

ASC600N1700HPDF

1700V, 600A, 4.3mΩ, Six-pack (Three-phase), Silicon Carbide MOSFET Module

Product Data Sheet

ASTC-3T03-180A A/1



爱仕特科技
AST TECHNOLOGY

General Description

The AST-HPD module incorporates AST's 1700V Gen3 N-channel SiC MOSFET. NTC temperature sensor inside.

Features

- High Temperature, Humidity, and Bias Operation
- Ultra Low Loss <10nH
- High-Frequency Operation
- Zero Turn-off Tail Current from MOSFET
- Normally-off, Fail-Safe Device Operation
- Copper Flat Baseplate and Silicon Nitride Insulator

Benefits

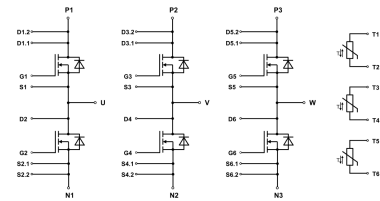
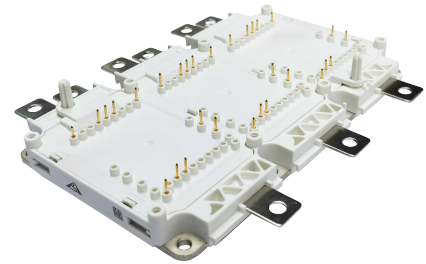
- Enables Compact, Lightweight, Efficient Systems
- Harsh Outdoor Environment Installation
- Mitigates Over-Voltage Protection
- Reduced Thermal Requirements and System Cost

Applications

- Traction Inverter for New Energy Vehicles
- Aviation Controller
- Industrial Controller

Key Parameters

Symbol	Parameter	Values			Unit	Test Conditions
Absolute maximum rating						
V _{DS}	Drain-Source Voltage	1700			V	T _C =25°C
I _D	Drain Current (Continuous)	600			A	T _C =25°C
		360				T _C =65°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	-	4.3	5.5	mΩ	V _{GS} =18V; I _D =300A; T _C =25°C
Dynamic characteristics						
Q _G	Total Gate Charge	-	1008	-	nC	V _{DD} =1200V; V _{GS} =-5/+18V; I _D =300A; T _C =25°C
Q _{GD}	Gate-Drain Charge	-	300	-		
Source-drain diode						
Q _{RR}	Reverse Recovery Charge	-	4308	-	nC	V _{GS} =-5/+18V; I _F =300A; V _R =1200V; Load=35uH; R _{G(off)} =5Ω; T _C =25°C



Absolute Maximum Ratings (at $T_c=25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Parameter	Value	Unit
V_{DS}	Drain-Source Voltage	1700	V
V_{GS}	Gate-Source Voltage (Dynamic)	-10/+22	V
I_D	Drain Current (continuous; $T_c=25^{\circ}\text{C}$)	600	A
	Drain Current (continuous; $T_c=65^{\circ}\text{C}$)	360	
I_{DM}	Drain Current (Pulsed)	720	A
$T_{op}; T_{stg}$	Operating and Storage Temperature Range	-40 to +175	$^{\circ}\text{C}$
$T_{J; Max}$	Junction Temperature	175	$^{\circ}\text{C}$
L_{Stray}	Stray Inductance	8.5	nH
V_{isol}	Isolation Test Voltage (AC; 2mA; t=10s)	3.0	kV
$R_{th JC}$	Thermal Resistance, Junction to Case	0.11	$^{\circ}\text{C}/\text{W}$
M	Mounting Torque for Module Mounting (Screw M4 Baseplate to Heatsink)	2.0	Nm

MOSFET Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
Static characteristics (at $T_c=25^{\circ}\text{C}$ unless otherwise specified)						
BV_{DS}	Drain-Source Breakdown Voltage	1700	-	-	V	$V_{GS}=0\text{V}$
I_{DSS}	Zero Gate Voltage Drain Current	-	-	60	μA	$V_{DS}=1700\text{V}; V_{GS}=0\text{V}$
I_{GSS}	Gate-Body Leakage Current	-	-	3.0	μA	$V_{GS}=-10/+20\text{V}; V_{DS}=0\text{V}$
$V_{GS(th)}$	Gate Threshold Voltage	2.0	-	4.0	V	$V_{DS}=V_{GS}; I_D=60\text{mA}$
$R_{DS(on)}$	Static Drain-Source on Resistance	-	4.3	5.5	m Ω	$V_{GS}=18\text{V}; I_D=300\text{A}$
$V_{GS(on)}$	Recommended Turn-on Voltage	-	18	-	V	Static
$V_{GS(off)}$	Recommended Turn-off Voltage	-	-5	-	V	
R_G	Gate Resistance	-	0.42	-	Ω	$V_{AC}=25\text{mV}; f=1\text{MHz}$
Dynamic characteristics (at $T_c=25^{\circ}\text{C}$ unless otherwise specified)						
C_{iss}	Input Capacitance	-	38.8	-	nF	$V_{DS}=1200\text{V}; f=100\text{kHz}; V_{AC}=25\text{mV}$
C_{oss}	Output Capacitance	-	1.19	-		
C_{rss}	Reverse Transfer Capacitance	-	96	-	pF	
E_{on}	Turn-on Switching Energy	-	38	-	mJ	$V_{DD}=1200\text{V}; V_{GS}=-5/+18\text{V}; I_D=300\text{A}; R_{G(ext)}=5\Omega; \text{Load}=35\mu\text{H}$
E_{off}	Turn-off Switching Energy	-	10	-		
Q_{GS}	Gate-Source Charge	-	312	-	nC	$V_{DD}=1200\text{V}; V_{GS}=-5/+18\text{V}; I_D=300\text{A}$
Q_{GD}	Gate-Drain Charge	-	300	-		
Q_G	Total Gate Charge	-	1008	-		
$t_{d(on)}$	Turn-on Delay Time	-	110	-	ns	$V_{DD}=1200\text{V}; V_{GS}=-5/+18\text{V}; I_D=300\text{A}; R_{G(ext)}=5\Omega; \text{Load}=35\mu\text{H}$
t_r	Rise Time	-	66	-		
$t_{d(off)}$	Turn-off Delay Time	-	294	-		
t_f	Fall Time	-	43	-		

Body Diode Characteristics (at $T_J=25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
V_{FSD}	Forward Voltage	-	-	6	V	$V_{GS}=0\text{V}$; $I_F=300\text{A}$
I_S	Continuous Diode Forward Current	-	300	-	A	$V_{GS}=0\text{V}$; $T_C=25^{\circ}\text{C}$
t_{RR}	Reverse Recovery Time	-	90	-	ns	$V_{GS}=-5/+18\text{V}$; $I_F=300\text{A}$; $V_R=1200\text{V}$; $R_{G(off)}=5\Omega$; Load=35 μH
Q_{RR}	Reverse Recovery Charge	-	4308	-	nC	
I_{RRM}	Peak Reverse Recovery Current	-	170	-	A	

NTC Thermistor Characteristics

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

Typical Performance

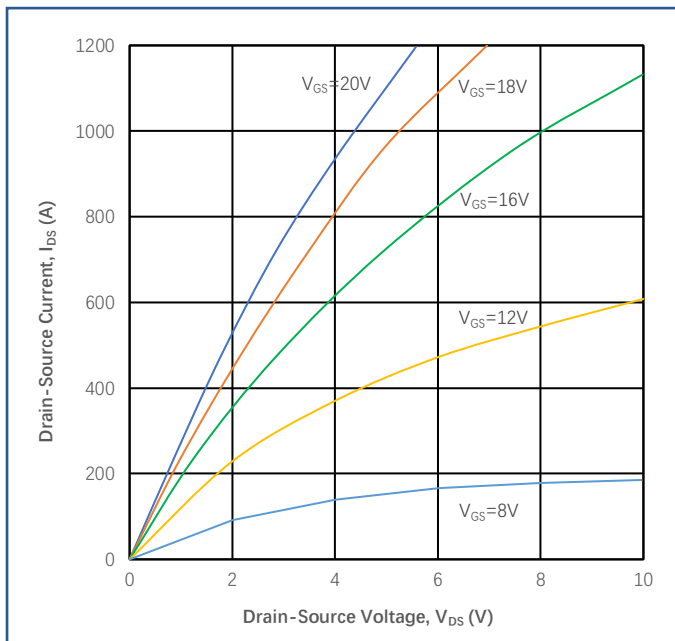


Figure 1
Output Characteristics ($T_J = 25^\circ\text{C}$)

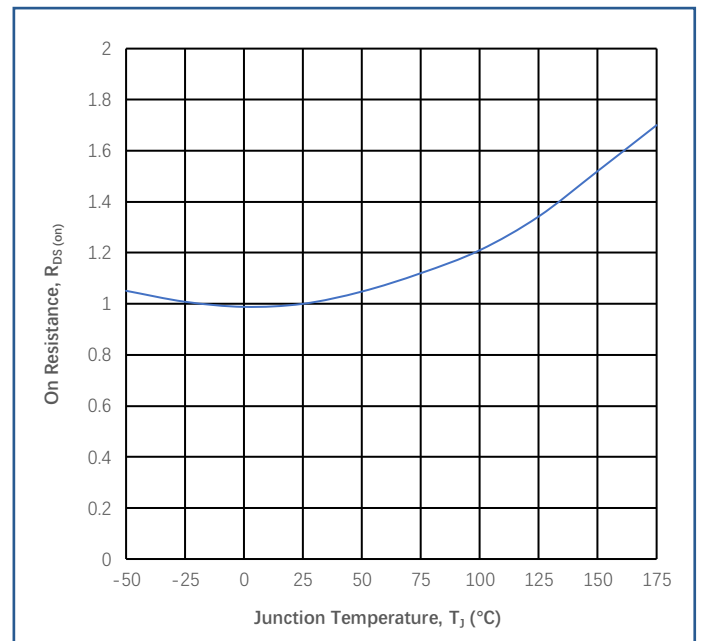


Figure 2
Normalized On-Resistance vs. Temperature

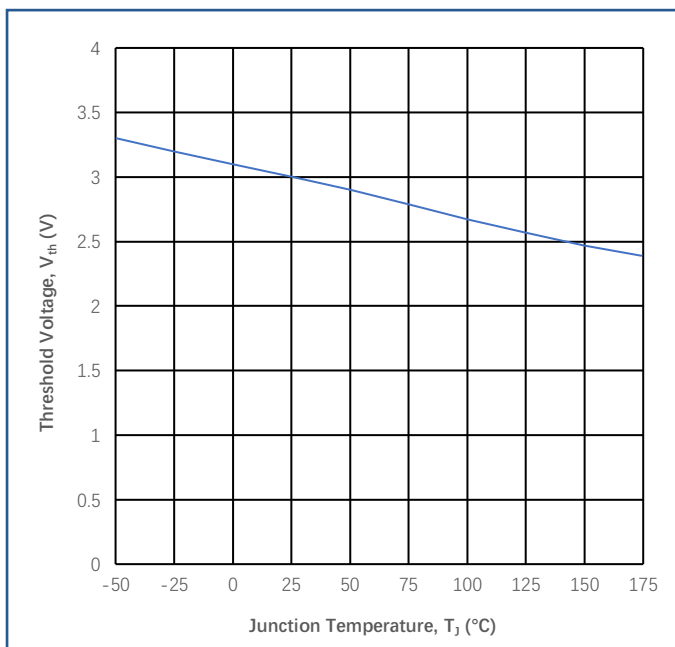


Figure 3
Threshold Voltage vs. Temperature

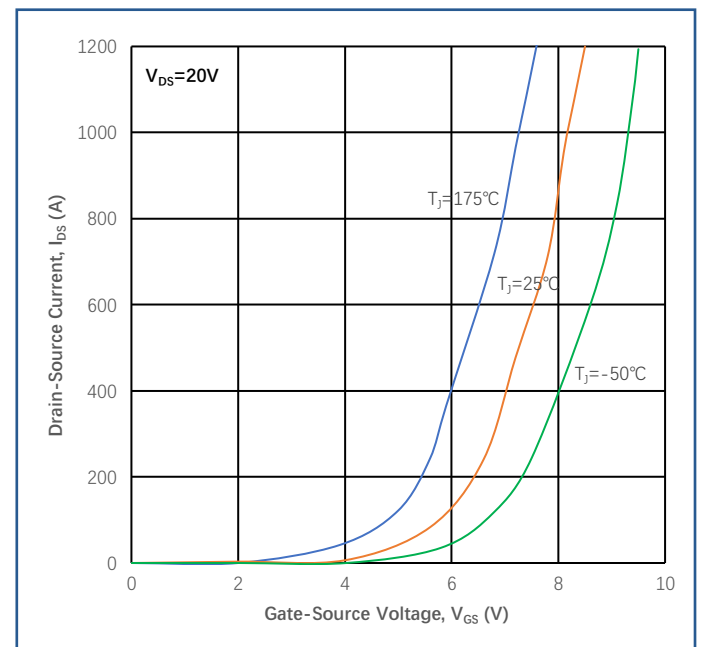
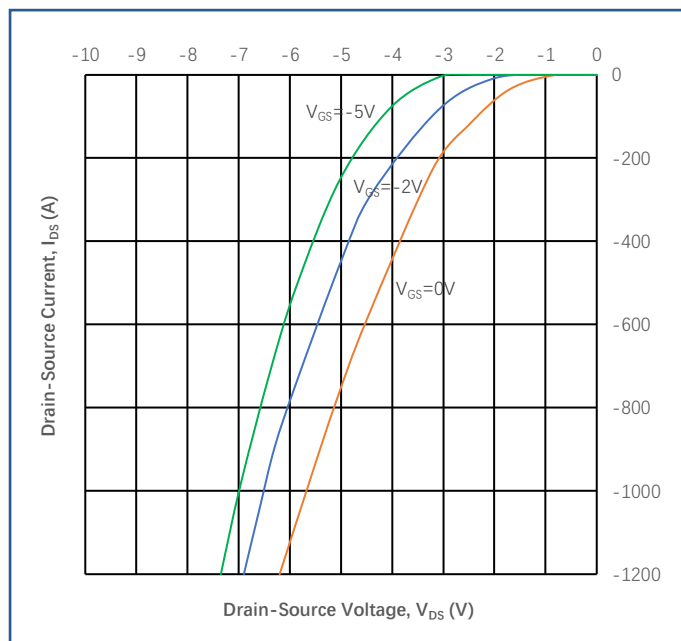
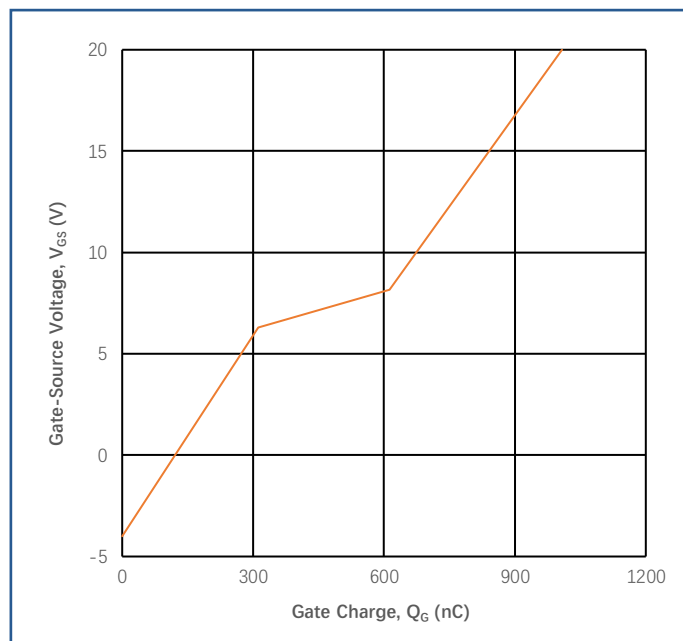


Figure 4
Transfer Characteristic for Various T_J

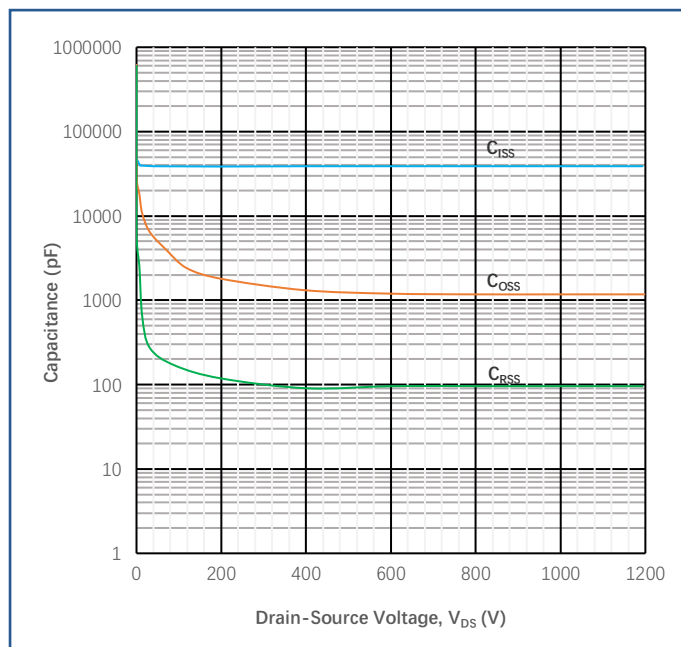
Typical Performance


Figure 5

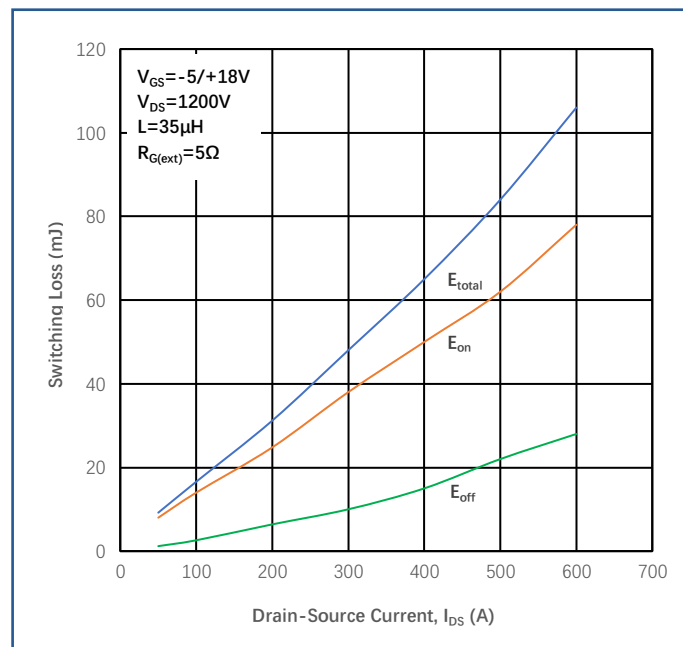
Diode Characteristic at 25°C


Figure 6

Typical Gate Charge Characteristics


Figure 7

Typical Capacitances vs. Drain-Source Voltage


Figure 8

Inductive Switching Energy vs. Drain Current

Typical Performance

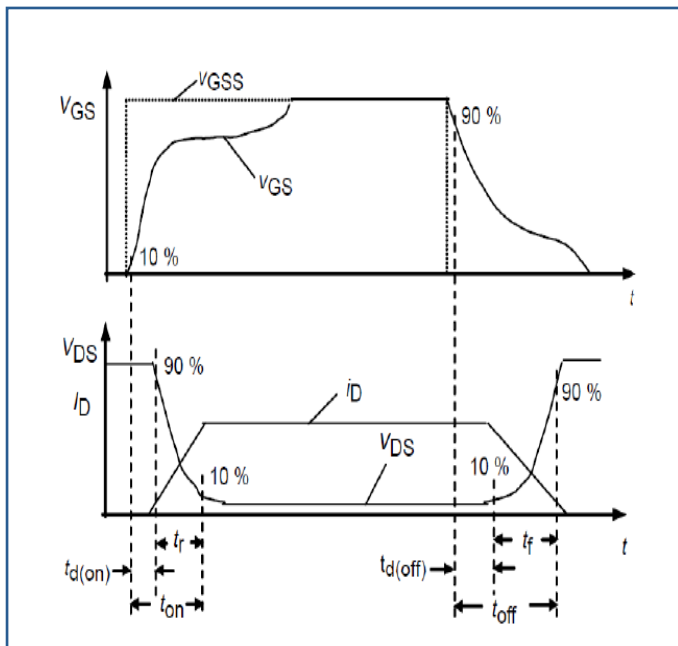


Figure 9

Switching Time Description

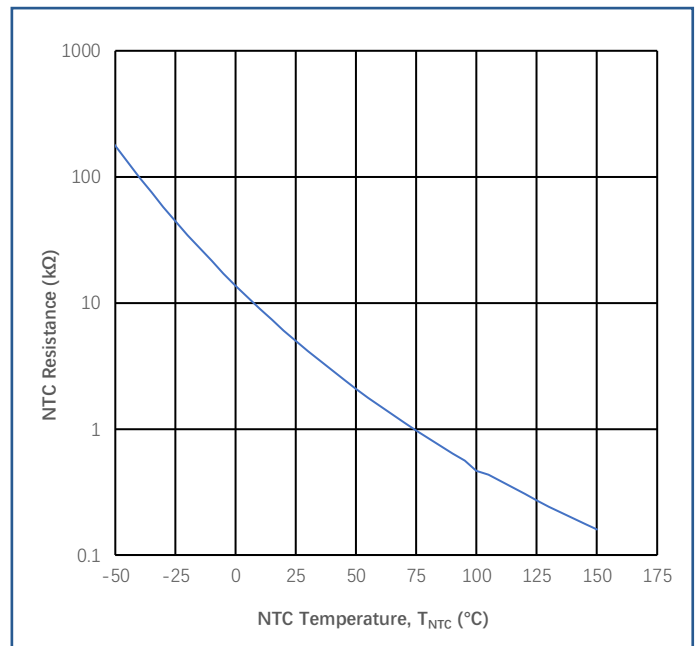
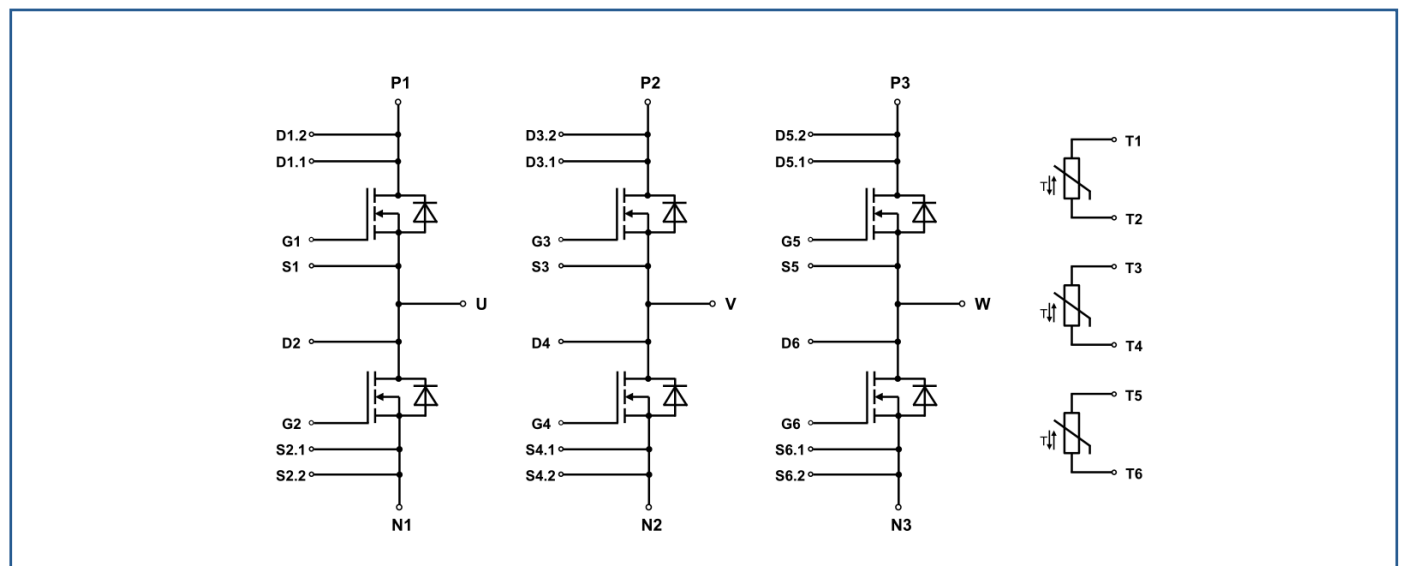


Figure 10

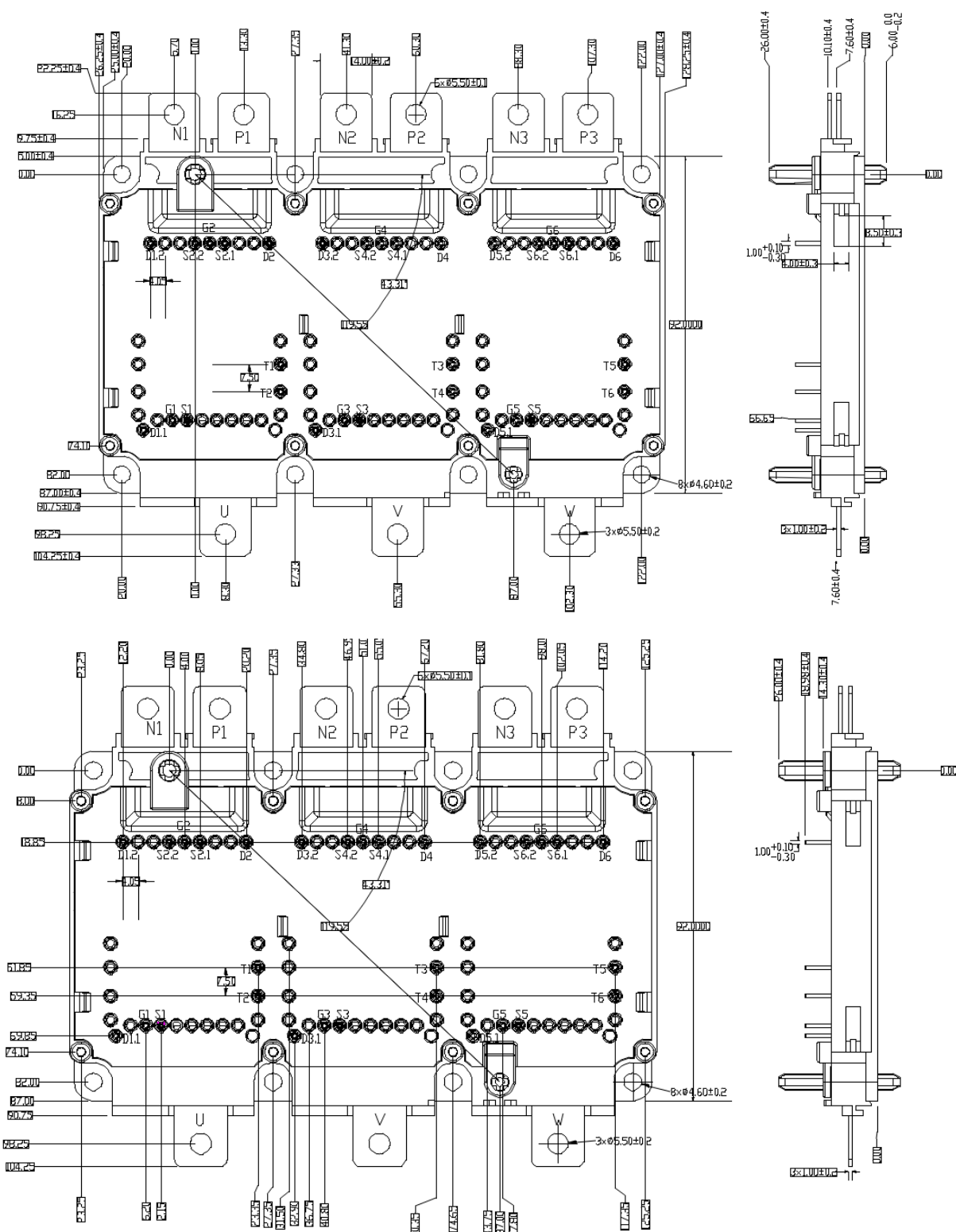
NTC-Temperature characteristic (typical)

Circuit Diagram Headline



Package Dimensions (mm)

Package Type: HPDF



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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