

**描述 / Descriptions**

N 沟道 TO-251 塑封封装场效应管。N-CHANNEL MOSFET in a TO-251 Plastic Package.

**特征 / Features**

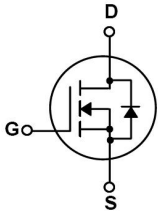
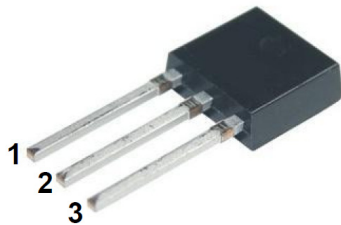
$R_{DS(on)}$ 小, 门电荷低,  $C_{rSS}$ 小, 开关速度快。

Low  $R_{DS(on)}$ , low gate charge, low  $C_{rSS}$ , fast switching.

**用途 / Applications**

用于低压电路如: 汽车电路、DC/DC 转换、便携式产品的电源高效转换。

Suited for low voltage applications such as automotive, DC/DC Converters, and high efficiency switching for power management in portable and battery operated products.

**内部等效电路 / Equivalent Circuit****引脚排列 / Pinning**

PIN 1 : G

PIN 2 : D

PIN 3 : S

**放大及印章代码 /  $h_{FE}$  Classifications & Marking**

见印章说明。See Marking Instructions.

**极限参数 / Absolute Maximum Ratings(Ta=25°C)**

参数 Parameter	符号 Symbol	数值 Rating	单位 Unit
Drain-Source Voltage	$V_{DSS}$	20	V
Drain Current <sup>G</sup>	$I_D(T_C=25^\circ C)$	30	A
	$I_D(T_C=100^\circ C)$	20	A
Drain Current - Pulsed <sup>C</sup>	$I_{DM}$	120	A
Maximum Body-Diode Continuous Current <sup>G</sup>	$I_S$	30	A
Gate-Source Voltage	$V_{GS}$	$\pm 12$	V
Avalanche Current <sup>C</sup>	$I_{AS}$	12	A
Avalanche energy L=0.5mH <sup>C</sup>	$E_{AS}$	115	mJ
Power Dissipation <sup>B</sup>	$P_D(T_C=25^\circ C)$	100	W
	$P_D(T_C=100^\circ C)$	50	W
Power Dissipation <sup>A</sup>	$P_{DSM}(T_A=25^\circ C)$	2.5	W
	$P_{DSM}(T_A=70^\circ C)$	1.6	W
Junction and Storage Temperature Range	$T_j, T_{stg}$	-55~150	°C

**电性能参数 / Electrical Characteristics(Ta=25°C)**

参数 Parameter	符号 Symbol	测试条件 Test Conditions	最小值 Min	典型值 Typ	最大值 Max	单位 Unit
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V$ $I_D=250\mu A$	20			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=20V$ $V_{GS}=0V$			1.0	$\mu A$
		$T_j=55^\circ C$			5.0	$\mu A$
Gate-Body Leakage Current Forward	$I_{GSS}$	$V_{GS}=\pm 12V$ $V_{DS}=0V$			$\pm 0.1$	$\mu A$
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}$ $I_D=250\mu A$	0.4	1.0	1.2	V
Static Drain-Source On-Resistance	$R_{DS(on)1}$	$V_{GS}=10V$ $I_D=30A$		10	13	m $\Omega$
	$R_{DS(on)2}$	$V_{GS}=4.5V$ $I_D=15A$		11	14	m $\Omega$
Diode Forward Voltage	$V_{SD}$	$I_S=30A$ $V_{GS}=0V$		0.9	1.35	V

## 电性能参数 / Electrical Characteristics(Ta=25°C)

参数 Parameter	符号 Symbol	测试条件 Test Conditions	最小值 Min	典型值 Typ	最大值 Max	单位 Unit
Input Capacitance	$C_{iss}$	$V_{DS}=25V$ $V_{GS}=0V$ $f=1.0MHz$		884		pF
Output Capacitance	$C_{oss}$			174		
Reverse Transfer Capacitance	$C_{rss}$			78		
Gate resistance	$R_g$	$V_{GS}=0V$ $V_{DS}=0V$ $f=1MHz$	0.6	1.4	2.1	$\Omega$
Total Gate Charge	$Q_g(4.5V)$	$V_{GS}=10V$ $V_{DS}=10V$ $I_D=20A$	28	36	43	nC
Gate Source Charge	$Q_{gs}$			9		
Gate Drain Charge	$Q_{gd}$			12		
Turn-On Delay Time	$t_{d(on)}$	$V_{GS}=10V$ $V_{DS}=10V$ $R_L=0.5\Omega$ $R_{GEN}=3\Omega$		7		ns
Turn-On Rise Time	$t_r$			8		
Turn-Off Delay Time	$t_{d(off)}$			70		
Turn-Off Fall Time	$t_f$			18		
Body Diode Reverse Recovery Time	$t_{rr}$	$I_F=20A$ $dI/dt=500A/ms$	13	17	20	ns
Body Diode Reverse Recovery Charge	$Q_{rr}$	$I_F=20A$ $dI/dt=500A/ms$	29	36	43	nC
Maximum Junction-to-Ambient <sup>A</sup>	$R_{\theta JA}$	$t \leq 10s$		16	20	$^{\circ}C/W$
Maximum Junction-to-Ambient <sup>AD</sup>		steady-State		41	50	$^{\circ}C/W$
Maximum Junction-to-Case	$R_{\theta JC}$	steady-State		1.2	1.5	$^{\circ}C/W$

A. The value of  $R_{\theta JA}$  is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A = 25^{\circ}C$ . The Power dissipation PDSM is based on  $R_{\theta JA}$  and the maximum allowed junction temperature of 150°C. The value in any given application depends on the user's specific board design, and the maximum temperature of 150°C may be used if the PCB allows it.

B. The power dissipation PD is based on  $T_{J(MAX)}=150^{\circ}C$ , using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

C. Repetitive rating, pulse width limited by junction temperature  $T_{J(MAX)}=150^{\circ}C$ . Ratings are based on low frequency and duty cycles to keep initial  $T_J = 25^{\circ}C$ .

D. The  $R_{qJA}$  is the sum of the thermal impedance from junction to case  $R_{qJC}$  and case to ambient.

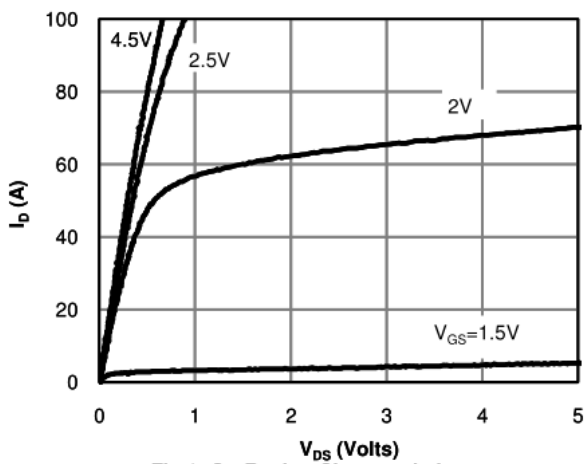
E. The static characteristics in Figures 1to6 are obtained using <300ms pulses, duty cycle 0.5% max.

F. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of  $T_{J(MAX)}=150^{\circ}C$ . The SOA curve provides a single pulse rating.

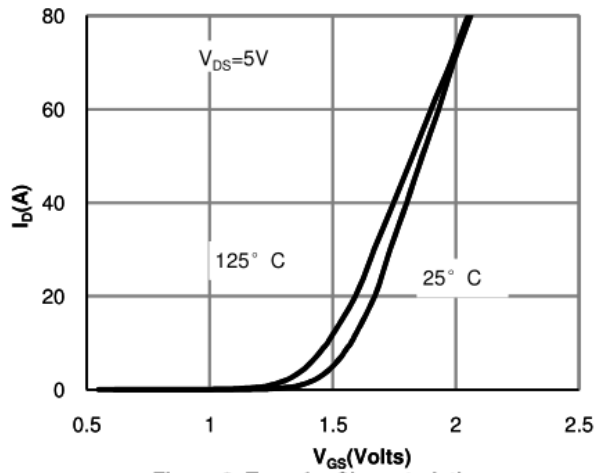
G. The maximum current rating is package limited.

H. These tests are performed with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^{\circ}C$ .

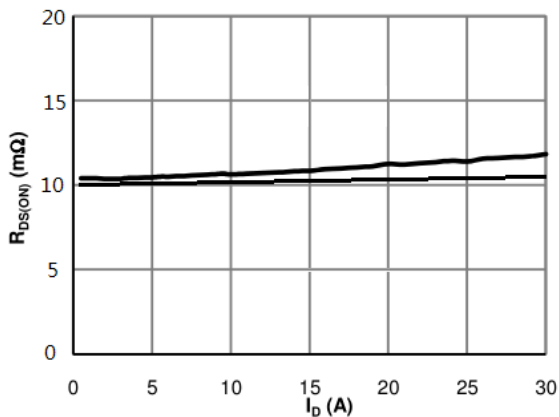
**电参数曲线图 / Electrical Characteristic Curve**



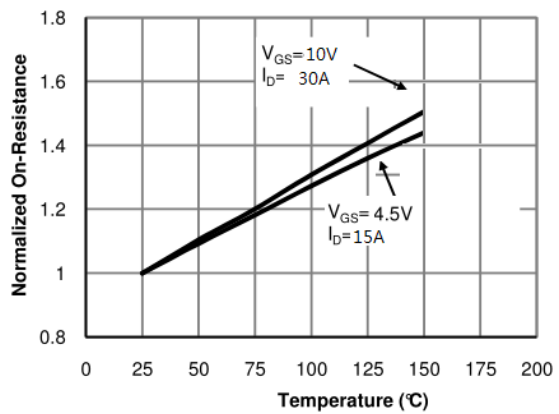
**Fig 1: On-Region Characteristics**



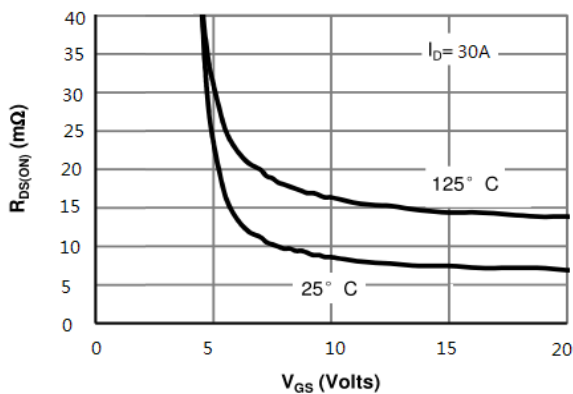
**Figure 2: Transfer Characteristics**



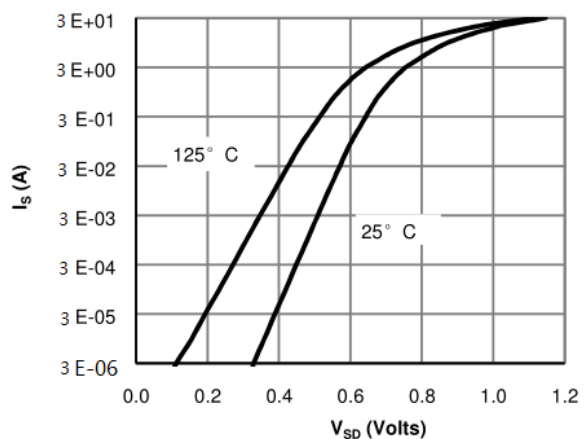
**Figure 3: On-Resistance vs. Drain Current and Gate Voltage**



**Figure 4: On-Resistance vs. Junction Temperature**



**Figure 5: On-Resistance vs. Gate-Source Voltage**



**Figure 6: Body-Diode Characteristics**

电参数曲线图 / Electrical Characteristic Curve

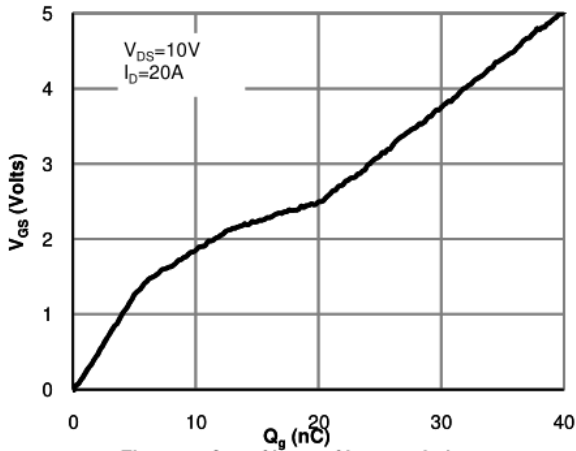


Figure 7: Gate-Charge Characteristics

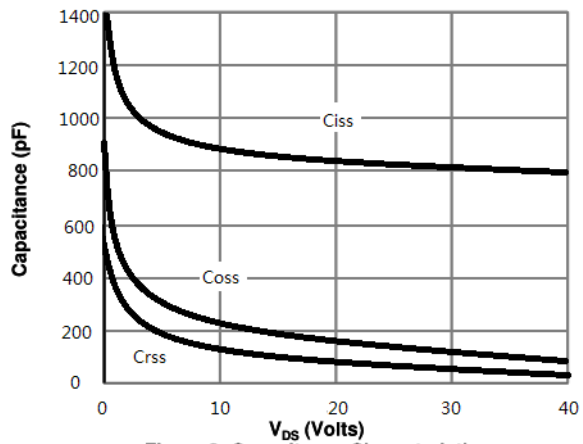


Figure 8: Capacitance Characteristics

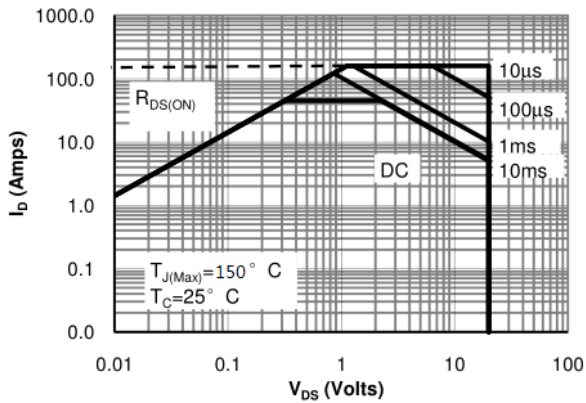


Figure 9: Maximum Forward Biased Safe Operating Area

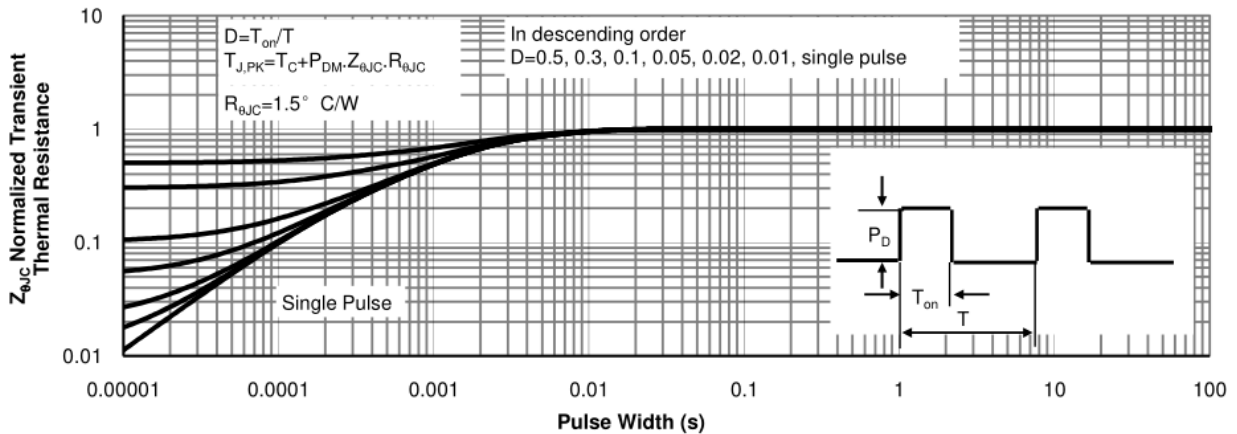
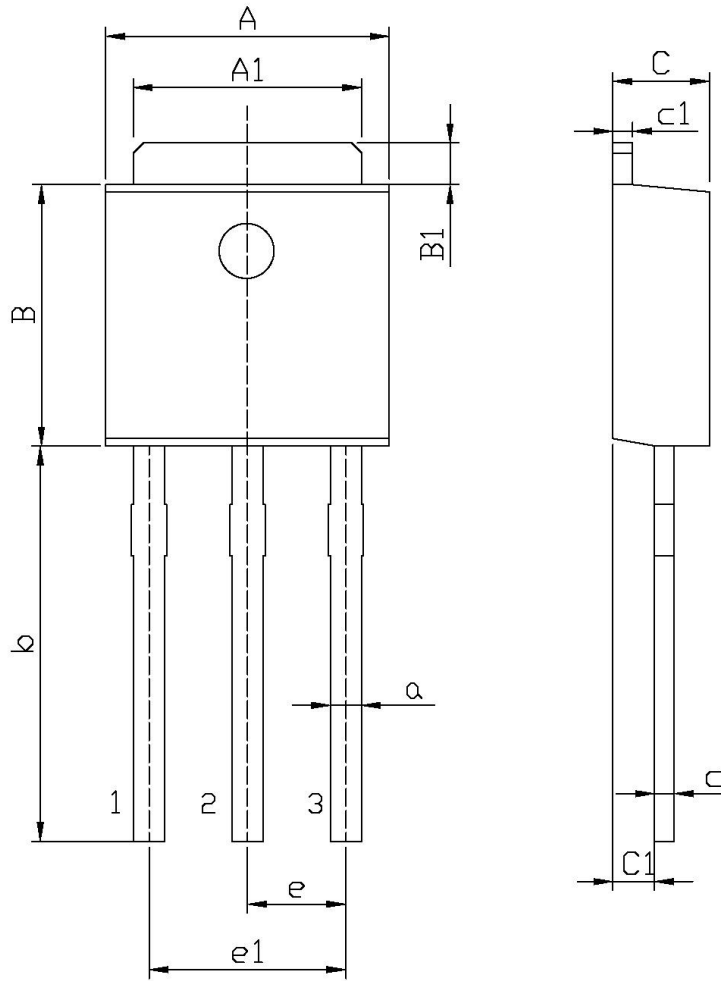


Figure 10 : Normalized Maximum Transient Thermal Impedance

**外形尺寸图 / Package Dimensions**

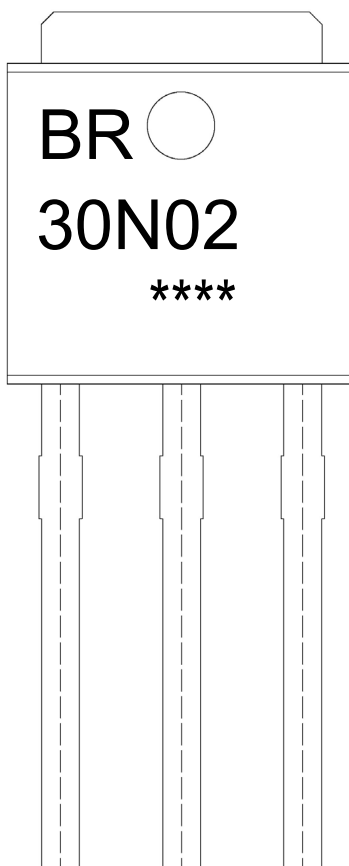


单位: mm

Symbol	Dimensions In Millimeters		Symbol	Dimensions In Millimeters	
	Min	Max		Min	Max
A	6.45	6.75	a	0.50	0.70
A1	5.10	5.50	b	9.00	9.40
B	5.95	6.25	c	0.45	0.55
B1	0.95	1.25	c1	0.45	0.55
C	2.20	2.40	e	2.24	2.34
C1	0.95	1.15	e1	4.43	4.73

TO-251

**印章说明 / Marking Instructions**



说明：

BR： 为公司代码

30N02： 为型号代码

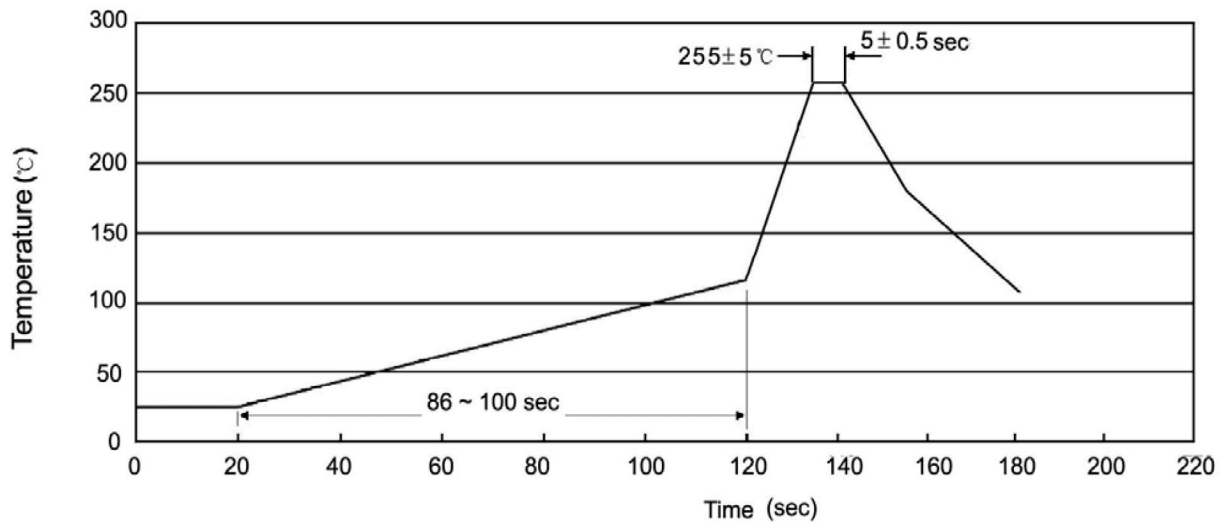
\*\*\*\*： 为生产批号代码，随生产批号变化。

Note:

BR: Company Code

30N02: Product Type Code.

\*\*\*\*: Lot No. Code, code change with Lot No.

**波峰焊温度曲线图(无铅) / Temperature Profile for Dip Soldering(Pb-Free)**


说明：

- 1、预热温度 25 ~ 150°C，时间 60 ~ 90sec；
- 2、峰值温度 255±5°C，时间持续为 5±0.5sec；
- 3、焊接制程冷却速度为 2 ~ 10°C/sec.

Note:

- 1.Preheating:25~150°C, Time:60~90sec.
- 2.Peak Temp.:255±5°C, Duration:5±0.5sec.
3. Cooling Speed: 2~10°C/sec.

**耐焊接热试验条件 / Resistance to Soldering Heat Test Conditions**

温度：270±5°C

时间：10±1 sec.

Temp.:270±5°C

Time:10±1 sec

**包装规格 / Packaging SPEC.**

散件包装 / REEL

Package Type 封装形式	Units 包装数量					Dimension 包装尺寸 (unit: mm <sup>3</sup> )		
	Units/Reel 只/卷盘	Reels/Inner Box 卷盘/盒	Units/Inner Box 只/盒	Inner Boxes/Outer Box 盒/箱	Units/Outer Box 只/箱	Reel	Inner Box 盒	Outer Box 箱
TO-251	1,000	10	10,000	5	50,000	135×190	237×172×102	560×245×195

套管包装 / TUBE

Package Type 封装形式	Units 包装数量					Dimension 包装尺寸 (unit: mm <sup>3</sup> )		
	Units/Tube 只/套管	Tubes/Inner Box 套管/盒	Units/Inner Box 只/盒	Inner Boxes/Outer Box 盒/箱	Units/Outer Box 只/箱	Tube 套管	Inner Box 盒	Outer Box 箱
TO-251/252	75	48	3,600	5	18,000	526×20.5×5.25	555×164×50	575×290×180

**使用说明 / Notices**