



ZHEJIANG UNIÜ-NE Technology CO., LTD

浙江宇力微新能源科技有限公司



## AP90N04K Data Sheet

V 1.1

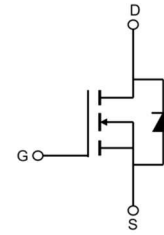
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**Features**

- 40V,80A
- $R_{DS(ON)} < 5.5m\Omega @ V_{GS} = 10V$
- $R_{DS(ON)} < 10m\Omega @ V_{GS} = 4.5V$
- Lead free and Green Device Available
- Excellent  $R_{DS(ON)}$  and Low Gate Charge
- Lead free product is acquiredcc

**Application**

- Load Switch
- PWM Application
- Power management



Schematic Diagram



Marking and pin assignment

**Package Marking and Ordering Information**

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity (PCS)
90N04K	AP90N04K	TO-252	13 inch	-	2500

**Absolute Maximum Ratings** ( $T_C=25^\circ\text{C}$  unless otherwise specified)

Symbol	Parameter	Max.	Units
$V_{DSS}$	Drain-Source Voltage	40	V
$V_{GSS}$	Gate-Source Voltage	$\pm 20$	V
$I_D$	Continuous Drain Current	$T_C = 25^\circ\text{C}$	80
		$T_C = 100^\circ\text{C}$	52
$I_{DM}$	Pulsed Drain Current <sup>note1</sup>	320	A
$E_{AS}$	Single Pulsed Avalanche Energy <sup>note2</sup>	104	mJ
$P_D$	Power Dissipation	$T_C = 25^\circ\text{C}$	77
$R_{\theta JC}$	Thermal Resistance, Junction to Case	3.0	$^\circ\text{C}/\text{W}$
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +175	$^\circ\text{C}$

**Electrical Characteristics** ( $T_J=25^\circ\text{C}$  unless otherwise specified)

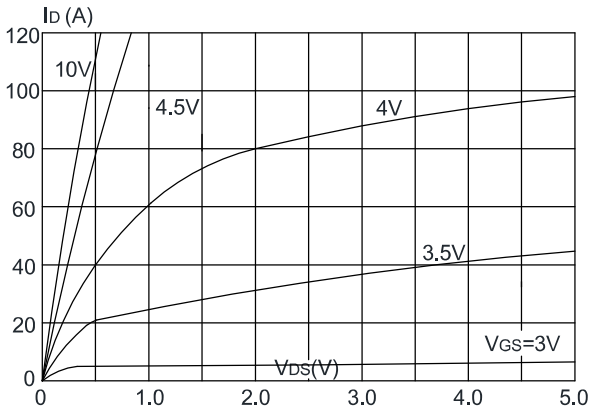
Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
<b>Off Characteristic</b>						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	40	-	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=40V, V_{GS}=0V,$	-	-	1.0	$\mu A$
$I_{GSS}$	Gate to Body Leakage Current	$V_{DS}=0V, V_{GS}=\pm 20V$	-	-	$\pm 100$	nA
<b>On Characteristics</b>						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0	1.5	2.5	V
$R_{DS(on)}$	Static Drain-Source on-Resistance <small>note3</small>	$V_{GS}=10V, I_D=30A$	-	4.2	5.5	m $\Omega$
		$V_{GS}=4.5V, I_D=20A$	-	6.5	10	
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{DS}=20V, V_{GS}=0V,$ $f=1.0MHz$	-	3042	-	pF
$C_{oss}$	Output Capacitance		-	386	-	pF
$C_{rss}$	Reverse Transfer Capacitance		-	232	-	pF
$Q_g$	Total Gate Charge	$V_{DS}=20V, I_D=30A,$ $V_{GS}=10V$	-	57	-	nC
$Q_{gs}$	Gate-Source Charge		-	9	-	nC
$Q_{gd}$	Gate-Drain("Miller") Charge		-	11	-	nC
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-on Delay Time	$V_{DD}=20V, I_D=30A,$ $R_L=1\Omega, R_{GEN}=3\Omega,$ $V_{GS}=10V$	-	8	-	ns
$t_r$	Turn-on Rise Time		-	18	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	24	-	ns
$t_f$	Turn-off Fall Time		-	14	-	ns
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	Maximum Continuous Drain to Source Diode Forward Current		-	-	80	A
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current		-	-	320	A
$V_{SD}$	Drain to Source Diode Forward Voltage	$V_{GS}=0V, I_S=30A$	-	-	1.2	V
$t_{rr}$	Body Diode Reverse Recovery Time	$T_J=25^\circ\text{C},$ $I_F=20A, di/dt=100A/\mu s$	-	22	-	ns
$Q_{rr}$	Body Diode Reverse Recovery Charge		-	11	-	nC

Notes:1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

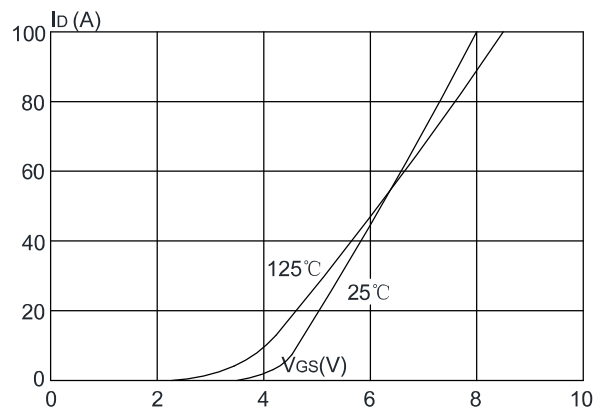
2. EAS condition:  $T_J=25^\circ\text{C}, V_{DD}=20V, R_G=25\Omega, L=0.5mH, I_{AS}=20.4A$

3. Pulse Test: Pulse Width $\leq 300\mu s$ , Duty Cycle $\leq 0.5\%$

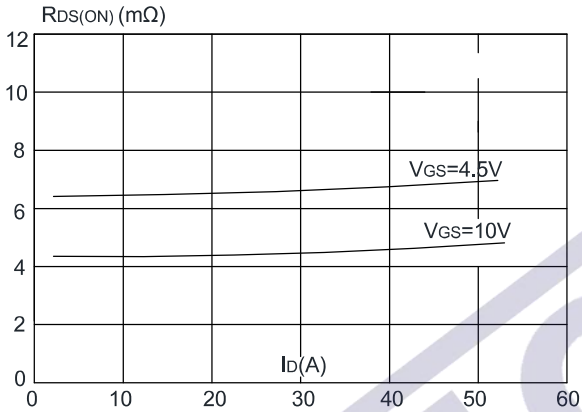
**Figure 1: Output Characteristics**



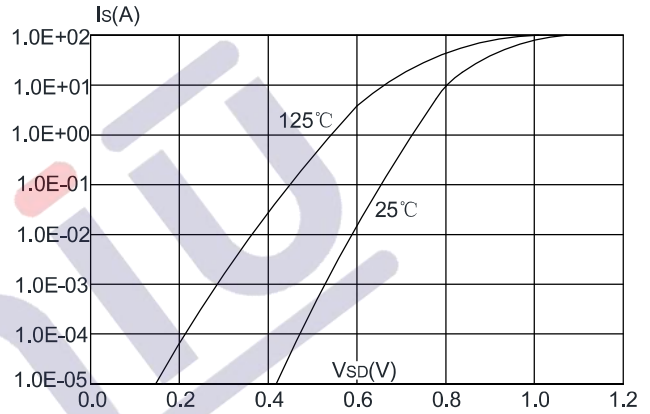
**Figure 2: Typical Transfer Characteristics**



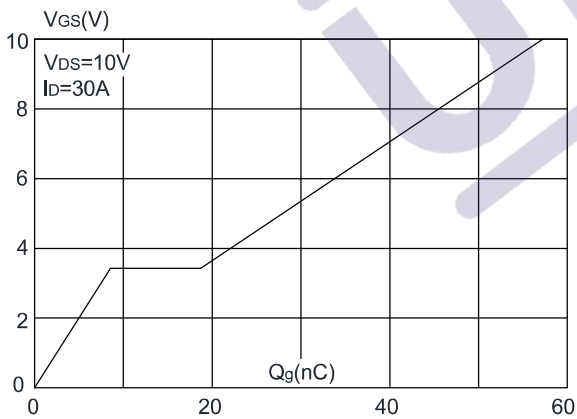
**Figure 3: On-resistance vs. Drain Current**



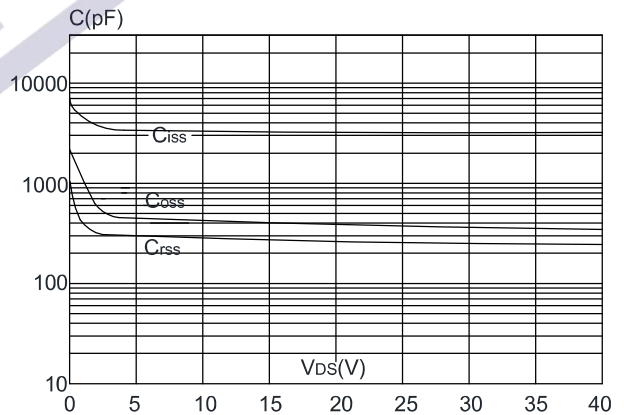
**Figure 4: Body Diode Characteristics**



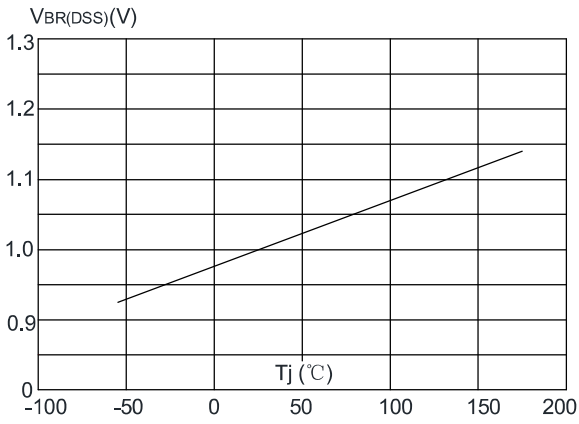
**Figure 5: Gate Charge Characteristics**



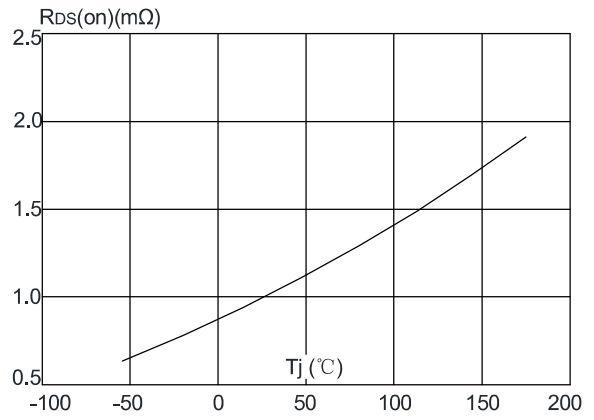
**Figure 6: Capacitance Characteristics**



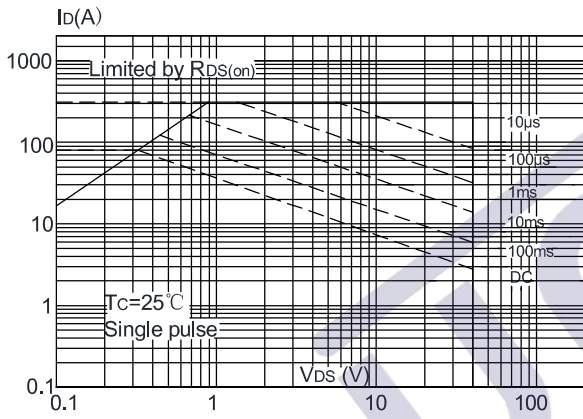
**Figure 7:** Normalized Breakdown Voltage vs. Junction Temperature



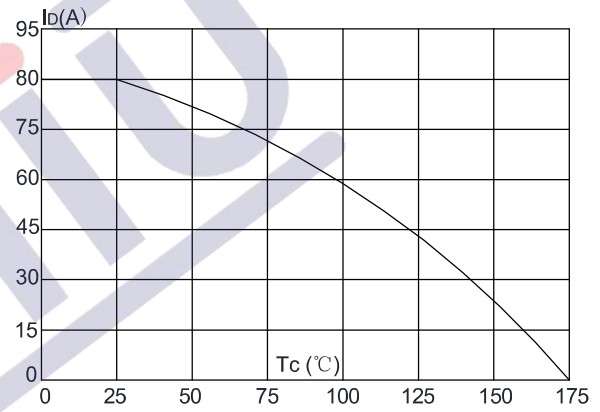
**Figure 8:** Normalized on Resistance vs. Junction Temperature



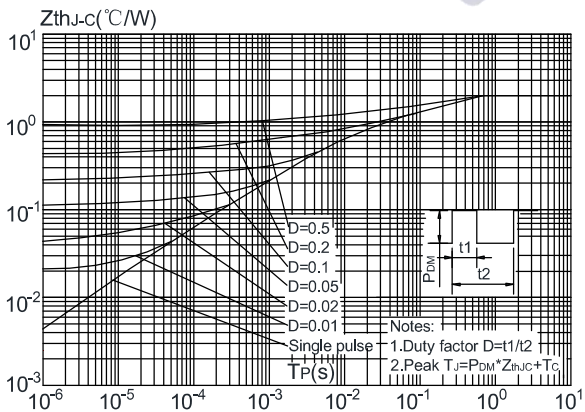
**Figure 9:** Maximum Safe Operating Area



**Figure 10:** Maximum Continuous Drain Current vs. Case Temperature



**Figure.11:** Maximum Effective Transient Thermal Impedance, Junction-to-Case



Test Circuit

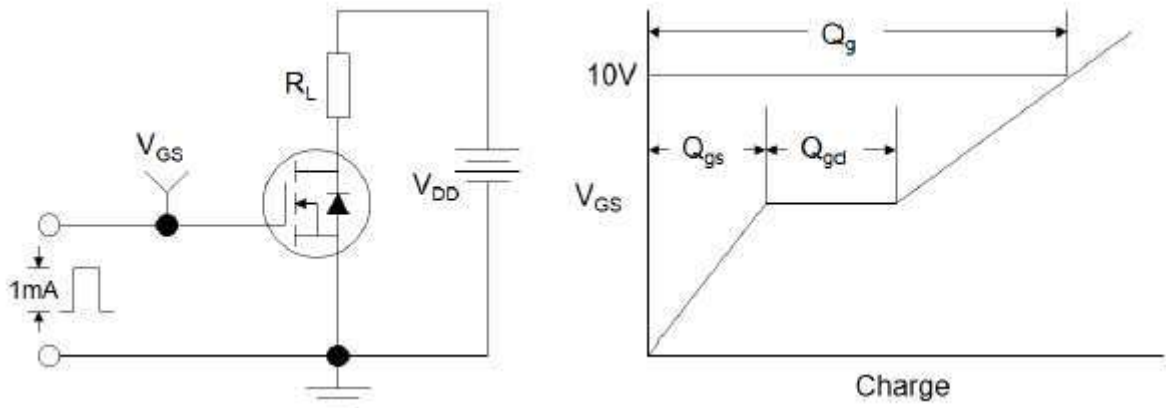


Figure 1: Gate Charge Test Circuit & Waveform

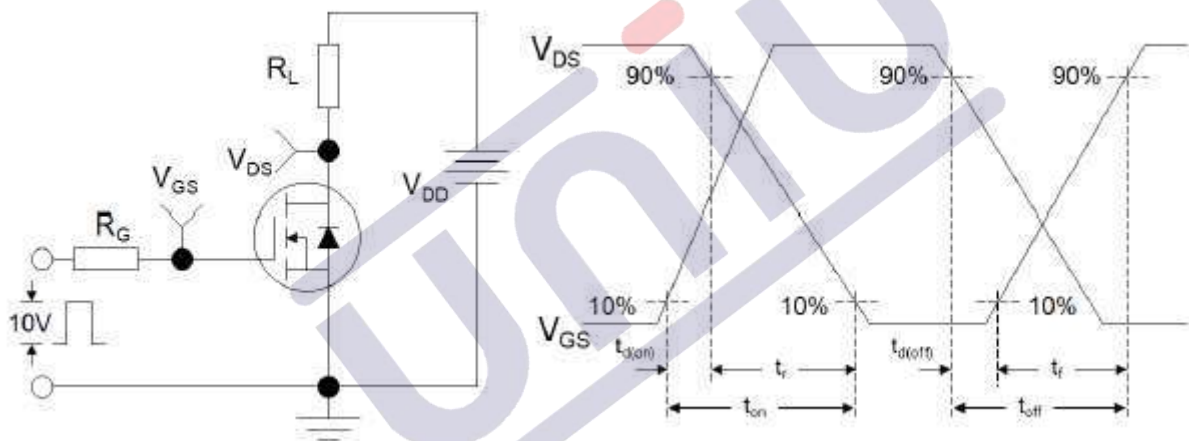


Figure 2: Resistive Switching Test Circuit & Waveforms

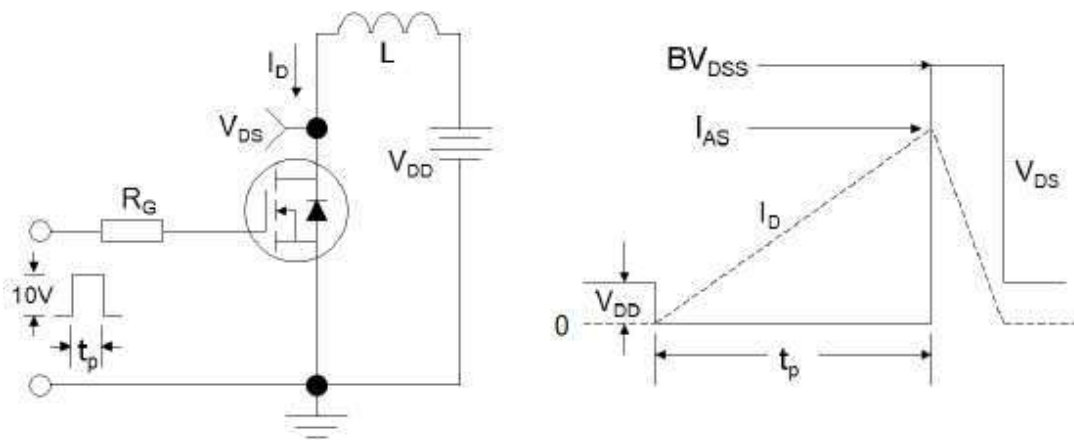
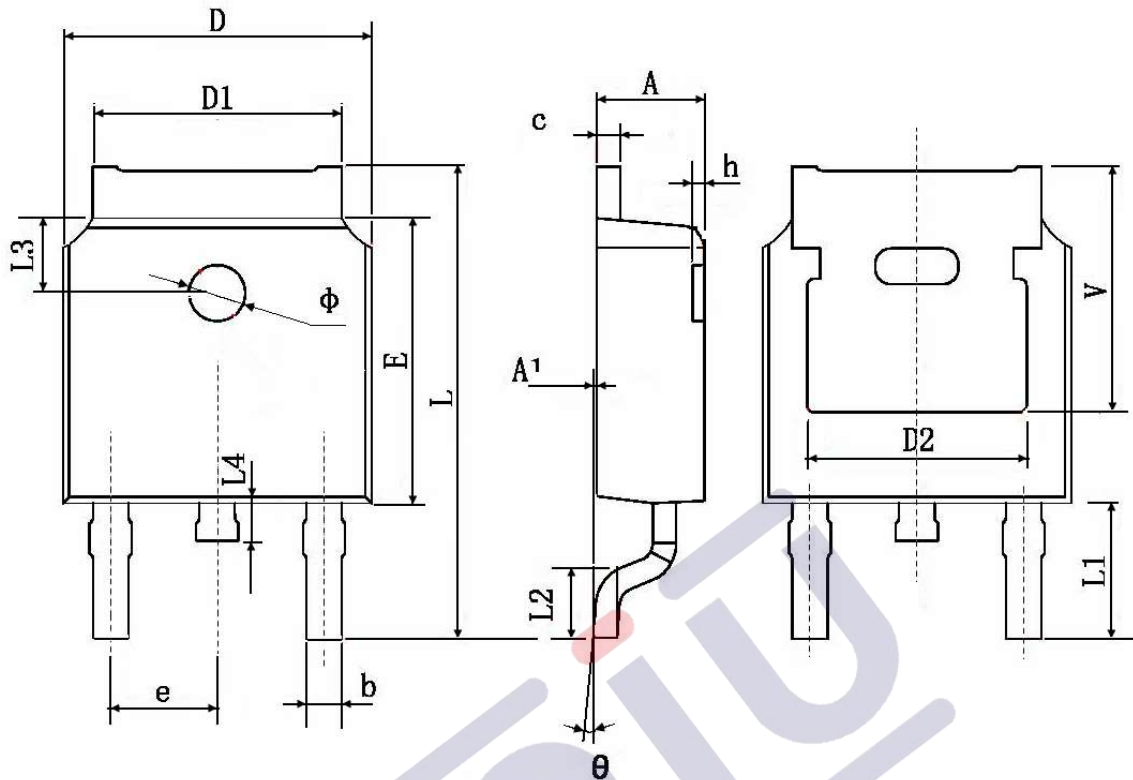


Figure 3: Unclamped Inductive Switching Test Circuit & Waveforms

## TO-252 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.660	0.860	0.026	0.034
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 TYP.		0.190 TYP.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.800	10.400	0.386	0.409
L1	2.900 TYP.		0.114 TYP.	
L2	1.400	1.700	0.055	0.067
L3	1.600 TYP.		0.063 TYP.	
L4	0.600	1.000	0.024	0.039
Φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 TYP.		0.211 TYP.	

## 1.版本记录

DATE	REV.	DESCRIPTION
2018/11/15	1.0	First Release
2020/09/18	1.1	Layout adjustment

## 2.免责声明

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## 3.联系我们

浙江宇力微新能源科技有限公司

总部地址：绍兴市越城区斗门街道袍渎路25号中节能科创园45幢4/5楼

电话：0575-85087896（研发部）

传真：0575-88125157

E-mail: htw@uni-semic.com

无锡地址：无锡市锡山区先锋中路6号中国电子（无锡）数字芯城1#综合楼503室

电话：0510-85297939

E-mail: zh@uni-semic.com

深圳地址：深圳市宝安区西乡街道南昌社区宝源路泳辉国际商务大厦410

电话：0755-84510976

E-mail: htw@uni-semic.com