

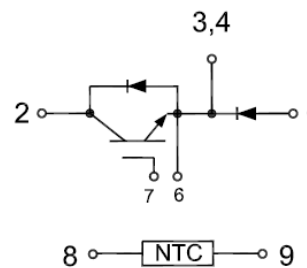
GT450CL65T9H-M

IGBT Module

Preliminary Data

Features:

- Trench & Field Stop IGBT
- Short Circuit Rated > 10 μ s
- Low Switching Loss
- 100% RBSOA Tested (2 \times I_c)
- Low Stray Inductance
- Copper Wire Bonding on Power Terminal
- Lead Free, Compliant with RoHS Requirement



Applications:

- Hybrid Electrical Vehicles(H)EV
- Automotive Applications
- Commercial Agriculture Vehicles
- Motor Drives

IGBT, Brake-chopper

Maximum Rated Values(T_c=25°C unless otherwise specified)

V _{CES}	Collector-Emitter Blocking Voltage		650	V
V _{GES}	Gate-Emitter Voltage		±20	V
I _C	Continuous Collector Current	T _c =100°C	450	A
		T _c =25°C	870	A
I _{CM}	Peak Collector Current Repetitive	T _j =175°C	900	A
t _{SC}	Short Circuit Withstand Time		>10	μs
P _D	Maximum Power Dissipation (IGBT)	T _c =25°C T _{Jmax} =175°C	2027	W

Electrical Characteristics of Brake-chopper 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	$I_C=12\text{mA}$, $V_{CE}=V_{GE}$	5.0	6.1	6.8	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=450\text{A}$, $V_{GE}=15\text{V}$	$T_J=25^\circ\text{C}$	1.50		V
			$T_J=125^\circ\text{C}$	1.65		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	$V_{GE}=\pm 20\text{V}$, $V_{CE}=0\text{V}$, $T_J=25^\circ\text{C}$			800	nA
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=1\text{MHz}$		36.5		nF
C_{oes}				1.68		nF
C_{res}	Reverse Transfer Capacitance			1.20		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=300\text{V}$, $I_C=450\text{A}$, $R_{Gon}=3\Omega$, $V_{GE}=\pm 15\text{V}$, Inductive Load	$T_J=25^\circ\text{C}$	0.61		μs
			$T_J=125^\circ\text{C}$	0.61		
t_r	Rise Time		$T_J=25^\circ\text{C}$	0.30		μs
			$T_J=125^\circ\text{C}$	0.31		
$t_{d(off)}$	Turn-off Delay Time	$V_{CC}=300\text{V}$, $I_C=450\text{A}$, $R_{Goff}=3\Omega$, $V_{GE}=\pm 15\text{V}$, Inductive Load	$T_J=25^\circ\text{C}$	0.54		μs
			$T_J=125^\circ\text{C}$	0.55		
t_f	Fall Time		$T_J=25^\circ\text{C}$	0.15		μs
			$T_J=125^\circ\text{C}$	0.18		
E_{on}	Turn-on Switching Loss	$V_{CC}=300\text{V}$, $I_C=450\text{A}$, $R_{Gon}=3\Omega$, $V_{GE}=\pm 15\text{V}$, $di/dt=1850\text{A}/\mu\text{s}$ ($T_J=125^\circ\text{C}$) Inductive Load	$T_J=25^\circ\text{C}$	7.30		mJ
			$T_J=125^\circ\text{C}$	7.95		
E_{off}	Turn-off Switching Loss		$T_J=25^\circ\text{C}$	19.35		mJ
			$T_J=125^\circ\text{C}$	23.25		
Q_g	Total Gate Charge	$V_{GE}=+15\text{V}\dots-15\text{V}$	$T_J=25^\circ\text{C}$	2.73		μC
RBSOA	$I_C=900\text{A}$, $V_{CC}=600\text{V}$, $V_p=650\text{V}$, $R_{Goff}=3\Omega$, $V_{GE}=+15\text{V}$ to 0V , $T_J=150^\circ\text{C}$			Trapezoid		
SCSOA	$V_{CC}=300\text{V}$, $V_{GE}=15\text{V}$, $T_J=150^\circ\text{C}$			10		μs
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-To-Case(per leg)			0.074		$^\circ\text{C}/\text{W}$



Diode, Brake-chopper

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

V_{RRM}	Repetitive Peak Reverse Voltage	650	V
I_F	Diode Continuous Forward Current	450	A
I_{FM}	Diode Maximum Forward Current	900	A

Electrical Characteristics of Brake-chopper Diode ($T_C=25^\circ\text{C}$ unless otherwise specified)

Symbol	Description	Conditions	Min	Typ	Max	Unit	
V_{FM}	Forward Voltage	$I_F=450\text{A}$	$T_J=25^\circ\text{C}$	1.40		V	
			$T_J=125^\circ\text{C}$	1.40			
t_{rr}	Reverse Recovery Time	$I_F=450\text{A}$, $-diF/dt = 2100\text{A}/\mu\text{s}(T_J=125^\circ\text{C})$, $V_R=300\text{V}$, $V_{GE}=-15\text{V}$ I	$T_J=25^\circ\text{C}$	0.21		μs	
			$T_J=125^\circ\text{C}$	0.29			
I_{rr}	Peak Reverse Recovery Current		$T_J=25^\circ\text{C}$	155		A	
			$T_J=125^\circ\text{C}$	207			
Q_{rr}	Reverse Recovery Charge		$T_J=25^\circ\text{C}$	12.8		μC	
			$T_J=125^\circ\text{C}$	24.5			
E_{rec}	Reverse Recovery Energy		$T_J=25^\circ\text{C}$	0.37		mJ	
			$T_J=125^\circ\text{C}$	3.29			
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case (per leg)			0.122		$^\circ\text{C}/\text{W}$	

Diode, Anti-parallel

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

V_{RRM}	Repetitive Peak Reverse Voltage	650	V
I_F	Diode Continuous Forward Current	300	A
I_{FM}	Diode Maximum Forward Current	600	A



Electrical Characteristics of Anti-parallel Diode ($T_C=25^\circ\text{C}$ unless otherwise specified)

Symbol	Description	Conditions	Min	Typ	Max	Unit
V_{FM}	Forward Voltage	$I_F = 300\text{A}$	$T_J=25^\circ\text{C}$	1.90		V
			$T_J=125^\circ\text{C}$	1.90		
			$T_J=150^\circ\text{C}$	1.90		
t_{rr}	Reverse Recovery Time		$T_J=25^\circ\text{C}$	0.14		μs
			$T_J=125^\circ\text{C}$	0.19		
I_{rr}	Peak Reverse Recovery Current	$I_F = 300\text{A}$, $-di_F/dt = 1440\text{A}/\mu\text{s}(T_J=125^\circ\text{C})$, $V_R = 300\text{V}$, $V_{GE} = -15\text{V}$	$T_J=25^\circ\text{C}$	103		A
			$T_J=125^\circ\text{C}$	138		
Q_{rr}	Reverse Recovery Charge		$T_J=25^\circ\text{C}$	8.6		μC
			$T_J=125^\circ\text{C}$	16.3		
E_{rec}	Reverse Recovery Energy		$T_J=25^\circ\text{C}$	0.25		mJ
			$T_J=125^\circ\text{C}$	2.19		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case (per leg)			0.224		$^\circ\text{C}/\text{W}$

Internal NTC-Thermistor Characteristics

R_{25}	$T_C = 25^\circ\text{C}$	5		k Ω
$\Delta R/R$	$T_C = 100^\circ\text{C}$, $R_{100} = 481\Omega$		± 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 _{iso}	Isolation Voltage (All Terminals Shorted) f = 50Hz, 1minute	2500			V
T _J	Maximum Junction Temperature			175	°C
T _{JOP}	Maximum Operating Junction Temperature Range	-40		+150	°C
T _{stg}	Storage Temperature	-40		+125	°C
CTI	Comparative Tracking Index	200			
R _{θCS}	Case-To-Sink Thermally (Conductive Grease Applied)		0.02		°C/W
M	Power Terminals Screw:M5	3.0		5.0	N·m
M	Mounting Screw:M6	4.0		6.0	N·m
G	Weight		330		g

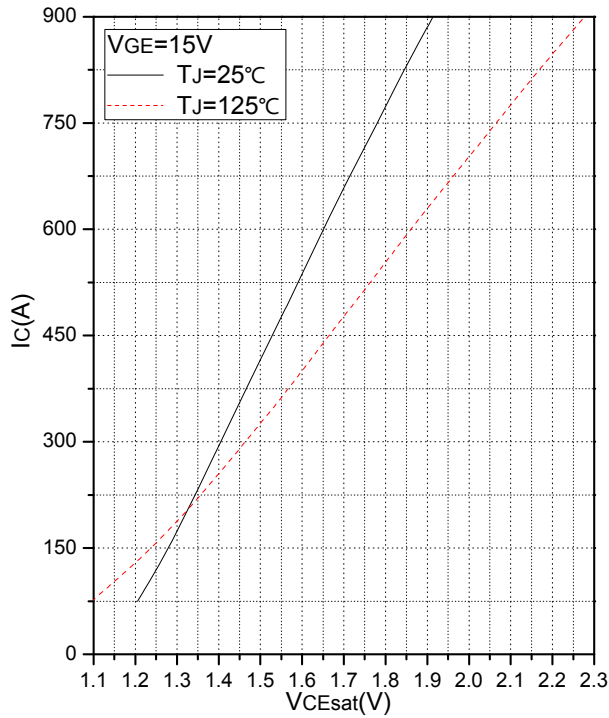


Fig.1 Typical Saturation Voltage Characteristics

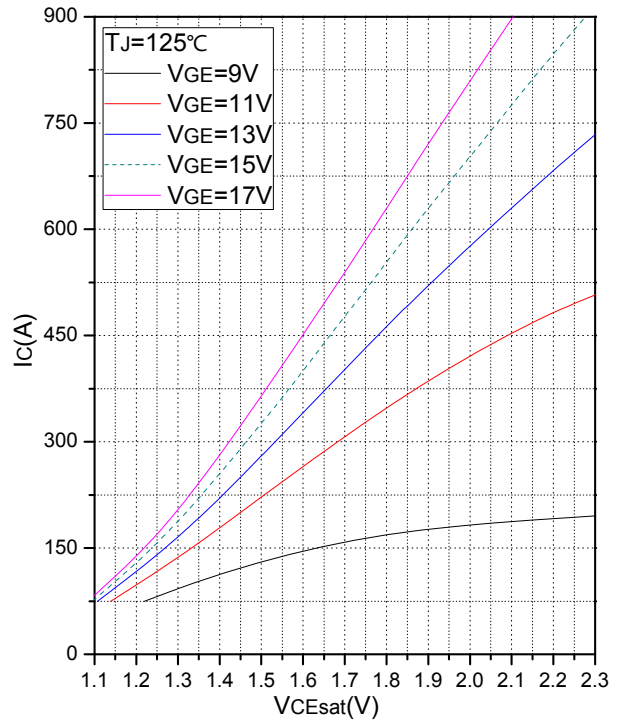


Fig.2 Typical Output Characteristics

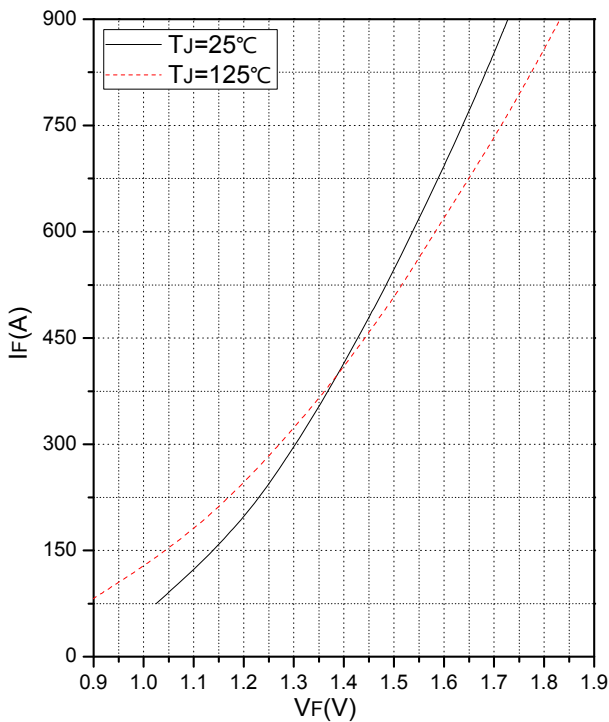


Fig.3 Forward Characteristics of Brake-chopper Diode

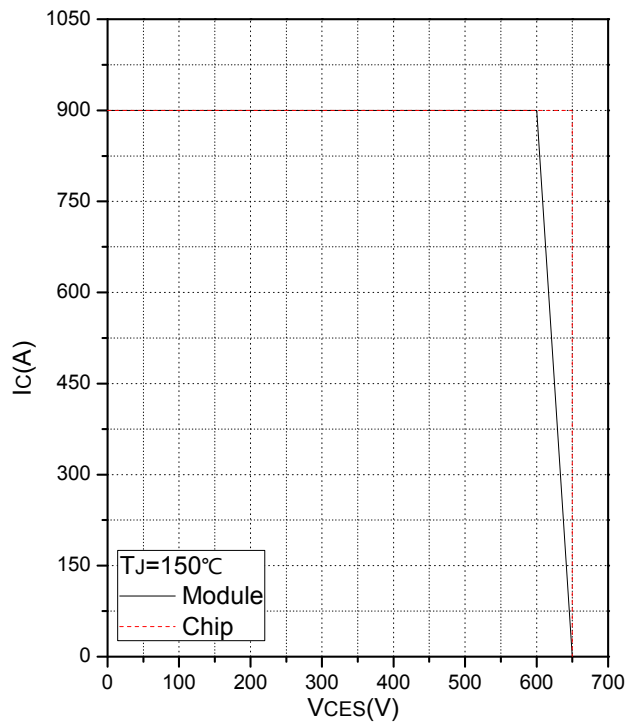


Fig.4 Reverse Bias Safe Operation Area (RBSOA)

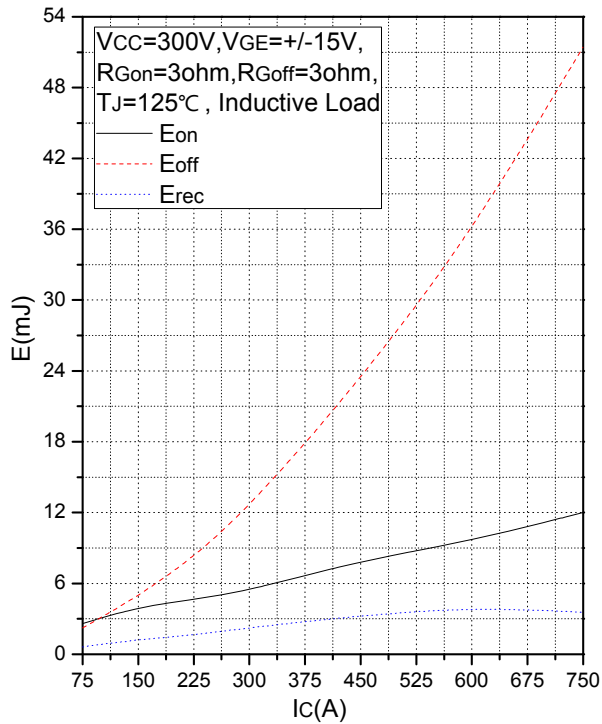


Fig.5 Typical Switching Loss vs. Collector Current

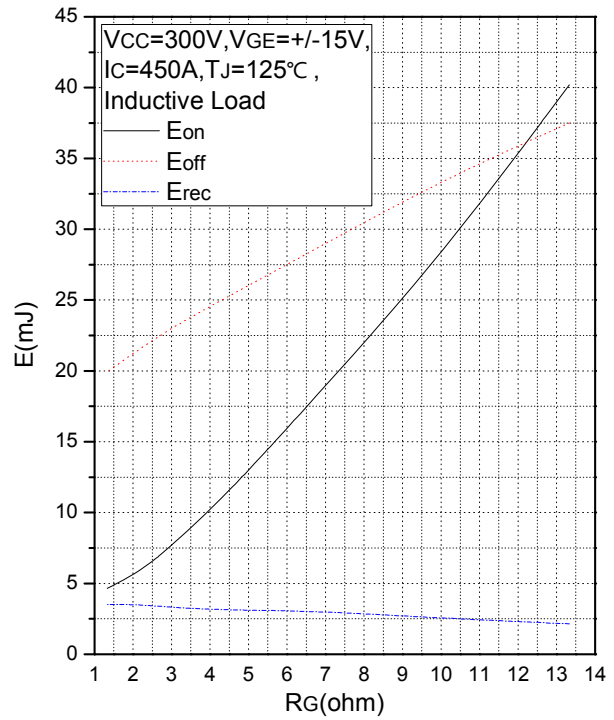


Fig.6 Typical Switching Loss vs. Gate Resistance

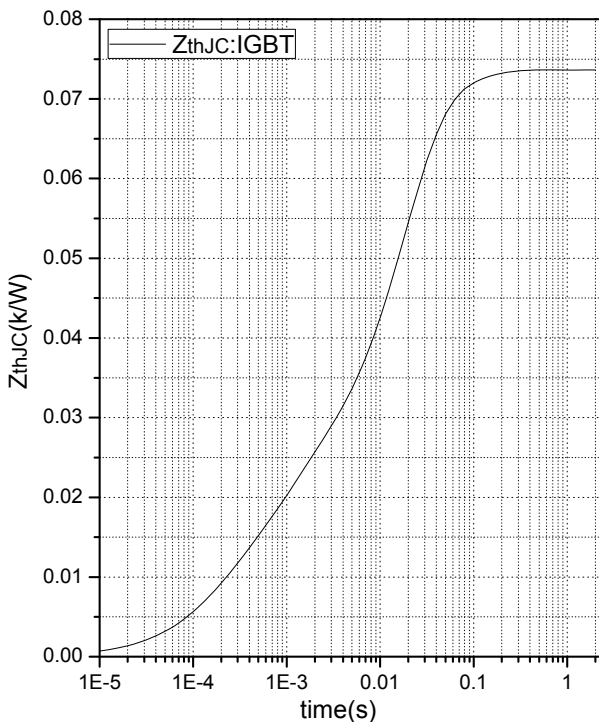


Fig.7 Transient Thermal Impedance (IGBT)

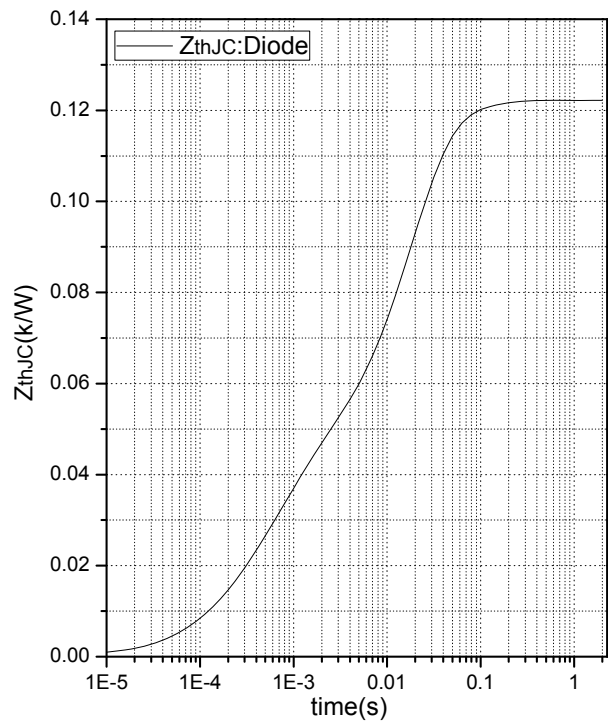


Fig.8 Transient Thermal Impedance (Diode)

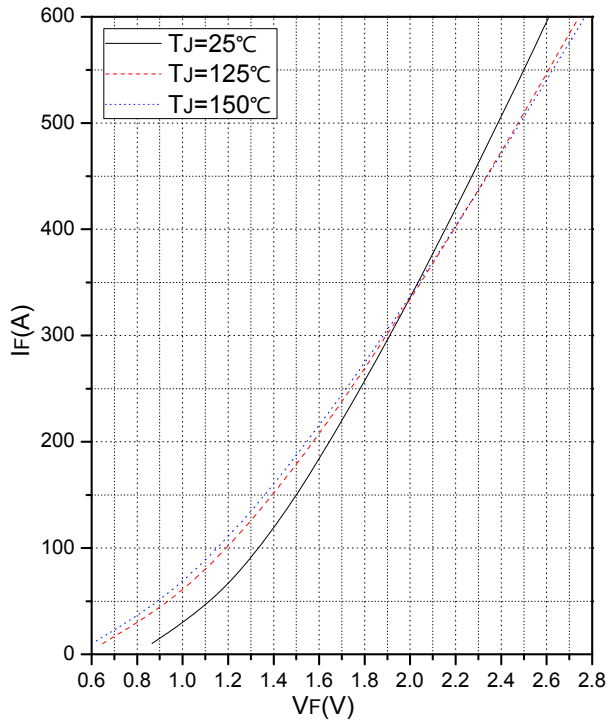


Fig.9 Forward Characteristics of Anti-parallel Diode

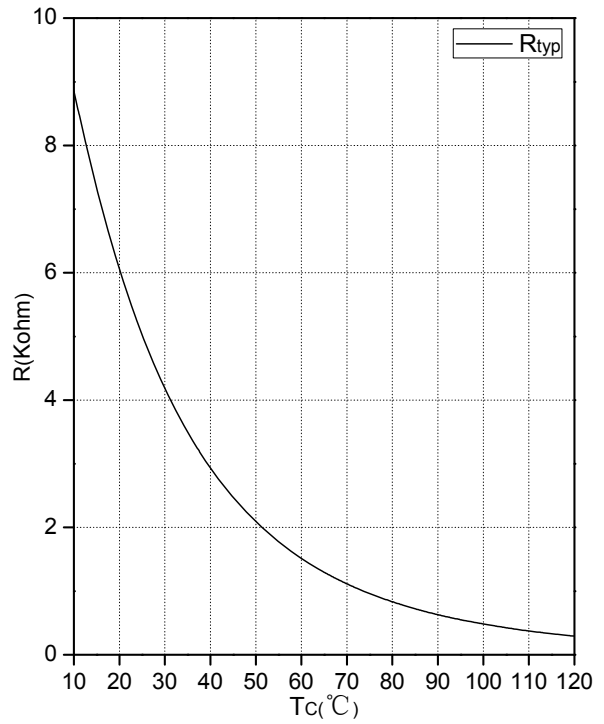
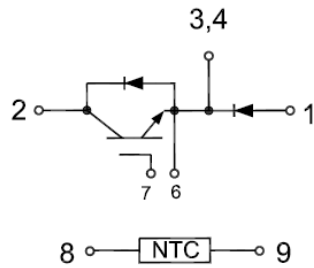
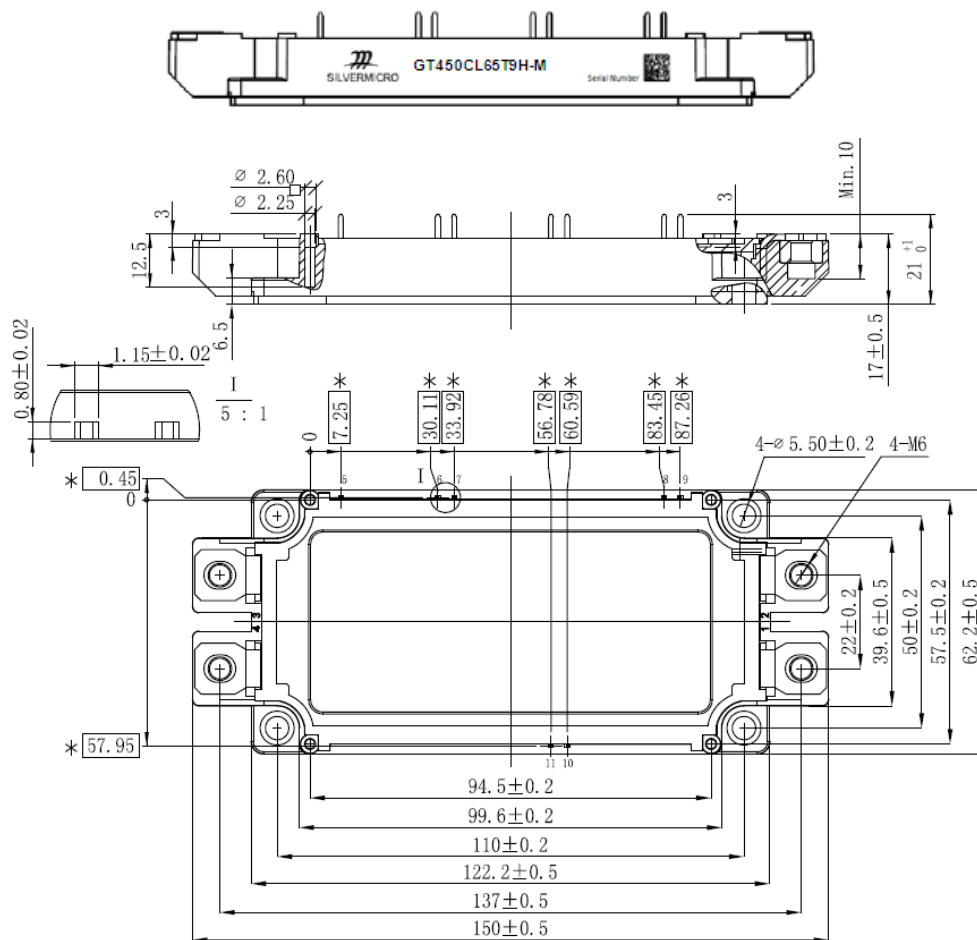


Fig.10 NTC Temperature Characteristics

Internal Circuit:



Package Outline (Unit: mm):





Date	Revision	Notes
07/30/2019	01	Initial Release

Announcement

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