QSD50HCS120U: 1200V, 50A Homogeneous Current SiC Schottky Diode

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1200V, 50A Homogeneous-current SiC Schottky diode

Description

Homogeneous-current SiC Schottky diode with low V_F, high repetitive surge current, low leakage, no reverse or forward recovery, and high-temperature operation.

Package

TO220-2L

Features

- Temperature-independent fast switching
- Low reverse leakage current
- Low V_F at high temperatures
- Easy paralleling (positive temperature coefficient of V_F)
- Essentially no switching losses
- Subject to AEC-Q101 qualification
- High repetitive surge current

Typical applications

- High-frequency power converters
- Industrial motor drives
- Switch-mode power supplies
- Electric vehicles and battery chargers
- Solar inverters
- Power factor correction
- Free-wheeling diode

Maximum ratings

Paramet	Symbol	Test conditions	Value	Unit	Note
Repetitive peak reverse voltage	V_{RRM}		1200	V	
DC peak reverse voltage	V_R		1200	V	
Continuous forward current	I_F	T_C=25°C	149	A	Fig. 3
		T_C=135°C	72		
		T_C=150°C	53		
Power dissipation	P_{TOT}	T_C=25°C	682	W	Fig. 4
		T_C=110°C	295		
Repetitive peak forward surge current, which limits the chip temperature to 175°C	I_{FRM}	T_C=25°C, t_P=10 ms, half sine pulse	210	A	Fig. 5
Non-repetitive forward square-pulse surge current	$I_{F,MAX}$	T_C=25°C, t_P=10 ms	963	A	
		T_C=115°C, t_P=10 ms	871	A	
Operating junction and storage temperature	T_j, T_{stg}		-55 to 175	°C	

Electrical characteristics

Parameter	Symbol	Typ.	Max.	Unit	Test conditions	Note
Forward voltage	V_F	1.5 1.9	1.7	V	I_F=50 A T_j=25°C I_F=50 A T_j=175°C	Fig. 1
Reverse current	I_R	10 70	40	□A	V_R=1200 V T_j=25°C V_R=1200 V T_j=175°C	Fig. 2
Reverse recovery charge	Q_{rr}	0		nC	Note: Majority-carrier diode	
Total capacitance	C	2,380 186 181		nF	V_R=0 V, f=1 MHz V_R=400 V, f=1 MHz V_R=800 V, f=1 MHz	Fig. 6
Total capacitive charge	Q_C	206		nC	V_R=800 V, T_j=25°C	Fig. 7
Capacitance stored energy	E_C	51		□J	V_R=800 V	Fig. 8

Thermal characteristics

Parameter	Symbol	Typ.	Unit	Note
Thermal resistance from junction to case	$R_{\theta JC}$	0.22	°C/W	Fig. 9

Fig. 1: Typical forward characteristics

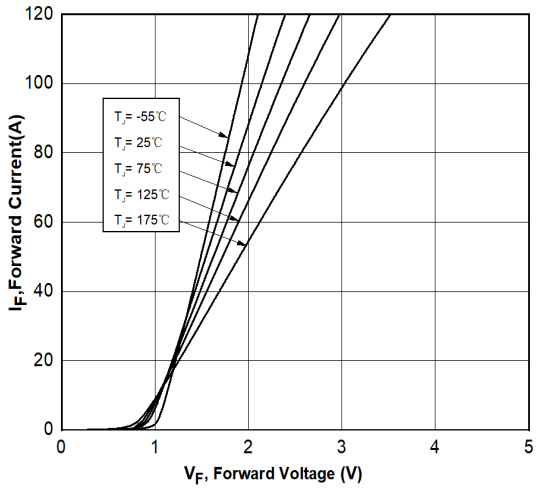


Fig.2: Typical reverse characteristics

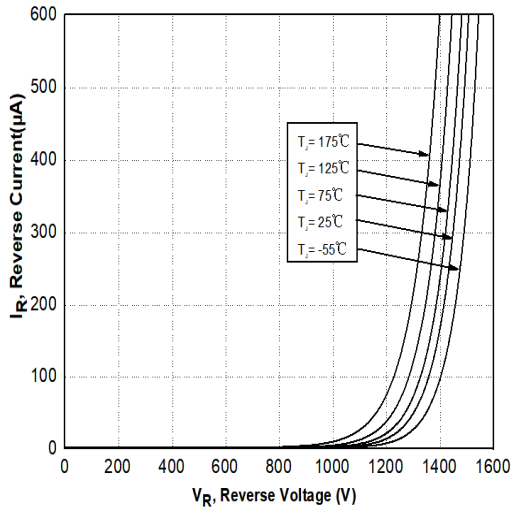


Fig. 3: Current derating

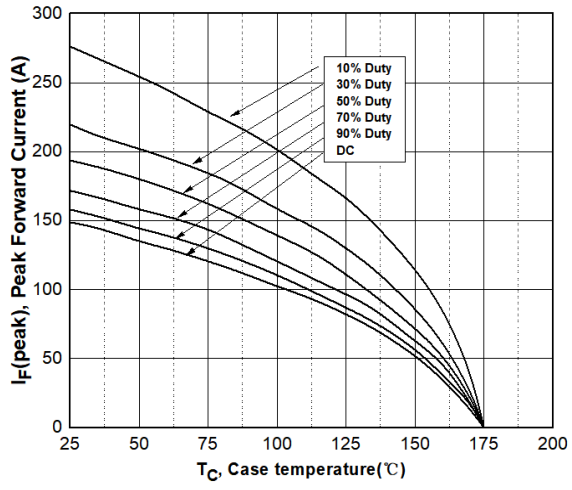


Fig. 4: Power derating

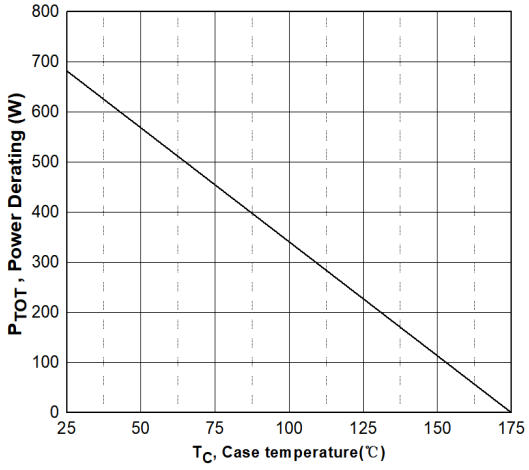


Fig. 5: Chip temperature during repetitive peak forward surge currents

[ref.: J. Damcevska, S. Dimitrijev, D. Haasmann, and P. Tanner, *Scientific Reports*, 13:19189, 2023; https://doi.org/10.1038/s41598-023-465 38-6]

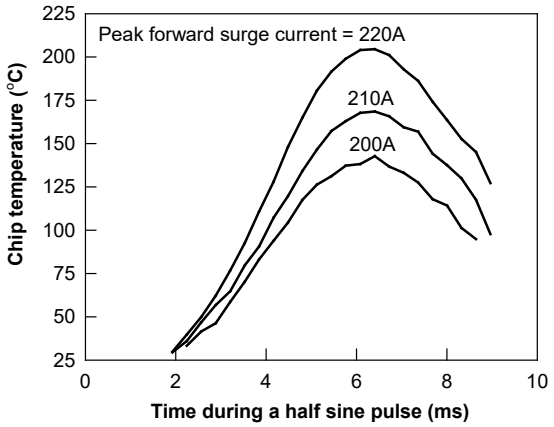


Fig. 6: Capacitance vs reverse voltage

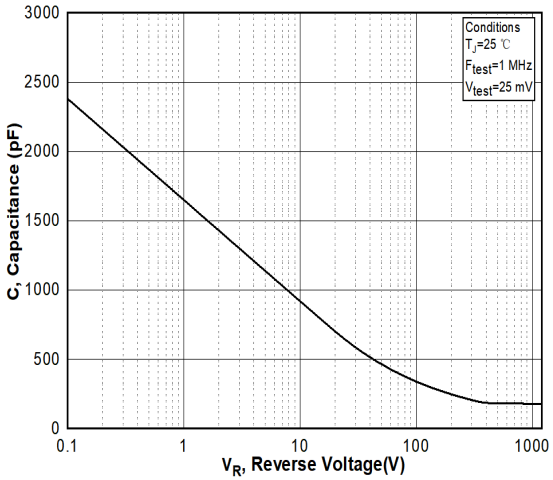


Fig. 7: Capacitive charge vs reverse voltage

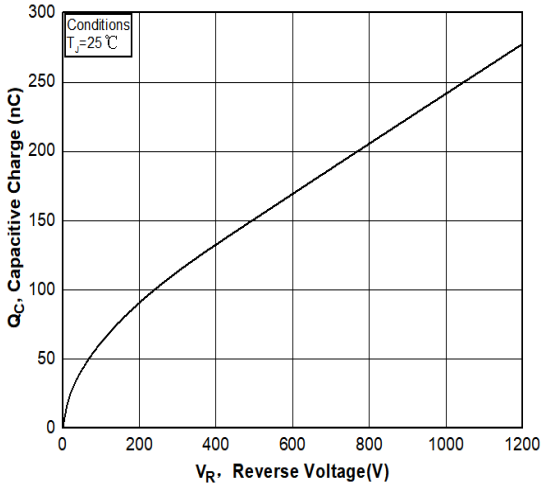


Fig. 8: Capacitance stored energy

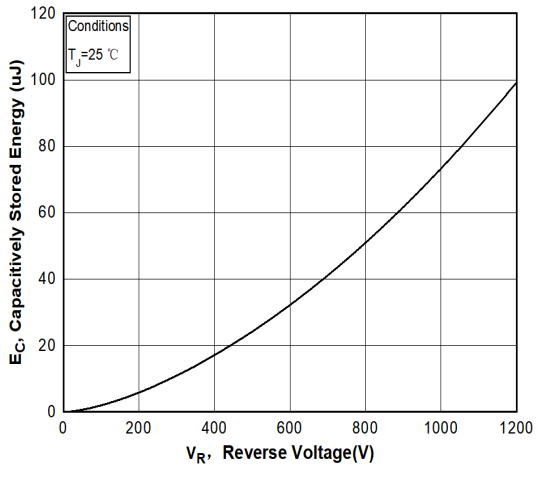
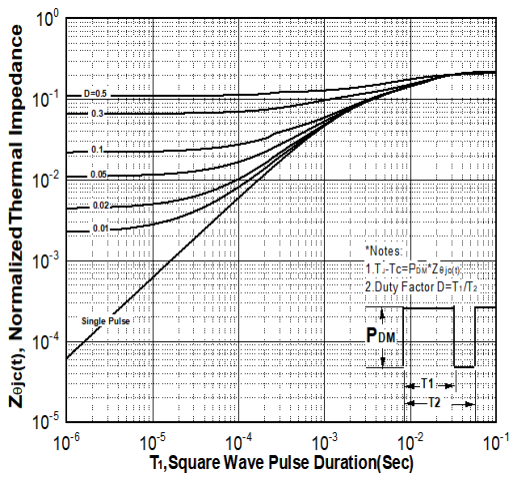
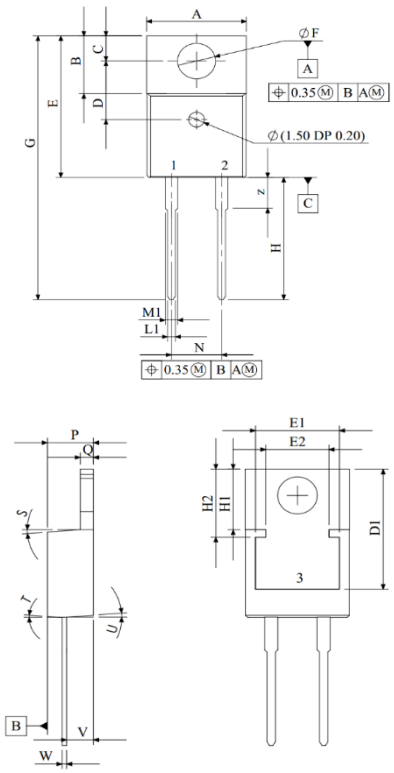


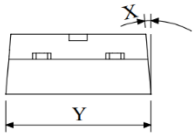
Fig. 9: Transient thermal-response curve (junction to case)



Package Dimensions

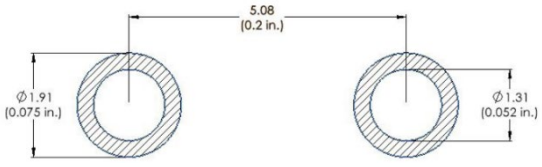
Package TO-220-2L





SYMBOL	MIN (mm)	MAX (mm)
A	9.677	10.414
B	5.969	6.477
C	2.540	3.048
D	5.664	8.560
D1	12.450 REF	
E	14.986	15.621
E1	8.120 REF	
E2	6.100 REF	
F	3.632	3.886
G	28.067	29.134
H	12.700	13.970
H1	6.223 REF	
H2	7.040 REF	
L1	0.635	0.914
M1	1.143	1.397
N	4.953	5.207
P	4.191	4.699
Q	1.219	1.372
S	3°	6°
T	3°	6°
U	3°	6°
V	2.388	2.794
W	0.356	0.635
W1	0.356	0.520
X	3°	5.5°
Y	9.779	10.414
Z	3.302	3.810

Recommended Solder Pad Layout



TO-220-2L

Part Number	Package	Marking
QSD50HCS120U	TO-220-2L	Q