



N 沟道增强型场效应晶体管
N-CHANNEL MOSFET
FHP12N60A/FHF12N60A

主要参数 MAIN CHARACTERISTICS

ID	13A
VDSS	600 V
Rdson-typ (@Vgs=10V)	0.48Ω
Qg-typ	56nC

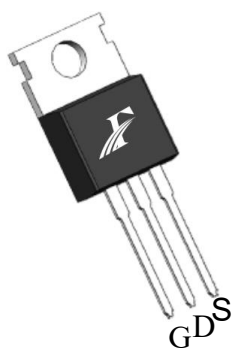
用途 APPLICATIONS

开关电源	Switch mode power supplies (SMPS)
功率校正因数	Power factor correction (PFC)

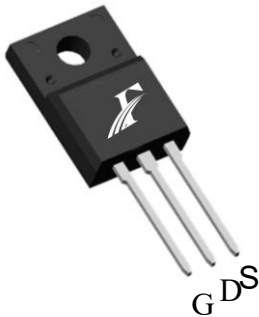
产品特性 FEATURES

低栅极电荷	Low gate charge
低 Crss (典型值 30pF)	Low Crss (typical 30pF)
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

封装形式 Package

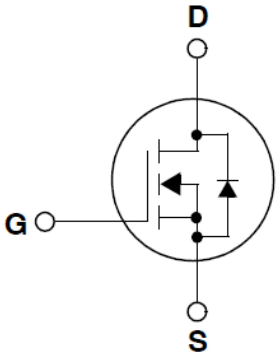


TO-220
FHP series



TO-220F
FHF series

等效电路 Equivalent Circuit



绝对最大额定值 ABSOLUTE RATINGS (Tc=25℃)

项目 Parameter	符号 Symbol	数值 Value		单位 Unit
		FHP12N60A	FHF12N60A	
最高漏极-源极直流电压 Drain-Source Voltage	VDS	600		V
连续漏极电流* Drain Current -continuous *	ID (Tc=25℃)	13		A
	ID (Tc=100℃)	10		A
最大脉冲漏极电流 (注 1) Drain Current – pulse (note 1)	IDM	52		A
最高栅源电压 Gate-Source Voltage	VGS	±30		V
单脉冲雪崩能量 (注 2) Single Pulsed Avalanche Energy (note 2)	EAS	1080		mJ
雪崩电流 (注 1) Avalanche Current (note 1)	IAS	14.7		A
重复雪崩能量 (注 1) Repetitive Avalanche Current (note 1)	EAR	270		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	Pd (TC=25℃)	150	70	W
	-Derate above 25℃	1.1	0.4	W/℃
最高结温及存储温度 Operating and Storage Temperature Range	TJ, TSTG	-55~+150		℃
引线最高焊接温度 Maximum Lead Temperature for Soldering Purposes	TL	300		℃

*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	600	-	-	V
击穿电压温度特性 Breakdown Voltage Temperature Coefficient	ΔBV _{DSS} /Δ T _J	I _D =250μA, referenced to 25℃	-	0.6	-	V/℃
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℃	-	-	1	μA
		V _{DS} =480V, T _C =125℃	-	-	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	3	-	4	V
静态导通电阻 Static Drain-Source On-Resistance	R _{DS(ON)}	V _{GS} =10V , I _D =6.5A	-	0.48	0.6	Ω
正向跨导 Forward Transconductance	g _{fs}	V _{DS} = 25V, I _D =6.5A (note 4)	-	12	-	S
动态特性 Dynamic Characteristics						
输入电容 Input capacitance	C _{iss}	V _{DS} =25V, V _{GS} =0V, f=1.0MHz	-	1730	-	pF
输出电容 Output capacitance	C _{oss}		-	193	-	
反向传输电容 Reverse transfer capacitance	C _{rss}		-	30	-	
开关特性 Switching Characteristics						
延迟时间 Turn-On delay time	t _{d(on)}	V _{DS} =300V, I _D =13A, R _G =25Ω V _{GS} =10V (note 4, 5)	-	46	-	ns
上升时间 Turn-On rise time	t _r		-	38	-	ns
延迟时间 Turn-Off delay time	t _{d(off)}		-	247	-	ns
下降时间 Turn-Off Fall time	t _f		-	63	-	ns
栅极电荷总量 Total Gate Charge	Q _g	V _{DS} =480V , I _D =13A , V _{GS} =10V (note 4, 5)	-	56	-	nC
栅－源电荷 Gate-Source charge	Q _{gs}		-	8	-	nC
栅－漏电荷 Gate-Drain charge	Q _{gd}		-	36	-	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		-	-	13	A
正向最大脉冲电流 Maximum Pulsed Drain-Source Diode Forward Current	I _{SM}		-	-	52	A
正向压降 Drain-Source Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =6.5A	-	0.9	1.4	V
反向恢复时间 Reverse recovery time	t _{rr}	V _{GS} =0V, I _S =13A ,dI _F /dt=100A/μs (note 4)	-	587	-	ns
反向恢复电荷 Reverse recovery charge	Q _{rr}		-	3.2	-	μC

热特性 THERMAL CHARACTERISTIC

项目 Parameter	符号 Symbol	FHP12N60A	FHF12N60A	单位 Unit
结到管壳的热阻 Thermal Resistance, Junction to Case	Rth(j-c)	0.8	1.78	℃/W
结到环境的热阻 Thermal Resistance, Junction to Ambient	Rth(j-A)	62.5	100	℃/W

- 注释:
- 1: 脉冲宽度由最高结温限制
 - 2: L=10mH, IAS=14.7A, VDD=50V, RG=25 Ω,起始结温 TJ=25℃
 - 3: ISD ≤10A,di/dt ≤100A/μs,VDD≤BVDSS,起始结温 TJ=25℃
 - 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=14.7A, VDD=50V, RG=25 Ω,Starting TJ=25℃
 - 3: ISD ≤10A,di/dt ≤100A/μs,VDD≤BVDSS, Starting TJ=25℃
 - 4: Pulse Test: Pulse Width ≤300μs,Duty Cycle≤2%
 - 5: Essentially independent of operating temperatur

特性曲线 Typical Characteristics

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

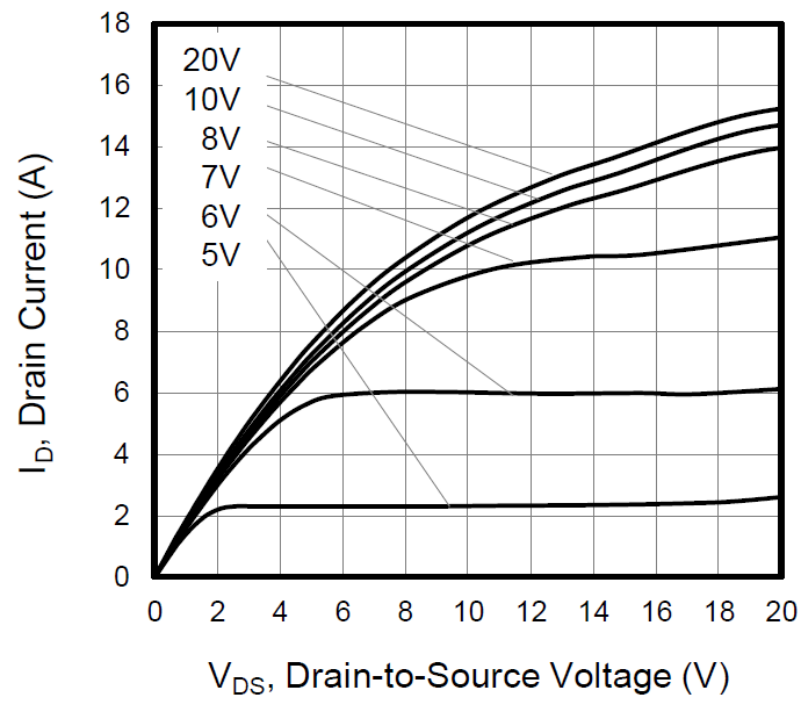


Figure 2. On-Resistance vs. Drain Current

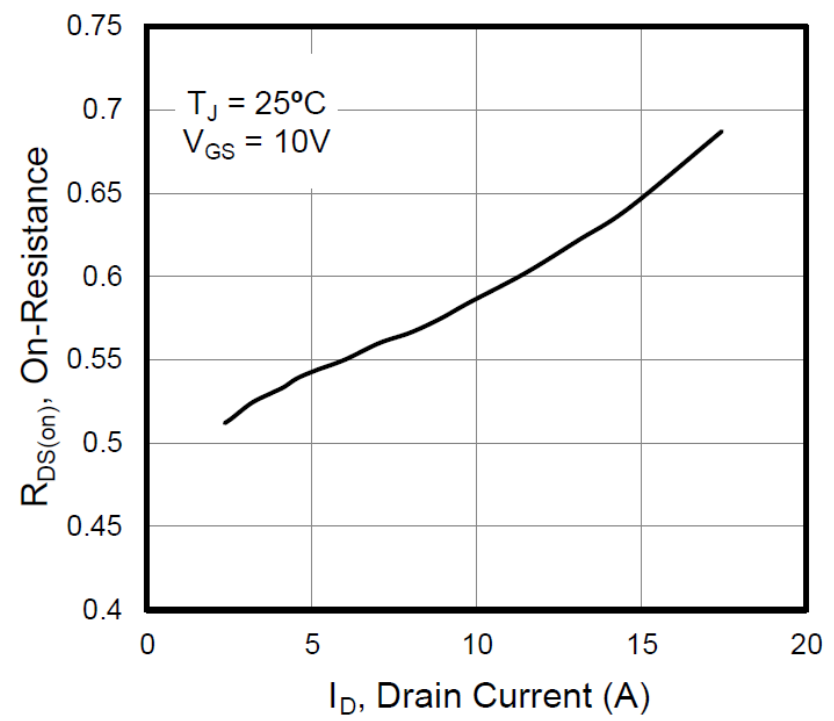


Figure 3. BV_{DSS} vs. Temperature

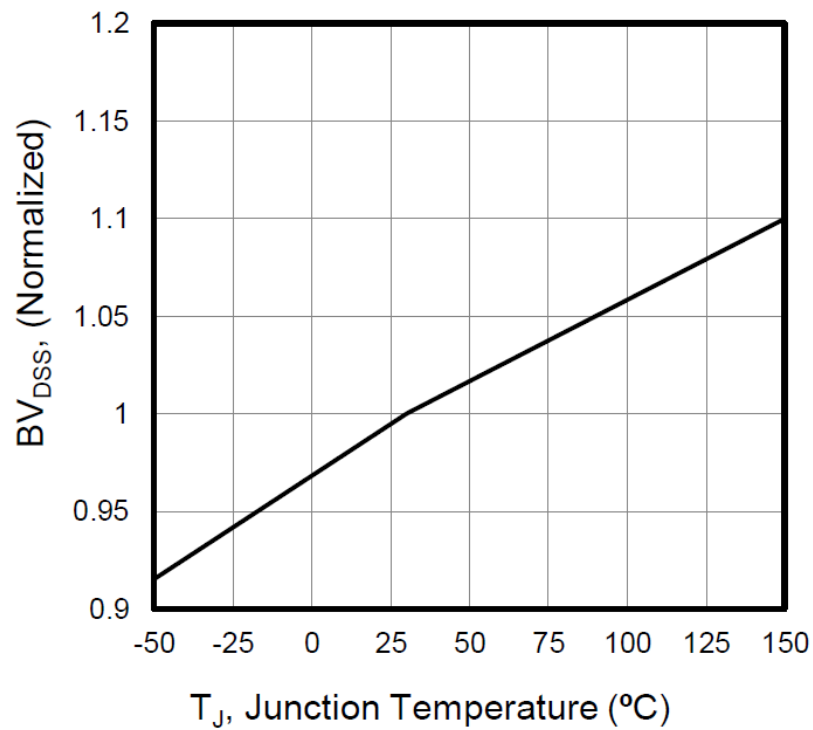


Figure 4. On-Resistance vs. Temperature

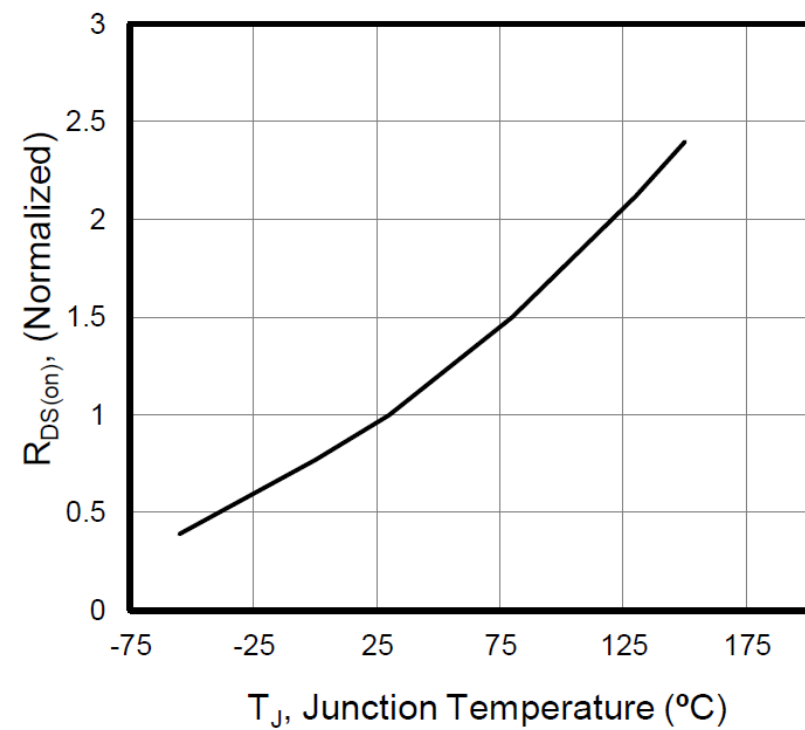


Figure 5. Gate Charge

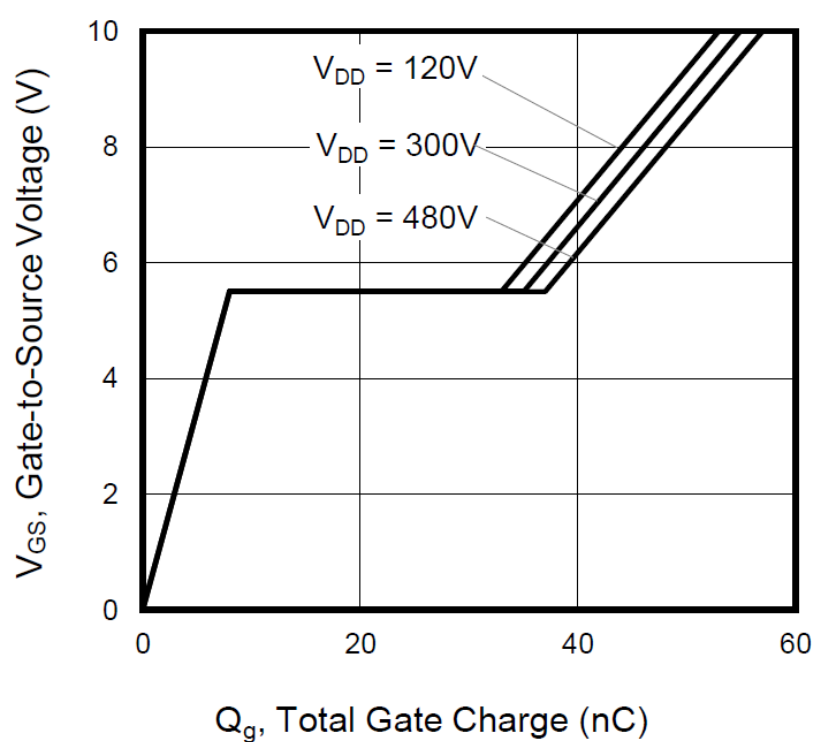


Figure 6. Body Diode Forward Voltage

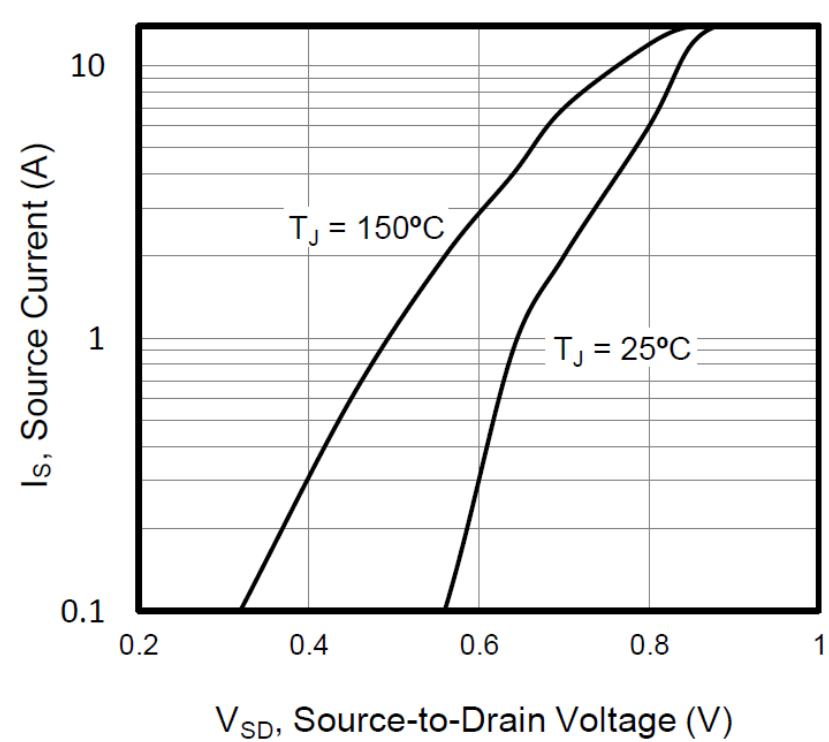


Figure 7. Capacitance

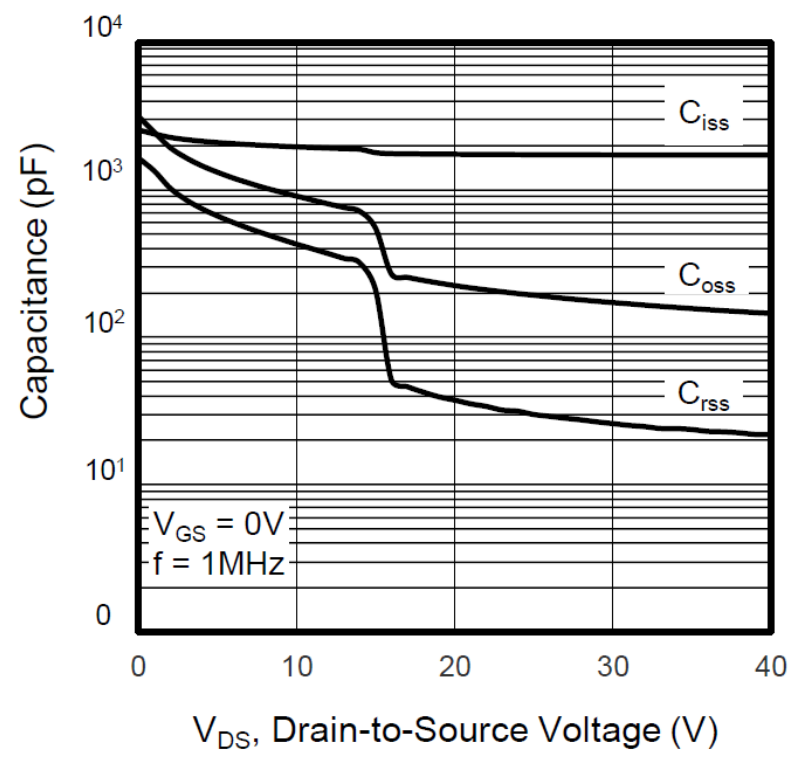


Figure 8. Transient Thermal Impedance

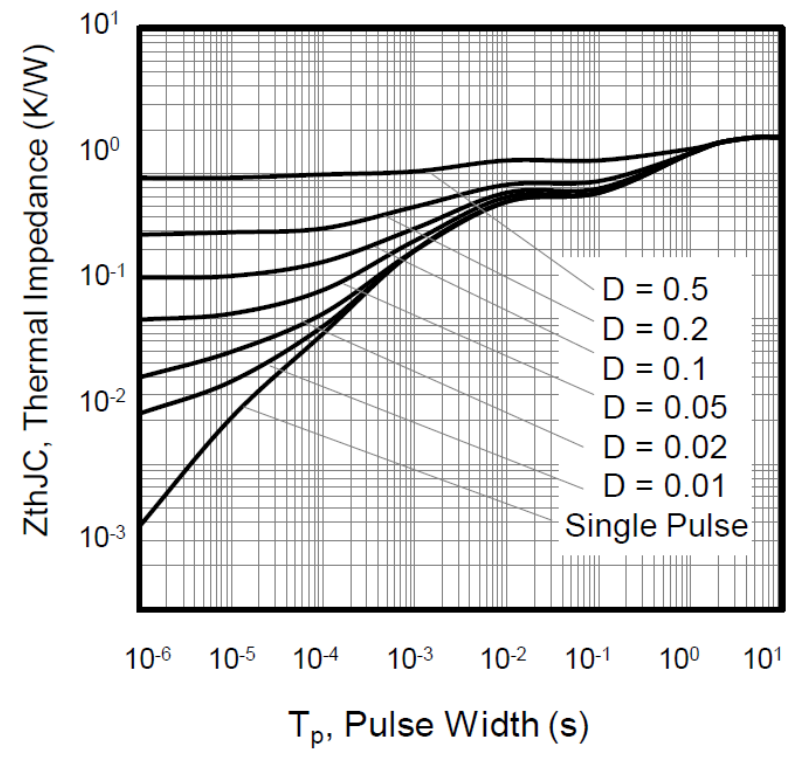


Figure A: Gate Charge Test Circuit and Waveform

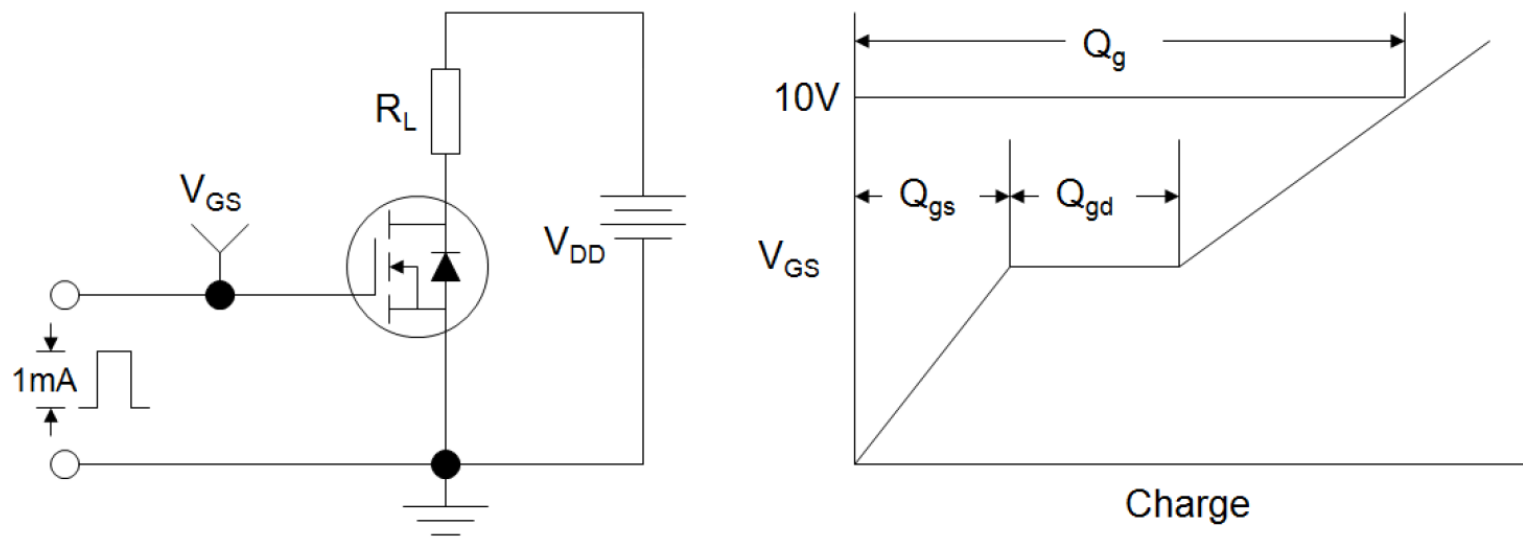


Figure B: Resistive Switching Test Circuit and Waveform

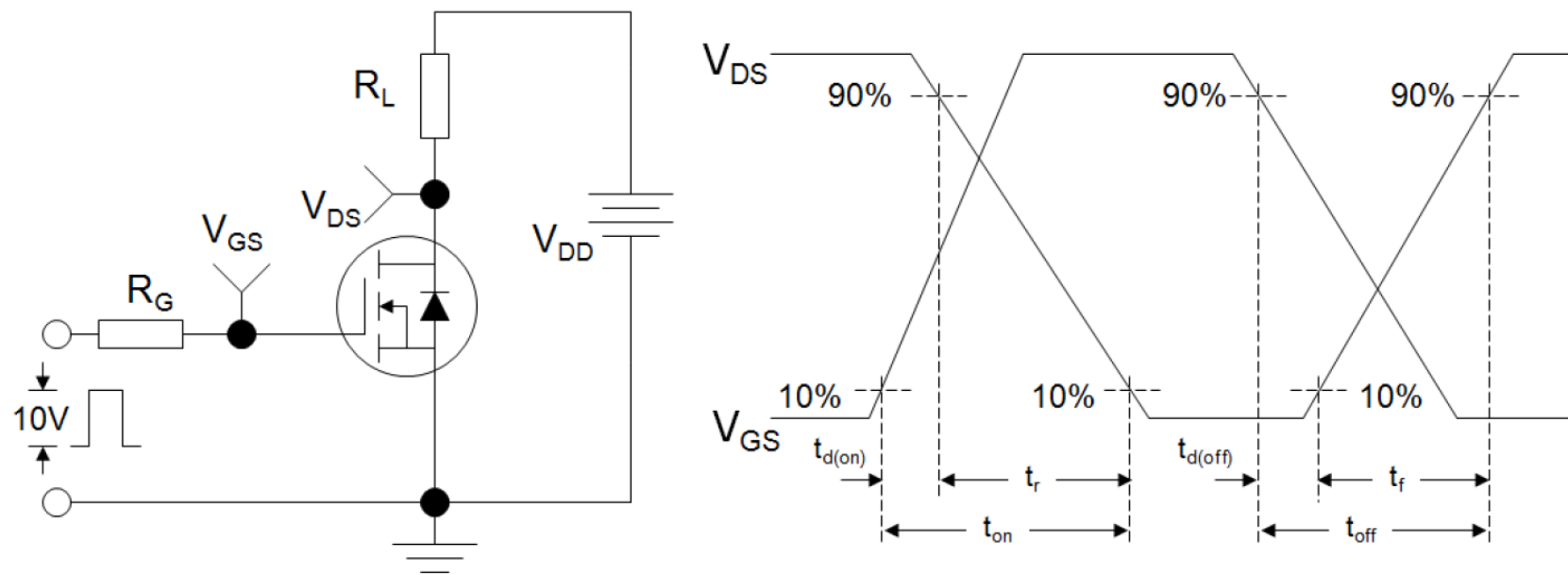
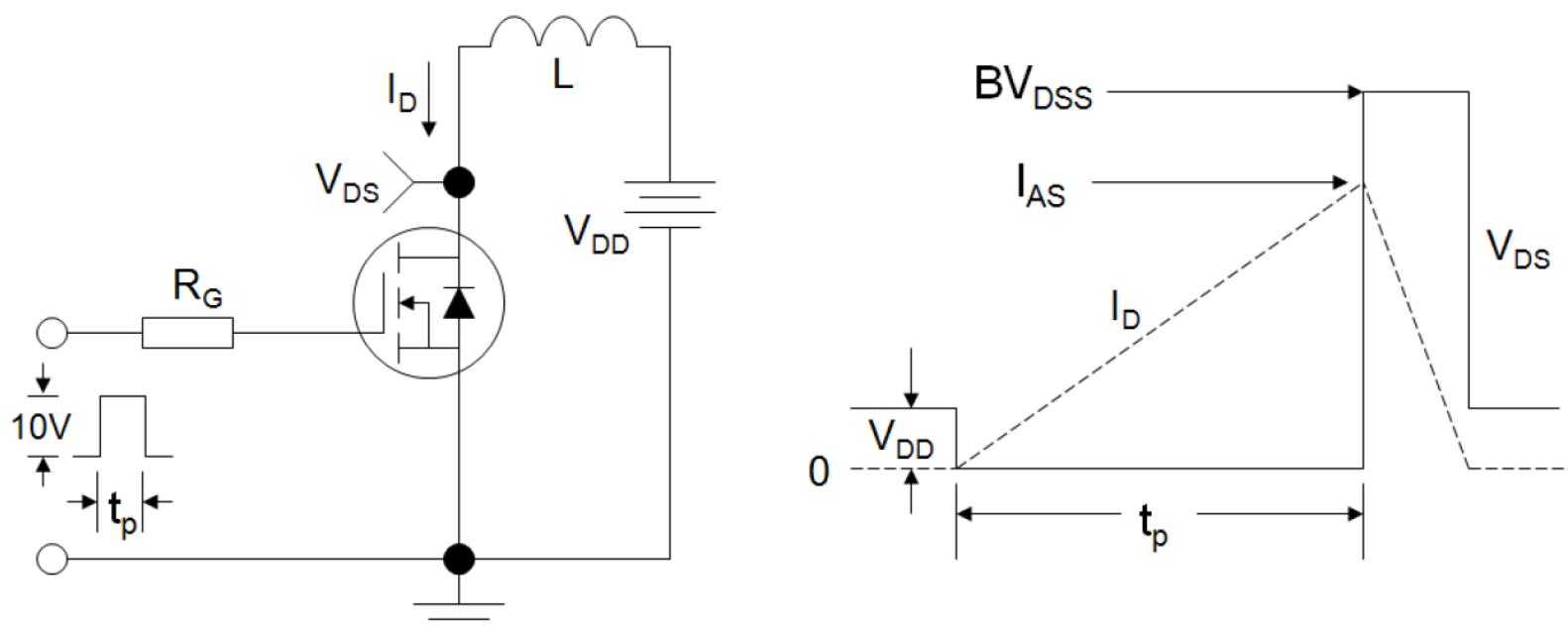
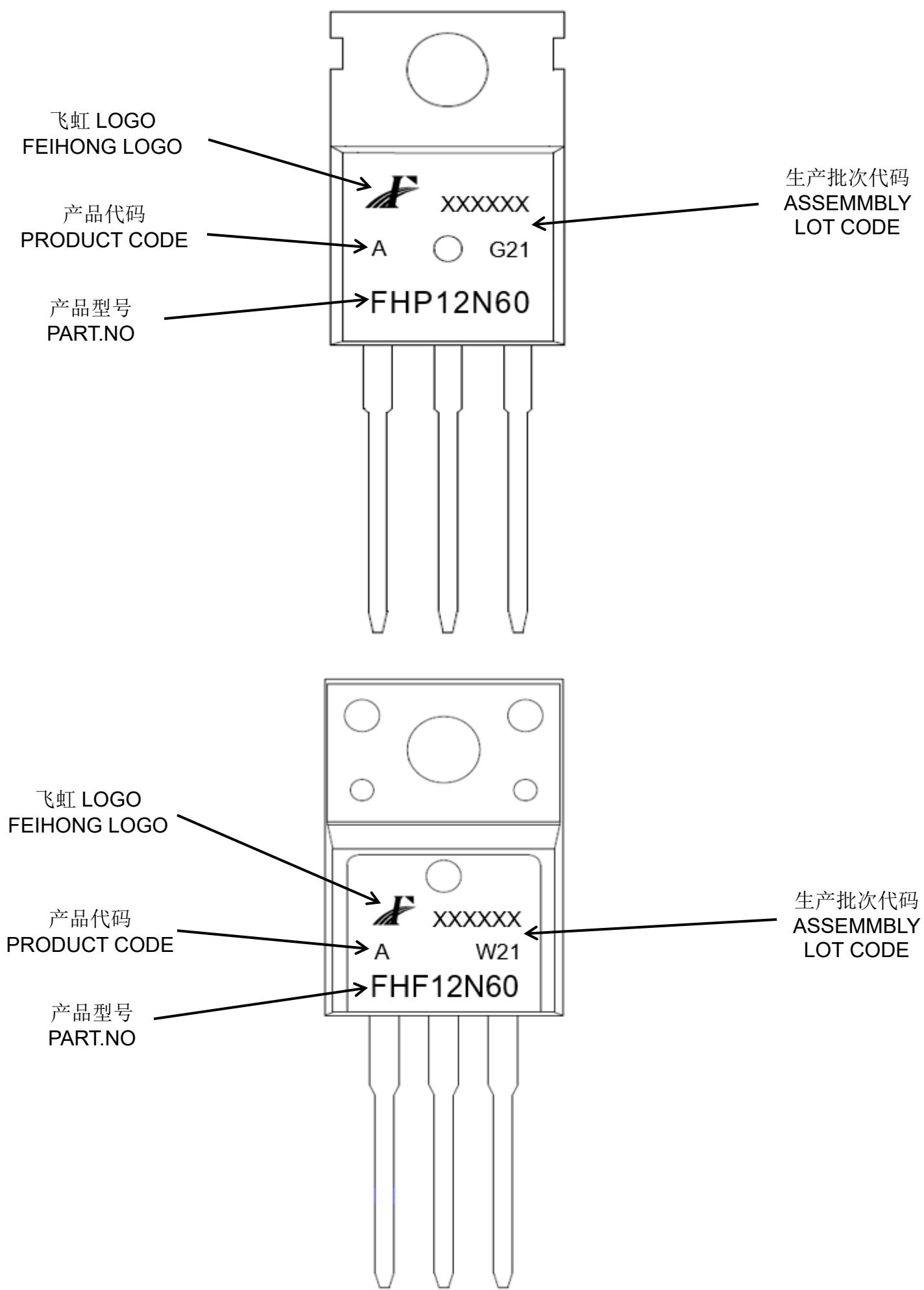


Figure C: Unclamped Inductive Switching Test Circuit and Waveform



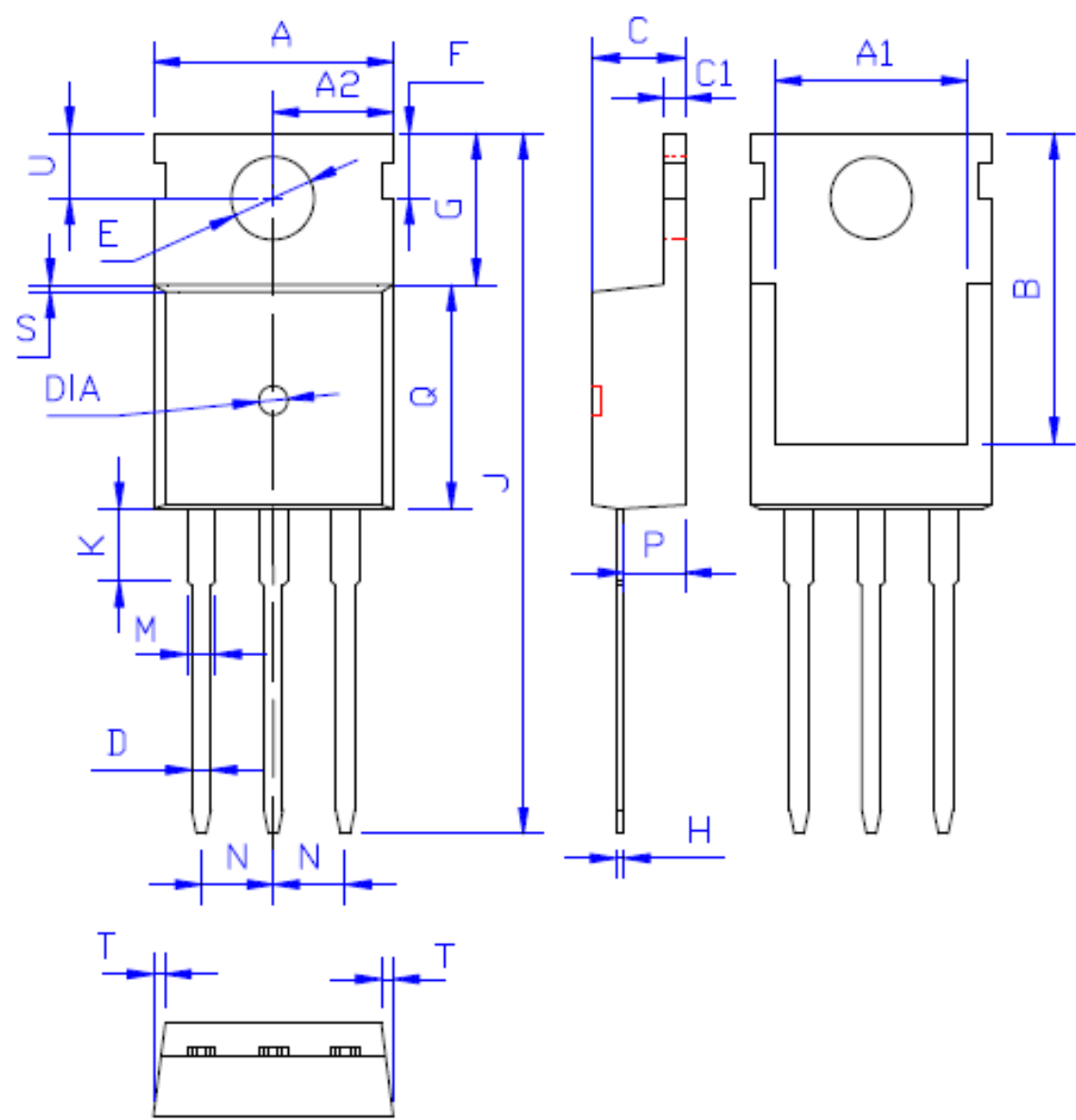
印记 Marking:



外形尺寸:

Package Dimension:

TO-220



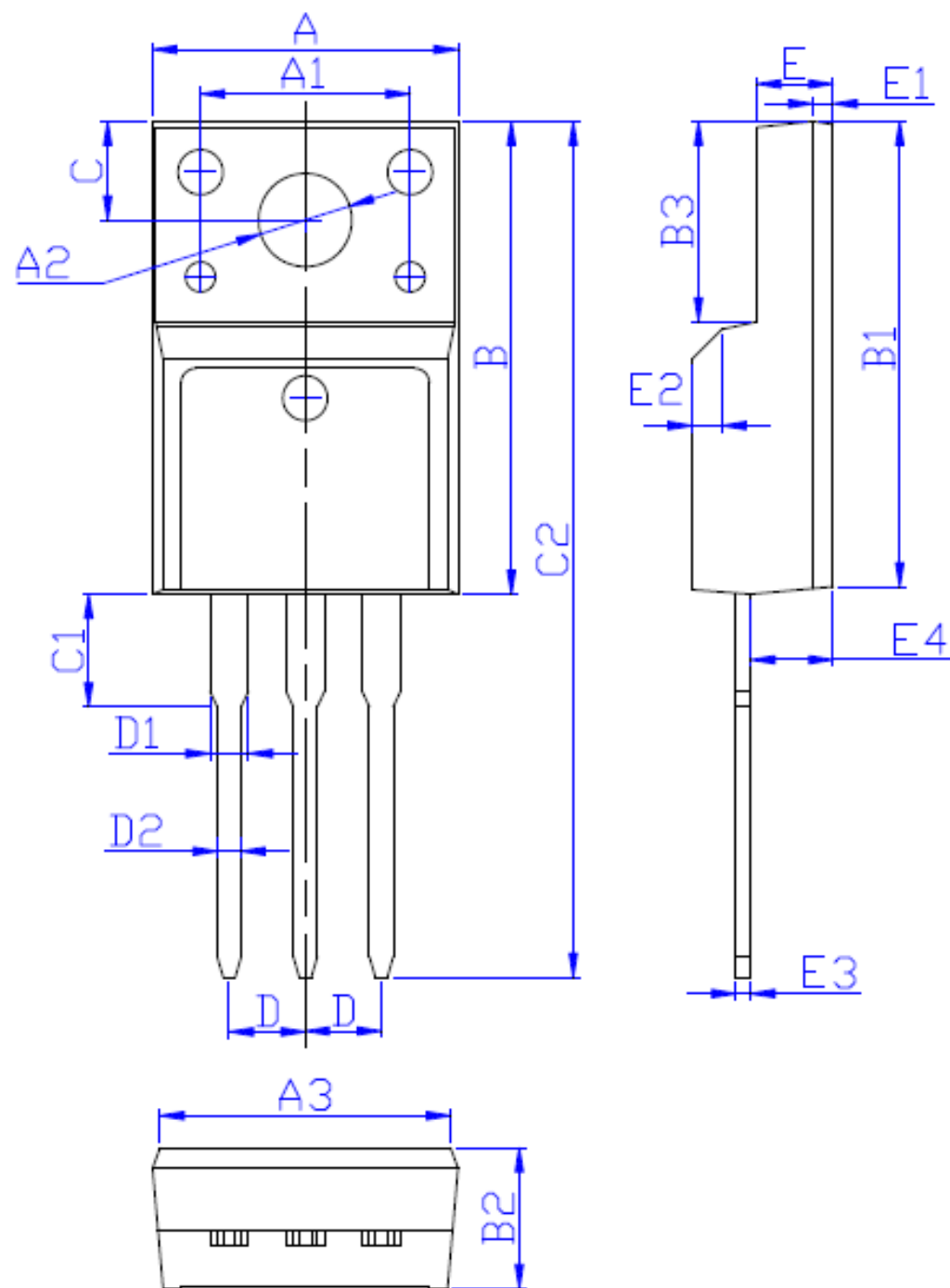
DIM	MILLIMETERS
A	10.00±0.30
A1	8.00±0.30
A2	5.00±0.30
B	13.20±0.40
C	4.50±0.20
C1	1.30±0.20
D	0.80±0.20
E	3.60±0.20
F	3.00±0.30
G	6.60±0.40
H	0.50±0.20
J	28.88±0.50
K	3.00±0.30
M	1.30±0.30
N	Typical 2.54
P	2.40±0.40
Q	9.20±0.40
S	0.25±0.15
T	0.25±0.15
U	2.80±0.30
DIA	宽 1.50±0.10 深 0.50 MAX

(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)