ASR4N1200HEP04-X

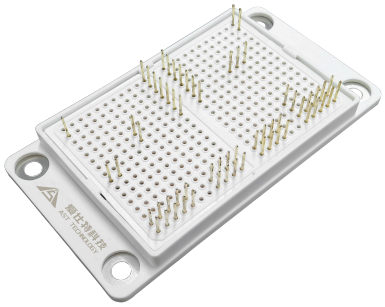
1200V, 4mΩ, 3-Level, Silicon Carbide MOSFET Module

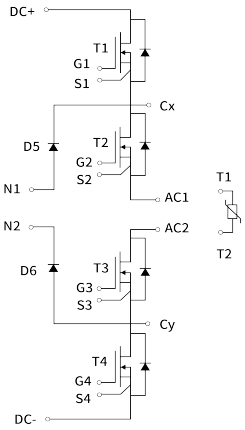
Product Data Sheet ASTC-3T03-209A A/0

爱仕特科技
AST TECHNOLOGY

General Description

The AST-HEP module incorporates AST's 1200V Gen3-X N-channel SiC MOSFET, Diode and solder pin type. NTC temperature sensor inside.





Features

- High Current Density
- Low Inductive Design
- Low Switching Losses
- High-Frequency Operation
- Zero Turn-off Tail Current from MOSFET
- Normally-off, Fail-Safe Device Operation
- Silicon Nitride Internal Isolation

Applications

- 3-Level Applications
- Solar Applications
- UPS Systems
- SST Applications

Ordering Informations

Order Number	ASR4N1200HEP04-X
Marking	ASR4N1200HEP04
Package Type	HEP

Key Parameters (SiC MOSFET T1-T4)

Symbol	Parameter	Values			Unit	Test Conditions
Absolute maximum rating						
V_{DS}	Drain-Source Voltage	1200			V	T_C=25°C
I_D	Drain Current (continuous)	380			A	T_C=25°C
		300				T_C=75°C
$T_{J;\,MAX}$	Junction Temperature	175			°C	
Symbol	**Parameter**	**Min.**	**Typ.**	**Max.**	**Unit**	**Test Conditions**
Static characteristics						
$R_{DS(on)}$	Static Drain-Source on Resistance	-	4.0	5.0	mΩ	V_{GS}=18V; I_D=400A; T_C=25°C
Dynamic characteristics						
Q_G	Total Gate Charge	-	824	-	nC	V_{DD}=800V; V_{GS}=-5/+18V; I_D=200A; T_C=25°C
Q_{GD}	Gate-Drain Charge	-	196	-		
Source-drain diode						
Q_{RR}	Reverse Recovery Charge	-	2.5	-	μC	V_{GS}=-5/+18V; I_F=400A; V_R=800V; Load=27μH; $R_{G(ext)}$=5Ω; T_J=25°C

Absolute Maximum Ratings (at T_C=25℃ unless otherwise specified)

Symbol	Parameter	Values	Unit
V_{DS}	Drain-Source Voltage	1200	V
V_{GS}	Gate-Source Voltage	-10/+22	V
I_D	Continuous DC Drain Current (T_C=25°C)	380	A
	Continuous DC Drain Current (T_C=75°C)	300	
I_{DM}	Drain Current (pulsed)	600	A
V_{isol}	Isolation Test Voltage (DC; t=10s)	4.2	kV
L_{Stray}	Stray Inductance	10	nH
T_J; T_{stg}	Junction and Storage Temperature Range	-40 to +150	°C
M_S	Mounting Force Per Clamp	40 - 80	N
$R_{th\ Jh}$	Thermal Resistance, Junction to Heatsink	0.14	°C/W
M	Weight	260	g

SiC MOSFET (T1-T4) Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
Static characteristics (at T_C=25℃ unless otherwise specified)						
BV_{DS}	Drain-Source Breakdown Voltage	1200	-	-	V	V_{GS}=0V; I_D=1mA
I_{DSS}	Zero Gate Voltage Drain Current	-	-	40	μA	V_{DS}=1200V; V_{GS}=0V
I_{GSS}	Gate-Body Leakage Current	-	-	2.0	μA	V_{GS}=-10/20V; V_{DS}=0V
$V_{GS(th)}$	Gate Threshold Voltage	2	-	4	V	V_{DS}=V_{GS}; I_D=40mA
$R_{DS(on)}$	Static Drain-Source on Resistance	-	4.0	5.0	mΩ	V_{GS}=18V; I_D=400A; T_C=25°C
$V_{GS(on)}$	Recommended Turn-on Voltage	-	18	-	V	Static
$V_{GS(off)}$	Recommended Turn-off Voltage	-	-5	-	V	
R_G	Gate Resistance	-	1.8	-	Ω	V_{GS}=0V; f=1MHz
Dynamic characteristics (at T_C=25℃ unless otherwise specified)						
C_{iss}	Input Capacitance	-	12.2	-	nF	V_{DS}=1000V; f=100kHz; V_{AC}=25mV
C_{oss}	Output Capacitance	-	0.38	-		
C_{rss}	Reverse Transfer Capacitance	-	60	-	pF	
E_{on}	Turn-on Energy	-	22	-	mJ	V_{DS}=800V; V_{GS}=-5/+18V; I_D=400A; $R_{G(ext)}$=5Ω; Load=27μH
E_{off}	Turn-off Energy	-	20	-		
Q_{GS}	Gate-Source Charge	-	232	-	nC	V_{DD}=800V; V_{GS}=-5/+18V; I_D=200A
Q_{GD}	Gate-Drain Charge	-	196	-		
Q_G	Total Gate Charge	-	824	-		
$t_{d(on)}$	Turn-on Delay Time	-	89	-	ns	V_{DD}=800V; V_{GS}=-5/+18V; I_D=400A; $R_{G(ext)}$=5Ω; Load=27μH
t_r	Rise Time	-	92	-		
$t_{d(off)}$	Turn-off Delay Time	-	373	-		
t_f	Fall Time	-	64	-		

MOSFET Body Diode Characteristics (at T_J=25℃ unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
V_{FSD}	Forward Voltage	-	3.5	5	V	V_{GS}=0V; I_F=200A
I_S	Continuous Diode Forward Current	-	200	-	A	V_{GS}=0V; T_C=25°C
t_{RR}	Reverse Recovery Time	-	147	-	ns	V_{GS}=-5/+18V; I_F=400A; V_R=800V; $R_{G(ext)}$=5Ω; Load=27μH
Q_{RR}	Reverse Recovery Charge	-	2.5	-	μC	
I_{RRM}	Peak Reverse Recovery Current	-	48	-	A	

SiC Diode (D5-D6) Characteristics (at T_J=25℃ unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
V_{RRM}	Repetitive Peak Reverse Voltage	1200	-	-	V	I_R=300μA
V_F	Forward Voltage	-	1.6	1.9	V	I_F=300A; T_C=25°C
		-	2.0	2.5		I_F=300A; T_C=175°C
I_F	Continuous Diode Forward Current	-	300	-	A	V_{GS}=0V; T_C=150°C
I_{FRM}	Repetitive Forward Surge Current (Half-Sine Wave)	-	1140	-	A	T_C=25°C; t_p=10ms
		-	780	-		T_C=110°C; t_p=10ms
I_{FSM}	Non-Repetitive Forward Surge Current (Half-Sine Pulse)	-	1650	-	A	T_C=25°C; t_p=10ms
		-	1140	-		T_C=110°C; t_p=10ms
Q_C	Total Capacitive Charge	-	1.68	-	μC	V_R=800V

NTC Thermistor Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
R_{25}	Rated Resistance	-	5.00	-	kΩ	T_{NTC}=25°C
ΔR/R	Deviation of R_{100}	-5	-	5	%	T_{NTC}=100°C; R_{100}=493.3Ω
$B_{25/50}$	Beta Value for 25°C to 50°C	-	3375	-	K	$R_2=R_{25}\exp[B_{25/50}(1/T_2 - 1/(298.15K))]$
$B_{25/80}$	Beta Value for 25°C to 80°C	-	3414	-	K	$R_2=R_{25}\exp[B_{25/80}(1/T_2 - 1/(298.15K))]$
$B_{25/100}$	Beta Value for 25°C to 100°C	-	3436	-	K	$R_2=R_{25}\exp[B_{25/100}(1/T_2 - 1/(298.15K))]$

Typical Performance

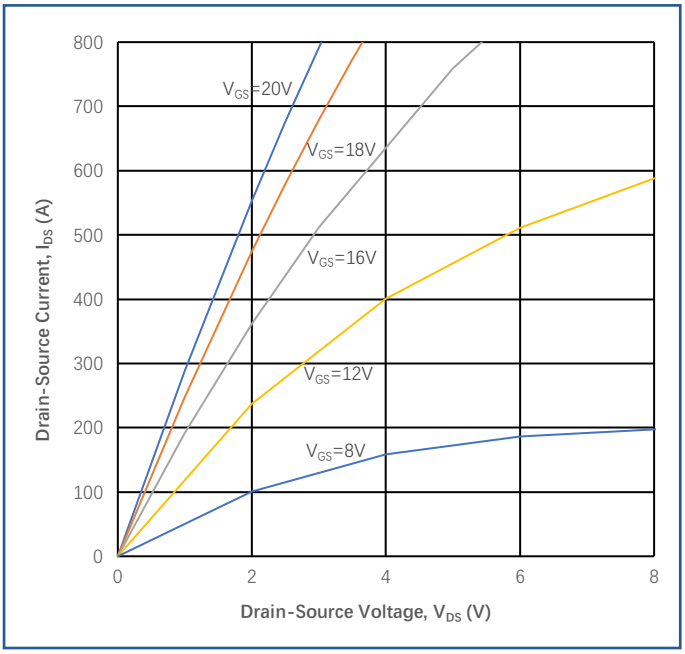


Figure 1

Output Characteristics (T_J=25°C)

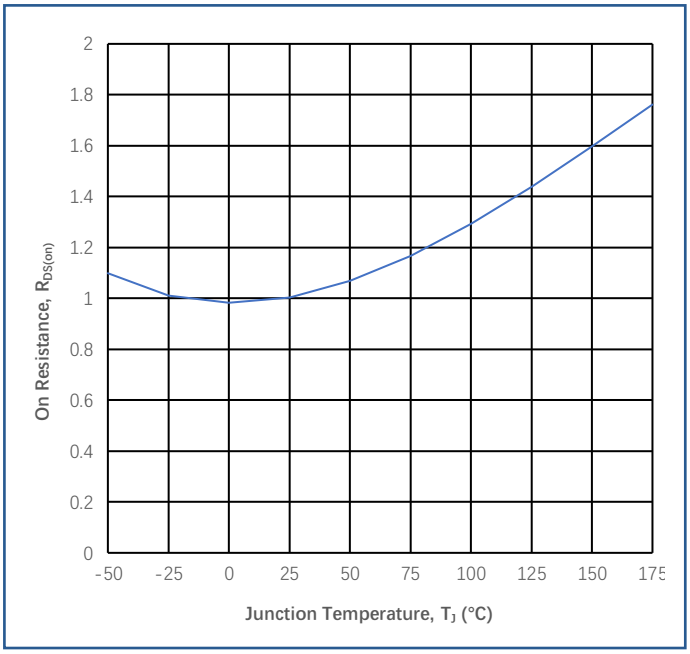


Figure 2

Normalized On-Resistance vs. T_J

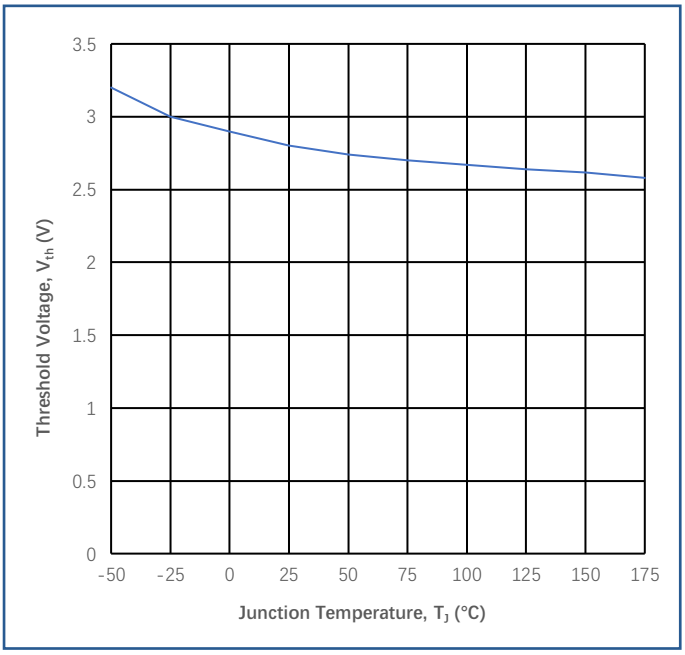


Figure 3

Threshold Voltage vs. Temperature

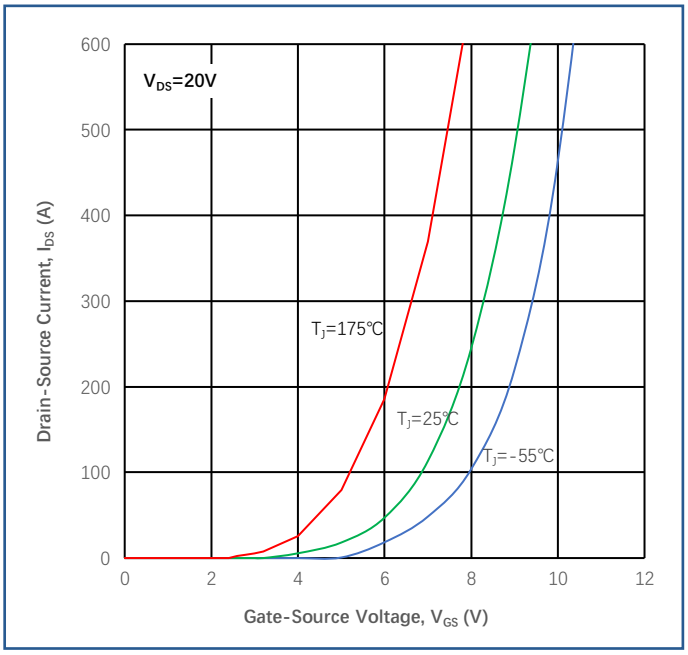


Figure 4

Transfer Characteristic for Various T_J

Typical Performance

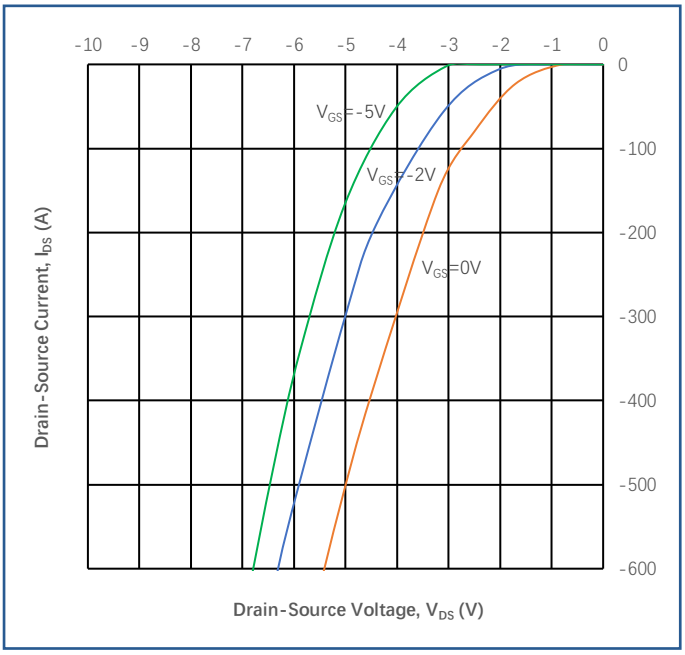


Figure 5

SiC-MOS Body Diode Characteristic at 25˚C

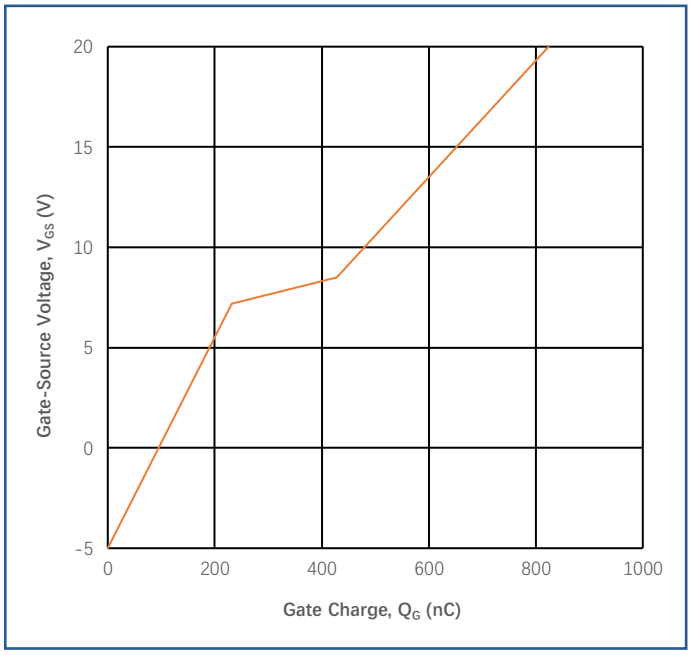


Figure 6

Typical Gate Charge Characteristics

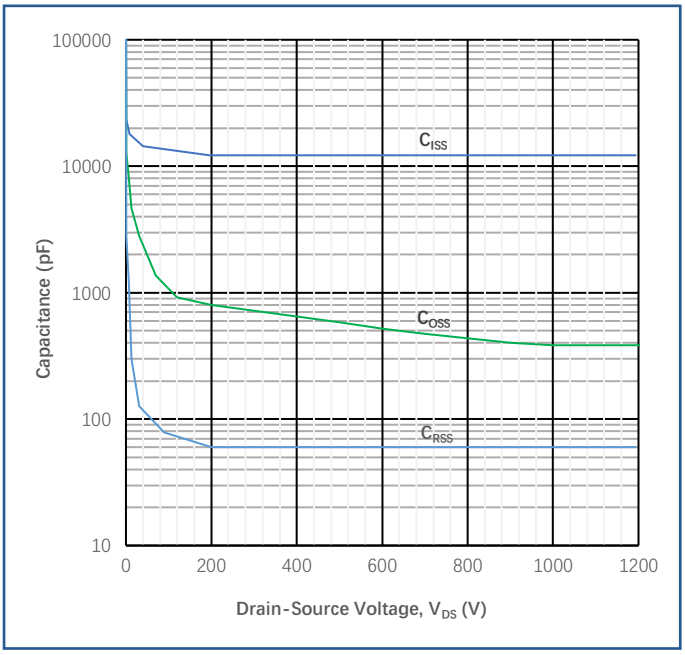


Figure 7

Typical Capacitances vs. Drain-Source Voltage

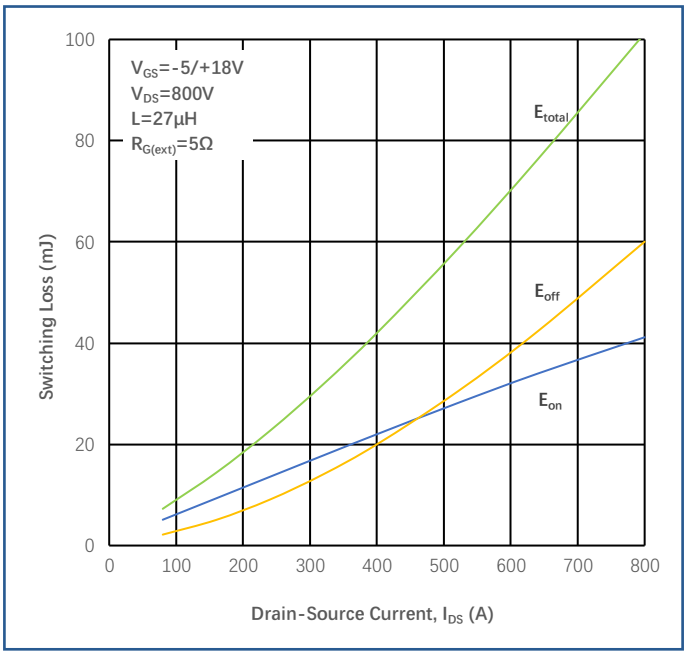


Figure 8

Inductive Switching Energy vs. Drain Current

Typical Performance

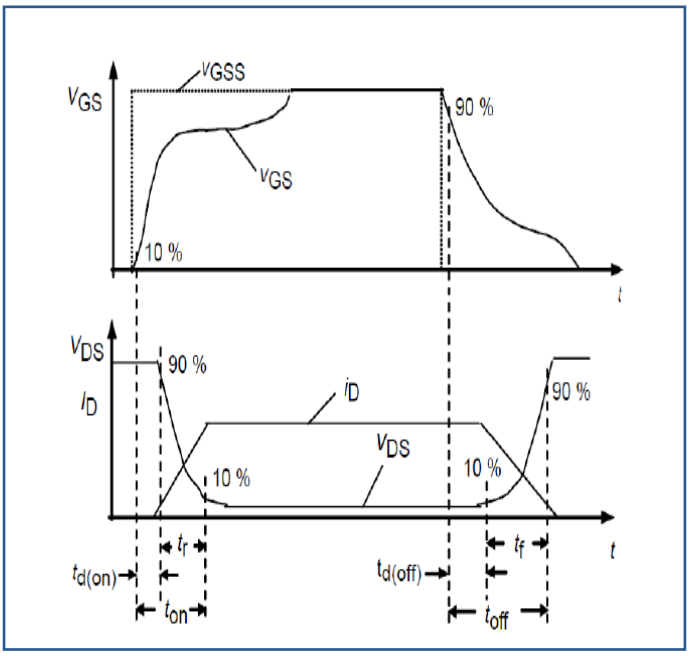


Figure 9
Switching Time Description

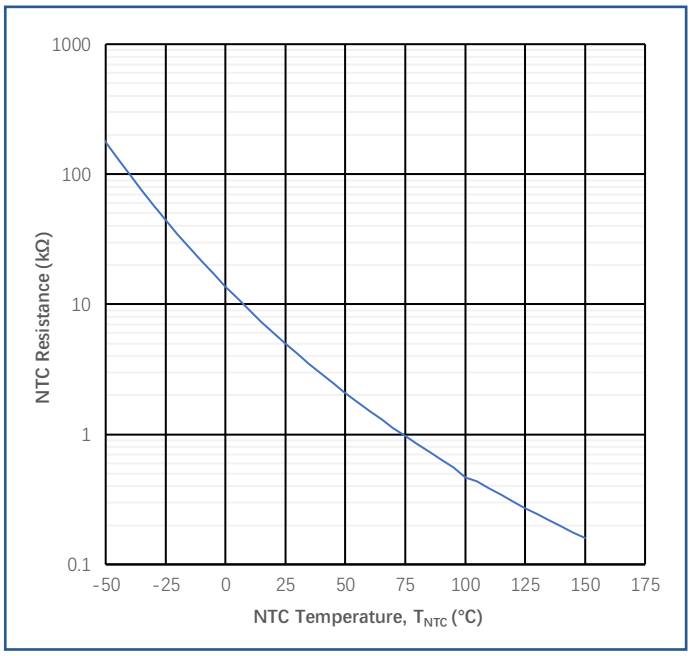
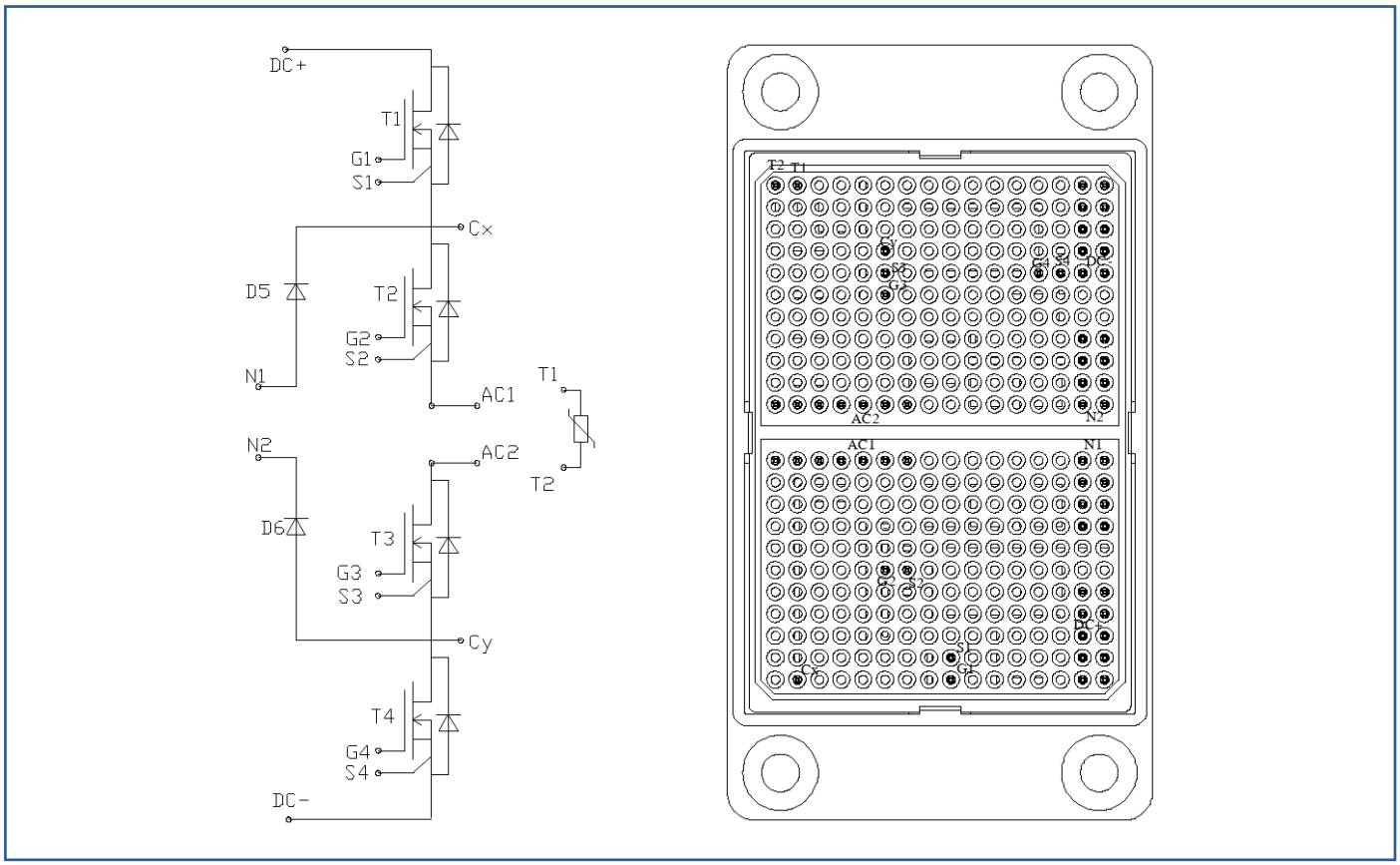


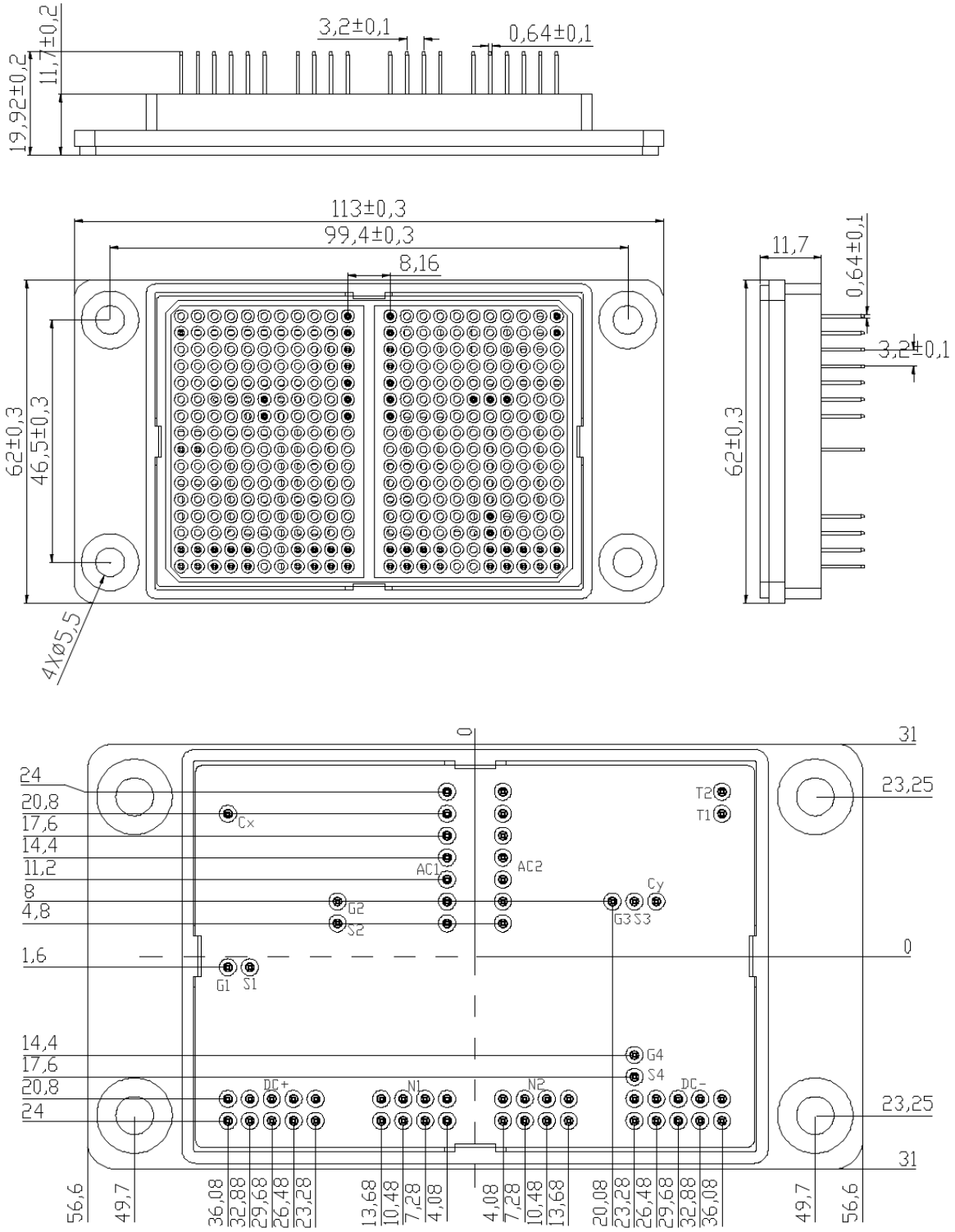
Figure 10
NTC-Temperature Characteristic (typical)

Circuit Diagram Headline



Package Dimensions (mm)

Package Type：HEP



未标注线性公差按 GB/1804-2000c 级执行	公差分段	0.5-3	3-6	6-30	30-120	120-400
	c 级	±0.2	±0.3	±0.5	±0.8	±1.2

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