N 沟道增强型场效应晶体管
N-CHANNEL MOSFET
FHP20N60B/ FHF20N60B/FHA20N60B

主要参数 MAIN CHARACTERISTICS

ID	20A
VDSS	600V
Rdson-typ（@Vgs=10V）	0.32Ω
P_D(T_C=25℃)	220W

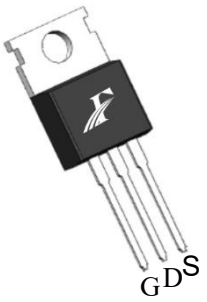
产品特性 FEATURES

低栅极电荷	Low gate charge
低 Crss (典型值 6pF)	Low Crss (typical 6pF)
开关速度快	Fast switching
100%经过雪崩测试	100% avalanche tested
100%经过热阻测试	100% DVDS tested
100%经过 RG 测试	100% Rg tested
高抗 dv/dt 能力	Improved dv/dt capability
RoHS 产品	RoHS product

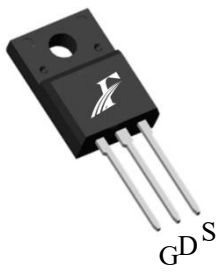
用途 APPLICATION

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

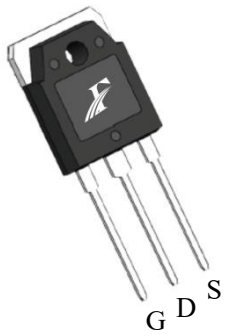
封装形式 Package



TO-220
FHP series

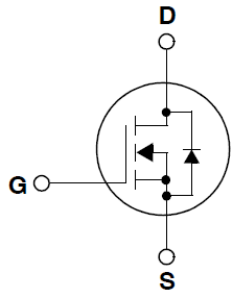


TO-220F
FHF series



TO-3PN
FHA 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**
		FHF20N60B	**FHP20N60B**	**FHA20N60B**	
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℃）	20			A
	I_D（T_C=100℃)	12.5			A
最大脉冲漏极电流（注 1） Drain Current – pulse（note 1）	I_{DM}	80			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}	1200			mJ
雪崩电流（注 1） Avalanche Current（note 1）	I_{AR}	15.5			A
重复雪崩能量（注 1） Repetitive Avalanche Current（note 1）	E_{AR}	90			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℃）	48	220	300	W
	-Derate above 25℃	0.38	1.79	2.4	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						
漏一源击穿电压 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	$\Delta BV_{DSS}/\Delta$ TJ	I_D=250μA, referenced to 25℃	-	0.60	-	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℃	-	-	10	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	μA
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=10A	-	0.32	0.4	Ω
动态特性 Dynamic Characteristics						
输入电容 Input capacitance	Ciss	V_{DS}=25V, V_{GS} =0V, f=1.0MHz	-	3710	-	pF
输出电容 Output capacitance	Coss		-	255	-	
反向传输电容 Reverse transfer capacitance	Crss		-	6	-	
开关特性 Switching Characteristics						
延迟时间 Turn-On delay time	td(on)	V_{DS}=300V, I_D=19.2A, R_G=25Ω （note 4，5）	-	48	-	ns
上升时间 Turn-On rise time	tr		-	75	-	ns
延迟时间 Turn-Off delay time	td(off)		-	148	-	ns
下降时间 Turn-Off Fall time	tf		-	82	-	ns
栅极电荷总量 Total Gate Charge	Qg	V_{DS} =480V , I_D=20A , V_{GS} =10V （note 4，5）	-	60	-	nC
栅一源电荷 Gate-Source charge	Qgs		-	18.4	-	nC
栅一漏电荷 Gate-Drain charge	Qgd		-	34	-	nC
漏一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		-	-	20	A
正向最大脉冲电流 Maximum Pulsed Drain-Source Diode Forward Current	I_{SM}		-	-	80	A
正向压降 Drain-Source Diode Forward Voltage	V_{SD}	V_{GS}=0V, I_S=20A	-	-	1.2	V
反向恢复时间 Reverse recovery time	trr	V_{GS}=0V, I_S=20A ,dI_F/dt=100A/μs (note 4)	-	490	-	ns
反向恢复电荷 Reverse recovery charge	Qrr		-	5.6	-	μC

热特性 THERMAL CHARACTERISTIC

项目 **Parameter**	符号 **Symbol**	**FHF20N60B**	**FHP20N60B**	**FHA20N60B**	单位 **Unit**
结到管壳的热阻 Thermal Resistance, Junction to Case	Rth(j-c)	2.6	0.56	0.42	℃/W
结到环境的热阻 Thermal Resistance, Junction to Ambient	Rth(j-A)	62.5	62.5	40	℃/W

注释:
Notes:

1：脉冲宽度由最高结温限制
2：L=10mH, V_{DD}=50V, R_G=25 Ω,起始结温 T_J=25℃
3：I_{SD} ≤20A,di/dt ≤100A/μs,V_{DD}≤BV_{DSS},起始结温 T_J=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

1：Pulse width limited by maximum junction temperature
2：L=10mH, V_{DD}=50V, R_G=25 Ω ,Start T_J=25℃.
3：I_{SD} ≤20A,di/dt ≤100A/μs,V_{DD}≤BV_{DSS}, 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 1a Safe Operating Area (TO-3PN)

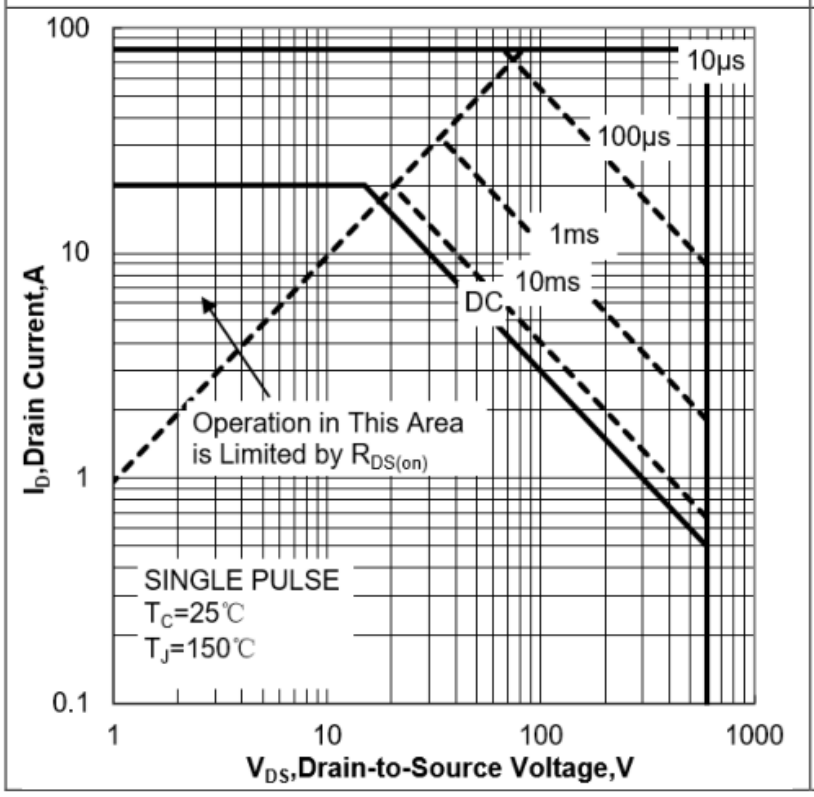


Figure 1b Safe Operating Area (TO-220)

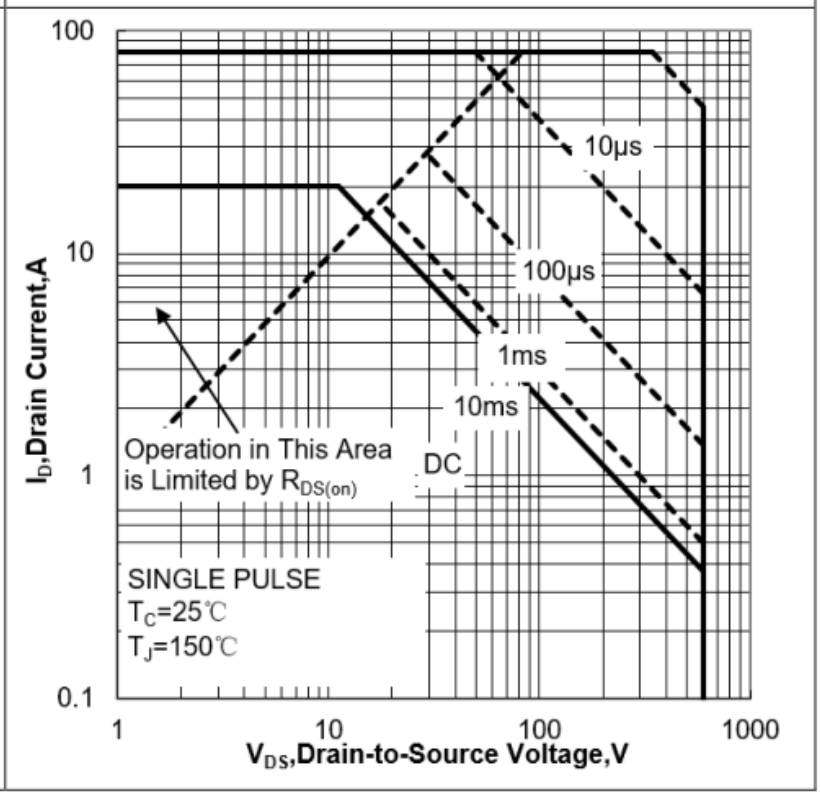


Figure 1c Safe Operating Area (TO-220F)

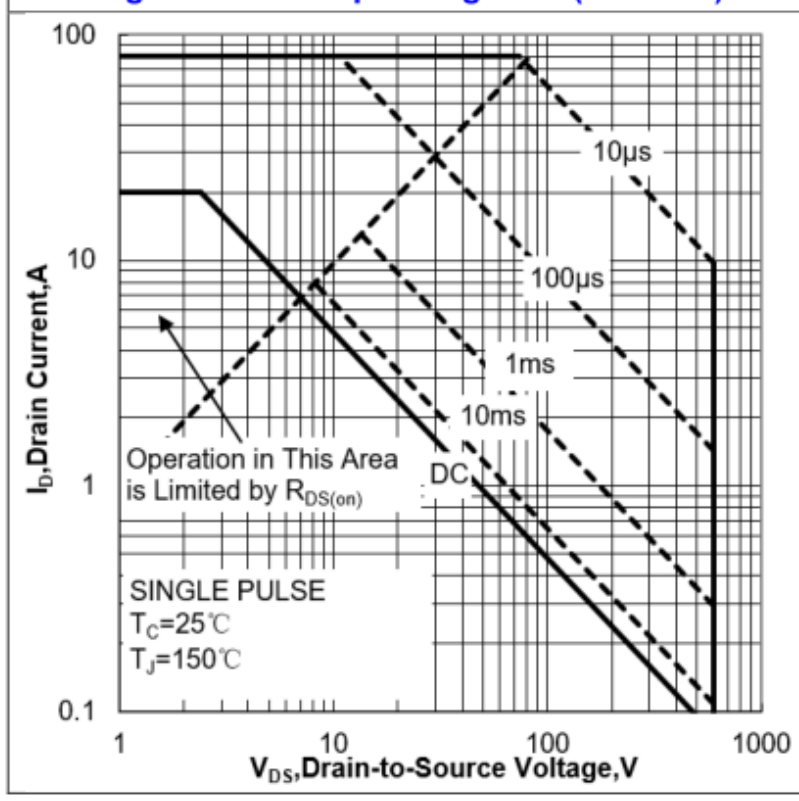


Figure 2a Power Dissipation (TO-3PN)

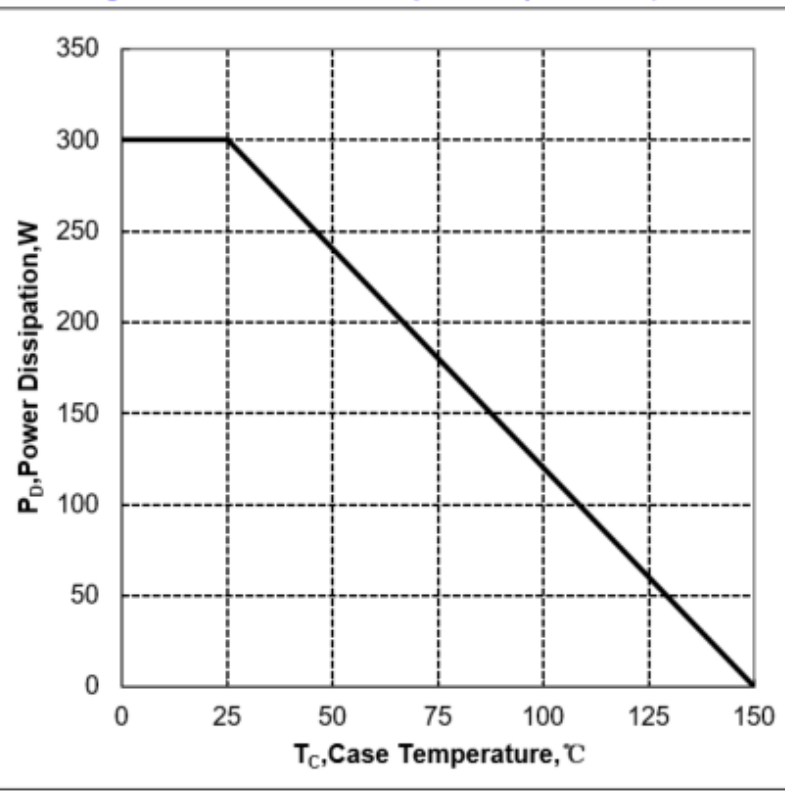


Figure 2b Power Dissipation (TO-220)

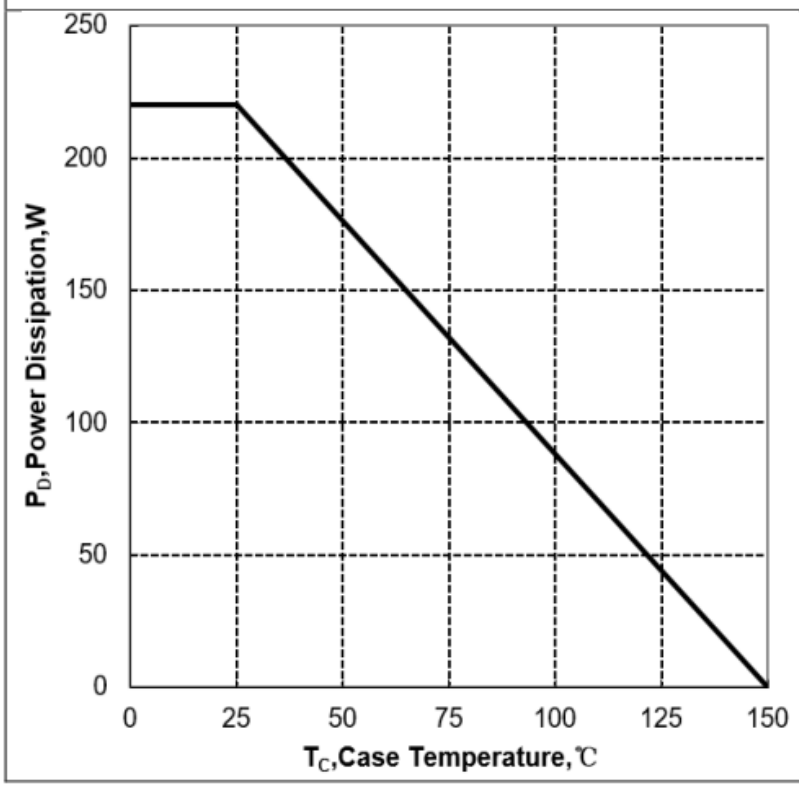


Figure 2c Power Dissipation (TO-220F)

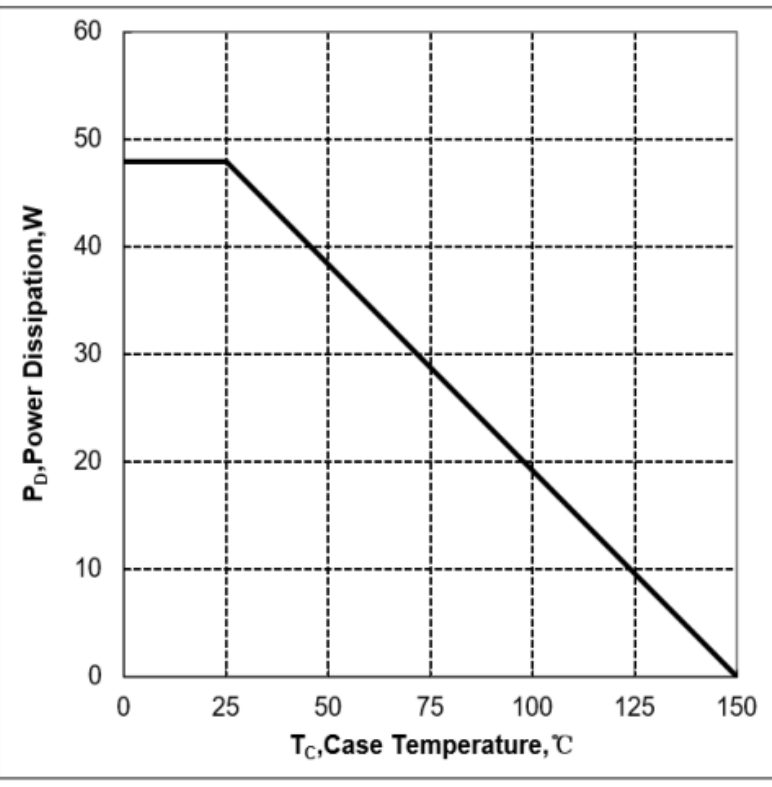


Figure 3a Max Thermal Impendance (TO-247&TO-3PN)

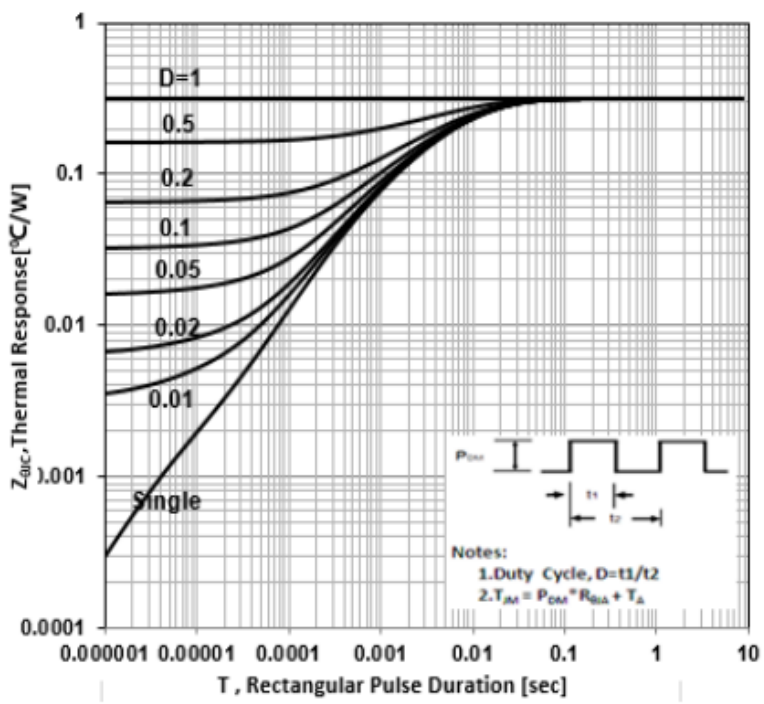


Figure 3b Max Thermal Impendance (TO-220)

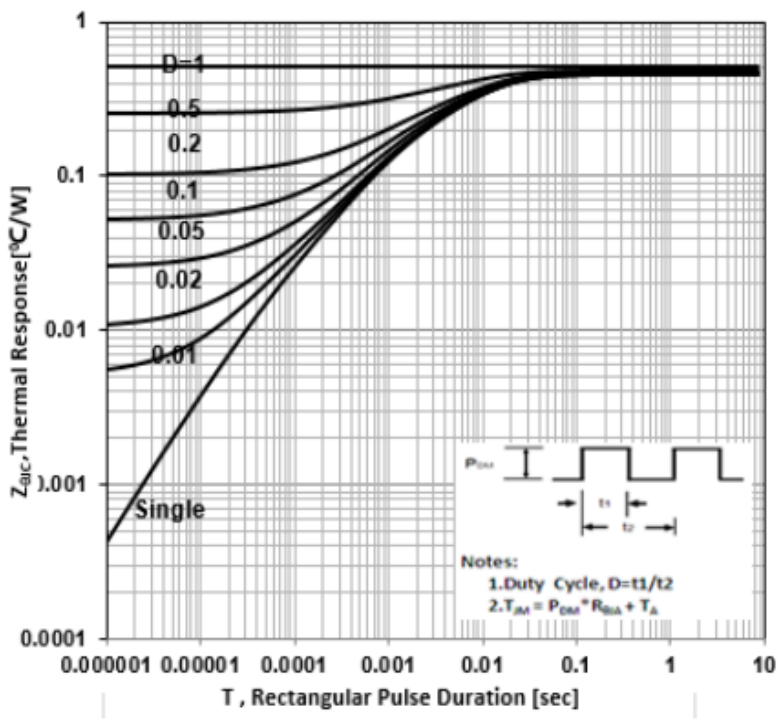


Figure 3c Max Thermal Impendance (TO-220F)

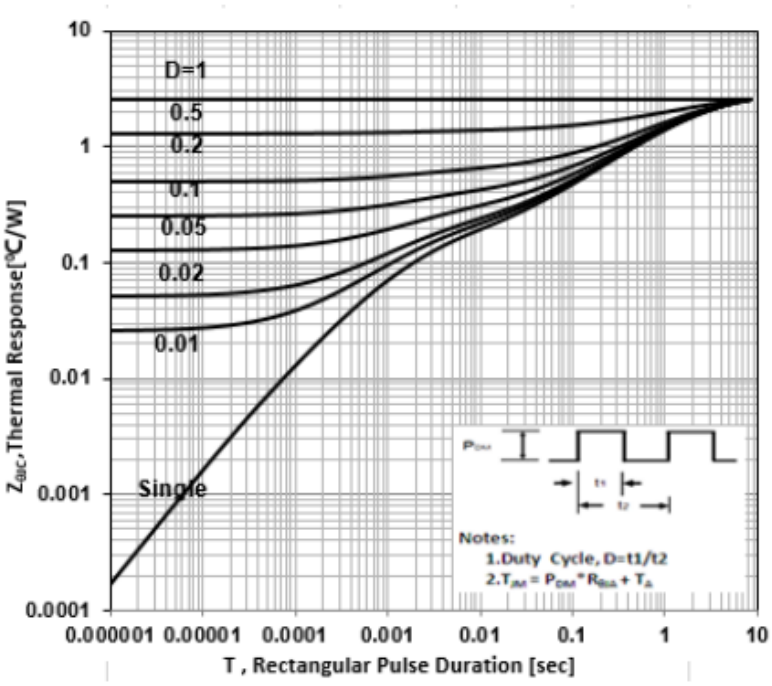


Figure 4 Typical Output Characteristics

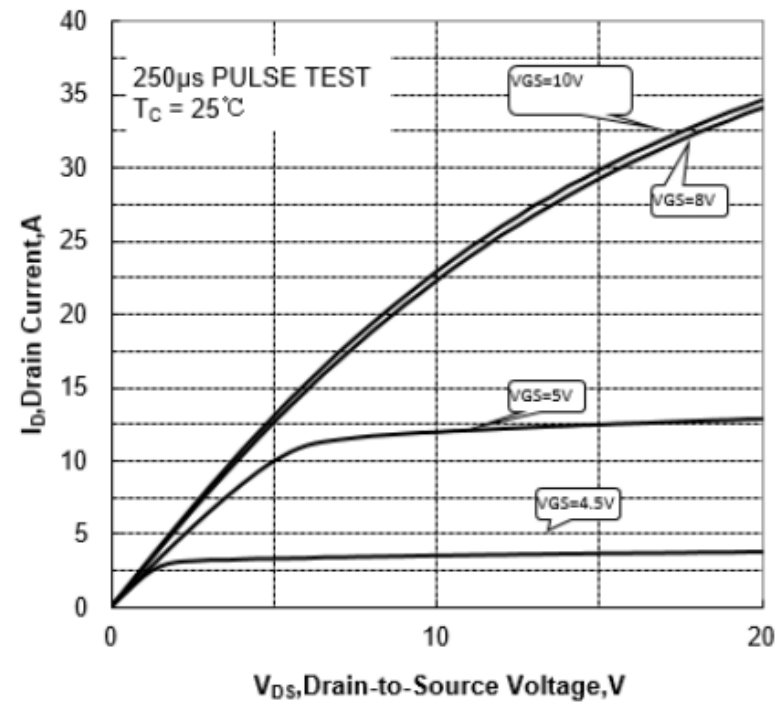


Figure 5 Typical Transfer Characteristics

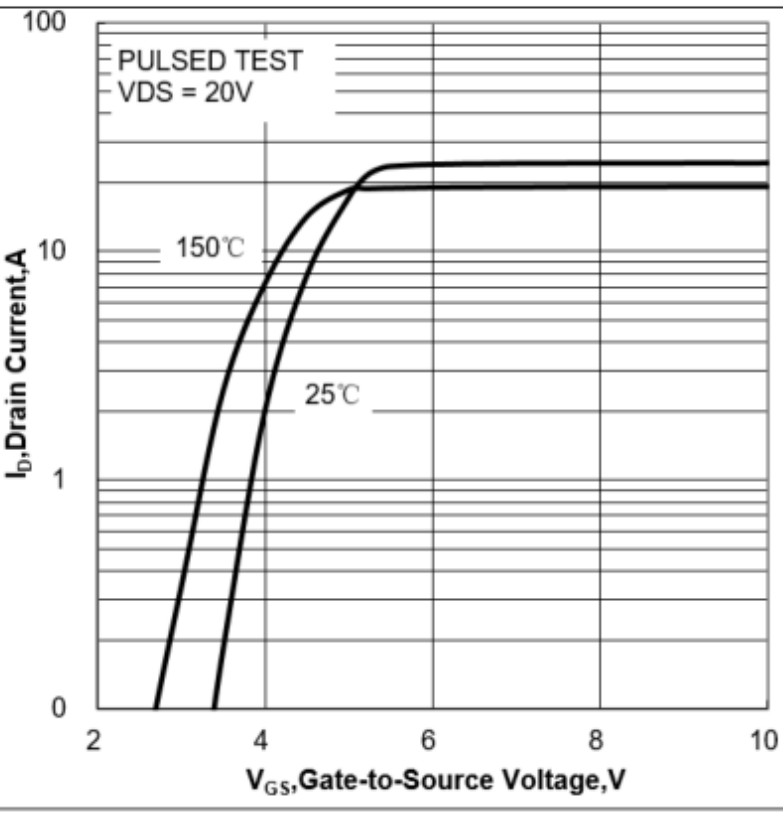


Figure 6 Typical Drain to Source ON Resistance vs Drain Current

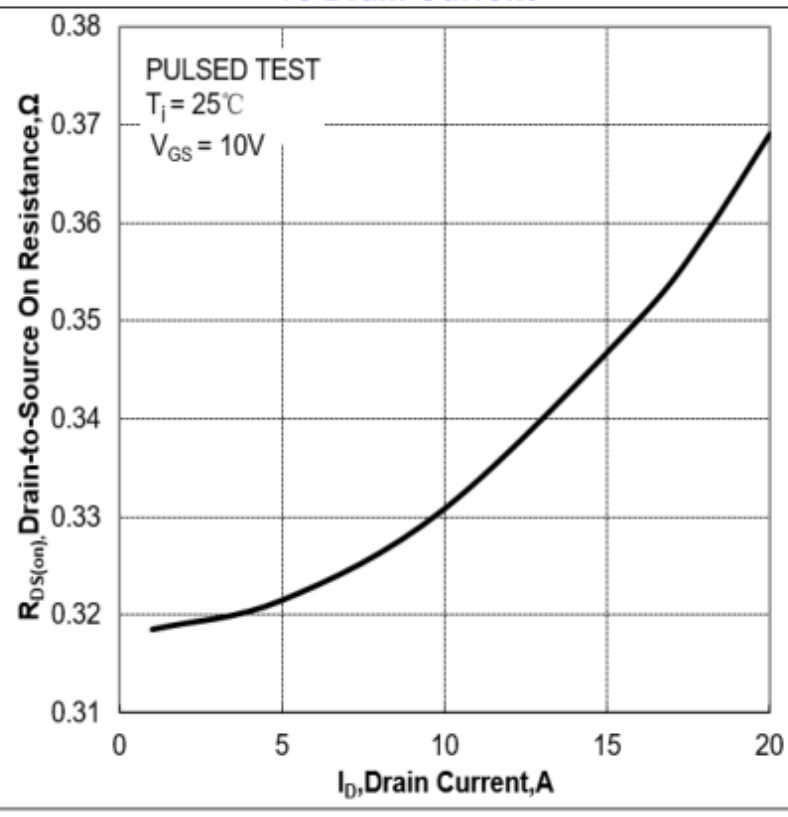


Figure 7 Typical Drian to Source on Resistance vs Junction Temperature

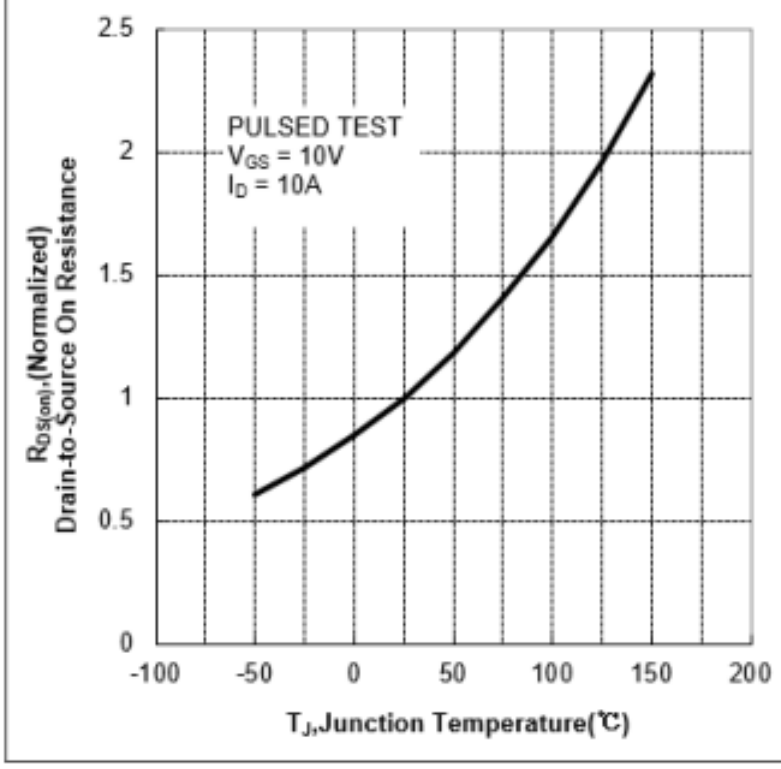


Figure 8 Typical Theshold Voltage vs Junction Temperature

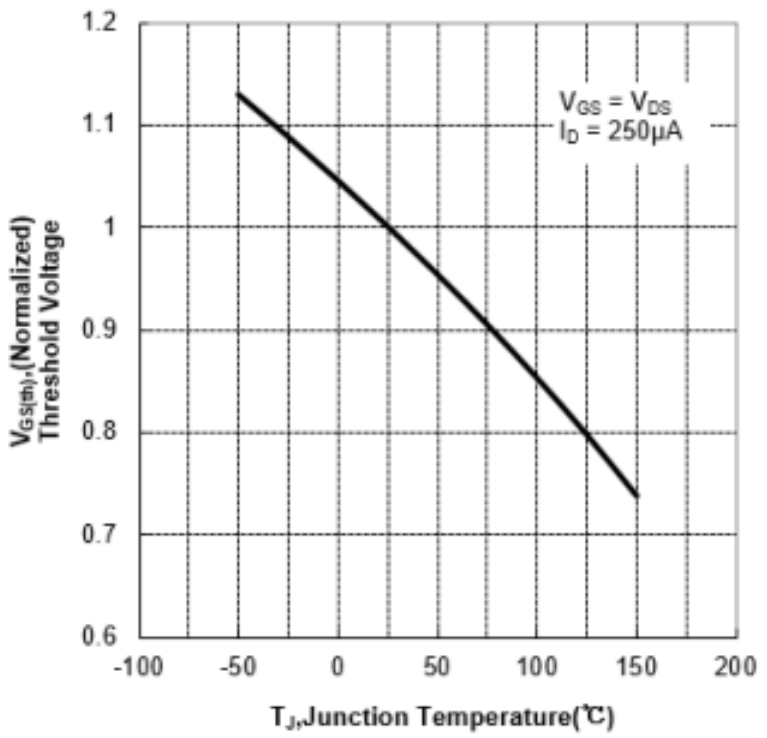


Figure 9 Typical Breakdown Voltage vs Junction Temperature

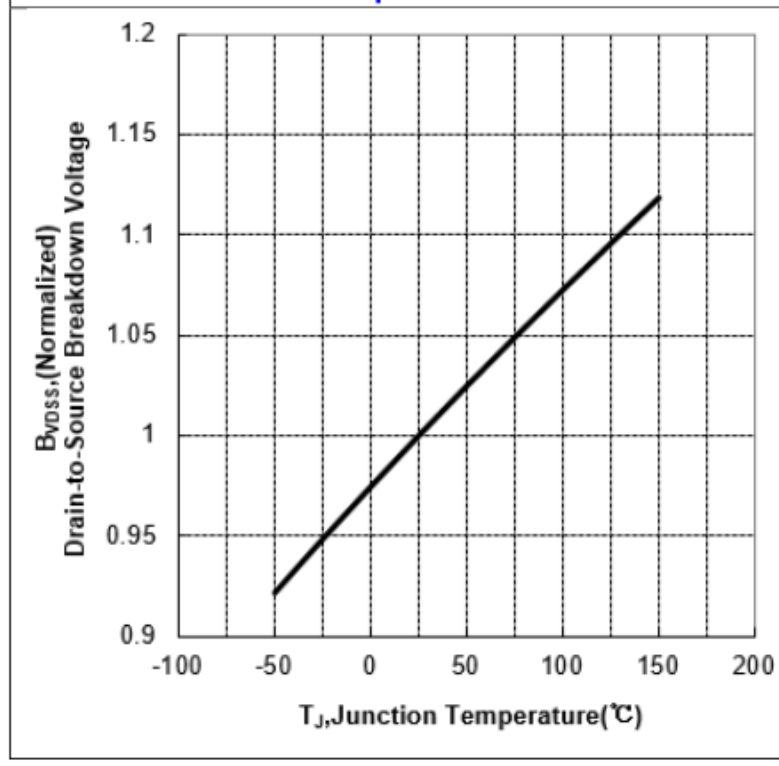


Figure 10 Typical Capacitance vs Drain to Source Voltage

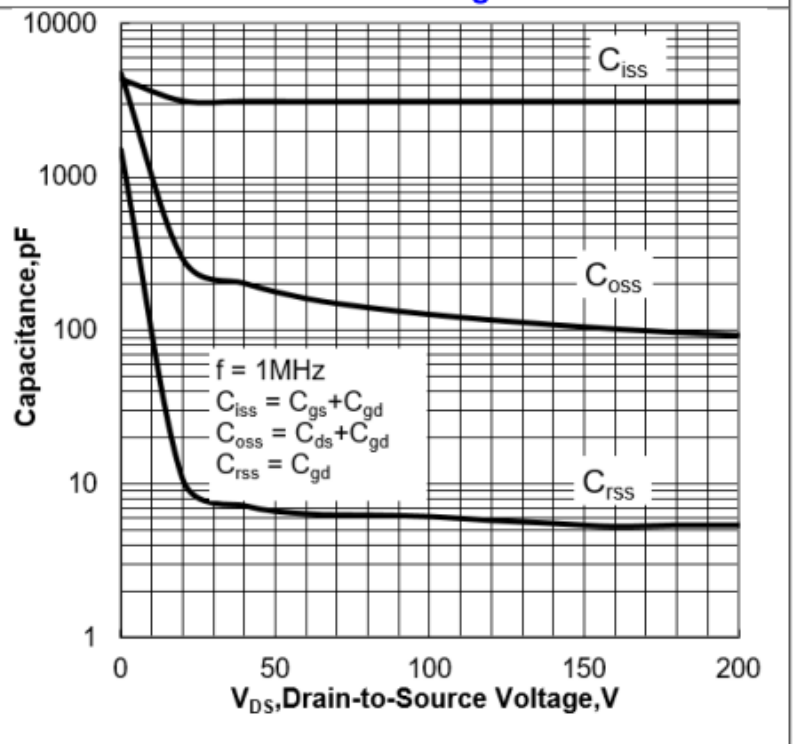
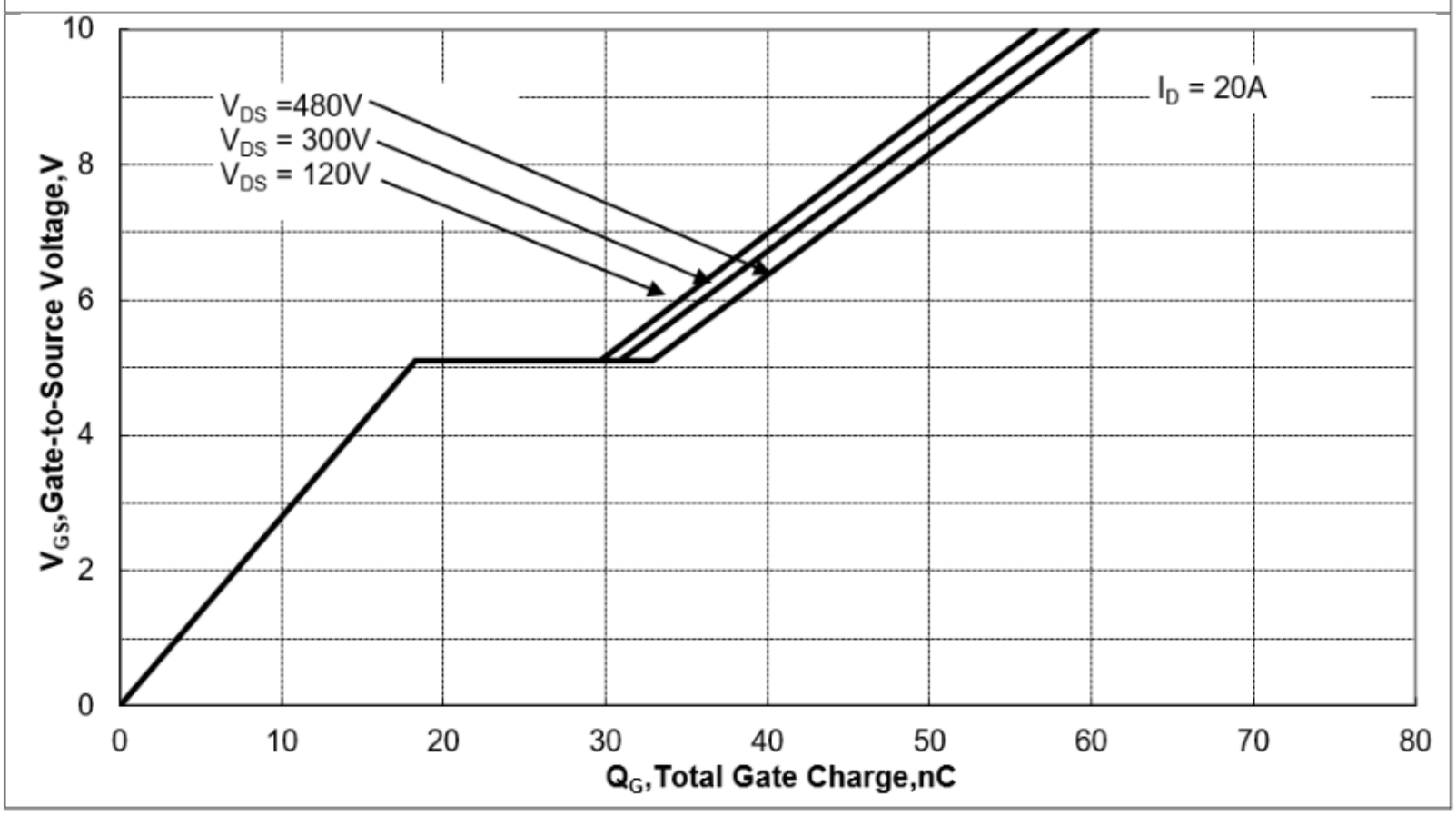


Figure 11 Typical Gate Charge vs Gate to Source Voltage



测试电路 Test circuits

Figure 12 Gate Charge Test Circuit

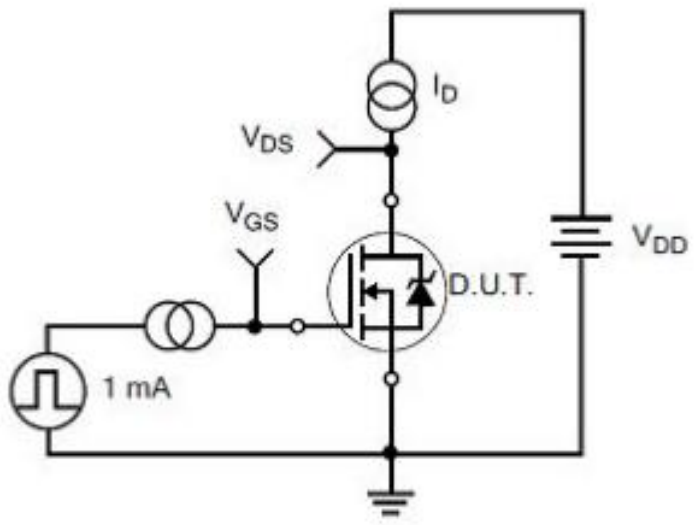


Figure 13 Gate Charge Waveforms

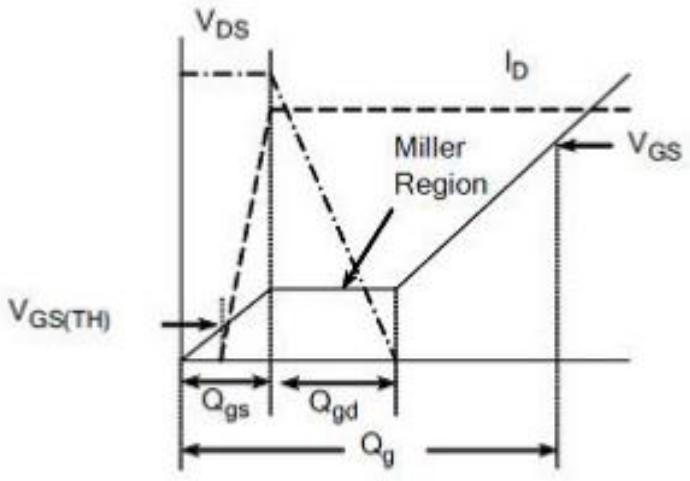


Figure 14 Resistive Switching Test Circuit

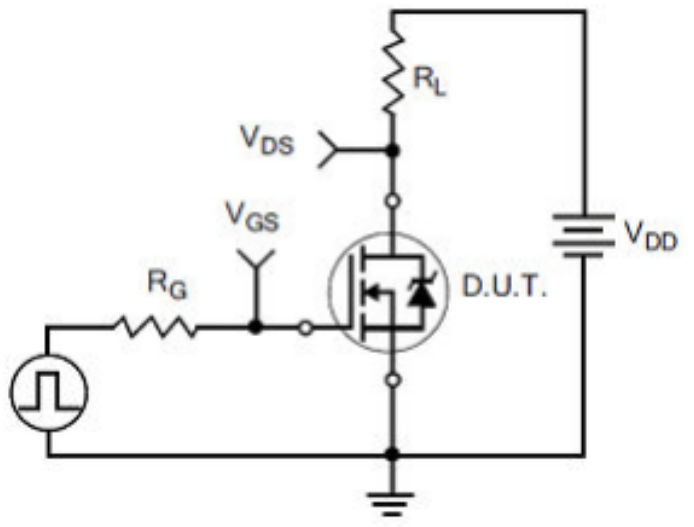


Figure 15 Resistive Switching Waveforms

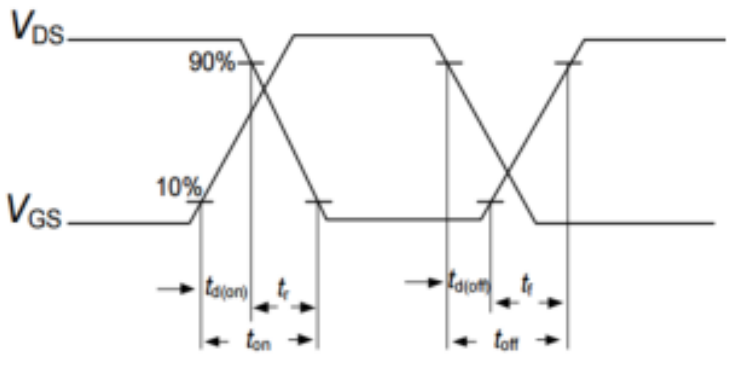


Figure 16 Diode Reverse Recovery Test Circuit

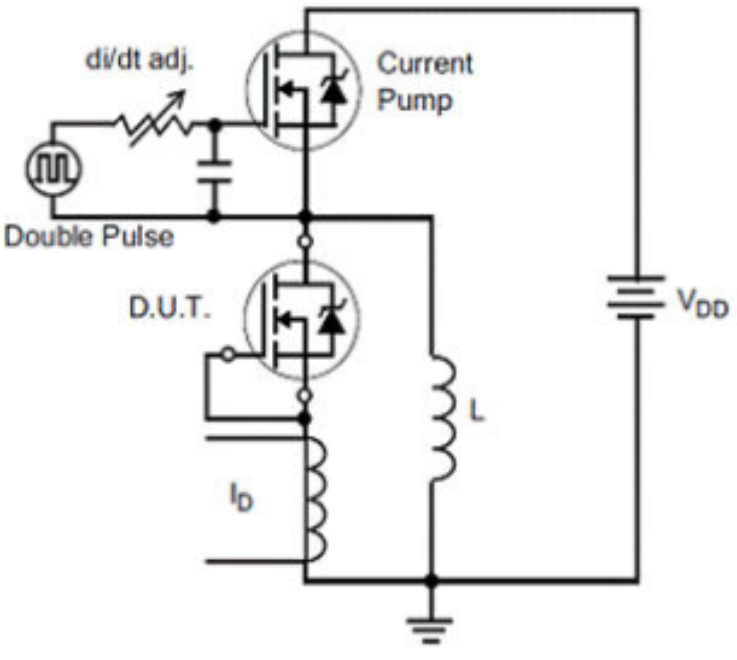


Figure 17 Diode Reverse Recovery Waveform

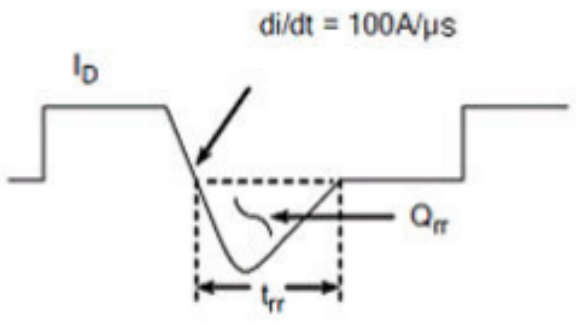


Figure 18 Unclamped Inductive Switching Test Circuit

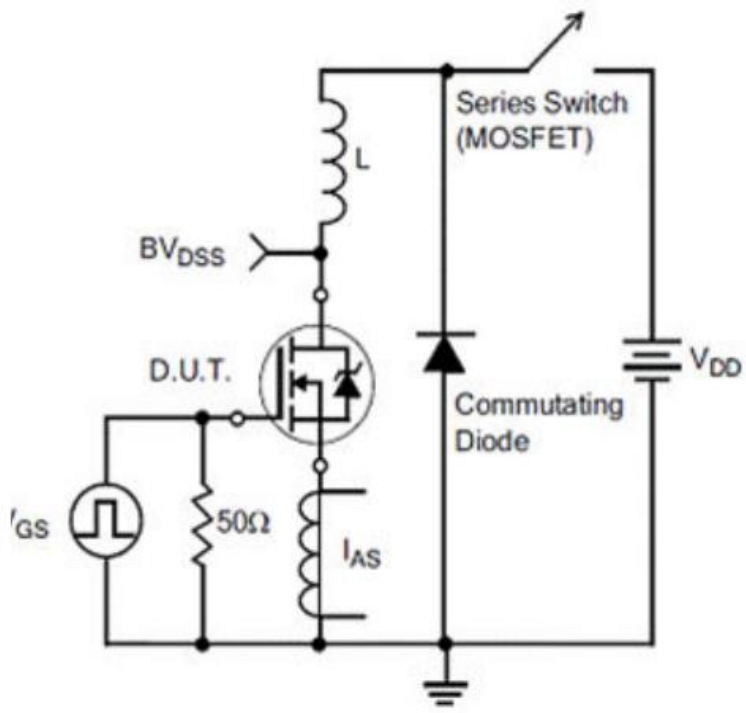
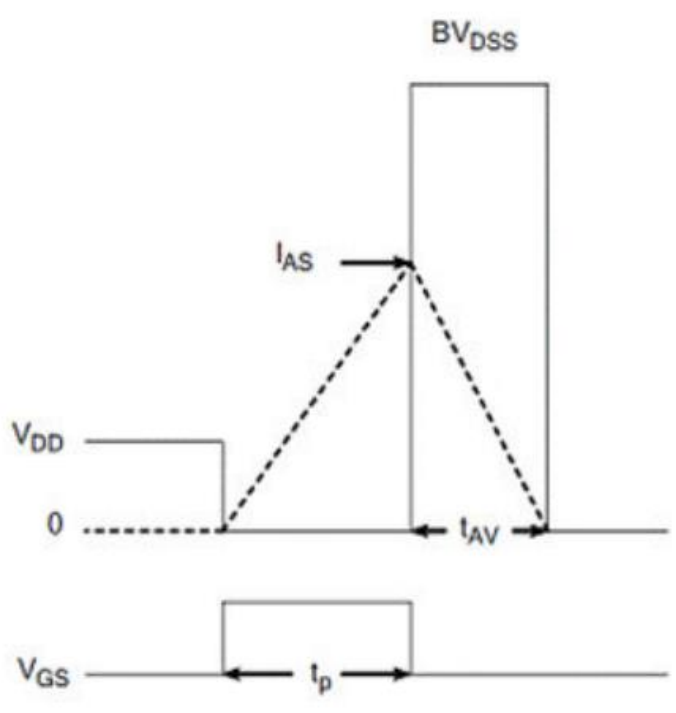
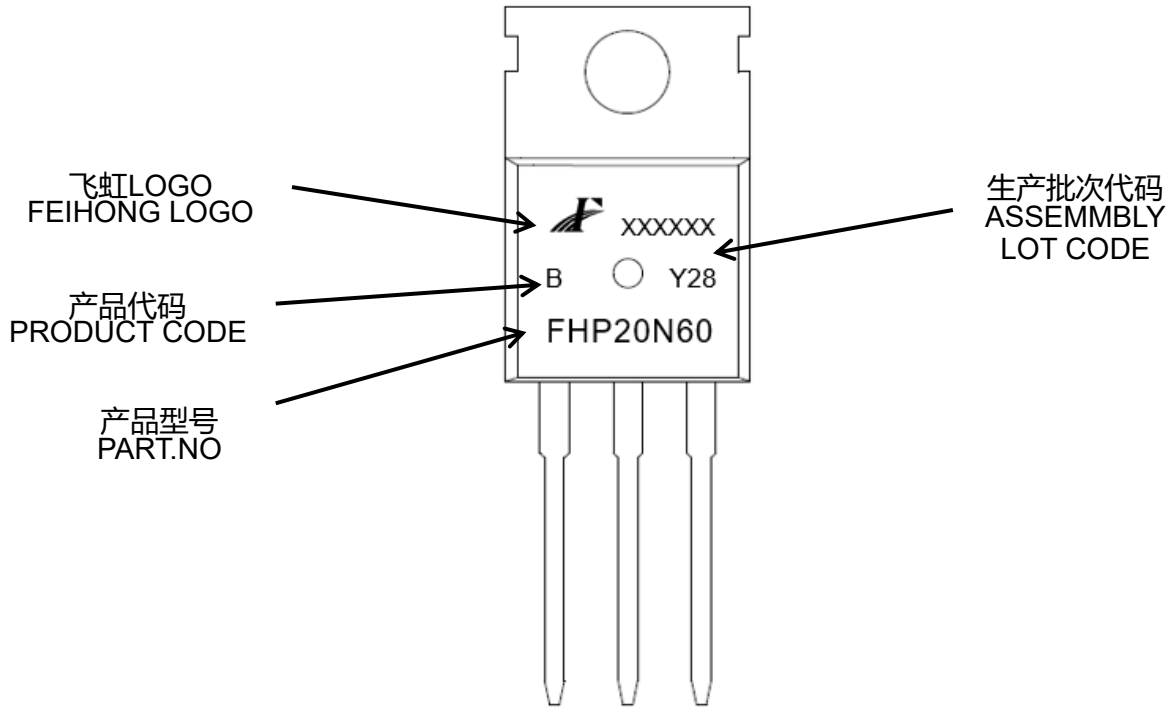


Figure 19 Unclamped Inductive Switching Waveform



印记 **Marking**


飞虹LOGO
FEIHONG LOGO
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PRODUCT CODE
产品型号
PART.NO
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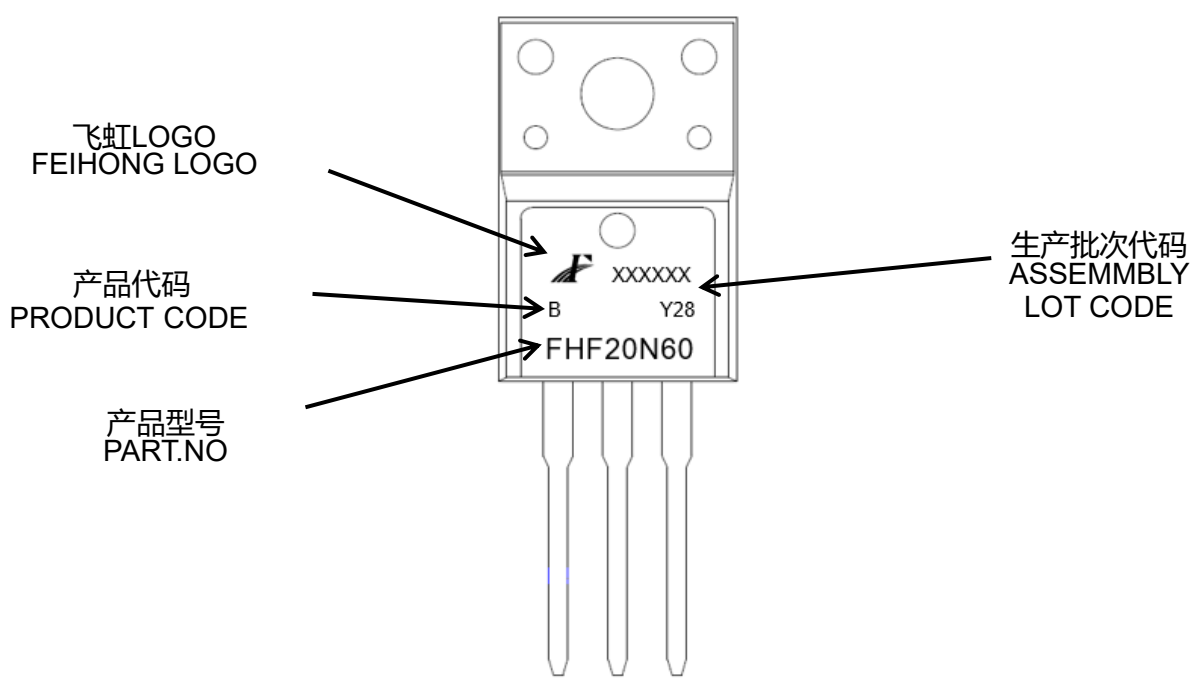
B
Y28
FHP20N60
生产批次代码
ASSEMMBLY
LOT CODE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生产批次代码
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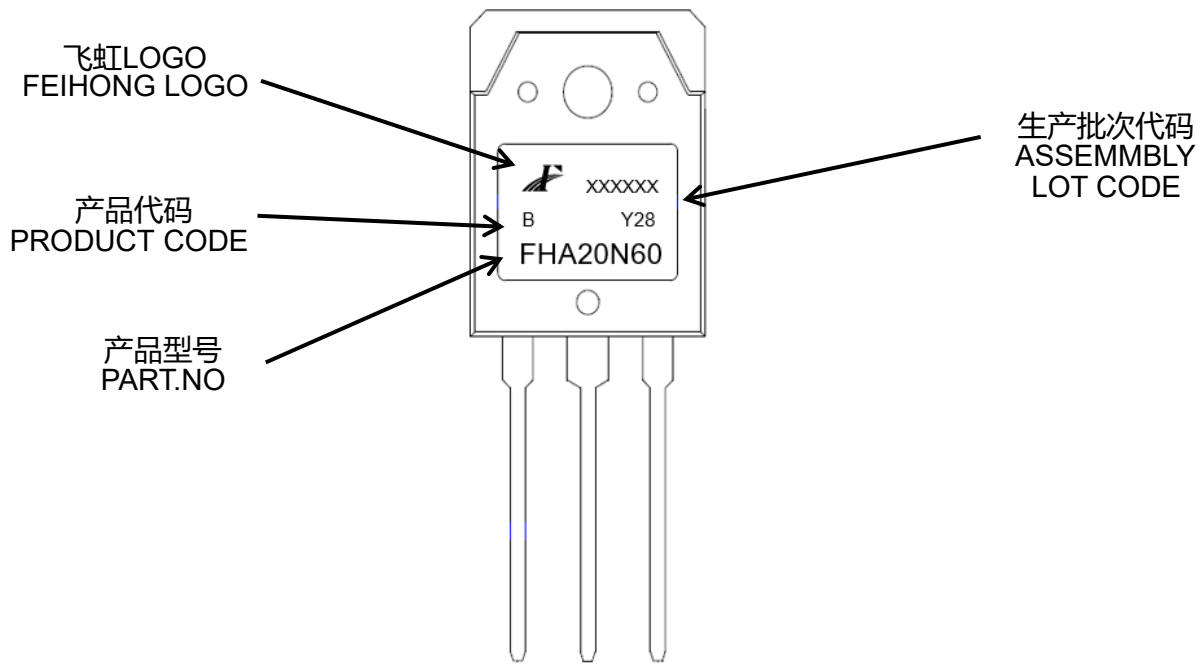
飞虹LOGO
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PRODUCT CODE
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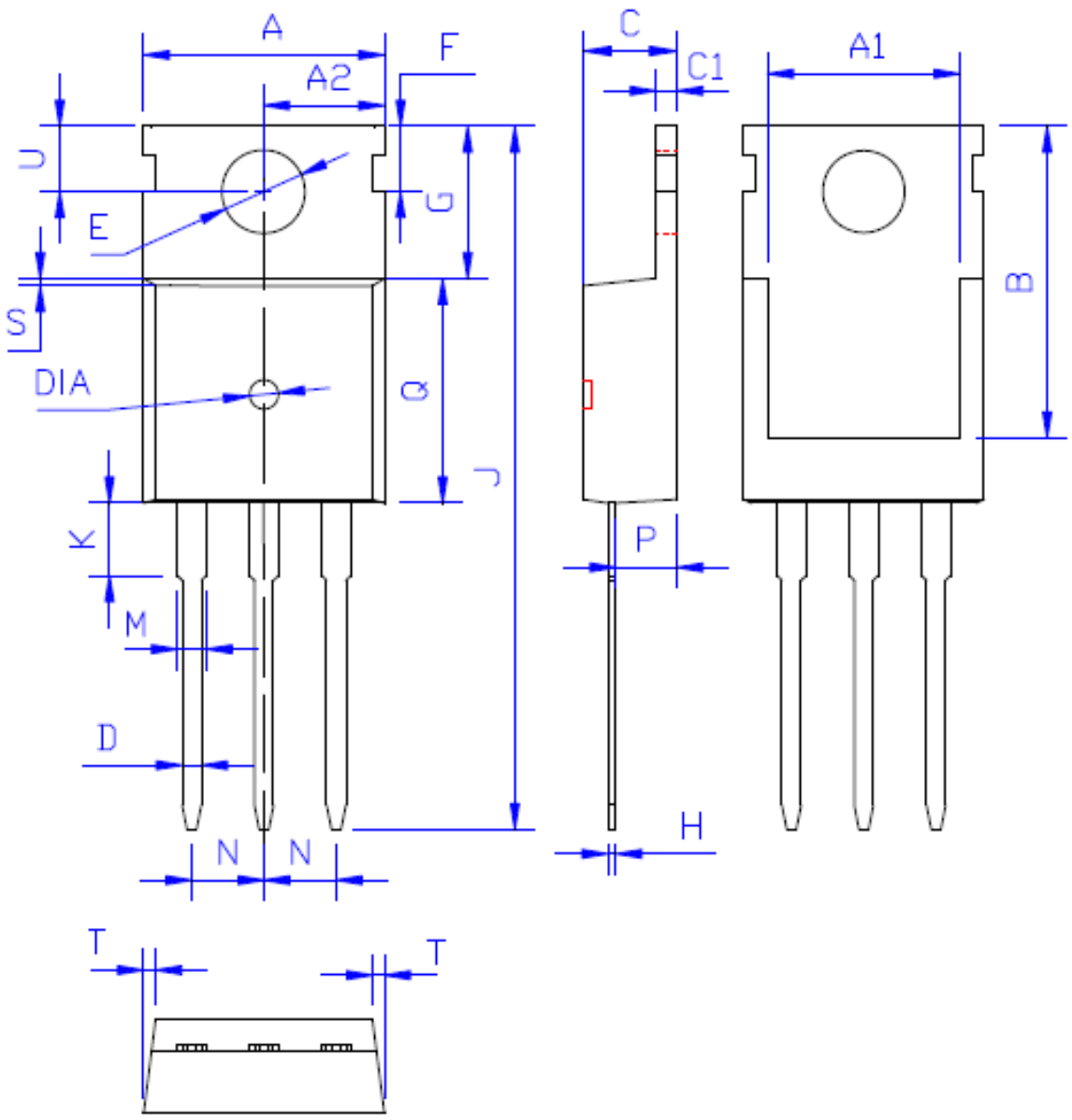
PART.NO
XXXXXX
B
Y28
FHA20N60
生产批次代码
ASSEMMBLY
LOT CODE

外形尺寸：

Package Dimension：

TO-220



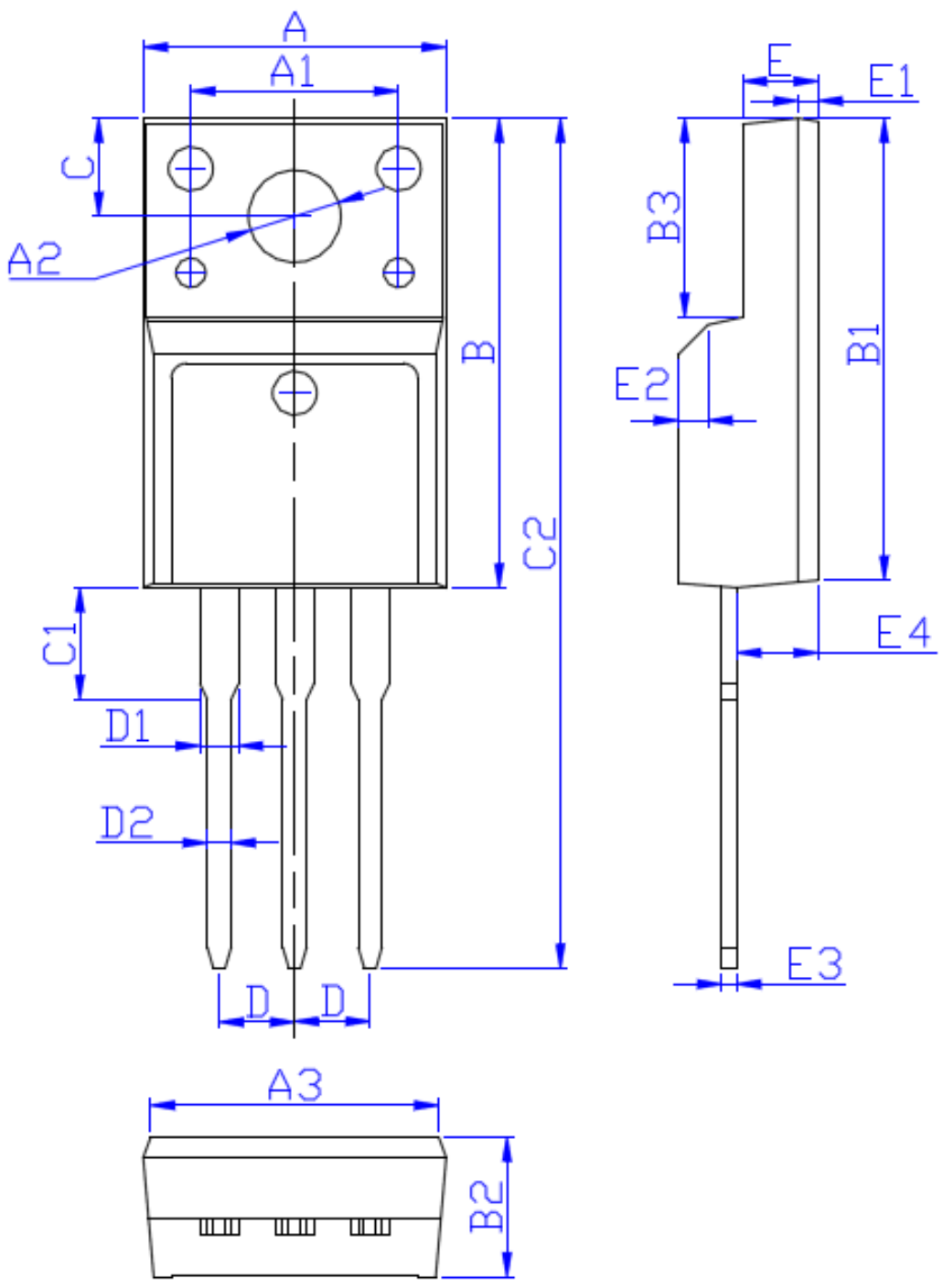
DIM	MILLIMETERS
A	10.00±0.30
A1	8.00±0.30
A2	5.00±0.30
B	13.20±0.40
C	4.50±0.20
C1	1.30±0.20
D	0.80±0.20
E	3.60±0.20
F	3.00±0.30
G	6.60±0.40
H	0.50±0.20
J	28.88±0.50
K	3.00±0.30
M	1.30±0.30
N	Typical 2.54
P	2.40±0.40
Q	9.20±0.40
S	0.25±0.15
T	0.25±0.15
U	2.80±0.30
DIA	宽 1.50±0.10 深 0.50 MAX

（Unit：mm）

外形尺寸：

Package Dimension：

TO-220F



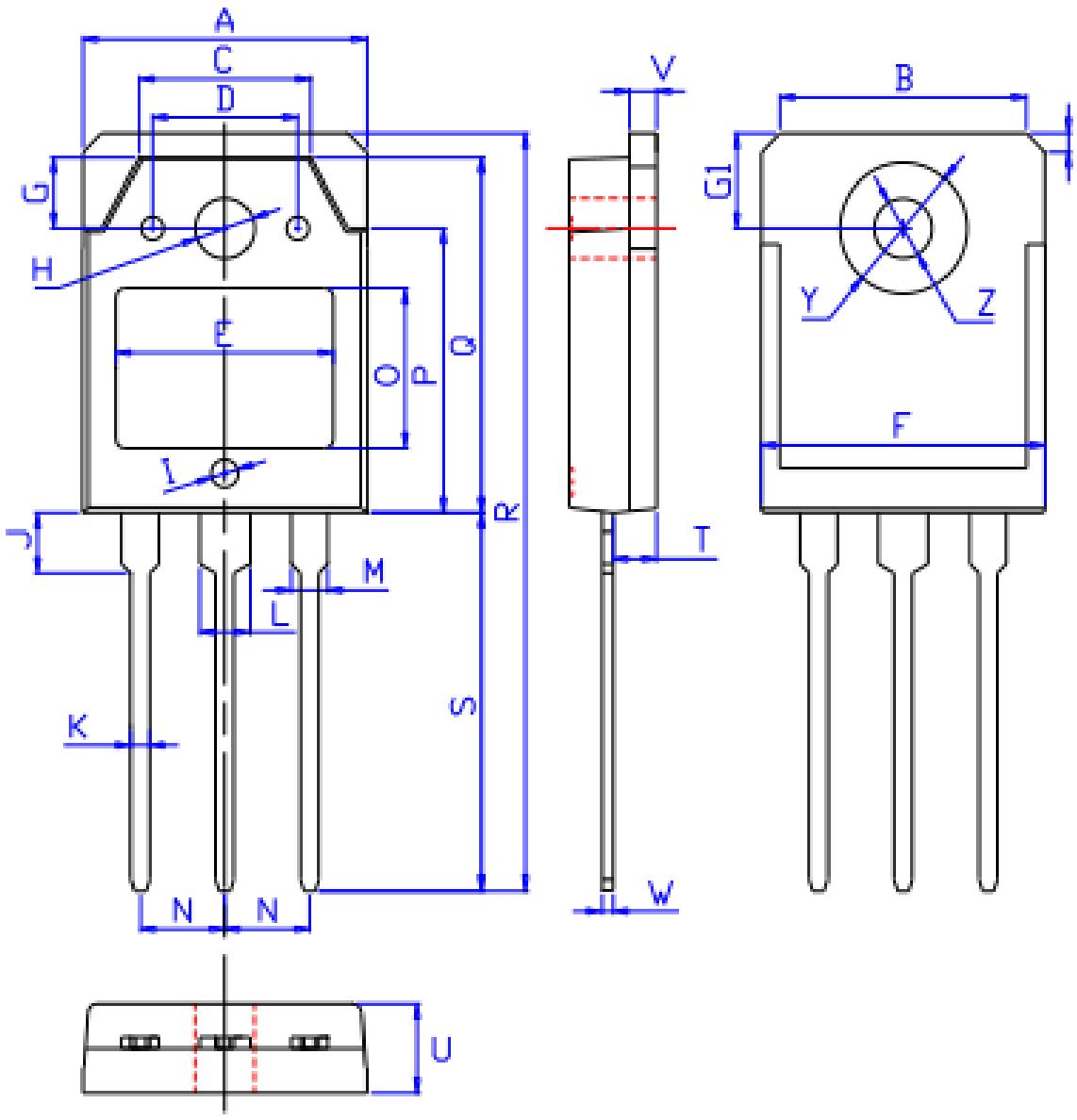
DIM	MILLIMETERS
A	10.16±0.30
A1	7.00±0.20
A2	3.12±0.20
A3	9.70±0.30
B	15.90±0.50
B1	15.60±0.50
B2	4.70±0.30
B3	6.70±0.30
C	3.30±0.25
C1	3.25±0.30
C2	28.70±0.50
D	Typical 2.54
D1	1.47 (MAX)
D2	0.80±0.20
E	2.55±0.25
E1	0.70±0.25
E2	1.0×45°
E3	0.50±0.20
E4	2.75±0.30

（Unit：mm）

外形尺寸：

Package Dimension：

TO-3PN



DIM	MILLIMETERS
A	15.60±0.30
B	13.60±0.30
C	9.50±0.30
D	8.00±0.30
E	11.85±0.30
F	15.65±0.30
G	3.80±0.30
G1	5.00±0.30
H	Φ3.50±0.30
I	Φ1.50±0.30 深 0.15±0.15
J	3.20±0.30
K	1.00±0.15
L	3.10±0.15
M	2.10±0.15
N	5.45±0.30
O	8.40±0.30
P	13.90±0.30
Q	18.70±0.30
R	40.00±0.60
S	20.00±0.40
T	2.40±0.30
U	4.80±0.30
V	1.50±0.15
W	0.60±0.15
X	1.80±0.40
Y	7.00±0.30
Z	3.20±0.30

（Units：mm）