N 沟道增强型场效应晶体管

N-CHANNEL MOSFET

FHF4N90A

主要参数 MAIN CHARACTERISTICS

ID	4A
VDSS	900V
Rdson-typ（ @Vgs=10V）	2.6Ω
Qg-typ	25.2nC

用途 APPLICATIONS

高频开关电源	High efficiency switch mode power supplies
LED电源	LED Power

产品特性 FEATURES

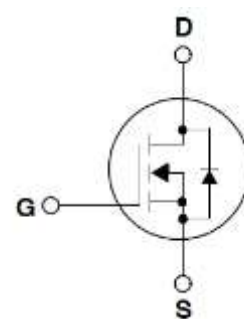| 低栅极电荷	Low gate charge
低 Crss (典型值 7.4pF)	Low Crss (typical 7.4pF)
开关速度快	Fast switching
100%经过雪崩测试	100% avalanche tested
高抗 dv/dt 能力	Improved dv/dt capability
RoHS 产品	RoHS product

封装形式 Package

TO-220F
FHF 系列

G D S

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
		FHF4N90A	
最高漏极－源极直流电压 Drain-Source Voltage	V_{DS}	900	V
连续漏极电流* Drain Current -continuous *	I_D（Tc=25℃）	4	A
	I_D（Tc=100℃)	2.5	A
最大脉冲漏极电流（注 1） Drain Current – pulse（note 1）	I_{DM}	16	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}	150	mJ
雪崩电流（注 1） Avalanche Current（note 1）	I_{AR}	3.3	A
重复雪崩能量（注 1） Repetitive Avalanche Current（note 1）	E_{AR}	5.5	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 （TC=25℃）	35	W
	-Derate above 25℃	0.28	W/℃
最高结温及存储温度 Operating and Storage Temperature Range	T_J，T_{STG}	150，–55 to 150	℃
引线最高焊接温度 Maximum Lead Temperature for Soldering Purposes	T_L	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	900	-	-	V
击穿电压温度特性 Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS}/\Delta TJ$	I_D=250µA, referenced to 25℃	-	0.92	-	V/℃
零栅压下漏极漏电流 Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=900V,V_{GS}=0V, T_C=25℃	-	-	1	µA
		V_{DS}=720V, 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	2.0	-	4.0	V
静态导通电阻 Static Drain-Source On-Resistance	$R_{DS(ON)}$	V_{GS} =10V , I_D=2A	-	2.6	3.0	Ω
正向跨导 Forward Transconductance	gfs	V_{DS} = 15V, I_D=2A（note 4）	-	5	-	S
动态特性 **Dynamic Characteristics**						
输入电容 Input capacitance	Ciss	V_{DS}=25V, V_{GS} =0V, f=1.0MHz	-	835	-	pF
输出电容 Output capacitance	Coss		-	76	-	
反向传输电容 Reverse transfer capacitance	Crss		-	7.4	-	
开关特性 **Switching Characteristics**						
延迟时间 Turn-On delay time	td(on)	V_{DS}=450V, I_D=4A, R_G=10Ω V_{GS} =10V （note 4，5）	-	16	-	ns
上升时间 Turn-On rise time	tr		-	17	-	ns
延迟时间 Turn-Off delay time	td(off)		-	43	-	ns
下降时间 Turn-Off Fall time	tf		-	14	-	ns
栅极电荷总量 Total Gate Charge	Qg	V_{DS} =720V , I_D=4A , V_{GS} =10V （note 4，5）	-	25.2	-	nC
栅－源电荷 Gate-Source charge	Qgs		-	4	-	nC
栅－漏电荷 Gate-Drain charge	Qgd		-	12.2	-	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	Is		-	-	4	A
正向最大脉冲电流 Maximum Pulsed Drain-Source Diode Forward Current	Ism		-	-	16	A
正向压降 Drain-Source Diode Forward Voltage	V_{SD}	V_{GS}=0V, Is=4A	-	-	1.4	V
反向恢复时间 Reverse recovery time	trr	V_{GS}=0V, Is=4A ,dIF/dt=100A/µs (note 4)	-	382	-	ns
反向恢复电荷 Reverse recovery charge	Qrr		-	1.79	-	µC

热特性 THERMAL CHARACTERISTIC

项目 Parameter	符号 Symbol	FHF4N90A	单位 Unit
结到管壳的热阻 Thermal Resistance, Junction to Case	Rth(j-c)	3.57	℃/W
结到环境的热阻 Thermal Resistance, Junction to Ambient	Rth(j-A)	62.5	℃/W

注释：
1：脉冲宽度由最高结温限制
2：L=10mH, IAS=5.5A, VDD=50V, RG=25 Ω,起始结温 TJ=25℃
3：ISD ≤4A,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=5.5A, VDD=50V, RG=25 Ω ,Start TJ=25℃;
3：ISD ≤4A,di/dt ≤100A/μs,VDD≤BVDSS, Starting TJ=25℃
4：Pulse Test：Pulse Width ≤300μs,Duty Cycle≤2％
5：Essentially independent of operating temperature

特性曲线
（ELECTRICAL CHARACTERISTICS curves）
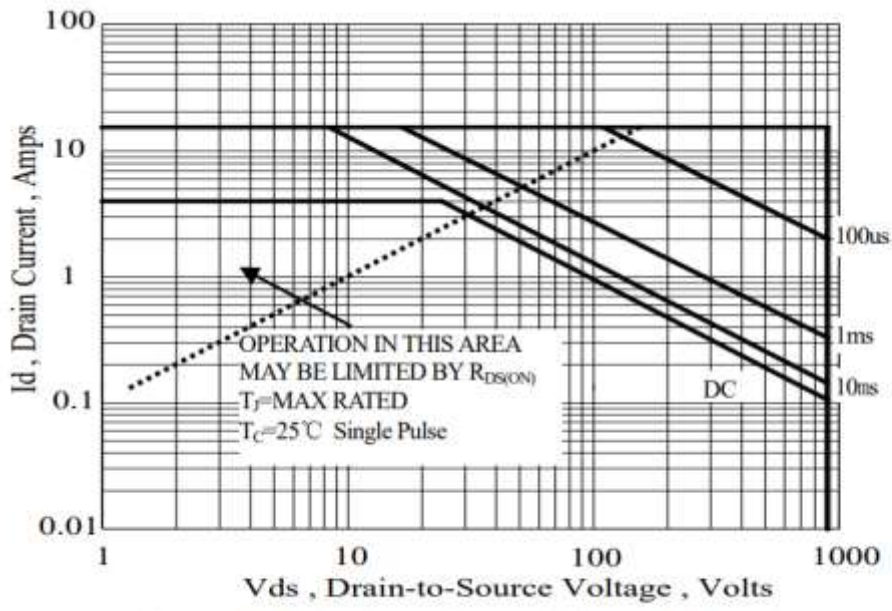
Figure 1 Maximum Forward Bias Safe Operating Area
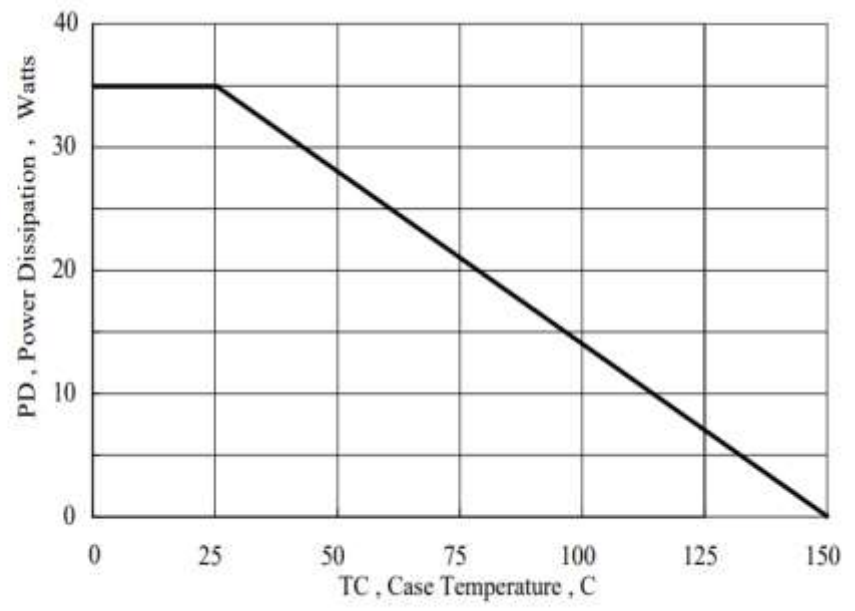
Figure 2 Maximum Power Dissipation vs Case Temperature
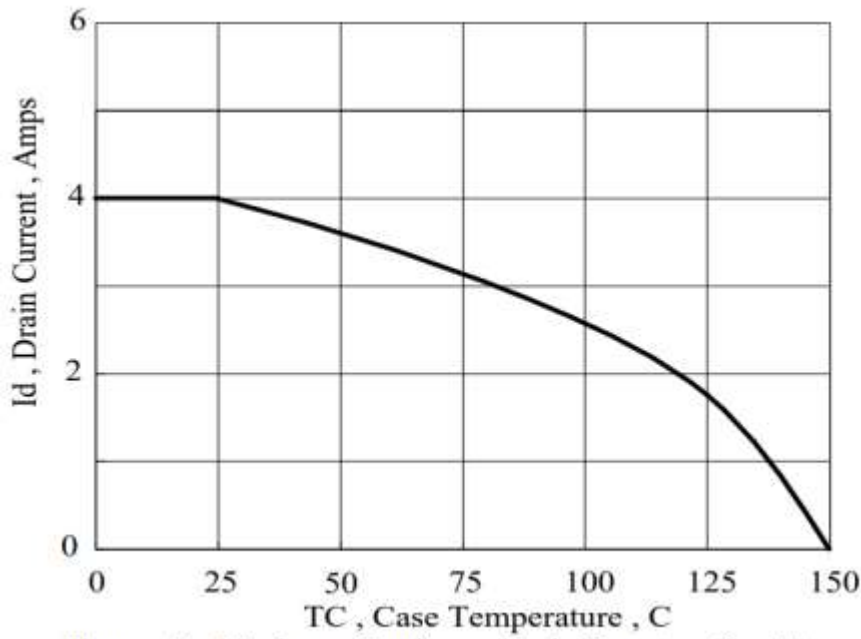
Figure 3 Maximum Continuous Drain Current vs Case Temperature
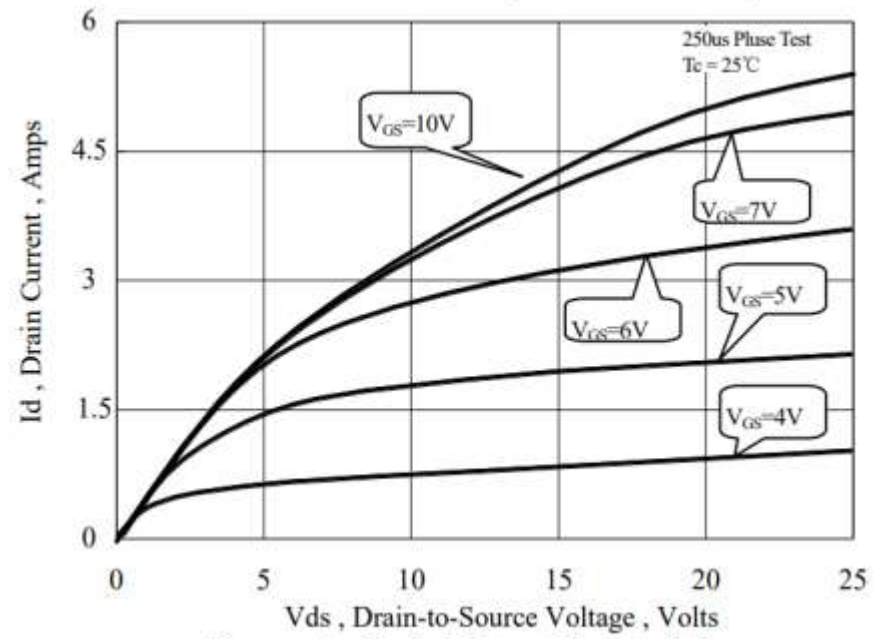
Figure 4 Typical Output Characteristics
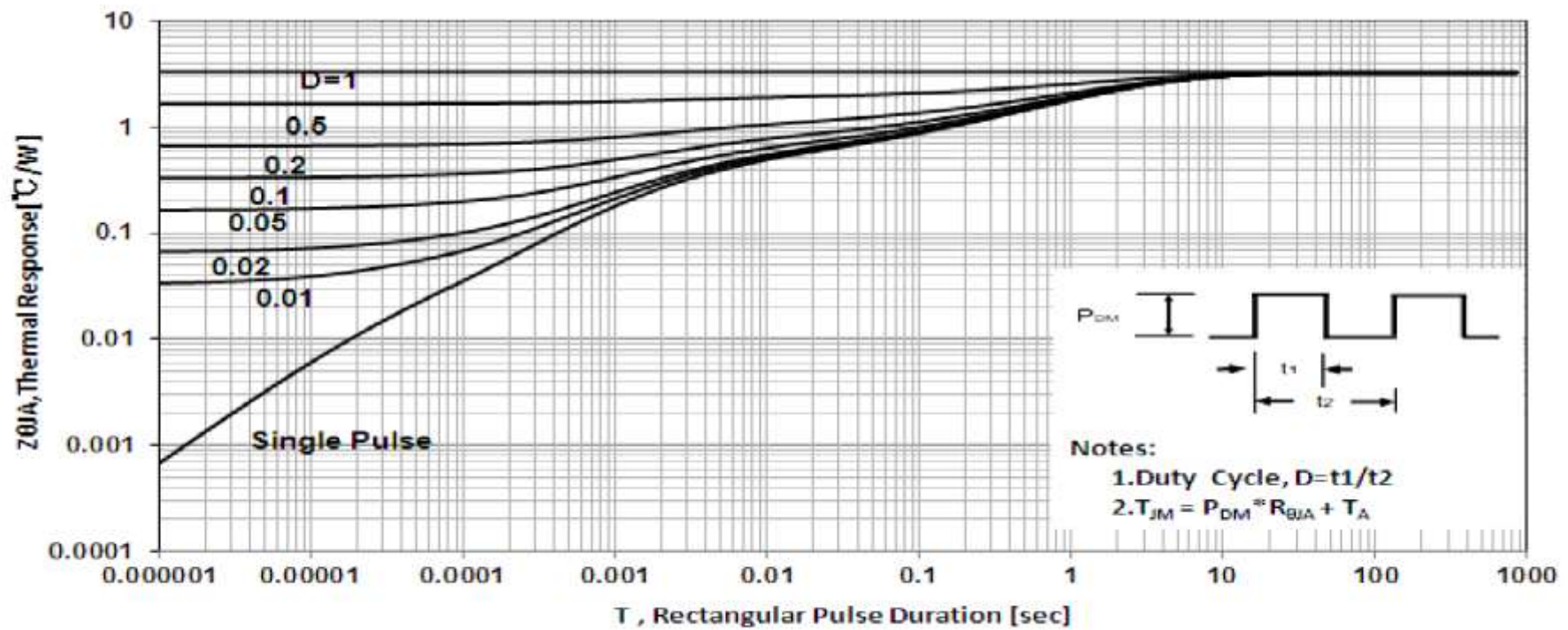
Figure 5 Maximum Effective Thermal Impendance , Junction to Case
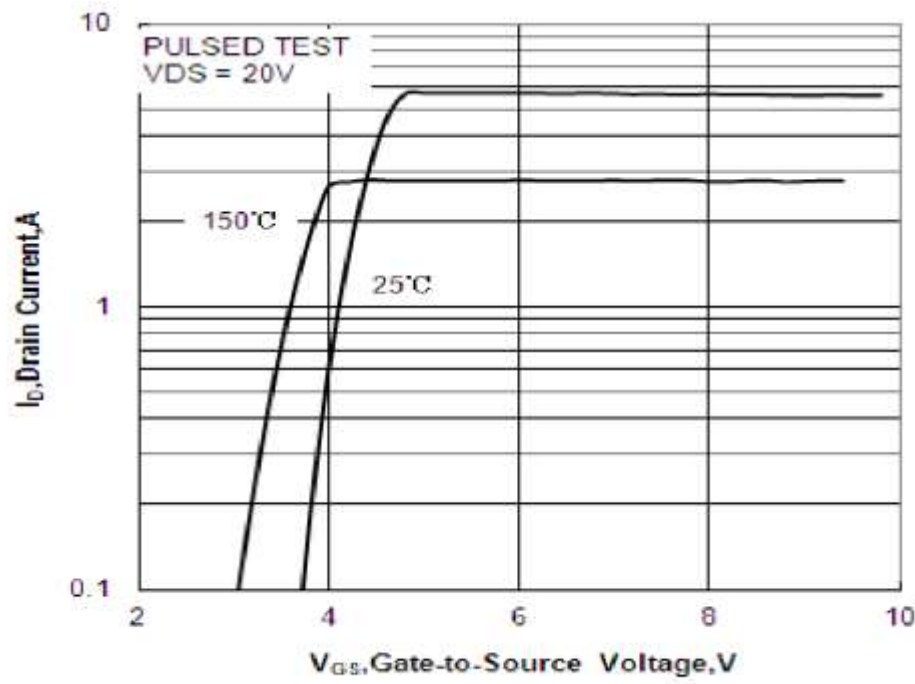
Figure 6 Typical Transfer Characteristics
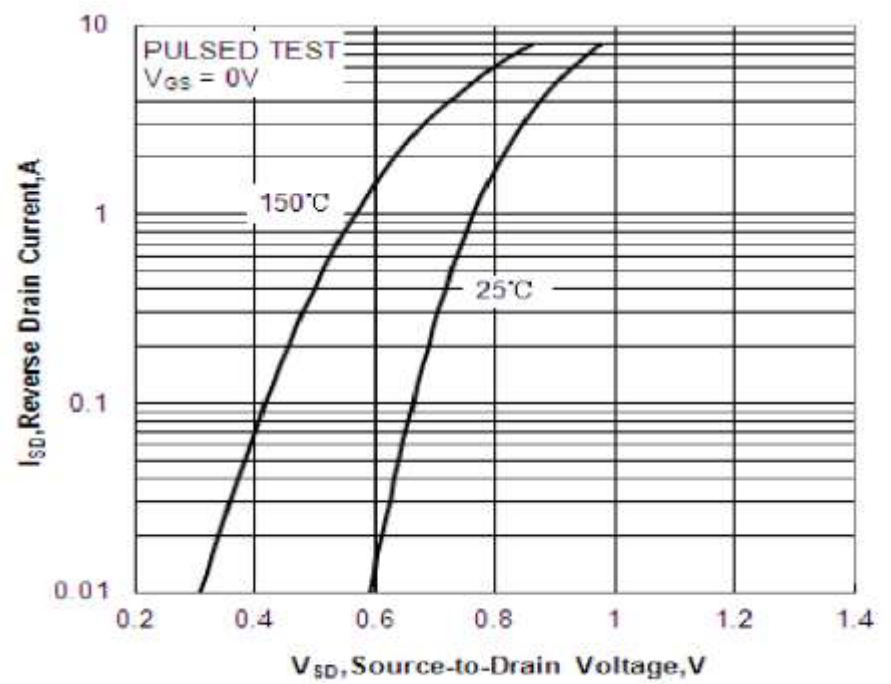
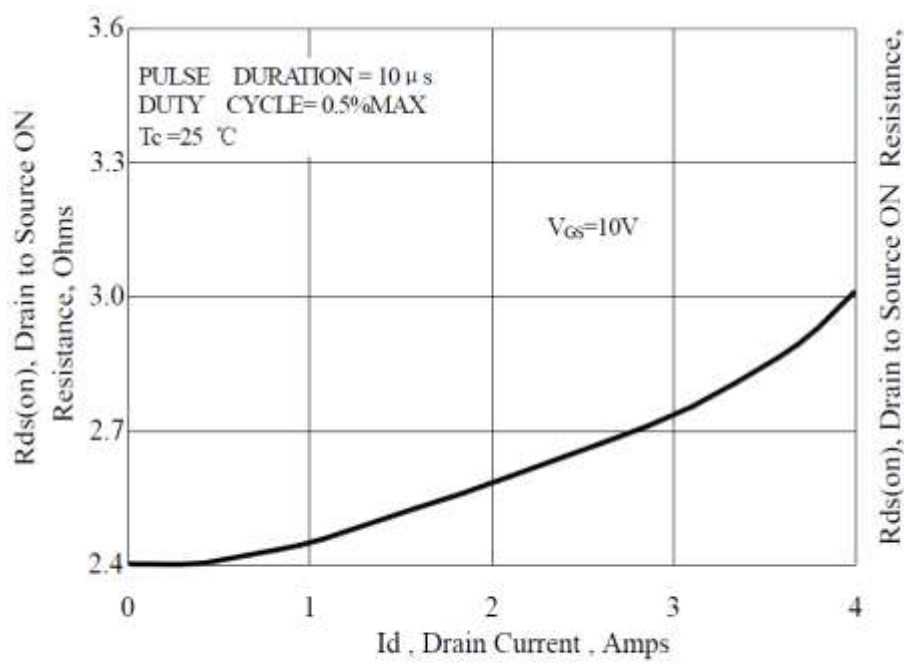Figure 7 Typical Body Diode Transfer Characteristics
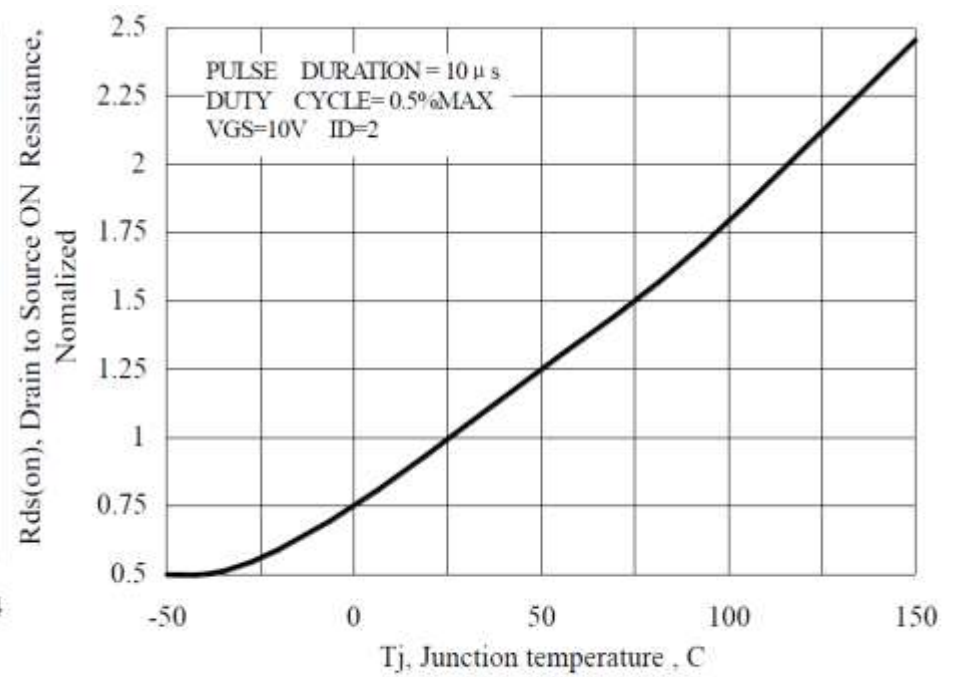

Figure 8 Typical Drain to Source ON Resistance vs Drain Current

Figure 9 Typical Drian to Source on Resistance vs Junction Temperature
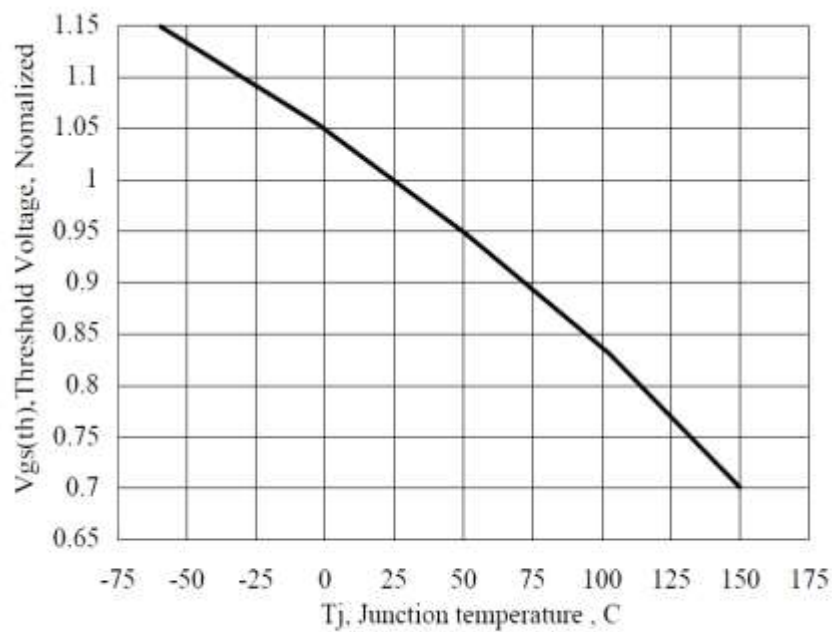
Figure 10 Typical Theshold Voltage vs Junction Temperature
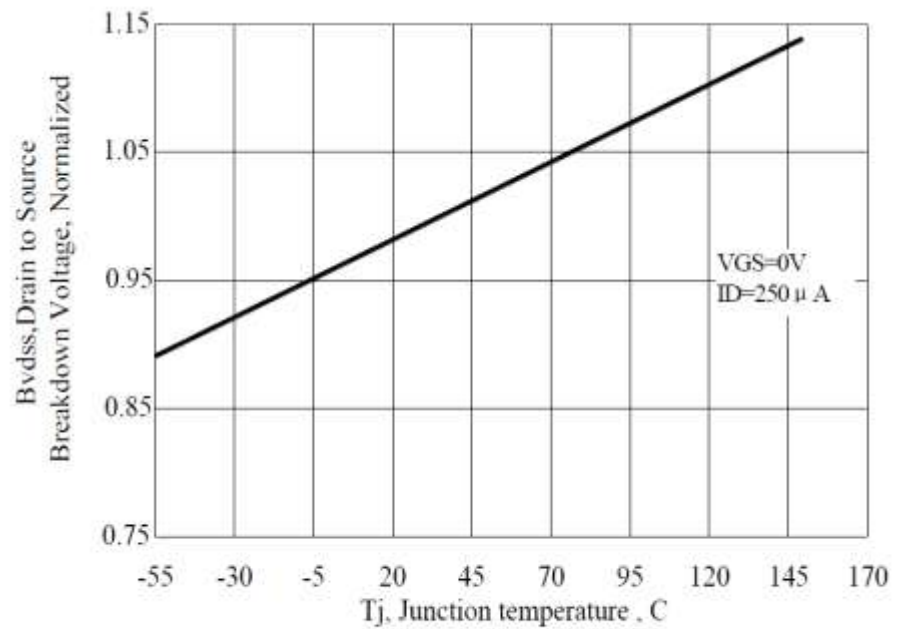
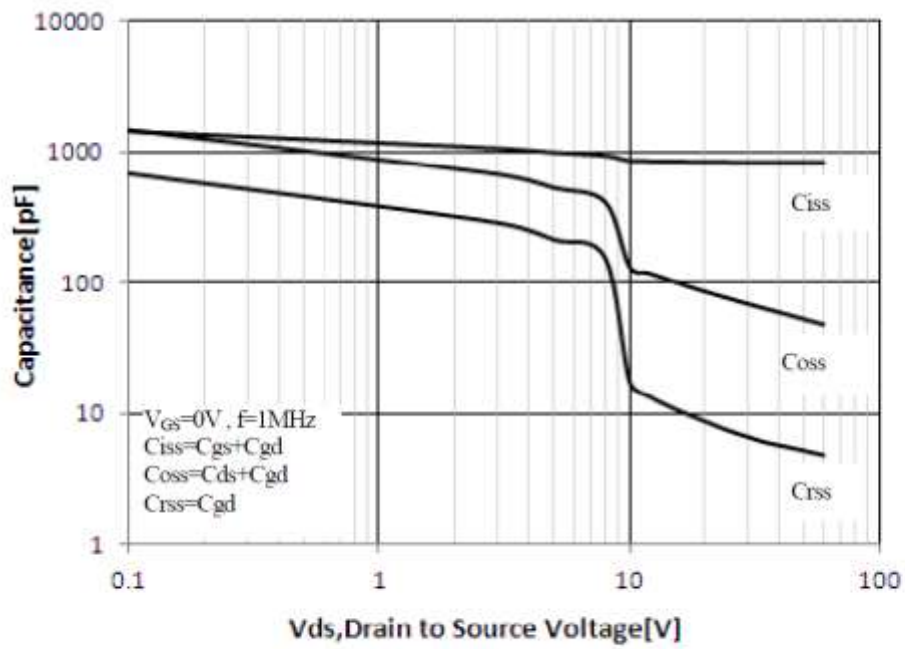Figure 11 Typical Breakdown Voltage vs Junction Temperature

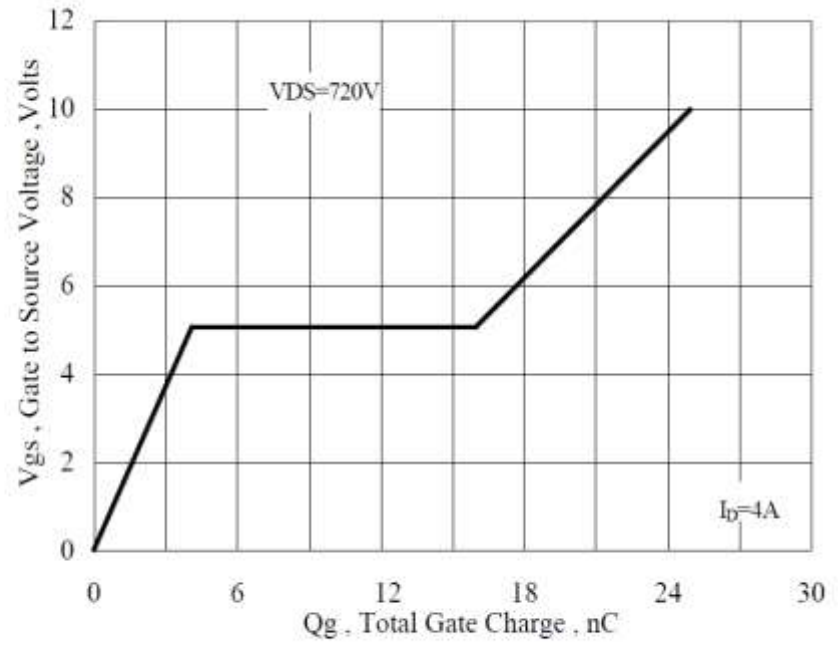Figure 12 Typical Capacitance vs Drain to Source Voltage

Figure 13 Typical Gate Charge vs Gate to Source Voltage
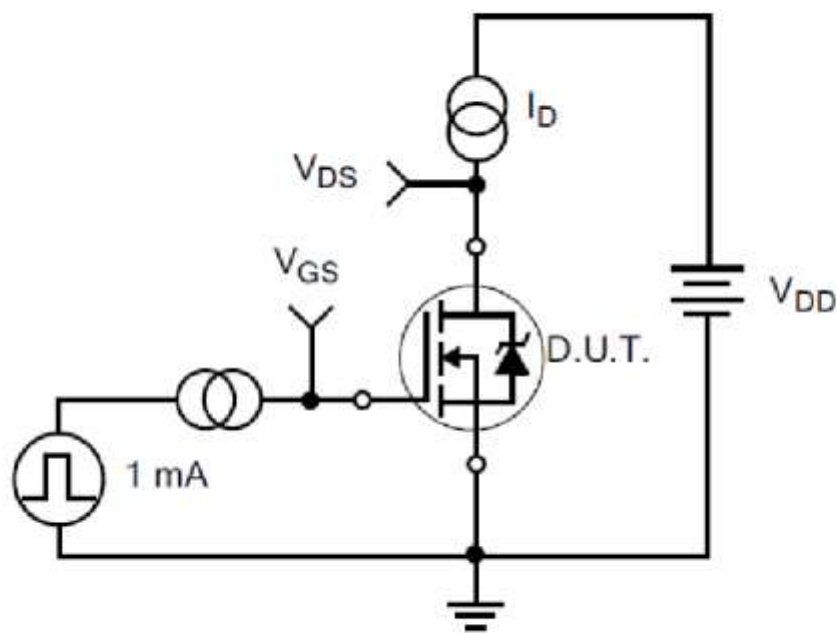
Test Circuit and Waveform
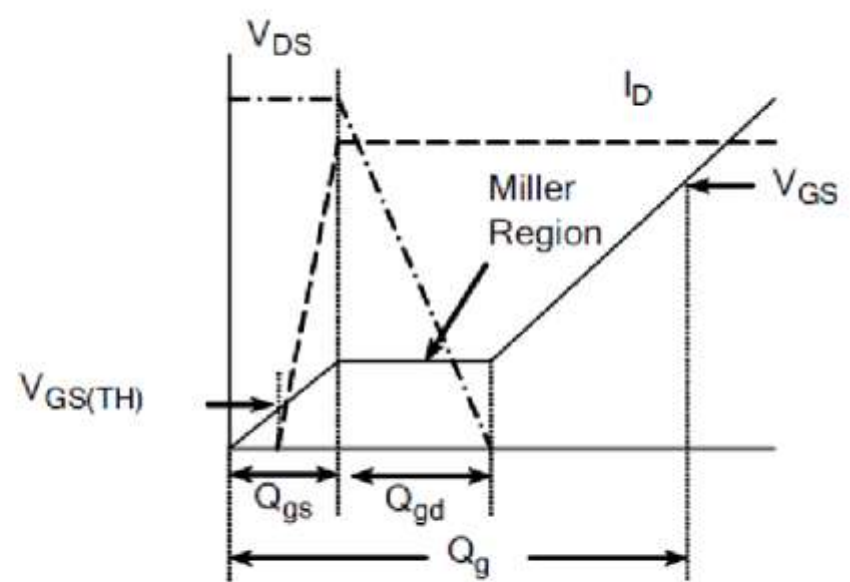

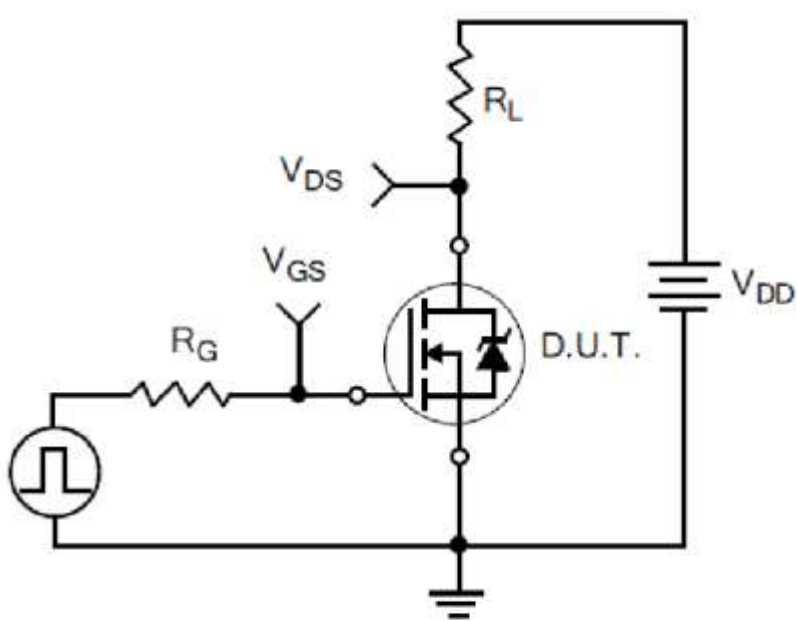**Figure 14. Gate Charge Test Circuit**

Figure 15. Gate Charge Waveforms

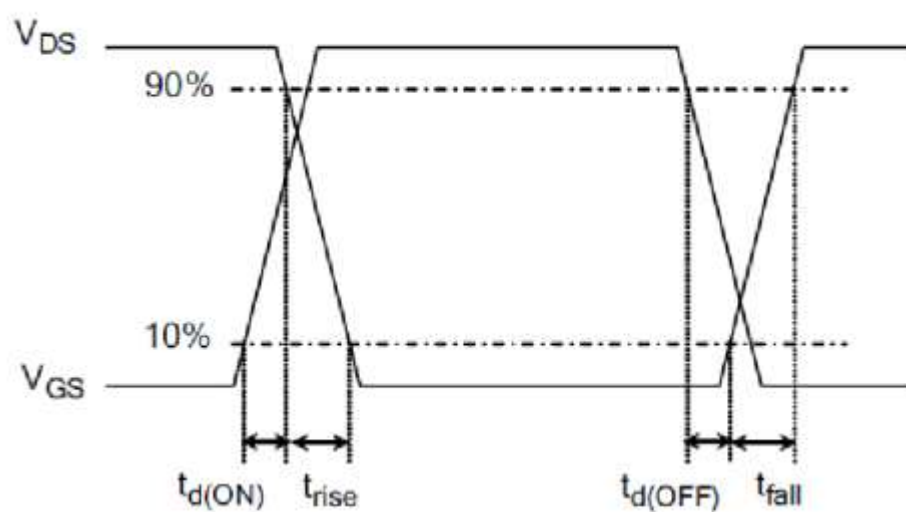**Figure 16. Resistive Switching Test Circuit**

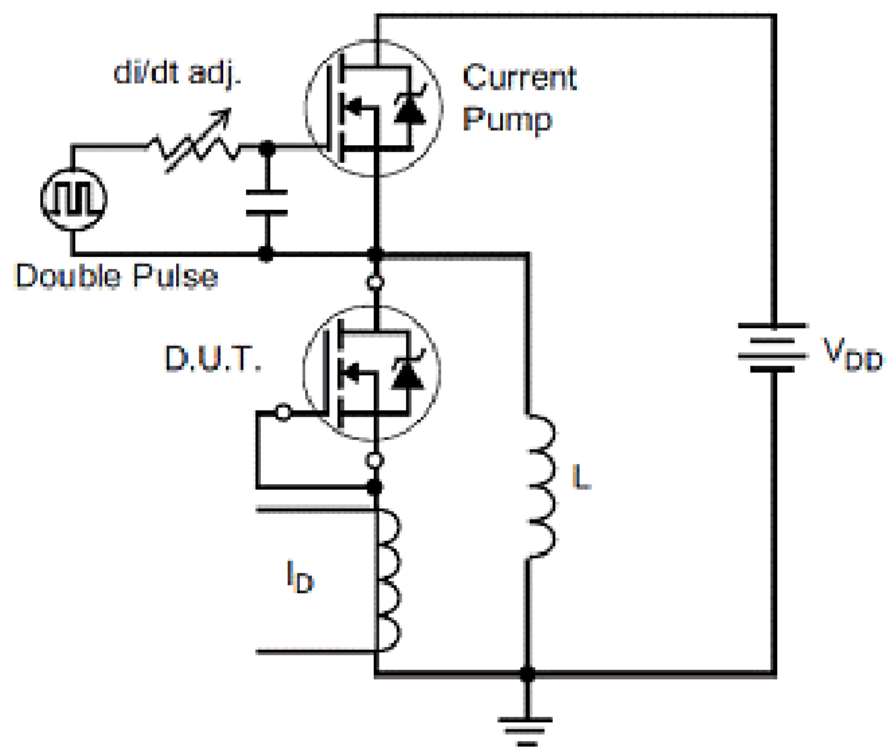**Figure 17. Resistive Switching Waveforms**

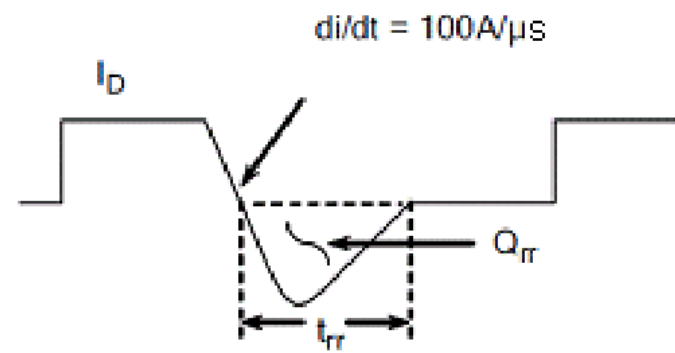**Figure 18. Diode Reverse Recovery Test Circuit**

Figure 19. Diode Reverse Recovery Waveform

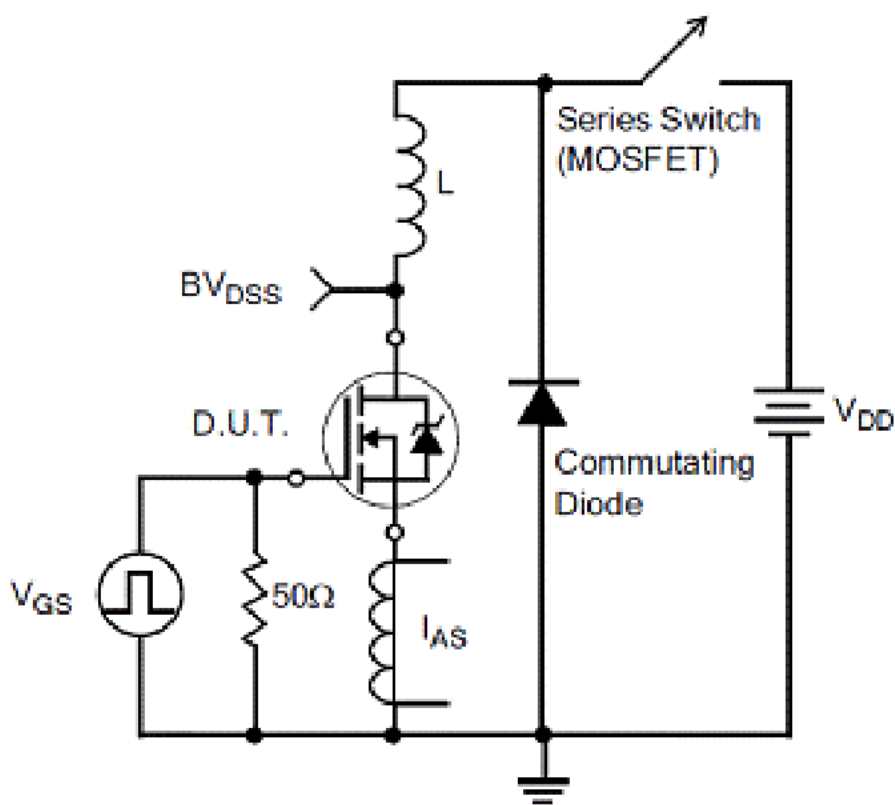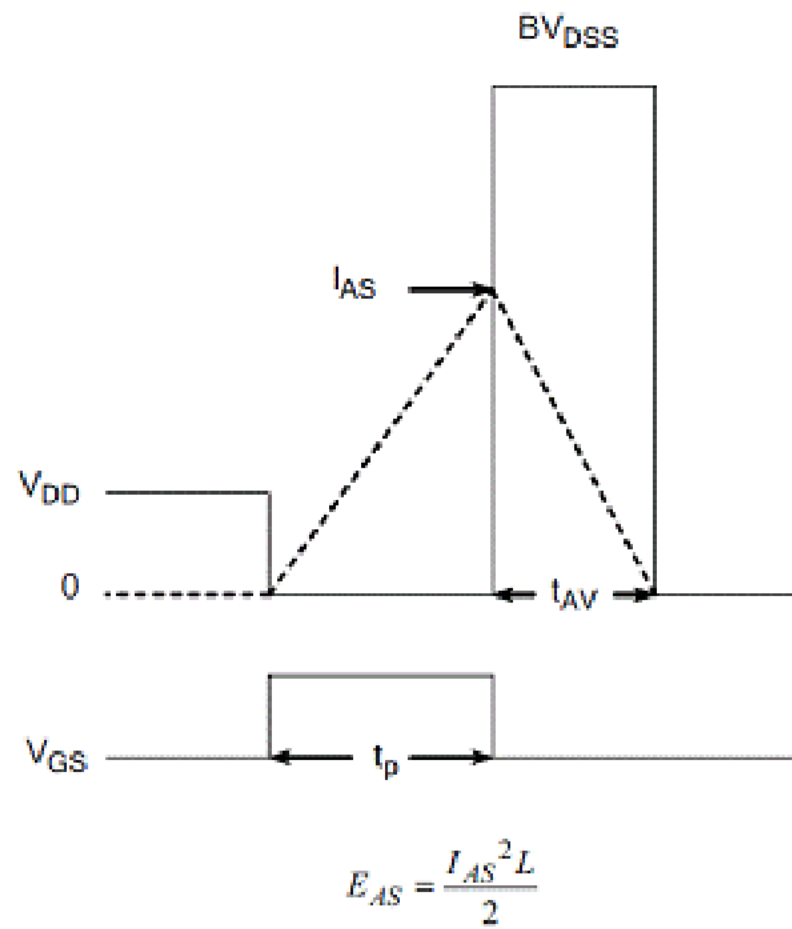**Figure20.Unclamped Inductive Switching Test Circuit**

$$E_{AS} = \frac{I_{AS}^2 L}{2}$$

Figure21.Unclamped Inductive Switching Waveform

印记 Marking:

飞虹LOGO
FEIHONG LOGO

生产批次代码
ASSEMMBLY
LOT CODE

XXXXXX

产品代码
PRODUCT CODE

A

FHF4N90

产品型号
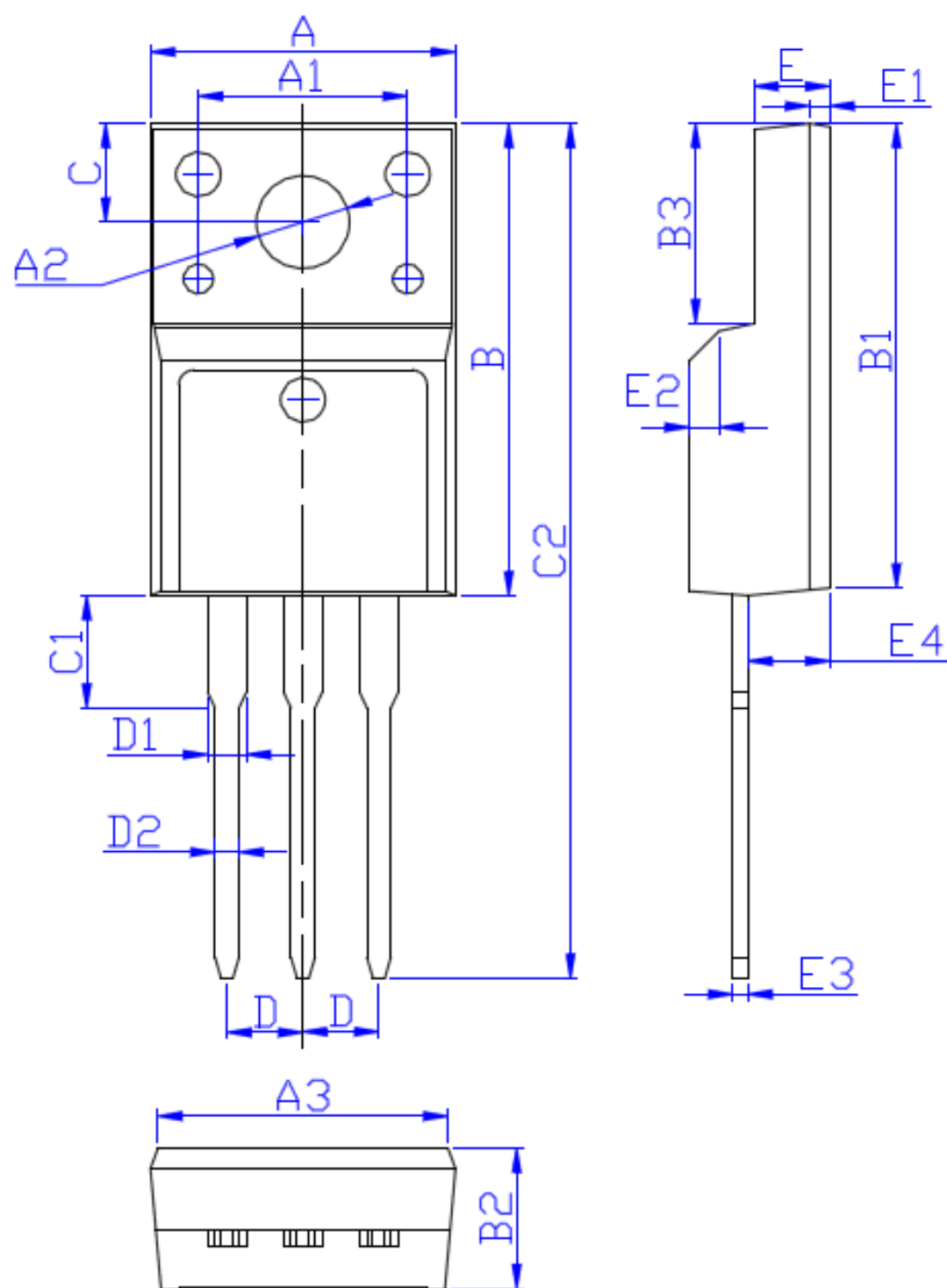PART.NO
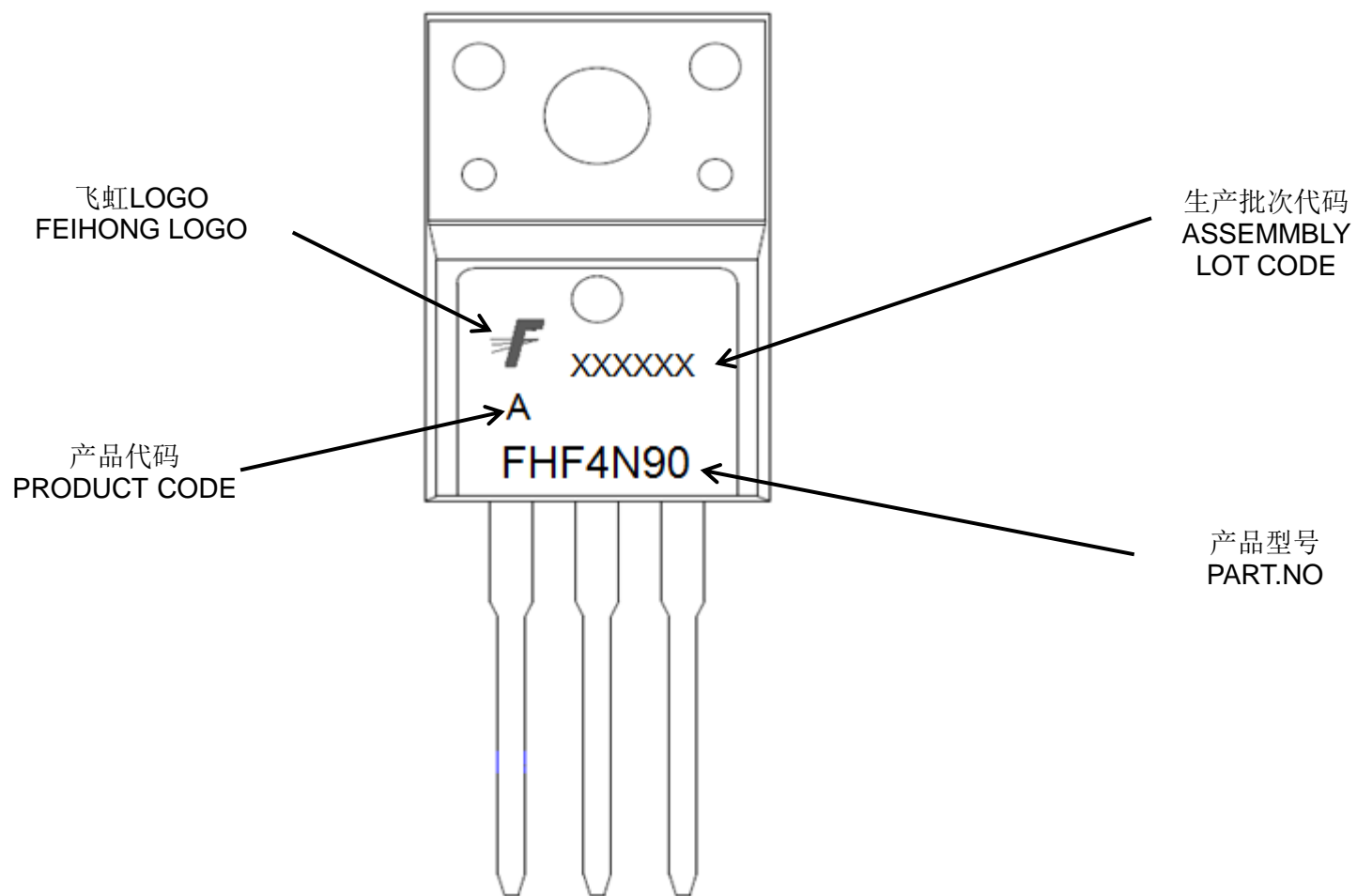
外形尺寸：

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）

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