



N 沟道增强型场效应晶体管
N-CHANNEL MOSFET
FHA130N20F9A

主要参数 MAIN CHARACTERISTICS

ID	130 A
VDSS	200 V
Rdson-typ (@Vgs=10V)	9.1 mΩ
Qg-typ	70 nC

用途 APPLICATIONS

高频开关电源	High efficiency switch mode power supplies
DC-DC转换器	DC-DC converter
同步整流	Synchronus Rectification
MPPT控制器	Maximum Power Point Tracking controller

封装形式 Package

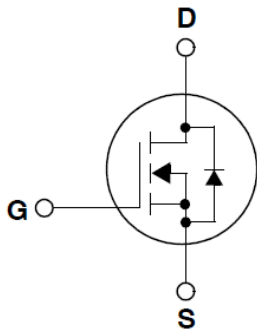


TO-247
FHA series

产品特性 FEATURES

低栅极电荷	Low gate charge
低 Crss (典型值 42 pF)	Low Crss (typical 42 pF)
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
SGT 工艺	SGT technology
符合 RoHS 标准	ROHS compliant

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
		FHA130N20F9A	
最高漏极-源极直流电压 Drain-Source Voltage	Vds	200	V
连续漏极电流* Drain Current -continuous *	Id (Tc=25℃)	130	A
	Id (Tc=100℃)	92	A
最大脉冲漏极电流 (注 1) Drain Current – pulse (note 1)	IDM	520	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	364.5	mJ
雪崩电流 (注 1) Avalanche Current (note 1)	IAS	27	A
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℃)	375	W
	-Derate above 25℃	2.5	W/℃
最高结温及存储温度 Operating and Storage Temperature Range	TJ, TSTG	175, -55 to 175	℃
引线最高焊接温度 Maximum Lead Temperature for Soldering Purposes	TL	260	℃

*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	200	-	-	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} =200V,V _{GS} =0V, T _C =25℃	-	-	1	μA
		V _{DS} =160V, T _C =125℃	-	-	5	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	2.5	-	4.0	V
静态导通电阻 Static Drain-Source On-Resistance	R _{DS(ON)}	V _{GS} =10V , I _D =81A	-	9.1	10	mΩ
动态特性 Dynamic Characteristics						
栅电阻 Gate Resistance	R _g	f=1.0MHz,V _{DS} OPEN	-	7.5	-	Ω
输入电容 Input capacitance	C _{iss}	V _{DS} =100V, V _{GS} =0V, f=1.0MHz	-	3910	-	pF
输出电容 Output capacitance	C _{oss}		-	405	-	
反向传输电容 Reverse transfer capacitance	C _{rss}		-	42	-	
开关特性 Switching Characteristics						
延迟时间 Turn-On delay time	t _{d(on)}	V _{DS} =100V, I _D =81A, R _G =5Ω V _{GS} =10V (note 4, 5)	-	18.3	-	ns
上升时间 Turn-On rise time	t _r		-	27	-	ns
延迟时间 Turn-Off delay time	t _{d(off)}		-	38	-	ns
下降时间 Turn-Off Fall time	t _f		-	19.4	-	ns
栅极电荷总量 Total Gate Charge	Q _g	V _{DS} =100V , I _D =81A , V _{GS} =10V (note 4, 5)	-	70	-	nC
栅－源电荷 Gate-Source charge	Q _{gs}		-	12.5	-	nC
栅－漏电荷 Gate-Drain charge	Q _{gd}		-	18.9	-	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		-	-	130	A
正向最大脉冲电流 Maximum Pulsed Drain-Source Diode Forward Current	I _{SM}		-	-	520	A
正向压降 Drain-Source Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _{SD} =81A	-	-	1.3	V
反向恢复时间 Reverse recovery time	t _{rr}	V _{GS} =0V, I _S =81A ,dI _F /dt=50A/μs (note 4)	-	130	-	ns
反向恢复电荷 Reverse recovery charge	Q _{rr}		-	667	-	nC

热特性 THERMAL CHARACTERISTIC

项目 Parameter	符号 Symbol	FHA130N20F9A	单位 Unit
结到管壳的热阻 Thermal Resistance, Junction to Case	Rth(j-c)	0.40	℃/W
结到环境的热阻 Thermal Resistance, Junction to Ambient	Rth(j-A)	40	℃/W

注释:

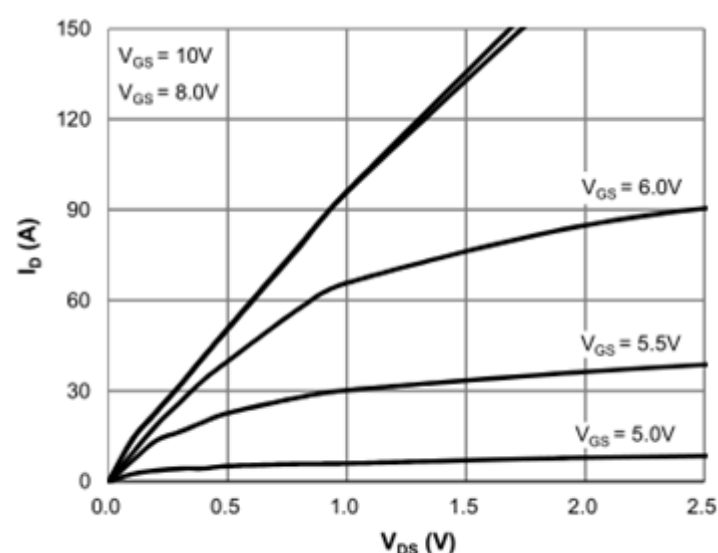
- 1: 脉冲宽度由最高结温限制
- 2: L=1mH, IAS=27A, VDD=50V, RG=25 Ω,起始结温 TJ=25℃
- 3: ISD ≤130A,di/dt ≤200A/μs,VDD≤BV_{DSS},起始结温 TJ=25℃
- 4: 脉冲测试: 脉冲宽度 ≤300μs,占空比≤2%
- 5: 基本与工作温度无关

Notes:

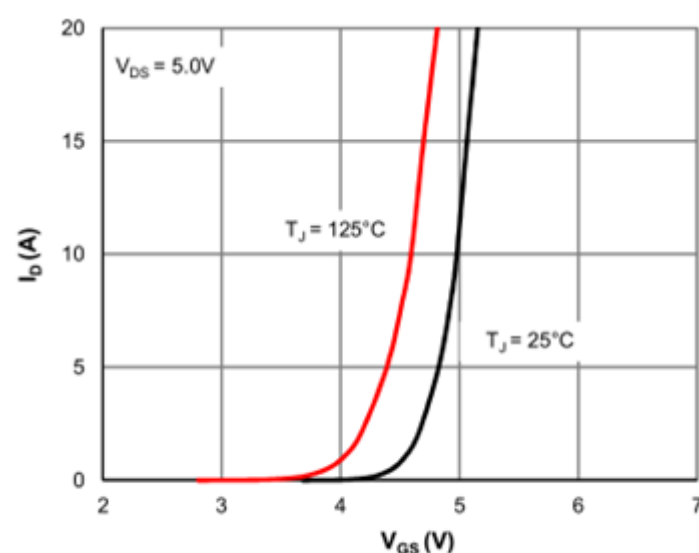
- 1: Pulse width limited by maximum junction temperature
- 2: L=1mH, IAS=27A, VDD=50V, RG=25 Ω ,Start TJ=25℃;
- 3: ISD ≤130A,di/dt ≤200A/μs,VDD≤BV_{DSS}, Starting TJ=25℃
- 4: Pulse Test: Pulse Width ≤300μs,Duty Cycle≤2%
- 5: Essentially independent of operating temperature

特性曲线

(ELECTRICAL CHARACTERISTICS (curves))



Saturation Characteristics



Transfer Characteristics

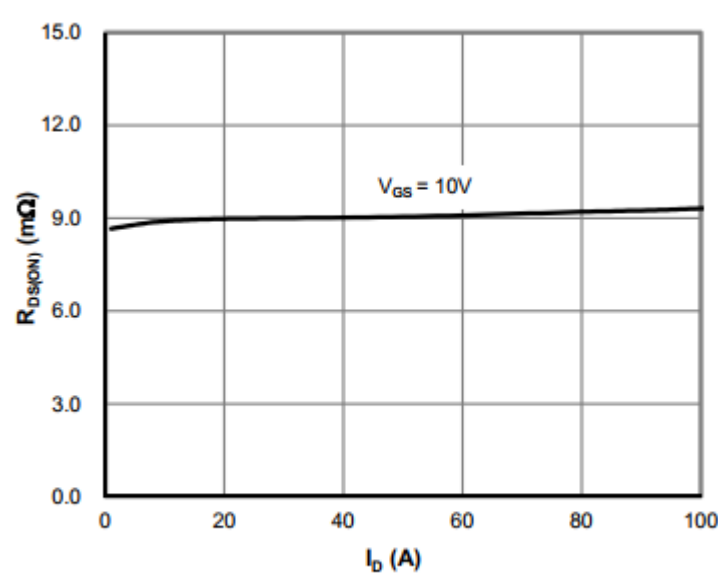
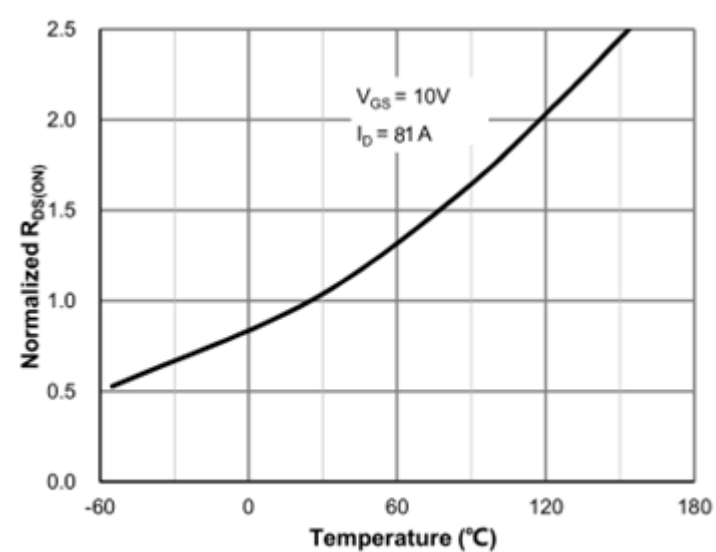
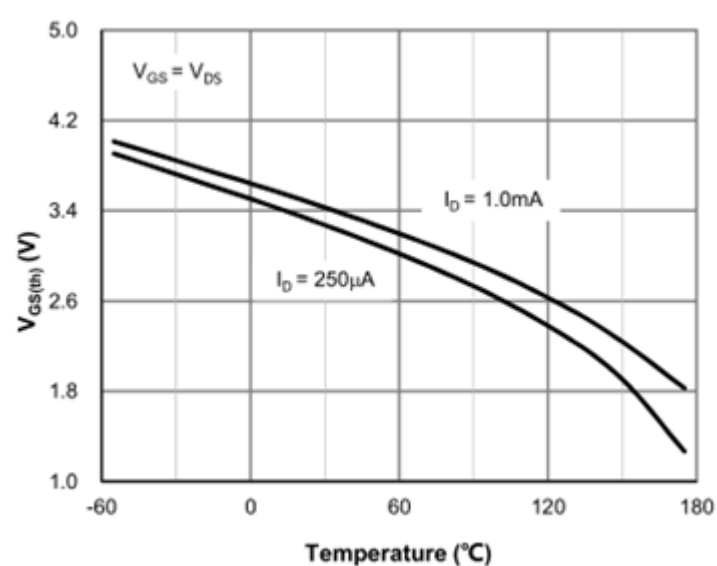


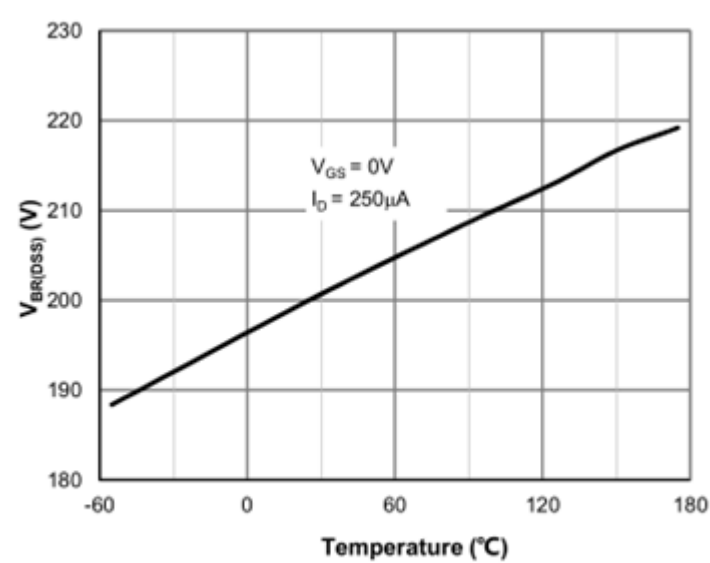
Figure 3: $R_{DS(on)}$ vs. Drain Current



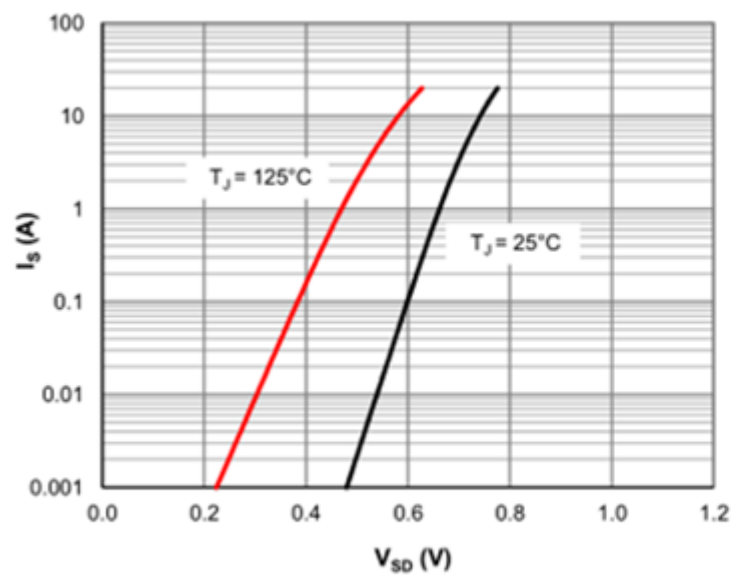
$R_{DS(on)}$ vs. Junction Temperature



$V_{GS(th)}$ vs. Junction Temperature



$V_{BR(DSS)}$ vs. Junction Temperature



Body-Diode Characteristics

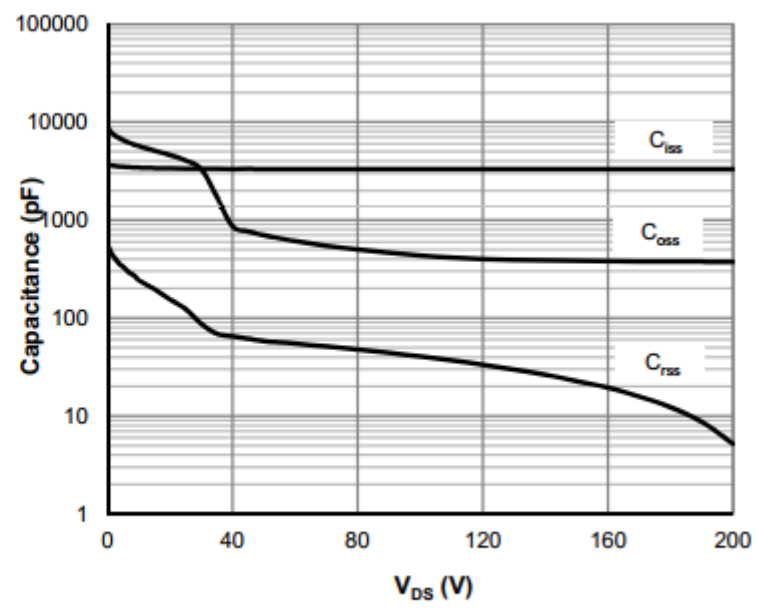
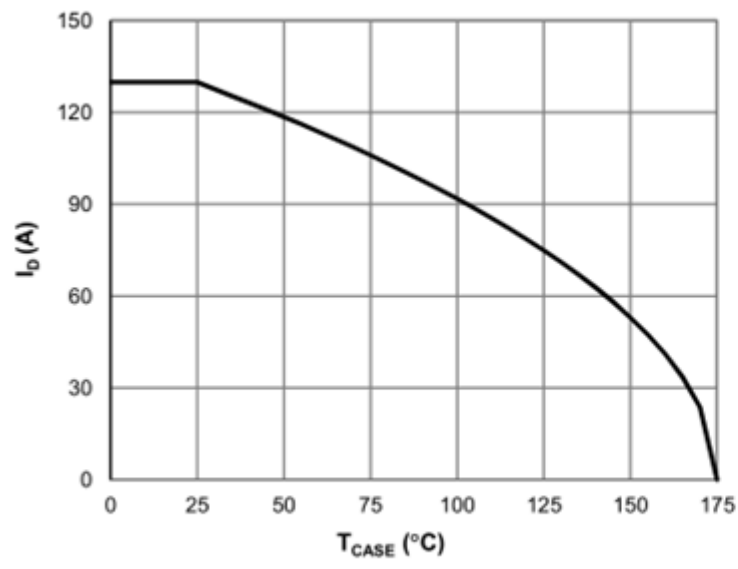
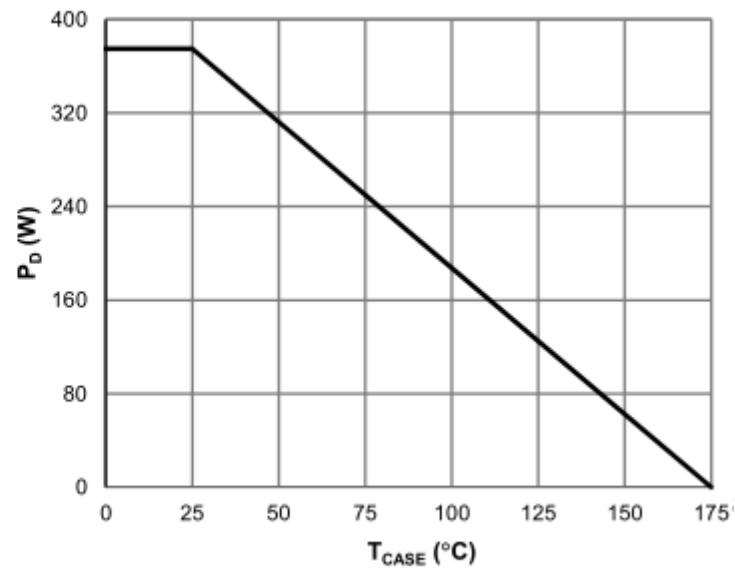


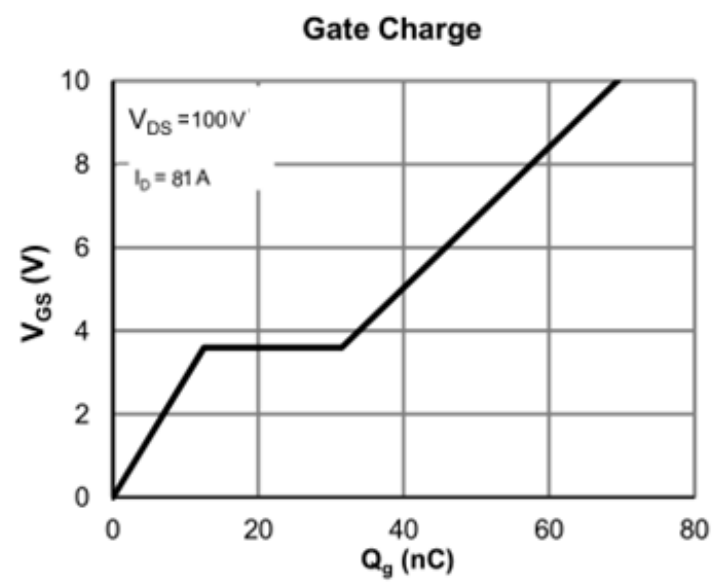
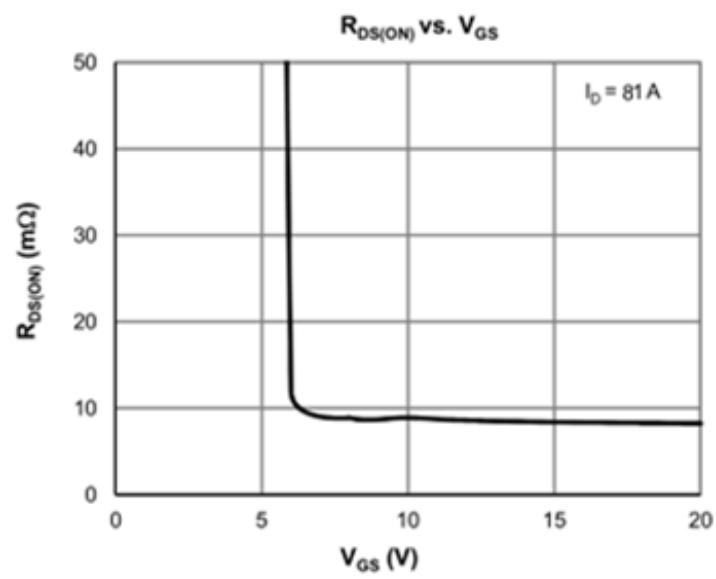
Figure 8: Capacitance Characteristics

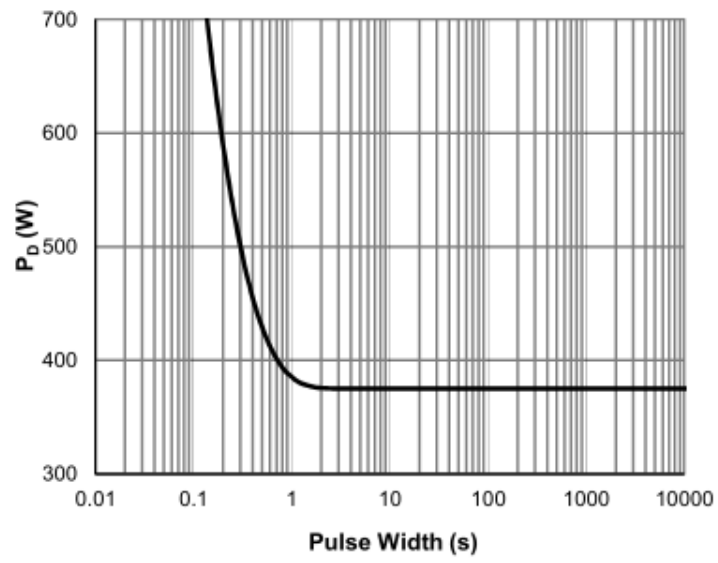


Current De-rating

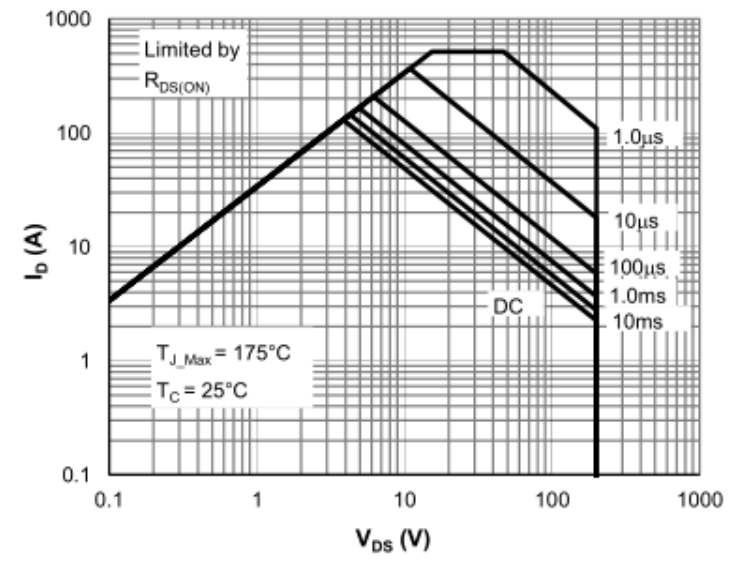


Power De-rating

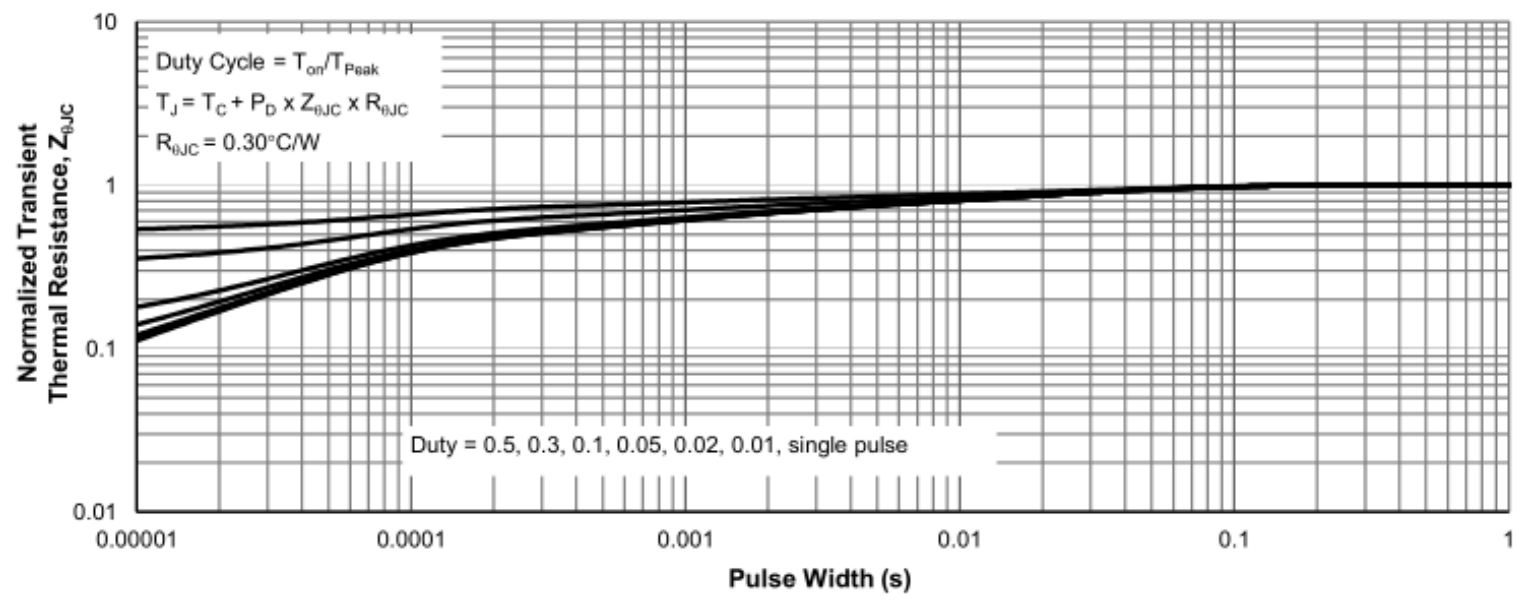




Single Pulse Power Rating, Junction-to-Case



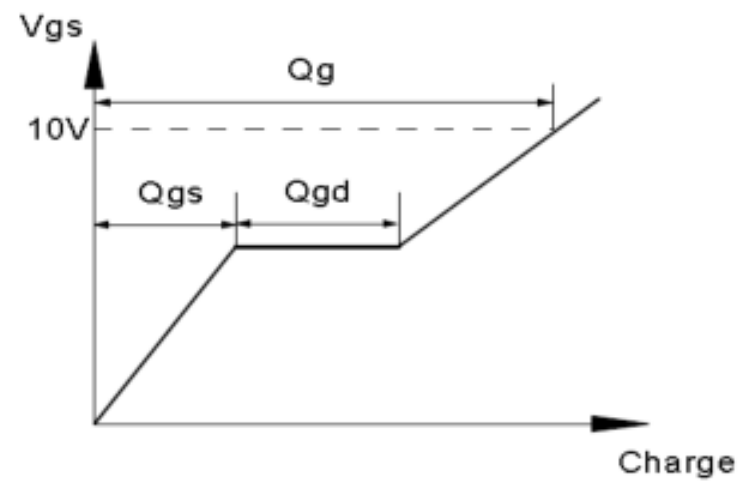
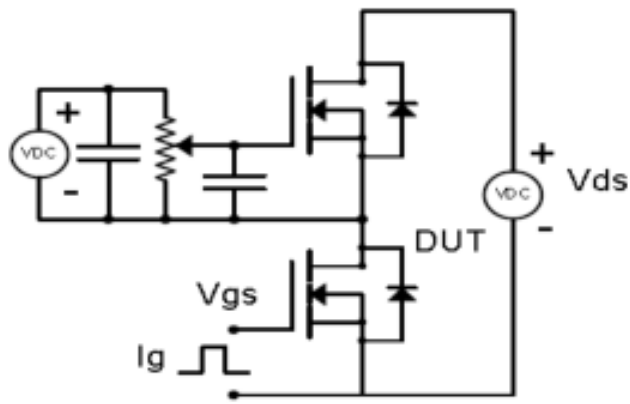
Maximum Safe Operating Area



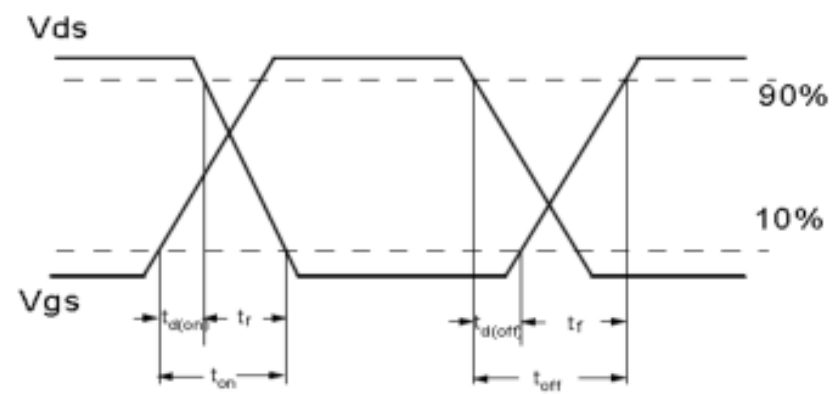
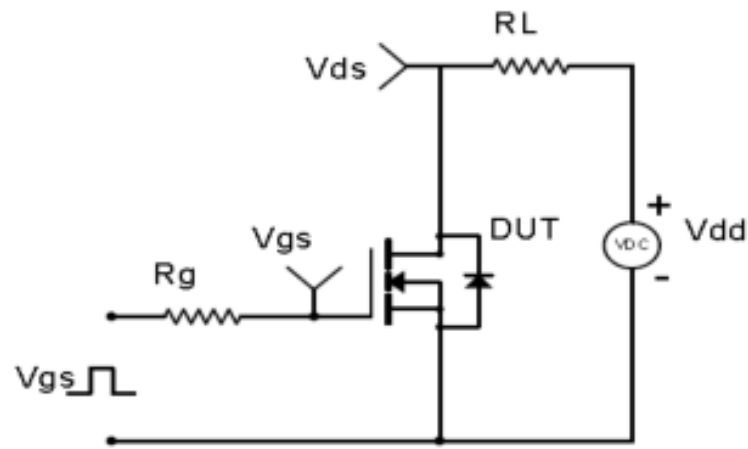
Normalized Maximum Transient Thermal Impedance

Test Circuit & Waveform

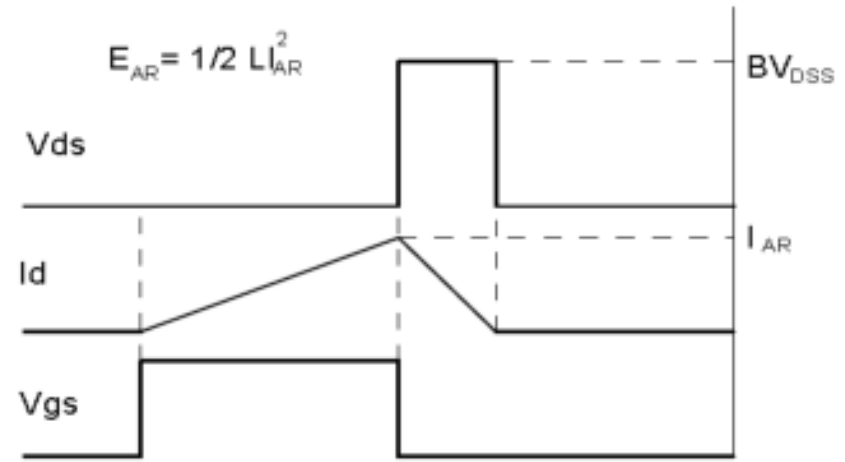
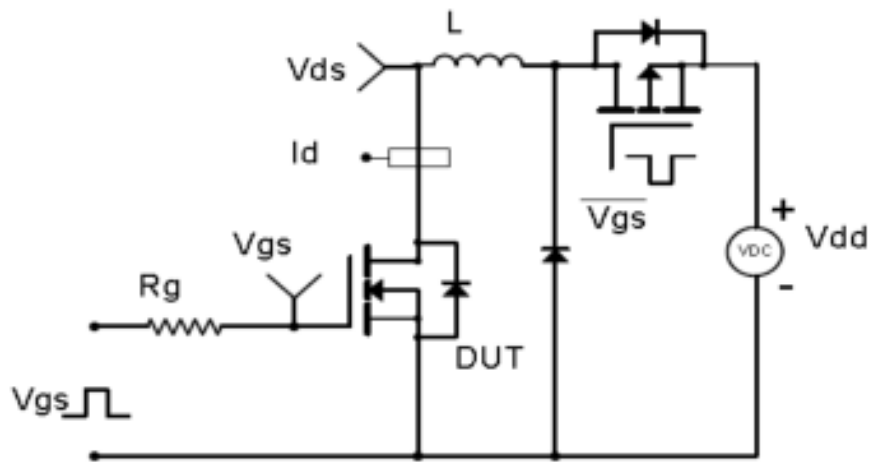
Gate Charge Test Circuit & Waveform



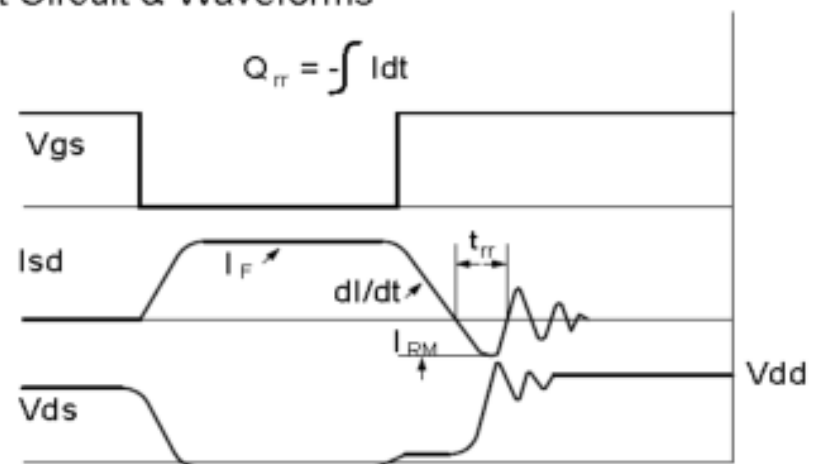
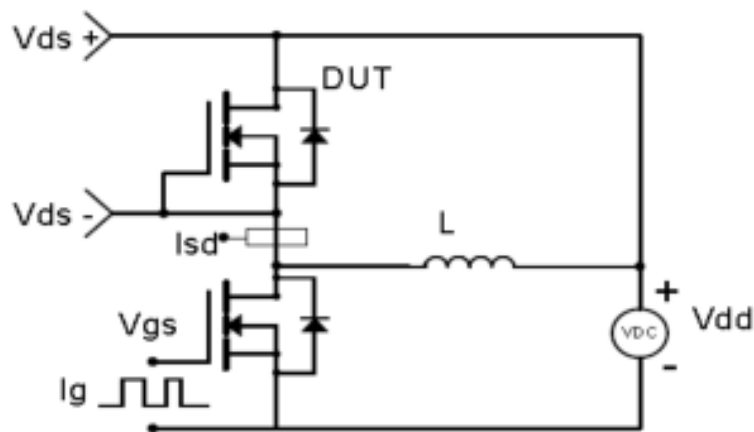
Resistive Switching Test Circuit & Waveforms



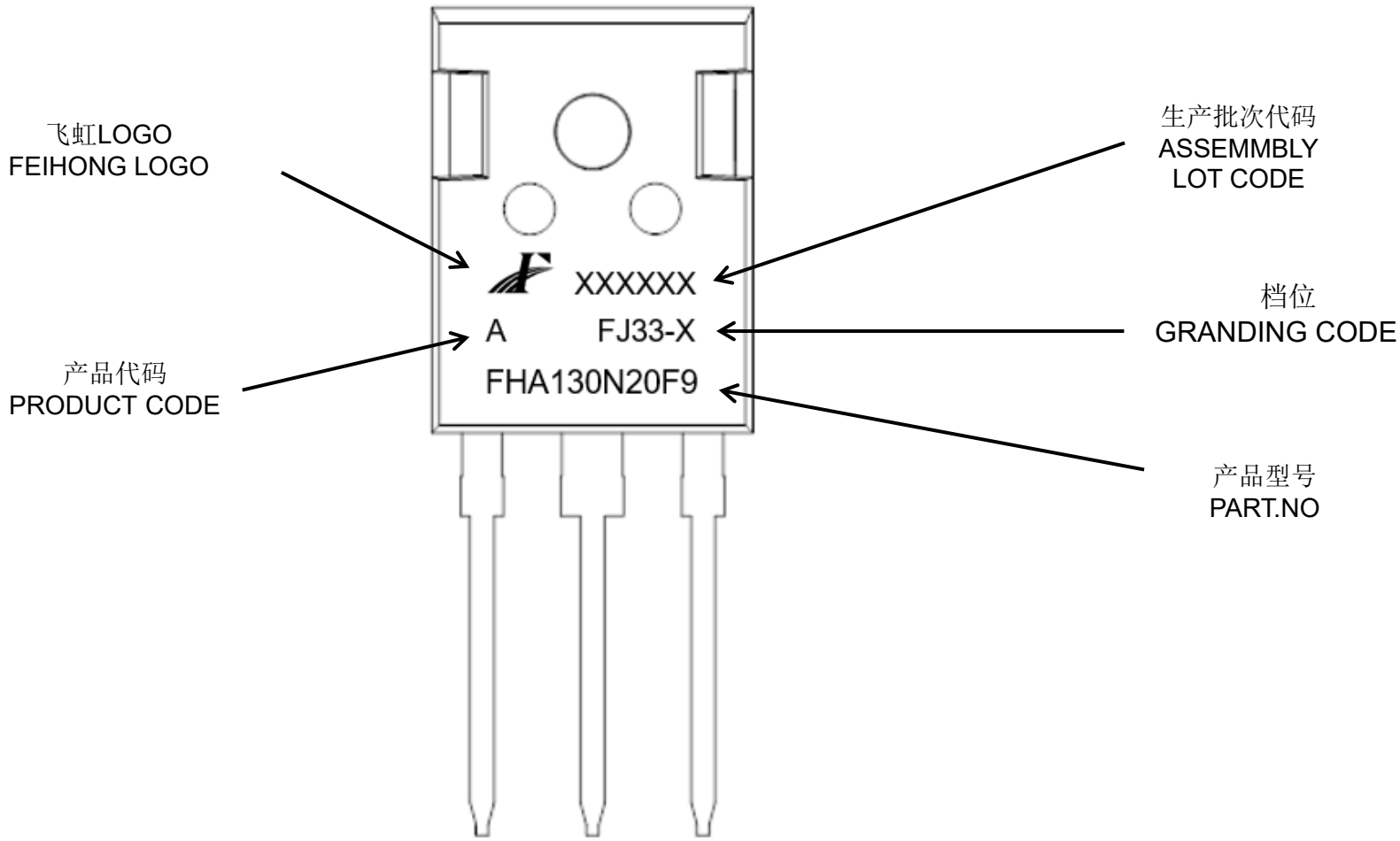
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



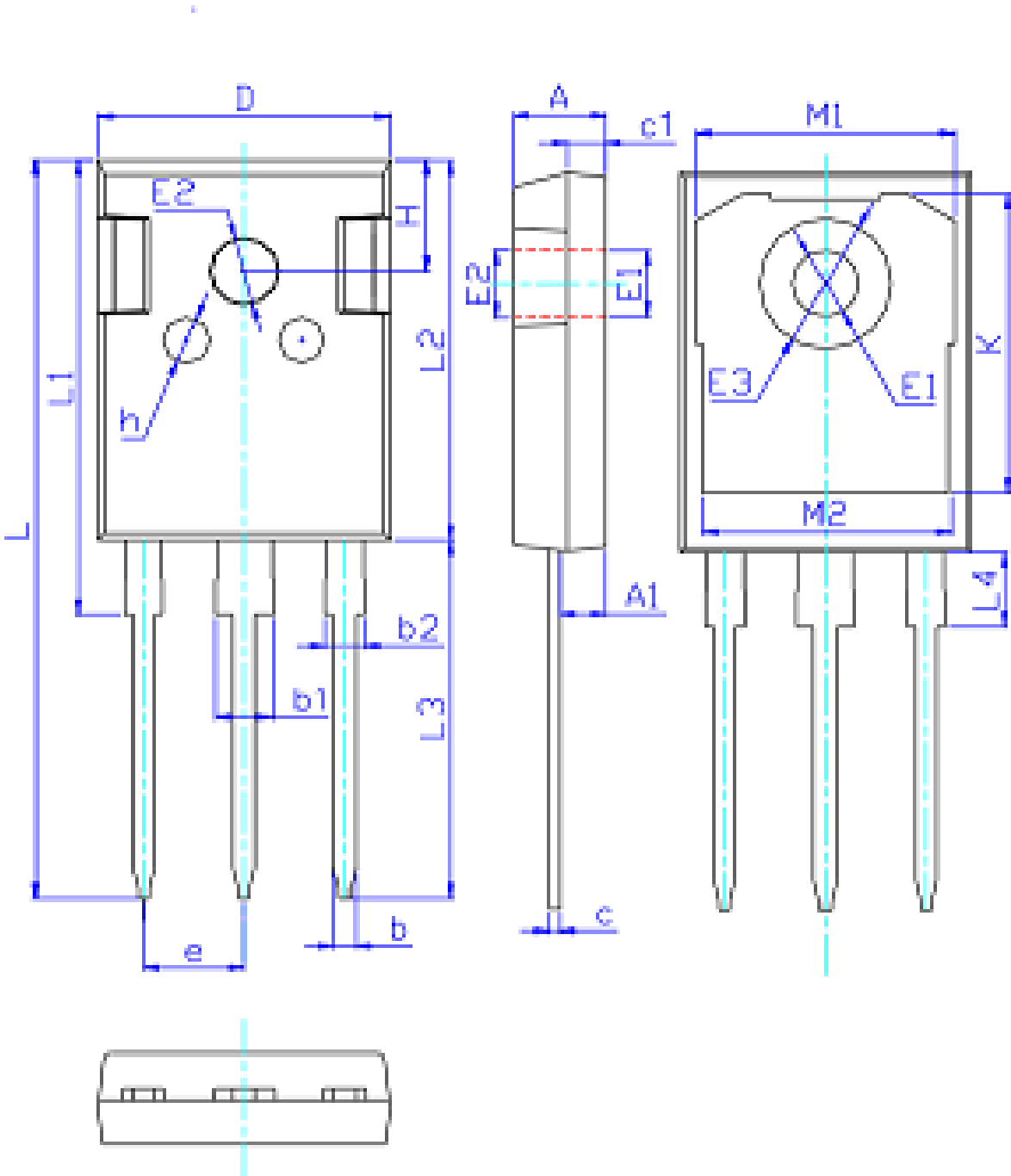
印记 Marking:



外形尺寸:

Package Dimension:

TO-247



标注	尺寸(mm)
A	5.00±0.05
A1	2.41±0.05
b	1.2±0.05
b1	3.05±0.05
b2	2.05±0.05
c	0.60±0.05
c1	2.00±0.05
D	15.80±0.10
E1	3.60±0.05
E2	3.70±0.05
E3	7.19±0.05
L	40.92±0.10
L1	24.95±0.10
L2	21.00±0.10
L3	19.92±0.10
L4	4.10±0.05
e	5.44±0.05
H	6.15±0.05
h	2.50±0.05
K	16.45±0.10
M1	14.00±0.10
M2	13.30±0.10