

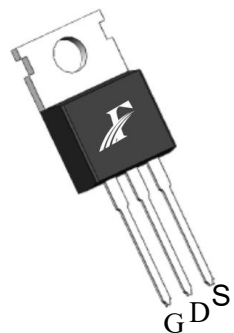
主要参数 MAIN CHARACTERISTICS

ID	24 A
VDSS	600 V
Rdson-typ (@Vgs=10V)	115 mΩ
Qg-typ	45 nC

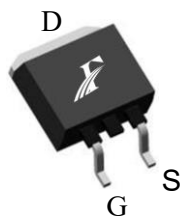
用途 APPLICATIONS

高频开关电源	High efficiency switch mode power supplies
功率因数校正	Power Factor Correction
LLC半桥	LLC half-bridge
锂电池充电器	Lithium battery charger

封装形式 Package



TO-220
FHP series

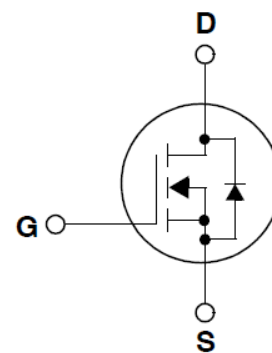


TO-263
FHS series

产品特性 FEATURES

多层外延工艺	Multi-Epi process SJ-FET
低栅极电荷	Low gate charge
低 Crss (典型值 52 pF)	Low Crss (typical 52 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
高抗 dv/dt 能力	Improved dv/dt capability
符合 RoHS 标准	ROHS compliant
内置 FRD	Built-in fast recovery diode

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
		FHP/S60R130AF	
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℃)	24	A
	I _D (T _C =100℃)	14	A
最大脉冲漏极电流 (注 1) Drain Current – pulse (note 1)	I _{DM}	96	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}	211.25	mJ
雪崩电流 (注 1) Avalanche Current (note 1)	I _{AS}	6.5	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	15	V/ns
耗散功率 Power Dissipation	P _D (T _C =25℃)	220	W
	-Derate above 25℃	1.75	W/℃
最高结温及存储温度 Operating and Storage Temperature Range	T _J , T _{STG}	150,-55~+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	600	-	-	V
击穿电压温度特性 Breakdown Voltage Temperature Coefficient	ΔBV _{DSS} /Δ T _J	I _D =250μA, referenced to 25℃	-	0.6	-	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,V _{GS} =0V, T _C =125℃	-	-	500	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	3.6	4.5	V
静态导通电阻 Static Drain-Source On-Resistance	R _{DS(ON)}	V _{GS} =10V , I _D =12A	-	115	135	mΩ
动态特性 Dynamic Characteristics						
栅电阻 Gate Resistance	R _g	f=1.0MHz,V _{DS} =OPEN	-	1.9	-	Ω
输入电容 Input capacitance	C _{iss}	V _{DS} =25V, V _{GS} =0V, f=1.0MHz	-	1810	-	pF
输出电容 Output capacitance	C _{oss}		-	103	-	
反向传输电容 Reverse transfer capacitance	C _{rss}		-	52	-	
开关特性 Switching Characteristics						
延迟时间 Turn-On delay time	t _{d(on)}	V _{DS} =400V, I _D =12A, R _G =2Ω V _{GS} =10V (note 4, 5)	-	35	-	ns
上升时间 Turn-On rise time	t _r		-	29	-	ns
延迟时间 Turn-Off delay time	t _{d(off)}		-	45	-	ns
下降时间 Turn-Off Fall time	t _f		-	39	-	ns
栅极电荷总量 Total Gate Charge	Q _g	V _{DS} =400V , I _D =12A , V _{GS} =10V (note 4, 5)	-	45	-	nC
栅－源电荷 Gate-Source charge	Q _{gs}		-	12	-	nC
栅－漏电荷 Gate-Drain charge	Q _{gd}		-	17	-	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		-	-	24	A
正向最大脉冲电流 Maximum Pulsed Drain-Source Diode Forward Current	I _{SM}		-	-	96	A
正向压降 Drain-Source Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =24A	-	1.0	1.25	V
反向恢复时间 Reverse recovery time	t _{rr}	V _{GS} =0V, I _S =24A ,dI _F /dt=100A/μs (note 4)	-	180	-	ns
反向恢复电荷 Reverse recovery charge	Q _{rr}		-	1350	-	nC
反向恢复峰值电流 Peak reverse recovery current	I _{rrm}		-	50	-	A

热特性 THERMAL CHARACTERISTIC

项目 Parameter	符号 Symbol	FHP/S60R130AF	单位 Unit
结到管壳的热阻 Thermal Resistance, Junction to Case	Rth(j-c)	0.56	℃/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=6.5A, VDD=48V, RG=25 Ω,起始结温 TJ=25℃
 - 3: ISD ≤24A,di/dt ≤200A/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=6.5A, VDD=48V, RG=25 Ω,Starting TJ=25℃
 - 3: ISD ≤24A,di/dt ≤200A/μs,VDD≤BVDSS, Starting TJ=25℃
 - 4: Pulse Test: Pulse Width ≤300μs,Duty Cycle≤2%
 - 5: Essentially independent of operating temperature

Typical Characteristics

Figure 1 Safe Operating Area

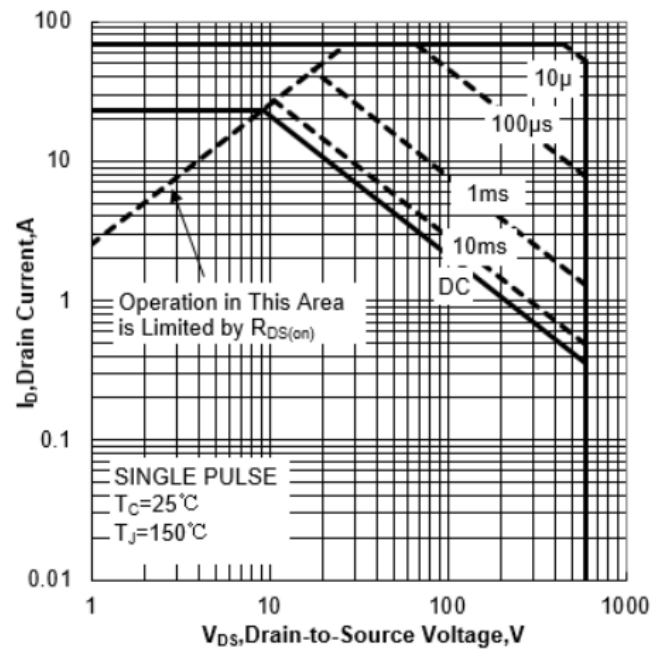


Figure 2 Power Dissipation

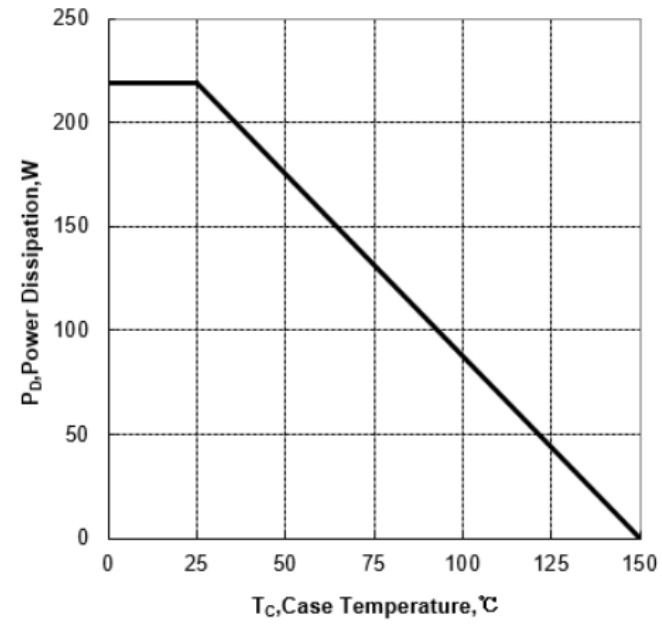


Figure 3 Max Thermal Impedance

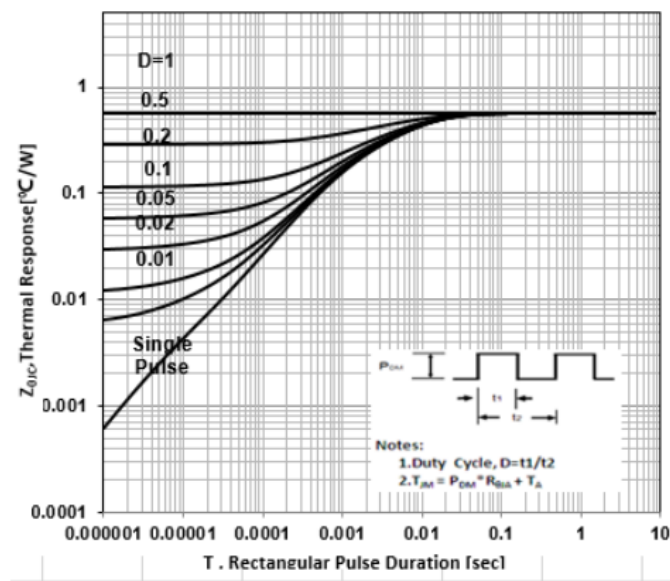


Figure 4 Typical Output Characteristics

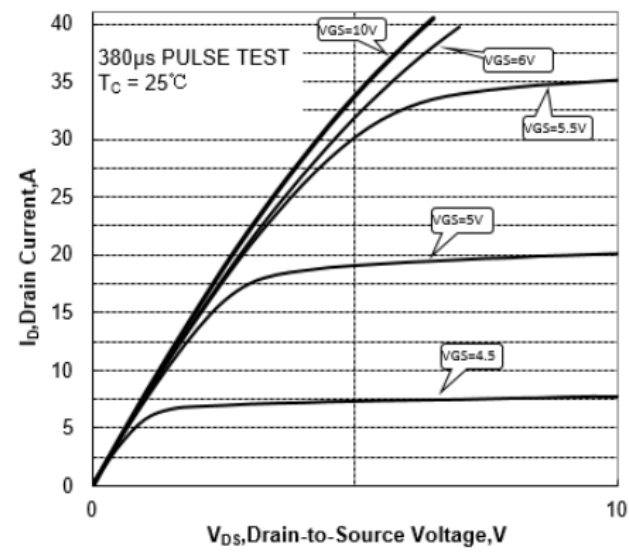


Figure 5 Typical Drain to Source ON Resistance vs Drain Current

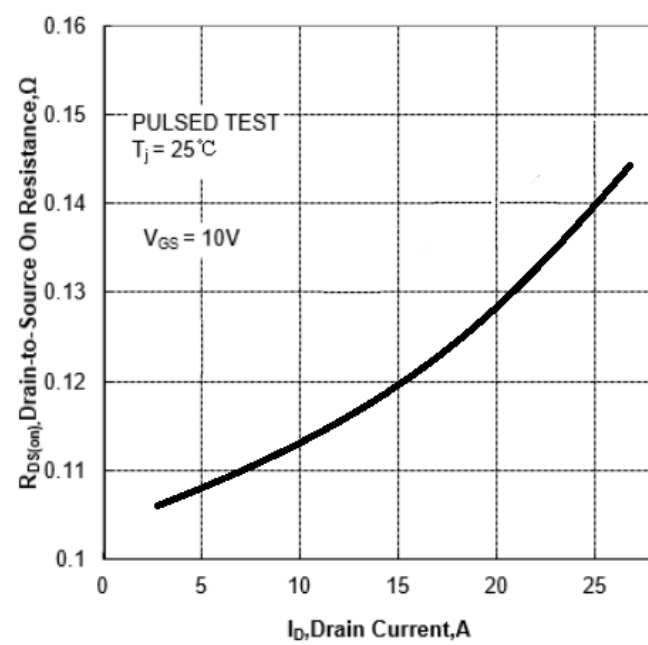
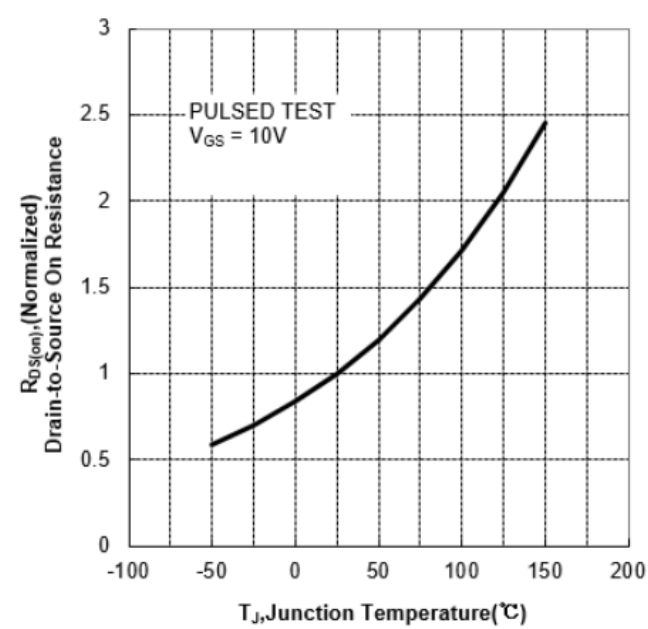
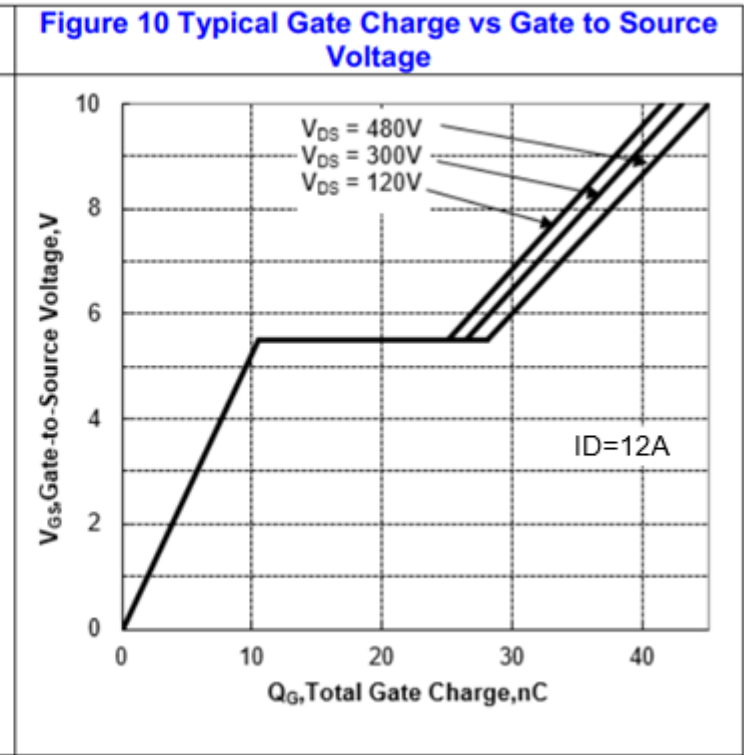
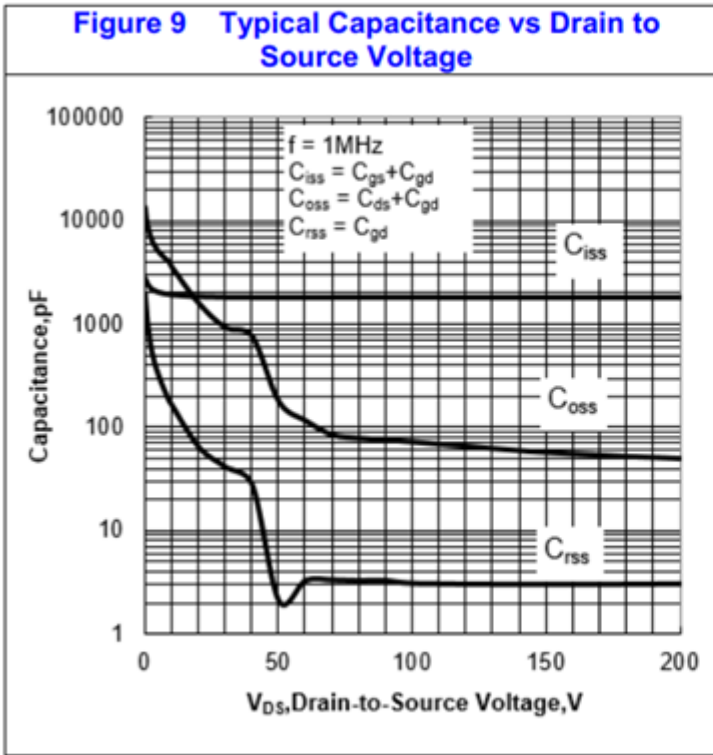
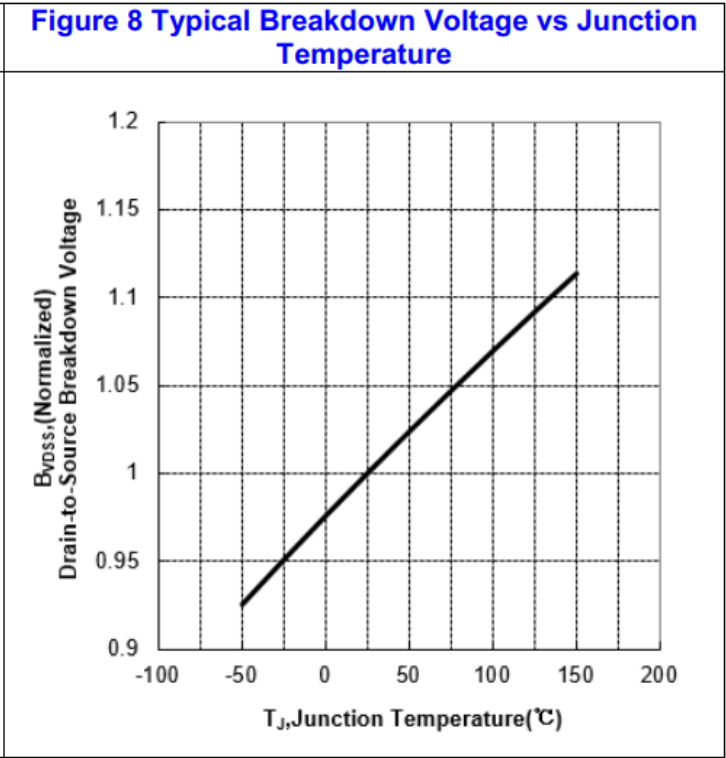
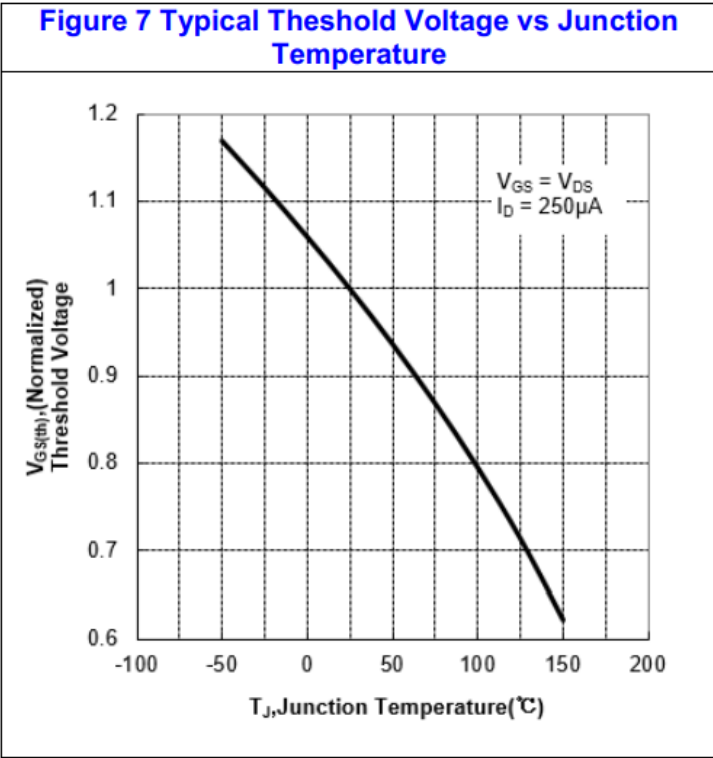


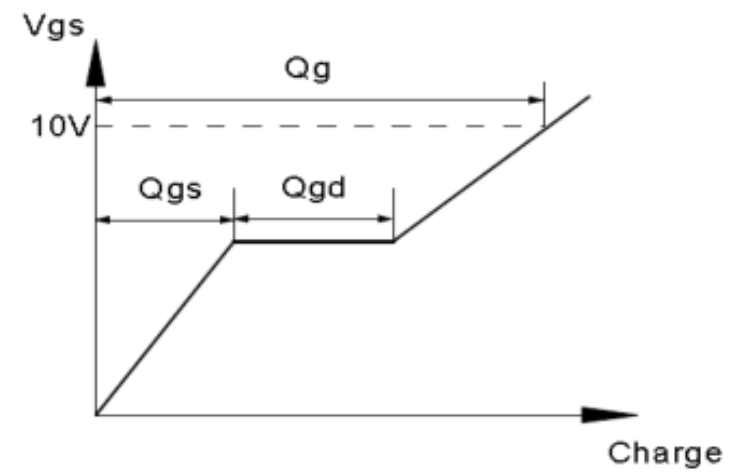
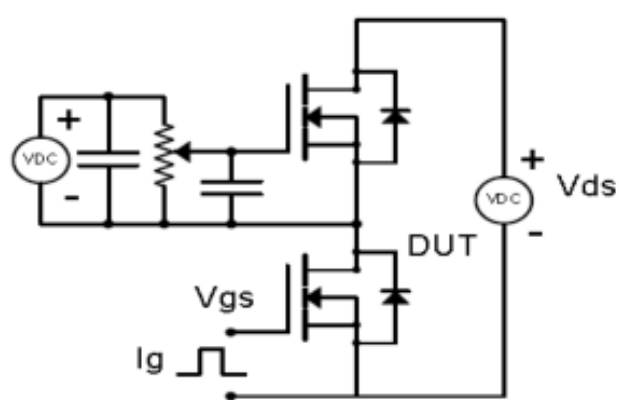
Figure 6 Typical Drain to Source on Resistance vs Junction Temperature



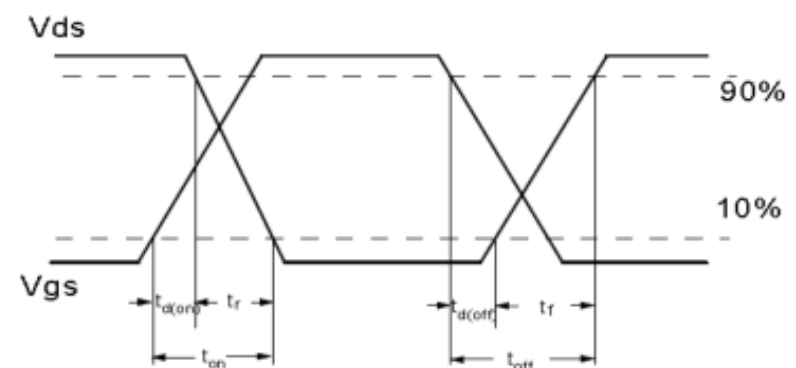
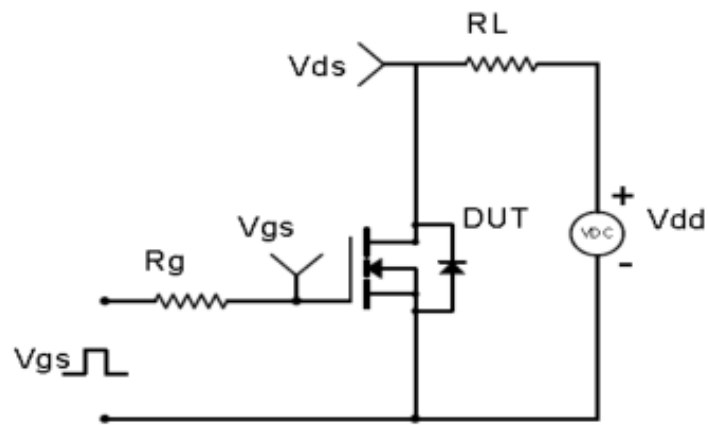


Test Circuit & Waveform

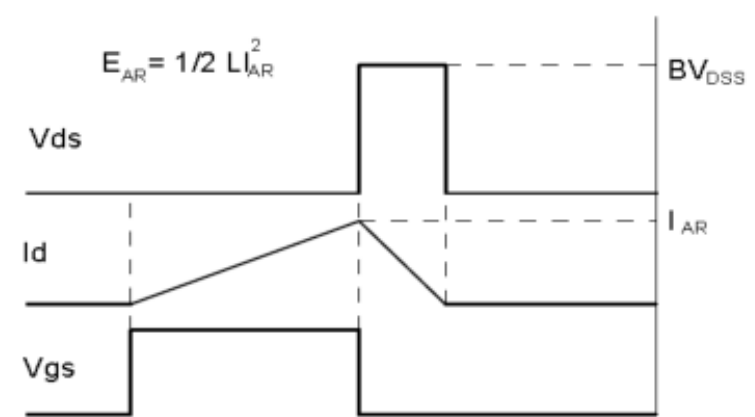
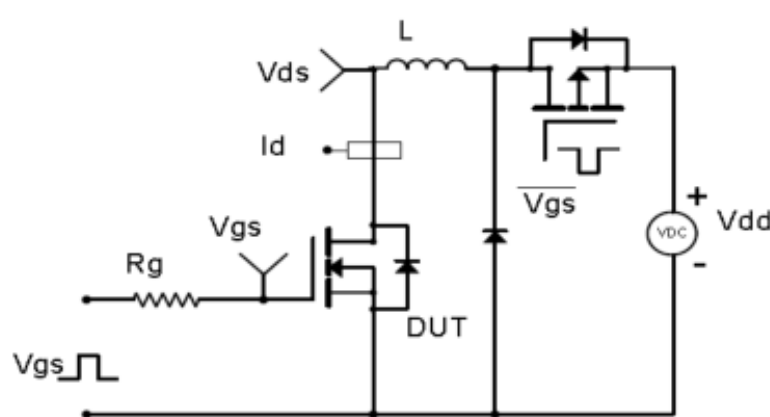
Gate Charge Test Circuit & Waveform



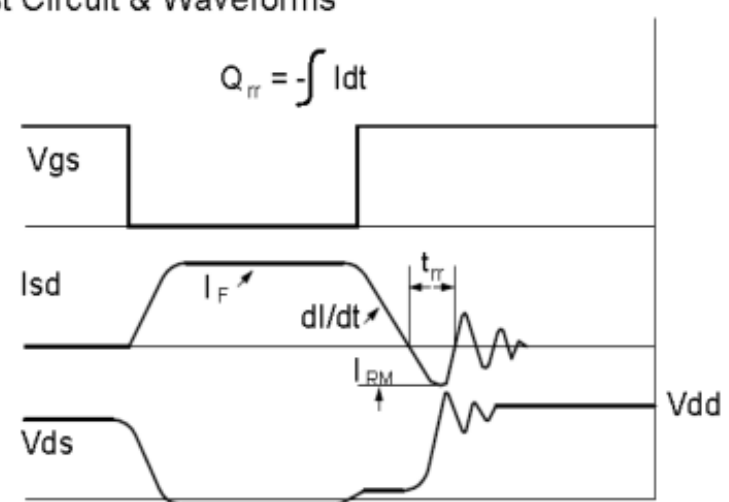
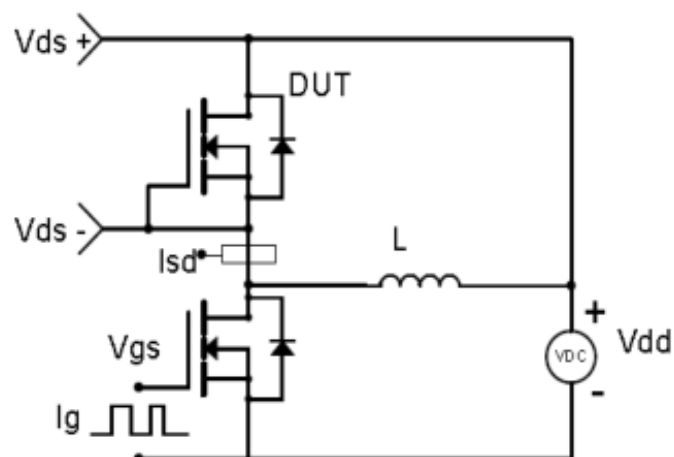
Resistive Switching Test Circuit & Waveforms



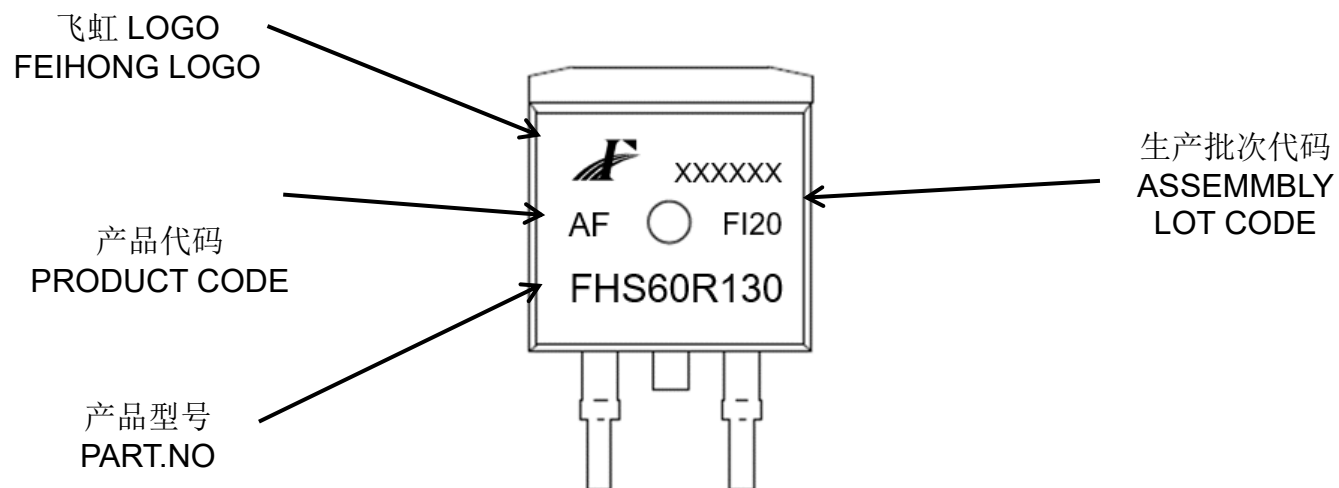
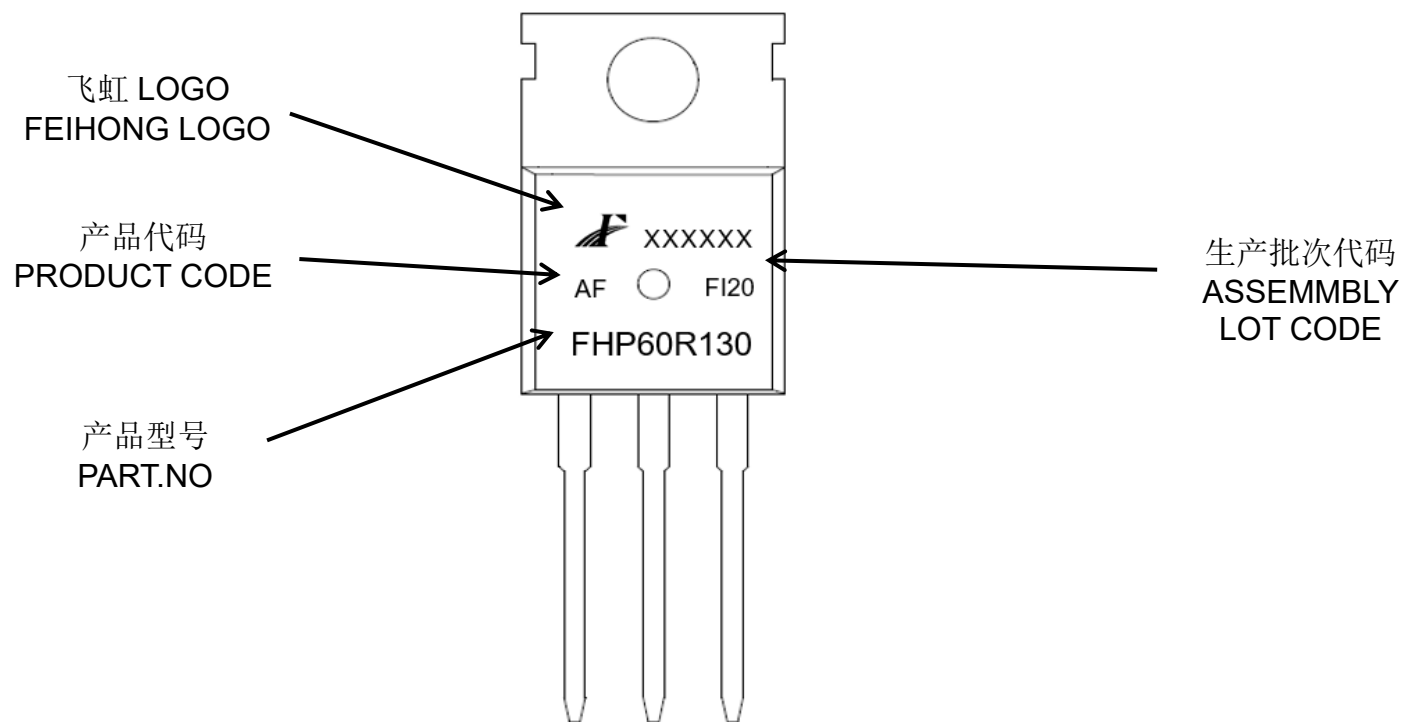
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



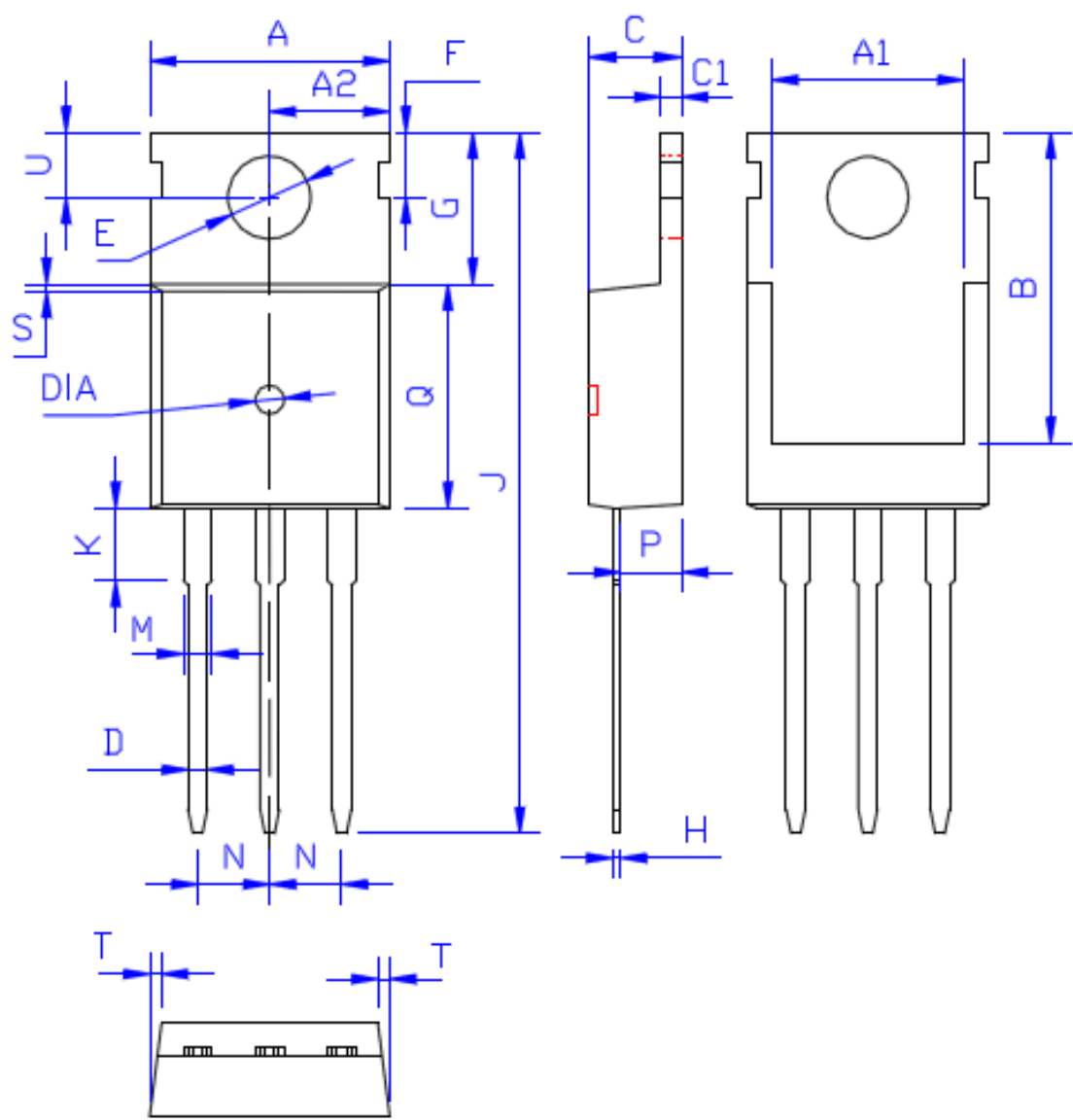
印记 Marking:



外形尺寸:

Package Dimension:

TO-220



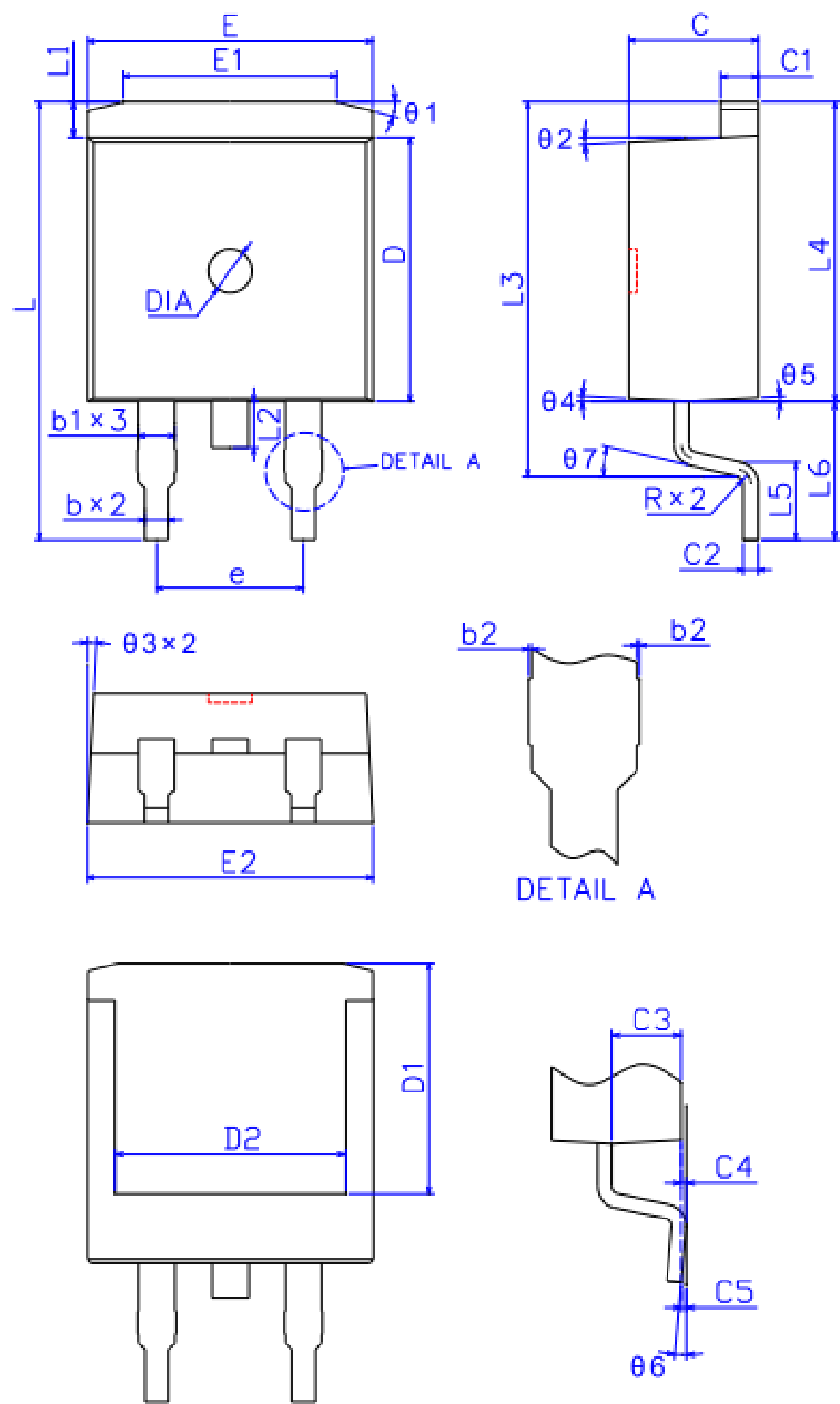
DIM	MILLIMETERS
A	10.00±0.30
A1	8.00±0.30
A2	5.00±0.30
B	13.20±0.40
C	4.50±0.20
C1	1.30±0.20
D	0.80±0.20
E	3.60±0.20
F	3.00±0.30
G	6.60±0.40
H	0.50±0.20
J	28.88±0.50
K	3.00±0.30
M	1.30±0.30
N	Typical 2.54
P	2.40±0.40
Q	9.20±0.40
S	0.25±0.15
T	0.25±0.15
U	2.80±0.30
DIA	宽 1.50±0.10 深 0.50 MAX

(Unit: mm)

外形尺寸:

Package Dimension:

TO-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