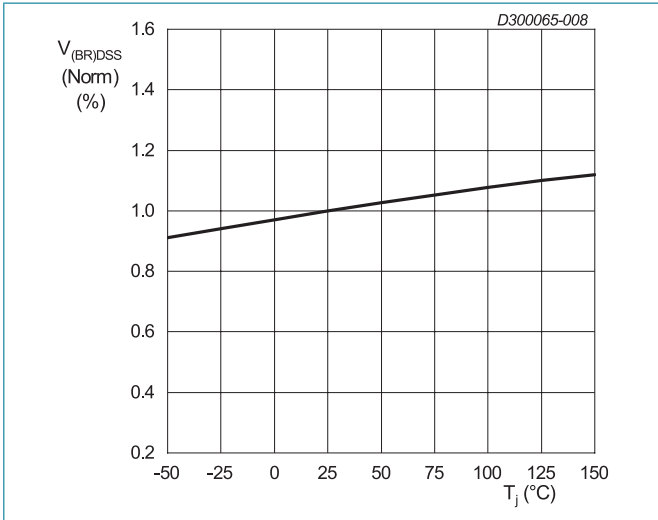
**Fig. 6. Drain-source on-state resistance as a function of drain current; typical values**

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

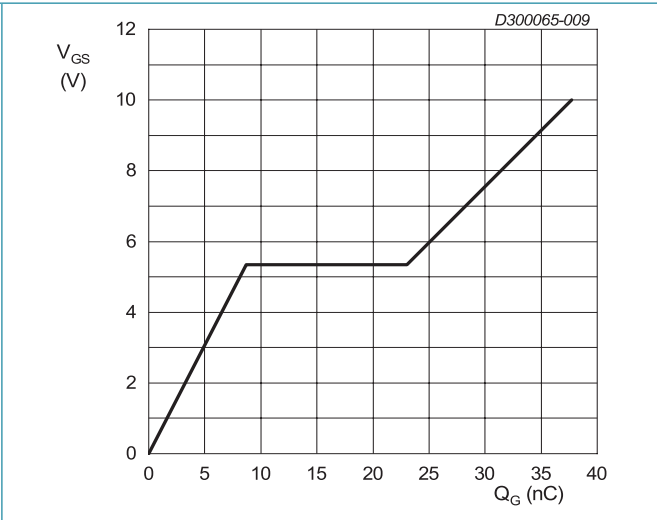


**Fig. 7. Normalized drain-source on-state resistance as a function of junction temperature**

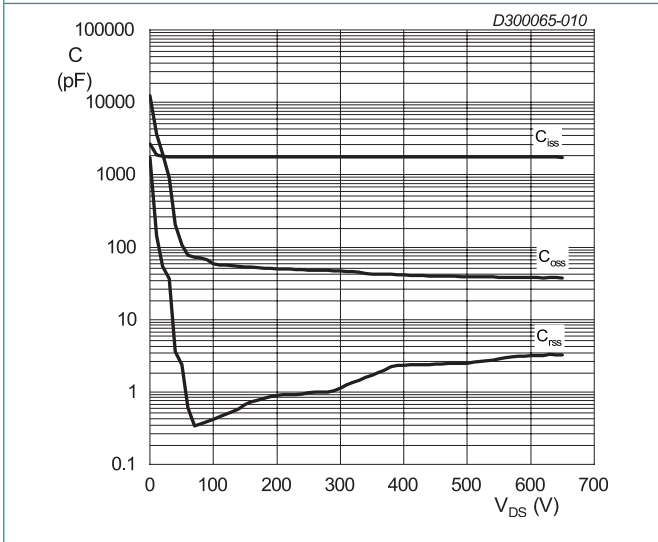
$V_{GS} = 10\text{ V}; I_D = 11\text{ A}$



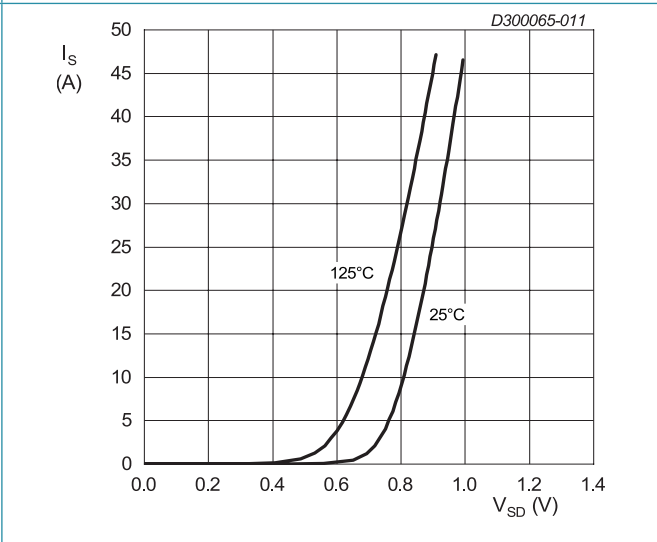
$I_D = 250 \mu A$   
**Fig. 8. Normalized drain-source breakdown voltage as a function of junction temperature**



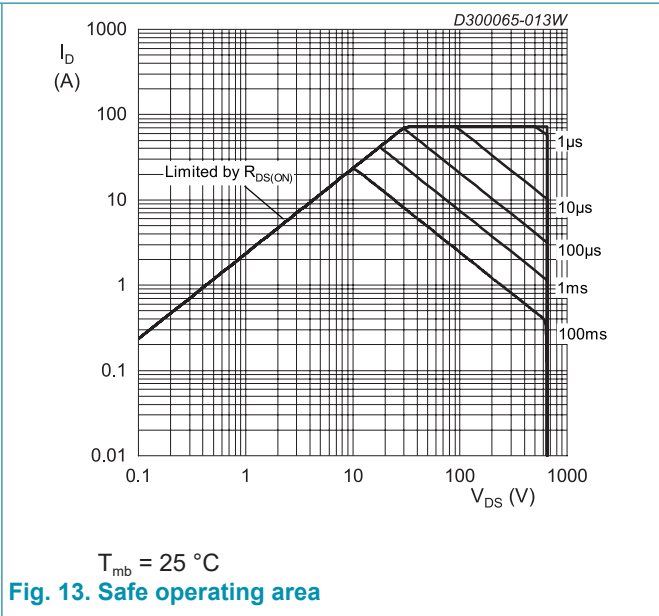
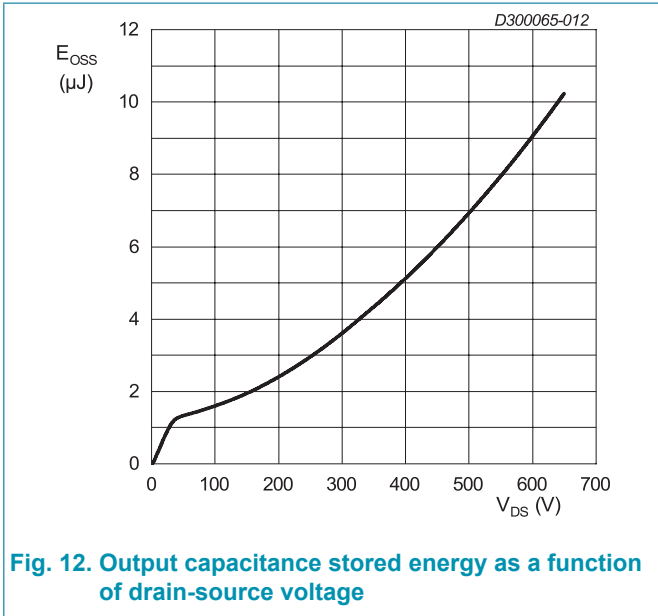
$I_D = 11 A; V_{DS} = 400 V$   
**Fig. 9. Gate-source voltage as a function of gate charge; typical values**



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

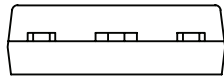
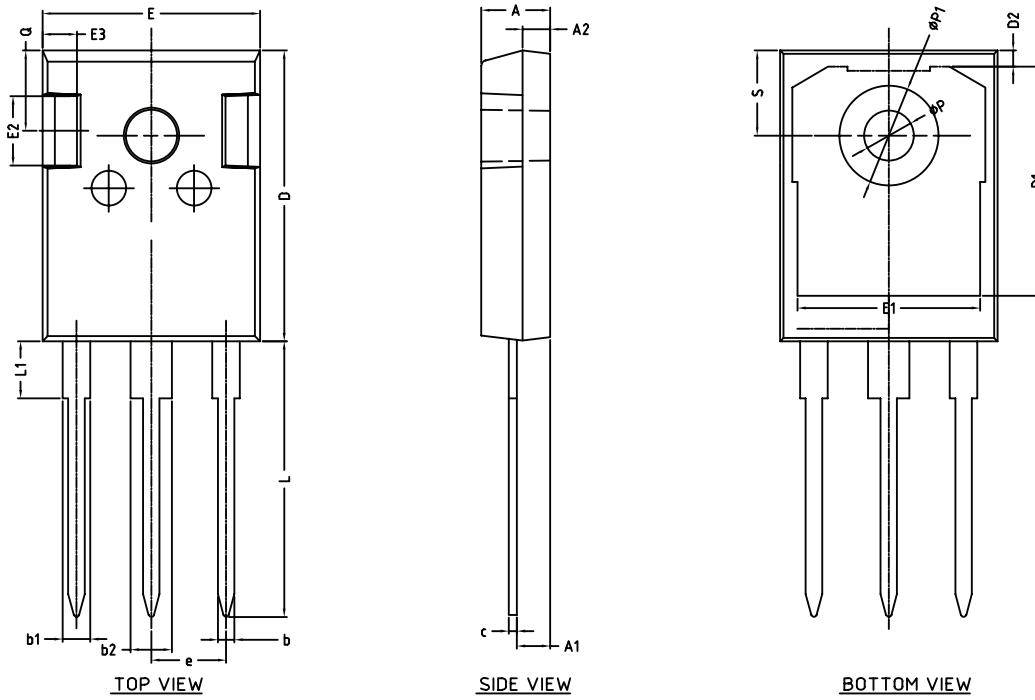




### 11. Package outline

Plastic single-ended through-hole package; heatsink mounted; 1 mounting hole; 3-lead TO-247

SOT429N



SIDE VIEW

UNIT	A	A1	A2	b	b1	b2	c	D	D1	D2	E	E1	E2	E3	e	L	L1	P	P1	Q	S
mm	5.20	2.60	2.10	1.40	2.20	3.20	0.70	21.10	16.85	1.35	15.90	13.50	5.20	2.60	5.45	20.10	4.75	3.70	7.40	6.00	6.25
	4.70	2.20	1.90	1.00	1.80	2.80	0.50	20.90	16.25	1.05	15.70	13.10	4.80	2.40		19.80	-	3.50	-	5.60	6.05

OUTLINE VERSION	REFERENCES				PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT429N		TO-247				

## 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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