

ASC600N1700DCS12

1700V, 600A, Half-Bridge, Silicon Carbide MOSFET Module

Product Data Sheet

ASTC-3T03-03A A/0



General Description

AST DCS12 series Silicon Carbide MOSFET module with AST 1700V Gen3 N-channel SiC MOSFET and PinFin cooler type, NTC temperature sensor inside.

Features

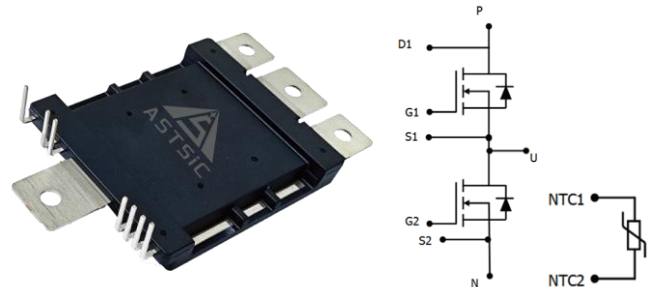
- High Temperature, Humidity and Bias Operation
- Ultra Low Loss $\leq 5\text{nH}$
- High-Frequency Operation
- Zero Turn-off Tail Current from MOSFET
- Normally-off, Fail-safe Device Operation
- Cu Baseplate and Silicon Nitride Insulator

Benefits

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

Applications

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



Ordering Informations

Order Number / Marking	ASC600N1700DCS12
Package Type	DCS12

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
T _J	Junction Temperature	175			°C	
Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
Static characteristics						
R _{DS(on)}	Drain-Source On-State Resistance	-	4.3	5.0	mΩ	V _{GS} =18V; I _D =300A; T _C =25°C
Dynamic characteristics						
Q _G	Total Gate Charge	-	1008	-	nC	I _D =300A; V _{DD} =1200V V _{GS} =-5/+18V ; T _C =25°C
Q _{GD}	Gate-Drain Charge	-	300	-		
Source-drain diode						
Q _{RR}	Reverse Recovered Charge	-	2563	-	nC	V _{GS} =-5V; I _{SD} =300A; V _R =1200V T _i =25°C

Absolute Maximum Ratings

Symbol	Parameter	Values	Unit
V_{DS}	Drain-Source Voltage	1700	V
V_{GS}	Gate-Source Voltage (dynamic)	-10/+22	V
I_D	Drain Current (continuous)	600	A
I_{DM}	Drain Current (pulsed)	1200	A
$T_{op}; T_{stg}$	Operating and Storage Temperature Range	-40 to +175	°C
T_J	Junction Temperature	175	°C
L_{Stray}	Stray Inductance	5	nH
V_{ISOL}	Isolation Test Voltage (DC; 2mA; t=10s)	4.2	kV
$R_{th JC}$	Thermal Resistance, Junction to Cooling Fluid	0.12	°C/W

MOSFET Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
Static characteristics (at $T_J=25^{\circ}\text{C}$, unless otherwise specified)						
BV_{DS}	Drain-source Breakdown Voltage	1700	-	-	V	$V_{GS}=0\text{V}$
I_{DSS}	Zero Gate Voltage Drain Current	-	-	300	μA	$V_{DS}=1700\text{V}; V_{GS}=0\text{V}$
I_{GSS}	Gate-source Leakage Current	-	-	3	μA	$V_{GS}=20\text{V}; V_{DS}=0\text{V}$
$V_{GS(th)}$	Gate-source 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	5.0	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 $T_J=25^{\circ}\text{C}$, 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	-	1.2	-		
C_{rss}	Reverse Transfer Capacitance	-	96	-	pF	
E_{on}	Turn-on Energy Loss Per Pulse	-	38.7	-	mJ	$V_{DS}=1200\text{V}; V_{GS}=-5/+18\text{V}$ $I_D=300\text{A}; \text{Load}=100\mu\text{H}$
E_{off}	Turn-off Energy Loss Per Pulse	-	32.5	-		
Q_{GS}	Gate-Source Charge	-	312	-	nC	$V_{DS}=1200\text{V}; V_{GS}=-5/+18\text{V}; I_D=300\text{A}$
Q_{GD}	Gate-Drain Charge	-	300	-		
Q_G	Total Gate Charge	-	1008	-		
$t_{d(on)}$	Turn-on Delay Time	-	65	-	nS	$V_{DS}=1200\text{V}; V_{GS}=-5/+18\text{V}$ $I_D=300\text{A}; R_{G(ext)}=5\Omega; \text{Load}=100\mu\text{H}$
t_r	Rise Time	-	79	-		
$t_{d(off)}$	Turn-off Delay Time	-	358	-		
t_f	Fall Time	-	72	-		

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

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
V_{SD}	Body Diode Forward Voltage	-	3.6	6	V	$V_{GS}=0\text{V}$; $I_{SD}=300\text{A}$
I_{SD}	Continuous Diode Forward Current	-	300	-	A	$V_{GS}=0\text{V}$; $T_C=25^{\circ}\text{C}$
t_{RR}	Reverse Recovery Time	-	56	-	ns	$V_{GS}=-5\text{V}$; $I_{SD}=300\text{A}$; $V_R=1200\text{V}$
Q_{RR}	Reverse Recovery Charge	-	2563	-	nC	
I_{RRM}	Peak Reverse Recovery Current	-	84	-	A	

NTC Thermistor Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
R_{25}	Rated Resistance	-	5.00	-	$\text{k}\Omega$	$T_{NTC}=25^{\circ}\text{C}$
$\Delta R/R$	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

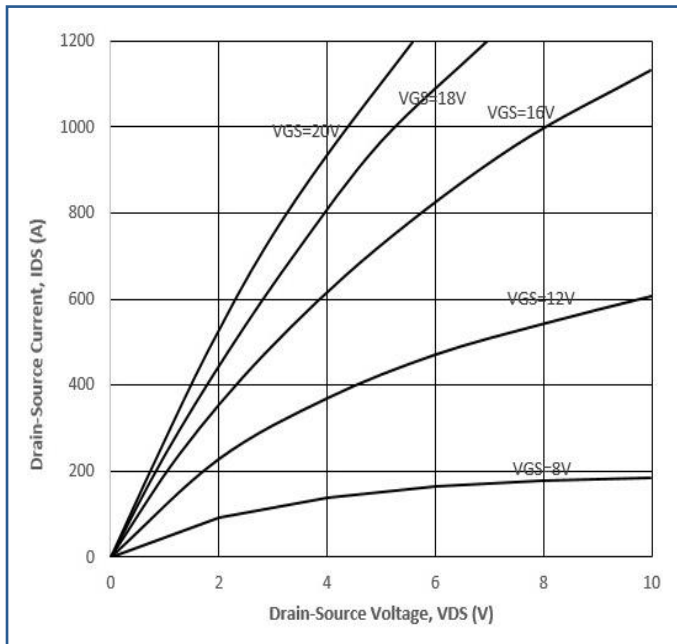


Figure 1
Output Characteristics (T_J=25 °C)

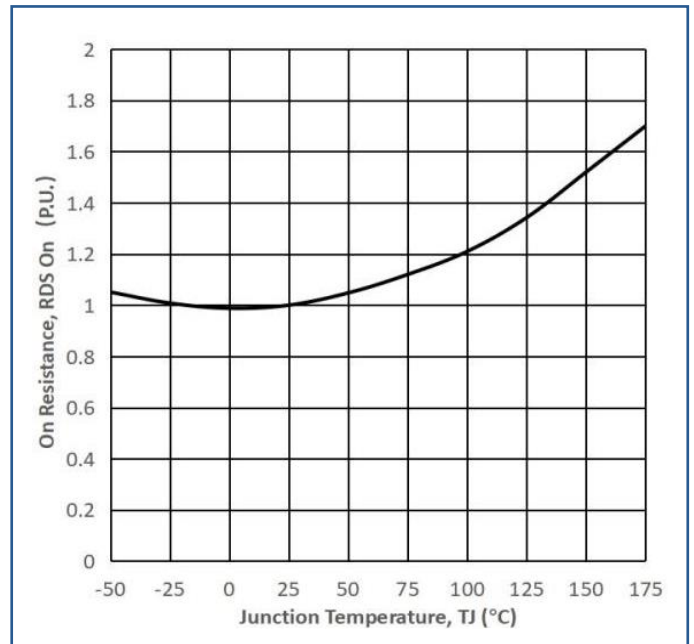


Figure 2
Normalized On-State Resistance vs. Junction Temperature

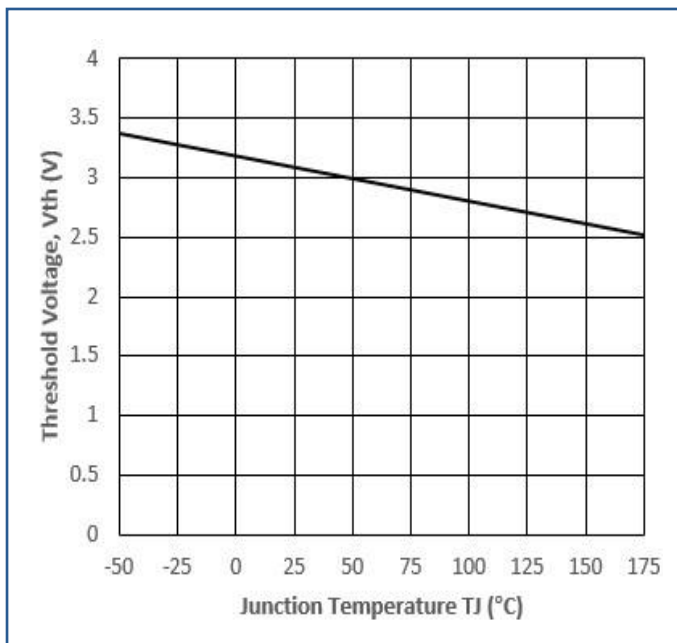


Figure 3
Threshold Voltage vs. Junction Temperature

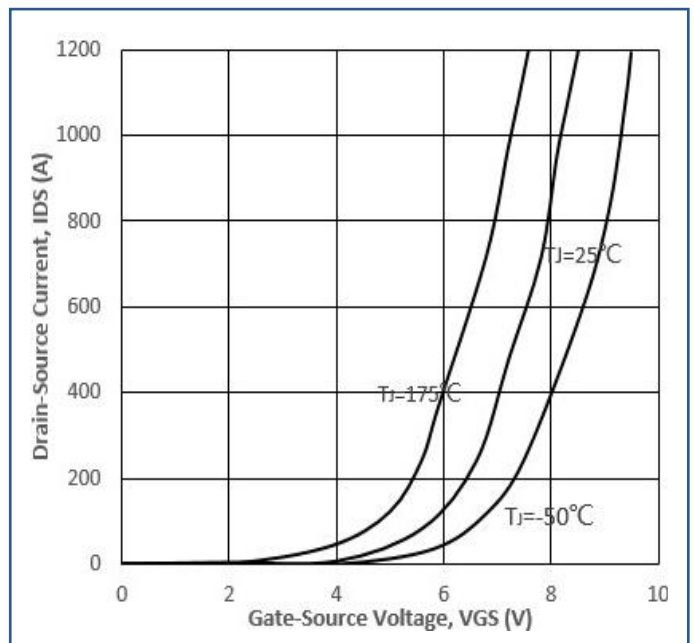


Figure 4
Transfer Characteristic for Various Junction Temperatures

Typical Performance

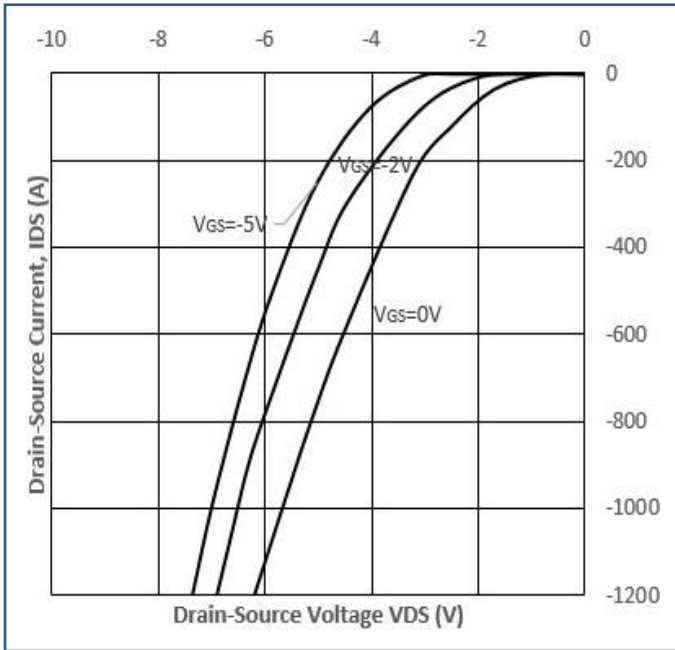


Figure 5

Body Diode Characteristic ($T_J=25^{\circ}\text{C}$)

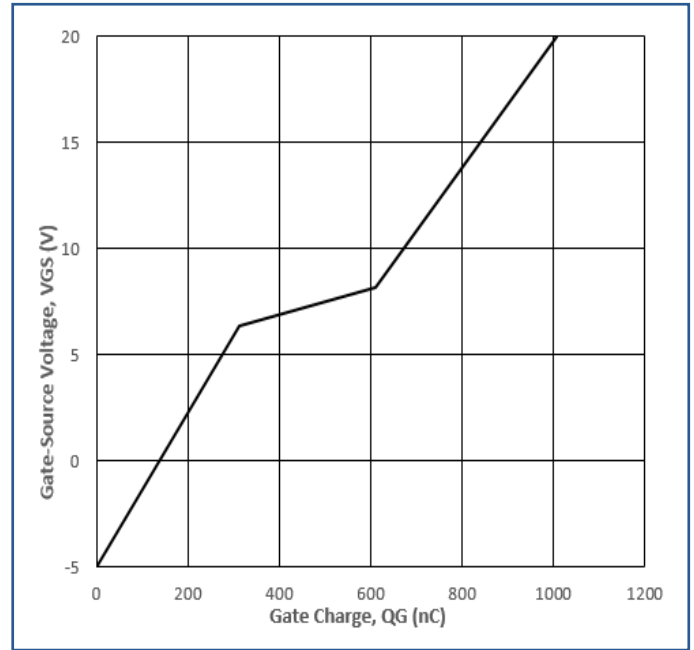


Figure 6

Typical Gate Charge Characteristics

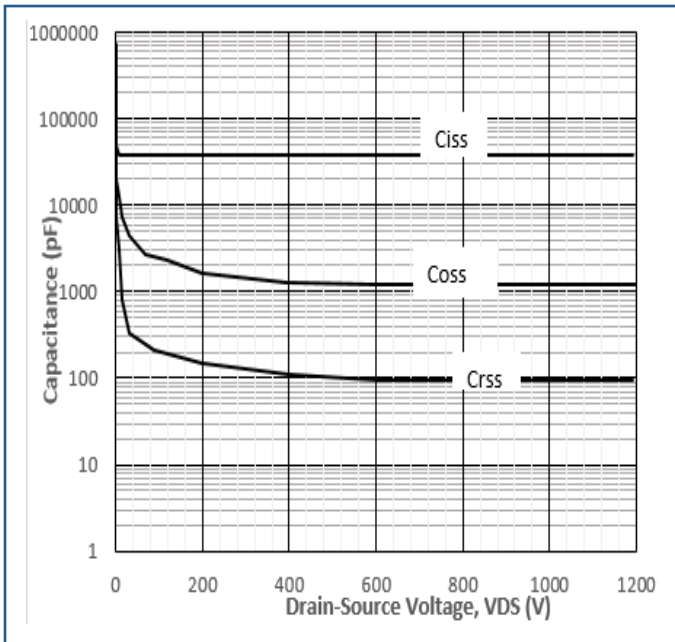


Figure 7

Typical Capacitances vs. Drain-Source Voltage

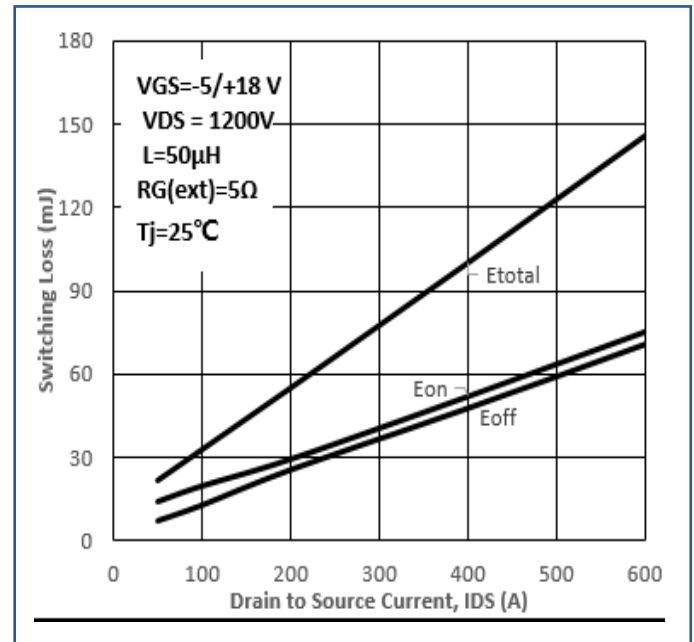


Figure 8

Inductive Switching Energy vs. Drain Current

Typical Performance

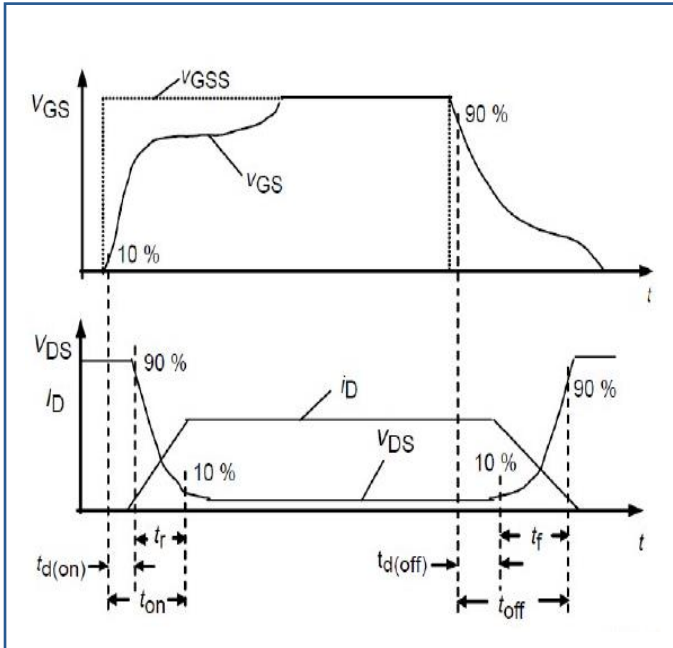


Figure 9

Switching Time Description

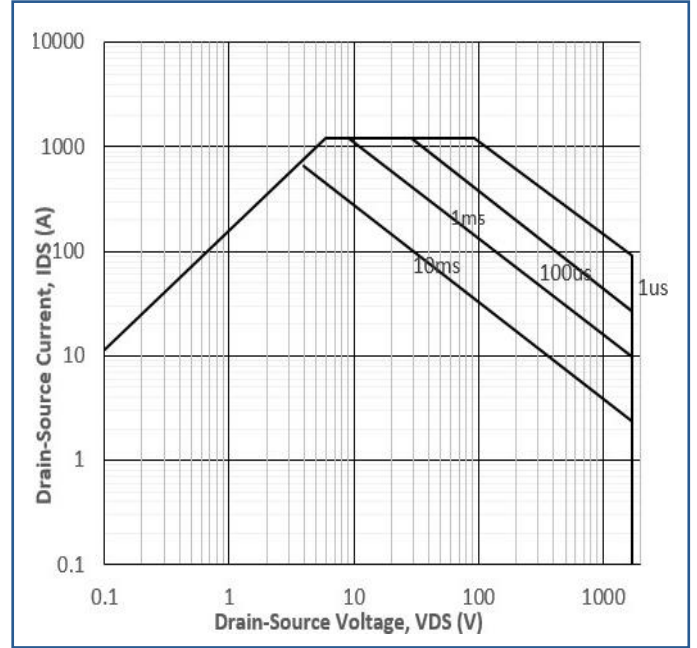
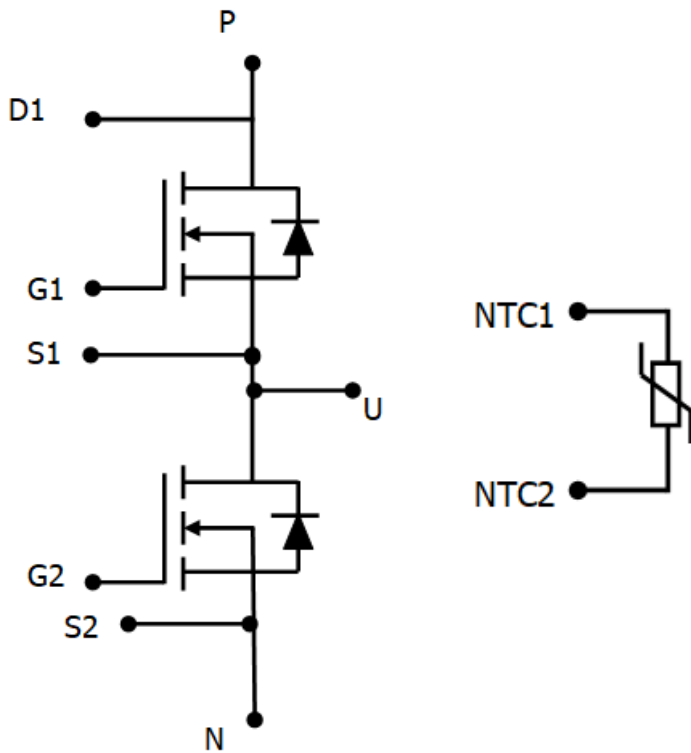
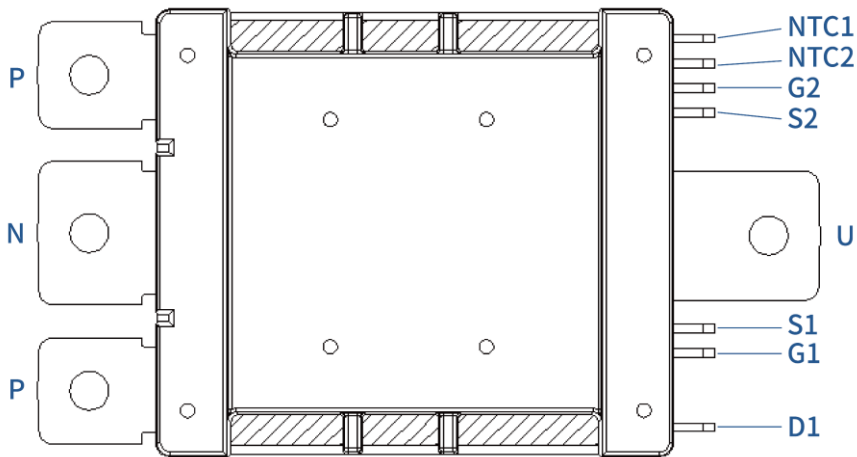


Figure 10

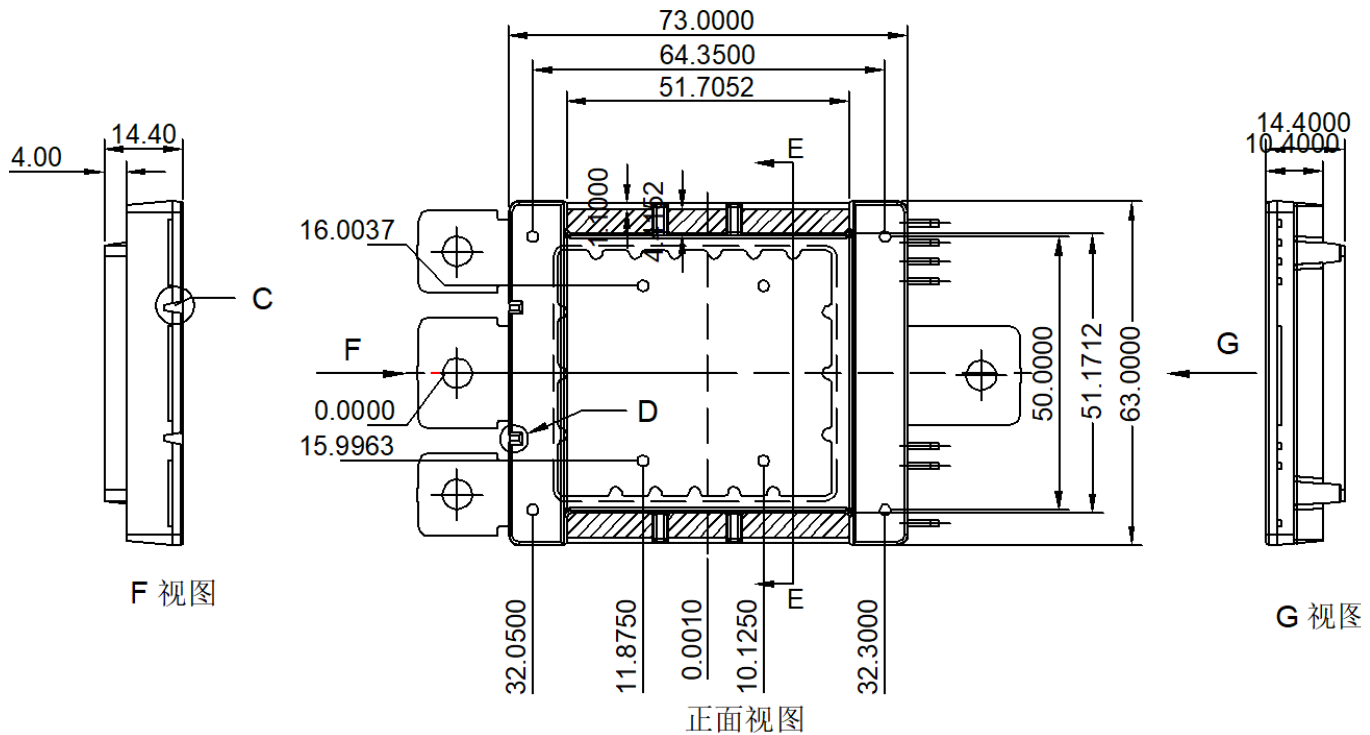
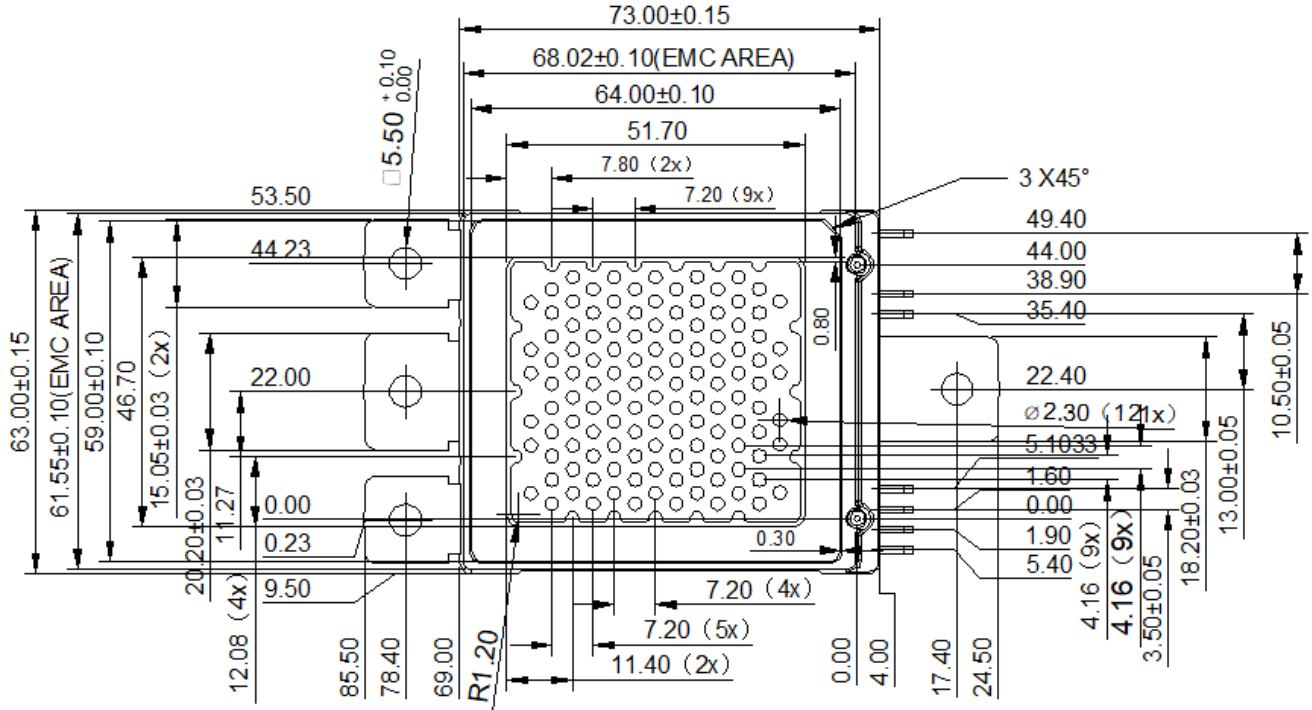
Safe Operating Area

Schematic and Pin Out

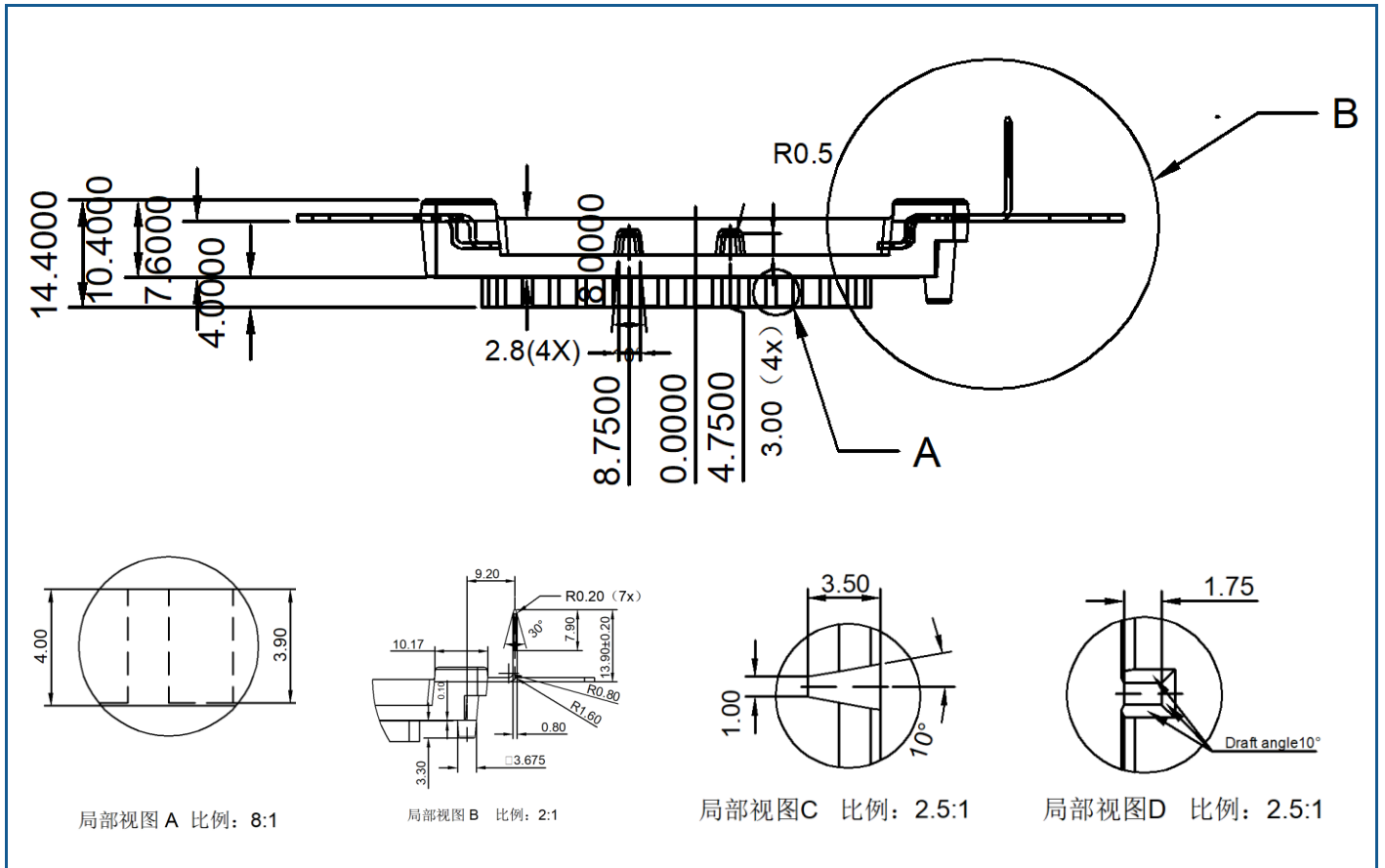


Package Dimensions (mm)

Package Type: DCS12



Package Dimensions (mm)



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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