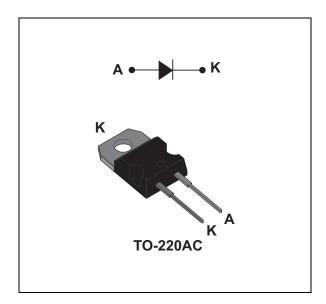


STPSC6C065D-L

650 V power Schottky silicon carbide diode

Datasheet - production data



Features

- No or negligible reverse recovery
- Switching behavior independent of temperature
- High forward surge capability

Description

The SiC diode is an ultrahigh performance power Schottky rectifier. It is manufactured using a silicon carbide substrate. The wide band gap material allows the design of a Schottky diode structure with a 650 V rating. Due to the Schottky construction, no recovery is shown at turn-off and ringing patterns are negligible. The minimal capacitive turn-off behavior is independent of temperature.

Especially suited for use as boost or freewheeling diode, this rectifier will enhance the performance of the targeted application. Its high forward surge capability ensures a good robustness during transient phases and thus, allows an easier design.

Table 1. Device summary

Symbol	Value
I _{F(AV)}	6 A
V _{RRM}	650 V
T _j (max.)	175 °C

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Characteristics

Table 2. Absolute ratings (limiting values at 25 °C unless otherwise specified)

Symbol	Parameter			Unit
V_{RRM}	Repetitive peak reverse voltage		650	V
I _{F(RMS)}	Forward rms current		22	Α
I _{F(AV)}	Average forward current	TO-220AC, $T_c = 135 ^{\circ}C^{(1)}$, DC	6	Α
		t _p = 10 ms sinusoidal, T _c = 25 °C	54	
I_{FSM}	Surge non repetitive forward current	t_p = 10 ms sinusoidal, T_c = 125 °C	48	Α
		$t_p = 10 \mu s \text{ square}, T_c = 25 \text{ °C}$	450	
I _{FRM}	Repetitive peak forward current	TO-220AC, $T_c = 135 {}^{\circ}C^{(1)}$, $T_j = 175 {}^{\circ}C$, $\delta = 0.1$	25	Α
T _{stg}	Storage temperature range		-65 to +175	°C
T _j	Operating junction temperature ⁽²⁾		-40 to +175	°C

Table 3. Thermal resistance

Symbol	nbol Parameter		Typ. value	Max. value	Unit
R _{th(j-c)}	Junction to case	TO-220AC	1.95	2.6	°C/W

Table 4. Static electrical characteristics

Symbol	Parameter	Tests conditions		Min.	Тур.	Max.	Unit
I _R ⁽¹⁾	Reverse leakage current	T _j = 25 °C	V - V	-	5	60	μA
'R`'	Reverse leakage current	T _j = 150 °C	$V_R = V_{RRM}$	-	50	250	μΑ
V _F ⁽²⁾	V (2) Forward voltage drap	T _j = 25 °C	1 6 4	-	1.56	1.75	W
V _F ⁽²⁾ Forward voltage drop	T _j = 150 °C	I _F = 6 A	-	1.98	2.5	V	

^{1.} $t_p = 10 \text{ ms}, \delta < 2\%$

To evaluate the conduction losses use the following equation: P = 1.35 x $I_{F(AV)}$ + 0.192 x $I_{F^2(RMS)}$

Table 5. Other parameters

Symbol	Parameter	Test conditions	Тур.	Unit
Q _{cj} ⁽¹⁾	Total capacitive charge	V _R = 400 V	15.2	nC
C _j Total capacitance	Total canacitance	$V_R = 0 \text{ V}, T_c = 25 \text{ °C}, F = 1 \text{ MHz}$	270	pF
	Total capacitance	$V_R = 300 \text{ V}, T_C = 25 \text{ °C}, F = 1 \text{ MHz}$	29	рг

^{1.} Most accurate value for the capacitive charge: $Q_{cj} = \int_{0}^{V_{OUT}} c_{j}(v_{R}).dv_{R}$

 $[\]begin{array}{ll} \text{1.} & \text{Value based on } R_{th(j-c)} \text{ max.} \\ \text{2.} & \frac{dPtot}{dTj} < \frac{1}{Rth(j-a)} \text{ condition to avoid thermal runaway for a diode on its own heatsink} \\ \end{array}$

^{2.} $t_p = 500 \, \mu s, \, \delta < 2\%$

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 $V_F(V)$

Figure 1. Forward voltage drop versus forward current (typical values, low level)

12 | I_F(A) | Pulse test: t_p = 500 µs | T_a = 150°C |

8 | T_a = 100°C | T_a = 175°C |

4 | Pulse test: T_a = 175°C | T_a = 175°C |

10 | T_a = 175°C | T_a = 175°C |

11 | T_a = 175°C | T_a = 175°C |

12 | T_a = 175°C | T_a = 175°C |

13 | T_a = 175°C | T_a = 175°C |

14 | T_a = 175°C | T_a = 175°C |

15 | T_a = 175°C | T_a = 175°C |

16 | T_a = 175°C | T_a = 175°C |

17 | T_a = 175°C | T_a = 175°C |

18 | T_a = 175°C | T_a = 175°C |

19 | T_a = 175°C | T_a = 175°C |

10 | T_a = 175°C | T_a = 175°C |

11 | T_a = 175°C | T_a = 175°C |

12 | T_a = 175°C | T_a = 175°C |

13 | T_a = 175°C | T_a = 175°C |

14 | T_a = 175°C | T_a = 175°C |

15 | T_a = 175°C | T_a = 175°C |

16 | T_a = 175°C | T_a = 175°C |

17 | T_a = 175°C | T_a = 175°C |

18 | T_a = 175°C | T_a = 175°C |

19 | T_a = 175°C | T_a = 175°C |

10 | T_a = 175°C | T_a = 175°C |

10 | T_a = 175°C | T_a = 175°C |

10 | T_a = 175°C | T_a = 175°C |

11 | T_a = 175°C | T_a = 175°C |

12 | T_a = 175°C | T_a = 175°C |

13 | T_a = 175°C | T_a = 175°C |

14 | T_a = 175°C | T_a = 175°C |

15 | T_a = 175°C | T_a = 175°C |

16 | T_a = 175°C | T_a = 175°C |

17 | T_a = 175°C | T_a = 175°C |

18 | T_a = 175°C | T_a = 175°C |

18 | T_a = 175°C | T_a = 175°C |

18 | T_a = 175°C | T_a = 175°C |

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18 | T_a = 175°C | T_a = 175°C |

18 | T_a = 175°C | T_a = 175°C |

18 | T_a = 175°C | T_a = 175°C |

18 | T_a = 175°C | T_a = 175°C | T_a = 175°C |

18 | T_a = 175°C |

1.5

current (typical values, high level) Pulse test : t_p= 500 µs 50 T_= 25°C 30 T_a= 100°C 20 T_a= 150°C $V_F(V)$ 0.0 3.0 1.0 2.0 4.0 5.0 6.0 7.0

Figure 2. Forward voltage drop versus forward

Figure 3. Reverse leakage current versus reverse voltage applied (typical values)

1.E+02
1.E+01
1.E-02
1.E-03
1.E-04
0 50 100 150 200 250 300 350 400 450 500 550 600 650

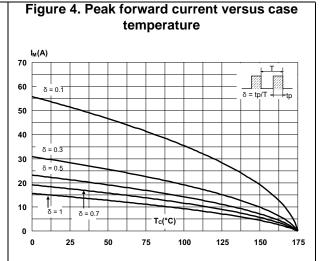


Figure 5. Junction capacitance versus reverse voltage applied (typical values)

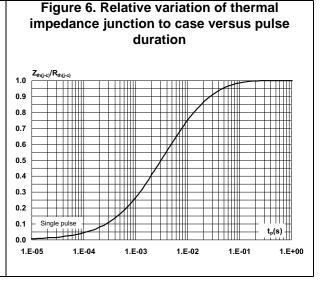
C_j(pF)

C_j(pF)

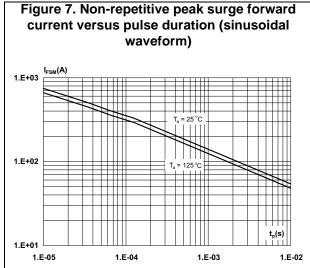
V_{osc} = 30 mV_{RMS}
T_j = 25 °C

V_e(V)

0.1 1.0 10.0 100.0 1000.0



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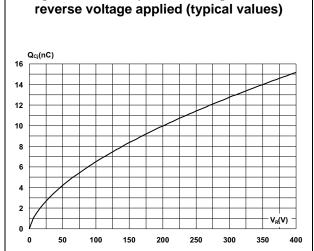


Figure 8. Total capacitive charges versus

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Package information 2

- Epoxy meets UL94, V0
- Recommended torque value (TO-220AC): 0.4 to 0.6 N·m
- Cooling method: conduction (C)

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.

2.1 **TO-220AC** package information

H2 Ø١ L₅ **L7** L6 L2 L9 F1 L4 Ε

Figure 9. TO-220AC package outline



Package information STPSC6C065D-L

Table 6. TO-220AC package mechanical data

	Dimensions					
Ref.	Millim	neters	Inches			
	Min.	Max.	Min.	Max.		
А	4.40	4.60	0.173	0.181		
С	1.23	1.32	0.048	0.051		
D	2.40	2.72	0.094	0.107		
E	0.49	0.70	0.019	0.027		
F	0.61	0.88	0.024	0.034		
F1	1.14	1.70	0.044	0.066		
G	4.95	5.15	0.194	0.202		
H2	10.00	10.40	0.393 0.409			
L2	16.40	typ.	0.645 typ.			
L4	13.00	14.00	0.511	0.551		
L5	2.65	2.95	0.104	0.116		
L6	15.25	15.75	0.600	0.620		
L7	6.20	6.60	0.244	0.259		
L9	3.50	3.93	0.137	0.154		
M	2.6 typ.		0.102	2 typ.		
Diam. I	3.75	3.85	0.147	0.151		

3 Ordering information

Table 7. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STPSC6C065D-L	PSC6C065D	TO-220AC	1.86 g	50	Tube

4 Revision history

Table 8. Document revision history

Date	Revision	Changes
09-Jul-2014	1	First issue.
13-May-2015	2	Updated Table 7. Format updated to current standard.
21-May-2015	3	Updated marking of Table 7 and properties.
08-Jan-2016	4	Title name updated. Format updated to current standard.

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