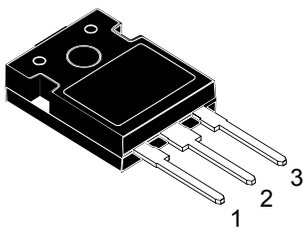
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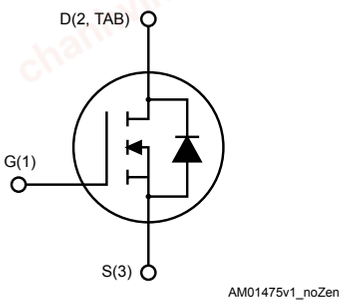
SCTW90N65G2V

Datasheet

Silicon carbide Power MOSFET 650 V, 119 A, 18 mΩ (typ., T_J = 25 °C) in an HiP247 package



HiP247



Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D
SCTW90N65G2V	650 V	24 mΩ	119 A

- Very high operating junction temperature capability (T_J = 200 °C)
- Very fast and robust intrinsic body diode
- Extremely low gate charge and input capacitances

Applications

- Switching applications
- Power supply for renewable energy systems
- High frequency DC-DC converters

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
SCTW90N65G2V

Product summary	
Order code	SCTW90N65G2V
Marking	SCT90N65G2V
Package	HiP247
Packing	Tube

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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 °C	119	A
	Drain current (continuous) at T_C = 100 °C	90	
I_{DM} (1)	Drain current (pulsed)	220	A
P_{TOT}	Total power dissipation at T_C = 25 °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
$R_{thj\text{-}case}$	Thermal resistance junction-case	0.31	°C/W
$R_{thj\text{-}amb}$	Thermal resistance junction-ambient	40	°C/W

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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	650			V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 650 V, V_{GS} = 0 V			10	µA
		V_{DS} = 650 V, V_{GS} = 0 V, T_J = 150 °C		10		
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 = 250 µA	1.9	3.2	5.0	V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 18 V, I_D = 50 A		18	24	mΩ
		V_{GS} = 18 V, I_D = 50 A, T_J = 200 °C		30		

Table 4. Dynamic

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

Table 5. Switching energy (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
E_{on}	Turn-on switching energy	V_{GS} = -5 to 18 V, V_{DD} = 400 V, I_D = 50 A, R_G = 2.2 Ω	-	130	-	µJ
E_{off}	Turn-off switching energy		-	210	-	
E_{on}	Turn-on switching energy	V_{GS} = -5 to 18 V, V_{DD} = 400 V, I_D = 50 A, R_G = 2.2 Ω, T_C = 150 °C	-	135	-	
E_{off}	Turn-off switching energy		-	200	-	

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Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 400 V, I_D = 50 A, R_G = 2.2 Ω, V_{GS} = -5 V to 18 V	-	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 A, V_{GS} = 0 V	-	2.5	-	V
t_{rr}	Reverse recovery time	I_F = 50 A, di/dt = 4000 A/µs, V_{DD} = 400 V	-	17	-	ns
Q_{rr}	Reverse recovery charge		-	308	-	nC
I_{RRM}	Reverse recovery current		-	30	-	A

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2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

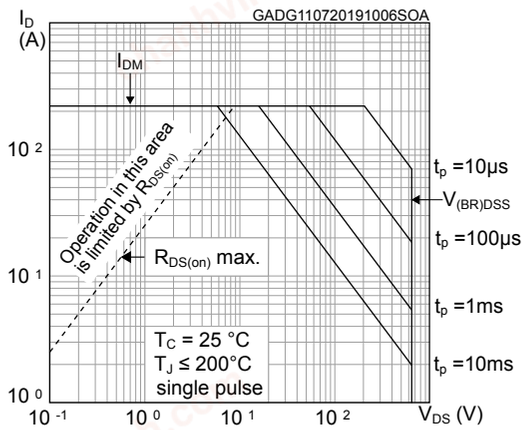


Figure 2. Maximum transient thermal impedance

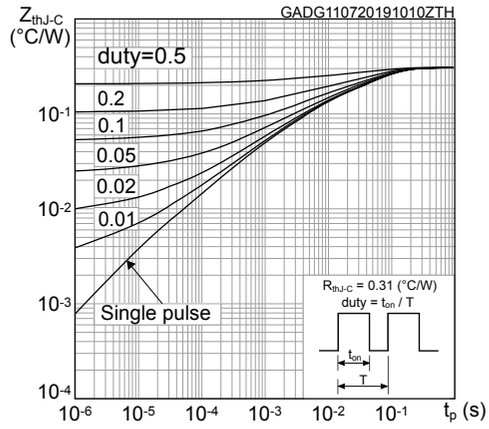


Figure 3. Typical output characteristics (T_J = -50 °C)

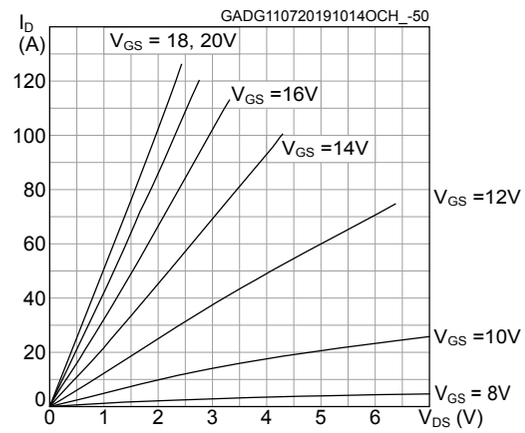


Figure 4. Typical output characteristics (T_J = 25 °C)

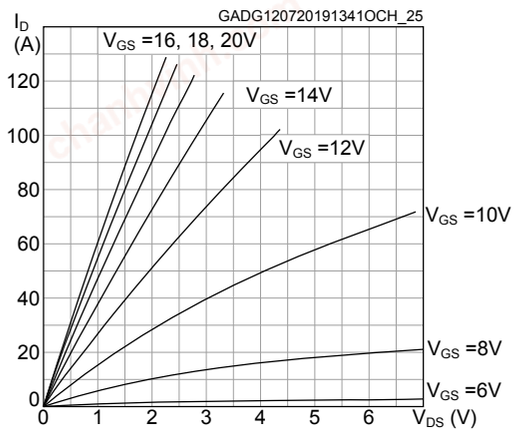


Figure 5. Typical output characteristics (T_J = 200 °C)

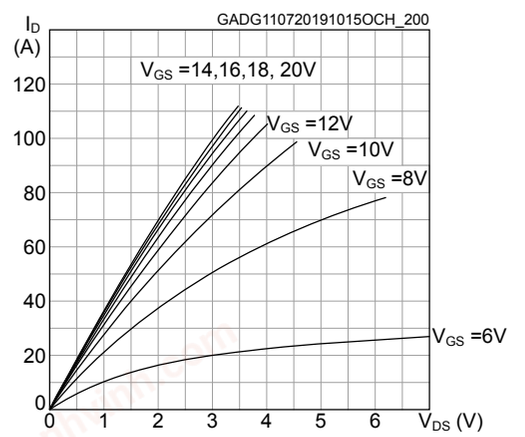
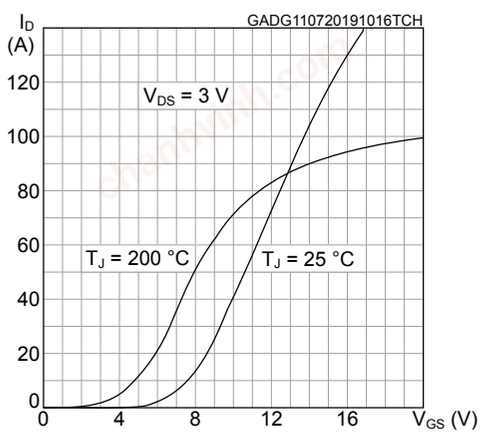


Figure 6. Typical transfer characteristics



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Figure 7. Typical capacitances

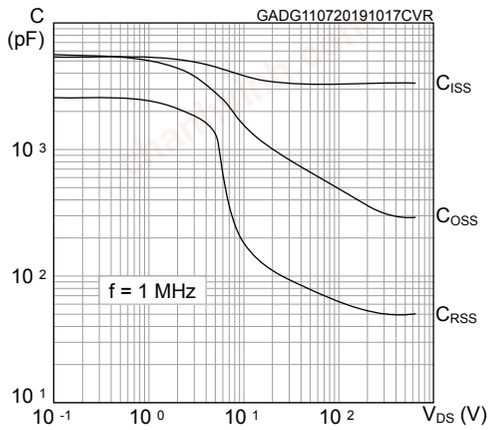


Figure 8. Typical gate charge

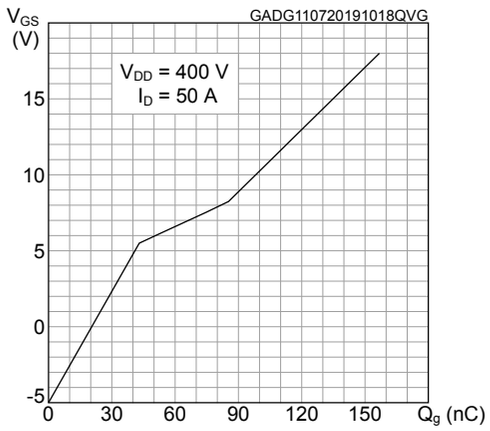


Figure 9. Maximum total power dissipation

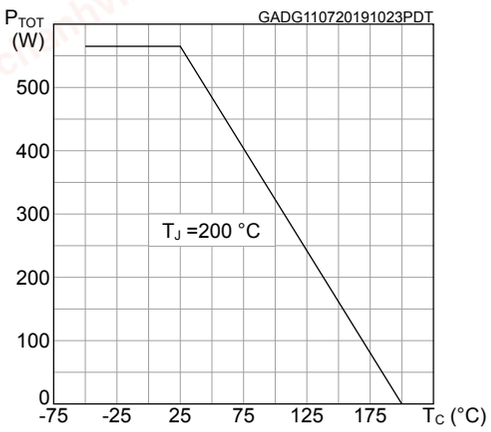


Figure 10. Typical drain-source on-resistance

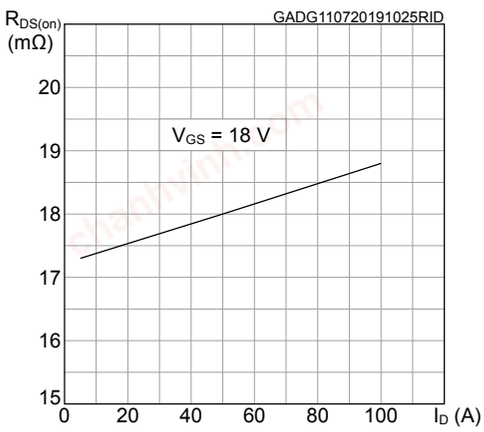


Figure 11. Normalized on-resistance vs temperature

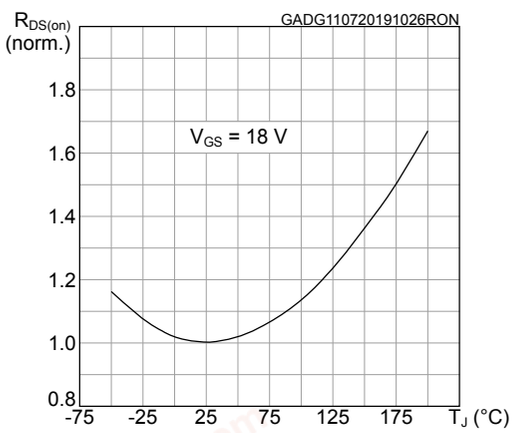
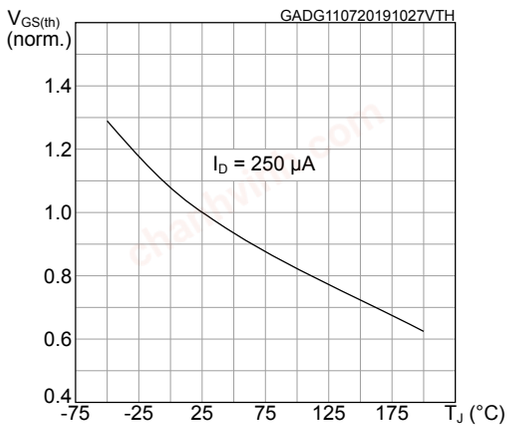


Figure 12. Normalized gate threshold voltage vs temperature



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Figure 13. Normalized breakdown voltage vs temperature

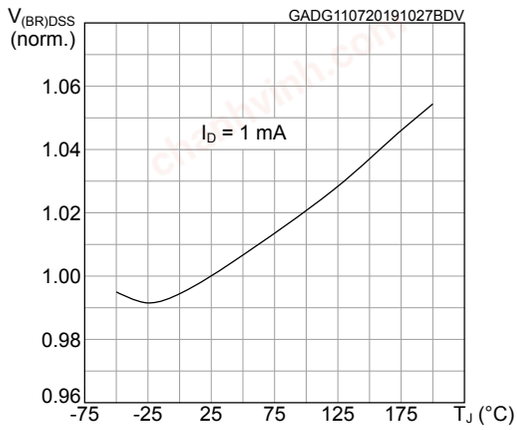


Figure 14. Typical switching energy vs drain current

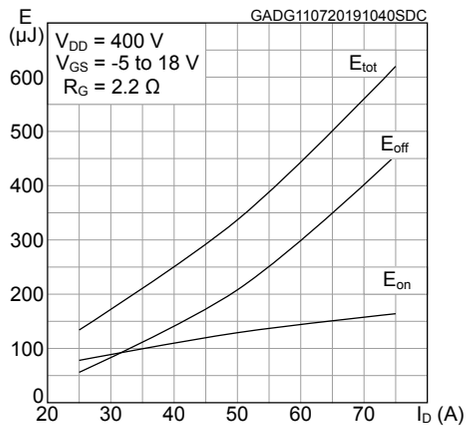


Figure 15. Typical switching energy vs temperature

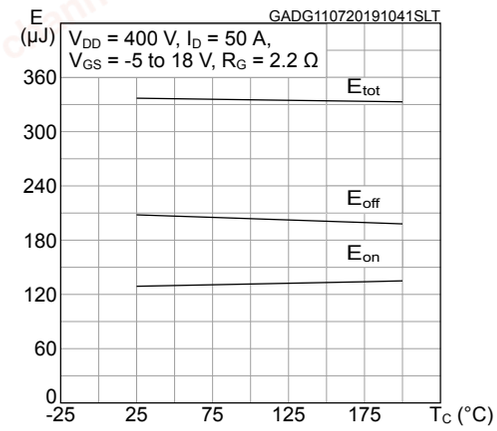


Figure 16. Typical reverse conduction characteristics (T_J = -50 °C)

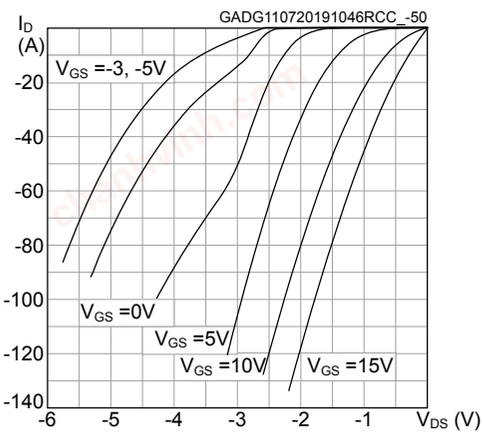


Figure 17. Typical reverse conduction characteristics (T_J = 25 °C)

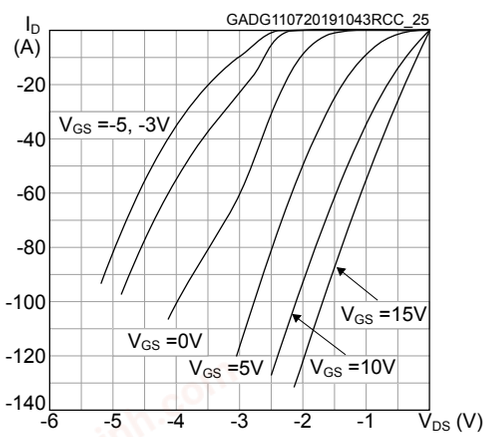
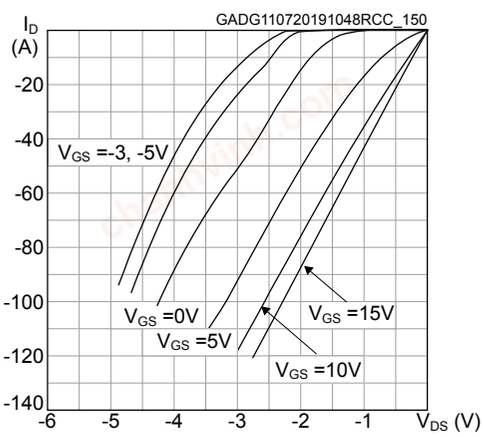


Figure 18. Typical reverse conduction characteristics (T_J = 150 °C)



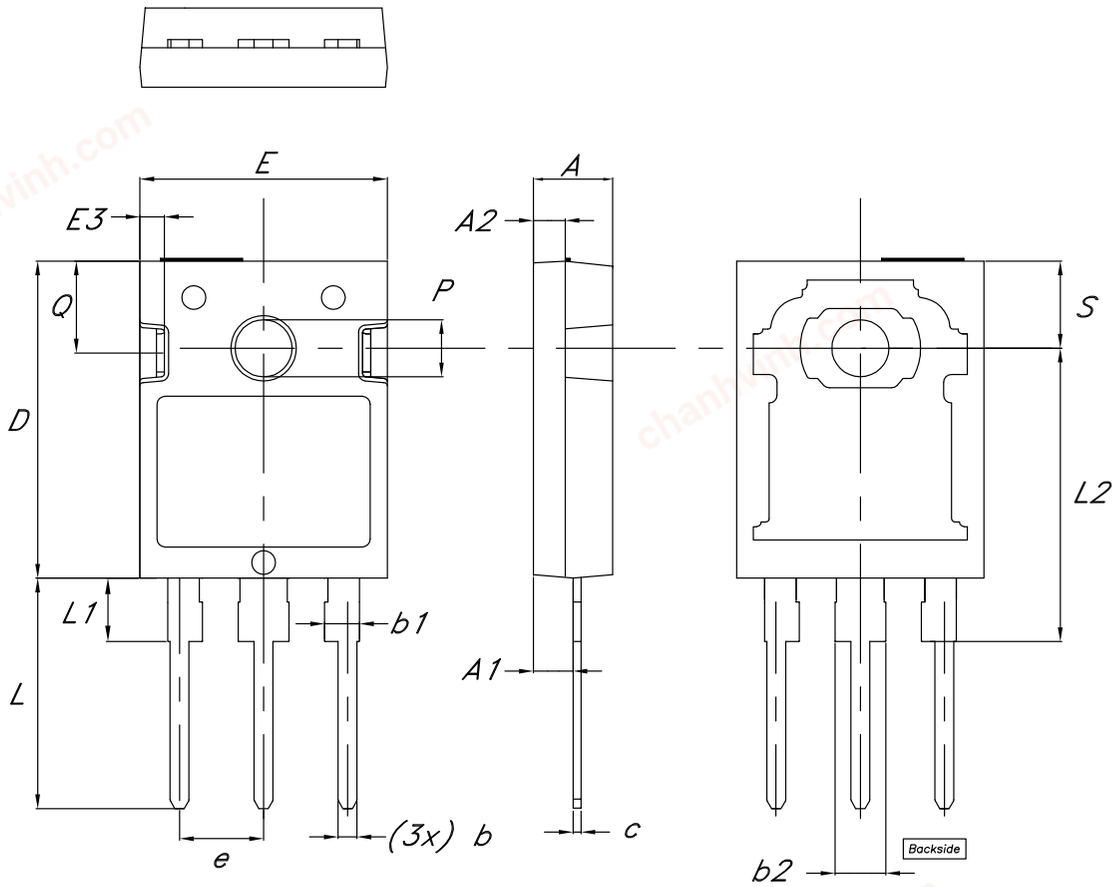
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3 Package information

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

Figure 19. **HiP247 package outline**



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Table 8. **HiP247 package mechanical data**

Dim.	mm		
	Min.	Typ.	Max.
A	4.85	5.00	5.15
A1	2.20		2.60
A2	1.90	2.00	2.10
b	1.00		1.40
b1	2.00		2.40
b2	3.00		3.40
c	0.40		0.80
D	19.85	20.00	20.15
E	15.45	15.60	15.75
E3	1.45		1.65
e	5.30	5.45	5.60
L	14.20		14.80
L1	3.70		4.30
L2	18.30	18.50	18.70
P	3.55		3.65
Q	5.65		5.95
S	5.30	5.50	5.70

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Revision history

Table 9. **Document revision history**

Date	Revision	Changes
15-Sep-2016	1	First release
29-Mar-2017	2	Updated *Table 7: "Switching times"* and *Table 8: "Reverse diode characteristics".* Updated *Section 2.1: "Electrical characteristics (curves)".* Minor text changes
25-Jun-2018	3	Updated cover page. Updated *Section 2 Electrical characteristics* and *Section 3 Package information.* Minor text changes.
24-Jan-2019	4	Modified *Table 1. Absolute maximum ratings*, *Table 3. On/off states.* Modified *Figure 1. Safe operating area* and *Figure 2. Normalized thermal impedance.* Minor text changes.
15-Jul-2019	5	Updated Section 1 Electrical ratings. Updated Section 2 Electrical characteristics and Section 2.1 Electrical characteristics (curves). Minor text changes.

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