

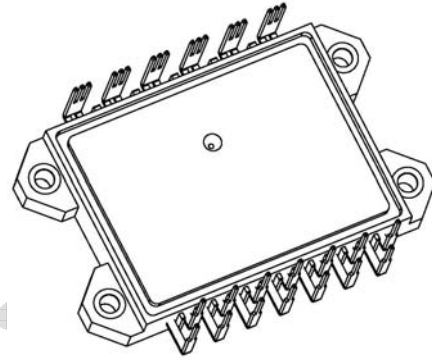
# GT50FF120A1H

## IGBT Module

Preliminary Data

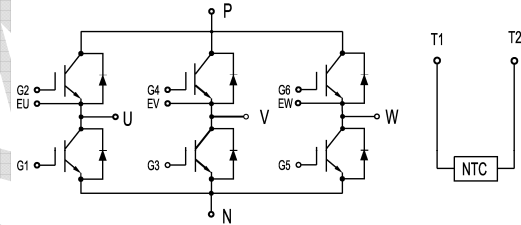
### Features:

- Short Circuit Rated 10 $\mu$ s
- Low Saturation Voltage:  $V_{CE(sat)} = 1.90V @ I_C = 50A, T_C=25^{\circ}C$
- Low Switching Loss
- 100% RBSOA Tested (2 $\times$ I<sub>C</sub>)
- Low Stray Inductance
- Lead Free, Compliant with RoHS Requirement



### Applications:

- Industrial Inverters
- Servo Applications



### IGBT, Inverter

#### Maximum Rated Values ( $T_C=25^{\circ}C$ unless otherwise specified)

$V_{CES}$	Collector-Emitter Blocking Voltage		1200	V
$V_{GES}$	Gate-Emitter Voltage		$\pm 20$	V
$I_C$	Continuous Collector Current	$T_C = 80^{\circ}C,$	50	A
		$T_C = 25^{\circ}C$	100	A
$I_{CM}$	Repetitive Peak Collector Current	$T_J = 175^{\circ}C$	100	A
$t_{SC}$	Short Circuit Withstand Time		>10	$\mu$ s
$P_D$	Maximum Power Dissipation per IGBT	$T_C = 25^{\circ}C$ $T_{Jmax}=175^{\circ}C$	500	W

## Electrical Characteristics of IGBT ( $T_C=25^\circ\text{C}$ unless otherwise specified)

### Static characteristics

Symbol	Description	Conditions	Min	Typ	Max	Unit
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C = 1\text{mA}, V_{CE} = V_{GE}$	5.0	5.5	6.0	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 50\text{A}, V_{GE} = 15\text{V}$	$T_J = 25^\circ\text{C}$	1.90	2.20	V
			$T_J = 125^\circ\text{C}$	2.20		V
$I_{CES}$	Collector-Emitter Leakage Current	$V_{GE} = 0\text{V}, V_{CE} = V_{CES}, T_J = 25^\circ\text{C}$			1	mA
$I_{GES}$	Gate-Emitter Leakage Current	$V_{GE} = \pm 20\text{V}, V_{CE} = 0\text{V}, T_J = 25^\circ\text{C}$			200	nA
$C_{ies}$	Input Capacitance	$V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$		6.7		nF
$C_{oes}$	Output capacitance			0.38		nF

### Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC} = 600\text{V}, I_C = 50\text{A}, R_G = 15\Omega, V_{GE} = \pm 15\text{V},$ Inductive Load	$T_J = 25^\circ\text{C}$	240		ns
			$T_J = 125^\circ\text{C}$	235		
$t_r$	Rise Time		$T_J = 25^\circ\text{C}$	75		ns
			$T_J = 125^\circ\text{C}$	75		
$t_{d(off)}$	Turn-off Delay Time		$T_J = 25^\circ\text{C}$	235		ns
			$T_J = 125^\circ\text{C}$	250		
$t_f$	Fall Time		$T_J = 25^\circ\text{C}$	165		ns
			$T_J = 125^\circ\text{C}$	280		
$E_{on}$	Turn-on Switching Loss		$T_J = 25^\circ\text{C}$	3.72		mJ
			$T_J = 125^\circ\text{C}$	4.48		
$E_{off}$	Turn-off Switching Loss	$T_J = 25^\circ\text{C}$	2.25		mJ	
		$T_J = 125^\circ\text{C}$	3.54			
$Q_g$	Total Gate Charge	$T_J = 25^\circ\text{C}$	390		nC	
RBSOA	Reverse Bias Safe Operation Area	$I_C=100\text{A}, V_{CC}=1050\text{V}, V_p=1200\text{V}, R_g = 15\Omega, V_{GE}=\pm 15\text{V to } 0\text{V}, T_J=150^\circ\text{C}$	Trapezoid			
SCSOA	Short Circuit Safe Operation Area	$V_{CC} = 600\text{V}, V_{GE} = 15\text{V}, T_J = 150^\circ\text{C}$	10			$\mu\text{s}$
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-To-Case			0.30		$^\circ\text{C/W}$

## Diode, Inverter

### Maximum Rated Values ( $T_C=25^\circ\text{C}$ unless otherwise specified)

$V_{RRM}$	Repetitive Peak Reverse Voltage	1200	V
$I_F$	Diode Continuous Forward Current	50	A
$I_{FM}$	Diode Maximum Forward Current	100	A

### Electrical Characteristics of FWD ( $T_C=25^\circ\text{C}$ unless otherwise specified)

Symbol	Description	Conditions	Min	Typ	Max	Unit
$V_{FM}$	Forward Voltage	$I_F = 50\text{A}$ , $V_{GE} = 0\text{V}$	$T_J = 25^\circ\text{C}$	1.80	2.10	V
			$T_J = 125^\circ\text{C}$	2.00		
$I_{rr}$	Peak Reverse Recovery Current		$T_J = 25^\circ\text{C}$	30		A
			$T_J = 125^\circ\text{C}$	40		
$Q_{rr}$	Reverse Recovery Charge	$I_F = 50\text{A}$ , $di/dt = 800\text{A}/\mu\text{s}$ , $V_{rr} = 600\text{V}$ , $V_{GE} = -15\text{V}$	$T_J = 25^\circ\text{C}$	4.45		$\mu\text{C}$
			$T_J = 125^\circ\text{C}$	7.36		
$E_{rec}$	Reverse Recovery Energy		$T_J = 25^\circ\text{C}$	1.67		mJ
			$T_J = 125^\circ\text{C}$	3.07		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case			0.45		$^\circ\text{C}/\text{W}$

### Internal NTC-Thermistor Characteristics

$R_{25}$	$T_C = 25^\circ\text{C}$	5		k $\Omega$
$\Delta R/R$	$T_C = 100^\circ\text{C}$ , $R_{100} = 481\Omega$		$\pm 5$	%
$P_{25}$	$T_C = 25^\circ\text{C}$	50		mW
$B_{25/50}$	$R_2 = R_{25} \exp[B_{25/50}(1/T_2 - 1/(298.15\text{K}))]$	3380		K
$B_{25/80}$	$R_2 = R_{25} \exp[B_{25/80}(1/T_2 - 1/(298.15\text{K}))]$	3440		K

## Module

Symbol	Description	Min	Typ	Max	Unit
V <sub>iso</sub>	Isolation Voltage(All Terminals Shorted)      f = 50Hz, 1minute	2500			V
T <sub>J</sub>	Maximum Junction Temperature			175	°C
T <sub>JOP</sub>	Maximum Operating Junction Temperature Range	-40		+150	°C
T <sub>stg</sub>	Storage Temperature	-40		+125	°C
R <sub>eCS</sub>	Case-To-Sink (Conductive Grease Applied)		0.1		°C/W
T	Mounting Screw:M3	1.5		2.0	N·m
G	Weight		30		g

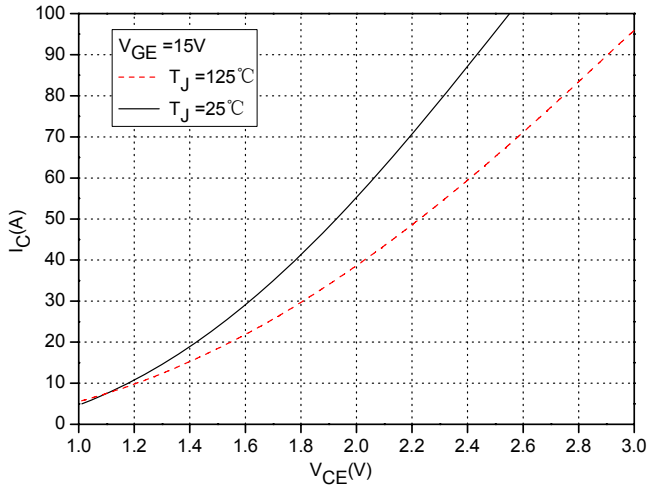


Fig.1 Typical Saturation Voltage Characteristics

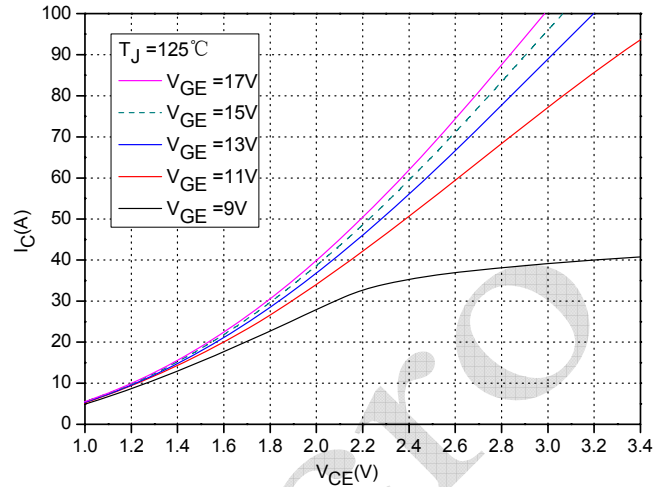


Fig.2 Typical Output Characteristics

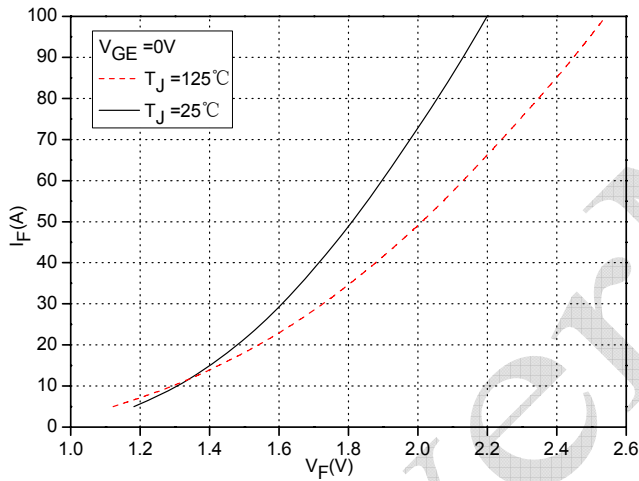


Fig.3 Forward Characteristics of FWD

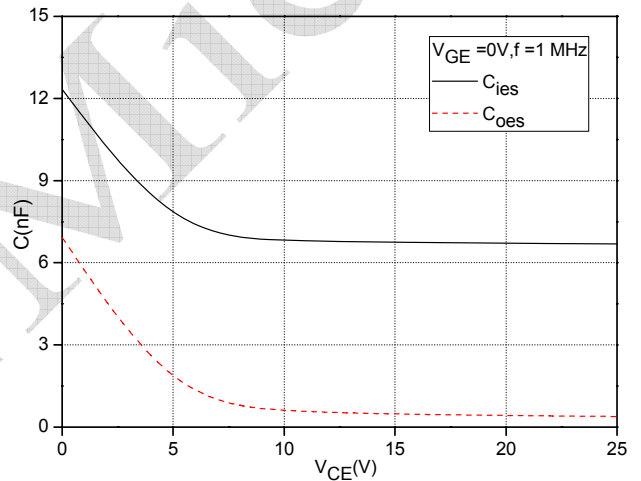


Fig.4 Capacitance Characteristics

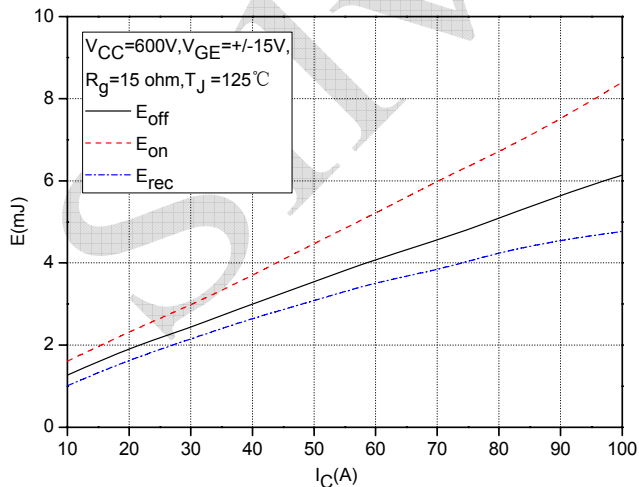


Fig.5 Typical Switching Loss vs. Collector Current

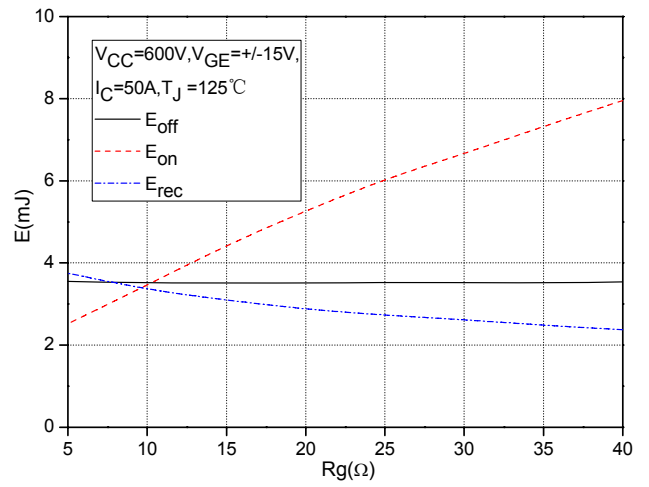


Fig.6 Typical Switching Loss vs. Gate Resistance

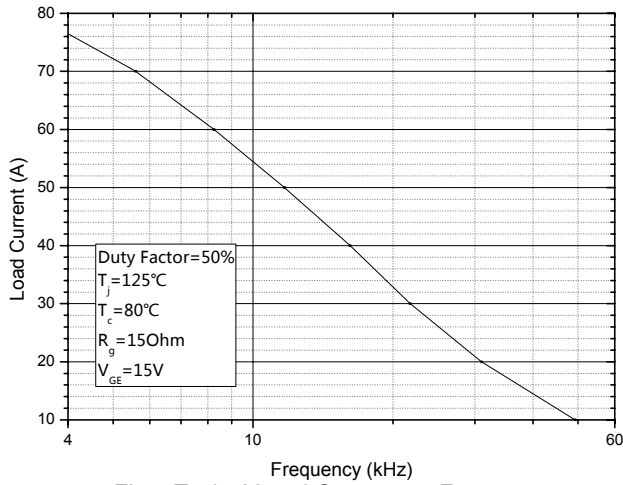


Fig.7 Typical Load Current vs. Frequency

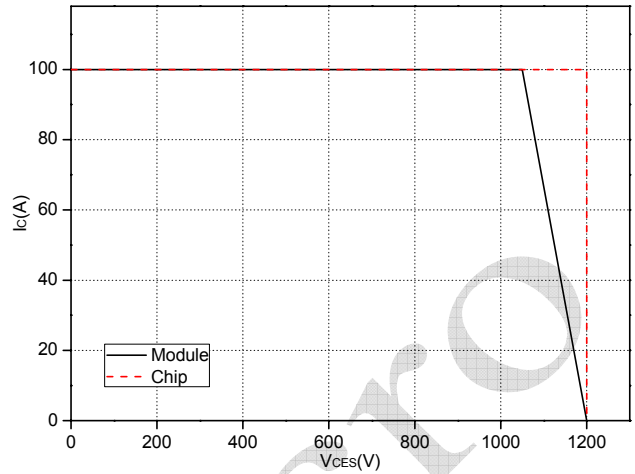


Fig.8 Reverse Bias Safe Operation Area (RBSOA)

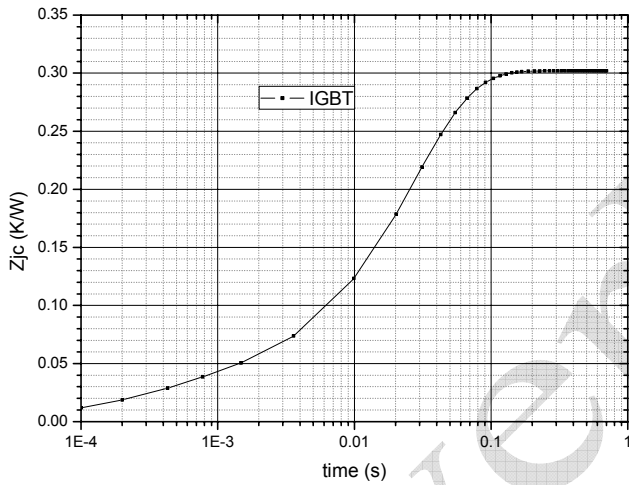


Fig.9 Transient thermal impedance (IGBT)

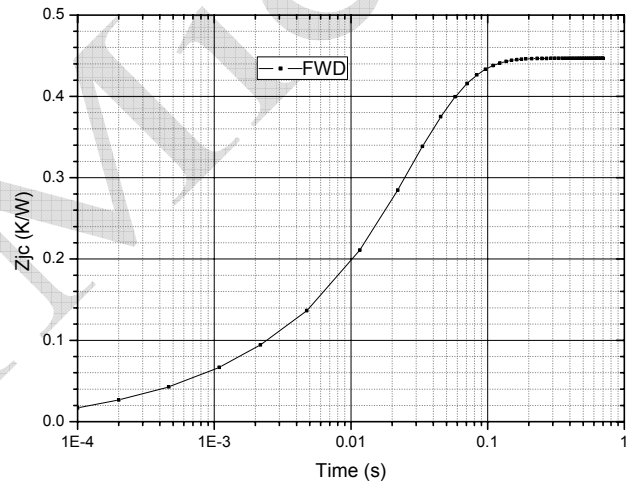


Fig.10 Transient thermal impedance (Diode)

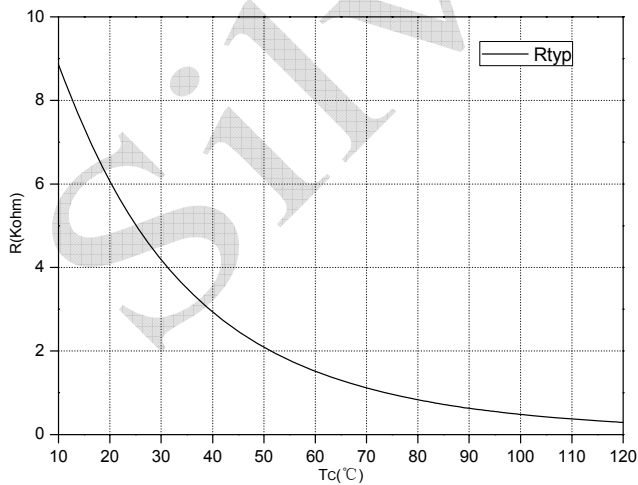
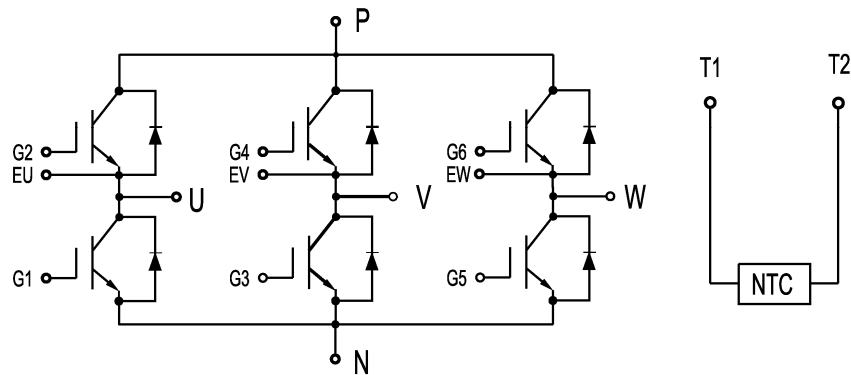
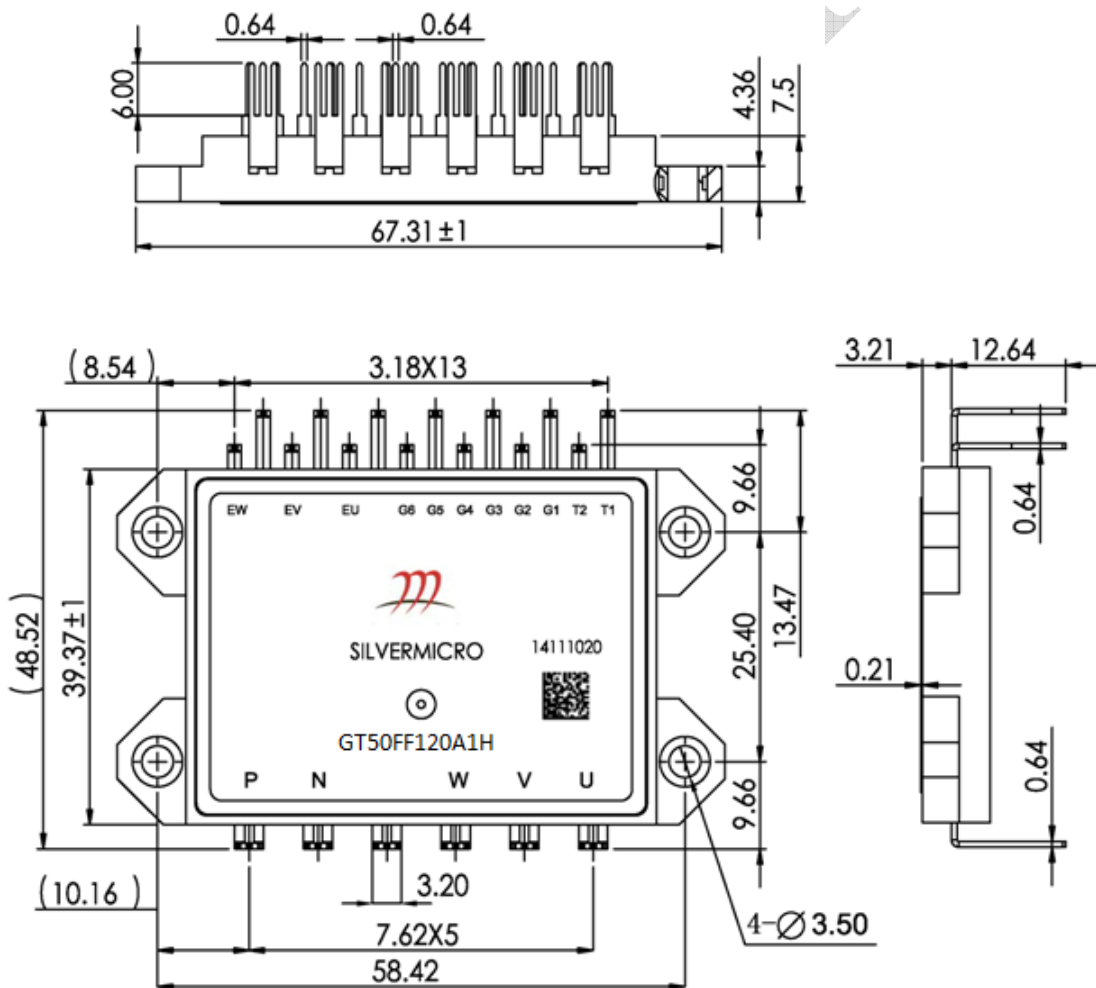


Fig.11 NTC Temperature characteristics

**Internal Circuit:**



**Package Outline (Unit: mm):**



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