

ASR1P5N1200HPD-A

1200V, 1000A, 1.3mΩ, Six-pack (Three-phase), Silicon Carbide MOSFET Module

Product Data Sheet

ASTC-3T03-186A A/0



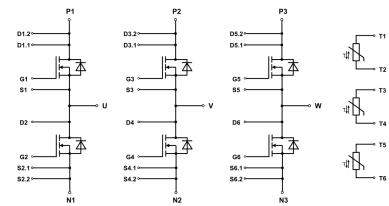
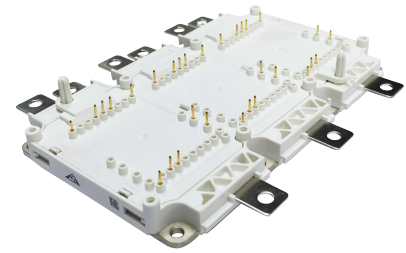
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General Description

The AST-HPD module incorporates AST's 1200V Gen4-A 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 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

Ordering Informations

Order Number	ASR1P5N1200HPD-A
Marking	ASR1P5N1200HPD
Package Type	HPD

Key Parameters

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)	1000			A	T _c =25°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	-	1.3	1.6	mΩ	V _{GS} =18V; I _D =600A; T _c =25°C
Dynamic characteristics						
Q _G	Total Gate Charge	-	2384	-	nC	V _{DD} =800V; V _{GS} =-5/+18V; I _D =600A; T _c =25°C
Q _{GD}	Gate-Drain Charge	-	784	-		
Source-drain diode						
Q _{RR}	Reverse Recovery Charge	-	6376	-	nC	V _{GS} =-5/+18V; I _F =1000A; V _R =600V; Load=50uH; R _{G(ext)} =5Ω; T _i =25°C

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

Symbol	Parameter	Values	Unit
V_{DS}	Drain-Source Voltage	1200	V
V_{GS}	Gate-Source Voltage (Dynamic)	-10/+22	V
I_D	Drain Current (Continuous)	1000	A
I_{DM}	Drain Current (Pulsed)	2000	A
T_{op}, T_{stg}	Operating and Storage Temperature Range	-40 to +175	$^{\circ}\text{C}$
T_J	Junction Temperature	175	$^{\circ}\text{C}$
L_{Stray}	Stray Inductance	8.5	nH
V_{isol}	Isolation Test Voltage (AC; 2mA; t=10s)	3.4	kV
$R_{\theta JC}$	Thermal Resistance, Junction to Cooling Fluid	0.085	$^{\circ}\text{C}/\text{W}$
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°C unless otherwise specified)						
BV _{DS}	Drain-Source Breakdown Voltage	1200	-	-	V	V _{GS} =0V
I _{DSS}	Zero Gate Voltage Drain Current	-	-	400	μA	V _{DS} =1200V; V _{GS} =0V
I _{GSS}	Gate-Body Leakage Current	-	-	4.0	μA	V _{GS} =-10/20V; V _{DS} =0V
V _{GS(th)}	Gate Threshold Voltage	2.0	-	4.0	V	V _{DS} =V _{GS} ; I _D =80mA
R _{DS(on)}	Static Drain-Source on Resistance	-	1.3	1.6	mΩ	V _{GS} =18V; I _D =600A
V _{GS(on)}	Recommended Turn-On Voltage	-	18	-	V	Static
V _{GS(off)}	Recommended Turn-Off Voltage	-	-5	-	V	
Dynamic characteristics (at T _c =25°C unless otherwise specified)						
C _{iss}	Input Capacitance	-	63.8	-	nF	V _{DS} =1000V; f=100KHz; V _{AC} =25mV
C _{oss}	Output Capacitance	-	2.5	-		
C _{rss}	Reverse Transfer Capacitance	-	128	-	pF	
E _{on}	Turn-On Switching Energy	-	40.3	-	mJ	V _{DS} =600V; V _{GS} =-5/+18V; I _D =1000A; R _{G(ext)} =5Ω; Load=50μH
E _{off}	Turn-Off Switching Energy	-	95.1	-		
Q _{GS}	Gate-Source Charge	-	656	-	nC	V _{DD} =800V; V _{GS} =-5/+18V; I _D =600A
Q _{GD}	Gate-Drain Charge	-	784	-		
Q _G	Total Gate Charge	-	2384	-		
t _{d(on)}	Turn-On Delay Time	-	173	-	ns	V _{DD} =600V; V _{GS} =-5/+18V; I _D =1000A; R _{G(ext)} =5Ω; Load=50μH
t _r	Rise Time	-	160	-		
t _{d(off)}	Turn-Off Delay Time	-	565	-		
t _f	Fall Time	-	211	-		

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	$V_{GS}=0\text{V}$; $I_F=600\text{A}$
I_S	Continuous Diode Forward Current	-	600	-	A	$V_{GS}=0\text{V}$; $T_C=25^{\circ}\text{C}$
t_{RR}	Reverse Recovery Time	-	92	-	ns	$V_{GS}=-5/+18\text{V}$; $I_F=1000\text{A}$; $V_R=600\text{V}$; Load=50 μH ; $R_{G(ext)}=5\Omega$
Q_{RR}	Reverse Recovery Charge	-	6376	-	nC	
I_{RRM}	Peak Reverse Recovery Current	-	345	-	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

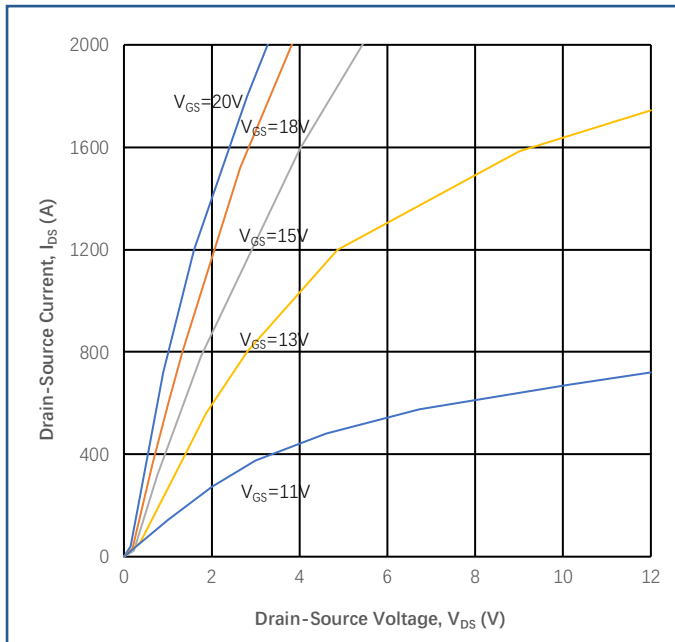


Figure 1
Output Characteristics ($T_J = 25^\circ\text{C}$)

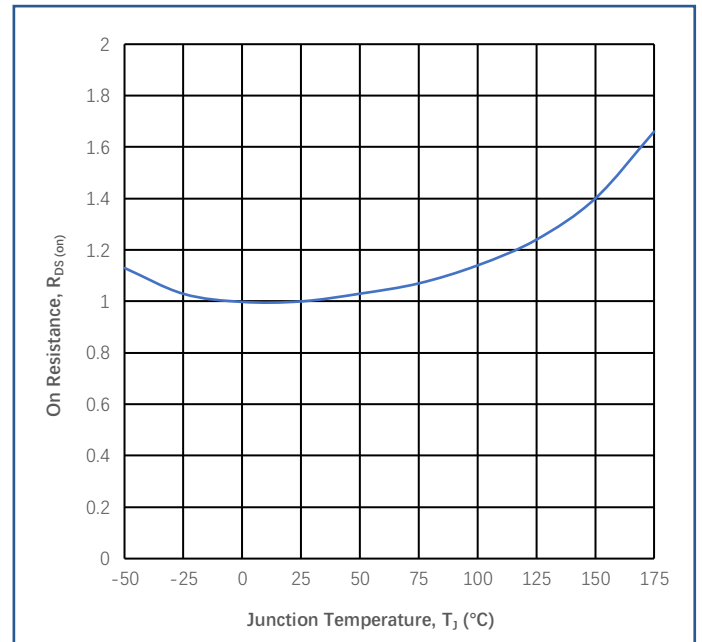


Figure 2
Normalized On-Resistance vs. Temperature

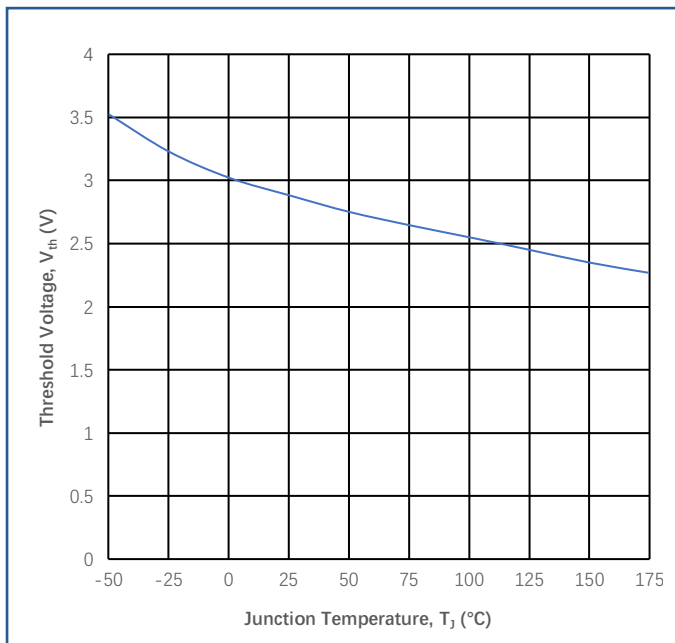


Figure 3
Threshold Voltage vs. Temperature

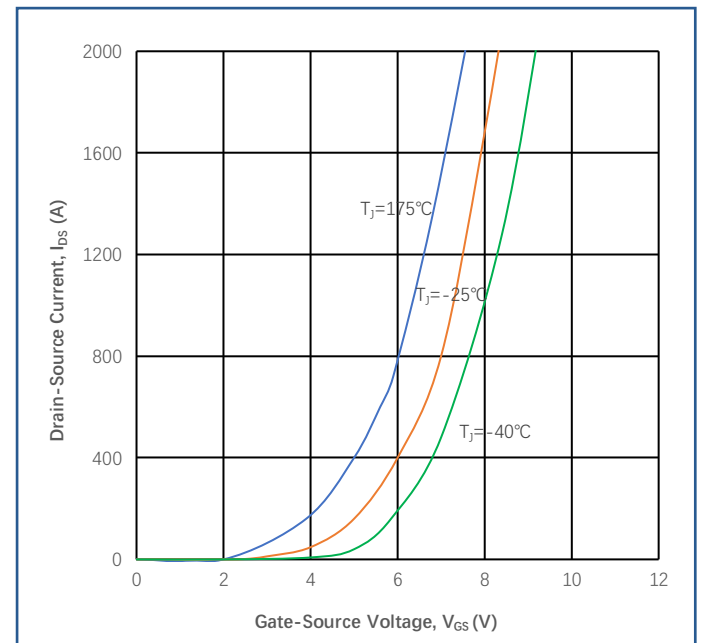


Figure 4
Transfer Characteristic for Various T_J

Typical Performance

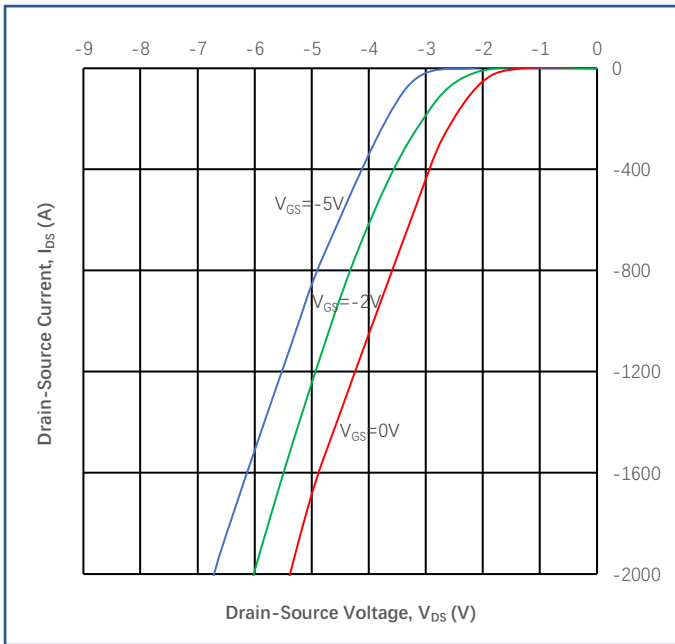


Figure 5
Diode Characteristic at 25°C

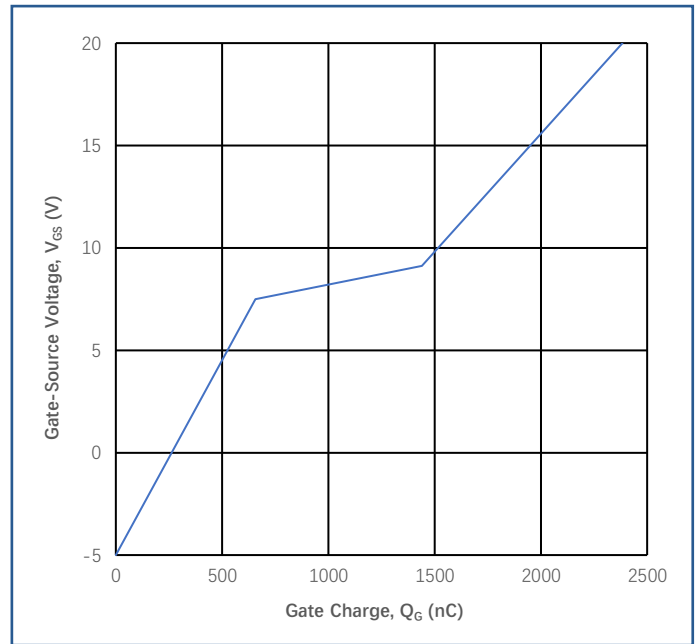


Figure 6
Typical Gate Charge Characteristics

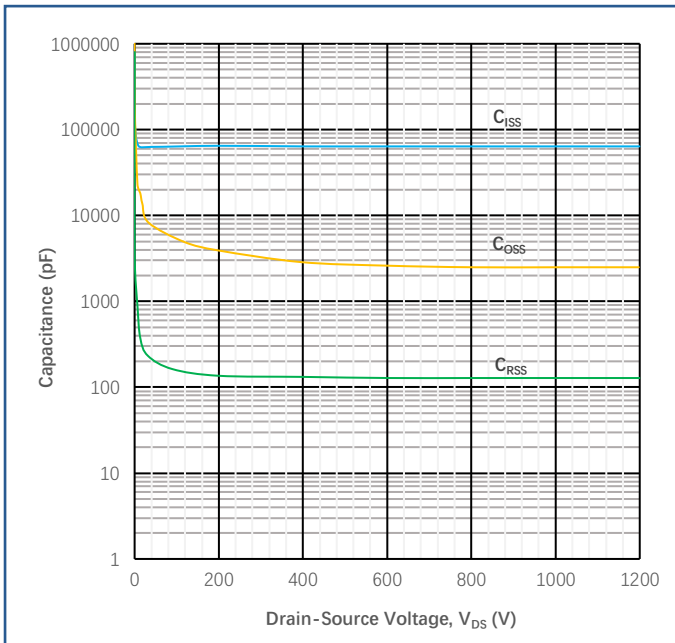


Figure 7
Typical Capacitances vs. Drain-Source Voltage

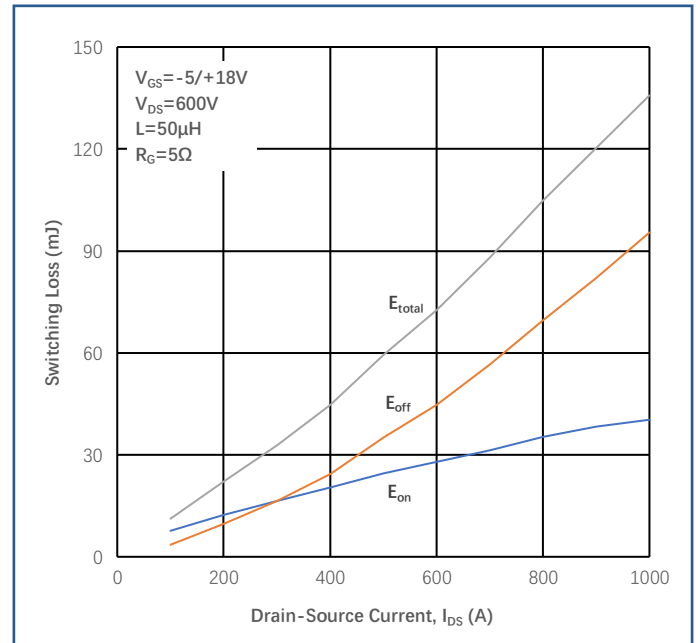


Figure 8
Inductive Switching Energy vs. Drain Current

Typical Performance

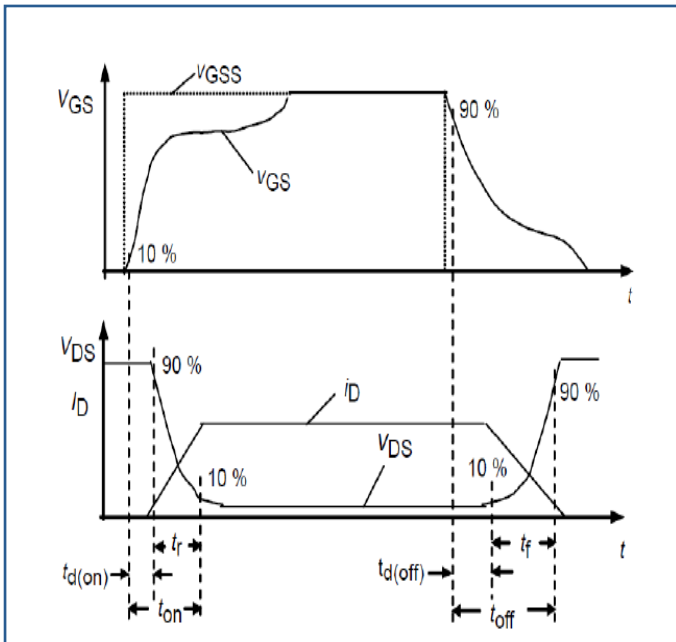


Figure 9
Switching Time Description

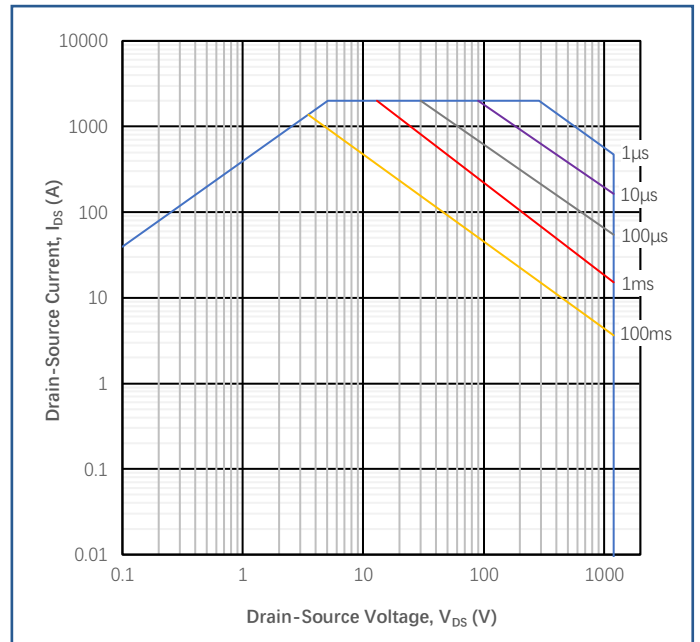
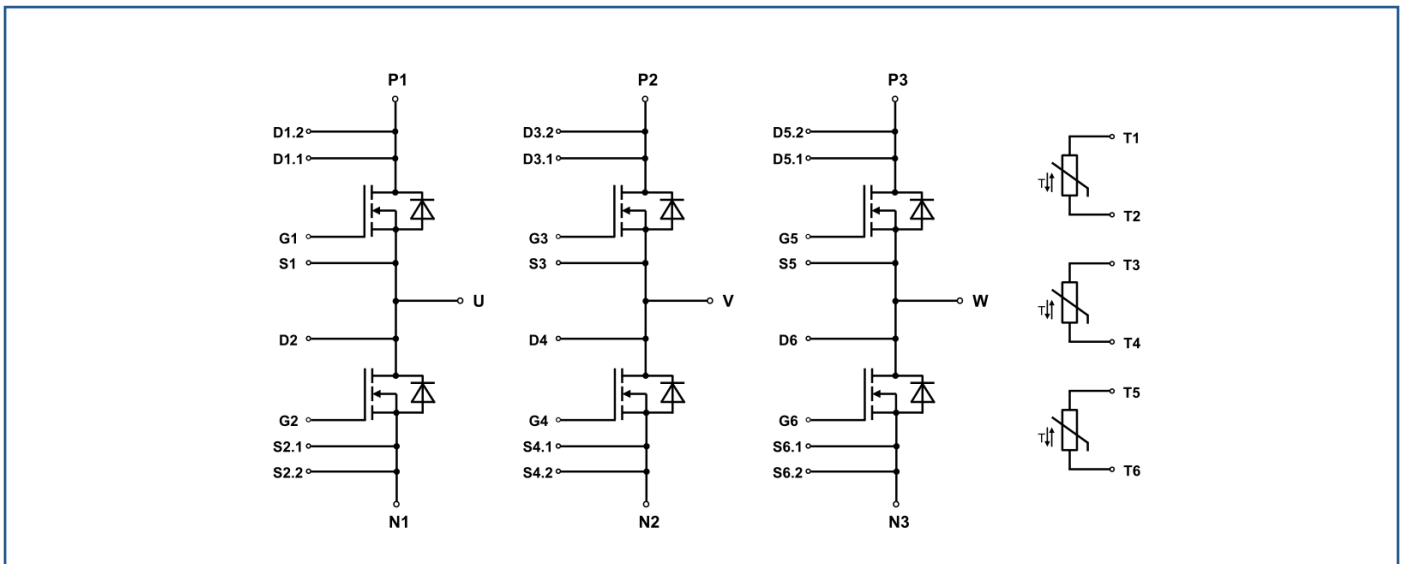


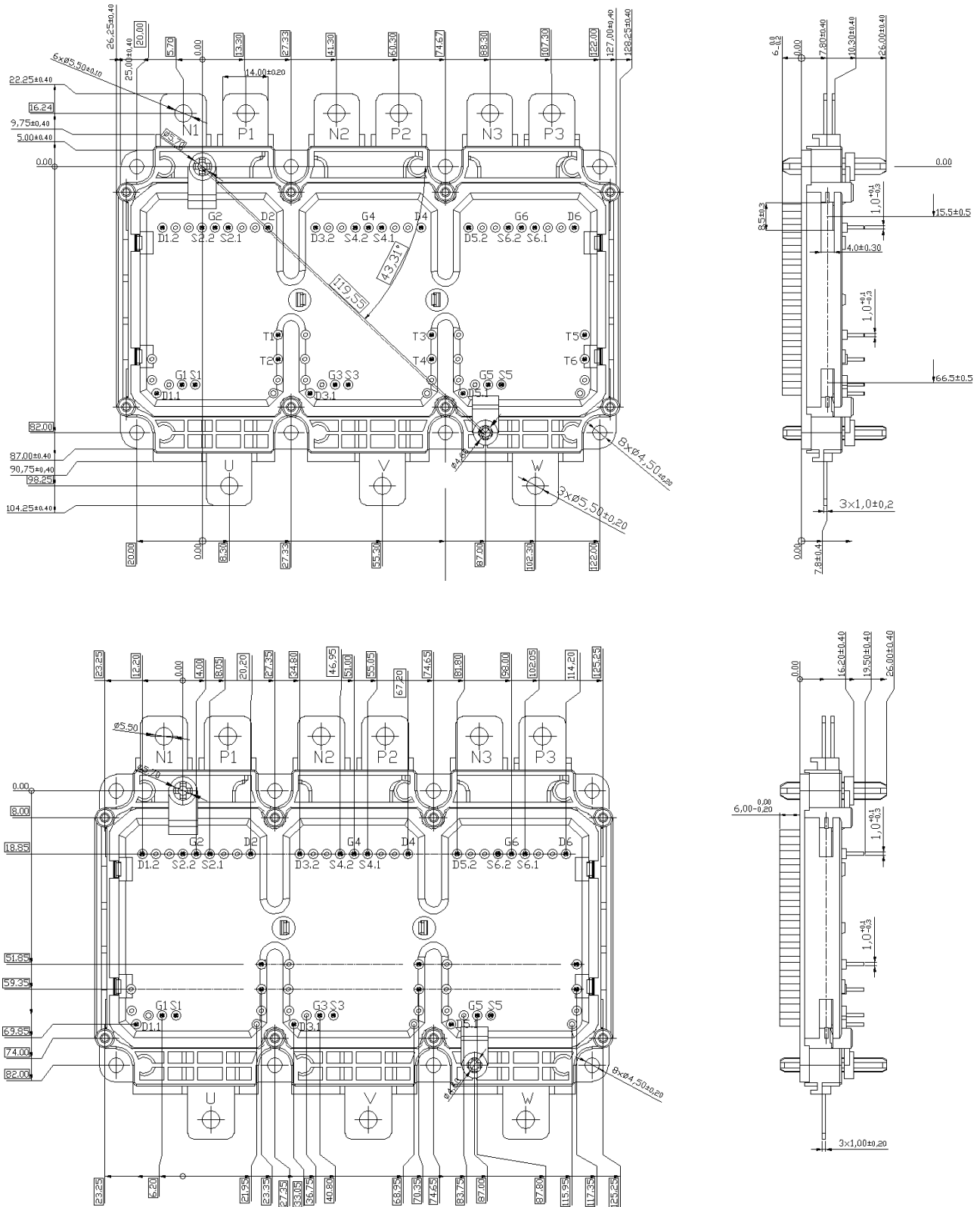
Figure 10
Safe Operating Area

Circuit Diagram Headline



Package Dimensions (mm)

Package Type: HPD



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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