

GCS600F120ECD

EconoDual module with SiC MOSFET and SiC SBD

V_{DS}	1200 V
$I_{D\ nom}$	600 A
$R_{DS(on)}$	2.67 m

Electrical features

- Ultra Low Loss
- High-Frequency Operation
- Zero Reverse Recovery Current from Diode
- Zero Turn-Off Tail Current from MOSFET
- Low Stray Inductive Design <10nH
- $T_{vj\ max} = 175\ ^\circ\text{C}$

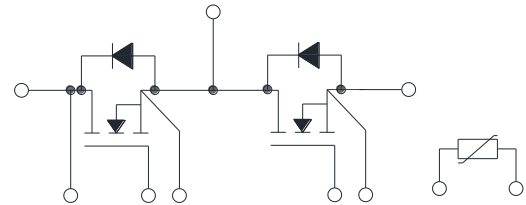
Mechanical features

- High Power Density
- Direct Cooled Base Plate
- High Reliability Si_3N_4 Insulator
- Integrated NTC temperature sensor
- Standard Package

Applications

- Motor Drives
- Solar and Wind Inverters
- DC/AC Converters

Circuit Diagram



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

Parameter	Symbol	Conditions	Value	Unit
Drain-Source Voltage	$V_{DS\ max}$		1200	V
Continuous Drain Current	I_D	$V_{GS}=18\text{V}, T_c=25\ ^\circ\text{C}$	600	A
		$V_{GS}=18\text{V}, T_c=80\ ^\circ\text{C}$	500	
Gate- Source Voltage	$V_{GS\ max}$	Absolute Maximum Values	-8/+22	V
Gate-Source Voltage	$V_{GS\ op}$	Recommended Operational Values	-4/+18	V
Operating Junction Temperature	$T_{vj\ op}$		-40~+175	$^\circ\text{C}$

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

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Gate Threshold Voltage	$V_{GS(th)}$	$I_D=150\text{mA}$	1.9	2.4	4	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=1200\text{V}, V_{GS}=0\text{V}$		10	1000	μA
Gate-Source Leakage Current	I_{GSS}	$V_{GS}=-8\text{V}/+22\text{V}$		100	3000	nA
On State Resistance	$R_{DS(on)}$	$V_{GS}=18\text{V}, I_{DS}=600\text{A}$		2.67	3.4	$\text{m}\Omega$
		$V_{GS}=18\text{V}, I_{DS}=600\text{A}, T_{vj}=175^{\circ}\text{C}$		4.3		$\text{m}\Omega$
Input Capacitance	C_{iss}	$V_{DS}=1000\text{V}, V_{AC}=25\text{mV}$ $f=1\text{MHz}$		42		nF
Output Capacitance	C_{oss}			2.5		nF
Reverse Transfer Capacitance	C_{rss}			0.17		nF
Gate-Source Charge	Q_{GS}	$V_{DS}=600\text{V}, V_{GS}=-4\text{V}/+18\text{V}$ $I_D=600\text{A}$		268.3		nC
Gate-Drain Charge	Q_{GD}			1365		nC
Total Gate Charge	Q_G			2173.3		nC
Internal gate resistor	R_{Gint}	$T_{vj} = 25^{\circ}\text{C}$		0.5		
Turn-On Delay Time	$t_{d(on)}$	$I_D=600\text{A}$ $V_{DS}=600\text{V}$ $V_{GS}=-4\text{V}/+18\text{V}$ $R_G=5.0\Omega$	$T_{vj}=25^{\circ}\text{C}$		231.3	ns
			$T_{vj}=125^{\circ}\text{C}$		133.3	
			$T_{vj}=150^{\circ}\text{C}$		116	
Rise Time	t_r	$I_D=600\text{A}$ $V_{DS}=600\text{V}$ $V_{GS}=-4\text{V}/+18\text{V}$ $R_G=5.0\Omega$	$T_{vj}=25^{\circ}\text{C}$		272	ns
			$T_{vj}=125^{\circ}\text{C}$		259.3	
			$T_{vj}=150^{\circ}\text{C}$		259.4	
Turn-Off Delay Time	$t_{d(off)}$	$I_D=600\text{A}$ $V_{DS}=600\text{V}$ $V_{GS}=-4\text{V}/+18\text{V}$ $R_G=5.0\Omega$	$T_{vj}=25^{\circ}\text{C}$		666	ns
			$T_{vj}=125^{\circ}\text{C}$		755.4	
			$T_{vj}=150^{\circ}\text{C}$		773.3	
Fall Time	t_f	$I_D=600\text{A}$ $V_{DS}=600\text{V}$ $V_{GS}=-4\text{V}/+18\text{V}$ $R_G=5.0\Omega$	$T_{vj}=25^{\circ}\text{C}$		160	ns
			$T_{vj}=125^{\circ}\text{C}$		150	
			$T_{vj}=150^{\circ}\text{C}$		149.5	

Energy Dissipation during Turn-On Time	E _{on}	I _D =600A V _{DS} =600V V _{GS} =-4V/+18V R _G =5.0Ω L=36μH	T _{vj} =25 °C	35.2	mJ
			T _{vj} =125 °C	31.5	
			T _{vj} =150 °C	29	
Energy Dissipation during Turn-Off Time	E _{off}	I _D =600A V _{DS} =600V V _{GS} =-4V/+18V R _G =5.0Ω L=36μH	T _{vj} =25 °C	22.17	mJ
			T _{vj} =125 °C	22	
			T _{vj} =150 °C	21.3	

Diode Characteristics

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Diode Forward Voltage	V _{SD}	V _{GS} =-4V, I _F =600A		1.4	1.8	V
		V _{GS} =-4V, I _F =600A, T _{vj} =175 °C		2.25	2.7	V
Peak Reverse Recovery Current	I _{rrm}	I _D =600A V _{DS} =600V V _{GS} =-4V	T _{vj} =25 °C	201.5		A
			T _{vj} =125 °C	232.7		
			T _{vj} =150 °C	242		
Reverse Recovery Time	T _{rr}	I _D =600A V _{DS} =600V V _{GS} =-4V	T _{vj} =25 °C	126		ns
			T _{vj} =125 °C	138.6		
			T _{vj} =150 °C	136		
Reverse Recovery Charge	Q _{rr}	I _D =600A V _{DS} =600V V _{GS} =-4V	T _{vj} =25 °C	21		μC
			T _{vj} =125 °C	22.6		
			T _{vj} =150 °C	22		
Reverse Recovery Energy	E _{rec}	I _D =600A V _{DS} =600V V _{GS} =-4V	T _{vj} =25 °C	3.65		mJ
			T _{vj} =125 °C	4.1		
			T _{vj} =150 °C	4.17		

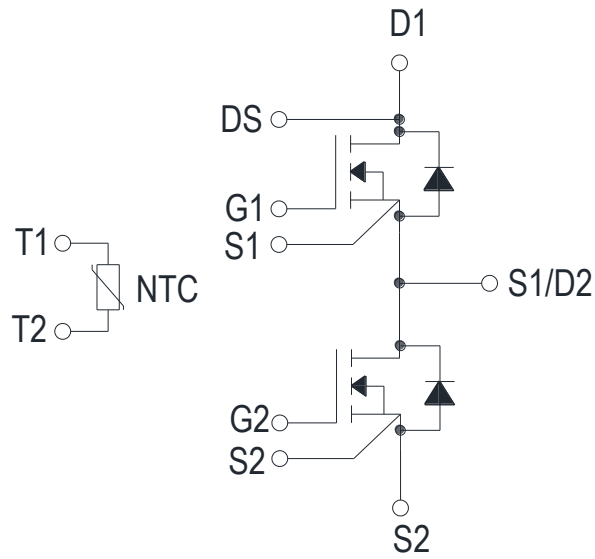
NTC Thermistor

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Rated Resistance	R ₂₅			5.0		kΩ
Deviation of R100	ΔR/R	T _C =100, R ₁₀₀ =493.3Ω	-5		5	%
Power Dissipation	P ₂₅			20.0		mW
B-value	B _{25/50}	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$		3375		K

Module Characteristics

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Case Isolation Voltage	V _{isol}	t=1min, f=50Hz	2500			V
Maximum Junction Temperature	T _{j max}				175	°C
Operating Junction Temperature	T _{vj op}		-40		150	°C
Storage Temperature	T _{stg}		-40		125	°C
Stray Inductance Module	L _{sCE}			10		nH
Thermal Resistance Junction to Case	R _{thJC}	Per MOSFET		0.055	0.065	K/W
Module Electrodes Torque	M _t	Recommended(M6)	3.0		6.0	N·m
Module to Heatsink Torque	M _s	Recommended(M5)	3.0		6.0	
Weight of Module	G			346		g

Circuit diagram



Package outlines

