



N 沟道增强型场效应晶体管
N-CHANNEL MOSFET
FHP120N9F4A/FHS120N9F4A

主要参数 MAIN CHARACTERISTICS

ID	147 A
VDSS	97 V
Rdson-typ (@Vgs=10V)	4.8 mΩ
Qg-typ	93nC

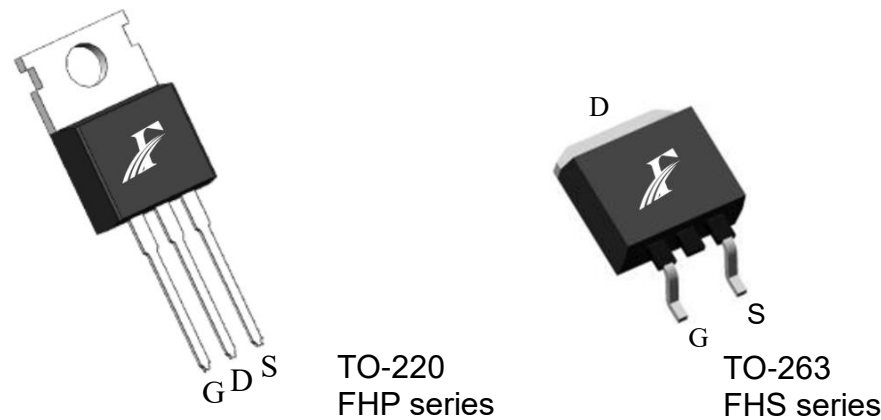
用途 APPLICATIONS

开关电源	Switch Mode Power Supplies
电动车控制器	Electric Vehicle Controller
逆变器	Power Management in Inverter System
电池管理系统	Battery Management System

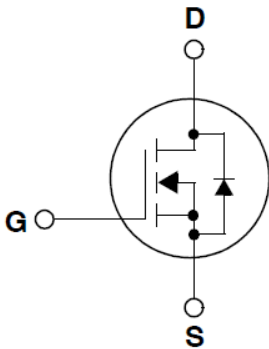
产品特性 FEATURES

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
100%经过热阻测试	100% DVDS tested
100%经过 UIS 测试	100% UIS Tested
100%经过 RG 测试	100% Rg tested
RoHS 产品	RoHS product

封装形式 Package



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
最高漏极—源极直流电压 Drain-Source Voltage	VDSS	97	V
连续漏极电流* Drain Current -continuous *	ID (Tc=25℃), Silicon Limited	147	A
	ID (Tc=25℃), Package Limited	120	
	ID (Tc=100℃)	93	A
最大脉冲漏极电流 (注 1) Drain Current – pulse (note 1)	IDM	480	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	364	mJ
雪崩电流 (注 1) Avalanche Current (note 1)	IAR	27	A
重复雪崩能量 (注 1) Repetitive Avalanche Current (note 1)	EAR	29	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℃)	184	W
	-Derate above 25℃	1.47	W/℃
最高结温及存储温度 Operating and Storage Temperature Range	TJ, TSTG	150, -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	97	-	-	V
击穿电压温度特性 Breakdown Voltage Temperature Coefficient	ΔBV _{DSS} /Δ T _J	I _D =250μA, referenced to 25℃	-	0.1	-	V/℃
零栅压下漏极漏电流 Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =85V V _{GS} =0V, T _C =25℃	-	-	1	μA
		V _{DS} =68V, T _C =125℃	-	-	100	μA
栅极体漏电流 Gate-body leakage current	I _{GSS} (F/R)	V _{DS} =0V, V _{GS} =±20V	-	-	±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	2.2	-	3.8	V
静态导通电阻 Static Drain-Source On-Resistance	R _{DS(ON)}	V _{GS} =10V , I _D =50A	-	4.8	5.5	mΩ
正向跨导 Forward Transconductance	g _{fs}	V _{DS} = 5V, I _D =50A (note 4)	-	84	-	S
动态特性 Dynamic Characteristics						
栅电阻 Gate Resistance	R _g	f=1.0MHz, V _{DS} OPEN	-	2.5	-	Ω
输入电容 Input capacitance	C _{iss}	V _{DS} =40V, V _{GS} =0V, f=1.0MHz	-	4260	-	pF
输出电容 Output capacitance	C _{oss}		-	670	-	
反向传输电容 Reverse transfer capacitance	C _{rss}		-	23	-	
开关特性 Switching Characteristics						
延迟时间 Turn-On delay time	t _{d(on)}	V _{DS} =40V, I _D =50A, R _G =3Ω V _{GS} =10V (note 4, 5)	-	50	-	ns
上升时间 Turn-On rise time	t _r		-	42	-	ns
延迟时间 Turn-Off delay time	t _{d(off)}		-	48	-	ns
下降时间 Turn-Off Fall time	t _f		-	25	-	ns
栅极电荷总量 Total Gate Charge	Q _g	V _{DS} =40V , I _D =50A , V _{GS} =10V (note 4, 5)	-	93	-	nC
栅－源电荷 Gate-Source charge	Q _{gs}		-	24	-	nC
栅－漏电荷 Gate-Drain charge	Q _{gd}		-	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	I _S		-	-	120	A
正向最大脉冲电流 Maximum Pulsed Drain-Source Diode Forward Current	I _{SM}		-	-	480	A
正向压降 Drain-Source Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =50A	-	-	1.2	V
反向恢复时间 Reverse recovery time	t _{rr}	V _{GS} =0V, I _S =20A ,dI _F /dt=100A/μs (note 4)	-	60	-	ns
反向恢复电荷 Reverse recovery charge	Q _{rr}		-	160	-	nC

热特性 THERMAL CHARACTERISTIC

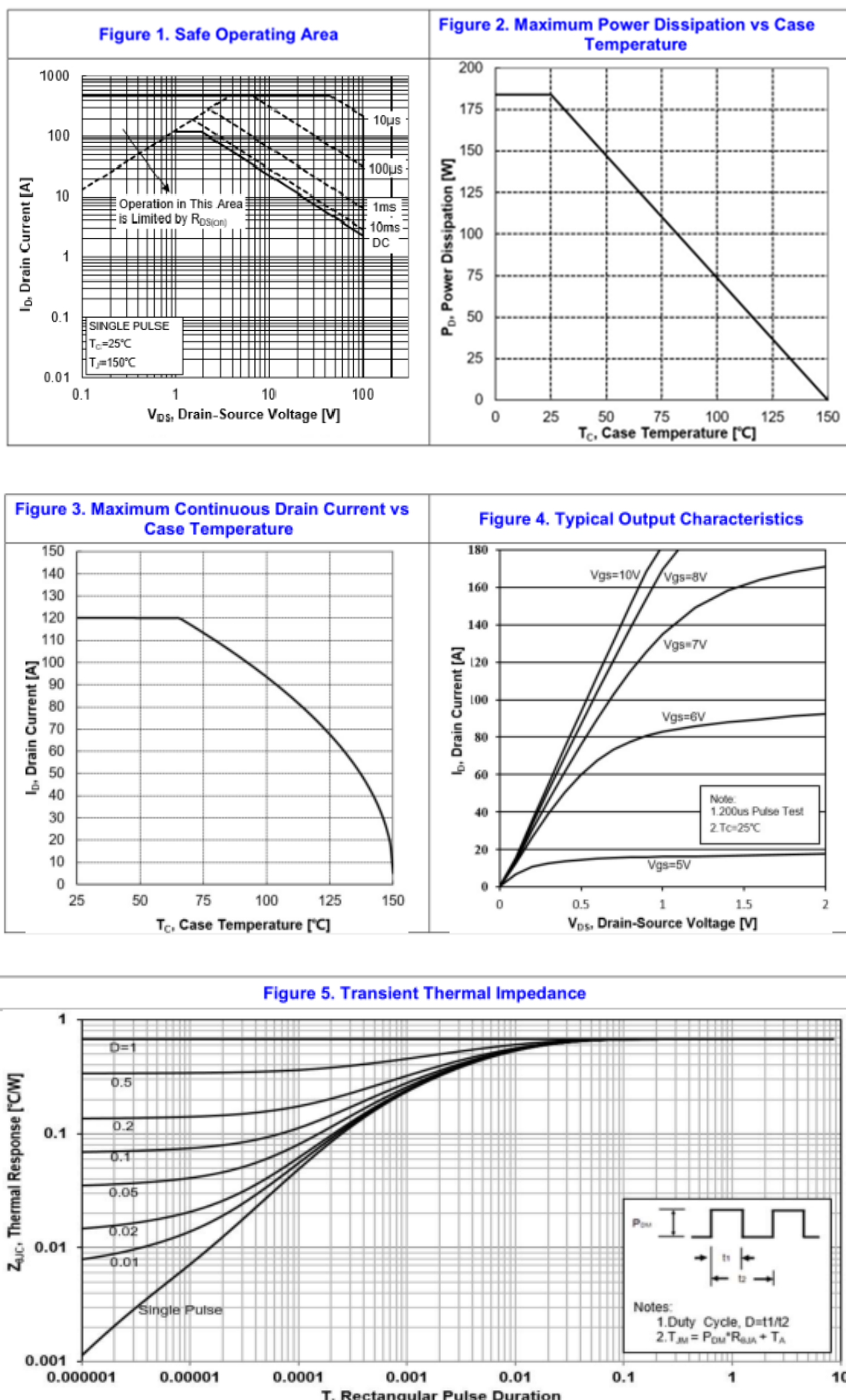
项目 Parameter	符号 Symbol	最大值 Max	单位 Unit
结到管壳的热阻 Thermal Resistance, Junction to Case	Rth(j-c)	0.68	℃/W
结到环境的热阻 Thermal Resistance, Junction to Ambient	Rth(j-A)	62.5	℃/W

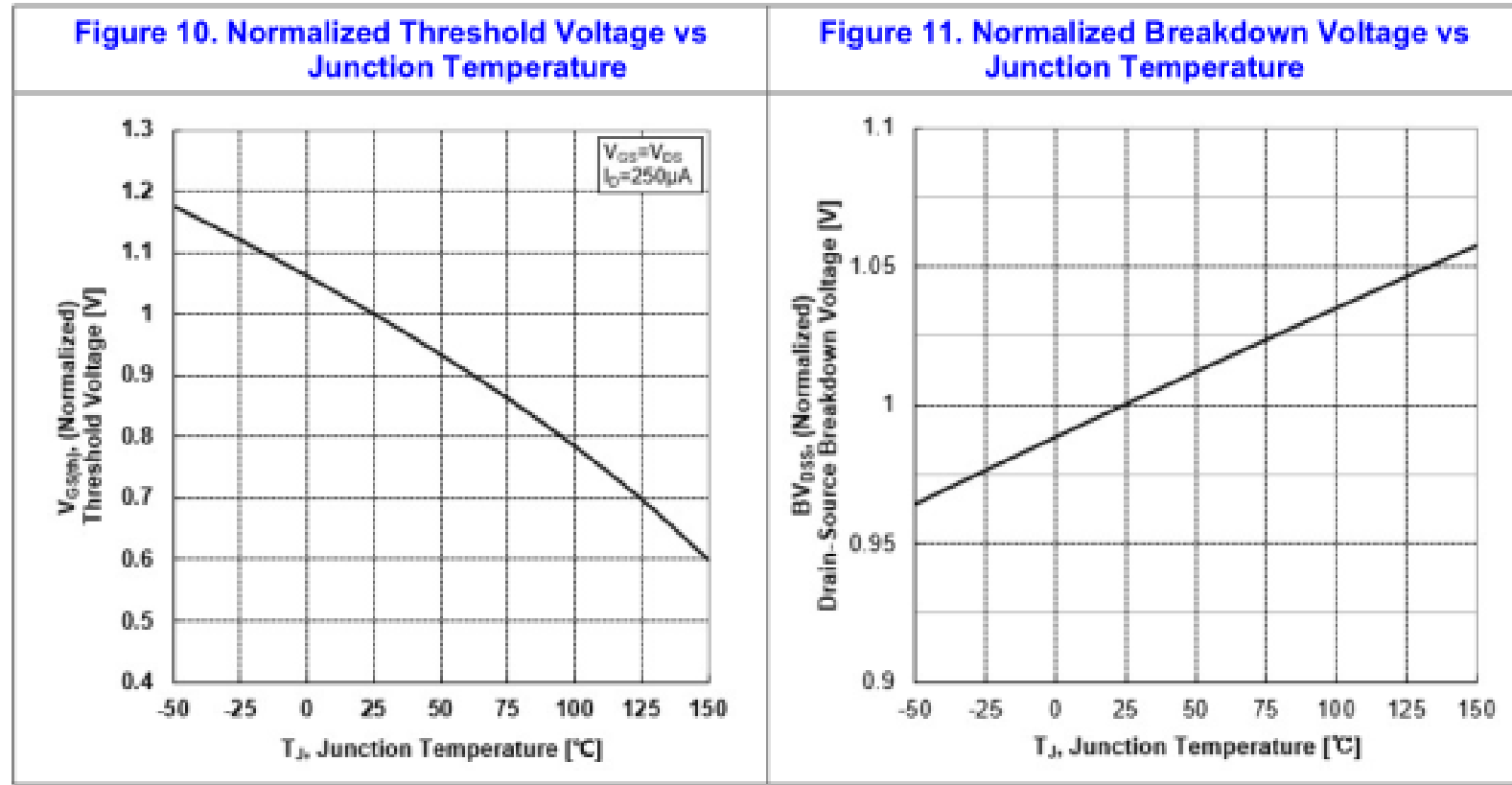
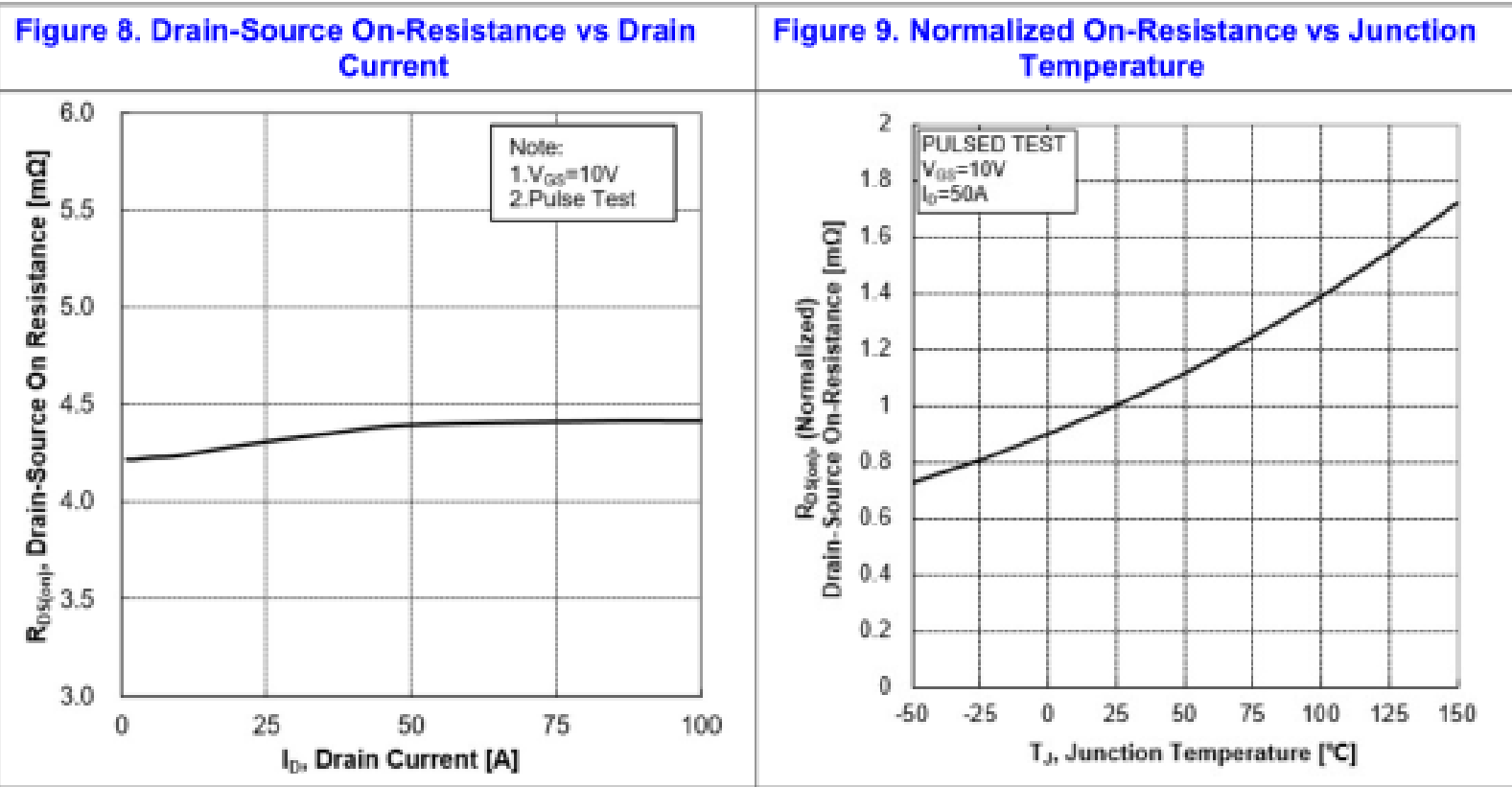
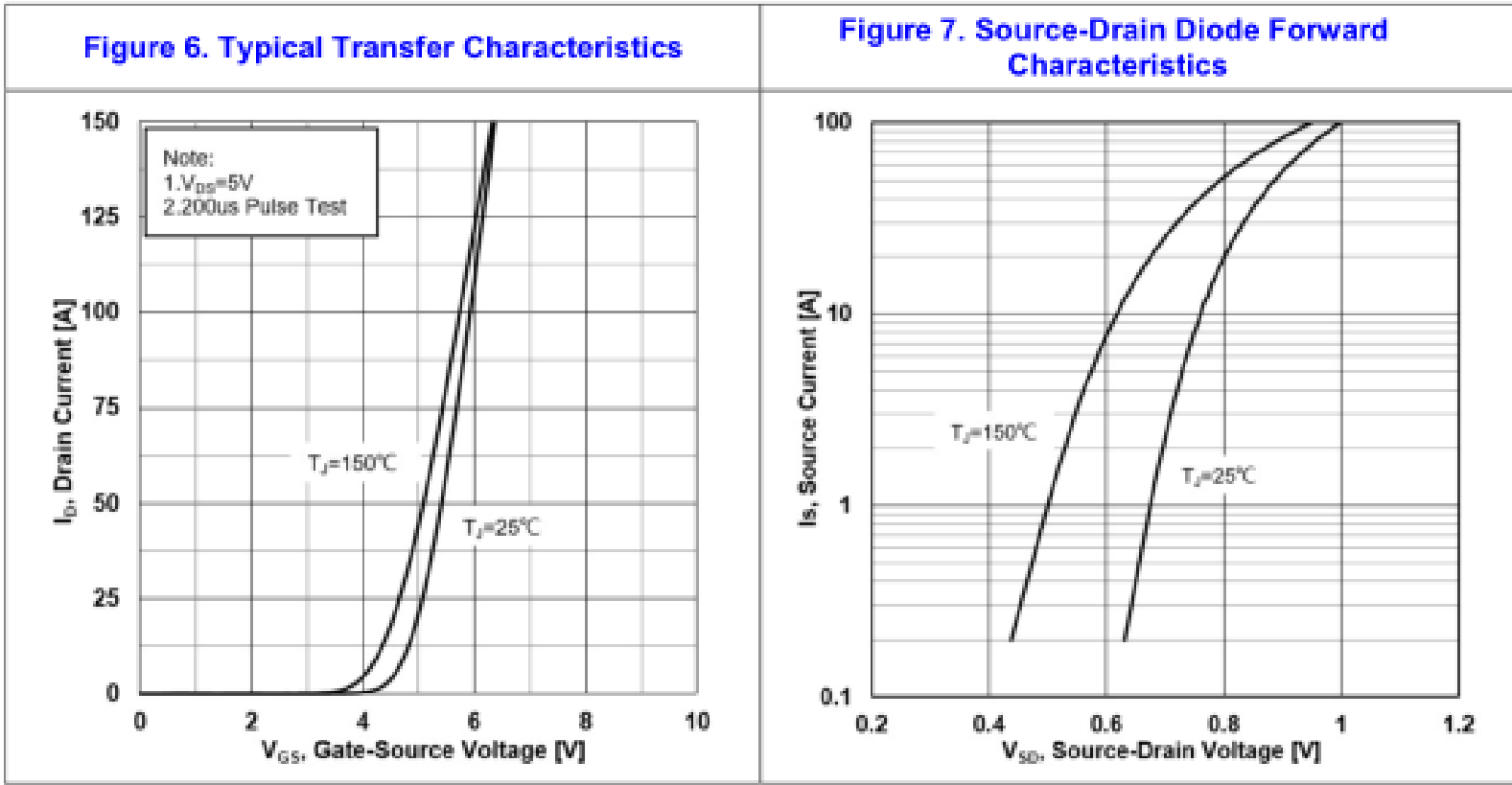
注释：
1： 脉冲宽度由最高结温限制
2： L=1.0mH, VGS=10V, VDD=48V, RG=25 Ω,起始结温 TJ=25℃
3： ISD ≤120A,di/dt ≤300A/μs,VDD≤BVDSS,起始结温 TJ=25℃
4： 脉冲测试： 脉冲宽度 ≤300μs,占空比≤2％
5： 基本与工作温度无关

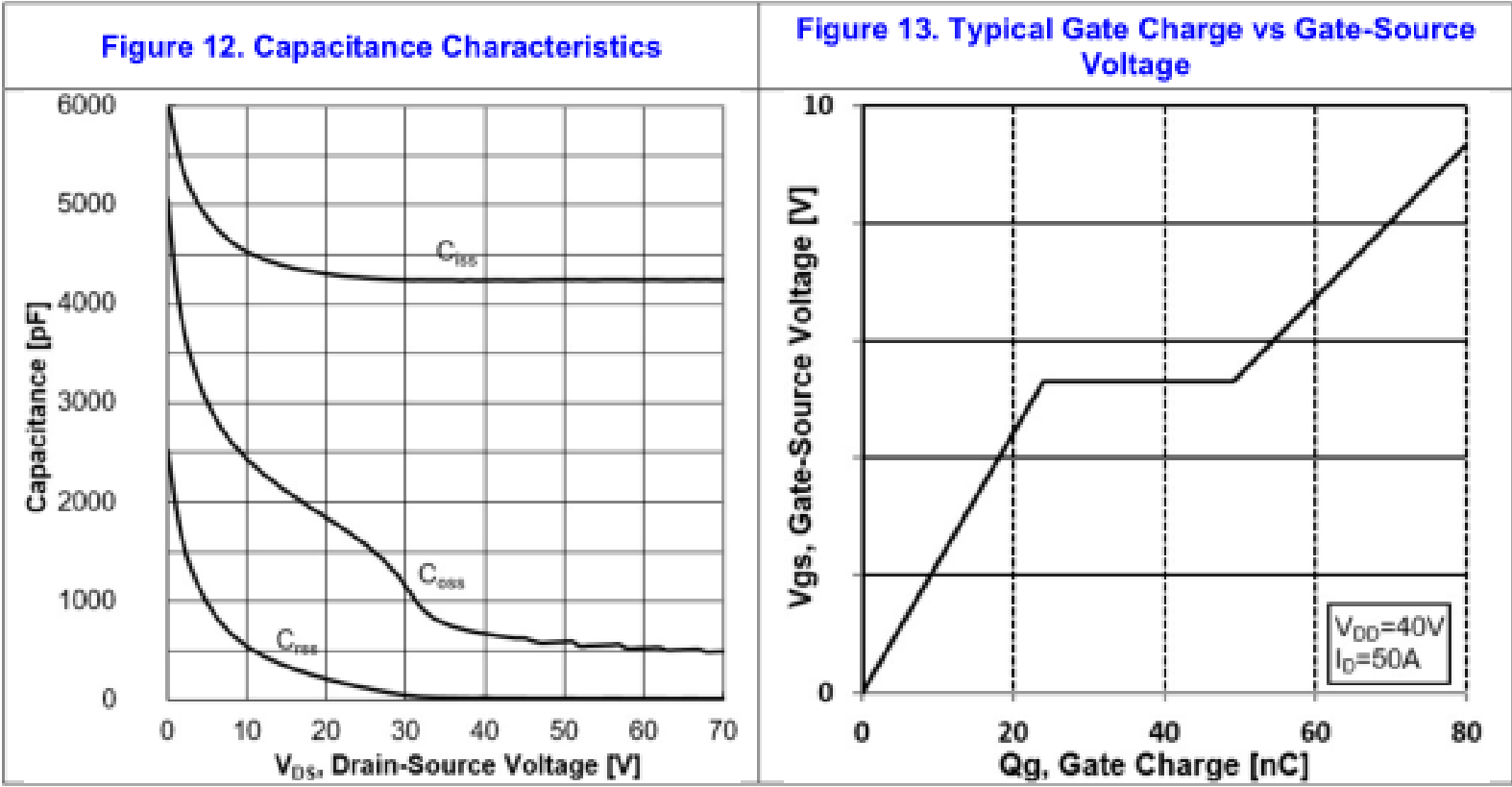
Notes:
1： Pulse width limited by maximum junction temperature
2： L=1.0mH, VGS=10V, VDD=48V, RG=25 Ω,Starting TJ=25℃
3： ISD ≤120A,di/dt ≤300A/μs,VDD≤BVDSS, Starting TJ=25℃
4： Pulse Test: Pulse Width ≤300μs,Duty Cycle≤2％
5： Essentially independent of operating temperature

Typical Characteristics

典型特性曲线

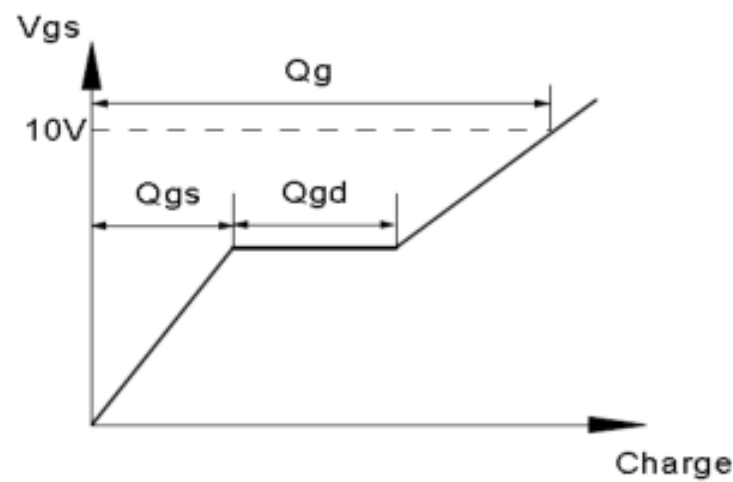
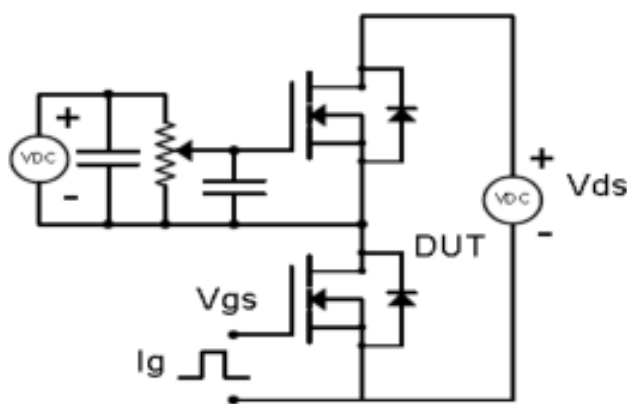




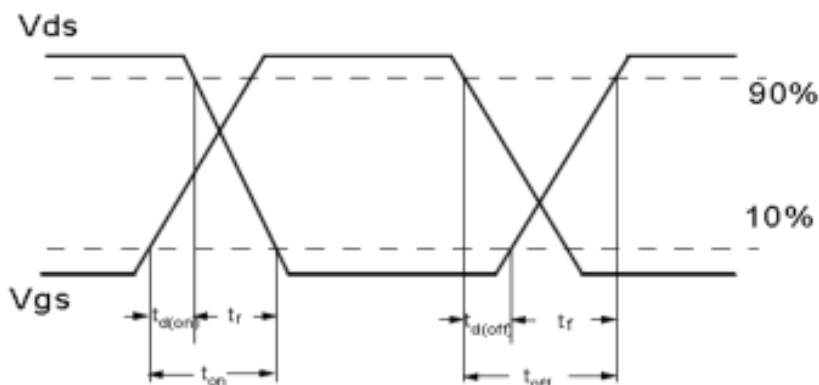
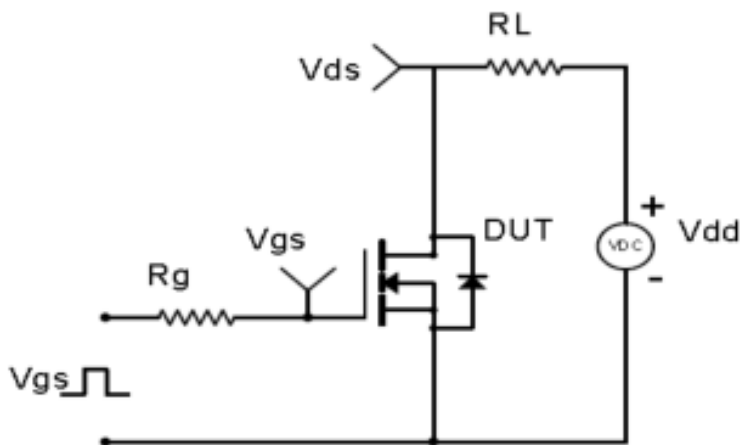


Test Circuit & Waveform

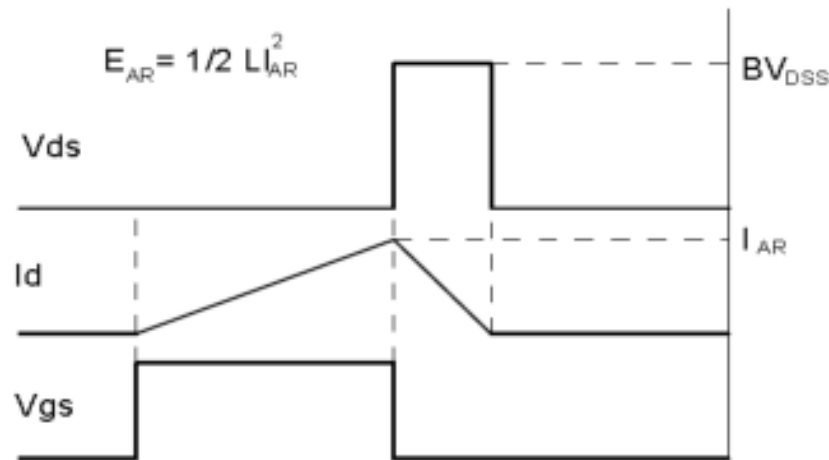
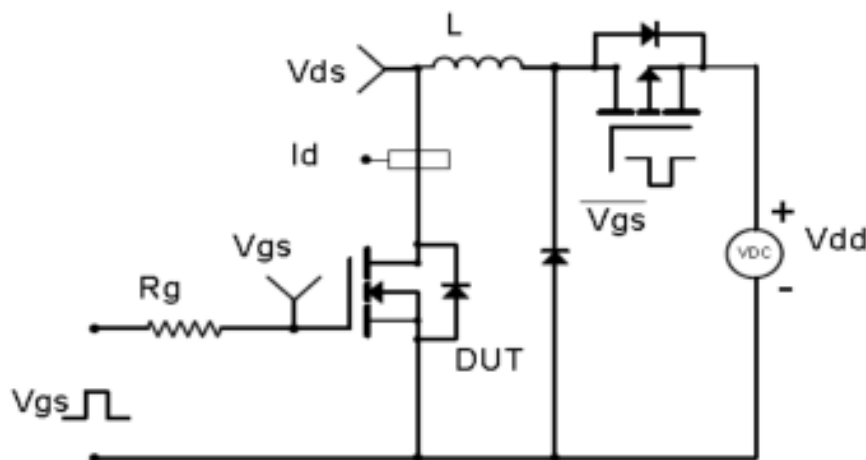
Gate Charge Test Circuit & Waveform



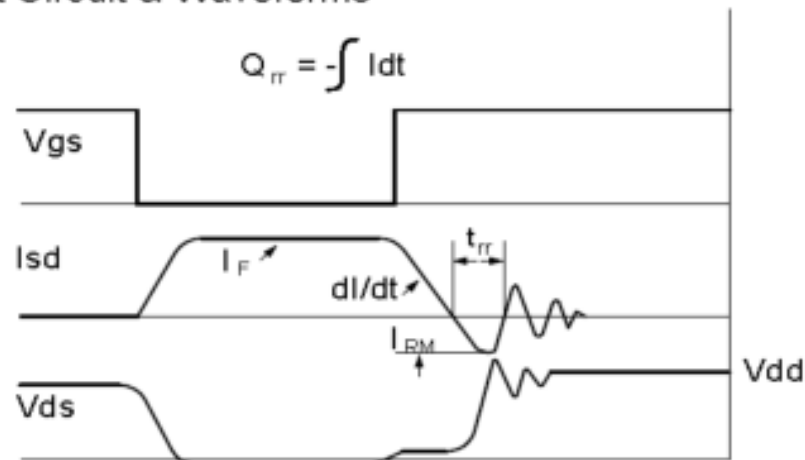
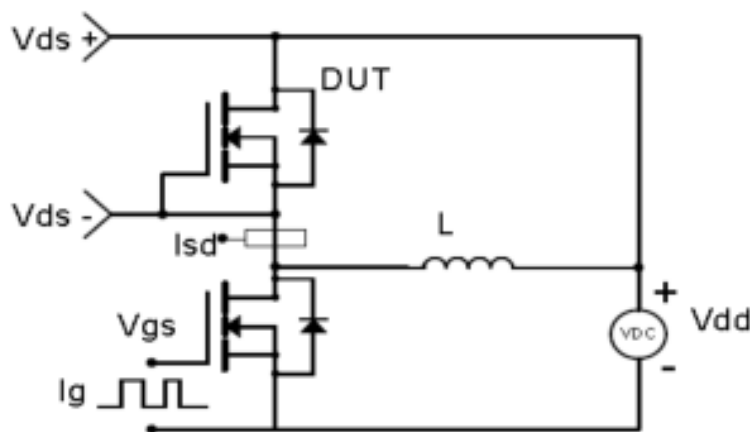
Resistive Switching Test Circuit & Waveforms



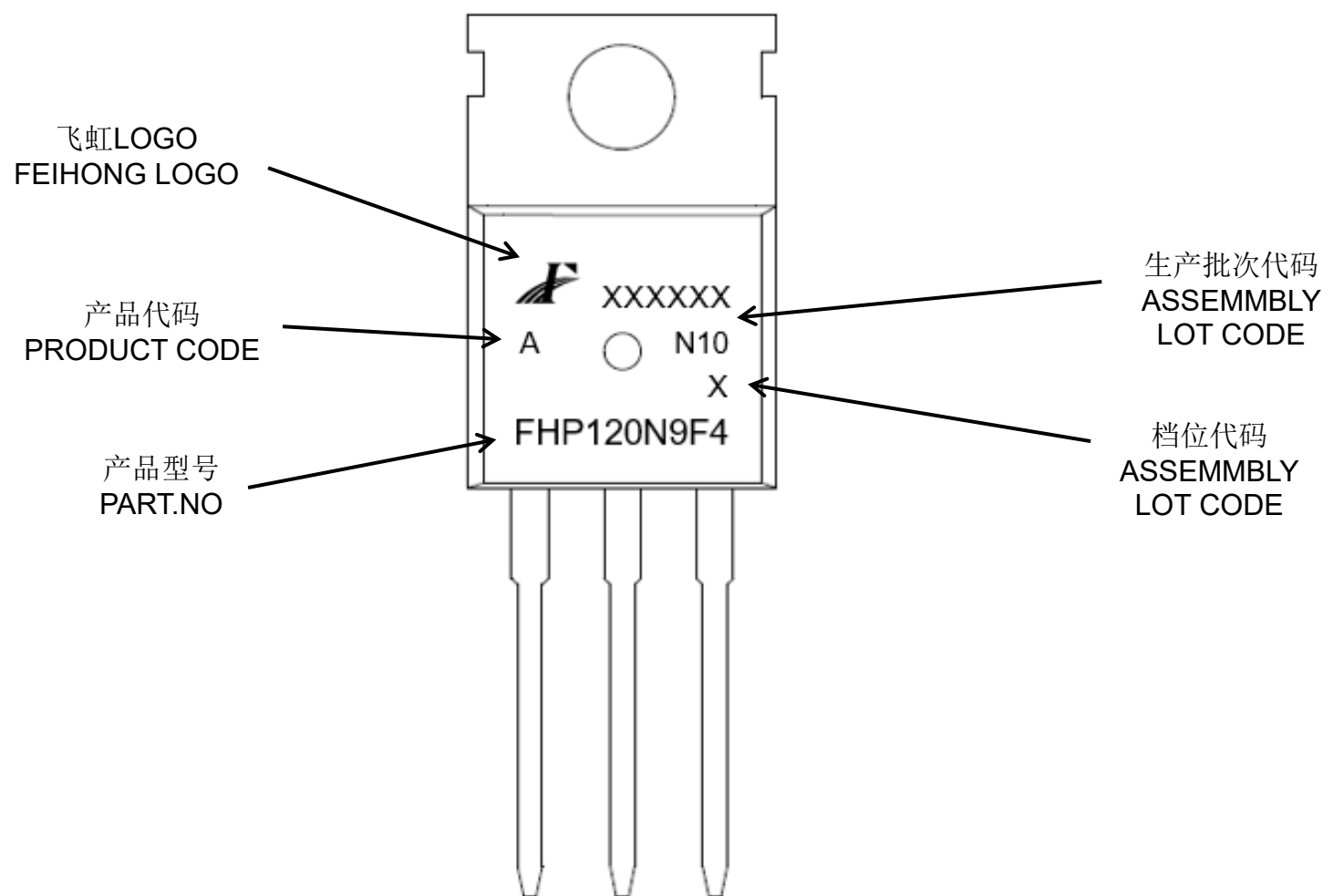
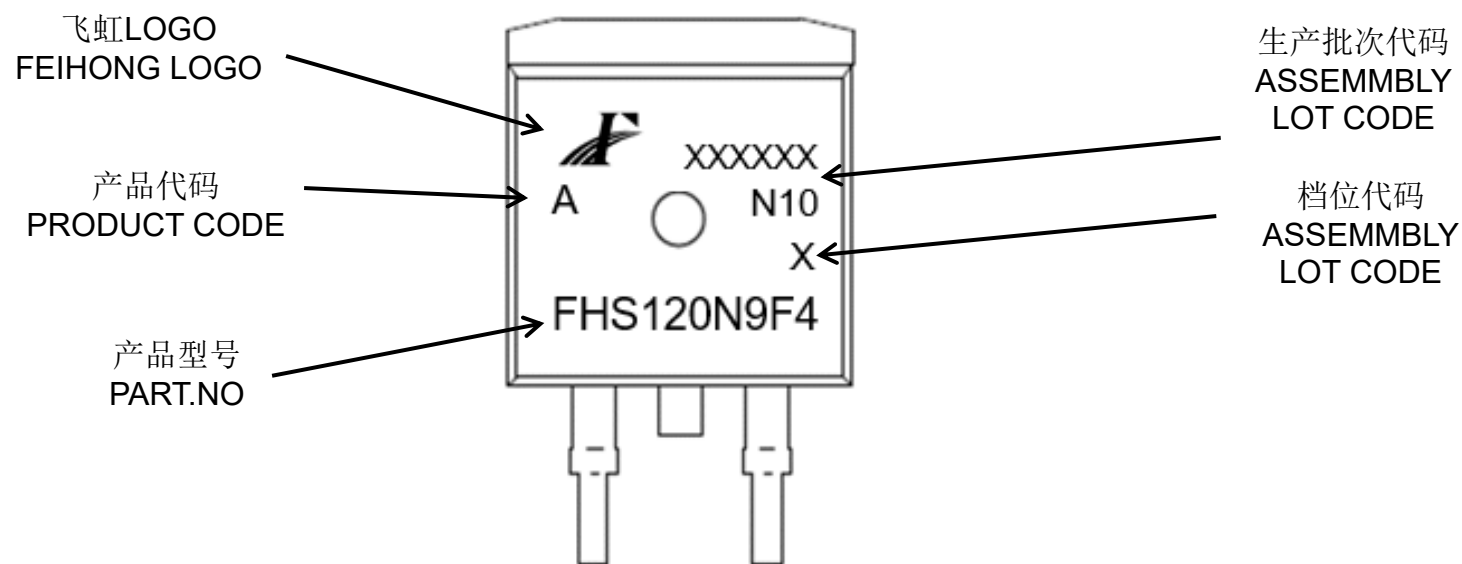
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



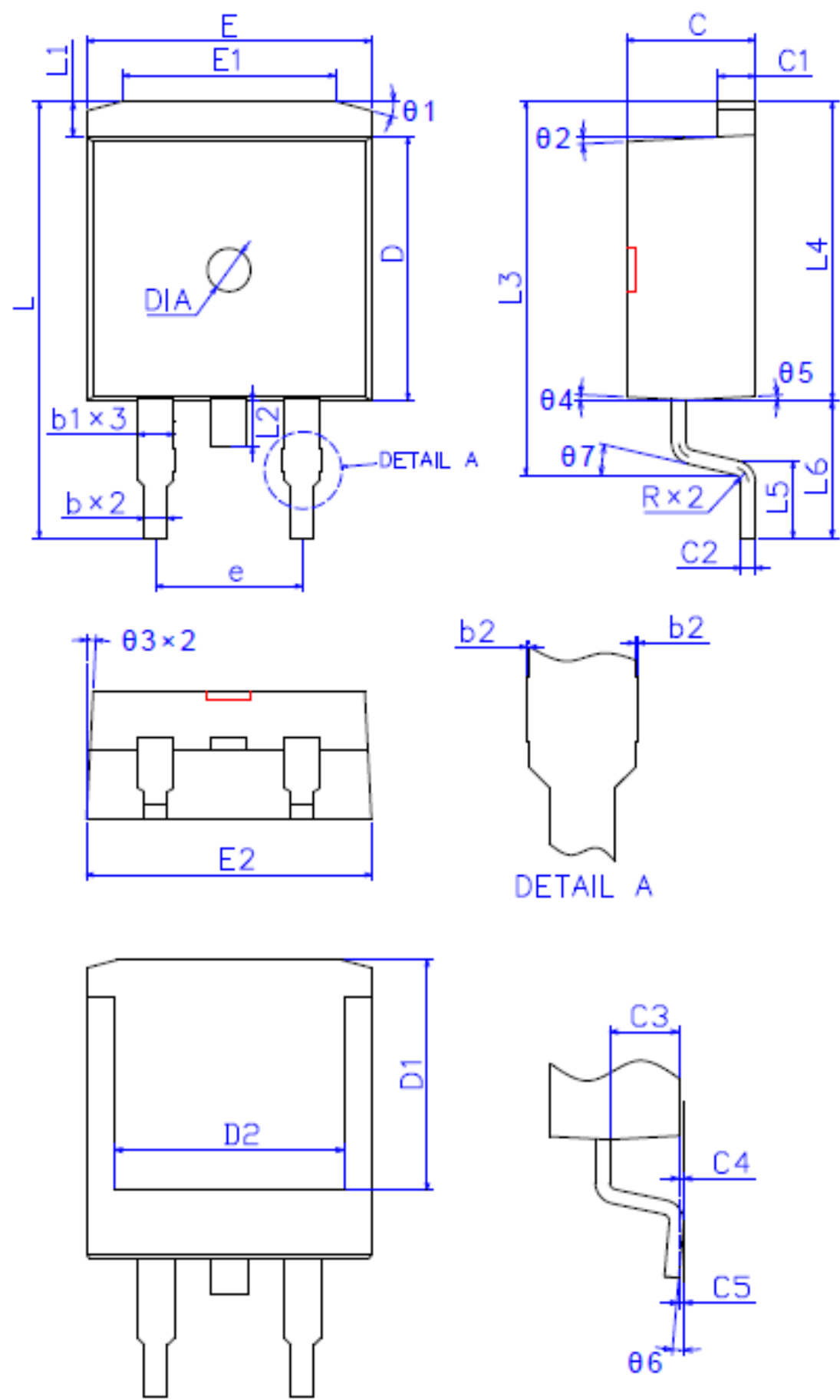
印记 Marking:



外形尺寸:

Package Dimension:

TO-263

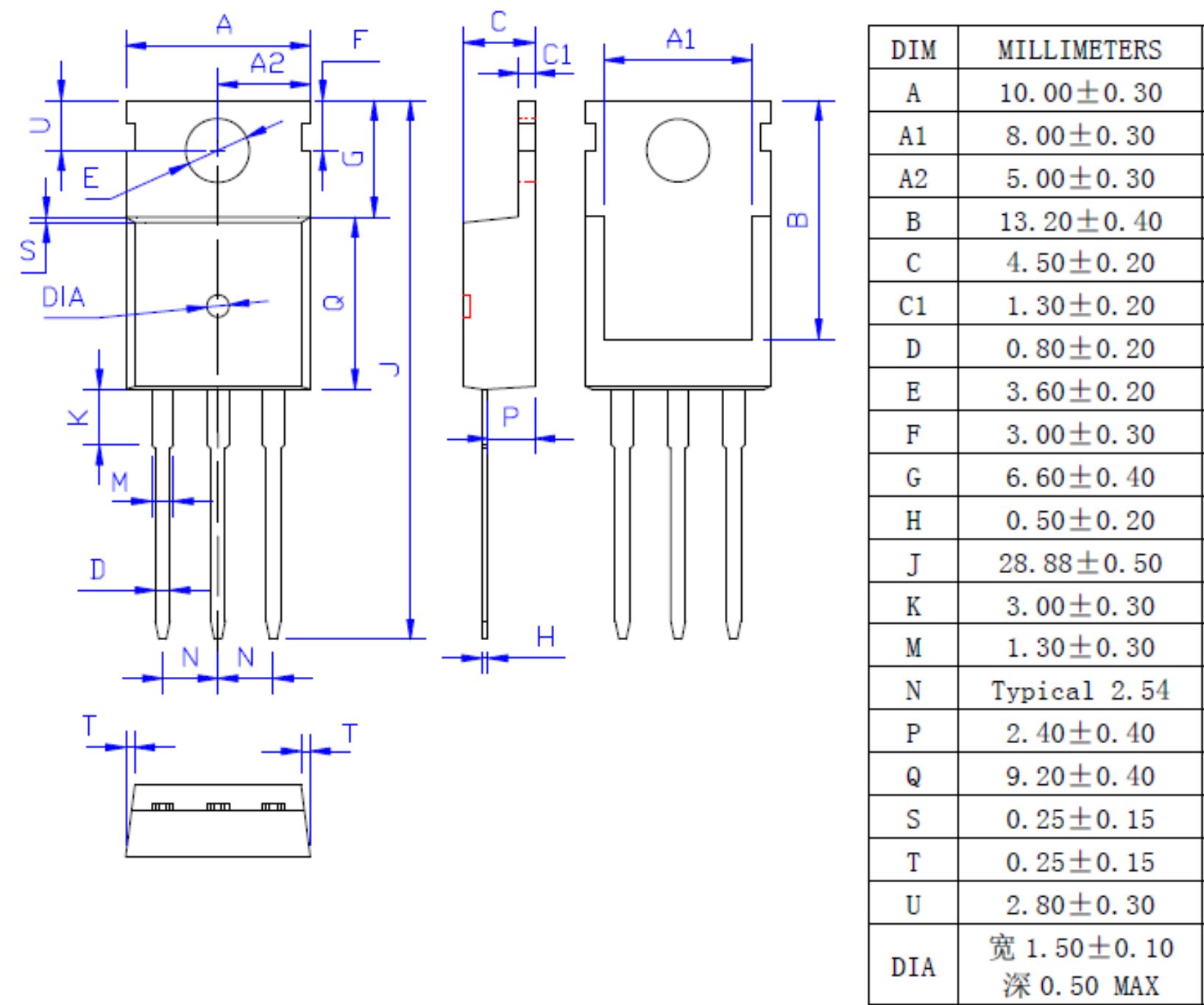


标注	尺寸(mm)
E	9.88±0.10
E1	7.40±0.20
E2	9.90±0.15
L	15.20±0.25
L1	1.30±0.15
L2	1.60±0.10
L3	13.00±0.20
L4	10.40±0.15
L5	2.60±0.15
L6	4.80±0.20
b	0.80±0.07
b1	1.27±0.07
b2	0.05±0.07
C	4.48±0.10
C1	1.30±0.07
C2	0.50±0.07
C3	2.40±0.06
C4	0.10±0.08
C5	0.10±0.08
D	9.20±0.10
D1	8.00±0.10
D2	8.00±0.10
R	0.50±0.10
θ1	15° ±2°
θ2	3° ±2°
θ3	3° ±2°
θ4	3° ±2°
θ5	3° ±2°
θ6	0° ~6°
θ7	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



(Unit: mm)