



# N 沟道增强型场效应晶体管

## N-CHANNEL MOSFET

### FHP10N60A/ FHF10N60A

#### 主要参数 MAIN CHARACTERISTICS

ID	10A
VDSS	600V
Rdson-typ(@Vgs=10V)	0.68Ω
Qg-typ	45nC

#### 产品特性 FEATURES

低栅极电荷	Low gate charge
低 Crss (典型值 23pF)	Low Crss (typical 23pF )
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

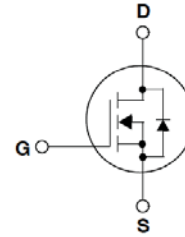
#### 用途 APPLICATION

高频开关电源	High efficiency switch mode power supplies
电子镇流器	Electronic ballast
LED 电源	LED power supply

#### 封装形式 Package



#### 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
		FHP10N60A	FHF10N60A	
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°C)	10*		A
	ID (TC=100°C)	6.2*		A
最大脉冲漏极电流 (注 1) Drain Current - pulse (note 1)	IDM	40*		A
最高栅源电压 Gate-Source Voltage	VGS	±20		V
单脉冲雪崩能量 (注 2) Single Pulsed Avalanche Energy (note 2)	EAS	600		mJ
雪崩电流 (注 1) Avalanche Current (note 1)	IAR	10		A
重复雪崩能量 (注 1) Repetitive Avalanche Current (note 1)	EAR	17.8		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	4.5		V/ns
耗散功率 Power Dissipation	PD (TC=25°C)	156	50	W
	-Derate above 25°C	1.43	0.48	W/°C
最高结温及存储温度 Operating and Storage Temperature Range	TJ, TSTG	150, -55 to 150		°C
引线最高焊接温度 Maximum Lead Temperature for Soldering Purposes	TL	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
<b>关态特性 Off –Characteristics</b>						
漏-源击穿电压 Drain-Source Voltage	BVDSS	ID=250μA, VGS=0V	600	-	-	V
击穿电压温度特性 Breakdown Voltage Temperature Coefficient	ΔBVDSS/Δ TJ	ID=250μA, referenced to 25°C	-	0.68	-	V/°C
零栅压下漏极漏电流 Zero Gate Voltage Drain Current	IDSS	VDS=650V, VGS=0V, TC=25°C	-	-	1	μA
		VDS=520V, TC=125°C	-	-	100	μA
栅极体漏电流 Gate-body leakage current	IGSS (F/R)	VDS=0V, VGS =±30V	-	-	±100	μA
<b>通态特性 On-Characteristics</b>						
阈值电压 Gate Threshold Voltage	VGS(th)	VDS = VGS , ID=250μA	2.0	-	4.0	V
静态导通电阻 Static Drain-Source On-Resistance	RDS(ON)	VGS =10V , ID=5A	-	0.68	0.85	Ω
<b>动态特性 Dynamic Characteristics</b>						
正向跨导 Forward Trans conductance	gfs	VDS=15V, ID =5A		8		S
输入电容 Input capacitance	Ciss	VDS=25V, VGS =0V, f=1.0MHz	-	1570	-	pF
输出电容 Output capacitance	Coss		-	167	-	
反向传输电容 Reverse transfer capacitance	Crss		-	30	-	
<b>开关特性 Switching Characteristics</b>						
延迟时间 Turn-On delay time	td(on)	VDS=300V, ID=5A, RG=25Ω (note 4, 5)	-	34.8	-	ns
上升时间 Turn-On rise time	tr		-	121	-	ns
延迟时间 Turn-Off delay time	td(off)		-	65.6	-	ns
下降时间 Turn-Off Fall time	tf		-	59.6	-	ns
栅极电荷总量 Total Gate Charge	Qg	VDS =480V , ID=5A , VGS =10V (note 4, 5)	-	37.2	-	nC
栅-源电荷 Gate-Source charge	Qgs		-	6.9	-	nC
栅-漏电荷 Gate-Drain charge	Qgd		-	21.1	-	nC
<b>漏-源二极管特性及最大额定值 Drain-Source Diode Characteristics and Maximum Ratings</b>						
正向最大连续电流 Maximum Continuous Drain -Source Diode Forward Current		IS	-	-	10	A
正向最大脉冲电流 Maximum Pulsed Drain-Source Diode Forward Current		ISM	-	-	40	A
正向压降 Drain-Source Diode Forward Voltage	VSD	VGS=0V, IS=10A	-	-	1.4	V
反向恢复时间 Reverse recovery time	trr	VGS=0V, IS=5A ,dIF/dt=100A/μs (note 4)	-	420	-	ns
反向恢复电荷 Reverse recovery charge	Qrr		-	4.2	-	μC

## 热特性 THERMAL CHARACTERISTIC

项目 Parameter	符号 Symbol	FHP10N60A	FHF10N60A	单位 Unit
结到管壳的热阻 Thermal Resistance, Junction to Case	Rth(j-c)	0.8	2.5	°C/W
结到环境的热阻 Thermal Resistance, Junction to Ambient	Rth(j-A)	62.5	62.5	°C/W

注释:

Notes:

- 1: 脉冲宽度由最高结温限制
  - 2: L=10mH, I<sub>D</sub>=10A, V<sub>DD</sub>=48V, R<sub>G</sub>=25 Ω, 起始结温 T<sub>J</sub>=25°C
  - 3: I<sub>SD</sub> ≤10A, di/dt ≤200A/μs, V<sub>DD</sub> ≤B<sub>VDS</sub>, 起始结温 T<sub>J</sub>=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
- 
- 1: Pulse width limited by maximum junction temperature
  - 2: L=10mH, I<sub>D</sub>=10A, V<sub>DD</sub>=48V, R<sub>G</sub>=25 Ω, Start T<sub>J</sub>=25°C.
  - 3: I<sub>SD</sub> ≤10A, di/dt ≤200A/μs, V<sub>DD</sub> ≤B<sub>VDS</sub>, Starting T<sub>J</sub>=25°C
  - 4: Pulse Test: Pulse Width ≤300μs, Duty Cycle ≤2%
  - 5: Essentially independent of operating temperature

特性曲线

ELECTRICAL CHARACTERISTICS (curves)

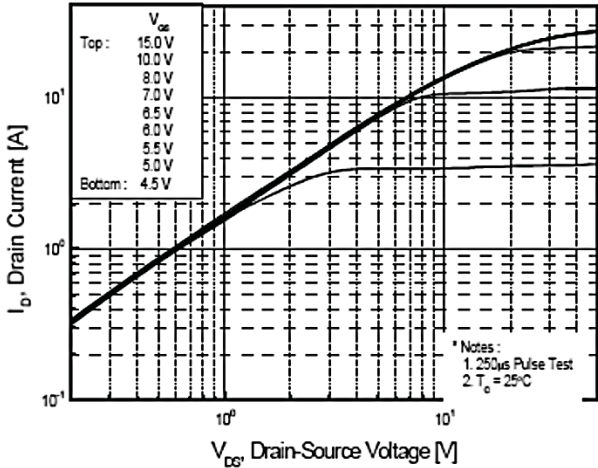


图 1 输出特性曲线, Tc=25°C

Fig1 Typical Output Characteristics, Tc=25°C

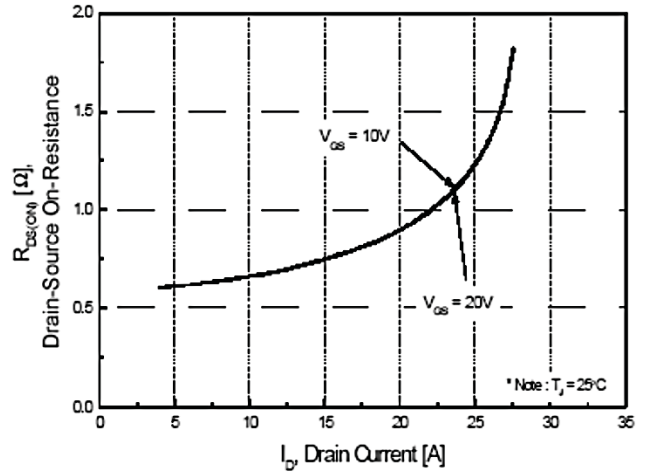


图 2 导通电阻与漏极电流和栅极电压曲线

Fig2 On-Resistance Vs.Drain Current and Gate Voltage

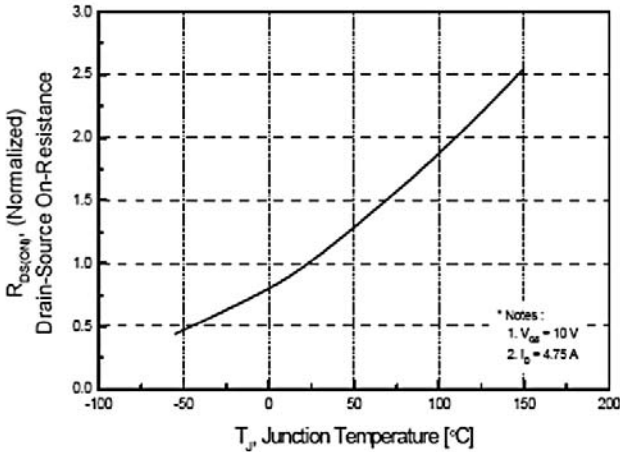


图 3 导通电阻与温度曲线

Fig3 Normalized On-Resistance Vs. Temperature

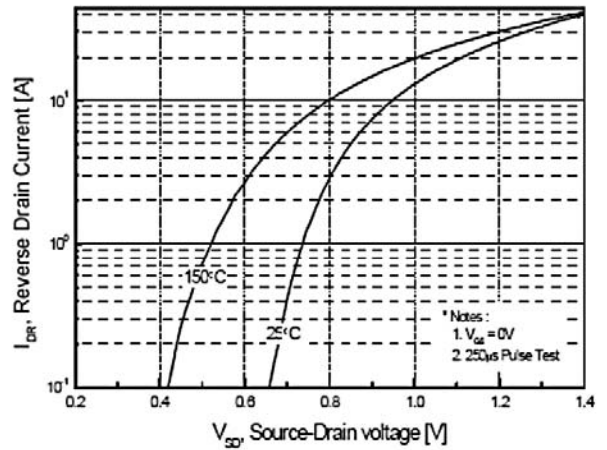


图 4 二极管正向电压曲线

Fig4 Typical Source-Drain Diode Forward Voltage

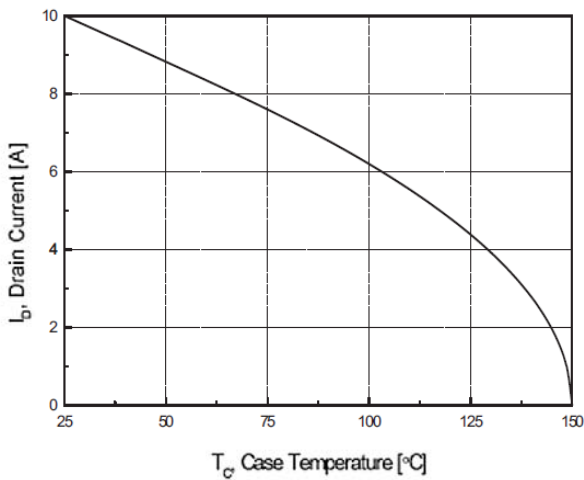


图 5 最大漏极电流与壳温曲线

Fig5 Maximum Drain Current Vs. Case Temperature

特性曲线

ELECTRICAL CHARACTERISTICS (curves)

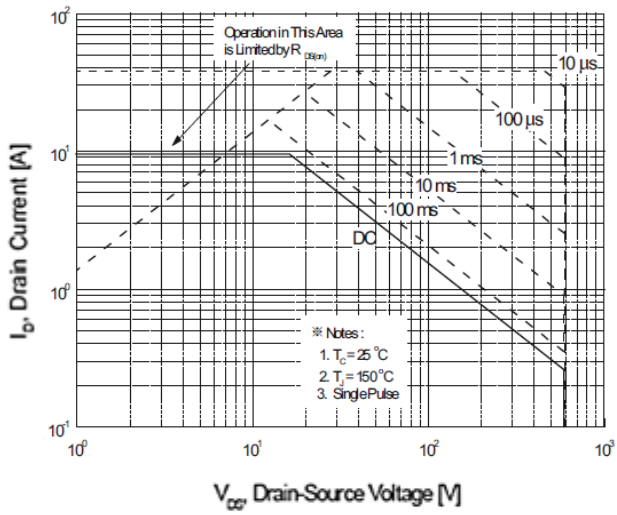


图 6-1 (TO-220)  
最大安全工作区曲线  
Fig6-1 Maximum Safe Operating Area

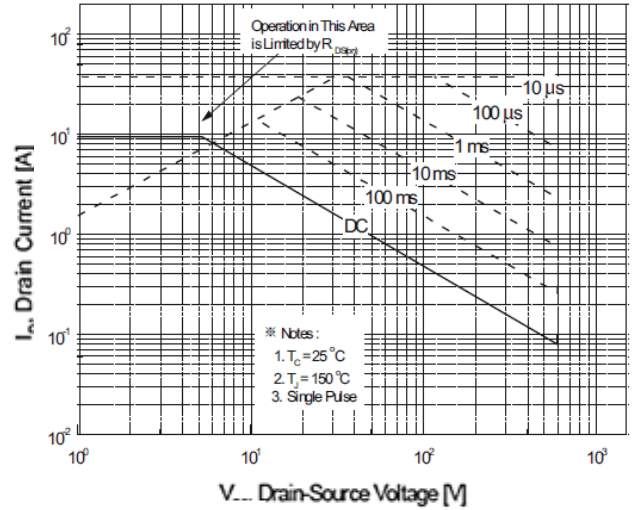
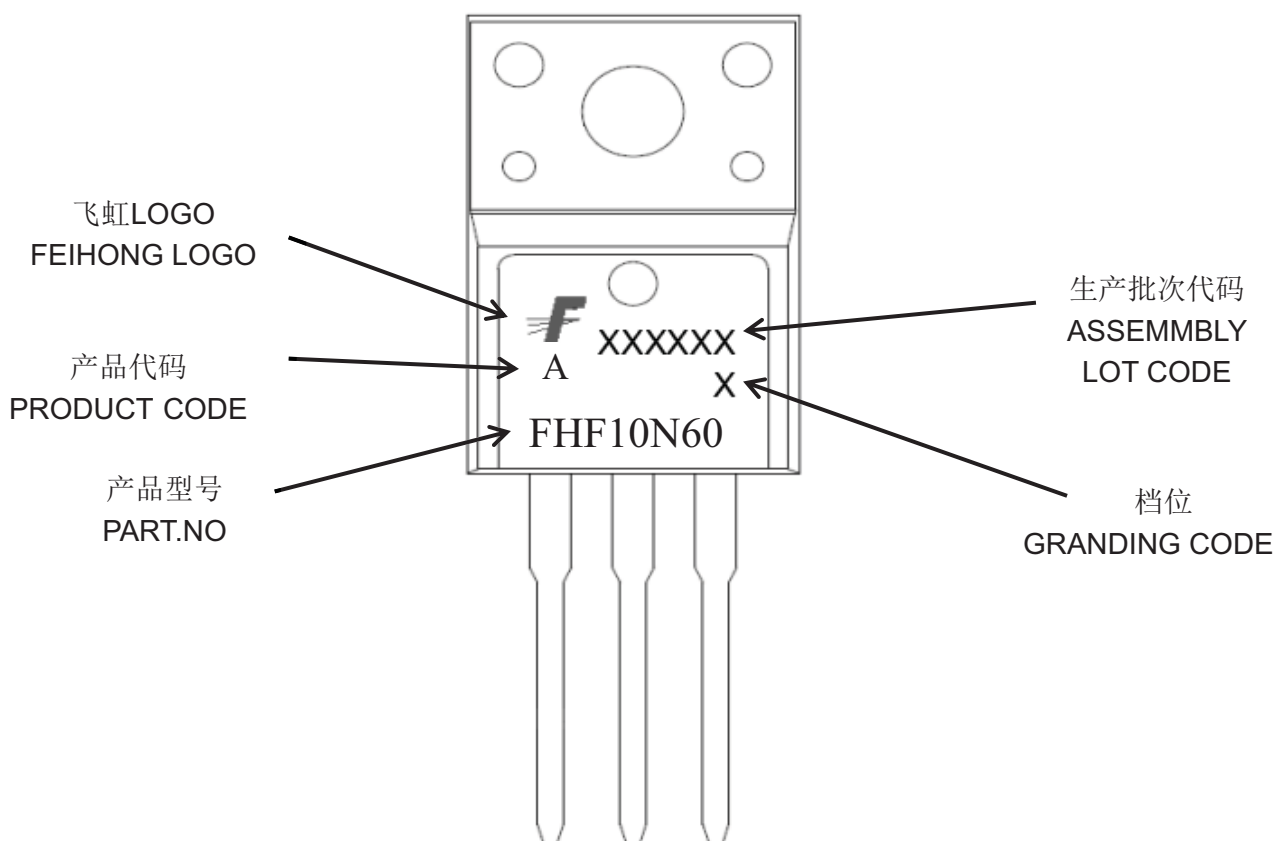
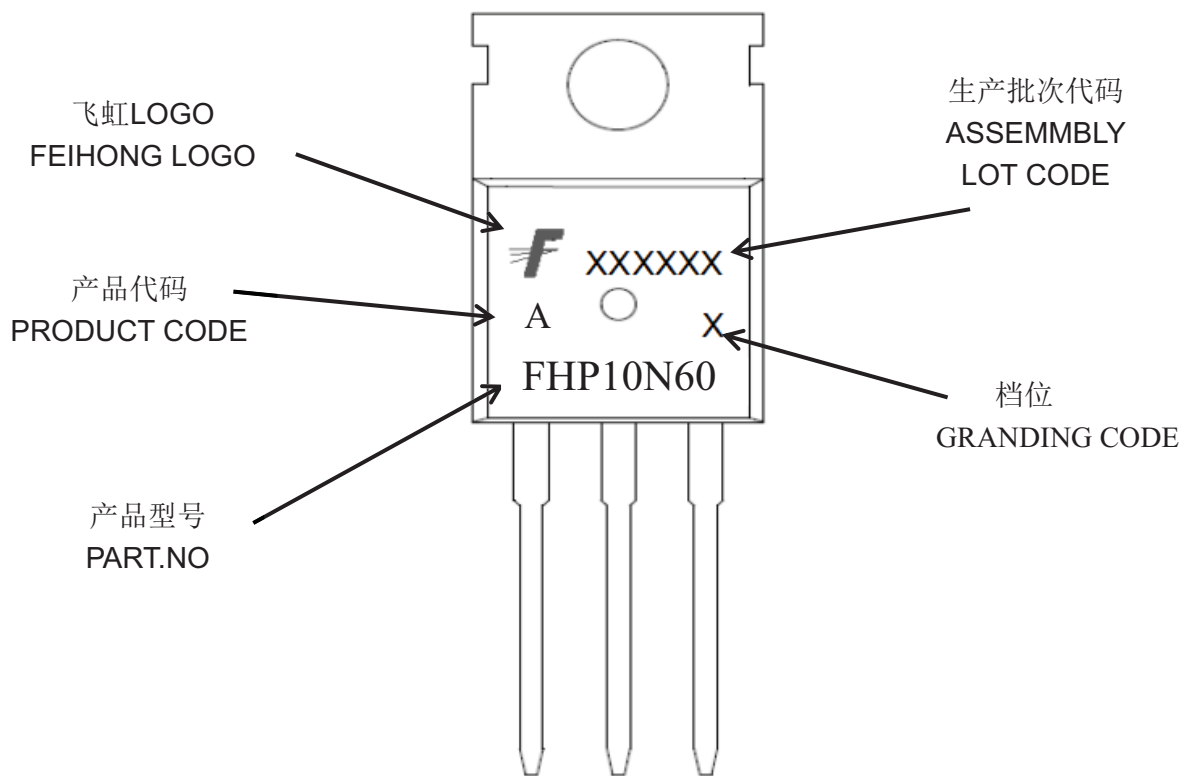


图 6-1 (TO-220F)  
最大安全工作区曲线  
Fig6 -2Maximum Safe Operating Area

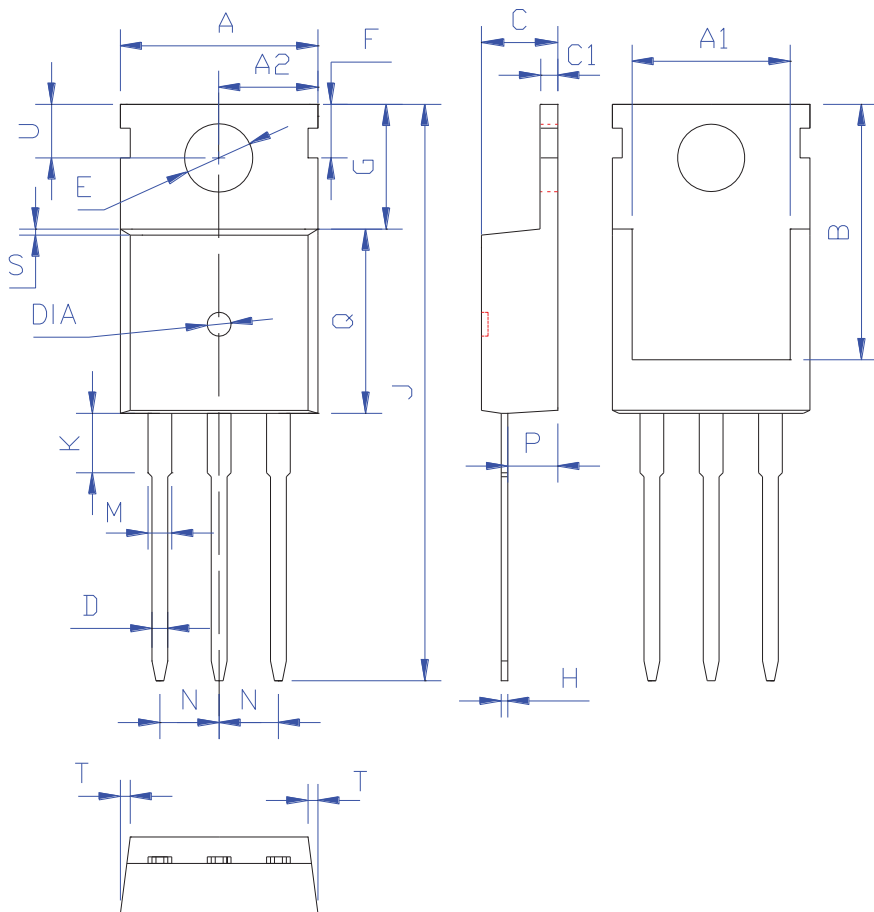
# 印记 Marking



外形尺寸:

Package Dimension:

TO-220



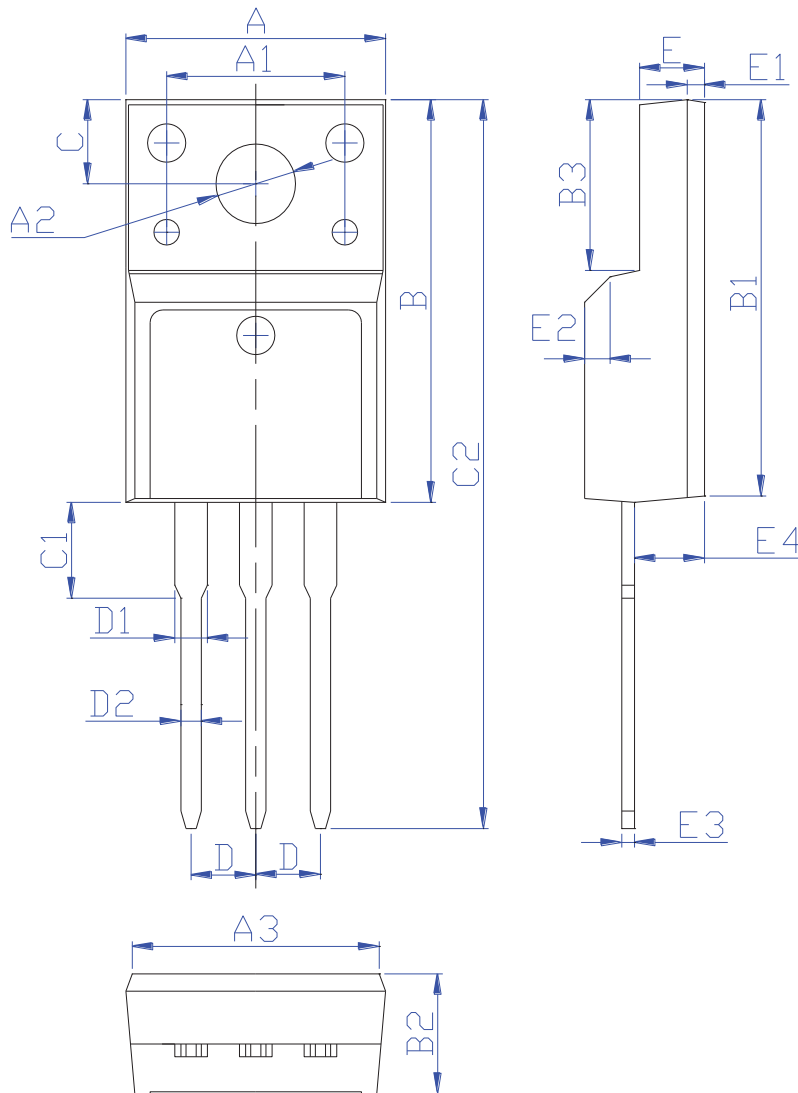
DIM	MILLIMETERS
A	10.00±0.30
A1	8.00±0.30
A2	5.00±0.30
B	13.20±0.40
C	4.50±0.20
C1	1.30±0.20
D	0.80±0.20
E	3.50±0.20
F	3.00±0.30
G	5.50±0.40
H	0.50±0.20
J	28.88±0.50
K	3.00±0.30
M	1.30±0.30
N	Typical 2.54
P	2.40±0.40
Q	9.20±0.40
S	0.25±0.15
T	0.25±0.15
U	2.80±0.30
DIA	宽 1.50±0.10 深 0.50 MAX

(Units: mm)

外形尺寸:

Package Dimension:

TO-220F



DIM	MILLIMETERS
A	$10.15 \pm 0.30$
A1	$7.00 \pm 0.20$
A2	$3.12 \pm 0.20$
A3	$9.70 \pm 0.30$
B	$15.90 \pm 0.50$
B1	$15.50 \pm 0.50$
B2	$4.70 \pm 0.30$
B3	$5.70 \pm 0.30$
C	$3.30 \pm 0.25$
C1	$3.25 \pm 0.30$
C2	$28.70 \pm 0.50$
D	Typical $2.54$
D1	$1.47$ (MAX)
D2	$0.80 \pm 0.20$
E	$2.55 \pm 0.25$
E1	$0.70 \pm 0.25$
E2	$1.0 \times 45^\circ$
E3	$0.50 \pm 0.20$
E4	$2.75 \pm 0.30$

(Units: mm)