

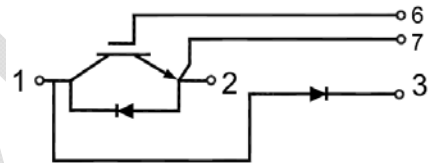
# GT150CU120T2VH-M

## IGBT Module

Preliminary Data

### Features:

- Field Stop Trench Gate IGBT
- Short Circuit Rated  $> 10\mu\text{s}$
- Low Saturation Voltage
- Low Switching Loss
- 100% RBSOA Tested ( $2 \times I_c$ )
- Low Stray Inductance
- Lead Free, Compliant with RoHS Requirement



### Applications:

- Welding
- HEV Inverter
- Industrial Motor Drives
- UPS

### IGBT, Inverter

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

$V_{CES}$	Collector-Emitter Blocking Voltage		1200	V
$V_{GES}$	Gate-Emitter Voltage		$\pm 20$	V
$I_C$	Continuous Collector Current	$T_C = 100^\circ\text{C}$	150	A
		$T_C = 25^\circ\text{C}$	300	A
$I_{CM}$	Repetitive Peak Collector Current	$T_J = 175^\circ\text{C}$	300	A
$t_{SC}$	Short Circuit Withstand Time		$> 10$	$\mu\text{s}$
$P_D$	Maximum Power Dissipation per IGBT	$T_C = 25^\circ\text{C}$ $T_{Jmax} = 175^\circ\text{C}$	1085	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	$I_C=4\text{mA}, V_{CE}=V_{GE}$	5.0	5.9	6.6	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=150\text{A}, V_{GE}=15\text{V}$	$T_J=25^\circ\text{C}$	1.70	2.00	V
			$T_J=125^\circ\text{C}$	1.90		V
			$T_J=150^\circ\text{C}$	2.00		
$I_{CES}$	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	$V_{GE}=\pm 20\text{V}, V_{CE}=0\text{V}, T_J=25^\circ\text{C}$			400	nA
$C_{ies}$	Input Capacitance	$V_{CE}=25\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$		10.13		nF
$C_{oes}$	Out Capacitance			1.01		nF
$C_{res}$	Reverse Transfer Capacitance			0.77		nF

### Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=600\text{V}, I_C=150\text{A}, R_{Gon}=4.7\Omega, V_{GE}=\pm 15\text{V},$ Inductive Load	$T_J=25^\circ\text{C}$		258		ns
			$T_J=125^\circ\text{C}$		258		
			$T_J=150^\circ\text{C}$		260		
$t_r$	Rise Time		$T_J=25^\circ\text{C}$		85		ns
			$T_J=125^\circ\text{C}$		89		
			$T_J=150^\circ\text{C}$		89		
$t_{d(off)}$	Turn-off Delay Time		$T_J=25^\circ\text{C}$		265		ns
			$T_J=125^\circ\text{C}$		277		
			$T_J=150^\circ\text{C}$		284		
$t_f$	Fall Time	$T_J=25^\circ\text{C}$		205		ns	
		$T_J=125^\circ\text{C}$		376			
		$T_J=150^\circ\text{C}$		428			
$E_{on}$	Turn-on Switching Loss	$V_{CC}=600\text{V}, I_C=150\text{A}, R_{Gon}=4.7\Omega, V_{GE}=\pm 15\text{V},$ $di/dt=1550\text{A}/\mu\text{s} (T_J=150^\circ\text{C})$ Inductive Load	$T_J=25^\circ\text{C}$		12.5		mJ
			$T_J=125^\circ\text{C}$		15.7		
			$T_J=150^\circ\text{C}$		17.5		

E <sub>off</sub>	Turn-off Switching Loss	V <sub>CC</sub> =600V, I <sub>C</sub> =150A, R <sub>Goff</sub> =4.7Ω, V <sub>GE</sub> = ±15V, du/dt=4106V/μs ( T <sub>J</sub> =150°C) Inductive Load	T <sub>J</sub> =25°C	10.3	mJ
			T <sub>J</sub> =125°C	15.8	
			T <sub>J</sub> =150°C	17.4	
Q <sub>g</sub>	Total Gate Charge	V <sub>GE</sub> =+15V...-15V	T <sub>J</sub> =25°C	0.71	μC
RBSOA	I <sub>C</sub> =300A, V <sub>CC</sub> =1050V, V <sub>p</sub> =1200V, R <sub>Goff</sub> =4.7Ω, V <sub>GE</sub> =+15V to 0V, T <sub>J</sub> =150°C			Trapezoid	
SC Data	V <sub>CC</sub> =600V, R <sub>Gon</sub> =4.7 Ω, R <sub>Goff</sub> =4.7 Ω, tp=10us, V <sub>GE</sub> =+/-15V, T <sub>J</sub> =125°C			680	A
R <sub>θJC</sub>	IGBT Thermal Resistance: Junction-To-Case(per leg)			0.138	°C/W

### Diode, Freewheel

#### Maximum Rated Values of FWD (T<sub>C</sub>=25°C unless otherwise specified)

V <sub>RRM</sub>	Repetitive Peak Reverse Voltage	1200	V
I <sub>F</sub>	Diode Continuous Forward Current	150	A
I <sub>FM</sub>	Diode Maximum Forward Current	300	A

#### Electrical Characteristics of FWD (T<sub>C</sub>=25°C unless otherwise specified)

Symbol	Description	Conditions	Min	Typ	Max	Unit
V <sub>FM</sub>	Forward Voltage	I <sub>F</sub> =150A	T <sub>J</sub> =25°C	1.50		V
			T <sub>J</sub> =125°C	1.50		
			T <sub>J</sub> =150°C	1.50		
t <sub>rr</sub>	Reverse Recovery Time		T <sub>J</sub> =25°C	371		ns
			T <sub>J</sub> =125°C	562		
			T <sub>J</sub> =150°C	625		
I <sub>rr</sub>	Peak Reverse Recovery Current	I <sub>F</sub> =150A, -diF/dt=1670A/μs(T <sub>J</sub> =150°C), V <sub>R</sub> =600V, V <sub>GE</sub> =-15V	T <sub>J</sub> =25°C	127		A
			T <sub>J</sub> =125°C	142		
			T <sub>J</sub> =150°C	145		
Q <sub>rr</sub>	Reverse Recovery Charge		T <sub>J</sub> =25°C	22.6		μC
			T <sub>J</sub> =125°C	34.6		
			T <sub>J</sub> =150°C	39.4		

E <sub>rec</sub>	Reverse Recovery Energy	I <sub>F</sub> =150A, -diF/dt=1670A/μs(T <sub>J</sub> =150°C), V <sub>R</sub> =600V, V <sub>GE</sub> =-15V	T <sub>J</sub> =25°C	9.7	mJ
			T <sub>J</sub> =125°C	15.2	
			T <sub>J</sub> =150°C	17.6	
R <sub>θJC</sub>	Diode Thermal Resistance: Junction-To-Case (per leg)			0.213	°C/W

**Diode, Inverse**  
**Maximum Rated Values of Inverse Diode (T<sub>C</sub> = 25°C unless otherwise specified)**

V <sub>RRM</sub>	Repetitive Peak Reverse Voltage	1200	V
I <sub>F</sub>	Diode Continuous Forward Current	100	A
I <sub>FM</sub>	Peak FWD Current Repetitive	200	A

**Electrical Characteristics of Inverse Diode (T<sub>C</sub>=25°C unless otherwise specified)**

Symbol	Description	Conditions	Min	Typ	Max	Unit
V <sub>FM</sub>	Forward Voltage	I <sub>F</sub> =100A	T <sub>J</sub> =25°C	1.70		V
			T <sub>J</sub> =125°C	1.80		
			T <sub>J</sub> =150°C	1.80		
t <sub>rr</sub>	Reverse Recovery Time	I <sub>F</sub> =100A, -diF/dt =1911A/μs(T <sub>J</sub> =150°C), V <sub>R</sub> =600V, V <sub>GE</sub> =-15V	T <sub>J</sub> =25°C	260		ns
			T <sub>J</sub> =125°C	396		
			T <sub>J</sub> =150°C	454		
I <sub>rr</sub>	Peak Reverse Recovery Current	I <sub>F</sub> =100A, -diF/dt =1911A/μs(T <sub>J</sub> =150°C), V <sub>R</sub> =600V, V <sub>GE</sub> =-15V	T <sub>J</sub> =25°C	92		A
			T <sub>J</sub> =125°C	104		
			T <sub>J</sub> =150°C	105		
Q <sub>rr</sub>	Reverse Recovery Charge	I <sub>F</sub> =100A, -diF/dt =1911A/μs(T <sub>J</sub> =150°C), V <sub>R</sub> =600V, V <sub>GE</sub> =-15V	T <sub>J</sub> =25°C	10.2		μC
			T <sub>J</sub> =125°C	16.8		
			T <sub>J</sub> =150°C	19.2		
E <sub>rec</sub>	Reverse Recovery Energy	I <sub>F</sub> =100A, -diF/dt =1911A/μs(T <sub>J</sub> =150°C), V <sub>R</sub> =600V, V <sub>GE</sub> =-15V	T <sub>J</sub> =25°C	4.83		mJ
			T <sub>J</sub> =125°C	7.92		
			T <sub>J</sub> =150°C	9.13		

R <sub>θJC</sub>	Diode Thermal Resistance: Junction-To-Case		0.34		°C/W
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## 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
CTI	Comparative Tracking Index		200			V
R <sub>θCS</sub>	Case-To-Sink Thermally (Conductive Grease Applied)			0.03		°C/W
T	Power Terminals Screw:M6		3.0		5.0	N·m
T	Mounting Screw:M6		4.0		6.0	N·m
G	Weight			300		g

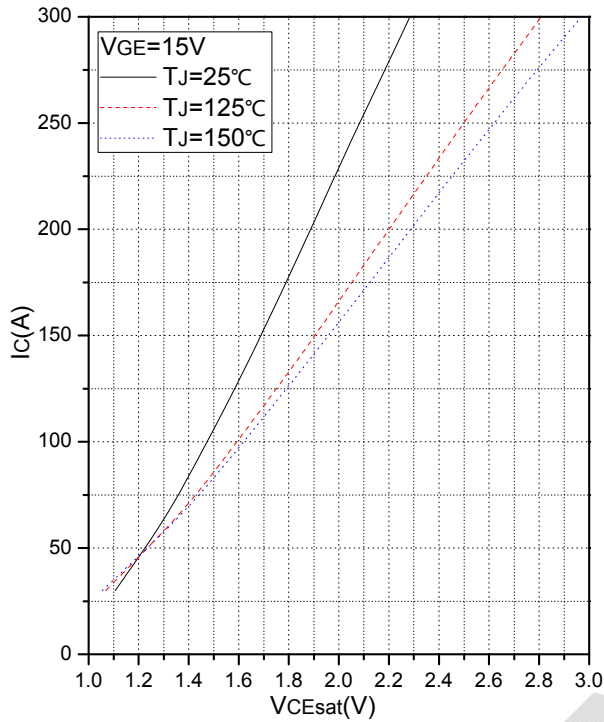


Fig.1 Typical Saturation Voltage Characteristics

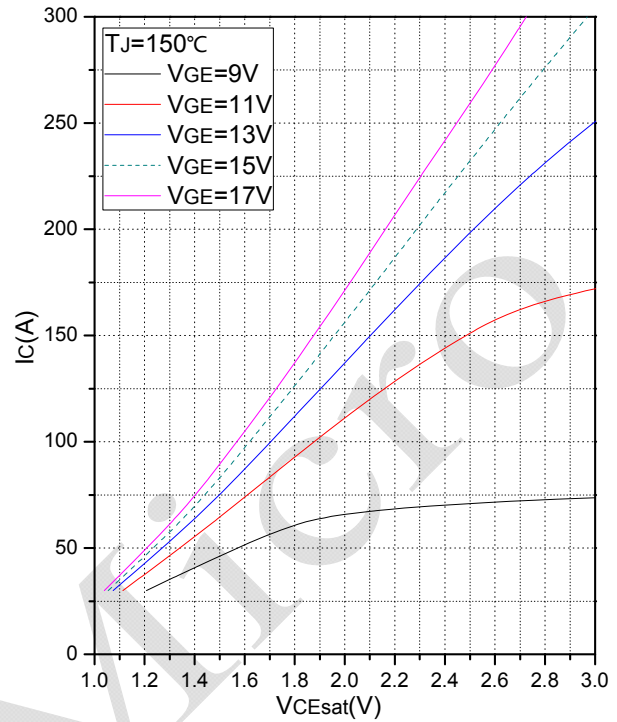


Fig.2 Typical Output Characteristics

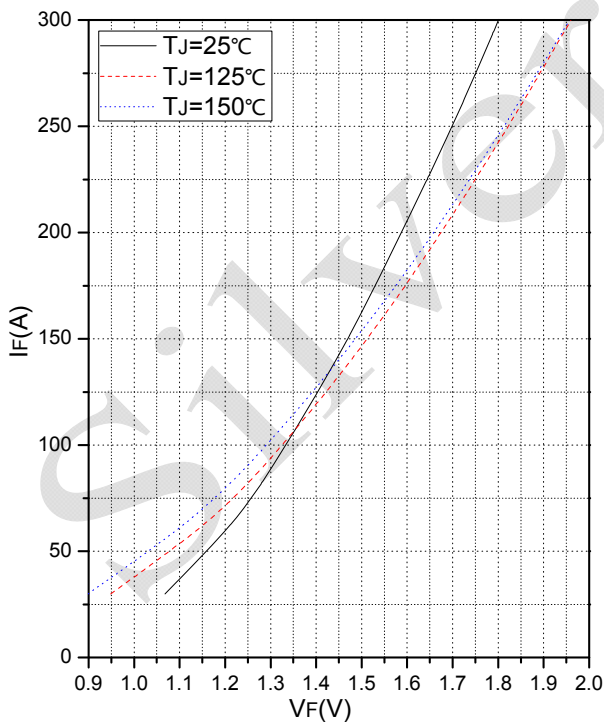


Fig.3 Forward Characteristics of FRD

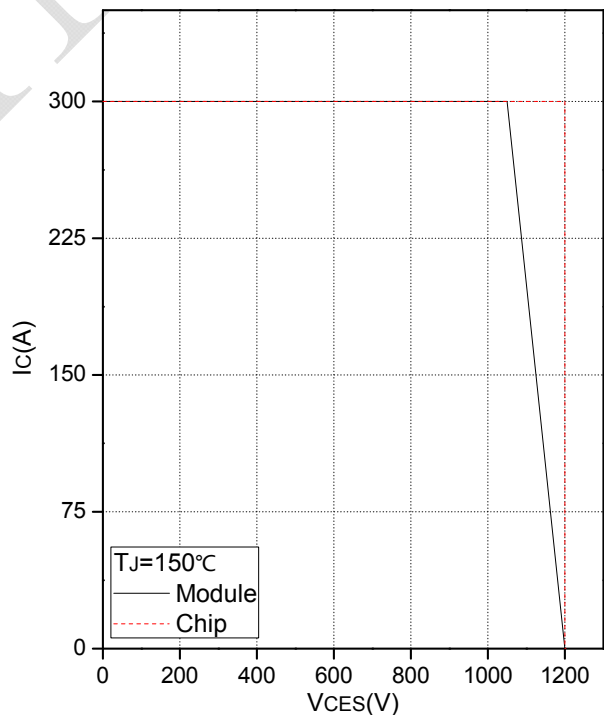


Fig.4 Reverse Bias Safe Operation Area (RBSOA)

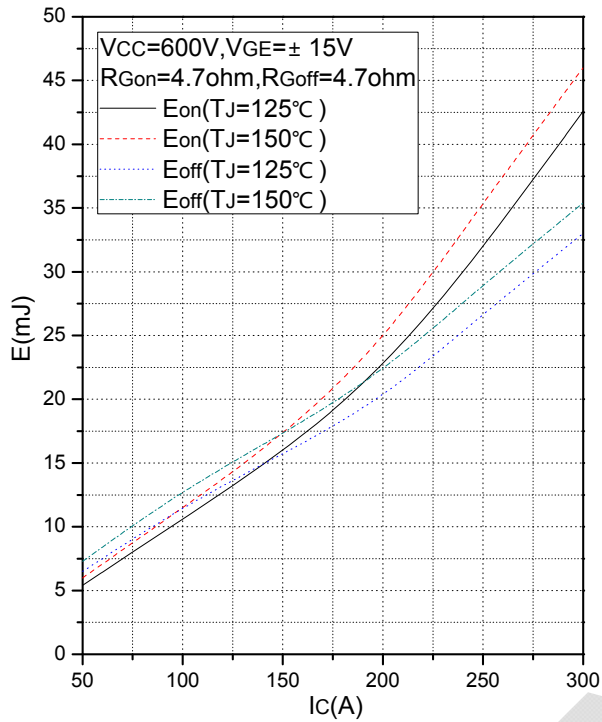


Fig.5 Typical Switching Loss vs. Collector Current

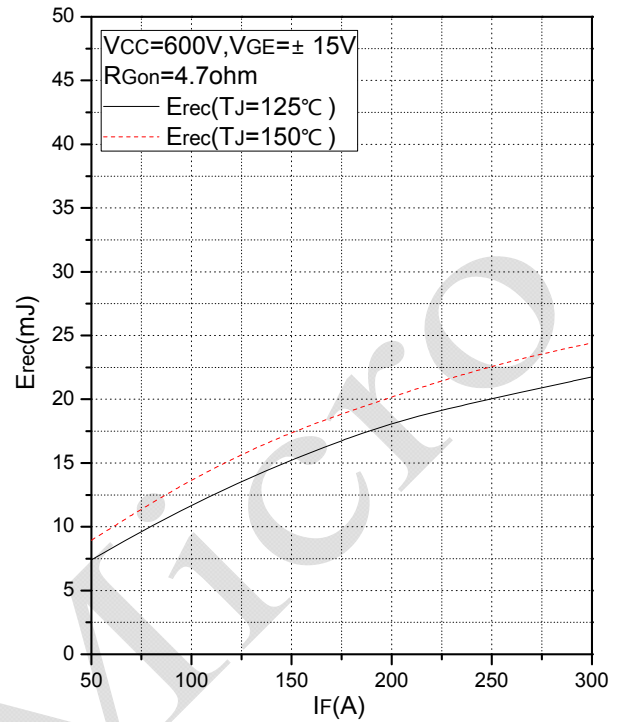


Fig.6 Typical Switching Loss vs. Forward Current

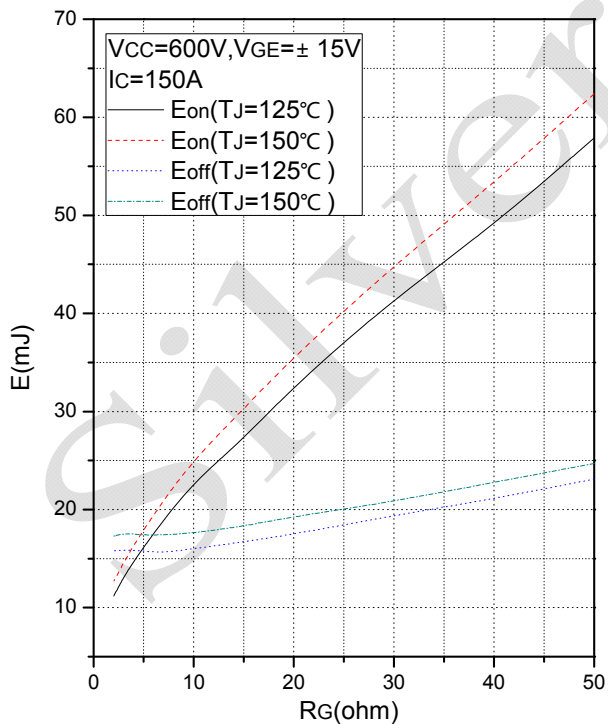


Fig.7 Typical Switching Loss vs. Gate Resistance

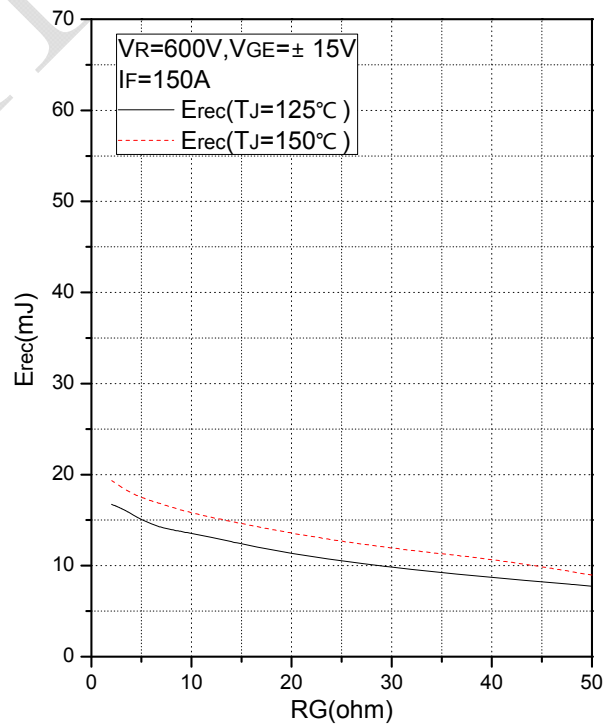


Fig.8 Typical Switching Loss vs. Gate Resistance

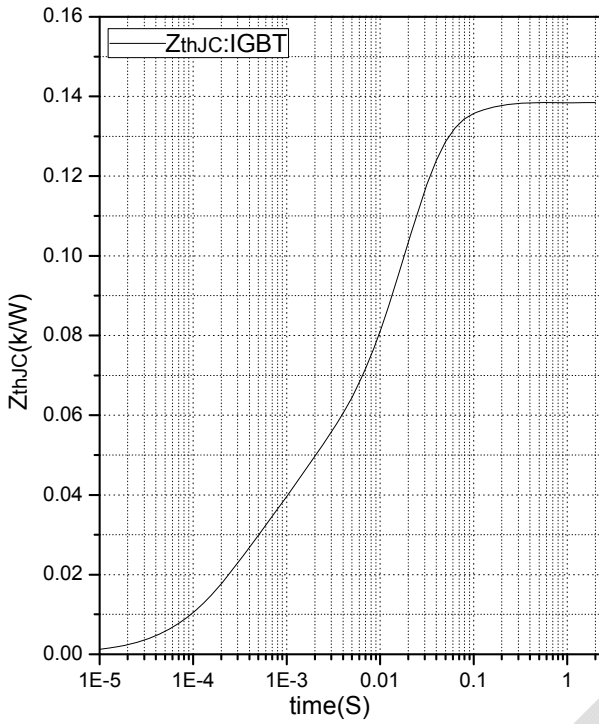


Fig.9 Transient Thermal Impedance (IGBT)

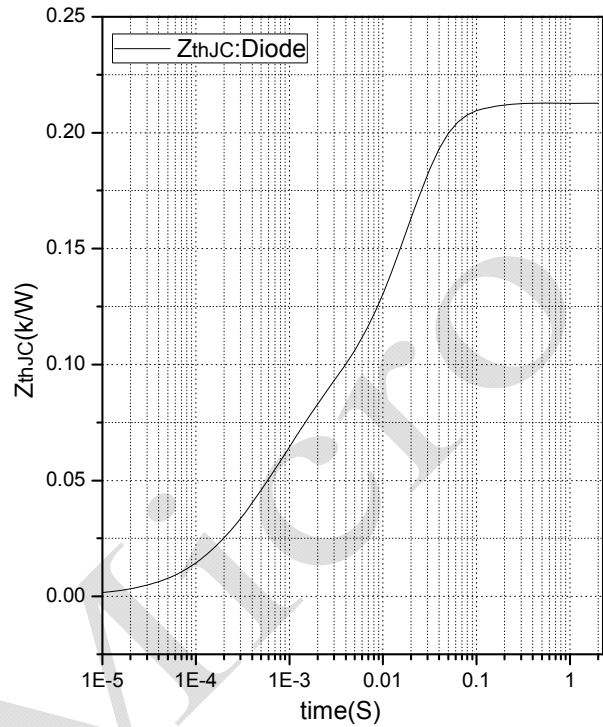


Fig.10 Transient Thermal Impedance (FWD)

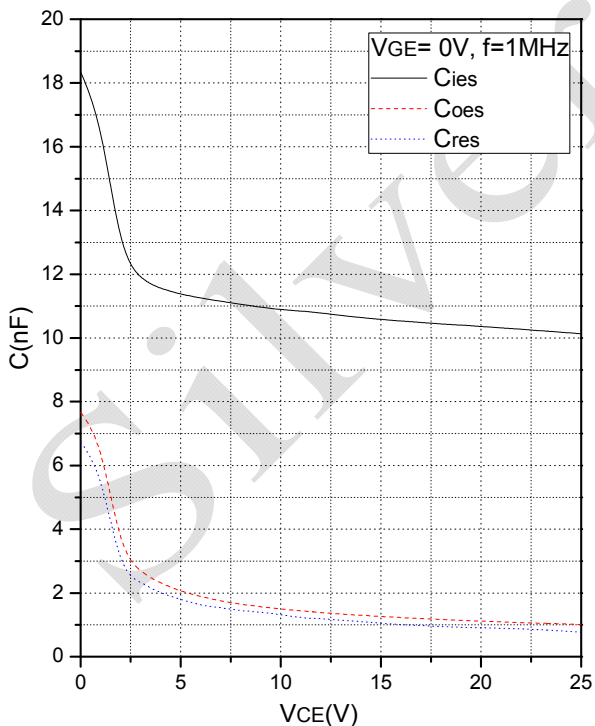


Fig.11 Capacitance Characteristics

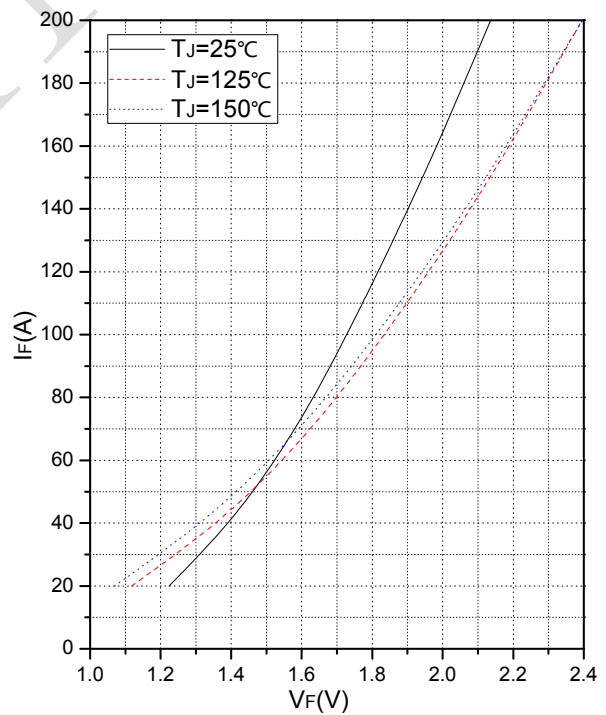
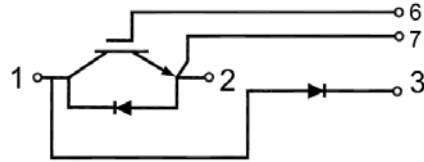


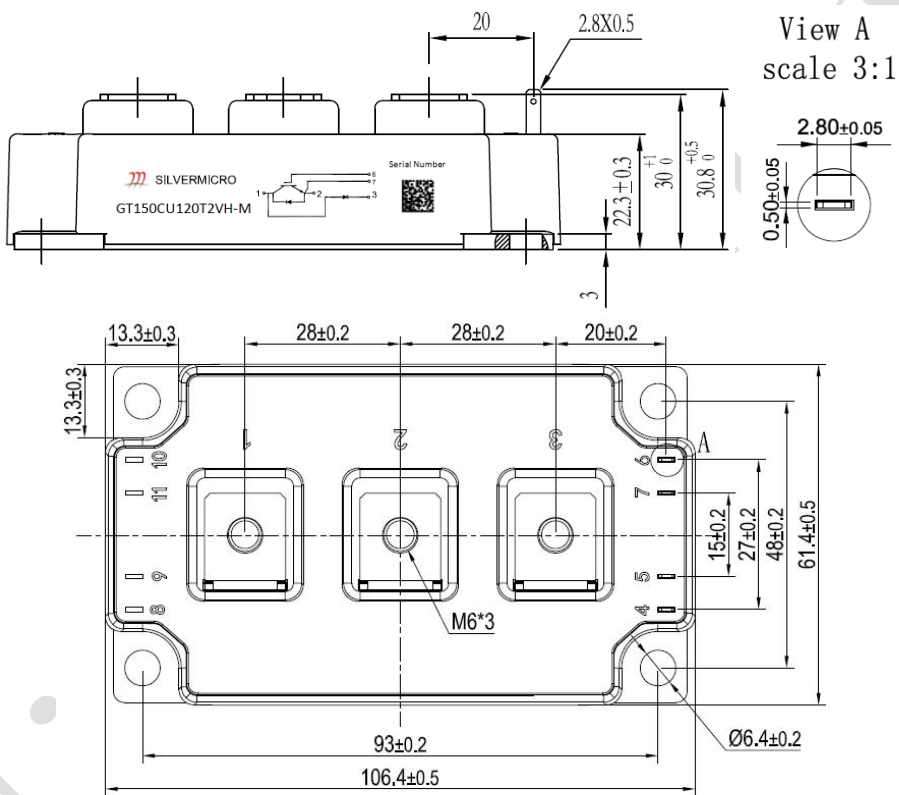
Fig.12 Forward Characteristics of Inverse Diode



**Internal Circuit**



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





Date	Revision	Notes
12/04/2018	01	Initial release

## Announcement

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