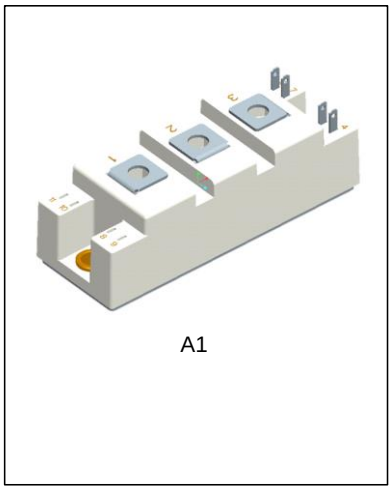
50A, 1200V IGBT MODULE

DESCRIPTION

SGM50HF12A1TFD Module offers the optimum performance for UPS, AC inverter drive and electronic welders.



A1

FEATURES

- 50A, 1200V, $V_{CE(sat)(typ.)}$ =2.3V@I_C=50A
- $V_{CE(sat)}$ with positive temperature coefficient
- High short circuit capability
- Low switching loss
- Isolated copper baseplate using DBC technology

NOMENCLATURE

S G M 5 0 H F 1 2 A 1 T F D

- IGBT Module Series
- Nominal Current: e.g. 50=50A
- Circuit Configuration: Half Bridge
- Voltage: e.g. 12=1200V
- Package Type: Cu Base, DBC, 94mm×34mm×30mm
- Feature and grade: TF-trench-gate short switching time; D- industrial grade

ORDERING INFORMATION

Part No.	Package	Marking	Packing
SGM50HF12A1TFD	A1	SGM50HF12A1TFD	Carton

IGBT, INVERTER (MAXIMUM RATED VALUES) (T_C = 25°C, unless otherwise noted)

Characteristics	Symbol	Test conditions	Ratings	Unit
Collector-emitter voltage	V_{CES}	T_C= 25°C	1200	V
DC collector current	IC nom	T_C= 80°C, T_C max = 150°C	50	A
Repetitive peak collector current	I_{CRM}	t_P = 1 ms	100	A
Total power dissipation	P_{tot}	T_C= 25°C, T_C max = 150°C	320	W
Gate-emitter peak voltage	V_{GES}		+/-20	V

IGBT, INVERTER THERMAL CHARACTERISTICS (T_C = 25°C, unless otherwise noted)

Characteristics	Symbol	Test condition		Min.	Typ.	Max.	Unit
Collector-emitter saturation voltage	V_{CEsat}	I_C=50A,V_{GE}=15V,T_C=25°C		--	2.37	2.8	V
		I_C=50A,V_{GE}=15V,T_C=125°C		--	2.58	--	
		I_C=50A,V_{GE}=15V,T_C=150°C		--	2.63	--	
Gate threshold voltage	V_{GEth}	I_C=250μA,V_{CE}=V_{GE},T_C=25°C		4.3	4.7	6.8	V
Collect-emitter cut-off current	I_{CES}	V_{CE}=1200V,V_{GE}=0V,T_C=25°C		--	--	1	mA
G-E Leakage Current	I_{GES}	V_{CE}=0V,V_{GE}=20V,T_C=25°C		--	--	500	nA
Integrated Gate Resistor	R_{Gint}	T_C=25°C		--	5.3	--	Ω
Input Capacitance	C_{ies}	f=1MHz,T_C=25°C, V_{CE}=25V,V_{GE}=0V		--	3922	--	pF
Output Capacitance	C_{oes}			--	958	--	
Reverse Transfer Capacitance	C_{res}			--	570	--	
Total Gate Charge	Q_G	V_{GE}=-15V---+15V		--	0.42	--	μC
Turn-on Delay Time	$T_{d(on)}$	I_C=50A,V_{CE}=600V V_{GE}=±15V,R_G=35Ω Inductive load	T_C=25°C	--	0.08	--	μs
			T_C=125°C	--	0.09	--	
			T_C=150°C	--	0.10	--	
Rise Time	t_r		TC=25°C	--	0.08	--	μs
			TC=125°C	--	0.09	--	
			TC=150°C	--	0.09	--	
Turn-off Delay Time	$T_{d(off)}$		TC=25°C	--	0.36	--	μs
			TC=125°C	--	0.38	--	
			TC=150°C	--	0.40	--	
Fall Time	T_f		TC=25°C	--	0.17	--	μs
			TC=125°C	--	0.21	--	
			TC=150°C	--	0.30	--	
Turn-on Switching Loss (per pulse)	E_{on}		TC=25°C	--	9.4	--	mJ
			TC=125°C	--	10.2	--	
			TC=150°C	--	12.9	--	
Turn-Off Switching Loss (per pulse)	E_{off}		TC=25°C	--	1.8	--	mJ
			TC=125°C	--	2.8	--	
			T_C=150°C	--	3.1	--	
S-C Data	I_{SC}	V_{GE}=15V,V_{CC}=600V, t_P≤10μs,T_C=25°C		--	220	--	A
Thermal Resistance : Junction-Case	$R_{\theta JC}$	per IGBT		--	0.39	--	K/W
Temperature under on-state	T_{Cop}			-40	--	125	°C

FRD, INVERTER (MAXIMUM RATED VALUES) (T_C = 25°C, unless otherwise noted)

Characteristics	Symbol	Test conditions	Ratings	Unit
Repetitive peak reverse voltage	V_{RRM}	T_C= 25°C	1200	V
DC forward current	I_F		50	A
Repetitive peak forward current	I_{FRM}	t_P= 1ms	100	A
I^2t-value	I^2t	V_R = 0V, t_P = 10 ms, T_C= 125°C	600	A^2s

FRD, INVERTER THERMAL CHARACTERISTICS(T_C = 25°C, unless otherwise noted)

Characteristics		Symbol	Test conditions	Min.	Typ.	Max.	Unit
Forward voltage		V_F	I_F=50A, V_{GE}=0V, T_C=25°C	--	2.1	2.7	V
			I_F=50A, V_{GE}=0V, T_C=125°C	--	1.8	--	
			I_F=50A, V_{GE}=0V,T_C=150°C	--	1.5	--	
Peak reverse Recovery current	T_C=25°C	I_{RM}	I_F=50A,diF/dt=600A/μs, V_R=600V, V_{GE}=-15V	--	50	--	A
	T_C=125°C			--	55	--	
	T_C=150°C			--	60	--	
Recovery charge	T_C=25°C	Q_r		--	3.4	--	μC
	T_C=125°C			--	8.0	--	
	T_C=150°C			--	9.5	--	
Reverse recovery energy (per pulse)	T_C=25°C	E_{rec}		--	0.2	--	mJ
	T_C=125°C			--	0.9	--	
	T_C=150°C			--	1.1	--	
Thermal Resistance, Junction to Case		$R_{\theta JC}$	Per diode	--	0.69	--	K/W
Temperature under switching conditions		T_{Cop}		-40	--	125	°C

IGBT MODULE (MAXIMUM RATED VALUES) (T_C = 25°C, unless otherwise noted)

Characteristics	Symbol	Test conditions	Ratings	Unit
Insulation test voltage	V_{ISOL}	RMS, f =50Hz, t=1min	2.5	kV
Material of module baseplate			Cu	
Material for internal insulation		Insulation (class1,IEC61140)	Al_2O_3	
Creepage distance		Terminal-heatsink	17	mm
		Terminal - terminal	20	
Clearance distance		Terminal-heatsink	17	mm
		Terminal - terminal	9.5	
Comparative tracking index	CTI		> 200	

IGBT MODULE THERMAL CHARACTERISTICS(T_C = 25°C, unless otherwise noted)

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Stray inductance module	L_{sCE}		--	30	--	nH
Module lead resistance, terminal-chip	$R_{CC'+EE'}$	T_C = 25°C, per switch	--	0.65	--	mΩ
Storage temperature	T_{stg}		-40	--	125	°C
Mounting torque	M	Screw M6	3.0	--	5.0	Nm
Terminal connection torque	M	Screw M5	2.5	--	5.0	Nm
Weight	G		--	160	--	g

TYPICAL CHARACTERISTICS CURVE

Figure 1. Typical output characteristics

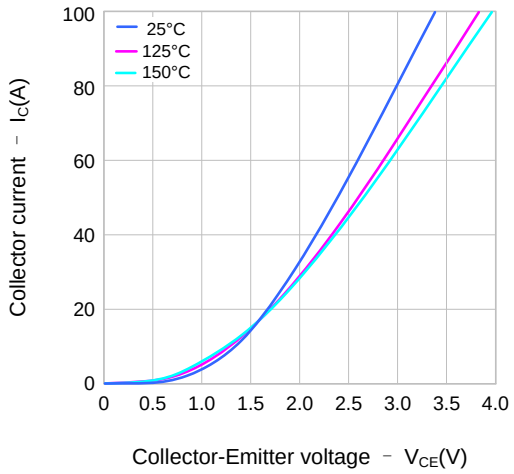


Figure 2. Typical output characteristics (150°C)

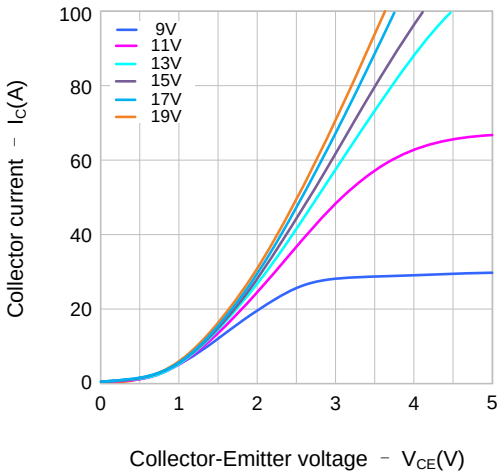


Figure 3. Transfer characteristics

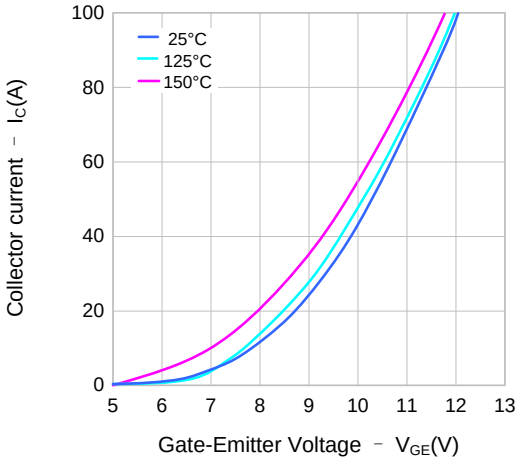


Figure 4. Switching Loss vs. Collector Current

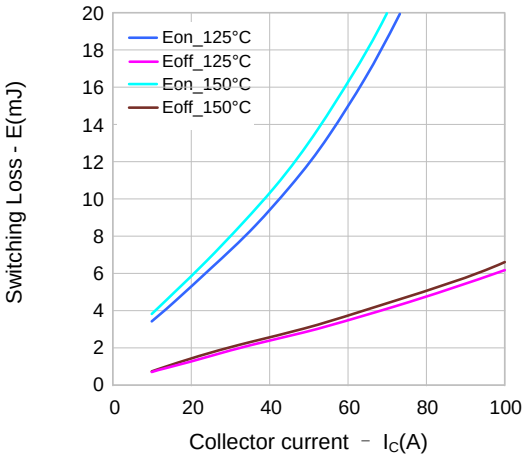


Figure 5. Switching loss vs. Gate resistance

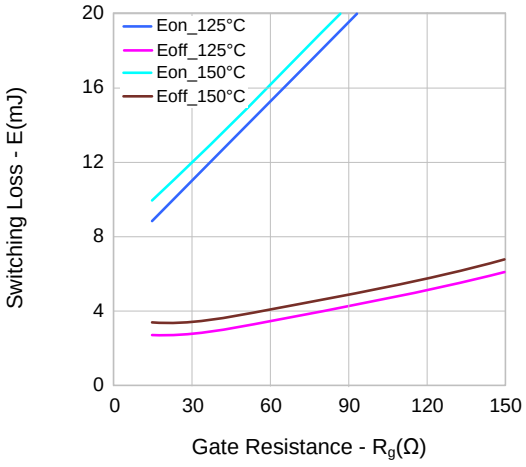
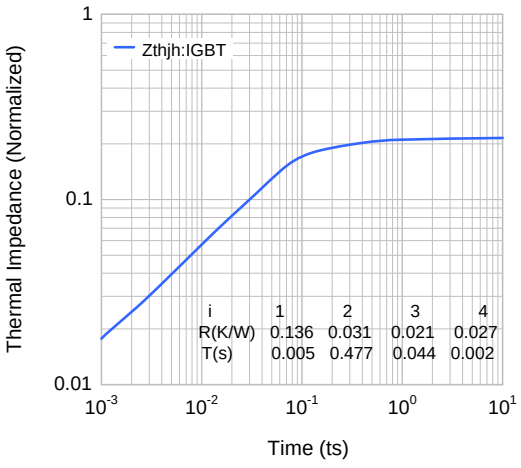


Figure 6. Transient Thermal Impedance



TYPICAL CHARACTERISTICS CURVE (CONTINUED)

Figure 7. Diode Forward Characteristics

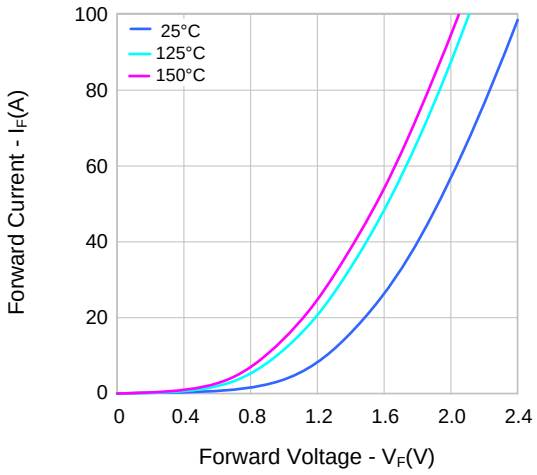


Figure 8. Switching Loss vs. Collector Current

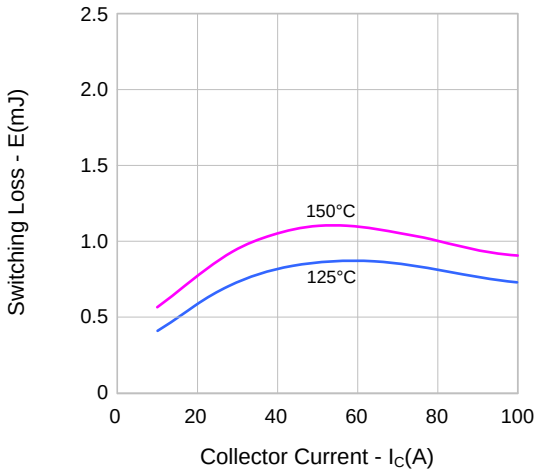


Figure 9. Switching Loss vs. Resistance

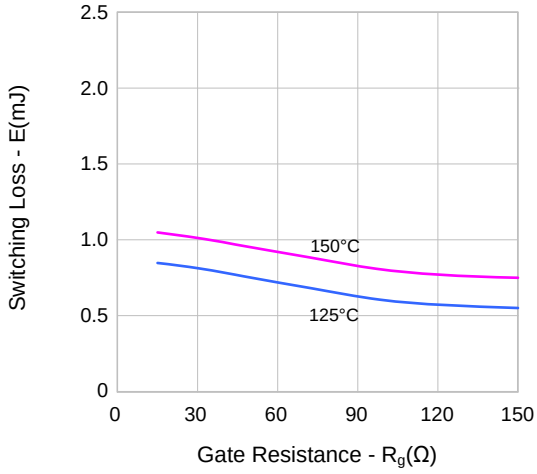
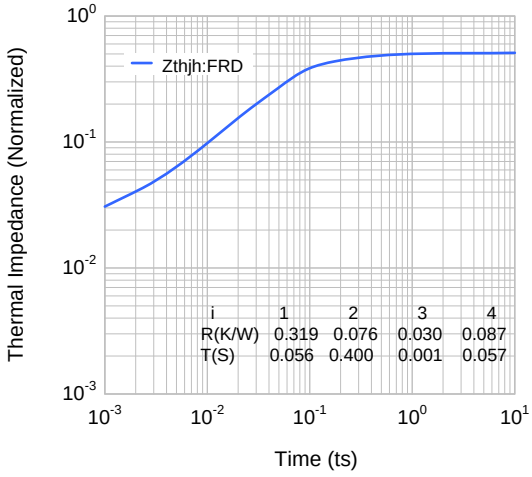
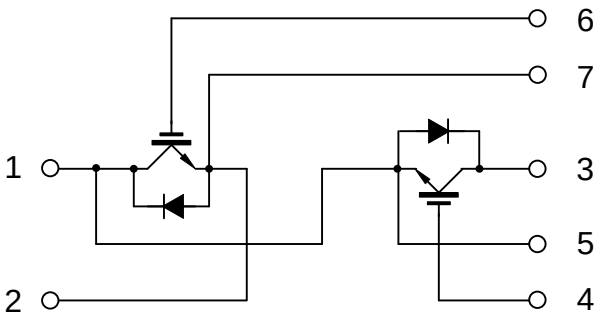


Figure 10. Transient Thermal Impedance

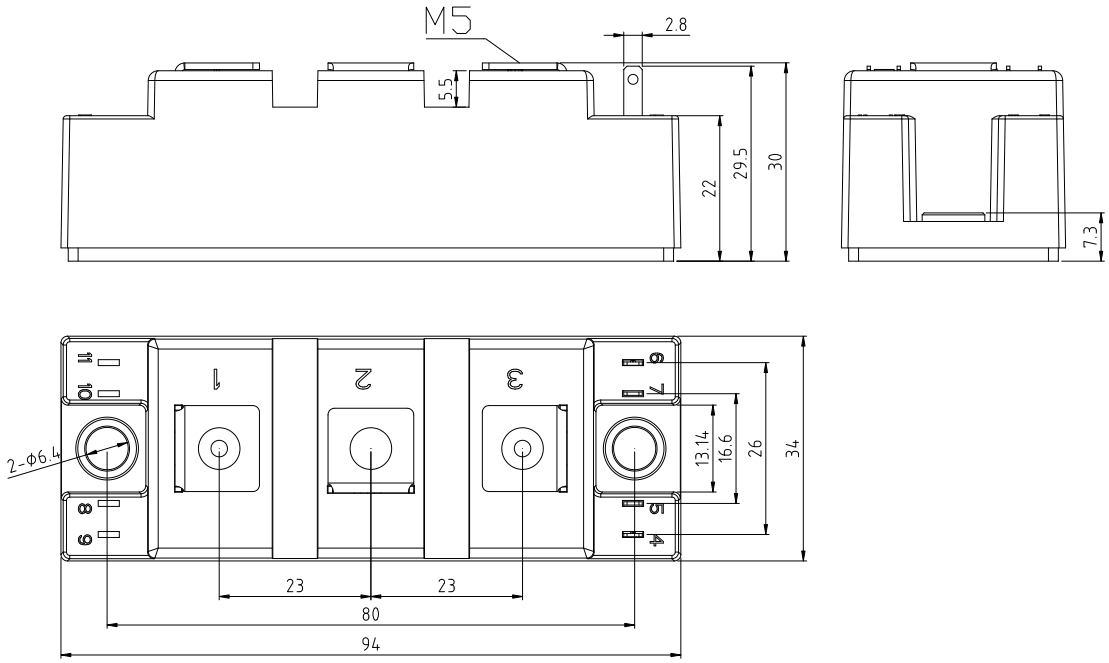


CIRCUIT DIAGRAM



PACKAGE OUTLINE

A1 **UNIT: mm**



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Part No.:	SGM50HF12A1TFD	Document Type:	Datasheet
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Rev.: 1.5

Revision History:

1. Modify the electric characteristics
2. Update all curves
3. Modify package outline

Rev.: 1.4

Revision History:

1. Modify the electric characteristics. upon version 1.3
2. Update all curves
3. Modify Manual layout

Rev.: 1.3

Revision History:

1. Modify the electrical characteristics description features and curve
2. Delete the ”trench-gate” of nomenclature’s TF

Rev.: 1.2

Revision History:

1. Modify the drain current

Rev.: 1.1

Revision History:

1. Modify the electric characteristics of FRD

Rev.: 1.0

Revision History:

1. First release