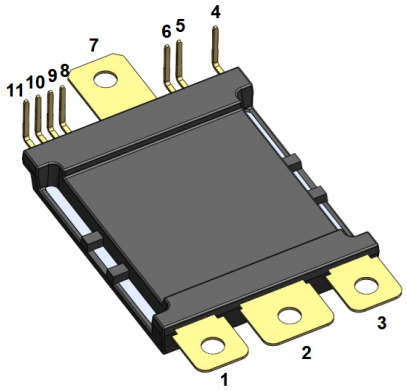
ATSCM1R4N120HBECM

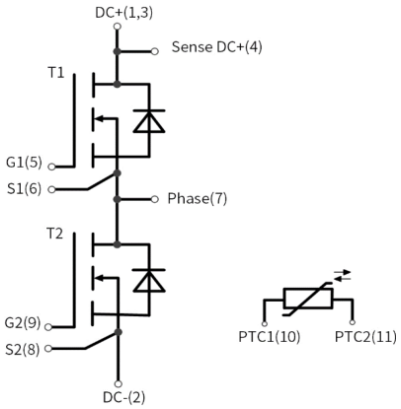
Half Bridge SiC Module

Preliminary version

Product Summary

Product Type	V_{DSS}	I_D	$R_{DS(on)}$	Package
ATSCM1R4N120HBECM	1200V	600A	1.4mΩ	ECM





Features

- 1200V SiC MOSFET Power Module
- Very Low $R_{DS(on)}$
- Very low switching loss
- ECM(Easy Cooling Molded) half bridge module
- Junction temperature up to 175ºC

Typica Applications

- Motor drive
- xEV
- Commercial Vehicle
- Energy storage system

Maximum Ratings (SiC MOSFET, T_j=25°C unless otherwise specified)

Parameter	Symbol	Conditions	Value	Unit
Drain-Source Voltage	V_{DSS}		1200	V
Gate-Source Voltage	V_{GSS}		-4/+22	V
Drain Current	I_D	$T_{j(max)}$ =175°C	600	A
Pulse Drain Current	I_{DM}		1200	A
Maximum Power Dissipation	P_D	T_C =25°C, T_j =150°C	1300	W
Operation junction temperature	$T_{vj\text{-}op}$		-40 to175	°C
Storage temperature	T_{stg}		-40 to 150	°C

Maximum Ratings (diode, Tj =25°C unless otherwise specified)

Parameter	Symbol	Conditions	Value	Unit
Body diode current	I_S	T_C =25°C, V_{GS}=-4V	360	A
Pulse source current	I_{SM}	verified by design, tp limited by T_{vjmax}	1200	A

Module information

Parameter	Conditions	Value	Unit
Isolation Voltage	RMS, f = 50Hz, t =1min	2.7	KV
Stray Inductance	Ls	7.3	nH
Isolation material		Si_3N_4	
Baseplate material		Ni+Cu	
Mounting torque for module mounting	M4, M5	3 to 6	Nm
Weight of Module	G	225	g
Juction to cooling (MOSFET) Junction to cooling (per module)	R_{thCH}	0.08 typ. 0.09 typ.	K/W

MOSFET Electrical characteristics (T_j =25°C unless otherwise specified, chip)

Parameter	Symbol	conditions		Min	Typ	Max	Unit
Drain to source breakdown voltage	$V_{(BR)DSS}$	V_{GS}=0V, ID=100uA		1200			V
Static Drain-Source On-Resistance	$R_{DS(on)}$	I_D=600A, V_{GS}=18V	T_j=25 °C		1.4	1.6	mΩ
			T_j=175 °C		3.0		V
Gate-Source threshold Voltage	$V_{GS(th)}$	I_D =90mA, V_{DS} =V_{GS}	T_j=25 °C	3.0	4.0	4.5	V
			T_j=175 °C		2.5		
Gate charge	Q_G	V_{DS}=1200V, V_{GS}=-4/+18V I_D=600A			2000		nC
Internal gate resistor	R_{Gint}	V_{AC}=25mV, f=1MHz	T_j=25 °C		1.38		Ω
Input Capacitance	C_{iss}	V_{GS} =0V, V_{DS} =800V f =100KHz	T_j=25 °C		63		nF
Output Capacitance	C_{oss}				1770		pF
Reverse transfer Capacitance	C_{rss}				35		pF
Drain-Source leakage Current	I_{DSS}	V_{DS} =1200V, V_{GS} =0V	T_j=25 °C			100	uA
Gate-Source Leakage Current	I_{GSS}	V_{GS} =18V V_{DS} =0V	T_j=25 °C			100	nA
Turn-on delay time	$t_{d(on)}$	V_{DS} =800V I_D = 600A V_{GS} =-1V/18V R_G =3.6Ω L=19nH	T_j=25 °C		208		ns
Rise time	t_r		T_j=25 °C		123		ns
Turn-off delay time	$t_{d(off)}$		T_j=25 °C		485		ns
Fall time	t_f		T_j=25 °C		45		ns
Turn-on switch loss	E_{on}		T_j=25 °C		55		mJ
Turn-off switch loss	E_{off}		T_j=25 °C		32		mJ

Diode Electrical characteristics (Tj =25°C unless otherwise specified, chip)

Item	Symbol	Condition		Min.	Typ.	Max.	Unit
Diode Forward Voltage	V_{SD}	I_S =350A, V_{GS} =-4V	T_j=25 °C		3.85		V
			$_j$=175 °C		3.7		V
Peak reverse recovery Current	I_{rr}	V_{rr} =800V, I_F =600A di/dt = 4100A/us V_{GS}=-4V	T_j=25 °C		105		A
Diodes reverse recovery time	trr		T_j=25 °C		30.5		ns
Recovered charge	Q_{rr}		T_j=25 °C		1935		nC

Characteristics graphs:

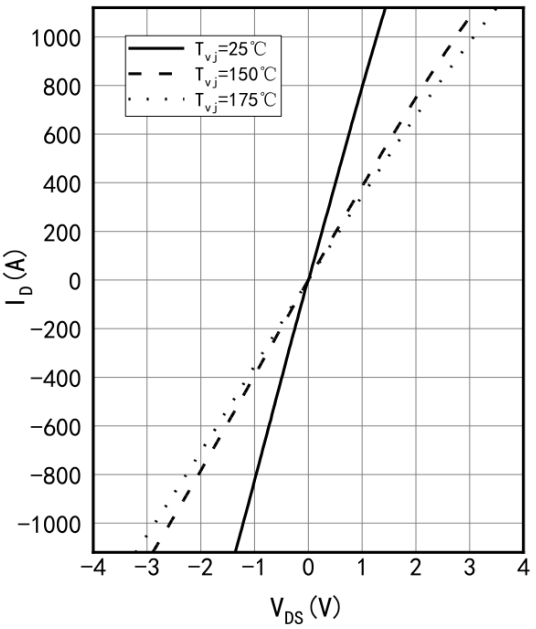


Fig 1: Typical output characteristics, MOSFET

$I_D=f(V_{DS})$, tp<200us, V_{GS}=18V

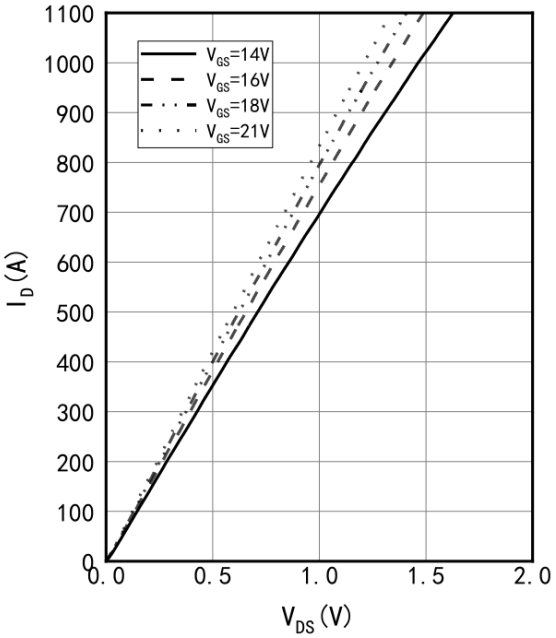


Fig 2: Typical output characteristics, MOSFET

$I_D=f(V_{DS})$, tp<200us, Tj=25ºC

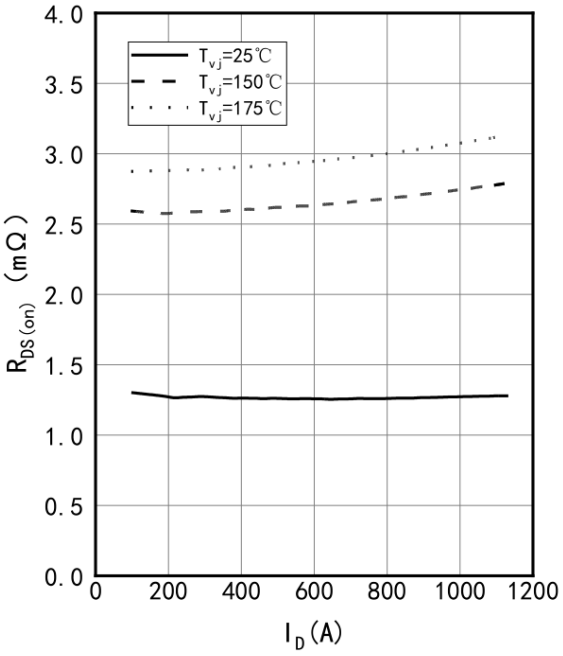


Fig 3: $R_{DS(on)}$ as function of Drain Current

$I_D=f(I_D)$, tp<200us, V_{GS}=18V

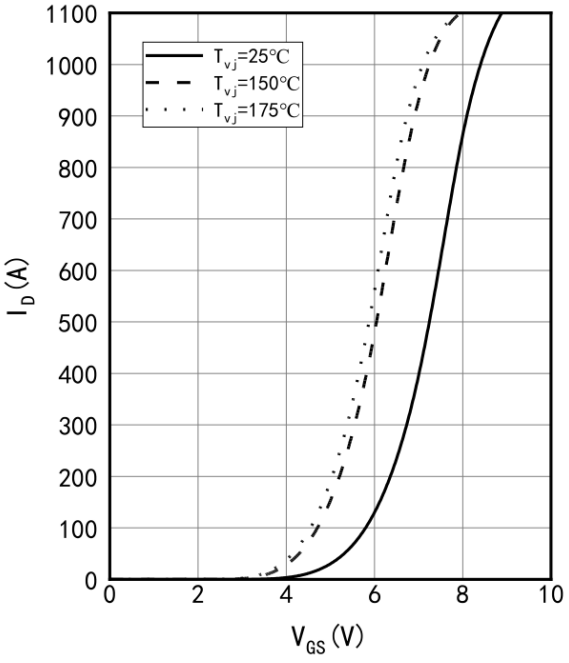


Fig 4: Transfer characteristics versus temperature

$I_D=f(V_{DS})$, tp<200us, V_{DS}=20V

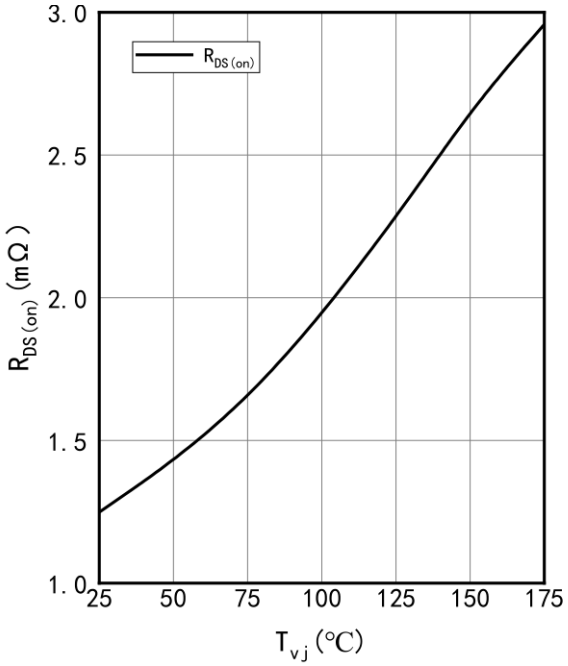


Fig 5: $R_{DS(on)}$ vs Temperature

$R_{DS(on)}$=f(Tj), tp<200us, I_D=600A

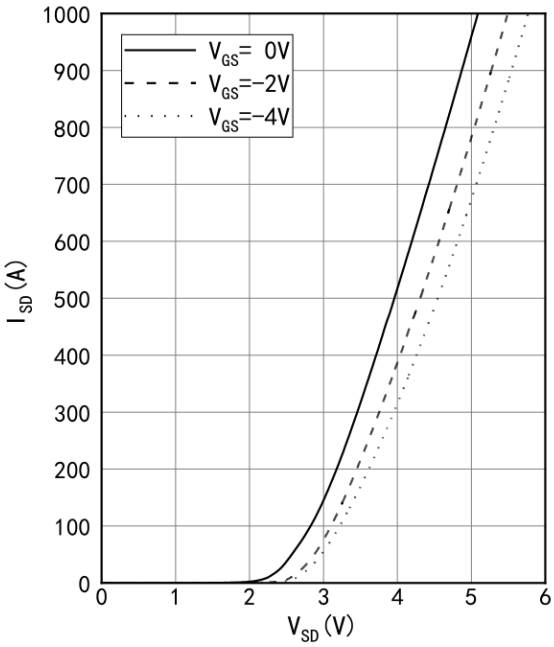


Fig 6: Body diode forward voltage drop

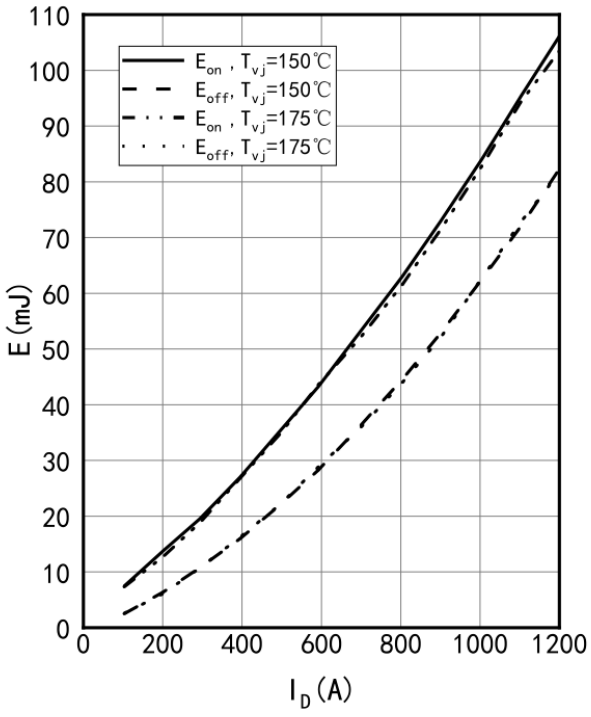


Fig 7: MOSFET switching loss as function of drain current

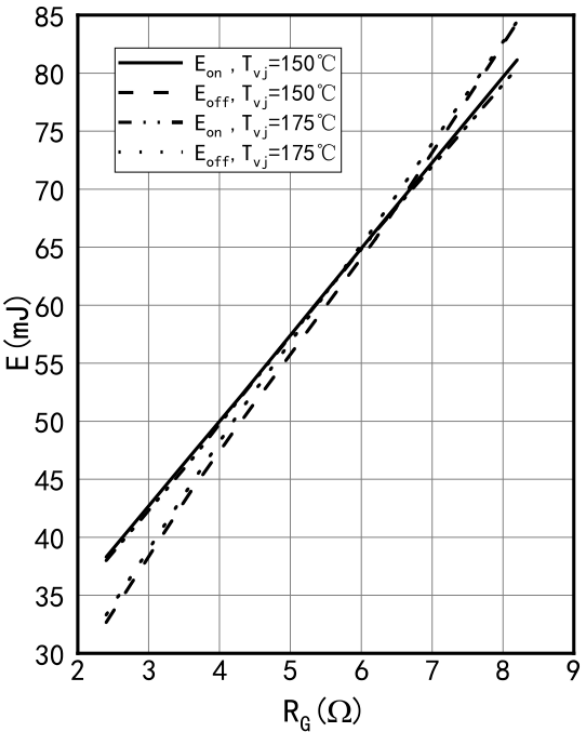


Fig 8: MOSFET switching loss as function of Rg

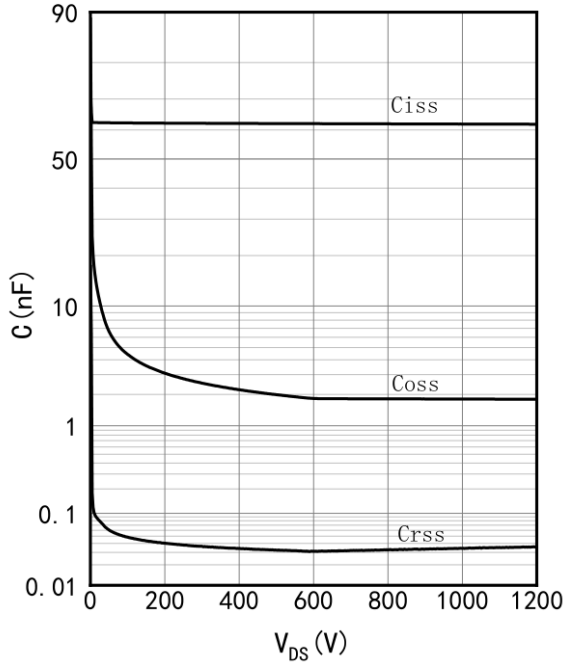


Fig 9: Capacitance as function of Drain-Source voltage, 25ºC

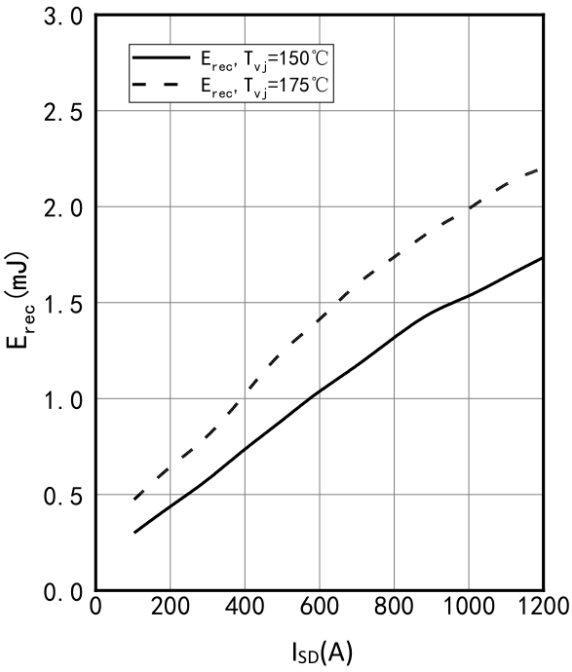


Fig 10: body diode switching loss

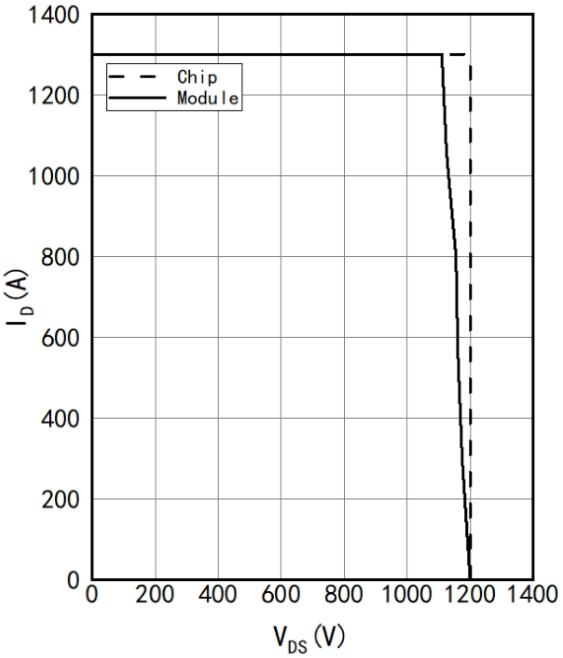


Fig 11: MOSFET reverse bias safe operation area (RBSOA)

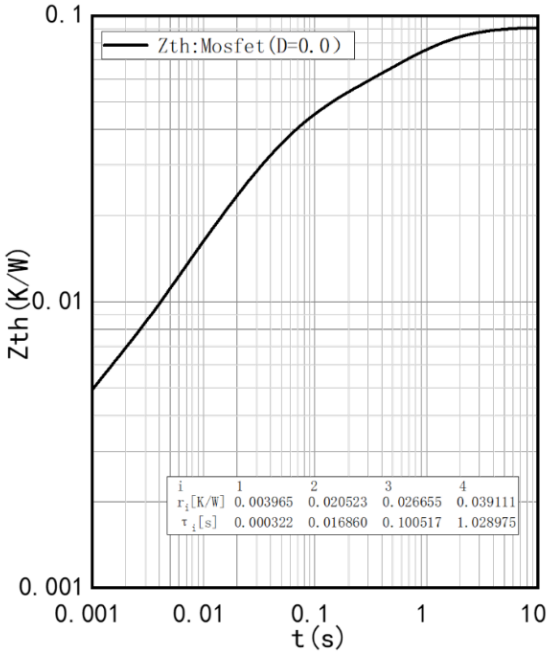


Fig 12: thermal Impedance Module

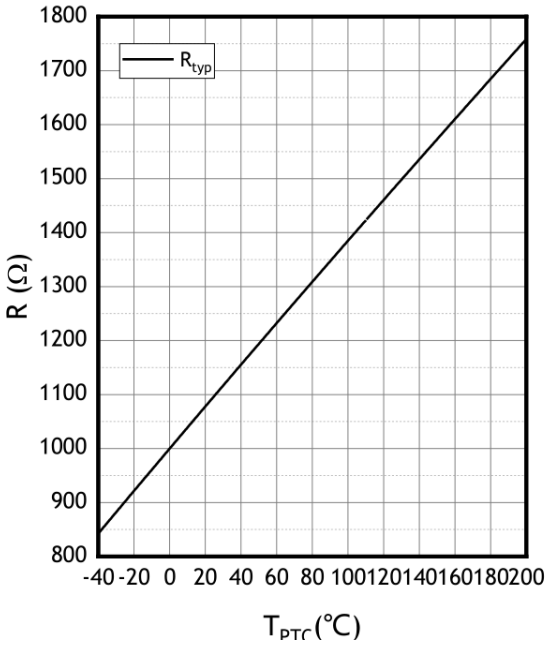
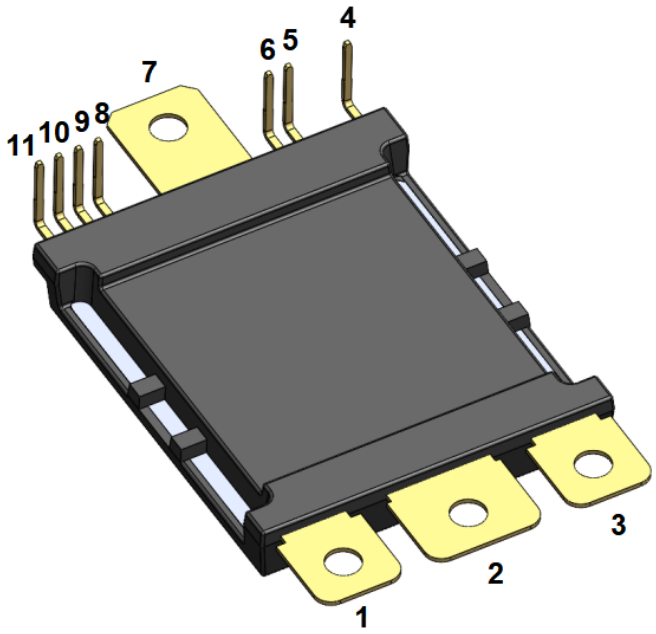
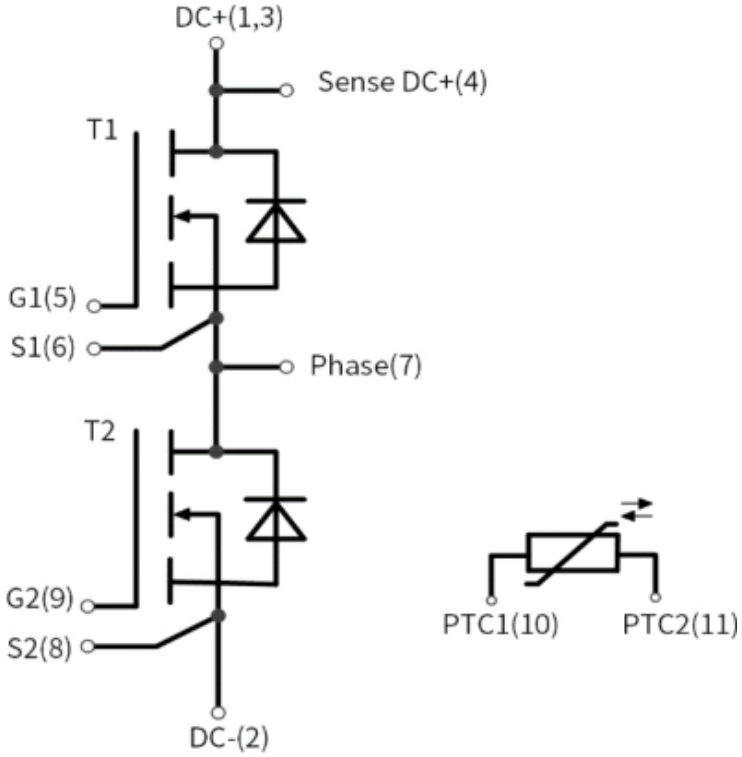


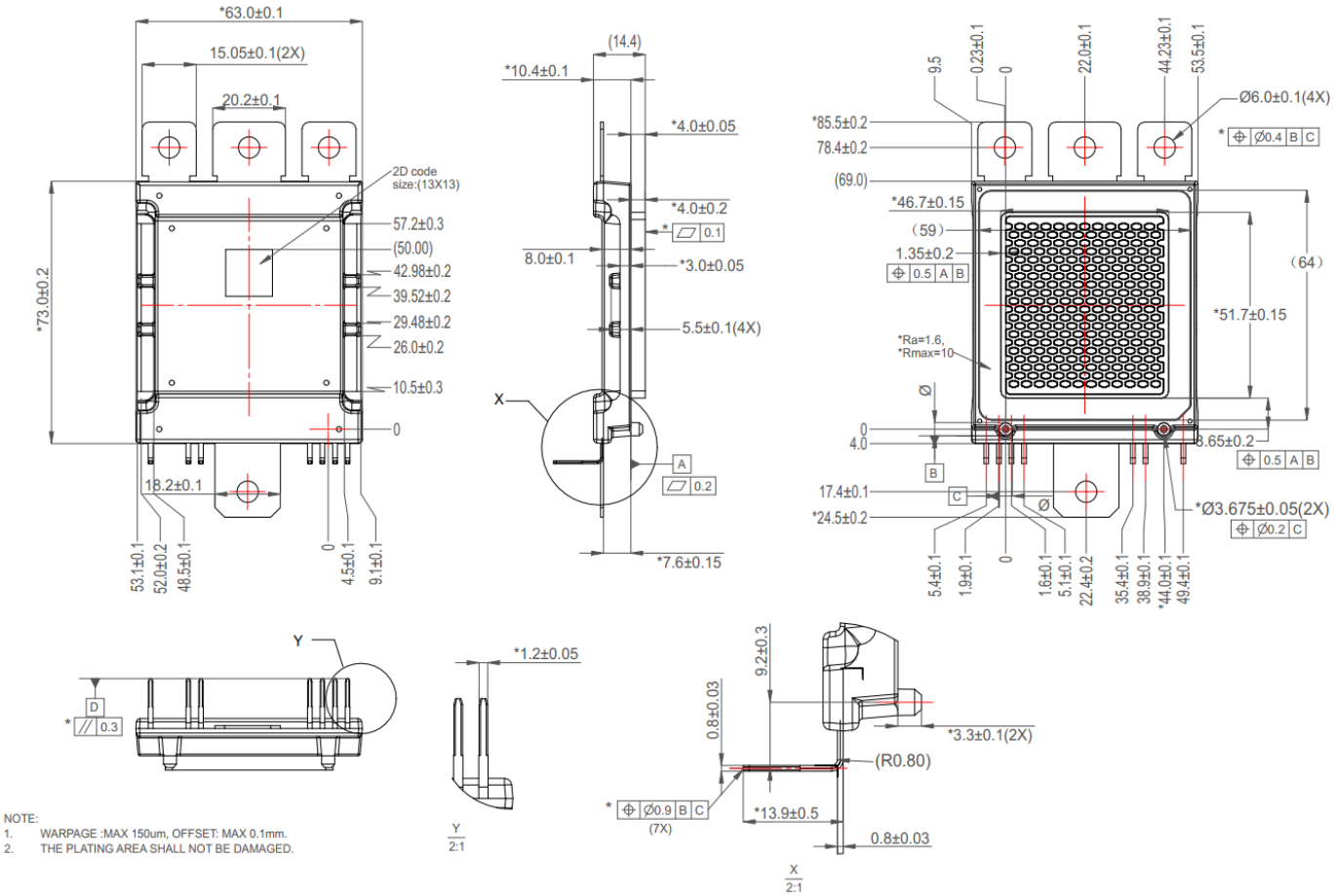
Fig 13: NTC Characteristics

Topology and Pin-out:





Package Information: ECM (Easy Cooling Molded)



NOTE:
1. WARPAGE :MAX 150um, OFFSET: MAX 0.1mm.
2. THE PLATING AREA SHALL NOT BE DAMAGED.

