

ASC400N650MED

650V, 400A, 3.0mΩ, Half-Bridge, Silicon Carbide MOSFET Module

Product Data Sheet

ASTC-3T03-130A A/0



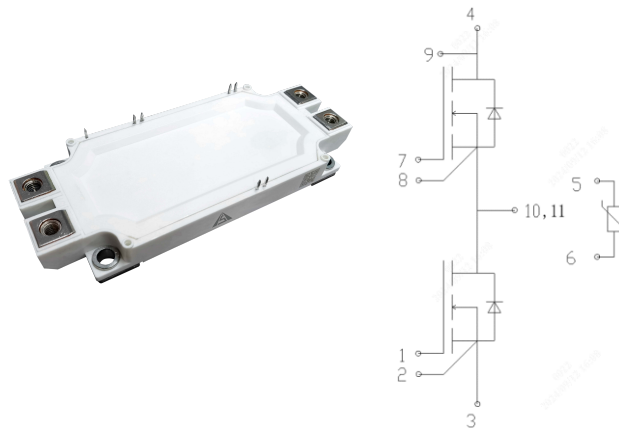
爱仕特科技
AST TECHNOLOGY

General Description

The AST-MED module incorporates AST's 1200V Gen3 N-channel SiC MOSFET. NTC temperature sensor inside.

Features

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



Applications

- High Power Converters
- Motor Drives
- Servo Drives
- UPS Systems
- Wind Turbines

Ordering Informations

Order Number / Marking	ASC400N650MED
Package Type	MED

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	V _{GS} =18V; 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=100μH; T _J =25°C

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

Symbol	Parameter	Values	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	20	nH
V_{isol}	Isolation Test Voltage (DC; 2mA; t=10s)	4.2	kV
$R_{th Jh}$	Thermal Resistance, Junction-to-Heatsink	0.13	$^{\circ}\text{C/W}$

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	-	-	40	μA	$V_{DS}=650V; V_{GS}=0V$
I_{GSS}	Gate-Body Leakage Current	-	-	2	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	-	3.0	4.0	$m\Omega$	$V_{GS}=18V; I_D=300A$
$V_{GS(on)}$	Recommended Turn-on Voltage	-	18	-	V	Static
$V_{GS(off)}$	Recommended Turn-off Voltage	-	-5	-	V	
R_G	Gate Resistance	-	0.8	-	Ω	$V_{AC}=25mV; f=1MHz$
Dynamic characteristics (at $T_c=25^{\circ}\text{C}$ unless otherwise specified)						
C_{iss}	Input Capacitance	-	28.7	-	nF	$V_{DS}=400V; f=1MHz; V_{AC}=25mV$
C_{oss}	Output Capacitance	-	1.3	-		
C_{rss}	Reverse Transfer Capacitance	-	124	-	pF	
E_{on}	Turn-on Energy	-	6.5	-	mJ	$V_{DD}=400V; V_{GS}=-5/+18V; I_D=400A; R_{G(ext)}=5\Omega; \text{Load}=100\mu H$
E_{off}	Turn-off Energy	-	6.3	-		
Q_{GS}	Gate-Source Charge	-	224	-	nC	$V_{DD}=400V; V_{GS}=-5/+18V; I_D=200A$
Q_{GD}	Gate-Drain Charge	-	256	-		
Q_G	Total Gate Charge	-	944	-		
$t_{d(on)}$	Turn-on Delay Time	-	102	-	ns	$V_{DD}=400V; V_{GS}=-5/+18V; I_D=400A; R_{G(ext)}=5\Omega; \text{Load}=100\mu H$
t_r	Rise Time	-	75	-		
$t_{d(off)}$	Turn-off Delay Time	-	323	-		
t_f	Fall Time	-	63	-		

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	-	3.5	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	-	74	-	ns	$V_{\text{GS}}=-5/+18\text{V}$; $I_{\text{F}}=400\text{A}$; $V_{\text{R}}=400\text{V}$; Load=100 μH
Q_{RR}	Reverse Recovery Charge	-	2720	-	nC	
I_{RRM}	Peak Reverse Recovery Current	-	134	-	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

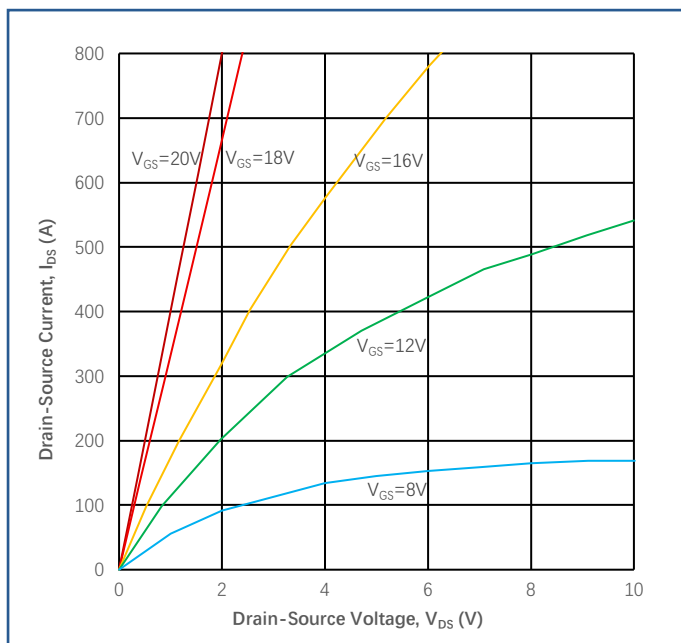


Figure 1
Output Characteristics ($T_J = 25^\circ\text{C}$)

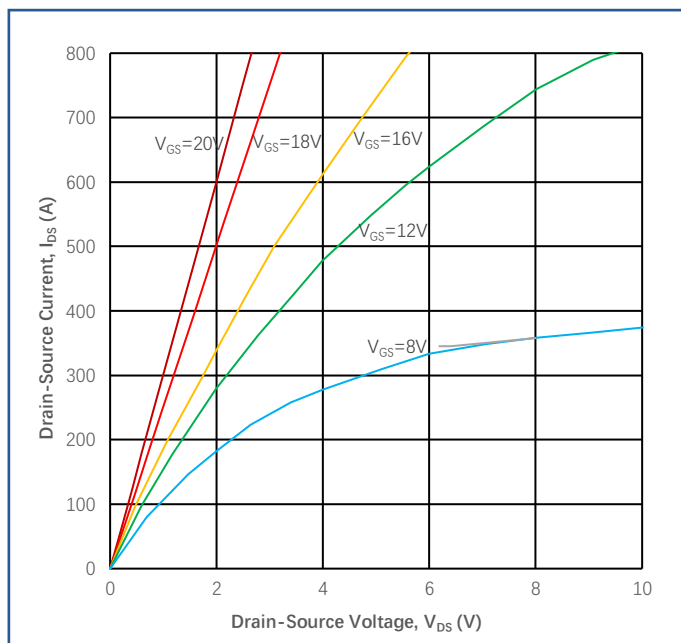


Figure 2
Output Characteristics ($T_J = 175^\circ\text{C}$)

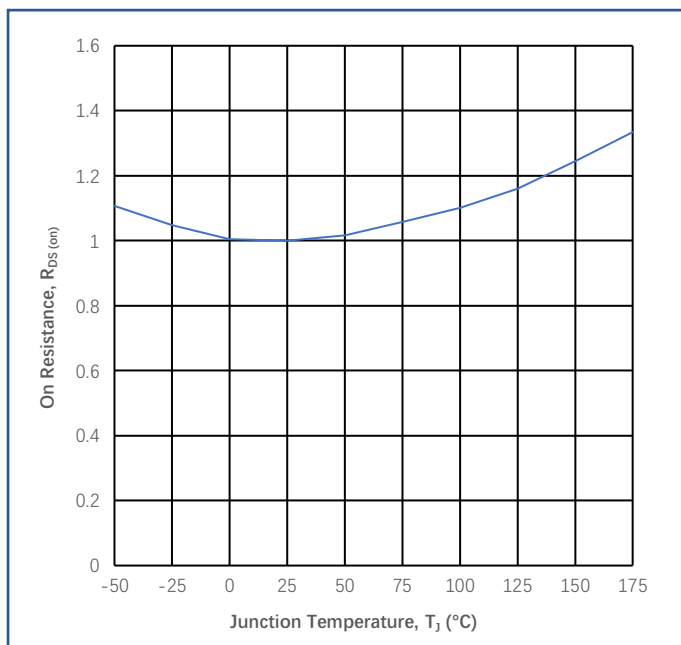


Figure 3
Normalized On-Resistance vs. Temperature

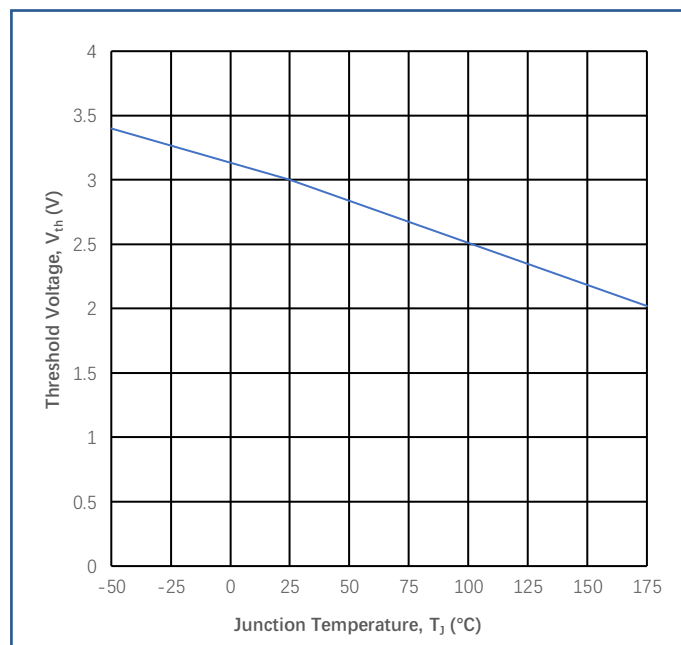


Figure 4
Threshold Voltage vs. Temperature

Typical Performance

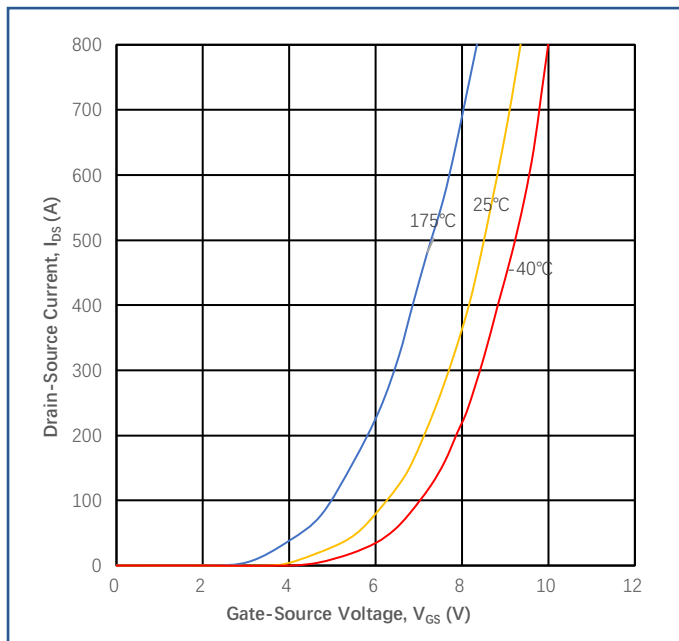


Figure 5
Transfer Characteristic for Various T_j

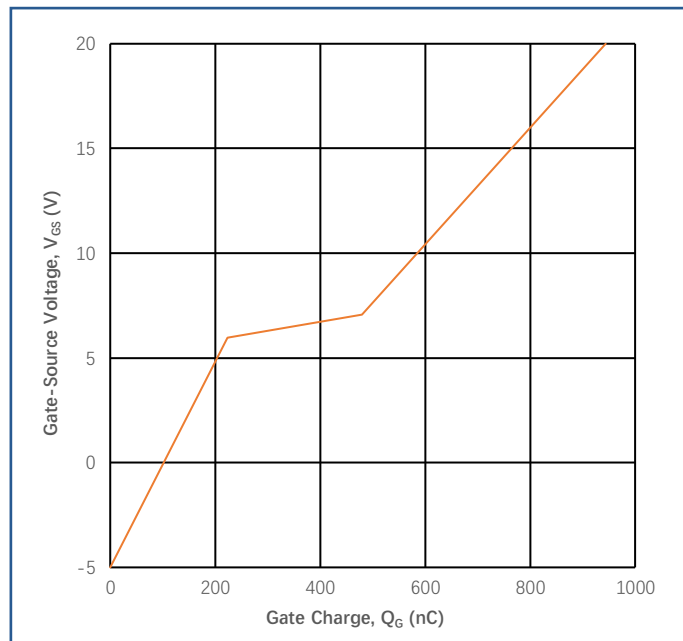


Figure 6
Typical Gate Charge Characteristics

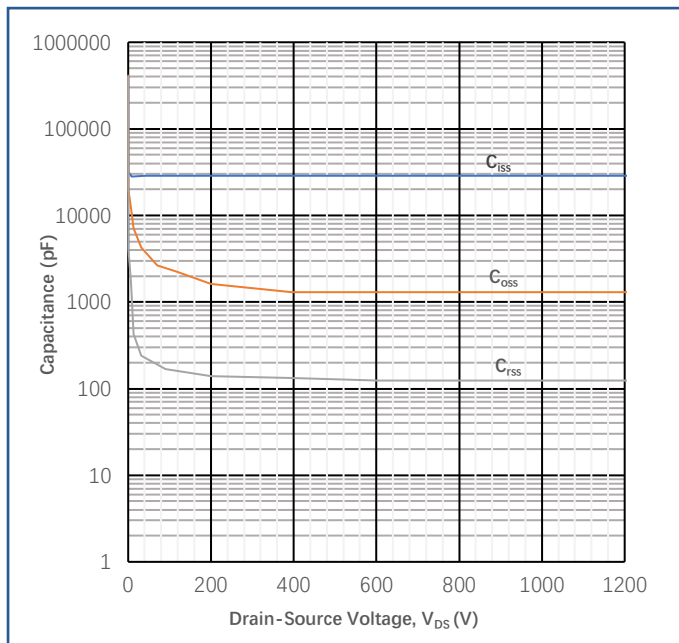


Figure 7
Typical Capacitances vs. Drain-Source Voltage

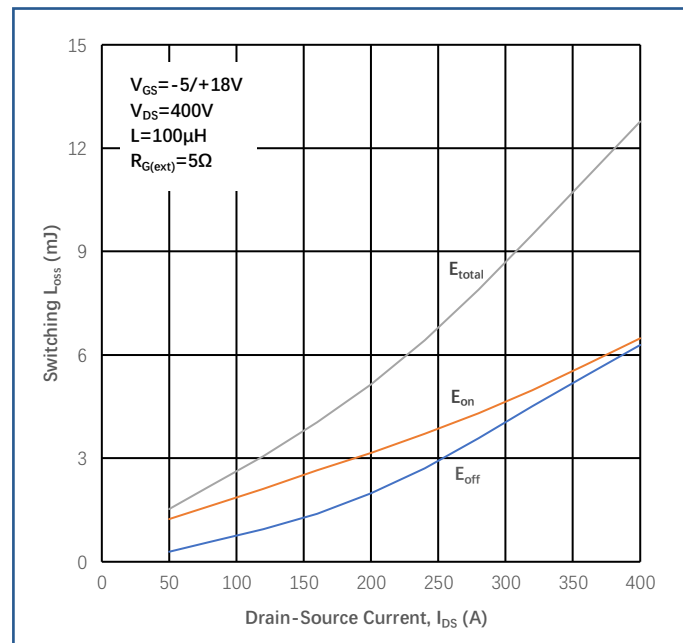


Figure 8
Inductive Switching Energy vs. Drain Current

Typical Performance

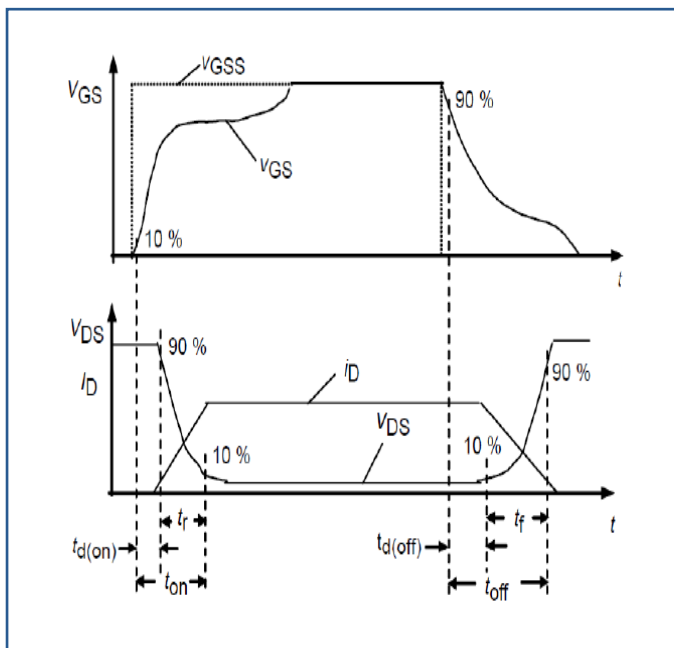


Figure 9

Switching Time Description

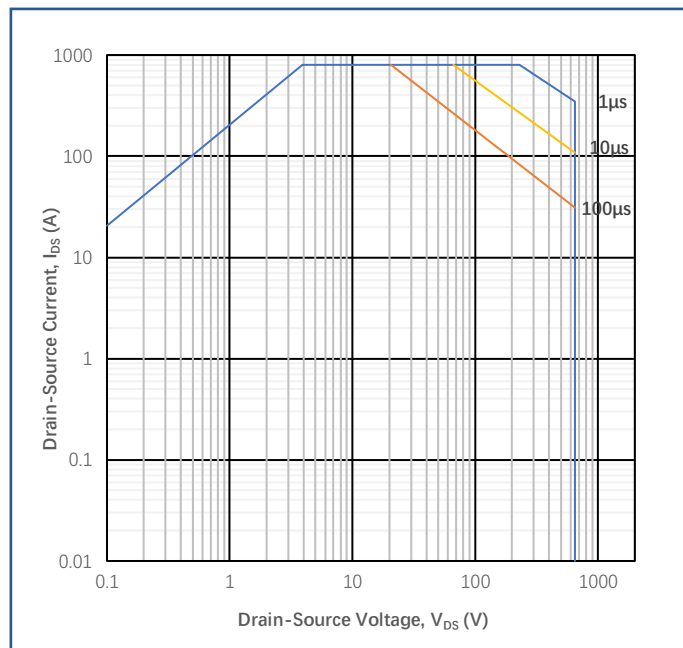
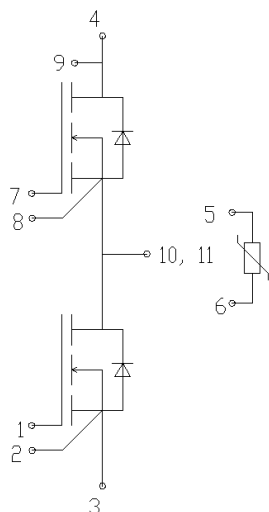


Figure 10

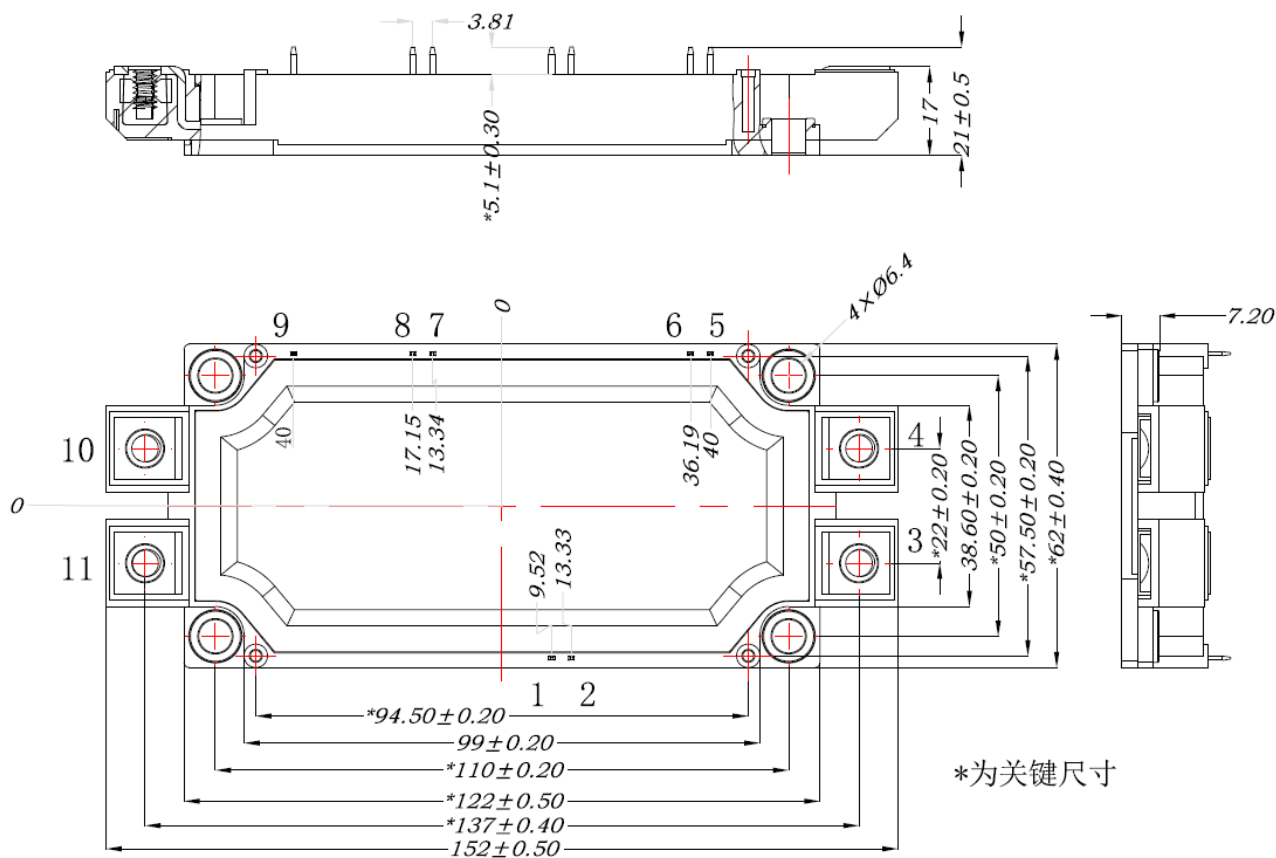
Safe Operating Area

Circuit Diagram Headline



Package Dimensions (mm)

Package Type: MED



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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