STARPOWER

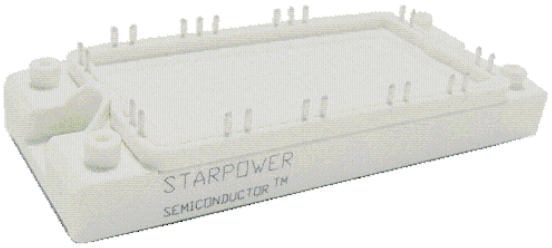
SEMICONDUCTOR™

IGBT

GD50HHU60C5S

Molding Type Module

600V/50A 4 in one-package

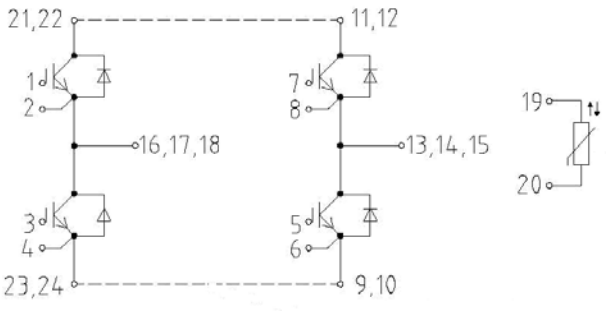


General Description

STARPOWER IGBT Power Module provides ultrafast switching speed as well as short circuit ruggedness. It's designed for the applications such as electronic welder and Inductive heating.

Features

- High short circuit capability, self limiting to 6*I_{Cnom}
- 10us short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Rugged with ultrafast performance
- Square RBSOA
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DCB technology



Equivalent Circuit Schematic

Typical Applications

- Switching mode power supplies at f_{SW}>30kHz
- Inductive heating
- UPS
- Electronic welder at f_{SW}>30kHz

Absolute Maximum Ratings T_C=25℃ unless otherwise noted

Symbol	Description	GD50HHU60C5S	Units
V_{CES}	Collector-Emitter Voltage	600	V
V_{GES}	Gate-Emitter Voltage	±20V	V
I_C	Collector Current @ T_C=25℃, T_j=150℃	75	A
	@ T_C=80℃, T_j=150℃	50	
$I_{CM(1)}$	Pulsed Collector Current @ T_C=80℃	100	A
I_F	Diode Continuous Forward Current	50	A
I_{FM}	Diode Maximum Forward Current	100	A
P_D	Maximum power Dissipation @ T_j=150℃	230	W
T_{SC}	Short Circuit Withstand Time @ T_j=125℃	10	μs
T_J	Operating Junction Temperature	-40 to +150	℃
T_{STG}	Storage Temperature Range	-40 to +150	℃
I^2t-value, Diode	V_R=0V, t=10ms, T_j=125℃	400	A^2s
V_{ISO}	Isolation Voltage RMS, f=50Hz, t=1min	2500	V
Mounting Torque	Mounting Screw:M5	3 to 6	N.m

Notes:

(1) Repetitive rating: Pulse width limited by max. junction temperature

Electrical Characteristics of IGBT T_C=25℃ unless otherwise noted

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℃			1	mA
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=250μA,V_{CE}=V_{GE}, T_j=25℃	3.5	4.5	5.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=50A,V_{GE}=15V, T_j=25℃		2.5	2.9	V
		I_C=50A,V_{GE}=15V, T_j=125℃		2.7	3.1	

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=50A, R_G=10Ω, V_{GE} =±15V, T_j=25℃		46		ns
t_r	Rise Time			28		ns
$t_{d(off)}$	Turn-Off Delay Time			185		ns
t_f	Fall Time			31		ns
E_{on}	Turn-On Switching Loss			1.5		mJ
E_{off}	Turn-Off Switching Loss			3.3		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=50A, R_G=10Ω, V_{GE} =±15V, T_j=125℃		55		ns
t_r	Rise Time			40		ns
$t_{d(off)}$	Turn-Off Delay Time			215		ns
t_f	Fall Time			42		ns
E_{on}	Turn-On Switching Loss			2		mJ
E_{off}	Turn-Off Switching Loss			4.3		mJ
C_{ies}	Input Capacitance	V_{CE} =25V, f=1MHz, V_{GE} =0V		1.79		nF
C_{oes}	Output Capacitance			0.16		nF
C_{res}	Reverse Transfer Capacitance			0.07		nF
I_{SC}	SC Data	T_P≤10us, V_{GE}=15V, T_j=125℃, V_{CC}=360V, V_{CEM}≤600V		270		A
L_{CE}	Stray inductance			30		nH
$R_{CC'+EE'}$	Module lead resistance, terminal to chip	T_C=25℃		2.20		mΩ

Electrical Characteristics of DIODE T_C=25℃ unless otherwise noted

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_{FM}	Diode Forward Voltage	I_F=50A	T_j=25℃		1.3	1.7	V
			T_j=125℃		1.4	1.8	
Q_r	Diode Reverse Recovered charge	I_F=50A, V_R=300V, di/dt=-2600A/μs, V_{GE}=-15V	T_j=25℃		2.1		μC
			T_j=125℃		3.4		
I_{RM}	Diode Peak Reverse Recovery Current		T_j=25℃		60		A
			T_j=125℃		68		
E_{rec}	Reverse Recovery Energy		T_j=25℃		0.42		mJ
			T_j=125℃		0.71		

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}=439Ω	5		5	%
P_{25}	Power dissipation				20.0	mW
$B_{25/50}$	B-value	$R2=R_{25}\exp[B_{25/50}(1/T2-1/(298.15K))]$		3375		K

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (IGBT Part, per 1/2 Module)		0.45	℃/W
$R_{\theta JC}$	Junction-to-Case (DIODE Part, per 1/2 Module)		0.85	℃/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)	0.05		℃/W
Weight	Weight of Module	180		g

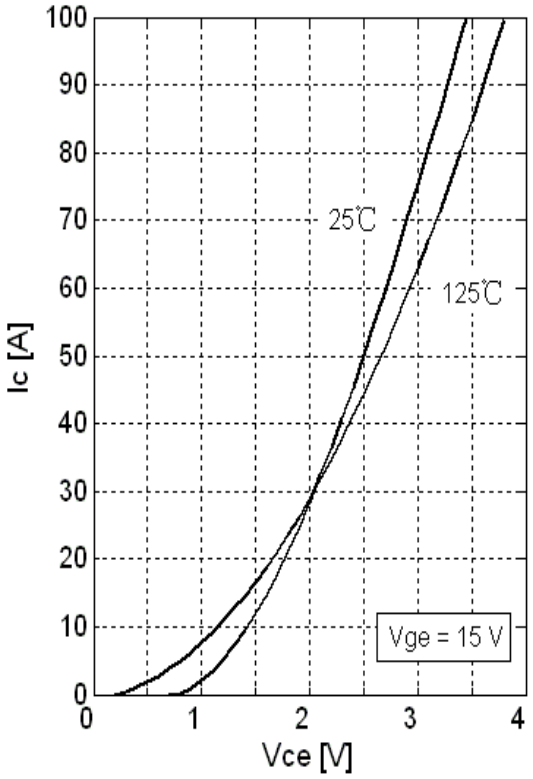


Fig 1. Typical Output Characteristics

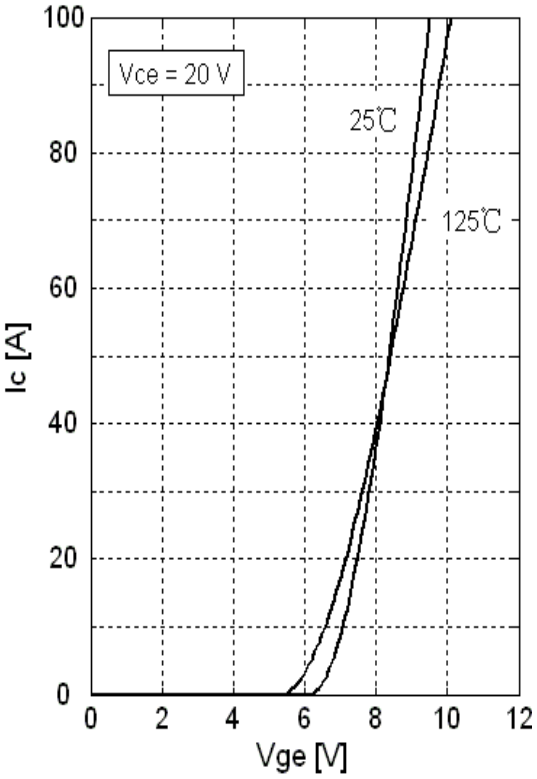


Fig 2. Typical Transfer Characteristics

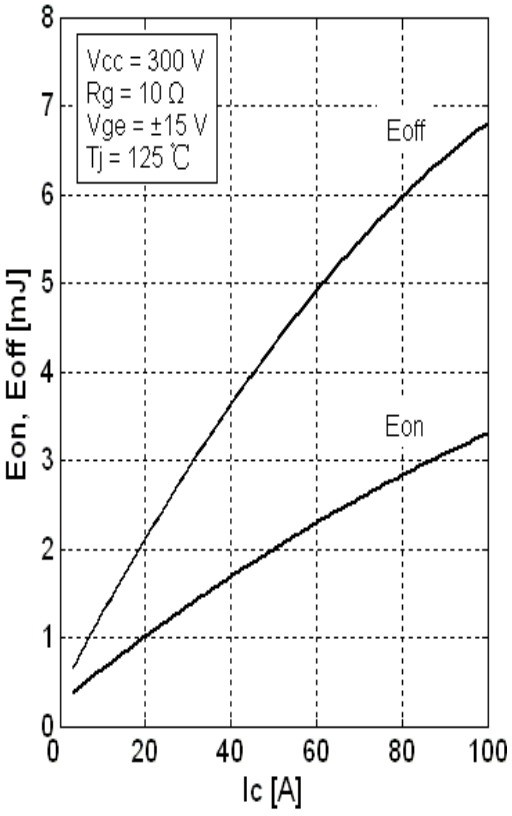


Fig 3.Switching Loss vs. Collector Current

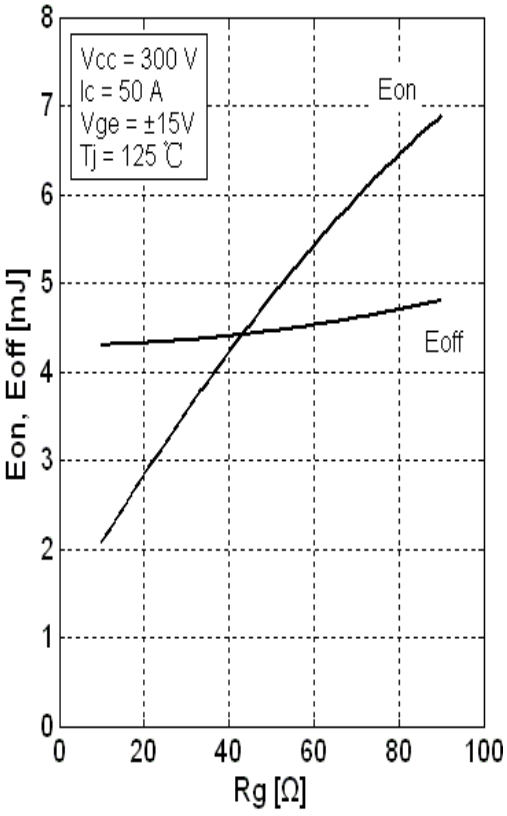


Fig 4. Switching Loss vs. Gate Resistor

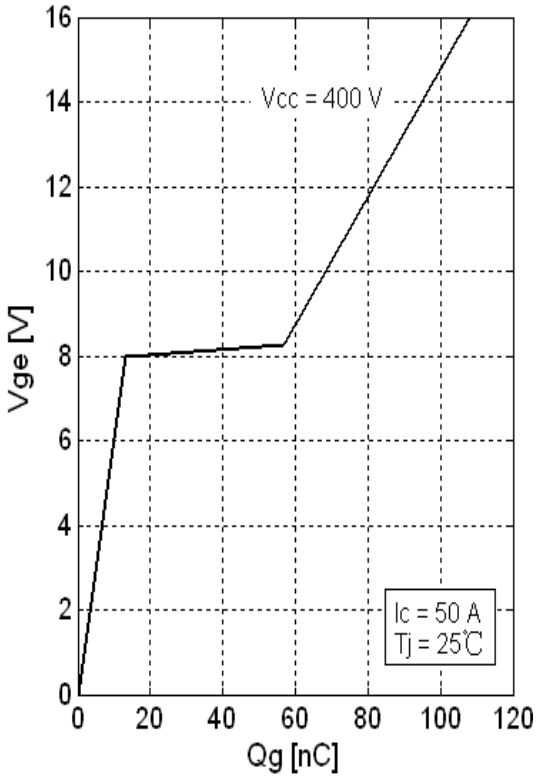


Fig 5. Gate Charge Characteristics.

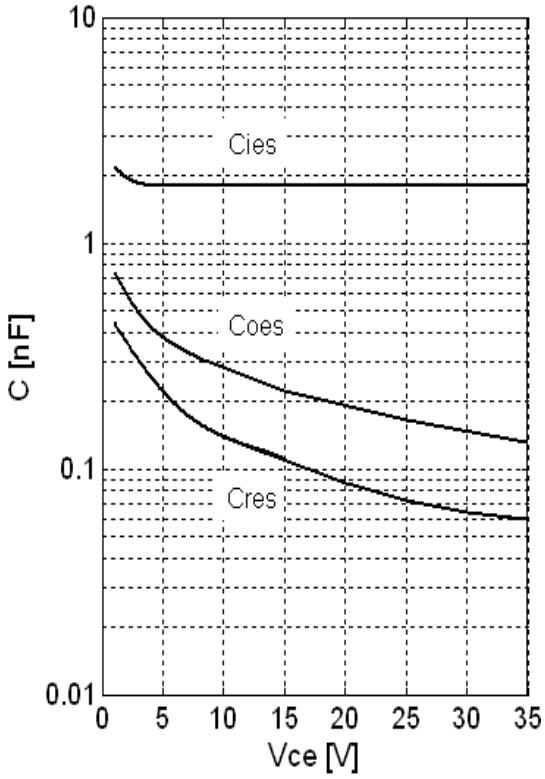


Fig 6. Typical Capacitance vs. Collector-Emitter Voltage

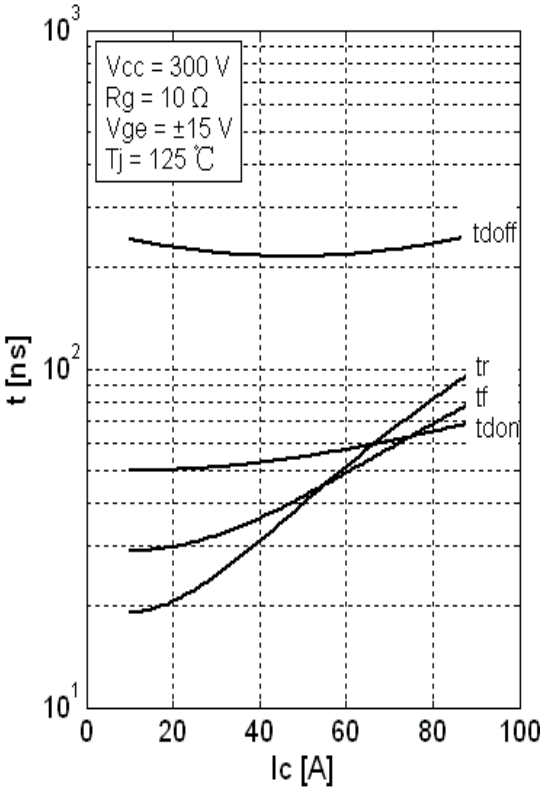


Fig 7. Typical Switching Times vs. I_C

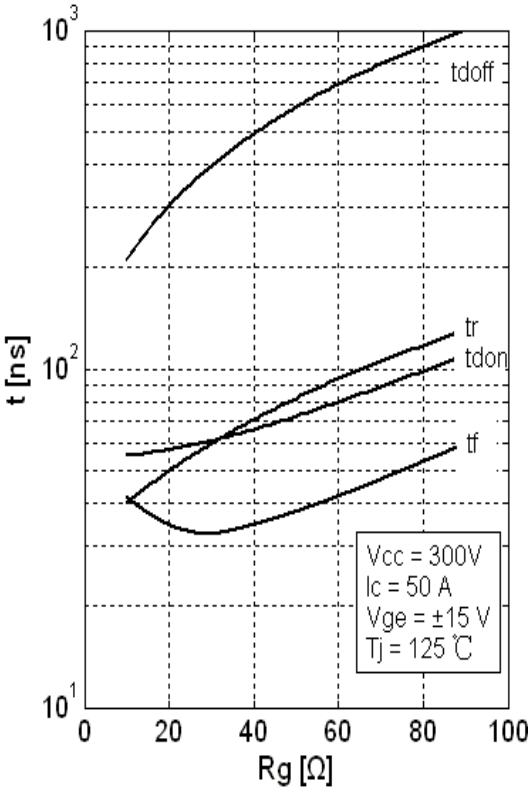


Fig 8. Typical Switching Times vs. Gate Resistance R_G

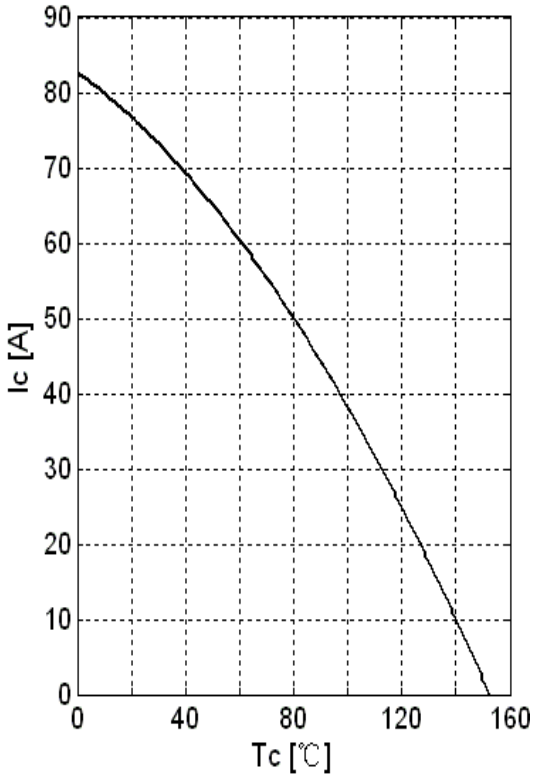


Fig 9. Maximum DC Collector Current vs. Case Temperature

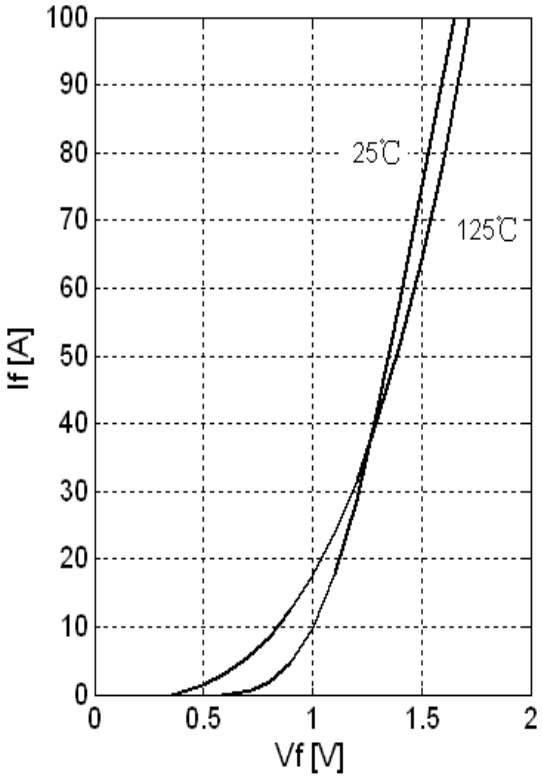


Fig 10. Typical Forward Characteristics (diode)

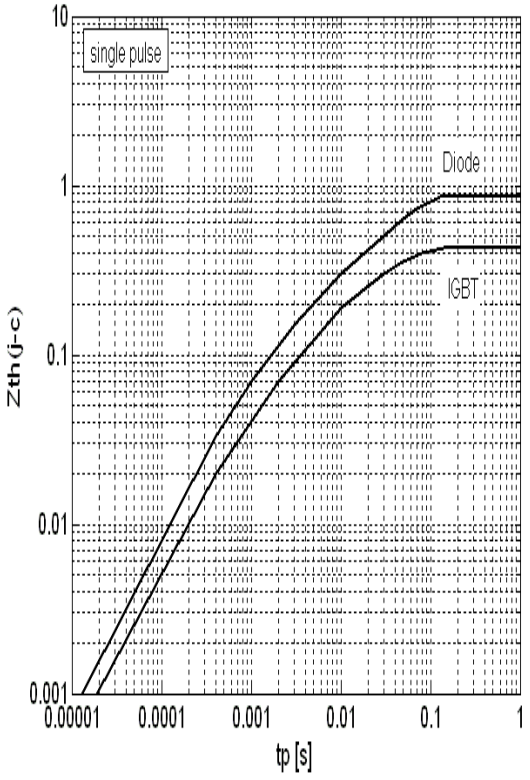


Fig 11. Transient thermal impedance

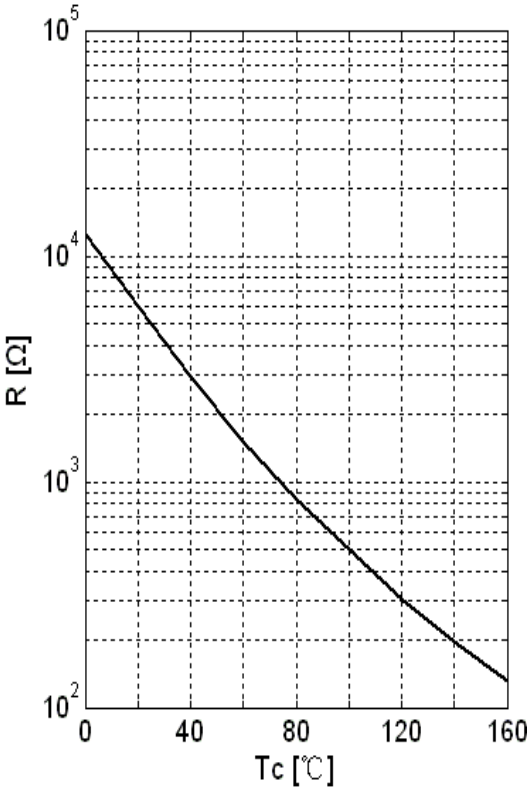
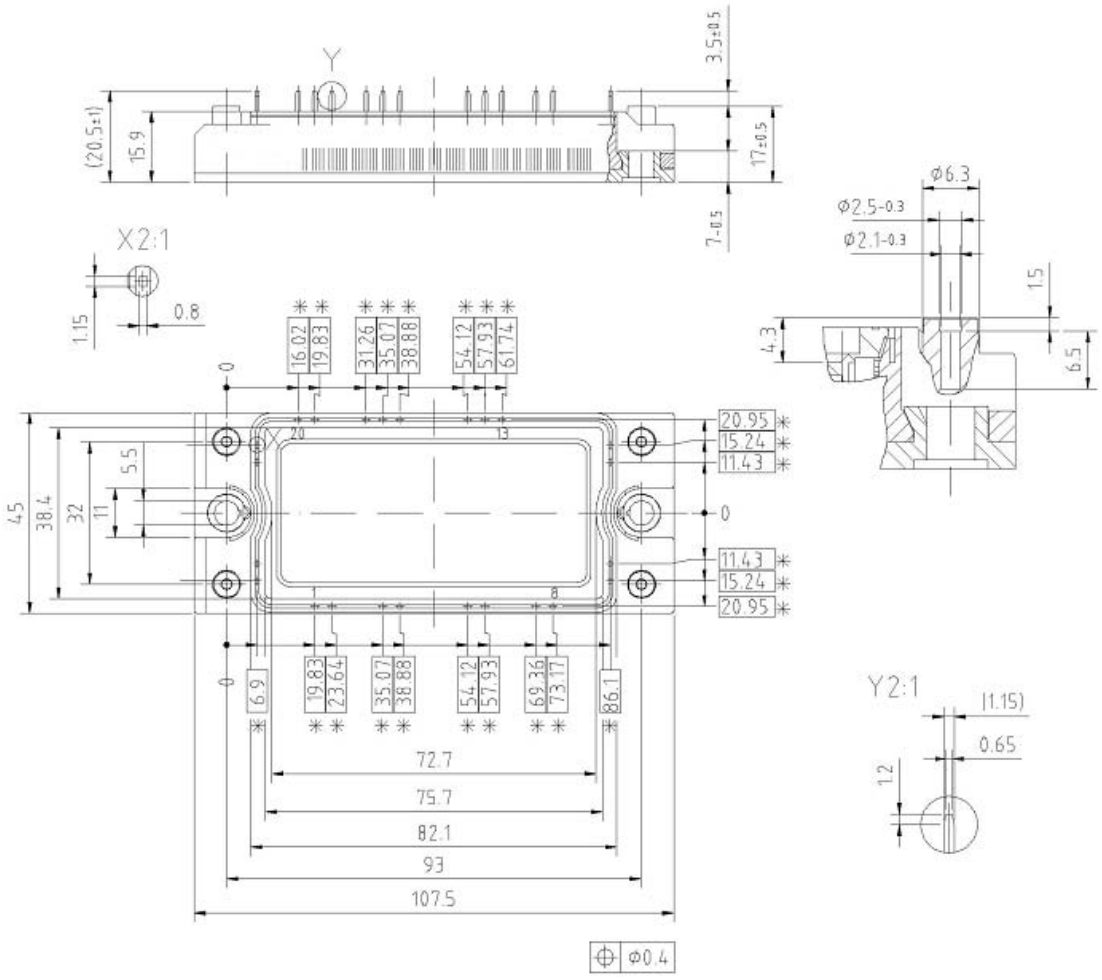


Fig 12. NTC-temperature characteristic

Package Dimension

Dimensions in Millimeters



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