HC3D20065A

Silicon Carbide Schottky Diode

Features

- 650-Volt Schottky Rectifier
- Zero Reverse Recovery Current
- Zero Forward Recovery Voltage
- High-Frequency Operation
- Temperature-Independent Switching Behavior
- Extremely Fast Switching
- Positive Temperature Coefficient on V_F

Benefits

- Replace Bipolar with Unipolar Rectifiers
- Essentially No Switching Losses
- Higher Efficiency
- Reduction of Heat Sink Requirements
- Parallel Devices Without Thermal Runaway

Applications

- Switch Mode Power Supplies
- Power Factor Correction
- Motor Drives

TO220-2L
Package

Part Number	Package	Marking
HC3D20065A	TO220-2L	HC3D20065A

Maximum Ratings (T_C = 25 ˚C unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions
V_{RRM}	Repetitive Peak Reverse Voltage	650	V	
V_{RSM}	Surge Peak Reverse Voltage	650	V	
V_{DC}	DC Blocking Voltage	650	V	
I_F	Continuous Forward Current	20	A	T_C=125˚C
I_{FRM}	Repetitive Peak Forward Surge Current	81	A	T_C=110˚C, t_P=10 ms, Half Sine Wave
I_{FSM}	Non-Repetitive Peak Forward Surge Current	123 104	A	T_C=25˚C, t_p = 10 ms, Half Sine Wave T_C=150˚C, t_p = 10 ms, Half Sine Wave
$I_{F,Max}$	Non-Repetitive Peak Forward Surge Current	450	A	T_C=25˚C, t_P = 10 µs, Pulse
P_{tot}	Power Dissipation	115	W	T_C=25˚C
T_J , T_{stg}	Operating Junction and Storage Temperature	-55 to +175	˚C	

Electrical Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions
V_F	Forward Voltage	1.35 1.5	1.5 -	V	I_F = 20 A ,T_J=25°C I_F = 20 A ,T_J=175°C
I_R	Reverse Current	0.06 12	100 -	μA	V_R = 650 V T_J=25°C V_R = 650 V T_J=175°C
Q_C	Total Capacitive Charge	24		nC	V_R = 400 V, I_F = 10 A di/dt = 500 A/μs T_J = 25°C
C	Total Capacitance	1000 91		pF	V_R = 0 V, T_J = 25°C, f = 1 MHz V_R = 400 V, T_J = 25°C, f = 1 MHz
E_{ava}	Non-repetetive Avaranche Energy	220		mJ	L=1mH

Note: This is a majority carrier diode, so there is no reverse recovery charge.

Thermal Characteristics

Symbol	Parameter	Typ.	Unit
$R_{\theta JC}$	Thermal Resistance from Junction to Case	0.87	°C/W

Typical Performance

Fig.1 V_F - I_F Characteristics

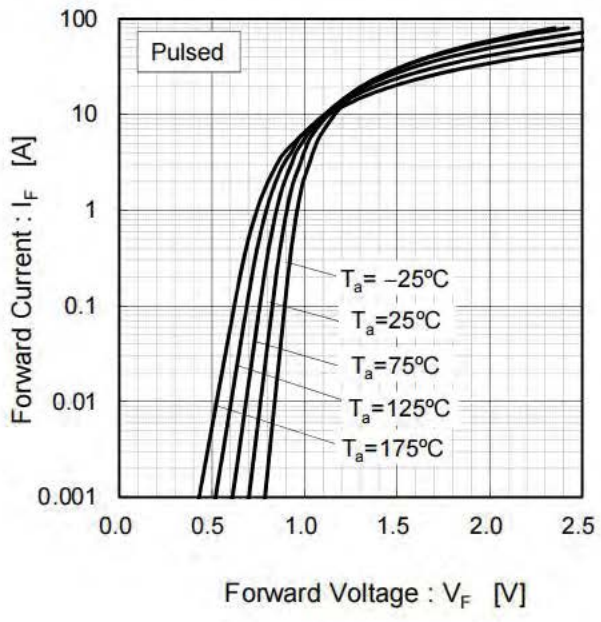
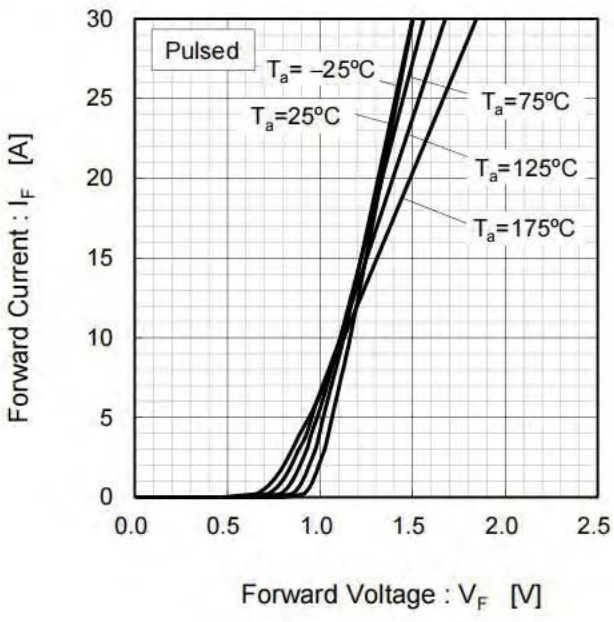


Fig.2 V_F - I_F Characteristics



Typical Performance

Fig.3 V_R - I_R Characteristics

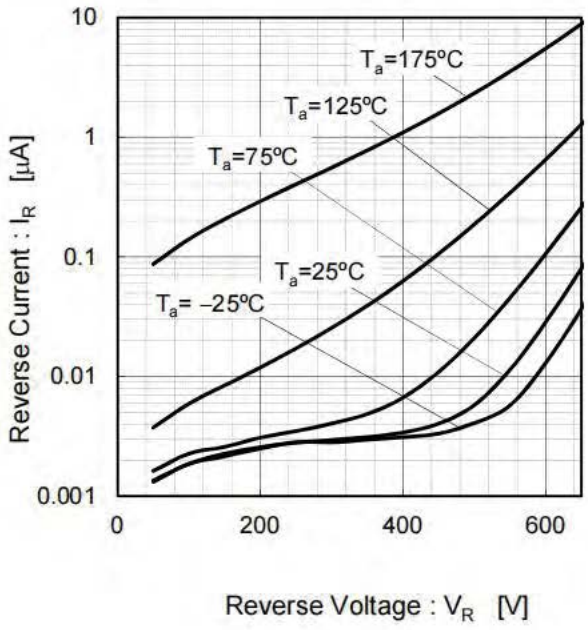


Fig.4 V_R-C_t Characteristics

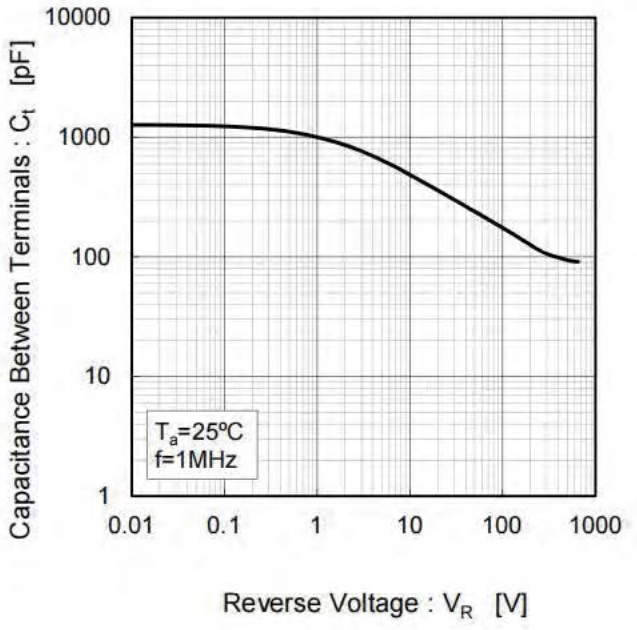


Fig.5 Typical Transient Thermal Resistance vs. Pulse Width

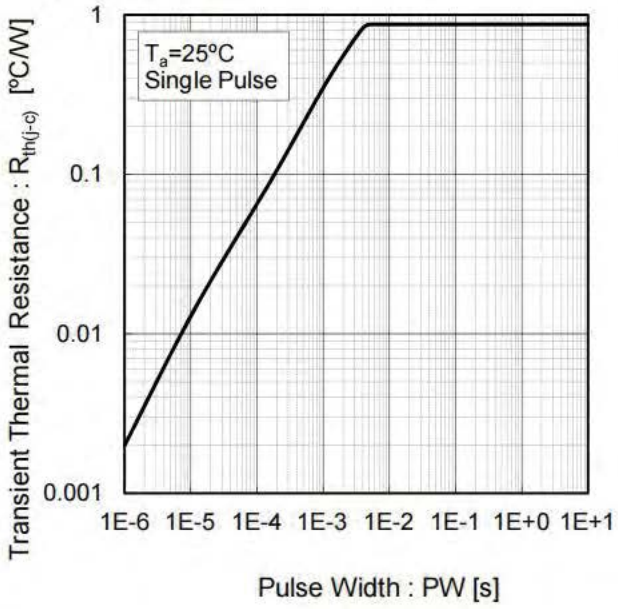
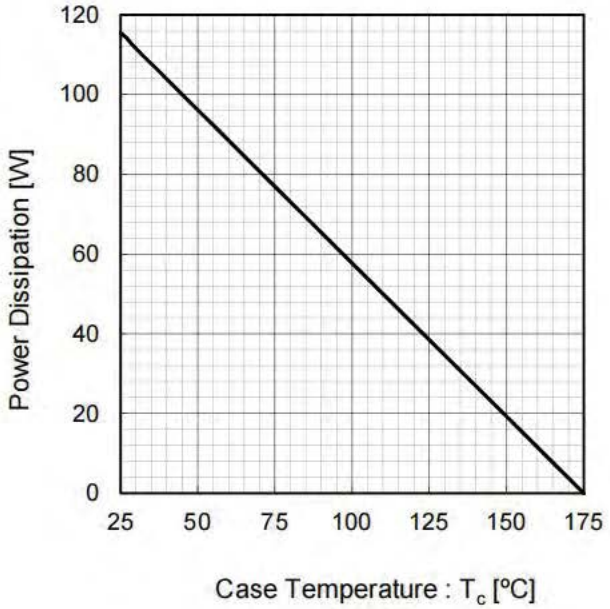
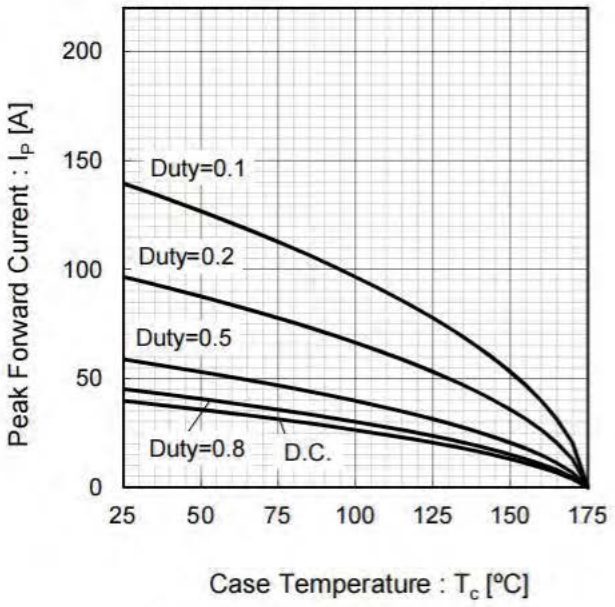


Fig.6 Power Dissipation



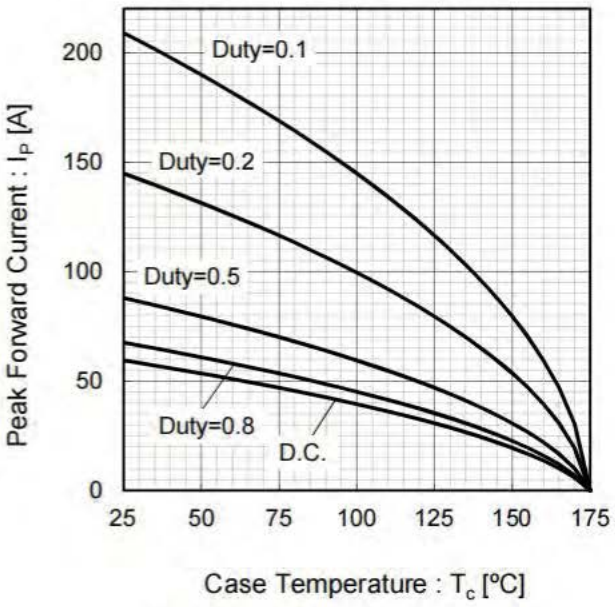
Typical Performance

Fig.7*3 Maximum peak forward current derating curve I_P - T_c



*3 Based on max Vf, max $R_{th(j-c)}$
Valid for switching of above 10kHz,
excluding D.C. curve.

Fig.8*4 Typical peak forward current derating curve I_P - T_c (Not guaranteed)



*4 Based on typ Vf, typ $R_{th(j-c)}$
Typical value, not guaranteed
Valid for switching of above 10kHz,
excluding D.C. curve

Fig.9 Surge non-repetitive forward current vs. Pulse width (Sinusoidal waveform)

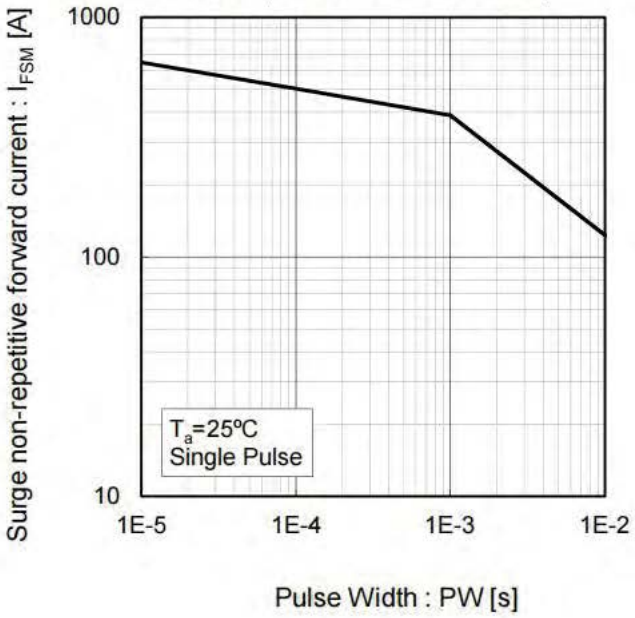
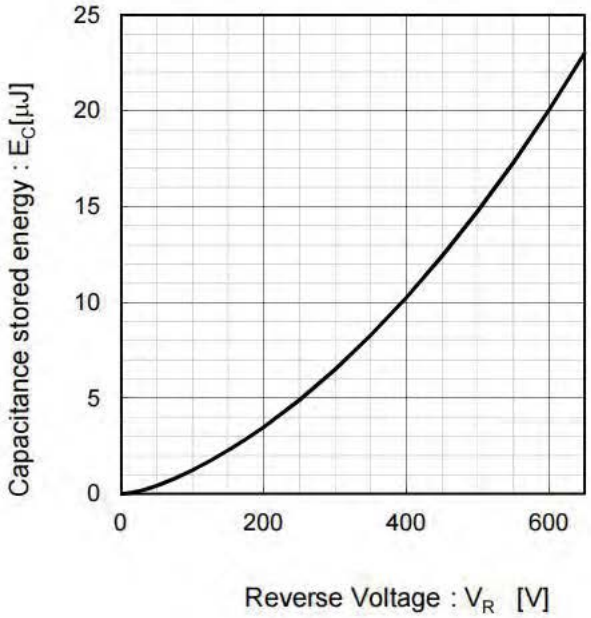
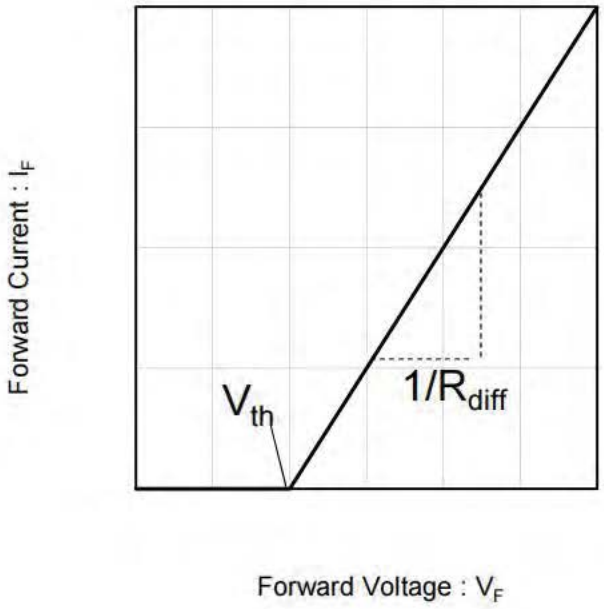


Fig.10 Typical capacitance store energy



Typical Performance

Fig.11 Equivalent forward current curve



$$V_F = V_{th} + R_{diff} I_F$$

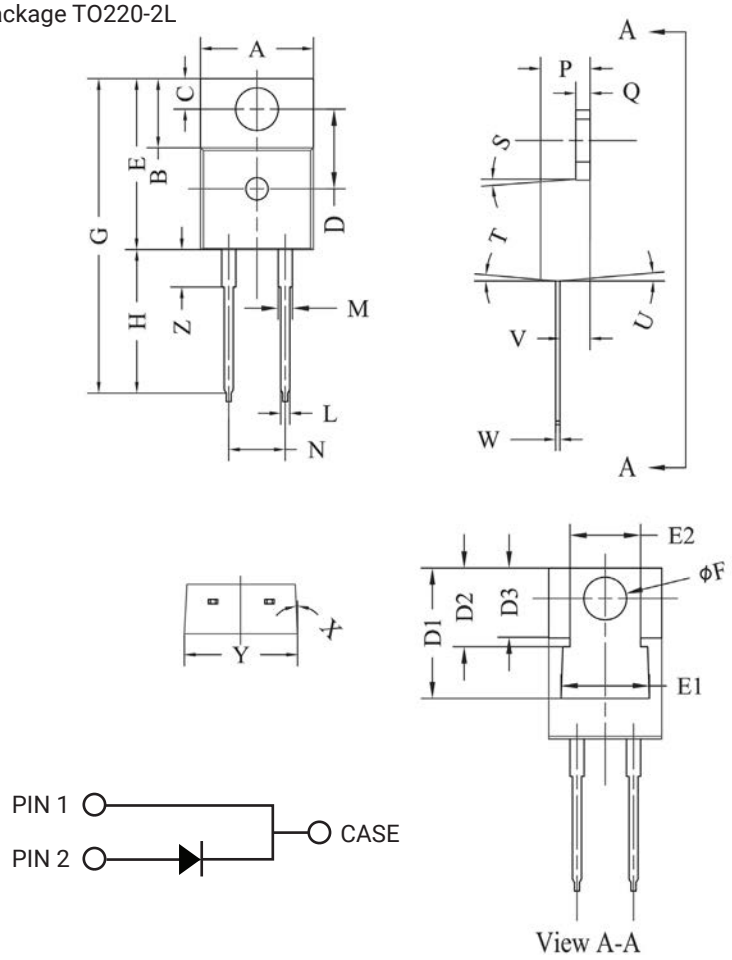
$$V_{th}(T_j) = a_0 + a_1 T_j$$
$$R_{diff}(T_j) = b_0 + b_1 T_j + b_2 T_j^2$$

Symbol	Typical Value	Unit
a_0	9.66E-01	V
a_1	– 1.10E-03	V/°C
b_0	1.76E-02	Ω
b_1	3.73E-05	Ω/°C
b_2	3.84E-07	$\Omega/°C^2$

T_j in ºC; -55 ºC < T_j < 175ºC ; I_F < 40A

Package Dimensions

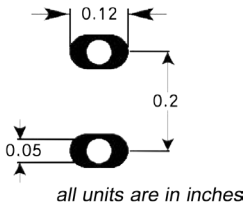
Package TO220-2L



POS	Inches		Millimeters	
	Min	Max	Min	Max
A	.381	.410	9.677	10.414
B	.235	.255	5.969	6.477
C	.100	.120	2.540	3.048
D	.223	.337	5.664	8.560
D1	.457-.490		11.60-12.45 typ	
D2	.277-.303 typ		7.04-7.70 typ	
D3	.244-.252 typ		6.22-6.4 typ	
E	.590	.615	14.986	15.621
E1	.302	.326	7.68	8.28
E2	.227	251	5.77	6.37
F	.143	.153	3.632	3.886
G	1.105	1.147	28.067	29.134
H	.500	.550	12.700	13.970
L	.025	.036	.635	.914
M	.045	.055	1.143	1.550
N	.195	.205	4.953	5.207
P	.165	.185	4.191	4.699
Q	.048	.054	1.219	1.372
S	3°	6°	3°	6°
T	3°	6°	3°	6°
U	3°	6°	3°	6°
V	.094	.110	2.388	2.794
W	.014	.025	.356	.635
X	3°	5.5°	3°	5.5°
Y	.385	.410	9.779	10.414
z	.130	.150	3.302	3.810

NOTE:
1. Dimension L, M, W apply for Solder Dip Finish

Recommended Solder Pad Layout



all units are in inches

TO220-2L

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