STARPOWER

SEMICONDUCTOR™

IGBT

GD450HTT60C7S

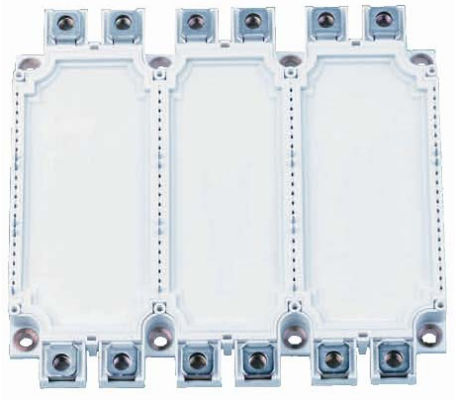
Preliminary

Molding Type Module

600V/450A 6 in one-package

General Description

STARPOWER IGBT power module provides ultra low conduction loss as well as short circuit ruggedness. They are designed for the applications such as general inverters and UPS.



Features

- Low $V_{CE(sat)}$ trench IGBT technology
- Low switching losses
- Maximum junction temperature 175℃
- 5μs short circuit capability
- Square RBSOA
- $V_{CE(sat)}$ with positive temperature coefficient
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology

Typical Applications

- Inverter for motor drive
- AC and DC servo drive amplifier
- Uninterruptible power supply

IGBT-inverter T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD450HTT60C7S	Units
V_{CES}	Collector-Emitter Voltage @ T_j=25℃	600	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current @ T_C=25℃ @ T_C=80℃	700 450	A
I_{CM}	Pulsed Collector Current t_p=1ms	900	A
P_{tot}	Total Power Dissipation @ T_j=175℃	1111	W
T_{SC}	Short Circuit Withstand Time @ T_j=150℃	5.0	μs

Off Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
BV_{CES}	Collector-Emitter Breakdown Voltage	T_j=25℃	600			V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_j=25℃			150	μA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=V_{GES},V_{CE}=0V, T_j=25℃			100	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=1.0mA,V_{CE}=V_{GE}, T_j=25℃	4.0		6.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=450A,V_{GE}=15V, T_j=25℃		1.87		V
		I_C=450A,V_{GE}=15V, T_j=125℃		2.20		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
E_{on}	Turn-On Switching Loss	V_{CC}=300V,I_C=450A, R_G=4.7Ω,V_{GE} =±15V, T_j=25℃		17.7		mJ
E_{off}	Turn-Off Switching Loss			12.9		mJ
E_{tot}	Total Switching Loss			30.6		mJ
E_{on}	Turn-On Switching Loss	V_{CC}=300V,I_C=450A, R_G=4.7Ω,V_{GE} =±15V, T_j=125℃		27.6		mJ
E_{off}	Turn-Off Switching Loss			20.7		mJ
E_{tot}	Total Switching Loss			48.3		mJ

$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=450A, R_G=4.7Ω,V_{GE} =±15V, T_j=25℃		40		ns
t_r	Rise Time			125		ns
$t_{d(off)}$	Turn-Off Delay Time			165		ns
t_f	Fall Time			150		ns
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=450A, R_G=4.7Ω,V_{GE} =±15V, T_j=125℃		42		ns
t_r	Rise Time			140		ns
$t_{d(off)}$	Turn-Off Delay Time			200		ns
t_f	Fall Time			165		ns
C_{ies}	Input Capacitance	V_{CE} =30V,f=1Mhz, V_{GE} =0V		23.1		pF
C_{oes}	Output Capacitance			1.59		pF
C_{res}	Reverse Transfer Capacitance			0.69		pF
I_{SC}	SC Data			TBD		A

DIODE-inverter T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD450HTT60C7S	Units
V_{RRM}	Collector-Emitter Voltage @ T_j=25℃	600	V
I_F	DC Forward Current @ T_C=25℃ @ T_C=80℃	900 450	A
I_{FRM}	Repetitive Peak Forward Current V_R=0V,t_p=10ms,T_C=80℃	900	A
I^2t	I^2t-value,V_R=0V, t_p=10ms, T_j=125℃	35000	A^2s

Characteristics Values

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	I_F=450A,V_{GE}=0V	T_j=25℃		1.23		V
			T_j=125℃		1.29		
t_{rr}	Diode Reverse Recovery Time	I_F=450A, V_R=300V, di/dt=-5900A/μs, V_{GE}=-15V	T_j=25℃		60		ns
			T_j=125℃		120		
I_{RM}	Diode Peak Reverse Recovery Current		T_j=25℃		230		A
			T_j=125℃		285		
E_{rec}	Reverse Recovery Energy		T_j=25℃		3.7		mJ
			T_j=125℃		7.5		

Electrical Characteristics of NTC T_C=25℃ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
R_{25}	Rated Resistance			5.0		kΩ
ΔR/R	Deviation of R_{100}	R_{100}=493.3Ω	5		5	%
P_{25}	Power Dissipation				20.0	mW
$B_{25/50}$	B-value	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$		3375		K

IGBT Module

Symbol	Parameter	Min.	Typ.	Max.	Units
V_{ISO}	Isolation Voltage RMS, f=50Hz, t=1min		2500		V
L_{CE}	Stray Inductance		20		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip @ T_C=25℃		1.10		mΩ
$R_{\theta JC}$	Junction-to-Case (per IGBT) Junction-to-Case (per DIODE)		0.135 0.102		K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)		0.005		K/W
T_j	Operating Junction Temperature	-40		175	℃
T_{STG}	Storage Temperature Range	-40		125	℃
Mounting Torque	Power Terminal Screw:M5	3.0		6.0	N.m
	Mounting Screw:M6	3.0		6.0	N.m
Weight	Weight of Module		910		g

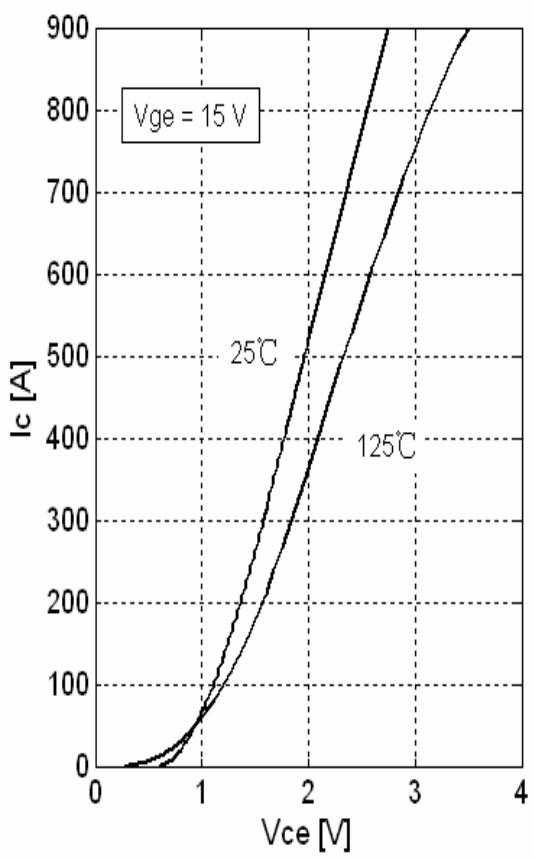


Fig 1. Typical Output Characteristics

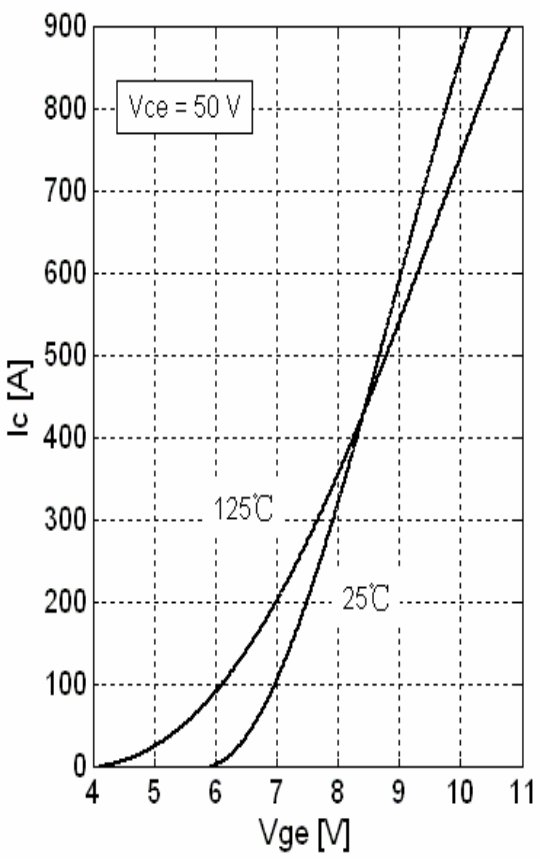


Fig 2. Typical Transfer Characteristics

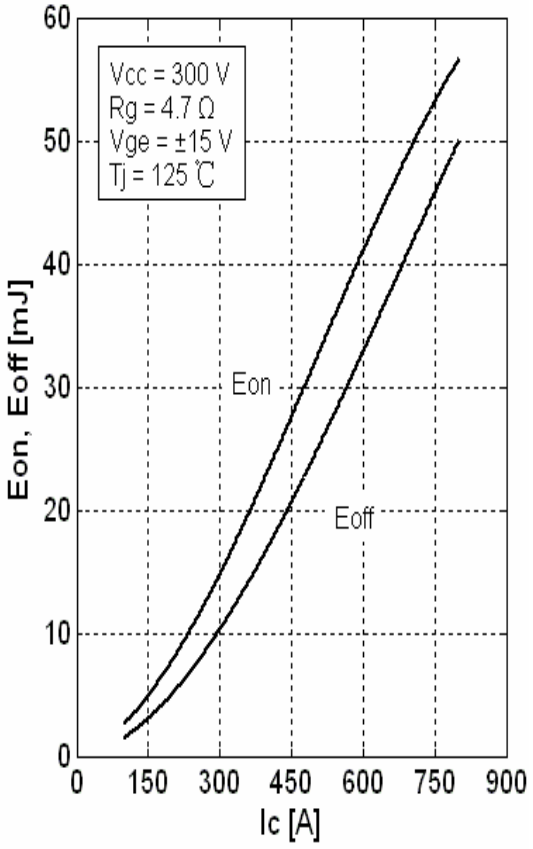


Fig 3. Switching Loss vs. Collector Current

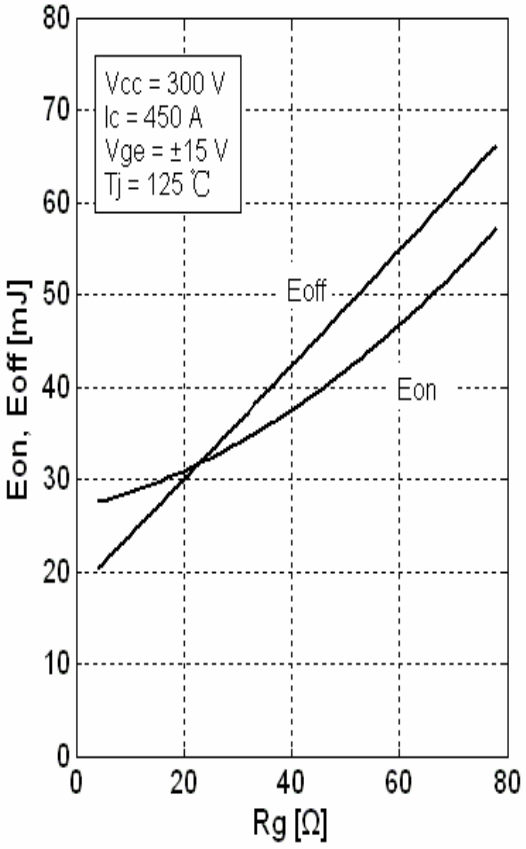


Fig 4. Switching Loss vs. Gate Resistor

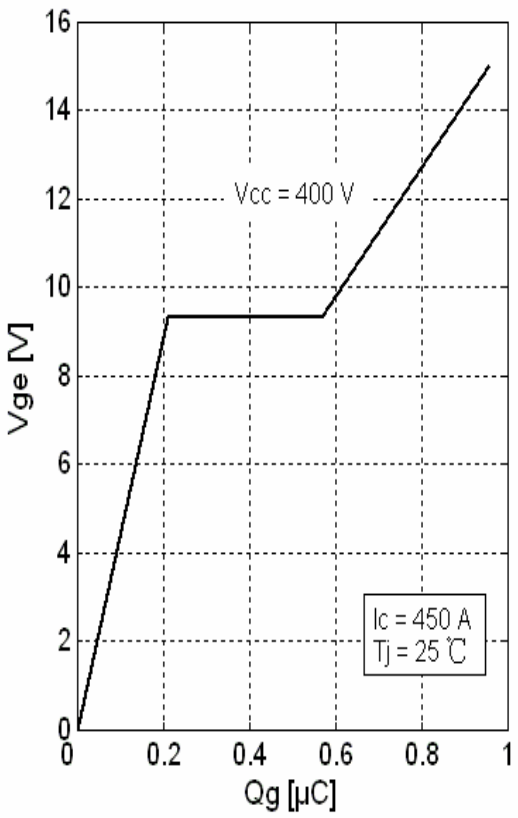


Fig 5. Gate Charge Characteristic

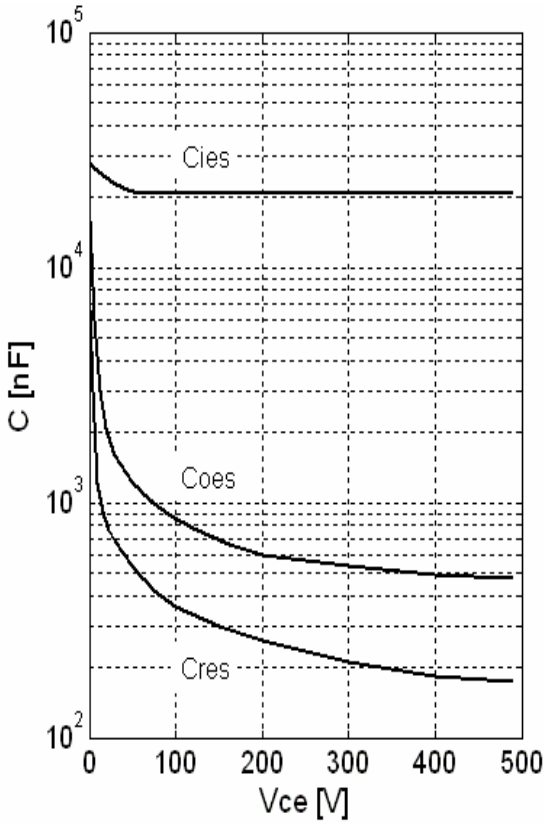


Fig 6. Typical Capacitance vs. Collector-Emitter Voltage

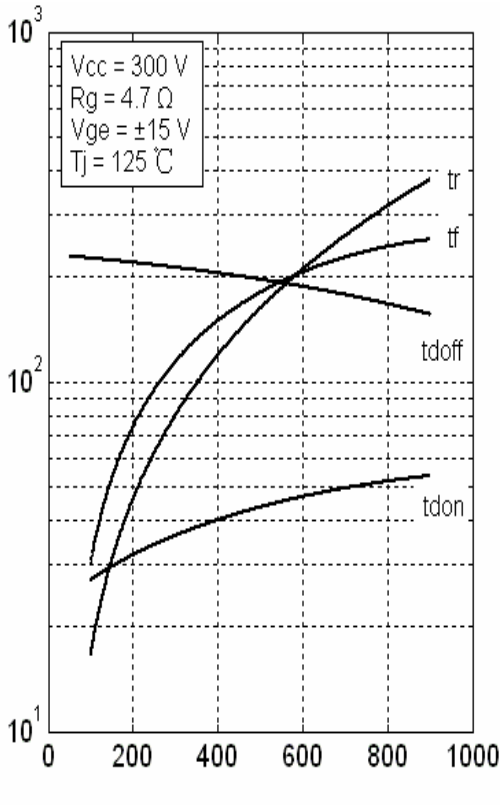


Fig 7. Typical Switching Times vs. I_C

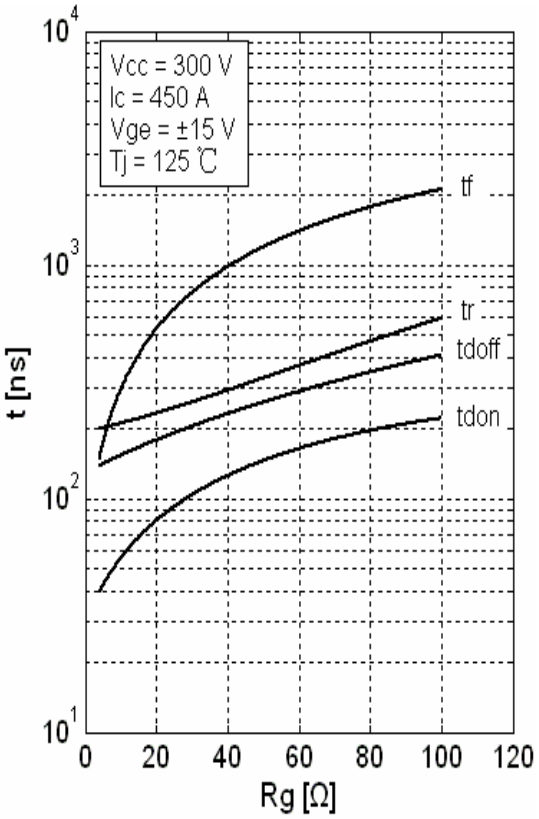


Fig 8. Typical Switching Times vs. Gate Resistance R_G

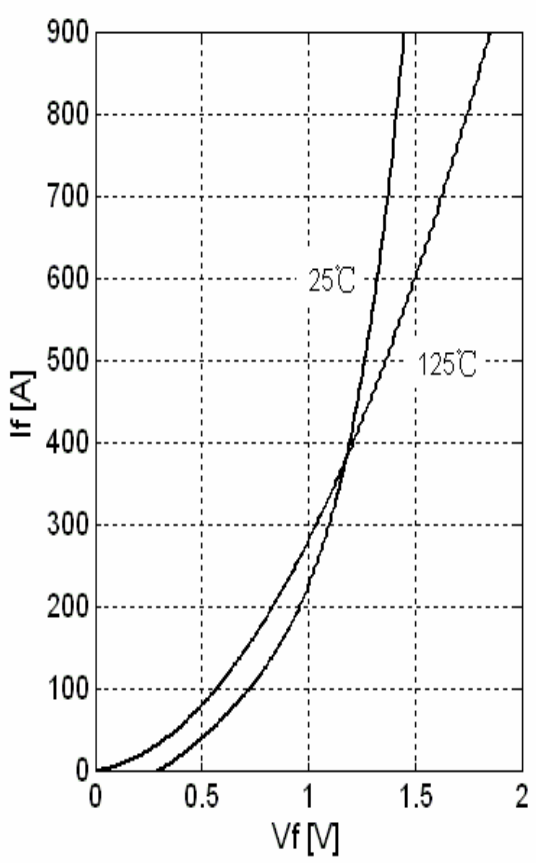


Fig 9. Typical Forward Characteristics(diode)

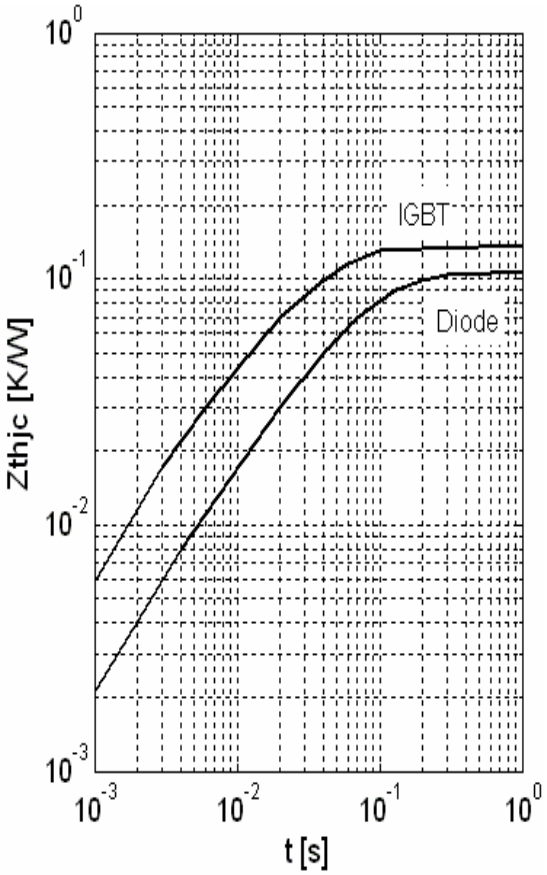


Fig 10. Transient Thermal Impedance

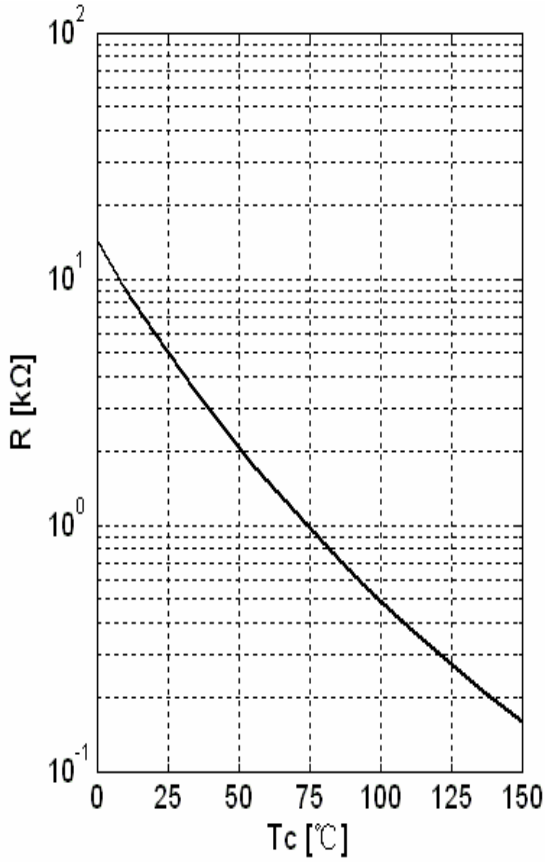
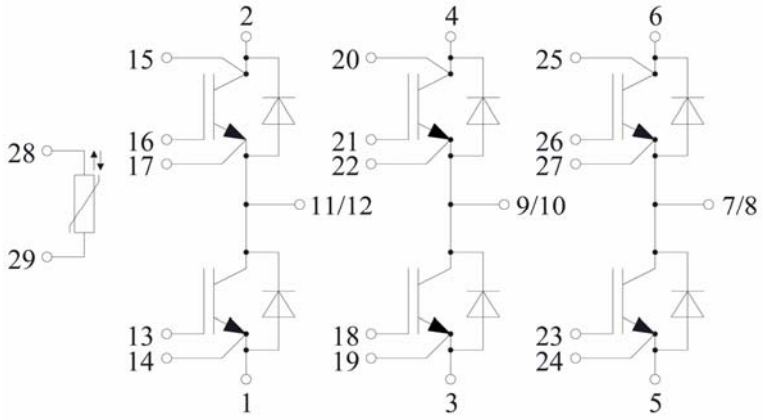
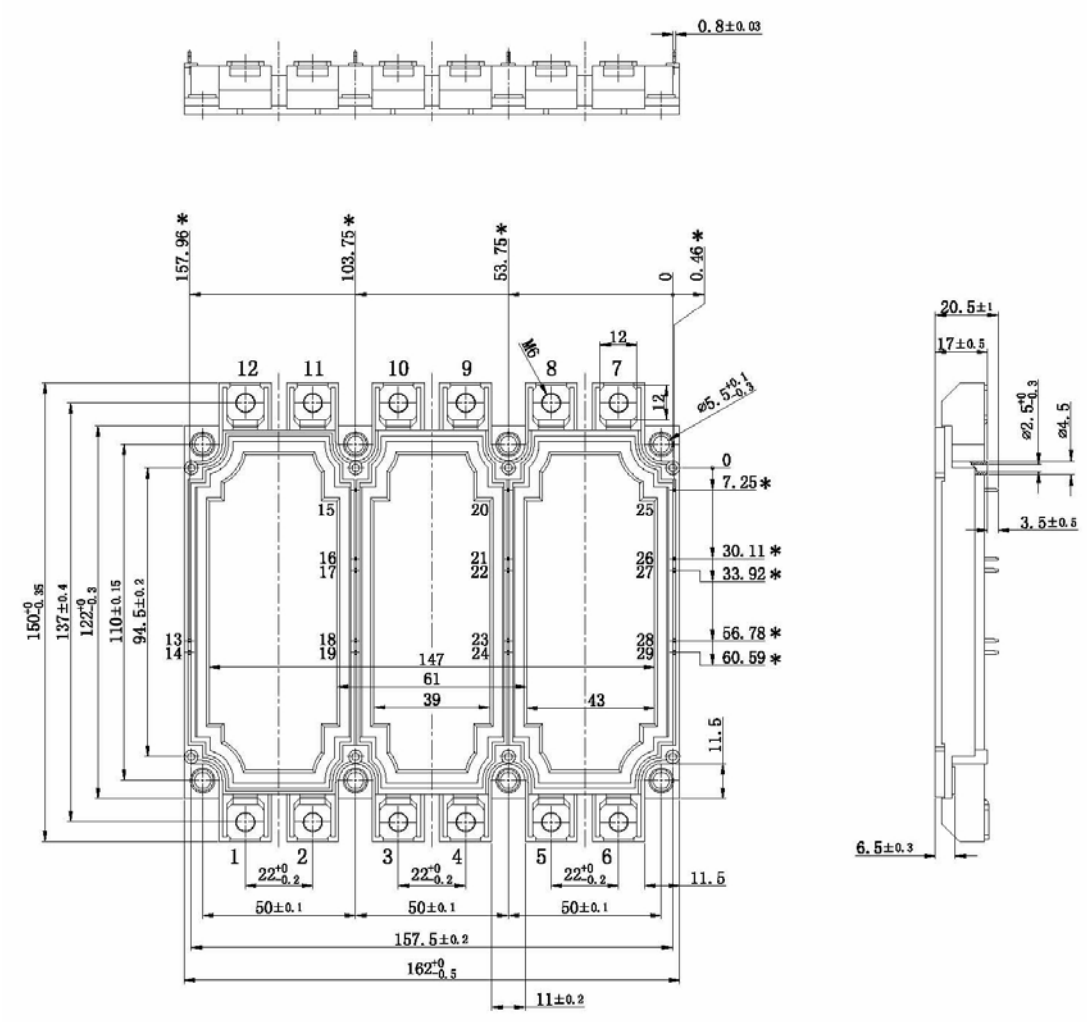


Fig 11. NTC-Temperature Characteristic



Package Dimension

Dimensions in Millimeters



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