



# HCS13N50 N-CHANNEL MOSFET

## FEATURES

- Low gate charge
- Low  $C_{rss}$  (typical 14pF)
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability
- RoHS product

## APPLICATIONS

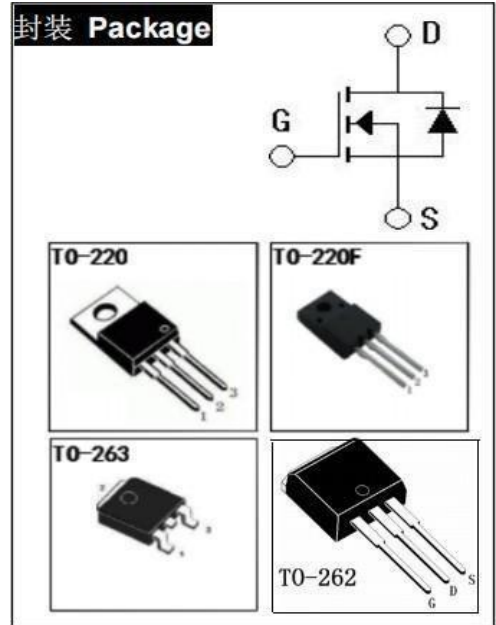
- High efficiency switch mode power supplies
- Electronic lamp ballasts based on half bridge
- LED power supplies

## 产品特性

- 低栅极电荷
- 低  $C_{rss}$  (典型值 14pF)
- 开关速度快
- 产品全部经过雪崩测试
- 高抗 dv/dt 能力
- RoHS 产品

## 用途

- 高频开关电源
- 电子镇流器
- LED电源



## 主要参数 MAIN CHARACTERISTICS

$I_D$		13A
$V_{DSS}$		500 V
$R_{dson}$ ( $V_{gs}=10V$ )	Typ	
	Max	0.49Ω
$Q_g$ -typ		27nC

## 产品型号信息 PRODUCT MESSAGE

型号 Model	印记 Marking	封装 Package
HCS13N50C	HCS13N50C	TO-220
HCS13N50D	HCS13N50D	TO-220F
HCS13N50S	HCS13N50S	TO-263
HCS13N50B	HCS13N50B	TO-262



## 绝对最大额定值 ABSOLUTE RATINGS (Tc=25°C)

项 目 Parameter	符 号 Symbol	数 值 Value		单 位 Unit
		TO-220/263/262	TO-220F	
最高漏极-源极直流电压 Drain-Source Voltage	V <sub>DSS</sub>	500		V
连续漏极电流 Drain Current -Continuous	I <sub>D</sub> T=25°C T=100°C	13.0	13.0*	A
		8	8*	A
最大脉冲漏极电流 (注 1) Drain Current -Pulse (note 1)	I <sub>DM</sub>	52	52*	A
最高栅源电压 Gate-Source Voltage	V <sub>GSS</sub>	±30		V
单脉冲雪崩能量 (注 2) Single Pulsed Avalanche Energy (note 2)	E <sub>AS</sub>	840		mJ
雪崩电流 (注 1) Avalanche Current (note 1)	I <sub>AR</sub>	13.0		A
重复雪崩能量 (注 1) Repetitive Avalanche Energy (note 1)	E <sub>AR</sub>	4.8		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	4.5		V/ns
耗散功率 Power Dissipation	P <sub>D</sub> T <sub>C</sub> =25°C -Derate above 25°C	190	49	W
		1.57	0.39	W/°C
最高结温及存储温度 Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55~+150		°C
引线最高焊接温度 Maximum Lead Temperature for Soldering Purposes	T <sub>L</sub>	300		°C

\*漏极电流由最高结温限制

\*Drain current limited by maximum junction temperature



## 电特性 ELECTRICAL CHARACTERISTIC

项 目 Parameter	符 号 Symbol	测试条件 Tests conditions	最小 Min	典型 Typ	最大 Max	单 位 Units
<b>关态特性 Off-Characteristics</b>						
漏-源击穿电压 Drain-Source Voltage	$BV_{DSS}$	$I_D=250\mu A, V_{GS}=0V$	500	-	-	V
击穿电压温度特性 Breakdown Voltage Temperature Coefficient	$\frac{\Delta BV_{DSS}}{\Delta T_J}$	$I_D=250\mu A$ , referenced to $25^\circ C$	-	0.5	-	V/°C
零栅压下漏极漏电流 Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=500V, V_{GS}=0V, T_C=25^\circ C$	-	-	1.0	$\mu A$
		$V_{DS}=400V, T_C=125^\circ C$	-	-	100	$\mu A$
正向栅极体漏电流 Gate-body Leakage Current, Forward	$I_{GSSF}$	$V_{DS}=0V, V_{GS}=30V$	-	-	100	nA
反向栅极体漏电流 Gate-body Leakage Current, Reverse	$I_{GSSR}$	$V_{DS}=0V, V_{GS}=-30V$	-	-	-100	nA
<b>通态特性 On-Characteristics</b>						
阈值电压 Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
静态导通电阻 Static Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS} = 10V, I_D=6.5A$	-	0.41	0.49	$\Omega$
正向跨导 Forward Transconductance	$g_{fs}$	$V_{DS} = 40V, I_D=6.5A$ (note 4)	-	14	-	S
<b>动态特性 Dynamic Characteristics</b>						
输入电容 Input Capacitance	$C_{iss}$	$V_{DS}=25V,$ $V_{GS}=0V,$ $f=1.0MHz$	-	1870	2155	pF
输出电容 Output Capacitance	$C_{oss}$		-	170	225	pF
反向传输电容 Reverse Transfer Capacitance	$C_{rss}$		-	14	20	pF



## 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
<b>开关特性 Switching –Characteristics</b>						
延迟时间 Turn-On delay time	$t_{d(on)}$	$V_{DD}=250V, I_D=13A, R_G=25\Omega$ (note 4, 5)	-	70	160	ns
上升时间 Turn-On rise time	$t_r$		-	145	240	ns
延迟时间 Turn-Off delay time	$t_{d(off)}$		-	135	230	ns
下降时间 Turn-Off Fall time	$t_f$		-	45	120	ns
栅极电荷总量 Total Gate Charge	$Q_g$	$V_{DS}=400V,$	-	27	35	nC
栅-源电荷 Gate-Source charge	$Q_{gs}$	$I_D=13A$	-	9	-	nC
栅-漏电荷 Gate-Drain charge	$Q_{gd}$	$V_{GS}=10V$ (note 4, 5)	-	12	-	nC
<b>漏-源二极管特性及最大额定值 Drain-Source Diode Characteristics and Maximum Ratings</b>						
正向最大连续电流 Maximum Continuous Drain-Source Diode Forward Current		$I_S$	-	-	13	A
正向最大脉冲电流 Maximum Pulsed Drain-Source Diode Forward Current		$I_{SM}$	-	-	52	A
正向最大连续电流 Maximum Continuous Drain-Source Diode Forward Current	$V_{SD}$	$V_{GS}=0V, I_S=13A$	-		1.5	V
反向恢复时间 Reverse Recovery Time	$t_{rr}$	$V_{GS}=0V, I_S=13A$		400		ns
反向恢复电荷 Reverse Recovery Charge	$Q_{rr}$	$di_f/dt=100A/\mu s$ (note 4)		4.3		$\mu C$

## 热特性 THERMAL CHARACTERISTIC

项 目 Parameter	符 号 Symbol	最大值 Value		单 位 Unit
		TO-220/263/262	TO-220F	
结到管壳的热阻 Thermal Resistance, Junction to Case	$R_{th(j-c)}$	0.79	2.55	$^{\circ}C/W$
结到环境的热阻 Thermal Resistance, Junction to Ambient	$R_{th(j-A)}$	62.5	62.5	$^{\circ}C/W$

注 1: 脉冲宽度由最高结温限制

注 2:  $L=9.0mH, I_{AS}=13A, V_{DD}=50V, R_G=25\Omega$ , 起始结温  $T_J=25^{\circ}C$ 注 3:  $I_{SD} \leq 13A, di/dt \leq 200A/\mu s, V_{DD} \leq BV_{DSS}$ , 起始结温  $T_J=25^{\circ}C$ 注 4: 脉冲测试: 脉冲宽度 $\leq 300\mu s$ , 占空比 $\leq 2\%$ 

注 5: 基本与工作温度无关

Notes:

1: Pulse width limited by maximum junction temperature

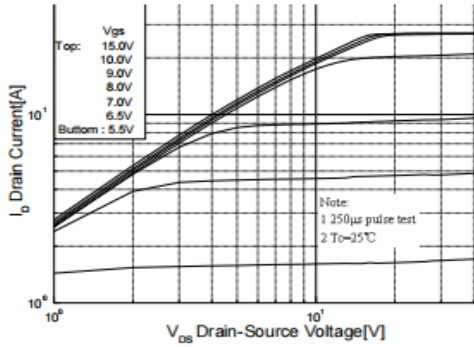
2:  $L=9.0mH, I_{AS}=13A, V_{DD}=50V, R_G=25\Omega$ , Starting  $T_J=25^{\circ}C$ 3:  $I_{SD} \leq 13A, di/dt \leq 200A/\mu s, V_{DD} \leq BV_{DSS}$ , Starting  $T_J=25^{\circ}C$ 4: Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycles  $\leq 2\%$ 

5: Essentially independent of operating temperature

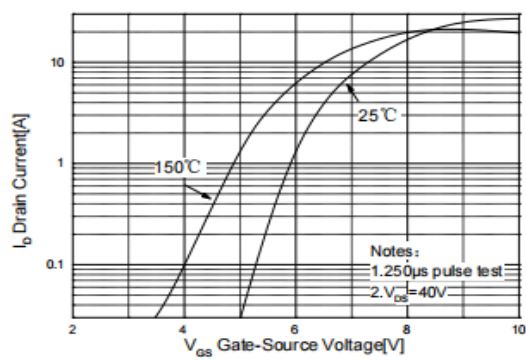


## 特征曲线 ELECTRICAL CHARACTERISTICS (curves)

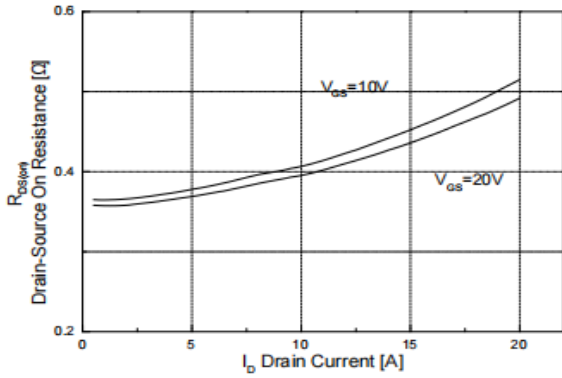
### On-Region Characteristics



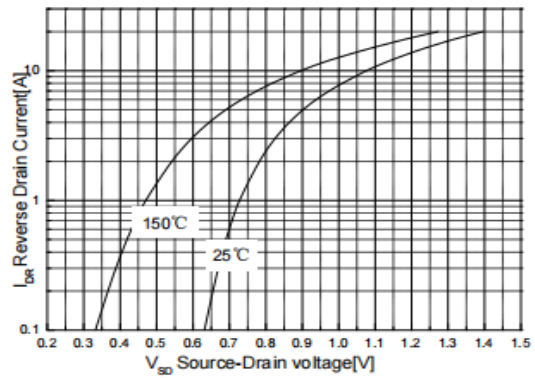
### Transfer Characteristics



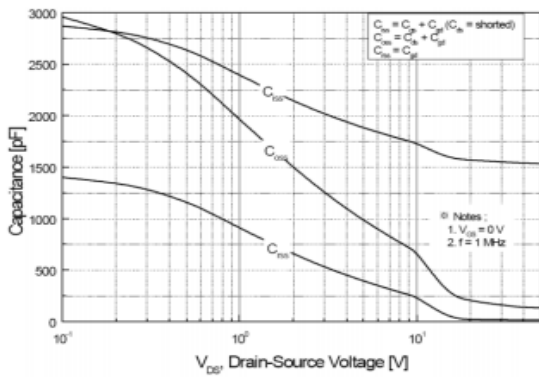
### On-Resistance Variation vs Drain Current and Gate Voltage



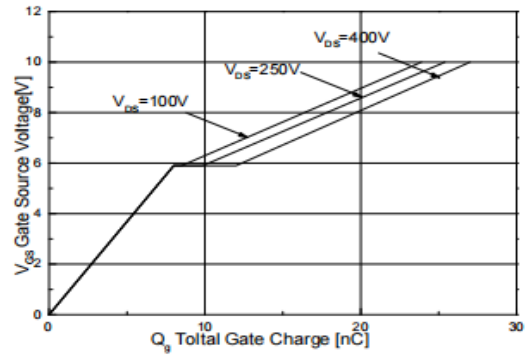
### Body Diode Forward Voltage Variation vs. Source Current and Temperature



### Capacitance Characteristics



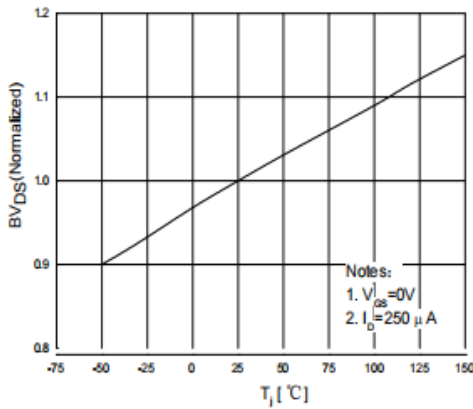
### Capacitance Characteristics



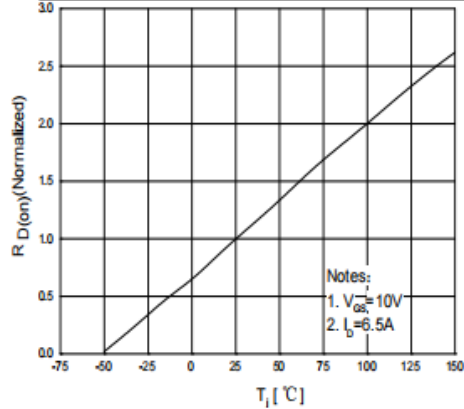


## 特征曲线 ELECTRICAL CHARACTERISTICS (curves)

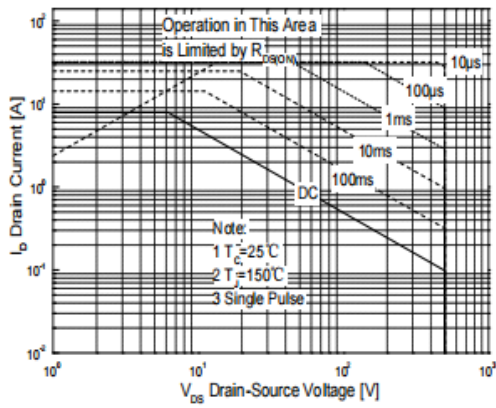
### Breakdown Voltage Variation vs. Temperature



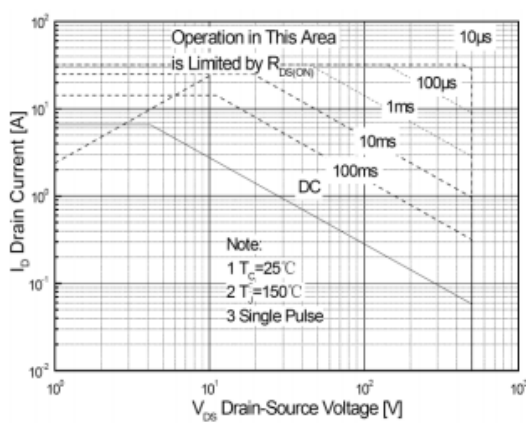
### On-Resistance Variation vs. Temperature



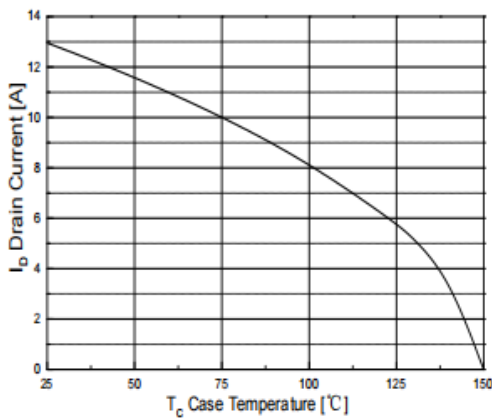
### Maximum Safe Operating Area For TO-220/263/262



### Maximum Safe Operating Area For TO-220F



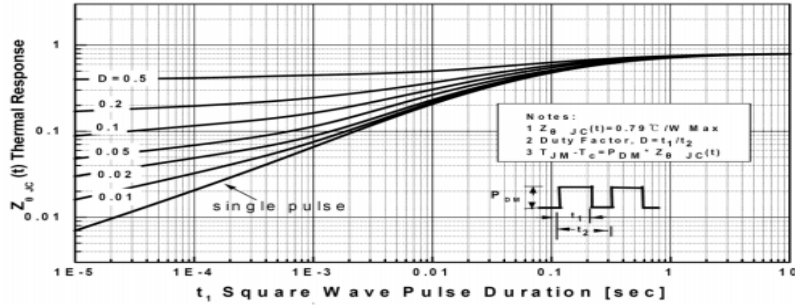
### Maximum Drain Current vs. Case Temperature



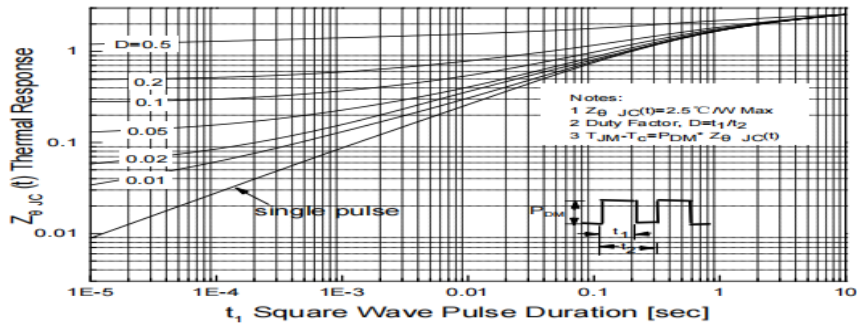


## 特征曲线 ELECTRICAL CHARACTERISTICS (curves)

**Transient Thermal Response Curve  
For TO-220/263/262**



**Transient Thermal Response Curve  
For TO-220F**



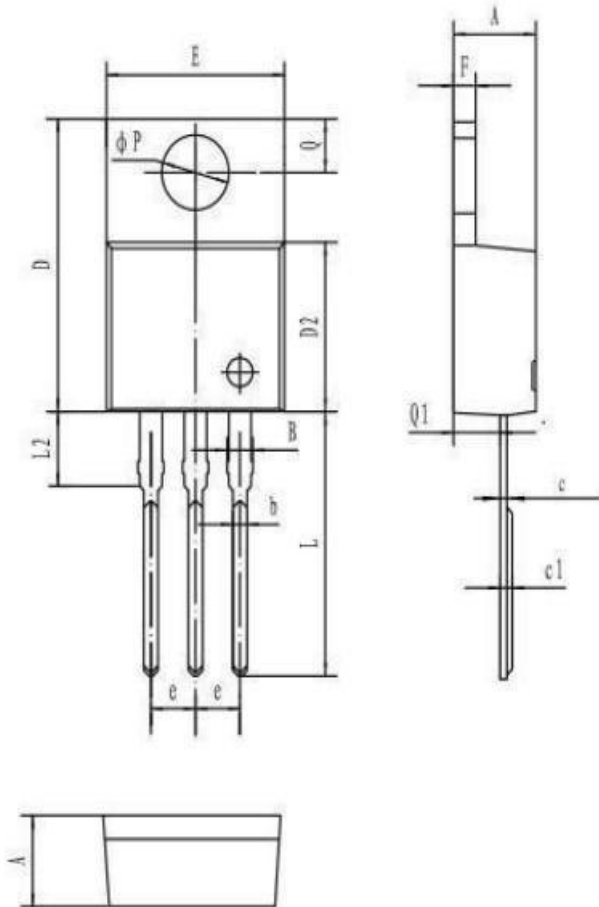


# HCS13N50 N-CHANNEL MOSFET

## 外形尺寸 PACKAGE MECHANICAL DATA

**TO-220**

单位 Unit : mm



符号 symbol	MIN	MAX
A	4.40	4.80
B	1.10	1.40
b	0.70	0.95
c	0.28	0.48
c1	0.32	0.52
D	14.45	16.00
D2	8.20	9.20
E	9.60	10.40
e	2.39	2.69
F	1.20	1.35
L	13.05	14.05
L2	3.70	3.90
Q	2.40	3.00
Q1	2.20	2.90
P	3.50	4.00





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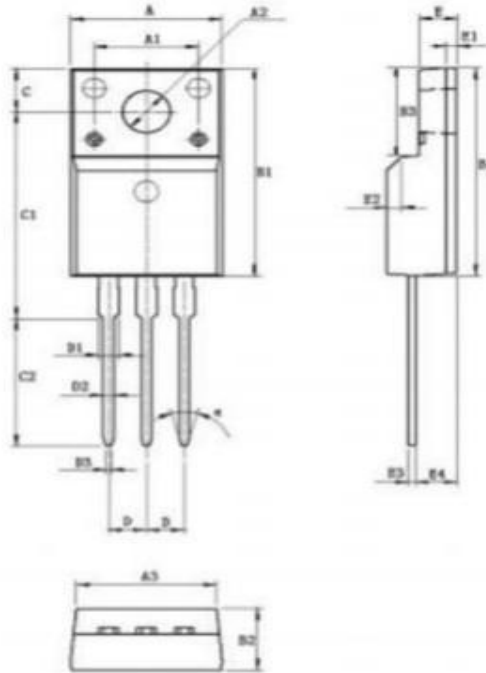
## 外形 寸 PACKAGE MECHANICAL DATA

**TO-220F**

单位 Unit : mm

Package Dimension

TO-220F



单位: mm

Symbol	Min	Max	Symbol	Min	Max
<b>A</b>	9.96	10.36	<b>D</b>	2.54	
<b>A1</b>	7.00		<b>D1</b>	1.15	1.35
<b>A2</b>	3.08	3.28	<b>D2</b>	0.70	0.90
<b>A3</b>	9.25	9.65	<b>D3</b>	0.28	0.48
<b>B1</b>	15.70	16.10	<b>E</b>	2.34	2.74
<b>B2</b>	4.50	4.90	<b>E1</b>	0.70	
<b>B3</b>	6.20	6.80	<b>E2</b>	1.0×45°	
<b>C</b>	3.20	3.40	<b>E3</b>	0.36	0.65
<b>C1</b>	15.20	16.00	<b>E4</b>	2.55	2.95
<b>C2</b>	9.75	10.15	a(度)	30°	

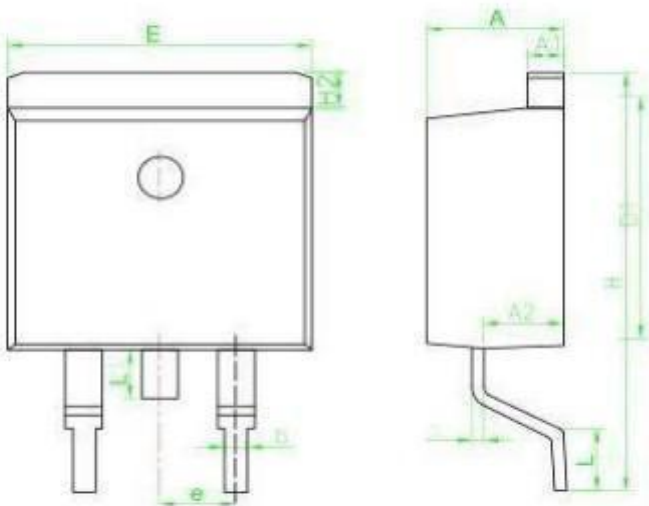


# HCS13N50 N-CHANNEL MOSFET

## 外形尺寸 PACKAGE MECHANICAL DATA

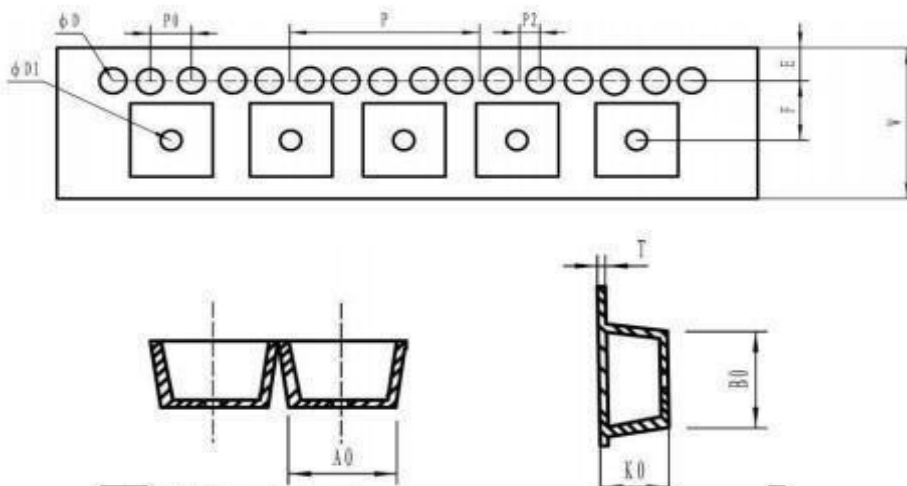
**TO-263**

单位 Unit : mm



SYMBOL	MM	
	MIN	MAX
A	4.30	4.80
A1	1.12	1.42
A2	2.54	2.84
b	0.67	1.00
c	0.29	0.52
D1	8.40	9.00
E	9.80	10.46
e	2.54BSC	
H	14.00	16.00
H2	1.12	1.45
L	1.50	3.10
L1	1.45	1.70

### 编带 REEL



产品尺寸规格 (UNIT: mm)				
规格	W	A0	P	D
尺寸	24 ± 0.3	18.9 ± 0.2	1.75 ± 0.2	1.5 ± 0.2 / -0.1
规格	D1	P0	P2	T
尺寸	1.5 ± 0.2 / -0.1	4 ± 0.2	2 ± 0.2	0.35 ± 0.05
规格	K0	B0		
尺寸	4.9 ± 0.2	16.0 ± 0.2		

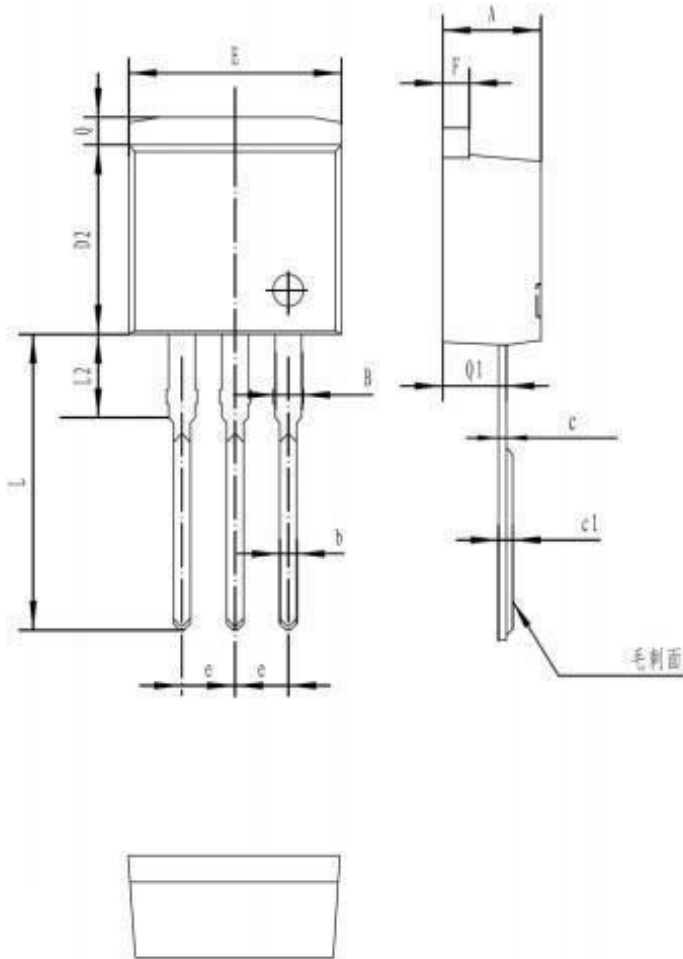


# HCS13N50 N-CHANNEL MOSFET

## 外形尺寸 PACKAGE MECHANICAL DATA

TO-262

单位 Unit: mm



符号 symbol	MIN	MAX
A	4.40	4.90
B	1.10	1.40
b	0.70	0.95
c	0.30	0.60
c1	0.33	0.63
D2	8.20	9.20
E	9.60	10.50
e	2.39	2.69
F	1.20	1.35
L	13.11	14.61
L2	3.55	4.05
Q	1.10	1.40
Q1	2.65	2.85



## 注意事项

1. 深圳市华天微电子有限公司的产品销售分为直销和销售代理，无论哪种方式，订货时请与公司核实。
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3. 在电路设计时请不要超过器件的绝对最大额定值，否则会影响整机的可靠性。
4. 本说明书如有版本变更不另外告知

## NOTE

1. Shenzhen Huatianwei Electronics co., Ltd sales its product either through direct sales or sales agent , thus, for customers, when ordering , please check with our company.
2. We strongly recommend customers check carefully on the trademark when buying our product, if there is any question, please don't be hesitate to contact us.
3. Please do not exceed the absolute maximum ratings of the device when circuit designing.
4. Shenzhen Huatianwei Electronics co., Ltd reserves the right to make changes in this specification sheet and is subject to change without prior notice.

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