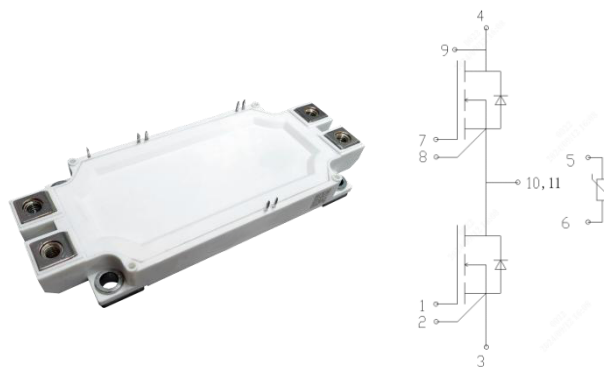


General Description

The H&M-ED3 module incorporates H&M'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 Aluminum Nitride Insulator



Applications

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

Ordering Informations

Order Number / Marking	HMSMQ800HF12ED3
Package Type	ED3

Key Parameters

Symbol	Parameter	Values			Unit	Test Conditions
Absolute maximum rating						
V_{DS}	Drain-source Voltage	1200			V	$T_C=25^\circ\text{C}$
I_D	Drain Current (continuous)	800			A	$T_C=25^\circ\text{C}$
T_J	Junction Temperature	175			$^\circ\text{C}$	
Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
Static characteristics						
$R_{DS(on)}$	Static Drain-source on Resistance	-	2.0	2.8	m Ω	$V_{GS}=18\text{V}; I_D=400\text{A}; T_C=25^\circ\text{C}$
Dynamic characteristics						
Q_G	Total Gate Charge	-	1904	-	nC	$V_{DD}=800\text{V}; V_{GS}=-5/+18\text{V}; I_D=400\text{A}; T_C=25^\circ\text{C}$
Q_{GD}	Gate-drain Charge	-	626.4	-		
Source-drain diode						
Q_{RR}	Reverse Recovery Charge	-	4904	-	nC	$V_{GS}=-5/+18\text{V}; I_F=400\text{A}; V_R=900\text{V}; \text{Load}=100\mu\text{H}; T_J=25^\circ\text{C}$

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

Symbol	Parameter	Values	Unit
V_{DS}	Drain-source Voltage	1200	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	20	nH
V_{isol}	Isolation Test Voltage (DC; 2mA; t=10s)	4.2	kV
$R_{th Jh}$	Thermal Resistance, Junction-to-heatsink	0.12	$^\circ\text{C}/\text{W}$

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	1200	-	-	V	$V_{GS}=0\text{V}$
I_{DSS}	Zero Gate Voltage Drain Current	-	-	400	μA	$V_{DS}=1200\text{V}; V_{GS}=0\text{V}$
I_{GSS}	Gate-body Leakage Current	-	-	4	μA	$V_{GS}=-10/20\text{V}; V_{DS}=0\text{V}$
$V_{GS(th)}$	Gate Threshold Voltage	2.0	-	4.0	V	$V_{DS}=V_{GS}; I_D=80\text{mA}$
$R_{DS(on)}$	Static Drain-source on Resistance	-	2.0	2.8	$\text{m}\Omega$	$V_{GS}=18\text{V}; I_D=400\text{A}$
$V_{GS(on)}$	Recommended Turn-on Voltage	-	18	-	V	Static
$V_{GS(off)}$	Recommended Turn-off Voltage	-	-5	-	V	
R_G	Gate Resistance	-	0.4	-	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	-	55.0	-	nF	$V_{DS}=1000\text{V}; f=100\text{kHz}; V_{AC}=25\text{mV}$
C_{oss}	Output Capacitance	-	2.3	-		
C_{riss}	Reverse Transfer Capacitance	-	104	-	pF	
E_{on}	Turn-on Energy	-	44.8	-	mJ	$V_{DD}=900\text{V}; V_{GS}=-5/+18\text{V}; I_D=400\text{A};$ Load=100 μH
E_{off}	Turn-off Energy	-	38.5	-		
Q_{GS}	Gate-source Charge	-	613.6	-	nC	$V_{DD}=800\text{V}; V_{GS}=-5/+18\text{V}; I_D=400\text{A}$
Q_{GD}	Gate-drain Charge	-	626.4	-		
Q_G	Total Gate Charge	-	1904	-		
$t_{d(on)}$	Turn-on Delay Time	-	125	-	ns	$V_{DD}=900\text{V}; V_{GS}=-5/+18\text{V}; I_D=400\text{A};$ $R_{G(ext)}=5\Omega; \text{Load}=100\mu\text{H}$
t_r	Rise Time	-	112	-		
$t_{d(off)}$	Turn-off Delay Time	-	567	-		
t_f	Fall Time	-	113	-		

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 =400A
I _S	Continuous Diode Forward Current	-	400	-	A	V _{GS} =0V; T _C =25°C
t _{RR}	Reverse Recovery Time	-	90	-	ns	V _{GS} =-5/+18V; I _F =400A; V _R =900V; Load=100μH
Q _{RR}	Reverse Recovery Charge	-	4904	-	nC	
I _{RRM}	Peak Reverse Recovery Current	-	170	-	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

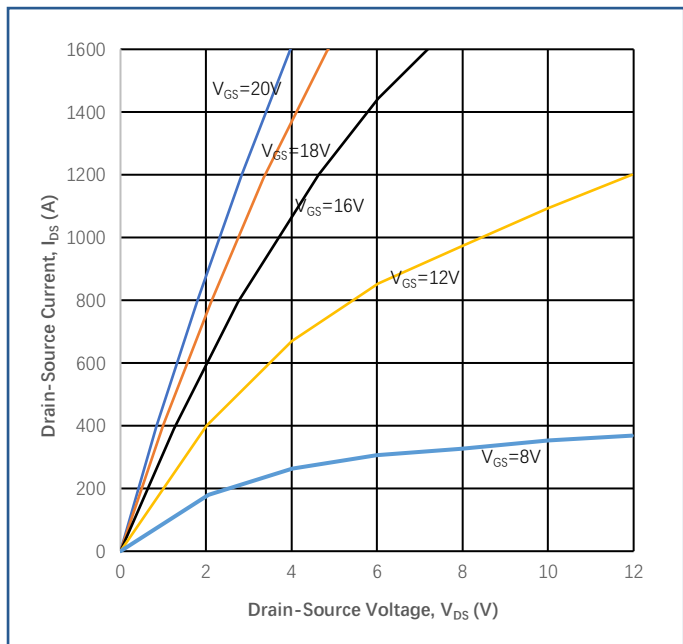


Figure 1
Output Characteristics ($T_J=25\text{ }^\circ\text{C}$)

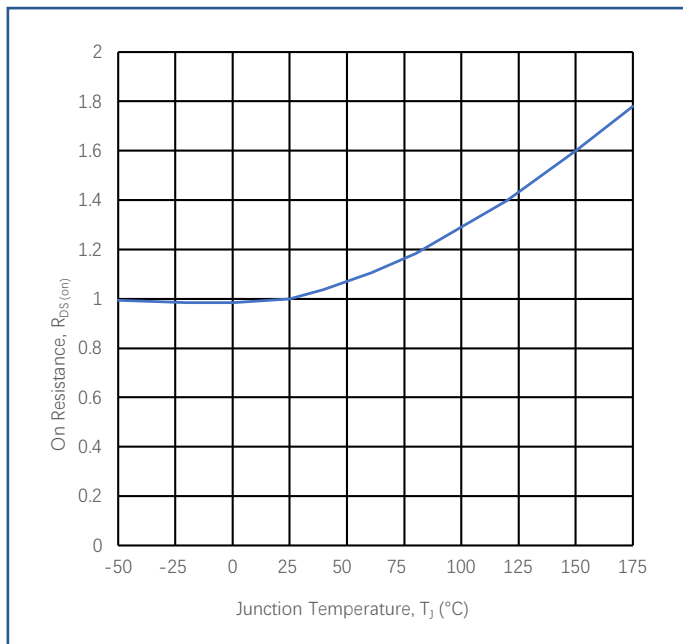


Figure 2
Normalized on-resistance vs. Temperature

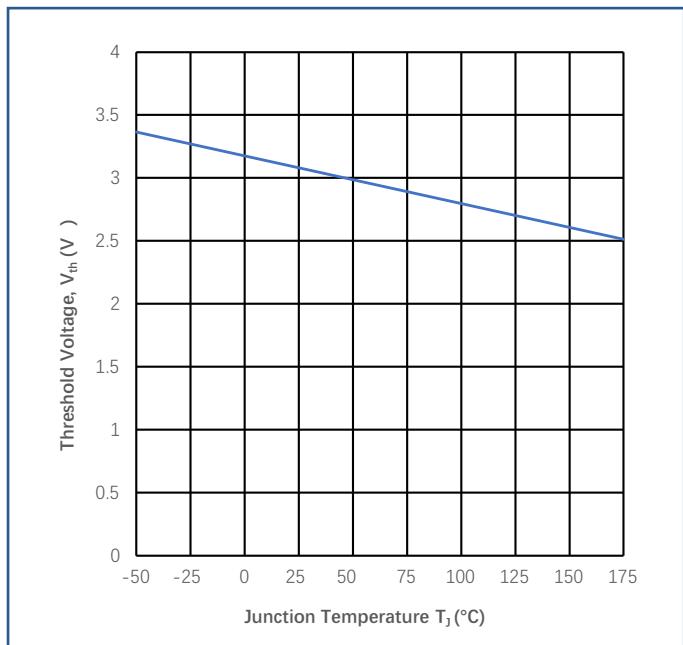


Figure 3
Threshold Voltage vs. Temperature

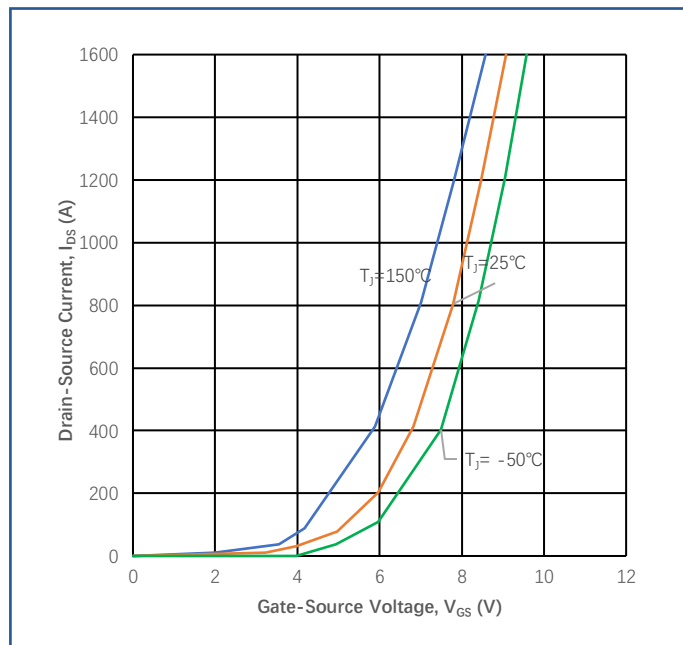


Figure 4
Transfer Characteristic for Various T_J

Typical Performance

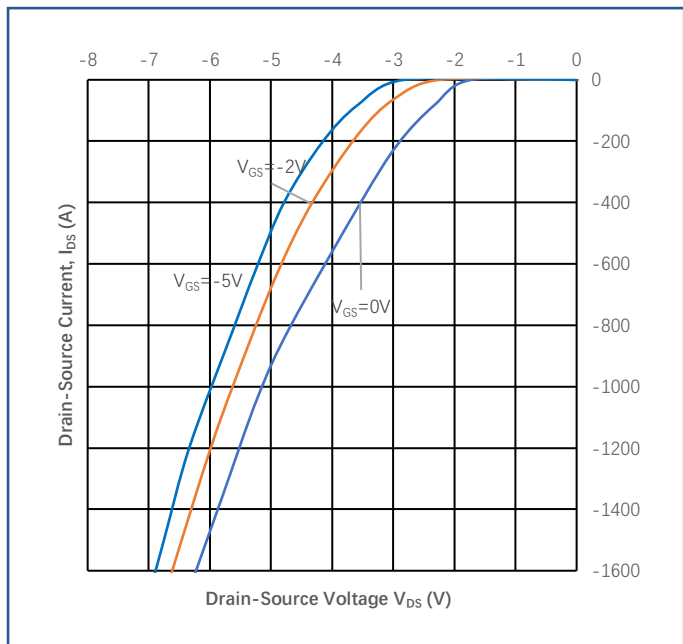


Figure 5
Diode Characteristic at 25 °C

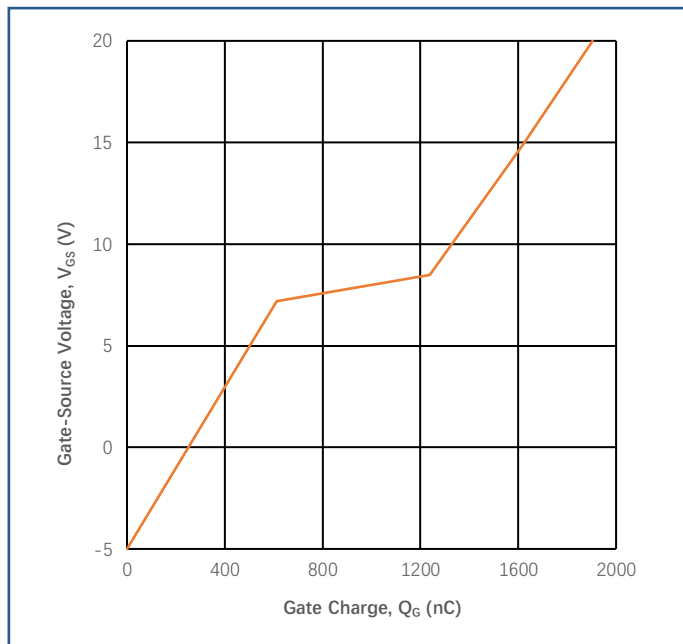


Figure 6
Typical Gate Charge Characteristics

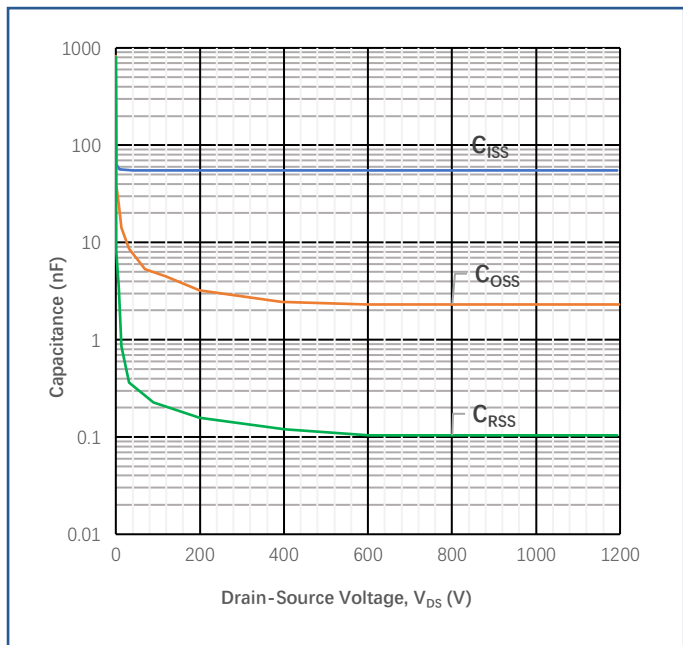


Figure 7
Typical Capacitances vs. Drain-source Voltage

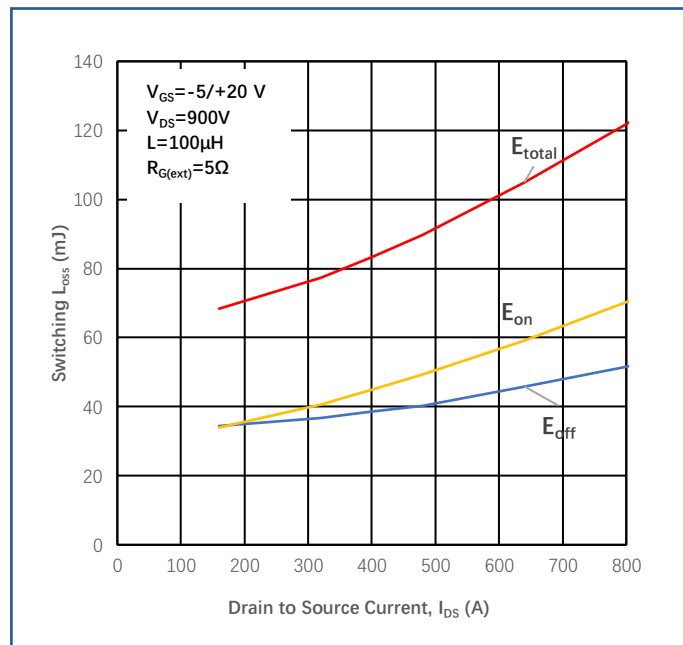


Figure 8
Inductive Switching Energy vs. Drain Current

Typical Performance

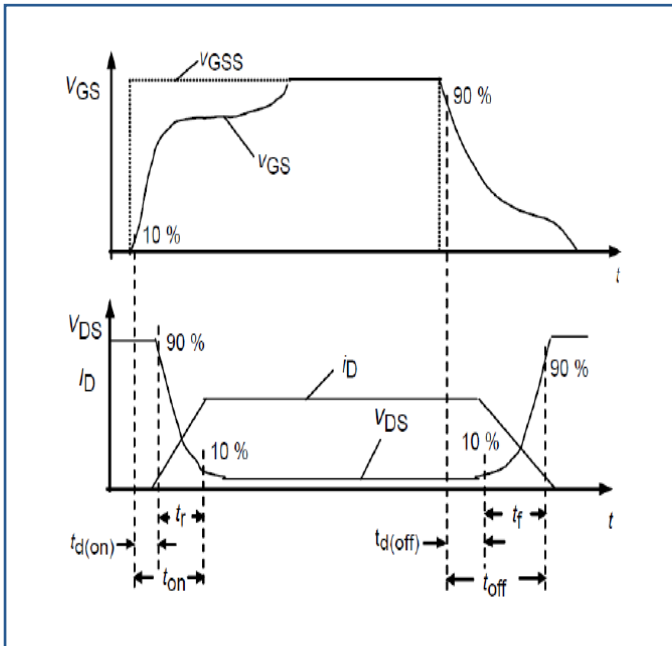


Figure 9
Switching Time Description

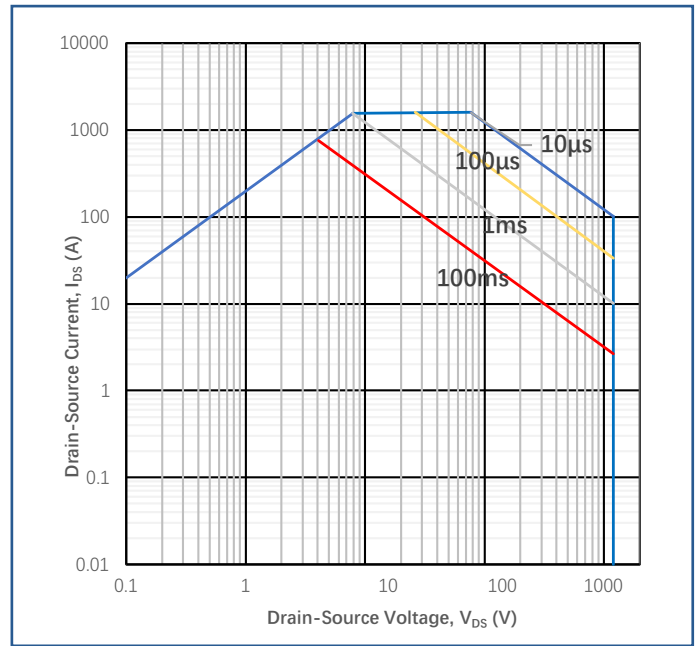
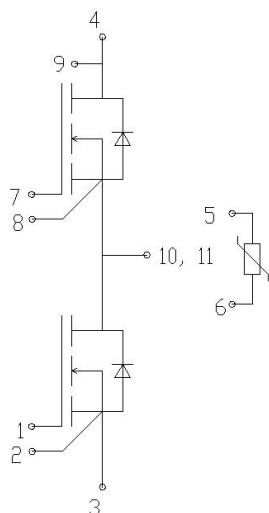
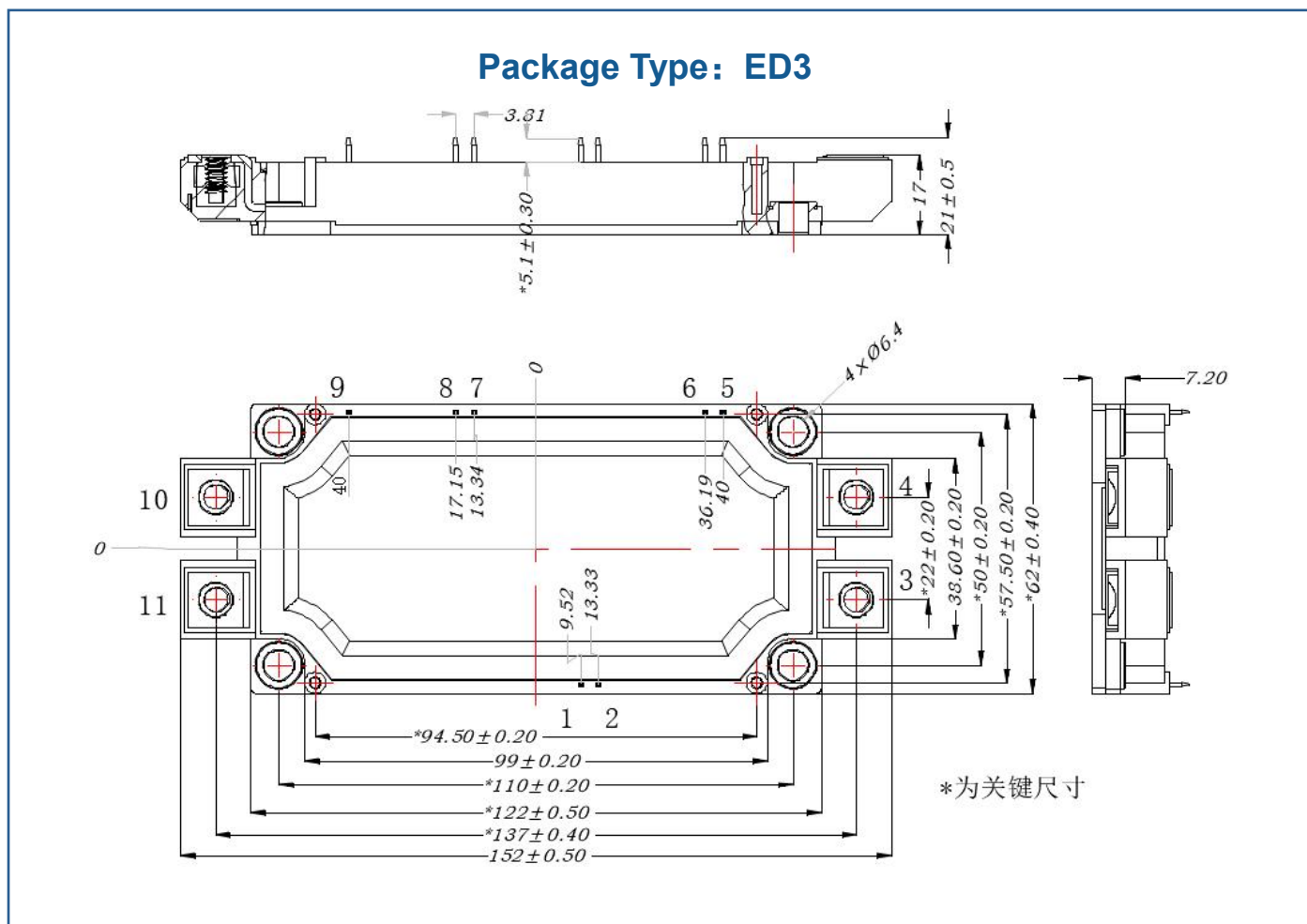


Figure 10
Safe Operating Area

Circuit Diagram Headline



Package Dimensions (mm)



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