

### **SCTWA30N120**

# Silicon carbide Power MOSFET 1200 V, 45 A, 90 mΩ (typ., T<sub>J</sub>= 150 °C), in an HiP247<sup>™</sup> long leads package

Datasheet - production data

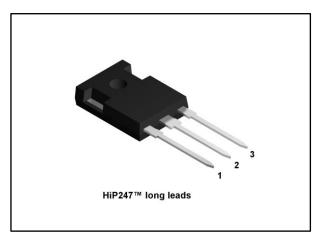
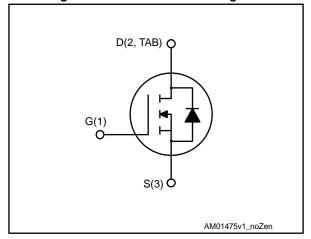


Figure 1: Internal schematic diagram



### **Features**

- Very tight variation of on-resistance vs. temperature
- Very high operating junction temperature capability (T<sub>J</sub> = 200 °C)
- Very fast and robust intrinsic body diode
- Low capacitance

#### **Applications**

- Solar inverters, UPS
- Motor drives
- High voltage DC-DC converters
- Switch mode power supply

### Description

This silicon carbide Power MOSFET is produced exploiting the advanced, innovative properties of wide bandgap materials. This results in unsurpassed on-resistance per unit area and very good switching performance almost independent of temperature. The outstanding thermal properties of the SiC material allow designers to use an industry-standard outline with significantly improved thermal capability. These features render the device perfectly suitable for high-efficiency and high power density applications.

Table 1: Device summary

Order code	Marking	Package	Packaging
SCTWA30N120	SCT30N120	HiP247™ long leads	Tube

Contents SCTWA30N120

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SCTWA30N120 Electrical ratings

# 1 Electrical ratings

Table 2: Absolute maximum ratings

Symbol	Parameter	Value	Unit
V <sub>DS</sub>	Drain-source voltage	1200	V
V <sub>GS</sub>	Gate-source voltage	-10 to 25	V
I <sub>D</sub>	Drain current (continuous) at T <sub>C</sub> = 25 °C (limited by die)	45	А
l <sub>D</sub>	Drain current (continuous) at T <sub>C</sub> = 25 °C (limited by package)	40	А
l <sub>D</sub>	Drain current (continuous) at T <sub>C</sub> = 100 °C	34	Α
I <sub>DM</sub> <sup>(1)</sup>	Drain current (pulsed)	90	Α
Ртот	Total dissipation at T <sub>C</sub> = 25 °C	270	W
T <sub>stg</sub>	Storage temperature range	FF to 200	လူ
Tj	Operating junction temperature range	-55 to 200	

#### Notes:

Table 3: Thermal data

Symbol	Parameter	Value	Unit
R <sub>thj-case</sub>	Thermal resistance junction-case	0.65	°C/W
R <sub>thj-amb</sub>	Thermal resistance junction-amb	40	°C/W

<sup>&</sup>lt;sup>(1)</sup>Pulse width limited by safe operating area.

Electrical characteristics SCTWA30N120

### 2 Electrical characteristics

(T<sub>case</sub> =25 °C unless otherwise specified)

Table 4: On /off states

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
	7	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 1200 V		1	25	μΑ
I <sub>DSS</sub>	Zero gate voltage drain current	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 1200 V, T <sub>J</sub> =200 °C		50		μΑ
Igss	Gate-body leakage current	V <sub>DS</sub> =0 V, V <sub>GS</sub> = -10 to 22 V			±100	nA
V <sub>GS(th)</sub>	Gate threshold voltage	$V_{DS} = V_{GS}$ , $I_D = 1 \text{ mA}$	1.8	3.5		V
	Static drain-source on- resistance	$V_{GS} = 20 \text{ V}, I_D = 20 \text{ A}$		80	100	mΩ
R <sub>DS(on)</sub>		V <sub>G</sub> S = 20 V, I <sub>D</sub> = 20 A T <sub>J</sub> = 150 °C		90		mΩ
		V <sub>G</sub> S = 20 V, I <sub>D</sub> = 20 A T <sub>J</sub> = 200 °C		100		mΩ

#### Table 5: Dynamic

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
Ciss	Input capacitance		1	1700	ı	pF
Coss	Output capacitance	V <sub>GS</sub> =0 V, V <sub>DS</sub> =400 V, f=1 MHz	1	130	ı	pF
Crss	Reverse transfer capacitance	1-1 101112	•	25	•	pF
$R_{G}$	Intrinsic gate resistance	$f = 1 \text{ MHz}, I_D=0 \text{ A}$	-	5	•	Ω
Qg	Total gate charge		-	105	-	nC
Qgs	Gate-source charge	$V_{DD} = 800 \text{ V}, I_{D} = 20 \text{ A}$ $V_{GS} = 0 \text{ to } 20 \text{ V}$	-	16	•	nC
$Q_{gd}$	Gate-drain charge	VGS -0 to 20 V	-	40	-	nC

Table 6: Switching energy (inductive load)

Symbol	Parameter	Test conditions	Min.	Тур.	Max	Unit
Eon	Turn-on switching energy	$V_{DD} = 800 \text{ V}, I_D = 20 \text{ A},$	ı	500	ı	μJ
E <sub>off</sub>	Turn-off switching energy	$R_G = 6.8 \Omega$ , $V_{GS} = -2 \text{ to } 20 \text{ V}$	-	350		μJ
Eon	Turn-on switching energy	$V_{DD} = 800 \text{ V}, I_D = 20 \text{ A},$	-	500	-	μJ
Eoff	Turn-off switching energy	$R_G = 6.8 \Omega$ , $V_{GS} = -2 \text{ to } 20 \text{ V}$ $T_J = 150 ^{\circ}\text{C}$	1	400	ı	μJ

#### Table 7: Switching times

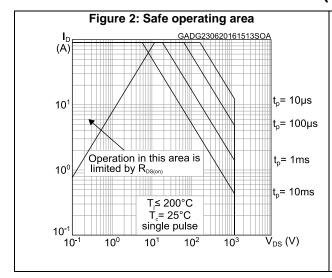
Symbol	Parameter	Test conditions	Min.	Тур.	Max	Unit
t <sub>d(on)V</sub>	Turn-on delay time		1	19	•	ns
t <sub>f(V</sub>	Fall time	$V_{DD} = 800 \text{ V}, I_{D} = 20 \text{ A},$	-	28	-	ns
t <sub>d(off)</sub> v	Turn-off-delay time	$R_G = 0 \Omega$ , $V_{GS} = 0$ to 20 V	-	45	-	ns
t <sub>r(V)</sub>	Rise time		-	20	-	ns

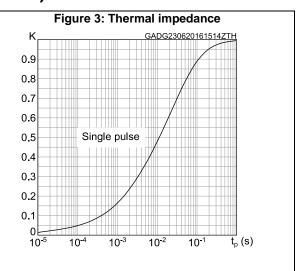
SCTWA30N120 Electrical characteristics

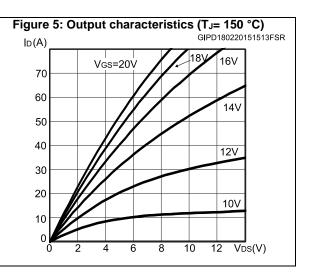
#### Table 8: Reverse SiC diode characteristics

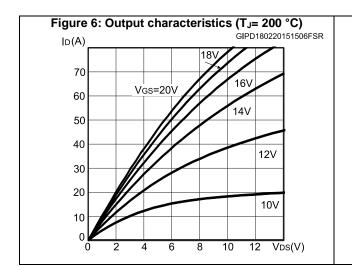
Symbol	Parameter	Test conditions	Min.	Тур.	Max	Unit
V <sub>SD</sub>	Diode forward voltage	I <sub>F</sub> = 10 A, V <sub>GS</sub> = 0 V	ı	3.5	ı	V
t <sub>rr</sub>	Reverse recovery time		-	140	-	ns
Qrr	Reverse recovery charge $I_{SD} = 20 \text{ A, di/dt} = 100 \text{ A/µs}$ $V_{DD} = 800 \text{ V}$		-	140		nC
I <sub>RRM</sub>	Reverse recovery current	- UUD - OOO V	-	2		Α

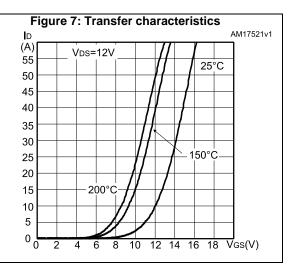
# 2.1 Electrical characteristics (curves)

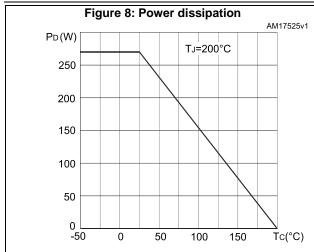


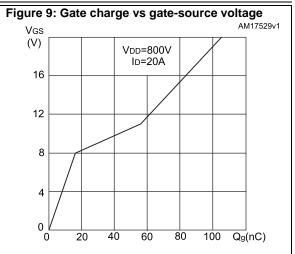


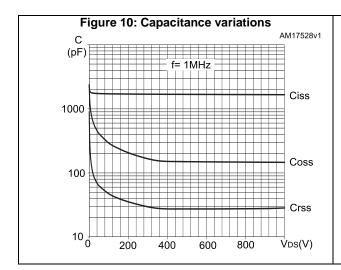


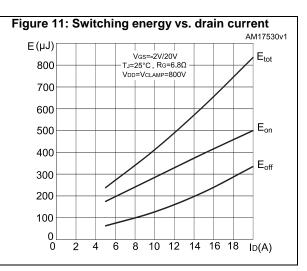


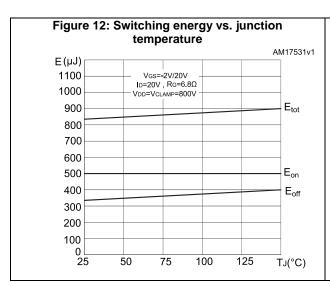












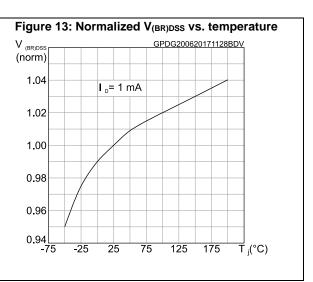


Figure 14: Normalized gate threshold voltage vs. temperature

V GS(III) (NORM) | I D = 1 mA | 1.2

Figure 15: Normalized on-resistance vs. temperature

R DS(on) (NORM)

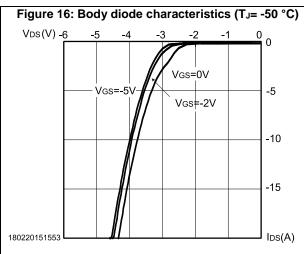
2.0 V GS= 20 V

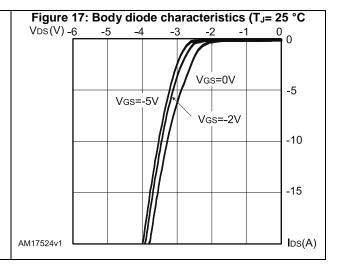
1.5

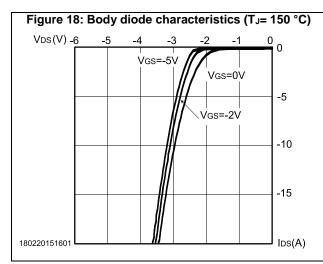
1.0 0.5

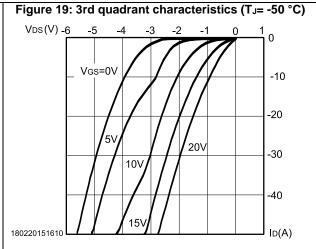
0.0 -75 -25 25 75 125 175 T (°C)

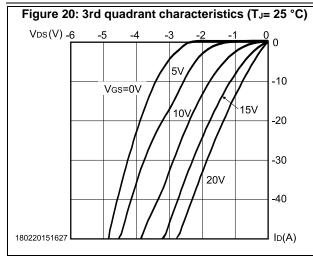
1.0 0.8 0.6 -75 -25 25 75 125 175 T<sub>j</sub>(°C)

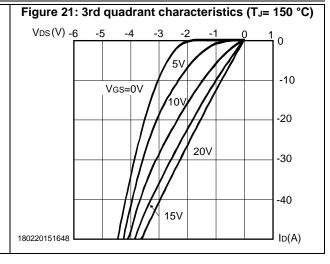












# 3 Package information

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**. ECOPACK® is an ST trademark.

### 3.1 HiP247 long leads package information

Figure 22: HiP247™ long leads package outline

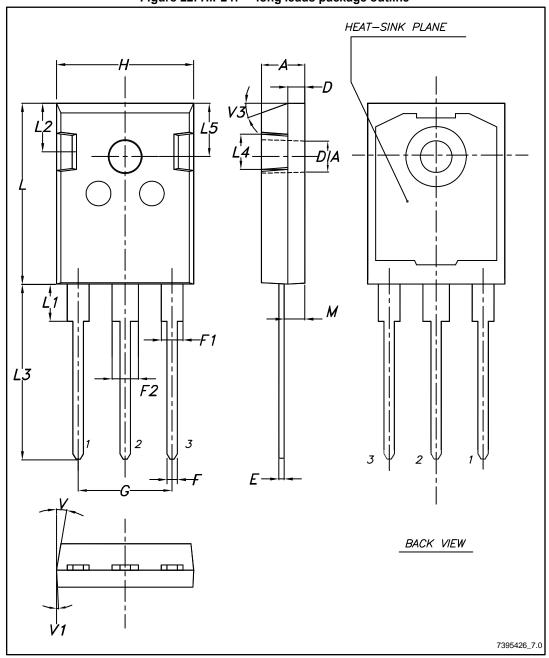


Table 9: HiP247™ long leads package mechanical data

Table 3. THE 247 Tong leads package mechanical data			
Dim.		mm	
Dilli.	Min.	Тур.	Max.
А	4.90		5.15
D	1.85		2.10
Е	0.55		0.67
F	1.07		1.32
F1	1.90		2.38
F2	2.87		3.38
G		10.90 BSC	
Н	15.77		16.02
L	20.82		21.07
L1	4.16		4.47
L2	5.49		5.74
L3	20.05		20.30
L4	3.68		3.93
L5	6.04		6.29
М	2.25		2.55
V		10°	
V1		3°	
V3		20°	
DIA	3.55		3.66

Revision history SCTWA30N120

# 4 Revision history

**Table 10: Document revision history** 

Date	Revision	Changes
11-Jan-2016	1	First release.
19-Jun-2017	2	Updated title, features in cover page.  Minor text edit in Section 1: "Electrical ratings" and Section 2: "Electrical characteristics".  Updated Figure 2: "Safe operating area", Figure 3: "Thermal impedance", Figure 13: "Normalized V(BR)DSS vs. temperature", Figure 14: "Normalized gate threshold voltage vs. temperature" and Figure 15: "Normalized on-resistance vs. temperature".  Document status promoted from preliminary to production data.

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