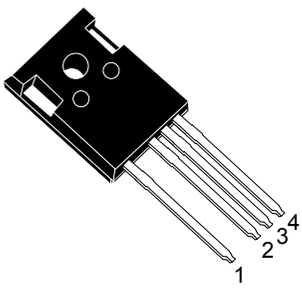
chanhvinh.com

life.augmented

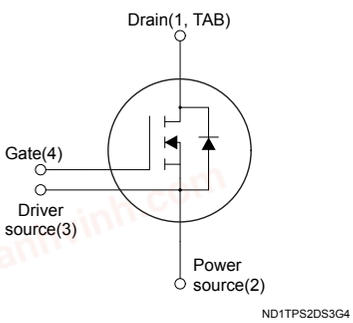
SCTWA70N120G2V-4

Datasheet

Silicon carbide Power MOSFET 1200 V, 21 mΩ typ., 91 A in an HiP247-4 package



HiP247-4



Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D
SCTWA70N120G2V-4	1200 V	30 mΩ	91 A

- Very fast and robust intrinsic body diode
- Extremely low gate charge and input capacitance
- Very high operating junction temperature capability (T_J = 200 °C)
- Source sensing pin for increased efficiency

Applications

- Switching mode power supply
- DC-DC converters
- Industrial motor control

Description

This silicon carbide Power MOSFET device has been developed using ST's advanced and innovative 2nd 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.

STPOWER

Product status link
SCTWA70N120G2V-4

Product summary	
Order code	SCTWA70N120G2V-4
Marking	SCT70N120G2V
Package	HiP247-4
Packing	Tube

chanhvinh.com

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	1200	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 °C	91	A
	Drain current (continuous) at T_C = 100 °C	69	
I_{DM}(1)	Drain current (pulsed)	274	A
P_{TOT}	Total power dissipation at T_C = 25 °C	547	W
T_{stg}	Storage temperature range	-55 to 200	°C
T_J	Operating junction temperature range		

1. *Pulse width is limited by safe operating area.*

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance, junction-to-case	0.32	°C/W
R_{thJA}	Thermal resistance, junction-to-ambient	40	°C/W

chanhvinh.com

2 Electrical characteristics

(T_C = 25 °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 V, I_D = 1 mA	1200			V
I_{DSS}	Zero-gate voltage drain current	V_{DS} = 1200 V, V_{GS} = 0 V			10	µA
I_{GSS}	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 mA	1.9	2.45	4.90	V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 18 V, I_D = 50 A		21	30	mΩ
		V_{GS} = 18 V, I_D = 50 A, T_J = 200 °C		46		

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 800 V, f = 1 MHz, V_{GS} = 0 V	-	3540	-	pF
C_{oss}	Output capacitance		-	176	-	pF
C_{rss}	Reverse transfer capacitance		-	28	-	pF
R_G	Intrinsic gate resistance	f = 1 MHz, I_D = 0 A	-	1	-	Ω
Q_g	Total gate charge	V_{DD} = 800 V, I_D = 50 A, V_{GS} = -5 to 18 V	-	150	-	nC
Q_{gs}	Gate-source charge		-	28	-	nC
Q_{gd}	Gate-drain charge		-	63	-	nC

Table 5. Switching energy

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
E_{on}	Turn-on switching energy	V_{DD} = 800 V, I_D = 50 A	-	932	-	µJ
E_{off}	Turn-off switching energy	R_G= 3.3 Ω, V_{GS} = -5 to 18 V	-	226	-	µJ

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 800 V, I_D = 50 A, R_G= 3.3 Ω, V_{GS} = -5 to 18 V	-	15.5	-	ns
t_r	Rise time		-	9	-	ns
$t_{d(off)}$	Turn-off delay time		-	36	-	ns
t_f	Fall time		-	18	-	ns

chanhvinh.com

Table 7. **Reverse SiC diode characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{SD}	Forward on voltage	I_{SD} = 50 A, V_{GS} = 0 V	-	2.7	-	V
t_{rr}	Reverse recovery time	I_{SD} = 50 A, V_{DD} = 800 V, V_{GS} = -5 to 18 V	-	11.16	-	ns
Q_{rr}	Reverse recovery charge		-	276	-	nC
I_{RRM}	Reverse recovery current		-	40	-	A

chanhvinh.com

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

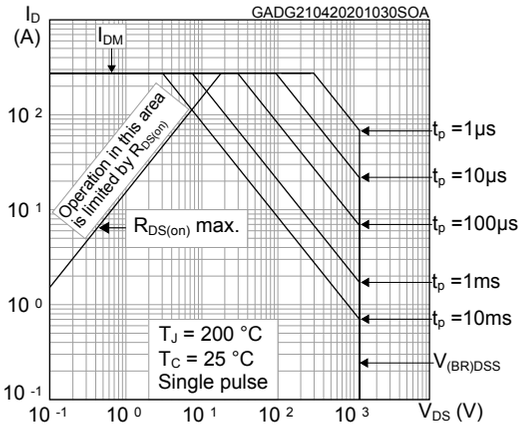


Figure 2. Maximum transient thermal impedance

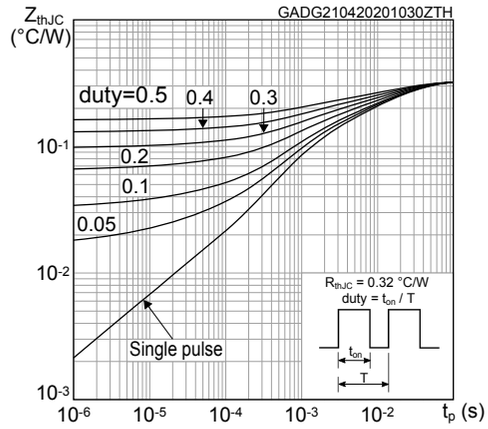


Figure 3. Typical output characteristics (T_J = 25 °C)

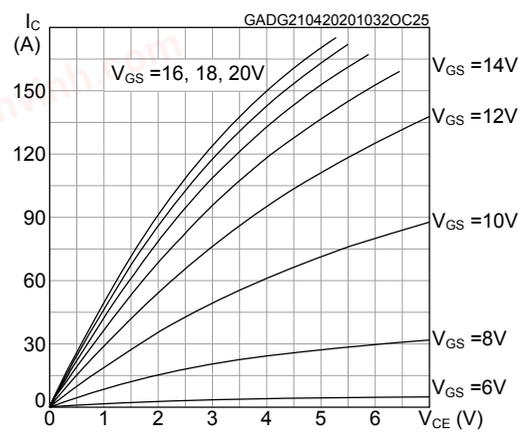


Figure 4. Typical output characteristics (T_J = 200 °C)

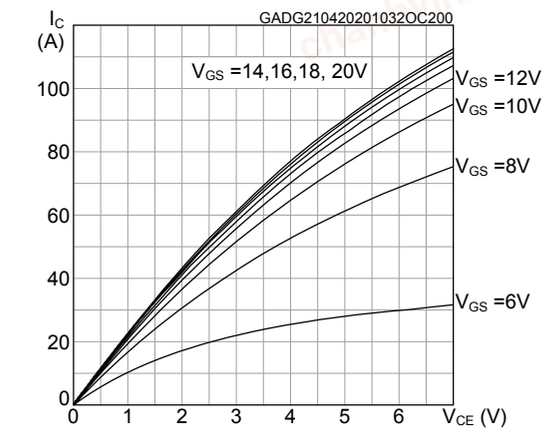


Figure 5. Typical transfer characteristics

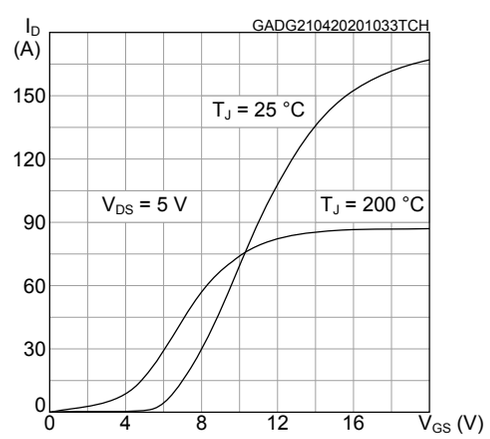
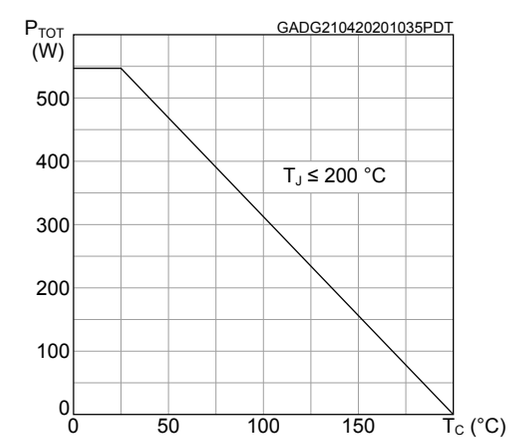


Figure 6. Total power dissipation



chanhvinh.com

Figure 7. Typical gate charge characteristics

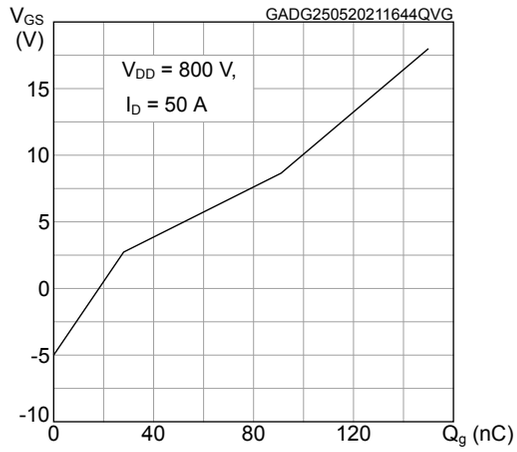


Figure 8. Typical capacitance characteristics

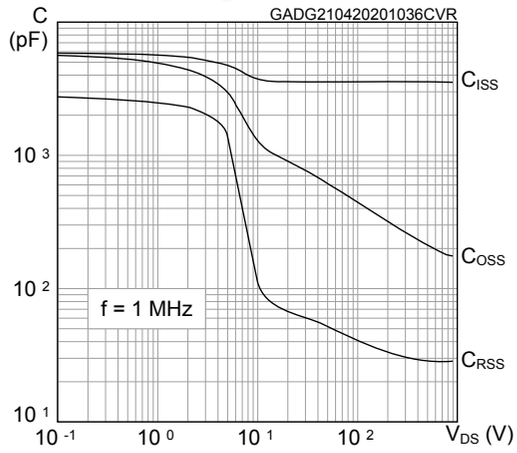


Figure 9. Typical switching energy vs drain current

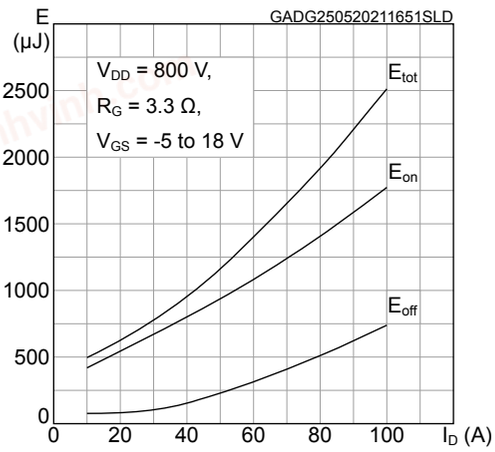


Figure 10. Typical switching energy vs temperature

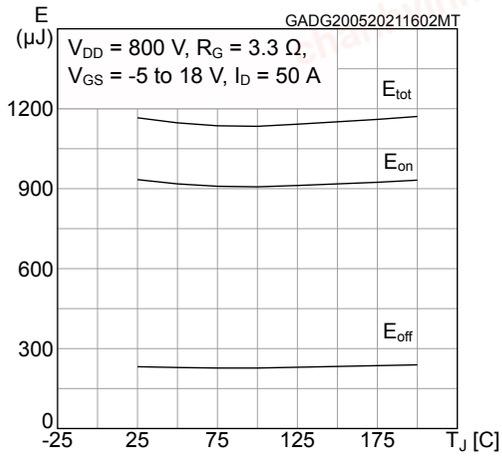


Figure 11. Normalized breakdown voltage vs temperature

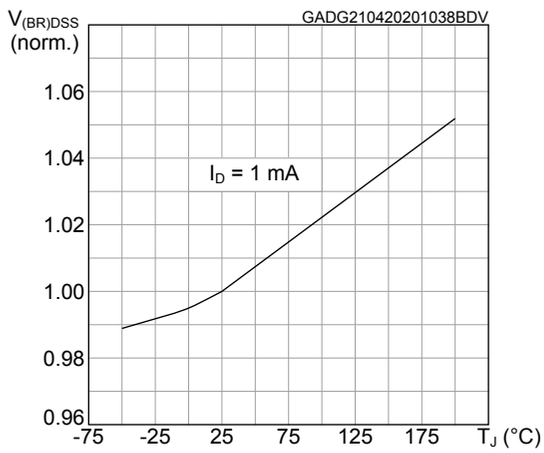
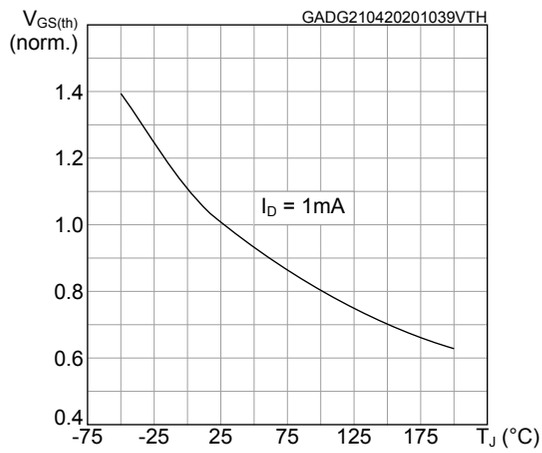


Figure 12. Normalized gate threshold vs temperature



chanhvinh.com

Figure 13. Normalized on-resistance vs temperature

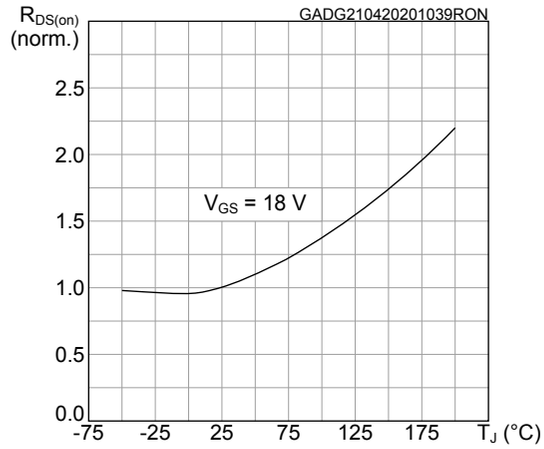


Figure 14. Typical reverse conduction characteristics (T_J = 25 °C)

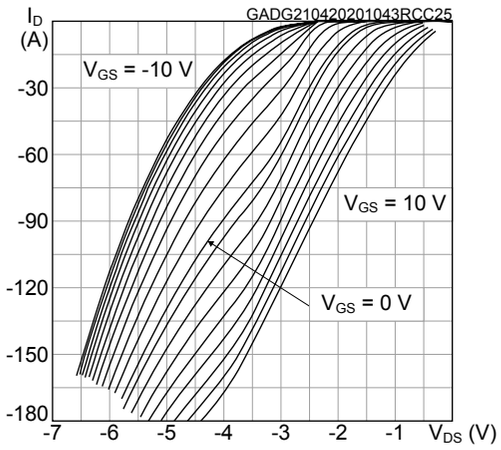


Figure 15. Typical reverse conduction characteristics (T_J = 200 °C)

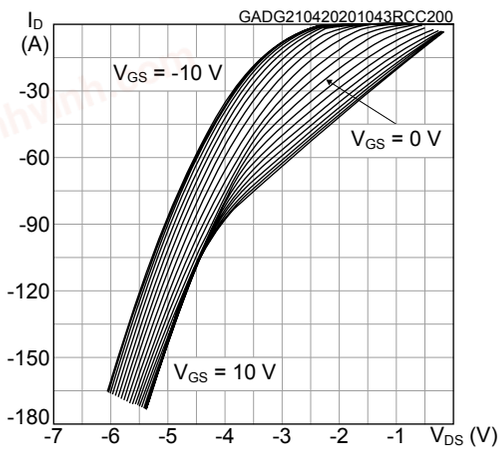
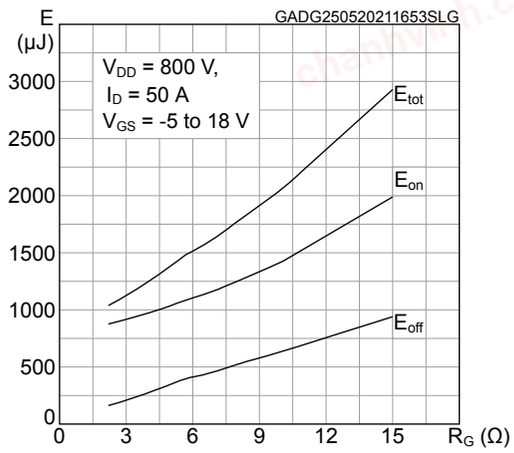


Figure 16. Typical switching energy vs gate resistance



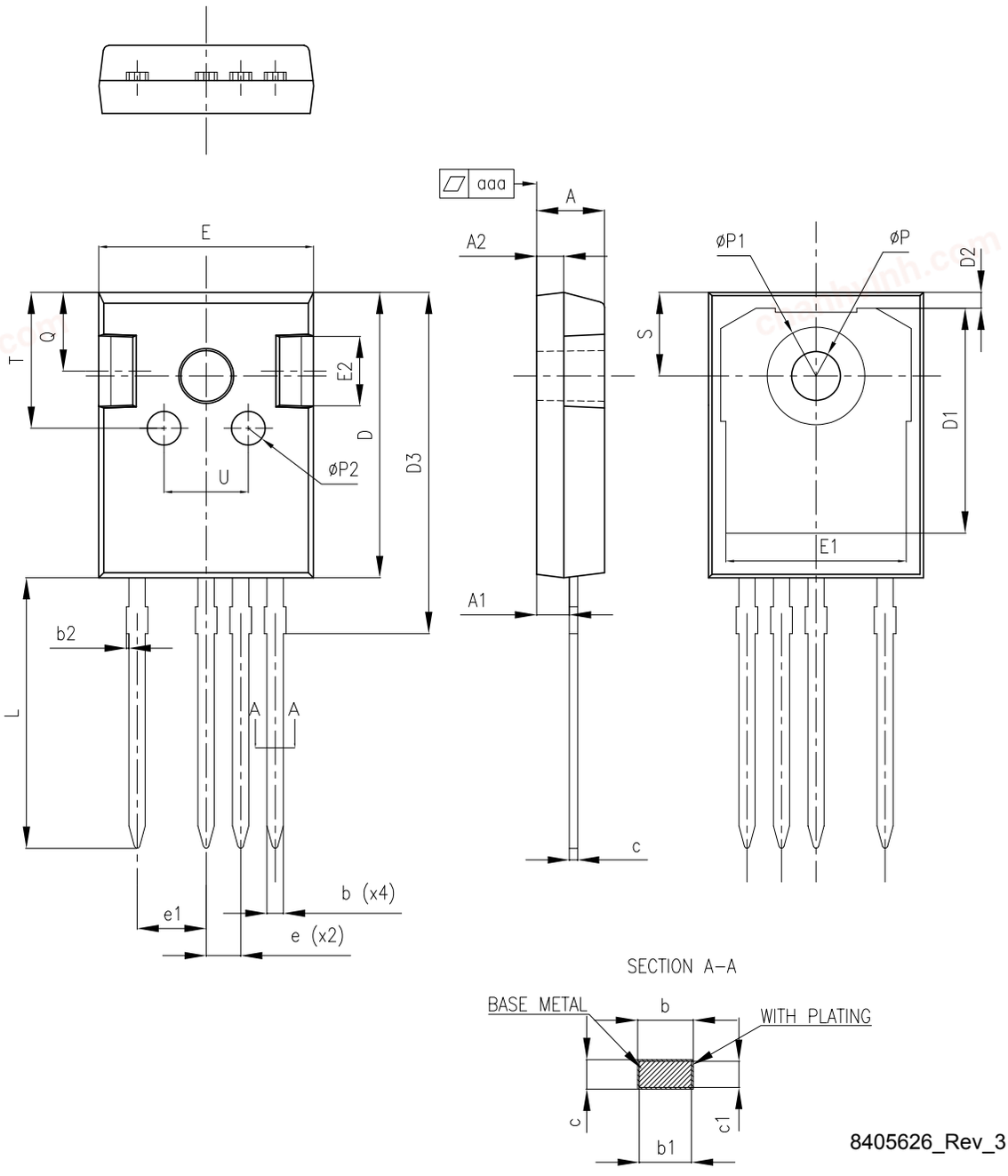
chanhvinh.com

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 HiP247-4 package information

Figure 17. HiP247-4 package outline



chanhvinh.com

Table 8. **HiP247-4 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		1.29
b1	1.15	1.20	1.25
b2	0		0.20
c	0.59		0.66
c1	0.58	0.60	0.62
D	20.90	21.00	21.10
D1	16.25	16.55	16.85
D2	1.05	1.20	1.35
D3	24.97	25.12	25.27
E	15.70	15.80	15.90
E1	13.10	13.30	13.50
E2	4.90	5.00	5.10
E3	2.40	2.50	2.60
e	2.44	2.54	2.64
e1	4.98	5.08	5.18
L	19.80	19.92	20.10
P	3.50	3.60	3.70
P1			7.40
P2	2.40	2.50	2.60
Q	5.60		6.00
S		6.15	
T	9.80		10.20
U	6.00		6.40
aaa		0.04	0.10

chanhvinh.com

Revision history

Table 9. **Document revision history**

Date	Revision	Changes
01-Jun-2021	1	First release.

chanhvinh.com

chanhvinh.com

Contents

1 **Electrical ratings** 2

2 **Electrical characteristics** 3

2.1 Electrical characteristics (curves) 5

3 **Package information** 8

3.1 HiP247-4 package information 8

Revision history 10

chanhvinh.com

IMPORTANT NOTICE – PLEASE READ CAREFULLY

STMicroelectronics NV and its subsidiaries (“ST”) reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST’s terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers’ products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. For additional information about ST trademarks, please refer to www.st.com/trademarks. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2021 STMicroelectronics – All rights reserved

chanhvinh.com