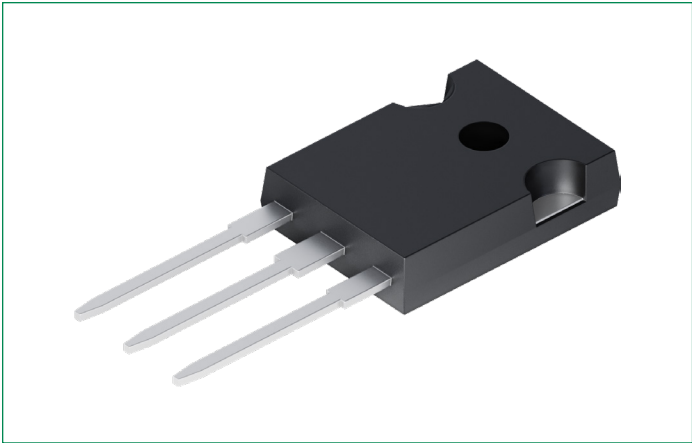


DCK20C650HB

650 V, 20 A SiC Schottky Diode

RoHS

HF



Features

- Max junction temperature of 175 °C
- High surge current capacity
- Extremely short reverse recovery time
- High-frequency operation
- Temperature independent switching behavior
- Positive temperature coefficient on V_F

Applications

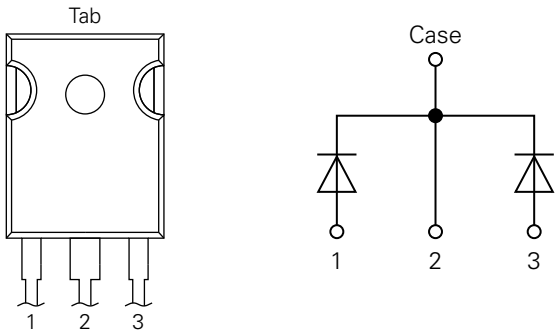
- PV microinverter
- TV power
- Power factor correction
- Telecom / Server SMPS

Product Summary

Characteristic	Value	Unit
V_{RRM}	650	V
$I_F (T_c = 152\text{ °C})$	10*	A
Q_c	25.5	nC

* per leg

Pinout Diagram TO-247-3L



1: Anode; **2:** Cathode; **3:** Anode; **Tab:** Case

Maximum Ratings ($T_c = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)

Symbol	Characteristic	Conditions		Value	Unit
V_{RRM}	Repetitive peak reverse voltage	–		650	V
V_{DC}	DC blocking voltage	–		650	V
I_F	Continuous forward current	–	$T_c = 25\text{ }^{\circ}\text{C}$	30.4*	A
			$T_c = 135\text{ }^{\circ}\text{C}$	14.5*	
			$T_c = 152\text{ }^{\circ}\text{C}$	10*	
I_{FSM}	Non-repetitive surge forward current	Sine halfwave @ $T_c = 25\text{ }^{\circ}\text{C}$, $t_p = 10\text{ ms}$		60*	A
I_{FSM}	Non-repetitive surge forward current (two anodes tested in parallel)			120	A
I_{FRM}	Repetitive peak forward current	Frequency = 0.1 Hz, 100 cycles sine halfwave @ $T_c = 25\text{ }^{\circ}\text{C}$, $t_p = 10\text{ ms}$		48*	A
P_{tot}	Total power dissipation	–	$T_c = 25\text{ }^{\circ}\text{C}$	115.3*	W
			$T_c = 150\text{ }^{\circ}\text{C}$	19.2*	
I^2t	I^2t (two anodes tested in parallel)	$T_c = 25\text{ }^{\circ}\text{C}$, $t_p = 10\text{ ms}$		72	A^2s
T_{vj}	Virtual operating junction temperature range	–		–55 to 175	$^{\circ}\text{C}$
T_{stg}	Storage temperature range	–		–55 to 175	$^{\circ}\text{C}$
M	Mounting torque	M3 screw		0.7	Nm

* per leg

Note: Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

Thermal Characteristics (per leg)

Symbol	Characteristic	Value			Unit
		Min.	Typ.	Max.	
$R_{th(j-c)}$	Thermal resistance, junction to case ^{Fig.7}	–	1.3	–	K/W

Electrical Characteristics (per leg) ($T_{vj} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)

Symbol	Characteristic	Conditions		Value			Unit
				Min.	Typ.	Max.	
V_F	Forward voltage ^{Fig.1}	$I_F = 10\text{ A}$	$T_{vj} = 25\text{ }^{\circ}\text{C}$	–	1.37	1.55	V
			$T_{vj} = 175\text{ }^{\circ}\text{C}$	–	1.70	2.00	
I_R	Reverse current ^{Fig.2}	$V_R = 650\text{ V}$	$T_{vj} = 25\text{ }^{\circ}\text{C}$	–	1	10	μA
			$T_{vj} = 175\text{ }^{\circ}\text{C}$	–	10	100	
C	Total capacitance ^{Fig.3}	$V_R = 1\text{ V}$, $f = 1\text{ MHz}$		–	398	–	pF
		$V_R = 200\text{ V}$, $f = 1\text{ MHz}$		–	476	–	
		$V_R = 400\text{ V}$, $f = 1\text{ MHz}$		–	41.9	–	
Q_c	Total capacitive charge ^{Fig.4}	$V_R = 400\text{ V}$, $T_{vj} = 25\text{ }^{\circ}\text{C}$, $Q_c = \int_0^{VR} C(V)dV$		–	25.5	–	nC
E_c	Capacitance stored energy ^{Fig.5}	$V_R = 400\text{ V}$, $T_{vj} = 25\text{ }^{\circ}\text{C}$, $E_c = \int_0^{VR} C(V) \cdot VdV$		–	3.80	–	μJ

Characteristic Curves (per leg)

Fig. 1. Typical Forward Characteristics

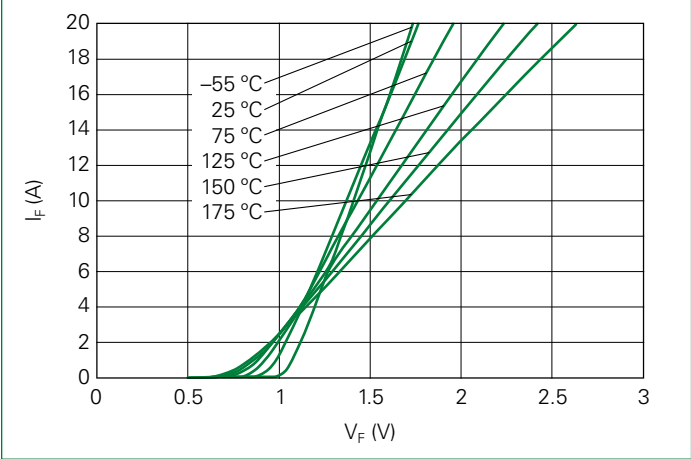


Fig. 2. Typical Reverse Characteristics

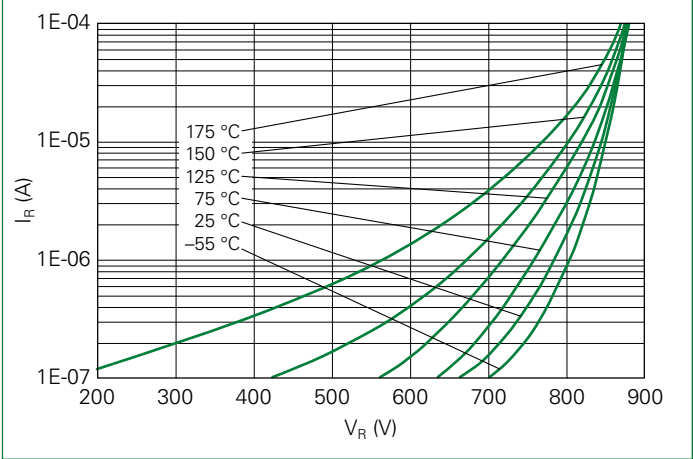


Fig. 3. Capacitance vs. Reverse Voltage

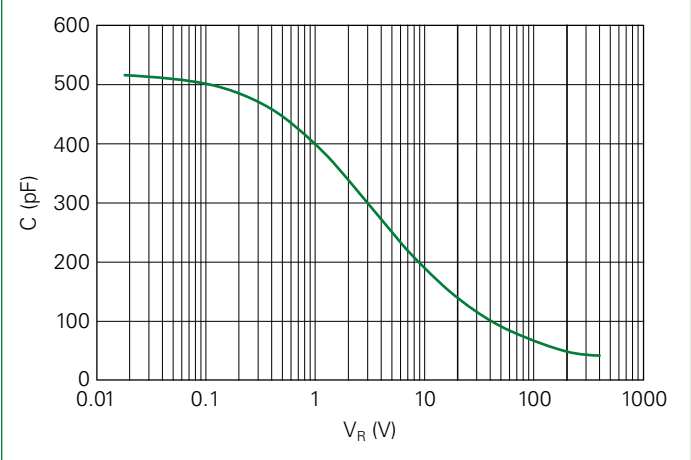


Fig. 4. Total Capacitive Charge vs. Reverse Voltage

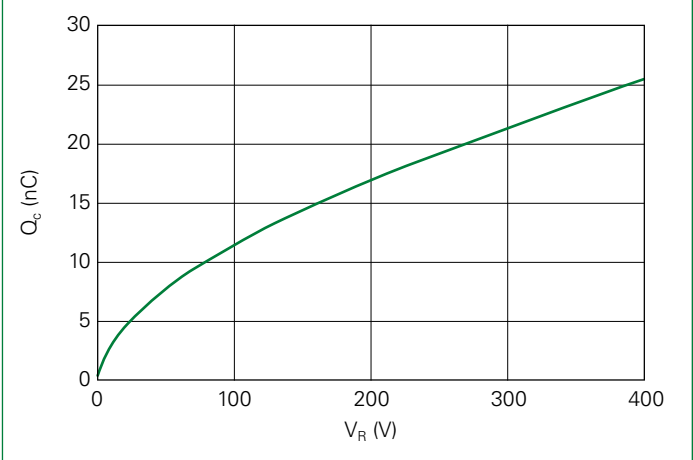


Fig. 5. Capacitance Stored Energy

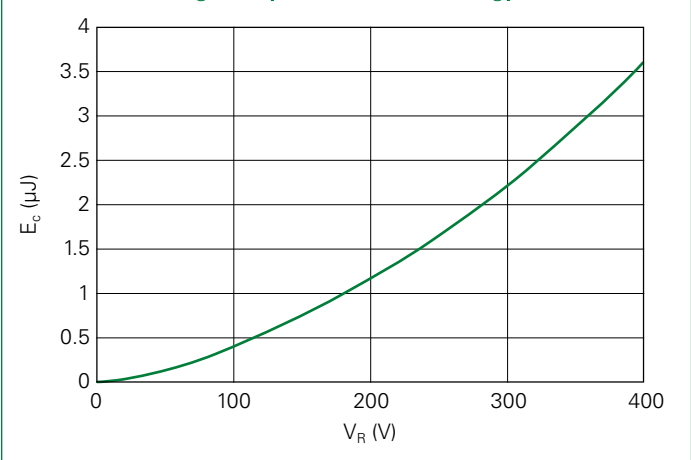


Fig. 6. Power Derating

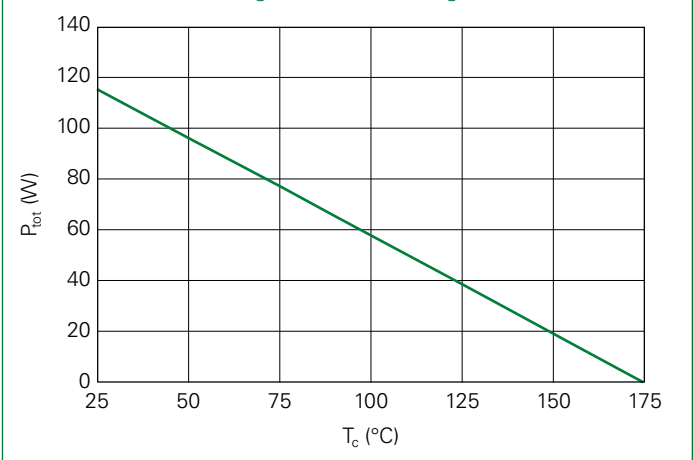


Fig. 7. Transient Thermal Impedance

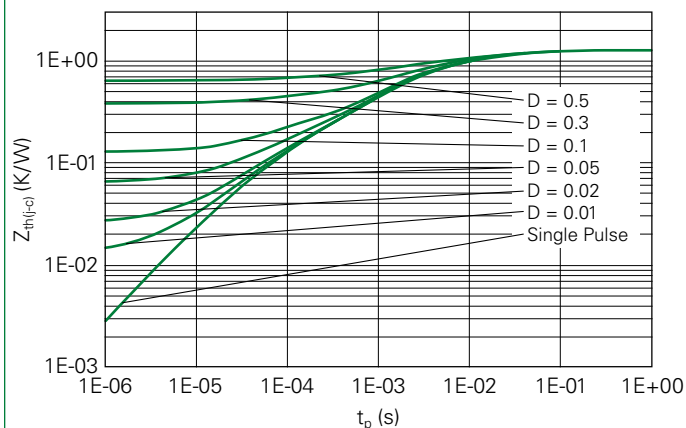
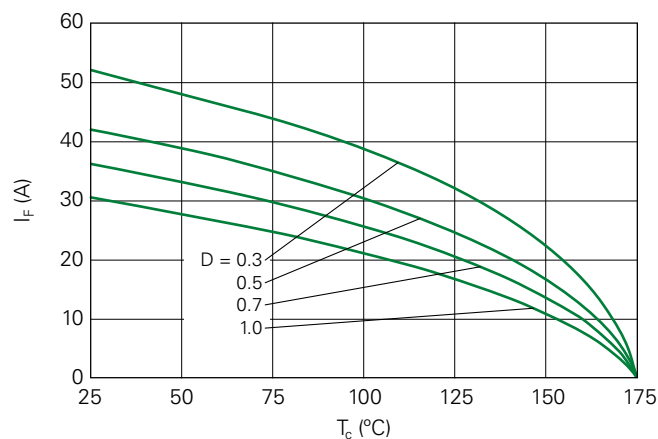
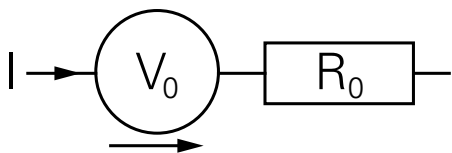


Fig. 8. Forward Current vs. Case Temperature



Diode V_F Model for Simulation



$$V_F(T_j) = V_0 + IR_0$$

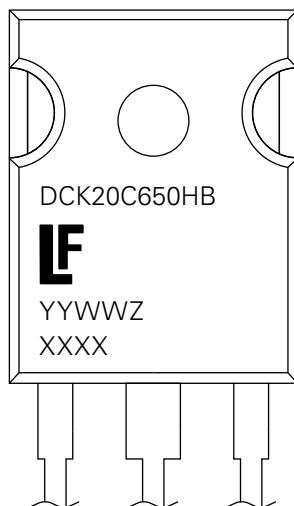
$$V_0 = 4 \times 10^{-8} \cdot T_j^2 - 0.0013 \cdot T_j + 1.0067$$

$$R_0 = 1 \times 10^{-6} \cdot T_j^2 - 0.0001 \cdot T_j + 0.0393$$

Notes

- T_j is the junction temperature in °C
- Range valid from 25 °C to 175 °C
- Model represents performance of a typical chart

Part Number and Marking



DCK20C650HB = Part Material Number

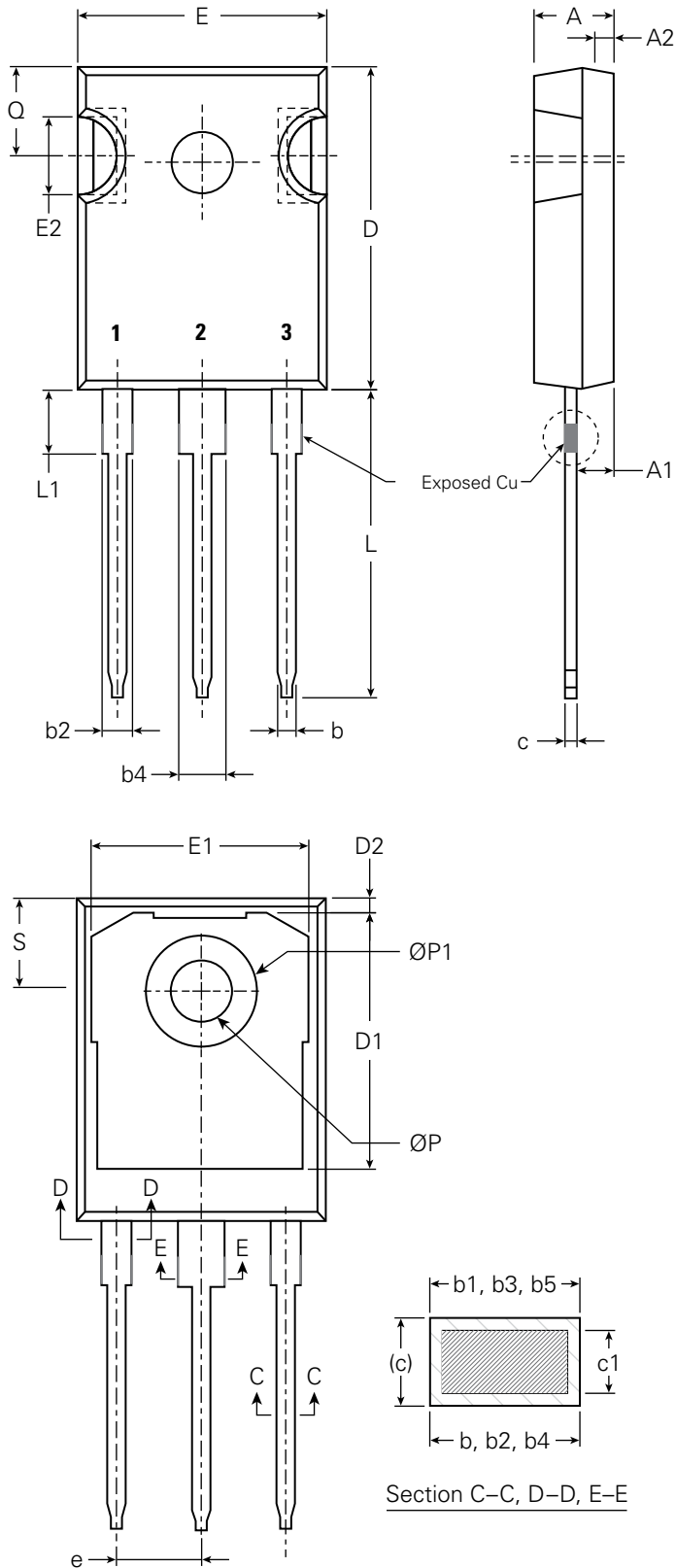
YY = Year

WW = Work Week

Z = Assembly Location

XXXX = Lot Traceability

Part Outline Drawing TO-247-3L



Symbol	Inches			Millimeters		
	Min.	Typical	Max.	Min.	Typical	Max
A	0.190	—	0.205	4.83	—	5.21
A1	0.087	—	0.102	2.20	—	2.60
A2	0.059	—	0.098	1.50	—	2.49
b	0.039	—	0.055	1.00	—	1.40
b1	0.039	—	0.053	0.99	—	1.35
b2	0.071	—	0.095	1.80	—	2.41
b3	0.065	—	0.094	1.65	—	2.39
b4	0.110	—	0.133	2.80	—	3.38
b5	0.104	—	0.125	2.65	—	3.18
c	0.020	—	0.028	0.50	—	0.70
c1	0.015	—	0.028	0.38	—	0.70
D	0.799	—	0.831	20.30	—	21.10
D1	0.515	—	—	13.08	—	—
D2	0.020	—	0.053	0.51	—	1.35
E	0.608	—	0.635	15.45	—	16.13
E1	0.516	—	—	13.10	—	—
E2	0.145	—	0.216	3.68	—	5.49
e	0.214 BSC			5.44 BSC		
L	0.780	—	0.827	19.80	—	21.00
L1	—	—	0.177	—	—	4.50
ØP	0.138	—	0.146	3.50	—	3.70
ØP1	—	—	0.291	—	—	7.40
Q	0.212	—	0.244	5.39	—	6.20
S	0.238	—	0.248	6.04	—	6.30

Note:

1. Package Reference: JEDEC TO247, Variation AD
2. Slot required, notch may be rounded or rectangular
3. Dimension D&E do not include mold flash
4. Subject to change without notice

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Part of:

