ST(意法) SCT30N120 PDF



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SCT30N120



Silicon carbide Power MOSFET 1200 V, 45 A, 90 mΩ (typ., T_J = 150 °C) in an HiP247[™] package

Datasheet - production data

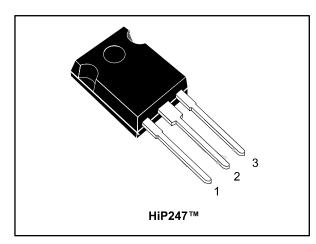
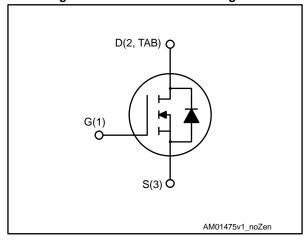


Figure 1: Internal schematic diagram



Features

- Very tight variation of on-resistance vs. temperature
- Very high operating junction temperature capability (T_J = 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, combined with the device's housing in the proprietary HiP247™ package, allows designers to use an industry standard outline with significantly improved thermal capability. These features render the device perfectly suitable for highericiency and high power density applications.

Table 1: Device summary

Order code	Marking Package		Packaging
SCT30N120	SCT30N120	HiP247™	Tube

Contents SCT30N120

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SCT30N120 Electrical ratings

1 Electrical ratings

Table 2: Absolute maximum ratings

Symbol	Parameter	Value	Unit
V _{DS}	Drain-source voltage	1200	V
V _{GS}	Gate-source voltage	-10 to 25	V
ID	Drain current (continuous) at T _C = 25 °C (limited by die)	45	А
I _D	Drain current (continuous) at T _C = 25 °C (limited by package)	40	А
ΙD	Drain current (continuous) at T _C = 100 °C	34	Α
I _{DM} ⁽¹⁾	Drain current (pulsed)	90	Α
Ртот	Total dissipation at T _C = 25 °C	270	W
T _{stg}	Storage temperature range	FF to 200	°C
Tj	Operating junction temperature range	-55 to 200	°C

Notes:

Table 3: Thermal data

Symbol	Parameter	Value	Unit
R _{thj-case}	Thermal resistance junction-case	0.65	°C/W
R _{thj-amb}	R _{thj-amb} Thermal resistance junction-ambient		°C/W

⁽¹⁾Pulse width limited by safe operating area.

Electrical characteristics SCT30N120

2 Electrical characteristics

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

Table 4: On/off states

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
		V _{DS} = 1200 V; V _{GS} = 0 V		1	25	μΑ
IDSS	Zero gate voltage drain current	V _{DS} = 1200 V, V _{GS} = 0 V, T _J = 200 °C		50		μΑ
Igss	Gate-body leakage current	V _{DS} = 0 V; V _{GS} = -10 to 22 V			±100	nA
V _{GS(th)}	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 1 \text{ mA}$	1.8	3.5		V
		$V_{GS} = 20 \text{ V}, I_{D} = 20 \text{ A}$		80	100	mΩ
R _{DS(on)}	R _{DS(on)} Static drain-source on- resistance	$V_{GS} = 20 \text{ V}, I_D = 20 \text{ A},$ $T_J = 150 ^{\circ}\text{C}$		90		mΩ
	OII- Tesistance	V _{GS} = 20 V, I _D = 20 A, T _J = 200 °C		100		mΩ

Table 5: Dynamic

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
Ciss	Input capacitance	100 1/ (4 14 14	-	1700	-	pF
Coss	Output capacitance	$V_{DS} = 400 \text{ V}, f = 1 \text{ MHz},$ $V_{GS} = 0 \text{ V}$	-	130	-	pF
Crss	Reverse transfer capacitance	VGS = 0 V	-	25	-	pF
Q_g	Total gate charge	N 000 N 1 00 A	-	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 t0 20 V	-	40	-	nC
Rg	Gate input resistance	f=1 MHz open drain	-	5	-	Ω

Table 6: Switching energy (inductive load)

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
Eon	Turn-on switching energy	V _{DD} = 800 V, I _D = 20 A,	1	500	ı	μJ
E _{off}	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
E _{off}	Turn-off switching energy	$R_G = 6.8 \Omega$, $V_{GS} = -2 \text{ to } 20 \text{ V}$ $T_J = 150 \text{ °C}$	-	400	-	μJ

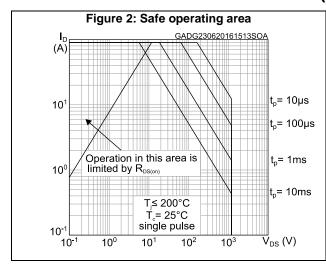
Table 7: Switching times

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
t _{d(on)}	Turn-on delay time		-	19	-	ns
t _f	Fall time	$V_{DD} = 800 \text{ V}, I_D = 20 \text{ A},$	-	28	-	ns
t _{d(off)}	Turn-off delay time	$R_G = 0 \Omega$, $V_{GS} = 0$ to 20 V	-	45	-	ns
tr	Rise time		-	20	-	ns

Table 8: Reverse SiC diode characteristics

Symbol	Parameter	Test conditions	Min	Тур.	Max	Unit
V _{SD}	Diode forward voltage	I _F = 10 A, V _{GS} = 0 V	-	3.5	-	V
t _{rr}	Reverse recovery time		-	140		ns
Qrr	Reverse recovery charge	I _{SD} = 20 A, di/dt = 100 A/µs V _{DD} = 800 V	-	140	-	nC
I _{RRM}	Reverse recovery current	000 V	-	2	-	Α

2.1 Electrical characteristics (curves)



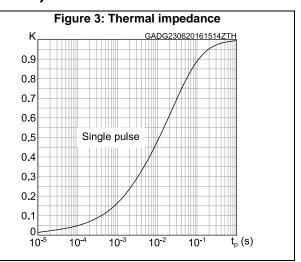


Figure 4: Output characteristics (T_J = 25 °C)

AM17518v1

70

60

40

30

20

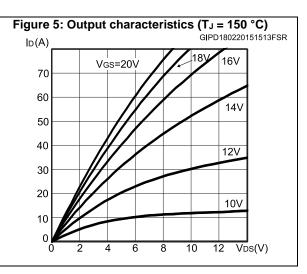
14V

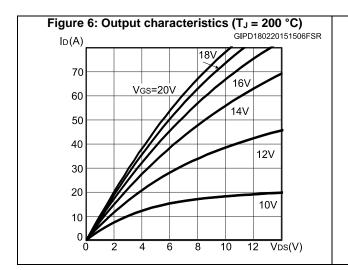
12V

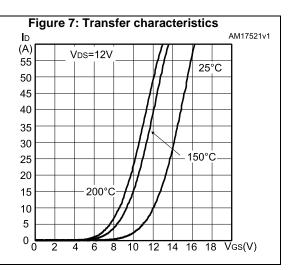
10V

0

2 4 6 8 10 12 VDs(V)







SCT30N120 Electrical characteristics

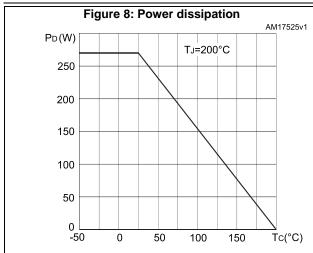


Figure 9: Gate charge vs gate-source voltage

VGS
(V)

VDD=800V
ID=20A

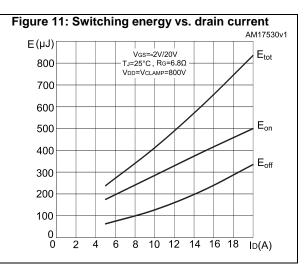
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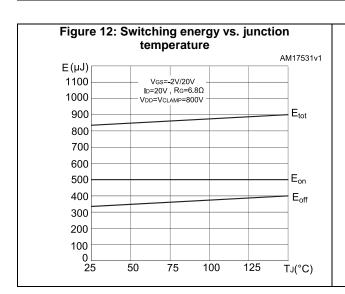
8

4

0
0
20
40
60
80
100
Qg(nC)

Figure 10: Capacitance variations AM17528v1 С (pF) f= 1MHz Ciss 1000 Coss 100 Crss 10 1 VDS(V) 200 400 600 800





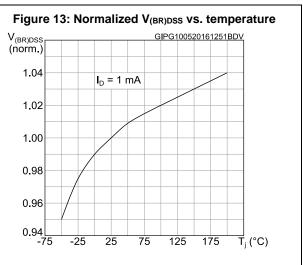


Figure 14: Normalized gate threshold voltage vs. temperature

V GS(th) GIPG100520161252VTH

(norm.)

1.4

1.2

1.0

0.8

0.6

-75 -25 25 75 125 175 T j(°C)

Figure 15: Normalized on-resistance vs. temperature $R_{DS(on)}$ (norm.) 2.0 $V_{GS} = 20 \text{ V}$ 1.5 1.0 0.5 0.0 -75 -25 25 75 125 175 T_{j} (°C)

Figure 16: Body diode characteristics (T_J = -50 °C)

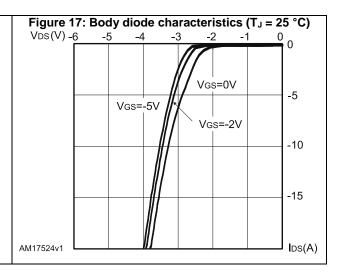
VDS(V) -6 -5 -4 -3 -2 -1 0

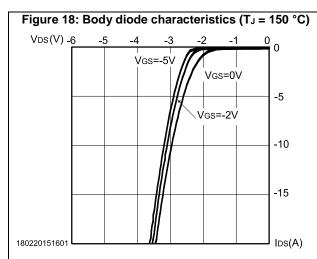
VGS=-5V VGS=-2V -5

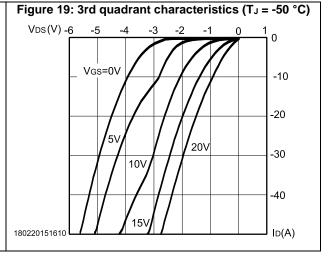
-10

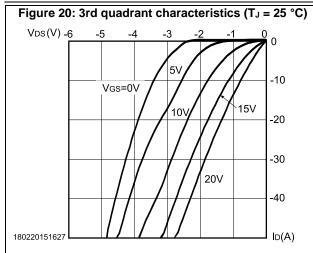
-15

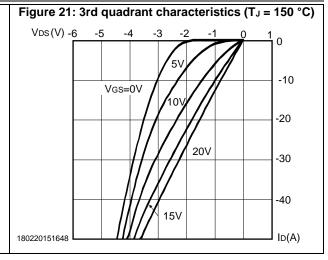
IDS(A)











Package information SCT30N120

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 package information

HEAT-SINK PLANE

A

BACK VIEW

B396756, 2

Figure 22: HiP247™ package outline

Table 9: HiP247™ package mechanical data

Dim	·	mm	
Dim.	Min.	Тур.	Max.
А	4.85		5.15
A1	2.20		2.60
b	1.0		1.40
b1	2.0		2.40
b2	3.0		3.40
С	0.40		0.80
D	19.85		20.15
Е	15.45		15.75
е	5.30 5.45		5.60
L	14.20		14.80
L1	3.70		4.30
L2		18.50	
ØP	3.55		3.65
ØR	4.50		5.50
S	5.30	5.50	5.70

Revision history SCT30N120

Revision history 4

Table 10: Document revision history

Date	Revision	Changes
10-May-2012	1	First release
21-May-2013	2	Updated trr value in Table8. Updated dynamic parameters in Table5, VGS(th) in Table4 and Eon in Table6.
24-Jun-2013	3	Document status promoted from target to preliminary data. Added: Section2.1: Electrical characteristics (curves)
11-Jul-2013	4	Updated Figure6: Output characteristics (TJ=200°C) and Figure7: Transfer characteristics.
18-Dec-2013	5	Updated parameters in Table2: Absolute maximum ratings and Table4: On/off states.
27-May-2014	6	Added Table7: Switching times. Updated Section3: Package mechanical data. Minor text changes.
25-Sep-2014	7	Document status promoted from preliminary to production data.
17-Feb-2015	8	Updated title in cover page.
20-Feb-2015	9	Updated Section2.1: Electrical characteristics (curves).
24-Jul-2016	10	Updated title and features in cover page. Updated Figure 2: "Safe operating area" and Figure 3: "Thermal impedance". Minor text changes.
11-May-2017	11	Updated Table 4: "On/off states" and Section 2.1: "Electrical characteristics (curves)". Minor text changes.

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