



N 沟道增强型场效应晶体管
N-CHANNEL MOSFET
FHA24N60W

主要参数 MAIN CHARACTERISTICS

ID	24A
VDSS	600V
Rdson-typ (@Vgs=10V)	240 mΩ
Qg-typ	86 nC

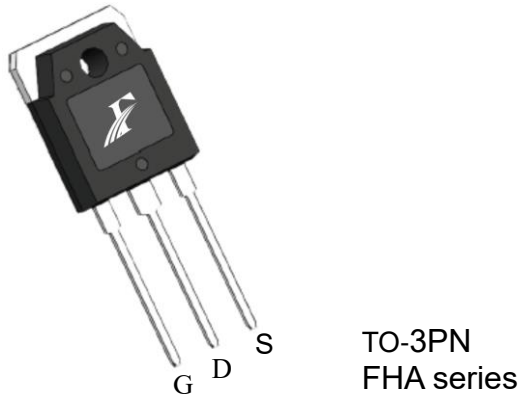
用途 APPLICATIONS

逆变电源	Power management for inverter systems
功率开关	Switch mode power supply

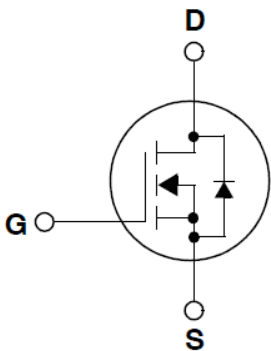
产品特性 FEATURES

低栅极电荷	Low gate charge
低 Crss (典型值 18 pF)	Low Crss (typical 18 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
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
		FHA24N60W	
最高漏极－源极直流电压 Drain-Source Voltage	Vds	600	V
连续漏极电流* Drain Current -continuous *	Id (Tc=25℃)	24	A
	Id (Tc=100℃)	15	A
最大脉冲漏极电流 (注 1) Drain Current – pulse (note 1)	IDM	96	A
最高栅源电压 Gate-Source Voltage	VGS	±30	V
单脉冲雪崩能量 (注 2) Single Pulsed Avalanche Energy (note 2)	EAS	605	mJ
雪崩电流 (注 1) Avalanche Current (note 1)	IAR	11	A
重复雪崩能量 (注 1) Repetitive Avalanche Current (note 1)	EAR	23	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℃)	408	W
	-Derate above 25℃	3.26	W/℃
最高结温及存储温度 Operating and Storage Temperature Range	TJ, TSTG	150, -55 to 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	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, 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	nA
通态特性 On-Characteristics						
阈值电压 Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D =250μA	2.0	-	4.0	V
静态导通电阻 Static Drain-Source On-Resistance	R _{DS(ON)}	V _{GS} =10V , I _D =12A	-	240	290	mΩ
正向跨导 Forward Transconductance	g _{fs}	V _{DS} = 20V, I _D =12A (note 4)	-	24	-	S
动态特性 Dynamic Characteristics						
栅电阻 Gate Resistance	R _g	f=1.0MHz,V _{DS} OPEN	-	1.3	-	Ω
输入电容 Input capacitance	C _{iss}	V _{DS} =25V, V _{GS} =0V, f=1.0MHz	-	4702	-	pF
输出电容 Output capacitance	C _{oss}		-	379	-	
反向传输电容 Reverse transfer capacitance	C _{rss}		-	18	-	
开关特性 Switching Characteristics						
延迟时间 Turn-On delay time	t _{d(on)}	V _{DS} =300V, I _D =24A, R _G =20Ω V _{GS} =10V (note 4, 5)	-	38	-	ns
上升时间 Turn-On rise time	t _r		-	76	-	ns
延迟时间 Turn-Off delay time	t _{d(off)}		-	110	-	ns
下降时间 Turn-Off Fall time	t _f		-	80	-	ns
栅极电荷总量 Total Gate Charge	Q _g	V _{DS} =480V , I _D =24A , V _{GS} =10V (note 4, 5)	-	86	-	nC
栅－源电荷 Gate-Source charge	Q _{gs}		-	21	-	nC
栅－漏电荷 Gate-Drain charge	Q _{gd}		-	55	-	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 _{SD} =24A	-	-	1.3	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)	-	514	-	ns
反向恢复电荷 Reverse recovery charge	Q _{rr}		-	7.43	-	μC

热特性 THERMAL CHARACTERISTIC

项目 Parameter	符号 Symbol	FHA24N60W	单位 Unit
结到管壳的热阻 Thermal Resistance, Junction to Case	Rth(j-c)	0.3	℃/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=10mH, IAS=11A, VDD=50V, RG=25 Ω,起始结温 TJ=25℃
3：ISD ≤24A,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=10mH, IAS=11A, VDD=50V, RG=25 Ω ,Start TJ=25℃;
3: ISD ≤24A,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))

Figure 1 Safe Operating Area

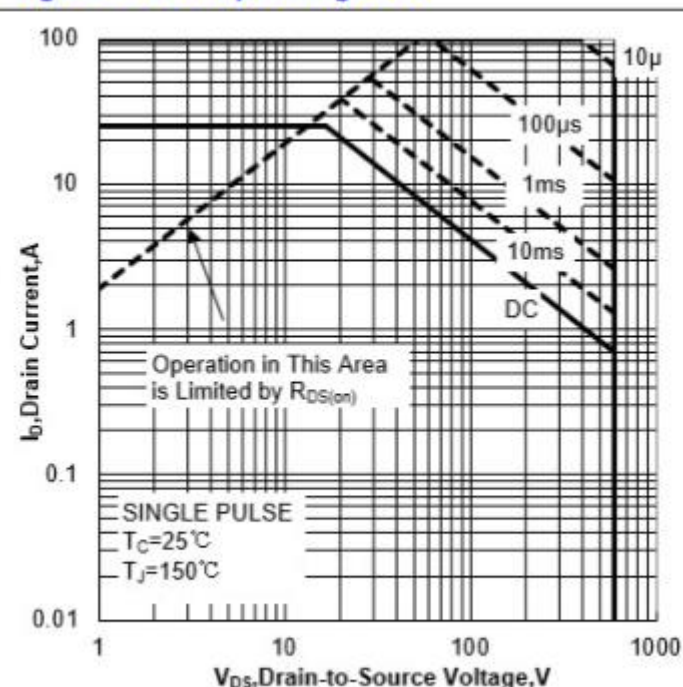


Figure 2 Power Dissipation

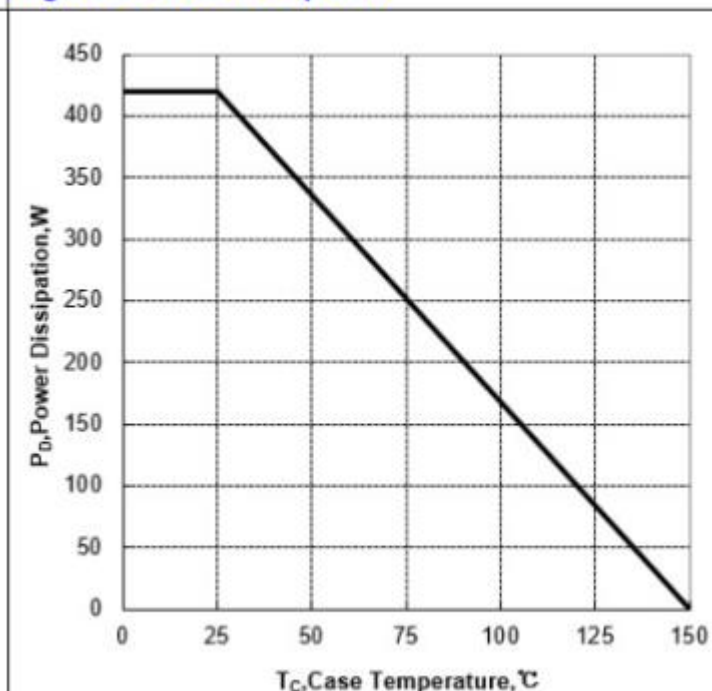


Figure 3 Max Thermal Impedance

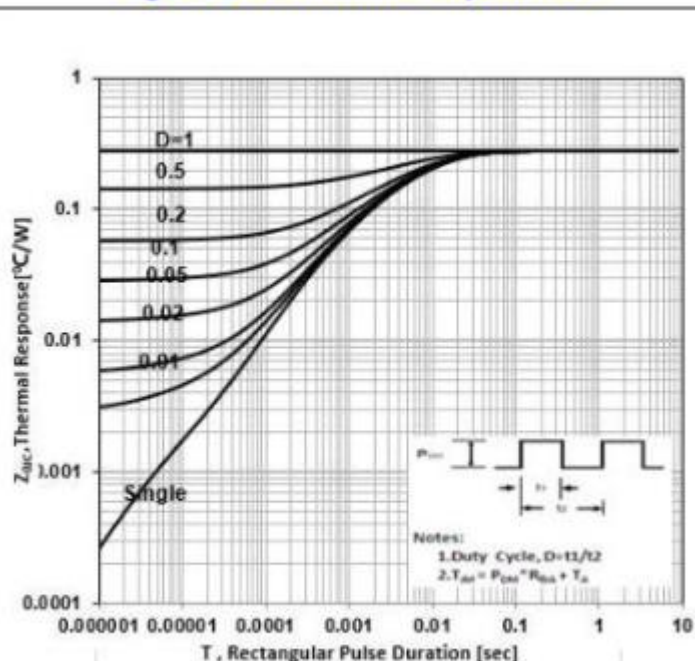


Figure 4 Typical Output Characteristics

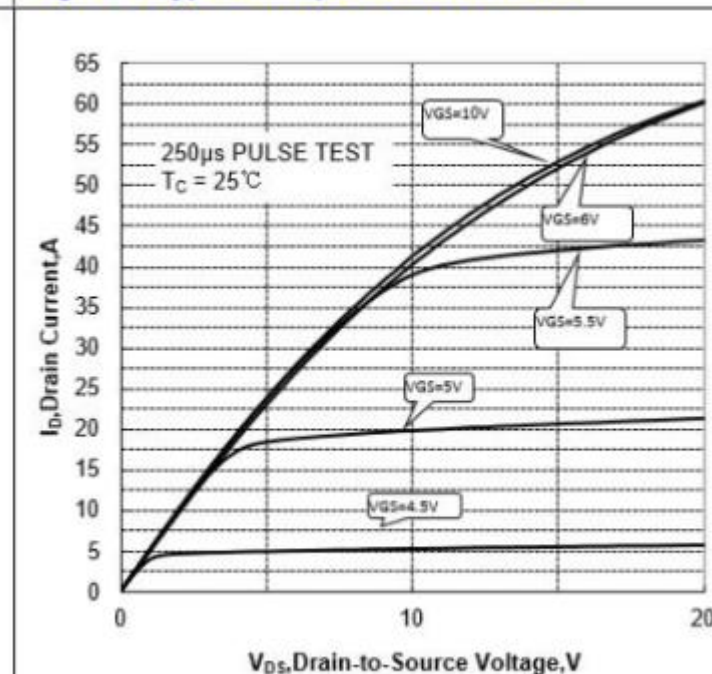


Figure 5 Typical Transfer Characteristics

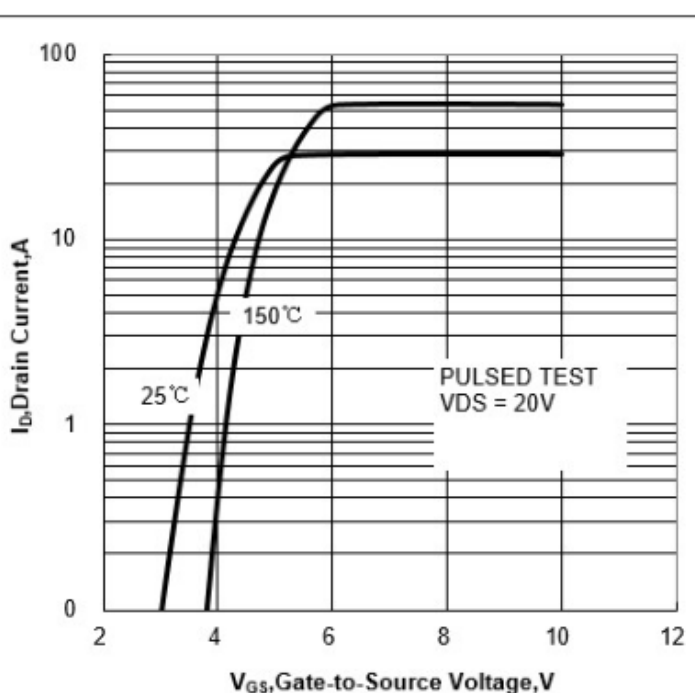


Figure 6 Typical Drain to Source ON Resistance vs Drain Current

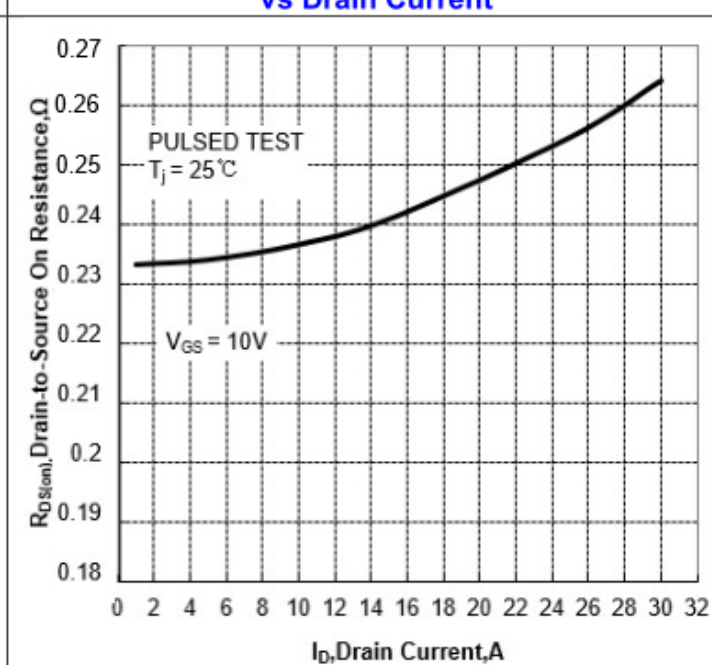


Figure 7 Typical Drian to Source on Resistance vs Junction Temperature

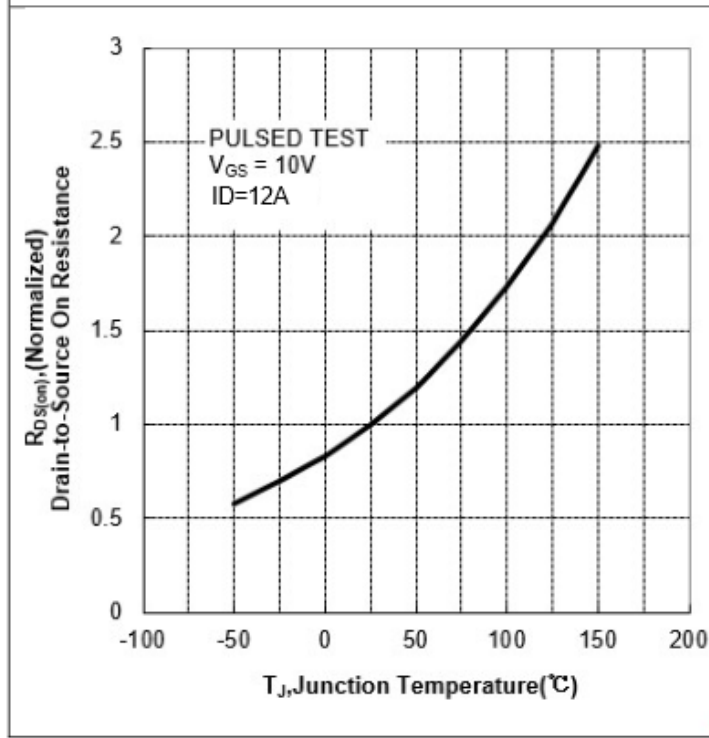


Figure 8 Typical Theshold Voltage vs Junction Temperature

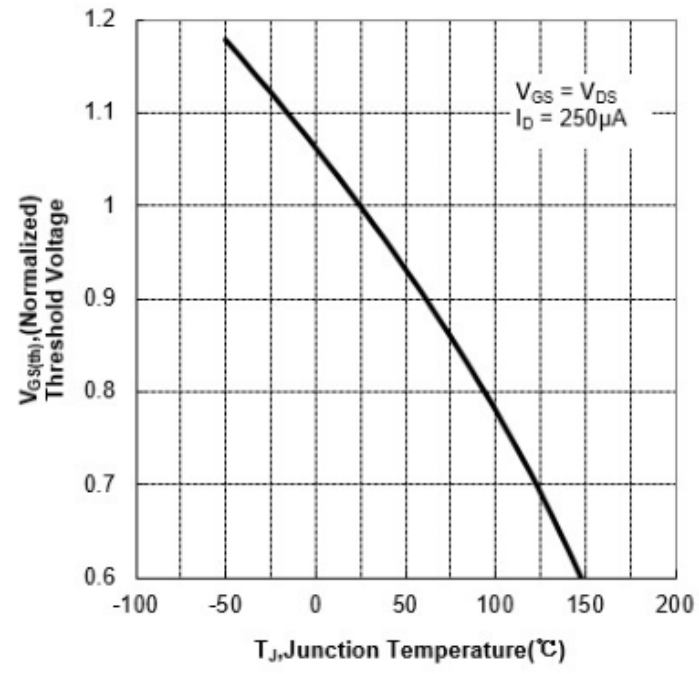


Figure 9 Typical Breakdown Voltage vs Junction Temperature

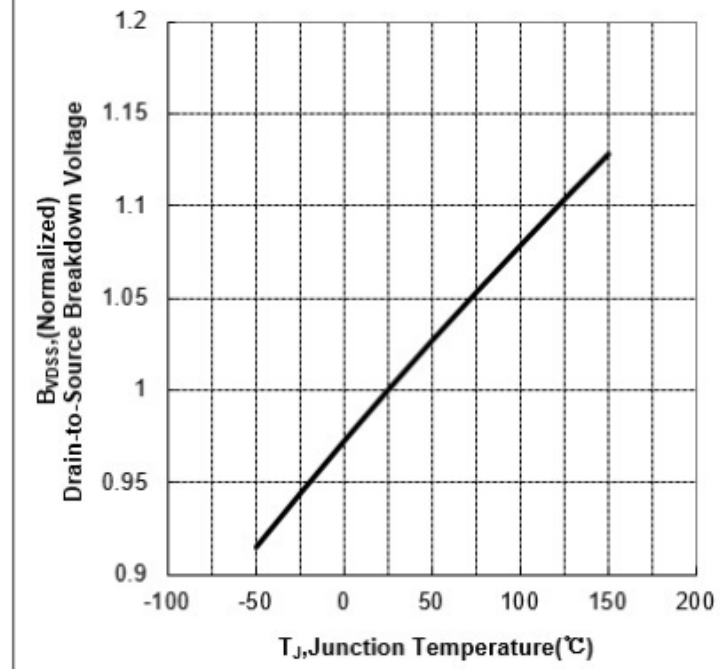


Figure 10 Typical Theshold Voltage vs Junction Temperature

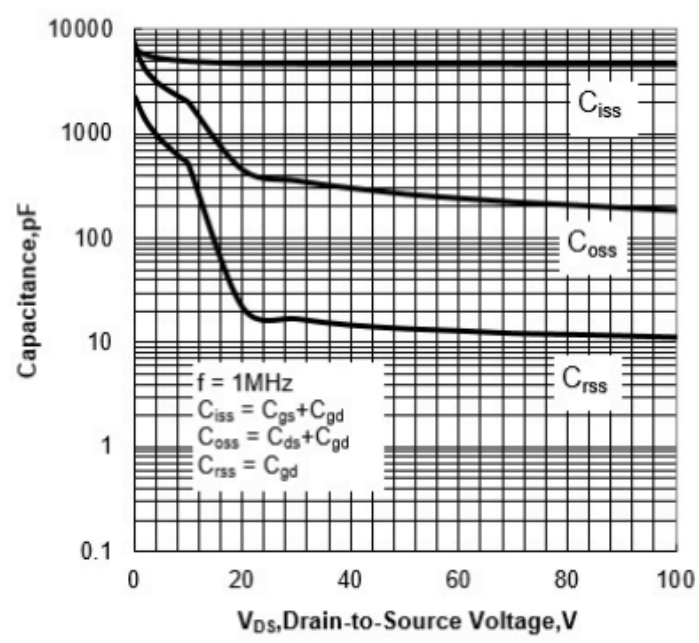
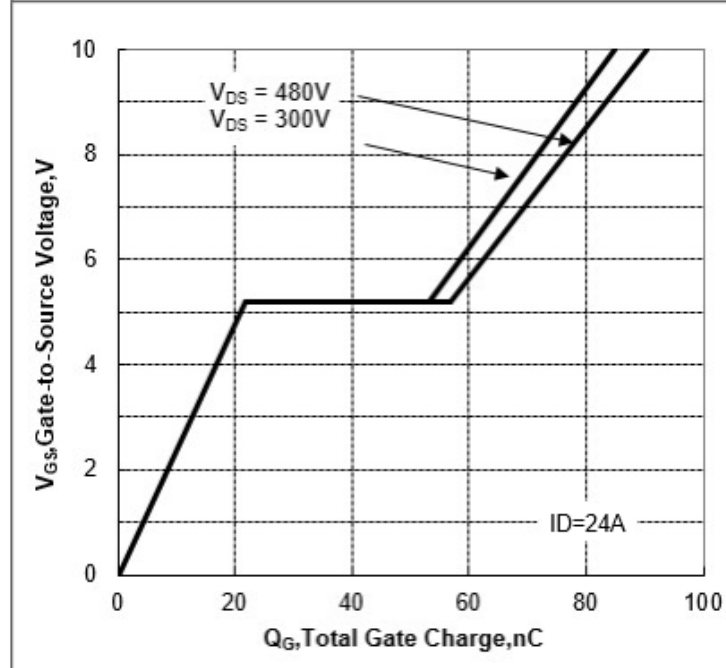
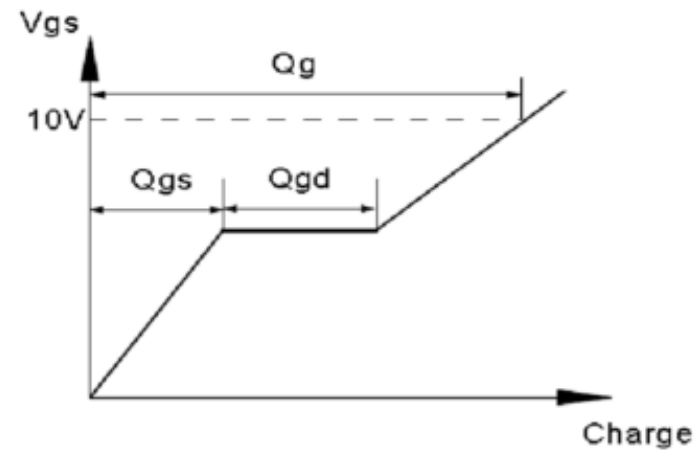
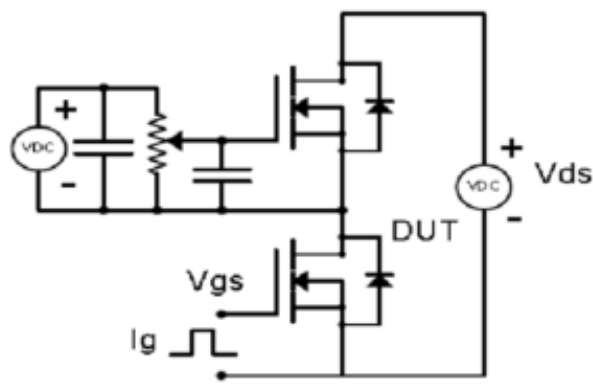


Figure 11 Typical Breakdown Voltage vs Junction Temperature



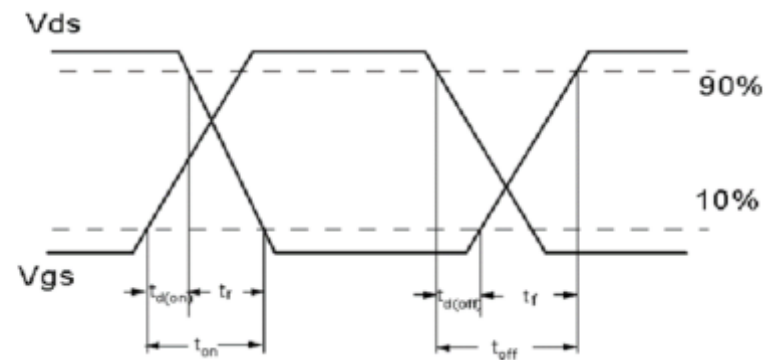
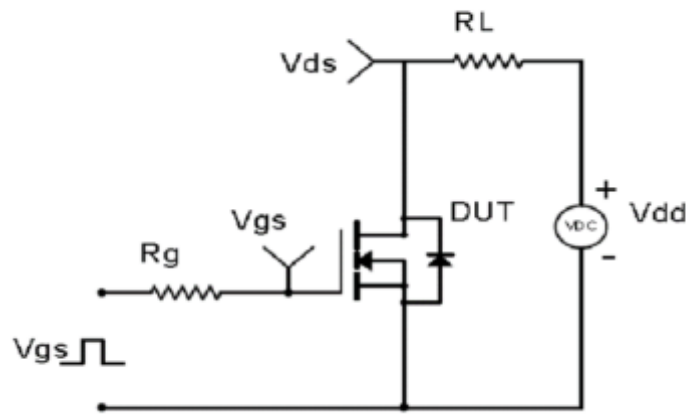
Test Circuit & Waveform

Gate Charge Test Circuit & Waveform

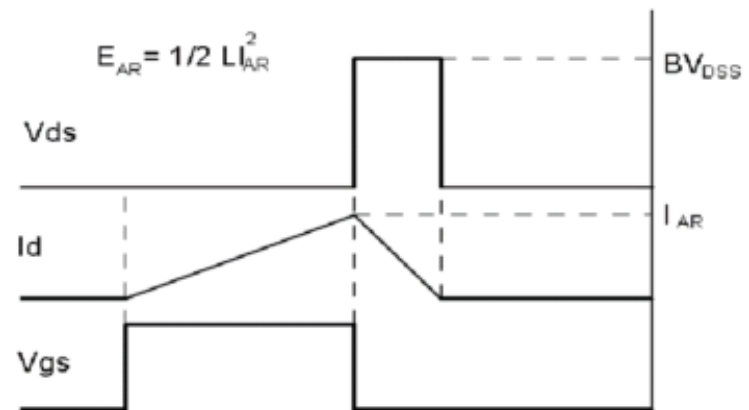
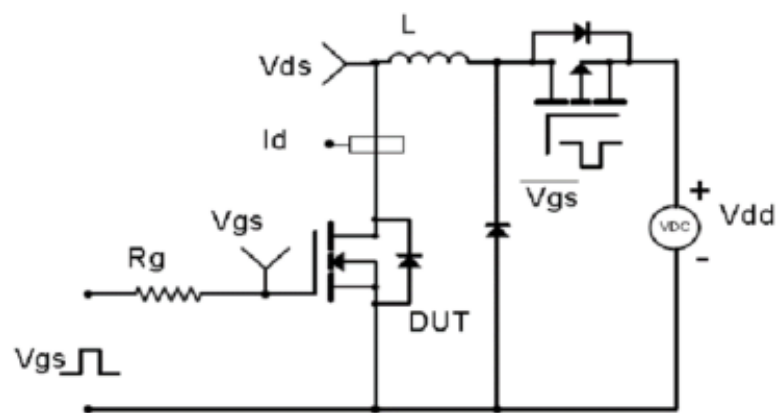


Resistive Switching Test Circuit & Waveforms

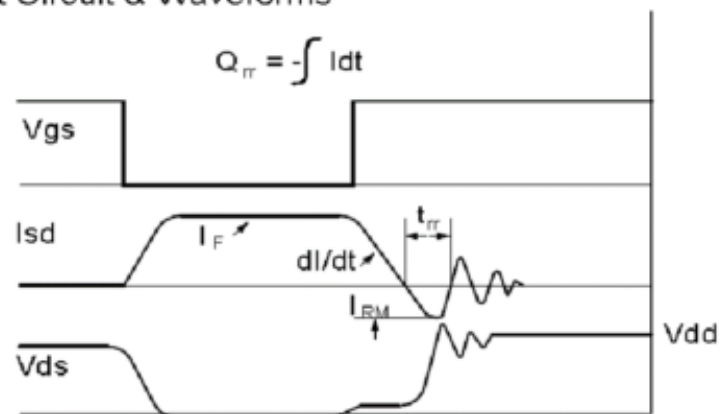
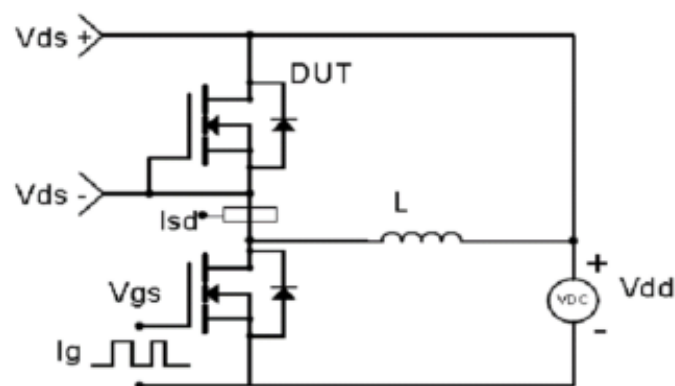
Resistive Switching Test Circuit & Waveforms



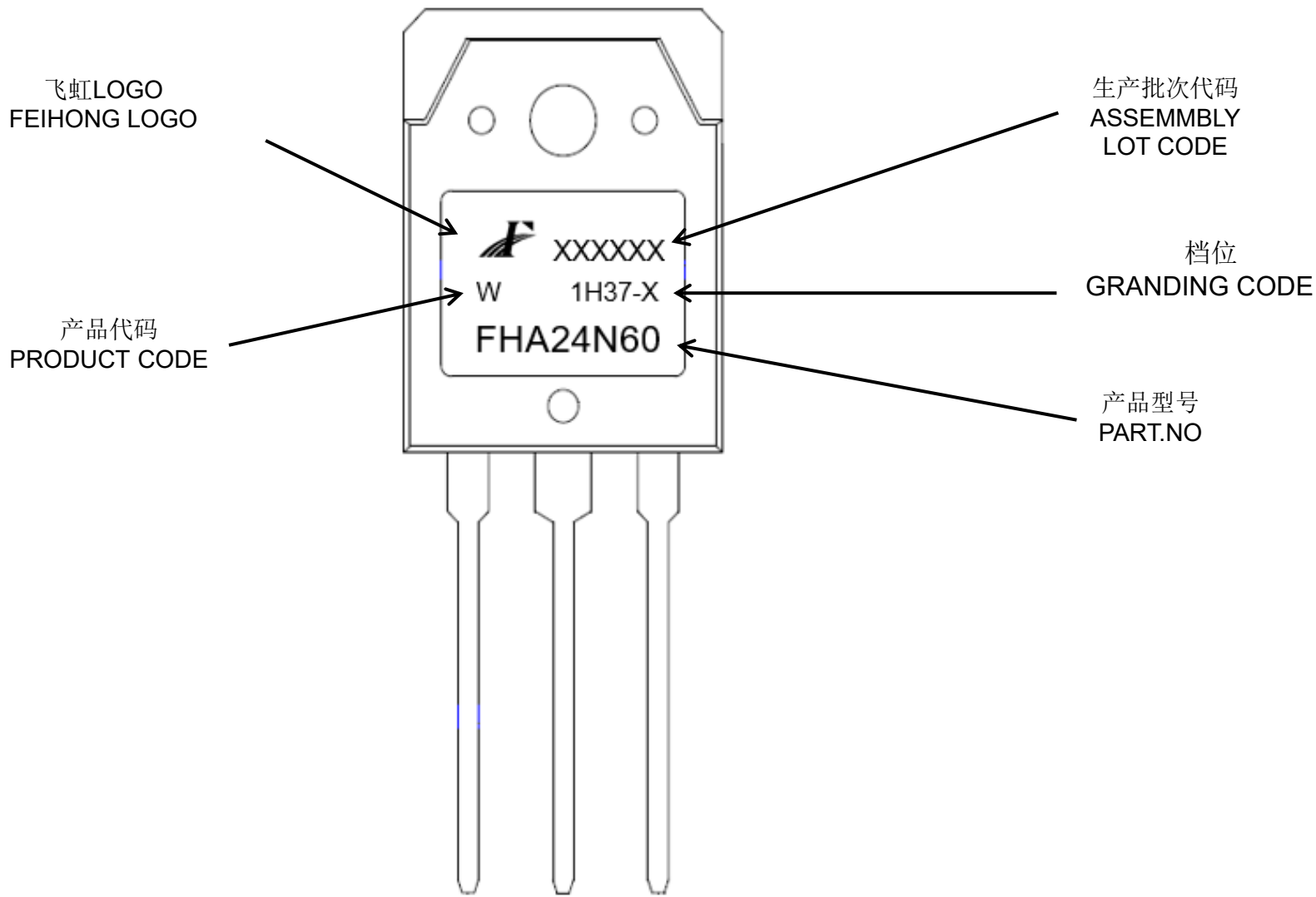
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



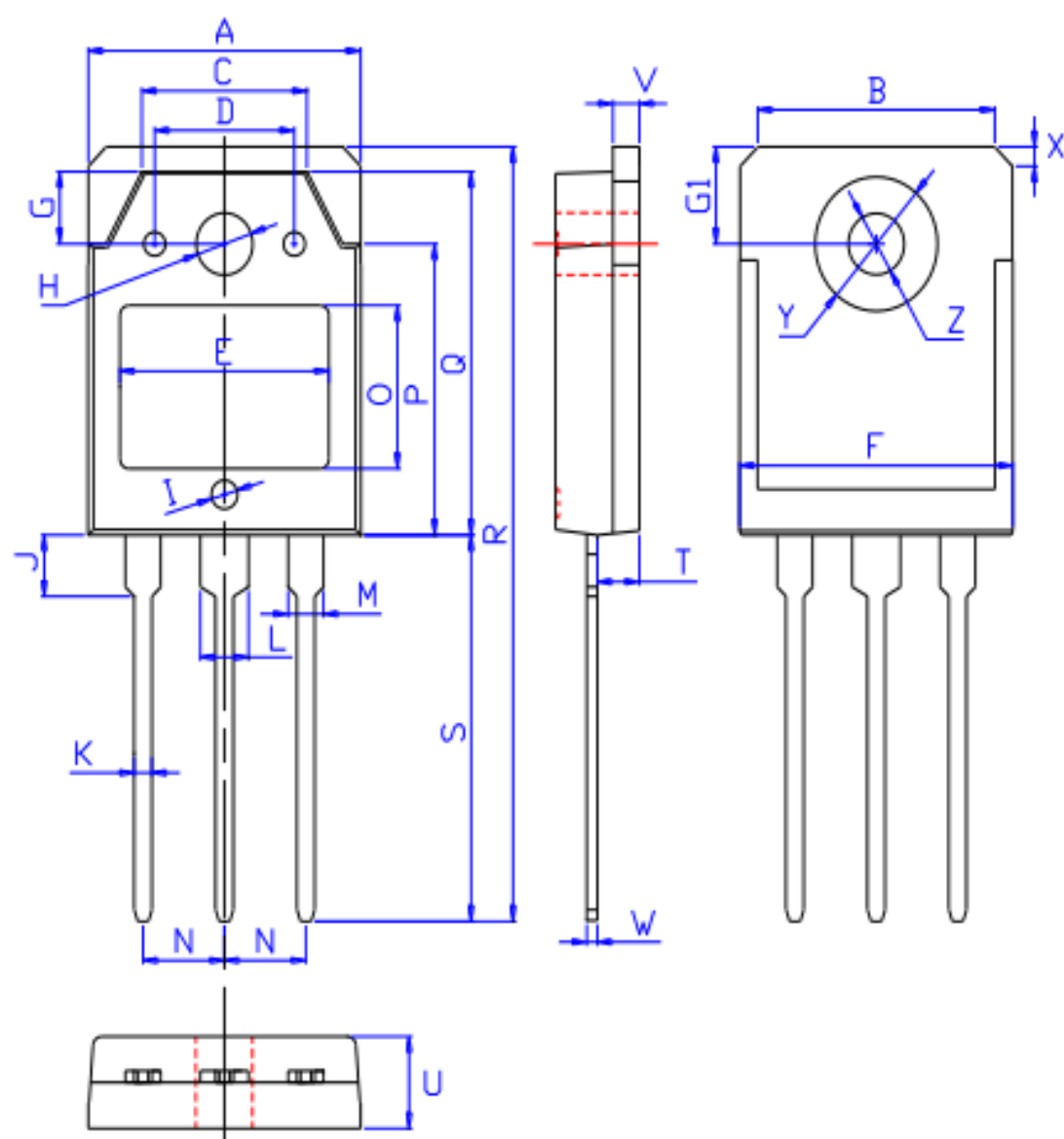
印记 Marking:



外形尺寸:

Package Dimension:

TO-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	$\phi 3.50 \pm 0.30$
I	$\phi 1.50 \pm 0.30$ 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)