

ASC800N650DCS12

650V, 800A, 1.5mΩ, Half-Bridge, Silicon Carbide MOSFET Module

Product Data Sheet

ASTC-3T03-40A A/0



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

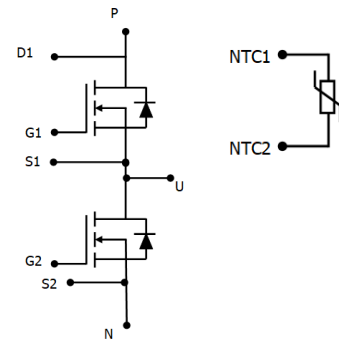
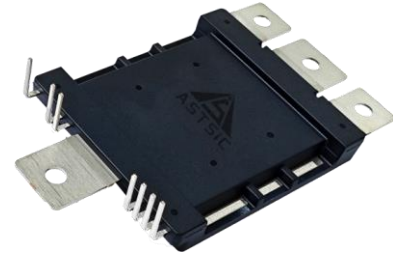
Benefits

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

Applications

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

Key Parameters



Ordering Informations

Order Number / Marking	ASC800N650DCS12
Package Type	DCS12

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)	800			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	-	1.5	2.5	mΩ	V _{GS} =18V; I _D =600A; T _C =25°C
Dynamic characteristics						
Q _G	Total Gate Charge	-	1888	-	nC	V _{DD} =400V; V _{GS} =-5/+18V; I _D =400A; T _C =25°C
Q _{GD}	Gate-drain Charge	-	512	-		
Source-drain diode						
Q _{RR}	Reverse Recovery Charge	-	5440	-	nC	V _{GS} =-5/+18V; I _F =400A; V _R =900V; Load=100uH; T _J =25°C

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)	800	A
I_{DM}	Drain Current (pulsed)	1600	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=10s)	4.2	kV
$R_{th JC}$	Thermal Resistance, Junction to Cooling Fluid	0.12	$^\circ\text{C/W}$

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	$V_{GS}=0V$
I_{DSS}	Zero Gate Voltage Drain Current	-	-	400	μA	$V_{DS}=650V; V_{GS}=0V$
I_{GSS}	Gate-body Leakage Current	-	-	4	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	-	1.5	2.5	$m\Omega$	$V_{GS}=18V; I_D=600A$
$V_{GS(on)}$	Recommended Turn-on Voltage	-	18	-	V	Static
$V_{GS(off)}$	Recommended Turn-off Voltage	-	-5	-	V	
R_G	Gate Resistance	-	0.4	-	Ω	$V_{AC}=25mV; f=1MHz$
Dynamic characteristics (at $T_c=25^\circ\text{C}$ unless otherwise specified)						
C_{iss}	Input Capacitance	-	57.4	-	nF	$V_{DS}=400V; f=1MHz; V_{AC}=25mV$
C_{oss}	Output Capacitance	-	2.6	-		
C_{rss}	Reverse Transfer Capacitance	-	248	-	pF	
E_{on}	Turn-on Energy	-	8.6	-	mJ	$V_{DD}=400V; V_{GS}=-5/+18V; I_D=400A;$ Load=100 μH
E_{off}	Turn-off Energy	-	5.7	-		
Q_{GS}	Gate-source Charge	-	448	-	nC	$V_{DD}=400V; V_{GS}=-5/+18V; I_D=400A$
Q_{GD}	Gate-drain Charge	-	512	-		
Q_G	Total Gate Charge	-	1888	-		
$t_{d(on)}$	Turn-on Delay Time	-	117	-	ns	$V_{DD}=400V; V_{GS}=-5/+18V; I_D=400A;$ $R_{G(ext)}=5\Omega; \text{Load}=100\mu\text{H}$
t_r	Rise Time	-	101	-		
$t_{d(off)}$	Turn-off Delay Time	-	367	-		
t_f	Fall Time	-	71	-		

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	$V_{GS}=0V$; $I_F=400A$
I_S	Continuous Diode Forward Current	-	400	-	A	$V_{GS}=0V$; $T_C=25^\circ\text{C}$
t_{RR}	Reverse Recovery Time	-	80.9	-	ns	$V_{GS}=-5/+18V$; $I_F=400A$; $V_R=900V$; Load=100 μ H
Q_{RR}	Reverse Recovery Charge	-	5440	-	nC	
I_{RRM}	Peak Reverse Recovery Current	-	136	-	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 R100	-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	$R_2=R_{25}\exp [B_{25/50}(1/T_2-1/ (298.15K))]$
$B_{25/80}$	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

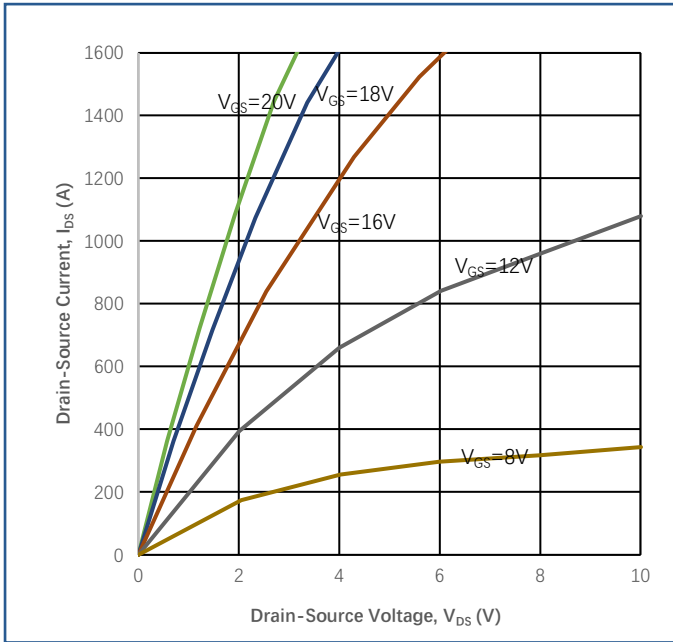


Figure 1
Output Characteristics ($T_J = 25^\circ\text{C}$)

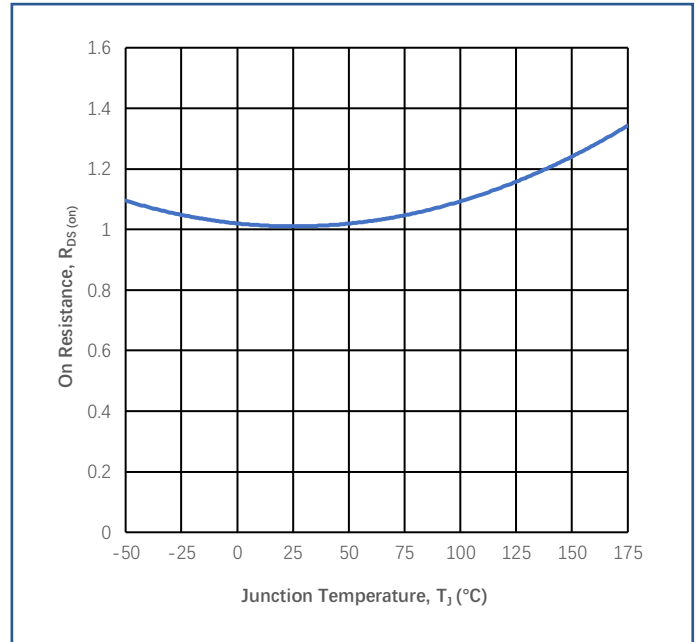


Figure 2
Normalized on-resistance vs. Temperature

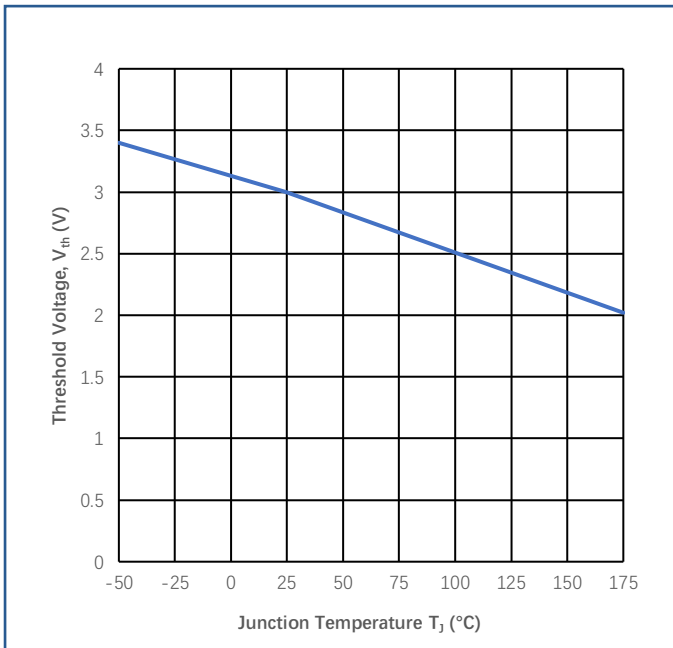


Figure 3
Threshold Voltage vs. Temperature

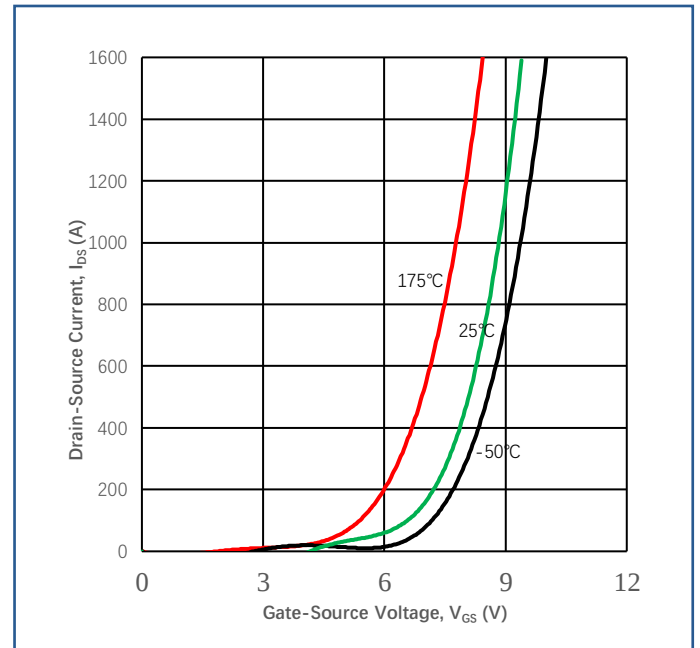


Figure 4
Transfer Characteristic for Various T_J

Typical Performance

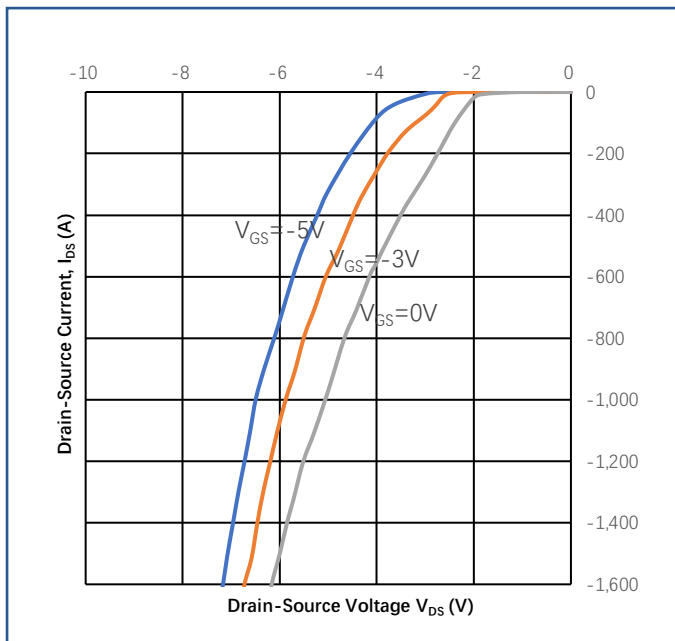


Figure 5
Diode Characteristic at 25°C

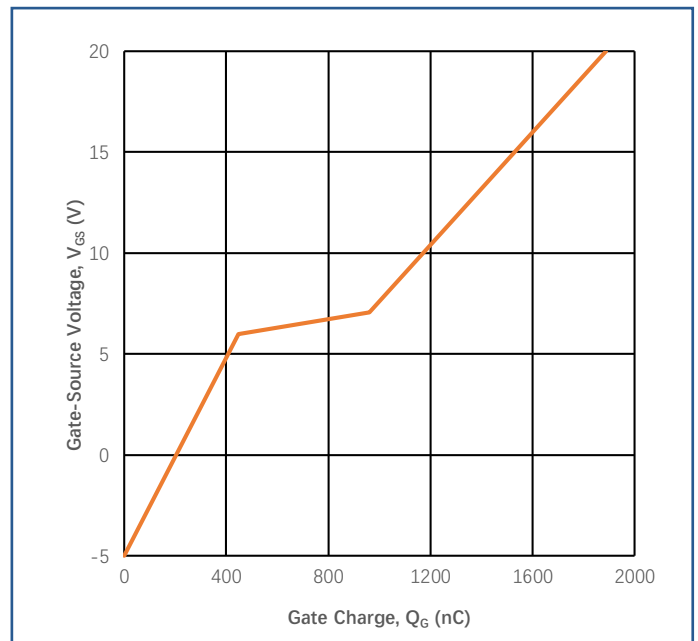


Figure 6
Typical Gate Charge Characteristics

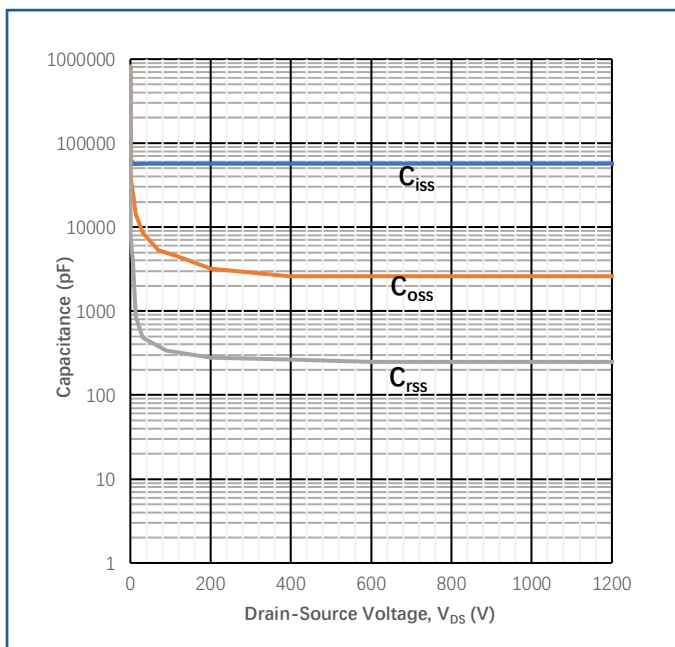


Figure 7
Typical Capacitances vs. Drain-source Voltage

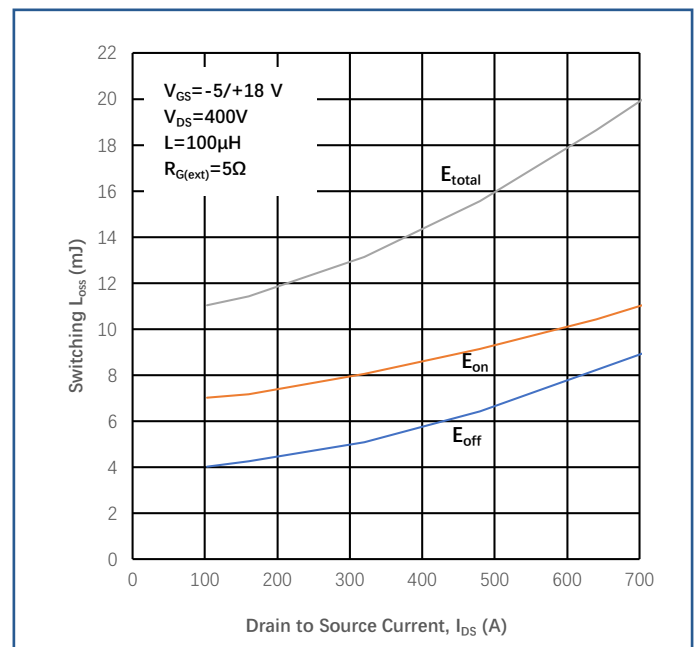


Figure 8
Inductive Switching Energy vs. Drain Current

Typical Performance

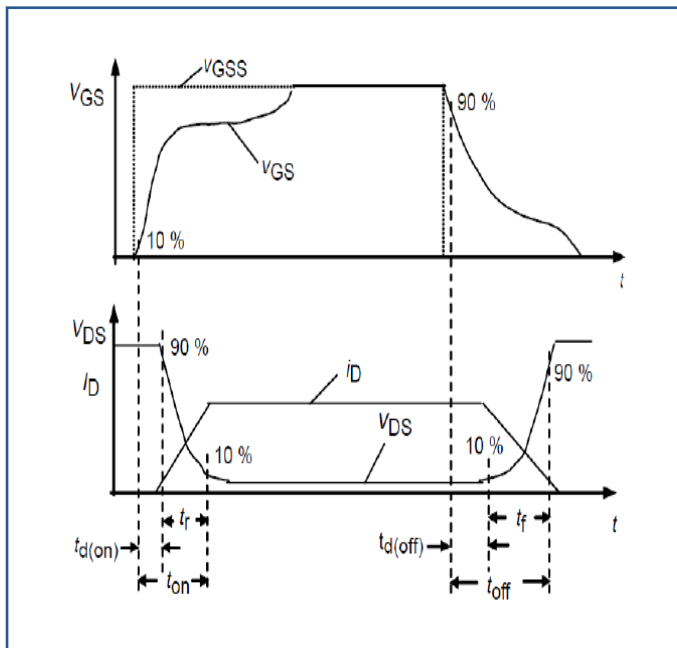


Figure 9
Switching Time Description

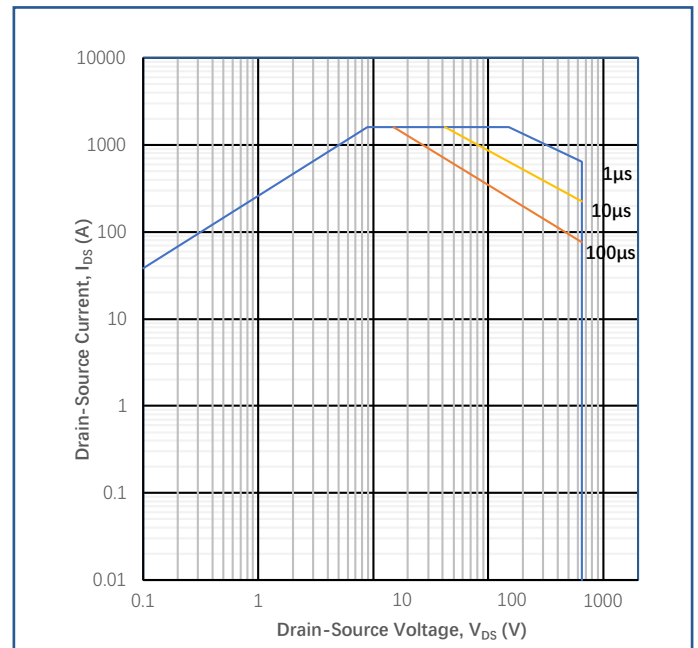
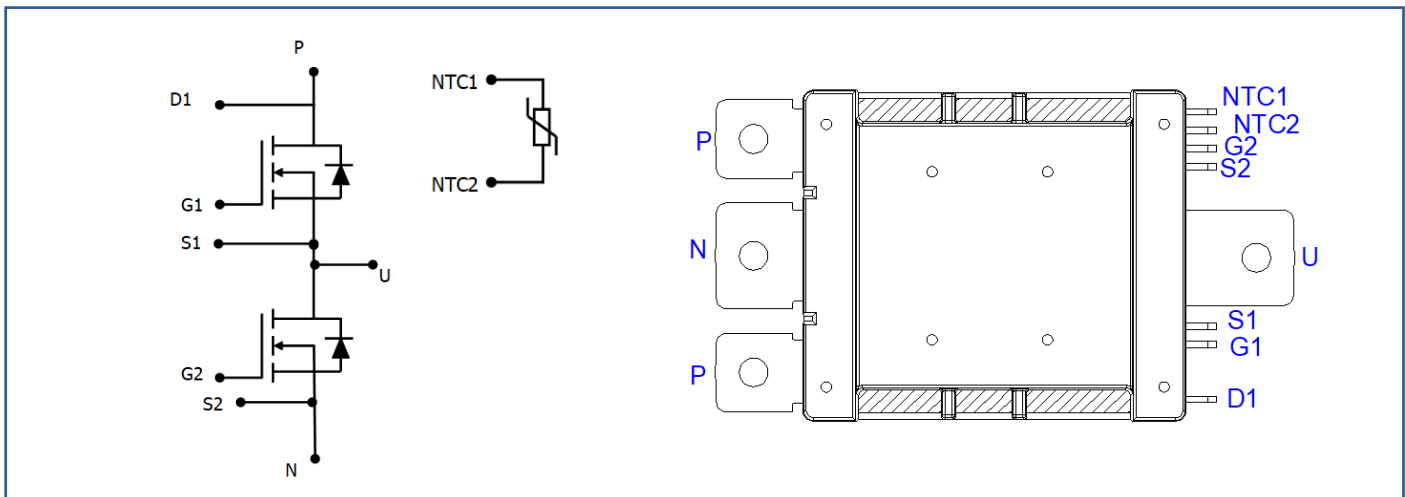


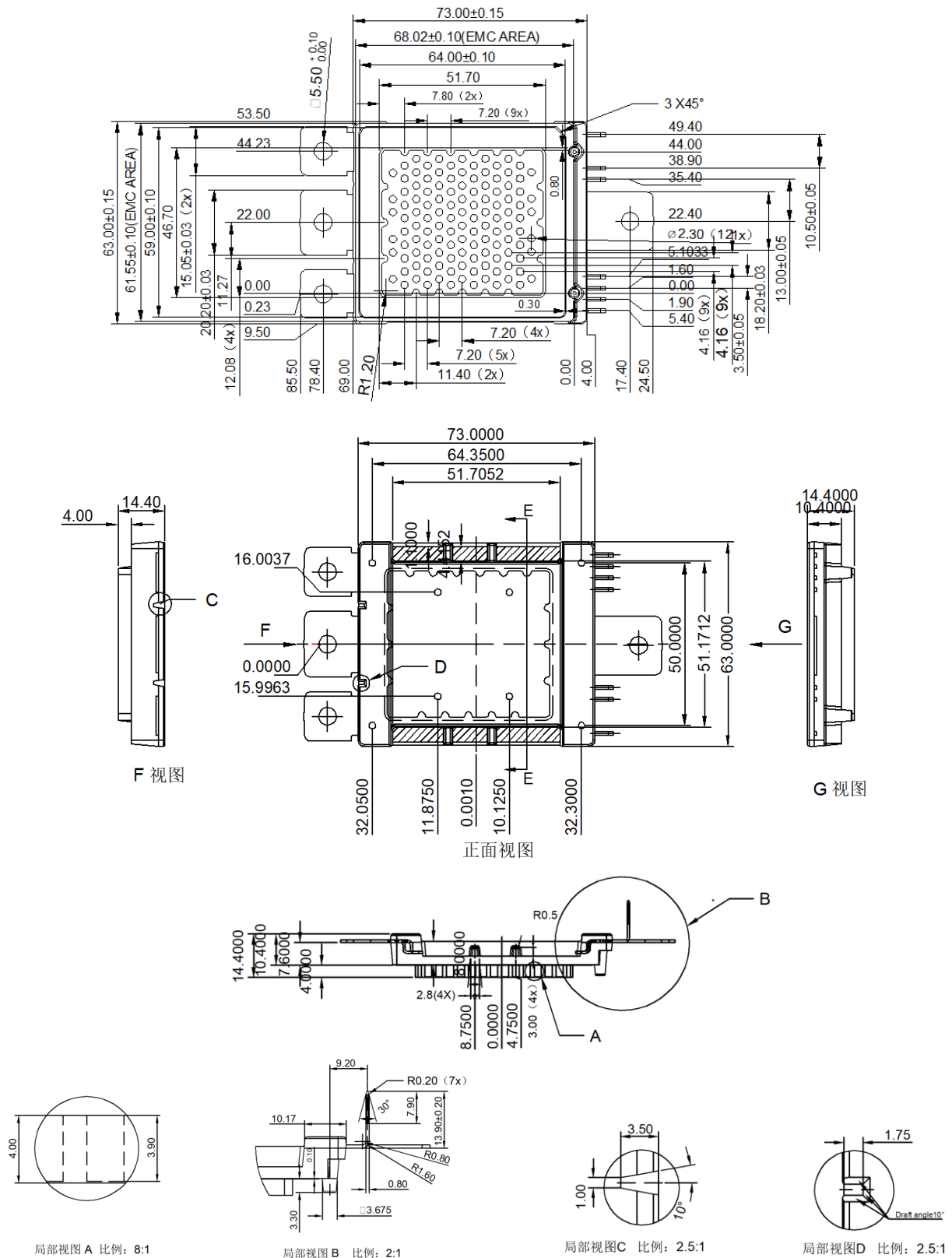
Figure 10
Safe Operating Area

Circuit Diagram Headline



Package Dimensions (mm)

Package Type: 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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