

ASC400N1200HPD

1200V, 400A, 4mΩ, Six-pack (Three-phase), Silicon Carbide MOSFET Module

Product Data Sheet

ASTC-3T03-17A A/0



General Description

The AST-HPD module incorporates AST's 1200V 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 Baseplate and Silicon Nitride Insulator

Benefits

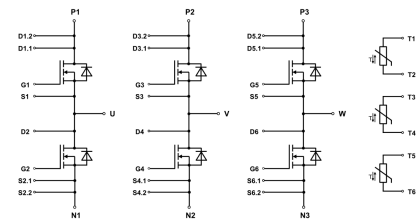
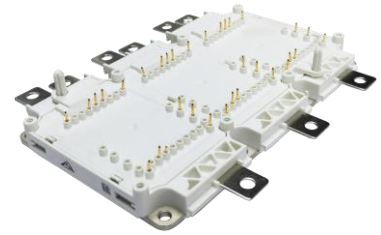
- Enables Compact, Lightweight, Efficient Systems
- Harsh Outdoor Environment Installation
- Mitigates Over-voltage Protection
- Reduced Thermal Requirements and System Cost

Applications

- New Energy Vehicle Main Drive Inverter
- Aviation Controller
- Industrial Controller

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)	400			A	T _C =25°C
T _J	Junction Temperature	175			°C	
Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
Static characteristics						
R _{DS(on)}	Static Drain-source on Resistance	-	4.0	5.5	mΩ	V _{GS} =18V; I _D =200A; T _C =25°C
Dynamic characteristics						
Q _G	Total Gate Charge	-	952	-	nC	V _{DD} =800V; V _{GS} =-5/+18V; I _D =200A; T _C =25°C
Q _{GD}	Gate-drain Charge	-	313	-		
Source-drain diode						
Q _{RR}	Reverse Recovery Charge	-	1833	-	nC	V _{GS} =-5/+18V; I _F =200A; V _R =800V; Load=100μH; R _{G(off)} =5Ω



Ordering Informations

Order Number / Marking	ASC400N1200HPD
Package Type	HPD

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

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage	1200	V
V_{GS}	Gate-source Voltage (dynamic)	-10/+22	V
I_D	Drain Current (continuous)	400	A
I_{DM}	Drain Current (pulsed)	800	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 (DC; 2mA; t=10s)	4.2	kV
$R_{th JC}$	Thermal Resistance, Junction to Cooling Fluid	0.085	$^{\circ}\text{C/W}$
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	1200	-	-	V	$V_{GS}=0V$
I_{DSS}	Zero Gate Voltage Drain Current	-	-	200	μA	$V_{DS}=1200V; V_{GS}=0V$
I_{GSS}	Gate-body Leakage Current	-	-	2.00	μA	$V_{GS}=-10/+20V; V_{DS}=0V$
$V_{GS(th)}$	Gate Threshold Voltage	2.0	-	4.0	V	$V_{DS}=V_{GS}; I_D=40mA$
$R_{DS(on)}$	Static Drain-source on Resistance	-	4.0	5.5	$m\Omega$	$V_{GS}=18V; I_D=200A$
$V_{GS(on)}$	Recommended Turn-on Voltage	-	18	-	V	Static
$V_{GS(off)}$	Recommended Turn-off Voltage	-	-5	-	V	
R_G	Gate Resistance	-	0.55	-	Ω	$V_{AC}=25mV; f=1MHz$
Dynamic characteristics (at $T_c=25^{\circ}\text{C}$ unless otherwise specified)						
C_{iss}	Input Capacitance	-	27.5	-	nF	$V_{DS}=1000V; f=1MHz; V_{AC}=25mV$
C_{oss}	Output Capacitance	-	1.15	-		
C_{rss}	Reverse Transfer Capacitance	-	52	-	pF	
E_{on}	Turn-on Switching Energy	-	11.9	-	mJ	$V_{DD}=800V; V_{GS}=-5/+18V; I_D=200A; R_{G(ext)}=5.0\Omega; \text{Load}=100\mu H$
E_{off}	Turn-off Switching Energy	-	8.0	-		
Q_{GS}	Gate-source Charge	-	307	-	nC	$V_{DD}=800V; V_{GS}=-5/+18V; I_D=200A$
Q_{GD}	Gate-drain Charge	-	313	-		
Q_G	Total Gate Charge	-	952	-		
$t_{d(on)}$	Turn-on Delay Time	-	104	-	ns	$V_{DD}=800V; V_{GS}=-5/+18V; I_D=200A; R_{G(ext)}=5.0\Omega; \text{Load}=100\mu H$
t_r	Rise Time	-	68	-		
$t_{d(off)}$	Turn-off Delay Time	-	328	-		
t_f	Fall Time	-	69	-		

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	$V_{\text{GS}}=0\text{V}; I_{\text{F}}=200\text{A}$
I_{S}	Continuous Diode Forward Current	-	200	-	A	$V_{\text{GS}}=0\text{V}; T_{\text{C}}=25^{\circ}\text{C}$
t_{RR}	Reverse Recovery Time	-	55	-	ns	$V_{\text{GS}}=-5/+18\text{V}; I_{\text{F}}=200\text{A}; V_{\text{R}}=800\text{V}; R_{\text{G(off)}}=5\Omega; \text{Load}=100\mu\text{H}$
Q_{RR}	Reverse Recovery Charge	-	1833	-	nC	
I_{RRM}	Peak Reverse Recovery Current	-	76	-	A	

NTC Thermistor Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
R_{25}	Rated Resistance	-	5.00	-	k Ω	$T_{\text{NTC}}=25^{\circ}\text{C}$
$\Delta R/R$	Deviation of R_{100}	-5	-	5	%	$T_{\text{NTC}}=100^{\circ}\text{C}; R_{100}=493.3\Omega$
$B_{25/50}$	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

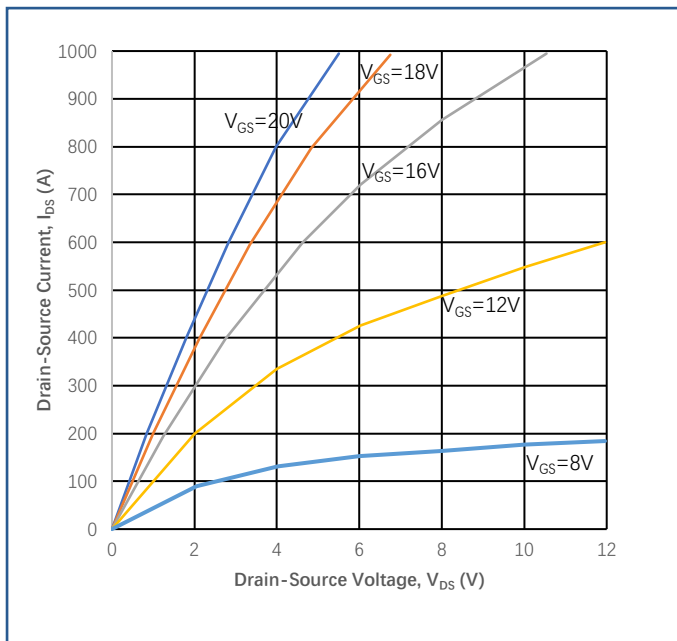


Figure 1
Output Characteristics ($T_J = 25^\circ\text{C}$)

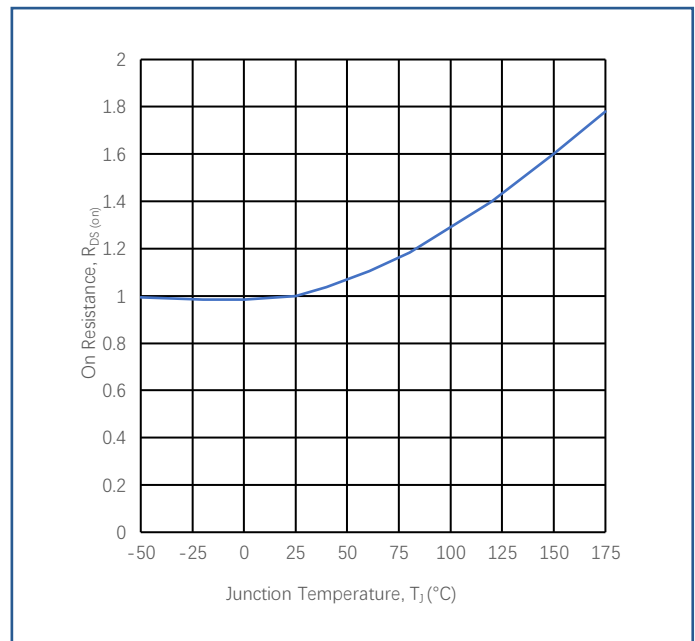


Figure 2
Normalized On-resistance vs. Temperature

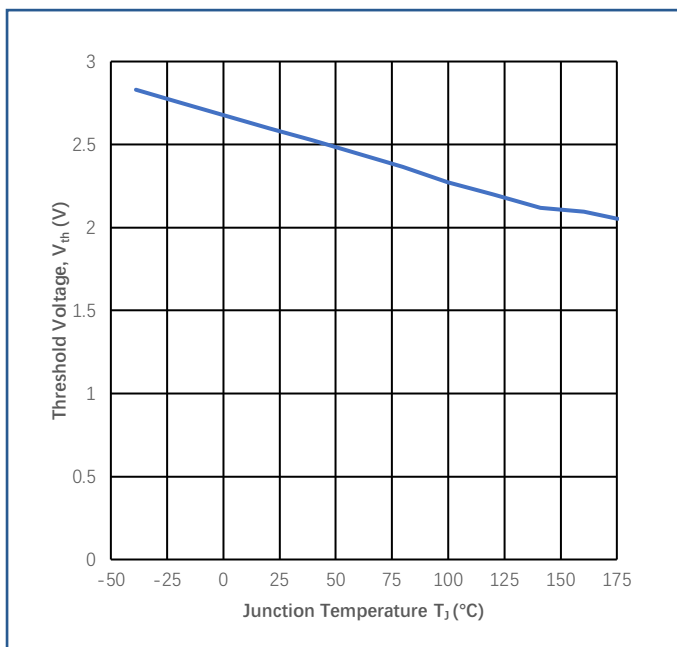


Figure 3
Threshold Voltage vs. Temperature

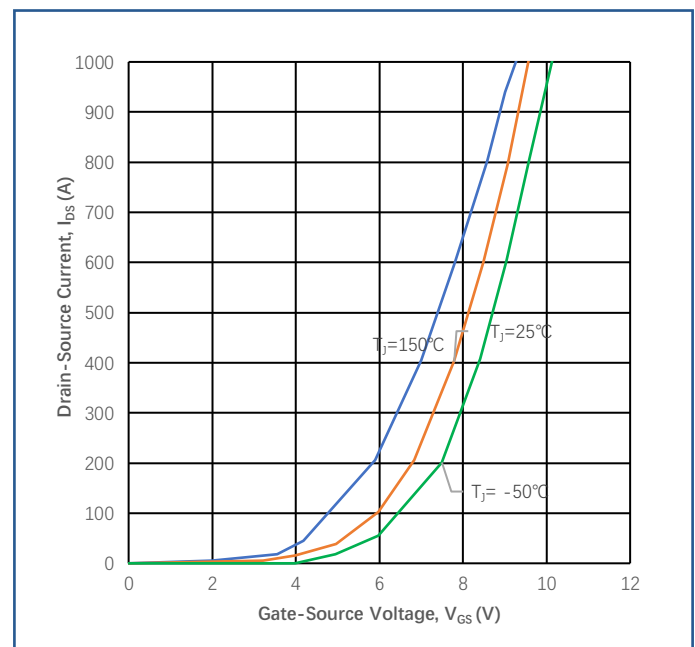


Figure 4
Transfer Characteristic for Various T_J

Typical Performance

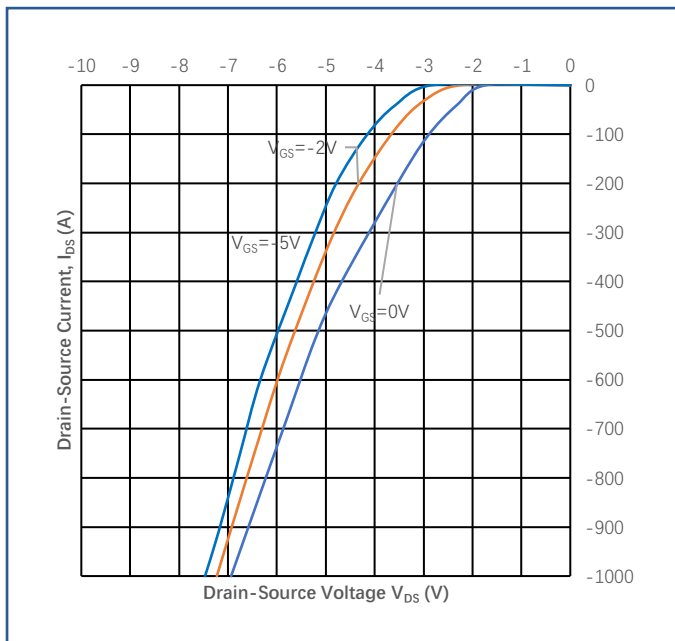


Figure 5
Diode Characteristic at 25 °C

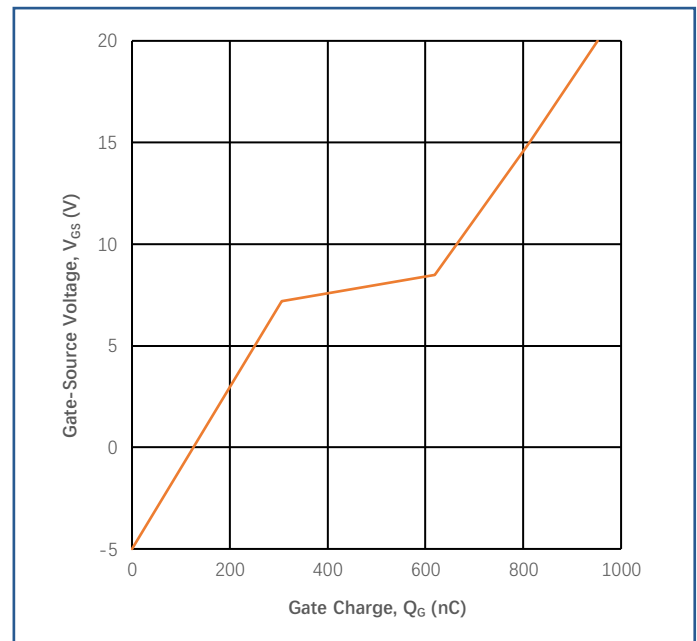


Figure 6
Typical Gate Charge Characteristics

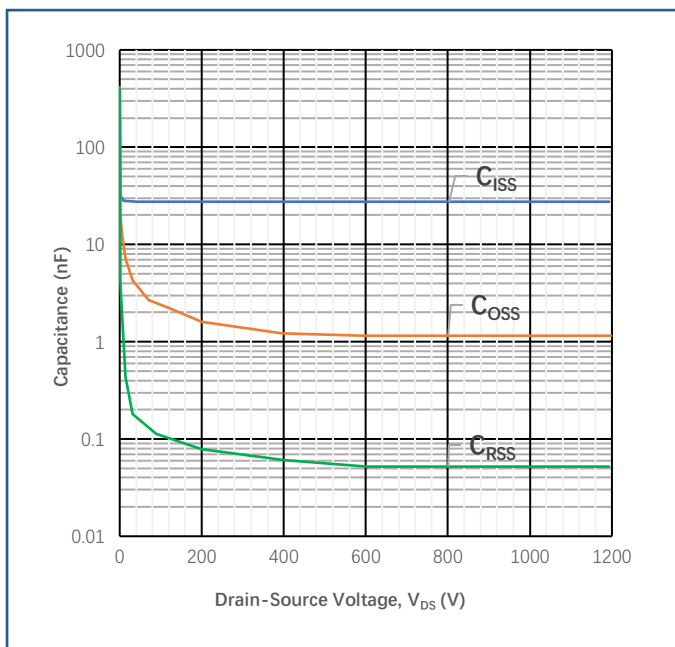


Figure 7
Typical Capacitances vs. Drain-source Voltage

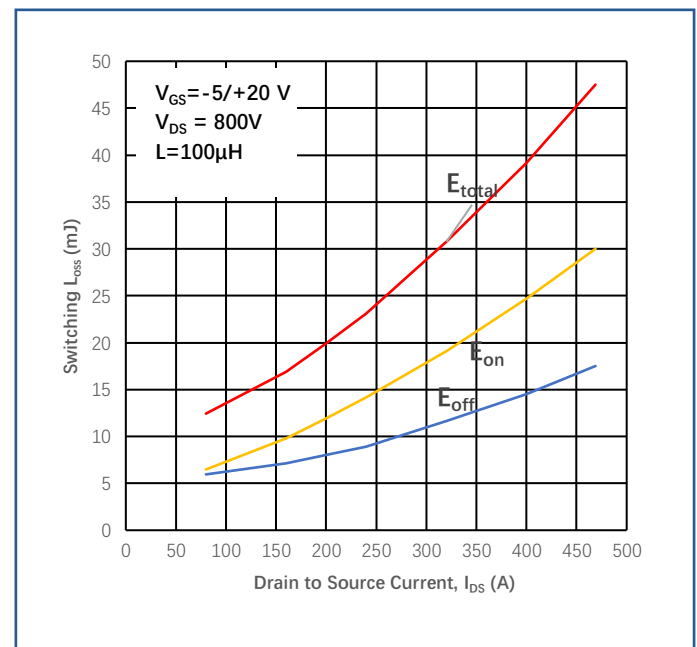


Figure 8
Inductive Switching Energy vs. Drain Current

Typical Performance

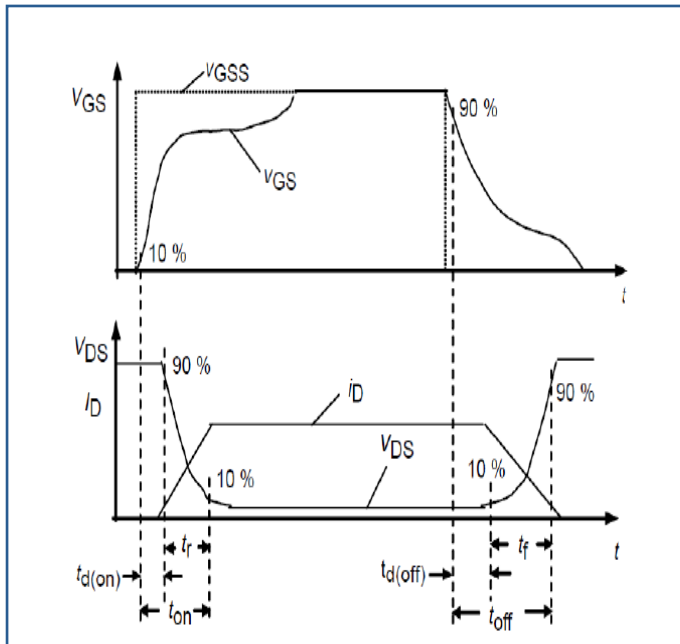


Figure 9
Switching Time Description

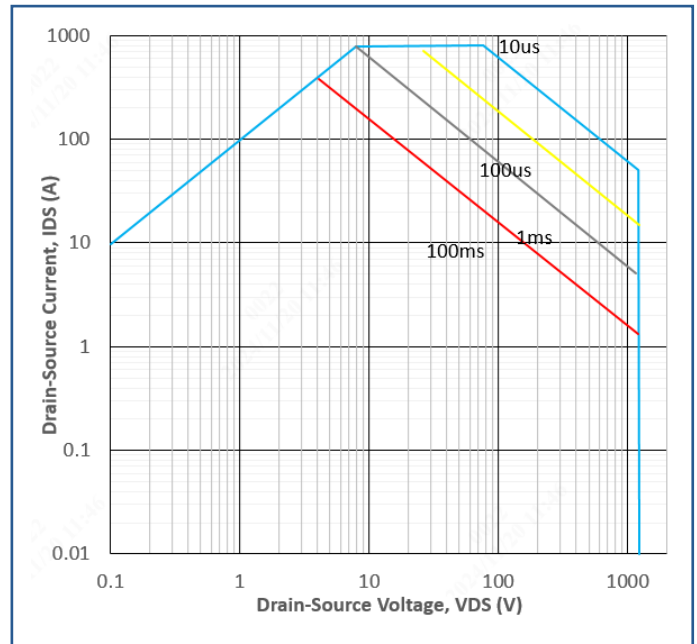
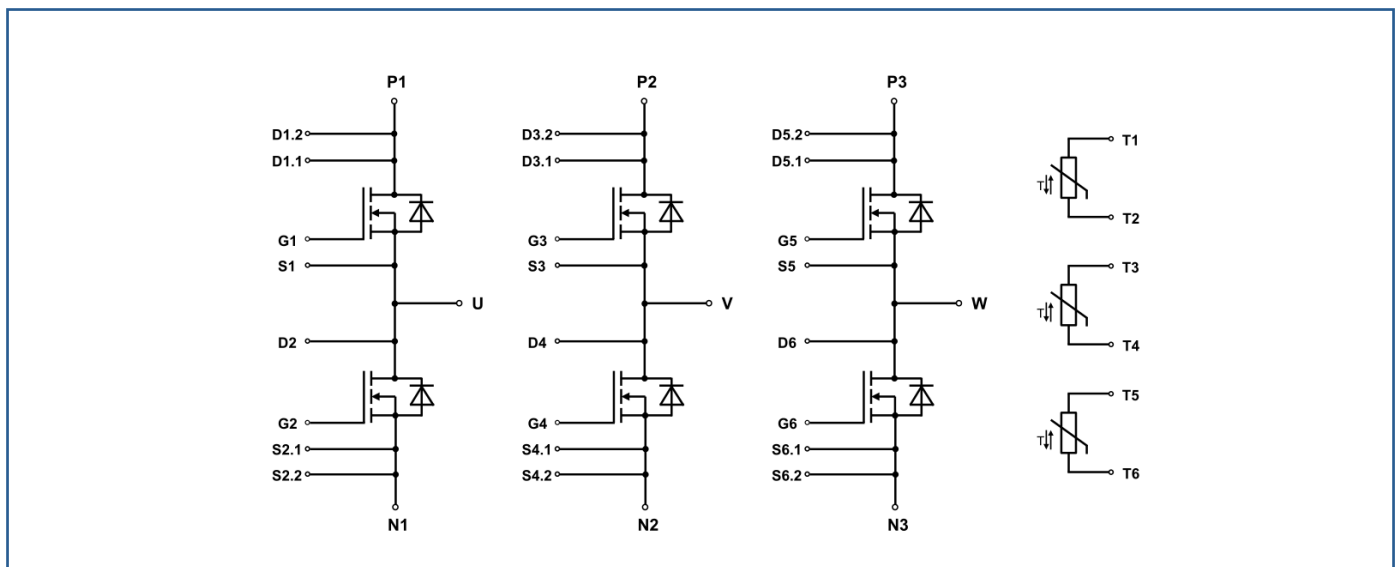


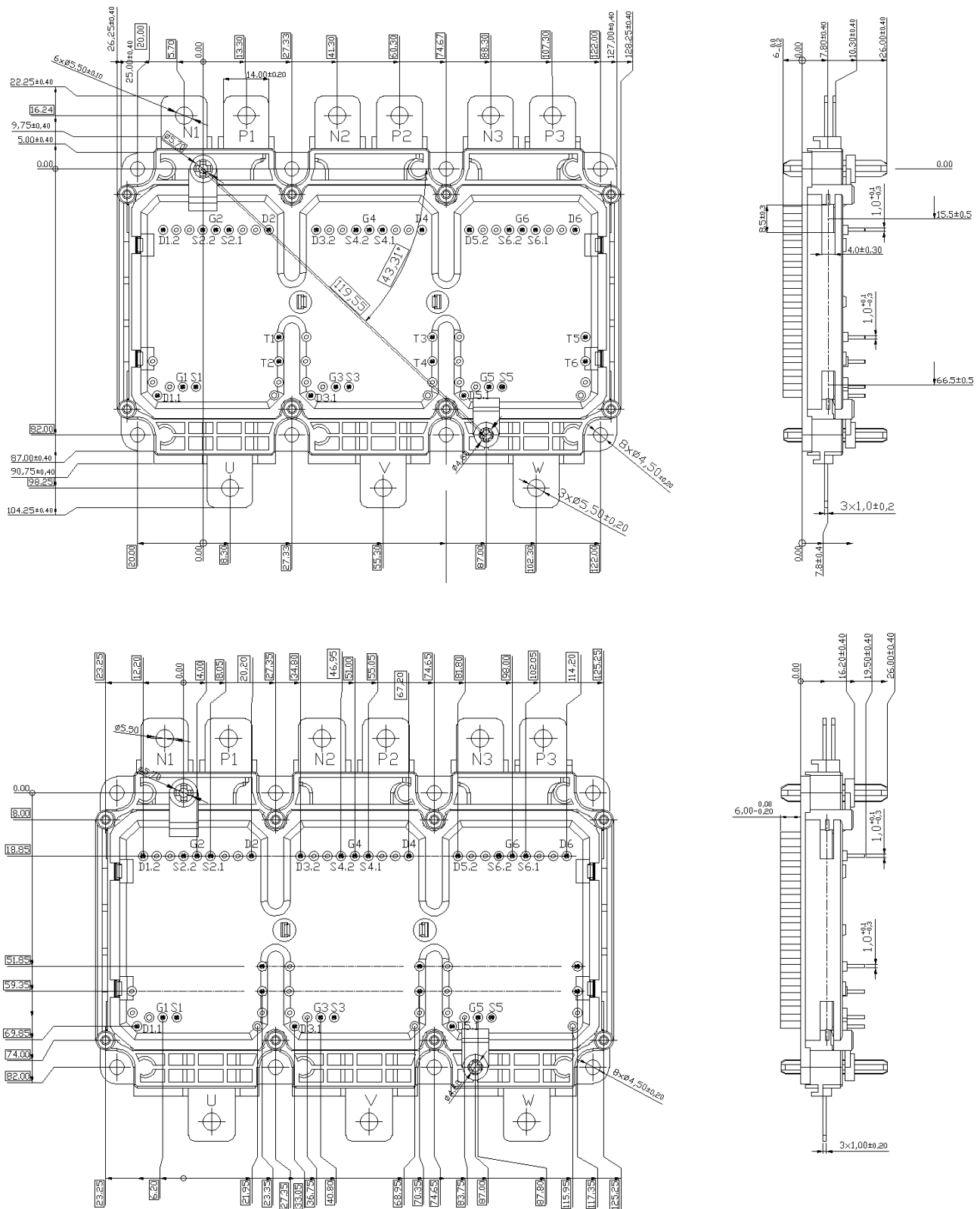
Figure 10
Safe Operating Area

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

Notes & Disclaimer

This document and the information contained herein are subject to change without notice. Any such change shall be evidenced by the publication of an updated version of this document by AST Technology. No communication from any employee or agent of AST Technology or any third party shall effect an amendment or modification of this document.

With respect to any examples, hints or any typical values stated herein and/or any information regarding the application of the product, AST Technology hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.

Any information given in this document is subject to customer's compliance with its obligations stated in this document and any applicable legal requirements, norms and standards concerning customer's products and any use of the product of AST Technology in customer's applications.

The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer's technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

Except as otherwise explicitly approved by AST Technology in a written document signed by authorized representatives, the products of AST Technology may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury.

Contact Info

Tel: +86 755-89300160

Web: <http://www.astsic.com/>

Add: No.1 Rongtian Rd., Pingshan, Shenzhen, China

@2024 Shenzhen AST Technology Company. All Rights Reserved.