



N 沟道增强型场效应晶体管

N-CHANNEL MOSFET

FHP10N60J/FHF10N60J

主要参数 MAIN CHARACTERISTICS

ID	10A
VDSS	600 V
Rdson-typ (@Vgs=10V)	0.72Ω
Qg-typ	41.5nC

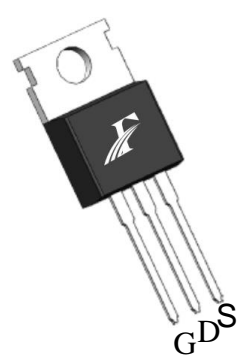
产品特性 FEATURES

低栅极电荷	Low gate charge
低 Crss (典型值 17.7pF)	Low Crss (typical 17.7pF)
开关速度快	Fast switching
100%经过雪崩测试	100% avalanche tested
高抗 dv/dt 能力	Improved dv/dt capability
RoHS 产品	RoHS product

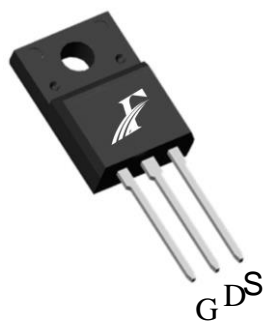
用途 APPLICATIONS

高频开关电源	High efficiency switch mode power supplies
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封装形式 Package

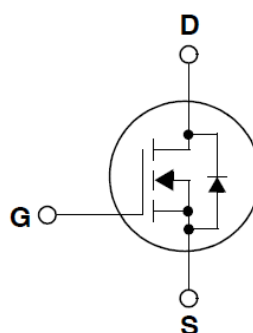


TO-220
FHP series



TO-220F
FHF series

等效电路 Equivalent Circuit



绝对最大额定值 ABSOLUTE RATINGS (Tc=25°C)

项目 Parameter	符号 Symbol	数值 Value		单位 Unit
		FHP10N60J	FHF10N60J	
最高漏极-源极直流电压 Drain-Source Voltage	V _{DS}	600		V
连续漏极电流* Drain Current -continuous *	I _D (T _C =25°C)	10		A
	I _D (T _C =100°C)	6.3		A
最大脉冲漏极电流 (注 1) Drain Current – pulse (note 1)	I _{DM}	40		A
最高栅源电压 Gate-Source Voltage	V _{GS}	±30		V
单脉冲雪崩能量 (注 2) Single Pulsed Avalanche Energy (note 2)	E _{AS}	500		mJ
雪崩电流 (注 1) Avalanche Current (note 1)	I _{AS}	10		A
重复雪崩能量 (注 1) Repetitive Avalanche Current (note 1)	E _{AR}	192		mJ
二极管反向恢复最大电压变化速率 (注 3) Peak Diode Recovery dv/dt (note 3)	dv/dt	5.0		V/ns
耗散功率 Power Dissipation	P _D (T _C =25°C)	130	50	W
	-Derate above 25°C	1.04	0.4	W/°C
最高结温及存储温度 Operating and Storage Temperature Range	T _J , T _{STG}	-55~+150		°C
引线最高焊接温度 Maximum Lead Temperature for Soldering Purposes	T _L	300		°C

*漏极电流由最高结温限制

*Drain current limited by maximum junction temperature

电特性 ELECTRICAL CHARACTERISTICS

项目 Parameter	符号 Symbol	测试条件 Tests conditions	最小 Min	典型 Typ	最大 Max	单位 Units
关态特性 Off –Characteristics						
漏-源击穿电压 Drain-Source Voltage	BV _{DSS}	I _D =250μA, V _{GS} =0V	650	640	-	V
击穿电压温度特性 Breakdown Voltage Temperature Coefficient	ΔBV _{DSS} /ΔT _J	I _D =250μA, referenced to 25°C	-	0.6	-	V/°C
零栅压下漏极漏电流 Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =600V, V _{GS} =0V, T _C =25°C	-	-	1	μA
		V _{DS} =480V, T _C =125°C	-	-	100	μA
栅极体漏电流 Gate-body leakage current	I _{GSS} (F/R)	V _{DS} =0V, V _{GS} =±30V	-	-	±100	nA
通态特性 On-Characteristics						
阈值电压 Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D =250μA	2	3.2	4	V
静态导通电阻 Static Drain-Source On-Resistance	R _{DS(ON)}	V _{GS} =10V , I _D =5A	-	0.72	0.9	Ω
正向跨导 Forward Transconductance	g _{fs}	V _{DS} = 25V, I _D =5A (note 4)	-	8	-	S
动态特性 Dynamic Characteristics						
输入电容 Input capacitance	C _{iss}	V _{DS} =25V, V _{GS} =0V, f=1.0MHz	-	1374	-	pF
输出电容 Output capacitance	C _{oss}		-	126	-	
反向传输电容 Reverse transfer capacitance	C _{rss}		-	17.7	-	
开关特性 Switching Characteristics						
延迟时间 Turn-On delay time	t _{d(on)}	V _{DS} =325V, I _D =10A, R _G =25Ω V _{GS} =10V (note 4, 5)	-	45	-	ns
上升时间 Turn-On rise time	t _r		-	29	-	ns
延迟时间 Turn-Off delay time	t _{d(off)}		-	201	-	ns
下降时间 Turn-Off Fall time	t _f		-	69	-	ns
栅极电荷总量 Total Gate Charge	Q _g	V _{DS} =480V , I _D =10A , V _{GS} =10V (note 4, 5)	-	41.5	-	nC
栅-源电荷 Gate-Source charge	Q _{gs}		-	8	-	nC
栅-漏电荷 Gate-Drain charge	Q _{gd}		-	26	-	nC
漏-源二极管特性及最大额定值 Drain-Source Diode Characteristics and Maximum Ratings						
正向最大连续电流 Maximum Continuous Drain-Source Diode Forward Current		I _S	-	-	10	A
正向最大脉冲电流 Maximum Pulsed Drain-Source Diode Forward Current		I _{SM}	-	-	40	A
正向压降 Drain-Source Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =10A	-	0.9	1.4	V
反向恢复时间 Reverse recovery time	t _{rr}	V _{GS} =0V, I _S =10A ,dI _F /dt=100A/μs (note 4)	-	524	-	ns
反向恢复电荷 Reverse recovery charge	Q _{rr}		-	2.7	-	μC

热特性 THERMAL CHARACTERISTIC

项目 Parameter	符号 Symbol	FHP10N60J	FHF10N60J	单位 Unit
结到管壳的热阻 Thermal Resistance, Junction to Case	Rth(j-c)	0.89	1.92	°C/W
结到环境的热阻 Thermal Resistance, Junction to Ambient	Rth(j-A)	60	62.5	°C/W

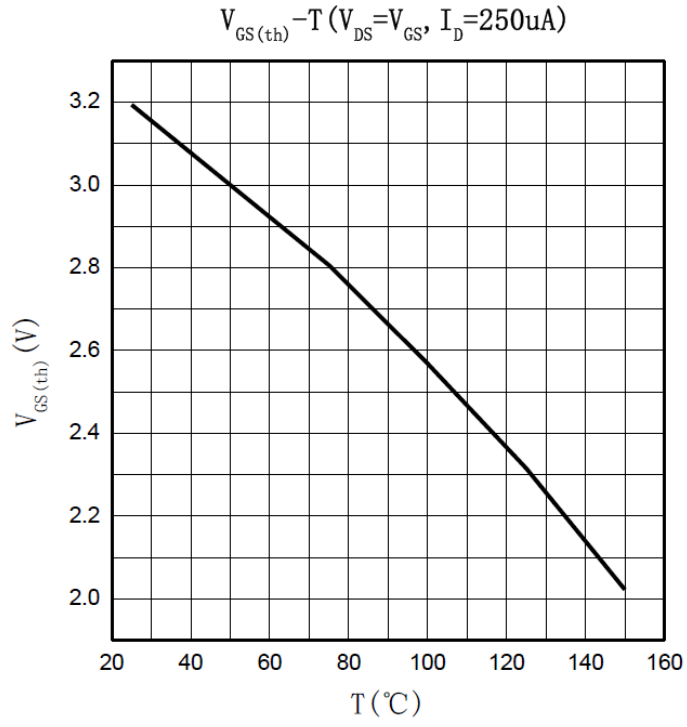
注释:

- 1: 脉冲宽度由最高结温限制
- 2: L=10mH, IAS=10A, VDD=50V, RG=25 Ω, 起始结温 TJ=25°C
- 3: ISD ≤10A, di/dt ≤100A/μs, VDD≤BVDSS, 起始结温 TJ=25°C
- 4: 脉冲测试: 脉冲宽度 ≤300μs, 占空比≤2%
- 5: 基本与工作温度无关

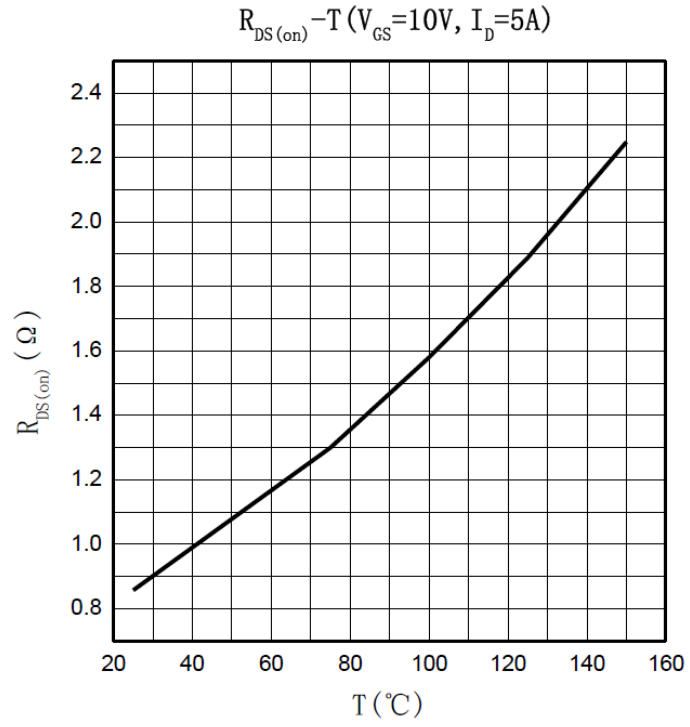
Notes:

- 1: Pulse width limited by maximum junction temperature
- 2: L=10mH, IAS=10A, VDD=50V, RG=25 Ω, Starting TJ=25°C
- 3: ISD ≤10A, di/dt ≤100A/μs, VDD≤BVDSS, Starting TJ=25°C
- 4: Pulse Test: Pulse Width ≤300μs, Duty Cycle≤2%
- 5: Essentially independent of operating temperatur

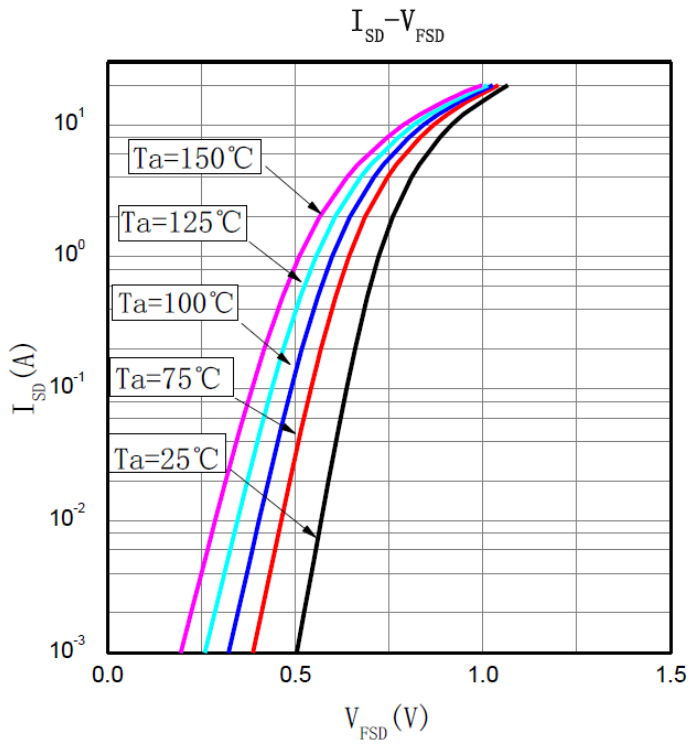
特性曲线 Typical Characteristics



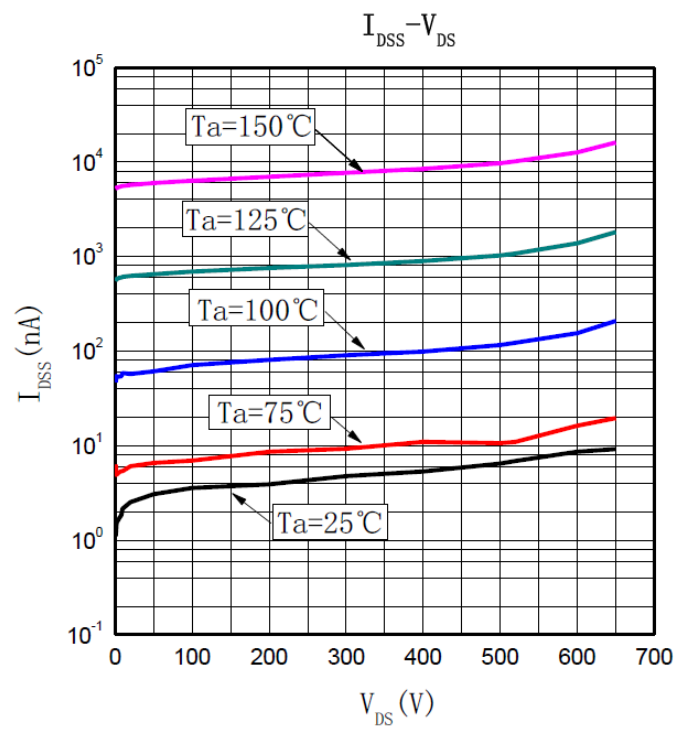
图一 $V_{GS(th)}-T$



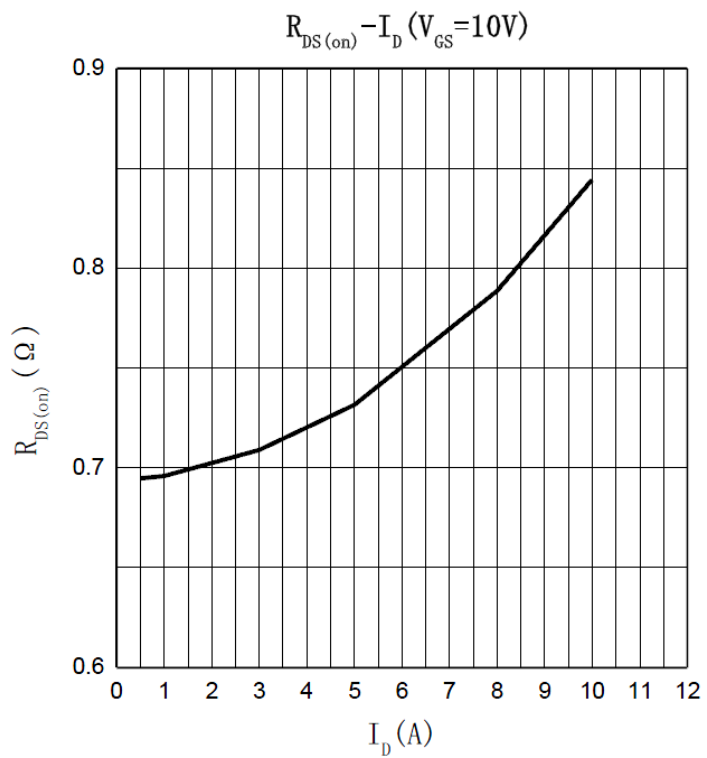
图二 $R_{DS(on)}-T$



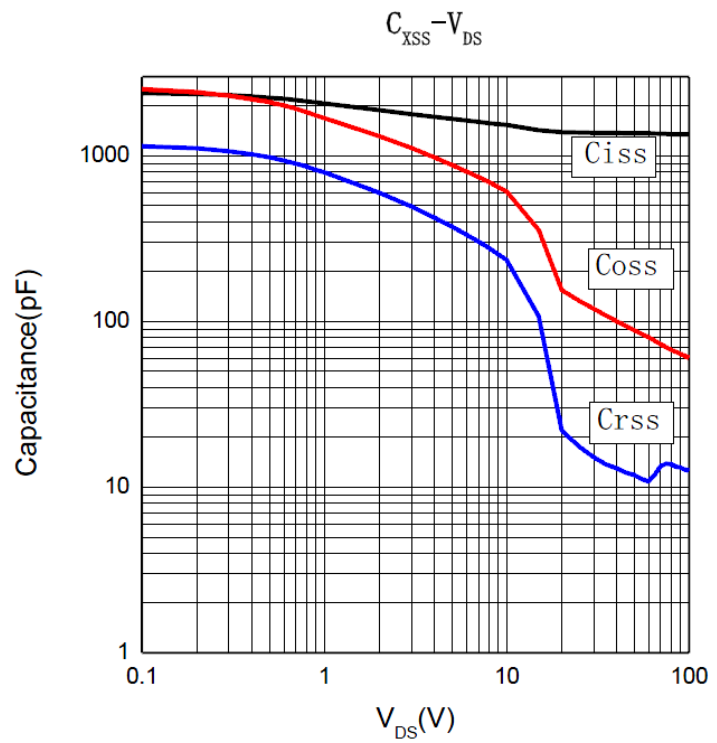
图三 $I_{SD}-V_{FSD}$



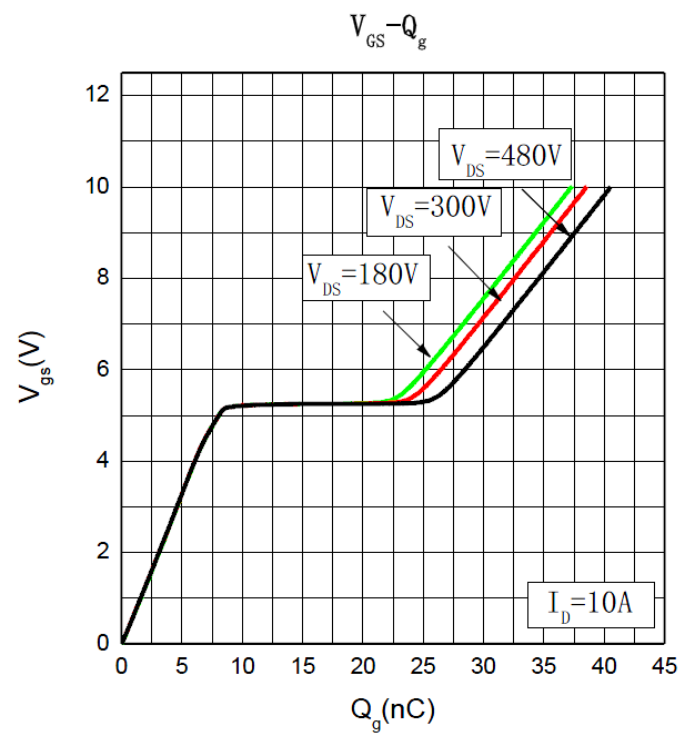
图四 $I_{DSS}-V_{DS}$



图五 $R_{DS(on)}-I_D$



图六 $C_{XSS}-V_{DS}$



图七 $V_{GS}-Q_g$

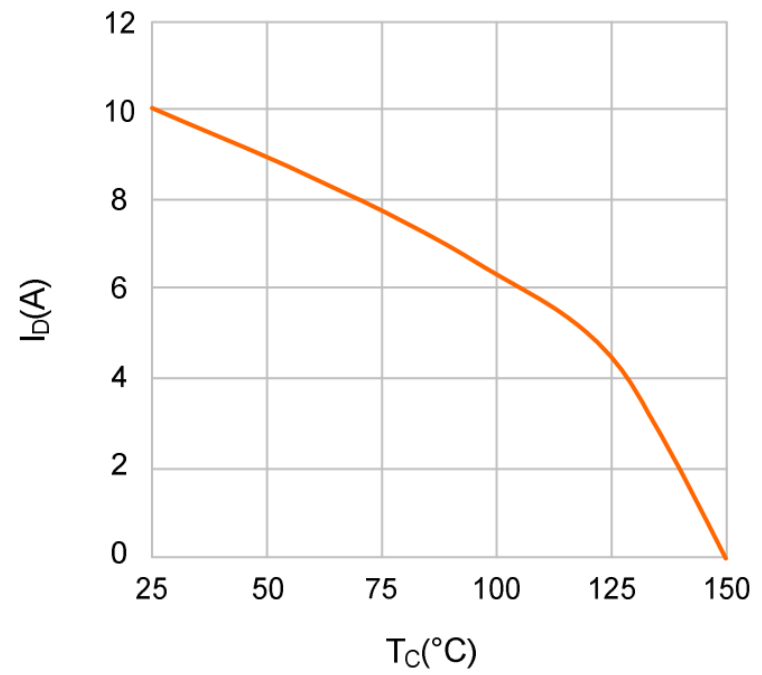


图8. I_D VS T_c

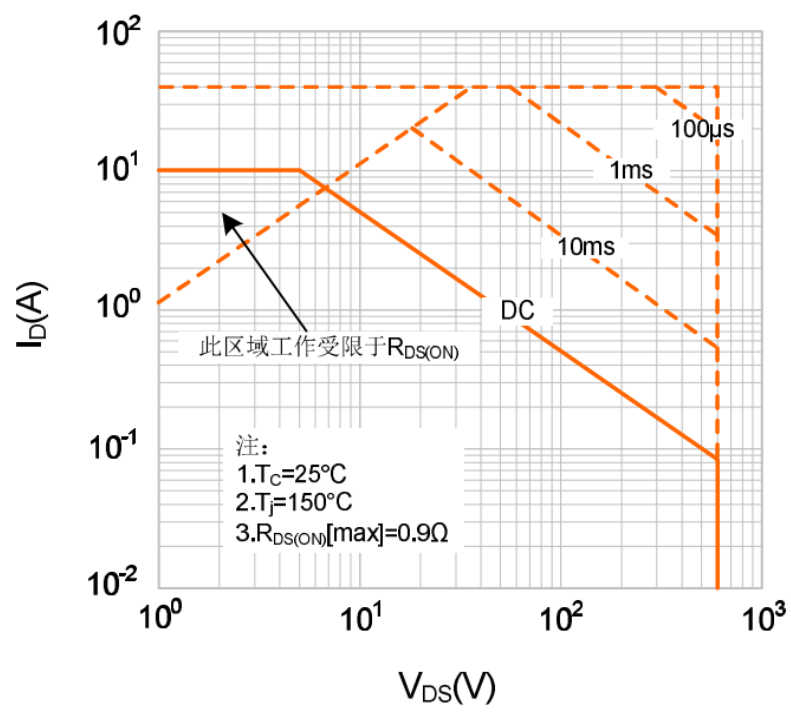


图9-1. SOA(TO-220F)

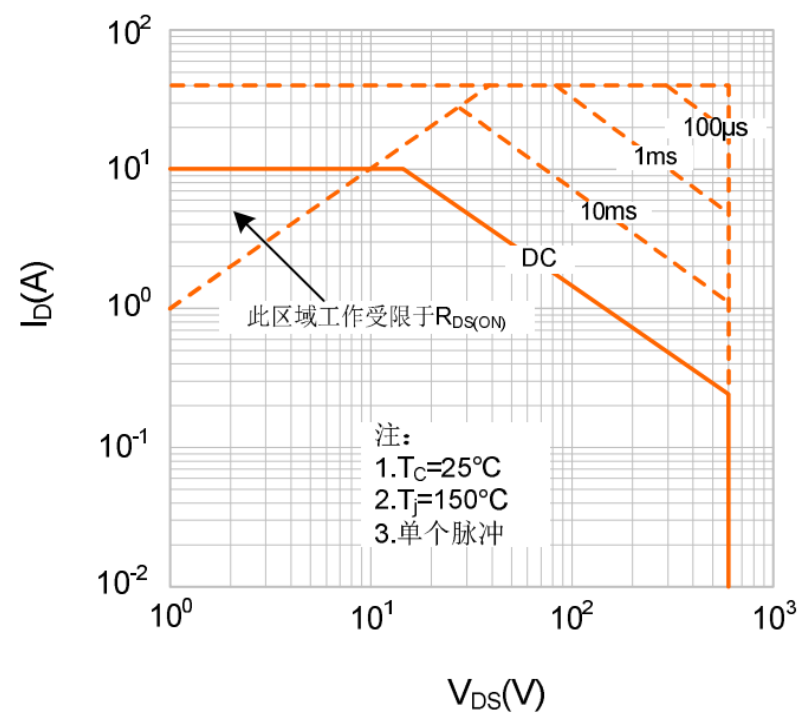


图9-2. SOA(TO-220)

Figure A: Gate Charge Test Circuit and Waveform

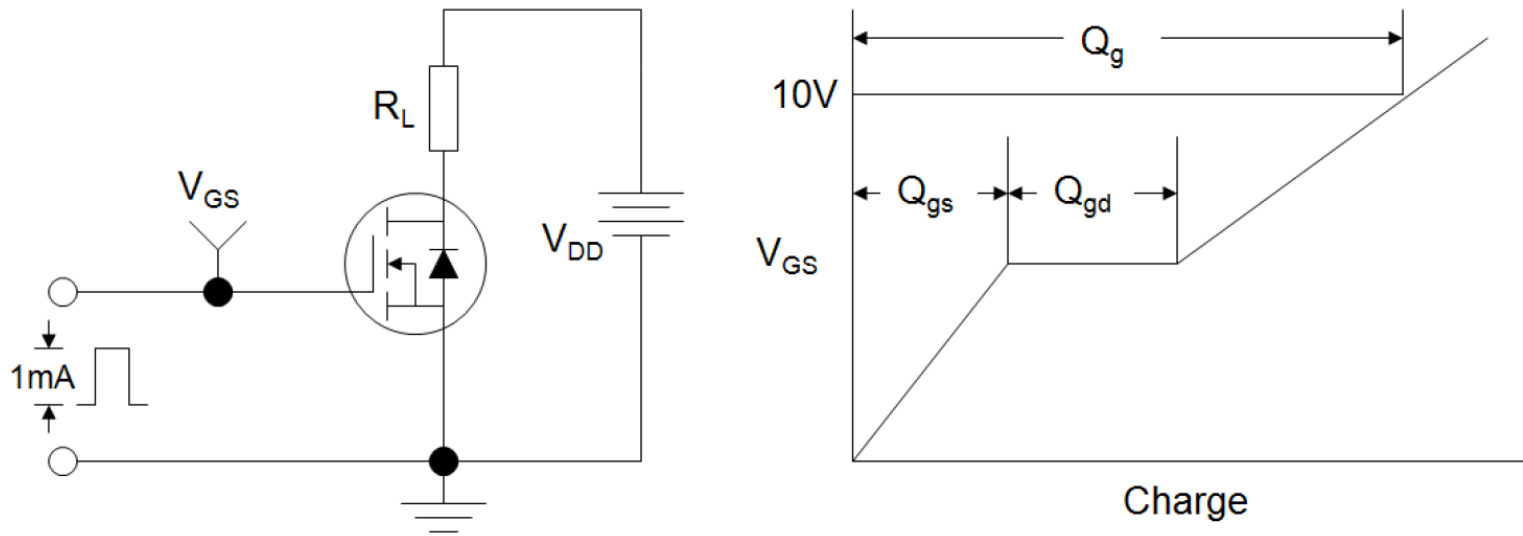


Figure B: Resistive Switching Test Circuit and Waveform

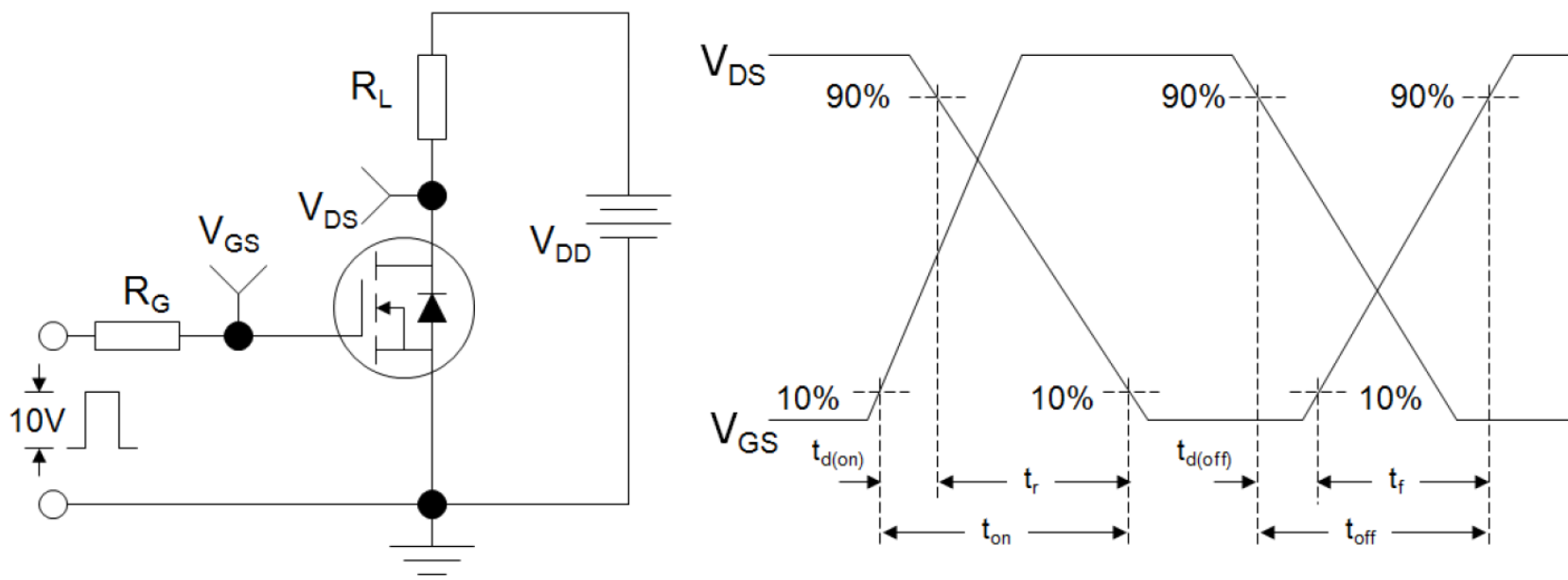
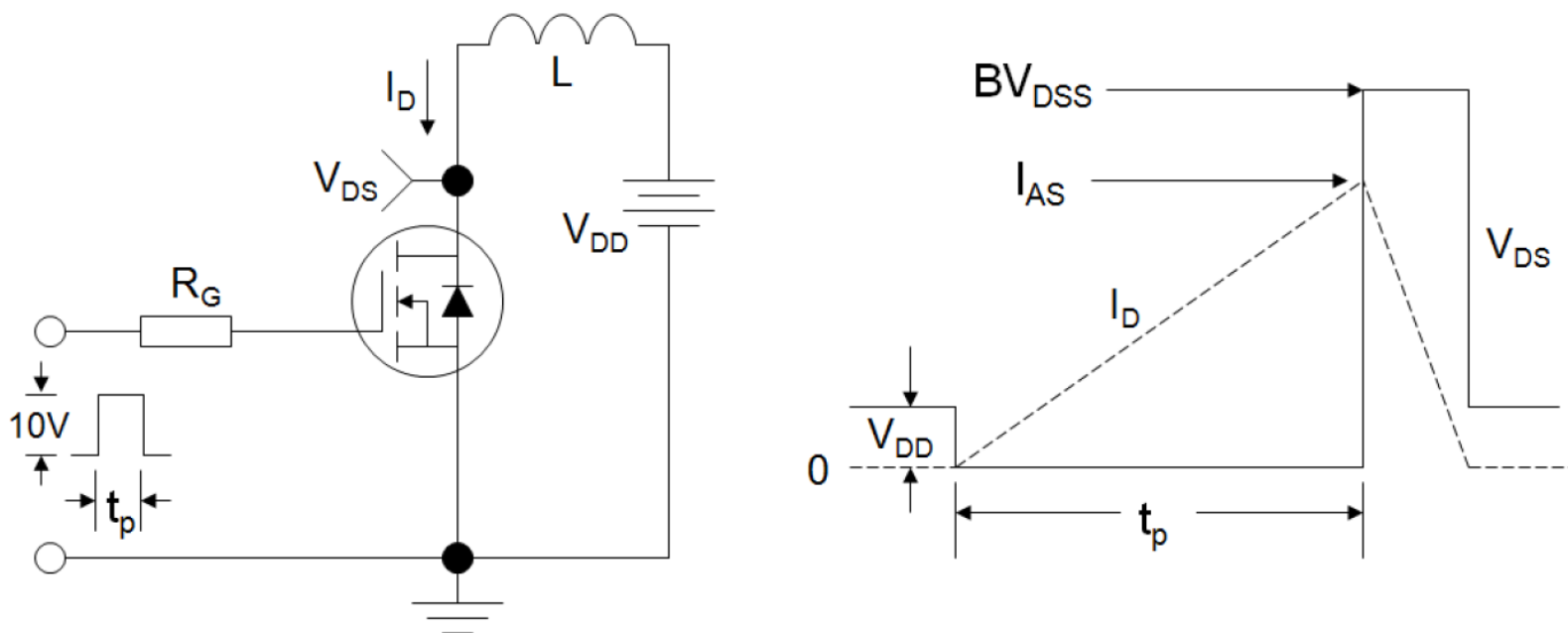
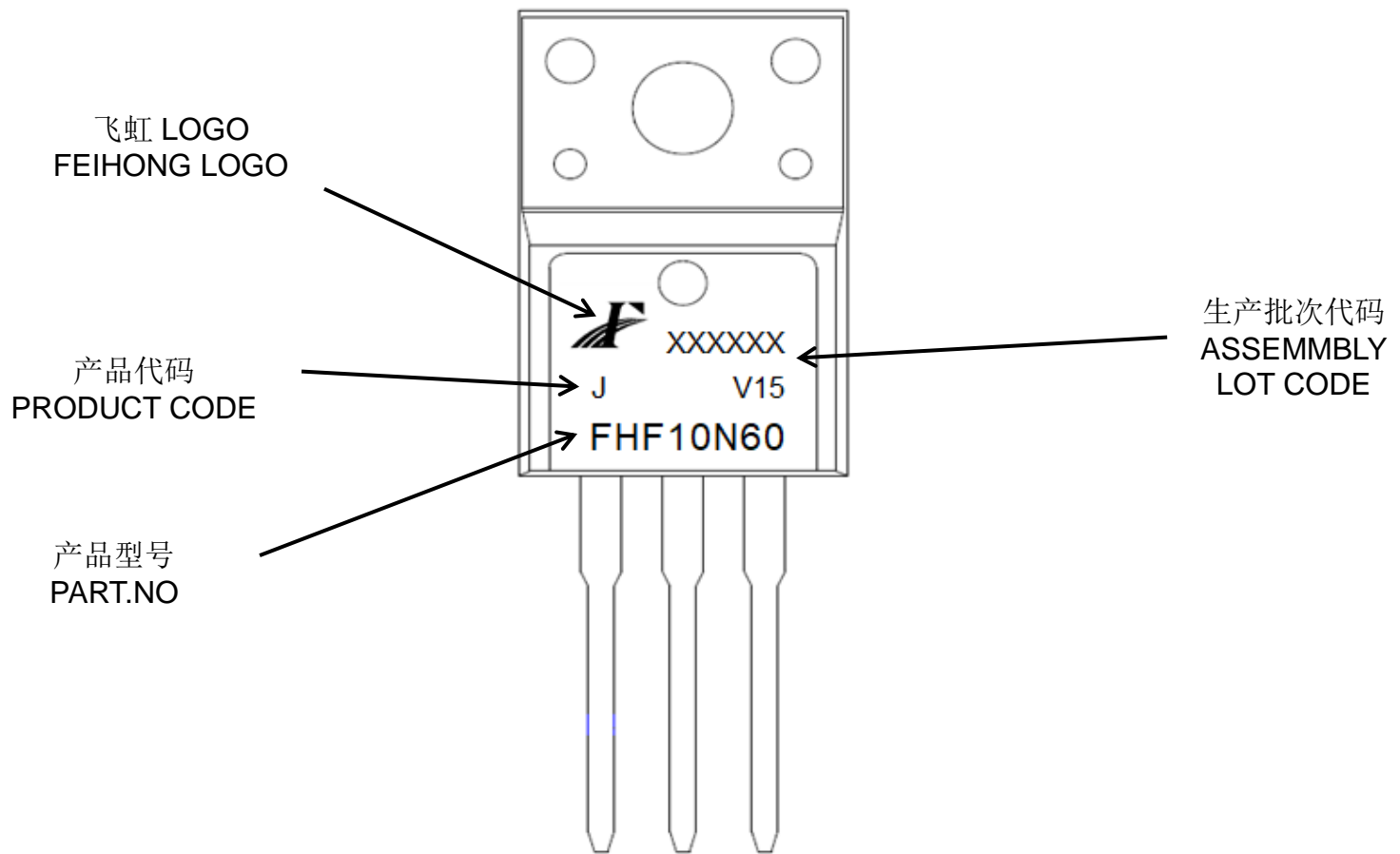
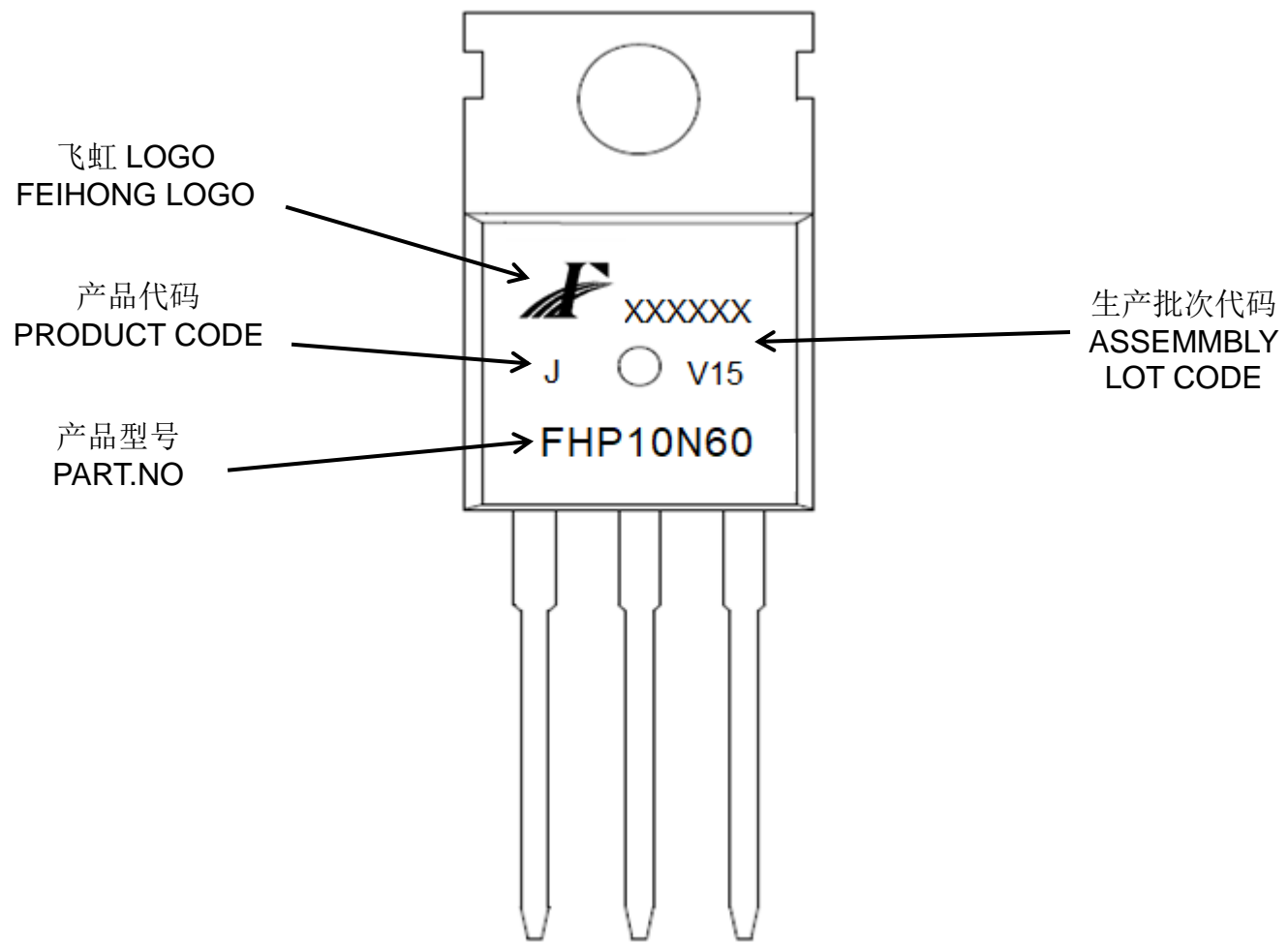


Figure C: Unclamped Inductive Switching Test Circuit and Waveform



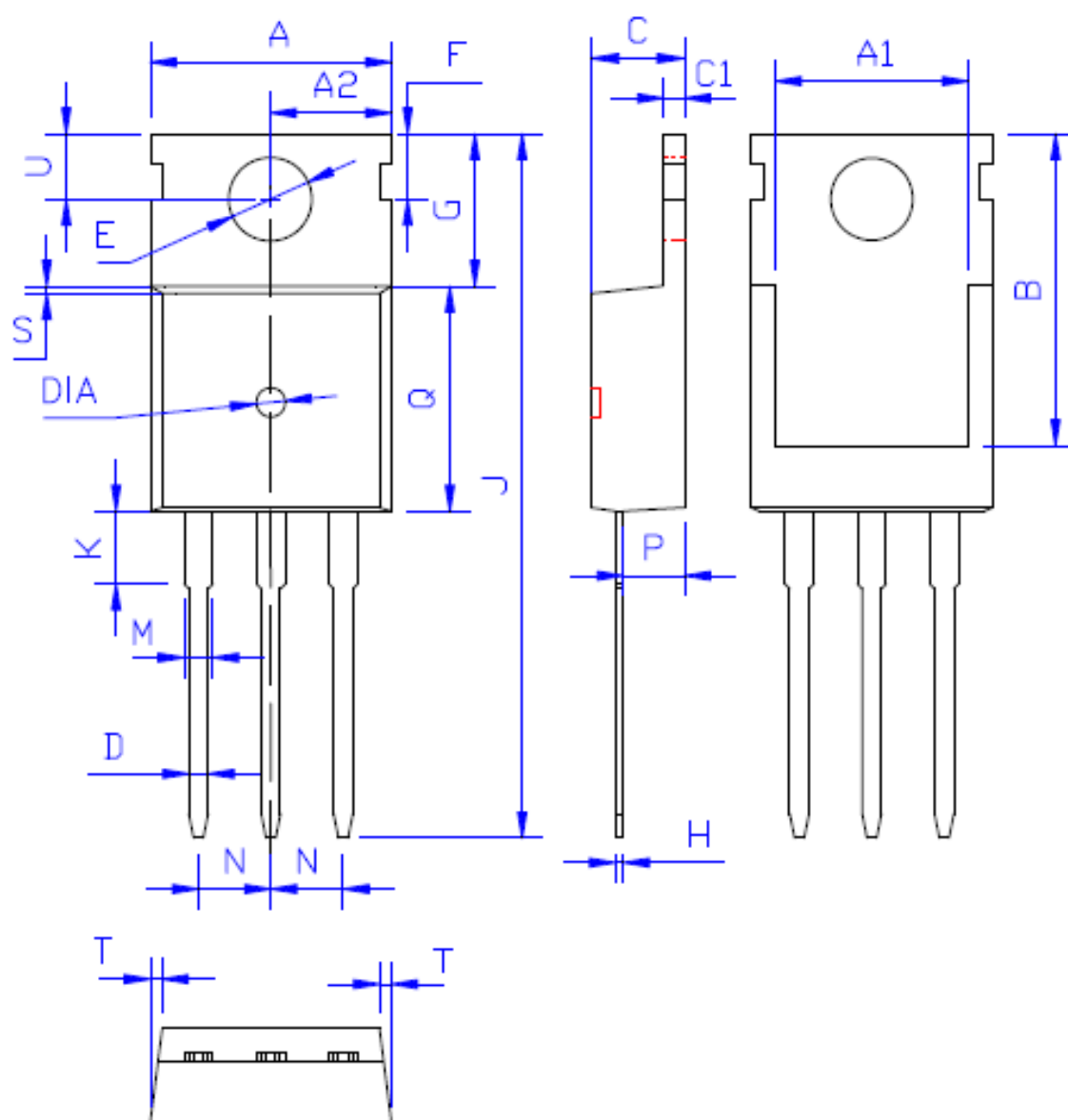
印记 Marking:



外形尺寸:

Package Dimension:

TO-220



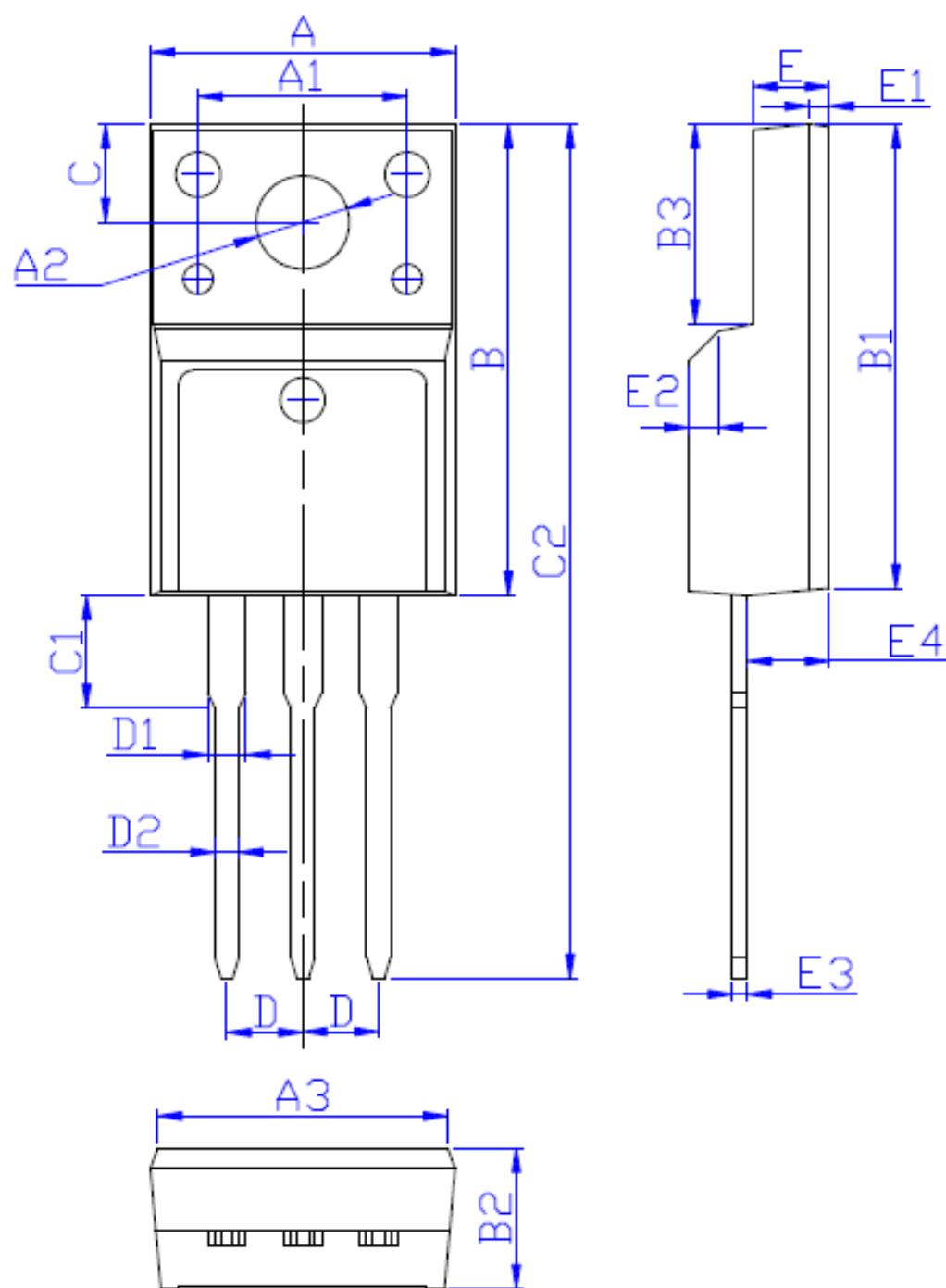
DIM	MILLIMETERS
A	10.00 ± 0.30
A1	8.00 ± 0.30
A2	5.00 ± 0.30
B	13.20 ± 0.40
C	4.50 ± 0.20
C1	1.30 ± 0.20
D	0.80 ± 0.20
E	3.60 ± 0.20
F	3.00 ± 0.30
G	6.60 ± 0.40
H	0.50 ± 0.20
J	28.88 ± 0.50
K	3.00 ± 0.30
M	1.30 ± 0.30
N	Typical 2.54
P	2.40 ± 0.40
Q	9.20 ± 0.40
S	0.25 ± 0.15
T	0.25 ± 0.15
U	2.80 ± 0.30
DIA	宽 1.50 ± 0.10 深 0.50 MAX

(Unit: mm)

外形尺寸:

Package Dimension:

TO-220F



DIM	MILLIMETERS
A	10.16±0.30
A1	7.00±0.20
A2	3.12±0.20
A3	9.70±0.30
B	15.90±0.50
B1	15.60±0.50
B2	4.70±0.30
B3	6.70±0.30
C	3.30±0.25
C1	3.25±0.30
C2	28.70±0.50
D	Typical 2.54
D1	1.47 (MAX)
D2	0.80±0.20
E	2.55±0.25
E1	0.70±0.25
E2	1.0×45°
E3	0.50±0.20
E4	2.75±0.30

(Unit: mm)