



N 沟道增强型场效应晶体管

N-CHANNEL MOSFET

FHP120N9F4A/FHS120N9F4A

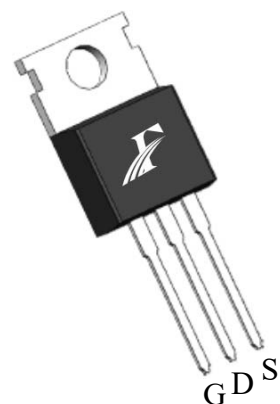
主要参数 MAIN CHARACTERISTICS

ID	120A
BVdss-min	90V
Rdson-typ (@Vgs=10V)	4.8mΩ
Qg-typ	93nC

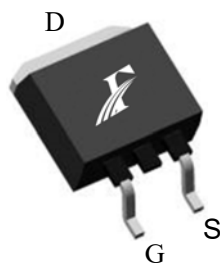
用途 APPLICATIONS

DC-DC转换电路/同步整流	DC-DC conversion Circuit/ synchronous rectification
电机驱动	Motor Drive
逆变器	Power Management in Inverter System
电池管理系统	Battery Management System

封装形式 Package



TO-220
FHP series

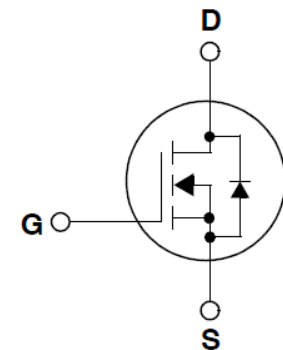


TO-263
FHS series

产品特性 FEATURES

低栅极电荷	Low gate charge
低 Crss (典型值 pF)	Low Crss (typical 23pF)
开关速度快	Fast switching
100%经过 Rg 测试	100% Rg tested
100%经过雪崩测试	100% avalanche tested
100%经过热阻测试	100% DVDS tested
RoHS 产品	RoHS product
SGT 工艺	SGT technology

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
最高漏极-源极直流电压 Drain-Source Voltage	V _{DSS}	90	V
连续漏极电流* Drain Current -continuous *	I _D (T _c =25°C) , Silicon Limited	147	A
	I _D (T _c =25°C) , Package Limited	120	
	I _D (T _c =100°C) ,Package Limited	93	A
最大脉冲漏极电流 (注 1) Drain Current – pulse (note 1)	I _{DM}	480	A
最高栅源电压 Gate-Source Voltage	V _{GS}	±20	V
单脉冲雪崩能量 (注 2) Single Pulsed Avalanche Energy (note 2)	E _{AS}	364	mJ
雪崩电流 (注 1) Avalanche Current (note 1)	I _{AR}	27	A
重复雪崩能量 (注 1) Repetitive Avalanche Current (note 1)	E _{AR}	25	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°C)	184	W
	-Derate above 25°C	1.47	W/°C
最高结温及存储温度 Operating and Storage Temperature Range	T _J , T _{STG}	150, -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 Unit
关态特性 Off –Characteristics						
漏-源击穿电压 Drain-Source Voltage	BVDSS	ID=250μA, VGS=0V	90	100	-	V
击穿电压温度特性 Breakdown Voltage Temperature Coefficient	ΔBVDSS/ΔTJ	ID=250μA, referenced to 25°C	-	0.1	-	V/°C
零栅压下漏极漏电流 Zero Gate Voltage Drain Current	IDSS	VDS=90V, VGS=0V, Tc=25°C	-	-	1	μA
		VDS=72V, Tc=125°C	-	-	100	μA
栅极体漏电流 Gate-body leakage current	IGSS (F/R)	VDS=0V, VGS =±20V	-	-	±100	nA
通态特性 On-Characteristics						
阈值电压 Gate Threshold Voltage	VGS(th)	VDS = VGS, ID=250μA	2.3	-	3.8	V
静态导通电阻 Static Drain-Source On-Resistance	RDS(ON)	VGS =10V, ID=50A	-	4.8	5.4	mΩ
正向跨导 Forward Transconductance	gfs	VDS = 5V, ID=50A (note 4)	-	84	-	S
动态特性 Dynamic Characteristics						
栅电阻 Gate Resistance	Rg	f=1.0MHz, VDS OPEN	-	2.5	-	Ω
输入电容 Input capacitance	Ciss	VDS=40V, VGS =0V, f=1.0MHz	-	4260	-	pF
输出电容 Output capacitance	Coss		-	670	-	
反向传输电容 Reverse transfer capacitance	Crss		-	23	-	
开关特性 Switching Characteristics						
延迟时间 Turn-On delay time	td(on)	VDS=40V, ID=50A, RG=3Ω VGS =10V (note 4, 5)	-	50	-	ns
上升时间 Turn-On rise time	tr		-	42	-	ns
延迟时间 Turn-Off delay time	td(off)		-	48	-	ns
下降时间 Turn-Off Fall time	tf		-	25	-	ns
栅极电荷总量 Total Gate Charge	Qg	VDS =40V , ID=50A , VGS =10V (note 4, 5)	-	93	-	nC
栅-源电荷 Gate-Source charge	Qgs		-	24	-	nC
栅-漏电荷 Gate-Drain charge	Qgd		-	25	-	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	-	-	120	A
正向最大脉冲电流 Maximum Pulsed Drain-Source Diode Forward Current		ISM	-	-	480	A
正向压降 Drain-Source Diode Forward Voltage	VSD	VGS=0V, IS=50A	-	-	1.2	V
反向恢复时间 Reverse recovery time	trr	VGS=0V, IS=20A, dIF/dt=100A/μs (note 4)	-	60	-	ns
反向恢复电荷 Reverse recovery charge	Qrr		-	160	-	nC

热特性 THERMAL CHARACTERISTIC

项目 Parameter	符号 Symbol	最大值 Max	单位 Unit
结到管壳的热阻 Thermal Resistance, Junction to Case	Rth(j-c)	0.68	°C/W
结到环境的热阻 Thermal Resistance, Junction to Ambient	Rth(j-A)	62.5	°C/W

BVDSS&VTH 的档位 (X) 信息 BVDSS&VTH Classifications

参 数	档位	B3	C3	D3	B	C	D	单位 Unit
BVDSS		≥97	≥97	≥97	≥90	≥90	≥90	V
VTH		2.6-2.9	2.9-3.2	3.2-3.5	2.3-2.8	2.8-3.3	3.3-3.8	V

注释:

- 1: 脉冲宽度由最高结温限制
- 2: L=1.0mH, VGS=10V, VDD=48V, RG=25 Ω, 起始结温 TJ=25°C
- 3: ISD ≤120A, di/dt ≤300A/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=1.0mH, VGS=10V, VDD=48V, RG=25 Ω, Starting TJ=25°C
- 3: ISD ≤120A, di/dt ≤300A/μs, VDD≤BVDSS, Starting TJ=25°C
- 4: Pulse Test: Pulse Width ≤300μs, Duty Cycle≤2%
- 5: Essentially independent of operating temperature

Typical Characteristics

典型特性曲线

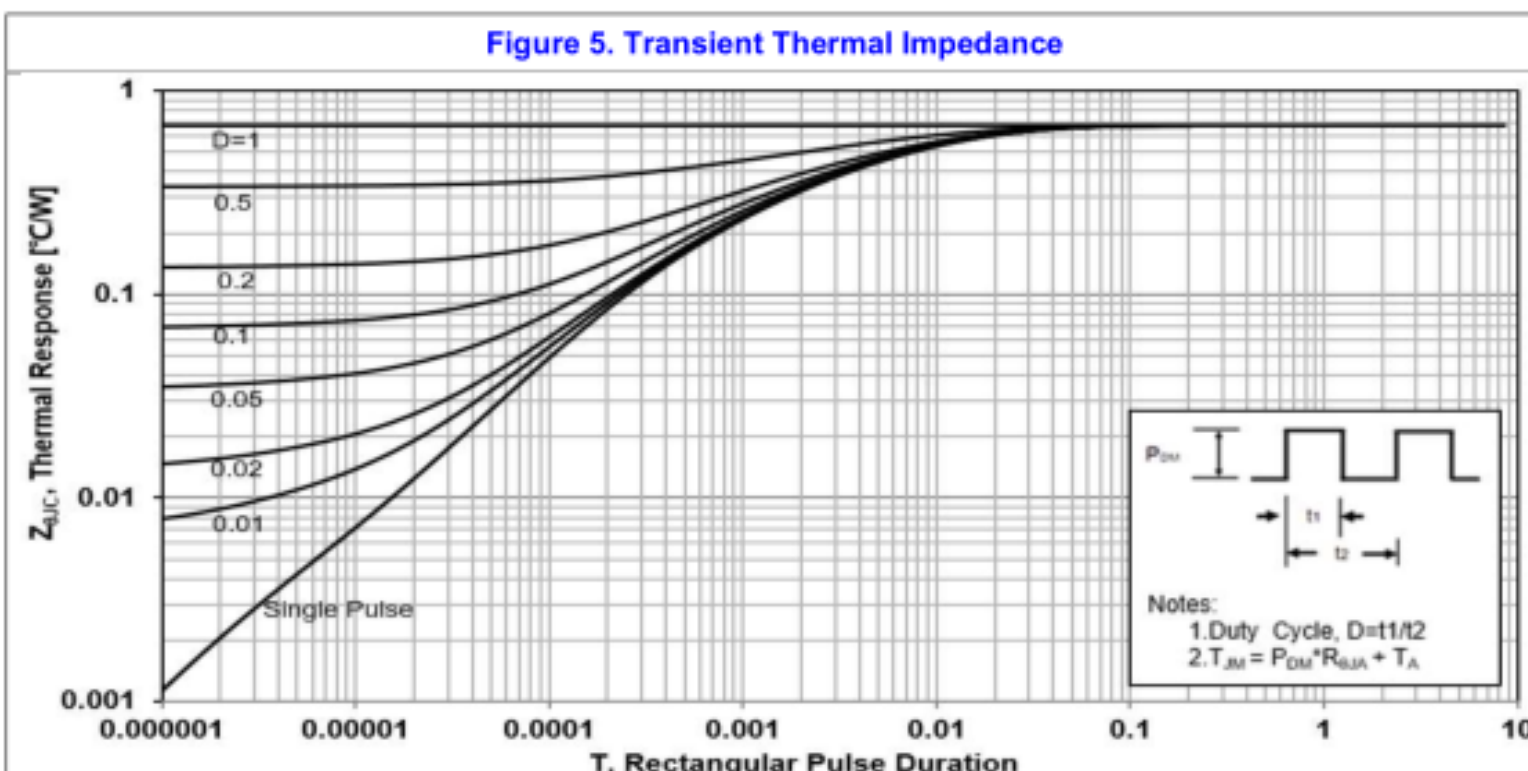
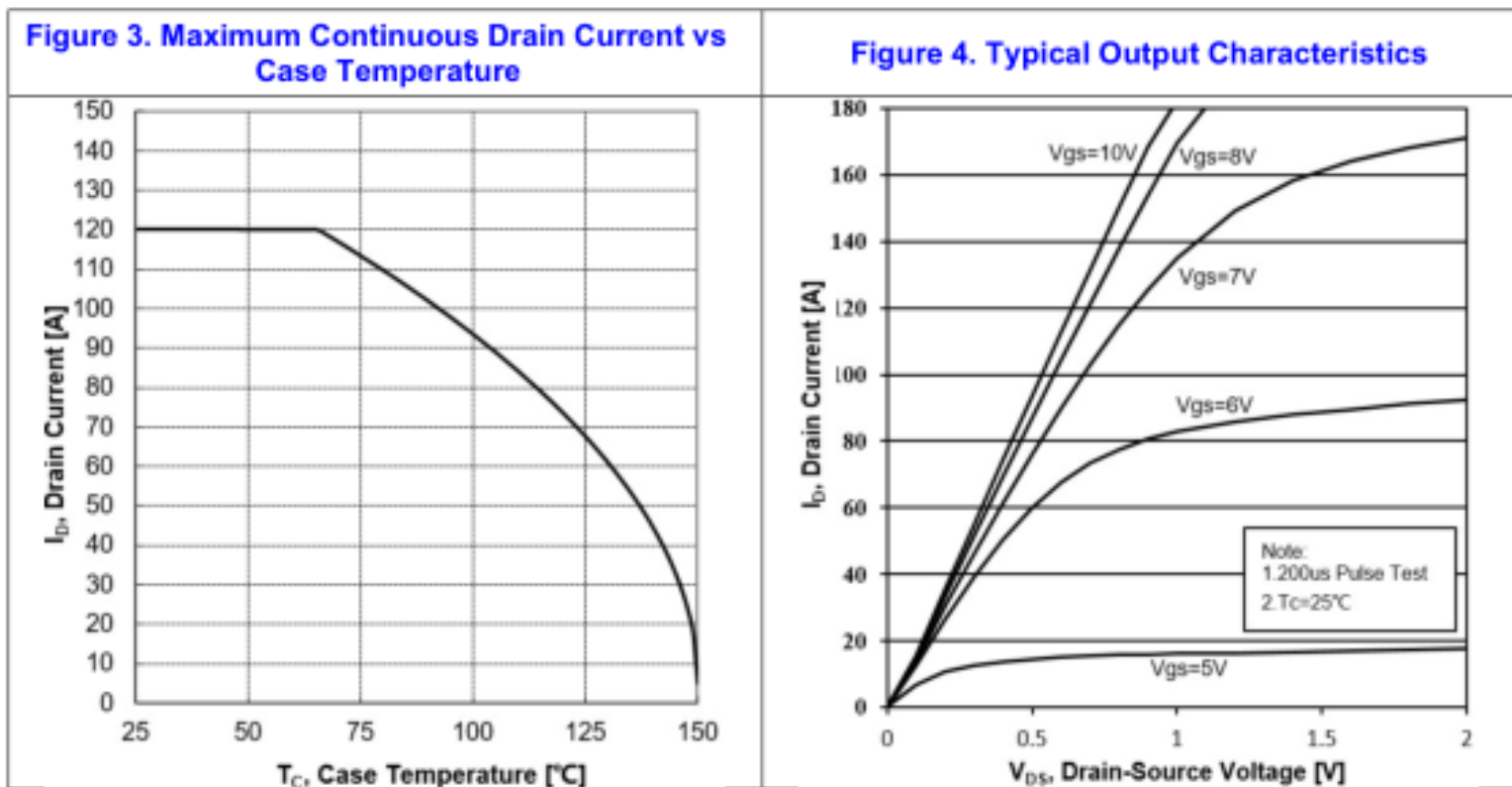
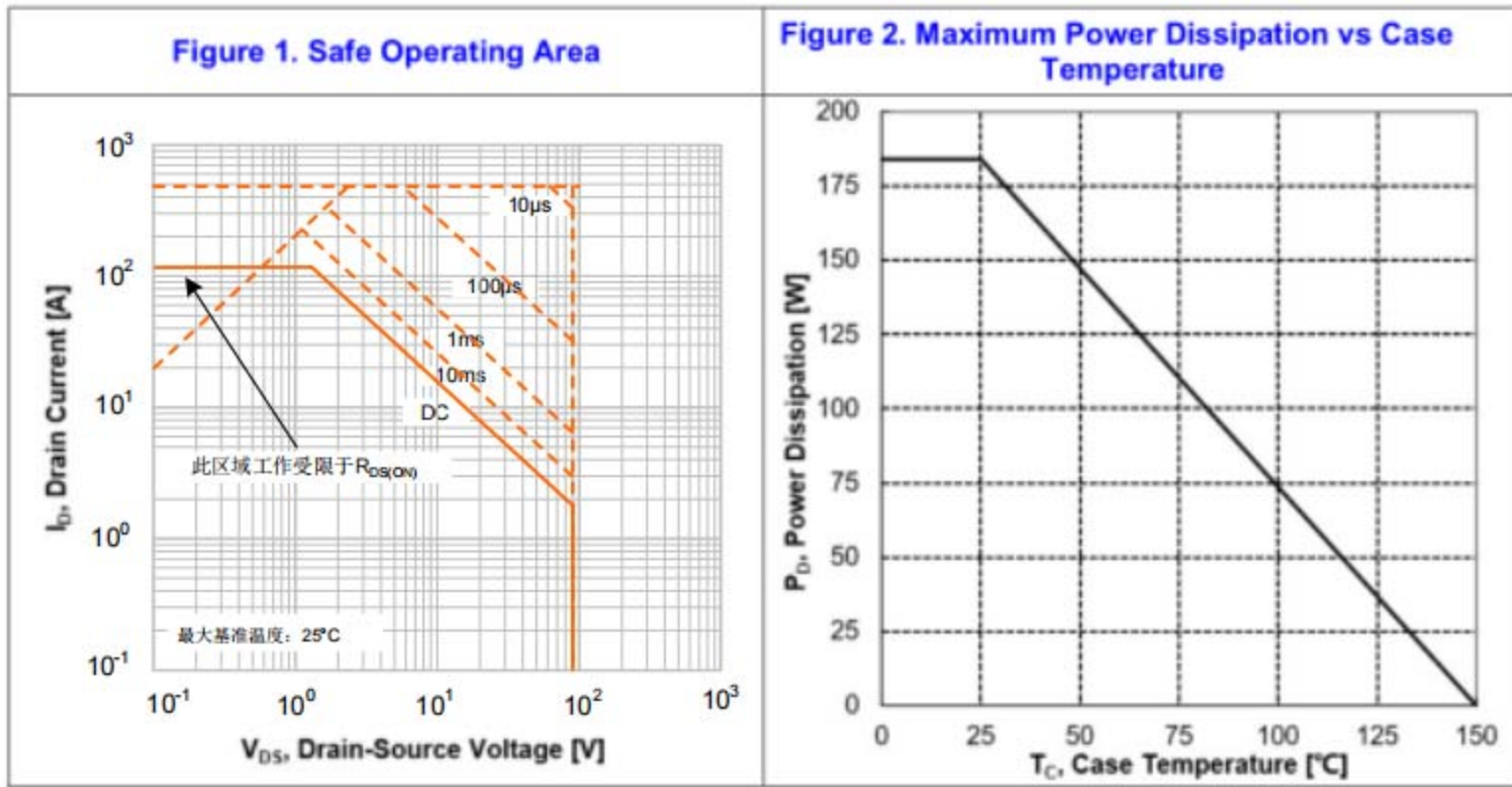


Figure 6. Typical Transfer Characteristics

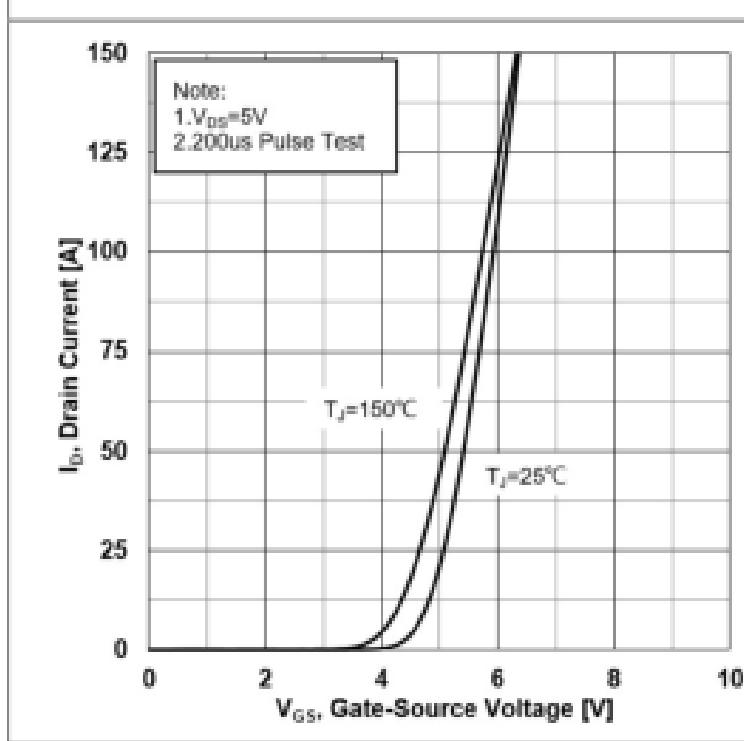


Figure 7. Source-Drain Diode Forward Characteristics

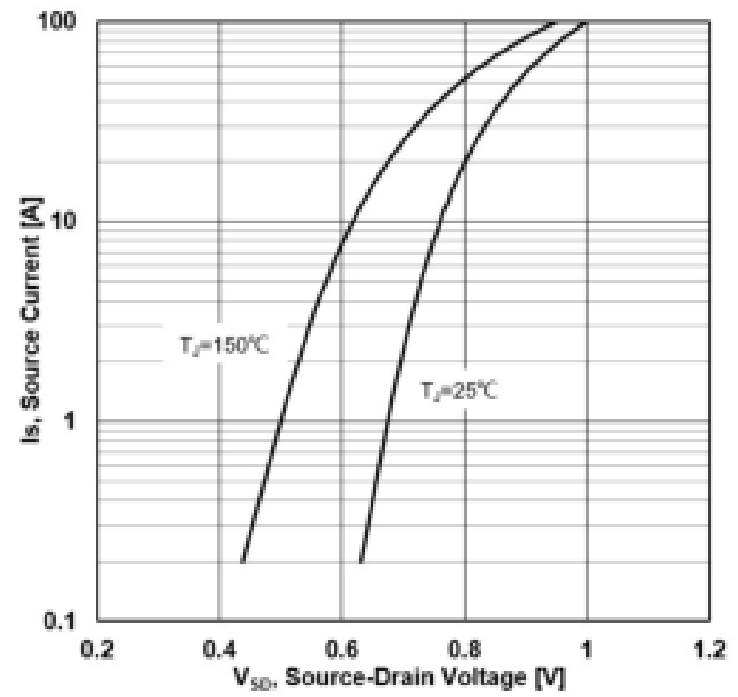


Figure 8. Drain-Source On-Resistance vs Drain Current

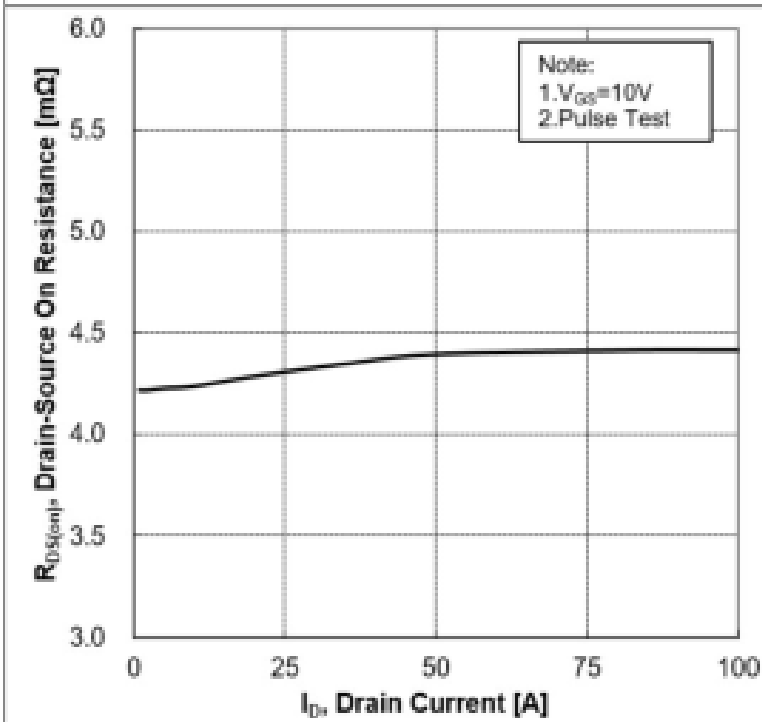


Figure 9. Normalized On-Resistance vs Junction Temperature

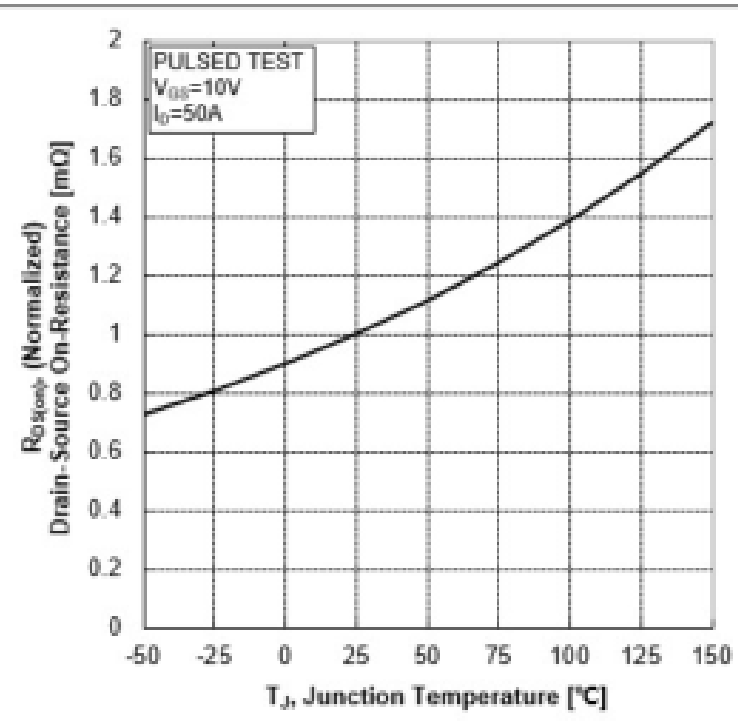


Figure 10. Normalized Threshold Voltage vs Junction Temperature

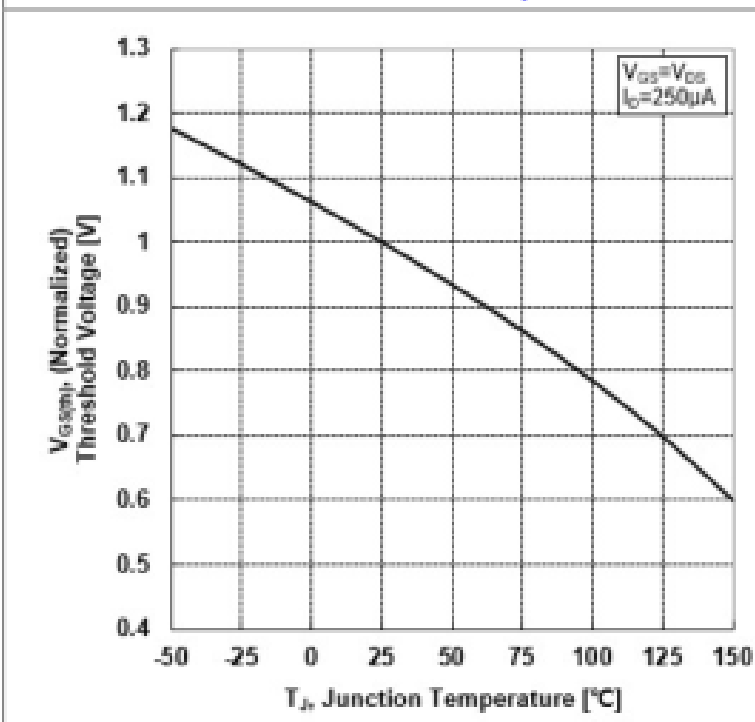
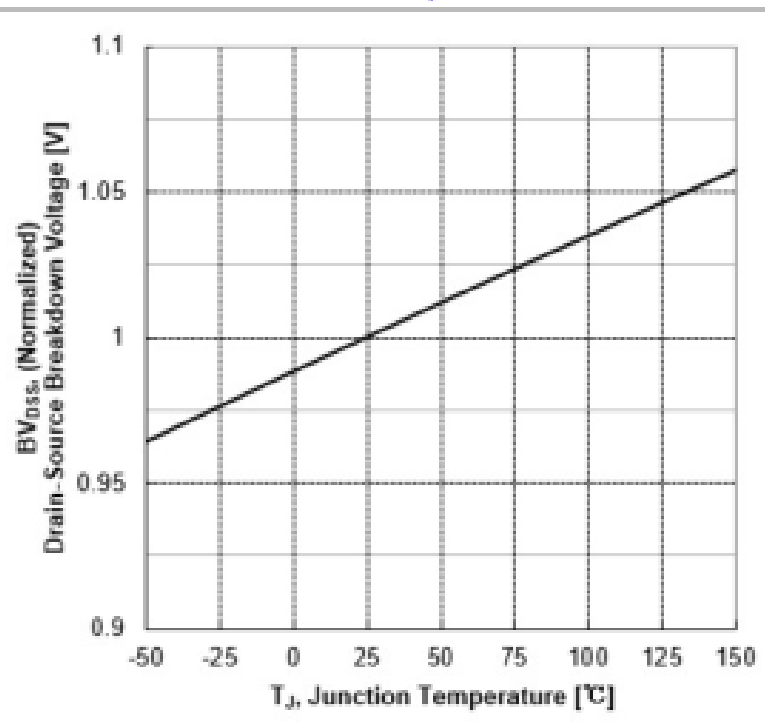
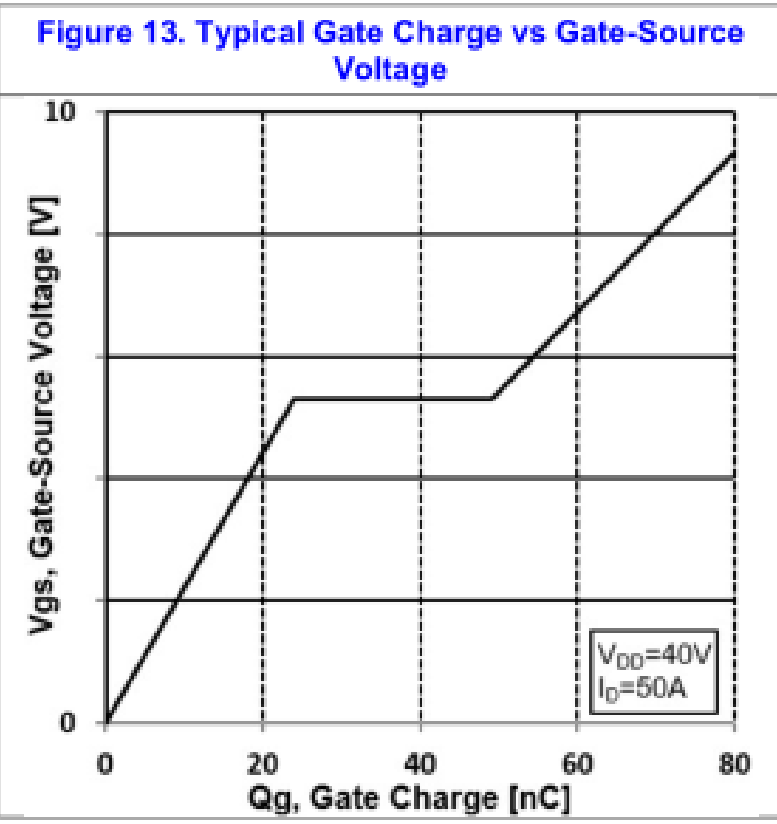
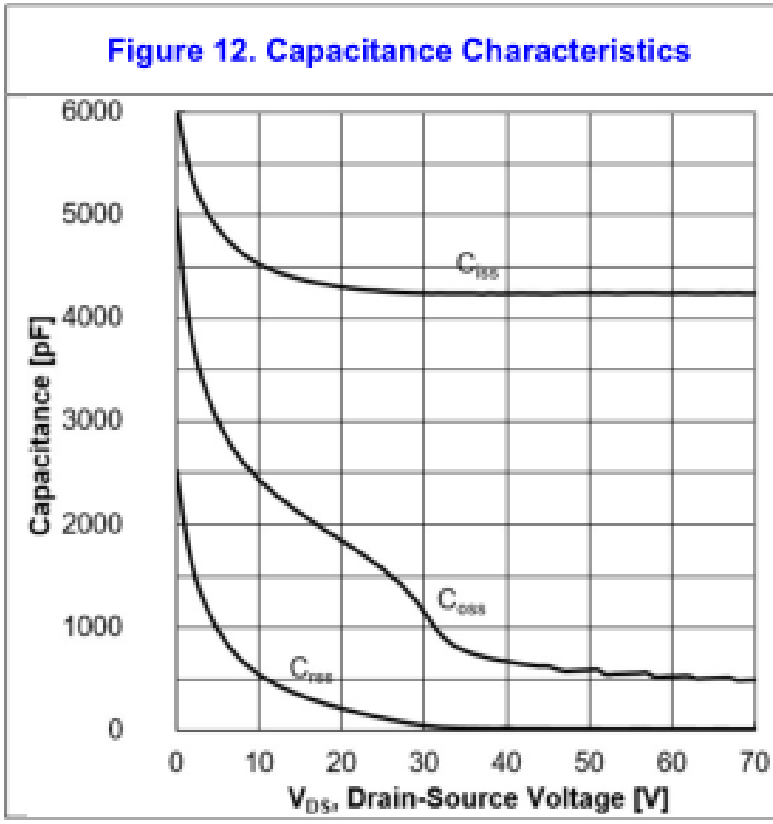


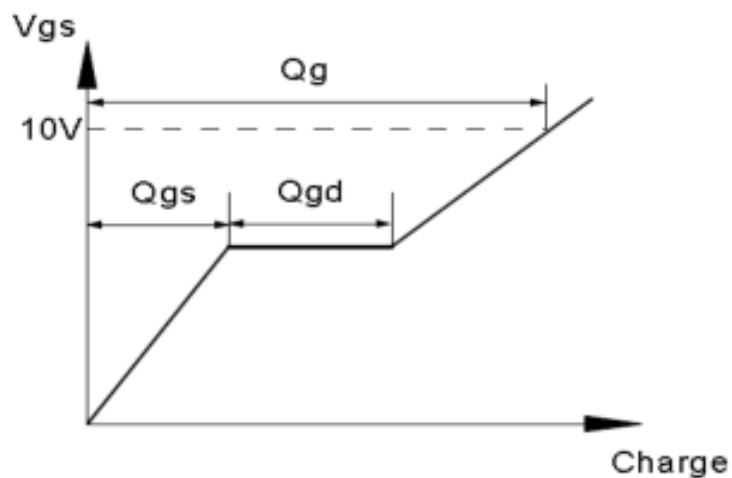
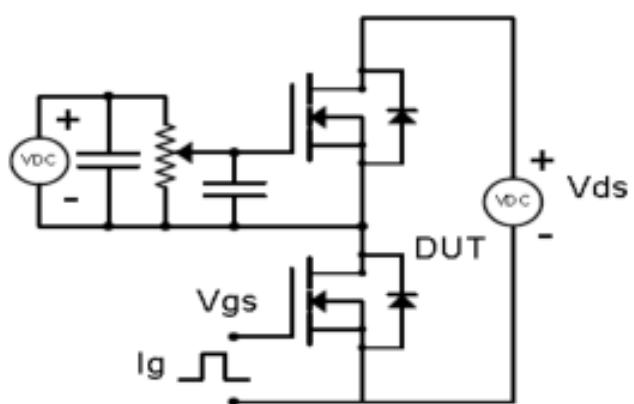
Figure 11. Normalized Breakdown Voltage vs Junction Temperature



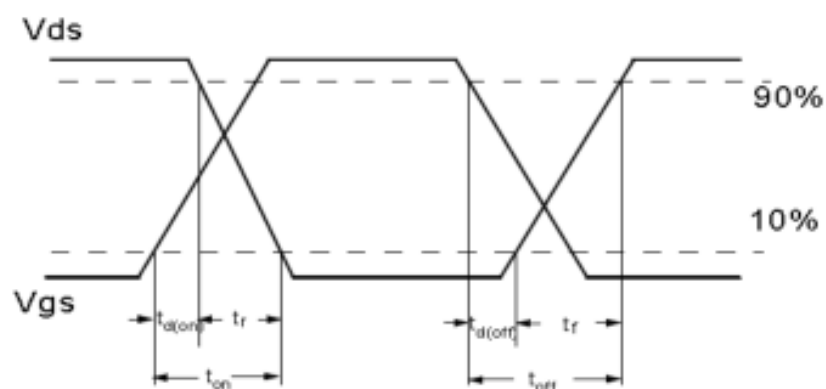
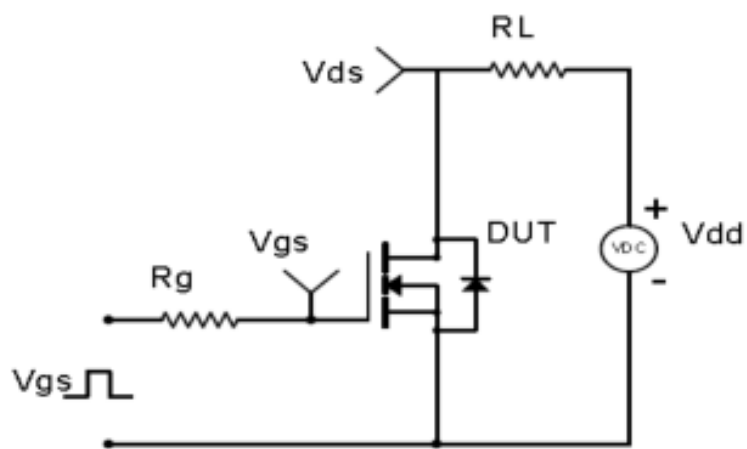


Test Circuit & Waveform

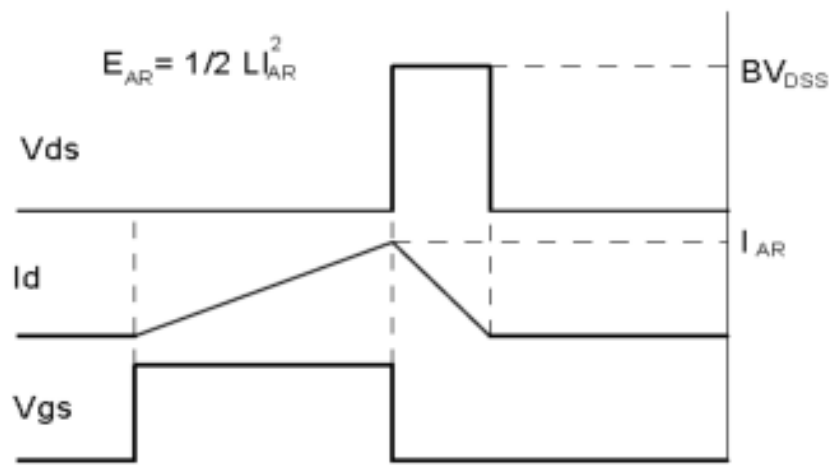
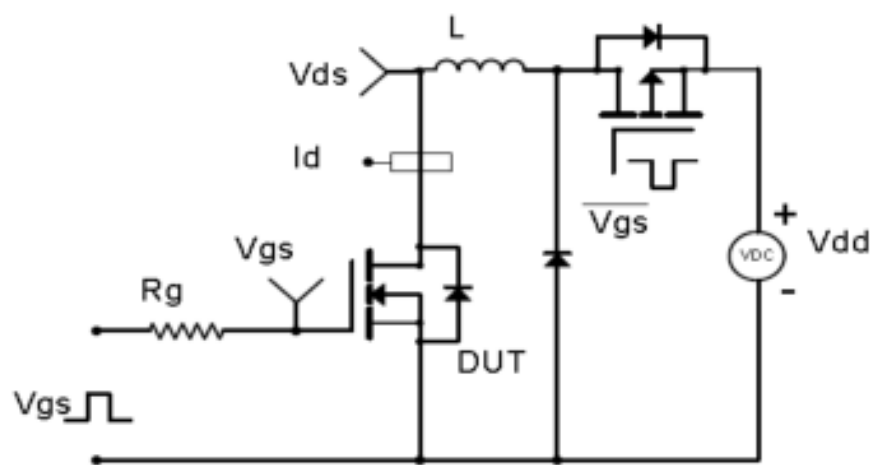
Gate Charge Test Circuit & Waveform



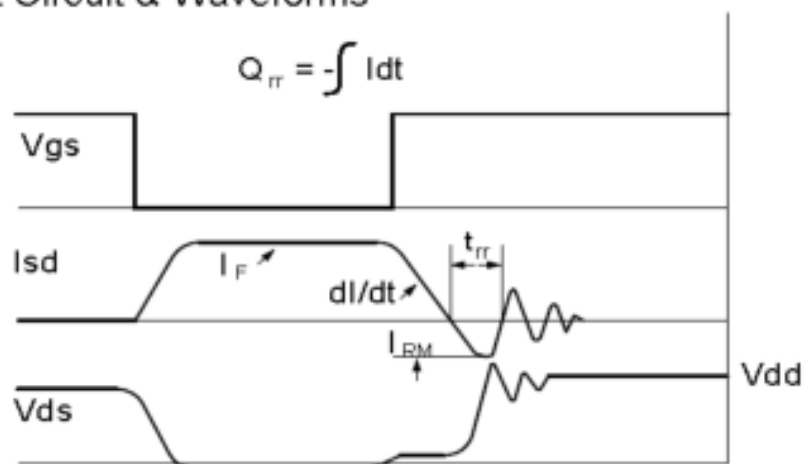
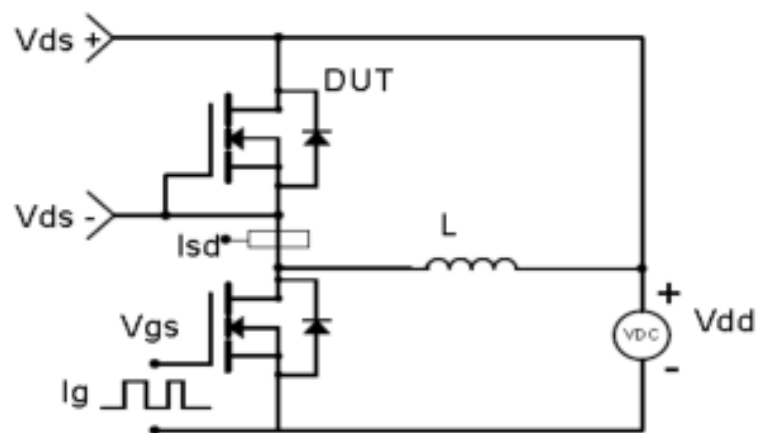
Resistive Switching Test Circuit & Waveforms



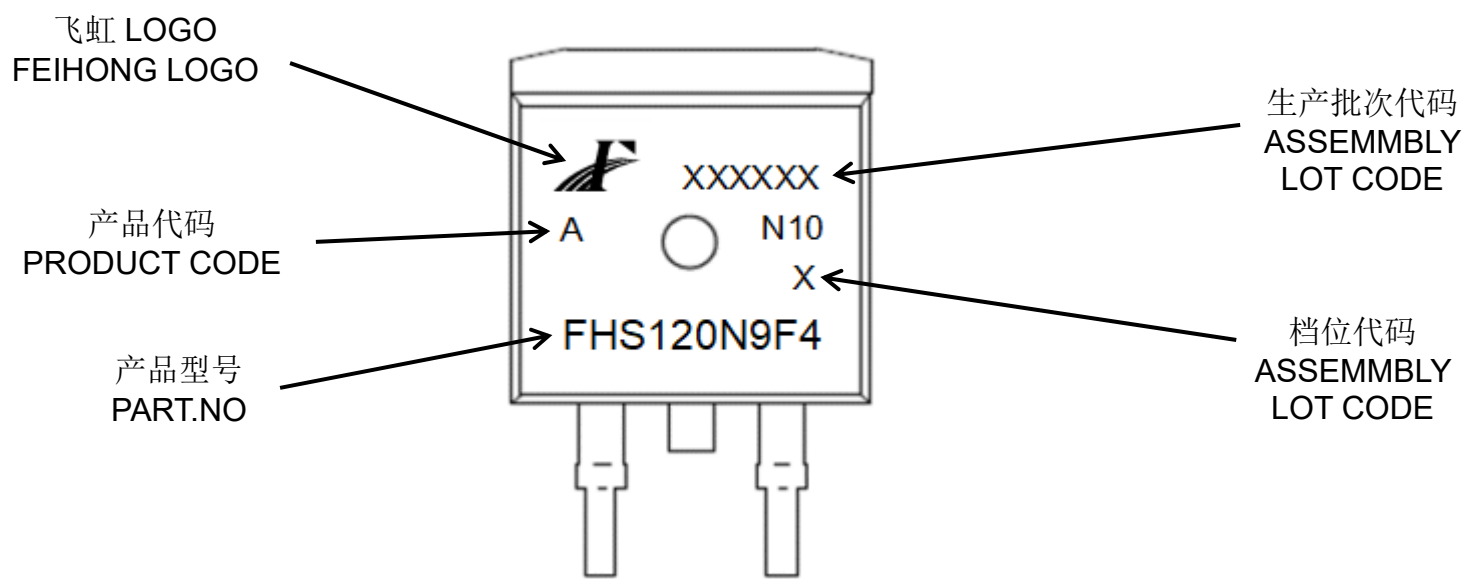
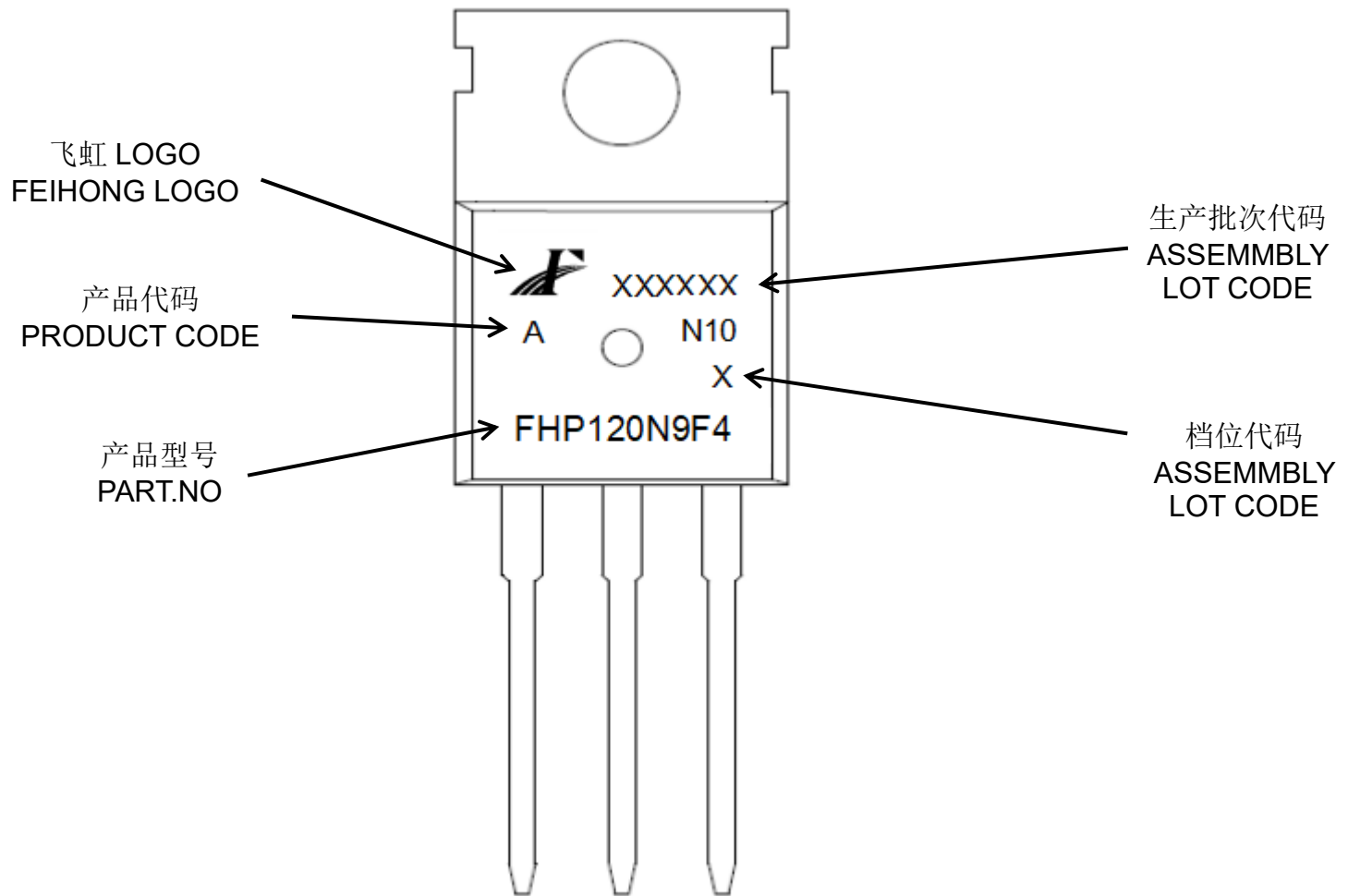
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



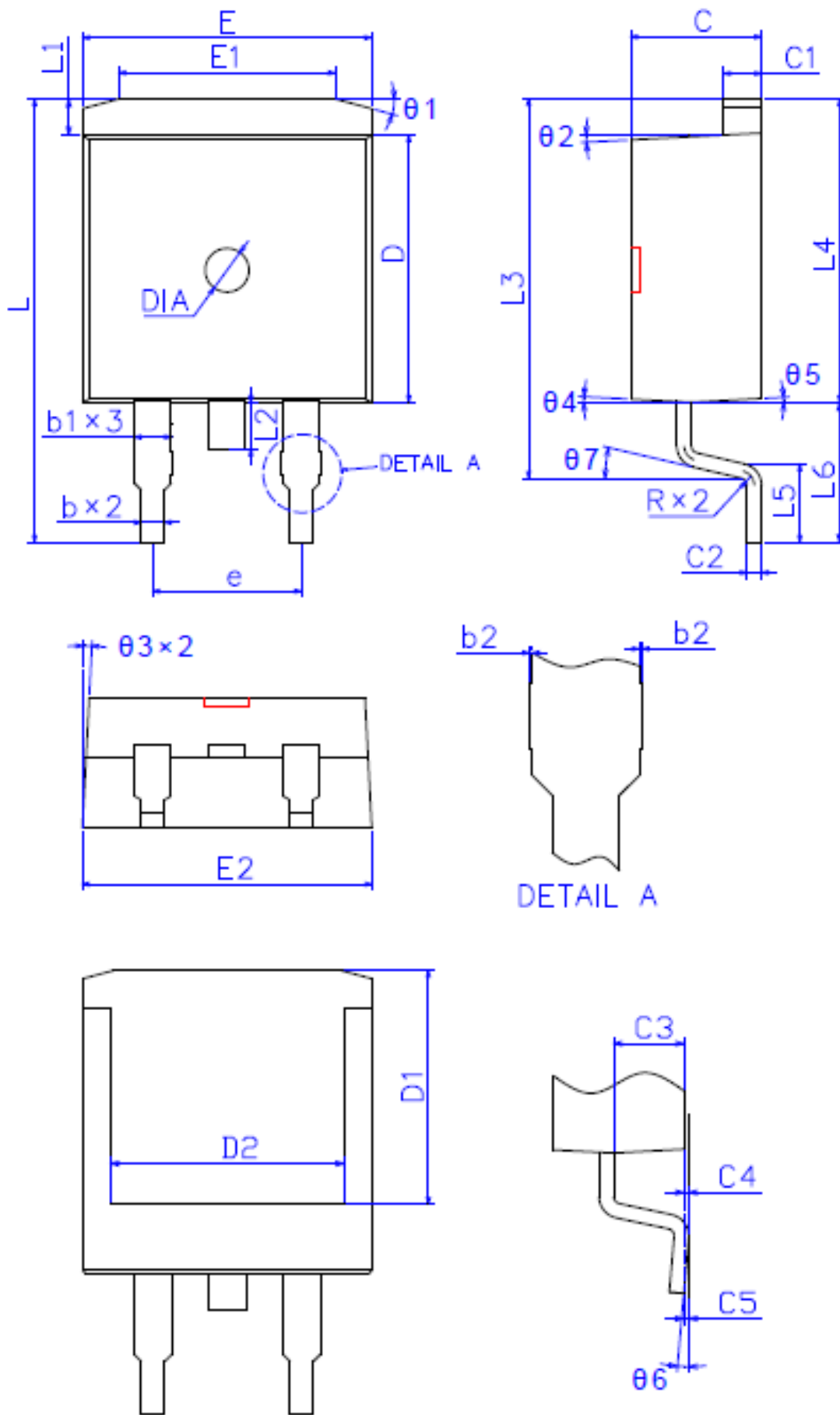
印记 Marking:



外形尺寸:

Package Dimension:

TO-263

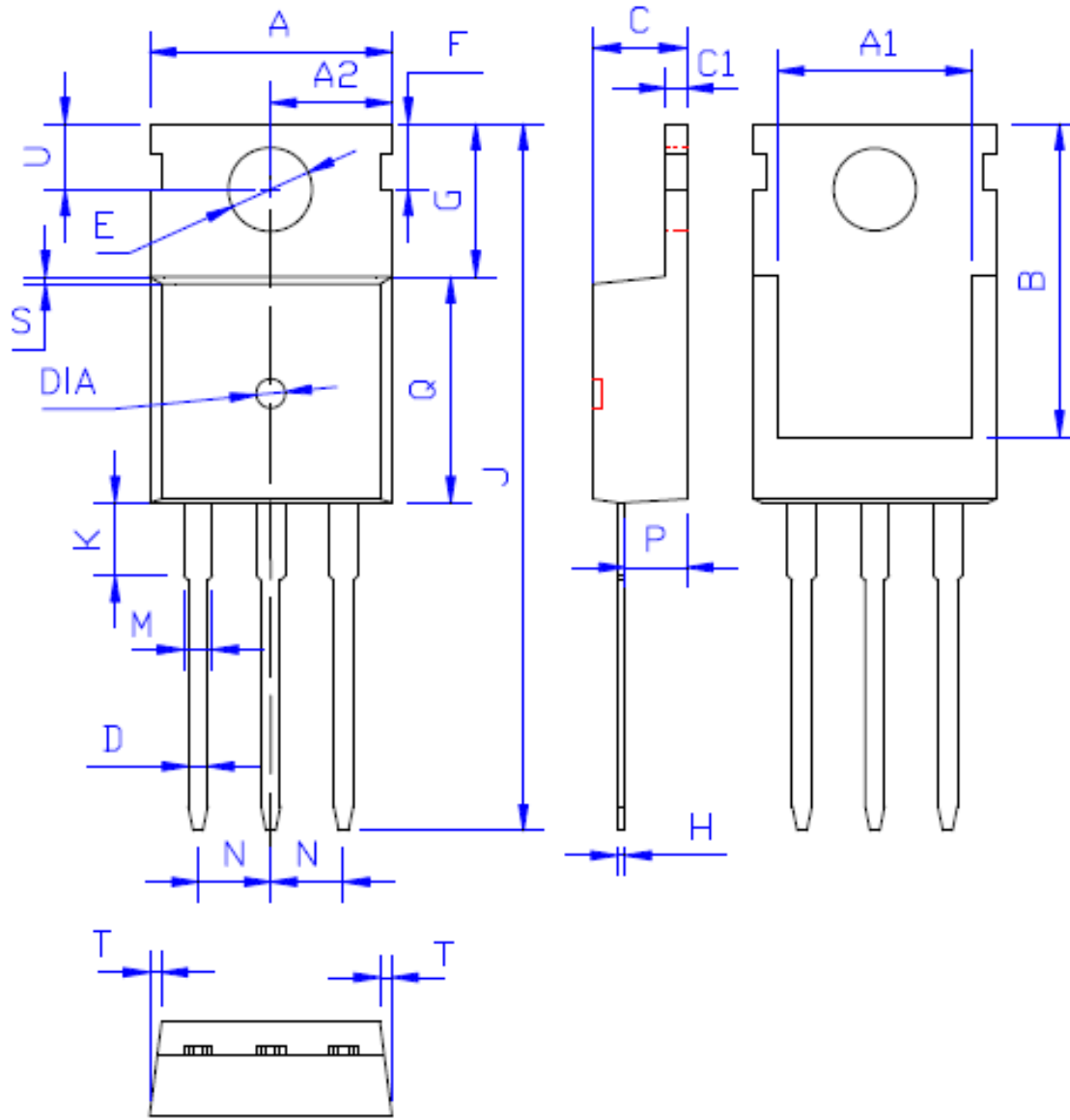


标注	尺寸(mm)
E	9.88±0.10
E1	7.40±0.20
E2	9.90±0.15
L	15.20±0.25
L1	1.30±0.15
L2	1.60±0.10
L3	13.00±0.20
L4	10.40±0.15
L5	2.60±0.15
L6	4.80±0.20
b	0.80±0.07
b1	1.27±0.07
b2	0.05±0.07
C	4.48±0.10
C1	1.30±0.07
C2	0.50±0.07
C3	2.40±0.06
C4	0.10±0.08
C5	0.10±0.08
D	9.20±0.10
D1	8.00±0.10
D2	8.00±0.10
R	0.50±0.10
$\theta1$	15° ±2°
$\theta2$	3° ±2°
$\theta3$	3° ±2°
$\theta4$	3° ±2°
$\theta5$	3° ±2°
$\theta6$	0° ~6°
$\theta7$	13° ±2°
e	5.08±0.10
DIA	宽 1.50±0.10 深 0.30±0.15

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)