



HCS20N60 N-CHANNEL MOSFET

FEATURES

- Low gate charge
- Low C_{rss} (typical 12.3pF)
- 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 12.3pF)
- 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

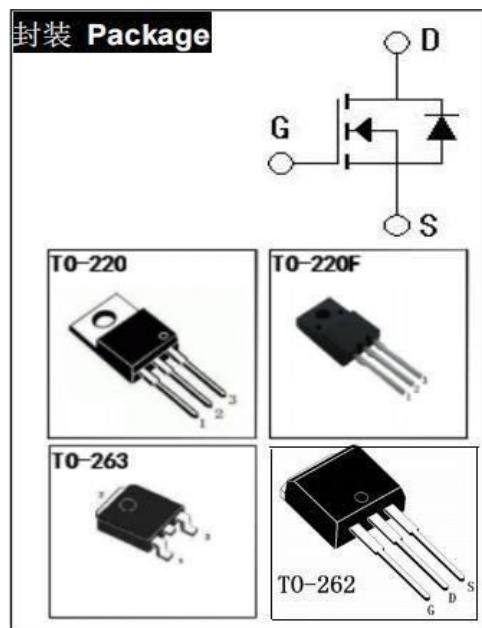
- 高频开关电源
- 电子镇流器
- LED电源

主要参数 MAIN CHARACTERISTICS

I_D		20A
V_{DS}		600 V
$R_{ds(on)}$ ($V_{GS}=10V$)	Typ	
	Max	0.39 Ω
Q_g -typ		50nC

产品型号信息 PRODUCT MESSAGE

型 号 Model	印 记 Marking	封 装 Package
HCS20N60C	HCS20N60C	TO-220
HCS20N60D	HCS20N60D	TO-220F
HCS20N60S	HCS20N60S	TO-263
HCS20N60B	HCS20N60B	TO-262



绝对最大额定值 ABSOLUTE RATINGS ($T_c=25^\circ\text{C}$)

项 目 Parameter	符 号 Symbol	数 值 Value	单 位 Unit
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 $T=25^\circ\text{C}$ $T=100^\circ\text{C}$	20.0	A
		12.5	A
最大脉冲漏极电流 (注 1) Drain Current -pulse (note 1)	I_{DM}	80	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}	450	mJ
雪崩电流 (注 1) Avalanche Current (note 1)	I_{AR}	20.0	A
重复雪崩能量 (注 1) Repetitive Avalanche Current (note 1)	E_{AR}	20.7	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	50	V/ns
耗散功率 Power Dissipation	P_D $T_c=25^\circ\text{C}$ -Derate above 25°C	55.0	W
		0.31	W/ $^\circ\text{C}$
最高结温及存储温度 Operating and Storage Temperature Range	T_J, T_{STG}	$-55\sim+150$	$^\circ\text{C}$
引线最高焊接温度 Maximum Lead Temperature for Soldering Purposes	T_L	300	$^\circ\text{C}$

*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
关态特性 Off-Characteristics						
漏-源击穿电压 Drain-Source Voltage	BV_{DSS}	$I_D=250\mu A, V_{GS}=0V$	600	-	-	V
击穿电压温度特性 Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	$I_D=250\mu A$, referenced to $25^\circ C$	-	0.5	-	$V/^\circ C$
零栅压下漏极漏电流 Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=600V, V_{GS}=0V, T_C=25^\circ C$	-	-	1	μA
		$V_{DS}=480V, T_C=125^\circ C$	-	-	10	μA
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
通态特性 On-Characteristics						
阈值电压 Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D=250\mu A$	3.0	-	5.0	V
静态导通电阻 Static Drain-Source On-Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=10.0A$	0.1	0.35	0.39	Ω
正向跨导 Forward Transconductance	g_{fs}	$V_{DS}=40V, I_D=10.0A$ (note 4)	-	15.4	-	S
动态特性 Dynamic Characteristics						
栅极电阻 Gate resistance	R_g	$F=1.0MHz$ open drain	1.2	-	4.5	Ω
输入电容 Input capacitance	C_{iss}	$V_{DS}=25V,$ $V_{GS}=0V,$ $f=1.0MHz$	1200	2310	4200	pF
输出电容 Output capacitance	C_{oss}		125	250	650	pF
反向传输电容 Reverse transfer capacitance	C_{rss}		2.5	12.3	30	pF



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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
开关特性 Switching –Characteristics						
延迟时间 Turn-On delay time	$t_{d(on)}$	$V_{DD}=250V, I_D=20A, R_G=25\Omega$ (note 4, 5)	35	106	158	ns
上升时间 Turn-On rise time	t_r		35	102	150	ns
延迟时间 Turn-Off delay time	$t_{d(off)}$		70	226	345	ns
下降时间 Turn-Off Fall time	t_f		20	40.6	100	ns
栅极电荷总量 Total Gate Charge	Q_g	$V_{DS}=480V,$	15	50	80	nC
栅-源电荷 Gate-Source charge	Q_{gs}	$I_D=20A$	5	14.3	40	nC
栅-漏电荷 Gate-Drain charge	Q_{gd}	$V_{GS}=10V$ (note 4, 5)	7	14.2	40	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		-	-	20	A
正向最大脉冲电流 Maximum Pulsed Drain-Source Diode Forward Current	I_{SM}		-	-	80	A
正向最大连续电流 Maximum Continuous Drain-Source Diode Forward Current	V_{SD}	$V_{GS}=0V, I_S=20A$	-		1.4	V
反向恢复时间 Reverse recovery time	t_{rr}	$V_{GS}=0V, I_S=20A$	250	481	1200	ns
反向恢复电荷 Reverse recovery charge	Q_{rr}	$di/dt=100A/\mu s$ (note 4)	2.5	10.6	16	μC

热特性 THERMAL CHARACTERISTIC

项 目 Parameter	符 号 Symbol	最大值 Value	单 位 Unit
结到管壳的热阻 Thermal Resistance, Junction to Case	$R_{th(j-c)}$	3.20	$^{\circ}C/W$
结到环境的热阻 Thermal Resistance, Junction to Ambient	$R_{th(j-A)}$	62.5	$^{\circ}C/W$

注:

1: 脉冲宽度由最高结温限制

2: $L=5.0mH, I_{AS}=20A, V_{DD}=50V, R_G=25\Omega$, 起始结温 $T_J=25^{\circ}C$

3: $I_{SD} \leq 20A, di/dt \leq 200A/\mu s, V_{DD} \leq BV_{DSS}$, 起始结温 $T_J=25^{\circ}C$

4: 脉冲测试: 脉冲宽度 $\leq 300\mu s$, 占空比 $\leq 2\%$

5: 基本与工作温度无关

Notes:

1: Pulse width limited by maximum junction temperature

2: $L=5.0mH, I_{AS}=20A, V_{DD}=50V, R_G=25\Omega$, Starting $T_J=25^{\circ}C$

3: $I_{SD} \leq 20A, di/dt \leq 200A/\mu s, V_{DD} \leq BV_{DSS}$, Starting $T_J=25^{\circ}C$

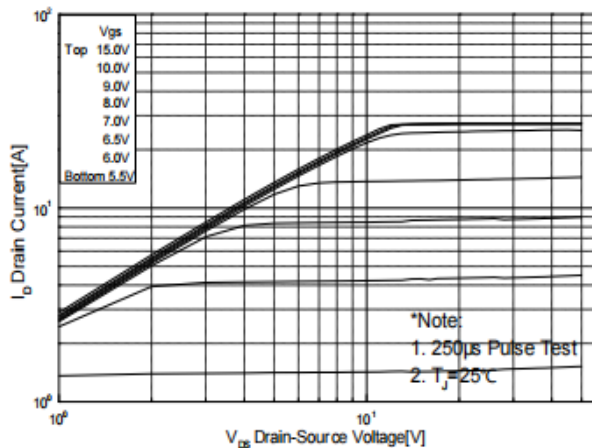
4: Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$

5: Essentially independent of operating temperature

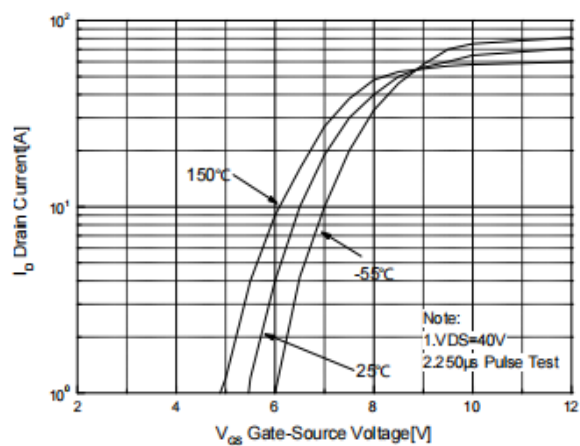


特征曲线 ELECTRICAL CHARACTERISTICS (curves)

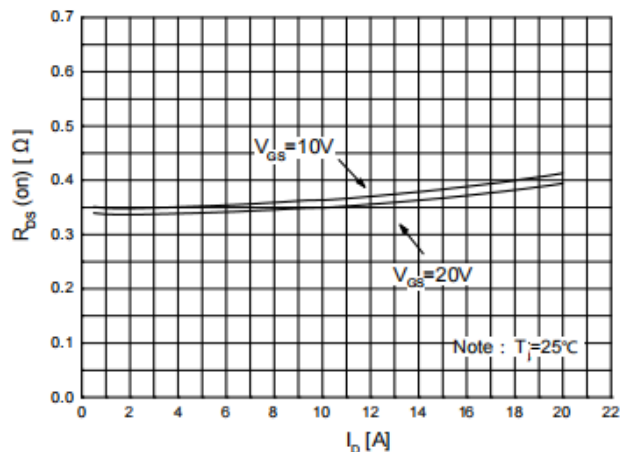
On-Region Characteristics



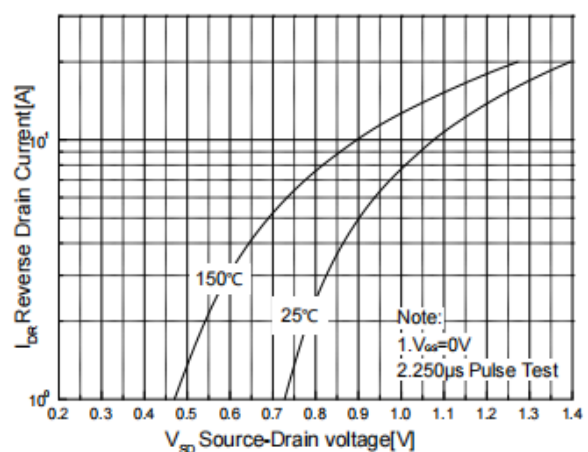
Transfer Characteristics



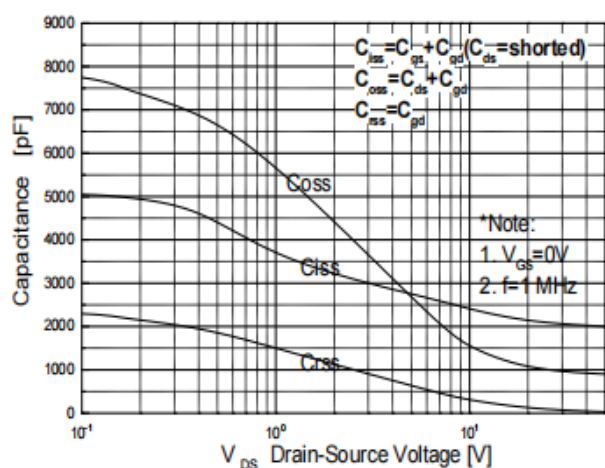
On-Resistance Variation vs Drain Current and Gate Voltage



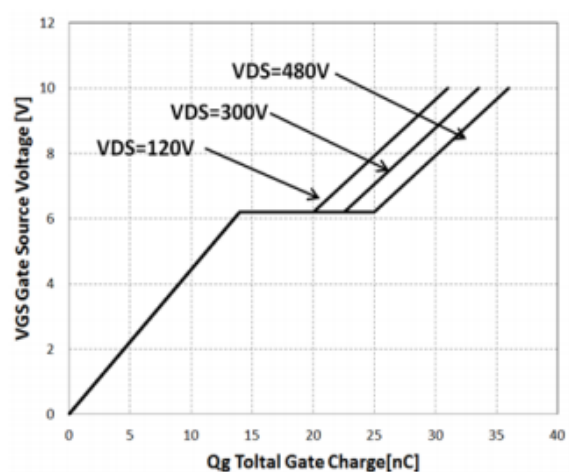
Body Diode Forward Voltage Variation vs. Source Current and Temperature



Capacitance Characteristics



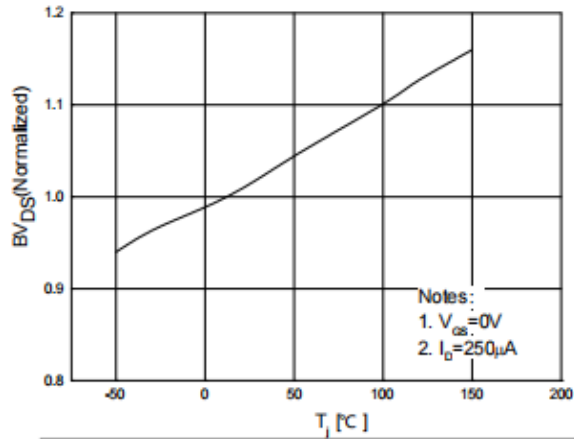
Capacitance Characteristics



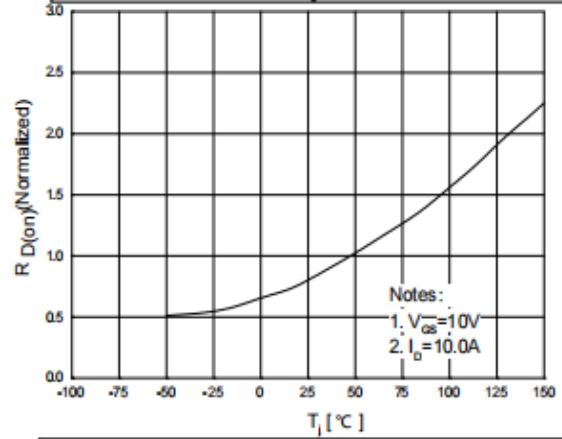


特征曲线 ELECTRICAL CHARACTERISTICS (curves)

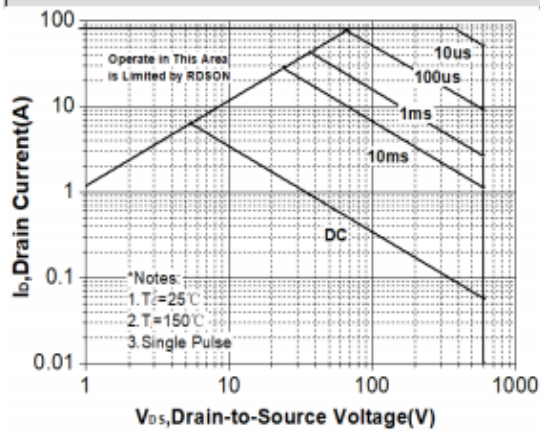
Breakdown Voltage Variation vs. Temperature



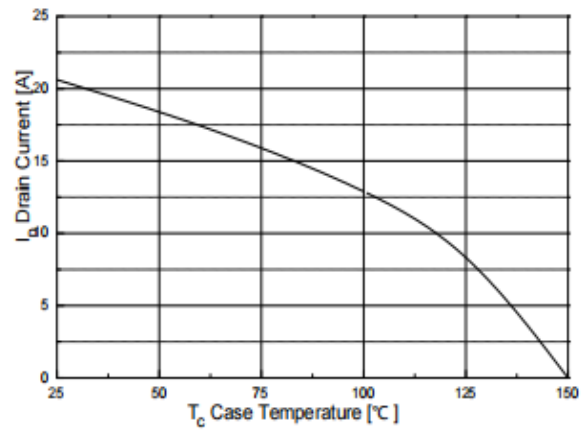
On-Resistance Variation vs. Temperature



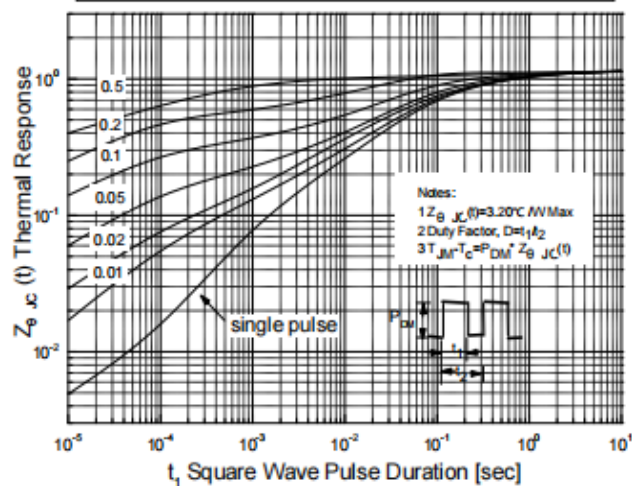
Maximum Safe Operating Area



Maximum Drain Current vs. Case Temperature



Transient Thermal Response Curve

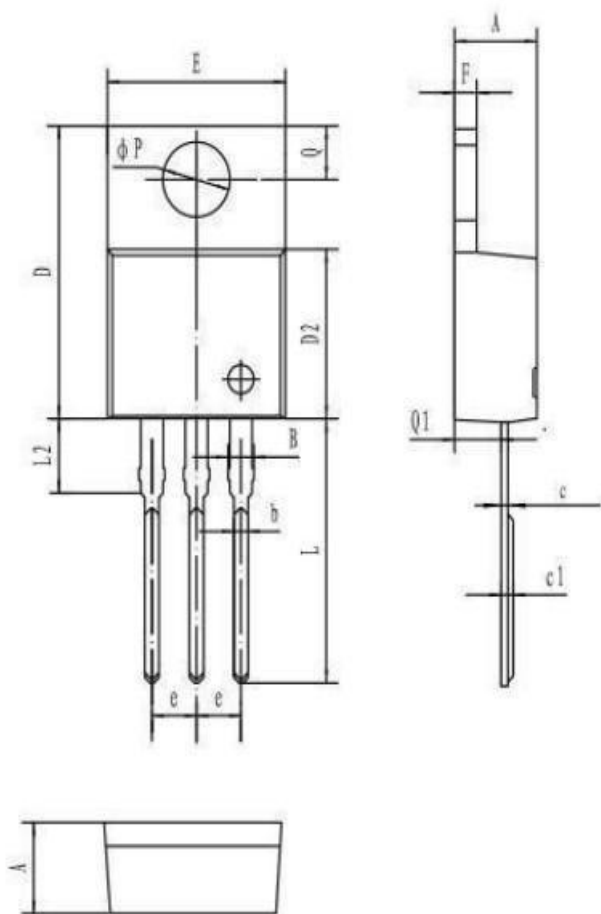




外形尺寸 PACKAGE MECHANICAL DATA

TO-220

单位 Unit : mm



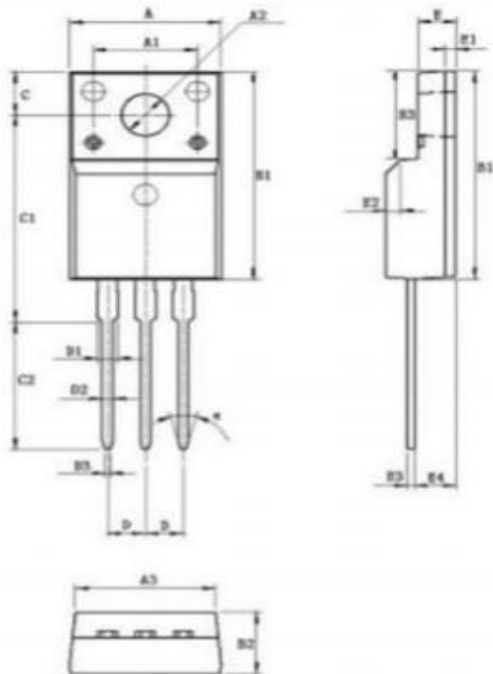
符号 symbol	MIN	MAX
A	4.40	4.80
B	1.10	1.40
b	0.70	0.95
c	0.28	0.48
c1	0.32	0.52
D	14.45	16.00
D2	8.20	9.20
E	9.60	10.40
e	2.39	2.69
F	1.20	1.35
L	13.05	14.05
L2	3.70	3.90
Q	2.40	3.00
Q1	2.20	2.90
P	3.50	4.00



外形尺寸 PACKAGE MECHANICAL DATA

Package Dimension

TO-220F



单位: mm

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

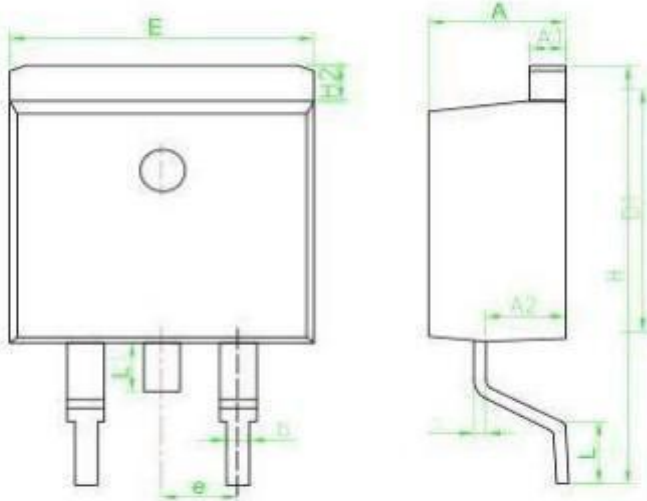


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外形尺寸 PACKAGE MECHANICAL DATA

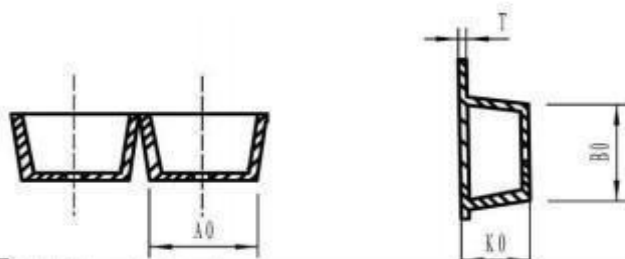
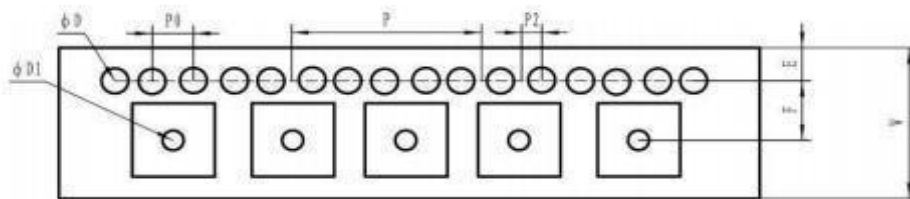
TO-263

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



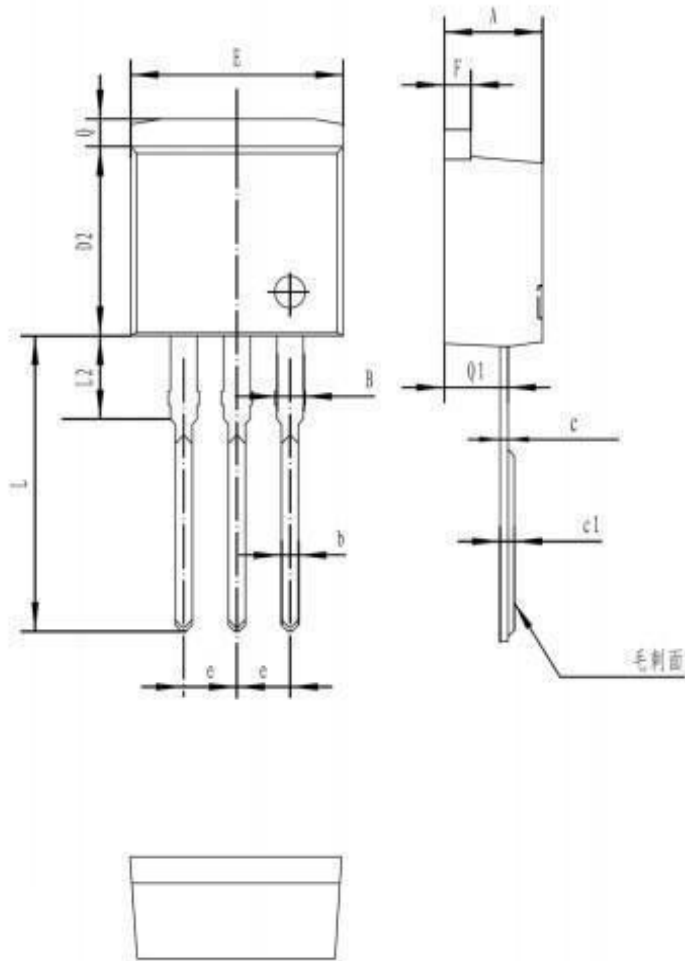
产品尺寸规格 (UNIT:mm)				
规格 W	A0	E	F	D
尺寸	14 ± 0.3	10.9 ± 0.2	1.75 ± 0.2	11.5 ± 0.2
规格 D1	P0	P2	P	T
尺寸	1.5 ± 0.2/-0.1	4 ± 0.2	2 ± 0.2	16 ± 0.2
规格 K0	B0			
尺寸	4.9 ± 0.2	16.0 ± 0.2		



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



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3. Please do not exceed the absolute maximum ratings of the device when circuit designing.
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