

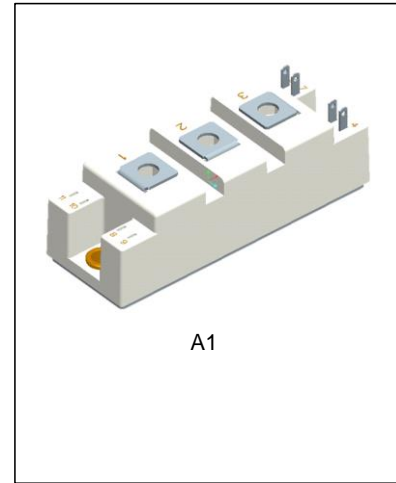
75A, 1200V IGBT MODULE

DESCRIPTION

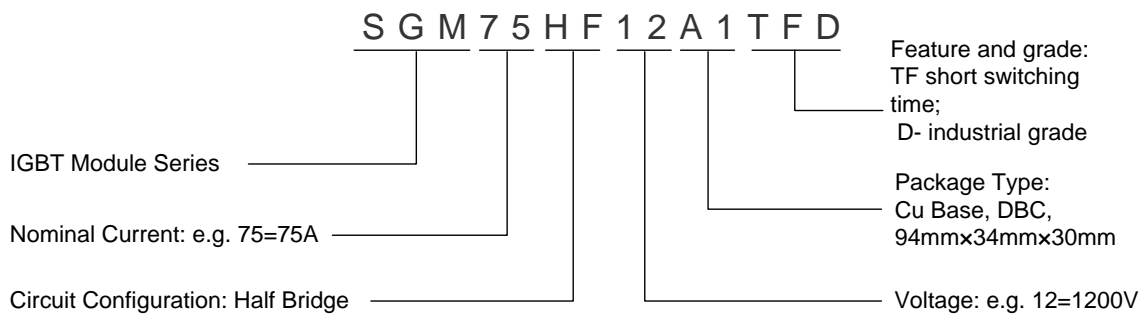
SGM75HF12A1TFD Module offers the optimum performance for UPS, AC inverter drive and electronic welders.

FEATURES

- ◆ 75A, 1200V, $V_{CE(sat)(typ.)}=2.2V@I_C=75A$
- ◆ $V_{CE(sat)}$ with positive temperature coefficient
- ◆ High short circuit capability
- ◆ Low switching loss
- ◆ Isolated copper baseplate using DBC technology



NOMENCLATURE



ORDERING INFORMATION

Part No.	Package	Marking	Packing
SGM75HF12A1TFD	A1	SGM75HF12A1TFD	Carton

ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$, unless otherwise noted)

Characteristics	Symbol	Ratings	Units
Collector to Emitter Voltage	V_{CE}	1200	V
Gate to Emitter Voltage	V_{GE}	± 20	V
Collector Current	I_C	75	A
Repetitive Pulsed Collector Current	I_{CRM}	150	A
Operating Junction Temperature Range	T_J	-40~+125	$^\circ\text{C}$
Storage Temperature Range	T_{stg}	-40~+125	$^\circ\text{C}$
Isolation Voltage	Viso	2500	V
To heat sink M6	Ms	3~5	Nm
To terminals M5	Mt	2.5~5	Nm
Weight	W	160	g

THERMAL CHARACTERISTICS

Characteristics	Symbol	Ratings	Units
Thermal Resistance, Junction to Case (IGBT)	$R_{\theta JC}$	0.33	$^{\circ}\text{C/W}$
Thermal Resistance, Junction to Case (FRD)	$R_{\theta JC}$	0.56	$^{\circ}\text{C/W}$
Thermal Resistance, Case to Sink	$R_{\theta CS}$	0.03	$^{\circ}\text{C/W}$

ELECTRICAL CHARACTERISTICS OF IGBT ($T_C = 25^{\circ}\text{C}$ unless otherwise noted)

Characteristics	Symbol	Test condition	Min.	Typ.	Max.	Unit	
Collector-emitter saturation voltage	V_{CEsat}	$I_C=75\text{A}, V_{GE}=15\text{V}, T_j=25^{\circ}\text{C}$	--	2.2	2.8	V	
		$I_C=75\text{A}, V_{GE}=15\text{V}, T_j=125^{\circ}\text{C}$	--	2.4	--		
		$I_C=75\text{A}, V_{GE}=15\text{V}, T_j=150^{\circ}\text{C}$	--	2.5	--		
Gate threshold voltage	V_{GEth}	$I_C=250\mu\text{A}, V_{CE}=V_{GE}, T_j=25^{\circ}\text{C}$	4.4	5.0	6.7	V	
Collect-emitter cut-off current	I_{CES}	$V_{CE}=1200\text{V}, V_{GE}=0\text{V}, T_j=25^{\circ}\text{C}$	--	--	1	mA	
G-E Leakage Current	I_{GES}	$V_{CE}=0\text{V}, V_{GE}=20\text{V}, T_j=25^{\circ}\text{C}$	--	--	500	nA	
Integrated Gate Resistor	R_{Gint}	$T_j=25^{\circ}\text{C}$	--	4.8	--	Ω	
Input Capacitance	C_{ies}	$f=1\text{MHz}, T_j=25^{\circ}\text{C},$ $V_{CE}=25\text{V}, V_{GE}=0\text{V}$	--	4.79	--	nF	
Output Capacitance	C_{oes}		--	0.72	--		
Reverse Transfer Capacitance	C_{res}		--	0.25	--		
Total Gate Charge	Q_G	$V_{GE}=-15\text{V}\text{---}+15\text{V}$	--	0.53	--	μC	
Turn-on Delay Time	$t_{d(on)}$	$I_C=75\text{A}, V_{CE}=600\text{V}$ $V_{GE}=\pm 15\text{V}, R_G=35\Omega,$ Inductive load	$T_j=25^{\circ}\text{C}$	--	0.11	--	μs
			$T_j=125^{\circ}\text{C}$	--	0.12	--	
			$T_j=150^{\circ}\text{C}$	--	0.12	--	
Rise Time	t_r		$T_j=25^{\circ}\text{C}$	--	0.09	--	μs
			$T_j=125^{\circ}\text{C}$	--	0.95	--	
			$T_j=150^{\circ}\text{C}$	--	0.10	--	
Turn-off Delay Time	$t_{d(off)}$		$T_j=25^{\circ}\text{C}$	--	0.50	--	μs
			$T_j=125^{\circ}\text{C}$	--	0.52	--	
			$T_j=150^{\circ}\text{C}$	--	0.54	--	
Fall Time	t_f		$T_j=25^{\circ}\text{C}$	--	0.18	--	μs
			$T_j=125^{\circ}\text{C}$	--	0.27	--	
			$T_j=150^{\circ}\text{C}$	--	0.29	--	
Turn-on Switching Loss (per pulse)	E_{on}	$T_j=25^{\circ}\text{C}$	--	11	--	mJ	
		$T_j=125^{\circ}\text{C}$	--	14	--		
		$T_j=150^{\circ}\text{C}$	--	16	--		
Turn-Off Switching Loss (per pulse)	E_{off}	$T_j=25^{\circ}\text{C}$	--	4.2	--	mJ	
		$T_j=125^{\circ}\text{C}$	--	4.8	--		
		$T_j=150^{\circ}\text{C}$	--	5.2	--		
S-C Data	I_{SC}	$V_{GE}=15\text{V}, V_{CC}=600\text{V}, t_p \leq 10\mu\text{s}, T_j=25^{\circ}\text{C}$	--	420	--	A	
Thermal Resistance : Junction-Case	$R_{\theta JC}$	per IGBT	--	0.35	--	$^{\circ}\text{C/W}$	

Characteristics	Symbol	Test condition	Min.	Typ.	Max.	Unit
Temperature under on-state	T_{jop}		-40	--	125	°C

ELECTRICAL CHARACTERISTICS OF FRD ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Units
Diode Forward Voltage	V_F	$I_F=75\text{A}, V_{GE}=0\text{V}, T_C=25^\circ\text{C}$	--	2.1	--	V
		$I_F=75\text{A}, V_{GE}=0\text{V}, T_C=125^\circ\text{C}$	--	1.7	--	
		$I_F=75\text{A}, V_{GE}=0\text{V}, T_C=150^\circ\text{C}$	--	1.7	--	
Peak reverse Recovery current	I_{RM}	$T_C=25^\circ\text{C}$	--	62	--	A
		$T_C=125^\circ\text{C}$	--	88	--	
		$T_C=150^\circ\text{C}$	--	109	--	
Recovery charge	Q_r	$T_C=25^\circ\text{C}$	--	4.3	--	μC
		$T_C=125^\circ\text{C}$	--	9.9	--	
		$T_C=150^\circ\text{C}$	--	12.6	--	
Reverse recovery energy (per pulse)	E_{rec}	$T_C=25^\circ\text{C}$	--	0.38	--	mJ
		$T_C=125^\circ\text{C}$	--	1.40	--	
		$T_C=150^\circ\text{C}$	--	1.76	--	
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) ($T_C = 25^\circ\text{C}$, unless otherwise noted)

Characteristics	Symbol	Test conditions	Ratings	Unit
Insulation test voltage	V_{ISOL}	RMS, $f=50\text{Hz}, t=1\text{min}$	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 ELECTRICAL CHARACTERISTICS($T_C = 25^\circ\text{C}$, unless otherwise noted)

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Stray inductance module	L_{SCE}		--	30	--	nH
Module lead resistance, terminal-chip	$R_{CC'+EE'}$	$T_C = 25^\circ\text{C}$, per switch	--	0.65	--	m Ω
Storage temperature	T_{stg}		-40	--	125	$^\circ\text{C}$
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

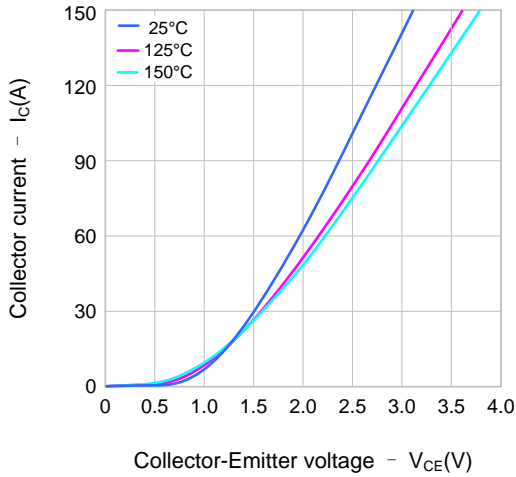


Figure 2. Typical output characteristics (150°C)

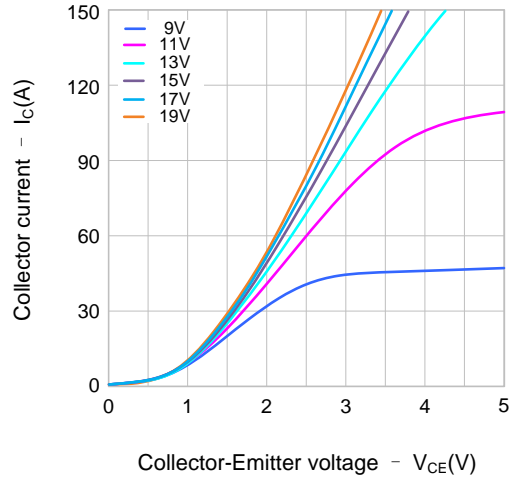


Figure 3. Transfer characteristics

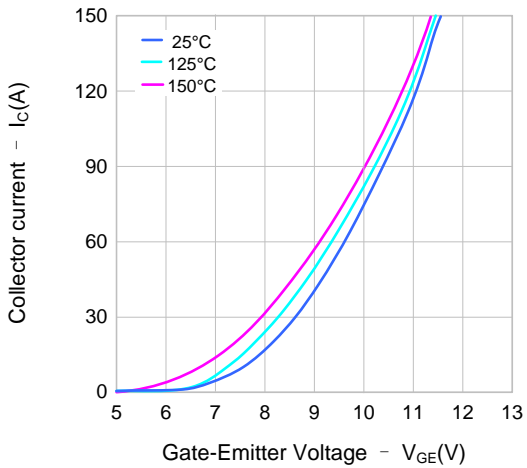


Figure 4. Switching Loss vs. Collector Current

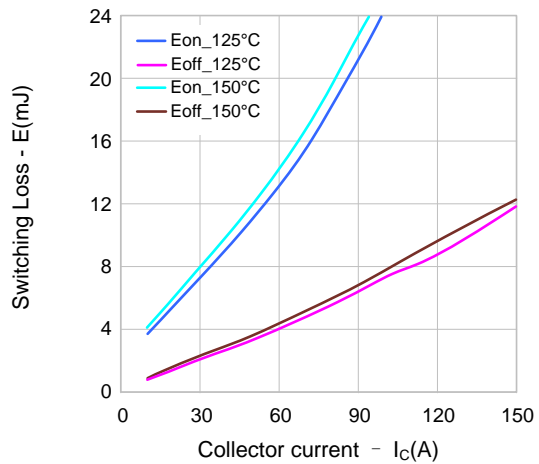


Figure 5. Switching loss vs. Gate resistance

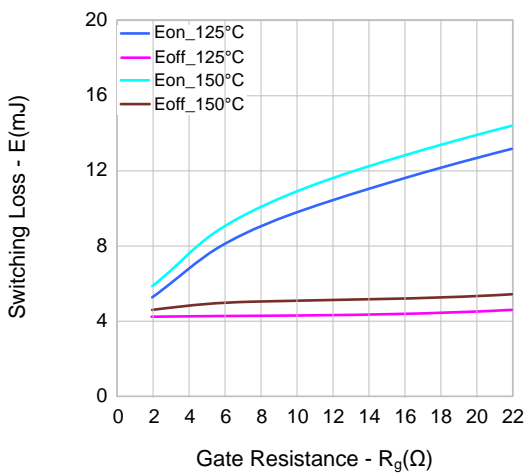
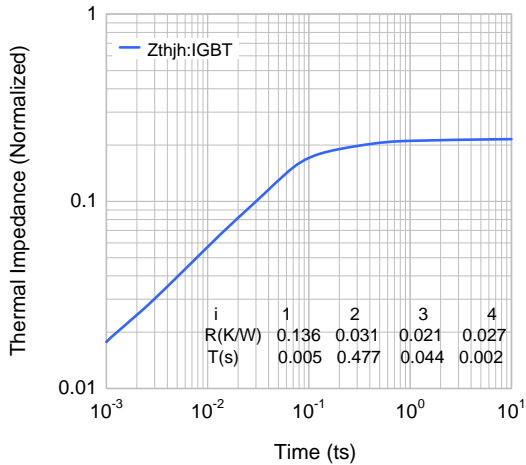


Figure 6. Transient Thermal Impedance



TYPICAL CHARACTERISTICS CURVE (continued)

Figure 7. Diode Forward Characteristics

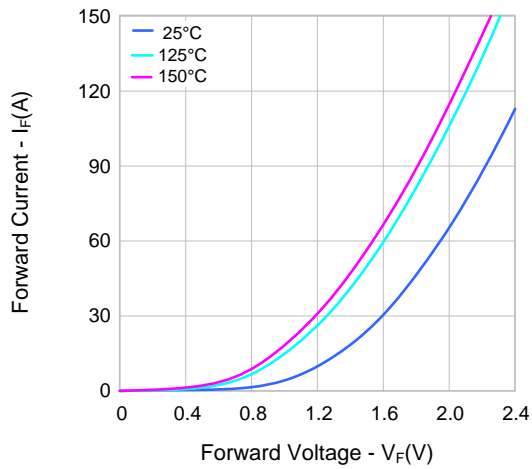


Figure 8. Switching Loss vs. Collector Current

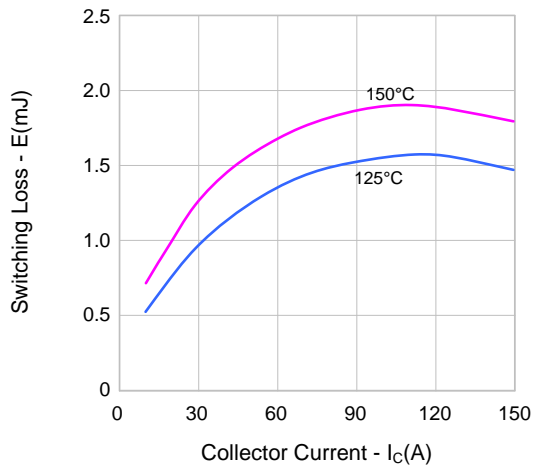


Figure 9. Switching Loss vs. Resistance

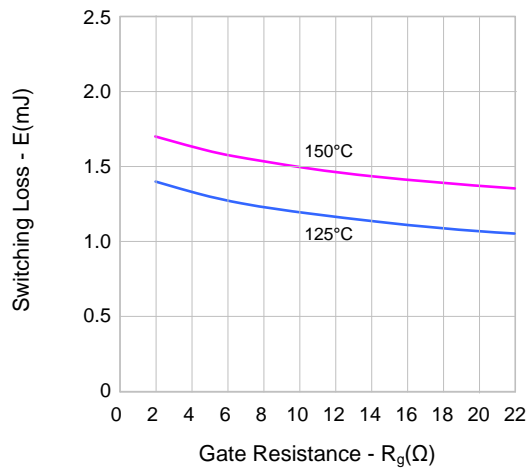
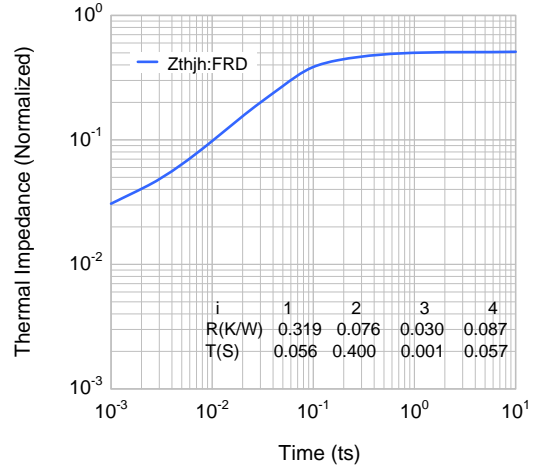
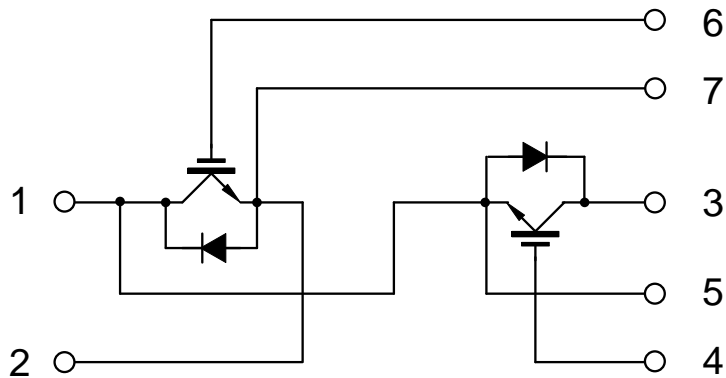


Figure 10. Transient Thermal Impedance



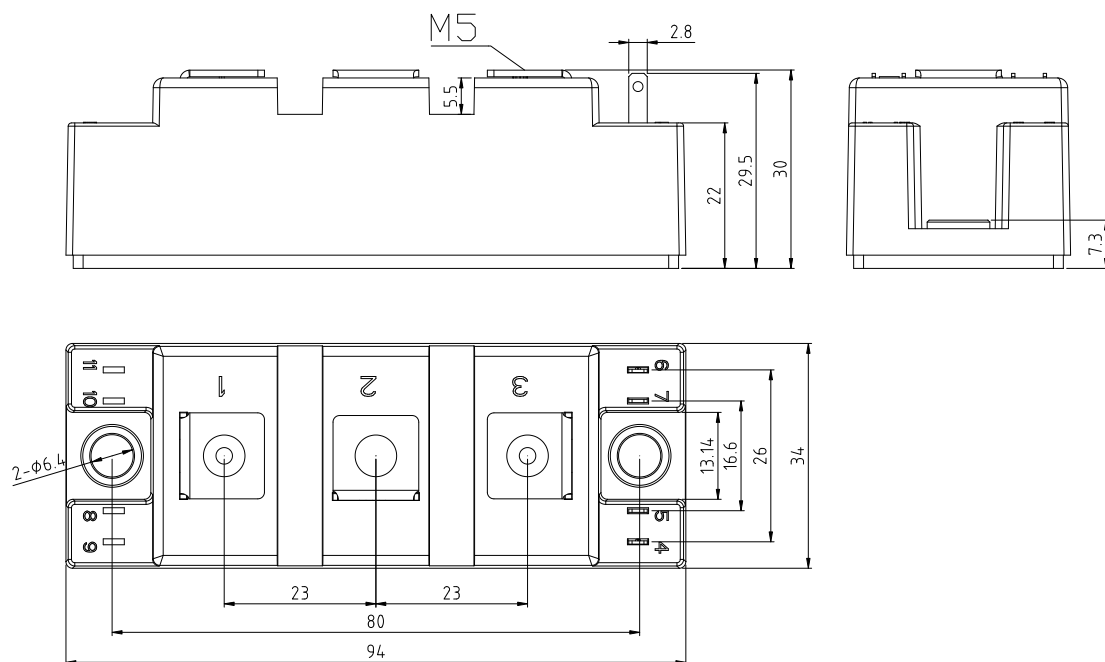
CIRCUIT DIAGRAM



PACKAGE OUTLINE

A1

UNIT: mm



Disclaimer :

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Rev.: 1.5

Revision History:

1. Modify the electric characteristics
 2. Update all curves
 3. Modify the package outline
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Rev.: 1.4

Revision History:

1. Modify the electric characteristics features description and curve
 2. Delete the "trench-gate" of nomenclature's TF
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Rev.: 1.3

Revision History:

1. Modify the electric characteristics of IGBT
-

Rev.: 1.2

Revision History:

1. Modify the electric characteristics
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Rev.: 1.1

Revision History:

1. Modify the electric characteristics of FRD
-

Rev.: 1.0

Revision History:

1. First release
-
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