

工业型号	公司型号	通俗命名	H	封装标识	包装方式	每管数量	每盒数量	每箱数量
FQU4N60C FQD4N60C	H4N60U H4N60D	4N60	HAOHAI	U: TO-251 D: TO-252	条管装 载带卷盘	80只/管 2.5K/卷	4Kpcs/盒 5Kpcs/盒	24Kpcs 25Kpcs

**APPLICATION**  
 ELECTRONIC BALLAST  
 ELECTRONIC TRANSFORMER  
 SWITCH MODE POWER SUPPLY

$I_D=4A$   
 $V_{DS}=600V$   
 $R_{DS(on)}=2.5\Omega$

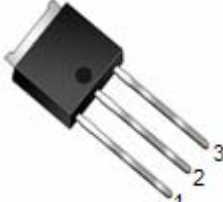
**FEATURES**  
 LOW ON-RESISTANCE  
 FAST SWITCHING  
 HIGH INPUT RESISTANCE  
 RoHS COMPLIANT  
 Package: TO-251 or TO-252 (IPAK & DPAK)

**特点**  
 导通电阻低、开关速度快、输入阻抗高、符合RoHS规范

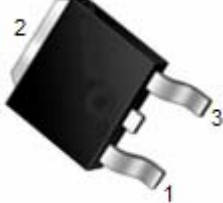
**应用范围**  
 开关电源、LCD电源、LED驱动电源、机箱电源、UPS电源  
 各种充电器、电子整流器、电子变压器、逆变器、控制器  
 转换器、风扇控制板、  
 以及电源适配器、汽车稳压器等线性放大和功率开关电路

**封装形式**  
 TO-251 (IPAK)、TO-252 (DPAK)

### 4N60 Series Pin Assignment

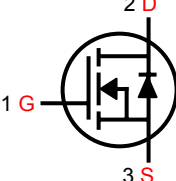


3-Lead Plastic TO-251  
Package Code: U  
Pin 1: Gate  
Pin 2: Drain  
Pin 3: Source



3-Lead Plastic TO-252  
Package Code: D  
Pin 1: Gate  
Pin 2: Drain  
Pin 3: Source

Series Symbol:



■ 最大额定 Absolute Maximum Ratings ( $T_C=25^\circ C$ )

参数 PARAMETER	符号 SYMBOL	额定值 VALUE	单位 UNIT
漏-源电压 Drain-source Voltage	$V_{DS}$	600	V
栅-源电压 gate-source Voltage	$V_{GS}$	$\pm 30$	
漏极电流 Continuous Drain Current	$I_D$	$T_C=25^\circ C$	4.0*
		$T_C=100^\circ C$	2.5
最大脉冲电流 Drain Current – Pulsed ①	$I_{DM}$	16*	A
耗散功率 Power Dissipation	$P_{tot}$	50	
最高结温 Junction Temperature	$T_j$	150	$^\circ C$
存储温度 Storage Temperature	$T_{STG}$	-55~+150	
单脉冲雪崩能量 Single Pulse Avalanche Energy ②	$E_{AS}$	120	mJ

\* 漏极电流由最高结温限制 (\*Drain current limited by maximum junction temperature)

■ 电特性 Electronic Characteristics (T<sub>C</sub>=25°C)

参数 PARAMETER	符号 SYMBOL	测试条件 TEST CONDITION	最小值 MIN	典型值 TYP	最大值 MAX	单位 UNIT
漏-源击穿电压 Drain-source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	650			V
击穿电压温度系数 Breakdown Voltage Temperature Coefficient	ΔBV <sub>DSS</sub> /ΔT <sub>j</sub>	I <sub>D</sub> =250μA Referenced to 25°C		0.6		V/°C
栅极开启电压 Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>GS</sub> =V <sub>DS</sub> I <sub>D</sub> =250μA	2.0		4.0	V
漏-源漏电流 Drain-source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =600V V <sub>GS</sub> =0V, T <sub>j</sub> =25°C			25	μA
		V <sub>DS</sub> =480V V <sub>GS</sub> =0V, T <sub>j</sub> =125°C			250	
跨导 Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =40V, I <sub>D</sub> =2A ③		2.5		S

■ 订货方式 ORDERING INFORMATION

包装方式 PACKING	订货方式 ORDERING CODE	
	普通塑封料 Nomal Package Material	无卤塑封料 Halogen Free
TO-251 普通袋装: NORMAL PACKING	H4N60U	H4N60U-PbF
TO-251 条管装: TUBE PACKING	H4N60U-TU	H4N60U-TU-PbF
TO-252 条管装: TUBE PACKING	H4N60D-TU	H4N60D-TU-PbF
TO-252 载带卷盘装: TAPE & REEL PACKING	H4N60D-TR	H4N60D-TR-PbF

■ 包装规格 Packaging Specifications

TO-251	条管装, 每管80只, 每盒4000只, 每箱24000只 (80Pcs/Tube, 4Kpcs/BOX, 24Kpcs/Carton)
TO-252	条管装, 每管80只, 每盒4000只, 每箱24000只 (80Pcs/Tube, 4Kpcs/BOX, 24Kpcs/Carton)
	载带卷盘包装, 每卷盘2500只, 每盒5000只, 每箱25000只 (2.5Kpcs/Reel, 5Kpcs/BOX, 25Kpcs/Carton)

■ Electrical Characteristics (T<sub>C</sub>=25°C)

参数 PARAMETER	符号 SYMBOL	测试条件 TEST CONDITION	最小值 MIN	典型值 TYP	最大值 MAX	单位 UNIT
栅极漏电流 Gate-body Leakage Current (V <sub>DS</sub> =0)	I <sub>GSS</sub>	V <sub>GS</sub> =±30V			±100	nA
漏-源导通电阻 Static Drain-source On Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =2A ③		2.0	2.5	Ω
输入电容 Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V F=1.0MHZ		580		pF
关断延迟时间 Turn -Off Delay Time	T <sub>d(off)</sub>	V <sub>DD</sub> =300V, I <sub>D</sub> =4A R <sub>G</sub> =25Ω ③		20		nS
栅极电荷 Total Gate Charge	Q <sub>g</sub>	I <sub>D</sub> =4A V <sub>DS</sub> =480V V <sub>GS</sub> =10V ③		14.8		nC
栅源电荷 Gate-to-Source Charge	Q <sub>gs</sub>			3.4		
栅漏电荷 Gate-to-Drain Charge	Q <sub>gd</sub>			4.8		
二极管正向电流 Continuous Diode Forward Current	I <sub>S</sub>				4.0	A
二极管正向压降 Diode Forward Voltage	V <sub>SD</sub>	T <sub>J</sub> =25°C, I <sub>S</sub> =4A V <sub>GS</sub> =0V ③			1.4	V
反向恢复时间 Reverse Recovery Time	t <sub>rr</sub>	T <sub>J</sub> =25°C I <sub>F</sub> =4A di/dt=100A/μs ③		390		nS
反向恢复电荷 Reverse Recovery Charge	Q <sub>rr</sub>			1.5		μC

■ 热特性 Thermal Characteristics

参数 PARAMETER	符号 SYMBOL	最大值 MAX	单位 UNIT
热阻 结-壳 Thermal Resistance Junction-case	R <sub>thJC</sub>	2.50	°C/W
热阻 结-环境 Thermal Resistance Junction-ambient	R <sub>thJA</sub>	110	

注释 (Notes):

- ① 脉冲宽度: 以最高节温为限制 (Repetitive rating: Pulse width limited by maximum junction temperature)
- ② 初始结温=25°C, V<sub>DD</sub>=50V, L=25mH, R<sub>G</sub>=25Ω, I<sub>AS</sub>=4A (Starting T<sub>J</sub>=25°C, V<sub>DD</sub>=50V, L=25mH, R<sub>G</sub>=25Ω, I<sub>AS</sub>=4A)
- ③ 脉冲测试: 脉冲宽度≤300μs, 占空比≤2% (Pulse Test: Pulse width ≤300μs, Duty cycle ≤2%)

■ 特性曲线 Typical Performance Characteristics

图1: 输出特性曲线,  $T_c=25^\circ\text{C}$

Fig1: Typical Output Characteristics,  $T_c=25^\circ\text{C}$

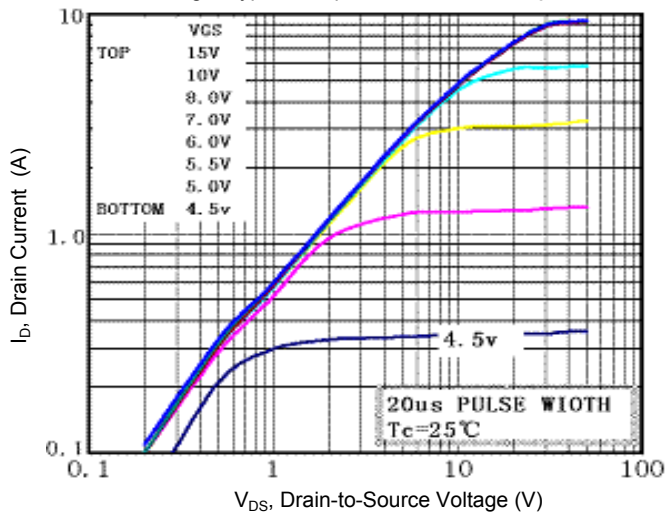


图2: 输出特性曲线,  $T_c=150^\circ\text{C}$

Fig2: Typical Output Characteristics,  $T_c=150^\circ\text{C}$

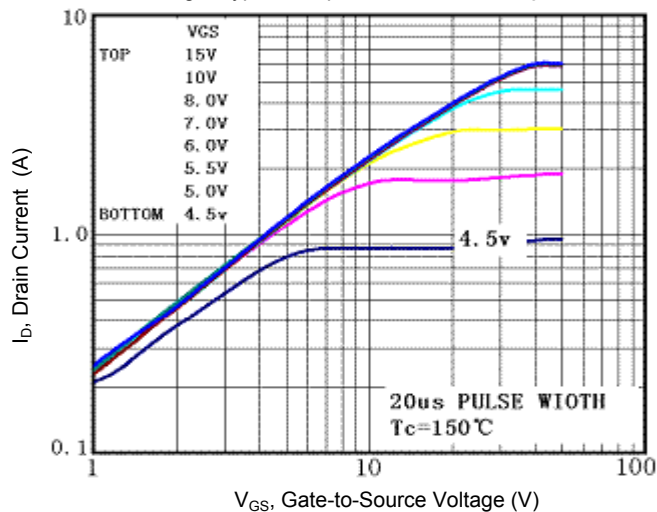


图3: 归一化导通电阻与温度曲线

Fig3: Normalized On-Resistance Vs. Temperature

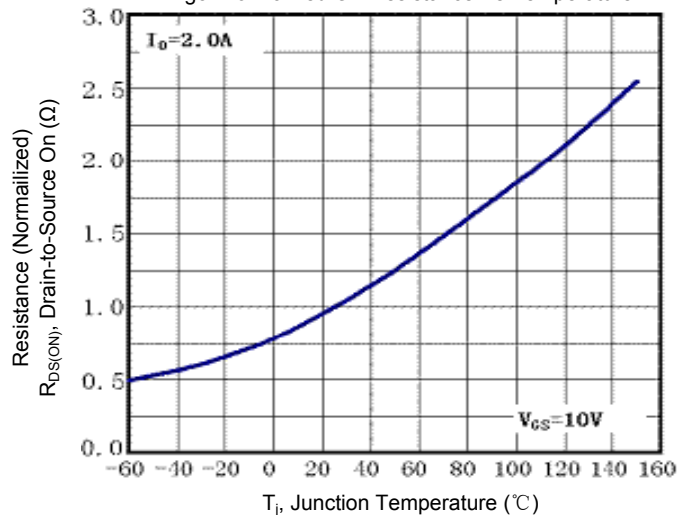


图4: 二极管正向电压曲线

Fig4: Typical Source-Drain Diode Forward Voltage

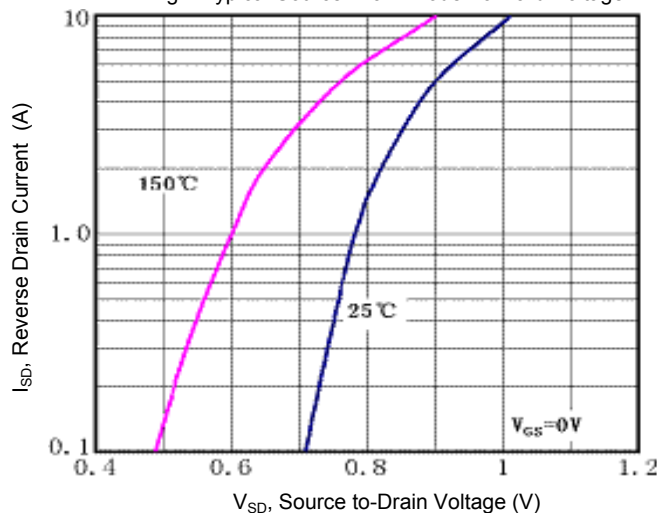


图5: 最大漏极电流与壳温曲线

Fig5: Maximum Drain Current Vs. Case Temperature

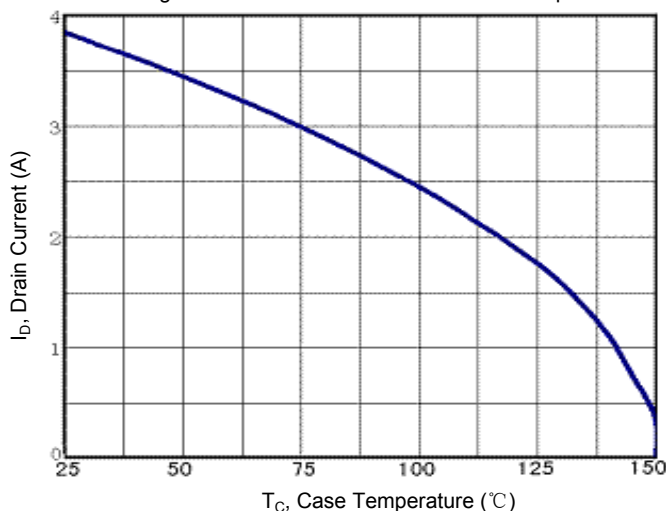
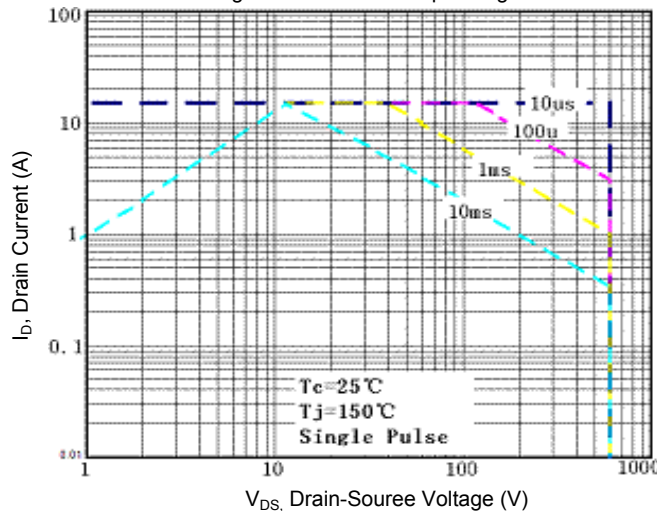
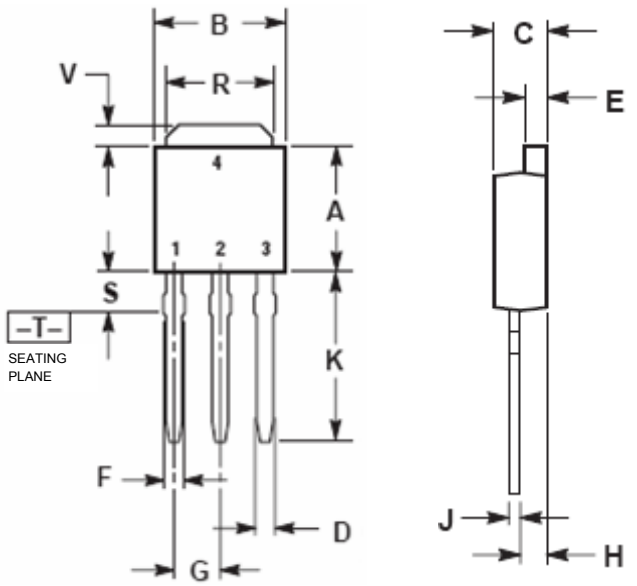
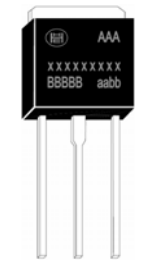


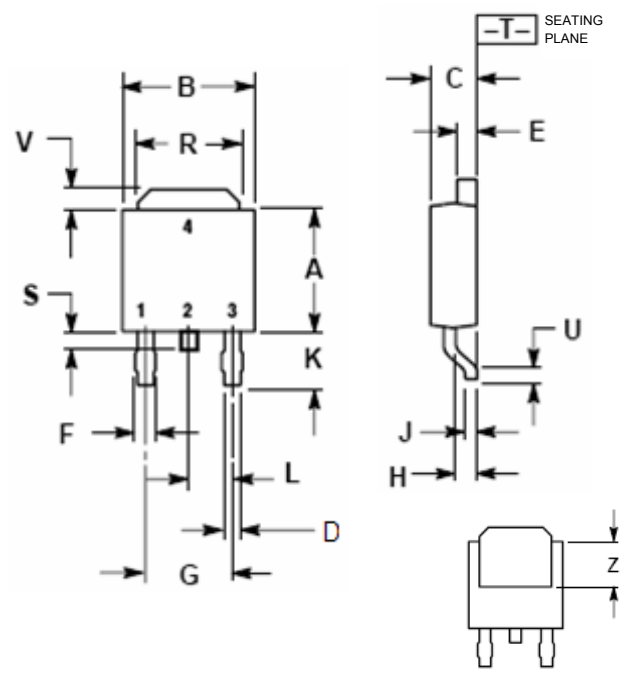

图6: 最大安全工作区曲线

Fig6: Maximum Safe Operating Area



**PACKAGE DIMENSIONS**

■ TO-251 (IPAK) Dimension (封装尺寸数据, 单位: mm)		元件打印标识	
 <p>SEATING PLANE</p>	DIM	MILLIMETERS	
		Min.	Max.
	A	5.97	6.35
	B	6.35	6.73
	C	2.19	2.38
	D	0.69	0.88
	E	0.84	1.01
	F	0.94	1.19
	G	2.29 BSC	
	H	0.87	1.01
	J	0.46	0.58
	K	8.89	9.65
	R	4.45	5.46
	S	1.27	2.28
V	0.77	1.27	
		 <p>左上角:公司LOGO AAA:芯片代码 XXXXXXXXXX:器件型号 BBBBB:批次代码 aabb:出厂批号 其中: aa:出厂年份 bb:出厂自然周 (01-53)</p>	

■ TO-252 (DPAK) Dimension (封装尺寸数据, 单位: mm)		元件打印标识	
 <p>SEATING PLANE</p>	DIM	MILLIMETERS	
		Min.	Max.
	A	5.97	6.35
	B	6.35	6.73
	C	2.19	2.38
	D	0.69	0.88
	E	0.84	1.01
	F	0.94	1.19
	G	4.58 BSC	
	H	0.87	1.01
	J	0.46	0.58
	K	2.60	2.89
	L	2.29 BSC	
	R	4.45	5.46
	S	0.51	1.27
	U	0.51	--
V	0.77	1.27	
Z	3.51	--	
		 <p>左上角:公司LOGO AAA:芯片代码 XXXXXXXXXX:器件型号 BBBBB:批次代码 aabb:出厂批号 其中: aa:出厂年份 bb:出厂自然周 (01-53)</p>	



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