DFS15HF12DEA2

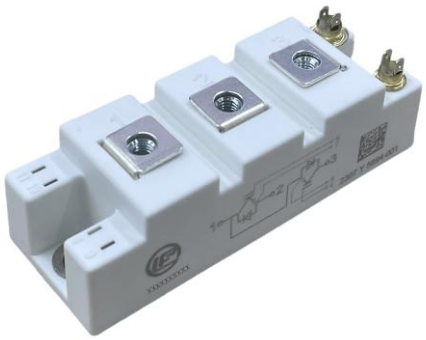
1200V/15mΩ Half Bridge SiC Module

Description

The DFS15HF12DEA2 is 34mm package SiC power module. It offers lower losses and higher energy for applications such as motor drives, inverter, UPS and welding applications.

Features

- 1200V/15mΩ
- High Frequency Operation
- ZTA substrate
- Fast intrinsic diode with low reverse recovery



Applications

- Motor drives
- Inverter
- UPS
- Welding application

Circuit diagram

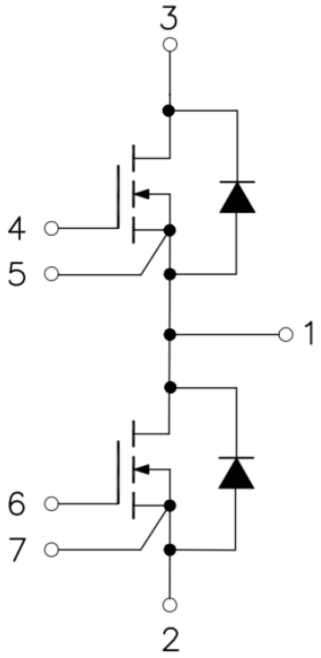


Figure 1. Out drawing & circuit diagram for DFS15HF12DEA2

Pin Configuration and Marking Information

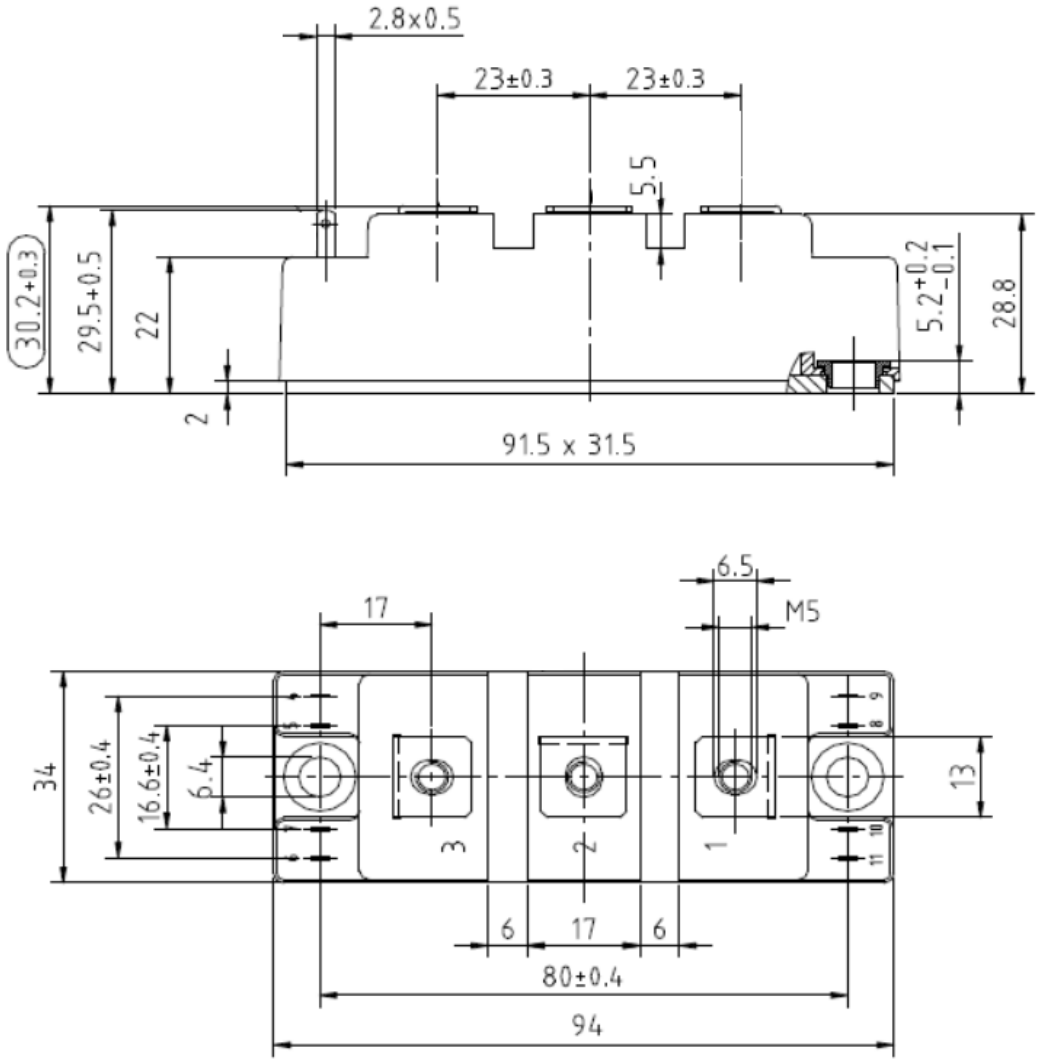


Figure 2. Pin configuration

Module

Parameter	Conditions	Value	Unit
Isolation Voltage	RMS, f = 50Hz, t =1min	2.5	kV
Material of module baseplate	-	Cu	-
Creepage distance	terminal to heatsink terminal to terminal	26 21	mm
Clearance	terminal to heatsink terminal to terminal	23.6 10	mm
CTI	-	>200	-
Module lead resistance, terminals – chip	T_C =25°C	0.8	m
Mounting torque for module mounting	M5, M6	3 to 6	Nm
Weight	-	160	g

Maximum Ratings (SiC MOSFET, T_j =25°C unless otherwise specified)

Symbol	Parameter	Conditions	Ratings	Unit
V_{DSS}	Drain-Source Voltage	G-S Short	1200	V
V_{GSS}	Gate-Sourse Voltage	D-S Short, AC frequency ⩾1Hz, Note1	-10 to 23	V
I_{DS}	DC Continuous Drain Current	T_C =25°C, V_{GS} =18V	126	A
		T_C =100°C, V_{GS} =18V	90	A
I_{SD}	Source-Drain Current(diode)	T_C =25°C, with ON signal	126	A
		T_C =100°C, with ON signal	90	A
I_{DSM}	Pulse Drain Current	T_C =25°C, Pulse width =1ms, V_{GS} =18V, Note2	340	A
P_{tot}	Total Power Dissipation	T_C =25°C	893	W
T_{jmax}	Max Junction Temperature	-	175	°C
T_{stg}	Storage Temperature	-	-55 to 175	°C

Note1: Recommended Operating Value, +18V/-4V

Note2: Pulse width limited by maximum junction temperature

SiC MOSFET Electrical characteristics (T_j =25°C unless otherwise specified, chip)

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max	
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	V_{GS} =0V, I_D =100μA		1200	-	-	V
$V_{GS(th)}$	Gate-source threshold Voltage	I_D =27mA, V_{DS} =V_{GS}	T_j =25°C	2.0	2.8	3.7	V
			T_j =150°C	-	2.1	-	
			T_j =175°C	-	2.0	-	
I_{DSS}	Zero gate voltage drain Current	V_{DS} =1200V, V_{GS} =0V	Tj =25°C	0	1	50	μA
I_{GSS}	Gate-Source Leakage Current	V_{GS} =18V, V_{DS} =0V	T_j =25°C	0	1	200	nA
$R_{DS(on)}$ (Chip)	Static drain-source On-state resistance	I_D =80A V_{GS} =+18V	T_j =25°C	-	15	18	mΩ
			Tj =150°C	-	25	-	
			T_j =175°C	-	28	-	
$V_{DS(on)}$ (Chip)	Static drain-source On-state Voltage	I_D =80A V_{GS} =+18V	T_j =25°C	-	1.89	-	V
			Tj =150°C		3.15		
			T_j =175°C	-	3.53	-	
C_{iss}	Input Capacitance	V_D =1000V, V_{GS} =0V f =1MHz, V_{AC} =25mV		-	4.3	-	nF
C_{oss}	Output Capacitance			-	0.214	-	
C_{rss}	Reverse transfer Capacitance			-	0.019	-	
R_{Gint}	Internal gate resistor	f =1MHz, I_D=0V		-	1.4	-	Ω
Q_g	Total gate charge	V_{DD} =800V, I_D =80A, V_{GS} =+18/-4V		-	222	-	nC
Q_{gs}	Gate-source charge			-	55	-	
Q_{gd}	Gate-drain charge			-	88	-	
$R_{th(j-c)}$	FET Thermal Resistance	Junction to Case, Note1		-	0.224	-	°C /W

Note1: Assumes Thermal Conductivity of grease is 2.8 W/m・K and thickness is 50um.

Body Diode Electrical characteristics (T_j =25°C unless otherwise specified, chip: Target)

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max	
V_{SD}	Body Diode Forward Voltage	V_{GS} =-4V, I_{SD} =40A	T_j =25°C	-	4.1	-	V
			T_j =150°C	-	3.7	-	
			T_j =175°C	-	3.6	-	
I_S	Continuous Diode Forward Current	V_{GS} = -4V	T_j =25°C	-	-	97	A
T_{rr}	Reverse recovery time	V_{DD} =800V, I_D =80A V_{GS} =+18/-4V, R_g =1Ω Inductive load switching operation	T_j =25°C	-	21	-	ns
Q_{rr}	Reverse recovery charge		T_j =25°C	-	470	-	nC
I_{rr}	Diode switching power dissipation		T_j =25°C	-	40	-	A

Test Conditions

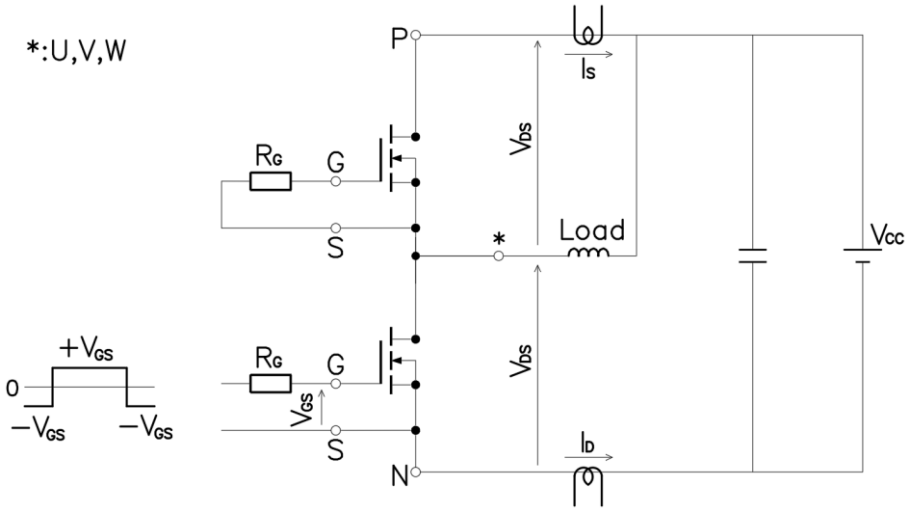


Figure 3. Switching time measure circuit

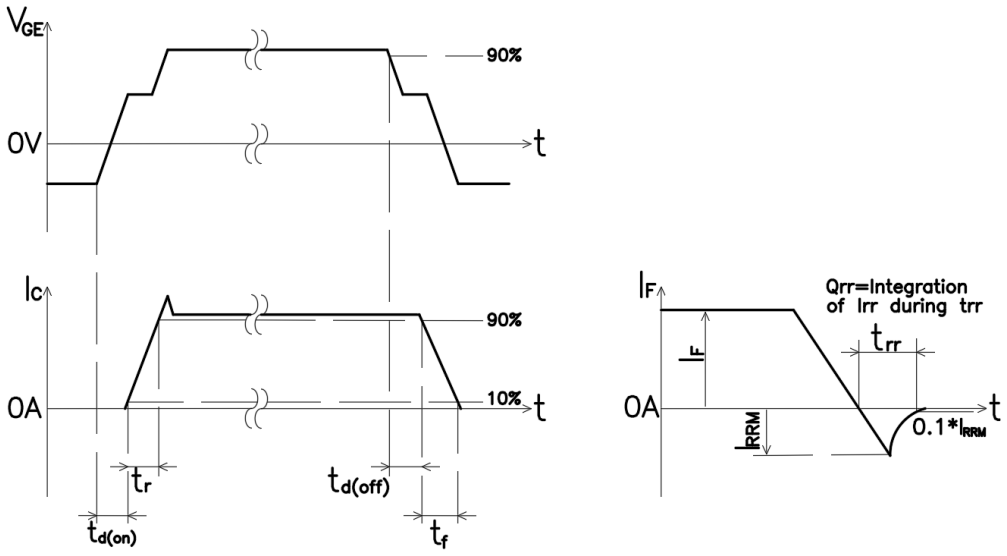


Figure 4. Switching time definition

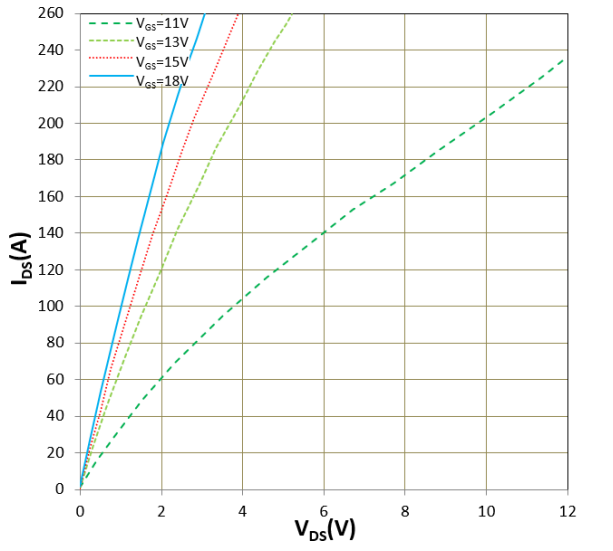


Figure 5. I_{DS} vs V_{DS}
T_j =25°C

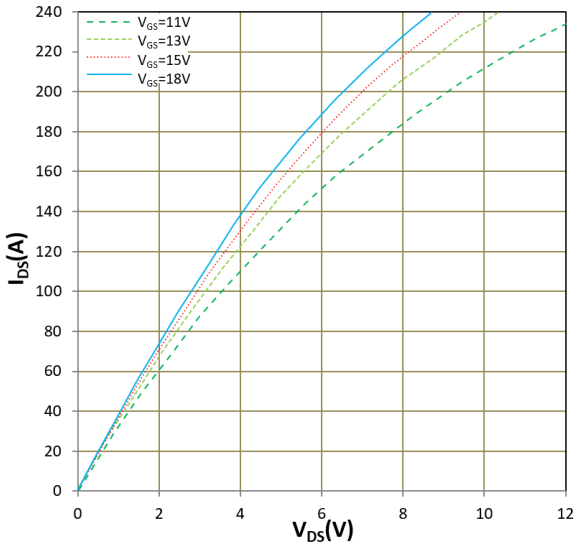


Figure 6. I_{DS} vs V_{DS}
T_j =175°C

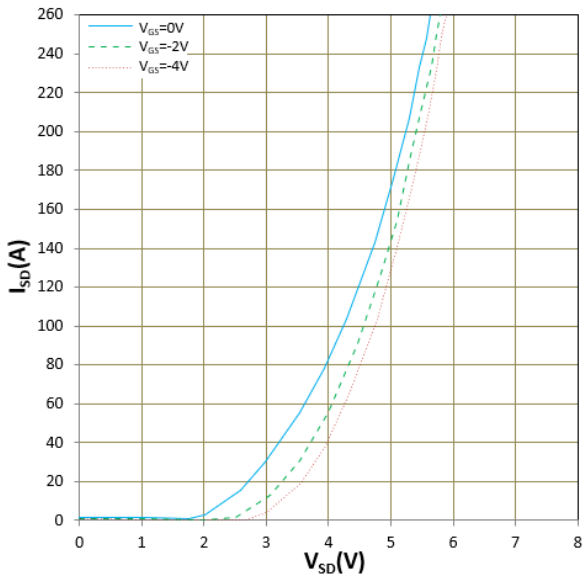


Figure 7. I_{SD} vs V_{SD}
T_j =25°C

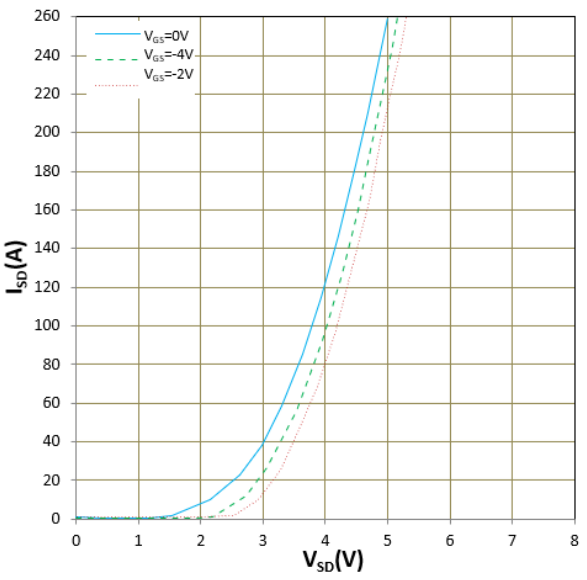


Figure 8. I_{SD} vs V_{SD}
T_j =175°C

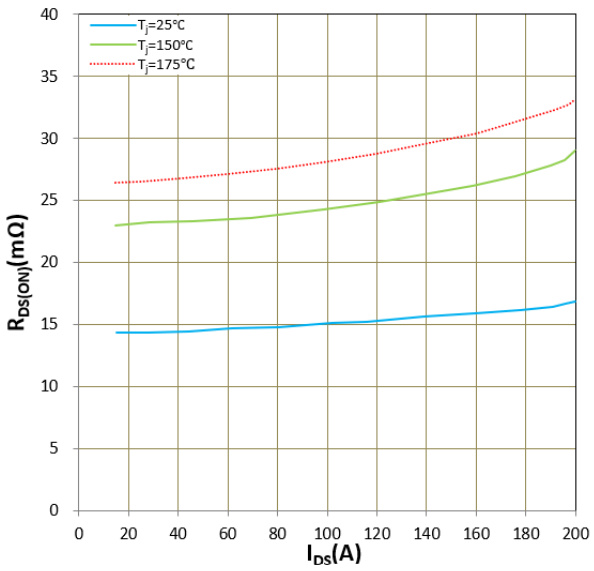


Figure 9.$R_{DS(ON)}$ vs I_{DS}

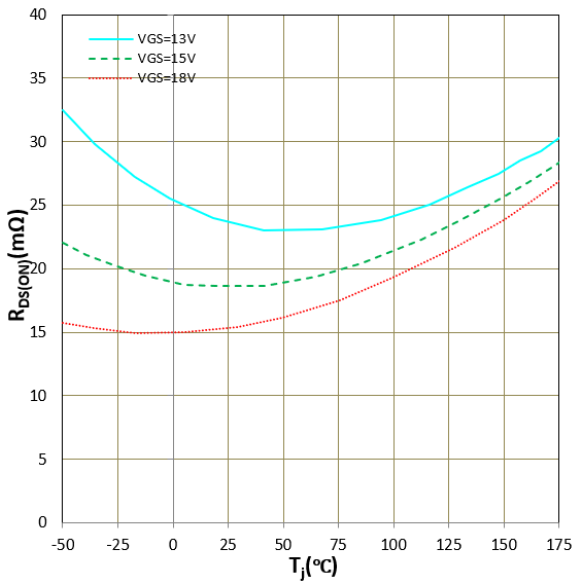


Figure 10.$R_{DS(ON)}$ vs T_j
I_{DS}=80A

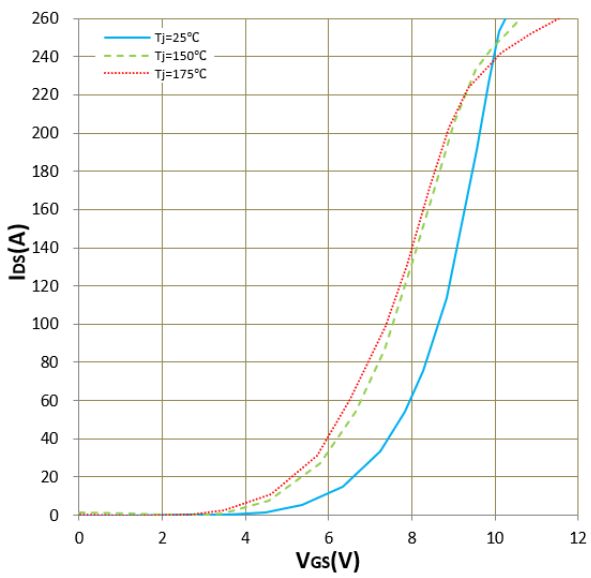


Figure 11. I_{DS} vs V_{GS}
V_{DS} =20V

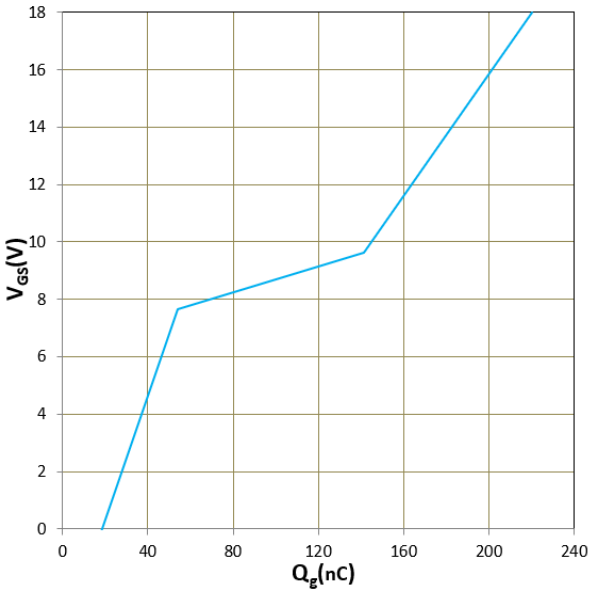


Figure 12. Gate charge
V_{DS}=800V, I_{DS}=80A, I_{GS}=1mA, T_j=25℃

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