

# 650V SiC Schottky Diode

## GP3D020A065U

VDC	650 V
Q <sub>C</sub>	54 nC***
I <sub>F</sub>	20 A***
T <sub>j,max</sub>	175 °C

### Amp+™ Features

- Unipolar rectifier with surge current
- Zero reverse recovery current
- Fast, temperature-independent switching
- Avalanche tested to 67mJ\*
- All parts tested to greater than 715V

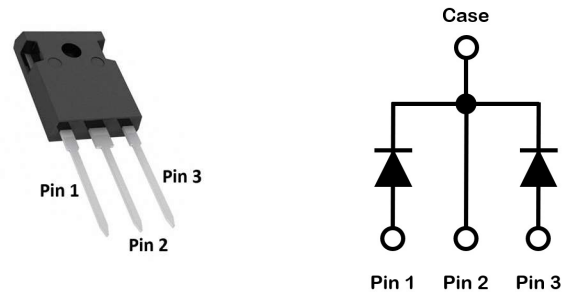
### Amp+™ Benefits

- Near zero switching loss
- Higher efficiency
- Reduced heat sink requirements
- Easy to parallel

### Amp+™ Applications

- Switch mode power supplies, UPS
- Power factor correction
- EV charging stations
- Output rectification

### Package



Part #	Package	Marking
GP3D020A065U	TO-247-3L	3D020A065



### Maximum Ratings, at T<sub>j</sub>=25 °C, unless otherwise specified

Characteristics Per Leg	Symbol	Conditions	Values	Unit
Continuous forward current	I <sub>F</sub> **	T <sub>C</sub> =25 °C, T <sub>J</sub> =175 °C	29	A
		T <sub>C</sub> =125 °C, T <sub>J</sub> =175 °C	15	
		T <sub>C</sub> =150 °C, T <sub>J</sub> =175 °C	9	
Surge non-repetitive forward current sine halfwave	I <sub>FSM</sub>	T <sub>C</sub> =25 °C, t <sub>p</sub> =8.3 ms	75	A
		T <sub>C</sub> =110 °C, t <sub>p</sub> =8.3 ms	65	
Non-repetitive peak forward current	I <sub>F,max</sub>	T <sub>C</sub> =25 °C, t <sub>p</sub> =10 μs	780	A
i <sup>2</sup> t value	∫i <sup>2</sup> dt	T <sub>C</sub> =25 °C, t <sub>p</sub> =8.3 ms	23	A <sup>2</sup> s
		T <sub>C</sub> =110 °C, t <sub>p</sub> =8.3 ms	18	
Repetitive peak reverse voltage	V <sub>RRM</sub>	T <sub>J</sub> =25 °C	650	V
Diode dv/dt ruggedness	dv/dt	Turn-on slew rate, repetitive	200	V/ns
Power dissipation	P <sub>tot</sub> **	T <sub>C</sub> =25 °C	94	W
Operating junction & storage temperature	T <sub>j</sub> , T <sub>storage</sub>	Continuous	-55...175	°C
Soldering temperature	T <sub>solder</sub>	Wave soldering leads	260	°C
Mounting torque		M3 Screw	1	N-m

**Notes:**

\* EAS of 67 mJ is based on starting T<sub>J</sub> = 25°C, L = 1.0 mH, I<sub>AS</sub> = 11.58 A, V = 50 V.

\*\* Typical R<sub>th(j-c)</sub> used

\*\*\*Per Device

Electrical Characteristics, at T<sub>j</sub>=25 °C, unless otherwise specified

Characteristics Per Leg	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
DC blocking voltage	V <sub>DC</sub>	T <sub>j</sub> =25 °C	650	-	-	V
Breakdown voltage	V <sub>BR</sub>	I <sub>R</sub> =330uA, T <sub>j</sub> =25 °C	715	-	-	V
Diode forward voltage	V <sub>F</sub>	I <sub>F</sub> =10A, T <sub>j</sub> =25 °C	-	1.41	1.50	V
		I <sub>F</sub> =10A, T <sub>j</sub> =125 °C	-	1.53	-	
		I <sub>F</sub> =10A, T <sub>j</sub> =175 °C	-	1.65	1.90	
Reverse current	I <sub>R</sub>	V <sub>R</sub> =650V, T <sub>j</sub> =25 °C	-	1	25	μA
		V <sub>R</sub> =715V, T <sub>j</sub> =25 °C	-	3	-	
		V <sub>R</sub> =650V, T <sub>j</sub> =125 °C	-	9	-	
		V <sub>R</sub> =650V, T <sub>j</sub> =175 °C	-	30	250	
Total capacitive charge	Q <sub>C</sub>	V <sub>R</sub> =400V, T <sub>j</sub> =25 °C	-	27	-	nC
Total capacitance	C	V <sub>R</sub> =1V, f=1 MHz	-	440	-	pF
		V <sub>R</sub> =200V, f=1 MHz	-	53	-	
		V <sub>R</sub> =400V, f=1 MHz	-	43	-	

Thermal Characteristics

Characteristics Per Leg	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Thermal resistance, junction-case	R <sub>thJC</sub>	-	-	1.60	2.00	°C/W

Typical Performance Per Leg

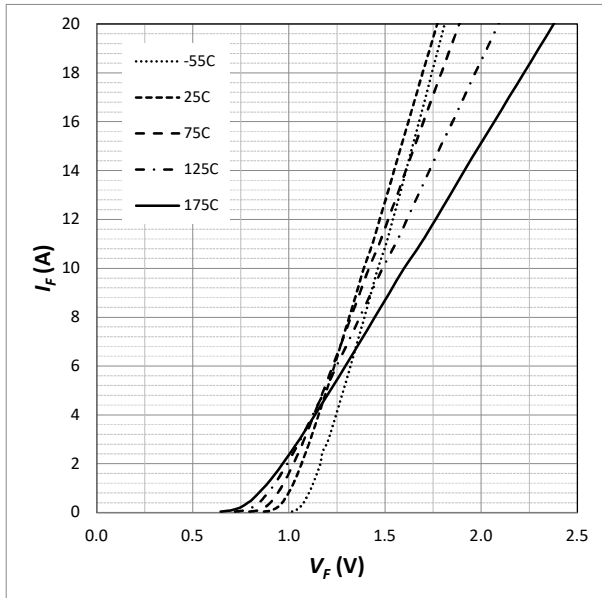


Fig. 1 Forward Characteristics (parameterized on T<sub>j</sub>)

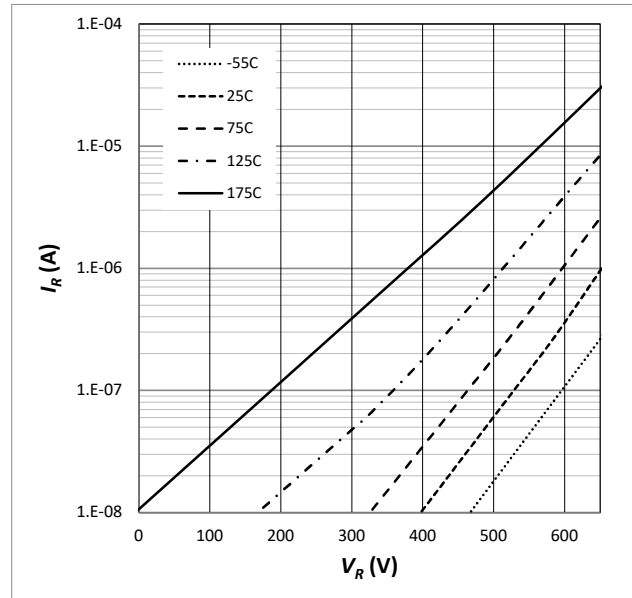


Fig. 2 Reverse Characteristics (parameterized on T<sub>j</sub>)

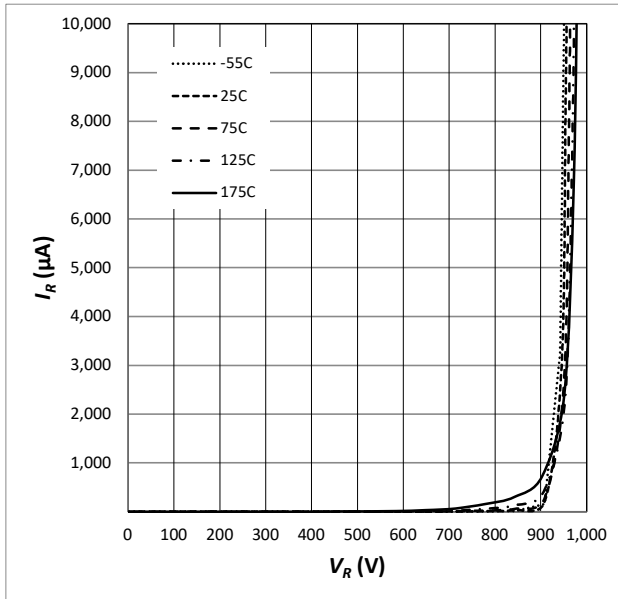


Fig. 3 Reverse Characteristics (parameterized on  $T_j$ )

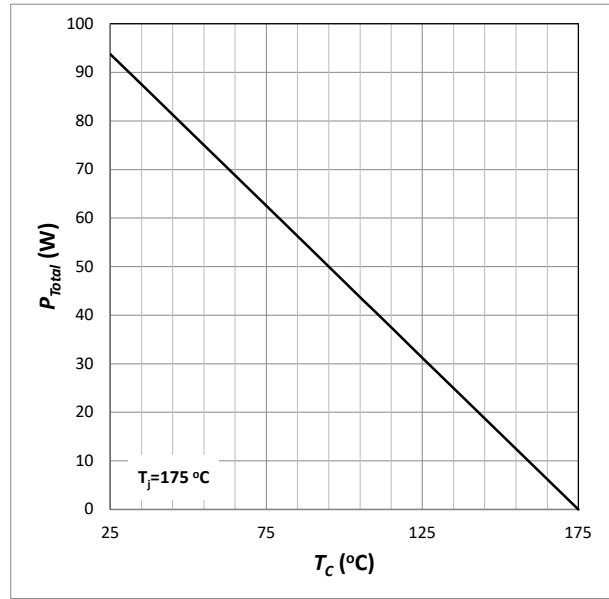


Fig. 4 Power Derating

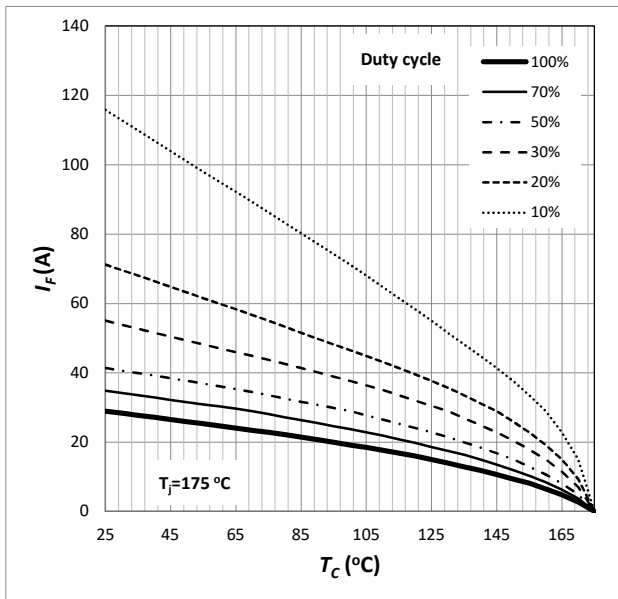


Fig. 5 Current Derating

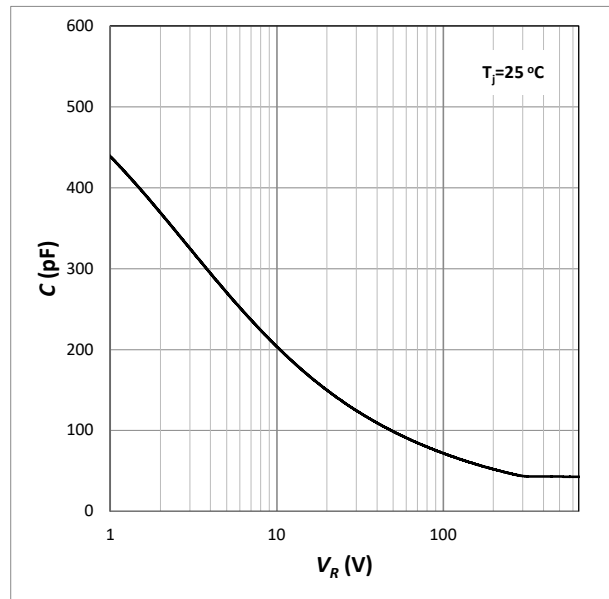


Fig. 6 Capacitance

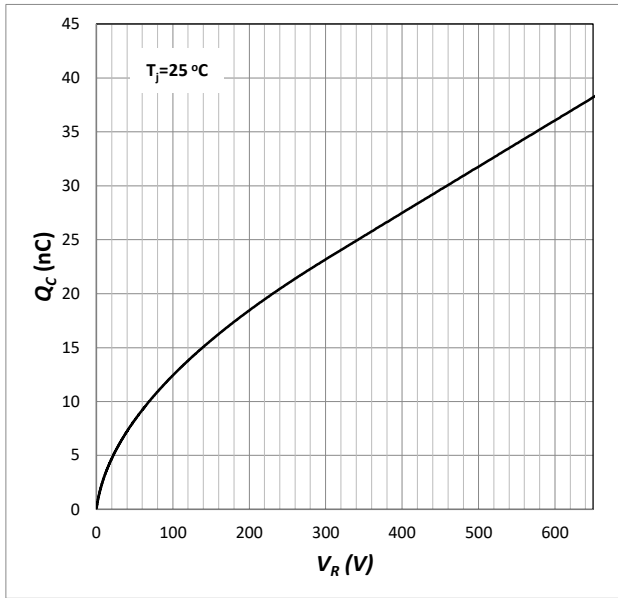


Fig. 7 Capacitive Charge

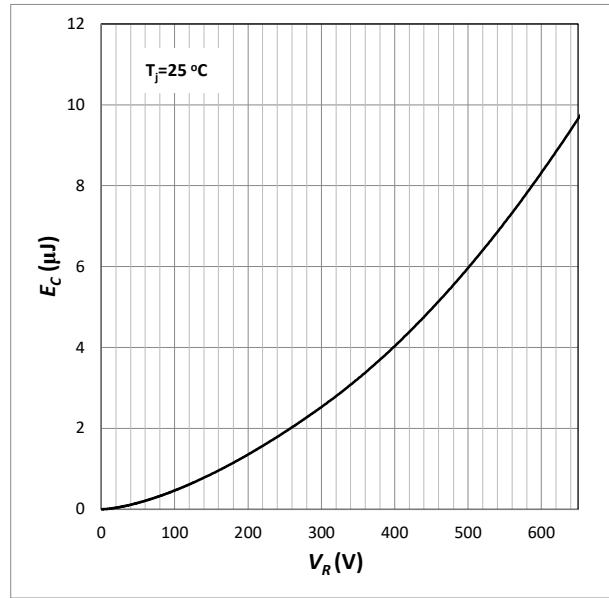


Fig. 8 Typical Capacitance Stored Energy

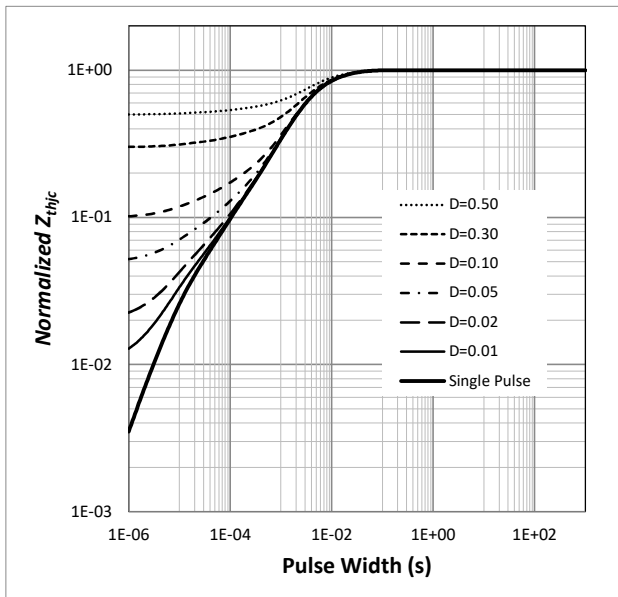


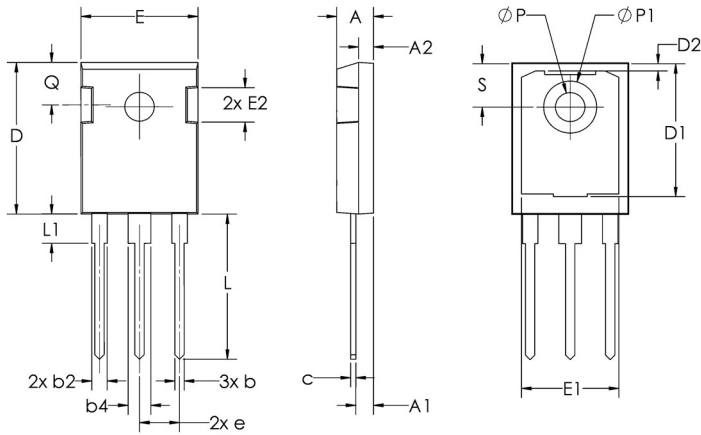
Fig. 9 Transient Thermal Impedance

# 650V SiC Schottky Diode

Amp+™

GP3D020A065U

## Package Dimensions TO-247-3L



Sym	Millimeters		Inches	
	Min	Max	Min	Max
A	4.70	5.31	0.185	0.209
A1	2.21	2.59	0.087	0.102
A2	1.50	2.49	0.059	0.098
b	0.99	1.40	0.039	0.055
b2	1.65	2.39	0.065	0.094
b4	2.59	3.43	0.102	0.135
c	0.38	0.89	0.015	0.035
D	20.80	21.46	0.819	0.845
D1	13.08	17.65	0.515	0.695
D2	0.51	1.35	0.020	0.053
E	15.49	16.26	0.610	0.640
E1	13.46	14.16	0.530	0.557
E2	3.43	5.49	0.135	0.216
e	5.44 BSC		0.214 BSC	
L	19.81	20.32	0.780	0.800
L1	4.10	4.50	0.161	0.177
ϕP	3.56	3.66	0.140	0.144
ϕP1	7.06	7.39	0.278	0.291
Q	5.39	6.20	0.212	0.244
S	6.04	6.30	0.238	0.248

**Revision History**

Date	Revision	Notes
11/819	1.0	Initial release of datasheet
12/19/2019	1.1	Company name and style change, updated Rthjc spec
2/20/2013	1.2	Using Rthjc typical for $I_F$ and $P_{tot}$
4/30/2021	1.3	Updated forward voltage spec, surge, Rthjc - valid for date codes after 2101 (YYWW format)

**Notes****RoHS Compliance**

The levels of RoHS restricted materials in this product are below the maximum concentration values (also referred to as the threshold limits) permitted for such substances, or are used in an exempted application, in accordance with EU Directive 2011/65/EC (RoHS2), as implemented March, 2013. RoHS Declarations for this product can be obtained from the Product Documentation sections of [www.SemiQ.com](http://www.SemiQ.com).

**REACH Compliance**

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