CMSG120N013MDG

1200-V Hybrid IGBT with Built in SiC MOSFET

Features

- Hybrid IGBT with Built in SiC MOSFET & FRED
- The device with Dual Gate pad for circuit design optimize
- High efficiency in hard switching and resonant topologies
- Easy paralleling capability due to positive temperature coefficient in $V_{CE(on)}$
- Pb-free lead plating
- RoHS compliant

Benefits

- Low EMI
- Low Gate Charge QG
- Low Switching Loss & Soft Switching
- Higher Switching Frequency up to 150kHz

Typical Applications

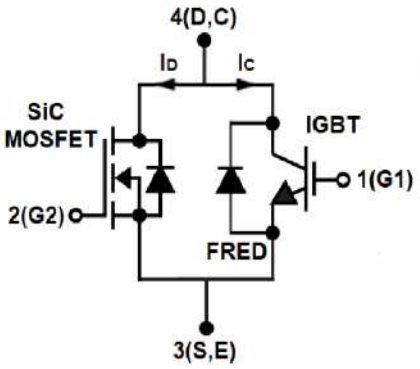
- Industrial UPS
- Charger
- Energy Storage
- Three-level Solar String Inverter
- Welding
- Inductive cooking
- Inverterized microwave ovens
- High power converters
- Soft switching applications

Package type：SOT-227

IGBT:		SiC MOSFET	
G1	Gate	G2	Gate
C	Collector	D	Drain
E	Emitter	S	Source

RoHS Compliant

Graphic Symbol

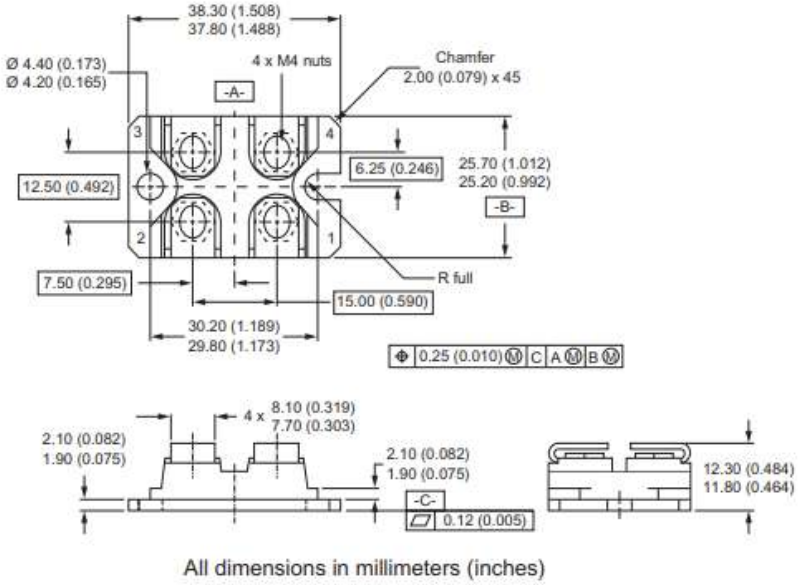


IGBT	
G1	Gate
C	Collector
E	Emitter

SiC MOSFET	
G2	Gate
D	Drain
S	Source

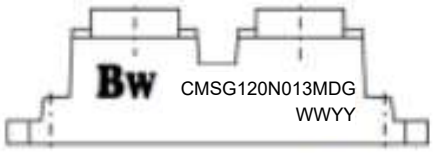
$V_{CE(on)}$ typ. = 1.73V & $R_{CE(on)}$ typ. = 13.3mΩ
@ $V_{G1E} = V_{G2S}$ = 15V, I_C = 130A
Equivalent MOSFET Parameters
$R_{DS(on)}$ typ. = 13.3mΩ @ V_{GS} = 15V, I_D = 130A

Package Dimension



All dimensions in millimeters (inches)

Marking



CMSG120N013MDG

1200-V Hybrid IGBT with Built in SiC MOSFET

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings			
Symbol	**Parameter**	**Value**	**Units**
V_{CE}	Collector-Emitter Voltage, Tvj ≥25°C	1200	V
I_C	DC Collector & Drain current, Tc = 25°C	260	A
	DC Collector & Drain current, Tc = 100°C	130	
$I_{C\ pulse}$	Pulsed collector current, tp ≤ 1ms	520	A
I_F	Diode forward current, Tc = 25°C	200	A
	Diode forward current, Tc = 100°C	100	
$I_{F\ pulse}$	Diode pulsed current, tp ≤ 1ms	200	A
V_{GE}	V_{G1E} =V_{G2S} voltage Transient V_{G1E} =V_{G2S} voltage (tp ≤10μs, D < 0.010)	±20	V
P_{tot}	Power Dissipation (T_C =25°C)	750	W
T_{VJ}	Operating Junction Temperature	-55…175	°C
T_{STG}	Storage Temperature	-55…175	°C

Thermal Resistance Ratings			
Symbol	**Parameter**	**Maximum**	**Units**
$R_{\theta JA}$	Maximum Junction-to-Ambient	0.2	°C/W
$R_{\theta JC}$	IGBT Maximum Junction-to-Case	0.8	°C/W
$R_{\theta JC}$	SiC MOSFET Maximum Junction-to-Case	0.38	°C/W

CMSG120N013MDG

1200-V Hybrid IGBT with Built in SiC MOSFET

Static Electrical Characteristics, (T_{VJ}=25°C unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GE\ (th)}$	Gate-emitter threshold voltage	V_{CE}=V_{G1E}=V_{G2S} , I_C=6mA	2.0	2.7	4.0	V
$V_{(BR)CES}$	Collector-emitter breakdown voltage	V_{G1E}=V_{G2S}=0V , I_C=0.5mA	1200	-	-	V
$V_{CE(on)}$	Collector-Emitter saturation voltage	V_{G1E} =V_{G2S} =15V, I_C =130A ,Tvj=25°C	-	1.73	2.1	V
		V_{G1E} =V_{G2S}=15V, I_C =130A ,Tvj=100°C	-	1.9	2.3	
$R_{CE(on)}$	Collector-Emitter saturation resistor	V_{G1E} =V_{G2S} =15V, I_C =130A ,Tvj=25°C	-	13.3	-	mΩ
		V_{G1E} =V_{G2S}=15V, I_C =130A ,Tvj=100°C	-	14.6	-	
V_F	Diode Forward Voltage	V_{G1C} =V_{G2D}=0V, I_F =100A Tvj=25°C	-	1.9	-	V
		V_{G1C} =V_{G2D} =0V, I_F =100A Tvj=100°C	-	1.8	-	
I_{GES}	Gate-Emitter leakage current	V_{CE}=0V, V_{G1E}=V_{G2S} =20V	-	-	200	nA
		V_{CE}=0V, V_{G1E}=V_{G2S} =-10V	-	-	-200	
I_{CES}	Zero gate voltage collector current	V_{CE}=1200V, V_{G1E}=V_{G2S}=0V Tvj=25°C	-	-	50	uA
		V_{CE}=1200V, V_{G1E}=V_{G2S}=0V Tvj=175°C	-	2.5	-	mA

IGBT AC Electrical Characteristics, (T_{VJ}=25°C unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
C_{IES}	Input Capacitance	V_{CE}=25 V, V_{G1E} = V_{G2S} =0 V, f=100 KHz	-	6700	-	pF
C_{OES}	Output Capacitance		-	158	-	
C_{RES}	Reverse Transfer Capacitance		-	50	-	
Q_g	Total Gate Charge	V_{CC}=600 , V_{G1E}=V_{G2S} =15V, I_C =20A	-	1.1	-	uC
$t_{d(on)}$	Turn-On Delay Time	V_{CE}=600 V, V_{G1E}=V_{G2S} =15V, I_C =100A R_{Gon} = 3.3Ω	-	160	-	ns
t_r	Rise Time		-	60	-	
$t_{d(off)}$	Turn-Off Delay Time		-	275	-	
t_f	Fall Time		-	126	-	
E_{on}	Turn-On Switching Energy		-	3.9	-	mJ
E_{off}	Turn-Off Switching Energy		-	7.6	-	

Diode AC Electrical Characteristics, (T_{VJ}=25°C unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
t_{rr}	Diode reverse recovery time	I_F = 50 A, dI_F/dt = 200 A/μs, V_R = 400 V	-	175	-	ns
I_{rr}	Diode peak reverse current		-	12.5	-	A
Q_{rr}	Diode recovery charge		-	1100	-	nC

CMSG120N013MDG

1200-V Hybrid IGBT with Built in SiC MOSFET

- **Typical Electrical Characteristics**

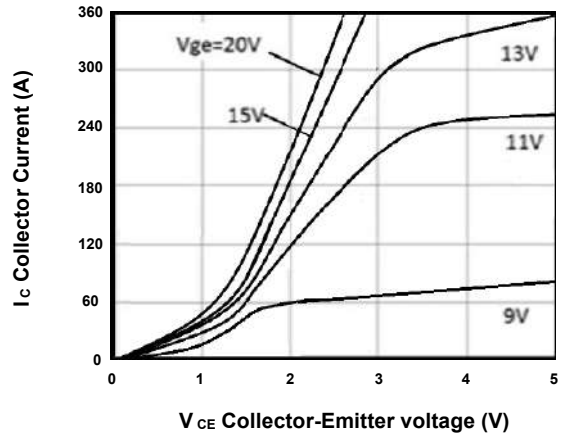


FIG.1-Output Characteristics Tvj = 25°C

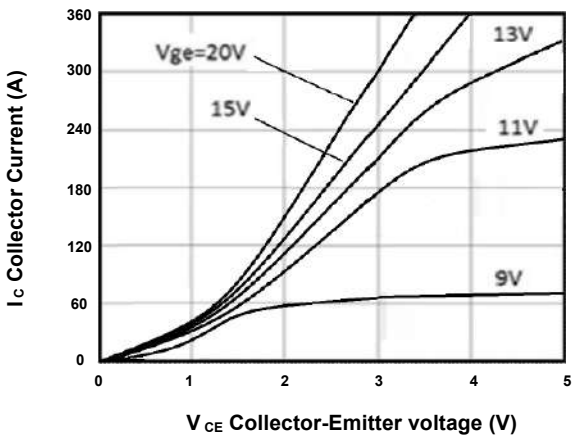


FIG.2- Output Characteristics Tvj = 150°C

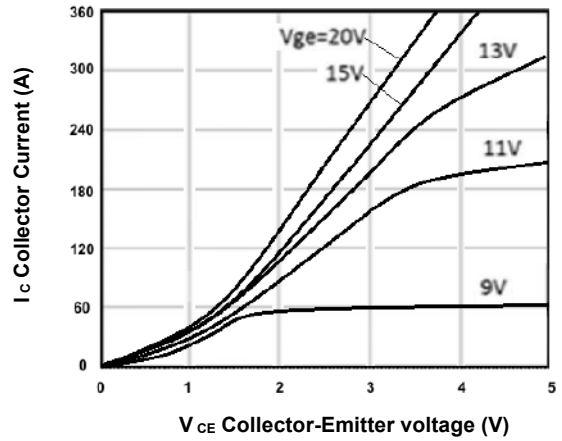


FIG.3-Output Characteristics Tvj = 175°C

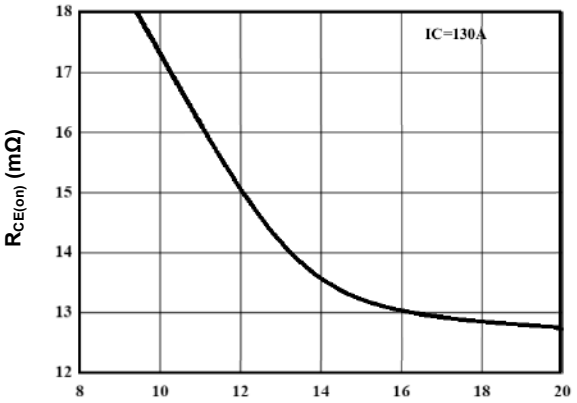


FIG.4-Collector-Emitter saturation resistor vs VGE

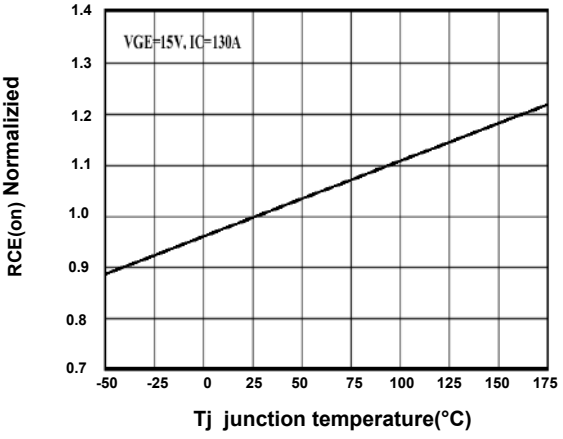


FIG.5- $R_{CE(on)}$ Normalized vs Junction temperature

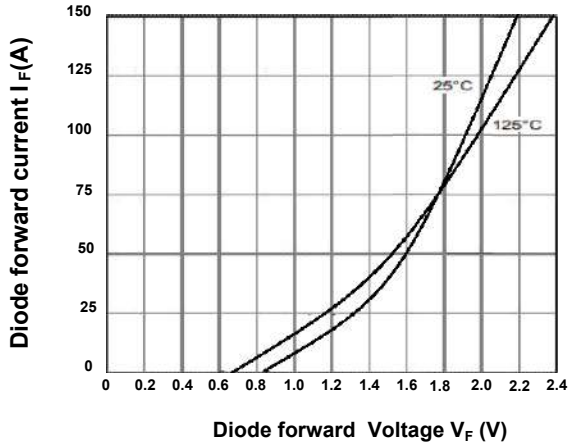


FIG.6- Diode forward Characteristics

CMSG120N013MDG

1200-V Hybrid IGBT with Built in SiC MOSFET

- **Typical Electrical Characteristics**

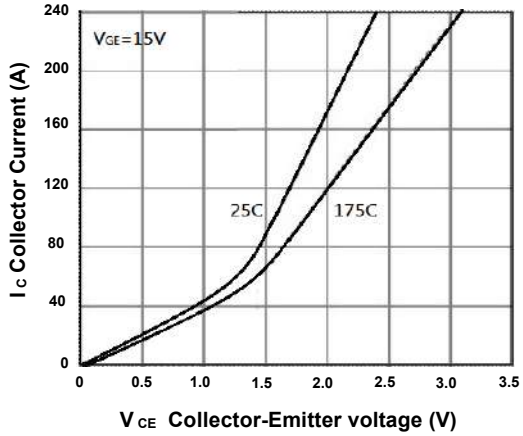


FIG.7- I_C Collector Current vs V_{CE} Collector-Emitter voltage

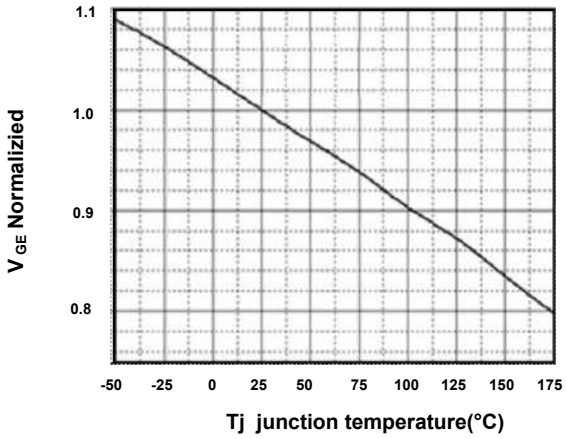


FIG.8- V_{GE} Normalized vs Junction temperature

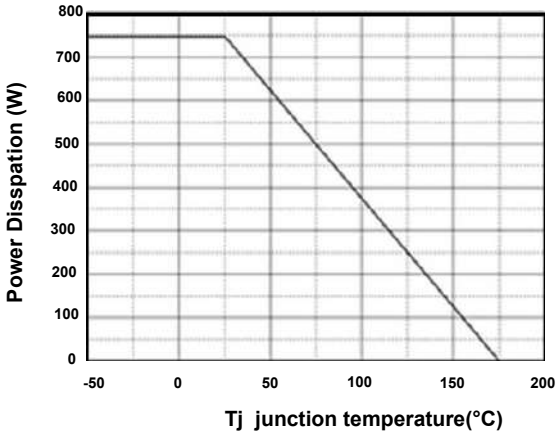


FIG.9- Power Disspation vs Junction Temperature

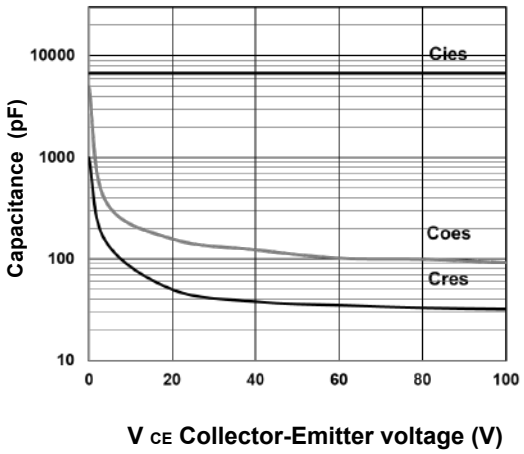


FIG.10- Capacitance

CMSG120N013MDG

1200-V Hybrid IGBT with Built in SiC MOSFET

Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Bruckewell Technology Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, “Bruckewell”), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Bruckewell makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Bruckewell disclaims

(i) Any and all liability arising out of the application or use of any product.

(ii) Any and all liability, including without limitation special, consequential or incidental damages.

(iii) Any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Bruckewell’s knowledge of typical requirements that are often placed on Bruckewell products in generic applications.

Such statements are not binding statements about the suitability of products for a particular application. It is the customer’s responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and/or specifications may vary in different applications and performance may vary over time.

Product specifications do not expand or otherwise modify Bruckewell’s terms and conditions of purchase, including but not limited to the warranty expressed therein.