

ASC400N650DCS12

650V, 400A, Half-Bridge, Silicon Carbide MOSFET Module

Product Data Sheet

ASTC-3T03-176A A/0



爱仕特科技
AST TECHNOLOGY

General Description

The AST-DCS12 module incorporates AST's 650V Gen3 N-channel SiC MOSFET. NTC temperature sensor inside.

Features

- High Temperature, Humidity, and Bias Operation
- Ultra Low Loss < 5nH
- High-Frequency Operation
- Zero Turn-off Tail Current from MOSFET
- Normally-off, Fail-Safe Device Operation
- Copper Baseplate and Silicon Nitride Insulator

Benefits

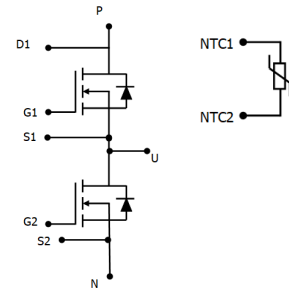
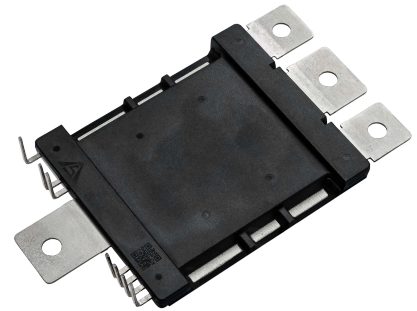
- Enables Compact, Lightweight, Efficient Systems
- Harsh Outdoor Environment Installation
- Mitigates Over-Voltage Protection
- Reduced Thermal Requirements
- Reduced System Cost

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	650			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	-	3.0	4.0	mΩ	V _{GS} =18V; I _D =300A; T _C =25°C
Dynamic characteristics						
Q _G	Total Gate Charge	-	944	-	nC	V _{DD} =400V; V _{GS} =-5/+18V; I _D =200A; T _C =25°C
Q _{GD}	Gate-Drain Charge	-	256	-		
Source-drain diode						
Q _{RR}	Reverse Recovery Charge	-	2720	-	nC	V _{GS} =-5/+18V; I _F =400A; V _R =400V; Load=50uH; T _i =25°C



Ordering Informations

Order Number	ASC400N650DCS12
Marking	ASC400N650DCS12
Package Type	DCS12

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

Symbol	Parameter	Value	Unit
V_{DS}	Drain-Source Voltage	650	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	5	nH
V_{isol}	Isolation Test Voltage (DC; 2mA; $t=10\text{s}$)	4.2	kV
$R_{\theta Jh}$	Thermal Resistance, Junction-to-Heatsink (per MOSFET; 8 L/min; $T_F=65^\circ\text{C}$)	0.07	$^\circ\text{C}/\text{W}$

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	650	-	-	V	$V_{GS}=0\text{V}$
I_{DSS}	Zero Gate Voltage Drain Current	-	-	200	μA	$V_{DS}=650\text{V}; V_{GS}=0\text{V}$
I_{GSS}	Gate-Body Leakage Current	-	-	2.0	μA	$V_{GS}=-10/+20\text{V}; V_{DS}=0\text{V}$
$V_{GS(th)}$	Gate Threshold Voltage	2.0	-	4.0	V	$V_{DS}=V_{GS}; I_D=40\text{mA}$
$R_{DS(on)}$	Static Drain-Source on Resistance	-	3.0	4.0	m Ω	$V_{GS}=18\text{V}; I_D=300\text{A}; T_c=25^\circ\text{C}$
$V_{GS(on)}$	Recommended Turn-on Voltage	-	18	-	V	Static
$V_{GS(off)}$	Recommended Turn-off Voltage	-	-5	-	V	
R_G	Gate Resistance	-	0.6	-	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	-	25.4	-	nF	$V_{DS}=600\text{V}; f=1\text{MHz}; V_{AC}=25\text{mV}$
C_{oss}	Output Capacitance	-	1.4	-		
C_{rss}	Reverse Transfer Capacitance	-	64	-	pF	
E_{on}	Turn-on Energy	-	3.8	-	mJ	$V_{DD}=400\text{V}; V_{GS}=-5/+18\text{V}; I_D=400\text{A}; R_{G(ext)}=5\Omega; \text{Load}=50\mu\text{H}$
E_{off}	Turn-off Energy	-	15.3	-		
Q_{GS}	Gate-Source Charge	-	224	-	nC	$V_{DD}=400\text{V}; V_{GS}=-5/+18\text{V}; I_D=200\text{A}$
Q_{GD}	Gate-Drain Charge	-	256	-		
Q_G	Total Gate Charge	-	944	-		
$t_{d(on)}$	Turn-on Delay Time	-	180	-	ns	$V_{DD}=400\text{V}; V_{GS}=-5/+18\text{V}; I_D=400\text{A}; R_{G(ext)}=5\Omega; \text{Load}=50\mu\text{H}$
t_r	Rise Time	-	74	-		
$t_{d(off)}$	Turn-off Delay Time	-	285	-		
t_f	Fall Time	-	64	-		

Body Diode Characteristics (at T_J=25°C unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
V _{FSD}	Forward Voltage	-	-	6	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	-	59	-	ns	V _{GS} =-5/+18V; I _F =400A; V _R =400V; Load=50μH; R _{G(ext)} =5Ω
Q _{RR}	Reverse Recovery Charge	-	2720	-	nC	
I _{RRM}	Peak Reverse Recovery Current	-	131	-	A	

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

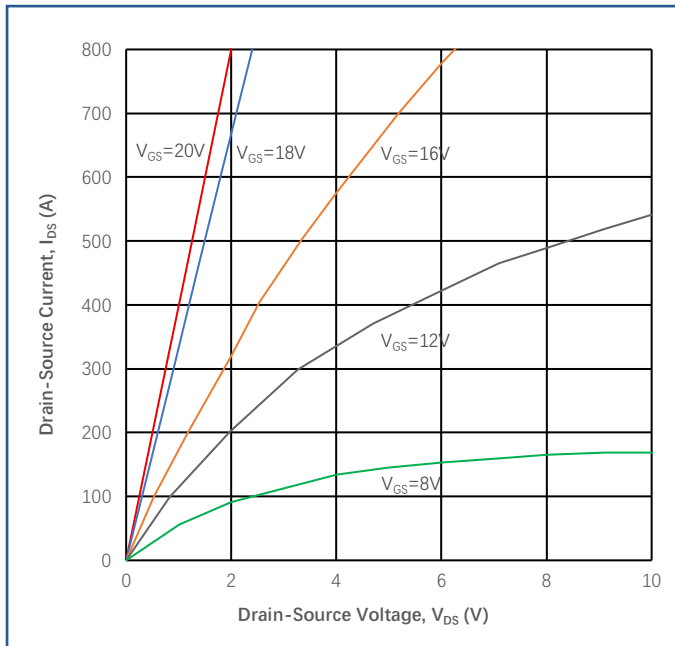


Figure 1
Output Characteristics (T_j=25°C)

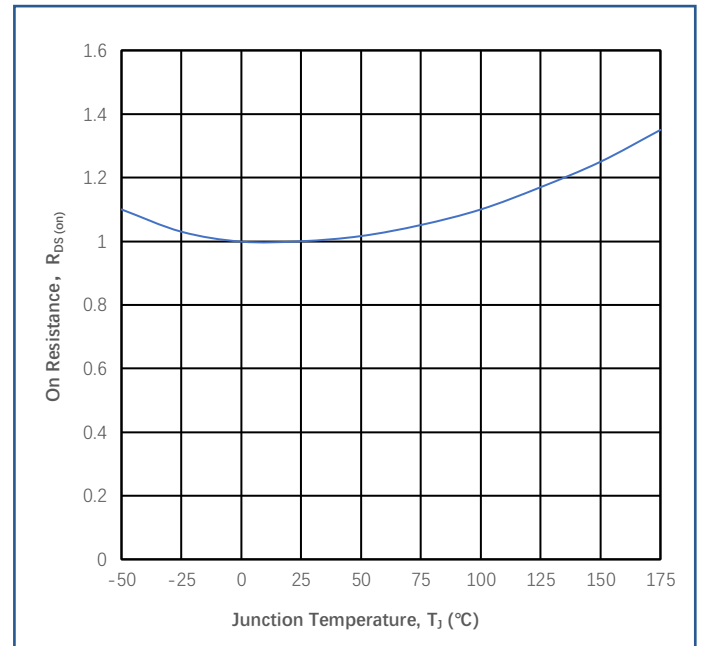


Figure 2
Normalized On-Resistance vs. Temperature

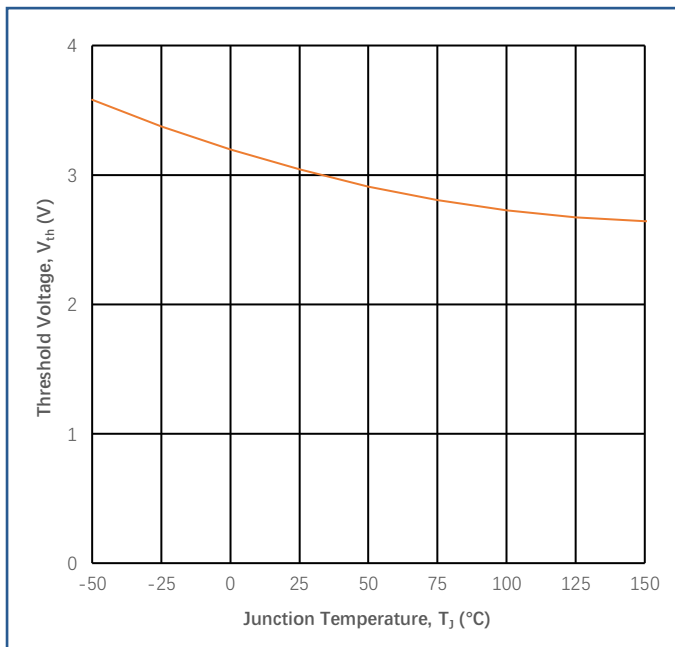


Figure 3
Threshold Voltage vs. Temperature

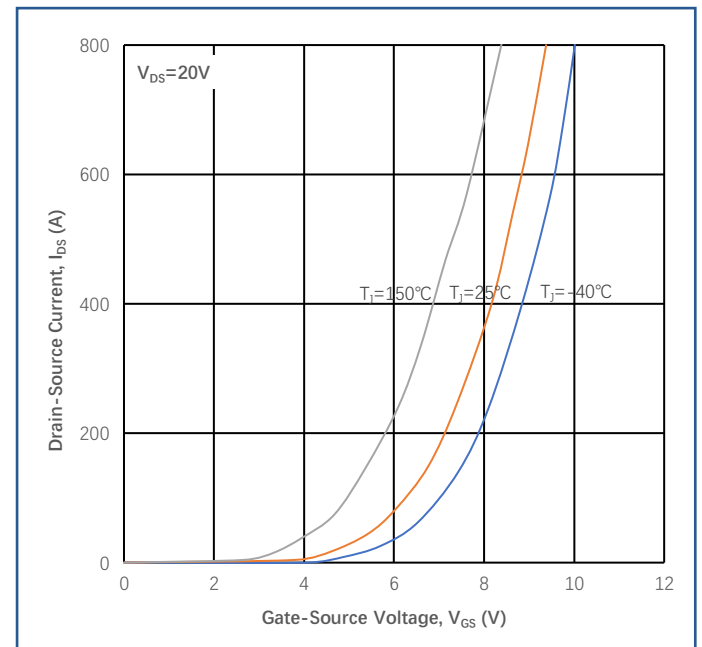


Figure 4
Transfer Characteristic for Various T_j; V_{DS}=20V

Typical Performance

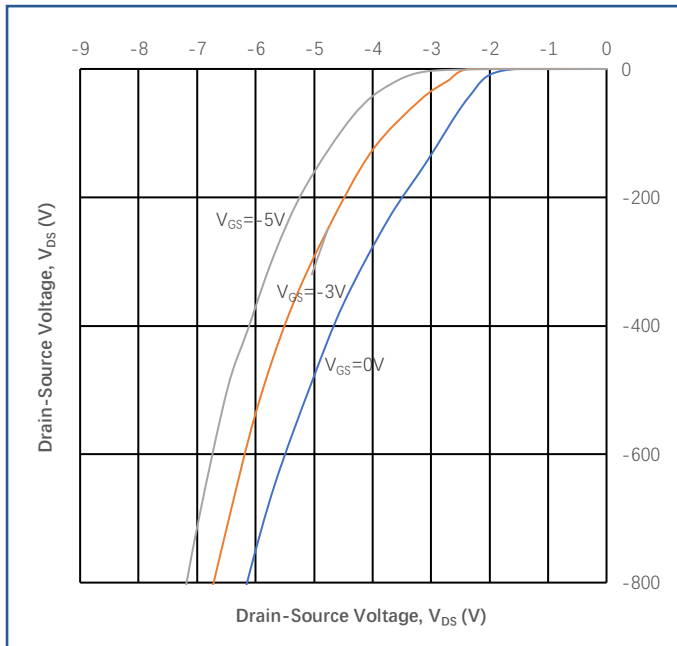


Figure 5
Diode Characteristic at 25°C

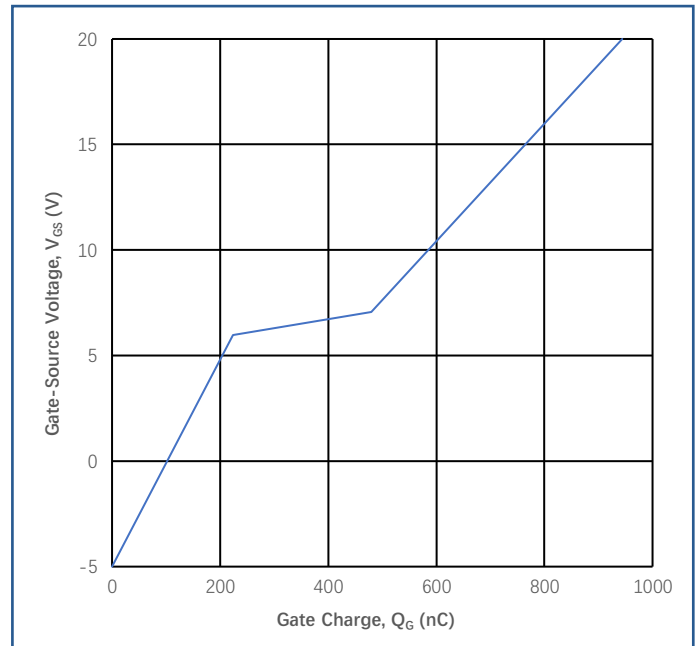


Figure 6
Typical Gate Charge Characteristics

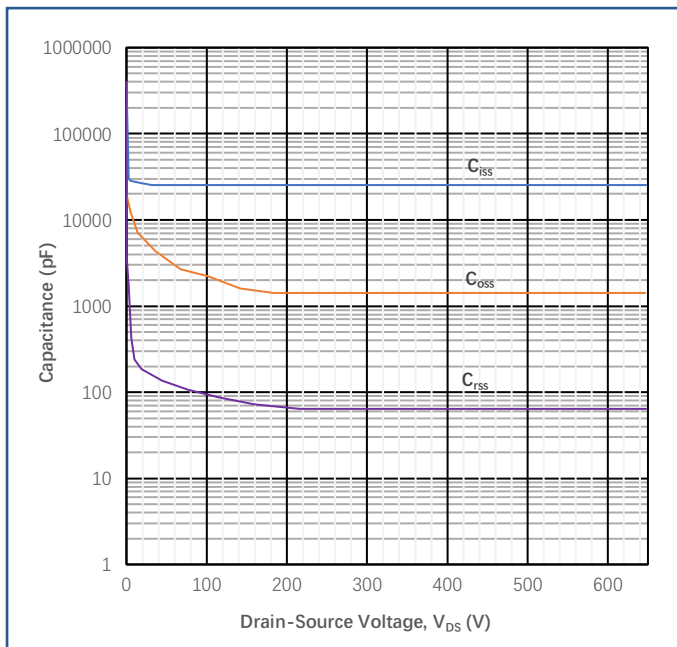


Figure 7
Typical Capacitances vs. Drain-Source Voltage

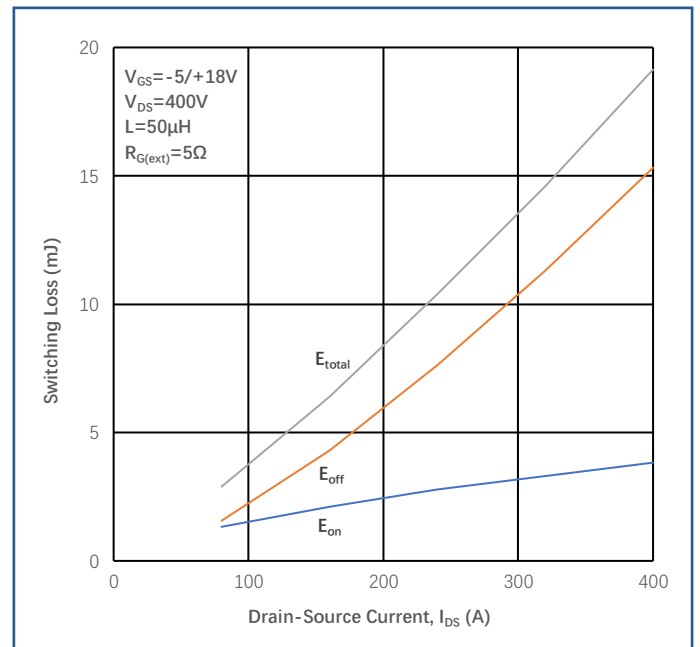


Figure 8
Inductive Switching Energy vs. Drain Current

Typical Performance

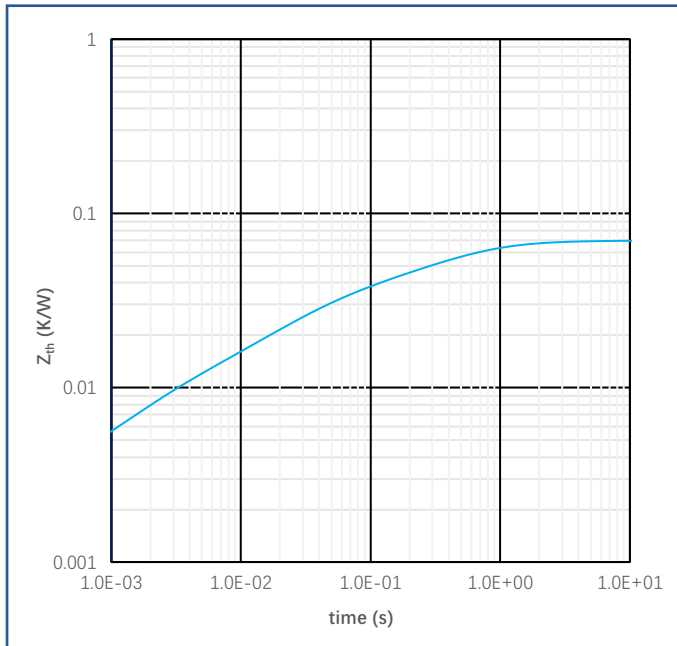


Figure 9
MOSFET Transient Thermal Impedance

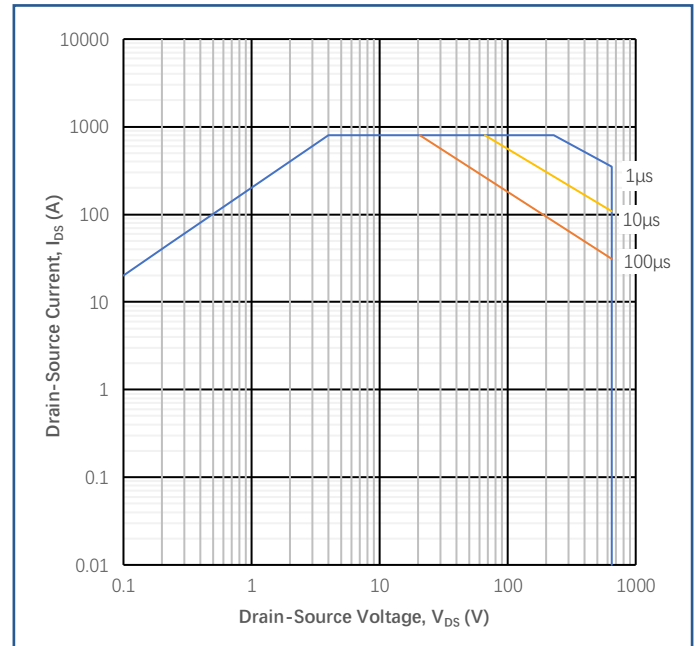
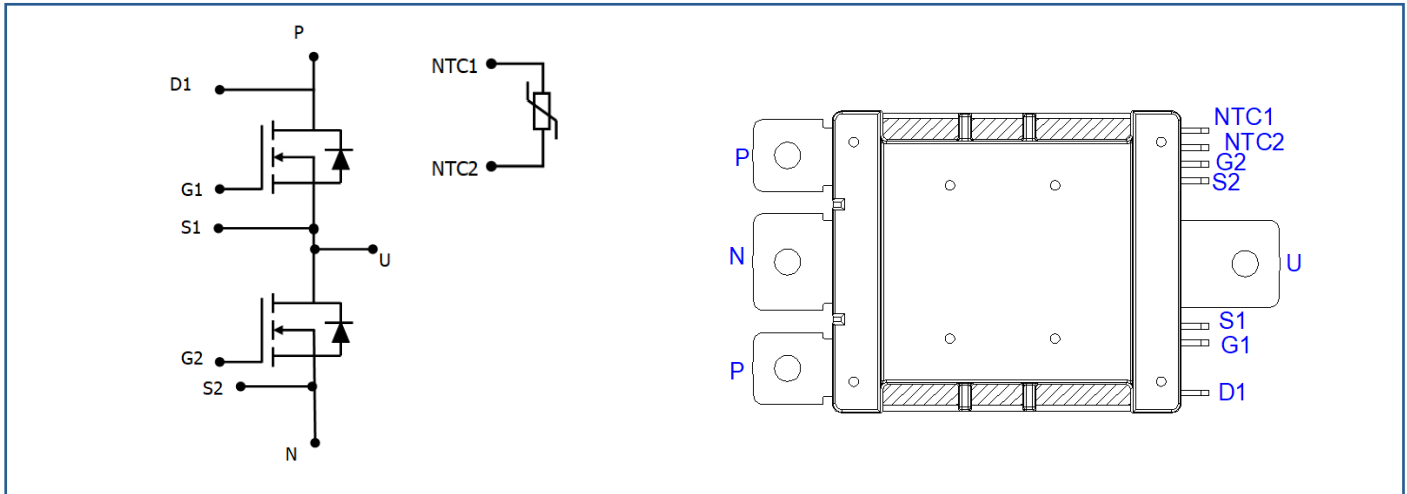


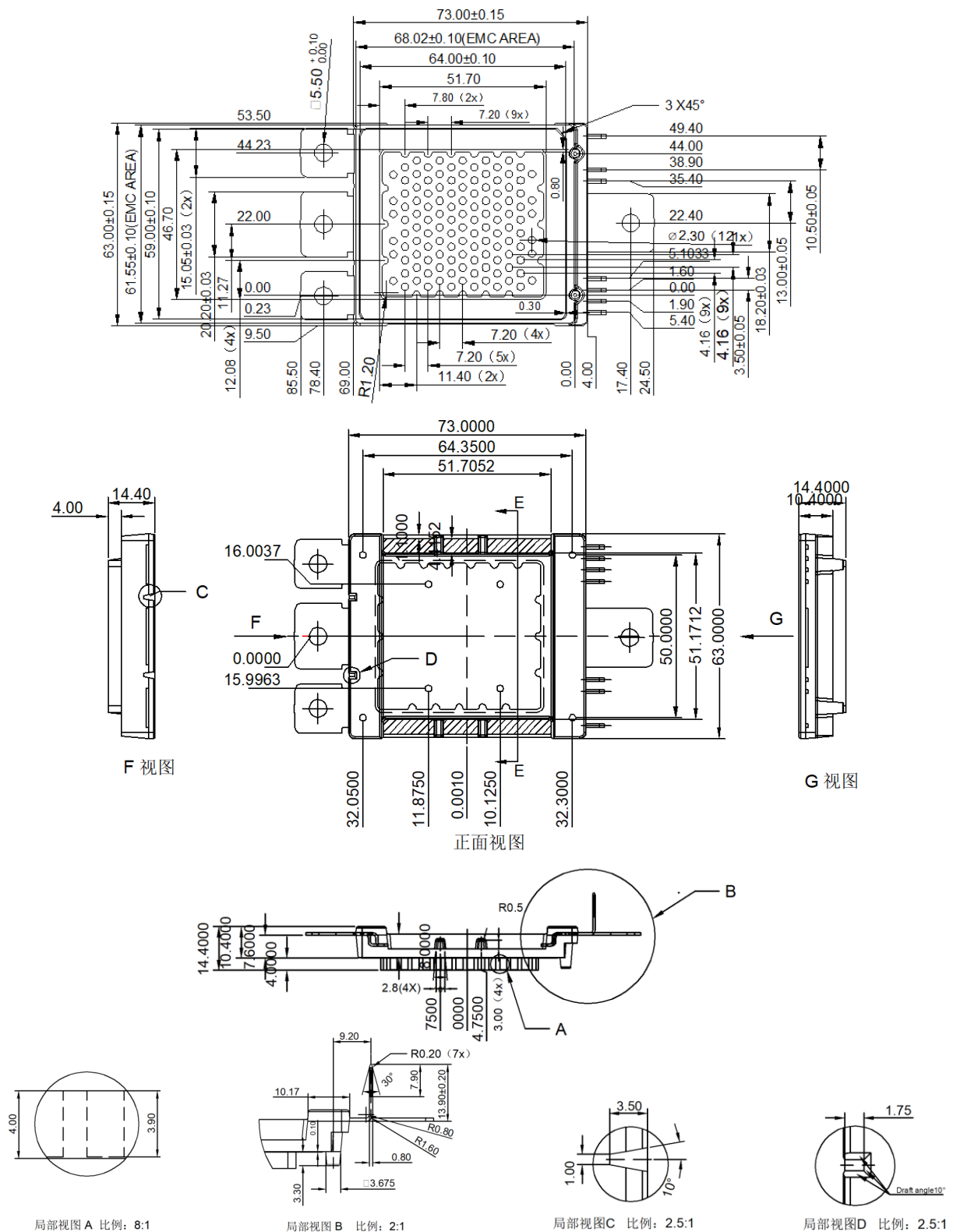
Figure 10
Safe Operating Area

Circuit Diagram Headline



Package Dimensions(mm)

Package Type: DCS12



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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