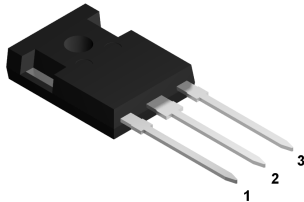
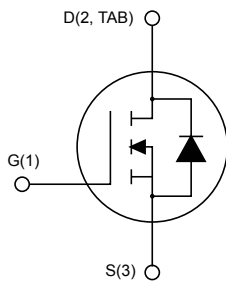


## Silicon carbide Power MOSFET 650 V, 119 A, 18 mΩ (typ., T<sub>J</sub> = 25 °C) in an HiP247 long leads package


**HiP247 long leads**


AM01475v1\_noZen



### Features

Order code	V <sub>DS</sub>	R <sub>DS(on)</sub> max.	I <sub>D</sub>
SCTWA90N65G2V	650 V	24 mΩ	119 A

- High speed switching performance
- Very high operating junction temperature capability (T<sub>J</sub> = 200 °C)
- Very fast and robust intrinsic body diode
- Extremely low gate charge and input capacitances

### Applications

- Power supply for renewable energy systems
- High frequency DC-DC converters
- Charging stations

### Description

This silicon carbide Power MOSFET device has been developed using ST's advanced and innovative 2<sup>nd</sup> generation SiC MOSFET technology. The device features remarkably low on-resistance per unit area and very good switching performance. The variation of switching loss is almost independent of junction temperature.

#### Product status link

[SCTWA90N65G2V](#)

#### Product summary

<b>Order code</b>	SCTWA90N65G2V
<b>Marking</b>	SCT90N65G2V
<b>Package</b>	HiP247 long leads
<b>Packing</b>	Tube

# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage	650	V
$V_{GS}$	Gate-source voltage	-10 to 22	V
	Gate-source voltage (recommended operating values)	-5 to 18	
$I_D$	Drain current (continuous) at $T_C = 25\text{ °C}$	119	A
	Drain current (continuous) at $T_C = 100\text{ °C}$	90	
$I_{DM}^{(1)}$	Drain current (pulsed)	220	A
$P_{TOT}$	Total power dissipation at $T_C = 25\text{ °C}$	565	W
$T_{stg}$	Storage temperature range	-55 to 200	°C
$T_j$	Operating junction temperature range		°C

1. Pulse width is limited by safe operating area.

**Table 2. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	0.31	°C/W
$R_{thj-amb}$	Thermal resistance junction-ambient	40	°C/W

## 2 Electrical characteristics

( $T_{CASE} = 25\text{ °C}$  unless otherwise specified).

**Table 3. On/off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	650			V
$I_{DSS}$	Zero gate voltage drain current	$V_{DS} = 650\text{ V}, V_{GS} = 0\text{ V}$			10	$\mu\text{A}$
		$V_{DS} = 650\text{ V}, V_{GS} = 0\text{ V}, T_J = 150\text{ °C}$		10		
$I_{GSS}$	Gate-body leakage current	$V_{DS} = 0\text{ V}, V_{GS} = -10\text{ to }22\text{ V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 1\text{ mA}$	1.9	3.2	5	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 18\text{ V}, I_D = 50\text{ A}$		18	24	m $\Omega$
		$V_{GS} = 18\text{ V}, I_D = 50\text{ A}, T_J = 200\text{ °C}$		30		

**Table 4. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 400\text{ V}, f = 1\text{ MHz}, V_{GS} = 0\text{ V}$	-	3380	-	pF
$C_{oss}$	Output capacitance		-	294	-	pF
$C_{riss}$	Reverse transfer capacitance		-	49	-	pF
$Q_g$	Total gate charge	$V_{DD} = 400\text{ V}, I_D = 50\text{ A}, V_{GS} = -5\text{ V to }18\text{ V}$	-	157	-	nC
$Q_{gs}$	Gate-source charge		-	43	-	nC
$Q_{gd}$	Gate-drain charge		-	42	-	nC
$R_g$	Gate input resistance	$f = 1\text{ MHz}, I_D = 0\text{ A}$	-	1	-	$\Omega$

**Table 5. Switching energy (inductive load)**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$E_{on}$	Turn-on switching energy	$V_{DD} = 400\text{ V}, I_D = 50\text{ A}, R_G = 2.2\text{ }\Omega, T_J = 25\text{ °C}$	-	130	-	$\mu\text{J}$
$E_{off}$	Turn-off switching energy		-	210	-	
$E_{on}$	Turn-on switching energy	$V_{DD} = 400\text{ V}, I_D = 50\text{ A}, R_G = 2.2\text{ }\Omega, V_{GS} = -5\text{ to }18\text{ V}, T_J = 200\text{ °C}$	-	135	-	
$E_{off}$	Turn-off switching energy		-	200	-	

**Table 6. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 400\text{ V}$ , $I_D = 50\text{ A}$ , $R_G = 2.2\ \Omega$ , $V_{GS} = -5\text{ V to }18\text{ V}$ , $T_J = 25\text{ }^\circ\text{C}$	-	26	-	ns
$t_f$	Fall time		-	16	-	ns
$t_{d(off)}$	Turn-off delay time		-	58	-	ns
$t_r$	Rise time		-	38	-	ns

**Table 7. Reverse SiC diode characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{SD}$	Forward on voltage	$I_F = 30\text{ A}$ , $V_{GS} = 0\text{ V}$	-	2.5	-	V
$t_{rr}$	Reverse recovery time	$I_F = 50\text{ A}$ , $di/dt = 4000\text{ A}/\mu\text{s}$ , $V_{DD} = 400\text{ V}$ , $T_J = 25\text{ }^\circ\text{C}$	-	17	-	ns
$Q_{rr}$	Reverse recovery charge		-	308	-	nC
$I_{RRM}$	Reverse recovery current		-	30	-	A

## 2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

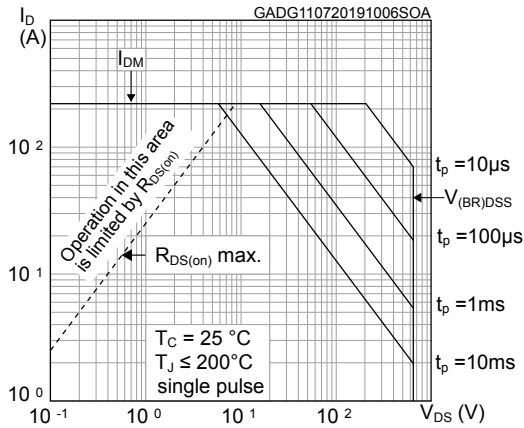


Figure 2. Maximum transient thermal impedance

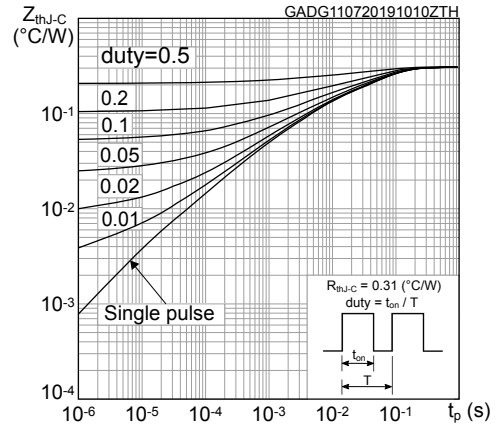


Figure 3. Typical output characteristics ( $T_J = -50\text{ °C}$ )

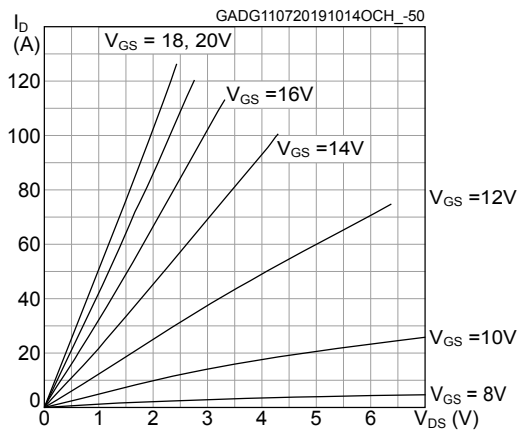


Figure 4. Typical output characteristics ( $T_J = 25\text{ °C}$ )

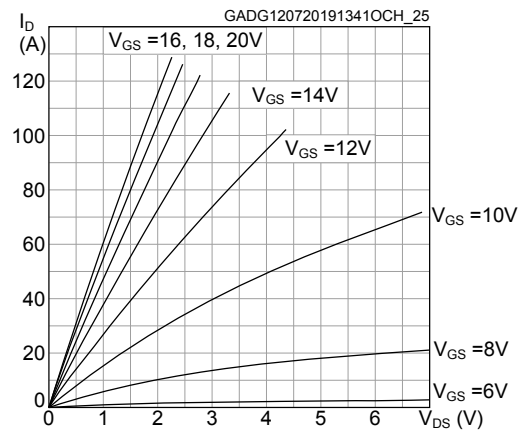


Figure 5. Typical output characteristics ( $T_J = 200\text{ °C}$ )

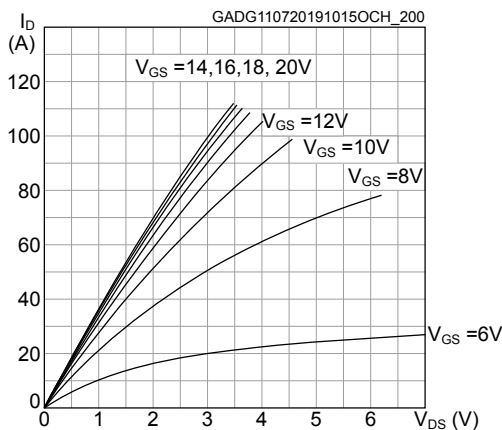
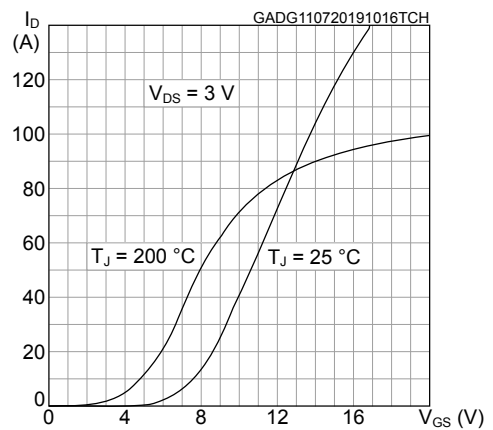
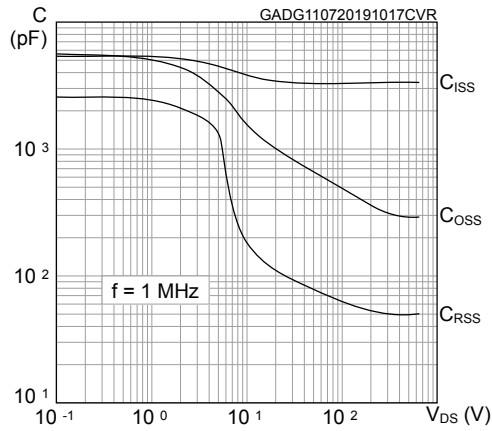


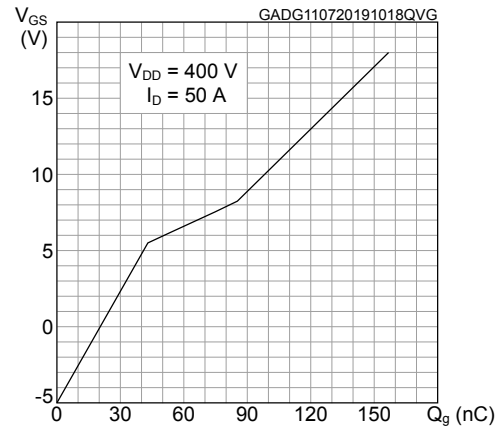
Figure 6. Typical transfer characteristics



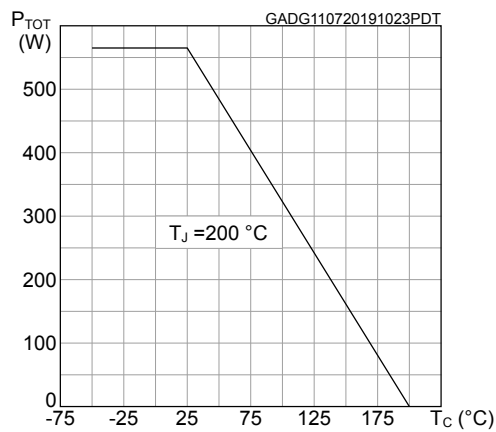
**Figure 7. Typical capacitances**



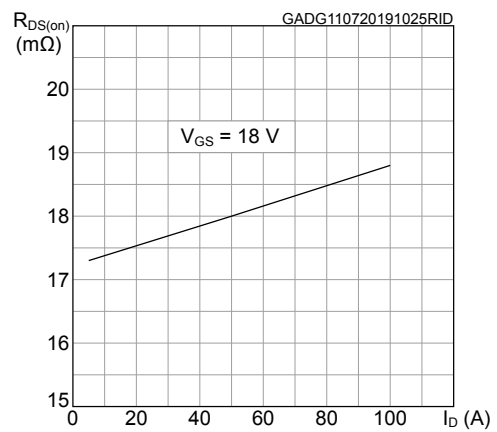
**Figure 8. Typical gate charge**



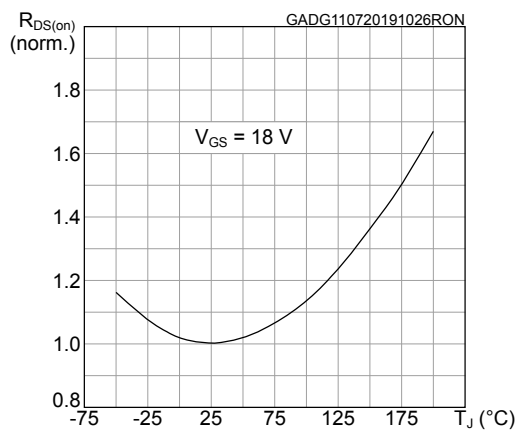
**Figure 9. Maximum total power dissipation**



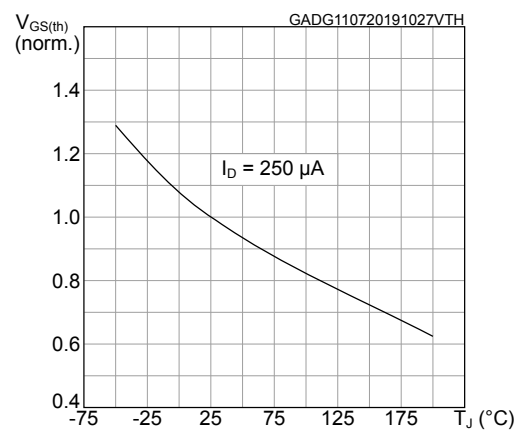
**Figure 10. Typical drain-source on-resistance**



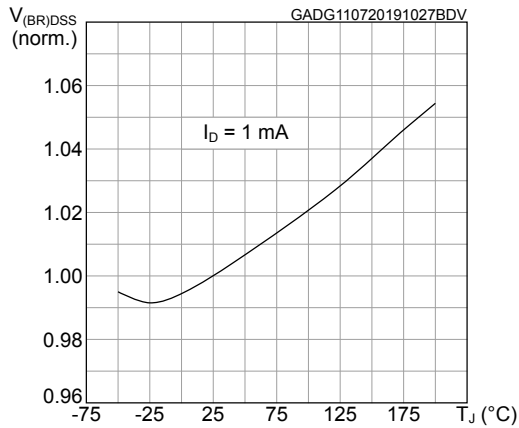
**Figure 11. Normalized on-resistance vs temperature**



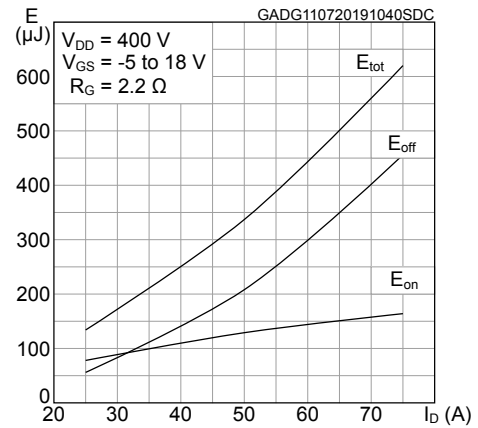
**Figure 12. Normalized gate threshold voltage vs temperature**



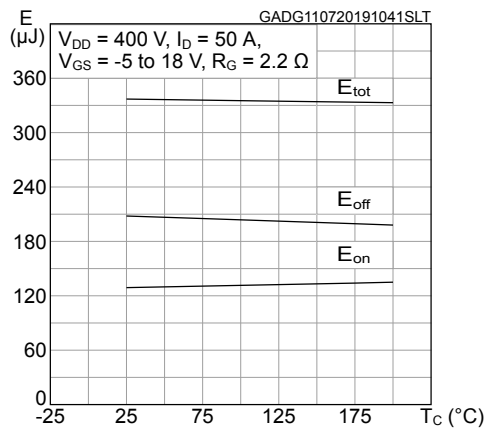
**Figure 13. Normalized breakdown voltage vs temperature**



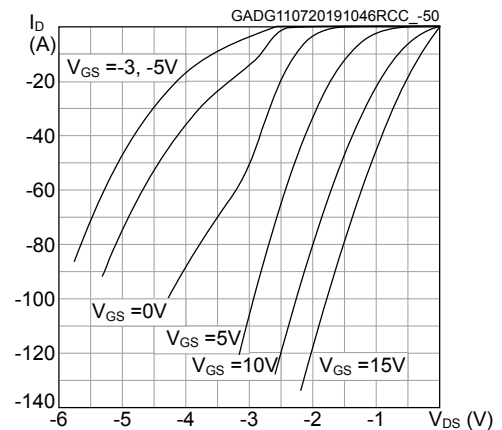
**Figure 14. Typical switching energy vs drain current**



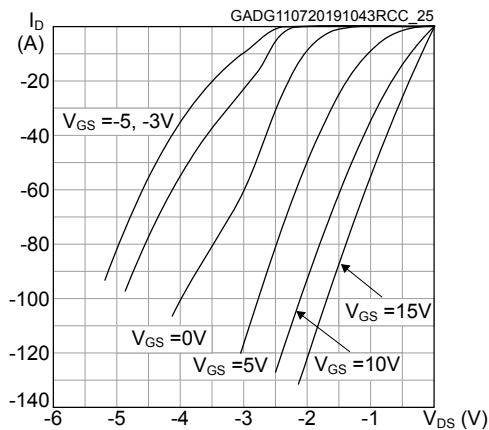
**Figure 15. Typical switching energy vs temperature**



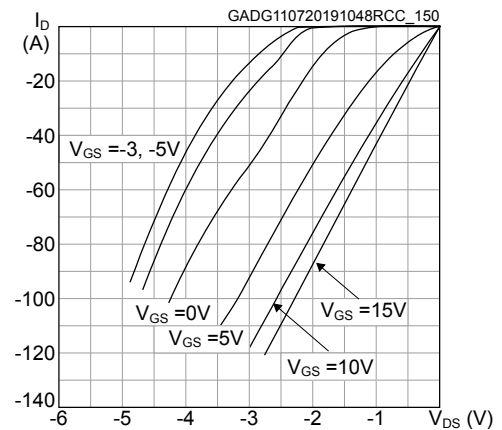
**Figure 16. Typical reverse conduction characteristics (Tj = -50 °C)**



**Figure 17. Typical reverse conduction characteristics (Tj = 25 °C)**



**Figure 18. Typical reverse conduction characteristics (Tj = 150 °C)**

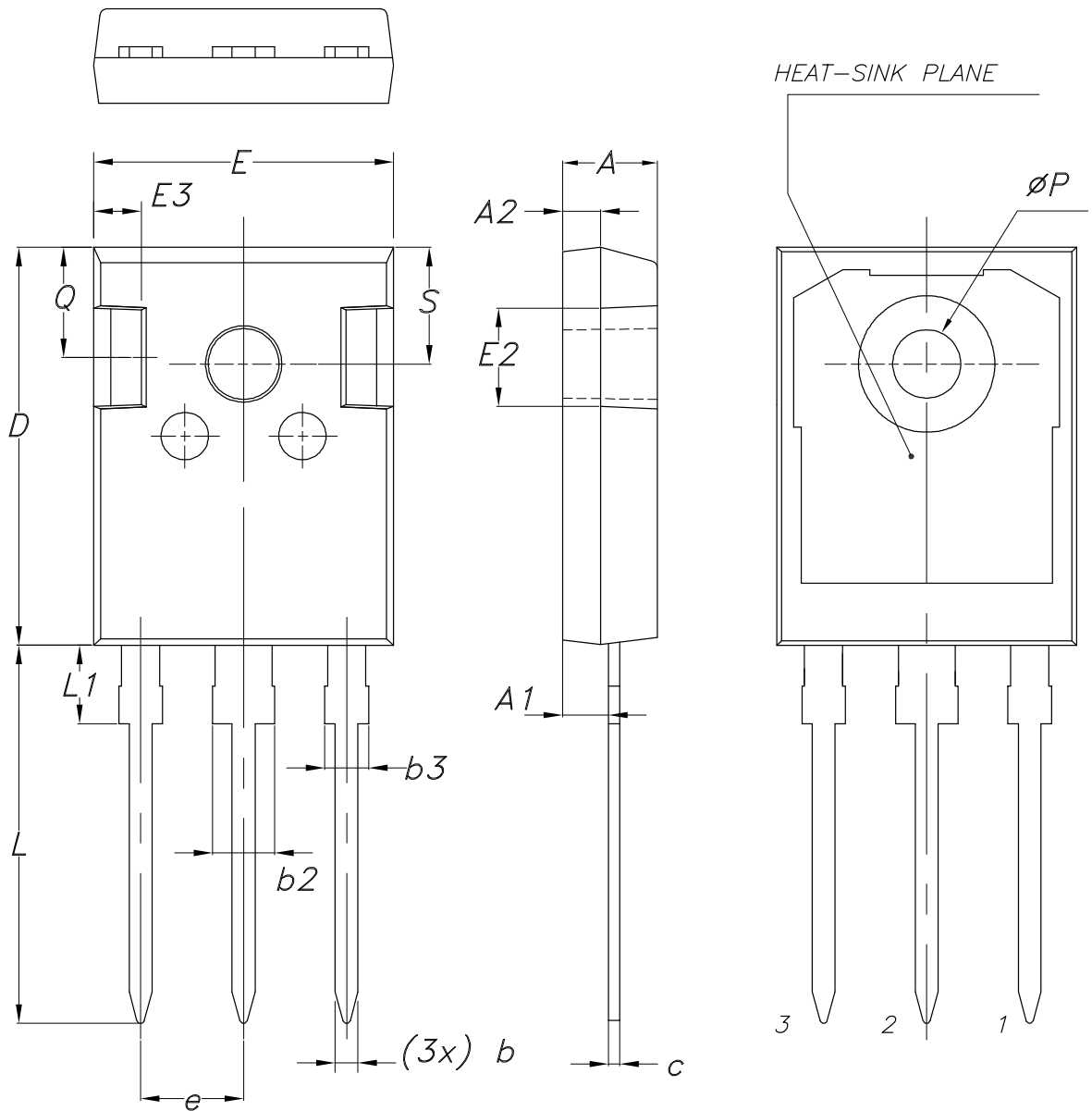


### 3 Package information

In order to meet environmental requirements, ST offers these devices in different grades of **ECOPACK** packages, depending on their level of environmental compliance. ECOPACK specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK is an ST trademark.

#### 3.1 HiP247 long leads package information

Figure 19. HiP247 long leads package outline



8463846\_2\_F



**Table 8. HiP247 long leads package mechanical data**

Dim.	mm		
	Min.	Typ.	Max.
A	4.90	5.00	5.10
A1	2.31	2.41	2.51
A2	1.90	2.00	2.10
b	1.16		1.26
b2			3.25
b3			2.25
c	0.59		0.66
D	20.90	21.00	21.10
E	15.70	15.80	15.90
E2	4.90	5.00	5.10
E3	2.40	2.50	2.60
e	5.34	5.44	5.54
L	19.80	19.92	20.10
L1			4.30
P	3.50	3.60	3.70
Q	5.60		6.00
S	6.05	6.15	6.25

## Revision history

**Table 9. Document revision history**

Date	Revision	Changes
06-Jul-2018	1	First release.
10-Aug-2020	2	Modified features and applications on cover page. Modified Table 1. Absolute maximum ratings, Table 2. Thermal data, Dynamic, Table 5. Switching energy (inductive load) and Section 2.1 Electrical characteristics (curves). Updated Section 3.1 HiP247 long leads package information. Minor text changes.

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