



# JCS4N60B

## 主要参数 MAIN CHARACTERISTICS

$I_D$	4.0 A
$V_{DS}$	600 V
$R_{dson} (V_{gs}=10V)$	2.4 $\Omega$
$Q_g$	18.1nC

### 用途

- 高频开关电源
- 电子镇流器
- LED 电源

### 产品特性

- 低栅极电荷
- 低  $C_{rss}$  (典型值 2.69pF)
- 开关速度快
- 产品全部经过雪崩测试
- 高抗  $dv/dt$  能力
- RoHS 产品

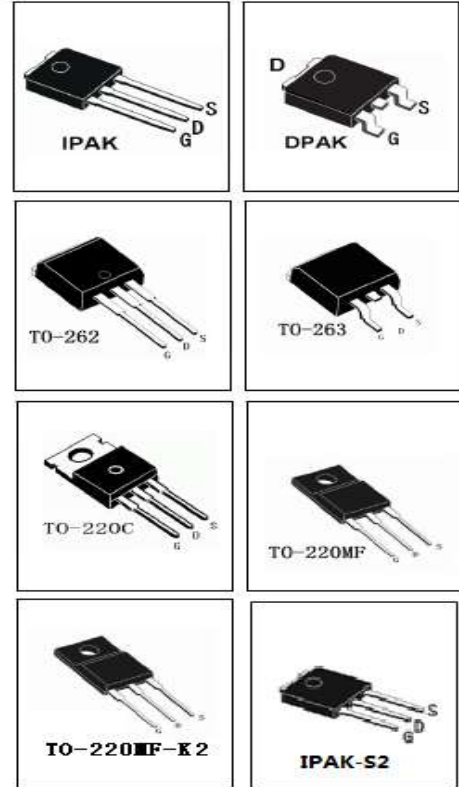
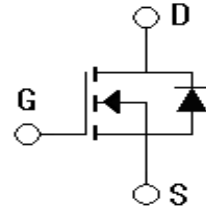
### APPLICATIONS

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

### FEATURES

- Low gate charge
- Low  $C_{rss}$  (typical 2.69pF)
- Fast switching
- 100% avalanche tested
- Improved  $dv/dt$  capability
- RoHS product

## 封装 Package



## 订货信息 ORDER MESSAGE

订货型号 Order codes				印 记 Marking	封 装 Package
有卤-条管 Halogen-Tube	无卤-条管 Halogen-Free-Tube	有卤-编带 Halogen-Reel	无卤-编带 Halogen-Free-Reel		
JCS4N60VB-V-B	JCS4N60VB-V-BR	N/A	N/A	JCS4N60VB	IPAK
JCS4N60RB-R-B	JCS4N60RB-R-BR	JCS4N60RB-R-A	JCS4N60RB-R-AR	JCS4N60RB	DPAK
JCS4N60BB-B-B	JCS4N60BB-B-BR	N/A	N/A	JCS4N60BB	TO-262
JCS4N60SB-S-B	JCS4N60SB-S-BR	JCS4N60SB-S-A	JCS4N60SB-S-AR	JCS4N60SB	TO-263
JCS4N60CB-C-B	JCS4N60CB-C-BR	N/A	N/A	JCS4N60CB	TO-220C
JCS4N60FB-F-B	JCS4N60FB-F-BR	N/A	N/A	JCS4N60FB	TO-220MF
JCS4N60FB-F2-B	JCS4N60FB-F2-BR	N/A	N/A	JCS4N60FB	TO-220MF-K2
JCS4N60VB-V2-B	JCS4N60VB-V2-BR	N/A	N/A	JCS4N60VB	IPAK-S2





## 绝对最大额定值 ABSOLUTE RATINGS (Tc=25℃)

项 目 Parameter	符 号 Symbol	数 值 Value				单 位 Unit
		JCS4N60 VB/RB	JCS4N60 CB/SB/BB	JCS4N60 FB(TO-2 20MF)	JCS4N60 FB(TO-22 0MF-K2)	
最高漏极-源极直流电压 Drain-Source Voltage	V <sub>DSS</sub>	600				V
连续漏极电流 Drain Current -continuous	I <sub>D</sub> T=25℃ T=100℃	4.0		4.0*		A
		2.5		2.5*		A
最大脉冲漏极电流 (注1) Drain Current - pulse (note 1)	I <sub>DM</sub>	16		16*		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>	610.9				mJ
雪崩电流 (注1) Avalanche Current (note 1)	I <sub>AR</sub>	4.0				A
重复雪崩能量 (注1) Repetitive Avalanche Current (note 1)	E <sub>AR</sub>	15.0				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	5.5				V/n s
耗散功率 Power Dissipation	P <sub>D</sub> T <sub>C</sub> =25℃ -Derate above 25℃	165.56	193.20	41.92	27.61	W
		1.32	1.55	0.34	0.22	W/ ℃
最高结温及存储温度 Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55~+150				℃
引线最高焊接温度 Maximum Lead Temperature for Soldering Purposes	T <sub>L</sub>	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
<b>关态特性 Off –Characteristics</b>						
漏—源击穿电压 Drain-Source Voltage	$BV_{DSS}$	$I_D=250\mu A, V_{GS}=0V$	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 $25^\circ C$	-	0.65	-	V/ $^\circ C$
零栅压下漏极漏电流 Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=600V, V_{GS}=0V,$ $T_C=25^\circ C$	-	-	10	$\mu A$
		$V_{DS}=480V, T_C=125^\circ C$	-	-	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	$R_{DS(ON)}$	$V_{GS} = 10V, I_D=2A$	-	1.7	2.4	$\Omega$
正向跨导 Forward Transconductance	$g_{fs}$	$V_{DS} = 40V, I_D=2A$ (note 4)	-	4.3	-	S
<b>动态特性 Dynamic Characteristics</b>						
输入电容 Input capacitance	$C_{iss}$	$V_{DS}=25V,$ $V_{GS}=0V,$ $f=1.0MHz$	-	702	1100	pF
输出电容 Output capacitance	$C_{oss}$		-	89	124	pF
反向传输电容 Reverse transfer capacitance	$C_{rss}$		-	2.69	12	pF





## 电特性 ELECTRICAL CHARACTERISTICS

开关特性 Switching Characteristics						
延迟时间 Turn-On delay time	$t_{d(on)}$	$V_{DD}=300V, I_D=4.0A, R_G=25\Omega$ (note 4, 5)	-	9.8	20	ns
上升时间 Turn-On rise time	$t_r$		-	23.7	50	ns
延迟时间 Turn-Off delay time	$t_{d(off)}$		-	33.5	70	ns
下降时间 Turn-Off Fall time	$t_f$		-	25.8	55	ns
栅极电荷总量 Total Gate Charge	$Q_g$	$V_{DS}=480V,$ $I_D=4.0A$ $V_{GS}=10V$ (note 4, 5)	-	13.3	28	nC
栅-源电荷 Gate-Source charge	$Q_{gs}$		-	3.6	10	nC
栅-漏电荷 Gate-Drain charge	$Q_{gd}$		-	4.9	12	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		$I_S$	-	-	4.0	A
正向最大脉冲电流 Maximum Pulsed Drain-Source Diode Forward Current		$I_{SM}$	-	-	16	A
正向压降 Drain-Source Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V,$ $I_S=4.0A$	-	-	1.4	V
反向恢复时间 Reverse recovery time	$t_{rr}$	$V_{GS}=0V, I_S=4.0A$ $di_F/dt=100A/\mu s$ (note 4)	-	383	-	ns
反向恢复电荷 Reverse recovery charge	$Q_{rr}$		-	1.85	-	$\mu C$

## 热特性 THERMAL CHARACTERISTIC

项 目 Parameter	符 号 Symbol	最大 Max				单位 Unit
		JCS4N60 VB /RB	JCS4N60 CB /SB/BB	JCS4N60FB(TO-220MF)	JCS4N60FB(TO-220MF-K2)	
结到管壳的热阻 Thermal Resistance, Junction to Case	$R_{th(j-c)}$	0.755	0.647	2.982	4.528	$^{\circ}C/W$
结到环境的热阻 Thermal Resistance, Junction to Ambient	$R_{th(j-A)}$	80.25	60.18	46.22	49.62	$^{\circ}C/W$

注释:

- 1: 脉冲宽度由最高结温限制
- 2:  $L=70mH, I_{AS}=4.0A, V_{DD}=50V, R_G=25\Omega$ , 起始结温  $T_J=25^{\circ}C$
- 3:  $I_{SD} \leq 4.0A, di/dt \leq 200A/\mu s, V_{DD} \leq BV_{DSS}$ , 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

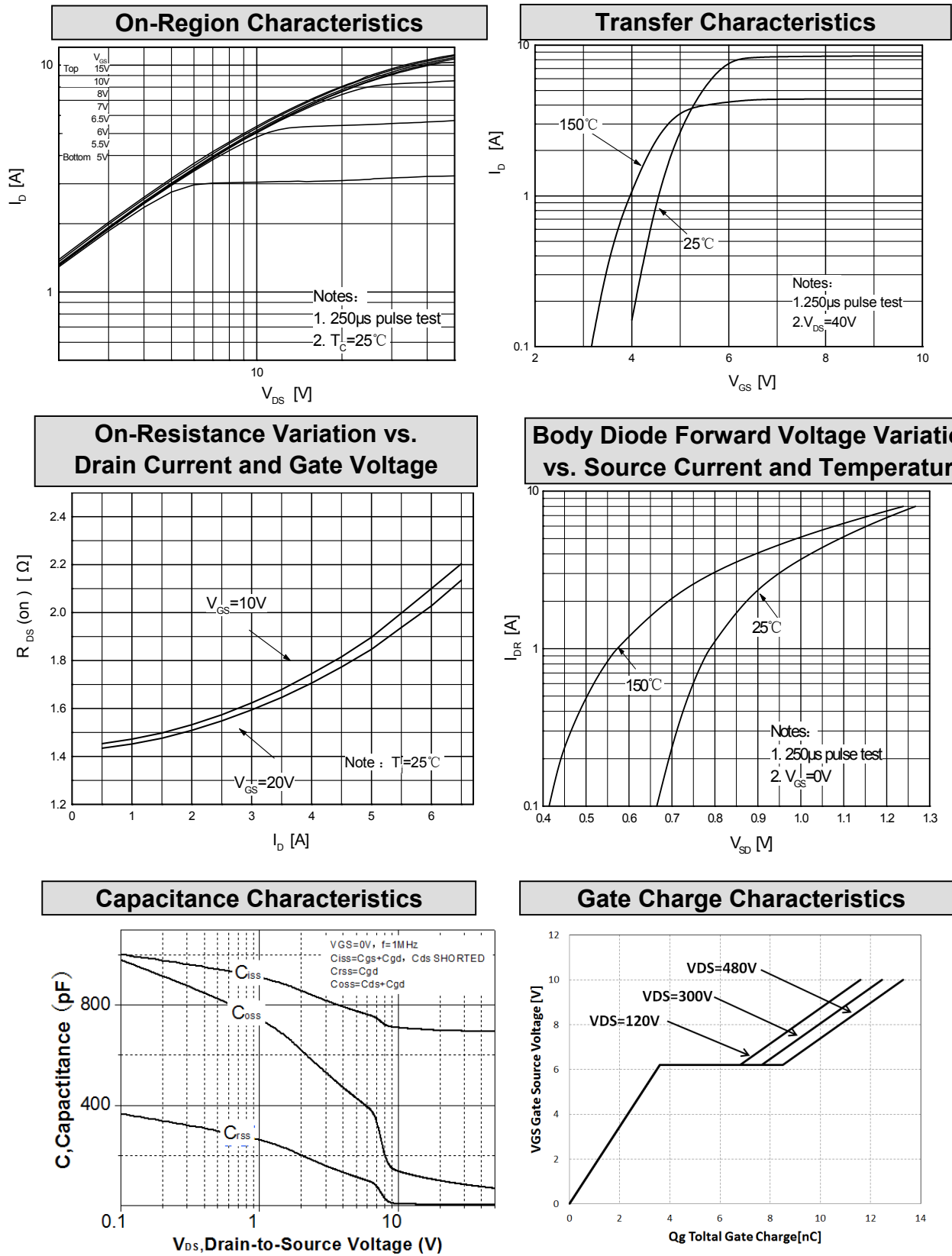
Notes:

- 1: Pulse width limited by maximum junction temperature
- 2:  $L=70mH, I_{AS}=4.0A, V_{DD}=50V, R_G=25\Omega$ , Starting  $T_J=25^{\circ}C$
- 3:  $I_{SD} \leq 4.0A, di/dt \leq 200A/\mu s, V_{DD} \leq BV_{DSS}$ , 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





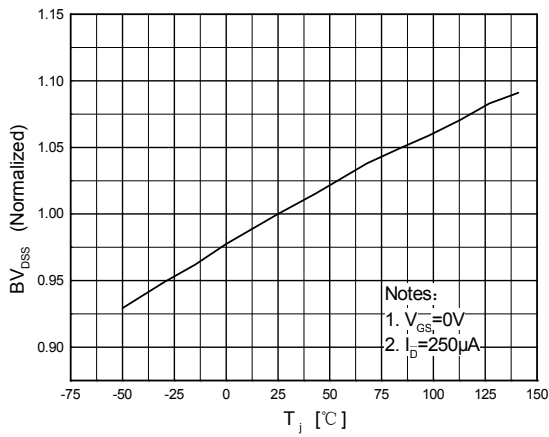
特征曲线 ELECTRICAL CHARACTERISTICS (curves)



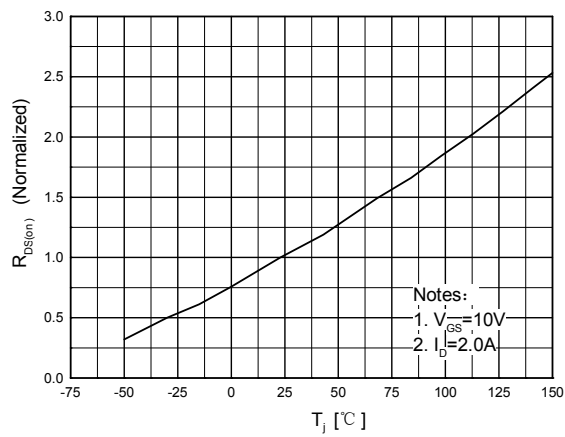


特征曲线 ELECTRICAL CHARACTERISTICS (curves)

Breakdown Voltage Variation vs. Temperature



On-Resistance Variation vs. Temperature



Maximum Safe Operating Area For JCS4N60(V/R)B



Maximum Safe Operating Area For JCS4N60(C/S)B



Maximum Safe Operating Area For JCS4N60FB(TO-220MF-K2)



Maximum Safe Operating Area For JCS4N60FB(TO-220MF)

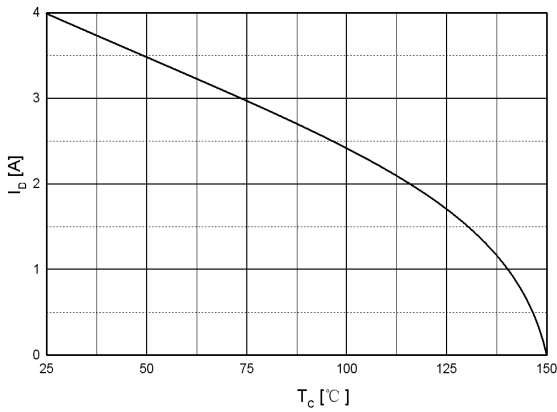




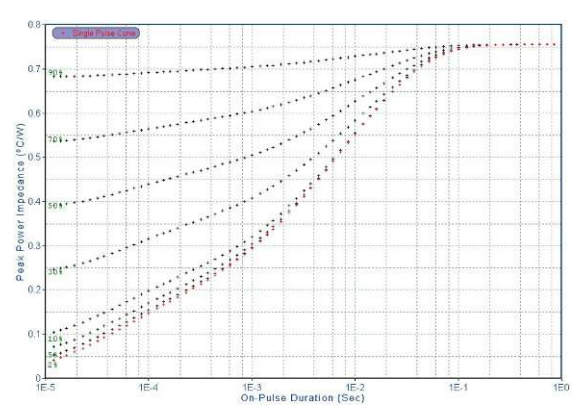


特征曲线 ELECTRICAL CHARACTERISTICS (curves)

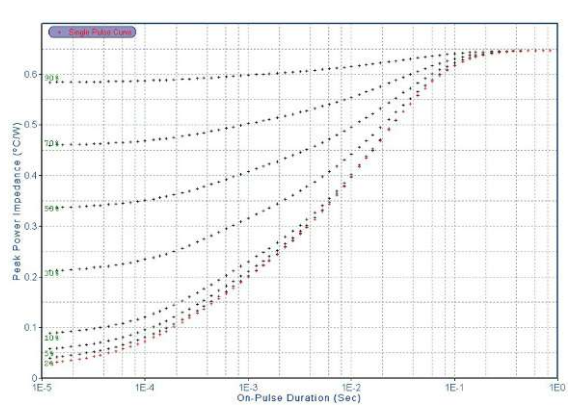
Maximum Drain Current vs. Case Temperature



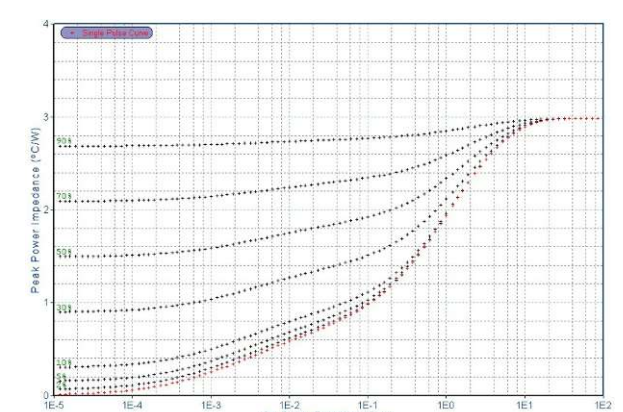
Transient Thermal Response Curve For JCS4N60(V/R)B



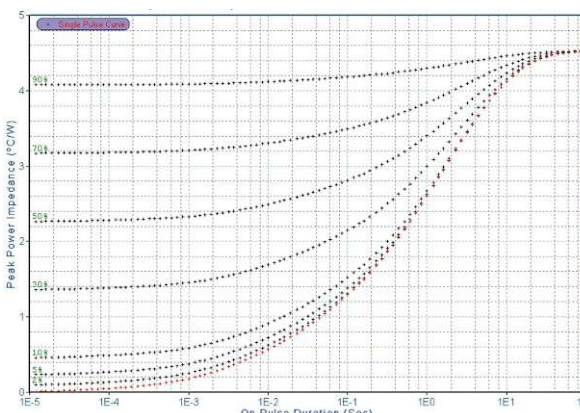
Transient Thermal Response Curve For JCS4N60CB/SB/BB



Transient Thermal Response Curve For JCS4N60FB(TO-220MF)



Transient Thermal Response Curve For JCS4N60FB(TO-220MF-K2)

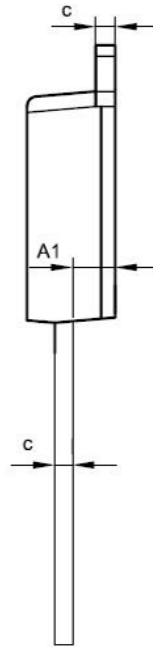
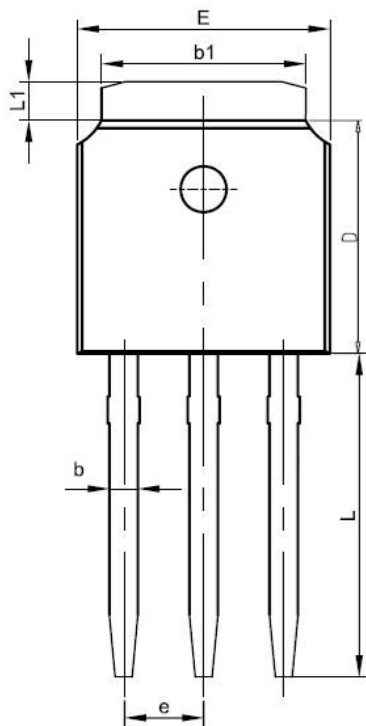




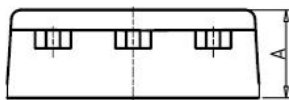
## 外形尺寸 PACKAGE MECHANICAL DATA

IPAK

单位 Unit: mm



SYMBOL	MM	
	MIN	MAX
A	2.1	2.5
A1	0.87	1.27
b	0.63	0.93
b1	5.13	5.53
c	0.40	0.60
D	5.80	6.40
E	6.30	6.90
L	9.10	9.70
e	2.286BSC	
L1	0.82	1.22



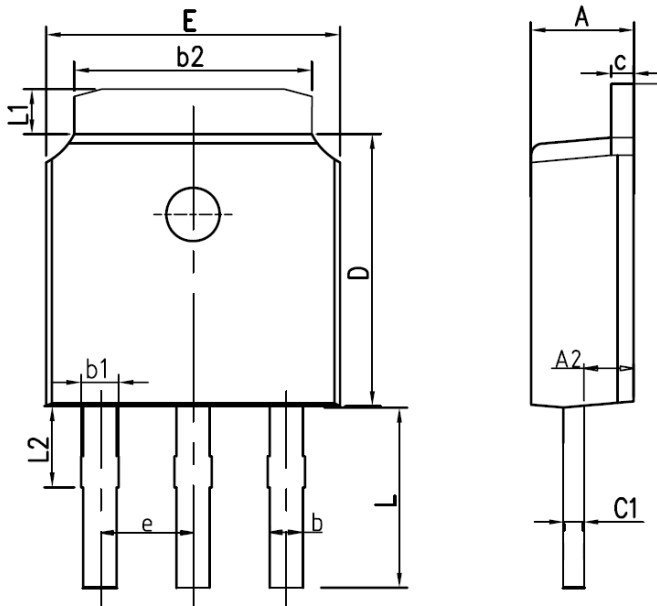




## 外形尺寸 PACKAGE MECHANICAL DATA

IPAK S2

单位 Unit: mm



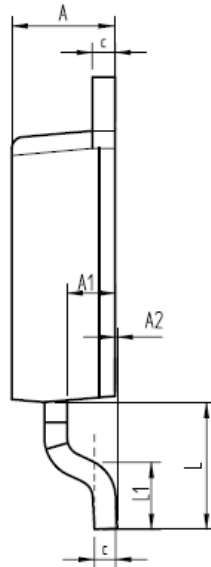
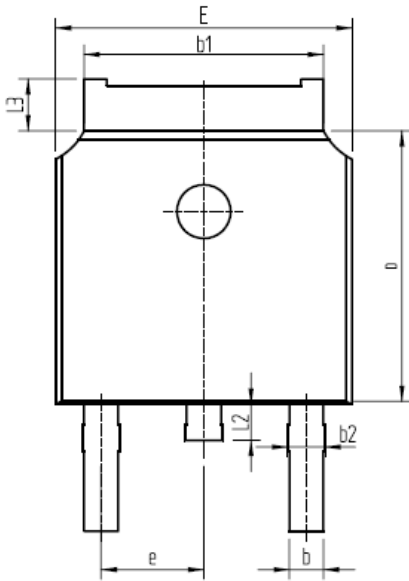
SYMBOL	MM	
	MIN	MAX
A	2.15	2.45
A2	0.92	1.22
b	0.68	0.88
b1	0.61	0.95
b2	5.18	5.48
c	0.43	0.63
c1	0.41	0.61
D	5.95	6.25
E	6.45	6.75
e	2.286BSC	
L	3.35	3.65
L1	0.80	1.25
L2	0.90	1.20



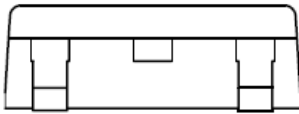


DPAK

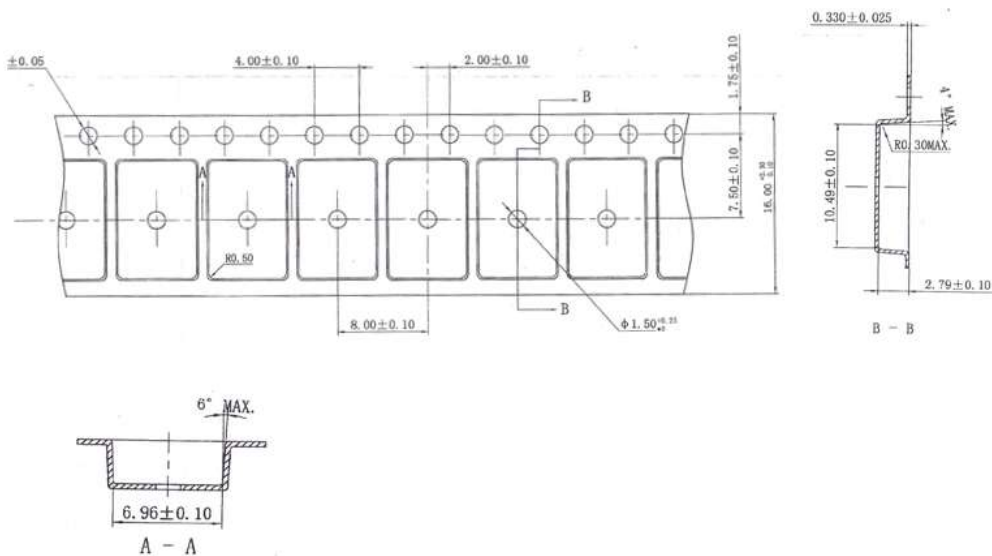
单位 Unit: mm



SYMBOL	mm	
	MIN	MAX
A	2.16	2.41
A1	0.97	1.17
A2	0.00	0.15
b	0.63	0.93
b1	5.13	5.53
b2	0.66	0.96
c	0.40	0.60
D	5.80	6.40
E	6.30	6.90
e	2.286BSC	
L	2.50	3.30
L1	1.20	1.80
L2	0.60	1.00
L3	0.85	1.30



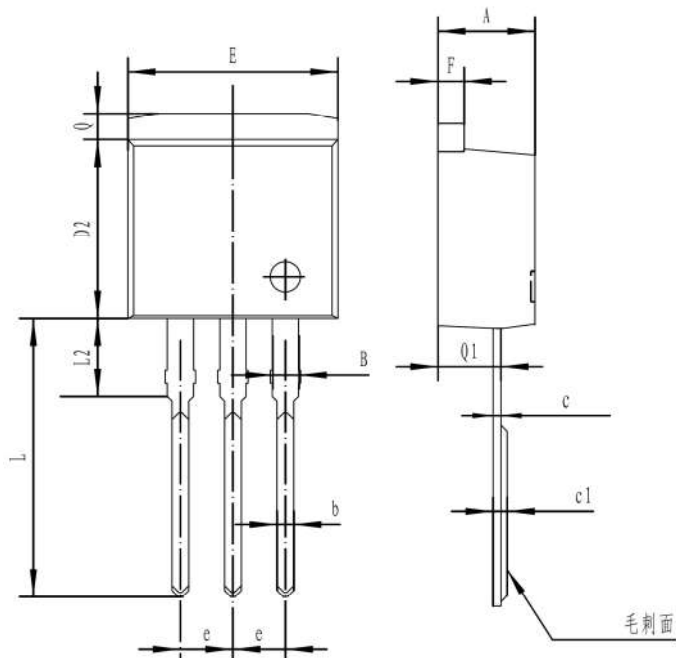
编带 REEL





TO-262

单位 Unit: mm



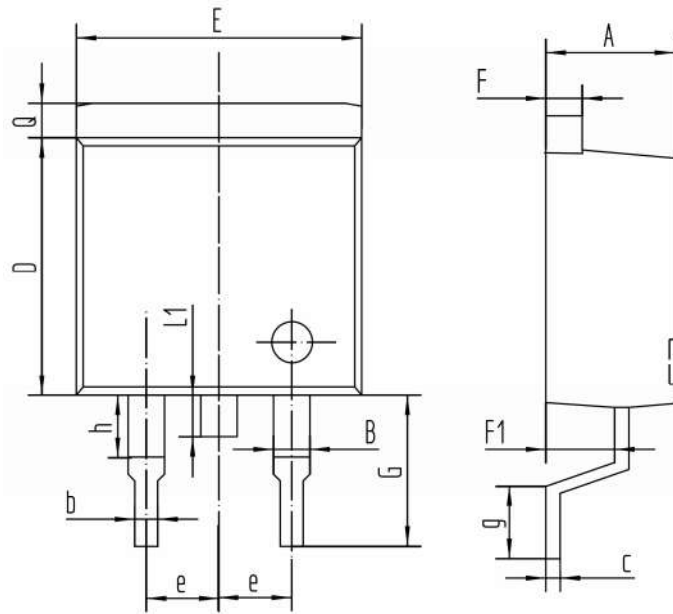
符号 symbol	MIN	MAX
A	4.40	4.90
B	1.10	1.40
b	0.70	0.95
c	0.30	0.60
c1	0.33	0.63
D2	8.20	9.20
E	9.60	10.50
e	2.39	2.69
F	1.20	1.35
L	13.11	14.61
L2	3.55	4.05
Q	1.10	1.40
Q1	2.65	2.85





TO-263

单位 Unit: mm



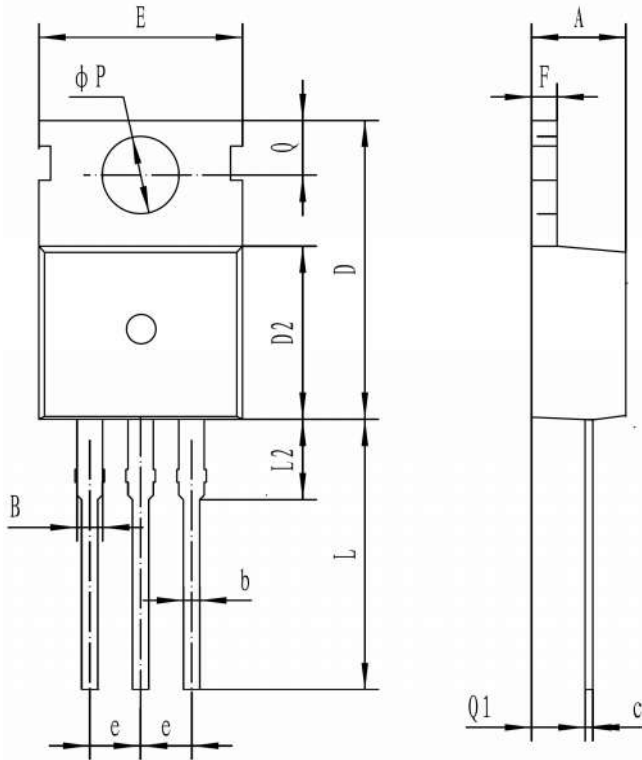
符号 symbol	MIN	MAX
A	4.50	4.90
B	1.20	1.40
D	8.40	8.80
E	9.50	10.50
F	1.20	1.40
F1	2.50	2.90
G	4.50	5.50
L1	1.30	1.60
Q	1.20	1.50
b	0.75	0.95
c	0.35	0.50
e	2.49	2.59
g	1.90	2.80
h	2.30	3.30





TO-220C

单位 Unit: mm



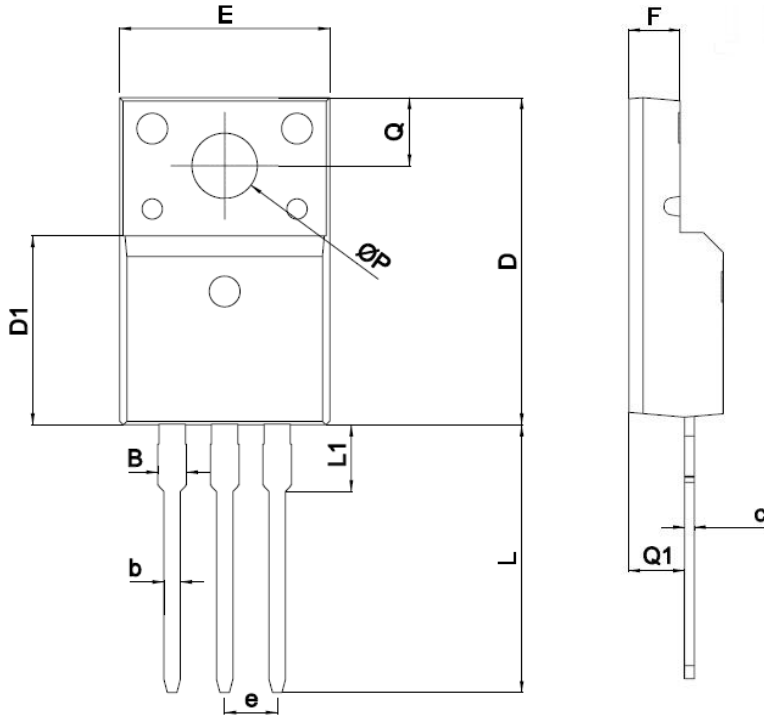
符号 symbol	MIN	MAX
A	4.30	4.70
B	1.10	1.40
b	0.70	0.95
c	0.40	0.65
D	15.20	16.20
D2	9.00	9.40
E	9.70	10.10
e	2.39	2.69
F	1.25	1.40
L	12.60	13.60
L2	2.80	3.20
Q	2.60	3.00
Q1	2.20	2.60
P	3.50	3.80



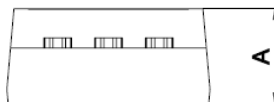


TO-220MF

单位 Unit: mm



SYMBOL	mm	
	MIN	MAX
A	4.5	4.9
B		1.47
b	0.7	0.9
c	0.45	0.60
D	15.67	16.07
D1	9.04	9.20
e	2.54TYPE	
E	9.96	10.36
F	2.34	2.74
L	12.58	13.38
L1	3.13	3.33
Q	3.2	3.4
Q1	2.56	2.96
ΦP	3.08	3.28

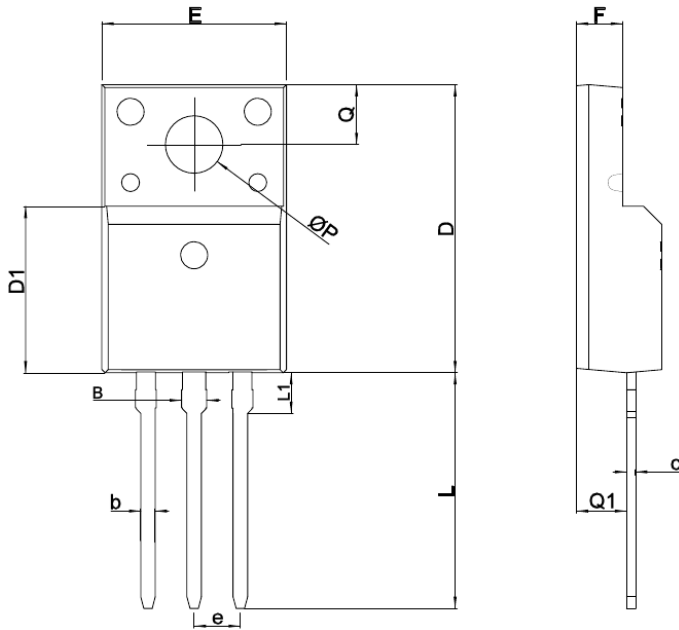






## TO-220MF-K2

单位 Unit: mm



SYMBOL	mm	
	MIN	MAX
A	4.5	4.9
B		1.27
b	0.59	0.79
c	0.45	0.60
D	15.67	16.07
D1	8.97	9.37
e	2.54TYPE	
E	9.96	10.36
F	2.34	2.74
L	12.65	13.35
L1	1.80	2.20
Q	3.2	3.4
Q1	2.56	2.96
ΦP	3.08	3.28



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[TK31J60W5,S1VQ\(O](#) [2SK2614\(TE16L1,Q\)](#) [DMN1017UCP3-7](#) [EFC2J004NUZTDG](#) [FCAB21350L1](#) [P85W28HP2F-7071](#) [DMN1053UCP4-7](#)  
[NTE2384](#) [NTE2969](#) [NTE6400A](#) [DMN61D9UWQ-13](#) [US6M2GTR](#) [DMN31D5UDJ-7](#) [SSM6P54TU,LF](#) [DMP22D4UFO-7B](#)  
[IPS60R3K4CEAKMA1](#) [DMN1006UCA6-7](#) [DMN16M9UCA6-7](#) [STF5N65M6](#) [STU5N65M6](#) [C3M0021120D](#) [DMN13M9UCA6-7](#)  
[BSS340NWH6327XTSA1](#) [MCM3400A-TP](#) [DMTH10H4M6SPS-13](#) [IPS60R1K0PFD7SAKMA1](#) [IPS60R360PFD7SAKMA1](#)  
[IPS60R600PFD7SAKMA1](#) [IPS60R210PFD7SAKMA1](#) [DMN2990UFB-7B](#)